

Top triple mobile coverage with the TRIO mXTEND™

- **Antenna Component:** TRIO mXTEND™ FR01-S4-210
- **Dimensions:** 30.0 mm x 3.0 mm x 1.0 mm
- **Frequency regions:** 698-960 MHz, 1710-2690 MHz and 3400-3800 MHz



5G goes beyond the connection of people as the industry is now connecting things. The new generation of mobile communication technology goes even further as technology is now **connecting everything**. 5G has to take on the challenge given by the upcoming wireless market that requires all types of mobile communications standards and a high level of adaptability to many different multiband wireless devices.

The new TRIO mXTEND™ is a **modular, multiband** and **multi-port** antenna that has been designed for providing **top quality mobile** operation at **3G, 4G** and **5G** in three frequency regions: 698-960 MHz, 1710-2690 MHz and 3400-3800 MHz. This triple mobile coverage of the TRIO mXTEND™ is presented in an **ultra slim, off the shelf component of only 1.0 mm height**. This enables TRIO mXTEND™ to be assembled into virtually any mobile or IoT device.

TRIO mXTEND™ is **fully reconfigurable**, being adaptable to any mobile standard requirement thanks to its modular and multi-port nature that allows the operation at 3G, 4G and 5G at the same time and also the possibility of having other operation architectures depending of the service and application needed. The same component is able, for example, to cover 3G, 4G and 5G simultaneously but also to tune only a full top 5G frequency bands coverage.

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](#).

All information contained within this document is property of Fractus Antennas and is subject to change without prior notice. Information is provided “as is” and without warranties. It is prohibited to copy or reproduce this information without prior approval.

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



TABLE OF CONTENTS

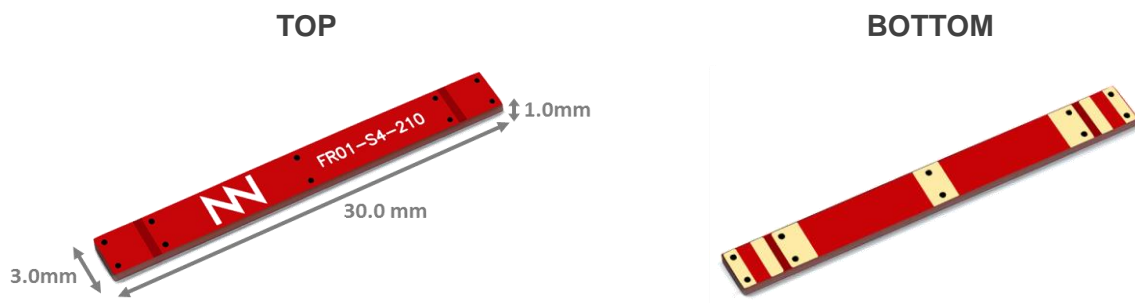
1.	PRODUCT DESCRIPTION FR01-S4-210	3
2.	EVALUATION BOARD (698-960MHz, 1710-2690MHz and 3400-3800MHz).....	4
2.1.	QUICK REFERENCE GUIDE	4
2.2.	EVALUATION BOARD (698-960 MHz, 1710-2690 MHz and 3400-3800 MHz)	4
2.3.	MATCHING NETWORK.....	5
2.4.	VSWR AND TOTAL EFFICIENCY	6
2.5.	RADIATION PATTERNS (698 – 960 MHz), GAIN AND EFFICIENCY	8
2.6.	RADIATION PATTERNS (1710 –2690 MHz), GAIN AND EFFICIENCY	9
2.7.	RADIATION PATTERNS (3400 –3800 MHz), GAIN AND EFFICIENCY	10



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 any required frequency band inside any wireless device. TRIO mXTEND™ chip antenna component is capable of operating the main mobile communication standards, enabling worldwide 3G, 4G and 5G coverage, such as GSM850, GSM900, GSM1800/DCS, GSM1900/PCS, UMTS, LTE700, LTE800, LTE850, LTE900, LTE1700, LTE1800, LTE1900, LTE2000, LTE2100, LTE2300, LTE2500, and LTE2600, (698-960MHz and 1710-2690MHz) and 5G (3400-3800MHz), through the same antenna component.

