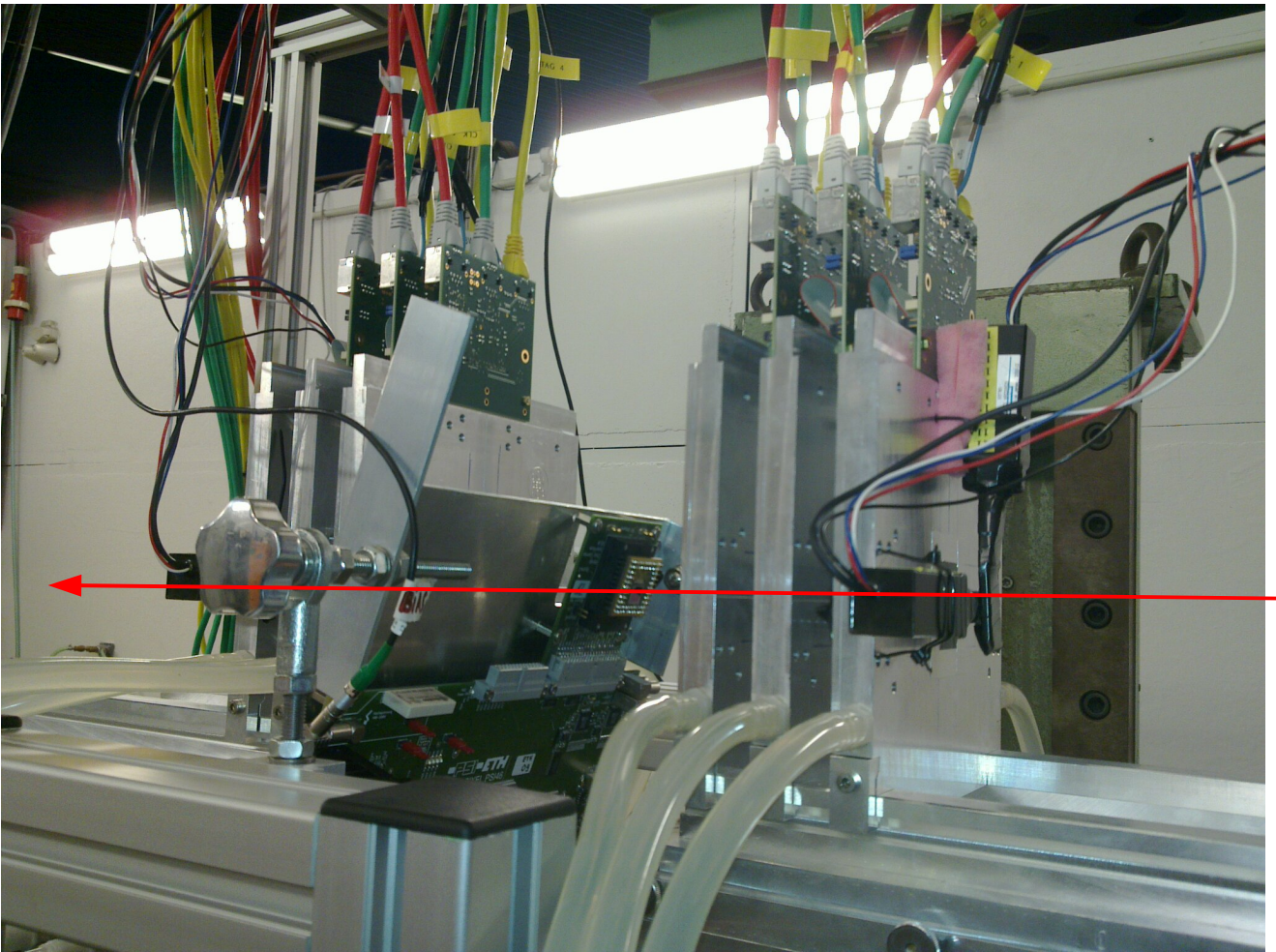
Pixel test plans 1st half of 2012

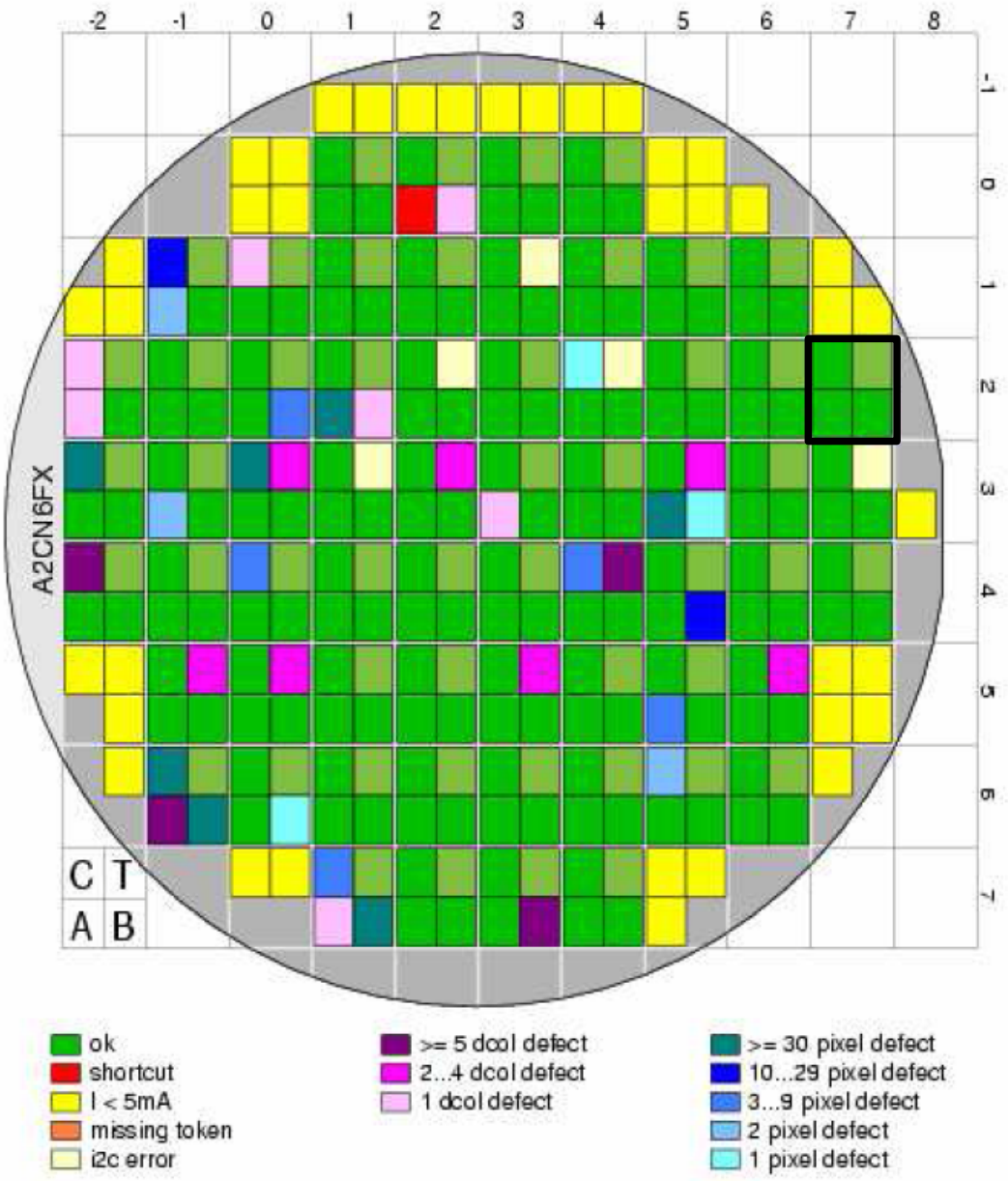
Daniel Pitzl, DESY

DESY CMS Tracker Upgrade, 17.1.2012



- beam tests
- test procedures

CMS Pixel ROC



Hans-Christian Kästli, Beat Meier (PSI)

