

Clock & PPS distribution at Nancay Observatory using White Rabbit for NEBULA project

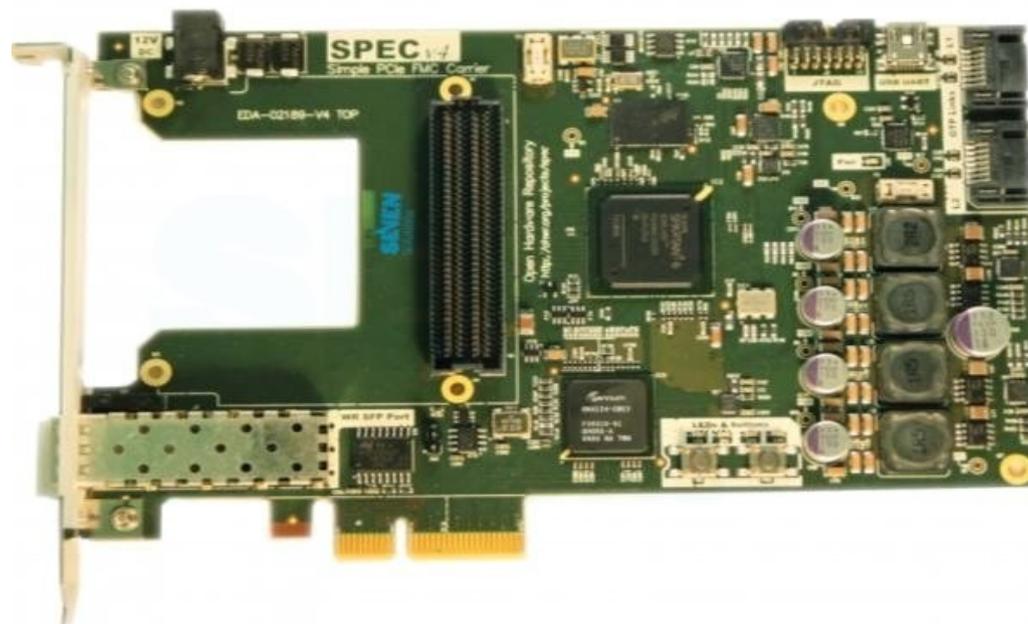
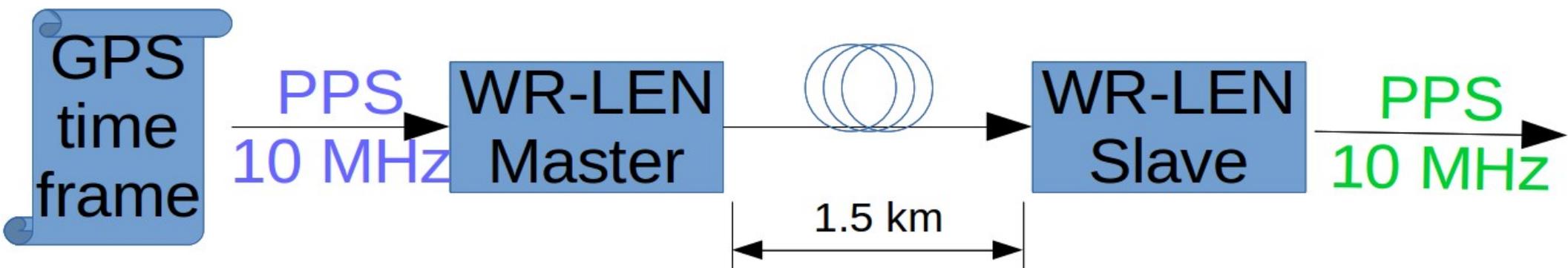


Agenda

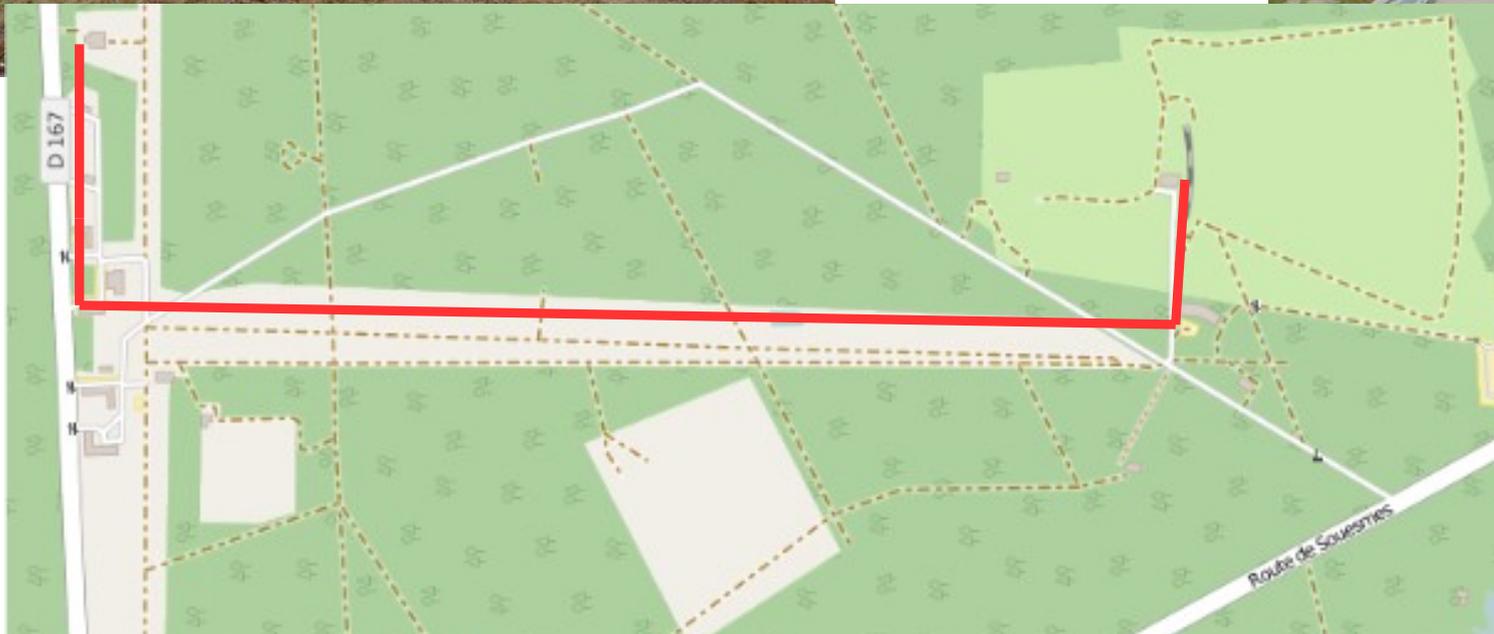
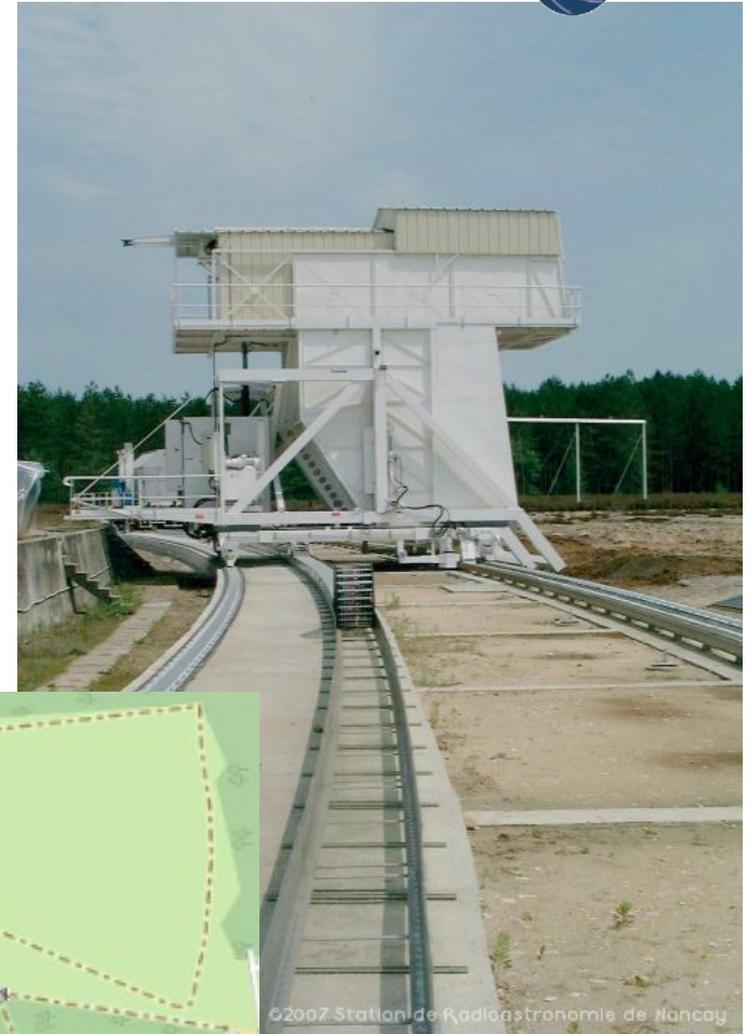
- White-Rabitt test at Nancay Observatory
- NEBULA implementation

