HAC (T-Coil) TEST REPORT

Summary Result: T-Rating Category = T4

REPORT NO.: SA111221C21-2

MODEL NO.: PJ53100

FCC ID: NM8PJ53100

RECEIVED: Dec. 21, 2011

TESTED: Jan. 19, 2012

ISSUED: Jan. 20, 2012

APPLICANT: HTC Corporation

ADDRESS: 23, Xinghua Rd., Taoyuan 330, Taiwan, R.O.C.

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Dist., New Taipei City 244, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	N/A	Jan. 20, 2012

1. CERTIFICATION

PRODUCT : Smartphone
MODEL NO. : PJ53100
BRAND : HTC
APPLICANT : HTC Corporation
TESTED : Jan. 19, 2012
STANDARDS : FCC 47 CFR Part 20.19
ANSI C63.19-2007
TEST ITEM: T-coil performance

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch,** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Pettie Chen / Specialist , **DATE:** Jan. 20, 2012

APPROVED BY : Gary Chang / Technical Manager , **DATE:** Jan. 20, 2012

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

EUT	Smartphone
MODEL NO.	PJ53100
CLASSIFICATION	Production Unit
MODULATION TYPE	QPSK, OQPSK, HPSK
TX FREQUENCY RANGE	CDMA2000 BC0 : 824 MHz ~ 849 MHz CDMA2000 BC1 : 1850 MHz ~ 1910 MHz
ANTENNA TYPE	Fixed internal antenna
ACCESSORY DEVICES	Refer to Note as below

Air Interfaces/Bands List						
Air Interface	**Band**	**Type**	**C63.19 Tested**	**Simultaneous Transmissions**	**Reduced Power**	**VOIP**
CDMA2000 1xRTT	BC0	Voice	Yes	1xEVDO+WLAN/BT LTE+WLAN/BT	N/A	N/A
	BC1	Voice	Yes	1xEVDO+WLAN/BT LTE+WLAN/BT	N/A	N/A
CDMA2000 1xEVDO	BC0	Data	N/A	1xRTT+WLAN/BT	N/A	Yes
	BC1	Data	N/A	1xRTT+WLAN/BT	N/A	Yes
LTE	13	Data	N/A	1xRTT+WLAN/BT	N/A	Yes
WLAN	2.4G	Data	N/A	1xRTT+1xEVDO+BT 1xRTT+LTE+BT	N/A	Yes
	5G	Data	N/A	1xRTT+1xEVDO+BT 1xRTT+LTE+BT	N/A	Yes
BT	2.4G	Data	N/A	1xRTT+1xEVDO+WLAN 1xRTT+LTE+WLAN	N/A	N/A

Note: The HAC rating was evaluated for voice mode only.

NOTE:

1. The EUT's accessories list refers to Ext Pho_NM8PJ53100.pdf.
2. Conducted power list as below:

Mode	RC	SO	Type	Data Rate	CDMA2000 BC0			CDMA2000 BC1		
					Low Ch (1013)	Mid Ch (384)	High Ch (777)	Low Ch (25)	Mid Ch (600)	High Ch (1175)
CDMA 1XRTT	1	2	Loop	Full	24.57	24.46	24.71	24.55	24.59	24.36
				Eighth	24.59	24.49	24.77	24.58	24.67	24.54
	1	3	Voice	-	24.59	24.48	24.74	24.64	24.69	24.52
	1	55	Loop	Full	24.63	24.56	24.78	24.63	24.71	24.70
				Eighth	24.59	24.48	24.75	24.54	24.66	24.57
	2	17	Voice	-	24.59	24.46	24.71	24.65	24.66	24.50
	2	32768	Voice	-	24.58	24.46	24.71	24.62	24.65	24.49
	3	2	Loop	Full	24.57	24.48	24.66	24.62	24.63	24.38
				Eighth	24.54	24.44	24.62	24.62	24.65	24.53
	3	3	Voice	-	24.55	24.44	24.65	24.60	24.56	24.28
	3	55	Loop	Full	24.60	24.53	24.79	24.64	24.72	24.68
				Eighth	24.52	24.42	24.61	24.55	24.63	24.45
	4	3	Voice	-	24.58	24.43	24.62	24.60	24.58	24.28
	5	17	Voice	-	24.56	24.44	24.66	24.56	24.59	24.30
	5	32768	Voice	-	24.57	24.45	24.59	24.56	24.57	24.31

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 DESCRIPTIONOF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
1	Universal Radio Communication Tester	R&S	CMU200	101372	Oct. 10, 2012

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC 47 CFR Part 20.19

ANSI C63.19 - 2007

All test items have been performed and recorded as per the above standards.

3. SUMMARY OF THE TEST RESULTS

Band	(S+N)/N in dB	T Rating
CDMA BC0	40.1	T4
CDMA BC1	38	T4

4. GENERAL INFORMATION OF THE DASY 5 SYSTEM

4.1 GENERAL INFORMATION OF TEST EQUIPMENT

DASY5 (Software 5.2 Build 52.6) consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY 5 software defined.
The DASY 5 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box.
The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.
This system consists of the following items:

AM1DV3 Audio Magnetic Field Probe

The AM1D probe is an active probe with a single sensor. It is fully RF-shielded and has a rounded tip 6mm in diameter incorporating a pickup coil with its center offset 3mm from the tip and the sides. The symmetric signal preamplifier in the probe is fed via the shielded symmetric output cable from the AMMI with a 48V “phantom” voltage supply. The 7-pin connector on the back in the axis of the probe does not carry any signals. It is mounted to the DAE for the correct orientation of the sensor. If the probe axis is tilted 54.7 degree from the vertical, the sensor is approximately vertical when the signal connector is at the underside of the probe (cable hanging downwards).

Specification:

Frequency range	0.1 ~ 20 kHz (RF sensitivity <-100dB, fully RF shielded)
Sensitivity	<-50dB A/m @ 1 kHz
Pre-amplifier	40 dB, symmetric
Dimensions	Tip diameter/ length: 6/ 290 mm, sensor according to ANSI-C63.19

DATA ACQUISITION ELECTRONICS (DAE)

CONSTRUCTION

The data acquisition electronics (DAE 4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplex, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe is mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3,4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

AMMI

The Audio Magnetic Measuring Instrument (AMMI) is a desktop 19-inch unit containing a sampling unit, a waveform generator for test and calibration signals, and a USB interface.

Specification:

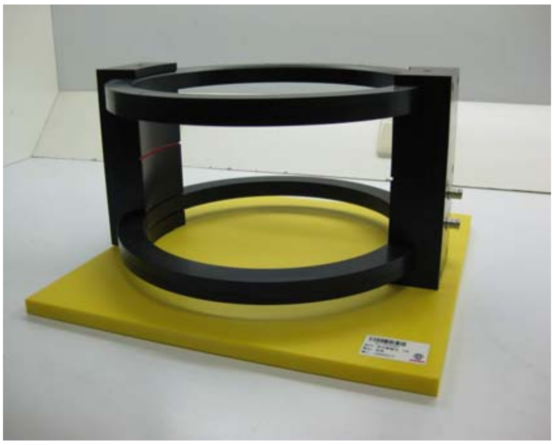
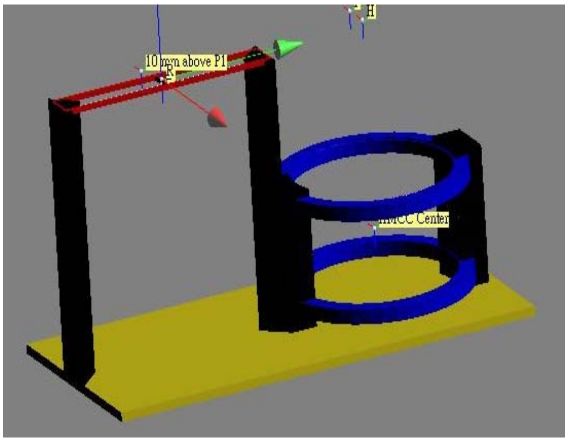
Sampling rate	48 kHz/24 bit
Dynamic range	85 dB
Test signal generation	User selectable and predefined (via PC)
Calibration	Auto-calibration/full system calibration using AMCC with monitor output
Connection:	Front connectors Audio Out - audio signal to the base station simulator Coil Out - test and calibration signal to the AMCC Coil In - monitor signal from the AMCC BNO connector Probe In - probe signal
Dimensions	482 x 65 x 270 mm

AMCC

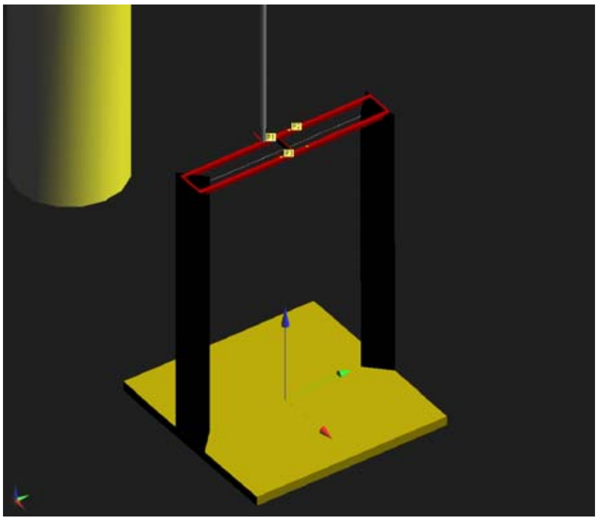
The Audio Magnetic Calibration coil is a Helmholtz Coil designed according to ANSI C63.19-2007 section D.9, for calibration of the AM1D probe. The two horizontal coils generate a homogeneous magnetic field in the z direction. The DC input resistance is adjusted to approximately 50 Ohm by a series resistor, and a shunt resistor of 10 Ohm allows monitoring the current with a scale of 1:10.

Specification:

Coil In	typically 50 Ohm
Coil Monitor	10Ohm ±1%(100mV corresponding to 1 A/m)
Dimensions	370 x 370 x 196 mm

HAC ARCH

DIMENSIONS 370 x 370 x 370mm

DEVICE HOLDER

CONSTRUCTION Supports accurate and reliable positioning of any phone effect on near field <+/-0.5dB

4.2 TEST SYSTEM CONFIGURATION

Figure 4.2: T-Coil setup with HAC Test Arch and AMCC

4.3 TEST EQUIPMENT LIST

NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Audio Band Magnetic Probe	SPEAG	AM1DV3	3067	Dec. 08, 2011	Dec. 07, 2012
DAE	SPEAG	DAE4	861	Aug. 29, 2011	Aug. 28, 2012
Audio Band Magnetic Measuring Instrument	SPEAG	AMMI	1075	NA	NA
Helmholtz Coil	SPEAG	AMCC	1076	NA	NA
HAC Arch	SPEAG	HAC ARCH	1034	NA	NA
Robot Positioner	Staubli Unimation	NA	NA	NA	NA

NOTE1: All test equipment has been calibrated by the SPEAG. Please reference" APPENDIX B "for the calibration report.

NOTE2: Before starting the measurement, all test equipment shall be warmed up for 30min.

4.4 T-COIL MEASUREMENT UNCERTAINTY

HAC UNCERTAINTY BUDGET ACCORDING TO ANSI C63.19							
ERROR DESCRIPTION	UNCERTAINTY VALUE	PROBABILITY DISTRIBUTION	DIV.	(Ci) ABM1	(Ci) ABM2	STD. UNC. AMB1	STD. UNC. AMB2
PROBE SENSITIVITY							
Reference level	±3.0%	Normal	1	1	1	±3.0%	±3.0%
AMCC geometry	±0.4%	Rectangular	√3	1	1	±0.2%	±0.2%
AMCC current	±1.0%	Rectangular	√3	1	1	±0.6%	±0.6%
Probe positioning during calibration	±0.1%	Rectangular	√3	1	1	±0.1%	±0.1%
Noise contribution	±0.7%	Rectangular	√3	0.0143	1	±0.0%	±0.4%
Frequency slope	±5.9%	Rectangular	√3	0.1	1	±0.3%	±3.5%
PROBE SYSTEM							
Repeatability / Drift	±1.0%	Rectangular	√3	1	1	±0.6%	±0.6%
Linearity / Dynamic range	±0.6%	Rectangular	√3	1	1	±0.4%	±0.4%
Acoustic noise	±1.0%	Rectangular	√3	0.1	1	±0.1%	±0.6%
Probe angle	±2.3%	Rectangular	√3	1	1	±1.4%	±1.4%
Spectral processing	±0.9%	Rectangular	√3	1	1	±0.5%	±0.5%
Integration time	±0.6%	Normal	1	1	5	±0.6%	±3.0%
Field distribution	±0.2%	Rectangular	√3	1	1	±0.1%	±0.1%
TEST SIGNAL							
Reference signal spectral response	±0.6%	Rectangular	√3	0	1	±0.0%	±0.4%
POSITIONING							
Probe positioning	±1.9%	Rectangular	√3	1	1	±1.1%	±1.1%
Phantom thickness	±0.9%	Rectangular	√3	1	1	±0.5%	±0.5%
DUT positioning	±1.9%	Rectangular	√3	1	1	±1.1%	±1.1%
EXTERNAL CONTRIBUTIONS							
RF interference	±0.0%	Rectangular	√3	1	0.3	±0.0%	±0.0%
Test signal variation	±2.0%	Rectangular	√3	1	1	±1.2%	±1.2%
Combined Standard Uncertainty (ABM):						**±4.1%**	**±6.1%**
Extended Standard Uncertainty (k=2) [%]:						**±8.1%**	**±12.3%**

The uncertainty budget for HAC Audio Band Magnetic Field (AMB) assessment according to ANSI C63.19-2007.The budget is valid for the DASY system and represents a worst- case analysis. For specific tests and configurations, the uncertainty could be smaller.

5. SYSTEM VALIDATION & CALIBRATION

At the beginning of the HAC T-coil measurement, a 3-phase calibration was performed per Speag instruction to ensure accurate measurement of the voltages and ABM field. Reference input level was also validated and calibrated per C63.19.

5.1 CABLING OF SYSTEM

The principal cabling of the T-Coil setup is shown in Figure 6.1 All cables provided with the basic setup have a length of approximately 5 m.

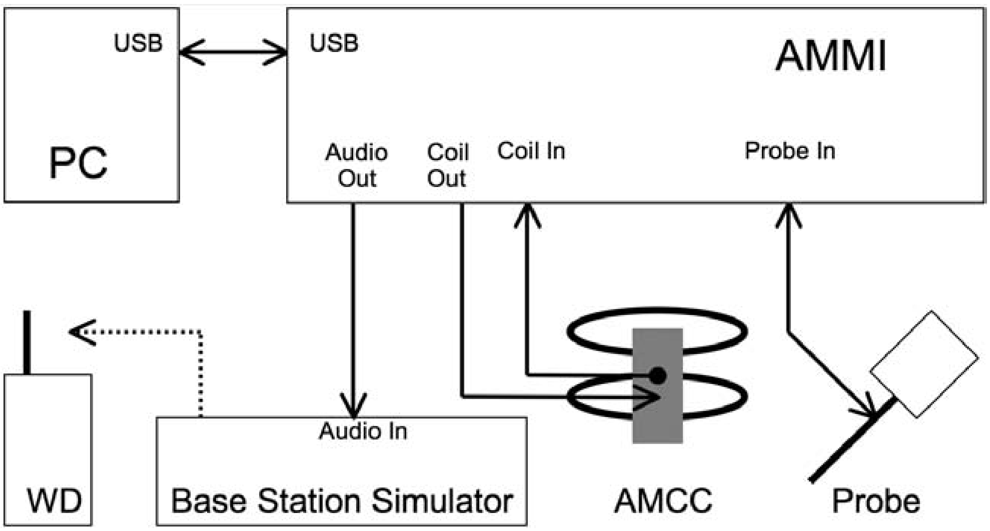


Figure 5.1: T-Coil setup cabling

5.2 INPUT CHANNEL CALIBRATION

Phase 1: The AMMI audio output was switched off, and a 200 mV_pp symmetric rectangular signal of 1 kHz was generated and internally connected directly to both channels of the sampling unit (coil in, probe in).

Phase 2: The AMMI audio output was off, and a 20 mV_pp symmetric 100 Hz signal was internally connected.

The signals during phases 1 and 2 were available at the output on the rear panel of the AMMI. The output must however not be loaded in order not to influence the calibration. After the first two phases, the two input channels were both calibrated for absolute measurements of voltages. The resulting factors were displayed above the multimeter window.

After phases 1 and 2, the input channels were calibrated to measure exact voltages.

5.3 PROBE CALIBRATION IN AMCC

Phase 3: Probe Calibration in AMCC

The probe sensitivity at **1 kHz is 0.00731303V / (A/m)** was calibrated by AMCC coil for verification of setup performance. The evaluated probe sensitivity was able to be compared to the calibration of the AM1D probe. The frequency response and sensitivity was shown in appendix A1. The probe signal is represented after application of an ideal integrator. The green curve represents the current though the AMCC, the blue curve the integrated probe signal. The difference between the two curves is equivalent to the frequency response of the probe system and shows the characteristics. The probe/system complies with the frequency response and linearity requirements in C63.19 according to the Speag's calibrated report as shown in appendix C1

(1)The frequency response has been tested within +/- 0.5 dB of ideal differentiator from 100 Hz to 10 kHz.

(2)The linearity has also been tested within 0.1dB from 5 dB below limitation to 16 dB above noise level. The AMCC coil is qualified according to certificate report that shown in appendix C2.

