České vysoké učení technické v Praze

Technische Universität München

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# Geometry bias in a short baseline ground calibration

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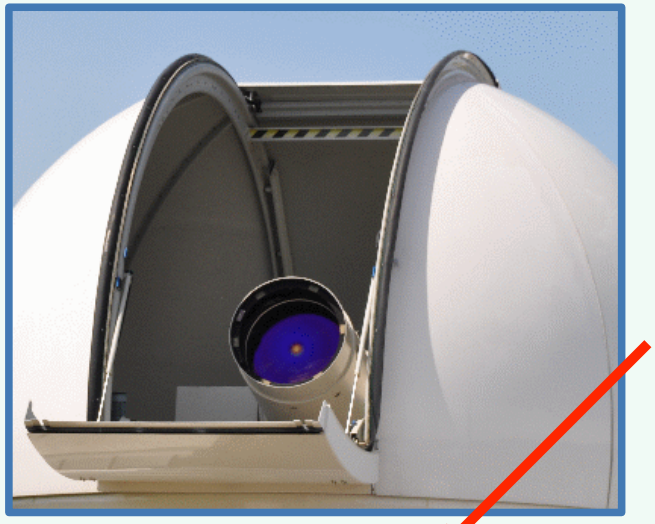
# Motivation – ELT calibration experiment

