

10MHz frequency source

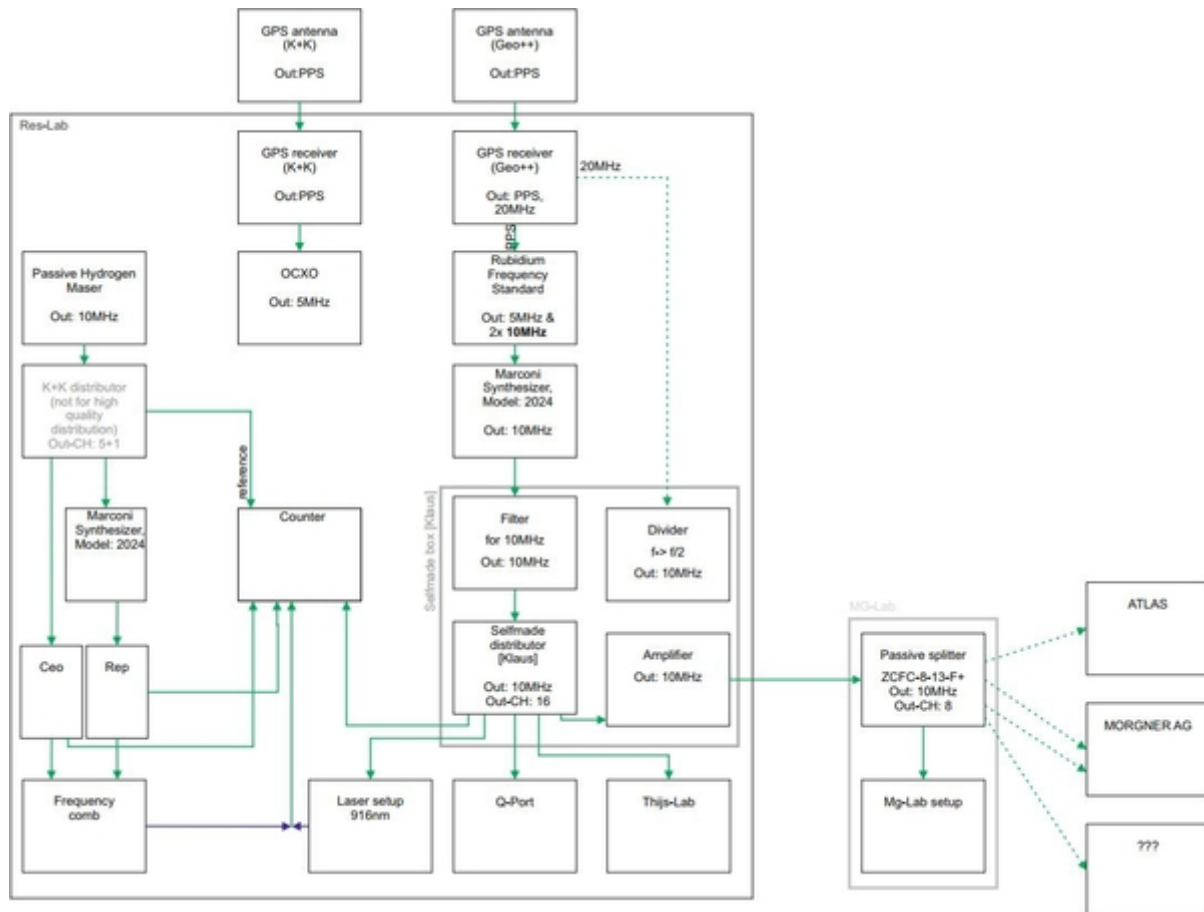
Possible sources

All sources exist in ResLab.

