

 <b>PRODEX EXPERIMENT ARRANGEMENT CHANGE NOTICE</b>	
PEA: 4000119373 <span style="float: right;">CN No: CN2</span> Institute: Institute of Atmospheric Physics, Czech Academy of Sciences Project: JUICE RPWI Low Frequency Receiver – Phase C/D	
Title of area affected: Funds and Term	Article(s) of the Arrangement: 2 & 3 Initiator of change: ESA
Description of change: - Extension of the contract due to continued development of RPWI flight software and ground SW - Costs for 2021/2022 updated to reflect real expenses, remaining budget used in 2023/2024	
Reason for change: Continuing work on RPWI flight software, ground software and operations support.	
Funds <i>in addition to</i> those stipulated in Article 2.1: <b>Cost Neutral</b>  See updated Financial Plan in annex.  Total amount LoL including present CN: <b>639 600 EUR</b>	
Effect on other Arrangement provisions: N/A	Commencement of Term: 01/01/2017  End of Term: 31/12/2024
<b>Institute</b>	
Institute's representative(s):	Date 19.12.2023
<b>ESA</b>	
PRODEX Office representative(s):  Jeremie 18.12.2023 Capoulade  Michel Lazerges 18.12.2023	Date <b>Veronique Dowson</b> 18.12.2023

## 1. WORK DESCRIPTION

The hardware activities on the RPWI-LF receiver have been completed and the instrument has been delivered to IRFU in 2020 (PFM) and 2021 (FS). After JUICE launch in April 2023, the RPWI instrument has been commissioned and operates nominally. However, the flight software version 1.0 installed in the RPWI instrument is relatively limited in functionality and an update is needed to reach full scientific performance of the instrument. This updated flight software, version 2.0, is planned to be uploaded in the RPWI instrument and tested in flight in early 2024.

The RPWI flight software is developed as a collective effort of several teams lead by the RPWI team at IRF in Uppsala, with contributions from the HF team from Tohoku University in Japan, MIME team at LPC2E in Orleans, France and LF team at IAP Prague. The RPWI team in Uppsala manages the software development and implements the LP and system part of the software. The LF team contributes the part of the software for science processing of LF data and control of the LF receiver. In version 2.0 this code implements:

- Processing cross-spectral data, generating highly compressed information about plasma wave properties.
- On-board triggering and wave / dust detection, generating statistical product and triggered waveform snapshots
- Control of the LF hardware

The software is developed as a sub-module of the main RPWI codebase from which the flight software is built. As a part of the development, a test bench of validation tests has been developed as well as software for parsing and real-time visualisation of the obtained telemetry.

After the version 2.0 is tested in flight during cruise, work will start on the final version 3.0 which will be uploaded in 2025. This version shall correct issues discovered when operating 2.0, improve synchronization of data product between RPWI subunits and possibly implement new features. The flight software 3.0 should be the version used in Jupiter orbit.

The PRODEX contract covers the work on the development and testing of flight software version 2.0 and the development of new features planned for version 3.0.

The cruise phase activities in 2023/2024 involve instrument commissioning and in-flight tests running between April and July 2023 and during the instrument checkout windows in 2024 and the Earth flyby in September, when RPWI shall operate to test the instrument on the waves in the known terrestrial environment. The work performed by the LF team involves preparation of operations, command sequences and analysis of the obtained telemetry with the objective to characterize instrument performance. New features implemented in software 2.0 need to be tested through this process.

Finally, the LF team develops the ground software component for processing and calibration of RPWI-LF from the raw telemetry to scientifically useful products. This software is developed as a Python component and integrated in the RPWI pipeline maintained by IRF in Uppsala.

This CN only describes the work after the completion of hardware activities, related to the operations and software development, the work packages related to the already completed hardware development have been removed.

## 2. WORK BREAKDOWN STRUCTURE (WBS)

The WBS only covers the work performed in 2023 and 2024.

WP number	Work package title
<b>WP010</b>	<b>Project management</b>
<b>WP020</b>	<b>RPWI operations</b>
<b>WP030</b>	<b>Flight software development</b>
<b>WP040</b>	<b>Ground SW development</b>

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