



Characterization of the ISM Antenna for ITAB

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1 Revisions

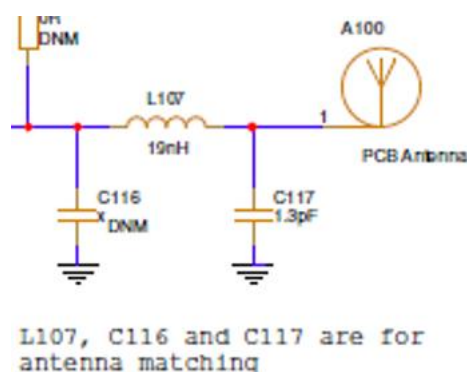
Revision	Updates	Author	Date
0.1	Creation of the document	André da Silva Frazão	November 24 2025
1.0	Reviewed and approved content	André da Silva Frazão	November 26 2025

2 Characterisation of Antennas

ITAB requested Sigma Connectivity AB (Lund, Sweden) to characterize the efficiency and gain of an ISM and EU equivalent antenna placed on a fully populated PCB (PBA). The operational bandwidths are ~867MHz and 902-928 MHz respectively.

2.1 Antenna and Antenna Matching Network

Only one antenna is present on the PBA and the antenna is a copper trace on the FR4 substrate with a feed only, see picture 8 below. Between the radio and the antenna a Pi-type matching network. See the schematics in picture 1 below.



Picture 1: Schematics of the antenna matching network and the values of the matching components.

2.2 Antenna Chamber Description

The chamber used for the measurements is SG 24L from MVG (MVG - Microwave Vision Group). The application-software WaveStudio version 25.3.0 used was.



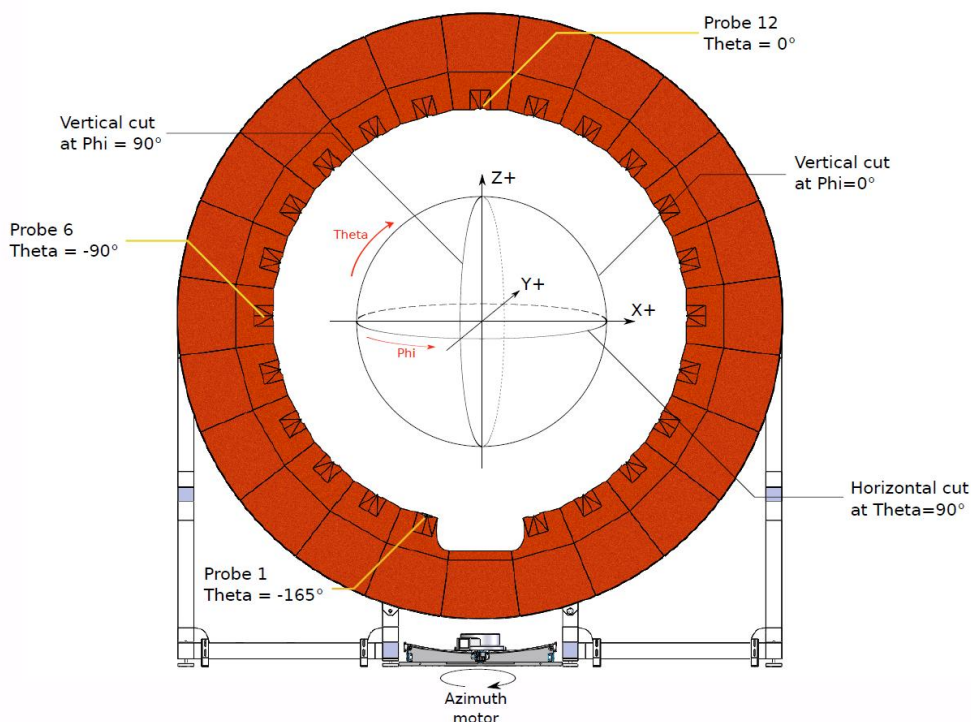
Picture 2: SG24L control software, version 25.3.0.



Picture 3: Serial number of the SG24L system and the compliance date after the delivery and installation of said system.

The annual calibration, performed by MVG personal, was performed June 5 2025. Annual calibration technical document, MATR.155.15.25.PAR.A.

Chamber orientation as shown below.

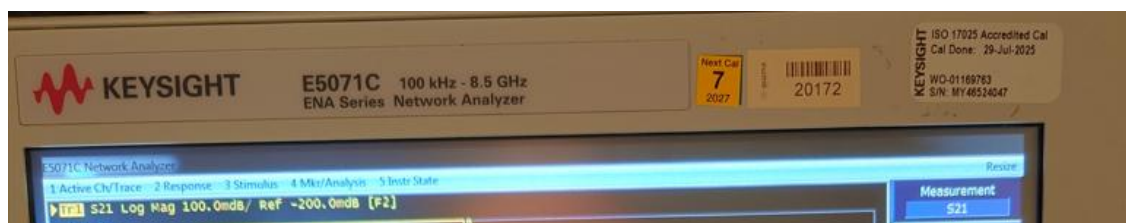


Picture 4: SG24L coordinate orientation.

