# Hearing Aid Compatibility (HAC) Test Report

**In accordance with the requirements of ANSI-PC63.19-2001 Revision 3.5**

**For**

**Dual-Band Tri-mode AMPS/CDMA Cellular Phone**

**Models: KX9B and KX9C**

**FCC ID: OVFKWC-KX9**

**Report Number: 05U3723-1**

**Issue Date: September 26, 2005**

Prepared for

**Kyocera Wireless Corp.**
**10300 Campus Point Drive**
**San Diego, CA 92121**
**United States**

Prepared by

**Compliance Certification Services**
**561F Monterey Road**
**Morgan Hill, CA 95037**
**United States**

Revision History

| Rev. | Issued date | Revisions | Revised By |
|---|---|---|---|
| A | 9/26/05 | Initial issue | MH |

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# 1. ATTESTATION OF TEST RESULTS

Date of testing: September 20 - 21, 2005

| | |
|---|---|
| FCC ID: | OVFKWC-KX9 |
| Applicant: | Kyocera Wireless Corp. |
| Address: | 10300 Campus Point Drive<br>San Diego, CA 92121<br>United States |
| Application Type: | Class II Permissive Change (Adding HAC Rating) |

| | |
|---|---|
| Models: | KX9B and KX9C |
| Serial No.: | 10-N708B-02 & 10-N700B-02 |
| TX Frequency: | 824.7 – 848.31 MHz for CDMA Cellular Band<br>1851.25 – 1908.75 MHz for CDMA PCS Band |

| APPLICABLE STANDARDS | |
|---|---|
| ANSI/IEEE Std. PC63.19-2001, Revision 3.5 | NO NON-COMPLIANCE NOTED |

## Hearing Aid Near-Field Categories: Category M3

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by any government agency.

Approved & Released For CCS By:

Mike Heckrotte
Engineering Manager
Compliance Certification Services

Tested By:

Hsin Fu Shih
Senior Engineer
Compliance Certification Services

## 2. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods." The CCS test facilities are listed with the Federal Communications Commission.

No part of this report may be used to claim product certification, approval, or endorsement by any government agency.

## 3. Equipment Under Test (EUT) Description

The wireless device is described as follows:

| | |
|---|---|
| FCCID: | OVFKWC-KX9 |
| Models: | KX9B (SN: 10-N708B-02) and KX9C (10-N700B-02) |
| | (Difference in internal memory) |
| Trade Name: | Kyocera Wireless Corp |
| Product: | This product is a slide telephone, Dual-Band Tri-mode AMPS/CDMA Cellular and CDMA PCS Band. |
| Type: | Pre-production |
| Battery: | Rechargeable Lithium ion Battery – Standard, model CV90-M6310-01, rating: 3.7 Vdc, 850 mAh. The battery was fully charged in accordance with manufacture's instructions prior to HAC measurements. |

EUT Photo - KX9B

EUT Photo - KX9C

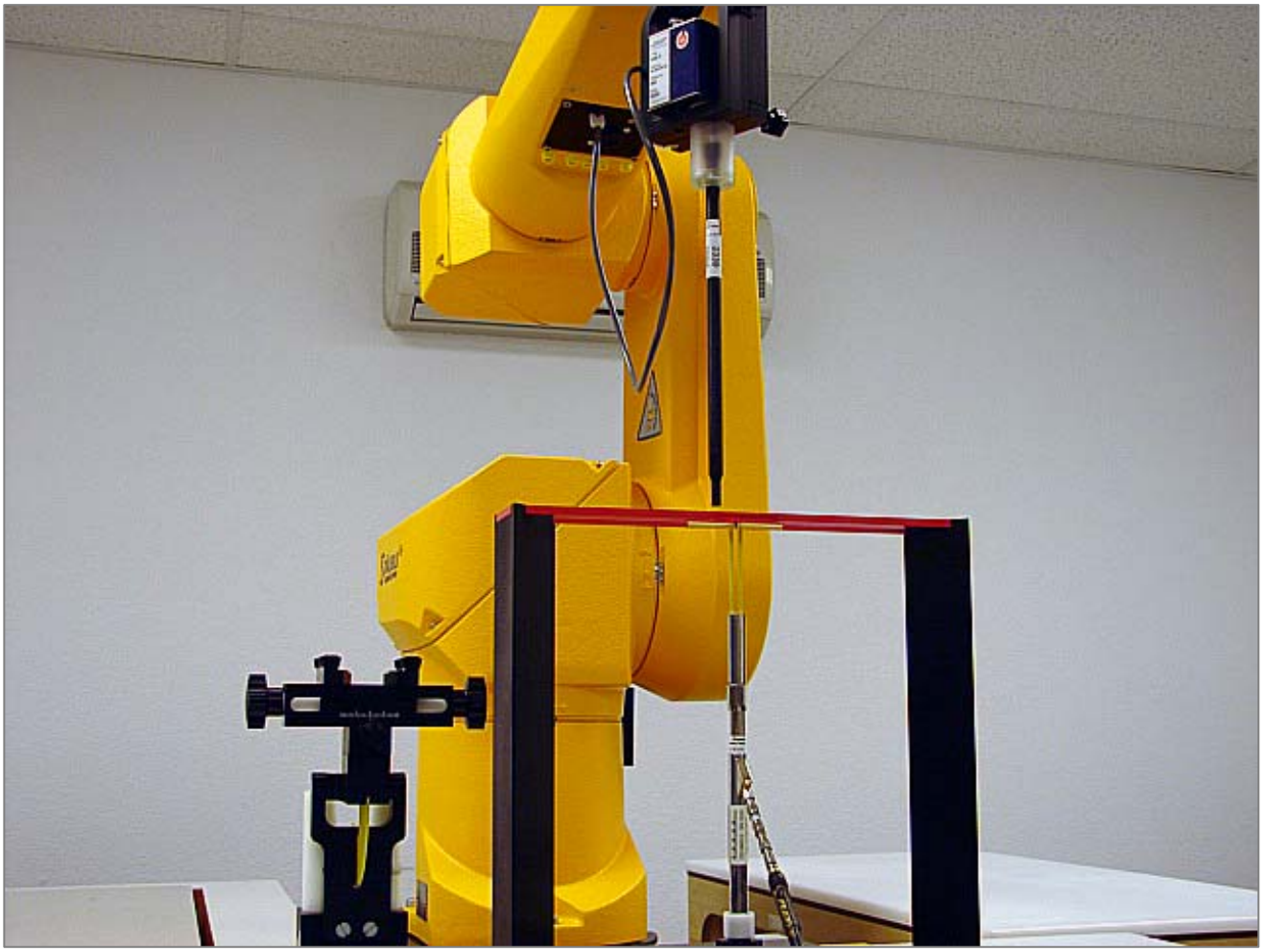
| | |
|---|---|
| Max E-Field Emission: | @ channel 383, 836.49 MHz = 63.9 V/m (Category M3) |
| Max H-Field Emission: | @ channel 777, 848.31 MHz = 0.097 A/m (Category M4) |

