ignion

Your innovation.
Accelerated.

Matching Network Service

Dashine Electronics - BLE Gamepad

DAELCOLT.RF.Gamepad.2023.005

Date 20/10/2023
Sant Cugat del Vallès, Barcelona

Outline

1. Objectives

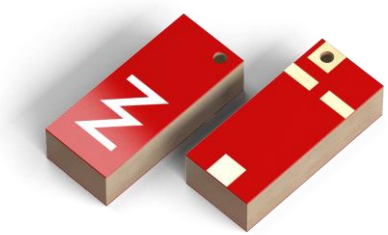
The initial requirements from the customer:

- Frequency bands to cover: 2400-2500MHz
- Number of antennas: 2
- PCB PEN dimensions: 32x12mm
- PCB CONTROL dimensions: 132x60mm
- Selected antenna: DUO mXTEND™

PEN

CONTROLLER

2. Proposed Antenna



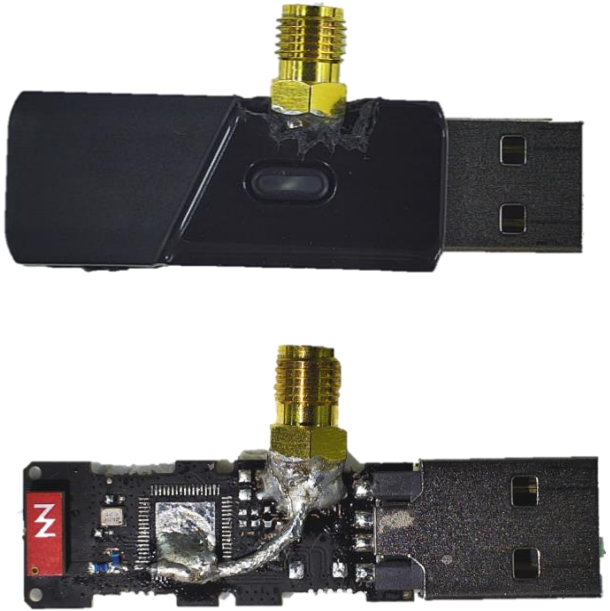
PN: NN03-320

DUO mXTEND™ ANTENNA BOOSTER (NN03-320)

This product and/or its use is protected by at least the following patents and other domestic and international patents pending. Any update on new patents linked to this product will appear in
https://ignion.io/files/Patent-list-NN.pdf

