

# Side noises of pro TRXs

OK1DFC - ZDENEK SAMEK



# Agenda:

- Selected TRXs
- 116 MHz quality LO measurement
- Used IF filter 28 MHz
- Measuring individual TRX
- TRX and MW TRV measurements
- Effect of 28 MHz IF filter

# Selected types of TRX

- FT101D
- FT10
- IC7610
- IC756PROIII
- IC756PROII
- IC7700
- IC9100
- TS480

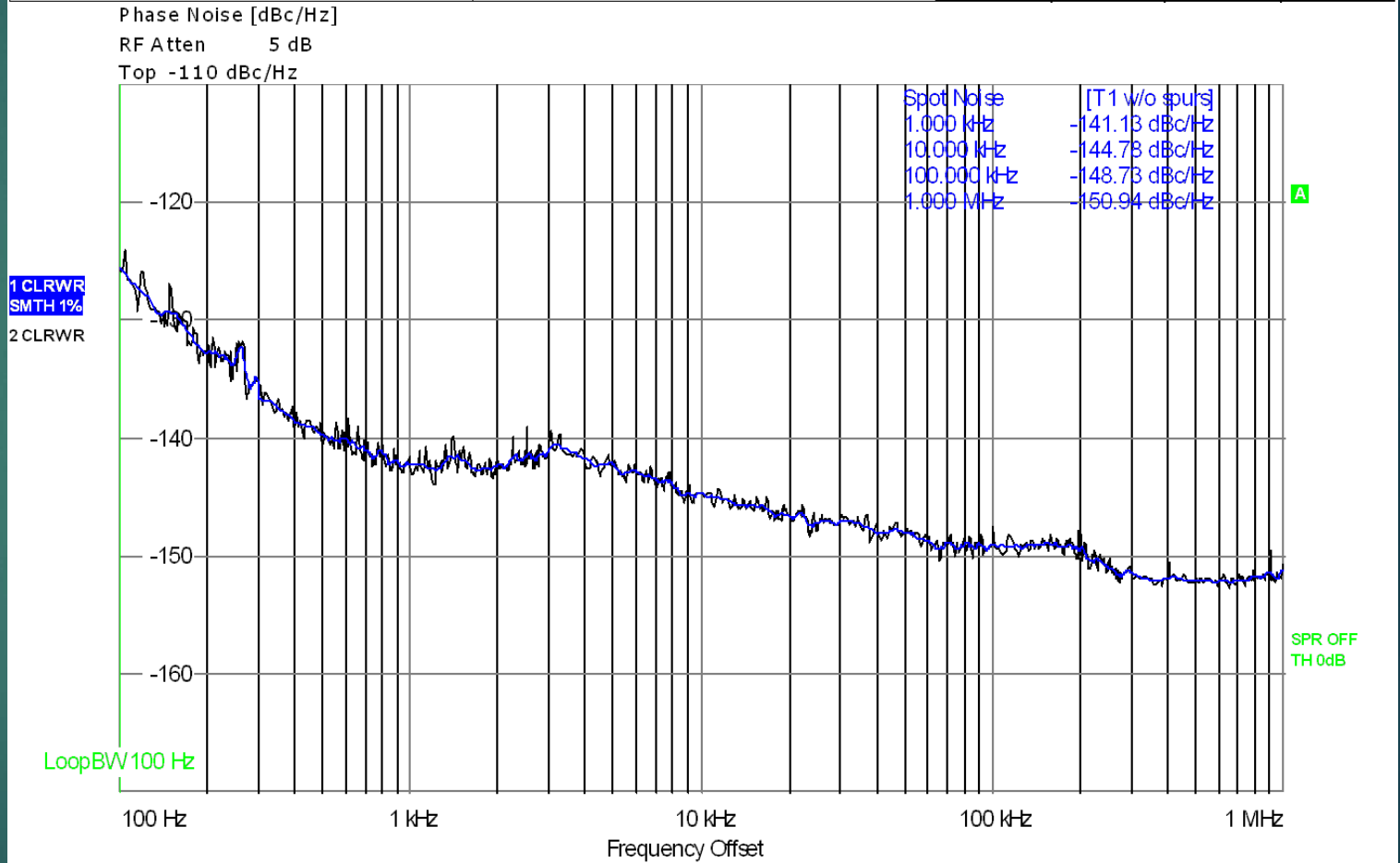


# FTDX101D



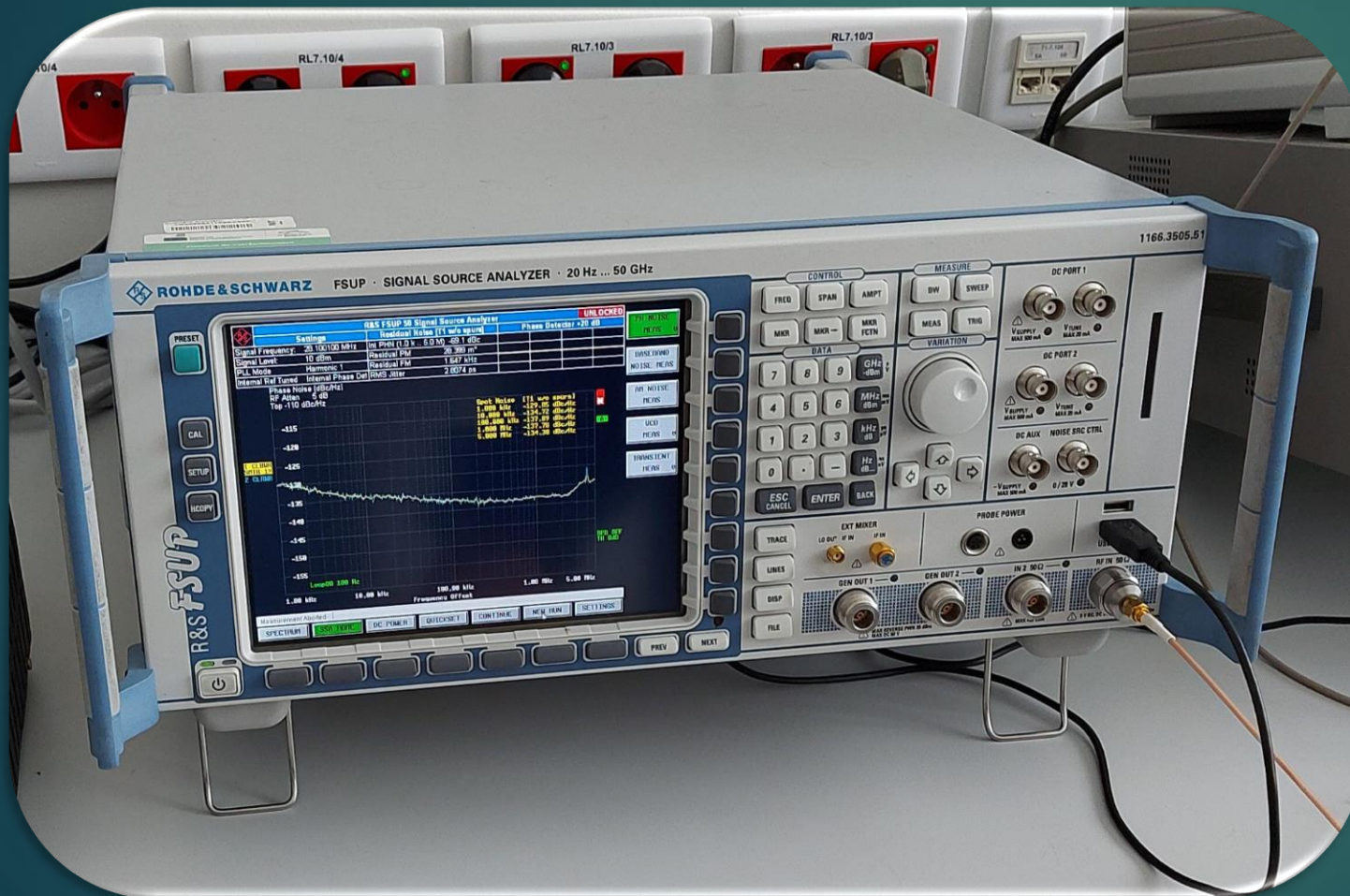
1 kHz - -141,13 dBc  
 10 kHz - **-144,73 dBc**  
 100 kHz - **-148,73 dBc**  
 1 MHz - **-150.94 dBc**

R&S FSUP 50 Signal Source Analyzer				LOCKED	
Settings		Residual Noise [T1 w/o spurs]		Phase Detector +20 dB	
Signal Frequency:	28.100000 MHz	Int PHN (100.0 .. 1.0 M) -90.5 dBc			
Signal Level:	1.03 dBm	Residual PM	2.422 m°		
PLL Mode	Harmonic 1	Residual FM	20.864 Hz		
Internal Ref Tuned	Internal Phase Det	RMS Jitter	0.2395 ps		



