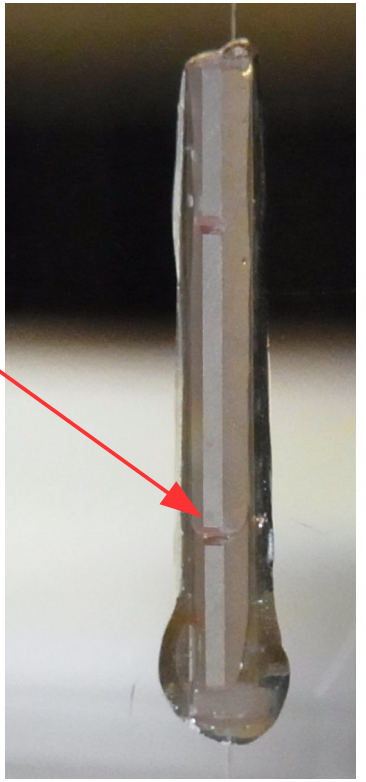
CLIO-LISM-TAMA-KAGRA Hybrid Interferometer

Y. Aso: 2016/1/6

Further delay of suspension installation

- PR2 wire breaker developed cracks

- This will cause a further delay in the schedule
  - Suspension installation will finish at the end of April at the earliest



Operation of iKAGRA by the end of 2016 March is a strict requirement

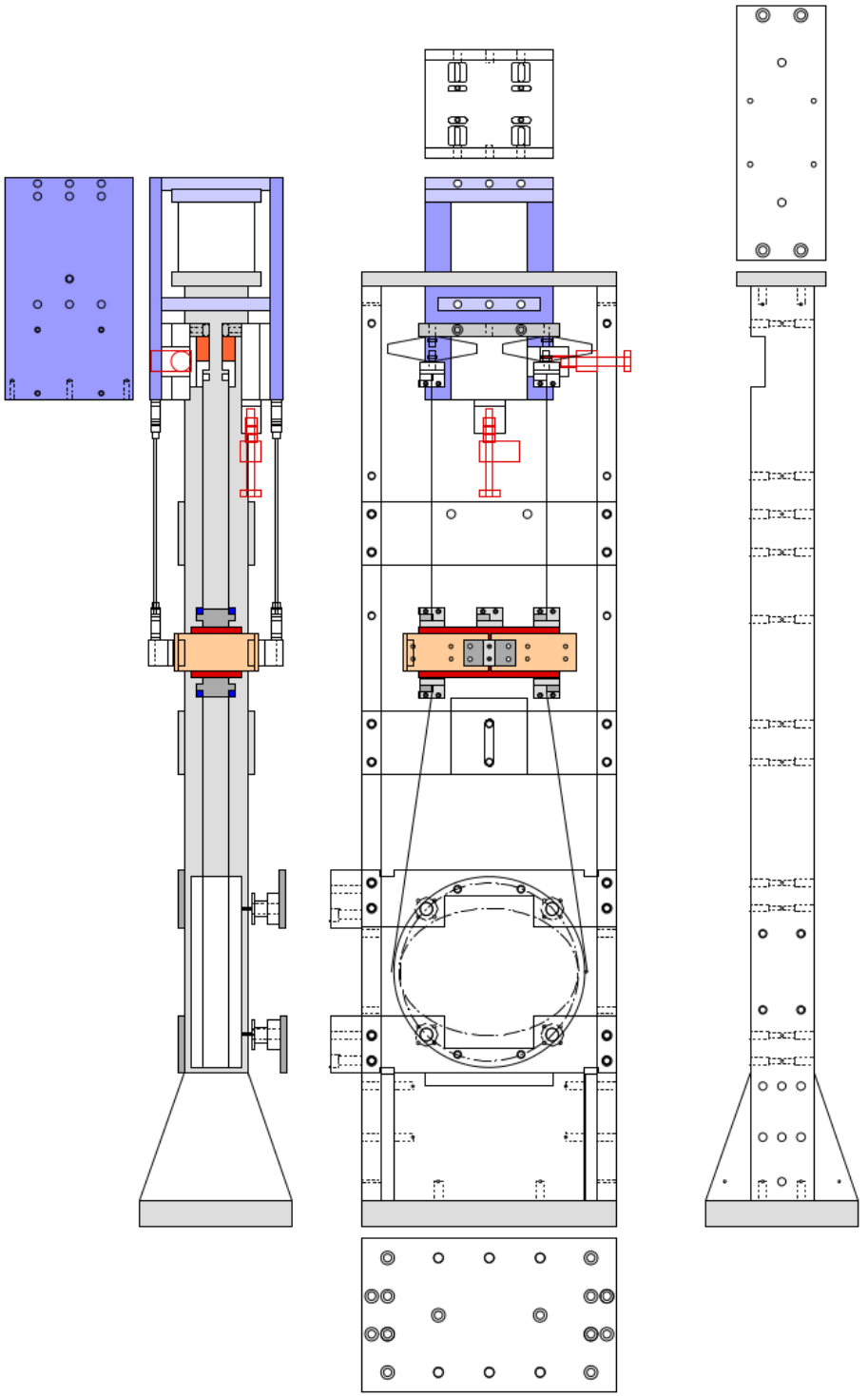
We need to do something about it

