Cosmic Birefringence

Status of the post-PTEP paper

Alessandro Gruppuso (alessandro.gruppuso@inaf.it)
INAF OAS Bologna

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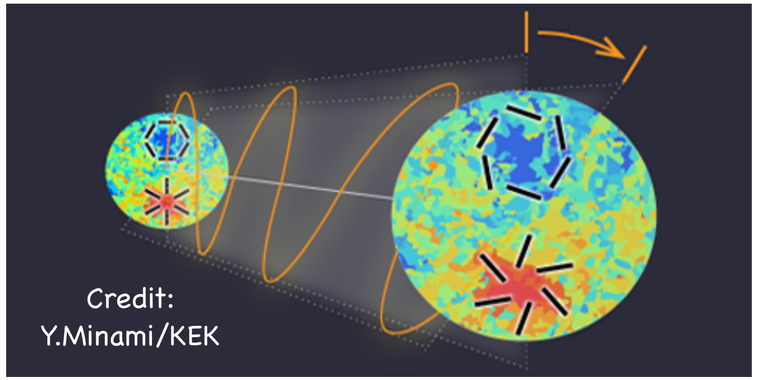
Cosmic Birefringence



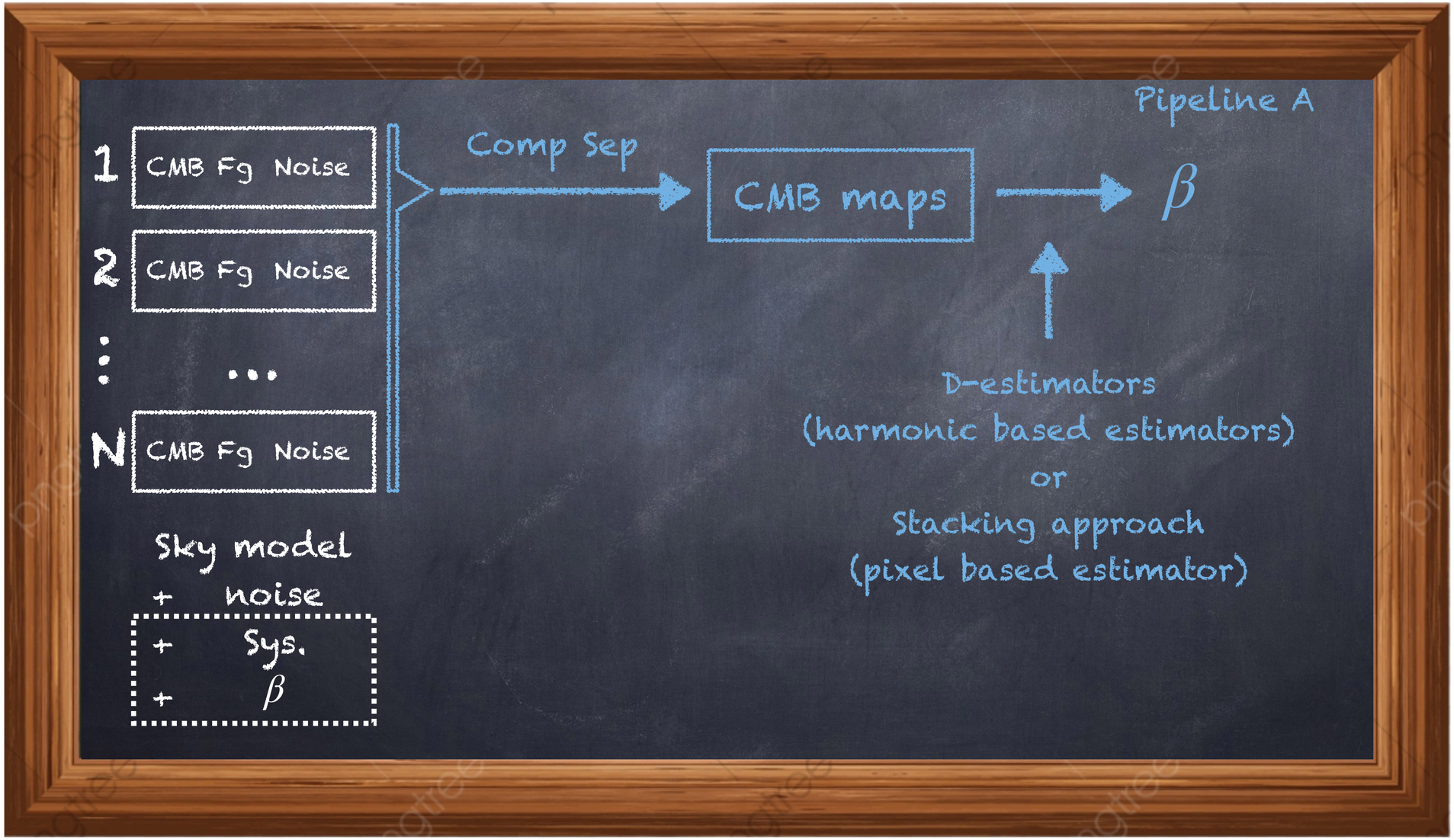
Cosmic birefringence is a tracer of parity-violating extensions beyond standard electromagnetism. Such extensions produce a **rotation** of the linear polarisation plane of photons during propagation: this creates TB and EB signals (which do not exist in the standard scenario).

