

AtmoHEAD 2024

Instrumentation for mobile measurement in thunderstorms

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<https://rb.gy/ptnymj>



Measurement cars (2019)

Motivation:
More frequent
in situ
thunderstorm measurement



Car's equipment

Antennas

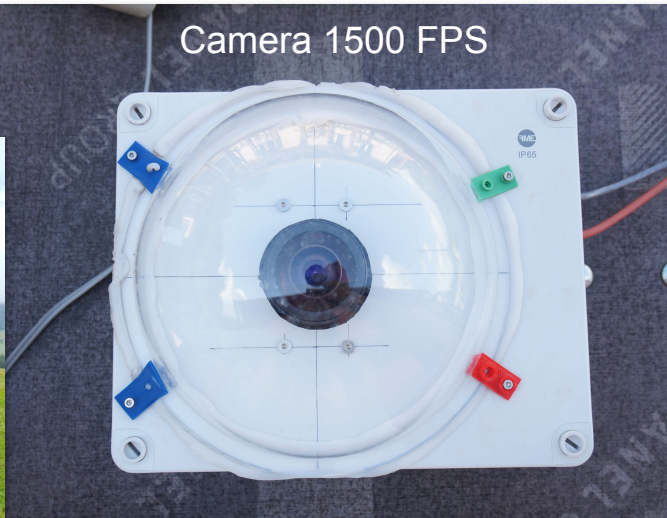
~400 MHz



EFM

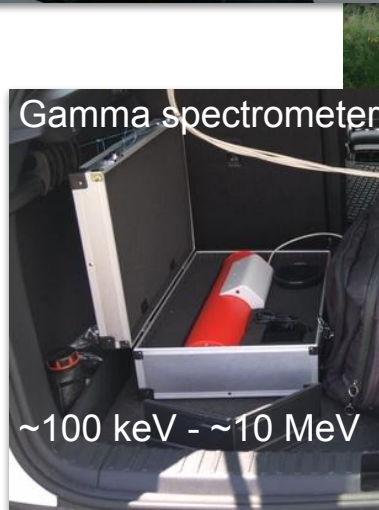


Camera 1500 FPS



Gamma spectrometer

~100 keV - ~10 MeV



~100 kHz

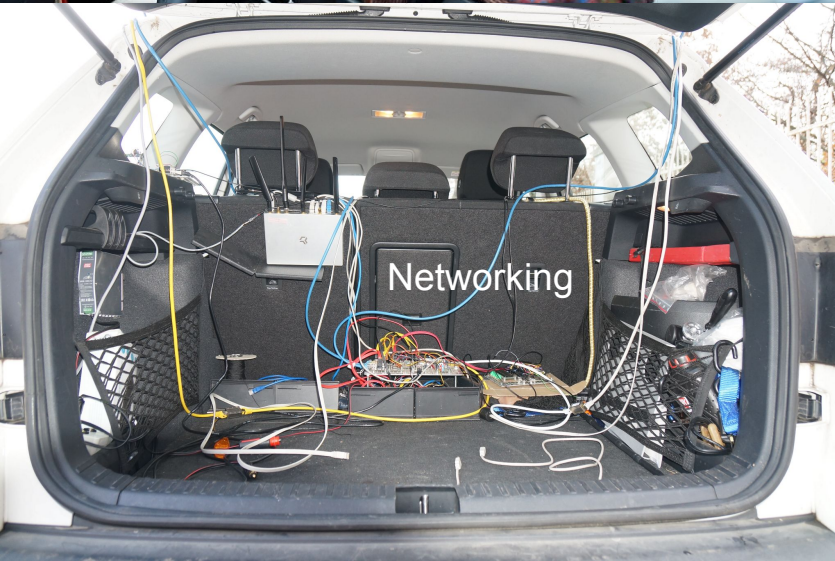


~50 MHz

Distrometer
Anemometer

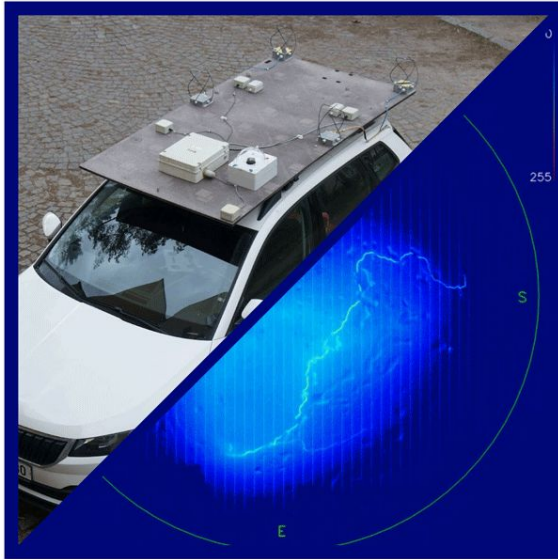


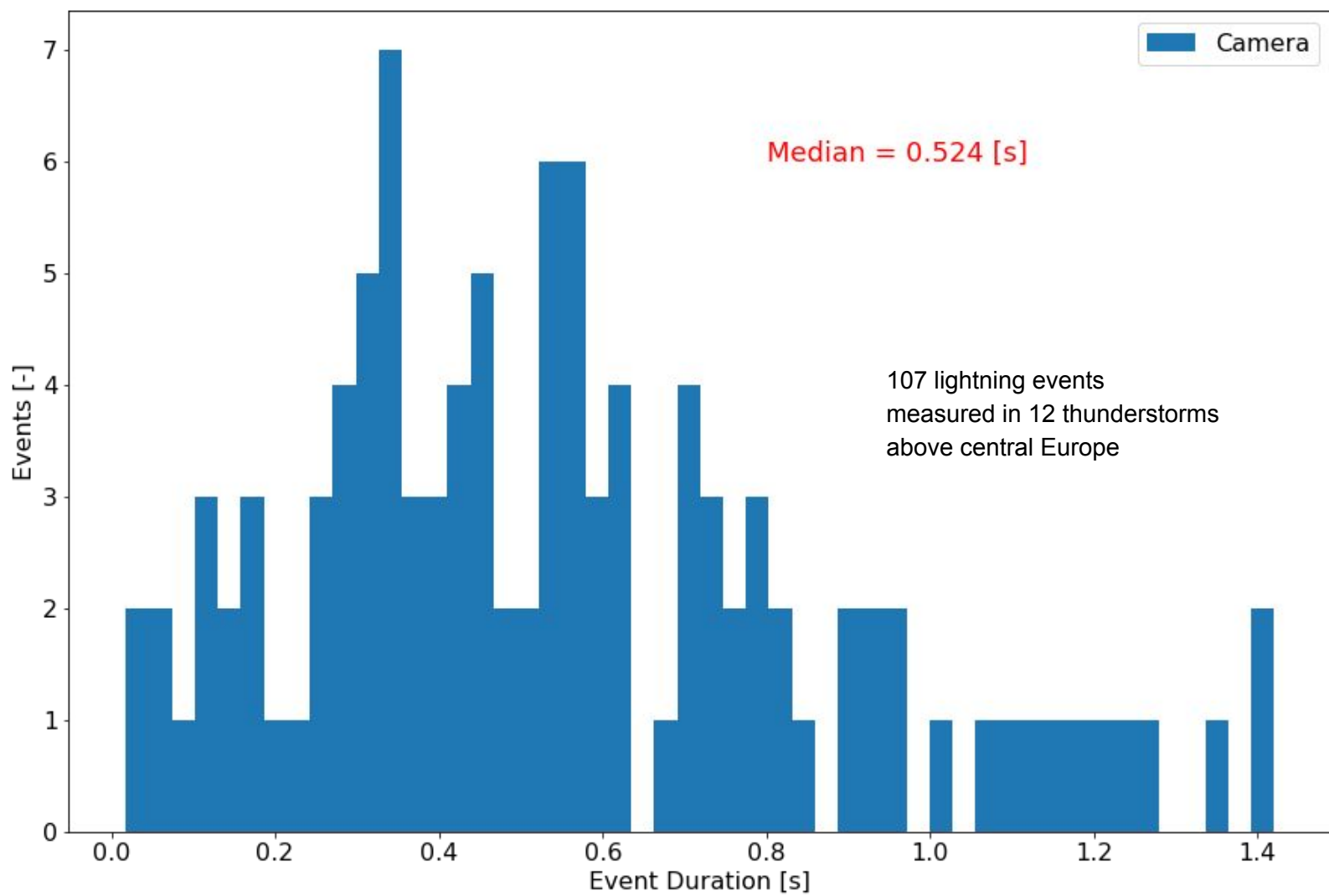
Car's equipment



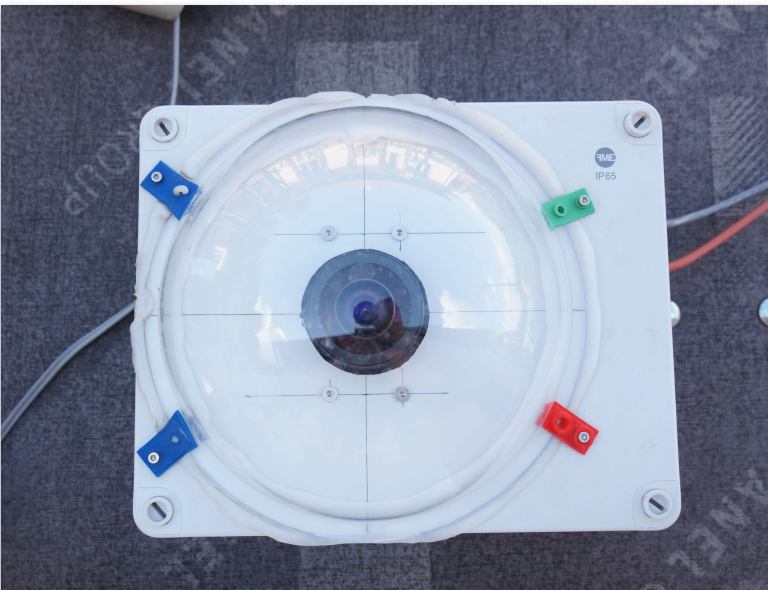
Car's instrumentation (2021)

