T-Coil HAC Test Report

FOR:

Manufacturer: Teleepoch Limited
Model Name: CDM2035
FCC ID: U46-CDM2035

Test Report #: HAC_BAYAR-001-12001_T-Coil_rev1

Date of Report: 2012-03-12

ACCREDITED
TESTING LABORATORY
Certificate #2135.01

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC Listed #: A2LA Accredited

IC Recognized # 3462B-1

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1. Assessment

The following device was tested against the applicable criteria specified in FCC 20.19 and ANSI C63.19 – 2007 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Teleepoch Limited	CDMA 1x Cellular phone with Bluetooth and GPS function. CDMA working at Celluar, PCS and AWS band.	CDM2035

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2012-03-12	Compliance	Sajay Jose (Test Lab Manager)	Sajay Jose 2012.03.13 11:38:48 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2012-03-12	Compliance	Josie Sabado (Project Engineer)	

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2. Administrative Data

2.1. Identification of the Testing Laboratory Issuing the HAC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
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Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	Josie Sabado

2.2. Identification of the Client

Applicant's Name:	Teleepoch Limited
Street Address:	5A, B1 Building, Digital Tech Zone, High Tech Park (South)
City/Zip Code	Nanshan District Shenzen, Guangdong Province
Country	China

2.3. Identification of the Manufacturer

Same as above client.

3. Equipment under Test (EUT)

3.1. Specification of the Equipment under Test

Marketing Name:	CDM2035
Model No:	CDM2035
Supported Radios:	CDMA
FCC-ID:	U46-CDM2035
Frequency Range:	CDMA BC0: 824.7 – 848.52 MHz CDMA BC1: 1851.25 – 1908.5 MHz CDMA BC15: 1711.25 – 1753.75 MHz
Type(s) of Modulation:	QPSK, HPSK
Antenna Type:	Internal
HAC Rated Category:	T4

3.2. Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Version	SW Version
1	D561548202000220	N/A	N/A

3.3. Identification of Accessory equipment

No accessory equipment.

4. Subject of Investigation

The objective of the measurements done by Cetecom Inc. was to determine the HAC rating of the EUT according to requirements in ANSI C63.19 – 2007. The examinations were carried out with the DASY 52 system described in Section 6.

4.1. FCC rules and ANSI Measurement Methods

Chapter 47 of Code of Federal Regulations, Part 20 § 19 specify criteria for Hearing aid-compatible mobile handsets and ANSI C63.19-2007: American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids establish categories for hearing aids and methods of measurement.

4.2. HAC performance and Equipment categorization

AWF : Articulation Weighing Factor

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

4.2.1. Categories of Hearing Aid Compatibility for wireless devices

Telephone RF Parameters 850 MHz					
Category	AWF (dB)	Limits for E-Field Emissions		Limits for H-Field Emissions	
		V/m	dBV/m	A/m	dBA/m
M1/T1	0	631.0 to1122.0	51 to 61	1.91 to 3.39	+5.6 to +10.6
	-5	473.2 to 814.4	53.5 to 58.5	1.43 to 2.54	+3.1 to +8.1
M2/T1	0	354.8 to 631.0	51 to 56	1.07 to 1.91	+0.6 to +5.6
	-5	266.1 to 473.2	48.5 to 53.5	0.80 to 1.43	-1.9 to +3.1
M3/T1	0	199.5 to 354.8	46 to 51	0.60 to 1.07	-4.4 to +0.6
	-5	149.6 to 266.1	43.5 to 48.5	0.45 to 0.80	-6.9 to -1.9
M4/T1	0	< 199.5	< 46	< 0.60	< -4.4
	-5	< 149.6	<43.5	< 0.45	< -6.9

