C8 Radio Updates

18.11.2021

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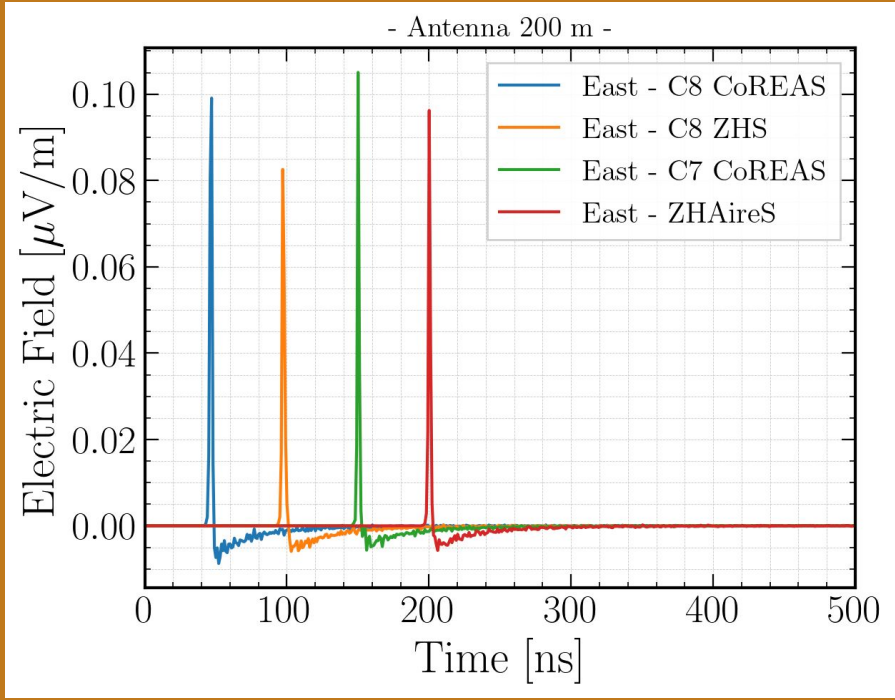
Studies involve:

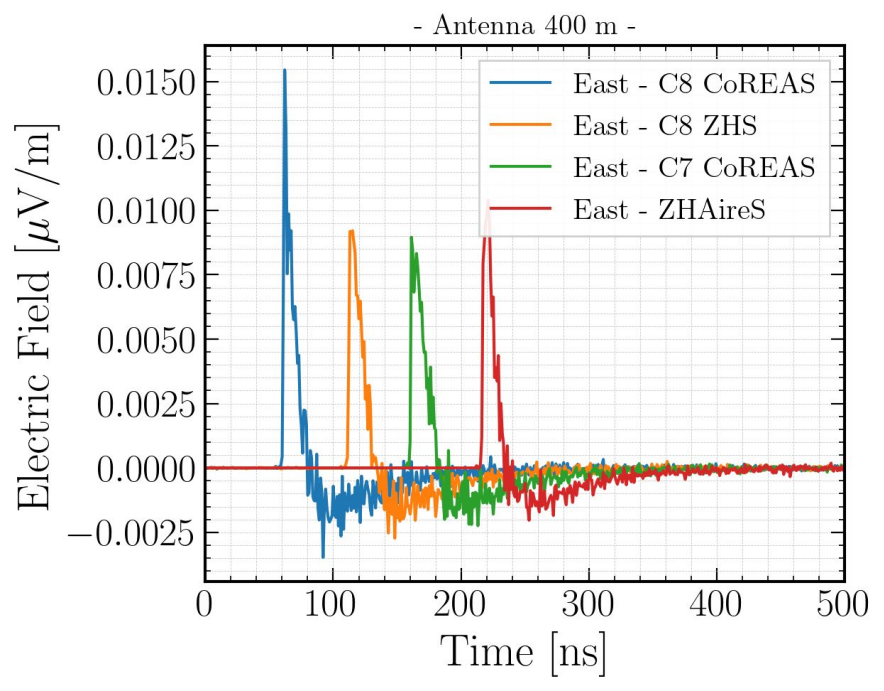
- EM showers with & without geomagnetic field
- Comparisons with C7 and ZHAireS

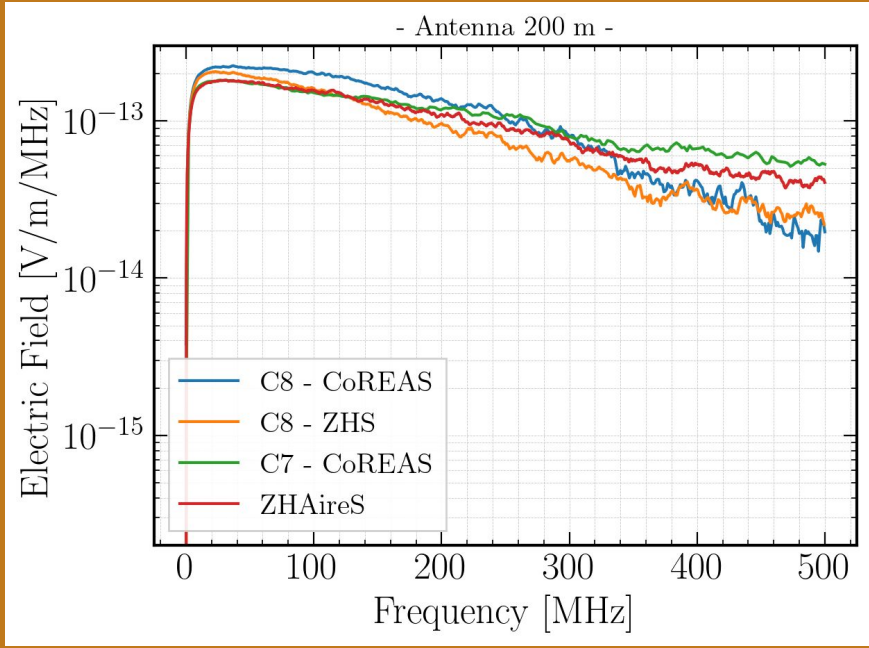
Work that has been done:

