Simulations & Data Challenges: Experiment Models

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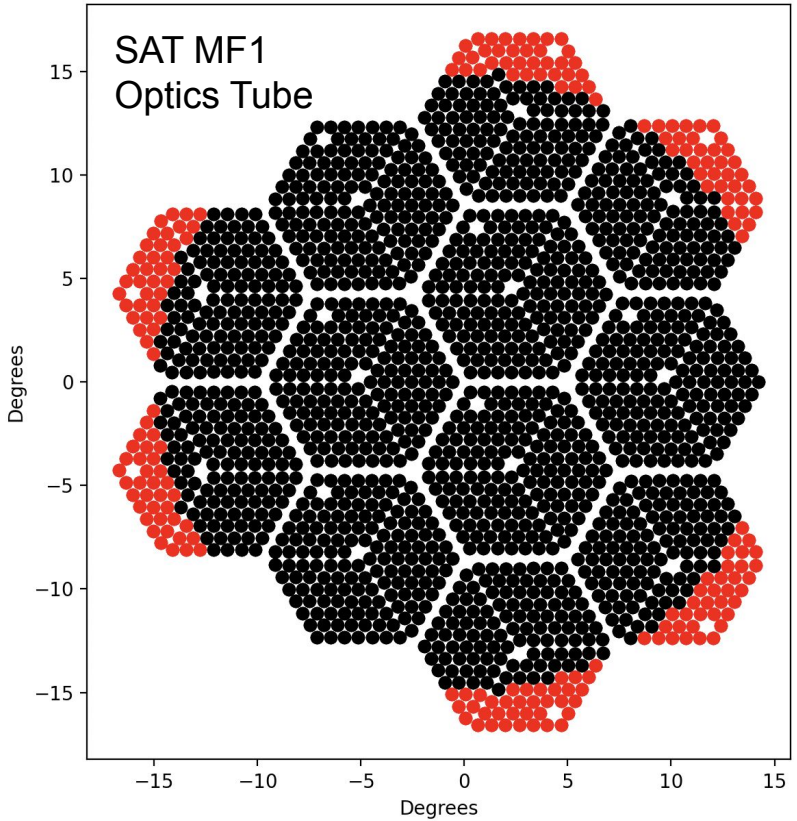
DC0 Experiment Model Overview

- Python dictionary structure that outputs a human-readable toml file
  - bands: tophat frequency bands and their noise properties
  - wafers: wafer slots and properties of wafers including layout, frequencies, wafer-to-wafer spacing, clocking
  - tubes: tube slotting
  - telescopes: telescope/platform slots including beam size (FWHM) and platescale
  - cards: readout card slotting (dummy readout mapping)
  - crates: readout crate slotting (dummy readout mapping)
  - detectors: individual detector properties
- These are positional slots tied to physical locations
- Noise: Per detector NET and correlation factors + NET vs. PWV and NET vs. elevation scalings fit from jbolo simulations
- Optics: Linear layout projected on-sky via a platescale

DC0 Simulation Details

- Key instrument updates to match point design
  - 3 SATs vs. 6
  - LF band changes, 227 GHz band edges (minor)
  - Optics updates (scale factor, beams, tube spacing)
  - Distribution of SAT optics tubes on mounts
  - Updated beam sizes
  - Noise updates
  - Dead pixels for pins and slots implemented
  - Removed partial wafers that approximate optically “good” detectors→ cut on optically “good” detectors to match point design
  - SAT wafer clocking to avoid losing additional pixels



Note: CHLAT sims ran in December and thus used the AoA configuration. Similar updates will be implemented in a new branch to ensure we capture changes

DC1 Simulation Draft Plan

- This is a draft plan. **We would like your feedback**
  - Comments during this session
  - Can also message Sara after session
- These include proposed updates and areas of study for DC1
- Based on feedback from last project meeting
- Scoped to match the available resources for this work and DC1 timeline (end of this calendar year)
- Keeping projects that we can't address in this run in a list of future priorities

DC1 Simulation Goals

- Update instrument model to match evolving design
- SPLAT scan strategy study: SPT-like raster vs. azimuthal-locked constant elevation scans
- Capabilities for more realistic bandpasses and beams
- Ground pickup framework

Future Goals

- Comparison and validation with real data→ Some high-level comparisons in validation and verification process, but detailed studies are a top future priority
- Bolometer model with optical loading → stability/non-linearity studies
- Updated readout structure for TMUX
- Future systematic studies:
  - Gain variation, temperature gradients, 1/f noise
  - Crosstalk
  - Other systematics prioritized by systematics group
- Understanding required S:N for calibration
- Effects from RFI