Goal: Assess LiteBIRD capabilities in constraining the cosmological **isotropic birefringence** angle, β. This will be done in the presence of Galactic foregrounds and (selected) instrumental systematics.

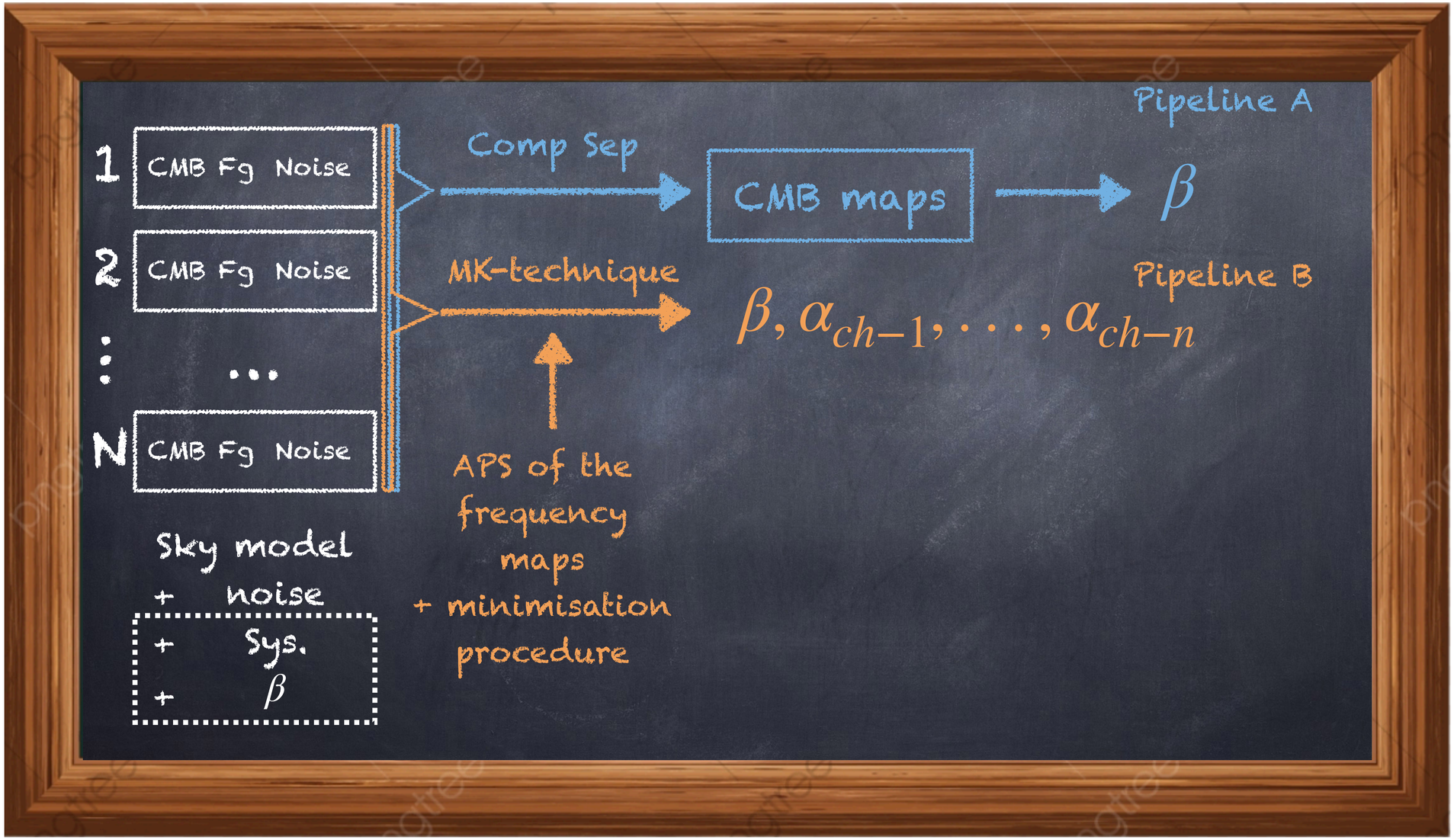
Project Paper group: A.Gruppuso and J.Errard (coordinators). More than 30 people signed in. We have regular telecons, ~1 every 2 weeks. So far we had 36 telecons. All the activities are traced in our wiki page, including the minutes of our telecons.

