



RF Exposure Evaluation Declaration

FCC ID: BRWSPMBT2000

IC: 6157A-SPMBT2000

Applicant: Horizon Hobby, LLC

Application Type: Certification

Product: BT2000 Bluetooth Module

Model No.: BT2000

Brand Name: Spektrum

FCC Classification: Digital Transmission System (DTS)

Test Procedure(s): KDB 447498 D01v06, RSS-102 Issue 5

Reviewed By:

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The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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Revision History

Report No.	Version	Description	Issue Date	Note
2003RSU030-U2	Rev. 01	Initial Report	05-25-2020	Valid

1. Equipment Description

1.1. Feature of Equipment under Test

Product Name:	BT2000 Bluetooth Module
Model No.:	BT2000
Brand Name:	Spektrum
Hardware Version:	rev.D
Software Version:	0.0.4
Working Temperature:	0 ~ 35°C
Working Voltage:	6VDC
Bluetooth Version:	V5.1 (BLE only)
Sample Code:	03

1.2. Product Specification Subjective to this Report

Bluetooth Frequency:	2402 ~ 2480MHz
Type of modulation:	GFSK
Data Rate:	1Mbps
Antenna Type:	Ceramic Antenna
Max Antenna Gain:	0.5 dBi

1.3. Working Frequencies for this report

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz
03	2408 MHz	04	2410 MHz	05	2412 MHz
06	2414 MHz	07	2416 MHz	08	2418 MHz
09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz
15	2432 MHz	16	2434 MHz	17	2436 MHz
18	2438 MHz	19	2440 MHz	20	2442 MHz
21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz
27	2456 MHz	28	2458 MHz	29	2460 MHz
30	2462 MHz	31	2464 MHz	32	2466 MHz
33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz
39	2480 MHz	--	--	--	--

2. RF Exposure Evaluation

2.1. Limits

For FCC: SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in Note 1 must be applied to determine SAR test exclusion.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	
MHz	30	35	40	45	50	mm
150	232	271	310	349	387	SAR Test Exclusion Threshold (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Note: The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

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

- $f(\text{GHz})$ 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.

For ISSED: SAR Test Exclusion Thresholds for RSS-102 issue 5

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

MHz	5	10	15	20	25	mm
≤ 300	71	101	132	162	193	SAR Test Exclusion Threshold (mW)
450	52	70	88	106	123	
835	17	30	42	55	67	
1900	7	10	18	34	60	
2450	4	7	15	30	52	
3500	2	6	16	32	55	
5800	1	6	15	27	41	
MHz	30	35	40	45	50	mm
≤ 300	223	254	284	315	345	SAR Test Exclusion Threshold (mW)
450	141	159	177	195	213	
835	80	92	105	117	130	
1900	99	153	225	316	431	
2450	83	123	173	235	309	
3500	86	124	170	225	290	
5800	56	71	85	97	106	

2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

2.3. Test Result of RF Exposure Evaluation

Product	BT2000 Bluetooth Module
Test Item	RF Exposure Evaluation

Output Power into Antenna:

Test Mode	Frequency Band (MHz)	Maximum output power to antenna (dBm)	Maximum output power to antenna (mW)	SAR Test Exclusion Threshold (mW)
BLE	2402 ~ 2480	2.92	1.96	10

Note:

Per FCC KDB 447498 D01v06, the SAR exclusion threshold for distances < 50mm is defined by the following equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0$$

Based on the maximum conducted power of this device and the antenna to use separation distance, The SAR test was not required:

$$[(1.96\text{mW}/5) * \sqrt{2.402}] = 0.61 < 3.0$$

Note: When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

For ISED SAR exclusion assessment via e.i.r.p Power:

Test Mode	Frequency Band (MHz)	Max EIRP (dBm)	Max EIRP (mW)	SAR Test Exclusion Threshold (mW)	Results
BLE	2402 ~ 2480	3.42	2.20	4	Complies

Note: The minimum distance of antenna to user is less than 5mm.

_____ The End _____

Annex - EUT Photographs

Please refer to “2003RSU030-UE” file.