

RPC-LAP OPERATIONS REPORT ESCORT PHASE 4

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Document history

Revision	Date	Comment
0.1	2017-02-28	Initial revision (AIE)
1.0	2017-02-28	First release (AIE/EJ)

1 Introduction

This is the report from the operations of RPC-LAP in the 4th part of the escort phase (ESC4) at the target comet 67P/Churyumov-Gerasimenko. During this period, heliocentric distance increased from 1.5 to 2.1 AU.

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), 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 (LDL), to enable MIP density measurements at low densities. At the start of this period, the baseline was to do so for 2 hours per day, cut to 1 hour every second day in mid-November as the plasma density mainly remained sufficiently high for MIP to operate without LDL. Two LAP macros were used for LDL operations: macro 805 in normal telemetry mode (NM) and macro 827 in burst mode (BM), both leaving P1 to collect ion current (at -20 V and -30 V bias voltage, respectively).

For the operations where LAP could use both probes, macro 624 (BM) saw constant use throughout the period, placing P1 at +30 V and P2 and -30 V between sweeps. The NM version 525 were used for some periods with stricter data volume limits. A macro 901, with both probes at +30 V saw some use. As the most useful data were found to be provided by macro 914 with both probes at -30 V, collecting ions, this became the single most used macro in this period. Macros 900 (BM), 903 (BM) and 905 (NM) with the probe(s) at +30 V in low gain, to avoid saturation in very high density plasmas by allowing a current range of ± 200 μA , were only occasionally used as the probe current mostly remained within the high gain limitations of ± 10 μA . In all these modes, sweeps every 160 s are connected by quasi-continuous sampling of the current to the two probes. Electric field mode is used in macro 802, with both LAP probes floating. To give similar measurement conditions at the two probes, both probes should be sunlit in this mode. As a result of this restriction, few E-field periods exist in December and early January.

A special caveat must be issued for the use of data obtained at positive values of the fixed bias voltage. In principle, the probe 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. At negative bias potential, the probe current increases with density, and the problem disappears.

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 break at midnight even if the instrument operation is continuous over this artificial border. Instrument blocks running the same macros on both sides of midnight are thus 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.

Start time	End time	Macro
2015-10-21T00:04:11.095	2015-10-21T23:56:43.123	624
2015-10-22T00:02:03.123	2015-10-22T01:58:51.126	805
2015-10-22T02:04:11.126	2015-10-22T23:56:43.151	624
2015-10-23T00:02:03.151	2015-10-23T01:58:51.154	802
2015-10-23T02:02:03.154	2015-10-23T03:58:51.156	805
2015-10-23T04:04:11.156	2015-10-23T23:59:55.179	914
2015-10-24T00:00:00.006	2015-10-24T01:56:43.182	914
2015-10-24T02:02:03.182	2015-10-24T03:58:51.184	802
2015-10-24T04:02:03.184	2015-10-24T05:58:51.186	805
2015-10-24T06:04:11.186	2015-10-24T15:56:43.198	624
2015-10-24T16:02:03.198	2015-10-24T23:59:55.207	905
2015-10-25T00:00:01.851	2015-10-25T01:58:51.210	905
2015-10-25T02:02:03.210	2015-10-25T05:58:51.214	802
2015-10-25T06:02:35.214	2015-10-25T07:57:15.217	805
2015-10-25T08:08:27.217	2015-10-25T23:59:55.235	914
2015-10-26T00:00:00.010	2015-10-26T07:56:43.245	914
2015-10-26T08:02:03.245	2015-10-26T09:58:51.247	805
2015-10-26T10:04:11.247	2015-10-26T23:59:55.263	914
2015-10-27T00:00:00.004	2015-10-27T07:56:43.273	914
2015-10-27T08:02:03.273	2015-10-27T09:58:51.275	802
2015-10-27T10:02:03.275	2015-10-27T11:58:51.277	805
2015-10-27T12:04:11.277	2015-10-27T23:26:19.291	624
2015-10-27T23:32:11.291	2015-10-27T23:59:55.291	901
2015-10-28T00:00:00.014	2015-10-28T11:56:43.305	901
2015-10-28T12:02:03.305	2015-10-28T13:58:51.308	805
2015-10-28T14:29:47.308	2015-10-28T23:59:55.325	914
2015-10-29T00:00:00.013	2015-10-29T13:56:43.341	914
2015-10-29T14:02:03.341	2015-10-29T15:58:51.343	805
2015-10-29T16:04:11.343	2015-10-29T23:59:55.353	914
2015-10-30T00:00:00.007	2015-10-30T03:56:43.357	914
2015-10-30T04:02:03.358	2015-10-30T15:58:51.372	525
2015-10-30T16:02:03.372	2015-10-30T17:58:51.374	805
2015-10-30T18:04:11.374	2015-10-30T23:59:55.381	624

