

Front-End Scalability for Multi-Band Multi-Mode Radios

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The worldwide expansion of new frequency bands and standards for mobile telecommunications has exposed a problem with the existing scalability model for RF Front Ends. Many current mobiles support single WCDMA bands and utilize discrete WCDMA PA and DPX, or a PA-DPX Module. The implications to the RF Front End are relatively incremental increases in size and cost. A limited number of mobiles support 2 or even 3 WCDMA bands, and in these applications the added size and cost scales linearly with the number of bands supported. The trend for future mobiles is toward further increase in WCDMA bands and standards to support increased data throughput and locational transparency. Scaling to 4 or 5 WCDMA bands becomes a size and cost burden on Front End designers. Further expansion of data-centric mobiles into LTE, with complex MIMO and Coexistence implications, creates a potentially untenable situation for designers that are simultaneously being required to reduce mobile form factors and extend battery life.

To combat this trend, Module Designers are being asked to combine and simplify the RF Front End to allow Multi-Band and Multi-Mode operation without the penalties of scaled size and cost. Proposed solutions such as integration of Multiple PA bands into a single package, or consolidation into Wideband PA chains that can cover multiple bands and transmit standards, offer some improvement to the linear-scaling model. These approaches bring with them added technical requirements unique to these architectures.

Switching and Filtering a wide array of bands and transmit standards is forcing consolidation and simplification of these functions as well. Co-Banding and Multiplexing can maximize band scalability while minimizing Front-End complexity. Depending on the WBMM / MBMM band-support concept, Switch integration with PA or Filter components drives the overall form of the Front End Architecture. In this session, I will survey a range of approaches to solve the scalability problem, their pros and cons, and methods for system optimization through module integration.