UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-Q

☒ **Quarterly Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**

For the quarterly period ended September 30, 2019

or

☐ **Transition Report Pursuant Section 13 or 15(d) of the Securities Exchange Act of 1934**

For the transition period from to .

Commission file number 001-36467

RESONANT INC.

(Exact name of registrant as specified in its charter)

Delaware	**45-4320930**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

175 Cremona Drive, Suite 200
Goleta, California 93117
(Address of principal executive offices, zip code)

(805) 308-9803

(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.001 par value	RESN	The NASDAQ Stock Market LLC

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act:

Large accelerated filer	☐	Accelerated filer ☒
Non-accelerated filer	☐	Smaller reporting company ☒
		Emerging growth company ☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☒

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes☐ No ☒

As of November 5, 2019, the issuer had 32,534,699 shares of common stock issued and outstanding.

RESONANT INC.

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PART I: FINANCIAL INFORMATION

Item 1. Financial Statements

RESONANT INC.
Condensed Consolidated Balance Sheets
(Unaudited)

	September 30, 2019	December 31, 2018
ASSETS		
CURRENT ASSETS		
Cash and cash equivalents	$ 14,663,000	$ 4,394,000
Investments held-to-maturity	—	16,863,000
Accounts receivable	2,006,000	165,000
Prepaid expenses and other current assets	262,000	364,000
TOTAL CURRENT ASSETS	16,931,000	21,786,000
PROPERTY AND EQUIPMENT		
Property and equipment	4,143,000	3,784,000
Less: Accumulated depreciation and amortization	(2,433,000)	(1,797,000)
PROPERTY AND EQUIPMENT, NET	1,710,000	1,987,000
NONCURRENT ASSETS		
Intangible assets, net	1,511,000	1,374,000
Restricted cash	211,000	211,000
Goodwill	808,000	817,000
Operating lease right-of-use assets	2,642,000	—
Other assets	68,000	69,000
TOTAL NONCURRENT ASSETS	5,240,000	2,471,000
TOTAL ASSETS	$ 23,881,000	$ 26,244,000
LIABILITIES AND STOCKHOLDERS' EQUITY		
CURRENT LIABILITIES		
Accounts payable	$ 948,000	$ 695,000
Accrued expenses	272,000	464,000
Accrued salaries and payroll related expenses	1,751,000	1,835,000
Deferred revenue	2,109,000	271,000
Operating lease liabilities, current	600,000	—
TOTAL CURRENT LIABILITIES	5,680,000	3,265,000
LONG-TERM LIABILITIES		
Deferred rent	—	81,000
Operating lease liabilities, net of current portion	2,217,000	—
TOTAL LIABILITIES	7,897,000	3,346,000
Commitments and contingencies (Note 11)		
STOCKHOLDERS' EQUITY		
Common stock, $0.001 par value, 100,000,000 authorized and 32,489,179 outstanding as of September 30, 2019, and 47,000,000 authorized and 27,391,290 outstanding as of December 31, 2018	32,000	27,000
Preferred stock, $0.001 par value, 3,000,000 authorized and none outstanding as of September 30, 2019 and December 31, 2018	—	—
Additional paid-in capital	130,623,000	115,450,000
Accumulated other comprehensive loss	(25,000)	(15,000)
Accumulated deficit	(114,646,000)	(92,564,000)
TOTAL STOCKHOLDERS' EQUITY	15,984,000	22,898,000
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	$ 23,881,000	$ 26,244,000

See Accompanying Notes to Condensed Consolidated Financial Statements

RESONANT INC.
Condensed Consolidated Statements of Comprehensive Loss
(Unaudited)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	**2018**	**2019**	**2018**
REVENUES	$ 79,000	$ 115,000	$ 276,000	$ 396,000
OPERATING EXPENSES				
Research and development	4,609,000	3,584,000	13,628,000	10,185,000
Sales, marketing and administration	2,952,000	3,002,000	8,931,000	8,500,000
TOTAL OPERATING EXPENSES	7,561,000	6,586,000	22,559,000	18,685,000
NET OPERATING LOSS	(7,482,000)	(6,471,000)	(22,283,000)	(18,289,000)
OTHER INCOME (EXPENSE)				
Interest and investment income	42,000	177,000	220,000	323,000
Other expense	(7,000)	8,000	(18,000)	4,000
TOTAL OTHER INCOME, NET	35,000	185,000	202,000	327,000
LOSS BEFORE INCOME TAXES	(7,447,000)	(6,286,000)	(22,081,000)	(17,962,000)
Provision for (benefit from) income taxes	—	(11,000)	1,000	(19,000)
NET LOSS	$ (7,447,000)	$ (6,275,000)	$ (22,082,000)	$ (17,943,000)
Foreign currency translation adjustment, net of tax	(16,000)	10,000	(10,000)	(5,000)
COMPREHENSIVE LOSS	$ (7,463,000)	$ (6,265,000)	$ (22,092,000)	$ (17,948,000)
NET LOSS PER SHARE - BASIC AND DILUTED	$ (0.26)	$ (0.23)	$ (0.78)	$ (0.73)
Weighted average shares outstanding — basic and diluted	**29,169,495**	**27,006,046**	**28,295,248**	**24,645,658**

See Accompanying Notes to Condensed Consolidated Financial Statements

RESONANT INC.
Condensed Consolidated Statements of Stockholders' Equity
For the Three and Nine Months Ended September 30, 2019 and 2018
(Unaudited)

	Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance, January 1, 2019	27,391,290	$ 27,000	$ 115,450,000	$ (92,564,000)	$ (15,000)	$ 22,898,000
Vesting of restricted stock units	116,997	—	—	—	—	—
Stock-based compensation	—	—	1,040,000	—	—	1,040,000
Exercise of warrants	140,000	—	400,000	—	—	400,000
Net loss	—	—	—	(7,137,000)	—	(7,137,000)
Foreign currency translation adjustment, net of tax	—	—	—	—	(10,000)	(10,000)
Balance, March 31, 2019	27,648,287	$ 27,000	$ 116,890,000	$ (99,701,000)	$ (25,000)	$ 17,191,000
Vesting of restricted stock units	334,774	—	—	—	—	—
Stock-based compensation	—	—	1,460,000	—	—	1,460,000
Exercise of warrants	346,809	1,000	986,000	—	—	987,000
Net loss	—	—	—	(7,498,000)	—	(7,498,000)
Foreign currency translation adjustment, net of tax	—	—	—	—	16,000	16,000
Balance, June 30, 2019	28,329,870	$ 28,000	$ 119,336,000	$ (107,199,000)	$ (9,000)	$ 12,156,000
Vesting of restricted stock units	198,749	—	—	—	—	—
Stock-based compensation	—	—	1,351,000	—	—	1,351,000
Issuance of common stock	3,960,560	4,000	9,936,000	—	—	9,940,000
Net loss	—	—	—	(7,447,000)	—	(7,447,000)
Foreign currency translation adjustment, net of tax	—	—	—	—	(16,000)	(16,000)
Balance, September 30, 2019	**32,489,179**	**$ 32,000**	**$ 130,623,000**	**$ (114,646,000)**	**$ (25,000)**	**$ 15,984,000**

	Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
	Shares	Amount				
Balance, January 1, 2018	19,511,276	$ 20,000	$ 88,447,000	$ (67,748,000)	$ (7,000)	$ 20,712,000
Vesting of restricted stock units	184,818	—	—	—	—	—
Stock-based compensation	—	—	1,108,000	—	—	1,108,000
Sales of common stock, net of offering costs	5,714,286	6,000	18,375,000	—	—	18,381,000
Exercise of warrants	15,000	—	43,000	—	—	43,000
Common stock issued in exchange of warrants	242,913	—	—	—	—	—
Net loss	—	—	—	(5,716,000)	—	(5,716,000)
Foreign currency translation adjustment, net of tax	—	—	—	—	21,000	21,000
Balance, March 31, 2018	25,668,293	$ 26,000	$ 107,973,000	$ (73,464,000)	$ 14,000	$ 34,549,000
Vesting of restricted stock units	293,998	—	—	—	—	—
Stock-based compensation	—	—	1,639,000	—	—	1,639,000
Sales of common stock, net of offering costs	857,142	1,000	2,808,000	—	—	2,809,000
Exercise of warrants	74,142	—	217,000	—	—	217,000
Exercise of stock options	4,692	—	14,000	—	—	14,000
Net loss	—	—	—	(5,952,000)	—	(5,952,000)
Foreign currency translation adjustments, net of tax	—	—	—	—	(36,000)	(36,000)
Balance, June 30, 2018	26,898,267	$ 27,000	$ 112,651,000	$ (79,416,000)	$ (22,000)	$ 33,240,000
Vesting of restricted stock units	142,447	—	—	—	—	—
Stock-based compensation	—	—	1,349,000	—	—	1,349,000
Net loss	—	—	—	(6,275,000)	—	(6,275,000)
Foreign currency translation adjustments, net of tax	—	—	—	—	10,000	10,000
Balance, September 30, 2018	**27,040,714**	**$ 27,000**	**$ 114,000,000**	**$ (85,691,000)**	**$ (12,000)**	**$ 28,324,000**

See Accompanying Notes to Condensed Consolidated Financial Statements

RESONANT INC.
Condensed Consolidated Statements of Cash Flows
(Unaudited)

	Nine months ended September 30, 2019	Nine months ended September 30, 2018
CASH FLOWS FROM OPERATING ACTIVITIES		
Net Loss	$ (22,082,000)	$ (17,943,000)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	735,000	600,000
Benefit from income taxes	—	(41,000)
Stock-based compensation	4,200,000	3,958,000
Non-cash loss on disposal of assets	1,000	8,000
Non-cash investment income	—	(63,000)
Non-cash patent write-off	104,000	87,000
Right-of-use asset amortization	440,000	—
Changes in assets and liabilities:		
Accounts receivable	(1,841,000)	(2,000)
Prepaid expenses and other current assets	102,000	206,000
Other assets	1,000	(50,000)
Accounts payable	280,000	88,000
Accrued expenses	101,000	(82,000)
Accrued salaries and payroll related expenses	(433,000)	(437,000)
Operating lease liabilities	(346,000)	—
Deferred revenue	1,838,000	46,000
Deferred rent	—	47,000
Net cash used in operating activities	(16,900,000)	(13,578,000)
CASH FLOWS FROM INVESTING ACTIVITIES		
Proceeds from sale of fixed assets	—	16,000
Purchases of property and equipment	(715,000)	(865,000)
Expenditures for patents	(306,000)	(157,000)
Redemption of investments held-to-maturity	29,295,000	39,590,000
Purchase of investments held-to-maturity	(12,432,000)	(48,411,000)
Net cash provided by (used in) investing activities	15,842,000	(9,827,000)
CASH FLOWS FROM FINANCING ACTIVITIES		
Net proceeds from the sale of common stock from private placement offering	9,940,000	—
Net proceeds from the sale of common stock from underwritten public offering	—	21,190,000
Proceeds from exercise of stock options	—	14,000
Proceeds from exercise of warrants	1,387,000	260,000
Net cash provided by financing activities	11,327,000	21,464,000
Effects of exchange rates on cash, cash equivalents and restricted cash	—	(2,000)
NET INCREASE (DECREASE) IN CASH, CASH EQUIVALENTS AND RESTRICTED CASH	10,269,000	(1,943,000)
CASH, CASH EQUIVALENTS AND RESTRICTED CASH — Beginning of period	4,605,000	19,624,000
CASH, CASH EQUIVALENTS AND RESTRICTED CASH — End of period	$ 14,874,000	$ 17,681,000
SUPPLEMENTAL DISCLOSURE OF CASH FLOW INFORMATION		
Taxes Paid	$ 1,000	$ 3,000
SUPPLEMENTAL DISCLOSURE OF NON-CASH ACTIVITIES		
Restricted stock units issued in settlement of liability	$ 349,000	$ 1,004,000
Property and equipment included in accounts payable	$ 37,000	$ 124,000
Property and equipment included in accrued liabilities	$ 16,000	$ 282,000
Patents included in accounts payable	$ 70,000	$ 32,000
Patents included in accrued liabilities	$ 2,000	$ —

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the Condensed Consolidated Balance Sheets to the total of the same such amounts shown above:

	September 30,	
	2019	**2018**
Cash and cash equivalents	$ 14,663,000	$ 17,470,000
Restricted cash	211,000	211,000
Total cash, cash equivalents and restricted cash	$ 14,874,000	$ 17,681,000

See Accompanying Notes to Condensed Consolidated Financial Statements

RESONANT INC.
Notes to Condensed Consolidated Financial Statements

NOTE 1—ORGANIZATION AND DESCRIPTION OF BUSINESS

Overview

Resonant Inc. is a late-stage development company located in Goleta, California. We were incorporated in Delaware in January 2012 as a wholly owned subsidiary of Superconductor Technologies Inc., or STI. Resonant LLC, a limited liability company, was formed in California in May 2012. We changed our form of ownership from a limited liability company to a corporation in an exchange transaction in June 2013, when we commenced business. We are the successor of Resonant LLC. We completed our initial public offering, or IPO, on May 29, 2014. On July 6, 2016 we acquired all of the issued and outstanding capital stock of GVR Trade S.A, or GVR. GVR is a wholly owned subsidiary of Resonant Inc.

Using our innovative software platform we have developed an IP portfolio of more than 200 patents filed or issued, with more than 40 filed or issued targeting XBAR technology, including application to 5G. In addition, with continued requirements for increasing numbers of filter designs our innovative software platform addresses the need for increased designer efficiency, reduced time to market and lower unit costs in the designs of filters for radio frequency, or RF, front-ends for the mobile device industry. The RF front-end, or RFFE, is the circuitry in a mobile device responsible for analog signal processing and is located between the device’s antenna and its digital circuitry. The software platform we continue to develop is based on fundamentally new technology that we call Infinite Synthesized Networks®, or ISN®, to configure and connect resonators, the building blocks of RF filters. Filters are a critical component of the RF front-end used to select desired radio frequency signals and reject unwanted signals.

We believe licensing our designs is the most direct and effective means of validating our ISN® platform and related IP libraries. Our target customers make part or all of the RFFE. We intend to retain ownership of our designs, and we expect to be compensated through license fees and royalties based on sales of RFFE filters that incorporate our designs.

Capital Resources and Liquidity

We use the net proceeds from the sales of our common stock for product development to commercialize our technology, research and development, the development of our patent strategy and expansion of our patent portfolio, as well as for working capital and other general corporate purposes.

We have earned minimal revenues since inception, and our operations have been funded with initial capital contributions and proceeds from the sale of equity securities and debt. At September 30, 2019 and December 31, 2018, we had incurred accumulated losses of $114.6 million and $92.6 million, respectively. The losses are primarily the result of research and development costs associated with commercializing our technology, combined with start-up, financing and public company costs. We expect to continue to incur substantial costs as we continue to engage customers, increase the number of devices under design and build the infrastructure to support our anticipated growth.

Our condensed consolidated financial statements account for the continuation of our business as a going concern. We are subject to the risks and uncertainties associated with a new business. Our principal sources of liquidity as of September 30, 2019 consist of existing cash and cash equivalents totaling $14.7 million, which includes approximately $9.9 million in proceeds from our private placement of common stock that closed in September 2019. In the first nine months of 2019, we used approximately $17.9 million of cash and investments for operating activities, the purchase of property and equipment, and expenditures for patents. Due to these conditions, along with anticipated increases in expenses, substantial doubt exists as to our ability to continue as a going concern. After evaluation of these conditions, we believe our current resources, along with expected proceeds from forecasted billings, will provide sufficient funding for planned operations into June of 2020. If necessary, we will seek to raise additional capital from the sale of equity securities or the incurrence of indebtedness to allow us to continue operations. There can be no assurance that additional financing will be available to us on acceptable terms, or at all. Additionally, if we issue additional equity securities to raise funds, whether to existing investors or others, the ownership percentage of our existing stockholders would be reduced. New investors may demand rights, preferences or privileges senior to those of existing holders of common stock. Additionally, we may be limited as to the amount of funds we can raise pursuant to SEC rules and the continued listing requirements of NASDAQ. If we cannot raise needed funds, we might be forced to make substantial reductions in our operating expenses, which could adversely affect our ability to implement our business plan and ultimately our viability as a company. These condensed consolidated financial statements do not include any adjustments relating to the recoverability and classification of recorded asset amounts or amounts and classification of liabilities that might result from this uncertainty.

We have a Form S-3 universal shelf registration statement on file with the SEC. The universal shelf registration statement on Form S-3 permits us to sell, in one or more public offerings, shares of our common stock, shares of preferred stock or debt securities, or any combination of such securities and warrants to purchase securities, for proceeds in an aggregate amount of up to $50.0 million, subject to potential limitations on the amount of securities we may sell in any twelve-month period. The Form S-3 will expire in November 2021. No securities have been issued pursuant to the registration statement.

NOTE 2—SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation and Use of Estimates—The accompanying unaudited condensed consolidated financial statements were prepared in accordance with accounting principles generally accepted in the United States ("GAAP") for interim financial information. Certain information and disclosures normally included in consolidated financial statements prepared in accordance with GAAP have been condensed or omitted. Accordingly, these condensed consolidated financial statements should be read in conjunction with our audited consolidated financial statements and the related notes included in our Annual Report for the year ended December 31, 2018 filed with the SEC on March 14, 2019. The year-end condensed balance sheet was derived from our audited consolidated financial statements. Our unaudited interim condensed consolidated financial statements include, in the opinion of management, all adjustments, consisting of normal and recurring items, necessary for the fair statement of the condensed consolidated financial statements. The operating results for the nine months ended September 30, 2019 are not necessarily indicative of the results expected for the full year ending December 31, 2019. Prior period figures have been reclassified, wherever necessary, to conform to current presentation. Significant estimates made in preparing these financial statements include (a) assumptions to calculate the fair values of financial instruments, warrants and equity instruments and other liabilities and the deferred tax asset valuation allowance and (b) the useful lives for depreciable and amortizable assets. Actual results could differ from those estimates.

Consolidation —The accompanying financial statements include the accounts of the Company and its wholly-owned subsidiary, GVR Trade, S.A. All significant intercompany balances and transactions have been eliminated.

Cash and Cash Equivalents—We consider all liquid instruments purchased with a maturity of three months or less to be cash equivalents.

Concentration of Credit Risk—We maintain bank accounts atone U.S. financial institution. The U.S. bank accounts are insured by the Federal Deposit Insurance Corporation (FDIC) for up to $250,000 per account owner. GVR Trade S.A., our wholly owned Swiss-based subsidiary maintains checking accounts at one major national financial institution. Additionally, we maintain a checking account with a very minimal balance at one bank in South Korea, which is used to fund payroll and rent in South Korea. Management believes we are not exposed to significant credit risk due to the financial position of the depository institutions in which our deposits are held.

Restricted Cash—Restricted cash as of September 30, 2019 and December 31, 2018 consists of a $211,000 pledged mutual fund account which is held as collateral against a letter of credit issued in May 2018 in connection with the lease of our corporate headquarters. See also Note 9 - Leases, for further details.

