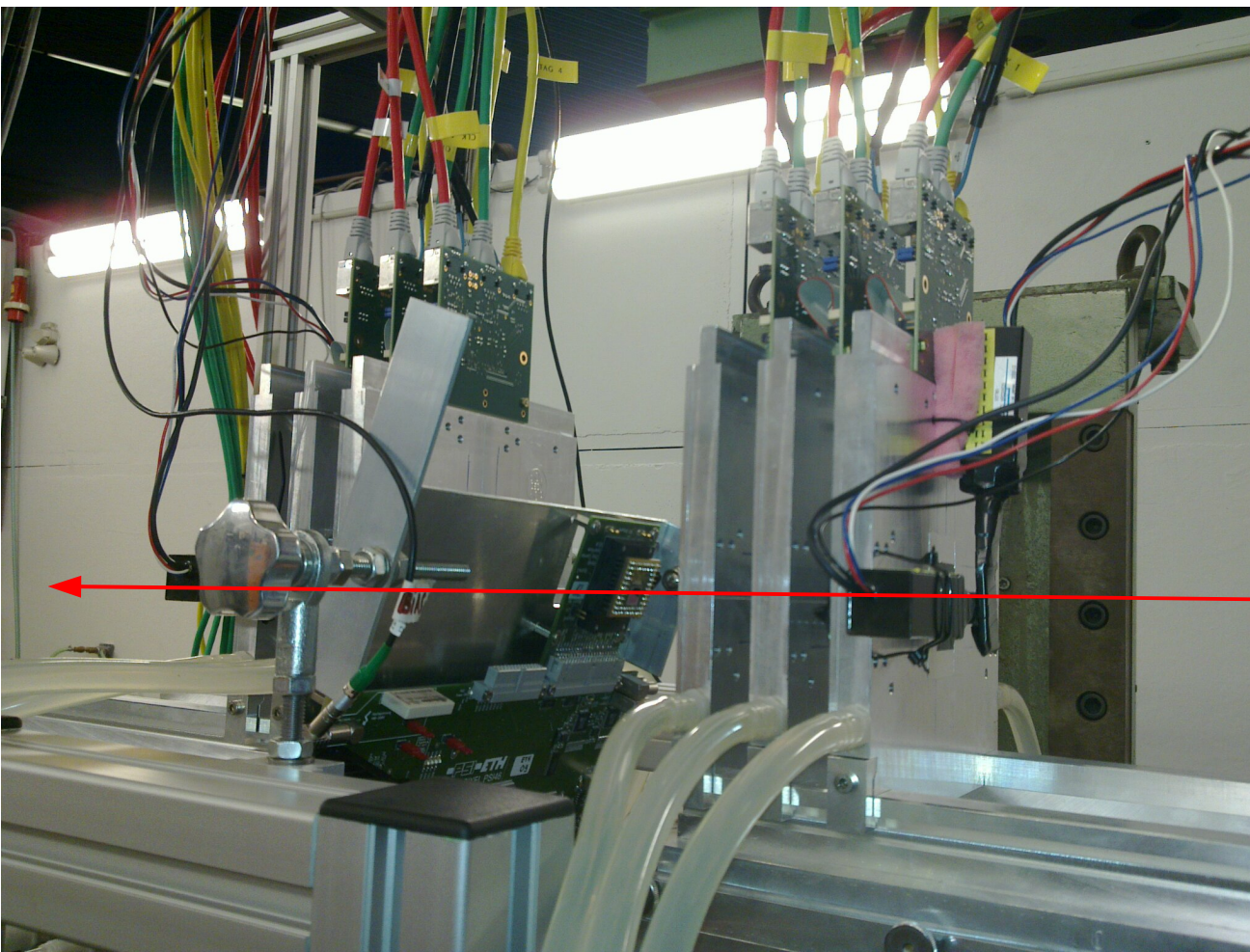


# Pixel test plans 1<sup>st</sup> half of 2012

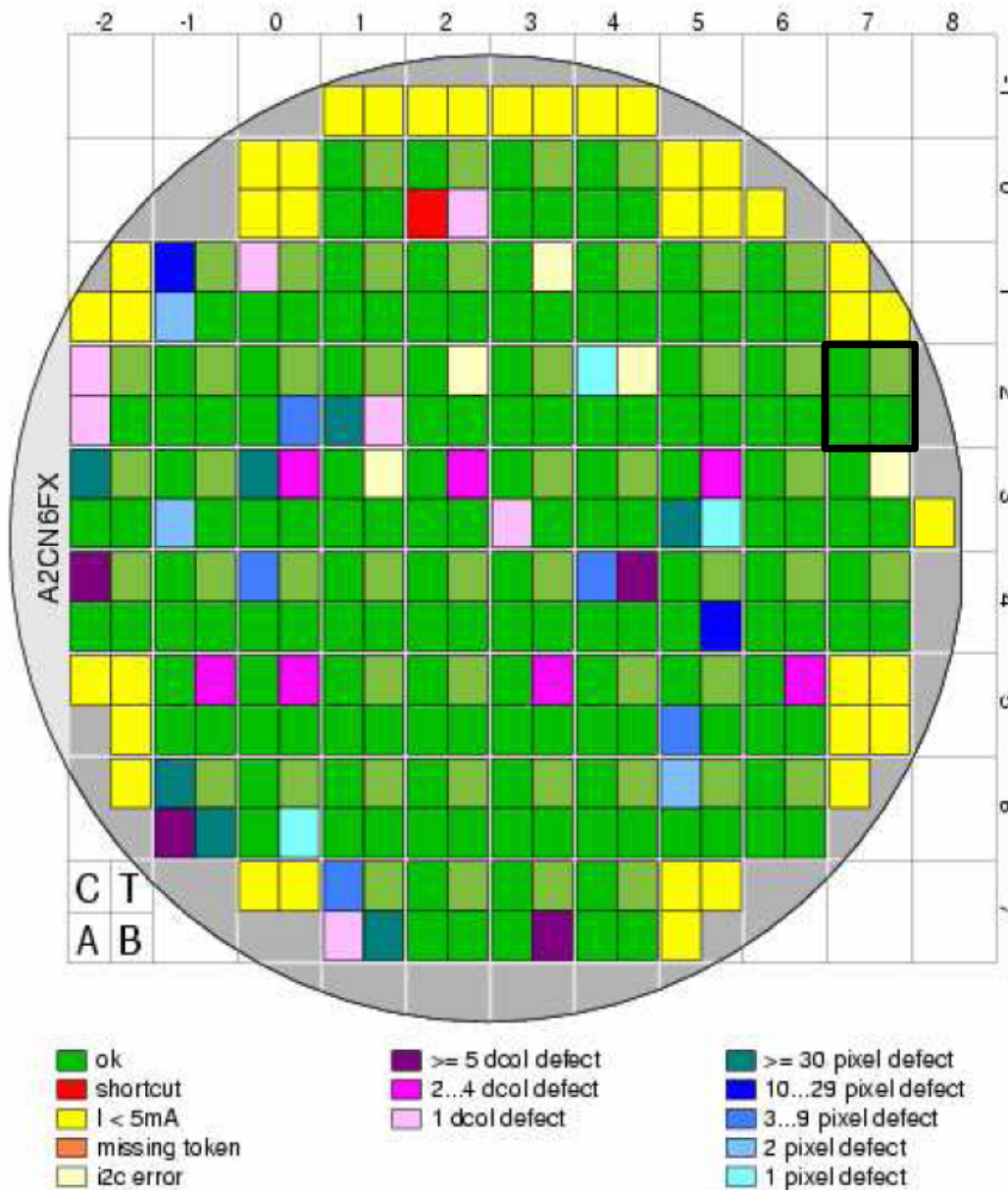
Daniel Pitzl, DESY

DESY CMS Tracker Upgrade, 17.1.2012



- beam tests
- test procedures

# CMS Pixel ROC



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.

Hans-Christian Kästli, Beat Meier (PSI)

# Pixel plans for 1<sup>st</sup> half of 2012

- Study event offset between PSI test board and telescope EUDAQ:
  - take data with VME - based telescope DAQ TB 22, soon
- Prepare ROC efficiency measurement:
  - use 2<sup>nd</sup> 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  
as  
timing  
plane**

