Optical Properties of a Narrow-band Filter for HSC, NB718

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1 Abstract

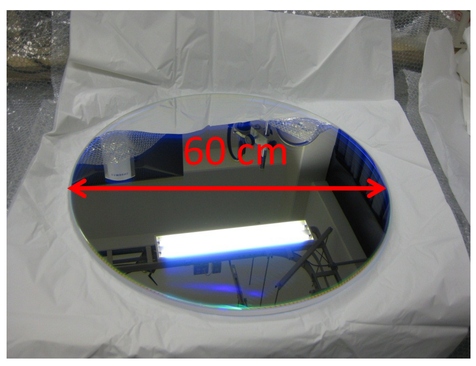
Hyper Suprime-Cam (HSC) is a new prime focus camera of Subaru telescope, and is characterized by wide field-of-view, 1.5 degree in diameter. However, because filters must be huge, 60 cm in diameter, it is seriously difficult to produce them. We had developed a skill of multi-layer coatings with a company Optical Coatings Japan, and manufactured a narrow band filter NB718. In order to confirm its optical property, we have measured its transmittance curves at 69 points on 2012.5.30 – 6.1. The obtained data indicate that peak transmittance, FWHM, FW10M, FW80M, center wavelength, and center wavelength change rate fulfill our requirements, and thus, the fabrication of NB718 is succeeded.

2 Introduction

Aim: wide-field Lyman alpha emitter (LAE) survey

- It is difficult to find distant galaxies.
- LAEs, a kind of distant galaxies, can be found from imaging data only.

We manufactured a narrow-band filter for HSC, NB718.



In order to confirm whether the filter meets all the specifications, we measured filters transmission curves.

terms	specifications
center wavelength	within 718 nm±0.3%
FWHM	within 10.2 nm±10%
FW80M	FW80M/FWHM > 0.6
FW10M	FW10M/FWHM < 1.6
transmittance at bandpass	more than 75% at peak
center wavelength change rate	smaller than (0.15%CW) / 2 cm

A part of specifications of NB718

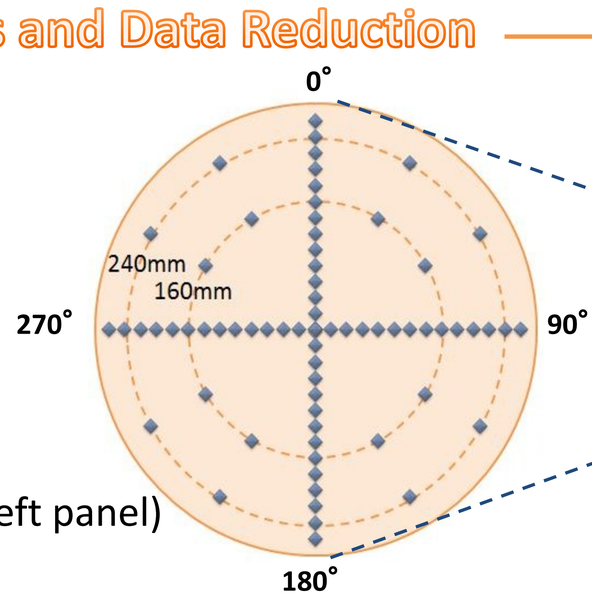
3 Measurements and Data Reduction

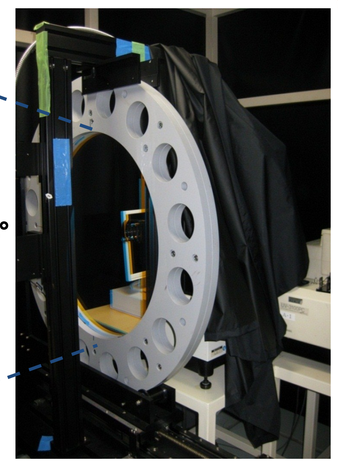
◇ Measurement

・Date
2012.5.30 – 6.1

・Spectral photometer
MPC-3100 (SHIMADZU)

・Measurement points
69 points (diamonds in left panel)





・Methods
We measured the filter transmittance between 700 nm and 740 nm with 1-nm increments. We repeated the measurements 20 times at each position. Also we measured the transmittance of the same glass without coatings.

