

## 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.<sup>22</sup> 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.<sup>23</sup> "

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

- 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  $\leq 50$  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)
BT 4.0 DSS	GFSK	00	2402	3.275
		39	2441	3.659
		78	2480	4.325
	π/4DQPSK	00	2402	2.233
		39	2441	2.706
		78	2480	3.267
	8DPSK	00	2402	2.365
		39	2441	2.794
		78	2480	3.343
BT 4.0 DTS	GFSK	00	2402	-2.809
		19	2440	-2.447
		39	2480	-3.016
2.4GWLAN	802.11b	01	2412	8.320
		06	2437	8.260
		11	2462	8.380
	802.11g	01	2412	8.150
		06	2437	8.210
		11	2462	8.220
	802.11n(HT20)	01	2412	8.150
		06	2437	8.260
		11	2462	8.080
	802.11n(HT40)	03	2422	7.450
		06	2437	7.260
		09	2452	7.320

Mode		Channel	Frequency(MHz)	AVG Conducted Output Power (dBm)
5.2GWLAN	802.11a	36	5180	7.320
		44	5220	7.250
		48	5240	7.360
	802.11n(HT20)	36	5180	7.030
		44	5220	7.100
		48	5240	7.090
	802.11n(HT40)	03	5190	6.990
		06	5230	6.890
	5.8G WLAN	802.11a	149	5745
157			5785	7.260
165			5825	7.330
802.11n(HT20)		149	5745	7.070
		157	5785	7.110
		165	5825	7.040
802.11n(HT40)		151	5755	6.850
		159	5795	6.910

## Manufacturing tolerance

Mode		Channel	Frequency(MHz)	Target (dBm) Peak	Tolerance ±(dB)
BT 4.0 DSS	GFSK	00	2402	4.0	1.0
		39	2441	4.0	1.0
		78	2480	4.0	1.0
	π/4QPSK	00	2402	3.0	1.0
		39	2441	3.0	1.0
		78	2480	3.0	1.0
	8DPSK	00	2402	3.0	1.0
		39	2441	3.0	1.0
		78	2480	3.0	1.0
BT 4.0 DTS	GFSK	00	2402	-3.0	1.0
		19	2440	-3.0	1.0
		39	2480	-3.0	1.0
2.4GWLAN	802.11b	01	2412	8.0	1.0
		06	2437	8.0	1.0
		11	2462	8.0	1.0
	802.11g	01	2412	8.0	1.0
		06	2437	8.0	1.0
		11	2462	8.0	1.0
	802.11n(HT20)	01	2412	8.0	1.0
		06	2437	8.0	1.0
		11	2462	8.0	1.0
	802.11n(HT40)	03	2422	7.0	1.0
		06	2437	7.0	1.0
		09	2452	7.0	1.0

Mode		Channel	Frequency(MHz)	Target (dBm) Average	Tolerance ±(dB)
5.2GWLAN	802.11a	36	5180	6.5	1.0
		44	5220	6.5	1.0
		48	5240	6.5	1.0
	802.11n(HT20)	36	5180	6.5	1.0
		44	5220	6.5	1.0
		48	5240	6.5	1.0
	802.11n(HT40)	03	5190	6.5	1.0
06		5230	6.5	1.0	
5.8G WLAN	802.11a	149	5745	6.5	1.0
		157	5785	6.5	1.0
		165	5825	6.5	1.0
	802.11n(HT20)	149	5745	6.5	1.0
		157	5785	6.5	1.0
		165	5825	6.5	1.0
	802.11n(HT40)	151	5755	6.5	1.0
		159	5795	6.5	1.0

**Evaluation Results**

Band/Mode		f (GHz)	Antenna Distance (mm)	RF output Peak power (including tune-up tolerance)		SAR Test Exclusion Threshold	SAR Test Exclusion
				dBm	mW		
BT 4.0 DSS	GFSK	2.402	5.0	5.0	3.1623	0.9802<3.0	Yes
		2.441	5.0	5.0	3.1623	0.9881<3.0	Yes
		2.480	5.0	5.0	3.1623	0.9960<3.0	Yes
	π /4DQPSK	2.402	5.0	4.0	2.5119	0.7786<3.0	Yes
		2.441	5.0	4.0	2.5119	0.7849<3.0	Yes
		2.480	5.0	4.0	2.5119	0.7911<3.0	Yes
	8DPSK	2.402	5.0	4.0	2.5119	0.7786<3.0	Yes
		2.441	5.0	4.0	2.5119	0.7849<3.0	Yes
		2.480	5.0	4.0	2.5119	0.7911<3.0	Yes
BT 4.0 DTS	GFSK(BLE)	2.402	5.0	-2.0	0.6310	0.1956<3.0	Yes
		2.440	5.0	-2.0	0.6310	0.1971<3.0	Yes
		2.480	5.0	-2.0	0.6310	0.1987<3.0	Yes
2.4G WLAN	802.11b	2.412	5.0	9.0	7.9433	2.4673<3.0	Yes
		2.437	5.0	9.0	7.9433	2.4800<3.0	Yes
		2.462	5.0	9.0	7.9433	2.4927<3.0	Yes
	802.11g	2.412	5.0	9.0	7.9433	2.4673<3.0	Yes
		2.437	5.0	9.0	7.9433	2.4800<3.0	Yes
		2.462	5.0	9.0	7.9433	2.4927<3.0	Yes
	802.11n(HT20)	2.412	5.0	9.0	7.9433	2.4673<3.0	Yes
		2.437	5.0	9.0	7.9433	2.4800<3.0	Yes
		2.462	5.0	9.0	7.9433	2.4927<3.0	Yes
	802.11n(HT40)	2.422	5.0	8.0	6.3096	1.9639<3.0	Yes
		2.437	5.0	8.0	6.3096	1.9700<3.0	Yes
		2.452	5.0	8.0	6.3096	1.9760<3.0	Yes

Band/Mode		f (GHz)	Antenna Distance (mm)	RF output AVG power (including tune-up tolerance)		SAR Test Exclusion Threshold	SAR Test Exclusion
				dBm	mW		
5.2G WLAN	802.11a	5.180	5.0	7.5	5.6234	2.5597<3.0	Yes
		5.220	5.0	7.5	5.6234	2.5696<3.0	Yes
		5.240	5.0	7.5	5.6234	2.5745<3.0	Yes
	802.11n(HT20)	5.180	5.0	7.5	5.6234	2.5597<3.0	Yes
		5.220	5.0	7.5	5.6234	2.5696<3.0	Yes
		5.240	5.0	7.5	5.6234	2.5745<3.0	Yes
	802.11n(HT40)	5.190	5.0	7.5	5.6234	2.5622<3.0	Yes
		5.230	5.0	7.5	5.6234	2.5721<3.0	Yes
		5.745	5.0	7.5	5.6234	2.6957<3.0	Yes
5.8G WLAN	802.11a	5.785	5.0	7.5	5.6234	2.7051<3.0	Yes
		5.825	5.0	7.5	5.6234	2.7144<3.0	Yes
		5.745	5.0	7.5	5.6234	2.6957<3.0	Yes
	802.11n(HT20)	5.785	5.0	7.5	5.6234	2.7051<3.0	Yes
		5.825	5.0	7.5	5.6234	2.7144<3.0	Yes
		5.755	5.0	7.5	5.6234	2.6981<3.0	Yes
	802.11n(HT40)	5.795	5.0	7.5	5.6234	2.7074<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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