## 4. System Specifications

E-field and H-field measurements are performed using the DASY4 automated dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland.

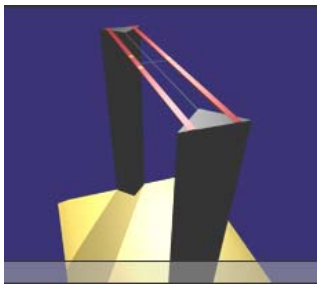
The DASY4 HAC Extension consists of the following parts:

The Test Arch phantom, magnetic and electric field probes, calibration dipoles, dipole and DUT holder, and HAC test software.



**Test Arch phantom**

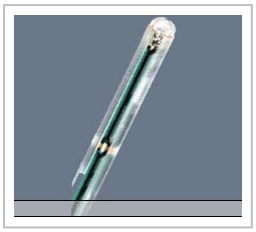
The specially designed Test Arch allows high precision positioning of both the device and any of the validation dipoles.



**ER3DV6 Isotropic E-Field Probe**

| | |
|---|---|
| Construction: | One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether) |
| Calibration: | In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2) |
| Frequency: | 100 MHz to > 6 GHz; Linearity: ± 0.2 dB (100 MHz to 3 GHz) |
| Directivity: | ± 0.2 dB in air (rotation around probe axis)<br>± 0.4 dB in air (rotation normal to probe axis) |
| Dynamic Range: | 2 V/m to > 1000 V/m; Linearity: ± 0.2 dB |
| Dimensions: | Overall length: 330 mm (Tip: 16 mm)<br>Tip diameter: 8 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.5 mm<br>The closest part of the sensor element is 1.1 mm closer to the tip |
| Application: | General near-field measurements up to 6 GHz<br>Field component measurements |

**H3DV6 3-Dimensional H-Field Probe**



| | |
|---|---|
| Construction: | Three concentric loop sensors with 3.8 mm loop diameters resistively loaded detector diodes for linear response Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether) |
| Frequency: | 200 MHz to 3 GHz (absolute accuracy ± 6.0%, k=2); Output linearized |
| Directivity: | ± 0.25 dB (spherical isotropy error) |
| Dynamic Range: | 10 mA/m to 2 A/m at 1 GHz |
| E-Field Interference: | < 10% at 3 GHz (for plane wave) |
| Dimensions: | Overall length: 330 mm (Tip: 40 mm)<br>Tip diameter: 6 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 3 mm<br>The closest part of the sensor element is 1.9 mm closer to the tip |
| Application: | General magnetic near-field measurements up to 3 GHz<br>Field component measurements<br>Surface current measurements<br>Measurements in air or liquids<br>Low interaction with the measured field |

## 5. Performance Test

The test setup was validated when configured and prior to each test to ensure proper function. The procedure provided in this section is the validation procedure using dipole antennas for which the field levels were computed by FDTD modeling.

**Performance Test Procedure**

Place a dipole antenna meeting the requirements given in ANSI-PC63.19 in the position normally occupied by the WD. The dipole antenna serves as a known source for an electrical and magnetic output. Position the E-field and H-field probes so that:

Scan the length of the dipole with both E-field and H-field probes and record the maximum values for each. Compare the readings to expected values.

