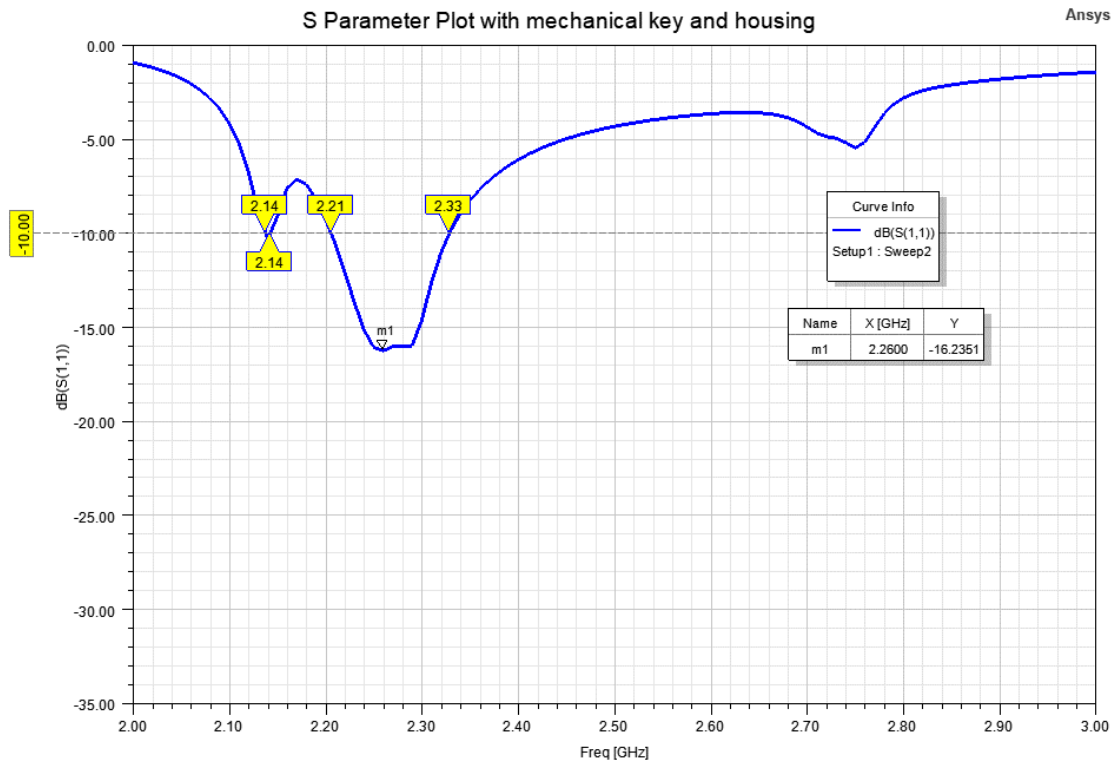
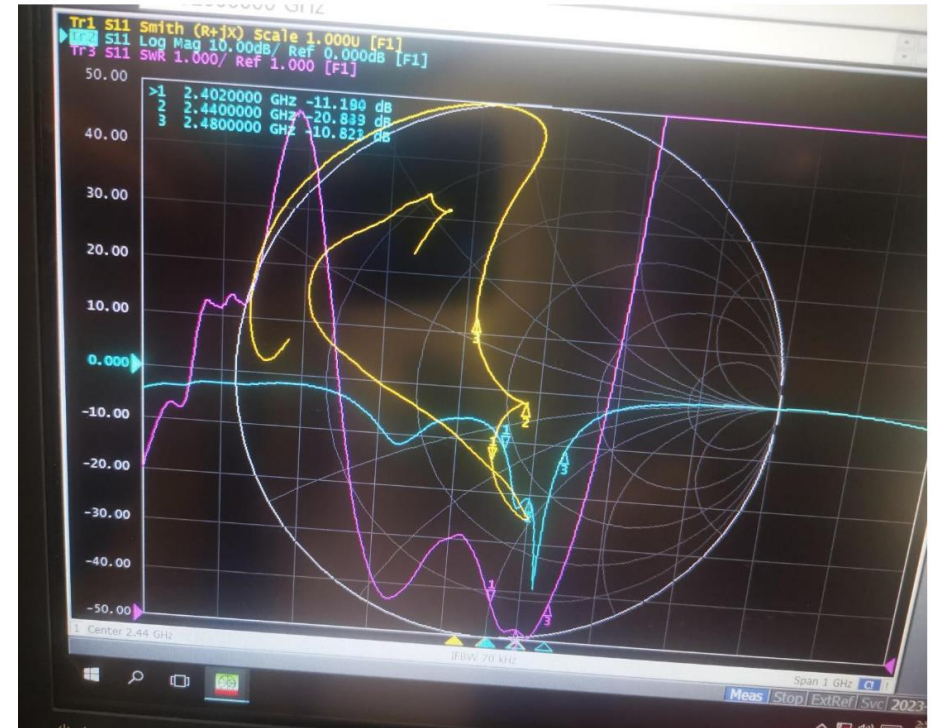


