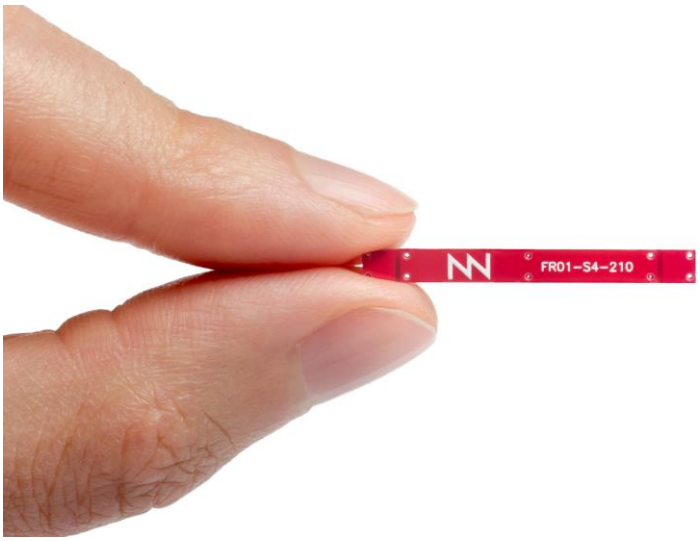
Mobile and GNSS in a single antenna package. Making your tracking device simpler.

- **Antenna Component:** TRIO mXTEND™ FR01-S4-210
- **Dimensions:** 30.0 mm x 3.0 mm x 1.0 mm
- **Frequency regions:** 824-960 MHz, 1710-2170 MHz, 1561 MHz, 1575 MHz & 1598-1606 MHz



We know your global tracking device needs to be as small and simple as possible. Therefore, we have developed an off-the-shelf chip antenna component that integrates both mobile and GNSS connectivity. One chip, two independent radio ports. One component, yet two functions to keep your device basic and compact. No more concerns on **lack of space** and the **double cost** of integrating two different antennas into one device. **TRIO mXTEND™** blends two antennas into one: the antenna component that **enables GNSS and Mobile connectivity simultaneously through a single antenna package.**

Moreover, because TRIO mXTEND is slim and small, it will fit all your present and future generations of tracking devices. Forget about having too many antenna choices, just select TRIO mXTEND™. This chip antenna is an off-the-shelf piece, no part customization is needed and even better, it works in multiple frequency regions at the same time thanks to its **modular**, **multiband** and **multi-port** configuration.

The double functionality of this chip antenna component will save time, cost and could accelerate time to market to all those applications requiring this dual relation, as for example **fleet management**, **automotive** or **IoT**, the new generation of “connected things”.

TRIO mXTEND™, the newest member of the Virtual Antenna™ (antenna less) family, is presented in an **ultra slim, off the shelf component of only 1.0 mm height** and could be easily assembled into virtually any mobile or IoT device.

TABLE OF CONTENTS

1. PRODUCT DESCRIPTION FR01-S4-210 3
2. EVALUATION BOARD (824-960MHz, 1710-2170MHz and 1561MHz, 1575MHz, and 1598-1606MHz) 4
2.1. QUICK REFERENCE GUIDE 4
2.2. EVALUATION BOARD (824-960 MHz, 1710-2170 MHz and 1561 MHz, 1575 MHZ, and 1598-1606 MHz) 5
2.3. MATCHING NETWORK 6
2.4. VSWR AND TOTAL EFFICIENCY 8
2.5. RADIATION PATTERNS (824 – 960 MHz), GAIN AND EFFICIENCY 10
2.6. RADIATION PATTERNS (1710 – 2170 MHz), GAIN AND EFFICIENCY 11
2.7. RADIATION PATTERNS (1561 MHz, 1575 MHz, 1598 - 1606 MHz), GAIN AND EFFICIENCY 12

1. PRODUCT DESCRIPTION FR01-S4-210

The TRIO mXTEND™ chip antenna component has been specifically designed for providing the major level of flexibility to operate at any required frequency band inside any wireless device and enables the antenna to work in different frequency bands at the same time.

TRIO mXTEND™ chip antenna component covers among many others, the frequency bands used for operating at the Global Navigation Satellite Systems, GPS, Galileo, GLONASS and BeiDou while it covers worldwide 2G, 3G and 4G.

