

Low transmission loss & high optical isolation

1. Maximum forward transmission

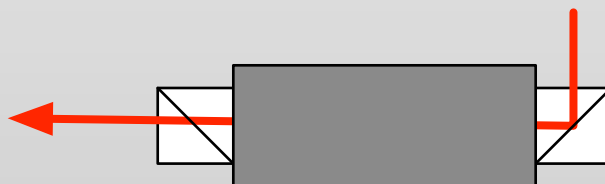
~ Minimum "back scatter isolation" towards squeezer



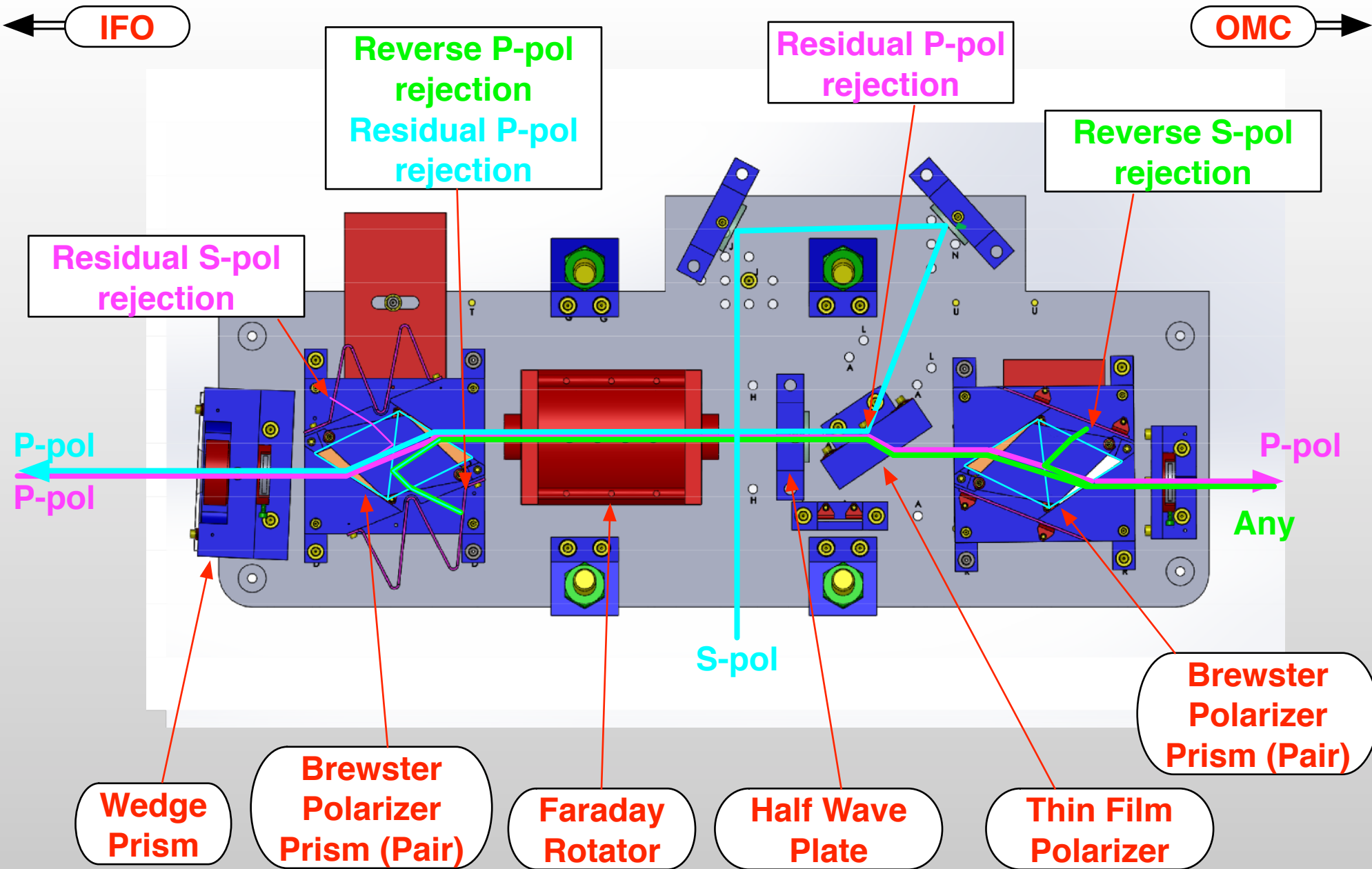
2. Minimum reverse transmission



3. Maximum transmission from the squeezer input



4. And other requirements (wave front distortion, scattering...)



aLIGO OFI Design Spec: T1000181

Trans ~98%, Isolation $1.0\text{e-}4$ (-40dB) based on iLIGO performance

Overall performance test LLO T1300342

Trans 97.6%, Isolation $5.0\text{e-}4$ (-33dB)

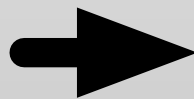
Overall performance test LHO

Raw numbers found in <https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=10996> and analysis E1300390

Trans 96.5%, Isolation $9.6\text{e-}5$ (-40dB)

Intrinsic loss T1400274/E1300428/and the appendix of this file

Wedge	600ppm
Brewster Prism	4000ppm
Rotator	4000ppm
HWP	5000ppm
TFP	820ppm
Brewster Prism	4000ppm



**Total intrinsic loss
of ~2% per pass**

Summary:

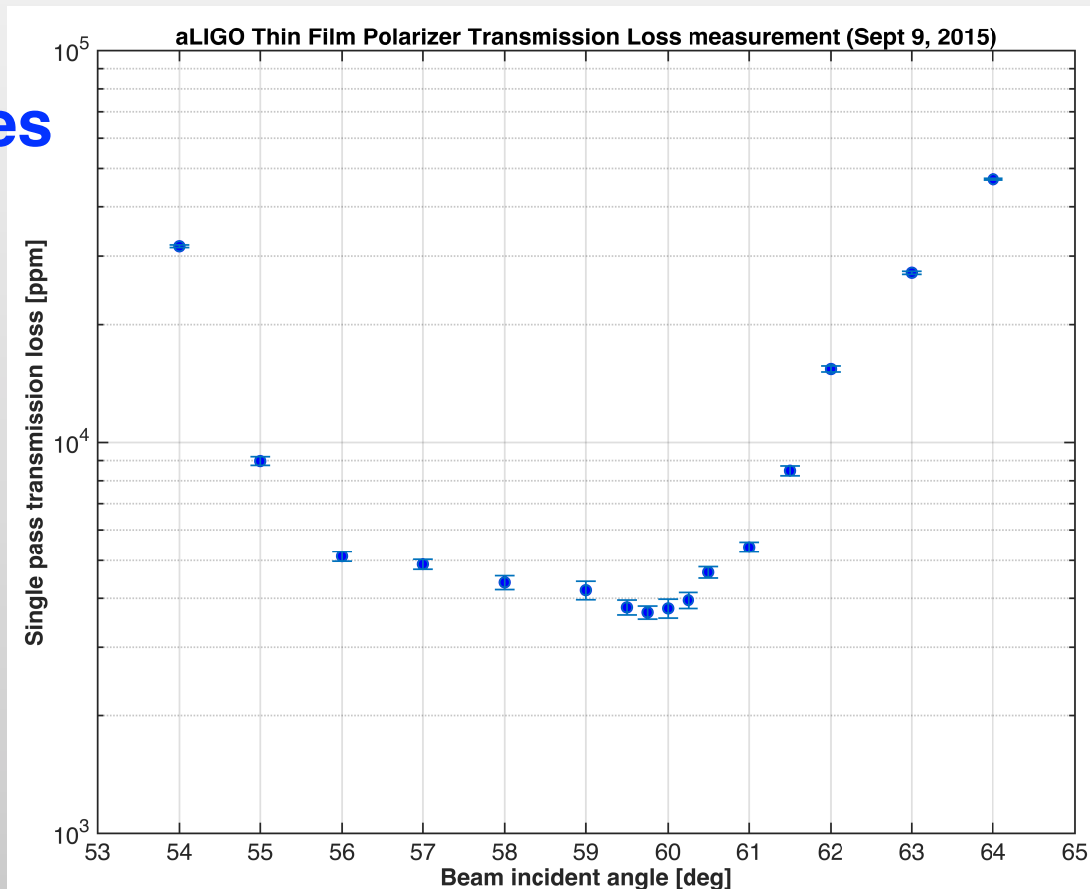
We should aim Trans 98%, Isolation $1.0\text{e-}4$ (-40dB)

Check the performance on the optical table & HAM5

Careful alignment may reduce the non-intrinsic losses

We may need adjustability of the TFP angle
(spec 56deg, measured 56~60.5 for <5000ppm)

Prepare spare optics



Components extracted from H1 squeezer OFI by Lisa B -> Kate D -> Koji A

- Half Wave Plate (In a holder: looks like D1100029)
- aLIGO Thin Film Polarizer
- Brester Prism Polarizer (2 Prisms)

- A rotator crystal in a housing was returned to Calum (Aug 7, 2015)

Note: All components have unknown cleanliness

- **Do we want to do more enhancement on the straylight treatment of the OFI?**
 - the OFI input has a black glass aperture (D1001920).
 - Don't we want to have a glass dump at the output side too? (For the septum reflection)
 - Is the steel dumps on the OFI OK?
- **Beam deflection in HAM6**
 - At the HAM6 installation, anomalous deflection of the incoming beam was found
 - The deflection was horizontal by 2" at LLO and absorbed by moving OM1.
<https://alog.ligo-la.caltech.edu/aLOG/index.php?callRep=7600>
 - It was horizontal and vertical at LHO and mitigated by rotating the septum window
<https://alog.ligo-wa.caltech.edu/aLOG/index.php?callRep=13391>
 - Keita estimated the deflection angle and evaluated that it is too big to be mis-adjustment of the wedge prism. So we can't say this is owing to the OFI. We just can say "there is something unmodeled".
 - Meaning, the OFI replacement likely to involve opening of HAM6.

Wedge Plate

Spec: E1200098 ==> AR R=500ppm (per surface)

Meas: T1300789 ==> AR R<300ppm (per surface)

AOI tolerance: 0~8deg

Half wave plate

Spec:

Vendor: T1300346 (Unreadable small number)

Meas: OMC elog http://nodus.ligo.caltech.edu:8080/OMC_Lab/243

Loss = 820+/-160ppm per optic

AOI tolerance: +/-5deg

Faraday Rotator

Spec: E1000116

Vendor: T1300347 99.58% (4200ppm loss per optic)

E1500418 99.6% (4000ppm loss per optic) PO: S230407 S/N 006

Meas:

Brewster Polarizer Prism

Spec:

Vendor: T1300346 (Unreadable small number)

Meas: OMC elog http://nodus.ligo.caltech.edu:8080/OMC_Lab/243
900+/-50ppm per surface (x4 per prism pair)
AOI: +/-1deg (<1000ppm)

Thin Film Polarizer

Spec: E1000398 T>99.5% (loss 5000ppm)

Vendor: T1300346 (Unreadable small number)

Meas: OMC elog http://nodus.ligo.caltech.edu:8080/OMC_Lab/243
3680+/-140ppm per optics
AOI: 56~60.5 for <5000ppm