<https://doi.org/10.5194/amt-16-547-2023>



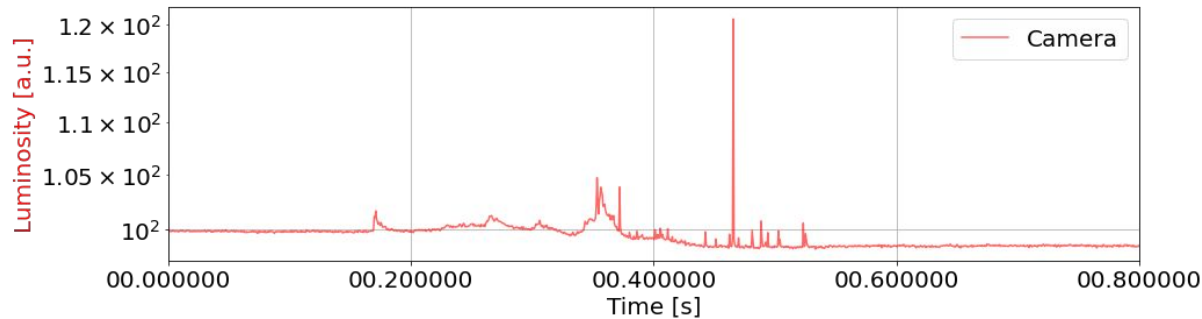
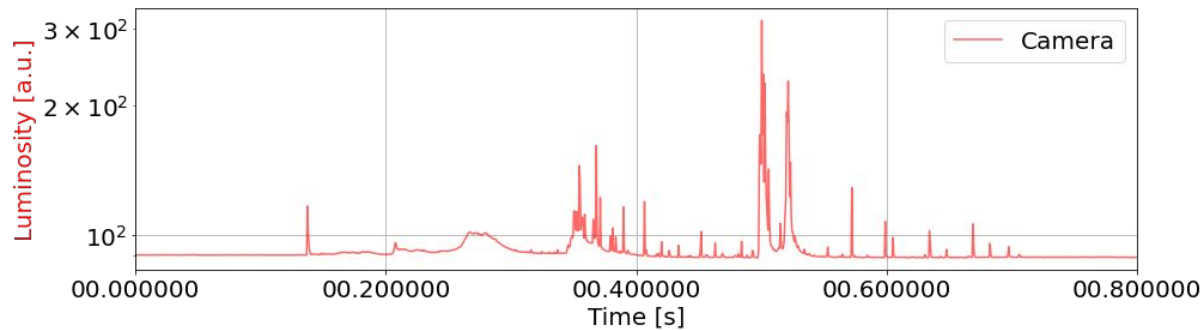
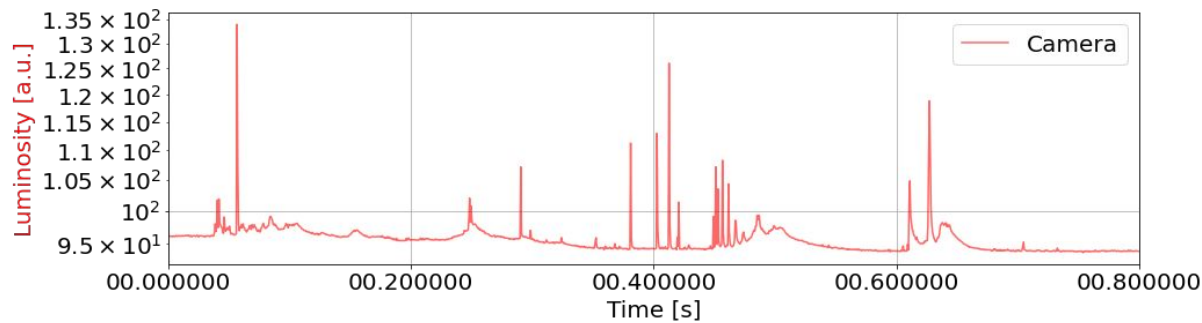


