RevMexAA (Serie de Conferencias), **44**, 124–124 (2014)

OBSERVATIONAL RESULTS USING BTFI

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We present here an overview of a new tunable filter instrument for the SOAR telescope. The Brazilian Tunable Filter Imager (BTFI) is a highly versatile new technology to be used both in seeing-limited mode and at higher spatial fidelity using SAM Ground-Layer Adaptive Optics facility (SOAR Adaptive Module) which is being deployed at the SOAR telescope. It presents important new science capabilities for the SOAR astronomical community, from studies of the centers of nearby galaxies and the insterstellar medium to statistical cosmological investigations.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

BTFI will deliver XYλ data-cubes that can be seen as set of images at different wavelengths or a set of spectra for each XY pixel. For that, it relies on three new technologies.

The imaging Bragg Tunable Filter (iBTF) concept utilizes Volume Phase Holographic Gratings in a double-pass configuration as a tunable filter, while a new Fabry-Perot (FP) concept involves the use of commercially available technologies which allow a single FP etalon to act over a very large range of interference orders and hence spectral resolutions. Both of these filter technologies will be used in the same instrument. The combination allows for highly versatile capabilities. Spectral resolutions spanning the range between 25 and 2000 can be achieved in the same instrument through the use of iBTF at low resolution and scanning FPs beyond $R \approx 2000$ with some overlap in the mid-range.

The third component of the new technologies deployed in BTFI is the use of EMCCDs, which allow for rapid and cyclical wavelength scanning thus mitigating the damaging effect of atmospheric variability through the acquisition of the data cube. The system was designed to supply tunable filter imaging with a field-of-view of 3' on a side, sampled at 0.12" for direct Nasmyth seeing-limited area spectroscopy and for SAM"s visitor instrument port for GLAO-fed area spectroscopy.

The final data-cube is obtained throught scanning in wavelength while acquiring images, stacking these images together and processing this stack thoght software so the cube has XYλ information. The instrument has been already tested on sky and we are presenting observational data of the planetary nebulae NGC 7009 both in high and low resolution BTFI modes. For high resolution, we used a QueensGate Fabry-Perot installed inside BTFI with $R = 4500$ while, for low resolution, the iBTF was used with $R = 1200$ gratings, both near H-alpha.

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