Telephone RF Parameters 1900 MHz					
Category	AWF (dB)	Limits for E-Field Emissions		Limits for H-Field Emissions	
		V/m	dBV/m	A/m	dBA/m
M1/T1	0	199.5 to 354.8	41 to 51	0.60 to 1.07	+4.4 to +0.6
	-5	146.6 to 266.1	43.5 to 48.5	0.45 to 0.80	-6.9 to -1.9
M2/T1	0	112.2 to 199.5	41 to 46	0.34 to 0.60	-9.4 to -4.4
	-5	84.1 to 149.6	38.5 to 43.5	0.25 to 0.45	-11.9 to -6.9
M3/T1	0	62.1 to 112.2	36 to 41	0.19 to 0.34	-14.4 to -9.4
	-5	47.3 to 84.1	33.5 to 38.5	0.14 to 0.25	-16.9 to -11.9
M4/T1	0	< 63.1	< 36	< 0.19	< -14.4
	-5	< 47.3	<33.5	< 0.14	< -16.9

5. Measurement Procedure

ANSI has published an American National Standard on June 2007 (C63.19), which establishes categories for hearing aids and for wireless devices, and provide tests that can be used to assess the electromagnetic characteristics of hearing aids and for wireless devices and assign them to these categories.

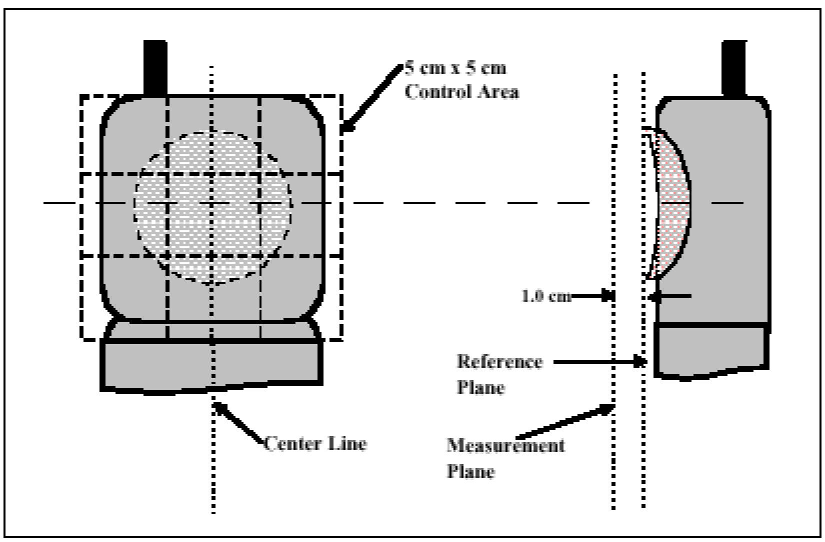
5.1. General Requirements

The test shall be performed in a laboratory with an environment which avoids influence on HAC measurements by ambient EM sources and any reflection from the environment itself. The ambient temperature shall be in the range of 20°C to 26°C and 30-70% humidity.