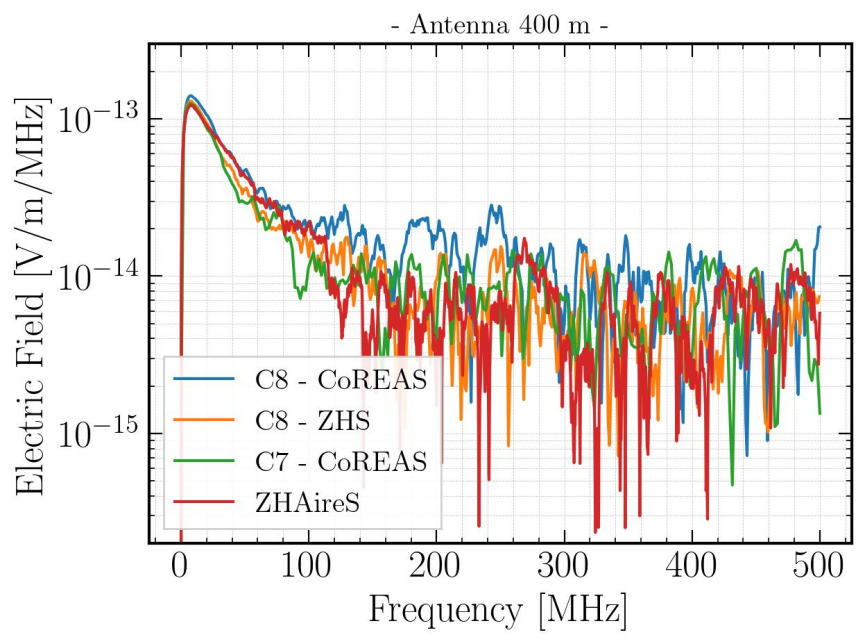
- bug fixes in ZHS
- fixed exponential refractive index profile
- upgrade to PROPOSAL 7.1.1
- got rid of Setup files dependency, so we can have by default the most general and realistic environment interfaces

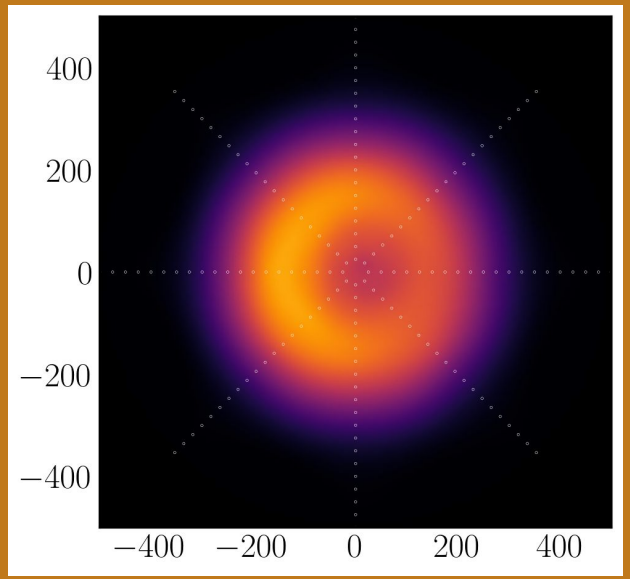
Some plots with Geomagnetic field turned on (PROPOSAL 7.0.5)


- Antenna 200 m -
East - C8 CoREAS
East - C8 ZHS
East - C7 CoREAS
East - ZHAireS
Electric Field [μV/m]
Time [ns]
0.10
0.08
0.06
0.04
0.02
0.00
0
100
200
300
400
500

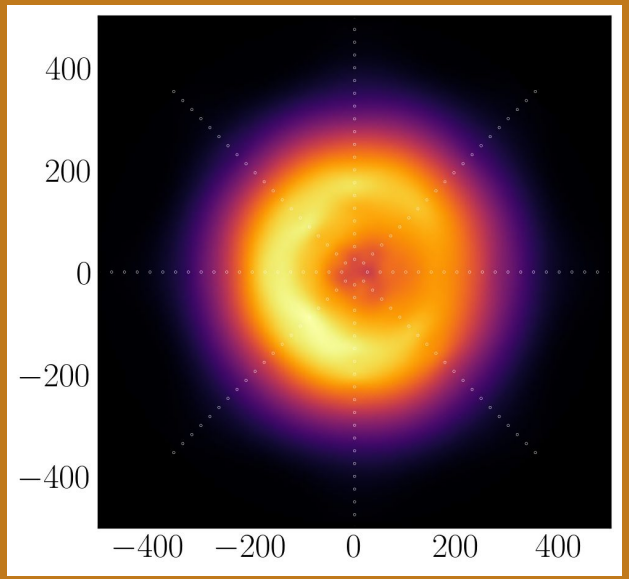

- Antenna 400 m -
East - C8 CoREAS
East - C8 ZHS
East - C7 CoREAS
East - ZHAireS
Electric Field [μV/m]
Time [ns]
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
0
100
200
300
400
500


