Hearing Aid Compatibility (OTT/VoLTE_HAC) RF Emissions Test Report

APPLICANT	:	**Sony Mobile Communications Inc.**
BRAND NAME	:	**Sony**
FCC ID	:	**PY7-57442Z**
M-RATING	:	**M4**
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 / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
HA760712-06A	Rev. 01	Initial issue of report	May 14, 2018
HA760712-06A	Rev. 02	Update page1 information	May 16, 2018

1. Attestation of Test Results

Applicant Name	Sony Mobile Communications Inc.
Brand Name	Sony
FCC ID	PY7-57442Z
S / N	CQ30002GB8
HW Version	A
SW Version	6.64
EUT Stage	Production Unit
Exposure category	General Population/Uncontrolled Exposure
HAC Rating	M4
Test Result	Pass

Remark:

1. For this report is enabled VoLTE and OTT VoIP function, according to ANSI C63.19 2011, when the average antenna input power plus its MIF is < 17dBm for any of its operating modes, the RF rating is M4 for the air interface which meets the low power exemption. But base on the Sporton RF original report, FCC ID: PY7-57442Z, Report No.: HA760712-01A, the worst case RF rating still is M3.

2. Administration Data

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

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	Sony Mobile Communications Inc.
Address	4-12-3 Higashi-Shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer	
Company Name	Sony Mobile Communications Inc.
Address	4-12-3 Higashi-Shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan

3. Equipment Under Test Information

3.1 General Information

Wireless Technologies	Frequency	Operating Mode	
GSM	850 1900	· GSM Voice · GPRS (GMSK) · EDGE (8PSK)	Multi-Slot Class: Class 33
	Does device support dual transfer mode? (Yes)		
W-CDMA (UMTS)	Band 2 Band 4 Band 5	· AMR / RMC 12.2Kbps · HSDPA · HSUPA · DC-HSDPA	
LTE	Band 2 Band 4 Band 5 Band 7 Band 12 Band 13 Band 17 Band 25 Band 66	· QPSK · 16QAM · 64QAM · Rel 11 Carrier Aggregation Downlink only	
WiFi	2.4GHz: 2412 MHz ~ 2462 MHz	· 11b · 11g · 11n (HT20) · 11ac (VHT20)	
	5GHz: 5.2GHz: 5180 MHz ~ 5240 MHz 5.3GHz: 5260 MHz ~ 5320 MHz 5.5GHz: 5500 MHz ~ 5720 MHz 5.8GHz: 5745 MHz ~ 5825 MHz	· 11a · 11n (HT20) · 11n (HT40) · 11ac (VHT20) · 11ac (VHT40) · 11ac (VHT80)	
Bluetooth	2.4GHz	· BR / EDR / LE	
NFC	13.56MHz	· ASK	

4. Applied Standards

- FCC CFR47 Part 20.19
- ANSI C63.19-2011
- FCC KDB 285076 D01 HAC Guidance v05
- FCC KDB 285076 D02 T Coil testing v03
- FCC KDB 285076 D03 HAC FAQ v01

5. RF Audio Interference Level

FCC wireless hearing aid compatibility rules ensure that consumers with hearing loss are able to access wireless communications services through a wide selection of handsets without experiencing disabling radio frequency (RF) interference or other technical obstacles.
To define and measure the hearing aid compatibility of handsets, in CFR47 part 20.19 ANSI C63.19 is referenced. A handset is considered hearing aid-compatible for acoustic coupling if it meets a rating of at least M3 under ANSI C63.19, and A handset is considered hearing aid compatible for inductive coupling if it meets a rating of at least T3. According to ANSI C63.19 2011 version, for acoustic coupling, the RF electric field emissions of wireless communication devices should be measured and rated according to the emission level as below.

Emission Categories	E-field emissions	
	<960Mhz	>960Mhz
M1	50 to 55 dB (V/m)	40 to 45 dB (V/m)
M2	45 to 50 dB (V/m)	35 to 40 dB (V/m)
M3	40 to 45 dB (V/m)	30 to 35 dB (V/m)
M4	<40 dB (V/m)	<30 dB (V/m)

