

Channel Spatial Profile Validation for FR2 New Radio Over-the-air Testing

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Introduction

- Over-the-air (OTA) testing of 5G new radio (NR) at frequency range 2 (FR2) is mandatory.
- Multi-probe anechoic chamber (MPAC) solution is the reference method for performance testing of FR2 NR in the standardization.
- Channel Spatial Profile Validation for FR2 New Radio Over-the-air Testing is challenging:
 - 3D channel spatial profile estimation
 - Near field scenario
 - Much larger test zone size

Possible solutions

- directional scanning scheme (all on mode)
- directional scanning scheme (on-off mode)
- Virtual array concept (far field algorithm) [1]
- **Virtual array concept (near field algorithm) [2]**

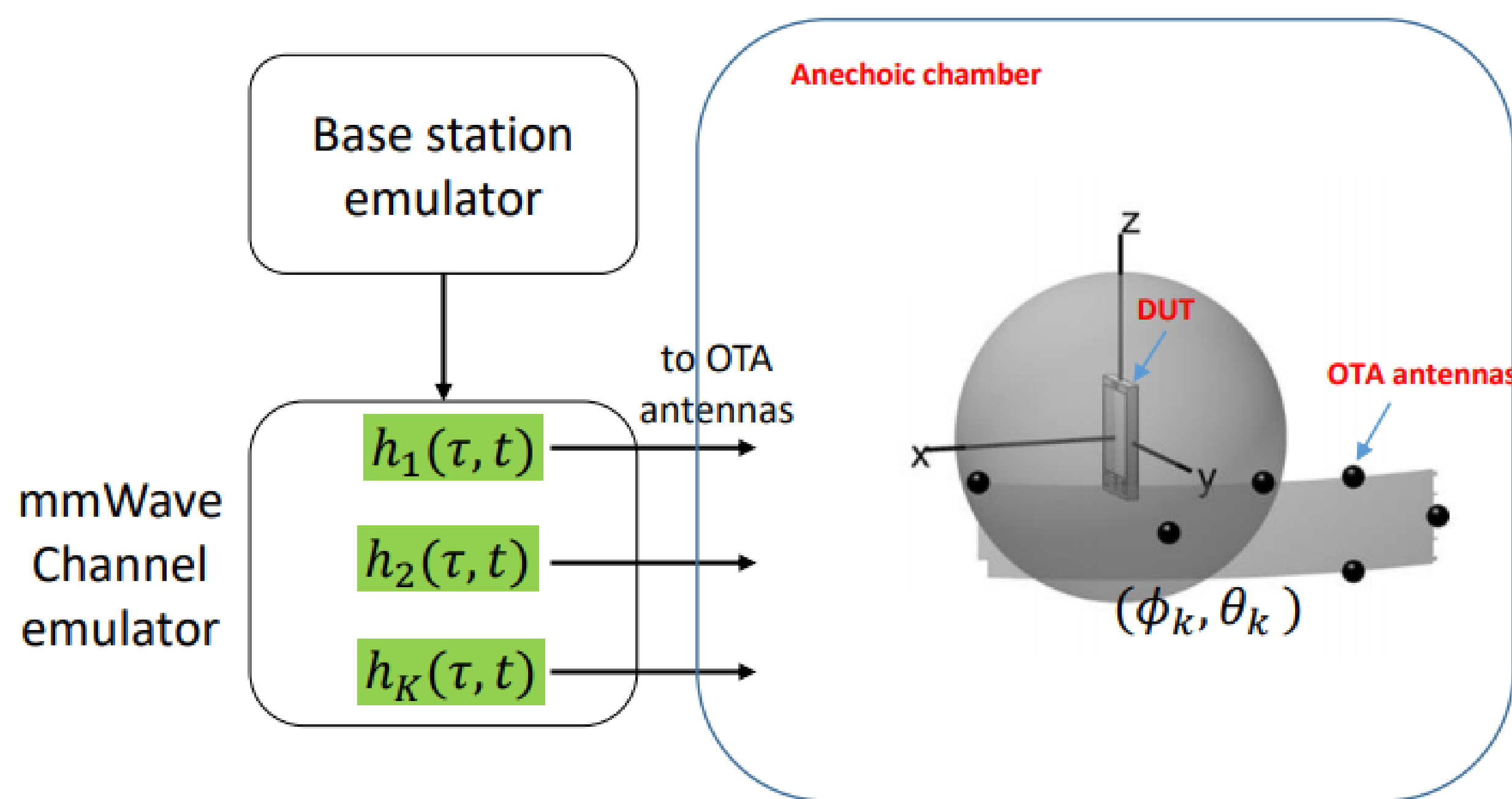


Fig. 1. System diagram for the 3D MPAC setup for FR2 NR performance testing. $h_q(\tau, t)$ is the wideband time-variant CIRs loaded for the q -th OTA antenna, with $q \in [1, Q]$.

