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July 22, 2005

Martin Perrine
Federal Communications Commission,
Equipment Authorization Division
Application Processing Branch
7435 Oakland Mills Road
Columbia, MD 21045

Subject: Response to the FCC Correspondence Reference # 21583 / 21584 for additional information on RIM BlackBerry Wireless Handheld FCC ID: L6AR6230GE, 731 Confirmation # TC493009

Dear Martin:

The following addresses the comment on your **Correspondence Reference # 21583 / 21584**, dated July 12, 2005.

I Regarding the T Coil audio band testing included please revise the report to clarify the purpose for this measurement. TCBs are not allowed to review such data for rating purposes.

The following sentence was included in section 5.4 of the test report number RTS-0228-056-01 rev 02 that was submitted on June 29, 2005 to clarify the purpose of that measurement:

“This section of the test report shows the measurement method for locating the center of the T-Coil only.”

II Regarding your answer to question 1, please update the contour plots to show the grid lines and some means to indicate the excluded blocks.

In Annex A.4 of the test report number RTS-0228-056-01 rev 02, the grid lines are shown, and exclusion blocks are shaded yellow. Please also see the plots below.

Date/Time: 27/05/2005 12:44:51 PM

Test Laboratory: RTS

BB 7230 Model R6230GE_GSM 1900_Low Channel_Speaker Center_E-Field

DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.18
Medium: Air Medium parameters used: s = 0 mho/m, e_r = 1; ? = 1000 kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above Device Reference/Hearing Aid Compatibility Test (11x11x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 31.4 V/m

E Scan 10mm above Device Reference/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 82.0 V/m
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

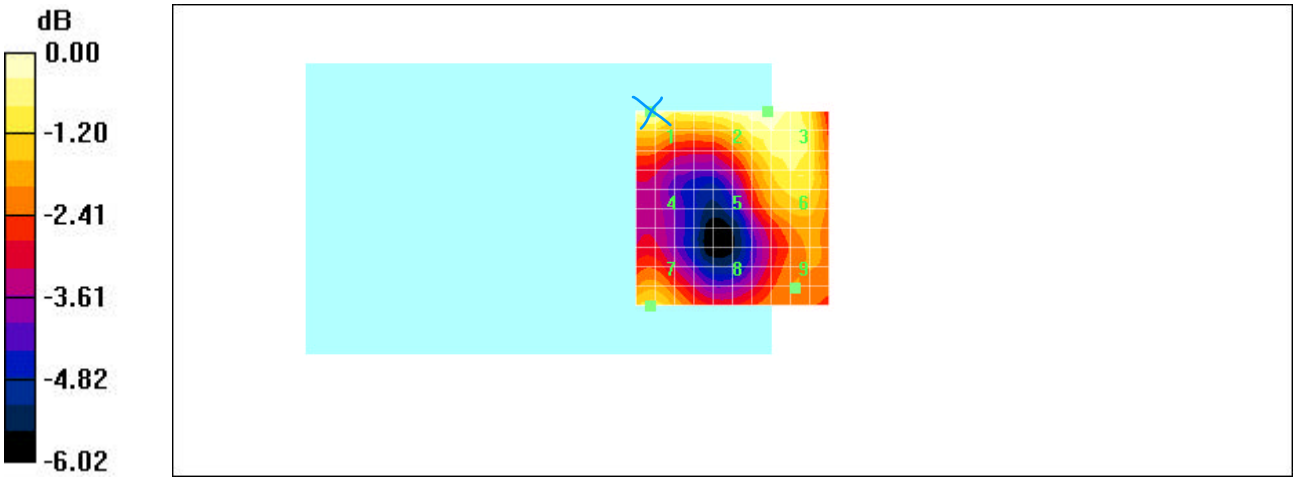
E in V/m (Time averaged)

Grid 1 **31.4**	Grid 2 **31.0**	Grid 3 **31.1**
Grid 4 **22.1**	Grid 5 **26.3**	Grid 6 **28.7**
Grid 7 **28.1**	Grid 8 **24.3**	Grid 9 **25.1**

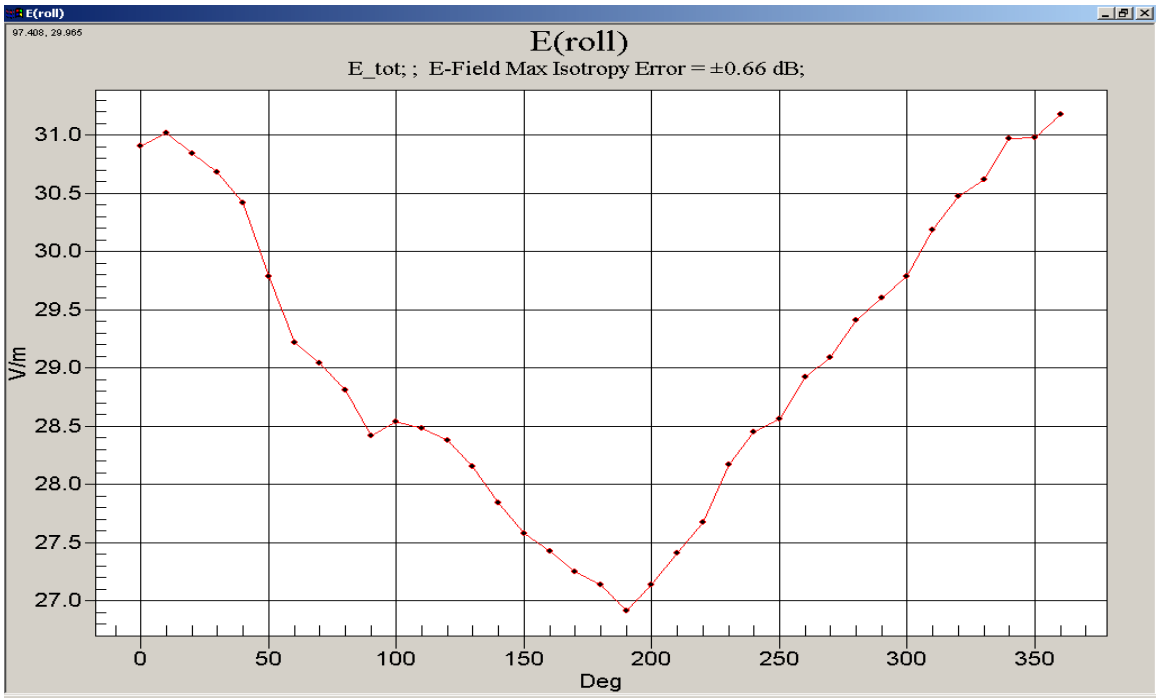
E in V/m (Slot averaged)

Grid 1 **89.9**	Grid 2 **88.7**	Grid 3 **88.8**
Grid 4 **63.3**	Grid 5 **75.1**	Grid 6 **82.0**
Grid 7 **80.4**	Grid 8 **69.5**	Grid 9 **71.8**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 31.4V/m



Delta Peak E-Field (V/m) = (Max. RMS Field – RMS Field at 0 degrees) * Modulation Factor
= (31.17 – 31.01) * 2.86
= 0.16 * 2.86
= 0.46

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Test Laboratory: RTS

BB 7230 Model R6230GE_GSM 1900_Low Channel_T-Coil Center_E-Field

DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.18
Medium: Air Medium parameters used: s = 0 mho/m, e_r = 1; ? = 1000 kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above Device Reference/Hearing Aid Compatibility Test (11x11x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 30.2 V/m

E Scan 10mm above Device Reference/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 79.6 V/m
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

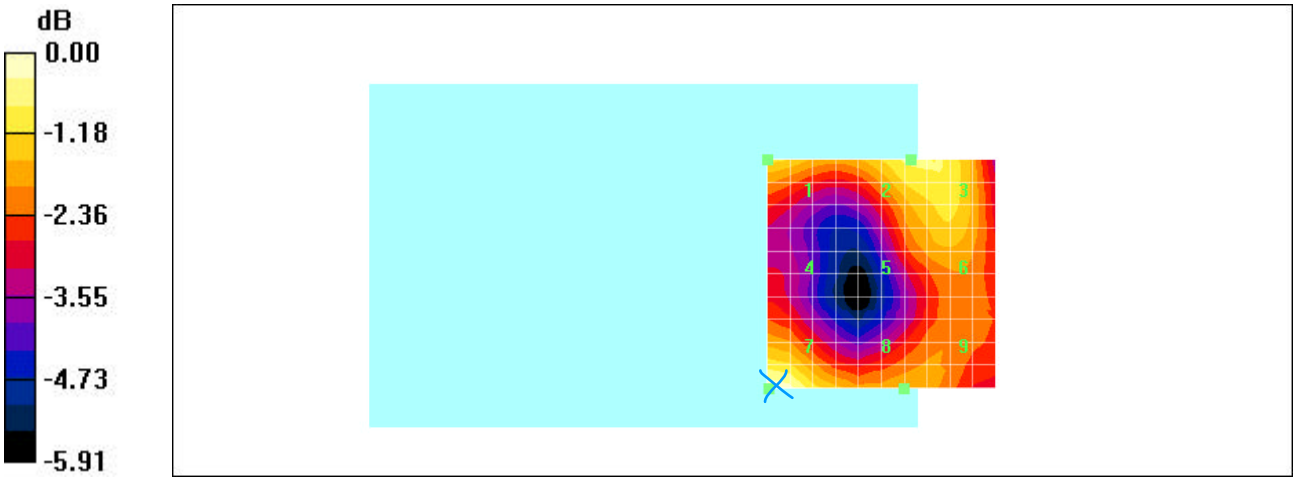
E in V/m (Time averaged)

Grid 1 **26.8**	Grid 2 **27.8**	Grid 3 **27.7**
Grid 4 **22.5**	Grid 5 **24.5**	Grid 6 **25.9**
Grid 7 **30.2**	Grid 8 **25.2**	Grid 9 **25.0**

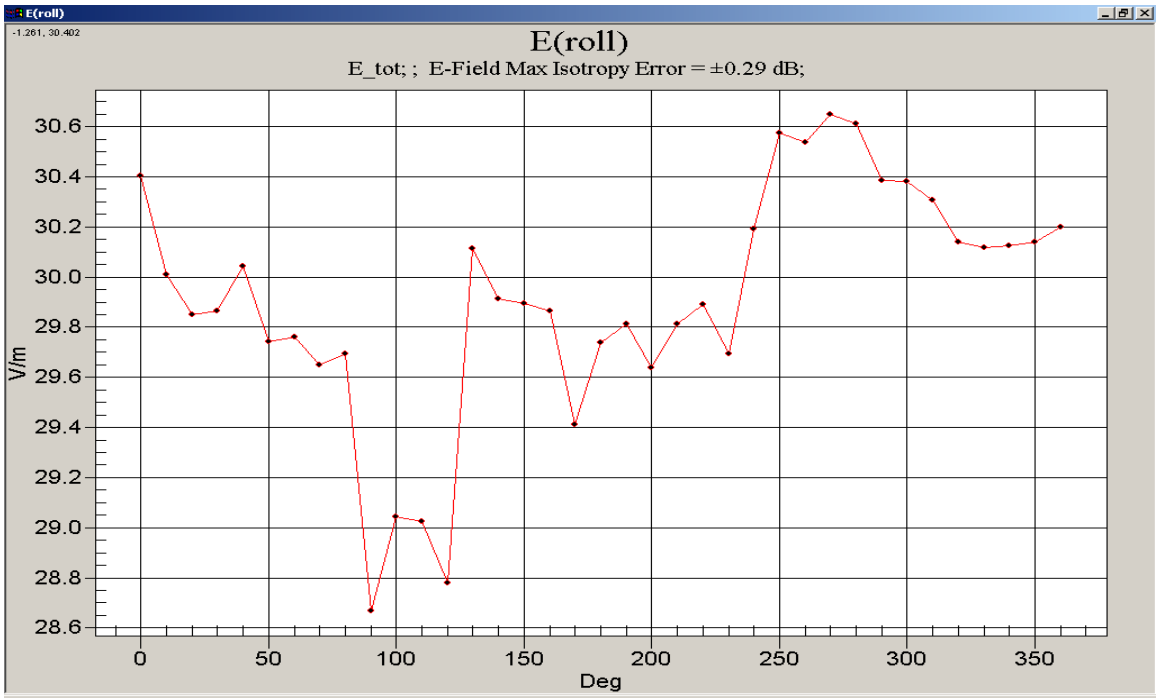
E in V/m (Slot averaged)

