

HEARING AID COMPATIBILITY RF EMISSIONS TEST REPORT

FCC ID : UZ7TCX01G
Equipment : Touch Computer
Brand Name : ZEBRA
Model Name : TCX01G
Applicant : Zebra Technologies Corporation
3 Overlook Point, Lincolnshire, IL 60069 USA
Manufacturer : Zebra Technologies Corporation
3 Overlook Point, Lincolnshire, IL 60069 USA
Standard : FCC 47 CFR §20.19
ANSI C63.19-2019

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in ANSI C63.19-2019 / 47 CFR Part 20.19 and has been pass the FCC requirement.

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



Approved by: Cona Huang / Deputy Manager



Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan



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Appendix A. UID specifications for HAC RFE



History of this test report

Report No.	Version	Description	Issued Date
HA5O3114A	Rev. 01	Initial issue of report	Feb. 19, 2029



1. General Information

Product Feature & Specification	
Applicant Name	Zebra Technologies Corporation
Equipment Name	Touch Computer
Brand Name	ZEBRA
Model Name	TCX01G
FCC ID	UZ7TCX01G
Frequency Band	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 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 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 53: 2483.5 MHz ~ 2495 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 70: 1695 MHz ~ 1710 MHz LTE Band 71: 663 MHz ~ 698 MHz LTE Band 106: 896 MHz ~ 901 MHz 5G NR n2: 1850 MHz ~ 1910 MHz 5G NR n5: 824 MHz ~ 849 MHz 5G NR n7: 2500 MHz ~ 2570 MHz 5G NR n12: 699 MHz ~ 716 MHz 5G NR n13: 777 MHz ~ 787 MHz 5G NR n14: 788 MHz ~ 798 MHz 5G NR n25: 1850 MHz ~ 1915 MHz 5G NR n26: 814 MHz ~ 849 MHz 5G NR n30: 2305 MHz ~ 2315 MHz 5G NR n38: 2570 MHz ~ 2620 MHz 5G NR n41: 2496 MHz ~ 2690 MHz 5G NR n48: 3550 MHz ~ 3700 MHz 5G NR n53: 2483.5 MHz ~ 2495 MHz 5G NR n66: 1710 MHz ~ 1780 MHz 5G NR n70: 1695 MHz ~ 1710 MHz 5G NR n71: 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450 MHz ~ 3550 MHz, 3550 MHz ~ 3700 MHz 5G NR n78: 3700 MHz ~ 3800 MHz, 3450 MHz ~ 3550 MHz, 3550 MHz ~ 3700 MHz WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 6GHz Band: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC: 13.56 MHz RFID: 902 MHz ~ 928 MHz



Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink) LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN: 802.11a/b/g/n/ac/ax/be HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160/EHT20/EHT40/EHT80/EHT160/EHT320 Bluetooth BR/EDR/LE NFC: ASK RFID: ASK
HW Version	DV1.2
SW Version	eris_A15_userdebug_GMS_RelKey_2025-10-07-205955_main_SE
FW Version	eris_A15_userdebug_GMS_RelKey_2025-10-07-205955_main_SE
MFD	30-Sep-25
EUT Stage	Identical Prototype

Sample list	Scanner	Camera	Bumper
Sample1	SE4730	Main	w/o
Sample2	SE4780	Main+Indirect Time-of-Flight	w/o
Sample3	SE4780	Main+Ultra wide Camera	w/o
Sample4	SE56	Main+Indirect Time-of-Flight	w/o
Sample5	SE56	Main+Ultra wide Camera	w/o
Sample6	SE4730	Main	w/
Sample7	SE4780	Main+Indirect Time-of-Flight	w/
Sample8	SE4780	Main+Ultra wide Camera	w/
Sample9	SE56	Main+Indirect Time-of-Flight	w/
Sample10	SE56	Main+Ultra wide Camera	w/

Specification of Accessories				
AC Adapter 1 (TYPE C Wall Charger 1)	Brand Name	Zebra	Part Number	PWR-WUA5V45W1US
AC Adapter 2 (TYPE A Wall Charger 2)	Brand Name	Zebra	Part Number	PWR-WUA5V12W0US
Trigger Handle 1	Brand Name	Zebra	Part Number	TRG-TC5A-ELEC-01
Trigger Handle 2	Brand Name	Zebra	Part Number	TRG-TC7A-ELEC-01
Trigger Handle 3	Brand Name	Zebra	Part Number	TRG-TC5AB-ELEC-01
Arm Mount 1	Brand Name	Zebra	Part Number	SG-TC5A-WMADP1-01
Arm Mount 2	Brand Name	Zebra	Part Number	SG-TC5A-WMADP2-01
Soft Holster	Brand Name	Zebra	Part Number	SG-NGTC5TC7-HLSTR-01
Rugged boot	Brand Name	Zebra	Part Number	SG-TC5AEXO-01
Earphone 1 (Wired headset USB-C)	Brand Name	Zebra	Part Number	HDST-USBC-PTT1-01
Earphone 2 (3.5mm PTT Headset)	Brand Name	Zebra	Part Number	HDST-35MM-PTT1-01
Earphone 3 (Rugged Headset)	Brand Name	Zebra	Part Number	HS2100-OTH
Battery	Brand Name	Zebra	Part Number	BT-000535-0020
3.5mm to 3.5mm audio connector	Brand Name	Zebra	Part Number	CBL-HS2100-3MS1-01
USB Cable 1 USB-C to C Cable	Brand Name	Zebra	Part Number	CBL-EC5X-USBC3A-01
USB Cable 2 USB-A to C Cable	Brand Name	Zebra	Part Number	CBL-TC5X-USBC2A-01

