4.3-5.0 GHz bandpass-filter from surplus BOSCH filter unit

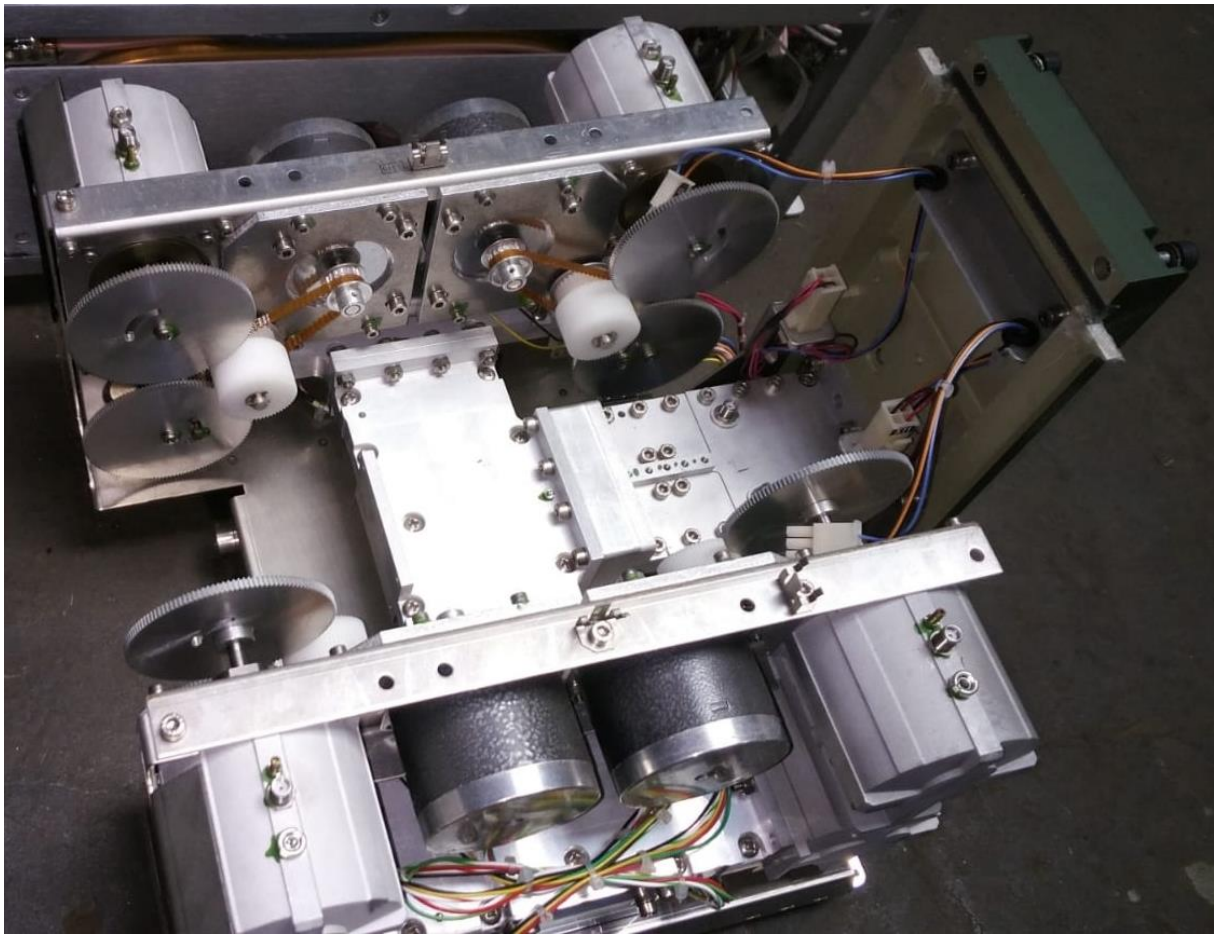
Matthias, DD1US, November 17th 2019, rev 1.0

Hello,

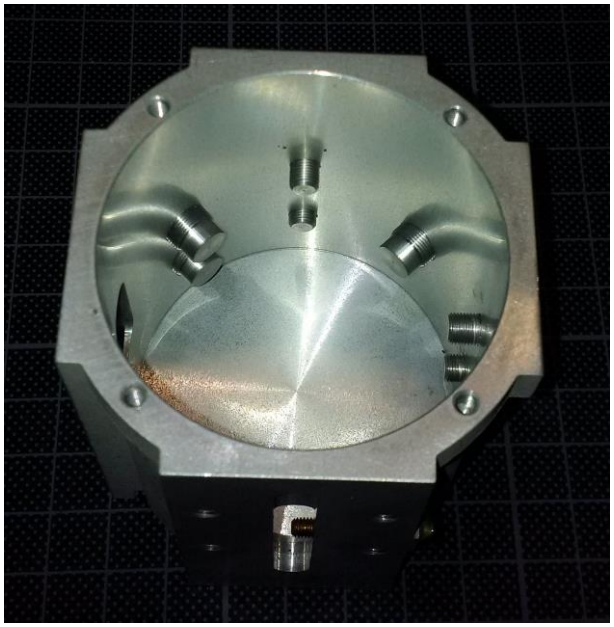
Last week a friend gave me an unknown filter unit. A label on the frame states, that it is from BOSCH:

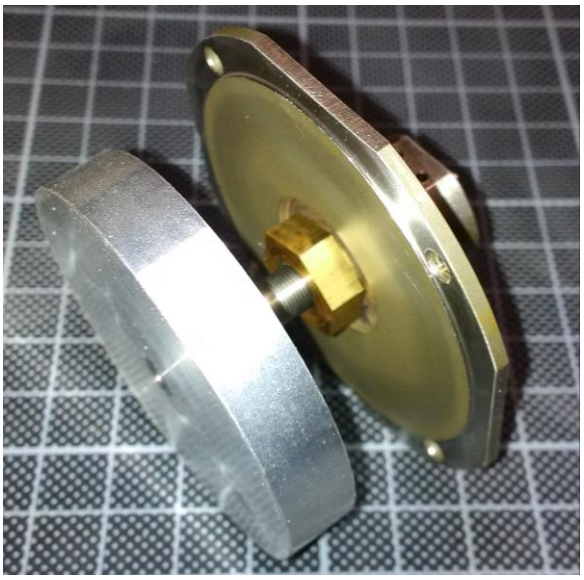
Vers.-Nr. 5915-12-347-5120
FILTER FD
BOSCH 65.7160.300.00-A001
99 8984714 G01

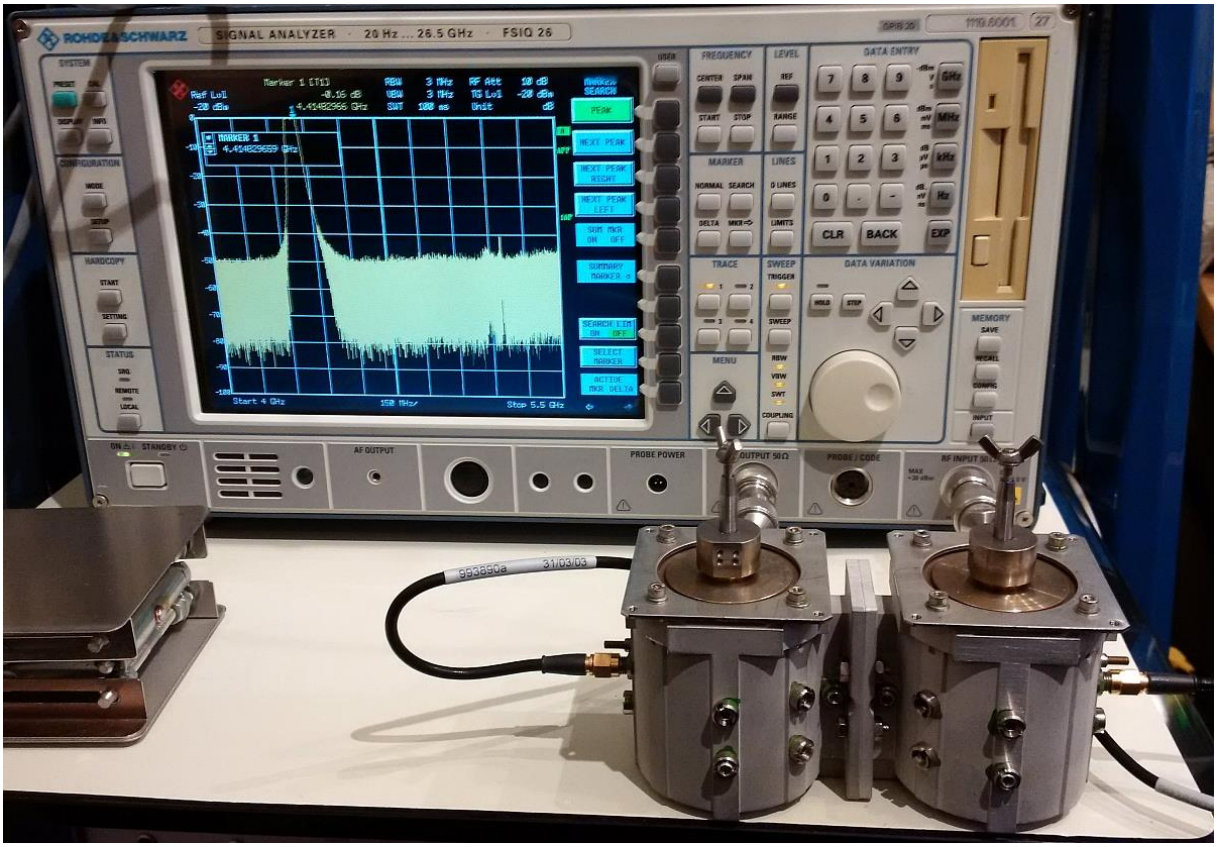
There are 8 cavities in 2 branches which are tuned by 4 bipolar stepper motors (Sonceboz 6500R374). The filter unit has 4 inputs / outputs with SMA connectors which are combined using 3 Circulators. The common port is a rectangular waveguide. With the motors the filter units can be tuned remotely. Here is a picture of the unit:

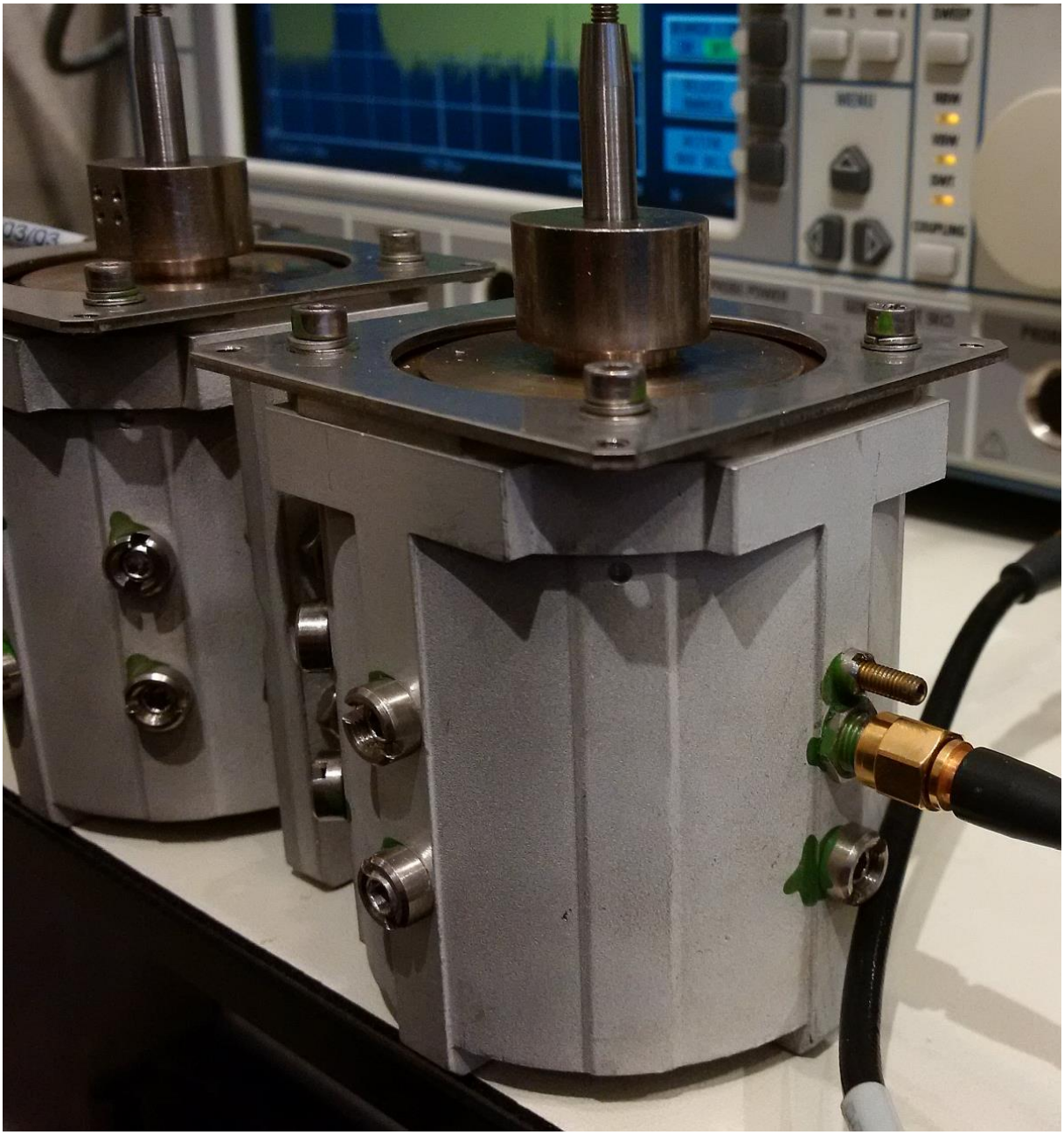


As I had no data of the unit, I decided to disassemble the filter unit and use 2 of the cavities to build a tunable filter. I used 2 identical cavities with SMA connectors and coupled them using the waveguide like output port. Here are some pictures of the cavities:



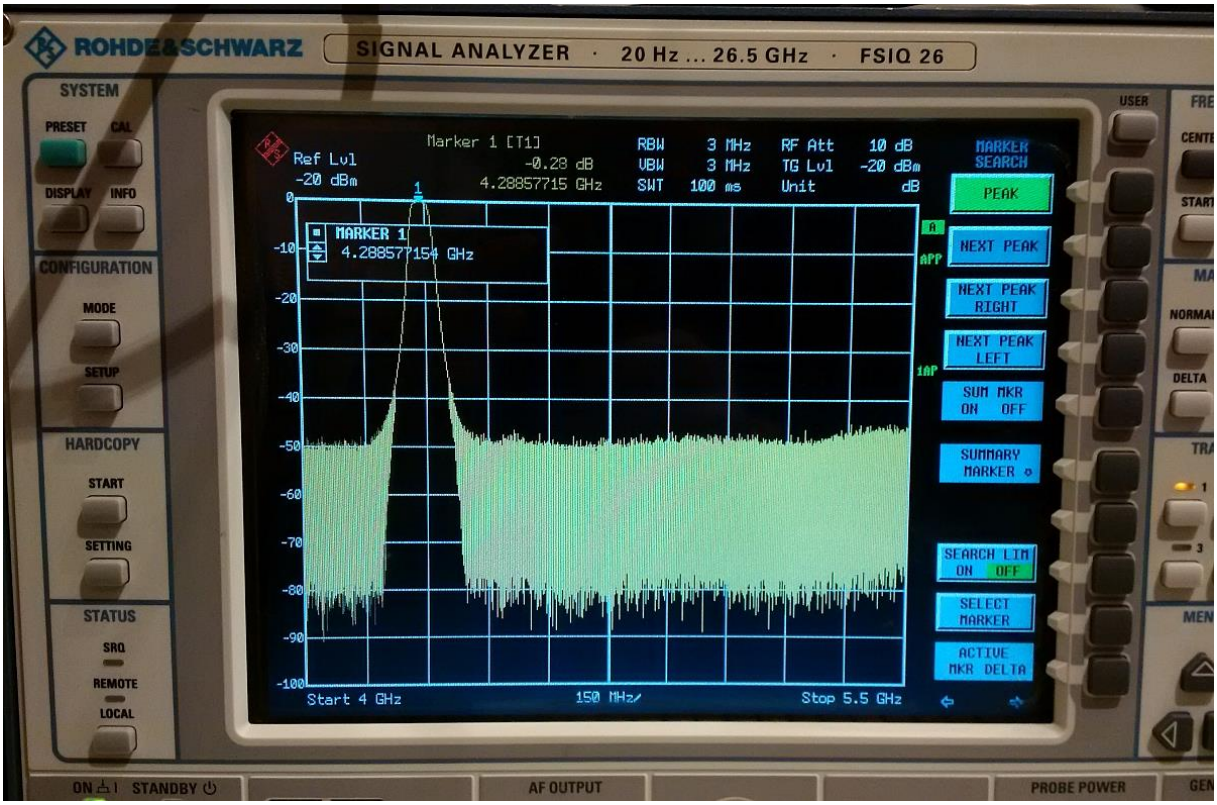


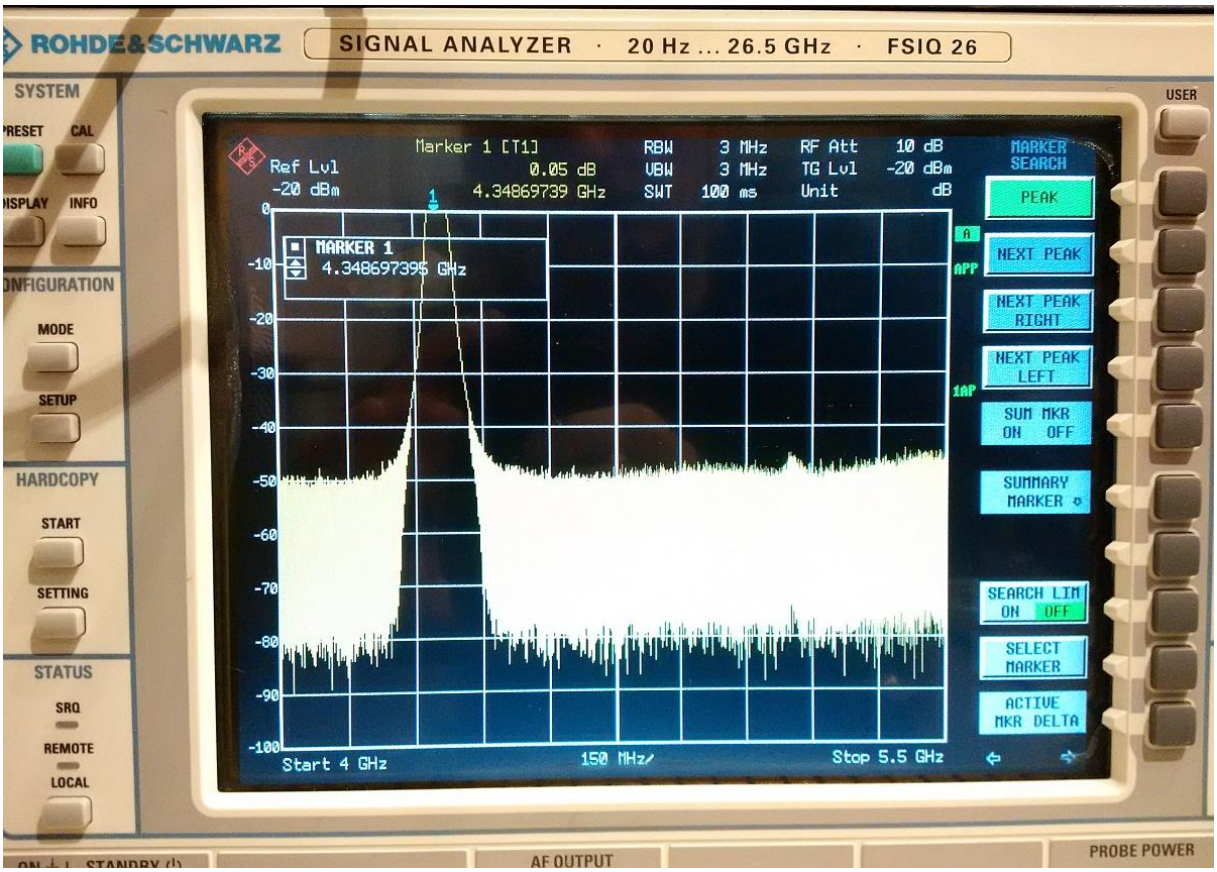

ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
FREQUENCY
LEVEL
DATA ENTRY
MARKER
TRACE
SWEEP
DATA VARIATION
MENU
MEMORY
CLR
BACK
AF OUTPUT
PROBE POWER
PROBE / CODE
Start 4 GHz
Stop 5.5 GHz

