Effective Date: 03/18/2024 Expiration Date: 03/18/2029

XRISM/ Resolve CMO 03/18/2024 RELEASED

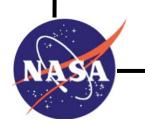
INSTRUMENT CALIBRATION REPORT

LOG OF RESOLVE DETECTOR THRESHOLDS AND OPTIMAL FILTER TEMPLATES

RESOLVE-SCI-RPT-0058
REVISION (B)
XRISM-RESOLVE-CALDB-CONFTHRE-217

X-ray Imaging and Spectroscopy Mission (XRISM) Project

NASA/GSFC Code 461



Goddard Space Flight Center Greenbelt, Maryland

National Aeronautics and Space Administration

Revision B

Effective Date: 03/18/2024

Log of Resolve Detector Thresholds and Optimal Filter Templates Signature/Approval Page

Prepared by: M.E. Eckart and the Resolve Instrument Team

Reviewers/Approvers:

Maurice Leutenegger Tahir Yaqoob Michael Loewenstein Caroline Kilbourne Megan Eckart

Approved by:

Megan Eckart

*** Electronic signatures are available on-line at: https://ipdtdms.gsfc.nasa.gov***

Revision B

Effective Date: 03/18/2024

Preface

This document is an XRISM Project signature-controlled document. Changes to this document require prior approval of the applicable Product Design Lead (PDL) or designee. Proposed changes shall be submitted in the Technical Data Management System (TDMS) via a Signature Control Request (SCoRe) along with supportive material justifying the proposed change. Changes to this document will be made by complete revision.

All of the requirements in this document assume the use of the word "shall" unless otherwise stated.

Questions or comments concerning this document should be addressed to: XRISM Configuration Management Office Mail Stop: 461 Goddard Space Flight Center Greenbelt, Maryland 20771

Effective Date: 03/18/2024

Change History Log

Revision	Effective Date	Description of Changes (Reference the SCoRe Approval Date)
_	09/11/2019	Released per RESOLVE-SCoRe-0298
A	08/14/2023	Update document for two file deliveries covering the CSI-level calibration values and Resolve instrument-level calibration values. The latter are intended to remain the same for launch. Release per RESOLVE-SCoRe-0561
В	03/18/2024	Documents on-orbit change of detector pixel thresholds from 75 to 120 during commissioning. Release per RESOLVE-SCoRe-0569

Revision B

Effective Date: 03/18/2024

NOTE to editors: The document name will be XRISM-CAL-RPT-XXXX, where XXXX is assigned by the TDMS system. The document will be cross-referenced in TDMS to the filename in the format XRISM-XXX-CALDB-FILEDESC-NN where XXX is the instrument or component (e.g. RESOLVE), FILEDESC refers to a specific calibration report (e.g., rmfparams) and NN the corresponding number assigned to that report by the SDC. For example the calibration report addressing the Resolve LSF calibration may be assigned XRISM-RESOLVE-CALDB-RMFPARAMS-01, that addressing the Resolve gain calibration XRISM-RESOLVE-GAINPIX-CALDB-02, etc. (where the numbers are to be provided by the SDC).

These documents are updated as needed, e.g. when the relevant CalDB files, or the relevant calibration data analysis, is revised. The document version will be assigned by the TDMS system. The tracking tool should be used to record changes.

This document must include the CalDB file name, an explanation of how the data were collected and the analysis conducted and, if using standard Ftools, the software version number. All revisions are consolidated into the same document to maintain a full record of all changes.

Effective Date: 03/18/2024

Table of Contents

I	Int	troduction	
	1.1	Purpose	1
	1.2	Scientific Impact	
	1.3	Report organization	1
2	Fii	rst Delivery – 20190329	1
	2.1	File delivered to the SDC	1
	2.2	CalDB FITS file created by the SDC	3
	2.3	Procedure for updating the confthre file	3
	2.4	Final remarks	3
3	Re	vision 20220520A	4
	3.1	File delivered to the SDC	4
	3.2	CalDB FITS file created by the SDC and procedure for updating file	4
	3.3	Changes from previous version.	4
4	Re	vision 20220520B	5
	4.1	File delivered to the SDC	5
	4.2	CalDB FITS file created by the SDC and procedure for updating file	5
	4.3	Changes from previous versions	5
5	Re	vision 20231201	6
	5.1	File delivered to the SDC	6
	5.2	CalDB FITS file created by the SDC and procedure for updating file	6
	5.3	Changes from previous versions	6
6	R _e	ferences	-

