

GRAND Collaboration Meeting Warsaw 2025

Wrap-up & Perspectives



Olivier Martineau - LPNHE - CNRS/SU
Kumiko Kotera - IAP - CNRS/SU

GRAND Collaboration Meeting - Warsaw U₁ - 06/06/2025

GRANDProto300

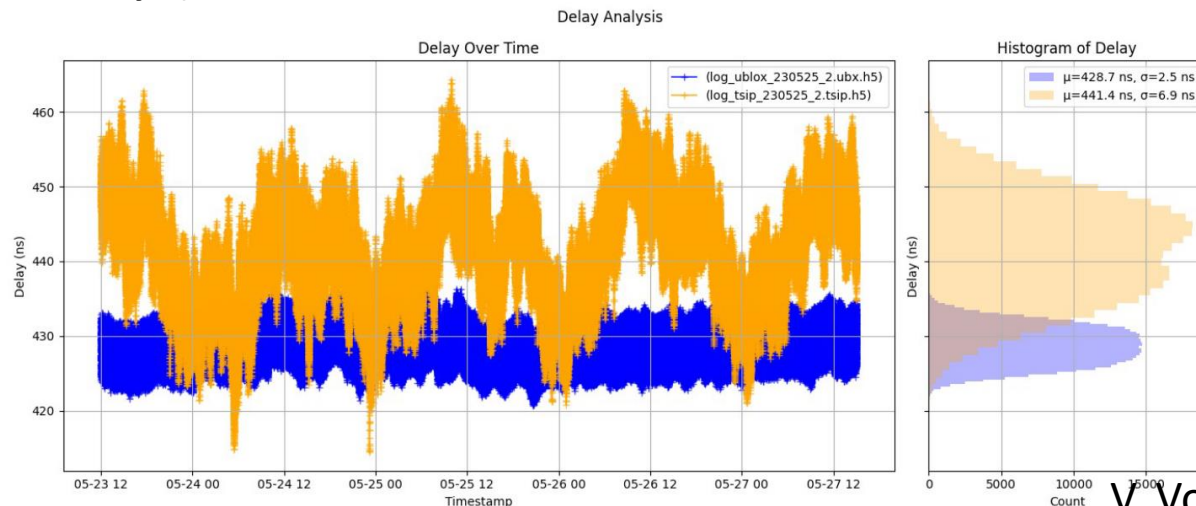
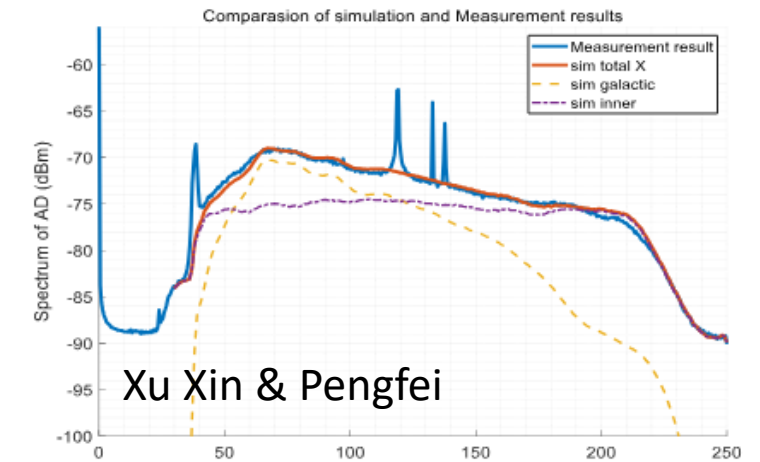
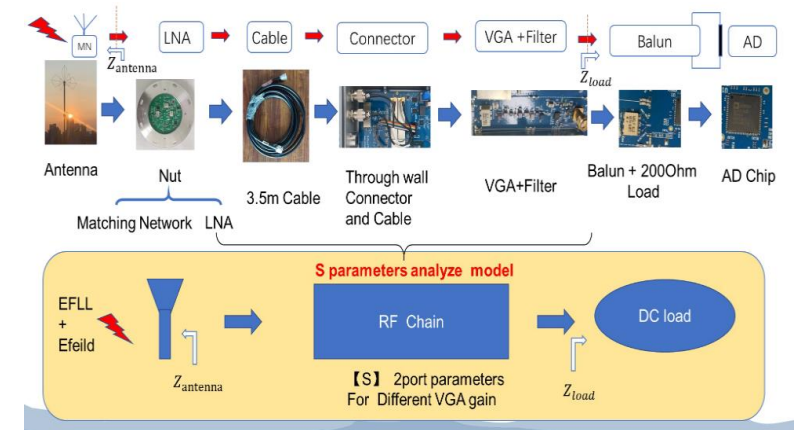
- 18 contributions! A vivid activity 😊
- Operations
 - Huge amount of work to run, understand, quantify and improve detector, from antenna down to data server
 - **Presently impeded by detector stability issues... Ferrites inductances guilty? → under test now!**
 - Reinforce collaboration & organisation for better results!
 - Upgrade efforts well on the way (FEBv2 by Xu Xing/PMO)
 - ... Monitoring tools to be implemented!
- Trigger
 - Recent effort by 2+ groups to better understand and qualify our DU-level trigger (T1) → T1 suspected as one main cause for our reduced CR-detection efficiency
 - Efforts for more advanced methods on the way (NUTRIG, Xidian)