It offers the flexibility to be tuned at the frequency regions of interest through the proper adjustment of the matching network. This feature provides an important benefit since removes the need of including different antenna parts inside the same wireless device for operating different communication standards, thus reducing considerably the integration complexity while saving costs. The results gathered herein presents how the matching network should be configured for operating the main mobile communication standards of 2G, 3G, 4G and GNSS bands.

TOP

BOTTOM

Material: The TRIO mXTEND™ chip antenna component is built on glass epoxy substrate.

APPLICATIONS

- Handsets
- Smartphones
- Tablets
- Tracking systems
- Navigation Devices
- Smart Meters (Gas, Electricity, Water...)
- Digital Cameras
- Wearables
- Sensors (Parking, Speed control, Optics…)
- IoT Devices
- GPS/GLONASS/BeiDou Modules

BENEFITS

- High efficiency
- Small size
- Cost-effective
- Easy-to-use (pick and place)
- Multiband behaviour (worldwide standards)
- Off-the-Shelf Standard Product (no customization is required)

2. EVALUATION BOARD (824-960MHz, 1710-2170MHz and 1561MHz, 1575MHz, and 1598-1606MHz)

2.1. QUICK REFERENCE GUIDE

Technical features	824 – 960 MHz	1710 – 2170 MHz
Average Efficiency	> 55 %	> 60 %
Peak Gain	1.9 dBi	1.9 dBi
VSWR	< 3:1	
Radiation Pattern	Omnidirectional	
Polarization	Linear	
Weight (approx.)	0.25 g.	
Temperature	-40 to + 85 ºC	
Impedance	50 Ω	
Dimensions (L x W x H)	30.0 mm x 3.0 mm x 1.0 mm	

Table 1 – Technical features for the 2G/3G/4G bands. Measures from the Evaluation Board port #1. See Figure 1. Note that for obtaining comparable results, a ground plane length larger than 100 mm is recommended.

Technical features	1561 MHz	1575 MHz	1598 – 1606 MHz
Average Efficiency	> 40 %	> 40 %	> 40 %
Peak Gain	0.5 dBi	0.8 dBi	1.5 dBi
VSWR	< 3:1		
Radiation Pattern	Omnidirectional		
Polarization	Linear		
Weight (approx.)	0.25 g.		
Temperature	-40 to + 85 ºC		
Impedance	50 Ω		
Dimensions (L x W x H)	30.0 mm x 3.0 mm x 1.0 mm		

Table 2 – Technical Features for the GNSS bands (BeiDou, GPS, Galileo, and GLONASS). Measures from the Evaluation Board port #2. See **Figure** 1.

2.2. EVALUATION BOARD (824-960 MHz, 1710-2170 MHz and 1561 MHz, 1575 MHZ, and 1598-1606 MHz)

This Evaluation Board (part number: EB_FR01-S4-210-M-GNSS) integrates one TRIO mXTEND™ chip antenna component to provide operation from 824 to 960 MHz, 1710 to 2170 MHz through port #1, and 1561 MHz, 1575 MHz, and 1598 to 1606 MHz through port #2. Two UFL cable connects each input/output port to SMA connectors.

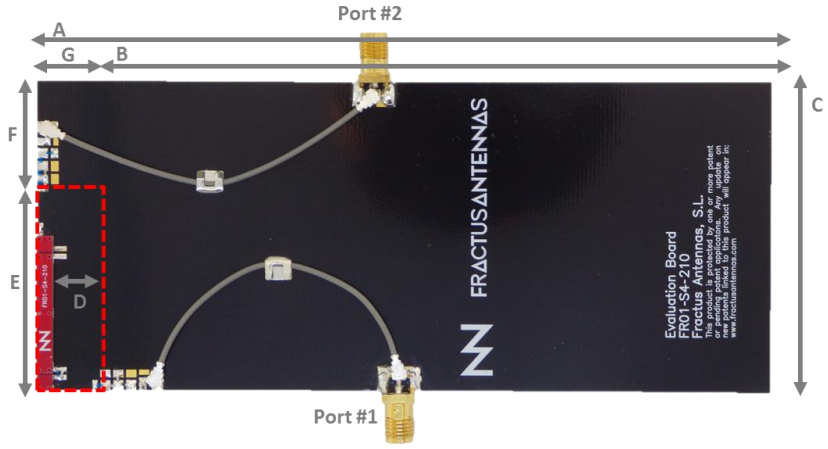


Figure 1 – EB_FR01-S4-210-M-GNSS. Evaluation Board for providing operation at 824 – 960MHz, 1710 – 2170MHz and 1561MHz, 1575MHz, and 1598 – 1606MHz.

