MOTOROLA

FCC ID: AZ489FT5848
DECLARATION OF COMPLIANCE HAC ASSESSMENT - TELECOIL

iDEN Mobile Devices **Audio Test Laboratory** **8000 West Sunrise Blvd** **Fort Lauderdale, FL. 33322**	**Date of Report:** **11 AUgust 2006** **Report Revision:** **Rev. C** **Report ID:** **FCC_HAC_Telecoil_Rpt_i580_Rev-D_060811**

Responsible Engineer:	Chad Jackman
Date/s Tested:	2/16/2006 to 7/26/2006
Manufacturer/Location:	Motorola – Plantation, Florida
Sector/Group/Div.:	iDEN Mobile Devices
Date submitted for test:	16 Feb. 2006
DUT Description:	Clamshell style with extendable antenna
Signaling type:	TDMA: iDEN
Test TX mode(s):	2:6 (a.k.a. 1:3), 1:6
Max. Power output:	0.640W; Pulse Average; Factory tuning
Nominal Power:	0.600W; Pulse Average; Factory tuning
TX Frequency Bands:	iDEN - 806-821 MHz, 896-901 MHz (in the U.S.)
Model(s) Tested:	i580 (H83XAH6RR4AN)
Model(s) Certified:	i580 (H83XAH6RR4AN)
Serial Number(s):	364AFW00HP
Rule Part(s):	20.19(b)(2)

Approved Applicable Accessories:

Antenna(s):

8575868A01 - 806-928MHz extendable ¼ wave antenna
Gain - 806-825MHz extended 2.15dBd, retracted -1.16 dBd; 896-902MHz extended 2.15 dBd, retracted -1.22 dBd

Battery(ies):

SNN5765A High Performance Li Ion, Battery Cover NNTN2332A
SNN5744A Slim Li Ion, Battery Cover NNTN2331A

Min. Axial field strength:	**9.49 dB A/m**
Min. Radial field strength:	**-0.79 dB A/m**
Min. ABM Desired-to-Undesired signal ratio:	**26.59 dB**
HAC Category rating:	**M3, T3**

Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the C63.19-2005 reference standard. This report shall not be reproduced without written approval from an officially designated representative of the Motorola EME Laboratory.

The results and statements contained in this report pertain only to the device(s) evaluated.

Alfred Wieczorek, P. E
Motorola iDEN Mobile Devices Business

/S/ Alfred Wieczorek **Approval Date:** 11 August 2006

Certification Date: 24 Feb. 2006

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REVISION HISTORY

Date	Revision	Comments
2/24/06	O	Initial release
5/11/06	A	Modification to address issues raised by FCC examiner.
6/2/2006	B	Additional modifications, based on feedback from FCC.
7/13/2006	C	Additional modifications based on feedback from the FCC, Correspondence Numbers 31105 and 31106.
8/11/2006	D	Additional modifications based on feedback from the FCC, Correspondence Numbers 31366 and 31367.

1.0 Introduction and Overview

This report details the utilization, test setup, test equipment, and test results of Hearing Aid Compatibility (HAC) telecoil measurements required per 47 CFR 20.19(b)(2). These measurements were performed during a controlled on-network telephone call, at full rated RF power with the antenna extended, to assess compliance with the PC63.19-2001 rd 3.6 standard. The data in this report is for assessing T-coil compliance only, as a separate report was previously filed with near-field performance data for assessing RF Interference potential, establishing an M3 rating. Some relevant data extracted from that report are included in Appendix A.

Per the Table 7-1 of the standard the iDEN air interface protocol articulation weighting factor (AWF) has been assigned a value of zero.

2.0 Telecoil Compliance Criteria (Per C63.19-2001 rd 3.6 section 7.3)

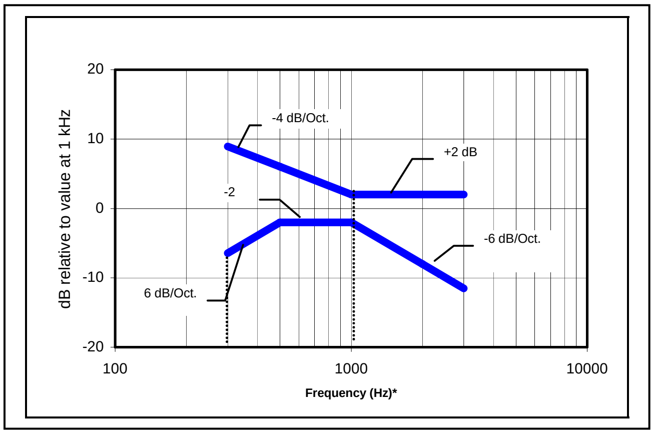
The signal quality rating shall be T3 or better per 47 CFR 20.19. Per C63.19 this rating is dependent upon the articulation weighting factor (AWF) for specific air interface protocols as listed in the following table:

Table 2-1 – Signal Quality rating limits

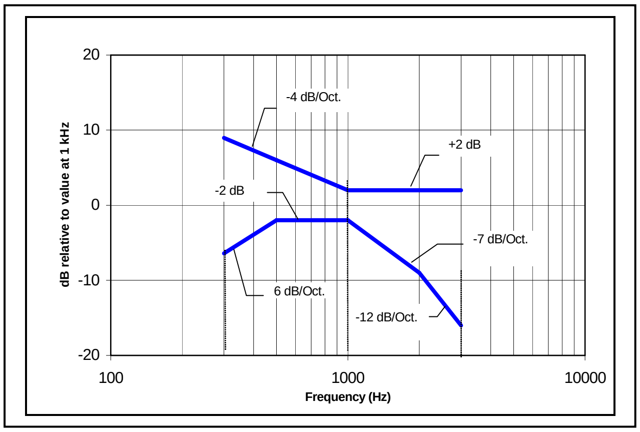
Rating	AWF = 0	AWF = 5
T4	> 10 dB	> 15 dB
T3	0 to 10 dB	5 to 15 dB

To merit this rating the axial component of the audio band magnetic (ABM) field shall be ≥ -13 dB A/m at 1 kHz, and the radial components of the audio band magnetic field shall be ≥ -18 dB A/m at 1 kHz.

In addition the frequency response shall lie with the limit lines evident in the following graphs:



A – Mask for WDs with a field that exceeds -10 dB(A/m) at 1 kHz



B - Mask for WDs with a field t between -10 to -13dB at 1kHz

Figure 1-1 –Frequency Response (Axial only)

The current C63.19 methodology used to determine a wireless device (WD) T-category rating is illustrated in the attached flow chart in Figure 1. This process presumes that the interference heard by a hearing aid used is dominated by the RF interference component rather than the inductively coupled noise interference component due to pulsing currents flowing in a handset. As a result a WD T-category rating value is precluded from exceeding the RF interference rating by virtue of the highlighted steps within the diagram.

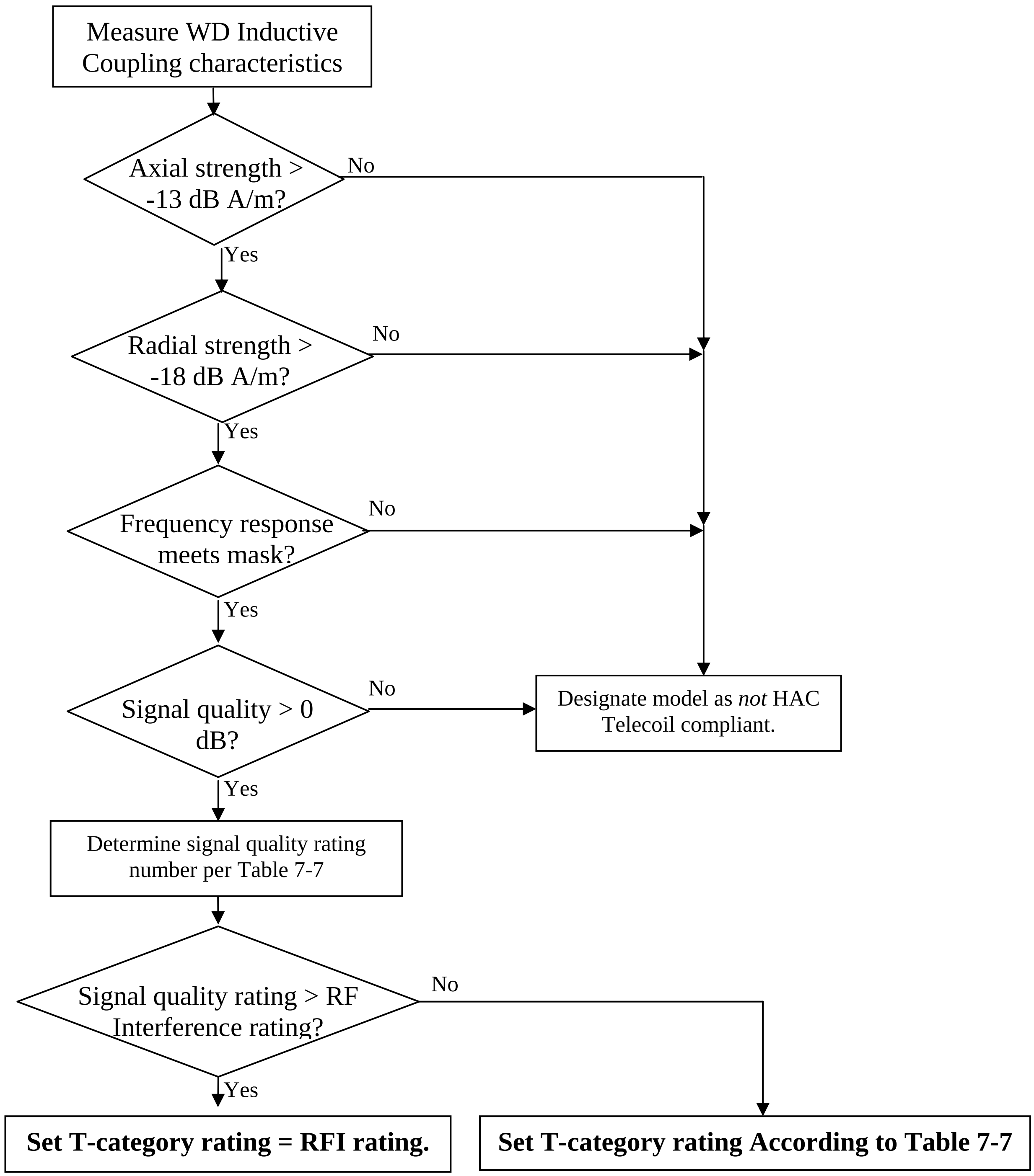


Figure 2-2 - WD Telecoil Category Rating Process
(Note: RFI rating assumed to be M3 or M4)

