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Solar Orbiter/Radio and Plasma Wave observations during the first Venus flyby

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We present measurements from the Radio and Plasma Wave (RPW) instrument suite onboard the Solar Orbiter mission during the first Venus encounter. RPW consists of several units and is capable of measuring both the electric and magnetic field fluctuations with three electric antennas and a search-coil magnetometer: The Low Frequency Receiver (LFR) cover the range from DC up to 10kHz when measuring the electric and magnetic waveform and spectra; the Thermal Noise and High Frequency Receiver (TNR-HFR) determines the electric power spectra and magnetic power spectra from 4kHz-20MHz, and 4kHz to 500kHz, respectively, to determine properties of the electron population; the Time Domain Sampler (TDS) measures and digitizes onboard the electric and magnetic field waveforms from 100 Hz to 250 kHz. The BIAS subunit measures DC and LF electric fields as well as the spacecraft potential, which gives a high cadence measure of the local plasma density when calibrated to the low-cadence tracking of the plasma peak from the TNR. Solar Orbiter approached Venus from the induced magnetotail and had its closest approach at an

altitude of 7500 km over the north pole of Venus on 27 Dec 2020. The RPW instruments observed a tail region that extended several 10's of Venus radii downstream of the planet. The induced magnetosphere was characterized to be a highly dynamic environment as Solar Orbiter traversed the downstream tail and magnetosheath before it crossed the Bow Shock outbound at ~12:40 UT. Polarized whistler waves, high frequency electrostatic waves, narrow-banded emissions, possible electron double layers were observed. The fine structure of the bow shock could also be investigated in detail. Solar Orbiter could hence enhance the knowledge of the structure of the solar wind-Venus interaction.

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