RUN mXTEND^{TM} (FR01-S4-224) – AN for BLUETOOTH/WIFI 2400-2500 MHz

Fractus Antennas specializes in enabling effective mobile communications. Using Fractus Antennas technology, we design and manufacture optimized antennas to make your wireless devices more competitive. Our mission is to help our clients develop innovative products and accelerate their time to market through our expertise in antenna design, testing and manufacturing.

RUN mXTEND^{TM} Antenna Booster

FR01-S4-224

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

ISO 9001: 2015 Certified

TABLE OF CONTENTS

1.   PRODUCT DESCRIPTION FR01-S4-224

The RUN mXTEND™ Antenna Booster has been specifically designed for providing multiband performance in wireless devices (in particular in mobile devices), enabling worldwide coverage by allowing operation in the communication standards Bluetooth, ISM, WIFI, and WLAN.

TOP	BOTTOM

Material: The RUN mXTEND™ Antenna Booster is built on glass epoxy substrate.

APPLICATIONS	BENEFITS
• Handsets	• High efficiency
• Smartphones	• Small size
• Tablets	• Cost-effective
• Phablets	• Easy-to-use (pick and place)
• Laptop PCs	• Multiband behaviour (worldwide standards)
• Netbooks	• Off-the-Shelf Standard Product (no customization is required)
• Modules	
• Routers	
• eBook readers	

The RUN mXTEND™ Antenna Booster 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 BLUETOOTH

2.1.   QUICK REFERENCE GUIDE

Technical features	2.4 – 2.5 GHz
Average Efficiency	> 75 %
Peak Gain	4.2 dBi
VSWR	< 1.5:1
Radiation Pattern	Omnidirectional
Polarization	Linear
Weight (approx.)	0.19 g.
Temperature	-40 to + 85 ºC
Impedance	50 Ω
Dimensions (L x W x H)	12.0 mm x 3.0 mm x 2.4 mm

Table 1 – Technical Features. Measures from the Evaluation Board. See Figure 1.

2.2.   EVALUATION BOARD

This Evaluation Board EB_FR01-S4-224-2400 integrates a UFL cable to connect the RUN mXTEND™ Antenna Booster with the SMA connector. The RUN mXTEND™ provides operation in the frequency region which covers from 2.4 GHz to 2.5 GHz, through a single input/output port.
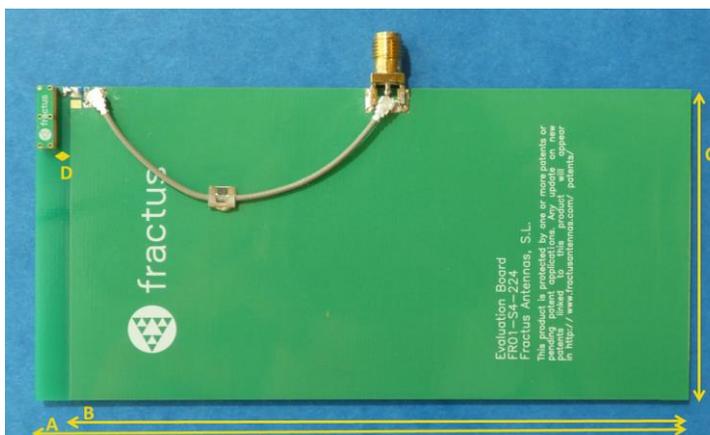
Measure	mm
A	126.5
B	120
C	60
D	2.5

Tolerance: ±0.2 mm

D: Distance between the RUN mXTEND™ Antenna Booster and the ground plane.

Material: The evaluation board is built on FR4 substrate. Thickness is 1 mm.

Figure 1 – EB_FR01-S4-224-2400. Evaluation Board providing operation from 2.4 GHz to 2.5 GHz.

This product and its use are protected by at least one or more of the following patent PAT. US 9,130,259 B2. 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 area, not in the clearance area. This provides a degree of freedom to tune the RUN mXTEND™ Antenna Booster once the design is finished and taking into account all elements of the system (batteries, displays, covers, etc.).