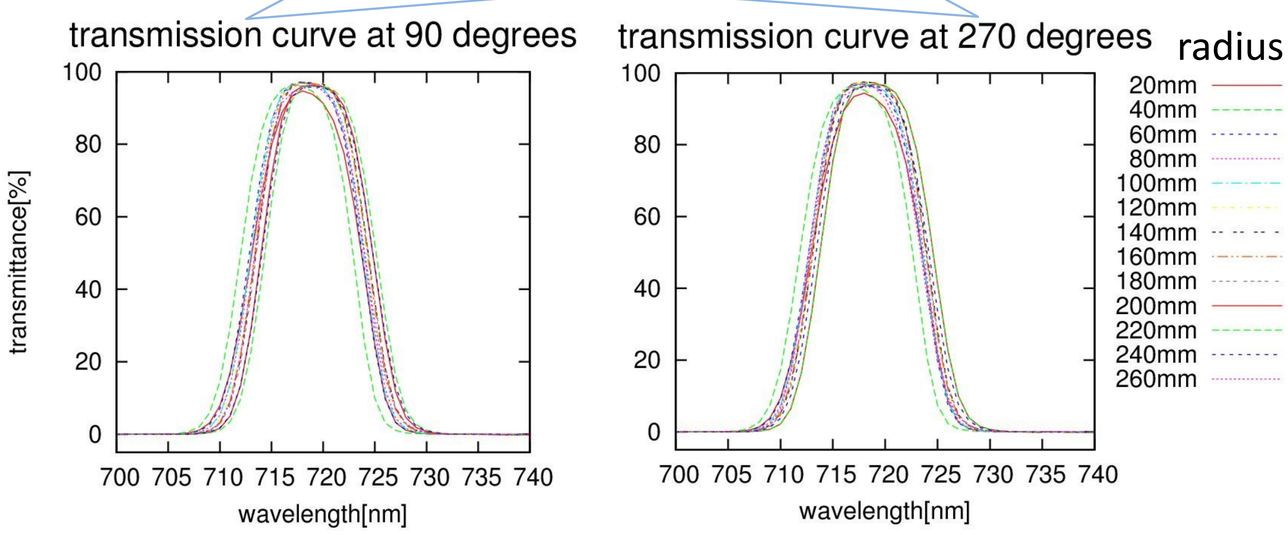
◇ Data reduction

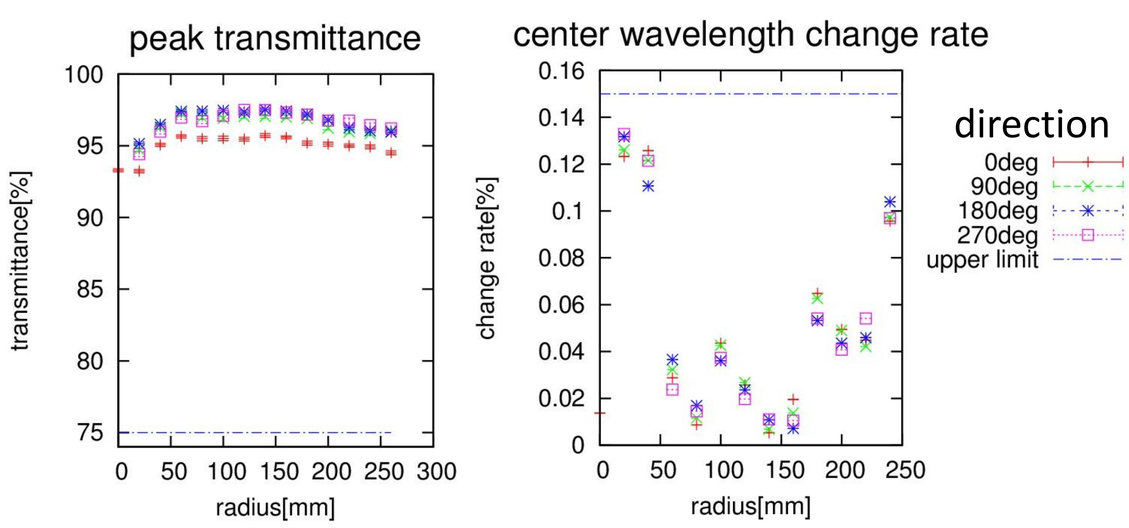
1. We averaged the measured 20 values at same positions of the filter.
2. We normalized the filter transmission curves with the assumption that the transmittance of the glass without coatings is 92% at all wavelengths.
   (filter transmittance) = (filter value) / (glass value) x 92%