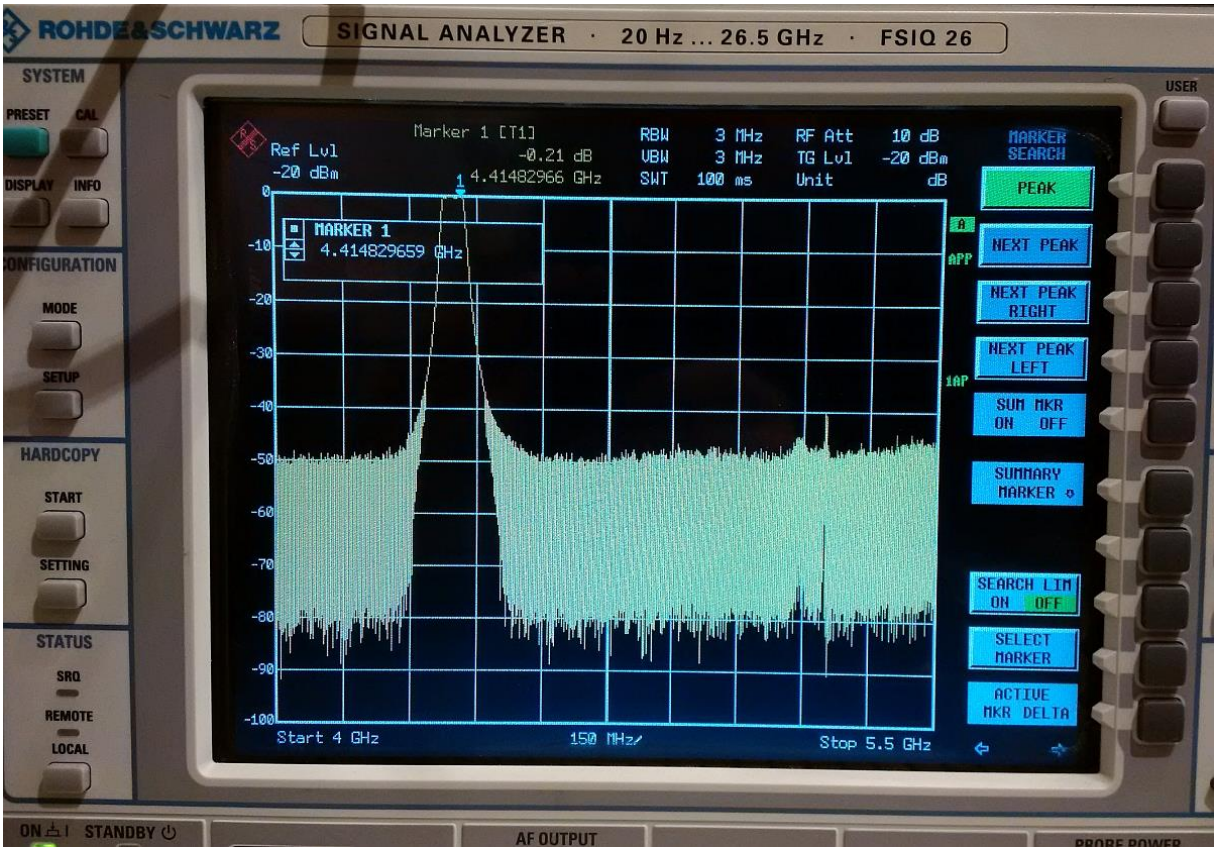


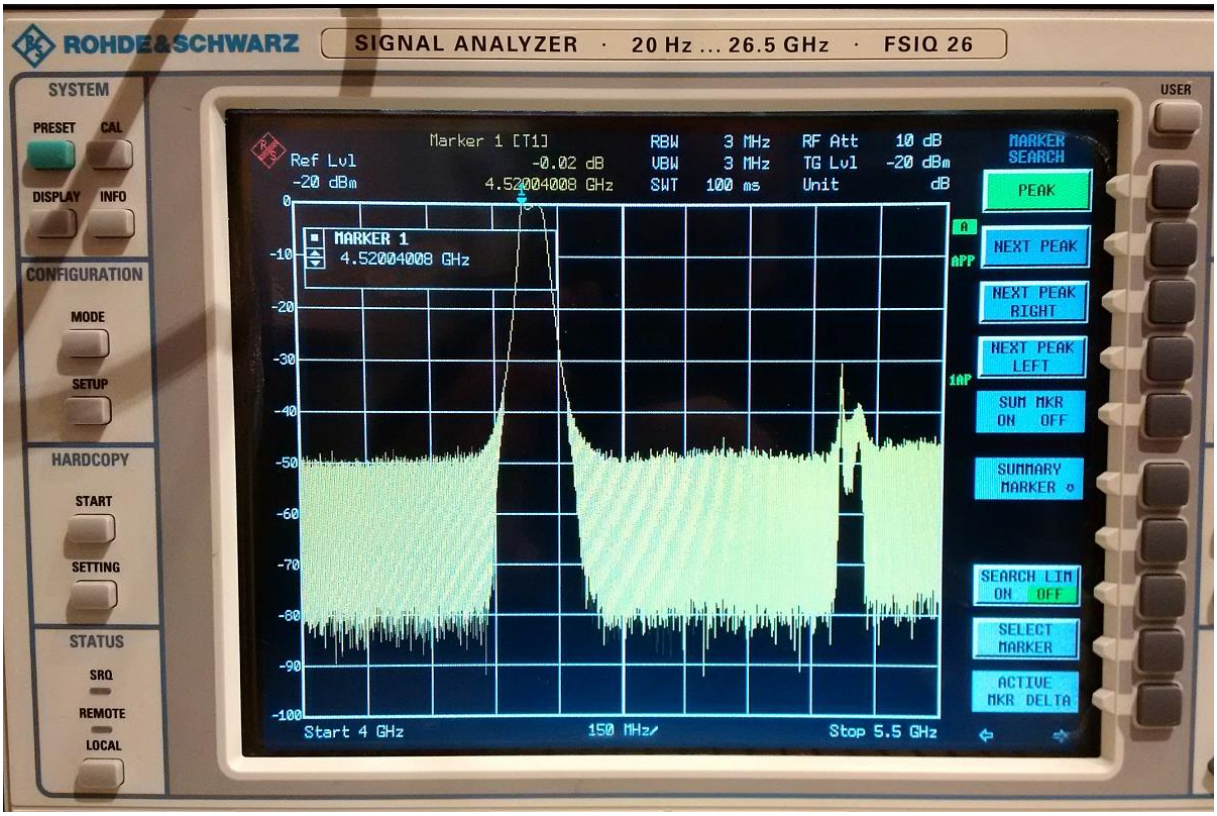
Using my spectrum analyzer with built in tracking generator I characterized the filter. Both cavities were tuned to the same frequency. It turned out that the frequency range is approx. 4.3 – 5.0 GHz.

