



# HARPS North

## FRD Measurment of the Octagonal fibers

Issue 1.0

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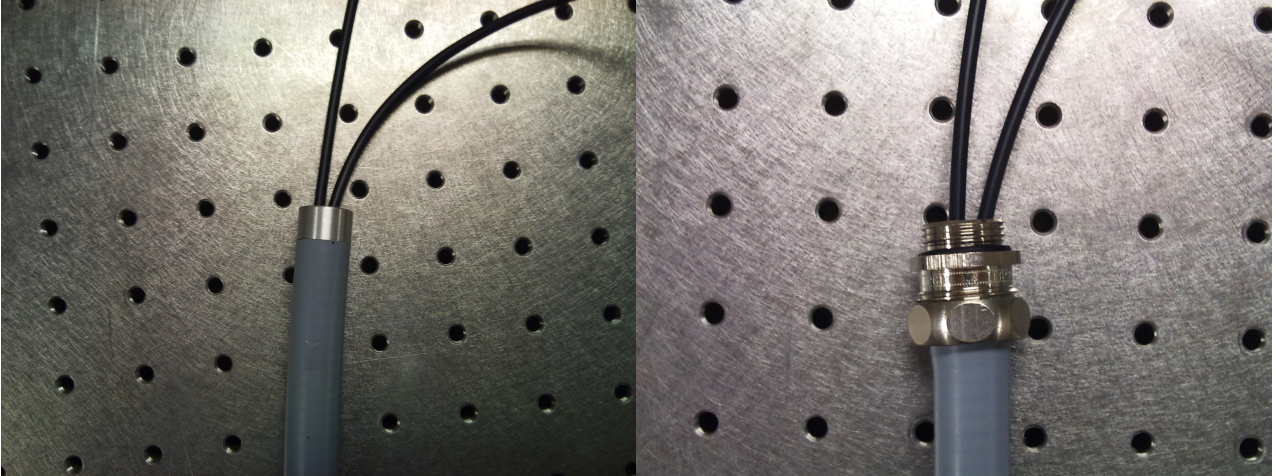


Figure 1: Photo to identify both ends of the **ext** Fibers. On the left the 1 fiber

## 1 introduction

In this document are reported the measurement of the geometrical FRD of the different fibers produced for the HARPS NORTH instrument. There are 2 types of fibers that have been tested. the fiber inside the instrument named **int** the rest of the text and the fibers outside the instrument named **ext** in the rest of the text. the **int** fibers have a SMA connector at one end and are naked at the other end. These fibers have been characterized only on the connected side. The **ext** fibers are grouped in 2 assembly of 2 fibers. They are connectorized at both ends. In order to differentiate the 2 extremities one uses the fact that the external cladding grouping the 2 fibers is not symetric. On one end there is a threaded termination and on the other ther is a flat termination. In the rest of the text the side with the flat termination is noted 1

## 2 Definition of the measurement

The measurement is performed the following way. The tested fiber is illuminated in a controlled way by a beam of tunable aperture (in this case F/4) and the image size is 35 microns. The output of the fiber is directly projected on a CCD. To calbrate angularly the output of the fiber the distance CCD Fiber can be tuned thanks to micrometer. This calibration has been made for all the measurments presented here.

There is a risk of systematic error in the measurement due to the fact that the injection of the light is doen blindly. The biggest risk seems to be to inject a beam that is not orthogonal to the acceptance cone of the fiber. This means the value presented here have a tendency to overestimate the loss due to FRD.

The measurement is done producing a radial beam profile from the image. The image reduction process is the following. A background is removed from the image using the corner of the image (a simple mean is calculated). The barycenter of the image is used as the center of the beam profile. The profile is then build as a radial mean.

The FRD number is then only geometry based. It represent the proportion of the energy inside the input aperture measured on the output profile.