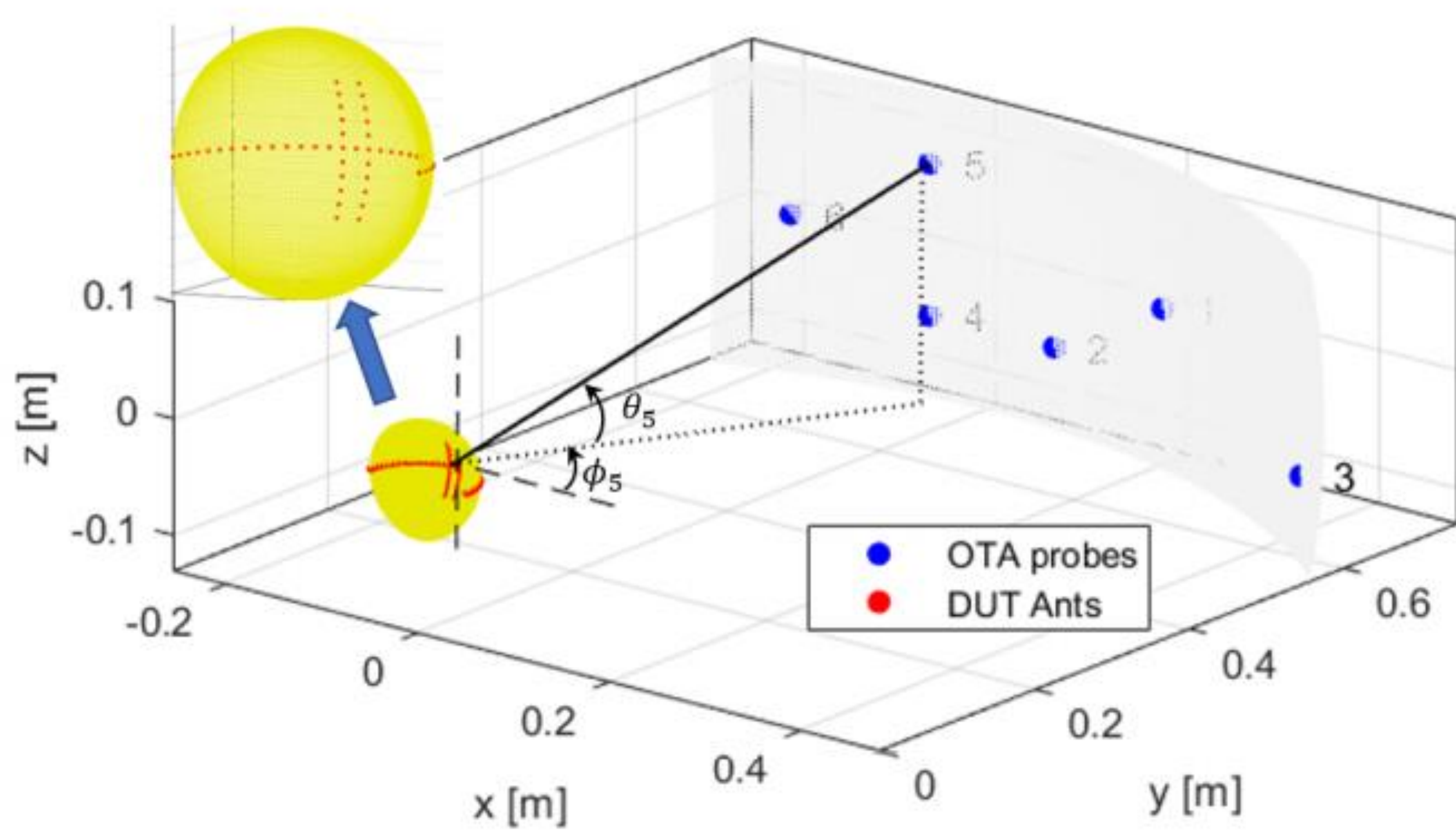


Fig. 2. An illustration of the virtual array configuration and 3D MPAC setups.

