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 (τ = 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)

Telescope, focal plane, cooling, readout

4 Mission (3 pgs)

To be included: mission architecture, spacecraft and subsystems, orbit, attitude control and determination (Trangsrud)

5 Technology Maturation (4 pgs)

Requirements, planned activities, schedules and milestones, estimated cost (O'Brient?)

6 Cost (4 pgs)

cost, risk, heritage (Trangsrud)

References

ACS attitude control system

ADC analog-to-digital converters

ADS attitude determination software

AHWP achromatic half-wave plate

AMC Advanced Motion Controls

ARC anti-reflection coatings

ATA advanced technology attachment

BRC bolometer readout crates

BLAST Balloon-borne Large-Aperture Submillimeter Telescope

CANbus controller area network bus

CIB cosmic infrared background

CMB cosmic microwave background

CMM coordinate measurement machine

CSBF Columbia Scientific Balloon Facility

CCD charge coupled device

DAC digital-to-analog converters

DASI Degree Angular Scale Interferometer

dGPS differential global positioning system

DfMUX digital frequency domain multiplexer

DLFOV diffraction limited field of view

DSP digital signal processing

EBEX E and B Experiment

EBEX2013 EBEX2013

ELIS EBEX low inductance striplines

ETC EBEX test cryostat

FDM frequency domain multiplexing

FPGA field programmable gate array

FCP flight control program

FOV field of view

FWHM full width half maximum

GPS global positioning system

HDPE high density polyethylene

HIM high index materials

HWP half-wave plate

IA integrated attitude

IP instrumental polarization

JSON JavaScript Object Notation

LDB long duration balloon

LED light emitting diode

LCS liquid cooling system

LC inductor and capacitor

LZH Lazer Zentrum Hannover

MCP multi-color pixel

MSM millimeter and sub-millimeter

MLR multilayer reflective

MAXIMA Millimeter Anisotropy eXperiment IMaging Array

NASA National Aeronautics and Space Administration

NDF neutral density filter

PCB printed circuit board

PE polyethylene

PME polarization modulation efficiency

PSF point spread function

PV pressure vessel

PWM pulse width modulation

RMS root mean square

SLR single layer reflective

SMB superconducting magnetic bearing

SQUID superconducting quantum interference device

SQL structured query language

STARS star tracking attitude reconstruction software

SWS sub-wavelength structures

TES transition edge sensor

TDRSS tracking and data relay satellites

TM transformation matrix

UHMWPE ultra high molecular weight polyethylene

UMN University of Minnesota