Investments—Securities held-to-maturity: Management determines the appropriate classification of debt securities at the time of purchase and reevaluates such designation as of each balance sheet date. Investment/debt securities are classified as held-to-maturity when we have the positive intent and ability to hold the securities to maturity. Held-to-maturity securities are stated at amortized cost, adjusted for amortization of premiums and accretion of discounts to maturity computed under the effective interest method. Such amortization is included in investment income. Interest on securities classified as held-to-maturity is included in interest and investment income.

When the fair value of an investment instrument classified as held-to-maturity is less than its amortized cost, management assesses whether or not: (i) we have the intent to sell the instrument or (ii) it is more likely than not that we will be required to sell the instrument before its anticipated recovery. If either of these conditions is met, we must recognize an other-than-temporary impairment for the difference between the instrument's amortized cost basis and its fair value, and include such amounts in other income (expense).

For investment instruments that do not meet the above criteria and are not expected to be recovered at the amortized cost basis, the instrument is considered other-than-temporarily impaired. For these instruments, we separate the total impairment into the credit loss component and the amount of the loss related to other factors. In order to determine the amount of the credit loss, we calculate the recovery value by performing a discounted cash flow analysis based on the current cash flows and future cash flows management expects to recover. The discount rate is the effective interest rate implicit in the underlying instrument. The amount of the total other-than-temporary impairment related to credit loss is recognized in earnings and is included in other income (expense). The amount of the total other-than-temporary impairment related to other factors is recognized in other comprehensive income. For investment instruments that have other-than-temporary impairment recognized through earnings, if through subsequent evaluation there is a significant increase in the cash flow expected, the difference between the amortized cost basis and the cash flows expected to be collected is accreted as interest income.

Fair Value of Financial Instruments—We measure certain financial assets and liabilities at fair value based on the exit price notion, or price that would be received for an asset or paid to transfer a liability, in an orderly transaction between the market participants at the measurement date. The carrying amounts of our financial instruments, including cash equivalents, restricted cash, investments held-to-maturity, accounts payable, and accrued liabilities, approximate fair value due to their short maturities.

Accounts Receivable—Trade accounts receivable are stated net of allowances for doubtful accounts. Management estimates the allowance for doubtful accounts based on review and analysis of specific customer balances that may not be collectible, customer payment history and any other customer-specific information that may impact ability to collect the receivable. Accounts are considered for write-off when they become past due and when it is determined that the probability of collection is remote. There was no allowance for doubtful accounts at September 30, 2019 and December 31, 2018.

Property and Equipment—Property and equipment consists of leasehold improvements associated with our corporate offices, software purchased during the normal course of business, equipment and office furniture and fixtures, all of which are recorded at cost. Depreciation and amortization is recorded using the straight-line method over the respective useful lives of the assets ranging from three to five years. Leasehold improvements are amortized over the shorter of lease term or useful life. Long-lived assets are reviewed for impairment whenever events or circumstances indicate that the carrying amount of these assets may not be recoverable.

Intangible Assets, net —Intangible assets are recorded at cost and amortized over the useful life. In the case of business combinations, intangible assets are recorded at fair value. At September 30, 2019 and December 31, 2018, intangible assets, net, includes patents and a domain name and other intangible assets purchased as part of our acquisition of GVR, including customer relationships, technology and a trademark. Intangible assets are reviewed for impairment whenever events or circumstances indicate that the carrying amount of these assets may not be recoverable. In certain cases, patents may expire or be abandoned as we no longer plan to pursue them. In such cases we write off the capitalized patent costs as patent abandonment costs which are included in research and development expenses.

Goodwill—At September 30, 2019 and December 31, 2018, goodwill represents the difference between the price paid to acquire GVR and the fair value of the assets acquired, net of assumed liabilities. We review goodwill for impairment annually and whenever events or circumstances indicate that the carrying amount of these assets may not be recoverable. As of January 1, 2019, we have adopted ASU No. 2017-04, *Intangibles-Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment*, which simplifies the accounting for goodwill impairments by eliminating step 2 from the goodwill impairment test.

Revenue Recognition—We recognize revenue in accordance with the Financial Accounting Standards Board, or FASB, Accounting Standards Codification, or ASC, Topic 606, *Revenue from Contracts with Customers.*

Revenue is recognized upon the transfer of control of promised goods or services to the customers in an amount that reflects the consideration we expect to receive in exchange for those products or services. Revenue consists primarily of upfront non-refundable fees received in connection with filter design projects with customers and royalties. Our performance obligation is to design a licensable filter in accordance with customer specifications. The license of the completed design is considered part of this performance obligation as the design and licensing of the filter are highly interdependent. We recognize revenue over the course of the design development phase as our customers are able to benefit from our design services as they are provided, primarily by marketing the in-process design to their customers. We recognize revenue from our design services based on efforts expended to date. At the end of each reporting period, we reassess our measure of progress and adjust revenue when appropriate. We record the expenses related to these projects in the periods incurred and they are generally included in research and development expense.

In most cases, upfront non-refundable payments related to design development are recognized over a period of 12 to 18 months. Contracts generally include upfront non-refundable fees, intended to support our initial engineering product development efforts, and may include milestone payments based upon the successful completion of certain deliverables. Milestone payments represent variable consideration, and we use the "most likely amount" approach to determine the amount we ultimately expect to receive. At contract inception, we assess the likelihood of achieving milestones to estimate the total consideration we believe we will receive for our services.

Upon completion of design services, our customers retain a license over the completed design. The license will typically last for a minimum of two years, and in many cases for the life of the design. Royalties are sales-based, and we recognize royalty revenue upon shipment, by our customer, of products that include our licensed design. Payment is generally due within 30 days.

We apply the practical expedients available in ASC 606 to not disclose information about 1) remaining performance obligations that have original expected durations of one year or less and 2) variable consideration that is a sales-based or usage-based royalty.

Research and Development—Costs and expenses that can be clearly identified as research and development are charged to expense as incurred in accordance with ASC Topic 730-10, *Research and Development*.

Operating Leases—We lease office space and research facilities under operating leases. Certain lease agreements contain free or escalating rent payment provisions. As of January 1, 2019, we have adopted ASU No. 2016-02, *Leases (Topic 842)* as well as other clarifying and practical updates issued under *Leases (Topic 842)* applicable to us.

We determine if an arrangement is a lease at lease inception. Operating leases are included in right-of-use ("ROU") lease assets, other current liabilities (current portion of lease obligations), and long term lease obligations on our balance sheets. ROU lease assets represent our right to use an underlying asset for the lease term and lease obligations represent our obligation to make lease payments arising from the lease. Operating ROU lease assets and obligations are recognized at the commencement date based on the present value of lease payments over the lease term. As most of our leases do not provide an implicit rate, we use an incremental borrowing rate based on the information available at the commencement date in determining the present value of lease payments. The ROU lease asset also includes any lease payments made and excludes lease incentives. We evaluate renewal options at lease inception and on an ongoing basis, and include renewal options which we are reasonably certain to exercise in our expected lease term when classifying leases and measuring lease liabilities. We allocate the consideration between lease and nonlease components and exclude nonlease components from our recognized lease assets and liabilities. See also *Recent Accounting Pronouncements* and Note 9 - Leases.

Minimum lease payments, including scheduled rent increases, are recognized as lease expenses on a straight-line basis over the applicable lease term. We recognize lease expenses within research and development and sales, marketing and administration expenses on a straight-line basis over the lease term.

We are not party to any leases for which we are the lessor.

Stock-Based Compensation—We account for stock options in accordance with ASC Topic 718, *Compensation-Stock Compensation*. We use the Black-Scholes option valuation model for estimating fair value at the date of grant.

We account for restricted stock units issued at fair value, based on the market price of our stock on the date of grant, net of estimated forfeitures. Compensation expense is recognized for the portion of the award that is ultimately expected to vest over the period during which the recipient renders the required services to the Company generally using the straight-line single option method.

In the case of award modifications, we account for the modification in accordance with ASU No. 2017-09, *Compensation-Stock Compensation (Topic 718): Scope of Modification Accounting*, whereby we recognize the effect of the modification in the period the award is modified.

As of January 1, 2019, we adopted ASU No. 2018-07, *Compensation-Stock Compensation (Topic 718): Improvements to Non-employee Share-Based Payment Accounting*, which aligns the accounting of share-based payment awards issued to employees and non-employees. The adoption did not materially impact our condensed consolidated financial statements.

Stock-based compensation expense is included in research and development expenses and general and administrative expenses.

Earnings Per Share, or EPS—EPS is computed in accordance with ASC Topic 260, *Earnings per Share*, and is calculated using the weighted average number of common shares outstanding during each period. Diluted EPS assumes the conversion, exercise or issuance of all potential common stock equivalents unless the effect is to reduce a loss or increase the income per share. Potential common shares consist of the incremental common shares issuable upon the exercise of stock options (using the treasury stock method), the exercise of warrants (using the if-converted method) and the vesting of restricted stock unit awards.

Income Taxes—We account for income taxes in accordance with ASC Topic 740, *Income Taxes*, or ASC 740, which requires the recognition of deferred tax assets and liabilities for the future consequences of events that have been recognized in our condensed consolidated financial statements or tax returns. The measurement of the deferred items is based on enacted tax laws. In the event the future consequences of differences between financial reporting bases and the tax bases of our assets and liabilities result in a deferred tax asset, ASC 740 requires an evaluation of the probability of being able to realize the future benefits indicated by such asset. A valuation allowance related to a deferred tax asset is recorded when it is more likely than not that some portion or the entire deferred tax asset will not be realized. As part of the process of preparing our condensed consolidated financial statements, we are required to estimate our income tax expense in each of the jurisdictions in which we operate. We also assess temporary differences resulting from differing treatment of items for tax and accounting differences. We record a valuation allowance to reduce the deferred tax assets to the amount of future tax benefit that is more likely than not to be realized. For the period when we were organized as a limited liability company, we were treated as a partnership for federal and state income tax purposes under the entity classification domestic default rules. As of September 30, 2019 and December 31, 2018, no liability for unrecognized tax benefits was required to be reported. We recognize interest and penalties related to income tax matters in income taxes, and there were none for the three and nine months ended September 30, 2019 and 2018.

We have filed, or are in the process of filing, tax returns that are subject to audit by the relevant tax authorities. Although the ultimate outcome would be unknown, we believe that any adjustments that may result from tax return audits are not likely to have a material, adverse effect on our condensed consolidated results of operations, financial position or cash flows.

Foreign Currency Translation—The Swiss Franc has been determined to be the functional currency for the net assets of our Swiss-based subsidiary. We translate the assets and liabilities to U.S. dollars at each reporting period using exchange rates in effect at the balance sheet date and record the effects of the foreign currency translation in accumulated other comprehensive loss in shareholders' equity. We translate the income and expenses to U.S. dollars at each reporting period using the average exchange rate in effect for the period and record the effects of the foreign currency translation as other comprehensive income (loss) in the condensed consolidated statements of comprehensive loss. Gains and losses resulting from foreign currency transactions are included in net loss in the condensed consolidated statements of comprehensive loss.

Recent Accounting Pronouncements

Leases—In February 2016, the FASB issued ASU No. 2016-02,*Leases (Topic 842)*, which, among other things required the recognition of lease assets and lease liabilities on the balance sheet for substantially all leases, including operating leases. Expanded disclosures with additional qualitative and quantitative information are also required. ASU 2016-02 and its amendments are effective for interim and annual reporting periods beginning after December 15, 2018 and early adoption was permitted. The standard allows for two methods of transition, one of which allows for the guidance to be applied to all leases existing at the adoption date with a cumulative effect adjustment to the opening balance sheet of retained earnings. Under this transition approach, comparative periods presented in the financial statements remain under legacy lease guidance.

We adopted the standard, as well as certain practical expedients included therein, utilizing the optional transition method as of January 1, 2019. Therefore, we have not restated comparative periods in our 2019 financial statements and prior periods are not included in our leased properties footnote. The adoption did not have any cumulative adjustment impact on retained earnings. We elected the package of practical expedients permitted under the transition guidance, which allowed us to carry forward our historical assessments of: (1) whether contracts are or contain leases, (2) lease classification and (3) initial direct costs. In addition, we did not elect the hindsight practical expedient to determine the reasonably certain lease term for existing leases. We also elected a policy of not recording leases on our condensed consolidated balance sheets when the leases have a term of 12 months or less and we are not reasonably certain to elect an option to purchase the leased asset.

The adoption of the standard on January 1, 2019 caused us to recognize approximately $3.0 million in each, right-of-use assets and lease liabilities, in our condensed consolidated financial statements. The right-of-use asset balance reflects the impact of other liability amounts, specifically deferred rent, that has been effectively reclassified. The standard did not materially impact consolidated net income or liquidity.

NOTE 3—REVENUE RECOGNITION

We record contract assets and contract liabilities in connection with revenue recognized for filter design projects.

Contract Assets - Contract assets, other than accounts receivable, consist of unbilled revenue and generally arise when revenue is recognized on a contract whose transaction price includes an estimate of variable consideration from milestone payments. We do not have material amounts of contract assets as we have relatively few contracts, only modest design service fees and a small number of contracts containing milestone payments. Contract asset balances are included in prepaid expenses and other current assets in our condensed consolidated balance sheets.

Contract Liabilities - Our contract liabilities consist of customer deposits and deferred revenue. We classify contract liabilities as current or noncurrent based on the timing of when we expect to recognize revenue. Generally, our contract liabilities are expected to be recognized in one year or less. Customer deposits and deferred revenue are separately stated in our condensed consolidated balance sheets.

Summary of changes in contract assets and liabilities for the nine months ended September 30, 2019 and 2018:

	Nine Months Ended September 30,	
	2019	2018
Contract assets		
Contract assets, beginning	$ 36,000	$ 67,000
Contract assets at beginning of year transferred to accounts receivable	(36,000)	(43,000)
Reversal of contract assets due to changes in transaction price	(8,000)	(24,000)
Contract assets recorded on contracts during the period	8,000	3,000
Contract assets, ending	$ —	$ 3,000
Contract liabilities		
Contract liabilities, beginning	$ 271,000	$ 146,000
Recognition of revenue included in beginning of year contract liabilities	(199,000)	(92,000)
Contract liabilities, net of revenue recognized on contracts during the period	2,037,000	132,000
Foreign currently translation	$ —	$ 1,000
Contract liabilities, ending	$ 2,109,000	$ 187,000

The following table presents our disaggregated revenue by region and source:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Revenue by geographic region:				
United States	$ 79,000	$ 96,000	$ 276,000	$ 338,000
Switzerland	—	19,000	—	58,000
Total revenue	$ 79,000	$ 115,000	$ 276,000	$ 396,000
Revenue by source:				
Design services	$ 70,000	$ 85,000	$ 252,000	$ 276,000
Royalties	9,000	30,000	24,000	120,000
Total revenue	$ 79,000	$ 115,000	$ 276,000	$ 396,000

Effective September 30, 2019, we entered into a collaboration and license agreement, dated September 30, 2019, with Murata Manufacturing Co., Ltd. Pursuant to the collaboration agreement, we have agreed with Murata to collaborate on the development of proprietary circuit designs using our XBAR® technology, and we licensed to Murata rights for products in four specific radio frequencies, or bands. Murata has agreed to pay us up to an aggregate of $9.0 million as pre-paid royalties and other fees for the licensed designs and certain other intellectual property developed in the collaboration, payable in installments over a multi-year development period, with each installment conditional upon our achievement of certain milestones and deliverables acceptable to Murata in its discretion. Murata may terminate the collaboration agreement at any time upon thirty (30) days prior written notice to us.

Murata's rights to our XBAR® technology are exclusive for a period of30 months, through March 2022, during which period we may not grant to any third party the right to develop, make, have made, use, sell, offer for sale or import any filter or resonator produced through the use of the XBAR® technology for use in mobile communication devices.

Under the collaboration agreement, the first of payment of$2.0 million was due to us, and was recorded in accounts receivable with the offset to deferred revenue at September 30, 2019. Payment was received on October 11, 2019.

NOTE 4—INVESTMENTS HELD-TO-MATURITY

We classify investments as held-to-maturity when we have the positive intent and ability to hold the securities to maturity.

During the nine months ended September 30, 2019, we invested in commercial papers that were classified as investments held-to-maturity. As of September 30, 2019, all investments have matured. We did not recognize an other-than-temporary impairment or comprehensive gain or loss for the three and nine months ended September 30, 2019.

We recorded interest and investment income of$42,000 and $177,000 for the three months ended September 30, 2019 and 2018, respectively, and$220,000 and $323,000 for the nine months ended September 30, 2019 and 2018, respectively, associated with our cash and investment accounts.

NOTE 5—WARRANTS

From time to time, we have issued warrants to purchase shares of common stock. These warrants have been issued in connection with the financing transactions and consulting services. Our warrants are subject to standard anti-dilution provisions applicable to shares of our common stock.

In January 2018, we entered into an agreement with our founders to exchange warrants to purchase an aggregate of249,999 shares of our common stock, with an exercise price of $0.20 per share, for an amount of shares that would equal the number of shares they would have received if exercised under a cashless exercise. The effect of exchanging the warrants for shares of our common stock was considered a modification of the award which required us to record expense for the excess of the fair value of the common stock issued over the fair value of the exchanged warrants. On the date of the exchange the fair value of the warrants was determined to be $1.6 million and the fair value of the shares of common stock issued were $1.6 million. There was a difference in fair value of $2,000 which was recorded to sales, marketing and administration expenses during the nine months ended September 30, 2018. No expense was recorded in the nine months ended September 30, 2019.

A roll-forward of warrant share activity from January 1, 2018 toSeptember 30, 2018 is shown in the following table:

	Issued and Outstanding Warrants as of January 1, 2018	**Warrants Exercised/ Expired**		**Issued and Outstanding Warrants as of September 30, 2018**
Bridge Warrants	249,999	(249,999)	(1)	—
Consulting Warrants	12,223	(5,556)	(2)	6,667
Financing Warrants	62,530	—		62,530
Underwriting Warrants	310,500	—		310,500
IR Consulting Warrants	6,000	(6,000)	(3)	—
Private Placement Warrants - 2016	891,063	(73,000)	(4)	818,063
Underwriting Warrants - Public Offering 2016	122,175	—		122,175
Private Placement Warrants - September 2017	1,976,919	(10,600)	(5)	1,966,319
Placement Agent Warrants	98,846	—		98,846
	3,730,255	(345,155)		3,385,100

(1) During the nine months ended September 30, 2018, there were 249,999 warrants that were exchanged for 242,913 shares of common stock in an exchange transaction where the warrant holders exchanged the warrants for the same number of shares they would have been entitled to in a cashless exercise.

(2) During the nine months ended September 30, 2018, there were 5,556 warrants that were exercised through a cashless exercise which netted5,542 shares being issued.

(3) During the nine months ended September 30, 2018, 6,000 warrants expired.

(4) During the nine months ended September 30, 2018, there were 73,000 warrants exercised for cash.

(5) During the nine months ended September 30, 2018, there were 10,600 warrants exercised for cash.

