

ABLOY

SWING HANDLE BLE ANTENNA STATUS

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General

Actions described in this document were done at Etteplan in Jyväskylä.

- Antenna resonant frequency (return loss) measurements
- Antenna matching re-tuning and component selection
 - Antenna return loss measurement using a vector network analyzer
 - Return loss tuning using laboratory component kits
- Equipment
 - Agilent E5071B vector network analyzer for return loss measurements

General

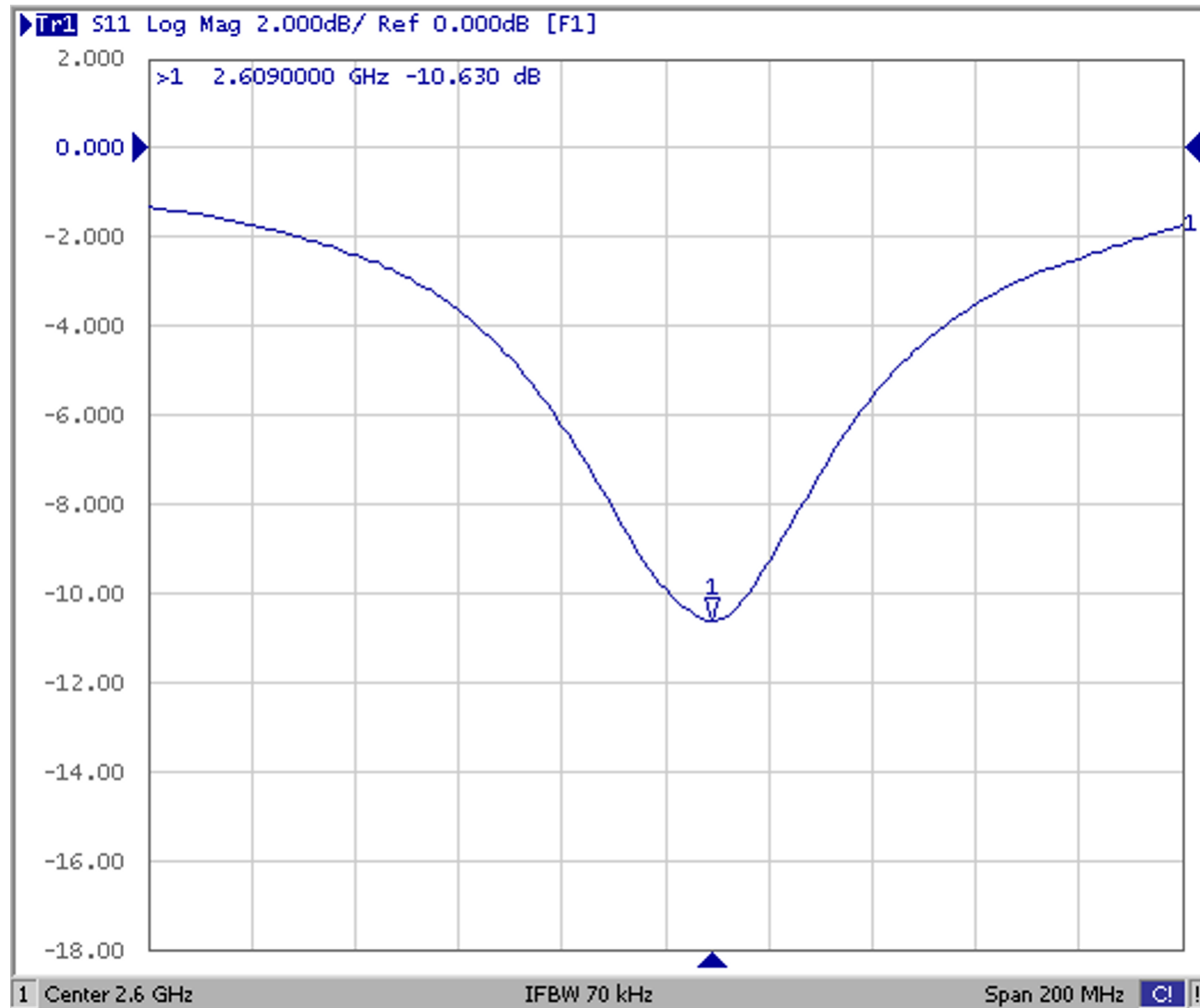
- Because the antenna has been tuned to be working inside the lock some metal was needed near the antenna in order to make antenna resonate. Measurements were made in a test jig shown in the picture on right. This way test environment was more stable for each board.
- Five production series circuit boards were measured.
- Antenna resonant frequency was measured with Agilent E5071B VNA.
- Resonant frequency varied between 2592 MHz and 2623 MHz (Δ 31 MHz).
- It is recommended to use this kind of jig in production line when testing board without mechanics.
- Screw torques seem to have some effect on antenna resonant frequency. So it is recommended to tighten screws with a torque spanner if not done already.

