

Phase Noise Measurement

- We measured the phase noise with FSWP from "Rohde und Schwarz". Manual: fswp_dat-sw_en_3607-2090-22_v0400.pdf
- Information about the measurements is in the ResLab book on the pages 134 - 136 (date: 18.08.2016).
- measurement:
 - each device was measured directly behind the output, except it's mentioned
 - use SMA-cables instead of BNC-cables if possible, tighten the SMA-plug with an open-end wrench, use golden SMA-I-Connection (better quality)
 - don't wiggle the cable → results in noise in the range of 1Hz - 200Hz
 - let the cable swing off bevor starting the measurement
 - check before the measurement, if the dBm number isn't too high for the device
- analysis method:
 - Program "phasenoise_combined.nb" is located in the AFS
 - Copy the program into the folder with the data, which needs to be analyzed and start the program
- physical units:
 - dB: epresses the ratio of two values of a physical quantity
 - dBc (decibels relative to the carrier): power ratio of a signal to a carrier signal, expressed in decibels(dB)
 - dBm: abbreviation for the power ratio in decibels (dB) of the measured power referenced to one milliwatt

<hi #ff7f27> - Wie hatten wir gemessen? Was verwendet?

1. Klaus Zettel verwenden



2. Wie hatten wir die Datei gespeichert?

3. Was is dB, dBm, dBc und wie hängt W damit zusammen?

4. Frequenzen und dBm-Zahl zu jeder Messung angeben. Gibt es noch andere wichtige Daten in der Datei?</hi>

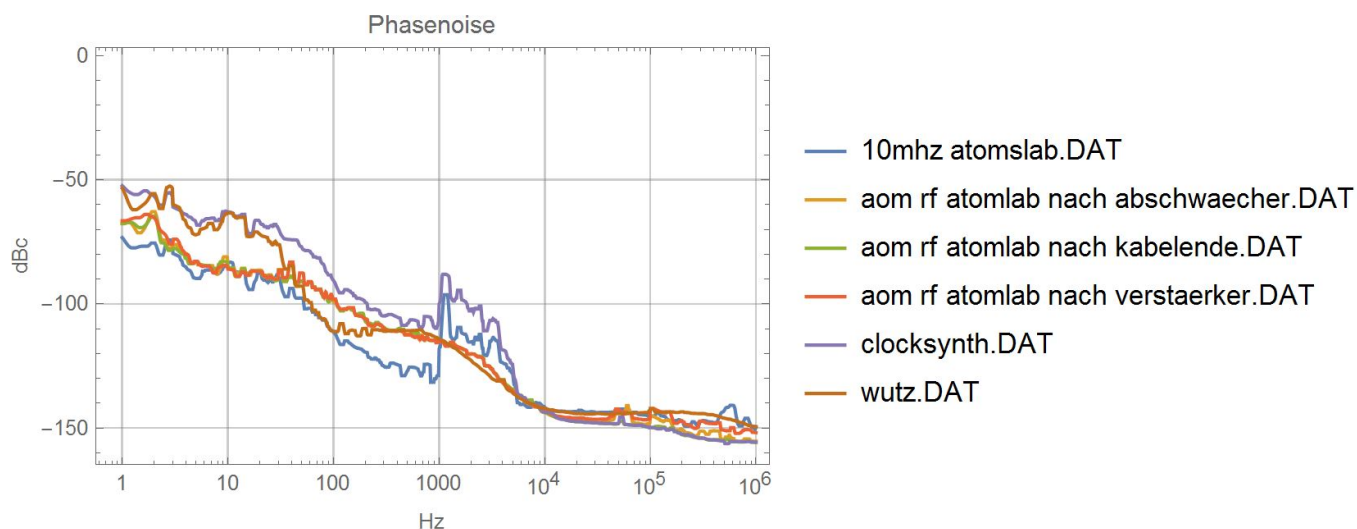


Beim nächsten mal Messen: klären wie gut die Geräte bei anderen Frequenzen funktionieren? Kabel überprüfen, Frequenzen hinter Originalkabel bis hin zum zum Beispiel AOM prüfen, Steckverbinder wie BNC-I überprüfen

9 Atomlab

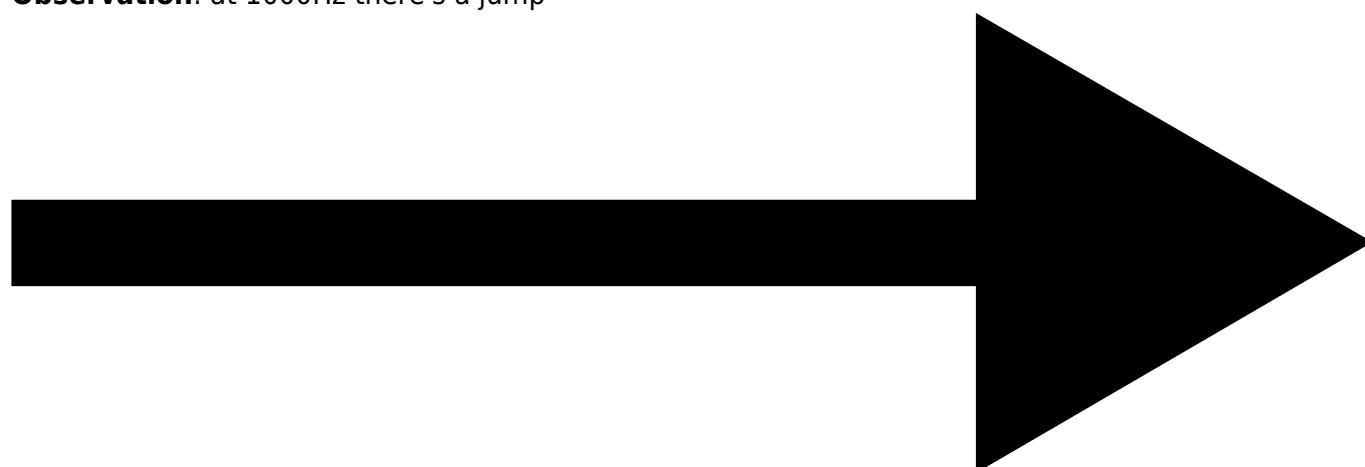
<hi #ff7f27>Dateien umbenennen + ändern! </hi>

atom_lab.pdf



- 10mhz atomslab.DAT: 9.999.999,686110 Hz [18.08.2016] referenced to OCXO
- 80 mhz.DAT: 79.110.997,503162 Hz [18.08.2016] referenced to 10MHz (= 10MHz atomslab.DAT)
- chlocksynth.DAT: 87.169.997,232243 Hz [18.08.2016] referenced to 10MHz (= 10MHz atomslab.DAT)
- wutz.DAT: 104.673.996,567979 Hz [22.08.2016] synthesizer for shifter - AOM

