There is a frequency converter, Fig1.

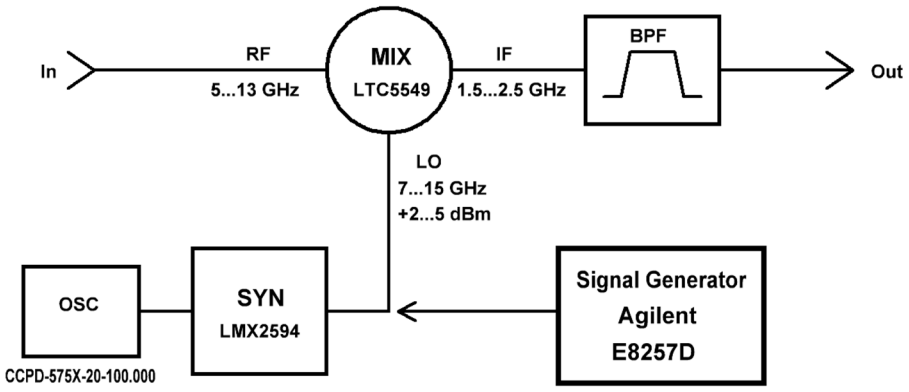


Fig 1

The heterodyne is an LMX2595 synthesizer.

When we test the device, a significant increase in output noise power was found when the LMX2595 tuning frequency was increased regardless of the presence or absence of a signal on the RF input. When a similar signal from the Signal Generator Agilent E8257D was applied, no such increase in noise power was observed. To investigate this effect a special LMX2595 PCB was made with improved power filtering, short links and the ability to test different elements, Fig. 2. The values of the main elements are according to the LMX2595 evaluation board schematic recommendations. The board is made up of 4 layers, Fig. 3.

