

Product Manufacturing Specifications

LOFAR2 MidPlane (LMP)

PCB nr.: 03118

	Organisatie / Organization	Datum / Date
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This publication is part of the project DUPLLO with project number 175.2017.012 of the research program "Investerings NWO-groot" which is (partly) financed by the Dutch Research Council (NWO).

Doc.nr.: PMS00047
Rev: 1.0
Date: 11-03-2022
Class.:

Distribution list:

Group:	Others:
Gijs Schoonderbeek Sieds Damstra Nico Ebbendorf	

Document history:

Revision	Date	Chapter / Page	Modification / Change
0.1	20-01-2022	-	Creation
0.2	01-03-2022		Update
0.3	08-03-2022		Update after review
1.0	11-03-2022		Final

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1 Introduction

1.1 Document Scope

This document is the Product Manufacturing Specification (PMS) and is intended for PCB assembly manufacturers and test facilities. It describes the manufacturing specification for a complete PCB assembly, production and handling quality and if applicable a final functional test.

A functional description of the assembly is presented in section 2. Specific information and specification for this assembly can be found in the underlying documents shown in section 1.2. In section 3.1 the quality requirements and specifications are mentioned. References to general documents related to this module can be found in section 1.3. These documents are available upon request from the manufacturer.

1.2 Applicable documents (AD)

Ref.nr.	Document number	Rev.	Title	File name
AD-1	012032		Verzoek tot Offerte LOFAR2.0 Modules	
AD-2	012033		Annex-A Pakket van Eisen LOFAR2.0 Modules	

1.3 Reference documents (RD)

Ref.nr.	Document number	Rev.	Title	File name
RD-1	EDW00073	3.0	Schematic LMP, LOFAR2.0 MID PLANE, LOFAR 2.0, PCB-03118	EDW00073.pdf
RD-2	PPL00054	3.0	PPL LMP, LOFAR2.0 MID PLANE, LOFAR 2.0, PCB-03118	PPL00054_LMP_20220309.xlsx
RD-3	PSF00170	3.0	PSF LMP, LOFAR2.0 MID PLANE, LOFAR 2.0, PCB-03118	PSF00170__LMP_LOFAR_2_0_PCB3118.pdf
RD-4	PPD00068	3.0	PPD LMP, LOFAR2.0 MID-PLANE	lmp_21022022.tgz
RD-5	PAD00056	1.0	PAD LMP, LOFAR2.0 MID PLANE, LOFAR 2.0, PCB-03118	PAD00056_LMP.pdf
RD-6	TPR00021	1.0	TPR LMP, LOFAR2.0 MID PLANE, LOFAR 2.0, PCB-03118	TPR00021_LMP.pdf

1.4 List of Terms and acronyms

ANSI	American National Standards Institute
AOI	Automated Optical Inspection
APS	Antenna Processing Subrack
APSCT	Antenna Processing Subrack Clock and Translator
APSFB	Antenna Processing Subrack Fan Box
BOM	Bill Of Material
ESD	Electro Static Discharge
IPC	Association Connecting Electronics Industries
LMP	LOFAR2 Midplane
LOFAR	Low Frequency Array
PO	Purchase Order
PCB	Printed Circuit Board
PMS	Product Manufacturing Specification
RCU2	Receiver Unit 2
RCU2H	Receiver Unit 2 High
RCU2L	Receiver Unit 2 Low
RoHS	Restriction of Hazardous Substances
SMD	Service Mount Devices
SPI	Solder Paste Inspection
VtO	Verzoek tot Offerte (request for quotation)

2 Functional description

The LOFAR2 Mid-Plane (LMP) is one of the central boards in the processing subrack for the LOFAR2.0 station. In this subrack 96 signals are digitally combined to form a beam on the sky to which the station is most sensitive. Figure 1 shows an exploded view of the LOFAR2.0 Antenna Processing Subrack (APS) and the location of the LMP.

