

Development and Measurement of 79 GHz 24×32 MIMO Radar

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In this paper, we present a 79 GHz 24×32 multiple-input multiple-output (MIMO) radar for disaster monitoring. The chirp signal bandwidth is 0.727 GHz. The theoretical maximum measurement range and the range resolution are 115.2 m and 0.25 m, respectively.

Figure 1 shows the front view and circuit board of the prototype radar system. The system consists of 24 transmitting (Tx) and 32 receiving (Rx) antennas, 8 radar ICs, and 8 onboard computers (OBCs). A series-feed element is used as the antenna element. It has a gain of 6 dBi at 79 GHz and a wide radiation pattern in the azimuth plane. The elements are arrayed as Tx on the top and bottom of the circuit board and as Rx in the middle as shown in Figure 1(b). This arrangement produces four sets of horizontal virtual array. Each radar IC controls 3 Tx and 4 Rx. For the data interface between radar ICs and OBCs MIPI-CSI2 is employed, and Ethernet between the OBCs and the control PC. The radar IC is a mmWave FMCW transceiver IC AWR2243 from Texas Instruments, and 8 ICs are cascaded.

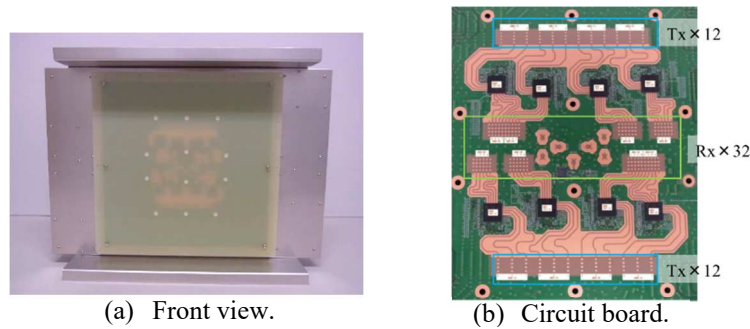


Figure 1. Prototype of 79 GHz 24×32 MIMO radar.

In the primary test, the Angle-Of-Arrival (AoA) for the radar return signal was measured. A trihedral corner reflector was placed in an EMC chamber as the target, and the distance between the radar system and target was set to 3.5 m. The time delay and phase offsets were calibrated for each Tx/Rx pair.

Figure 3 shows the FFT output image obtained by one set of horizontal virtual array, and the target position of 3.5m is identified. The SNR at the target position is around 57 dB.

In the future work, we will acquire SAR image reconstruction with full channel data.

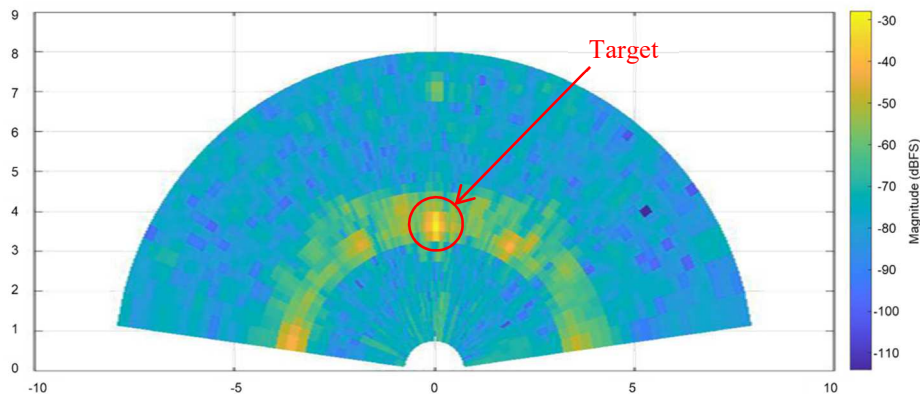


Figure 2. Radar image results (target distance: 3.5 m)

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