Mirrors of the Optical Parametric Oscillator (OPO) of the H1 squeezer

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1 Description

The OPO designed for the H1 squeezer is formed by 4 mirrors.
The four mirrors are labeled as O1, O2, O3 and O4, as shown in Figure 1.

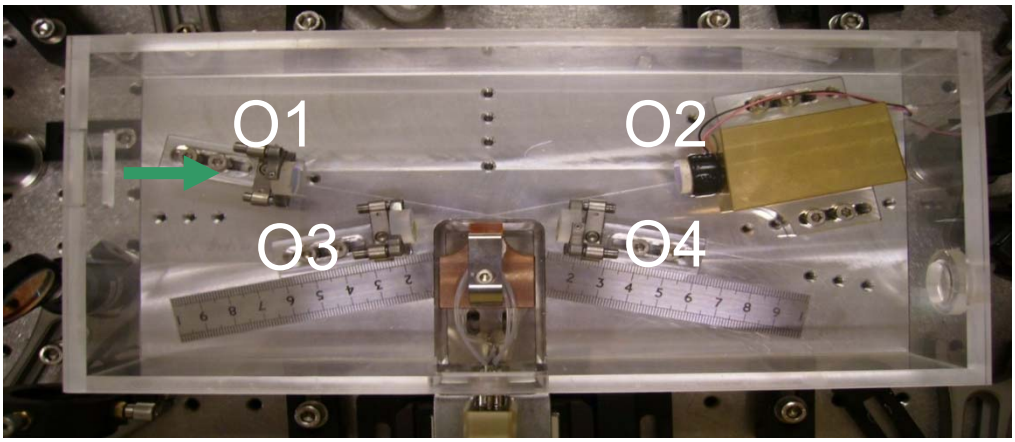

Figure 1: OPO layout

The pumping green field enters the OPO from the rear of O1.
The characteristics of the four mirrors are specified in this document.
Mirrors O5 and O6 will be coated as O1 and O2 respectively, but they have different thickness.

2 Material

Corning HPFS 7980 (high purity fused silica, UV grade)
Grade 0A (Low inclusion class: <0.3 mm² cross section, 0.1 mm max. size;
Homogeneity < 1ppm)

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3 Dimensions

MIRROR O1
FLAT-FLAT
Diameter: 12.7mm +0/-0.2mm
Thickness (center): 6.35mm ± 0.05mm
Wedge: 30 arcminute

MIRROR O2
FLAT-FLAT
Diameter: 12.7mm +0/-0.2mm
Thickness (center): 3.175mm ± 0.050mm
Wedge: 30 arcminute

MIRROR O3
PLANO-CONCAVE
Diameter: 12.7mm +0/-0.2mm
Thickness (center): 6.35mm ± 0.05mm
Radius of Curvature (ROC):

- Inner ROC **(Side1):** R1 = -38mm ± 0.75mm (2%)
- Outer ROC **(Side2):** FLAT

MIRROR O4
PLANO-CONCAVE
Diameter: 12.7mm +0/-0.2mm
Thickness (center): 6.35mm ± 0.05mm
Radius of Curvature (ROC):

- Inner ROC **(Side1):** R1 = -38mm ± 0.75mm (2%)
- Outer ROC **(Side2):** FLAT

MIRROR O5
FLAT-FLAT
Diameter: 12.7mm +0/-0.2mm
Thickness (center): 3.175mm ± 0.05mm
Wedge: 30 arc-minute

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MIRROR O6

FLAT-FLAT
Diameter: 12.7mm +0/-0.2mm
Thickness (center): 6.35mm ± 0.05mm
Wedge: 30 arc-minute

4 Surface Roughness

Side 1
Super-polished
< 1 Angstrom over central 80% of diameter with 10-5
scratch-dig; best effort for 0/0 20-10 scratch-dig outside central 80% of diameter.
Side 2
< 5 Angstrom over central 80% of diameter

5 Surface Figure

Side 1
Flat < λ/10 at 632.8 over central 80%
Side 2
Flat < λ/4 at 632.8 over central 80%

6 Coating

Wavelength: 1064nm and 532nm
Polarization: **s** (both for 1064nm and 532nm)
AOI: **6 degrees**

O1

Side 1
R@1064nm = 87.5% ± 1%
R@532nm= 70% ± 1%
Side 2
AR@1064 < 0.1%
AR@532 < 0.2%

O2

Side 1
R@1064 = 99.85% ± 0.05%
HR@532 > 99.9%

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Side 2
AR@1064 < 0.1%
AR@532 < 0.2%

O3

Side 1 (concave)
HR@1064 > 99.99% (best effort)
HR@532 > 99.9%
Side 2 (flat)
AR@1064 < 0.1%
AR@532 < 0.2%

O4

Side 1 (concave)
HR@1064 > 99.99% (best effort)
HR@532 > 99.9%
Side 2 (flat)
AR@1064 < 0.1%
AR@532 < 0.2%

O5

Side 1
R@1064nm = 87.5% ± 1%
R@532nm= 70% ± 1%
Side 2
AR@1064 < 0.1%
AR@532 < 0.2%

O6

Side 1
R@1064 = 99.85% ± 0.05%
HR@532 > 99.9%
Side 2
AR@1064 < 0.1%
AR@532 < 0.2%