

NEWFIRM
NOAO Extremely Wide-Field Infrared Imager

Filters Overview

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This overview presents general properties of NEWFIRM's filter set, with pointers to technical details, use history, and policies for filter access and scheduling.

The NEWFIRM camera uses cryogenic filters 124 mm in diameter x 5 mm thick. These are located in two, 8-position filter wheels very close to the cold pupil image and Lyot stop. Although NEWFIRM's scientific range is 1-2.4 microns, its InSb arrays in combination with its lens materials and coatings are sensitive out to 3.8 microns. Thus longwave blocking is necessary. For some filters this is provided by using two pieces of glass, one defining the bandpass and one providing the blocking, with a piece in each filter wheel. This impacts the total suite of wavelength-defining filter options that can be offered at any one time. Changing filters is time consuming and impacts instrument availability on-sky. The broadband J, H, and KS set is permanently installed; installation of other filters is dependent upon scientific merit, scheduling constraints, and technical issues and is at the NOAO Director's discretion.

The optical beam originating from any image point in the input focal plane is collimated at the filter (\approx pupil) location. However the angle of incidence of this collimated beam changes with its point of origin in the focal plane. The beam originating from field-of-view center passes through the filters at normal incidence. Maximum beam tilt is 13.5 degrees for image points at the corners of the field of view. The optical result is that the filter bandpass is increasingly blueshifted from center to corner of the field of view. This is negligible for the broadband filters but significant for narrowband ($R > 75$) filters. The Galactic emission line filters ([Fe II] 1.64 mm, H₂ 2.12 mm, Br g 2.17 mm) are designed to capture the line of interest somewhere within the effective filter bandpass for all points in the field of view, as this bandpass shifts across the line with changing field position.

The [NEWFIRM Filter Identification and Properties List](#) compiles identifications and basic bandpass properties for all NEWFIRM filters in NOAO's possession. This includes PI-provided filters requiring permission for

use. Filter data packs provided under this heading have transmission curves and other technical details for each piece of glass. Bandpass defining filters and out-of-band blockers are treated separately.

Lists of NEWFIRM filters for [semester] identify what has been installed in the Dewar at various times. These provide a guide--but not a guarantee--to combinations that may be installed in the future.

[NEWFIRM Filter Availability and Policy on Filter Changes](#) presents Observatory policies governing filters available to all users and those for which owner permission must be obtained prior to proposal submission.

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