Measure	mm
A	142
B	130
C	60
D	9
E	40
F	20
G	12

Tolerance: ±0.2 mm

Material: The Evaluation Board is built on FR4 substrate. Thickness is 1 mm.

Clearance Area: 40 mm x 12 mm (ExG)

This product and its use are protected by at least the following patents and/or patent applications US 62529032, US 62634943, EP 18158695. Additional information about patents related to this product is available at www.fractusantennas.com/virtual-antenna/.

2.3. MATCHING NETWORK

The specs of a Fractus Antennas standard product are measured in their Evaluation Board, which is an ideal case. In a real design, components nearby the antenna, LCD's, batteries, covers, connectors, etc. affect the antenna performance. This is the reason why it is highly recommended placing pads compatible with 0402 and 0603 SMD components for a matching network as close as possible to the feeding point. Do it in the ground plane area, not in the clearance area. This provides a degree of freedom to tune the TRIO mXTEND™ chip antenna component once the design is finished and taking into account all elements of the system (batteries, displays, covers, etc.).

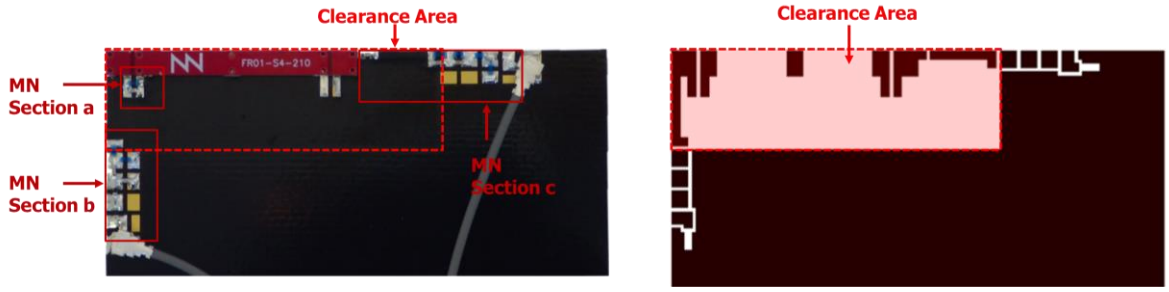
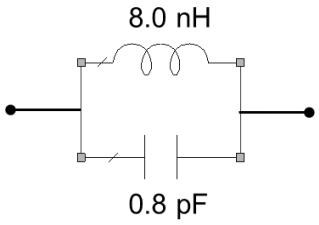


Figure 2 – Matching network distribution

Please notice that different devices with different ground planes and different components nearby the TRIO mXTEND™ chip antenna component may need a different matching network. To ensure optimal results, the use of high Q and tight tolerance components is highly recommended (Murata components).

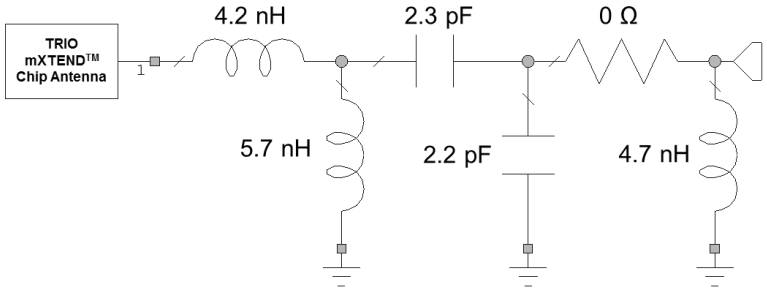
824 MHz – 960 MHz and 1710 MHz – 2170 MHz

MN Section a



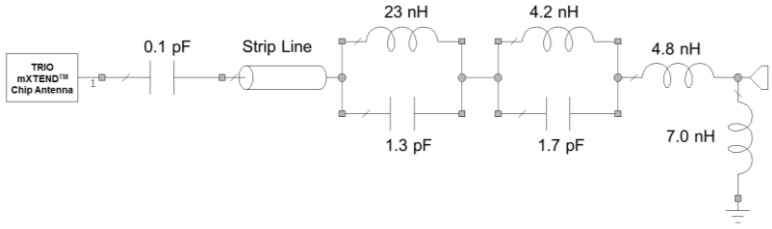
Value	Part Number
8.0 nH	LQW15AN8N0G80
0.8 pF	GJM1555C1HR80WB01

MN Section b



Value	Part Number
4.2 nH	LQW15AN4N2G80
5.7 nH	LQW15AN5N7B80
2.3 pF	GJM1555C1H2R3WB01
2.2 pF	GJM1555C1H2R2WB01
0 Ω	
4.7 nH	LQW15AN4N7G80

Figure 3 – Matching network implemented in the Evaluation Board port #1 (Figure 1).

