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Alert. Locate. Respond.

G7 Bridge Model 103989 Antenna Compliance with Cellular Module Integration Requirements

1 Document Revision History

Revision	Date	Author	Summary
1	June 3, 2021	Scott Jacobsen	Initial Release
2			

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 G7 Bridge Model 103989

3 Identifiers

3.1 Host Product

Product Name: G7 Bridge

Model: 103989

3.2 Module Identifiers

Module Description	Model	FCC ID	IC ID	Grantee
Cellular	LARA-R202	XPY1EIQ24NN	8595A-1EIQ24NN	u-blox AG

3.3 Antennas

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

3.4 Module Grant Requirements – XPY1EIQ24NN

Output Power is conducted. This device is certified for use in mobile and fixed applications; where the transmitter antenna(s) is at least 20cm from all persons. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other transmitter antenna, except in accordance with FCC multi-transmitter product procedures. To meet the MPE RF Exposure, ERP and EIRP limits, the antenna gain including cable loss must not exceed:

9.8 dBi at 700 MHz;

10.0 dBi at 850 MHz;

6.5 dBi at 1700 MHz and

8.7 dBi at 1900 MHz.

End users and installers must be provided with transmitter operating conditions and installation instructions for satisfying compliance. This filing is only applicable for: 700 MHz LTE; 850 MHz Cell; 1700 MHz WCDMA and 1900 MHz PCS operations.

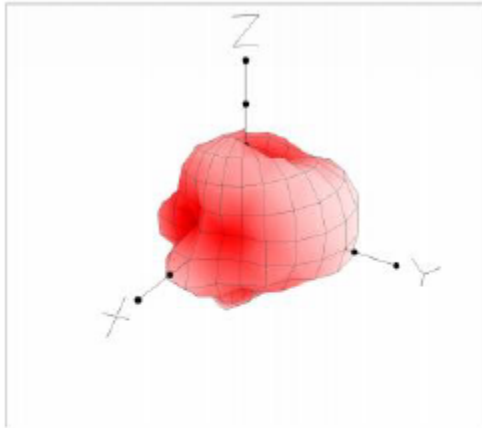
The Grantee is responsible for providing the documentation required for modular use. The responsibility for use of this module in all configurations remains with the Grantee.

3.5 Comparison of Antenna Gain with Module Requirements

Requirement Maximum Gain	Band	Actual Peak Gain Across Band
9.8 dBi	700 MHz	-3.3 dBi
10.0 dBi	850 MHz	-2.2 dBi
6.5 dBi	1700 MHz	-0.5 dBi
8.7 dBi	1900 MHz	-0.8 dBi

3.6 Sample Radiation Patterns

Total Radiated power: -2.72 dBm
Efficiency -2.72 dB

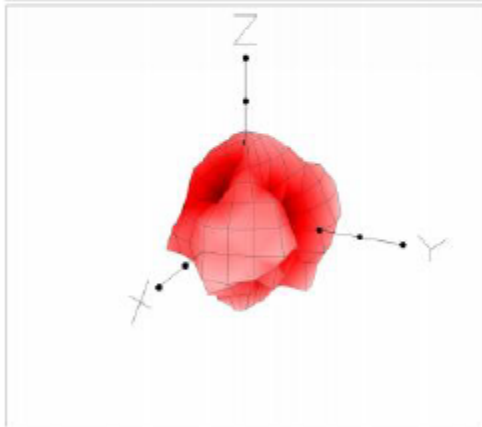


Vertical Polarization

Vert. Component: -4.40 dBm

Peak Gain: 1.08 dBi

Theta 105, Phi 150 deg



Horizontal Polarization

Horz. Component: -7.66 dBm

Peak Gain: -0.69 dBi

Theta 90, Phi 150 deg

File Name: Ant1 high freq2 2110

Tx Power: 0.00 dBm **Estimated**

Frequency: 2110.00 MHz

Cable Attenuation: 14.10 dB

Notes:

Wed, Mar 31, 2021 7:24 PM

Receive Antenna Gain: 2.15 dBi

Separation: 1.28 m

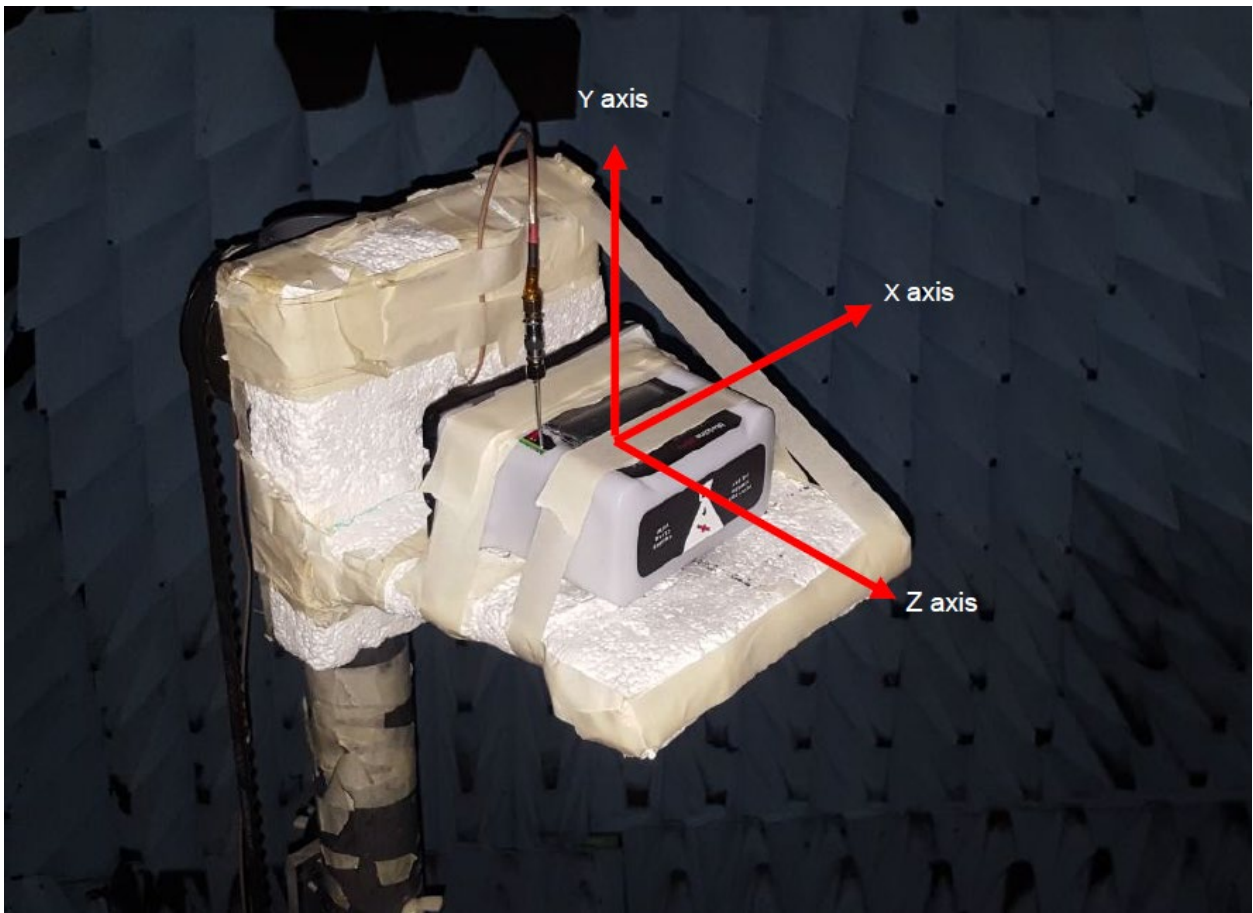
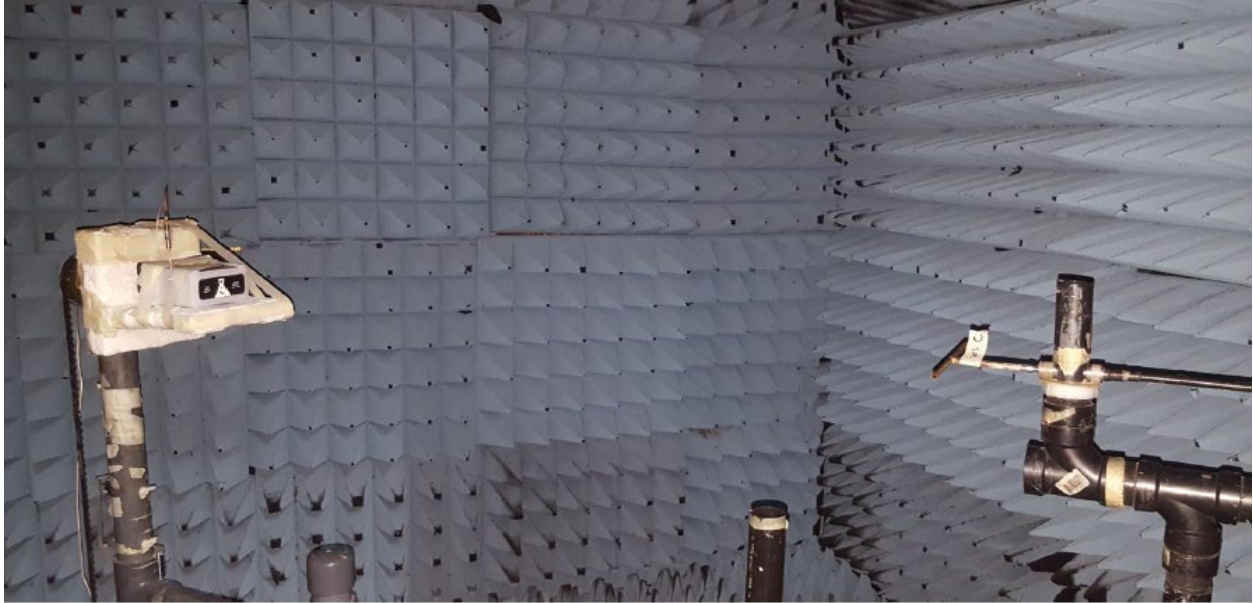
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3.7 Antenna Measurement Assembly



3.8 Test Setup Pictures



4 Statement of Compliance

The gain values found for Blackline cellular antenna in G7 Bridge Model 103989 are below the maximum allowed levels according to module integration requirements.

SPECIFICATION

Iridium Certified

Part No. : **IP.1621.25.4.A.02**

Product Name : **4mm thick Iridium Patch Antenna, 1621MHz**

Features : 25mm*25mm*4mm
ROHS Compliant

:



1. Introduction

This miniaturized ceramic Iridium patch antenna is based on smart **XtremeGain™** technology. It is mounted via pin and double-sided adhesive and has been selected as optimal solution for the customer device environment. Iridium certifies the IP.1621.25.4.A.02 for commercial use in connection with the Iridium Communications systems.