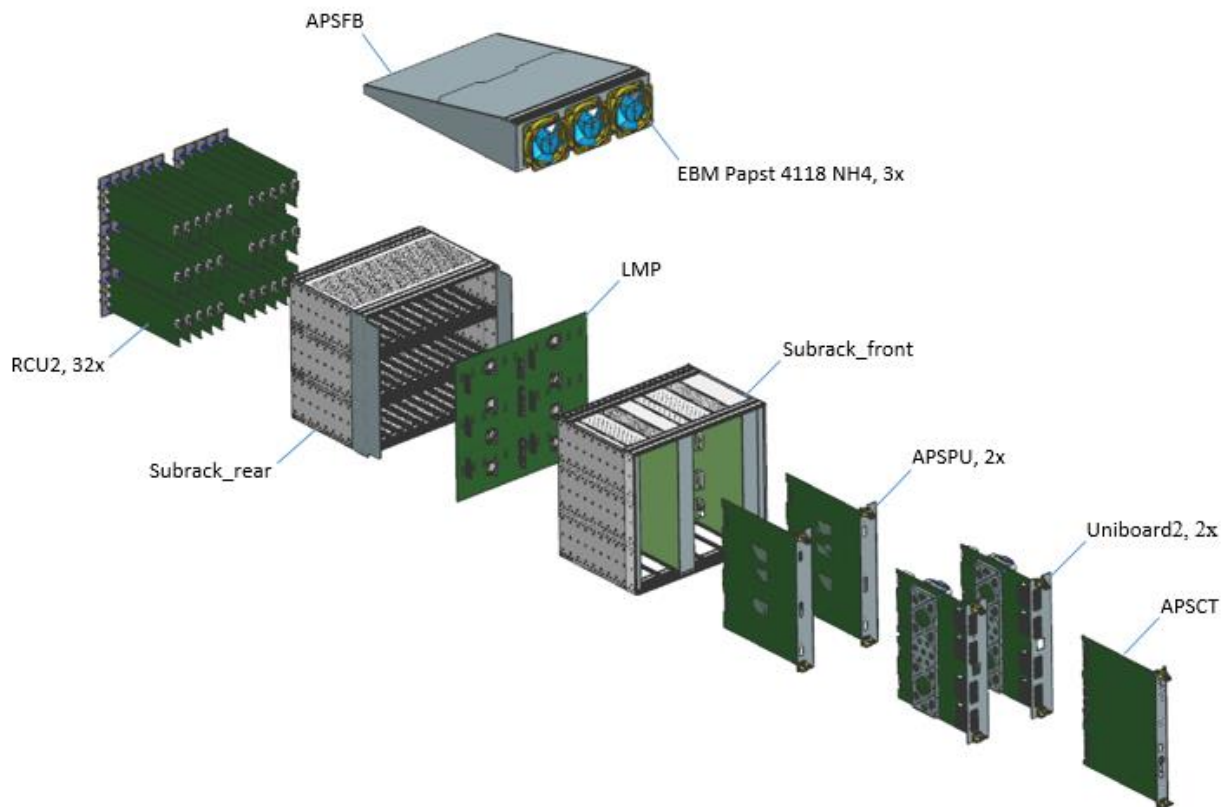


Figure 1 Picture of the boards in the Antenna Processing Subrack.

The LMP PCBA provides the power and signal interconnection of all APS modules using high speed type connectors and power connectors. This board is positioned in the centre of the APS interfacing directly with the receiver units (RCU2) at one side rack and the digital processing and power modules at the other side (see Figure 1).

A schematic diagram of the LMP board can be found in [RD-1]. Figure 2 shows a 3D drawing of the LMP PCBA.