The TRIO mXTEND™ chip antenna component offers the flexibility to be tuned at the frequency regions of interest through the proper adjustment of the matching network. This characteristic 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 3G, 4G and 5G.



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

APPLICATIONS

- Handsets
- Smartphones
- Tablets
- Laptop PCs
- Smart Meters
- IoT Devices
- Modules
- Routers

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)

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.

2. EVALUATION BOARD (698-960MHz, 1710-2690MHz and 3400-3800MHz)

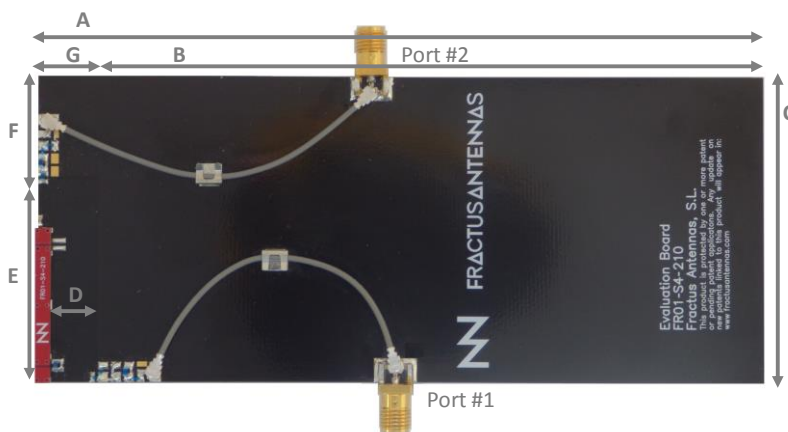
2.1. QUICK REFERENCE GUIDE

Technical features	698 – 960 MHz	1710 – 2690 MHz	3400 – 3800 MHz
Average Efficiency	> 50 %	> 70 %	> 65 %
Peak Gain	1.2 dBi	4.1 dBi	3.7 dBi
VSWR	< 3:1		
Radiation Pattern	Omnidirectional		
Polarization	Linear		
Weight (approx.)	0.25 g.		
Temperature	-40 to + 85 °C		
Impedance	50 Ω		
Dimensions (L x W x H)	30.0 mm x 3.0 mm x 1.0 mm		

Table 1 – Technical features. Measures from the Evaluation Board. See Figure 1. Note that for obtaining comparable results, a ground plane length larger than 100 mm is recommended.

2.2. EVALUATION BOARD (698-960 MHz, 1710-2690 MHz and 3400-3800 MHz)

This Evaluation Board (part number: EB_FR01-S4-210-M-5G) integrates one TRIO mXTEND™ chip antenna component to provide operation from 698 to 960 MHz, 1710 to 2690 MHz at port #1, and 3400 to 3800 MHz at port #2. Two UFL cable connects each input/output port to SMA connectors.



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

Tolerance: ±0.2 mm

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

Clearance Area: 40 mm x 12 mm (ExG)

Figure 1 – EB_FR01-S4-210-M-5G. Evaluation Board for providing operation at 698 – 960MHz, 1710 – 2690MHz and 3400 – 3800MHz.

This product and its use are protected by at least one or more of the following [patents and patent applications](#) PAT. US 62/529032; and other domestic and international patents pending. 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, 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.).

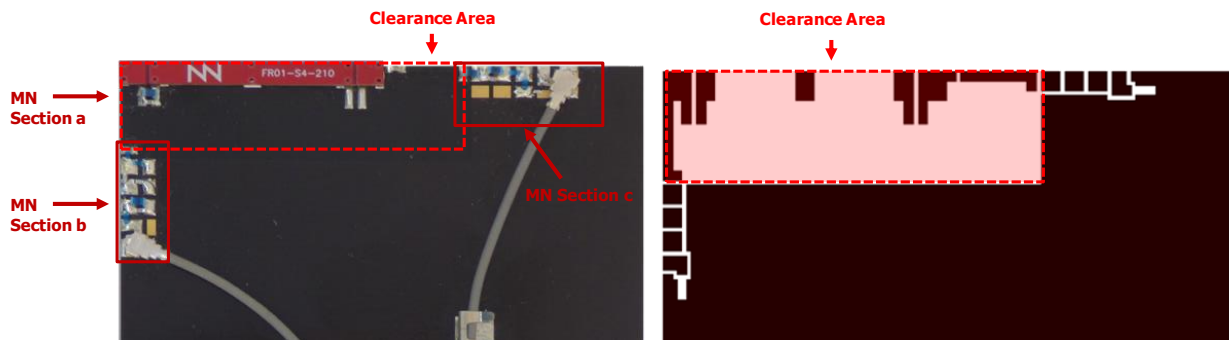


Figure 2 – Matching network distribution

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).

