D-PL-12111-01-01

CNAS L0447

Registration No.910917

HAC RF Emission Test Report

Report No.: SRTC2011-HAC004-E0003

Product Name: CDMA 1X-EVDO Digital Mobile Phone with Bluetooth

Model Name: Sonim XP3400-A-R1

Type Number: C21F007AA

Applicant: Sonim Technologies Inc.

Manufacturer: BYD COMPANY LIMITED

Specification: ANSI C63.19-2007

FCC ID: WYPC21F007AA

The State Radio_monitoring_center Testing Center (SRTC)

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Executive summary

Test report no.:	**SRTC2011-HAC004-E0003**
Model Name:	**Sonim XP3400-A-R1**
Type Number:	**C21F007AA**
Date of test:	**2011.7.2**
Date of report:	**2011.7.12**
Laboratory:	**The State Radio_monitoring_center Testing Center (SRTC)**
Test has been Carried out in accordance with:	**ANSI C63.19-2007 American National standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids**
Documentation:	**The documentation of the testing performed on the tested devices is archived for 5 years at SRTC**

Result summary:

Band & Mode	Combined category (E-fields and H-fields)	Pass/Fail
CDMA 800	**M4/M4**	**PASS**
CDMA1900	**M4/M4**	**PASS**
Final M Category	**M4**	**PASS**

This Test Report Is Issued by: Mr. Song Qizhu Director of the test lab	Checked by: Mr. Wang Junfeng Deputy director of the test lab
Tested by: Ms. Liu Jia Test engineer	Issued date: **2011.07.12**

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1. General information

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).
The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

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1.4 Manufacturer's details

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1.5 Test Details

FCC ID	WYPC21F007AA
Tx frequency	CDMA800:824MHz~849MHz CDMA1900:1850MHz~1910MHz
Rx frequency	CDMA800:860MHz~894MHz CDMA1900:1930MHz~1990MHz
Batteries used in testing	Li-Lon/XP3.20-0001100/Sunwoda Electronic Co., Ltd
Charger	DSA-3PFC-05 FEU 050065/DEE VAN ENTERPRISE CO., LTD
S/W Version H/W Version	E343B_1200B03 A
State of sample	Production Unit
MEID	A100001290A090
Notes	---

1.6 Maximum results

The maximum measured HAC RF emissions values and categories for electric and magnetic fileds are given in section 1.6.1 and 1.6.2 respectively.

1.6.1 Electric field measurements

Band & Mode	Ch/Freq.[MHz]	Limited of E-field max. value in category M4 [V/m]	Maximum E-field value after exclusion [V/m]	Category
CDMA800	1013/824.70	<199.5	52.3	M4
CDMA1900	600/1880.00	<63.1	18.1	M4

1.6.2 Magnetic field measurements

Band & Mode	Ch/Freq.[MHz]	Limited of H-field max. value in category M4 [A/m]	Maximum H-field value after exclusion [A/m]	Category
CDMA800	777/848.30	〈0.60	0.109	M4
CDMA1900	25/1851.25	〈0.19	0.065	M4

1.6.3 Overall RF emissions category of the tested device

Band & Mode	Combined category (E-fields and H-fields)	Pass/Fail
CDMA800	M4/M4	PASS
CDMA1900	M4/M4	PASS
Final M Category	M4	PASS

2. EUT Description

Modes of operation	Bands	Modulation mode	Duty cycle
CDMA	800	OQPSK	1
CDMA	1900	OQPSK	1

2.1 picture of Device

3. Test conditions

3.1 Temperature and Humidity

Ambient temperature [℃]	21.0 to 23.0
Ambient humidity[RH %]	32 to 39

3.2 Test Signal, Frequencies, and Output Power

The transmitter of the device was put into operation by using a call tester .communications between the device and the call tester were established by air link.
For all tests the device output power was set to maximum power level; a fully charged battery was used for every test sequence.
The measurements were performed on low, middle, high channels.

4. Description of the test equipment

4.1 Measurement system and components

The measurements were performed using an automated near-field scanning system, DASY4, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland .

The following table lists calibration dates of SPEAG components:

Test equipment	Serial number	Calibration interval	Calibration expiry
DAE 4	720	12months	2012.01.19
E-field probe （ER3DV6）	2371	12months	2011.08.23
H-field probe (H3DV6)	6198	12months	2011.08.23
Dipole validation kit CD835V3	1069	24months	2011.08.24
Dipole validation kit CD1880V3	1056	24months	2011.08.24

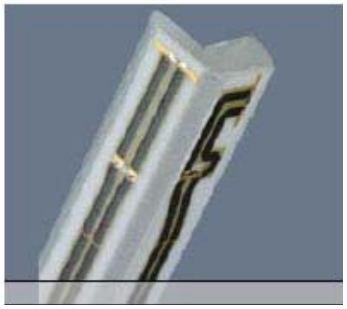
Additional test equipment used in testing and validation:

Test equipment	Model	Serial number	Calibration Interval	Calibration expiry
Signal generator	E4428C	MY45280865	12months	2011.08.20
Amplifier	5S1G4	0323472	N/A	N/A
Power meter	E4417A	MY45101182	12months	2011.08.20
Power sensor	E4412A	MY41502214	12months	2011.08.20
Power sensor	E4412A	MY41502130	12months	2011.08.20
Radio communication Tester	CMU200	114666	12months	2011.08.20

DUAL Directional Coupler	777D	20217	12months	2011.08.20
phantom	SD HAC P01 BB	1080	N/A	N/A

4.1.1 ER3DV6 E-Field Probe Description

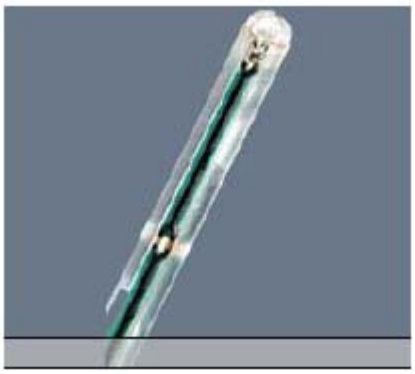
Construction:	One dipole parallel, two dipoles normal to probe axis .Built-in shielding against static charges PEEK enclosure material
Calibration:	In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2)
Frequency:	100 MHz to > 6 GHz; Linearity: ± 0.2 dB (100 MHz to 3 GHz)
Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)
Dynamic Range:	2 V/m to > 1000 V/m (M3 or better device readings fall well below diode compression point)
Linearity:	± 0.2 dB
Dimensions	Overall length:330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm
Application:	General near-field measurements up to 6GHz Field component measurements Fast automatic scanning in phantoms



E-field Free-space probe

4.1.2 H3DV6 H-field Probe Description

Construction:	Three concentric loop sensors with 3.8 mm loop diameters Resistively loaded detector diodes for linear response Built-in shielding against static charges
Frequency:	200 MHz to 3 GHz (absolute accuracy ± 6.0%, k=2); Output linearized
Directivity:	± 0.25 dB (spherical isotropy error)
Dynamic Range:	10 mA/m to 2 A/m at 1 GHz (M3 or better device readings fall well below diode compression point)
Dimensions:	Overall length: 330 mm (Tip: 40 mm) Tip diameter: 6 mm (Body: 12 mm) Distance from probe tip to dipole centers: 3 mm



H-field Free-space probe

E-Field: < 10% at 3 GHz (for plane wave)
Interference:
Application : General magnetic near-field measurements up to 3 GHz (in air or liquids)
Field component measurements
Surface current measurements
Low interaction with measured field

4.1.3 Device Holder

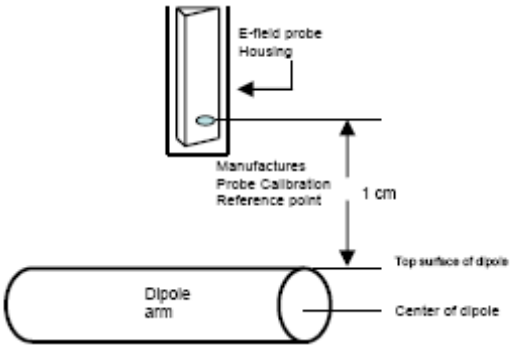
The Device Holder and Test Arch are manufactured by Speag (http://www.dasy4.com/hac), Test arch is used for all tests i.e. for both validation testing and device testing. The holder and test arch conforms to requirements of ANSI C63.19.
The SPEAG device holder (see section 5.1) was used to position the test device in all tests.

