

ACTIVE AND PASSIVE ANTENNA SYSTEMS FOR TELECOM INFRASTRUCTURE 2019

Market & Technology Report - November 2019

The transition to active antenna systems and small cells is changing the technological mix of RF components in telecom infrastructure.

KEY FEATURES

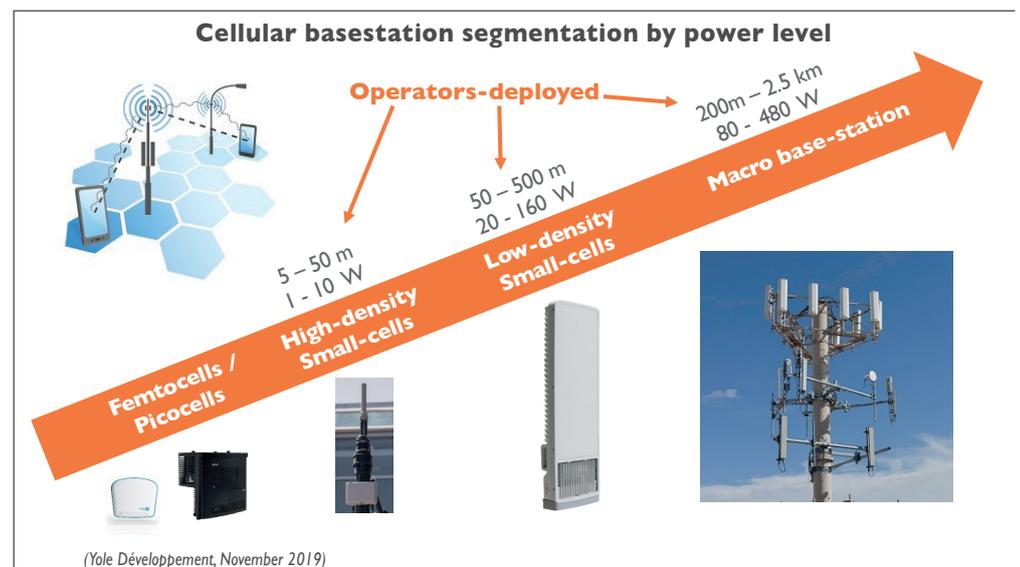
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A DRASTIC TECHNOLOGY CHANGE FUELED BY A VALUE DIVERSION

5G has brought huge changes in the telecom infrastructure industry, with the use of higher frequencies and with the arrival of active antenna systems (AAS). These systems use up to 64 independent radio frequency (RF) chains that can create direct beams, addressing specific users instead of radiating over a large area. From a practical standpoint, using such beamforming results in using 64 sets of RF components instead of two with standard remote radio head (RRH) based technologies. These components generate lower power output at antenna level, and the industry has had to adapt its technology to emitting at lower power levels. In addition to that, the newly released frequencies for 5G use are higher in frequency than current technologies. Asking for devices able to work at frequencies up to 3.5GHz today, and up to 6GHz in the future, obviously impacts the RF component industry.

From a cost stand-point, adding new components and multiplying RF chains has

increased the RF front-end bill of materials for antenna systems. This is a critical change as the telecom infrastructure market is static. Instead of growing, this market is defined by the telecom operators' investment levels, which have stayed stable all over the world in the past decades. At system and component level, this situation induces a focus on margin improvement and securing market share in order to increase profitability. The arrival of 5G will not change this trend unless new markets such as enterprise or industrial applications open up to operators, but this is not anticipated in the short term. In order to implement these new antenna systems, some methods of cost reduction and optimization have appeared, such as antenna sharing between operators, or the development of Cloud-Radio Access Networks (RAN) that are supposed to offer higher information management optimization. This saved value is then diverted toward the RF front-end and the new antenna systems, namely the AAS.