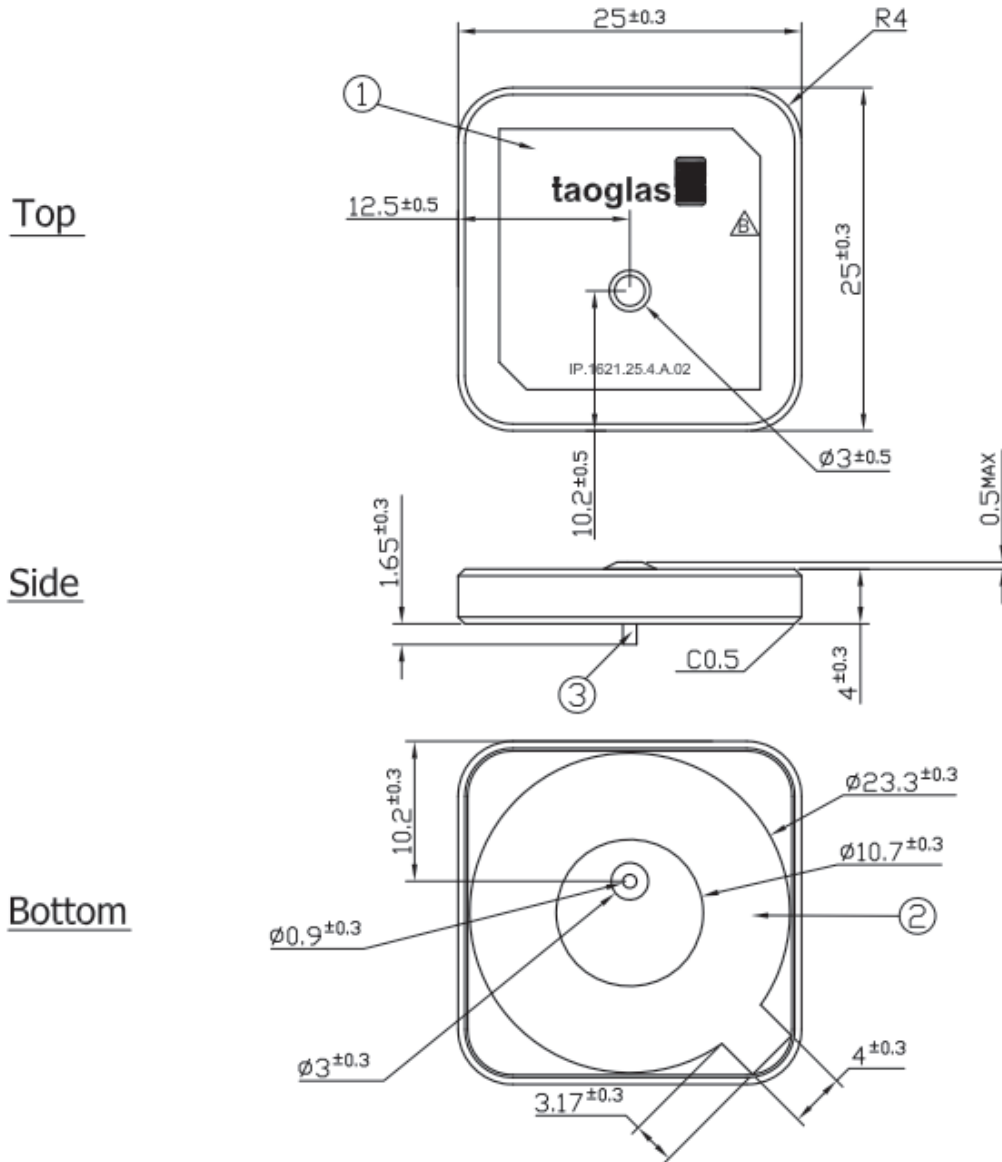
2. Key Antenna Performance Indicators

Original Patch Specification tested on 50*50mm ground plane

No	Parameter	Specification	Notes
1	Range of Receiving Frequency	1616~1626.5Mhz	
2	Center Frequency	1621MHz ±3MHz	with 50*50mm GND Plane
3	Bandwidth	16MHz	Return Loss ≤-10dB
4	VSWR	1.5 max	Center Frequency
5	Gain at Zenith	+2.0dBi typ.	Center Frequency
6	Gain at 10° Elevation	--	Center Frequency
7	Axial Ratio	3 dB Max	Center Frequency
8	Polarization	RHCP	
9	Impedance	50Ω	
10	Frequency Temp Coefficient (Tf)	0±20ppm/°C	-40°C to +85°C
11	Operating Temperature	-40°C to +85°C	
12	Antenna Weight	10g	

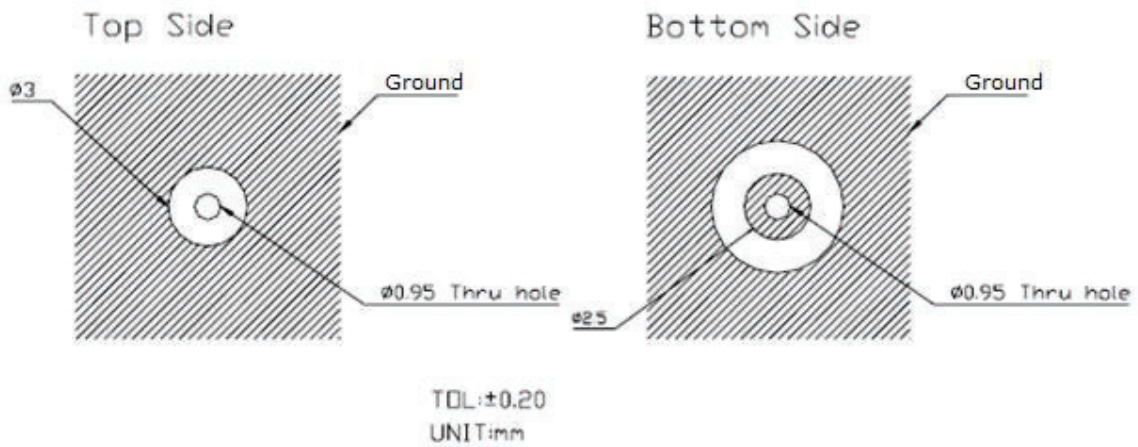
3. Mechanical Specifications

3.1 Shape and Dimension

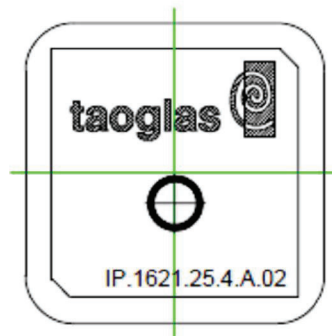


	Name	Material	Finish	QTY
1	IP.25A Iridium Patch (25x25x4mm)	Ceramic	Clear	1
2	Double sided Adhesive	NITTO 5015	White Liner	1
3	Pin	Brass	Tin Plated	1