3. Set-up (1/2)

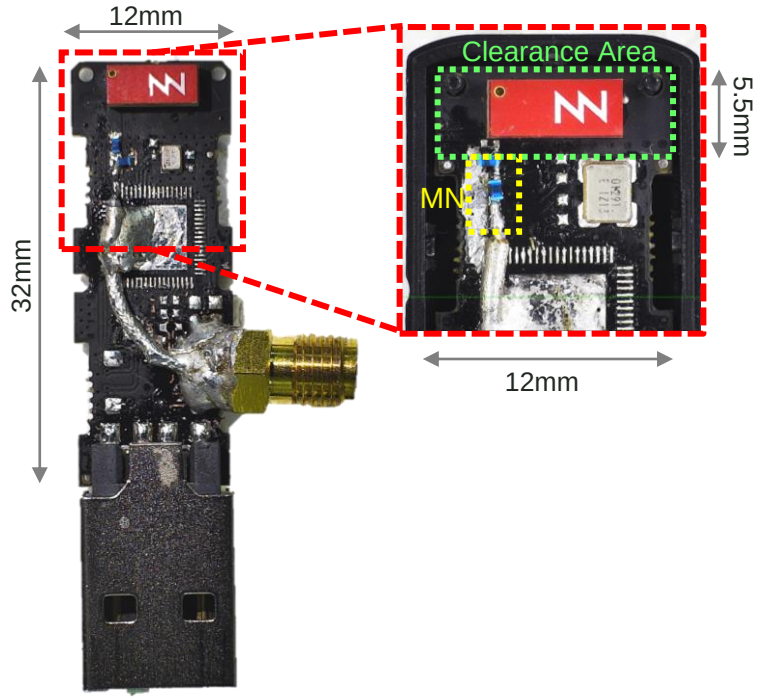
PEN



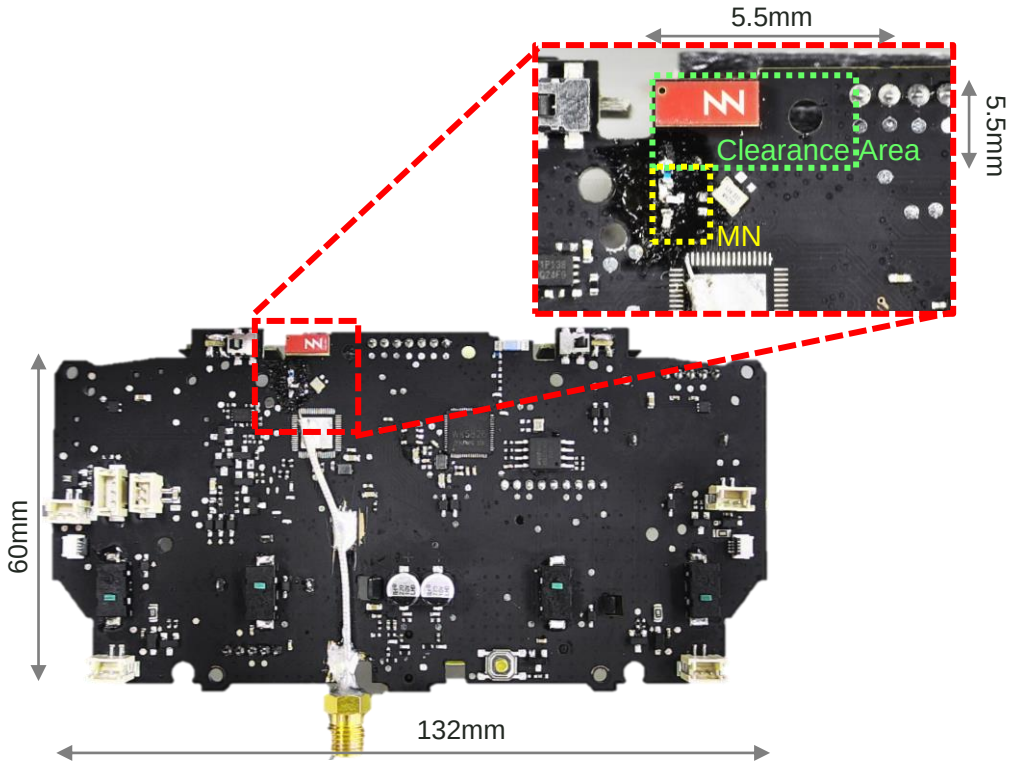
CONTROLLER

3. Set-up (2/2)

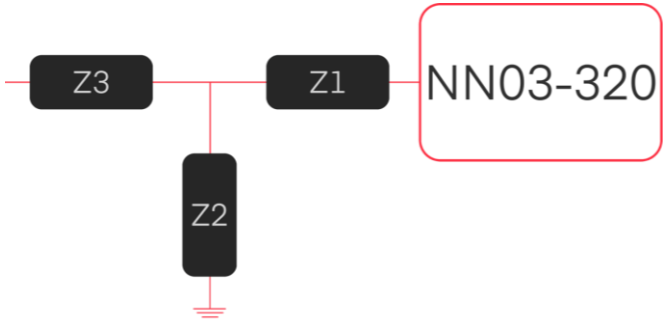
PEN

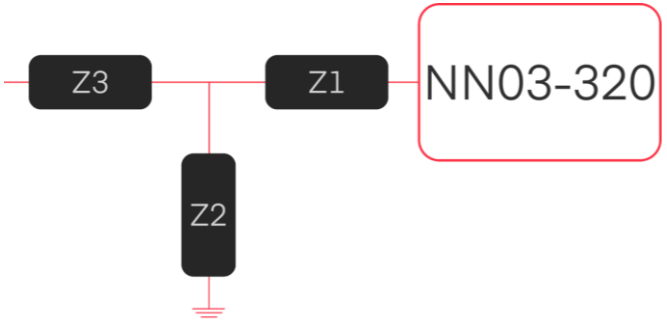


CONTROLLER



4. Proposed Matching Network

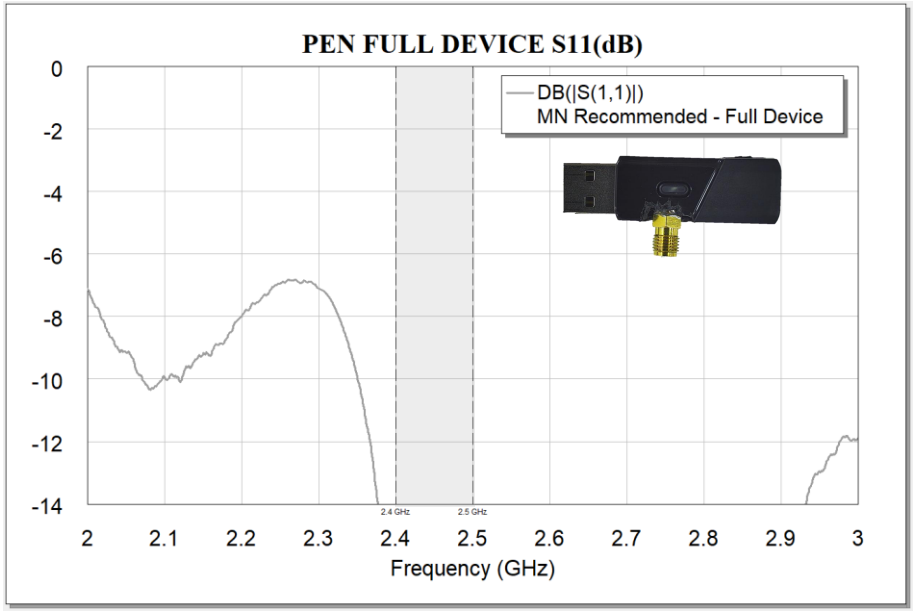