4.2 Validation of the system

4.2.1 System check parameters

The input signal was an unmodulated continuous wave. The following points were taken into consideration in performing this check：

- Average Input Power P=100mW RMS(20dBm RMS) after adjustment for return loss
- The test fixture must meet the 2 wavelength separation criterion
- The proper measurement of the 1 cm probe to dipole separation , which is measured from top surface of the dipole to the calibration reference point of the sensor , defined by probe manufacturer is shown in the following diagram:



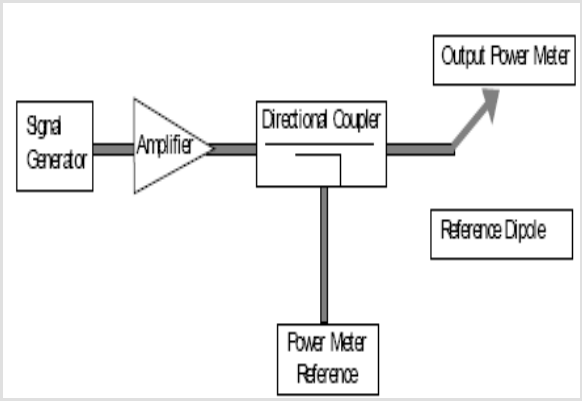
Separation distance from dipole to field-probe

RF power was recorded using both an average reading meter and a peak reading meter. Reading of the probe are provided by the measurement system.
To assure proper operation of the near-field measurement probe the input power to dipole shall be commensurate with the full rated output power of the wireless device (e.g.-for a cellular phone wireless device the average peak antenna input power will be on the order of

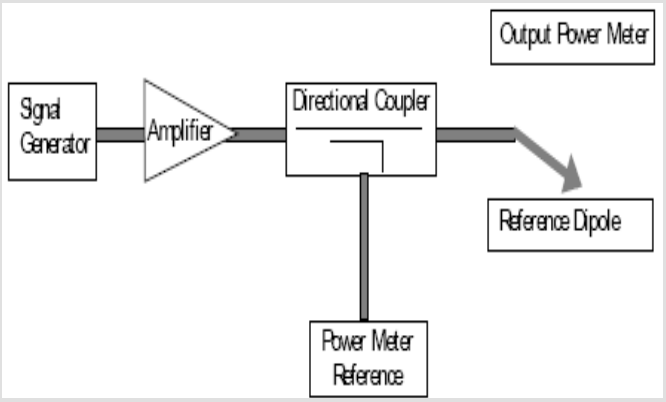
100 mW (i.e.-20dBm) RMS after adjustment for any mismatch.)

4.2.2 Validation procedure

A dipole antenna meeting the requirements given in ANSI C63.19 was placed in the position normally occupied by the WD.
The length of the dipole was scanned with both E-field and H-field probes and the maximum values for each were recorded.



setup for desired output power to dipole



setup to dipole

Using this setup configuration, the signal generator was adjusted for the desired output power (100mW) at a specified frequency. The reference power from the coupled port of the directional coupler is recorded. Next, the output cable is connected to the reference dipole, as shown up figure.
Comparing to the original E-field or H-field value by SPEAG, the validation date should be within its specification of 25%.

System validation, H-field and E-field

f(MHz)	Description	E-field [V/m]	H-field[A/m]
835	Reference result ±25% window	169.2 126.9-211.5	0.446 0.350-0.558
	2011.7.2	153.4	0.420
1880	Reference result ±25% window	140.7 105.52-175.88	0.465 0.349-0.581
	2011.7.2	150.8	0.483

Plots of the system validation scans are given in Appendix A

5. Description of the test procedure

5.1 Test Arch and Device Holder

The test device was placed in the Device (illustrated below) that is supplied by SPEAG. Using this positioner the tested device is positioned under Test Arch.

Device holder and test Arch supplied by SPEAG

5.2 Test positions

5.2.1 Scan area centered at the acoustic output

The device was positioned such that Device Reference plane was touching the bottom of the Test Arch. The scan is centered at the acoustic output by aligning the acoustic output with the intersection of the Test Arch's middle bar and dielectric wire.

5.3 Scan Procedures

Near field scans of 5cm x 5cm were used for determination of the field distribution. Measurement plane distance from WD reference plane is 1.5cm. Scans were performed for both E and H-field using appropriate probe. DASY software divides detected values into 3 x 3 sub grids as described in the C63.19 standard.

5.4 Scan area centered at the maximum magnetic T-coil coupling

Scanning centered at the maximum magnetic T-coil coupling was not applicable for the tested device

5.5 Probe Modulation Factor

A calibration was made of the modulation response of the probe and its instrumentation chain. This calibration was performed with the field probe, attached to its instrumentation. The response of the probe system to a CW field at the frequency of interest is compared to its response to a modulated signal with equal peak amplitude to that of a CW signal. The field level of the test signals are ensured to be more than 10 dB above the ambient level and the noise floor of the instrumentation being used. The ratio of the CW reading to that taken with a modulated reading was applied to the DUT measurements.

This was done using the following procedure:

The measurement setup for determination of the PMF is given in DASY4 manual section 28.2. The following points describe the installation, the measurement procedure and the evaluation.

1. Install the field probe in the DASY4 window setup.
2. Mount a validation dipole for the appropriate frequency band under the Test Arch. Move the probe manually to a point of high field strength for the specific field type. The probe may be very close to the dipole and might even touch it. During the fine adjustment of the probe with a signal applied to the dipole, read the x, y and z channel amplitudes in a multimeter job. They should all show a similar amplitude.
3. For comparing the peak amplitudes of modulated and CW signal, the same spectrum analyzer settings are required. The signal path (and setup geometry) between spectrum analyzer and probe must not be changed during the evaluation of the PMF! Only signal type and amplitudes as well as DASY4 settings may be varied.

Spectrum analyzer settings:

- Center Frequency: nominal center frequency of channel
- Span: zero
- Resolution bandwidth >= emission bandwidth
- Video bandwidth >= 20kHz

• Detection: RMS detection
• Trigger: Video or IF trigger, adjusted to give a stable display of the transmission
• Sweep rate: Set to show a complete tranmission cycle
• Line max hold may be used temporarily to ease the peak reading.

4. Define a DASY4 document and set the procedure properties (frequency as above, modulation frequency and crest factor for the modulated signal) according to the measured signal. Define a multimeter job (continuous mode) for the field reading. The probe shall not move. A predefined document is available.
5. Define a DASY4 document with a procedure for the evaluation of the CW signal (frequency, modulation frequency = 0, crest factor = 1) with a multimeter job.

The HAC measurement procedure is as follows:

6. Prepare the evaluation sheet for the installed field probe, frequency and modulation type.
7. Modulated signal measurement: Connect the modulated signal using the appropriate frequency via the cable to the setup. Do not move the setup between the following measurements.
8. Run the multimeter job in the procedure with the corresponding modulation setting in continuous mode.
9. Adjust the signal amplitude to achieve the the desired field level display in the multimeter. (A number of levels over the full dynamic range of the probe in the desired range shall be set, including the values read during the WD scans.)
10. Read the total field for the modulated signal.
11. Read the peak envelope signal on the spectrum analyzer.
12. Repeat these readings for other amplitude settings.
13. Switch the signal source off and verify that the ambient and instrumentation noise level is at least 10 dB lower (a factor of 3 in field).
14. CW measurement: Change the signal to CW at the same center frequency, without touching or moving dipole or probe in the setup.
15. Adjust the CW signal amplitude to a similar range of peak levels on the spectrum analyzer.
16. Run the multimeter in the CW procedure in continuous mode.
17. Read the multimeter total field display.
18. Read the signal on the spectrum analyzer.
19. Repeat these readings for other amplitude settings.

Evaluation of the readings:

20. Select the correct type of predefined Excel calculation sheet and insert the readings into the appropriate measurement columns. Conversion from linear DASY readings to logarithmic will be automatically made. The diagrams contain fitting curves for the logarithmic quantities. CW and E-field values will be fitted by linear trendlines, H-field values by quadratic.
21. Verify that the fitting quality is sufficient (value R2 > 0.99). If not fulfilled, repetition or range reduction may be required.

22. Copy the parameters of the fitting curve equation in the appropriate fields lower in the sheet.
23. The PMF is calculated for the target peak fields in the lowest table. (The target fields values may be edited.

Perform the above setup and procedure for both E-field and H-field probes. (For the H-field probe, it is important that the frequency setting is correct.)

Application of the Probe Modulation Factor in the DASY4 Postprocessor

The application of the PMF within the DASY4 Postprocessor is outlined in the DASY4 manual 28.5 Use the PMF corresponding to the WD field measurement. If not exactly matching, use the next higher PMF value.

Modulation factors, CDMA

f(MHz)	Functions	PMF E-field	PMF H-field
835.0	CDMA	0.933	0.833
1880.0	CDMA	0.820	0.990

5.6 Conversion to Peak

Peak is defined as Peak Envelope Power. All raw measurements from the HAC measurement system are RMS values. The DASY4 system incorporates the crest factor of the signal in the computation of the RMS values (See Equation 1). Although the software also has capability to estimate the peak field by applying a square root of crest factor value to the readings, the probe modulation factor was applied manually instead per PC63.19 in the measurement tables in this report. The equation to convert the raw measurements in the data tables are:

$$\text{Peak Field} = 20 \cdot \log (\text{Raw} \cdot \text{PMF})$$

Where:
Peak Field = Peak field (in dBV/m or dBA/m)
Raw = Raw field measurement from the measurement system (in V/m or A/m).
PMF = Probe Modulation Factor (in linear units). See MODULATION FACTOR Chapter of test report.

