



Geostationary Operational Environmental Satellite (GOES) – R Series

EXIS Beta, Provisional and Full Validation Readiness, Implementation and Management Plan (RIMP)

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EXIS Beta, Provisional and Full Validation Readiness, Implementation and Management Plan (RIMP)

Revision Prepared by:

Electronically approved by:
Katherine Pitts
GOES-R Product Readiness and Operations Cal/Val Support

04/07/2021
Date

Submitted by:

Electronically approved by:
Matthew Seybold
GOES- R Product Readiness and Operations Manager

05/202/2021
Date

Concurred by:

Electronically approved by Laurel Rachmeler for:
Robert Redmon
NCEI Solar & Terrestrial Physics Section Lead

05/11/2021
Date

Electronically approved by:
Melissa Dahya
GOES-R Flight PLT Director

04/19/2021
Date

Approved by:

Electronically approved by:
James Valenti
GOES-R Ground Segment Project Manager

06/28/2021
Date

Electronically approved by Monica Todirita for:
Candace Carlisle
GOES-R Flight Project Manager

05/27/2021
Date

Electronically approved by:
Pamela Sullivan
GOES-R Series System Program Director

07/09/2021
Date

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PREFACE

The Readiness, Implementation, and Management Plans (RIMPs) have been created to document the analysis techniques, methodology, duration, tools, data, resources, staffing, and schedule of the Post-Launch Product Tests (PLPTs) to be used by the calibration and validation (cal/val) science teams to demonstrate the different levels of product maturity. The primary purpose of the RIMPs is to act as a planning resource for the cal/val teams as they prepare for Launch. Additionally, the RIMPs can be used by other members of the GOES-R Program to prepare for cal/val activities, to assess the suitability of the cal/val test plans, and to understand the science teams' data and resource requirements. Cal/val testing is likely to reveal necessary algorithm and look-up table (LUT) changes to evolve the product quality through the maturity levels. The Algorithm Change Management Plan (ACMP) will be used to track and implement these software changes.

The evolving cal/val maturity of GOES-R products is described by three levels: Beta, Provisional, and Full Validation. The Flight Project is responsible for producing the Level 1b (L1b) products according to the GOES-R Level III requirement documents. Once Beta maturity of the L1b products is achieved, validation activities for Level 2+ (L2+) products can begin. Further levels of maturity (Provisional and Full Validation) require additional and often long-term activities. A detailed description of the three product maturity levels is given in Figure 1, but a brief description of the three maturity levels are:

Beta: the product is minimally validated based on product quick looks using the initial calibration parameters and may still contain significant errors. Product is made available to users to gain familiarity with data formats and parameters.

Provisional: product performance has been demonstrated through a select number of independent measurements and periods. The analysis is sufficient to communicate known product performance and issues to end users, and the product is ready for operational use.

Full: product performance has been demonstrated over a large and wide range of representative conditions, with comprehensive documentation of product performance, including known anomalies and their remediation strategies. The product is operational.

Product quality assessment and declaration of maturity levels is performed during Peer Stakeholder–Product Validation Reviews (PS-PVRs). At each PS-PVR, the status of products will be presented by members of the cal/val science teams. For GOES-16 and GOES-17 L1b products, Beta maturity PS-PVRs are held once each instrument's Post-Launch Tests (PLTs) have been successfully completed by the GOES-R Flight Project and the instrument vendors. For GOES-18 and GOES-19, Beta maturity will leverage early PLT results and the performance and characterization needed for the first public image/data release. After an L1b product has achieved Beta maturity, the product is added to the GOES Rebroadcast (GRB) stream, so that operational users can begin familiarizing themselves with the product format and parameters. Beta PS-PVRs for ABI L2+ products were only held for GOES-16; for subsequent satellites, ABI L2+ Beta maturity is assumed when the L1b product is Beta due to the maturity of the

Ground Processing Algorithms (GPAs). After an L1b or L2+ product has achieved Provisional maturity, the product is approved for distribution from Product Distribution and Access (PDA) and Comprehensive Large Array-data Stewardship System (CLASS). The review panel at the PS-PVRs will include the GOES-R Operational Readiness Working Group (GORWG), GOES-R Program System Engineering (PSE), NOAA Office of Satellite and Product Operations (OSPO), National Weather Service (NWS), Calibration Working Group (CWG; L1b products) and/or Algorithm Working Group (AWG; L2+ products), NESDIS Office of Satellite Ground Services (OSGS), NESDIS Scientist, GOES-R Scientist, and GOES-R Product Readiness and Operations (PRO). The outcome of the PS-PVR is determined by the panel Chair. PS-PVR artifacts will be publicly available at https://www.noaasis.noaa.gov/GOES/product_quality.html.

The introspection necessary to create these RIMPs has led to extensive consultations between the cal/val teams and other groups within the GOES-R Program, including Program System Engineering, the Flight Project and the Ground Segment. Figure 2 below describes the responsibilities and accountability of each of the main parties involved in the creation of the RIMPs. This delineation is required because GOES-R operations are to be handed over from the GOES-R Program to NOAA OSPO at the end of the PLT period, yet the process of validating product maturity will continue. This changing nature of accountability during the process must be acknowledged. Accountability of the RIMPs changes at Operations Handover from NASA to NOAA and is aligned with the level of each RIMP's validation maturity objective. Accountability describes which organization owns documentation, process, and procedures. Responsibility describes which organization creates, executes, and maintains specific activities.

