HERSCHEL / PLANCK

Reduced Thermal Models Requirements for CLA

H-P-1-ASP-SP-0515

Product Code : 100 000

Rédigé par/*Written by*	**Responsabilité-Service-Société** ***Responsibility-Office –Company***	**Date**	**Signature**
Myriam CORNUT	H/P Thermal Architect	30/04/2003	
Vérifié par/*Verified by*			
Pascal RIDEAU	H/P System Manager	30/04/2003	
Denis MONTET	Launcher Interfaces Manager	30/04/2003	
Approbation/*Approved*			
Christian MASSE	H/P PA Manager	30/04/2003	
Jean-Jacques JUILLET	H/P Project Manager	30/04/2003	

Data management : Christiane GIACOMETTI

Entité Emettrice : Alcatel Space - Cannes
(détentrice de l'original)

DISTRIBUTION / *DISTRIBUTION RECORD*

EXTERNAL DISTRIBUTION	For Information For Application For Approbation For Action For Acceptation	INTERNAL DISTRIBUTION	
ESA	For Information	**HP team**	
		P.Rideau	X
ASTRIUM	For Application	Y.Roche	X
		I.Bénilan	X
ALENIA	For Application	K.Hibberd	
		L.Trougnou	
ALCATEL	For Application	P.Couzin	
		B.Collaudin	
		Ph.Clavel	
		B.Marchand	
		M.Cornut	X
		D.Montet	
		M.Pastorino	
		O.Fratacci	
		L. Ouchet	X
		E. Gavila	X
		Clt Documentation	Orig.

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS *§ : CHANGE RECORD*	REDACTEUR *AUTHOR*
1.0	30/04/2003	New Document	Myriam CORNUT

TABLE OF CONTENTS

1. OBJECT

The purpose of this document is to define the requirements for the delivery of the Reduced Mathematical Models of Herschel and Planck modules. The reduced models will be used afterwards by Arianespace for the thermal Coupled Launcher Analyses.

The head applicable document for the elaboration of the reduced models is the "Technical Specification for the payload thermal model" ([AD1]). ASP has moreover specific requirements towards Alenia and Astrium, which are described in this document.

2. APPLICABLE DOCUMENTATION

[AD1]: Technical Specification for the Payload Thermal Model, A4-SG-1-26-[3], dated 5/10/92

[AD2]: Herschel SVM Thermal Interfaces, H-P-1-ASP-TN-0418 iss. 01 dated 31/10/2002

[AD3]: Planck SVM Thermal Interfaces , doc. H-P-1-TN-0417 iss. 01 dated 31/10/2002

[AD4]: Herschel E-PLM Thermal Interfaces, doc. H-P-1-ASP-TN-0413 iss. 01 dated 24/10/2002

3. SPECIFIC REQUIREMENTS

3.1 Schedule

The needed delivery date for the Reduced Models (RGMM and RTMM) are specified hereafter.

Herschel:

- H-EPLM: 30/05/2003
- H-SVM: 30/05/2003

Planck:

- P-PLM: 30/06/2003
- P-SVM: 30/06/2003

These early dates are requested for a delivery to Arianespace of the complete S/C's reduced thermal model mid-july 2003.

3.2 Nodal Breakdown

- The maximum number of thermal nodes for each module (H-SVM, P-SVM, H-EPLM, P-PLM) is 200 (400 thermal nodes maximum for each spacecraft)

Remark: for a given module, the interfaces nodes which are not under the responsibility of the module supplier are not accounted for in the total number of modules nodes.

- The numbering of the thermal nodes will be as followed:
  - H-EPLM:

    range [6001-6161] for the interface nodes (see [AD4])

    range [2000-2999] for the EPLM
  - H-SVM:

    range [1-46] for the interface nodes (see [AD2])

    range [1000, 1999] for the SVM
  - P-PLM: range [4000-4999]
  - P-SVM:

    range [1-12] for the interface nodes (see [AD3])

    range [3000-3999] for the SVM

3.3 List and format of the deliverables

3.3.1 Description of the Models

A description of the models will be delivered in accordance with [AD1], following the information requested from §2.1 (Thermal nodes) to §2.7 (Spacecraft/launch vehicle interface).

3.3.2 Format of the Models for Arianespace

External geometry of the modules will be provided in the descriptive format as specified in [AD1], §2.8.2. These informations are requested by Arianespace in order to compute the radiative and convective exchanges between the S/C and it's environment.

3.3.3 Format of the Models for Alcatel

In addition to these informations, the **complete** reduced TMM of each modules will be provided to Alcatel in the following format:

- Esarad for the Geometrical and Thermal Model.
- Esatan for the Thermal and Mathematical Model.

The models are requested in order Alcatel can merge them in a overall S/C model, to be able to perform test runs as requested by Arianespace.

Constraints on the ESARAD modelling: the GMM will be built WITHOUT cutting surfaces.

3.4 Elaboration of the reduced models

The reduced TMM of each module will be validated against the detailed one, using the same thermal environment as defined in the following documents:

- Documents applicable to Alenia
  - Herschel SVM Thermal Interfaces [AD2]

The validation of the reduced TMM with respect to the detailed one will be achieved under the thermal interfaces condition defined as "COLD CASE". The choice of the respective associated SVM thermal load case is let free.

  - Planck SVM Thermal Interfaces [AD3]

The validation of the reduced TMM with respect to the detailed one will be achieved under the only thermal interfaces condition defined in [AD3] document. The choice of the associated SVM thermal load case is let free.

- Document applicable to Astrium
  - Herschel E-PLM Thermal Interfaces [AD4]

The validation of the reduced TMM with respect to the detailed one will be achieved under the thermal interfaces condition HOT CASE. The choice of the associated H-PLM thermal load case is let free.

Remark:

The RTMM's shall be able to predict issues during the launch phase identified as potentially tricky by the Module supplier. Some of the foreseen areas to be assessed are listed below (list non exhaustive, to be completed by Module responsible):

- MLI temperatures, with special care to H-EPLM ones
- SVM units temperatures during the launch phase (active thermal control, if any, implemented)
- Planck RCS units temperature on the launch pad

3.5 Accuracy of the RTMM's

The RTMM's shall give results comparable to the one obtained with the Detailed TMM's within the following accuracy:

- ± 5 K for the SVM units (Instruments Warm units and Spacecraft units)
- ± 10 K for all the remaining nodes (MLI blankets, panels, "V-grooves", CVV, telescope, struts...)

Rk: for a given part of an element meshed in N and 1 thermal nodes in respectively the DTMM and RTMM, the temperature of the RTMM single node will be compared to the average of the temperatures of the corresponding N thermal nodes of the DTMM.