5.7 RF Emissions Test Procedure:

The following illustrate a typical RF emissions test scan over a wireless communications device:

1. Proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.
2. WD is positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.
3. The WD operation for maximum rated RF output power was configured and

confirmed with the base station simulator, at the test channel and other normal operating parameters as intended for the test. The battery was ensured to be fully charged before each test.
4. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The WD audio output was positioned tangent (as physically possible) to the measurement plane.
5. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the HAC Phantom.
6. The measurement system measured the field strength at the reference location.
7. Measurements at 2mm increments in the 5 x 5 cm region were performed and recorded. A 360^{o} rotation about the azimuth axis at the maximum interpolated position was measured. For the worst-case condition, the peak reading from this rotation was used in re-evaluating the HAC category.
8. The system performed a drift evaluation by measuring the field at the reference location.
9. Steps 1-8 were done for both the E and H-Field measurements.

5.8 Slot Averaged Calculation Method

The slot-averaged values for the every measured signal type were calculated using observed duty cycles.

5.9 Sub-grid Exclusion

The measurement grid defined in C63.19 consists of 9 evenly sized blocks, which are used to define permissible exclusion areas. For both E- and H-field measurements three contiguous blocks may be excluded from the measurements except center block may never be excluded. There must be 4 blocks left that are common for both E- and H-field measurements, so maximum of 5 different blocks can be excluded (e.g. 3 blocks excluded from E-field and 2 blocks from H-field).

5.10 Category Limits

The following AWF factors shall be used for the standard transmission protocols:

Standard	Technology	AWF (dB)
TIA/EIA/IS-2000	CDMA	0
TIA/EIA-136	TDMA (50 Hz)	0
J-STD-007	GSM (217)	-5
T1/T1P1/3GPP	UMTS (WCDMA)	0
iDENTM	TDMA (22 and 11 Hz)	0

From remaining maximum values after exclusion process, Hearing Aid M-category is defined according to the category limits of C63.19 – 2007.

Category		Telephone RF parameters < 960 MHz			
Near field	AWF	E-field emissions		H-field emissions	
Category M1/T1	0	631.0 to 1122.0	V/m	1.91 to 3.39	A/m
	–5	473.2 to 841.4	V/m	1.43 to 2.54	A/m
Category M2/T2	0	354.8 to 631.0	V/m	1.07 to 1.91	A/m
	–5	266.1 to 473.2	V/m	0.80 to 1.43	A/m
Category M3/T3	0	199.5 to 354.8	V/m	0.60 to 1.07	A/m
	–5	149.6 to 266.1	V/m	0.45 to 0.80	A/m
Category M4/T4	0	< 199.5	V/m	< 0.60	A/m
	–5	< 149.6	V/m	< 0.45	A/m

Category		Telephone RF parameters > 960 MHz			
Near field	AWF	E-field emissions		H-field emissions	
Category M1/T1	0	199.5 to 354.8	V/m	0.60 to 1.07	A/m
	–5	149.6 to 266.1	V/m	0.45 to 0.80	A/m
Category M2/T2	0	112.2 to 199.5	V/m	0.34 to 0.60	A/m
	–5	84.1 to 149.6	V/m	0.25 to 0.45	A/m
Category M3/T3	0	63.1 to 112.2	V/m	0.19 to 0.34	A/m
	–5	47.3 to 84.1	V/m	0.14 to 0.25	A/m
Category M4/T4	0	< 63.1	V/m	< 0.19	A/m
	–5	< 47.3	V/m	< 0.14	A/m

6. Measurement uncertainty

Source of uncertainty	Tolerance ±%	Probability Distribution	Div.	C_i E	C_i H	Std.Unc. E	Std.Unc. H
Measurement system							
Probe Calibration	±5.1	N	1	1	1	±5.1	±5.1
Axial Isotropy	±4.7	R	$\sqrt{3}$	1	1	±2.7	±2.7
Sensor Displacement	±16.5	R	$\sqrt{3}$	1	0.145	±9.5	±1.4
Boundary Effects	±2.4	R	$\sqrt{3}$	1	1	±1.4	±1.4
Linearity	±4.7	R	$\sqrt{3}$	1	1	±2.7	±2.7
Scaling to peak envelope power	±2.0	R	$\sqrt{3}$	1	1	±1.2	±1.2
System Detection limit	±1.0	R	$\sqrt{3}$	1	1	±0.6	±0.6
Readout Electronics	±0.3	N	1	1	1	±0.3	±0.3
Response time	±0.8	R	$\sqrt{3}$	1	1	±0.5	±0.5
Integration time	±2.6	R	$\sqrt{3}$	1	1	±1.5	±1.5
RF Ambient conditions	±3.0	R	$\sqrt{3}$	1	1	±1.7	±1.7
RF Reflections	±12.0	R	$\sqrt{3}$	1	1	±6.9	±6.9
Probe positioner	±1.2	R	$\sqrt{3}$	1	0.67	±0.7	±0.5
Probe positioning	±4.7	R	$\sqrt{3}$	1	0.67	±2.7	±1.8
Extrap. and interpolation	±1.0	R	$\sqrt{3}$	1	1	±0.6	±0.6
Test Sample Related							
Device Positioning Vertical	±4.7	R	$\sqrt{3}$	1	0.67	±2.7	±1.8
Device Positioning Lateral	±1.0	R	$\sqrt{3}$	1	1	±0.6	±0.6
Device Holder and Phantom	±2.4	R	$\sqrt{3}$	1	1	±1.4	±1.4
Power Drift	±5.0	R	$\sqrt{3}$	1	1	±2.9	±2.9
Phantom and setup related							
Phantom Thickness	±2.4	R	$\sqrt{3}$	1	0.67	±1.4	±0.9
Combined Std. uncertainty						±14.7	±10.9
Expanded std. uncertainty on power						±29.4	±21.8
Expanded std. uncertainty on field						±14.7	±10.9

7. Results

The calculated maximum field values for the test device are tabulated below:

CDMA850,E and H emissions results

mode	Test configuration	Ch 1013 824.7MHz	Ch 384 836.52MHz	Ch 777 848.3MHz
CDMA850	E-field[V/m]	52.3	37.3	24.7
	H-field[A/m]	0.090	0.088	0.109
	Category	M4	M4	M4

CDMA1900, E and H emissions results

mode	Test configuration	Ch 25 1851.25MHz	Ch 600 1880.0MHz	Ch 1175 1908.75MHz
CDMA1900	E-field[V/m]	12.3	18.1	16.6
	H-field[A/m]	0.065	0.047	0.058
	Category	M4	M4	M4

Conducted power:

For HAC test, the maximum power output is very important and essential; it is identical under the measurement uncertainty. It is proper to use typical Test Mode 3 (FW RC3, RVS RC3, SO55) as the worst case for SAR test.Under the loop back mode between mobile station and CMU200, the transmitter continuously emits with maximum power more strong than voice mode, so the SAR test was done with loop back mode.

CDMA835:

Mode: SO55 RC1Full rate

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.70	1013	23.95
836.52	384	23.92
848.31	777	24.07

Mode: SO55 RC3 Full rate

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.70	1013	24.02
836.52	384	23.90
848.31	777	23.95

Mode: SO32 RC3 FCH-SCH

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.70	1013	23.93
836.52	384	23.87
848.31	777	23.95

Mode: SO32 RC3 FCH+SCH

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.70	1013	23.97
836.52	384	23.86
848.31	777	23.91

CDMA1900:

Mode: SO55 RC1Full rate

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1851.25	25	24.28
1880.00	600	23.94
1908.75	1175	23.72

Mode: SO55 RC3 Full rate

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1851.25	25	24.25
1880.00	600	24.10
1908.75	1175	23.61

Mode: SO32 RC3 FCH-SCH

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1851.25	25	24.47
1880.00	600	24.10
1908.75	1175	23.78

Mode: SO32 RC3 FCH+SCH

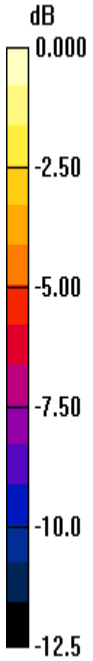
Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1851.25	25	24.44
1880.00	600	23.91
1908.75	1175	23.77

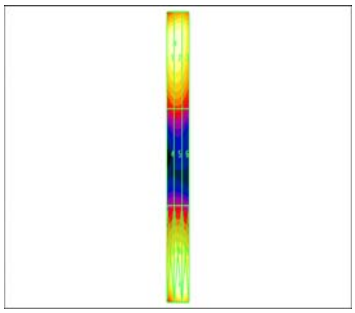
*RC Configuration tested at “all up” power control bit.

