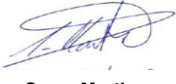




SOLAR ORBITER ENERGETIC PARTICLE DETECTOR

PQM EPT Preamp Board Mandatory Inspection Points

Document ID: SO-EPD-KIE-IR-0001
Issue: 1
Revision: 0
Date: 17. March, 2014

Written	Checked	Approved Configuration Control	Approved QA	Approved Experiment Manager	Approved Principal Investigator
 Mahesh Yedla Date and Signature	 Cesar Martin Date and Signature	 Cesar Martin Date and Signature	 Date and Signature	 Date and Signature	 Date and Signature

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 2 of 12
--	---	---

DISTRIBUTION LIST

The following lists indicate the individuals and agencies in receipt of review copies of the present document:

Agency / Organization	Name & Title	Contact information
SRG-UAH	Javier Rodríguez-Pacheco EPD-Principal Investigator	javier.pacheco@uah.es
SRG-UAH	Manuel Prieto, EPD Project Manager	manuel.prieto@uah.es
SENER	Giuseppe Pennestri, EPD System Engineer	giuseppe.pennestri@sener.es
SENER	Mario Basile, EPD Product Assurance Manager	mario.basile@sener.es
CAU	EPD-Solar Orbiter Kiel Team	solo_kiel@physik.uni-kiel.de
UT	Eino Valtonen, EPD-LET Lead Co-I	eino.valtonen@utu.fi
SRG-UAH	Sebastián Sánchez, EPD-ICU Lead Co-I	sebastian.sanchez@uah.es

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 3 of 12
--	---	--

CHANGES RECORD

Issue	Revision	Date	Modified by	Section / Paragraph modified	Change implemented
1	0	17/03/2015		All	Initial release

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 4 of 12
--	---	--

TABLE OF CONTENTS

1	INTRODUCTION.....	5
1.1	Purpose	5
1.2	Scope	5
1.2.1	Project Outline.....	5
2	GLOSARY AND DEFINITIONS	7
2.1	Acronyms and Abbreviations	7
3	MANUFACTURING DATA PACKAGE FOR BOARDS	8
3.1	Printed Circuit Boards (PCB).....	8
3.2	EEE Components	8
4	PRODUCT ASSURANCE AND CONFIGURATION STATUS	9
4.1	NCR Status	9
4.2	RFD / RFW Status.....	9
5	OPEN POINTS & COMMENTS: OPEN WORK	10
5.1	Comments	10
5.2	Thermistor	10
6	CONCLUSION	12

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 5 of 12
--	---	--

1 INTRODUCTION

1.1 Purpose

The purpose of this document is to identify the Mandatory Inspection Points (MIP) for the EPT PQM Preamp board. The inspection points are defined here in a summary of inspection identified during the visual inspection and testing.

1.2 Scope

This document applies to the current design of the electronics for EPT-HET.

1.2.1 Project Outline

The Energetic Particle Detector (EPD) suite consists of five sensors measuring electrons, protons, and ions from helium to iron, and operating at partly overlapping energy ranges from 2 keV up to 200 MeV/n. The EPD sensors are:

- SupraThermal Electrons, Ions, & Neutrals (STEIN)
- Suprathermal Ion Spectrograph (SIS)
- Electron Proton Telescope (EPT)
- Low Energy Telescope (LET)
- High Energy Telescope (HET)

The EPD sensors share the Instrument Control Unit (ICU) that is composed by the Common Data Processing Unit and the Low Voltage Power Supply (CDPU/LVPS), which is the sole power and data interface of EPD to the spacecraft.

STEIN consists of a single unit having two view cones in opposite directions. SIS consists of two sensor heads with roughly opposite (160°) view directions sharing a common electronics box. EPT-HET has multiple view cones sharing a common electronics box. There are two identical EPT-HET units. LET has multiple view cones and consists of two separate identical units.