1561MHz, 1575 MHz and 1598MHz – 1606MHz		
MN **Section c**		

Value	Part Number
0.1 pF	GJM1555C1HR10WB01
23 nH	LQW18AN23NG80
1.3 pF	GJM1555C1H1R3WB01
4.2 nH	LQW15AN4N2G80
1.7 pF	GJM1555C1H1R7WB01
4.8 nH	LQW15AN4N8G80
7.0 nH	LQW15AN7N0G80

Figure 4 – Matching network implemented in the Evaluation Board port #2 (Figure 1).

This matching network applies to this Evaluation Board. Other configurations would require a matching network adjustment. Please contact support@fractusantennas.com for more information related to the matching network service for a chip antenna component.

2.4. VSWR AND TOTAL EFFICIENCY

VSWR (Voltage Standing Wave Ratio) and Total Efficiency versus Frequency (GHz).

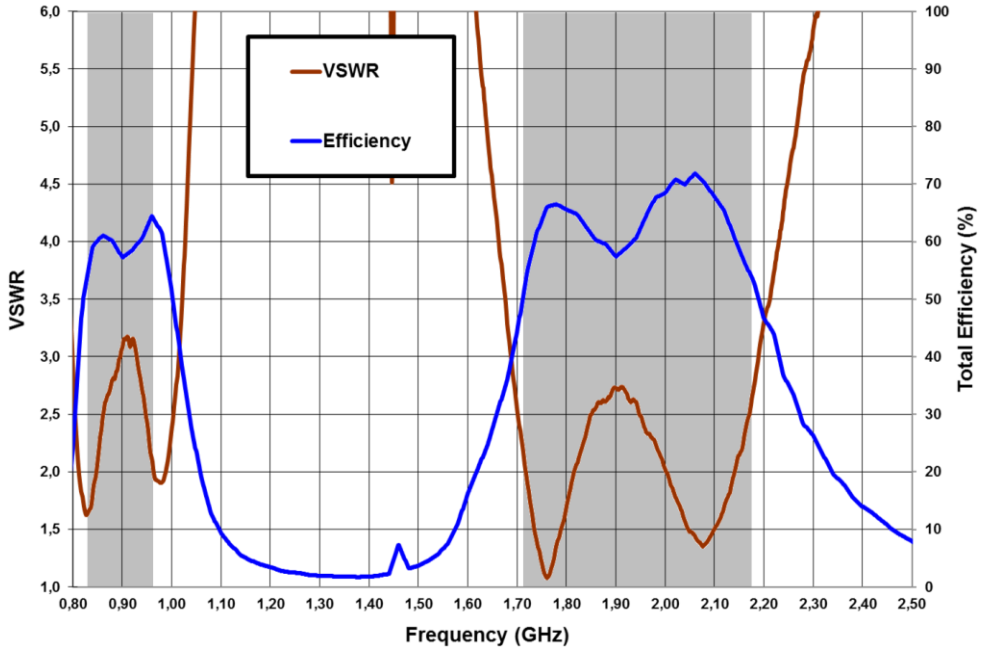


Figure 4 – VSWR and Total Efficiency for the 824 – 960 MHz frequency range and for the 1710 – 2170 MHz frequency range (from the Evaluation Board, port #1) (Figure 1).