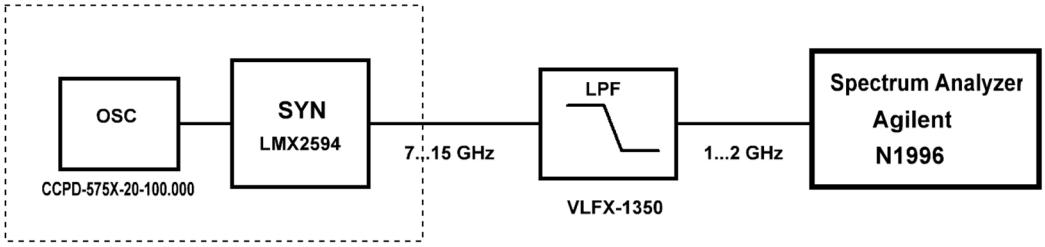
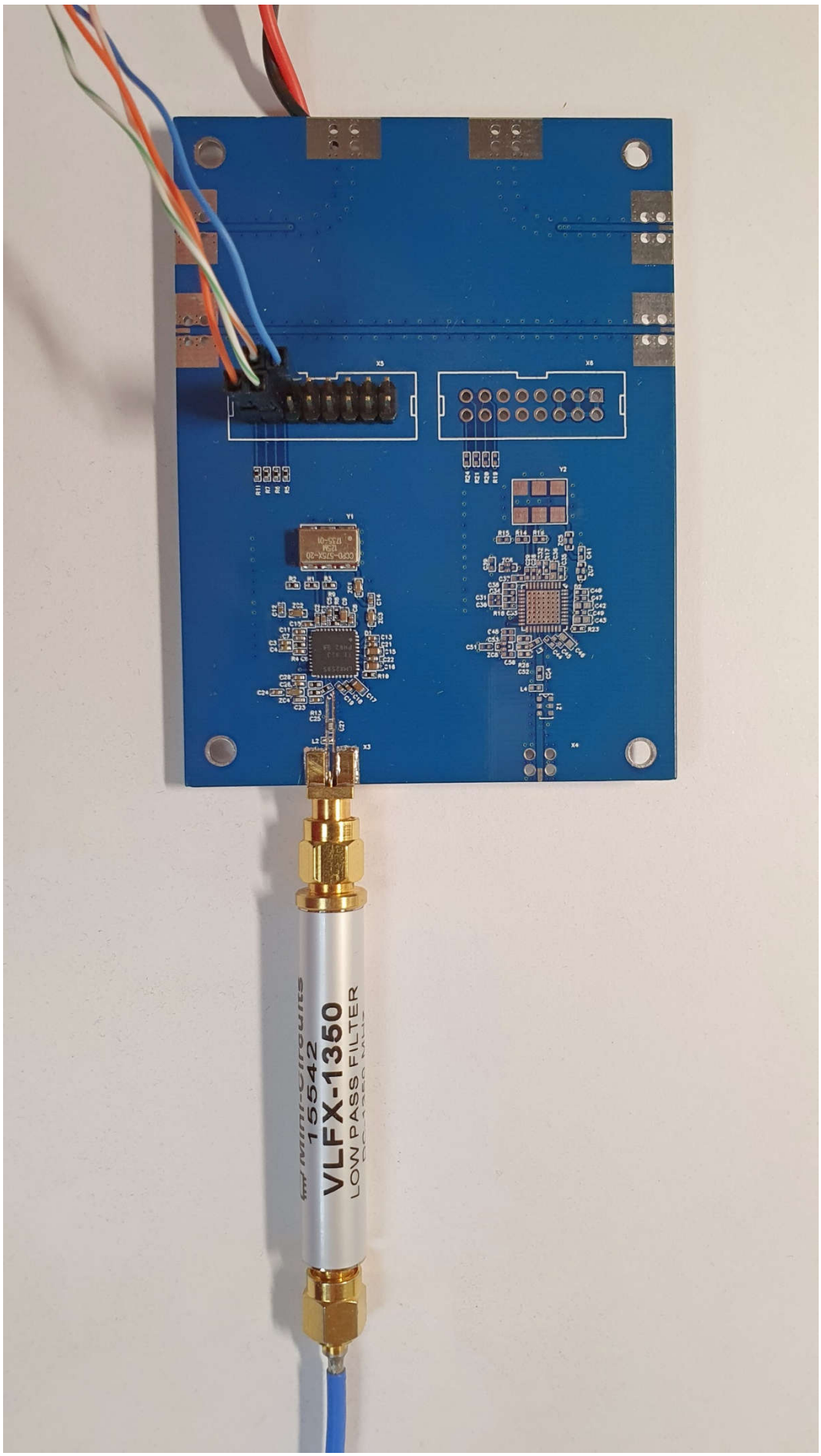


Fig 2

To avoid overloading the Spectrum Analyzer with powerful LMX2595 output signal the VLFX-1350 low pass filter with cutoff frequency of about 2–2,2 GHz and high frequency cutoff of more than 50 dB is used.