The overall energy coverage achieved with the EPD sensors is 0.002 MeV to 20 MeV for electrons, 0.003 MeV to 100 MeV for protons, 0.008 MeV/n to 200 MeV/n for heavy ions (species-dependent). This energy and species coverage well satisfies and for a large part exceeds the requirements defined for EPD in the Solar Orbiter Payload Definition Document and in the report of the Joint Science and Technology Definition Team (JSTDT) for the Solar Orbiter/Sentinels mission.

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 6 of 12
--	--	--

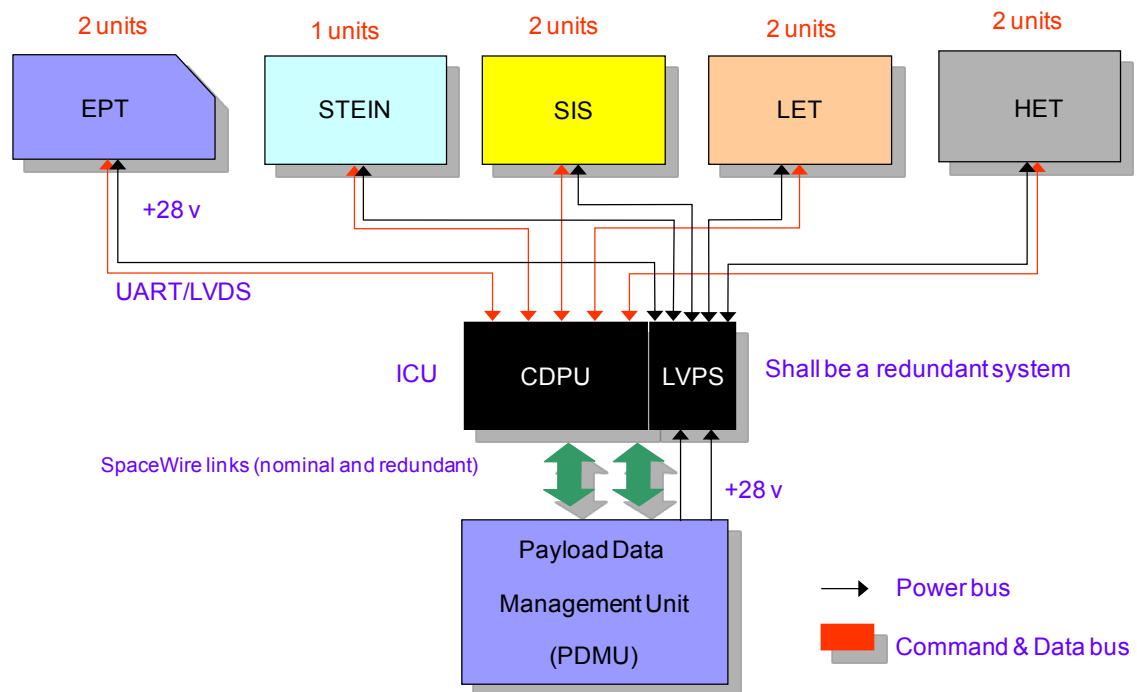


Figure 1 EPD Block Diagram

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 7 of 12
--	---	--

2 GLOSARY AND DEFINITIONS

2.1 Acronyms and Abbreviations

APL (Johns Hopkins University) Applied Physics Laboratory

CAU Christian-Albrechts Universität, Kiel

EEE Electronic, Electrical and Electro-mechanical

EPD Energetic Particles Detector

EPT Electron, Proton Telescope

FM Flight Model

HET High Energy Telescope

ICU Instrument Control Unit

LET Low Energy Telescope

MIP Mandatory Inspection Point

NCR Non Conformance Report

RFD Request for Deviation

RFW Request for Waiver

SSD Solid State Detector

SIS Suprathermal Ion Spectrograph

STEIN SupraThermal Electrons Ions and Neutrals

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 8 of 12
--	--	--

3 MANUFACTURING DATA PACKAGE FOR BOARDS

3.1 Printed Circuit Boards (PCB)

The EPT preamp Printed Circuit Board is manufactured according to the provided gerber files by Invotec Circuits Ltd, England.