2.3 Stargate 24L Measurement Equipment

For the antenna characterization the following measurement equipment was used.

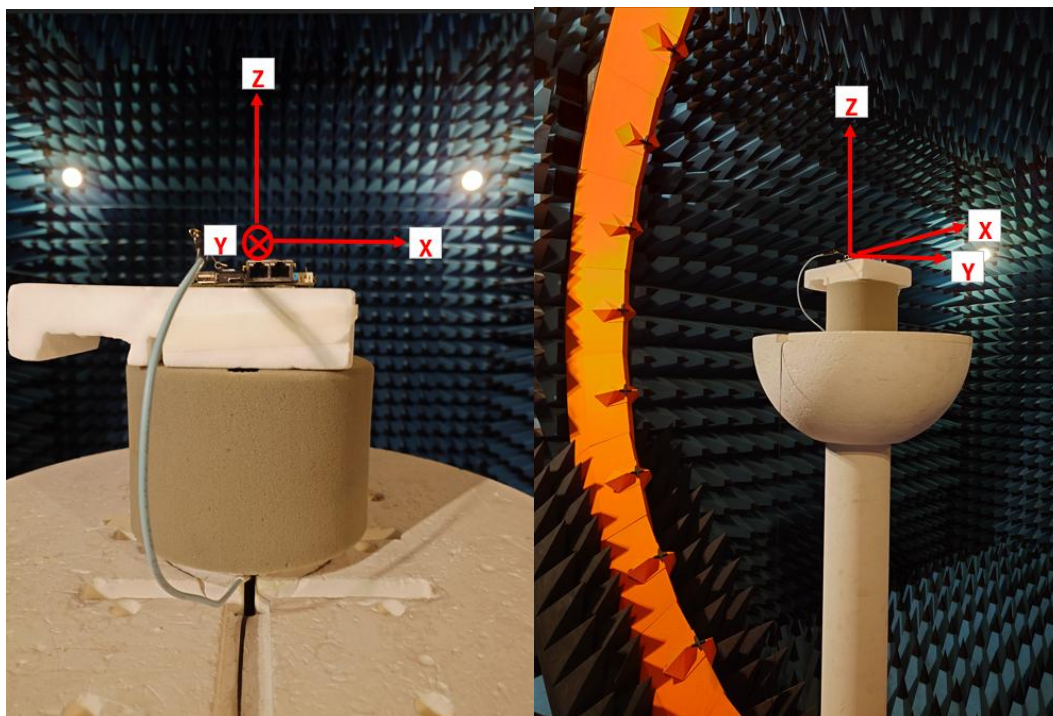
VNA Agilent Technologies E5071C ENA series. This VNA had an accredited calibration done in 2025 July 29.



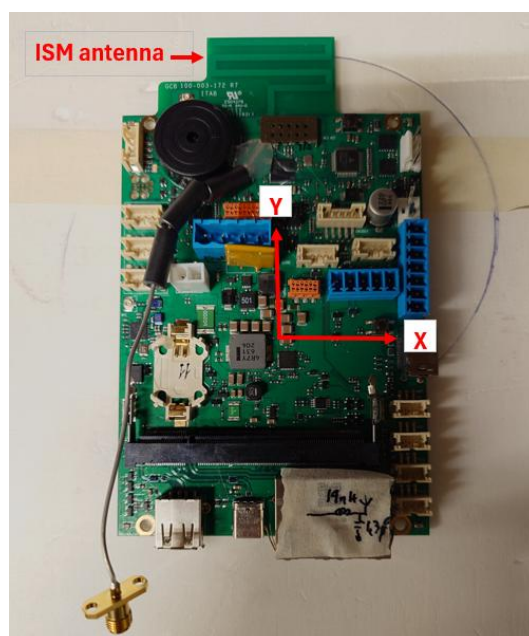
Picture 5: The VNA used for the measurements and its calibration date.

2.4 Setup of the DUT in the SG24L Chamber

The placement of the DUT is with a spacer in order to be in the origo of the measurement system. The orientation of the PBA is as follows according to the anechoic chamber's coordinate system (see picture 4 above):



Picture 6: DUT placement in the chamber. Picture 7: DUT placement in the chamber.



Picture 8: PCB assembly with antenna under test.