Please notice that different devices with different ground planes and different components nearby the RUN mXTEND™ Antenna Booster may need a different matching network. To ensure optimal results, the use of high Q and tight tolerance components is highly recommended (Murata components). Please, if you need assistance contact info@fractusantennas.com for more information related to the antenna booster matching service.
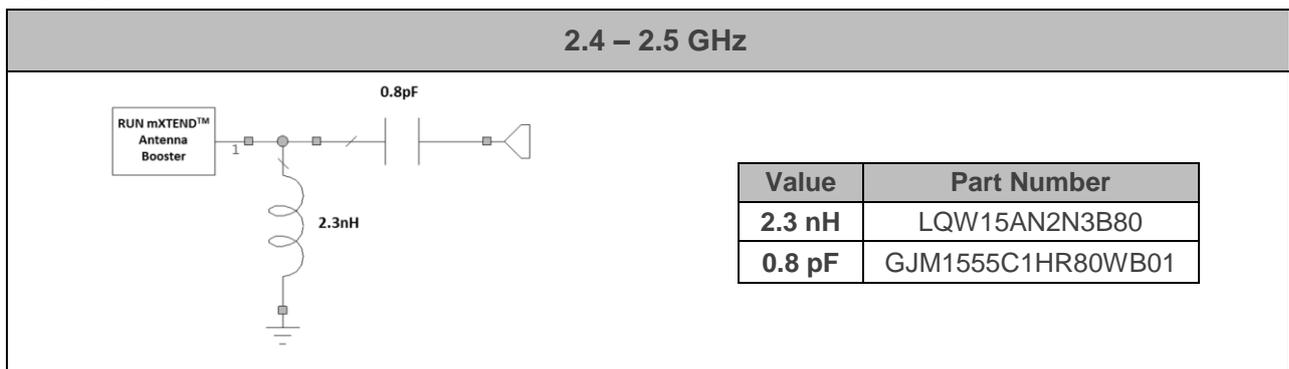

Value	Part Number
2.3 nH	LQW15AN2N3B80
0.8 pF	GJM1555C1HR80WB01

Figure 2 – Matching Network implemented in the evaluation board (Figure 1).

2.4. VSWR AND TOTAL EFFICIENCY

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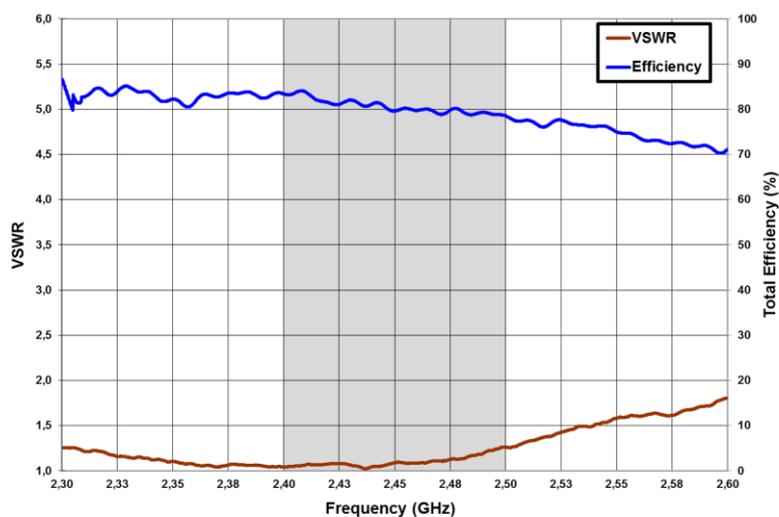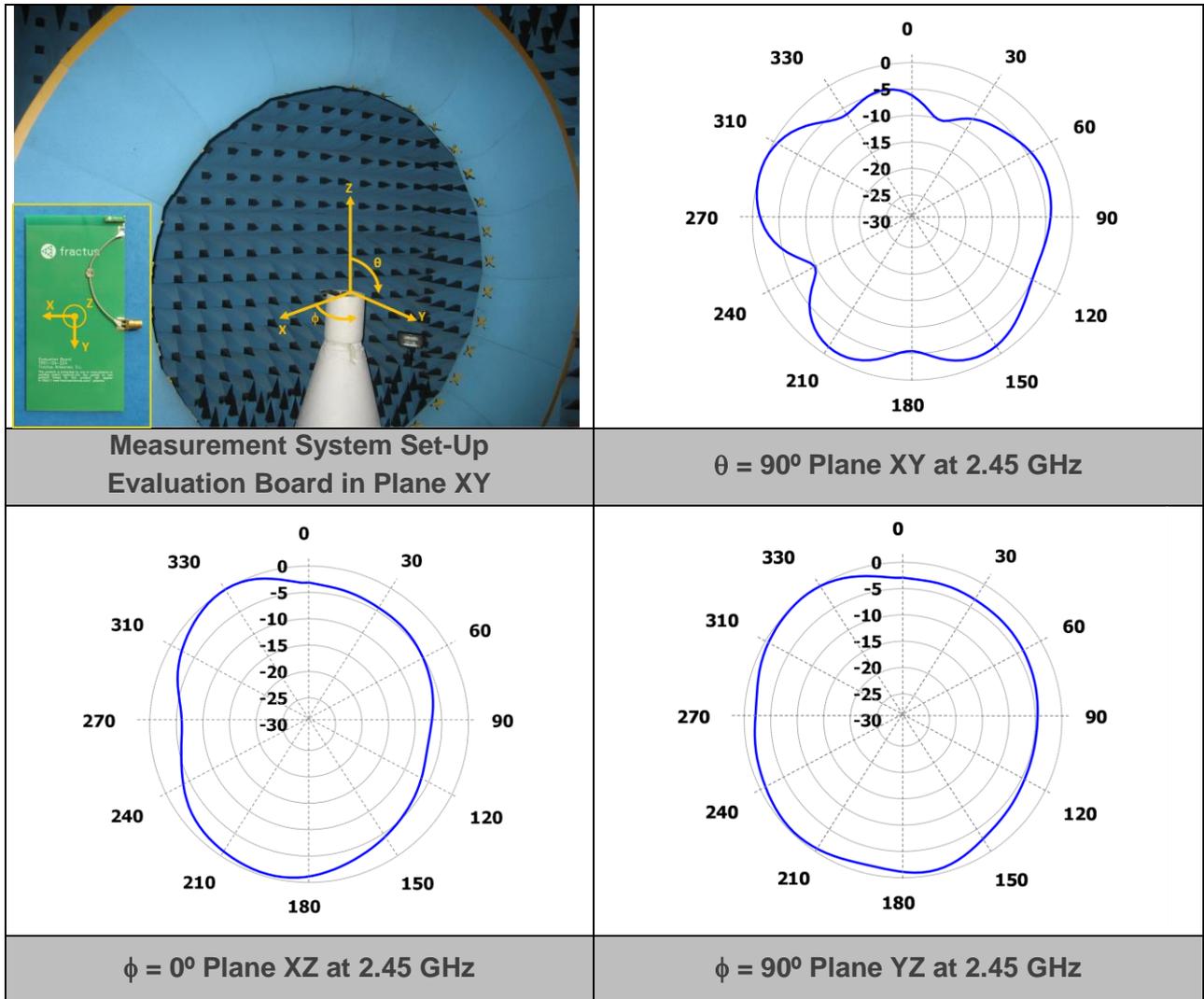

