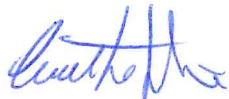



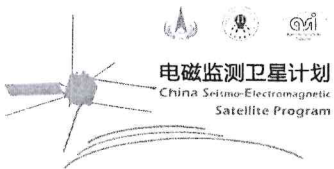


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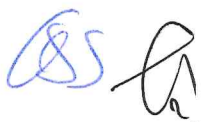
<b>Meeting Subject</b>	EFD-02 FM update and calibration at DFH and Satellite Level Verification
<b>Meeting Date</b>	February 26 - March 5, 2024
<b>Meeting Place</b>	Beijing (China)
<b>Prepared by</b>	Cristian DE SANTIS Yuanqing MIAO

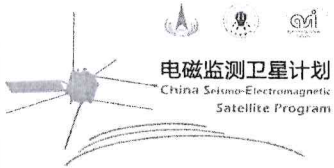
<b>Participants</b>			
<b>Participant</b>	<b>Institute/ Company</b>	<b>Role</b>	<b>Signature</b>
Cristian DE SANTIS	INFN	INFN CSES-Limadou Program Manager	
Davide BADONI	INFN	EFD-02 Analog Electronics MAIT Manager	
Gianmaria REBUSTINI	INFN	EFD-02 Calibration Manager	
Piero DIEGO	INAF	EFD-02 Deputy PI	
Fabrizio DE ANGELIS	INAF	EFD-02 Software Manager	
Wen SU	DFH	CSES-02 Project Manager	
Yan LI	DFH	CSES-02 Chief Designer	
Sen LIU	DFH	CSES-02 Vice Project Manager	



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Yuanqing MIAO	DFH	CSES-02 System Engineer	
Xiaofei ZHAO	DFH	CSES-02 Payload Engineer	
Tianyun ZHANG	DFH	CSES-02 Project Coordinator	
Jungang LEI	LIP	EFD-02 Rotary Joint Harness System Engineer	
Shixun LI	LIP	EFD-02 Rotary Joint Harness Engineer	

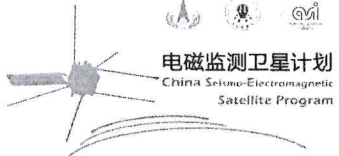


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## Documents

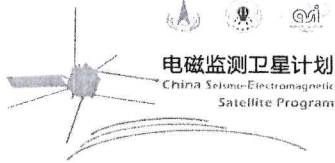
Document	Description
TNO-LIM2-038-1.4	Harness configuration and signal injection procedure for EFD-02 FM performance test on board CSES-02
TNO-LIM2-039-1.1	EFD-02 FM test on-board CSES-02 - Power-on and functional test
TNO-LIM2-043-1.1	EFD-02 EFP - Taping of injection wire and sensor handling procedure
TNO-LIM2-045-1.1	Procedure and harness setup configurations for EFD-02 FM calibration



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Item	Description/Actions	Responsible/ Due date
1.1	<p><b>EFD-02 Inside Cabin FM cables</b></p> <p>After a reworking in Italy, five EFD-02 Inside Cabin FM cables (four FM + one spare) have been delivered to DFH on February 26, 2024.</p> <p>For each cable, DFH personnel verified length (<math>\geq 3700</math> mm), continuity (<math>&lt; 5</math> Ohm) and isolation (<math>&gt; 10</math> MOhm) of each pin according to the cable connection scheme. Verification results have been considered acceptable by DFH.</p> <p>Then, X ray images of Inside Cabin FM (and QM) cables have been acquired.</p> <p>Some solder joints have been found under the cable holders of each connector. DFH remarks that this kind of process is forbidden to be applied on space mission according to CAST low frequency cable processing technology regulations because they represent two kind of risks.</p> <ol style="list-style-type: none"> <li>1. The solder joints under the cable holder could break due to mechanical stress for vibration or thermal effects.</li> <li>2. Metal edges of the solder joints could cause a shortcut in case of rupture of the isolation layer.</li> </ol> <p>DFH remarks that the presence of solder joints under the cable holder is particularly critical because these joints are on signal lines whose break could cause the loss of one or more EFP sensors.</p> <p>INFN remarks that all cables have been reworked and assembled by certified ECSS personnel according to specific ECSS standards as reported in the certificate of conformance already shared with DFH.</p> <p>INFN remarks that the signal lines interested by the remarks from DFH are</p>	





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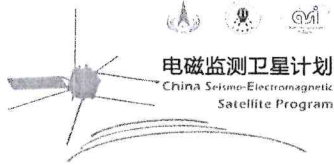
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two couples of redundant (hot/cold) wires specifically designed to make this kind of cable fault tolerant in case of rupture of one wire. Moreover, INFN remarks that each Inside Cabin FM cable has been subject to 14.5 thermal cycles and 3.5 thermal-vacuum cycles between  $-25\text{ }^{\circ}\text{C}$  and  $+60\text{ }^{\circ}\text{C}$ . No failure has been observed after this acceptance test.

