



Pushing ahead pulsar science with MeerKAT: the Meertime and Trapum projects

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MeerKat is the South-African precursor of SKA and will be embedded in SKA1-MID. Its ideal geographical location in the Karoo desert area, the high gain resulting from the large collecting area of its 64x13.5m antennas distributed over 8 km (to be soon complemented by additional antennas), the large available bandwidth at L-band and UHF-band (soon complemented by S-band receivers), the capability of creating few hundreds beams in the sky, the state-of-the-art system temperature, and the unprecedented fast slew rates of the antennas (1-2 deg/sec) make **MeerKat an outstanding new asset for pulsar astronomy**.

Two MeerKat Large Survey Projects (LSPs), dubbed **Meertime** and **Trapum**, are focused on pulsar observations. They are five-year long programs run by an international collaboration, and are expected to become landmarks in pulsar science during the next decade, on the pathway to the advent of SKA1. In particular they aim to significantly improve our knowledge about some of the most intriguing issues of the modern physics and astrophysics, alike: (i) the limit of validity of General Relativity and of alternative gravity, (ii) the internal structure of the neutron stars and the related equation of state for the nuclear matter, (iii) the cosmological process of galaxy assembling and its relation with the in-spiral of super-massive black holes binaries included in the galaxy cores (in turn releasing Gravitational Waves that are potentially detectable via the parallel Pulsar Timing Array experiment(s)), (iv) the final stages of the evolution of the compact binaries including a neutron star and the existence of a pulsar orbiting a black hole, (v) the impact of ultra strong magnetic fields on the behavior of matter and photons and the long standing question of the nature of the emission processes in the magnetosphere of the neutron stars, (vi) the occurrence of black holes of intermediate mass in the globular clusters and the existence of a magnetic field permeating them.

The basic experimental set-up and the organization of the Meertime and Trapum LSPs are presented, while summarizing some of the first very promising scientific achievements, resulting mostly from L-band observations, complemented by some preliminary UHF observations.