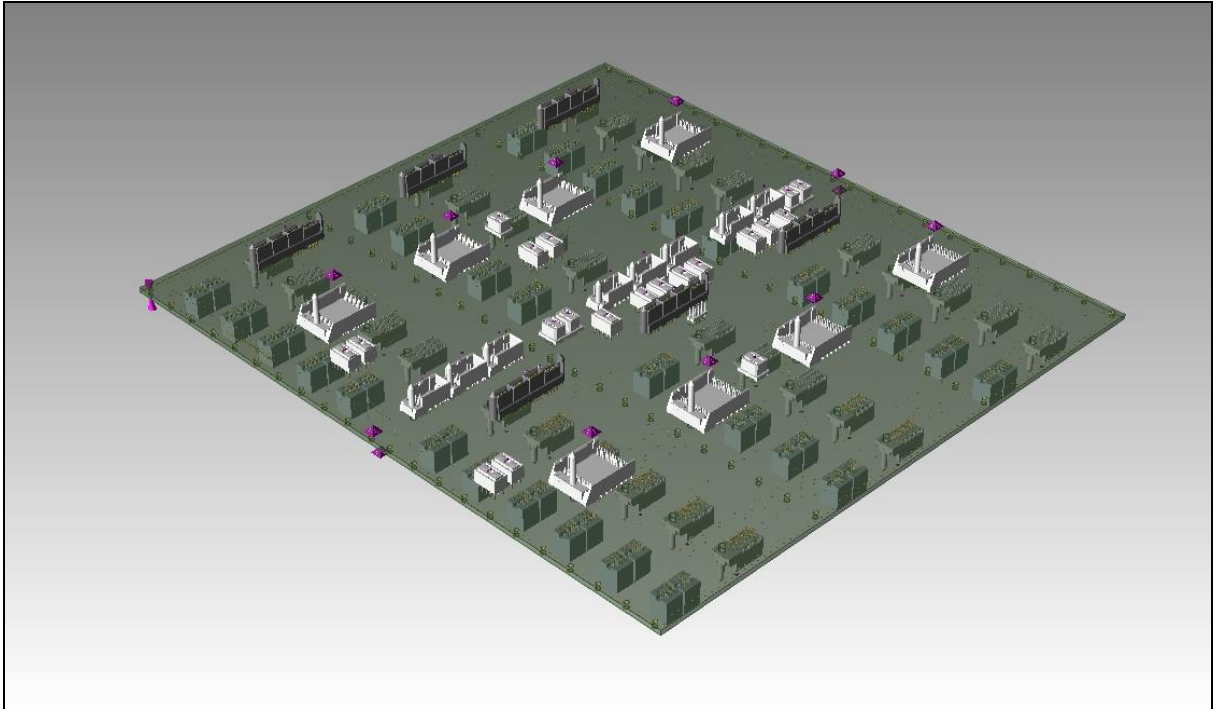


Figure 2 3D drawing of the LMP PCBA.

3 General technical assembly requirements and specifications

Unless otherwise specified in the VtO [AD-1], the assembly will be complete and carried out according to good workmanship and quality. The work will involve but not limited to the following responsibilities:

- Inspection of incoming design files for manufacturing.
- Component purchase according to the BOM provided in [RD-2] (both electrical and mechanical parts).
- Proposing alternative components in case of obsolescence, long lead time and/or economical reason. Since not all parts can be replaced by alternatives, like components in a sensitive analogue filter, ASTRON engineers keep final control as to whether an alternative component may be used.
- Purchase of PCB according to the provided design files [RD-4] and PCB specification form [RD-3] (a preferred supplier maybe demanded).
- Component assembly including in-line quality tests.
- Module assembly..

The following standards are applicable for the PCB production and the assembly process including purchase and handling:

- ISO 9001
- For the PCB design the following IPC standards have been used:
 - o IPC-2221B, Class 2 Dedicated Service Electronic Products Level B, Moderate Design Producibility-Standard
 - o IPC-2222B, Type 4, Multilayer Printed Board with blind and buried vias
 - o IPC-7351, Level B Moderate Design Producibility-Standard

3.1 PCB quality requirements and standards

The LMP is a double sided multilayer rigid organic printed circuit board without blind and buried vias. The design includes press-fit connectors. More information about the PCB is provided in the LMP PCB

specification form [RD-3].

The following standards are applicable for the PCB production process including purchase and handling:

- IPC-A-600, Class 2
- IPC-6011
- IPC-6012
- IPC-SM-840
- IPC-SM-4100

The bare PCB board has to pass PCB electrical test (isolation, shorts and conductance) as provided by the LMP Production Test Procedure [RD-6].

3.2 LMP board assembly quality requirements and standards

The assembly of the LMP board require press-fit technology. The board connectors are press-fit type connectors and require special press-fit tooling.

Assembly details are provided in the LMP Product Assembly Document [RD-5].

The following standards are applicable for the PCB production process including purchase and handling:

- IPC-A-610, Class 2
- RoHS directives, 2011/65/EU
- ANSI/ESD-S-20.20 (ESD prevention)
- ANSI/EIA-471 (ESD symbol and labels)
- JESDD625-A (ESD handling devices)
- Other applicable IPC norms specifically related to the product

All components must be RoHS compliant unless specifically stated otherwise in the product BOM. In case RoHS components are not available an alternative option must be discussed with the project manager (see section 4).

Assembly process inspections like SPI, AOI, AXI are advised or must be performed. More details on the inspections and test are provided in in LMP Production Test Procedure [RD-6].

3.3 Functional test

A functional test of the LMP board assembly is not required. Production quality will be ensured by the production tests as outlined in the LMP board test documentation, [RD-6].

These requirements of the production to ensure the quality of this product are detailed in the board test documentation, [RD-6].

3.4 Acceptance

ASTRON will only accept PCB assemblies as specified in the Annex-A of the VtO [AD-2] and underlying documents. Incomplete or non-functional items will be subject for negotiation

4 Information and Communication

Detailed information is provided in the VtO [AD-1].



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