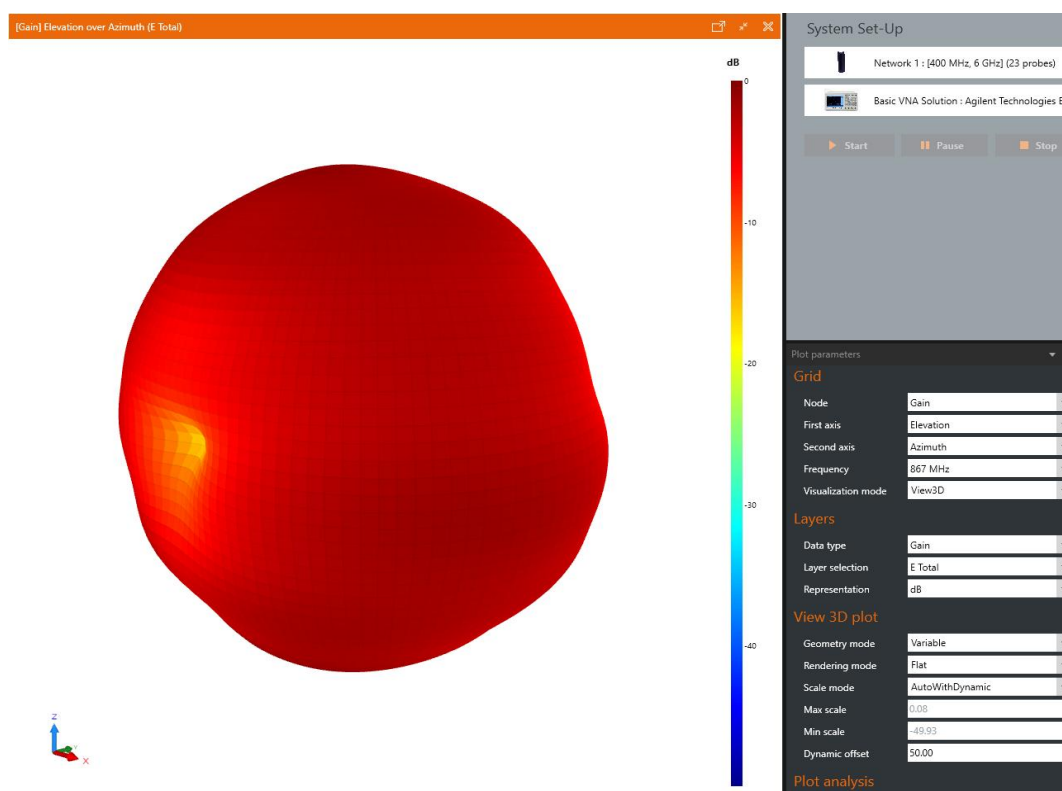
2.5 Measurement Results

The frequencies of interest are 867MHz, 902MHz, 915MHz, and 928MHz, as requested by the customer. The antenna's efficiency, gain, and directivity can be found in table 1 below.

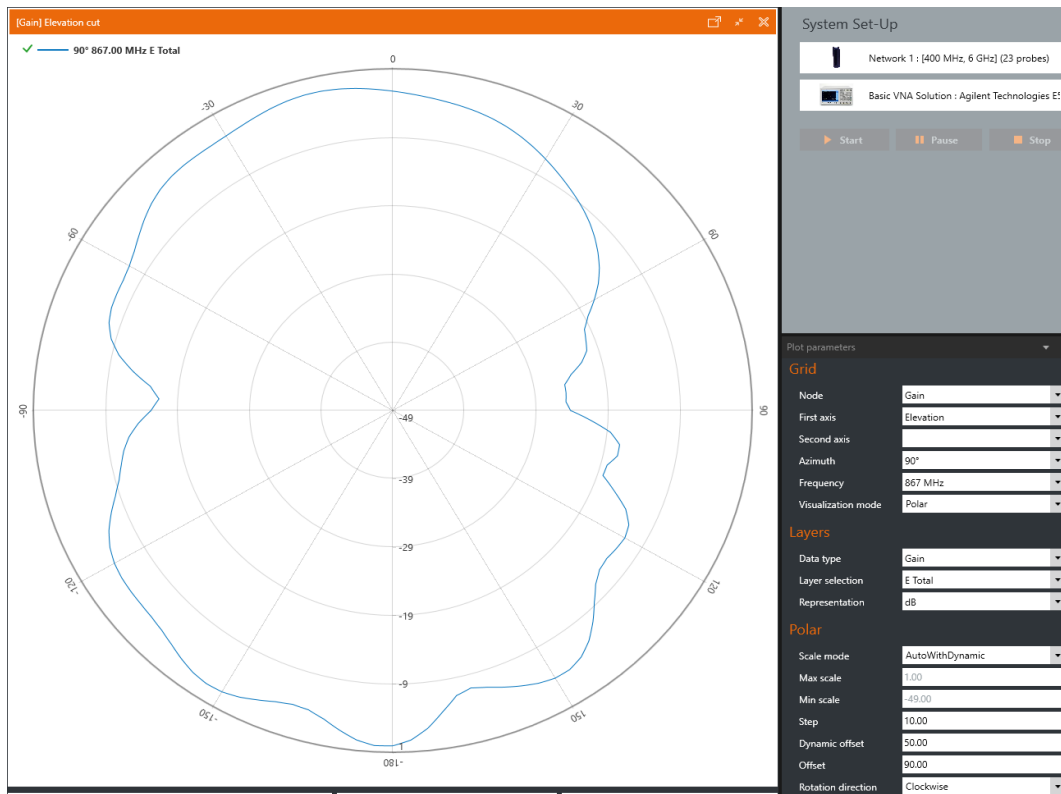
Frequency	Efficiency	Gain	Directivity
867MHz	-4.4dBi	0.1dBi	4.4dBi
902MHz	-4.8dBi	-0.9dBi	3.9dBi
915MHz	-4.5dBi	-0.3dBi	4.1dBi
928MHz	-4.5dBi	-0.4dBi	4.1dBi

