

# Synthetic Aperture Standards Committee

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# IEEE Recommended Practice for Antenna Measurements

- IEEE Std 149-2021 published by the IEEE Standards and Propagation Society
- Antenna Range Design
- Antenna Range Instrumentation
- Antenna Range Evaluation
- Measurement of Radiation Patterns
  - Amplitude and phase patterns
  - Antenna phase center
  - Phase measurements
- Measurement of Gain and Directivity
  - Gain Standards
  - Calibration of gain standards
  - Errors in gain measurements
- Measurement of Polarization

## Measurements -- 2

- Measurement of Radiation Efficiency
- Measurement of Impedance
  - Correcting for impedance mismatch
  - Impedance mismatch uncertainty
- Special Techniques
  - Near-field probing
    - Plane waves expressed in terms of complex exponentials for a planar surface
    - Cylindrical waves expressed in terms of Bessel functions and complex exponentials for a cylindrical surface
    - Spherical waves are expressed in terms of associated Legendre functions and spherical Bessel functions for a spherical measurement surface
  - Outdoor measurements
  - Indirect measurements
- Uncertainty evaluation
- Antenna Range Operation
- Electromagnetic Radiation Hazards
- Antenna Testing Under Environmental Conditions

# IEEE Recommended Practice for Near-Field Antenna Measurements

- IEEE Std 1720-2012
- Measurement Systems
- Planar Near-Field Scanning Measurements
- Cylindrical Near-Field Scanning Measurements
- Spherical Near-Field Scanning
- Probes
- Uncertainty Analysis
- Special Topics
  - Effective isotropic radiated power
  - ***Phase retrieval methods***
  - Back projections
  - Probe-position correction
  - Truncation mitigation
  - Time gating
    - Can mitigate probe-AUT multiple reflections, room scattering and AUT-probe leakage
    - It is necessary to determine the bandwidth necessary to separate the desirable from undesirable signals

# Signal Processing Gaps in the Standards

- New or emerging technologies, such as Intelligent Reflecting Surfaces (IRSs)
- Phaseless measurements – applicable to many applications, e.g. drones
- In-situ measurements corrupted by extraneous scattering
- Errors induced when a non-planar wavefront propagates across a large planar synthetic aperture. Large apertures are necessary to provide high angular resolution.