### 3 Results

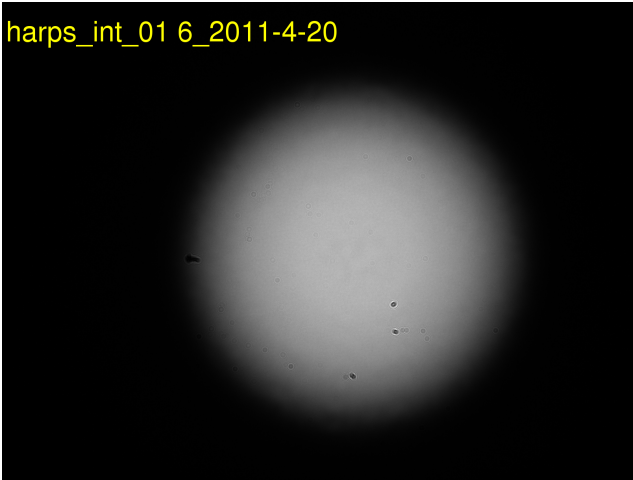
Some fiber ends have been measured more than once. It shows the possible systematics of the measurement. The maximum number is the most probable value because most of the systematics tends to lower the value measured.

Fiber Name	FRD
harps-int-01 6-2011-4-20	88.2 %
harps-int-02 5-2011-4-20	89.2 %
harps-int-03 19 2011-5-24	83.5 %
harps-int-04 20 2011-5-24	94.7 %
harps-ext-01 18-2011-5-17	82.9 %
harps-ext-01 8-2011-4-21	89.7 %
harps-ext-01 4-2011-4-13	72.1 %
harps-ext-01 7-2011-4-21	76.1 %
harps-ext-01l 11-2011-5-5	81.0 %
harps-ext-01l 17-2011-5-17	81.6 %
harps-ext-02 9-2011-5-5	85.0
harps-ext-02l 10-2011-5-5	85.3 %
harps-ext-03 15-2011-5-17	86.5 %
harps-ext-03l 14-2011-5-17	86.1 %
harps-ext-03l 13-2011-5-5	86.6 %
harps-ext-04 16-2011-5-17	91.2 %
harps-ext-04l 12-2011-5-5	87.8 %

