

# Market for RF filters/duplexers, PAs and antenna switches to reach \$4.7bn in 2016

## SOI antenna switches are winning market share over GaAs, says market research firm Yole Développement.

**E**merging technologies are driving changes in RF architecture and will create new market opportunities, says market research firm Yole Développement in its new report 'RF filters, PAs, Antenna Switches & Tunability for Cellular Handsets'.

The radio front-end is a key part in every cell phone, from low-cost GSM handset to multi-mode multi-band LTE smartphones. This market is very fragmented in terms of architectures, however there are a few types of components that are key. Filters or duplexers, power amplifiers (PAs) and antenna switches are at the heart of every cell phone radio. "Those components represent a \$3.6bn market in 2011 already, growing at a 5.6% rate annually until 2016 [to \$4.7bn]," says Laurent Robin, activity leader at Yole. As the market becomes increasingly attractive, major technical evolutions and changes are observed in the competitive landscape for those categories of devices.

Filters and duplexers are the most dynamic market. Driven by duplexers which are growing at 10.5% annually, this market will reach \$1.7bn in 2016. Indeed, smartphones are widely using WCDMA bands and LTE is a new strong driver.

Depending on each band, SAW (surface acoustic wave) or BAW (bulk acoustic wave) developments are candidates for further growth. While Epcos and Murata dominate the SAW area, we observe a fierce competition between Avago and TriQuint in the BAW segment.

The power amplifier is another strategic component in the RF segment. This market is maturing, but Yole's analysts still see many new technologies that are impacting the market. One current trend is that converged PAs and more broadband PAs are increasingly accepted in the market. Gallium arsenide (GaAs) is still dominating the PA market by far but is poised to lose market share as complementary metal oxide semiconductor (CMOS) PAs are growing (starting at the low end of the market) and as silicon-on-insulator (SOI) technology could be used for PAs in the near future. There is hence still room for many changes in the competitive landscape dominated by Skyworks, with RFMD, TriQuint, Avago and Murata/Renesas as challengers.

Antenna switches are also becoming more mature, however Yole observes evolutions in two directions. First, the team sees an evolution towards more performance for the new LTE bands and an increasing number of throws. This is where Peregrine Semiconductor has a leading position. Second, Yole has observed massive adoption of SOI technology since 2010. All the big players are now involved with this technology, which offers a good price/performance ratio. GaAs switches are thus decreasing, although some players (such as Sony) are still releasing products with exceptional performance. At the same time new technologies are nearing production, e.g. MEMS (micro-electro-mechanical systems).

### Tunability and changes in architecture

Yole's report also provides a detailed analysis on tunability, which is a new hot topic for radio front-end modules. Indeed, after years of development, antenna tuners have seen adoption in 2011. In addition to GaAs switches, ferroelectric capacitors and MEMS variable capacitors have also been integrated successfully into flagship products such as some Samsung Galaxy S2 smartphones. While there is no consensus yet on this topic, antenna tuners are now providing a significant value proposition, so Yole expects them to become the next hot market in this sector.

New types of tuners and the massive deployment of LTE by 2014 will be additional drivers of tunability. Leading the MEMS field, Wispry will be a key player to watch, while Sony and Peregrine also offer promising approaches based on alternative technologies. The acquisition of Paratek by RIM (Research In Motion) in March is also a sign that antenna tuners will become a strategic technology to be integrated into many cell-phone platforms in the near future.

All these changes at the component level (PA, ASM, filters, etc) and the rise of tunability are having a dramatic impact on the global evolution of RF component architectures. Both technical and competitive challenges and opportunities are shaping future front end modules. Similarly, the trend towards integration in various types of modules is driving changes at the individual component level. New packaging technolo-

