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RF Exposure Considerations for the Signal Hub v1

FCC ID: 2A7VH-CSL-101

Contains FCC ID: XMR201903EG25G.

For mobile product operation the FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The FCC ID: 2A7VH-CSL-101 operates with BT LE and LTE cellular transmitters.

The Cellular operation is achieved using a pre-approved module FCC ID: XMR201903EG25G.

The BT transmitter uses a APARN1204-S2450 antenna.

The Cellular transmitter uses a Pulse W3906B0100 antenna.

The BT LE and cellular transmitters can transmit simultaneously.

LTE module certified operating bands:

Band 2	1850 – 1910 MHz
Band 4	1710 - 1765 MHz
Band 5	824 - 849 MHz
Band 7	2500 - 2570 MHz
Band 12	699 - 716 MHz
Band 13	777 - 787 MHz
Band 25	1850 - 1915 MHz
Band 26	814 - 824 MHz
Band 38	2570 - 2620 MHz
Band 41	2496 - 2690 MHz

The following FCC Rule Parts and procedures are applicable:

Part 1.1310 – Radiofrequency radiation exposure limits

Part 2.1091 – Radiofrequency radiation exposure evaluation: mobile devices

KDB447498 D01 v06

Mobile and Portable Devices RF Exposure Procedures and Equipment Authorisation Policies

MPE CALCULATIONS

The MPE calculation to calculate the safe operating distance for the user is.

$$S = EIRP / 4 \pi R^2$$

Where S = Power density

EIRP = Effective Isotropic Radiated Power ($EIRP = P \times G$)

P = Conducted Transmitter Power

G = Antenna Gain (relative to an isotropic radiator)

R = distance to the centre of radiation of the antenna (safe operating distance)

Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC §1.1310 (e) for $f > 1500\text{MHz}$, $S_{req1} = 1.0 \text{ mW/cm}^2$

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC §1.1310 (e) for $f = 300 - 1500\text{MHz}$, $S_{req2} = f/1500 \text{ mW/cm}^2$

(f = operating frequency in MHz)

VALUES

BT LE power is declared power.

LTE powers are from FCC Grant FCC ID: XMR201903EG25G

Antenna gains are from Manufacturers' spec. sheets.

Frequency Range (MHz)	Operating Band	TX Conducted Power (dBm)	Antenna Gain (max dBi)	EIRP (mW)	Calculated Distance R @ S_{req} (cm)	Power Density S mw/ cm^2		
						Limit S_{req}	Calculated S_n @ 20cm	S_n / S_{req}
2402- 2480	BT	23.0	2.0	251.2	4.47	1.00	0.05	0.05
1850 - 1915	LTE 2, 25	25.0	+3.2	660.7	7.25	1.0	0.13	0.13
1710 - 1765	LTE 4	25.0	+3.2	660.7	7.25	1.0	0.13	0.13
814 - 849	LTE 5, 26	25.0	+2.7	588.8	9.29	0.54	0.12	0.22
699 - 716	LTE 12	25.0	+2.7	588.8	10.03	0.47	0.12	0.25
777 - 787	LTE 13	25.0	+2.7	588.8	9.51	0.54	0.12	0.22
2500 - 2690	LTE 7,38,41	25.0	+3.6	724.4	7.59	1.0	0.14	0.14

KDB447498 D01 v06 Section 7.2 SIMULTANEOUS TRANSMISSION CONSIDERATIONS

For BT LE and LTE simultaneous transmission:

As per KDB, summation of calculated MPE ratios (worst case):

$$\begin{aligned}\Sigma \text{MPE}_{\text{ratios}} &= (S_1 / S_{\text{req1}}) + (S_5 / S_{\text{req5}}) \\ &= 0.050 + 0.251 \\ &= \mathbf{0.301}\end{aligned}$$

Σ of MPE ratios < 1.0, so in accordance with KDB447498 D01 V06 Section 7.2, simultaneous transmission test exclusion applies for the transmitters.

Conclusion

The required 20cm RF exposure limits for General Population/ Uncontrolled Exposure will not be exceeded for the Signal Hub v1 using the specified antennas.

Yours faithfully,



Gideon Farrell
CTO

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