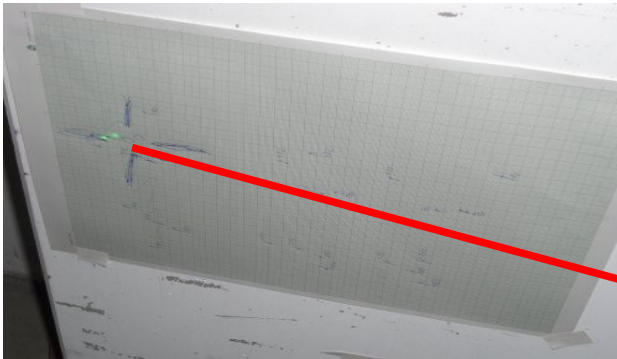


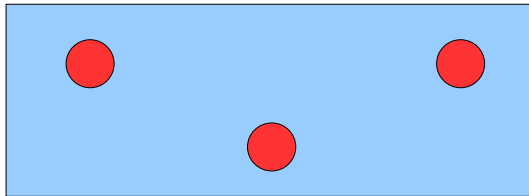
# Shape Measurements of Radiators

C.Schwarz, GSI

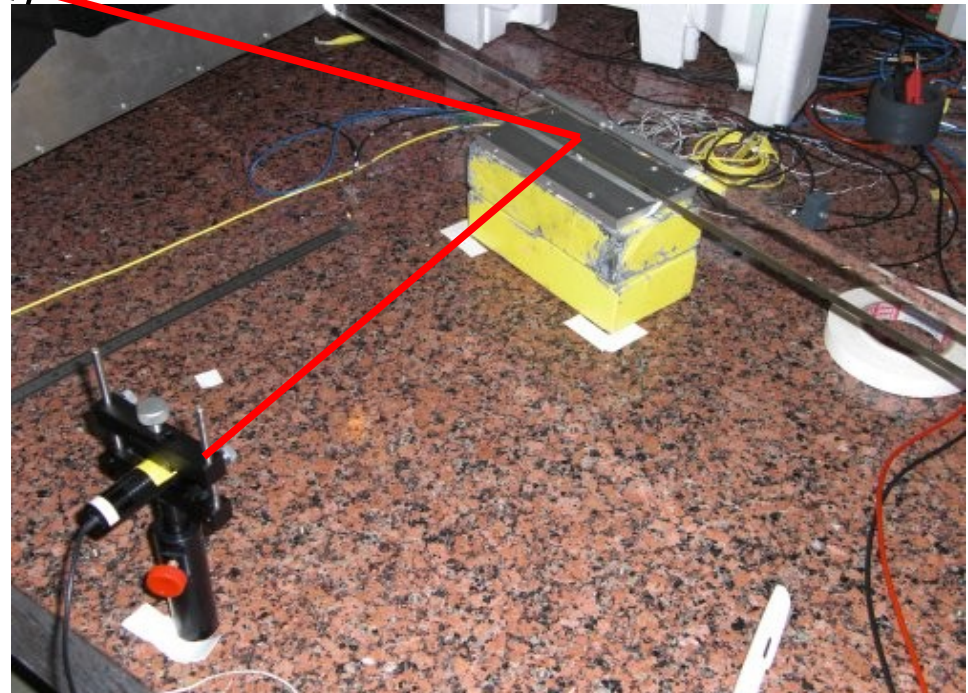


