HEXAGON METROLOGY

Autocollimation Workshop

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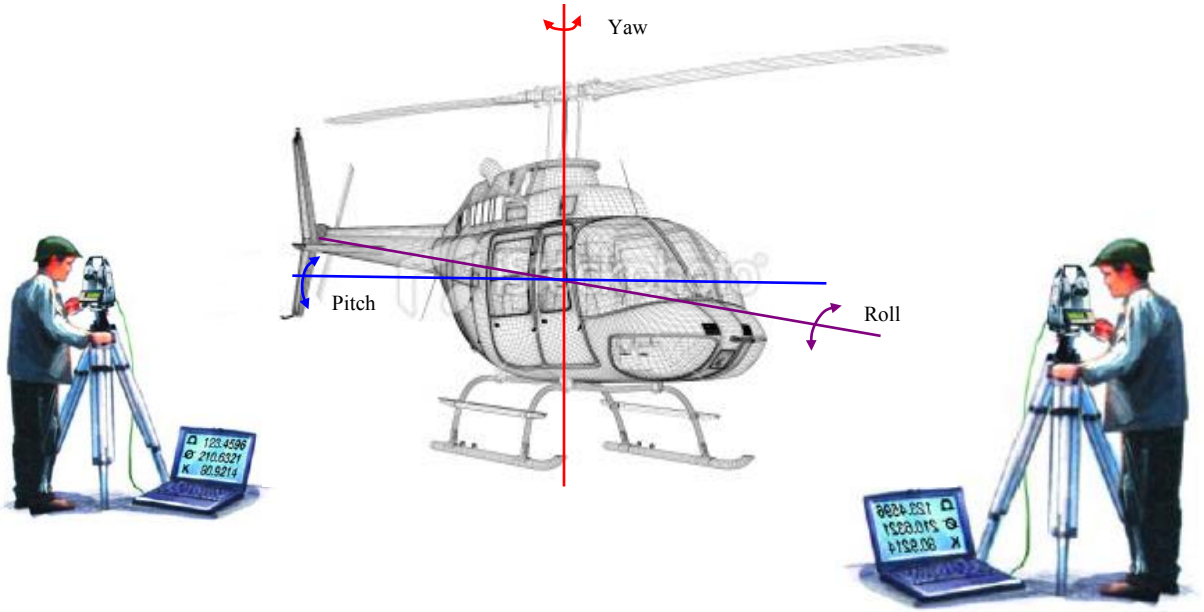
International Support Meeting 13/14 Mar 2013
Unterentfelden (Switzerland)

AT402 Autocollimation

Historically autocollimation work has been done exclusively by the TM series theodolites.

The pan focal telescope and built in autocollimation eyepiece allow for unparalleled accuracy in these applications.



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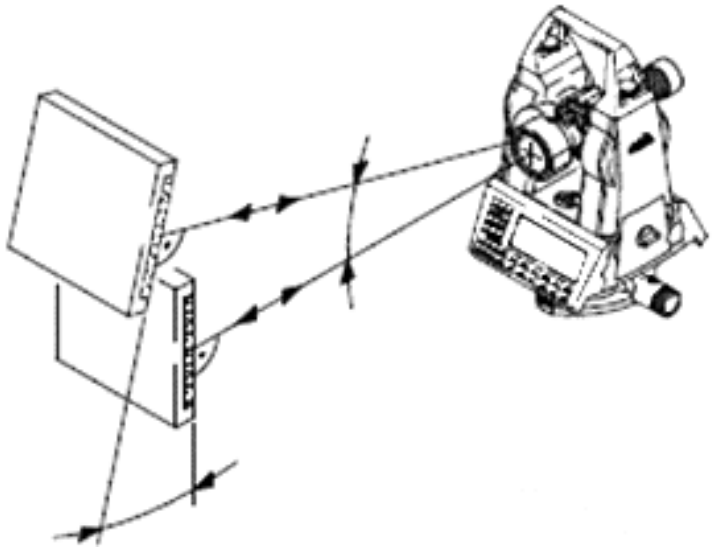
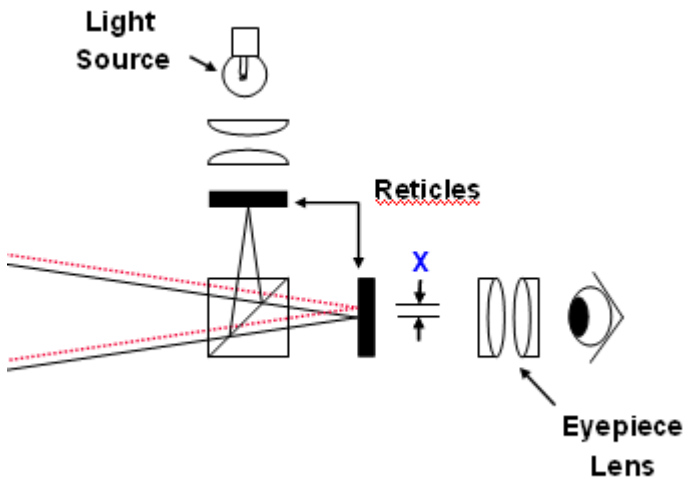
AT402 Autocollimation