Grid 1 **76.6**	Grid 2 **79.6**	Grid 3 **79.3**
Grid 4 **64.5**	Grid 5 **70.0**	Grid 6 **74.0**
Grid 7 **86.3**	Grid 8 **72.2**	Grid 9 **71.6**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 30.2V/m



Delta Peak E-Field (V/m) = (Max. RMS Field – RMS Field at 0 degrees) * Modulation Factor
= (30.66 – 30.41) * 2.86
= 0.25 * 2.86
= 0.72

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Test Laboratory:RTS

BB 7230 Model R6230GE_GSM 1900_Low Channel_Speaker Center_E-Field_Battery 2

DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.18
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above Device Reference/Hearing Aid Compatibility Test (11x11x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 31.4 V/m

E Scan 10mm above Device Reference/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 83.7 V/m
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

E in V/m (Time averaged)

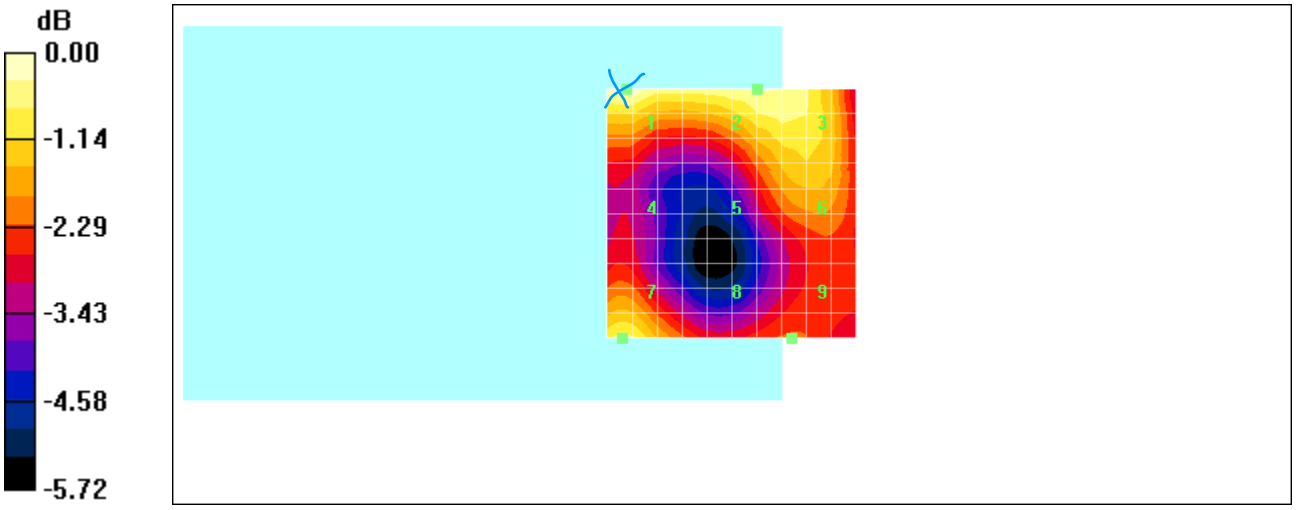
Grid 1 **31.5**	Grid 2 **30.5**	Grid 3 **30.3**
Grid 4 **22.9**	Grid 5 **25.6**	Grid 6 **27.2**
Grid 7 **29.3**	Grid 8 **24.2**	Grid 9 **24.4**

E in V/m (Slot averaged)

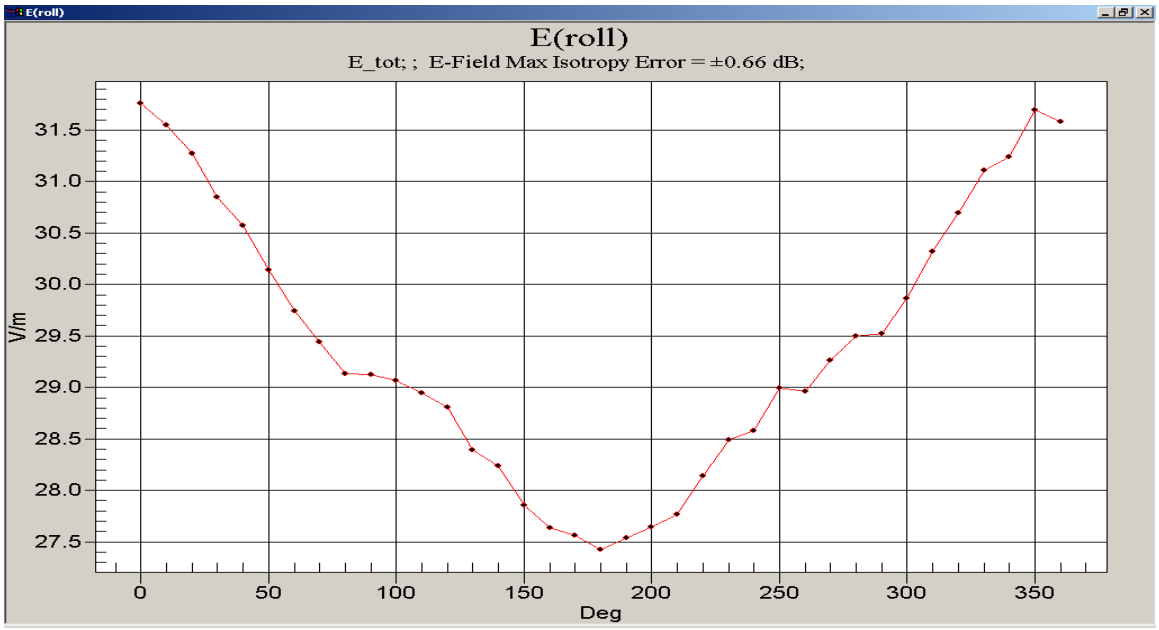
Grid 1 **90.0**	Grid 2 **87.3**	Grid 3 **86.6**
Grid 4 **65.4**	Grid 5 **73.1**	Grid 6 **77.9**
Grid 7 **83.7**	Grid 8 **69.2**	Grid 9 **69.8**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25

M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 31.5V/m



Delta Peak E-Field (V/m) = (Max. RMS Field – RMS Field at 0 degrees) * Modulation Factor
= (31.78 – 31.78) * 2.86
= 0 * 2.86
= 0

Date/Time: 30/05/2005 10:14:03 AM

Test Laboratory: RTS

BB 7230 Model R6230GE_GSM 1900_Low Channel_Speaker Center_H-Field

DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:6.35
Medium: Air Medium parameters used: s = 0 mho/m, e_r = 1; ? = 1 kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above Device Reference/Hearing Aid Compatibility Test (11x11x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 0.079 A/m

H Scan 10mm above Device Reference/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.200 A/m
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

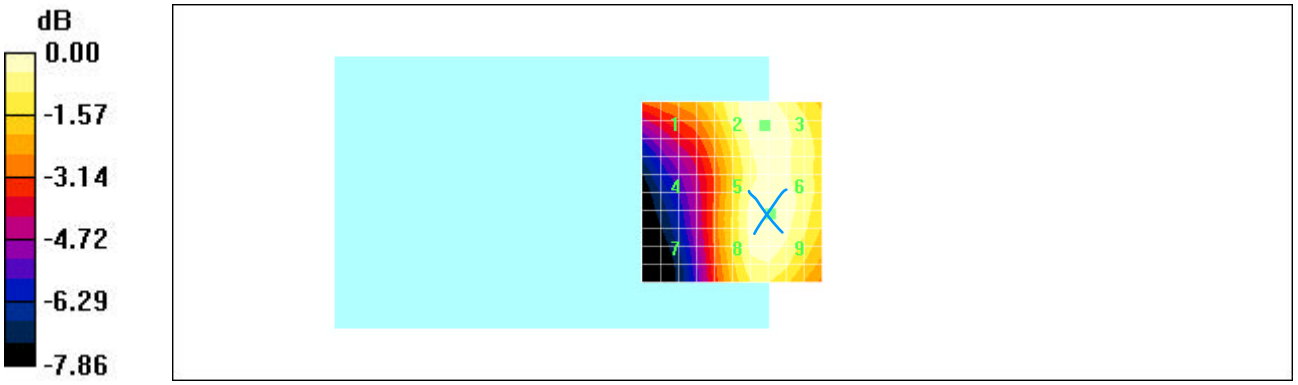
H in A/m (Time averaged)

Grid 1 **0.064**	Grid 2 **0.078**	Grid 3 **0.078**
Grid 4 **0.052**	Grid 5 **0.079**	Grid 6 **0.080**
Grid 7 **0.049**	Grid 8 **0.079**	Grid 9 **0.079**

H in A/m (Slot averaged)

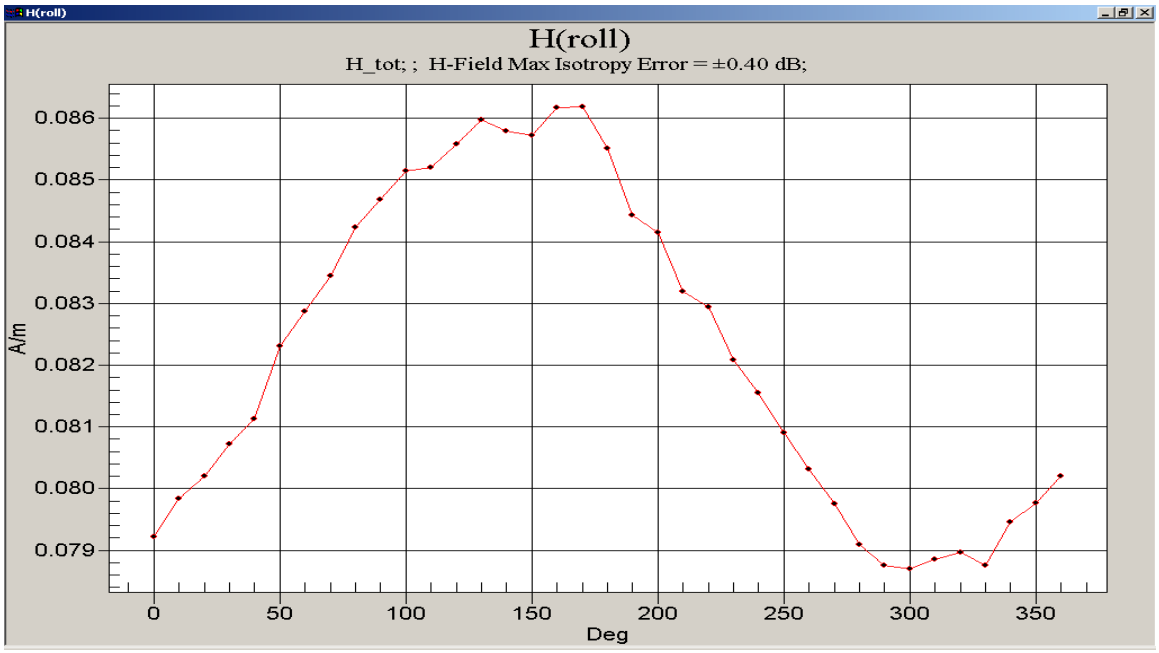
Grid 1 **0.161**	Grid 2 **0.197**	Grid 3 **0.197**
Grid 4 **0.130**	Grid 5 **0.200**	Grid 6 **0.200**
Grid 7 **0.122**	Grid 8 **0.199**	Grid 9 **0.200**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.080A/m

