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HI Intensity Mapping Focus Group

NICE, SKA COSMOLOGY SWG MEETING NOVEMBER 2024

Background

- Previous work
  - SKA Science Book 2014: 2 HI IM chapters (one general forecasts led by Mario Santos, one on foreground removal led by Laura Wolz)
  - SKA Cosmology SWG Red Book contains many ‘standard’ HI IM forecasts for AA4
  - HI Intensity Mapping FG foreground Removal challenge
- HI Intensity Mapping FG telecon on 24th October 2024: Minutes are linked within slack channel

Proposal for Science Book

- **Proposal: Three FG-led chapters** (but this is only a proposal and we should discuss this week!)
- Chapters leads are not identified but ideally should be this week!
- FG-led chapters are probably quite chunky, i.e. ~20pages
- 16 HI IM related external EoI (however, many of the 16 are not external and some have large overlap with FG-led chapters)
- Proposal: Ask some/many/all EoIs to join as sections in FG-led chapters

1. Chapter

- **Title suggestion: Cosmology with HI Intensity Mapping**
- Idea: Present standard forecasts, re-use many forecasts 2018 Red Book (or re-run old codes)
- Intention: Highlight improvements of full AA4 over AA*
- Survey and array definitions based on Red Book
- New contributions are encouraged to use Red Book survey/definitions or clearly state deviations
- Invite general contributions and also external EoI that fit this chapter
- Should have MID Single Dish, MID Interferometric and LOW forecasts

2. Chapter

- **Title suggestion: Observational frontiers in HI Intensity Mapping**
- Idea: Showcase Pathfinder and Pre-cursor analysis and results
- Intention: Show that we can do this!
- It should showcase MeerKLASS results and also pipeline
- Observational challenges/processing techniques should be showcased here (1/f noise, foregrounds etc)
- *Question: Should OTF be in here or separate chapter?*

3. Chapter

- **Title suggestion: Methodological frontiers in HI IM**
- Idea: Show new ideas and new techniques, but also science
- Intention: Be ambitious, be creative! Demonstrate that we have many ideas but need AA4 for it
- This chapter could combine many external EoIs that are on non-standard techniques (e.g new foreground removal, topology, simulation-based inference, Bayesian inference etc)