Observation: at 1000Hz there's a jump



correlation of "10mhz atomslab.DAT" and "clocksynth.DAT"

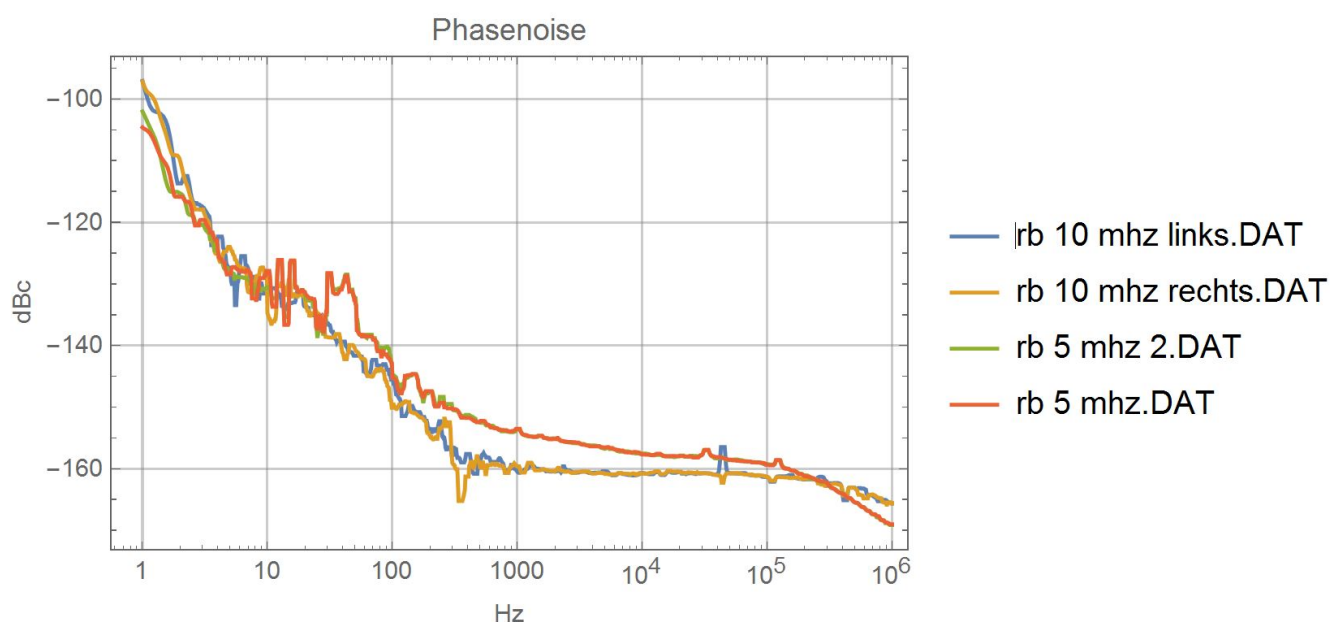
AOM

<hi #ff7f27> Name? → pdf und bild einfügen
als eigenes “Kapitel” oder zu Atomlab dazu? </hi>

- aom rf atomlab nach abschwaecher.DAT: 87.169.997,264110 Hz [22.08.2016]
- aom rf atomlab nach kabelende.DAT: 87.169.997,256448 Hz [22.08.2016]
- aom rf atomlab nach verstaerker.DAT: 87.169.997,268579 Hz [22.08.2016]

2 Rb clock

rb_clock.pdf



- rb 10 mhz links.DAT: 9.999.999,682126 Hz [22.08.2016] left BNC-connector
- rb 10 mhz rechts.DAT: 9.99.999,681785 Hz [22.08.2016] right BNC-connector
- rb 5 mhz 2.DAT: 4.999.999,836086 Hz [22.08.2016]
- rb 5 mhz.DAT: 4.999.999,850747 Hz [22.08.2016]

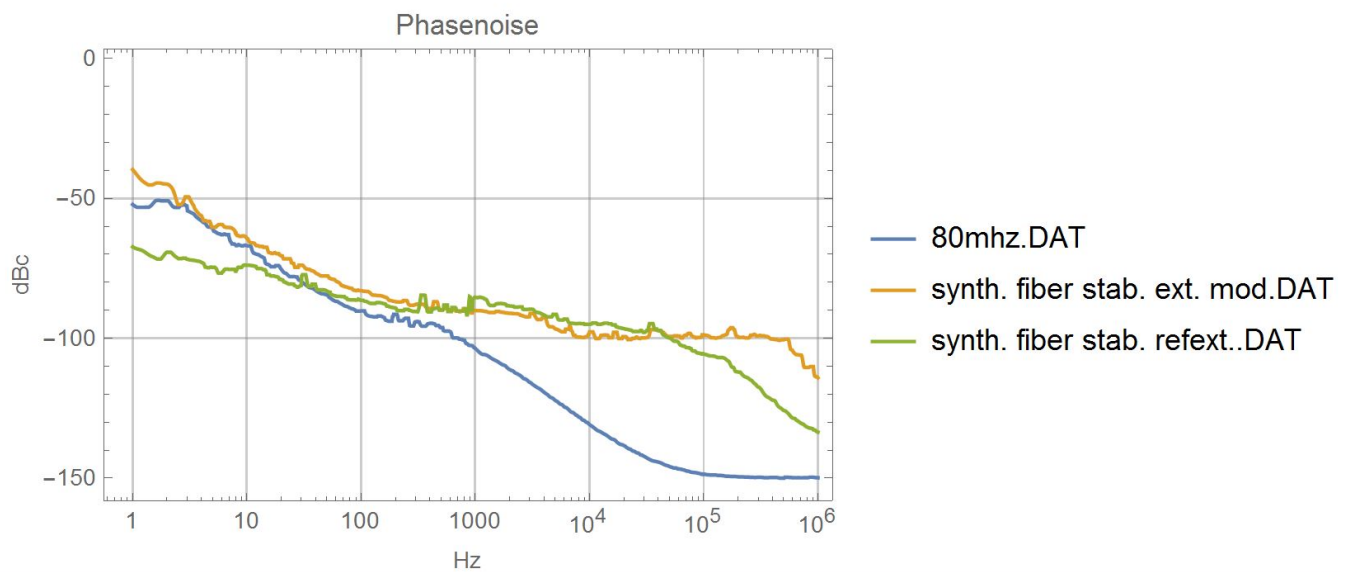
Question: Referenced to what?

