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Daoud Attayi	May 17-18, June 02-03, 2010	RTS-2581-1006-02	L6ARCU20CW

Annex B: Probe and dipole description and calibration certificates

B.1 Probe, measurement chain description, specification and calibration certificate

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DASY Dosimetric Assessment System by Schmid & Partner Engineering AG



ER3DV6 ISOTROPIC E-FIELD PROBE FOR GENERAL NEAR-FIELD Applications MEASUREMENTS Support & Downloads Download Product Flyer (PDF, 192kB) Products DASY4 Packages • EASY4 One dipole parallel, two dipoles normal to probe axis Construction Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., ET3DV6 - Isotropic Dos-Probe glycolether) ES3DV3 - Isotropic Dos-Probe EX3DV4 - Isotropic Dos-Probe Calibration In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2) ET1DV3 - D-Prob EUV3 - Universal Vector E-Probe Frequency 100 MHz to > 6 GHz; Linearity: ± 0.2 dB (100 MHz to 3 GHz) H3DV6 - Isotropic H-Probe HUV4 - Universal Vector H-Probe Directivity ± 0.2 dB in air (rotation around probe axis) T1V3 - Temp-Probe ± 0.4 dB in air (rotation normal to probe axis) DP1 - Dummy-Probe Dynamic Range Data Acquisition System 2 V/m to > 1000 V/m; 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 Validation Kits & Calibration Dipoles Application General near-field measurements up to 6 GHz Hearing Aid Compatibility (HAC) Ext Field component measurements • Tissue Simulating Liquids Fast automatic scanning in phantoms SPEAG Home

http://www.dasy4.com/er3.htm

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DASY Dosimetric Assessment System by Schmid & Partner Engineering AG



H3DV6 3-DIMENSIONAL H-FIELD PROBE FOR SMALL BAND Applications APPLICATIONS Support & Downloads 🔼 <u>Download Product Flyer</u> (PDF, 192kB) Products • DASY4 Packages • EASY4 Construction Three concentric loop sensors with 3.8 mm loop diameters Resistively loaded detector diodes for linear response Probes Built-in shielding against static charges ET3DV6 - Isotropic Dos-Probe PEEK enclosure material (resistant to organic solvents, e.g., ES3DV3 - Isotropic Dos-Probe glycolether) EX3DV4 - Isotropic Dos-Probe ET1DV3 - D-Probe 200 MHz to 3 GHz (absolute accuracy \pm 6.0%, k=2); Frequency ER3DV6 - Isotropic E-Probe Output linearized EUV3 - Universal Vector E-Pri Directivity ± 0.25 dB (spherical isotropy error) Dynamic Range 10 mA/m to 2 A/m at 1 GHz HUV4 - Universal Vector H-Probe T1V3 - Temp-Probe E-Field Interference < 10% at 3 GHz (for plane wave) DP1 - Dummy-Probe Overall length: 330 mm (Tip: 40 mm) Data Acquisition System Dimensions Tip diameter: 6 mm (Body: 12 mm) Distance from probe tip to dipole centers: 3 mm Phantoms Application General magnetic near-field measurements up to 3 GHz Field component measurements Surface current measurements Measurements in air or liquids • Hearing Aid Compatibility (HAC) Ext Low interaction with the measured field Tissue Simulating Liquids SPEAG Home

http://www.dasy4.com/h3d.htm

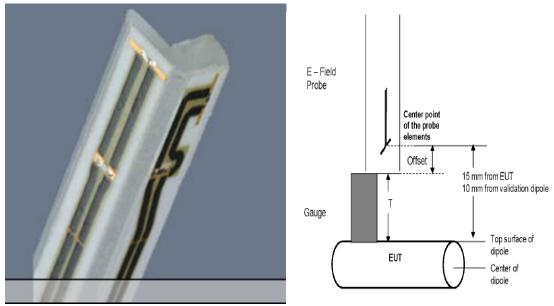
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Description Testing	Annex B _Hearing Aid Compa		
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All measurements were performed to the nearest element point as per the C63.19 standard. Offset distances were entered in the DASY4 software so that the measurement was to the nearest element.