Running ...  
 Date: 22.FEB.2023 13:18:04

# Measuring equipment:



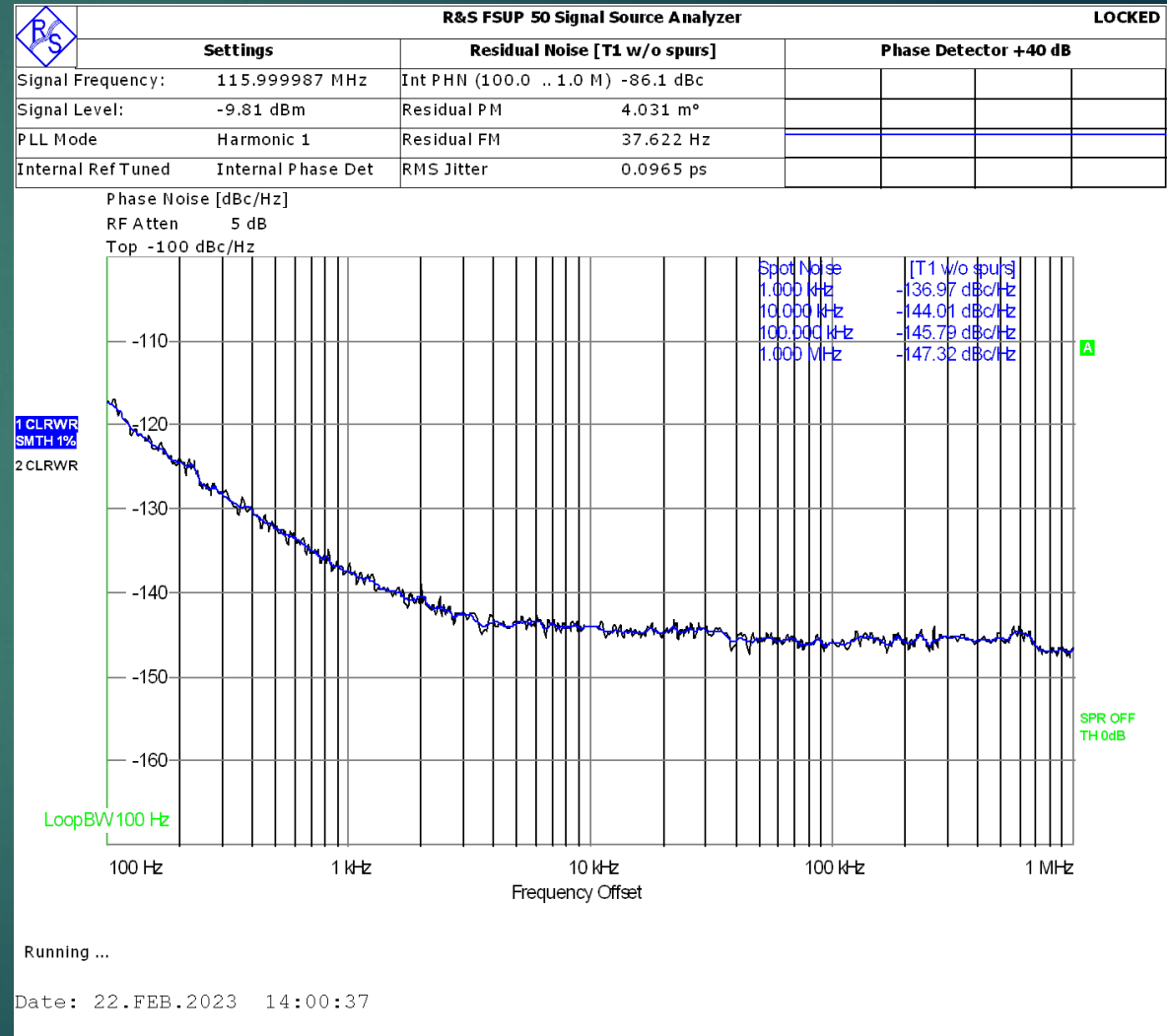
**Rohde & Schwarz FSUP  
Signal source analyzer  
20 Hz - 50 GHz**