Table 1: Measurement results of the DUT.

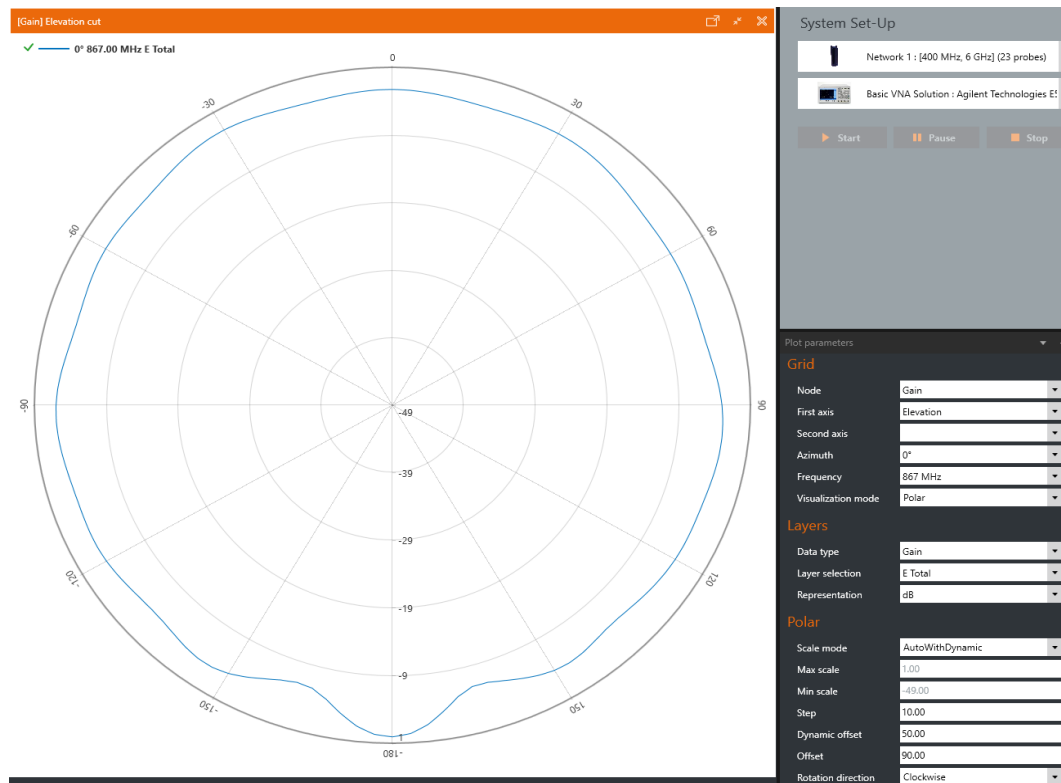
2.5.1 3D Radiation Pattern and 2D-cuts for 867MHz