A roll-forward of warrant share activity from January 1, 2019 toSeptember 30, 2019 is shown in the following table:

	Exercise Price	Expiration Date	Issued and Outstanding Warrants as of January 1, 2019	Warrants Exercised/ Expired	Issued and Outstanding Warrants as of September 30, 2019
Consulting Warrants	$0.01	6/17/2020	6,667	—	6,667
Financing Warrants	$3.35	6/17/2020	62,530	—	62,530
Underwriting Warrants	$7.50	5/28/2019	310,500	(310,500) (1)	—
Private Placement Warrants - 2016	$2.86	4/25/2019	818,063	(818,063) (2)	—
Underwriting Warrants - Public Offering 2016	$4.25	9/9/2019	122,175	(122,175) (3)	—
Private Placement Warrants - September 2017	$4.85	9/28/2020	1,966,319	—	1,966,319
Placement Agent Warrants	$4.85	9/28/2020	98,846	—	98,846
			3,385,100	(1,250,738)	2,134,362

(1) During the nine months ended September 30, 2019, there were 310,500 warrants that expired.

(2) During the nine months ended September 30, 2019, there were 485,000 warrants exercised for cash, 44,928 warrants that were exercised through a cashless exercise which netted1,809 shares being issued and 288,135 warrants that expired.

(3) During the nine months ended September 30, 2019, there were 122,175 warrants that expired.

NOTE 6—STOCKHOLDERS' EQUITY AND LOSS PER SHARE

Common Stock

Pursuant to our amended and restated certificate of incorporation, we are authorized to issue100,000,000 shares of common stock. Holders of our common stock are entitled to dividends as and when declared by the Board of Directors, subject to rights and holders of all classes of stock outstanding having priority rights to dividends. There have been no dividends declared to date. Each share of common stock is entitled to one vote.

On March 27, 2018, we completed the sale of5,714,286 shares of common stock at a price of$3.50 per share in an underwritten public offering. Gross proceeds were $20.0 million with net proceeds of $18.4 million after deducting underwriter fees and offering expenses. The shares were issued pursuant to a shelf registration statement that we filed with the SEC, which became effective in May 2016. On April 6, 2018, following exercise by the underwriter of its overallotment option, we sold an additional857,142 shares at a price of $3.50, resulting in gross proceeds of$3.0 million and net proceeds of $2.8 million after deducting underwriter fees and offering expenses.

We entered into a securities purchase agreement, datedJuly 31, 2019, for the sale of an aggregate of3,960,560 shares of common stock at a price of$2.53 per share. Gross proceeds were approximately $10.0 million with net proceeds of $9.9 million after deducting fees and operating expenses. The initial closing, for 1,193,762 shares, took place on August 9, 2019 and gross proceeds were approximately $3.0 million. The second closing with a single investor, which was subject to additional conditions, including the execution of a definitive multi-year commercial agreement with an affiliate of the investor, for 2,766,798 shares and gross proceeds of$7.0 million took place on September 30, 2019.

We have a Form S-3 universal shelf registration statement on file with the SEC. The universal shelf registration statement on Form S-3 permits us to sell, in one or more public offerings, shares of our common stock, shares of preferred stock or debt securities, or any combination of such securities and warrants to purchase securities, for proceeds in an aggregate amount of up to $50.0 million, subject to potential limitations on the amount of securities we may sell in any twelve-month period. The Form S-3 will expire in November 2021. No securities have been issued pursuant to the registration statement.

Preferred Stock

Pursuant to our amended and restated certificate of incorporation, we are authorized to issue3,000,000 shares of preferred stock. The Board of Directors has the authority, without action by our stockholders, to designate and issue shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. To-date, no preferred shares have been issued.

Stock Repurchase Program

On November 26, 2018, we announced that our board of directors had authorized a program to repurchase up to $4.0 million of our common stock over a 12-month period, either in the open market or through privately negotiated transactions. As of December 31, 2018, we had repurchased approximately $152,000. No purchases were made in the three and nine months ended September 30, 2019.

Loss Per Share

The following table presents the number of shares excluded from the calculation of diluted net loss per share attributable to common stockholders for the periods below:

	Nine Months Ended September 30,	
	2019	2018
Common stock warrants	2,134,362	3,385,100
Common stock options	1,338,603	1,234,967
Non-vested restricted stock unit awards	2,672,087	2,071,299
Total shares excluded from net loss per share attributable to common stockholders	6,145,052	6,691,366

NOTE 7— STOCK-BASED COMPENSATION

2014 Omnibus Incentive Plan

In January 2014, our board of directors approved the 2014 Omnibus Incentive Plan and amended and restated the plan in March 2014. Our stockholders approved the Amended and Restated 2014 Omnibus Incentive Plan, or the 2014 Plan, in March 2014. Our 2014 Plan initially permitted for the issuance of equity-based instruments covering up to a total of 1,400,000 shares of common stock. Our board of directors and stockholders approved an increase of 1,300,000 shares in June 2016, an additional increase of 3,250,000 shares in June 2017, and an additional increase of 4,000,000 shares in June 2019, bringing the total shares allowed under the plan to 9,950,000.

Option Valuation

We account for stock options in accordance with ASC Topic 718, *Compensation-Stock Compensation*. As of January 1, 2019, we adopted ASU No. 2018-07, *Compensation-Stock Compensation (Topic 718): Improvements to Non-employee Share-Based Payment Accounting*, which aligns the accounting of share-based payment awards issued to employees and non-employees.

We use the Black-Scholes option valuation model for estimating fair value at the date of grant. Option forfeitures are estimated at the time of valuation and reduce expense ratably over the vesting period. This estimate will be adjusted periodically based on the extent to which actual option forfeitures differ, or are expected to differ, from the previous estimate, when it is material. The expected term used for options is the estimated period of time that options granted are expected to be outstanding. We have estimated the expected life of stock options using the “simplified” method, whereby, the expected life equals the arithmetic average of the vesting term and the original contractual term of the option due to our lack of sufficient historical data. Since our stock has not been publicly traded for a sufficiently long period of time, we are utilizing an expected volatility figure based on a review of the historical volatilities, over a period of time, equivalent to the expected life of the instrument being valued, of similarly positioned public companies within our industry. The risk-free interest rate was determined from the implied yields from U.S. Treasury zero-coupon bonds with a remaining term consistent with the expected term of the instrument being valued.

Stock Options

During the three and nine months ended September 30, 2018, we granted incentive stock options for the purchase of 110,000 and 227,500 shares, respectively, of our common stock. The stock options have an exercise price range of $4.12 per share to $5.96 per share with a term of 10 years. The stock options vest quarterly over sixteen quarters. For the three and nine months ended September 30, 2018, the options granted had an aggregate grant date fair value of $345,000 and $738,000, respectively, utilizing the Black-Scholes option valuation model.

During the three and nine months ended September 30, 2019, we granted incentive stock options for the purchase of 25,000 and 127,000 shares, respectively, of our common stock. The stock options have an exercise price range of $1.52 per share to $3.26 per share with a term of 10 years. The stock options vest quarterly over sixteen quarters. For the three and nine months ended September 30, 2019, the options granted had an aggregate grant date fair value of$53,000 and $233,000, respectively, utilizing the Black-Scholes option valuation model.

We estimated the fair value of stock options awarded during thenine months ended September 30, 2019 and 2018 using the Black-Scholes option valuation model. The fair values of stock options granted for the periods were estimated using the following assumptions:

	Stock Option Grants Awarded During the Nine Months Ended September 30, 2019	Stock Option Grants Awarded During the Nine Months Ended September 30, 2018
Stock Price	$1.52 to $3.26	$4.12 to $5.96
Dividend Yield	0.00%	0.00%
Expected Volatility	70%	70%
Risk-free interest rate	1.47% - 2.62%	2.50% - 2.98%
Expected Life	7 years	7 years

Stock-based compensation expense related to stock options was$110,000 and $125,000 for the three months ended September 30, 2019 and 2018, respectively, and $320,000 and $347,000 for the nine months ended September 30, 2019 and 2018, respectively. For all stock options, we estimate forfeitures at the time of grant, and revise those estimates in subsequent periods if actual forfeitures differ from our estimates. We use historical data to estimate pre-vesting option forfeitures and record stock-based compensation expense only for those awards that are expected to vest. To the extent that actual forfeitures differ from our estimates, the difference is recorded as a cumulative adjustment in the period the estimates were revised. During the three and nine months ended September 30, 2019 and September 30, 2018, we applied a forfeiture rate of 10% and 6%, respectively, which is reflected in our stock-based compensation expense related to stock options.

Stock Option Award Activity

The following is a summary of our stock option activity during thenine months ended September 30, 2019:

	Number of Options	Weighted Average Exercise Price	Weighted Average Grant Date Fair Value	Weighted Average Remaining Life In Years
Outstanding, January 1, 2019	1,255,280	$ 4.82	$ 3.03	7.75
Granted	127,000	2.72	1.83	9.59
Exercised	—	—	—	—
Canceled / Forfeited	(43,677)	4.56	2.90	—
Outstanding, September 30, 2019	1,338,603	$ 4.63	$ 2.92	7.10

	Number of Options	Weighted Average Exercise Price	Weighted Average Grant Date Fair Value	Weighted Average Remaining Life In Years
Exercisable, January 1, 2019	843,019	$ 5.02	$ 3.13	7.23
Vested	129,372	4.07	2.57	7.22
Exercised	—	—	—	—
Canceled / Forfeited	(15,242)	4.57	2.76	—
Exercisable, September 30, 2019	957,149	$ 4.90	$ 3.06	6.49

The following table presents information related to stock options outstanding and exercisable at September 30, 2019:

Options Outstanding		Options Exercisable	
Exercise Price	Outstanding Number of Options	Weighted Average Remaining Life In Years	Exercisable Number of Options
$1.52 – $3.15	283,183	6.58	138,521
$3.25 – $4.92	613,620	7.42	441,094
$5.01 – $6.00	281,500	5.34	234,095
$6.18 – $7.20	70,000	5.41	58,757
$7.54 – $7.80	67,800	5.43	62,182
$8.06 – $12.98	22,500	5.30	22,500
	1,338,603	6.49	957,149

As of September 30, 2019, there was $884,000 of unrecognized compensation expense related to unvested employee stock options, which is expected to be recognized over a weighted-average period of approximately 2.5 years. The aggregate intrinsic values of outstanding stock options and vested stock options as of September 30, 2019 were $203,000 and $136,000, respectively, which represent options whose exercise price was less than the closing fair market value of our common stock on September 30, 2019 of $2.97 per share.

Restricted Stock Units Activity

We account for restricted stock units issued at fair value, based on the market price of our stock on the date of grant, net of estimated forfeitures. RSUs issued in connection with our employee incentive programs typically vest within 10 days of grant. All other RSUs, primarily issued as long term incentives, generally vest annually over three to four years.

During the three months ended September 30, 2019 and 2018, we recorded $1.3 million and $1.2 million, respectively, of stock-based compensation related to the restricted stock unit shares that had been issued to-date. During the nine months ended September 30, 2019 and 2018, we recorded $3.9 million and $3.6 million, respectively, of stock-based compensation related to the restricted stock unit shares that had been issued to-date.

A summary of restricted stock unit activity for the nine months ended September 30, 2019 is as follows:

	Number of Restricted Share Units	Weighted-Average Grant-Date Fair Value Per Share
Outstanding at January 1, 2019	1,921,594	$ 4.78
Granted	1,553,475	2.95
Vested	(650,520)	4.15
Forfeited	(152,462)	4.25
Outstanding at September 30, 2019	2,672,087	$ 3.69

As of September 30, 2019, there was $6.2 million of unrecognized compensation expense related to unvested restricted stock unit agreements which is expected to be recognized over a weighted-average period of approximately 2.1 years. For restricted stock unit awards subject to graded vesting, we recognize compensation cost on a straight-line basis over the service period for the entire award.

Market-based Awards

In August 2016, we granted 250,000 market-based restricted stock units to an executive. The restricted stock units are subject to market-based vesting requirements, measured quarterly, based on the average of (a) the average high daily trading price of our common stock for each trading day during the last month of the applicable calendar quarter and (b) the average low daily trading price of our common stock for each trading day during the last month of the applicable calendar quarter, each as reported by The Nasdaq Stock Market, LLC. The restricted stock units are eligible to be earned on a quarterly basis based on a linear interpolation of the applicable share price, or in the case of a liquidation event, on the day of (or in connection with) such liquidation event based on the applicable transaction price. The share price on the date of issuance was $5.06 per share.

In June 2019, the market-based award was modified to increase the number of restricted stock units to500,000 and to decrease the applicable share price. Additionally, the performance period was extended to September 30, 2022. The share price on the date of modification was $2.73 per share.

Once earned, the restricted stock units vest50% on the date such restricted stock units become earned and50% on September 30, 2022. We recognize compensation expense for restricted stock units with market conditions using a graded vesting model, based on the probability of the performance condition being met, net of estimated pre-vesting forfeitures. For the three months ended September 30, 2019 and 2018, we recognized $3,000 and $6,000, respectively, and for the nine months ended September 30, 2019 and 2018, we recognized $10,000 and $18,000, respectively, of stock compensation expense in connection with this award, which is included in sales, marketing and administration expenses. The unamortized expense related to this award is $143,000 and is expected to be recognized over3.0 years.

Incentive Bonus Awards

We provide eligible employees, including executives, the opportunity to earn bonus awards upon achievement of predetermined performance goals and objectives. The purpose is to reward attainment of company goals and/or individual performance objectives, with award opportunities expressed as a percentage of base salary. Bonuses can be measured and paid quarterly and/or annually, and are paid in cash, equity or a combination of cash and equity, in the discretion of our compensation committee. If paid in the form of equity, the expense is included in the above disclosures for stock options or restricted stock units as applicable.

Total stock-based compensation recorded in the condensed consolidated statements of comprehensive loss is allocated as follows:

	Three Months Ended September 30, 2019	Three Months Ended September 30, 2018	Nine Months Ended September 30, 2019	Nine Months Ended September 30, 2018
Research and development	$ 703,000	$ 686,000	$ 2,026,000	$ 2,033,000
Sales, marketing and administration	686,000	682,000	2,174,000	1,925,000
Total stock-based compensation	$ 1,389,000	$ 1,368,000	$ 4,200,000	$ 3,958,000

NOTE 8—INCOME TAXES

Income tax for the three months ended September 30, 2019 and 2018 was an expense ofzero and a benefit of $11,000, respectively. Income tax for the nine months ended September 30, 2019 and 2018 was an expense of $1,000 and benefit of $19,000, respectively. The effective tax rate for the three and nine months ended September 30, 2019 and 2018 differed from the statutory rate primarily due to the valuation allowance recorded against the Company’s deferred tax assets.

NOTE 9— LEASES

We lease facilities under two non-cancelable operating leases. The leases expire between January 2022 and August 2024 and include renewal provisions fortwo to five years, provisions which require us to pay taxes, insurance, maintenance costs or provisions for minimum rent increases. We also lease facilities and equipment under short-term agreements for a period of 12 months or less. All of the information presented below, with the exception of total lease costs, relates to our two non-cancelable operating leases.

One lease requires us to maintain a cash security deposit of $50,000 and also a $200,000 letter of credit in favor of the lessor. The letter of credit steps down $50,000 at each anniversary date if there have been no monetary defaults. The letter of credit is secured by a pledge in favor of the issuing bank of a $211,000 mutual fund account which is classified as restricted cash in our balance sheet.

Lease renewal options are at our discretion. No renewal options have been recognized in our right-of-use assets and lease liabilities as of September 30, 2019. Our lease agreements do not require material variable minimum lease payments, residual value guarantees or restrictive covenants.

The table below presents the operating lease assets and liabilities recognized on the condensed consolidated balance sheet as ofSeptember 30, 2019:

	Balance Sheet Line Item		September 30, 2019
Operating lease assets	Operating lease right-of-use assets	$	2,642,000
Current operating lease liabilities	Operating lease liabilities, current	$	600,000
Noncurrent operating lease liabilities	Operating lease liabilities	$	2,217,000
Total operating lease liabilities	N/A	$	2,817,000

The depreciable lives of operating lease assets and leasehold improvements are limited by the expected lease term.

Our leases generally do not provide an implicit rate, and therefore we use our incremental borrowing rate as the discount rate when measuring operating lease liabilities. The incremental borrowing rate represents an estimate of the interest rate we would incur at lease commencement to borrow an amount equal to the lease payments on a collateralized basis over the term of the lease. We used a weighted average incremental borrowing rate of 4.75% as of January 1, 2019 for operating leases that commenced prior to that date. The discount rates applied to each lease reflect our estimated incremental borrowing rate. This includes an assessment of our credit rating to determine the rate that we would have to pay to borrow, on a collateralized basis for a similar term, an amount equal to our lease payments in a similar economic environment.

The Company's weighted average remaining lease term and weighted average discount rate for operating leases as ofSeptember 30, 2019 is shown below:

	September 30, 2019
Weighted average remaining lease term (years)	4.47
Weighted average discount rate (%)	4.75

The table below reconciles the undiscounted cash flows for each of the first five years and total of the remaining years to the total operating lease liabilities recognized on the condensed consolidated balance sheets as of September 30, 2019:

		September 30, 2019
October 1, 2019 through December 31, 2019	$	179,000
2020		726,000
2021		748,000
2022		557,000
2023		555,000
2024		376,000
Total minimum lease payments		3,141,000
Less: imputed interest		(324,000)
Total operating lease liabilities	$	2,817,000

Operating lease costs were $268,000 for the three months ended September 30, 2019, of which $204,000 and $64,000 are included in research and development expenses and sales, marketing and administration expenses, respectively. Operating lease costs were $795,000 for the nine months ended September 30, 2019, of which $597,000 and $198,000 are included in research and development expenses and sales, marketing and administration expenses, respectively. Prior to the adoption of ASC 842, we recorded rent expense for the three and nine months ended September 30, 2018 of $200,000 and $484,000, respectively, which was included in sales, marketing and administration expenses.

Cash paid for amounts included in the measurement of operating lease liabilities were$441,000 for the nine months ended September 30, 2019, and this amount is included in operating activities in the condensed consolidated statements of cash flows.

The future minimum obligations under operating leases in effect as of December 31, 2018 having a noncancelable term in excess of one year as determined prior to the adoption of ASU 842 are as follows:

		December 31, 2018
2019	$	658,000
2020		726,000
2021		748,000
2022		557,000
2023		555,000
2024		376,000
Future minimum obligations	$	3,620,000

NOTE 10—RELATED PARTY TRANSACTIONS

In August 2019, we entered into a consulting agreement with a member of our board of directors. Under the agreement, the board member would provide technical advisory services for cash payments totaling $50,000 paid in twelve equal monthly installments as well as an award of restricted stock units equal in value to $100,000 as of the grant date. The restricted stock units vest in full on January 1, 2020. No later than January 15, 2020, the board member shall receive an additional grant of restricted stock units equal to $100,000 of value as of the grant date, provided that, as of the grant date of the second grant, the board member is still providing the technical advisory services to the company. The second grant will vest in full on December 31, 2020. In the event the board member is still performing services to the company after 2020, the Company will issue new grants equal to no less than $100,000 worth of restricted stock units in January of each additional year with such grants vesting at the end of each year so long as the services are still being provided. The agreement is cancelable at any time by either the Company or the board member. During the three and nine months ended September 30, 2019, we recorded expenses of $8,000 in connection with cash compensation portion of the consulting agreement, which are included in general and administrative expenses. Additionally, during the three and nine months ended September 30, 2019, we recorded $42,000 related to the restricted stock unit award, which is included in research and development expenses. As of September 30, 2019, there were no amounts due to the board member under this consulting agreement.

