Multi-Object Spectroscopy in the Next Decade: Big Questions, Large Surveys and Wide Fields
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Beyond MOS and fibers: large FoV Imaging Fourier Transform Spectroscopy, an instrumentation proposal for the present and future Mexican telescopes.

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Abstract

Many physical processes in astronomy are still hampered by the lack of spatial and spectral resolution, and also restricted to the field-of-view (FoV) of current 2D spectroscopy instruments available worldwide. It is due to that that many of the ongoing or proposed studies are based on large-scale imaging and/or spectroscopic surveys. Under this philosophy, large aperture telescopes are devoted to the study of intrinsically faint and/or distance objects, covering small FoVs, with high spatial resolution, while smaller telescopes are devoted to wide-field explorations. The future astronomical surveys, however, should be addressed by acquiring un-biases, spatially resolved, high-quality spectroscopic information for a wide FoV. Therefore, and in order to improve the current instrumental offer in the Observatorio Astrofísico Guillermo Haro (OAGH) in Cananea, Mexico (INAOE); and to explore a possible instrument for the future Telescopio San Pedro Martir (6.5m), we propose to create a prototype that will provide us with un-biased wide-field (few arcmin) spectroscopic information, and with the flexibility of operating at different spectral resolutions ($R \sim 1 - 20000$), with a spatial resolution limited by seeing, and therefore, to be used in a wide range of astronomical problems. This instrument will make use of the Fourier Transform Spectroscopic technique, which has been proved to be feasible in the optical wavelength range (350-1000 nm) with designs such as SITELLE (CFHT). The proposed pilot instrument would be designed for and installed in the 2.1m telescope of OAGH-Mexico. This would allow us to understand the technical issues of this technology, interpret the data, prepare the reduction and analysis pipelines, train students and postdocs in the use of the data, and address a set of suitable astronomical problems. We describe here the basic technical description of a Fourier transform spectrograph with important modifications from previous astronomical versions, as well as the technical advantages and weakness, and the science cases in which this instrument can be implemented.