Functional setup

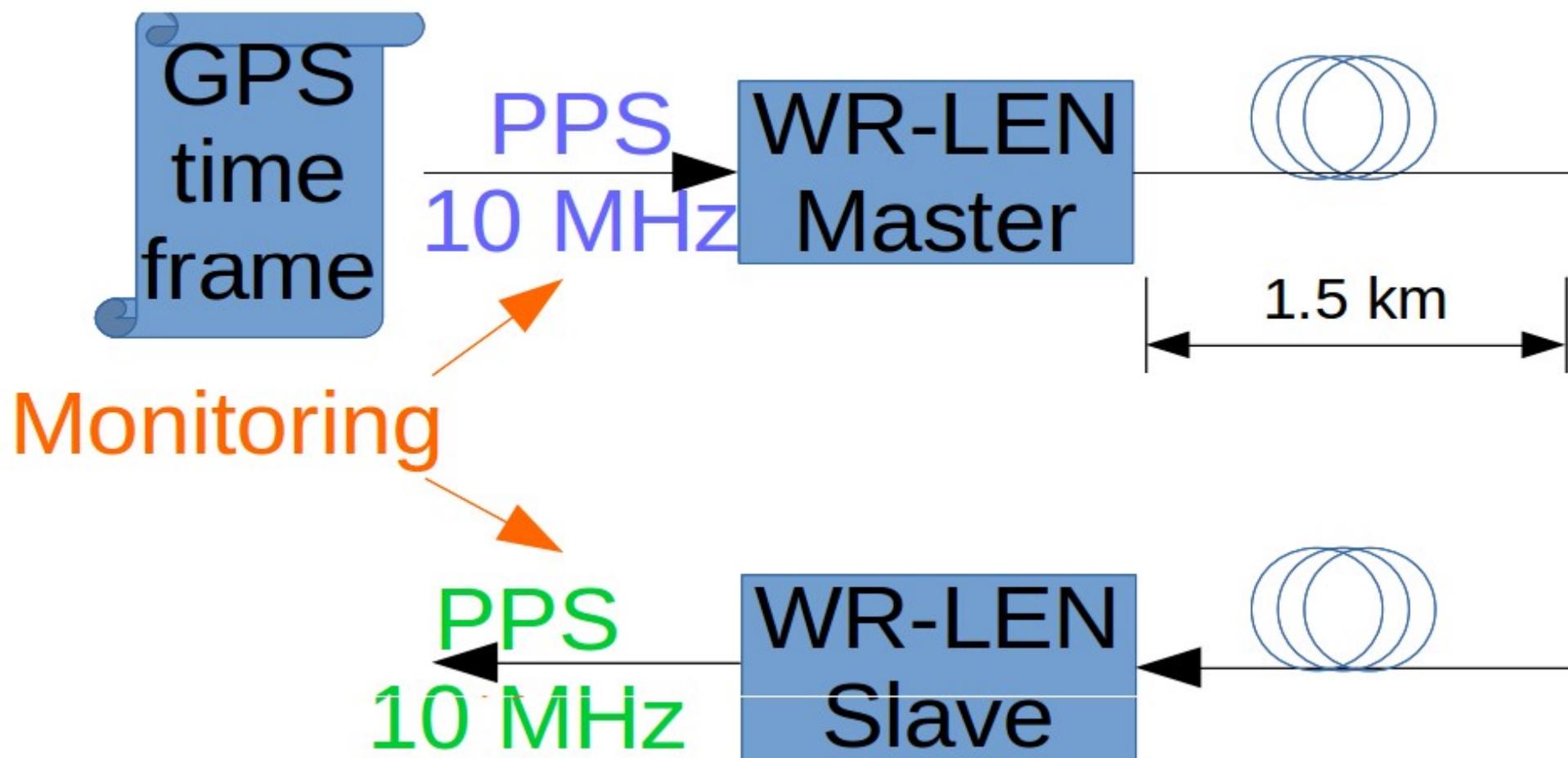
PPS accuracy from GPS ?
Difference de longueur estimé