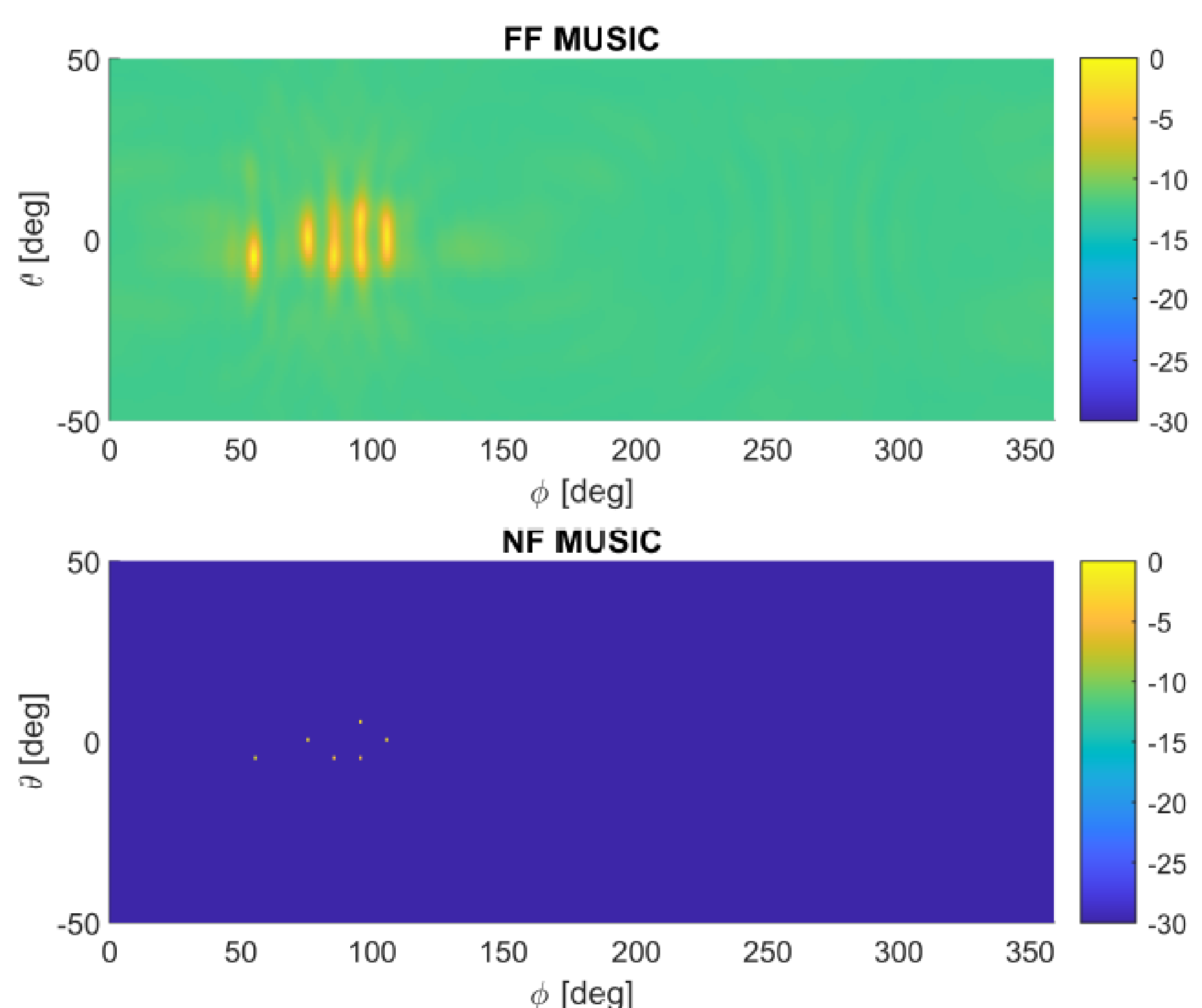


Figure 2. Power-angle profile estimated with far field MUSIC and near field MUSIC for a test zone with a radius of 5 cm.

