

Production Test Procedure

LMP

PCB nr.: 3118-02

	Organisatie / Organization	Datum / Date
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Table of contents:

1	Introduction.....	4
1.1	Document Scope	4
1.2	List of Terms and acronyms	4
1.3	Applicable documents (AD)	5
1.4	Reference documents (RD).....	5
1.5	Test results storage	5
2	Test configuration.....	7
2.1	Identification of the test article	7
2.2	Objectives of the test	7
2.3	Configuration control.....	7
2.4	Safety.....	7
2.5	Test responsibilities	7
2.6	Test facility requirements.....	8
3	Test description	8
3.1	PCB Production	Error! Bookmark not defined.
3.1.1	(Automatic) Optical Inspection (AOI)	8
3.2	Functional Tests	8
4	Anomalies and procedure variations	8
4.1	Deviations from the step-by-step procedure	9
4.2	Software anomalies	9
4.3	Production failure.....	9
5	Annexes.....	10
5.1	Procedure variations sheets	10
5.2	Test result check list	11

Author: G. W. Schoonderbeek	Date of issue: 09-03-2022 Kind of issue: limited	Doc.id : TPR-00021	
	Status: Final Revision: 1.0	File name:TPR00021_LMP.docx	

1 Introduction

1.1 Document Scope

This document is intended for PCB assembly, manufacturers and test facilities. It describes the test that have to be performed on the LOFAR2 Mid-Plane (LMP) during production. The LMP PCBA is described in RD.1. For each PCBA the test results have to be recorded. **ASTRON is open for adjustment to this test plan. These adjustments however should be discussed and an update of this document will be made.**

In section 2 an overview of the test configuration, all steps that have to be taken prior to testing, is described. Section 3 describes the verification steps during the assembly steps and to the steps which must be performed on the PCBA or module. How to handle anomalies and procedure variation is described in section 4. Annexes to this document can be found in section 5.

1.2 List of Terms and acronyms

ANSI	American National Standards Institute
AD-n	nth document in the list of Applicable Documents
BOM	Bill Of Material
DMM	Digital multi meter
EMC	Electromagnetic compatibility
ESD	Electrostatic discharge
IPC	Association Connecting Electronics Industries
ICT	In Circuit Test
LOFAR	Low Frequency Array
LMP	LOFAR2 Mid-Plane
NCR	Non-Compliant Report
PO	Purchase Order
PCB	Printed Circuit Board
PPS	Pulse per second
PV	Procedure Variation
RD-n	nth document in the list of Reference Documents
RoHS	Restriction of Hazardous Substances
SW	Software
TBC	To be confirmed
Vpp	Volt peak-to-peak

Author: G. W. Schoonderbeek	Date of issue: 09-03-2022 Kind of issue: limited	Doc.id : TPR-00021	
	Status: Final Revision: 1.0	File name:TPR00021_LMP.docx	

1.3 Applicable documents (AD)

Ref.nr.	Doc. number	Title	Author
AD.1	EN55022-B	EMC standards	
AD.2	IEC 61000 -4-3	Radiated immunity	
AD.3	IEC 61000 -4-6	Conductive immunity	
AD.4	IEC 62305	Protection against lightning	

1.4 Reference documents (RD)

Ref.nr.	Doc. number	Title	Author
RD.1	PMS00046	LMP Product Manufacturing Specifications	Gijs Schoonderbeek

1.5 Test results storage

The results of all inspections, functional and delivery tests should be stored in the ASTRON data-base. This makes it possible to verify that a test was successful.

The OEM can use its own data base for storing a detailed report on the production process. An export with the summary of the production process has to be transferred to the ASTRON data base. This report should include at least:

- The passing of each step from bare board inspection to final delivery check. Each step should including a time stamp.
- The repairs done on the product

The format of this summary should be a PDF file ready to be imported in the ASTRON database.

Author: G. W. Schoonderbeek	Date of issue: 09-03-2022 Kind of issue: limited	Doc.id : TPR-00021	
	Status: Final Revision: 1.0	File name:TPR00021_LMP.docx	

Figure 1 and Figure 2 are showing an example of the ASTRON database.