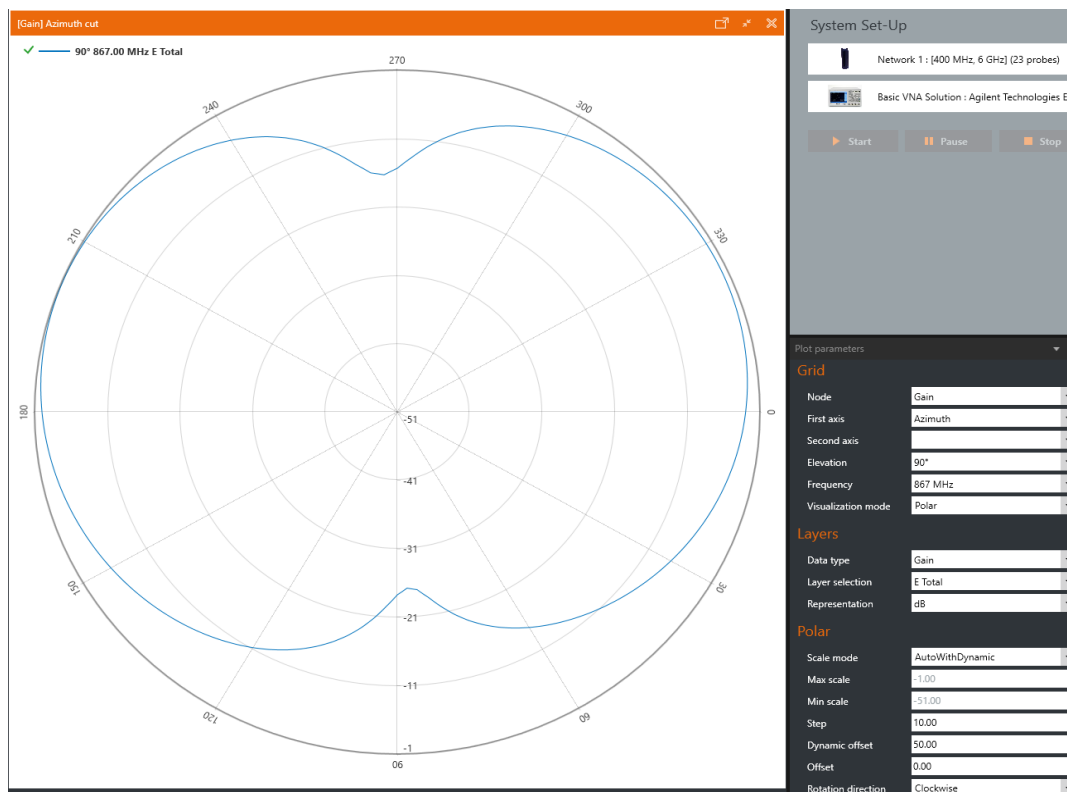
Picture 9: 3D-pattern, 867MHz.



Picture 10: Elevation cut 90deg., 867MHz.

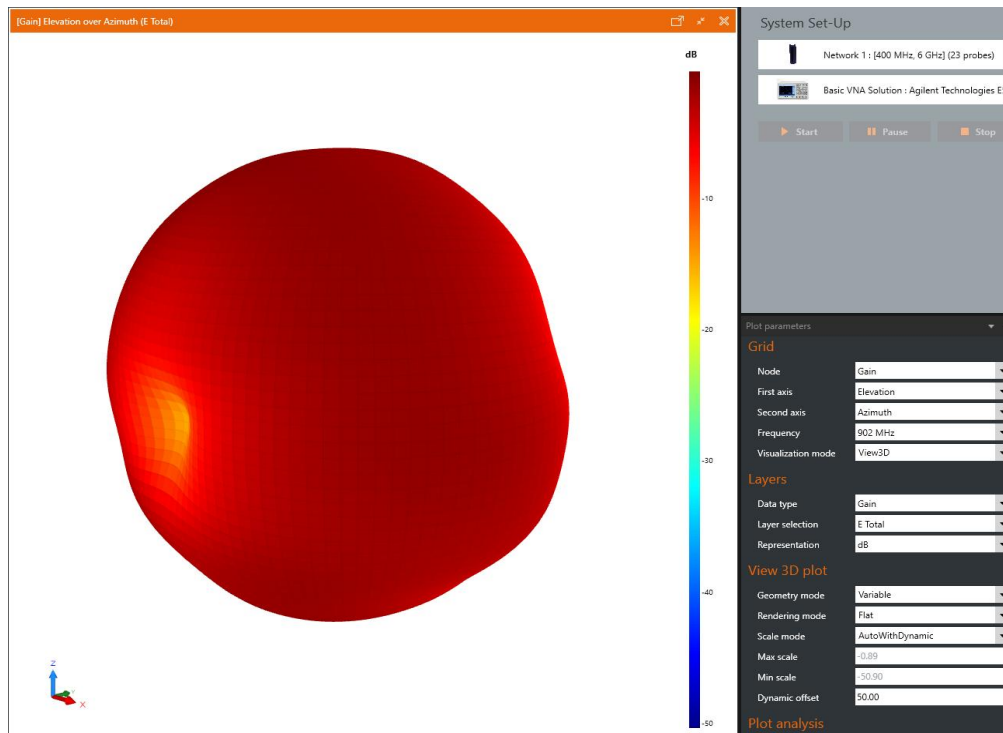


Picture 11: Elevation cut 0deg., 867MHz.