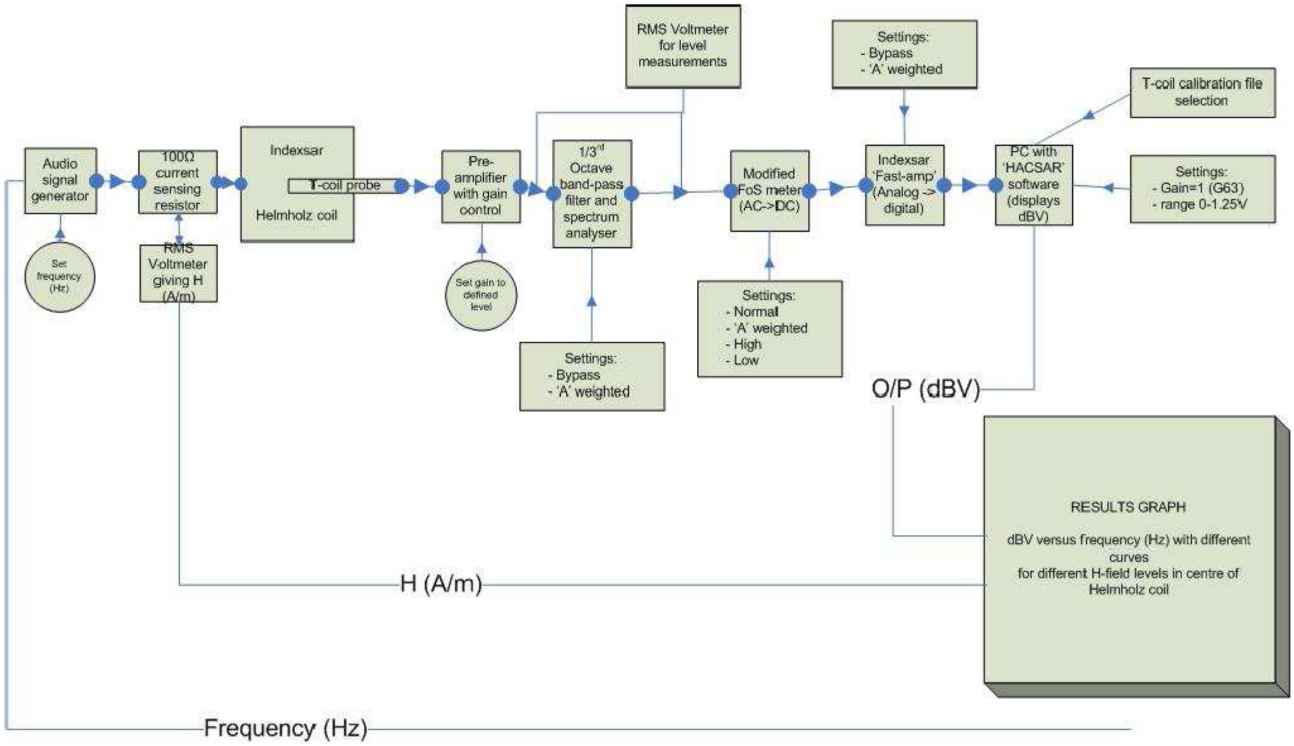
5.2. Configurations

Device holder and positioning description
The IndexSAR phone holder is a skeletal design. It is designed so that most phones can be held from the bottom without putting any plastic materials in contact with the upper part of the EUT.

Test positions of device
The HAC measurements are perform according to the requirements of ANSI C63.19. It allows centering the wireless device inside a 5 x 5 cm control area marked with 4 points for position adjustment. SARA2’s robot arm allows an exact adjustment of the measurement distance from the DUT.
The measurement probe is centered above the mobile phone speaker inside the control area.



5.3. Pre-Measurement Calibration Procedure



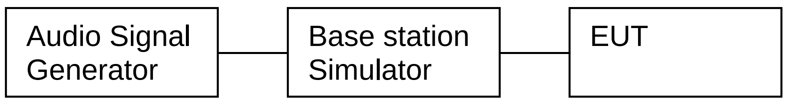
1. Generate a 1 kHz and increase the amplitude until the RMS voltmeter measures 1 V across the 100Ω current sensing resistor.
2. Increase the gain of the preamplifier until the software measures 1 A/m.
3. Open a Tcoil Report window in the software.
4. Adjust the signal generator to each 1/3 Octave Band and measure each.
5. Adjust the 1/3rd Octave band-pass filter until the spectrum is flat along the 0 dB relative to 1 kHz axis.

5.4. Audio Signal Preparation

Normal speech input levels are as follows:

Standard	Technology	Input (dBm0)
TIA/EIA/IS-2000	CDMA	-18
TIA/EIA-136	TDMA (50 Hz)	-18
T1/T1P1/3GPP	UMTS (WCDMA)	-16
iDEN	TDMA (22 Hz and 11 Hz)	-18
J-STD-007	GSM (217 Hz)	-16