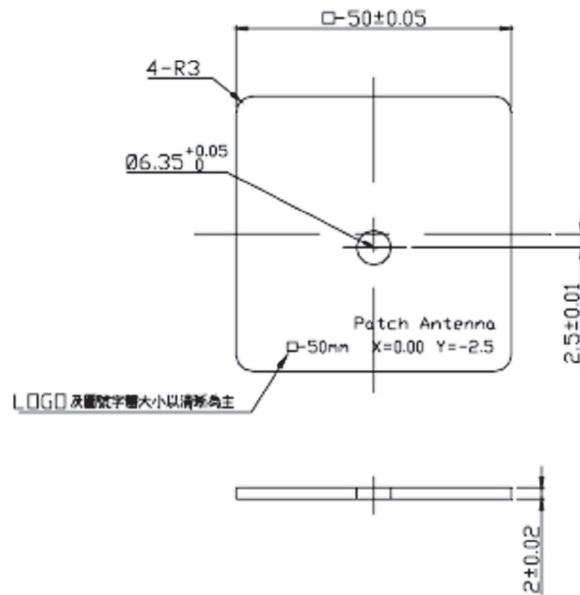
3.2 Layout



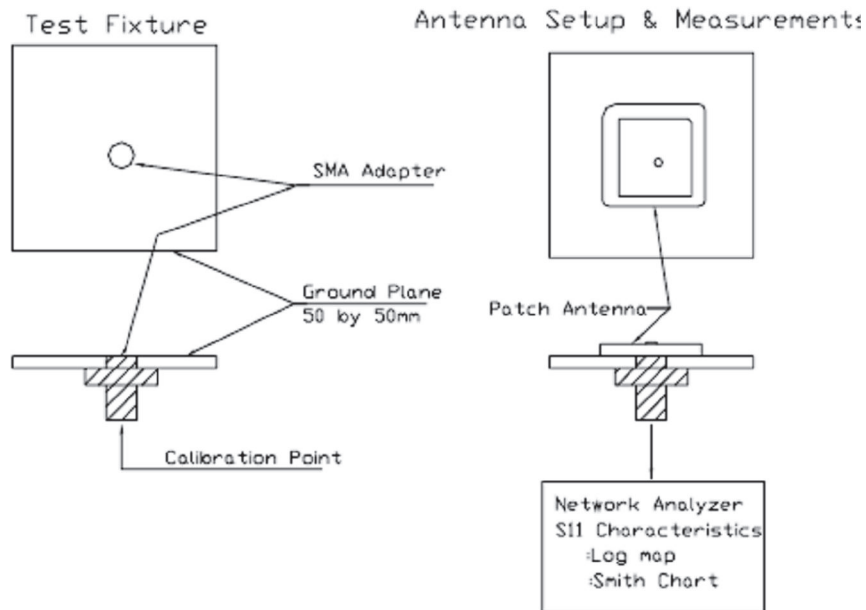
3.3 Mark



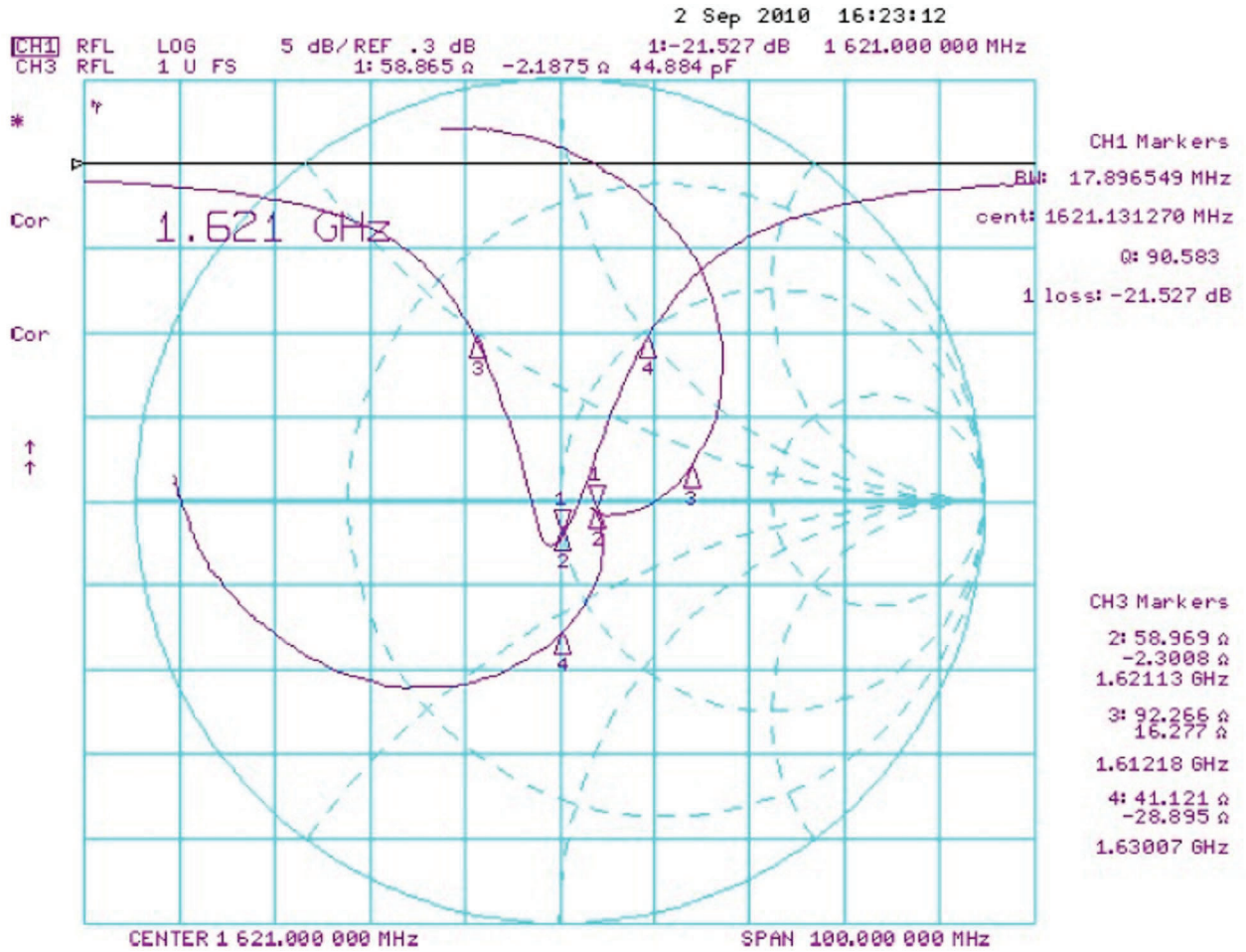
3.4 Test Jig and Dimensions



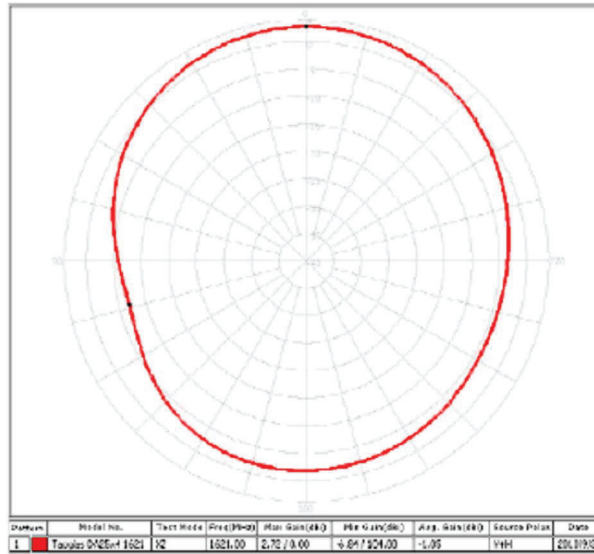
3.5 Test Fixture Antenna Setup and Measurements