In autocollimation the sensor is pointed directly at a mirror and the reflected image is measured establishing a measured vector from the surface of the mirror.

As the mirror is moved or multiple mirrors are measured the angle between the mirror faces can be measured very accurately.





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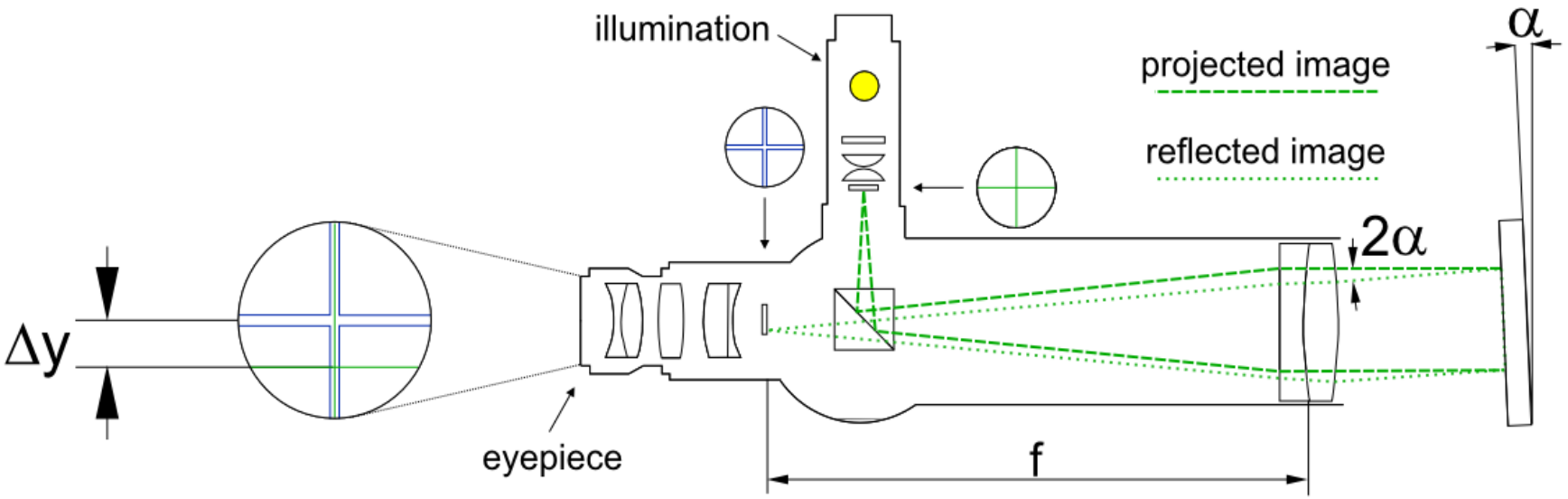
Autocollimation – Working Principle

With the pan focal telescope in the TM6100A we use the human eye to align the reflected image with the telescope reticle.

With the AT402 we are able to do this directly with the ATR!



