SOLAR ORBITER   **RPW**   **ROC**

RPW Operation Centre

RPW Calibration Software User Manual for TDS-CALBA

ROC-PRO-SFT-SUM-00501-IAP
Iss.01, Rev.00

Prepared by:	Function:	Signature:	Date
David Pisa	Ground Segment Software Engineer		09/01/2018
Jan Soucek	TDS lead Co-I		09/01/2018
Verified by:	**Function:**	**Signature:**	**Date**
			Dd/mm/yyyy
Approved by:	**Function:**	**Signature:**	**Date**
			Dd/mm/yyyy
For application:	**Function:**	**Signature:**	**Date**
			Dd/mm/yyyy

CLASSIFICATION   **PUBLIC** ☒   **RESTRICTED** ☐

l'Observatoire de Paris — LESIA

Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

CNRS-Observatoire de PARIS
Section de MEUDON – LESIA
5, place Jules Janssen
92195 Meudon Cedex – France

Change Record

Issue	Rev.	Date	Authors	Modifications
1	0	09/01/2018	David Pisa	First release. Applies to CALBA version 0.8.0

Acronym List

Acronym	Definition	Acronym	Definition
RCS	RPW Calibration Software	RSWF	Regular Snapshot Waveform (TDS product)
ROC	RPW Operation Centre	TSWF	Triggered Snapshot WF (TDS product)
RPW	Radio and Plasma Waves instrument	WF	waveform
SUM	Software User Manual	CWF	Continuous WaveForm (TDS product)
TDS	Time Domain Sampler	ROC	RPW Operations Centre
TDS_CALBA	TDS CALiBrAtion Software	S/W	Software
SCM	Search Coil Magnetometer	TBC	To Be Confirmed
WF	Waveform	TBD	To Be Defined
JSON	JavaScript Object Notation	TBW	To Be Written
ICD	Interface Control Interface	HW	Hardware
L1	Level 1 (defined in AD2)	I/F	Interface
L2	Level 2 (defined in AD2)	SPS	Samples per second
CLI	Command Line Interface	FFT	Fast Fourier transform
LF	Low-frequency	BASH	Bourne again shell
IDL	Interactive Data Language	HF	High-frequency

Table of Contents

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 4 / 16 -

List of Figures

No table of figures entries found.

List of Tables

	RPW Calibration Software User Manual Template	**Ref: ROC-PRO-SFT-SUM-00043-LES**
		Issue: 01
		Revision: 00
		Date: 20/01/20178
		- 5 / 16 -

1 GENERAL

1.1 Scope of the Document

This document is the software user manual (SUM) of the TDS_CALBA S/W. It describes the purpose, content, functions and procedures to retrieve, configure and run TDS-CALBA on a validated system environment.

Aspects from the user side are presented.

TDS-CALBA is developed and maintained by the TDS team based at the IAP (Prague, Czech Republic)

1.2 Applicable Documents

This document responds to the requirements of the documents listed in the following table:

Mark	Reference/Iss/Rev	Title of the document	Authors	Date
AD1	ROC-PRO-DAT-NTT-00006-LES/1/0	RPW Data Products	X. Bonnin	23/12/2016
AD2	RPW-SYS-MEB-TDS-CSS-00500-IAP	RPW/TDS CALBA software requirements specification	J. Soucek	20/12/2017
AD3	ROC-PRO-PIP-ICD-00037/1/0	RPW Calibration Software Interface Control Document	M .Duarte, X. Bonnin	16/11/2016
AD4	ROC-GEN-SYS-SPC-00036-LES/1/0	ROC Software System Design Document	X.Bonnin, S.Lion	02/12/2016
AD5	ROC-TST-GSE-ICD-00023-LES	ROC-SGSE Calibration Software ICD	X. Bonin	Iss. 02, Rev. 02 06/06/2016
AD6	ROC-TST-GSE-NTT-00017-LES	Data format and metadata definition for the ROC-SGSE data	X. Bonin	Iss. 02, Rev. 01 14/10/2016
AD7				

1.3 Reference Documents

This document is based on the documents listed in the following table:

Mark	Reference/Iss/Rev	Title of the document	Authors	Date
RD1				
RD2				
RD3				
RD4				
RD5				

2 CONVENTIONS

The ground segment calibration software for RPW TDS data (TDS_CALBA) will be referenced as S/W further in this manual. S/W installation directory will be referenced as **$SW_ROOT** in the next sections.