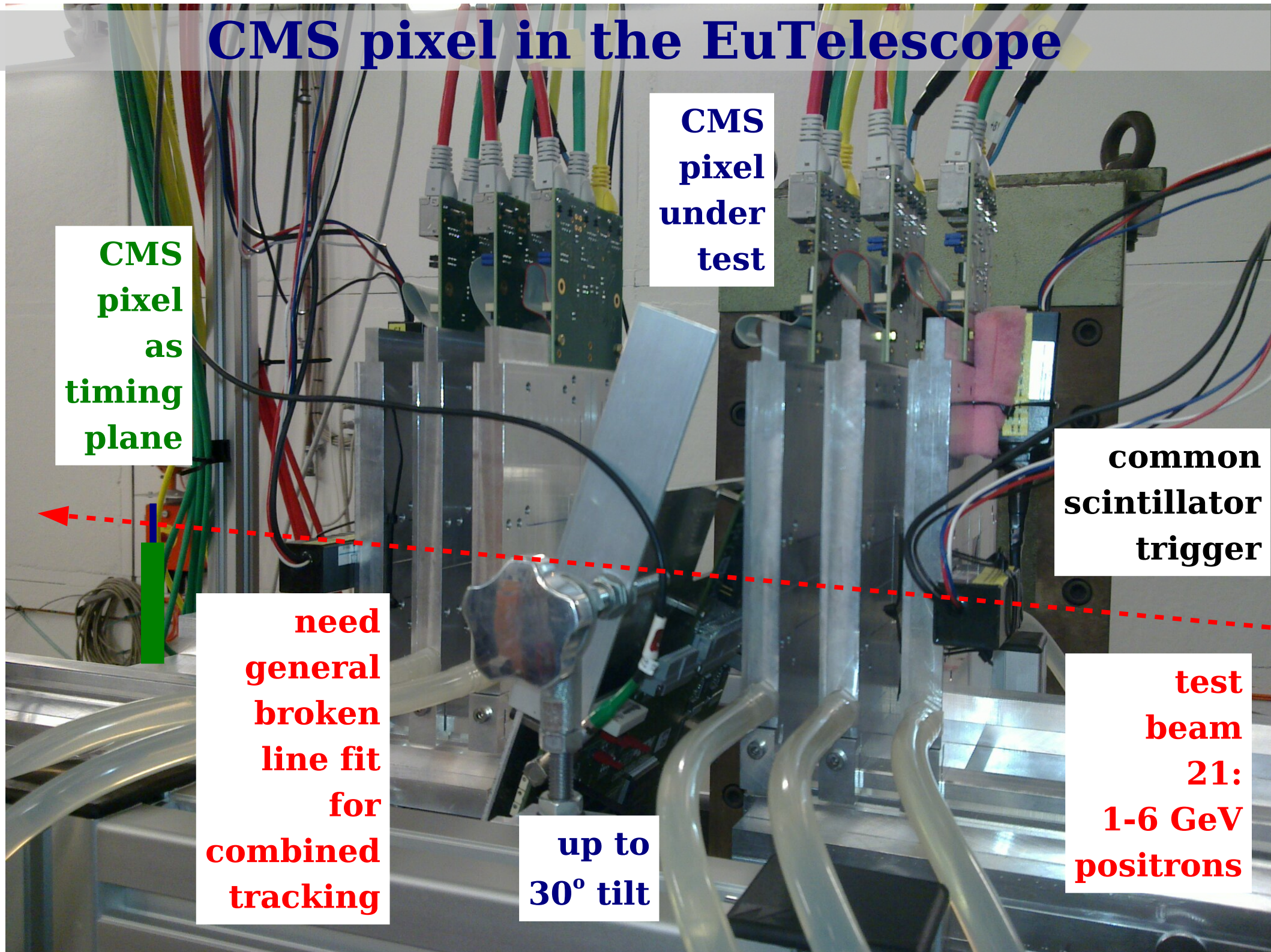
**CMS  
pixel  
under  
test**

**common  
scintillator  
trigger**

**need  
general  
broken  
line fit  
for  
combined  
tracking**

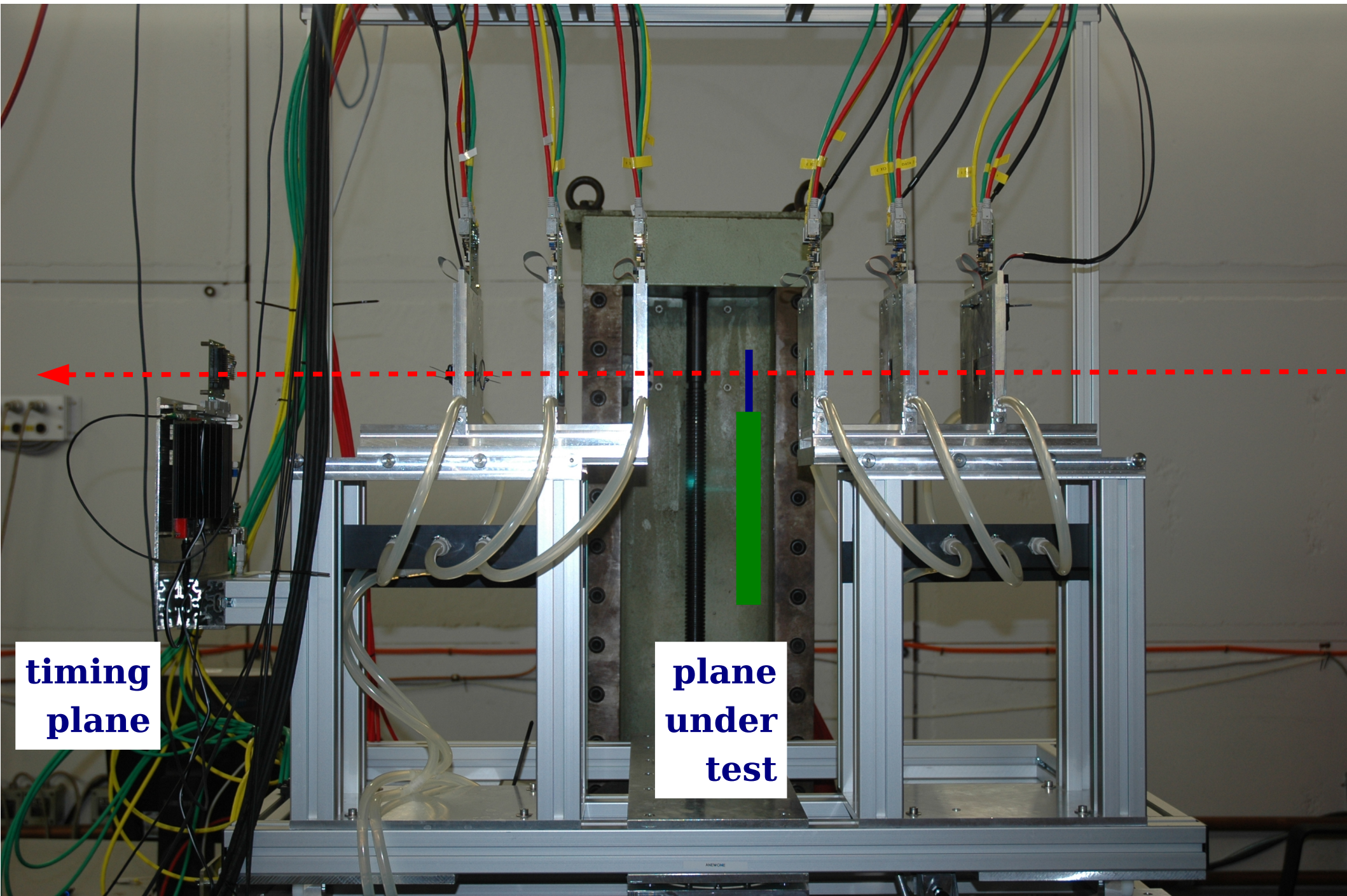
**up to  
30° tilt**

**test  
beam  
21:  
1-6 GeV  
positrons**





# CMS Pixel with EuTelescope



**timing  
plane**

**plane  
under  
test**

# CMS Pixel in the DESY test beam

<http://adweb.desy.de/~testbeam/>

16.01.2012

## Test Beam at DESY in 2012 1. Half

No (stable) beam Wednesdays 7-12

Beam	Responsible	January				February				March				April				May				June					
	Collaboration/Subdetector	02	09	16	23	30	06	13	20	27	05	12	19	26	02	09	16	23	30	07	14	21	28	04	11	18	25
ALL	NO BEAM																										
	16.11.2011																										
21	DATURA																										
	DESY Telescope																										
21	Weingarten																										
	ATLAS/PPS,IBL,3d,Dia																										
21	Terwort																										
	CALICE																										
21	Pitzl																										
	CMS/Pixel																										
21	Tackmann																										
	ATLAS/DESY																										

