HS_DRCU (HS_DCU & HS_FCU) FM
Verfication control document

	Name	Function	Date/Signature
Prepared by	J. Fontignie	AP manager	02/08/06
Checked by	C. Cara	System engineer	
Checked by	H. Triou	AIV responsible	
Approved by	J-L. Auguères	Project manager	2/8/06

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Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
5.1	Each unit labelled	I			
5.1.1	Labelling according to project code in IID-B	I			
5.1.2	Unit identification code :	I	HS_DCU PF HS_FCU_PF	Refer DRCU outgoing inspection report	
5.1.3	Units connectors identified Jxx	I	Jyy	Refer DRCU outgoing inspection report	
	Harness connectors identification HS_DCU_Pxx & HS_PCU_Jxx	I	Applies to internal harness		
5.2.1	Spacecraft coordinate system				
5.2.2	Instrument unit coordinate system : - ref hole as origin - unit coordinate system // to spacecraft coordinate system	A	Analysis of MICD supposed applicable to PhFPU (though PhFPU is not a unit)	Refer MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
5.4	External configuration drawings	A	Analysis of MICD supposed applicable to PhFPU (though PhFPU is not a unit)		
5.5	Size and mass properties				
5.5.1	Mass tolerance : within 1% or 100g of estimated mass	T		Refer to annotated MICD	
5.5.2	COG location : COG within 1mm sphere	T		Refer to annotated MICD	
5.5.3	Moi tolerance : +/- 10% from nom value	T		Refer to annotated MICD	
5.5.4	Overall instrument mass	n/a	not applicable to units		
5.6	Mechanical i/f				
5.6.1	Herschel payload module	n/a			
5.6.2	Mechanical interface, Plank payload module	n/a			
5.6.3	Mechanical i/f : SVM				
5.6.3.1	Attachment points : mechanical, thermal, bonding purpose	By design			
5.6.3.2	Design requirement for fixation feet	A	DCU : OK, M4 HS_FCU : M5 fixation (RFD_FCU_N10)	Refer MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L

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5.6.3.3	Herschel SVM warm units configuration : info only	n/a			
5.6.3.4	Planck only	n/a			
5.6.3.5	Planck only	n/a			
5.6.3.6	Instrument to provide : bonding stud hardware (washer/nut)	I		Refer DRCU outgoing inspection report	
5.7	Thermal interfaces				
5.7.1	Thermal interface on Herschel Payload module	n/a			
5.7.2	Thermal interfaces on Planck payload module	n/a			
5.7.3	Thermal interface on Service Modules :				
	DRCU op. Temp -15ºC/+45ºC	T	OK, tested at -20°C/+50°C	Refer HS_DCU & HS_FCU VTC test report	
	DRCU startup/switchoff : -30ºC/50ºC	T	OK, tested at -30°C/+50°C	Refer HS_DCU & HS_FCU VTC test report	
	DRCU non op temp. -35°C/+60°C	T	OK, tested at -35°C/+60°C	Refer HS_DCU & HS_FCU VTC test report	
	Acceptance / qualification temp margins on min&max op. Temperatures	T	+5°C margin on max -5°C margin on min	Refer HS_DCU & HS_FCU VTC test report	
	All units [...] shall have a flat base plate contact	I	Waiver for FCU RFD_FCU_N9		
	contact area : flatness 0.1mm/100mm	T	OK	DCU : refer to Annotated MICD FCU : refer to PSU RCI	SPIR-MX-5100 000 I HSPIR.PSU.RT.00208.V.ASTR
	Contact area : overall flatness <0.2mm	T	OK	DCU : refer to Annotated MICD FCU : refer to PSU RCI	SPIR-MX-5100 000 I HSPIR.PSU.RT.00208.V.ASTR
	Contact area : Roughness < 3.2µm	By design			
	Warm units to be coated with high emissivity coating; emissivity > 0.8	by design	Black coating applied		
5.7.4	Temperature stability	n/a			
5.7.5	Temp monitoring	n/a			
5.8	Optical interface	n/a			
5.8.1	Herschel	n/a			
5.8.2	Planck	n/a			

Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
5.9	Power				
5.9.1	Thermal dissipation on Herschel payload module interface	n/a			
5.9.2	Thermal dissipation on Planck payload module interface	n/a			
5.9.3	Thermal dissipation on Herschel service module				
	Difference between BOL & EOL dissipation < 10%	By design			
	Warm units power dissipations	n/a	Thermal budget to be spread to sub-systems (refer to IID-B reqs)		
5.9.4	Thermal dissipation on Plank service module	n/a			
5.9.5	Power supply load on main bus				
	Power supply limitation		Power budget to be spread to sub-systems (refer to IID-B reqs)		
	SPIRE FCU : LCL class III	Info			
5.9.5.1	Bus voltage	Info			
5.9.5.2	Main bus characteristics				
	Nominal performance in 26Vmin/29Vmax	T	At PSU level; PSU tested at 26V/29V	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
	Equipemnt shall safely survive to any standing or fluctuating voltage in range [0:32V]	T	At PSU level (Under voltage detection)	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
5.9.5.3	Dynamic behaviour				
5.9.5.3.1	Transient : superseeded by 5.14.3.8	n/a			
5.9.5.3.2	Ripple and spikes	Info			
5.9.5.4	Power distribution : LCL caracteristics	Info			
	Power distribution : use of fuse shall be avoided	By design	Design does not include any fuse; ref to DCL.	HSPSU FM DCL	HSPIR.PSU.LI.00210.V.ASTR
5.9.5.5	Bus impedance : figure 5.9.5-1	Info			
	each instrument shall not be susceptible to voltage transients induced by its own current transitions when connected to 28Vdc (+2%-1%) with bus impedance as per figure 5.9.5-1	by design	Emi-emc tests with LISN, but lisn caracteristics not compliant with bus caracteristics		

Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
5.9.5.6	Power demand				
5.9.5.6.1	Average power demand definition	Info			
5.9.5.6.2	Long peak power demand definition	Info			
5.9.5.6.3	Short peak power demand definition	Info			
5.9.5.6.4	Inrush current : LCL caracteristics	Info	Inrush reqs applicable are found in 5.14.7		
5.9.5.6.5	Load current transitions : dI/dt < 5.10^4 A/s	N/a	Superseeded by 5.14.7 1A/µS		
5.9.5.6.6	Initial electrical status : after switch off of 10s, equipment shall reach a reproducible and identified electrical status	By design			Open point : mecanism
5.9.5.7	Instruments converter synchronisation : 131 Khz +/- 10%	By design	PSU switching frequency 200 Khz		
5.9.5.8	Pyrotechnic device	n/a			
5.9.5.9	Instruments power demand during launch	n/a			
5.10	Connectors : Harness, Grounding, bonding				
5.10.1	Connectors				
5.10.1.1	Connector types				
5.10.1.1.1	Warm connector types : use of SCC 3401 DxMA	A	Analysis : Refer to DCL/MICD		
5.10.1.1.2	Hercshel cryo harness connectors	n/a			
5.10.1.2	Connector characteristics				
	Connector shall be clearly identified to prevent incorrect mating	I	Outgoing inspection procedure / fullfilled MICD	Refer DRCU outgoing inspection report	Ref TBD
	The housing of connectors shall be electrically connected to the connector shell	I	Outgoing inspection procedure / fullfilled MICD	Refer DRCU outgoing inspection report	Ref TBD
	Flight-quality connectors shall be protected by savers	I	Outgoing inspection procedure / fullfilled MICD	Refer DRCU outgoing inspection report	Ref TBD
	Connectors shall be mechanically locked	I	Outgoing inspection procedure / fullfilled MICD		

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§	Req. Description				
	All units shall use dedicated connectors for the different signal categories	By design	Considered as a goal, not a requirement; ref to DRCU ICD & BOLC ICD		
	Separate connectors shall be used fore each redundant system/subsystem	By design	ref to DRCU ICD		
	Cross straping shall be allowed between prime and redundant	Info	No cross straping		
5.10.1.3	Connector mounting				
	Equipment and bracket mounted connectors shall be located in easily accessible positions	A	Analysis of MICD	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
	The physical position is to be indicated in external conf. Drawings, and must be compliant with the minimum of fig 5.10.1-1	A	Analysis of MICD	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
	Connector pitch shall be designed to accomodate connector backshells	n/a	No verification can be performed by CEA/SAp		
5.10.2	Harness	n/a	Nota : applicable to SPIRE warm harness, not to DRCU		
5.10.3	Grounding and isolation				
5.10.3.1	Grounding concept	by design			
5.10.3.2	Return path not used as return path for power and signals	by design			
5.10.3.3	Grounding to structure	by design			
5.10.3.4	Isolation between prim. Power lines and structure > 1MΩ < 50nF.	T	Test at PSU level : 200MΩ/13nF	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
5.10.3.5	Isolation between prim. Power lines + sec. Power line returns & struct. > 1MΩ < 50nF.	S	Test at PSU level, on PSU EM	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
5.10.3.6	Secondary power grounding	by design			
5.10.3.7	Grounding for equipement distributing secondary power	by design			
5.10.3.8	Deleted requirement				
5.10.3.9	When disconnected from chassis, sec power lines isolation wrt chassis > 1MΩ < 50nF.	T	Test at PSU level : 200MΩ/22nF	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
5.10.4	Bonding				

Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
5.10.4.1	Fault current : bonding device shall be designed to carry fault currents of 1.5 times the subsystem equipment protection device	by design			
5.10.4.2	Bonding provision shall be corrosion resistant	by design	refer to MICD	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
5.10.4.3	Direct and indirect bonding : use of conductive mounting surface is the prefered bonding method	Info	--		
5.10.4.4	Bounding through mounting feet : each foot area > 1cm^2.	by design	Refer to MICD	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
	DC resistance between equipment chassis and the hosting spacefcraft < 10mΩ	n/a	Not measurable at subsystem level		
5.10.4.5	Bonding of equipment thermally insulated from structure	n/a	--		
5.10.4.6	Characteristics of bonding structures : clean metal or gold plate or alodine 1200	By design	Analysis of MICD : base plate surface : alodine 1200 bonding stud : clean metal	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
5.10.4.7	Unstable bonding	by design	nut+washer used		
5.10.4.8	Compression fastner	by design	nut+washer used		
5.10.4.9	DC resistance between adjacent faces of equipment chassis < 2.5mΩ	T	Test at PSU level : 0.8mΩ	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
		T/By design	Test at DCU level : Test at FCU level :	HS_DCU continuity test report HS_FCU continuity test report	Sap-SPIRE-CH-408-06 Sap-SPIRE-CH-412-06
5.10.4.10	Bonding lug characteristics				
	M4x6 close to mounting plane	by design	Analysis of MICD : M4x6	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
	Clearly indicated on MICD	A	Analysis of MICD	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
	DC resistance between lug and mounting feet < 2.5mΩ	T	Test at PSU level : 0.30mΩ	HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
			Test at DCU level : Test at FCU level : <2.5mΩ	HS_DCU continuity test report HS_FCU continuity test report	Sap-SPIRE-CH-408-06 Sap-SPIRE-CH-412-06
5.10.4.11	Serial connection of bonding strap	n/a	Specs for integration!		