3.0 Description of Device Under Test (DUT)

FCC ID: AZ489FT5848 is used for telephone service subject to 47 CFR 20.19 for hearing aid compatibility. The maximum output power is 0.640 watts pulse average as determined by the upper limit of the production line final test station. The DUT was tuned to be within 5% of the maximum rated power. It is capable of transmitting on any network commanded frequency in the bands of 806 to 821 MHz (within the United States) and 896 to 901 MHz. It employs a time division multiplexing (TDM) transmission technology with a duty cycle of 16.67% (1:6 multiplexing) or 33.33% (2:6 multiplexing) using 16-QAM modulation on each of four OFDM-like sub-carriers. Since the TDM period is fixed at 90 ms. this duty cycle difference results in a difference in the RF carrier modulation envelope fundamental frequency being either 11Hz or 22Hz respectively. To evaluate the effect of the difference in envelope fundamental frequency measurements were made with both duty cycles in each band of operation (see section 9).

A different Vocoder is used for each multiplexing factor as commanded by the cellular network because a more efficient Vocoder is needed to achieve the greater spectral efficiency provided by the low-rate 1:6 multiplexing. Each Vocoder operates for the full duration of a transmission burst and both produce a random digital stream during the burst so between them there is essentially no difference in the modulation envelope during the burst. Accordingly measurements were made for the 2 duty cycles using the Vocoder normally used with the particular duty cycle.

User controls include selecting the duration of the backlight duration and the audio frequency response characteristic. Instructions for setting the backlight duration and the frequency response are provided in the User Guide respectively in the sections entitled *Customizing Your Phone*, *User Settings*, and *Advanced Calling Features*, *Features for the Hearing Impaired*.

4.0 Test Equipment List

Table 4-1 – List of test equipment used

Equipment Type	Model Number	Serial Number	Calibration Due
Axial Probe	HAC – A100	0238	5-1-07
Radial Probe	HAC – R100	0238	5-1-07
Audio Analyzer software	SoundCheck 6.1	SC-421	6-1-07
Input amplifier	SoundConnect	PS-418	6-1-07
Telephone Magnetic Field Simulator	TMFS-1	300-01151	APREL TMFS v.1.6, Release 23 March 2005
Helmholtz Coil	AMCC SD HAC P02 AB	1005	5-22-07
iDEN Service Monitor	R2660B	496KZJ0054	5-6-07

5.0 Descriptions of Measurement System (a variation of PC63.19-2001 rd 3.5 Figure 6-1)

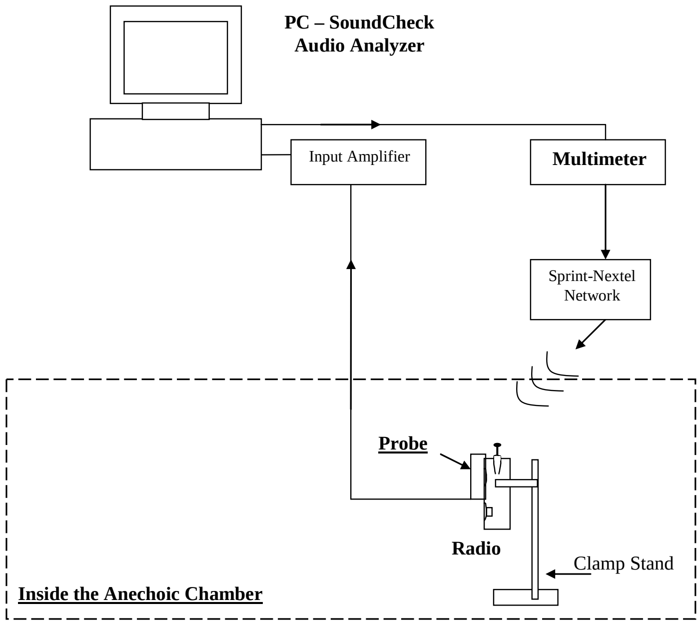


Figure 5-1 – Test setup

The laboratory utilizes the Listen *SoundCheck* system, which is a software package that both generates and measures audio signals via a D/A card installed in a personal computer. This software provides the filtering and integration functions necessary to complete the measurements in C63.19, section 6.3.4.2 and 6.3.4.3. The 11-second P50 male audio signal so generated is applied to the DUT which is engaged in an on-network telephone call as the antenna is not removable and the antenna port connector lies between the battery and the housing. Transmission power was monitored via embedded diagnostic software that displays output power to ensure no power cutback occurred. The measurement system consists of a CCL A-100 Axial telecoil probe and an R-100 Radial telecoil probe. Section 4.0 presents relevant test equipment information. All measurement equipment used to assess Telecoil HAC compliance was calibrated.

6.0 Measurement System Verification

The HAC measurements were conducted with Axial and Radial telecoil probes model/serial numbers A-100/0238 and R-100/0238. A Telephone Magnetic Field Simulator (TMFS) was used (rather than a Helmholtz coil) for system verification following the guidelines stated in the TMFS procedures document. For calibration, telecoil probe output signal levers were compared with target valued provided by the manufacturer, and the results provided in Table 6-1-1. The photos below depict the validation setup using the TMFS.

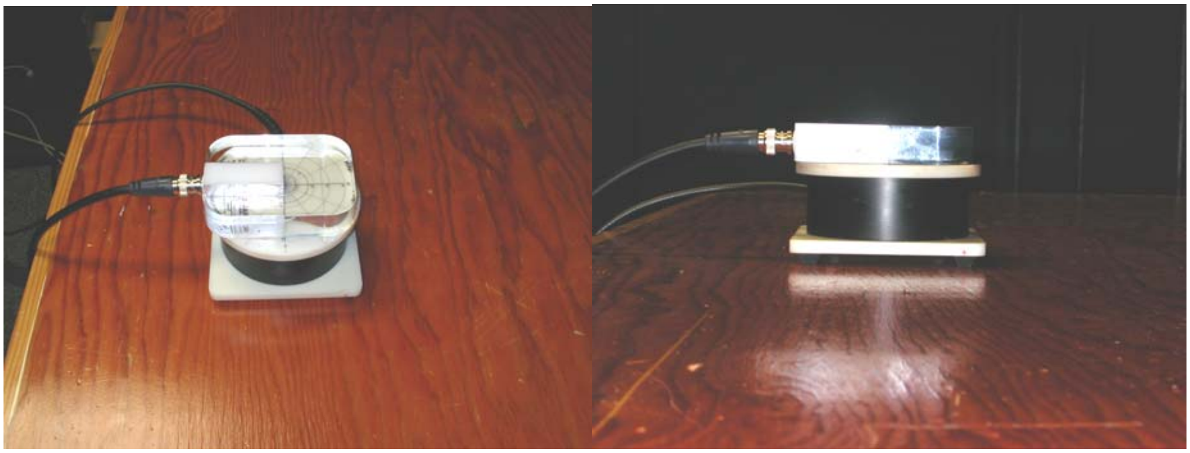


Figure 6-1 – Probe coil being calibrated with TMFS

6.1 System Verification Test Results

In accordance with C63.19-2005 clause 6.2.4 the probes were calibrated and sensitivity levels at 1 kHz verified and listed below on 10 February 2006. System verification measurement results for Axial and Radial probes are listed and compared with expected values from the TMFS in Table 6-1-1. The amplitude linearity data obtained using a Helmholtz coil are shown in Table 6-1-2. The data demonstrates compliance to the ± 0.5 dB tolerance, with the output varying in corresponding 10 dB steps.

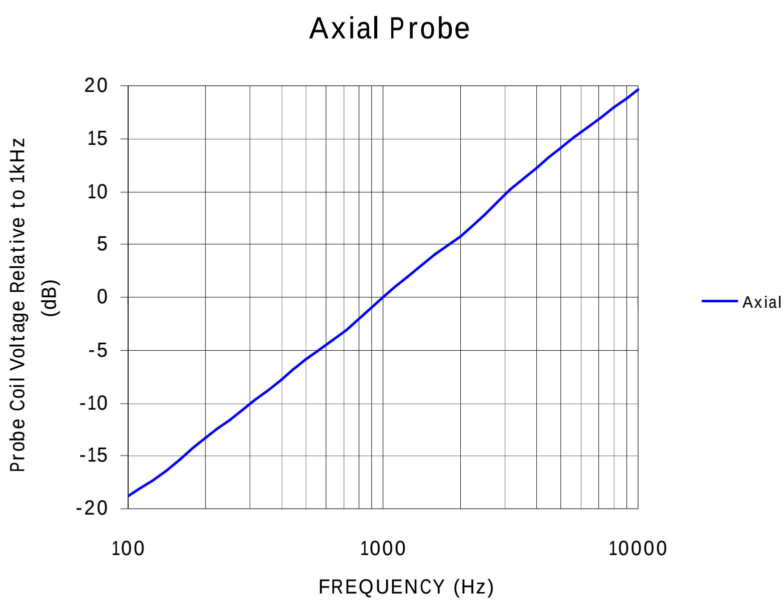


Figure 6-1-1 - Axial Probe sensitivity at 1000 Hz: -58.5 dB V/(A/m)

