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# RUN mXTEND<sup>™</sup> — 2G/3G/4G HANDSETS

APPLICATION NOTE  
RUN mXTEND<sup>™</sup> (NN02-224)

## RUN mXTEND™ (NN02-224) – 2G/3G/4G Handsets 824-960 MHz and 1710-2170MHz

Ignion specializes in enabling effective mobile communications. Using Ignion 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™ antenna booster

NN02-224

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

ISO 9001: 2015

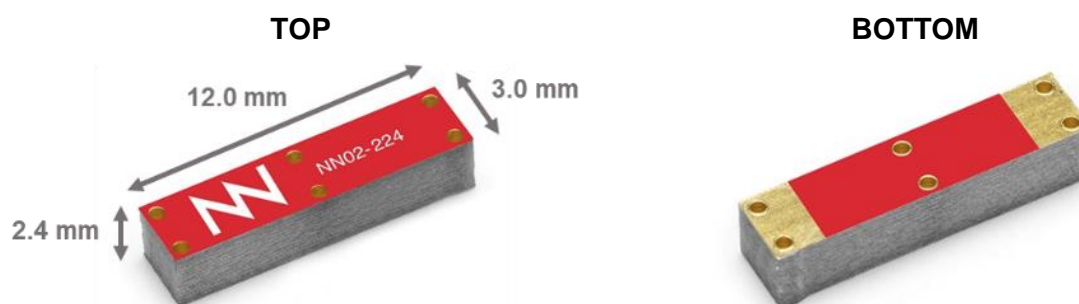


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# 1. PRODUCT DESCRIPTION NN02-224

The RUN mXTEND<sup>™</sup> 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 GSM850, GSM900, GSM1800/DCS, GSM1900/PCS, UMTS, LTE850, LTE900, LTE1700, LTE1800, LTE1900, LTE2000, and LTE2100.



**Material:** The RUN mXTEND<sup>™</sup> antenna booster is built on glass epoxy substrate.

## APPLICATIONS

- Handsets
- Smartphones
- Tablets
- Phablets
- Laptop PCs
- Netbooks
- Modules
- Routers
- eBook readers

## 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 RUN mXTEND<sup>™</sup> antenna booster belongs to a new generation of antenna solutions based on the Virtual Antenna<sup>™</sup> technology developed by Ignion. The technology is mainly focused on replacing conventional antenna solutions by miniature and standard components.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 674491



