

Product Manufacturing Specifications
Antenna Processing Subrack Power Unit
(APSPU)

PCB nr.: 03117

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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 1.21.2. In section 3 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.

1.2 Applicable documents (AD)

Ref.nr.	Document number	Rev.	Title	File name
AD-1	012032	1.0	Verzoek tot Offerte LOFAR2.0 Modules	
AD-2	012033	1.0	Annex-A Pakket van Eisen LOFAR2.0 Modules	

1.3 Reference documents (RD)

Ref.nr.	Document number	Rev.	Title	File name
RD-1	EDW00072	2.0	Schematic APSPU	EDW00072.pdf
RD-2	PPL00053	2.01	PRODUCT PART LIST APSPU, ANT. PROC. SUBRACK POWER UNIT LOFAR 2.0 PCB-03117	PPL00053_APSPU_20220309.xlsx
RD-3	PSF00169	2.1	PSF APSPU, ANT. PROC. SUBRACK POWER UNIT LOFAR 2.0 PCB-03117	PSF00169__APSPU_LOFAR_2_0_PCB3117.pdf
RD-4	PPD00067	2.0	PPD, APSPU, ANT. PROC. SUBRACK POWER UNIT LOFAR 2.0 PCB-03117	apspu_2022022.tgz
RD-5	PAD00055	1.0	PAD APSPU, ANT. PROC. SUBRACK POWER UNIT LOFAR 2.0 PCB-03117	PAD00055_APSPU.pdf
RD-6	TPR00020	1.0	TPR APSPU, ANT. PROC. SUBRACK POWER UNIT LOFAR 2.0 PCB-03117	TPR00020_APSPU.pdf
RD-7	014983-01	01	Mech. drawing APSPU module	014984-01-APSPU.pdf
RD-8	014983-01	01	Mechanical BOM APSPU module	M-BOM_APSPU_R1_17-02-2022.xlsm

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 Antenna Processing Subrack's Power Unit (APSPU) is one of the central boards in the processing subrack for the LOFAR2.0 station. In this subrack 96 signals are combined to from a beam on the sky to which the station is most sensitive. Figure 1 shows an exploded view of LOFAR2.0 Antenna Processing Subrack (APS) and the location of the APSPU board.



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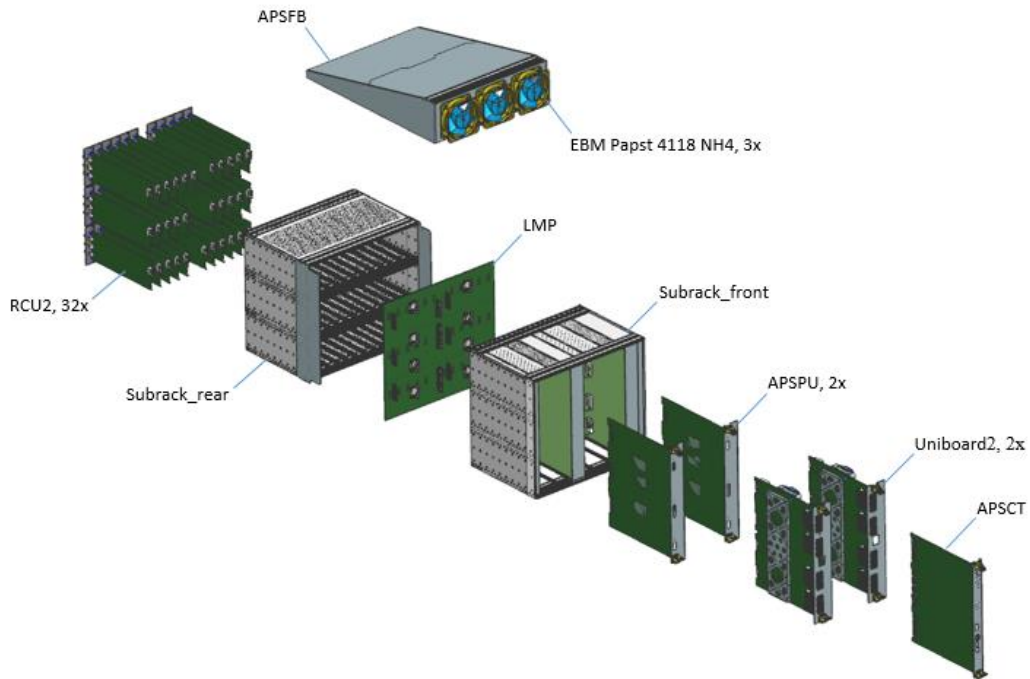


Figure 1 Picture of the boards in the Antenna Processing Subrack.