Reviewed by: Jason Wang
Report Producer: Carlie Tsai



2. Air Interfaces

Air Interface	Band MHz	Type	C63.19 Tested	Simultaneous Transmitter	Name of Voice Service	Power State for HAC Compliance
GSM	GSM850	VO	No ⁽¹⁾	WLAN, BT	CMRS Voice	Pmax
	GSM1900				Google Meet WFC ⁽³⁾	
	EDGE850	VD				
	EDGE1900					
UMTS	Band 2	VO	No ⁽¹⁾	WLAN, BT	CMRS Voice	Pmax
	Band 4				Google Meet WFC ⁽³⁾	
	Band 5					
	HSPA	VD				
LTE	Band 2	VD	No ⁽¹⁾	5G NR, WLAN, BT	VoLTE / Google Meet WFC ⁽³⁾	Pmax
	Band 4					
	Band 5					
	Band 7					
	Band 12					
	Band 13					
	Band 14					
	Band 17					
	Band 25					
	Band 26					
	Band 30					
	Band 38					
	Band 41					
	Band 48					
	Band 53					
	Band 66					
	Band 70					
	Band 71					
	Band 106					
5G NR	n2	VD	No ⁽¹⁾	LTE, WLAN, BT	VoNR / Google Meet WFC ⁽³⁾	Pmax
	n5					
	n7					
	n12					
	n13					
	n14					
	n25					
	n26					
	n30					
	n38					
	n41					
	n48					
	n53					
	n66					
	n70					
	n71					
	n77					
	n78					



Wi-Fi	2450	VD	No ^(1,6)	WWAN, 5G/6GHz WLAN	VoWiFi / Google Meet WFC ⁽³⁾	Pmax
	5200			WWAN, 2.4GHz WLAN, BT		
	5300					
	5500					
	5800	VD		WWAN, 2.4GHz WLAN, BT	VoWiFi / Google Meet WFC ⁽³⁾	Pmax
	U-NII 5					
	U-NII 6					
	U-NII 7					
U-NII 8						
BT	2450	DT	No	WWAN, 5G/6GHz WLAN	NA	NA
NFC	13.56	DT	No	WWAN, WLAN, BT, RFID	NA	NA
RFID	902	DT	No	WWAN, WLAN, BT, NFC	NA	NA

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 max power plus MIF is complies with ANSI63.19-2019 Table 4.1 RF_{AIPL}.
2. Because features of Google Meet allow the option of voice-only communications, Meet has been tested for HAC/T-Coil compatibility to ensure the best user experience.
3. The Workforce Connect (WFC) is an over-the-top (OTT) – voice services operating over IP, and this voice application was development and pre-installed on a wireless handset by the Zebra Technologies Corporation.
4. The product supports the TAS feature for GSM, UMTS, LTE, NR, and Wi-Fi; therefore, HAC testing for these technologies was conducted at the Pmax power level.
5. Pmax is the maximum output power for the handset for the indicated air interface.
6. The Wi-Fi 6E are currently outside the scope of ANSI C63.19 and FCC HAC regulations therefore they were not evaluated.



3. Applied Standards

- FCC CFR47 Part 20.19
- ANSI C63.19-2019
- FCC KDB 285076 D01 HAC Guidance v06r04
- FCC KDB 285076 D03 HAC FAQ v01r07

4. WD Emission Requirements

The WD's conducted power must be at or below either the stated RFAIPL (Table 4.1) or the stated peak power level (Table 4.2), or the average near-field emissions over the measurement area must be at or below the stated RFAIL (Table 4.3), or the stated peak field strength (Table 4.4). The WD may demonstrate compliance by meeting any of these four requirements, but it must do so in each of its operating bands at its established worst-case normal speech-mode operating condition.