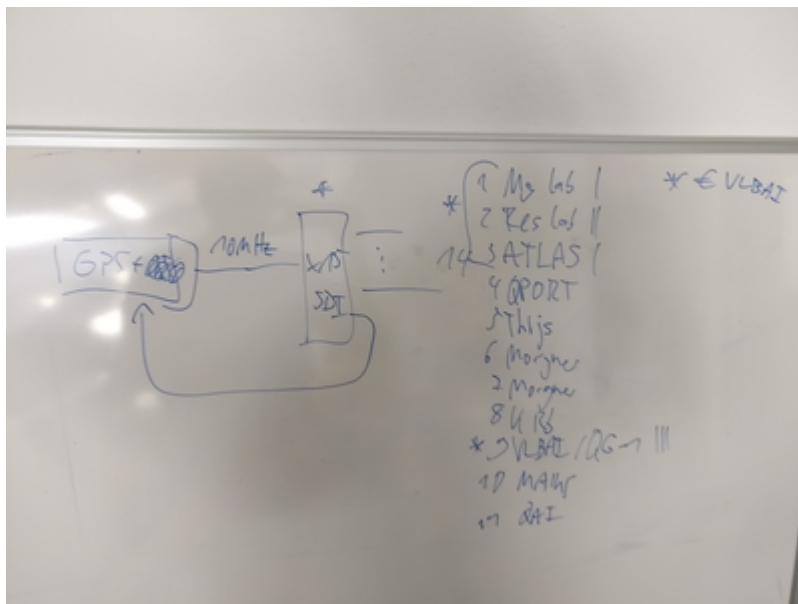
1. [Passive Hydrogen Maser](#)
2. [OCXO](#)
 1. OXCO 5 MHz
 2. OXCO 10 MHz (broken)
3. [Rubidium Frequency Standard](#)
 1. [GPS receiver](#)
 2. [Marconi Synthesizer](#), Model: 2024
 3. Selfmade distributor [Klaus]
 4. K+K distributor (not for high quality distribution)
 5. HighTec Fiber ???
1. CSAC Chip für stabile 10MHz Referenz

Current Setup [30.05.2017]

Current 10MHz setup.pdf



Future Setup



- Ansprechpartner für Löcher in der Uni: Miehlbradt, Marion
 - Raumpläne IQO
 - 10_MHz_Verlegung_IQ_08_2017

Experiment	Raumnummer	Number of cables [new = old =	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
Ansprechperson Experiment Ansprechperson Kabelverlegung						
						

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Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	Number of cables [new =  , old = ] Mean cable Lab cable 1 + ? [	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
KRB J. Peise A. Igel	E311		1 (16)	25(Reslab - Mg- Lab) + 20(Mg-Lab) + 60(Mg-Lab- KRB)	-	* KRB_10MHz_Kabel_08_2017 * Die Durchführungen sind alle groß genug, nur auf höhe des Elektroniklabors liegen die Kabel in der Nähe von Heizungsrohren. * Im Flur befindet sich ein offener Kabelkanal.

Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	Number of cables [new =  , old =  Mean cable Lab cable 1 + ? [	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
QAI,EPR J. Peise C. Pür	D313 → D315		1 (16)	25 (Reslab - Mg-Lab) + 20(Mg-Lab) + 25(Mg-Lab-QAI) + 25(QAI-EPR)	-	-

Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	Number of cables [new =  , old =  Mean cable Lab cable 1 + ? [	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
ATLAS H. Albers H. Albers	D330		1 (16)	25(Reslab - Mg-Lab) + 25(Mg-Lab) + 50 (Mg-Lab-ATLAS) + 5(ATLAS-Lab)	?, Ø=10cm, ?	* ATLAS_10MHz_Habel_08_2017 * Gibt keine Information wie es über den Seminarraum verlegt ist → Neue Löcher bohren oder zusätzlicher Durchgang zu VLBAI

Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	Number of cables [new =  , old = ] Mean cable Lab cable	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
VLBAI E. Wodey ?	D323		1 (16)	25(Reslab - Mg- Lab) + 25(Mg-Lab) + 20 (Mg-Lab- VLBAI) + 5 (VLBAI)	-	-

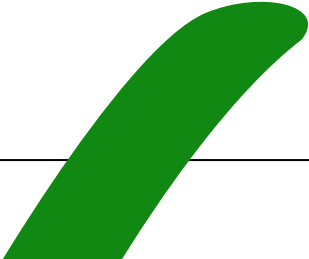
Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	Number of cables [new =  , old =  Mean cable Lab cable
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Number of distributors (Number of outputs)

Cable length + "Lab cable Length" [m]

Holes [Number, size, place]