In July 2019 we entered into a securities purchase agreement with Murata Electronics North America, Inc., an affiliate of Murata Manufacturing Co., Ltd., ("Murata") for the sale by the Company of 2,766,798 shares of common stock of the Company, par value $0.001 per share at a price of $2.53 per Share, for gross proceeds of approximately $7.0 million. Upon closing in September 2019, Murata owned approximately 8.5% of our outstanding common stock. Concurrent with the closing, we entered into a collaboration and license agreement with Murata Manufacturing Co., Ltd. Pursuant to the collaboration agreement, we have agreed with Murata to collaborate on the development of proprietary circuit designs using our XBAR® technology, and we licensed to Murata rights for products in four specific radio frequencies, or bands. Murata has agreed to pay us up to an aggregate of $9.0 million as pre-paid royalties and other fees for the licensed designs and certain other intellectual property developed in the collaboration, payable in installments over a multi-year development period, with each installment conditional upon our achievement of certain milestones and deliverables acceptable to Murata in its discretion. Murata may terminate the collaboration agreement at any time upon thirty (30) days prior written notice to us.

Murata's rights to our XBAR® technology are exclusive for a period of 30 months, ending in March 2022, during which period we may not grant to any third party the right to develop, make, have made, use, sell, offer for sale or import any filter or resonator produced through the use of the XBAR® technology for use in mobile communication devices. Under the collaboration agreement, the first of payment of $2.0 million was due to us, and was recorded in accounts receivable with the offset to deferred revenue at September 30, 2019. Payment was received on October 11, 2019.

NOTE 11— COMMITMENTS AND CONTINGENCIES

Legal Proceedings—We are not party to any legal proceedings. We may, from time to time, be party to litigation and subject to claims incident to the ordinary course of business. As our growth continues, we may become party to an increasing number of litigation matters and claims. The outcome of litigation and claims cannot be predicted with certainty, and the resolution of any future matters could materially affect our future financial position, results of operations or cash flows.

Legal fees and other costs associated with legal proceedings are expensed as incurred. We assess, in conjunction with our legal counsel, the need to record a liability for litigation and contingencies. Litigation accruals are recorded when and if it is determined that a loss related matter is both probable and reasonably estimable. Material loss contingencies that are reasonably possible of occurrence, if any, are subject to disclosure. We evaluate developments in legal proceedings and other matters on a quarterly basis. As of September 30, 2019 and 2018, there was no litigation or contingency with at least a reasonable possibility of a material loss. No losses have been recorded during the three and nine months ended September 30, 2019 and 2018, respectively, with respect to litigation or loss contingencies.

Intellectual Property Indemnities—We indemnify certain customers and manufacturers against liability arising from third-party claims of intellectual property rights infringement related to our products. These indemnities may appear in license agreements, development agreements and manufacturing agreements, may not be limited in amount or duration and generally survive the expiration date of the contract. Given that the amount of any potential liabilities related to such indemnities cannot be determined until an infringement claim has been made, we are unable to determine the maximum amount of losses that we could incur related to such indemnifications.

Director and Officer Indemnities and Contractual Guarantees—We have entered into indemnification agreements with our directors and executive officers, which require us to indemnify such individuals to the fullest extent permitted by Delaware law. Our indemnification obligations under such agreements are not limited in amount or duration. Certain costs incurred in connection with such indemnifications may be recovered under certain circumstances under various insurance policies. Given that the amount of any potential liabilities related to such indemnities cannot be determined until a lawsuit has been filed, we are unable to determine the maximum amount of losses that we could incur relating to such indemnities.

We have also entered into severance and change in control agreements with certain of our executives. These agreements provide for the payment of specific compensation benefits to such executives upon the termination of their employment with us.

Guarantees and Indemnities—In the normal course of business, we are occasionally required to undertake indemnification for which we may be required to make future payments under specific circumstances. We review our exposure under such obligations no less than annually, or more frequently as required. The amount of any potential liabilities related to such obligations cannot be accurately determined until a formal claim is filed. Historically, any such amounts that become payable have not had a material negative effect on our business, financial condition or results of operations. We maintain general and product liability insurance which may provide a source of recovery to us in the event of an indemnification claim.

Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations

This Quarterly Report on Form 10-Q contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934. The words "believe," "may," "will," "potentially," "estimate," "continue," "anticipate," "intend," "could," "would," "project," "plan," "expect" and similar expressions that convey uncertainty of future events or outcomes are intended to identify forward-looking statements. These forward-looking statements speak only as of the date of this Form 10-Q and are subject to uncertainties, assumptions and business and economic risks. As such, our actual results could differ materially from those set forth in the forward-looking statements as a result of the factors referenced in the subsection "Risk Factors" set forth in Part II, Item 1A of this Report and Part I, Item 1A of our Annual Report, and similar discussions in our other reports filed with the Securities and Exchange Commission. You should not rely upon forward-looking statements as predictions of future events. Although we believe that the expectations reflected in our forward-looking statements are reasonable, we cannot guarantee that the future results, levels of activity, performance or events and circumstances described in the forward-looking statements will be achieved or occur. We undertake no obligation to update publicly any forward-looking statements for any reason after the date of this Form 10-Q to conform these statements to actual results or to changes in our expectations, except as required by law.

The following discussion should be read in conjunction with our unaudited condensed consolidated financial statements and notes thereto appearing elsewhere in this Quarterly Report on Form 10-Q with the understanding that our actual future results, levels of activity, performance and events and circumstances may be materially different from what we expect.

Overview

We are a late-stage development company that designs filters for the mobile device industry. We have not yet realized material revenues and our focus is on continuing to engage new customers, expand the number of contracts for filter designs and build the necessary infrastructure to support anticipated growth. Consequently, our expenses will continue to modestly increase as we position for a ramp in royalty revenues.

We plan to expand our IP libraries, further the development of our ISN® platform and continue to develop IP associated with high frequency/high-wide bandwidth filters. While we remain a filter design licensing company, we are also investigating the potential of licensing part or all of our ISN® software design suite and certain patents, including IP associated with our XBAR™ filters, to potential customers in the RFFE industry. During the third quarter of 2019, we completed an investment and commercial agreement with Murata Manufacturing Co., Ltd., the first collaboration agreement leveraging our XBAR IP. In all licensing arrangements with our customers we intend to retain ownership of our technology, software, designs and related improvements. Our goal is to establish and leverage alliances with new and existing customers, who will help grow the market for our designs by integrating them with their own proprietary technology and products, or by using our software products for their own designs, thus combining their own particular strengths with ours to provide an extensive array of solutions. We continue to expand our foundry program, which allows fabless companies to enter into the filter business quickly and efficiently. It is through this foundry program that we expect to engage OEM's directly to provide a significant cost and time to market advantage.

Our costs include employee salaries and benefits, compensation paid to consultants, capital costs for research and other equipment, costs associated with development activities including travel and administration, legal expenses, sales and marketing costs, general and administration expenses, and other costs associated with a late-stage development, publicly-traded technology company. We continue to add employees, as needed, to support the development of our ISN® platform, applications and system test, research and development, as well as sales, marketing and administration functions, to support our efforts.

The amounts that we actually spend for any specific purpose may vary significantly and will depend on a number of factors including, but not limited to, our expected cash resources, the pace of progress of our commercialization and development efforts, actual needs with respect to product testing, research and development, market conditions, and changes in or revisions to our marketing strategies. In addition, we may invest in complementary products, technologies or businesses.

Critical Accounting Policies and Estimates

Our discussion and analysis of financial condition and results of operations is based upon our condensed consolidated financial statements, which have been prepared in conformity with accounting principles generally accepted in the United States of America. Certain accounting policies and estimates are particularly important to the understanding of our financial position and results of operations and require the application of significant judgment by our management or can be materially affected by changes from period to period in economic factors or conditions that are outside of our control. As a result, they are subject to an inherent degree of uncertainty. In applying these policies, our management uses their judgment to determine the appropriate assumptions to be used in the determination of certain estimates. Those estimates are based on our historical operations, our future business plans and projected financial results, the terms of existing contracts, our observance of trends in the industry, information provided by our customers and information available from other outside sources, as appropriate.

A description of our critical accounting policies that represent the more significant judgments and estimates used in the preparation of our financial statements was provided in the Management's Discussion and Analysis of Financial Condition and Results of Operations section of our Annual Report on Form 10-K for the year ended December 31, 2018. Except for the adoption of ASU No. 2016-02, *Leases (Topic 842)* and ASU No. 2018-07, *Compensation-Stock Compensation (Topic 718): Improvements to Non-employee Share-Based Payment Accounting*, there have been no changes to our critical accounting policies and estimates described in the Annual Report on Form 10-K for the year ended December 31, 2018 that have had a material impact on our condensed consolidated financial statements and related notes.

Recently Issued and Adopted Accounting Pronouncements

Recent accounting pronouncements are detailed in Note 2 to our condensed consolidated financial statements included in Part I, Item 1 of this Quarterly Report on Form 10-Q.

Results of Operations

Comparison of the Three and Nine Months Ended September 30, 2019 and 2018

Revenues. Revenues consist of the recognized portion of amounts received from customers for the development of our filter designs, milestone payments based on the achievement of specific milestones and royalties from shipments of our licensed designs. Revenues consist of the recognized portion of the transaction price associated with our contracts from customers recognized over time as the obligations under the terms of the contract are satisfied. Generally, the transaction price includes both upfront and milestone payments which we expect to receive in exchange for providing services. For the three months ended September 30, 2019 and 2018, we recognized a total of $79,000 and $115,000, respectively, of revenue. For the nine months ended September 30, 2019 and 2018, we recognized a total of $276,000 and $396,000, respectively, of revenue. We expect revenues to continue to be recorded due to the $2,109,000 of deferred revenue we have recorded as ofSeptember 30, 2019. Additionally, we expect to continue to recognize royalty revenue from our license agreements.

During the third quarter of 2019, we entered into a Collaboration and License Agreement, dated as of September 30, 2019, with Murata Manufacturing Co., Ltd., pursuant to which Murata has agreed to pay us up to an aggregate of $9.0 million as pre-paid royalties and other fees for the licensed designs and certain other intellectual property developed in the collaboration, payable in installments over a multi-year development period, with each installment conditional upon our achievement of certain milestones and deliverables acceptable to Murata in its discretion. We received payment of the first $2.0 million under the agreement on October 11, 2019.

Research and Development. These expenses relate to direct engineering and other costs associated with the development and commercialization of our technology, including the development of filter designs for our customers and consist primarily of the compensation costs of employees, including stock-based compensation, and to a lesser extent, development related costs for consultants, equipment, software and supplies. We also include the costs for our intellectual property development program under research and development. This program focuses on patent strategy and invention extraction.

Research and development expenses increased $1.0 million, from $3.6 million in the third quarter of 2018 to $4.6 million in the third quarter of 2019 and increased $3.4 million, from $10.2 million in the first nine months of 2018 to$13.6 million in the first nine months of 2019. The increases were primarily related to higher compensation expenses from increased headcount, as well as higher development costs related to expanded activity on our ISN® platform, XBAR™ and filter design development. Additional increases related to increased occupancy and software costs. We have increased our research and development employees over the past year and we anticipate that our research and development expenses will continue to increase as a result of our planned growth and expenses associated with our contract with Murata.

Sales, Marketing and Administration Expenses. These expenses relate to our sales and marketing efforts and our back-office support and include compensation costs of employees, including stock-based compensation. They also include expenses for facilities, travel expenses, telecommunications, investor relations, insurance and professional and consulting fees.

Sales, marketing and administration expenses remained flat at $3.0 million in both the third quarter of 2018 and the third quarter of 2019 and increased $0.4 million from $8.5 million in the first nine months of 2018 to$8.9 million in the first nine months of 2019. The nine month increase is primarily the result of increased payroll and related costs associated with headcount increases. We anticipate that our sales, marketing and administration expenses will likely continue to increase as a result of planned growth.

Interest and Investment Income. Interest and investment income decreased by $135,000 from $177,000 in the third quarter of 2018 to $42,000 in the third quarter of 2019 and decreased by $103,000 from $323,000 in the first nine months of 2018 to$220,000 in the first nine months of 2019, primarily due to fluctuations in cash and investment balances outstanding. We expect interest income to fluctuate in proportion to our cash and investment balances.

Income Taxes. We have earned minimal revenues and are currently operating at a loss. In the nine months ended September 30, 2019 and 2018, our only tax liability was for minimum taxes in the states where we conduct business. In the nine months ended September 30, 2018, the benefit from income taxes recorded was the result of a benefit for the net change in deferred income taxes for GVR, offset by expense related to minimum state income taxes.

Liquidity and Capital Resources

Financing Activities

We have earned minimal revenues since inception. Our operations have been funded with initial capital contributions and proceeds from the sale of equity securities and debt.

As of September 30, 2019, we have raised aggregate gross proceeds of$97.0 million through the use of loans, convertible debt and equity through an IPO, private placement financings, exercise of warrants and secondary offerings of our common stock.

We had current assets of $16.9 million and current liabilities of $5.7 million at September 30, 2019, resulting in working capital of $11.3 million. This compares to working capital of $24.1 million at September 30, 2018 and $18.5 million at December 31, 2018. The change in working capital is primarily the result of use of cash in our normal business operations.

Our condensed consolidated financial statements account for the continuation of our business as a going concern. We are subject to the risks and uncertainties associated with a new business. Our principal sources of liquidity as of September 30, 2019 consist of existing cash and cash equivalents totaling $14.7 million, which includes approximately $9.9 million in proceeds from our private placement of common stock that closed in September 2019. In the first nine months of 2019, we used approximately $17.9 million of cash and investments for operating activities, the purchase of property and equipment, and expenditures for patents. Due to these conditions, along with anticipated increases in expenses, substantial doubt exists as to our ability to continue as a going concern. After evaluation of these conditions, we believe our current resources, along with expected proceeds from forecasted billings, will provide sufficient funding for planned operations into June of 2020. If necessary, we will seek to raise additional capital from the sale of equity securities or the incurrence of indebtedness to allow us to continue operations. There can be no assurance that additional financing will be available to us on acceptable terms, or at all. Additionally, if we issue additional equity securities to raise funds, whether to existing investors or others, the ownership percentage of our existing stockholders would be reduced. New investors may demand rights, preferences or privileges senior to those of existing holders of common stock. Additionally, we may be limited as to the amount of funds we can raise pursuant to SEC rules and the continued listing requirements of NASDAQ. If we cannot raise needed funds, we might be forced to make substantial reductions in our operating expenses, which could adversely affect our ability to implement our business plan and ultimately our viability as a company. These condensed consolidated financial statements do not include any adjustments relating to the recoverability and classification of recorded asset amounts or amounts and classification of liabilities that might result from this uncertainty.

Cash Flow Analysis

Operating activities used cash of $16.9 million in the first nine months of 2019 and $13.6 million in the first nine months of 2018. The increase is primarily the result of our increased loss.

Investing activities provided cash of $15.8 million in the first nine months of 2019 and used cash of $9.8 million in the first nine months of 2018. In 2019, the cash provided was a result of net redemptions of investments held to maturity, offset by the cash used to purchase property and equipment and expenditures for patents. In 2018, the cash used was a result of the net purchases of investments held to maturity and cash used to purchase property and equipment and expenditures for patents.

Financing activities provided cash of $11.3 million in the first nine months of 2019 as a result of the net proceeds from the sale of equity securities in a private placement financing completed in August and September 2019, and the exercise of Private Placement Warrants - 2016, which resulted in the issuance of over 485,000 shares of common stock. Financing activities provided cash of $21.5 million in the first nine months of 2018 as a result of the net proceeds from the sale of equity securities in an underwritten public offering completed in March 2018 along with the underwriter overallotment option exercised in April 2018, and the exercise of stock options and warrants.

Off-Balance Sheet Transactions

We do not have any off-balance sheet arrangements.

Item 3. Quantitative and Qualitative Disclosures About Market Risk

Not Applicable

Item 4. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

The phrase “disclosure controls and procedures” refers to controls and procedures designed to ensure that information required to be disclosed in our reports filed or submitted under the Securities Exchange Act of 1934, as amended, or the Exchange Act, such as this Quarterly Report on Form 10-Q, is recorded, processed, summarized and reported within the time periods specified in the rules and forms of the U.S. Securities and Exchange Commission, or SEC. Disclosure controls and procedures are also designed to ensure that such information is accumulated and communicated to our management, including our chief executive officer, or CEO, and chief financial officer, or CFO, as appropriate to allow timely decision regarding required disclosure.

Our management, with the participation of our CEO and CFO, has evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act), as of September 30, 2019, the end of the period covered by this Quarterly Report on Form 10-Q. Based on such evaluation, our CEO and CFO have concluded that as of September 30, 2019, our disclosure controls and procedures were designed at a reasonable assurance level and were effective to provide reasonable assurance that information we are required to disclose in reports that we file or submit under the Exchange Act is recorded, processed, summarized, and reported within the time periods specified in the rules and forms of the SEC, and that such information is accumulated and communicated to our management, including our CEO and CFO, as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Controls over Financial Reporting

There was no change in our internal control over financial reporting identified in management’s evaluation pursuant to Rules 13a-15(d) or 15d-15(d) of the Exchange Act during the quarter ended September 30, 2019 that materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Limitations on Effectiveness of Controls and Procedures

In designing and evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives. In addition, the design of disclosure controls and procedures must reflect the fact that there are resource constraints and that management is required to apply judgment in evaluating the benefits of possible controls and procedures relative to their costs.

PART II: OTHER INFORMATION

Item 1. Legal Proceedings

We are not party to any legal proceedings. We may, from time to time, be party to litigation and subject to claims incident to the ordinary course of business. As our product offerings continue to develop, we may become party to an increasing number of litigation matters and claims. The outcome of litigation and claims cannot be predicted with certainty, and the resolution of any future matters could materially affect our future financial position, results of operations or cash flows.

Item 1A. Risk Factors

This Quarterly Report on Form 10-Q contains forward-looking statements, which are subject to a variety of risks and uncertainties. Other actual results could differ materially from those anticipated in those forward-looking statements as a result of various factors, including those set forth in the risk factors relating to our business and common stock contained in Item 1A of our Annual Report on Form 10-K for the year ended December 31, 2018. There have been no material changes to such risk factors during the period ended September 30, 2019.

Item 5. Other Information

On November 4, 2019, the Compensation Committee of our Board of Directors approved quarterly bonus awards to our executive officers pursuant to our 2019 Incentive Bonus Program for their performance during the third quarter of 2019. The bonus awards were paid in the form of restricted stock units for shares of our common stock in the amounts set forth below. The restricted stock units vest in full on November 25, 2019.

