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Study of solar brightness profiles in the 18 - 26 GHz frequency range with INAF radio telescopes: evidence for coronal emission

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One of the most important objectives of solar physics is the physical understanding of the solar atmospheric structure (still a matter of debate in the literature), including a full description in terms of the density (n) and temperature (T) distributions.
In our analysis we aim to constrain the n and T distributions through observations in the centimetric radio domain. We employ single-dish observations from two of the INAF radio telescopes: the newly-appointed Medicina "Gavril Grueff" Radio Telescope and the Sardinia Radio Telescope (SRT), in the context of the SunDish project, designed for the monitoring of the Sun and its atmosphere at the radio K-band frequencies (18 –26 GHz, and up to 100 GHz in perspective) since 2018 to date. The uniform exposure of the entire solar disk and its surroundings, together with the low noise, accurate absolute calibration, and good sensitivity of these radio telescopes, make our data set crucial to analyse and model the solar atmospheric emission in this frequency range.

In this talk we present our first results about the evidence of the significant coronal emission in the 18-26 GHz radio band, using about 300 radio solar maps obtained in the context of the SunDish project.
We describe our methods to prove the physical origin of the coronal emission and to analyse the Physics (we assumed the thermal bremsstrahlung as the emission mechanism) of the solar atmosphere.
The modelled brightness profiles are compared with those observed with the Grueff Radio Telescope by averaging solar maps obtained at 18.3 and 25.8 GHz during the minimum of solar activity (2018 –2020).
Finally, we discuss and compare our results with those of literature, also including the Metis density distributions.

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