VLFX-1350
LOW PASS FILTER

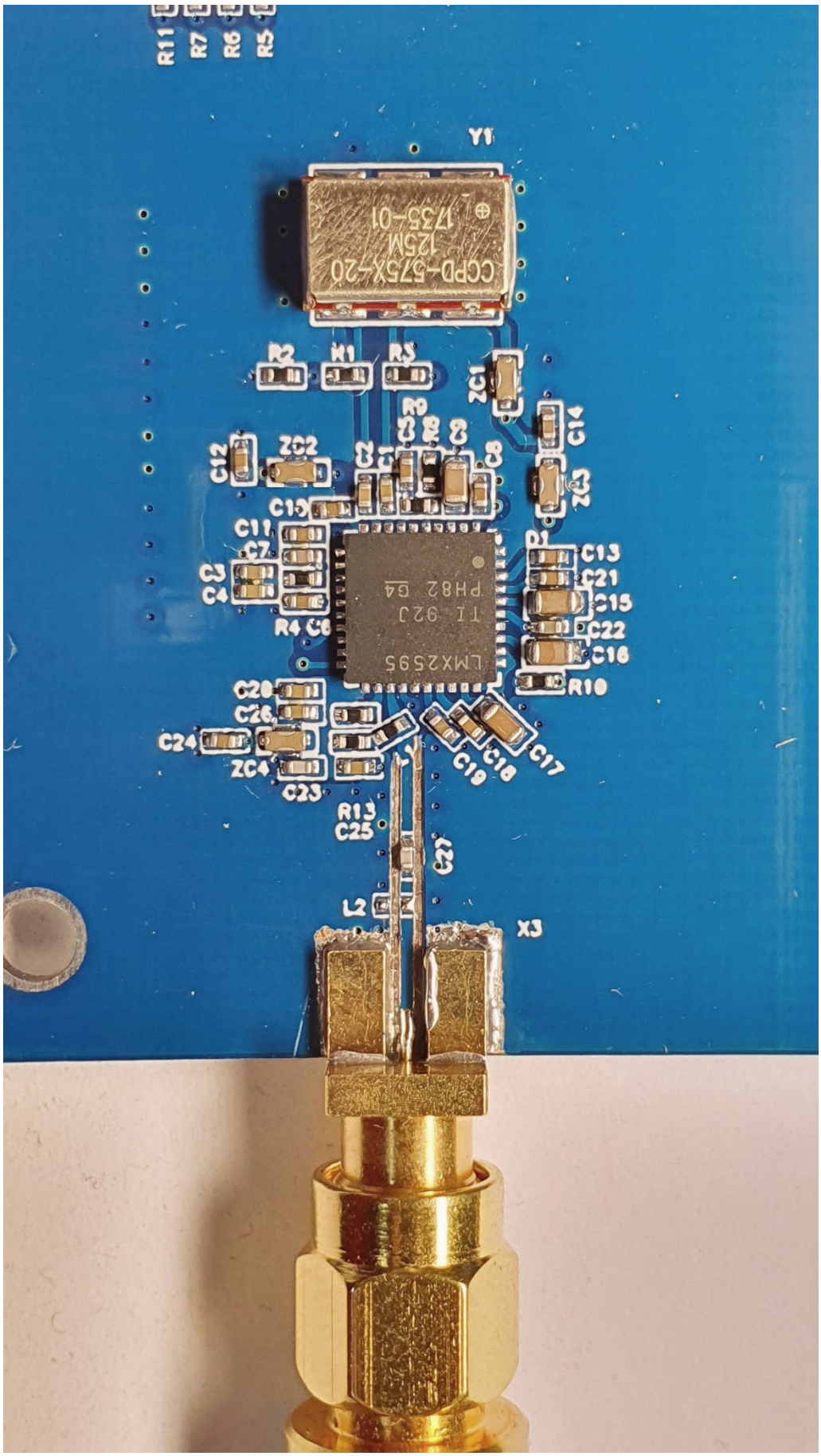

R11
R7
R6
R5
Y1
CCPD-575X-20
125M
735-01
R2
R1
R3
ZC1
C14
R9
C12
ZC2
C2
C1
C8
ZC3
C15
C11
C7
C3
C4
R4
C6
LMX2595
C13
C21
C15
C22
C16
R10
C20
C26
C24
ZC4
C23
C19
C18
C17
R13
C25
C27
L2
X3

Fig 3

Measurement results.