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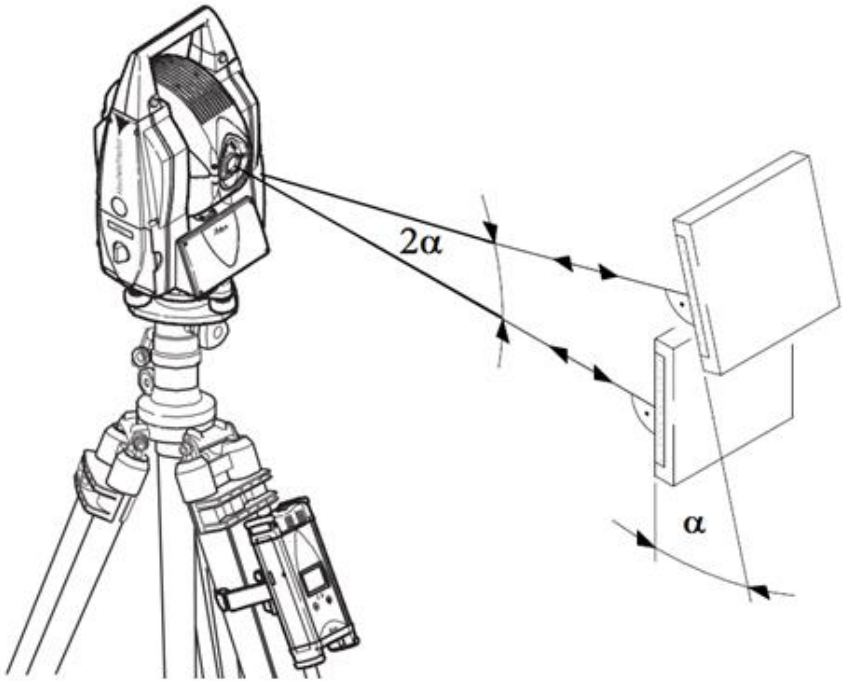
AT402 Autocollimation Process

- All measurements are averaged two face angles
- All measurements include a distance
- Very convenient setup due to the visible Laser Pointer
  → significant time saving compared to TM6100A
- No instrument accessories required



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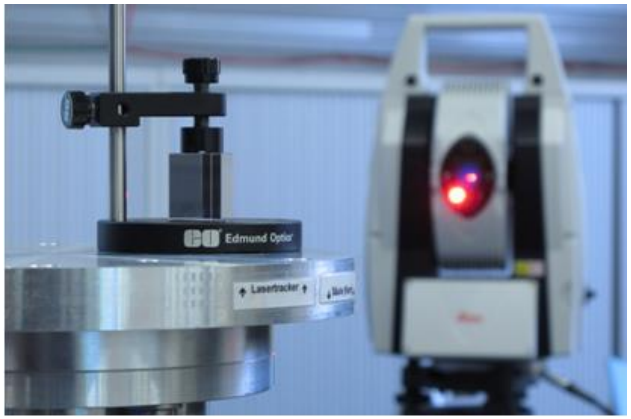
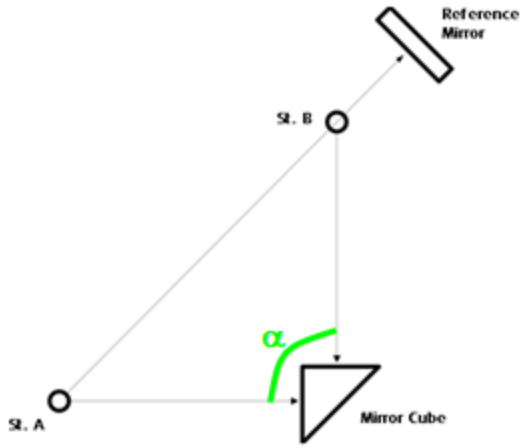
AT402 Autocollimation - Accuracy

- Tests @ University of Applied Sciences Mainz, Germany
- Observation of intersecting angle of mirror cube face normal
- Comparison to traditional Autocollimation Theodolites
- → Same accuracy as TM5100A!





