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Reality Check: One for all

REDUCING THE NUMBER OF POWER AMPLIFIERS NEEDED IN MULTIBAND 3G SMARTPHONES

January 5 2010 - 6:00 am ET | Rob Rovetta, VP of Products, Quantance Inc. | RCR Wireless News

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Rob Rovetta, VP of Products, Quantance Inc.

Editor's Note: *Welcome to our weekly Reality Check column. We've gathered a group of visionaries and veterans in the mobile industry to give their insights into the marketplace.*

As wireless voice and data communication has evolved from a high-end business tool to a mass market consumer service, wireless operators have increased their service footprints, extended roaming to a global level, added radio frequency bands, and expanded their technology roadmaps to include multiple operating modes. This in turn has led the major wireless providers to require that handsets work seamlessly in each of their operating radio bands. While the associated equipment volumes are compelling, the development and delivery of smartphones that address this demand pose a significant technical challenge for the operator's OEM suppliers.

There are now 14 UMTS-FDD frequency bands either in operation or planned for future use around the world. Even though some of the bands are relatively close to each other on the frequency spectrum, phones that operate in these bands generally require separate power amplifiers for each band to achieve acceptable performance. This is particularly true for smartphones that support the newer 3G standards (WCDMA, HSDPA, HSUPA, HSPA+) because greater degrees of optimization are required for a PA to amplify these signals due to their increased complexity compared to the simpler GSM signals.

While no single smartphone is capable of connecting to networks in all these radio bands, it is quite common for today's smartphones to offer quad-band functionality that enables consumers to use a single phone in North America, Europe, Asia and other parts of the world. And there are certainly smartphones that support more than just four bands, a phenomenon that soon is expected to become the norm. In fact, both operators and consumers already have expectations that worldwide connectivity is a given for the most advanced smartphones.

If each frequency band in a smartphone needs a separate PA, then these multiband handsets require four or five PAs in the design. The

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need to support several different bands forces original equipment manufacturers to increase the size and component cost of the smartphone in order to fit the PAs, or they must make size and cost reduction tradeoffs that severely impact performance or reduce the number of bands supported. So the demand from wireless providers and consumers for multiband phones requires OEMs to face one of their biggest challenges head on: how can today's smartphones be designed to work on an increasing number of frequency bands while keeping the size of the handset small and at the same time maintaining or even lowering cost?

An unconventional, space-saving approach

The complexity of designing multiband, multimode smartphones leaves OEMs in a quandary. Either they develop smartphones that are bigger and cost more, running counter to the trends in trying to make handsets ever smaller and less expensive. Or they revert to manufacturing simpler phones that are not capable of connecting to networks around the world, or even within certain parts of a single country.

This doesn't have to be an “either/or” decision. A single PA is used for each unique band because its linearity tends to be limited to a single frequency band. Linearity is the PA's ability to amplify a signal without distorting it, and it generally fails outside the PA's target 8 frequency band. This limited linearity is common for the high-order modulation schemes used for 3G signals and is particularly noticeable in the higher power ranges of the PA, where it is often necessary for the PA to operate when transmitting high-speed data. If the OEMs can expand the linearity of a PA, it is possible that a PA designed for a single frequency band would be able to operate effectively in several frequency bands. Technology that increases the linearity of commonly used mass market PAs does indeed exist today, and it can enable OEMs to more effectively manage PAs, therefore making it possible to reduce the number of PAs needed in a multiband smartphone design.

Using such a technology to expand the operating range of a PA has several positive effects. The most obvious are both cost and size savings, which result from the use of fewer PAs. For instance, a phone designed for UMTS bands 1, 2, 4, 5 and 8 requires five separate PAs. In contrast, using a single PA to operate across several frequency bands by using linearizing technology might enable the use of only two PAs to cover the same five frequency bands – one to support the high bands (1, 2 and 4) and a second to support the low bands (5 and 8). The reduction in the number of parts required to build a multiband smartphone can save a significant amount of space, and shrink the cost of the PA section of the phone by an estimated 25% to 40%.

With integration of this innovative PA management technology, OEMs do not have to sacrifice size and cost to achieve multiband performance. This technology enables them to effectively develop multiband smartphones that offer a streamlined profile and cost less, despite the increased connectivity capabilities. Now they can deliver the smartphones that world travelers demand, creating one

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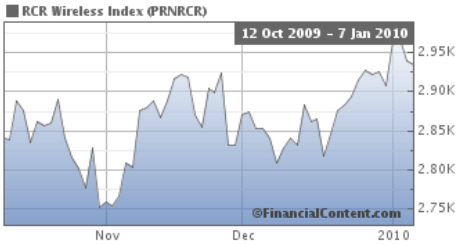

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solution that extends the reach of a single handset beyond the confines of a single network.

Rob Rovetta, VP of Products for Quantance Inc., has over 25 years of experience in wireless communications, GPS and digital processing systems in both business and engineering roles. Prior to Quantance, Rovetta was senior director of Product Management at Qualcomm's chip division, QCT, responsible for defining strategic opportunities, marketing, licensing and launching assisted-GPS (AGPS) and Qualcomm's gpsOne technology in location-based services worldwide. Rovetta came to Qualcomm from SnapTrack Inc., the start-up that pioneered AGPS, where he was responsible for licensing AGPS silicon and software to chip manufacturers and handset OEMs. Prior to SnapTrack, Rovetta held leadership positions for Magellan Corp. and Trimble Navigation, where he led business development and product management for GPS-enabled enterprise and consumer products. Before the GPS and communication industries, Rovetta worked for ROLM Corp., where he had product management, program management, and system engineering responsibilities for digital processing systems. Rovetta started his career as a member of the development engineering staff at ESL/TRW, where he designed and produced VHF, UHF and microwave antenna systems for strategic and tactical reconnaissance. Rovetta earned a B.S. degree in Electrical Engineering from the University of California at Davis.

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