Note: “rb 5 mhz 2.DAT” and “rb 5 mhz.DAT” are the same, measured at different times

8 fiber stabilization

<hi #ff7f27>Dateien umbenennen + ändern! </hi>

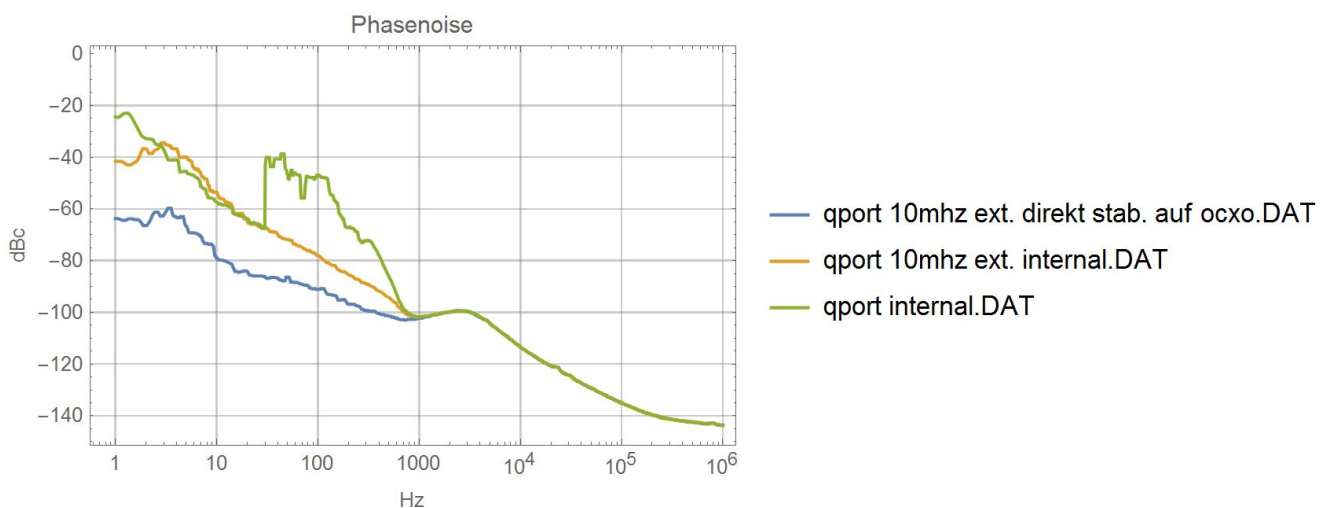
fiber_stab.pdf



- synth. fiber stab. ext. mod.DAT: 79.110.937,461429 Hz [22.08.2016]
- synth.fiber stab. refext..DAT: 79.110.997,261913 Hz [22.08.2016]

10 synthesizer von Q-Port

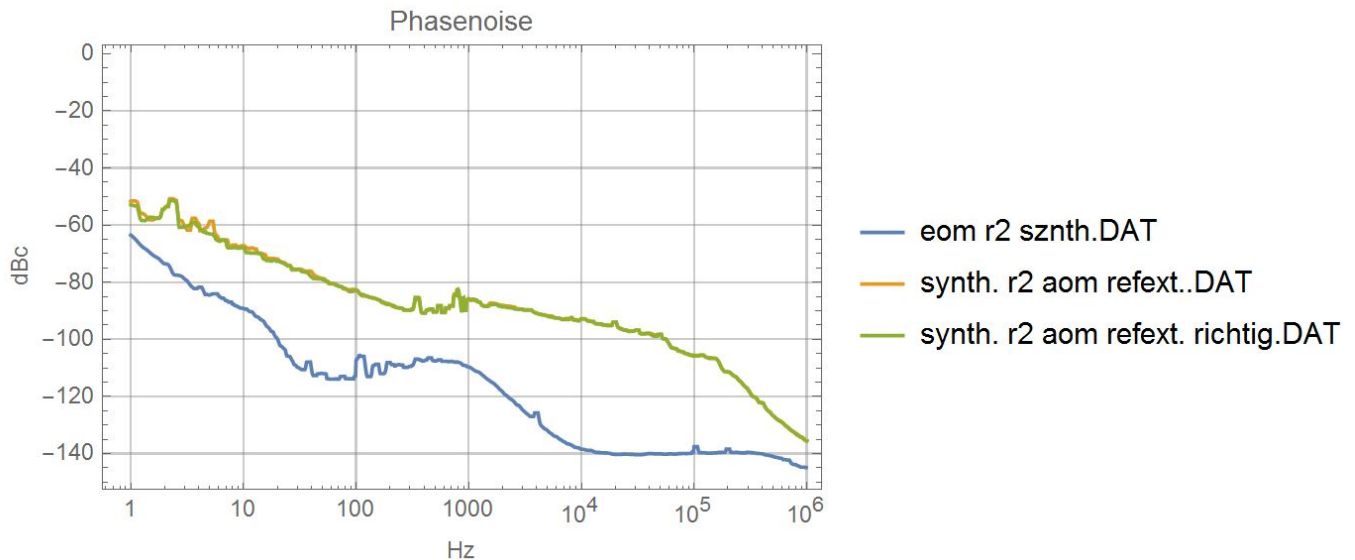
qport.pdf



- qport internal.DAT: 987.732.665,994588 Hz [22.08.2016]
- qport 10mhz ext. direkt stab. auf ocxo.DAT: 987.733.301,133802 Hz [22.08.2016]
- qport 10mhz ext.internal.DAT: 987.733.301,151171 Hz [22.08.2016]

