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G7EXO-NA2 Antenna Compliance with Cellular Module Integration Requirements

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1 Document Revision History

Revision	Date	Author	Summary
1	Aug 17, 2020	Scott Jacobsen	Initial Release
2	Jun 27, 2024	Scott Jacobsen	Add LARA-R6001D

2 Purpose of this Report

The purpose of this report is to show the radio frequency (RF) exposure compliance of the cellular module integration on G7EXO-NA2

3 Identifiers

3.1 Host Product

Product Name: G7 EXO

Model: G7EXO-NA2

3.2 Module Identifiers

Module Description	Model	FCC ID	IC ID	Grantee
Cellular	LARA-R202	XPYUBX21BE01	8595A-UBX21BE01	u-blox AG

3.3 Antennas

Frequency Band	Vendor	Model	Peak Gain(dBi)	Data Sheet Reference
Cellular	Blackline Safety	103452r2	See section 3.5	

3.4 Module Grant Requirements – XPYUBX21BE01

Output power listed is conducted. Single Modular Approval. The module antenna must be installed to meet the RF exposure compliance separation distance of 20 cm. For mobile and fixed operating configurations the antenna gain, including cable loss, must not exceed

3.9dBi at GSM850
4.5dBi at GSM1900
9.9dBi at FDD Band 2
9.5dBi at FDD LTE Band 2
6.0dBi at FDD LTE Band 4
10.4dBi at FDD Band 5 and FDD LTE Bands 5 and 26
10.3dBi at FDD LTE Band 7
10.2dBi at FDD LTE Band 13
9.7dBi at FDD LTE Band 12
10.8dBi at FDD LTE Band 8
9.1dBi at TDD LTE Band 38
8.8dBi at TDD LTE Band 41

Integration not consistent with these conditions will entail additional testing and authorization process. Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the FCC multi-transmitter procedures. Host integrators must be provided with antenna

installation instructions and transmitter operating conditions to satisfy RF exposure compliance. Host integrator is responsible for complying with the instructions and requirements for each transmitter they choose to integrate into a host product. This device supports bandwidth modes of 1.4, 3, 5, 10, 15 and 20 MHz for FDD LTE Bands 2 and 4; bandwidth modes of 5, 10, 15 and 20 MHz for FDD LTE Band 7 and TDD LTE Bands 38 and 41; bandwidth modes of 1.4, 3, 5 and 10 MHz for FDD LTE Bands 5, 12 and 26; bandwidth modes of 5 and 10 MHz for FDD LTE Band 13 and bandwidth modes of 1.4 and 3 MHz for FDD LTE Band 8.

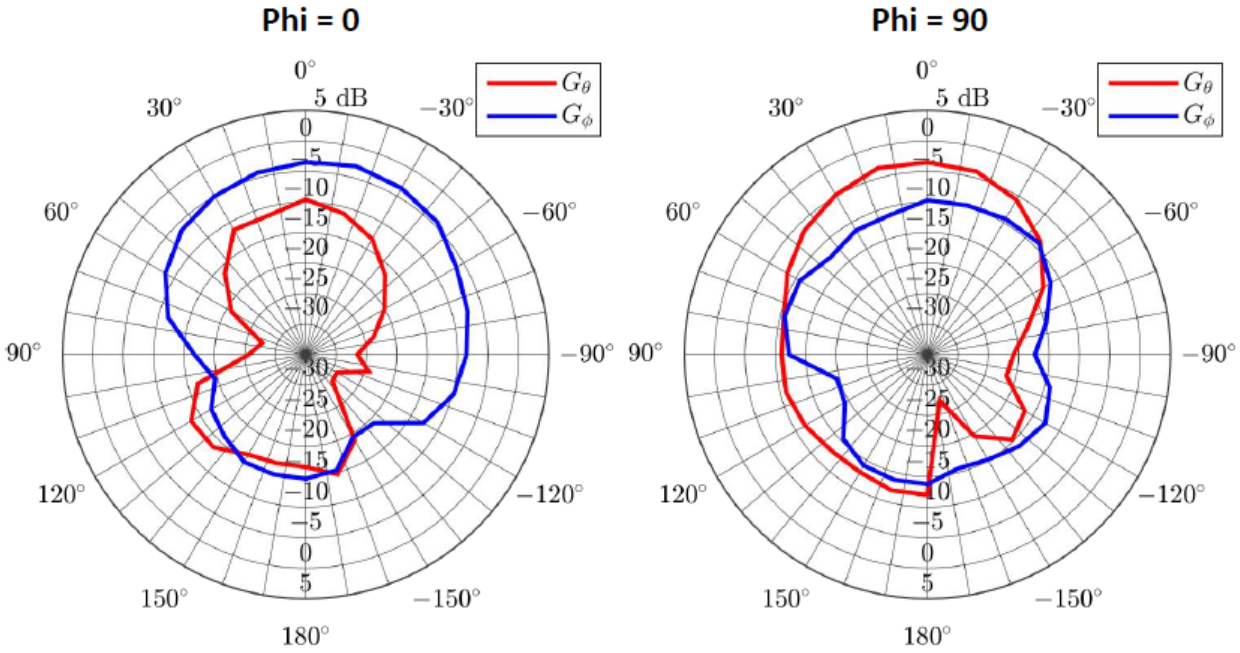
3.5 Comparison of Antenna Gain with Module Requirements

