SAR TEST EXCLUSION EVALUATION REPORT

Product Name:	Bluetooth FM Transmitter
Trade Mark:	INSIGNIA, DYNEX, MODAL
HVIN:	NS-MBTFMT-C
Report Number:	190605007RFC-4
Test Standards:	FCC 47 CFR Part 2.1093 RSS-102 Issue 5
FCC ID:	2AEI7MBTFMT
IC:	9697A-MBTFMT
Test Result:	PASS
Date of Issue:	July 16, 2019

Prepared for:

Anfair Electronics Plastic Factory
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Prepared by:

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Date: July 16, 2019

Version

Version No.	Date	Description
V1.0	July 16, 2019	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Anfair Electronics Plastic Factory
Address of Applicant:	182 Qingzhang Road Chang Shan Tou, QingXi Town, Dong Guan, China
Manufacturer:	Anfair Electronics Plastic Factory
Address of Manufacturer:	182 Qingzhang Road Chang Shan Tou, QingXi Town, Dong Guan, China

1.2 EUT INFORMATION

Product Name:	Bluetooth FM Transmitter		
HVIN:	NS-MBTFMT-C		
Model No.:	NS-MBTFMT-C, NS-MBTFxxxxxxx, DX- MBTFxxxxxxx, MD- MBTFxxxxxxxx ("x"=0-9, A-Z, a-z, - or blank, for market purpose only, all models are identical except the model number or color) (For trademark: INSIGNIA, DYNEX, MODAL)		
Trade Mark:	INSIGNIA, DYNEX, MODAL		
DUT Stage:	Identical Prototype		
EUT Supports Function:	2.4 GHz ISM Band:	Bluetooth V4.2	
	BSR:	VHF Band II	FM
Sample Received Date:	June 10, 2019		
Sample Tested Date:	June 10, 2019 to July 16, 2019		

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

For BT_LE	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth LE
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Antenna Type:	PCB Antenna
Antenna Gain:	-0.61 dBi
Maximum Peak Power:	4.98 dBm

For BT_EDR	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth BR + EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK, π/4DQPSK, 8DPSK
Number of Channels:	79
Channel Separation:	1 MHz
Antenna Type:	PCB Antenna
Antenna Gain:	-0.61 dBi
Maximum Peak Power:	8.01 dBm

For FM	
Frequency Band:	88 MHz to 108 MHz
Frequency Range:	88.1 MHz to107.9 MHz
Type of Modulation:	FM
Number of Channels:	100
Channel Separation:	200 KHz
Antenna Type:	PCB Antenna
Antenna Gain:	-1.0 dBi
Maximum Peak Power:	-50.0 dBm

1.4 OTHER INFORMATION

Test channels for BT_LE				
Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
GFSK	2402 MHz to 2480 MHz	Channel 0	Channel 19	Channel 39
		2402 MHz	2440 MHz	2480 MHz

Test channels for BT_EDR				
Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
GFSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
π/4DQPSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
8DPSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz

Test channels for FM				
Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
FM	88.1 MHz to 107.9 MHz	Channel 0	Channel 50	Channel 99
		88.1 MHz	98.1 MHz	107.9 MHz

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 2.1093
RSS-102 Issue 5

All test items have been performed and recorded as per the above standards

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

2. EQUIPMENT LIST

Please refer to the RF test report.

3. SAR TEST EXCLUSION EVALUATION

3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 2.1093	Radiofrequency radiation exposure evaluation: portable devices.
2	RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
3	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

3.2 EXEMPTION LIMITS FOR ROUTINE EVALUATION – SAR EVALUATION

3.2.1 SAR Test Exclusion Threshold

3.2.1.1 KDB 447498 D01 v06

Appendix A

***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 4.3.1 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: 10-g Extremity SAR Test Exclusion Power Thresholds are 2.5 times higher than the 1-g *SAR Test Exclusion Thresholds* indicated above. These thresholds do not apply, by extrapolation or other means, to occupational exposure limits.

3.2.1.2 RSS-102 Issue 5

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

4 The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. 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.

5 Transmitters operating between 0.003-10 MHz, meeting the exemption from routine SAR evaluation, shall

demonstrate compliance to the instantaneous limits in Section 4.