0 dB = 0.080A/m



Delta Peak H-Field (A/m) = (Max. RMS Field – RMS Field at 0 degrees) * Modulation Factor
= (0.086 – 0.079) * 2.52
= 0.007 * 2.52
= 0.018

Date/Time: 30/05/2005 11:05:44 AM

Test Laboratory: RTS

BB 7230 Model R6230GE_GSM 1900_Low Channel_T-Coil Center_H-Field

DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:6.35
Medium: Air Medium parameters used: s = 0 mho/m, e_r = 1; ? = 1 kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above Device Reference/Hearing Aid Compatibility Test (11x11x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 0.079 A/m

H Scan 10mm above Device Reference/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.201 A/m
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

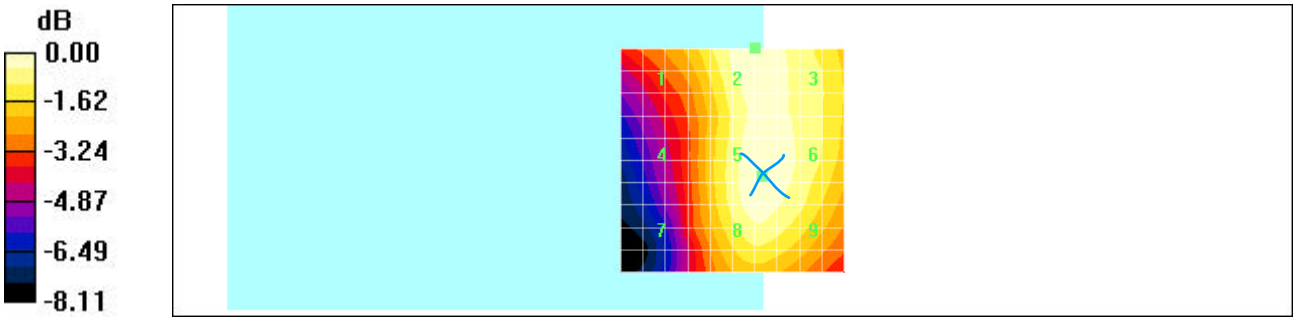
H in A/m (Time averaged)

Grid 1 **0.065**	Grid 2 **0.079**	Grid 3 **0.078**
Grid 4 **0.056**	Grid 5 **0.080**	Grid 6 **0.079**
Grid 7 **0.055**	Grid 8 **0.079**	Grid 9 **0.077**

H in A/m (Slot averaged)

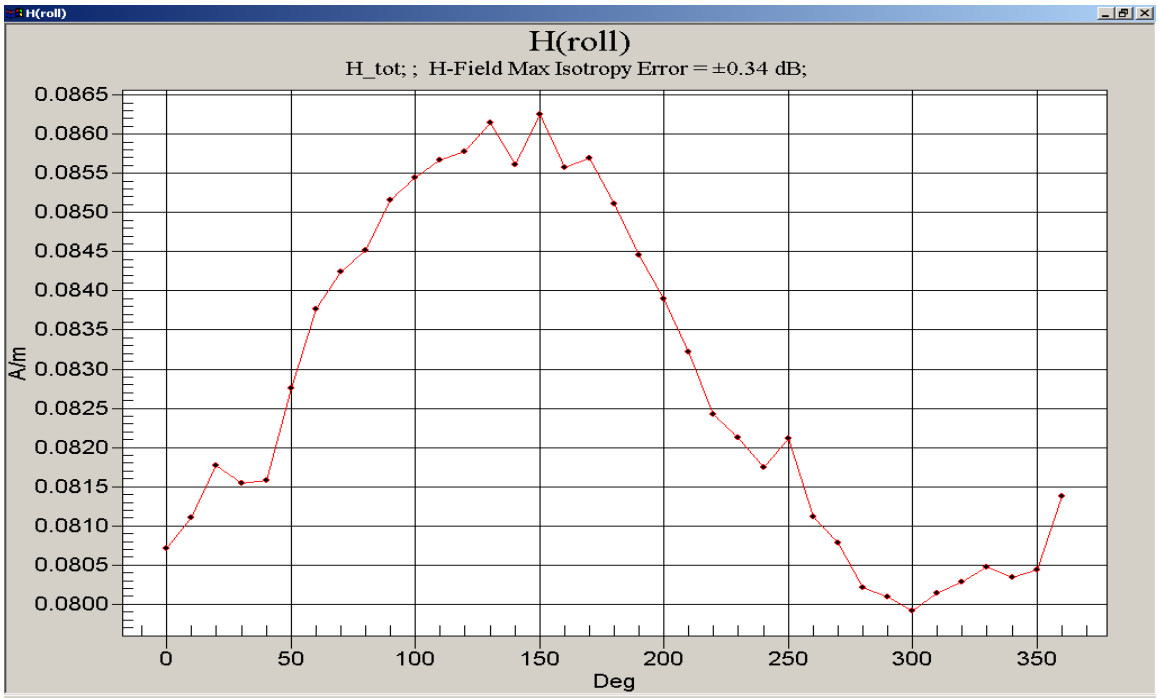
Grid 1 **0.163**	Grid 2 **0.199**	Grid 3 **0.196**
Grid 4 **0.142**	Grid 5 **0.201**	Grid 6 **0.199**
Grid 7 **0.139**	Grid 8 **0.198**	Grid 9 **0.195**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.080A/m

0 dB = 0.080A/m



Delta Peak H-Field (A/m) = (Max. RMS Field – RMS Field at 0 degrees) * Modulation Factor
= (0.086 – 0.081) * 2.52
= 0.005 * 2.52
= 0.013

Date/Time: 30/05/2005 11:47:57 AM

Test Laboratory: RTS

BB 7230 Model R6230GE_GSM 1900_Low Channel_T-Coil Center_H-Field_Batt. 2

DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:6.35
Medium: Air Medium parameters used: s = 0 mho/m, e_r = 1; ? = 1 kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above Device Reference/Hearing Aid Compatibility Test (11x11x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 0.089 A/m

H Scan 10mm above Device Reference/Hearing Aid Compatibility Test (101x101x1):

Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.225 A/m
Hearing Aid Near-Field Category: M3 (AWF -5 dB)

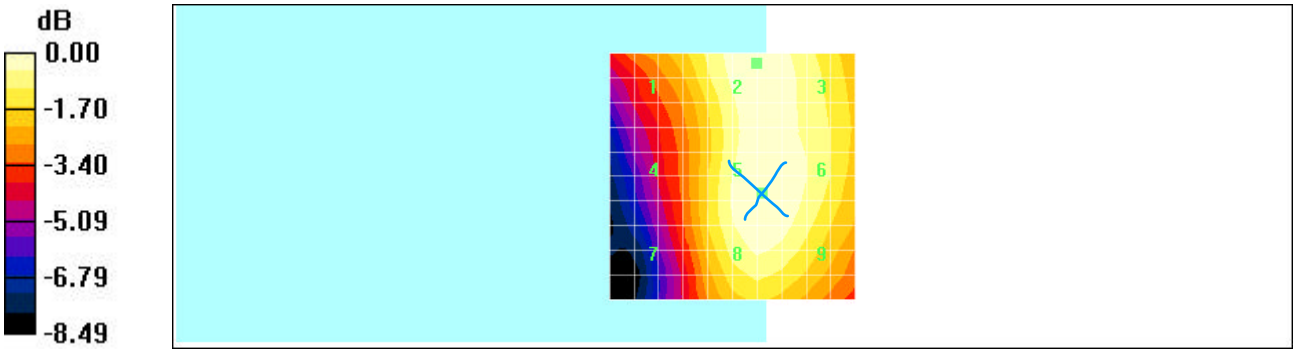
H in A/m (Time averaged)

Grid 1 **0.073**	Grid 2 **0.087**	Grid 3 **0.087**
Grid 4 **0.064**	Grid 5 **0.089**	Grid 6 **0.089**
Grid 7 **0.063**	Grid 8 **0.089**	Grid 9 **0.088**

H in A/m (Slot averaged)

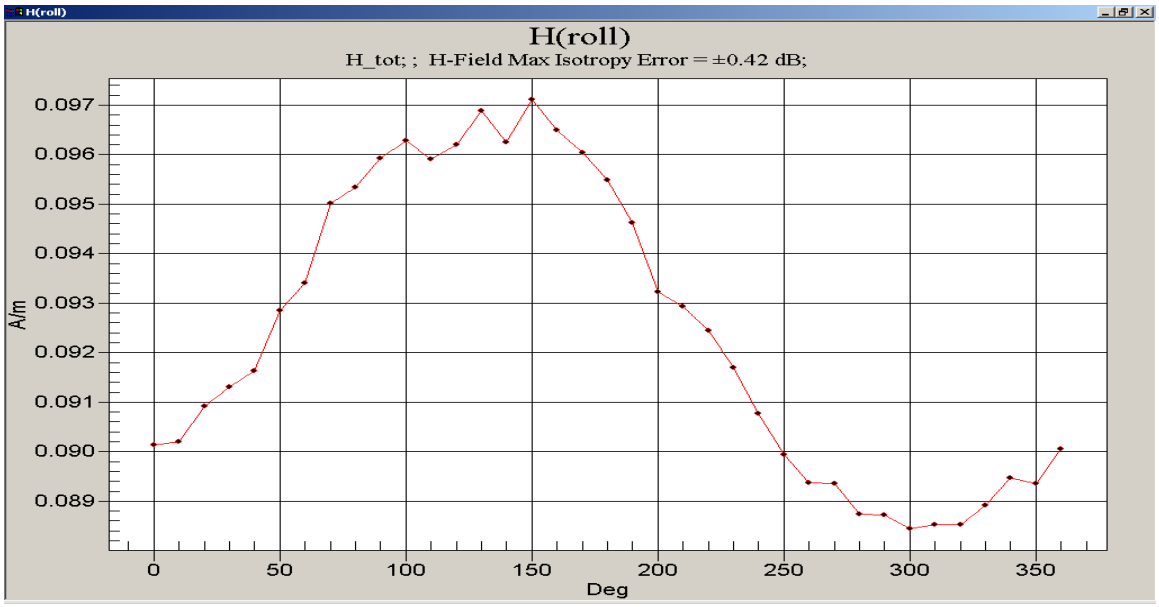
Grid 1 **0.185**	Grid 2 **0.220**	Grid 3 **0.218**
Grid 4 **0.162**	Grid 5 **0.225**	Grid 6 **0.224**
Grid 7 **0.159**	Grid 8 **0.223**	Grid 9 **0.221**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19
	-5	<47.3	<0.15



0 dB = 0.089A/m

0 dB = 0.089A/m



Delta Peak H-Field (A/m) = (Max. RMS Field – RMS Field at 0 degrees) * Modulation Factor
= (0.097 – 0.090) * 2.52
= 0.007 * 2.52
= 0.018

III Regarding your answer to the FCC's general question
C) Please provide and justify a target value for AM and WD signals.

