KDB Publication 662911 (MIMO) Updates - Measurement Option

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Introduction

- Directional Gain of devices' antenna system becomes relevant to compliance testing when:
  - Limits on output power (density) becomes dependent on directional gain
  - Conducted measurement (plus directional gain) is used to demonstrate compliance with radiated limits
- KDB Publication 662911 describes a method to calculate directional gain of a multi-antenna system
- However, The method may overestimate the actual gain as it calculates the maximum directional gain that is theoretically possible
- **We are proposing to permit alternative method to use appropriate antenna gain measurement results in lieu of theoretical calculations to demonstrate compliance**
  - **A complementary (to KDB 662911) guidance document will be published to address appropriate measurement options**
  - **Approval is on a case by case basis and it is subject to PAG**

Directional Gain Calculation

- Calculating directional gain, as provided in KDB Publication 662911, may overestimate the actual gain for the following reasons (among others):
  - Mutual interaction between radiating elements are not taken into account
    - Mutual coupling can impact radiation pattern of an antenna system
      - Especially in small irregular-placed elements
  - Impedance mismatch, between radiating elements and drivers, matching networks, etc. is not accounted for

Antenna Gain Measurement

- Alternatively, for compliance purposes, actual gain of an antenna system, when properly measured, may be used in lieu of calculation
- However, given the complexity of advanced antenna systems, characterizing radiation pattern of such systems becomes more and more challenging
- Hence, a well defined procedure must accompany measurement results for review

Antenna Gain Measurements, Requirements and Expectations

- When submitting antenna gain measurement results the following items should be sufficiently addressed
  - Measurement Environment
    - Types of chambers, their effective operating range, measurement limitations, etc.
  - Measurement Method
    - Far Field, Near Field, Absolute Gain Measurement vs. Gain Comparison Method, etc.
  - Measurement Quantity
    - Gain, Directivity, Radiation Efficiency, Polarization, etc.

Antenna Gain Measurements, Requirements and Expectations

- In case of antenna systems with beamforming capability,
  - The configuration(s) that represent the beam(s) with maximum directivity (gain) shall be identified and measured
- In case of antenna systems with beam steering capability,
  - Multiple configurations shall be identified and measured to verify
    - The (steered) beam with maximum gain
    - The extent of Steering capability