Table 4.1 - Wireless device RF audio interference power level	
Frequency range (MHz)	RF _{AIPL} (dBm)
< 960	29
960 - 2000	26
> 2000	25

Table 4.2 - Wireless device RF peak power level	
Frequency range (MHz)	RF _{Peak Power} (dBm)
< 960	35
960 - 2000	32
> 2000	31

Table 4.3 - Wireless device RF audio interference level	
Frequency range (MHz)	RF _{AIL} [dB(V/m)]
< 960	39
960 - 2000	36
> 2000	35

Table 4.4 - Wireless device RF peak near-field level	
Frequency range (MHz)	RF _{Peak} [dB(V/m)]
< 960	45
960 - 2000	42
> 2000	41



5. Modulation Interference Factor

For any specific fixed and repeatable modulated signal, a Modulation Interference Factor (MIF, expressed in decibels) 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 or 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.

MIF may be determined using a radiated RF field, a conducted RF signal, or, in a preliminary stage, a mathematical analysis of a modeled RF signal.

- a. Verify the slope accuracy and dynamic range capability over the desired operating frequency band of a fast probe or sensor, square-law detector, as specified in ANSI C63.19: 2019 D.3, and weighting system as specified in ANSI C63.19: 2019 D.4 and ANSI C63.19: 2019 D.5. For the probe and instrumentation included in the measurement of MIF, additional calibration and application of calibration factors are not required.
- b. Using RF illumination, or conducted coupling, apply the specific modulated signal in question to the measurement system at a level within its confirmed operating dynamic range
- c. Measure the steady-state rms level at the output of the fast probe or sensor
- d. Measure the steady-state average level at the weighting output
- e. Without changing the square-law detector or weighting system, and using RF illumination, or conducted coupling, substitute for the specific modulated signal a 1 kHz, 80% amplitude modulated carrier at the same frequency and adjust its strength until the level at the weighting output equals the Step d) measurement
- f. Without changing the carrier level from Step e), remove the 1 kHz modulation and again measure the steady-state rms level indicated at the output of the fast probe or sensor.
- g. The MIF for the specific modulation characteristic is given by the ratio of the Step f) measurement to the Step c) measurement, expressed in decibels ($20 \cdot \log(\text{step6}/\text{step3})$)

In practice, Step e) and Step f) need not be repeated for each MIF determination if the relationship between the two measurements has been pre-established for the measurement system over the operating frequency and dynamic ranges. In such cases, only the modulation characteristic being tested needs to be available during WD testing

Since indirect measurement procedure was using for RF audio interference power level evaluation, the 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 Wireless device RF audio interference power level.

UID	Communication System Name	MIF(dB)
10021	GSM-FDD(TDMA,GMSK)	3.63
10023	GPRS-FDD (TDMA, GMSK, TN 0)	3.8
10024	GPRS-FDD (TDMA, GMSK, TN 0-1)	1.15
10027	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	-0.67
10028	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	-2.05
10025	EDGE-FDD (TDMA, 8PSK, TN 0)	3.75
10026	EDGE-FDD (TDMA, 8PSK, TN 0-1)	1.23
10029	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	-0.52
10058	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	-1.82
10460	UMTS-FDD(WCDMA, AMR)	-25.43
10225	UMTS-FDD (HSPA+)	-20.39
10170	LTE-FDD(SC-FDMA,1RB,20MHz,16-QAM)	-9.76
10173	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	-1.44
10769	5G NR 100% duty (CP-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	-12.08
10973	5G NR 40% duty ((DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	-1.64
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 Greenfield, 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
10671	IEEE 802.11ax (20MHz, MCS0, 90pc duty cycle)	-5.58
11026	IEEE 802.11be (320MHz, MCS0, 99pc duty cycle)	-28.73

Remark:

Refer to appendix A for RFE UID specifications summary provided by SPEAG

6. Evaluation of WD RF interference potential

General Note:

1. The following table is according to ANSI C63.19:2019 section 4.4 indirect measurement procedure to evaluation max average conducted power from each air interface plus MIF to evaluate whether it complies with ANSI C63.19-2019 Table 4.1 RF_{AIPL} , compliance with table 4.1 means compliance with WD emission requirements.
2. To demonstrate compliance with ANSI C63.19-2019 requirement, HAC RF evaluations were performed using the Pmax average power level for technologies that support the TAS feature, including GSAM, UMTS, LTE, FR1, and Wi-Fi.