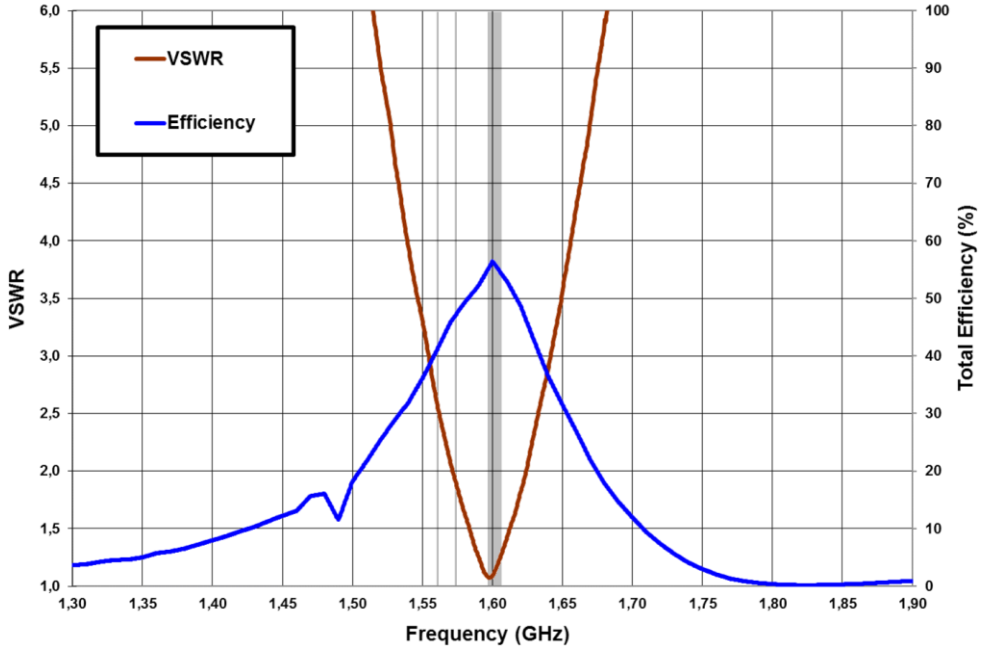


Figure 5 – VSWR and Total Efficiency for BeiDou E1 band (1561 MHz), GPS L1 band, Galileo E1 (1575 MHz), and GLONASS L1 band (1598 – 1606 MHz) (from the Evaluation Board, port #2) (Figure 1)

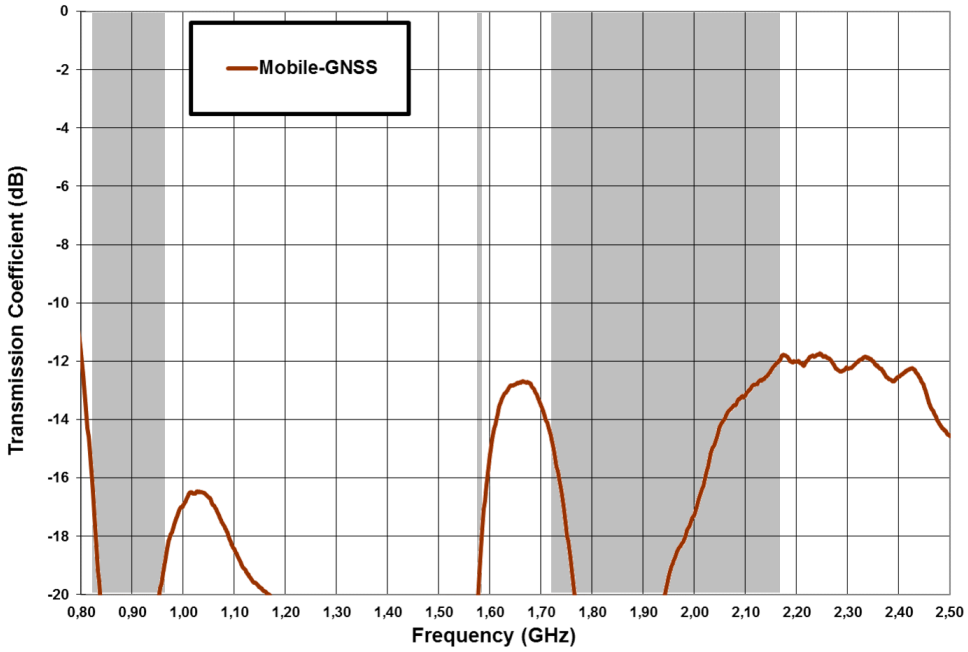
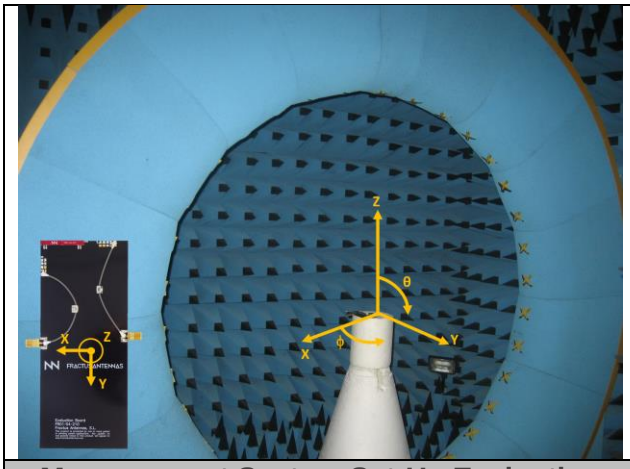
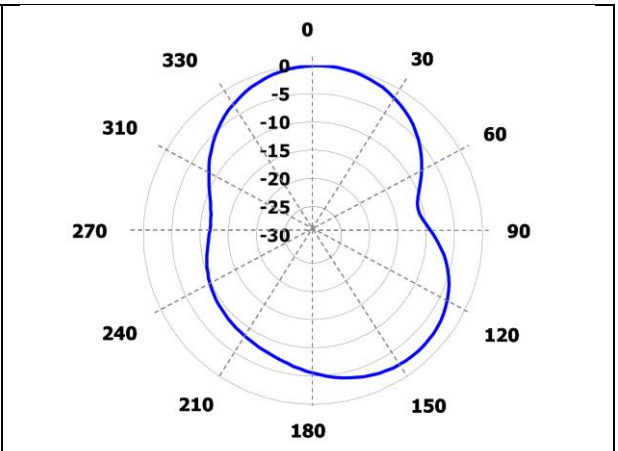