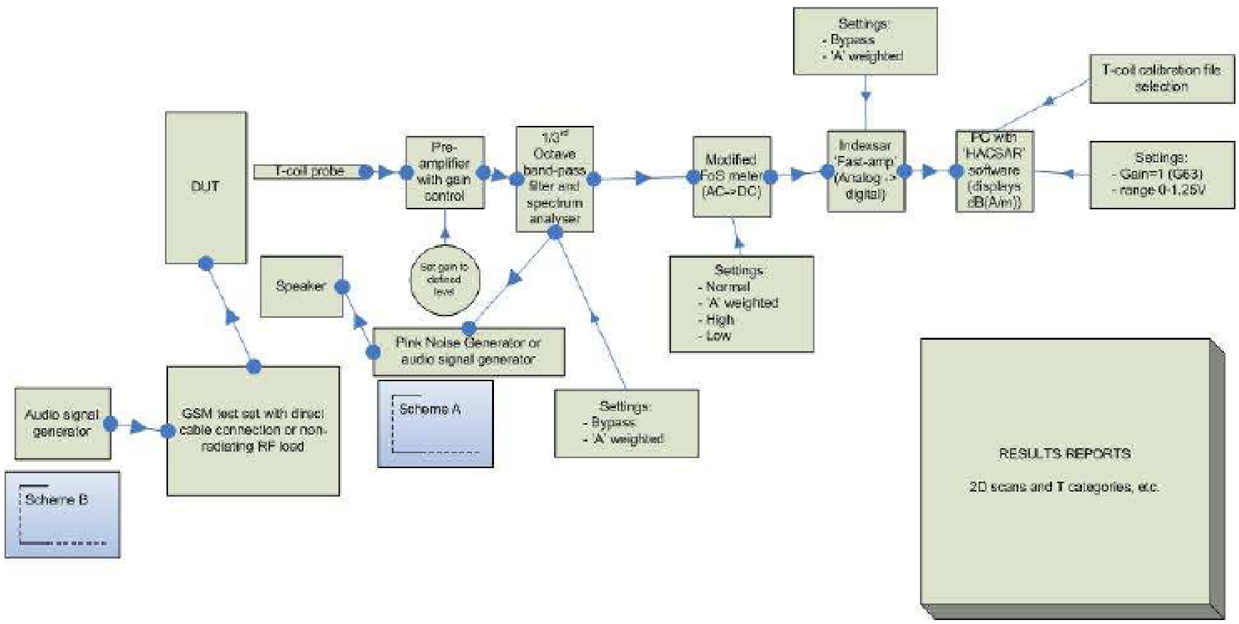
Because accurate results may not be possible with voice coders used with CDMA, a P.50 artificial voice signal is used.



1. Establish a call between the base station simulator and the EUT via a conducted link.
2. Set the voice coder on the base station simulator to “Decoder Cal”. This represents 3.14 dBm0.
3. Using the audio analyzer function of the base station simulator, note the RMS value.
4. Calculate the RMS value of the desired input level using the equation
   $$(\text{RMS value of Decoder Cal}) * 10^{[3.14 - (\text{desired input level})] / 20}$$
5. Change the voice coder to “Encoder Cal”.
6. Adjust the audio signal generator so that the base station simulator audio analyzer matches the RMS value of the desired input level calculated in step 4.

5.5. EUT Scanning Procedure

All tests are performed with the same configuration of test steps and in accordance with the requirements described in C63.19-2007 Chapter 4.



