



WG 1-15.6, C63.5 Revision October 2008 Update

Dennis Camell
NIST

WG 1-15.6, C63.5 revision schedule

- ◆ **Sept 08 - draft went out to WG**
- ◆ **yesterday - WG meeting to review draft**
- ◆ **TODAY - summary of review**
- ◆ **Jan 09 - revised draft to WG**
- ◆ **Apr 09 - draft to SC**

now on to the proposed changes ...

WG 1-15.6, C63.5 revision

Revised order of annexes

- **Annex A (informative) Determination of EDmax**
- **Annex B (informative) The discrete frequency calibration method**
- **Annex C (informative) The Roberts dipole, a reference antenna**
- **Annex D (informative) Example drawings of Roberts dipole antenna [B5]**
- **Annex E (informative) Monopole performance equations**
- **Annex F (normative) Tuned dipole antenna correction factors (30 - 1000 MHz) for free-space calibration and normalized site attenuation**

new



WG 1-15.6, C63.5 revision

Revised order of annexes

Annex G (normative) Biconical dipole antenna correction factors (30 - 200 MHz) for free-space calibration and normalized site attenuation

- **Annex H (informative) Rationale for geometry specific correction factors for biconical dipoles used in the normalized site attenuation test**
- **Annex I (normative) Procedure for measuring geometry specific correction factors for broadband antennas and reference-site requirements**
- **Annex J (informative) Guideline for computing estimated measurement uncertainties in SSM antenna calibrations**
- **Annex K (informative) Bibliography**

WG 1-15.6, C63.5 revision

Added categories in annex A

Annex A (informative)

Determination of ED_{max}

A.1 Determination of ED_{max} for horizontal polarization, below 1000 MHz

A.2 Determination of ED_{max} for vertical polarization, below 1000 MHz

A.3 Determination of ED_{max} , above 1000 MHz

WG 1-15.6, C63.5 revision

Added categories in section 5

5. Standard Site Method (30 MHz to 40 GHz)

5.1 General

5.1.1 SSM Measurements below 1000 MHz

5.1.2 SSM Measurements above 1000 MHz

WG 1-15.6, C63.5 revision

Proposed Text Changes ...

WG 1-15.6, C63.5 revision

Refined definitions

3.9 normalized site attenuation (NSA): Site attenuation divided by the free-space antenna factors (all in linear units) of the transmitting and receiving antennas corrected by the geometry specific correction factors if available. Results can be stated in decibel units.

3.12 standard antenna calibration site (SACS): A site comprised of a flat, open-area, devoid of nearby scatterers such as trees, power lines, and fences, that has a large metallic ground plane (see ANSI C63.7) and meets the requirements listed in annex H.

WG 1-15.6, C63.5 revision

Additional site requirements for calibration sites

4.3 Test Site and Instrumentation

The test site used for antenna calibrations shall be within ± 2 dB of an ideal site when tested for site attenuation in accordance with C63.4. The normalized site attenuation test shall be evaluated over a volume (e.g., as an alternate test site) in the near free-space geometry that the site will be used to calibrate antennas. Additional requirements are listed in Annex H for measuring GSCF. Measurement instrumentation should be located beneath the ground plane or be removed by at least 20 meters from the edge of the ground plane to reduce site and system contributions to uncertainty (see Annex I).

WG 1-15.6, C63.5 revision

Better define symmetry test

4.4.1 Antenna Symmetry

In addition to the antenna calibration procedure, balance of antenna symmetry shall be checked. This test will determine if both elements are similar across the antenna's usable frequency range. This test should detect mechanical or electrical differences that might affect the AF values.