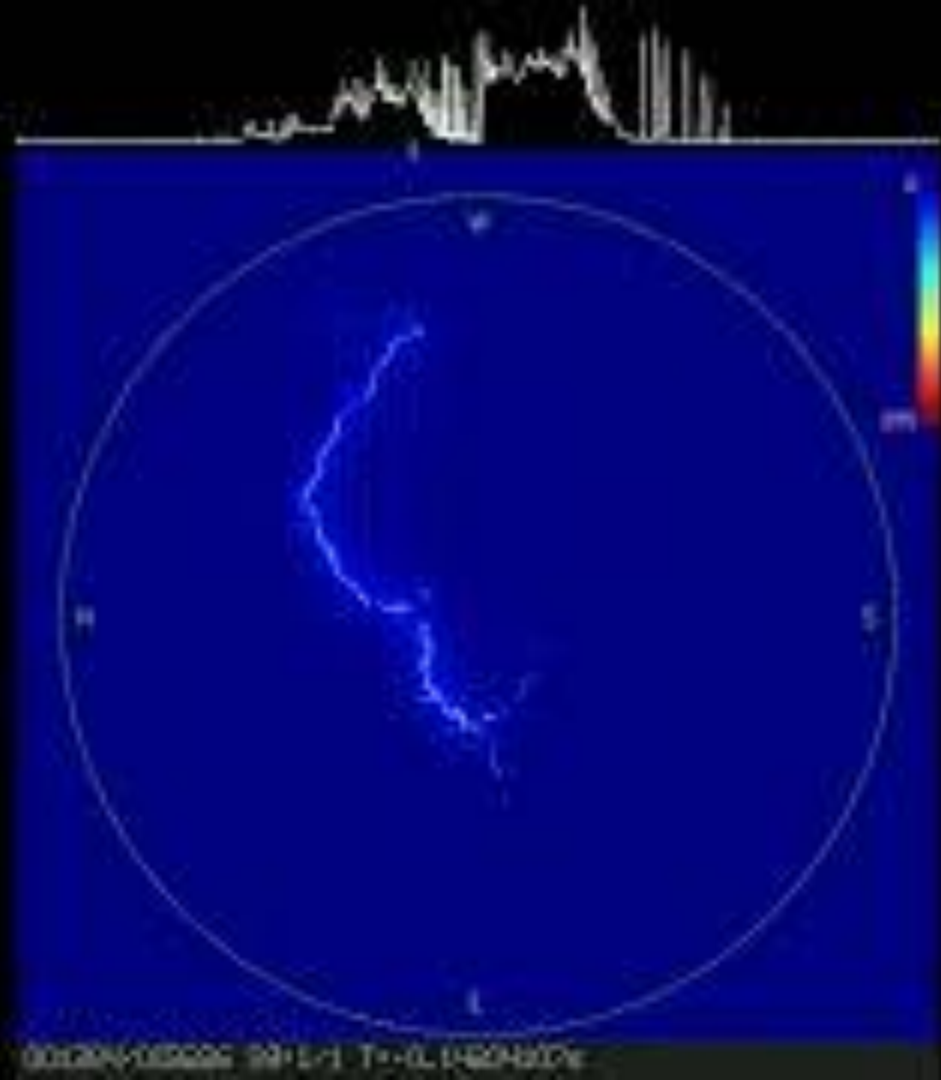
Fast Motion Camera

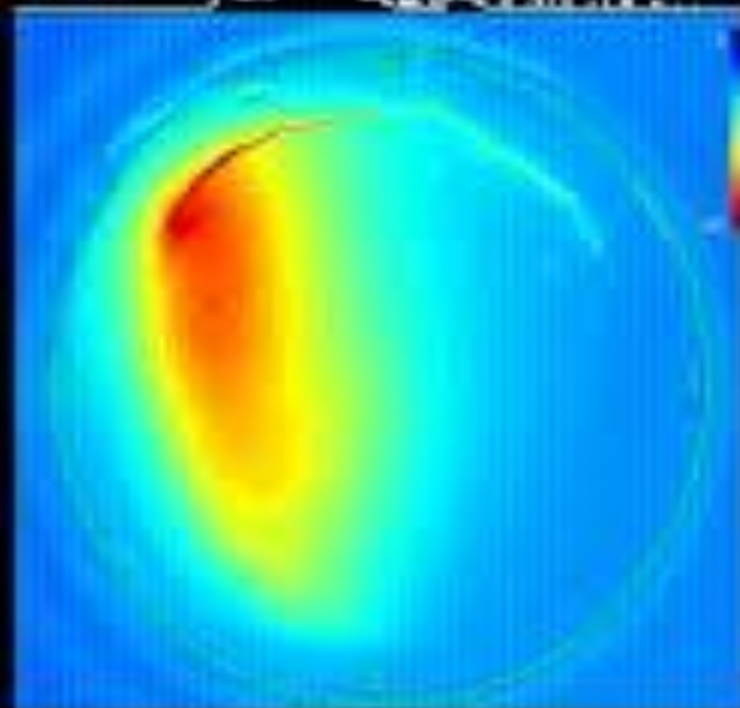
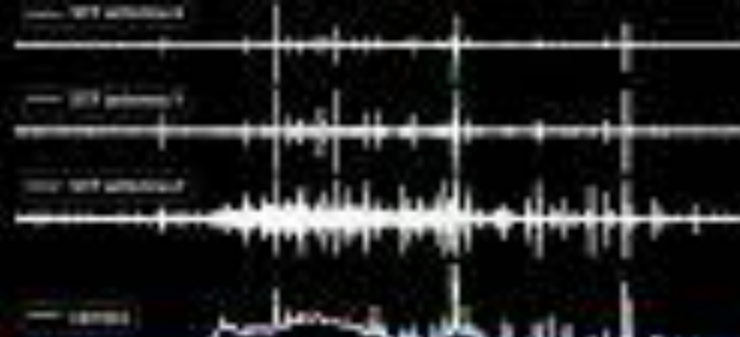