Requirement Maximum Gain	Band	Measured Actual Gain	Frequency
9.7 dBi	FDD LTE Band 12	-7.2 dBi	700 MHz
9.7 dBi	FDD LTE Band 12	-6.7dBi	707 MHz
9.7 dBi	FDD LTE Band 12	-6.4 dBi	715 MHz
10.2 dBi	FDD LTE Band 13	-4.0 dBi	780 MHz
10.2 dBi	FDD LTE Band 13	-3.9 dBi	784 MHz
3.9 dBi	GSM850	-3.6 dBi	826 MHz
3.9 dBi	GSM850	-3.1 dBi	837 MHz
3.9 dBi	GSM850	-1.7 dBi	847 MHz
10.4 dBi	FDD Band 5 and FDD LTE Bands 5 and 26	-3.6 dBi	826 MHz
10.4 dBi	FDD Band 5 and FDD LTE Bands 5 and 26	-3.1 dBi	837 MHz
10.4 dBi	FDD Band 5 and FDD LTE Bands 5 and 26	-1.7 dBi	847 MHz
10.8 dBi	FDD LTE Band 8	-1.4 dBi	899 MHz
6.0 dBi	FDD LTE Band 4	1.6 dBi	1710 MHz
6.0 dBi	FDD LTE Band 4	1.0 dBi	1730 MHz
6.0 dBi	FDD LTE Band 4	-0.8 dBi	1750 MHz
4.5 dBi	GSM1900	-0.3 dBi	1850 MHz
4.5 dBi	GSM1900	-0.6 dBi	1880 MHz
4.5 dBi	GSM1900	-1.8 dBi	1910 MHz
9.9 dBi	FDD Band 2	-0.3 dBi	1850 MHz
9.9 dBi	FDD Band 2	-0.6 dBi	1880 MHz
9.9 dBi	FDD Band 2	-1.8 dBi	1910 MHz

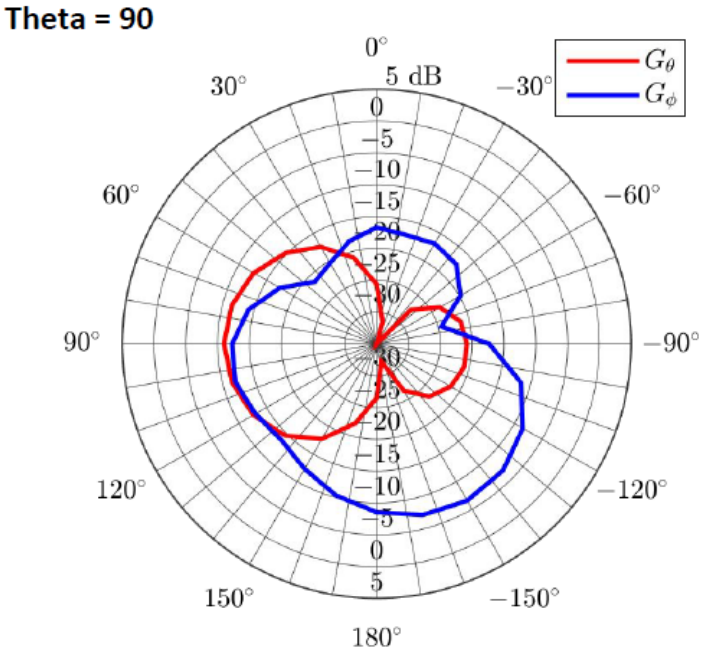
9.5 dBi	FDD LTE Band 2	-0.3 dBi	1850 MHz
9.5 dBi	FDD LTE Band 2	-0.6 dBi	1880 MHz
9.5 dBi	FDD LTE Band 2	-1.8 dBi	1910 MHz
10.3 dBi	FDD LTE Band 7	1.2 dBi	2500 MHz
10.3 dBi	FDD LTE Band 7	1.3 dBi	2530 MHz
10.3 dBi	FDD LTE Band 7	1.3 dBi	2560 MHz
9.1 dBi	TDD LTE Band 38	1.4 dBi	2570 MHz
9.1 dBi	TDD LTE Band 38	1.4 dBi	2590 MHz
9.1 dBi	TDD LTE Band 38	1.4 dBi	2610 MHz
8.8 dBi	TDD LTE Band 41	1.2 dBi	2500 MHz
8.8 dBi	TDD LTE Band 41	1.4 dBi	2590 MHz
8.8 dBi	TDD LTE Band 41	1.5 dBi	2680 MHz