- Antenna 200 m -
Electric Field [V/m/MHz]
10^{-13}
10^{-14}
10^{-15}
0
100
200
300
400
500
Frequency [MHz]
C8 - CoREAS
C8 - ZHS
C7 - CoREAS
ZHAireS

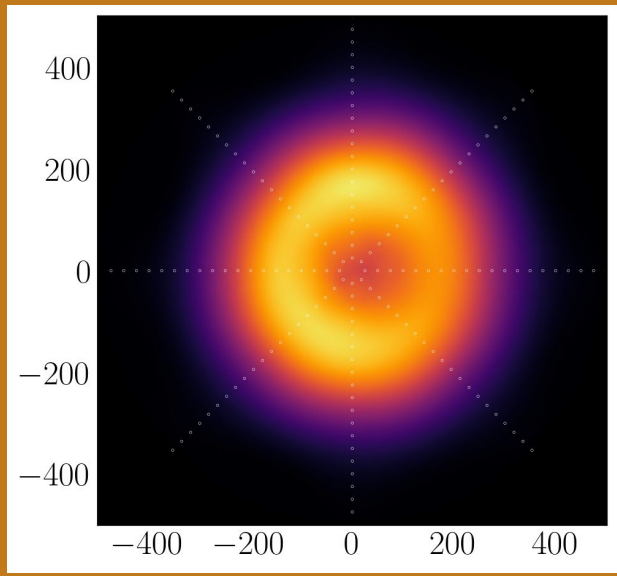

- Antenna 400 m -
Electric Field [V/m/MHz]
10^{-13}
10^{-14}
10^{-15}
0
100
200
300
400
500
Frequency [MHz]
C8 - CoREAS
C8 - ZHS
C7 - CoREAS
ZHAireS