General

- Antenna matching was fine-tuned because antenna support plastic part was a prototype part when tuning components were selected. The final part is different material and had effect on antenna matching.

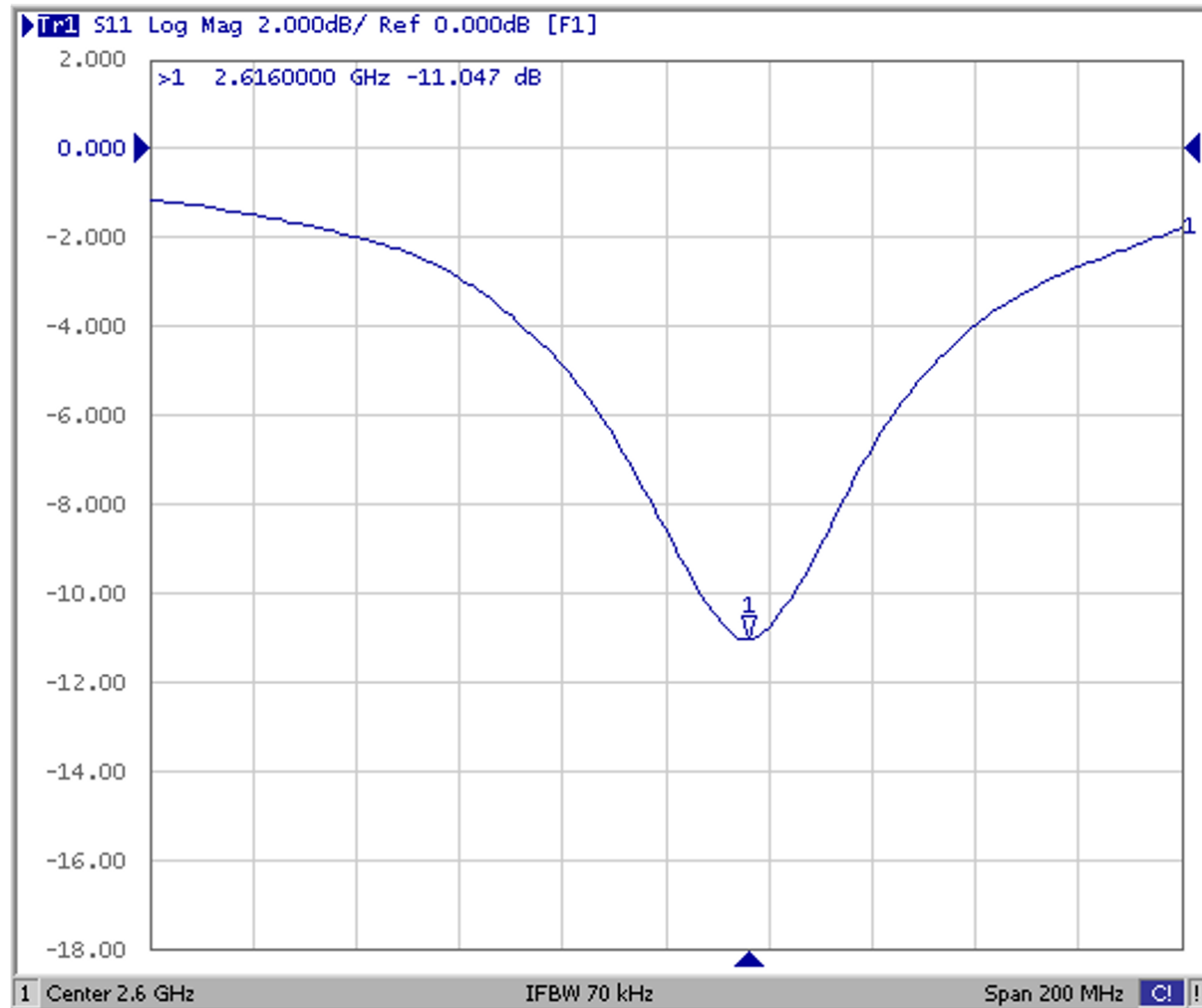