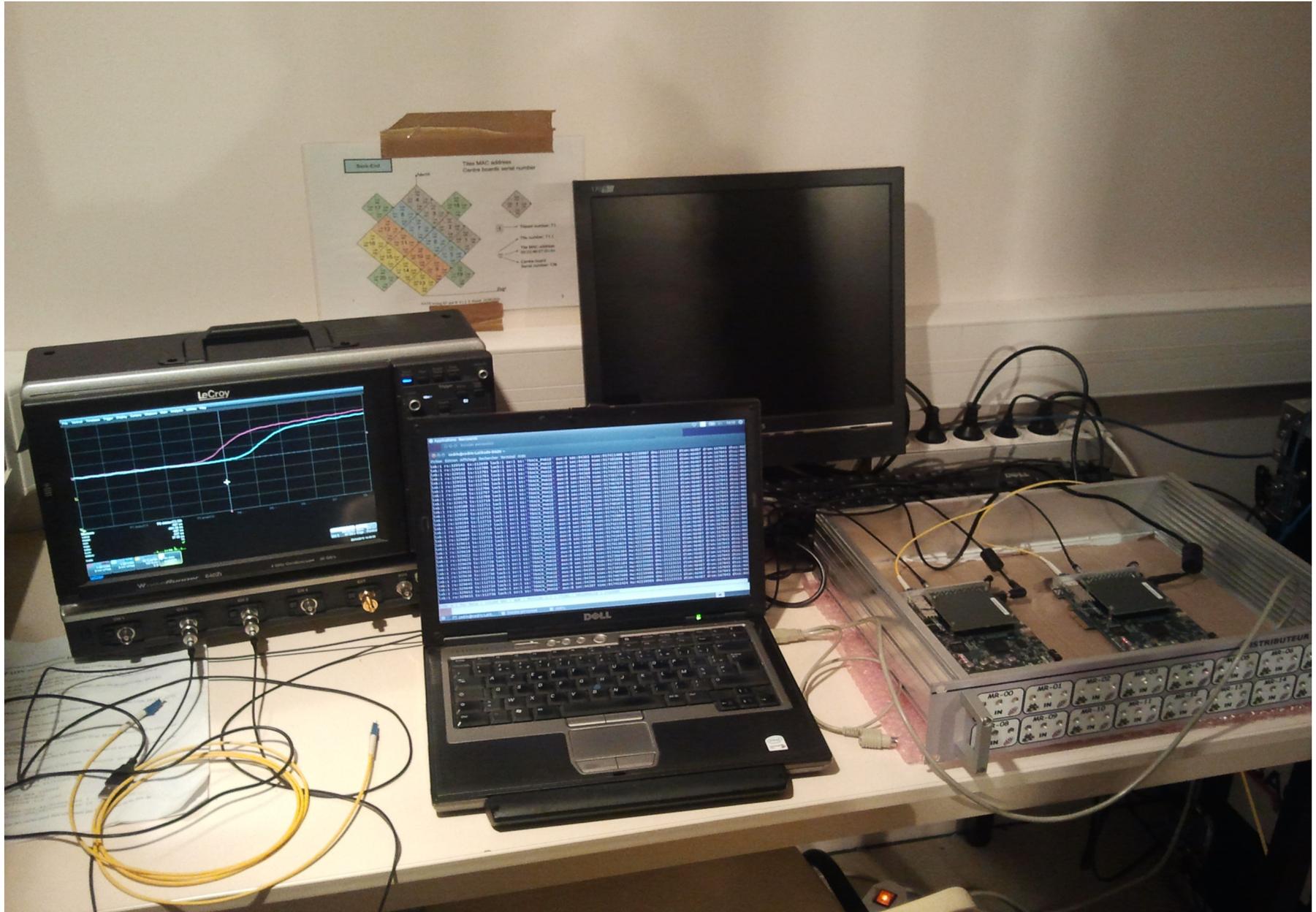
Map of fiber implementation



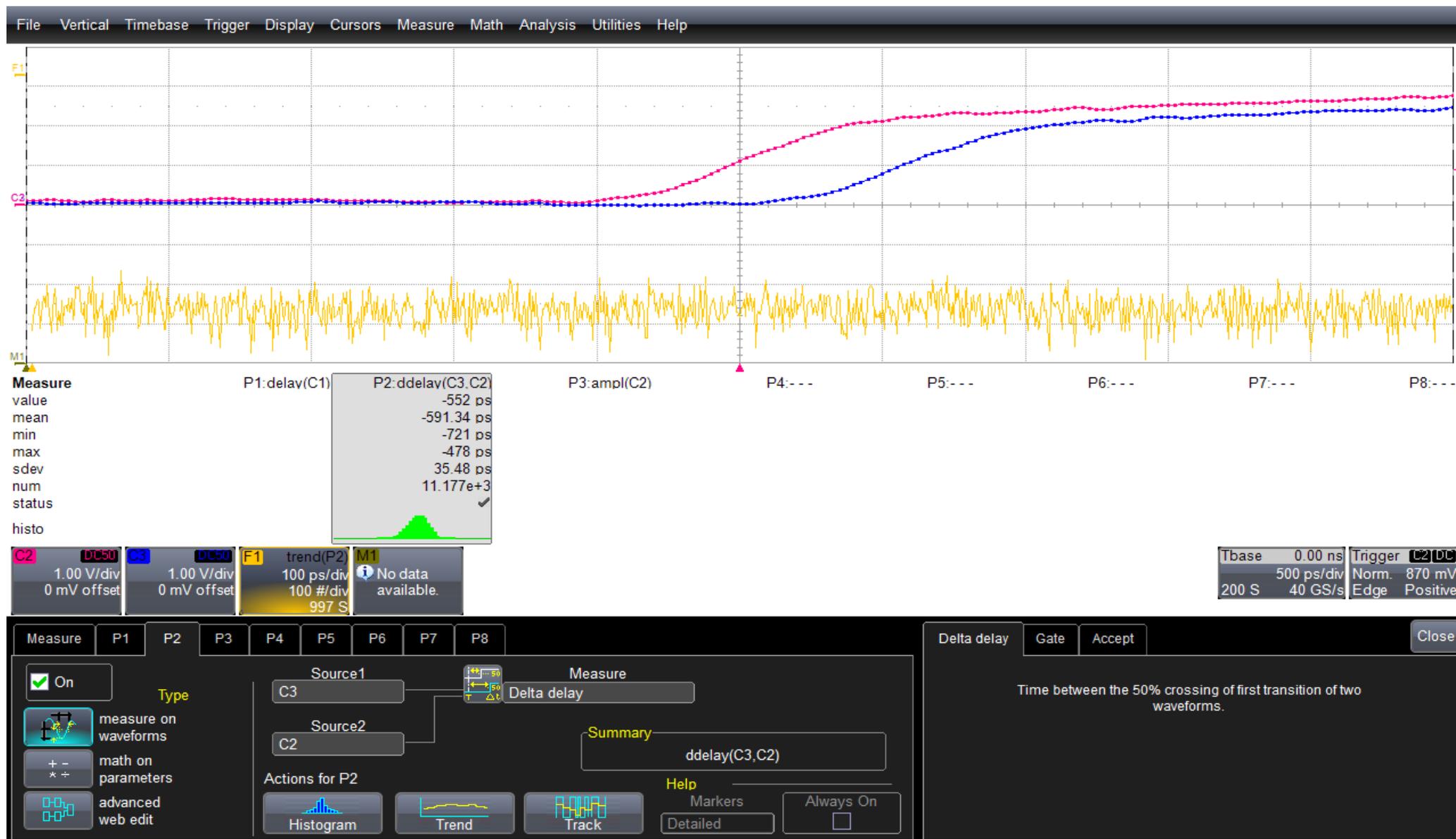
Test setup



Test setup in EMBRACE shelter