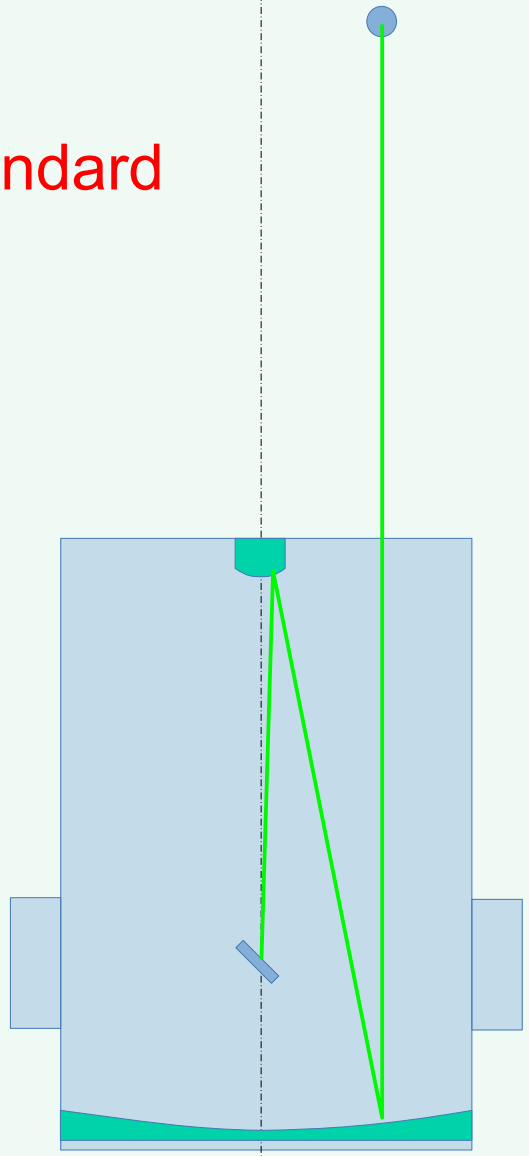
## at Wettzell WLRS



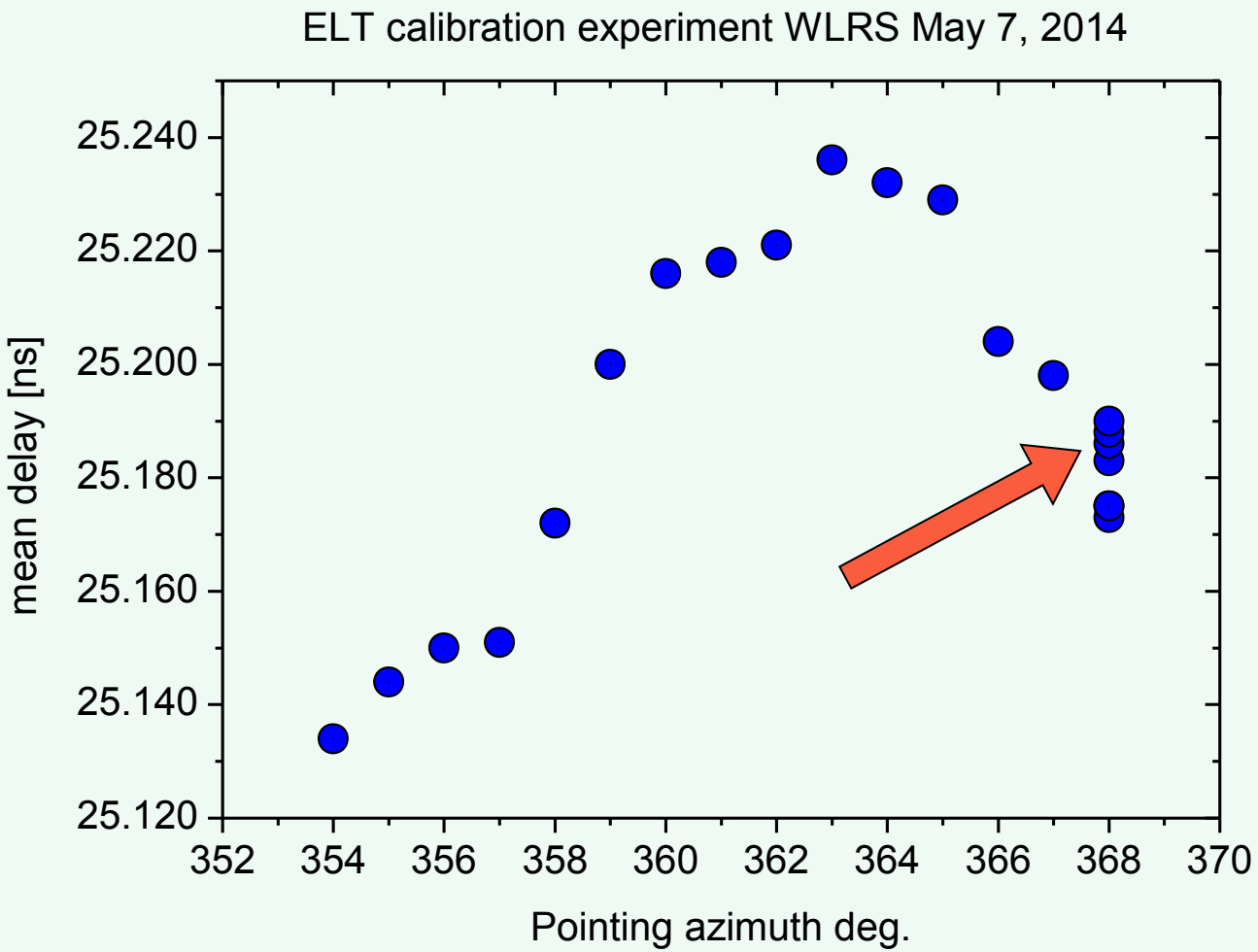
- T/R telescope 75 cm diameter reflector
- ELT Calibration detector installed in front (~ 1 m) of it
  (see previous talks related to European Laser Timing)
- SLR versus ELT reference points distance surveyed
  L = 2302 ± 1 mm
- calibration procedures performed routinely
  over 2 months, stability and reproducibility tested
- significant (3 cm !)  az/el dependence identified