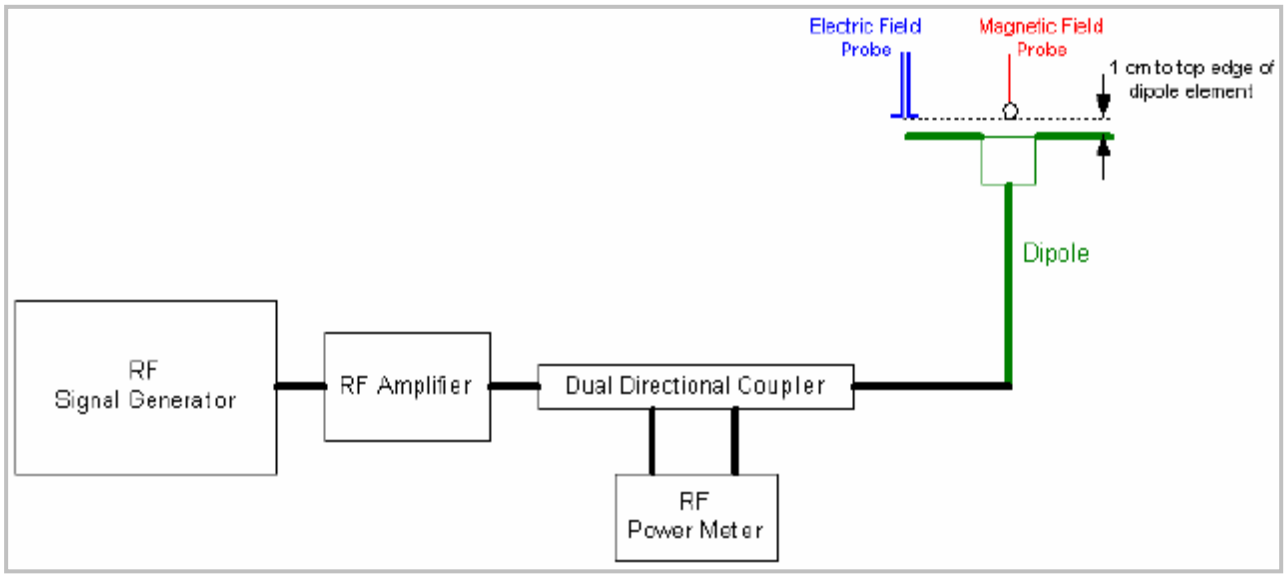



Figure 1

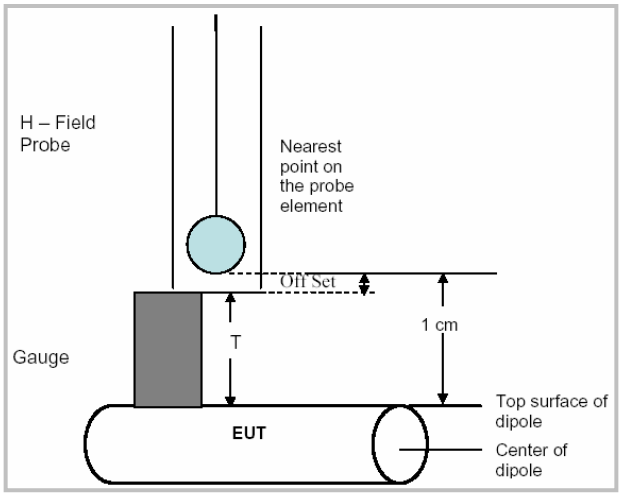



Figure 2

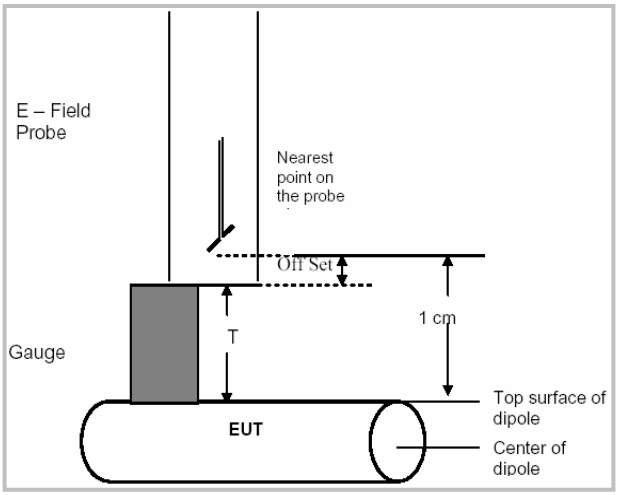



Figure 3

The probe is positioned over the illuminated dipole at 10 mm distance from the nearest point on the probe sensor element to the top surface (edge) of the dipole element.

**Performance Test Results**

Validation Dipoles CD835V3 SN: 1014 and CD1880V3 SN: 1010 with CW Signals

| E-field Scan - Probe (ER3DV6 SN: 2339) center 10 mm above dipoles | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Signal Type | f (MHz) | Input Power (mW) | Power Drift (dB) | Max. measured from above high end (V/m) | Max. measured from above low end (V/m) | Average max. above arm (V/m) | E-field Target Values (V/m) (From SPEAG) | Deviation[1)] (%) |
| CW | 835 | 100 | -0.028 | 163.1 | 159.40 | 161.25 | 163.3 | -1.26 |
| CW | 1880 | 100 | -0.058 | 133.1 | 131.20 | 132.15 | 136.7 | -3.33 |

| H-field Scan - Probe (H3DV6 SN: 6157) center 10 mm above dipoles | | | | | | |
|---|---|---|---|---|---|---|
| Signal Type | f (MHz) | Input Power (mW) | Power Drift (dB) | Measured H-field (A/m) | H-field Target Values (A/m) (From SPEAG) | Deviation[1)] (%) |
| CW | 835 | 100 | -0.017 | 0.438 | 0.446 | -1.79 |
| CW | 1880 | 100 | 0.000 | 0.467 | 0.450 | 3.78 |

Notes:

1) Delta (Deviation) % = 100 * (Measured value minus Target value) divided by the Target value. Deltas within ±25% are acceptable, of which 12% is deviation and 13% is measurement uncertainty.

2) The maximum E-field or H-field were evaluated and compared to the target values provided by SPEAG in the calibration certificate of specific dipoles.

3) Please refer to the attachment for detailed measurement data and plots.