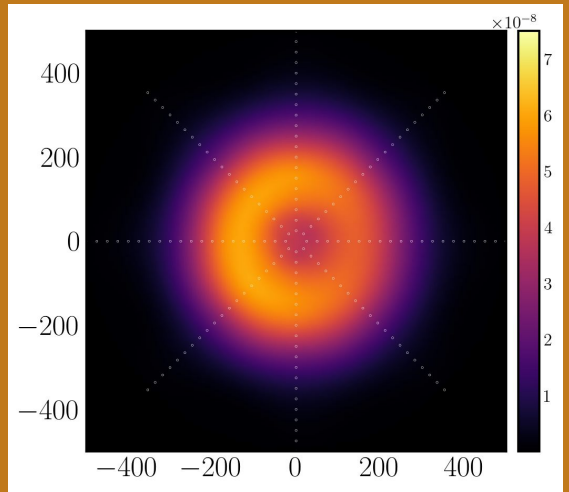
C7



C8 CoREAS



C8 ZHS

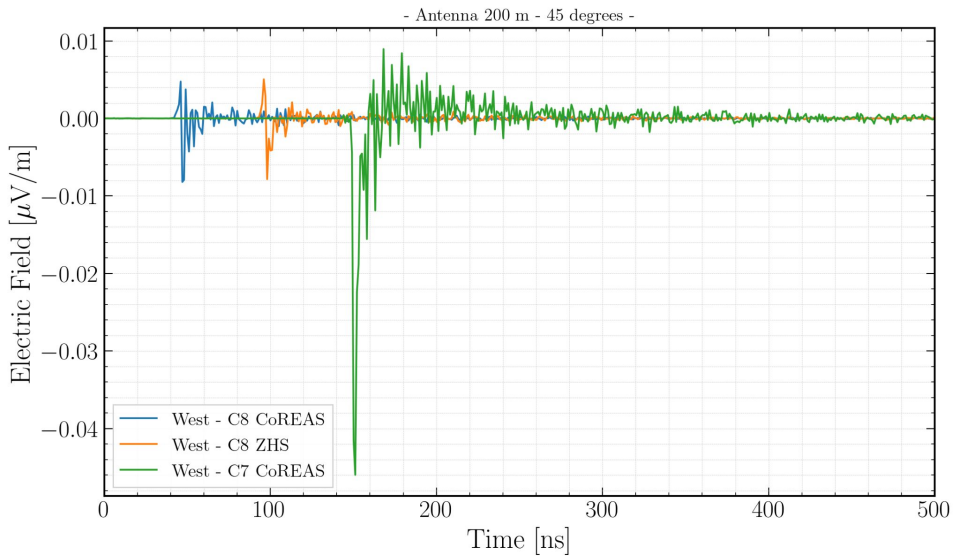


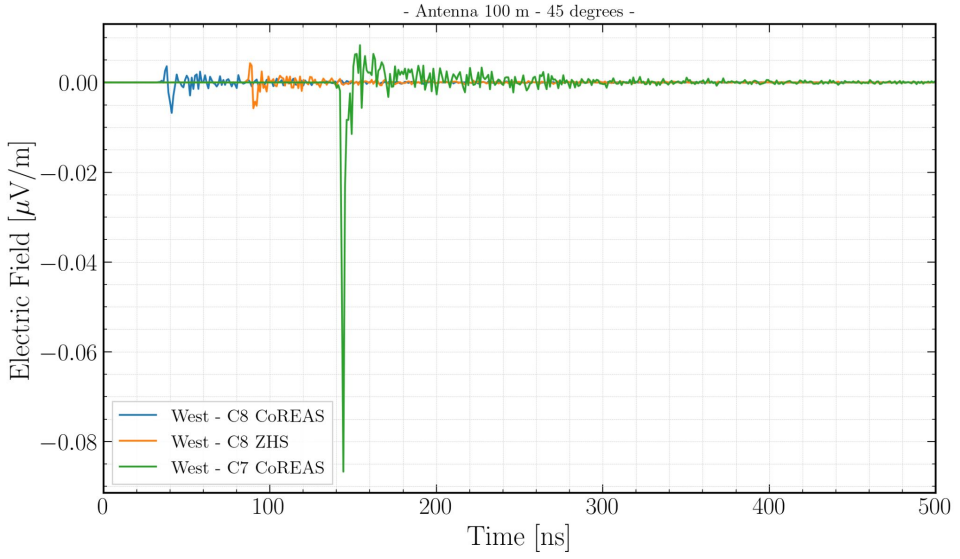
ZHAireS

All polarizations

Some plots with Geomagnetic field turned off (PROPOSAL 7.0.5)