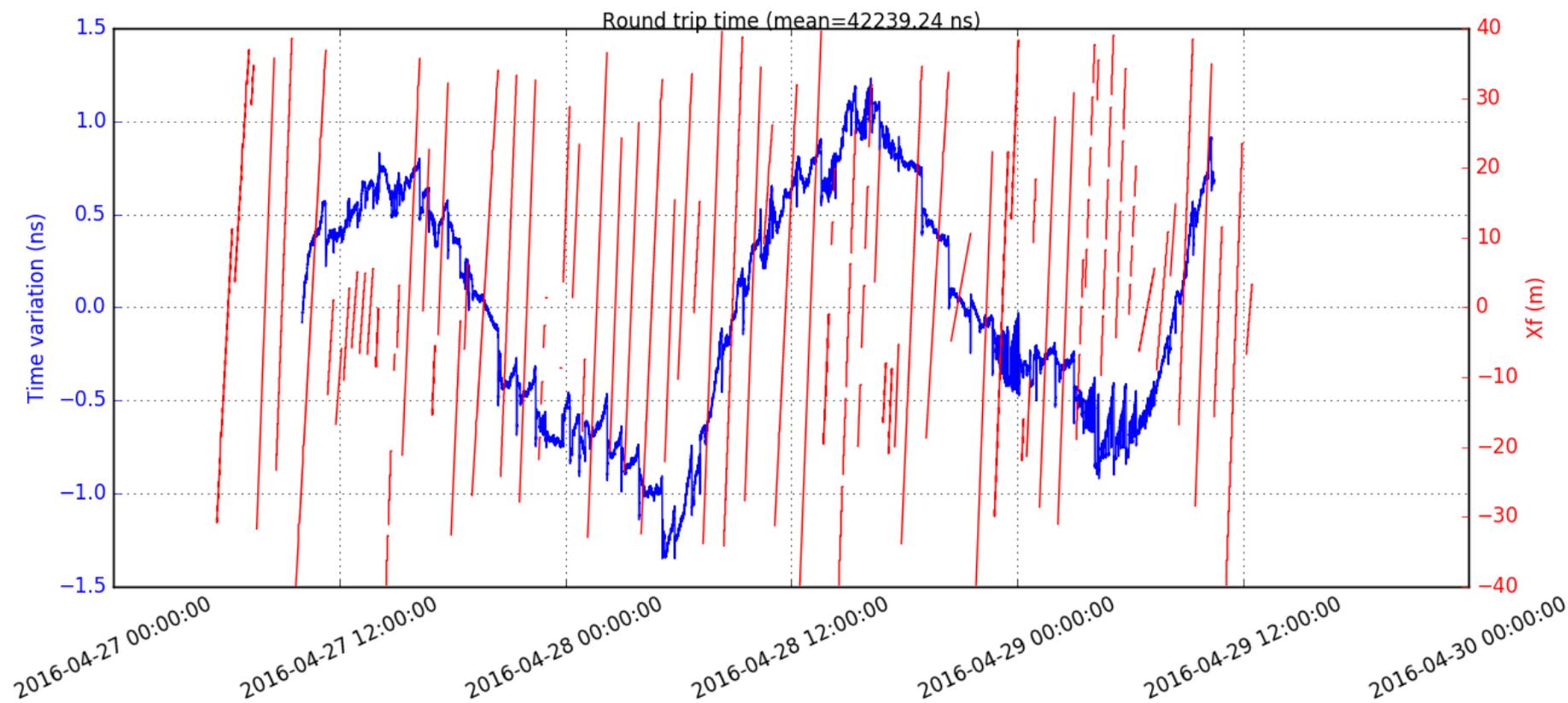


PPS Observation with scope

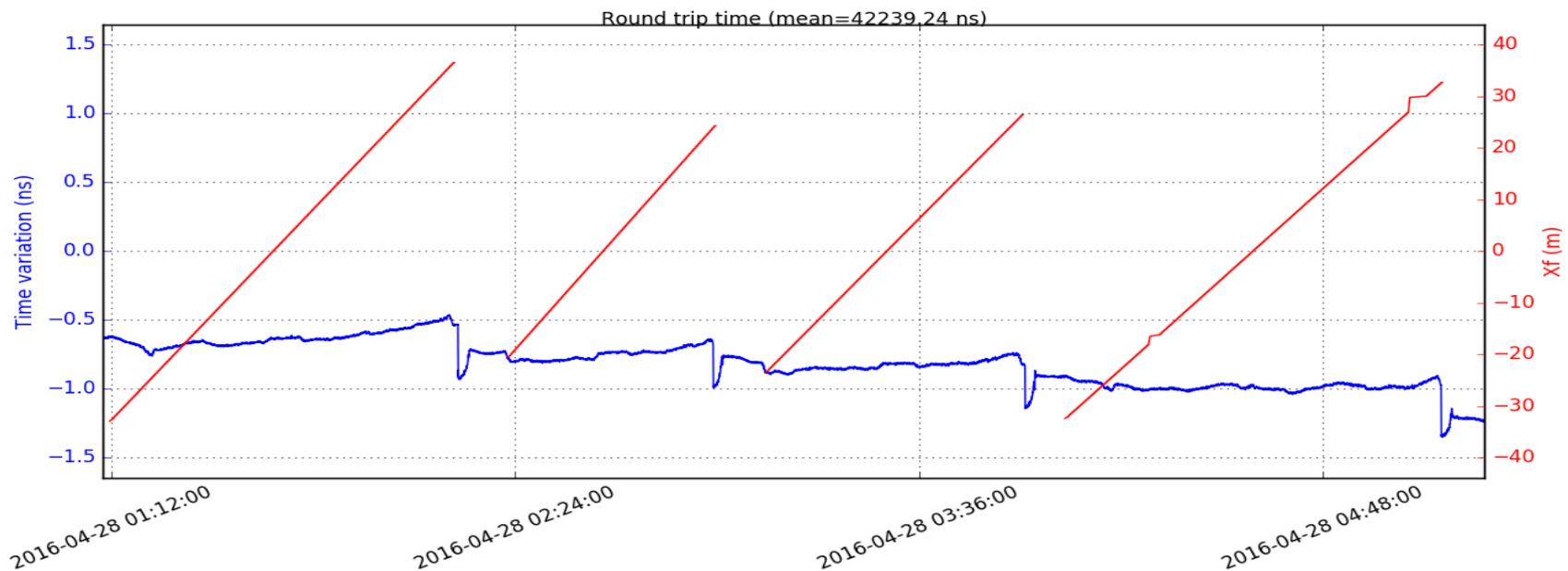
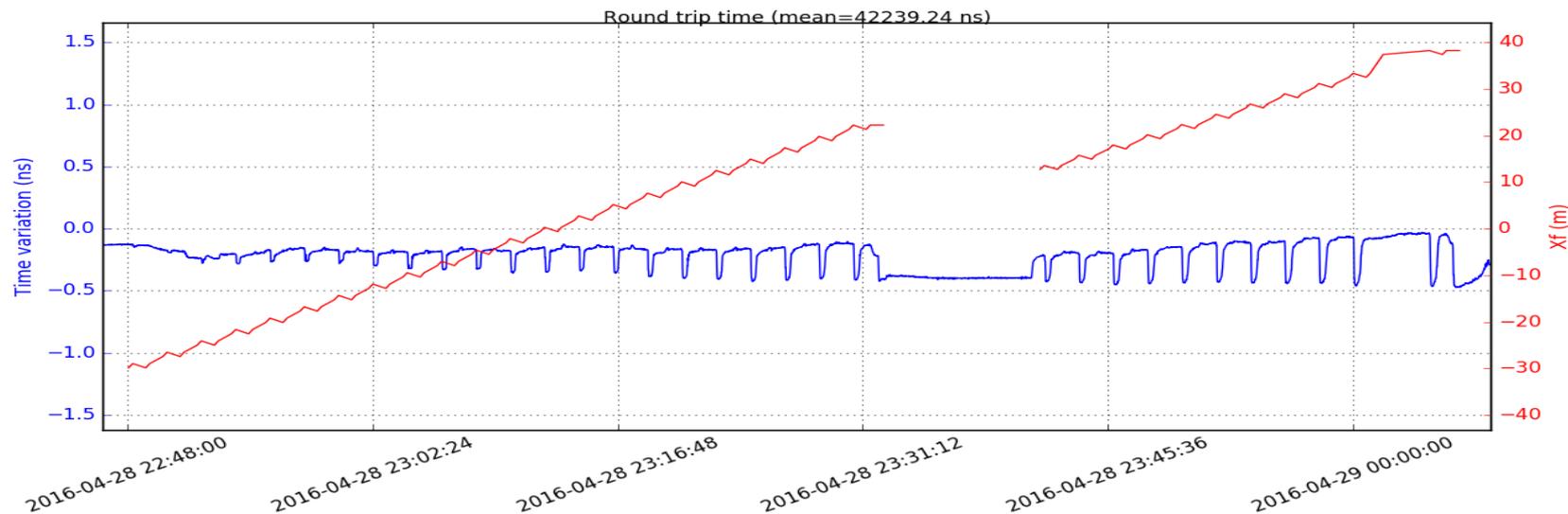