3 DESCRIPTION OF THE SOFTWARE

3.1 Purpose of the software

S/W allows processing of any properly formatted TDS L1 CDF file (described in [AD1]) and convert it into corresponding L1R or L2 files. S/W follows software requirements specified in [AD2]. Any anomalies in the source file are reported.

3.2 Operations environment

S/W is executable on the ROC server environment (and similar systems) based on a Linux Debian Operating System (OS) with Bourne-Again Shell (BASH) as a primary shell (see [AD3] for details).

3.3 Software design overview

TDS_CALBA software implements the modes of operation described in section 3.5 (Table 1).

3.4 External interfaces

3.5 Software operating modes

Mode name	Description	Input data name(s)	Output data name(s)
tds_surv_rswf	Produce calibrated science TDS data file at analyser level (L1R) - survey mode regular snapshot waveform.	SOLO_L1_RPW-TDS-SURV-RSWF	SOLO_L1R_RPW-TDS-SURV-RSWF-E SOLO_L1_RPW-TDS-SURV-RSWF-B
tds_surv_tswf	Produce calibrated science TDS data file at analyser level (L1R) - survey triggered waveform snapshots	SOLO_L1_RPW-TDS-SURV-TSWF	SOLO_L1R_RPW-TDS-SURV-TSWF-E SOLO_L1_RPW-TDS-SURV-TSWF-B
tds_smb1_rswf	Produce calibrated science TDS data file at analyser level (L1R) - regular SBM1 mode snapshot waveform"	SOLO_L1_RPW-TDS-SMB1-RSWF	SOLO_L1R_RPW-TDS-SMB1-RSWF-E SOLO_L1_RPW-TDS-SMB1-RSWF-B
tds_smb2_tswf	Produce calibrated science TDS data file at analyser level (L1R) - triggered SBM2 mode snapshot waveform"	SOLO_L1_RPW-TDS-SMB2-TSWF	SOLO_L1R_RPW-TDS-SMB2-TSWF-E SOLO_L1_RPW-TDS-SMB2-TSWF-B
tds_surv_stat	Produce calibrated science TDS data file at analyser level (L2) - survey mode statistical parameters	SOLO_L1_RPW-TDS-SURV-STAT	SOLO_L2_RPW-TDS-SURV-STAT
tds_surv_mamp	Produce calibrated science TDS data file at analyser level (L2) - HF maximum amplitudes in survey mode	SOLO_L1_RPW-TDS-SURV-MAMP	SOLO_L1_RPW-TDS-SURV-MAMP

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 7 / 16 -

tds_surv_hist1d	Produce calibrated science TDS data file at analyser level (L2) - survey mode 1D Histogram data	SOLO_L1_RPW-TDS-SURV-HIS1D	SOLO_L2_RPW-TDS-SURV-HIST1D
tds_surv_hist2d	Produce calibrated science TDS data file at analyser level (L2) - survey mode 2D Histogram data	SOLO_L1_RPW-TDS-SURV-HIS2D	SOLO_L2_RPW-TDS-SURV-HIST2D
tds_lfm_rswf	Produce calibrated science TDS data file at analyser level (L1R) - waveform snapshot data in LFM mode	SOLO_L1_RPW-TDS-LFM-RSWF	SOLO_L1R_RPW-TDS-LFM-RSWF-E SOLO_L1R_RPW-TDS-LFM-RSWF-B
tds_lfm_cwf	Produce calibrated science TDS data file at analyser level (L1R) - low rate waveform data in LFM mode	SOLO_L1_RPW-TDS-LFM-CWF	SOLO_L1_RPW-TDS-LFM-CWF-E SOLO_L1_RPW-TDS-LFM-CWF-B
tds_lfm_psd	Produce calibrated science TDS data file at analyser level (L2) - averaged power spectra in LFM mode	SOLO_L1_RPW-TDS-LFM-PSD	SOLO_L2_RPW-TDS-LFM-PSDSM
tds_lfm_psdsm	Produce calibrated science TDS data file at analyser level (L2) - averaged power spectra and cross spectral part of the spectral matrix in LFM mode	SOLO_L1_RPW-TDS-LFM-PSD SOLO_L1_RPW-TDS-LFM-SM	SOLO_L2_RPW-TDS-LFM-PSDSM

Table 1. Software operating mode list.