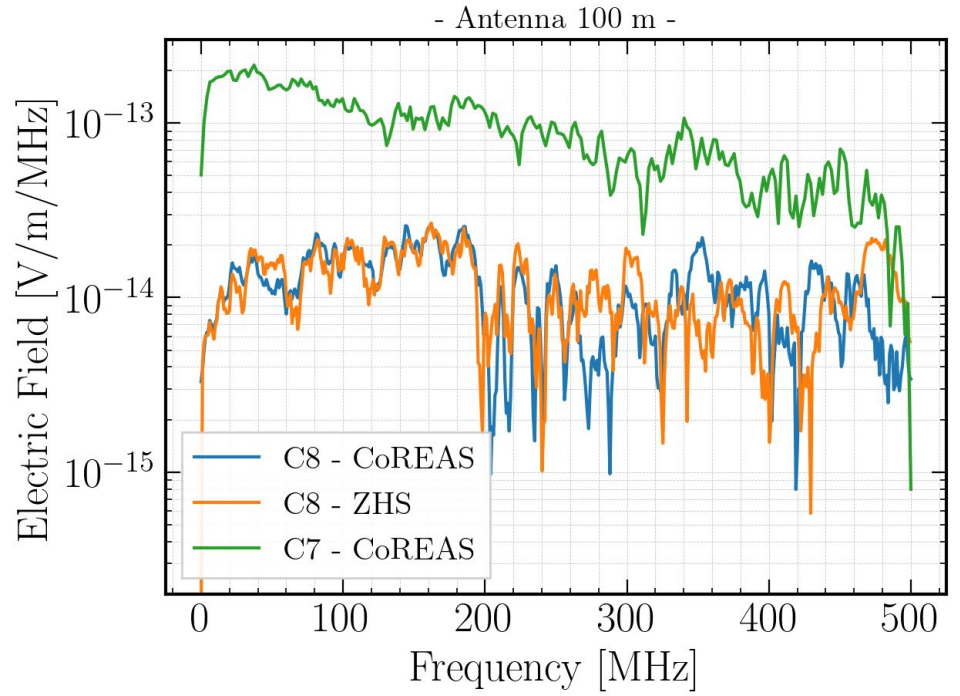
Antenna at 100m from shower core

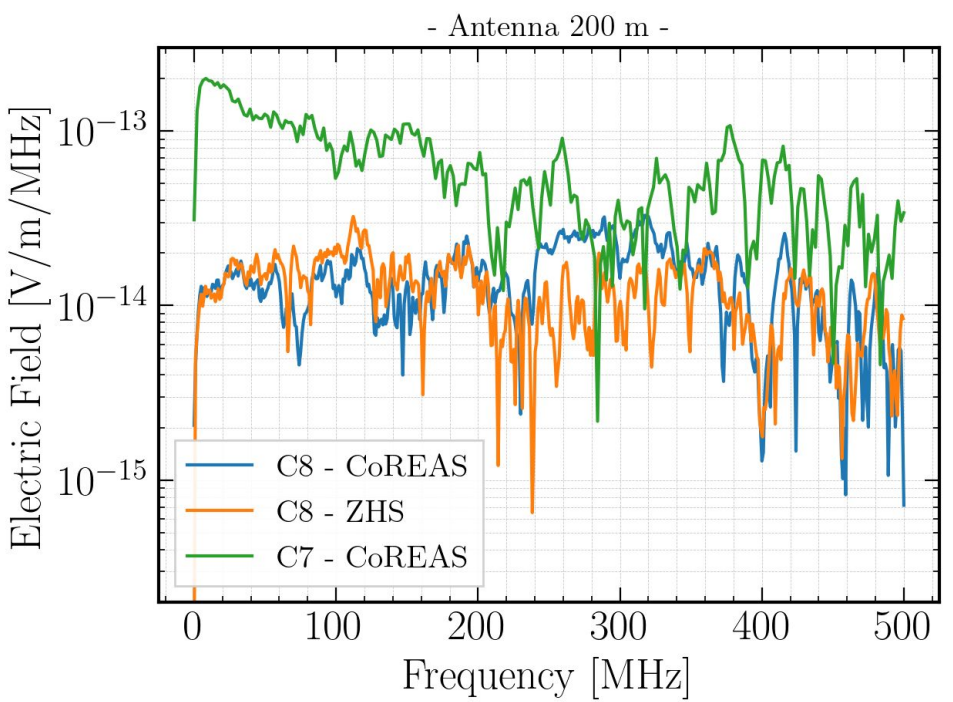




Antenna at 200m from shower core

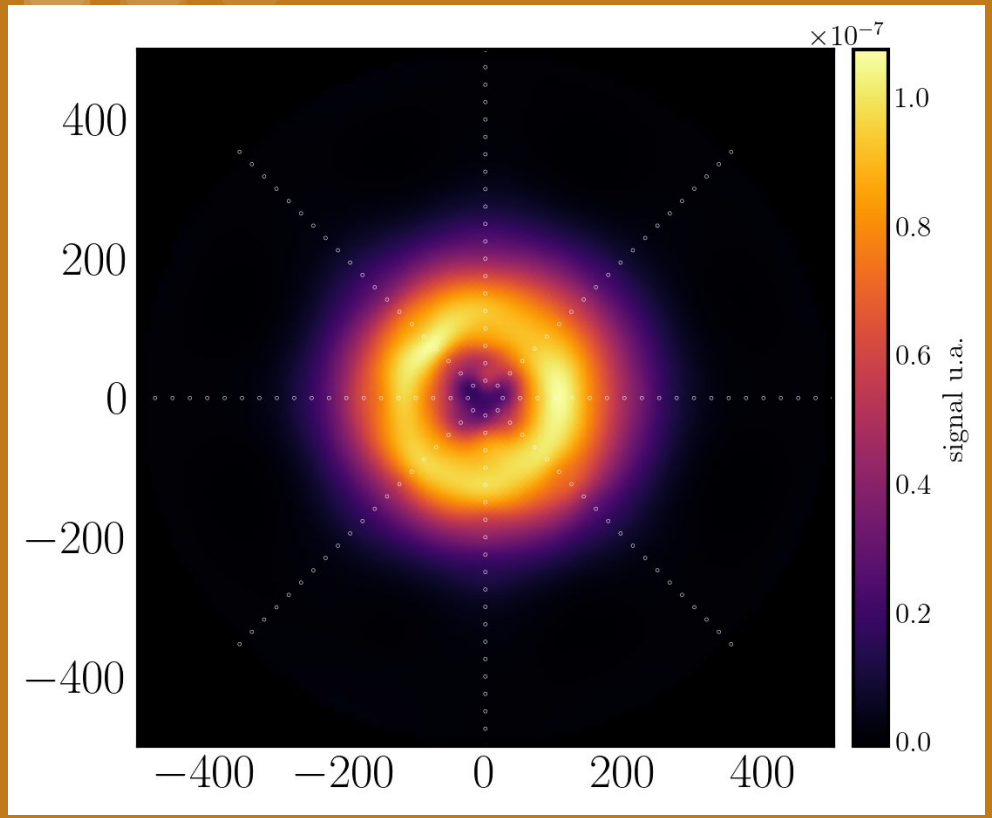
Antenna at 100m from shower core





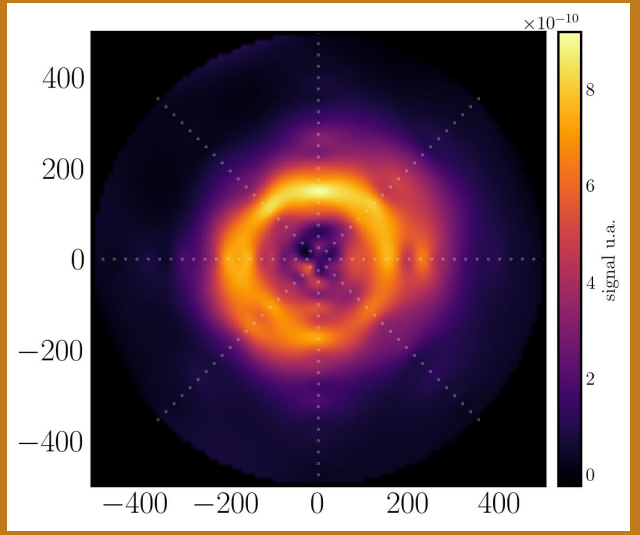
Antenna at 200m from shower core

All Polarizations

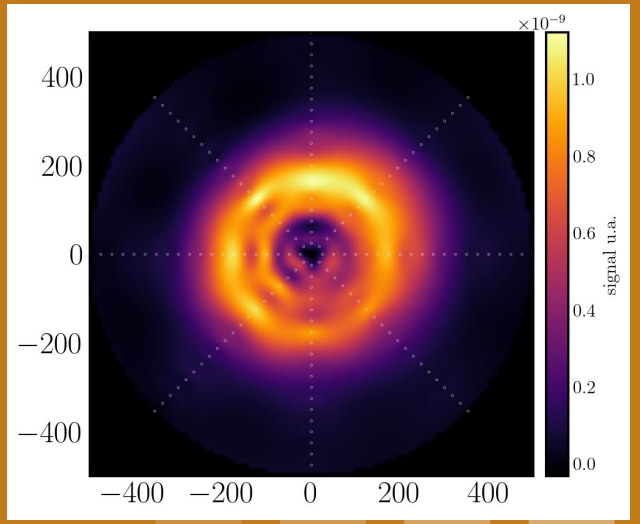