Instrument	Angle [gon]	Std.Dev. [mgon]
Leica AT401 3 sets per station	99.9982	0.10
Leica TM5100A 4 sets per station	99.9983	0.10
Kern E2 4 sets per station	99.9982	0.15

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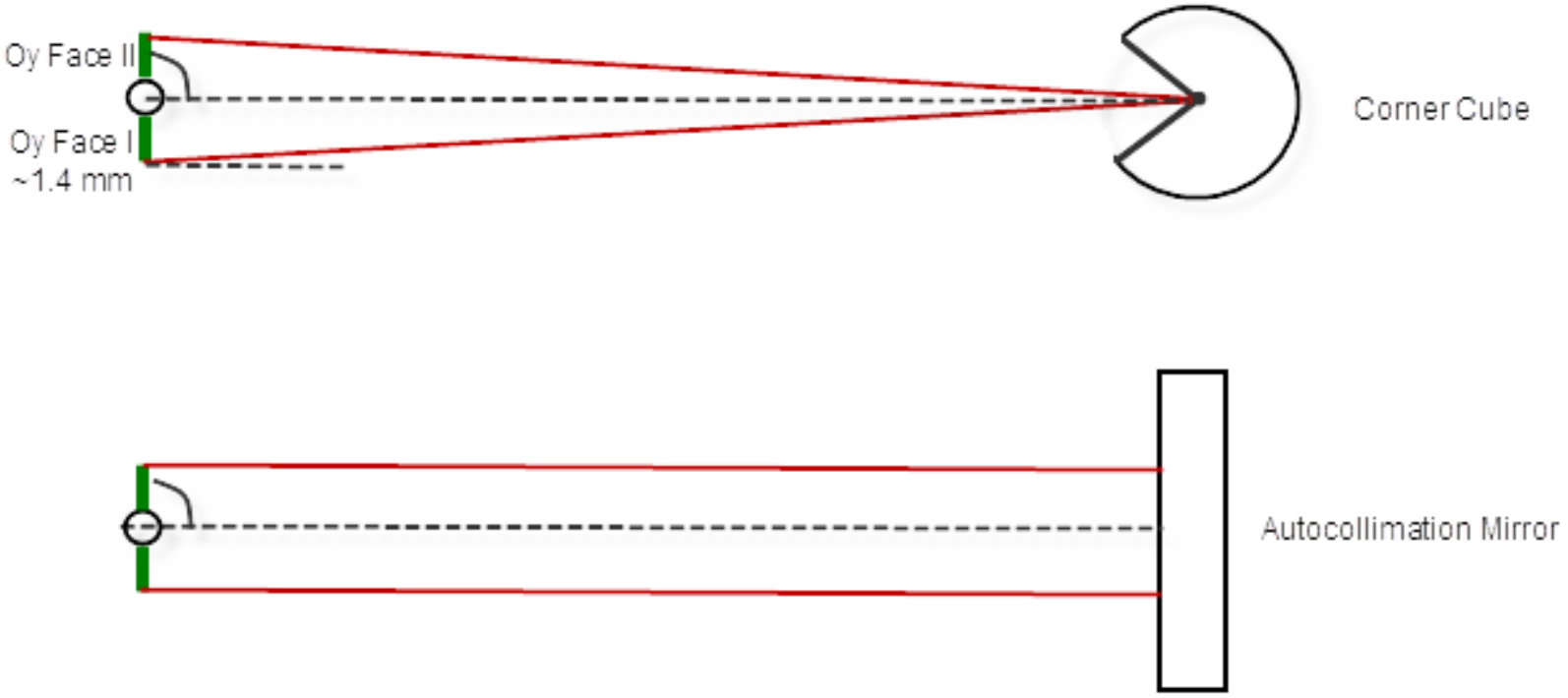
AT402 Autocollimation - Principle

- Why is a two face measurement required with the AT401?