<u>GOES-R Product (L1b and L2+) Maturity Levels</u>	
<u>Beta Validation</u>	
<u>Preparation Activities</u>	<ul style="list-style-type: none"> ○ Initial calibration applied (L1b). ○ Rapid changes in product input tables, and possibly product algorithms, can be expected. ○ Product quick looks and initial comparisons with ground truth data (if any) are not adequate to determine product quality. ○ Anomalies may be found in the product and the resolution strategy may not exist.
<u>End State</u>	<ul style="list-style-type: none"> ○ Products are made available to users to gain familiarity with data formats and parameters. ○ Product has been minimally validated and may still contain significant errors. ○ Product is not optimized for operational use.
<u>Provisional Validation</u>	
<u>Preparation Activities</u>	<ul style="list-style-type: none"> ○ Validation and quality assurance (QA) activities are ongoing, and the general research community is now encouraged to participate. ○ Severe algorithm anomalies are identified and under analysis. Solutions to anomalies are in development and testing. ○ Incremental product improvements may still be occurring. ○ Users are engaged in the Customer Forums (L2+ products only), and user feedback is assessed.
<u>End State</u>	<ul style="list-style-type: none"> ○ Product performance (L1b or L2+) has been demonstrated through analysis of a small number of independent measurements obtained from selected locations, periods, and associated ground-truth/field program efforts. ○ Product analysis is sufficient to communicate product performance to users relative to expectations. ○ Documentation of product performance exists that includes recommended remediation strategies for all anomalies and weaknesses. Any algorithm changes associated with severe anomalies have been documented, implemented, tested, and shared with the user community. ○ Testing has been fully documented. ○ Product ready for operational use and for use in comprehensive calibration/validation activities and product optimization.
<u>Full Validation</u>	
<u>Preparation Activities</u>	<ul style="list-style-type: none"> ○ Validation, QA, and anomaly resolution activities are ongoing. ○ Incremental product improvements may still be occurring. ○ Users are engaged and user feedback is assessed.
<u>End State</u>	<ul style="list-style-type: none"> ○ Product performance for all products is defined and documented over a wide range of representative conditions via ongoing ground-truth and validation efforts. ○ Products are operationally optimized, as necessary, considering mission parameters of cost, schedule, and technical competence as compared to user expectations. ○ All known product anomalies are documented and shared with the user community. ○ Product is operational.

Figure 1. GOES-R product maturity levels.

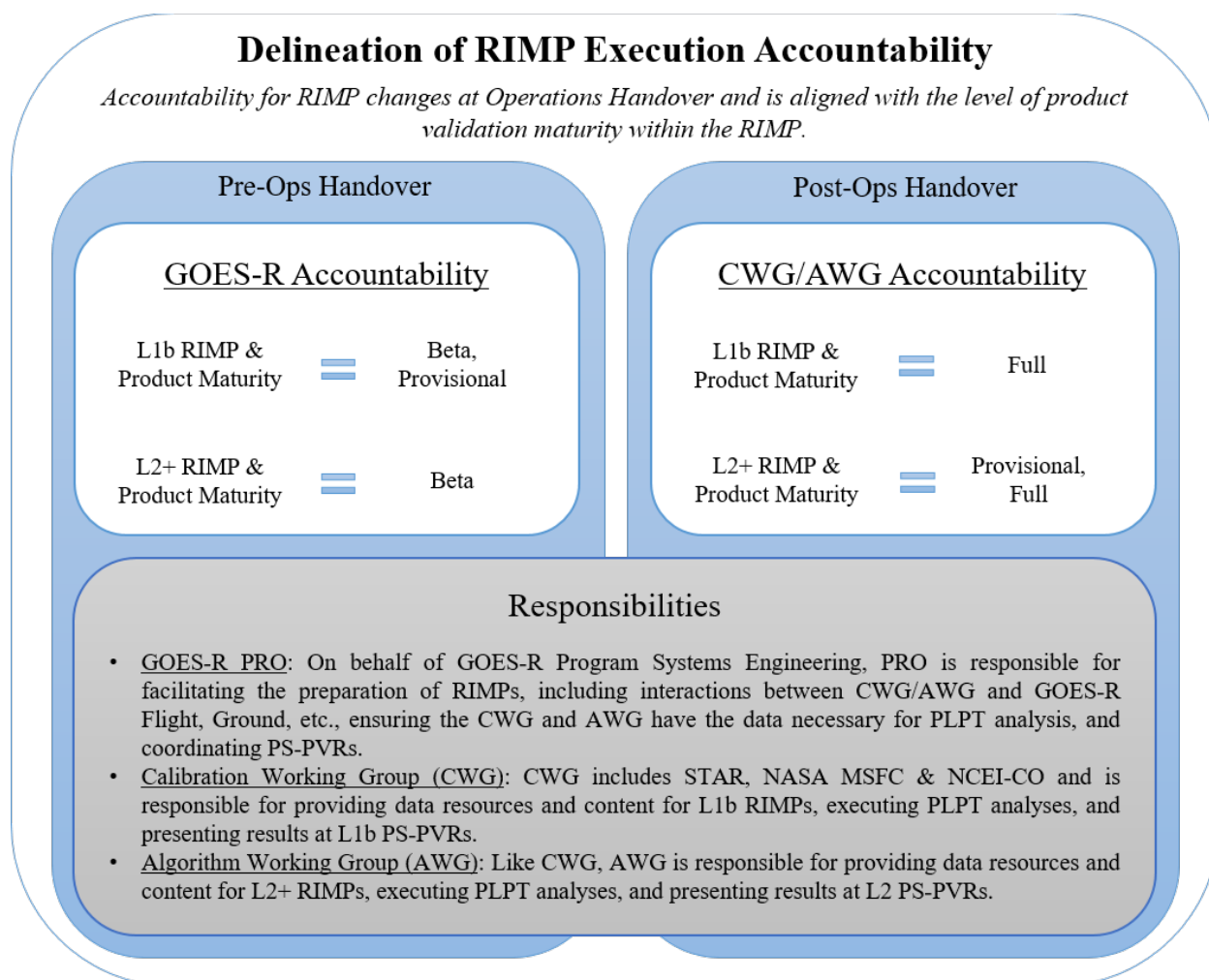


Figure 2. Delineation of RIMP execution accountability between GOES-R and CWG/AWG.

1. EXIS VALIDATION OVERVIEW

The Extreme ultraviolet and X-ray Irradiance Sensors (EXIS) can be broken down into three units: X-Ray Sensor (XRS), Extreme Ultraviolet Sensor (EUVS), and Solar Pointing Sensor (SPS). XRS and EUVS produce science data. Each has a heritage sensor on GOES satellites, although both have been modified somewhat for the GOES-R Series. The SPS measures the pointing of the EXIS relative to the center of the Sun.

