

FCC RF Exposure

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Portable Device

Refer Standard: KDB 447498 D01 General RF Exposure Guidance v06

FCC Part 2 §2.1093

Evaluation method

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations: "Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.²² The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.²³ "

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [f (\text{GHz})] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$$

- f (GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Conducted Power Results

Mode	Channel	Frequency(MHz)	Peak Conducted Output Power (dBm)
GFSK	00	2402	4.616
	39	2441	4.570
	78	2480	4.148
π /4DQPSK	00	2402	4.029
	39	2441	3.998
	78	2480	3.539
8DPSK	00	2402	4.111
	39	2441	4.050
	78	2480	3.589
GFSK(BLE)	00	2402	-3.042
	19	2440	-3.219
	39	2480	-4.032
802.11b	01	2412	9.240
	06	2437	9.010
	11	2462	9.370
802.11g	01	2412	8.710
	06	2437	8.060
	11	2462	8.850
802.11n(HT20)	01	2412	8.210
	06	2437	8.120
	11	2462	8.310
802.11n(HT40)	03	2422	7.240
	06	2437	8.020
	09	2452	8.050

Manufacturing tolerance

GFSK (Peak)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	4.0	4.0	4.0
Tolerance \pm (dB)	1.0	1.0	1.0
π /4DQPSK (Peak)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	4.0	4.0	4.0
Tolerance \pm (dB)	1.0	1.0	1.0
8DPSK (Peak)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	4.0	4.0	4.0
Tolerance \pm (dB)	1.0	1.0	1.0
GFSK (Peak) (BLE)			
Channel	Channel 00	Channel 19	Channel 39
Target (dBm)	-4.0	-4.0	-4.0
Tolerance \pm (dB)	1.0	1.0	1.0
802.11b (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	8.5	8.5	8.5
Tolerance \pm (dB)	1.0	1.0	1.0
802.11g (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	8.0	8.0	8.0
Tolerance \pm (dB)	1.0	1.0	1.0
802.11n(HT20) (Peak)			
Channel	Channel 01	Channel 06	Channel 11
Target (dBm)	8.0	8.0	8.0
Tolerance \pm (dB)	1.0	1.0	1.0
802.11n(HT40) (Peak)			
Channel	Channel 03	Channel 06	Channel 09
Target (dBm)	8.0	8.0	8.0
Tolerance \pm (dB)	1.0	1.0	1.0

Evaluation Results

Band/Mode	f (GHz)	Antenna Distance (mm)	RF output power (including tune-up tolerance)		SAR Test Exclusion Threshold	SAR Test Exclusion
			dBm	mW		
GFSK	2.402	5	5	3.1623	0.9802<3.0	Yes
	2.441	5	5	3.1623	0.9881<3.0	Yes
	2.480	5	5	3.1623	0.9960<3.0	Yes
π /4DQPSK	2.402	5	5	3.1623	0.9802<3.0	Yes
	2.441	5	5	3.1623	0.9881<3.0	Yes
	2.480	5	5	3.1623	0.9960<3.0	Yes
8DPSK	2.402	5	5	3.1623	0.9802<3.0	Yes
	2.441	5	5	3.1623	0.9881<3.0	Yes
	2.480	5	5	3.1623	0.9960<3.0	Yes
GFSK(BLE)	2.402	5	-3	0.5012	0.1554<3.0	Yes
	2.440	5	-3	0.5012	0.1566<3.0	Yes
	2.480	5	-3	0.5012	0.1579<3.0	Yes
802.11b	2412	5	9.5	8.9125	2.7683<3.0	Yes
	2437	5	9.5	8.9125	2.7826<3.0	Yes
	2462	5	9.5	8.9125	2.7969<3.0	Yes
802.11g	2412	5	9	7.9433	2.4673<3.0	Yes
	2437	5	9	7.9433	2.4800<3.0	Yes
	2462	5	9	7.9433	2.4927<3.0	Yes
802.11n(HT20)	2412	5	9	7.9433	2.4673<3.0	Yes
	2437	5	9	7.9433	2.4800<3.0	Yes
	2462	5	9	7.9433	2.4927<3.0	Yes
802.11n(HT40)	2422	5	9	7.9433	2.4724<3.0	Yes
	2437	5	9	7.9433	2.4800<3.0	Yes
	2452	5	9	7.9433	2.4877<3.0	Yes

Note: EUT could not operate at WIFI mode and BT modes simultaneously.

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

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