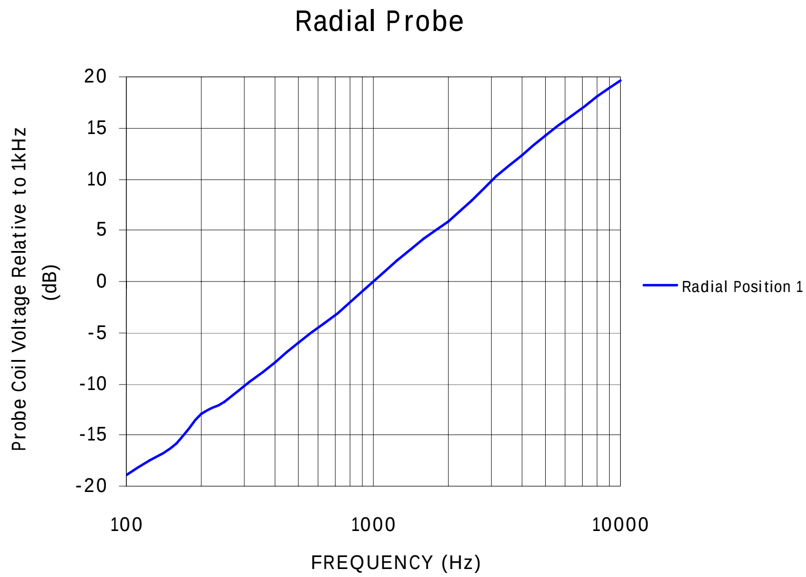


Figure 6-1-2 - Radial Probe sensitivity at 1000 Hz: -59.9 dB V/(A/m)

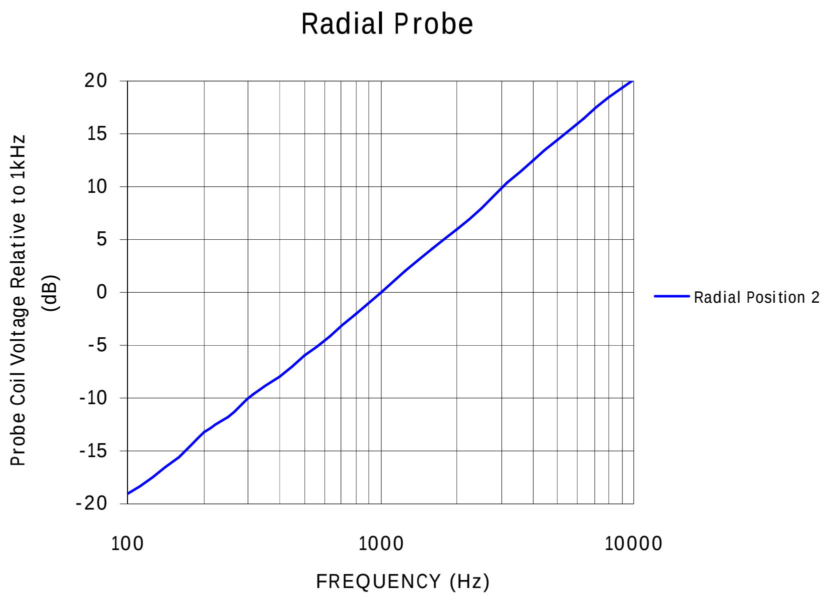


Figure 6-1-3 - Radial Probe sensitivity at 1000 Hz: -59.9 dB V/(A/m)

Table 6-1-1 - Probe Sensitivity

Orientation	Input Signal	Target Magnetic Field	Measured Magnetic field	Deviation
Axial	1 kHz, 0.5V	-20.0 dB A/m	-20.66 dB A/m	0.66 dB
Radial 1	1 kHz, 0.5V	-27.5 dB A/m	-28.08 dB A/m	0.58 dB
Radial 2	1 kHz, 0.5V	-27.5 dB A/m	-27.90 dB A/m	0.40 dB

Table 6-1-2 - Probe Linearity

Level	Delta of Axial Probe (at 1 kHz)	Delta of Radial Probe (at 1 kHz)	Acceptance Criteria	Result
0 - 10	0.0	0.0	± 0.5 dB	Pass
10 - 20	0.0	0.0	± 0.5 dB	Pass
20 - 30	-0.2	-0.2	± 0.5 dB	Pass
30 – 40	-0.1	-0.2	± 0.5 dB	Pass

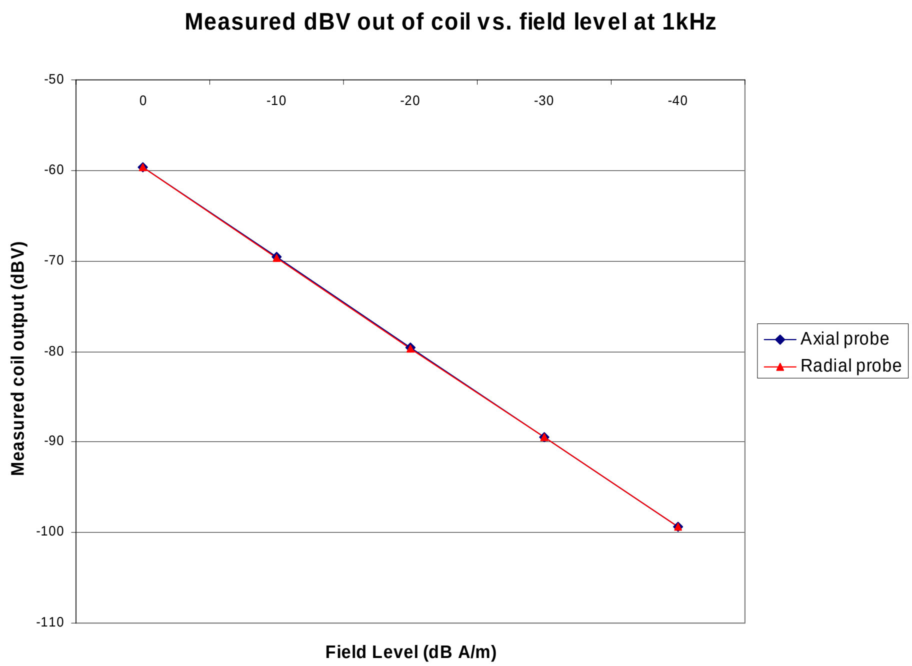


Figure 6-1-4 – Axial/Radial Probe Linearity

The input signal used for verification was set by calculating the average RMS power of the P50 male wave file averaged over the length of the file (11-seconds). A 1 kHz tone was then created at that calculated level. The 1 kHz tone is then measured at the input point of the network and adjusted to achieve the desired -18 dBm0 (92mV) level. The P50 signal is validated by comparing a sinusoidal tone sweep from 100 Hz to 5 kHz with the P50 frequency response after correction. The 1 kHz value used in all measurements is the absolute value received with the P50 response, no additional adjustment was made. As an example to show that all mathematics are being calculated correctly, the sinusoidal tone sweep and P50 frequency responses of a TMFS are plotted in the graph below (Figures 6-1-5 and 6-1-6). The results show that both are equivalent in level and shape.

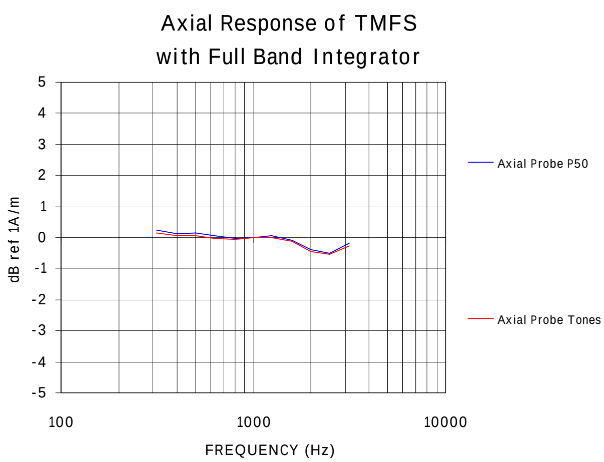


Figure 6-1-5 – TMFS Measured Frequency response

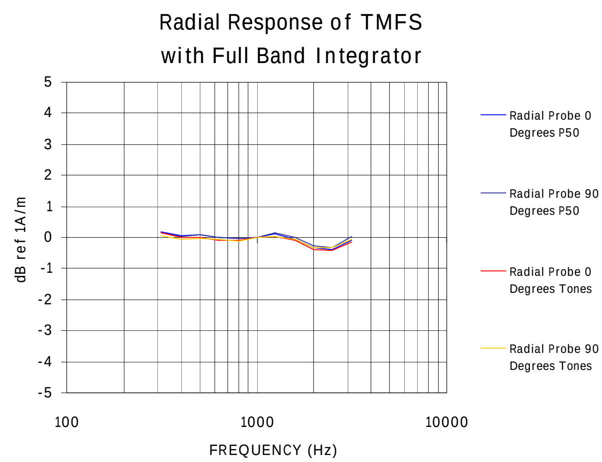


Figure 6-1-6 – TMFS Measured Frequency response

6.2 RF Immunity Verification

To alleviate any concern that RF radiation from the handset would influence ABM readings by the measurement system the ambient noise floor was measured when a Reference Coil was positioned where the handset antenna was located during ABM measurements. The Plots below show the Axial probe ambient noise floor measured with and without RF. The RF signal was produced with a signal generator at 900 and 1900 MHz transmitting at a power level of 1 Watt. The data shows only a small affect to the frequency response below 300 Hz, the amount of which would be negligible in the determination of the signal quality.