# SIMULATION VS. MEASUREMENTS



Simulation

Comperable results => equal behavior

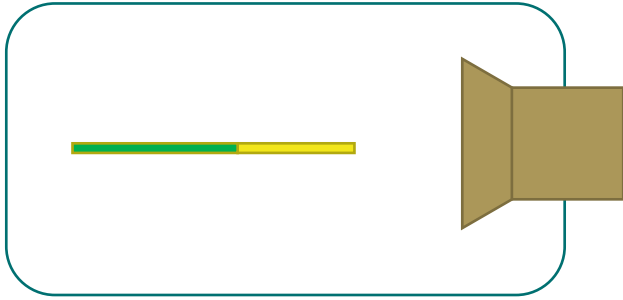


Measurement

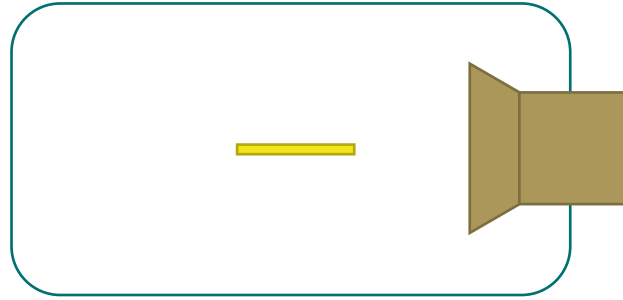
# MEASUREMENT SETUP

- Measurements are done inside a anachonic chamber.
- As reference a PCB antenna is used
- The measured parameter is  $S_{21}$  (mag) => 2 Port VNA
- The VNA is calibrated on the two feeding points of the antennas (reference and DUT)
- The antenna pattern of the xy-, xz-, yz-planes is calculated
- Stepsize =>  $3^\circ$

