

NAC

Report antenna design and gain calculation

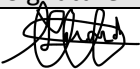

Document Name

NAC_antennaInformation-V2_signed.docx

Products concerned

NAC – Netatmo Smart Air Conditioner Controller

Document Approval

Title	Name and date	Signature
Author	Clémence GERARD	 29/11/2022
Team Manager	Frédéric ESNAULT	 29/11/22

Revision History

Revision	Date	Changes
1	05/09/22	Initial Release
2	12/09/22	Adding the dimension of the antenna

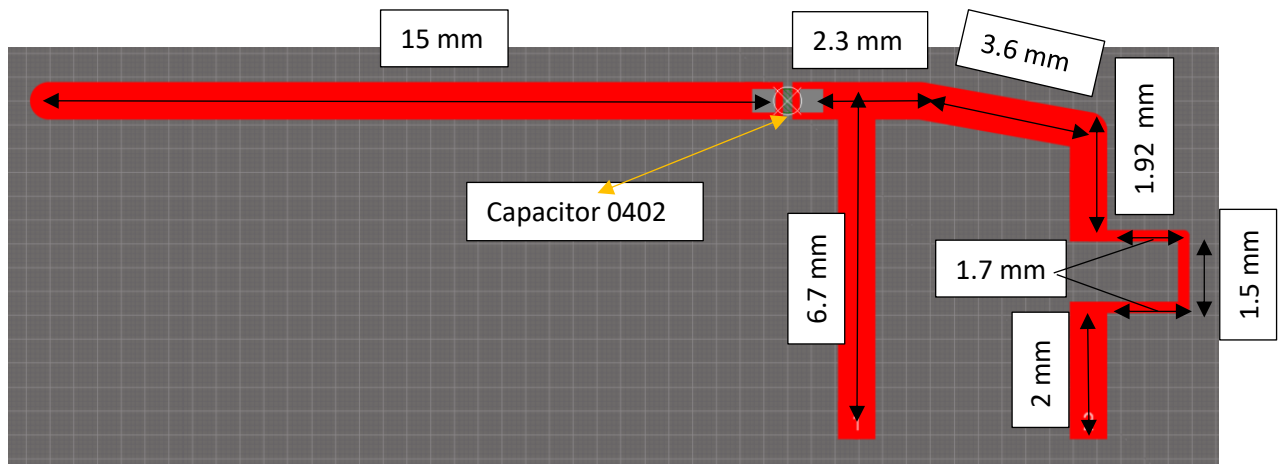
Table des matières

I.	Introduction.....	3
II.	Antenna dimension	3
III.	Radiated measurements	4
	a) Setup.....	4
	b) Results	5
IV.	Antenna gain calculation	7
	a) Setup.....	7
	b) Results	7
V.	Conclusion	8

I. Introduction

This test report is to characterise the antenna of the product NAC (Netatmo Smart Air Conditioner Controller).

II. Antenna dimension



The antenna is a PIFA antenna.

The global dimension of the antenna is 6.7 mm x 23.6 mm.

III. Radiated measurements

a) Setup

The measurements of the radiation patterns (radiated power measurements) have been performed in the anechoic chamber of XXI-Lab in active mode: signal emitted from the modem embedded in the electronic board of the product. The H and E planes (azimuth and elevation planes used to characterize all antennas) were measured for the frequencies 2410, 2440 and 2480MHz for vertical and horizontal polarizations with a step of 1° angle. The total polarization was calculated.

- In the H plane the product is mounted upright with the front of the box facing forward for the 0° measurement angle.
- In E plane the product is mounted flat with the front side up and PCB towards 180°.