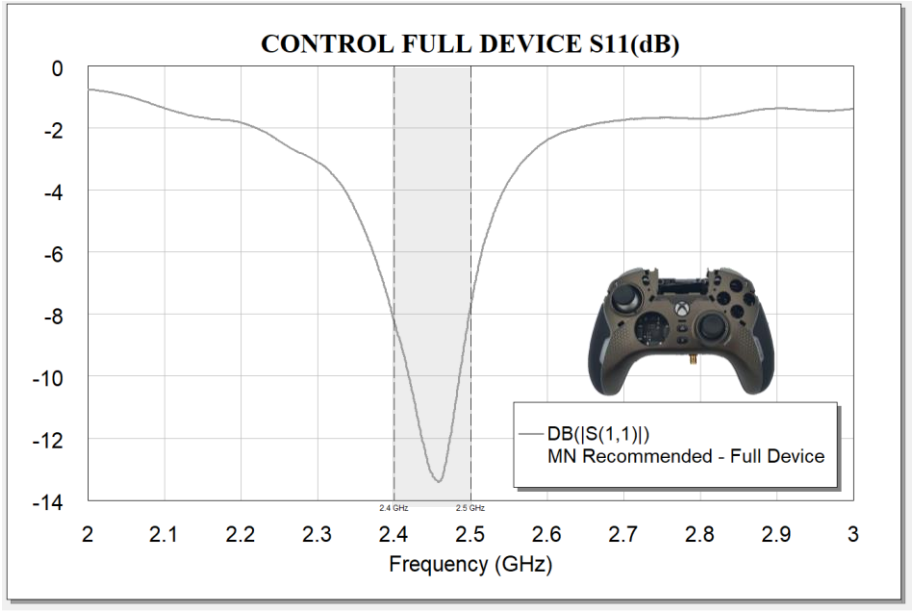


Recommended Matching Network PEN		
Z	**Value**	**Part Number**
Z_1	3.3nH	LQW15AN3N3G80
Z_2	3.7nH	LQW15AN3N7G80
Z_3	R0	-

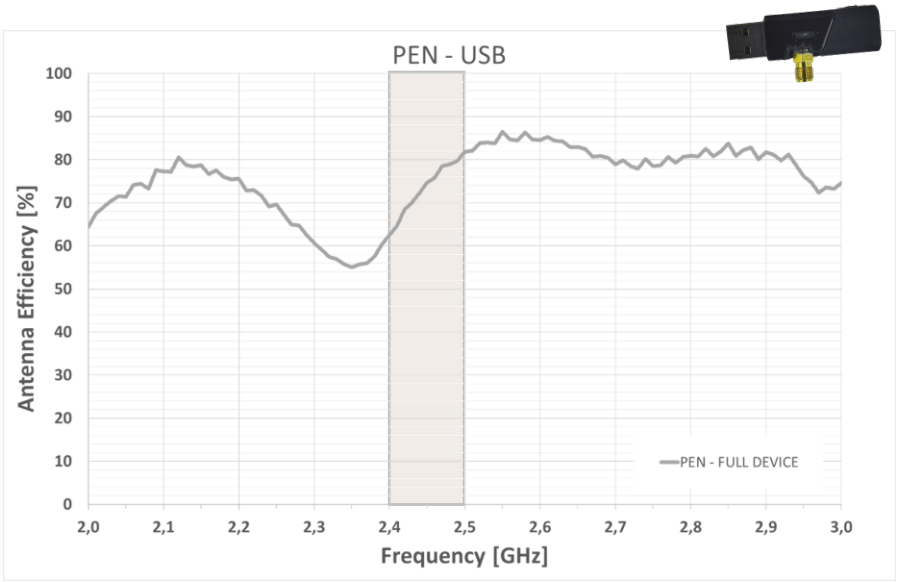
Recommended Matching Network CONTROLLER		
Z	**Value**	**Part Number**
Z_1	2.8nH	LQW15AN2N8G80
Z_2	1.6nH	LQW15AN1N6C80
Z_3	R0	-

