



HEARING AID COMPATIBILITY RF EMISSIONS TEST REPORT

FCC ID : RWO-RZ350259
Equipment : Smartphone
Brand Name : RAZER
Model Name : RZ35-0259
M-Rating : M4
Applicant : Razer Inc.
201 3rd Street, Suite 900, San Francisco, CA 94103, USA
Manufacturer : Razer Inc.
201 3rd Street, Suite 900, San Francisco, CA 94103, USA
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 test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

| Report No. | Version | Description | Issued Date |
|--------------|---------|-------------------------|---------------|
| HA871722-03A | Rev. 01 | Initial issue of report | Sep. 17, 2018 |
| | | | |
| | | | |



1. General Information

| Product Feature & Specification | |
|---------------------------------|---|
| Applicant Name | Razer Inc. |
| Equipment Name | Smartphone |
| Brand Name | RAZER |
| Model Name | RZ35-0259 |
| FCC ID | RWO-RZ350259 |
| HW Version | DVT |
| SW Version | V1.2xx |
| EUT Stage | Identical Prototype |
| 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 LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 14: 790.5 MHz ~ 795.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 26: 814.7 MHz ~ 848.3 MHz LTE Band 30: 2307.5 MHz ~ 2312.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz LTE Band 71: 665.5 MHz ~ 695.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC: 13.56 MHz |
| Mode | GSM/GPRS/EGPRS AMR / RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK |

Reviewed by: Jason Wang

Report Producer: Wan Liu



2. Testing Location

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, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978 |
| Test Site No. | Sporton Site No.: SAR04-HY |

3. 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

4. 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



5. 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 | SIP calling ^(1,2) | No |
| | EDGE1900 | | | WLAN, BT | / Google Duo ⁽¹⁾ | No |
| WCDMA | 850 HSPA | VD | No ⁽¹⁾ | WLAN, BT | SIP calling ^(1,2) / Google Duo ⁽¹⁾ | No |
| | 1750 HSPA | | | WLAN, BT | | No |
| | 1900 HSPA | | | WLAN, BT | | No |
| LTE (FDD) | Band 2 | VD | No ⁽¹⁾ | WLAN, BT | SIP calling ^(1,2) / Google Duo ⁽¹⁾ | 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 14 | | | WLAN, BT | | No |
| | Band 17 | | | WLAN, BT | | No |
| | Band 26 | | | WLAN, BT | | No |
| | Band 30 | | | WLAN, BT | | No |
| | Band 66 | | | WLAN, BT | | No |
| LTE (TDD) | Band 38 | VD | Yes | WLAN, BT | SIP calling ^(1,2) / Google Duo ⁽¹⁾ | No |
| | Band 41 | | | WLAN, BT | | No |
| Wi-Fi | 2450 | VD | No ⁽¹⁾ | GSM,CDMA,LTE | VoWiFi ⁽¹⁾ / SIP calling ^(1,2) / Google Duo ⁽¹⁾ | No |
| | 5200 | | | GSM,CDMA,LTE | | No |
| | 5300 | | | GSM,CDMA,LTE | | No |
| | 5500 | | | GSM,CDMA,LTE | | No |
| | 5800 | | | GSM,CDMA,LTE | | No |
| BT | 2450 | DT | No | GSM,CDMA,LTE | NA | No |

Type Transport:

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

Remark:

- 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.
- The SIP calling is android internal auxiliary functions under the dialing program.
- This is a variant report to add VoWiFi and VoIP evaluation for RZ35-0259.



6. 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 alternatively 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.

Table with 3 columns: UID, Communication System Name, MIF(dB). Rows include various systems like EDGE-FDD, UMTS-FDD, LTE-FDD, LTE-TDD, and IEEE WiFi standards with their respective MIF values.