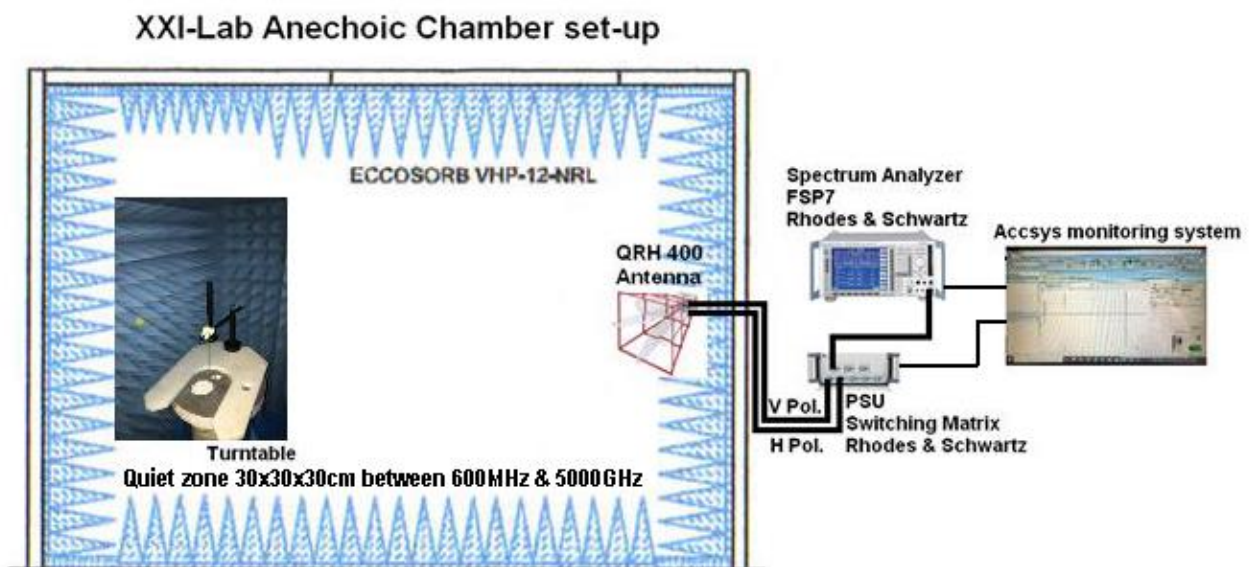


Figure 1 : setup of the test

b) Results

The results of the maximum output power are in the table below :

Power Pt (dBm) / Frequency (MHz)	Plane H			Plane E		
	2410	2440	2480	2410	2440	2480
Power measurement test were performed after matching	20.84	19.44	17.53	22.65	21.95	20.72

Table 1 : Summary of radiated power measurements

The radiation patterns are below:

Remark: Power measurement tests were performed after matching to optimize radiation and make sure that correct power level was measured.