Effective Date: 03/18/2024

1 Introduction

1.1 Purpose

This document describes the format and content of the "confthre" CalDB file, which provides a detailed log of the Resolve detector array trigger thresholds, anti-co trigger thresholds, and optimal filter templates that are used by the Resolve Pulse Shape Processor (PSP).

1.2 Scientific Impact

This CalDB file is not used by the pipeline software but is included in the CalDB to ensure there is a detailed record of these key instrument operating parameters.

1.3 Report organization

The description of the information contained in the confthre file is given in subsections 2.1 and 2.2. The procedure for updates to the confthre file is specified in subsection 2.3, and the details of any such updates will be documented in subsequent sections.

2 First Delivery – 20190329

CalD	B Filename	Validity	File as delivered	Delivery	Comment
		date		date	i I
xa_rsl_confthi	re_20190101v002.fits	20180913	Resolve_thresh_templ_descripion_v1.0.txt	20190329	
		00:00 UT			ı

2.1 File delivered to the SDC

Table 1 shows the data delivered to the SDC by the instrument team.

- The start and end rows describe the start- and end-times for which this set of trigger thresholds and optimal filter templates are valid.
- The DEVPTHRE_value is a short string ID representing the set of detector and anti-co thresholds. This keyword is contained in all "pixel" event files and all anti-co event files. Table 2 gives examples of DEVPTHRE_value that can be used for various sets of thresholds. The keyword value is limited to 8 characters in length.
- DEVPTHRE_description is a brief description of the set of thresholds. Again, see Table 2 for further examples.
- DEVPTHRE array provides the PSP trigger threshold for all 36 detector pixels.

Effective Date: 03/18/2024

- DEVPTHRE_antico provides the PSP trigger thresholds for the two anti-co channels. This information is also included in the timing parameters CalDB file [1], for reference, since some timing parameters depend on the anti-co thresholds.
- SHPTEMPL_value provides a short string ID representing the set of optimal filter templates. We use the creation date of the set of templates for this entry. This keyword is contained in all "pixel" event files, the timing parameters CalDB file [1], the detector gain CalDB file [2], and the RMF CalDB file [3].
- SHPTEMPL description provides the description of the set of optimal filter templates.

date_start [UT]	2018-09-13
time start [UT]	00:00:00
date end [UT]	present
time_end [UT]	present
DEVPTHRE_value	A120a
DEVPTHRE_description	Thresholds are dummy values. Example description: thresh=120
	(~165 eV) for all array pixels; thresh=25 (~10 keV) for anti-co
	channels
DEVPTHRE_array	[120,120,120,120,120,120,120,120,120,120,
	120,120,120,120,120,120,120,120,120,120,
	120,120,120,120,120,120,120]
DEVPTHRE antico	[25,25]
SHPTEMPL_value	20180913
SHPTEMPL_description	Templates created during Resolve detector system calibration on
	Sep 13, 2018 in B34 at GSFC. Templates were created with
	SCDP and uploaded to the PSP.

Table 1 Data delivered by the instrument team to the SDC.

DEVPTHRE_value	DEVPTHRE_description
A120a	thresh = 120 all pixels, anti-co thresh = 25
A75a	thresh = 75 all pixels, anti-co thresh = 25
A120b	thresh = 120 all pixels, anti-co $thresh = 40$
A50Raa	thresh = 50 all pixels except ringing pixels at set a (\sim 80),
	anti-co thresh=25
A50Rba	thresh = 50 all pixels except ringing pixels at set b (\sim 100),
	anti-co thresh=25
M25Raa	mix of thresholds, average is 25 except for ringing pixels at set a (\sim 80),
	$anti-co\ thresh = 25$

Table 2 Examples of DEVPTHRE_value and DEVPTHRE_description that may be used to describe sets of detector and anti-co thresholds. This is not intended to be an exhaustive list; variations may be adopted as appropriate and we provide this table only as a guide. As described in Table 1, all 38 thresholds are enumerated in the CalDB file. The first two lines have been used in official CalDB releases for Astro-H or XRISM, and thus we freeze these definitions; the latter rows, in italics, are simply examples but do not exist in any official files.