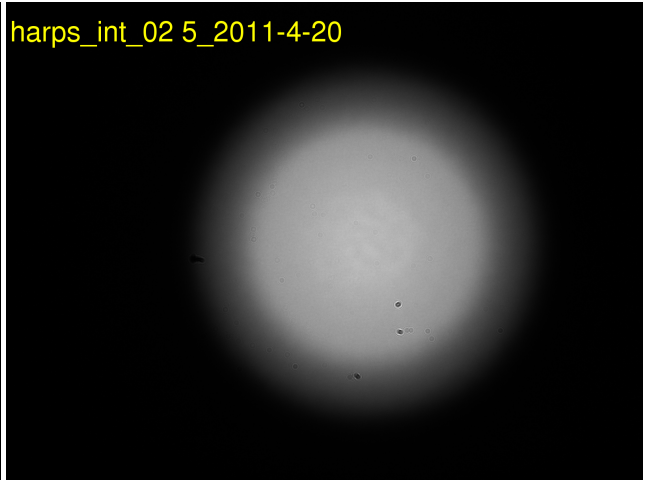
## 4 Experimental Data

### 4.1 Images

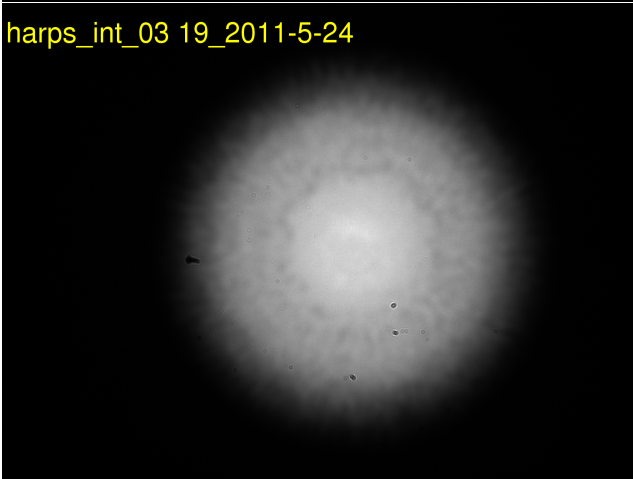
harps\_int\_01 6\_2011-4-20



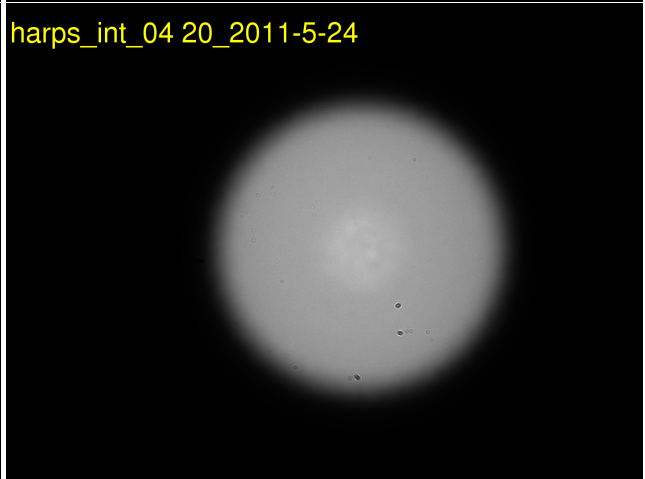
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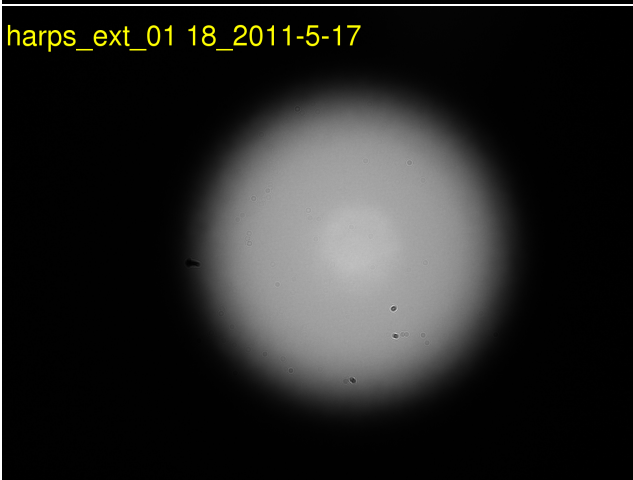