APPENDIX A: SYSTEM VALIDATION SCAN

System validation data 850MHz

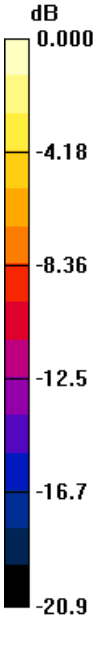
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1 Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3 Phantom section: RF Section	Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1 Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1 kg/m3 Phantom section: RF Section
E Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm Maximum value of peak Total field = 153.4 V/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, -6.30 mm Reference Value = 99.7 V/m; Power Drift = -0.054 dB	**H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm** Maximum value of peak Total field = 0.420 A/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, -6.30 mm Reference Value = 0.442 A/m; Power Drift = -0.002 dB

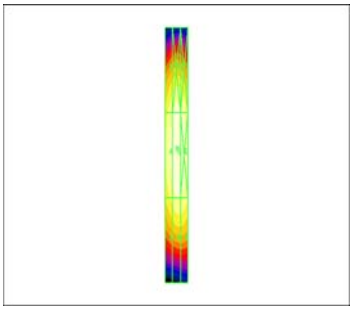




Peak E-field in V/m

Grid 1 149.5 M4	Grid 2 149.7 M4	Grid 3 142.1 M4
Grid 4 82.7 M4	Grid 5 83.2 M4	Grid 6 79.2 M4
Grid 7 142.4 M4	Grid 8 153.4 M4	Grid 9 152.6 M4



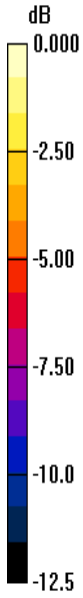


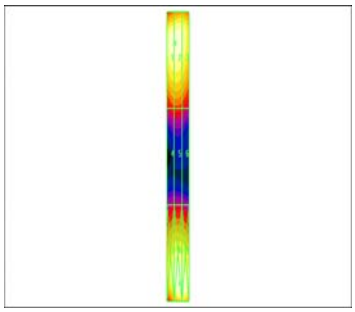
Peak H-field in A/m

Grid 1 0.354 M4	Grid 2 0.381 M4	Grid 3 0.371 M4
Grid 4 0.388 M4	Grid 5 0.420 M4	Grid 6 0.411 M4
Grid 7 0.327 M4	Grid 8 0.358 M4	Grid 9 0.355 M4

System validation data 1880MHz

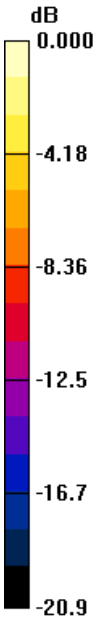
Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1 Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3 Phantom section: RF Section	Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1 Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1 kg/m3 Phantom section: RF Section
E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm Maximum value of peak Total field = 150.8 V/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, -6.30 mm Reference Value =154.6 V/m; Power Drift = -0.004 dB	**H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm** Maximum value of peak Total field = 0.483 A/m Probe Modulation Factor = 1.00 Device Reference Point: 0.000, 0.000, -6.30 mm Reference Value = 0.512 A/m; Power Drift = -0.051 dB

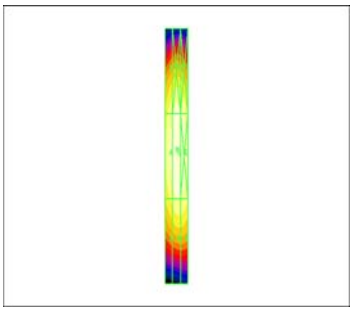




Peak E-field in V/m

Grid 1 146.2 M2	Grid 2 142.6 M2	Grid 3 142.1 M2
Grid 4 99.1 M3	Grid 5 100.1 M3	Grid 6 99.2 M3
Grid 7 150.1 M2	Grid 8 150.8 M2	Grid 9 149.6 M2





Peak H-field in A/m

Grid 1 0.431 M2	Grid 2 0.456 M2	Grid 3 0.435 M2
Grid 4 0.461 M2	Grid 5 0.483 M2	Grid 6 0.460 M2
Grid 7 0.428 M2	Grid 8 0.445 M2	Grid 9 0.417 M2

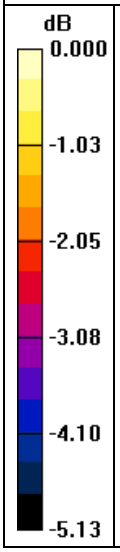
APPENDIX B: MEASUREMENT SCANS

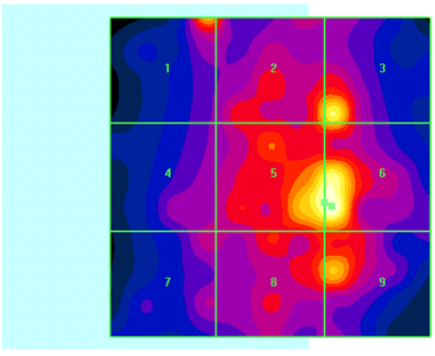
MEASUREMENT DATA CDMA800, CHANNEL Middle (836.52MHz)

Communication System: cdma 1X ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section
E Scan - ER3D - 2007: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 37.3 V/m
Probe Modulation Factor = 0.933
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 30.1 V/m; Power Drift = 0.102 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **27.8 M4**	Grid 2 **29.0 M4**	Grid 3 **32.4 M4**
Grid 4 **19.6 M4**	Grid 5 **36.3 M4**	Grid 6 **37.3 M4**
Grid 7 **19.8 M4**	Grid 8 **26.2 M4**	Grid 9 **28.0 M4**

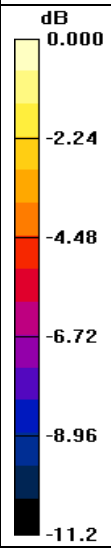


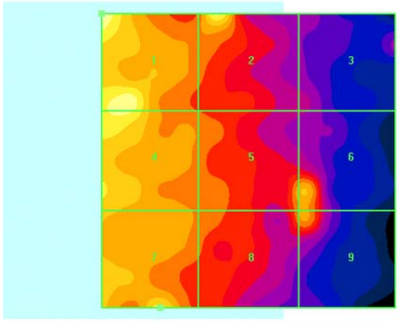


Communication System: cdma 1X ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section
H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.088 A/m
Probe Modulation Factor = 0.833
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.046 A/m; Power Drift = 0.146 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.088 M4**	Grid 2 **0.072 M4**	Grid 3 **0.033 M4**
Grid 4 **0.073 M4**	Grid 5 **0.053 M4**	Grid 6 **0.056 M4**
Grid 7 **0.066 M4**	Grid 8 **0.049 M4**	Grid 9 **0.051 M4**





MEASUREMENT DATA CDMA800, CHANNEL low (824.7MHz)

Communication System: cdma 1X ; Frequency: 824.7 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3

Phantom section: RF Section

E Scan - ER3D - 2007: 15 mm from Probe Sensor closest part to the Device 2/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 52.3 V/m

Probe Modulation Factor = 0.933

Device Reference Point: 0.000, 0.000, -6.30 mm

Reference Value = 28.9 V/m; Power Drift = -0.111 dB

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **39.0 M4**	Grid 2 **52.3 M4**	Grid 3 **46.8 M4**
Grid 4 **43.6 M4**	Grid 5 **50.3 M4**	Grid 6 **41.7 M4**
Grid 7 **39.4 M4**	Grid 8 **35.1 M4**	Grid 9 **40.9 M4**

Communication System: cdma 1X ; Frequency: 824.7 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3

Phantom section: RF Section

H Scan-H3DV6-2007:15mm from probe center to the device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.090 A/m

Probe Modulation Factor = 0.833

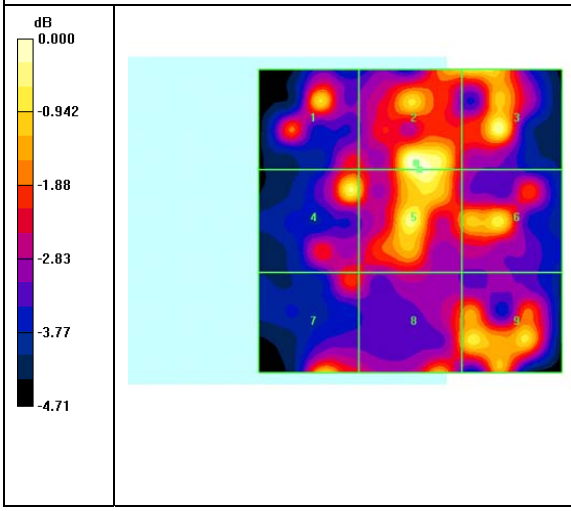
Device Reference Point: 0.000, 0.000, -6.30 mm