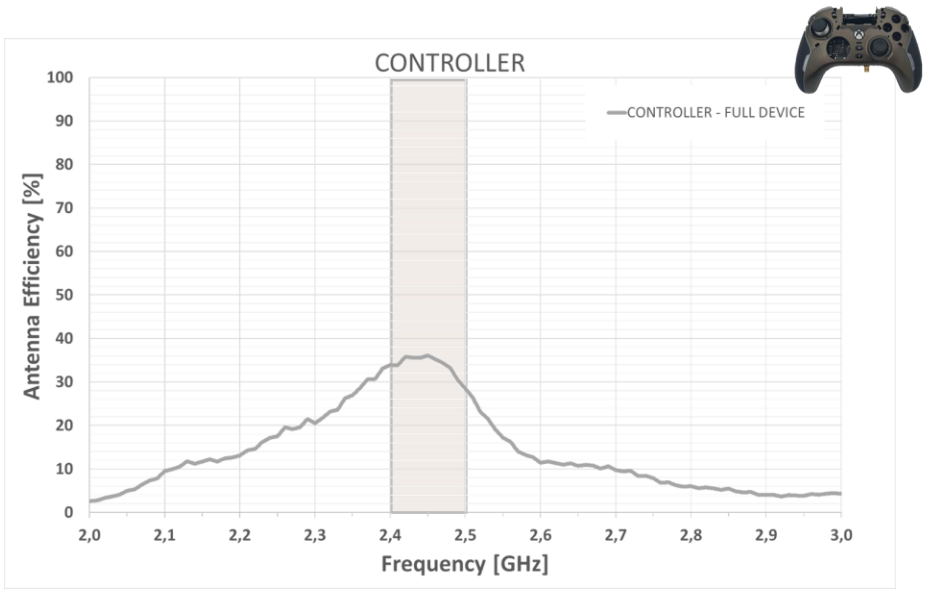
5.1 Performance Analysis: Reflection Coefficient (dB)





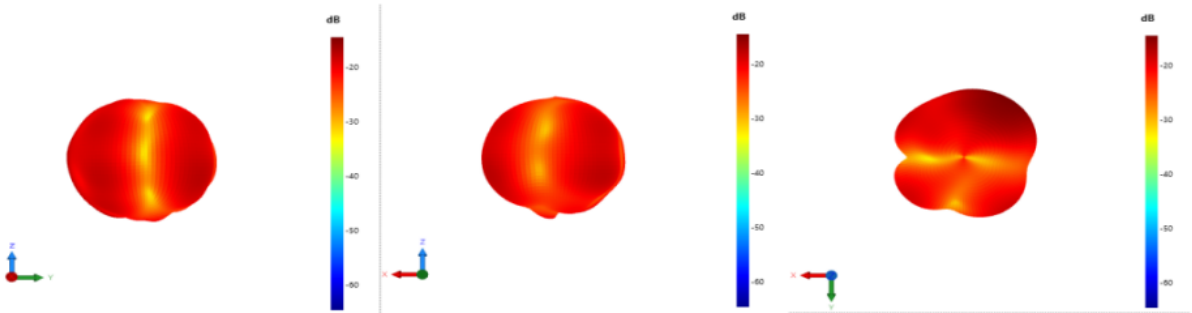
5.2 Performance Analysis: Antenna Efficiency (%)



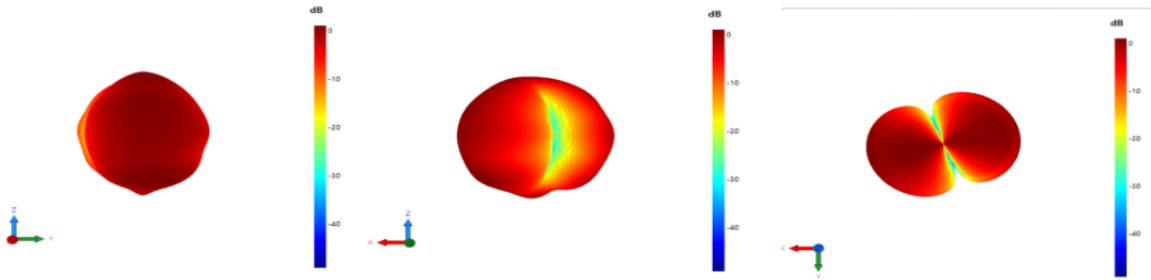


	$\eta_{a\ 2400MHz}$ (%)	$\eta_{a\ 2500MHz}$ (%)	Average $\eta_{a\ LFR}$(%)
Recommended MN PEN-USB	62.5	81.8	73.5
Recommended MN CONTROLLER	33.8	28.4	34.1

Frequencey/Mhz	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490
Gain/dBi	-6.4	-0.57	-0.16	-0.14	-0.08	0	-0.11	-0.1	-0.13	-0.31