5.4 REFERENCE INPUT LEVEL

An Input Level is measured to verify that it is within +/-0.2 dB from the Reference Input Level in section 6.3.2.1 of ANSI C63.19-2007.

5.4.1 SETTING OF THE AUDIO SIGNAL LEVEL

According to ANSI C63.19:2007 section 6.3.2.1, the normal speech input level for HAC T-coil tests shall be set to -16 dBm0 for GSM and UMTS (WCDMA), and to -18 dBm0 for CDMA. This technical note shows a possibility to evaluate and set the correct level with the HAC T-Coil setup with a Rohde & Schwarz communication tester CMU200 with audio option B52 and B85.Establish a call from the CMU200 to a wireless device. Select CMU200 Network Bitstream ”Decoder Cal” to have a 1kHz signal with a level of 3.14 dBm0 at the speech output. Run the measurement job and read the voltage level at the multi-meter display “Coil signal”. Read the RMS voltage corresponding to 3.14 dBm0 and note it. Calculate the desired signal levels of -16dBm0 &-18dBm0:

3.14 dBm0 = X dBV
-16 dBm0 = L1 dBV
-18 dBm0 = L2 dBV
Determine the 1kHz input level to generate the desired signal level. Select CMU200 Network Bitstream “Codec Cal” to loop the input via the codec to the output. Run the easurement job (AMMI 1kHz signal with gain 10 inserted) and read the voltage level at the multimeter display “Coil signal”. Calculate the required gain setting for the above levels:

Gain 10 = G dBV
Difference for -16 dBm0 = L1 - (G) = D1 dB
Difference for -18 dBm0 = L2 - (G) = D2 dB
Gain factor for -16dBm0 = 10 ^ ((D1) / 20) = F1
Gain factor for -18dBm0 = 10 ^ ((D2) / 20) = F2
Resulting Gain for -16dBm0 = 10 x F1 = R1
Resulting Gain for -18dBm0 = 10 x F2 = R2

5.4.2 TARGET LEVEL FOR "AUDIO OUT" OF THE AMMI

(CMU200 Audio Codec Calibration)

Measured data is shown in Table 5.4.1. This target level takes into account the difference between AMMI's and CMU's reference levels.

Table 5.4.1: Measured Input Level

CMU voltage level(dBV)	AMMI 1kHz signal with gain 10 inserted(dBV)
-2.5	-19.81

5.4.3 MEASURED GAIN SETTING

The predefined signal types have the following differences / factors compared to the 1kHz sine signal:

Table 5.4.2: Measured Gain Setting

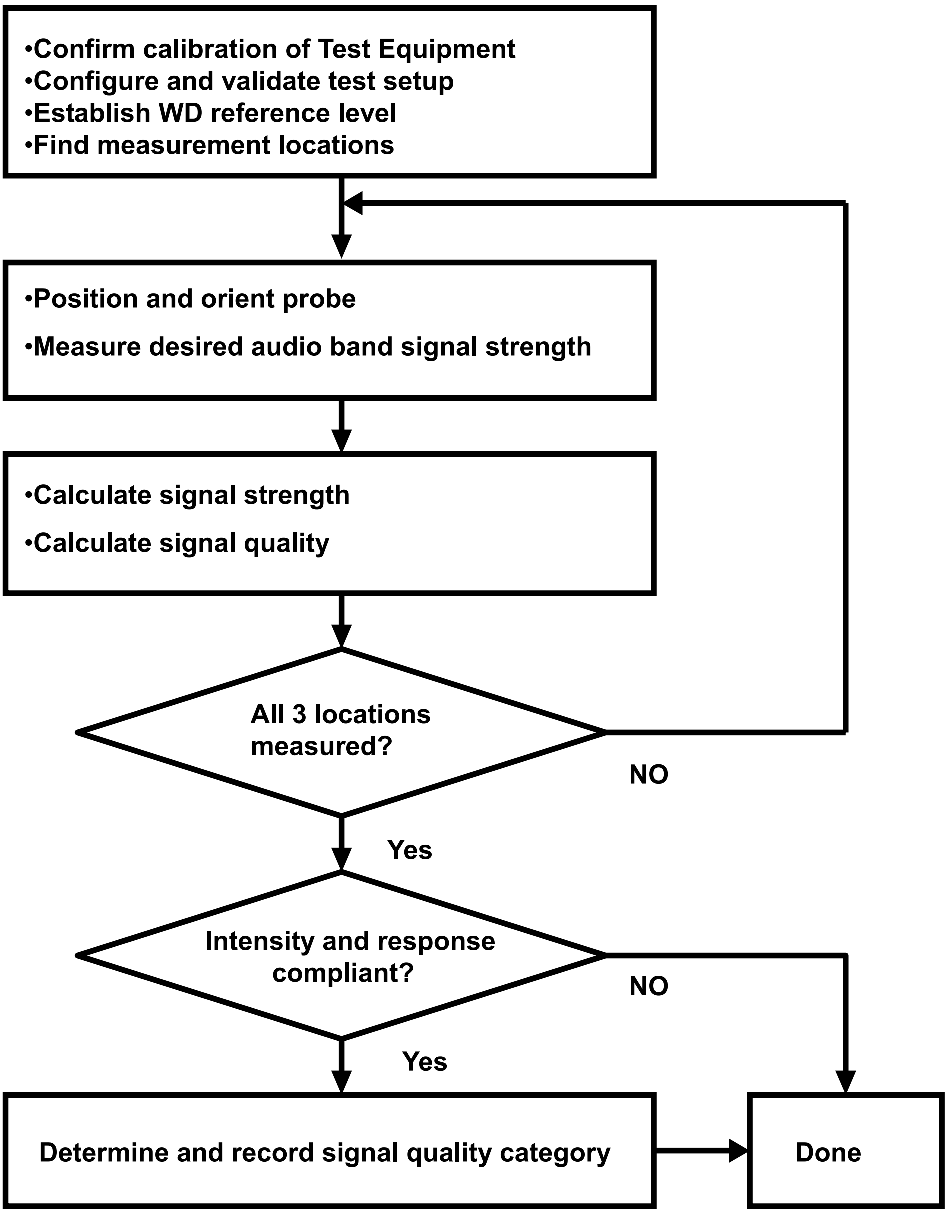
Audio Signal Level	Signal Type Duration	Peak to RMS (dB)	RMS(dB)	Gain factor	Gain Setting
-18dBm0	**1KHz**	16.2	-12.7	4.33	27.86
-18dBm0	300 to 3KHz	21.6	-18.6	8.48	54.56

5.5 REFERENCE INPUT OF AUDIO SIGNAL SPECTRUM

With the reference job "use as reference" in the beginning of a procedure, measure the spectrum of the current when applied to the AMCC, i.e. the input magnetic field spectrum, as shown in the **appendix A2**. For this, the delay of the window shall be set to a multiple of the signal period and at least 2s. From the measurement on the device, using the same signal, the postprocessor deducts the input spectrum, so the result represents the net DUT response.

6. T-COIL TEST PROCEDURE

The device was positioned and setup according to ANSI C63.19-2007. The following shows the T-Coil Signal measurement flowchart:



The following steps were a typical test scan for the wireless communications device:

1. Geometry and signal check: system probe alignment, proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.
   A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the test Arch.
2. Set the reference drive level of signal voice defined in C63.19 per 6.3.2.1, as shown in the **appendix A2** of this report
3. The ambient and test system background noise (dB A/m) was measured as well as ABM2 over the full measurement. The maximum noise level must be at least 10dB below the limit of C63.19 per 7.3.2.
   For the three probe positions, noise spectrum plots for the highest ambient noise are given in **appendix A3.**
4. The DUT was positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.
5. The DUT operation for maximum rated RF output power was configured and connected by using of coaxial cable connection to 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. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The DUT audio output was positioned tangent (as physically possible) to the measurement plane.
6. The DUT's RF emission field was eliminated from T-coil results by using a well RF-shielding of the probe, AM1D, and by using of coaxial cable connection to a Base Station Simulator. One test channel was pre-measurement to avoid this possibility.
7. Determined the optimal measurement locations for the DUT by following the three steps, coarse resolution scan, fine resolution scans, and point measurement, as described in C63.19 per 6.3.4.4. At each measurement locations, samples in the measurement window duration were evaluated to get ABM1 and the signal spectrum. The noise measurement was performed after the scan with the signal, the same happened, just with the voice signal switched off. The ABM2 was calculated from this second scan.
   (1) Coarse resolution scans (1 KHz signal at 50 x 50 mm grid area with 10 mm spacing). Only ABM1 was measured in order to find the location of T-Coil source.
   (2) Fine resolution scans (1 KHz signal at 10 x 10 mm grid area with 2 mm spacing). The positioned appropriately based on optimal AMB1 of coarse resolution scan. Both ABM1 and ABM2 were measured in order to find the location of the SNR point.
   (3) Point measurement (1 KHz signal) for ABM1 and ABM2 in axial, radial transverse and radial longitudinal. The positioned appropriately based on optimal SNR of fine resolution scan. The SNR was calculated for axial, radial transverse and radial longitudinal orientation.

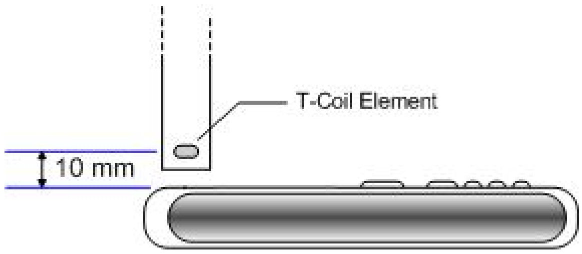
(4) Point measurement (300Hz to 3 KHz signal) for frequency response in axial. The positioned appropriately based on optimal SNR of fine resolution axial scan.

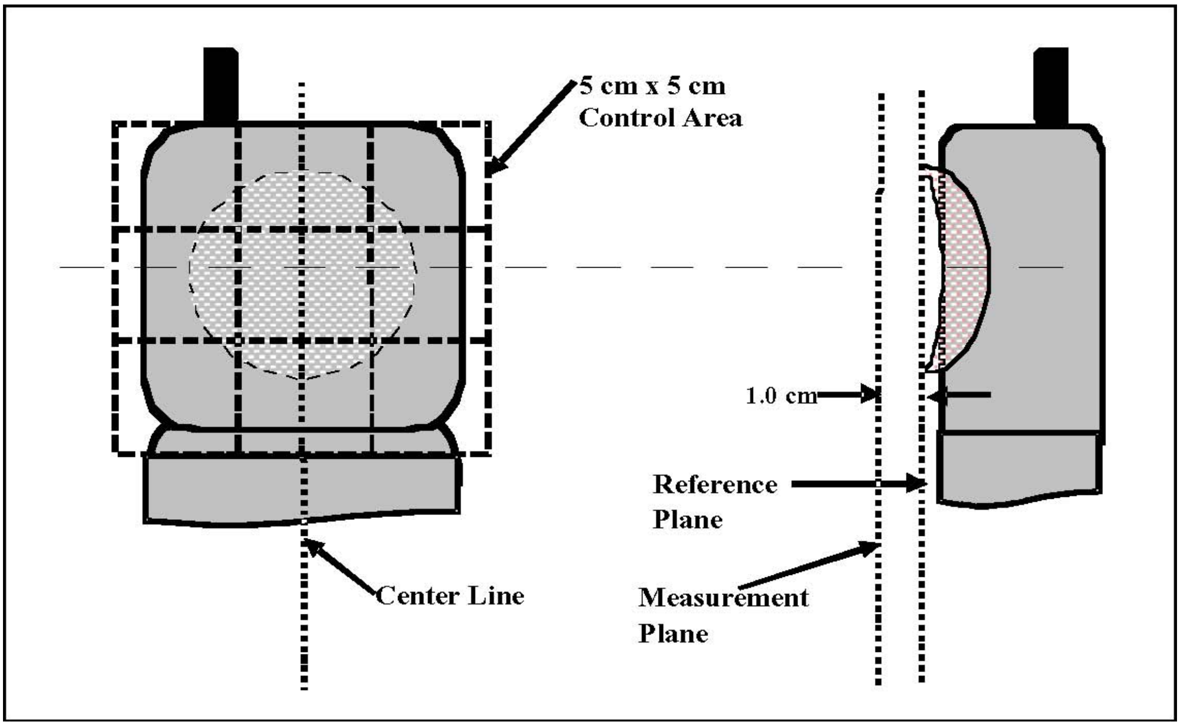
8. All results resulting from a measurement point in a T-Coil job were calculated from the signal samples during this window interval. ABM values were averaged over the sequence of these samples.
9. At an optimal point measurement, the SNR(ABM1/ABM2) was calculated for axial, radial transverse and radial longitudinal orientation, and the frequency response was measured in axial axis.
10. Corrected for the frequency response after the DUT measurement since the DASY5 system had known the spectrum of the input signal by using a reference job, as shown in the **appendix B2** of this report.
11. In SEMCAD post-processing, the spectral points are in addition scaled with the high-pass (half-band) and the A-weighting, bandwidth compensated factor (BWC) and those results are final as shown in this report.
12. Classified the signal quality based on the T-Coil Signal Quality Categories.

7. DESCRIPTION FOR EUT TESTING CONFIGURATION

The phone was tested in normal configurations for the ear use. The DASY5 measurement system specified in section 3.1 was utilized within the intended operations as set by the SPEAG™ setup. The Test Arch provided by SPEAG is used to position the DUT. All tests are done via conducted setup with CMU 200.

The distance is established by positioning the device beneath the test arch phantom so that it is touching the frame. The location and thickness of the arch, and the location/orientation of the coil within the probe housing, are precisely known values in the DASY software. The height of the measurement plane is further fine-tuned by performing a Surface Detection job at the beginning of each test. The end result is that the probe sensor is very precisely located 10mm above the device reference plane.





8. T-COIL REQUIREMENTS AND CATEGORY

8.1 RF EMISSIONS

EUT has to fulfill RF emission requirements at the axial measurement location.

8.2 AXIAL FIELD INTENSITY

The minimum limits of ABM1 field intensity shall be ≥ –18 dB (A/m) at 1 kHz, in a 1/3 octave band filter for all orientations.

8.3 SIGNAL QUALITY

Table 9.3 provides the signal quality requirement for the intended T-Coil signal from a Wireless Device. The worst Signal Quality of the axial and radial components of the magnetic field was used to determined the T-Coil category

Category	Telephone parameters WD signal quality [(signal + noise)-to-noise ratio in decibels]
Category T1	0 dB to 10 dB
Category T2	10 dB to 20 dB
Category T3	20 dB to 30 dB
Category T4	> 30 dB

8.4 FREQUENCY RESPONSE

The frequency response of the axial component must follow the frequency curve specified in ANSI C63.19-2007 section 7.3.3, over the frequency range 300-3000 Hz.

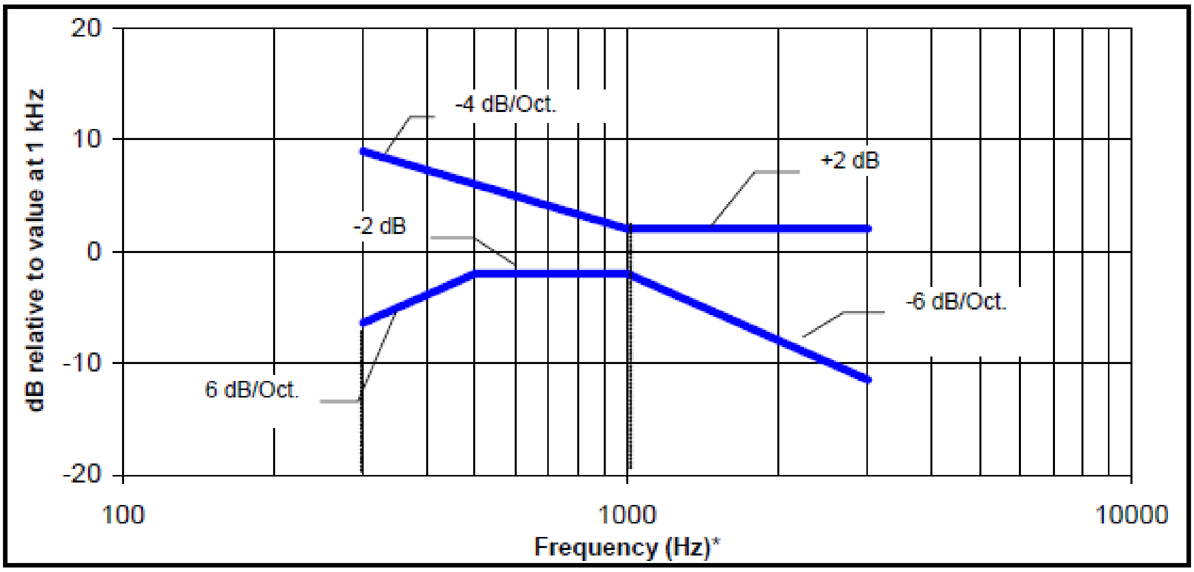


Figure 8.4a Magnetic field frequency response for WDs with a field ≤ –15 dB (A/m) at 1 kHz