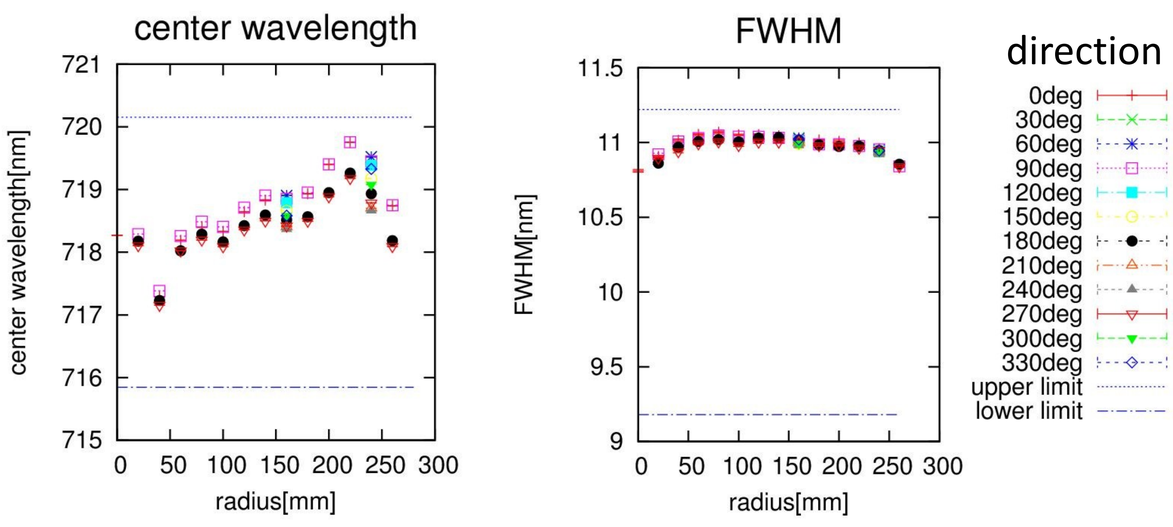
4 Results

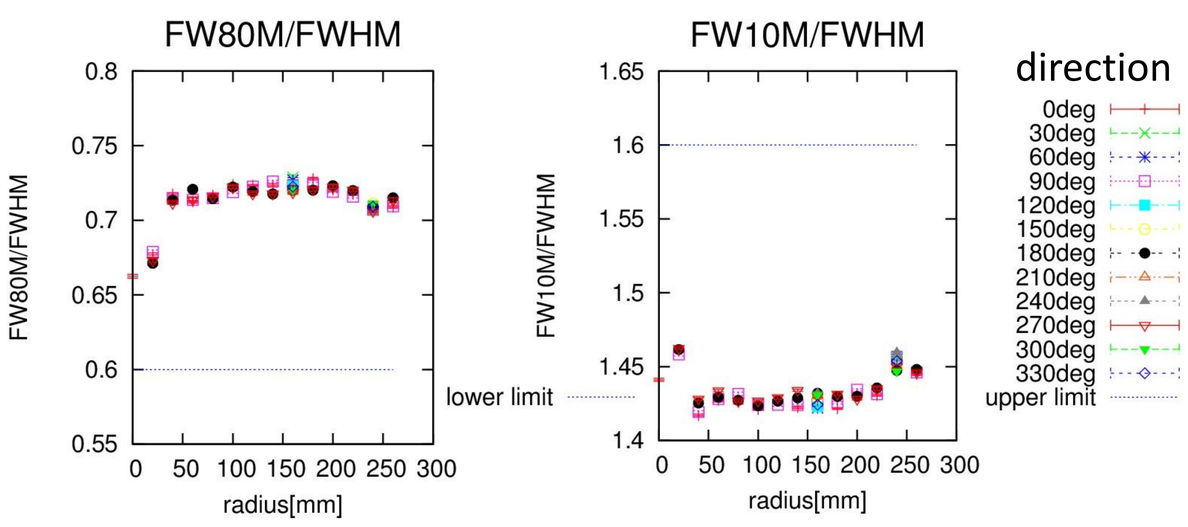
◇Transmission curve of a filter

Transmission curves are almost the same everywhere.









・**Peak transmittance**
・**Center wavelength**
・**Center wavelength change rate**
・**FWHM**
・**FW80M**
・**FW10M**

All specifications are fulfilled.

We succeeded in fabrication of NB718!