We already decided to use

CLIO BS

Diameter: 150mm
Thickness: 40mm
No wedge
S-polarization

Effective clear aperture
(in diameter): 7.4cm



Can we use CLIO mirrors as the ETMs ?

In order to keep the coming back beam at the BS from diverging, we want to use mirrors with ROC close to 7.4km.

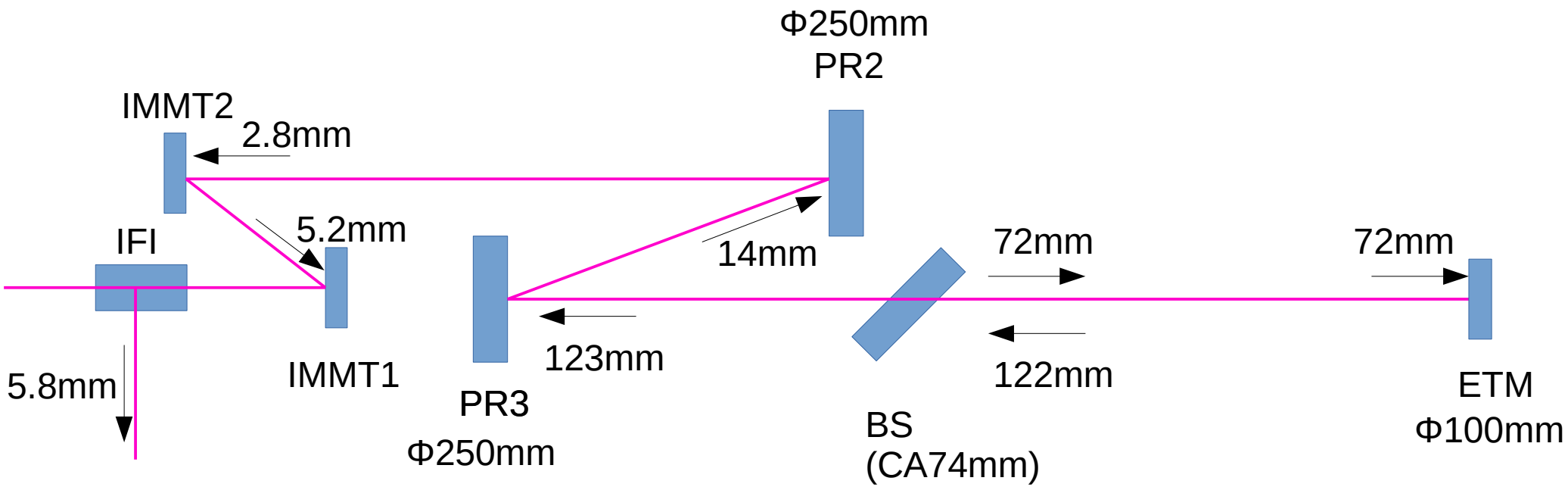
We have flat mirrors

10cm dia. Sapphire (CLIO ITM)

10cm dia. Silica (LISM ITM)

What happens if we use flat ETMs ?