**ATT R&S 1kW - 40dB - DC-6 GHz  
ATT Agilent - 10dB - DC-4 GHz**

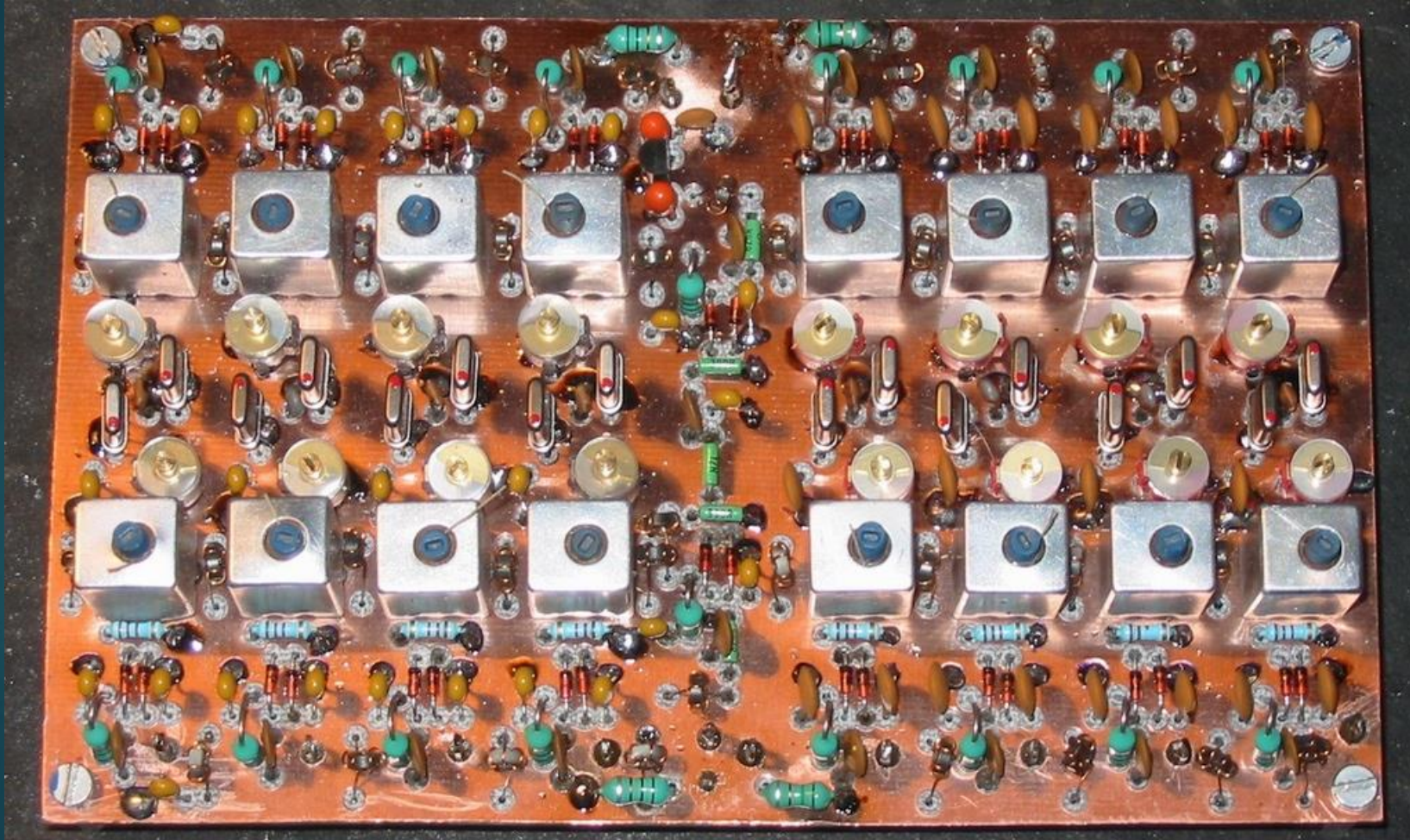
# High quality LO MKU 8-13PLL DB6NT



1 kHz	10 kHz	100 kHz	1 MHz
<b>-137</b>	<b>-144</b>	<b>-146</b>	<b>-147</b>
<b>dBc</b>	<b>dBc</b>	<b>dBc</b>	<b>dBc</b>