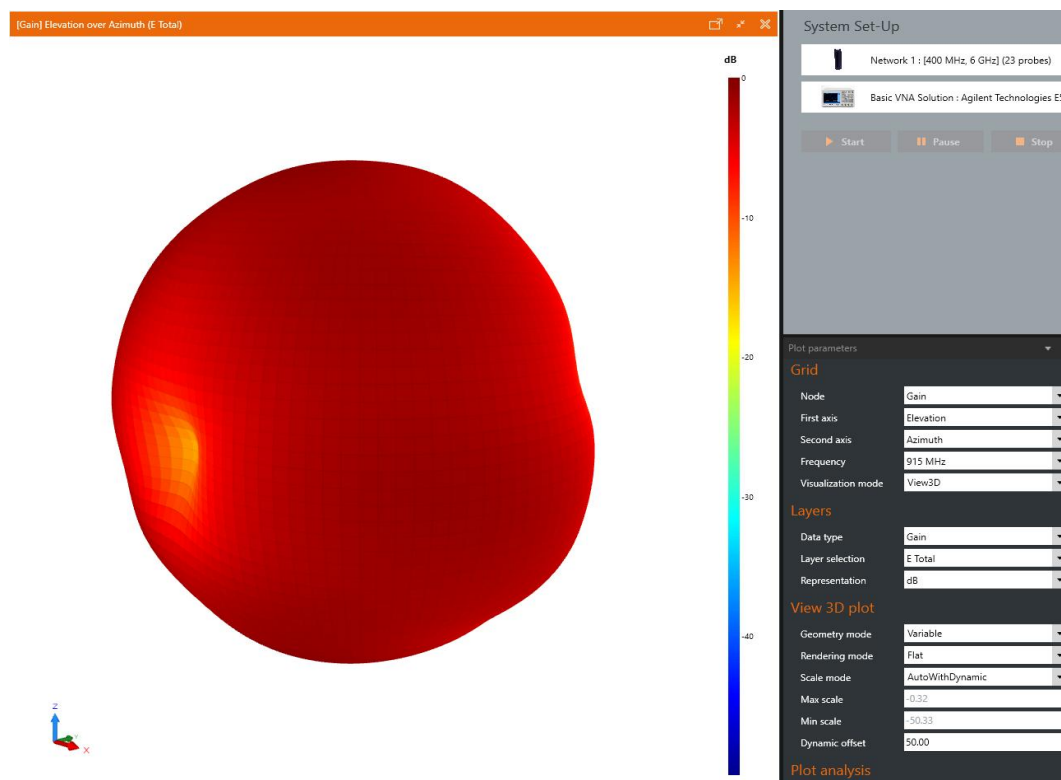


Picture 12: Azimuth cut 90deg., 867MHz

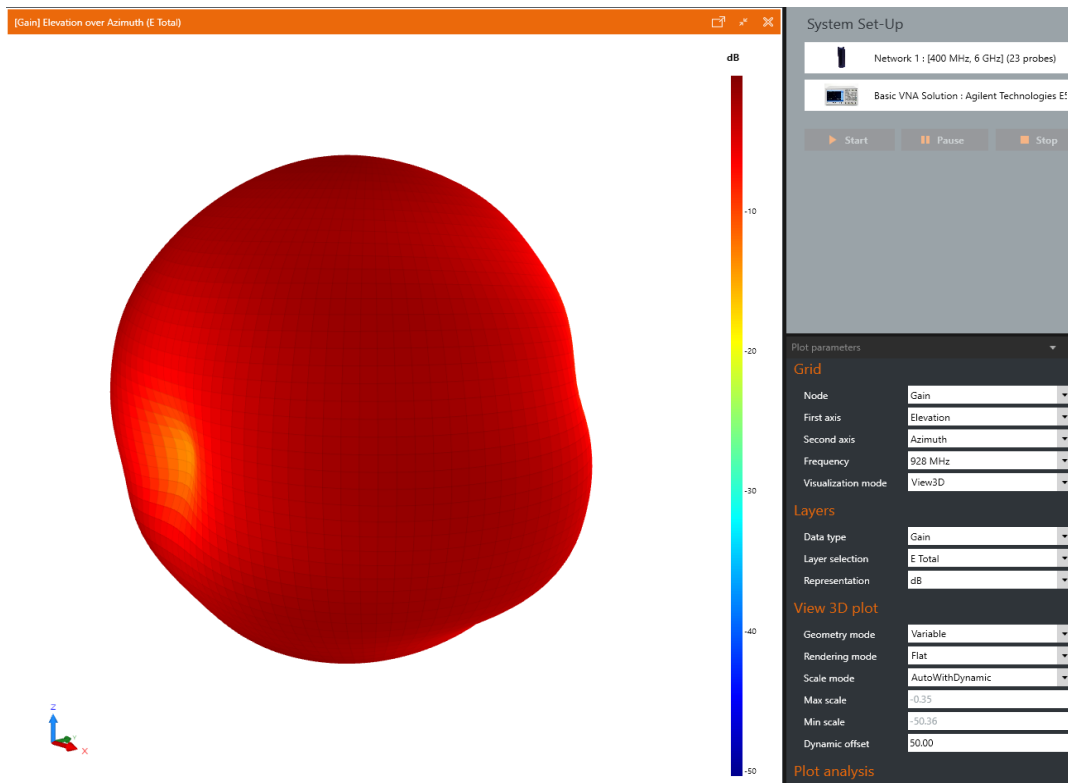
2.5.2 3D Radiation Patterns and 2D-cuts for 902MHz, 915MHz, 928MHz