8420 mm

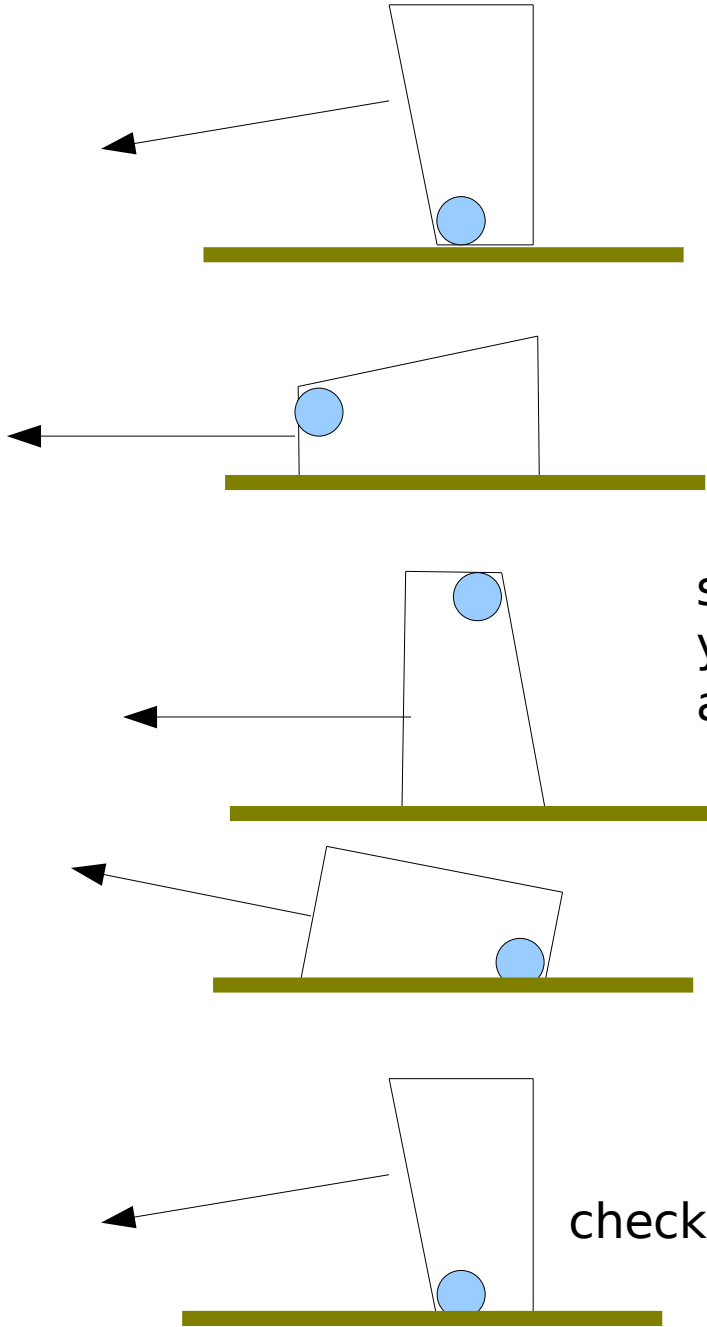
$\delta y = \pm 0.5 \text{ mm}$   
 $\rightarrow \delta \theta = \pm 30 \mu \text{ rad}$



