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Detection and Characterisation of Microwave Emission of Extensive Air Showers with the CROME Experiment

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Microwave radiation from high-energy air showers has been observed in the C band (3.4–4.2 GHz) with the Cosmic-Ray Observation via Microwave Emission (CROME) setup. The obtained dataset provides a unique opportunity to study the radio emission of air showers at microwave frequencies. The compatibility of the measured GHz signals with different hypotheses for the emission mechanism is discussed. It is shown that the component measured in the forward direction of an air shower is compatible with emission mechanisms known from the MHz frequency range, namely the geomagnetic charge separation and charge excess variation. Furthermore, a limit on a potentially isotropic, unpolarized component, as expected from molecular bremsstrahlung, is derived.

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