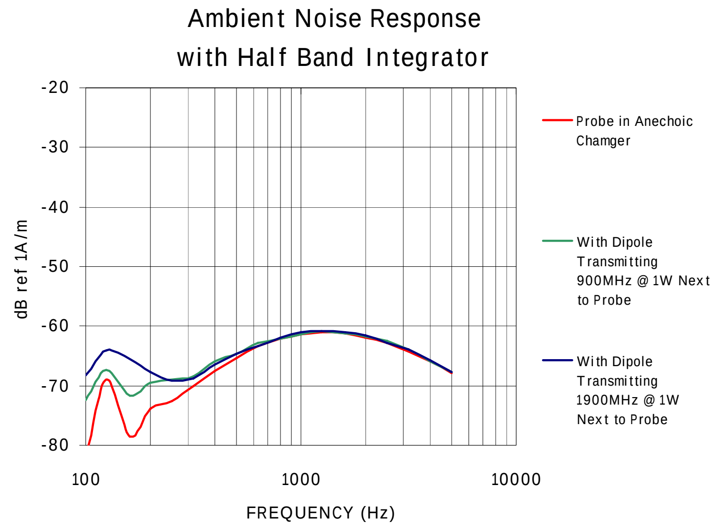


Figure 6-2 – Noise with RF Measured Response

6.3 RF Frequency Independence

It was noted in section 5 that a live on-the-air network call test was used to obtain audio band magnetic (ABM) data using the system illustrated in Figure 5-1 rather than a base station emulator. This was done because no base station emulator is available commercially or internally that supports both of the Vocoders described in section 3. A limitation of the network test is that the network assigned RF test frequency could not be controlled and was limited to a narrow frequency range near those listed with the ABM data in section 9. To compensate for this testing limitation an additional set of ABM data was taken to verify that the ABM data was not dependent on the RF test frequency.

The commercially available R2660B Service Monitor instrument listed in Table 4-1 does support testing at selectable frequencies, but only using the 33.3% duty cycle 2:6 vocoder. One was used to obtain additional ABM1 and ABM 2 axial orientation data at several band-edge and mid-band frequencies to verify that the ABM data is independent of the test frequency. The data is listed in the following table together with some statistical results that show ABM data is essentially independent of the RF test frequency.

Table 6.3 –Axial Probe Measurements

Axial		
Test Frequency (MHz)	**AMB1 (dB A/m)**	**AMB2 (dB A/m)**
806.1000 MHz	9.94	-31.49
813.5125 MHz	10.02	-30.83
820.9875 MHz	10.37	-30.57
896.1062 MHz	9.77	-30.66
900.9812 MHz	10.29	-30.84
Standard Deviation	**0.25**	**0.41**

6.4 Input Signal Characterization

The following tables and graph document the measured frequency response of the 11-second P50 artificial voice Wide Band source signal described in Section 5 used for ABM1 measurements and the measured frequency response of the P50 Narrow Band source signal in the respective 1/3 octave frequency sub-bands specified in C63.19 Appendix B.1. This is compared to a Narrow Band version of the same signal generated by using a 1/3rd octave filter centered at 1000 Hz. The purpose of these measurements is to determine the difference in probe readings that occurs when measuring with these two signals. This enables measured ABM data to be properly compensated as provided in sections 9.2 and 9.4. These measurements were made using the same Listen Sound Check System used to obtain ABM data that is described in Section 5, but performed with it directly connected to the P50 sound source.

In table 6.4.1 the P50 Wide Band columns list measured values stated logarithmically and linearly for the 11 second P50 signal in each sub-band. The total RMS power is summed linearly at the bottom of the table, and then converted to a dB value. The power summation was limited to the highlighted range of sub-bands from 315 to 3150 Hz because the PSTN line used in the ABM measurements rejects voice power outside that range. The audio power in each sub-band relative to the total power is listed in the right-most column. There it can be seen that the 1 kHz sub-band power is 11.07 dB less than the total power.

Table 6.4-1 –Wide Band P50 Source Characterization

Acoustic Frequency (Hz) 1/3 Octave Sub-Band, per C63.19 Annex B.1	**P50 Wide Band Response (dB)**	**P50 Wide Band Linear**	**Response Relative to Total Power dB**
100	-26.50	0.002238721	-11.94081137
125	-21.78	0.006637431	-7.220811368
160	-21.82	0.006576578	-7.260811368
200	-20.16	0.00963829	-5.600811368
250	-19.15	0.01216186	-4.590811368
315	**-21.93**	**0.006412096**	**-7.370811368**
400	**-20.05**	**0.009885531**	**-5.490811368**
500	**-23.95**	**0.00402717**	**-9.390811368**
630	**-24.70**	**0.003388442**	**-10.14081137**
800	**-25.91**	**0.002564484**	**-11.35081137**
1000	**-25.63**	**0.002735269**	**-11.07081137**
1250	**-27.61**	**0.001733804**	**-13.05081137**
1600	**-28.72**	**0.001342765**	**-14.16081137**
2000	**-27.67**	**0.001710015**	**-13.11081137**
2500	**-30.63**	**0.000864968**	**-16.07081137**
3150	**-34.73**	**0.000336512**	**-20.17081137**
4000	-40.01	9.977E-05	-25.45081137
5000	-43.71	4.25598E-05	-29.15081137
6300	-46.85	2.06538E-05	-32.29081137
8000	-56.62	2.17771E-06	-42.06081137
10000	-73.89	4.08319E-08	-59.33081137
	Network Limited (315 to 3150 Hz) Linear Sum:	0.035001055	
	Total Power dB:	**-14.55918863**	

Some of the energy in the P50 narrowband signal lies outside its sub-band defined frequency range as evident in Figure 6.4-1. Accordingly the same measurement and data processing approach was applied to it with the results listed in Table 6.4-2. There it is seen that 1.61 dB of the energy lies outside the 1 kHz sub-band. The ABM1 wide band to narrow band compensation is therefore the difference of the two highlighted 1 kHz component, 11.07 – 1.61 = 9.46 dB. This value was used to scale ABM1 data reported in sections 9.2 and 9.4.

Figure 6-4-1 – P50 Source Characterization (Wideband v. Narrowband)

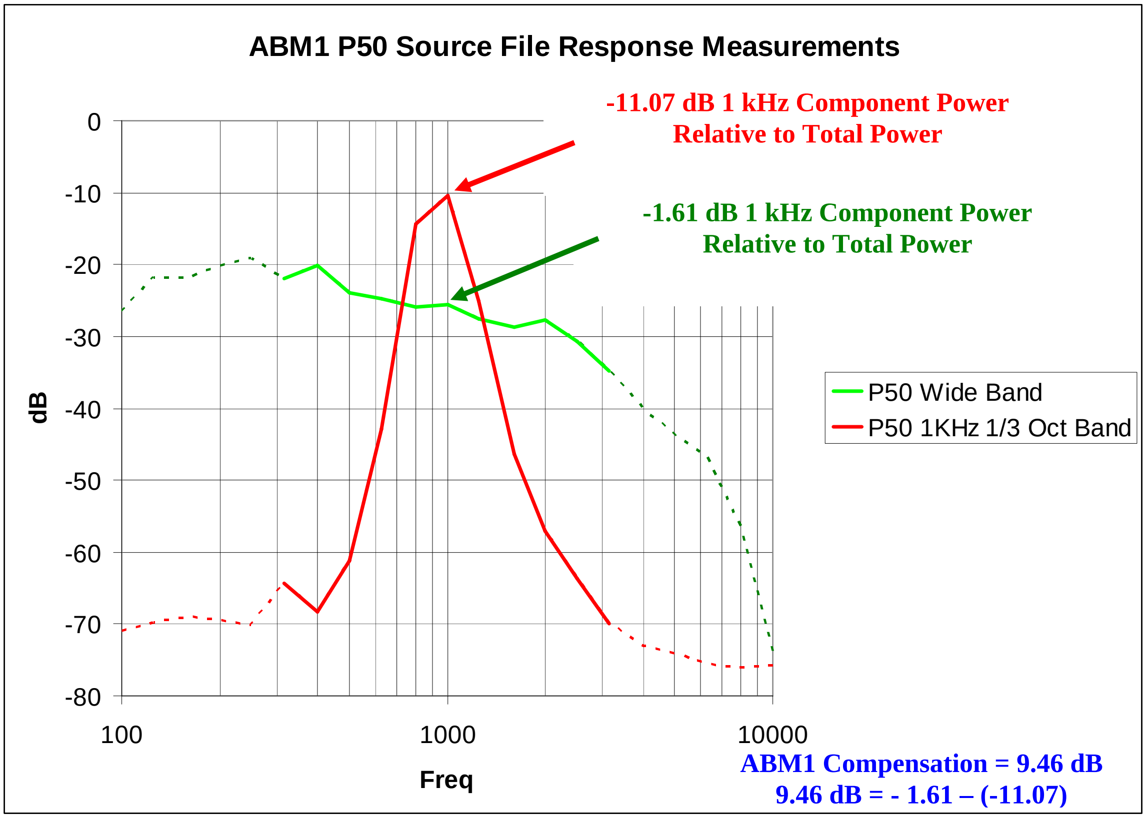


Table 6.4-2 –Measured Wideband vs. Narrowband AMB1 Compensation

Measured 1kHz Power of TMFS with Axial Probe	
Narrow Band Signal	-3.83
Broad Band Signal	-13.47

ABM1 Compensation Measured	9.64

Table 6.4-3 –Narrow Band P50 Source Characterization

Acoustic Frequency (Hz) 1/3 Octave Sub-Band, per C63.19 Annex B.1	**P50 1 kHz 1/3 Octave Band Response dB**	**P50 1 kHz 1/3 Octave Band Linear**	**Response Relative to Total Power dB**
100	-71.01	7.92501E-08	-62.16276014
125	-69.71	1.06905E-07	-60.86276014
160	-68.96	1.27057E-07	-60.11276014
200	-69.49	1.1246E-07	-60.64276014
250	-70.11	9.7499E-08	-61.26276014
315	**-64.32**	**3.69828E-07**	**-55.47276014**
400	**-68.21**	**1.51008E-07**	**-59.36276014**
500	**-61.17**	**7.63836E-07**	**-52.32276014**
630	**-42.95**	**5.06991E-05**	**-34.10276014**
800	**-14.29**	**0.037239171**	**-5.442760138**
1000	**-10.46**	**0.089949758**	**-1.612760138**
1250	**-25.04**	**0.003133286**	**-16.19276014**
1600	**-46.41**	**2.2856E-05**	**-37.56276014**
2000	**-57.13**	**1.93642E-06**	**-48.28276014**
2500	**-63.62**	**4.3451E-07**	**-54.77276014**
3150	**-69.95**	**1.01158E-07**	**-61.10276014**
4000	-73.05	4.9545E-08	-64.20276014
5000	-74.05	3.9355E-08	-65.20276014
6300	-75.59	2.76058E-08	-66.74276014
8000	-76.1	2.45471E-08	-67.25276014
10000	-75.68	2.70396E-08	-66.83276014
	Network Limited (315 to 3150 Hz) Linear Sum:	0.130399526	
	Power dB:	**-8.847239862**	

6.4.1 Input Signal Temporal Responses

The following figures, 6.4.1-1 and 6.4.1-2, illustrate the Frequency domain, Time Domain, and Temporal Response of the Wide Band P50 network input signal.