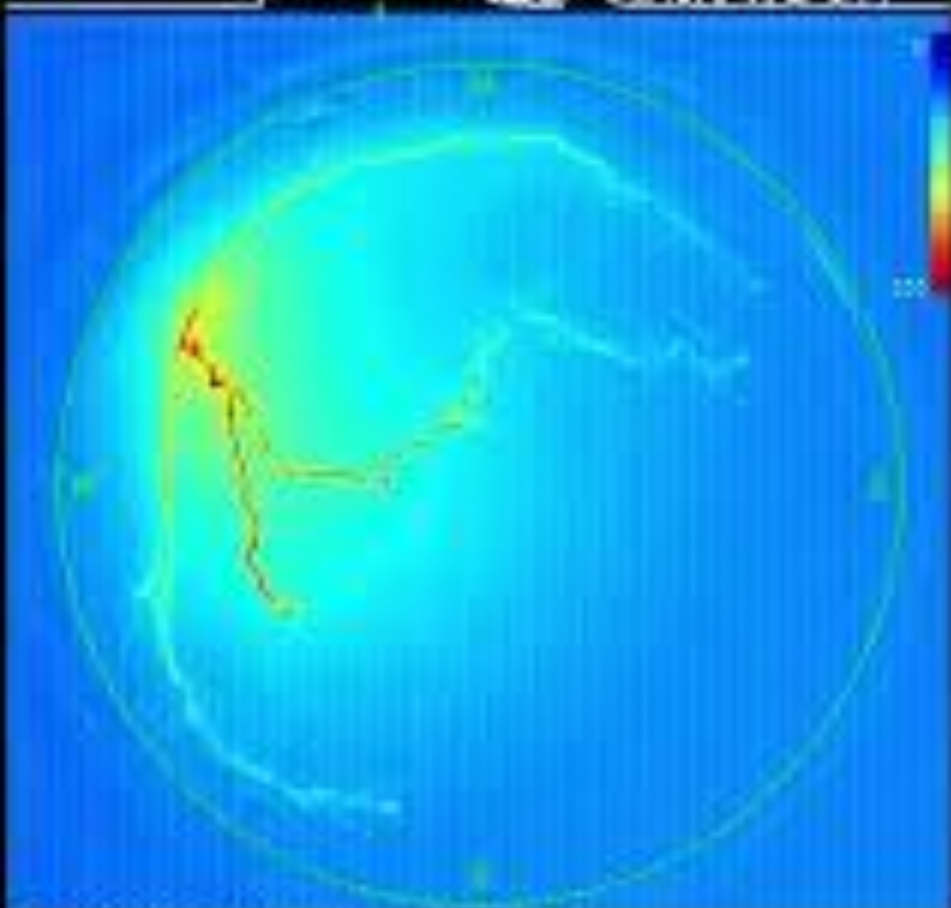
000012/013284 S9=1/1 T=-8.799451205

Similar evolution

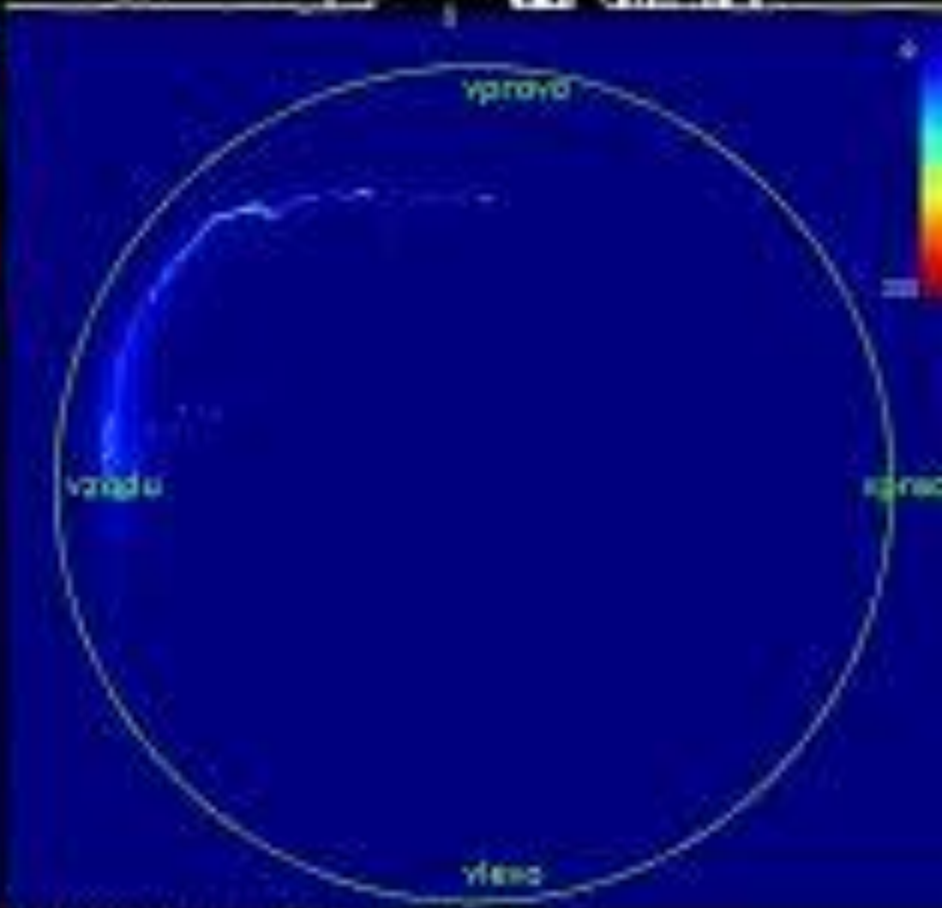






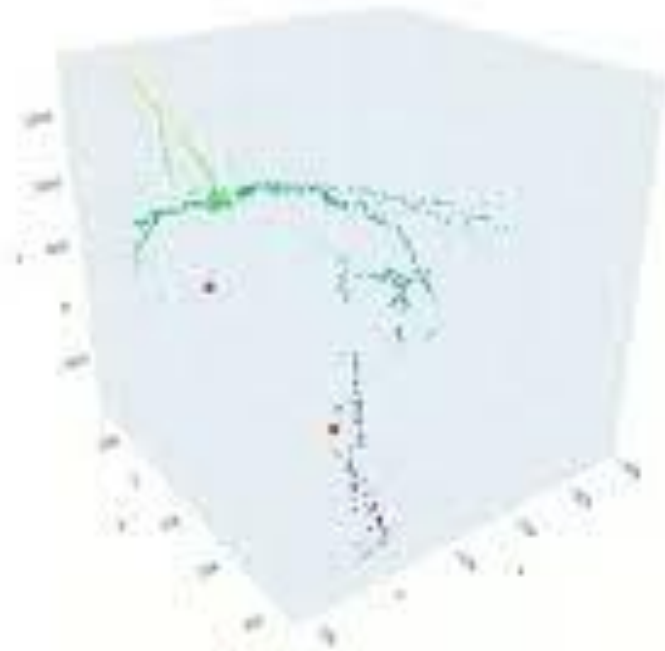


000000-000000 00-1/1 T=-0.2100000000e



000000-000000 00-1/1 T=-0.0700000000e