14:00	Status GP300 <i>B2.38, Faculty of Physics, University of Warsaw</i>	Yi Zhang	14:00 - 14:25
	Overview of the technique Status of GP65 and the Plan for GP300 <i>B2.38, Faculty of Physics, University of Warsaw</i>	Pengfei Zhang	14:25 - 14:50
14:00	DAQ Design/Update/Testing <i>B2.38, Faculty of Physics, University of Warsaw</i>	DUAN BOHAO	14:00 - 14:15
	GP300 Data Quality Study <i>B2.38, Faculty of Physics, University of Warsaw</i>	Nathan LEBAS	14:15 - 14:25
	FEB Board Design Update/Testing <i>B2.38, Faculty of Physics, University of Warsaw</i>	Xing Xu	14:25 - 14:40
	Intro on trigger <i>B2.38, Faculty of Physics, University of Warsaw</i>	Olivier Martineau	14:40 - 14:45
	GP80 Trigger Efficiency Study <i>B2.38, Faculty of Physics, University of Warsaw</i>	Marion Guelfand	14:45 - 15:00
	Trigger Optimization Based on Filters and Parameter Selection <i>B2.38, Faculty of Physics, University of Warsaw</i>	Hanrui Wang	15:00 - 15:15
15:00	Trigger Studies using GP300 data <i>B2.38, Faculty of Physics, University of Warsaw</i>	George Vittakis	15:15 - 15:30
	Results of the First-Level Trigger Study with NUTRIG <i>B2.38, Faculty of Physics, University of Warsaw</i>	Pablo Correa	15:30 - 15:45
	Results of the Second-Level Trigger Study with NUTRIG <i>B2.38, Faculty of Physics, University of Warsaw</i>	Kohler Jelena	15:45 - 16:00
	GPS Performance with the GRANDProto FEB <i>B2.38, Faculty of Physics, University of Warsaw</i>	Vincent Voisin	16:30 - 16:45
17:00	GPS Time Calibration <i>B2.38, Faculty of Physics, University of Warsaw</i>	Pengfei Zhang	16:45 - 17:00
	Calibration Studies using GP300 data <i>B2.38, Faculty of Physics, University of Warsaw</i>	Antonios Leisos	17:00 - 17:15
	Comparison of Xidian and GrandLib noise level computations <i>B2.38, Faculty of Physics, University of Warsaw</i>	Aurélien Benoit-Lévy	17:15 - 17:20
09:00	The status of data management <i>B2.38, Faculty of Physics, University of Warsaw</i>	Francois Legrand	09:00 - 09:20
	Updates to the antenna model, RF chain and Galactic noise <i>B2.38, Faculty of Physics, University of Warsaw</i>	George Vittakis et al.	09:40 - 10:00
12:00	Antenna and RF Chain Response Simulation: Update, Optimization, and Calibration Based on Galactic Background Xing Xu		

GRANDProto 300

• Calibration

- High level of quality of our description and modeling of GP300 detection chain. A key element for our work!
- Amplitude calibration (Galactic signal) now a robust tool! ☺... Other tools needed for directional calibration (antenna lobe, ground effects)
- Time calibration efforts ramping up this year (in lab & out site → more collaborative work needed to better quantify!)...