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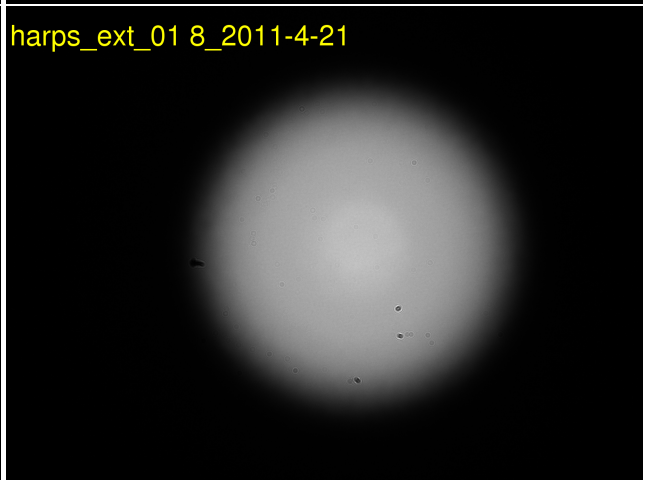
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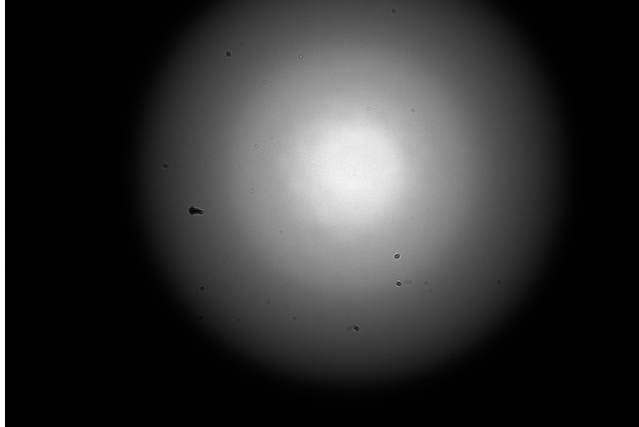
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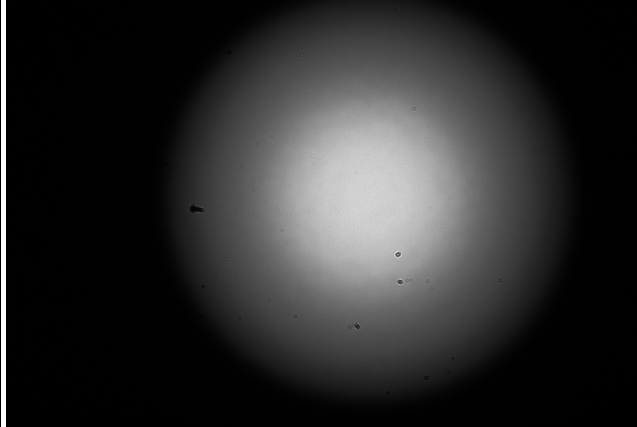
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harps\_ext\_01 4\_2011-4-13