On the APSPU, the 48V input powers are filtered before passed to the UniBoard2 processing board, via the LOFAR2 Midplane (LMP). Additionally, local supply voltages are made to power the receiver units and the antennas. A schematic of the APSPU is provided in Schematic APSPU [RD-1]. Figure 2 shows a 3D drawing of the APSPU.

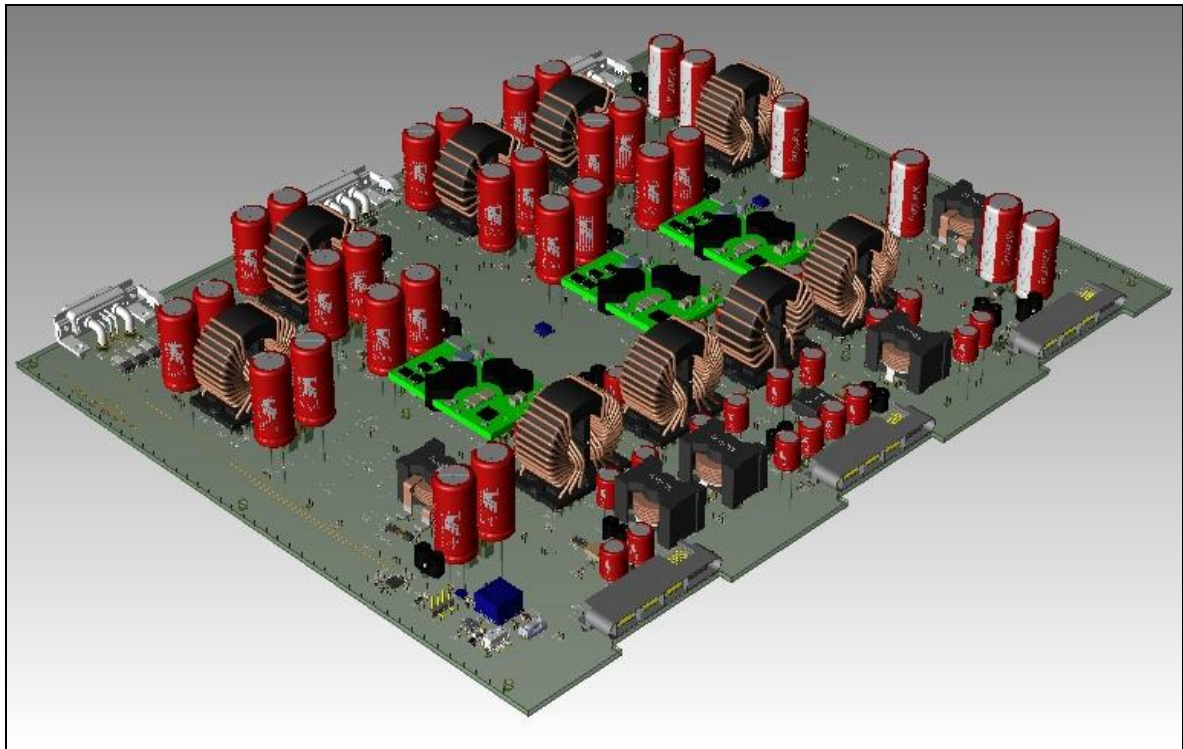


Figure 2 3D drawing of the APSPU board.

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.
- Functional test according to provided test specifications.

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 APSPU is a double sided multilayer rigid organic printed circuit board without blind and buried vias. The design includes via in pad technology. More information about the PCB is provided in the APSPU 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 APSPU Production Test Procedure [RD-6].

3.2 APSPU assembly quality requirements and standards

The assembly of the APSPU require SMD assembly technology and through hole soldering. Due to additional copper used for the power distribution, additional power might be needed during the solder stages, without overheating other components. Further mechanical assembly is required for the screw-on type mechanical parts such as the board front panel and heat sinks. More information about the mechanical parts is provided in the mechanical drawing of the APSPU Front panel [RD-7].

Assembly details are provided in the APSPU 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



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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, are advised or must be performed. More details on the inspections and test are provided in the APSPU Production Test Procedure [RD-6].

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).

3.3 Functional test

A functional test of the APSPU assembly is required. ASTRON will provide the requirements and specification for the test and the test setup. These requirements are detailed in the board test documentation, [RD-6]. The manufacturer must specify the test- and test facility options to carry out such a functional test. ASTRON designers will assist where special test equipment or test jigs are not available at the manufacturer. Such a request for support must be clearly stated in the manufacturer quotation.

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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