2.4GHz Planar Inverted F Antenna

Model AA-INVF-IN100

ASSA ABLOY
110 Sargent Drive
06511 CT New Haven

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1.Introduction

This report presents necessary adjustments for the trace length for the internal IFA antenna that is integrated on the main PCB for the Assa Abloy Aperio IN100 V3 and antenna measurements (VSWR and radiation patterns).

The mechanical housing for the IN100 may be made of plastic as well as with metal wings. The antenna measurements have been done for both of the possible configurations of the mechanics.

Fig 1: IN100 plastic cover with metal wings.

Fig 2: IN100 plastic cover.

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2.Antenna Trace Length Adjustment

To get the internal IFA resonant for the frequency band 2405-2480MHz, the antenna trace length had to be modified (cut back) as shown in Fig 3 below.

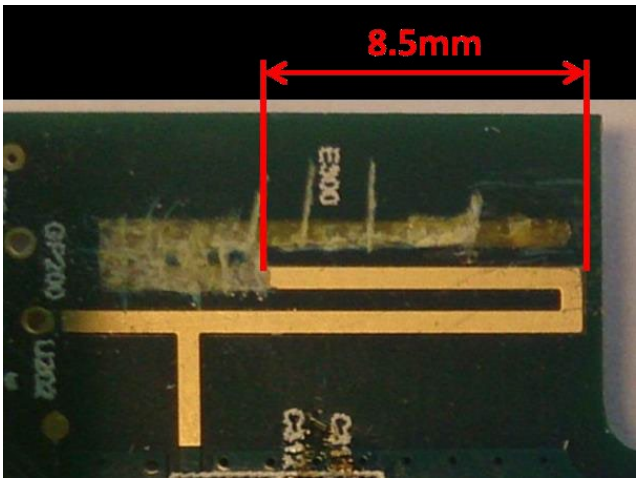

Fig 3: Antenna length adjustment.

The maximum deviations from nominal dimension are:

Trace length: Nominal +/-0.1mm

Trace width: Nominal +/-0.05mm

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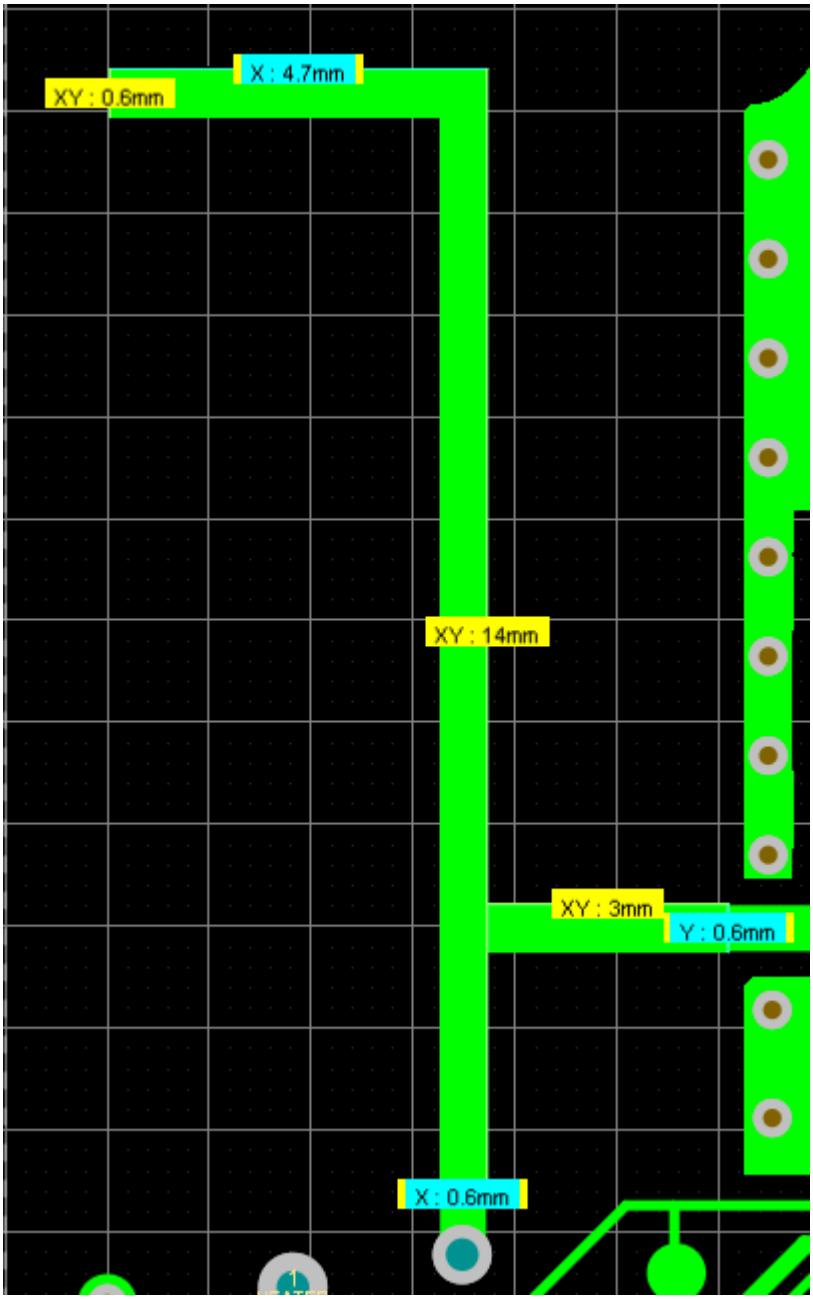
2.1. Tuned Antenna Dimensions