3.2.2 Test Procedure

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

3.3 MPE CALCULATION RESULTS

Note: *For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.*

3.3.1 For BR&EDR

For BT_BR & EDR function, operating at 2402MHz to 2480 MHz for GFSK, π/4 DQPSK, 8DPSK

3.3.1.1 Antenna Type:

Chain 0: PCB antenna

3.3.1.2 Antenna Gain:

Chain 0: 2402MHz to 2480 MHz: -0.61 dBi

3.3.1.3 Results for FCC 47 CFR Part 2.1093

Operating Mode	Frequency	Tune-up Power (Average)	Tolerance	Maximum Tune-up Power		Separation Distance	SAR Test Exclusion Threshold
	(MHz)	(dBm)	(dBm)	(dBm)	(mW)	(mm)	(mW)
EDR	2402-2480	5	1	6	3.98	5	10

So the transmitter complies with the RF exposure requirements and the SAR is not required.

3.3.1.4 Results for RSS-102 Issue 5

Operating Mode	Frequency	Tune-up Power (Average)	Tolerance	Maximum Tune-up Power		Separation Distance	SAR Test Exclusion Threshold
	(MHz)	(dBm)	(dBm)	(dBm)	(mW)	(mm)	(mW)
EDR	2402-2480	5	1	6	3.98	5	4

So the transmitter complies with the RF exposure requirements and the SAR is not required.

3.3.2 For BLE

For BT_BLE function, operating at 2402MHz to 2480 MHz for GFSK

3.3.2.1 Antenna Type:

Chain 0: PCB antenna

3.3.2.2 Antenna Gain:

Chain 0: 2402MHz to 2480 MHz: -0.61 dBi

3.3.2.3 Results for FCC 47 CFR Part 2.1093

Operating Mode	Frequency	Tune-up Power (Average)	Tolerance	Maximum Tune-up Power		Separation Distance	SAR Test Exclusion Threshold
	(MHz)	(dBm)	(dBm)	(dBm)	(mW)	(mm)	(mW)
BLE	2402-2480	5	1	6	3.98	5	10

So the transmitter complies with the RF exposure requirements and the SAR is not required.

3.3.2.4 Results for RSS-102 Issue 5

Operating Mode	Frequency	Tune-up Power (Average)	Tolerance	Maximum Tune-up Power		Separation Distance	SAR Test Exclusion Threshold
	(MHz)	(dBm)	(dBm)	(dBm)	(mW)	(mm)	(mW)
BLE	2402-2480	5	1	6	3.98	5	4

So the transmitter complies with the RF exposure requirements and the SAR is not required.

3.3.3 For FM

For FM function, operating at 88.1MHz to 107.9 MHz.

3.3.3.1 Antenna Type:

Chain 0: PCB antenna

3.3.3.2 Antenna Gain:

Chain 0: -1 dBi

3.3.3.3 Results for FCC 47 CFR Part 2.1093

Operating Mode	Frequency	Tune-up Power (Average)	Tolerance	Maximum Tune-up Power		Separation Distance	SAR Test Exclusion Threshold
	(MHz)	(dBm)	(dBm)	(dBm)	(mW)	(mm)	(mW)
FM	88.1-107.9	-50	2	-48	0.000016	5	39

So the transmitter complies with the RF exposure requirements and the SAR is not required.

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3.3.3.4 Results for RSS-102 Issue 5

Operating Mode	Frequency	Tune-up Power (Average)	Tolerance	Maximum Tune-up Power		Separation Distance	SAR Test Exclusion Threshold
	(MHz)	(dBm)	(dBm)	(dBm)	(mW)	(mm)	(mW)
FM	88.1-107.9	-50	2	-48	0.000016	5	71

So the transmitter complies with the RF exposure requirements and the SAR is not required.

3.3.4 Simultaneous Multi-band Transmission MPE Analysis

3.3.4.1 List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Support/Not Support
1	BT + FM	Support

3.3.4.2 Results for transmit simultaneously

FCC 47 CFR Part 2.1093

No.	Configurations	Maximum MPE Value			Limits
		FM	BT	Transmit simultaneously	
1	BT + FM	0	0.398	**0.398**	1

Note:

According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:

Transmit simultaneously MPE = Σ of MPE ratios

MPE ratios = Field strengths or power density / MPE limit at the test frequency

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No.	Configurations	Maximum MPE Value			Limits
		FM	BT	Transmit simultaneously	
1	BT + FM	0	0.995	**0.995**	1

Note:

According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:

Transmit simultaneously MPE = Σ of MPE ratios

MPE ratios = Field strengths or power density / MPE limit at the test frequency

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 1 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***