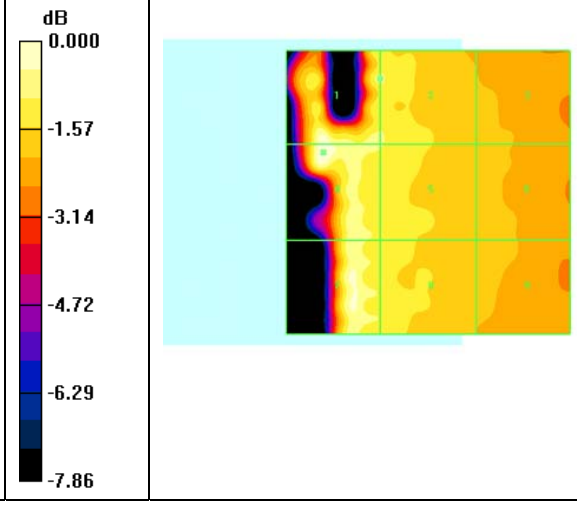
Reference Value = 0.002 A/m; Power Drift = 0.026dB

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.085 M4**	Grid 2 **0.047 M4**	Grid 3 **0.024 M4**
Grid 4 **0.090 M4**	Grid 5 **0.045 M4**	Grid 6 **0.023 M4**
Grid 7 **0.068 M4**	Grid 8 **0.041 M4**	Grid 9 **0.023 M4**





MEASUREMENT DATA CDMA800, CHANNEL High (848.3 MHz)

Communication System: cdma 1X ; Frequency: 848.3 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3

Phantom section: RF Section

E Scan - ER3D - 2007: 15 mm from Probe Sensor closest part to the Device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 24.7 V/m

Probe Modulation Factor = 0.933

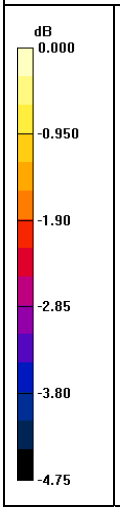
Device Reference Point: 0.000, 0.000, -6.30 mm

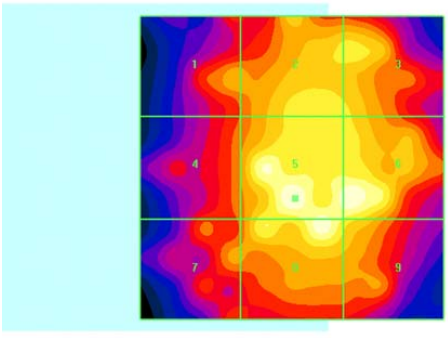
Reference Value = 37.5 V/m; Power Drift = -0.128 dB

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **20.6 M4**	Grid 2 **22.5 M4**	Grid 3 **22.4 M4**
Grid 4 **19.8 M4**	Grid 5 **24.7 M4**	Grid 6 **24.6 M4**
Grid 7 **20.1 M4**	Grid 8 **24.3 M4**	Grid 9 **22.4 M4**





Communication System: cdma 1X ; Frequency: 848.3 MHz;Duty Cycle: 1:1

Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3

Phantom section: RF Section

H-Scan-H3dv6-2007:15mm from probe center to the device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.109 A/m

Probe Modulation Factor = 0.833

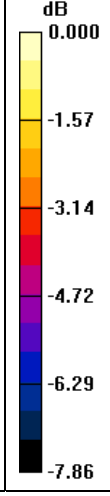
Device Reference Point: 0.000, 0.000, -6.30 mm

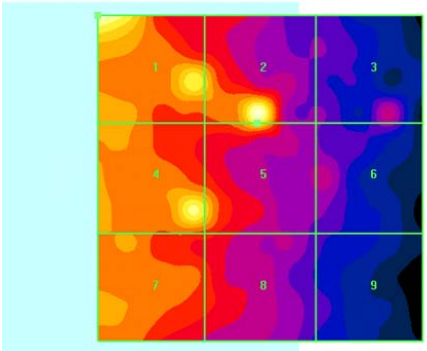
Reference Value = 0.056 A/m; Power Drift = 0.104 dB

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.109 M4**	Grid 2 **0.103 M4**	Grid 3 **0.040 M4**
Grid 4 **0.089 M4**	Grid 5 **0.080 M4**	Grid 6 **0.039 M4**
Grid 7 **0.063 M4**	Grid 8 **0.050 M4**	Grid 9 **0.031 M4**





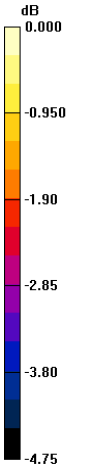
MEASUREMENT DATA CDMA1900, CHANNEL LOW (1851.25MHz)

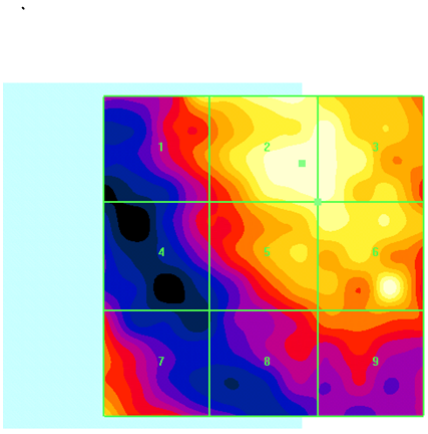
Communication System: cdma PCS (2000 ,1900);
Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section

E Scan - ER3D - 2007: 15 mm from Probe Sensor closest part to the Device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 12.3 V/m
Probe Modulation Factor = 0.820
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 12.9 V/m; Power Drift = 0.018 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **11.2 M4**	Grid 2 **12.3 M4**	Grid 3 **12.0 M4**
Grid 4 **8.12 M4**	Grid 5 **11.5 M4**	Grid 6 **12.2 M4**
Grid 7 **10.6 M4**	Grid 8 **8.94 M4**	Grid 9 **9.30 M4**



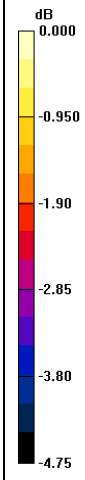


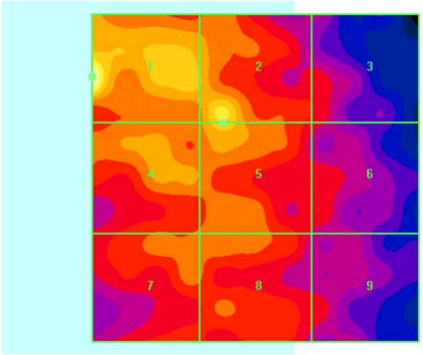
Communication System: cdma PCS (2000 ,1900);
Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section

H Scan-H3DV6-2007:15mm from probe center to the device/Hearing Aid Compatibility Test (101x101x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.065 A/m
Probe Modulation Factor = 0.990
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.050 A/m; Power Drift = -0.035 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.065 M4**	Grid 2 **0.054 M4**	Grid 3 **0.040 M4**
Grid 4 **0.047 M4**	Grid 5 **0.052 M4**	Grid 6 **0.040 M4**
Grid 7 **0.044 M4**	Grid 8 **0.045 M4**	Grid 9 **0.039 M4**





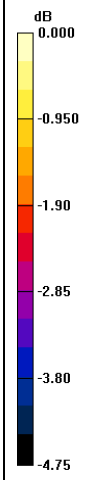
MEASUREMENT DATA CDMA1900, CHANNEL MID (1880.0MHz)

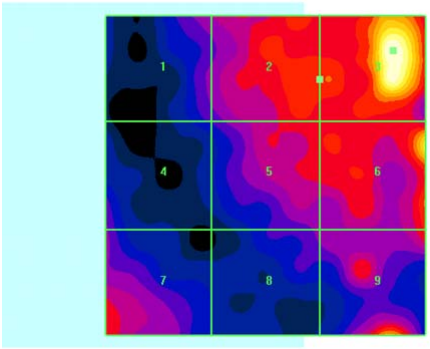
Communication System: cdma PCS (2000 ,1900);
Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section

E Scan - ER3D - 2007: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 18.1 V/m
Probe Modulation Factor = 0.820
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 9.81 V/m; Power Drift = 0.053 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak E-field in V/m

Grid 1 **7.37 M4**	Grid 2 **9.80 M4**	Grid 3 **18.1 M4**
Grid 4 **6.85 M4**	Grid 5 **8.87 M4**	Grid 6 **14.4 M4**
Grid 7 **8.89 M4**	Grid 8 **6.88 M4**	Grid 9 **11.8 M4**