3.6 Description of the software data

3.6.1 Software input data

S/W expects input data in RPW L1 level and in NASA CDF format. Data are uncompressed, decommutated, and UTC-tagged. Waveform (E and B components in the same file), spectral and statistical data are in telemetry units (uncalibrated) and in spacecraft coordinate system. All input data processed by S/W are listed in Table 1.

Input data name	Description	Purpose	Format	Required in the following mode(s)
SOLO_L1_RPW-TDS-SURV-RSWF	Contains RPW TDS L1regular snapshot waveform data in normal and burst survey mode, time-tagged		CDF	tds_surv_rswf
SOLO_L1_RPW-TDS-SURV-TSWF	Contains RPW TDS L1triggered snapshot waveform data in normal and burst survey mode, time-tagged		CDF	tds_surv_tswf
SOLO_L1_RPW-TDS-SMB1-RSWF	Contains RPW TDS L1regular snapshot waveform data in		CDF	tds_smb1_rswf

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 8 / 16 -

	SMB1 mode, time-tagged			
SOLO_L1_RPW-TDS-SMB2-TSWF	Contains RPW TDS L1 regular snapshot waveform data in SMB2 mode, time-tagged		CDF	tds_smb2_tswf
SOLO_L1_RPW-TDS-SURV-MAMP	Contains RPW TDS L1 continuous HF signal maximum data in normal and burst survey mode, time-tagged		CDF	tds_surv_mamp
SOLO_L1_RPW-TDS-SURV-STAT	Contains RPW TDS L1 statistical data in normal and burst survey mode, time-tagged		CDF	tds_surv_stat
SOLO_L1_RPW-TDS-SURV-HIST1D	Contains RPW TDS L1 1D histogram data in normal and burst survey mode, time-tagged		CDF	tds_surv_hist1d
SOLO_L1_RPW-TDS-SURV-HIST2D	Contains RPW TDS L1 2D histogram data in normal and burst survey mode, time-tagged		CDF	tds_surv_hist2d
SOLO_L1_RPW-TDS-LFM-RSWF	Contains RPW TDS L1 regular snapshot waveform data in low frequency mode, time-tagged		CDF	tds_lfm_rswf
SOLO_L1_RPW-TDS-LFM-CWF	Contains RPW TDS L1 continuous waveform data in low frequency mode, time-tagged		CDF	tds_lfm_cwf
SOLO_L1_RPW-TDS-LFM-PSD	Contains RPW TDS L1 single power spectrum data in low frequency mode, time-tagged		CDF	tds_lfm_psd tds_lfm_psdsm
SOLO_L1_RPW-TDS-LFM-SM	Contains RPW TDS L1 spectral matrix data in low frequency mode, time-tagged		CDF	tds_lfm_psdsm

Table 2. Software input data list.

NOTE:

- *A reference to the detailed description of the input data shall be supplied. The reference can be a document or a file schema (e.g., CDF skeleton or XML schema). In the case where there is no reference, the full description shall be given in the present document.*

  ==TBW==

3.6.2 Software output data

The L1R level data sets only concern the TDS waveform (WF) data (snapshot and continuous). They provide L1 data plus additional parameters, which allow the Bias and SCM RCS to generate the corresponding L2 data sets. The L1R intermediary datasets will be for internal purpose only, and thus should be not distributed to teams outside the RPW consortium. The L2 level data sets store the RPW calibrated science data files produced by the RCS from the un-calibrated data files (L1). All L1R and L2 data product provided by S/W are listed in Table 2.