Executive Officers	Number of RSU Shares
Martin McDermut	9,011
Robert Hammond	4,452
Neal Fenzi	1,468

Item 6. Exhibits

Exhibit Number	Exhibit Description	Incorporated by Reference				Filed Herewith
		Form	File Number	Exhibit	Filing Date	
3.1.1	Amended and Restated Certificate of Incorporation of the Registrant	8-K	001-36467	3.1	6/5/2014	
3.1.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of the Registrant	8-K	001-36467	3.1	6/12/2019	
3.2	Amended and Restated Bylaws of the Registrant	8-K	001-36467	3.2	6/5/2014	
10.1*	Collaboration and License Agreement, dated as of September 30, 2019, by and between the Registrant and Murata Manufacturing Co., Ltd					X
31.1	Certification of Principal Executive Officer Pursuant to Securities Exchange Act Rules 13a-14(a) and 15d-14(a) as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002					X
31.2	Certification of Principal Financial Officer Pursuant to Securities Exchange Act Rules 13a-14(a) and 15d-14(a) as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002					X
32.1#	Certification of Principal Executive Officer and Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002					X
101.INS	XBRL Instance Document					X
101.SCH	XBRL Taxonomy Extension Schema Document					X
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document					X
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document					X
101.LAB	XBRL Taxonomy Extension Label Linkbase Document					X
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document					X

* Portions of this exhibit have been omitted pursuant to Rule 601(b)(10)(iv) of Regulation S-K.

The information in this exhibit is furnished and deemed not filed with the Securities and Exchange Commission for purposes of section 18 of the Exchange Act of 1934, as amended, and is not to be incorporated by reference into any filing of Resonant Inc. under the Securities Act of 1933, as amended, or the Exchange Act of 1934, as amended, whether made before or after the date hereof, regardless of any general incorporation language in such filing.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

Date:	November 7, 2019	**Resonant Inc.**

By: /s/ Martin S. McDermut
Martin S. McDermut
Chief Financial Officer
(Principal Financial and Accounting Officer)

Exhibit 10.1

RESONANT

CERTAIN IDENTIFIED INFORMATION HAS BEEN EXCLUDED FROM THE EXHIBIT BECAUSE IT IS BOTH NOT MATERIAL AND WOULD LIKELY CAUSE COMPETITIVE HARM TO THE REGISTRANT IF PUBLICLY DISCLOSED. OMISSIONS ARE DESIGNATED AS [***].

COLLABORATION AND LICENSE AGREEMENT

This Collaboration and License Agreement (this " Agreement") is entered into as of September 30, 2019 (" Closing Date") by Resonant Inc., a Delaware corporation ("Resonant"), and Murata Manufacturing Co., Ltd., a Japanese company based in Nagaokakyo-shi, Kyoto ("MMC"), on behalf of itself and its Affiliates (collectively, "Murata"). Resonant and Murata are each a "Party" and collectively, the "Parties."

A. Resonant creates innovative circuit designs for radio frequency front-ends for the mobile device industry using the XBAR Technology to configure and connect resonators;

B. Murata designs, packages, manufactures and supplies advanced electronic materials, electronic components, and multi-functional, high-density modules;

C. Murata desires for Resonant to create certain circuit designs produced through the use of the XBAR Technology to be used by Murata in packaging and manufacturing certain device front-ends and Resonant is willing to create such circuit designs, subject to the terms and conditions of this Agreement;

D. The Parties desire to enter into this Agreement governing the development of such circuit designs, which Murata desires to incorporate into the filters and resonators that it will manufacture, under statements of work hereunder; and

E. The Parties desire further to enter into this Agreement to clarify each Party's Intellectual Property Rights with respect to such new circuit designs arising from the Parties' performance under this Agreement.

NOW, THEREFORE, in consideration of the terms and conditions contained herein, and for other good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, and intending to be legally bound, the Parties hereby agree as follows:

DEFINITIONS. Capitalized terms are defined in Schedule A, attached hereto, unless otherwise defined within the body of this Agreement.

1. SERVICES

1.1. SOWs. All Services to be performed under this Agreement shall be set forth in one or more SOWs, each of which shall be agreed to in writing and signed by the Parties. This Agreement, together with each individual SOW (including any attachments or schedules thereto), but separate and apart from any other SOW, shall constitute the entire agreement between the Parties for the performance of any Services described in the applicable SOW. The performance of the Services shall be controlled by the terms and conditions of this Agreement (including any applicable SOW). In the event of a conflict between the terms and conditions of this Agreement and any SOW in connection with any Services, the terms and conditions of this Agreement shall control.

1.2. Services.

(a) The Parties agree to collaborate in the development of Deliverables using the XBAR Technology, as more fully described in the SOW attached hereto as Schedule B (the "DR1 SOW") and in each other Scheduled SOW (as defined below) (the " Collaboration").

(b) Resonant shall prepare and deliver the Deliverables for the Selected Band(s) to Murata according to the milestone schedule set forth in the applicable SOW ("Services").

(c) In furtherance of the Collaboration:

(i) Within fifteen (15) business days following Design Review Sign-off of the DR1 SOW, the Parties will use their commercially reasonable efforts to execute the second SOW, in the form attached hereto as Schedule C, subject to any revisions to which the Parties may mutually agree (the "DR2 SOW"); and

(ii) Within fifteen (15) business days following Design Review Sign-off of the DR2 SOW, the Parties will use their commercially reasonable efforts to execute the third SOW, in the form attached hereto as Schedule D, subject to any revisions to which the Parties may mutually agree (the "DR3 SOW", and together with the DR1 SOW and DR2 SOW, the " Scheduled SOWs").

To the extent Murata does not specify **[***]** additional bands and/or **[***]** for each of the four (4) bands to be developed pursuant to the Scheduled SOWs, as contemplated thereby, at the time such Scheduled SOWs are executed, the Parties agree to use their commercially reasonable efforts to enter into one (1) or more additional SOWs for the development of Deliverables for such additional bands and/or **[***]** as Murata may request within fifteen (15) days of the execution of such Scheduled SOWs, in any case not to exceed four (4) bands and **[***]** in the aggregate under each Scheduled SOW, and Resonant shall develop and deliver such Deliverables in accordance with this Agreement without additional charge.

When fully executed by the Parties, each of the Scheduled SOWs shall be incorporated in and made a part of this Agreement.

(d) Resonant shall not delegate any of its obligations under this Agreement or any SOW to any Third Party without Murata's prior written consent; provided, however, that Murata's prior written consent shall not be required with respect to the pre-approved Third Parties set forth on Exhibit A attached hereto. Resonant shall be responsible for the conduct of any permitted delegatees, and shall ensure that they comply with the terms of this Agreement. As between Murata and Resonant, Resonant shall be responsible for any payments due to such delegatees, including to any of their employees, agents and contractors.

(e) Title to the tangible medium in which a Deliverable is incorporated and physical samples, if any, produced as ancillary items in the course of the Collaboration (but, for the avoidance of doubt, not in any Intellectual Property Rights) will transfer to Murata upon delivery.

1.3. Change to the Scope of Work.

(a) During the term of this Agreement, Resonant and Murata shall evaluate and communicate regarding Resonant's progress with respect to the Services and whether the Specifications, milestones or milestone schedule require adjustment. Murata may request changes or modifications to the Specifications, milestones or milestone schedule by submitting a change request in writing ("Change Request") to Resonant. Each SOW shall include (i) procedures that the Parties must follow with respect to the submission, receipt, evaluation and completion of any Change Request, (ii) timeframes, or related timing guidelines, for the evaluation, negotiation and completion of any Change Request, and (iii) names and contact information of the persons required and authorized to submit or receive, as applicable, evaluate and negotiate, any Change Request. Upon each Change Request being delivered, the Parties will negotiate in good faith the terms of a mutually agreed upon amendment to the SOW for the Services. Each amended SOW signed by the Parties shall be incorporated into, and governed by the terms and conditions of, this Agreement. Resonant and Murata shall promptly implement all such changes or modifications set forth in each such amended SOW. Alternatively, should the Parties be unable to mutually agree upon an amendment to a SOW, then the original SOW shall remain in effect.

(b) Notwithstanding the foregoing, to the extent Murata reasonably determines that any aspect of the Deliverables to be provided under an SOW, including the use of the XBAR Technology or any Resonant IP incorporated therein, may infringe upon, misappropriate or otherwise violates any Third Party's Intellectual Property Rights which, if successfully asserted, could prevent Murata from fully exercising the licenses, or which could subject Murata to potential liability (regardless of whether Murata would be indemnified pursuant to Article 7), (i) the SOW shall be amended to make the Deliverables non-infringing without materially changing the applicable requirements and specifications, (ii) the financial terms of the SOW shall remain unchanged, and (iii) the parties shall discuss in good faith reasonable and necessary revisions in milestones and delivery dates.

1.4. Disclosure to Other Party of Relevant Information. Each Party shall disclose to the other Party information which such Party reasonably believes is relevant to accomplishing the development goals of the Collaboration and is needed to be used by a Party in its performance in the Collaboration, but only to the extent said Party is legally and contractually able to disclose such information. Such disclosures shall be subject in all respects to the obligations of confidentiality in Article 5.

1.5. License of Murata IP. Subject to all of the terms and conditions of this Agreement, Murata hereby grants to Resonant a limited, royalty-free, non-transferable, worldwide, non-exclusive license to use the Murata IP only to the extent necessary for, and for the sole purpose of, Resonant preparing and delivering the Deliverables as required hereunder during the term of this Agreement.

1.6. Design Review Sign-off.

(a) Upon completion of each milestone under a SOW, Resonant shall notify Murata in writing, and Murata shall have ten (10) business days (subject to reasonable extensions which shall be granted upon Murata's request) (the "Design Review Period") from the date of such notice to test and evaluate the applicable milestone deliverable. If Murata reasonably determines in good faith that the milestone deliverable does not achieve the performance targets specified in the Specifications ("Performance Targets"), then Murata shall promptly notify Resonant in writing and, to the extent applicable, provide all reasonable information and data concerning its determination that may be useful to Resonant in evaluating such alleged failure to achieve the Performance Targets. Resonant shall then promptly and diligently undertake to make appropriate modifications, at no expense to Murata, as soon as reasonably practicable and shall notify Murata when the modifications are complete and the applicable milestone deliverable is available for testing. An additional Design Review Period shall occur during the ten (10) business days following Resonant's notice to Murata of the completed modifications, subject to reasonable extensions which shall be granted upon Murata's request, and the foregoing evaluation, notification and modification procedure shall be repeated until the milestone deliverable (or modified milestone deliverable) achieves the performance targets specified in the Specifications. If Murata (i) provides its written acceptance of a milestone deliverable to Resonant, or (ii) does not notify Resonant during any Design Review Period, as reasonably extended, that a milestone deliverable (or a modified milestone deliverable) does not achieve the Performance Targets, then Murata shall be deemed to accept the corresponding milestone deliverable ("Design Review Sign-off"). Notwithstanding the foregoing, Murata may elect at any time during the Design Review Period to accept a Deliverable even if Murata has determined that such Deliverable does not achieve the performance targets specified in the Specifications.

(b) Murata acknowledges that Resonant's performance is dependent upon Murata's cooperation and provision of information, materials and assistance, to the extent specifically set forth in the applicable SOW. If Resonant reasonably determines that a failure to achieve, or a delay in the achievement of, the Performance Targets for a milestone deliverable is caused by a delay or failure by Murata to cooperate, provide information, materials or assistance or perform its obligations set forth in the applicable SOW, then Resonant shall promptly so notify Murata in writing. Murata and Resonant will then engage in good faith discussions regarding the alleged delay or failure, and Murata will make any mutually agreed corrections and notify Resonant when all such corrections are complete. Resonant will not be liable for any failure or delay in its performance under a SOW to the extent caused by Murata's failure or delay to provide any cooperation, information, materials or assistance specifically required in the applicable SOW or perform its obligations in a timely manner.

(c) Resonant's commencement of the Services with respect to each milestone deliverable specified in a SOW following the first milestone deliverable is expressly conditioned upon Design Review Sign-off of the immediately preceding milestone deliverable as evidenced by Murata's acceptance, as provided above.

(d) Murata's obligation to make payments under any SOW is expressly conditioned upon Design Review Sign-off with respect to the milestone deliverables provided under such SOW.

1.7. Program Managers. The Parties will designate in each SOW a program manager for each Party to be the primary point of contact concerning that SOW. The program managers shall have the requisite knowledge and expertise necessary to carry out the respective obligations of the Parties set forth in the SOW and be reasonably familiar with the technology to be used in connection therewith. Any Party can change its program manager upon written notice to the other Party so long as such new designee meets the requirements of this paragraph.

1.8. Further Assurances. Resonant shall provide Murata with a reasonable amount of assistance, training and support as Murata may reasonably request with respect to the process steps for enabling the manufacture of Licensed Products, regardless of whether such assistance, training or support is expressly described herein or in any SOW. Such assistance, training and support shall be provided without charge.

1.9. Murata Affiliates. MMC may permit one or more of its Affiliates to participate in the Collaboration, provided that MMC shall: (i) ensure that each such Affiliate adheres to all of the requirements set forth in this Agreement; and (ii) be liable for any such Affiliate's non-compliance with such requirements.

2. COMMERCIAL LICENSES

2.1. Background IP License. Subject to Murata's payment of the $2,000,000 pre-payment of royalties pursuant to the first sentence of Section 3.1, Resonant hereby grants to Murata, a non-exclusive, perpetual (except where such License is terminated pursuant to Section 9.4(a)), worldwide, and paid-up license of Resonant Background IP, with the right to sublicense, to make, have-made, use, offer for sale, sell, export, import or otherwise commercially exploit the Licensed Products for the Selected Band(s) corresponding to each SOW. Murata shall be responsible for compliance of its sublicensees with the terms and conditions of this Agreement and a violation by any such sublicensee of such terms and conditions shall be deemed a material breach by Murata of this Agreement. The Parties may discuss the grant of additional licenses to allow Murata to make, have-made, use, offer for sale, sell, export, import or otherwise commercially exploit Licensed Products for radio frequencies other than those specified in the Scheduled SOWs, and such licenses, if any, may be granted subject to the terms and conditions set forth in a mutual written agreement of the Parties.

2.2. Foreground IP Licenses.

(a) License to Murata. Subject to Murata's payment of the $2,000,000 pre-payment of royalties pursuant to the first sentence of Section 3.1, Resonant hereby grants to Murata a perpetual (except where such License is terminated pursuant to Section 9.4(a)), worldwide, and paid-up license of Resonant Foreground IP, with the right to sublicense, to:

(i) make, have-made, use, offer for sale, sell, export, import, or otherwise commercially exploit the Licensed Products for the Selected Band(s) corresponding to each

SOW, such rights being exclusive both during and after the thirty (30) month period described in Section 2.3 below;

(ii) to make, have-made, use, offer for sale, sell, export, import, or otherwise commercially exploit any Improvements of the Licensed Products for the Selected Band(s) corresponding to each SOW, such rights being non-exclusive; and

(iii) to make, have-made, use, offer for sale, sell, export, import or otherwise commercially exploit any other products, other than the Licensed Products for the Selected Band(s) corresponding to each SOW or Improvements of such products, such rights being non-exclusive.

(b) Omitted.

(c) Omitted.

2.3. No Third-Party IP Licenses. For a period of thirty (30) months following the Closing Date, Resonant shall not (i) grant to any Third Party the right to make, have made, use, sell, offer for sale or import any filter or resonator produced through the use of the XBAR Technology, any XBAR Technology IP, any related Resonant Foreground IP or any jointly-owned Foreground IP pursuant to Section 4.3, in each case, for use in a Mobile Communications Device (the "Restricted Technology"), (ii) develop, make, have made, use, sell, offer for sale, import, export or otherwise commercially exploit any filter or resonator produced through the use of the Restricted Technology together with or for any Third Party, or (iii) promote to any prospective customer the use of the Restricted Technology. Furthermore, during the term of this Agreement, Resonant shall not grant to any Third Party the exclusive right to make, have made, use, sell, offer for sale, import, export or otherwise commercially exploit any filter or resonator produced through the use of the Restricted Technology without Murata's prior written consent.

2.4. Omitted.

2.5. No Rights in Trademarks. Nothing in this Agreement shall be construed as granting Murata any rights to use, or any other rights in or to, any trademarks of Resonant. Notwithstanding the foregoing, Resonant hereby grants to Murata a non-exclusive, perpetual, irrevocable, worldwide and royalty-free license to use trademarks of Resonant related to XBARTM for the purpose of publication of results under this Collaboration (subject to the provisions of Article 5), and for purposes of sales promotion and sales of the Licensed Products. Any use by Murata of Resonant's trademarks shall inure to the benefit of Resonant. Murata will not file any application for registration of XBARTM used by Murata in any country of any mark, symbol or phrase, in any language. Nothing in this Agreement shall be construed as granting Resonant any rights to use, or any other rights in or to, any trademarks of Murata.

2.6. Omitted.

2.7. No Other Rights or Obligations. Notwithstanding anything to the contrary contained herein, all rights not specifically granted in this Agreement to Murata shall be reserved and remain always with Resonant. Notwithstanding anything to the contrary contained herein, all rights not specifically granted in this Agreement to Resonant shall be reserved and remain always with Murata.

2.8. Similar Technology or Products.

(a) Except as expressly authorized or licensed hereunder, Murata shall not, either directly or through a Third Party, use any Resonant IP, to create or develop, or assist any Third Party in the development of, any radio frequency wave filters or circuits.

(b) Except as expressly authorized or licensed hereunder, Resonant shall not, either directly or through a Third Party, use any Murata IP, to create or develop, or assist any Third Party in the development of, manufacturing processes or methods.

2.9. Responsibility for Design, Production and Manufacturing of Licensed Product. Except as otherwise set forth in this Section 2.9, Murata will solely be responsible for engineering and fabrication of all Licensed Products including, but not limited to, all filters and wafers, and related architecture, materials, structure, testing and testing evaluation of package design realized in acoustic wave substrate material during production of the Licensed Products. The parties acknowledge that the foregoing is not part of the Collaboration. Notwithstanding the foregoing, Resonant will be responsible for performing all of its obligations hereunder, including engineering and development of the design of the acoustic wave circuit structures incorporated in the Deliverables and any modifications thereto necessary to achieve Design Review Sign-off.

2.10. Performance Data. The Parties will share fully all performance data from any parts, devices, components, circuits, breadboards, and prototypes developed under each SOW. Notwithstanding anything else to the contrary, Resonant shall not, and shall ensure that is Representatives shall not, disclose any such performance data to any unauthorized Third Party.

2.11. Bankruptcy. All rights and licenses granted by Resonant under this Agreement are and will be deemed to be rights and licenses to “intellectual property” as such term is used in, and interpreted under, Section 365(n) of the United States Bankruptcy Code (11 U.S.C. §365(n)). Murata has all rights, elections, and protections under the Bankruptcy Code and all other bankruptcy, insolvency and similar laws with respect to the Agreement, and the subject matter hereof. Without limiting the generality of the foregoing, Resonant acknowledges and agrees that, if Resonant shall become subject to any bankruptcy or similar proceeding, subject to Murata’s rights of election under Section 365(n), all rights, licenses, and privileges granted to Murata under this Agreement will continue subject to the respective terms and conditions hereof, and will not be affected, even by Resonant’s or its bankruptcy estate’s rejection of this Agreement.