## Test Beam at DESY in 2012 2.Half

No (stable) beam Wednesdays 7-12

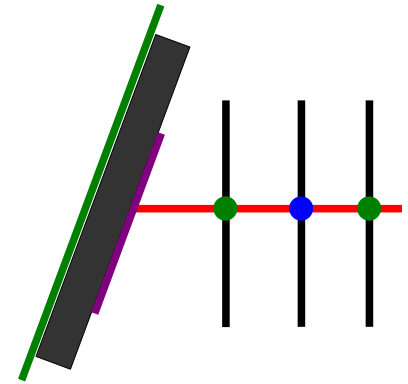
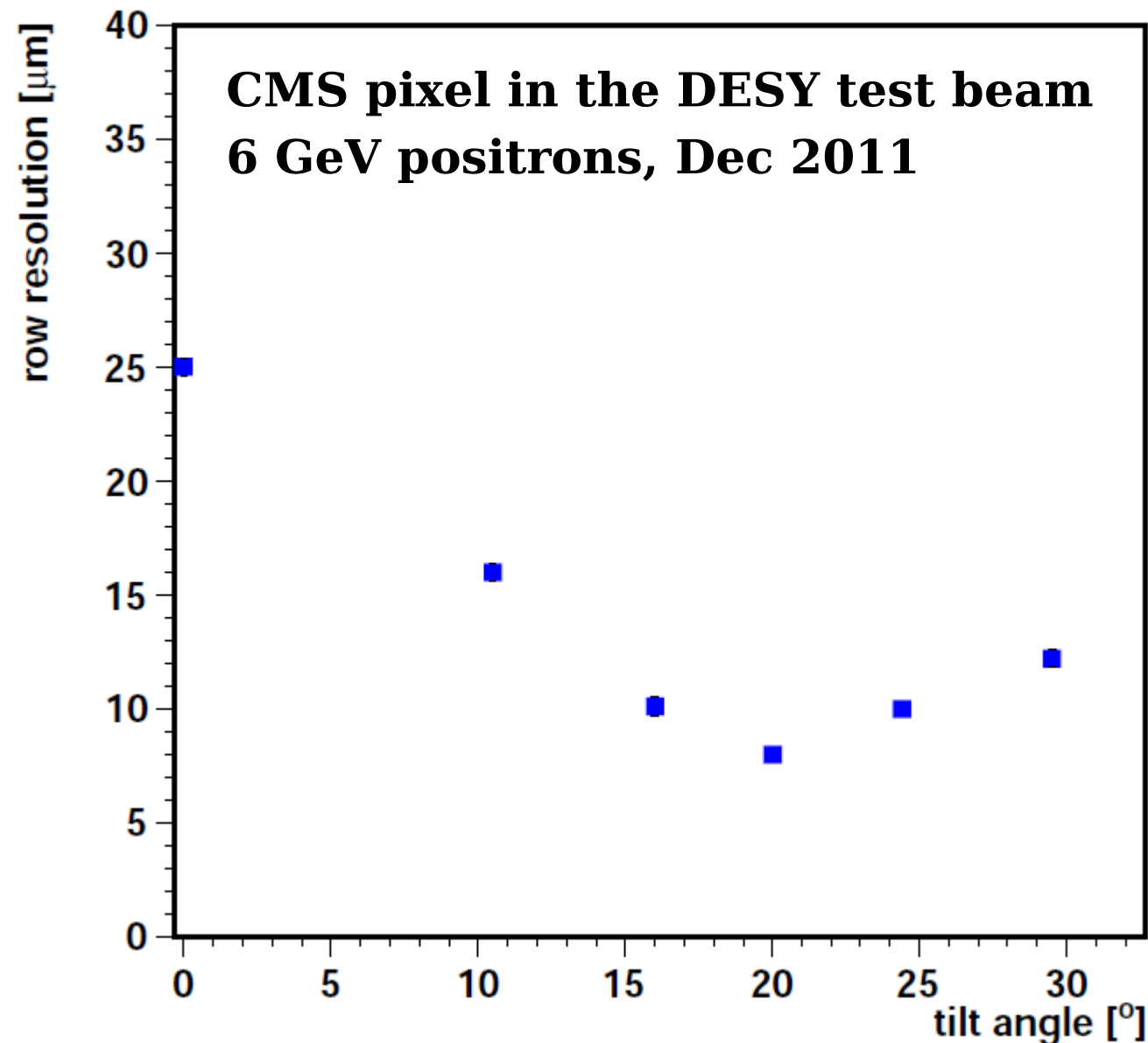
Beam	Responsible	July					August					September					October				November				December			
	Collaboration/Subdetector	02	09	16	23	30	06	13	20	27	03	10	17	24	01	08	15	22	29	05	12	19	26	03	10	17	24	
All	NO BEAM																											
	16.11.2011																											
21	DATURA																											
	DESY Telescope																											
21	Garutti																											
	CALICE																											
21	Frullani																											
	JLab12/SBS-FT																											
21	Poeschl et.al.																											
	SiTu-ECAL																											
21	Pitzl																											
	CMS/Pixel																											