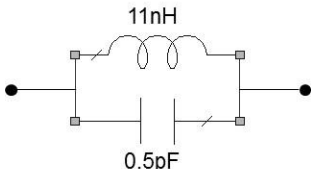
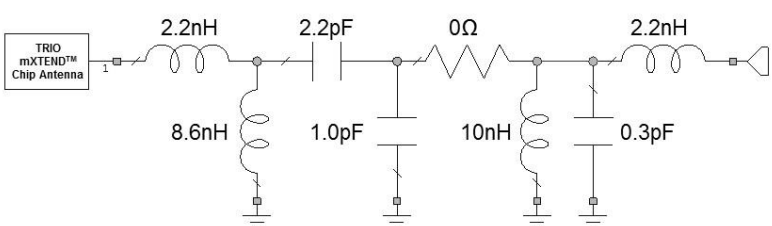
698 MHz – 960 MHz and 1710 MHz – 2690 MHz																	
MN Section a	<div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Value</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>11 nH</td> <td>LQW18AN11NG80</td> </tr> <tr> <td>0.5 pF</td> <td>GJM1555C1HR5WB01</td> </tr> </tbody> </table> </div>	Value	Part Number	11 nH	LQW18AN11NG80	0.5 pF	GJM1555C1HR5WB01										
Value	Part Number																
11 nH	LQW18AN11NG80																
0.5 pF	GJM1555C1HR5WB01																
MN Section b	<div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Value</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>2.2 nH</td> <td>LQW15AN2N2G80</td> </tr> <tr> <td>8.6 nH</td> <td>LQW15AN8N6G80</td> </tr> <tr> <td>2.2 pF</td> <td>GJM1555C1H2R2WB01</td> </tr> <tr> <td>1.0 pF</td> <td>GJM1555C1H1R0WB01</td> </tr> <tr> <td>10 nH</td> <td>LQW18AN10NG80</td> </tr> <tr> <td>0.3 pF</td> <td>GJM1555C1HR30WB01</td> </tr> <tr> <td>2.2 nH</td> <td>LQW15AN2N2G80</td> </tr> </tbody> </table> </div>	Value	Part Number	2.2 nH	LQW15AN2N2G80	8.6 nH	LQW15AN8N6G80	2.2 pF	GJM1555C1H2R2WB01	1.0 pF	GJM1555C1H1R0WB01	10 nH	LQW18AN10NG80	0.3 pF	GJM1555C1HR30WB01	2.2 nH	LQW15AN2N2G80
Value	Part Number																
2.2 nH	LQW15AN2N2G80																
8.6 nH	LQW15AN8N6G80																
2.2 pF	GJM1555C1H2R2WB01																
1.0 pF	GJM1555C1H1R0WB01																
10 nH	LQW18AN10NG80																
0.3 pF	GJM1555C1HR30WB01																
2.2 nH	LQW15AN2N2G80																