Output data name	Description	Format	Product of the following mode(s)
SOLO_L1R_RPW-TDS-SURV-RSWF-E	Contains RPW TDS L1R regular snapshot waveform data – electric component - in normal and burst survey mode, time-tagged	CDF	tds_surv_rswf
SOLO_L1R_RPW-TDS-SURV-RSWF-B	Contains RPW TDS L1R regular snapshot waveform data – magnetic component - in normal and burst survey mode, time-tagged	CDF	tds_surv_rswf
SOLO_L1R_RPW-TDS-SURV-TSWF-E	Contains RPW TDS L1R triggered snapshot waveform data - magnetic component - in normal and burst survey mode, time-tagged	CDF	tds_surv_tswf
SOLO_L1R_RPW-TDS-SURV-TSWF-B	Contains RPW TDS L1R triggered snapshot waveform data in normal and burst survey mode, time-tagged	CDF	tds_surv_tswf
SOLO_L1R_RPW-TDS-SMB1-RSWF-E	Contains RPW TDS L1R regular snapshot waveform data – electric component - in SMB1 mode, time-tagged	CDF	tds_smb1_rswf
SOLO_L1R_RPW-TDS-SMB1-RSWF-B	Contains RPW TDS L1R regular snapshot waveform data – magnetic component - in SMB1 mode, time-tagged	CDF	tds_smb1_rswf
SOLO_L1R_RPW-TDS-SMB2-TSWF-E	Contains RPW TDS L1R regular snapshot waveform data – electric component - in SMB2 mode, time-tagged	CDF	tds_smb2_tswf
SOLO_L1R_RPW-TDS-SMB2-TSWF-B	Contains RPW TDS L1R regular snapshot waveform data – magnetic component - in SMB2 mode, time-tagged	CDF	tds_smb2_tswf
SOLO_L2_RPW-TDS-SURV-MAMP	Contains RPW TDS L2 continuous HF signal maximum data in normal and burst survey mode, time-tagged	CDF	tds_surv_mamp
SOLO_L2_RPW-TDS-SURV-STAT	Contains RPW TDS L2 statistical data in normal and burst survey mode, time-tagged	CDF	tds_surv_stat

RPW Calibration Software User Manual Template

SOLO_L2_RPW-TDS-SURV-HIST1D	Contains RPW TDS L2 1D histogram data in normal and burst survey mode, time-tagged	CDF	tds_surv_hist1d
SOLO_L2_RPW-TDS-SURV-HIST2D	Contains RPW TDS L2 2D histogram data in normal and burst survey mode, time-tagged	CDF	tds_surv_hist2d
SOLO_L1R_RPW-TDS-LFM-RSWF-E	Contains RPW TDS L1R regular snapshot waveform data – electric component - in low frequency mode, time-tagged	CDF	tds_lfm_rswf
SOLO_L1R_RPW-TDS-LFM-RSWF-B	Contains RPW TDS L1R regular snapshot waveform data – magnetic component - in low frequency mode, time-tagged	CDF	tds_lfm_rswf
SOLO_L1R_RPW-TDS-LFM-CWF-E	Contains RPW TDS L1R continuous waveform data – electric component - in low frequency mode, time-tagged	CDF	tds_lfm_cwf
SOLO_L2_RPW-TDS-LFM-PSDSM	Contains RPW TDS L2 single power spectrum and spectral matrix data in low frequency mode, time-tagged	CDF	tds_lfm_psd tds_lfm_psdsm

Table 3. Software output data list.

- *A reference to the detailed description of the output data shall be supplied. The reference can be a document or a file schema (e.g., CDF skeleton or XML schema). In the case where there is no reference, the full description shall be given in the present document.*

TBW

3.6.3 Software installation and configuration files

S/W can be downloaded from the official ROC Git repository (https://gitlab.obspm.fr/ROC/RCS/TDS_CALBA). Some environment variables need to be set prior S/W run. To setup the environment properly, the setup script must be edited.

3.6.4 Software internal data files

.

File name	Description	Format	Used for the following mode(s)
hf_calpar	Contains the constant factors to calibrate the statistical data products in HF mode.	JSON	tds_surv_stat tds_surv_mamp
hist_axes	Contains the axis vectors in physical units for 1D and 2D histograms in HF mode	SAV	tds_surv_hist1D tds_surv_hist2D
lfm_axes	Contains the frequency axis in Hz for LFM spectral products	SAV	tds_lfm_psd tds_lfm_psdsm
TBD	Contains the transfer	TBD	tds_lfm_psd

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 11 / 16 -

	function for LF spectral products		tds_lfm_psdsm

<p align="center">Table 4. Software internal data file list</p>

3.6.5 Software testing data files

4 REFERENCE MANUAL

4.1 Software configuration requirements

4.1.1 General

S/W is executable by one script. The IAP team is ensured that the S/W executable files can be launched on the ROC server environment: a Linux Debian Operating System (OS) with Bourne-Again Shell (BASH) as a primary shell (see [AD1] for details). The name of the executable contains alphanumeric characters only.