Requirement identification		METHOD	Comments	Test report title	Doc number
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5.10.4.12	Impedance between unique secondary power ref and bonding stud < 5mΩ	by design	Unique secondary power ref not directly available, only available through internal wires/pcb (R~15mΩ)		
5.10.4.13	Bonding of equipment not performing electrical functions	n/a	--		
5.10.4.14	Bonding strap characteristics	n/a	Specs for integration!		
5.11	Data handling	n/a			
5.12	Attitude and orbit control/pointing	n/a			
5.13	On board HW/SW and autonomy functions	n/a			
5.14	EMC				
	Design guide lines	by design			
5.14.1	Electrical interfaces				
5.14.1.1	Signal interface grounding	by design			
5.14.1.2	Signal isolation : receiver i/f to provide common mode isolation according to fig 5.14.1-1	by design			
5.14.1.3	Signal reference : no use of primary pwr ground; sec. Pwr ref. Shall constitute user signal ref.	by design	Nota : Isolation between primary and secondary return is tested (5.10.3.5)		
5.14.1.4	Allowed Interface topologies	by design			
5.14.1.5	i/f designed for noise immunity with level and time discrimination	by design			
5.14.1.6	Analog and digital circuits not to respond to signals out of their own intentional frequency bandwidths	by design			
5.14.1.7	Transmission bandwidth shall be limited to the minimum extent possible	by design			
5.14.1.8	Filters to be placed at the source end	by design			
5.14.2	Harness, connectors and shielding				
5.14.2.1	Emc class definition	Info			
5.14.2.2	Wire/bundle coding	by design			
5.14.2.3	Cable separation of different EMC class	by design			
5.14.2.4	Harness routing and crossing	n/a			
5.14.2.5	Twisting	n/a	Nota : applicable to SPIRE warm harness, not to DRCU		

Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
5.14.2.6	Pin allocation on connectors : avoid different EMC class on same connector; if not possible, they shall be separated ...	by design			
5.14.2.7	Twisted wire allocation	Ref 5.10.2.4			
5.14.2.8	Tri axial cable recommandation	n/a			
5.14.2.9	Shield coverage > 85%	I	Visual inspection of HS_FCU internal harness		
5.14.2.10	Cable shield grounded at both ends	I	Inspection of HS_FCU internal harness		
5.14.2.11	DC resistance between shield and connector back shell < 5mΩ	T	Test of HS_FCU internal harness	HS_FCU internal harness test report (harness eidp)	RT-662/04/CAM/JC
5.14.2.12	DC resistance between equipment structure and connector back shell < 10mΩ	T	Test at PSU level : 1.60mΩ		
		T	Test at HS_FCU level Test at HS_DCU level <1.5mΩ	HS_DCU & HS_FCU continuity test report	Sap-SPIRE-CH-408-06 Sap-SPIRE-CH-412-06
5.14.2.13	Cable shield insulation	n/a			
5.14.2.14	Overall shield shall be circularly terminated or shield terminations shall be at the connector backshell	by design	Inspection of HS_FCU internal harness		
5.14.2.15	DC resistance between shield ground pin and equipment chassis < 2.5mΩ	N/a	All overshield connected to backshell in spire harness def.		
5.14.2.16	Non RF shield termination of individual shield wire : low inductive, lentgh < 8cm.	by design			
5.1.2.17	Shielding through intermediate connectors	n/a			
5.14.2.18	All electrical connectors not engaged shall be covered with a conductive cap	n/a	Applicable to unengaged at flight; all DRCU connectors supposed to be engaged at flight		
5.14.2.19	Apertures : outgassing vents diameter < 5mm	by design	Analysis of MICDs	HS_DCU MICD HS_FCU MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
5.14.2.20	Grounding diagram shall be established at subsystem level, minimum extent as defined		Grounding diagram managed at SPIRE system level		

Requirement identification		METHOD	Comments	Test report title	Doc number
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5.14.3	EMC performance requirements				
5.14.3.1	Conducted emission on power lines				
5.14.3.1.1	CE on primary power lines, frequency domain, differential mode, NB	T	Test at PSU level, NOK, waiver	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.14.3.1.2	CE on primary power lines, frequency domain, common mode, NB	T	Test at PSU level : OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.14.3.1.3	Current ripple, time domain diff mode (cond. For nom. Current > 1A)	T	Test at Full DRCU system level	Results available with Dominique Schmitt	
5.14.3.2	CE on power lines : no specification of max level	n/a	No spec available		
5.14.3.3	CS on power lines, diff mode steady state	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.14.3.4	CS on power lines, com. Mode steady state	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.14.3.5	CS on signal bundles, com. Mode current; no spec available	n/a	No spec available		
5.14.3.6	CS on signal ref, common mode voltage, steady state	n/a	No signal ref provided to HS_DCU/FCU		
5.14.3.7	CS on signal ref, common mode voltage, Transient	n/a	No signal ref provided to HS_DCU/FCU		
5.14.3.8	CS on power lines, transients				
5.14.3.8.1	CS on power lines, com. Transients, diff mode	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.14.3.8.2	CS on power lines, com. Transients, common mode	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.14.3.9	NB E Field radiated emission	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
			No test at HS_DCU or HS_FCU level	**Waiver n°17**	
5.14.3.10	NB E Field radiated susceptibility	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
		S	**HS_DCU QM2 : NCR456 / RFW n°15** **HS_FCU QM2 : OK**	HS_DCU QM2 test report HS_FCU QM2 test report	Sap-SPIRE-DS-010-06 Sap-SPIRE-DS-011-06
5.14.3.11	H Field radiated emission	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
			No test at HS_DCU or HS_FCU level	**Waiver n°17**	Waiver to be raised
5.14.3.12	H Field radiated susceptibility	T	Test at PSU level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
		S	HS_DCU QM2 : OK HS_FCU QM2 : OK	HS_DCU QM2 test report HS_FCU QM2 test report	Sap-SPIRE-DS-010-06 Sap-SPIRE-DS-011-06

Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
5.14.3.13	Arc discharge susceptibility	S	Test at PSU EM level, OK	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
		S	**HS_DCU QM2 : NCR453 / RFW n°16** **HS_FCU QM2 : OK**	HS_DCU QM2 test report HS_FCU QM2 test report	Sap-SPIRE-DS-010-06 Sap-SPIRE-DS-011-06
5.14.4	Deleted requirement	N/a			
5.14.5	Deleted requirement	N/a			
5.14.6	Deleted requirement	N/a			
5.14.7	Plug-in and inrush current	T	Test at PSU level	HS_PSU EMC test report	HSPIR-PSU-REE-DA0018814-V-ASTR
5.15	Instrument handling				
5.15.1	Transport container				
5.15.1.1	Focal plane unit	N/a			
5.15.1.2	Warm electronic units & interco harnesses				
	Container to be pressurized with dry nitrogen	N/a	Not necessary		
	Hygrometry recorded with witness device	A	DRCU packing procedure		
	The container shall be equiped with a mounting platform supported by a shock absorber	A	DRCU packing procedure		
	Shock recorders shall be mounted at TBD location	A	DRCU packing procedure		
	Containers shall be made of material compatible with cleanliness reqs and shall be equiped with witness devices	by design	**No contamination witness in container**		
5.15.2	Cleanliness				
5.15.2.1	Focal plane unit	N/a			
5.15.2.2	Warm electronics container shall be opened in CR 100000 with rel. Hum. 50%.	A	DRCU packing / handling procedure CEA specifies 50%+/-5%!		
5.15.2.3	Expected instrument cleanliness degradation during AIV	Info			
5.15.2.4	Outgassing properties materials				
	Warm units : TML<1% CVCM < 0.1%	by design	Analysis of DML	Ref DRCU and subsystems DML	
5.15.2.4	Herschel FPU bake out 80ºC 3 days	n/a			
5.15.3	Handling				

Requirement identification		METHOD	Comments	Test report title	Doc number
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5.15.3.1	Handling of FPU	N/a			
5.15.3.2	Warm electronic units : each unit weighting more than 10kg shall be equiped with handles	I	DCU/FCU outgoing inspection procedure handles provided		
5.15.4	Purging	N/a			
5.15.5	Mechanism position	N/a			
5.16	Environnement requirements				
5.16.1.1	Pressure environment	by design	Also tested with thermal vacuum tests		
5.16.1.2	Pressure during orbital phase < 10^{-4}Pa	T	VTC tests	HS_DCU thermal vacuum test report HS_FCU vacuum test report	Sap-SPIRE-HT-395-06 Sap-SPIRE-HT-396-06
5.16.2	Radiation environnement	by design	DRCU : analysis of DCL(rad tolerants EEE)		
5.16.3	Micrometeorite environnement	Info			
5.16.4	Displacement in planck PLM	n/a			
5.17	Lifetime : 3.5years + 0.5years	A	Reliability analysis performed	DRCU synthesis note about FMEA and reliability	Sap-SPIRE-JF-0099-03
6	Ground support equipment				
6.1	MGSE	n/a			
6.2	EGSE	n/a			
7	Integration, testing and operations	Info			
8	Product assurance	A	Refer CEA standard PA plan		
9	Development and verification	info			
9.1	General	Info			
9.2	Model philosophy	Info			
9.3	Deliverable instrument test plan	Info			
9.4	Design and Analysis Requirements	N/a	Out of scope of this document		
9.5	Verification and testing				
9.5.1	General test requirements	Info			
9.5.2	Test level tolerances	A	Analysis test procedure / test reports		
9.5.3	Mechanical verification and testing				

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9.5.3.1	Mass, MoI, CoG : all units to comply with MICD	T/I	Physical test		
9.5.3.2	Quasi static test	N/a	replaced by sine @ low freq		
9.5.3.3	Sine vibration tests				
9.5.3.3.1	General requirements for vibration test	A	Analysis procedure / test reports	HS_DCU vibration test report HS_FCU vibration test report	Sap-SPIRE-HT-393-06 Sap-SPIRE-HT-394-06
9.5.3.3.2	Sine vibration test level	A	Analysis procedure / test reports		
9.5.3.4	Random vibration tests level	A	Analysis procedure / test reports		
9.5.3.5	Acoustic tests	n/a			
9.5.3.6	Shock test levels	N/a	No shock test on FM		
9.5.3.7	Displacement : applies to planck only	N/a			
9.5.4	Thermal verification and testing				
9.5.4.1	General thermal test requirements	A	Analysis of test procedure / test reports		
9.5.4.2	General thermal test conditions	A	Analysis of test procedure / test reports		
9.5.4.3	Thermal vacuum and balance test				
9.5.4.3.1	Thermal vacuum test	A	Thermal vacuum tests	HS_DCU FM thermal vacuum test report HS_FCU thermal vacuum test report	SAp-SPIRE-HT-395-06 Sap-SPIRE-HT-396-06
9.5.4.3.2	Thermal balance test	n/a	Performed on STM		
9.5.4.4	Thermal cycling	T	Thermal vacuum tests	HS_DCU FM thermal vacuum test report HS_FCU thermal vacuum test report	SAp-SPIRE-HT-395-06 Sap-SPIRE-HT-396-06
9.5.4.5	Thermal shock	n/a			
9.5.4.6	Bake out	n/a			
9.5.5	Mechanism verification and testing		No mechanism		
9.5.6	EMC verification and testing	A	Ref EMI/EMC tests		

Requirement identification		METHOD	Comments	Test report title	Doc number
§	Req. Description				
9.5.7	Qualification to the radiation environment	A	Purcahse of EEE parts rad tolerant	Ref DRCU and subsystems DCLs	
10	Management plan		Out of scope		