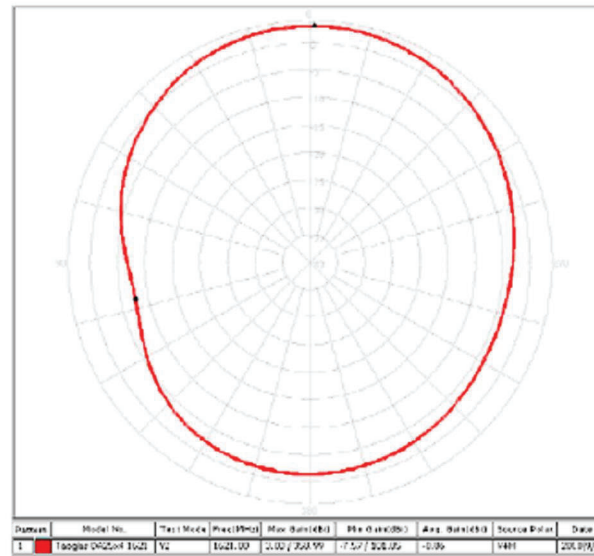
4. Performance testing and results



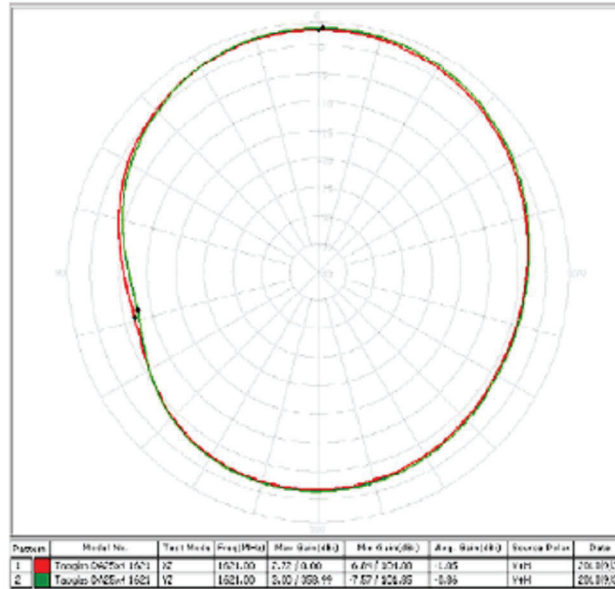
Antenna Gain Chart



XZ-Plane



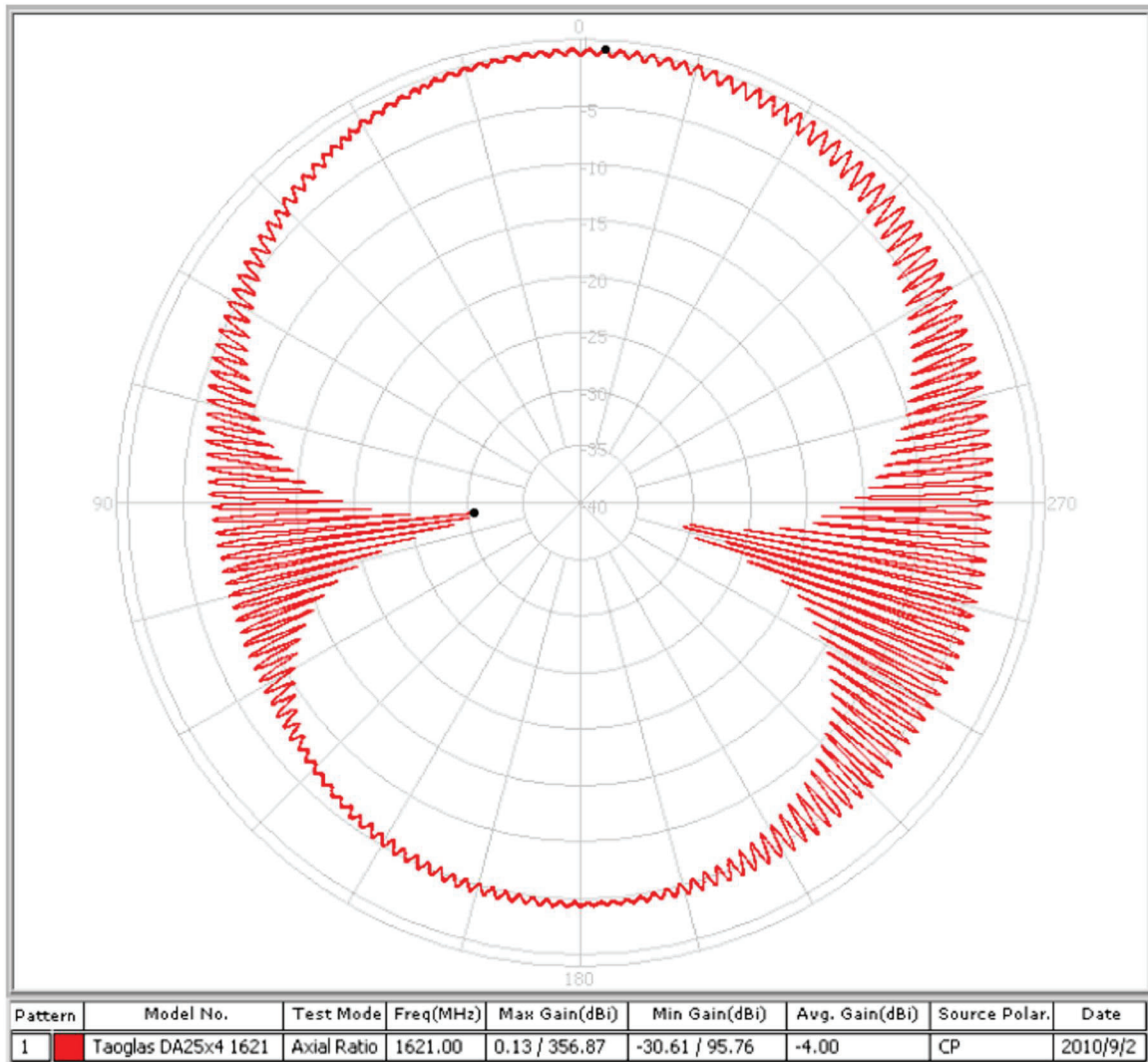