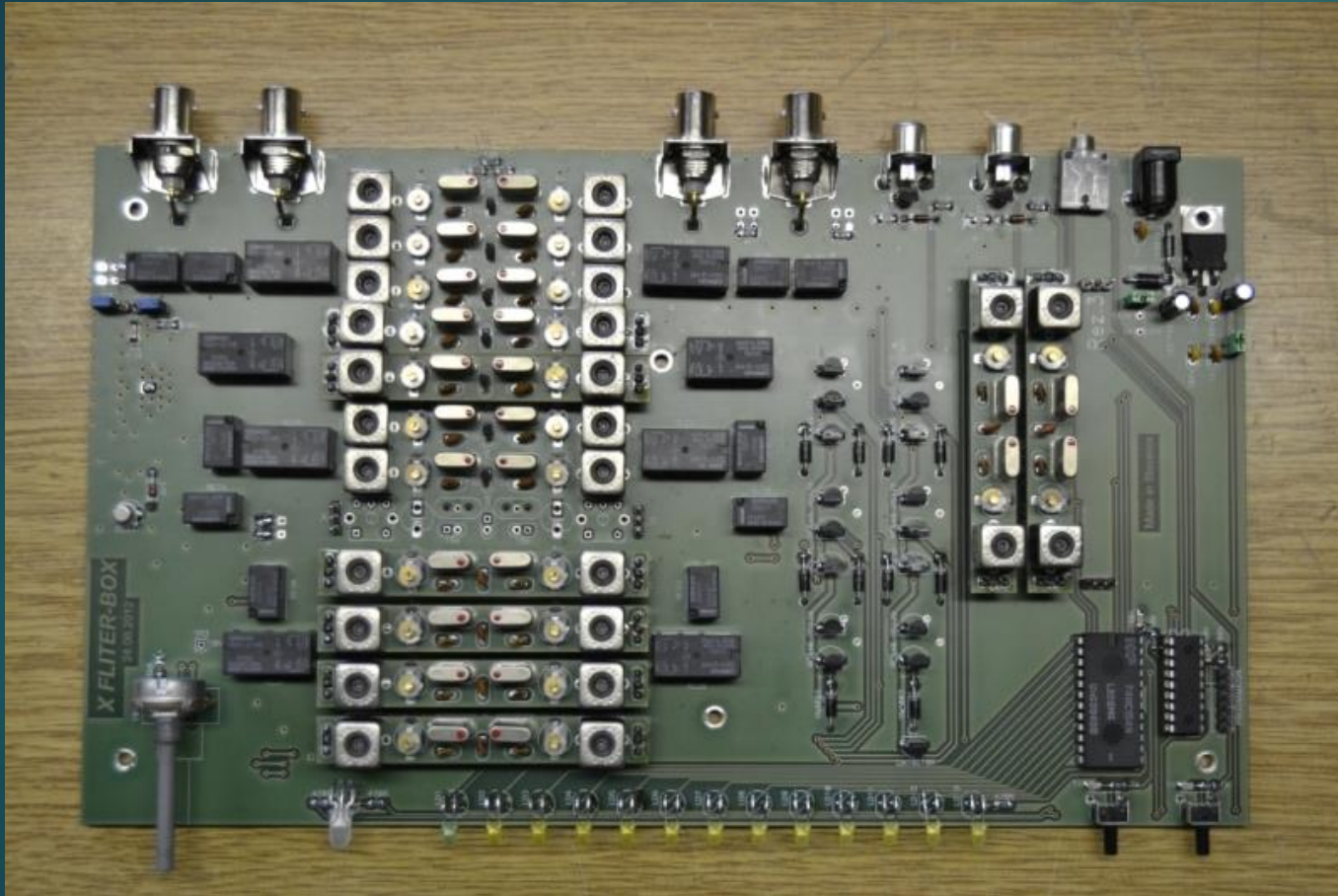


# IF filter 28 MHz



Filter 28 MHz OK1VPZ - source web OK2KKW

# IF filter 28 MHz



28 MHz S53WW filter - web S53WW



# IF filter 28 MHz



Filter 28 MHz OL3Z - OK1VUM

# 28 MHz OK1RI filter



## SPECIFICATION FOR CRYSTAL FILTER MCF 28.080...28.380-30/04

Number: 92 251  
Drawing: 61 9578

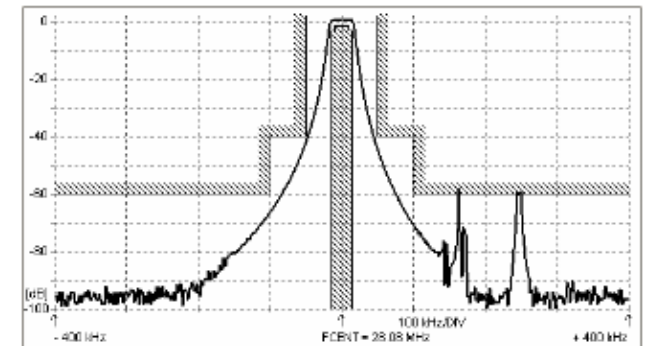
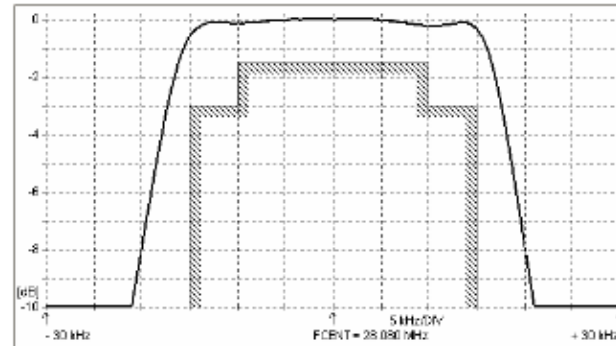
= This set of crystal filters is determined for the preselector of amateur transceivers =

### 1. Electric values

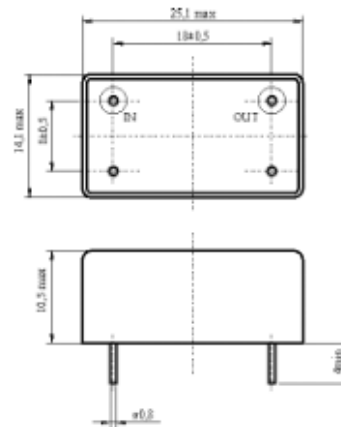
1.0 Number of poles :	4
1.1 Nominal centre frequency $f_{nom}$ :	28.080 MHz, 28.120 MHz, 28.180 MHz 28.220 MHz, 28.250 MHz, 28.280 MHz 28.320 MHz, 28.340 MHz, 28.380 MHz
1.2 Bandwidth between 3 dB frequencies :	$\geq \pm 15$ kHz
1.3 Ripple at $f_{nom} \pm 10$ kHz :	$\leq 1.5$ dB
1.4 Insertion loss :	$\leq 3.0$ dB
1.5 Stop band $f_{nom} \pm 50$ kHz :	$\geq 40$ dB
$f_{nom} \pm 100 \dots \pm 1000$ kHz :	$\geq 60$ dB
1.6 Spurious :	$\geq 35$ dB
1.7 Terminating impedance ( input and output ) :	50 Ohm // 0 pF
1.8 Operating temperature range :	-25°C to +70°C
1.9 Case :	KF 13 (25.1 x 14.1 x 10.5 mm)
1.10 Marking on the case :	YY = year WW = week

KRYSTALY CZ  
YYWW  
28.xxx-30/04

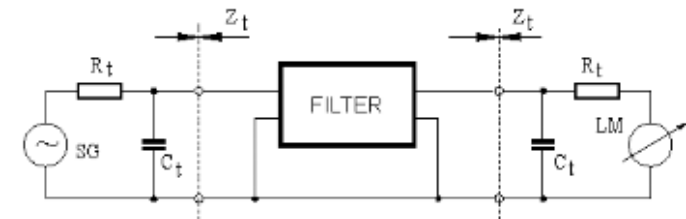
## 2. Characteristics MCF 28.080...28.380-30/04