2.12. Transferees. Any Transferee of Resonant IP shall take the same subject to Murata’s rights and Licenses granted hereunder.

3. FINANCIAL PROVISIONS

3.1. Pre-Paid Royalties; Payment for Services. Within fifteen (15) working days from the date of Resonant’s invoice, which shall not be issued prior the Closing Date, Murata shall pay to Resonant $2,000,000 by wire of immediately available funds, as a one-time pre-payment of royalties in connection with Murata’s sales of Licensed Products. Upon and subject to achieving Design Review Sign-off of the relevant Deliverables, Murata shall pay Resonant the amounts set forth in each SOW corresponding to such Deliverables. All payments of pre-paid royalties shall be non-refundable.

3.2. Late Payments. All payments received by Resonant more than ten (10) business days after their due date shall accrue interest at the rate of seven percent (7%) per annum, or the maximum rate permitted by law, whichever is less, from the original due date until paid in full and shall be immediately due from Murata to Resonant.

3.3. Taxes. Murata will withhold and pay the relevant tax authorities on behalf of Resonant any and all taxes that Murata is required to withhold from the payments due hereunder under Applicable Law, and deduct the amount of such withholding taxes, if any, from the amounts that it pays Resonant hereunder.

3.4. No Right of Set-Off. All sums due to Resonant under this Agreement shall be paid in full and Murata shall not be entitled to assert against Resonant any credit, set-off or other claim in order to justify withholding payment of any sum due hereunder.

3.5. Currency. All payments to Resonant shall be in United States Dollars.

3.6. Responsibility for Costs and Expenses. Except as specifically and expressly set forth herein, each Party shall bear its own costs and expenses in connection with its performance of this Agreement.

4. INTELLECTUAL PROPERTY

4.1. Background IP Ownership. Each Party shall always retain exclusive title and ownership and continue to own and control its respective Background IP, subject to the license granted under Section 2.1.

4.2. Solely-Owned Foreground IP – Ownership and Use. Foreground IP that is conceived, authored or invented by and/or for one Party shall be solely owned by the inventing Party. Each Party shall be free to use its solely owned Foreground IP without restriction, subject to the Licenses granted under Section 2.2.

4.3. Jointly-Owned Foreground IP – Ownership and Use. Foreground IP that is conceived, authored or invented jointly by or for the Parties shall be jointly owned by the Parties. Each Party agrees to notify the other Party in writing prior to granting any Third Party any license with respect to any jointly-owned Foreground IP. Notwithstanding the foregoing, Murata shall have the exclusive right under any jointly-owned Foreground IP to make, have made, sell, offer for sale, use, import, export or otherwise commercially exploit products based on Deliverables completed by Resonant corresponding to a Part Number without any additional consideration, both during and after the thirty (30) month period described in Section 2.3 above. Accordingly, Resonant shall not use any jointly owned Foreground IP (other than to perform its obligations hereunder), and shall not grant any license to any Third Party under any jointly-owned Foreground IP, to make, have-made, use, sell, offer for sale, import, export or otherwise commercially exploit any products based on Deliverables completed by Resonant corresponding to a Part Number.

4.4. Right of Negotiation. In the event Resonant proposes the Transfer of its rights in Resonant Foreground IP and any jointly-owned Foreground IP pursuant to Section 4.3 to any Third Party, Resonant shall provide Murata at least sixty (60) days prior written notice of such proposed Transfer, and Murata shall have the first priority right to negotiate in good faith the terms and conditions of the Transfer to Murata of such Resonant Foreground IP and any jointly-owned Foreground IP.

4.5. Foreground IP -- Obligation to Disclose & U.S. Patent Protection. The Parties will use their commercially reasonable efforts to maintain complete and accurate written records of meetings and communications among the Parties' respective engineering personnel pertaining to the development of any Foreground IP and shall include a reasonably detailed description of any and all Foreground IP. Each Party shall promptly disclose to the other Party in writing all Foreground IP that is developed or acquired in the course of its activities in connection with the Collaboration under this Agreement and any SOW. If, within thirty (30) days following receipt of a Party's disclosure of Foreground IP, a Party notifies the other Party that it disagrees with the characterization of the Foreground IP as solely owned by such Party or jointly-owned and it provides a reasonably detailed explanation of its position, then the dispute shall be resolved in accordance with Section 10.3. A patent application may be prepared and filed, pursuant to Section 4.6 below, for jointly-owned Foreground IP with respect to which the Parties mutually agree to file a patent application.

4.6. Common Law Firm. The Parties will select and use a mutually acceptable law firm to handle the preparation, filing and prosecution of all patent applications covering jointly-owned Foreground IP.

4.7. Cooperation with Filing & Prosecution. – During and after the term of this Agreement, the Parties agree to cooperate in executing documents and providing papers or other evidence in a timely manner as may be needed to facilitate the filing and prosecution of patent applications covering jointly-owned Foreground IP and the maintenance, renewal and defense of each patent granted. Each Party shall be entitled to receive a draft of each such patent application and to have a reasonable opportunity to review and comment on such application prior to its filing. In addition, each Party shall be entitled to receive a copy of each such patent application covering jointly-owned Foreground IP filed with the United States Patent and Trademark Office or any foreign patent agency (each, a "Patent Agency") and a copy of all communications received from, or sent to, a Patent Agency. Each Party shall consider in good faith any comments or suggestions provided by the other Party relating to the preparation, filing or prosecution of a patent application for any jointly-owned Foreground IP.

4.8. Costs & Filing Decisions -- Solely-Owned Foreground IP. Each Party shall be solely responsible for the costs of searching, preparing, filing and prosecuting patent applications (and maintaining resulting patents) for its solely owned Foreground IP.

4.9. Costs & Filing Decisions -- Jointly-owned Foreground IP. The Parties shall cooperate and, except as otherwise provided in this Section 4.9, share, in accordance with each Party's share in jointly-owned Foreground IP as separately agreed to by both Parties, the costs of searching, preparing, filing and prosecuting patent applications (and maintaining resulting patents) for such jointly-owned Foreground IP. If a Party desires to file a patent application in a given country claiming jointly-owned Foreground IP and the other Party declines to participate, the declining Party shall not be required to share in the costs of filing or prosecution of such patent application but shall assign its ownership rights in such jointly-owned Foreground IP in such country to the filing Party.

4.10. Maintaining Jointly-Owned Foreground IP. If a Party desires to abandon or discontinue its participation in/payment for any patent application or issued patent claiming any jointly-owned Foreground IP, it shall so inform the other Party at least sixty (60) days prior to any potential abandonment date thereof so that the other Party may decide whether to have such patent/application maintained, and if so, the Parties will mutually determine a course of action that serves the interests of both Parties.

4.11. Enforcement of Jointly-Owned Foreground IP. Each Party shall promptly notify the other Party of an infringement of any jointly-owned Foreground IP of which such Party becomes aware. The Parties shall consult with one another in good faith to determine which Party, if either, shall initiate action, including legal action, against an infringer. If the Parties agree upon which Party shall initiate such action, then the other Party shall fully cooperate with and assist the enforcing Party in any such action and the enforcing Party shall reimburse the other Party for any reasonable out-of-pocket expenses it incurs in providing requested assistance. The enforcing Party shall be entitled to retain all damages that it is awarded in any such action. If the Parties cannot agree whether and/or which Party shall initiate an infringement action, either Party may independently pursue such action, provided that the Party pursuing such action gives the other Party not less than twenty (20) days prior written notice of its decision to pursue such action and the opportunity to share equally in the costs of pursuing such action. If the Parties share equally the costs of the action, then all damages awarded in such action shall be shared equally by the Parties.

4.12. Omitted. .

4.13. Reward to Inventors. Each Party may independently provide a financial benefit or other reward to each inventor for Foreground IP that is employed by each Party, according to terms and conditions of each Party's internal inventor reward program. Each Party shall be solely and independently responsible for the administration and payment of such reward to its respective inventor. Each Party shall have no obligation with respect to reward or payment to the inventor of the other Party.

4.14. Agreements with Representatives. Resonant shall obtain and maintain in effect written agreements with each of its Representatives that contain terms sufficient for Resonant to comply with all of the provisions of this Agreement and to support all grants and assignments of rights and ownership and licenses hereunder, free and clear of all liens, encumbrances, charges, security interests, mortgages or other similar restrictions. Each Party shall ensure that its Representatives comply with the provisions in Article 5 with respect to the other Party's Confidential Information.

5. CONFIDENTIALITY

5.1. Disclosure and Use Restriction.

(a) Each Party possesses Confidential Information and in the course of performing activities pursuant to the Collaboration, a Party may receive, acquire or obtain access to the other Party's Confidential Information. In such event, the Receiving Party shall hold in strict confidence the Disclosing Party's Confidential Information and shall use at least the same standard of care as it uses to protect proprietary or confidential information of its own, but shall exercise not less than reasonable care, to maintain the confidentiality of the Disclosing Party's Confidential Information and to ensure that its Representatives do not disclose or make any unauthorized use of the Disclosing Party's Confidential Information. The Receiving Party shall promptly notify the Disclosing Party upon discovery of any unauthorized use or disclosure of the Disclosing Party's Confidential Information.

(b) Except to the extent expressly authorized by this Agreement, reasonably necessary to perform its obligations or exercise its rights under this Agreement, or otherwise agreed in writing by the Parties, the Receiving Party shall (i) keep confidential and shall not publish or otherwise disclose or transfer any of the Disclosing Party's Confidential Information to any Third Party at any time; (ii) not use (except as specifically permitted in writing by the Disclosing Party), copy, modify and/or transfer the Disclosing Party's Confidential Information and/or merge the Disclosing Party's Confidential Information with any other technology, proprietary information or materials; (iii) to the maximum extent permitted by Applicable Law, not reverse engineer any of the Disclosing Party's Confidential Information; and (iv) not remove any trademark, copyright, patent or mask work notices and/or other proprietary legends contained within any of the Disclosing Party's Confidential Information. Each Party, as a Receiving Party, agrees that it will disclose the Disclosing Party's Confidential Information only to its employees and contractors who have a specific need to know in order for the Receiving Party to be able to perform its obligations or exercise its rights under this Agreement and only to the extent necessary for such purpose, and shall ensure that such employees and contractors comply with the provisions set forth in this Article 5 with respect to the Disclosing Party's Confidential Information. Each Party shall be responsible for conduct by its respective Representatives that constitutes a breach of this Article 5 or that otherwise would cause such Party to be in breach of Article 5 had it performed such acts itself.

(c) To further protect each Party's interest in its Confidential Information, each Party, as the Receiving Party, agrees that, except as expressly authorized or licensed hereunder or under any SOW, it shall not in any way incorporate, use and/or exploit any part of the Disclosing Party's Confidential Information (disclosed separately or embodied in the Disclosing Party's products, equipment, processes, methods, designs, prototypes or operations) in its and/or any other party's products or businesses, including without limitation to develop, produce and/or distribute any technology or products or services that derive value from or use the Disclosing Party's Confidential Information.

5.2. Authorized Disclosure. The Receiving Party may disclose the Disclosing Party's Confidential Information to the extent that such disclosure is:

(a) made in response to a subpoena or valid order of a court of competent jurisdiction or other governmental authority; provided, however, that such Receiving Party shall, to the extent not prohibited by Applicable Law, have given notice to the Disclosing Party within five (5) business days of receipt of such order and given the Disclosing Party a reasonable opportunity to challenge such subpoena or order and/or obtain a protective order requiring that the Confidential

Information and documents that are the subject of such subpoena or order be held in confidence by such court or governmental or regulatory body or, if disclosed, be used only for the purposes for which the subpoena or order was issued; and provided, further, that if a disclosure order is not reversed or a protective order is not obtained, the Confidential Information disclosed in response to such court or governmental order shall be limited to that information which is legally required to be disclosed in response to such court or governmental order;

(b) otherwise required by Applicable Law; provided, that the Disclosing Party shall provide the Receiving Party with notice of such disclosure at least thirty (30) days in advance thereof to the extent practicable and not prohibited by Applicable Law;

(c) made by a Receiving Party in connection with its performance of this Agreement to regulatory authorities; provided, that the Receiving Party shall provide the Disclosing Party with notice of such disclosure at least thirty (30) days in advance thereof to the extent practicable and the Receiving Party shall reasonably consider any comments received from the Disclosing Party; or

(d) approved by the Disclosing Party in writing.

5.3. Terms of Agreement to be Maintained in Confidence . The Parties agree that the terms of this Agreement, including all SOWs, are confidential and shall not be disclosed by either Party to any Third Party (including in a press release or other public announcement) (except to a Party's professional advisors, including without limitation accountants, financial advisors, and attorneys) without prior written permission of the other Party; provided, however, that (a) either Party may make any filings of this Agreement required by Applicable Law or regulation in any country (based upon advice of counsel) so long as such Party uses its reasonable efforts to obtain confidential treatment for portions of this Agreement as available, consults with the other Party, and permits the other Party to participate, to the extent practicable, in seeking a protective order or other confidential treatment; (b) either Party may disclose this Agreement on a confidential basis to potential Third Party investors or acquirers, in each case in connection with due diligence or similar investigations; and (c) a Party may publicly disclose, without regard to the preceding requirements of this Section 5.3, information that was previously disclosed in compliance with such requirements.

5.4. Irreparable Harm. Each Party, as a Receiving Party, understands and acknowledges that any disclosure, misuse or misappropriation of any of the Disclosing Party's Confidential Information in violation of this Agreement will cause irreparable harm, for which there will be no adequate remedy at law, and the amount of which may be difficult to ascertain. Therefore, each Party agrees that in the event of any breach or threatened breach of this Article 5 by such Party, the other Party, as a Disclosing Party, shall be entitled to injunctive relief and shall have the right to apply to a court of competent jurisdiction for specific performance and/or an order restraining and enjoining any such further disclosure or breach and for such other relief as such Party shall deem appropriate. Such right of the Disclosing Party shall be in addition to the remedies otherwise available under this Agreement, at law or in equity. Each Party, as a Receiving Party, hereby expressly waives the defense that a remedy in damages will be adequate and any requirement in an action for specific performance or injunction for the posting of a bond by the Disclosing Party.

5.5. Presentations at Academic Conferences, Etc . Either Party may present the fruits of their Collaboration at academic conferences and in industry publications provided that (a) no Confidential Information is disclosed, and (b) the Party making the presentation or publication provides the other Party fifteen (15) business days prior written notice and obtains the other Party's written approval of the contents of such presentation or publication, provided, however, approval will be deemed to have been granted if a Party fails to object to a proposed presentation or publication within such fifteen (15) business day period.

5.6. Survival. The provisions contained in this Article 5 shall survive and remain in effect after the expiration or termination of this Agreement for any reason; provided, however, such provisions shall expire five (5) years after the date of disclosure with respect to any Confidential Information that does not constitute a trade secret under Applicable Law.

6. WARRANTIES

6.1. Mutual Representations and Warranties. Each Party represents and warrants to the other Party that: (a) it is duly organized, validly existing and in good standing under the laws of the jurisdiction in which it is organized; (b) the execution, delivery and performance of this Agreement has been duly and validly authorized by all necessary action on the part of such Party; (c) it has all of the rights and licenses necessary to perform its obligations under this Agreement and to grant the other Party the rights and licenses that are granted herein; and (d) this Agreement constitutes a valid and binding obligation of such Party, enforceable in accordance with its terms (subject to bankruptcy, insolvency, reorganization and other laws affecting creditors' rights generally).

6.2. Resonant Representations and Warranties. Resonant represents and warrants that it is the sole and exclusive owner of the XBAR Technology and the XBAR Technology IP, and that it is not required to obtain any consent, approval, license or authorization from or pay any fee or royalty to, any Third Party to execute, deliver and perform this Agreement or to grant the Licenses. With respect to each SOW, Resonant represents and warrants to Murata that, (a) the corresponding Deliverables will be the original work of Resonant and (b) neither Murata's use of the Deliverables (including the use thereof in the manner contemplated hereby), the Resonant Background IP nor the Resonant Foreground IP infringe, misappropriate or otherwise violate (i) any Third Party Patents, to the best of Resonant's knowledge, or (ii) any other Third Party Intellectual Property Rights, and, to the best of Resonant's knowledge, there are no facts upon which a valid claim could be made. Resonant covenants to Murata that it will not include in the Deliverables, any Third Party technology not provided by Murata, unless Murata has the right to so use or include such technology, in which case Resonant shall obtain Murata's prior written consent prior to using or including such Third Party technology.

6.3. Omitted.

6.4. Warranty Disclaimer. EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH IN THIS AGREEMENT OR IN ANY SOW, NEITHER PARTY MAKES ANY OTHER WARRANTIES OR CONDITIONS, AND EACH PARTY EXPLICITLY DISCLAIMS ALL OTHER WARRANTIES AND CONDITIONS, WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF SATISFACTORY QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, CONDITION OF TITLE AND NON-INFRINGEMENT AND ANY WARRANTY OR CONDITION BASED UPON CUSTOM OR USAGE IN TRADE OR COURSE OF DEALING.

7. ALLOCATION OF RISKS

7.1. Indemnity by Resonant. Resonant shall indemnify, defend and hold harmless Murata and their respective officers, directors, shareholders, agents, employees and other representatives ("Murata Indemnitees") against all Third Party claims and shall pay Murata all judgments, settlement amounts, costs and expenses, including without limitation reasonable attorneys' fees and costs, whether or not a lawsuit or other proceeding is filed, to the extent such Third Party claim alleges that Murata's use of any Deliverable delivered to Murata under a SOW, the Resonant Background IP, or the Resonant Foreground IP, in each case, when used in the manner contemplated hereby, infringes such Third Party's Intellectual Property Rights in existence anywhere in the world. Notwithstanding the foregoing, Resonant shall have no obligation under this Section 7.1 in respect of any infringement arising from: (i) the combination of the infringing Deliverable with other technology, software, materials, designs or products not supplied by Resonant (to the extent such combination is not contemplated by this Agreement or any SOW), if such infringement would not have occurred but for such combination; (ii) any modification of the infringing Deliverable other than by Resonant if such infringement would not have occurred but for such modification; (iii) any manufacturing process applied to the infringing Deliverable by Murata if such infringement relates exclusively to such manufacturing process; or (iv) adherence by Resonant in performing the Services to requirements or specifications required by Murata notwithstanding Resonant's proposal of non-infringing requirements and specifications, if the infringement results from such requirements or specifications required by Murata. In the event Resonant fails to promptly indemnify and defend such claims or pay a Murata Indemnitee's expenses, as provided above, such Murata Indemnitee shall have the right to defend itself, and in that case, Resonant shall reimburse such Murata Indemnitee for all of its reasonable attorneys' fees, costs and damages incurred in settling or defending such claims within thirty (30) days of each of Murata Indemnitee's written requests.