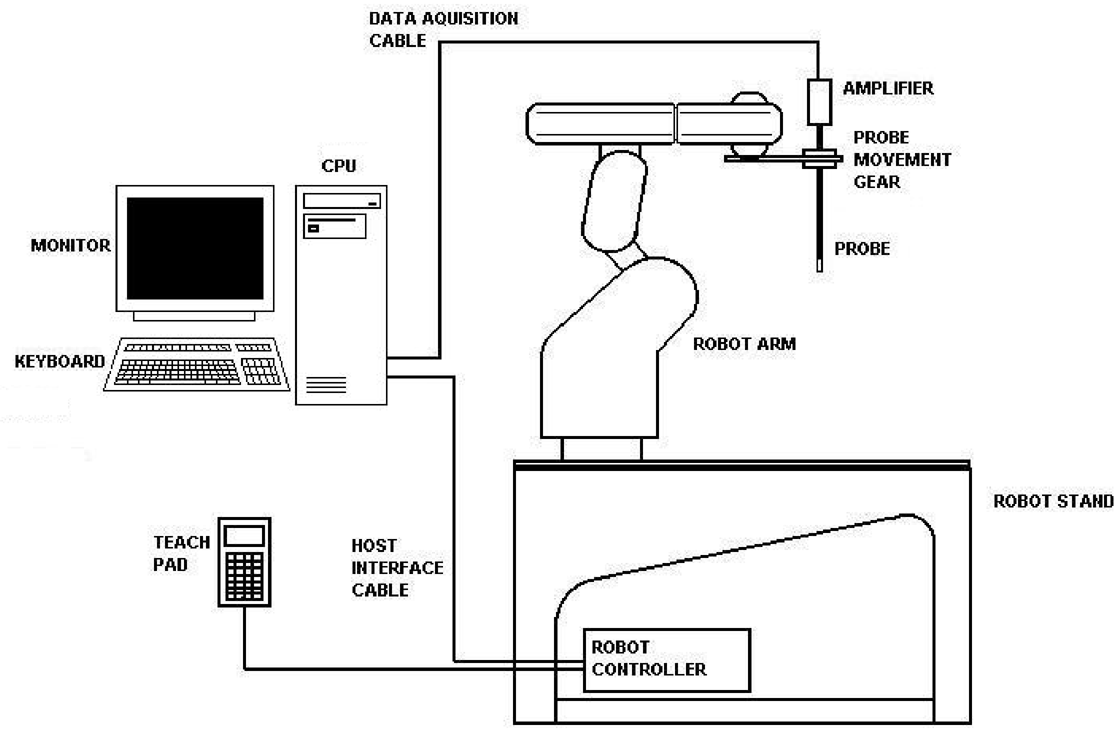
1. Select a probe and place it in the probe holder of the robot.
2. Setup a call at maximum output power on the EUT. Generate the desired audio file at the desired input level.
3. Perform an area scan.
4. Move the probe to the maximum measured point.
5. Measure the ABM1 value with the audio stimulus enabled.
6. Turn off the audio stimulus and measure AMB2.
7. With the axial probe only, perform spectral measurements in each of the 1/3 octave bands.

6. The Measurement System

6.1. Robot system specification

The HAC measurement system being used is the IndexSAR SARA2_HAC system, which consists of a Mitsubishi RV-E2 6-axis robot arm and controller, IndexSAR HAC probe and amplifier. The robot is used to articulate the probe to programmed positions inside the phantom head to obtain the SAR readings from the DUT.

The system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

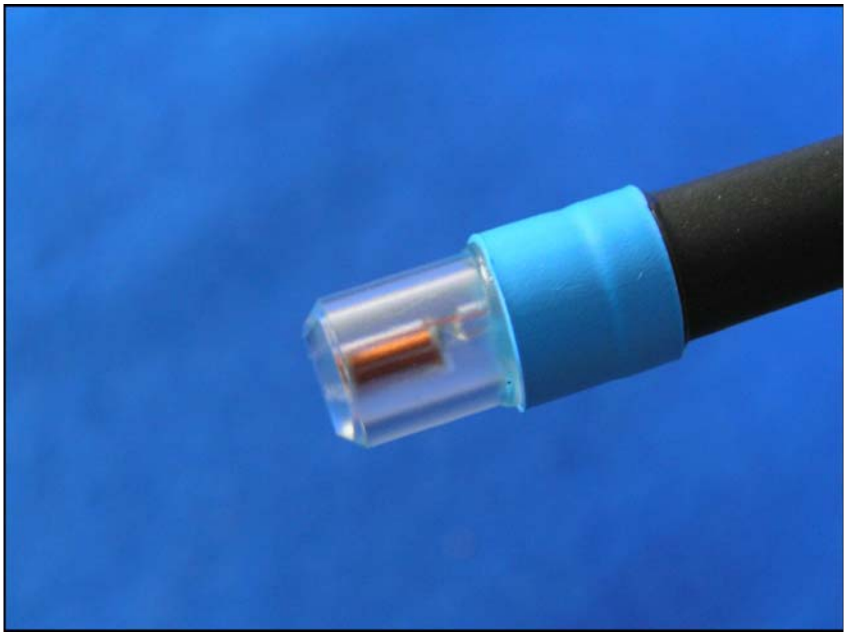


The position and digitized shape of the EUTs are made available to the software for accurate positioning of the probe and reduction of set-up time.