## 6. Probe Modulation Factor

In consideration of the measurement probes' responses to the RF power envelope employed by the WD, a probe modulation conversion factor must be applied to the E- and H-field probe readings from many typical probes used for these measurements, in order to accurately determine the field strength. The procedure to determine RF modulation response is provided in ANSI-PC63.19 Section C.3.1.

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

This was done using the following procedure:

1. Fixing the probe in a set location relative to a field generating device, such as a reference dipole antenna, as illustrated in Figure 6.
2. Illuminate the probe with a CW signal at the intended measurement frequency.
3. Record the reading of the probe measurement system of the CW signal.
4. Determine the level of the CW signal being used to drive the field generating device.
5. Substitute a signal using the same modulation as that used by the intended WD for the CW signal.
6. Set the amplitude during transmission of the modulated signal to equal the amplitude of the CW signal.
7. Record the reading of the probe measurement system of the modulated signal.
8. Repeat steps 1-7 for both the E- and H-field.
9. The ratio of the CW to modulated signal reading is the modulation factor.

**Probe Modulation Factor (PMF) Test Results:**

| Signal Type | f (MHz) | Input Power (dBm) | Max. measured from above high end (V/m) | Max. measured from above low end (V/m) | Average max. above arm (V/m) | Probe Modulation Factor |
|---|---|---|---|---|---|---|
| CW Signal | 835 | 23.7 | 241.3 | 236.20 | 238.75 | 0.98 |
| WD Signal | 835.02 | 23.7 | 247.5 | 241.50 | 244.50 | |
| CW Signal | 1880 | 24.0 | 142.5 | 141.30 | 141.90 | 0.99 |
| WD Signal | 1880 | 24.0 | 144.5 | 143.50 | 144.00 | |

| Signal type | f (MHz) | Input power (dBm) | H-field measured value (A/m) | Probe Modulation Factor |
|---|---|---|---|---|
| CW Signal | 835 | 23.7 | 0.560 | 0.99 |
| WD Signal | 835.02 | 23.7 | 0.567 | |
| CW Signal | 1880 | 24.0 | 0.629 | 0.93 |
| WD Signal | 1880 | 24.0 | 0.680 | |

Notes: 1). Modulation Factor (MF) = $CW/WD\_CDMA$

3). Please refer to the attachment for detailed measurement data and plots.

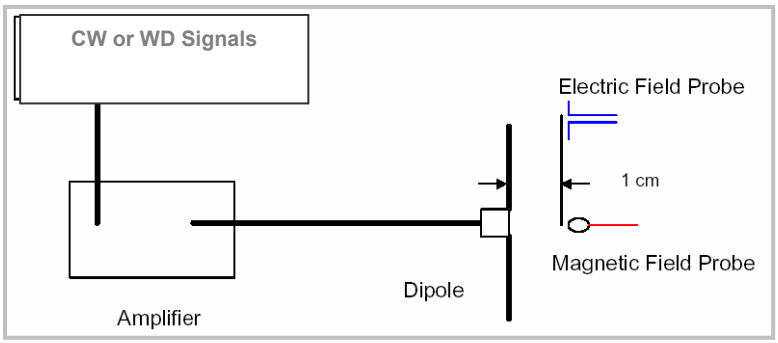



Figure 6 - Dipole Calibration

## 7. RF Emissions Test Procedure

Per ANSI-PC63.19-2005:

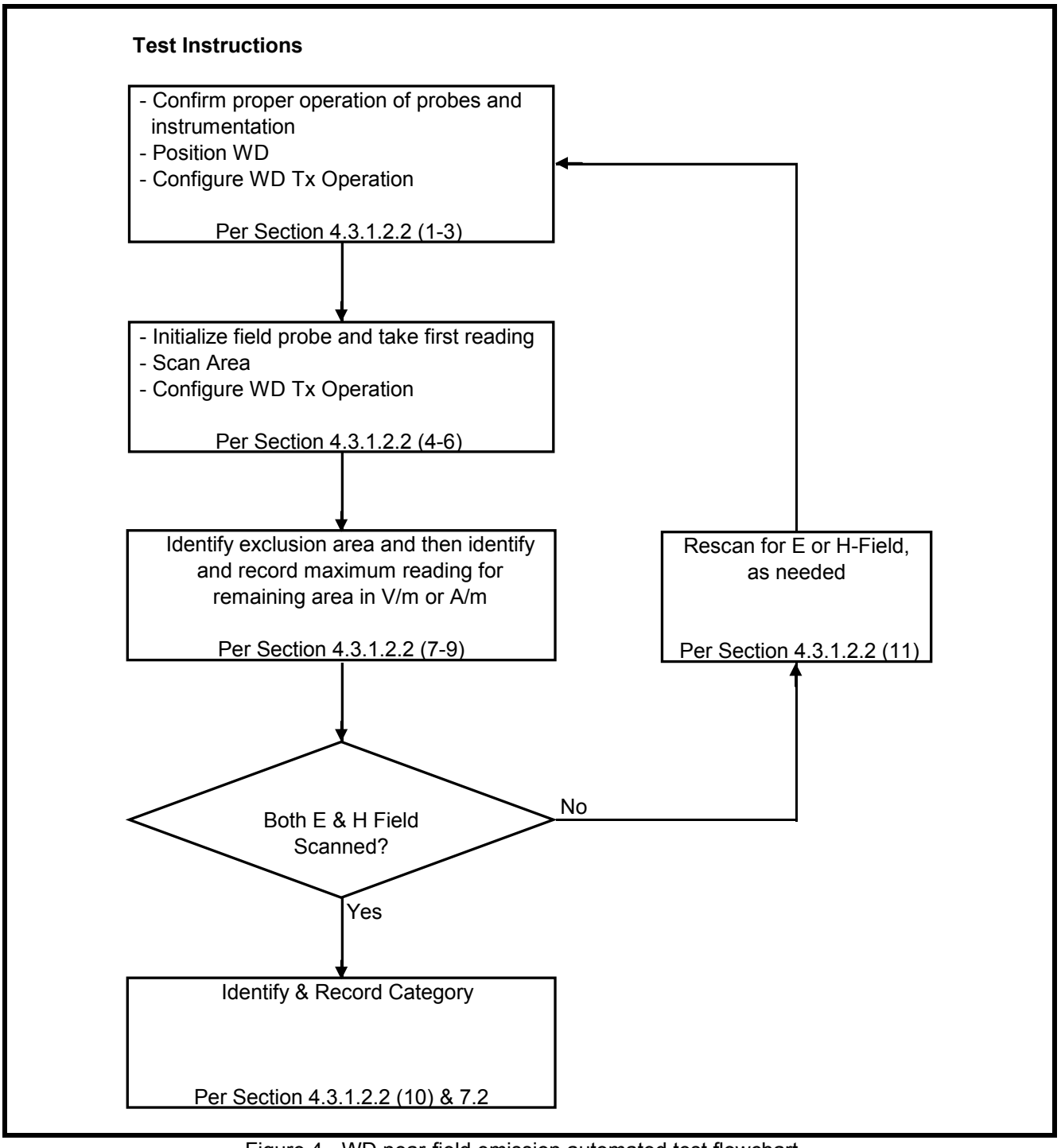



Figure 4 - WD near-field emission automated test flowchart

**RF Emissions Test Procedure:**

The following are step-by-step test procedures.

1. Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.
2. Position the WD in its intended test position.
3. Configure the WD normal operation for maximum rated RF output power, at the desired channel and other operating parameters, (e.g. test mode) as intended for the test.
4. The center sub-grid shall be centered on the center of the WD output (acoustic or T-coil output), as appropriate. Locate the field probe at the initial test position in the 5 x 5 cm grid, which is contained in the measurement plane, see illustrated in Figure 5.
5. Record the reading.
6. Scan the entire 5 x 5 cm region in equally spaced increments and record the reading at each measurement point. The distance between measurement points shall be sufficient to assure the identification of the peak reading.
7. Identify the five contiguous sub-grids around the center sub-grid with the lowest maximum strength readings. Thus the 6 areas to be used to determine the WD's peak emissions are identified and outlined for the final manual scan. Please note that a maximum of five blocks can be excluded for both E- and H-field measurements for the WD output being measured. State another way, the center sub-grid and 3 other must be common to both the E- and H-field measurements.
8. Identify the highest field reading within the non-excluded sub-grids identified in step 7.
9. Convert the highest field reading within identified in step 8 to peak V/m or A/m, as appropriate.
10. Repeat steps 1-10 for both the E- and H-field measurements.
11. Compare this reading to the categories in ANSI-PC63.19 and record the resulting category. The lowest category number listed in ANSI-PC63.19 obtained in step 10 for either E or H field determines the M category for the audio coupling mode assessment. Record the WD category rating.

**Near Field Compliance Criteria (Per ANSI-PC63.19-2005)**

The EUT must meet the following M3 or M4 category:

| Category | AWF (dB) | Limits for E-Field Emissions (V/m) | Limits for H-Field Emissions (A/m) |
|---|---|---|---|
| M1 | 0 | 199.5 - 354.8 | 0.6 - 1.07 |
| | -5 | 149.6 - 266.1 | 0.45 - 0.8 |
| M2 | 0 | 112.2 - 199.5 | 0.34 - 0.6 |
| | -5 | 84.1 - 149.6 | 0.25 - 0.45 |
| **M3** | **0** | **63.1 - 112.2** | **0.19 - 0.34** |
| | **-5** | **47.3 - 84.1** | **0.15 - 0.25** |
| **M4** | **0** | **<63.1** | **<0.19** |
| | **-5** | **<47.3** | **<0.15** |

Telephone Near-field Categories in Linear Units.

**WD RF Emission Measurements Reference and Plane**

Figure 5 illustrate the references and reference plane that shall be used in the WD emissions

- The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.
- The grid is centered on the audio frequency output transducer of the WD (speaker or T-coil).
- The grid is in a reference plane, which is defined as the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of the receiver area of the phone and is defined by the points of the receiver-end of the WD handset, which, in normal handset use, rest against the ear.
- The measurement plane is parallel to, and 1.0 cm in front of, the reference plane.