3D reconstruction



What we learned?

Everything is wrong

Leader, Streamer, Stroke, Strike, Lightning

< 10 % CG lightning

Lightning are huge and horizontally spread

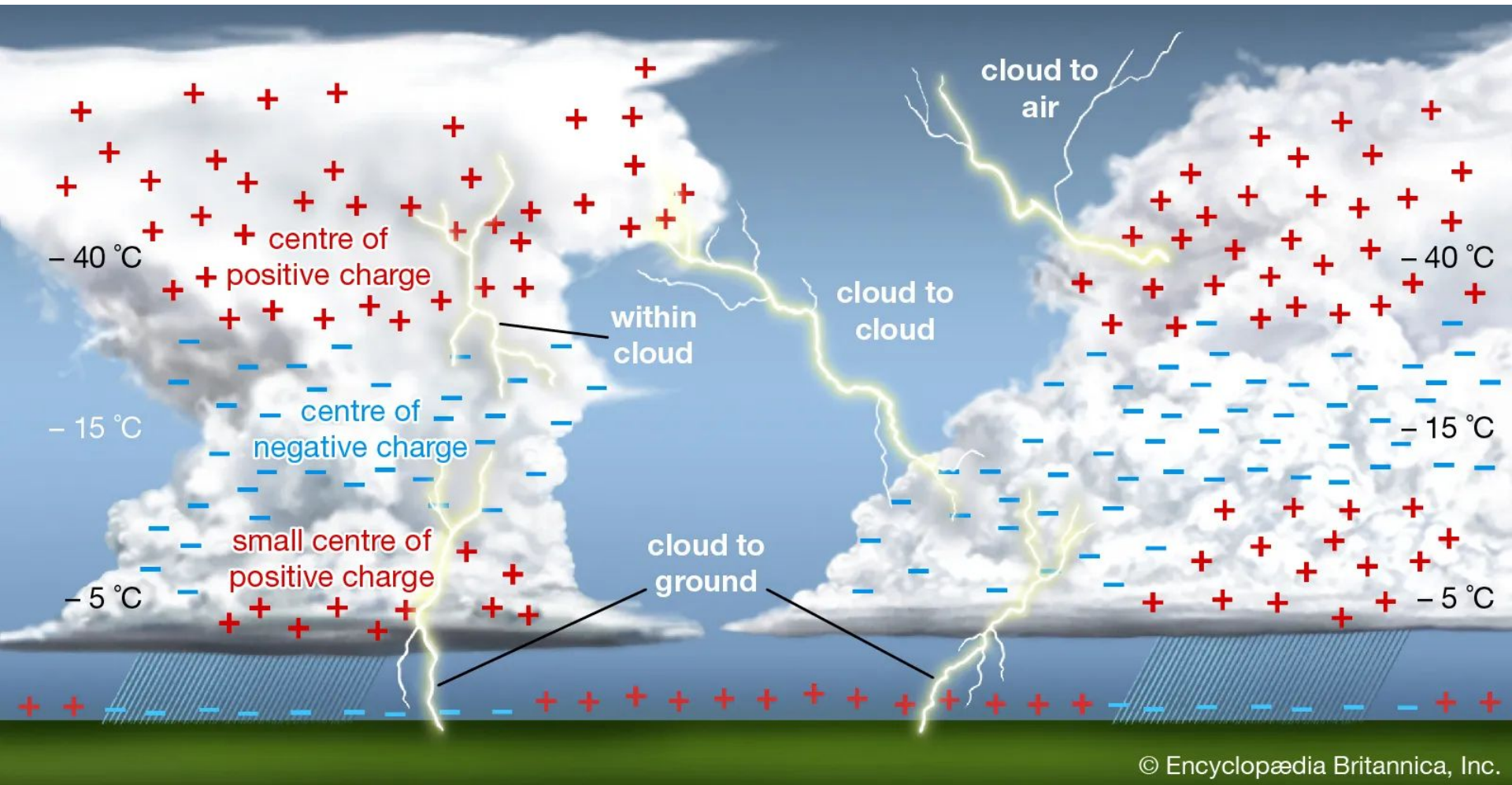
=> **Horizontal gradient of electric field**

