



SunDish Project: Single-Dish Solar Imaging with INAF Radio Telescopes

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The SunDish project (<https://sites.google.com/inaf.it/sundish/home>) is devoted to radio imaging and monitoring of the solar atmosphere at high radio frequencies (at present 18-26 GHz, up to 100 GHz in perspective) through the large single-dish telescopes of the Italian National Institute for Astrophysics (INAF), not originally conceived to observe the Sun. Observations of the brightness temperature of the solar atmosphere in the radio band can map plasma processes that produce free-free emission in the local thermodynamic equilibrium and gyromagnetic phenomena, providing a probe of physical conditions in a wide range of atmospheric layers both for quiet and Active Regions. To date, we obtained more than 200 maps of the entire solar disk in the 18-26 GHz range, filling the observational gap in the field of chromospheric imaging at these frequencies to date.

As a first early science result of the project (2018-2020) [1], we present the first catalog of about 170 radio continuum solar imaging observations with Medicina 32-m and SRT 64-m radio telescopes including the multi-wavelength identification of the Active Regions, their brightness and spectral characterization. The interpretation of the observed emission as thermal bremsstrahlung components combined with gyro-magnetic variable emission pave the way to the use of our system for long-term monitoring of the Sun. This system can provide: (i) accurate measurement of the brightness temperature of the radio-quiet Sun component; (ii) characterization of the flux density, spectral properties, and long-term evolution of dynamical features (Active Regions, Coronal Holes, loop systems, streamers, and the coronal plateau); (iii) prediction of powerful flares through the detection of peculiar spectral variations in the Active Regions, as a valuable forecasting probe for the hazard network of the Space Weather.

References

- [1] A. Pellizzoni, S. Righini, M. N. Iacolina, M. Marongiu, and et al., "Single-dish solar observations with INAF radiotelescopes: continuum imaging in the 18 – 26 GHz range", in prep.