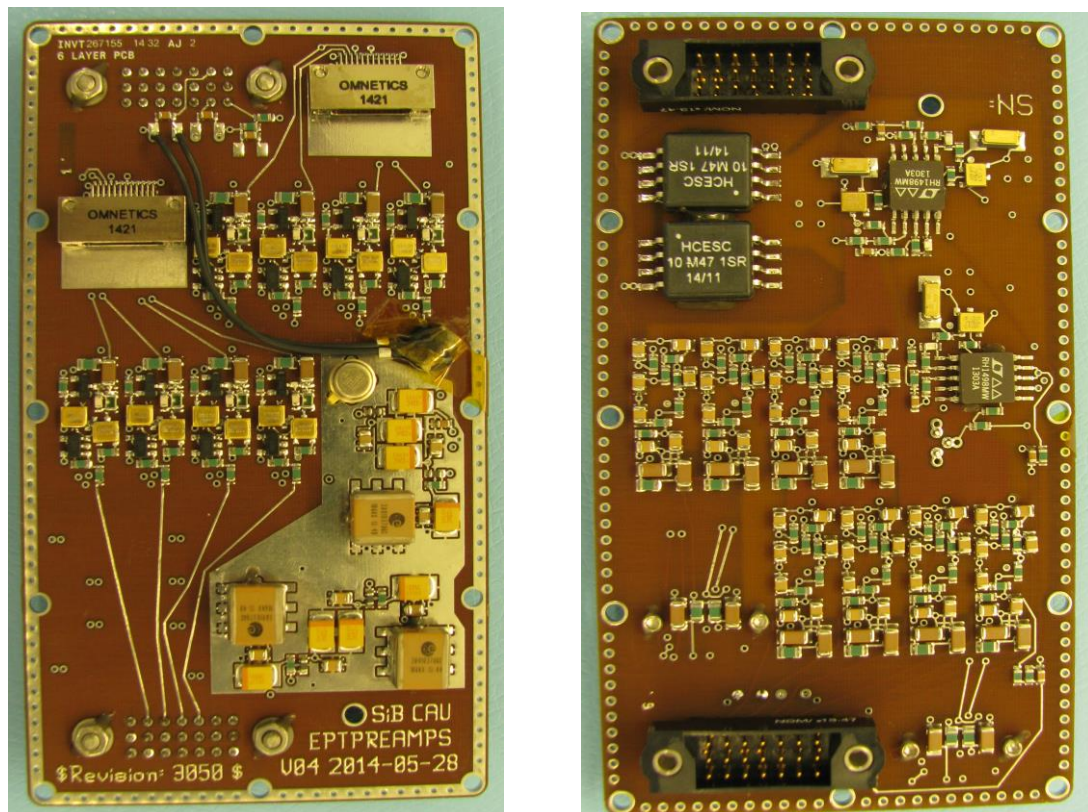


Figure 2 EPT PQM Preamp Assembled Board

3.2 EEE Components

All the EEE components are selected and used on the EPT PQM Preamplifier board hardware are from the MIL & ESCC standards and the standards are listed below:

- Passives ESCC 4001-3001-3009-3012/ESD 558-98-390-D/MIL-PRF-55342
- Transistors/Diodes MIL-PRF19500/ESCC 5101
- Microcircuits MIL-PRF-38535
- Inductors ESCC-Q-ST-70-02C/MIL-STD-202/DSCC 03024
- Thermistors ESCC 4006
- Connectors MIL-STD-202/MIL-DTL-32139

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 9 of 12
--	---	--

4 PRODUCT ASSURANCE AND CONFIGURATION STATUS

4.1 NCR Status

None

4.2 RFD / RFW Status

- Request to procure flight electronic printed circuit boards according to IPC 6012 Class 3 design rules instead of ECSS-Q-ST-70-11C design rules. RFD request “**SO-EPD-KIE-RD-0009_iss1_rev0_RFD_Electronics_boards.pdf**”.