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

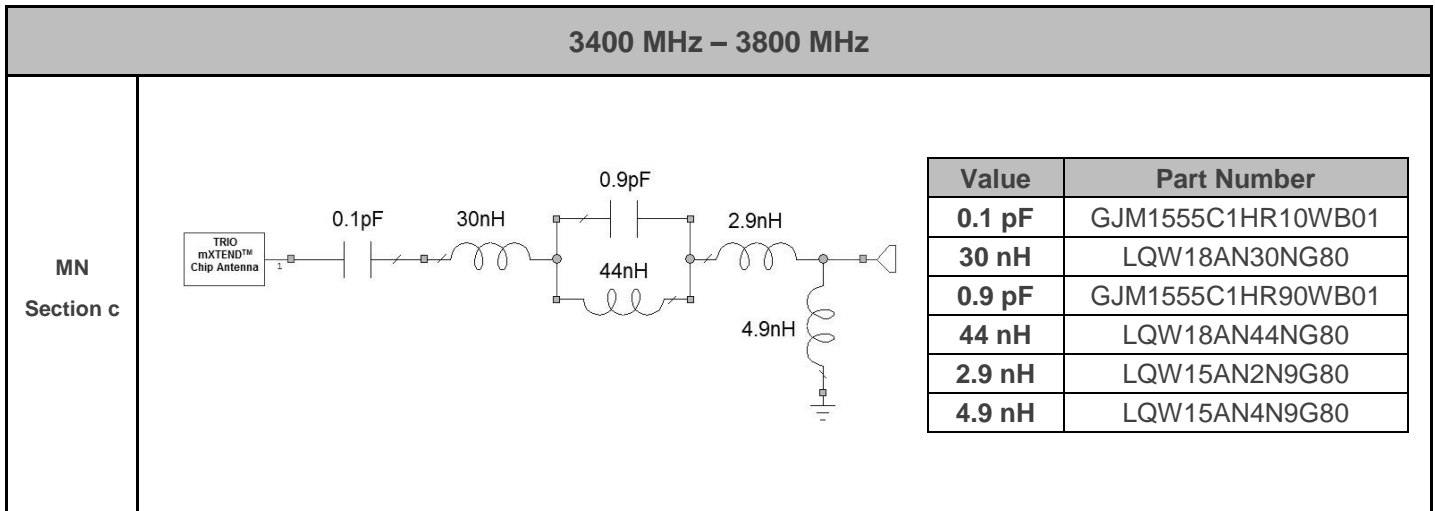


Figure 4 – Matching network implemented in the Evaluation Board port #2 (Figure 1).