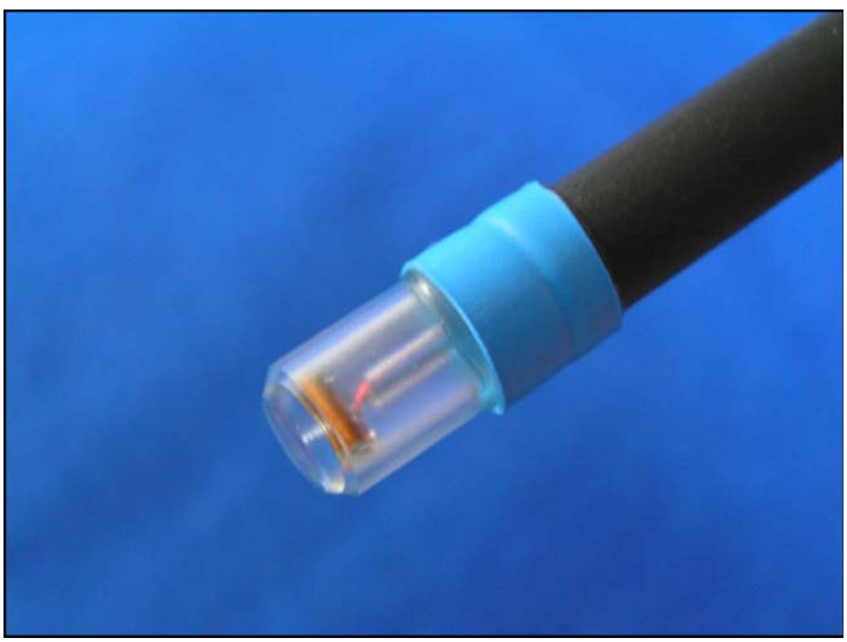
In operation, the system does an area (2D) scan at a fixed distance from the EUT.

6.2. Isotropic E-Field Probe for Dosimetric Measurements

Two separate probes are provided for measuring audio frequency magnetic fields in both axial and transverse direction. The probes are measured using associated electronics and positioned by the 3-axis Cartesian robot system and the results are processed and presented using the software application running on a PC.