Antenna B21 return loss

Measured in the test jig



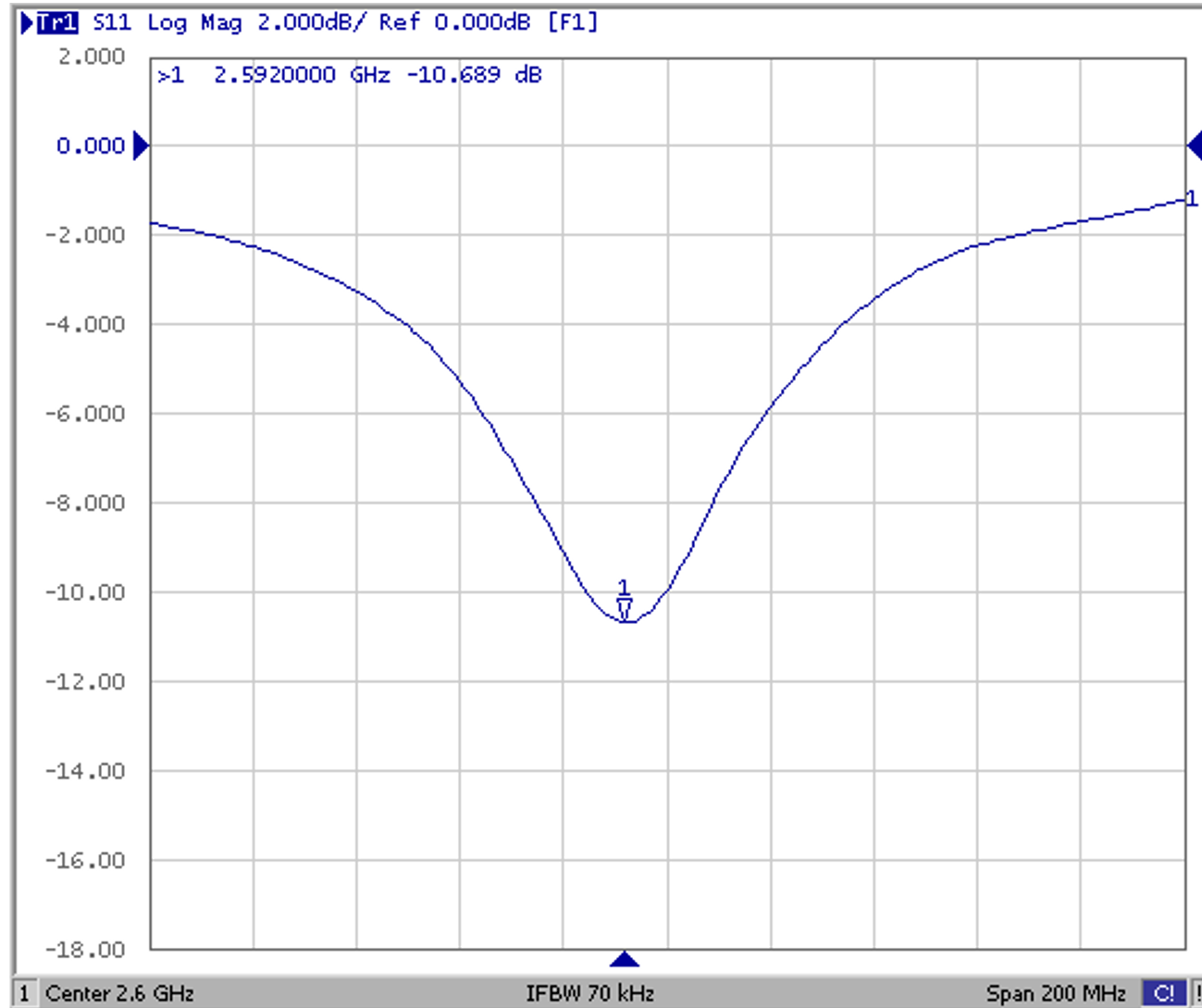
Antenna B22 return loss

Measured in the test jig



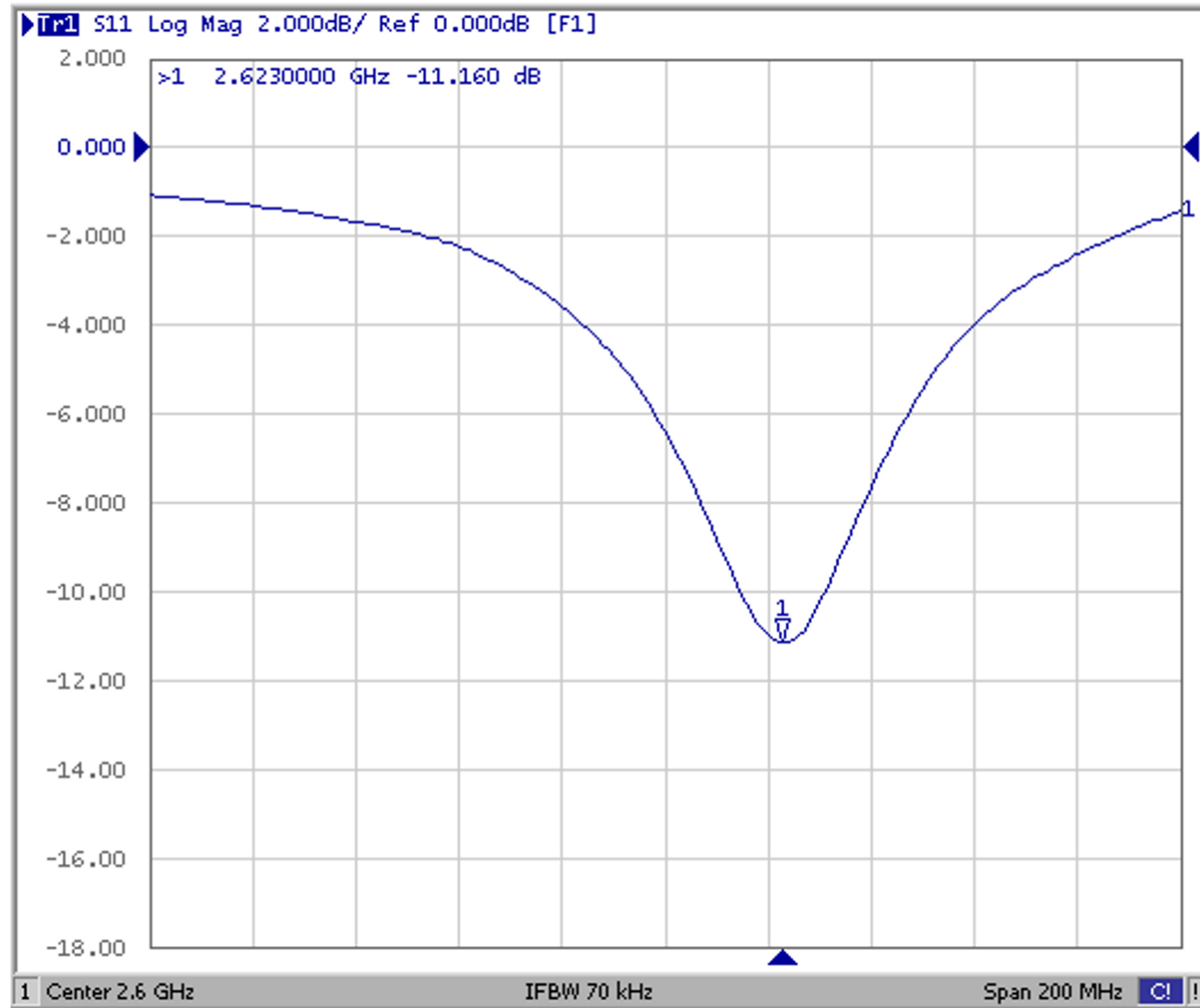
Antenna B23 return loss

Measured in the test jig



