RADIO FREQUENCY EXPOSURE

Limit

According to section B.4 of 447498 D04 Interim General RF Exposure Guidance v01

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of λ/4.

As for devices with antennas of length greater than λ/4 where the gain is not well defined, but always less than that of a half-wave dipole (length λ/2), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold Pth (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by Formula (B.2).

$$P_{th} \, (\text{mW}) = \begin{cases} ERP_{20\,cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ \\ ERP_{20\,cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \qquad (B.2)$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

The example values shown in Table B.2 are for illustration only.

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Conducted Power Results

TestMode	Antenna	Frequency[MHz]	Result[dBm]
BLE_1M	Ant1	2402	-0.37
BLE_1M	Ant1	2440	-0.15
BLE_1M	Ant1	2480	0.08

TestMode	Antenna	Frequency[MHz]	Result[dBm]
SRD	Ant1	2402	-0.35
SRD	Ant1	2440	-0.16
SRD	Ant1	2480	0.03

Manufacturing tolerance

BLE

GFSK (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-0.5	-0.5	0.0
Tolerance ±(dB)	1	1	1

SRD

GFSK (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-0.5	-0.5	0.0
Tolerance ±(dB)	1	1	1

Results

BLE

Test Mode	Max. Tune Up Power(dBm, Peak)	Max. Eirp including Tune Up (dBm, Peak)	Max. Eirp including Tune Up (mW, Peak)	Exemption Limit(mW)
GFSK	1.0	2.87	1.94	3

SRD

Test Mode	Max. Tune Up Power(dBm, Peak)	Max. Eirp including Tune Up (dBm, Peak)	Max. Eirp including Tune Up (mW, Peak)	Exemption Limit(mW)
GFSK	1.0	2.87	1.94	3

The antenna gain of the EUT for BT is 1.87dBi (Max). the Maximum Eirp is used for Routine Evaluation Exemption according to B.4 of 447498 D04 Interim General RF Exposure Guidance v01.

So, the SAR evaluation is not required.