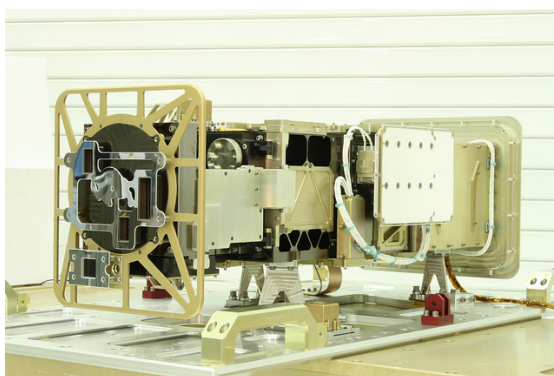


Figure 3. GOES-R EXIS instrument.

Table 1. EXIS key measurements chart.

Parameter	Requirement	Design
XRS λ Range	0.05 nm - 0.8 nm	0.05 nm - 0.8 nm
XRS Dynamic Range	10^{-9} W/m ² - 10^{-3} W/m ²	10^{-9} W/m ² - 10^{-3} W/m ²
XRS SNR	1:1 over 10 min. average	>30:1 over 10 min. average
XRS Data Product Accuracy	$\leq 20\%$ over mission life	14% over mission life
XRS Cadence	≤ 3 sec	1 sec
EUVS λ Range	5 - 127 nm	5 - 127 nm (data product)
EUVS $\Delta\lambda$ Resolution	From 5 to 35: 10 nm bins From 35 to 115 nm: 40 nm bins Ly- α (121.6 nm): 10 nm (FWHM)	5 - 115 nm; 5 nm bins 117 - 127; 10 nm bin
EUVS SNR	1:1 over 10 min. average	>20:1 over 10 min. average
EUVS Data Product Accuracy	$\leq 20\%$ over mission life	18% over mission life
EUVS Cadence	≤ 30 sec	30 sec

Post-Launch Testing (PLT) provides a qualitative and limited quantitative validation of L1b product integrity. It also includes validation of Ground Segment (GS) calibration/L1b product processing and data storage, monitoring, and distribution functions. During this time, operational calibration and L1b algorithms will more than likely be updated before system functioning would be considered nominal. The lead analysts and engineers during PLT are the Laboratory for Atmospheric and Space Physics (LASP), the EXIS sensor vendor. Once this nominal state has been reached, Post-Launch Product Testing (PLPT) begins which represents a continuation of the EXIS L1b product science validation. It is also composed of further in-depth analysis of EXIS calibration that establishes a beginning-of-life snapshot of EXIS calibration in the satellite on-orbit environment. This snapshot can be used as an initial benchmark for long-term trending of EXIS performance.

Only PLTs support EXIS Beta maturity, and those tests are listed in Table 2 with details in Appendix C. The PLPTs required for Provisional and Full Validation are listed in Table 3 and Table 4, respectively, with each test's details provided in Appendix A. Within each entry in Appendix A, the entry "Reference MRD" gives the reference numbers from the Mission Requirements Document (MRD). The performance baseline given by Massachusetts Institute of Technology – Lincoln Laboratory (MIT LL) demonstrates how these MRD requirements were verified pre-launch. The objective of the testing described in this RIMP is to determine through instrument and product characterization if the deliverable products satisfy their intended use in the intended environment, which also permits certification of the on-orbit performance against the pre-launch performance baseline. Therefore, the expectation is for the EXIS science team at NCEI to execute PLPTs necessary and sufficient to perform both objectives to the best of their ability. The references to specific MRD requirements are provided as justification for including each PLPT in the cal/val effort. These references are based on the analysis and recommendations of NCEI, MIT LL, and The Aerospace Corporation subject matter experts. The listing of MRD items does not fully enumerate the possible results from each PLPT, including those that may address other Performance Baseline results, but are the priority items according to the science team. Due to the limitations of post-launch testing, it may be difficult, if not impossible, to characterize some products or product characteristics to the same precision and accuracy as the performance baseline.

Beta Maturity Activities

The PLTs that support Beta maturity are listed in Table 2, with details in Appendix C (final approved list available in Operations Configuration Management System). Some PLTs are transitional from LASP to National Centers for Environmental Information (NCEI) in Colorado (CO), meaning they are not only conducted during the PLT period, but extended into the PLPT period and beyond. These are sustained over the lifetime of the instrument and include tool deliveries from the instrument vendor, LASP.

For GOES-16 and GOES-17, all PLTs were run before a Beta PS-PVR was held to determine that the product had reached Beta maturity. For GOES-18 and GOES-19, the minimum criteria for EXIS Beta product maturity – as agreed upon by a working group of Subject Matter Experts (SMEs) from CWG, Flight, LASP, and MIT LL – is that PLTs G*-C-EXS-002 through G*-C-EXS-005 and G*-C-EXS-008 through G*-E-EXS-009 are run, and the first LUT is delivered.

Table 2. EXIS PLTs that support Beta maturity for each satellite in the GOES-R Series (16, 17, 18, and 19). Table also indicates which PLTs are transitional to NCEI-CO. The star (*) in each ID represents the satellite number (i.e., 16, 17, 18, or 19). Blue color denotes test was / will be done. Gray shading indicates test was not / will not be done or is a reserve test.

Test ID	Test Title	Transitional	16	17	18/19
G*-C-EXS-001	XRS and SPS Dark	Yes			
G*-C-EXS-002	EUVS Stimulus Lamps and Gains	Yes			
G*-C-EXS-003	EUVS-AB Dark	Yes			
G*-C-EXS-004	EUVS-A/B/C Wavelength Scale and Line Masks	Yes			
G*-C-EXS-005	EUVS-C Integration Time Optimization	No			
G*-C-EXS-006	Cruciform Scan Slew	Yes			
G*-C-EXS-007	Field of View Mapping	Yes			
G*-C-EXS-008	EUVS Filter Characterization	Yes			
G*-E-EXS-009	Filter-Wheel Torque Margin	No			
G*-E-EXS-010	XRS Signal to Noise	No			
G*-E-EXS-011	EUVS Signal to Noise	No			
G*-C-EXS-012	EXIS XRS Inter-channel Comparison	No			
G*-C-EXS-013	EUVS Darks as a Function of Temperature	No			

Provisional Maturity Activities

PLPTs that support Provisional maturity are listed in Table 3 with details in Appendix A. LASP is responsible for executing PLPT-EXS-001 through PLPT-EXS-012, while NCEI-CO is responsible for executing PLPT-EXS-013 through PLPT-EXS-017.