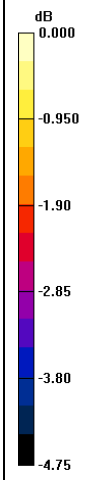


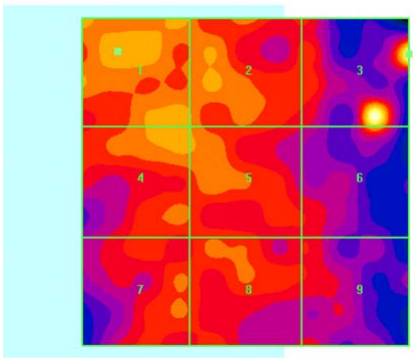
Communication System: cdma PCS (2000 ,1900);
Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section

H Scan - H3DV6 - 2007: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.047 A/m
Probe Modulation Factor = 0.990
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.032 A/m; Power Drift = 0.007 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

Peak H-field in A/m

Grid 1 **0.037 M4**	Grid 2 **0.035 M4**	Grid 3 **0.047 M4**
Grid 4 **0.036 M4**	Grid 5 **0.035 M4**	Grid 6 **0.037 M4**
Grid 7 **0.033 M4**	Grid 8 **0.033 M4**	Grid 9 **0.031 M4**





MEASUREMENT DATA CDMA1900, CHANNEL HIGH (1908.75MHz)

Communication System: cdma PCS (2000 ,1900); Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section
E Scan - ER3D - 2007: 15 mm from Probe Sensor closest part to the Device 2/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 16.6 V/m
Probe Modulation Factor = 0.820
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 11.2 V/m; Power Drift = 0.110 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

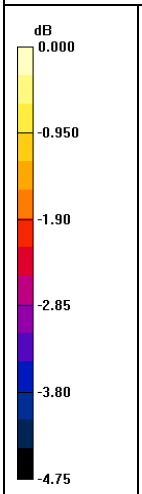
Peak E-field in V/m

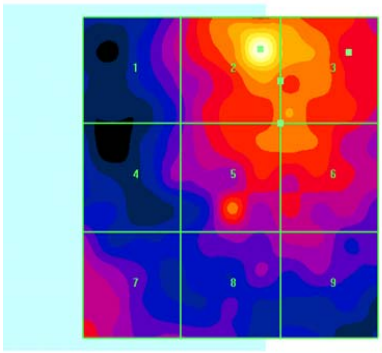
Grid 1 **8.38 M4**	Grid 2 **16.6 M4**	Grid 3 **12.2 M4**
Grid 4 **7.68 M4**	Grid 5 **10.7 M4**	Grid 6 **10.9 M4**
Grid 7 **9.77 M4**	Grid 8 **8.05 M4**	Grid 9 **8.31 M4**

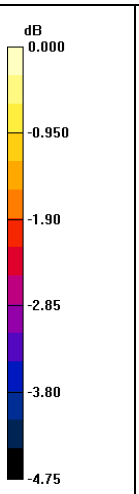
Communication System: cdma PCS (2000 ,1900); Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used: σ = 0 mho/m, εr = 1; ρ = 1000 kg/m3
Phantom section: RF Section
H-Scan-H3dv6-2007:15mm from probe center to the device/Hearing Aid Compatibility Test (101x101x1):
Measurement grid: dx=5mm, dy=5mm
Maximum value of peak Total field = 0.058 A/m
Probe Modulation Factor = 0.990
Device Reference Point: 0.000, 0.000, -6.30 mm
Reference Value = 0.035 A/m; Power Drift = -0.146 dB
Hearing Aid Near-Field Category: M4 (AWF 0 dB)

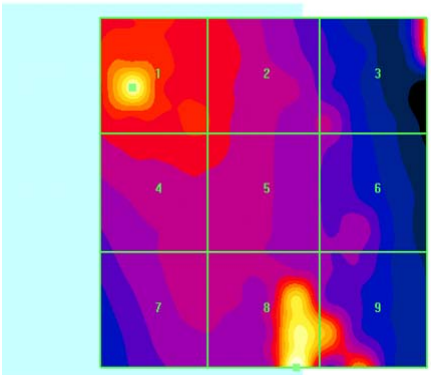
Peak H-field in A/m

Grid 1 **0.054 M4**	Grid 2 **0.036 M4**	Grid 3 **0.049 M4**
Grid 4 **0.036 M4**	Grid 5 **0.036 M4**	Grid 6 **0.031 M4**
Grid 7 **0.032 M4**	Grid 8 **0.058 M4**	Grid 9 **0.046 M4**









APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORTS

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Flextronics (Auden)

Certificate No: ER3-2371_Aug10

CALIBRATION CERTIFICATE

Object	ER3DV6 - SN:2371
Calibration procedure(s)	QA CAL-02.v5 and QA CAL-25.v2 Calibration procedure for E-field probes optimized for close near field evaluations in air
Calibration date:	August 23, 2010

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ER3DV6	SN: 2328	3-Oct-09 (No. ER3-2328_Oct09)	Oct-10
DAE4	SN: 789	23-Dec-09 (No. DAE4-789_Dec09)	Dec-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 24, 2010

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Glossary:

NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1309-2005, " IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 for XY sensors and ϑ = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart).
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ER3DV6

SN:2371

Manufactured:	October 12, 2005
Last calibrated:	February 16, 2009
Recalibrated:	August 23, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

ER3DV6 SN:2371 August 23, 2010

DASY/EASY - Parameters of Probe: ER3DV6 SN:2371

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)	1.73	1.62	2.00	± 10.1%
DCP (mV)[A]	96.4	92.4	97.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5 %
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

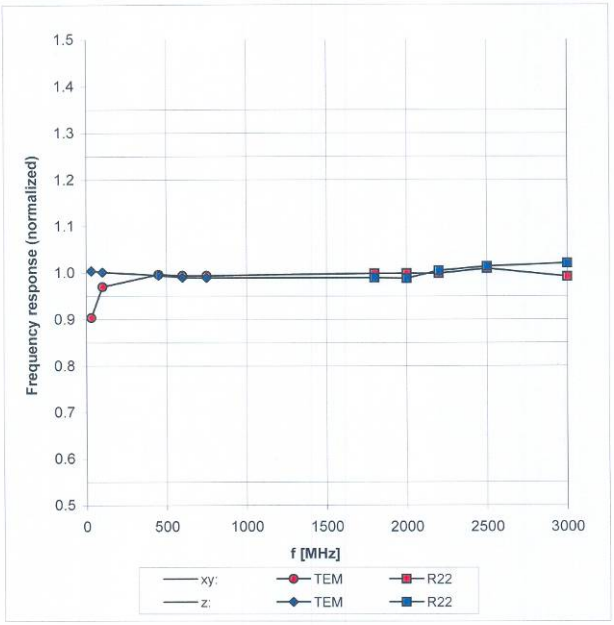
[A] numerical linearization parameter: uncertainty not required

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

ER3DV6 SN:2371 August 23, 2010

Frequency Response of E-Field

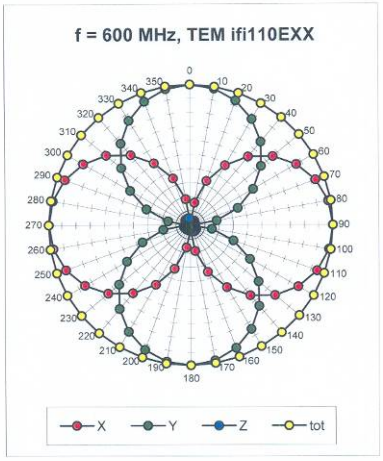
(TEM-Cell:ifi110 EXX, Waveguide R22)

