

GRAND White Paper: Timeline for v2

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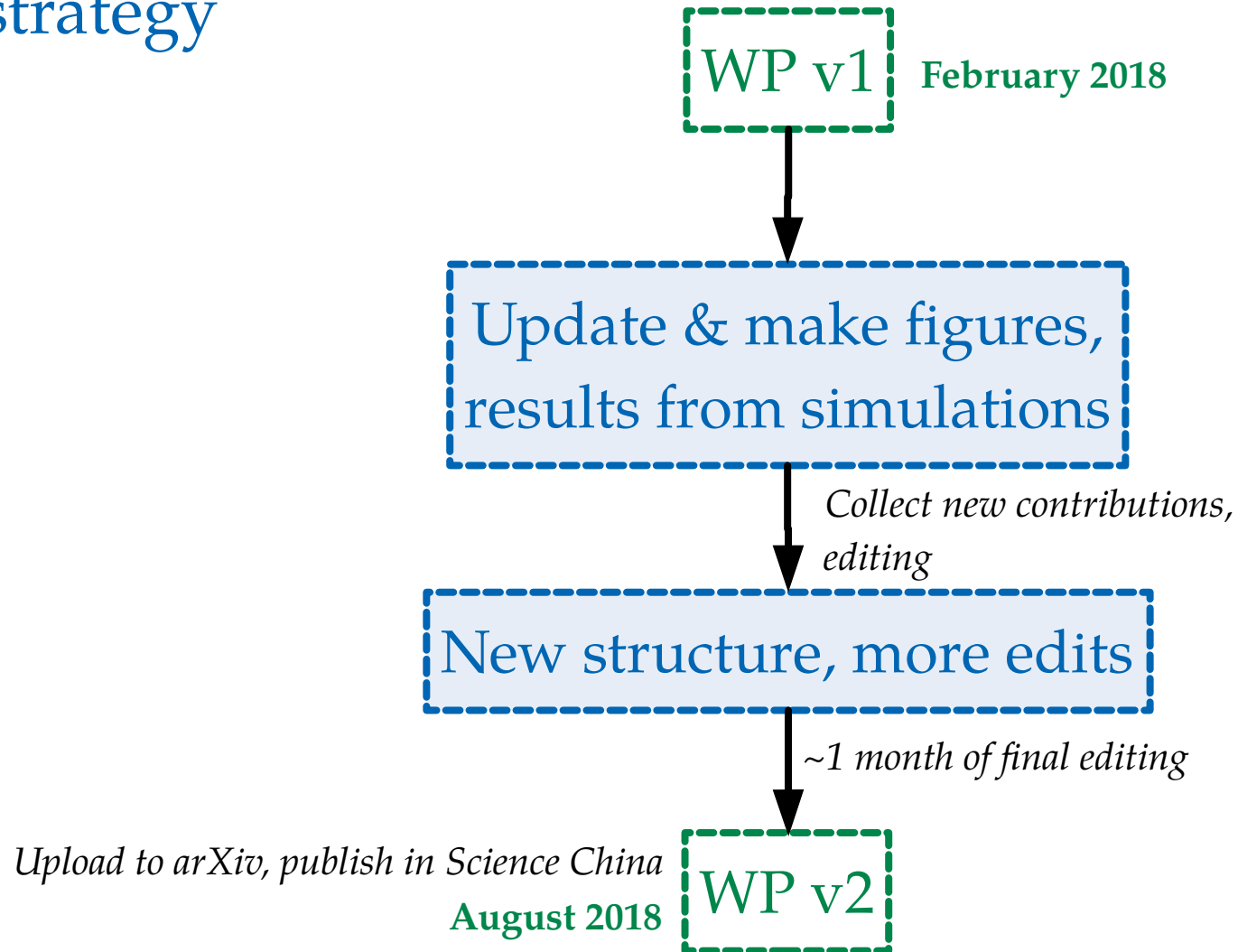
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General strategy



White Paper: New Structure

I. Introduction

I.A Motivation, science case summary

I.B What is GRAND?