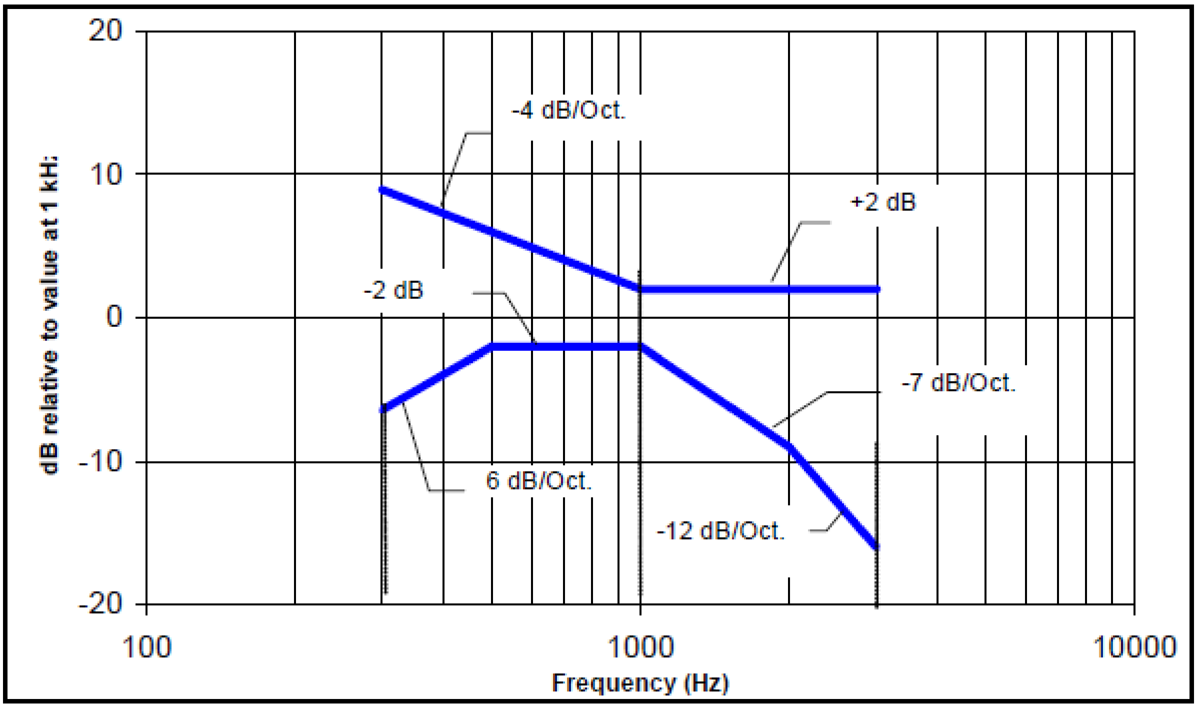


Figure 8.4b Magnetic field frequency response for WDs with a field that exceeds –15 dB(A/m) at 1 kHz

9. T-COIL TEST RESULT

9.1 SNR MEASUREMENT RESULT

Plot No.	Band	Mode	Ch.	Battery	Probe Position	Coordinates (mm)	Ambient Noise (dB A/m)	ABM2 (dBA/m)	ABM1 (dBA/m)	Freq. Response	SNR (dB)	T Rating
1	CDMA BC0	RC1+SO3	1013	1	Axial (Z)	6.3, -10.3	-49.21	-34.10	18.30	PASS	52.40	T4
					Radial 1 (X)	5.3, 0.7	-52.07	-45.00	17.40		62.40	T4
					Radial 2 (Y)	20.3, -11.3	-50.92	-44.28	7.02		51.30	T4
2	CDMA BC0	RC1+SO3	384	1	Axial (Z)	6.3, -12.3	-50.07	-34.30	18.40	PASS	52.70	T4
					Radial 1 (X)	20.3, -11.3	-51.23	-41.94	6.66		48.60	T4
					Radial 2 (Y)	5.3, 0.7	-51.24	-43.20	18.40		61.60	T4
3	CDMA BC0	RC1+SO3	777	1	Axial (Z)	4.3, -8.3	-49.88	-34.30	18.80	PASS	53.10	T4
					Radial 1 (X)	20.3, -11.3	-52.31	-43.61	6.19		49.80	T4
					Radial 2 (Y)	5.3, 3.7	-51.65	-45.90	16.80		62.70	T4
4	CDMA BC0	RC1+SO3	384	2	Axial (Z)	4.3, -8.5	-50.02	-38.60	17.80	**PASS**	56.40	T4
					Radial 1 (X)	**-3.7, -12.5**	**-51.33**	**-31.31**	**8.79**		**40.10**	**T4**
					Radial 2 (Y)	5.3, -6.5	-51.48	-45.10	11.50		56.60	T4
5	CDMA BC1	RC1+SO3	25	1	Axial (Z)	6.3, 6.3	-50.21	-32.50	18.40	PASS	50.90	T4
					Radial 1 (X)	23.3, 11.3	-52.42	-47.39	2.71		50.10	T4
					Radial 2 (Y)	5.3, 2.3	-51.70	-45.10	16.70		61.80	T4
6	CDMA BC1	RC1+SO3	600	1	Axial (Z)	6.3, -10.3	-49.66	-33.40	19.00	PASS	52.40	T4
					Radial 1 (X)	20.3, -11.3	-52.65	-42.69	7.31		50.00	T4
					Radial 2 (Y)	11.3, 3.7	-51.68	-45.60	16.50		62.10	T4
7	CDMA BC1	RC1+SO3	1175	1	Axial (Z)	4.3, -10.3	-50.40	-33.70	18.40	PASS	52.10	T4
					Radial 1 (X)	20.3, -11.3	-51.55	-42.67	6.53		49.20	T4
					Radial 2 (Y)	8.3, 3.7	-52.08	-46.00	16.10		62.10	T4
8	CDMA BC1	RC1+SO3	1175	2	Axial (Z)	6.3, -8.3	-49.62	-35.80	19.00	**PASS**	54.80	T4
					Radial 1 (X)	**-6.7, -11.3**	**-52.17**	**-31.03**	**6.97**		**38.00**	**T4**
					Radial 2 (Y)	5.3, -2.3	-52.17	-40.10	16.00		56.10	T4

Table 9.1: Test Result for Various Positions

Note:

- Minimum Limit: ABM1 ≥-18 dB A/m
- Signal Quality = ABM1/ABM2
- Bold Number = worst case at each frequency band
- Data plots are showed in **appendix B1**

9.2 FREQUENCY RESPONSE AT AXIAL MEASUREMENT POINT

Cell Phone Mode	Verdict
CDMA2000 BC0	Pass
CDMA2000 BC1	Pass

Note: Please see **appendix B2** for the frequency response test raw data.

10. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Email: service.adt@tw.bureauveritas.com
Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

---END---

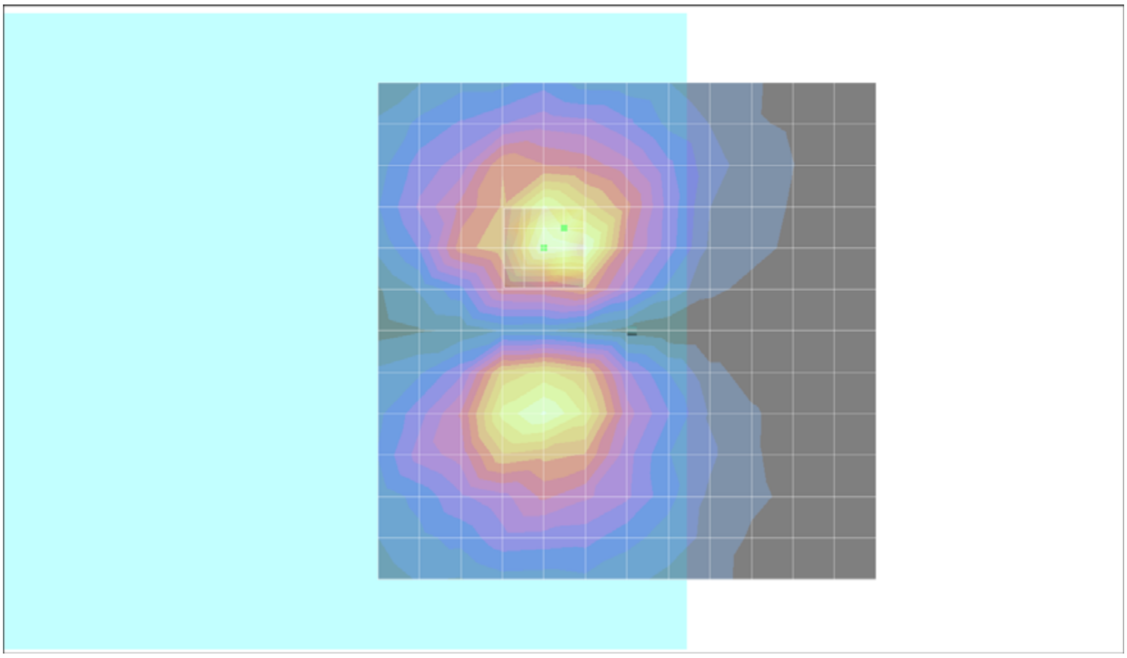
P01 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1013_Battery1_Cover1_Axial (Z)

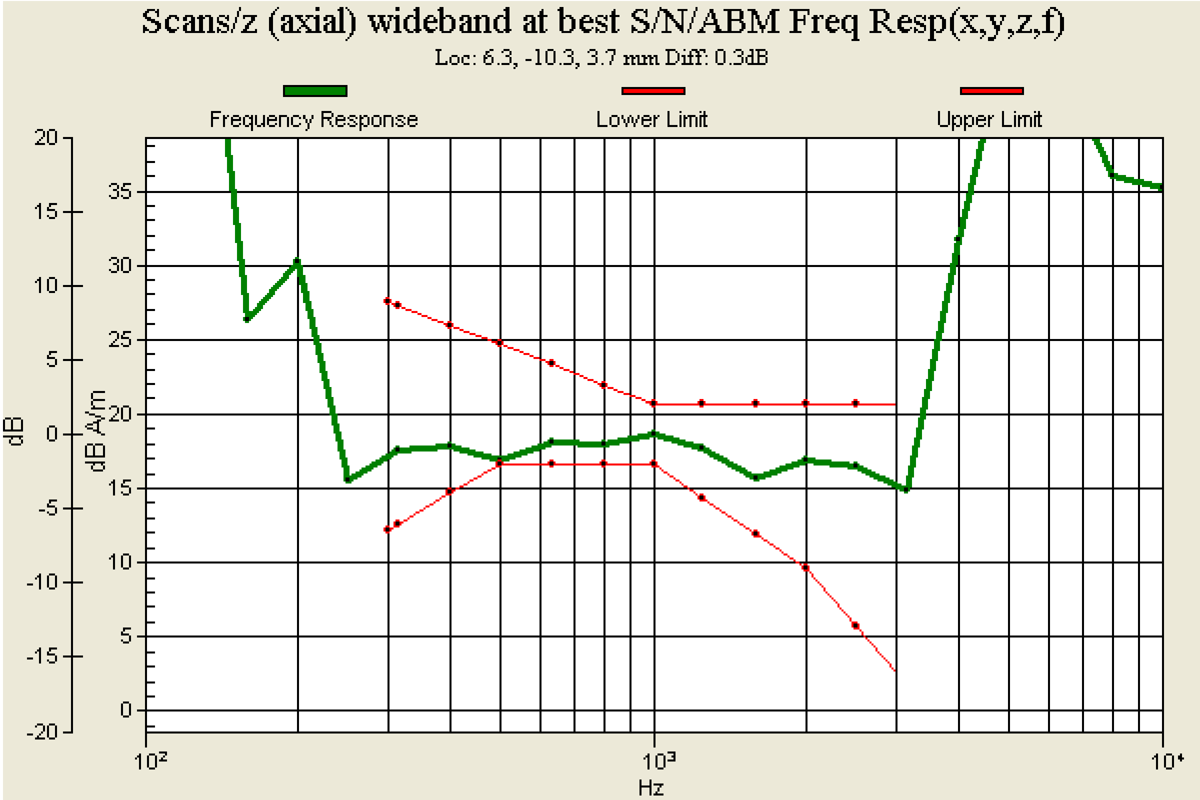
DUT: 111221C21

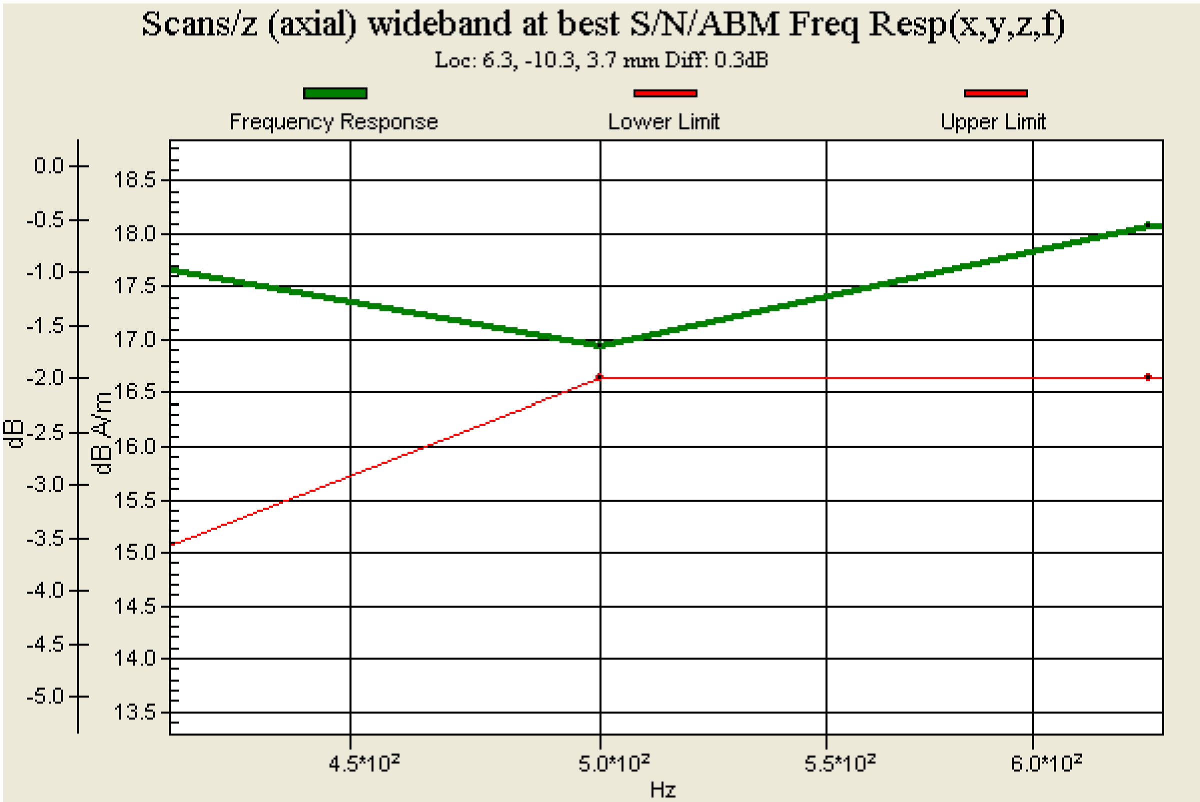
Communication System: CDMA2000 BC0; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):
ABM1/ABM2 = 52.4 dB
ABM1 comp = 18.3 dB A/m
Location: 6.3, -10.3, 3.7 mm




Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 6.3, -10.3, 3.7 mm Diff: 0.3dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz


Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 6.3, -10.3, 3.7 mm Diff: 0.3dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz

P01 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1013_Battery1_Cover1_Radial 1 (X)

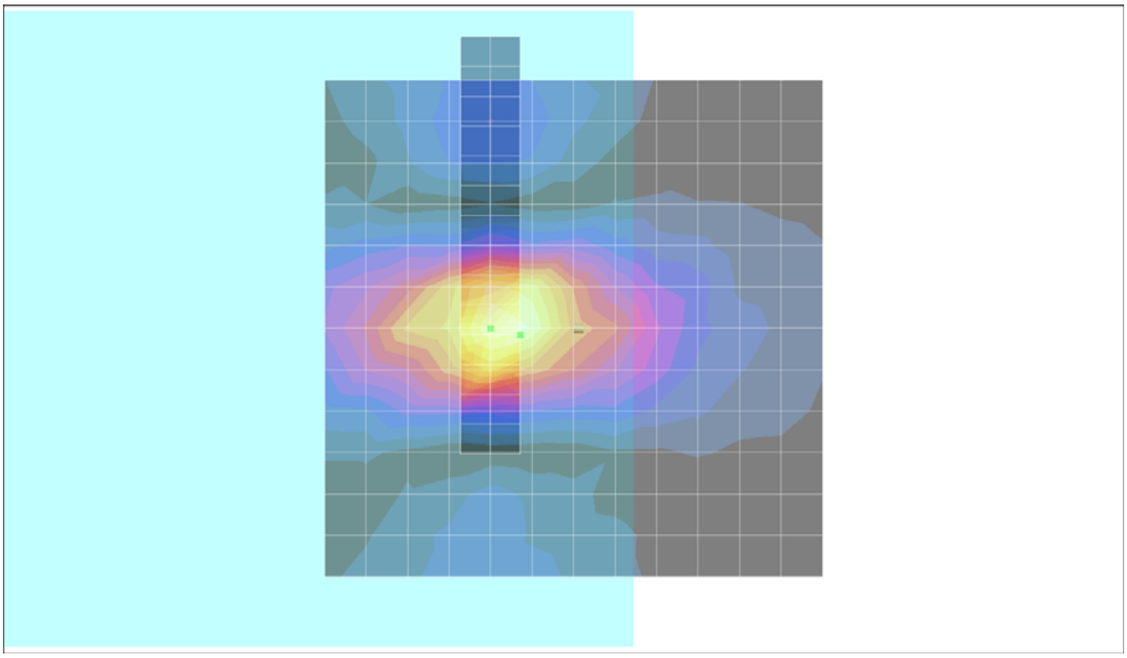
DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):