White Rabbit slave log plot 1

Blue line: WR slave round-trip log
 Chariot position: red line
 2 days of study

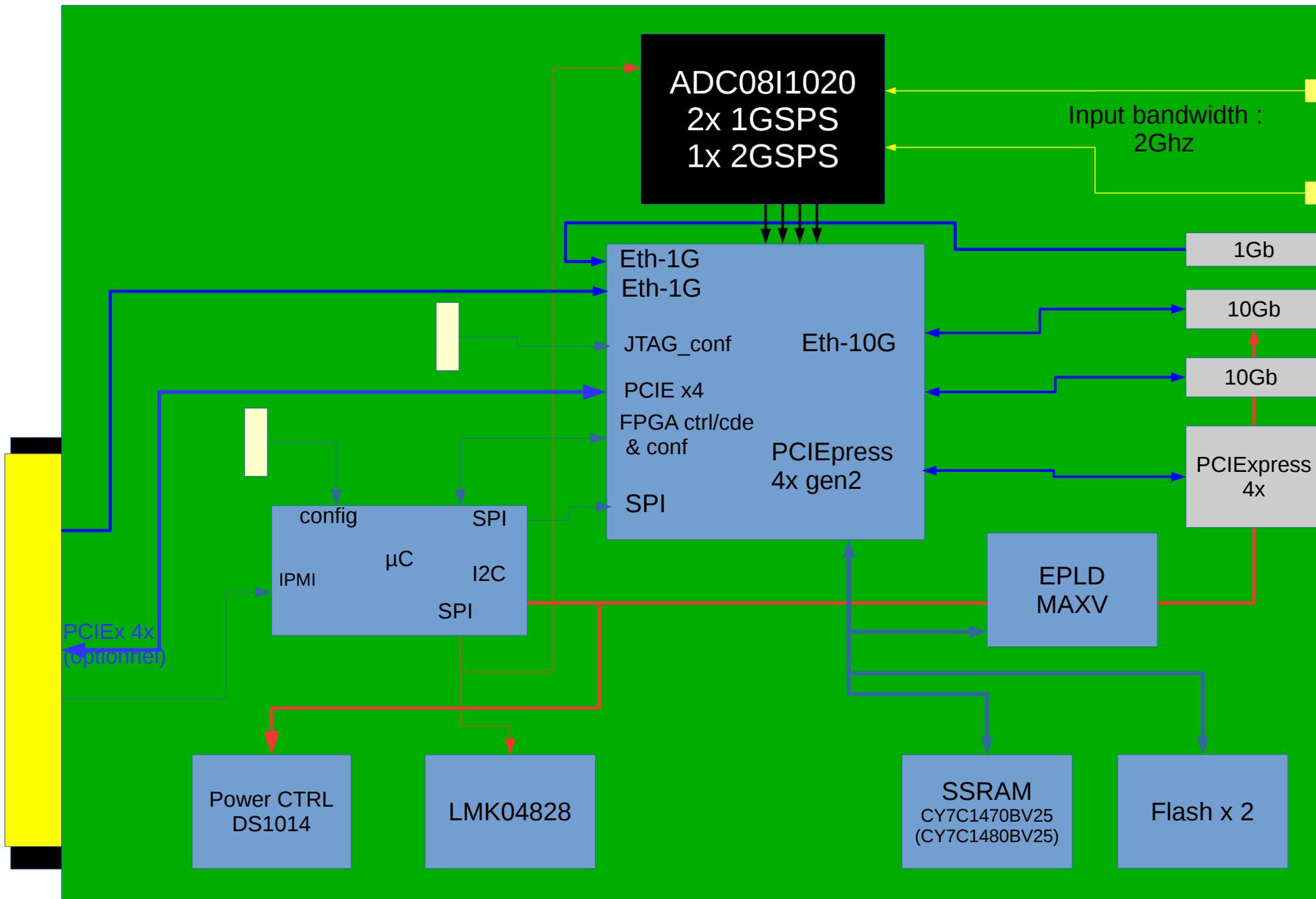


White rabbit slave log plot 2



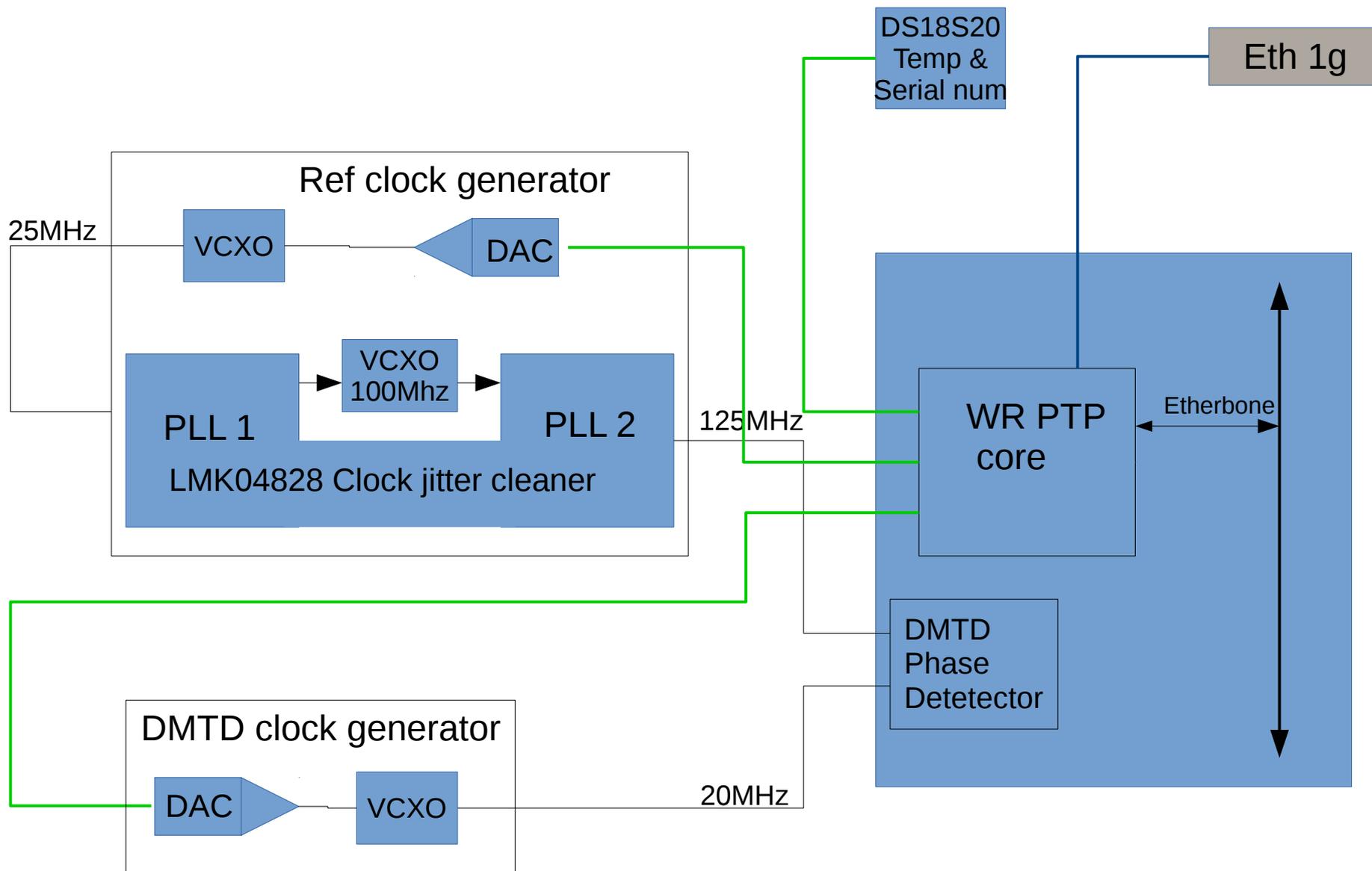


NEBULA Synoptic



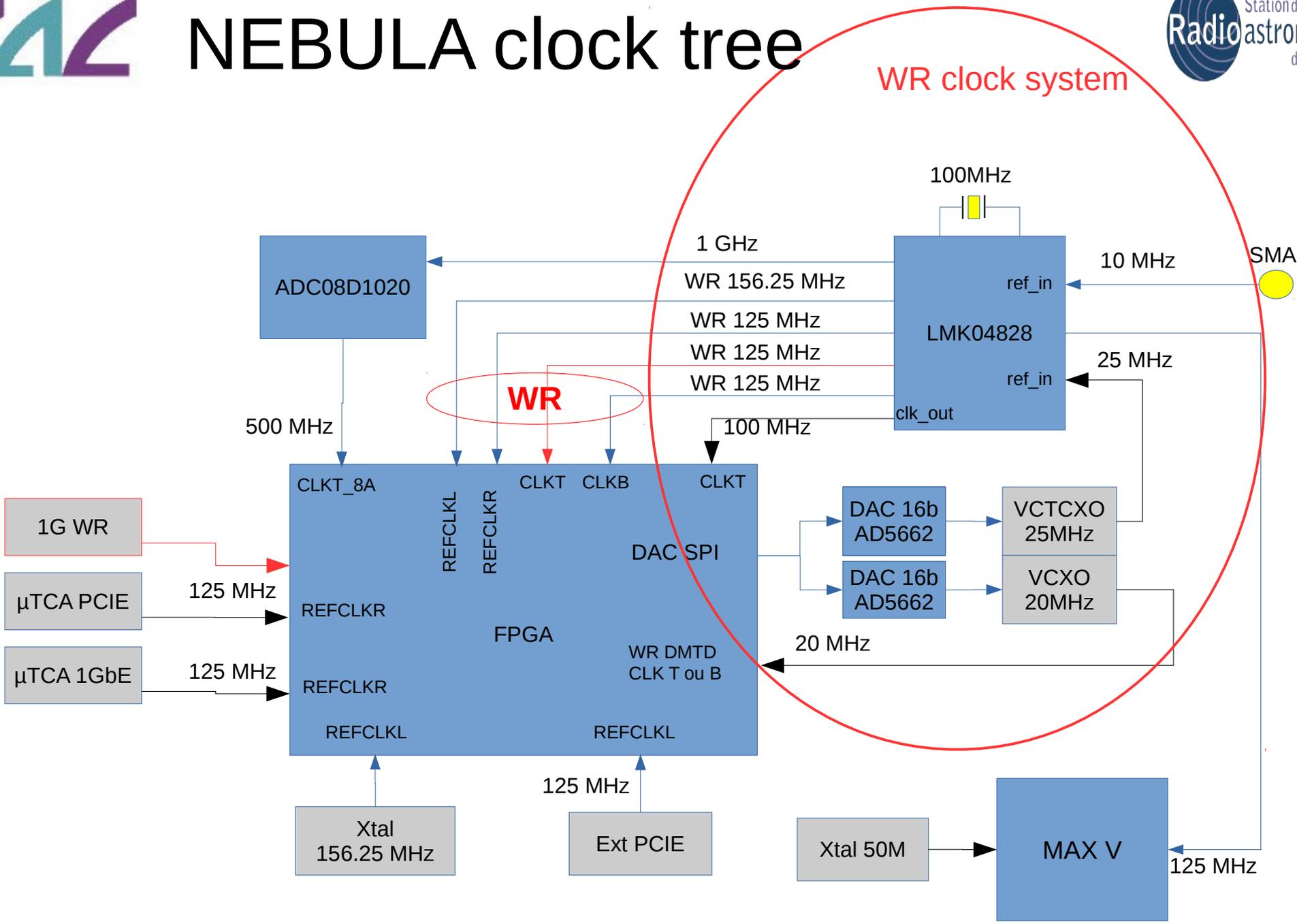


NEBULA WR implementation



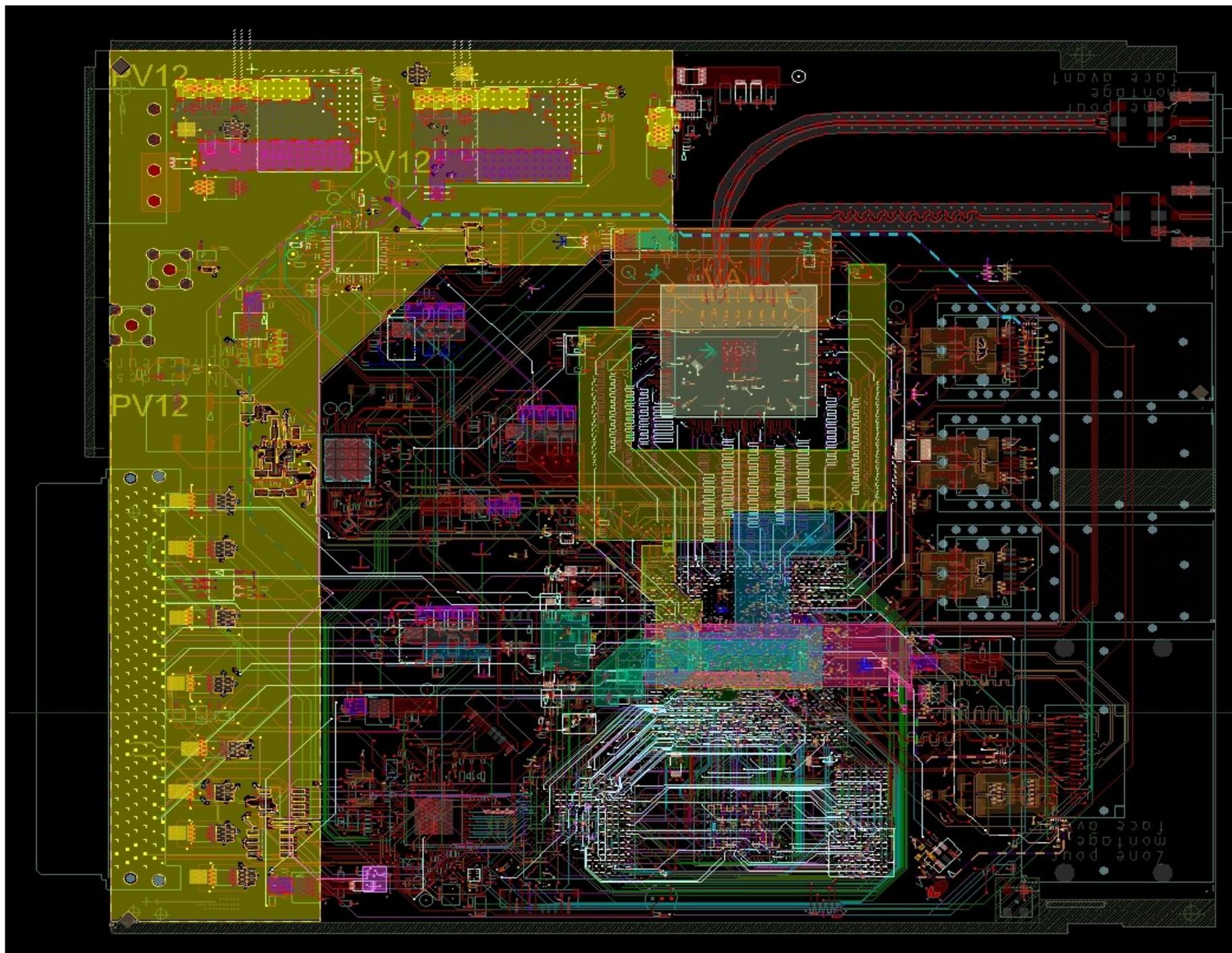


NEBULA clock tree





NEBULA board

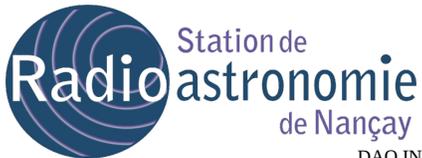




Conclusion

- Poor measurement of the mean PPS difference (~ 600 ps)
This could be improved with use of a WR switch.
- Clock jitter will be improved by better clock-jitter cleaner.
- However, this is quite sufficient to time-tag a 1GS/s ADC.
- WR hardware implementation quite easy (~ 10 components)
- Future test with NEBULA board and WR switch.

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DAQ IN2P3 2016

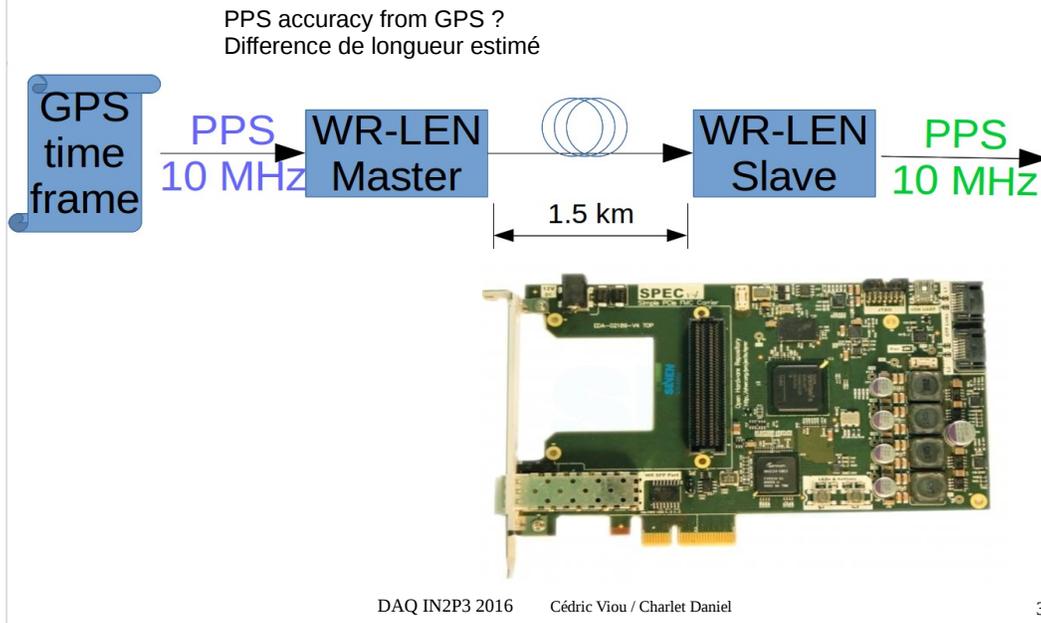
Cédric Viou / Charlet Daniel



Agenda

