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Search for Positrons and Positronium in nearby microquasars

Strong theoretical and observational reasons make us believe that free positrons are constantly produced within sources of high energy, such as galactic nuclei and microquasars. The clearest signature of the presence of those anti-particles is the observation, in the GC region, of the gamma-ray 511 keV line, which is known to result from the annihilation of positrons when they encounter free electrons. In the course of the e– e+ annhilation process, a transient bound system is formed with those two particles: Positronium.

One way to identify the sources of the 511 keV emission (detected with a resolution of only 3 arc-degrees) hence the sources of positrons and positronium, is to observe the positronium recombination spectrum. Whereas observations of the Lyman α and Balmer α lines are hampered by the high UV extinction or affected by a high background emission, the millimeter recombination lines, although somewhat weaker, do not suffer from those hindrances. Observed with an interferometer, the source(s) of their emission can be positioned within arc seconds. Taking advantage of the high sensitivity and high angular resolution of the IRAM-NOEMA mm-wave interferometer, we have embarked into a new search for Positronium.

The most favourable targets for positronium recombination lines detection are microquasars, which are known to produce positrons. They host asymmetrical jets carrying those positrons that collide with the nearby inter-stellar gas. A score of Radio-Xray Binaries, some in the Solar neighbouhood (<2 kpc), have been identified in the Galaxy. We will present the first results of our NOEMA search.

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