Status Power-Board

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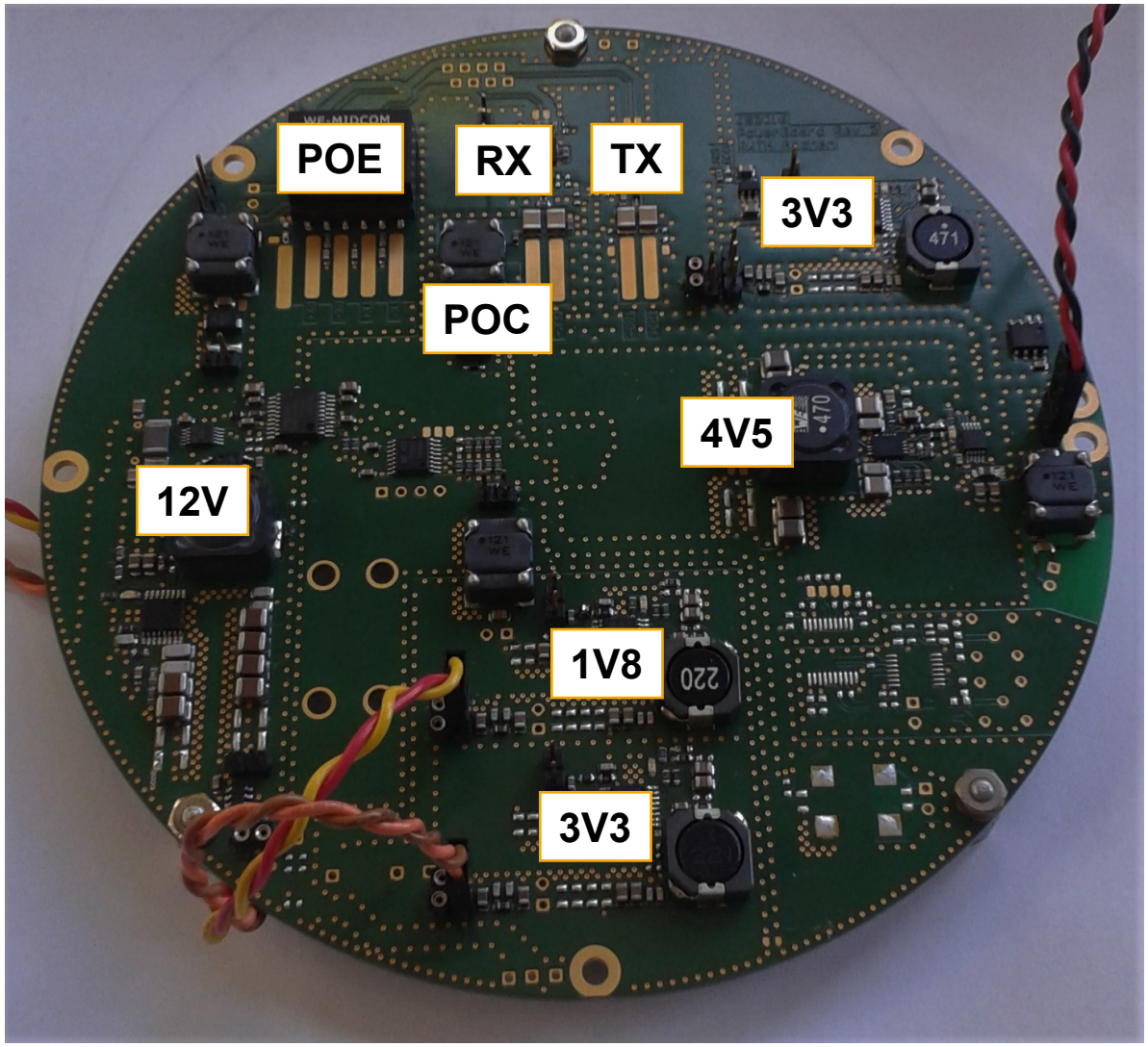
JUNO Electronics Workshop

