

Preliminary requirements specification for a set of 4 Dichroics for the VLT-ERIS project

V01.1, 18/Dec/2017

ERIS is a new instrument for the Very Large Telescope (VLT). It includes an Adaptive Optics (AO) Module requiring three dichroics:

1. **2 x IR/VIS Dichroic** – 2 elliptical (100x144mm) Dichroics reflecting the visible beam (400nm-1000nm) to the AO wavefront sensors (WFSs) and transmitting the NIR/MIR beam (1000nm-5400nm) to the science instruments. The Dichroic is wedged with a spherical back surface to compensate for lateral chromatism and astigmatism in the transmitted beam;
2. **1 x VIS/VIS Notch Dichroic** - 1 circular (92mm diam.) Notch Dichroic transmitting the D₂ Sodium beam (585nm-595nm) to the AO Laser Guide Star (LGS) WFS and reflecting the complementary visible band to the Natural Guide Star (NGS) WFS;
3. **1 x TC Dichroic** - 1 smaller circular (25mm diam.) Dichroic reflecting the long visible beam (595nm-1000nm) to the NGS WFS detector and transmitting the short visible beam (400nm-585nm) to the Technical Camera (TC).

1 IR/VIS Dichroic (x2)

Coating: Dichroic on Left Surface, AR on Right Surface

Dichroic Transition wavelength: 1000nm

AOI: 45°

F/number: 13.6

Dichroic performance:

Average un-polarized reflectance:
>90% (goal 95%) 450-950 nm

Dichroic+AR performance:

Absolute un-polarized transmittance:
>90% (goal 95%) 1050-3000nm; >85% (goal 90%) 3000nm-5400nm

Average un-polarized transmittance:
>85% (goal 90%) 1050-3000nm; >80% (goal 85%) 3000nm-5400nm

Emissivity:
<5% 3000-4000nm; <10% 4000-5000nm; <50% above 5500nm

Durability: as per MIL-C-48497 or equivalent.

Note that the dichroic is wedged (0.667deg) with spherical concave Right Surface (R=63700mm).

Adaptation of the prescription to melt data of the CAF2 blank is allowed.

The thickness in the ISO table refers to the central thickness.

Left Surface		Material	Right Surface
R PLANO $\emptyset e 136^{+8}_{-6}$ \emptyset 3/ 0,25(0,125) 4/ 0,667(2) 5/ 1x0,25;L1x0,004 6/ - AOI= 45 deg		GLASS: CAF2 Nd = 1,433849 $^{+0,0001}_{-0,0001}$ Vd = 95,00 $^{+1}_{-1}$ 0/ 5 1/ 2x0,05 2/ 4;5	R 63700 $^{+600}_{-600}$ CC $\emptyset e 136^{+8}_{-6}$ \emptyset 3/ -(0,125) 4/ - 5/ 1x0,25;L1x0,004 6/ -
ISO Element Drawing Indications According to ISO 10110			
DATE	SCALE	DRAWN	APPRV
01/12/2017	0,4300:1		
PROJECT/TITLE			Zemax Zemax OpticStudio 16.5 SP3
ERIS Warm Optics - OptA			
PART/DRAWING		REVISION	ERIS WD 2 aprMC_T0000 per ISO VIS-IR dichroico.ZMX
VIS-IR dichroic			Configuration 4 of 5

2 VIS/VIS Notch Dichroic

Coating: Notch Dichroic on Left Surface, AR on Right Surface

AOI: 17°

F/number: 13.4

Notch central wavelength: 589.3nm

Notch Dichroic performance:

Average un-polarized reflectance:

>95% 610-950 nm

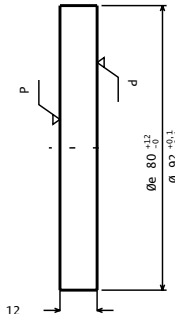
>95% 400-570 nm

Notch Dichroic+AR performance:

Absolute un-polarized transmittance:

>90% (goal 95%) 585-595nm

Durability: as per MIL-C-48497 or equivalent.

			
Dimensions in Millimeters			
Left Surface	Material	Right Surface	
R PLANO $\varnothing e 80^{+0.12}_{-0}$ Ø 3/ 0,25(0,125) 4/ - 5/ 1x0,25;L1x0,004 6/ - AOI = 17deg	GLASS: N-BK7 Nd = 1,516800 Vd = 64,17 0/ 5 1/ 2x0,05 2/ 4;5	R PLANO $\varnothing e 80^{+0.12}_{-0}$ Ø 3/ 0,25(0,125) 4/ - 5/ 1x0,25;L1x0,004 6/ -	
ISO Element Drawing Indications According to ISO 10110			
DATE	SCALE	DRAWN	APPRV
01/12/2017	0,6700:1		
PROJECT/TITLE			Zemax
ERIS Warm Optics - OptA			Zemax OpticStudio 16.5 SP3
PART/DRAWING		REVISION	ERIS_BFL500_WFS_LGS_v13 NGS LGS dichroic.zmx
NGS LGS dichroic			Configuration 1 of 1

3 TC Dichroic

Coating: Dichroic on Left Surface, AR on Right Surface

AOI: 40°

F/number: 13.4

Dichroic Transition wavelength: 590nm

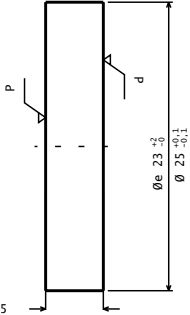
Dichroic performance:

Average un-polararized reflectance:
>95% 610-1000 nm

Dichroic+AR performance:

Absolute un-polararized transmittance:
>90% (goal 95%) 400-570nm

Durability: as per MIL-C-48497 or equivalent.

			
Dimensions in Millimeters			
Left Surface	Material	Right Surface	
R PLANO $\varnothing e 23^{+0.12}_{-0}$ $\textcircled{0}$ 3/ 0,25(0,125) 4/ - 5/ 1x0,25;L1x0,004 6/ -	GLASS: N-BK7 Nd = 1,516800 Vd = 64,17 0/ 5 1/ 2x0,05 2/ 4;5	R PLANO $\varnothing e 23^{+0.12}_{-0}$ $\textcircled{0}$ 3/ 0,25(0,125) 4/ - 5/ 1x0,25;L1x0,004 6/ -	
ISO Element Drawing Indications According to ISO 10110			
DATE	SCALE	DRAWN	APPRV
01/12/2017	2,5000:1		
PROJECT/TITLE		Zemax	
ERIS Warm Optics - OptA		Zemax OpticStudio 16.5 SP3	
PART/DRAWING	REVISION	ERIS_BFL500_WFS_NGS_v27.ZMX	
TV dichroic BS		Configuration 3 of 4	

4 Environmental

REQ#	Item	Specification
ENV01	Air Temperature	All requirements shall be met under the following temperature conditions: Functional air temperature range: -10 to +25°C Operational air temperature range: + 0 to +15°C Air temperature gradient at night: +0.5 to -0.9 °C/hour
ENV02	Humidity	All requirements shall be met under the following humidity conditions: Operational humidity: 0-80 % RH (not condensing).
ENV03	Storage Temperature	-30 to +60 °C

Contact point:

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