https://wiki.kek.jp/display/cmb/Project+Paper%3A+Cosmic+Birefringence

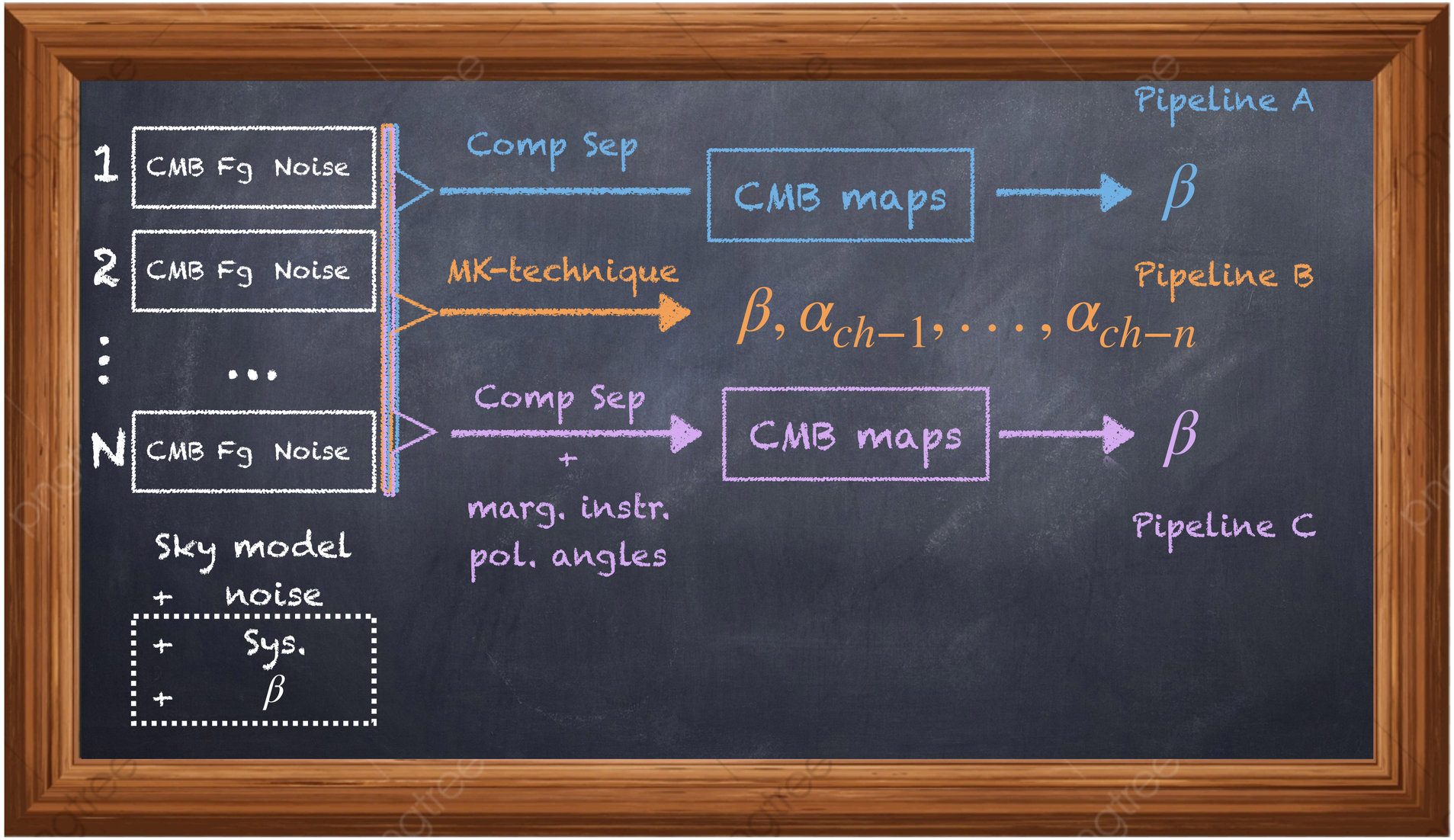
Cosmic Birefringence: pipelines



Cosmic Birefringence: pipelines



Cosmic Birefringence: pipelines



Cosmic Birefringence: input

Mixing of PTEP and HFS simulations + our own modifications

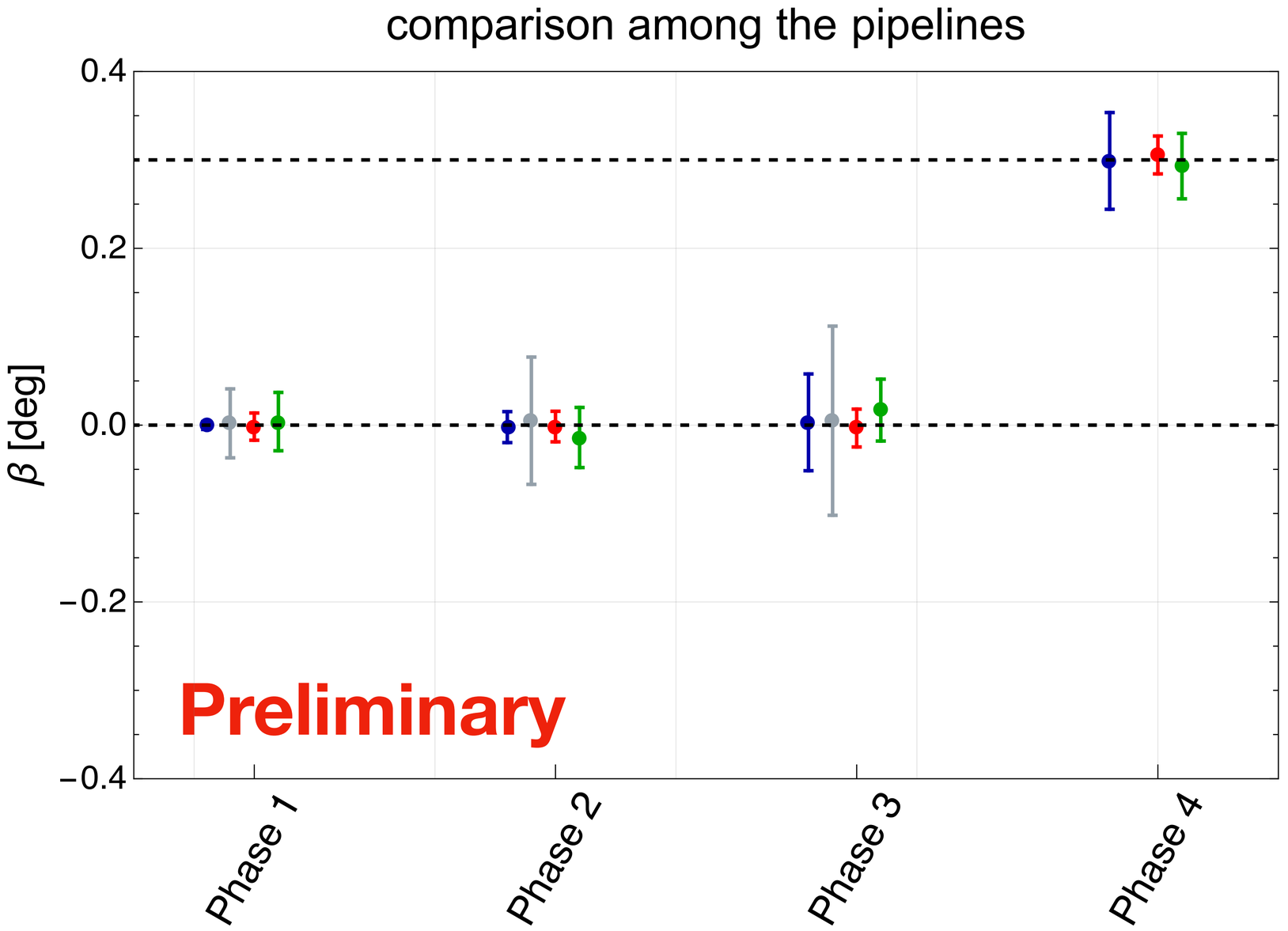
96 simulations

Inputs with an increasing level of complexity

- **Phase 1:** Set of sims based on cmb [HFS] + wn noise [PTEP] + fg from d0s0 [PTEP].
- **Phase 2:** Set of sims based on cmb [HFS] + wn noise [PTEP] + fg from d1s1 [HFS].