Figure 3 – VSWR and Total Efficiency for the 2.4 – 2.5 GHz frequency range (from the evaluation board (Figure 1)).

2.5. RADIATION PATTERNS (2.4-2.5 GHz), GAIN, AND EFFICIENCY

Measurement System Set-Up Evaluation Board in Plane XY	**θ = 90º Plane XY at 2.45 GHz**
ϕ = 0º Plane XZ at 2.45 GHz	**ϕ = 90º Plane YZ at 2.45 GHz**

Gain	**Peak Gain**	4.2 dBi
	Average Gain across the band	3.9 dBi
	Gain Range across the band (min, max)	3.6 <−> 4.2 dBi
Efficiency	**Peak Efficiency**	86.0 %
	Average Efficiency across the band	80.4 %
	Efficiency Range across the band (min, max)	75.7 – 86.0 %

Table 2 – Antenna Gain and Total Efficiency from the Evaluation Board (Figure 1) within the 2.4 – 2.5 GHz frequency range. Measures made in the Satimo STARGATE 32 anechoic chamber.

3. EVALUATION BOARD CR80 BLUETOOTH

3.1. QUICK REFERENCE GUIDE

Technical features	2.4 – 2.5 GHz
Average Efficiency	> 70 %
Peak Gain	3.0 dBi
VSWR	< 1.5:1
Radiation Pattern	Omnidirectional
Polarization	Linear
Weight (approx.)	0.19 g.
Temperature	-40 to + 85 ºC
Impedance	50 Ω
Dimensions (L x W x H)	12.0 mm x 3.0 mm x 2.4 mm

Table 3 – Technical Features. Measures from the Evaluation Board. See Figure 4.

3.2. EVALUATION BOARD

This Evaluation Board EB_FR01-S4-224-CR80-2400 integrates a UFL cable to connect the RUN mXTEND^{TM} Antenna Booster with the SMA connector. The RUN mXTEND^{TM} provides operation in the frequency region which covers from 2.4 GHz to 2.5 GHz, through a single input/output port.