Figure 6 – Transmission coefficient between port #1 (824 – 960 MHz and 1710 – 2170 MHz) and port #2 (1561 – 1606 MHz) from the Evaluation Board (Figure 1)

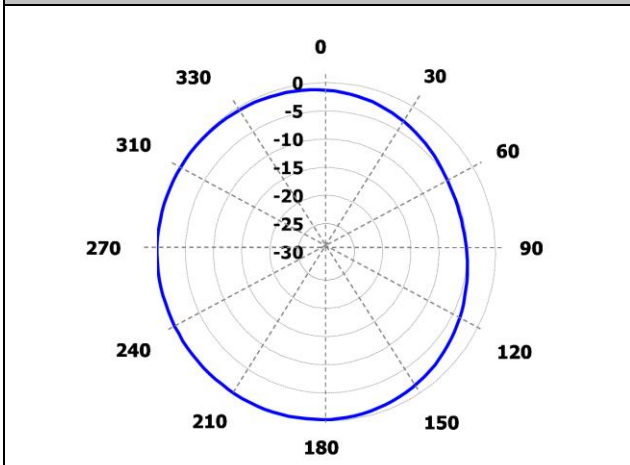
2.5. RADIATION PATTERNS (824 – 960 MHz), GAIN AND EFFICIENCY



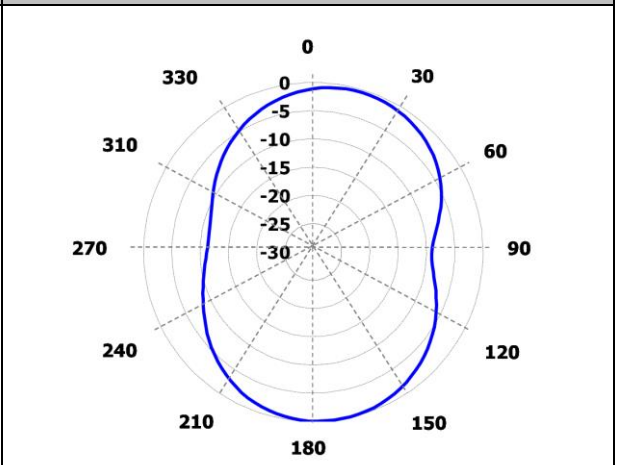
Measurement System Set-Up Evaluation Board in Plane XY