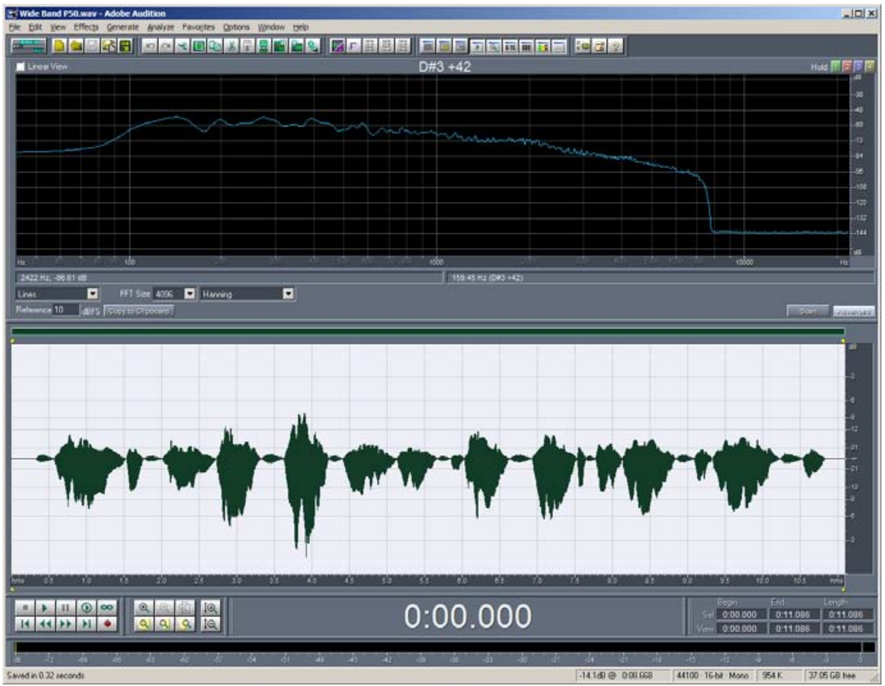


Figure 6.4.1-1
Wide Band P50 Frequency Response and Time Domain
Hanning Windowing Function and 4026 FFT Size

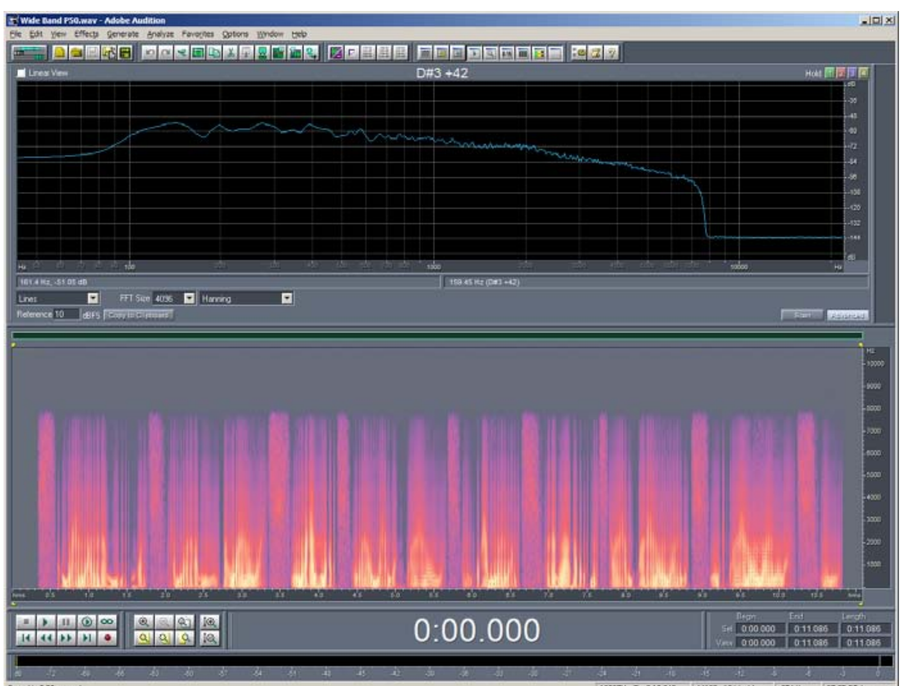


Figure 6.4.1-2
Wide Band P50 Frequency Response and Temporal Response
Hanning Windowing Function and 4026 FFT Size

The following figures, 6.4.1-3 and 6.4.1-4, illustrate the Frequency Domain, Time Domain and Temporal Response of the Narrow Band P50 network input signal.

Figure 6.4.1-3
Narrow Band P50 Frequency Response and Time Domain
Hanning Windowing Function and 4026 FFT Size

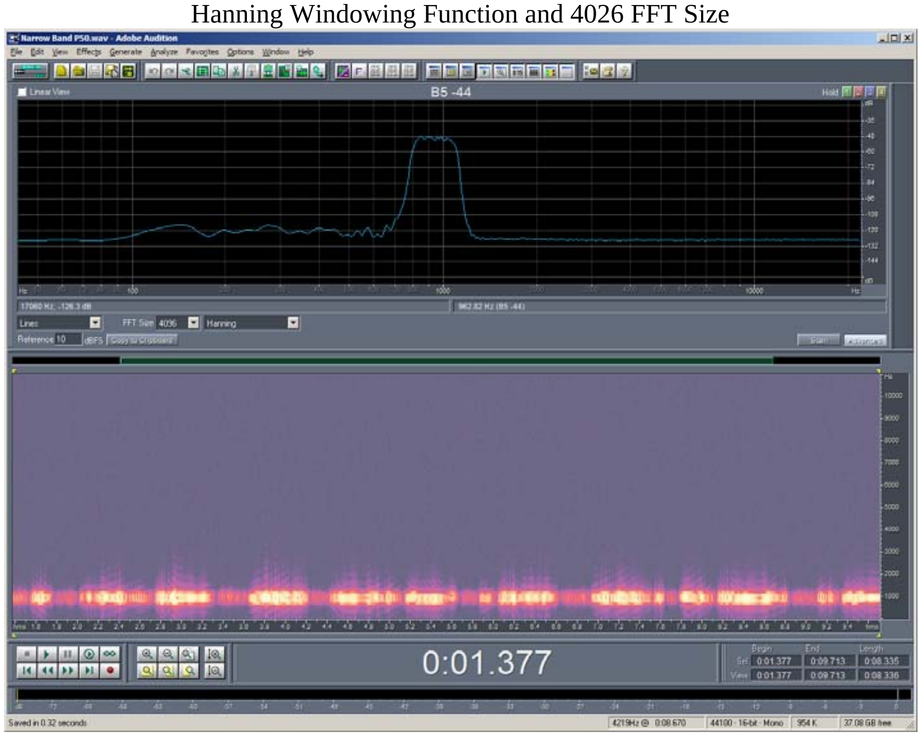


Figure 6.4.1-4
Narrow Band P50 Frequency Response and Temporal Response
Hanning Windowing Function and 4026 FFT Size

6.4.2 Measured Signal P50 Spectral Compensation

The following figure 6.4.2-1 illustrates the Real Time Analyzer settings of the Listen System used to measure the responses of the probes. These same settings were used to create the P50 Reference Response recalled to buffer in processing of the measured result for eliminating the P50 Spectral effect. Note that the Maximum Hold setting was selected to eliminate adverse amplitude lowering effects from any input P50 Signal nulls. The reference and test measurements are also performed in 1/3 Oct Bandwidth and with 11-seconds of Linear Averaging.