14.11.2016

Overview

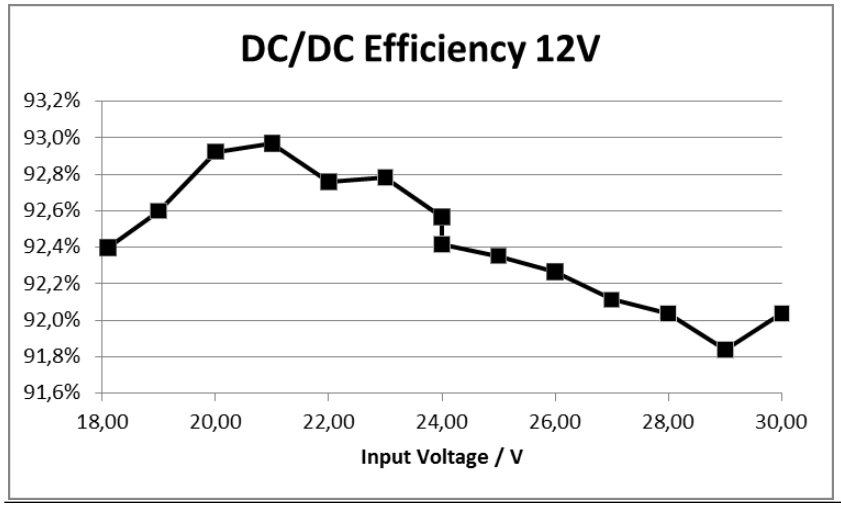


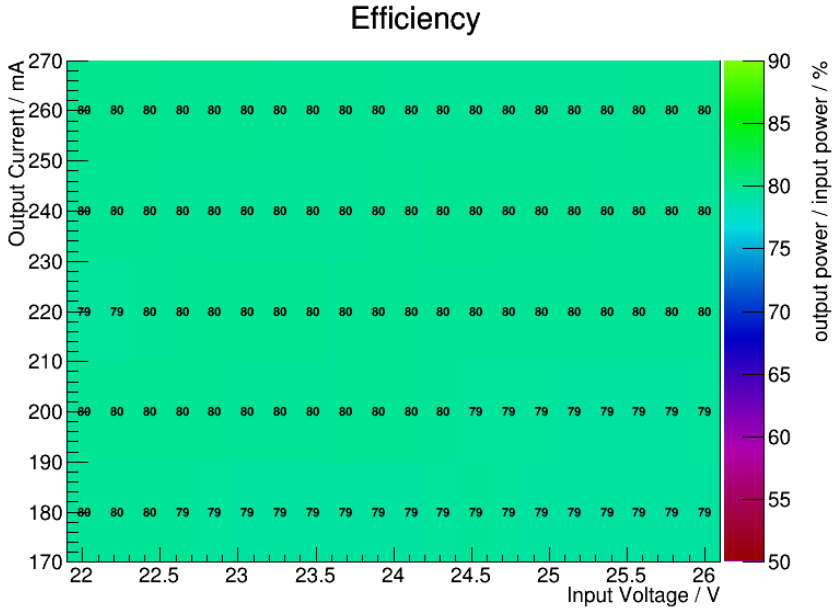
- Everything on the board, what is needed
- Final shape
- Connectors to GCU need update