Recoil leaders (Needles)

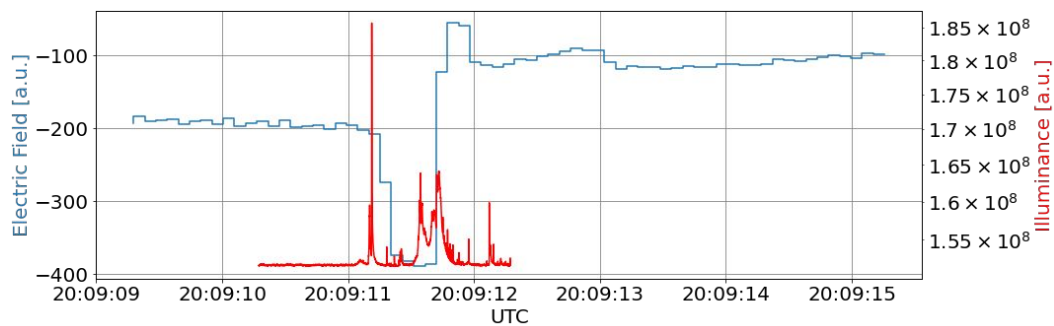
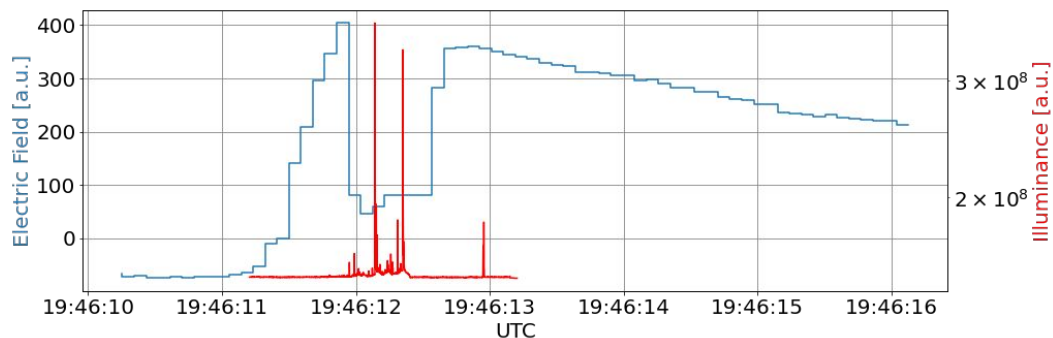
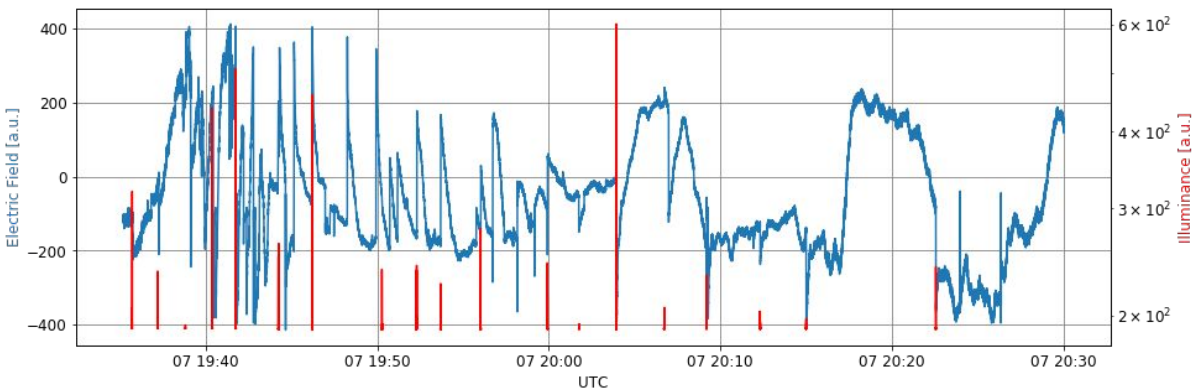
are brighter than “leaders”

(< 1 ms)