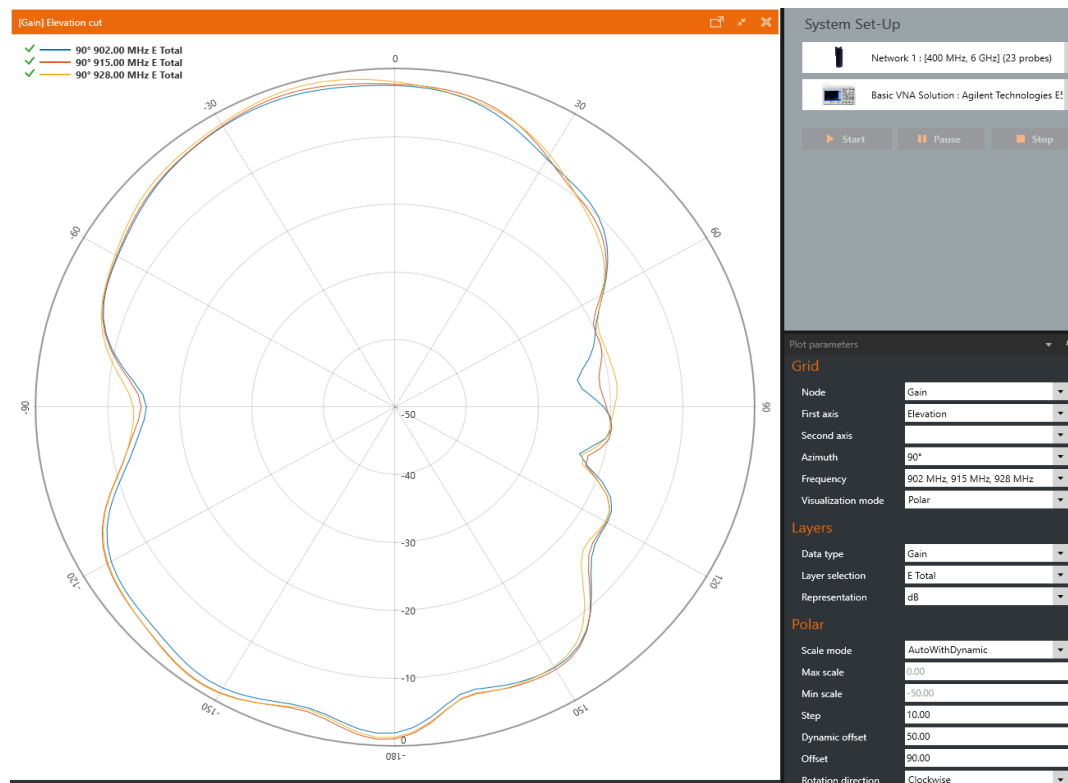
Picture 13: 3D-pattern, 902MHz.