ABM1/ABM2 = 62.4 dB
ABM1 comp = 17.4 dB A/m
Location: 5.3, 0.7, 3.7 mm



P01 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1013_Battery1_Cover1_Radial 2 (Y)

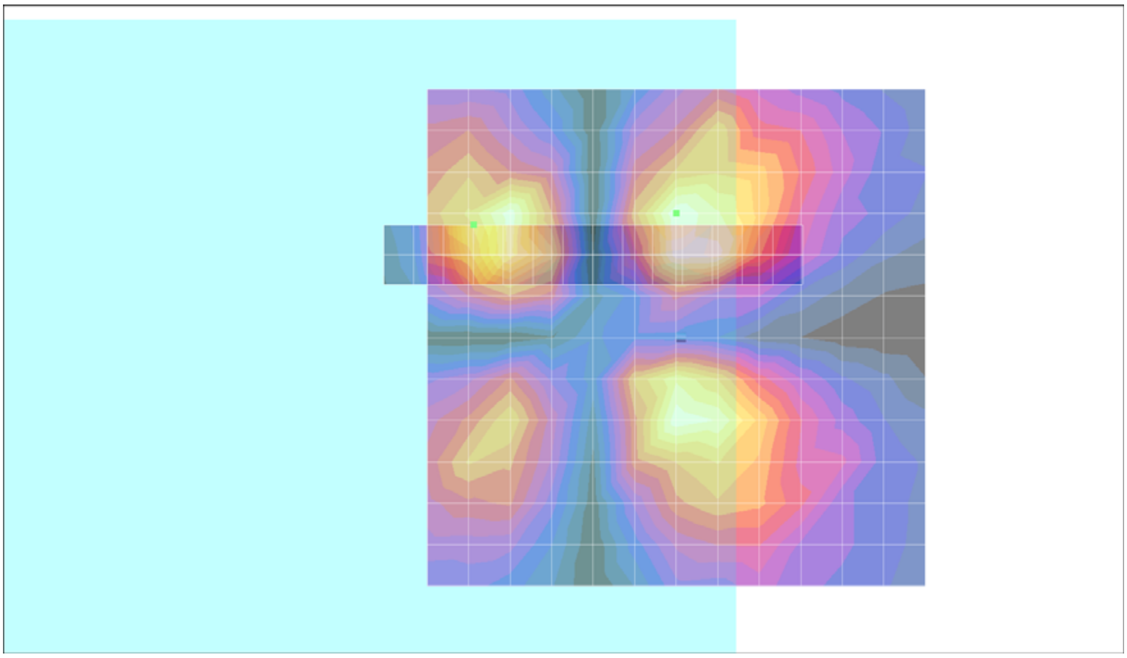
DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):

ABM1/ABM2 = 51.3 dB
ABM1 comp = 7.02 dB A/m
Location: 20.3, -11.3, 3.7 mm



P02 T-Coil_CDMA2000 BC0_RC1+SO3_Ch384_Battery1_Cover1_Axial (Z)

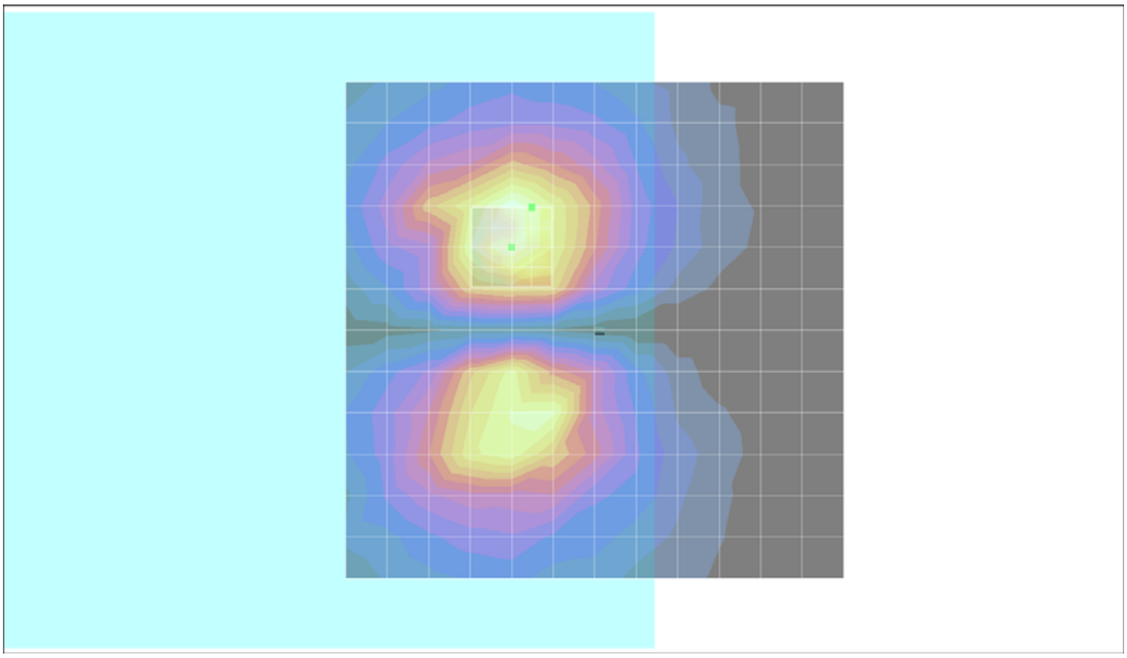
DUT: 111221C21

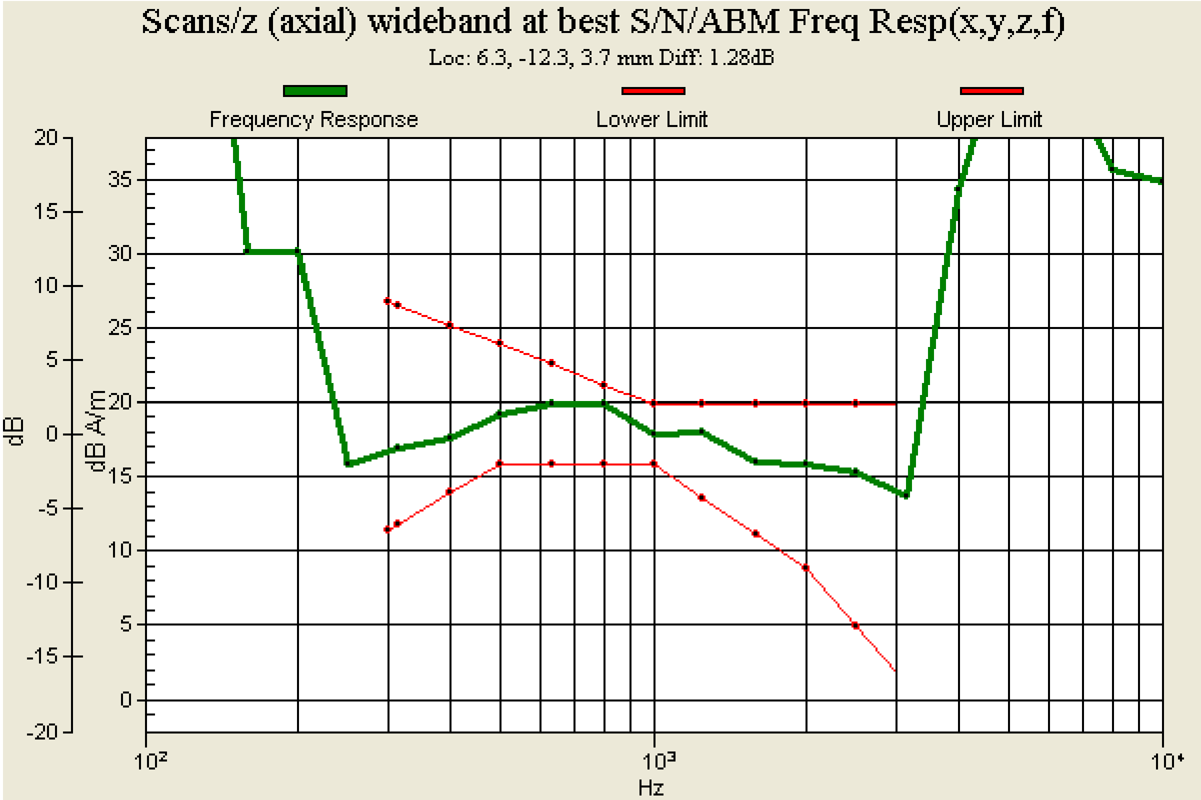
Communication System: CDMA2000 BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):

ABM1/ABM2 = 52.7 dB
ABM1 comp = 18.4 dB A/m
Location: 6.3, -12.3, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 6.3, -12.3, 3.7 mm Diff: 1.28dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz

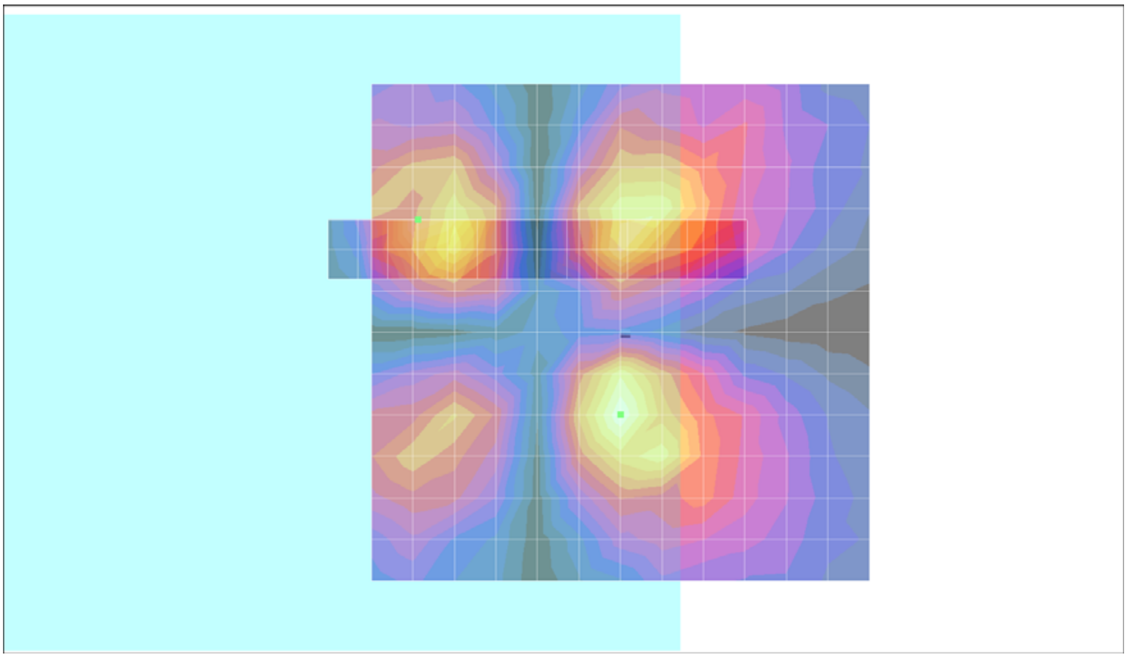
P02 T-Coil_CDMA2000 BC0_RC1+SO3_Ch384_Battery1_Cover1_Radial 1 (X)

DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):
ABM1/ABM2 = 48.6 dB
ABM1 comp = 6.66 dB A/m
Location: 20.3, -11.3, 3.7 mm



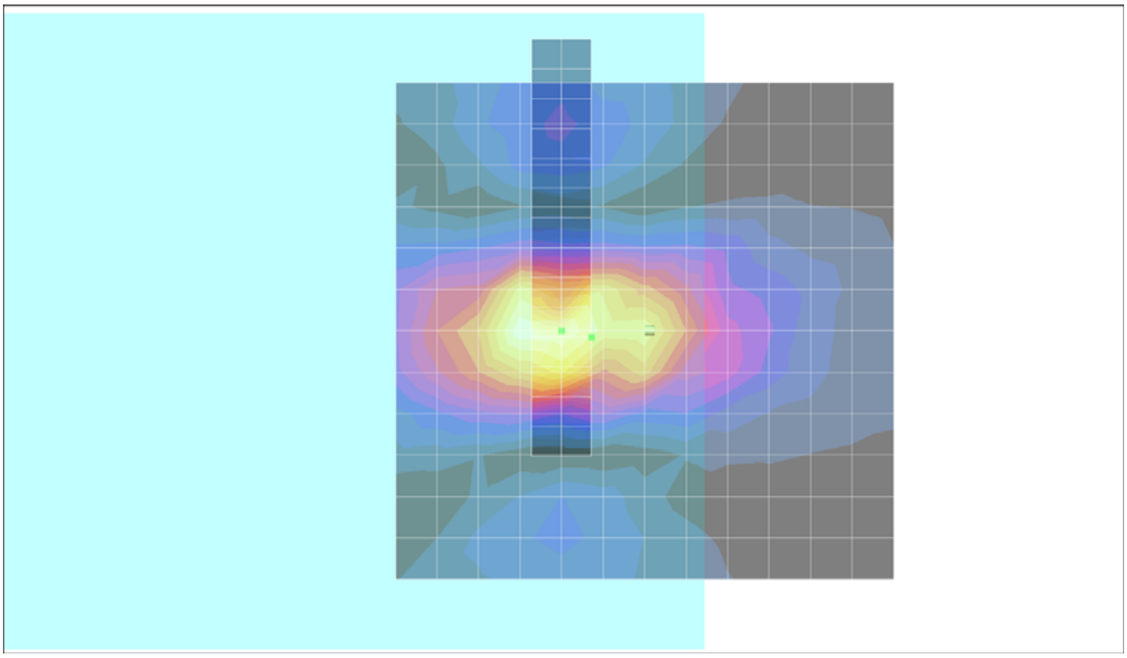
P02 T-Coil_CDMA2000 BC0_RC1+SO3_Ch384_Battery1_Cover1_Radial 2 (Y)

DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):
ABM1/ABM2 = 61.6 dB
ABM1 comp = 18.4 dB A/m
Location: 5.3, 0.7, 3.7 mm



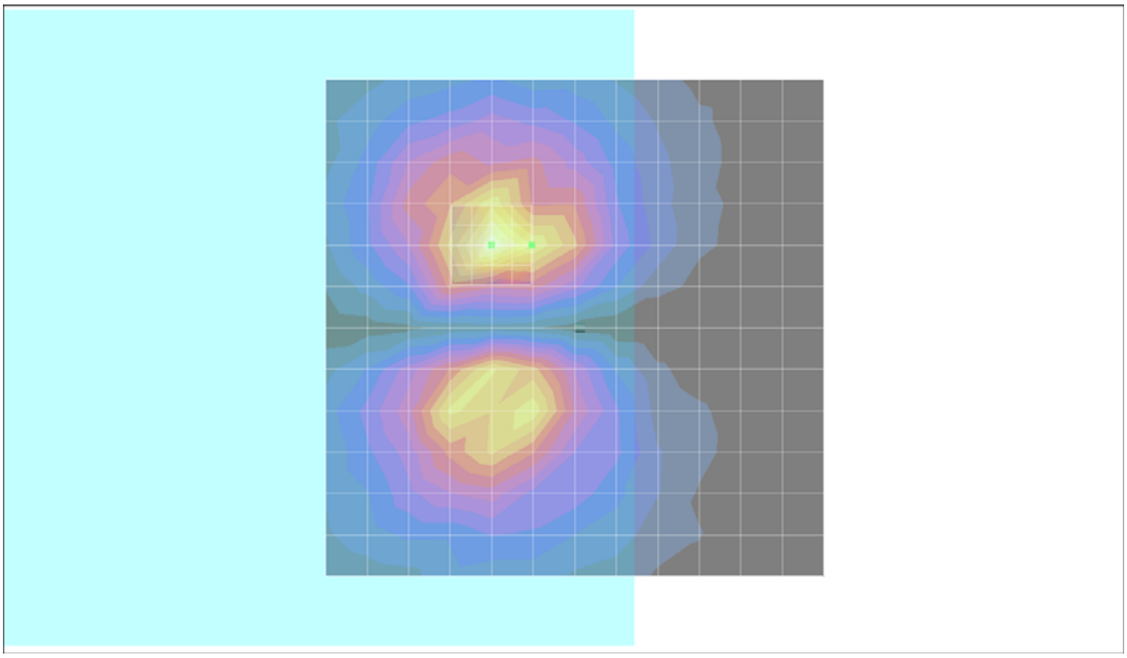
P03 T-Coil_CDMA2000 BC0_RC1+SO3_Ch777_Battery1_Cover1_Axial (Z)