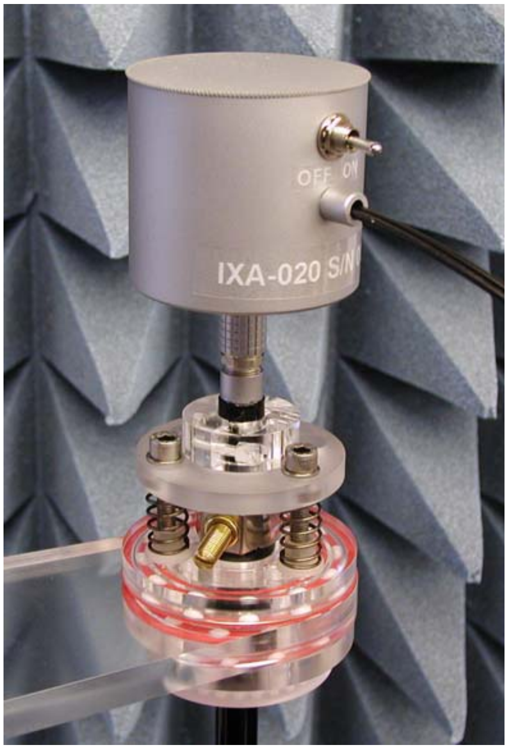


Axial T-coil Probe



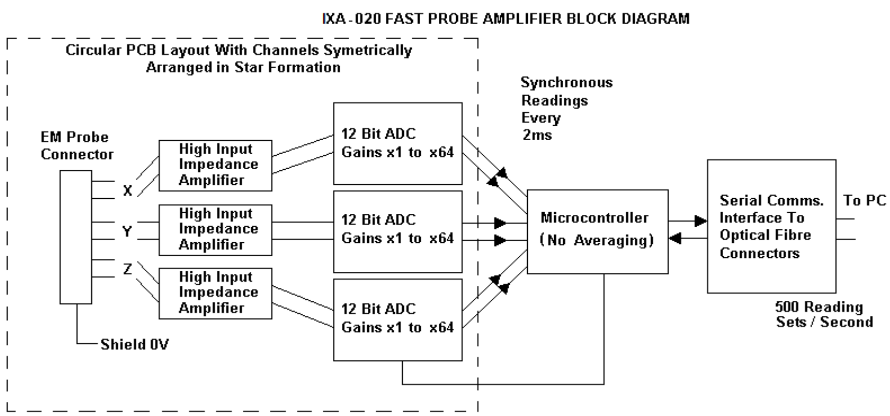
Transverse T-coil probe

6.3. The IXA-020 probe amplifier

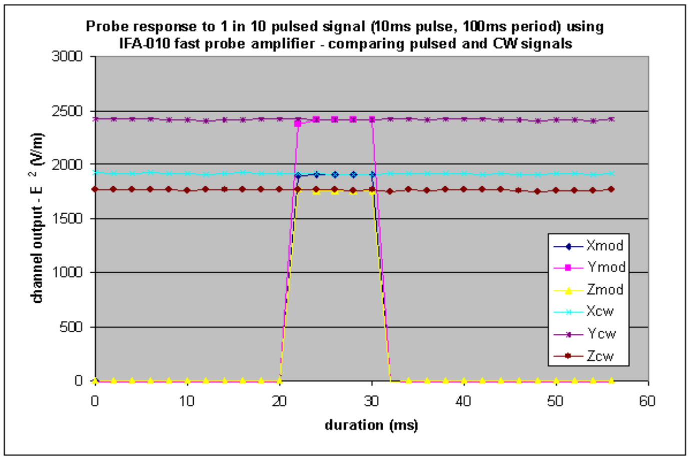


This component is a key component of the measurement system. When used with the T-coil probes, only the X-channel value is used and no linearization procedures are applied.

A block diagram of the fast probe amplifier electronics is shown below.



This amplifier has a time constant of approx. 50µs, which is much faster than the RF probe response time. The overall system time constant is therefore that of the probe (<1ms) and reading sets for all three channels (simultaneously) are returned every 2ms to the PC. The conversion period is approx. 1 µs at the start of each 2ms period. This enables the probe to follow pulse modulated signals of periods >>2ms. The PC software applies the linearization procedure separately to each reading, so no linearization corrections for the averaging of modulated signals are needed in this case. It is important to ensure that the probe reading frequency and the pulse period are not synchronized and the behavior with pulses of short duration in comparison with the measurement interval needs additional consideration.



7. Uncertainty Assessment

Measurement uncertainty values were evaluated for HAC measurements. The uncertainty values for components were evaluated according to the procedures given in ANSI C63.19.

7.1. Measurement Uncertainty Budget

Error Contribution	Uncertainty (+/- %)	Distribution	Div.	C ABM1	C ABM2	Std Unc. ABM1	Std. Unc. ABM2
RF reflections	0.8	rect	1.73	1	1	0.46	0.46
ABM noise	25.89	rect	1.73	0	1	0	14.97
Accuracy of level setting	4.71	rect	1.73	1	1	2.72	2.72
Positioning accuracy	4.7	rect	1.73	1	1	2.71	2.71
Probe coil sensitivity	1.799	rect	1.73	1	1	2.72	2.72
Helmholtz field accuracy	2.33	rect	1.73	1	1	1.35	1.35
Equaliser accuracy	12.20	rect	1.73	1	1	7.05	7.05
Reference level setting on Test Set	4.71	rect	1.73	1	1	2.72	2.72
Stability of ABM electronics	2.33	rect	1.73	1	1	1.35	1.35
					Combined	9.11	17.53
					Expanded (k=2)	18.23	35.05

