OC23040-PRP-00001

As part of project OC23040

Customer:

New-Mexico State University

Subject:

OAPs SONG3 COLLIMATOR

3 April 2024

NMSU

Off-Axis Parabolas

Doc. N.: OC23040-PRP-00001
Issue: 1.00
Date: 03/04/2023
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Attn: Charles Miller
New Mexico State University

Sarcedo, April 3rd, 2024

Subject: Final drawings and updated tech specs for OAPs SONG3 collimator

Dear Charles,

As per your recent technical discussion with my colleague Paolo Miotti, I'm providing this document which goal is to set the final specification for the OAPs that will be supplied.

I'm available for any question.

Luca Bonato, M.Phys.
Sales & Business Development

Signed for acceptance:

Officina Stellare   New Mexico State University

1 TECHNICAL SPECIFICATIONS

Optical characteristics

Each collimator mirror will be defined by following parameters:

Radius of curvature	900 ± 10 mm **(*)**
Conic constant	-1.000 (parabolic shape)
Focal length	450 mm
Off-axis distance	120 mm (see drawings in the appendix)
Clear aperture	<7 mm from mirror edges
Mother parabola diameter	370 mm
Mother parabola F/ratio (on-axis)	F/1.28
Substrate	Schott Zerodur (or equivalent)
Substrate thickness	>30 mm

(*) the tolerance on the radius of curvature must be intended as applicable to the parent mirror. All four delivered mirrors must share the same radius of curvature, being optically coupled inside the instrument.

Surface accuracy

In order to achieve the required image quality in the spectrograph, each mirror can contribute to the overall WFE for a limited amount. Each beam will hit the collimator mirror on a sub-pupil smaller than the overall size of the clear aperture. Then, surface accuracy must be guaranteed over each sub-pupil:

| Surface accuracy (PtV)	< λ/2 over each 85 mm diameter sub-pupil (PVr < 320 nm; any Ø90 mm inside C.A.)
Surface accuracy (RMS)	< λ/10 over each 85 mm diameter sub-pupil (RMSi < 32 nm)
Test wavelength (λ)	633 nm
Surface micro-roughness	S/D 60/40

Coatings and efficiency

Coatings shall withstand normal cleaning in a laboratory environment.

Reflection (average)	Rave	> 98.5% in the 500-600 nm range
		> 98% in the 480-680 nm range
Reflection (absolute)	Rabs	> 97% in the 470-700 nm range
Angle of Incidence	AoI	7° ± 3.5° (useful range)

Footprints on mirrors

Spectrograph dispersed beams impact on the collimator mirrors with different footprints as shown below:

MAIN COLLIMATOR

TRANSFER COLLIMATOR
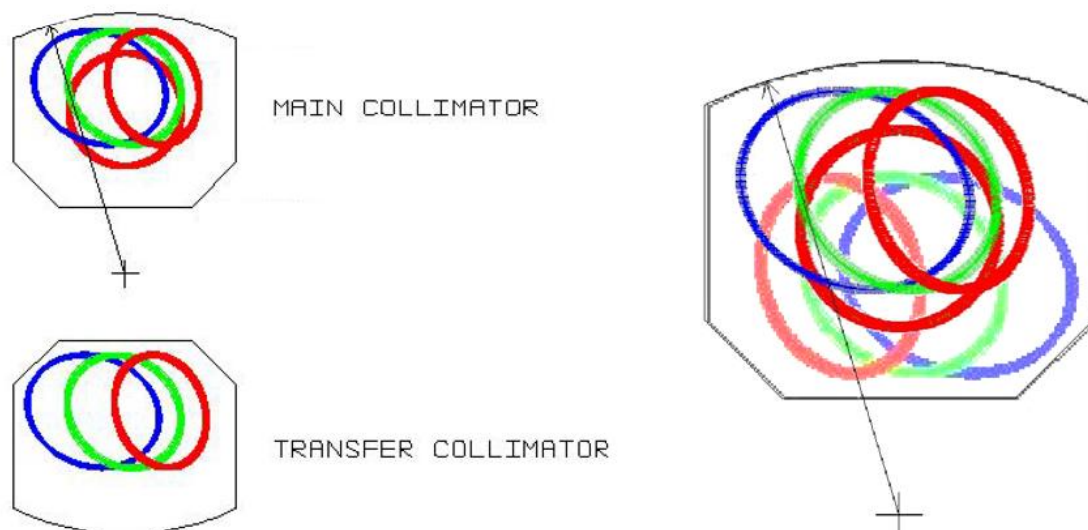
The shape of the mirrors has been selected in order to have some cost saving when multiple units will be done. Indeed, from the same mother parabola, four identical mirrors can be cut.

ISO 10110 Standard

R = 900 ± 1 mm CC

k = −1.000 ± 0.001 (Off Axis Parabola)

Clear Aperture (C.A.): edge exclusion < 7 mm

Prot. Chamfer: 1 mm

3/ RMSi < 32 nm; PVr < 320 nm; any Ø90 mm inside C.A.

4/-

5/ 60-40; C60-40; E2

6/-

Coating:

- Protected Ag

- withstands moderate abrasion & adhesion tests

- cleanable with IPA

R185 ± 0.5

(84.1)

130 ± 0.5

56 ± 1

(38.5)

90 ± 0.5

150 ± 0.5

55 ± 0.5

OAP Vertex

AUTHOR NAME :
P. Spanò

DATE :
11-Jan-2024

SUPERVISOR NAME :

DATE :

FORMAT :
A3

COMPANY :
New Mexico State University

SCALE :
SCALE

WEIGHT (kg) :
WEIGHT

VERSION :
2

SHEET :
1

SONG3 Collimator Mirrors
Off Axis Parabola

According to ISO 10110 Standard