



Test Type: SAR Test Exclusion

Product Type: Wireless Speaker

Product Name/Number: Model Number: 422914
FCC ID: A94422914
IC: 3232A-422914

Prepared For: Design Assurance Engineering Department,
Bose Corporation

Results: SAR test exempt

Applicable Standards: FCC CFR 2.1093 SAR Exclusion Calculation
Industry Canada RSS-102

Report Number: EMC.422914.17.219.1

	Print Name	Signature	Date
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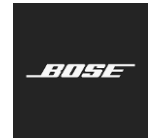


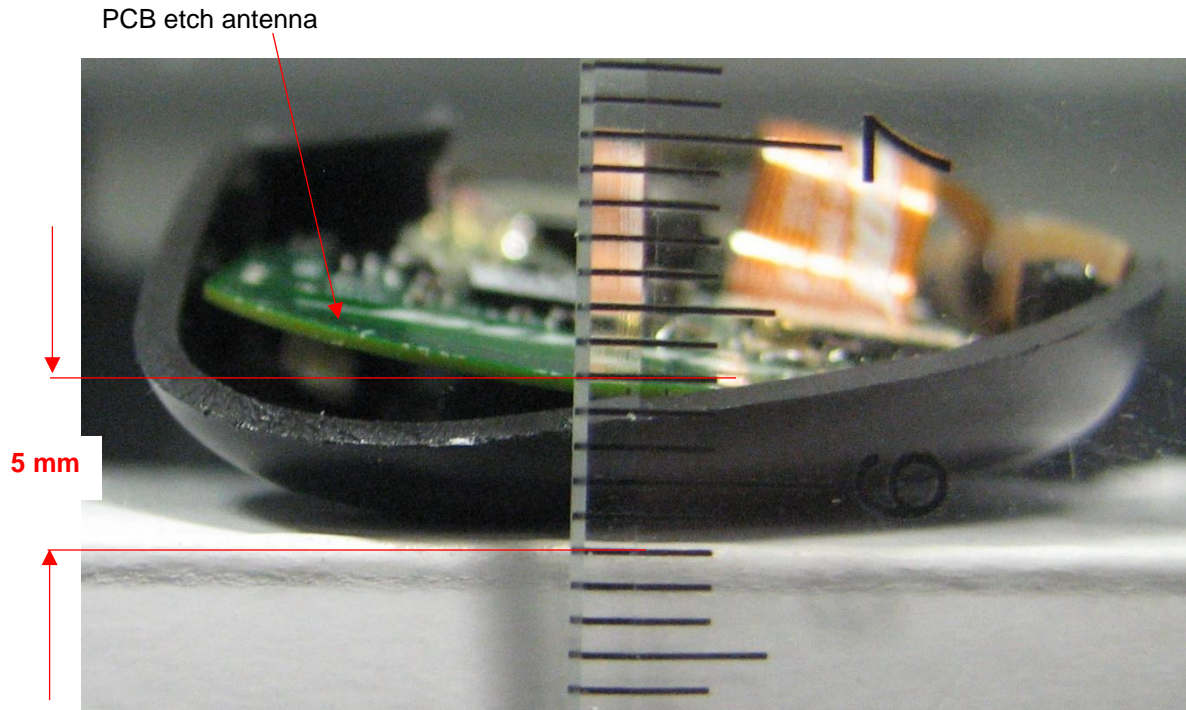
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1. Minimum distance declaration

Separation distance between EUT and closest part of the body is $\leq 5\text{mm}$

Minimum declared separation distance $\sim 5\text{ mm}$, $d = 5\text{ mm}$



Inside view showing PCB etch antenna (Antenna gain is 1.84 dBi)

2. Maximum EIRP

The maximum conducted output power is shown below for Bluetooth (BT) and Bluetooth Low Energy (BLE).

Data taken for FCC & IC reports: Bose_Model_422914_BT_Report_Rev1.pdf
Bose_Model_422914_BLE_Report_Rev1.pdf

It is not possible to have BT and BLE transmit at the same time.