7.2. Omitted.

7.3. Indemnification Procedures. In connection with any claim for which a Party seeks indemnification from the other Party pursuant to this Agreement, the Party seeking indemnification: (a) shall give the indemnifying Party written notice of the claim or action as soon as practicable; provided, however, that failure to provide such notice shall not relieve the indemnifying Party from its liability or obligation hereunder, except to the extent of any material prejudice as a direct result of such failure; (b) shall cooperate with the indemnifying Party, at the indemnifying Party's expense, in connection with the defense and settlement of the claim or action; and (c) shall permit the indemnifying Party to solely control the investigation, defense and settlement of the claim or action; provided, however, that the indemnifying Party may not settle the claim or action without the indemnified Party's prior written consent, which shall not be unreasonably withheld or delayed, in the event such settlement materially adversely impacts the indemnified Party's rights or obligations; provided further that any settlement by the indemnifying Party that does not involve a complete release of the indemnified Party and its Affiliates or that otherwise imposes any duties, obligations or other burdens on the indemnified Party or any of its Affiliates or diminishes, restricts or imposes any obligations with respect to any rights or licenses of the indemnified Party or any of its Affiliates, including, but not limited to, Resonant's rights in the Resonant IP, and Murata's rights in the Murata IP or under the Licenses, shall only be with the indemnified Party's prior written approval, which may be withheld in the indemnified Party's sole discretion. Further, the indemnified Party shall have the right to participate (but not control, except as otherwise provided herein) and be represented in any suit or action by advisory counsel of its selection and at its own expense. The indemnifying Party will not be responsible for any costs, expenses or compromise incurred or made by the indemnified Party without the indemnifying Party's prior written consent.

7.4. Resonant's Procurement of Third-Party Rights. If, as a result of any judgment, arbitral decision or settlement of a Third Party claim of infringement of its Intellectual Property Rights that is covered by Section 7.1, Murata is enjoined or effectively prevented from fully exercising the License as granted hereunder, Resonant shall, at its sole expense, in addition to its obligations under Section 7.1, procure for Murata the right to continue fully exercising such License.

8. LIMITATION ON DAMAGES

8.1. Exclusion of Certain Damages. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EXCEPT AS SPECIFIED BELOW, IN NO EVENT WILL EITHER PARTY BE LIABLE TO THE OTHER PARTY UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OF OTHER THEORY, UNDER LAW OR EQUITY FOR:

(a) ANY SPECIAL, INCIDENTAL, INDIRECT, PUNITIVE OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS AND LOST BUSINESS), WHETHER OR NOT SUCH PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES; OR

(b) THE COST OF PROCURING SUBSTITUTE GOODS, PRODUCTS, SERVICES, TECHNOLOGY OR RIGHTS.

THE LIMITATIONS IN THIS SECTION 8.1 SHALL NOT EXCLUDE ANY LIABILITY WHICH, UNDER APPLICABLE LAW, CANNOT LEGALLY BE EXCLUDED BY CONTRACT. FURTHERMORE, THE PARTIES ACKNOWLEDGE AND AGREE THAT AMOUNTS PAID WITH RESPECT TO CLAIMS BROUGHT BY A THIRD PARTY THAT ARE THE SUBJECT OF INDEMNIFICATION UNDER THIS AGREEMENT SHALL BE DEEMED TO BE DIRECT DAMAGES AND SHALL NOT BE DEEMED TO BE SPECIAL, INCIDENTAL, INDIRECT, PUNITIVE OR CONSEQUENTIAL DAMAGES. NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, THE LIMITATIONS OF LIABILITY CONTAINED IN THIS SECTION 8.1 SHALL NOT APPLY TO: (A) VIOLATION OF THE OTHER PARTY'S INTELLECTUAL PROPERTY RIGHTS BY A PARTY OR ITS REPRESENTATIVES; (B) ANY BREACH OF ARTICLE 5 BY A PARTY OR ITS REPRESENTATIVES; (C) THE GROSS NEGLIGENCE, WILLFUL MISCONDUCT OR FAILURE TO COMPLY WITH APPLICABLE LAW BY A PARTY OR ITS AFFILIATES; OR (D) RESONANT'S OBLIGATIONS UNDER SECTION 7.4.

8.2. Cap on Damages. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EXCEPT AS SPECIFIED BELOW:

THE MAXIMUM LIABILITY OF RESONANT UNDER THIS AGREEMENT SHALL NOT EXCEED THE AGGREGATE AMOUNT OF PAYMENTS RECEIVED BY RESONANT HEREUNDER AND UNDER EACH SOW; AND

THE MAXIMUM LIABILITY OF RESONANT UNDER THIS AGREEMENT WITH RESPECT TO A LICENSE SHALL NOT EXCEED THE AGGREGATE AMOUNT OF PAYMENTS RECEIVED BY RESONANT UNDER SUCH LICENSE.

NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, THE LIMITATIONS OF LIABILITY CONTAINED IN THIS SECTION 8.2 SHALL NOT APPLY TO: (A) VIOLATION OF MURATA'S INTELLECTUAL PROPERTY RIGHTS BY RESONANT OR ITS REPRESENTATIVES; (B) ANY BREACH OF ARTICLE 5 BY RESONANT OR ITS REPRESENTATIVES; (C) ANY LIABILITY OR OBLIGATION UNDER ARTICLE 7; OR (D) THE GROSS NEGLIGENCE, WILLFUL MISCONDUCT OR FAILURE TO COMPLY WITH APPLICABLE LAW BY RESONANT.

9. TERM AND TERMINATION

9.1. Term. The term of this Agreement shall commence on the Closing Date and continue in effect until terminated as set forth below. The term of each SOW shall commence on the last date such fully executed SOW is signed by a Party and end upon the completion of the Services under such SOW, unless terminated earlier in accordance with this Article 9. The term of each License shall commence on the Closing Date and end upon lapse or termination of any such License as set forth in Section 9.4(a).

9.2. Termination by Resonant.

(a) In the event (a) any SOW does not receive Design Review Sign-off notwithstanding Resonant's performance of its obligations in accordance herewith; (b) Murata breaches any material provision of this Agreement, including any SOW; (c) Murata breaches any provisions of Article 2 or Article 4; (d) Murata files a petition in bankruptcy, has a petition filed against it regarding bankruptcy, is adjudicated bankrupt, becomes insolvent, or makes any assignment for the benefit of creditors that has a material adverse effect on Murata's ability to perform under this Agreement; (e) of a Change of Control of Murata; or (f) Murata ceases to operate or continuously engage in business as a going concern, Murata shall be deemed to be in default under this Agreement. In the event of such default, Resonant shall notify Murata in writing of such default and require Murata to cure such default within thirty (30) days of the date of such notice (except that a Change of Control shall be deemed non-curable and Resonant has the right to immediately terminate this Agreement). If Murata fails to substantially cure such default within the applicable cure period, if any, Resonant shall have the right to immediately terminate this Agreement or, at Resonant's option, the SOW with respect to which the SOW relates upon written notice to Murata.

(b) In the event (a) Murata commits a material breach of Article 5; (b) Murata files any action to challenge, or assists another party in challenging the validity, ownership or enforceability of any XBAR Technology IP, and Murata fails to withdraw such action within thirty (30) days after written notice thereof by Resonant; or (c) in the absence of any material breach or default by Resonant that is not cured within thirty (30) days after written notice thereof by Murata, Murata fails to timely pay to Resonant any monetary obligations under Section 3.1 that is not disputed in good faith, Murata shall be deemed to be in consequential default under this Agreement (a "Consequential Default"). In the event of such Consequential Default, Resonant shall notify Murata in writing of such default and require Murata to cure such default within sixty (60) days of the date of such notice. If Murata fails to substantially cure a Consequential Default within the applicable cure period, if any, Resonant shall have the right to immediately terminate this Agreement.

9.3. Termination by Murata.

(a) Murata may terminate this Agreement and all incomplete SOWs at any time upon thirty (30) days' prior written notice to Resonant.

(b) In the event (i) any SOW does not receive Design Review Sign-off notwithstanding Murata's performance of its obligations in accordance herewith; (ii) Resonant breaches any material provision of this Agreement, including any SOW; (iii) Resonant fails to comply in all material respect with its obligations under section 1.3(b) ; (iv) Resonant breaches any provisions of Article 2 Article 4 or Article 5; (v) Resonant files a petition in bankruptcy, has a petition filed against it regarding bankruptcy, is adjudicated bankrupt, or makes any assignment for the benefit of creditors that has a material adverse effect on Resonant's ability to perform under this Agreement; (vi) of a Change of Control of Resonant; (vii) Resonant files any action to challenge, or assists another party in challenging the validity, ownership or enforceability of any Murata IP, and Resonant fails to withdraw such action within thirty (30) days after written notice thereof by Murata; or (viii) Resonant ceases to operate or continuously engage in business as a going concern, Resonant shall be deemed to be in default under this Agreement. In such event, Murata shall notify Resonant in writing of such default and require Resonant to cure such default within thirty (30) days of the date of such notice (except that the breach of Article 2.3, Article 4 or Article 5 or a Change of Control shall be deemed non-curable and Murata has the right to immediately terminate this Agreement). If Resonant fails to substantially cure such default within the thirty (30) day period, Murata shall have the right to immediately terminate this Agreement or, at Murata's option, immediately terminate the SOW with respect to which the default relates upon written notice to Resonant.

9.4. Effect of Termination.

(a) Upon termination of this Agreement by Murata pursuant to Section 9.3(a) or by Resonant pursuant to Section 9.2(b), (i) all Licenses shall immediately terminate and automatically revert to Resonant, and Murata shall thereafter immediately cease and refrain from using in any way any Resonant IP under any such License; (ii) except as provided in Section 9.5, Murata shall not further manufacture, sell or distribute any of the Licensed Products without Resonant's prior written consent; and (iii) Murata shall remain liable to Resonant to pay for all outstanding monetary obligations which have become due and payable pursuant to Section 3.1; provided, however, notwithstanding Resonant's right to terminate the Licenses pursuant to this Section 9.4(a), Murata may, at its option, exercisable within forty-five (45) days following the effective date of termination of this Agreement, pay Resonant an amount not to exceed the aggregate unpaid amounts payable hereunder and under each of the Scheduled SOWs (i.e., $2,000,000 pursuant to the first sentence of Section 3.1, $[***] under DR1 SOW, $[***] under DR2 SOW and $[***] under DR3 SOW, or $9,000,000 in the aggregate, to the extent such amounts have not already been paid) to retain the Licenses and, upon Murata's exercise of such option and payment of such amounts within forty-five (45) days following the effective date of termination of this Agreement, the Licenses shall be deemed to have continued without termination and Resonant shall not have the right to terminate the Licenses. For the avoidance of doubt, the Licenses may only be terminated, revoked or otherwise lost or forfeited pursuant to this Section 9.4(a), and no other breach, default or termination of this Agreement (including pursuant to Section 9.2(a) or Section 9.3(b)) or any SOW for any reason will affect the Licenses in any way whatsoever.

(b) Upon expiration or termination of this Agreement, (i) each Receiving Party shall return to the Disclosing Party all of the Disclosing Party's Confidential Information in the Receiving Party's possession or control and shall certify that it has not retained or made copies of such information; (ii) Murata shall remain liable to pay for all outstanding monetary obligations hereunder to Resonant; and (iii) neither Party shall be released from any obligation on its part to be performed that accrued prior to the date of expiration or termination.

9.5. Limited Right to Sell Inventory. Upon termination of the Licenses pursuant to Section 9.4(a), Murata shall have the limited right to sell and distribute its remaining inventory of Licensed Products and/or complete and distribute its works in progress of Licensed Products which existed as of the date of expiration for a period of one hundred eighty (180) days following the date of termination, provided that (a) a detailed schedule of the inventory and work in process remaining on the effective date of termination and its location is provided to Resonant within thirty (30) days after the date of termination, and (b) no defective or unapproved Licensed Products are sold. Murata, however, shall not manufacture or produce any more Licensed Products corresponding to the terminated License(s), except for works in progress that existed prior to the expiration or termination date.

9.6. Cumulative Remedies. All rights and remedies conferred herein shall be cumulative and in addition to all of the rights and remedies available to each Party at law, equity or otherwise.

10. MISCELLANEOUS PROVISIONS

10.1. Relationship of Parties. The Parties are independent contractors notwithstanding any joint activities set forth in this Agreement. Neither Party is the agent or legal representative of the other Party, and neither Party has the right or authority to bind the other Party in any way. This Agreement creates no relationship as partners or a joint venture, and creates no pooling arrangement.

10.2. Governing Law. This Agreement shall be interpreted and enforced under the laws of the State of California, without application of its conflicts or choice of law rules, except that issues relating to the arbitration clause and any arbitration hereunder shall be governed by the Federal Arbitration Act, Chapters 1 and 2 and the U.N. Convention on Contracts for the International Sale of Goods shall not be applicable.

10.3. Dispute Resolution; Waiver of Jury Trial. Any dispute relating to this Agreement or a Party's performance or failure of performance under this Agreement ("Dispute") will be resolved first through good faith negotiations between the Parties. If the Dispute cannot be resolved through good faith negotiation within ninety (90) days, the Dispute shall be resolved by private binding arbitration ("Arbitration") conducted by JAMS in Los Angeles, California in accordance with the Arbitration Rules and Procedures of JAMS that are in effect at the time the arbitration is initiated. The Arbitration shall be conducted by an arbitral tribunal (the "Arbitral Tribunal") consisting of three (3) neutral arbitrators and each Party shall select one (1) arbitrator and the two arbitrators so appointed shall attempt to agree upon the third arbitrator (who will act as the Chair of the Arbitral Tribunal for administrative purposes only); provided, however, if the amount at issue is less than Two Hundred Fifty Thousand Dollars ($250,000), then the Arbitration shall be conducted by one (1) neutral arbitrator chosen by mutual agreement of Resonant and Murata. The cost of the arbitration, including the fees and expenses of the arbitrator, will be shared equally by the Parties, with each Party paying its own attorney's fees. The arbitration award will be presented to the Parties in writing, and upon the request of either Party, will include findings of fact and conclusions of law. The award may be confirmed and enforced in any court of competent jurisdiction. With regards to any action for a Party's breach of confidentiality obligations or violation of the other Party's Intellectual Property Rights, nothing in this Section 10.3 shall preclude either Party from seeking interim equitable relief in the form of a temporary restraining order or preliminary injunction in any court having jurisdiction over the Parties. Any such request by a Party of a court for interim equitable relief shall not be deemed a waiver of the obligation to arbitrate hereunder.

10.4. Compliance with Laws. Each Party agrees to comply with all Applicable Law as may apply to its performance under or in connection with this Agreement, including all applicable regulations and treaties, and anti-kickback and fraud statutes. Such Applicable Law also may include, without limitation, export control laws, telecommunications laws, regulations and directives, labor laws, immigration laws, antitrust and competition laws, environmental, health and safety laws, and product safety laws, as applicable.

10.5. Export Controls. Resonant acknowledges that Murata is a Japanese company based in Kyoto, Japan with many Japanese employees, and that Resonant's performance of this Agreement will involve Resonant's export of the Deliverables, Resonant Confidential Information and other technology to Japan. Resonant shall be solely responsible to ensure that it complies with all Applicable Laws of the United States relating to such exports. Resonant will obtain any applicable export permits and licenses, and shall be solely responsible for violations of the export control laws of the United States or any other applicable export laws arising from Resonant's performance of its obligations hereunder, including, but not limited to, the export or deemed export by Resonant of the Deliverables, Resonant Confidential Information and other technology from the United States. Murata shall be solely responsible to ensure that Murata's marketing and sale of Licensed Products complies with any Applicable Law relating to import/export matters. Murata shall not use or export any Licensed Products or Resonant Confidential Information to any person located in or a national of Cuba, Iran, North Korea, Sudan, Syria or any other countries with which U.S. persons are generally prohibited from engaging in commerce, to any persons on the BIS Entity List, a denied parties list, or otherwise sanctioned; or to persons or entities that will use the technology for prohibited end-uses. Murata shall solely be responsible for violations of the export control laws of the United States or any other applicable export laws arising from the marketing and sale by Murata or attempts thereof, including, but not limited to, the export or deemed export by Murata of Licensed Products or of any Resonant Confidential Information.

10.6. Assignment. Neither this Agreement nor any rights or obligations under this Agreement may be assigned, by operation of law or otherwise, by either Party without the express written consent of the other, which consent shall not be unreasonably withheld. However, either Party may, without seeking permission of the other party, assign any such rights or obligations under this Agreement to a Third Party ("Acquiring Party") when such assignment is:

(a) part of the sale to such Acquiring Party of substantially all of the assets used by the assigning Party to carry out its responsibilities under this Agreement ("Assets"); or

(b) part of the formation of a separate entity, or merger with an existing Acquiring Party entity, that ultimately contains such Assets.

Any purported assignment in contravention of this Section 10.6 shall be null and void. This Agreement shall be binding upon the Parties and their successors and permitted assigns.

10.7. Contract Interpretation. The Parties agree that any principle of construction or rule of law that provides that an agreement shall be construed against the drafter of the agreement in the event of any inconsistency or ambiguity in such agreement shall not apply to the terms and conditions of this Agreement. Titles and headings to articles and sections of this Agreement are inserted for convenience of reference only and are not intended to affect the interpretation or construction of this Agreement. The terms "this Agreement," "herein," "hereof," "hereunder" and similar expressions refer to this Agreement and not to any particular section or other portion hereof. Unless otherwise specified, "days" means calendar days. Any use of the term "including" (or its derivatives) in this Agreement shall be construed as if followed by the phrase "without limitation."

10.8. Delivery by Facsimile, PDF Attachment or Electronic Signature . This Agreement and any amendments hereto, to the extent signed and delivered by means of a facsimile machine, PDF attachment or DocuSign electronic signature shall be treated in all manner and respects as an original contract and shall be considered to have the same binding legal effect as if it were the original signed version thereof delivered in person. At the request of either Party, the other Party shall re-execute original forms thereof and deliver them to the requesting Party. No Party shall raise the use of a facsimile machine, PDF attachment or DocuSign electronic signature to deliver a signature or the fact that any signature was transmitted or communicated through such use as a defense.

10.9. Counterparts. This Agreement may be executed in several counterparts that together shall be originals and constitute one and the same instrument.

10.10. Waiver. The failure of either Party to enforce any of its rights hereunder or at law shall not be deemed a waiver or a continuing waiver of any of its rights or remedies against the other Party, unless such waiver is in writing and signed by the Party to be charged.

10.11. Severability. If any provision of this Agreement, or part thereof, is declared by a court or other tribunal of competent jurisdiction to be invalid, void or unenforceable, each and every other provision, or part thereof, shall nevertheless continue in full force and effect.

10.12. Omitted.

10.13. Notice. All notices, requests or other communications under this Agreement shall be in writing, and shall be sent to the designated representatives of the Parties as set forth on the signature page herein, and shall be deemed to have been duly given on the date of service if sent by facsimile or e-mail (provided a hard copy is sent in one of the manners specified below), or on the day following service if sent by commercial air courier service with tracking capabilities and written confirmation of delivery. Each Party is required to notify the other Party in the above manner of any change of address.

