

## NIR Optics – FFTS Optical Interface

Interface Document: LN-MPIA-FDR-INT-222		Issue: 1.2
Relevant Documents: LN-MPIA-FDR-OPT-002, LN-MPIA-FDR-INT-221		
Brief Description: This document describes the optical interface of the NIR optics to the FFTS.		
Prepared: P. Bizenberger Date: 9 May 2005	Approved: T. Bertram Date: 11 May 2005	Released: M. Kürster Date: 20 May 2005

### Interface Description

In terms of f/ratio, sampling and PSF size, the specifications are identical with LN-MPIA-FDR-INT-221. Here, some further numbers are given which are relevant only for the larger FFTS field.

The field of view is basically elliptical but for the design only fields up to 1 arcmin in diameter were considered. Fields between 1 and 1.5 arcmin are weighted with zero for the design, and are used for analysis only.

The center fields are shifted in focus since the raypass through the dichroic in addition to the filter. Around this center area is an annular area where the field of view is basically blocked by the mounting of the dichroic. This area cannot be used. The transition from full blocking to full transmission is smooth. The area of vignetting is defined where any vignetting takes place, even though these fields could partially be used for fringe tracking.

## Interface Specification

Field of view	Elliptical 1 arcmin * 1.5 arcmin (partially vignetted by the primary mirror and the dichroic filter wheel unit)
Radius of curvature of the focal plane	-217.34 mm (center of curvature in direction of incoming rays)
Shape of image plane	Elliptical section of a sphere with some vignetting
Vignetting factors	Up to 100% for certain fields
Area of vignetting	See sketch next section
Focus shift due to FFT filter* transmission	1.628 mm (longer back focal length)
Focus shift due to FFT filter* plus dichroic** transmission	4.877 mm (longer back focal length)
Center, unvignetted area	Circular field, 55 mm diameter
Distance dichroic (structure) – focal plane	340 mm

\* Filter substrate assumed to be fused silica and 5 mm thick.

\*\* Dichroic substrate assumed to be fused silica and 10 mm thick.

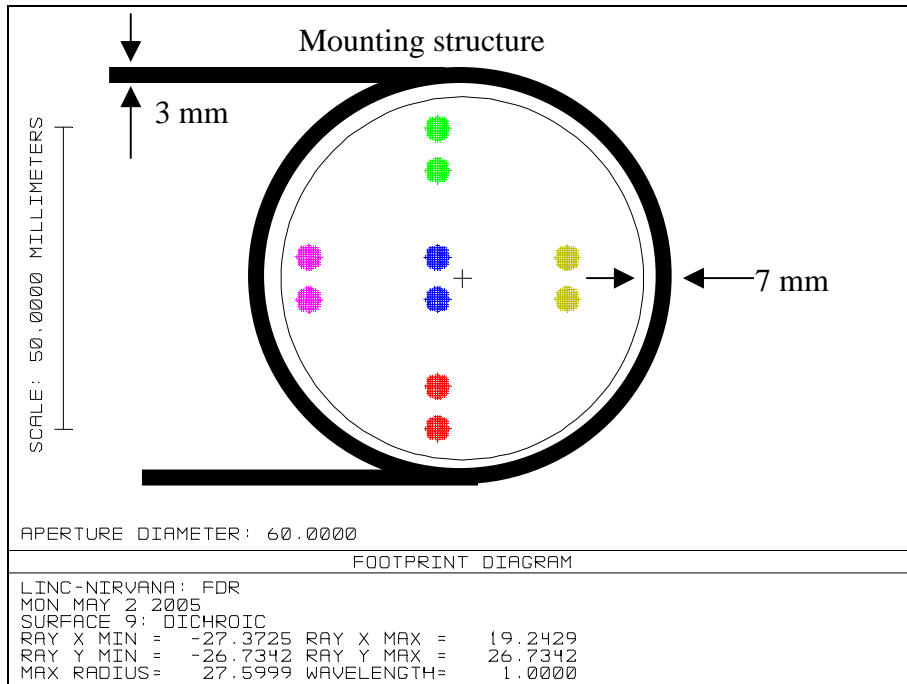
### Area of vignetting due to dichroic mounting structure:

There are two different areas which introduce vignetting: the spiders and the round mounting of the filters. The width of the spiders is 3 mm. The width of the round mounting is 7 mm.