Corsika 7 - CoREAS

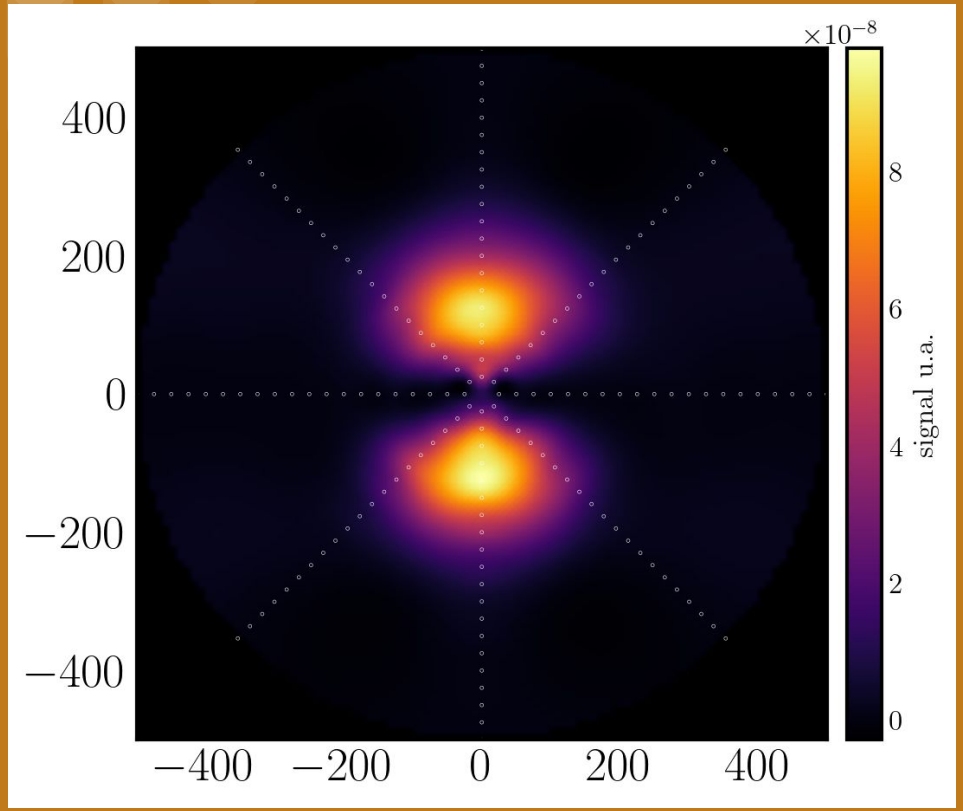
C8 - CoREAS



C8 - ZHS

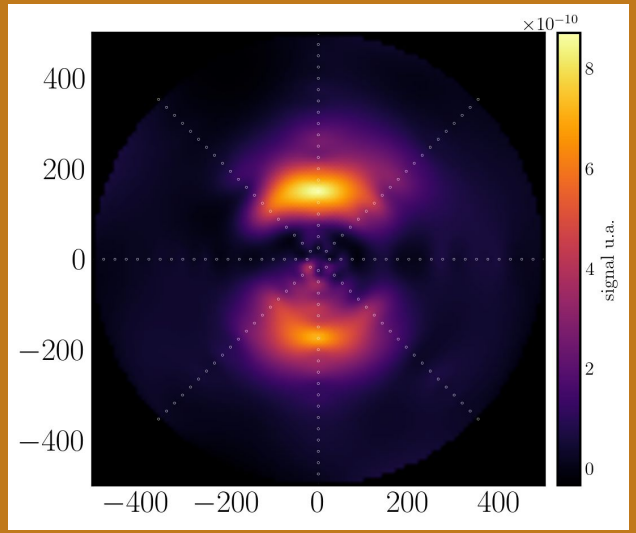


North Polarization

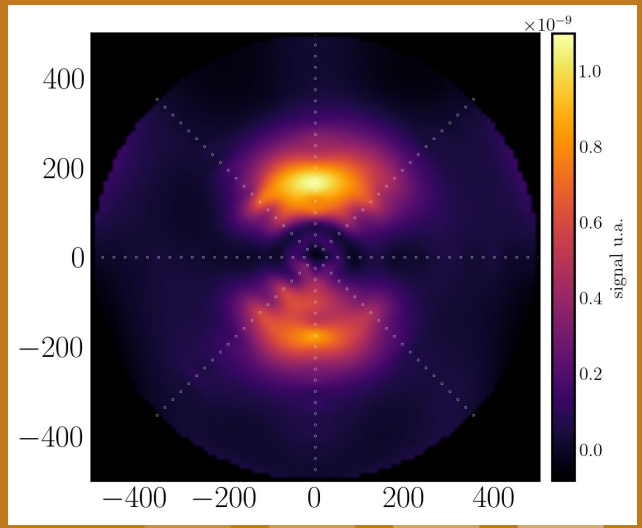


Corsika 7 - CoREAS

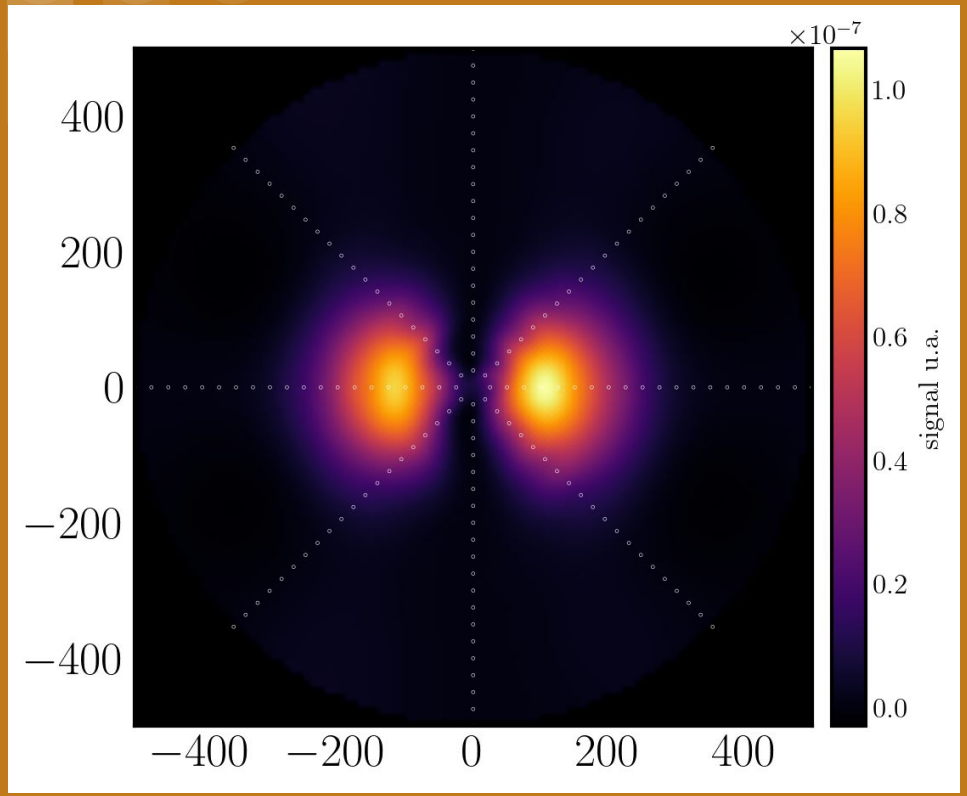
C8 - CoREAS



C8 - ZHS

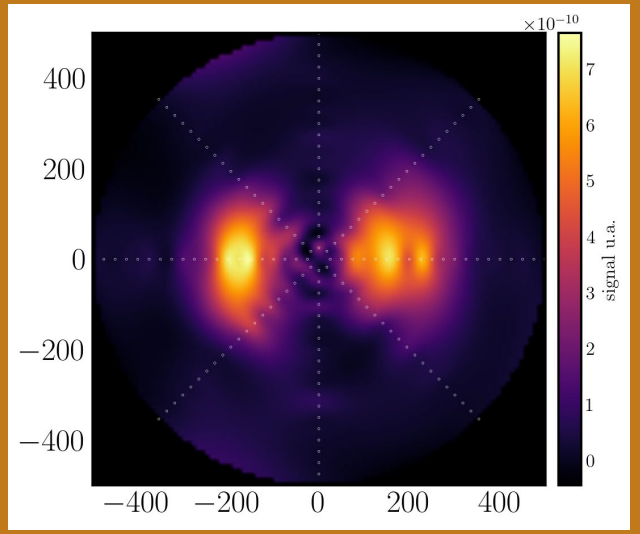


West Polarization

