# 1 Executive Summary (2 pg)

Responsibility: Hanany
Page count should sum to 49 + 1 margin

# 2 Science (29.5 pages)

To be included: State of the art in the field; Compelling outstanding questions; Needed capabilities for progress (Knox? + others)

## 2.1 Science Goals (18 pgs)

This describes the goals that drive the design

### 2.1.1 Cosmic Inflation

### 2.1.2 Light Relics

### 2.1.3 Neutrinos

### 2.1.4 Cosmic Structure Formation and Evolution

### 2.1.5 Galactic Structure and Star Formation

## 2.2 Measurement Requirements (2 pgs)

Some requirements derive from the science ($\tau$ = full sky) Some requirements derive from foregrounds (frequency coverage) and some from systematics (particular scan pattern)

## 2.3 Ancillary Science (2 pgs)

Describe science that we get for free.

## 2.4 Complementarity with Sub-Orbital Measurements (0.5 pg)

## 2.5 Foregrounds (4 pgs)

The state of knowledge and known challenges; how does PICO address the challenges; forecast of performance.

## 2.6 Systematic Errors (3 pgs)

State of knowledge; What have we assessed in this study; what's left to be done (Crill)

# 3 Instrument (6 pgs)

# Wrap-up Session

- “To Follow Up”
- White papers
- Pitch for space

# To Follow Up

- Primordial magnetic fields - Levon
- Cosmic birefringence constraints - Levon
- Axions - Grin
- High \ell + Neff - Green
  - How much sky is it reasonable to assume for Neff predictions?
  - other high \ell science beyond Neff?
  - articulate the complementarity of low \ell PICO and high \ell ground
  - Rayleigh scattering improves Neff - Daan
- Neutrinos
  - Joel will do forecasts with Euclid-BAO, and Euclid+DESI
  - check/quantify whether LSST z's are good enough for cluster cosmology
- Francis-Yan
  - run forecasts for PICO? Anything special to space?
- Dark matter annihilation + energy injection - Yacine
  - PICO Forecasts? Impact of new upper limits?
- Dust in high z clusters - Jim + Jean Baptiste
  - how does the bias in cluster count affect cluster cosmology (e.g. neutrino, DE)

# To Follow Up

- Galaxy evolution models using the tsz, ksz and lensing signals (baryons).
  - what galactic evolution models does PICO rule out
  - find a succinct compelling way to quantify ‘feedback’
- Colin’s Temperature pipeline
  - what science is enabled specifically with the high frequency bands?
  - Colin - what else do you think is useful?
- What does PICO, or PICO + S4 + CCAT, add relative to CCAT + S4?
- prospects for including foregrounds in lensing/delensing forecasts - Alex vE?
  - Alex vE - what else is important?
- Cross-Correlations - Marcel
  - any new information by correlating to anything other than LSST?
  - Do forecasts for PICO please?
- Reionization - Marcelo and Nick
  - What’s next?
  - use PICO high frequency to clean CIB and use ground high \ell for ksz (for z, deltaz plot; are we happy with this parametrization in the first place?)

# To Follow Up

- Galactic Magnetic fields (GMF)
  - Susan - We should be able to point PICO's ability to distinguish between models of large scale GMF. Can we make that point clearer? with e.g. a figure and text?
  - Cloud collapse and star formation efficiency is complicated. What is the best way to relay the science deliverables?
  - Is there a clearer way to connect the simulations to the forthcoming data? How will the forthcoming data be used to constrain the simulations?
- NextBASS (+ Matthieu's work) - a possible descope?
- Foregrounds
  - push ahead with analyzing the full sky models, include 85% (fake) delensing. Any real delensing?
  - How much of the sensitivity can we realize on small patches? Are we foreground or noise limited?
  - What's the next step with realizing small scale foreground complexities? Is it a high priority?

# To Follow Up

- Report Structure
  - An overall thread for some of the ‘extragalactic’
    - ‘baryons, star formation, mass’
    - perhaps more broadly ‘structure formation and evolution’
  - Presentation of complementarity to include with other surveys, not only sub-orbital.
    - discuss complementarity in relevant science section, but also highlight in a separate dedicated section
- Galactic Science Poster
- Potential for papers?
  - Gianfranco, point sources
  - Jim’s point about ‘overall framework’, e.g. CORE