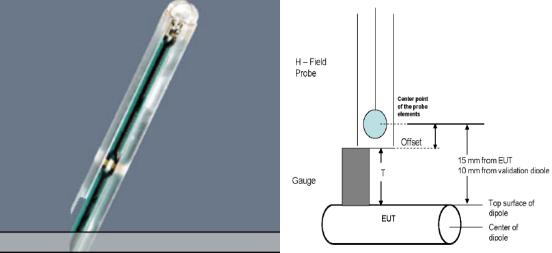
Figures 1 and 2, provided by the manufacturer, illustrate detail of the probe tip and its dimensions.

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.

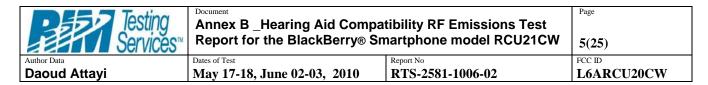
H3DV6 H-Field probe: The distance from the probe tip to the closest point of the X, Y and Z loop sensors is 1.1mm. From the probe tip to the center of the sensor is 3.00mm.



E-Field Probe (ER3DV6)



H-Field Probe (H3DV6)



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:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$
(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:

E – field
probes :
$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$${
m H-field probes}$$
 : $H_i = \sqrt{V_i} \cdot rac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$

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):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$
 (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%.



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





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

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

RTS (RIM Testing Services)

Certificate No: ER3-2286_Jan10

Accreditation No.: SCS 108

ALIBRATION	CERTIFICAT	医多类素多类	
bject	ER3DV6 - SN:2	286	
calibration procedure(s)		and QA CAL-25.v2 edure for E-field probes optimized ir	for close near field
alibration date:	January 8, 2010		
he measurements and the uno	ertainties with confidence	tional standards, which realize the physical uni probability are given on the following pages and ory facility: environment temperature (22 ± 3)°C	d are part of the certificate.
alibration Equipment used (M8		, idami, idami	
rimary Standards	ID#	Cal Date (Certificate No.)	Scheduled Calibration
ower meter E4419B	ID# GB41293874	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030)	Scheduled Calibration Apr-10
ower meter E4419B			
ower meter E4419B ower sensor E4412A	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10 Apr-10 Apr-10
wer meter E4419B wer sensor E4412A wer sensor E4412A	GB41293874 MY41495277	1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030)	Apr-10 Apr-10
ower meter E4419B ower sensor E4412A ower sensor E4412A eference 3 dB Attenuator	GB41293874 MY41495277 MY41498087	1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030)	Apr-10 Apr-10 Apr-10
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Primary Standards Power meter E4419B Power sensor E4412A Power Standards Power E43DV6	GB41293674 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 2328 SN: 789 ID # US3642U01700 US37390585 Name Kaţa Pokovic	1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028) 31-Mar-09 (No. 217-01027) 3-Oct-09 (No. ER3-2328_Oct09) 23-Dec-09 (No. DAE4-789_Dec09) Check Date (in house) 4-Aug-99 (in house check Oct-09) 18-Oct-01 (in house check Oct-09) Function Technical Manager	Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Oct-10 Dec-10 Scheduled Check In house check: Oct-11 In house check: Oct10

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Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Accreditation No.: SCS 108

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

Glossary:

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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 9 9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 9 = 0 is normal to probe axis

information used in DASY system to align probe sensor X to the robot coordinate system Connector Angle

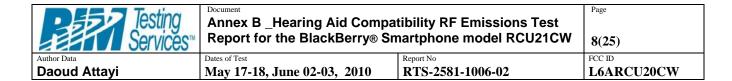
Calibration is Performed According to the Following Standards:

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 \leq 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
- 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).

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ER3DV6 SN:2286 January 8, 2010

Probe ER3DV6

SN:2286

Manufactured: September 18, 2002 Last calibrated: January 8, 2009 Recalibrated: January 8, 2010

Calibrated for DASY Systems
(Note: non-compatible with DASY2 system!)

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ER3DV6 SN:2286

January 8, 2010

DASY - Parameters of Probe: ER3DV6 SN:2286

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m)^2)$	2.23	1.50	1.54	± 10.1%
DCP (mV) ^A	94.9	94.8	95.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	С	VR mV	Unc ^E (k=2)
10000	cw	0.00	х	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%.