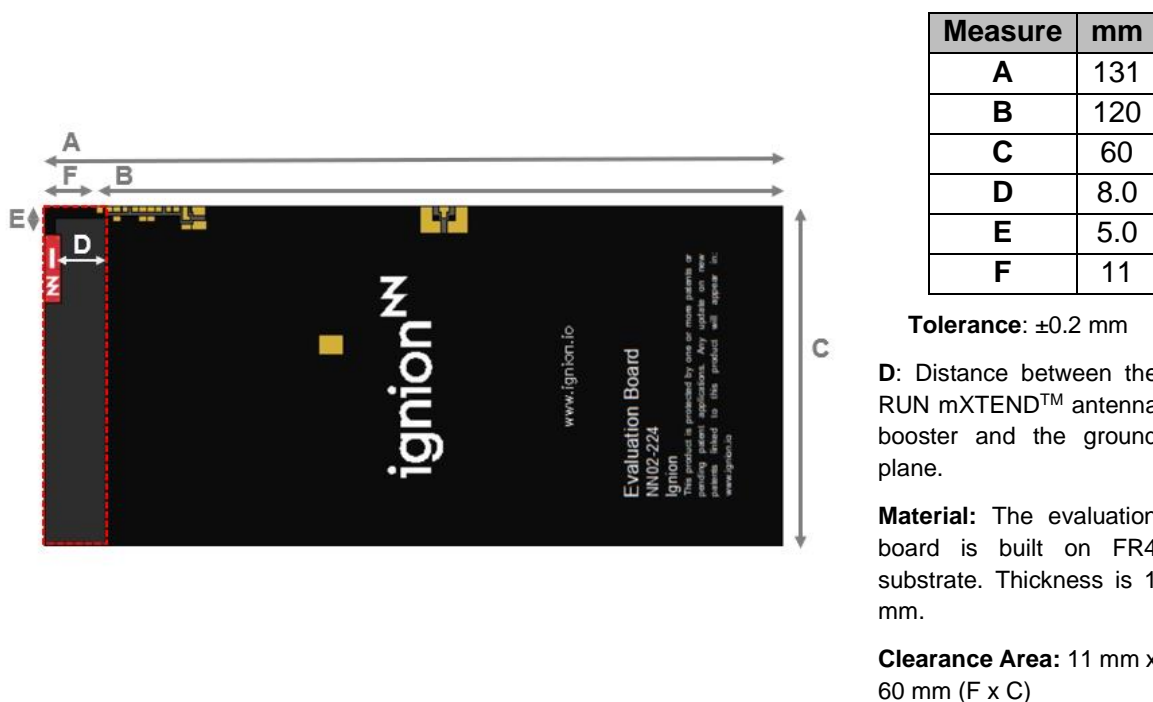
## 2. QUICK REFERENCE GUIDE

Technical features	824 – 960 MHz	1710 – 2170 MHz
Average Efficiency	> 65 %	> 75 %
Peak Gain	1.6 dBi	2.2 dBi
VSWR	< 3:1	
Radiation Pattern	Omnidirectional	
Polarization	Linear	
Weight (approx.)	0.19 g	
Temperature	-40 to +125 °C	
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. Note that for obtaining comparable results, a ground plane length larger than 100 mm is recommended.

## 3. EVALUATION BOARD (824-960 MHz and 1710-2170 MHz)

This Evaluation Board integrates a UFL cable to connect the RUN mXTEND™ antenna booster with the SMA connector. The RUN mXTEND™ provides operation in two frequency regions, from 824 MHz to 960 MHz and from 1710 MHz to 2170 MHz, through a single input/output port.

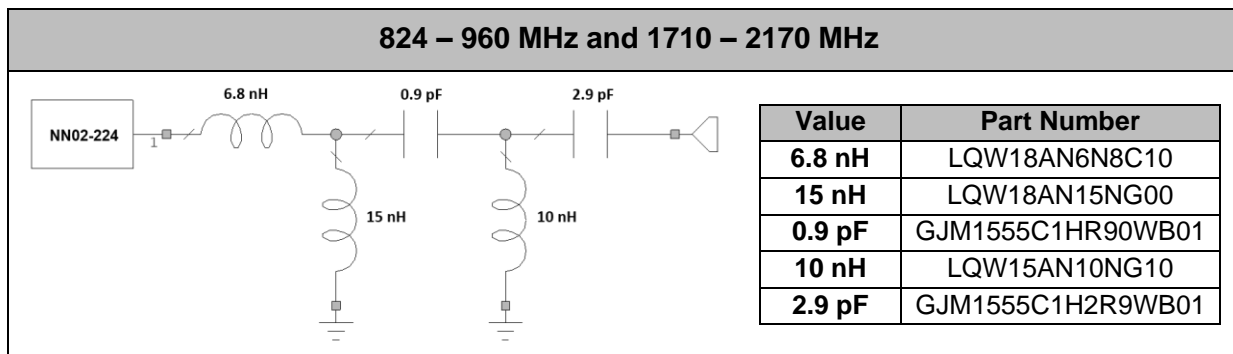


**Figure 1** – EB\_NN02-224-1B-2R-1P. Evaluation Board providing operation from 824 MHz to 960 MHz and from 1710 MHz to 2170MHz.

This product and its use is protected by at least one or more of the following [patents and patent applications](#) US 8,203,492; US 8,237,615; PCT/EP2013/064692; WO2014/012842; US 62/028,494; US 62/072,671; and other domestic and international patents pending. Additional information about patents related to this product is available at [www.ignion.io/virtual-antenna/](http://www.ignion.io/virtual-antenna/).

### 3.1. MATCHING NETWORK

The specs of a Ignion 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 series (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 [support@ignion.io](mailto:support@ignion.io) for more information related to the antenna booster matching service.