Maximum output power
22.65 dBm

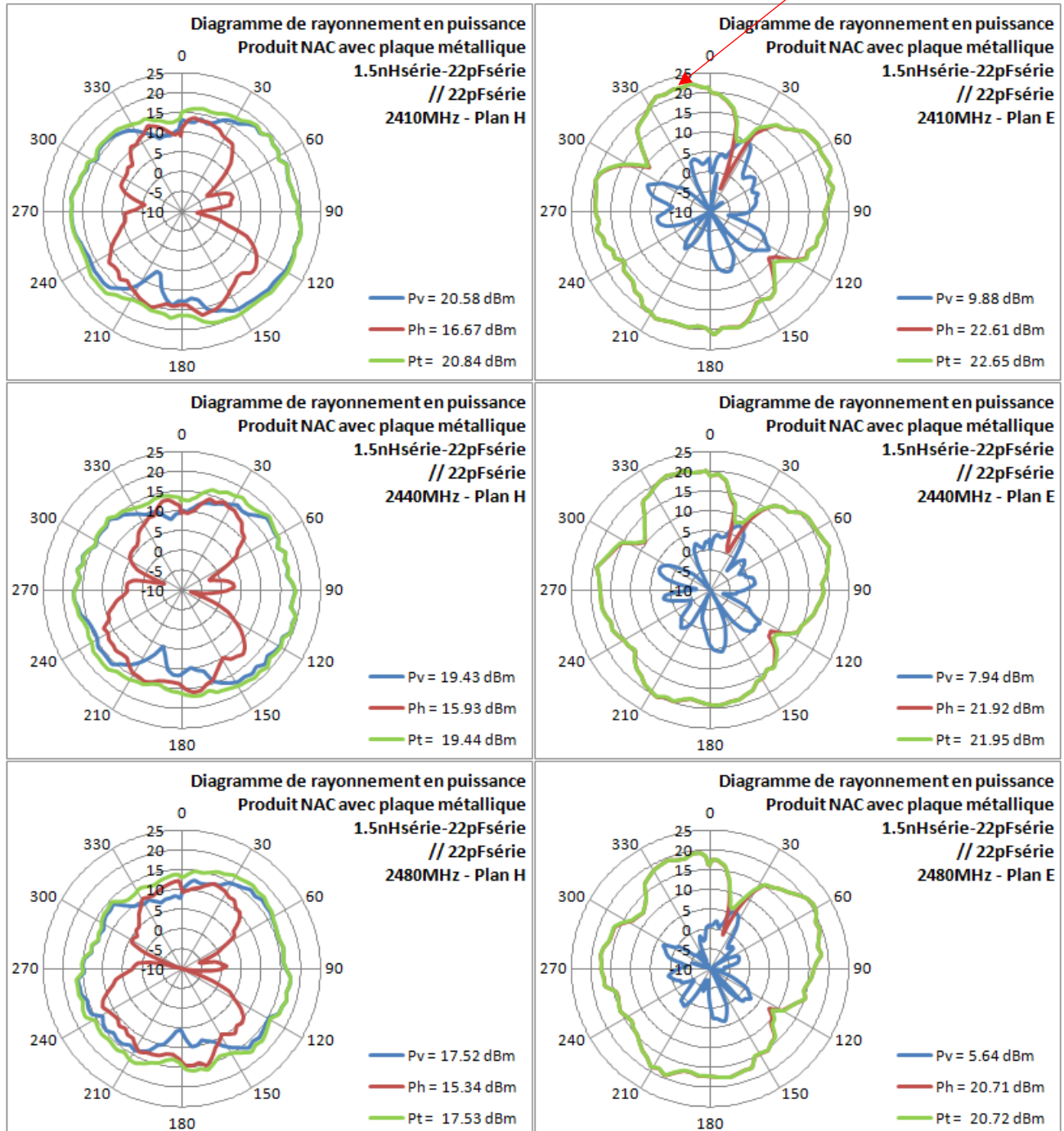


Figure 2 : H and E plane radiation patterns for 2410, 2440 and 2480MHz

IV. Antenna gain calculation

a) Setup

The measurement of the antenna gain has been performed at Netatmo with the help of the results from XXI-LAB. The setup below permits to determinate the gain of the antenna:



Figure 3 : Setup of the test

b) Results

Below conducted measurement from the maximum power in the worst case (channel 7 and rate 11Mbps):

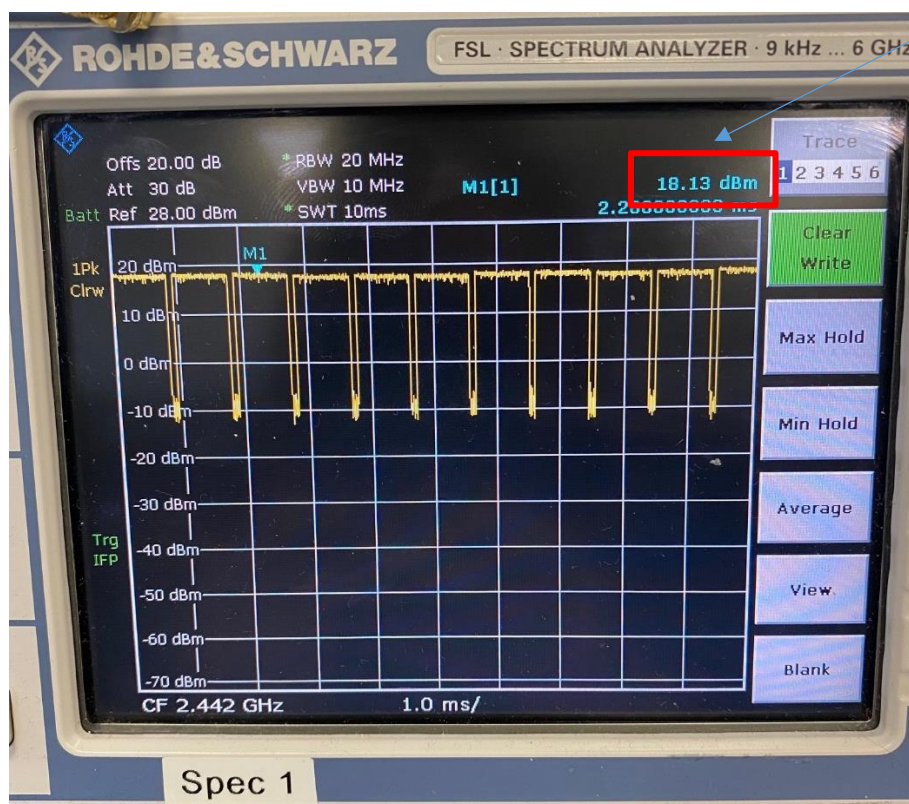


Figure 4 : Maximum output of the Product NAC

V. Conclusion

The maximum conducted output of the Wifi module is 18.13 dBm and the maximum radiated output power of the product is 22.65 dBm. So, the antenna gain is $22.65 \text{ dBm} - 18.13 \text{ dBm} = 4.52 \text{ dBi}$.