YZ-Plane



XZ+YZ-Plane

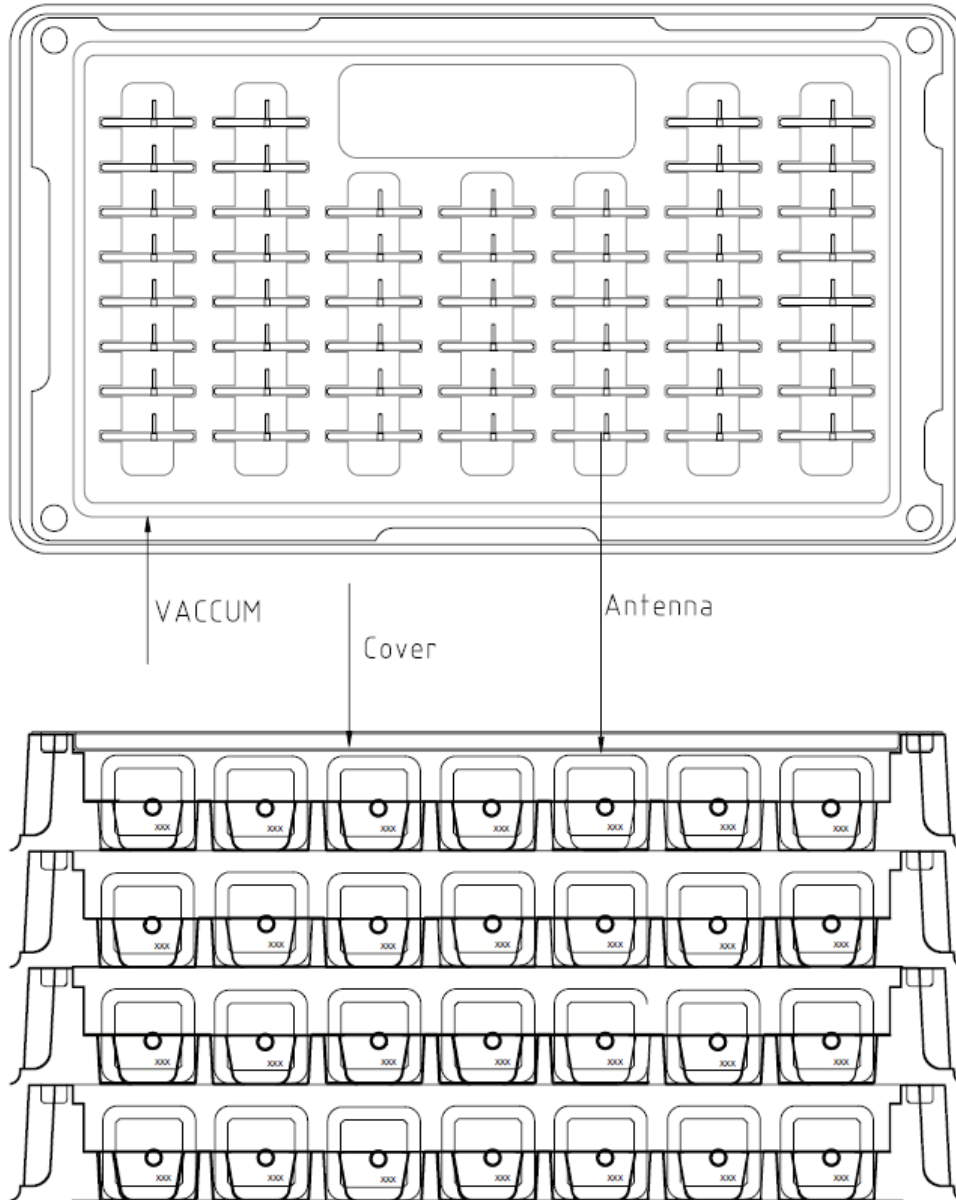
Plane	Max Gain(dBi)	Min Gain(dBi)	Avg. Gain(dBi)
XZ	2.72/1.00	-6.84/104	-1.05
YZ	3.00/358.99	-7.57/101.85	-0.86