There are no target values provided by the manufacturer of the measurement system or the ANSI C63.19 standard. However, from the ratio of average input powers, the modulation factor target was determined for AM and GSM signals. The manufacturer target value for CW was divided by the theoretical linear modulation factor to find target values for AM and WD signals.

f (MHz)	Signal Type	Average Power (dBm)	Pulse Average Power (dBm)	Measured E-Field (V/m)	Target E-Field (V/m)	Mod. Factor Ratio	Delta (%)	Crest Factor
1880	CW	20	20	138.20	135.40	-	2.1	-
1880	80 % AM	14.8	20	85.5	74.81	1.62	14.3	-
1880	GSM	10.8	20	48.3	47.01	2.86	2.7	8.18

f (MHz)	Signal Type	Average Power (dBm)	Pulse Average Power (dBm)	Measured H-Field (A/m)	Target H-Field (A/m)	Mod. Factor Ratio	Delta (%)	Crest Factor
1880	CW	20	20	0.423	0.442	-	-4.3	-
1880	80 % AM	14.8	20	0.271	0.244	1.56	11.1	-
1880	GSM	10.8	20	0.168	0.153	2.52	9.8	6.35

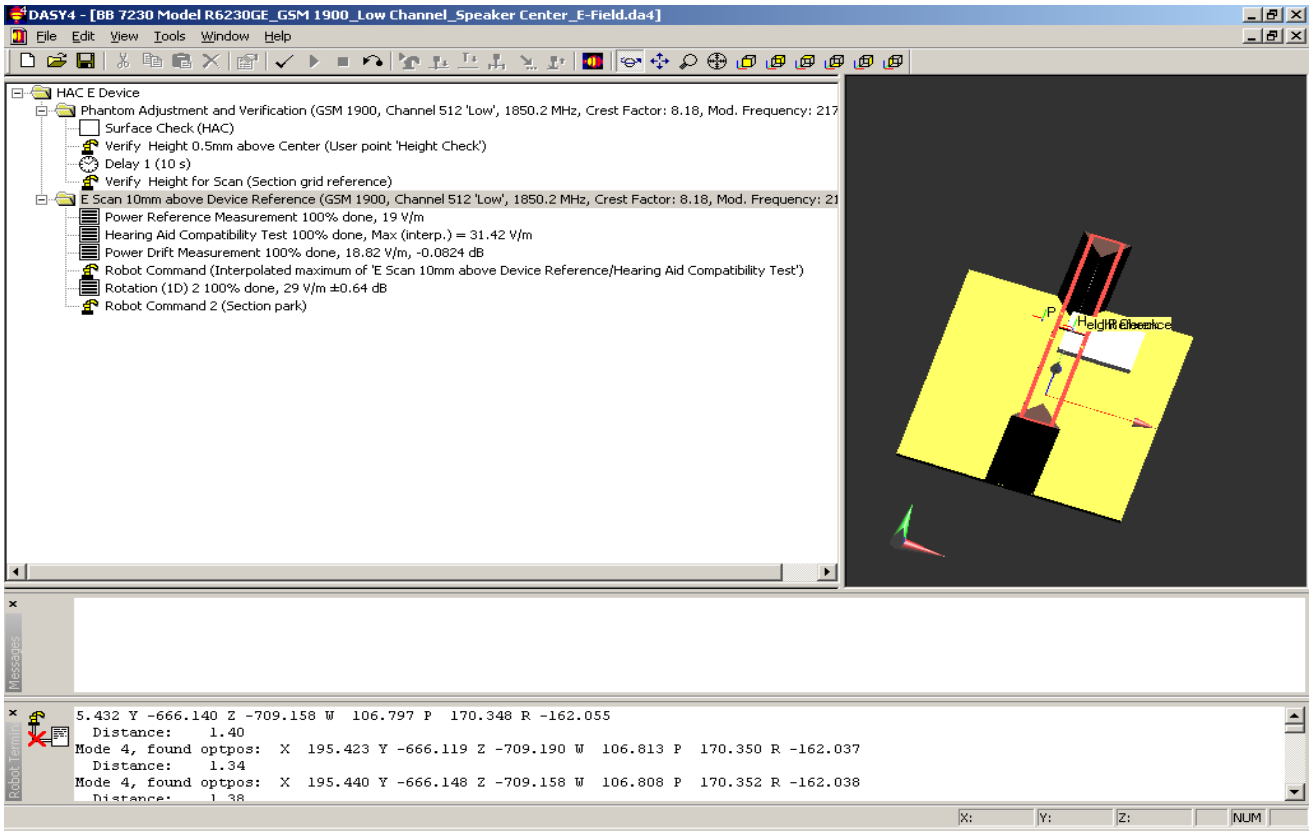
E) FYI Please note that Crest Factor and modulation factor are not always related by the squared relationship that you provide.

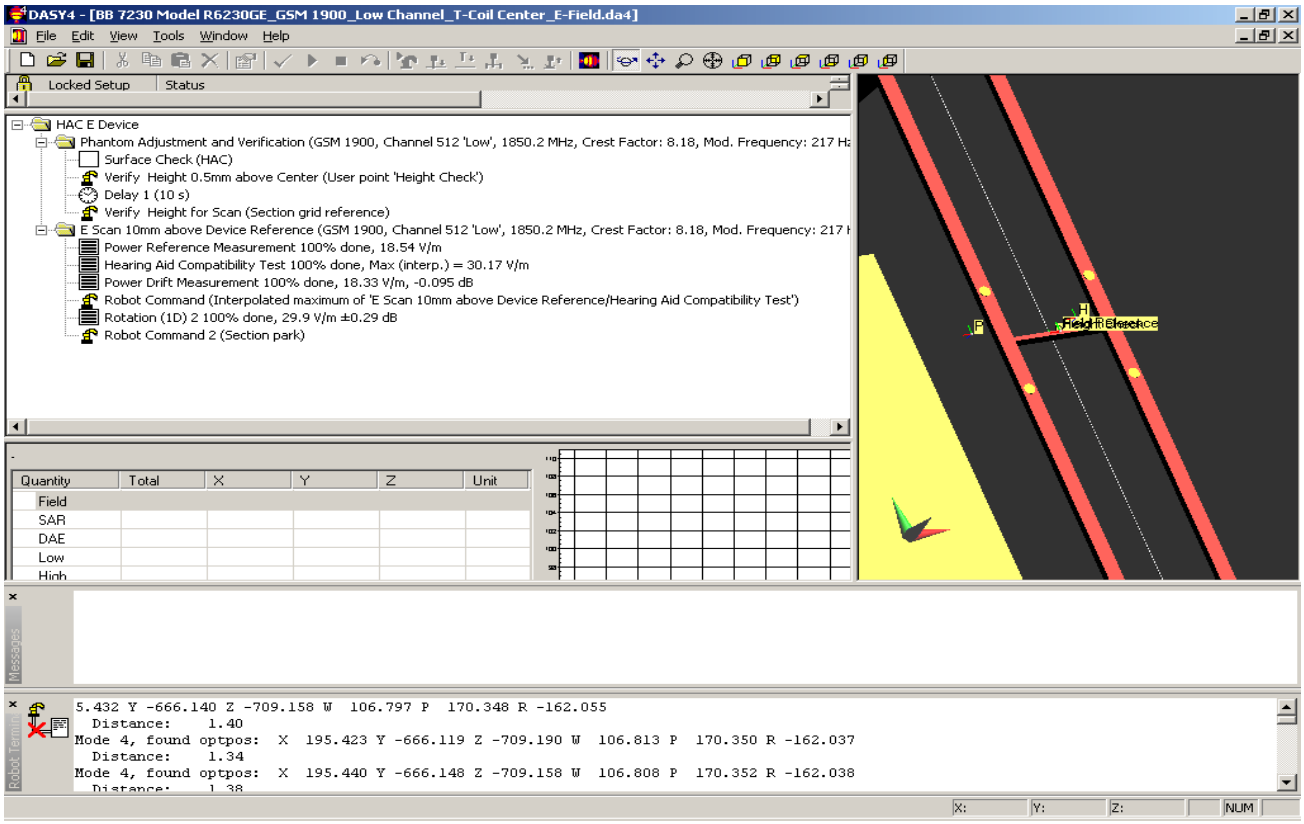
DASY4 software calculates the modulation factor as PMF = √CF where CF is entered by the user and is the square of the calculated modulation factor.

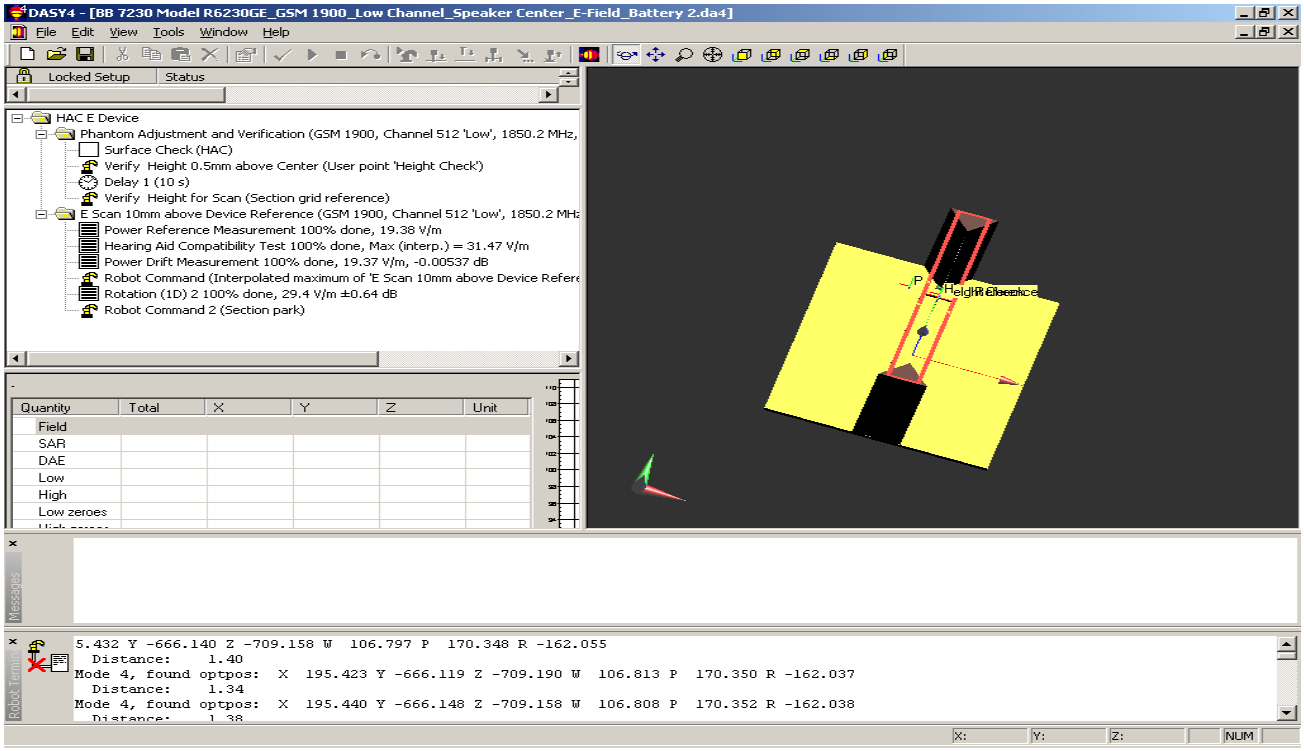
G) The power drift measurement data could not be located. Please provide.

