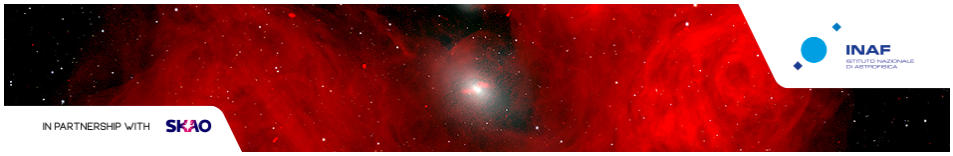

Contribution ID: **48** Type: **not specified**

Shaping the spectroscopic knowledge for SKA-based molecular searches

Wednesday 29 November 2023 10:10 (20 minutes)

The frequency coverage of the SKA mid 5 bands (4.6-15.4 GHz) will open a window of unprecedented sensitivity on molecular emission at centimetre wavelengths. In this frequency regime, most of medium size organic species present in the interstellar medium (the so called iCOM) exhibit strong rotational features. These spectra are generally complex, even at moderate temperatures, thus requiring input from very accurate molecular data to be successfully interpreted. Furthermore, at centimetre regimes, low-J transitions of N-bearing species appear as multiplets due to hyperfine interaction, thus contributing to increase the spectral congestion and the difficulty of the analysis. This latter task might be exceedingly difficult for chemically-rich warm sources where many molecules emit simultaneously and the search for novel targets implies dealing with thousands of interfering signals (weeds) generated by less interesting species.
In order to have a spectroscopic database in good shape for the SKA era, a great deal of preparatory work is needed both from the experimental and theoretical side. In the Rot&Comp laboratory at University of Bologna we investigate astrochemically important systems through a close interplay between theory and experiments. High-level quantum chemical calculations are used to derive accurate estimate of molecular properties and to infer thermochemical and kinetics reaction data; for key species, very precise spectroscopic data (up to 1 part to 10^9 for rest-frequencies) are obtained by direct measurements of the relevant spectra in the laboratory.
In this talk, I describe this approach highlighting a strategy to evaluate and improve the quality of spectroscopic knowledge which are deemed critical for pursuing the objectives of the “Cradle of Life”program.

Reasearch area

Cradle of Life

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Session Classification: Parallel - Our Galaxy & Cradle of Life