INFN reports that the choice of the RG179 coaxial cable has been made since with its low parasitic capacitance (63 pF/m) the EFD-02 scientific performance requirements can be met. Since the characteristics of the RG179 conductor makes not possible to realize a reliable solder joint with the solder cups of the J36W connectors, a 26 AWG wire has been used for this connections. INFN remarks that a different model of coaxial cable (e.g. RG178) would have fit the J36W solder cup but with its high parasitic capacitance (94 pF/m) will degrade significantly the EFD-02 scientific performance making not possible to meet the performance requirements of the instruments at high frequencies.

DFH expresses its concern about the risk of solder joints under the cable holder that could occur during following AIT test. Such an event would lead to a significant delay of the CSES-02 development and test plan. DFH recommends to INFN to evaluate the possibility to produce a new set of Inside Cabin FM cables without joints on signal lines. These cables could be used in place of the current Inside Cabin FM cables in case of a critical failure during the following AIT test.

DFH underlines that these remarks are presented to INFN as a risk evaluation on the reliability of this equipment which is ultimately a responsibility of the



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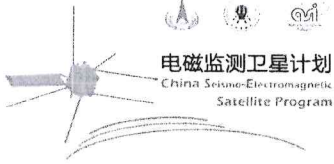
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	<p>Italian side. Therefore, the EFD-02 Inside Cabin FM cables have been accepted by DFH for the installation on the satellite for the EFD-02 FM performance test and the following vibration test. They will be re-evaluated after the vibration test.</p> <p>INFN confirms that the possibility to produce a new set of Inside Cabin FM cables without joints on signal lines will be evaluated. INFN underlines that the selection of a coaxial cable that can fit the J36W solder cup in a reliable way could imply a trade-off between reliability and performance. This choice could degrade the EFD-02 scientific performance. Moreover, some components needed for the cable assembly (e.g. braided shields) are not currently available and their procurement could take some weeks.</p>	
<p>1.2</p>	<p><b>EFD-02 FM Update</b></p> <p>Firmware and software of EFD-02 FM have been updated by INFN and INAF personnel by means of the EGSE. All four flash memories of MAIN and SPARE side have been updated.</p> <p>INFN reports that this firmware update (from version B5 to version F9) was needed to remove beats in ELF and VLF bands. The new firmware version keeps EFD-02 compliant with the requirements of band definition and data rate as well as the data budget requirement (<math>\leq 80</math> Gbit/day).</p> <p>INFN confirms that the firmware and software update has no impact on the RS422 interface with the satellite.</p>	
<p>1.3</p>	<p><b>EFD-02 FM Calibration</b></p> <p>EFD-02 FM data have been acquired for calibration purposes according to the procedure TNO-LIM2-045 "Procedure and harness setup configurations for EFD-02 FM calibration".</p>	



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The equipments listed below have been used.

Index	Equipment	Q.ty
1	EEB FM	1
2	Inside cabin cables FM	4
3	Boom FM	4
4	RJ harness FM	4
5	EFP FM	4
6	EGSE	1
7	Signal generator	1
8	Oscilloscope	1
9	Attenuator	1

In presence of INFN and INAF personnel, each EFP FM sensor has been mounted on the associated boom by a LIP specialists (no torque tightening). Wires for signal injection have been taped on EFP FM sensors by qualified LIP personnel according to the procedure TNO-LIM2-043 “EFD-02 EFP - Taping of injection wire and sensor handling procedure”.

INFN personnel run the calibration procedure as well as the data acquisition with EGSE.

Acquired data will be used to calculate the calibration coefficients in a configuration representative of the flight one.

INFN shall provide DFH with a report including the calibration coefficients.

A#1  
INFN  
2024-03-22

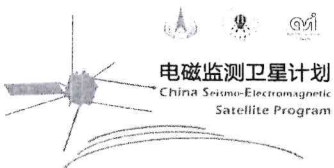
1.4 **EFD-02 FM functional and performance test on board CSES-02**

All on board test items are defined as follows:

- 1) Functional test according to TNO-LIM2-039-1.1
- 2) Performance test according to TNO-LIM2-038-1.4

After preliminary evaluation, INFN and DFH confirm that no anomalies have

A#2

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	<p>been found on TMs. DFH has provided all scientific and TM data to INFN for a detailed evaluation.</p> <p>INFN shall provide DFH with the functional and performance test report.</p>	<p>INFN</p> <p>2024-04-12</p>
1.5	<p><b>CSES-02 schedule</b></p> <p>The CSES-02 vibration test is foreseen to be held at the end of April.</p> <p>The CSES-02 thermal vacuum test is foreseen to be held in July.</p>	