An antenna height of 1.0 m and a distance of 10 m will be used. Frequency step size should be sufficient to detect variation between the two configurations listed below. Cabling shall be configured as for the calibrations. Two antennas of similar type (ie, same model) are required. Connect this pair of antennas to the test instrumentation as described in clause 4.3 and then

- a) Start by orienting the transmitting and receiving antennas vertically with respect to the ground plane at a height of 1 m to the antenna center. Close proximity to the ground plane is needed to maximize coupling effects. For larger antennas, the center height shall be raised until the bottom edge of the lower antenna element is 25 cm from the ground plane. Measure the received signal in this position while keeping the transmit signal at a fixed level.
- b) Rotate the receive antenna (the antenna being checked for balance) 180° so that it is oriented vertically with the opposite element(s) facing up. Measure the received signal with the transmit signal at the same level as step (a). The received signal should be within 1.0 dB of the received signal with the antenna in the original position.

WG 1-15.6, C63.5 revision

Additional wording for above 1 GHz setup
& standard gain horn calibration requirements

5.1.2 SSM Measurements above 1000 MHz

Antenna calibrations using SSM for frequencies above 1000 MHz are as follows: the separation distance is 3 m, the transmitting antenna height is 2 m or greater, and the receiving antenna height is 2 m or greater and at the same height as the transmitting antenna. The height shall be checked by measuring in both horizontal and vertical polarization until there is a difference of less than 0.x dB. Continue to raise the antennas or add RF absorber material on the ground until this requirement is met.

← defined from data

These dimensions are annotated in Table 3, which also provides values for E_D^{\max} and normalized site attenuation (NSA). This procedure provides near free-space antenna factors for horns and other antenna types that shall be used without further correction for site validation and product measurements as specified in C63.4.

Standard gain horn antennas are [gain standards] (see 12.3.1 of IEEE Std 149) based on their [dimensions]. While nominal values can be obtained from these dimensions, a calibration measurement provides unique terms specific to that antenna and its traceability.

← add references

← Adaptor losses?

WG 1-15.6, C63.5 revision

Expansion of reference antenna definition and usage

6. Reference Antenna Method (30 MHz to 1 GHz)

The Reference Antenna Method (RAM) is an antenna calibration method based on an antenna as a known quantity. A comparison of received signals is done between the unknown antenna and the reference antenna. One such antenna is the Roberts dipole, a dipole with a well-matched balun whose construction is described in Clause 6.2. A reference antenna is an antenna whose elements are calculable and balun is measureable.

Roberts might
be a problem



WG 1-15.6, C63.5 revision

Clarification of variables in table (annex B)

re-label variables

FREQ.	A	B	C	F	G	H	D
MHz	Attn. Data Antenna Pair 1 2 A1	Attn. Data Antenna Pair 1 3 A2	Attn. Data Antenna Pair 2 - 3 A3	$A + B - C$	$A + C - B$	$B + C - A$	$10 \log[F]$ - 24.46

WG 1-15.6, C63.5 revision

Annex F (normative)

Tuned dipole antenna correction factors (30 - 1000 MHz) for free-space calibration and normalized site attenuation

- **Will have tables of correction terms from SSM measurement to FREE-SPACE values for Roberts dipole, 50 ohm and 100 ohm dipoles (30-1000 MHz)**
- **Based on VCCI and IEC work**
- **Similar to Biconical terms in current annex G**

WG 1-15.6, C63.5 revision

Expansion of criteria for GSCF site

H.1 Measurement Procedure Summary

Three steps are needed to ensure the quality of the Standard Antenna Calibration Site (SACS). First, the calibration site shall meet the SA requirements of section 4.3 (only at the near free-space geometry) using biconical dipole antennas or dipole antennas. Second, the site shall meet the construction guidelines of C63.7 and this Annex. Third, the site shall comply with the statistical criteria described in this Annex.

Expand to include LPDAs ?

WG 1-15.6, C63.5 revision

Still on the Table (might get done)

- ◆ **Add Time Domain Method for Free Space (as informative annex)**
- ◆ **Add CFNSA (as informative annex)**
- ◆ **Add limits to vertical vs. horizontal 1-m ratio (as additional criteria for SA measurements)**
- ◆ **Frequency step size (should be in unc doc, as additional term if interpolating)**

WG 1-15.6, C63.5 revision

**REVISED schedule
spring 2009 to SC1**