Start time	End time	Macro
2015-10-31T00:00:00.000	2015-10-31T04:56:59.387	624
2015-10-31T05:01:47.387	2015-10-31T17:58:51.402	802
2015-10-31T18:02:03.402	2015-10-31T19:56:43.404	805
2015-10-31T20:08:27.405	2015-10-31T23:57:15.409	914
2015-11-01T00:00:00.011	2015-11-01T07:56:43.419	914
2015-11-01T08:02:03.419	2015-11-01T19:56:43.433	901
2015-11-01T20:02:03.433	2015-11-01T21:58:51.435	805
2015-11-01T22:04:11.435	2015-11-01T23:59:55.437	624
2015-11-02T00:00:00.005	2015-11-02T21:56:43.463	624
2015-11-02T22:02:03.463	2015-11-02T23:58:51.466	805
2015-11-03T00:04:11.466	2015-11-03T23:56:43.494	914
2015-11-04T00:02:03.494	2015-11-04T01:58:51.496	805
2015-11-04T02:04:11.496	2015-11-04T23:59:55.522	901
2015-11-05T00:00:00.003	2015-11-05T01:56:43.524	901
2015-11-05T02:02:03.524	2015-11-05T03:58:51.527	805
2015-11-05T04:04:11.527	2015-11-05T15:56:43.541	914
2015-11-05T16:02:03.541	2015-11-05T23:59:55.550	802
2015-11-06T00:00:00.014	2015-11-06T03:58:51.555	802
2015-11-06T04:02:03.555	2015-11-06T05:58:51.557	805
2015-11-06T06:04:11.557	2015-11-06T23:59:55.579	914
2015-11-07T00:00:00.008	2015-11-07T05:56:43.586	914
2015-11-07T06:02:03.586	2015-11-07T07:58:51.588	805
2015-11-07T08:34:35.589	2015-11-07T23:59:55.607	624
2015-11-08T00:00:00.001	2015-11-08T05:56:43.614	624
2015-11-08T06:02:03.614	2015-11-08T07:58:51.616	525
2015-11-08T08:02:03.616	2015-11-08T09:58:51.618	805
2015-11-08T10:04:11.619	2015-11-08T23:59:55.635	914
2015-11-09T00:00:00.012	2015-11-09T09:56:43.647	914
2015-11-09T10:02:03.647	2015-11-09T11:58:51.649	805
2015-11-09T12:04:11.649	2015-11-09T23:56:43.663	901
2015-11-10T00:02:03.663	2015-11-10T10:57:31.676	624
2015-11-10T11:01:47.676	2015-11-10T12:58:35.678	805
2015-11-10T13:03:55.679	2015-11-10T23:59:55.691	914
2015-11-11T00:00:00.017	2015-11-11T13:56:43.708	914
2015-11-11T14:02:03.708	2015-11-11T14:30:51.708	805
2015-11-11T14:34:03.709	2015-11-11T23:59:55.720	914
2015-11-12T00:00:00.010	2015-11-12T17:58:51.741	914
2015-11-12T18:04:11.741	2015-11-12T21:56:43.745	900
2015-11-12T22:02:03.746	2015-11-12T23:59:55.748	802
2015-11-13T00:00:00.004	2015-11-13T10:58:35.761	802
2015-11-13T11:01:47.761	2015-11-13T19:26:19.771	914
2015-11-13T19:32:11.771	2015-11-13T19:56:43.771	805
2015-11-13T20:08:27.772	2015-11-13T23:56:43.776	914
2015-11-14T00:02:03.776	2015-11-14T11:56:43.790	901
2015-11-14T12:02:03.790	2015-11-14T23:59:55.804	914
2015-11-15T00:00:00.008	2015-11-15T11:56:43.818	914
2015-11-15T12:02:03.818	2015-11-15T23:58:51.832	802
2015-11-16T00:02:03.833	2015-11-16T11:56:43.847	914