10.14. Further Assurances. Both Parties agree to execute such additional documents and perform such acts as are reasonably necessary to effectuate the intent of this Agreement.

10.15. Entire Agreement. This Agreement (including all Exhibits and Schedules hereto and SOWs) constitutes the entire agreement between the Parties regarding the subject matter hereof, and supersedes all prior or contemporaneous understandings or agreements, whether oral or written, except that any existing written confidentiality agreements between the Parties are superseded and replaced in their entirety solely with respect to any and all disclosures made on or after the Closing Date but shall remain in full force and effect with respect to any prior disclosures. This Agreement may be modified or amended only by a writing signed by both Resonant and Murata.

10.16. Authority. The Parties executing this Agreement on behalf of Resonant and Murata represent and warrant that they have the authority from their respective governing bodies to enter into this Agreement and to bind their respective companies to all the terms and conditions of this Agreement.

10.17. No Third-Party Beneficiaries. Nothing express or implied in this Agreement is intended to confer, or confers, upon person or entity other than the Parties and any respective successors or permitted assigns of the Parties, any rights, obligations, or remedies hereunder (whether as a third-party beneficiary or otherwise).

10.18. Force Majeure. Except for the payment of amounts due hereunder, neither Party shall have any liability for any failure or delay attributable in whole or in part to any cause beyond its reasonable control including, but not limited to, acts of God, governmental action, fire, storm, flood, insurrection, earthquake, tsunami, power failure, riot, act of terrorism, war, explosion, embargo, civil disturbance, disruption of telecommunications, disruption of power or other essential services, interruption or termination of service by any service provider used by such Party to link its servers to the Internet, strike, labor or materials shortage, vandalism, cable cut, computer viruses, cyber-attack or other similar occurrence, or malicious or unlawful acts of any Third Party.

10.19. English Language. This Agreement is in the English language only, which language shall be controlling in all respects, and all versions hereof in any other language shall be for accommodation only and shall not be binding upon the Parties hereto. All communications and notices to be made or given pursuant to this Agreement shall be in the English language.

10.20. Survival. All accrued rights to payment hereunder and the following provisions of this Agreement shall survive any expiration or termination of this Agreement and continue in full force and effect: from Sections 2.1, 2.2, from 2.4 to 2.12 (except to the extent the Licenses are terminated pursuant to Section 9.2(b) or 9.4(a)),2.3, 3, 4, 5, 6, 7, 8, and 10 and Sections 9.4, 9.5 and 9.6.

[*Signatures on Next Page*]

IN WITNESS WHEREOF, the Parties have, through their duly authorized representatives, executed this Agreement on the dates below their signatures, but both Parties nevertheless agree that this Agreement shall be deemed valid and effective as of the Closing Date.

Resonant Inc.		Murata Manufacturing Co., Ltd	
By:	/s/ George Holmes	By:	/s/ Ken Tonegawa
Name:	George Holmes, CEO	Name:	Ken Tonegawa
Title:	CEO	Title:	Senior Vice President
Date:	9/25/2019	Date:	Sep. 25, 2019

With notice to:		With notice to:	
Address:	175 Cremona Drive, Suite 200 Goleta, CA 93117	Address:	2288, Oshinohara, Yasu-shi, Shiga 520-2393 Japan
Facsimile:	______________	Facsimile:	____________
Email:	gholmes@resonant.com	Email:	masahiro.shiba@murata.com
Attn:	George Holmes, CEO	Attn:	Deputy Director Masahiro Shiba

EXHIBIT A

PRE-APPROVED THIRD PARTY DELEGATEES

[***]

SCHEDULE A

DEFINITIONS

"Affiliate" means any company, corporation, partnership, or any other entity (whether incorporated or not) which is at the time in question directly or indirectly Controls, is Controlled by or under direct, indirect or common control with, an entity. For the avoidance of doubt, any company, corporation, partnership or other entity that is not an Affiliate of a Party as of the Closing Date, but later becomes an Affiliate of such Party through any transaction or series of transactions will be deemed to be an Affiliate of such Party for purposes of this Agreement.

"Applicable Law" means, with respect to any domestic or foreign, national, federal, regional, state, provincial, town, city, municipal or other jurisdiction, any constitutional provision, law, statute, rule, regulation, ordinance, treaty, order, notification, decree, judgment, decision, certificate, injunction, or conditions of any registration, license, permit, authorization, guideline, governmental approval, consent or requirement of any governmental authority of such jurisdiction, as construed from time to time by any governmental authority of such jurisdiction.

"Background IP" means Intellectual Property Rights owned or controlled by a Party that either were (a) conceived, authored, invented, first developed and/or reduced to practice prior to the Closing Date, or (b) conceived, authored, invented, first developed and/or reduced to practice after the Closing Date by that Party, alone or in collaboration with others, independent of the Collaboration, including Improvements of or inventions derived therefrom outside of the Collaboration.

"Change of Control" with respect to either Party means the occurrence of any of the following:

(a) any merger or consolidation involving such Party in which such Party is not the continuing or surviving entity, or pursuant to which equity interests in such Party are or would be converted into cash, securities or other property; or

(b) the liquidation or dissolution of such Party; or

(c) any sale, lease, exchange or other transfer of the assets of such Party to which this Agreement relates; or

(d) any change in the entities that Control such Party as that term is defined herein.

"Confidential Information" means, as the context requires, Resonant Confidential Information disclosed to Murata or Murata Confidential Information disclosed to Resonant, or both, except that Confidential Information shall specifically exclude any information which:

(a) at the time of disclosure by the Disclosing Party is generally available to the public;

(b) after disclosure becomes generally available to the public by publication or otherwise through no fault of the Receiving Party or its Representatives;

(c) the Receiving Party can show was in its possession or in the possession of its Representatives prior to the time of disclosure by the Disclosing Party and which was not acquired, directly or indirectly, from the Disclosing Party or its Representatives and which is held by the Receiving Party free of any obligation of confidence to any third party;

(d) the Receiving Party can show was rightfully received by it after the time of disclosure by the Disclosing Party from a third party who had a lawful right to disclose it to the Receiving Party and who did not require the Disclosing Party to hold it in confidence; or

(e) the Receiving Party can show was developed by or for the Receiving Party or its Affiliates independently without any use of or reference to the Disclosing Party's Confidential Information or violation of Article 5.

"Control" means the possession, either directly or indirectly, of (a) more than fifty percent (50%) of the voting stock of the controlled company or legal entity, or (b) the power to control the management and policies of the controlled company or legal entity, whether through the ownership of voting securities, by contract, by virtue of the power to control the composition of the board of directors or managers or otherwise. Any such other relationship, which in fact results in actual control over the management, business, and affairs of a corporation or other entity, shall also be deemed to constitute Control. The terms "Controlling" and "Controlled" shall have correlative meanings.

"controlled by", as used in the definitions of "Background IP", "Murata Background IP" and "Resonant Background IP", means a Party has the right to grant licenses within and of the scope set forth in this Agreement and without the requirement to pay consideration to any Third Party (other than employees of the applicable party or its Affiliates).

"Deliverables" means the proprietary circuit designs developed or to be developed by Resonant hereunder as identified in an SOW, for license to Murata, and all other work product contemplated by the SOWincluding but not limited to (a) the design of a finish, patterned filter die, (b) an associated circuit board layout, and (c) the use or incorporation of passive elements on the circuit board.

"Design Rules" means the manufacturing or fabrication rules to which the Deliverables must adhere.

"Disclosing Party" means a Party who discloses its Confidential Information to the other Party in connection with this Agreement.

"Foreground IP" means any Intellectual Property Rights that are not Background IP which is conceived, authored, invented, first developed and/or reduced to practice, individually or jointly, in the performance of the development of Deliverables as part of the Collaboration.

"Gross Negligence" means acts or omissions of a Party which exhibit an extraordinary lack of diligence in serious or reckless disregard of or indifference to a risk known to said persons and so great as to make it highly probable that harm or a harmful event would result.

"Improvement" means any modification, enhancement or derivative work conceived and reduced to practice.

"Intellectual Property Rights" means all common law, statutory or other intellectual property and industrial property rights, interests and protections under Applicable Law of any jurisdiction throughout the world, whether registered or unregistered, or any agreement, including, without limitation, (a) patents, patent applications and provisional applications and any patents issuing thereon (including all reissues, divisionals, provisionals, continuations and continuations-in-part, revisions, re-examinations, renewals, substitutions and extensions thereof), and other patent rights and any other indicia of invention ownership issued by a governmental authority (including inventor's certificates, petty patents and patent utility models) ("Patents"); (b) copyrights in published and unpublished works (including all U.S. and foreign registrations and application for registration of the foregoing); (c) rights protecting data, collections of data and analytical tools, including computer software, databases and data compilations; (d) know-how (such as knowledge, techniques, and/or skills that are gained through years of experience developing RF filter), designs, mask works, (e) trade secrets, (f) trademarks, service marks, trade names, trade dress (whether or not any of the trade names are registered), and (g) any right or form of protection similar to any of the foregoing existing anywhere in the world.

"License" means any of the licenses granted under Section 2.1 or Section 2.2 of this Agreement.

"Licensed Product" means any and all products which incorporate and use in whole or in part, Deliverables and any Resonant IP, in either case pursuant to a License hereunder, including but not limited to any finished filter component realized on an acoustic wave substrate material for incorporation into an RFFE Module.

"Mobile Communications Device" means a mobile communications device (or handheld computer) small enough to hold and operate in the hand, including mobile computers or laptops, tablets, smartphones, smartwatches, personal digital assistants (PDAs), feature phones, and pagers.

"Murata Background IP" means, collectively, (a) Background IP owned or controlled by Murata, and (b) Murata Confidential Information.

"Murata Confidential Information" means Murata's confidential or proprietary technical or business information including, without limitation, the Specifications, the Design Rules, designs, methods, tools, packaging and other structures, fabrication, manufacturing and other processes, test, validation, manufacturing records and materials.

"Murata Foreground IP" means all Foreground IP solely owned by Murata pursuant to Section 4.2.

"Murata IP" means, collectively, (a) Murata Background IP, and (b) Murata Foreground IP.

"Part Number" means any Murata part number that corresponds to a Selected Band of a Licensed Product, to which one set of Specifications can be applied. For the avoidance of doubt, any change in the bottom four digits of any product number shall not be considered a new or separate product number, as any such change will not require a new or separate Deliverable in connection with the applicable Licensed Product(s) or any Improvements thereon.

"Receiving Party" is a Party who receives Confidential Information from the other Party in connection with this Agreement or the performance of its obligations hereunder.

"Representatives" means, with respect to any Party, (a) its employees, subcontractors, consultants and contractors; (b) its Affiliate(s); and (c) the employees, subcontractors, consultants and contractors of its Affiliate(s). For the avoidance of doubt, neither Murata nor Resonant is an Affiliate or other Representative of the other Party.

"Resonant Background IP" means, collectively, (a) Background IP owned or controlled by Resonant or any of its Affiliates, including but not limited to the patents listed on Schedule F attached hereto, and (b) Resonant Confidential Information.

"Resonant Confidential Information" means Resonant's or its Affiliate's confidential or proprietary technical or business information including, without limitation, the Deliverables, other designs, methods, tools and processes for creating radio frequency filter designs, the Infinite Synthesized Networks (ISN®) software code, the XBAR Technology, and test, validation or manufacturing records and materials.

"Resonant Foreground IP" means all Foreground IP solely owned by Resonant pursuant to Section 4.2.

"Resonant IP" means, collectively, (a) Resonant Background IP, and (b) Resonant Foreground IP.

"RFFE Module" means radio frequency front-end module.

"Selected Band" means with respect to Services or a License, the specific radio frequency set forth in the applicable SOW.

"SOW" means a statement of work, in the form attached hereto as Schedule E, agreed and executed by the Parties pursuant to this Agreement.

"Specifications" means the particular performance specifications provided by Murata for a Deliverable provided by Murata to Resonant set forth in the applicable SOW.

"Third Party" means any party other than (a) Murata, or (b) Resonant or any of its Affiliates.

"Transfer" means any direct or indirect transfer, assignment, grant of security interest in, or change of direct or indirect ownership or control, and "Transferee" means any individual, company, corporation, partnership or entity receiving such Transfer.

"Willful Misconduct" means the act of a Party which exhibits a serious or reckless disregard of or indifference to a risk known to said persons and which is intended to cause harm or a harmful event to result.

"XBAR Technology" means Resonant's proprietary XBAR™ resonator and filter technology, a bulk acoustic wave structure that can be produced in silicon using standard processes.

"XBAR Technology IP" means the Intellectual Property Rights set forth in Schedule F.

SCHEDULE B

DR1 STATEMENT OF WORK

Term	**Definition**
Selected Band(s)	**[***]**
Resonant Program Manager	[See attachment B-3
Murata Program Manager	See attachment B-3
Roles and Ownership	See attachment B-3
Milestone Schedule	See attachment B-2
Acceptance Criteria	See attachment B-2
Payment Schedule (non-refundable)	USD $**[***]** after Design Review Sign-off.
Note	At end of DR1 Murata and Resonant shall review and modify the structure, agenda and schedule of the technical steering committee as necessary

IN WITNESS WHEREOF, the Parties have caused this Statement of Work to be signed by their duly authorized representatives.

Resonant Inc.		Murata Manufacturing Co., Ltd	
By:	/s/ George Holmes	By:	/s/ Ken Tonegawa
Name:	George Holmes, CEO	Name:	Ken Tonegawa
Title:	CEO	Title:	Senior Vice President
Date:	9/25/2019	Date:	Sep. 25, 2019

Schedule B

DR1 STATEMENT OF Work

Attachment B-1 – Milestone Schedule (Overview)

Modifications may be made based on the effective date of the SOW.

[***]

Schedule B

DR1 STATEMENT OF Work

Attachment B-2 Detailed Schedule, Deliverables and Acceptance Criteria

[***]

Schedule B

DR1 STATEMENT OF Work

Attachment B-3 Committee Structure and Schedule

[***]

- The committee will consist of permanent / regular members and invited guests
- The permanent members will be **(tbd, working example below)**:

- Both Murata and Resonant may invite an unlimited number of guest members to any meeting. These participants would may include representatives from the Sales, Marketing, Engineering, Laboratory, and any other department if necessary and relevant.
- The permanent members are committed to participate in every meeting. In person presence is preferred for the quarterly face-to-face meetings, however teleconference would be acceptable in those cases when this is not possible
- In person / face-to-face meeting schedule will be set at least 60 days in advance. Proposed Schedule for DR1is:

[***]

- Committee meetings shall follow this agenda. These are working meetings and are expected to take a minimum of 2 hours and not exceed 4 hours, with breaks.

1. Review this agenda and add additional one-time Topics
2. Review of current milestones – complete and missed dates
3. Review of strategic action items from previous meeting – topics that are not already covered by the DR1 project plan, but have been agree to at the previous meeting
4. Review and if necessary, restate success criteria for DR1
5. Propose, discuss, accept or reject technical changes to specifications and review & summarize any such changes that have been proposed and agreed in ad-hoc manner since the last meeting

6. <BREAK>

7. Propose, discuss, accept or reject SOW / project plan / milestone changes and review & summarize any such changes that have been proposed and agreed in ad-hoc manner since the last meeting
8. Share top-3 perceived risks from each side and discuss mitigation
9. If necessary, agree action items for next meeting and assign owners
10. Additional one-time topics, added in (1) above

SCHEDULE C

DR2 STATEMENT OF WORK (Template)

Term	**Definition**
Selected Band	**[***]**
Resonant Program Manager	[________________]
Murata Program Manager	[________________]
Roles and ownership	TBD
Milestone Schedule	TBD
Acceptance Criteria	TBD
Payment Schedule (non-refundable)	USD $**[***]** after Design Review Sign-off.

IN WITNESS WHEREOF, the Parties have caused this Statement of Work to be signed by their duly authorized representatives.

Resonant Inc.		Murata Manufacturing Co., Ltd	
By:	________	By:	________
Name:	________	Name:	________
Title:	________	Title:	________
Date:	________	Date:	________

SCHEDULE D

DR3 STATEMENT OF WORK (TEMPLATE)

Term	**Definition**
Selected Band	**[***]**
Resonant Program Manager	TBD
Murata Program Manager	TBD
Roles and Ownership	TBD
Milestone Schedule	TBD
Acceptance Criteria	TBD
Payment Schedule (non-refundable)	USD $**[***]** upon Design Review Sign-off.

IN WITNESS WHEREOF, the Parties have caused this Statement of Work to be signed by their duly authorized representatives.

Resonant Inc.		Murata Manufacturing Co., Ltd	
By:	________	By:	________
Name:	________	Name:	________
Title:	________	Title:	________
Date:	________	Date:	________

SCHEDULE E

STATEMENT OF WORK (TEMPLATE)

Term	**Definition**
Selected Band	[________________]
Resonant Program Manager	[________________]
Murata Program Manager	[________________]
Roles and Ownership	[________________]
Milestone Schedule	[________________]
Acceptance Criteria	[________________]
Payment Schedule (non-refundable)	[________________]

IN WITNESS WHEREOF, the Parties have caused this Statement of Work to be signed by their duly authorized representatives.

Resonant Inc.		Murata Manufacturing Co., Ltd	
By:	________	By:	________
Name:	________	Name:	________
Title:	________	Title:	________
Date:	________	Date:	________

SCHEDULE F

LIST OF PATENTS INCLUDED IN RESONANT BACKGROUND IP

[***]

Exhibit 31.1

**Certification of Principal Executive Officer Pursuant To
Exchange Act Rules 13a-14(a) and 15d-14(a),
As Adopted Pursuant To
Section 302 of Sarbanes-Oxley Act of 2002**

I, George B. Holmes, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Resonant Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 7, 2019

/s/ George B. Holmes

George B. Holmes
Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

Certification of Principal Financial Officer Pursuant To
Exchange Act Rules 13a-14(a) and 15d-14(a),
As Adopted Pursuant To
Section 302 of Sarbanes-Oxley Act of 2002

I, Martin S. McDermut, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Resonant Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 7, 2019

/s/ Martin S. McDermut
Martin S. McDermut
Chief Financial Officer
(Principal Financial and Accounting Officer)

Exhibit 32.1

Certifications of Principal Executive Officer and Principal Financial Officer
Pursuant to 18 U.S.C. Section 1350, As Adopted Pursuant To
Section 906 of the Sarbanes-Oxley Act of 2002

Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (18 U.S.C. 1350), George B. Holmes, Chief Executive Officer (Principal Executive Officer) and Martin S. McDermut, Chief Financial Officer (Principal Financial and Accounting Officer) of Resonant Inc. (the "Company"), hereby certifies that, to the best of his knowledge:

1. Our Quarterly Report on Form 10-Q for the quarter endedSeptember 30, 2019, to which this Certification is attached as Exhibit 32.1 (the "Report"), fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: November 7, 2019

/s/ George B. Holmes
George B. Holmes
Chief Executive Officer
(Principal Executive Officer)

/s/ Martin S. McDermut
Martin S. McDermut
Chief Financial Officer
(Principal Financial and Accounting Officer)