The footprint in the dichroic plane are, for each point source, separated beams of each ~ 4 mm diameter and 3 mm separation. The total extension in the high resolution direction is 11 mm.

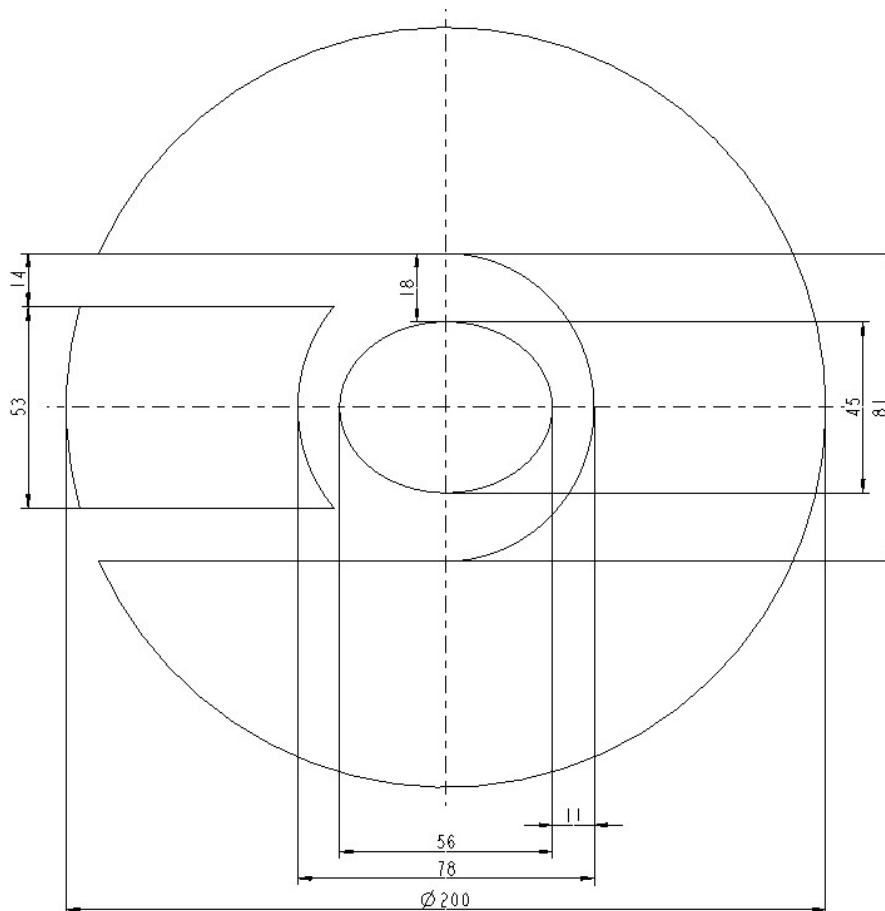
Conclusion: Some areas are vignetted by 100% from the round mounting structure. The fields transmitting light partially through the dichroic and partially passing the dichroic, cannot be used anyway since the focal position is different.

The straight mounting structure of the arms vignette in any case less than 50% i.e. a star is always visible but the fringes may fade, since one of the arms block one beam by a large factor.



Footprint in the dichroic plan.

The width of the vignetted field, where the vignetting goes from zero to maximum, on the FFT image plane corresponds to the width of the structure plus the width of the beam at the dichroic mirror plan.



Footprint in the focal plan. Vignetted areas in the 1 arcmin diameter FFTS focal plane.