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

2.4. VSWR AND TOTAL EFFICIENCY

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

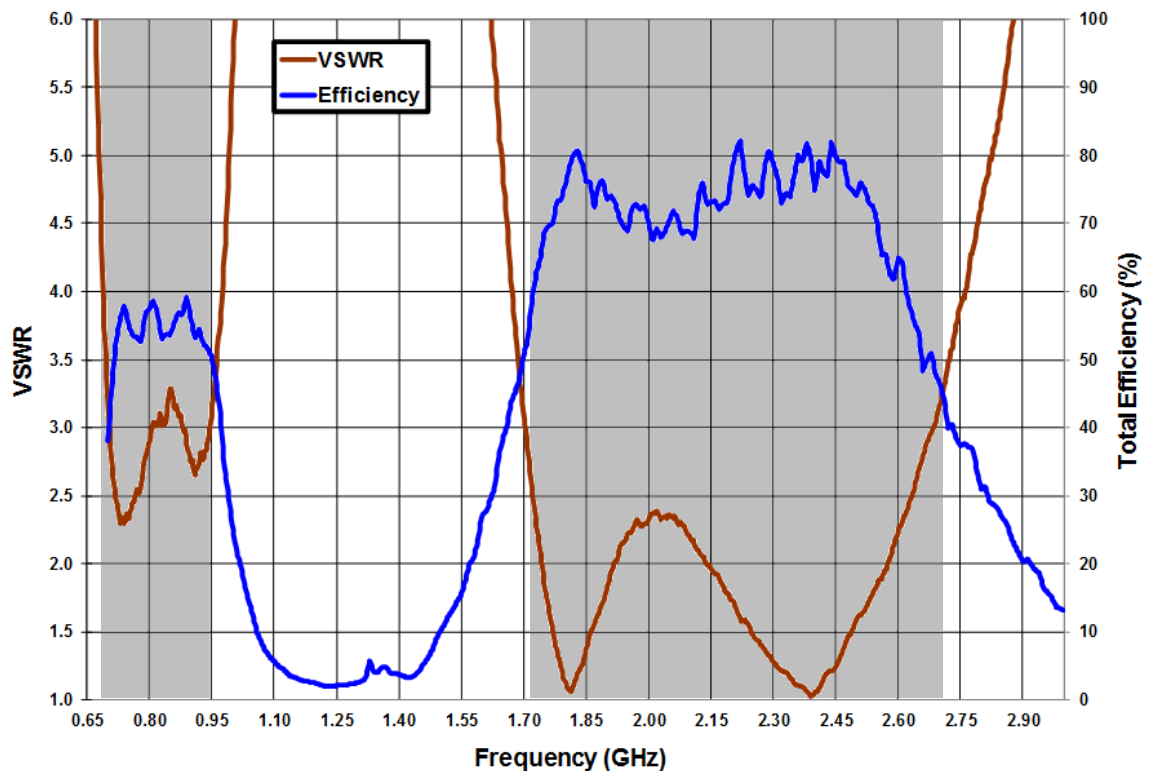


Figure 5 – VSWR and Total Efficiency for the 698 – 960 MHz