Notes

		Number of cables [new =  , old =				
Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	 Mean cable Lab cable	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
AG S.& C. Ospelkaus Mirko Sierke S. Grondwoski	E304A → E104A	 2 [	2 (min. 8)	25(Reslab - Mg- Lab) + 25 (Mg-Lab) + 100 (Mg-Lab - E-Trakt = vorhanden!) + E-Trakt	-	* AG_Ospelkaus_10MHz_Habel_08_2017 * Das vorhandene Kabel ist 100 Meter lang und hat bei 10 MHz eine Dämpfung von etwa 4,3 dB. * Kabelanfang im Mg-Labor ist mit "CW Tiemann" und das Ende im E- Trakt ist mit "MG ERT" beschriftet
IQwiki - https://iqwiki.iqo.uni-hannover.de/						

Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	Number of cables [new =  , old =	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
		 Mean cable Lab cable				
Q-Port S. Bode ?			-	-	-	Vorhandene Kabel ist verlegt, muss noch getestet werden

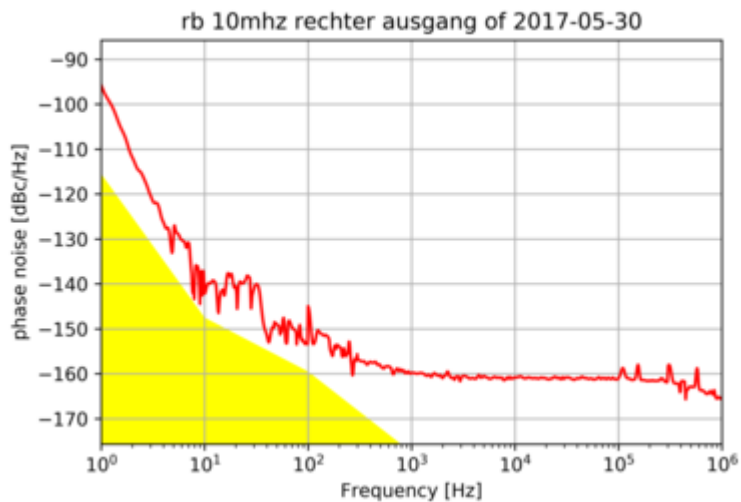
		Number of cables [new =  , old =				
Experiment Ansprechperson Experiment Ansprechperson Kabelverlegung	Raumnummer	 Mean cable Lab cable	Number of distributors (Number of outputs)	Cable length + "Lab cable Length" [m]	Holes [Number, size, place]	Notes
Lasus Thejs ?	D220		-	-	-	* Vorhandene Kabel ist verlegt, Aircell 7, muss noch getestet werden * Sein vorhandener Verteiler ist ein SRS FS710
Maius D. Becker		keine Antwort	keine Antwort	-	-	-
AG Morgner B. Kreipe		0	0	-	-	-
Gesamt			7 (16) 2 (min 8)	622		

To Do

1)

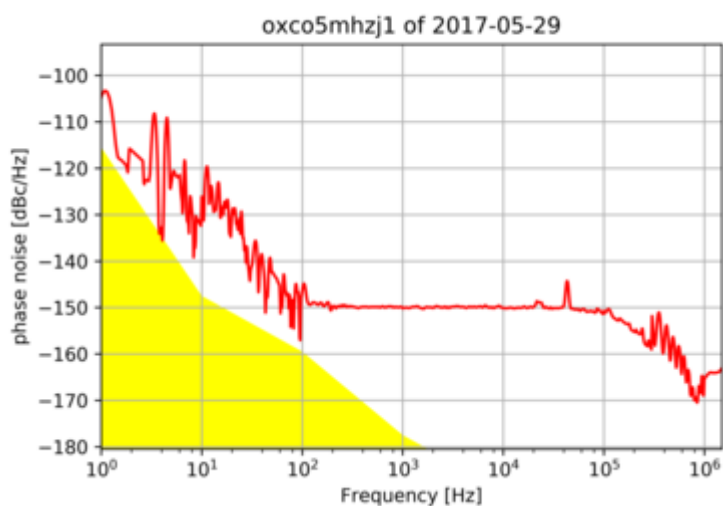
- ☐ FSWP-8 refernced to Maser
- ☐ FSWP-8 running 1 day ahead of measurement
- ☐ Measure: 100mHz-10MHz PN Rb-clock