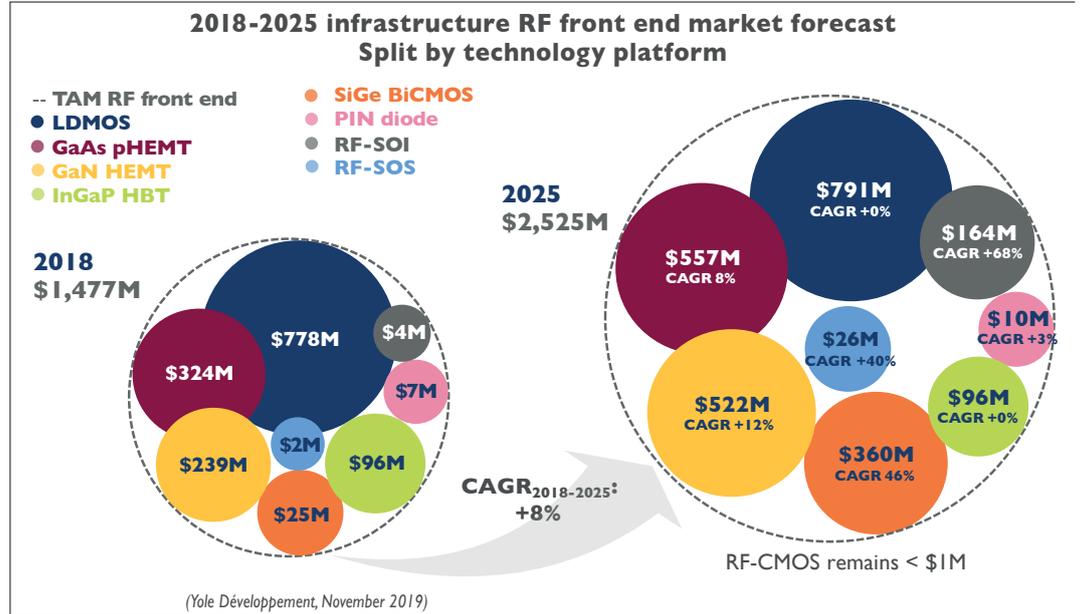
NEW TECHNOLOGY PLATFORMS TO CHALLENGE STANDARD ONES

The RF front-end market for telecom infrastructure is estimated to be worth \$1.47B in 2018 and is forecasted to reach \$2.52B in 2025. In this market, the main technology platform is LDMOS. This will remain the case for the next several years, but LDMOS is not expected to see any significant growth despite

an increase in component volumes shipped. It will see an almost null compound annual growth rate (CAGR) in a market growing by 8% on average between 2018 and 2025. On the other hand, other platforms such as GaN, GaAs, SiGe or RF-silicon-on-insulator (SOI) will see significant growth in the near future.

One of the most interesting dynamics in this matter is the expected evolution of the GaAs platform. With the arrival of AAS, a higher number of low power broadband power amplifiers will be needed, as well as new components such as beamformers. These components are expected to be made mostly on the GaAs platform at first, especially for performance reasons. It provides the

right performance level in a market for which no failure is allowed. But once the market has grown enough to be considered larger than a niche, other technologies like RF-SOI or SiGe are expected to replace GaAs, the same way GaAs has been replaced in the mobile phone industry. GaAs will be a transition platform for active antenna components.