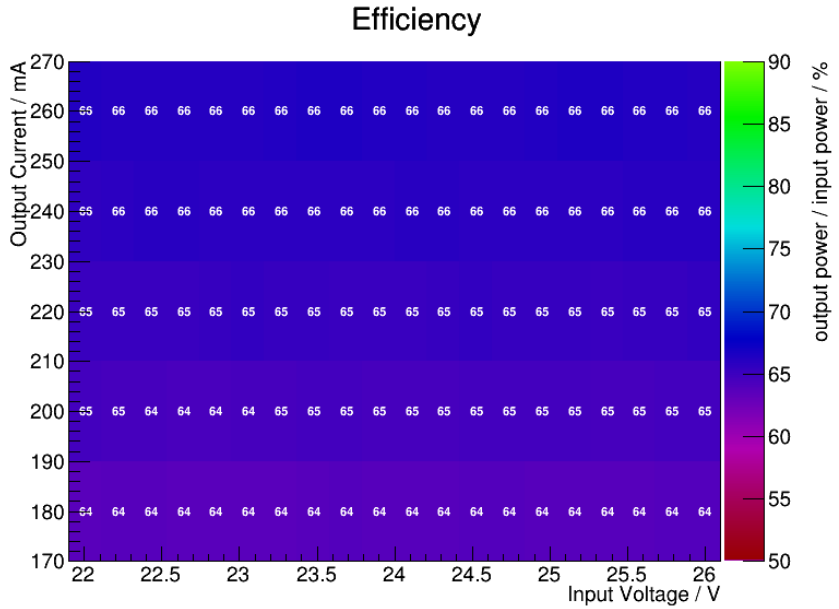
Performance DC/DC converter

Efficiency

- After a bit of tuning…
- VULCAN (from 24V)
  - 3V3 80%
  - 1V8 65%
- 12V for GCU
  - 10 Ω load
  - Efficiency at 24V input 93 %







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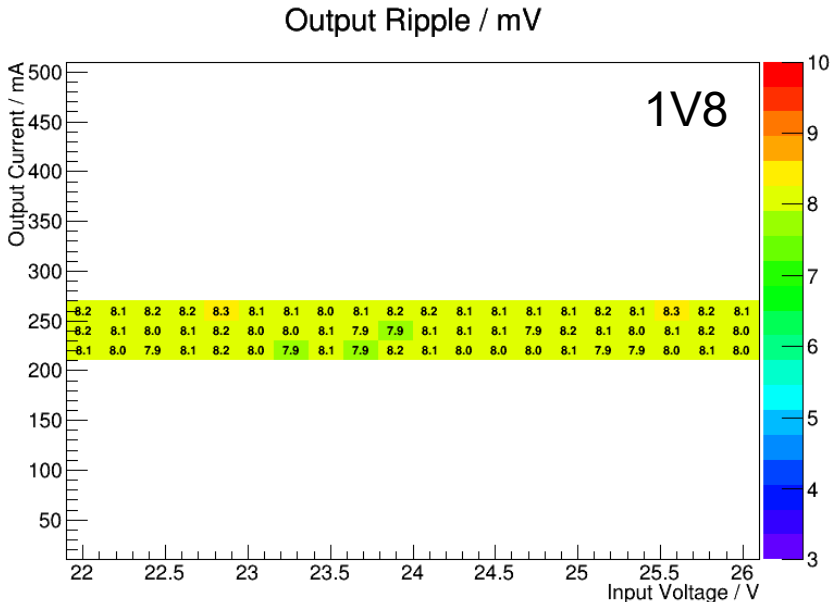
Performance DC/DC

