Hearing Aid Compatibility (HAC) RF Emissions Test Report

APPLICANT	:	Motorola Mobility LLC.
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	7383A
FCC ID	:	IHDT56VD6
STANDARD	:	FCC 47 CFR §20.19 ANSI C63.19-2011

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
HA651006-01A	Rev. 01	Initial issue of report	Jul. 18, 2016

1. Attestation of Test Results

Applicant Name	Motorola Mobility LLC.
Equipment Name	Mobile Cellular Phone
Brand Name	Motorola
Model Name	7383A
FCC ID	IHDT56VD6
EUT Stage	Identical Prototype
Exposure category	General Population/Uncontrolled Exposure
HAC Rating	M3
Test Result	Pass

This device is compliance with HAC limits specified in guidelines FCC 47 CFR §20.19 and ANSI Standard ANSI C63.19.

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. : **SAR04-HY**
Applicant	
Company Name	Motorola Mobility LLC.
Address	222 W. Merchandise Mart Plaza, Chicago IL 60654 USA
Manufacturer	
Company Name	Motorola Mobility LLC.
Address	222 W. Merchandise Mart Plaza, Chicago IL 60654 USA

3. Equipment Under Test Information

3.1 General Information

Product Feature & Specification	
Frequency Band	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz CDMA 2000 BC10: 817.9 MHz ~ 823.1 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	• GSM/GPRS/EGPRS • AMR / RMC 12.2Kbps • HSDPA • HSUPA • DC-HSDPA • CDMA2000 : 1xRTT/1xEv-Do(Rel.0)/1xEv-Do(Rev.A) • LTE: QPSK, 16QAM • 802.11b/g/n HT20 • Bluetooth EDR / LE

3.2 Air Interface and Operating Mode

Air Interface	Band MHz	Type	C63.19 Tested	Simultaneous Transmitter	OTT	Power Reduction
GSM	850	VO	Yes	WLAN, BT	NA	No
	1900			WLAN, BT	NA	No
	GPRS/EDGE	DT	No	WLAN, BT	Yes	No
WCDMA	850	VO	Yes(1)	WLAN, BT	NA	No
	1750			WLAN, BT	NA	No
	1900			WLAN, BT	NA	No
	HSPA	DT	No	WLAN, BT	Yes	No
CDMA	BC0	VO	Yes	WLAN, BT	NA	No
	BC1			WLAN, BT	NA	No
	BC10			WLAN, BT	NA	No
	EVDO	DT	No	WLAN, BT	Yes	No
FDD LTE	Band 2	VD	Yes(1)	WLAN, BT	Yes	No
	Band 4			WLAN, BT		No
	Band 5			WLAN, BT		No
	Band 7			WLAN, BT		No
	Band 12			WLAN, BT		No
	Band 13			WLAN, BT		No
	Band 17			WLAN, BT		No
	Band 25			WLAN, BT		No
	Band 26			WLAN, BT		No
TDD LTE	Band 41	VD	Yes	WLAN, BT	Yes	No
WLAN	2450	DT	No	GSM,CDMA WCDMA,LTE	Yes	No
BT	2450	DT	No	GSM,CDMA WCDMA,LTE	NA	No

VO=CMRS Voice Service
DT=Digital Transport
VD=CMRS IP Voice Service and Digital Transport

Remark:
1. WCDMA and FDD LTE is exempted from testing by low power exemption that its average antenna input power plus its MIF is ≤17 dBm, and is rated as M4

3.3 Applied Standards

- FCC CFR47 Part 20.19
- ANSI C63.19 2011-version
- FCC KDB 285076 D01 HAC Guidance v04r01
- FCC KDB 285076 D02 T Coil testing for CMRS IP v02

4. Re-use of Measured Data

1. **Introduction Section**

The parent model (FCC ID: IHDT56VD4) and the child model (FCC ID: IHDT56VD6) has identical hardware components, PCB layout, antenna, SW implementation, except the power setting of UMTS B4, LTE B2/4/12 is increased.

The FCC ID: IHDT56VD4 test data shall remain representative of FCC ID: IHDT56VD6 for those unchanged frequency bands, hence IHDT56VD6 reuse test data of unchanged frequency bands from IHDT56VD4.

2. **Difference Section**

Difference between FCC ID: IHDT56VD4 and FCC ID: IHDT56VD6:

The power setting of UMTS B4, LTE B2/4/12 in IHDT56VD6 is higher than the power setting in IHDT56VD4.

3. **Spot Check Verification Data Section**

The FCC ID: IHDT56VD4 and FCC ID: IHDT56VD6 are identical in those frequency bands that IHDT56VD6 reuse test data from IHDT56VD4, hence spot checking is not required.

4. **Reference detail section:**

Equipment Class	Reference FCC ID	Folder Test/HAC RF	Report Title/Section
Licensed	IHDT56VD4	RF (HA651006A)	All sections applicable

5. Modulation Interference Factor

The HAC Standard ANSI C63.19-2011 defines a new scaling using the Modulation Interference Factor (MIF).