Start time	End time	Macro
2015-11-16T12:02:03.847	2015-11-16T13:56:43.849	903
2015-11-16T14:02:03.849	2015-11-16T23:59:55.861	914
2015-11-17T00:00:00.013	2015-11-17T01:26:51.862	914
2015-11-17T01:32:11.863	2015-11-17T02:00:59.863	805
2015-11-17T02:04:11.863	2015-11-17T23:59:55.889	914
2015-11-18T00:00:00.007	2015-11-18T03:26:19.893	914
2015-11-18T03:32:11.893	2015-11-18T03:59:55.894	827
2015-11-18T04:04:11.894	2015-11-18T15:56:43.908	914
2015-11-18T16:02:03.908	2015-11-18T23:59:55.917	802
2015-11-19T00:00:00.000	2015-11-19T04:00:27.922	802
2015-11-19T04:04:11.922	2015-11-19T23:59:55.945	914
2015-11-20T00:00:00.011	2015-11-20T07:26:19.954	914
2015-11-20T07:32:11.954	2015-11-20T08:00:59.955	805
2015-11-20T08:04:11.955	2015-11-20T19:58:19.969	914
2015-11-20T20:04:11.969	2015-11-20T23:59:55.974	624
2015-11-21T00:00:00.005	2015-11-21T08:34:35.984	624
2015-11-21T09:32:11.985	2015-11-21T09:56:43.985	805
2015-11-21T10:08:27.985	2015-11-21T23:59:56.002	914
2015-11-22T00:00:00.016	2015-11-22T23:59:56.030	914
2015-11-23T00:00:00.009	2015-11-23T23:59:56.058	914
2015-11-24T00:00:00.003	2015-11-24T15:26:20.076	914
2015-11-24T15:32:12.076	2015-11-24T16:01:00.077	805
2015-11-24T16:04:12.077	2015-11-24T23:59:56.082	914
2015-11-25T00:00:00.009	2015-11-25T23:59:56.110	914
2015-11-26T00:00:00.002	2015-11-26T23:59:56.138	914
2015-11-27T00:00:00.013	2015-11-27T20:57:00.162	914
2015-11-27T21:01:48.162	2015-11-27T21:21:32.162	803
2015-11-27T21:32:44.162	2015-11-27T21:59:56.163	827
2015-11-27T22:04:12.163	2015-11-27T23:59:56.165	914
2015-11-28T00:00:00.006	2015-11-28T23:26:20.192	914
2015-11-28T23:32:12.193	2015-11-28T23:59:56.193	827
2015-11-29T00:00:00.017	2015-11-29T00:00:00.017	827
2015-11-29T00:04:12.193	2015-11-29T23:59:56.221	914
2015-11-30T00:00:00.010	2015-11-30T23:57:16.249	914
2015-12-01T00:00:00.003	2015-12-01T03:26:20.253	914
2015-12-01T03:32:12.253	2015-12-01T03:59:56.253	827
2015-12-01T04:04:12.253	2015-12-01T23:59:56.276	914
2015-12-02T00:00:00.013	2015-12-02T05:26:20.283	914
2015-12-02T05:32:12.283	2015-12-02T05:59:56.283	827
2015-12-02T06:04:12.283	2015-12-02T23:59:56.304	914
2015-12-03T00:00:00.007	2015-12-03T23:59:56.332	914
2015-12-04T00:00:00.017	2015-12-04T09:26:20.343	914
2015-12-04T09:32:12.343	2015-12-04T09:59:56.344	827
2015-12-04T10:04:12.344	2015-12-04T23:59:56.360	914
2015-12-05T00:00:00.010	2015-12-05T11:26:20.373	914
2015-12-05T11:32:12.373	2015-12-05T11:59:56.374	827
2015-12-05T12:04:12.374	2015-12-05T23:59:56.388	914
2015-12-06T00:00:00.003	2015-12-06T23:59:56.415	914