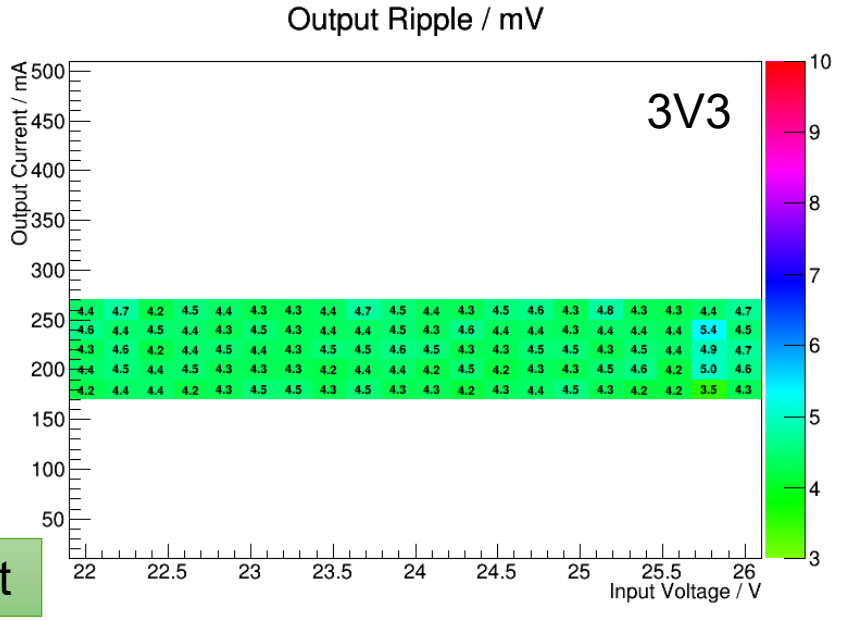
Output voltage ripple

- 12V
  - Spikes 30mVpp
  - Otherwise 13mVpp
- VULCAN
  - 3V3 8mVpp
  - 1V8 5mVpp

Measurement at **full Bandwidth 500MHz / 1GHz**

Typically Ripple is measured at 20Mhz BW limit





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Power Consumption

Using latest measured efficiencies…

	Device Load [W]	Efficiency	Cable Load [W]	current POE [A]	current POC [A]	
GCU	14,0	90%	15,56	0,65		Power Estimation of GCU
ADU	1,1	64%	1,71		0,07	VULCAN 3V3 & 1V8
HV	1,9	100%	1,92		0,08	HV Dubna (24V 80mA)
Cable Handling	0,7	76%	0,92		0,04	Driver + Equalizer
Slow Monitoring	1,0	76%	1,32		0,05	Slow Monitoring on Power Board

Total Power [W]	21,42	-	-	Total load connected to cable
total current [A]		0,65	0,24	current consumption of PMT electronics
Voltage rail [V]		24,00	24,00	voltage output at PMT side
Cable Resistance [Ω]		2,00	4,00	resistance for 100m cable (POE uses two wires for hot and return)
Voltage drop down / up [V]		1,30	0,98	single line voltage drop
Total voltage drop [V]		2,59	1,95	voltage drop of both lines
Input Voltage [V]		26,59	25,95	input voltage to get voltage at PMT
cable losses [W]		1,68	0,48	total cable losses

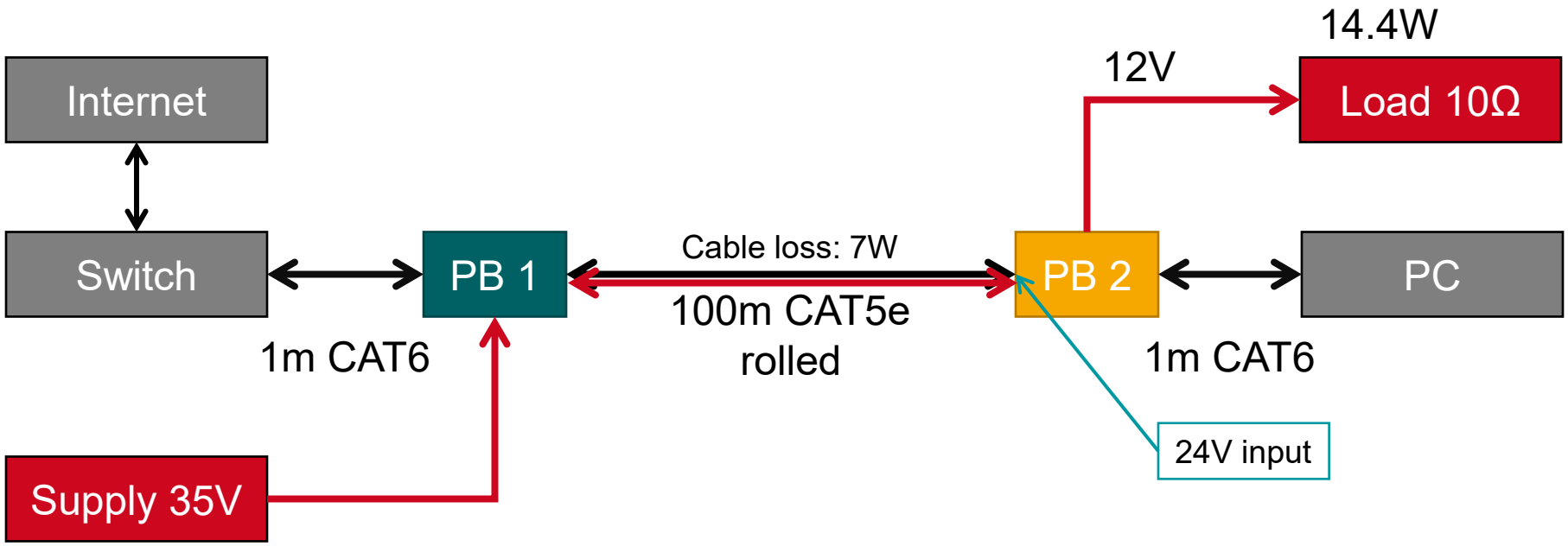
Total cable loss [W]	2,16	both rails
Total Power [W]	21,42	total power of PMT
Total Power Consumption [W]	23,58	total connection power of PMT @ surface