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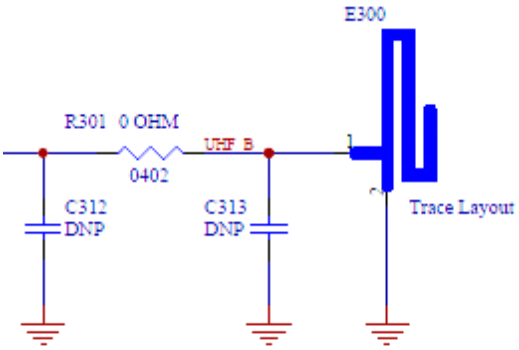
3.Matching Circuit

No need for matching components, see schematic below.



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4.VSWR

For a radio (transmitter or receiver) to deliver power to an antenna, the impedance of the radio and transmission line must be well matched to the antenna's impedance. The parameter VSWR (Voltage Standing Wave Ratio) is a measure that numerically describes how well the antenna is impedance matched to the radio or transmission line it is connected to.

4.1. Plastic Cover

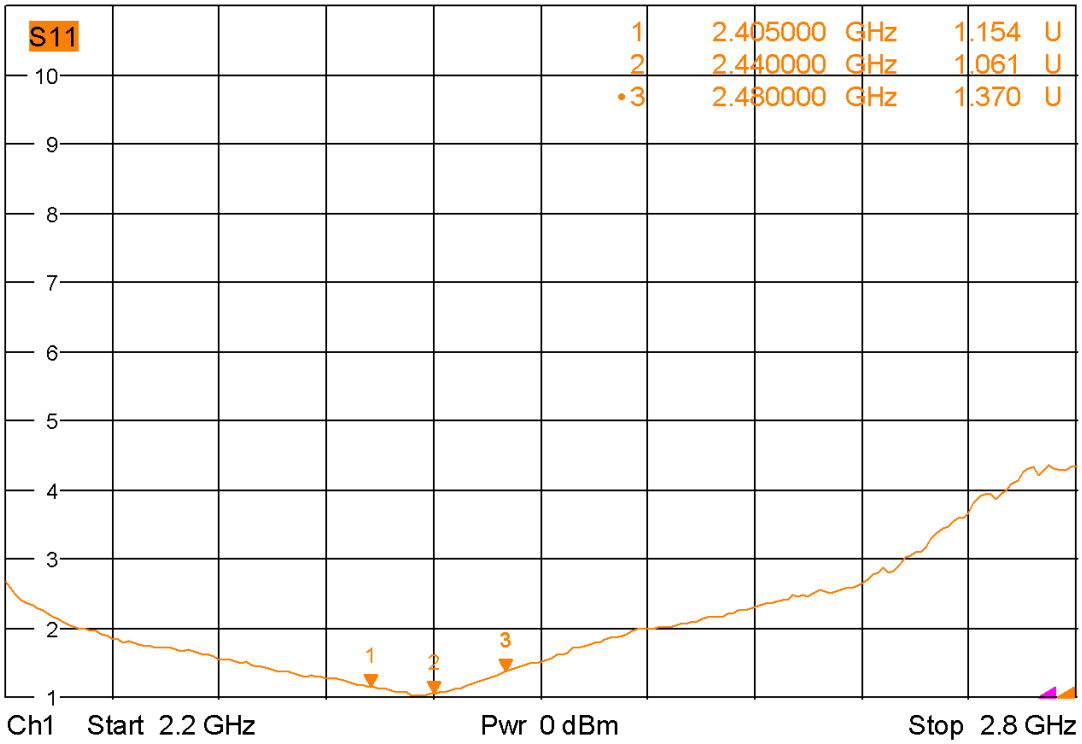

Fig 4: VSWR IN100 plastic cover.