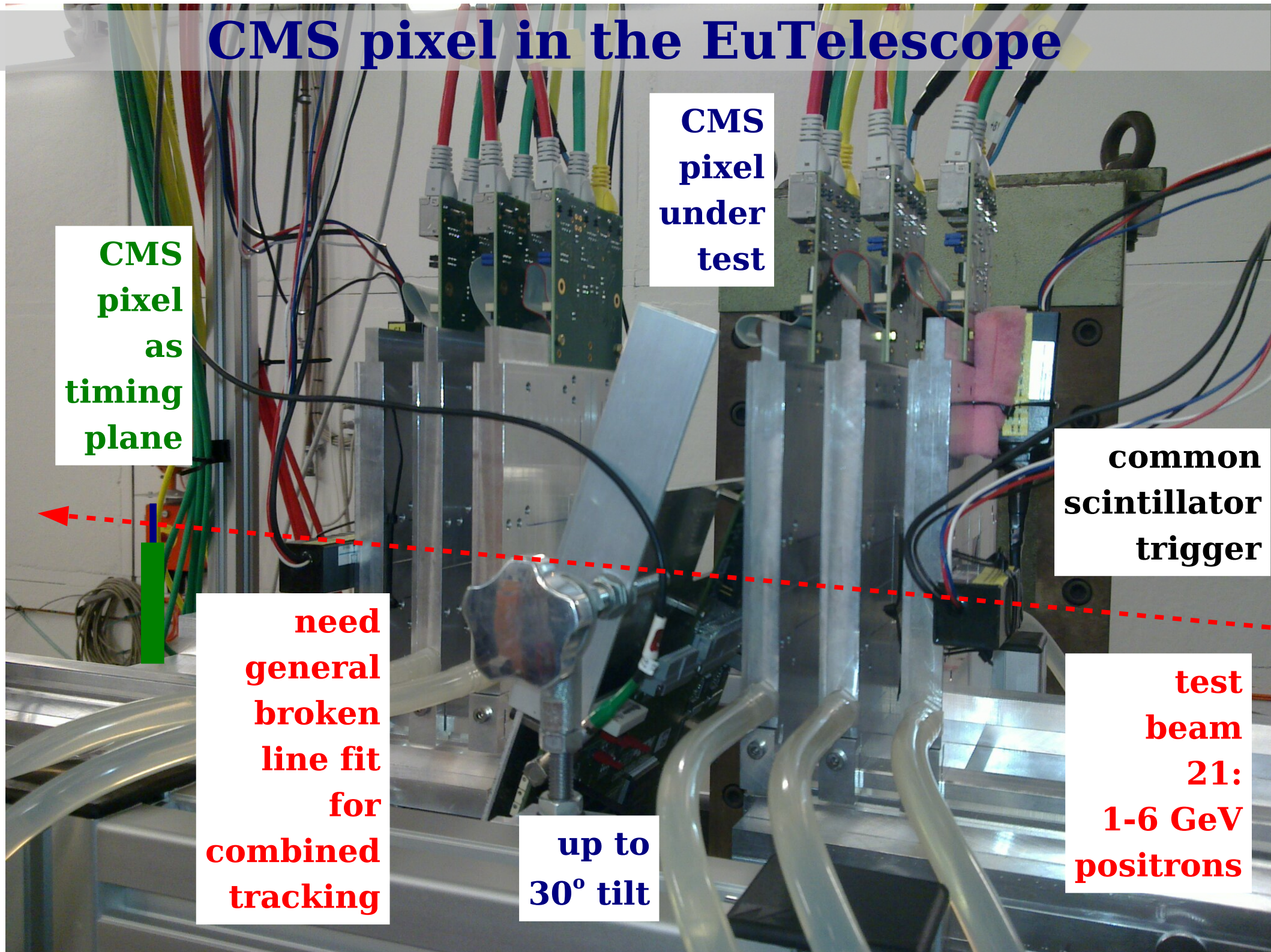
Wolfram Erdmann (PSI), today:

- new chip designs submitted via CERN to IBM:
- per recticle:
  - 1 x PSI46xdb
  - 2 x PSI46dig
  - 2 x TBM
- 64 recticles / 200 mm wafer,
- engineering run: 6 wafers,
- 4 months production time:
- expected not before end April 2012.