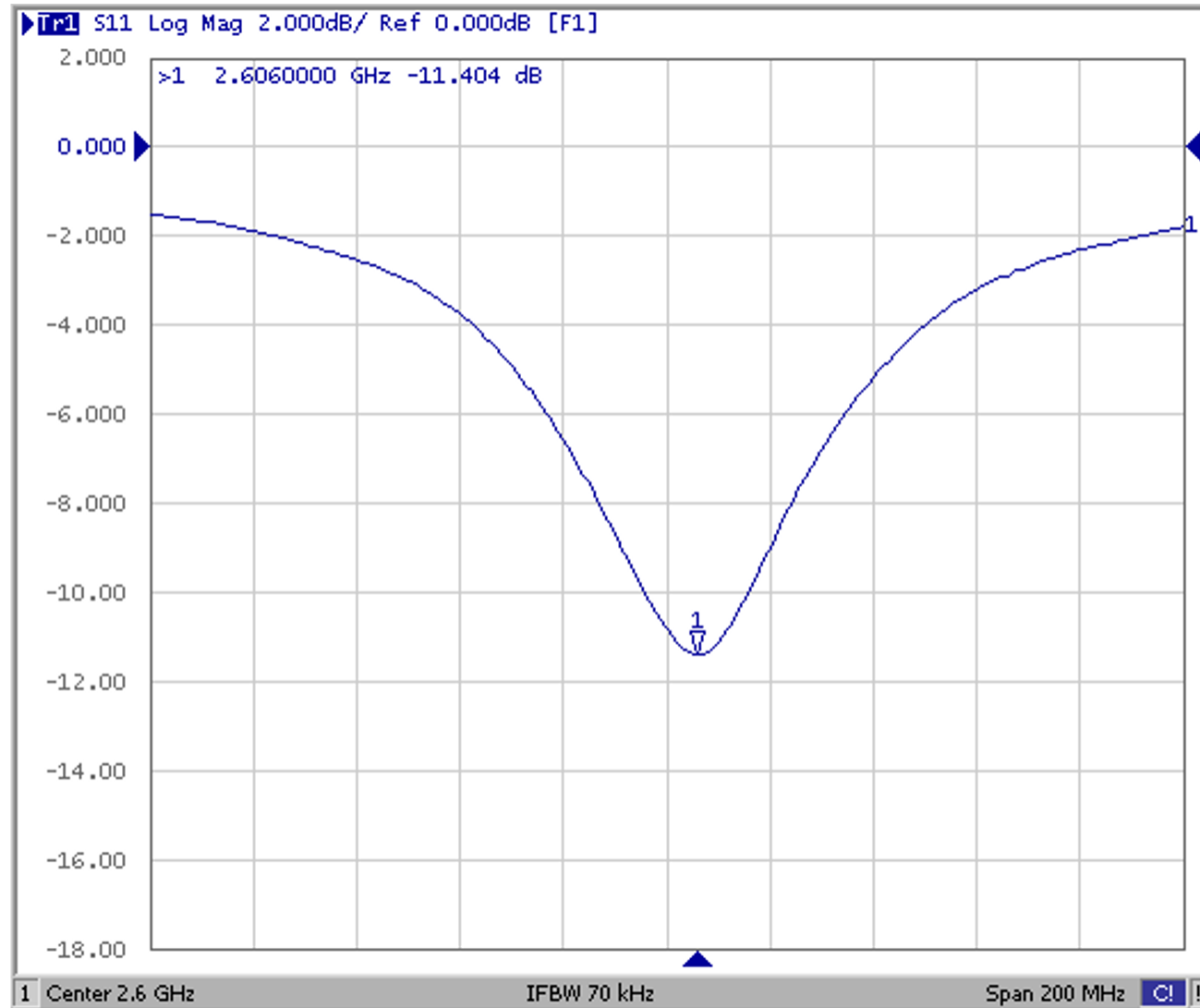
Antenna B24 return loss

Measured in the test jig



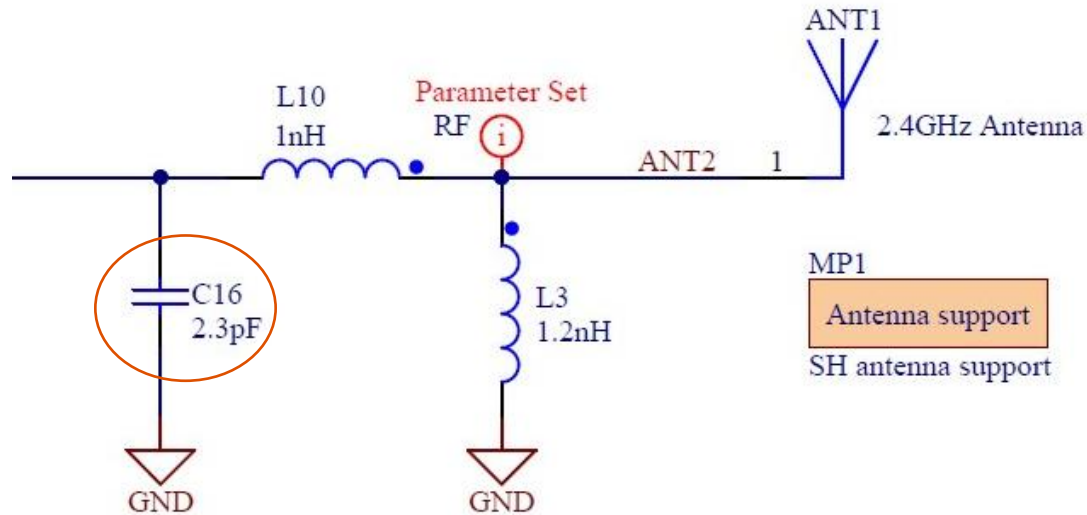
Antenna B25 return loss

Measured in the test jig



Antenna re-matching

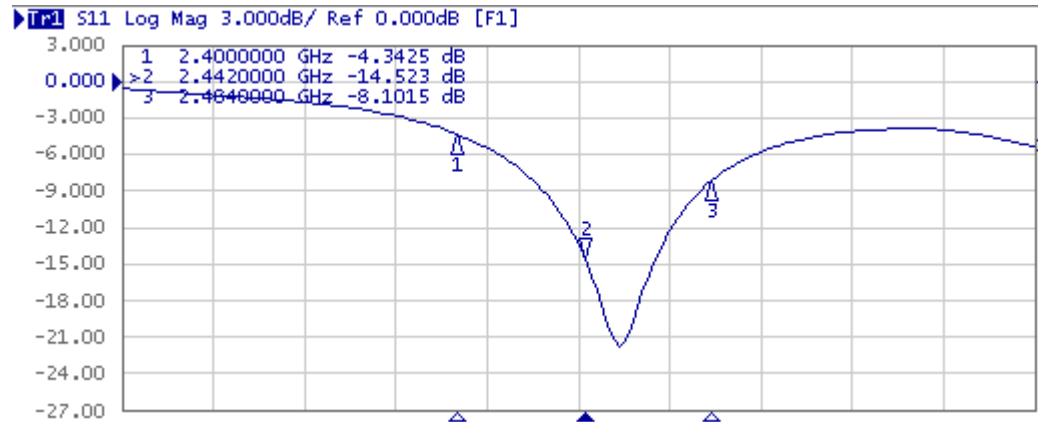