II. UHE messengers

II.A Detection principle

II.B Neutrinos

II.C Gamma rays

II.D Cosmic rays

II.E Multi-messenger studies

III. Cosmology and radioastronomy

III.A Epoch of reionization

III.B Fast radio bursts

III.C Giant radio pulses

IV. Detector design

IV.A Antenna design

IV.B Array layout

IV.C Construction stages

V. Detector commissioning

V.A Deployment strategy

V.B Data policy

V.C Outreach

V.D Budget estimate

VI. Summary

Appendix

Background, mathematical details

Current to-do list for WP v2

- ✓▶ Change structure: present each science case followed by its prediction
 - ▶ Figure out how to introduce general items, like radio air-shower detection
 - ▶ Page length?
 - ✓▶ Include results of improved simulations: UHE neutrinos, CRs, gamma rays
 - ✓▶ Reduce content on radio emission in ice
 - ✓▶ More balance between Auger and TA results
 - ✓▶ Quote angular and energy resolution of primaries, not showers
 - ✗▶ Clarify detection of cosmogenic ν *vs.* made-on-site ν from point sources
 - ✓▶ Need: GRAND sensitivity to the EoR, FRBs, GPs
 - ✓▶ Others: data preservation and sharing, outreach
- ✓ = Discussed/agreed
✗ = Not discussed

Discuss whether to include in WP v2

- ▶ Potential construction sites [Will discuss in next telecon]
 - ▶ Probably will have to be different between GRANDProto35 and later stages
- ▶ Results from TREND [Sandra], status of GRANDProto35 [Junhua]
- ▶ Discussion of tests of frequency-band optimization (1712.09042) [Yes]
- ▶ Structure of collaboration [No]
- ▶ Status of funding [No]
- ▶ Address the issue of logistics, deployment [Yes: Section IV]
- ▶ Budget: building cost, maintenance cost [Yes: *estimate* in Section IV]
- ▶ New money plots / stuff others can grab from the WP? [New plots discussed]

Figure changes

Removed (wrt v1): Figs. 7, 8 (UHECRs), 11 (gamma rays)

Agreed edits (numbers wrt v1):

▶ Fig. 1 [Ke]

- ▶ Add GRAND sensitivity curves for neutrinos and gamma rays, GRAND UHECR flux uncertainty
- ▶ Label each column in the legends as “gamma rays”, “neutrinos”, “cosmic rays”

▶ Figs. 1 [Ke], 3 [Mauricio], 27 [Mauricio]

- ▶ Use the new calculations of cosmogenic-neutrino fluxes by Rafael
- ▶ Remove “pure Fe” and “Fe rich” lines
- ▶ Fig. 3: Update the POEMMA curve [Claire]

▶ Fig. 5 [Ke]

- ▶ Add labels: “IceCube 15 yr”, “ARA-37 3 yr”, “GRAND 3 yr”
- ▶ Cut GRAND box at angular resolution of 0.1 deg
- ▶ Move plot title to inside the plot panel, top-left corner (in white font)

▶ Fig. 6 [Foteini]

- ▶ Make format of right panel (3-year exposure) closer to left panel

Figure changes (*cont.*)

New figures needed

- ▶ Cartoon of propagation of cosmic rays, neutrinos, gamma rays [Mauricio]
- ▶ EoR figure specific to GRAND [Xiangping]

New figure placement

- ▶ As discussed (will update here)

Important features for v2

- ▶ **Main goal:** Discovering the sources of UHECRs
 - Secondary goals:** Cosmology and radioastronomy
- ▶ Clearly answer *how will GRAND be able to find UHECR sources*
- ▶ Why is radio the way to go? Is autonomous radio-detection feasible?
- ▶ More details about GRAND design, not just GRAND science
- ▶ Remove conservative detection threshold scenario
 - ↳ **Need** to firmly justify that the aggressive scenario is realistic
- ▶ Focus on a single hotspot for now (re-assess in next telecon)
- ▶ Clearly address potential concerns from Auger, *etc.*:
 - ▶ Should we build a large observatory if we do not know the UHECR composition?
 - ▶ Can we reject enough of the background?
 - ▶ How will one manufacture, deploy, and maintain 200k antennas?

Important features for v2 (*cont.*)

- ▶ Reduce length of section on gamma-ray opacity of the Universe (I.G.3 in v1)
- ▶ Add GRAND-specific EoR predictions
- ▶ Move most background theory and mathematical details to an appendix
- ▶ *Anything else?* Send an e-mail!

Timeline for WP China & WP v2