For any specific fixed and repeatable modulated signal, a modulation interference factor (MIF, expressed in dB) may be developed that relates its interference potential to its steady-state rms signal level or average power level. This factor is a function only of the audio-frequency amplitude modulation characteristics of the signal and is the same for field-strength and conducted power measurements. It is important to emphasize that the MIF is valid only for a specific repeatable audio-frequency amplitude modulation characteristic. Any change in modulation characteristic requires determination and application of a new MIF

The Modulation Interference factor (MIF, in dB) is added to the measured average E-field (in dBV/m) and converts it to the RF Audio Interference level (in dBV/m). This level considers the audible amplitude modulation components in the RF E-field. CW fields without amplitude modulation are assumed to not interfere with the hearing aid electronics. Modulations without time slots and low fluctuations at low frequencies have low MIF values, TDMA modulations with narrow transmission and repetition rates of few 100 Hz have high MIF values and give similar classifications as ANSI C63.19-2011.

ER3D, EF3D and EU2D E-field probes have a bandwidth <10 kHz and can therefore not evaluate the RF envelope in the full audio band. DASY52 is therefore using the indirect measurement method according to ANSI C63.19-2011 which is the primary method. These near field probes read the averaged E-field measurement. Especially for the new high peak-to-average (PAR) signal types, the probes shall be linearized by PMR calibration in order to not overestimate the field reading. Probe Modulation Response (PMR) calibration linearizes the probe response over its dynamic range for specific modulations which are characterized by their UID and result in an uncertainty specified in the probe calibration certificate. The MIF is characteristic for a given waveform envelope and can be used as a constant conversion factor if the probe has been PMR calibrated.

The evaluation method for the MIF is defined in ANSI C63.19-2011 section D.7. An RMS demodulated RF signal is fed to a spectral filter (similar to an A weighting filter) and forwarded to a temporal filter acting as a quasi-peak detector. The averaged output of these filtering is scaled to a 1 kHz 80% AM signal as reference. MIF measurement requires additional instrumentation and is not well suited for evaluation by the end user with reasonable uncertainty. It may alliteratively be determined through analysis and simulation, because it is constant and characteristic for a communication signal. DASY52 uses well-defined signals for PMR calibration. The MIF of these signals has been determined by simulation and it is automatically applied.

MIF values applied in this test report were provided by the HAC equipment provider, SPEAG, and the values are listed below

UID	Communication System Name	MIF(dB)
10021	GSM-FDD(TDMA,GMSK)	3.63
10011	UMTS-FDD(WCDMA)	-27.23
10039	CDMA2000 (1xRTT, RC1)	-19.77
10081	CDMA2000 (1xRTT, RC3)	-19.71
10295	CDMA2000 (1xRTT, RC1 SO3, 1/8th Rate 25 fr.)	3.26
10100	LTE-FDD(SC-FDMA,100%RB,20MHz,QPSK)	-23.48
10101	LTE-FDD(SC-FDMA,100%RB,20MHz,16-QAM)	-17.86
10108	LTE-FDD(SC-FDMA,100%RB,10MHz,QPSK)	-21.57
10109	LTE-FDD(SC-FDMA,100%RB,10MHz,16-QAM)	-16.87
10110	LTE-FDD(SC-FDMA,100%RB,5MHz,QPSK)	-23.39
10111	LTE-FDD(SC-FDMA,100%RB,5MHz,16-QAM)	-16.35
10139	LTE-FDD(SC-FDMA,100%RB,15MHz,QPSK)	-18.25
10140	LTE-FDD(SC-FDMA,100%RB,15MHz,16-QAM)	-19.37
10142	LTE-FDD(SC-FDMA,100%RB,3MHz,QPSK)	-22.36
10143	LTE-FDD(SC-FDMA,100%RB,3MHz,16-QAM)	-14.75
10145	LTE-FDD(SC-FDMA,100%RB,1.4MHz,QPSK)	-17.39
10146	LTE-FDD(SC-FDMA,100%RB,1.4MHz,16-QAM)	-13.6
10148	LTE-FDD(SC-FDMA,50%RB,20MHz,QPSK)	-18.28
10149	LTE-FDD(SC-FDMA,50%RB,20MHz,16-QAM)	-16.87
10154	LTE-FDD(SC-FDMA,50%RB,10MHz,QPSK)	-23.42
10155	LTE-FDD(SC-FDMA,50%RB,10MHz,16-QAM	-16.36
10156	LTE-FDD(SC-FDMA,50%RB,5MHz,QPSK)	-21.71
10157	LTE-FDD(SC-FDMA,50%RB,5MHz,16-QAM)	-15.78
10160	LTE-FDD(SC-FDMA,50%RB,15MHz,QPSK)	-17.95
10161	LTE-FDD(SC-FDMA,50%RB,15MHz,16-QAM)	-17.54
10163	LTE-FDD(SC-FDMA,50%RB,3MHz,QPSK)	-19.99
10164	LTE-FDD(SC-FDMA,50%RB,3MHz,16-QAM)	-14.41
10166	LTE-FDD(SC-FDMA,50%RB,1.4MHz,QPSK)	-18.1
10167	LTE-FDD(SC-FDMA,50%RB,1.4MHz,16-QAM)	-12.15
10169	LTE-FDD(SC-FDMA,1RB,20MHz,QPSK)	-15.63
10170	LTE-FDD(SC-FDMA,1RB,20MHz,16-QAM)	-9.76
10175	LTE-FDD(SC-FDMA,1RB,10MHz,QPSK)	-15.63
10176	LTE-FDD(SC-FDMA,1RB,10MHz,16-QAM)	-9.76
10177	LTE-FDD(SC-FDMA,1RB,5MHz,QPSK)	-15.63
10178	LTE-FDD(SC-FDMA,1RB,5MHz,16-QAM	-9.76
10181	LTE-FDD(SC-FDMA,1RB,15MHz,QPSK)	-15.63
10182	LTE-FDD(SC-FDMA,1RB,15MHz,16-QAM)	-9.76
10184	LTE-FDD(SC-FDMA,1RB,3MHz,QPSK)	-15.62
10185	LTE-FDD(SC-FDMA,1RB,3MHz,16-QAM)	-9.76
10187	LTE-FDD(SC-FDMA,1RB,1.4MHz,QPSK)	-15.62
10188	LTE-FDD(SC-FDMA,1RB,1.4MHz,16-QAM)	-9.76
10103	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	-1.64
10104	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	-1.66
10105	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	-1.64
10151	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	-1.64
10152	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	-1.66
10153	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	-1.66
10172	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	-1.62
10173	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	-1.44
10174	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	-1.54
10226	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	-1.44
10227	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	-1.54
10228	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	-1.62
10226	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	-1.44
10227	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	-1.54
10228	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	-1.62