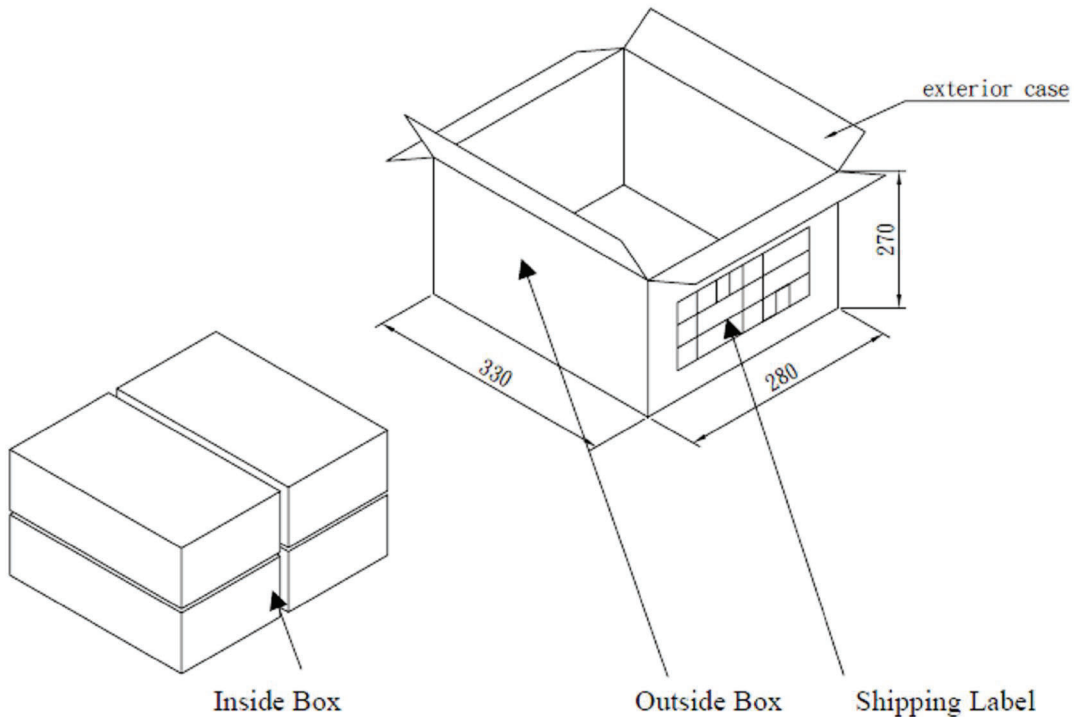
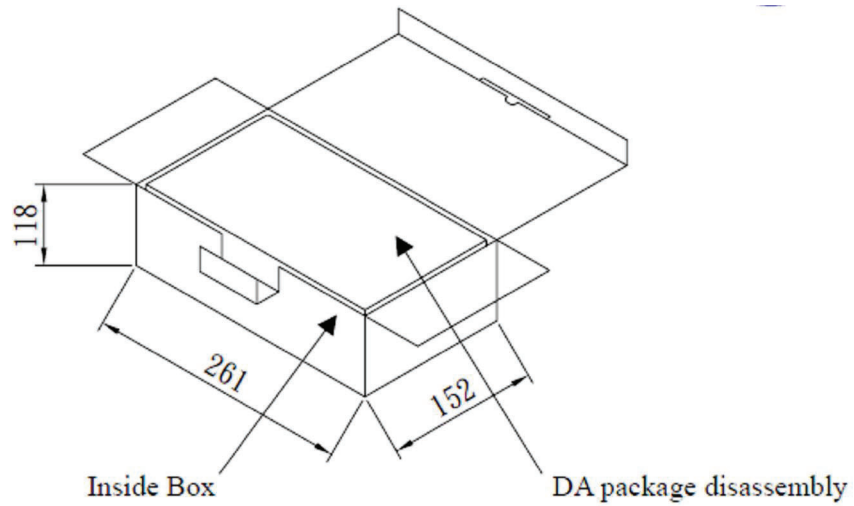
Axial Ratio



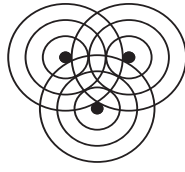
5. Packaging

- Per Tray: 50 pieces
- Per Carton(Inside Box) – 4 Trays = 200 pieces
- Outer Carton (Outside Box)– 4 Cartons = 800 pieces





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Murandi
Communications Ltd.
Innovative Radio Frequency Solutions

MLink Antenna Specification

Revision – Draft

Feb 10, 2014

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1 Revision History

Revision	Date	Description
Draft	Feb 10, 2014	Initial release

The details of each revision are captured in Revision Details Section 6.