VULCAN				
Voltage [V]	Current [A]	Output Power [W]	Efficiency	Input Power [W]
1,8	0,24	0,43	58,00%	0,57
3,3	0,20	0,66	76,00%	1,14
		1,09	64,00%	1,71

Updated 29.09.2016

Ethernet Transfer

- Successfully transmitted Ethernet-Data @ 100 Mbit/s
- Successfully transmitted 16W (12V 1.2A output) at the same time



Voltage drop: 5.5 V / line

just a single measurement

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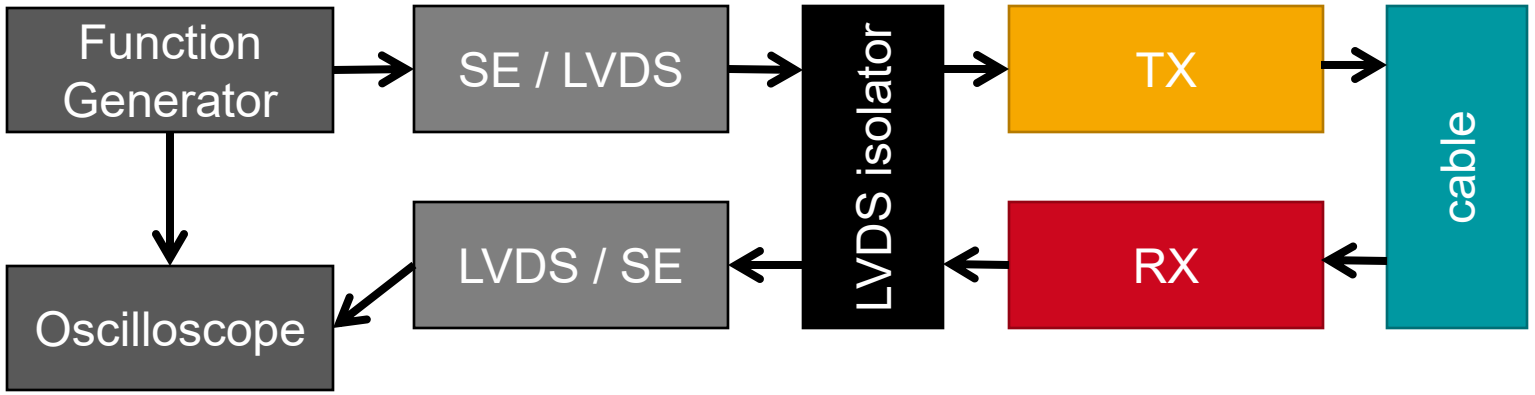
Synchronous Data Transfer Setup