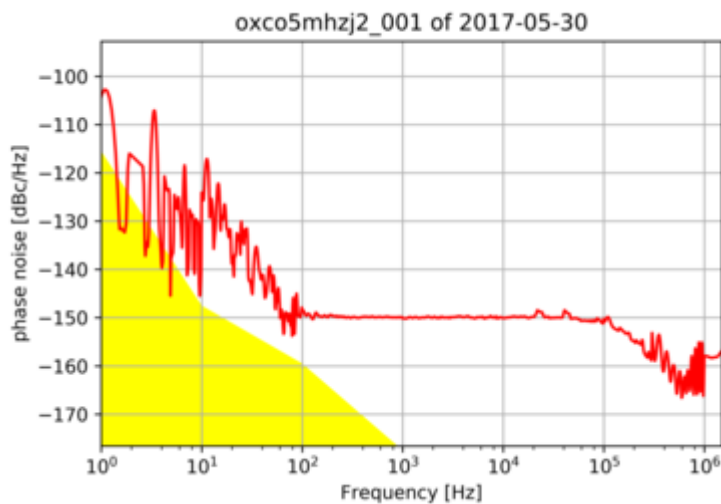
- "GPS →" Rb-10Mhz [right Output] → BNC cable → BNC-I-connector → BNC-SMA-conneccotor → long cable → PNA



- ☐ Measure: "- -" OCXO

- Channel J1 and J2: OCXO → short cable → SMA-I-connector → long cable → PNA

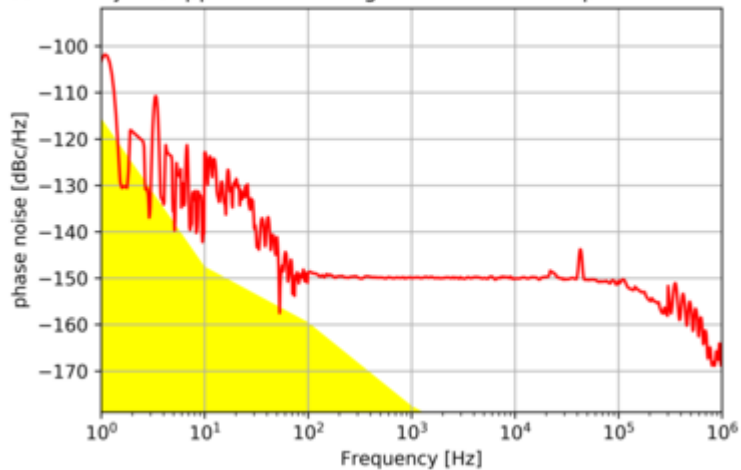




□ Measure: -"- -"- OCXO 5MHzx2 (passive)

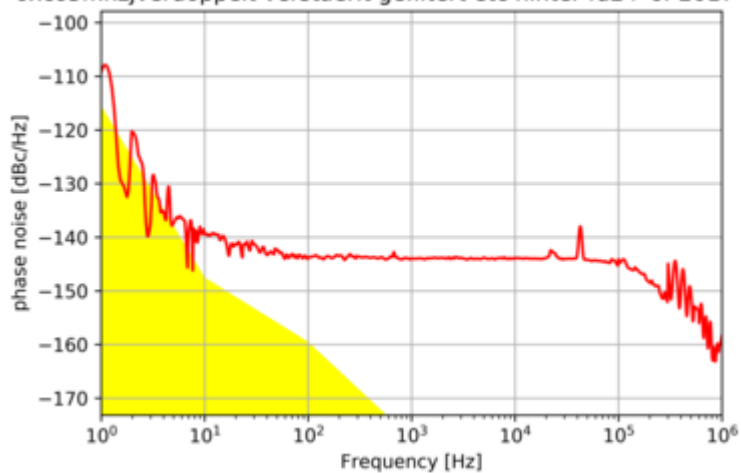
- J1 → short cable → SMA-BNC-connector → TP [6MHz] → long cable → PNA

