RF EXPOSURE EVALUATION

EUT Specification

EUT	Bluetooth Low Energy and 802.15.4 wireless radio module
Model	HM-MT2401
Series Model	HM-MT2401B
Model Difference	Note: HM-MT2401/20.11dBm, HM-MT2401B/10dBm.
IC	29598-149658
Modulation	BLE(FHSS/DTS): GFSK 802.15.4: O-QPSK
Input Rating	Input: DC 1.71V-3.8V
Max. output power（peak power）	BLE(FHSS) BLE 1M: 20.11 dBm BLE 2M: 19.69 dBm BLE(DTS) BLE 1M: 20.06 dBm BLE 2M: 19.75 dBm 802.15.4 19.59 dBm
Antenna gain (Max)	BLE(FHSS/DTS)/802.15.4: 1dBi
Evaluation Applied	MPE Evaluation

Limits for Maximum Permissible Exposure(MPE)

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20cm, except when the device operates as follows:

- Below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1W (adjusted for tune-up tolerance);
- At or above 20MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$W (adjusted for tune-up tolerance), where f is in MHz;
- At or above 48MHz and below 300MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6W (adjusted for tune-up tolerance);
- At or above 300MHz and below 6GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31*10^{-2}*f^{0.6834}$W (adjusted for tune-up tolerance), where f is in MHz;
- At or above 6GHz and the source-based, time-averaged maximum e.i.r.p. the device is equal to or less than 5W (adjusted for tune-up tolerance).

MHz	EIRP(W)	EIRP(dBm)
2402	2.68	34.28
2404	2.68	34.28
2405	2.68	34.28
2440	2.71	34.33
2478	2.73	34.36
2480	2.74	34.38

Measurement Result

BLE(FHSS)

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Antenna Gain (dBi)	E.i.r.p. (dBm)
BLE 1M	2402	Ant1	20.11	1	21.11
BLE 1M	2440	Ant1	19.75	1	20.75
BLE 1M	2480	Ant1	13.13	1	14.13
BLE 2M	2404	Ant1	19.69	1	20.69
BLE 2M	2440	Ant1	19.68	1	20.68
BLE 2M	2478	Ant1	14.56	1	15.56

BLE(DTS)

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Antenna Gain (dBi)	E.i.r.p. (dBm)
BLE 1M	2402	Ant1	20.06	1	21.06
BLE 1M	2440	Ant1	20.01	1	21.01
BLE 1M	2480	Ant1	13.16	1	14.16
BLE 2M	2404	Ant1	19.75	1	20.75
BLE 2M	2440	Ant1	19.68	1	20.68
BLE 2M	2478	Ant1	14.53	1	15.53

802.15.4

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Antenna Gain (dBi)	E.i.r.p. (dBm)
802.15.4	2405	Ant1	19.55	1	20.55
802.15.4	2440	Ant1	19.59	1	20.59
802.15.4	2480	Ant1	19.53	1	20.53

STANDALONE MPE EXCLUSION

BLE(FHSS)

Mode	Channel Freq. (MHz)	Max E.i.r.p (dBm)	Tune-up power (dBm)	Max tune-up power		Limit (W)	Verdict
				(dBm)	(W)		
BLE 1M	2402	21.11	21±1	22	0.1585	2.68	pass

BLE(DTS)

Mode	Channel Freq. (MHz)	Max E.i.r.p (dBm)	Tune-up power (dBm)	Max tune-up power		Limit (W)	Verdict
				(dBm)	(W)		
BLE 1M	2402	21.06	21±1	22	0.1585	2.68	pass

802.15.4

Mode	Channel Freq. (MHz)	Max E.i.r.p (dBm)	Tune-up power (dBm)	Max tune-up power		Limit (W)	Verdict
				(dBm)	(W)		
802.15.4	2440	20.59	21±1	22	0.1585	2.71	pass

Maximum Simultaneous transmission MPE Ratio for BLE(FHSS) & 802.15.4

Maximum MPE ratio (BLE(FHSS))	Maximum MPE ratio (802.15.4)	∑ MPE ratios	Limit	Verdict
0.1585	0.1585	0.3170	1.000	Pass

Note:

1. According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations; ∑of MPE ratios≤ 1.0
2. Maximum MPE Ratio (BLE(FHSS)) =Max tune-up power / Limit(EIRP Exemption) =0.1585W/2.68W=0.05914
   Maximum MPE Ratio (802.15.4) = Max tune-up power / Limit(EIRP Exemption) =0.1585W/2.71W=0.05849
   ∑ MPE ratios= Maximum MPE Ratio (BLE(FHSS))+ Maximum MPE Ratio (802.15.4) = 0.05914+0.05849=0.11763

Maximum Simultaneous transmission MPE Ratio for BLE(DTS) & 802.15.4

Maximum MPE ratio (BLE(DTS))	Maximum MPE ratio (802.15.4)	∑ MPE ratios	Limit	Verdict
0.1585	0.1585	0.3170	1.000	Pass

Note:

1. According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations; ∑of MPE ratios≤ 1.0
2. Maximum MPE Ratio (BLE(DTS)) =Max tune-up power / Limit(EIRP Exemption) =0.1585W/2.68W=0.05914
   Maximum MPE Ratio (802.15.4) = Max tune-up power / Limit(EIRP Exemption) =0.1585W/2.71W=0.05849
   ∑ MPE ratios= Maximum MPE Ratio (BLE(DTS))+ Maximum MPE Ratio (802.15.4) = 0.05914+0.05849=0.11763

Signature:

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