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New Resonant Whitepaper Provides Insight on 5G RF Front End Requirements

Number of RF filters is Poised to Triple as 5G Devices Support More Bands, Access Technologies, and Multiple RF Paths

GOLETA, Calif.--(BUSINESS WIRE)-- Resonant Inc. (NASDAQ: RESN), a designer of filters for radio frequency, or RF, front-ends that specializes in delivering designs for difficult bands and complex requirements, today announced the public availability of its latest whitepaper titled, "[RF Innovation and the Transition to 5G Wireless Technology](#)," which provides insight on the RF needs of 5G devices.

5G technologies, while still in the early stages of specification, promise more bandwidth, network capacity and connected devices. Mobile devices will need to support both evolving 4G/LTE technologies (LTE-Advanced and LTE-Advanced Pro) and 5G, in addition to multiple wireless LAN networks.

Multi-radio access technology (RAT) support, carrier aggregation (CA) and more complex multiple-input-multiple-output (MIMO) antenna requirements are driving significantly increased RF front end (RFFE) complexity and performance demands. RFFE design will also be impacted by new frequency bands, such as the >6GHz frequencies now being considered for 5G.

RF filters are the components that select or reject signals that are in the frequency bands supported by a mobile device. Unlike other RF components that can accommodate multiple frequency bands for each device, every frequency band supported by the smartphone requires a unique filter component. In fact, many frequency bands require several filters for each frequency band to increase data rates. According to the whitepaper, 4G/LTE smartphones today have up to 49 RF filters to accommodate the number of frequency bands used by mobile network operators, and the number of filters is expected to more than triple in the 5G era. Ultimately, the board space and cost of using RF filters in these devices will be prohibitive. The whitepaper details new alternative RF filter design techniques that can reduce the size and cost of these filters.

"Smartphones and tablets are space and cost constrained by the need for RF filters to support today's radio access technologies, so designers really need to consider how they will accommodate the evolving cellular and WLAN technologies that we'll see in the next 3-4 years," said George Holmes, President and Chief Commercial Officer for Resonant. "Using this whitepaper, we're raising awareness of the challenge that these product designers will face as they begin to develop their next-generation products."

The whitepaper is available for free from the Resonant website at:
<http://www.resonant.com/technology/white-papers>.

About Resonant® Inc.

Resonant is creating innovative filter designs for the RF front-end, or RFFE, for the mobile device industry. The RFFE is the circuitry in a mobile device responsible for the radio frequency signal processing and is located between the device's antenna and its digital baseband. Filters are a critical component of the RFFE that selects the desired radio frequency signals and rejects unwanted signals and noise.

About Resonant's ISN® Technology

Resonant can create designs for hard bands and complex requirements that we believe have the potential to be manufactured for half the cost and developed in half the time of traditional approaches. The Company's large suite of proprietary mathematical methods, software design tools and network synthesis techniques enable it to explore a much bigger set of possible solutions and quickly derive the better ones. These improved filters still use existing manufacturing methods (e.g. SAW) and can perform as well as those using higher cost methods (e.g. BAW). While most of the industry designs surface acoustic wave filters using a coupling-of-modes model, Resonant uses circuit models and physical models. Circuit models are computationally much faster, and physical models are highly accurate models based entirely on fundamental material properties and dimensions. Resonant's method delivers excellent predictability, enabling achievement of the desired product performance in roughly half as many turns through the fab. In addition, because Resonant's models are fundamental, integration with its foundry and fab customers is eased because its models speak the "fab language" of basic material properties and dimensions.

Safe Harbor/ Forward-Looking Statements

This press release contains forward-looking statements, which include the following subjects, among others: the impact of emerging technologies and trends on filter complexity and performance requirements; and the capabilities of Resonant's filter designs and ISN technology. Forward-looking statements are made as of the date of this document and are inherently subject to risks and uncertainties which could cause actual results to differ materially from those in the forward-looking statements, including, without limitation, the following: our limited operating history; our ability to complete designs that meet customer specifications; the ability of our customers (or their manufacturers) to fabricate our designs in commercial quantities; the ability of our designs to significantly lower costs compared to other designs and solutions; the risk that the intense competition and rapid technological change in our industry renders our designs less useful or obsolete; our ability to find, recruit and retain the highly skilled personnel required for our design process in sufficient numbers to support our growth; our ability to manage growth; and general market, economic and business conditions. Additional factors that could cause actual results to differ materially from those anticipated by our forward-looking statements are under the captions "*Risk Factors*" and "*Management's Discussion and Analysis of Financial Condition and Results of Operations*" in our most recent Annual Report (Form 10-K) or Quarterly Report (Form 10-Q) filed with the Securities and Exchange Commission. Forward-looking statements are made as of the date of this release, and we expressly disclaim any obligation or undertaking to update forward-looking statements.

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