I&S Boarden

Search in ALL fields (also those not displayed here):											
Number	Serial nr.	Type-Version	Status	Location	Project	Housing	Production				
		UniBoard2									
437	26287-004	UniBoard2-1.3	Tested	Dwingeloo	ARTS	Uni2Box	14-07-2017				
436	26287-003	UniBoard2-1.3	Tested	Dwingeloo	ARTS	Uni2Box	14-07-2017				
435	26287-002	UniBoard2-1.3	Tested	Dwingeloo	ARTS	Uni2Box	14-07-2017				
434	26287-001	UniBoard2-1.3	Tested	Dwingeloo	ARTS	Uni2Box	14-07-2017				
433	26287-005	UniBoard2-1.3	Working	Dwingeloo	ARTS	Uni2Box	14-07-2017				
8	26054-003	UniBoard2-1.3	Working	Italy	UniBoard2	Uni2Box	15-12-2015				
7	26054-004	UniBoard2-1.3	Errors	JIVE	UniBoard2	Uni2Box	15-12-2015				
6	26054-005	UniBoard2-1.3	Working	France Bordeaux	UniBoard2	Uni2Box	15-12-2015				
5	26054-002	UniBoard2-1.3	Working	Manchester	UniBoard2	Uni2Box	14-12-2015				
4	26054-001	UniBoard2-1.3	Working	France Nancy	UniBoard2	Subrack	15-12-2015				
3	26054-007	UniBoard2-1.3	Ready for test	Lab Dwingeloo	UniBoard2		15-12-2015				
2	26054-006	UniBoard2-1.3	Working	Duitsland	UniBoard2	Uni2Box	15-12-2015				
1	26012-001	UniBoard2-1.3	Working	Demo-Board	UniBoard2	Uni2Box	04-05-2015				

Figure 1 Overview of the "I&S Boarden" web form.

Board information

Board information		Wijzigen
Board Type	UniBoard2	
Board Version	1.3	
Serial number	26287-001	
Status	Tested	
Location	Dwingeloo	
Firmware	Switch 2.82c, unb2b	
Production date	14-07-2017	
Project	ARTS	
Housing	Uni2Box	
Schematic		
Repairs	Node 0 VCCRGXB SMPS gedraaid op de print.	
Remarks	B.S. OK ready for firmware test.	
Results		
Bestand 1	R_434_1.jpg	Vervang
Bestand 2	R_434_2.png	Vervang
Bestand 3		Nieuw

Figure 2 Example of one board.

Author: G. W. Schoonderbeek	Date of issue: 09-03-2022 Kind of issue: limited	Doc.id : TPR-00021	
	Status: Final Revision: 1.0	File name:TPR00021_LMP.docx	

2 Test configuration

2.1 Identification of the test article

The item under test is the LMP. For a description refer to RD.1.

2.2 Objectives of the test

The objective of the test is to fully test all solder joints, press-fit connections and mounting of mechanical part on the LMP PCBA such that the product can be installed on a remote location. All components should be mounted and placed correctly.

2.3 Configuration control

Prior to the test, the test configuration shall be established and recorded

1. Test equipment type, serial number and calibration due date
2. APSCT test environment SW (scripts) version/date
3. Test equipment settings

All test results tagged with the relevant serial number shall be stored digitally. The test results shall be available for later evaluation when requested by ASTRON. Copies and or prints of this information shall be available for the test result summary.

The content of the test database shall be handed over to ASTRON after delivery of each production batch

2.4 Safety

The following ESD and personnel safety precautions shall be taken:

- The PCBA is ESD sensitive. ESD precautions must be taken at any time during the assembly and handling of the PCBA or individual components (use a wrist strap connected to a ground terminal).
- Take care handling the LMP PCBA, as connector pins can easily bend.

2.5 Test responsibilities

It is the responsibility of the test-designer (ASTRON):

- Design a test which covers all aspects
- Design a test which is easy to perform.
- Design a consistent and repeatable test.

It is the responsibility of the test-conductor:

- Executing the test(s) following the test instructions.

The checklist of section 5.2 can be used as a guideline to verify that all verifications are performed.