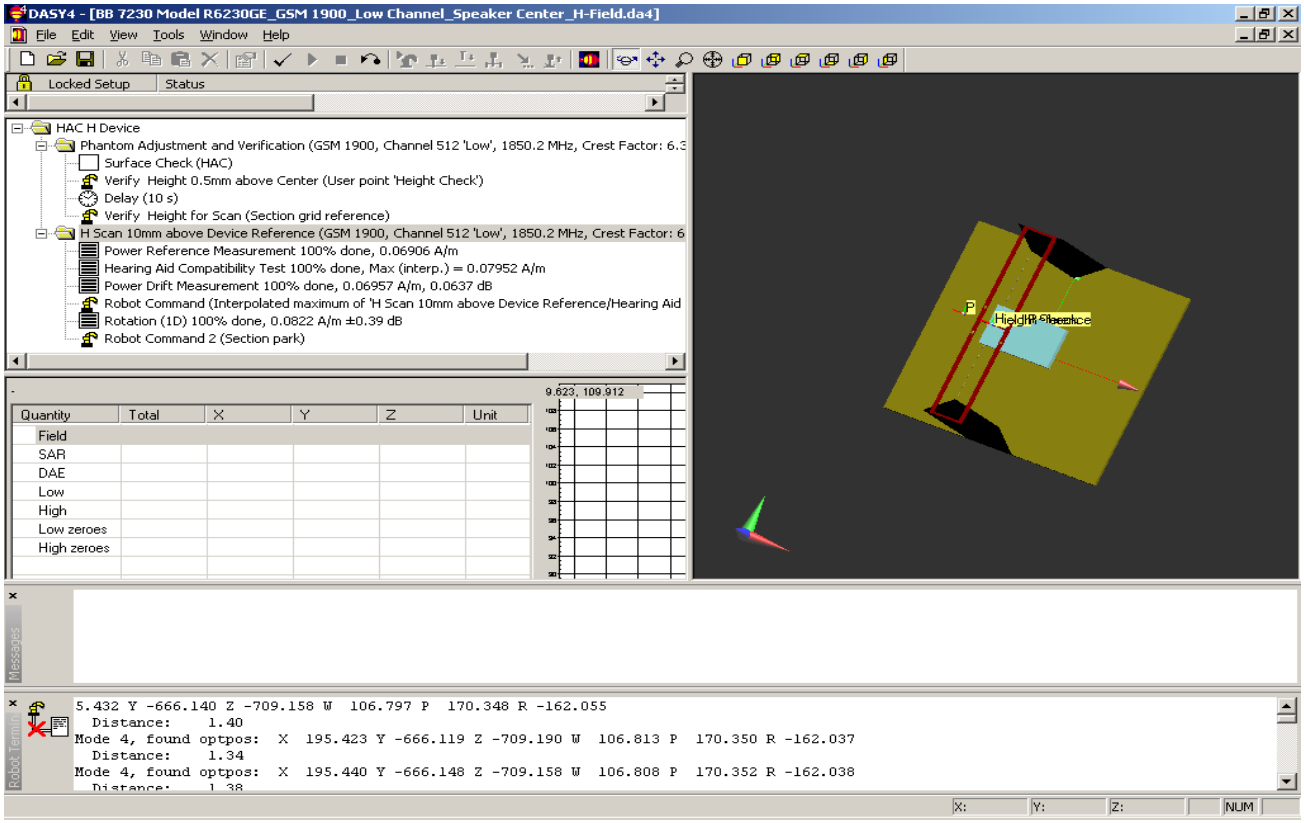
The current release of DASY4 measurement system software is not capable of including power drift when generating report or plots. RTS has informed SPEAG of this and SPEAG has indicated that the capability will be added to the next release of software.

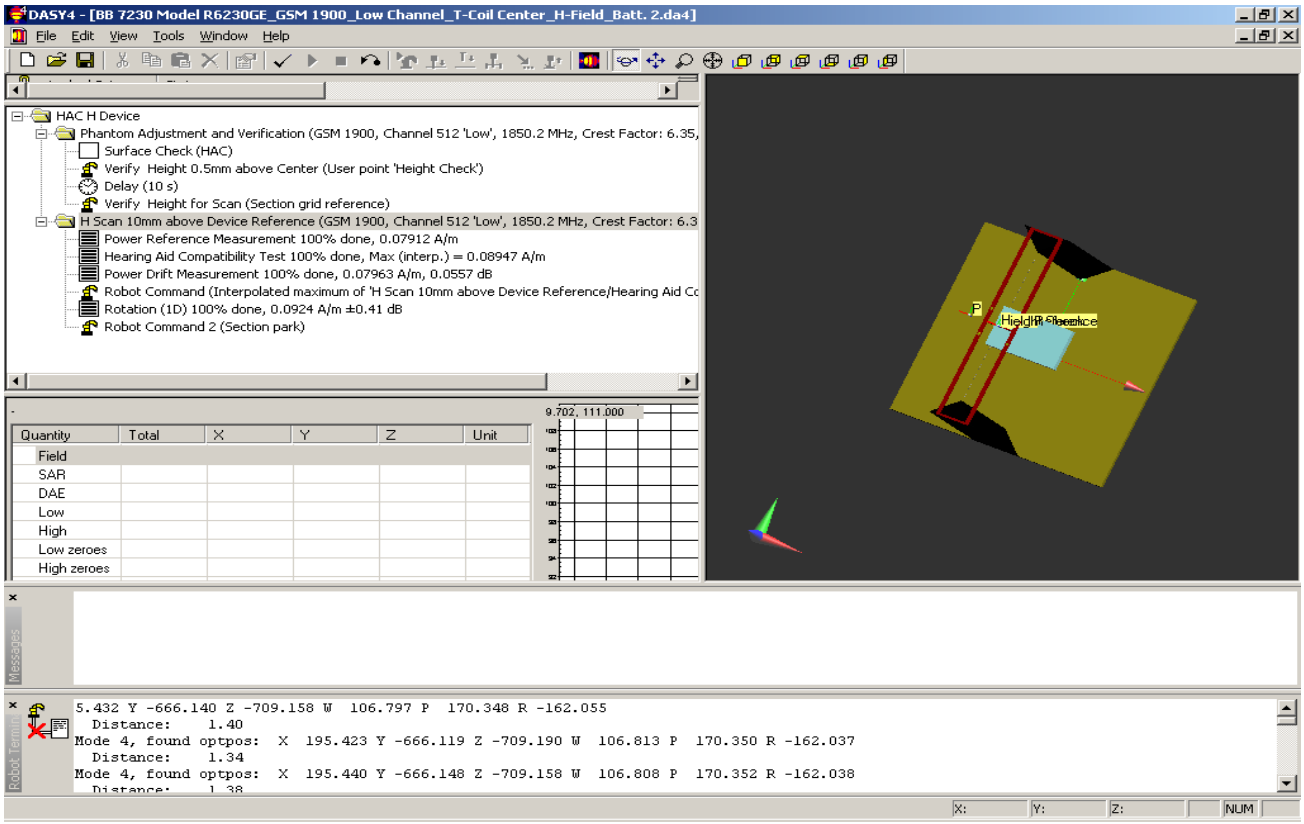
Please see below for screen shots of worst-case results showing power drift.











K) A discussion of the site-specific uncertainty components could not be located.

RF Reflections

Section 4.2 of ANSI C63.19 requires that any RF reflecting objects are a minimum distance of 2 wavelengths away from the WD under test. For this WD, the longest wavelength occurs when the WD is transmitting at 1850.2MHz. The wavelength is:

$$\lambda = \frac{c}{f} = \frac{3 \cdot 10^8 \, m/s}{1850.2 MHz} = 0.162m$$

Therefore, 2 wavelengths result in a distance of 0.32m. Tests are performed in an RF shielded chamber. The distance to the nearest wall is >1m and the distance to the robot's safety guardrail was measured at ~1.0m, both satisfying the requirement. In addition, RF absorbing cones are placed at the base of the robot to further reduce reflections. The HAC phantom arch is made of low dielectric constant plastic and should not be a source of reflections.

Ambient Noise

C63.19 requires ambient noise to be at least 20dB below the measurement level. Please see below for E- and H-Field ambient noise measurements and dipole validation plots. The ambient E-Field level was determined to be 3.03 V/m and the ambient H-field level 0.001 A/m. The ambient noise was determined to more than ~ 32 dB below the dipole validation results with an input power of 20 dBm.

Date/Time: 14/07/2005 11:22:49 AM

Lab: RIM Testing Services (RTS)

Ambient measurement_E-Field

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (5x19x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 1.43 V/m

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 3.03 V/m
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

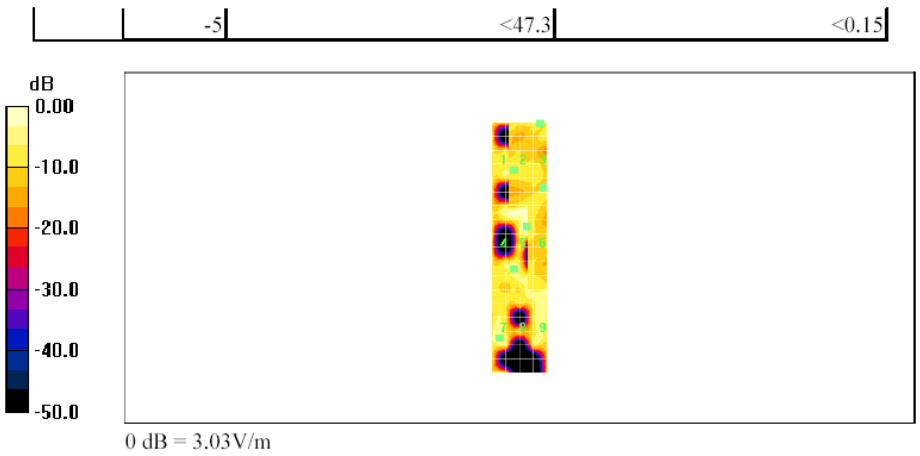
E in V/m (Time averaged)

Grid 1 **1.62**	Grid 2 **1.94**	Grid 3 **2.67**
Grid 4 **2.04**	Grid 5 **3.03**	Grid 6 **2.59**
Grid 7 **2.23**	Grid 8 **1.57**	Grid 9 **1.91**

E in V/m (Slot averaged)

Grid 1 **1.62**	Grid 2 **1.94**	Grid 3 **2.67**
Grid 4 **2.04**	Grid 5 **3.03**	Grid 6 **2.59**
Grid 7 **2.23**	Grid 8 **1.57**	Grid 9 **1.91**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 3.03V/m

Date/Time: 14/07/2005 11:35:24 AM

Lab: RIM Testing Services (RTS)

Dipole Validation 1880 MHz_E-Field 07_14_05

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (5x19x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 134.8 V/m

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 131.0 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