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

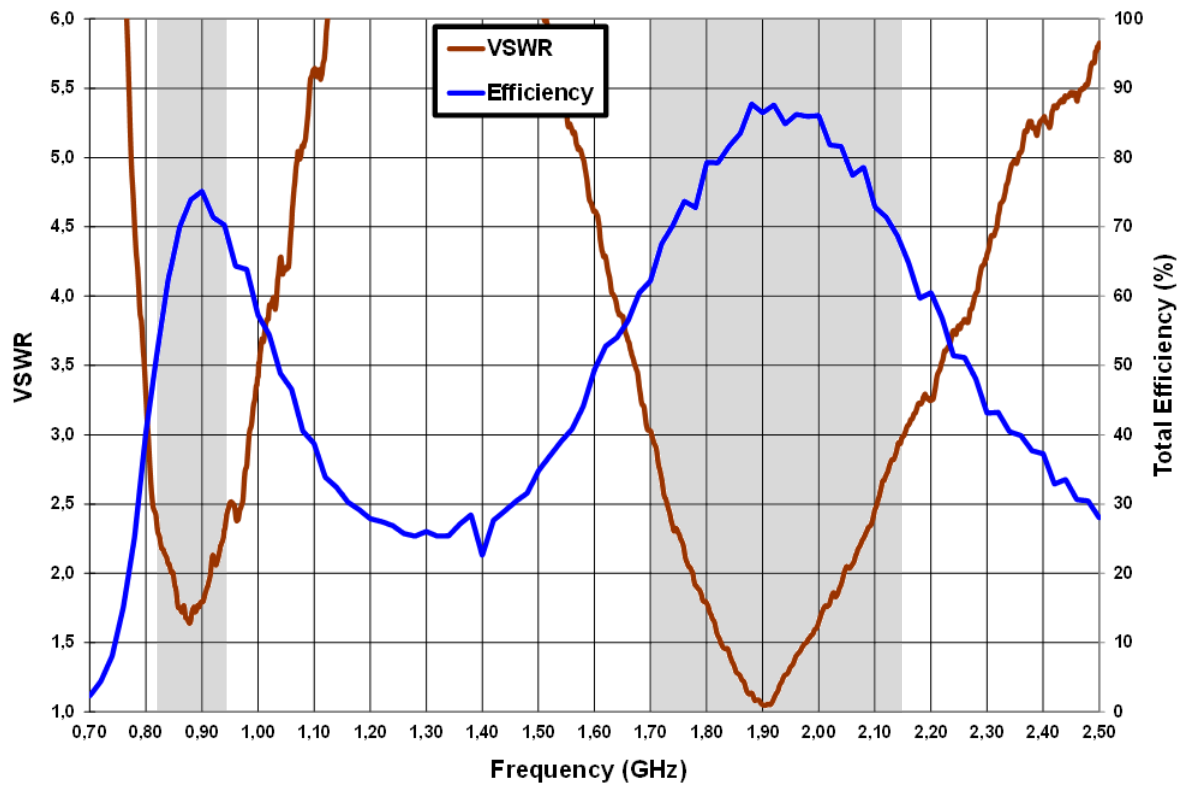
For additional information, please visit [www.ignion.io](http://www.ignion.io) or contact [info@ignion.io](mailto:info@ignion.io).

If you need assistance to design your matching network, please contact [support@ignion.io](mailto:support@ignion.io), or try our free-of-charge<sup>1</sup> **NN Wireless Fast-Track** design service, you will get your chip antenna design including a custom matching network for your device in 24h<sup>1</sup>. Other related to NN's range of R&D services is available at: <https://www.ignion.io/rdservices/>

<sup>1</sup> See terms and conditions for a free NN Wireless Fast-Track service in 24h at: <https://www.ignion.io/fast-track-project/>

