

# TCLink

Design choice

Support for DFE equalizer in MGT for VCU118 Rev1.3

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Eduardo Mendes

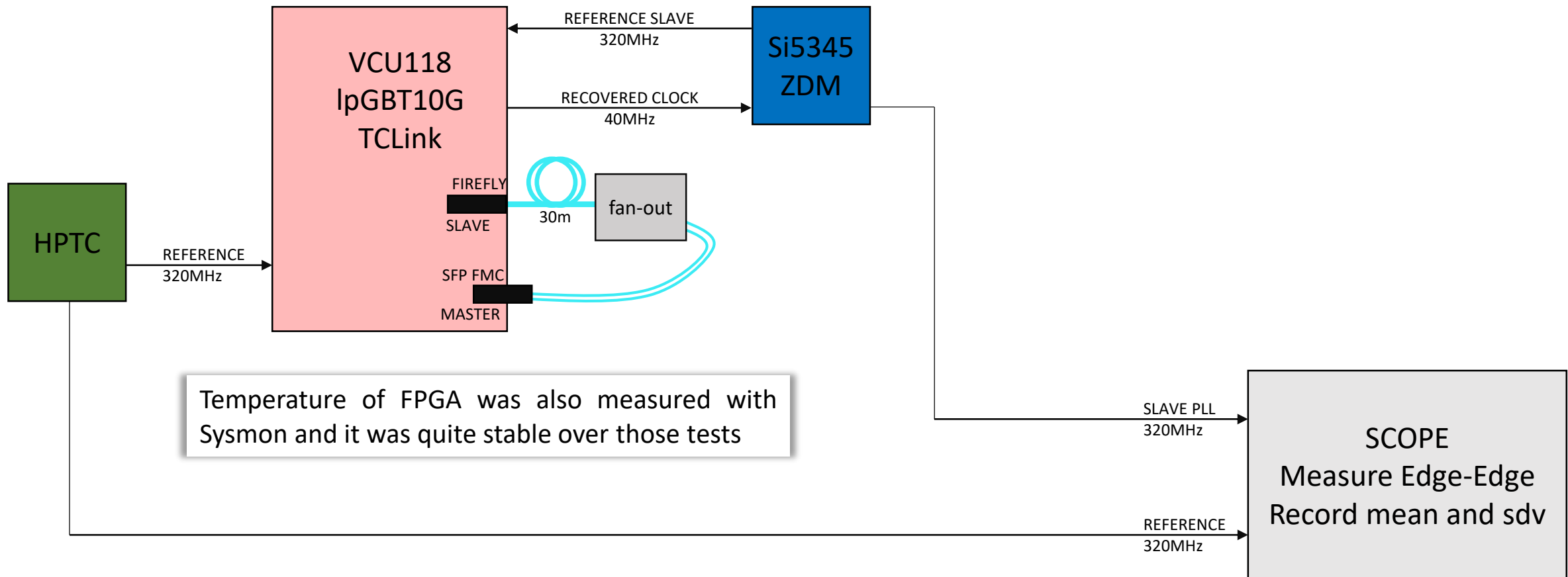
# Introduction

- **CMS DTH has links over a back-plane**
  - Jeroen observed that a loopback link implemented on this channel locks only when the rx equalizer chosen is a DFE (equalizer recommended for lossy channels)
  - Same behaviour was observed by Jeroen with IBERT design (proving that it is not a particularity of this design)
- Now the VCU118 design for master and slave offer the option of changing the equalizer mode between DFE and LPM on the fly
  - LPMEN = 0 for DFE, 1 for LPM (default in VIO control)
  - Full reset after changing the equalizer
- Here I performed some tests to check that for the different equalizer modes:
  - Link locks for a given equalizer after a full system reset
  - Link locks when changing equalizers
  - OBS: also measured the phase of the slave recovered clock to make sure it is fixed after resets