2 Abbreviations

Abbreviation	Description
Attn	attenuator
BW	bandwidth
dB	decibel
dBc	decibel relative to carrier power
dBi	decibel relative to an isotropic antenna
dBm	decibel relative to 1 milliwatt
FCC	federal communications commission
FHSS	frequency hopping spread spectrum
GPS	global positioning system
IC	Industry Canada
ISM	industrial, scientific and medical
ISR	interrupt service routine
kHz	kilohertz
LCD	liquid crystal display
LED	light emitting diode
LNA	low noise amplifier
mA	milliampere
mcd	millicandle
MHz	mega-hertz
mm	millimeter
msec	millisecond
mV	millivolt
PA	power amplifier
PLL	phase locked loop
ppm	parts per million
RBW	resolution bandwidth
RF	radio frequency
RTC	Real time clock

Abbreviation	Description
TBC	to be confirmed
TBD	to be determined
TRP	total radiated power
μ A	microampere
TDD	Time division duplex
UART	universal asynchronous receiver/transmitter
V	volts
W	width

3 Reference Documents

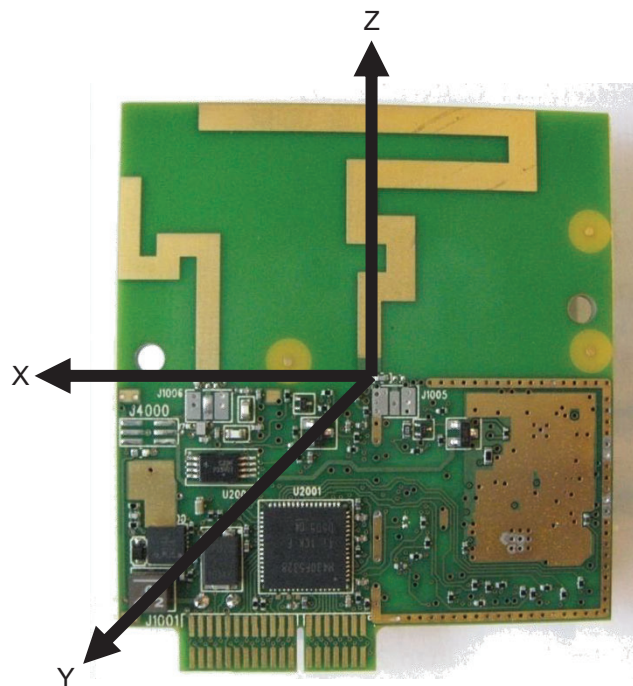
1. MLink Circuit Description – Draft, Feb 10, 2014
2. MLink Block Diagrams – Draft, Feb 10, 2014
3. Schematics (MLINK – Rev 3.pdf)
4. Bill of Materials (MLINK – Rev 3.bom)
5. Pictures (IMG_1673.jpg, IMG_1677.jpg, IMG_1680.jpg, IMG_1682.jpg, IMG_1684.jpg, & IMG_1695.jpg)

4 Introduction

This document contains Antenna Specifications for the Murandi Communications MLink 900 MHz transceiver as part of the FCC & IC submission.

5 Antenna Specification

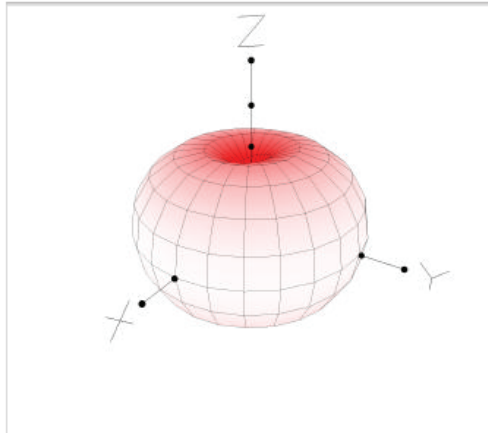
MLink 900 integral antenna performance was measured in the following orientation:



The following results obtained:



Total Radiated power: -0.41 dBm
Efficiency -0.11 dB

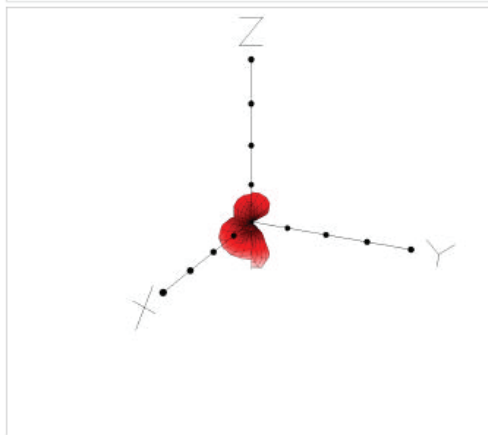


Vertical Polarization

Vert. Component: -0.43 dBm

Peak Gain: 2.14 dBi

Theta 90, Phi 285



Horizontal Polarization

Horz. Component: -23.26 dBm

Peak Gain: -14.22 dBi

Theta 165, Phi 75

File Name: MLink 65558 33pF 915MHz with 2AA cells extender

Tx Power: -0.30 dBm Estimated

Frequency: 915.50 MHz

Cable Attenuation: 1.45 dB

Notes:

Fri, Nov 15, 2013 12:29 PM

Receive Antenna Gain: 1.65 dBi

Separation: 1.20 m

The peak antenna gain is 2.4 dBi in the vertical polarization.

6 Revisions

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