Beam diameters (1σ)



Is it OK to clip the beam at 0.6σ at the BS ?

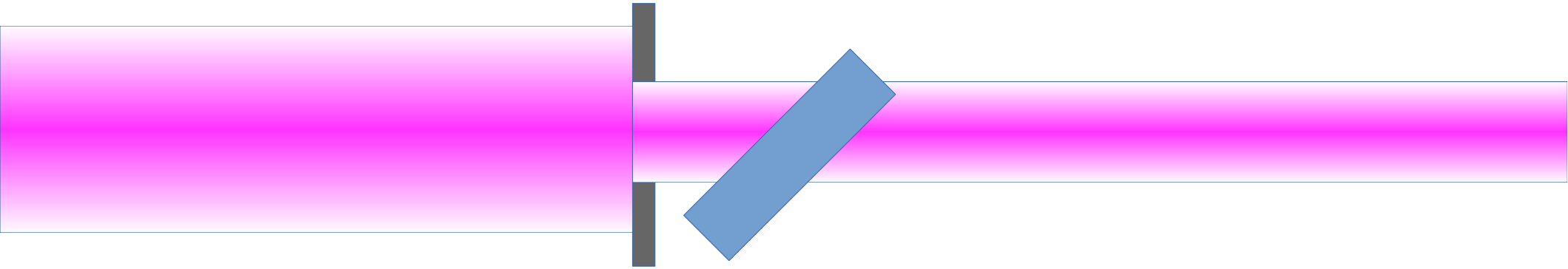
Return beam 1σ diameter: 122mm

vs

BS clear aperture: 74mm

About 50% of the light power is lost

Put an iris in front of BS ?



Can we use TAMA PRMs as the ETMs ?

There are two TAMA PRMs, High-Gain and Low-Gain.

ROC = 9000m
Reflectivitiy: 85% (High Gain), 48% (Low Gain)
Size: 10cm TAMA size

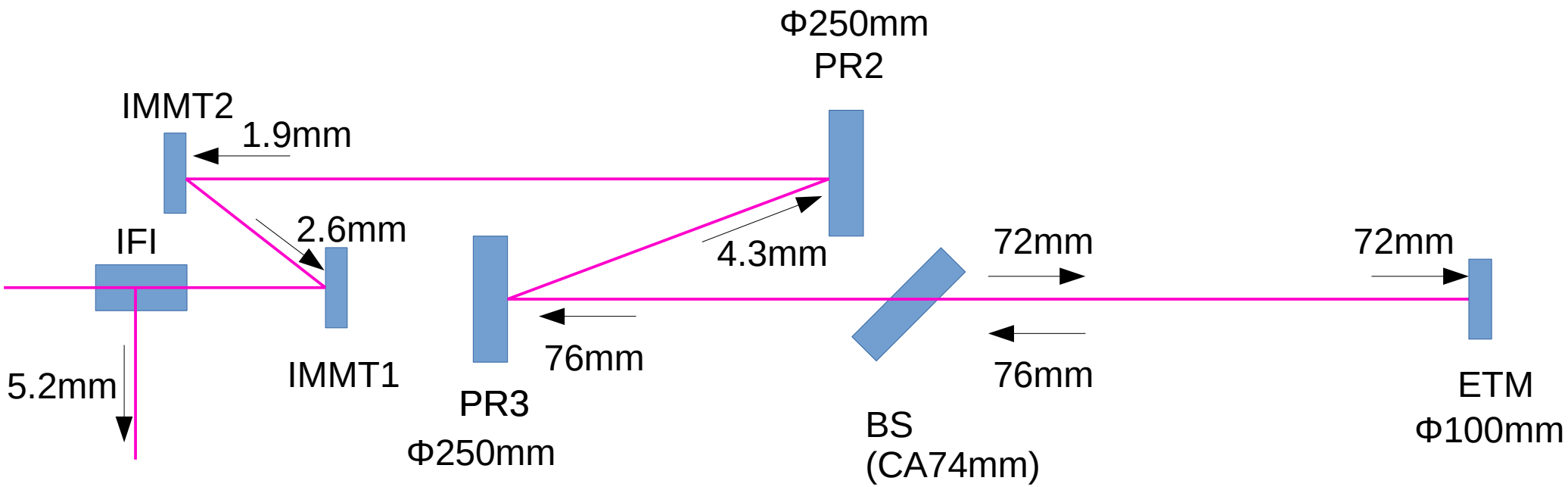
- Both are confirmed to exist in TAMA.
- Magnets and wire breakers are fine.