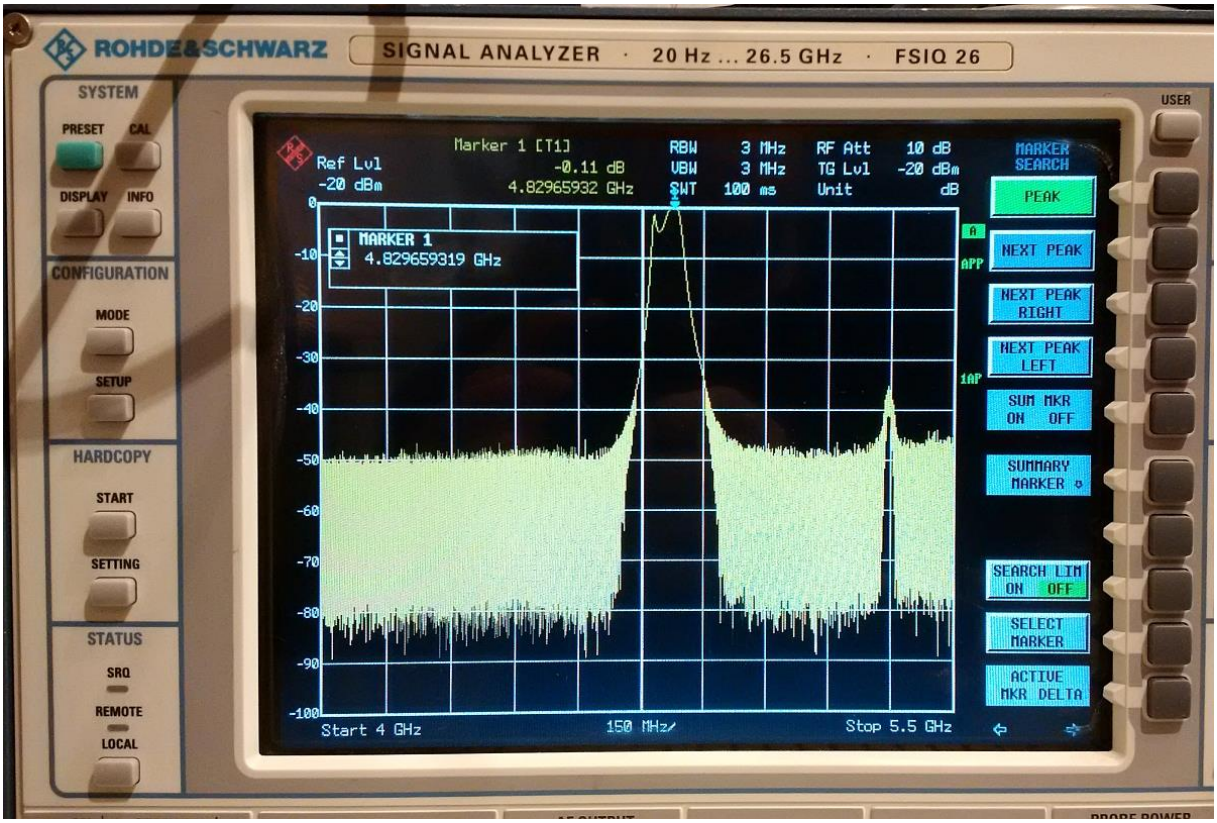
The filter based on 2 coupled cavities has a very low insertion loss of <0.3dB. At frequencies of 4.5 GHz and above, the passband shows significant ripple. It might be possible to reduce or eliminate this by adjusting some of the many tuning screw. I did not try this as I do not need that filter for ongoing projects. I might explore this once I find a suitable project for such a filter.