An Extended Corona Imaging (ECI) test will be performed during this phase in support of a SUVI PLT for ultraviolet coronal mass ejection detection. The SUVI ECI testing will be concurrent with EXIS tests PLPT-EXS-014 through PLPT-EXS-017. Based on results from ECI testing performed during GOES-17 PLPT, a LUT change may be needed after ECI testing due to reduced degradation during this period. ECI testing is described in more detail in the SUVI PLT form for G18-E-SUV-015 and is also summarized in the SUVI RIMP.

Table 3. EXIS PLPTs that support Provisional maturity for each satellite in the GOES-R Series (16, 17, 18, and 19). Purple color denotes test was / will be done. Gray shading indicates test was not / will not be done or is a reserve test.

Test ID	Test Title	16	17	18/19
PLPT-EXS-001	EUVS-C Mg II Scaling			
PLPT-EXS-002	EUVS L1b Model Baseline			
PLPT-EXS-003	EUVS L1b Uncertainties			
PLPT-EXS-008	XRS B1-B2 Crossover Threshold			
PLPT-EXS-009	XRS A1-A2 Crossover Threshold			
PLPT-EXS-010	XRS Ratio – Threshold Assessment			
PLPT-EXS-011	NOAA XRS Scaling Factors			
PLPT-EXS-012	XRS L1b Uncertainties			
PLPT-EXS-013*	XRS Flare Location Comparison			
PLPT-EXS-014*	EXIS XRS/EUVS/Mg II Inter-Satellite Comparisons			
PLPT-EXS-015*	Degradation trending for EUVS-A			
PLPT-EXS-016*	Degradation trending for EUVS-B			
PLPT-EXS-017*	Degradation trending for EUVS-C			

*NCEI-CO is responsible for these PLPTs; LASP is responsible for the others.

Full Maturity Activities

The PLPTs listed in Table 4 are extensions of the Provisional PLPTs that NCEI-CO are responsible for, and completion of these extended tests advance the EXIS L1b products to Full maturity. NCEI-CO continues to be responsible for these PLPTs. Details of the Full maturity PLPTs are in Appendix A.

Table 4. EXIS PLPTs that support Full maturity for each satellite in the GOES-R Series (16, 17, 18, and 19). Green color denotes test was / will be done.

Test ID	Test Title	16	17	18/19
PLPT-EXS-013	XRS Flare Location Comparison			
PLPT-EXS-014	EXIS XRS/EUVS/Mg II Inter-Satellite Comparisons			
PLPT-EXS-015	Degradation trending for EUVS-A			
PLPT-EXS-016	Degradation trending for EUVS-B			
PLPT-EXS-017	Degradation trending for EUVS-C			

The validation processes and procedures, monitoring and analysis methods, tools, and expected output artifacts are described in the following sections. The details of each PLPT are contained in Appendix A and each reference data set in Appendix B. The details of each PLT are in Appendix C and any tools used in the validation process are in Appendix D.

2. SCHEDULE OF EVENTS

The nominal post-launch validation schedule for all GOES-R Series products is shown in Figure 4¹. The schedule for PLT is owned by the GOES-R Flight Project and under configuration management. The details should be expected to change up to Launch and possibly even during PLT if major anomalies are found.

Table 5 and Table 6 break down the schedule specifically for the EXIS products EUVS and XRS, respectively, for all satellites in the GOES-R Series.

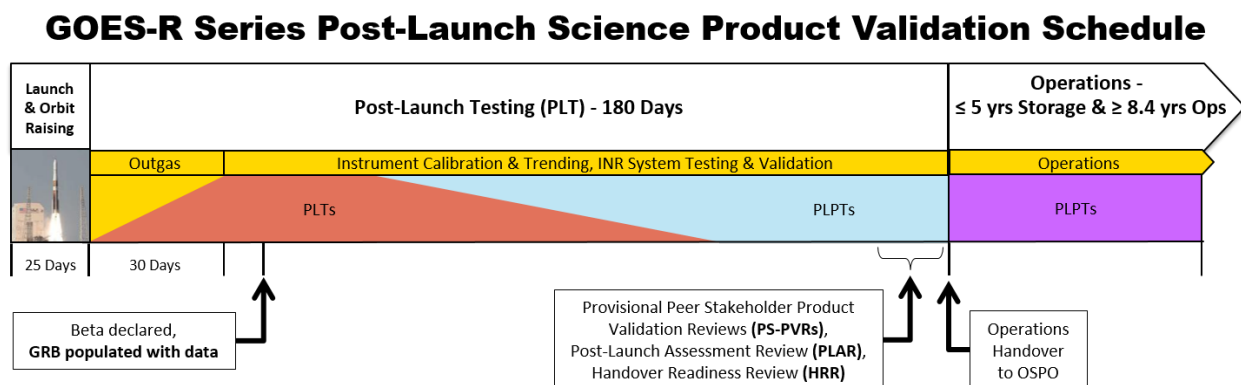


Figure 4. The product validation schedule from Launch through Operations.

Table 5. Post-launch science product validation schedule for EXIS EUVS. The first column shows the nominal schedule in time from launch (L) plus months. The second column shows the same for days. The GOES columns with colored cells denote actual date, while the white cells denote expected date; the values in parentheses show L+days.