7. Low-power Exemption

<Max Tune-up Limit>

| Mode | | Average Power (dBm) | |
|-------------|----------------|---------------------|------|
| GSM | EDGE850 | 27.0 | |
| | EDGE1900 | 25.0 | |
| WCDMA | Band II | 21.5 | |
| | Band IV | 21.0 | |
| | Band V | 22.5 | |
| FDD LTE | Band 2 | 22.0 | |
| | Band 4 | 22.0 | |
| | Band 5 | 24.0 | |
| | Band 7 | 24.5 | |
| | Band 12 | 24.0 | |
| | Band 13 | 24.0 | |
| | Band 14 | 24.0 | |
| | Band 17 | 24.0 | |
| | Band 26 | 24.0 | |
| | Band 30 | 23.5 | |
| TDD LTE | Band 38 | 24.5 | |
| | Band 41 | 25.0 | |
| 2.4GHz WLAN | ANT1 | 802.11b | 12.5 |
| | | 802.11g | 13.0 |
| | | 802.11n-HT20 | 13.0 |
| | | 802.11n-HT40 | 13.0 |
| | ANT2 | 802.11b | 13.5 |
| | | 802.11g | 14.0 |
| | | 802.11n-HT20 | 14.0 |
| | | 802.11n-HT40 | 14.0 |
| 5GHz WLAN | ANT1 | 802.11a | 16.0 |
| | | 802.11n-HT20 | 15.0 |
| | | 802.11n-HT40 | 16.0 |
| | | 802.11ac-VHT20 | 14.0 |
| | | 802.11ac-VHT40 | 15.0 |
| | ANT2 | 802.11ac-VHT80 | 15.0 |
| | | 802.11a | 16.5 |
| | | 802.11n-HT20 | 16.0 |
| | | 802.11n-HT40 | 16.5 |
| | | 802.11ac-VHT20 | 15.0 |
| | 802.11ac-VHT40 | 16.0 | |
| | 802.11ac-VHT80 | 16.0 | |



<Low Power Exemption>

| Air Interface | | Max Average Antenna Input Power (dBm) | Worst Case MIF (dB) | Power + MIF(dB) | C63.19 test required |
|------------------|----------------|---------------------------------------|---------------------|-----------------|----------------------|
| EDGE850 | | 27.0 | 3.75 | 30.75 | Yes ⁽¹⁾ |
| EDGE1900 | | 25.0 | 3.75 | 28.75 | Yes ⁽¹⁾ |
| WCDMA - HSPA | | 22.5 | -20.39 | 2.11 | No |
| LTE - FDD | | 24.5 | -9.76 | 14.74 | No |
| LTE – TDD | QPSK | 25.0 | -1.62 | 23.38 | Yes ⁽¹⁾ |
| | 16QAM | 24.0 | -1.44 | 22.56 | Yes ⁽¹⁾ |
| | 64QAM | 23.0 | -1.54 | 21.46 | Yes ⁽¹⁾ |
| 2.4GHz WLAN ANT1 | 802.11b | 12.5 | -2.02 | 10.48 | No |
| | 802.11g | 13.0 | 0.12 | 13.12 | No |
| | 802.11n-HT20 | 13.0 | -13.44 | -0.44 | No |
| | 802.11n-HT40 | 13.0 | -13.44 | -0.44 | No |
| 2.4GHz WLAN ANT2 | 802.11b | 13.5 | -2.02 | 11.48 | No |
| | 802.11g | 14.0 | 0.12 | 14.12 | No |
| | 802.11n-HT20 | 14.0 | -13.44 | 0.56 | No |
| | 802.11n-HT40 | 14.0 | -13.44 | 0.56 | No |
| 5GHz WLAN ANT1 | 802.11a | 16.0 | -3.15 | 12.85 | No |
| | 802.11n-HT20 | 15.0 | -13.44 | 1.56 | No |
| | 802.11n-HT40 | 16.0 | -13.44 | 2.56 | No |
| | 802.11ac-VHT20 | 14.0 | -5.57 | 8.43 | No |
| | 802.11ac-VHT40 | 15.0 | -5.57 | 9.43 | No |
| | 802.11ac-VHT80 | 15.0 | -5.57 | 9.43 | No |
| 5GHz WLAN ANT2 | 802.11a | 16.5 | -3.15 | 13.35 | No |
| | 802.11n-HT20 | 16.0 | -13.44 | 2.56 | No |
| | 802.11n-HT40 | 16.5 | -13.44 | 3.06 | No |
| | 802.11ac-VHT20 | 15.0 | -5.57 | 9.43 | No |
| | 802.11ac-VHT40 | 16.0 | -5.57 | 10.43 | No |
| | 802.11ac-VHT80 | 16.0 | -5.57 | 10.43 | No |

General Note:

- EDGE data modes is not necessary due the GSM Voice mode is the worst case, GSM Voice mode and TDD LTE already evaluation in the Sporton HAC report, FCC ID: RWO-RZ350259, Report No.: HA871722A.
- 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.
- HAC RF rating is M4 for the air interface which meets the low power exemption.



8. 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