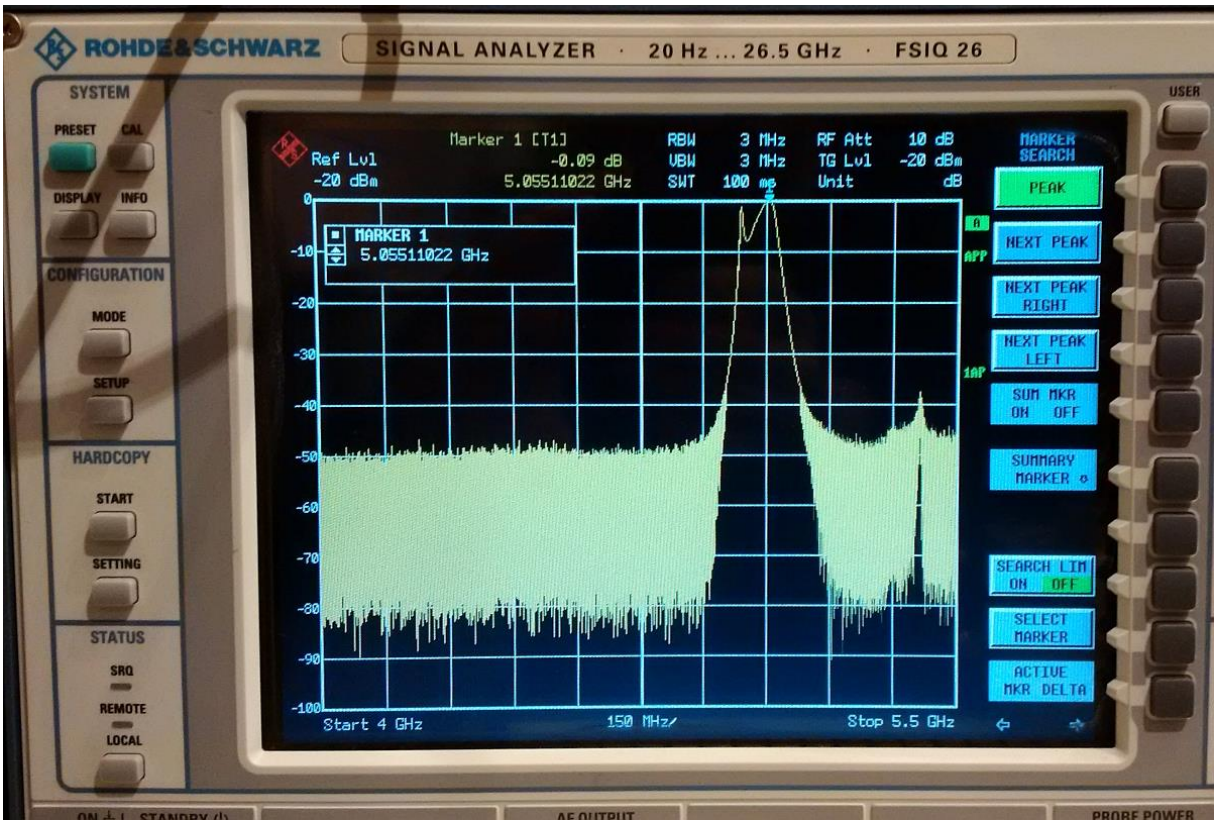

ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
SYSTEM
PRESET
CAL
DISPLAY
INFO
CONFIGURATION
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
Marker 1 [T1]
Ref Lvl
-20 dBm
-0.28 dB
4.28857715 GHz
RBW 3 MHz
VBW 3 MHz
SWT 100 ms
RF Att 10 dB
TG Lvl -20 dBm
Unit dB
MARKER 1
4.288577154 GHz
Start 4 GHz
150 MHz/
Stop 5.5 GHz
MARKER SEARCH
PEAK
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SUM MKR ON OFF
SUMMARY MARKER
SEARCH LIM ON OFF
SELECT MARKER
ACTIVE MKR DELTA
USER
AF OUTPUT
PROBE POWER
STANDBY


ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
SYSTEM
CAL
INFO
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
Marker 1 [T1]
Ref Lvl
-20 dBm
0.05 dB
4.34869739 GHz
RBW 3 MHz
VBW 3 MHz
SWT 100 ms
RF Att 10 dB
TG Lvl -20 dBm
Unit dB
MARKER 1
4.348697395 GHz
Start 4 GHz
150 MHz/
Stop 5.5 GHz
MARKER SEARCH
PEAK
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SUM MKR ON OFF
SUMMARY MARKER
SEARCH LIM ON OFF
SELECT MARKER
ACTIVE MKR DELTA
USER
AF OUTPUT
PROBE POWER


ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
SYSTEM
PRESET
CAL
DISPLAY
INFO
CONFIGURATION
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
USER
Marker 1 [T1]
Ref Lvl
-20 dBm
-0.21 dB
4.41482966 GHz
RBW 3 MHz
VBW 3 MHz
SWT 100 ms
RF Att 10 dB
TG Lvl -20 dBm
Unit dB
MARKER 1
4.414829659 GHz
Start 4 GHz
150 MHz/
Stop 5.5 GHz
MARKER SEARCH
PEAK
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SUM MKR ON OFF
SUMMARY MARKER
SEARCH LIM ON OFF
SELECT MARKER
ACTIVE MKR DELTA
ON STANDBY
AF OUTPUT


ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
SYSTEM
PRESET
CAL
DISPLAY
INFO
CONFIGURATION