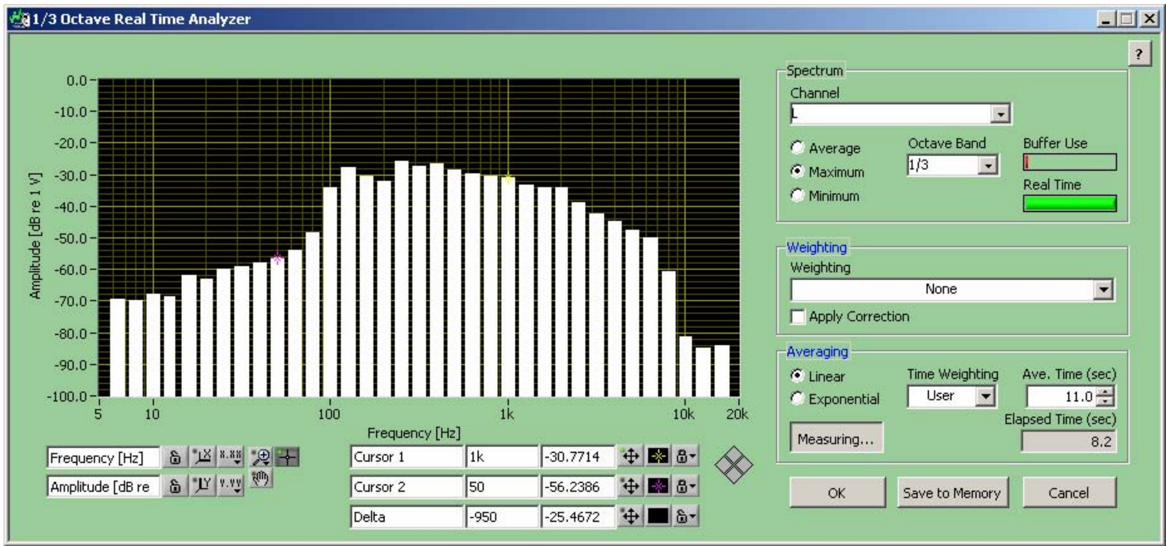


Figure 6.4.2-1
Real Time Analyzer Settings

The following figure 6.4.2-2 illustrates the signal processing performed on the measured response to account for the effects of the Wide Band P50 Input Signal. For this test, the Listen system was in a direct connection loopback configuration as described in section 5. The unprocessed measured signal is illustrated by the P50 Drive Source Response in Blue. The Listen System then recalls to a buffer, as a reference, the previously stored response of the signal that was sent to the network. This reference signal is inverted (in Yellow) and combined with the unprocessed measured signal to eliminate the effects of the P50 spectrum. The combined processed measured signal is illustrated in Green and in this case, flat and at 0 dBV since the exact signal that would have been sent to a network was that which we measured.

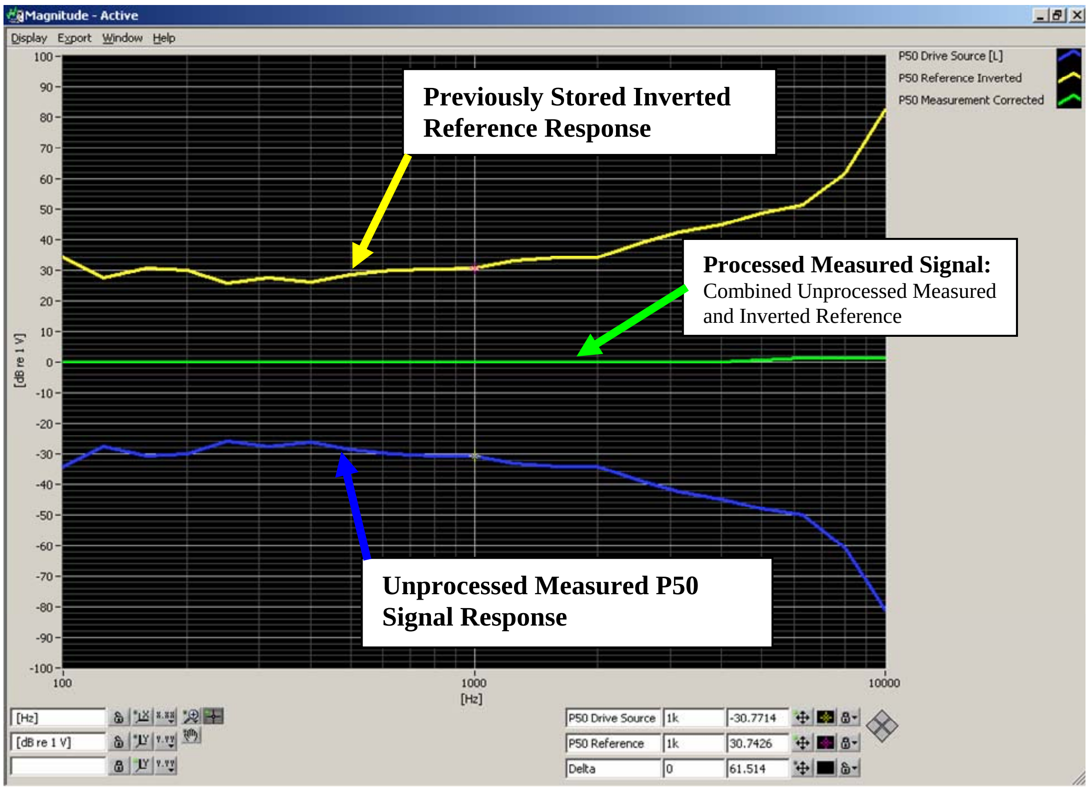


Figure 6.4.2-2
Wide Band P50 Spectral Processing Method

7.0 DUT Setup and Test Procedure

The test setup was done as specified in C63.19-2005 section 6.3.2 and Figure 6-1. Axial and radial measurements were performed at locations in accordance with C63.19 Annex A.3, and are illustrated in the test setup photograph. The coordinates for these locations, relative to the acoustic output center, are given in Table 2. The test flow and procedure was per C63.19 Figure 6-3, and section 6.3.1 was followed in order to demonstrate compliance. The test procedure consisted of placing the DUT in an interconnect phone call from the Sprint-Nextel system to a phone on the Motorola test site. Transmission power was monitored via embedded diagnostic software that displays output power to ensure no power cutback occurred. Then from the Motorola audio lab connection to the Mobile Switch Center (MSC) on the Motorola test site an 11 second P50 male signal was sent to the DUT. The P50 artificial speech levels were determined by the reference input levels as stated in C63.19 Table 6-1.

iDEN TDMA (22 and 11 Hz): -18 dBm0

Below is the corresponding voltage level used to send the audio signal to the iDEN network, and verified by the procedure stated in Section 6.5:

Input Level to the iDEN Network: -20.7 dB V = 92.26mV

The signal was then measured with the telecoils and analyzed for frequency response and level. The test results were obtained with:

- The antenna extended,
- The DUT user interface configured for telecoil operation,
- The display and keypad lighting off as would normally be the case when used for a call.
- The probe manually positioned for maximum coupling, then secured (See coordinates in Table 2):
  - Axial - center of acoustic output.
  - Radial 1 - probe at 0 degrees just left of the acoustic output center.
  - Radial 2 - probe at 90 degrees just above the acoustic output center.

Figure 7-1 – Test holder

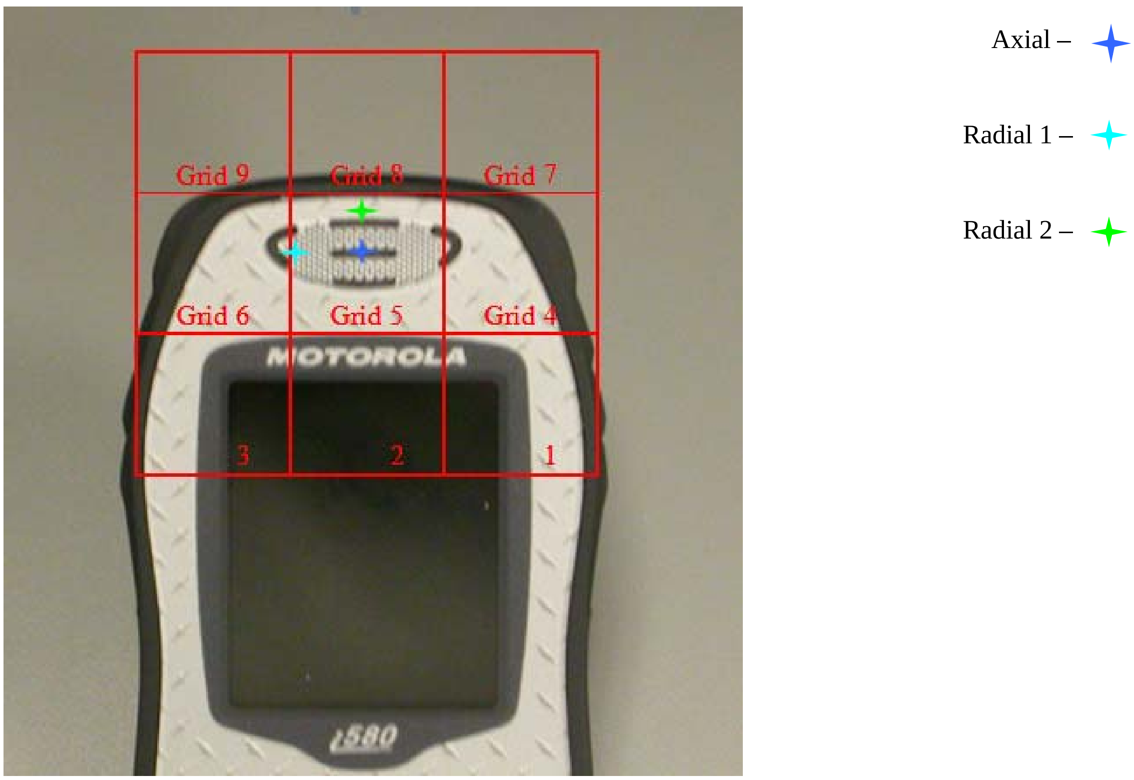


Figure 7-2 – Measurement Locations

Table 7 – Measurement location coordinates

Location	X coordinate (mm)	Y coordinate (mm)	Subgrid Number (See Appendix A)
Axial	0	0	5
Radial 1	-7.25	0	5
Radial 2	0	6.2	5

Note: X is offset to the right from the center of the acoustic output and Y is the vertical offset (see Figure A-5 in C63.19-2001 rd 3,6).

8.0 Environmental Test Conditions

The table below presents the range and average environmental conditions during the HAC tests reported herein:

Table 8 – Environmental Conditions

	Target	**Measured**
Ambient Temperature	23 ˚C +/- 5 ˚C	Within Guidelines
Relative Humidity	0 - 80 %	Within Guidelines

The Audio Laboratory's ambient and test system noise levels were determined and found satisfactory as specified in PC63.19-2001-rd3.6 section 6.2.1. The following graph shows the results obtained using a 1/3rd octave resolution bandwidth filter.

