

Expanding the Capability of Printed Circuit Board (PCB) Based AESA Tile Radar for Civil and Defense Applications

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The commercial electronics industry is estimated to grow to be greater than \$1.7 Trillion U.S.¹ by 2024 supported by a >\$300B U.S. electronic components industry². In contrast, total U.S. DoD spending on communications, electronics, telecommunications and intelligence is on the order of \$12B U.S. in 2018³. Further, in 2017, the U.S. DoD funding for Radar R&D was approximately \$750M US and for program procurement, \$560M US. Roughly, DoD expenditures on radar are on the order of 0.05% of the overall commercial electronics market. Over ten years ago, MACOM and MIT Lincoln Laboratory (MIT LL), began a journey in which we sought to demonstrate that high performance radar systems could be realized with commercial manufacturing practices, redefining the historic cost structure of these systems. The goal was to leverage the >\$1T scale of commercial electronics to drive the cost out of Active Electronically Scanned Array (AESA) radar systems. The initial target program was the Multifunction Phased Array Radar (MPAR) program. With MIT LL, through the FAA's SENSR Advanced Technology Demonstrator (ATD) Program, a dual polarization S-Band Air Surveillance and Weather Radar, the team was able to demonstrate state-of-the-art performance on a large scale field deployed system. This system deployment brought our approach for AESA manufacturability to an TRL and MRL of 9.

Expanding upon our MPAR work, we have augmented our designs and delivered hardware to:

- Significantly higher power levels integrating liquid cooling,
- Additional individual frequency bands as well as multiple bands, expanding the applications space,
- Offer multiple options for calibration, beamforming, main beam directivity and tapering, and
- Adapting to full digital to the element architectures enabling the most advanced radar system concepts

Critical elements in the evolution of this technology will be addressed with a focus on how this approach enables a new cost paradigm driving the ubiquitous use of radar sensors.



Figure 1. The URSI logo.

¹ Zionmarketresearch.com

² Statista

³ Military and Aerospace Magazine