SOLUTION BRIEF

Massive MIMO antenna array

Customizable reference design for a Massive MIMO antenna array with 16 dual polarized elements, operating at 2.5 GHz

Introduction

Massive MIMO (Multiple-Input Multiple-Output), abbreviated as mMIMO in this article, is a fundamental technology for 5G and 4G/LTE, providing significantly higher data rates, capacity and coverage than traditional macrocell technologies.

The increased performance is possible because mMIMO combines the radio and antenna elements into a single active antenna unit with 16/32/64/96 elements. This enables beamforming towards the user of interest, reducing interference with surrounding users and improving overall performance.

mMIMO units are often several times more expensive than traditional radio units. Based on our experience, this is due to the higher bill of materials cost (than traditional radios) and increased manual assembly effort during manufacturing to attach the 16-96 antenna elements onto the main antenna board.

Flex solution

Realizing that this was a major challenge for our customers, Flex developed a reference design for a mMIMO antenna array which can be efficiently assembled during production. The design uses a single board for the antenna array, which enables a higher degree of automation in production; we estimate this will reduce assembly effort by a factor of 5 times compared to traditional designs.

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Create the extraordinary.

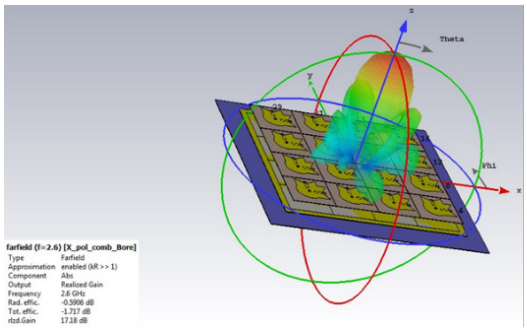
The mMIMO array consists of an antenna board with 16 dual polarized elements, as shown in the photo below, and a ground board behind the antenna board. The design team utilized a capacitive coupling technique to transfer RF energy between the antenna and ground boards. The antenna board has an L-probe feeding contact and DC grounding pin at the back, connecting to the ground board.

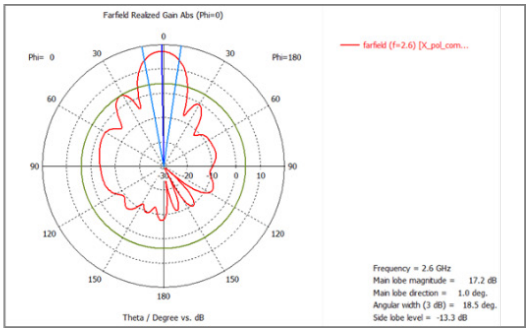
The key specifications in the table below can be customized by Flex in accordance with customer requirements.

Band	n41/B41 (2.5 GHz)	**Maximum gain**	17.5 dBi
Antenna bandwidth	200 MHz	**Antenna array efficiency**	67%
Transmit power	Up to 68 dBm EIRP	**3 dB beam width**	18°
Antenna elements	16 (dual polarized)	**Return loss**	-15 dB

Design & simulations

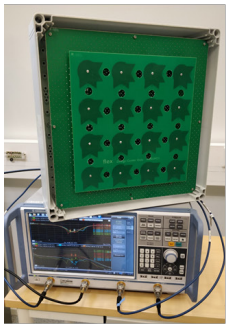
Our design process involved specification, modeling, simulation, construction, conducted testing, over-the-air testing and finally acceptance. The design process was iterative where design optimization was performed during the simulation and test phases if the results did not align with the specifications.

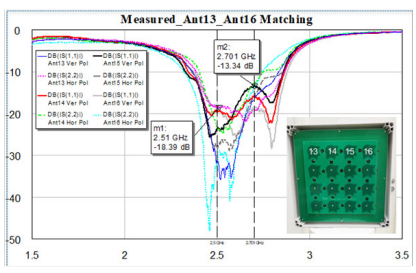


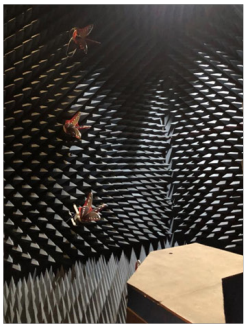


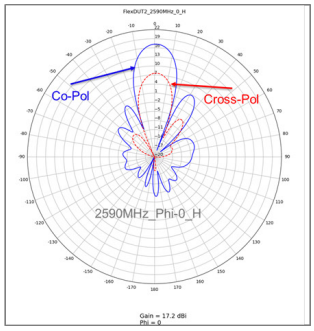
Conducted & over-the-air testing

Conducted testing was performed for all 32 antenna ports (16 dual polarized antenna elements) to measure antenna input matching. Isolation tests, between antenna elements, were also performed. Over-the-air testing was performed in a full anechoic conical-cut chamber where measurement data was collected in the near-field and transformed to the far-field using the spherical near to far-field transformation.









Partner with Flex

Accelerate your time to market and reduce initial investment by partnering with Flex on your next 5G mMIMO product. The mMIMO reference design can be customized to meet your specific requirements with our experienced wireless design team. We'll share our knowledge and experience in the design, development and manufacturing of Massive MIMO products, and the materials and components you need to build them.

Our design and manufacturing services can help you develop your next 5G mMIMO product, scale to volume production and provide the supporting supply chain and forward/reverse logistics. Our global scale also provides regional presence so we can tailor our solutions to your tax and trade situation and minimize the landed cost of your products.

Our advantage

- Accelerate time to market and reduce initial investment by tapping into our Massive MIMO reference design
- Move quickly from design to NPI to mass production with our best-in-class manufacturing capabilities
- Scale fast with our global sourcing and supply-chain expertise, combined with worldwide distribution, service, repair and logistics capabilities

Learn more at flex.com

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