Effective Date: 03/18/2024

2.2 CalDB FITS file created by the SDC

Extension 1 in the confthre CalDB file has 8 columns. The extension name is RSLTHRES.

- The first four columns present the date/time start/stop values. For stop date and stop time specified in the instrument team delivery file as "present" (e.g., see Table 1), the values are set to datestop = 21000101 and timestop=000000.
- The next two columns present DEVPTHRE and SHPTEMPL, and contain the DEVPTHRE_value and SHPTEMPL_value, respectively, as supplied by the instrument team. Note that for SHPTEMPL the hyphens are removed, e.g., this version reads "20180913" instead of "2018-09-13."
- The final two columns include arrays with the anti-co thresholds (DEVPTHAC) and pixel thresholds (DEVPTHPX), as specified by the instrument team with DEVPTHRE_antico and DEVPTHRE array.

The header for Extension 1 includes the DEVPTHRE_description and SHPTMPL_description, as well as a record of the filename used for the original delivery from the instrument team to the SDC.

2.3 Procedure for updating the confthre file

When an update to the confthre file is needed, a new text file, with the same content as described in Section 2.1, shall be submitted to the SDC. The SDC will create a new FITS file, with an additional row that contains the updated information for the new start/stop period. The new start/stop period takes precedence over the earlier submissions (e.g., an original 20180913 to present submission will be modified to 20180913 to 20190813 if the updated file has a start/stop period of 20190814 to present). The Extension 1 header in the updated FITS file will contain the DEVPTHRE_description and SHPTMPL_description information from the full suite of submissions, retaining the original information and adding the new information.

2.4 Final remarks

This is the first release of this CalDB file, created primarily to establish the file and header formats. The SHPTEMPL_value is consistent with the gain curves created using detector-system calibration data [2]. The data related to the detector and anti-co thresholds (DEVPTHRE_array and _antico) are dummy values that were set to match values used for Astro-H SXS.

Effective Date: 03/18/2024

3 Revision 20220520A

CalDB Filename	Validity	File as delivered	Delivery	Comment
	date		date	
xa rsl confthre 20190101v003.fits	20190903	Resolve thresh templ descripion v2.0.txt	20220520	
	18:35 UT			

3.1 File delivered to the SDC

Table 3 shows the data delivered to the SDC by the instrument team. See Section 2.1 for more detail on the meaning of each row.

date start [UT]	2019-09-03
time_start [UT]	18:35:00
date_end [UT]	present
time_end [UT]	present
DEVPTHRE_value	A120a
DEVPTHRE_description	Thresholds set for CSI calibration at high value to avoid crosstalk
	triggers. Thresh=120 (~165 eV) for all array pixels; thresh=25
	(~10 keV) for anti-co channels
DEVPTHRE_array	[120,120,120,120,120,120,120,120,120,120,
	120,120,120,120,120,120,120,120,120,120,
	120,120,120,120,120,120,120]
DEVPTHRE antico	[25,25]
SHPTEMPL_value	20190902
SHPTEMPL_description	Templates created during Resolve CSI calibration on Sep 2, 2019
	in the CRIF at GSFC. Templates were created with SCDP and
	uploaded to the PSP. Upload completed on 2019-09-03 at 18:34
	UT.

Table 3 Data delivered by the instrument team to the SDC for revision 20220520A.

3.2 CalDB FITS file created by the SDC and procedure for updating file

See Section 2.2 for a description of the confthre CalDB file structure, and Section 2.3 for a description on how the CalDB file will be updated with each new delivery.

3.3 Changes from previous version

This delivery includes the threshold and templates used for Resolve CSI-level calibration at GSFC.