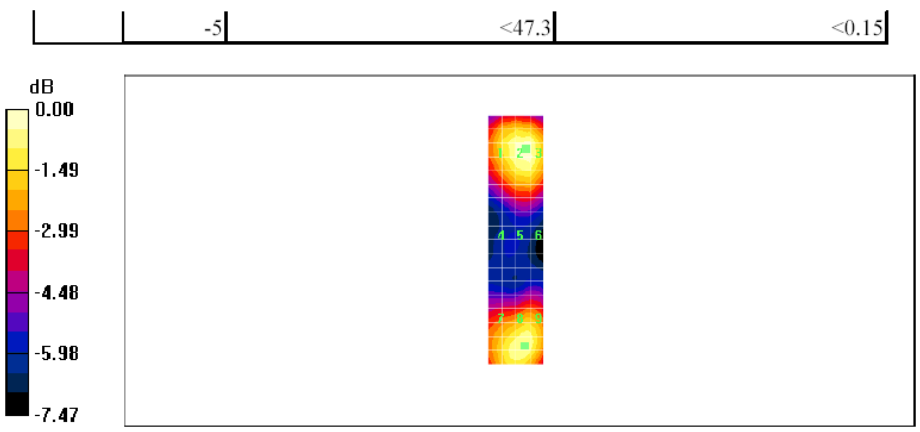
E in V/m (Time averaged)

Grid 1 **123.2**	Grid 2 **138.1**	Grid 3 **138.4**
Grid 4 **80.9**	Grid 5 **92.3**	Grid 6 **92.2**
Grid 7 **119.8**	Grid 8 **131.0**	Grid 9 **130.7**

E in V/m (Slot averaged)

Grid 1 **123.2**	Grid 2 **138.1**	Grid 3 **138.4**
Grid 4 **80.9**	Grid 5 **92.3**	Grid 6 **92.2**
Grid 7 **119.8**	Grid 8 **131.0**	Grid 9 **130.7**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 138.4V/m

Date/Time: 14/07/2005 12:36:18 PM

Lab: RIM Testing Services (RTS)

Ambient noise 1880_H_Field

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: H Dipole Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (5x19x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 0.00 A/m

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.00 A/m
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

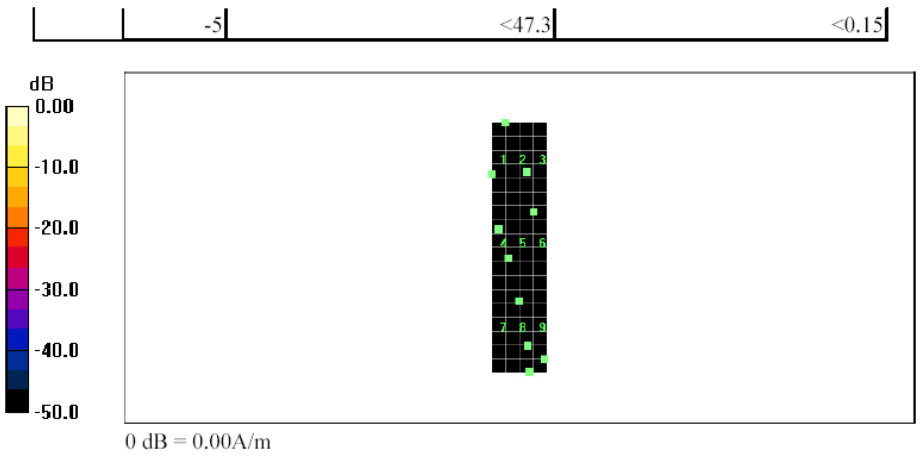
H in A/m (Time averaged)

Grid 1 **0.00**	Grid 2 **0.00**	Grid 3 **0.00**
Grid 4 **0.00**	Grid 5 **0.00**	Grid 6 **0.00**
Grid 7 **0.00**	Grid 8 **0.00**	Grid 9 **0.00**

H in A/m (Slot averaged)

Grid 1 **0.00**	Grid 2 **0.00**	Grid 3 **0.00**
Grid 4 **0.00**	Grid 5 **0.00**	Grid 6 **0.00**
Grid 7 **0.00**	Grid 8 **0.00**	Grid 9 **0.00**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 0.00A/m

Date/Time: 14/07/2005 12:43:02 PM

Lab: RIM Testing Services (RTS)

HAC_H_Dipole_CW 1880_5 mm step_07_14_05

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: H Dipole Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (5x19x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 0.406 A/m

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.406 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

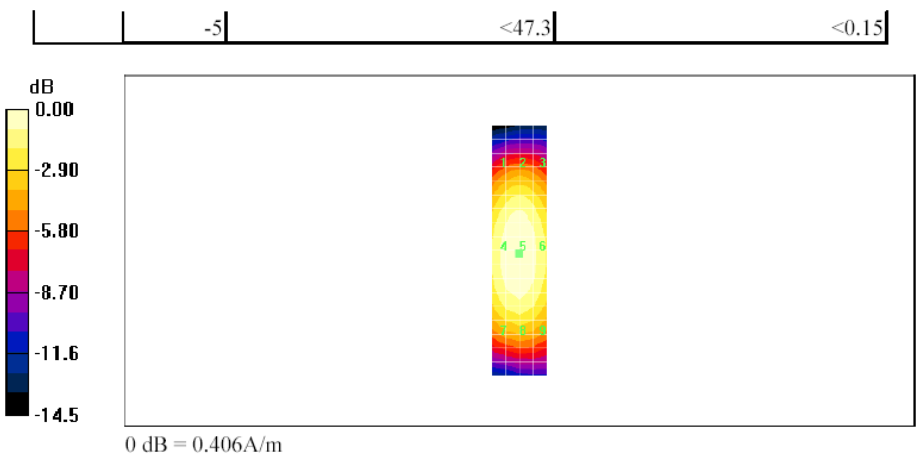
H in A/m (Time averaged)

Grid 1 **0.342**	Grid 2 **0.359**	Grid 3 **0.344**
Grid 4 **0.389**	Grid 5 **0.406**	Grid 6 **0.389**
Grid 7 **0.363**	Grid 8 **0.378**	Grid 9 **0.363**

H in A/m (Slot averaged)

Grid 1 **0.342**	Grid 2 **0.359**	Grid 3 **0.344**
Grid 4 **0.389**	Grid 5 **0.406**	Grid 6 **0.389**
Grid 7 **0.363**	Grid 8 **0.378**	Grid 9 **0.363**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 0.406A/m

IV The Speag Dasy 4 typically measures to the center of the sensor. C63.19 recommends device measurement to the nearest element point. Please justify. Please include additional illustrations of the probe/elements showing more detail of the probe tip area.

All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY4 software so that the measurement was to the nearest element.

Figures 1 and 2, provided by the manufacturer, illustrate detail of the probe tip and its dimensions.

ER3DV6 E-Field probe: The distances from the probe tip to the closest points on the dipole sensors are 1.45mm for X and Y and 1.25mm for Z. From the probe tip to the center of the sensors is 2.5mm.

H3DV6 H-Field probe: The distance from the probe tip to the closest point of the X, Y and Z loop sensors is 1.1mm. From the probe tip to the center of the sensor is 3.00mm.

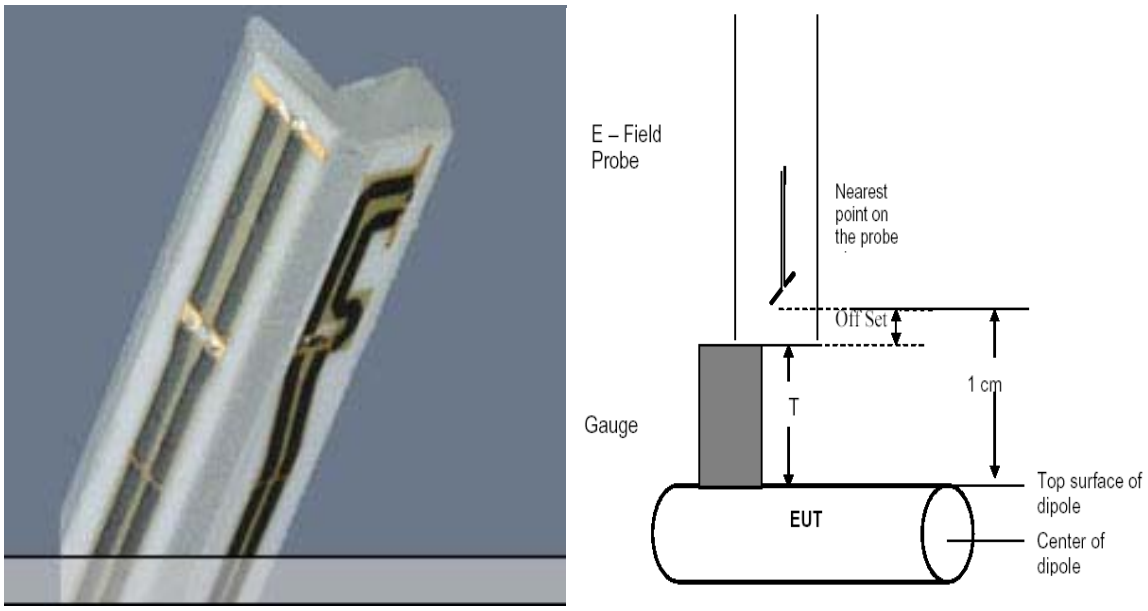


Figure 1: E-Field Probe (ER3DV6)

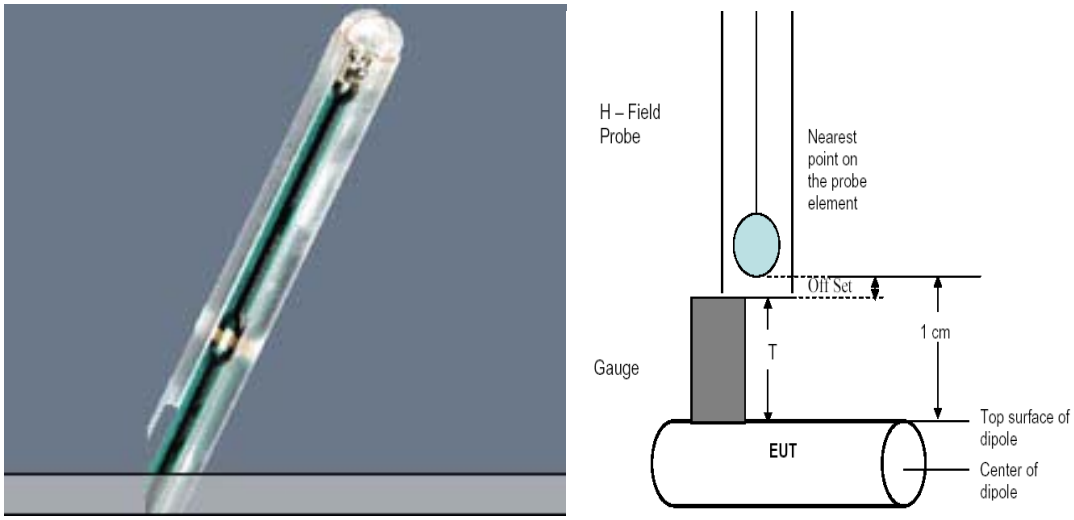


Figure 2: H-Field Probe (H3DV6)

V Please provide additional details of the WD's signal. How was the signal set up and controlled? What was the source for the validation test?

A Rohde & Schwarz CMU 200 base station simulator was used to establish a radiated connection with the WD. The base station simulator's Power Control Level was set to 0 to force WD to transmit at maximum power of ~ 30 dBm. Other parameters are: Channel type = full rate, Discontinuous transmission off.

For validation and modulation factor measurement, an Agilent signal generator, model E4433B was used to generate CW, AM and GSM modulated signals.

