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Mechanism Control Unit

Grounding Scheme

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Acronyms

AD	Applicable Document
AVM	Avionics Model
BOL	Begin Of Life
BSM	Beam Steering Mirror
CQM	Cryogenic Qualification Model
EGSE	Electrical Ground Support Equipment
EOL	End of Life
ESA	European Space Agency
FIRST	Far Infra Red and Sub-millimeter Telescope
FM	Flight Model
FPU	Focal Plane Unit
FTS	Fourier Transform Spectrometer
FTSE	FTS warm Electronics
FTSP	FTS Preamplifier for the position encoder signals
H/K	House Keeping
H/W	Hardware
I/F	Interface
LAM	Laboratoire Astrophysique de Marseille
MAC	Multi Axes Controller
MCU	Mechanism Control Unit
N/A	Not Applicable
RAL	Rutherford Appleton Laboratory
RD	Reference Document
ROE	Royal Observatory of Edinburgh
S/C	Spacecraft
SM	Spare Model
SMEC	Spectrograph MEchanism
S/W	Software
TBC	To Be Confirmed
TBD	To Be Define
TBW	To Be Written
TC	Tele-Command
TM	TeleMetry
WE	Warm Electronics

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this document is to describe the electronics design grounding of the MCU. The MCU includes the control electronics unit of the 2 SPIRE mechanical subsystems (SMEC and BSM).

The **MCU** is part of the **DRCU** and has electrical (Main Power Supplies) and mechanical (Electronics Cabinet) interfaces with it.

1.2 APPLICABLE AND REFERENCE DOCUMENTS

1.2.1 Applicable documents

AD1	Operating Modes for the SPIRE Instrument (SPIRE-RAL-DOC-000320)
AD2	FIRST/Planck Packet Structure Interface Control Document (SCI-PT-IF-07527)
AD3	Spire Spectrometer Mirror Mechanism Subsystem Specification (SPIRE-LAM-PRJ-000460)
AD4	FIRST / Planck Instrument Interface Document Part B (SCI-PT-IIDB/SPIRE-02124)
AD5	DRCU Electrical Interface Control Document (SAP-SPIRE-CCa-24-00)
AD6	SPIRE Instrument Requirements Specification (IRD) (SPIRE-RAL-PRJ-000034)
AD7	DPU Interface Control Document SPIRE-IFS-PRJ-000650 2 April 2001 Issue 1.0

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2 SYSTEM OVERVIEW

The **MCU** is dedicated to the control and monitoring of the following 3 axis of the SPIRE instrument:

- the Spectrometer Mechanism (**SMEC**). The control is typically based on a scan at a configurable speed, but can be set-up on the basis of a step position control in case of the step and integrate mode of the instrument.
- the **Chopper** and **Jiggle** axis of the Beam Steering Mirror subsystem . The control is a position step control pattern.

The MCU control electronics includes:

- 2 MAC Boards (prime and redundant): common digital control board including:
 - a **21020 DSP in charge of the control loop tasks and signal acquisitions**
 - 3 DACs for SMECm and BSMm motor control,
 - 1 multiplexed (16 channels) 16 bits ADC for SMEC and BSM analogue signal acquisitions,
 - 8 logical inputs
 - 12 logical outputs.
 - A 54SX32S ACTEL FPGA for:
 - the bus control for interface with DACs, multiplexed ADC, digital inputs and outputs, and the optical encoder counting and logic. The encoder pulses generated by the encoder electronics are entering an Encoder Unit Interface (Bus control FPGA function) for pulses counting and crude position determination. The incremental position count is done in the FPGA for in order to verify the trajectory controlled by the DSP and acts the role of a watchdog. Furthermore, the Encoder Unit Interface includes error signals generation for whatever problem occurs during the trajectory (limits reached, etc...). If one on the logical signal is high, the DSP is interrupted and put in safe configuration.
 - the communication with DPU high and low rate serial links.
- **2 SMEC Boards** (prime and redundant): analogue electronics for the power amplification of the actuators and acquisition electronics for sensors pre-amplification and conditioning of the SMEC subsystem
- **1 BSM Board**: analogue electronics for the power amplification of the actuators and acquisition electronics for sensors pre-amplification and conditioning of both prime and redundant BSM subsystems.

3 GROUNDING SCHEME.

- Motor PWR Analog ground to be added on the schematics
- The analog grounds not connected @ MCU level
- Analog/Digital grounds connected @ ADC level
- Analog ground not connected to mechanics