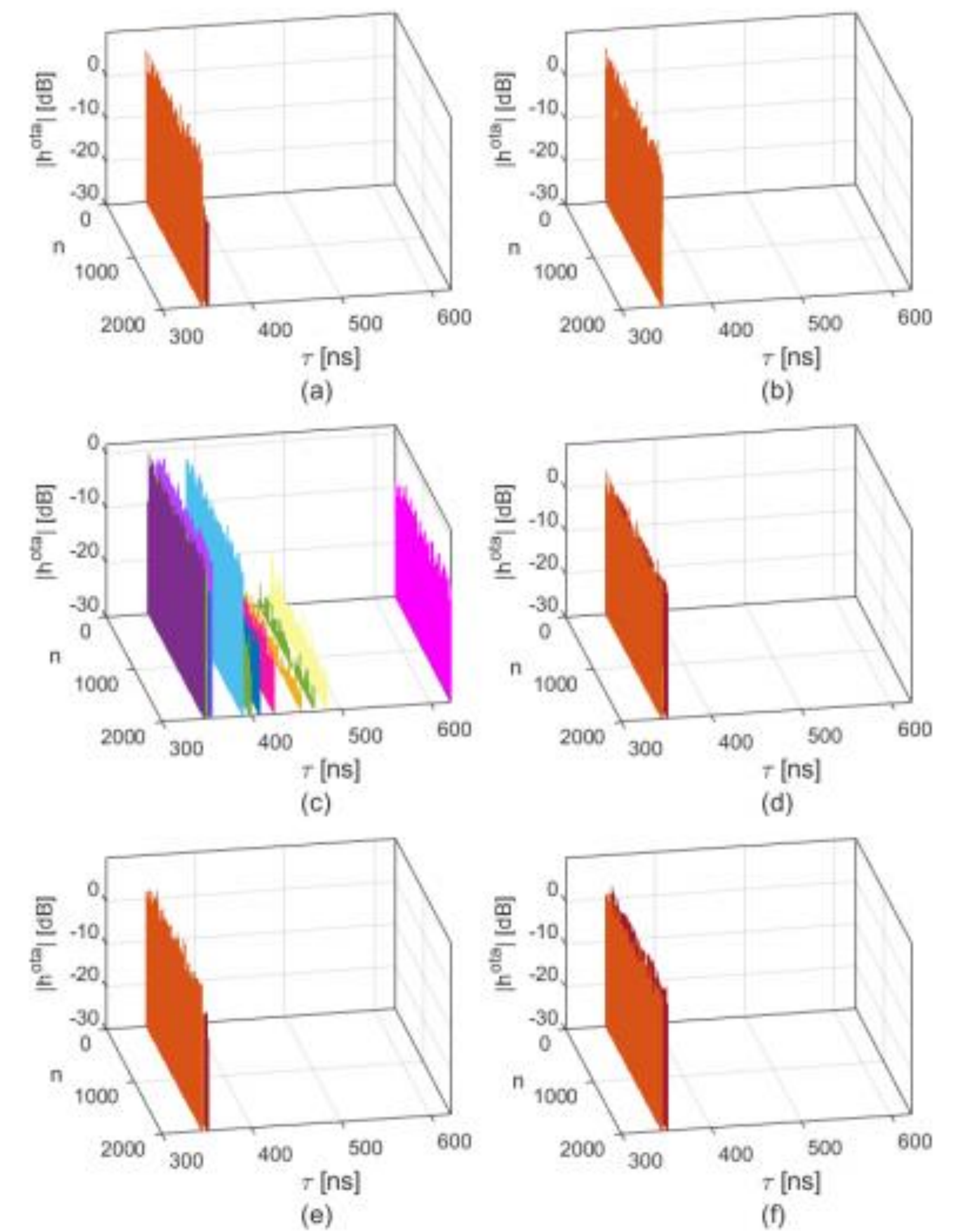


Fig. 3. Time-variant CIRs radiated from the 6 OTA antennas in (a) to (f).