oxco5mhzjverdoppelt verstaerlt gefiltert etc hinter tp6mhz of 2017-05-30



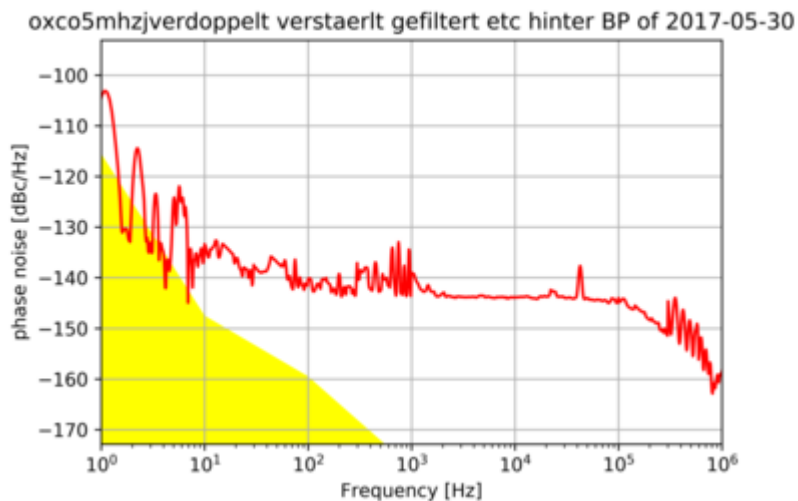
- J1 → short cable → SMA-BNC-connector → TP [6MHz] → Doubler [FD-2+] → BNC-SMA-connector → long cable → PNA

oxco5mhzjverdoppelt verstaerlt gefiltert etc hinter fd2+ of 2017-05-30

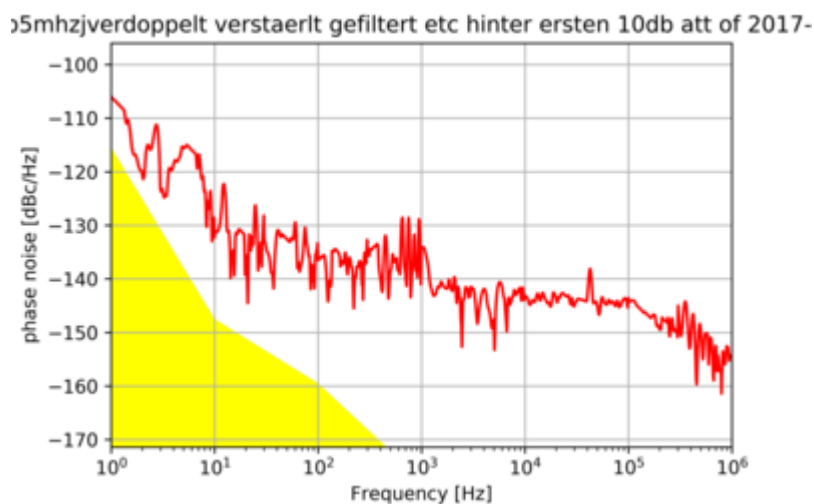


- J1 → short cable → SMA-BNC-connector → TP [6MHz] → Doubler [FD-2+] → BNC-SMA-connector → long cable → PNA

BP [SBP-10.7+] → long cable → PNA

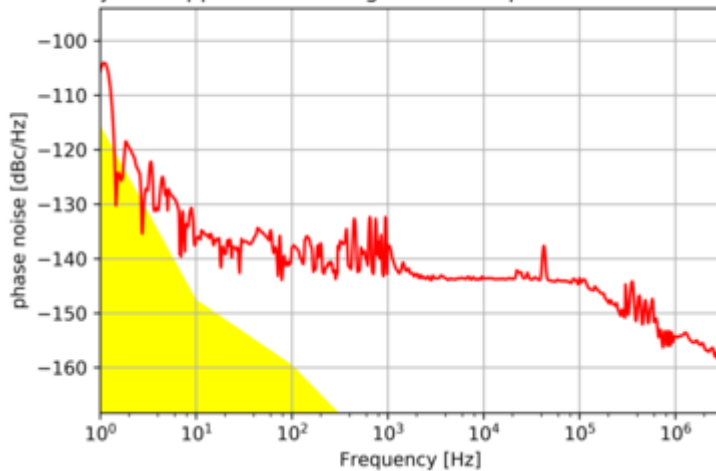


- J1 → short cable → SMA-BNC-connector → TP [6MHz] → Doubler [FD-2+] → BNC-SMA-connector → BP [SBP-10.7+] → BNC-SMA-connector → Att. [10dB] → BNC-SMA-connector → long cable → PNA

