RPC-LAP
OPERATIONS REPORT
PASSIVE CHECKOUT 12

Operations on May 2, 2010

IRFU-ROS-OPR-PC12
Version 1.0
5 May 2010

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Contents

Document history

Revision	Date	Comment
1.0	2010-05-05	Initial revision (AIE)

1 Introduction

This is the report from the operations of RPC-LAP during the active checkout PC12, performed on May 2, 2010.

2 Operations

During PC4, LAP was on for the following operations:

- RP10: Upload and test of new macros.
- RP01 Passive checkout: As in all passive checkouts.

3 Orbit and attitude

At 03:00 in May 2, 2010, Rosetta was at heliocentric position (-2.153 0.210, 0.138) AU, as illustrated in Figure 1. The heliocentric distance was 2.168 AU.

At the time of writing this, the available SANR and SAPR files only give zeros for all solar angles. This does not look reliable, and no illumination and attitude analysis has therefore been done.

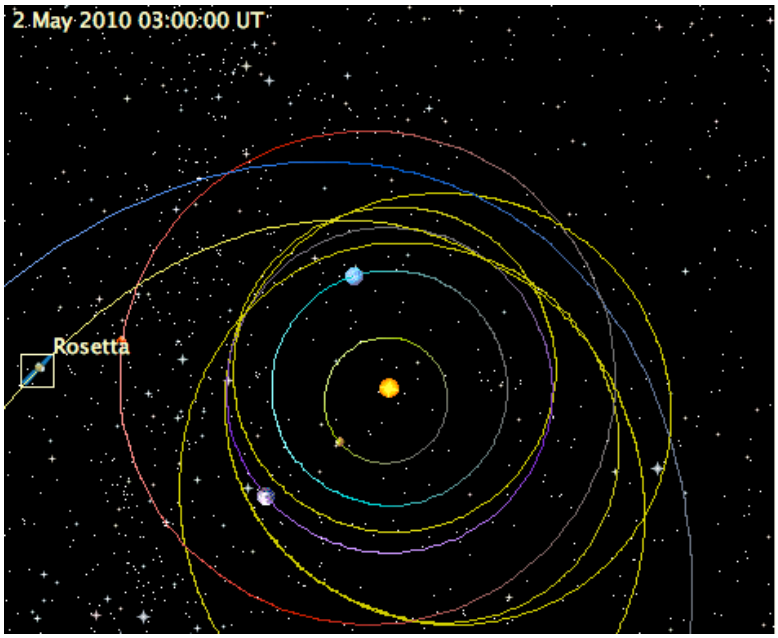

Figure 1. Sketch of Rosetta position during PC12.
Source: http://sci.esa.int/science-e/www/area/index.cfm?fareaid=13&fapplet=1.

<TBD>

Figure 2. Placeholder for attitude and illumination plot.

4 Operations log

The tables give the time relative to the start of the operation, as DDD_HH:MM:SS, as well as the time in UT (HH:MM).

The TM rates are abbreviated as follows:

Name	Abbreviation	Rate
None	O	0
Minimum	MM	1.5 bit/s
Normal	NM	58.5 bit/s
Burst	BM	2241 bit/s

4.1 RP05 Macro upload

This was an upload and test of three new science macros for the comet phase. The planning is given in the table below, with execution times in UT (from the command log) and post-operations comments added.

Step	Time	Action	Comment	Post-operation comments
010			Configuration before this step: RPC ON; all instruments off. OK	

020	+000_00:00:00 01:30	ARPS809A # LAP Mode Change
		--- 	
		VSK01262 = SID2 [ENG] # ModeLAP
		VSK01267 = 0x12 # LAParam
		VSK01269 = 0x0005 # LAP EEPROM Boot Bank
			Switch LAP ON in normal mode.
			LAP macro 0x212 (default normal)
				First data 01:33:12.4 (swp)
				Last data 01:38:00.4 (HF)
				
				Nominal data.
				Photoemission saturation currents: P1 13 nA, P2 12 nA.

030	+000_00:10:00 01:40	AC5S500A # LAP MACROS	LAP macro upload. (0x505 and 0x506)	

035	+000_00:20:00 01:50	AC5S501A # LAP MACROS	LAP macro upload. (0x807)	

040	+000_00:30:00
	02:00
		ARPS809A # LAP Mode Change
		--- 	
		VSK01262 = SID2 [ENG] # ModeLAP
		VSK01267 = 0x45 # LAParam
		VSK01269 = 0x0005 # LAP EEPROM Boot Bank
			Test new LAP macro 0x505 (NM NN density with HF and sweeps +-18 V).	First data 02:02:32.4
				Last data 02:18:29.2
				
				Data appears nominal, though there seems to be ground calibration problems (see Section 4.1.1)
				
				HK indicates this macro from 02:02:59 to 02:20:03.