Figure 4 – EB_FR01-S4-224-CR80-2400 in CR80 standard format. Evaluation Board providing operation from 2.4 GHz to 2.5 GHz.
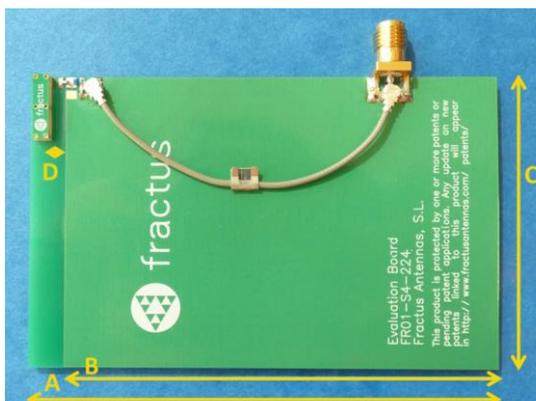
Measure	mm
A	86
B	79.5
C	54
D	2.5

Tolerance: ±0.2 mm

D: Distance between the RUN mXTEND^{TM} Antenna Booster and the ground plane.

Material: The evaluation board is built on FR4 substrate. Thickness is 1 mm.

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3.3. 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 RUN mXTEND™ Antenna Booster once the design is finished and taking into account all elements of the system (batteries, displays, covers, etc.).

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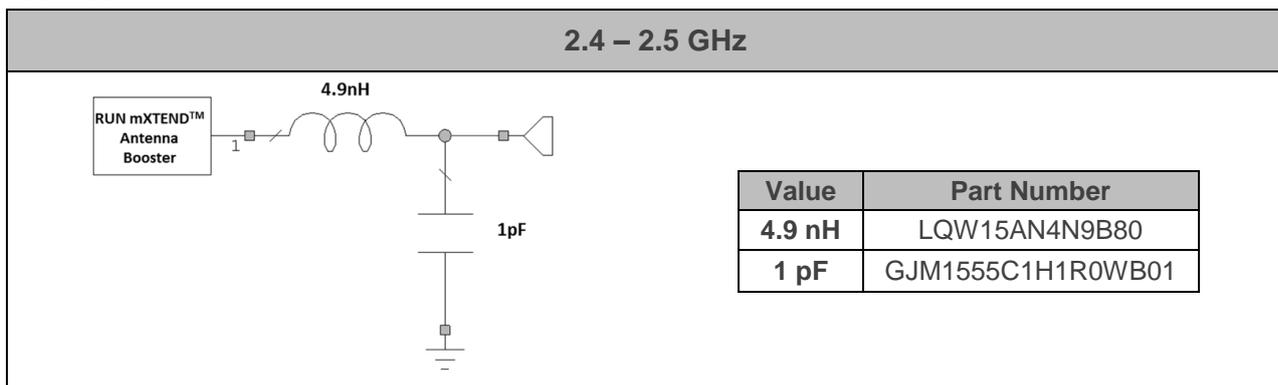

2.4 – 2.5 GHz	

Value	Part Number
4.9 nH	LQW15AN4N9B80
1 pF	GJM1555C1H1R0WB01

Figure 5 – Matching Network implemented in the evaluation board (Figure 4).