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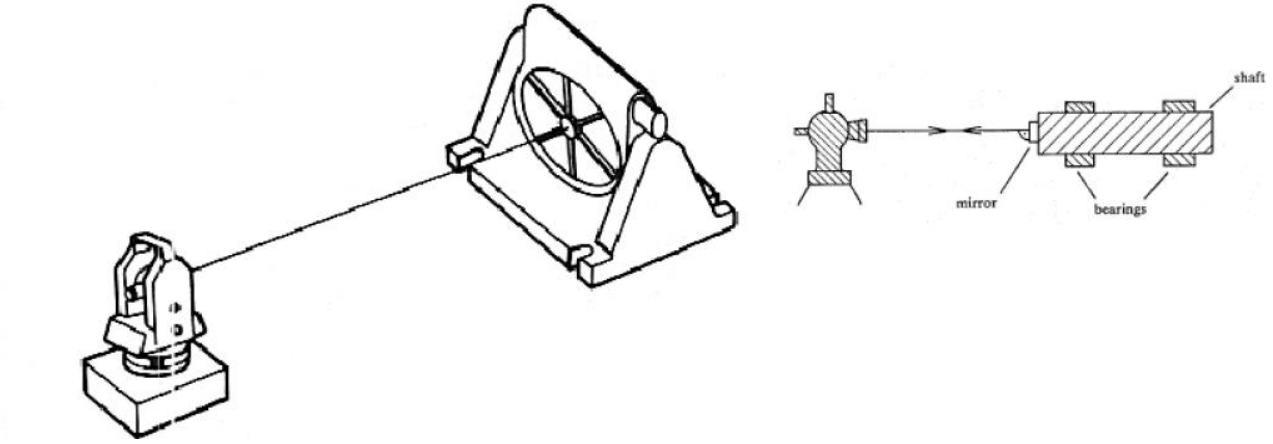
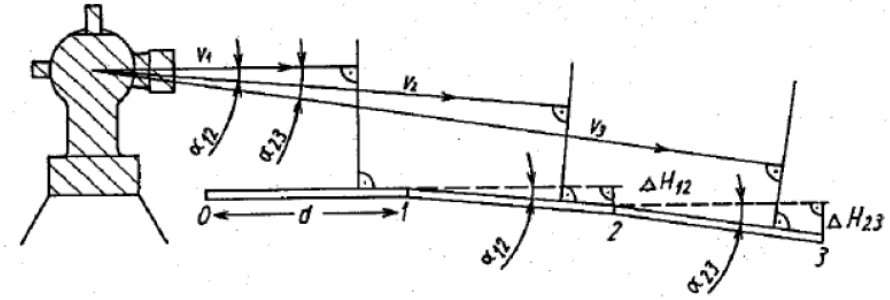
Autocollimation – Typical Applications

- Axis Wobble



- Straightness / Flatness



→ AT402 has a significant acceleration potential for these applications!

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Appendix – Autocollimation Mirror Requirements

- Optically Flat

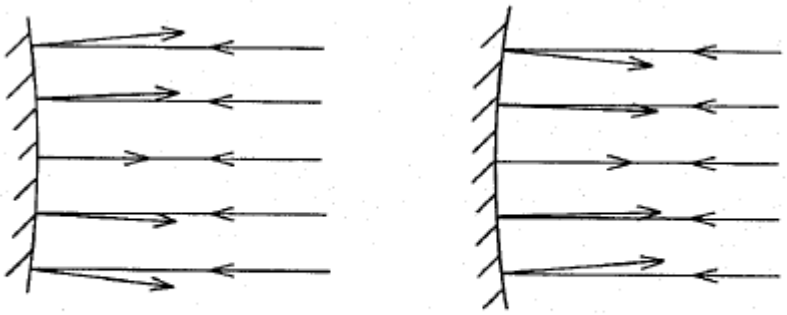


Fig. 12
If the mirror is not flat, rays of light will not be reflected back along their own paths. Thus the reflected image will not be sharp.

- Silvered Front Surface

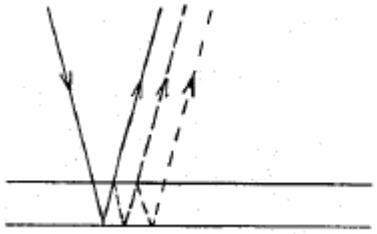
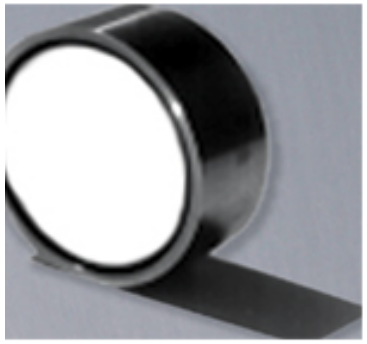


Fig. 13
A rear-surface mirror produces unwanted reflections which will result in the reflected image not being sharp.