UID	Communication System Name	MIF(dB)
10226	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	-1.44
10227	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	-1.54
10228	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	-1.62
10229	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	-1.44
10230	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	-1.54
10231	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	-1.62
10232	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM	-1.44
10233	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	-1.54
10234	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	-1.62
10235	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	-1.44
10236	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	-1.54
10237	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	-1.62
10238	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	-1.44
10239	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	-1.54
10240	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	-1.62
10241	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	-1.58
10242	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	-1.57
10243	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	-1.65
10244	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	-1.65
10245	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	-1.68
10246	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	-1.65
10247	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	-1.67
10248	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	-1.66
10249	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	-1.64
10250	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	-1.65
10251	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	-1.67
10252	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	-1.64
10253	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	-1.67
10254	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	-1.67
10255	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	-1.64
10256	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	-1.65
10257	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	-1.64
10258	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	-1.65
10259	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	-1.65
10260	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	-1.65
10261	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	-1.64
10262	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	-1.65
10263	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	-1.67
10264	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	-1.65
10265	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	-1.66
10266	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	-1.66
10267	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	-1.64
10268	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	-1.67
10269	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	-1.69
10270	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	-1.65

The MIF measurement uncertainty is estimated as follows, declared by HAC equipment provider SPEAG, for modulation frequencies from slotted waveforms with fundamental frequency and at least 2 harmonics within 10 kHz:

i) 0.2 dB for MIF: -7 to +5 dB,

ii) 0.5 dB for MIF: -13 to +11 dB

iii) 1 dB for MIF: > -20 dB

6. Low-power Exemption

<Max Tune-up Limit>

Mode		Average Antenna Input Power (dBm)
WCDMA	Band IV	25.00
LTE	Band 2	24.50
	Band 4	25.00
	Band 12	24.70

<Low Power Exemption>

Air Interface	Max Average Antenna Input Power (dBm)	Worst Case MIF (dB)	Power + MIF(dB)	C63.19 test required
WCDMA	25.00	-27.23	-2.23	No
LTE - FDD	25.00	-9.76	15.24	No

General Note:

1. According to ANSI C63.19 2011-version, for WWAN RF air interface technology of a device is exempt from testing when its average antenna input power plus its MIF is ≤17 dBm for any of its operating modes.
2. For FDD LTE operation the worst case MIF plus the worst case average antenna input power for all modes are investigated to determine the testing requirements for this device.
3. HAC RF rating is M4 for the air interface which meets the low power exemption.

7. References

[1] ANSI C63.19-2011, "American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids", 27 May 2011.

[2] FCC KDB 285076 D01v04r01, "Equipment Authorization Guidance for Hearing Aid Compatibility", Apr 2016

[3] FCC KDB 285076 D02v02, "Guidance for Performing T-Coil tests for Air Interfaces Supporting Voice over IP", Apr 2016

[4] SPEAG DASY System Handbook