V. Voisin

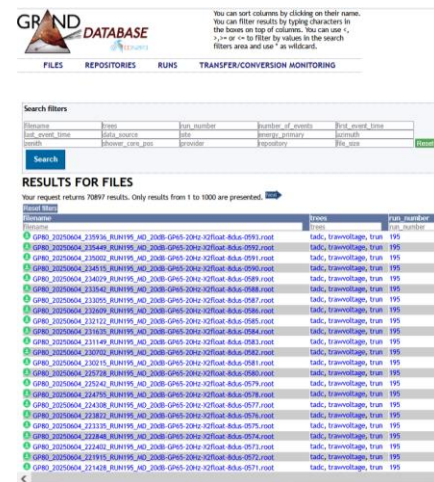


- GRANDLib & DC2 now coming to maturity!

- Tools are (more and more) ready for your favorite analysis → USE THEM and IMPROVE THEM. (way in: hands-on notebook)
 - Smooth data flow 😊
 - Environment « complexity » (Docker/Conda/...) being worked on 😊
 - Branches being merged 😊
 - Issues on analysis/reco variables management wrt ROOT?
- Cannot be a one-way deal: users also have to contribute to the code

- Great dedication of a very small team... who **needs help!** → will be organised.

- DC2-ZHaires: latest release (9k sims) on real layout with non-core contained events... Mass prod to come after that! Also T1 trigger to be included in sims!



Run

Stop

Restart

Clear

Code

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (ipykernel) Logout

```
# Get the trigger times (if these are really trigger times is still questionable)
trigger_times = np.array([v.trigger_time for v in e.voltages])

# Reduce the number of digits in times - there are Unix times with nanoseconds!
trigger_times = np.array(trigger_times - np.min(trigger_times)).astype(np.float64)

# Reconstruct the direction with plane wave analytical fit - may fail
fit_failed = False
try:
    zenith, azimuth, dzenith, dazimuth = plane_wave_direction_with_errors(positions[:, 0], positions[:, 1], trigger_times)
except:
    fit_failed = True

# *** X MAX "RECONSTRUCTION"
xmax = np.random.rand()*400+700

print(f"Reconstruction results: zenith {zenith}, azimuth {azimuth}, Xmax {xmax}")

# *** SAVING THE RESULTS - only for successful results***

if fit_failed: continue

# Create the Shower instance
e.shower = Shower()

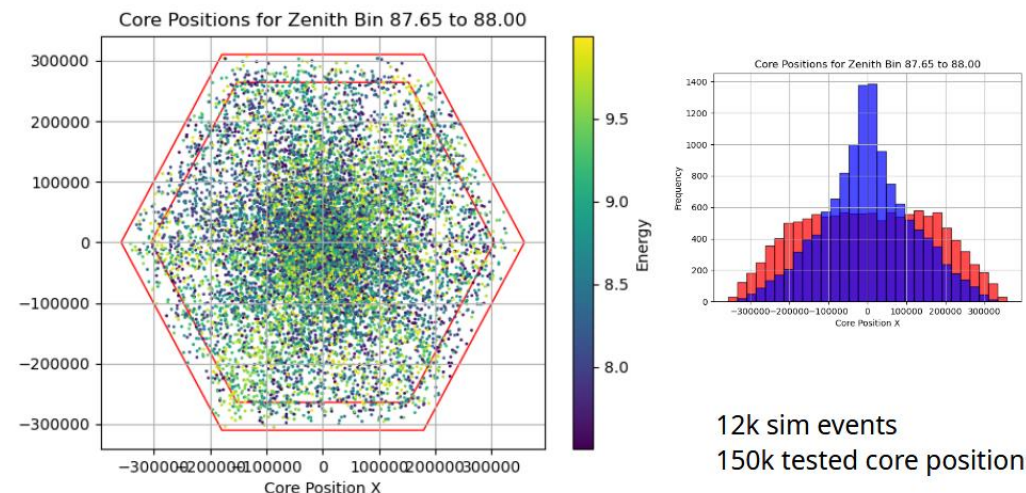
# Fill with reconstruction information
# We are not storing uncertainties anywhere - we should probably add fields in the trees
e.shower.zenith = zenith
e.shower.azimuth = azimuth
e.shower.Xmax = xmax

# Write the event in the target directory
e.write(out_dir="reconstructed_events")

plt.close()
```