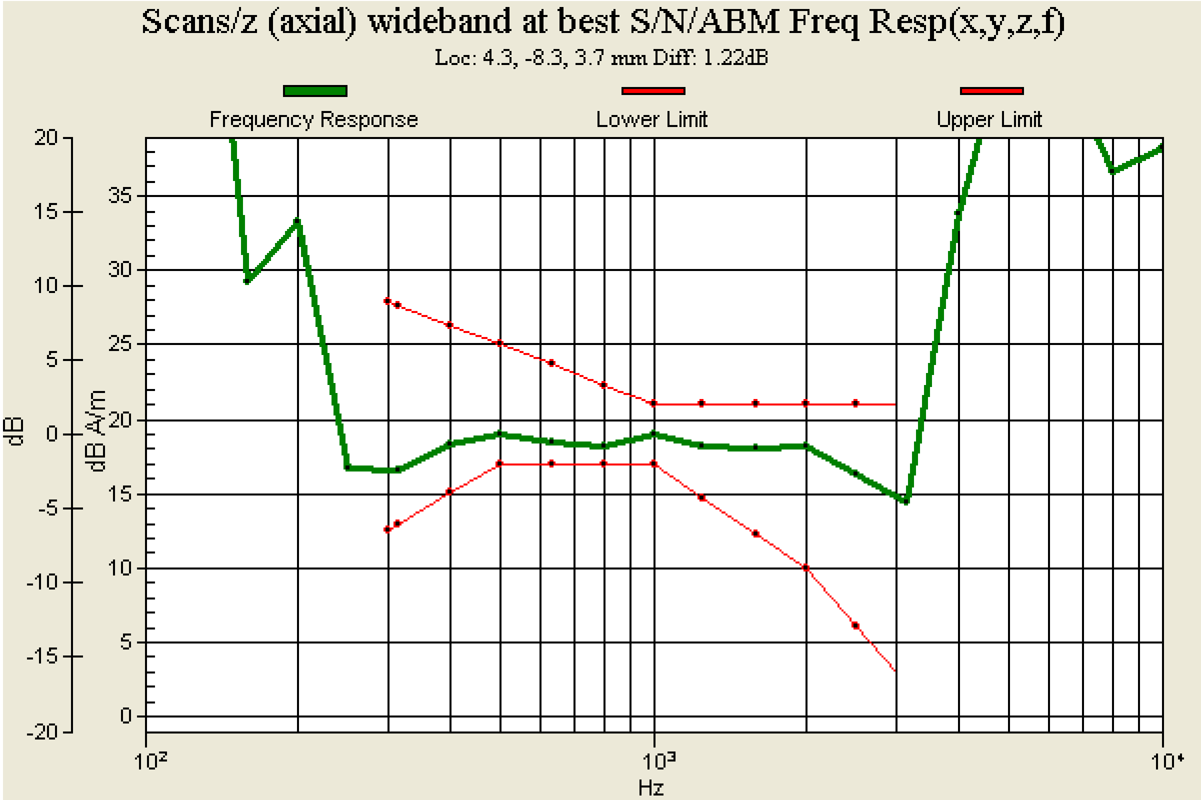
DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, ε_r = 1; ρ = 1 kg/m^3
Ambient Temperature：21.5 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):
ABM1/ABM2 = 53.1 dB
ABM1 comp = 18.8 dB A/m
Location: 4.3, -8.3, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 4.3, -8.3, 3.7 mm Diff: 1.22dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz
20
15
10
5
0
-5
-10
-15
-20
35
30
25
20
15
10
5
0
10²
10³
10⁴

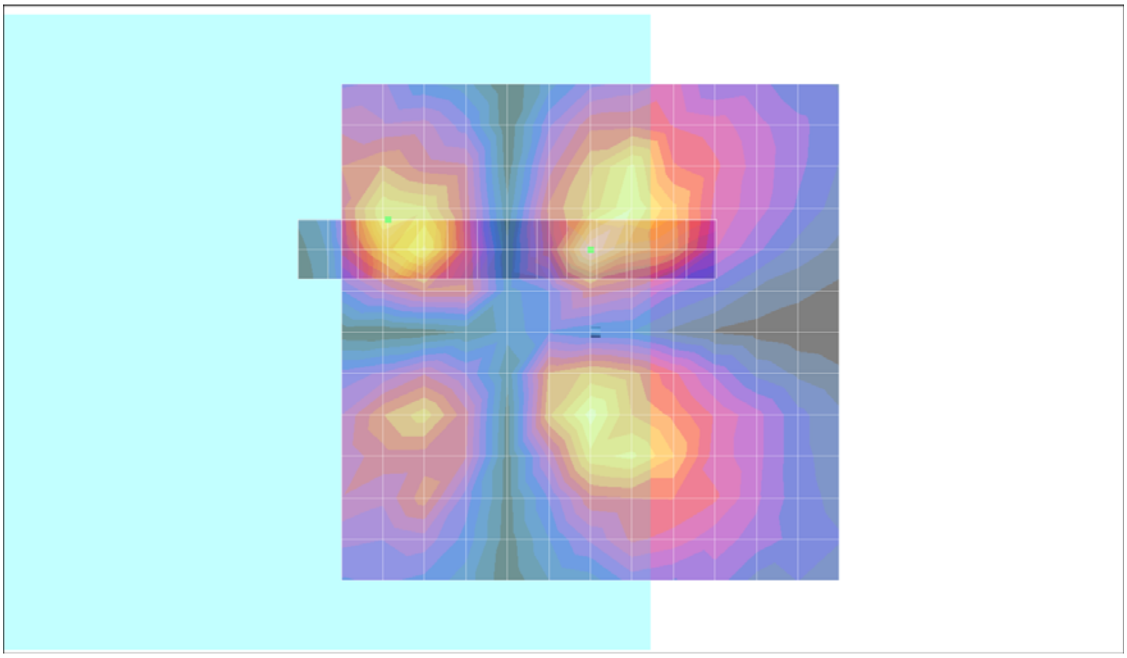
P03 T-Coil_CDMA2000 BC0_RC1+SO3_Ch777_Battery1_Cover1_Radial 1 (X)

DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.5 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):
ABM1/ABM2 = 49.8 dB
ABM1 comp = 6.19 dB A/m
Location: 20.3, -11.3, 3.7 mm



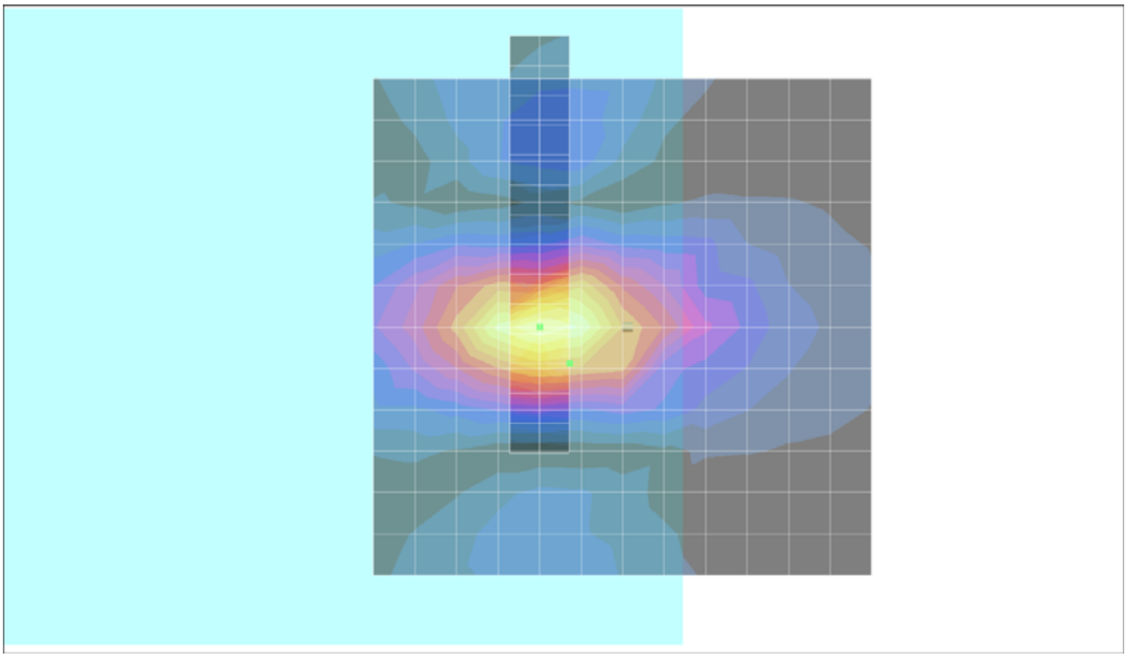
P03 T-Coil_CDMA2000 BC0_RC1+SO3_Ch777_Battery1_Cover1_Radial 2 (Y)

DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.5 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):
ABM1/ABM2 = 62.7 dB
ABM1 comp = 16.8 dB A/m
Location: 5.3, 3.7, 3.7 mm



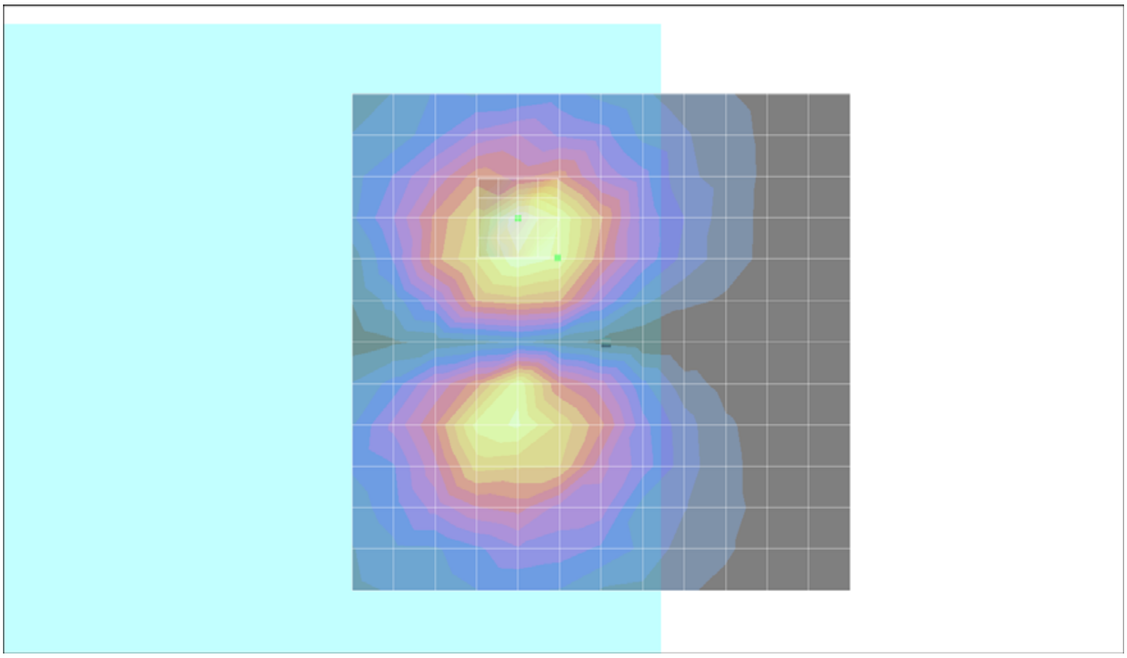
P04 T-Coil_CDMA2000 BC0_RC1+SO3_Ch384_Battery2_Cover2_Axial (Z)

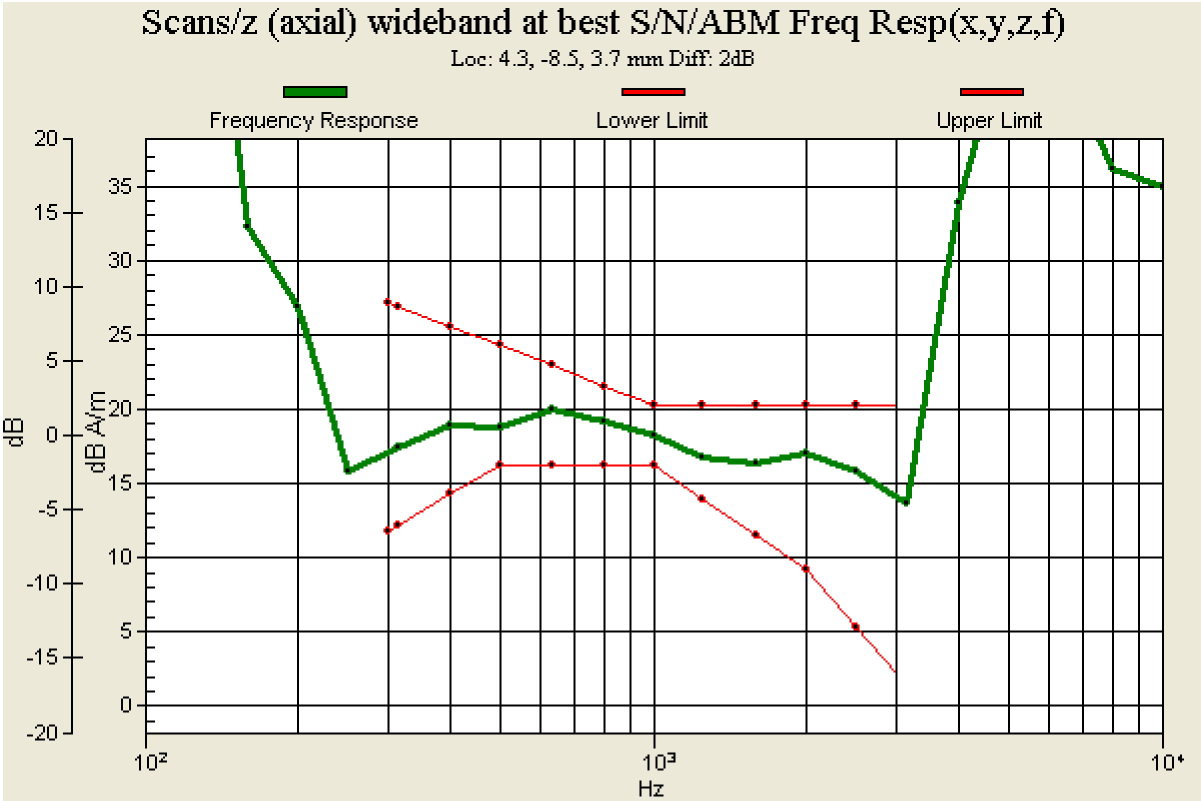
DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):
ABM1/ABM2 = 56.4 dB
ABM1 comp = 17.8 dB A/m
Location: 4.3, -8.5, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 4.3, -8.5, 3.7 mm Diff: 2dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz
20
15
10
5
0
-5
-10
-15
-20
35
30
25
20
15
10
5
0
10²
10³
10⁴

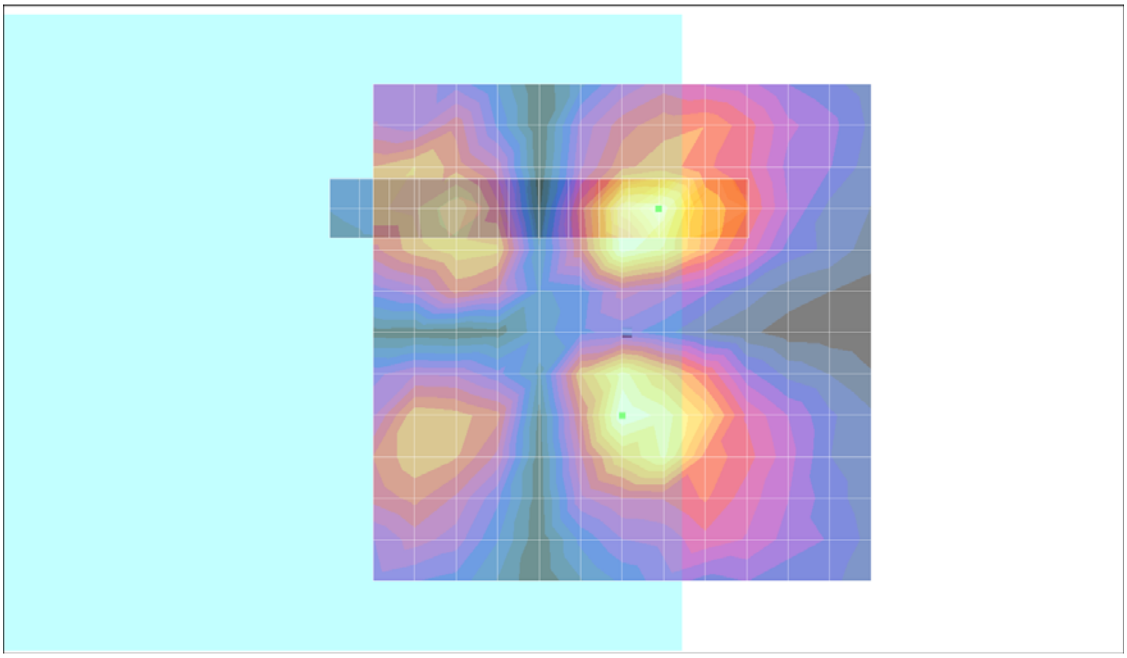
P04 T-Coil_CDMA2000 BC0_RC1+SO3_Ch384_Battery2_Cover2_Radial 1 (X)

DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):
ABM1/ABM2 = 40.1 dB
ABM1 comp = 8.79 dB A/m
Location: -3.7, -12.5, 3.7 mm