# 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

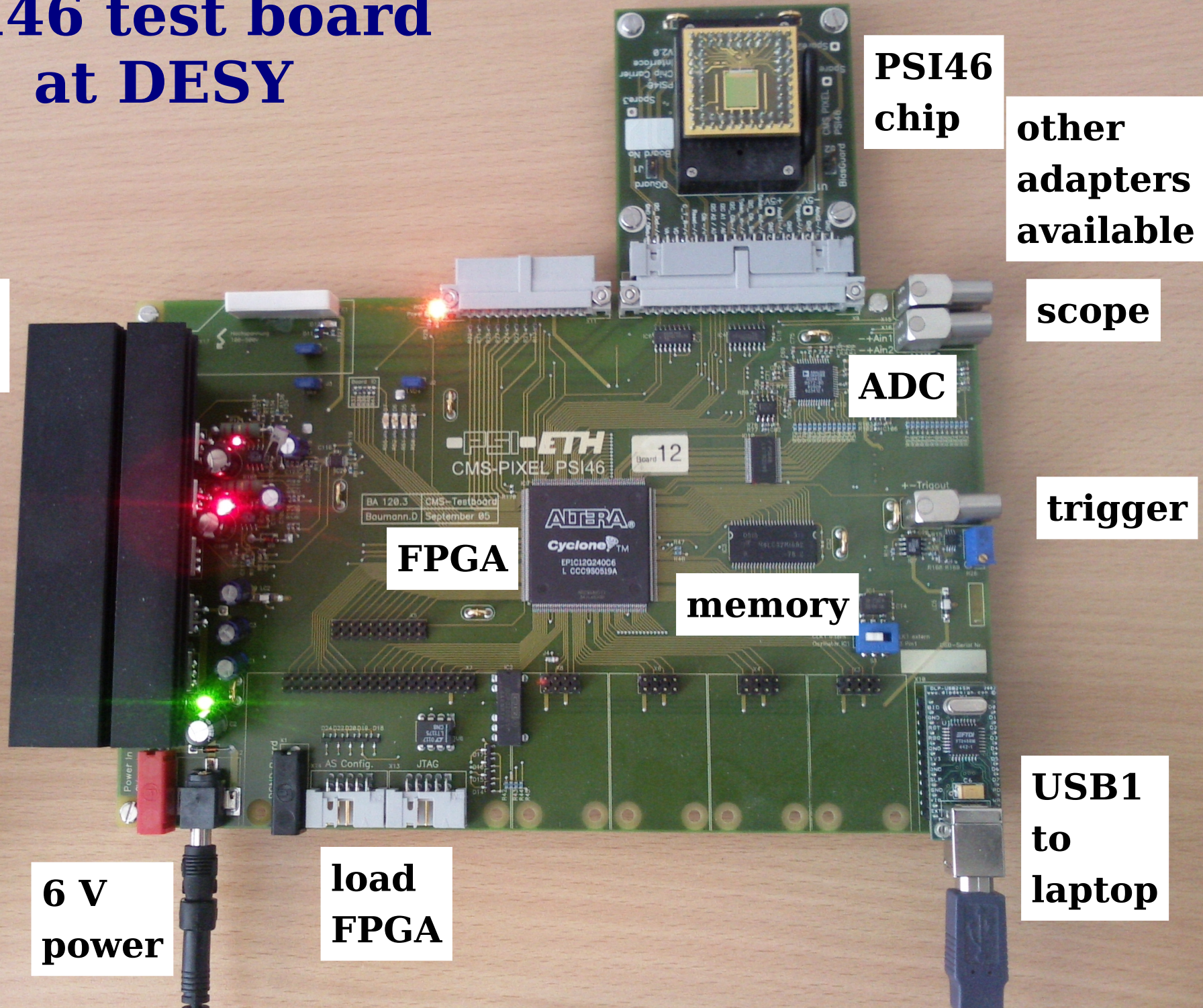
# CMS pixel row resolution vs tilt angle



- 6 GeV, 4.5  $\mu\text{m}$  telescope extrapolation uncertainty subtracted.
- row pixels = 100  $\mu\text{m}$ .
- Binary:
  - $\sigma = 100 / \sqrt{12} = 29 \mu\text{m}$
- Optimal angle 19°:
  - $\sigma = 8 \mu\text{m}$ .