Start time	End time	Macro
2015-12-07T00:00:00.014	2015-12-07T23:59:56.443	914
2015-12-08T00:00:00.007	2015-12-08T17:26:20.463	914
2015-12-08T17:32:12.463	2015-12-08T17:59:56.464	827
2015-12-08T18:04:12.464	2015-12-08T23:59:56.471	914
2015-12-09T00:00:00.000	2015-12-09T23:59:56.499	914
2015-12-10T00:00:00.011	2015-12-10T21:26:20.523	914
2015-12-10T21:32:12.524	2015-12-10T21:59:56.524	827
2015-12-10T22:04:12.524	2015-12-10T23:59:56.526	914
2015-12-11T00:00:00.004	2015-12-11T23:59:56.554	914
2015-12-12T00:00:00.014	2015-12-12T23:59:56.582	914
2015-12-13T00:00:00.008	2015-12-13T01:26:20.584	914
2015-12-13T01:32:12.584	2015-12-13T01:58:52.584	827
2015-12-13T02:08:28.584	2015-12-13T23:59:56.610	914
2015-12-14T00:00:00.001	2015-12-14T23:59:56.638	914
2015-12-15T00:00:00.011	2015-12-15T05:26:20.644	914
2015-12-15T05:32:12.644	2015-12-15T05:59:56.644	827
2015-12-15T06:04:12.645	2015-12-15T23:59:56.665	914
2015-12-16T00:00:00.004	2015-12-16T07:26:20.674	914
2015-12-16T07:32:12.674	2015-12-16T08:01:00.675	805
2015-12-16T08:04:12.675	2015-12-16T23:59:56.693	914
2015-12-17T00:00:00.015	2015-12-17T23:59:56.721	914
2015-12-18T00:00:00.008	2015-12-18T11:26:20.734	914
2015-12-18T11:32:12.734	2015-12-18T12:01:00.735	805
2015-12-18T12:04:12.735	2015-12-18T23:59:56.749	914
2015-12-19T00:00:00.001	2015-12-19T13:26:20.764	914
2015-12-19T13:32:12.764	2015-12-19T14:01:00.765	805
2015-12-19T14:04:12.765	2015-12-19T23:59:56.776	914
2015-12-20T00:00:00.012	2015-12-20T23:59:56.804	914
2015-12-21T00:00:00.005	2015-12-21T23:59:56.832	914
2015-12-22T00:00:00.015	2015-12-22T19:26:20.854	914
2015-12-22T19:32:12.855	2015-12-22T19:59:56.855	827
2015-12-22T20:34:36.856	2015-12-22T23:59:56.860	914
2015-12-23T00:00:00.009	2015-12-23T07:56:44.869	914
2015-12-23T08:02:04.869	2015-12-23T19:59:56.883	827
2015-12-23T20:04:12.883	2015-12-23T23:59:56.888	914
2015-12-24T00:00:00.002	2015-12-24T23:59:56.915	914
2015-12-25T00:00:00.012	2015-12-25T11:56:44.929	914
2015-12-25T12:02:04.929	2015-12-25T12:29:48.930	827
2015-12-25T12:34:04.930	2015-12-25T23:59:56.943	914
2015-12-26T00:00:00.005	2015-12-26T23:59:56.971	914
2015-12-27T00:00:00.016	2015-12-27T12:57:32.986	914
2015-12-27T13:01:48.986	2015-12-27T13:29:00.986	827
2015-12-27T13:38:36.987	2015-12-27T23:59:56.999	914
2015-12-28T00:00:00.009	2015-12-28T23:59:57.026	914
2015-12-29T00:00:00.002	2015-12-29T13:56:45.043	914
2015-12-29T14:02:05.043	2015-12-29T14:29:49.043	827
2015-12-29T14:34:05.043	2015-12-29T23:59:57.054	914
2015-12-30T00:00:00.013	2015-12-30T07:56:45.063	914

Start time	End time	Macro
2015-12-30T08:02:05.063	2015-12-30T19:59:57.077	827
2015-12-30T20:04:13.077	2015-12-30T23:59:57.082	914
2015-12-31T00:00:00.006	2015-12-31T23:57:17.110	914
2016-01-01T00:00:00.016	2016-01-01T11:56:45.124	914
2016-01-01T12:02:05.124	2016-01-01T12:28:45.124	827
2016-01-01T12:38:21.124	2016-01-01T23:59:57.138	914
2016-01-02T00:00:00.010	2016-01-02T23:59:57.165	914
2016-01-03T00:00:00.003	2016-01-03T12:56:29.180	914
2016-01-03T13:01:49.180	2016-01-03T13:30:05.181	827
2016-01-03T13:33:49.181	2016-01-03T23:59:57.193	914
2016-01-04T00:00:00.013	2016-01-04T23:59:57.221	914
2016-01-05T00:00:00.006	2016-01-05T13:56:45.237	914
2016-01-05T14:02:05.237	2016-01-05T14:29:49.238	827
2016-01-05T14:34:05.238	2016-01-05T23:59:57.249	914
2016-01-06T00:00:00.017	2016-01-06T23:59:57.276	914
2016-01-07T00:00:00.010	2016-01-07T23:59:57.304	914
2016-01-08T00:00:00.003	2016-01-08T23:59:57.332	914
2016-01-09T00:00:00.014	2016-01-09T23:59:57.360	914
2016-01-10T00:00:00.007	2016-01-10T23:59:57.387	914
2016-01-11T00:00:00.017	2016-01-11T23:59:57.415	914
2016-01-12T00:00:00.010	2016-01-12T23:59:57.443	914