5.1 Resonator

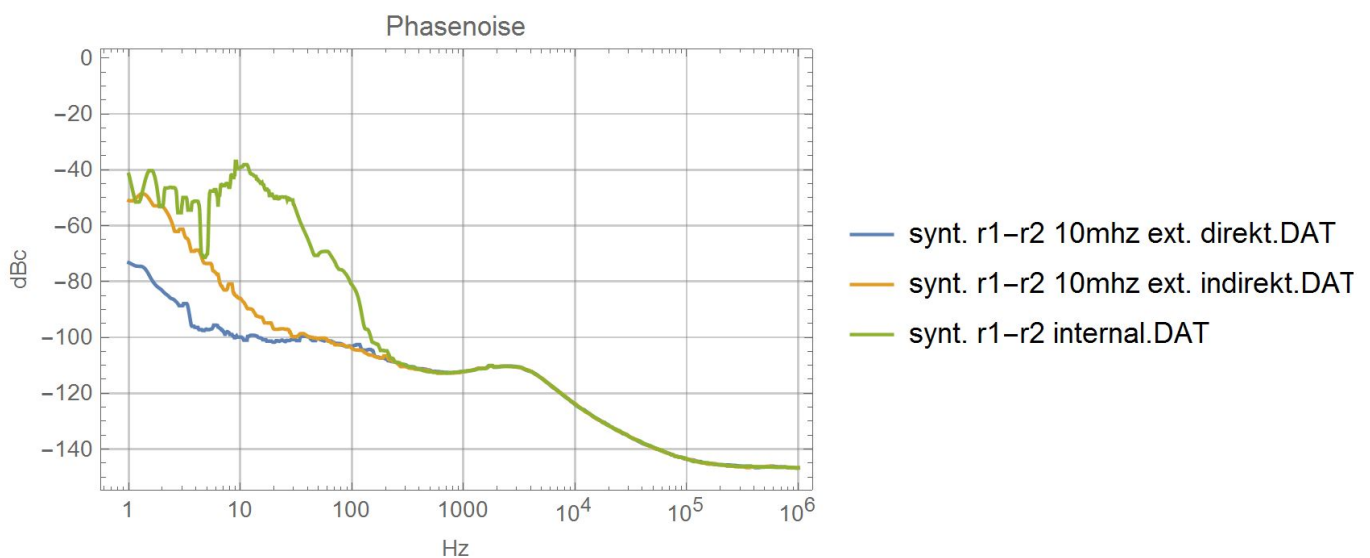
r2.pdf



- eom r2 sznth.DAT: 16.200.005,142169 Hz [24.08.2016]
- synth. r2 aom refext..DAT: 77.099.997,538021 Hz [22.08.2016]
- synth. r2 aom refext. richtig.DAT: 77.099.997,514594 Hz [22.08.2016]

6 Resonator 1 and 2

r1-r2.pdf

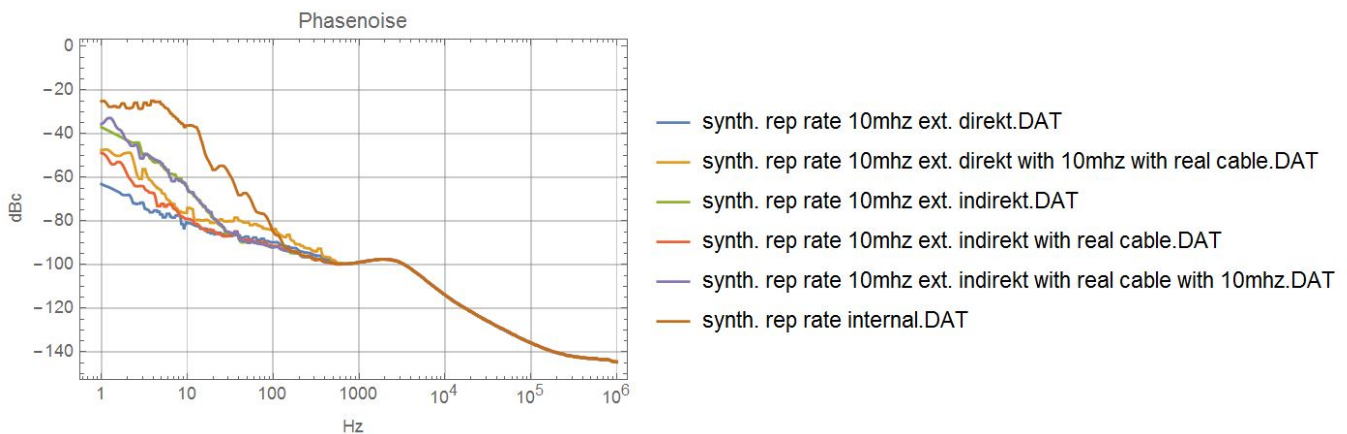


- synt. r1-r2 10mhz ext. direkt.DAT: 340.999.989,006932 Hz [22.08.2016]

- synz. r1-r2 10mhz ext. indirekt.DAT: 340.99.989,008668 Hz [22.08.2016]
- synt. r1-r2 internal.DAT: 341.000.016,201303 Hz [22.08.2016]