050	+000_00:50:00
	02:20
		ARPS809A # LAP Mode Change
		--- 	
		VSK01262 = SID2 [ENG] # ModeLAP
		VSK01267 = 0x46 # LAParam
		VSK01269 = 0x0005 # LAP EEPROM Boot Bank
			Test new LAP macro 0x506 (NM NN density with HF and sweeps +-12 V).	No data.
				
				HK indicates this macro from 02:23:15 - 02:40:19.
				
				See Section 4.1.2.

070	+000_01:10:00
	02:40
		ARPS809A # LAP Mode Change
		--- 	
		VSK01262 = SID3 [ENG] # ModeLAP
		VSK01267 = 0x77 # LAParam
		VSK01269 = 0x0005 # LAP EEPROM Boot Bank
			Test new LAP macro 0x807 (BM LDL N- density with HF and sweeps).	No data.
				
				No indication in HK that this macro has been run.
				
				See Section 4.1.3.

090	+000_01:20:00
	02:50
		ARPS809A # LAP Mode Change
		--- 	
		VSK01262 = OFF [ENG] # ModeLAP
		VSK01267 = 0xFF # LAParam
		VSK01269 = 0x0005 # LAP EEPROM Boot Bank
			LAP off.	

100	+000_01:30:00 03:00	ARPF806A # RPC OBCP Pwr-Off	Configuration after this step: RPC OFF. OK	

4.1.1 Macro 0x505

This seems to have uploaded as expected. Data from step 40 shows the following:

- The sweeps performed nominally. However, the calibration for P2 seems odd, as there is an obvious vertical displacement in the data (i.e. a constant current offset not corrected for in, or more probably introduced by, the calibration process).
- The HF performs nominally.
- The LF (continuous current at 0.45 Hz) also appears nominal, though we seem to have a bug in the calibration in the data reduction software for 20 bit current data: the LF and HF data do not coincide, and the first two AQPs are differently (and more oddly) calibrated than the following (the jump after the first two AQPs is not present in uncalibrated data).

4.1.2 Macro 0x506

There are no science data from step 50. The last science data packet is stamped at 2010-05-02 02:20:35.186097, whereafter there are no science packets until RP01 starts executing at 03:44. Execution of this macro is indicated in HK, but only from 02:23:15. This is late compared to the instantaneous indication in the run of 0x505. There may be an issue with the upload or execution of this macro, or possibly a reoccurrence of the LAP science production stop at ESB1.

4.1.3 Macro 0x807

For this macro, there are neither science data nor any indication in HK. The macro ID does not appear in HK, which from 02:40:51 just shows 0xff. Neither does HK indicate LDL, which it should have if the macro had started. The macro thus seems not to have executed, which can be due either to a problem with the upload, with the execution of this macro, or with the execution of the previous macro, or the generic problem of LAP stopping producing science seen in ESB1.