8. Test results summary

Radial A = East to West Direction
Radial B = North to South Direction

8.1. HAC Results for CDMA BC0

Operation Mode	Channel	Frequency (MHz)	Probe Position	ABM 1 (dB A/m)	ABM 2 (dB A/m)	Category	Results (Appendix A)
CDMA RC3, SO3	1013	824.7	Axial	-1.256	-32.728	T4	Data Set 1
			Radial A	-4.498	-60	T4	
			Radial B	-0.414	-60	T4	
	384	836.52	Axial	-0.941	-35.546	T4	Data Set 2
			Radial A	-4.066	-60	T4	
			Radial B	0.595	-60	T4	
	777	848.31	Axial	0.610	-35.703	T4	Data Set 3
			Radial A	1.126	-60	T4	
			Radial B	-4.933	-60	T4	

8.2. HAC Results for CDMA BC1

Operation Mode	Channel	Frequency (MHz)	Probe Position	ABM 1 (dB A/m)	ABM 2 (dB A/m)	Category	Results (Appendix A)
CDMA RC3, SO3	25	1851.25	Axial	2.531	-31.869	T4	Data Set 4
			Radial A	-2.862	-60	T4	
			Radial B	2.322	-60	T4	
	600	1880	Axial	0.678	-31.535	T4	Data Set 5
			Radial A	-1.906	-60	T4	
			Radial B	0.101	-60	T4	
	1175	1908.75	Axial	-0.122	-33.514	T4	Data Set 6
			Radial A	-3.057	-60	T4	
			Radial B	-0.845	-60	T4	

8.3. HAC Results for CDMA BC15

Operation Mode	Channel	Frequency (MHz)	Probe Position	ABM 1 (dB A/m)	ABM 2 (dB A/m)	Category	Results (Appendix A)
CDMA RC3, SO3	**25**	**1711.25**	Axial	0.407	-35.041	T4	Data Set 7
			Radial A	-5.965	-60	T4	
			Radial B	-7.521	-60	T4	
	450	**1732.48**	Axial	0.204	-32.360	T4	Data Set 8
			Radial A	-0.856	-60	T4	
			Radial B	-0.305	-60	T4	
	875	**1753.75**	Axial	1.273	-34.289	T4	Data Set 9
			Radial A	-4.568	-60	T4	
			Radial B	-2.922	-60	T4	

8.4. References

1. FCC 47 CFR 20 Article 19 – Hearing aid-compatible mobile handsets

2. ANSI C63.19-2007, American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids

3. INDEXSAR – HAC Test System User's Manual, December 2007.

9. Test Equipment

Instrument description	Supplier / Manufacturer	Model	Serial No.	Calibration (date)	Calibration Due (date)
Bench top Robot	Mitsubishi supplied by IndexSAR	RV-E2	EA1030108	N/A	N/A
Software	IndexSAR	SARA2_HAC v.1.1.3	N/A	N/A	N/A
Axial T-Coil Probe	IndexSAR	IXP-100	T0005	2005-12-21	N/A
Radial T-Coil Probe	IndexSAR	IXP-110	T0006	2005-12-21	N/A
Digital Multimeter	Klein Tools	MM200	0710X-A1	2011-05-02	2012-05-02
Preamplifier	ARTcessories	MicroMIX	N/A	N/A	N/A
Waveform Generator	Agilent	33220A	MY43004303	N/A	N/A
Digital Equalizer	Phonic	i SupraCurve	OIA0D20168	N/A	N/A
100 ohm resistor block	IndexSAR	N/A	N/A	N/A	N/A
Helmholtz Coil	IndexSAR	IXT-020	0004	N/A	N/A
FoS Meter	IndexSAR	IXHM-010	0003	N/A	N/A
Probe Amplifier	IndexSAR	IXA-020	0072	N/A	N/A
Audio Analyzer	Rohde & Schwarz	UPL 16	838205/005	2011-05-25	2012-05-25
Digital Radio Comm. Tester	Rohde&Schwarz	CMU200	110229	2011-05-19	2012-05-19

10. Report History

2012-03-05: Original Report.
2012-03-12: Updated CDMA BC15 Results. Added appendix C. Replaces previous report number **HAC_BAYAR-001-12001_Tcoil**