	Nominal (months)	Nominal (days)	GOES-16	GOES-17	GOES-18	GOES-19
Launch	L+0	L+0	11/19/16 (L+0)	3/1/18 (L+0)	12/7/21	4/1/24
Outgas complete	L+2	L+60	1/10/17 (L+52)	4/30/18 (L+60)	2/7/22	6/1/24
Beta	L+3.5	L+105	3/23/17 (L+124)	6/27/18 (L+118)	3/21/22	7/14/24
Provisional	L+6	L+180	9/25/19 (L+1040)	9/25/19 (L+573)	6/7/22	10/1/24
Full	L+18	L+545	5/3/21	5/3/21	6/7/23	10/1/25

¹ See also the GOES-R Series Calibration and Product Validation Strategy (410-R-CALVAL-0192) section on the GOES-R Calibration and Product Validation Schedules.

Table 6. Post-launch science product validation schedule for EXIS XRS. The first column shows the nominal schedule in time from launch (L) plus months. The second column shows the same for days. The GOES columns with colored cells denote actual date, while the white cells denote expected date; the values in parentheses show L+days.

	Nominal (months)	Nominal (days)	GOES-16	GOES-17	GOES-18	GOES-19
Launch	L+0	L+0	11/19/16 (L+0)	3/1/18 (L+0)	12/7/21	4/1/24
Outgas complete	L+2	L+60	1/10/17 (L+52)	4/30/18 (L+60)	2/7/22	6/1/24
Beta	L+3.5	L+105	3/23/17 (L+124)	6/27/18 (L+118)	3/21/22	7/14/24
Provisional	L+6	L+180	8/15/18 (L+634)	4/24/19 (L+419)	6/7/22	10/1/24
Full	L+18	L+545	8/19/20 (L+1369)	8/19/20 (L+902)	6/7/23	10/1/25

The following subsections describe the nominal EXIS product schedule on the assumption that a satellite is going to Operations. The goal is for Beta and Provisional Validation to be completed before Handover at L+6 months, at which point the satellite will either go into Operations or storage mode.

2.1 BETA MATURITY TESTING

For GOES-16 and GOES-17 a Beta PS-PVR was held to show the results of the PLT activities and determine if the product demonstrates on-orbit performance adequate to begin detailed product testing. In lieu of a Beta PS-PVR, for GOES-18 and GOES-19 the results from a subset of PLTs will be used for a Beta Certification. A cross-collaborative working group, including the cal/val team, GOES-R Program, and the Flight vendor, have defined those PLTs as G*-C-EXS-002 through G*-C-EXS-005 and G*-C-EXS-008 through G*-E-EXS-009, along with the first LUT delivery.

2.1.1 Beta Entrance Criteria:

Completion of launch, orbit raising, and outgassing, expected by L+60 days.

2.1.2 Duration of Beta Testing:

The Flight- and vendor-led PLT activities begin during the Beta phase and for GOES-16 and GOES-17 Beta maturity has been achieved around L+120 days. However, for GOES-18 and GOES-19 the prerequisites and activities leading up to the Beta maturity declaration will be streamlined and are expected to be achieved by L+105 days. Although Beta Certification will be given before all PLTs have been completed, the PLT activities will continue beyond this point into the PLPT period.

2.1.3 Beta Testing Artifacts:

The PLT reports will be generated by the Flight and vendor teams. These will be discussed at the Post Test Data Review (PTDR) meetings and stored on the GOES-R portal. There will be a summary report in the form of a README that will describe the instrument and L1b data status.

2.1.4 Exit Criteria and Readiness for Beta Certification:

The general criterion for Beta product maturity is that the product has demonstrated on-orbit performance adequate to begin detailed product testing. Specific criteria for completing the PLTs necessary for establishing Beta maturity are described in the PLT forms.

2.2 PROVISIONAL MATURITY TESTING

2.2.1 Provisional Entrance Criteria:

PLPT activities begin during Flight-led PLT activities - after the first public image release.

2.2.2 Duration of Provisional Testing:

Once PLPT begins, EXIS tests will be conducted simultaneously. Data collection for PLPT must start as soon as the respective sensors are commanded into their nominal operating mode in order to achieve Provisional maturity prior to Handover. The target completion times for the PLPTs are as follows:

- PLPT-EXS-001 through 012 - three months of continuous data
- PLPT-EXS-013 (XRS Flare Location Comparison) - one flare M1 class or greater
- PLPT-EXS-014 (EXIS XRS/EUVS/Mg II Inter-Satellite Comparisons) - 14 day measurement overlap
- PLPT-EXS-015 (EUVS-A Degradation Trending) - four months of continuous data
- PLTP-EXS-016 and 017 (EUVS-B and EUVS-C Degradation Trending) - three months of continuous data

Note that PLPT-EXS-015 data collection starts at EXIS first light when daily filter calibrations begin at approximately Day 46 following the successful completion of PLT G*-C-EXS-008.

Provisional testing is scheduled for completion and the Provisional PS-PVR presented by L+180 days. In the event that an M1 class (or greater) flare does not occur, or less than the nominal amount of time for data collection is available beyond Beta Certification, the Provisional PS-PVR will still be held prior to L+180 days and the risks and caveats from those PLPTs that did not meet their success criteria must be described.

2.2.3 Provisional Testing Artifacts:

A slide deck that documents the results of the Provisional PLPTs with tables and figures to substantiate the conclusions will be created. The success criteria for each individual Provisional

PLPT are listed in the PLPT descriptions within Appendix A. There will also be a summary report in the form of a README that will describe the instrument and L1b data status.

2.2.4 Exit Criteria and Readiness for Provisional PS-PVR:

All PLPTs supporting Provisional Validation need to be summarized in a slide deck and presented at a PS-PVR prior to Handover.

2.3 FULL MATURITY TESTING

2.3.1 Full Entrance Criteria:

Data are Provisionally mature. If the satellite has gone into storage immediately after Provisional Validation, Full maturity PLPTs will start after the satellite is moved out of storage location.