5 OPEN POINTS & COMMENTS: OPEN WORK

5.1 Comments

The EPT Preamp board is populated by OHB according to the Manufacturing Flow Chart “EPT-PREAMPS-OHB-X1-01.pdf”.

5.2 Thermistor

R80 and R81 thermistors are installed and glued (Scotch Weld 2216) at Kiel (CAU).

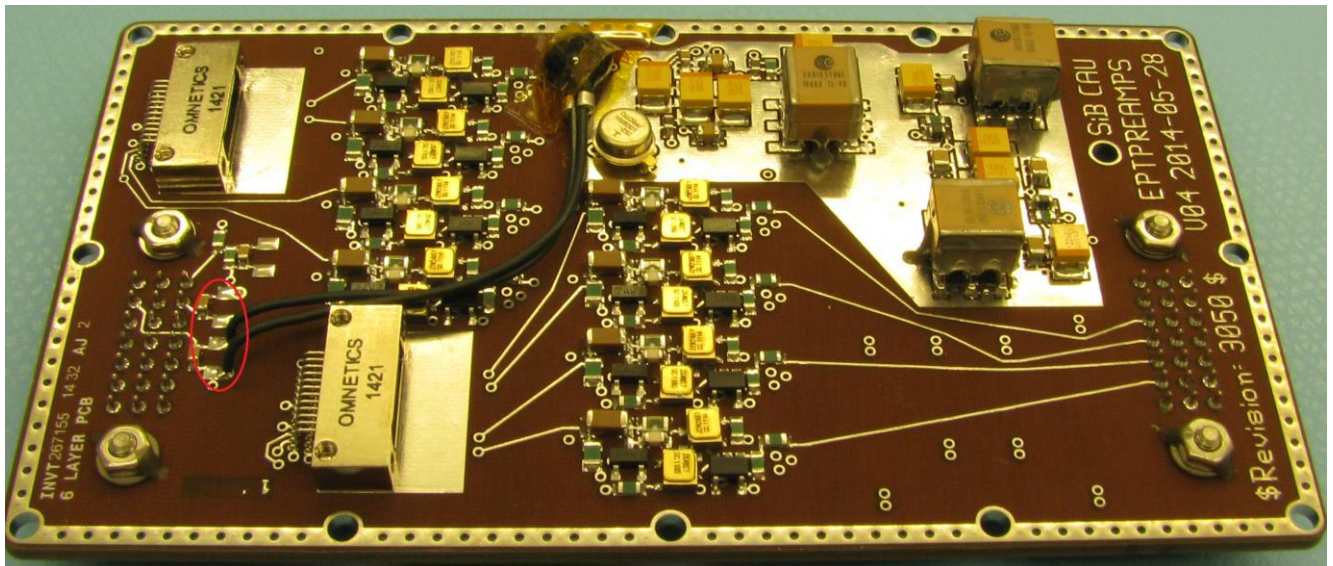


Figure 4 Thermistors on EPT preamp board

Pos.	Description	Result
1	Soldering Process	ECSS-Q-ST-70-08C
2	Producer	Violetta Knierim
3	Assembly Process	Hand Soldering
4	Solder type	Wire Sn63Pb37
5	Flux	ROLO
6	Soldering Temperature	300°C

 Christian-Albrechts-Universität zu Kiel	Solar Orbiter EPD Mandatory Inspection Points for EPT PQM Preamp Board	Doc.Nº:SO-EPD-KIE-IR-0001 Issue: 1 Rev.: 0 Date: 17.March.2014 Page: 11 of 12
--	---	---

7	Cleaning process	In acc. With 11.1 of ECSS-Q-ST-70_08C
8	Solvent	Isopropanol
9	Final Inspection	Violetta Knierim

Table 1 Thermistor soldering process

6 CONCLUSION

Pos.	Inspection Type	Pass/Fail/Comments
1	Connectors	Pass
2	Hardware Assembly	Pass
3	Gluing	Pass
4	Soldering	Pass
5	Cleanliness	Pass

Table 2 MIP inspection result