- **Phase 3:** Phase 2 + instrumental polarisation angles different from zero. Randomly distributed within requirements, see Table 3 (and case 2.0) of Vielva et al (LiteBIRD paper) JCAP 2022.
- **Phase 4:** Phase 3 + birefringence angle different from zero, $\beta = 0.3$ deg (~amplitude compatible with what obtained on recent Planck data through the MK)

Phase 3 and 4 tailored for our specific goal

Cosmic Birefringence: preliminary results



PIPELINE A
TO BE COMPLETED AND
UPDATED (increasing the
resolution of CMB solution)

- Pipeline A harmonic−based
- Pipeline A pixel−based
- Pipeline B
- Pipeline C

SECOND
IMPLEMENTATION OF
PIPELINE C
CURRENTLY RUNNING

Cosmic Birefringence: comments

- In ~6 weeks from now, we should have all the results for Pipeline A at “high resolution” and for Pipeline C (second implementation).
  - Concerning this “high res” set of sims, once we have finished the tests, if useful for the other groups, we can share those.
- We aim at a readable draft by this summer. Link to our draft: **https://www.overleaf.com/read/cqmqsgsrwvjv**
- We do not depend on the post-PTEP sims. But we are happy to consider those (e.g. 1/f noise sims). Of course, if the use of them has a big impact in terms of delay in our schedule, we have to take a decision.