4.1.2 Hardware configuration requirements

CALBA has no specific hardware requirements and shall run on most modern x86-64 systems. At least 4GB of RAM and adequate disk space are required.

4.1.3 Software configuration requirements

S/W is compatible with a Linux Debian Operating System (OS) with Bourne-Again Shell (BASH). S/W requires the IDL interpreter in version 8.5 or higher.

4.2 Operations manual

4.2.1 Setup and initialisation

The RCS descriptor file (*roc_sw_descriptor.json*) must be present in **$SW_ROOT**. The file contains information about the RCS that helps the ROC pipelines to automatically identify S/W, execution environment, a detailed description of the output files produced by S/W, and list of calling sequences for each S/W function. The information is used, among others, by the ROC pipelines to automatically build the CLI calling sequence for a given RCS function, and to monitor the outputs creation. It results that a ROC pipeline is not able to run a RCS delivered without, or with a badly formatted, descriptor file. The content of the descriptor is described in [AD4]

Prior S/W execution two steps must be done. In the first step, the activation BASH script shall be run. Relative path to the activation script is set in the descriptor file inside JSON object **"environment"** and the attribute **"activation"**. The script can be sourced from a user prompt (bash compatible shell MUST be used to launch these commands):

```
$     source $SW_ROOT/"environment.activation"
```

This script set all environment variables required for S/W run. Then makefile, located in **$SW_ROOT**/scripts/makefile, shall be run. The IDL executable is created at **$SW_ROOT**/bin/. This IDL executable is wrapped into a BASH script at **$SW_ROOT**/scripts/tds_calba. The attributes defined in the object **"environment"** contains the variable **"executable"**: Absolute path to the S/W executable file will be called by the ROC pipeline via the CLI, further written as **$EXECUTABLE**

4.2.2 Getting started

S/W executable calling sequence supports the following input keywords:

--identification

<p align="center">*ROC-PRO-SFT-SUM-00501-IAP_Iss01_Rev00*</p>

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 12 / 16 -

return information about S/W. The format and content of the returned stream shall correspond to the "identification" JSON object in the S/W descriptor file. (See the section Software descriptor file specifications for more details about the descriptor file.)

--version

>   return information about the current S/W release. The content of the returned stream comply the **"release.version"** attribute value in the S/W descriptor file.

--help

>   display a help message.

For instance, to get information about the current version of S/W:

```
$      $EXECUTABLE --version
```

where **$EXECUTABLE** is name of the executable file.

Calling the input keyword does not require to provide the function name as a first argument.

In order to allow the ROC-SGSE to launch a given function of the S/W from the CLI, the executable provides the name of this function as a first argument.

Every S/W executable calling sequence starts as followed:

```
$      $EXECUTABLE cal_funct
```

where **$EXECUTABLE** is the name of the S/W executable, and **cal_funct** is the name of the S/W function to be run. The name of the function, as a primary argument (as listed in Table 1), is followed by the common inputs parameters that take only one argument each:

--input_tds_l1 /path/to/input_1_file

>   the absolute path /path/to/input_1_file.

--input_tds_l1_2 /path/to/input_2_file

>   the absolute path /path/to/input_2_file. This is optional and only valid for *tds_lfm_psdsm* function.

--output /path/to/outputdir

>   the absolute path /path/to/outputdir to the directory where output files will be saved.

--log /path/to/logfile

>   the absolute path /path/to/logfile to the the log file.

--config /path/to/configfile

>   the absolute path /path/to/configfile to a possible configuration file. This parameter is optional.