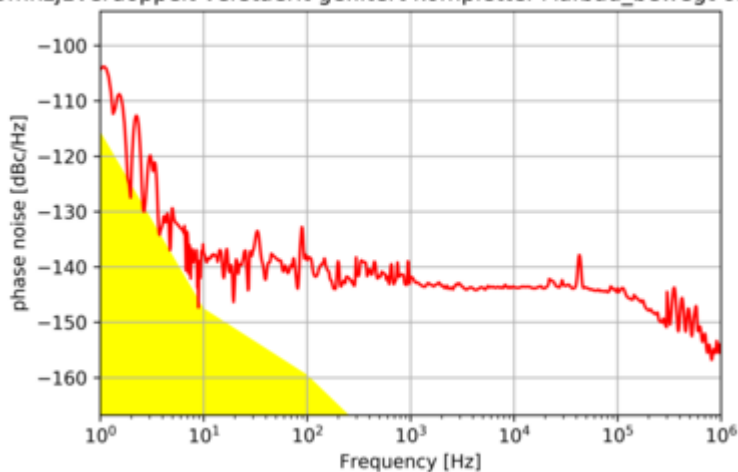


- Overall setup: J1 → short cable → SMA-BNC-connector → TP [6MHz] → Doubler [FD-2+] → BNC-SMA-connector → BP [SBP-10.7+] → BNC-SMA-connector → Att. [10dB] → short BNC-cable → Amplifier [ZFL-500LN-BNC+] → LP [BLP-15] → Att. [20dB] → Att. [3dB] → BNC-SMA-connector → long SMA cable → PNA

xco5mhzj1verdoppelt verstaerlt gefiltert kompletter Aufbau of 2017-05.



imhzj1verdoppelt verstaerlt gefiltert kompletter Aufbau_bewegt of 2017



☐ Measure: -"- -"- OCXO 5MHzx2 (DDS?)

- Currently not possible.

2)

☐ Propagate K+K manuals

3)

☐ Repair K+K box

4)

☐ Compare PN Marconi vs. ampfiere (which?)

5)

☐ Compare Specs Timetech & Spectra dynamics -> (PN, Channel/Channel isolation, Groundloops, min input power @ 10MHz)

Distibution

- Timetech distributor:

Timetech distributor_datasheet

- Spectra dynamics distributor: [HPDA-15RMi](#)

