RPC-LAP
OPERATIONS REPORT
ESCORT PHASE 2

March 11, 2015 -- June 30, 2015

IRFU-ROS-OPR-ESC2
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0.1	2016-07-01	Initial revision (AIE)
1.0	2017-08-24	First release (AIE/EJ)

1 Introduction

This is the report from the operations of RPC-LAP in the 2nd part of the escort phase (ESC2) at the target comet 67P/Churyumov-Gerasimenko.

2 Operations overview

LAP was operational during the full period of this archive. Shorter data gaps exist, due to macro switches (few minutes), calibration and maintenance activities (typically less than an hour), the effects of a spacecraft safe mode in the last days of March and first days in April, and some minor operational glitches.

The main operational mode of the instrument during this period was using one or both probes in bias voltage mode, measuring current at fixed bias voltage in between bias voltage sweeps occurring every few minutes. LAP can hand over probe 2 (P2) to RPC-MIP for use in its long-Debye length mode. During the period of interest here, the basic scheme was to do so every 2nd day, i.e. half of the time, though there are lots of deviations from this for a variety of reasons. Two macros are used for LDL operations: macro 805 with probe 1 (P1) at fixed negative potential, sampling the ion current, for normal mode (NM) telemetry, and macro 807, with P1 at +10 V for burst mode (BM).

For operations where LAP could use both probes, macros 525 and 624 were used in NM and BM, respectively. In both these modes, sweeps every 160 s are connected by quasi-continuous sampling of the current to the two probes, P1 at around +30 V sampling electrons and P2 at negative potential sampling ions. In late May and June operations started with two other BM macros being variants of 624. Macro 901 similar to 624 but with both probes at +30 V. Macro 903 is similar to 901, but applies a 20 times lower gain to the signal to extend the measurement range from ±10 to ±200 uA in anticipation of possibly very dense and cold plasmas on approach to perihelion (August 13). Two new macros for measurement of probe potential and E-fields, 0x801 in NM and 0x802, also came into use in May. Both these use floating rather than biased probes, a strategy better suited for the denser plasmas seen with increasing comet activity. Due to unfavourable illumination conditions, they were only used a few times in the period covered by this archive.

A special caveat must be issued for the use of data obtained at positive values of the fixed bias voltage. In principle, this current is proportional to plasma density. However, for the densities and electron temperatures encountered, the effect of varying density on the spacecraft potential, driving it more negatively and hence decreasing the current to the probe (whose positive bias is applied wrt to s/c ground), often outweighs the proportionality of current to density. As an effect, the probe current can decrease at a density increase. The effect is worst at low bias voltage (+10 as in macro 807), but sometimes can be seen also at +30 V. As plasma densities increased with comet activity, it was possible to use at least one probe instead at negative bias voltage, sampling ion current, with some sensitivity, which is what is done in the mainly used macros 525, 624 and 805.

The LAP data acquired are mainly good and scientifically useful, though any user must take great care of the limitations set by the varying pointing, the tenuous plasmas, and the spacecraft-plasma interaction.

3   Science operations list

Below is a list of all LAP operations blocks during this mission phase. A LAP operations block is defined as a continuous run of an instrument macro, though as the archive is organized by calendar days, blocks are defined to break at midnight even if the instrument operation is continuous over this artificial border. If there are instrument blocks running the same macros on both sides of midnight, this is likely to actually be a continuous operation.

The macro concept is described in the EAICD, and the macros definitions tabulated in the macro table, both available in the documents directory of the LAP archives in the ESA Planetary Science Archive (PSA). A LAP macro defines all aspects of the instrument operations, though when a probe is in electric field mode (bias current), the probe bias current may often be tuned by manual commands because of changes in pointing.

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2015-03-13T14:02:45.815	2015-03-13T23:56:53.827	624
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2015-03-15T00:03:49.854	2015-03-15T09:52:05.865	525
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2015-03-15T23:01:57.880	2015-03-15T23:57:57.882	204
2015-03-16T00:02:13.882	2015-03-16T23:59:01.909	805
2015-03-17T00:34:45.910	2015-03-17T23:56:53.936	525
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2015-03-19T00:02:45.964	2015-03-19T00:12:21.964	525
2015-03-19T00:22:29.964	2015-03-19T16:42:45.983	624
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2015-03-21T00:02:46.019	2015-03-21T11:27:02.032	525

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2015-03-27T00:34:46.184	2015-03-27T10:44:54.196	525
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2015-04-03T00:00:00.011	2015-04-03T23:59:42.409	624
2015-04-04T00:00:00.004	2015-04-04T23:59:42.438	624
2015-04-05T00:00:00.016	2015-04-05T23:59:42.466	624
2015-04-06T00:00:00.009	2015-04-06T23:59:42.495	624
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