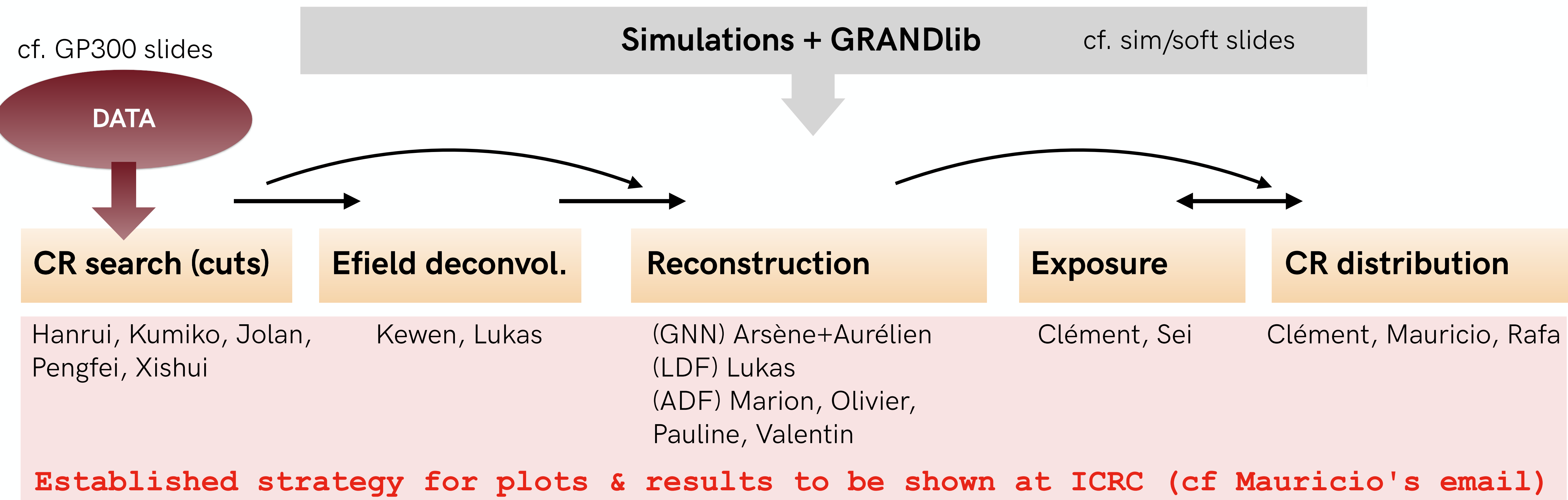
Run information loaded.
RunRawVoltage information loaded.

Extremely Inclined Events™



12k sim events
150k tested core positions

Matias



Powerful methods being developed for next stage of analysis

Improved cuts

Jolan, Xishui,
Simon C.