4.2.3 Normal operations

During normal operation there are no outputs in a standard output (*stdout)*

4.2.4 Normal termination

If S/W execution has succeeded the error code is 0. If there are no errors, S/W returns the JSON with the output file name(s) in the stdout:

```
{
     "OUTPUT_L1R_TDS_E":"output_file_name.cdf"
```

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 13 / 16 -

```
}
```

4.2.5 Error conditions

TDS_CALBA raises an exception if it encounters one of the events described in [AD1]. If the execution encounters a "high" level exception then the return code is 1.The error information is written in the standard error (*stderr*). The error message is also logged into a log file in format introduced in [AD1].

4.2.6 Recover runs

There is no special procedure to restart or recovery. In case of errors or malfunctions see a *stderr* message or log file.

4.2.7 Help method

The help information about calling sequences can be invoked by the input keyword **--help** or **–h**

```
$EXECUTABLE --help
```

More detailed information about methods and action to be performed by user can be found at **$SW_ROOT/howto.txt** (TBW). S/W reference describing all functions and procedures can be found in **$SW_ROOT/doc/** (TBD)

4.2.8 Commands and operations

4.2.9 Error messages

In case of error, S/W throws an exception with appropriate level (more details in [AD3]). If a "high" level exception is raised, S/W exits with an error code 1. The error information (i.e., code, type of error and message) is written in the standard error (stderr) and log file (for a log format see [AD3]).

4.2.10 Software testing operations

S/W can be simple tested by an identification and version command. For the identification command, S/W returns the JSON message in the *stdout*:

```
$       $SW_ROOT/scripts/tds_calba --identification
{

    "project": "ROC-SGSE",

    "name": "TDS-CALBA",

    "identifier": "ROC-SGSE-TDS-CALBA",

    "description": "The RPW TDS CALiBration softwAre (TDS-CALBA)
produces RPW TDS calibrated science data"

    "pipeline": "RODP"

}
```

And for the version command:

```
$       $SW_ROOT/scripts/tds_calba --version
{

    "version": "0.8.0"

}
```

4.2.11 Software upgrading operations

The most recent version of S/W is stored in the master branch of the ROC Git repository.

4.2.12 Software uninstalling operations

There is no special way how to uninstall the software.

5 TUTORIAL

5.1 Introduction

5.2 Getting started

5.3 Using the software on a typical task

Example of a CLI calling sequence for CALBA is as follow:

```
$       $SW_ROOT/script/tds_calba tds_surv_rswf \
        --input_tds /path/to/input_cdf \
        --output /[path/to/outputdir \
        --log /path/to/logfile \
```

6 APPENDICES

6.1 Troubleshooting & know issues

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 15 / 16 -

7 LIST OF TBC/TBD/TBWS

TBC/TBD/TBW			
Reference/Page/Location	Description	Type	Status

RPW Calibration Software User Manual Template

Ref: ROC-PRO-SFT-SUM-00043-LES
Issue: 01
Revision: 00
Date: 20/01/20178

- 16 / 16 -

8 DISTRIBUTION LIST

LISTS See Contents lists in "Baghera Web": Project's informations / Project's actors / RPW_actors.xls and tab with the name of the list or NAMES below		
	Tech_LESIA	
	Tech_MEB	
	Tech_RPW	
	[Lead-]Cols	
	Science-Cols	

INTERNAL

LESIA CNRS		

LESIA CNRS		

EXTERNAL (To modify if necessary)

Org	Name		Org	Name
CNES	C. FIACHETTI		AsI/CSRC	J.BRINEK
	C. LAFFAYE			P.HELLINGER
	R.LLORCA-CEJUDO			D.HERCIK
	E.LOURME			P.TRAVNICEK
	M-O. MARCHE		IAP	J.BASE
	E.GUILHEM			J. CHUM
	J.PANH			I. KOLMASOVA
	B.PONTET			O.SANTOLIK
				J. SOUCEK
				L.UHLIR
IRFU	L. BYLANDER		IWF	G.LAKY
	C.CULLY			T.OSWALD
	A.ERIKSSON			H. OTTACHER
	SE.JANSSON			H. RUCKER
	A.VAIVADS			M.SAMPL
				M. STELLER
LPC2E	P. FERGEAU		LPP	T.CHUST
	G. JANNET			A. JEANDET
	T.DUDOK de WIT			P.LEROY
	M. KRETZSCHMAR			M.MORLOT
	V. KRASNOSSELSKIKH			
SSL	S.BALE			