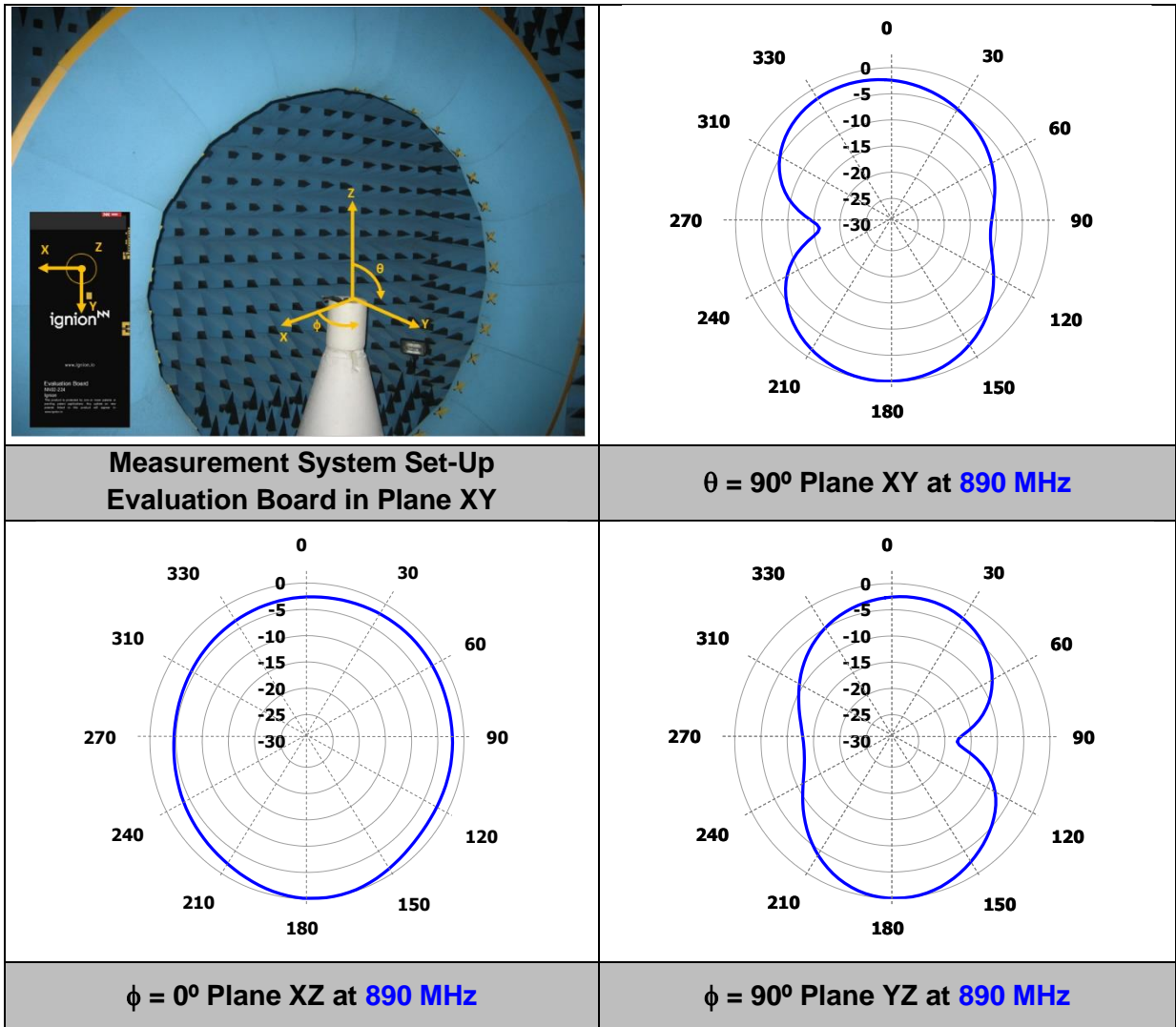
### 3.2. VSWR AND TOTAL EFFICIENCY

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



**Figure 3** – VSWR and Total Efficiency for the 824 – 960 MHz frequency range and for the 1710 – 2170 MHz frequency range (from the evaluation board (Figure 1)).