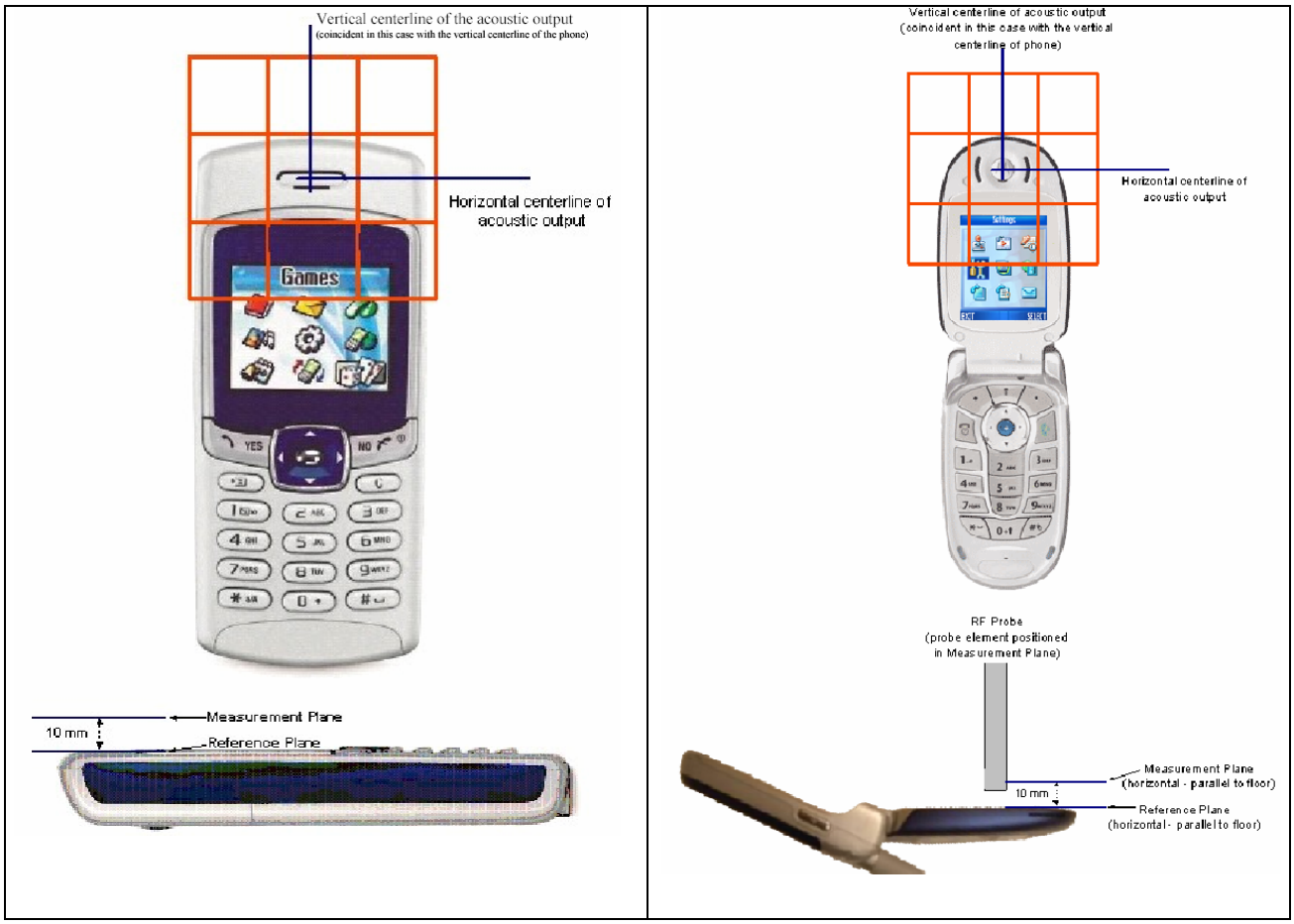



Figure 5 - WD reference and plane for RF emission measurements

## 8. Procedures Used to Establish Test Signal

The following settings were used to configure the Wireless Communications Test Set, Agilent 8960 Series 10, E5515C.

Operation Mode: Active Cell

System Mode: IS-2000

| Call Parms | Cell band | |
|---|---|---|
| | US Cellular | US PCS |
| Channel | 1013 / 383 / 777 | 25 / 600 / 1175 |
| Protocol Rev | 6 (IS-2000-0) | 6 (IS-2000-0) |
| Radio Config | (Fwd3, Rvs3), S055 (Loopback) | (Fwd3, Rvs3), S055 (Loopback) |
| Rvs Power Ctrl | All Up Bits | All Up Bits |
| Power Ctrl Size | 1.0 dBm | 1.0 dBm |
| Call Drop Timer | Off | Off |
| Call Limit Mode | Off | Off |
| Traffic Dada Rate | Full | Full |
| Rcvr Power Ctrl | Manual | Manual |
| Meas Frequency | Auto | Auto |
| Voice SO Mode | Voice Echo | Voice Echo |
| Echo Delay | Medium | Medium |

## 9. Summary of Results

**CDMA Cellular band – Model KX9B**

Table below shows the results of the near electric (E-Field) and magnetic (H-Field) fields generated by wireless communications devices (WD). The worst case result is highlighted.

**Model: KX9B**

**E-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (V/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA Cellular Band | 1013 | 824.70 | 25.10 | -0.057 | on | 0 | 56.40 | M4 |
| | 383 | 836.49 | 25.20 | -0.077 | on | 0 | 63.90 | M3 |
| | 777 | 848.31 | 25.10 | -0.130 | on | 0 | 63.40 | M3 |
| CDMA Cellular Band | 1013 | 824.70 | 25.10 | -0.023 | off | 0 | 55.20 | M4 |
| | 383 | 836.49 | 25.20 | -0.196 | off | 0 | 62.60 | M4 |
| | 777 | 848.31 | 25.10 | -0.220 | off | 0 | 63.50 | M3 |

**H-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (A/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA Cellular Band | 1013 | 824.70 | 25.10 | -0.116 | on | 0 | 0.080 | M4 |
| | 383 | 836.49 | 25.20 | -0.136 | on | 0 | 0.093 | M4 |
| | 777 | 848.31 | 25.10 | -0.173 | on | 0 | 0.094 | M4 |
| CDMA Cellular Band | 1013 | 824.70 | 25.10 | -0.133 | off | 0 | 0.071 | M4 |
| | 383 | 836.49 | 25.20 | -0.103 | off | 0 | 0.094 | M4 |
| | 777 | 848.31 | 25.10 | -0.162 | off | 0 | 0.097 | M4 |
| | | | | | | | **Overall M-Rating:** | **M3** |

**CDMA Cellular band – Model KX9C**

Table below shows the results of the near electric (E-Field) and magnetic (H-Field) fields generated by wireless communications devices (WD). The worst case result is highlighted.