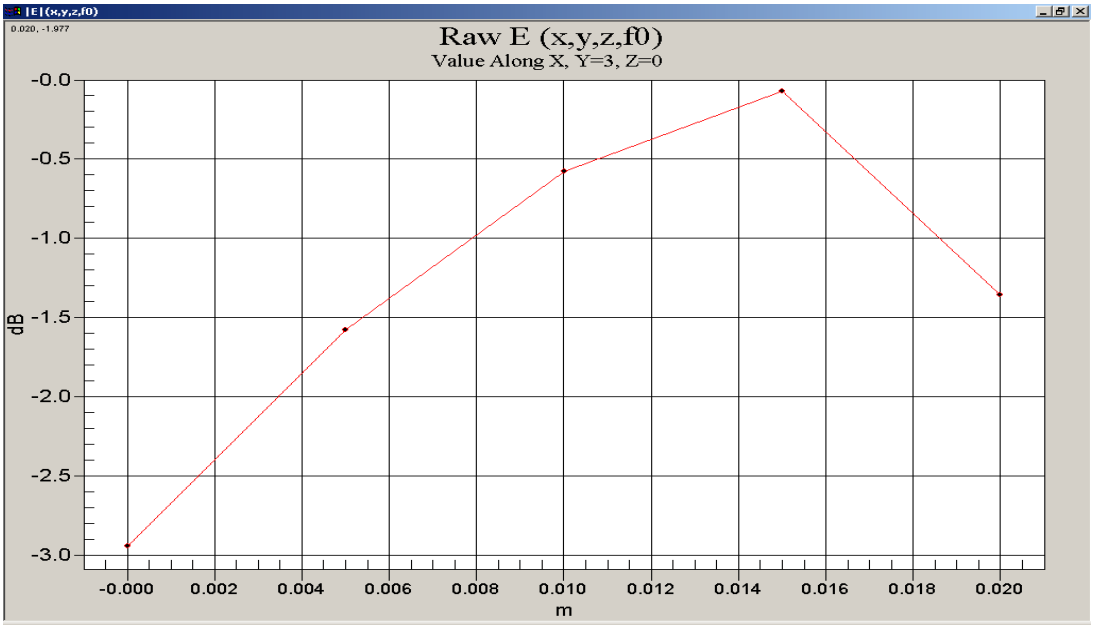
VI Regarding 1309 probe calibration. How was the low, middle and high channel recommendation handled? How were the differences between E and H field recommendations handled?

The near field probe sensors were calibrated for a number of frequencies with the frequency response documented in the calibration certificate. The compensation factors are included in the DASY4 software in the probe's calibration (.cf5) file. Depending on the desired frequency, the DASY4 software uses the proper factor for compensation.

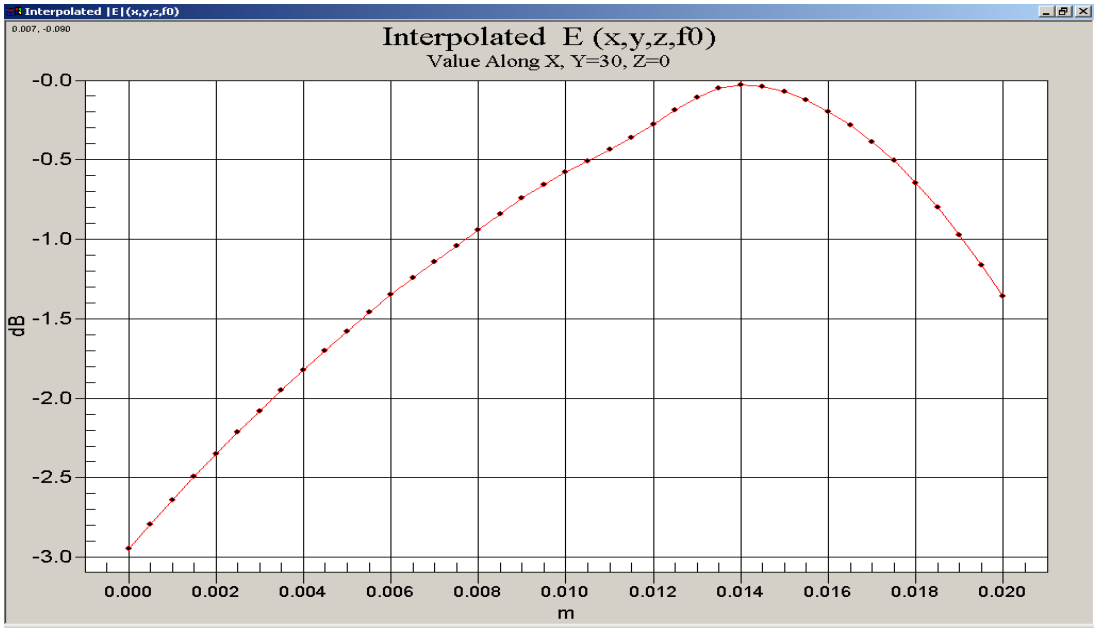
The E-field sensors have a very flat frequency response while the H-Field sensors' sensitivities are more dependent on frequency.

VII Please demonstrate that 5 mm step size is sufficient for both verification and WD measurement. One means might be though use of a two dimensional plot of field strength versus distance in a direction perpendicular to the length of the dipole. Was any interpolation used?

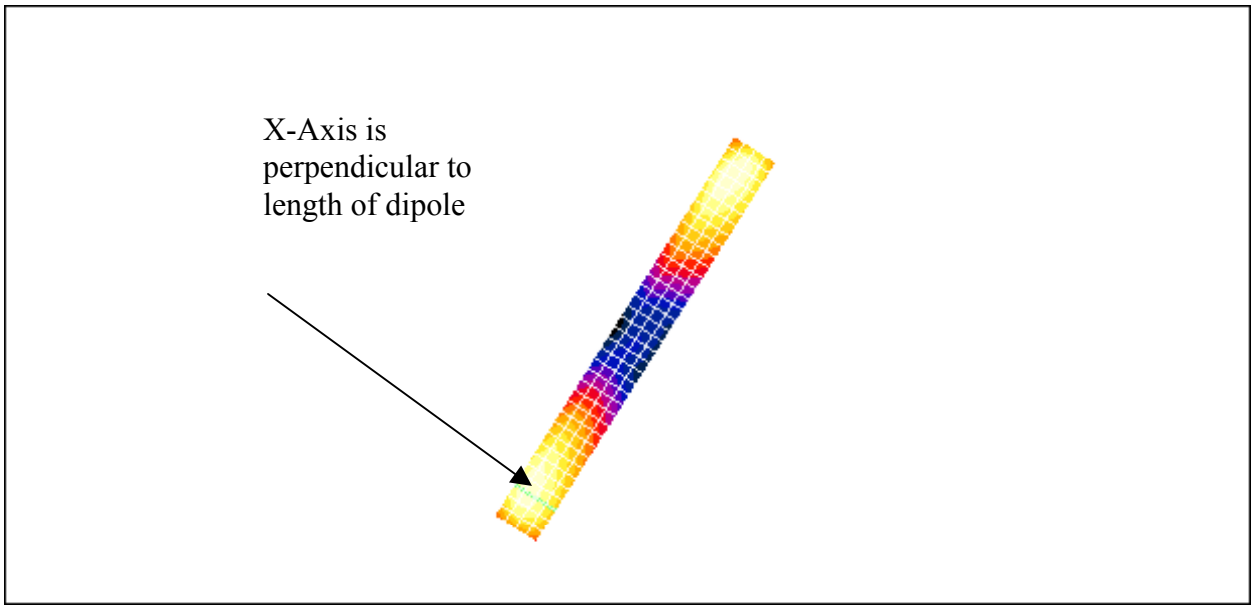
Please see the 2-D plots of raw and interpolated field strength versus distance in a direction perpendicular to the length of the dipole. The DASY 4 uses interpolation algorithms to derive 9 interpolated points between every measured point.



This figure shows the raw measured field strength perpendicular to the dipole. The TCB guidance slides require the 3dB width to be much larger than the step size. The width from the 0 to -3dB points is > 21mm, 4 times the step size.



This figure shows the interpolated field strength perpendicular to the dipole. The interpolated points follow the raw points with no inconsistencies.



The green line in this figure shows the axis along which the points lie.

Further proof of 5mm size:

An additional set of measurements was taken: dipole validations were performed using 5mm and 2mm step sizes. The delta between the two readings is insignificant for both field types (< 0.4% for E and 0% for H), demonstrating that 5mm is sufficient.

Date/Time: 14/07/2005 11:35:24 AM

Lab: RIM Testing Services (RTS)

Dipole Validation 1880 MHz_E-Field 07_14_05

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (5x19x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 134.8 V/m

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 131.0 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

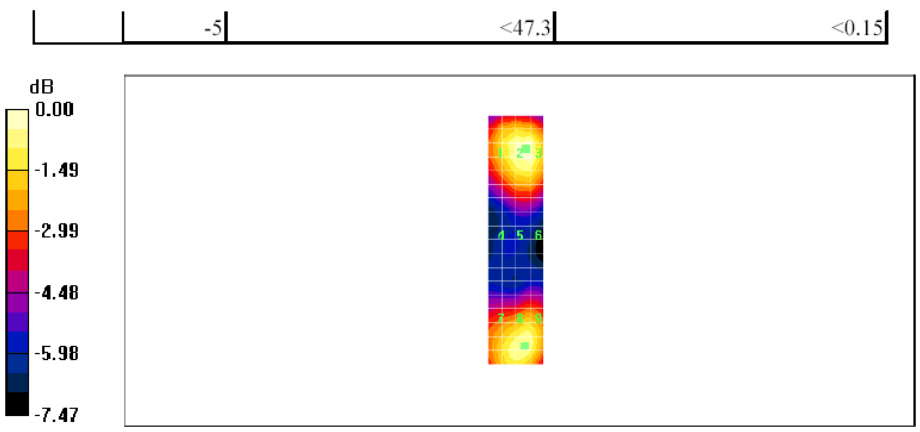
E in V/m (Time averaged)

Grid 1 **123.2**	Grid 2 **138.1**	Grid 3 **138.4**
Grid 4 **80.9**	Grid 5 **92.3**	Grid 6 **92.2**
Grid 7 **119.8**	Grid 8 **131.0**	Grid 9 **130.7**

E in V/m (Slot averaged)

Grid 1 **123.2**	Grid 2 **138.1**	Grid 3 **138.4**
Grid 4 **80.9**	Grid 5 **92.3**	Grid 6 **92.2**
Grid 7 **119.8**	Grid 8 **131.0**	Grid 9 **130.7**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 138.4V/m

Date/Time: 14/07/2005 11:44:51 AM

Lab: RIM Testing Services (RTS)

Dipole Validation 1880 MHz_2mm step_E-Field 07_14_05

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: H Device Section

DASY4 Configuration:
- Probe: ER3DV6 - SN2285; ConvF(1, 1, 1); Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (11x46x1):
Measurement grid: dx=2mm, dy=2mm
Maximum value of Total (measured) = 138.0 V/m

E Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (101x451x1):
Measurement grid: dx=2mm, dy=2mm
Maximum value of Total field (slot averaged) = 131.2 V/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