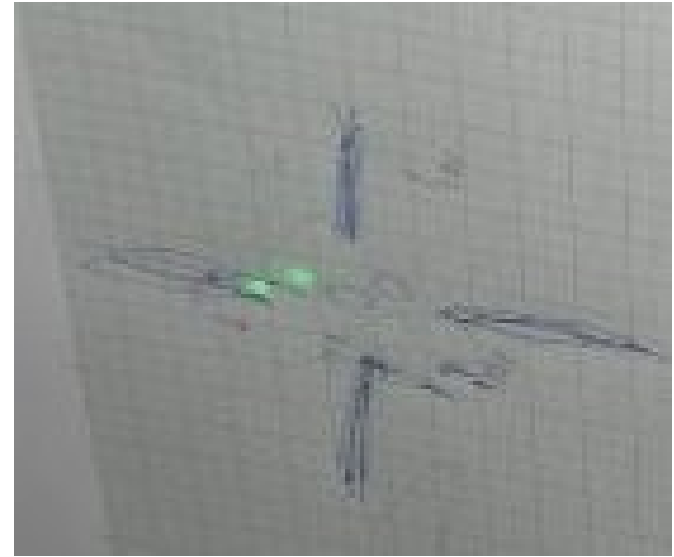
all parts rest on three points



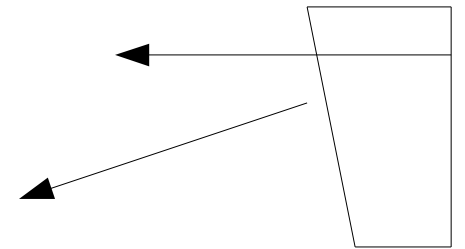
# Principle



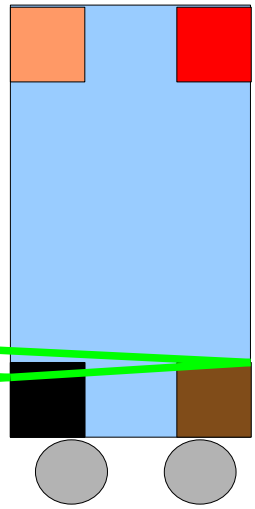
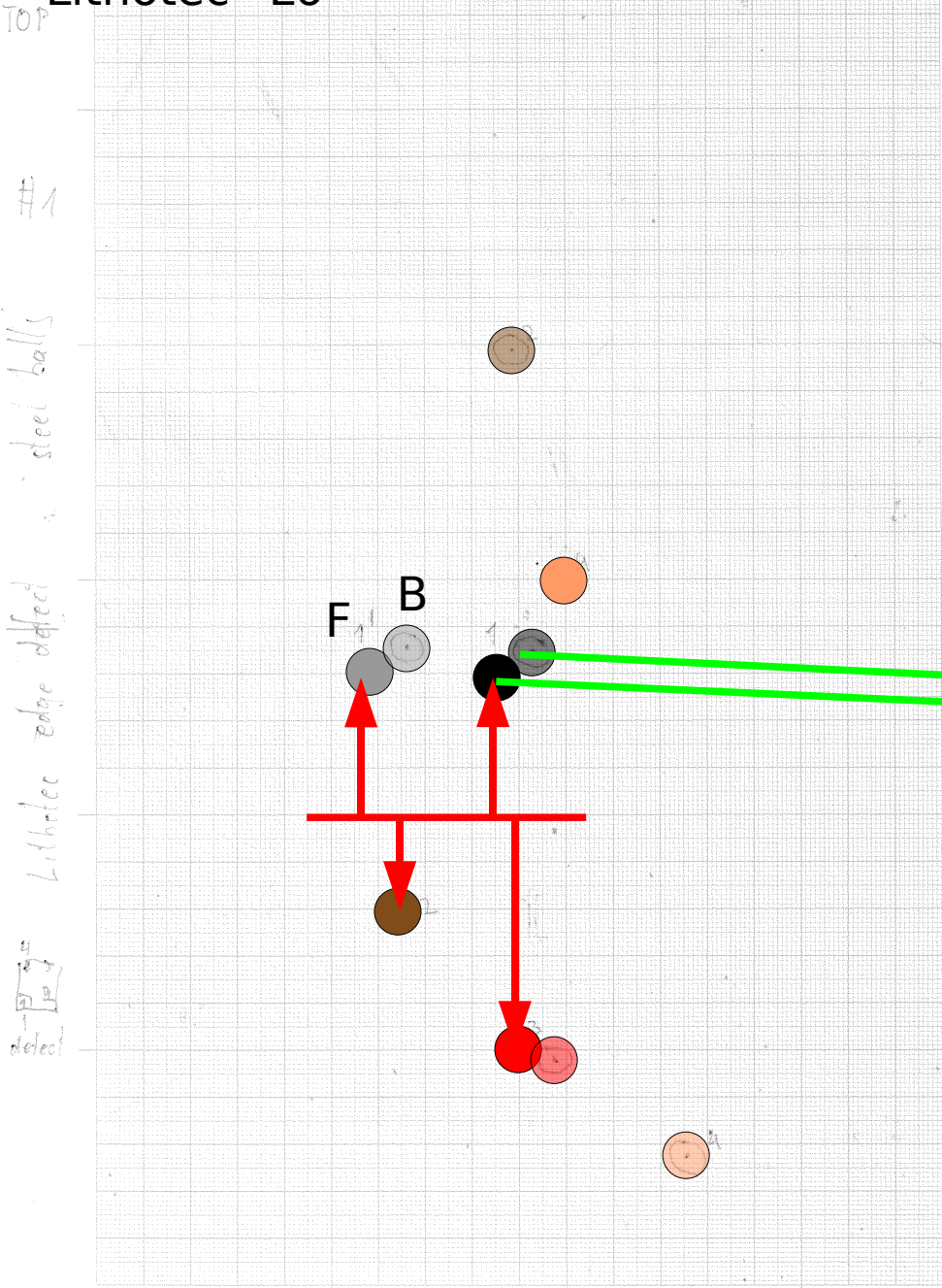
spots  
yields information  
about  $90^\circ + \delta_i$



second spot  
yields information  
about parallelism



# Lithotec "L6"



Taking "front" spots (F) with respect of their center of gravity ensures

$$\begin{aligned} \sum \theta_i &= 360^\circ \\ \sum 90^\circ + \delta_i &= 360^\circ \\ \sum \delta_i &= 0 \end{aligned}$$

Lithotec "L6"