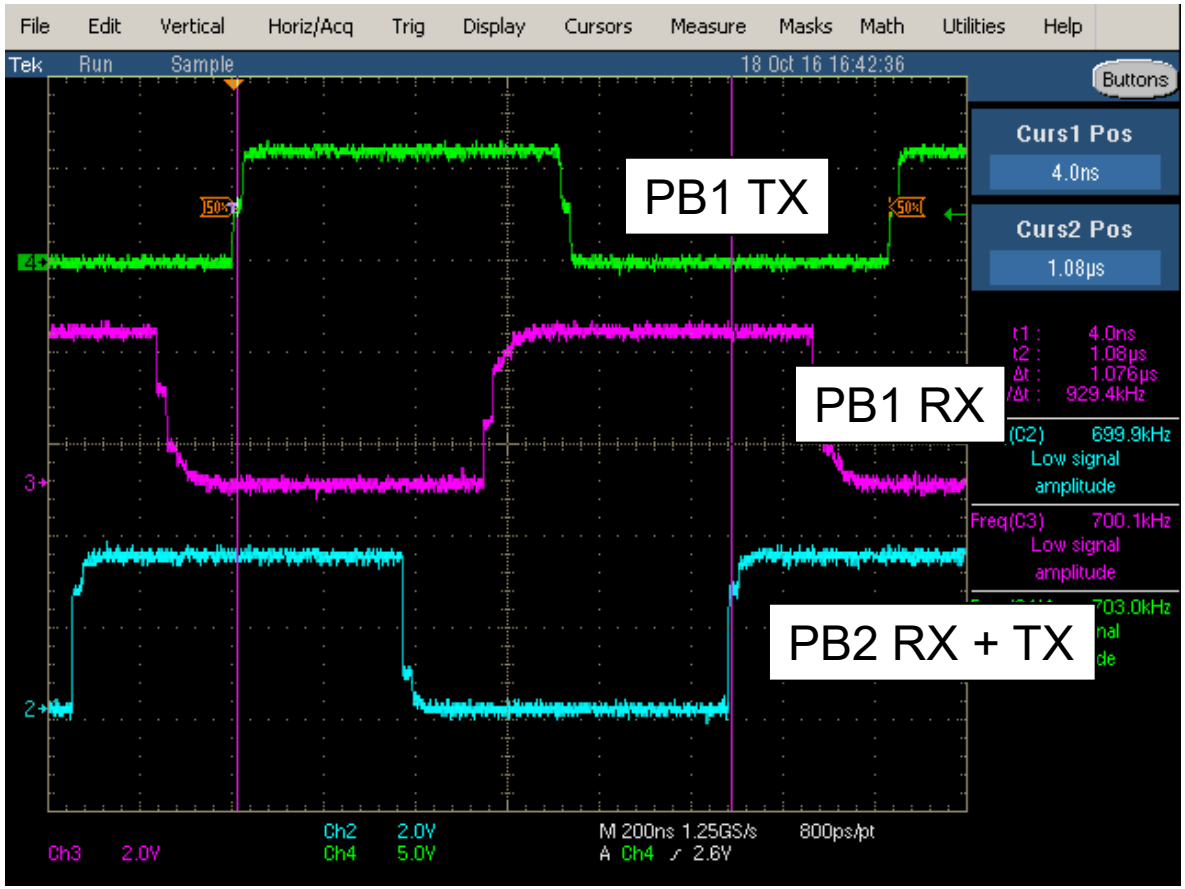
- Use galvanic isolation to be able to measure on both sides at the same time
  - Power-Over-Clock has about 1.6V voltage drop on GND line
  - Oscilloscope shortens GND between RX Power-Board and TX Signal
  - No measurement possible



Clock/Trigger Signal

Expected for 100m cable:

- 500ns + electronics
- 1µs for both ways



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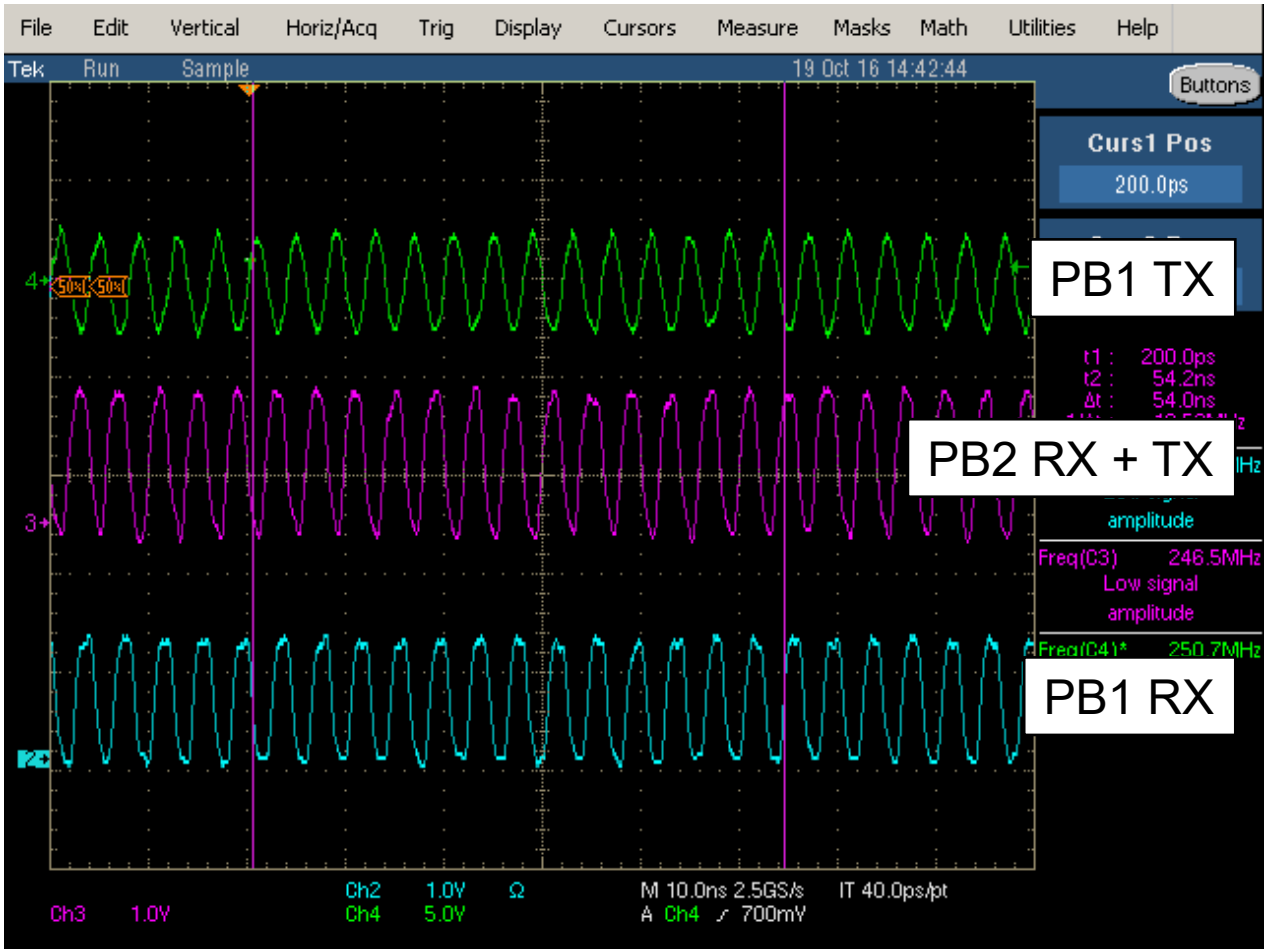
Clock/Trigger Signal

