



Contribution ID: 27

Type: Talk

Innovative VPH gratings for ELVIS (Exoplanet LBT Visible Imaging Spectrograph)

Thursday, 26 May 2022 10:00 (20 minutes)

The Exoplanet LBT Visible Imaging Spectrograph (ELVIS) embedded into the high contrast and resolution AO-assisted imager SHARK-VIS at Large Binocular Telescope 2 x 8.4m (LBT) is an upgrade of existing Integral Field Unit (IFU) to permit a newer comprehension of young accreting substellar and planetary companions with higher contrast (up to 10^{-5}) in their H-alpha emission with respect to standard imagers.

ELVIS performances are strongly related to the dispersing element. Using a classical single channel Volume Phase Holographic Gratings (VPHG), the light is smeared out in a single spectrum. For covering large bandwidths at a certain resolving power, ELVIS will need a very wide detectors. Our approach to this issue is to Multiplex the VPHGs (M-VPHGs). Instead of having a single grating we use multiple gratings stacked together in a single piece of glass. Each grating diffracts different target spectral ranges toward the same direction mimicking an echellette spectrograph. The result is a combination of a wider spectral range together with a higher resolution. The M-VPHGs will be manufactured using high performance holographic materials (Bayfol®HX) by COVESTRO AG. A feasibility study in the case of ELVIS will be carried out starting from the instrument requirements. Such innovative approach is more general and it could be applied to other AO fed spectrographs working both in the visible and infrared, such as Medres for SPHERE+, Vis-X for MagAO-X.

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Session Classification: Sessione 7