frequency range and for the 1710 – 2690 MHz frequency range (from the Evaluation Board, port #1) (Figure 1).

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

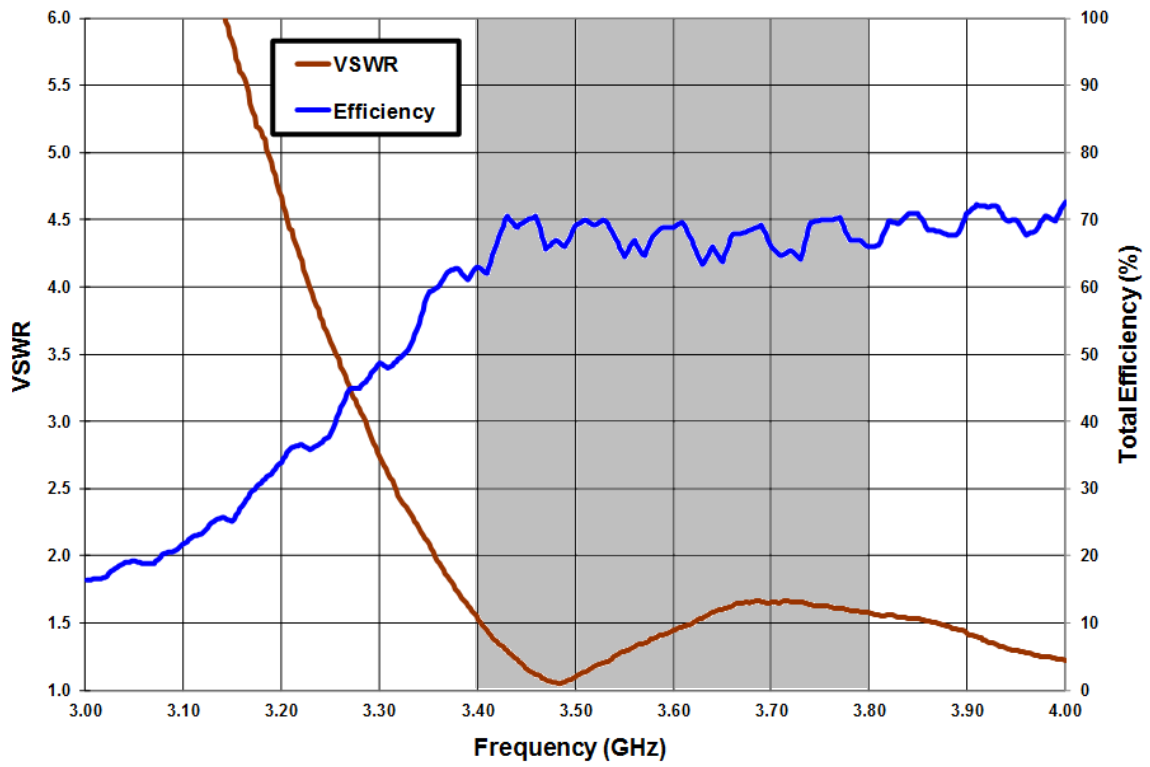
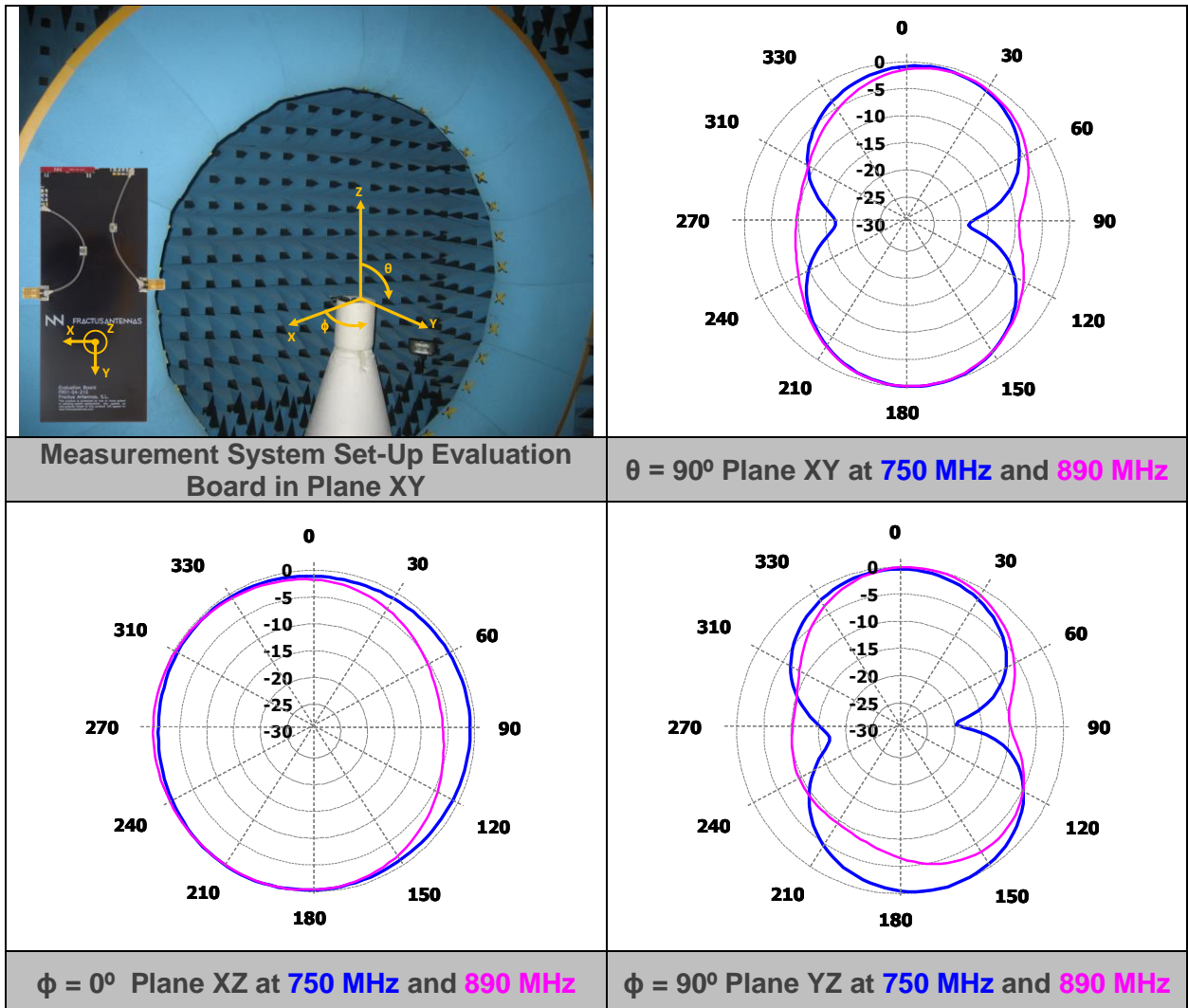