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4.2. Plastic Cover with Metal Wings

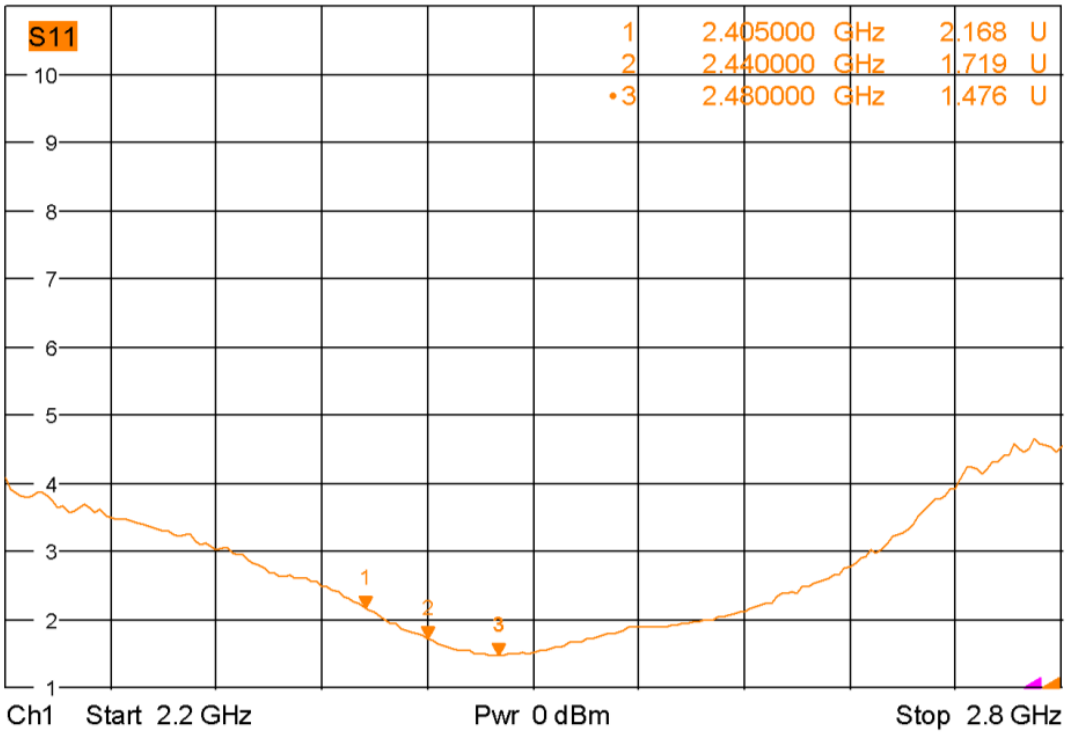

Fig 5: VSWR IN100 plastic cover with metal wings.

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5.Radiation Patterns

The radiation pattern measurements are done for three measurement planes; XY-plane, XZ-plane and YZ-plane (see Fig 7) with vertical and horizontal polarization of reference antenna. This section presents the total gain measurements (sum of the horizontal and the vertical gain).