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
USER
Marker 1 [T1]
Ref Lvl
-20 dBm
-0.02 dB
4.52004008 GHz
RBW 3 MHz
VBW 3 MHz
SWT 100 ms
RF Att 10 dB
TG Lvl -20 dBm
Unit dB
MARKER 1
4.52004008 GHz
Start 4 GHz
150 MHz/
Stop 5.5 GHz
MARKER SEARCH
PEAK
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SUM MKR ON OFF
SUMMARY MARKER
SEARCH LIM ON OFF
SELECT MARKER
ACTIVE MKR DELTA


ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
SYSTEM
PRESET
CAL
DISPLAY
INFO
CONFIGURATION
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
USER
Marker 1 [T1]
Ref Lvl
-20 dBm
-0.11 dB
4.82965932 GHz
RBW 3 MHz
VBW 3 MHz
SWT 100 ms
RF Att 10 dB
TG Lvl -20 dBm
Unit dB
MARKER 1
4.829659319 GHz
Start 4 GHz
150 MHz/
Stop 5.5 GHz
MARKER SEARCH
PEAK
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SUM MKR ON OFF
SUMMARY MARKER
SEARCH LIM ON OFF
SELECT MARKER
ACTIVE MKR DELTA


ROHDE&SCHWARZ
SIGNAL ANALYZER · 20 Hz ... 26.5 GHz · FSIQ 26
SYSTEM
PRESET
CAL
DISPLAY
INFO
CONFIGURATION
MODE
SETUP
HARDCOPY
START
SETTING
STATUS
SRQ
REMOTE
LOCAL
USER
Marker 1 [T1]
Ref Lvl
-20 dBm
-0.09 dB
5.05511022 GHz
RBW 3 MHz
VBW 3 MHz
SWT 100 ms
RF Att 10 dB
TG Lvl -20 dBm
Unit dB
MARKER 1
5.05511022 GHz
Start 4 GHz
150 MHz/
Stop 5.5 GHz
MARKER SEARCH
PEAK
NEXT PEAK
NEXT PEAK RIGHT
NEXT PEAK LEFT
SUM MKR ON OFF
SUMMARY MARKER
SEARCH LIM ON OFF
SELECT MARKER
ACTIVE MKR DELTA

I am interested in more information about this BOSCH filter unit, especially what it was originally used for.

I always appreciate feedback and will be happy to answer questions.

Please send it to Email address given below. Many thanks in advance.

Best regards

Matthias DD1US

Email: DD1US@AMSAT.ORG Homepage: http://www.dd1us.de