## Dimensions [mm] Case KF 13



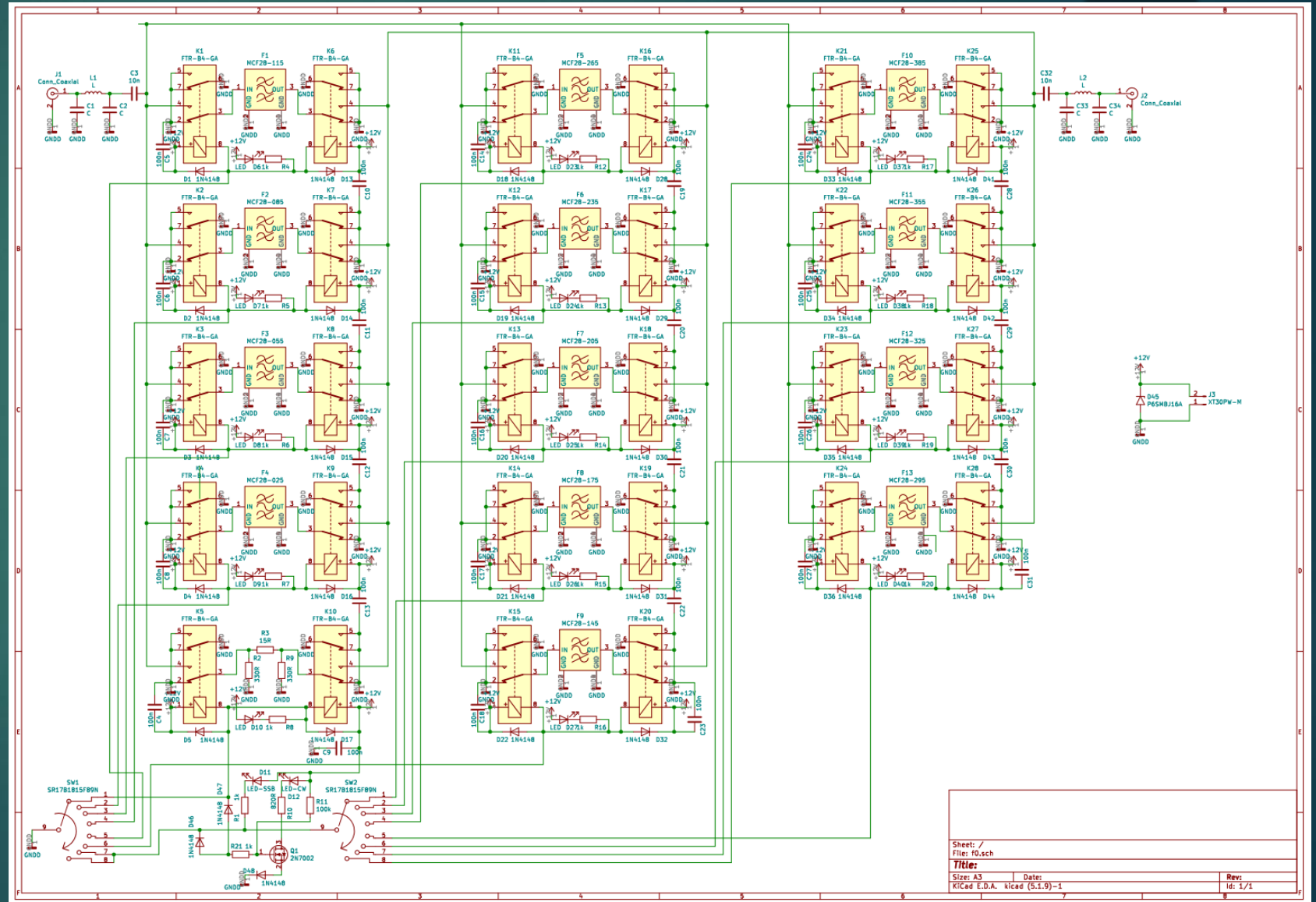
## Measurement Circuit



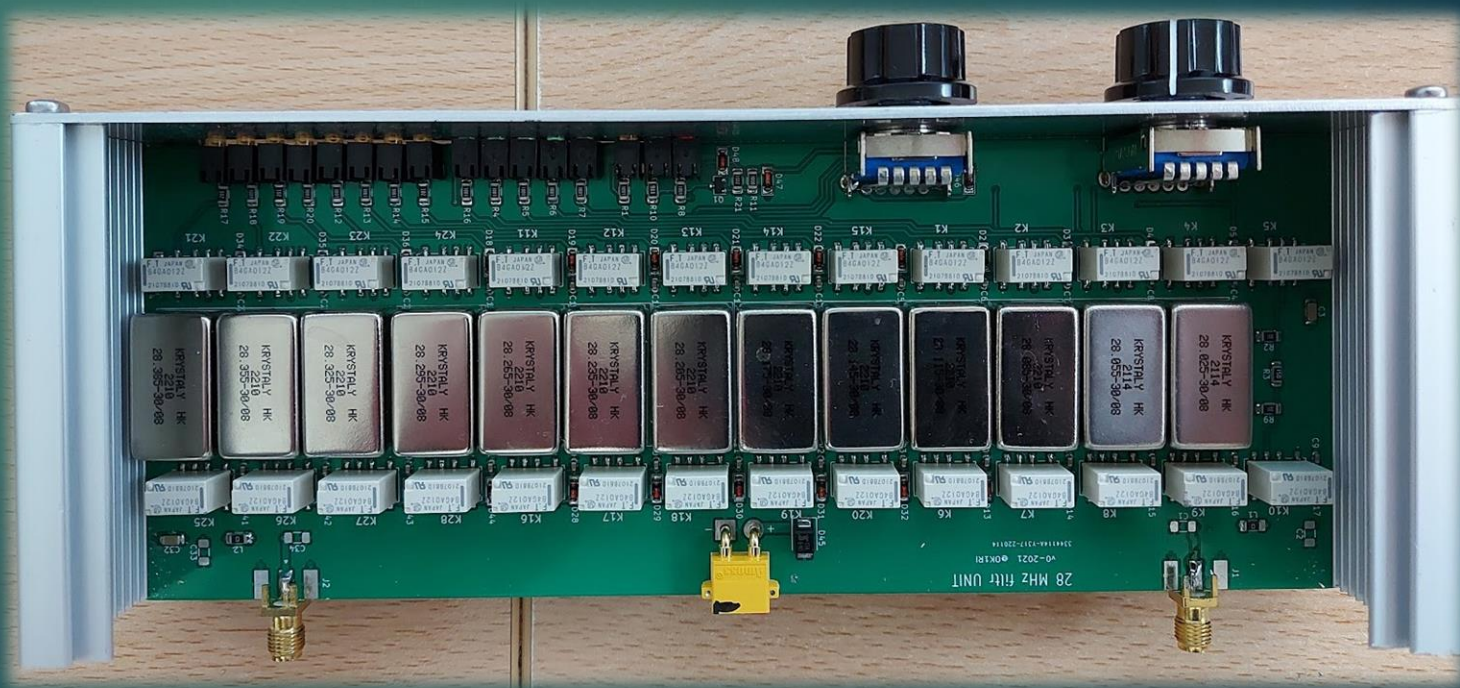
edited 07.06.2012 P. Seidl

# 28 MHz OK1RI filter

28,000 - 28,300 MHz at 25 kHz