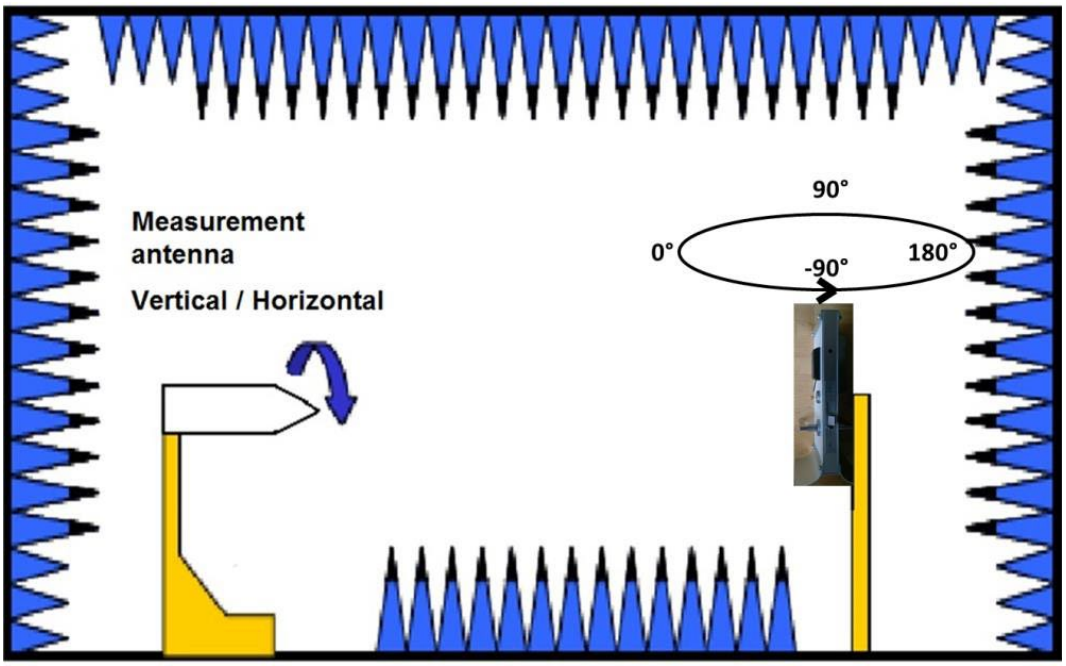

Fig 6: Measurement setup

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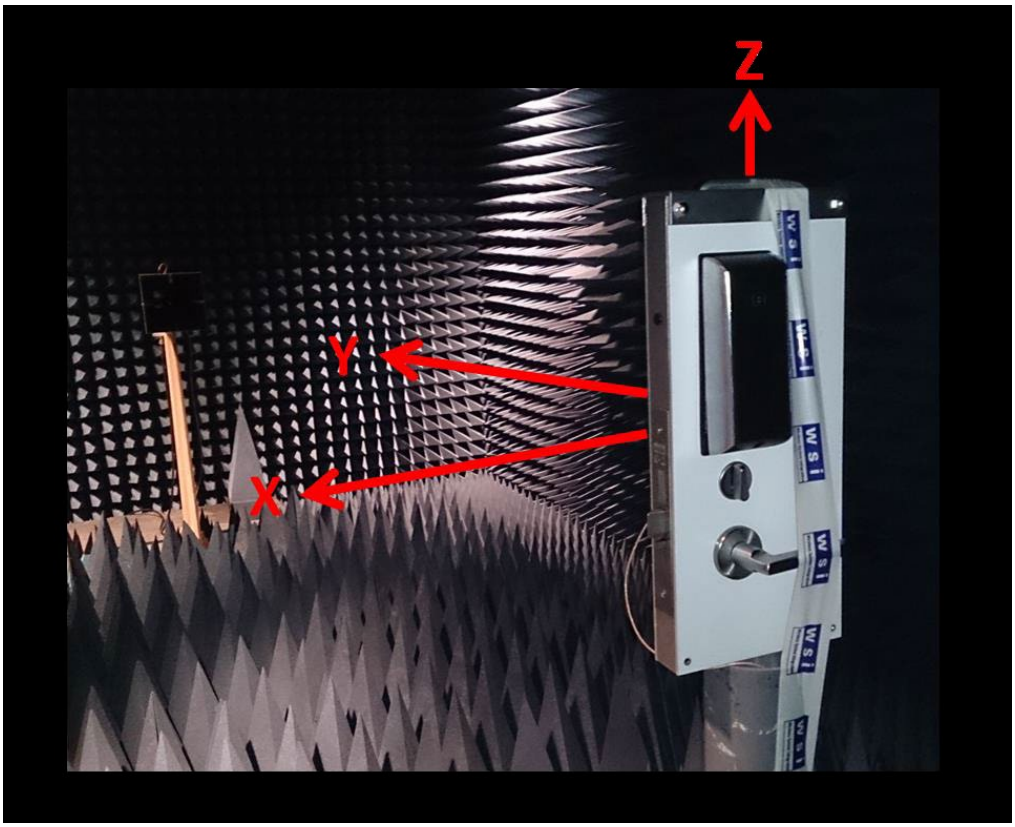

