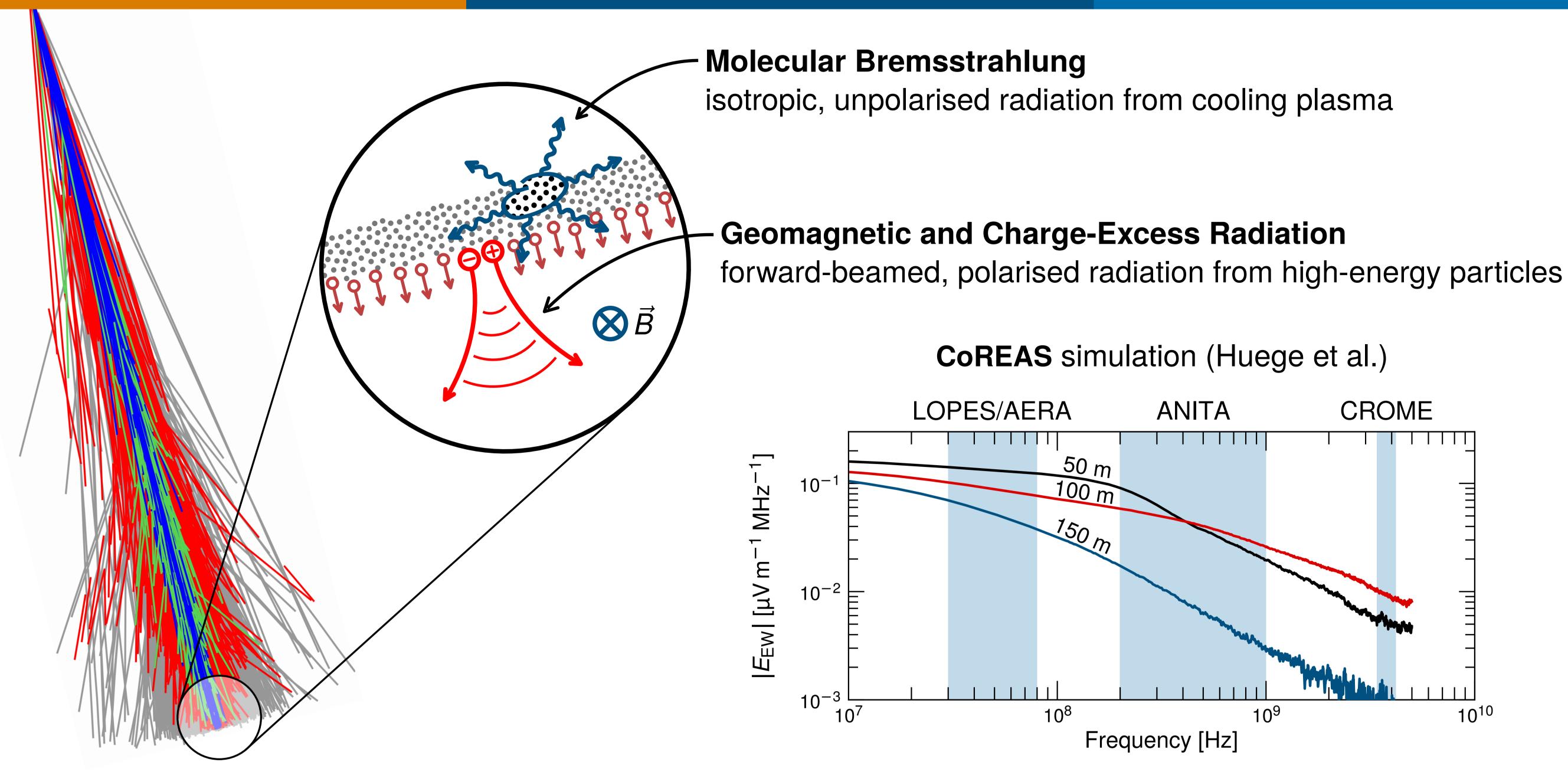
High-Frequency Radio Emission of Air Showers

Felix Werner and Anne Zilles (KIT)



CROME Microwave Antenna Array within KASCADE-Grande • 3.4 m parabolic reflectors within KASCADE • 3×3 + 4 linearly polarised LNBs (3.4–4.2 GHz) Custom detection chain triggered by KASCADE KASCADE trigger Example event—stereo observation of an air shower 50 Power [a.u.] 8 dB threshold Channel 2 30 8 dB threshold -5080-4980-5000Time after trigger [ns] Arrival directions of Measured core distribution compared with CoREAS simulation detected air showers From north Vertical 150 **△** From south to PRL 135° 100 $\alpha_{\text{mag}} = 40^{\circ}$ 50 $0^{\circ} \alpha_{\text{mag}} = 25^{\circ}$ 180° -50-100 $\alpha_{mag} = 10^{\circ}$ -150-200-150-100-50Easting [m]

Measurements are consistent with geomagnetic and charge-excess radiation

• Molecular bremsstrahlung is disfavoured as the dominant emission mechanism

Production of a dense particle shower in a strong magnetic field Electron LDPE target beam Coils — Side view Simulation of particle interactions with GEANT4 Simulation of radio emission with new extensions of GEANT4 **–** 8 m **-** 9 m **–** 10 m Magnitude [a.u.] **–** 11 m 12 m - 13 m - 14 m – 15 m 2000 1500 1000 Frequency [MHz] Verifying the simulations is crucial for coming analyses of radio measurements

Laboratory Experiment SLAC T-510