2.3.2 Duration of Full Testing:

One year of testing with Provisional data is the scheduled duration for Full maturity validation. During this Full testing period, the nominal target completion times for the Full PLPTs are as follows:

- PLPT-EXS-013 (XRS Flare Location Comparison) - 10 M-class flares, 10 C-class flares, and 2 X-class flares
- PLPT-EXS-014 (EXIS XRS/EUVS/Mg II Inter-Satellite Comparisons) - two month measurement overlap
- PLPT-EXS-015 (EUVS-A Degradation Trending) - ongoing through Full testing period
- PLTP-EXS-016 and 017 (EUVS-B and EUVS-C Degradation Trending) - ongoing through Full testing period

2.3.3 Full Testing Artifacts:

A slide deck that documents the results of the Full PLPTs with tables and figures to substantiate the conclusions will be created. The success criteria for each individual Full PLPT are listed in the PLPT descriptions within Appendix A. There will also be a summary report in the form of a README that will describe the instrument and L1b data status.

2.3.4 Exit Criteria and Readiness for Full PS-PVR:

Product performance is defined, product is operationally optimized, and all known product anomalies are documented and shared with the user community. Full Validation is expected by L+545 days if the satellite is not placed into storage. However, space weather phenomena of significant impact (as detailed in the PLPT descriptions) are needed for Full Validation, and lack of such phenomena prior to L+545 days may delay Full Validation.

3. ROLES AND RESPONSIBILITIES

The GOES-R Calibration/Validation Plan Volume 1: L1b Data (cal/val plan) is the governing document defining organizational responsibilities for GOES-R product testing, including the analysis, review, approval, and anomaly resolution processes required for product validation. The cal/val plan takes precedence over the following summary of specific post-launch test responsibilities.

PLT assessments of EXIS instrument functionality, non-nominal operations, and initial data quality are conducted by the Mission Operations Support Team (MOST) with vendor support by LASP. EXIS will achieve Beta Validation during these early PLT assessments. Subsequent PLPT activities to advance product maturity to Provisional Validation involves detailed data analysis conducted under guidance of the CWG and GOES-R Program management by members of the cal/val team at NOAA, NASA, and industry. The roles and responsibilities of specific individuals and organizations during each satellite's PLT period are listed in Table 7 (names and affiliations subject to change).

Table 7. EXIS roles and responsibilities.

Role	GOES-16	GOES-17	GOES-18/19
EXIS PLPT Lead (CWG)	Janet Machol (NCEI, CIRES)	Janet Machol (NCEI, CIRES)	Janet Machol (NCEI, CIRES)
EXIS PLPT Lead (vendor)	Don Woodraska (LASP)	Don Woodraska (LASP)	Don Woodraska (LASP)
GOES-R Product Quality Lead	Jon Fulbright (PRO)	Elizabeth Kline (PRO)	Elizabeth Kline (PRO)
Ground Segment Product Readiness and Operations Cal/Val Coordination	Jon Fulbright (PRO); Alternate: Elizabeth Kline (PRO)	Jon Fulbright (PRO); Alternate: Elizabeth Kline (PRO)	Jon Fulbright (PRO); Alternate: Elizabeth Kline (PRO)
PLT Test Engineer(s)	Matt Garhart (MOST)	Matt Garhart (MOST)	Matt Garhart (MOST)
EXIS Product Quality Feedback	Janet Machol (NCEI, CIRES)	Janet Machol (NCEI, CIRES)	Janet Machol (NCEI, CIRES)
ERB Rep	Elizabeth Kline (PRO)	Elizabeth Kline (PRO)	Elizabeth Kline (PRO)
Remote Access	Ryan Williams (PRO); Jon Fulbright (PRO)	Janet Larson (PRO)	Janet Larson (PRO)
PASS/eGRES Requests	Wayne Mackenzie (PRO)	Stephen Superczynski (PRO)	Stephen Superczynski (PRO)
Flight Coordination	Gus Comeyne (Flight)	Gus Comeyne (Flight)	Christopher L. Smith (Flight)
PLT SOE CR Contact	Mike Otero (Flight)	Andrew Lyashko (Flight)	Denis Pinha (Flight)

4. TOOLS

Appendix D describes the tools used for PLT and PLPT analyses by LASP and NCEI-CO. The vendor has delivered tools for each transitional PLT that is transferred from LASP's responsibility to NCEI-CO to continue the calibration activities for Mission Life. Details on transitional PLTs can be found in Appendix C.

NCEI-CO have installed and tested the transitional tools provided by LASP on in-house systems. NCEI-CO have upgraded some of the tools and used them to produce revised LUTs. A couple of the more complicated tools (XRS time-dependent darks, cruciform scan analysis) will be received from the vendor in FY21.

5. PRE-LAUNCH

For EXIS, the DOEs will validate the data flows rather than exercise the functionality of the L1b algorithms across a wide range of environmental conditions. The DOEs will run live data from either GOES-EAST or GOES-WEST through a GOES-18 or GOES-19 configured GS. To mitigate risks, inconsistencies in the format and content of each L1b test product will be noted and tracked within the Algorithm Action Review Team (AART). Any discrepancies found during the rehearsals will be entered into the Work Request (WR)/Algorithm Design Review (ADR) process. The EXIS rehearsals are finished when all discrepancies are documented.

6. REFERENCES

The following documents have information relevant to this RIMP document. Unless otherwise noted, all documents with a “410-R” or “417-R” prefix are located in the GOES-R Library (Windchill repository). All other government documents can be found in the GOES-R Portal at <https://goesportal.ndc.nasa.gov/>.

Unless otherwise noted, the current versions of the following documents apply.

