

SAR EXCLUSION REPORT

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Kanagawa 226-8525 Japan**Date of Issue: 06. 19, 2018****Test Report No.: HCT-SR-1806-FI001-R1****Test Site: HCT CO., LTD.****FCC ID:****ISED ID:****K44479000****282F-479000****FCC Model :** NX-3220-K, NX-3220-K2, NX-3220-K3, NX-3200-K, NX-3200-K2, NX-3200-K3**ISED Model :** NX-3220-K, NX-3220-K2, NX-3220-K3, NX-3200-K, NX-3200-K2, NX-3200-K3**Equipment Type:** VHF DIGITAL TRANSCEIVER**FCC Rule Part(s):** 47CFR §2.1093**ISED Rule Part(s):** RSS-102 Issue 5; Health Canada Safety Code 6**Application Type** Certification**Device Wireless specification overview**

Band & Mode	Operating Mode	Tx Frequency
Bluetooth 4.0 LE	Data	2 402 – 2 480 MHz

Maximum Output Power : 2.5 mW

This device has been excluded from SAR measurements based on FCC FDB KDB 447498 D01 v06 and ISED RSS102 Issue 5..

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1. FCC

1.1 SAR Test Exclusions Applied _Bluetooth 4.0 LE

According to the FCC KDB 447498 D01 v06 section 4.3.1, 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:

$$\frac{\text{Max Power of Channel (mW)}}{\text{Test Separation Distance (mm)}} * \sqrt{\text{Frequency (GHz)}} \leq 3.0 \text{ for } 1\text{-g SAR}$$

where

- f(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

Calculation Result:

Tx frequency range: 2 402 MHz ~ 2 480 MHz

Min. test separation distance: 5 mm

Maximum Output Power: 2.5 mW

The Highest RF channel frequency: 2 480 MHz

Mode	Frequency	Maximum Allowed Power	Separation Distance	≤ 3.0 for 1g SAR
	[MHz]	[mW]	[mm]	
Bluetooth 4.0 LE	2 480	3	5	0.9

Based on the maximum output power of Bluetooth 4.0 LE and antenna to use separation distance, Bluetooth 4.0 LE SAR was not required $[(3/5)*\sqrt{2.480}] = 0.9 < 3.0$.

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel mW})}{\text{Min Separation Distance}}$$

Estimated 1-g SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated 1g SAR (Body)
	[MHz]	[mW]	[mm]	[W/kg]
Bluetooth 4.0 LE	2 480	3	5	0.126

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. The Estimated SAR results were determined according to FCC KDB447498 D01v06.

1.2 Simultaneous SAR Analysis

Simultaneous Transmission Summation for Body-Worn

Exposure condition	VHF SAR	Bluetooth SAR	Σ 1-g SAR
	(W/kg)	(W/kg)	(W/kg)
Body-worn	5.46	0.126	5.586

1.3 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. And therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013

2. ISED

2.1 SAR Test Exclusions Applied _Bluetooth 4.0 LE

Per RSS102 Issue 5, 2.5.1 Exemption Limits for Routine Evaluation

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

The SAR exemption from RSS102: Issue 5 was also exempted by the above exclusion conditions.

The estimate SAR value is calculated based the following equation:

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/Kg

Estimated 1-g SAR

Mode	Frequency	Exemption Limit	Maximum Allowed Power	Separation Distance (Body)	Estimated 1g SAR (Body)
	[MHz]	[mW]	[mW]	[mm]	[W/kg]
Bluetooth 4.0 LE	2 450	4	2.5	5	0.250

2.2 Simultaneous SAR Analysis

Simultaneous Transmission Summation for Body-Worn

Simultaneous Transmission Summation Scenario with Bluetooth			
Exposure condition	VHF SAR	Bluetooth SAR	Σ 1-g SAR
	(W/kg)	(W/kg)	(W/kg)
Body-worn	5.96	0.250	6.21

2.3 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. And therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013