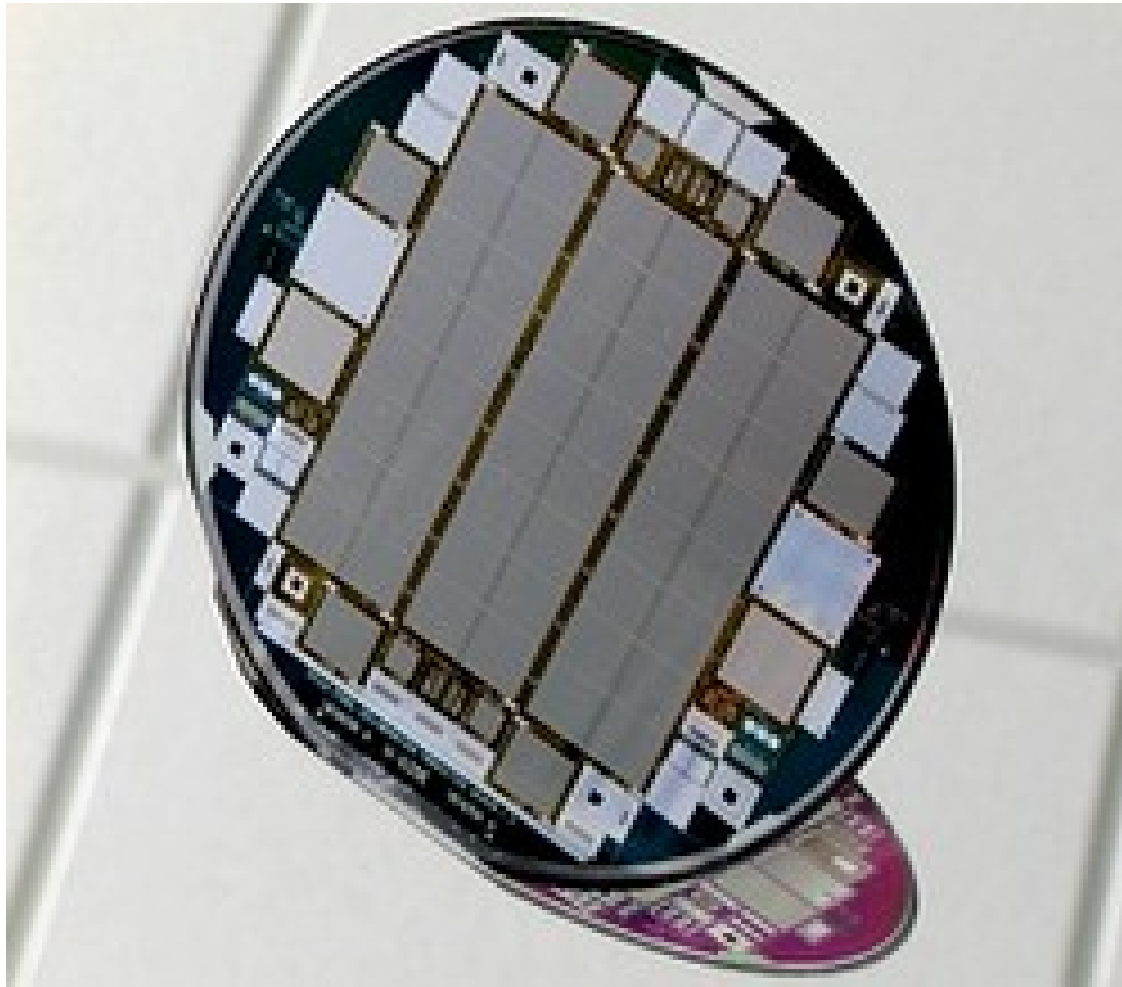


# PSI46 test board at DESY





# CMS Pixel Sensors



- 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  $\mu\text{m}$ , for DESY.
  - Delivery in Mar 2012.
- Full sensors for first bump bondings.
- Single chip sensors for tests with new ROCs.

design: Tilman Rohe, PSI