Table 5.1 Telephone near-field categories in linear units

6. Air Interface and Operating Mode

Air Interface	Band MHz	Type	C63.19 Tested	Simultaneous Transmitter	Name of Voice Service	Power Reduction
GSM	EDGE850	VD	Yes	WLAN, BT	Google Duo	No
	EDGE1900					
UMTS	850 HSPA	VD	Yes(1)	WLAN, BT	Google Duo	No
	1750 HSPA			WLAN, BT		No
	1900 HSPA			WLAN, BT		No
LTE (FDD)	Band 2	VD	Yes(1)	WLAN, BT	VoLTE / Google Duo	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 66			WLAN, BT		No
Wi-Fi	2450	VD	Yes(1)	GSM,WCDMA,LTE	Google Duo	No
	5200					No
	5300					No
	5500					No
	5800					No
BT	2450	DT	No	GSM,WCDMA,LTE	NA	No

Type Transport:
VO= Voice only
DT= Digital Transport only (no voice)
VD= CMRS and IP Voice Service over Digital Transport

Remark:
1. The air interface 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

7. 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.

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:

1. 0.2 dB for MIF: -7 to +5 dB
2. 0.5 dB for MIF: -13 to +11 dB
3. 1 dB for MIF: > -20 dB

MIF values applied in this test report were provided by the HAC equipment provider of SPEAG, and the worst values for all air interface are listed below to be determine the Low-power Exemption.

UID	Communication System Name	MIF(dB)
10021	GSM-FDD(TDMA,GMSK)	3.63
10025	EDGE-FDD (TDMA, 8PSK, TN 0)	3.75
10460	UMTS-FDD(WCDMA, AMR)	-25.43
10225	UMTS-FDD (HSPA+)	-20.39
10170	LTE-FDD(SC-FDMA,1RB,20MHz,16-QAM)	-9.76
10061	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	-2.02
10077	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	0.12
10427	IEEE 802.11n (HT Greeneld, 150 Mbps, 64-QAM)	-13.44
10069	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	-3.15
10616	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	-5.57

8. Low-power Exemption

<Max Tune-up Limit>

Mode		Average Power (dBm)
GSM	EDGE850	27.5
	EDGE1900	26.0
WCDMA	Band V	25.0
	Band IV	24.5
	Band II	24.5
FDD LTE	Band 2	24.5
	Band 4	24.5
	Band 5	24.5
	Band 7	24.5
	Band 12	24.5
	Band 13	24.5
	Band 17	24.5
	Band 25	24.0
	Band 66	24.0
2.4GHz WLAN	802.11b	16.0
	802.11g	14.0
	802.11n-HT20	14.0
	802.11ac-VHT20	14.0
5GHz WLAN	802.11a	17.0
	802.11n-HT20	14.0
	802.11n-HT40	13.0
	802.11ac-VHT20	14.0
	802.11ac-VHT40	13.0
	802.11ac-VHT80	12.0

<Low Power Exemption>

Air Interface	Max Average Antenna Input Power (dBm)	Worst Case MIF (dB)	Power + MIF(dB)	C63.19 test required
EDGE850	27.5	3.75	31.25	No(1)
EDGE1900	26.0	3.75	29.75	No(1)
WCDMA - HSPA	25.0	-20.39	4.61	No
LTE - FDD	24.5	-9.76	14.74	No
802.11b	16.0	-2.02	13.98	No
802.11g	14.0	0.12	14.12	No
802.11n-HT20	14.0	-13.44	0.56	No
802.11ac-VHT20	14.0	-5.57	8.43	No
802.11a	17.0	-3.15	13.85	No
802.11n-HT20	14.0	-13.44	0.56	No
802.11n-HT40	13.0	-13.44	-0.44	No
802.11ac-VHT20	14.0	-5.57	8.43	No
802.11ac-VHT40	13.0	-5.57	7.43	No
802.11ac-VHT80	12.0	-5.57	6.43	No

General Note:

1. EDGE data modes is not necessary due the GSM Voice mode is the worst case and already evaluation in the Sporton HAC report, FCC ID: PY7-57442Z, Report No.: HA760712-01A.
2. According to ANSI C63.19 2011-version, for the 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.
3. HAC RF rating is M4 for the air interface which meets the low power exemption.

9. 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 D01v05, “Equipment Authorization Guidance for Hearing Aid Compatibility”, Sep 2017

[3] FCC KDB 285076 D02v03, “Guidance for performing T-Coil tests for air interfaces supporting voice over IP (e.g., LTE and WiFi) to support CMRS based telephone services”, Sep 2017

[4] FCC KDB 285076 D03v01, “Hearing aid compatibility frequently asked questions”, Sep 2017

[5] SPEAG DASY System Handbook