7 rep rate

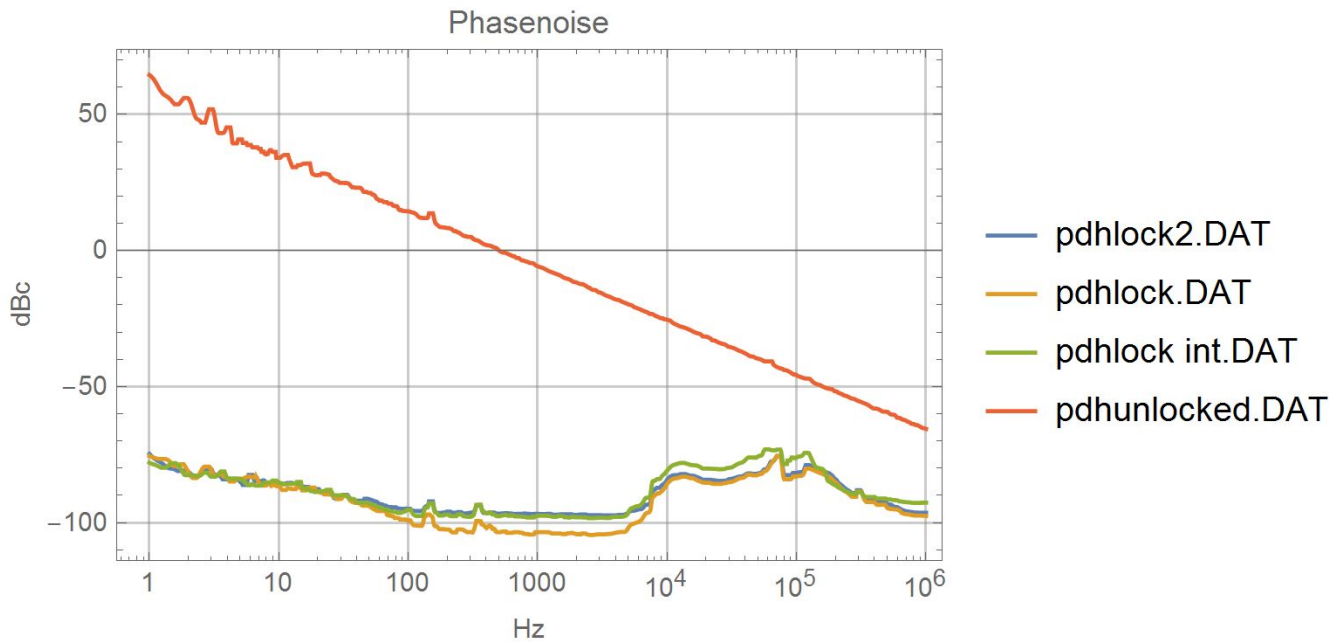
rep_rate.pdf



- synth. rep rate 10mhz ext. direkt.DAT: 1.000.000.248,806976 Hz [22.08.2016]
- synth. rep rate 10mhz ext. direkt with 10mhz with real cable.DAT: 1.000.000.249,473547 Hz [22.08.2016]
- synth. rep rate 10mhz ext. indirekt.DAT: 1.000.000.248,770376 Hz [22.08.2016]
- synth. rep rate 10mhz ext. indirekt with real cable.DAT: 999.997.802,893996 Hz [22.08.2016]
- synth. rep rate 10mhz ext. indirekt with real cable with 10mhz.DAT: 1.000.000.249,567324 Hz [22.08.2016]
- synth. rep rate internal.DAT: 1.000.000.282,423948 Hz [22.08.2016]

5.2 Pound-Breher-Hall for resonator 1

pdh.pdf

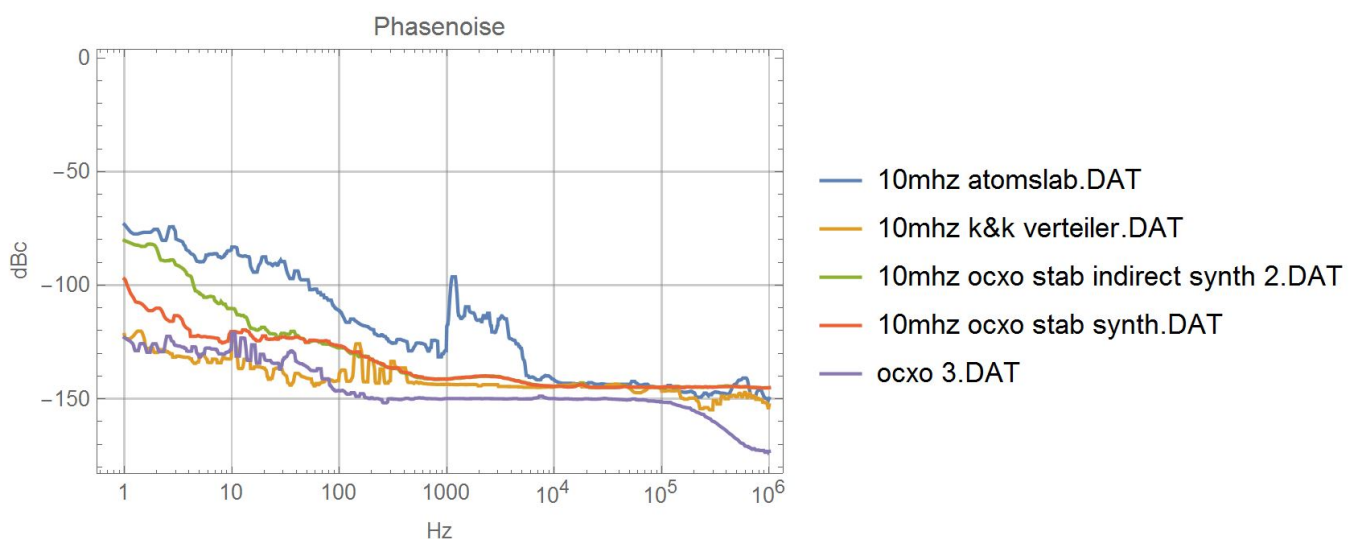


- pdhlock2.DAT: 13.810.003,192828 Hz [23.08.2016]
- pdhlock.DAT: 13.817.786,393137 Hz [23.08.2016]
- pdhlock int.DAT: 13.810.004,243357 Hz [23.08.2016]
- pdhunlocked.DAT: 13.60.299,455637 Hz [23.08.2016]

3: 10 MHz distribution

<hi #ff7f27>Dateien umbenennen + ändern! </hi>

10_mhz_distribution.pdf



- 10mhz atomslab.DAT: 9.999.999,686110 Hz [18.08.2016]
- 10mhz k&k verteiler.DAT: 9.999.999,651353 Hz [18.08.2016] referenced to generated 10MHz signal
- 10mhz ocxo stab indirect synth 2.DAT: 9.999.999,673212 Hz [22.08.2016]