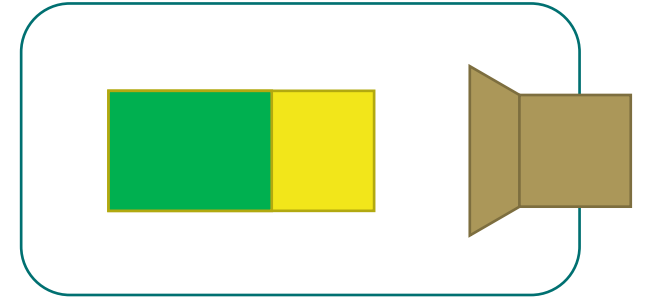
# SAMPLE ORIENTATIONS



xz - plane

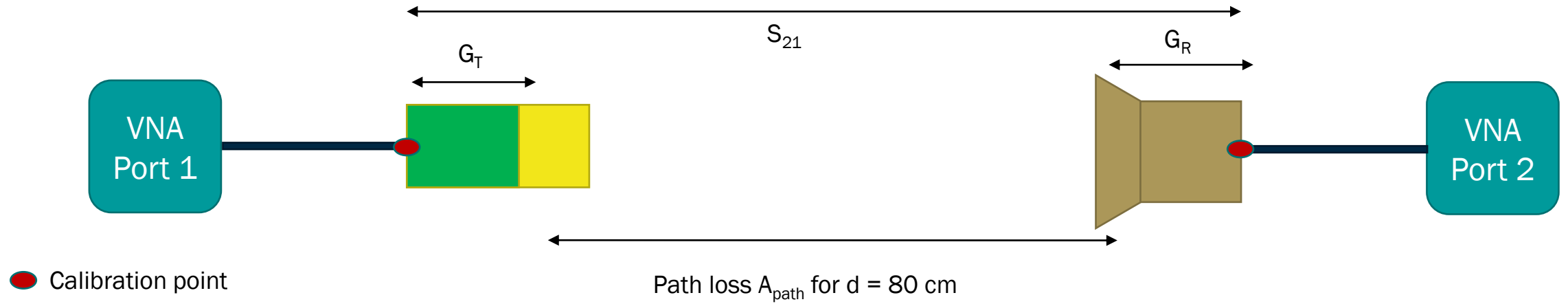


yz - plane



xy - plane

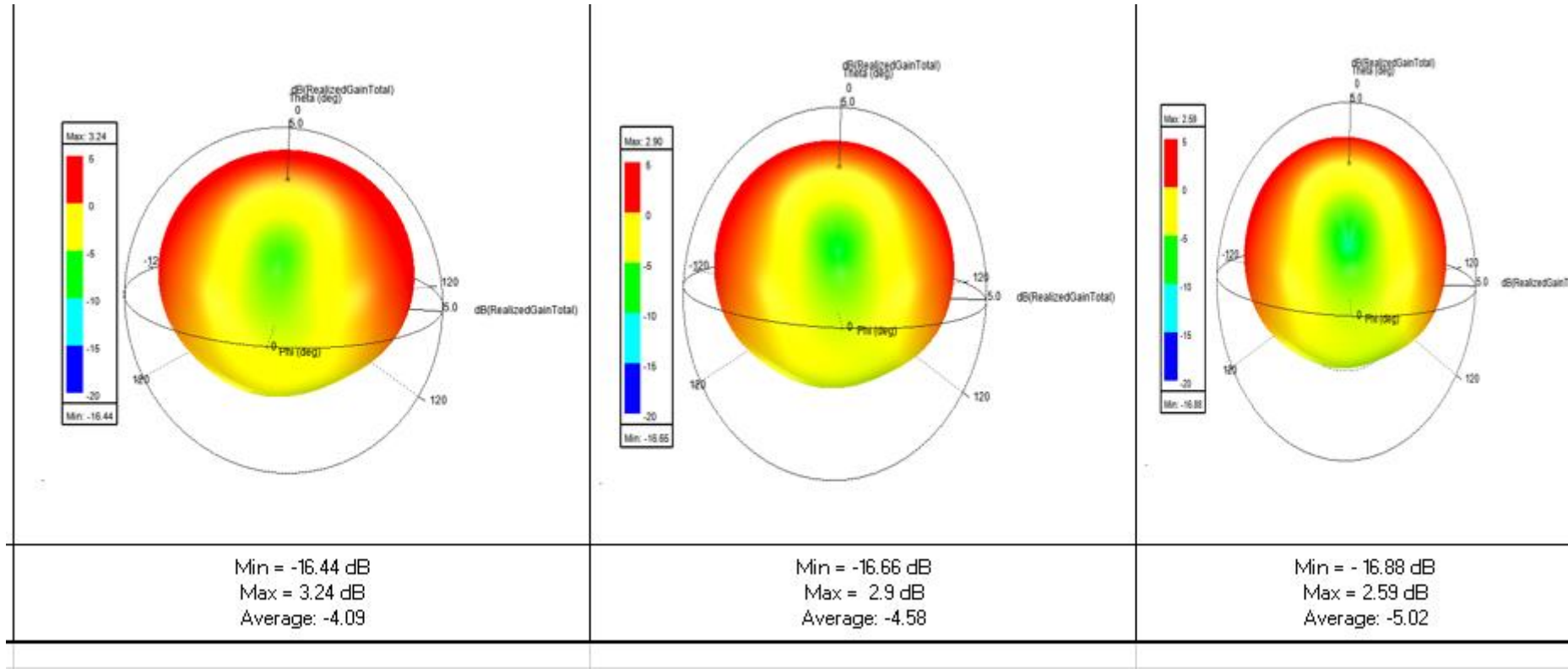
# CALCULATION OF THE ANTENNA GAIN



$$G_T = S_{21} - G_R - A_{path}$$

- $A_{path}$  = friis path loss
- $S_{21}$  = measured with VNA
- $G_R$  = gain of reference antenna

# TOTAL GAIN



- Antenna Manufacturer: Marquardt GmbH
- Manufacturer Address: Schloss-str.16,78604 Rietheim-Weilheim,Germany
- Model: BLE: MQBANTK
- Antenna Type: PCB Antenna
- BLE Antenna Size: 14.529mm\*4.9mm