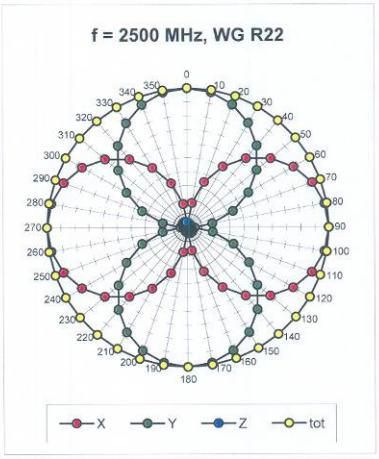


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

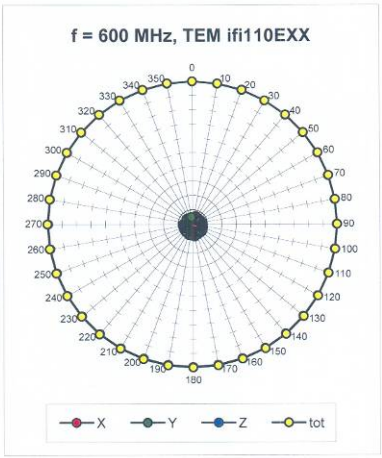
ER3DV6 SN:2371 August 23, 2010

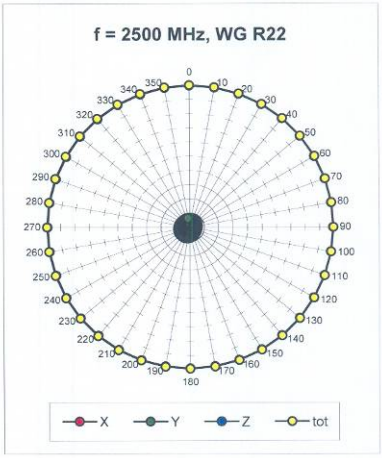
Receiving Pattern (ϕ), ϑ = 0°





Receiving Pattern (ϕ), ϑ = 90°

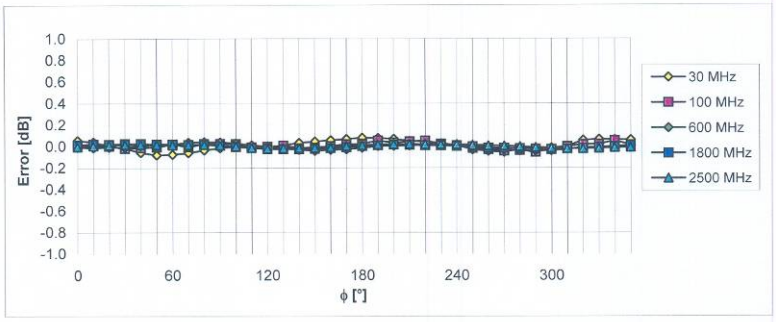




Certificate No: ER3-2371_Aug10 Page 6 of 10

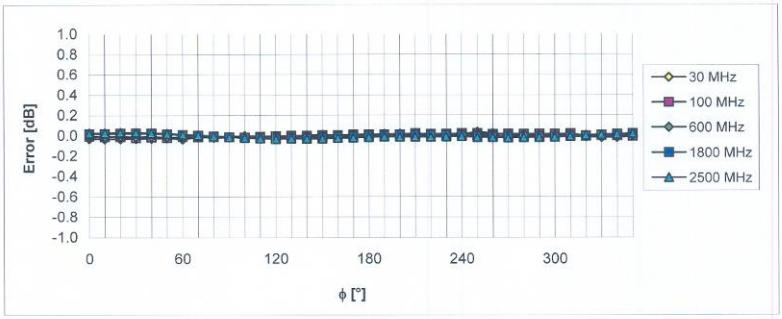
ER3DV6 SN:2371 August 23, 2010

Receiving Pattern (ϕ), ϑ = 0°



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Receiving Pattern (ϕ), ϑ = 90°



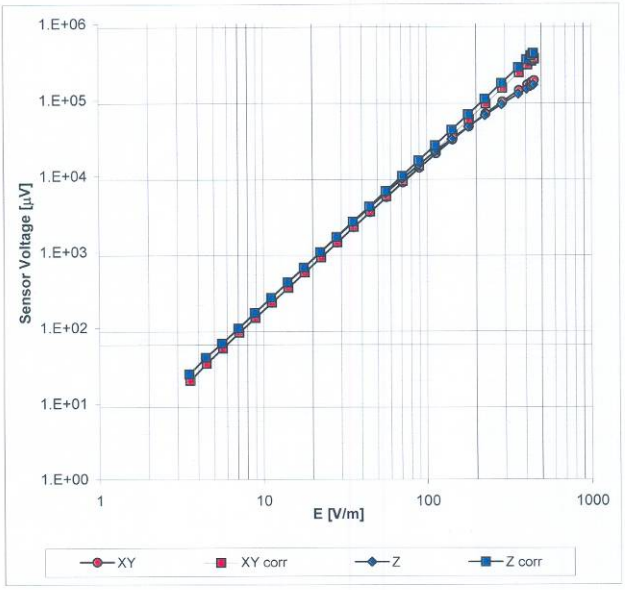
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

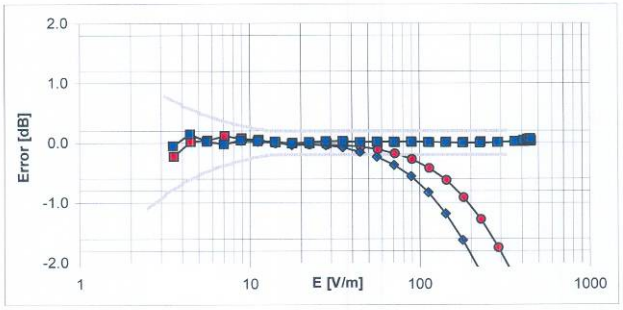
ER3DV6 SN:2371

August 23, 2010

Dynamic Range f(E-field)

(Waveguide R22, f = 1800 MHz)

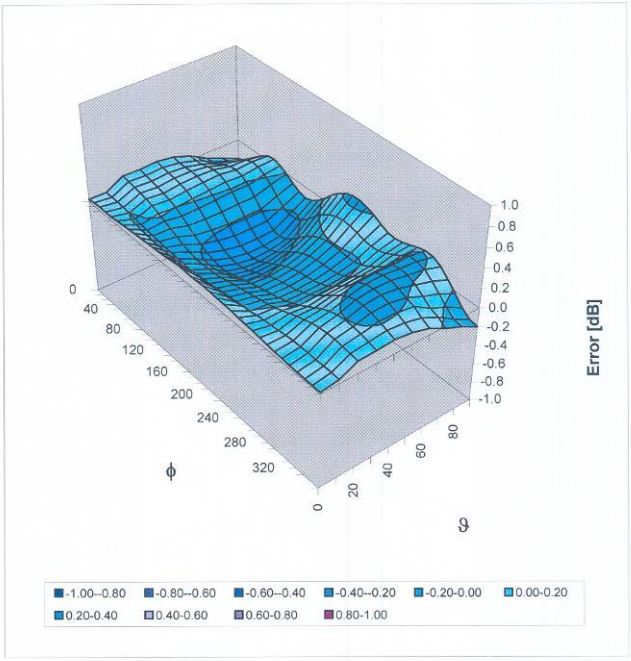




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ER3DV6 SN:2371 August 23, 2010

Deviation from Isotropy in Air
Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

ER3DV6 SN:2371 August 23, 2010

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	35.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8.0 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm

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Accreditation No.: SCS 108

Client Flextronics (Auden)

Certificate No: H3-6198_Aug10

CALIBRATION CERTIFICATE

Object	H3DV6 - SN:6198
Calibration procedure(s)	QA CAL-03.v5 and QA CAL-25.v2 Calibration procedure for H-field probes optimized for close near field evaluations in air
Calibration date:	August 23, 2010

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe H3DV6	SN: 6182	3-Oct-09 (No. H3-6182_Oct09)	Oct-10
DAE4	SN: 789	23-Dec-09 (No. DAE4-789_Dec09)	Dec-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 24, 2010

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1309-2005, " IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005.

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 for XY sensors and ϑ = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
- *X,Y,Z(f)_a0a1a2= X,Y,Z_a0a1a2* frequency_response* (see Frequency Response Chart).
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z; VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *X_a0a1a2* (no uncertainty required).

Probe H3DV6

SN:6198

Manufactured:	April 18, 2006
Last calibrated:	February 16, 2009
Recalibrated:	August 23, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

H3DV6 SN:6198 August 23, 2010

DASY/EASY - Parameters of Probe: H3DV6 SN:6198

Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(μV))	a0	2.39E-3	2.45E-3	2.81E-3	± 5.1%
Norm (A/m / √(μV))	a1	-7.46E-5	2.35E-6	-5.23E-5	± 5.1%
Norm (A/m / √(μV))	a2	6.69E-5	7.37E-5	6.00E-5	± 5.1%
DCP (mV)[A]		91.2	86.2	86.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5 %
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] numerical linearization parameter: uncertainty not required

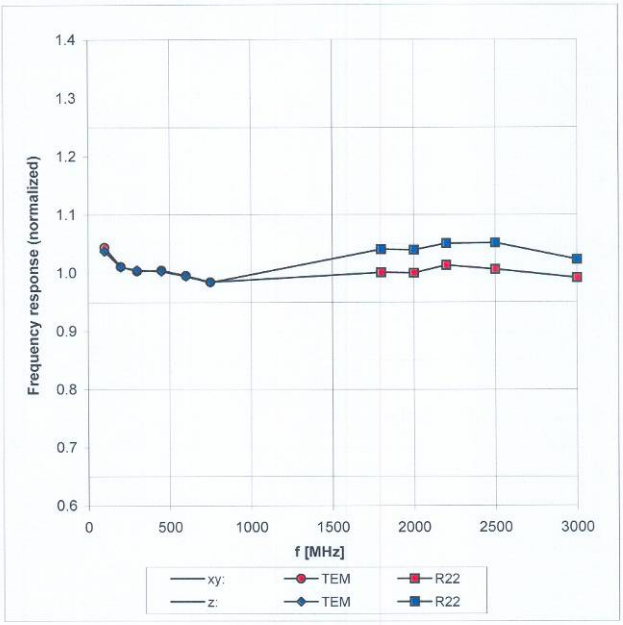
[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