3.6 Sample Radiation Patterns

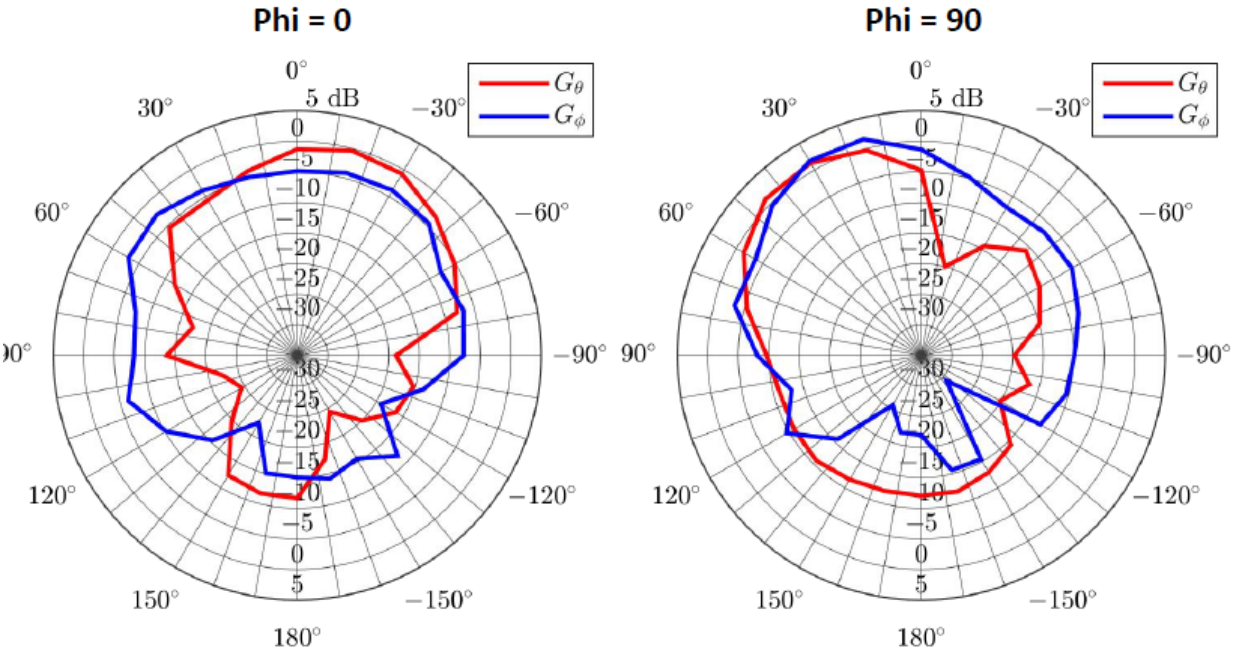
Cellular Linear Gain vs Theta Angle 0.75 GHz



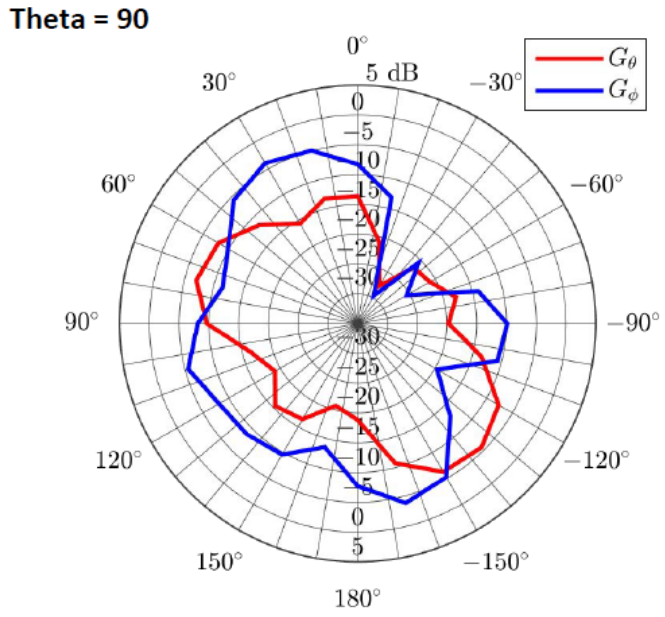
Cellular Linear Gain vs Phi Angle 0.75 GHz