- 10mhz ocxo stab synth.DAT: 9.999.999,673767 Hz [22.08.2016]
- 10mhz selbst.DAT: 9.99.999,650255 Hz [18.08.2016] self-construktion distributor, referenced with OCXO 10MHz, very bad at 1 - 10Hz → probably influenced by other labatories (powersplitter were used instead of buffer outputs?)
- 10mhz selbst no others.DAT: 9.999.999,640838 Hz [18.08.2016](= 10MHz selbs.DAT) self-construktion distributor without other labatories
- ocxo 3.DAT: 4.999.999,834145 Hz [22.08.2016]

Question:

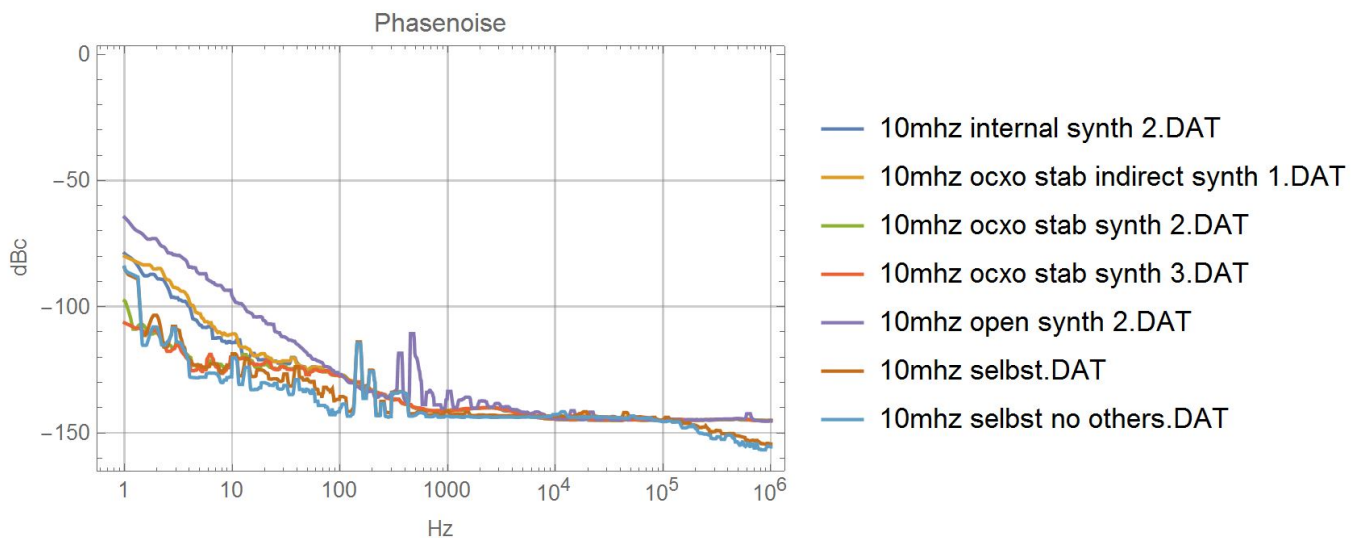
What was measured with “10mhz ocxo stab indirect synth 2.DAT”, “10mhz ocxo stab synth.DAT” and “ocxo 3.DAT”?

They need to be looked at in the original condition in the AFS!

4: 10 MHz synthesizer

[Dateien umbenennen + ändern!](#)

10_mhz_synthesizer.pdf

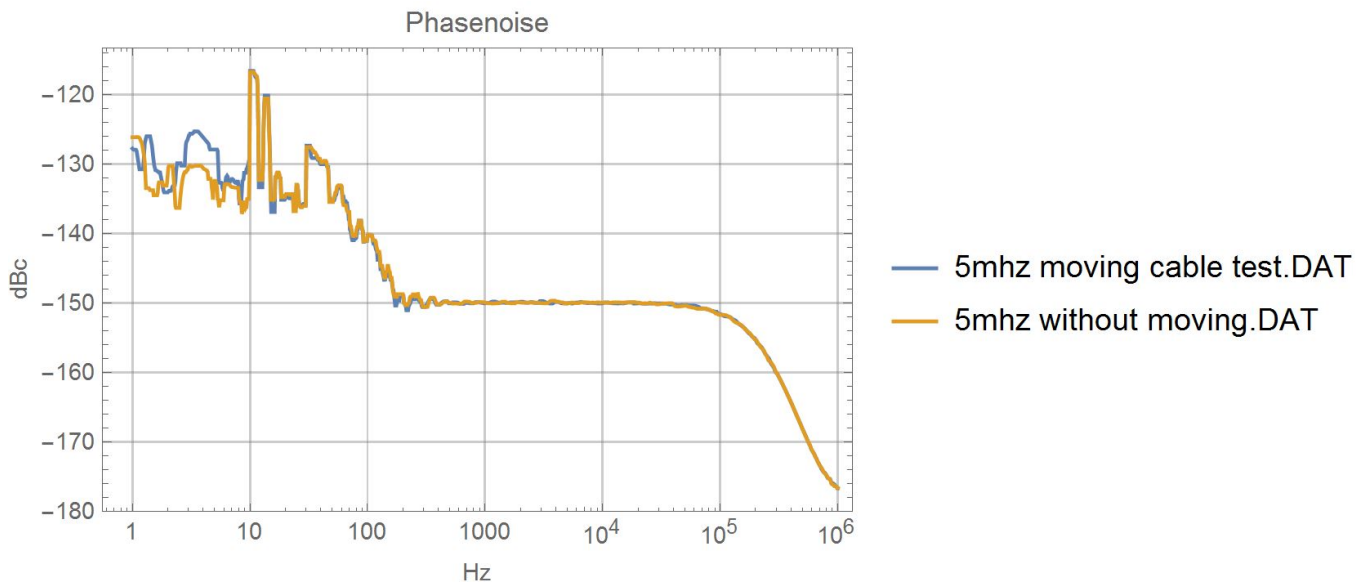


- 10mhz internal synth 2.DAT: 10.000.000,225102 Hz [22.08.2016]
- 10mhz ocxo stab indirect synth 1.DAT: 9.999.999,677410 Hz [22.08.2016]
- 10mhz ocxo stab synth 2.DAT: 9.999.999,672932 Hz [22.08.2016]
- 10mhz ocxo stab synth 3.DAT: 9.999.999,672579 Hz [22.08.2016]
- 10mhz open synth 2.DAT: 9.999.474,907956 Hz [22.08.2016]