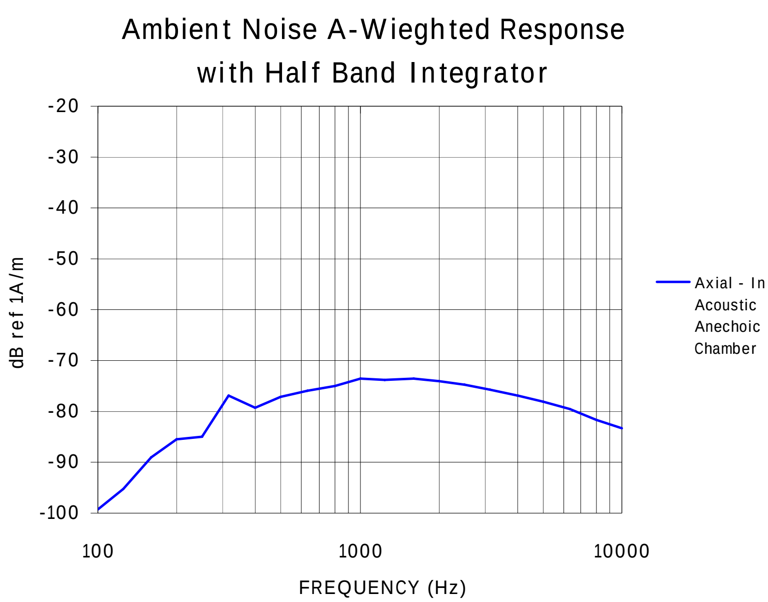


Figure 8-1– Axial Ambient Magnetic frequency distribution

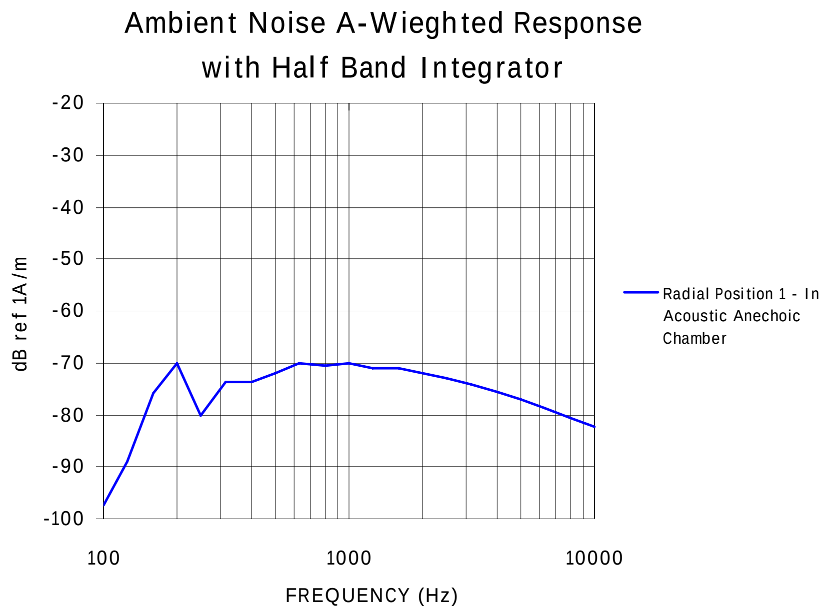


Figure 8-2 – Radial Position 1 Ambient Magnetic frequency distribution

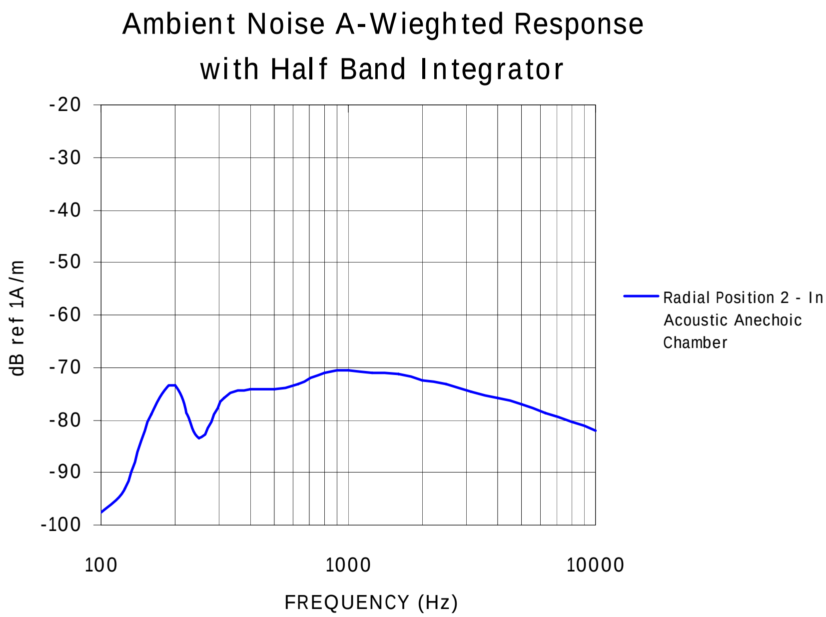


Figure 8-3 – Radial Position 2 Ambient Magnetic frequency distribution

9.0 Test Results Summary

The telecoil desired signal strength (ABM1) results per C63.19-2001 rd 3.6 section 6.3.4.2 are shown in Section 9.2 for the 800 MHz band and 9.4 for the 900 MHz band. The desired signal results are reported herein at the center of the 800 & 900 MHz bands only, as measured in a 1/3 octave bandwidth filter. The ABM1 frequency response plots for both 800 & 900MHz are shown in Section 9.1, and illustrate compliance with the C63.19 limits given in Section 2. Signal quality results depend on the undesired signal strengths (ABM2) measured per C63.19-2001 rd 3.6 Section 6.3.4.3 and are half band integrated with an A-weighted filter applied. The undesired signal results are plotted in Figures 9-2-1 and 9-2-2 for 800 MHz and Figures 9-4-1 and 9-4-2 for the 900 MHz band. The Desired-to-Undesired ABM signal strength ratio is taken to be the difference between the lowest signal strength measured and the greatest band-dependent interference level measured. This numbers are in bold and highlighted in **Blue**. Signal to Noise ratios are reported in Section 9.3 for the 800 MHz band and 9.5 for the 900 MHz band. All measurements were made with backlighting off.

9.1 Axial frequency response plot data comparison:

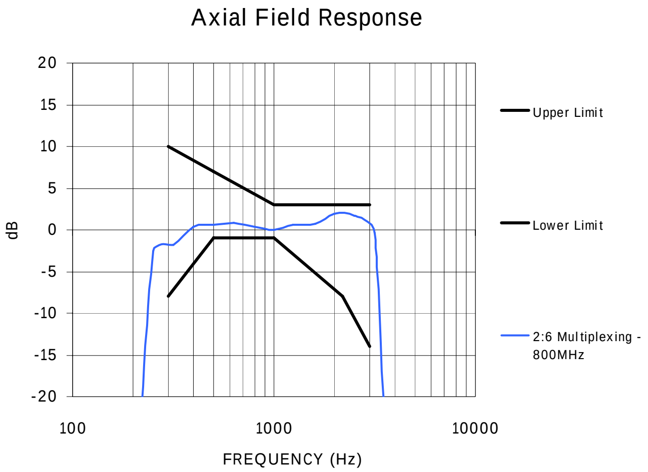


Figure 9-1-1 – 800MHz Measured Frequency response

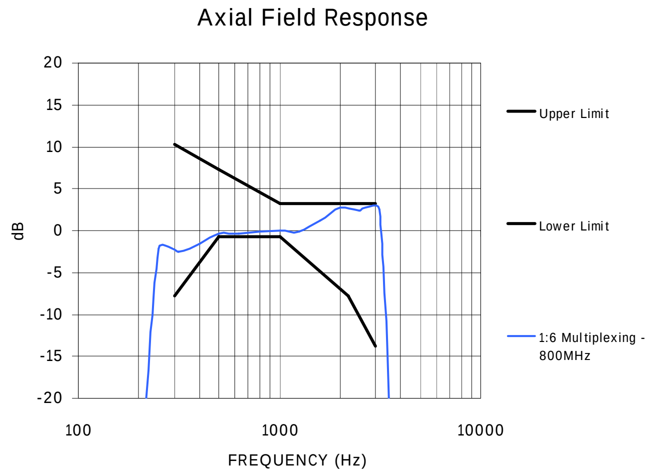


Figure 9-1-2 – 800MHz Measured Frequency response

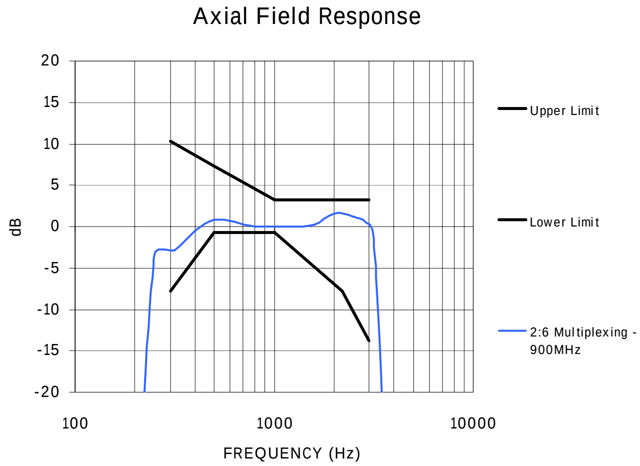


Figure 9-1-3 – 900MHz Measured Frequency response

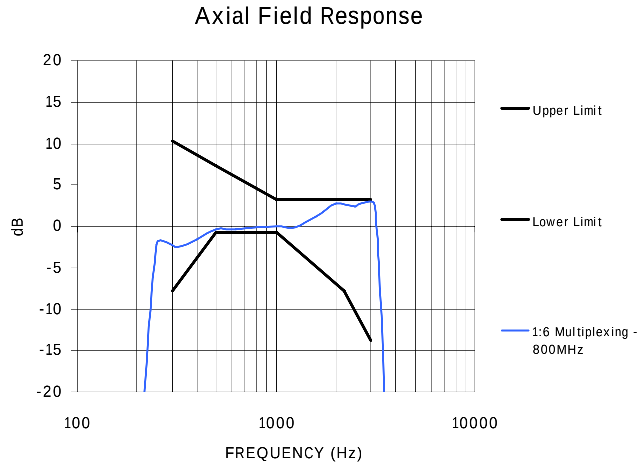


Figure 9-1-4 – 900MHz Measured Frequency response

The frequency responses above were measured with the DUT configured to optimize hearing aid inductive coupling frequency response, a setting selected by the user via the keypad.