- Because the antenna matching did not look to be very good new antenna matching was tried.
- When antenna matching components were selected antenna support plastic part was a prototype part. Final part is different material.
- C16 value was changed to 1.8 pF (Murata GRM1555C1H1R8CA01).
- Two DUTs were retuned, one with bad tuning and one with good.



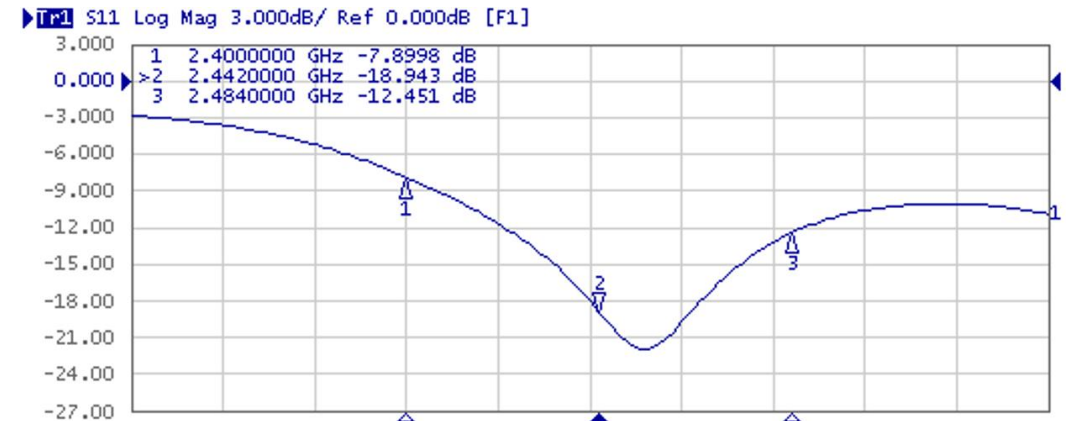
Antenna B22 return loss

- Measured with full mechanics on a metal plate.