H3DV6 SN:6198

August 23, 2010

Frequency Response of H-Field

(TEM-Cell:ifi110 EXX, Waveguide R22)

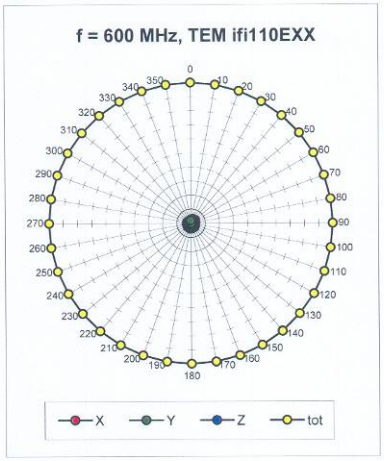


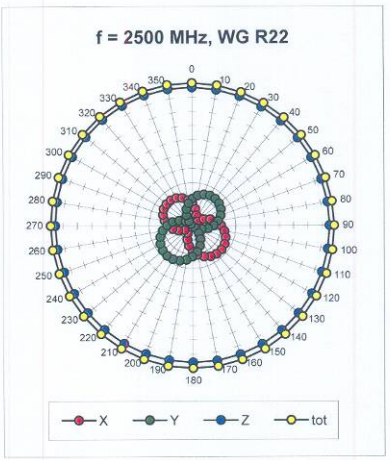
Uncertainty of Frequency Response of H-field: ± 6.3% (k=2)

H3DV6 SN:6198

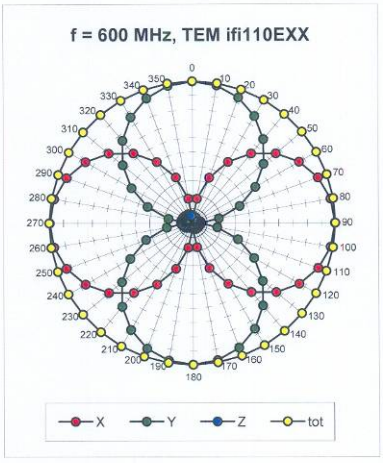
August 23, 2010

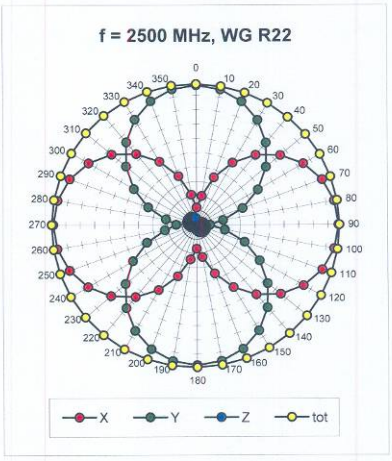
Receiving Pattern (ϕ), ϑ = 90°





Receiving Pattern (ϕ), ϑ = 0°

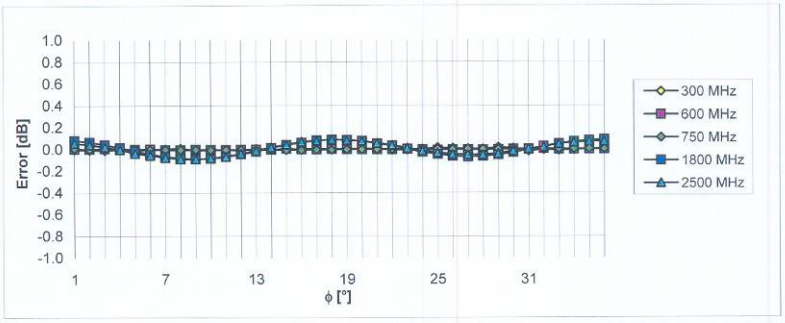




Certificate No: H3-6198_Aug10 Page 6 of 10

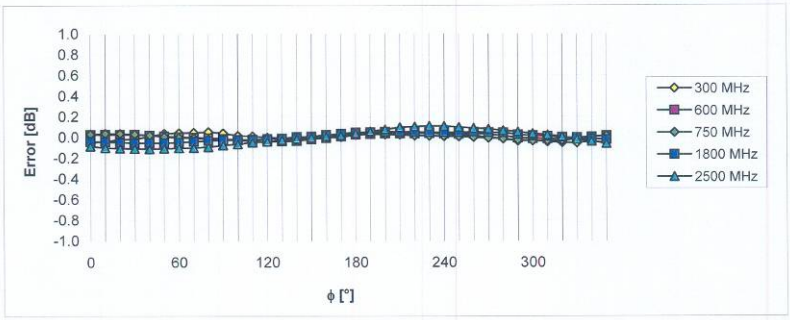
H3DV6 SN:6198 August 23, 2010

Receiving Pattern (ϕ), ϑ = 90°



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



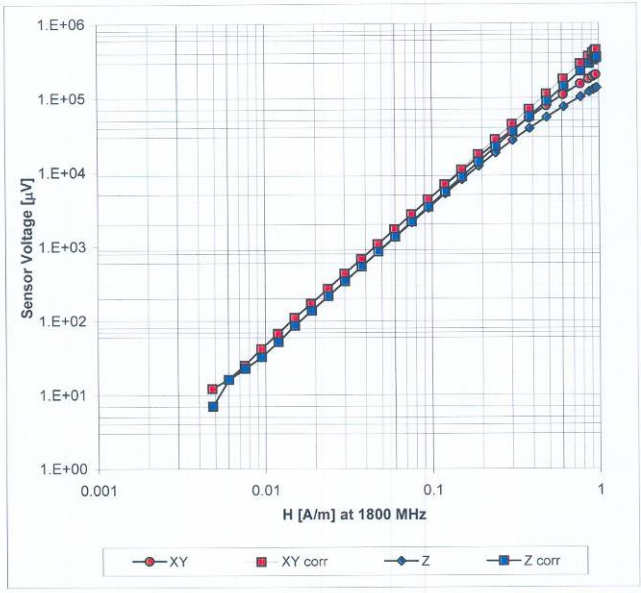
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

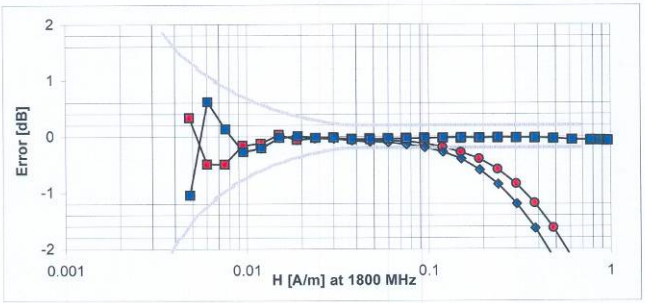
H3DV6 SN:6198

August 23, 2010

Dynamic Range f(H-field)

(Waveguide R22, f = 1800 MHz)





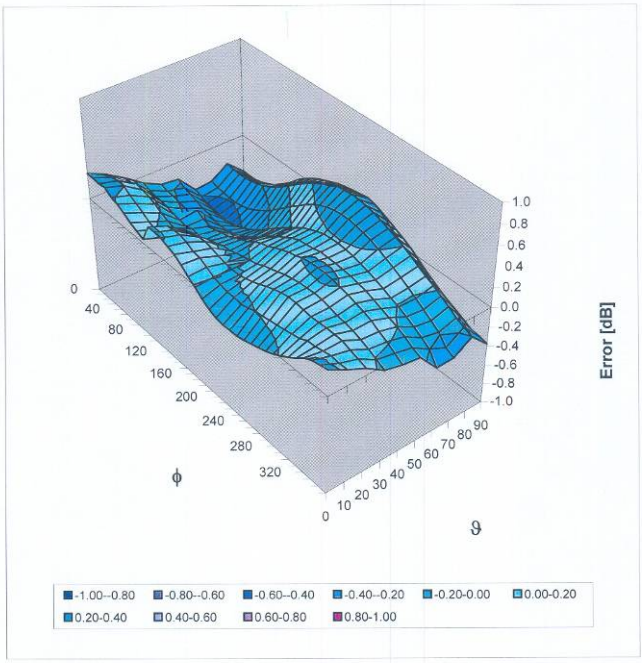
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: H3-6198_Aug10 Page 8 of 10

H3DV6 SN:6198

August 23, 2010

Deviation from Isotropy in Air
Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-222.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	20 mm
Tip Diameter	6.0 mm
Probe Tip to Sensor X Calibration Point	3 mm
Probe Tip to Sensor Y Calibration Point	3 mm
Probe Tip to Sensor Z Calibration Point	3 mm