Requirement identification		Method	Comments	Test report title	Doc number
§	Req. Description				
5	Interface with satellite				
5.1	Identification and labelling				
	See IID-A sheet	n/a			
5.2	Interface location	n/a			
5.3	Location and alignement	n/a			
5.4	External configuration drawings	n/a			
5.5	Size and mass properties HS_DCU :16,960kg HS_FCU :16,480kg	T	HS_DCU : 16779g HS_FCU : 16177g	See annotated MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
5.6	Mechanical interface				
5.6.1	Inside cryostat	n/a			
5.6.2	Outside cryostat : no requirement	n/a			
5.6.3	On SVM	Info			
5.7	Thermal interface				
5.7.1	Inside cryostat	n/a			
5.7.2	outside cryostat : no requirement	n/a			
5.7.3	On the SVM : superseeded by IID-A	n/a			
5.7.4	On plank PLM : N/A	n/a			
5.7.5	Temperature channels				
5.7.5.1	Instrument temperature sensor	Superseeded by DRCU subsystem specifications			
5.7.5.2	Shutter temp. Sensors	n/a			
5.7.5.3	SaTellite temp. Sensors	n/a			
5.8	Optical interface	n/a			
5.9	Power				
5.9.1	Power inside cryostat	n/a			
5.9.2	Power outside cryostat	n/a			
5.9.3	Power on the SVM : HS_DCU : 37W HS_FCU : 42.9W	T/A	DCU : 30W(Photo) DCU : 12,5W(spectro) FCU : 38W		
5.9.4	Power on plank plm	n/a			
5.9.5	Power versus operating mode	Info			

Requirement identification		Method	Comments	Test report title	Doc number
§	Req. Description				
5.9.6	Supply voltages				
5.9.6.1	Load on main bus : HS_FCU : 80W	T	68W		

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
3		Physical caracteristics				
3.1.3	DRCU REQ1	Electrical if between boards	By design			
3.2		Physical requirements				
3.2.1	DRCU REQ2 DRCU REQ3	Mass	n/a	Superseeded by IID-B		
3.2.2	DRCU REQ7 DRCU REQ8	Dimensions	T/I	OK -> DCU&FCU	See annotated MICD	SPIR-MX-5100 000 I SPIR-MX-5200 000 L
			T/I	OK -> At PSU level	See annotated MICD annex of HSPSU FM RCI	HSPIR.PSU.RT.00208.V.ASTR
3.3		Power				
3.3.1	DRCU REQ10	DCU power dissipation ≤37W	T/A	30W(Photo) 12,5W(spectro)		
3.3.2	DRCU REQ11	FCU power dissipation ≤42.9W	T/A	38W		
4.2		DCU subsystem				
4.2.1		Subsystem general description	Info			
4.2.2		Functional requirement				
	DRCU REQ15	48 P-LW channels 96 P-MW channels 144 P-SW channels 24 S-LW channles 48 S-SW channels	T	OK	DCU functional test report	Ref ??
	DRCU-REQ16	Channel subsets have to be defined and individually protected by current limiters	By design Test at board level (backplane)	OK	No report published for test at board level	
	DRCU REQ17	BIAS : 3 photometer channels 2 spectrometer channels 1 TC channel	T	OK	DCU functional test report	Ref ??
	DRCU REQ18	Bias channel amplitude adjustable individually	T	OK (full test ad mid excursion)	DCU functional test report	Ref ??
	DRCU REQ19	Bias channel frequency adjustable individually	T	OK (Test at 200Hz)	DCU functional test report	Ref ??
	DRCU REQ20	16 JFET bias bias channels 2 JFET heater bias channels	T	OK	DCU functional test report	Ref ??

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
	DRCU REQ21	Each JFET channel (Vdd / Vss) individually commandable	T	OK	DCU functional test report	Ref ??
	DRCU REQ22	Each JFET heater bias commandable on/off	T	OK	DCU functional test report	Ref ??
	DRCU REQ23	DCU to implement 2 independant bias module	by design	OK		
	DRCU REQ24	DCU to implement 2 independant daq+if module	by design	OK		
	DRCU REQ25	Data transfert from daq+if to be derived from bias frequency by division [1..128]	T	OK	DCU functional test report	Ref ??
	DRCU REQ26	Number of blocks to be transfered selectable by low level command [1..16] or continuous	T	OK	DCU functional test report	Ref ??
	DRCU REQ27	DCU to implement temp sensors	By design			
	DRCU REQ28	Temp measurement through AD590 probes	By design	See also DCL		
	DRCU REQ29	Temperature range [-40° to 88°C]	By design	Range partly tested in thermal vaccuum chamber		
		Temerature resolution 0.5°C	By design			
	DRCU REQ30	Description of HK channels	T		DCU functional test report	
	DRCU REQ30b	Caracteristics of secondary supply HK channels	By design / Test	OK, but test doesnot explore all range	DCU functional test report	
4.2.3		Performance requirements				
	DRCU-REQ31	Conducted RF current on lines <0.1nA/√Hz	Not testable	Openpoint		
	DRCU-REQ32 (1)	Photometer input sig<11mV	T/S	No « saturation » test performed; full test at mid excursion; same behaviour as previous models		
		Spectrometer input sig<17mV	T/S			
		T/C input sig<30mV	T/S			
	(2)	Input signal DC level ≤15mV	By design			
	(3)	Output signal (to ADC) +/-5Vpp	By design			
	(4)	Common mode offset	T			