Before re-matching

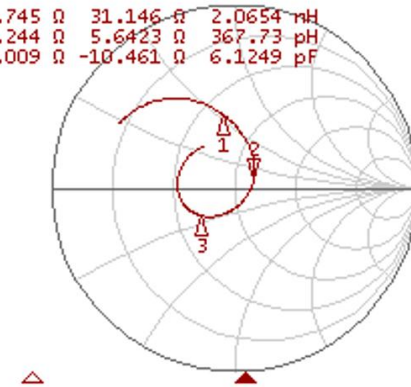


After re-matching



Tr2 S11 Smith (R+jX) Scale 1.000U [F1]

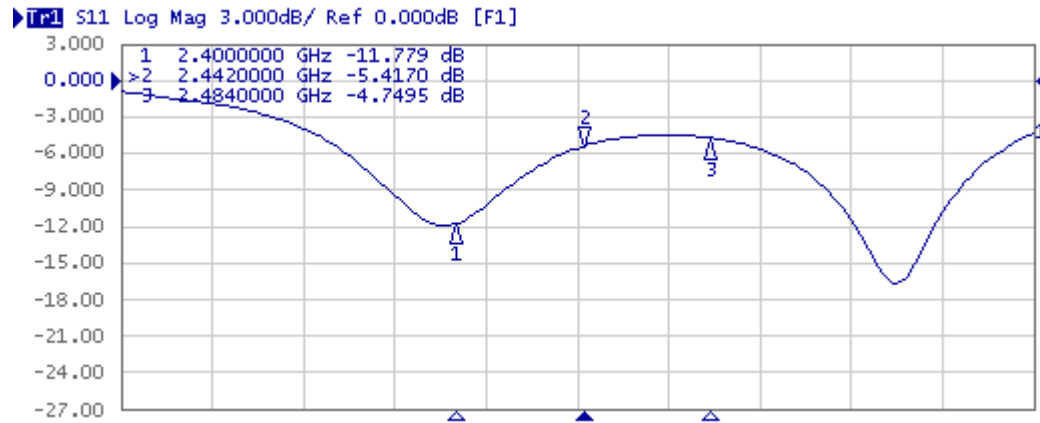
1	2.400000 GHz	32.745 Ω	31.146 Ω	2.0654 nH
2	2.442000 GHz	61.244 Ω	5.6423 Ω	367.73 pF
3	2.484000 GHz	33.009 Ω	-10.461 Ω	6.1249 pF



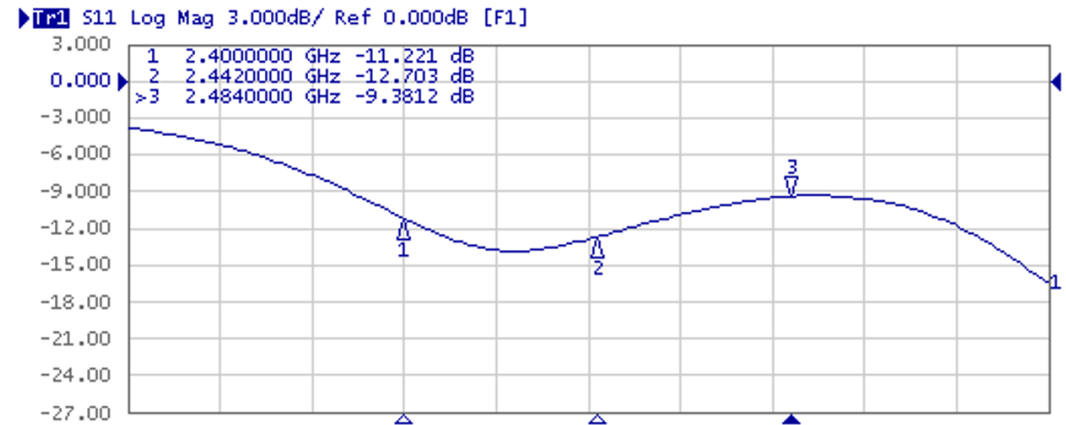
Antenna B25 return loss

- Measured with full mechanics on a metal plate.

Before re-matching



After re-matching



Tr2 S11 Smith (R+jX) Scale 1.000U [F1]

1	2.400000	GHz	55.222	Ω	29.573	Ω	1.9612	nH
2	2.442000	GHz	61.106	Ω	-23.869	Ω	2.7305	pF
3	2.484000	GHz	28.687	Ω	-17.134	Ω	3.7395	pF