1 10MHz OCXO doubling

5MHz-OCXO moving cable test

5mhz_moving_cable_test.pdf

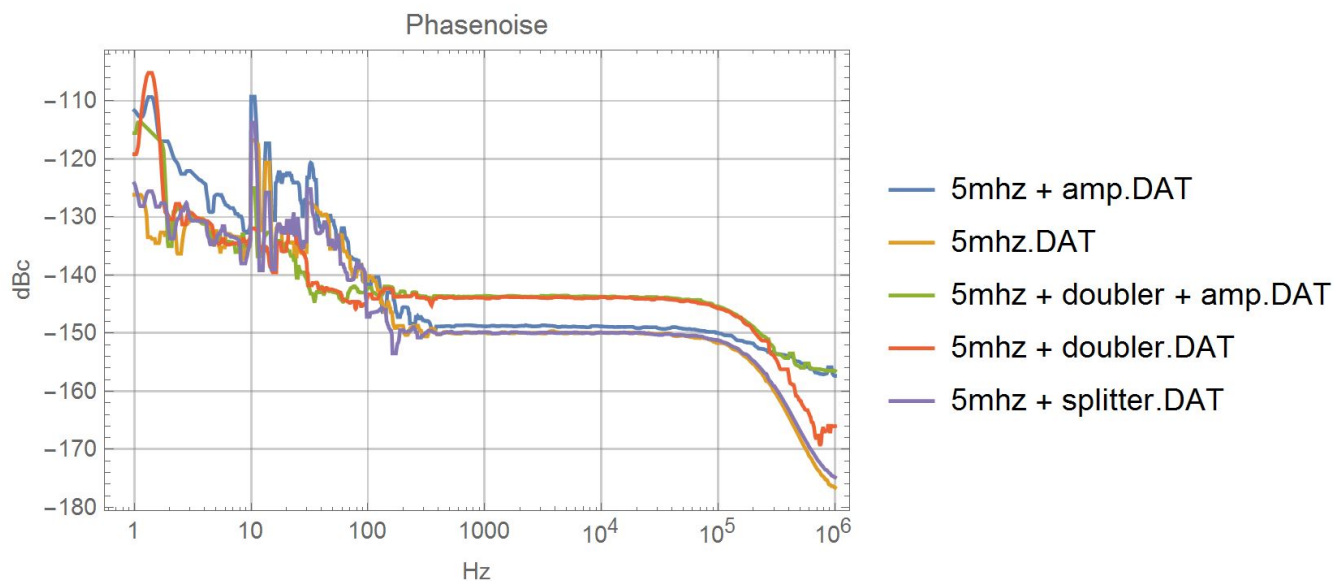


- 5mhz moving cable test.DAT: 4.999.999,822782 Hz [18.08.2016]
- 5mhz without moving.DAT: 4.999.999,825716 Hz [18.08.2016]

Information: Influence on the cable from 1Hz to 100Hz; probably no more from 200Hz

5MHz-OCXO to 10MHZ

5mhz-ocxo_the_way_to_10mhz.pdf



- 5mhz + amp.DAT: 5.000.000,518799 Hz [18.08.2016]
- 5mhz.DAT: 4.999.999,825716 Hz [18.08.2016]
- 5mhz + doubler + amp.DAT: 9.999.999,658937 Hz [18.08.2016]
- 5mhz + doubler.DAT: 9.999.999,651068 Hz [18.08.2016]
- 5mhz + splitter.DAT: 4.999.999,820720 Hz [18.08.2016]

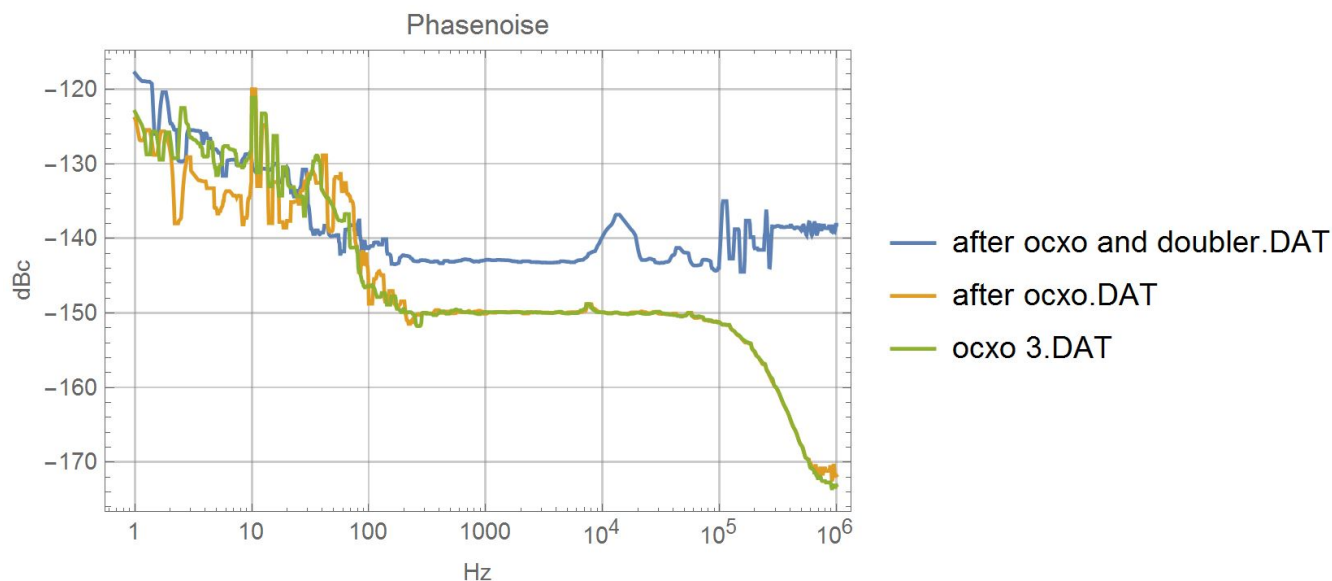
Question:

What was measured with 5MHz OCXO?

What is meant by splitter?