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A numerical linearization parameter, uncertainty not required

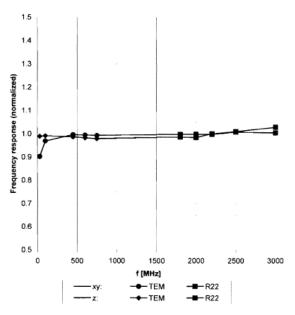
E Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

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Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide R22)



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

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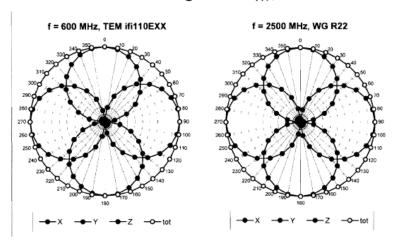
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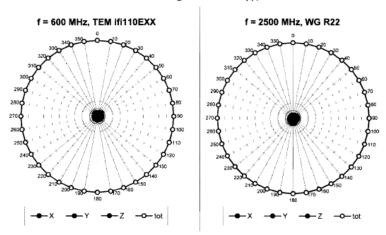
L6ARCU20CW

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Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



Receiving Pattern (ϕ), $\vartheta = 90^{\circ}$



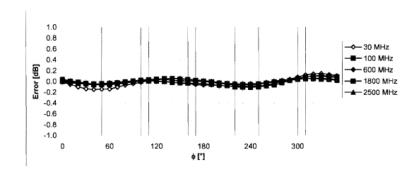
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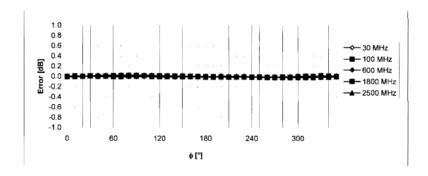
ER3DV6 SN:2286 January 8, 2010

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



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

Receiving Pattern (ϕ), ϑ = 90°



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

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f Test

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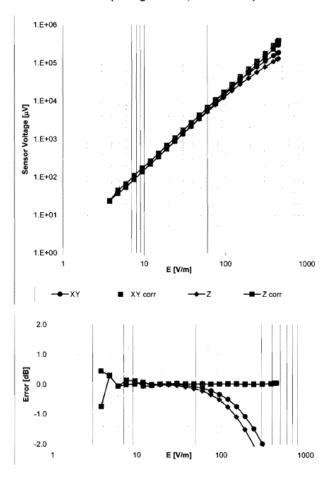
FCC ID L6ARCU20CW

ER3DV6 SN:2286

January 8, 2010

Dynamic Range f(E-field)

(Waveguide R22, f = 1800 MHz)



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

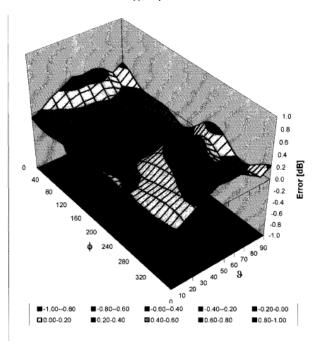
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ER3DV6 SN:2286 January 8, 2010

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



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

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May 17-18, June 02-03, 2010

RTS-2581-1006-02

L6ARCU20CW

ER3DV6 SN:2286

January 8, 2010

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-9.5
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

Certificate No: ER3-2286_Jan10

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Annex B _Hearing Aid Compatibility RF Emissions Test Report for the BlackBerry® Smartphone model RCU21CW

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Daoud Attayi

Dates of Test

May 17-18, June 02-03, 2010

RTS-2581-1006-02

L6ARCU20CW

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





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

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

Client RTS (RIM Testing Services)