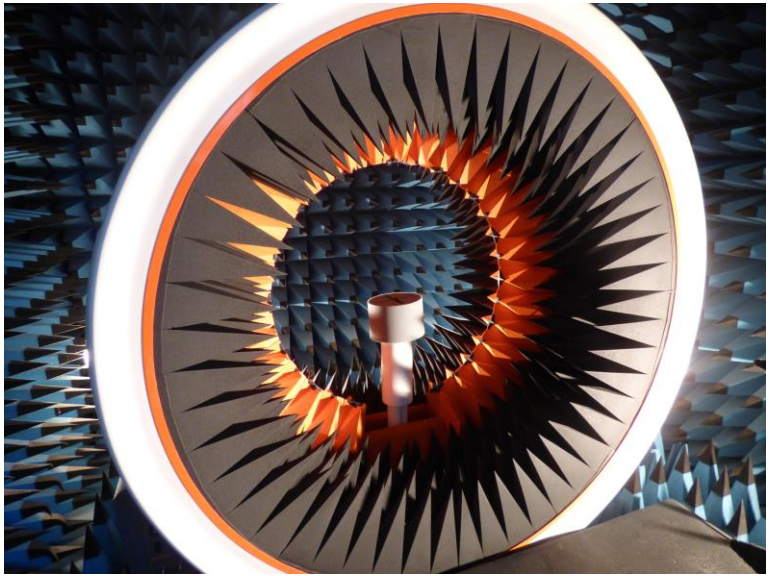


Frequencey/Mhz	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490
Gain/dBi	3.69	3.72	3.81	3.75	3.69	3.67	3.66	3.68	3.68	3.74

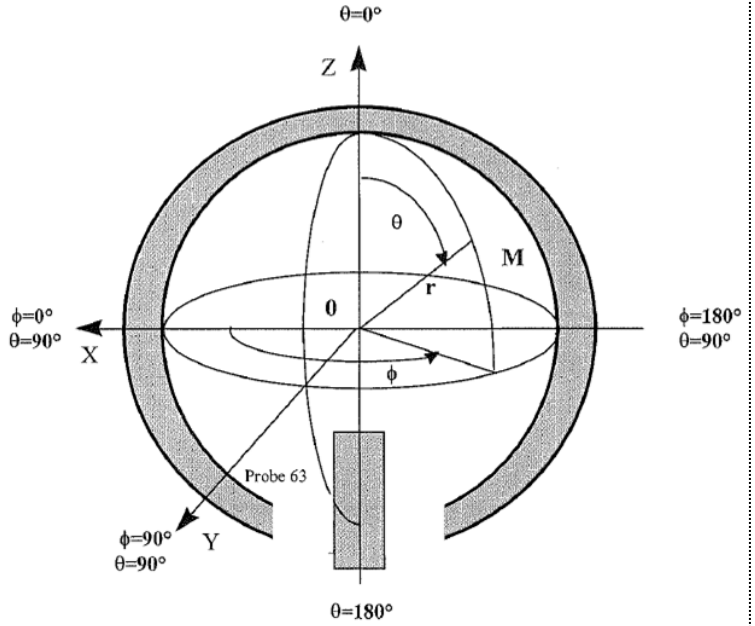


5.3 Performance Analysis: Coordinates for the Radiation Pattern

MVG StarLab18



Measurement coordinate system

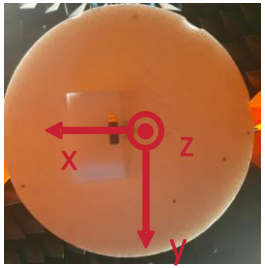


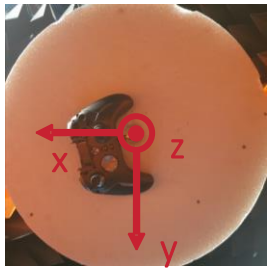
Radiation Pattern Phi 0º (1/3)