"L1"

$$\delta\theta_1 = 1.61$$

$$0.87 \text{ mrad}$$

$$\delta\theta_2 = -1.35$$

$$-0.36$$

$$\delta\theta_3 = -3.07$$

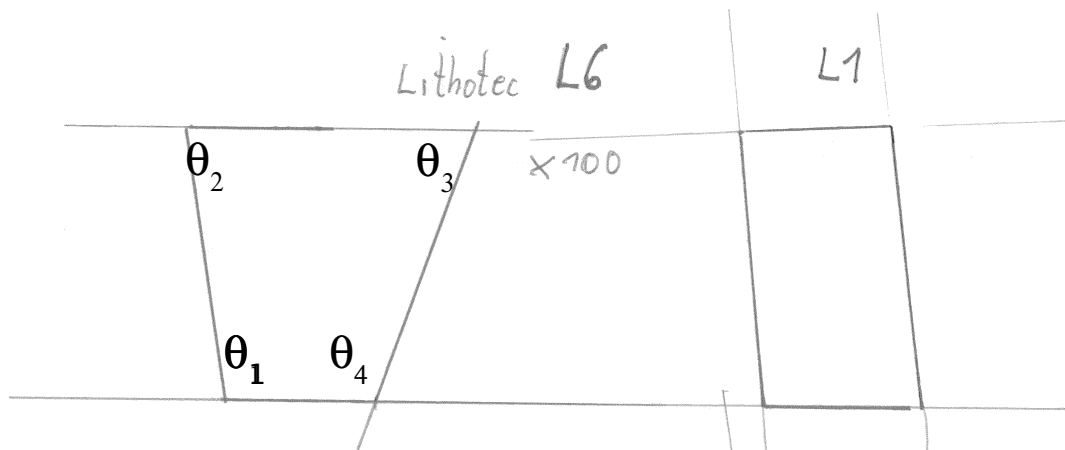
$$0.66$$

$$\delta\theta_4 = 2.81$$

$$-1.18$$

$$\pm 0.03$$

$$\pm 0.05$$



angles 100 times exaggerated

Miass "R1"

"R2"

$$\delta\theta_1 = 5.54$$

$$1.23$$

$$\delta\theta_2 = -5.33$$

$$-1.12$$

$$\delta\theta_3 = 5.54$$

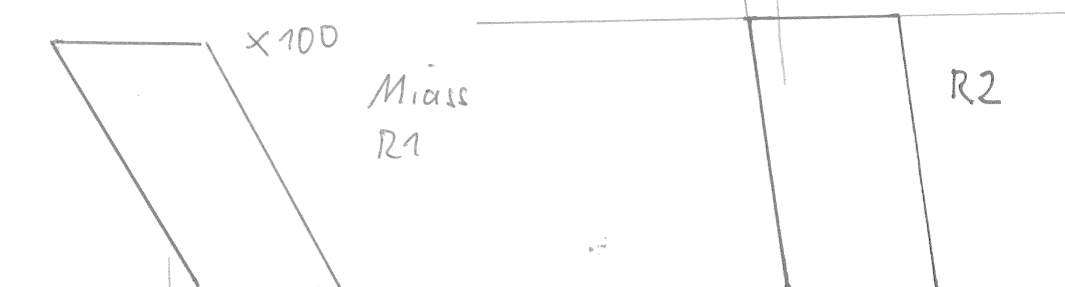
$$1.12$$

$$\delta\theta_4 = -5.75$$

$$-1.23$$

$$\pm 0.03$$

$$\pm 0.05$$



Boeing "J1"

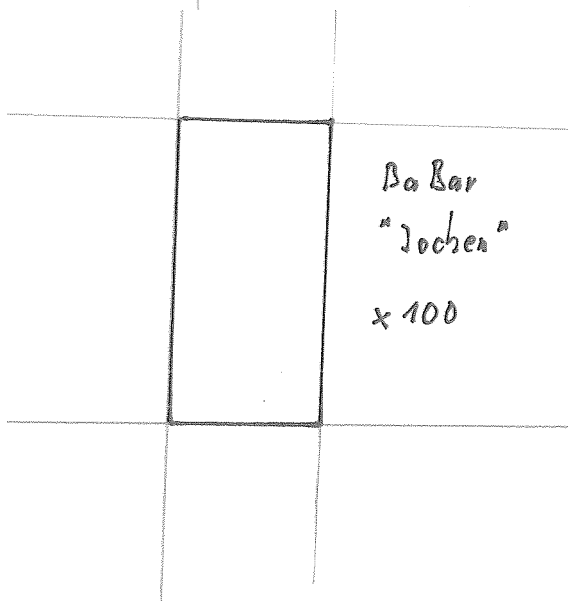
$$\delta\theta_1 = -0.28$$

$$\delta\theta_2 = 0.03$$

$$\delta\theta_3 = -0.08$$

$$\delta\theta_4 = 0.33$$

$$\pm 0.05$$



BaBar requirement:  
<0.25mrad

in principle the full bar can be scanned....

# Summary

- Simple setup allows squareness measurements with angular resolution  $25\mu\text{rad}$  ( $L=10\text{m}$ )
- Radiator bars of three companies were measured
  - Squareness requirements need to be defined
- Front side - back side reflections allow to measure parallelism of disks