# Calibration value dependency

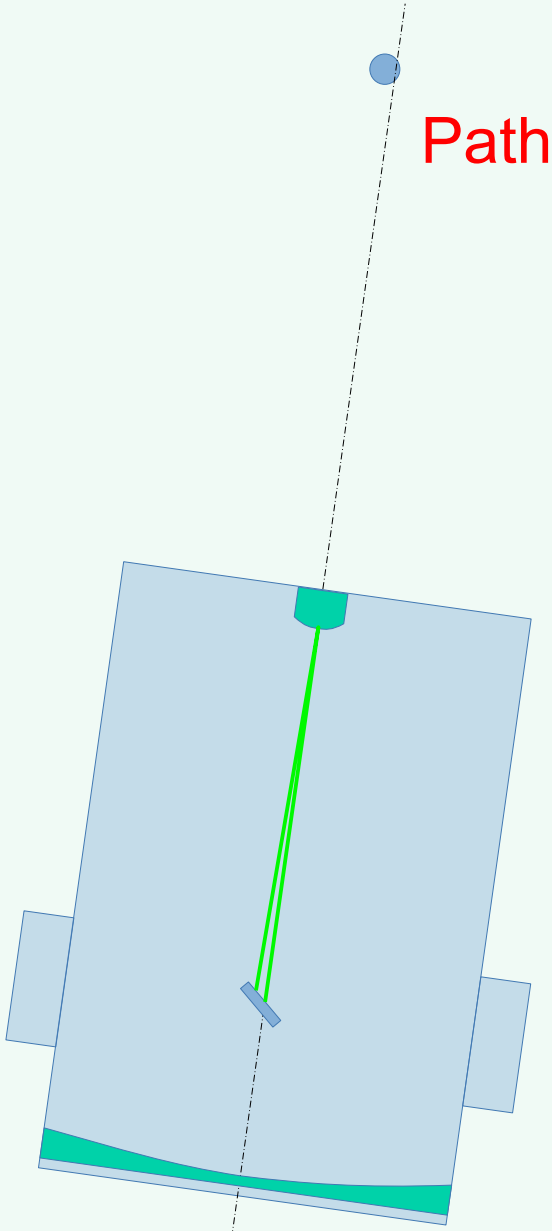
Standard

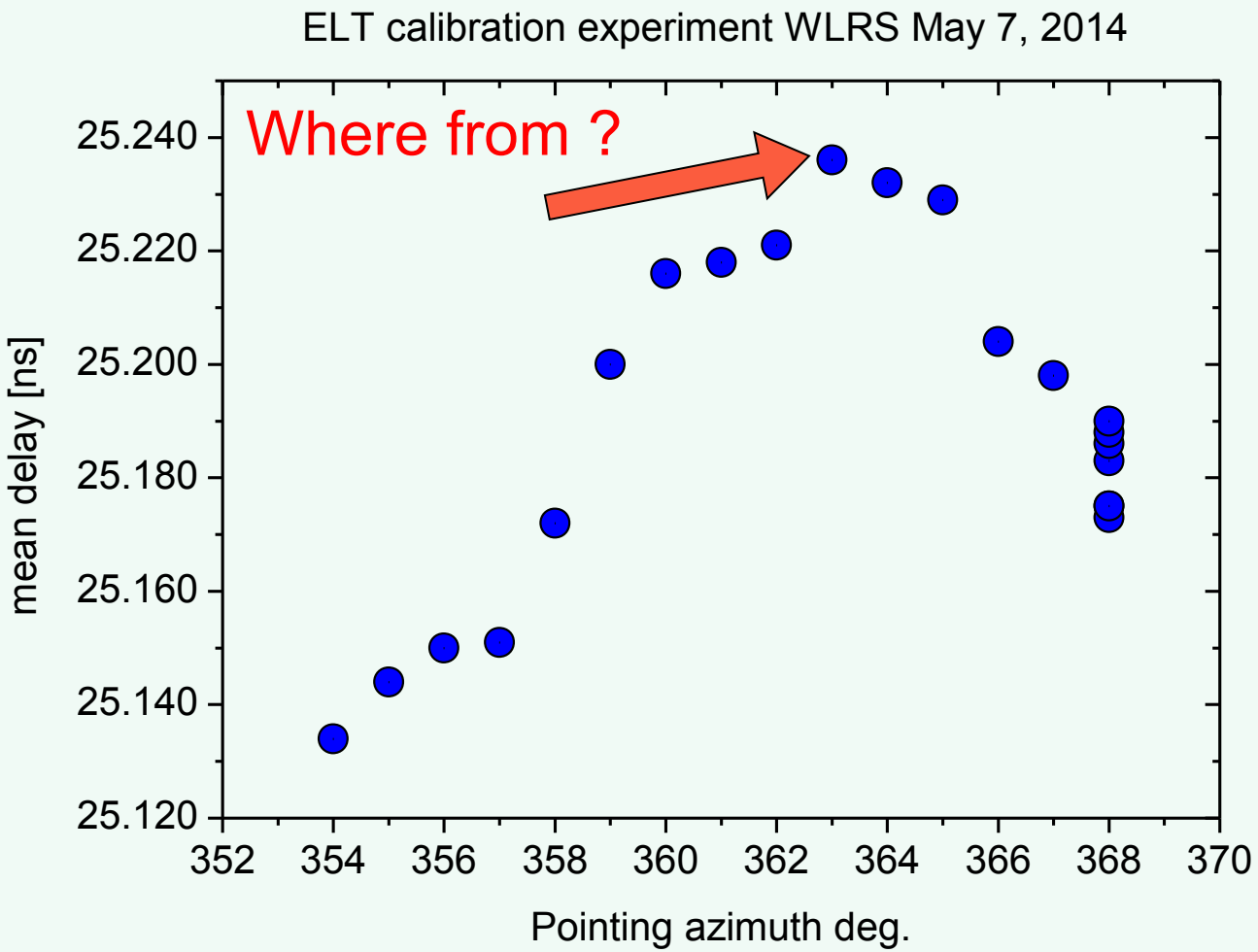


## Signal path delay azimuth dependency

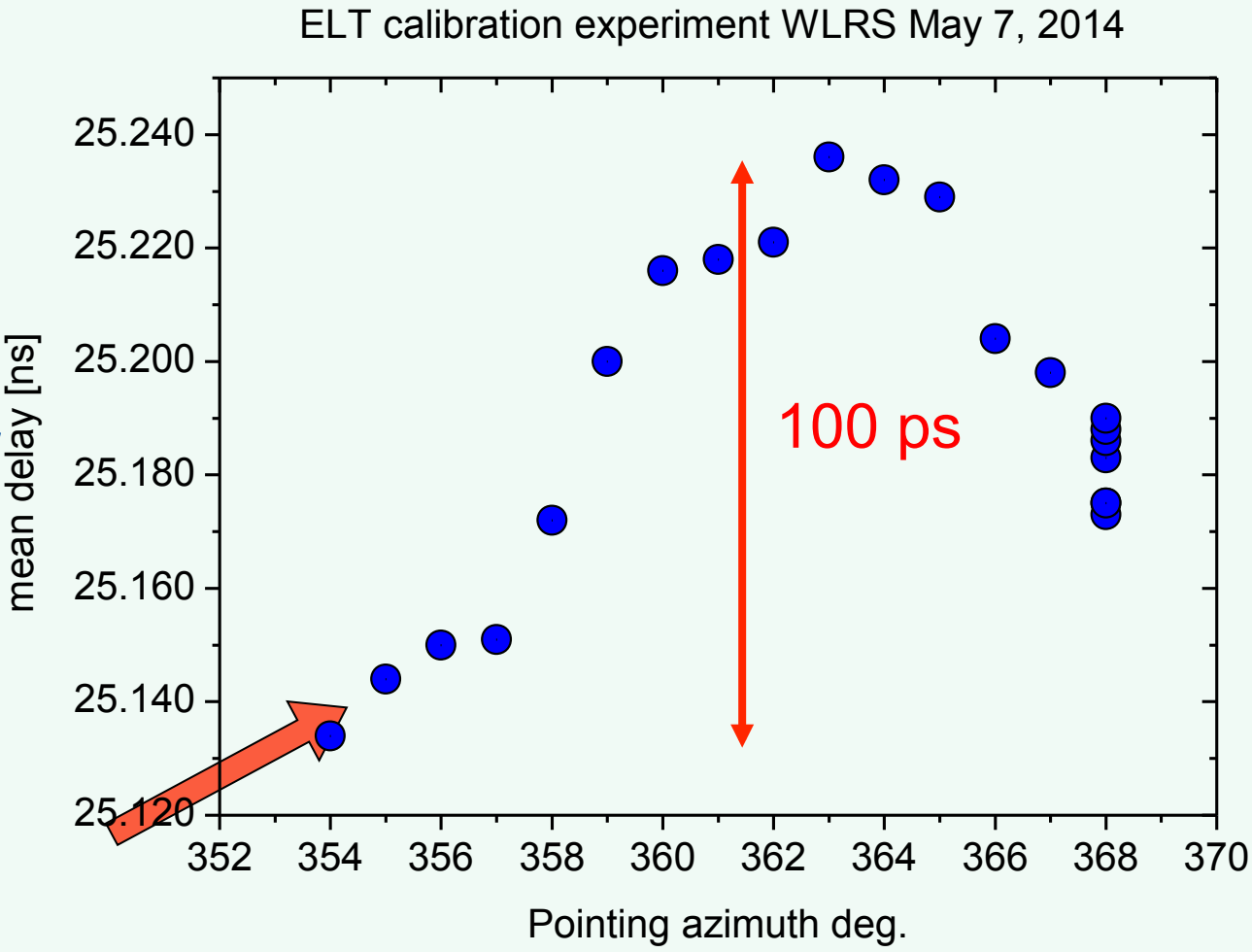