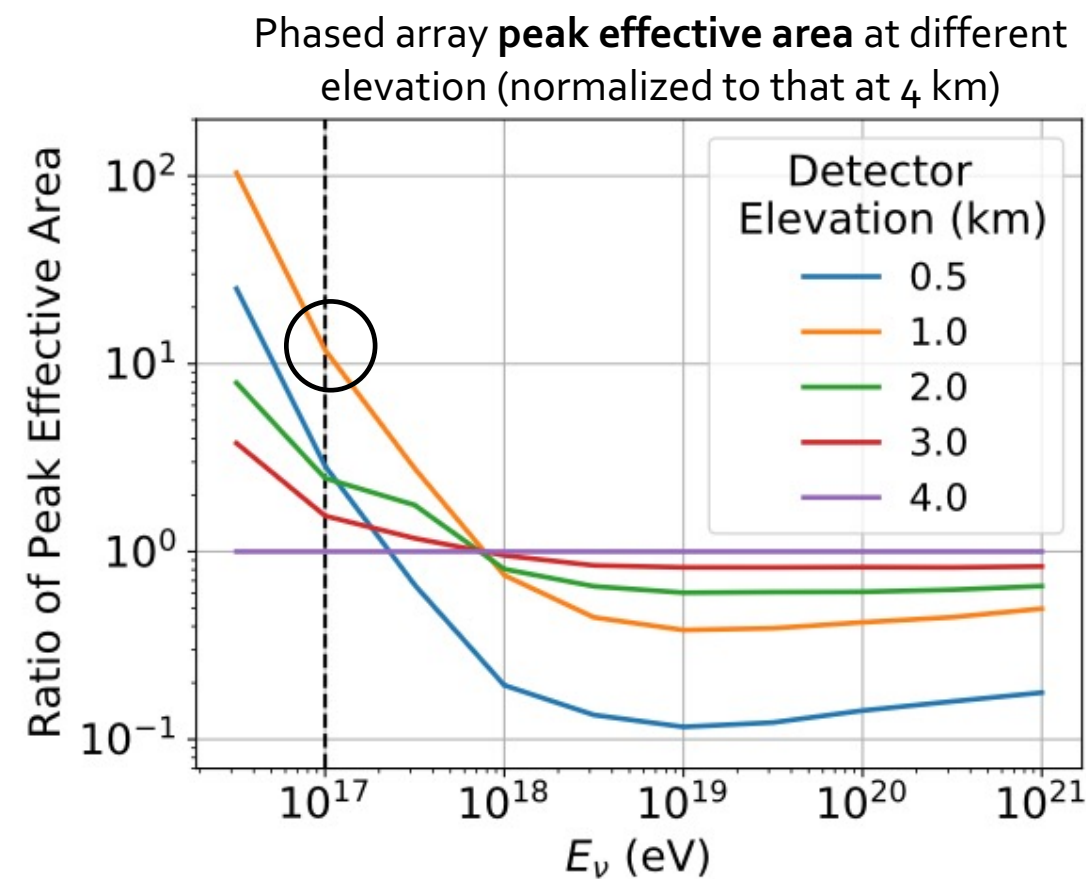
CNN

Jean-Marc, Oscar,
Sara, Simon P.