θ = 90º Plane XY at **890 MHz**



ϕ = 0º Plane XZ at **890 MHz**

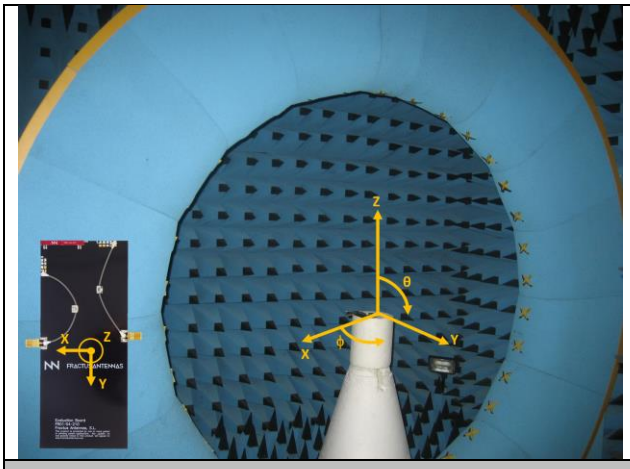


ϕ = 90º Plane YZ at **890 MHz**

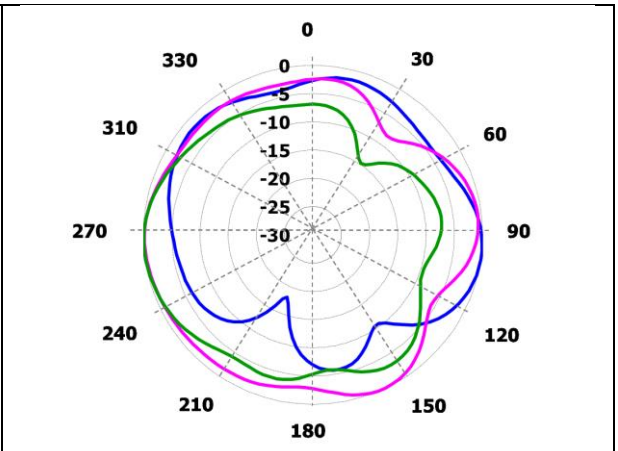
Gain	**Peak Gain**	1.9 dBi
	Average Gain across the band	1.1 dBi
	Gain Range across the band (min, max)	0.2 <–> 1.9 dBi
Efficiency	**Peak Efficiency**	64.5 %
	Average Efficiency across the band	59.4 %
	Efficiency Range across the band (min, max)	52.2 – 64.5 %

Table 3 - Antenna Gain and Total Efficiency from the Evaluation Board port #1 (Figure 1) within the 824 – 960 MHz frequency range. Measures made in the Satimo STARGATE 32 anechoic chamber.

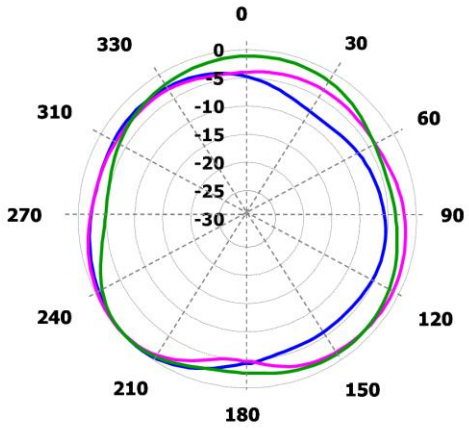
2.6. RADIATION PATTERNS (1710 – 2170 MHz), GAIN AND EFFICIENCY



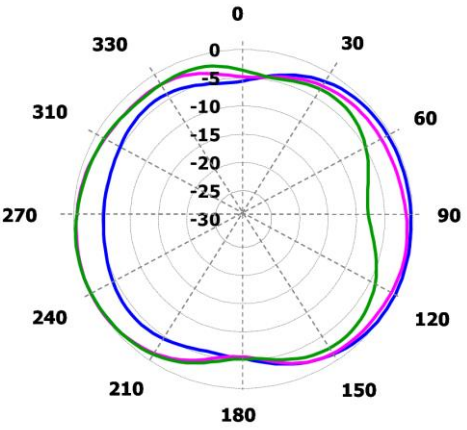
Measurement System Set-Up Evaluation Board in Plane XY