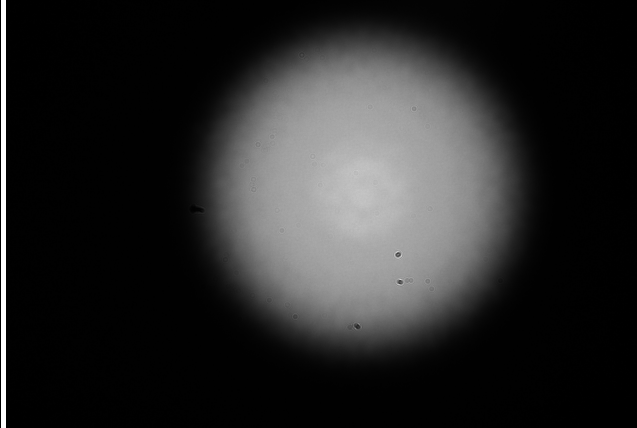
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harps\_ext\_01 11\_2011-5-5



harps\_ext\_01 17\_2011-5-17



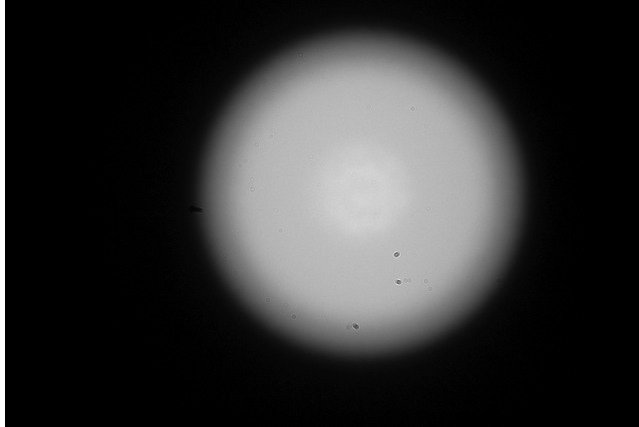
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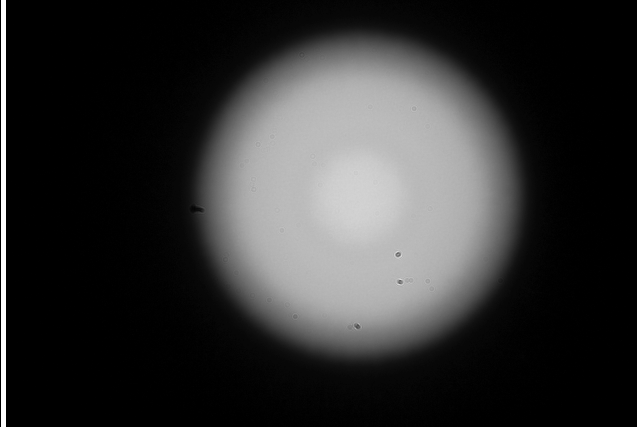
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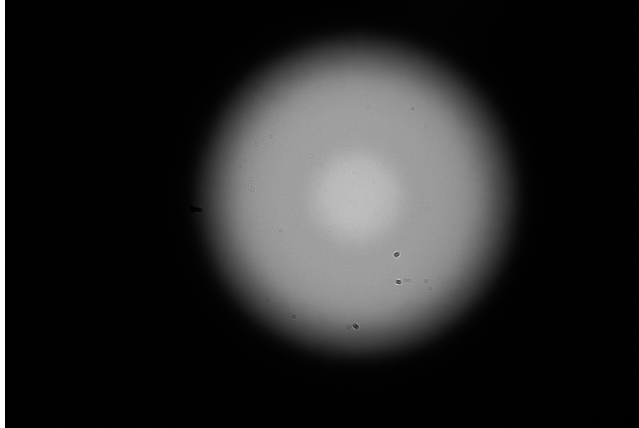
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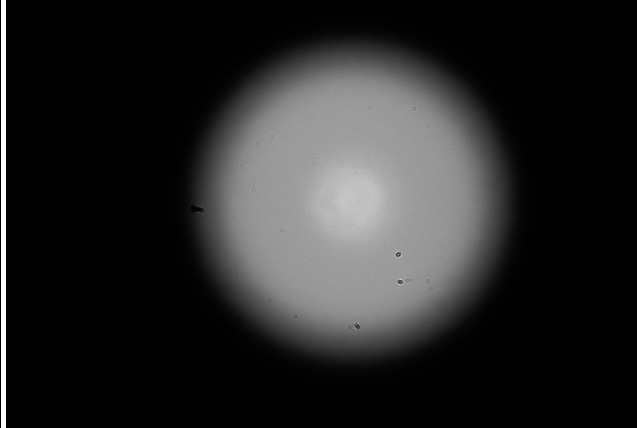
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harps\_ext\_03 13\_2011-5-5