Datasheet_HPDA-15RMi

Feature	TimeTech	Spectra dynamics HPDA-15RMi																												
Phase Noise [dBc]	@ 10MHz 1Hz -148 10Hz -160 100Hz -165 1000Hz -166 10000Hz -166	@ <hi #ed1c24>???</hi> MHz 1Hz -155 (max -150) 10Hz -165 (max-160) 1000Hz -170 (max 168) 10000Hz -171 (max -170)																												
Channel/Channel isolation [dB]	<table><tr><td></td><td>5 MHz</td><td>10 MHz</td><td>100 MHz</td></tr><tr><td>Np clipping below</td><td>+12 dBm</td><td>+12 dBm</td><td>+12 dBm</td></tr><tr><td>Reverse Isolation [dB]</td><td>> 140 (145 typ.)</td><td>> 120 (128 typ.)</td><td>> 110 (118 typ.)</td></tr><tr><td>Output / Output Isolation [dB]</td><td>> 100 (108 typ.)</td><td>> 90 (100 typ.)</td><td>> 75 (83 typ.)</td></tr><tr><td>Ch-A / Ch-B Isolation [dB]</td><td>> 110 (117 typ.)</td><td>> 100 (110 typ.)</td><td>> 90 (98 typ.)</td></tr><tr><td>Harmonics [dBc] (+10 dBm input)</td><td>-76 -76 -80</td><td>-70 -57 -65</td><td>-44 -46 -60</td></tr><tr><td>(1st, 2nd, 3rd) (+13 dBm input)</td><td>-73 -69 -82</td><td>-65 -55 -65</td><td>-42 -40 -55</td></tr></table>		5 MHz	10 MHz	100 MHz	Np clipping below	+12 dBm	+12 dBm	+12 dBm	Reverse Isolation [dB]	> 140 (145 typ.)	> 120 (128 typ.)	> 110 (118 typ.)	Output / Output Isolation [dB]	> 100 (108 typ.)	> 90 (100 typ.)	> 75 (83 typ.)	Ch-A / Ch-B Isolation [dB]	> 110 (117 typ.)	> 100 (110 typ.)	> 90 (98 typ.)	Harmonics [dBc] (+10 dBm input)	-76 -76 -80	-70 -57 -65	-44 -46 -60	(1 st , 2 nd , 3 rd) (+13 dBm input)	-73 -69 -82	-65 -55 -65	-42 -40 -55	Out-out: 130 (min 130)\\Out-in: 140 (min 145)
	5 MHz	10 MHz	100 MHz																											
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Groundloops	<hi #ed1c24>???</hi>	<hi #ed1c24>???</hi>																												
RF-Bandwidth [MHz]	5 to 100 MHz sine wave useable from 100kHz to 200 MHz	+/- 1 dB 0.5-65 (min 1-50)																												
Input Level [dBm]	Input level working: +6 to +17 (+14 dBm @ 100 MHz) Input level nominal: +13	1 dB compression 18 (min 17) @ <hi #ed1c24>???</hi> MHz																												
Output Level [dBm]	<hi #ed1c24>???</hi>	+18 @ <hi #ed1c24>???</hi> MHz																												
Gain [dB]	Gain: 0 (+0.15/-0.1 dB, 1 - 100 MHz, +0.15 to -0.5 dB @ 200 MHz) Gain variation: < 0.1, output vs. output	@5MHz 0.2 (max 0.5)																												
Impedance [Ω]	Input: 50, nominal Output: 50, nominal	Input: 50 Output: 50																												
Return loss [dB]	Input: >45 @5MHz and 10 MHz, >30 @100 MHz Output: >50 @5MHz and 10 MHz, >30 (typ -35) @ 100 MHz	Input(S11): -35 (max -30) Output(S22): -35 (max -30)																												
Distortion [dBc]	<hi #ed1c24>???</hi>	+13 dBm: -48 (max -45) +17 dBm: -42 (max -40)																												
Temp. Delay Coefficient	+15...+30°C 1K pp with maximum slopes 0.5K/h	0-50°C 1.2 (max 1.5) [ps/°C]																												
Connectors	only BNC <hi #ed1c24>???</hi>	SMA for input and output																												
Power connectors	Power Consumption (all outputs loaded): AC: < 0.2 A Priority on AC supply input DC: < 0.9 A, Stand-By: < 50 mA DC is used as back-up supply Supply voltage AC: 100 to 240 V AC, 50/60 Hz, LED indicating AC voltage Supply voltage DC: 18 to 36 V DC, DC isolated, LED indicating DC voltage 2 redundant DC power input connectors, automatic switchover	AC Operation: 100-240 VAC, 47-63Hz DC Operation: 12-36 VDC- Available for some models																												
Number of Outputs	16 or 15	5-15																												
Number of Inputs	1 or 2	1-3																												

Feature	TimeTech	Spectra dynamics HPDA-15RMi
More	Noise figure	< 22.0 dB, (21 dB typ. 1 – 100 MHz)
	Group delay absolute, 1 – 100 MHz	4.7 ns $\pm$ 0.2 ns
	Group delay flatness, 1 – 100 MHz	< 0.1 ns pp
	Group delay variation, channel vs channel	< 0.1 ns
	Group delay variation versus temperature	< 6 ps / K

6)

☐ HiTec: where is to 10MHz RF

7)

☐ Cable, Connector choice

Which cables?

- Best choice (cost-effectiveness) < 150 MHz:
RG223 - Datasheet
[RG223 - conrad](#)
- Aircell 5 for > 100 MHz, low attenuation for higher frequencies: [Aircell 5 - Datasheet](#) [Aircell 5 - conrad](#)
- For high frequencies <10 GHz:
[accuphasebrochure.pdf](#)
- **Testing cable:**
 - Offenes Ende vermessen, dann sollte es Hochohmig sein
 - Auf einer Seite mit 50 Ohm verbinden und vermessen: 50 Ohm+Kabelwiderstand (<3-4 Ohm ist ok)
 - Wenn der Kabelwiderstand höher ist, dann wurden vermutlich beim Crimpen (Luft-)Übergangswiderstände erzeugt

Which connectors?

- BNC or SMA?

8)

☐ More cables for counter RF-Signals in the resLab?

OCXO

- Vibration isolation for the OXCO?
- Frequency double, how?

Filters

- 5MHz
- 10MHz

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