5MHz-OCXO to 10MHz again

5mhz_to_10mhz_ocxo_again.pdf

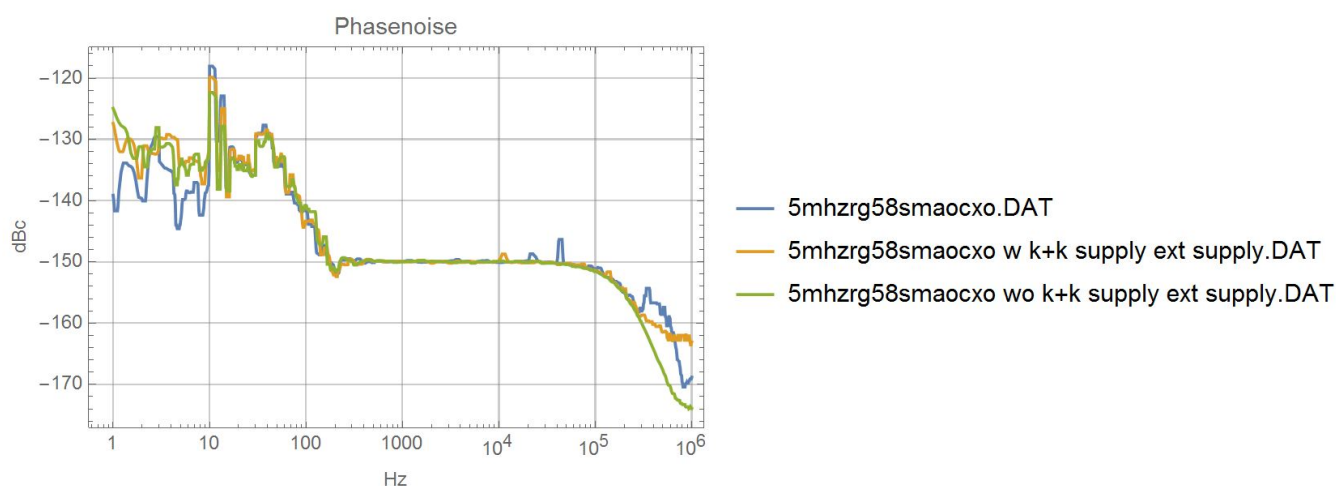


- after ocxo and doubler.DAT: 10.000.000,353714 Hz [22.08.2016]
- after ocxo.DAT: 4.999.999,838434 Hz [22.08.2016]
- ocxo 3.DAT: 4.999.999,834145;Hz [22.08.2016]

Information: measurement of the final 5MHz doubling on another day as a comparison

5MHz OCXO with/without original power supply

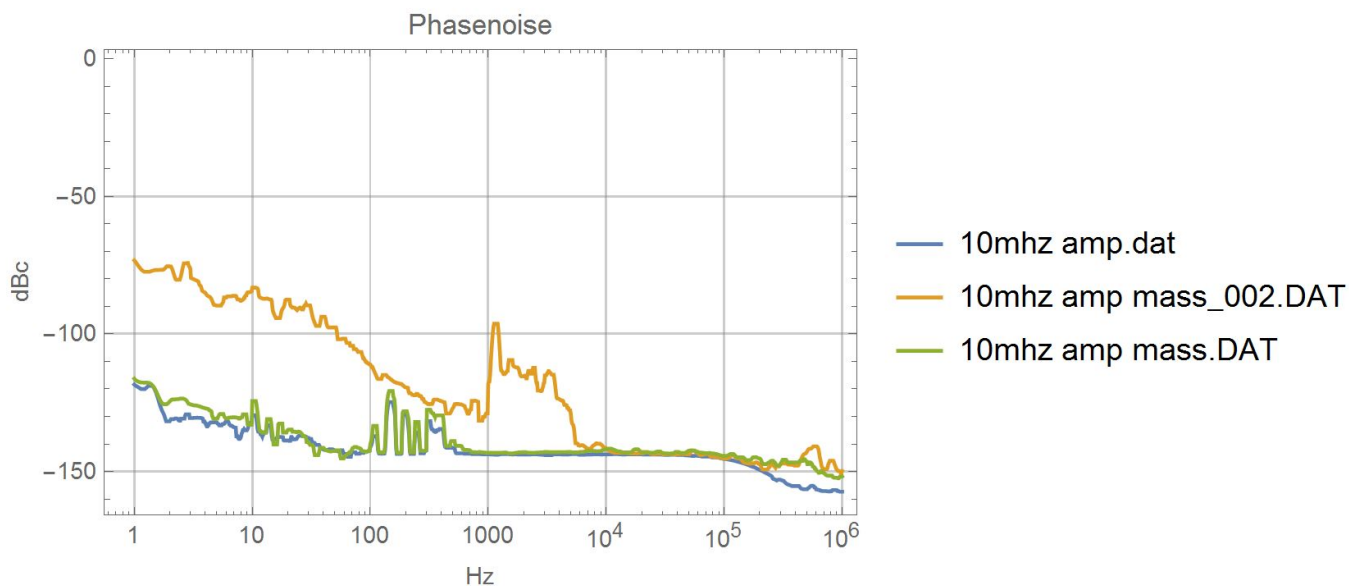
5mhz_ocxo_with_without_original_power_supply.pdf



- 5mhzrg58smaocxo.DAT: 4.999.999,836230 Hz [18.08.2016] direkt measurement of the new 5MHz OCXO without separate power supply
- 5mhzrg58smaocxo w k+k supply ext supply.DAT: 4.999.999,830501 Hz [18.08.2016] 5MHz OCXO with separate power supply, but K+K power supply was turned on and OCXO was located in the Rack
- 5mhzrg58smaocxo wo k+k supply ext supply.DAT: 4.999.999,824645 Hz [18.08.2016] 5MHz OCXO with separate power supply, but K+K power supply was turned off

10MHz amplifier

10_mhz_amplifier.pdf



- 10mhz amp.DAT: 9.999.999,652707 Hz [18.08.2016]
- 10mhz amp mass_002.DAT: 9.999.999,686110 Hz [19.08.2016] measurement of another day
- 10mhz amp mass.DAT: 9.999.999,651541 Hz [18.08.2016]

Question: What was the problem?

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Last update: 2016/10/28 15:42