These plots demonstrate that this model complies with the C63.19 limits given in Section 2 and thus met the requirements of 47 CFR 20.19.

9.2 800 MHz Band Audio band magnetic (ABM) signal strength measured at 813.5125 MHz

Measurement Orientation with 2:6 multiplexing	Desired signal ABM1 (dB A/m)	Undesired Signal ABM2 (dB A/m)
Axial	10.02	-30.83
Radial 1	-0.53	-28.78
Radial 2	**-0.79**	-39.88

Measurement Orientation with 1:6 multiplexing	Desired signal ABM1 (dB A/m)	Undesired Signal ABM2 (dB A/m)
Axial	10.43	-30.93
Radial 1	-1.47	-28.75
Radial 2	0.53	-41.84

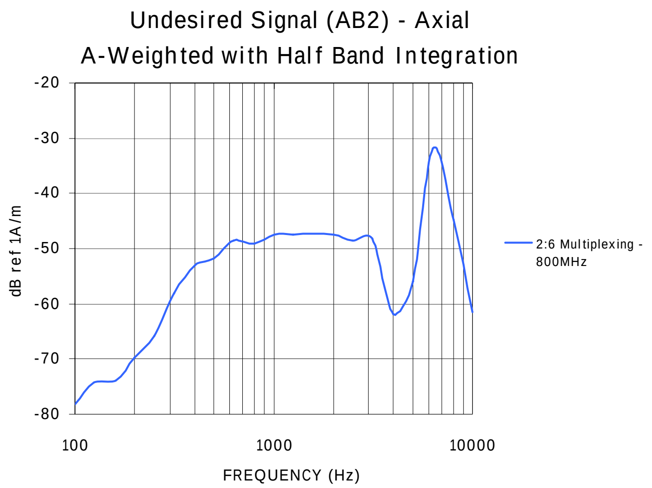


Figure 9-2-1 – 800MHz Undesired Signal (2:6)

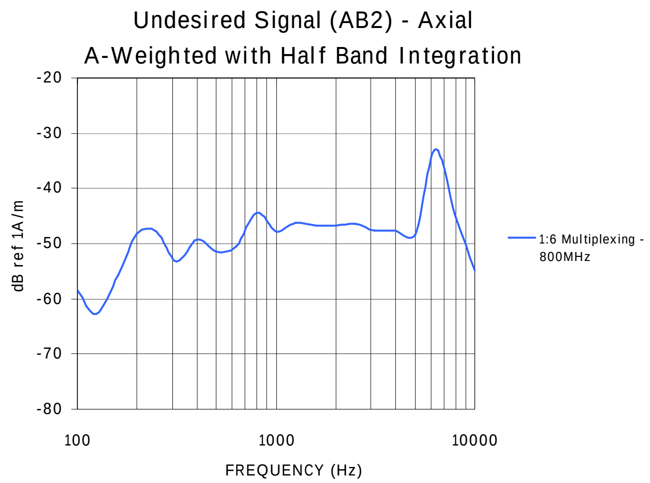


Figure 9-2-2 – 800MHz Undesired Signal (1:6)

Considering that the user has no choice of multiplexing ratio (i.e. it is determined by the infrastructure) the highlighted ABM1 axial and radial values are the minimum values that all users might experience. The ABM2 values reported are the greatest values measured for the two battery types listed on page 1 of this report.

9.3 800 MHz Band Desired to Undesired ABM Signal Ratio

Measurement Orientation	ABM Ratio (dB) 2:6 Multiplexing	ABM Ratio (dB) 1:6 Multiplexing
Axial	40.85	41.36
Radial 1	28.25	27.29
Radial 2	39.09	42.37

9.4 900 MHz Band Audio band magnetic (ABM) signal strength measured at 900.9812 MHz

Measurement Orientation with 2:6 multiplexing	Desired signal ABM1 (dB A/m)	Undesired Signal ABM2 (dB A/m)
Axial	10.29	-30.83
Radial 1	-1.56	-28.16
Radial 2	-0.07	-39.59

Measurement Orientation with 1:6 multiplexing	Desired signal ABM1 (dB A/m)	Undesired Signal ABM2 (dB A/m)
Axial	**9.49**	-30.93
Radial 1	-1.26	-30.07
Radial 2	0.06	-42.11

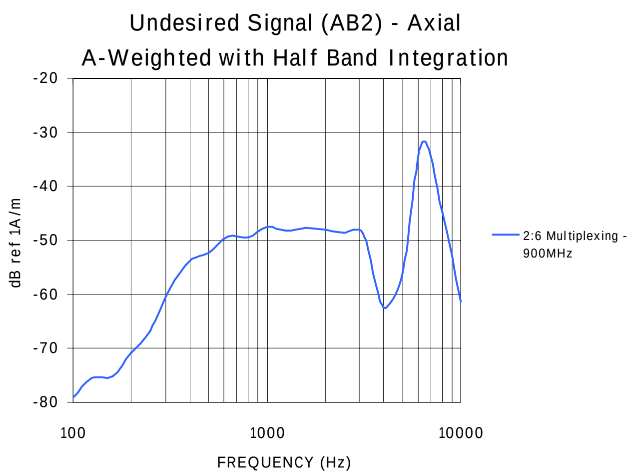


Figure 9-4-1 – 900MHz Undesired Signal (2:6)

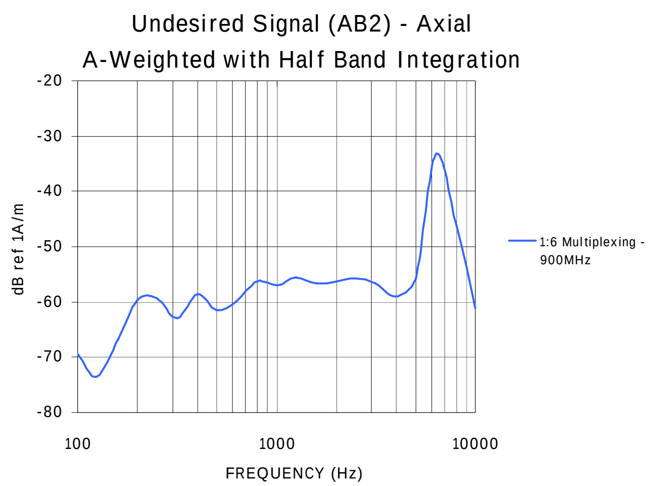


Figure 9-4-2 – 900MHz Undesired Signal (1:6)

The ABM2 value reported was the highest value measured for the two battery types listed.

9.5 900 MHz Band Desired to Undesired ABM Signal Ratio

Measurement Orientation	ABM Ratio (dB) 2:6 Multiplexing	ABM Ratio (dB) 1:6 Multiplexing
Axial	41.13	42.26
Radial 1	**26.59**	28.81
Radial 2	39.52	42.17

9.6 Minimum ABM1 Signal Strength Summary

Given that users cannot select either the frequency band or the multiplexing ratio then the minimum signal strength all users will experience is evident by comparing the highlighted values in sections 9.2 and 9.4. Those values are:

Minimum axial: 9.49 dB A/m
Minimum radial: -0.79 dB A/m (at location radial 2)

Comparing the summaries in sections 9.6 and 9.7 with the C63.19 limits in Section 2 then per the flow chart in Figure 2 it is evident that this model complies with the signal strength requirements mandated by FCC 47 CFR section 20.19.

9.7 Minimum Desired to Undesired Signal Ratio Summary

Given that users cannot select either the frequency band or the multiplexing ratio then the minimum signal strength all users will experience is evident by comparing the highlighted values in sections 9.3 and 9.5. The result is:

Minimum Desired to Undesired Signal: 26.59 dB (in the 900 MHz band)

Comparing the measured desired to undesired signal ratio values listed in the tables of sections 9.3 and 9.5 with Table 1 in section 2 a rating of M3 T3 may be justified based solely on audio band magnetic (ABM) measurements. Considering the RF interference potential this rating can be justified as long as the RF field strength warrants a rating of M3 at the specific locations where the telecoil measurements were made.

10.0 Category Rating Determination

The center of the telecoil inductive output field is concentric with the center of the acoustic output field so the RF interference field strength scan to determine the M-category rating may be used to determine the T-category rating. RF interference scan data for HAC compliance to justify an M3 rating was submitted previously for a class 2 permissive change. For convenience Annex A.3 herein contains 800 MHz E- and H-field plots which were extracted from that report. All of the telecoil inductive field measurement locations lie in sub-grid 5 (for exact locations see Table 7 in section 7).

In addition Annex A.1 herein contains RF interference field strength data summary tables extracted from section 9 of the cited report. It is evident in these tables that a M3 rating was justified in sub-grid 5 for all RF frequencies. Combined with the signal quality data summary in section 9.7 and Figure 2-2 this justifies a rating of M3 T3.