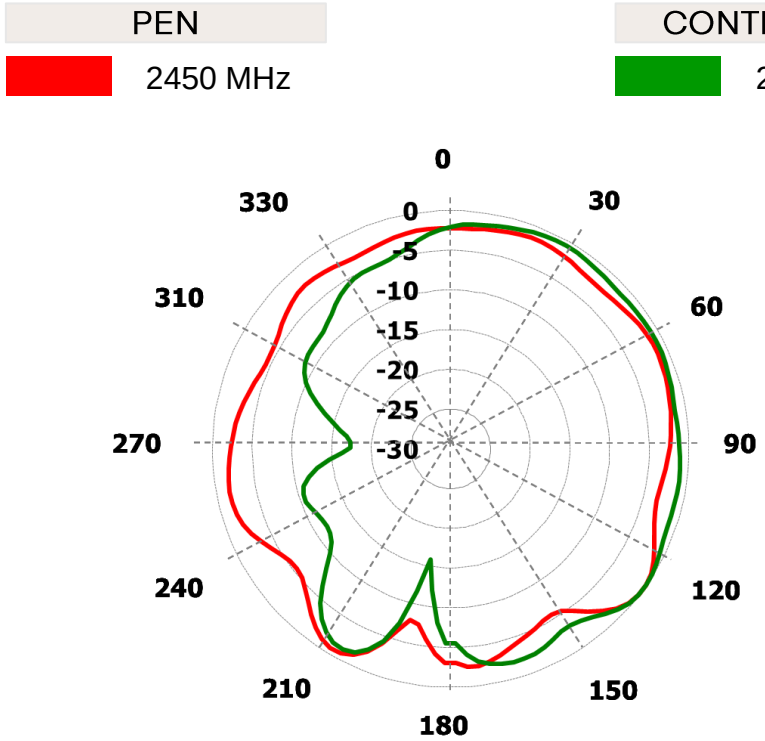
φ= 0º

Plane XZ

Y=0





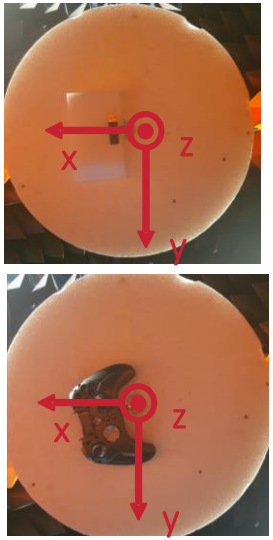


Radiation Pattern Phi 90º (2/3)

φ= 90º

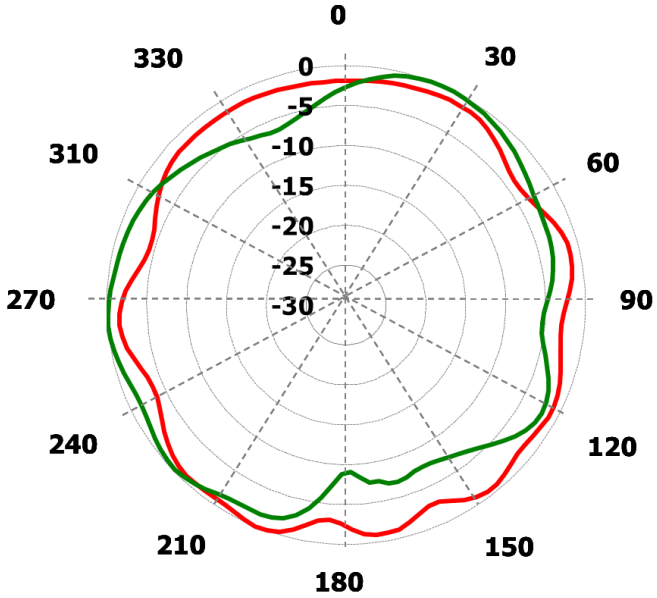
Plane YZ

X=0



PEN — 2450 MHz

CONTROLLER — 2450 MHz

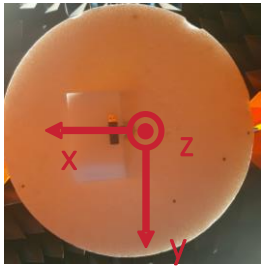


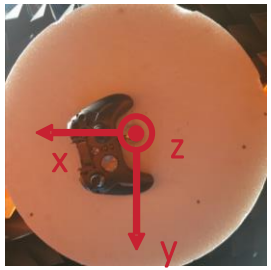
Radiation Pattern Theta 90º (3/3)

θ = 90º

Plane XY

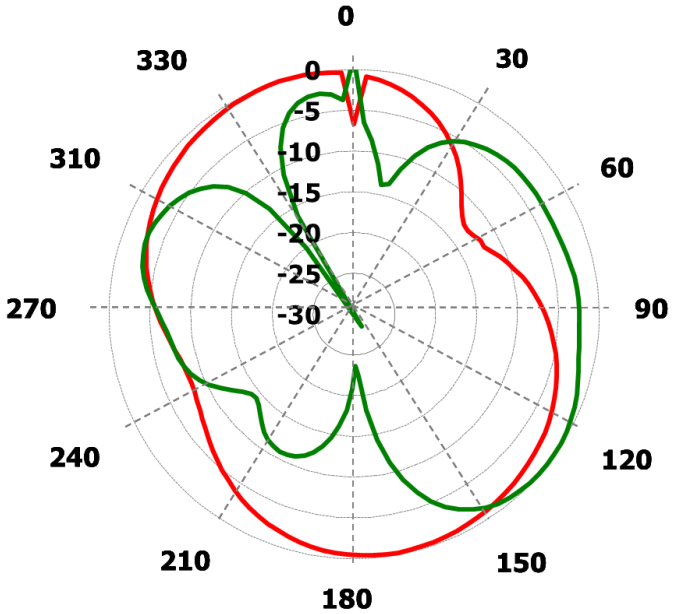
Z=0





PEN — 2450 MHz

CONTROLLER — 2450 MHz



6. Summary

- Results obtained for the main antenna parameters:
  - $VSWR_{PEN}$ is 1.5:1
  - $VSWR_{CONTROLLER}$ is 3:1
  - Antenna Efficiency for **PEN** is **73.5%**
  - Antenna Efficiency for **CONTROLLER** is **34%**
- Recommended matching network topology and component values considered the casings and the battery, the full device. The MN recommendations are in slide 7.
- It has been made some extra experiments to see the robustness of the solution. See it in the next slide.