Fig 7: Measurement plane definitions

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5.1. Plastic Cover

In100 plastic cover

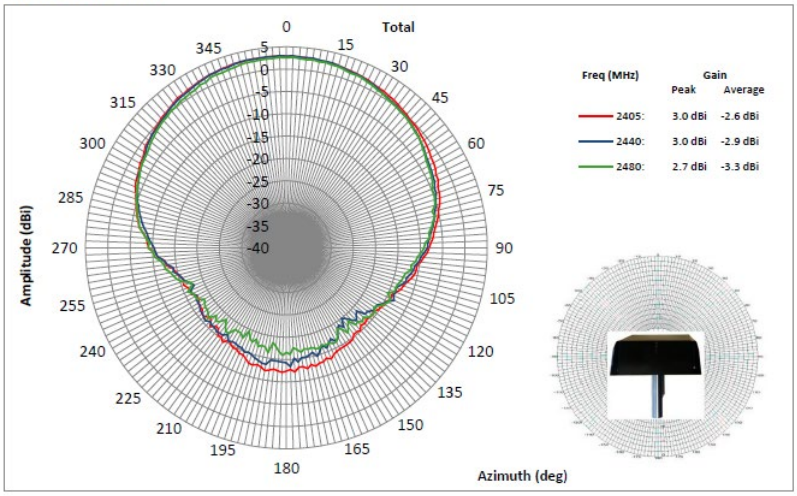

Fig 16: XY-plane, total gain (horizontal + vertical polarization). IN100 plastic cover.

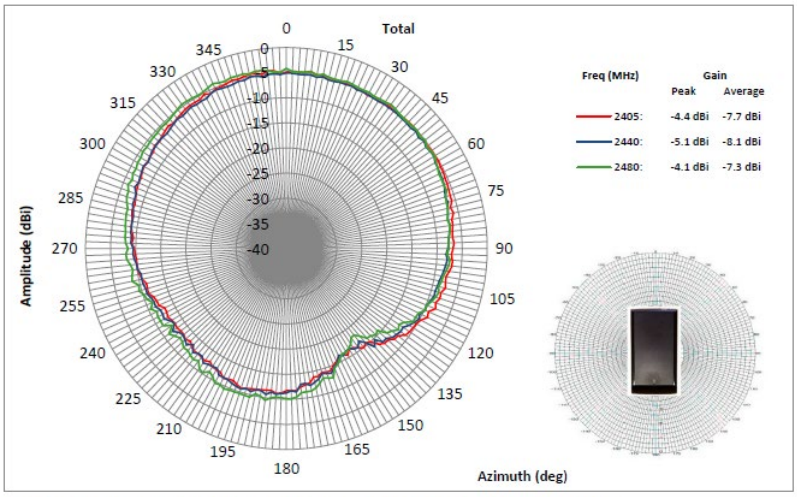

Fig 17: XZ-plane, total gain (horizontal + vertical polarization). IN100 plastic cover.

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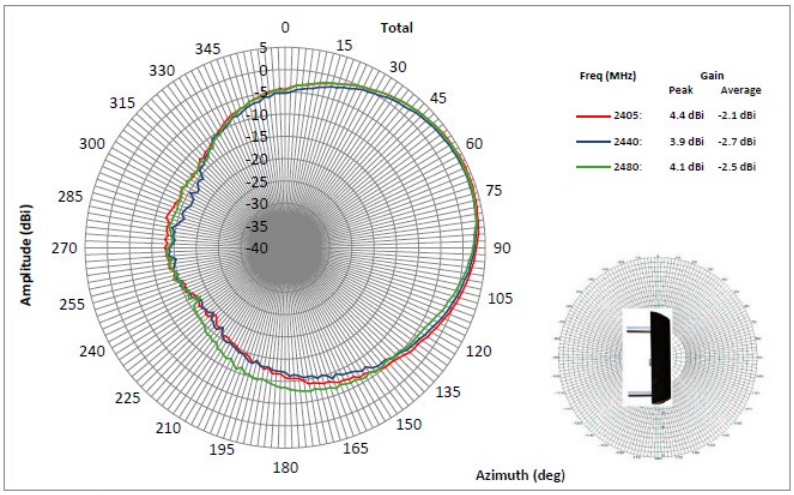

Fig 18: YZ-plane, total gain (horizontal + vertical polarization). IN100 plastic cover.