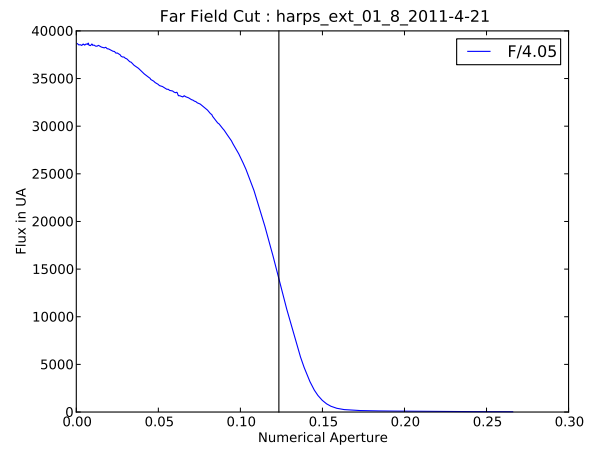
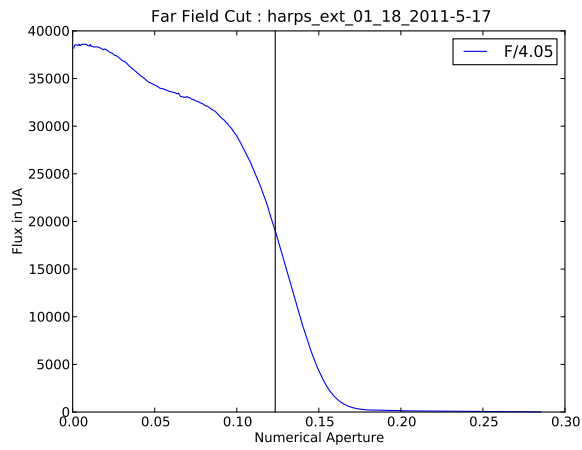
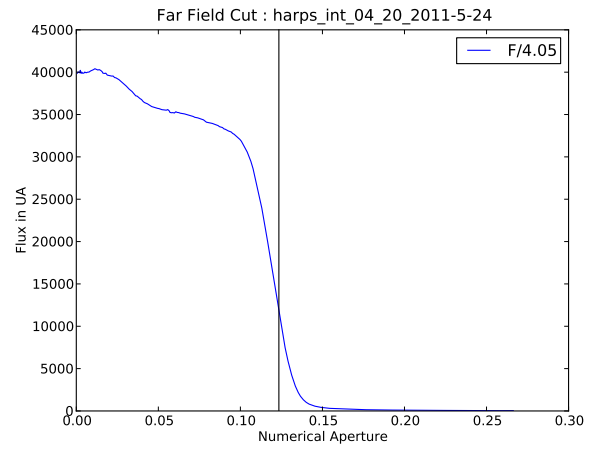
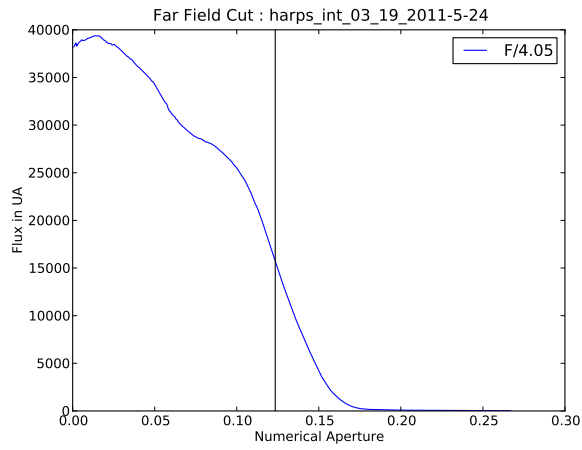
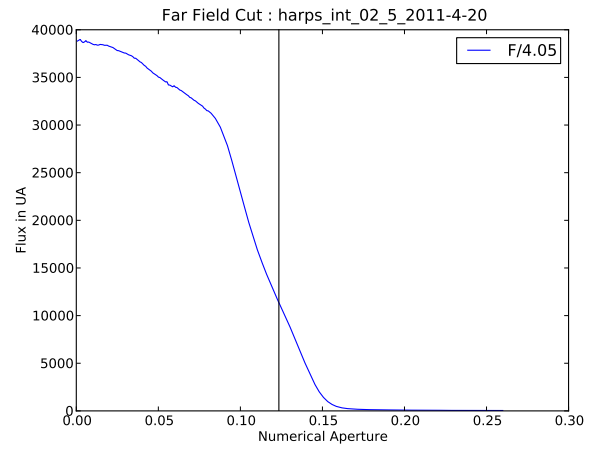
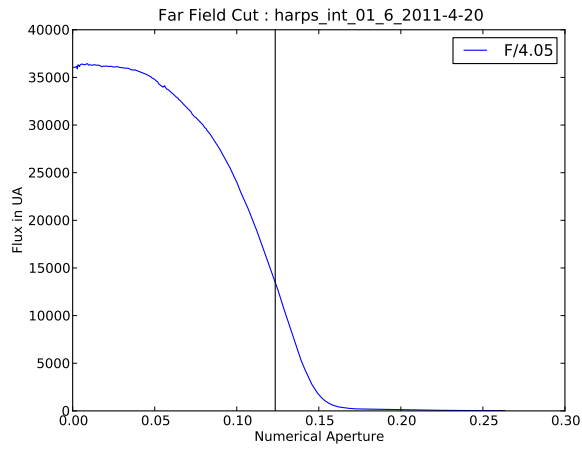
harps\_ext\_04 16\_2011-5-17

