

## **Simulation of multi-band MIMO FMCW radar performance in detecting maritime vessels**

### **ABSTRACT**

The objective of this paper is to investigate the range detection performance of co-located multi-band multiple-input multiple output (MIMO) Frequency Modulated Continuous Wave (FMCW) radar using various MIMO configurations, in detecting a slow radar cross sections (RCS) fluctuating vessel via a numerical simulation. The simulated MIMO FMCW radar is emitting multiple triangular FMCW waveforms with each baseband sweeps at different frequency range. At the MIMO radar receiver's ends, a proposed spectrum averaging scheme is applied to combine the receiving signals before implementing conventional ranging algorithms. A 3 MHz interval band is introduced between sub-bands and its effect had been observed. Performance of the proposed system was evaluated in terms of probability of range error against signal-to-noise ratio (SNR). From the simulation, it was observed that 3×3 MIMO performed 1 to 2 dB better compared to other topologies at 20% probability of range error.

**Keyword:** FMCW; Radar; Swerling; SISO; MIMO; Range; Radar detection