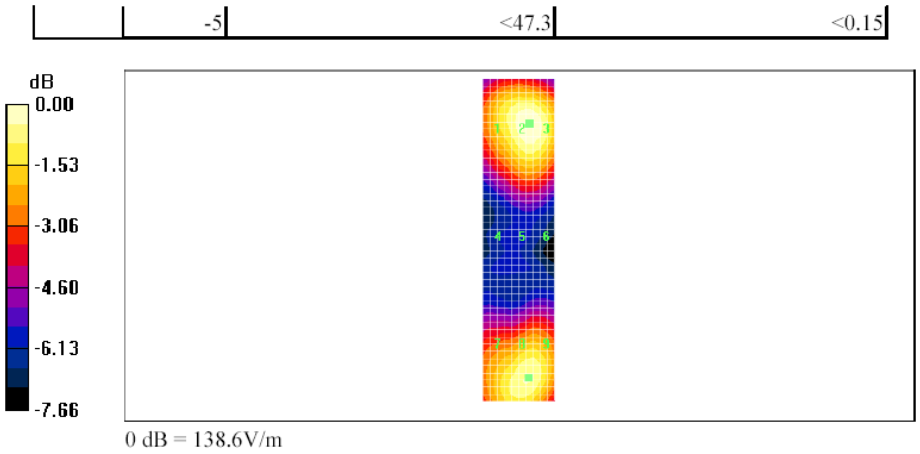
E in V/m (Time averaged)

Grid 1 **123.1**	Grid 2 **138.6**	Grid 3 **138.6**
Grid 4 **81.4**	Grid 5 **92.1**	Grid 6 **91.6**
Grid 7 **121.3**	Grid 8 **131.2**	Grid 9 **131.0**

E in V/m (Slot averaged)

Grid 1 **123.1**	Grid 2 **138.6**	Grid 3 **138.6**
Grid 4 **81.4**	Grid 5 **92.1**	Grid 6 **91.6**
Grid 7 **121.3**	Grid 8 **131.2**	Grid 9 **131.0**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 138.6V/m

Date/Time: 14/07/2005 12:43:02 PM

Lab: RIM Testing Services (RTS)

HAC_H_Dipole_CW 1880_5 mm step_07_14_05

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: H Dipole Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (5x19x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total (measured) = 0.406 A/m

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (41x181x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of Total field (slot averaged) = 0.406 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

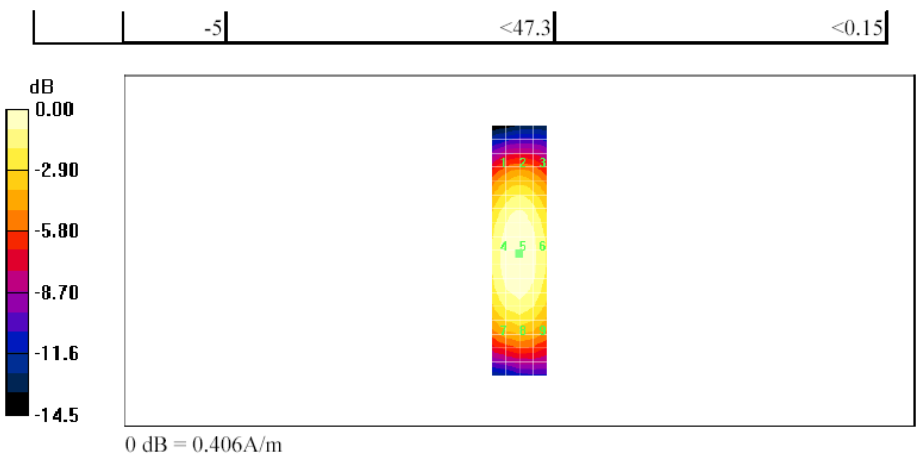
H in A/m (Time averaged)

Grid 1 **0.342**	Grid 2 **0.359**	Grid 3 **0.344**
Grid 4 **0.389**	Grid 5 **0.406**	Grid 6 **0.389**
Grid 7 **0.363**	Grid 8 **0.378**	Grid 9 **0.363**

H in A/m (Slot averaged)

Grid 1 **0.342**	Grid 2 **0.359**	Grid 3 **0.344**
Grid 4 **0.389**	Grid 5 **0.406**	Grid 6 **0.389**
Grid 7 **0.363**	Grid 8 **0.378**	Grid 9 **0.363**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



0 dB = 0.406A/m

Date/Time: 14/07/2005 12:53:40 PM

Lab: RIM Testing Services (RTS)

HAC_H_Dipole_CW 1880_2 mm step_07_14_05

DUT: HAC Dipole 1880 MHz; Type: CD1880V3

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Phantom section: H Dipole Section

DASY4 Configuration:
- Probe: H3DV6 - SN6105; ; Calibrated: 10/12/2004
- Sensor-Surface: 0mm (Fix Surface)Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn472; Calibrated: 03/01/2005
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (11x46x1):
Measurement grid: dx=2mm, dy=2mm
Maximum value of Total (measured) = 0.406 A/m

H Scan 10mm above CD 1880 MHz/Hearing Aid Compatibility Test (101x451x1):
Measurement grid: dx=2mm, dy=2mm
Maximum value of Total field (slot averaged) = 0.406 A/m
Hearing Aid Near-Field Category: M2 (AWF 0 dB)

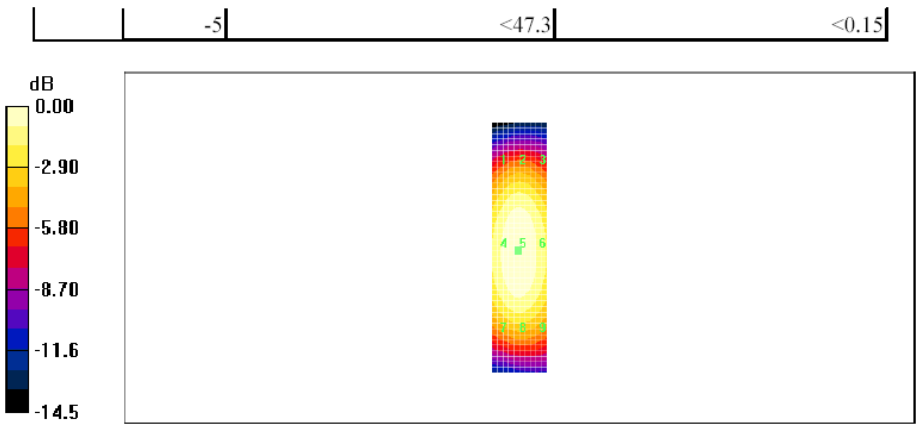
H in A/m (Time averaged)

Grid 1	Grid 2	Grid 3
0.347	**0.361**	**0.348**
Grid 4	Grid 5	Grid 6
0.394	**0.406**	**0.391**
Grid 7	Grid 8	Grid 9
0.367	**0.380**	**0.365**

H in A/m (Slot averaged)

Grid 1	Grid 2	Grid 3
0.347	**0.361**	**0.348**
Grid 4	Grid 5	Grid 6
0.394	**0.406**	**0.391**
Grid 7	Grid 8	Grid 9
0.367	**0.380**	**0.365**

Category	AWF (dB)	Limits for E-Field Emissions (V/m)	Limits for H-Field Emissions (A/m)
M1	0	199.5 - 354.8	0.6 - 1.07
	-5	149.6 - 266.1	0.45 - 0.8
M2	0	112.2 - 199.5	0.34 - 0.6
	-5	84.1 - 149.6	0.25 - 0.45
M3	0	63.1 - 112.2	0.19 - 0.34
	-5	47.3 - 84.1	0.15 - 0.25
M4	0	<63.1	<0.19



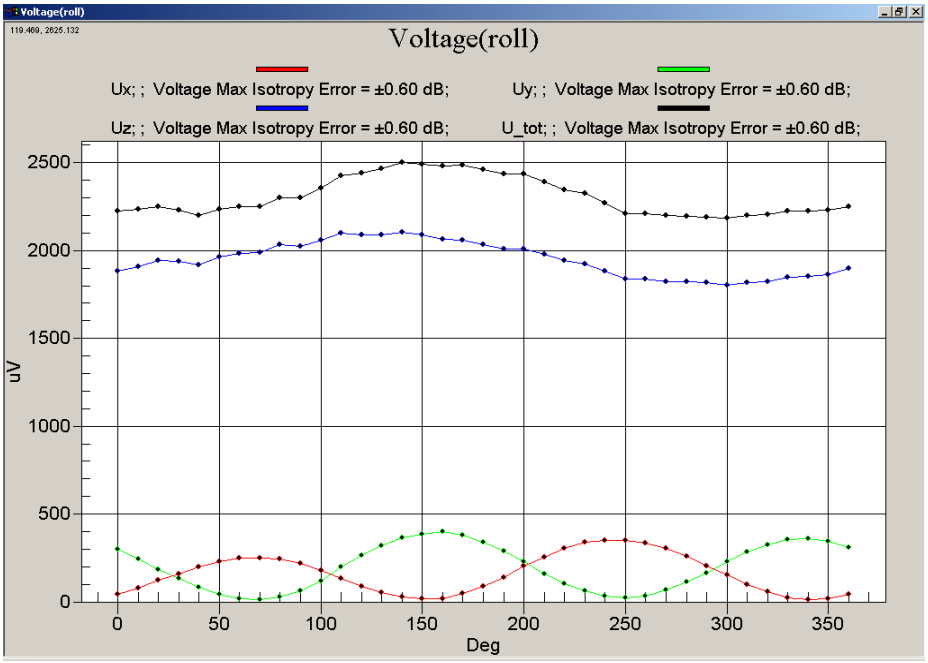
0 dB = 0.406A/m

VIII To help clarify dynamic range issues, if possible, please state the highest measured voltage at the diode compared to its compression point.

The diode compression point in the calibration certificate is stated to be ~95 mV for E-field as shown below.
The maximum measured voltage at each diode for the worst-case scan is determined to be ~ 2.5 mV which is much lower than the compression point.

Diode Compression[A]

DCP X	**95** mV
DCP Y	**95** mV
DCP Z	**98** mV



IX Please describe the processing chain from diode output, to raw measurement, and conversion to final peak value. Please include a discussion of averaging and measurement time windows and similar. Please clarify how the values in the right grid labeled slot average were developed.

The following information is from the system manufacturer user manual describing the process chain:

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:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i} \qquad (20.1)$$

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:

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

$$\text{H} - \text{fieldprobes}: \qquad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

with
V_i = compensated signal of channel i (i = x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
$\mu V/(V/m)^2$ 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):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2} \tag{20.2}$$

The measurement / integration time per point is > 500 ms, as per the system manufacturer:

The time response of the field probes has been assessed by exposing the probe to a well-controlled field producing signals larger than HAC E- and H-fields of class M4. 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 <5 ms. 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%.

The values in the right grid labeled 'Slot averaged' were calculated by the DASY4 software. The values in left grid labeled 'Time averaged' are multiplied by the measured modulation factor to get the slot averaged values.

X The probe modulation factor values for CW and GSM E field levels in section 5.1.2.1 #1 do not seem to agree with the Table 4 values. Please explain. Also, the E field probe modulation appears to agree well with the signal duty cycle as expected in this case but the H field factor does not. Please explain.

The CW and GSM E field values in section 5.1.2.1 were corrected in the test report number RTS-0228-056-01 rev 03 to agree with the measured values of Table 4.

The H-Field modulation factor was measured several times for GSM signals and other technologies using timeslots (iDEN, CDMA gating). The H-Field probe seems to be consistently more responsive to modulated signals, reading higher field levels, resulting in lower modulation factors. RTS has informed the probe manufacturer (SPEAG) about this phenomenon.

Please do not hesitate to contact the undersigned should you have any questions.

Yours truly,

M. Attay

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