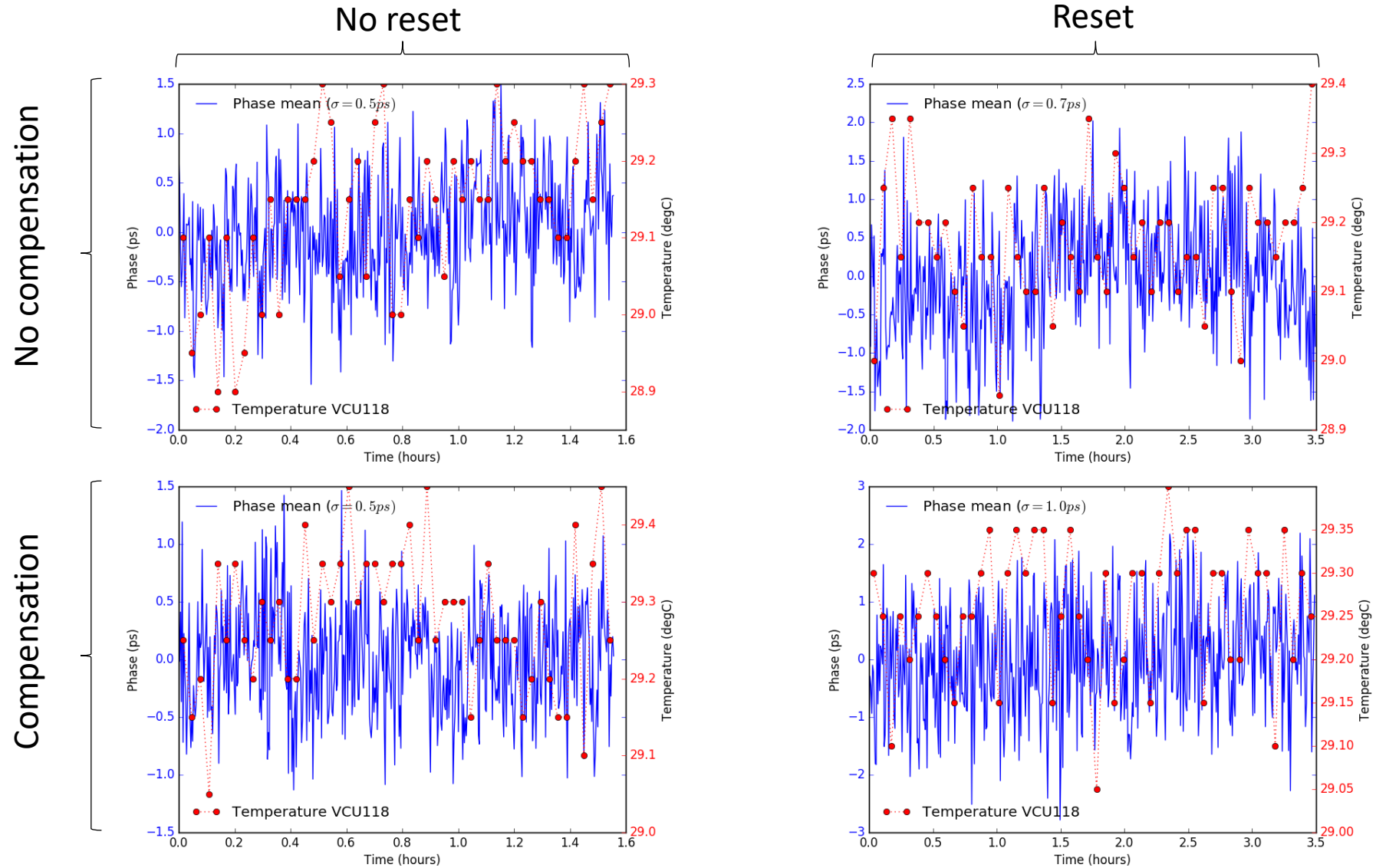
# Setup for validation

- **Full-reset (500 resets per test)**

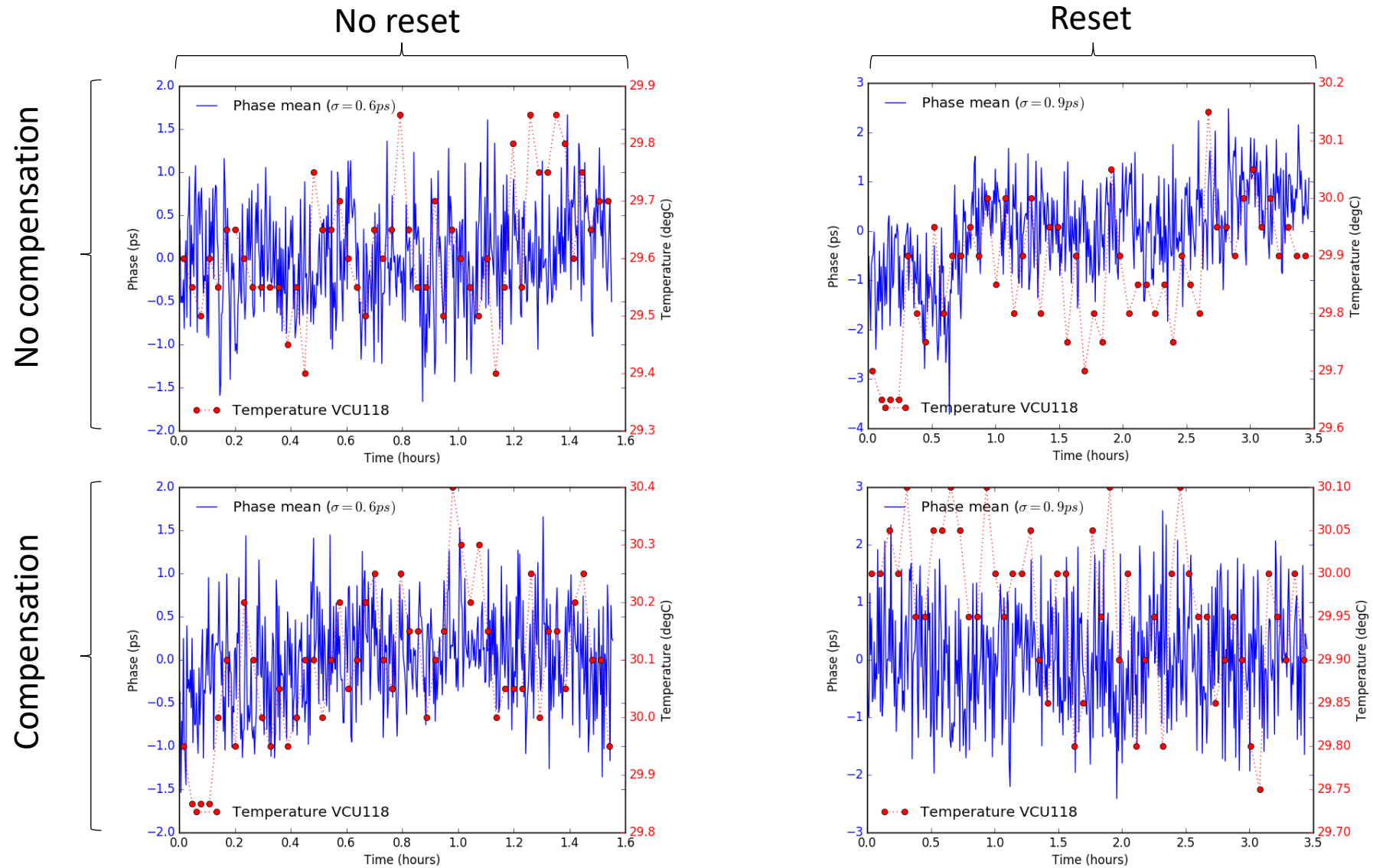
- Master Tx PLL and datapath reset, slave Rx PLL and datapath reset, slave Tx PLL and datapath reset, master Rx datapath reset
- After reset, check master tx ready, slave rx frame locked, slave tx ready, master rx frame locked