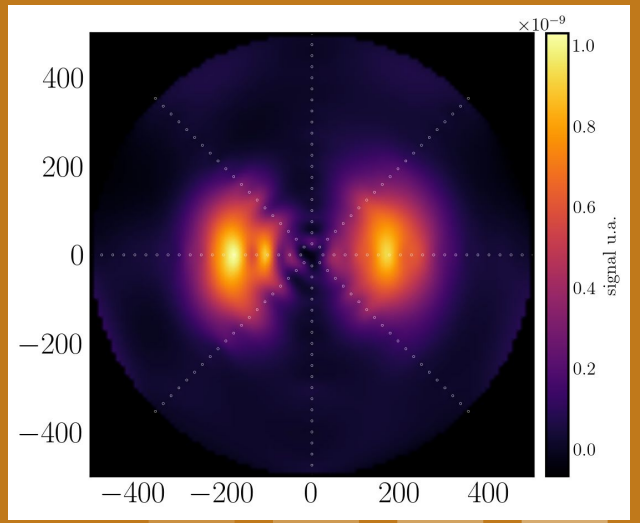


Corsika 7 - CoREAS

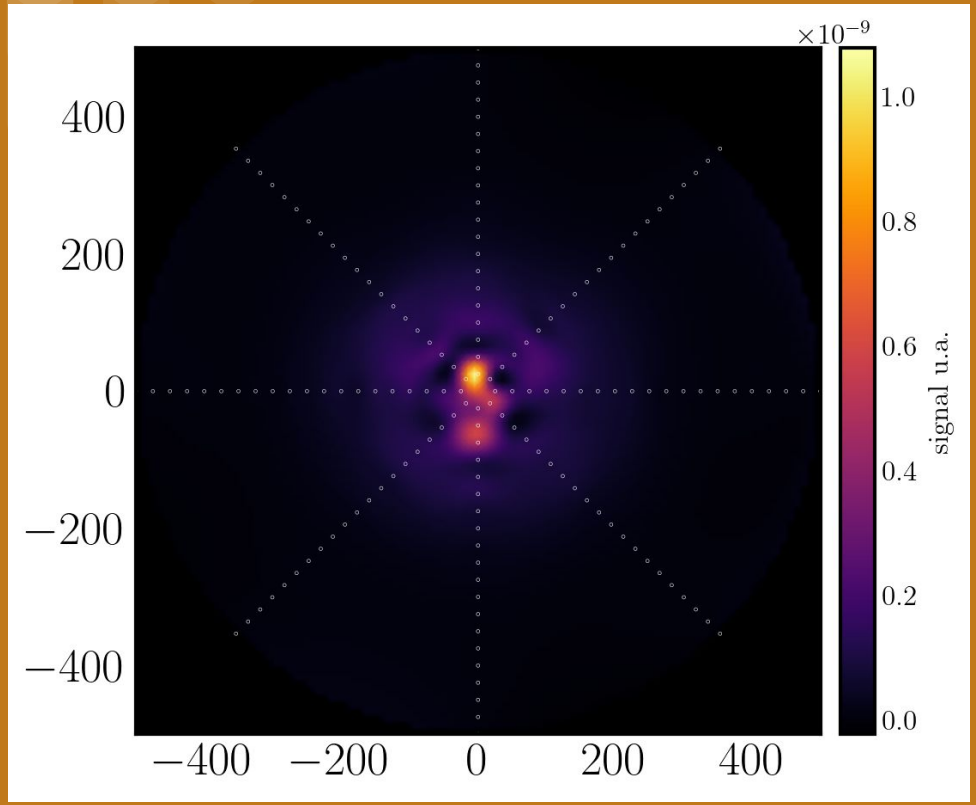
C8 - CoREAS



C8 - ZHS

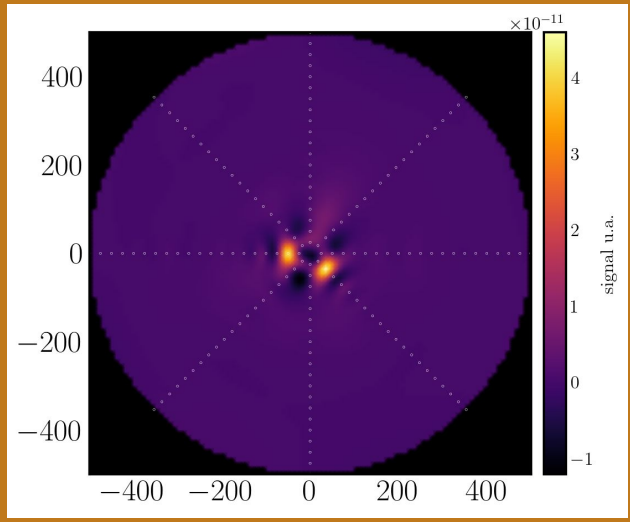


Vertical Polarization

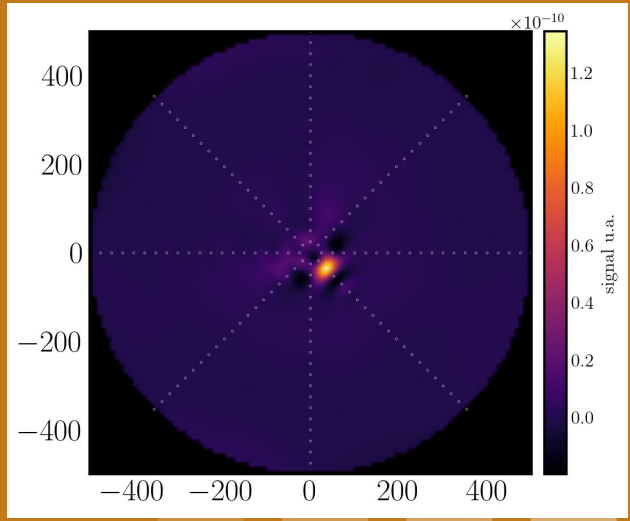


Corsika 7 - CoREAS

C8 - CoREAS



C8 - ZHS



Thoughts:

- There seems to be a discrepancy in the Askaryan emission - although a better analysis is being done as we speak to validate this or not.
- We need to merge radio and simulate these cases again.
- I want to make use of C8 boundary crossing and perform a more sophisticated propagator.
- A faster propagator would also be nice so we can now do a full fledged analysis using the fixed exponential refractive index profile.

Thank you!