Large reflectivity difference

Pmax = 0.66*Pin
Pmin = 0.013*Pin

Contrast = (Pmax-Pmin)/(Pmax+Pmin) = 0.96

TAMA PRM Case
Beam diameters (1σ)

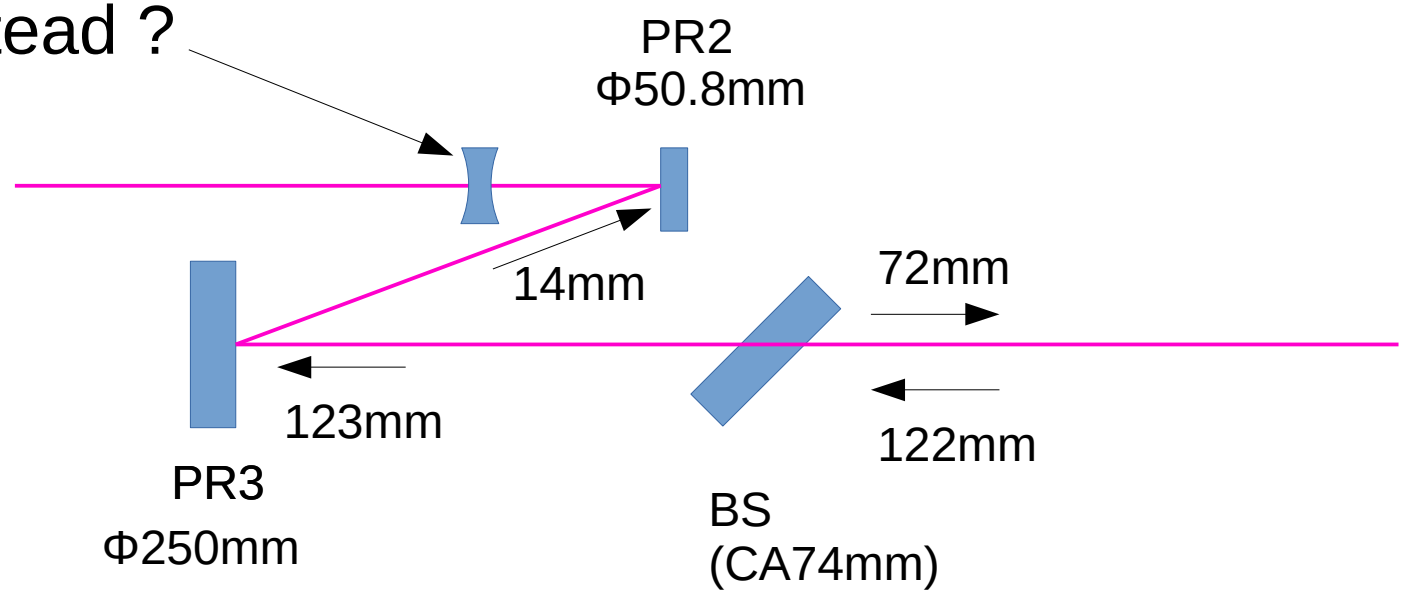


Back up plan for PR2

In case if the repair of the PR2 wire breakers take more time ...

Use a fixed 2-inch mirror ?

- Optimal ROC = -3.08m
- ROC error can be compensated with mirror position
- Availability of 2 inch convex mirror with suitable ROC is a question
- Use a lens instead ?



Questions to be answered

- Can we lock the interferometer ?
  - Fringe lock ?
  - Need optical simulation ?
- Can we put TAMA like suspensions with LISM mirrors in the EXA/EYA chambers ?
- Can we use fixed PR2 ?