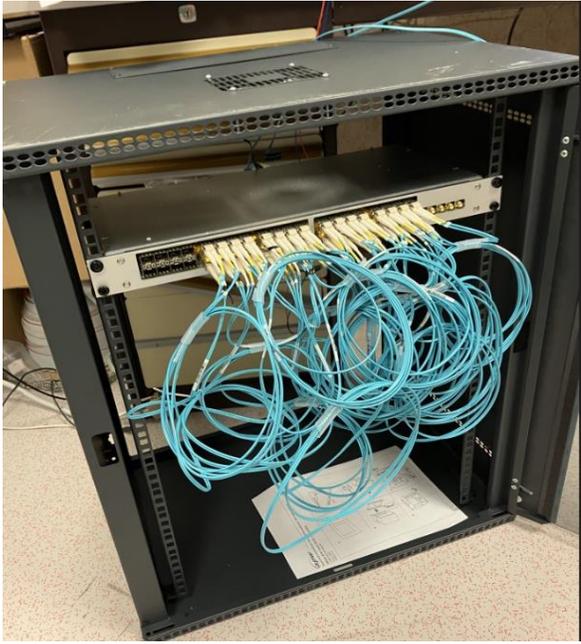


# Temperature study for the TDM integration

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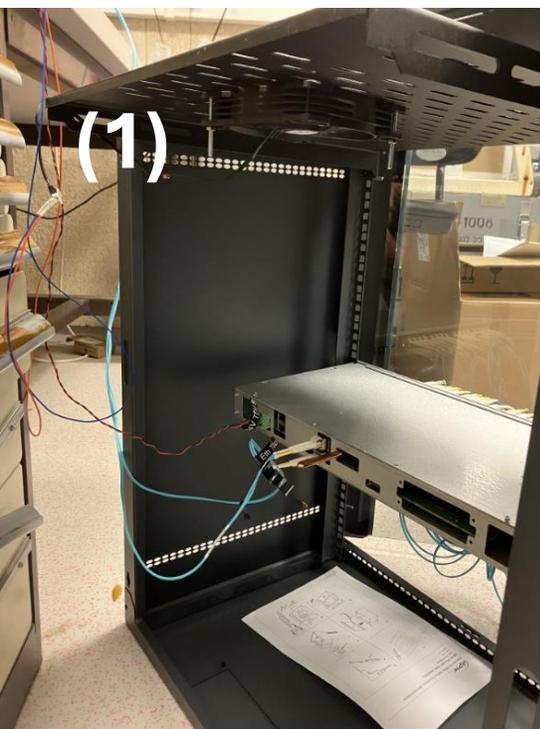


# Summary of tests

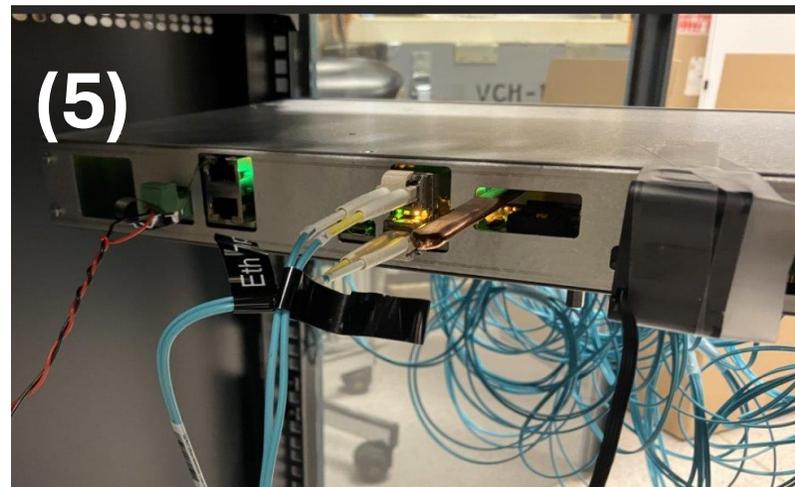
- TDM board in its final enclosure
- Enclosure in a rack (15U)
- Fan configuration:
  - ~120mm 2 types
  - 50 mm
  - Different position of the fans
- 1 or 2 heat pipes
- No data transfer on the optical links
- Temperature of FPGA and SFP monitored



# No SFP cooling, external Fans only

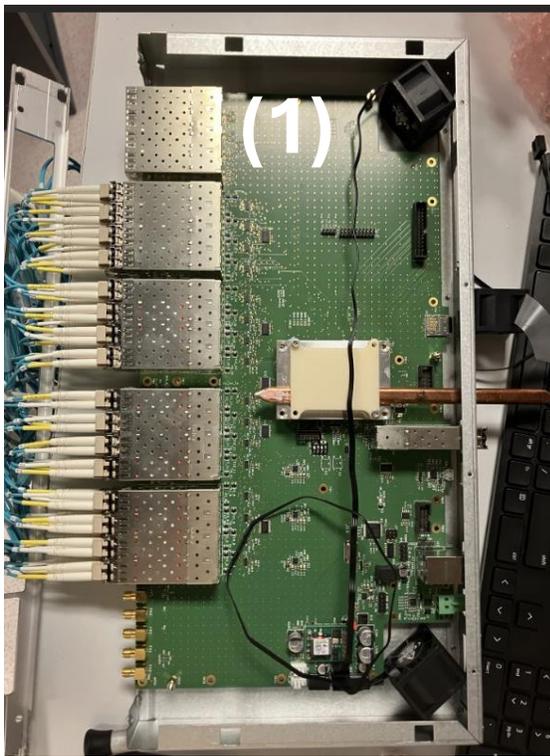


Configuration	(1) TDM far from FAN	(2) TDM far from FAN position 2	(3) TDM Closer	(4) Ebpapst Fan	(5) external small fan
FPGA temp	60	70	56	50	44
SFP temp	39 - 44	> 49	39 - 44	35- 42	39-46 (extrapolated)



- Air flow really matters
- SFP temp with no direct cooling can go up to 50C

# FPGA + SFP Cooling



Configuration	(1) Internal in diagonal	(2) External SFP cooling	(3) 2 heat pipes
FPGA temp	37	45	37
SFP temp	30-37	32-38	31-38



- Internal cooling can also help FPGA cooling (1)
- Possible cooling from all external fan (2, 3)
- 2 heat pipes help

# Summary of tests

- SFP not in function: dedicated firmware ?
- Internal fans (for SFP) + small fan on the heat pipe (for FPGA cooling) is the best solution
- But fans located outside the box would allow us to replace easily the fans (expected life time ~3-5 years)
- We could try several things:
  - Only one internal fan on
  - Fans at 50%