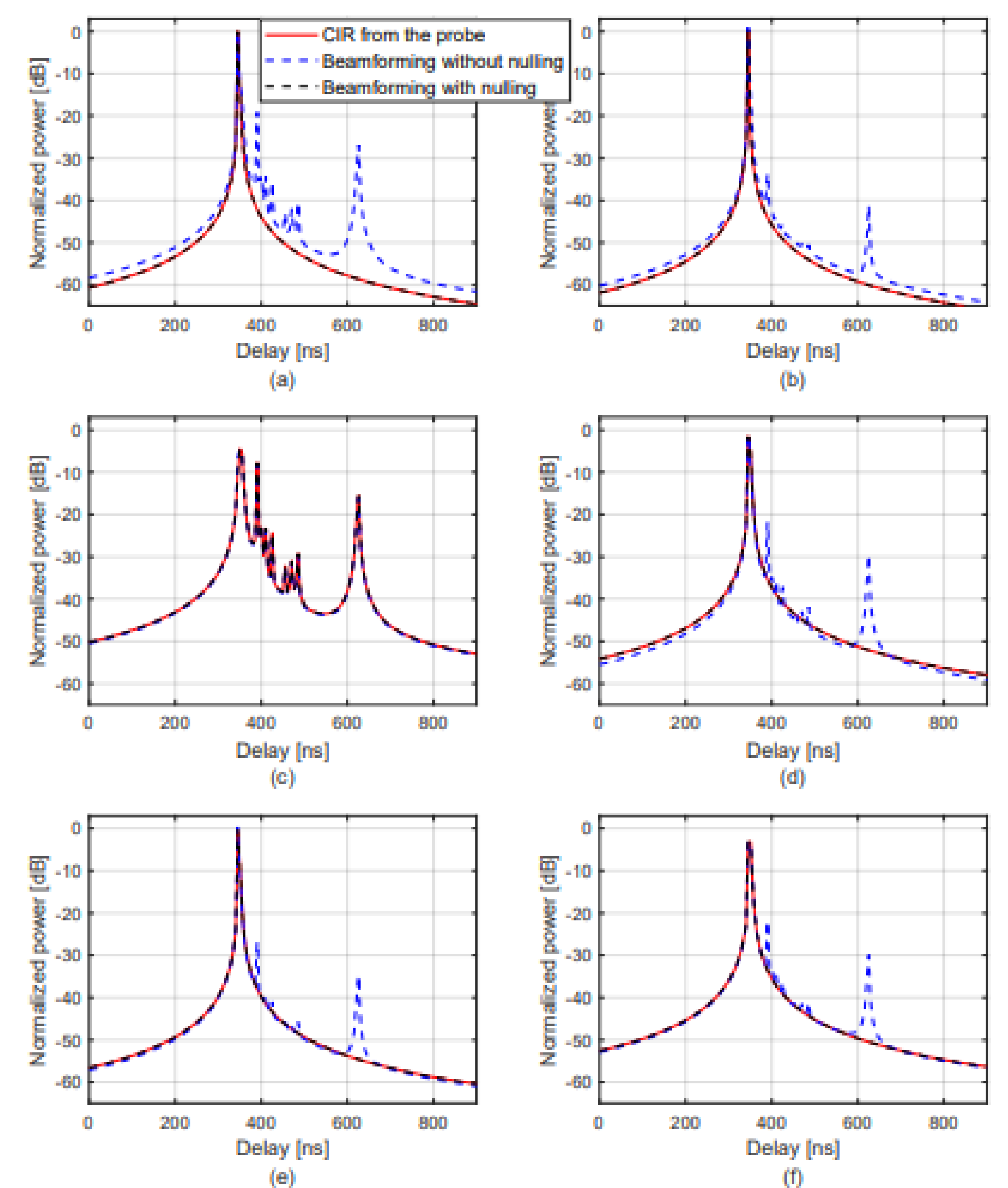


Fig. 5. The PDPs in the directions of the 6 OTA antennas, plotted in (a) to (f), respectively.

Conclusion

- In this paper, a novel channel estimation algorithm is proposed to estimate the emulated wideband channels within the test zone at mmWave frequencies.
- The proposed algorithm is a generic channel estimation algorithm which works for 3D channel models under the more challenging near-field conditions.
- The simulation results demonstrate that the proposed algorithm can accurately estimate the reconstructed channels inside the test zone even in the presence of errors in measurement distance R .
- Therefore, this algorithm is applicable in a practical MPAC testing setup.

Reference

- W. Fan, F. Zhang, and Z. Wang, "Over-the-air testing of 5g communication systems: Validation of the test environment in simple-sectored multiprobe anechoic chamber setups," IEEE Antennas and Propagation Magazine, pp. 0–0, 2019.
- F. Zhang, L. Hentila, and P. Kyosti, "Millimeter-wave new radio test zone validation for mimo over-the-air testing," IEEE Transactions on Antennas and Propagation, 2021.