Appendix – Autocollimation Mirror Specifications

- Parallelism: < 10‘
- Planarity: 3/0.3 (0.3)
- Cleaniliness: 5/5x0.16
- Coating: 450 – 700 nm
- Rabs: > 85 %



392 368 Autocollimation mirror GAS1, ø 50mm, in case. 783.- CHF

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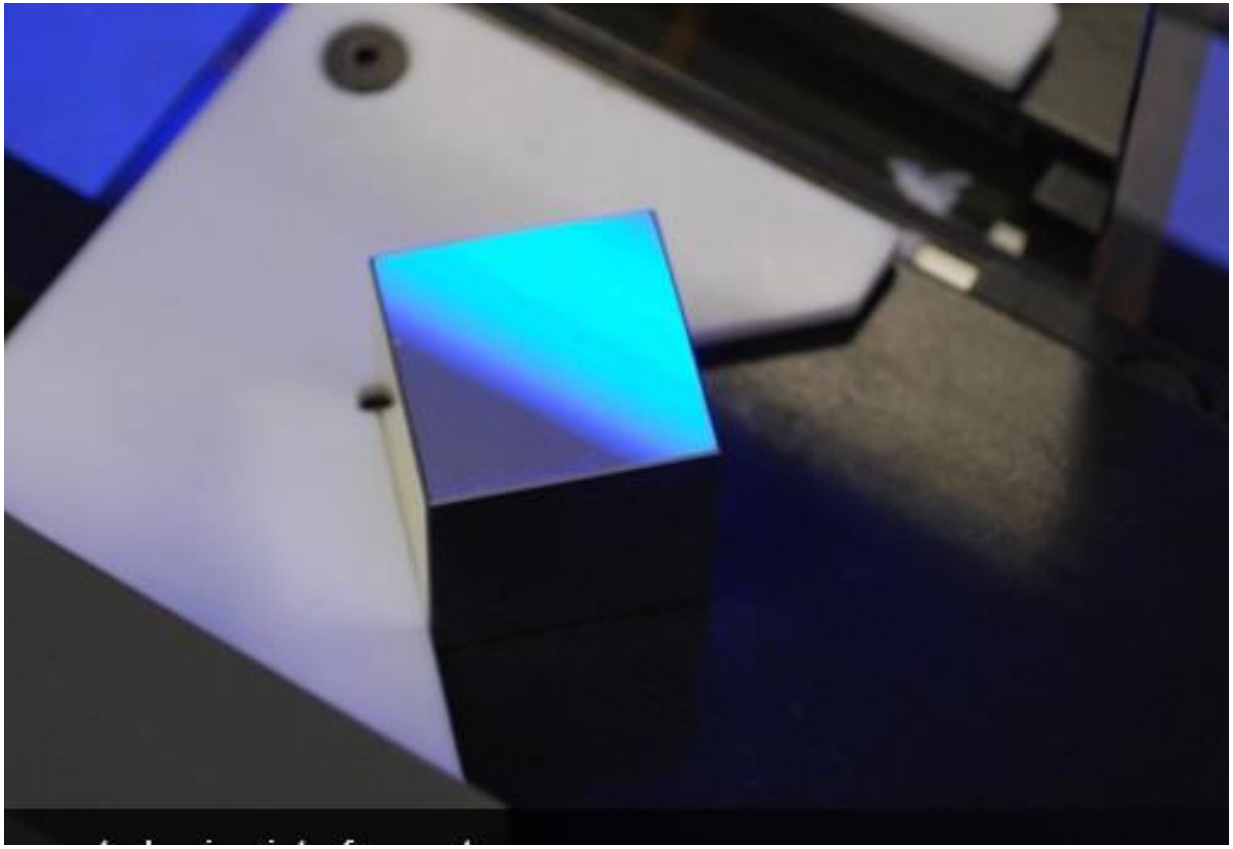
http://www.precisionoptical.com/alignment-cube.php



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