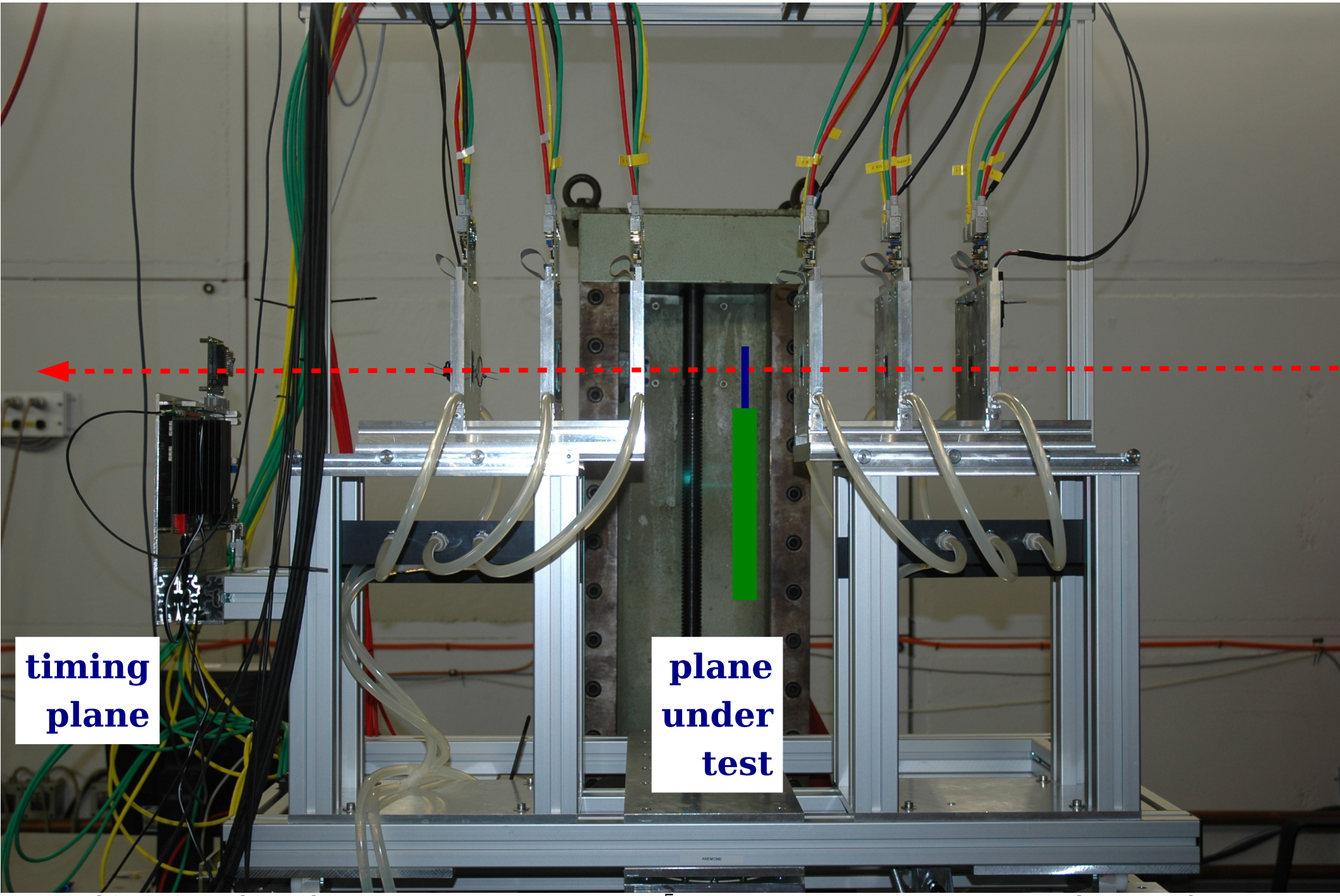
Pixel plans for 1st half of 2012

- Study event offset between PSI test board and telescope EUDAQ:
  - take data with VME – based telecope DAQ — TB 22, soon
- Prepare ROC efficiency measurement:
  - use 2nd CMS pixel plane as timing reference — TB 21/22, Feb
- More single-chip modules with present ROC design:
  - from PSI — visit next week
  - take reference data with present ROC — TB 21, end April
- New ROCs: PSI46xdb, PSI46dig
  - in production at IBM — expected at PSI end April
  - lab tests with PSI46xdb — May
  - get single chip modules with PSI46xdb — from PSI, June
  - test beam with PSI46xdb — TB 21, June-July