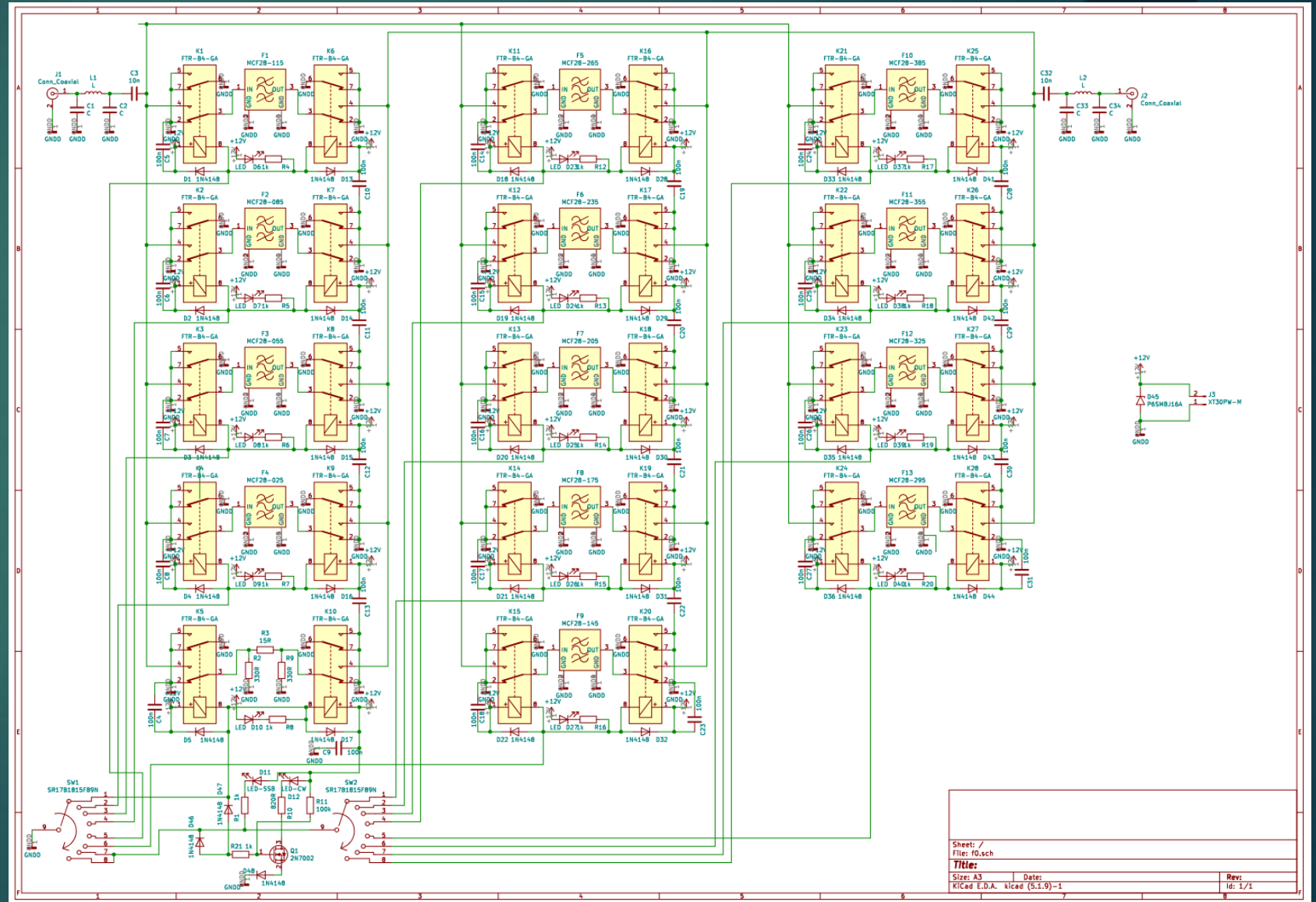


# 28 MHz OK1RI filter 28,000 - 28,300 MHz at 25 kHz



# 28 MHz OK1RI filter

28,000 - 28,300 MHz at 25 kHz



Sheet: /  
File: FD.sch  
Title:  
Size: A3 Date: / /  
KiCad E.D.A. kicad (5.1.9)-1 Rev:  
Id: 1/1