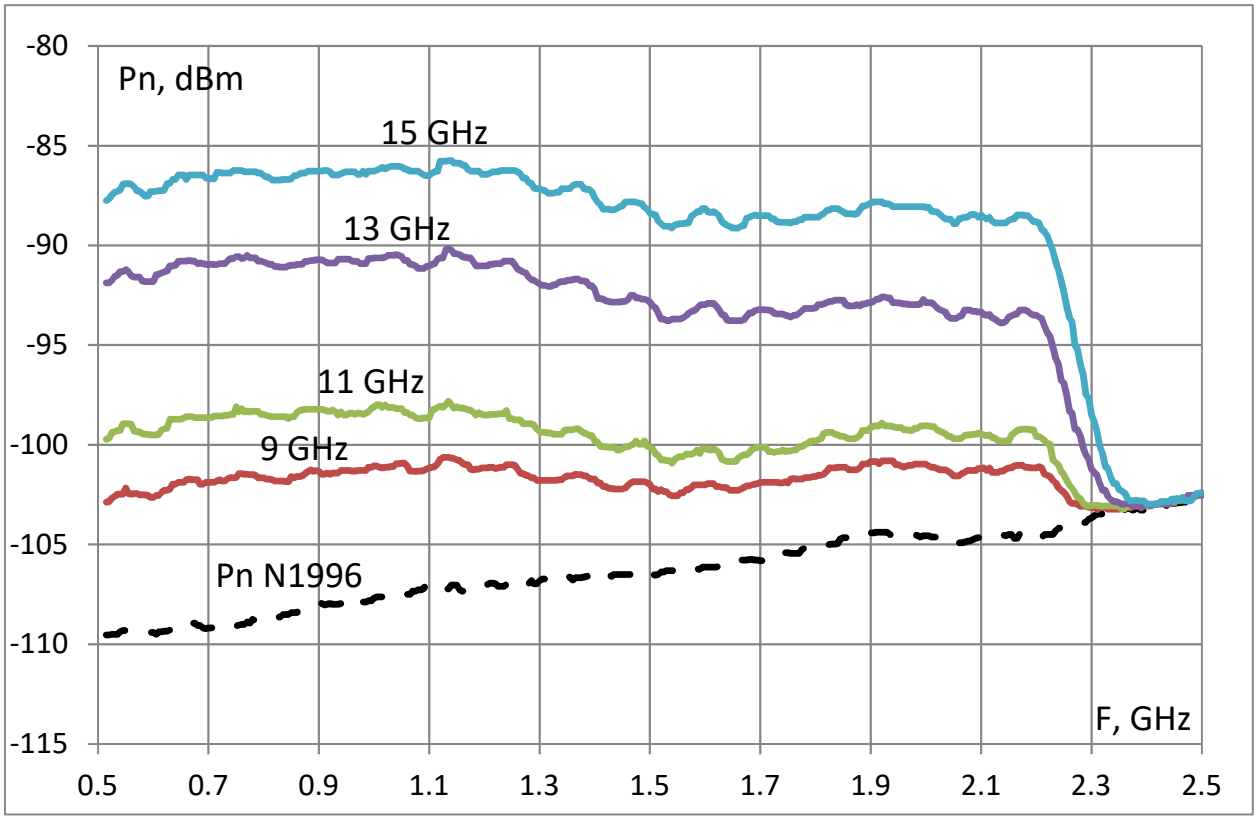


Fig 4

Noise power in the band 0,5...2,5 GHz with LMX2595 tuned to 9, 11, 13, 15 GHz. Dotted line - Spectrum Analyzer Agilent N1996 self noise.

Agilent N1996 settings: Fmin=0,5GHz, Fmax=2,5GHz, BW=100 kHz, VBW= 1 kHz, Int Amp=On, Att=0dB, Det=Average.

LMX2595 settings: Resistor Pull-up=50Ohm, OUTA_PWR=30.