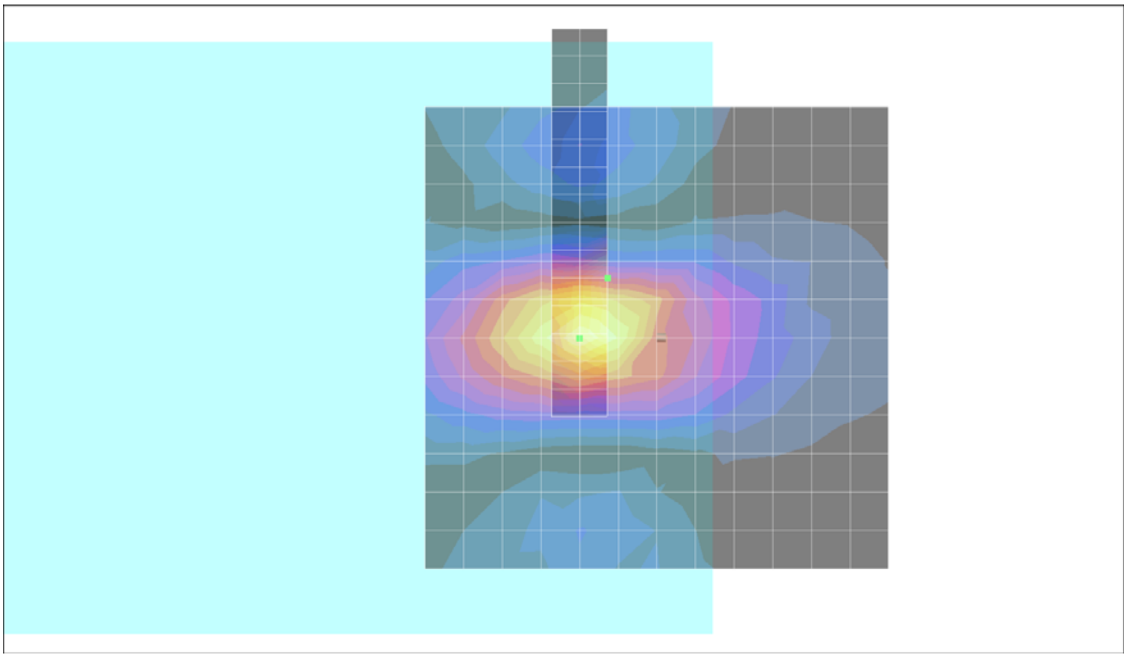
P04 T-Coil_CDMA2000 BC0_RC1+SO3_Ch384_Battery2_Cover2_Radial 2 (Y)

DUT: 111221C21

Communication System: CDMA2000 BC0; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):
ABM1/ABM2 = 56.6 dB
ABM1 comp = 11.5 dB A/m
Location: 5.3, -6.5, 3.7 mm



P05 T-Coil_CDMA2000 BC0_RC1+SO3_Ch25_Battery1_Cover1_Axial (Z)

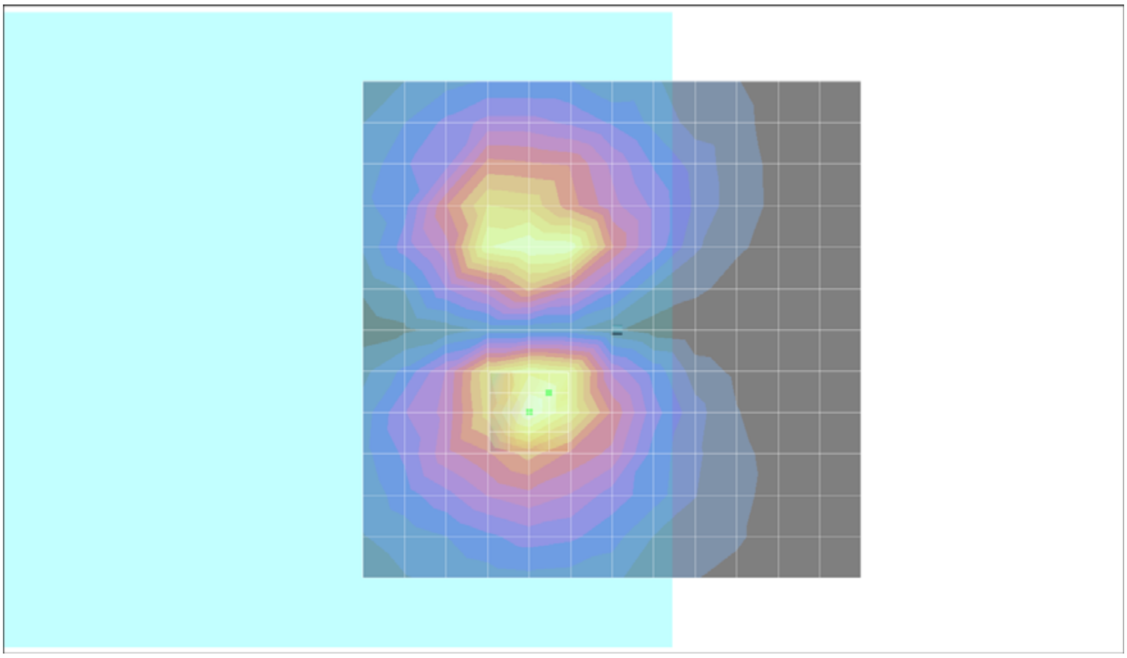
DUT: 111221C21

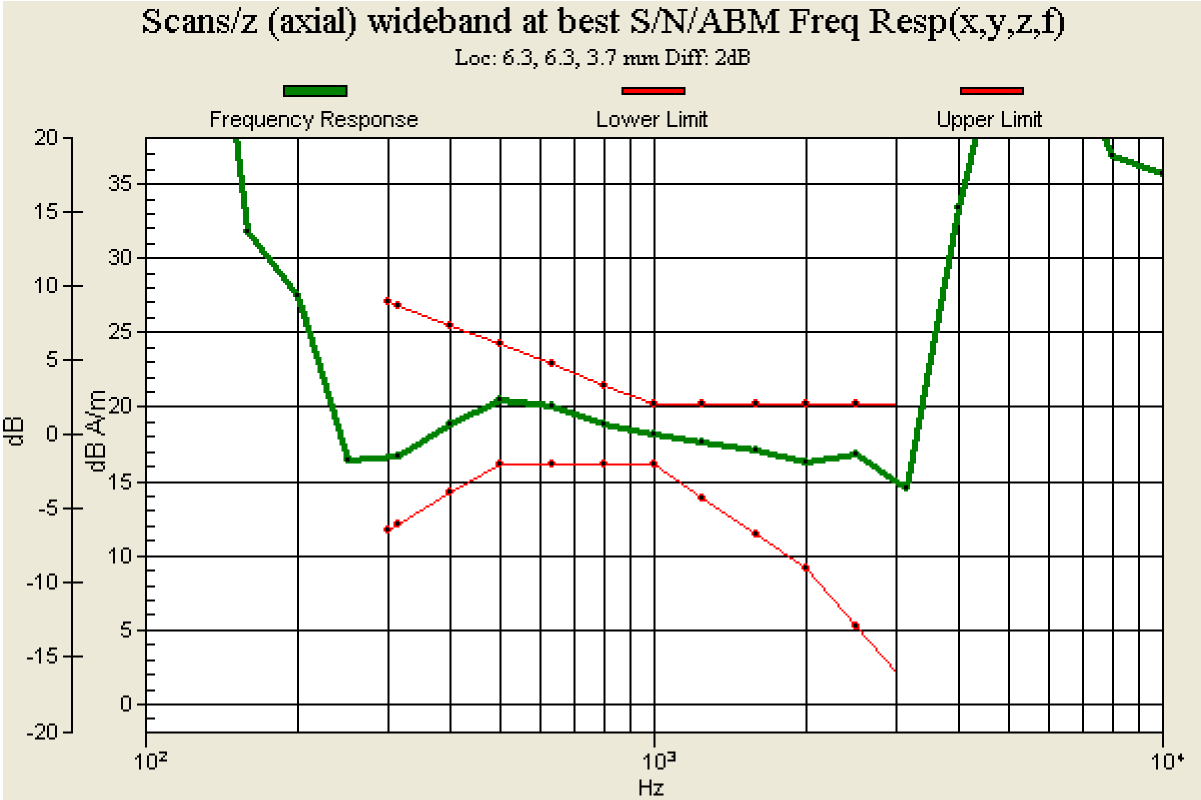
Communication System: CDMA2000 BC1; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):

ABM1/ABM2 = 50.9 dB
ABM1 comp = 18.4 dB A/m
Location: 6.3, 6.3, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 6.3, 6.3, 3.7 mm Diff: 2dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz
20
15
10
5
0
-5
-10
-15
-20
35
30
25
20
15
10
5
0
10²
10³
10⁴

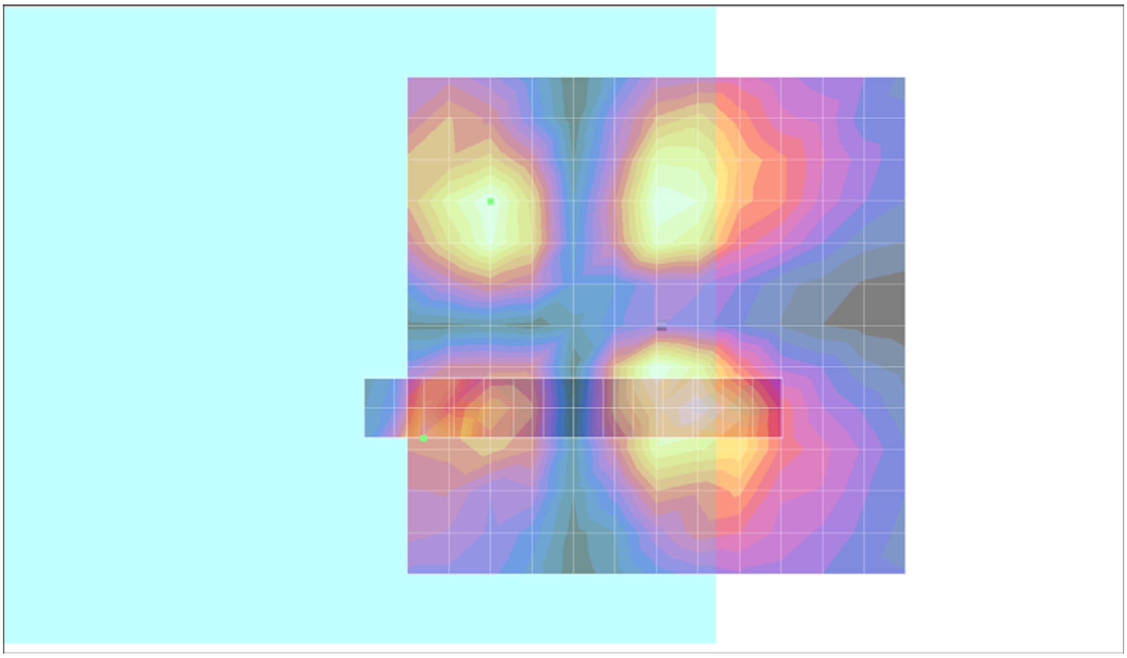
P05 T-Coil_CDMA2000 BC0_RC1+SO3_Ch25_Battery1_Cover1_Radial 1 (X)

DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):
ABM1/ABM2 = 50.1 dB
ABM1 comp = 2.71 dB A/m
Location: 23.3, 11.3, 3.7 mm



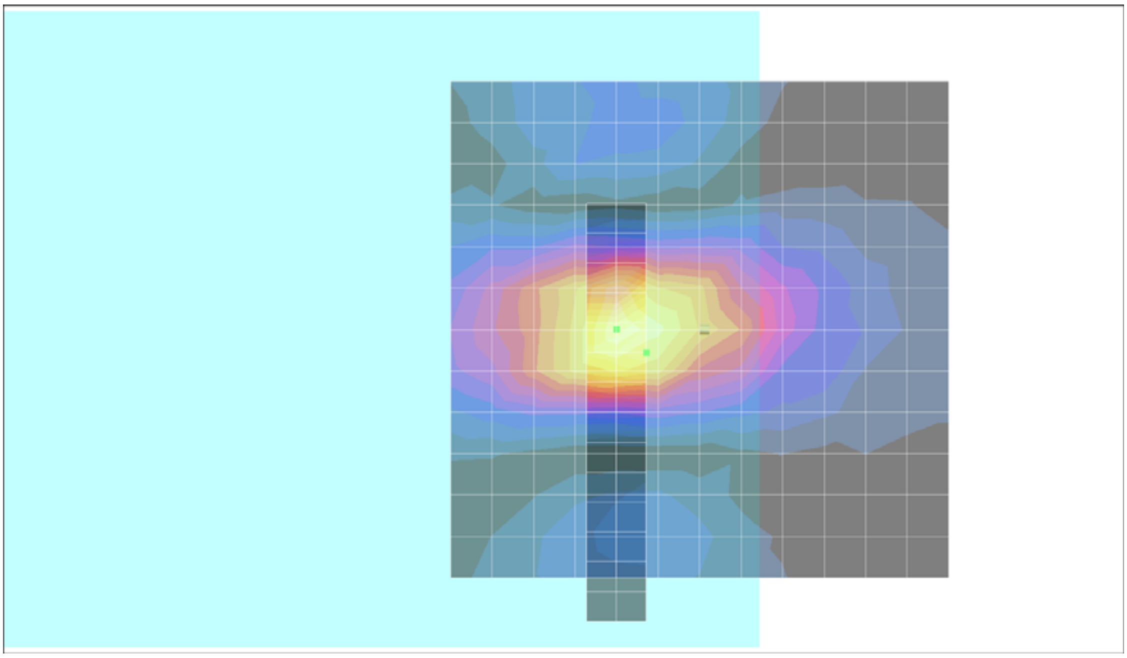
P05 T-Coil_CDMA2000 BC0_RC1+SO3_Ch25_Battery1_Cover1_Radial 2 (Y)

DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):
ABM1/ABM2 = 61.8 dB
ABM1 comp = 16.7 dB A/m
Location: 5.3, 2.3, 3.7 mm



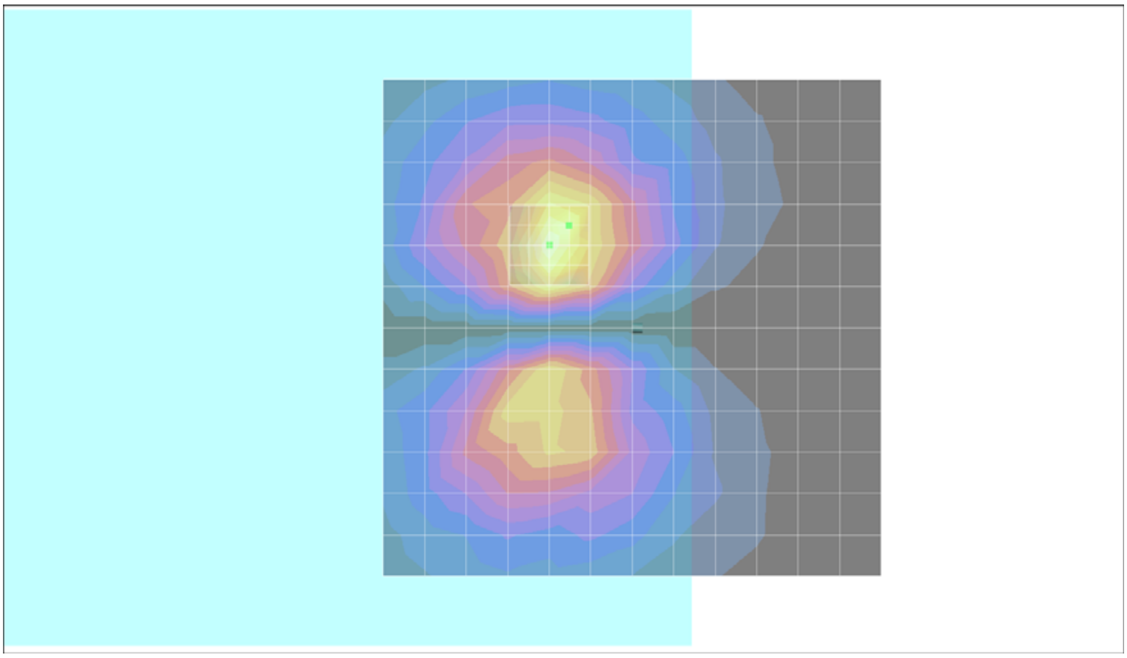
P06 T-Coil_CDMA2000 BC0_RC1+SO3_Ch600_Battery1_Cover1_Axial (Z)