TRX	QRG MHz	png.nr	1kHz	10kHz	100kHz	1MHz	Note
<b>FT101D</b>	<b>28,1</b>	<b>019</b>	<b>-141</b>	<b>-144,8</b>	<b>-148,7</b>	<b>-151</b>	<b>Full PWR, 50dB ATT</b>
FT10	14,1	037	-138,8	<b>-144,9</b>	<b>-147</b>	<b>-148</b>	Full PWR, 50dB ATT
<b>DB6NT LO MKU8-13PLL</b>	<b>116</b>	<b>024</b>	<b>-137</b>	<b>-144</b>	<b>-146</b>	<b>-147</b>	<b>LO 116 MHz DB6NT</b>
FT10	28,1	018	-136	<b>-145</b>	<b>-147,4</b>	<b>-147,4</b>	Full PWR, 50dB ATT
IC7610	28,1	016	-132,6	-135,3	-138,7	-137,9	TRV out -3dBm
FT10	28,1	036	-131	-136	-138	-138,2	Out PWR 10W ATT 40dB
FT10	28,1	034	-130,7	-136,4	-139,8	<b>-141</b>	Out PWR 25W
FT10	28,1	035	-130	-134,7	-137	-137,8	Out PWR 10W ATT 50dB
IC7610	28,1	015	-125,2	-132,8	<b>-143,4</b>	<b>-147,3</b>	Full PWR, 50dB ATT
IC9100	28,1	011	-106,5	-122,6	-136,4	-139	Full PWR, 50dB ATT
IC9100	144,1	012	-102	-113,6	-132	<b>-142,5</b>	Full PWR 100W
IC756 PRO III	28,1	003	-99,1	-120	-132,1	-133,4	10W PWR, 50dB ATT
IC756 PRO II	28,1	004	-99	-120,4	-139,6	<b>-143,6</b>	Full PWR, 50dB ATT
IC756PROIII+Filter 28MHz	28,1	009	-98,8	-125	<b>-148,8</b>	<b>-148,9</b>	TRV out -5dBm, descending filter edge <b>28 MHz filter</b>
IC756 PRO III	28,1	007	-98,6	-119,3	-131,7	-120,3	TRV out -3dBm
IC756PROIII+Filter 28MHz	28,1	010	-98,6	-125,5	<b>-148,5</b>	<b>-148,7</b>	TRV out -5dBm, rising edge filter <b>28 MHz filter</b>
IC756 PRO III	28,1	002	-98,6	-120,4	-139,1	<b>-143,3</b>	Full PWR, 50dB ATT
IC756 PRO II	28,1	006	-98,4	-119,6	-133	-129,1	TRV out -3dBm
IC756 PRO III	28,1	008	-98,3	-119	-126,4	-119	TRV out -8dBm
IC7700	28,1	031	-97,1	-128,7	<b>-149</b>	<b>-149</b>	TRV out + <b>28 MHz filter</b>
IC7700	28,1	022	-97	-123,1	-134	-139	TRV out -3dBm
IC7700 + <b>TRV144H</b>	144,1	027	-97	-124	<b>-140,5</b>	<b>-146</b>	IC+TRV144H-25W out, <b>LO DB6NT 116 MHz + 10MHz MORION</b>
IC7700	28,1	026	-97	-123	-135	-134,5	TRV out -6dBm
IC7700	28,1	032	-97	-124,5	<b>-141,6</b>	<b>-145,7</b>	TRV out + <b>28 MHz filter</b> switched to pass-through mode, ATT filter 3dB
IC756 PRO II	28,1	005	-96,7	-116	-122,4	-125,4	TRV out -10dBm
IC7700	28,1	033	-96,7	-123,7	-138,5	-138,4	TRV out, filter drained, cables used to connect filter connected with SMA connector
IC7700 + <b>TRV432 MHz</b>	432,1	028	-96,3	-123,3	-136,3	-139,7	IC+TRV 25W out, internal PLL LO - 10 MHz Morion TCXO
IC7700 + <b>TRV144H</b>	144,1	023	-95,9	-99,7	-132,9	<b>-141,5</b>	IC+TRV144H-25W out, - 116MHz PLL LO - <b>10MHz MORION TCXO</b>
IC7700	28,1	021	-95,8	-122,2	-135	-134,6	100 W PWR, 50dB ATT
TS480HX	28,1	020	-95,2	-115,3	-132	-132,5	100 W PWR, 50dB ATT
IC7700 + <b>TRV1296 MHz</b>	1296,1	030	-95	-99	-122,6	<b>-144</b>	IC+TRV 15W out + <b>28 MHz filter</b> - internal PLL LO - 10 MHz Morion TCXO
IC9100	432,1	013	-93,8	-111	-125,5	-132,7	Full PWR 75W
IC9100	1296,1	014	-78,7	-94,5	-111	-114,5	Full PWR 15W

# Conclusion:

Thank you:

**Mirek OK2AQ** for help and opportunity to measure the equipment

**Jirka OK1RI** for PCB construction for filter and loan of TRXs

**Vasek OK1VVT** for lending us TRX

Thank you for your attention -  
Questions ?????