Certificate No: H3-6105_Nov09

bject	H3DV6 - SN:61	05	Service State Court
alibration procedure(s)		and QA CAL-25.v2 edure for H-field probes optimized ir	l for close near field
alibration date:	November 13, 2	1009	
		itional standards, which realize the physical uni probability are given on the following pages an	1 7
Il calibrations have been condu	ucted in the closed laborat	ory facility: environment temperature (22 ± 3)°C	C and humidity < 70%.
		ory facility: environment temperature (22 ± 3)°C	C and humidity < 70%.
alibration Equipment used (M8		ory facility: environment temperature (22 ± 3)*C Cal Date (Certificate No.)	C and humidity < 70%. Scheduled Calibration
alibration Equipment used (M8	TE critical for calibration)		,
alibration Equipment used (M8 rimary Standards lower meter E4419B lower sensor E4412A	ID # GB41293874 MY41495277	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030)	Scheduled Calibration Apr-10 Apr-10
Failbration Equipment used (M8 rimary Standards ower meter E4419B ower sensor E4412A ower sensor E4412A	ID # GB41293874 MY41495277 MY41498087	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030)	Scheduled Calibration Apr-10 Apr-10 Apr-10
calibration Equipment used (M8 frimary Standards fower meter E4419B ower sensor E4412A fower sensor E4412A teference 3 dB Attenuator	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c)	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b)	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10
calibration Equipment used (M8 trimary Standards lower meter E4419B lower sensor E4412A lower sensor E4412A teference 3 dB Attenuator teference 20 dB Attenuator teference 30 dB Attenuator	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b)	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028) 31-Mar-09 (No. 217-01027)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Mar-10
All calibrations have been condu- Calibration Equipment used (M& Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b)	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference 70 b Attenuator Reference 70 b Attenuator	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 6182	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028) 31-Mar-09 (No. 217-01027) 31-Mar-09 (No. 217-01027) 3-Oct-09 (No. H3-6182_Oct09)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Mar-10 Oct-10
calibration Equipment used (M8 trimary Standards lower meter E4419B lower sensor E4412A lower sensor E4412A leference 3 dB Attenuator leference 20 dB Attenuator leference 30 dB Attenuator leference Probe H3DV6 l	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 6182 SN: 789	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028) 31-Mar-09 (No. 217-01027) 3-Oct-09 (No. H3-6182_Oct09) 19-Dec-08 (No. DAE4-789_Dec08)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Mar-10 Oct-10 Dec-09
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference Probe H3DV6 PARE4	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 6182 SN: 789 ID #	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028) 31-Mar-09 (No. 217-01027) 3-Oct-09 (No. H3-6182_Oct09) 19-Dec-08 (No. DAE4-789_Dec08) Check Date (in house)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Oct-10 Dec-09 Scheduled Check
railibration Equipment used (M8 rimary Standards ower meter E4419B ower sensor E4412A ower sensor E4412A leference 3 dB Attenuator leference 20 dB Attenuator leference 30 dB Attenuator leference Probe H3DV6 IAE4 econdary Standards IF generator HP 8648C letwork Analyzer HP 8753E	ID # GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 789 ID # US3642U01700 US37390585 Name	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01028) 31-Mar-09 (No. 217-01027) 3-Oct-09 (No. 13-6182 Oct09) 19-Dec-08 (No. DAE4-789 Dec08) Check Date (in house) 4-Aug-99 (in house check Oct-09) 18-Oct-01 (in house check Oct-09)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Mar-10 Oct-10 Dec-09 Scheduled Check In house check: Oct-11
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe H3DV6 PAE4 Recondary Standards RF generator HP 8648C	ID # GB41293874 MY41495277 MY41498277 MY41498087 SN: S5084 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 6182 SN: 789 ID # US3642U01700 US37390585	Cal Date (Certificate No.) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 1-Apr-09 (No. 217-01030) 31-Mar-09 (No. 217-01026) 31-Mar-09 (No. 217-01027) 3-Cct-09 (No. 1217-01027) 3-Cct-09 (No. DAE4-789_Dec08) Check Date (in house) 4-Aug-99 (in house check Oct-09) 18-Oct-01 (in house check Oct-09)	Scheduled Calibration Apr-10 Apr-10 Apr-10 Mar-10 Mar-10 Mar-10 Oct-10 Oct-10 Dec-09 Scheduled Check In house check: Oct-11 In house check: Oct10

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Daoud Attayi

May 17-18, June 02-03, 2010

RTS-2581-1006-02

L6ARCU20CW

Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerlscher Kalibrierdienst s Service suisse d'étalonnage С Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

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

Glossary:

NORMx,y,z

sensitivity in free space

DCP diode compression point crest factor (1/duty_cycle) of the RF signal CF

modulation dependent linearization parameters

A, B, C Polarization φ $\boldsymbol{\phi}$ rotation around probe axis Polarization 9

9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., $\vartheta = 0$ 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 \leq 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).