Bluetooth conducted output power

Output Power Summary Table (Basic Rate: 1 Mbps)							
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	DH5	5.81	1.84	30	24.19	Pass
Middle	2441	DH5	6.96	1.84	30	23.04	Pass
High	2480	DH5	7.79	1.84	30	22.21	Pass

Output Power Summary Table (Enhanced Rate: 2 Mbps)							
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	2-DH5	4.59	1.84	30	25.41	Pass
Middle	2441	2-DH5	6.29	1.84	30	23.71	Pass
High	2480	2-DH5	7.25	1.84	30	22.75	Pass

Output Power Summary Table (Enhanced Rate: 3 Mbps)							
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	3-DH5	4.92	1.84	30	25.08	Pass
Middle	2441	3-DH5	6.46	1.84	30	23.54	Pass
High	2480	3-DH5	7.40	1.84	30	22.60	Pass

Bluetooth Low Energy conducted output power

Output Power Summary Table (BLE)						
Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	5.82	0	30	24.18	Pass
Middle	2440	6.92	0	30	23.08	Pass
High	2480	7.80	0	30	22.20	Pass

Maximum power for Bluetooth is 7.79 dBm (Basic rate: 1 Mbps); rounding up to 7.8 dBm
Maximum power for Bluetooth low energy is 7.8 dBm.

17 units were screen for power variation, worst case spread including tune up tolerance was 1.17 dB

Antenna gain: 1.84 dBi

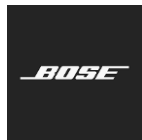
Maximum EIRP = 7.8 + 1.17 + 1.84 = 10.8 dBm (12 mW)



Certificate # 1514.1

DESIGN ASSURANCE ENGINEERING SAR Exclusion Calculation

FCC ID: A94422914 IC: 3232A-422914

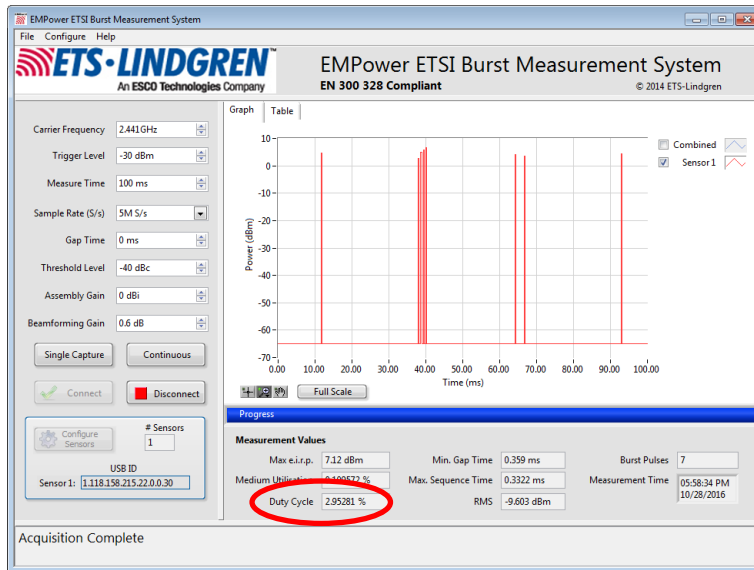


3. Duty cycle

Duty cycle measurements were made while operating in normal Bluetooth mode as well as operating in Bluetooth Low Energy mode.

