

**RF Exposure and Transmitter Power Considerations for the
G5PL which contains:**

FCC ID: 2A3C7-WIFIG5P, FCC ID: 2A3C7-HMIG5P and FCC ID:N7NHL78

FCC ID: 2A3C7- WIFIG5P

The FCC ID: 2A3C7-WIFIG5P operates in the 2.4 GHz and 5 GHz frequency bands using Bluetooth BDR / EDR (2402-2480MHz), WLAN 802.11b/g/n (2412-2462MHz), and WLAN 802.11a/n/ac (5180-5825MHz) technologies with 13.56MHz RFID.

FCC ID: 2A3C7-HMIG5P

The FCC ID : 2A3C7-HMIG5P operates at 13.56MHz

FCC ID: N7NHL78

The FCC ID: N7NHL78 operates in LTE bands 2, 4, 5, 12, 13, 25, 26, 66

The 2.4GHz/ 5GHz WLAN transmitters can transmit simultaneously with both of the RFID and LTE transmitters.

The BT transmitter can transmit simultaneously with both of the RFID and LTE transmitters.

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 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

MAXIMUM TRANSMITTER POWER CONSIDERATIONS**FCC ID: 2A3C7-WIFIG5P**

Conducted power values are maximum average tune up with tolerance (from Change of ID FCC ID: 2A3C7-WIFIG5P and original module grant Tune Up – FCC ID: VPYLBEE5HY1MW)

Bluetooth 2.4GHz:

Power conducted: 10.0dBm, Antenna Gain: 6.1

EIRP = 16.1dBm = 40.7 mW

WLAN 2.4GHz:

Power conducted : 18.0dBm, Antenna Gain: 6.1

EIRP = 24.1dBm = 257 mW

WLAN 5GHz:

Power conducted: 15.0dBm, Antenna Gain: 1.9

EIRP = 16.9dBm = 49 mW

FCC ID: 2A3C7-HMIG5P

Tx Power (from original module grant FCC ID: 2A3C7-HMIG5P:

+79.6dBuV/m @3m = -15.7dBm EIRP

FCC ID: N7NHL78

Conducted power values are maximum (from original module grant– FCC ID: N7NHL78

MPE CALCULATIONS

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

$$S = \text{EIRP} / 4 \pi R^2$$

Where

S = Power density

EIRP = Effective Isotropic Radiated Power (EIRP = P x 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 $f > 1500\text{MHz}$, $S_{\text{req1}} = 1.0 \text{ mW/cm}^2$

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

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC §1.1310 (e) for $f = 1.34 - 30\text{MHz}$, $S_{\text{req3}} = 180/f^2 \text{ mW/cm}^2$

(f = operating frequency)

VALUES

Frequency Range (MHz)	Operating Band	TX Conducted Power Average (dBm)	Antenna Gain (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}
13.56 -13.56	NFC	N/A	N/A	-15.7dBm	<0.1	0.98	5.4E-06	5.5E-06
2402 - 2480	BT	10.0	+6.1	40.7	1.8	1.0	0.008	0.008
2412 - 2462	WLAN	18.0	+6.1	257	4.5	1.0	0.05	0.05
5180 - 5825	WLAN	15.0	+1.9	49.0	2.0	1.0	0.01	0.01
1850 - 1915	LTE 2, 25	24.5	+5.5	1000	8.9	1.0	0.2	0.2
1710 - 1780	LTE 4, 66	24.5	+4.5	794	8.0	1.0	0.16	0.089
814 - 849	LTE 5, 26	24.5	0	282	6.5	0.54	0.06	0.11
699 - 716	LTE 12	24.5	+2.7	525	9.4	0.47	0.1	0.21
777 - 787	LTE 13	24.5	-0.4	257	6.3	0.52	0.05	0.1

KDB447498 D01 v06 Section 7.2 SIMULTANEOUS TRANSMISSION CONSIDERATIONS

For RFID, BT and LTE simultaneous transmission:

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

$$\sum \text{MPE}_{\text{ratios}} = (S_1/ S_{\text{req1}}) + (S_2/ S_{\text{req2}}) + (S_8/ S_{\text{req8}})$$

$$= 5.5\text{E-}06 + 0.008 + 0.21$$

$$= \mathbf{0.218}$$

For RFID, WLAN and LTE simultaneous transmission:

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

$$\begin{aligned}\Sigma \text{MPE}_{\text{ratios}} &= (S_1 / S_{\text{req1}}) + (S_3 / S_{\text{req3}}) + (S_8 / S_{\text{req8}}) \\ &= 5.5\text{E-}06 + 0.05 + 0.21 \\ &= \mathbf{0.26}\end{aligned}$$

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 G5PL using the specified antennas.