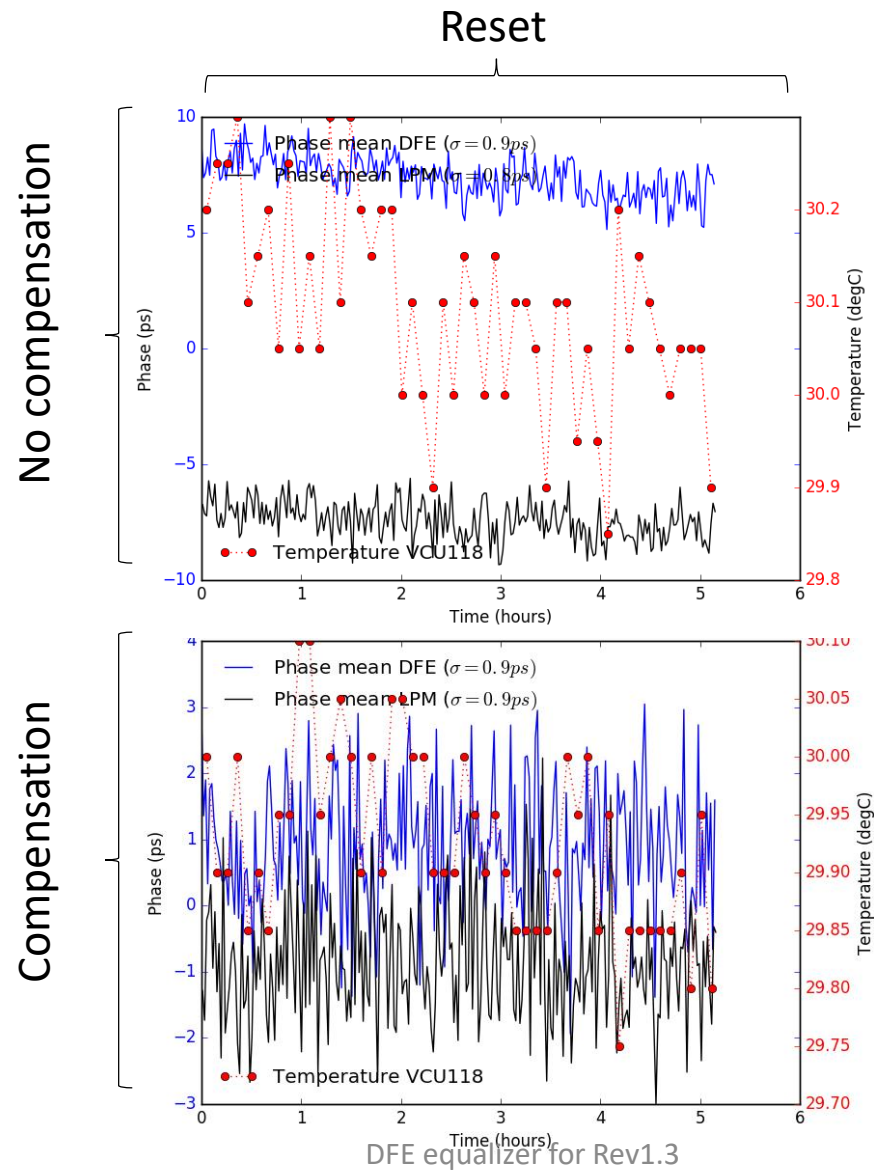
# LPM equalizer



# DFE equalizer



# Switching equalizer



OBS: If only applied DFELPMRESET (and not full-reset), sometimes the chain could not lock.

# Summary

- DFE equalizer available for VCU118 Rev1.3
  - Use-case: electrical links over lossy channels
- The design seems to work correctly from the tests performed
  - Link locks properly after resets for both equalizers
  - Phase-fixed after resets (freezing HPTD IP)
  - After changing equalizer it is required to perform a full-reset (after only DFELPMRESET the design was not getting ready sometimes)
- It was not necessary to freeze DFE parameters for the phase of the recovered clock to be fixed after resets (nevertheless, the ports available for such operation were also enabled)