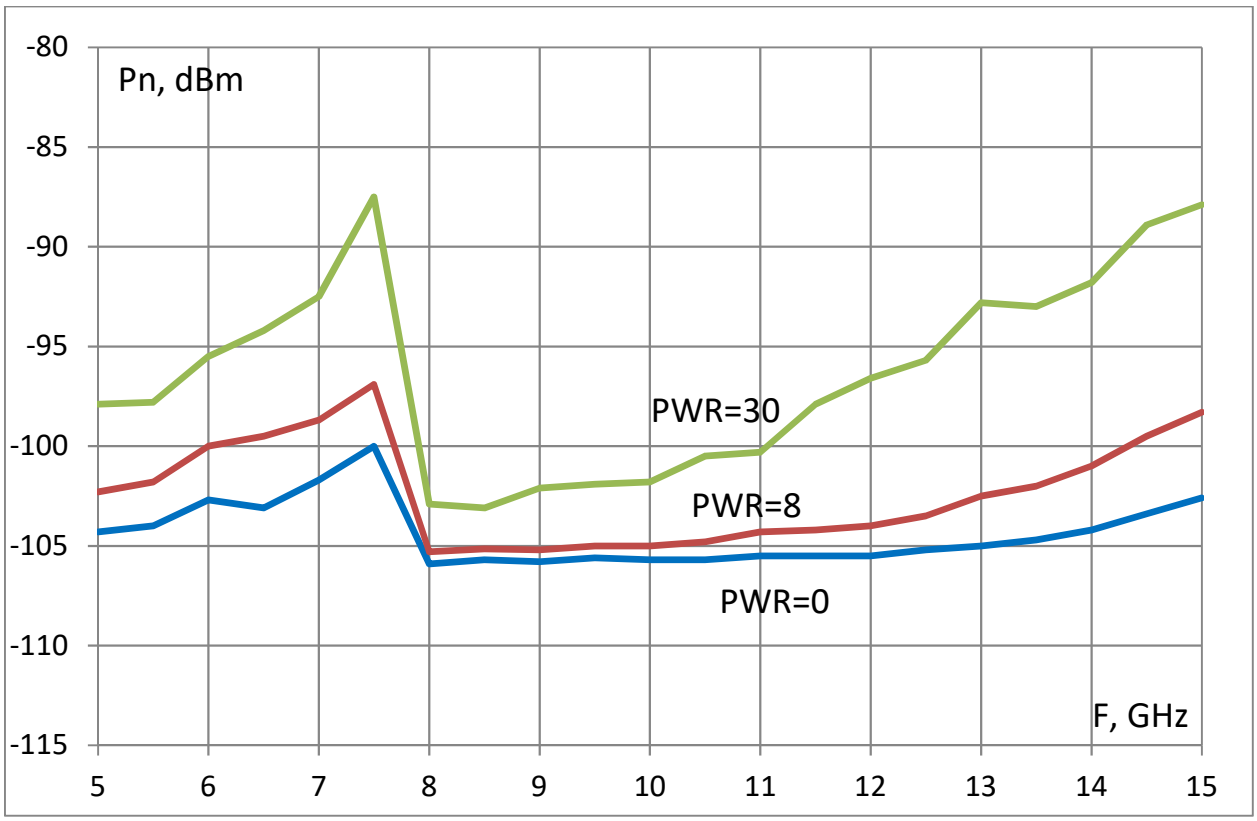


Fig 5

Dependence of the noise power at the measuring frequency 1,5 GHz when tuning the LMX2595 in the range of 5...15 GHz in steps of 0,5 GHz.
Agilent N1996 settings: Fmin=1,4GHz, Fmax=1,6GHz, BW=100 kHz, VBW= 1 kHz, Int Amp=On, Att=0dB, Det=Average.
LMX2595 settings: Resistor Pull-up=50Ohm, OUTA_PWR=0, 8, 30.

The experiments showed, that the character of noise change weakly depends on load circuit, values of loop filter elements.
Several LMX2595's from different batches were tested, as well as LMX2594, there were no significant differences in the results.

Questions.
1. What is the cause of the change in noise when the LMX2595 is tuned?
2. How can I reduce the noise change?
3. Does this effect occur with similar LMX2820, LMX2592 chips?
4. What would be your advice?