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
	(5)	Cross talk	T	OK	DCU functional test report	
	(6)	Noise allocation	T	Nearly conform	DCU FM noise performance test	
	(7)	Capacitance <100pF	by design			
	(8)	Input DC impedance > 1MΩ	By design			
	(9)	Base band signal bandwidth :				
		Photometer : 0.03 to 5Hz	T	Test at board level + test at DCU level	DCU functional test report	
		Spectrometer : 0.003 to 25 Hz	T	Test at board level + test at DCU level	DCU functional test report	
		T/C : 0.03 to 5Hz	T	Test at board level + test at DCU level	DCU functional test report	
	10	Predemodulation BPF bandwidth 50-300Hz	T	Test at board level	Test reports available at CEA	
	11	Post demodulation LPF order	T	Test at board level	Test reports available at CEA	
	12	Common mode rejection	S	Similarity with previous models)		
	14	Interface type : balanced	By design			
	DRCU REQ33	Noise performance to be maintained under thermal drift 1K/Hour	Info			
	DRCU REQ34	Bias module caracteristics				
		Photometer				
		Max amplitude 0-100mV	T	OK	DCU functional test report	Ref ??
		Ampl resolution 1/256	by design			
		Frequency 50-300Hz in 5Hz step	T	Test at board level + test at DCU level	DCU functional test report	
		Load impedance	Info			
		Interface type balanced & sine	by design			
		Noise < 20nV/√Hz	S	Similarity with QM2 <7.4nV/√Hz	Technical note DCU QM2 performance test	Sap-SPIRE-FP-236-05
		Sync signal phase 0 to 360°	T		DCU functional test report	
		Spectrometer				

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
		Max amplitude 0-140mV	T	OK	DCU functional test report	
		Ampl resolution 1/256	by design			
		Frequency 50-300Hz in 5Hz step	T	Test at board level + test at DCU level	DCU functional test report	Ref ??
		Load impedance	Info			
		Interface type balanced & sine	by design			
		Noise < 20nV/√Hz	S	Similarity with QM2 <8.5nV/√Hz	Technical note DCU QM2 performance test	Sap-SPIRE-FP-236-05
		Sync signal phase 0 to 360°	T		DCU functional test report	Ref ??
		T/C				
		Max amplitude 0-220mV	T	OK	DCU functional test report	Ref??
		Ampl resolution 1/256	by design			
		Frequency 50-300Hz in 5Hz step	T	Test at board level + test at DCU level	DCU functional test report	Ref ??
		Load impedance	Info			
		Interface type balanced & sine	by design			
		Noise < 20nV/√Hz	S	Similarity with QM2 <7.4nV/√Hz	Technical note DCU QM2 performance test	Sap-SPIRE-FP-236-05
		Sync signal phase 0 to 360°	T		DCU functional test report	
	DRCU REQ35	DC JFET bias caracteristics				
		Bias type DC	by design			
		-5V≤Vss≤0	T	OK	DCU functional test report	Ref??
		Vdd=2.5V	T	OK		
		Current range 1mA to 5mA	T/Design	Test on 1KΩ load; 5mA by design	DCU functional test report	Ref ??
		Voltage noise Vss <1µV/√Hz		Similarity with QM2 <32nV/√Hz	Technical note DCU QM2 performance test	Sap-SPIRE-FP-236-05
		Voltage noise Vdd<0.3µV/√Hz		Similarity with QM2 <32nV/√Hz	Technical note DCU QM2 performance test	Sap-SPIRE-FP-236-05
	DRCU REQ36	No Vss/Vdd overshoot at switch on	S	Similarity with QM2		

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
	DRCU REQ37	JFET heater bias caractristics				
		Photometer voltage 0 to 5V	T	OK	DCU functional test report	Ref??
		Spectrometer voltage 0 to 3V	T	DCU offers 0-5V range	DCU functional test report	Ref??
		Total current photo 25mA	T	-> 5mA by output; OK (tested under 1KΩ load)	DCU functional test report	Ref??
		Total current spectro 25mA	T/D	-> tested under 1kΩ load (5mA by design)	DCU functional test report	Ref??
	DRCU REQ38	Data acquisition caracteristics				
		ADC resolution 16bits	By design			
		Acquistion time ≤6.2ms (photo)	By design			
		Acquistion time ≤1.2ms (spectro)	By design			
		Input signal dc level ≤5V	By design			
		DC offset resolution 4bits	T	Test at daq+if board level	test reports available at CEA	
	DRCU REQ39	Daqif module to support modes: Photo array subset Spectro array subset Photo full array Spectro full array test pattern Photo offset table Spectro offset table	T	Test on subset : only checvked for frame consistency	DCU functional test report	Ref??
4.2.4		Interface requirements				
4.2.4.1		Electrical i/f				
	DRCU REQ40	Both DCU data i/f to comply with DRCU/DPU ICD	T?	Henri to provide a command test matrix		
4.2.4.2		Mecanical i/f				
	DRCU REQ41	DCU electronics boards dimensions	Info			
	DRCU REQ42	DCU backplane description	Info			
4.2.4.3		Power supplies				
	DRCU REQ43	Alocated average power				
		Photometer 33.2W	T	30W		
		Spectrometer 16W	T	12.5W		

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
	DRCU REQ44 DRCU REQ45	Deleted requirement (internal to DRCU)				
4.3		MCU				
4.3.1		subsystem general description	Info			
4.3.2		Functional requirements				
	DRCU REQ46	Both MCU data i/f to comply with DRCU/DPU ICD	T	Henri to provide a command test matrix		
	DRCU REQ47	MCU to implement 2 independant MAC module	by design			
	DRCU REQ48	MCU to transfert following data formats spectrometer steering miror trace test	??	Under LAM responsibility		
	DRCU REQ49	number of blocks to be transfered selectable by low level command [1..16] or continuous	T		FCU functional test report	Ref ??
	DRCU REQ50	MCU to implement temp sensors	By design			
	DRCU REQ51	Temp measurement through AD590 probes	By design	See also DCL		
	DRCU REQ52	Temperature range [-40° to 88°C]	By design	Range partly tested in thermal vaccuum chamber		
		Temerature resolution 0.5°C	By design			
	DRCU REQ53	Description of HK channels	T	Checked for consistency with values excpected by LAM	FCU functional test report	Ref ??
	DRCU REQ54	Caracteristics of secondary supply HK channels	By design / Test	OK, but test doesnot explore all range		
	DRCU REQ55	MCU to implement 2 electrically independant MAC module	by design			
	DRCU REQ56	MCU to implement 2 electrically independant MAC module	by design			
4.3.4		Interfaces requirement				
4.3.4.1		Electrical interface				