- White-Rabitt test at Nancay Observatory
- NEBULA implementation

Functional setup

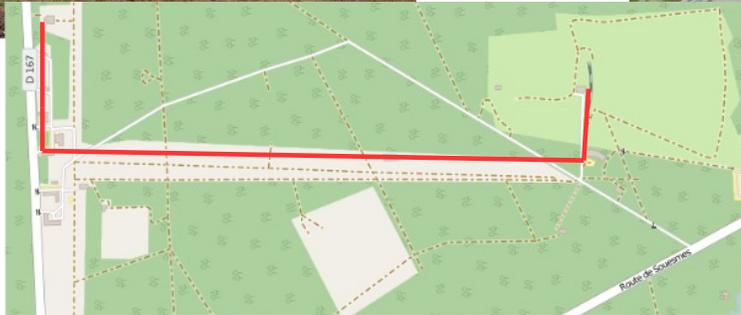


A pulse per second (PPS or 1PPS) is an electrical signal that has a width of less than one second and a sharply rising or abruptly falling edge that accurately repeats once per second. PPS signals are output by radio beacons, frequency standards, other types of precision oscillators and some GPS receivers.[1] Precision clocks are sometimes manufactured by interfacing a PPS signal generator to processing equipment that aligns the PPS signal to the UTC second and converts it to a useful display. Atomic clocks usually have an external PPS output, although internally they may operate at 9,192,631,770 Hz. PPS signals have an accuracy ranging from a 12 picoseconds to a few microseconds per second, or 2.0 nanoseconds to a few milliseconds per day based on the resolution and accuracy of the device generating the signal.