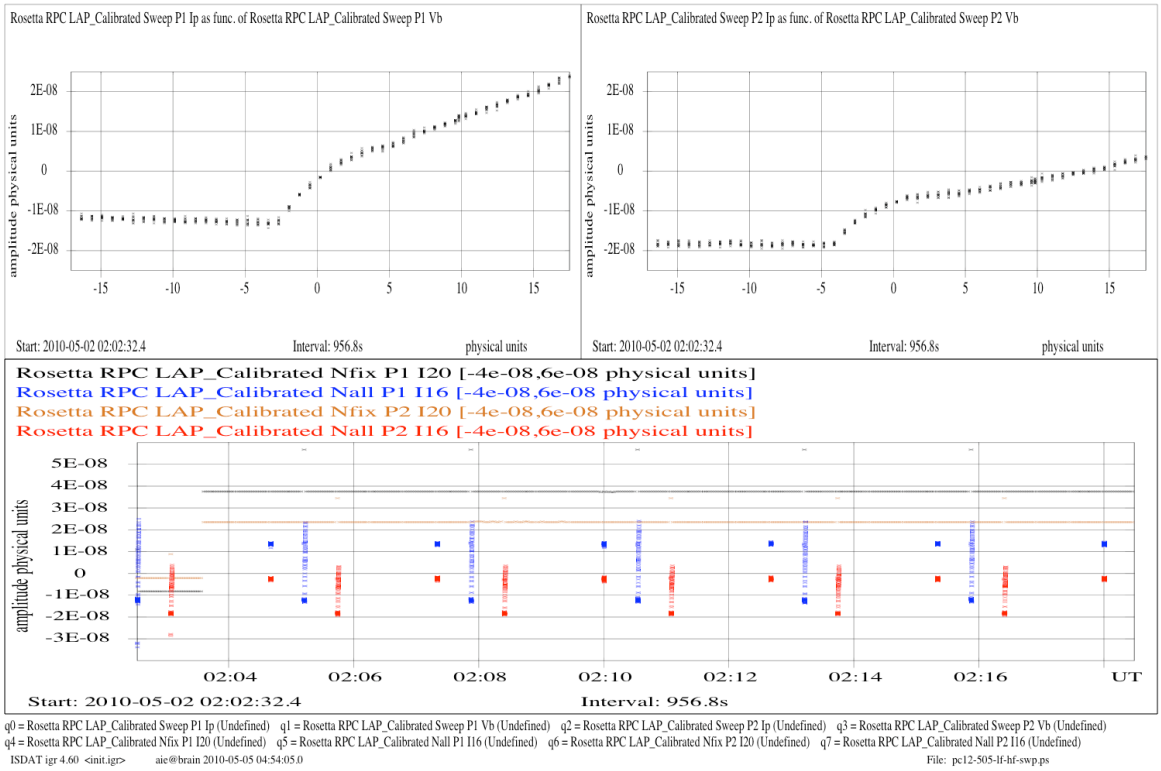

Figure 3. Data from the test of macro 0x505. Photoemission saturation currents: P1 13 nA, P2 18 nA (but note the vertical displacement of the P2 data, see text).

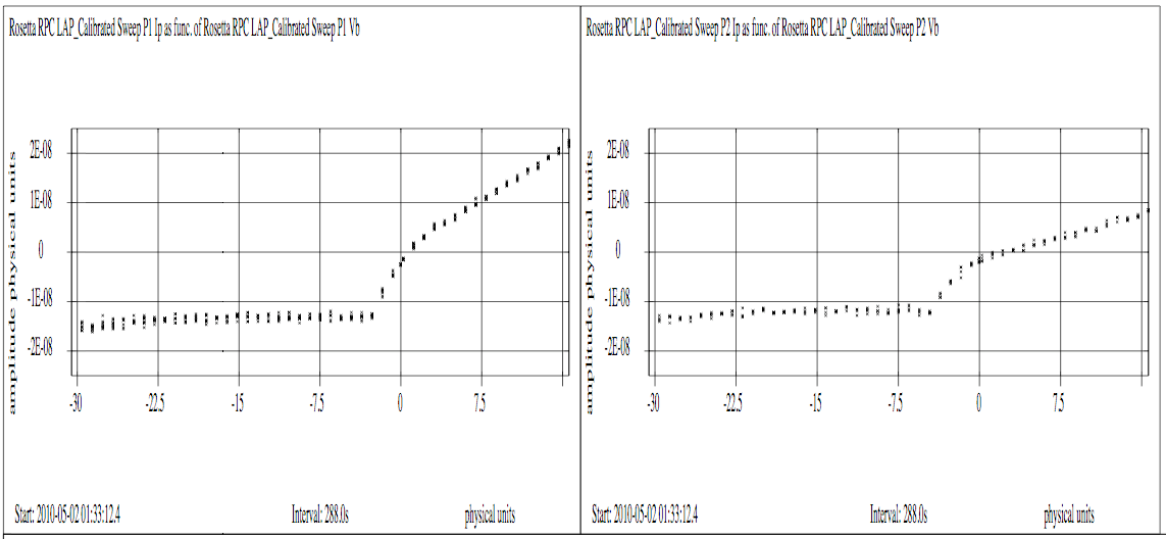

Figure 4. Data from the initial run of macro 0x212 in RP10. Photoemission saturation currents: P1 13 nA, P2 12 nA.

4.2 RP01 Passive checkout

Execution time: 100502 04:30-05:30.

The same operations as in all passive checkouts, i.e. sweeps and offset determination. All data were nominal.

From the sweeps, we can derive photosaturation currents 13 nA for P1 and 18 nA for P2 (Figure 5). However, something seems to be odd in our calibration routines for P2, or in the calibration values (from Steins). The shape of the P2 curve shows obvious signs of a vertical displacement of the probe curve. The same can be seen in the sweeps in Figure 3. One should note that the initial run in RP01 gave a more reasonable value of 12 nA for P2 (Figure 4). This needs to be sorted out, but is in all likelihood a ground software issue.