Positive side of the lightning is almost invisible

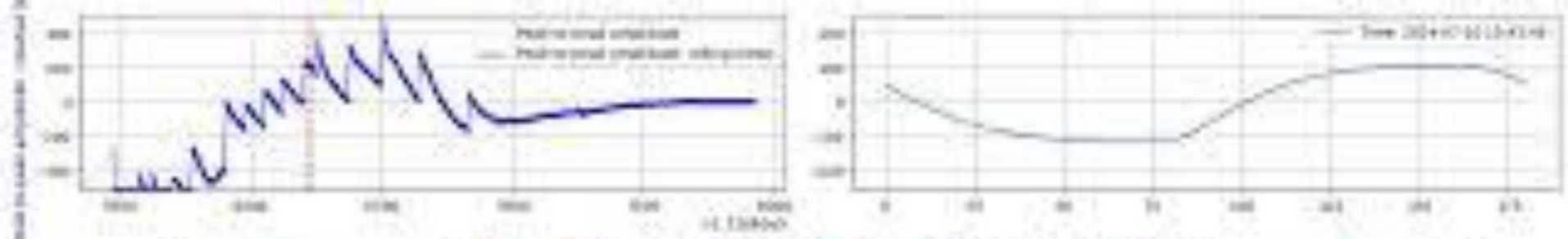


Electric field measurement

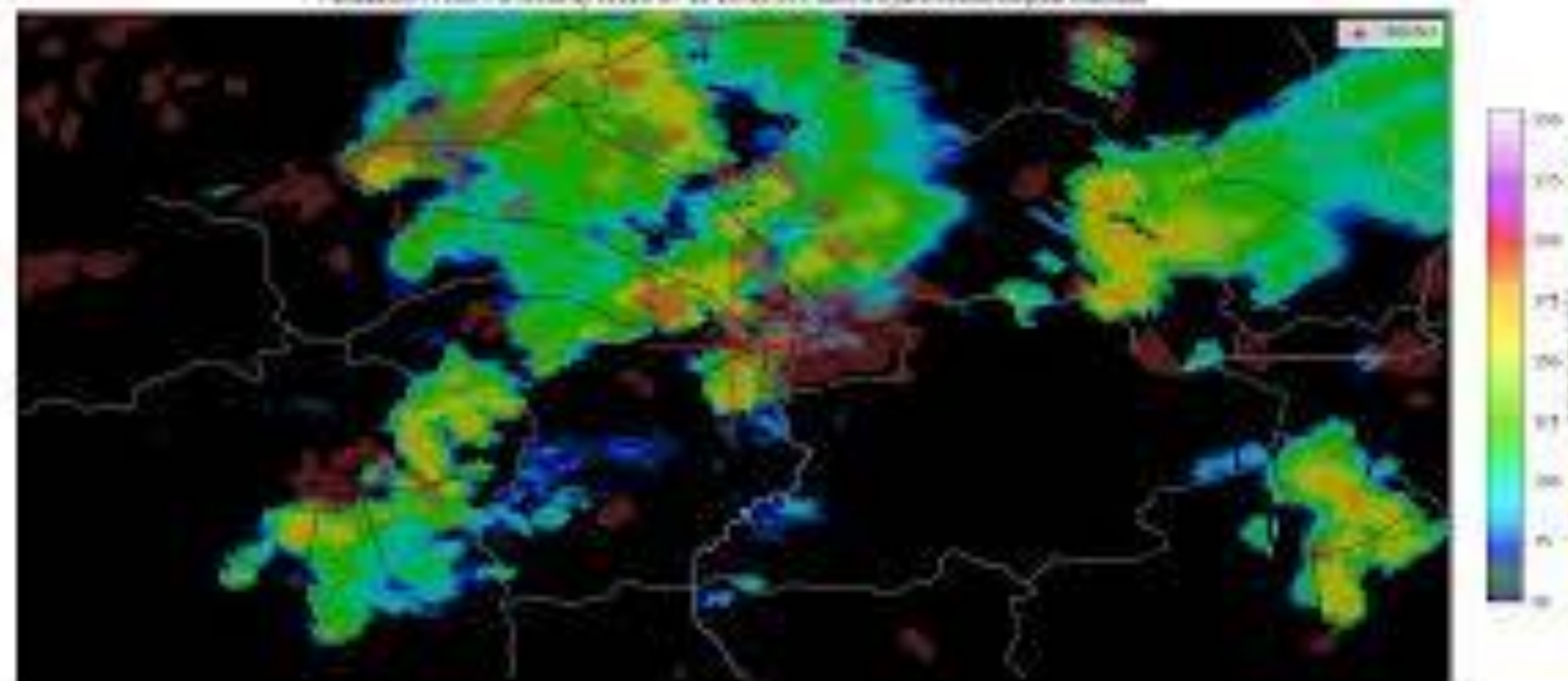


THUNDERMILL 01

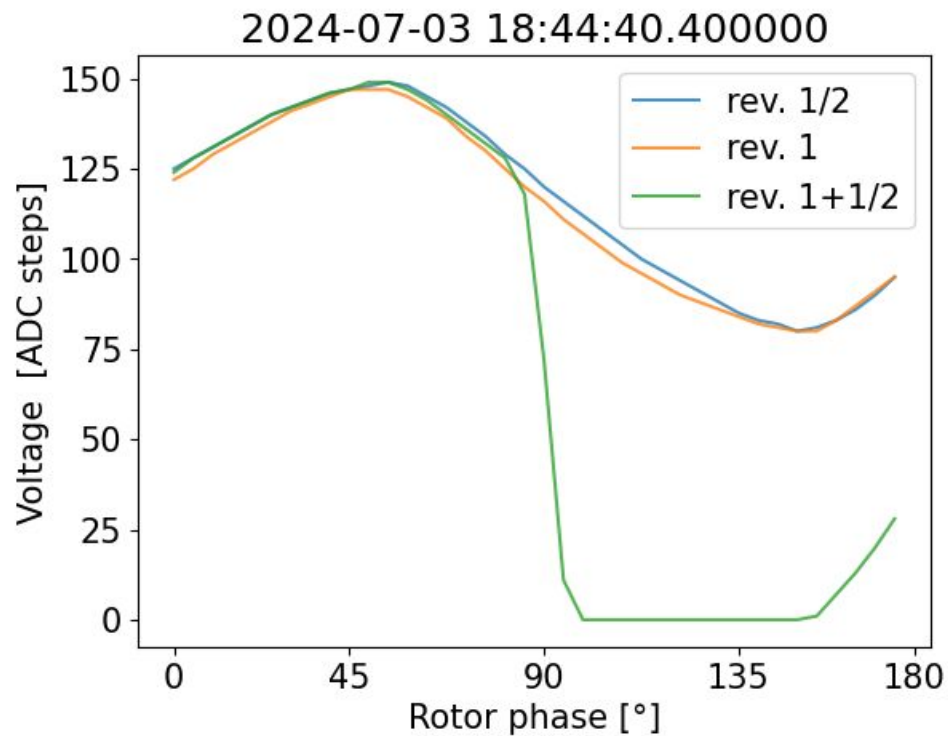




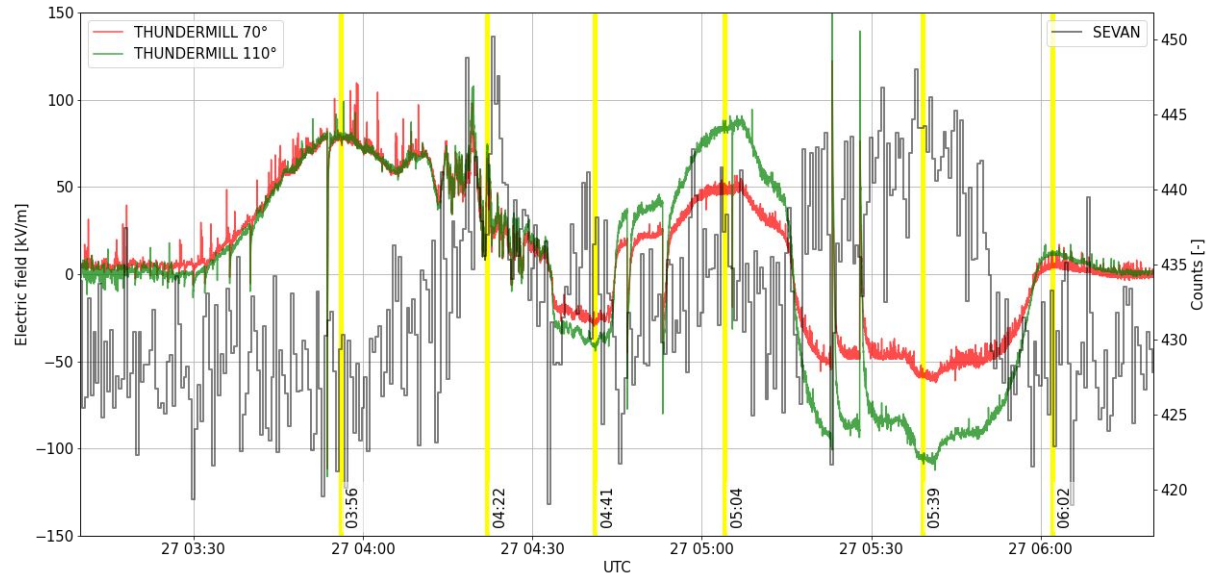