If **any change** is applied on the PCB, the device, or its surroundings, the **matching network** may need a **readjustment**.

7. Annex – Extra Experiments

PEN

The robustness of the solution has been tested by connecting the USB PEN to a DOC Station. The results are good. In S11, everything is below -10dB, and in terms of efficiency, it performs very well at over 50%.

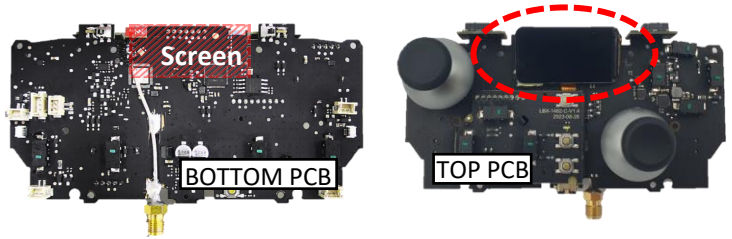
PEN Full Device

PEN Full Device with DOC Station

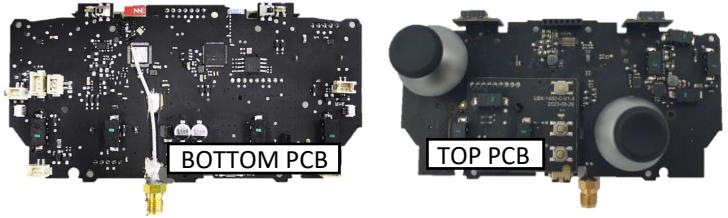
CONTROLLER

As for the Controller, we have measured S11 and Efficiency with the Bare PCB and then, the PCB without the screen. The screen is placed above the antenna and the clearance area, which may have an impact. We will examine this further, but the results are good.