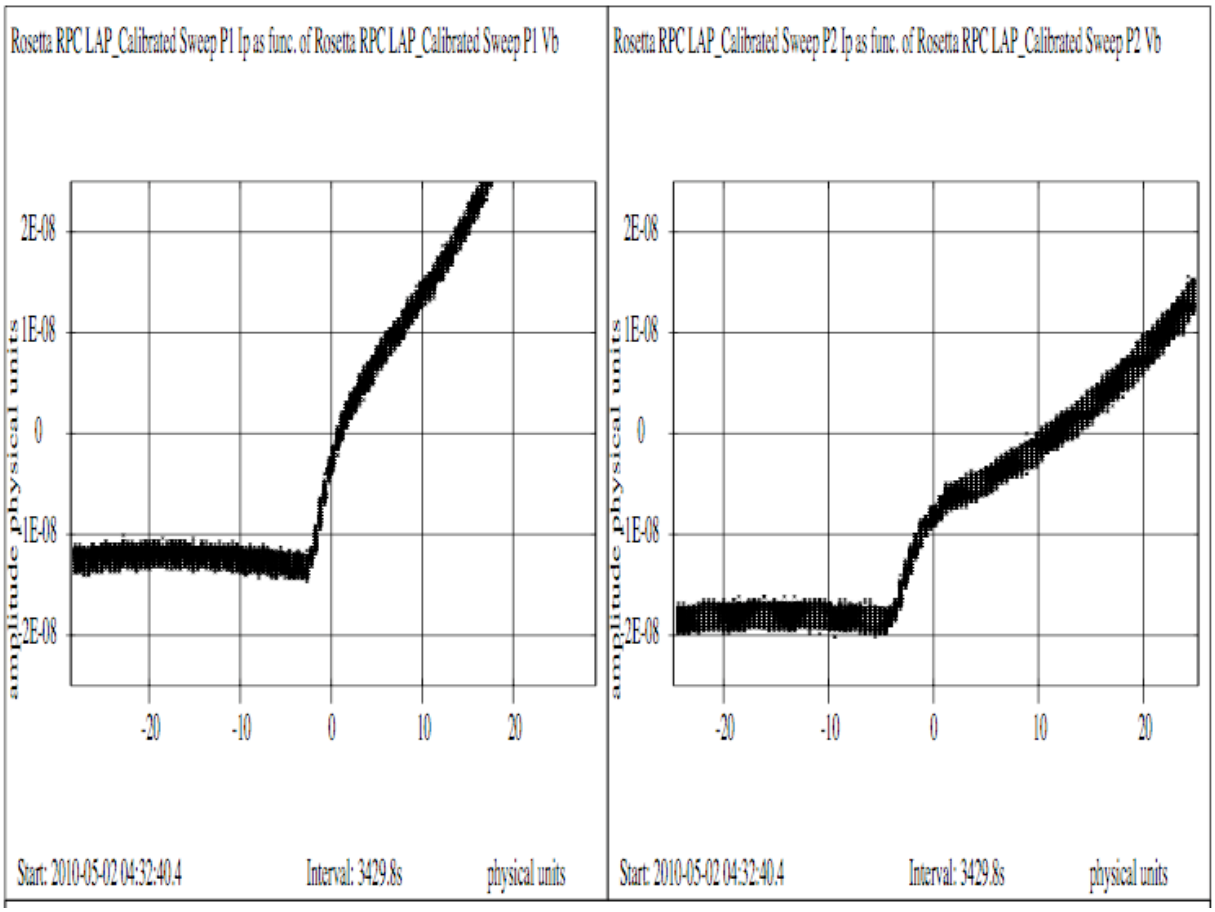

Figure 5. Data from macro 0x212 in RP10. Photoemission saturation currents: P1 13 nA, P2 18 nA (but note the vertical displacement of the P2 data, see text).

5 Data

5.1 Bias sweeps and photoemission

The results of these were discussed in Section 4.2 above. Adopting a value of 13 nA, we get a predicted value of 8.26 nA for the Lutetia flyby (2.72 AU). This is lower than the 9 nA assumed in the Lutetia planning, but not much so, and 5 nA should still be a safe bias current at Lutetia.

6 Conclusion

The following issues arise from the PC12 operations:

- We need to check the calibration routines in our ground software, as witnessed by the jump in 20-bit data around 02:03:30 in Figure 3 and the vertical displacement of the sweeps in Figures 3 and 5. Why it does not affect the initial data in Figure 4 needs to be understood.
- The possible problems with macros 0x506 and 0x708 also needs investigation.