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
	DRCU REQ57	The data data packet transmitted to be compliant with DRCU/DPU ICD	T			
	DRCU REQ58	MCU electronics boards dimensions	Info			
	DRCU REQ59	MCU backplane description	Info			
	DRCU REQ60	MCU subsystem mass budget	Superseeded by FCU mass budget			
	DRCU REQ61	MCU allocated average power 18.7W	Info	Internal requirement to DRCU		
	DRCU REQ62 DRCU REQ63	Deleted requirement (internal to DRCU)	n/a			
4.4		SCU				
4.4.1		subsystem general description	Info			
4.4.2		Functional requirements				
	DRCU REQ64	SCU to implement totally independant main&redundant temp. Channels	By design			
		16 standards channels + 1 subK	T	OK	FCU functional test report	Ref ??
		interface type : 4 wires + shield	by design			
	DRCU-REQ-65	Temperature probes individually switched on/off by command	T	OK	FCU functional test report	Ref ??
	DRCU REQ66	SCU to implement totally independant main&redundant calibrators i/f & electronics	By design	OK		
	DRCU REQ67	Calibrator bias current shall be individually controled on/off	T	OK	FCU functional test report	Ref ??
	DRCU REQ68	Both voltage and current of calibrators to be monitored and transfered to DPU	T	OK	FCU functional test report	Ref ??
	DRCU REQ69	SCU not to store waveforms	Info			
	DRCU REQ70	SCU to implement totally independant main&redundant cooler and T/C heaters i/f & electronics	by design	OK	FCU functional test report	Ref ??
	DRCU REQ71	Cryo-cooler heaters current shall be selectable individually with 1/4096 resolution	T	Saturation at about 3000 coder steps	FCU functional test report	Ref ??

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
	DRCU REQ72	T/C heaters current shall be individually selectable with 1/256 resolution by command	T	1/4096 resolution provided!	FCU functional test report	Ref ??
	DRCU REQ73	SCU to provide 3 remote commands for PSU group control	T		FCU functional test report	Ref ??
	DRCU REQ74	PSU remote command status configurable by low level command	T		FCU functional test report	Ref ??
	DRCU REQ75	SCU to implement totally independant main&redundant i/f to DPU	by design			
	DRCU REQ76	i/f to transfer fixed size data block to DPU through hi speed data i/f	T		FCU functional test report	Ref ??
	DRCU REQ77	Number of blocks to be transfered selectable by low level command [1..16] or continuous	T			
	DRCU REQ78	Sampling rate of blocks programmable by command [0.325Hz:80Hz] in 256 steps	T			
	DRCU REQ79	i/f to transfer 24 words in an imposed single data format	T			
	DRCU REQ80	SCU to implement temp sensors	By design			
	DRCU REQ81	Temp measurement through AD590 probes	By design	See also DCL		
	DRCU REQ22	Temperature range [-40° to 88°C]	By design	Range partly tested in thermal vaccuum chamber		
		Temperature resolution 0.5°C	By design			
	DRCU REQ83	SCU to provide HK parameters when requested by low level command	T		FCU functionnal test report	Ref ??
	DRCU REQ84	Caracteristics of secondary supply HK channels	By design / Test	OK, but test does not explore all range		
4.4.3		Performance requirements				
	DRCU REQ85	Thermometry channels caracteristics (Main)				
		T_PL0 range 1K-10K resol. 2mK accuracy 2mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
		T_SL0 range 1K-10K resol. 2mK accuracy 2mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SOB range 3K-300K resol. 10mK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SUB range 3K-100K resol. 25MK accuracy 25mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_BAF range 3K-100K resol. 10mK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_FTSM range 3K-20K resol. 10MK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_FTSS range 3K-100K resol. 25MK accuracy 50mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SCL2 range 4K-150K resol. 5MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SCL4 range 4K-150K resol. 5MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SCST range 1K-50K resol. 10MK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_CEV range 0.25K-10K resol. 0.1MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_CPHP range 1.5K-50K resol. 0.5K accuracy 1K	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_CEHS range 1.5K-25K resol. 0.5K accuracy 1K	T/A	SCU performance tests results to be mixed with temp probes	Open work	