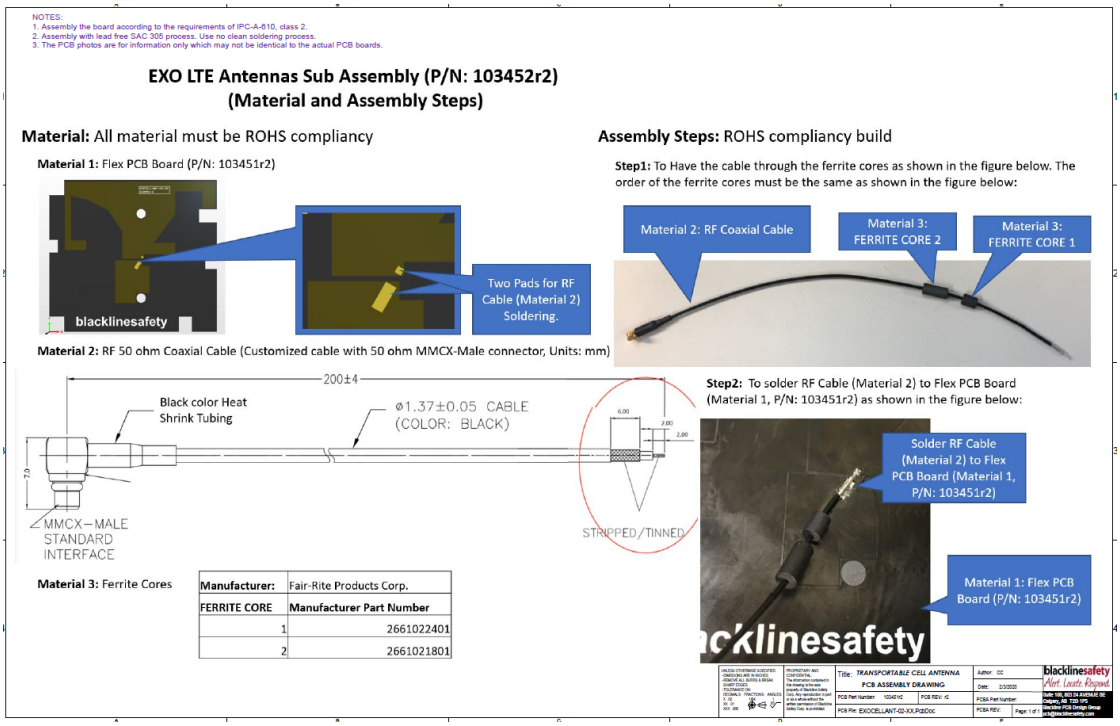
Cellular Linear Gain vs Theta Angle 1.85 GHz