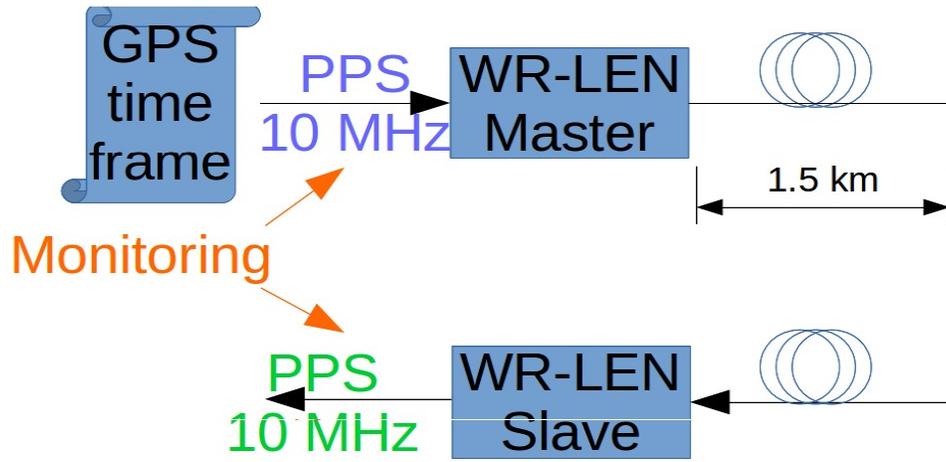
PPS GPS 10ns in the max capability

3cm de différence

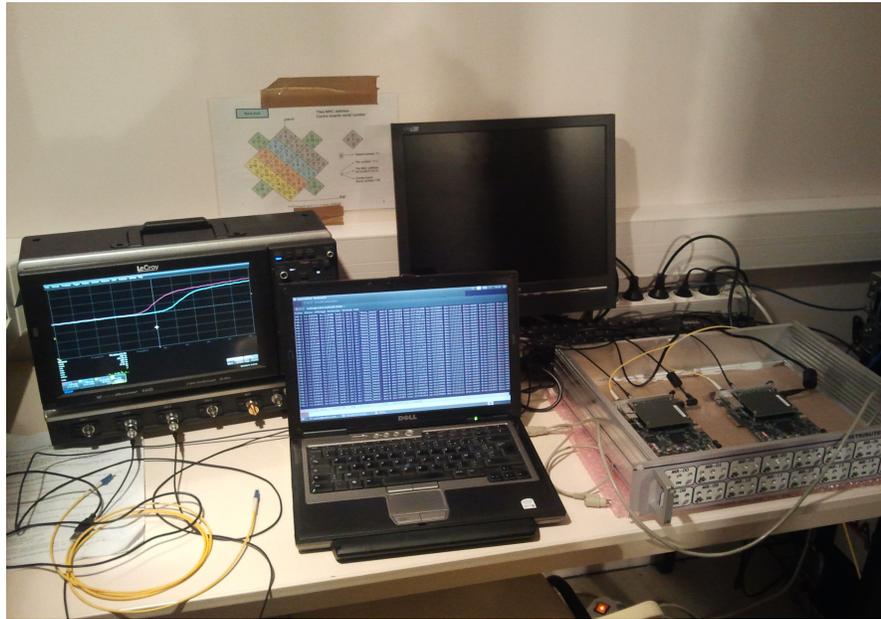
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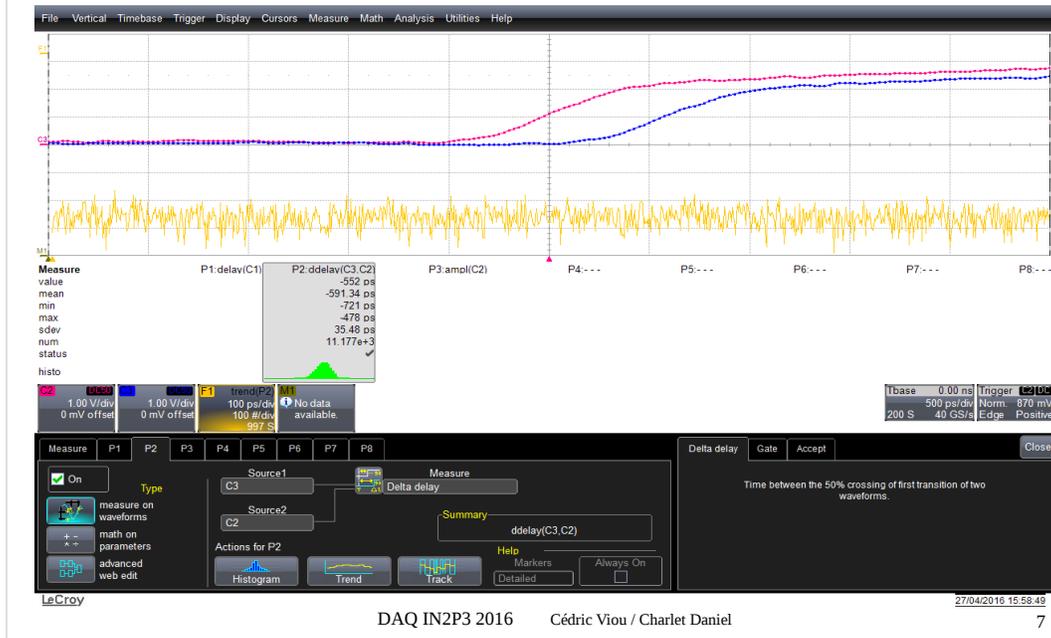
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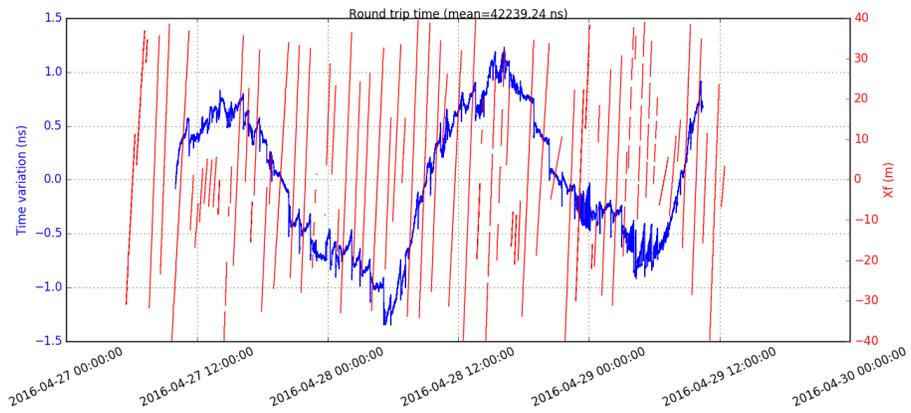
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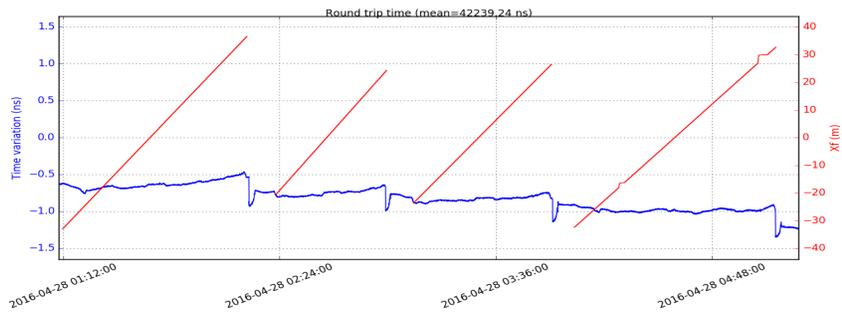
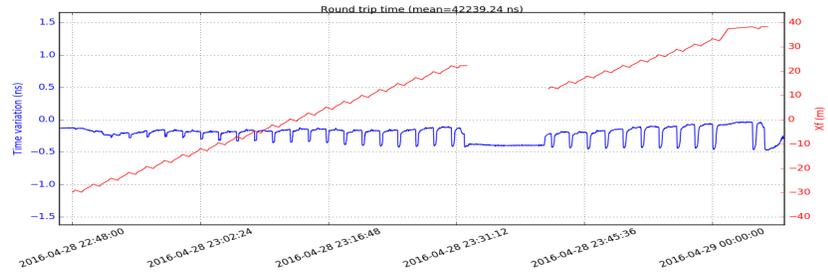
PPS jitter $\sim 600\text{ps}$
Standard deviation or RMS $\sim 35\text{ps}$