3.4. VSWR AND TOTAL EFFICIENCY

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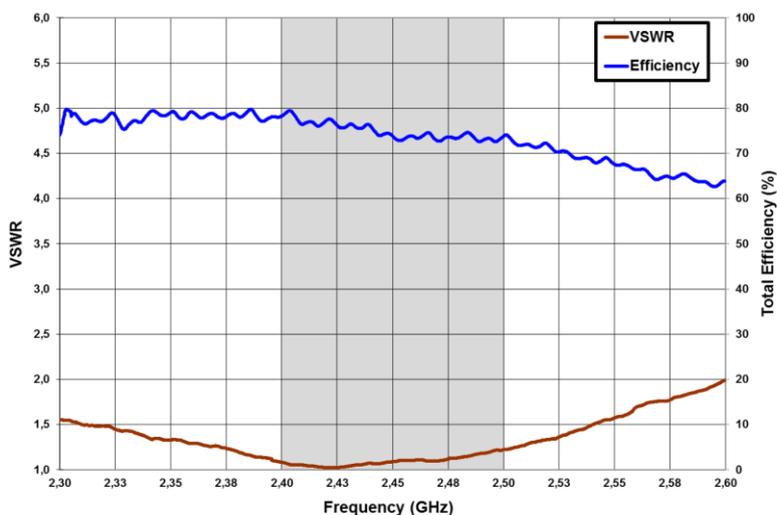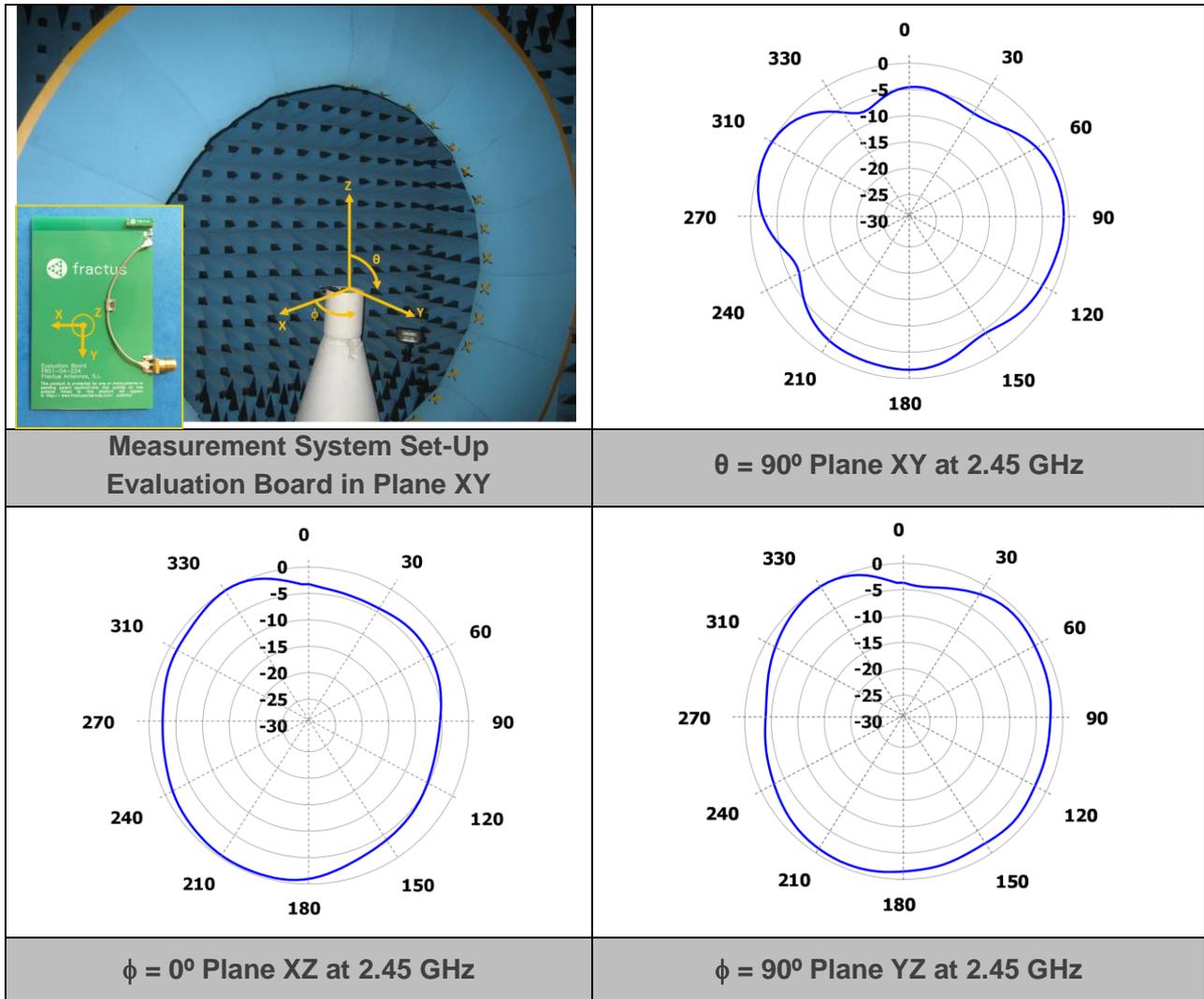

Figure 6 – VSWR and Total Efficiency for the 2.4 – 2.5 GHz frequency range (from the evaluation board (Figure 4)).

3.5. RADIATION PATTERNS (2.4-2.5 GHz), GAIN, AND EFFICIENCY

Measurement System Set-Up **Evaluation Board in Plane XY**	**θ = 90º Plane XY at 2.45 GHz**
ϕ = 0º Plane XZ at 2.45 GHz	**ϕ = 90º Plane YZ at 2.45 GHz**

Gain	**Peak Gain**	3.0 dBi
	Average Gain across the band	2.7 dBi
	Gain Range across the band (min, max)	2.5 <–> 3.0 dBi
Efficiency	**Peak Efficiency**	79.6 %
	Average Efficiency across the band	74.8 %
	Efficiency Range across the band (min, max)	71.6 – 79.6 %

Table 4 – Antenna Gain and Total Efficiency from the Evaluation Board (Figure 4) within the 2.4 – 2.5 MHz frequency range. Measures made in the Satimo STARGATE 32 anechoic chamber.

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