Cellular Linear Gain vs Phi Angle 1.85 GHz

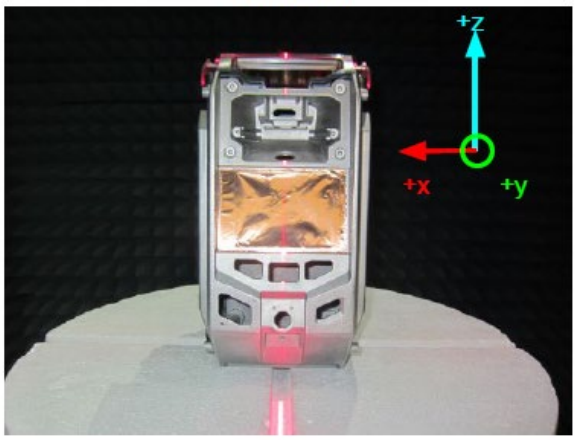


3.7 Antenna Assembly

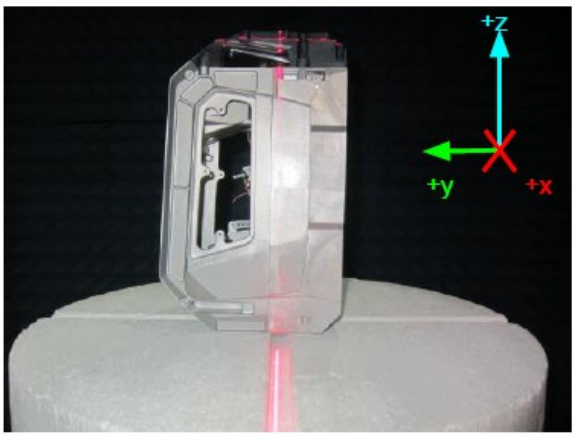


3.8 Test Setup Pictures

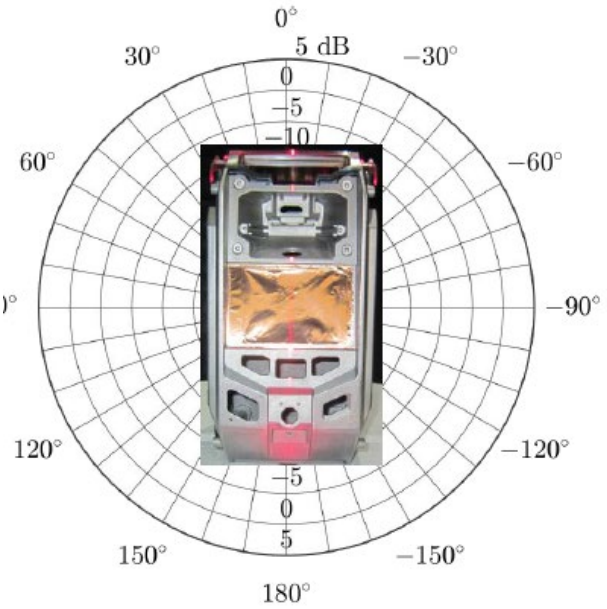
Front View



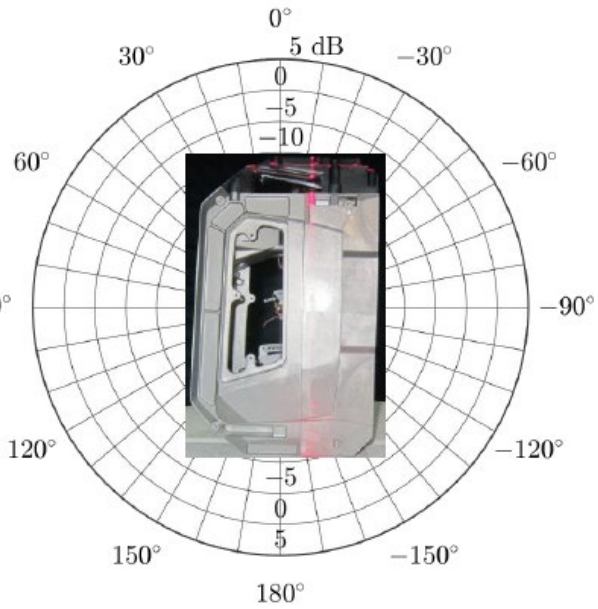
Side View



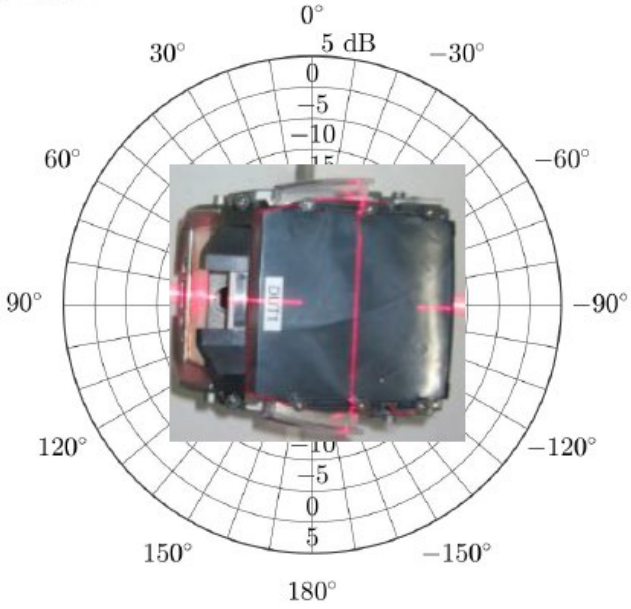
Phi = 0



Phi = 90



Theta = 90



4 Statement of Compliance

The gain values found for Blackline cellular antenna 103452r2 are below the maximum allowed levels according to module integration requirements.