- 410-R-CALVAL-0192, GOES-R Series Calibration and Product Validation Strategy
- 410-R-CONOPS-0008, GOES-R Series Concept of Operations (CONOPS)
- 410-R-MRD-0070, GOES-R Series Mission Requirements Document (MRD)
- 410-R-PLN-0101, GOES-R Series Calibration/Validation Plan Volume 1: Level 1b Data
- 417-R-PLN-0246, GOES-R Series Post-Launch Testing (PLT) Plan
- 417-R-EXISPORD-0116, GOES-R Series EUVS XRS Irradiance Sensors (EXIS) Performance and Operational Requirements Document (PORD)
- LASP document 133999, GOES-R EXIS Post Launch Test (PLT) Procedure
- LASP document 138866, GOES-R EXIS PLT-PLPT Analysis Tasks
- GOES-R PLT and Active PLPT Forms on the GOES-R Program Portal:
Repository > 01 GOES R > 02 GOES R - Flight Project > 04 Mission Operations > 900 CM Docs > 935 PLT - GOES-R
Repository > 01 GOES R > 02 GOES R - Flight Project > 04 Mission Operations > 900 CM Docs > 936 PLT - GOES-S
Repository > 01 GOES R > 02 GOES R - Flight Project > 04 Mission Operations > 900 CM Docs > 937 PLT - GOES-T
- GOES-R Passive L1b PLPT Forms on the GOES-R Program Portal:
Repository > 01 GOES R > 02 GOES R - Flight Project > 04 Mission Operations > PLT > GOES-18 Passive PLPT forms
- Snow, M., J. Machol R. Viereck T. Woods M. Weber D. Woodraska J. Elliott (2019). A Revised Magnesium II Core-to-Wing Ratio From SORCE SOLSTICE. *Earth and Space Science*, 6(11), 2106-2114. <https://doi.org/10.1029/2019EA000652>

A. APPENDIX A: POST-LAUNCH PRODUCT TESTS

LASP is responsible for PLPT-EXS-001 through PLPT-EXS-012. NCEI-CO is responsible for PLPT-EXS-013 through PLPT-EXS-017. Unless otherwise noted in the individual test description, each PLPT is performed for each satellite of the GOES-R Series.

A.1 PLPTs that support BETA maturity

None – only PLTs support Beta maturity.

A.2 PLPTs that support PROVISIONAL maturity

A.2.1 EUVS-C Mg II Scaling [PLPT-EXS-001]

Objective: Determine the NOAA Mg II scaling factors needed for historical continuity.

Reference MRD: 2028, 2031

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): EUVS L0 and L1b data

Provisional Success Criteria: EUVS L1b product data are available and analysis is completed.

Dependencies: Requires three months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: GOES 13-15 EUVS, GOES-R Series EUVS.

Monitoring & Analysis Method: A long time series of measurements with varying solar signal levels is needed to compare the EXIS measurements to the historical record. Refer to the paper by M. Snow et al. (2019) for details on transferring the calibration from one instrument to another.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.2 EUVS L1b Model Baseline [PLPT-EXS-002]

Objective: Determine if coefficient parameter updates are needed for the EUVS proxy model.

Reference MRD: 2028, 2031

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): EUVS L0 and L1b data

Provisional Success Criteria: EUVS L1b product data are available and analysis is completed.

Dependencies: Requires 3 months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: SDO EVE.

Monitoring & Analysis Method: Compare 30-second responses, daily averages, and quarterly trends. Determine if any updates are necessary to the coefficients to adjust the model to compensate for any deficiencies.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.3 EUVS L1b Uncertainties [PLPT-EXS-003]

Objective: Determine the uncertainties in the EUVS level 1b irradiances.

Reference MRD: 2028

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): EUVS L0 and L1b data

Provisional Success Criteria: EUVS L1b product data are available and analysis is completed.

Dependencies: Requires 3 months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: N/A.

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.4 XRS B1-B2 Crossover Threshold [PLPT-EXS-008]

Objective: Update the XRS B1 to B2 crossover threshold value.

Reference MRD: 2042

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): XRS L0 and L1b data

Provisional Success Criteria: XRS L1b product data are available and analysis is complete.

Dependencies: Requires 3 months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: N/A.

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.5 XRS A1-A2 Crossover Threshold [PLPT-EXS-009]

Objective: Update the XRS A1 to A2 crossover threshold value.

Reference MRD: 2042

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): XRS L0 and L1b data

Provisional Success Criteria: XRS L1b product data are available and analysis is complete.

Dependencies: Requires 3 months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: N/A.

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.6 XRS Ratio – Threshold Assessment [PLPT-EXS-010]

Required for GOES-R Series satellites: 16, 17

Objective: Determine the sensitivity of the XRS ratio to the selection of XRS crossover thresholds.

Reference MRD: 2042

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): XRS L0 and L1b data

Provisional Success Criteria: XRS L1b product data are available and analysis is complete.

Dependencies: Requires 3 months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: N/A.

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.7 NOAA XRS Scaling Factors [PLPT-EXS-011]

Objective: Determine the scaling needed to adjust EXIS XRS irradiances to the NOAA historical X-ray record.

Reference MRD: 2038, 2041

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): XRS L0 and L1b data

Provisional Success Criteria: XRS L1b product data are available and analysis is complete.

Dependencies: Requires 3 months of Nominal Weekly Operations to be completed.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: GOES 13-15 XRS historical record, GOES 1-12 XRS historical record.

Monitoring & Analysis Method: A long time series of measurements with varying solar signal levels is needed to compare the EXIS measurements to the historical record. Refer to the paper by M. Snow et al. (2019) for details on transferring the calibration from one instrument to another.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.8 XRS L1b Uncertainties [PLPT-EXS-012]

Objective: Determine the uncertainty in the XRS L1b irradiances.

Reference MRD: 2038

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): XRS L0 and L1b data

Provisional Success Criteria: XRS L1b product data are available and analysis is complete.

Dependencies: Requires XRS-GPA-lite and all calibration terms updated to final flight values.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: N/A.

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.9 XRS Flare Location Comparison [PLPT-EXS-013]

Objective: Quantify XRS-derived flare location to the SUVI flare location.

Reference MRD: 2036

Start Time: Beginning of PLPT.

Duration: One flare M1 class or greater.

Mode: Normal

GOES-R Data Type(s): XRS L1b data product (EXIS-L1b-SF XR)

Provisional Success Criteria: Solar flare responses are observed in all 4 elements of the quad-diode detection system.

Dependencies: Data for at least 1 M class flare or greater must be detected within the test window.

Procedural References: Compare flare locations derived from the XRS.10 algorithm to flare locations determined from SUVI images or a SUVI flare location algorithm. The accuracy of this test will depend upon the magnitude of the flare being analyzed. If the test is run with an X1 or larger flare, the results will be significantly more useful.