<WWAN operation>

Air Interface	Max Burst Antenna Input Power (dBm)	Duty Cycle (%)	Max Average Antenna Input Power (dBm)	Worst Case MIF (dB)	RF_{AIPL} (dBm)	RF_{AIPL} Limit(dBm)	RF_{AIPL}
GSM850	34.00	12.5	25.00	3.63	28.63	29	Pass
GPRS850 - 1TX	34.00	12.5	25.00	3.8	28.8	29	Pass
GPRS850 - 2TX	32.50	25	26.50	1.15	27.65	29	Pass
GPRS850 - 3TX	31.00	37.5	26.74	-0.67	26.07	29	Pass
GPRS850 - 4TX	29.50	50	26.50	-2.05	24.45	29	Pass
EDGE850 - 1TX	28.50	12.5	19.50	3.75	23.25	29	Pass
EDGE850 - 2TX	28.00	25	22.00	1.23	23.23	29	Pass
EDGE850 - 3TX	27.50	37.5	23.24	-0.52	22.72	29	Pass
EDGE850 - 4TX	26.00	50	23.00	-1.82	21.18	29	Pass
GSM1900	30.00	12.5	21.00	3.63	24.63	26	Pass
GPRS1900 - 1TX	30.00	12.5	21.00	3.8	24.8	26	Pass
GPRS1900 - 2TX	29.50	25	23.50	1.15	24.65	26	Pass
GPRS1900 - 3TX	29.00	37.5	24.74	-0.67	24.07	26	Pass
GPRS1900 - 4TX	27.00	50	24.00	-2.05	21.95	26	Pass
EDGE1900 - 1TX	24.50	12.5	15.50	3.75	19.25	26	Pass
EDGE1900 - 2TX	24.50	25	18.50	1.23	19.73	26	Pass
EDGE1900 - 3TX	24.00	37.5	19.74	-0.52	19.22	26	Pass
EDGE1900 - 4TX	24.00	50	21.00	-1.82	19.18	26	Pass
WCDMA	25.00	100	25.00	-25.43	-0.43	26	Pass
WCDMA - HSPA	24.00	100	24.00	-20.39	3.61	26	Pass
LTE - FDD	25.50	100	25.50	-9.76	15.74	25	Pass
LTE - TDD	27.00	63.3	23.40	-1.44	21.96	25	Pass
5G FR1 - FDD	25.00	100	25.00	-12.08	12.92	25	Pass
5G FR1 - TDD	27.00	50	24.00	-1.64	22.36	25	Pass
5G FR1 - TDD_ULMIMO	28.00	50	25.00	-1.64	23.36	25	Pass

<WLAN operation>
<MIMO 2.4GHz>

Ant MIMO					
Air Interface	Max Burst Antenna Input Power (dBm)	Worst Case MIF (dB)	RF _{AIPL} (dBm)	RF _{AIPL} Limit (dBm)	RF _{AIPL}
802.11b	26.00	-2.02	23.98	25	Pass
802.11g	24.50	0.12	24.62	25	Pass
802.11n-HT20	24.00	-13.44	10.56	25	Pass
802.11ac-VHT20	24.00	-5.57	18.43	25	Pass
802.11ax-HE20	24.50	-5.58	18.92	25	Pass
802.11be-EHT20	24.50	-28.73	-4.23	25	Pass

<MIMO 5/6GHz>

Ant MIMO					
Air Interface	Max Burst Antenna Input Power (dBm)	Worst Case MIF (dB)	RF _{AIPL} (dBm)	RF _{AIPL} Limit (dBm)	RF _{AIPL}
802.11a	24.50	-3.15	21.35	25	Pass
802.11n-HT20	23.50	-13.44	10.06	25	Pass
802.11n-HT40	23.00	-13.44	9.56	25	Pass
802.11ac-VHT20	23.50	-5.57	17.93	25	Pass
802.11ac-VHT40	23.00	-5.57	17.43	25	Pass
802.11ac-VHT80	23.00	-5.57	17.43	25	Pass
802.11ac-VHT160	17.00	-5.57	11.43	25	Pass
802.11ax-HE20	23.00	-5.58	17.42	25	Pass
802.11ax-HE40	24.00	-5.58	18.42	25	Pass
802.11ax-HE80	23.00	-5.58	17.42	25	Pass
802.11ax-HE160	19.50	-5.58	13.92	25	Pass
802.11be-EHT20	23.50	-28.73	-5.23	25	Pass
802.11be-EHT40	24.00	-28.73	-4.73	25	Pass
802.11be-EHT80	23.50	-28.73	-5.23	25	Pass
802.11be-EHT160	19.50	-28.73	-9.23	25	Pass
802.11be-EHT320	20.00	-28.73	-8.73	25	Pass

Conclusion

The device max average conducted power plus MIF are meet table 4.1 of ANSI 63.19:2019 section 4.7 requirement.



7. References

- [1] ANSI C63.19:2019, "American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids", Aug. 2019.
- [2] FCC KDB 285076 D01v06r04, "Equipment Authorization Guidance for Hearing Aid Compatibility", Sep 2023.
- [3] FCC KDB 285076 D03v01r07, "Hearing aid compatibility frequently asked questions", Dec. 2024
- [4] SPEAG DASY System Handbook