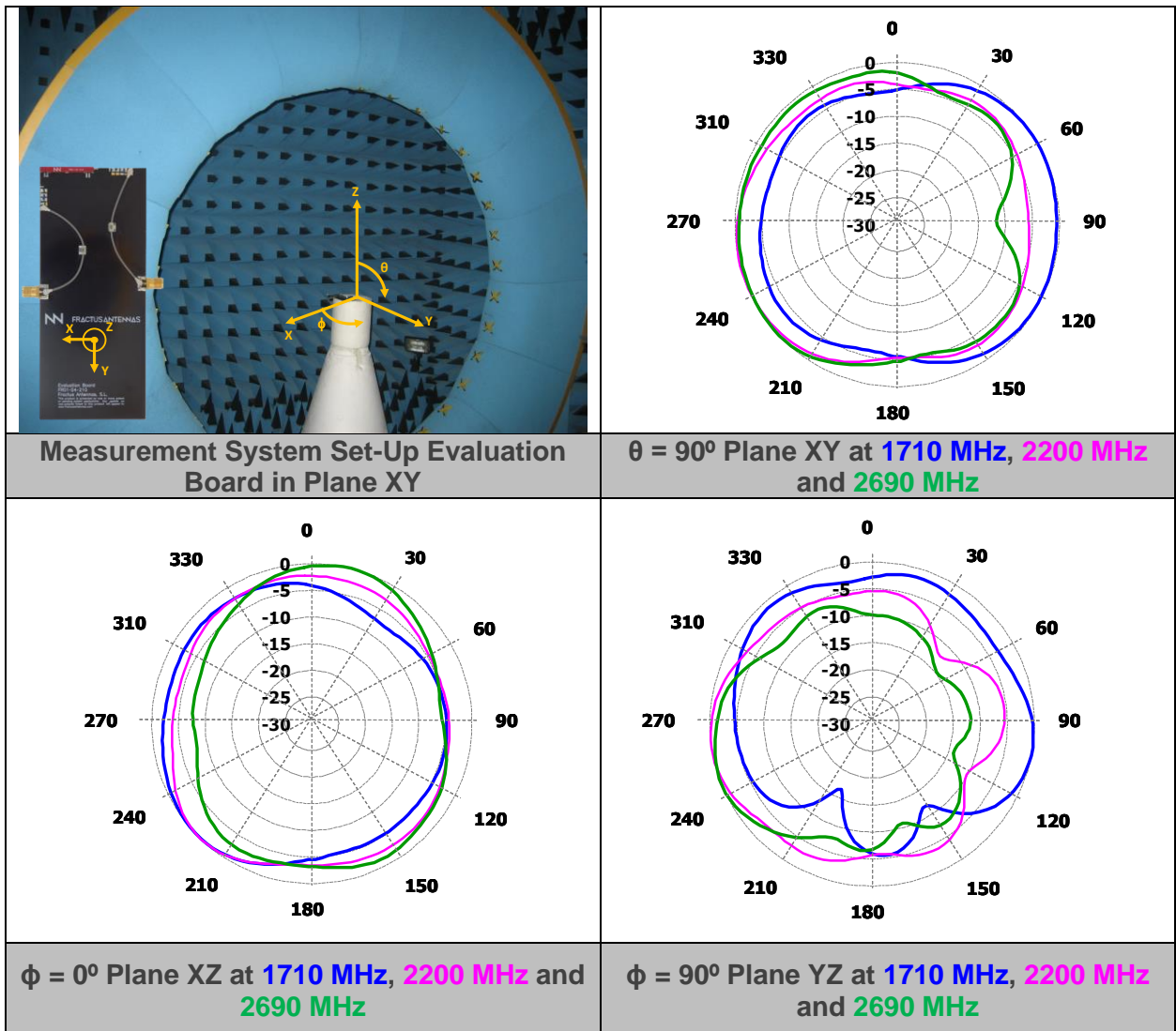
Figure 6 – VSWR and Total Efficiency for the 3400 – 3800 MHz frequency range (from the Evaluation Board, port #2) (Figure 1).