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2.6 Test facility requirements

The environmental specifications of the test facility shall be maintained within the values given below:

- Temperature: 18 °C to 25 °C
- Humidity: 50% to 70%
- Cleanliness: "normal" office environment or better
- EMC protected area as described in EN55022-B [AD.1]
- Radiation and conductive immunised area as described in IEC 61000 [AD.2][AD.3]
- Area protected against lightning as described in IEC 62305 [AD.4]
- Antistatic, ESD protected area (EPA)

3 Test description

This section describes the verifications that are required prior, during and after the production of this PCBA. The purpose of the verifications is to confirm good quality of the assembly process and can be divided in events required during the production of the PCBA (section 3.1) and events after completion of the PCB assembly (section 3.2).

A verification event can be one or a combination of the following actions:

Demonstration	Operation of the system, subsystem or a part of the system that relies on observable, functional operation, not requiring use of instrumentation, special test equipment or subsequent analysis.
Test	Operation of the system, subsystem or a part of the system using instrumentation or other special test equipment to collect data for later analysis.
Analysis	Processing of accumulated data obtained from other qualification methods.
Inspection	Visual examination of system components, documentation, certifications, etc.

3.1 PCB Production verification

Incoming PCB's must be visually inspected for anomalies in order to confirm that a PCB is qualified for the following production step. All PCBs have to full fill the IPC-A-610 standard. All PCBs have to pass an electrical test as specified by IPC-9252 to test all interconnections. Use a copy of the test result check list in 5.2 to record the test data and if the test has passed or failed. The results of the following verifications need to be analyst for each individual PCBA in order to confirm that the PCBA is properly assembled and suitable for the function test.

3.1.1 (Automatic) Optical Inspection (AOI)

The LMP PCBA should be optically checked such that:

- All pins are pressed successfully.
- No damaged has been done to the connector pins (all pins are straight).

3.2 Functional Tests

No functional test is required for the LMP PCBA.

4 Anomalies and procedure variations

During a test, several types of anomalies or deviations may occur. Depending on the type, the anomaly or deviation has to be documented. In the following subsection actions which have to be taken on the possible anomalies and deviations are described.

Author: G. W. Schoonderbeek	Date of issue: 09-03-2022 Kind of issue: limited	Doc.id : TPR-00021	
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4.1 Deviations from the step-by-step procedure

A Procedure Variation (PV) have to be added to the Procedure Variation Sheet in section. The PV shall have a unique number and explain which test step(s) have changed and for what reason. The PV reference must be added at the relevant test step. The PV must be communicated with the customer ASTRON and eventually agreed before proceeding with the tests depending on the impact on the test.

4.2 Software anomalies

Small mistakes in the test software which do not have impact on the overall flow of the test and need not to be discussed with the customer. Persistence malfunction of the software must be communicated with the customer ASTRON such that actions can be taken. Contact information can be found in the PMS [RD.1]

4.3 Production failure

When a test step fails (i.e. the pass/fail criteria = fail) during the test and the failure cannot be corrected by a small change to the test software (see 4.2 above), the following options are possible:

- Failure diagnosis to be performed to pin-point the problem to a replaceable item. The correction on the PCBA has to be stored in the component database.
- When the failure is such that testing has to be stopped and immediate action has to be taken: Inform the customer ASTRON and together will be decided if testing can continue and whether Software Problem Report (SPR) or PV must be raised. Any PV/SPR reference must be added at the relevant test step.

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5 Annexes

5.1 Procedure variations sheets

(to be copied as necessary)

PROCEDURE VARIATION/ ADDITIONAL ACTIVITIES					
Number	Date/ time	Procedure step/ Test phase	Variation description	Test Dir.	PA

5.2 Test result check list

Step	Operation	Pass/Fail criterion	Observation	P/F
1.	Record Serial number	Is a label with the ASTRON serial number (Sn: LMP-1-. . .) placed?	yes / no	
2.	PCB checked	Are electrical test done? Is the PCB according IPC-A-600	yes / no yes / no	
3.	Optical Inspection completed successful	Was the Optical Inspection completed successful?	yes / no	
4.	Store test results	Are the LMP test results stored in the database?	yes / no	