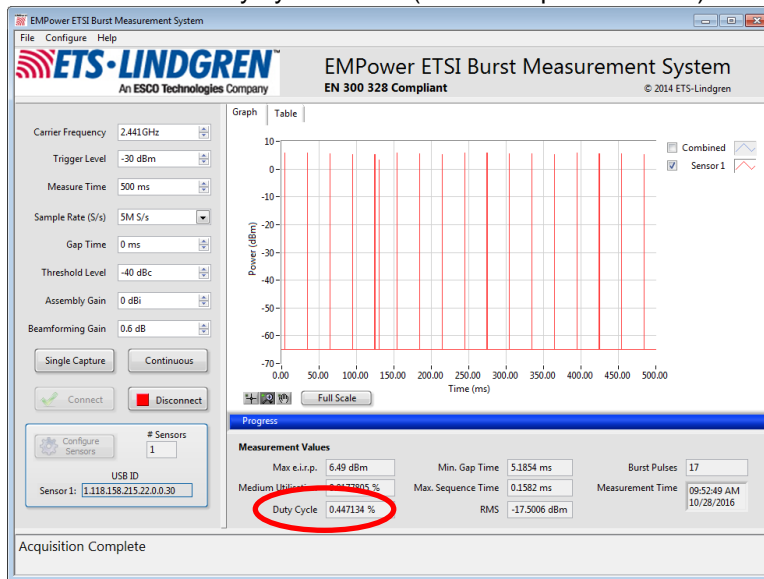
EUT paired with iPod playing music. (Bluetooth mode)

Measured duty cycle 2.9 % (100mS capture window)



Duty cycle while operating in Bluetooth Low energy mode.

Measured duty cycle 0.44% (500mS capture window)



Worst case duty cycle is when operating in normal Bluetooth mode; 2.9 % rounding up to 3%

Note: Duty cycles obtained when using BlueTest3 don't represent normal operating type duty cycle.



4. FCC

Reference KDB 447498: D01 General RF Exposure Guidance v06, October 23, 2015

4.3. General SAR test exclusion guidance

4.3.1. Standalone SAR test exclusion considerations

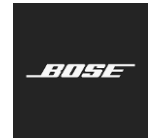
Unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition(s), listed below, is (are) 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.**²⁸ The minimum *test separation distance* defined in 4.1 f) 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. To qualify for SAR test exclusion, the *test separation distances* applied must be fully explained and justified, typically in the SAR measurement or SAR analysis report, by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, according to the required *published RF exposure KDB procedures*. When no other RF exposure testing or reporting are required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for 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 and tablets, etc.²⁹

- a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR,}^{30} \text{ where}$$

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation³¹
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) 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 4.1 f) is applied to determine SAR test exclusion.



SAR test exclusion calculation:

Bluetooth normal operation: (A2DP mode):

Separation distance between EUT antenna and human body = 5mm

Maximum EIRP = 10.8 dBm (12 mW)

Duty Cycle = 3 %

EIRP (dBm) duty cycle corrected = $10.8 - 10 \cdot \log(1/0.03) = 10.8 - 15.2 = -4.4$ dBm (0.36 mW)

$(\text{Max ERIP (mW)}) / (\text{Separation distance (mm)}) \cdot \sqrt{f(\text{GHz})} < 3.0$

$(0.36 / 5) \cdot \sqrt{f(2.48)} = 0.11 < 3.0$ SAR test exempt.

If BlueTest3 where used to transmit DH5 packet with maximum payload:

(FYI, test mode only, not typical of normal operation)

Duty cycle = 78 %

EIRP (dBm) duty cycle corrected = $10.8 - 10 \cdot \log(1/0.78) = 10.8 - 1.08 = 9.72$ dBm (9.37 mW)

$(\text{Max ERIP (mW)}) / (\text{Separation distance (mm)}) \cdot \sqrt{f(\text{GHz})} < 3.0$

$(9.37 / 5) \cdot \sqrt{f(2.48)} = 2.95 < 3.0$ SAR test exempt.

5. Industry Canada

Reference: RSS-102 Issue 5

2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable **output power level** (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

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

Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

RSS-102

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg

Factoring in real use duty cycle (3%), the maximum EIRP = -4.4 dB (0.36mW) see page 7.

0.36 mW is less than the 4 mW limit, therefore the EUT qualifies for SAR test exclusion.