2.5. RADIATION PATTERNS (698 – 960 MHz), GAIN AND EFFICIENCY



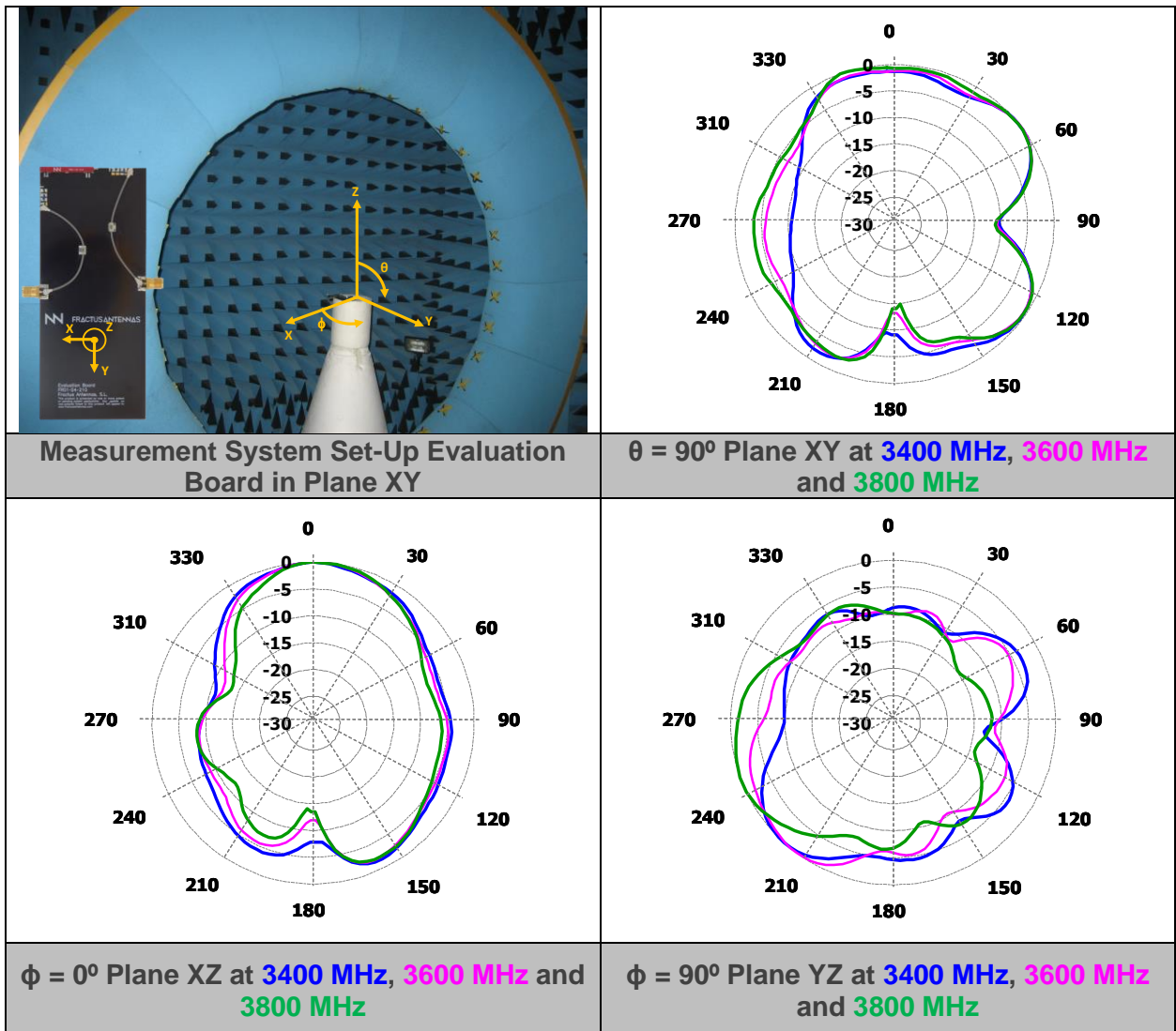
Gain	Peak Gain	1.2 dBi
	Average Gain across the band	0.6 dBi
	Gain Range across the band (min, max)	-1.1 <-> 1.2 dBi
Efficiency	Peak Efficiency	59.2 %
	Average Efficiency across the band	54.0 %
	Efficiency Range across the band (min, max)	38.1 – 59.2 %

2.6. RADIATION PATTERNS (1710 –2690 MHz), GAIN AND EFFICIENCY



Gain	Peak Gain	4.1 dBi
	Average Gain across the band	2.6 dBi
	Gain Range across the band (min, max)	0.7 <--> 4.1 dBi
Efficiency	Peak Efficiency	82.1 %
	Average Efficiency across the band	71.7 %
	Efficiency Range across the band (min, max)	48.0 – 82.1 %

2.7. RADIATION PATTERNS (3400 –3800 MHz), GAIN AND EFFICIENCY



Gain	Peak Gain	3.7 dBi
	Average Gain across the band	2.9 dBi
	Gain Range across the band (min, max)	2.4 <--> 3.7 dBi
Efficiency	Peak Efficiency	70.6 %
	Average Efficiency across the band	67.4 %
	Efficiency Range across the band (min, max)	62.0 – 70.6 %