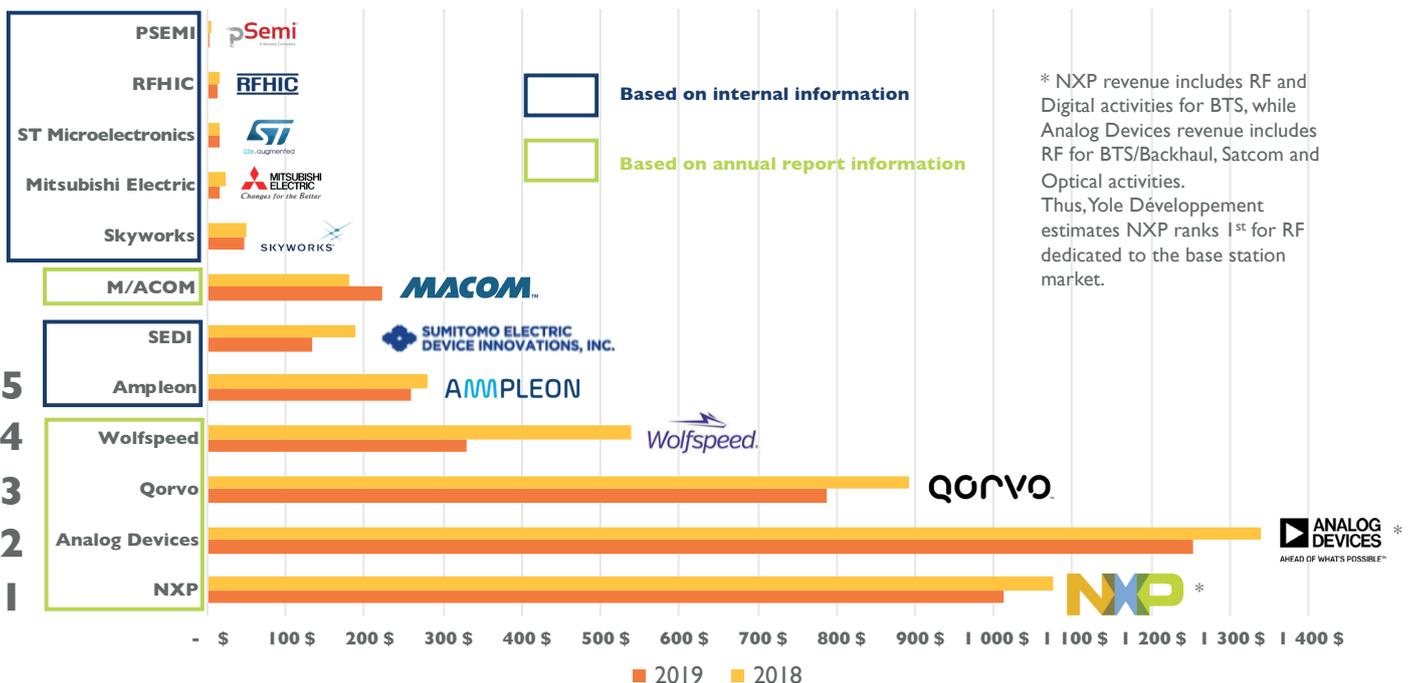


MULTIPLE PLAYERS, BUT CONSOLIDATION AWAITS TELECOM OPERATORS' TECHNOLOGY CHOICES

Unlike the mobile phone industry, RF front end component manufacturers in the telecom infrastructure industry are numerous and specialized. A lot of different technological platforms are used, leading to a wide variety of components being available. In this fragmented industry, very few acquisitions have been seen

lately and there has been little investment in start-ups. This is due to the fact that the industry is still unsure about the choices telecom operators will make in terms of deployment. A noticeable example has been China Mobile (CMCC), which has changed technological orientation twice over the past few years. It was first interested in 64 antenna

Main players ranking for communication infrastructure revenue (in \$M)



element AAS, thus motivating the industry to develop components with RF power amplifiers in the 5W range. But then CMCC went back to a preference for 32-element systems for cost reasons, rendering the developed elements unsuitable. Now CMCC has again started to go back on its plans of large scale implementation of AAS in favor of a more standard, lower cost RRH-based deployment. CMCC also

decided to not go to frequencies above 3GHz in the near future, thus completely changing the perspective for GaN device developers like Sumitomo. All these strategic changes impact technology development and create huge uncertainties in the industry. This market will first need to know which direction will be chosen by telecom operators before being able to consolidate.

REPORT OBJECTIVES

- Provide general market dynamics at antenna system level down to component level for 4G/5G telecom infrastructure
- Provide a clear view of the RF front-end architecture in all different telecom infrastructure systems
- Provide RF component technology platform breakdowns
- Provide market forecasts down to component, technology platform and wafer levels for telecom infrastructure RF front-ends
- Provide relevant information regarding the complex RF component value chain

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