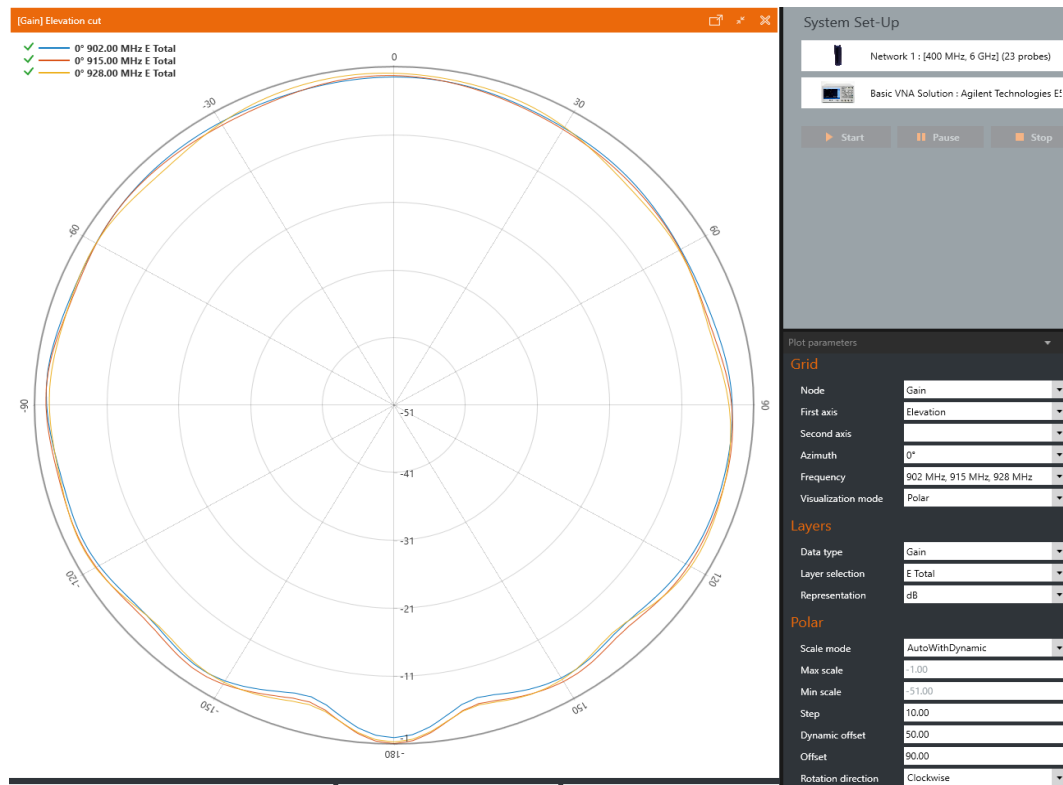
Picture 14: 3D-pattern, 915MHz.



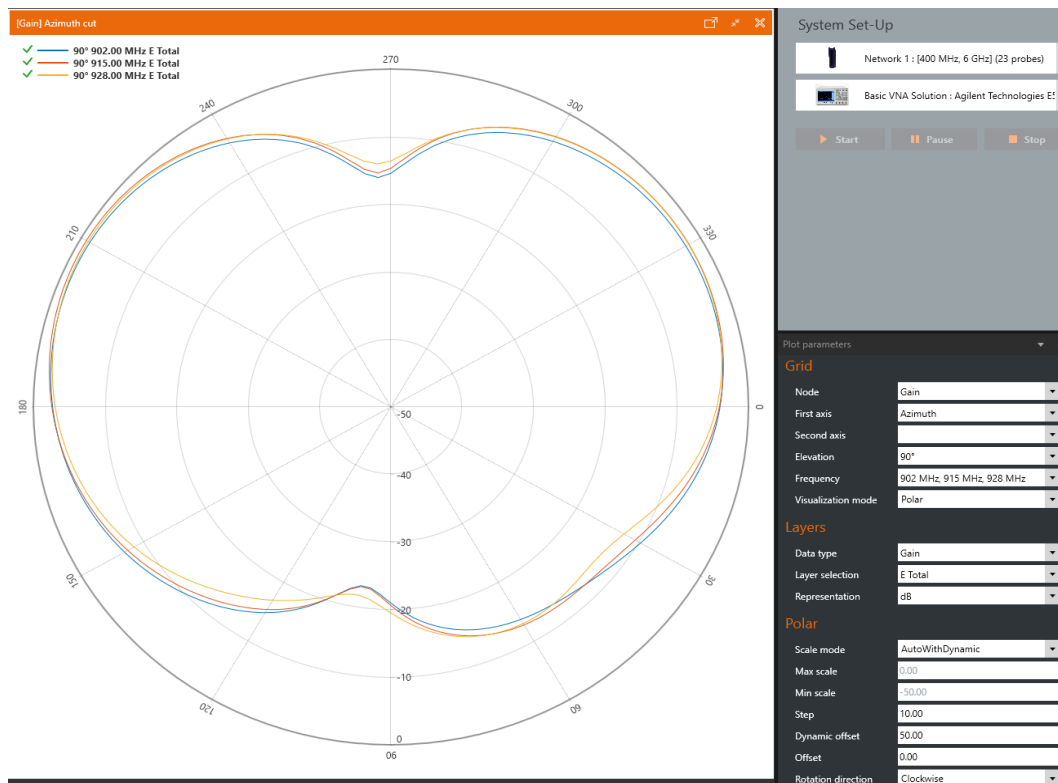
Picture 15: 3D-pattern, 928MHz.



Picture 16: Elevation cut 90deg., 902MHz, 915MHz, 928MHz.



Picture 17: Elevation cut 0deg., 902MHz, 915MHz, 928MHz.



Picture 18: Azimuth cut 90deg., 902MHz, 915MHz, 928MHz.