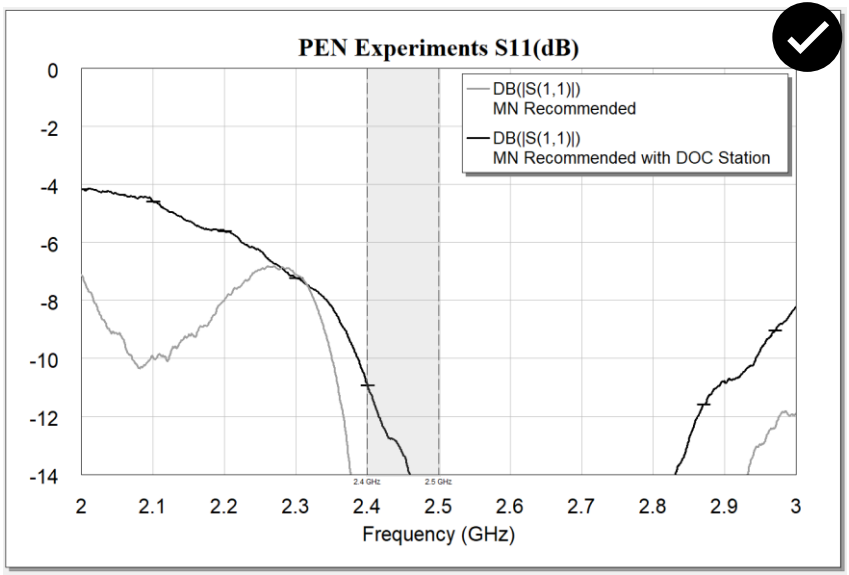
With Screen

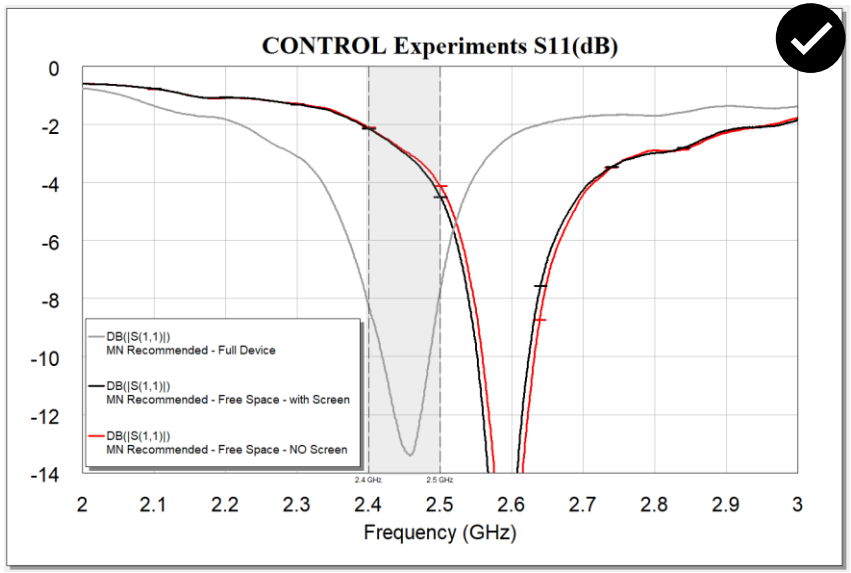


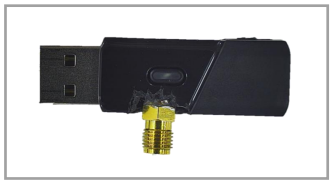
With NO Screen

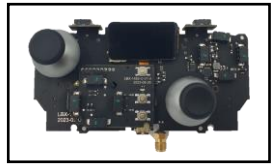


7. Annex – Extra Experiments – S11 (dB)



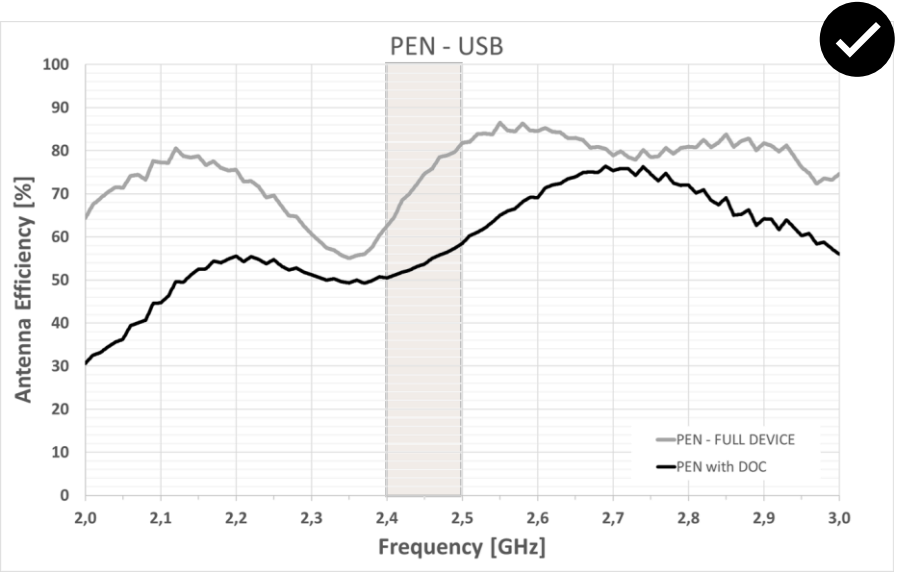


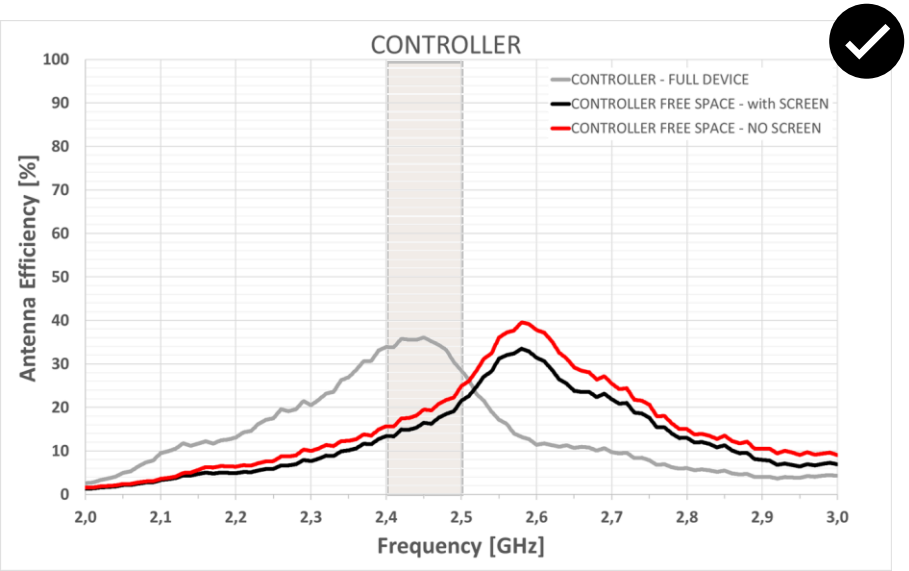




The signal is shifted because the casing is not involved in the measure

7. Annex – Extra Experiments – Eff (%)





The signal is shifted because the casing is not involved in the measure

ignion

Your innovation.
Accelerated.

Get in touch

ignion.io

info@ignion.io

Barcelona

Av. Alcalde Barnils 64-68, Module C
Sant Cugat del Vallès
Barcelona, 08174
Spain

+34 935 660 710

Tampa

8875 Hidden River Parkway,
Suite 300
Tampa, FL 33637
USA

+1 888 726 8366

Shenzhen

Topway Information Building, Binhai Avenue, Nanshan District, N°3369 - Room 2303 Shenzhen, 518000
China

+86 13826538470