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## RasLed

**The RasLed is the lightsource of the RasNik alignment system. It has nine high efficiency 875nm IR Emitters. These emitters are RadTol AlGaAs types.**

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<http://www.nikhef.nl/pub/departments/et/experiments/atlas/rasnik/>

## Introduction

The basic idea is to create an image of a coded mask on an optical sensor by means of a lens. The mask is lit by an infrared LED. In this set up the relative position in X and Y direction is measured along the line mask, optical center of the lens and the sensor. In addition, the (relative) rotation of the mask or the sensor can be measured. By calculating the actual image spotsize and comparing this with the mask spot size, the position of the lens along the Z-axis is calculated. Also the relative rotation around the X and Y-axis of the mask in respect to the CCD sensor can be calculated.

The system can be split into three major components

1. The optical system:
  - a coded mask
  - a lens
  - an optical sensor
2. The sensor and framegrabber combination (video):

The optical sensor is a commercially available B&W observation camera, without a lens. This can be a CCD type or CMOS.

The framegrabber is a commercially available 8-bit grayvalue type E.G.Data Translation DT3152. The RasMux connects a number of sensors to the framegrabber.
3. The reconstruction software ICARAS.

This paper describes the IR light source (RasLed), which illuminates the diffusor and coded mask. Details of the coded mask can be found at:

[http://www.nikhef.nl/pub/departments/et/experiments/atlas/rasnik/atlas\\_rasnik/rasled/code/code.html](http://www.nikhef.nl/pub/departments/et/experiments/atlas/rasnik/atlas_rasnik/rasled/code/code.html)  
or printed as NIKHEF paper ETR 94-10.

The RasLed for the projective alignment system is described in a different paper:

[http://www.nikhef.nl/pub/departments/et/experiments/atlas/rasnik/atlas\\_rasnik/rasled/ledpro.pdf](http://www.nikhef.nl/pub/departments/et/experiments/atlas/rasnik/atlas_rasnik/rasled/ledpro.pdf)

The lightsources described here are the production and the pre-production type that can be used during chamber production, test set-ups and in the MDT experiment. This version is radiation tolerant. Variation is in the grounding scheme.

**Specifications:**

The RasLeD circuit has nine high efficiency IR emitters arranged in a square to illuminate the diffuser in front of the coded RasNik mask. This square is appr. 0.5 inch x 0.5 inch. The IR emitters are 875nm LED's HP type HSDL-4420 #011 with high intensity. These IR emitters are MDT environment Radiation Tolerant. Typical light intensity ( $I_e$ ) of these emitters is 17mW/sr at 50mA. The viewing angle is 24 deg.

The RasLeD circuit places the nine IR emitters in series with a current limiting resistor of 165 Ohm (8 x 330 Ohm/1206). The RasLeD is voltage driven. Nominal input voltage is +24V. The circuit is reverse voltage protected with a parallel diode. The input connector is a standard unshielded RJ11 type. Shield / 0V static resistance is 10kOhm.

**Pre-production type:**

**Warning:** do NOT connect Shield and 0V.

The RasLeD printed circuit board has three brass press-fit Snap-Top Standoffs for easy mounting onto the mechanical RasNiK lightsource housing. These are connected to the shield as defined on the RJ11 connector. Power-On is indicated with a green LED on the connector side.

<b>RasLeD connections (RJ11 connector, pre-production)</b>		
<b>PIN</b>	<b>Function</b>	<b>Standard Cable Color</b>
1	Shield	Yellow
2	+24 V	Green
3	0 V	Red
4	Shield	Black

**Production type:**

This is mechanically the same as the pre-production type. Here the electrical connection of the stand-offs (chamber potential) ends at the RasLeD board. It is connected via a 10 k $\Omega$  resistor to ground to prevent static build-up. The signals on the connector, previously defined as shield, are now used as ground.

<b>RasLeD connections (RJ11 connector)</b>		
<b>PIN</b>	<b>Function</b>	<b>Standard Cable Color</b>
1	0 V	Yellow
2	+24 V	Green
3	0 V	Red
4	0 V	Black

For both types the rest of the connections and components are the same.

<b>RasLeD current and power dissipation</b>		
<b>Input voltage</b>	<b>Input current</b>	<b>Power</b>
+24 V	69 mA	1.66 W
+23 V	64 mA	1.47 W
+22 V	59 mA	1.30 W
+21 V	53 mA	1.11 W
+20.4V	50 mA	1.02 W

## RasLeD

Note: appr. 50% of the RasLeD power dissipation is in the IR emitters.

### **Warning**

The RJ11 connector is a commonly used type for telephone extension lines.  
Do NOT plug the RasLed into a telephone extension socket. These outlets can have  
line voltages of up to 48V !