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RE: FCC ID: QMNRM-19

Response to ATCB Question (ATCB002501) Dated Aug 2, 2005

The calibration procedure mentioned in ANSI C63.19 - 2005 is IEEE 1309 -2005. Granted I believe this is still a draft, but will soon be voted on if it has not already.

In the response you state that calibration of the probe is to IEEE1309 appendix C. Please note that Annex C (there are no appendixes) is an informative annex dealing with "Miscellaneous factors affecting probe calibration and use". The cal lab should state the actual calibration annex used from 1309.

- The Speag calibration information can be found in our test report in appendix C. Please refer to appendix C for probe calibration information.

What was the modulation factor of the probe, how was it calculated for this specific system setup and how was it used in calculating the results?

- As shown on page 10, probe modulation factors, the CDMA levels for E and H fields are higher than CW levels, therefore as a conservative (worse case) measurement no modulation factors were applied. If they are to be applied, all of the data will be slightly lower than stated in the test report.

The robotic automated system may need more detail. This description should include information on step size, locations relative to the measurement grid, and peak location determination.

- Step size = 5mm
- The measurement grid is centered on the center of the earpiece of the EUT.
- Peak location determination = as shown in our test report appendix B, the Speag system selects the peak point on the grid and rotates on that point.

It is not given as to how the measurement plane was established.

- The measurement plane was 10mm away from the active element in the probe to the EUT earpiece.

Perhaps I missed it, but how are the raw measurement values both in the measurement electronics and the post measurement in the computer are processed?

- Here is Speag’s definition for the Dasy4 test system:

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The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_2 * (cf/dcp_i)$$

with V_i = compensated signal of channel i (i = x, y, z)
U_i = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$E-\text{fieldprobes}: E_i = \sqrt{\frac{V_i}{Norm_i * ConvF}}$$

$$H-\text{fieldprobes}: H_i = \sqrt{V_i} * ((a_{i0}+a_{i1}f+a_{i2}f^2) / f)$$

with V_i = compensated signal of channel i (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
μV/(V/m)2 for E-field Probes
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
E_i = electric field strength of channel i in V/m
H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E^2_X + E^2_Y + E^2_Z}$$

The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/off switch of the power source with an integration time of 500 ms and a probe response time of <5ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization. The tolerances for the different systems had the worst-case of 2.6%.

You state in the response that reflections were more than 20 dB per ANSI C63.19 section 4.2.3. Do you mean 4.3.1.1 (3)? Was this done by measurement as in 4.3.1.1 (3) or was this done by placing all reflective objects more than 2 wavelengths away as mentioned in 4.2.1?

- Per ANSI C63.19, section 4.2.1, the lab performed the test per paragraph 2 and 3 and the reflections were less than 20dB.

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Some of the above responses appear as if an earlier version of ANSI C63.19 was used. Please note that the FCC has stated that ANSI C63.19 2005 is to be used even if it is in draft form. Please comment.

- Yes, we are using ANSI C63.19 2005 draft version.

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