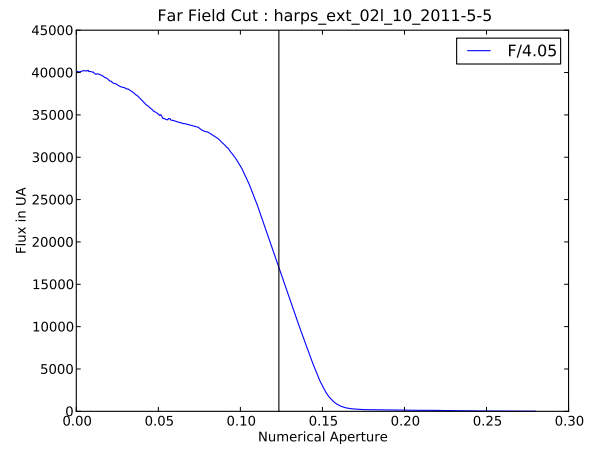
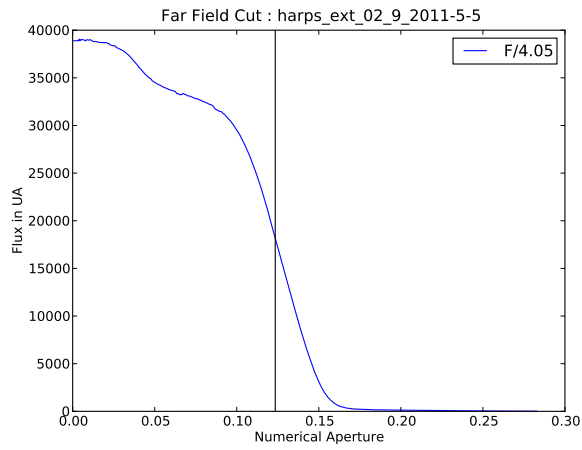
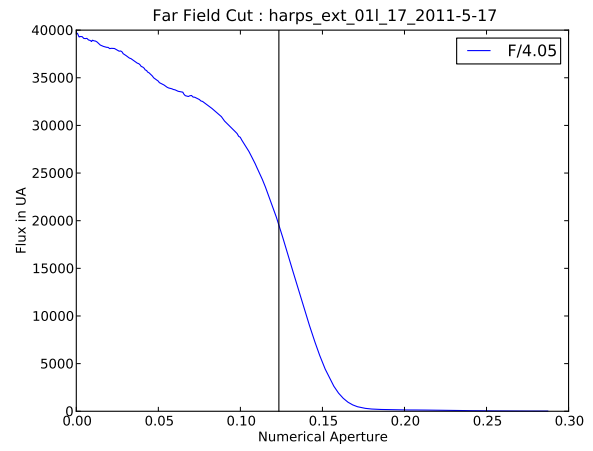
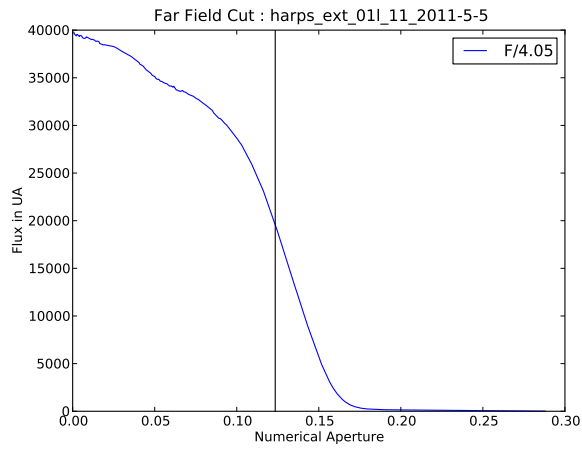
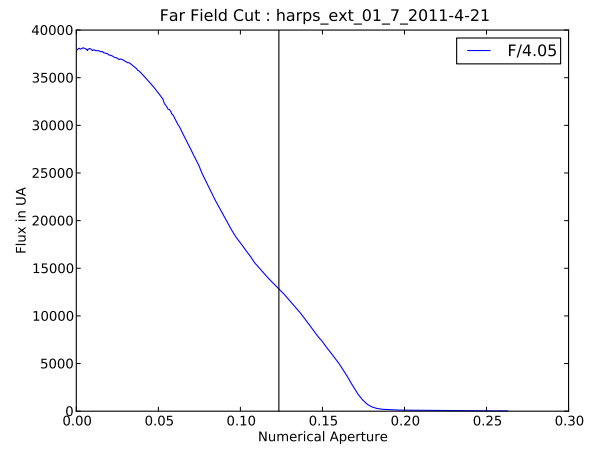
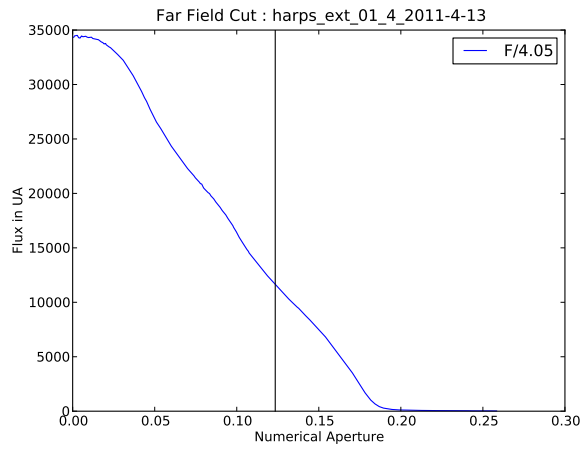