# Calibration value dependency

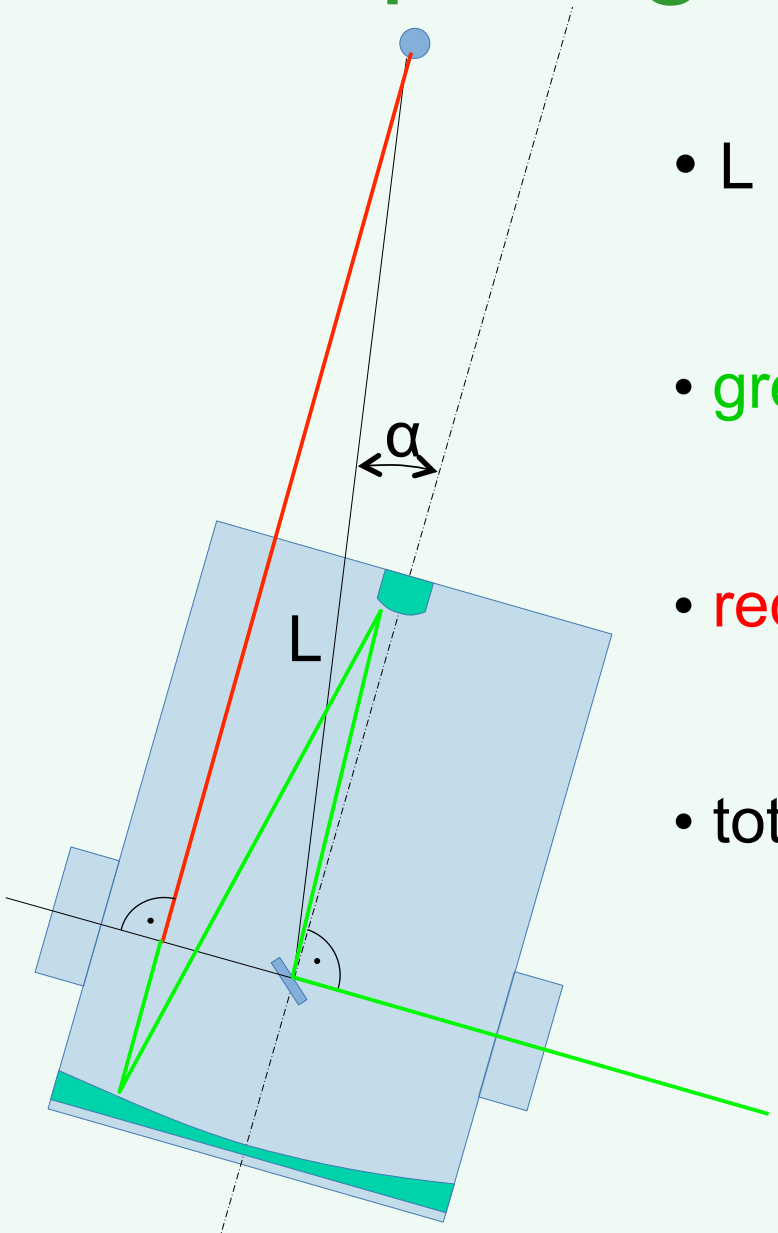


# Calibration value dependency

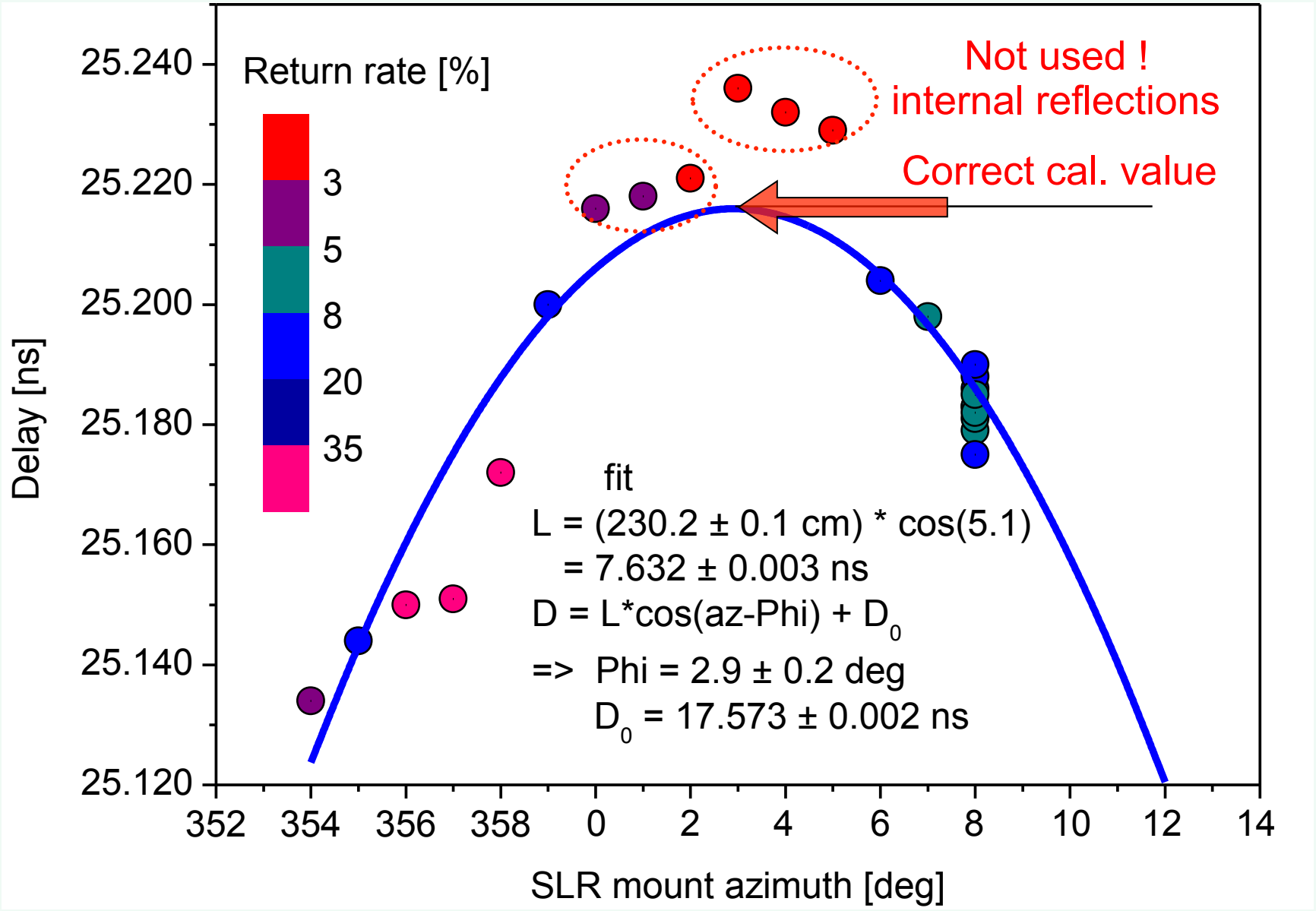


# Beam path geometry – one way




- L surveyed distance
- green part constant $D_0$
- red part variable $L*\cos(\alpha)$
- total path length $D = L*\cos(\alpha) + D_0$

# Experimental results



# Conclusions

- Pointing dependent bias in short baseline calibration has been identified
- This bias exceeds 3 cm on a modest size telescope.
- Beam path geometrical model has been built.
- The correct calibration value is not measureable directly, it has to be evaluated using a fit of pointing and ranging data.
- Analogical approach can be used in other short baseline calibration configurations

Good luck