**Model: KX9C**

**E-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (V/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA Cellular Band | 383 | 836.49 | 25.20 | -0.180 | on | 0 | 62.00 | M4 |
| CDMA Cellular Band | 383 | 836.49 | 25.20 | -0.086 | off | 0 | 58.90 | M4 |

**H-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (A/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA Cellular Band | 777 | 848.32 | 25.10 | -0.121 | on | 0 | 0.093 | M4 |
| CDMA Cellular Band | 777 | 848.31 | 25.10 | -0.186 | off | 0 | 0.095 | M4 |
| | | | | | | | **Overall M-Rating:** | **M4** |

**CDMA PCS band – Model KX9B**

Table below shows the results of the near electric (E-Field) and magnetic (H-Field) fields generated by wireless communications devices (WD). The worst case result is highlighted.

**Model: KX9B**

**E-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (V/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA PCS Band | 25 | 1851.25 | 23.3 | -0.037 | on | 0 | 32.90 | M4 |
| | 600 | 1880 | 23.4 | -0.016 | on | 0 | 36.80 | M4 |
| | 1175 | 1908.75 | 23.3 | -0.092 | on | 0 | 32.10 | M4 |
| CDMA PCS Band | 25 | 1851.25 | 23.3 | 0.022 | off | 0 | 33.00 | M4 |
| | 600 | 1880 | 23.4 | -0.014 | off | 0 | 37.80 | M4 |
| | 1175 | 1908.75 | 23.3 | -0.097 | off | 0 | 33.20 | M4 |

**H-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (A/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA PCS Band | 25 | 1851.25 | 23.3 | -0.002 | on | 0 | 0.076 | M4 |
| | 600 | 1880 | 23.4 | -0.050 | on | 0 | 0.094 | M4 |
| | 1175 | 1908.75 | 23.3 | -0.106 | on | 0 | 0.087 | M4 |
| CDMA PCS Band | 25 | 1851.25 | 23.3 | -0.085 | off | 0 | 0.080 | M4 |
| | 600 | 1880 | 23.4 | -0.141 | off | 0 | 0.090 | M4 |
| | 1175 | 1908.75 | 23.3 | -0.147 | off | 0 | 0.087 | M4 |
| | | | | | | | **Overall M-Rating:** | **M4** |

**CDMA PCS band – Model KX9C**

Table below shows the results of the near electric (E-Field) and magnetic (H-Field) fields generated by wireless communications devices (WD). The worst case result is highlighted.

**Model: KX9C**

**E-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (V/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA PCS Band | 600 | 1880 | 23.4 | 0.010 | on | 0 | 34.10 | M4 |
| CDMA PCS Band | 600 | 1880 | 23.4 | 0.046 | off | 0 | 35.40 | M4 |

**H-Field Emission Test**

| Operating Mode | Channel | f (MHz) | Conducted Power (dBm) | Power drift (dB) | Backlight | AWF | Measured E-field Emissions (A/m) | Category M-Rating |
|---|---|---|---|---|---|---|---|---|
| CDMA PCS Band | 25<br>600<br>1175 | 1851.25<br>1880<br>1908.75 | 23.4 | -0.044 | on | 0 | 0.086 | M4 |
| CDMA PCS Band | 25<br>600<br>1175 | 1851.25<br>1880<br>1908.75 | 23.4 | -0.026 | off | 0 | 0.088 | M4 |
| | | | | | | | **Overall M-Rating:** | **M4** |

## 10. Test Equipment List

| Name of Equipment | Manufacturer | Type/Model | Serial Number | Cal. Due date |
|---|---|---|---|---|
| Robot - Six Axes | Stäubli | RX90BL | N/A | N/A |
| Robot Remote Control | Stäubli | CS7MB | 3403-91535 | N/A |
| DASY4 Measurement Server | SPEAG | SEUMS001BA | 1041 | N/A |
| Probe Alignment Unit | SPEAG | LB (V2) | 261 | N/A |
| Data Acquisition Electronics | SPEAG | DAE3 V1 | 500 | 2/7/06 |
| E-Field Probe | SPEAG | ER3DV6 | 2339 | 3/11/06 |
| H-Field Probe | SPEAG | H3DV6 | 6157 | 3/11/06 |
| Calibration Dipole | SPEAG | CD1880V3 | 1014 | 2/23/07 |
| Calibration Dipole | SPEAG | CD835V3 | 1014 | 2/24/07 |
| Signal Generator | R&H | SMP 04 | DE34210 | 6/2/06 |
| Signal Generator | HP | 8648C | 3623A03025 | 7/5/06 |
| Power Meter | Giga-tronics | 8651A | 8651404 | 9/16/05 |
| Power Sensor | Giga-tronics | 80701A | 1834588 | 9/16/05 |
| Amplifier | Mini-Circuits | ZHL-42W | D072701-5 | N/A |
| Radio Communication Tester | R & S | CMU 200 | 838114/032 | 12/17/06 |
| Wireless Communication Test Set | Agilent | E5515C | GB44051333 | 5/5/06 |