### 3.3. RADIATION PATTERNS (824-960 MHz), GAIN AND EFFICIENCY

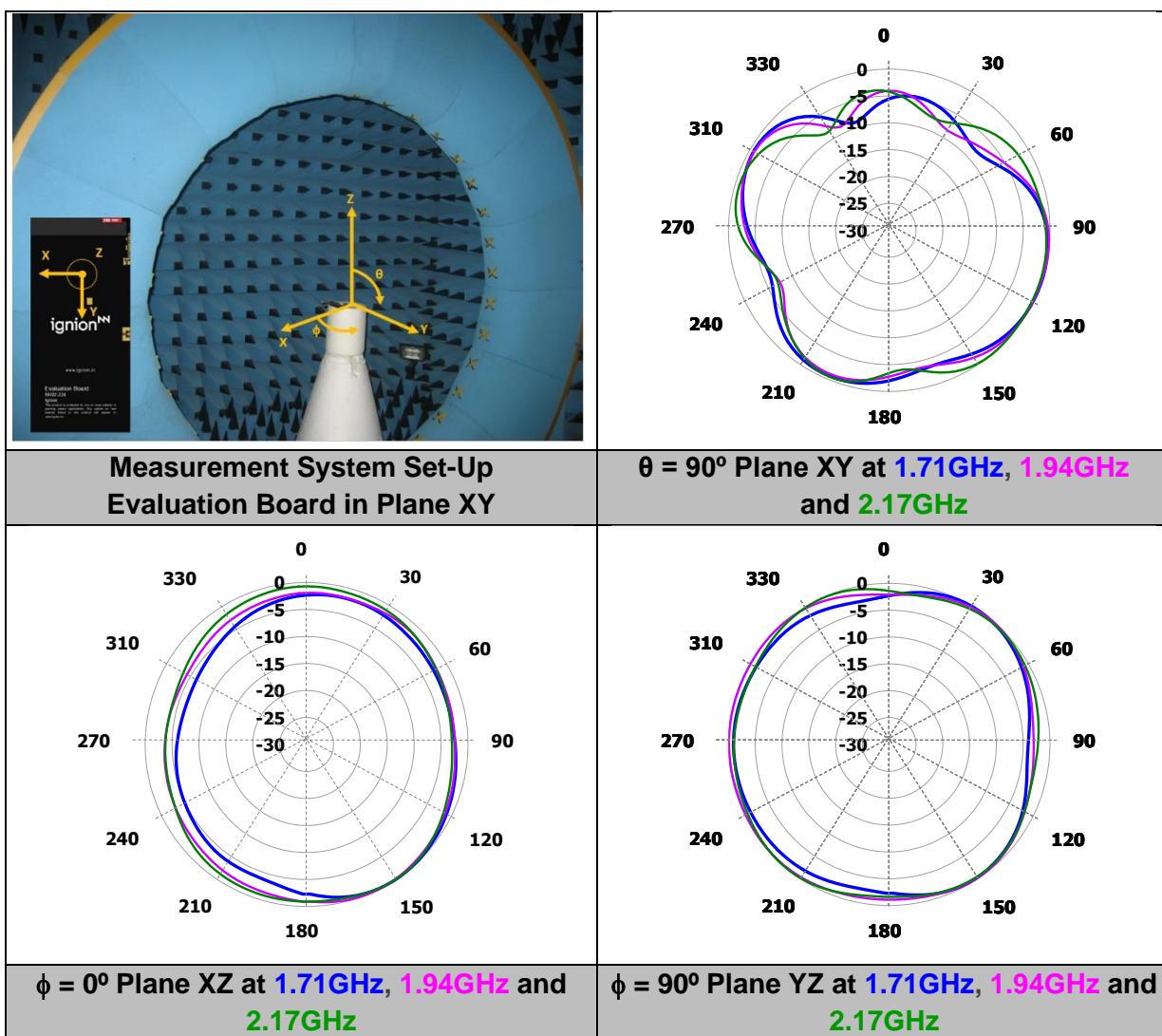


Gain	Peak Gain	1.6 dBi
	Average Gain across the band	1.0 dBi
	Gain Range across the band (min, max)	-0.3 <--> 1.6 dBi
Efficiency	Peak Efficiency	75.1 %
	Average Efficiency across the band	69.1 %
	Efficiency Range across the band (min, max)	54.1 – 75.1 %

**Table 2** – Antenna Gain and Total Efficiency from the Evaluation Board (Figure 1) within the 824 – 960 MHz frequency range. Measures made in the Satimo STARGATE 32 anechoic chamber.



### 3.4. RADIATION PATTERNS (1710-2170 MHz), GAIN AND EFFICIENCY



<b>Gain</b>	<b>Peak Gain</b>	2.2 dBi
	<b>Average Gain across the band</b>	1.7 dBi
	<b>Gain Range across the band (min, max)</b>	0.9 $\leftrightarrow$ 2.2 dBi
<b>Efficiency</b>	<b>Peak Efficiency</b>	87.7 %
	<b>Average Efficiency across the band</b>	78.6 %
	<b>Efficiency Range across the band (min, max)</b>	62.1 – 87.7 %

**Table 3** – Antenna Gain and Total Efficiency from the Evaluation Board (Figure 1) within the 1710 – 2170 MHz frequency range. Measures made in the Satimo STARGATE 32 anechoic chamber.

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