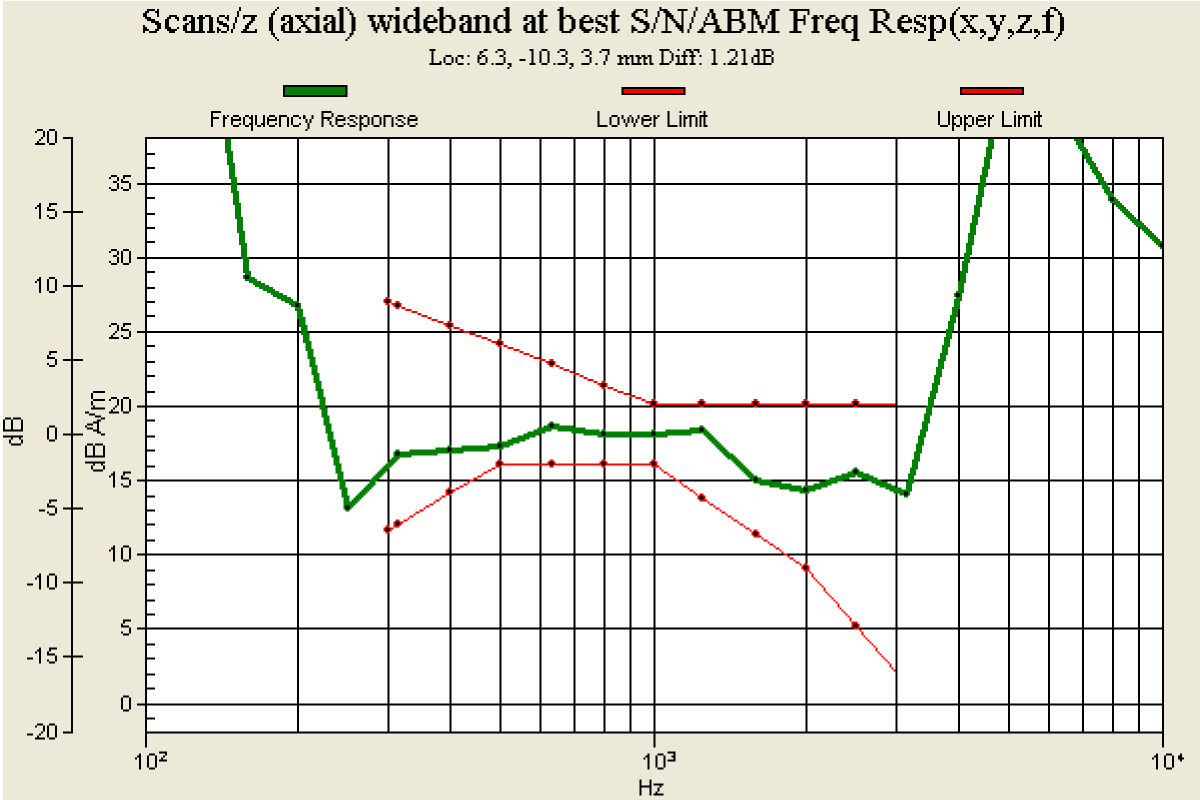
DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.2 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):
ABM1/ABM2 = 52.4 dB
ABM1 comp = 19.0 dB A/m
Location: 6.3, -10.3, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 6.3, -10.3, 3.7 mm Diff: 1.21dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz
20
15
10
5
0
-5
-10
-15
-20
35
30
25
20
15
10
5
0
10²
10³
10⁴

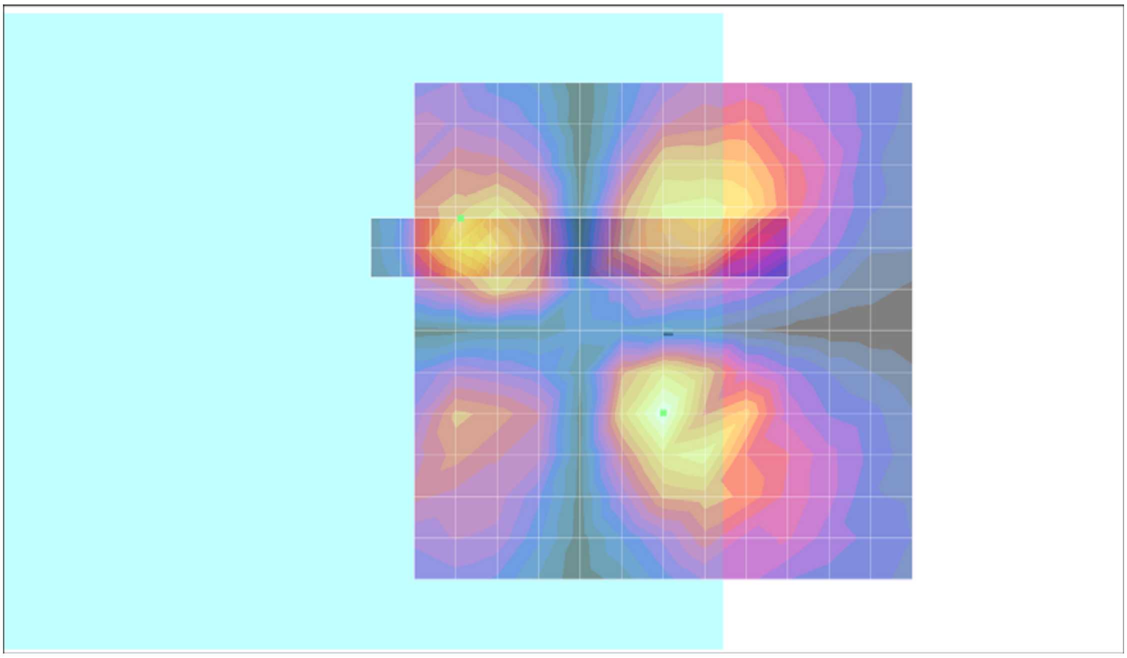
P06 T-Coil_CDMA2000 BC0_RC1+SO3_Ch600_Battery1_Cover1_Radial 1 (X)

DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.2 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):
ABM1/ABM2 = 50.0 dB
ABM1 comp = 7.31 dB A/m
Location: 20.3, -11.3, 3.7 mm



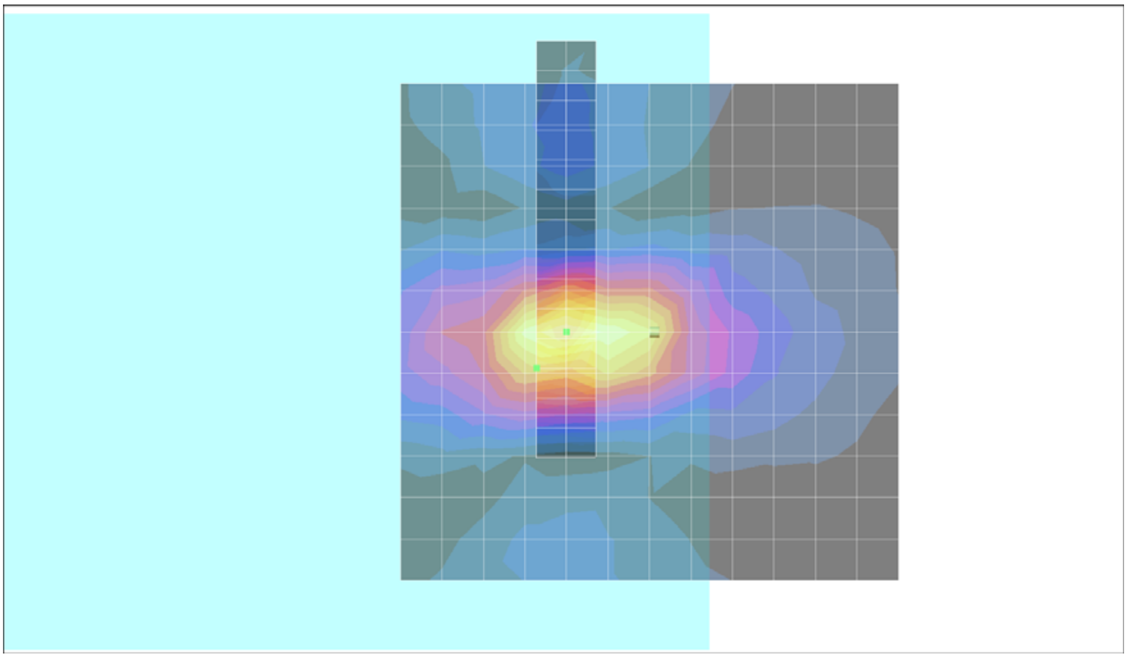
P06 T-Coil_CDMA2000 BC0_RC1+SO3_Ch600_Battery1_Cover1_Radial 2 (Y)

DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.2 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):
ABM1/ABM2 = 62.1 dB
ABM1 comp = 16.5 dB A/m
Location: 11.3, 3.7, 3.7 mm



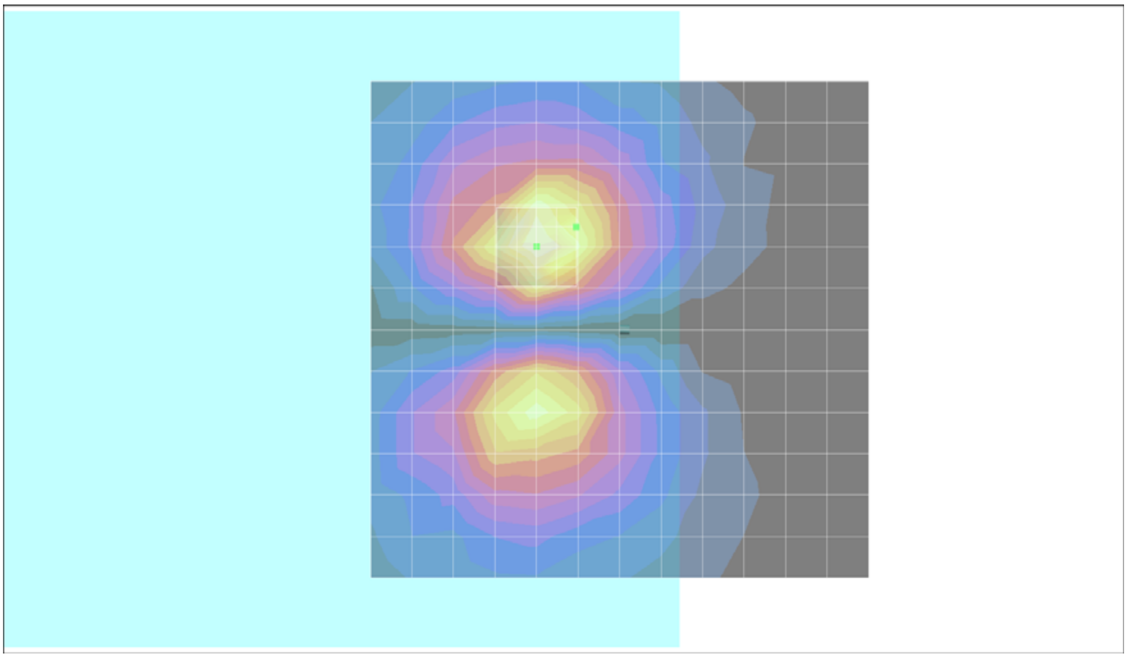
P07 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1175_Battery1_Cover1_Axial (Z)

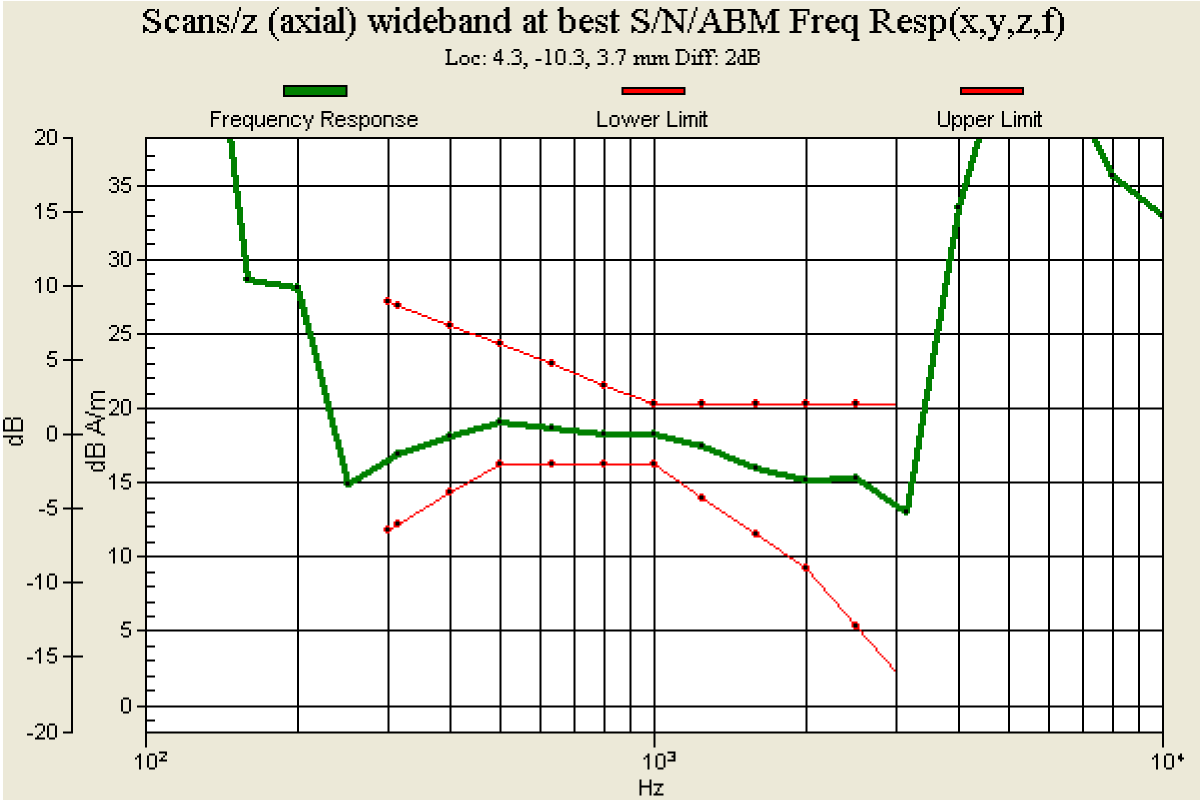
DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.2 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):
ABM1/ABM2 = 52.1 dB
ABM1 comp = 18.4 dB A/m
Location: 4.3, -10.3, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 4.3, -10.3, 3.7 mm Diff: 2dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz

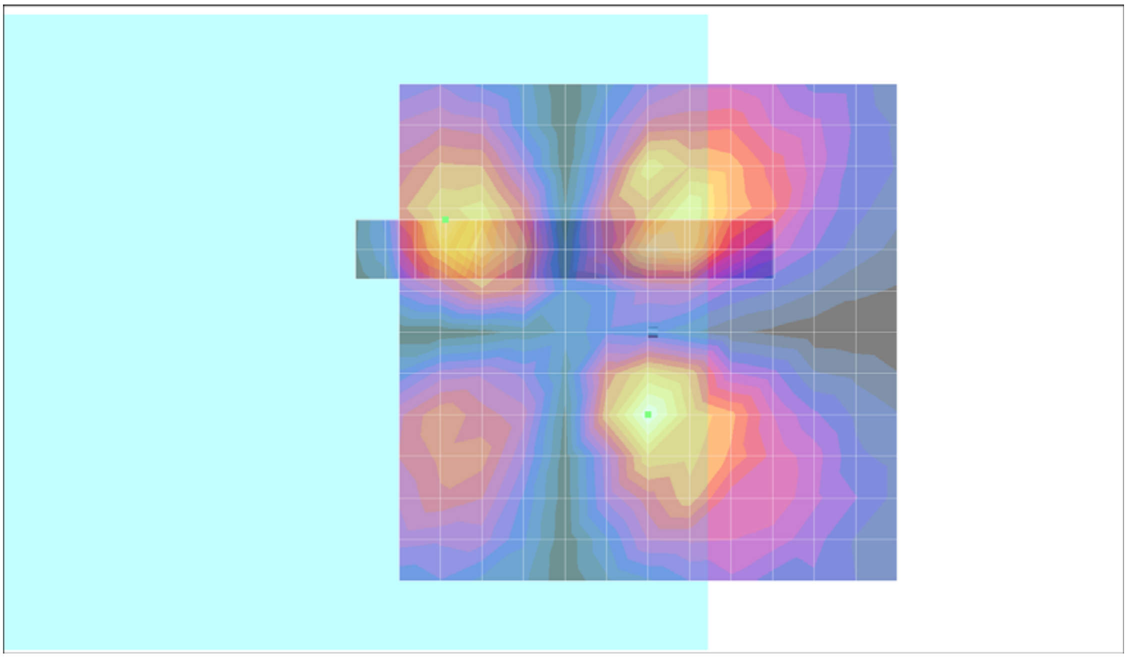
P07 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1175_Battery1_Cover1_Radial 1 (X)

DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.2 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):
ABM1/ABM2 = 49.2 dB
ABM1 comp = 6.53 dB A/m
Location: 20.3, -11.3, 3.7 mm



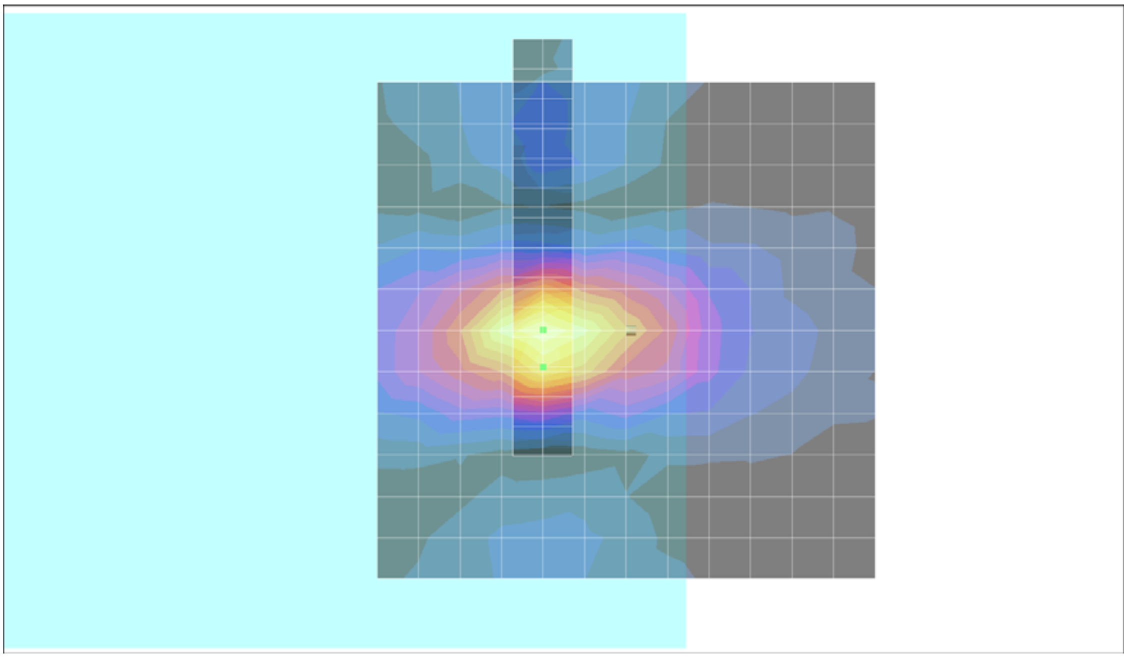
P07 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1175_Battery1_Cover1_Radial 2 (Y)

DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.2 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):
ABM1/ABM2 = 62.1 dB
ABM1 comp = 16.1 dB A/m
Location: 8.3, 3.7, 3.7 mm



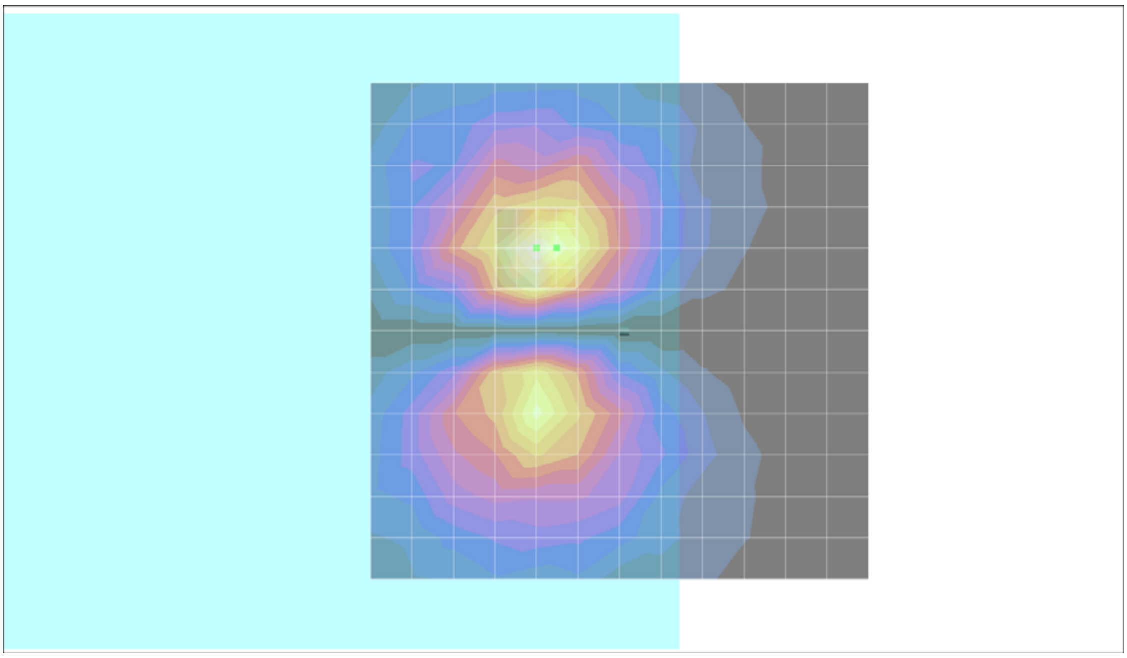
P08 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1175_Battery2_Cover2_Axial (Z)

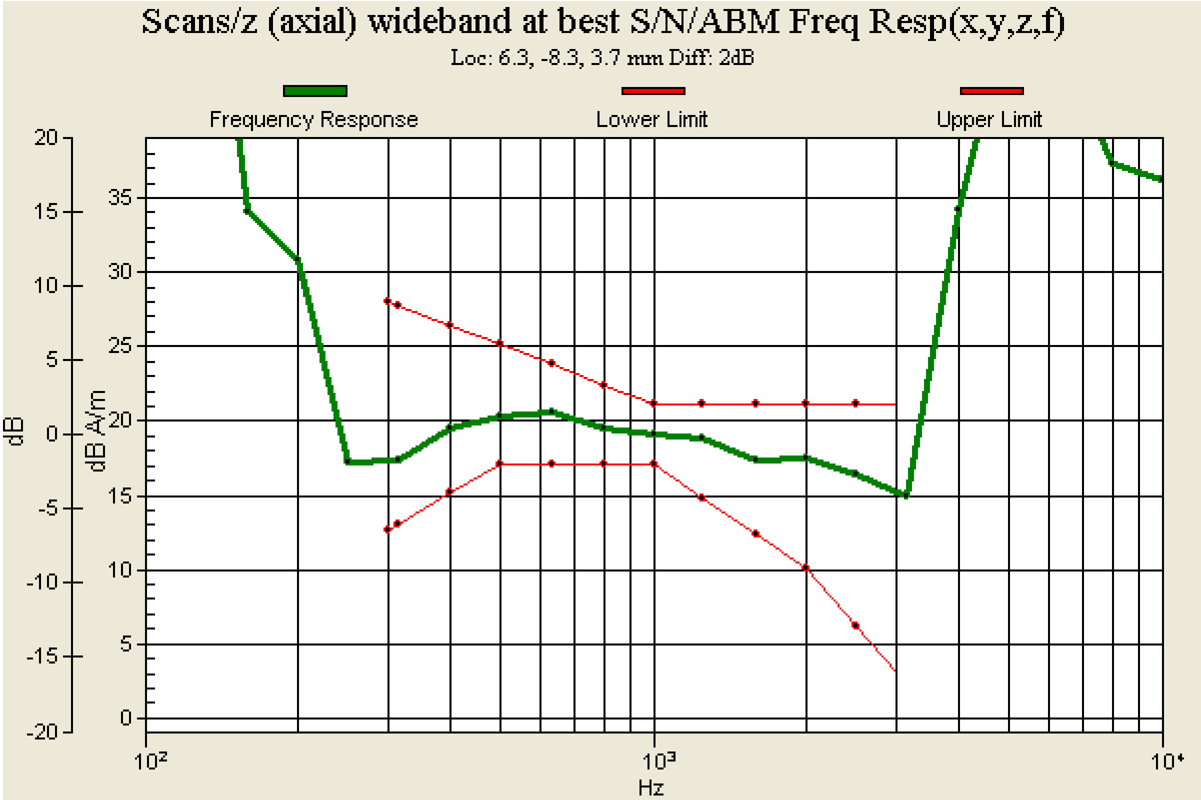
DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: σ = 0 mho/m, $\varepsilon_r = 1$; ρ = 1 kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/z (axial) fine 2mm 8 x 8/ABM SNR(x,y,z) (5x5x1):
ABM1/ABM2 = 54.8 dB
ABM1 comp = 19.0 dB A/m
Location: 6.3, -8.3, 3.7 mm





Scans/z (axial) wideband at best S/N/ABM Freq Resp(x,y,z,f)
Loc: 6.3, -8.3, 3.7 mm Diff: 2dB
Frequency Response
Lower Limit
Upper Limit
dB
dB A/m
Hz

P08 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1175_Battery2_Cover2_Radial 1 (X)

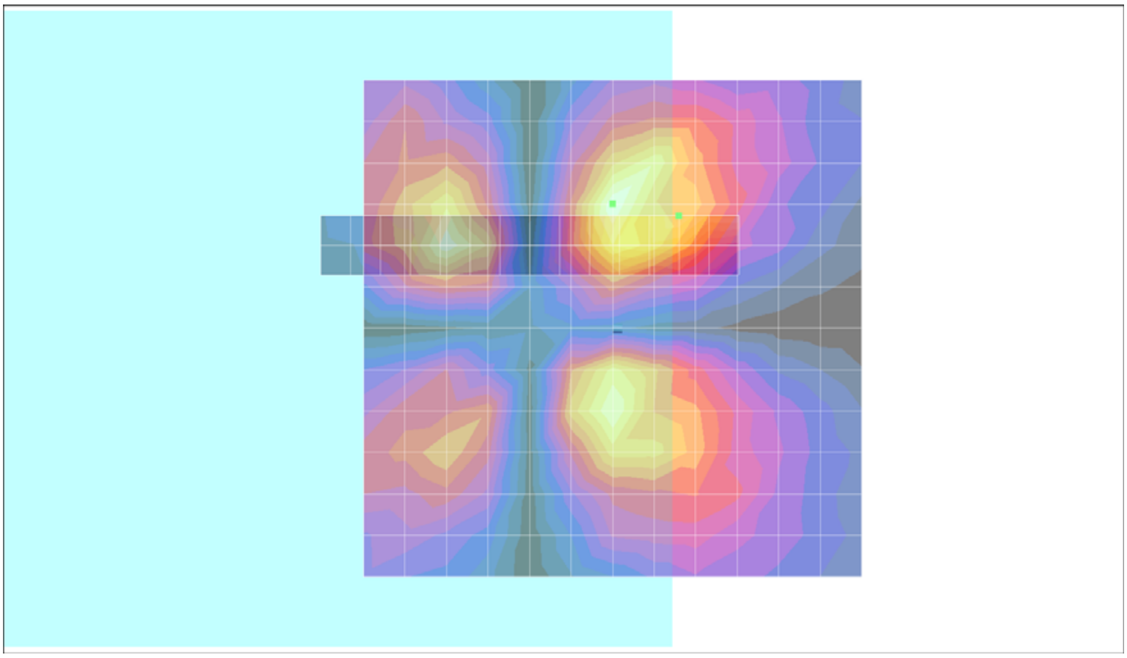
DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/x (longitudinal) fine 3mm 42 x 6/ABM SNR(x,y,z) (15x3x1):

ABM1/ABM2 = 38.0 dB
ABM1 comp = 6.97 dB A/m
Location: -6.7, -11.3, 3.7 mm



P08 T-Coil_CDMA2000 BC0_RC1+SO3_Ch1175_Battery2_Cover2_Radial 2 (Y)

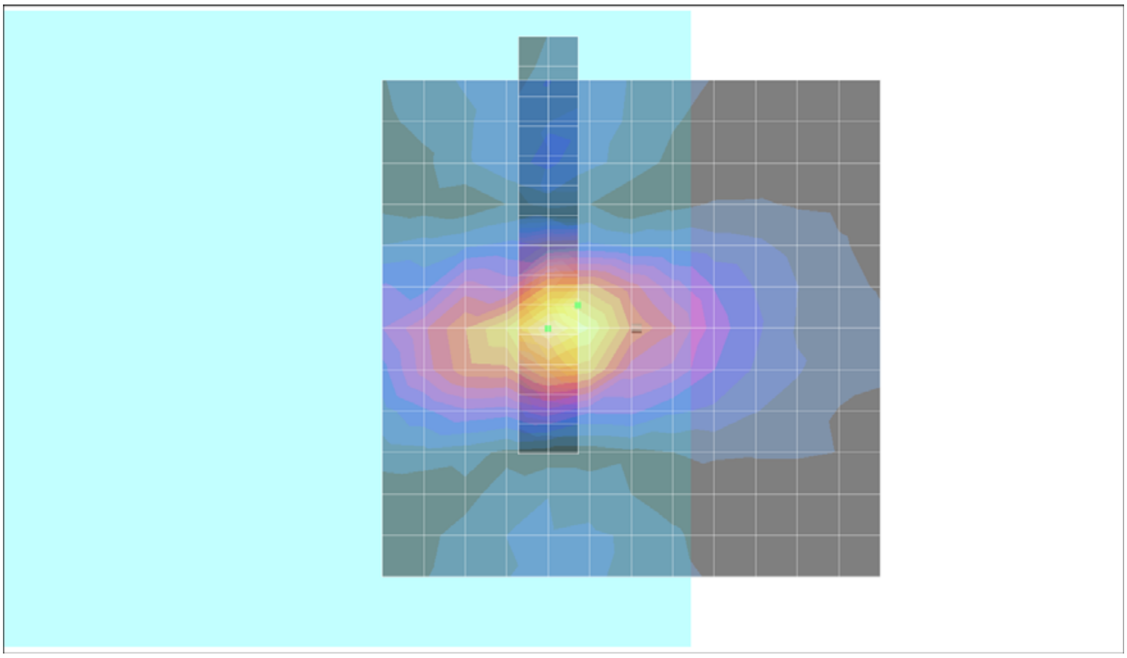
DUT: 111221C21

Communication System: CDMA2000 BC1; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\varepsilon_r = 1$; $\rho = 1$ kg/m^3
Ambient Temperature：21.3 ℃;

DASY4 Configuration:
- Probe: AM1DV3 - 3067; ; Calibrated: 2011/12/08
- Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Scans/y (transversal) fine 3mm 6 x 42/ABM SNR(x,y,z) (3x15x1):

ABM1/ABM2 = 56.1 dB
ABM1 comp = 16.0 dB A/m
Location: 5.3, -2.3, 3.7 mm



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

S **Schweizerischer Kalibrierdienst**
C **Service suisse d'étalonnage**
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Auden**

Certificate No: AM1DV3-3067_Dec11

CALIBRATION CERTIFICATE

Object	AM1DV3 - SN: 3067
Calibration procedure(s)	QA CAL-24.v2 Calibration procedure for AM1D magnetic field probes and TMFS in the audio range
Calibration date:	December 08, 2011

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
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12
Reference Probe AM1DV3	SN: 3000	17-Aug-11 (No. AM1D-3000_Aug11)	Aug-12
DAE4	SN: 781	20-Apr-11 (No. DAE4-781_Apr11)	Apr-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
AMCC	1050	12-Oct-11 (in house check Oct-11)	Oct-13

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: December 8, 2011

References

[1] ANSI C63.19-2007
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
[2] DASY5 manual, Chapter: Hearing Aid Compatibility (HAC) T-Coil Extension

Description of the AM1D probe

The AM1D Audio Magnetic Field Probe is a fully shielded magnetic field probe for the frequency range from 100 Hz to 20 kHz. The pickup coil is compliant with the dimensional requirements of [1]. The probe includes a symmetric low noise amplifier for the signal available at the shielded 3 pin connector at the side. Power is supplied via the same connector (phantom power supply) and monitored via the LED near the connector. The 7 pin connector at the end of the probe does not carry any signals, but determines the angle of the sensor when mounted on the DAE. The probe supports mechanical detection of the surface.
The single sensor in the probe is arranged in a tilt angle allowing measurement of 3 orthogonal field components when rotating the probe by 120° around its axis. It is aligned with the perpendicular component of the field, if the probe axis is tilted nominally 35.3° above the measurement plane, using the connector rotation and sensor angle stated below.
The probe is fully RF shielded when operated with the matching signal cable (shielded) and allows measurement of audio magnetic fields in the close vicinity of RF emitting wireless devices according to [1] without additional shielding.

Handling of the item

The probe is manufactured from stainless steel. In order to maintain the performance and calibration of the probe, it must not be opened. The probe is designed for operation in air and shall not be exposed to humidity or liquids. For proper operation of the surface detection and emergency stop functions in a DASY system, the probe must be operated with the special probe cup provided (larger diameter).

Methods Applied and Interpretation of Parameters

- *Coordinate System:* The AM1D probe is mounted in the DASY system for operation with a HAC Test Arch phantom with AMCC Helmholtz calibration coil according to [2], with the tip pointing to "southwest" orientation.
- *Functional Test:* The functional test preceding calibration includes test of
  Noise level
  RF immunity (1kHz AM modulated signal). The shield of the probe cable must be well connected.
  Frequency response verification from 100 Hz to 10 kHz.
- *Connector Rotation:* The connector at the end of the probe does not carry any signals and is used for fixation to the DAE only. The probe is operated in the center of the AMCC Helmholtz coil using a 1 kHz magnetic field signal. Its angle is determined from the two minima at nominally +120° and –120° rotation, so the sensor in the tip of the probe is aligned to the vertical plane in z-direction, corresponding to the field maximum in the AMCC Helmholtz calibration coil.
- *Sensor Angle:* The sensor tilting in the vertical plane from the ideal vertical direction is determined from the two minima at nominally +120° and –120°. DASY system uses this angle to align the sensor for radial measurements to the x and y axis in the horizontal plane.
- *Sensitivity:* With the probe sensor aligned to the z-field in the AMCC, the output of the probe is compared to the magnetic field in the AMCC at 1 kHz. The field in the AMCC Helmholtz coil is given by the geometry and the current through the coil, which is monitored on the precision shunt resistor of the coil.

AM1D probe identification and configuration data

Item	**AM1DV3** Audio Magnetic 1D Field Probe
Type No	SP AM1 001 BA
Serial No	**3067**

Overall length	296 mm
Tip diameter	6.0 mm (at the tip)
Sensor offset	3.0 mm (centre of sensor from tip)
Internal Amplifier	20 dB

Manufacturer / Origin	Schmid & Partner Engineering AG, Zürich, Switzerland
Manufacturing date	February 17, 2009
Last calibration date	November 29, 2010

Calibration data

Connector rotation angle	(in DASY system)	**265.1** °	+/- 3.6 ° (k=2)
Sensor angle	(in DASY system)	**0.71** °	+/- 0.5 ° (k=2)
Sensitivity at 1 kHz	(in DASY system)	**0.00738 V / (A/m)**	+/- 2.2 % (k=2)