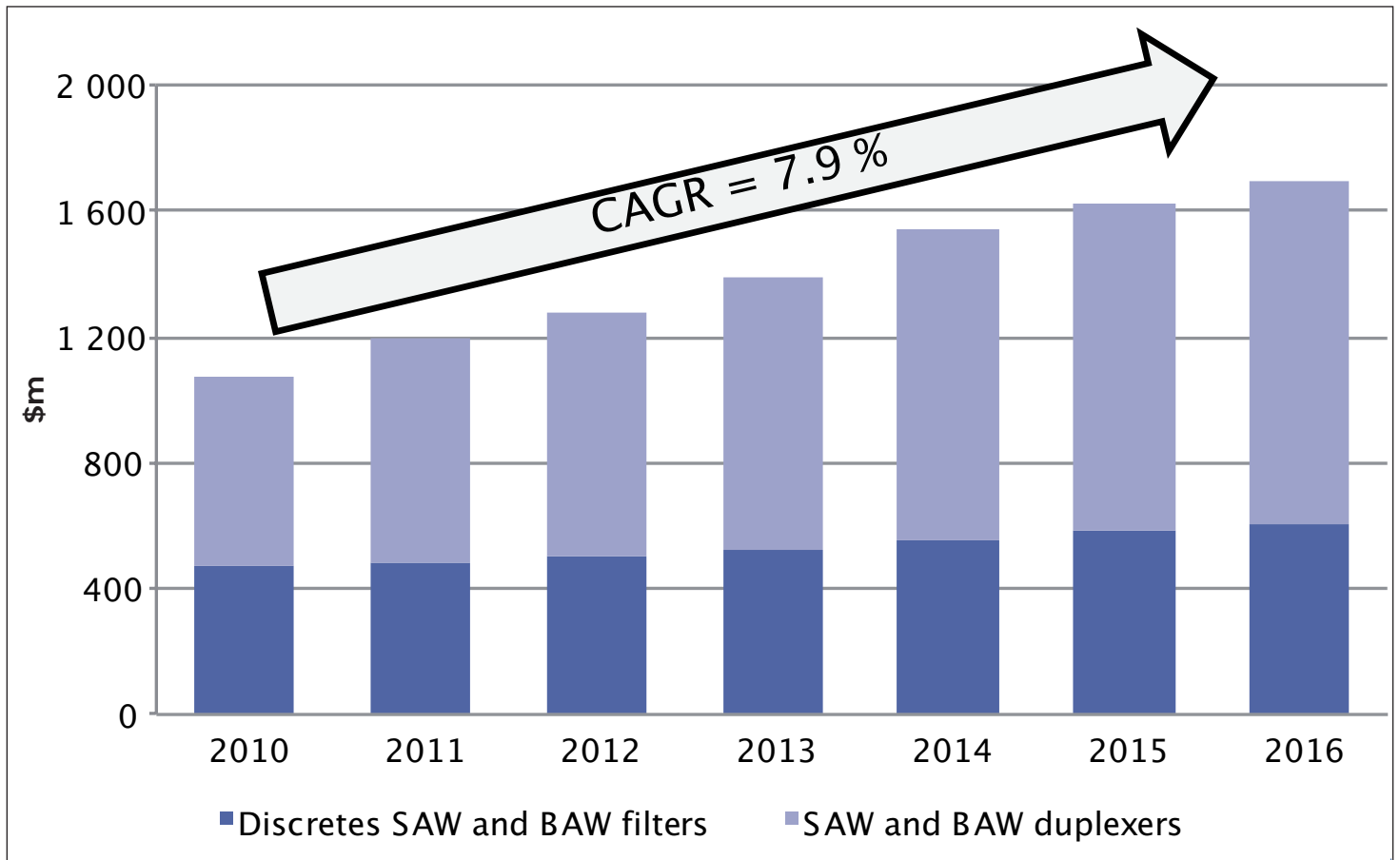


Figure 1. Market for RF filters and duplexers in RF part of mobile phones (\$m).

gies now enable compact multi-chip packages: Rx modules, PA modules, multi-duplexers, and other RF technologies. Collectively, front-end modules already comprise a \$2bn market in 2011. Growing at 12% annually, this will represent more than three times the market for standalone PAs, filters/duplexers and tuners in 2016.

#### Rapid evolution of technology and competitive landscape

While Yole is starting to see some level of consolidation, the competitive landscape in this RF market is changing quickly. Some firms are becoming more vertically integrated, such as Murata after its acquisition of the PA business of Renesas (which may translate into a change in the business model of the company). Currently, a limited number of companies dominates this RF segment, but generally those players are involved in a very specific market space, so significant

evolution can be expected in the near future. For instance, Skyworks leads the PA market and is a big player in switches but has no activity in filters, while Avago is a large PA vendor and dominates the BAW filter market, but is involved in neither SAW filters nor antenna switches.

The evolution of device architectures towards modules is one driver that pushes each company to be capable of handling all types of components or to set up specific partnerships. Another driver for competitive change is technical evolution, which is very rapid in this area: at the antenna switch level, players with early involvement in SOI switches (e.g. Skyworks and RF Micro Devices) are winning more market share versus players involved in GaAs (e.g. TriQuint). Such a change should also be seen with PA technology too, reckons Yole. ■

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