Revision B

Effective Date: 03/18/2024

4 Revision 20220520B

CalDB Filename	Validity	File as delivered	Delivery	Comment
	date		date	
xa_rsl_confthre_20190101v005.fits	20211213	Resolve_thresh_templ_descripion_v3.0.txt	20220520	
	06:54 UT			

4.1 File delivered to the SDC

Table 4 shows the data delivered to the SDC by the instrument team. See Section 2.1 for more detail on the meaning of each row.

date start [UT]	2021-12-13
time_start [UT]	06:54:00
date end [UT]	present
time_end [UT]	present
DEVPTHRE_value	A75a
DEVPTHRE_description	Thresholds set for instrument-level calibration to ensure that all
	pulses >100 eV can trigger. Thresh=75 (~100 eV) for all array
	pixels; thresh=25 (~10 keV) for anti-co channels
DEVPTHRE_array	[75,75,75,75,75,75,75,75,75,75,75,75,75,7
	,75,75,75,75,75,75,75,75,75,75,75,75,75]
DEVPTHRE_antico	[25,25]
SHPTEMPL_value	20211213
SHPTEMPL_description	Templates created during Resolve instrument-level calibration on
	December 13, 2021 at TKSC. Templates were first created with
	SCDP, modified offline to cut off frequencies above 366 Hz, and
	uploaded to the PSP. The upload was complete on 2021-12-13 at
	06:54 UT.

Table 4 Data delivered by the instrument team to the SDC for revision 20220520B.

4.2 CalDB FITS file created by the SDC and procedure for updating file

See Section 2.2 for a description of the confthre CalDB file structure, and Section 2.3 for a description on how the CalDB file will be updated with each new delivery.

4.3 Changes from previous versions

This delivery includes the threshold and templates used for Resolve instrument-level calibration at JAXA's Tsukuba Space Center (TKSC). These values are intended to remain in effect for launch.

Effective Date: 03/18/2024

5 Revision 20231201

CalDB Filename	Validity	File as delivered	Delivery	Comment
	date		date	
xa_rsl_confthre_20190101v006.fits	20231031	Resolve_thresh_templ_descripion_v4.0.txt	20231201	Change to
	16:24 UT			pixel
				thresholds

5.1 File delivered to the SDC

Table 5 shows the data delivered to the SDC by the instrument team. See Section 2.1 for more detail on the meaning of each row.

date_start [UT]	2023-10-31
time start [UT]	16:24:00
date end [UT]	present
time_end [UT]	present
DEVPTHRE_value	A120a
DEVPTHRE_description	Thresholds set at high value to avoid crosstalk triggers during
	GVO operation. Thresh=120 (~165 eV) for all array pixels;
	thres=25 (~10 keV) for anti-co channels
DEVPTHRE_array	[120,120,120,120,120,120,120,120,120,120,
	,120,120,120,120,120,120,120,120,120,120
	,120,120,120,120,120]
DEVPTHRE antico	[25,25]
SHPTEMPL_value	20211213
SHPTEMPL description	Templates created during Resolve instrument-level calibration on
	December 13, 2021 at TKSC. Templates were first created with
	SCDP, modified offline to cut off frequencies above 366 Hz, and
	uploaded to the PSP. The upload was complete on 2021-12-13 at
	06:54 UT.

Table 5 Data delivered by the instrument team to the SDC for revision 20231201.

5.2 CalDB FITS file created by the SDC and procedure for updating file

See Section 2.2 for a description of the confthre CalDB file structure, and Section 2.3 for a description on how the CalDB file will be updated with each new delivery.

5.3 Changes from previous versions

This delivery reflects the change in thresholds from 75 to 120 for all array pixels. This change was made during on-orbit commissioning prior to the first attempt to open the Resolve gate valve. The optimal filter templates remain the same as in the previous version.

Effective Date: 03/18/2024

6 References

- [1] M. Sawada, C. Kilbourne, M. Tsujimoto, et al., *Instrument Calibration Report, Resolve Timing Coefficients, XRISM-RESOLVE-CALDB-COEFTIME-207*, (2019).
- [2] M.E. Eckart, et al. *Instrument Calibration Report, Resolve Detector Gain, XRISM-RESOLVE-CALDB-GAINPIX-214*, in prep. (2023).
- [3] M.A. Leutenegger, et al. *Instrument Calibration Report, Resolve Response Matrix File (RMF) Parameters, XRISM-RESOLVE-CALDB-RMFPARAM-203*, in prep. (2023).