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H3DV6 SN:6105 November 13, 2009

Probe H3DV6

SN:6105

Manufactured: January 5, 2002 Last calibrated: November 10, 2008 Recalibrated: November 13, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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Daoud Attayi

May 17-18, June 02-03, 2010

RTS-2581-1006-02

L6ARCU20CW

H3DV6 SN:6105 November 13, 2009

DASY - Parameters of Probe: H3DV6 SN:6105

Basic Calibration Parameters

		Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (A/m / √(μV))	a0	2.89E-3	2.67E-3	3.00E-3	± 5.1%
Norm (A/m / √(μV))	a1	6.03E-5	3.03E-5	-9.91E-5	± 5.1%
Norm (A/m / √(μV))	a2	-1.23E-5	3.46E-6	1.02E-5	± 5.1%
DCP (mV) ^A		89.5	84.4	83.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	С	VR mV	Unc ^E (k=2)
10000	cw	0.00	×	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%.

Certificate No: H3-6105_Nov09

A numerical linearization parameter: uncertainty not required

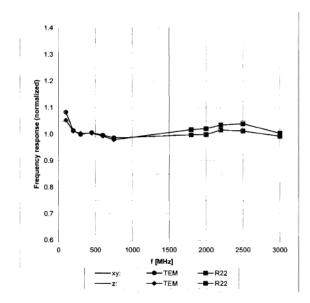
E Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value

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Daoud Attayi	May 17-18, June 02-03, 2010	RTS-2581-1006-02	L6ARCU20CW

H3DV6 SN:6105 November 13, 2009

Frequency Response of H-Field

(TEM-Cell:ifi110 EXX, Waveguide R22)



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

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May 17-18, June 02-03, 2010

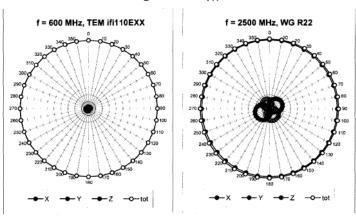
RTS-2581-1006-02

FCC ID

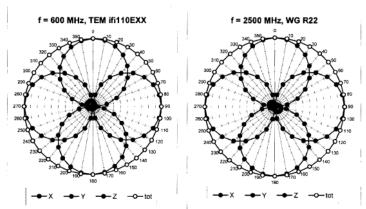
L6ARCU20CW

H3DV6 SN:6105 November 13, 2009

Receiving Pattern (ϕ), ϑ = 90°



Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



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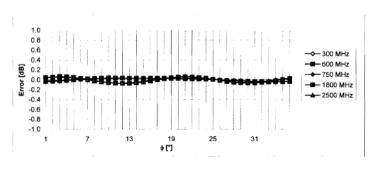
May 17-18, June 02-03, 2010

RTS-2581-1006-02

L6ARCU20CW

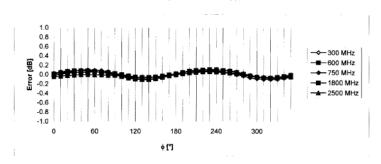
H3DV6 SN:6105 November 13, 2009

Receiving Pattern (ϕ), $\vartheta = 90^{\circ}$



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

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



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

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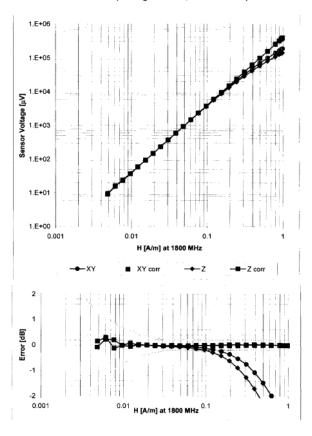
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H3DV6 SN:6105 November 13, 2009

Dynamic Range f(H-field)

(Waveguide R22, f = 1800 MHz)



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

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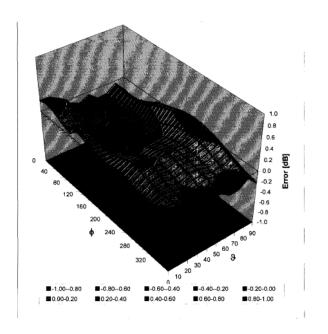
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H3DV6 SN:6105 November 13, 2009

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



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

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May 17-18, June 02-03, 2010

RTS-2581-1006-02

L6ARCU20CW

H3DV6 SN:6105

November 13, 2009

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	-243.0
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

Certificate No: H3-6105_Nov09

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