250 MHz in both directions + POC

- Power via Clock line for
  - Analog Part
  - TX and RX

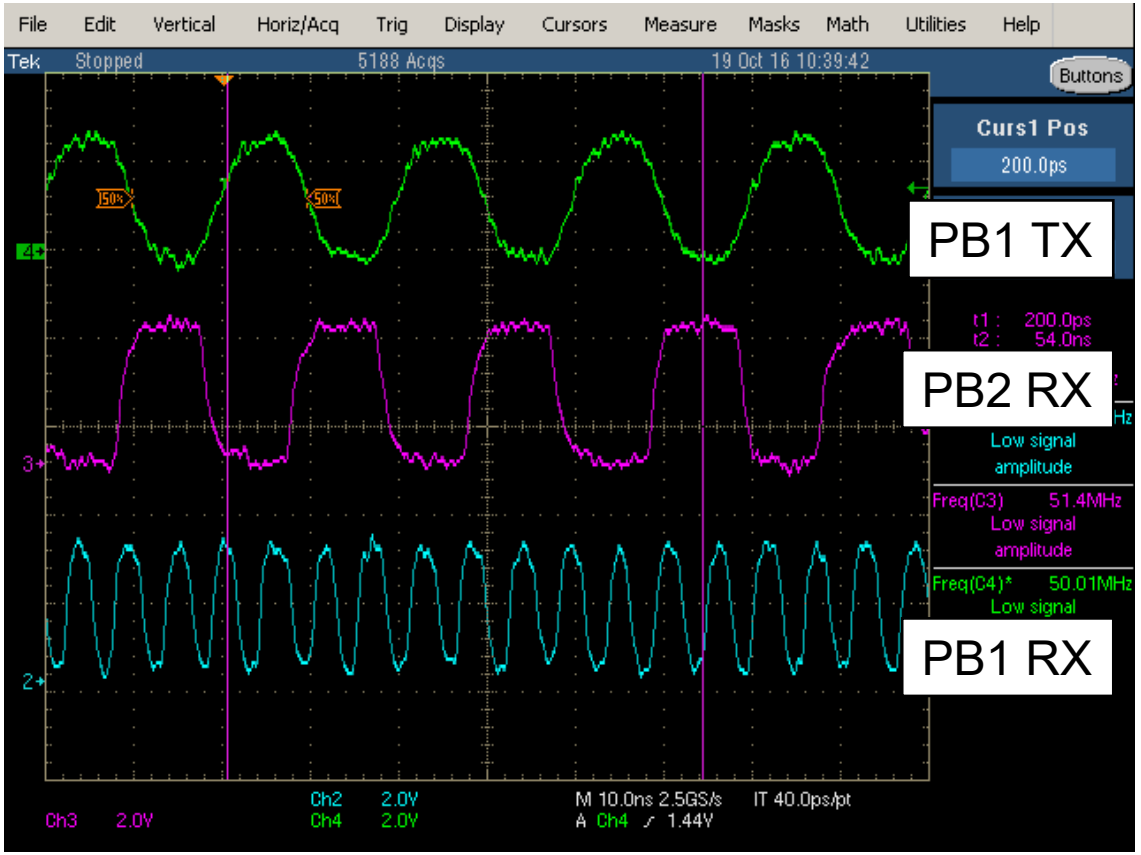


Clock/Trigger Signal

Same with two different pulse generators

- 250MHz upstream
- 50MHz downstream

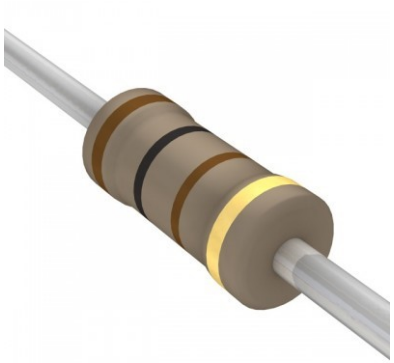
- Second generator limited in frequency



Lessons we learned during testing:

… learning is always a good point

- **The cable from the TX must have 100Ω**
  - If this the cable is about 30cm and not 100Ω it will kill the TX – IC
- **ESD might get a problem**
  - RX and TX are ESD sensitive devices
  - Assembly of GCU and Power-Board and Cable in an ESD controlled environment
- **Mechanical Stress can cause failures**
  - Accidentally bend one board during assembly into test fixture about 1mm over 70mm
  - Solder joint was broken



Thank you!