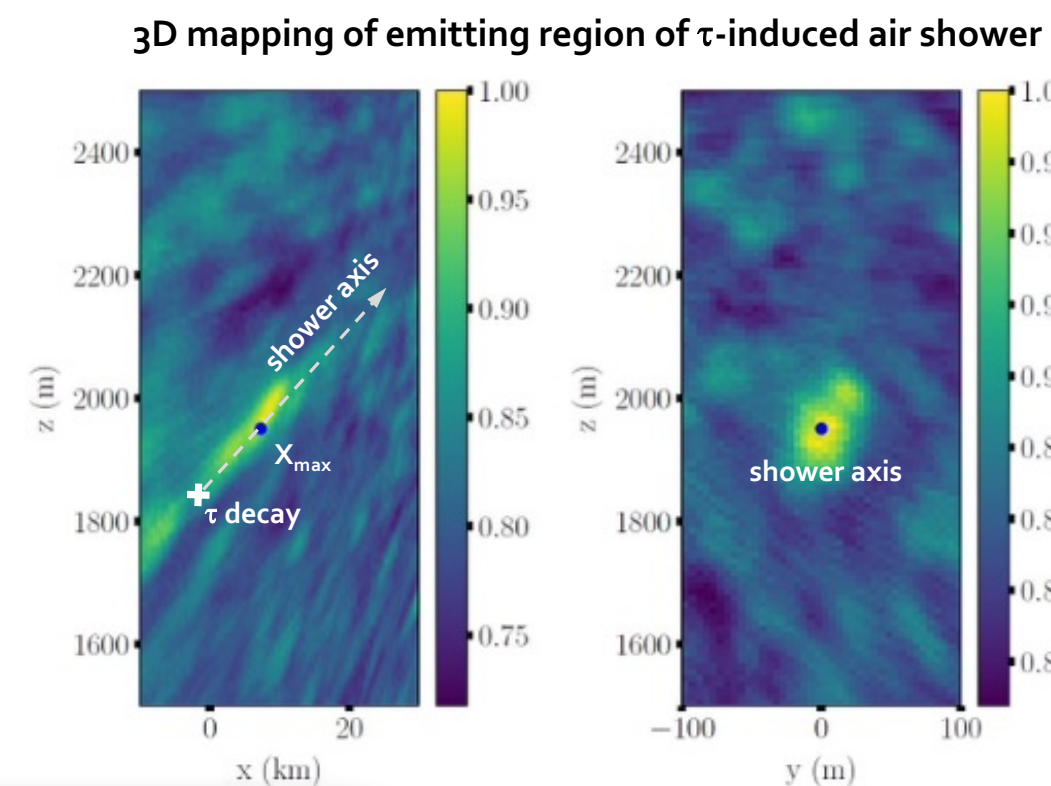
Valentin

CNN

Aurélien, Washington



- $\tau^- \rightarrow e^- \nu_e \nu_\tau$ $E_{\text{shower}} = 5.57 \cdot 10^{17} \text{ eV}$ $\theta_{\text{exit}} = 0.42^\circ$ $h_{\text{decay}} = 1.8 \text{ km a.s.l.}$
-



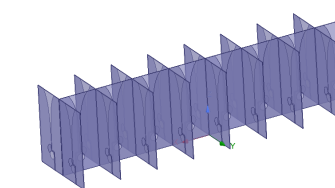
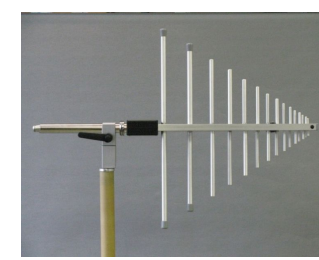
- CNEA (Argentina) – I. Allekotte, F. Sanchez, ...
- Inst. Física de La Plata (Argentina) - **M. Tueros**
- Xidian Univ. (China) – **Pengfei Zhang**
- PMO (China) – **Zhang Yi**
- Institute of Physics, Czech Academy of Sciences (Czech Republic) – **M. Bohacova**
- IAP, Paris (France) – **K. Kotera, R. Alves-Batista, P. Minodier**
- LPNHE, Paris (France) – **O. Martineau**
- Université Paris-Saclay, CEA, List (France) - **A. Benoit-Lévy, A. Ferrière**
- Lab. Univers et Particules Montpellier (France) – **C. Guepin**
- SUBATECH, Nantes (France) - **V. Decoene**
- Univ. Clermont Ferrand (France) – **V. Niess**
- Univ. of the Aegean (Greece) – **A. Leisos, G. Vittakis**
- Hellenic Open University, Pátrai (Greece) – **S. Nonis**
- IGFAE, Univ. Santiago (Spain) - **J. Alvarez-Muñiz, S. Cabana-Freire**
- Penn State Univ. (USA) – **S. Wissel, A. Zeolla, K. Murase**

GRAND-Beacon site Ingo Allekotte – 2025-06

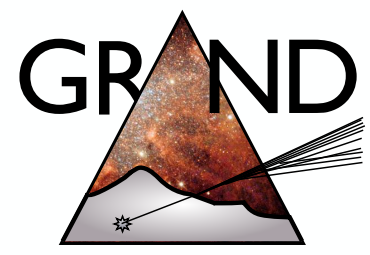
- **work for immediate future:**
 - **design optimization:** layout, antenna design & frequency range, antenna beams, gain...
 - **reconstruction performance** on low-threshold signals from standalone & phased array
 - impact of **topography**
 - **measurements of sky noise** when pointing at ground, need to conduct RFI site-survey