White Rabbit slave log plot 1

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2 days of study

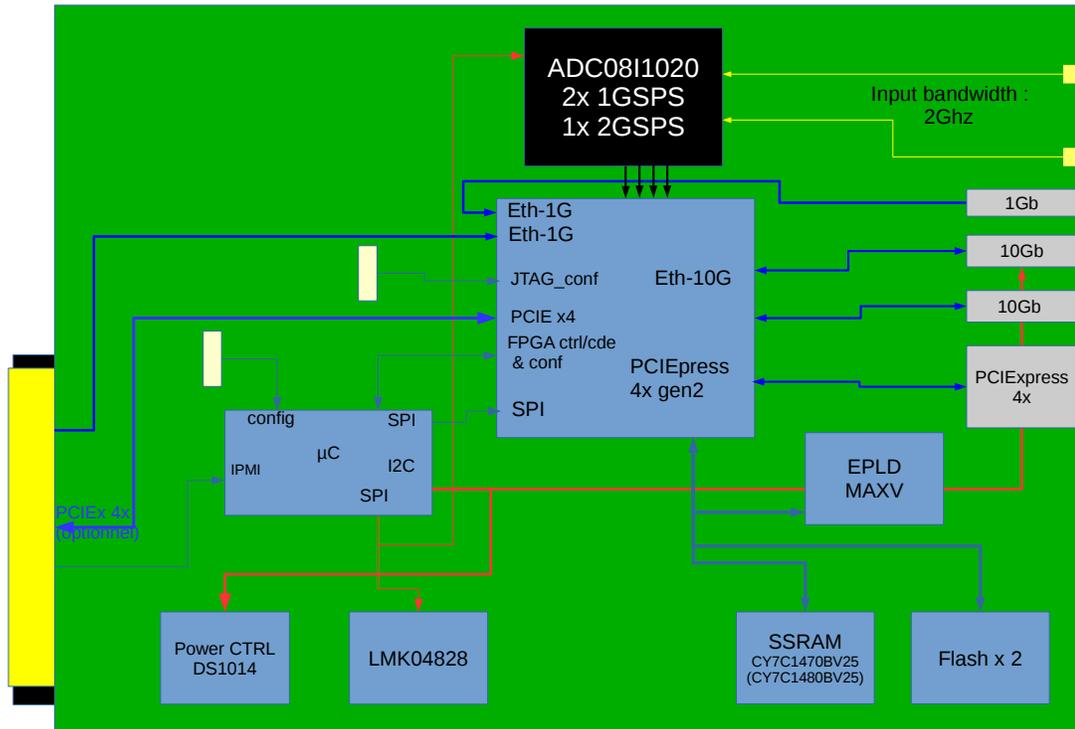


White rabbit slave log plot 2



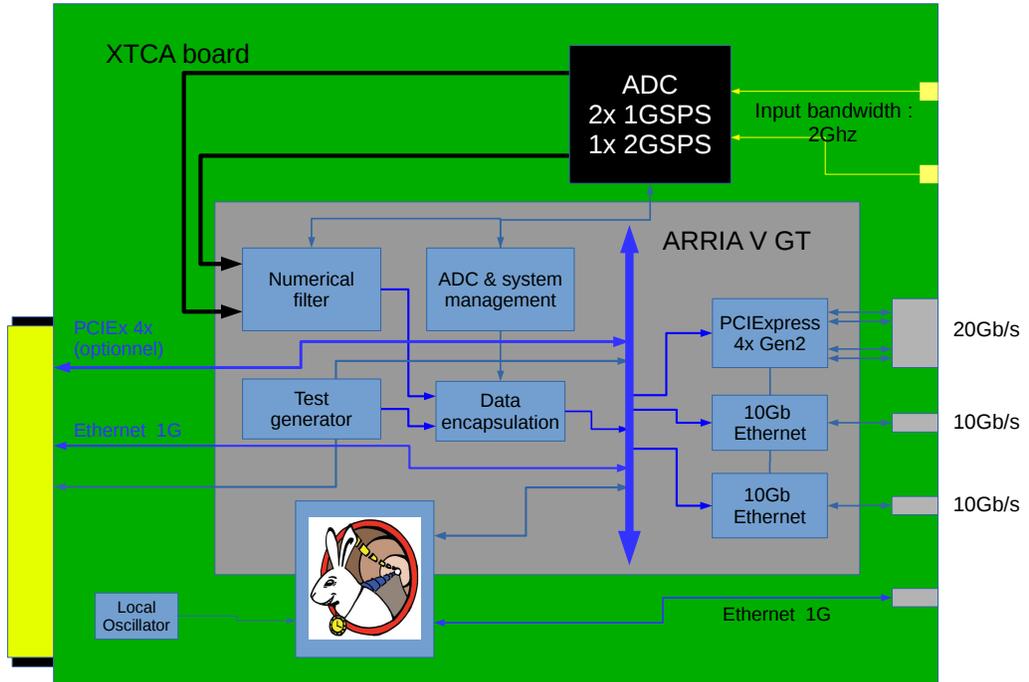


NEBULA Synoptic



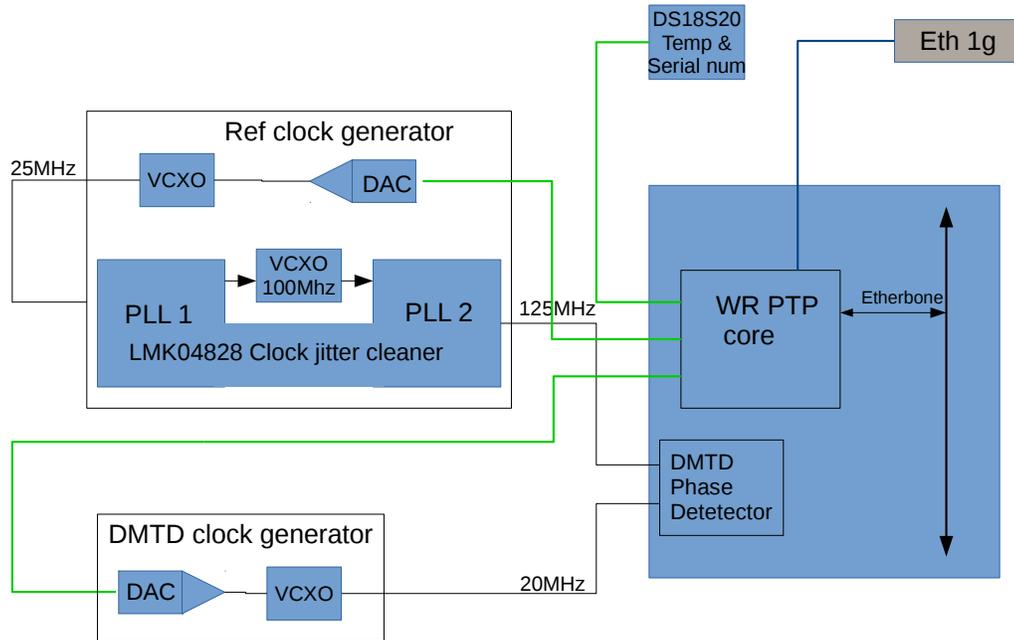


NEBULA FPGA content





NEBULA WR implementation

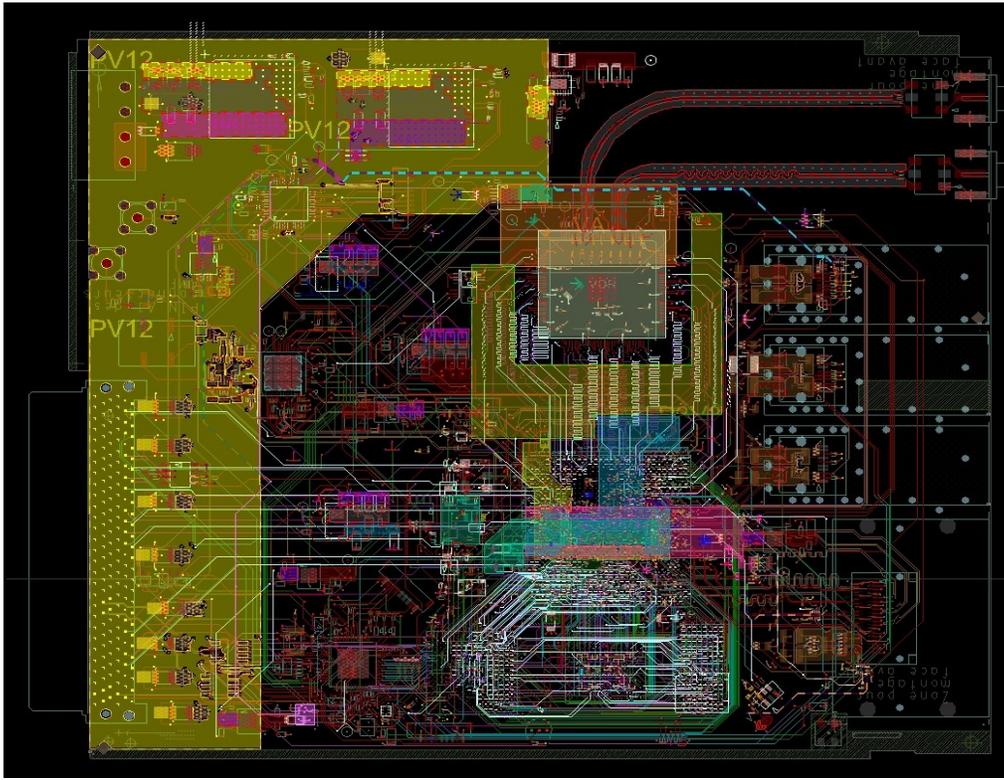


12

125 MHz → 162,5MHz
20MHz → 162,5+xxkhz



NEBULA board





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