 <b>IFSI CNR</b>	<b>Herschel</b>  <b>DPU/ICU Mass Budget</b>	<b>Ref.:</b> CNR.IFSI.2002TR03 <b>Issue:</b> 1 <b>Date:</b> 4/11/2002
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# Herschel

## DPU/ICU Mass Budget

**Document Ref.:** CNR.IFSI.2002TR03

**Issue: 1**

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Date: 4/11/2002


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## 1 INTRODUCTION

### 1.1 Purpose of the document

The Istituto di Fisica per lo Spazio Interplanetario (IFSI) of the Italian Consiglio Nazionale delle Ricerche (CNR) is responsible for the design and manufacturing of the three Digital Processing/Instrument Control Units for the three instruments to be flown on board of the ESA satellite Herschel: PACS, HIFI and SPIRE.


This documents shows the mass budget of the DPU/ICU for the three instruments.

It is to be taken into account that for SPIRE and PACS the mass budget is very similar, the only difference being in the circuits of the subsystems interfaces, while for the HIFI instrument a dedicated DC/DC converter powers also the HIFI subsystem called Focal plane Control Unit so in the DC/DC converter board there are two converters.


### 1.2 Acronyms and Abbreviations

#### 1.2.1 Acronyms

AD	Architectural Design
ATP	Acceptance Test Plan
ASI	Agenzia Spaziale Italiana (Italian Space Agency)
AVM	Avionic Model
CGS	Carlo Gavazzi Space
CNR	Consiglio Nazionale delle Ricerche
CPP	Coordinated Parts Procurement
CPU	Control Processing Unit
CDMS	Central Data Management System
CMOS	Complementary Metal Oxide Silicon
CGS	Carlo Gavazzi Space SpA

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CQM	Cryogenic Qualification Model
DDD	Detailed Design Document
DM	Data Memory
DPU	Digital Processing Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EMC	Electro-Magnetic Compatibility
EMI	Electro-Magnetic Interference
ESA	European Space Agency
FCU	Focal plane Control Unit
HK	HouseKeeping
HSO	Herschel Space Observatory
HW	HardWare
IBDR	Instrument Baseline Design Review
ICD	Interface Control Document
ICDR	Instrument Critical Design Review
ICU	Instrument Control Unit
DPU	Digital Control Unit
IHDR	Instrument Hardware Design Review
IFSI	Istituto di Fisica dello Spazio Interplanetario
ISVR	Instrument Science Verification Review
NA	Not Applicable
OBS	On-Board Software
PA	Product Assurance
PM	Program Memory
PROM	Programmable Read Only Memory
RAM	Random Access Memory
SCC	SpaceCraft Components
SEU	Single Event Upset
SPIRE	Spectral and Photometric Imaging Receiver
S/S	SubSystem
SVM	Service Module
SW	Software
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
TV	Thermal Vacuum

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## 1.3 REFERENCES

### 1.3.1 Applicable Documents

<b>Document Reference</b>	<b>Name</b>
AD01	FIRST/Planck Instrument Interface Document Part A
AD02	FIRST/Planck Instrument Interface Document Part B Instrument "PACS"
AD03	FIRST/Planck Instrument Interface Document Part B Instrument "HIFI"
AD04	FIRST/Planck Instrument Interface Document Part B Instrument "SPIRE"
AD05	HIFI ICD
AD06	SPIRE ICD
AD07	PACS ICD

### 1.3.2 Reference Documents

<b>Document Reference</b>	<b>Name</b>

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### 1.3.3 Introduction

The present document is intended to provide the mass budget of the DPU/ICU for the three instruments HIFI, PACS and SPIRE and for the EQM and the FM models where all the redundancies are implemented.

It is recalled that the DPU/ICU EQM and FM boxes will contain two complete units and that the only common board is the motherboard, where in any case all signals of the two units are completely separated. It is also recalled that all the boards are designed and manufactured by CGS under a contract CGS-ASI.

Each unit will consist of:

- CPU board (2 of in EQM and FM);
- Interface board (2 of in EQM and FM);
- DC/DC Converter board (2 of in EQM and FM);
- Motherboard (only 1 in EQM and FM);
- Box structure
- Cabling (2 full cablings with respect to the AVM).


The material used to manufacture the box is an aluminium alloy called ANTICORODAL 6082, the general box dimensions are 240x258x194 mm<sup>3</sup>.

**The following weights are inferred from the actual measurements on the Avionic Models.**

## 2 DPU/ICU Mass breakdown

### 2.1 Boards

<b>BOARD</b>	<b>PACS (g)</b>	<b>HIFI (g)</b>	<b>SPIRE (g)</b>
CPU (2 of)	960	960	960
I/F Board (2 of)	640	640	640
DC/DC (2 of)	1200	1580	1200
Motherboard	520	520	520
<b>SUBTOTAL</b>	<b>3320</b>	<b>3700</b>	<b>3320</b>

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## 2.2 Box

Box Component	Weight (g)
Base-Plate	1071
Front Wall	230
Front Wall Connectors(delta: Estimated)	150
Back Wall	230
Lateral Walls (2 of)	988
Cover	368
<b>SUBTOTAL</b>	<b>3037</b>

## 2.3 Other Components

Component	Weight (g)
Screws etc. (E)	100
Cabling (E)	300
Conformal Coating (60g/Board: E)	420
<b>SUBTOTAL</b>	<b>820</b>

## 2.4 Total Weights

As already said, the weights are inferred from the actual AVM measurements.

**We can assume the total to be within + - 200 g.**

Component	PACS (g)	HIFI (g)	SPIRE (g)
Boards	3320	3700	3320
Box	3037	3037	3037
Other	820	820	820
<b>TOTAL</b>	<b>7177</b>	<b>7557</b>	<b>7177</b>