## 11. Measurement Uncertainty

| HAC Validation Test<br>Using SPEAG Calbration Dipoles | | | | | | | |
|---|---|---|---|---|---|---|---|
| Error Description | Uncertainty value (? ) | Probe Dist. | Div. | (Ci) E | (Ci) H | Std. Unc.(? ) | |
| | | | | | | E | H |
| **Measurement System** | | | | | | | |
| Probe Calibration | 5.10 | N | 1 | 1 | 1 | 5.1 | 5.1 |
| Axial Isotropy | 4.70 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| Sensor Displacement | 16.50 | R | 1.732 | 1 | 0.145 | 9.5 | 1.4 |
| Boundary Effects | 2.40 | R | 1.732 | 1 | 1 | 1.4 | 1.4 |
| Linearity | 4.70 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| Scaling to Peak Envelope Power | 0.00 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| System Detection Limit | 1.00 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 0.30 | N | 1 | 1 | 1 | 0.3 | 0.3 |
| Response Time | 0.00 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| Integration Time | 0.00 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| RF Ambient Conditions | 3.00 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| RF Reflections | 6.00 | R | 1.732 | 1 | 1 | 3.5 | 3.5 |
| Probe Positioner | 1.20 | R | 1.732 | 1 | 0.67 | 0.7 | 0.5 |
| Probe Positioning | 4.70 | R | 1.732 | 1 | 0.67 | 2.7 | 1.8 |
| Extrapolation and Interpolation | 1.00 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| **Dipole Related** | | | | | | | |
| Distance dipole - Scanning Plane | 5.20 | R | 1.732 | 1 | 0.3 | 3.0 | 0.9 |
| Input power | 4.70 | N | 1 | 1 | 1 | 4.7 | 4.7 |
| Combined Std. Uncertainty | | | | | | 13.7 | 9.3 |
| **Expanded Std. Uncertainty on Power** | | | | | | **27.4** | **18.6** |
| **Expanded Std. Uncertainty on Field** | | | | | | **13.7** | **9.3** |
| Notesfor table<br>1. N - Nomal<br>2. R - Rectangular<br>3. Div. - Divisor used to obtain standard uncertainty<br>4. Ci - is te sensitivity coefficient | | | | | | | |

Note: Uncertainty budget for HAC setup performance test. The budget is valid for the frequency range 800 MHz - 3 GHz and represents a worst-case analysis with respect to power uncertainty of the field. Some of the parameters are dependent on the user situations and need adjustment according to the actual laboratory conditions.

| HAC Uncertainty Budget According to ANSI PC63.19 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Error Description | Uncertainty value (±%) | Probe Dist. | Div. | (Ci) E | (Ci) H | Std. Unc.(±%) | |
| | | | | | | E | H |
| **Measurement System** | | | | | | | |
| Probe Calibration | 5.10 | N | 1 | 1 | 1 | 5.1 | 5.1 |
| Axial Isotropy | 4.70 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| Sensor Displacement | 16.50 | R | 1.732 | 1 | 0.145 | 9.5 | 1.4 |
| Boundary Effects | 2.40 | R | 1.732 | 1 | 1 | 1.4 | 1.4 |
| Linearity | 4.70 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| Scaling to Peak Envelope Power | 2.00 | R | 1.732 | 1 | 1 | 1.2 | 1.2 |
| System Detection Limit | 1.00 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Readout Electronics | 0.30 | N | 1 | 1 | 1 | 0.3 | 0.3 |
| Response Time | 0.80 | R | 1.732 | 1 | 1 | 0.5 | 0.5 |
| Integration Time | 2.60 | R | 1.732 | 1 | 1 | 1.5 | 1.5 |
| RF Ambient Conditions | 3.00 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| RF Reflections | 12.00 | R | 1.732 | 1 | 1 | 6.9 | 6.9 |
| Probe Positioner | 1.20 | R | 1.732 | 1 | 0.67 | 0.7 | 0.5 |
| Probe Positioning | 4.70 | R | 1.732 | 1 | 0.67 | 2.7 | 1.8 |
| Extrapolation and Interpolation | 1.00 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| **Test sample Related** | | | | | | | |
| Test Positioning Vertical | 4.70 | R | 1.732 | 1 | 0.67 | 2.7 | 1.8 |
| Test Positioning Lateral | 1.00 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Device Holder and Phantom | 2.40 | R | 1.732 | 1 | 1 | 1.4 | 1.4 |
| Power Drift | 5.00 | R | 1.732 | 1 | 1 | 2.9 | 2.9 |
| **Phantom and Setup Related** | | | | | | | |
| Phantom Thickness | 2.40 | R | 1.732 | 1 | 0.67 | 1.4 | 0.9 |
| Combined Std. Uncertainty | | | | | | 14.7 | 10.9 |
| **Expanded Std. Uncertainty on Power** | | | | | | **29.4** | **21.8** |
| **Expanded Std. Uncertainty on Field** | | | | | | **14.7** | **10.9** |

Notesfor table
1. N - Nomal
2. R - Rectangular
3. Div. - Divisor used to obtain standard uncertainty
4. Ci - is te sensitivity coefficient

Note: Worst-Case uncertainty budget for HAC free field assessment according to ANSIC63.19. The budget is valid for the frequency range 800 MHz - 3 GHz and represents a worstcase analysis. For specific tests and configurations, the uncertainty could be considerably smaller. Some of the parameters are dependent on the user situations and need adjustment according to the actual laboratory conditions.

## 12. Attachment

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# END OF REPORT