5.2. Plastic Cover with Metal Wings

In100 plastic cover with metal wings

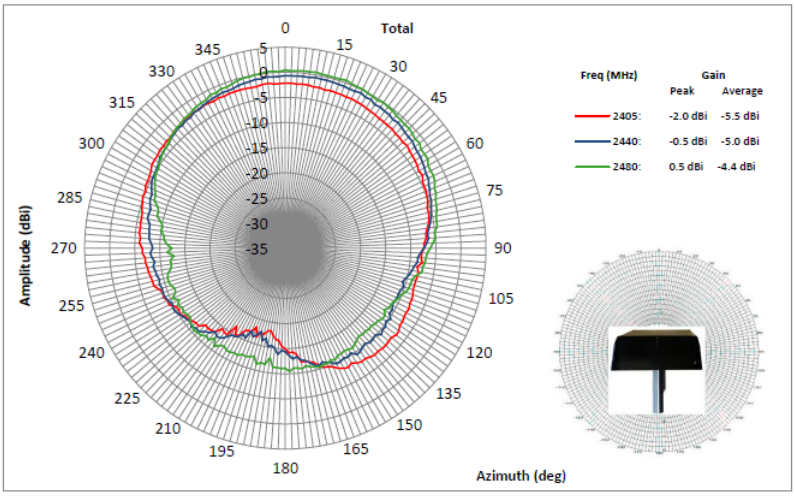

Fig 19: XY-plane, total gain (horizontal + vertical polarization). IN100 plastic cover with metal wings.

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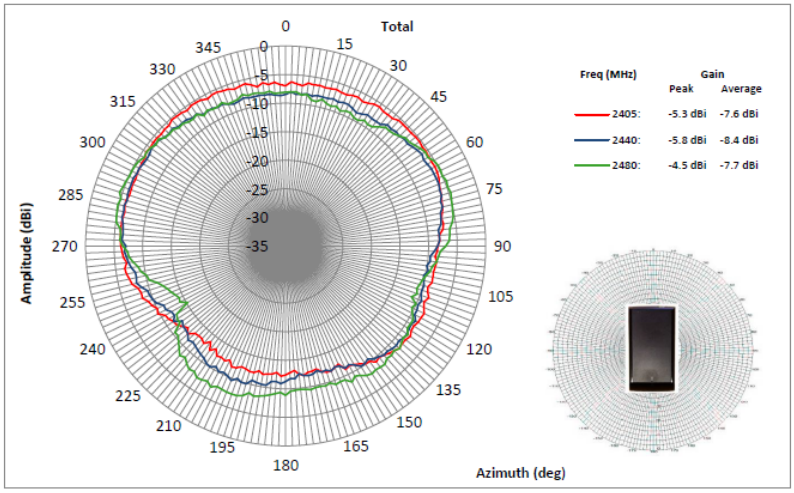

Fig 20: XZ-plane, total gain (horizontal + vertical polarization). IN100 plastic cover with metal wings.

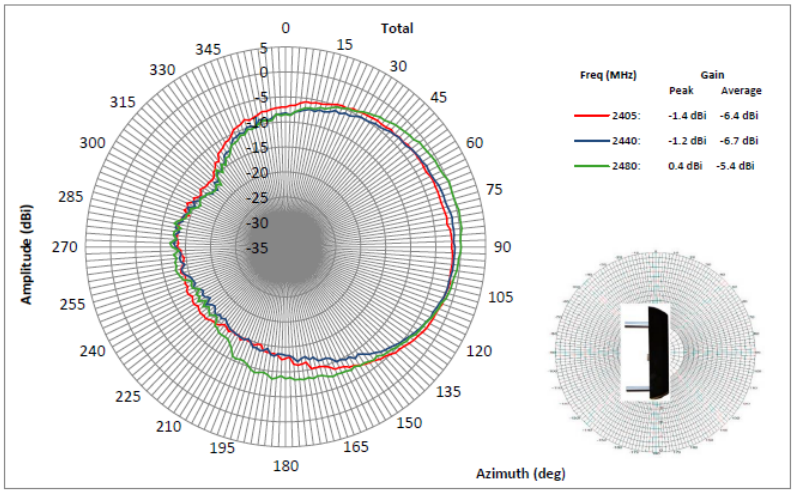

Fig 21: YZ-plane, total gain (horizontal + vertical polarization). IN100 plastic cover with metal wings.

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6.Specifications

6.1. Gain

Radio Technology	Antenna Gain (dBi)
ZigBee	4.4

6.2. Efficiency

6.2.1. PLASTIC COVER

Freq	Antenna efficiency	
MHz	%	dB
2405	37.1	-4.3
2440	38.0	-4.2
2480	32.7	-4.9

6.2.2. PLASTIC COVER WITH METAL WINGS

Freq	Antenna efficiency	
MHz	%	dB
2405	20.0	-7.0
2440	24.7	-6.1
2480	25.3	-6.0

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