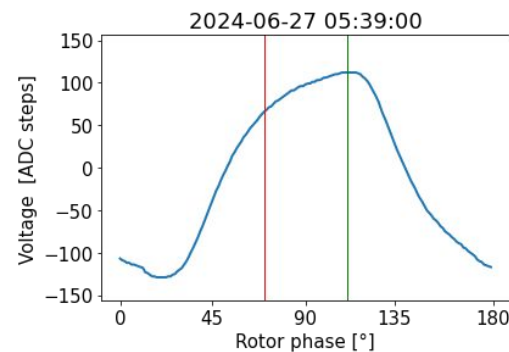
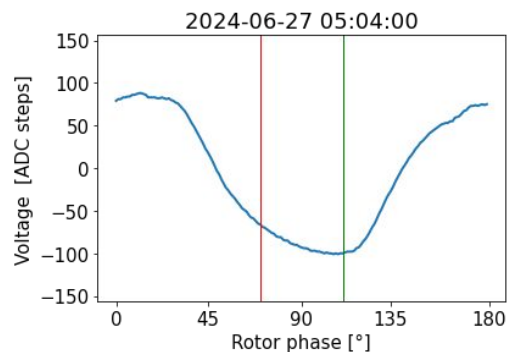
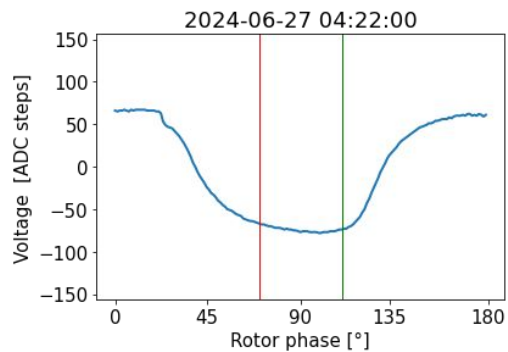
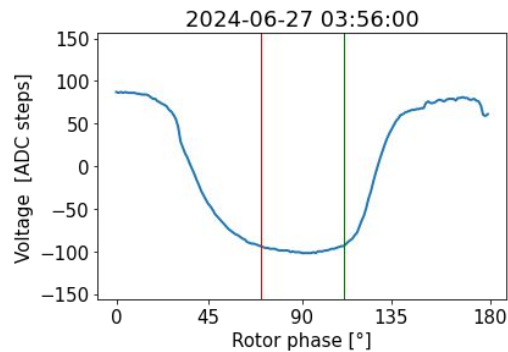
Pseudo-CMPI 20m. Reference: 1000 hPa 10-12-01-01. Case: Isothermobaric (0.001) hPa



High time resolution



Angular sensitivity





Autogyro

