

An angle sensor using a PD array

JPPN 2003-156319

Background

Angle sensor for surface profile measurement of precision parts

Required angle sensor

- High sensitivity and wide range
- Compact
- Detection of local slopes



Improvement of sensitivity

Detector: bi-cell photodiode

Spot size ↓ ⇒ Sensitivity ↑

Improvement of range

Detector: PD array

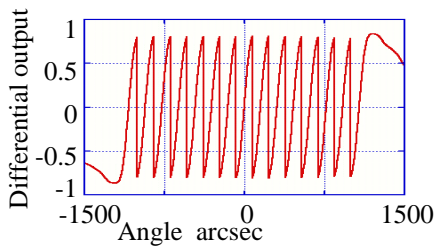
Number of cells ↑ ⇒ Range ↑

Sensor with 1D PD array



Cell number 16
Cell size 1mm×40μm
Cell gap 5μm

Sensor range:
2400 arcsec (1D)



Sensor with 2D PD array

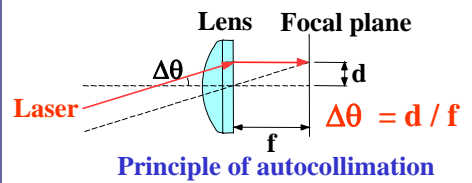
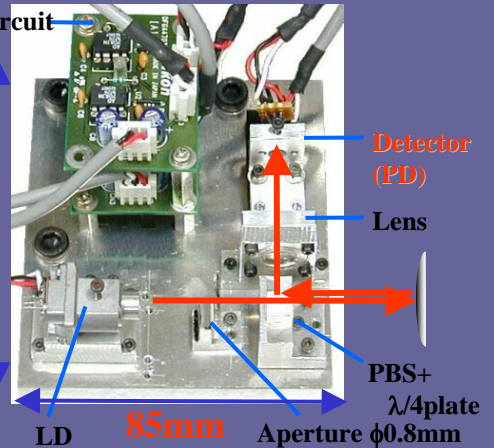


Cell number 16
Cell size 50μm×50μm
Cell gap 20μm

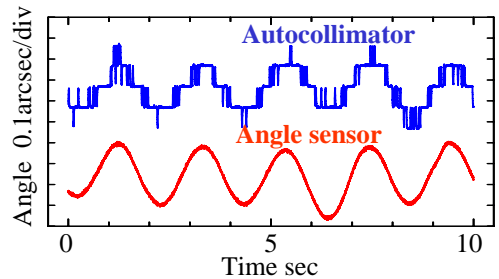
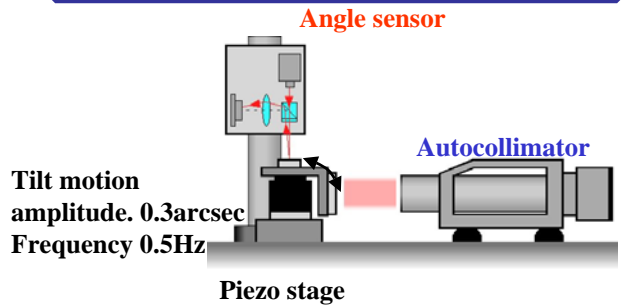
Sensor range
800 arcsec (2D)



I-V circuit

100mm



Comparison with commercial Autocollimator



	Band width	Size (W × D × H)	Weight	Resolution	Range	Dynamic range
Commercial Autocollimator 	60Hz	80 × 441 × 146 mm ³	4.0kg	0.1arcsec	1200arcsec	12000
Angle sensor 	1.6kHz	85 × 100 × 40 mm ³	約0.4kg	0.01arcsec	2300arcsec	230000
Comparison	25	1/10	1/10	1/10	2	20