

STEREO *IMPACT*

IMPACT / SWAVES Interface Control Document

IMPACT-SWAVES-ICD_A.doc
Version A – 2002-Sep-19

David Curtis, UCB IMPACT Project Manager

Keith Goetz, SWAVES Project Manager

Document Revision Record

Rev.	Date	Description of Change	Approved By
A	2002-Sep-19	Preliminary Draft	-

Distribution List

Dave Curtis, UCB
Davin Larson, UCB
Stuart Bale, UCB
Keith Goetz, UMn

Table of Contents

Document Revision Record..... i
Distribution List..... i
1. Overview..... 1
 1.1. *Introduction..... 1*
 1.2. *Document Conventions..... 1*
 1.3. *Applicable Documents..... 1*
2. Communication Channel..... 2
3. SWAVES to IMPACT Data..... 2
 3.1. *SWAVES Burst System..... 2*
 3.2. *SWAVES Data Format..... 2*
4. IMPACT To SWAVES Data..... 2
 4.1. *The IMPACT Burst System..... 2*
 4.2. *IMPACT Data Format..... 3*

1. Overview

1.1. *Introduction*

IMPACT and SWAVES are instruments on the STEREO spacecraft. These instruments need to be able to exchange data on board for the purposes of coordinating data collection. Both instruments have the ability to collect short segments of high time resolution data. The communication channel allows the systems to improve the chance that the data segments collected overlap.

1.2. *Document Conventions*

In this document, **TBD** (To Be Determined) means that no data currently exists. A value followed by **TBR** (To Be Resolved) means that this value is preliminary. In either case, the value is typically followed by a code such as UCB indicating who is responsible for providing the data, and a unique reference number.

1.3. *Applicable Documents*

The following documents are closely interrelated with this specification. All documents can be found on the Berkeley STEREO/IMPACT FTP site unless otherwise indicated:

<http://sprg.ssl.berkeley.edu/impact/dwc/>

1. IMPACT_ICD_init_rev (IMPACT/Spacecraft ICD, on the APL web page)
2. SWAVES_ICD_init_rel (SWAVES ICD, on APL web page)

2. Communication Channel

IMPACT and SWAVES are connected to the spacecraft 1553 bus as Remote Terminals (RT). This bus is used to forward commands to the instruments and collect telemetry from the instruments, as described in reference 1 and 2, under control of a Bus Controller (BC) in the spacecraft electronics. In addition this interface is used to allow SWAVES and IMPACT to communicate using RT-to-RT transfer mode. Once a second, the BC sets up an RT to RT transfer in each direction (IMPACT to SWAVES and SWAVES to IMPACT). These transfers are to/from unique sub-addresses in the IMPACT and SWAVES RTs. The details of this transfer are also described in Reference 1 and 2. This scheme allows IMPACT to send SWAVES up to 64 bytes of data once a second, and vice versa.

3. SWAVES to IMPACT Data

3.1. *SWAVES Burst System*

SWAVES collects a number of short Time Domain System (TDS) bursts, which it prioritizes based on a criteria computed from the burst data, and sends in priority order using a part of the normal SWAVES telemetry bandwidth. This implies that data may sit in the burst memory indefinitely. The plan is for SWAVES to upgrade the priority of bursts that coincide with IMPACT bursts.

SWAVES will provide information to IMPACT to be used as part of IMPACT's burst criteria. This shall include total power in the plasma frequency band, plus two HFR frequency bands. In addition, SWAVES will provide the rate of TDS events collected in the last 60 seconds.

3.2. *SWAVES Data Format*

Word 0:	Number of TDS in the last 60 seconds
Word 1:	Power in the Plasma frequency band
Word 2:	Power in the HFR1 frequency band
Word 3:	Power in the HFR2 frequency band
Word 4-31	Spare

The frequency bands are TBD.

The power units are approximately TBD.

4. IMPACT To SWAVES Data

4.1. *The IMPACT Burst System*

The IMPACT Burst system is designed to provide high time resolution data from MAG, SWEA and STE instruments for a short time interval (about 10 minutes). The data is then played back as part of the normal IMPACT science telemetry over a period of several hours. The time interval selected is based on a burst criteria computed from the

instrument data. The system is designed to provide the data segment with the best burst criteria. IMPACT has 3 burst segments: the one currently being telemetered (T), the best one seen (highest burst criteria) since T started to transmit (B), and the current collection buffer (C). C is continuously cycling in data from the instruments until its criteria value is better than B (at that point C and B swap). T is guaranteed to get to the ground (unless there is a telemetry dropout). B may get to the ground unless something better comes along.

The burst criterion is a programmable weighted average of a number of sub-criteria computed from the IMPACT instrument data and data provided from SWAVES. The criterion is a 16-bit unsigned number where larger numbers indicate a more desirable burst.

Also provided is the time (in spacecraft UTC) that the burst collection covers (start and end). These times are 32-bit seconds since epoch, using the same format that the time code is provided by the spacecraft (as described in reference 1 and 2), minus the sub-seconds. Times are sent Most Significant Word first.

4.2. **IMPACT Data Format**

The following data is sent:

Word 0,1	T-StartTime	Start time of IMPACT Burst T buffer collection
Word 2,3	T-EndTime	End time of IMPACT Burst T buffer collection
Word 4	T-Criterion	Criterion for burst buffer T
Word 5,6	B-StartTime	Start time of IMPACT Burst B buffer collection
Word 7,8	B-EndTime	End time of IMPACT Burst B buffer collection
Word 9	B-Criterion	Criterion for burst buffer B
Word 10	C-Criterion	Current burst criterion
Word 11-31	Spare	

All data are re-computed every 2 seconds by the IMPACT burst system. The most recent values are sent over the 1553 interface once a second, so typically the same value will be sent twice.