θ = 90º Plane XY at 1710 MHz, 1940 MHz and 2170 MHz



ϕ = 0º Plane XZ at 1710 MHz, 1940 MHz and 2170 MHz

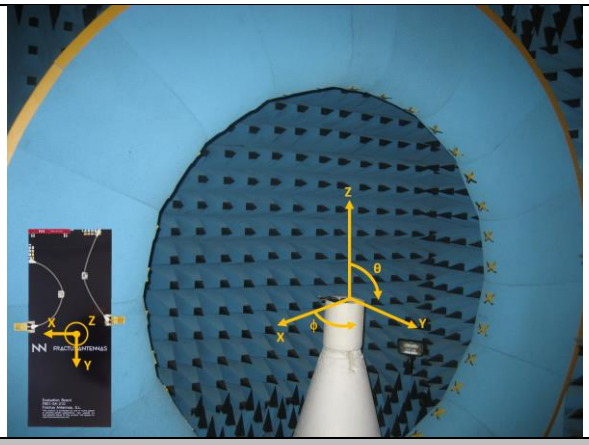


ϕ = 90º Plane YZ at 1710 MHz, 1940 MHz and 2170 MHz

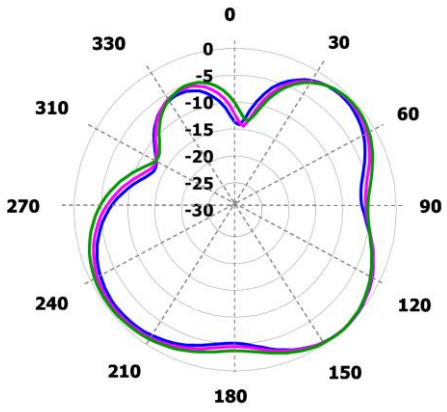
Gain	Peak Gain	1.9 dBi
	Average Gain across the band	0.9 dBi
	Gain Range across the band (min, max)	-0.2 <–> 1.9 dBi
Efficiency	Peak Efficiency	71.9 %
	Average Efficiency across the band	63.9 %
	Efficiency Range across the band (min, max)	49.7 – 71.9 %

Table 4 - Antenna Gain and Total Efficiency from the Evaluation Board port #1 (Figure 1) within the 1710 – 2170 MHz frequency range. Measures made in the Satimo STARGATE 32 anechoic chamber.

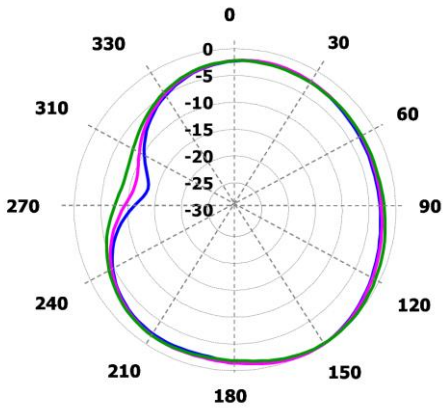
2.7. RADIATION PATTERNS (1561 MHz, 1575 MHz, 1598 - 1606 MHz), GAIN AND EFFICIENCY



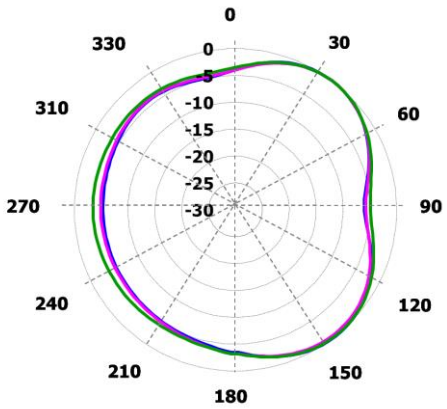
Measurement System Set-Up Evaluation Board in Plane XY



θ = 90º Plane XY at 1561 MHz, 1575 MHz and 1602 MHz



ϕ = 0º Plane XZ at 1561 MHz, 1575 MHz and 1602 MHz



ϕ = 90º Plane YZ at 1561 MHz, 1575 MHz and 1602 MHz

BeiDou	Gain	0.5 dBi	
	Efficiency	41.4%	
GPS Galileo	Gain	0.8 dBi	
	Efficiency	47.6 %	
GLONASS	Gain	Peak Gain	1.5 dBi
		Average Gain across the band	1.2 dBi
		Gain Range across the band (min, max)	0.8 <–> 1.5 dBi
	Efficiency	Peak Efficiency	56.4 %
		Average Efficiency across the band	55.5 %
		Efficiency Range across the band (min, max)	54.4 – 56.4 %

Table 5 - Antenna Gain and Total Efficiency from the evaluation board port #2 (Figure 1) for BeiDou E1 (1561 MHz), GPS L1, Galileo E1 (1575 MHz), and GLONASS L1 (1598 – 1606 MHz) bands. Measures made in the Satimo STARGATE 32 anechoic chamber.

The TRIO mXTEND™ chip antenna component belongs to a new generation of antenna solutions based on the Virtual Antenna™ technology owned by Fractus Antennas. The technology is mainly focused on replacing conventional antenna solutions by miniature and standard components.

The TRIO mXTEND™ chip antenna component and other Fractus Antennas products based on its proprietary Virtual Antenna™ technology are protected by one or more of the following Fractus Antennas patents.

Fractus Antennas is an ISO 9001:2015 certified company. All our antennas are lead-free and RoHS and REACH compliant.

Mouser Electronics

Authorized Distributor

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Ignion:
EB_FR01-S4-210-M-GNSS