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
		T_CSHT range 1.5K-25K resol. 0.5K accuracy 1K	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_BSMM range 3K-20K resol. 10mK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_BSMS range 3K-80K resol. 5MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
	DRCU REQ86	Thermometry channels caracteristics (Redundant)				
		T_PL0 range 1K-10K resol. 2mK accuracy 2mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SL0 range 1K-10K resol. 2mK accuracy 2mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SOB range 3K-300K resol. 10mK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SUB range 3K-100K resol. 25MK accuracy 25mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_BAF range 3K-100K resol. 10mK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_FTSM range 3K-20K resol. 10MK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_FTSS range 3K-100K resol. 25MK accuracy 50mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SCL4 range 4K-150K resol. 5MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_SCST range 1K-50K resol. 10MK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
		T_CEV range 0.25K-10K resol. 0.1MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_CPHP range 1.5K-50K resol. 0.5K accuracy 1K	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_CEHS range 1.5K-25K resol. 0.5K accuracy 1K	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_CSHT range 1.5K-25K resol. 0.5K accuracy 1K	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_BSMM range 3K-20K resol. 10mK accuracy 10mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
		T_BSMS range 3K-80K resol. 5MK accuracy 5mK	T/A	SCU performance tests results to be mixed with temp probes	Open work	
	DRCU-REQ87	Probe bias value: subK : 40nA others : 10mV	T	Test through HK feedback on a fixed value resistor	FCU functional test report	Ref ??
	DRCU REQ88	PCAL bias current caracteristics				
		Current range 0 to 7mA	T	Test at 7mA	FCU functional test report	Ref ??
		Max dissipated power 10mW	Info	Depends on resistance range		
		Heater resistance range	Info			
		stability/repeatability 0.5% or 5µA	T	Test result not available yet??	SCU performance test report	Ref ??
		Max drive voltage 3.9V	T		FCU functional test report	Ref ??
		i/f type 2x2 wires	by design			
	DRCU REQ89	SCAL bias current caracteristics				
		Current range 0 to 5.5mA	T	Test at 5.5mA	FCU functional test report	Ref ??
		Max dissipated power 15mW	Info	Depends on resistance range		

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
		Heater resistance range	Info			
		stability/repeatability 0.5% or 5µA	T	Test result not available	SCU performance test report	Ref ??
		Max drive voltage 3.1V	T		FCU functional test report	Ref ??
		i/f type 2x2 wires	by design			
	DRCU REQ90	Stability repeatability for 1h time and 3K/h drift	Info			
	DRCU REQ91	Calibrator h/w current limited by h/w to 110% of specified maximum.	by design			
	DRCU REQ92	SCU to provide cooler heater biases :				
		Heat switch : 2 heaters i/f	by design			
		Heat switch : power 0-1mW	T	Test at 1.63mA on 402Ω -> 1.3mW	FCU functional test report	Ref ??
		Heat switch : absol. Max voltage 15V	by design			
		Heat switch : i/f 2x2 wire	By design			
		Sorp. pump : 1 heater i/f	by design			
		Sorp. Pump : power 0-500mW	T	Test at 38mA on 402Ω -> 580mW	FCU functional test report	Ref ??
		Sorp. Pump : absol. Max voltage 15V	by design			
		Sorp. Pump : i/f 2x2 wire	By design			
		TC heater : 1 heater i/f	by design			
		TC heater : power 0-50µA	T	test at 4.53µA	FCU functional test report	Ref ??
		TC heater : i/f 2x2 wire	by design			
4.4.4		Interface requirements				
4.4.1		electrical i/f				
	DRCU REQ93	Both data and command i/f to be compliant with DRCU/DPU ICD	T	Henri to provide a command test matrix		
4.4.2		mecanical i/f				
	DRCU REQ94	SCU electronics boards dimensions	Info			
	DRCU REQ95	SCU backplane description	Info			

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
4.4.3		Power supplies				
	DRCU REQ96	Allocated power 4.7W	Info	Internal requirement to DRCU		
	DRCU REQ97 DRCU REQ98	Deleted requirement (internal to DRCU)	n/a			
4.5		PSU				
4.5.1	DRCU REQ99	Secondary power lines	Info (requirement internal to DRCU)			
4.5.2		Primary power lines				
	DRCUREQ100	Each psu (main/redundant) to have separate electrical i/f with SC power bus	by design			
	DRCU REQ101	(primary power caracteristics)	Superseedeed by IIDA			
	DRCU REQ102	Switching main/redundant by switching main/redundant PSU	By design			
	DRCU REQ102b	PSU efficiency>70°	T	OK	PSU RCI	HSPIR.PSU.RT.00208.V.ASTR
4.6		DRCU electrical configuration				
4.6.1		DRCU power distribution scheme	by design			
4.6.2	DRCU REQ103 to 107	Grouding and isolation		See IID-A reqs		
4.6.3	DRCU REQ108 to 114	Bonding		See by IID-A reqs		
4.7	DRCU REQ115 to 121	Modes of operation	By design			
4.8		Cross ref of capabilities	Info			
4.9	DRCU REQ122 to 125	FDIR	By design			
5		DRCU interfaces				
5.1	DRCU REQ126 to 130	Mechanical interfaces		see IID-A reqs		
5.2		Thermal i/f				
	DRCU REQ131	Max power dissipation on units		See IID-B reqs		

Requirement identification			Method	Comments	Test report title	Doc number
§	Req #	Req. Description				
5.3		Electrical i/f				
	DRCU REQ132 to 140	Misc connectors requirements				
6	DRCU REQ141 to 143	EMC requirements		See IID-A reqs		
7	DRCU REQ142 to 144	Environmental requirements		See IIDA reqs		
8	DRCU REQ145	Reliability	A	No figure required, but analysis performed	DRCU synthesis note about FMEA and reliability	Sap-SPIRE-JF-0099-03
	DRCU REQ146	Reliability evaluation to be performed according to MIL-HDBK-217- F	A	MIL-HDBK-217-F used for relaaibility evaluation	DRCU synthesis note about FMEA and reliability	Sap-SPIRE-JF-0099-03
9		Design and construction				
	DRCU REQ147	Material and process selection	A	Refer to DRCU and subsystems DML/DPL		
	DRCU REQ148	Compliance with deratings requirements (PSS 01-301)	A	Nearly conform; conformance for JFET supply + heaters only prooved to 4.5ma (specs up to 5mA)	DRCU deratings analysis report	Sap-SPIRE-JF-107-03
10	DRCU REQ149	Identification and labelling	I	See IID-A reqs		
11	DRCU REQ150	Product tree	Info			
13	DRCU REQ151	Requirements concerning the Failure Detection and Failure Isolation capabilities shall have precedence on any other requirement.	I			