CMS pixel in the EuTelescope

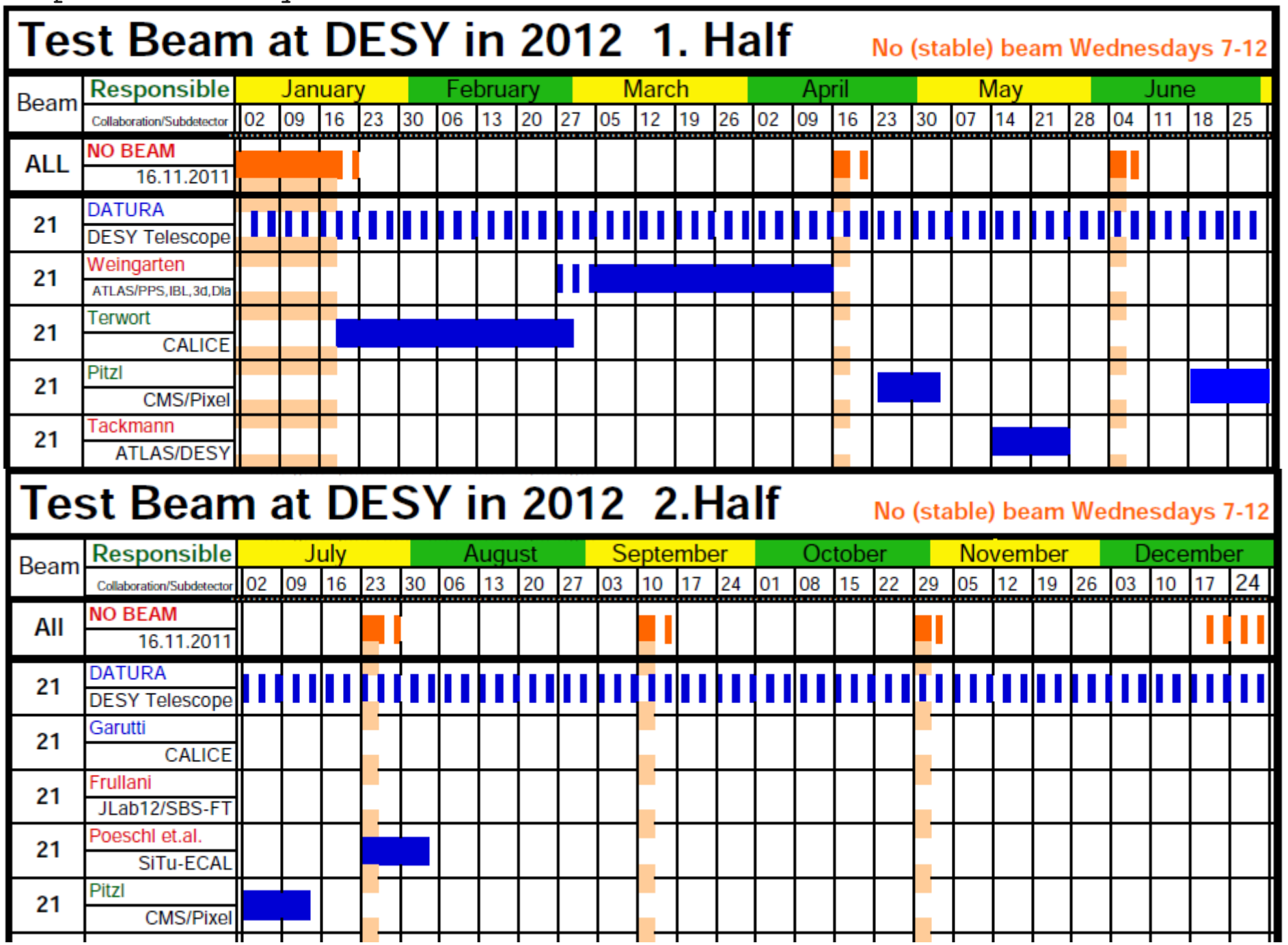


CMS Pixel with EuTelescope



CMS Pixel in the DESY test beam

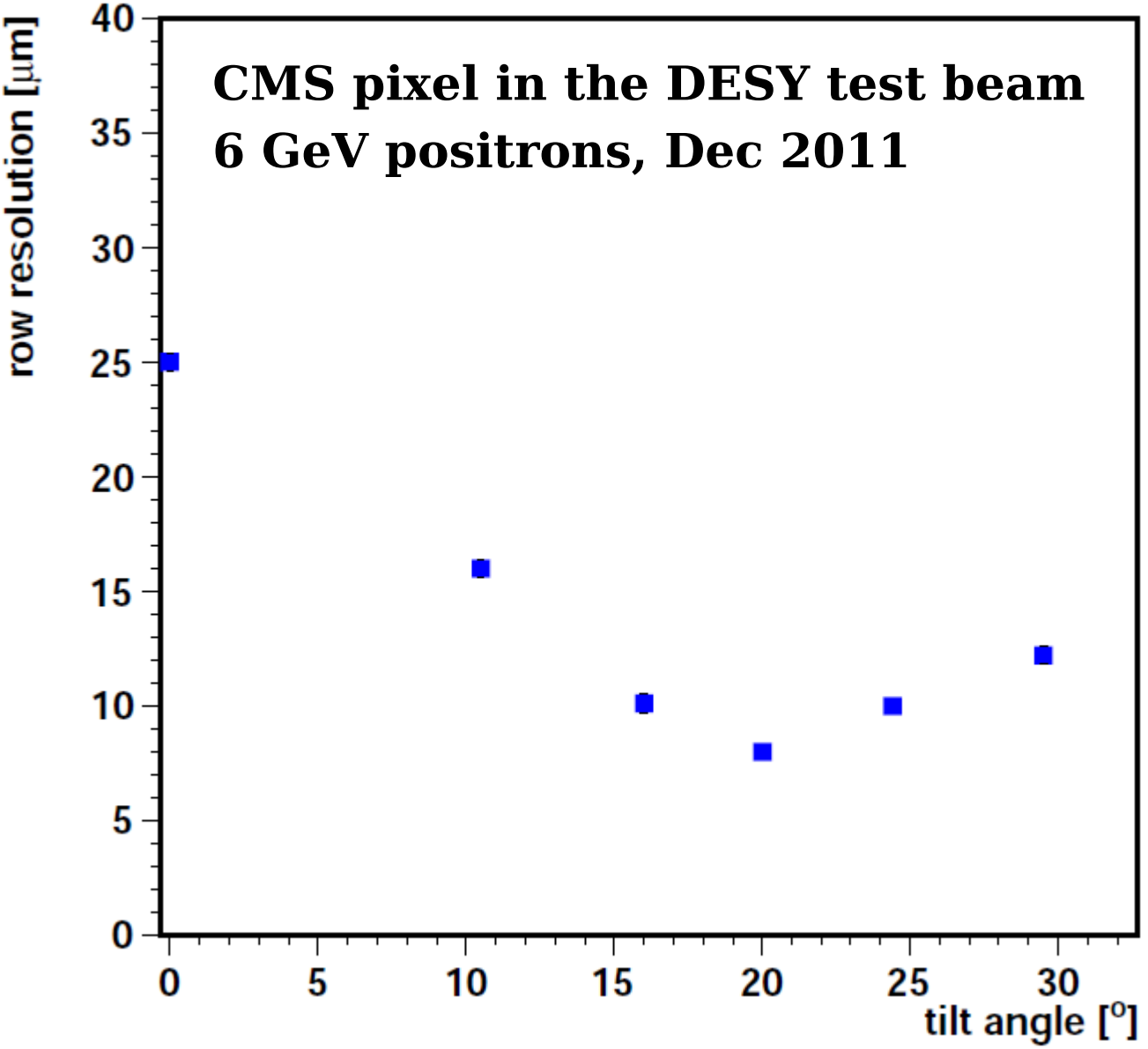
http://adweb.desy.de/~testbeam/ 16.01.2012

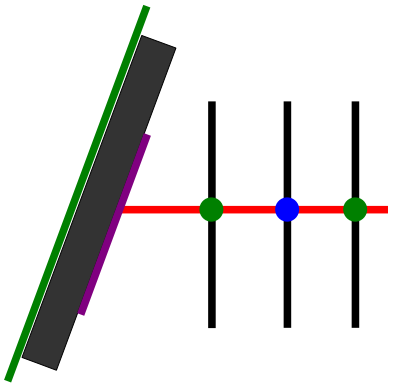


ROC testing procedures

- chip testing in the lab:
  - determine operation parameters for new chips — well advanced
  - bare module test with probe card — to be done
  - full module test: 16 ROCs + TBM — to be done
- stand-alone source and test beam — established
- resolution measurement in test beam:
  - pixel residuals w.r.t. telescope tracks, with tilt — established
- efficiency:
  - pixel w.r.t. to telescope + timing plane — to be done
- low temperature testing: — cold box being designed
- X-ray test: — Uni HH
  - X-ray guns arrived — waiting for license
  - to be used with full modules — get from PSI next week