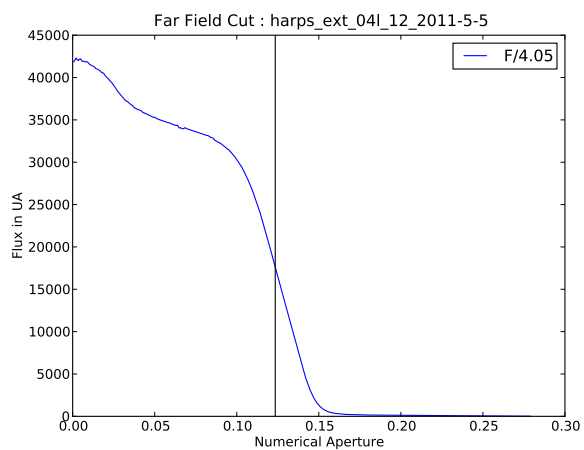
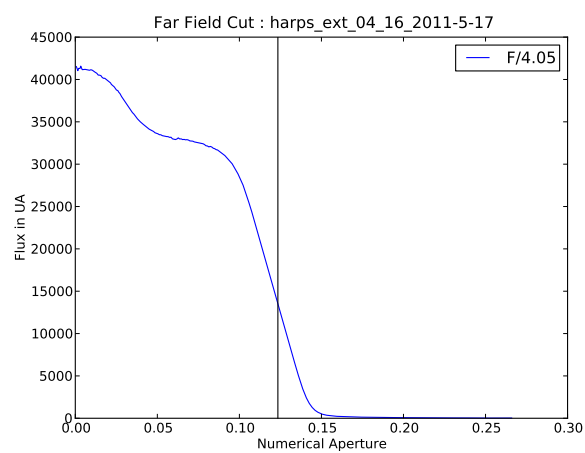
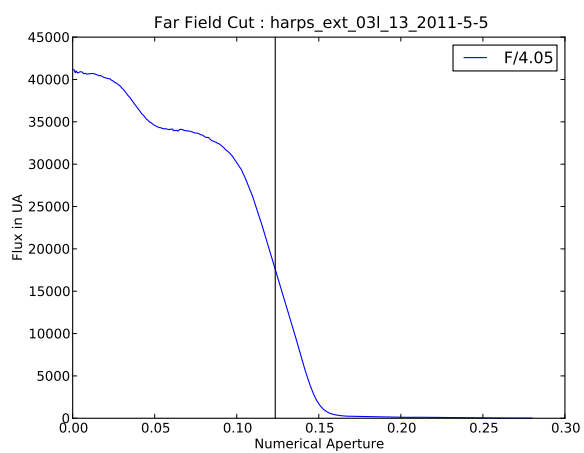
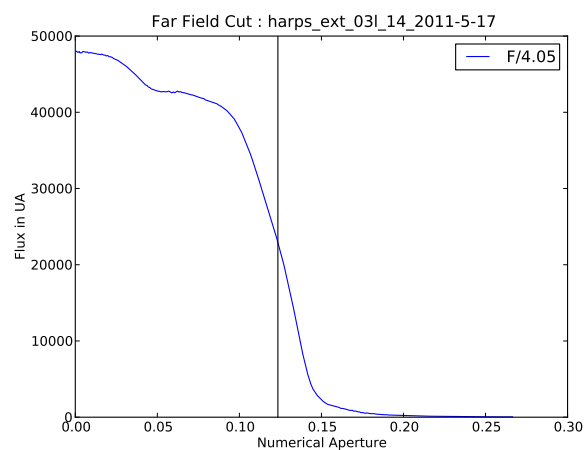
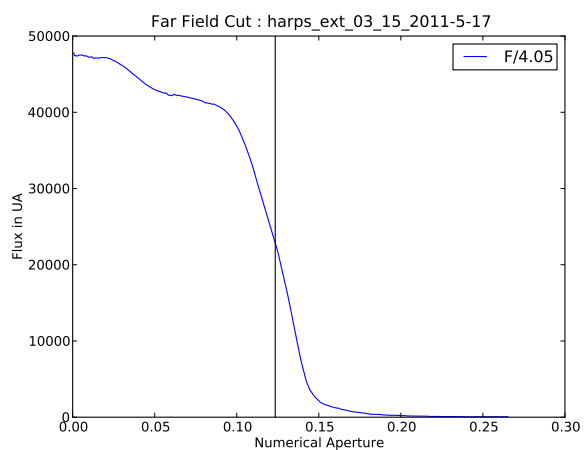
harps\_ext\_04 12\_2011-5-5



## 4.2 Profiles







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