X

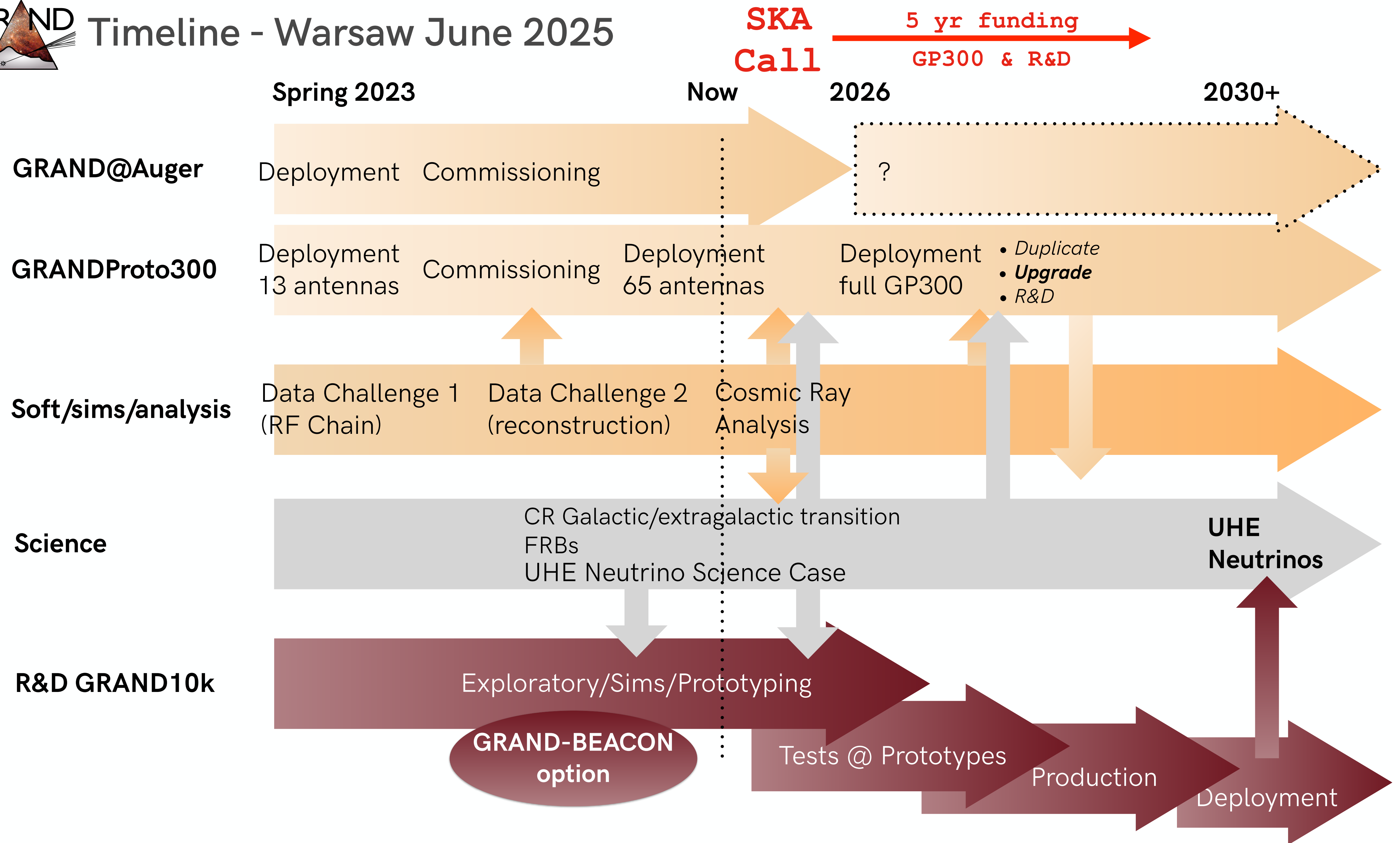
Part III: Candidates of antenna



TCA/Horn



Timeline - Warsaw June 2025



Board / Umbrella / Collab life

- Funding:
 - good perspectives planning ahead (SKA-China funding + running cost contribution to come in)!
 - Need for a long tem full funding planning (Finance WG ToDo)
- Work organisation: proceed **top-down** (Science Key Projects: what goals do we want to achieve) and **bottom-up** (Working Groups: what tools do we need to do that?) at the same time
- Meetings organisation: will follow up, but moving towards merging (some) forums (Analysis / ML / Software)
- **Documentation needed!!!**
 - Develop our best practices: notebook/examples; code integration within GRANDLib; code quality validation...
 - Reduce communication channels (ie quit Forge?) and promote internal notes instead?
 - Assign a « Documentation Committee » responsable?
- Jolan elected as ECS representative: congratulations!



Thank you Warsaw & the LOC!
looking forward to 2026: the GRAND Year