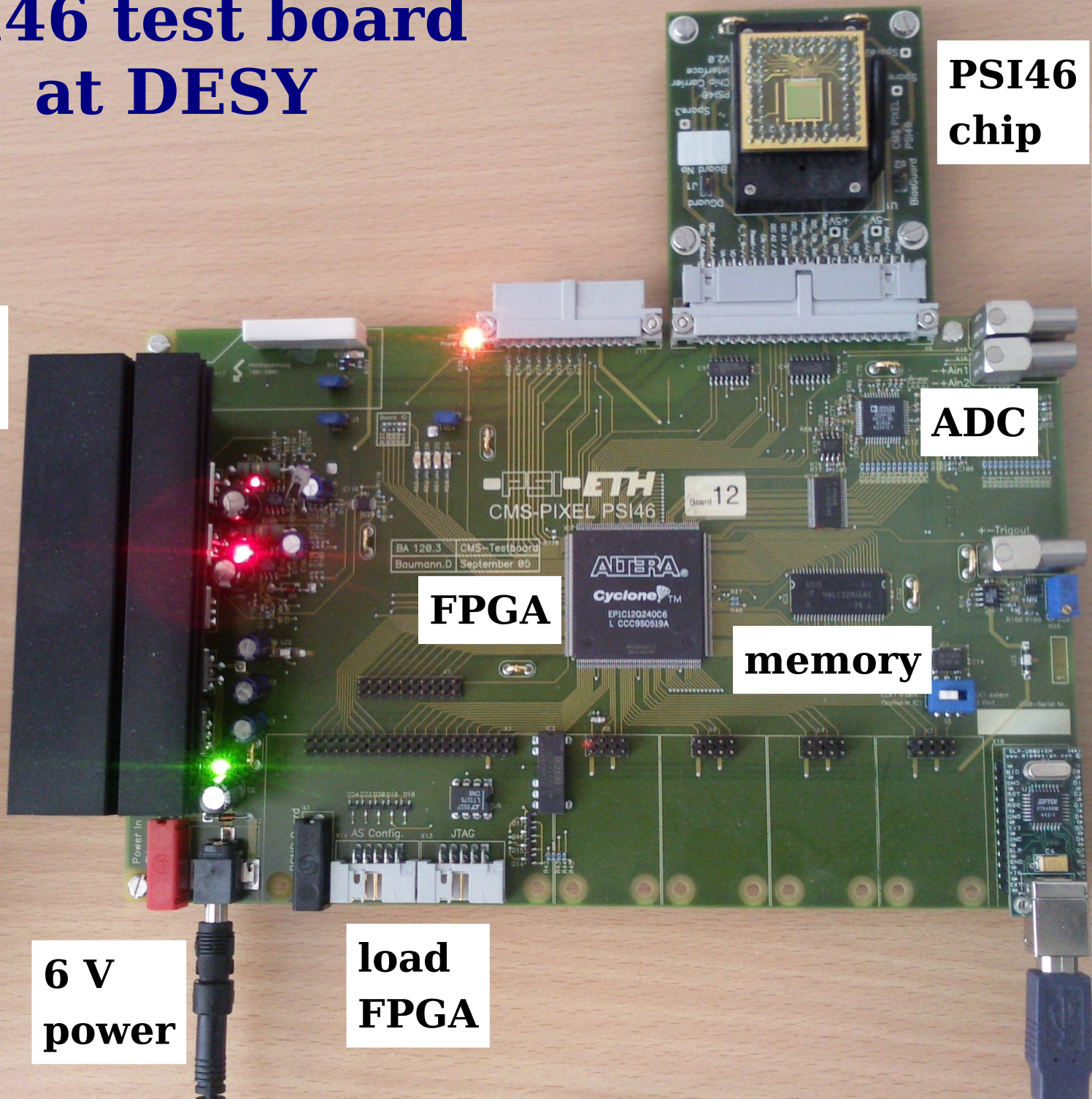
CMS pixel row resolution vs tilt angle



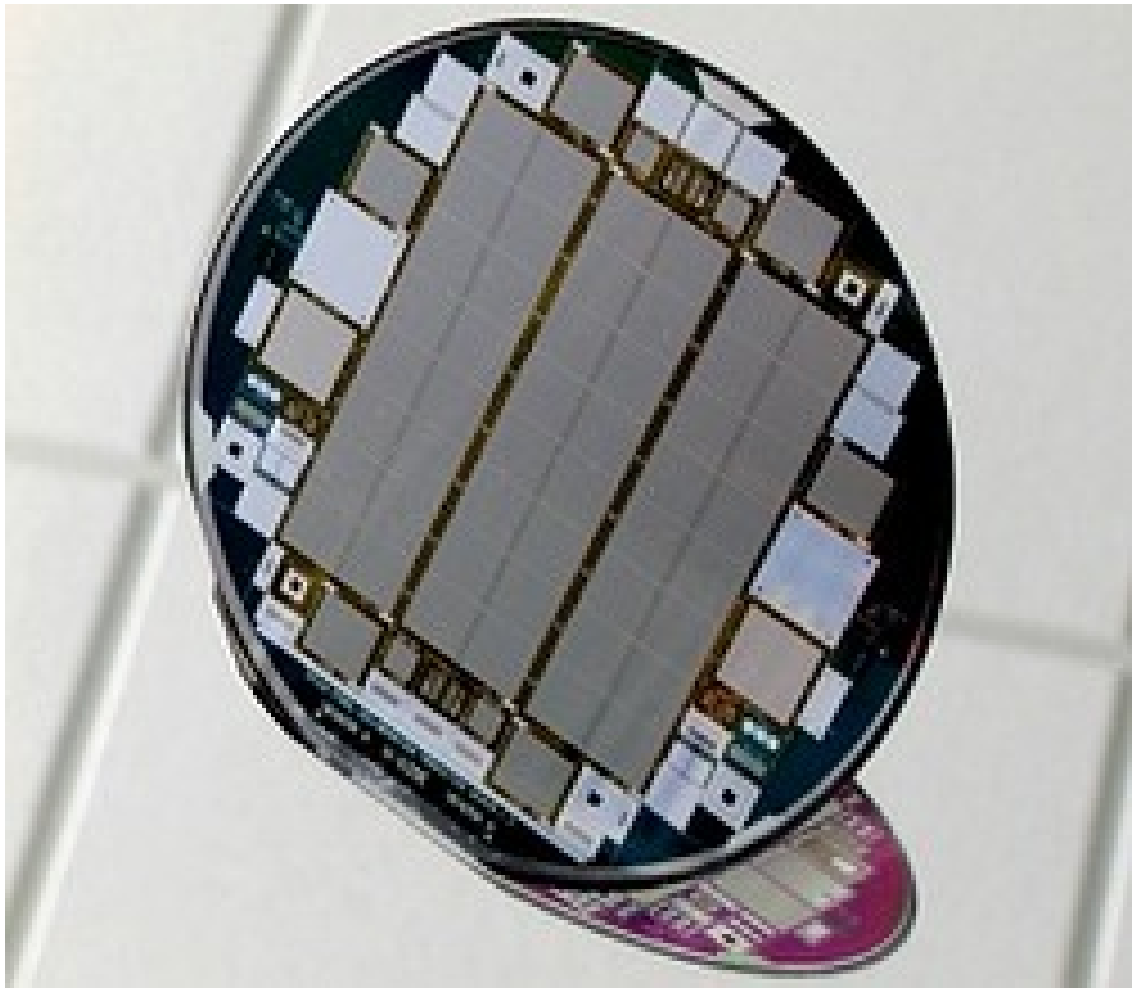


- 6 GeV, 4.5 μm telescope extrapolation uncertainty subtracted.
- row pixels = 100 μm.
- Binary:
  - σ = 100 / √12 = 29 μm
- Optimal angle 19°:
  - σ = 8 μm.

PSI46 test board at DESY



CMS Pixel Sensors



design: Tilman Rohe, PSI

- 60 wafers under production at CIS (Erfurt)
  - standard CMS pixel sensor design (double sided, n-in-n, p-spray insulation).
  - for Karlsruhe, INFN, CERN/Taiwan, MRI, Purdue, DESY.
  - 5 wafers with increased bump pad passivation opening: 30 µm, for DESY.
  - Delivery in Mar 2012.
- Full sensors for first bump bondings.
- Single chip sensors for tests with new ROCs.