Comparison/Reference Data: SUVI-L1b-Fe093, SUVI-L1b-Fe131, SUVI-L1b-Fe171, SUVI-L1b-Fe195, SUVI-L1b-Fe284, SUVI-L1b-He303, SDO AIA images.

Monitoring & Analysis Method: Assess performance using validated L2+ Flare Location Algorithm (XRS.10).

Tools Needed: XRS Flare Location Comparison tool.

A.2.10 EXIS XRS/EUVS/Mg II Inter-Satellite Comparisons [PLPT-EXS-014]

Objective: Inter-calibrate EXIS data with other available satellite datasets. For GOES-T and GOES-U, comparisons will primarily be made with GOES-16 and GOES-17.

Reference MRD: 2027, 2028, 2031, 2037, 2038, 2041

Start Time: Beginning of PLPT.

Duration: 14 day measurement overlap.

Mode: Normal

GOES-R Data Type(s): XRS and EUVS L1b data products (EXIS-L1b-SFXR and EXIS-L1b-SFEU)

Provisional Success Criteria: There is no pass/fail on the result itself of this cross-comparison.

Dependencies: Comparison data sets for 14 days of measurement overlap from other satellites must be available within the test window.

Procedural References: Plot and analyze data to determine standard deviation and offset between data sets. Characterize trends, periodicities or anomalies in the deviations, and try to determine source of any such issues. Evaluate possible corrections as needed.

Comparison/Reference Data: GOES-R Series XRS, GOES-R Series EUVS.

Monitoring & Analysis Method: Compare irradiance values for various wavelengths between different instruments.

Tools Needed: EXIS satellite inter-comparisons.

A.2.11 EUVS-A Degradation Trending [PLPT-EXS-015]

Objective: Create a back-up method to measure degradation trending on EUVS-A.

Reference MRD: 577, 2032

Start Time: EXIS first light (when daily filter calibrations begin at approximately Day 46 following the successful completion of PLT G*-C-EXS-008 – EUVS Filter Characterization).

Duration: Four months of continuous data.

Mode: Normal

GOES-R Data Type(s): EUVS L0 data

Provisional Success Criteria: EUVS L1b product data are available and analysis is completed.

Dependencies: Successful completion of PLT G*-C-EXS-008 – EUVS Filter Characterization. Four months of continuous operations as well as weekly and daily calibrations.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: EUVS L0 data

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.12 EUVS-B Degradation Trending [PLPT-EXS-016]

Objective: Create a method to measure degradation trending on EUVS-B.

Reference MRD: 577, 2032

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): EUVS L0 data

Provisional Success Criteria: EUVS L1b product data are available and analysis is completed.

Dependencies: Three months of continuous operations as well as weekly and daily calibrations.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: EUVS L0 data

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, EUVS-B Trending Tool, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.2.13 EUVS-C Degradation Trending [PLPT-EXS-017]

Objective: Create a method to measure degradation trending on EUVS-C.

Reference MRD: 577, 2032

Start Time: Beginning of PLPT.

Duration: Three months of continuous data.

Mode: Normal

GOES-R Data Type(s): EUVS L0 data

Provisional Success Criteria: EUVS L1b product data are available and analysis is completed.

Dependencies: Three months of continuous operations as well as weekly and daily calibrations.

Procedural References: LASP document 133999: GOES-R EXIS Post Launch Test (PLT) Procedure, Section 3.23.

Comparison/Reference Data: EUVS L0 data

Monitoring & Analysis Method: Time series analysis.

Tools Needed: QuickLook Tool Suite – Analysis and Trending, Stored Command Table Generator, Tlm Bandwidth Calculator, Memory Load Generator, Config Table Command Builder.

A.3 PLPTs that support FULL maturity

A.3.1 XRS Flare Location Comparison [PLPT-EXS-013]

Unless otherwise noted, see the Provisional test description for PLPT-EXS-013.

Duration: Ten M-class flares, 10 C-class flares, and 2 X-class flares.

Full Success Criteria: Derived solar flare location is found to be within 5 arc minutes (X class flare) of the accepted position.

Dependencies: Data for at least 10 M-class flares, 10 C-class flares, and 2 X-class flares must be detected within the test window.

A.3.2 EXIS XRS/EUVS/Mg II Inter-Satellite Comparisons [PLPT-EXS-014]

Unless otherwise noted, see the Provisional test description for PLPT-EXS-014.

Duration: Two months measurement overlap.

Dependencies: Comparison data sets for 2 months measurements overlap from other satellites must be available within the test window.

Comparison/Reference Data: GOES-R Series XRS, GOES-R Series EUVS. If available, SDO EVE, TIMED SEE, GOME2A, B Mg II.

A.3.3 Degradation trending for EUVS-A [PLPT-EXS-015]

Unless otherwise noted, see the Provisional test description for PLPT-EXS-015.

Duration: Ongoing through Full testing period.

A.3.4 Degradation trending for EUVS-B [PLPT-EXS-016]

Unless otherwise noted, see the Provisional test description for PLPT-EXS-016.

Duration: Ongoing through Full testing period.

A.3.5 Degradation trending for EUVS-C [PLPT-EXS-017]

Unless otherwise noted, see the Provisional test description for PLPT-EXS-017.

Duration: Ongoing through Full testing period.

B. APPENDIX B: GOES-R SERIES AND VALIDATION REFERENCE DATA

- B.1 Data set 1: Name:** EUVS L0 data
Storage Location: LZSS
Access Process: Through SPADES
Spatial Coverage: Full solar disk
Temporal Coverage: 2017 - present
Refresh Rate: Every 30 seconds
Contingency: NCEI FTP (<ftp://ftp.avl.class.noaa.gov/ddt/NCEI-NC/>)
Special Considerations: N/A
- B.2 Data set 2: Name:** XRS L0 data
Storage Location: LZSS
Access Process: Through SPADES
Spatial Coverage: Full solar disk
Temporal Coverage: 2017 - present
Refresh Rate: Every second
Contingency: NCEI FTP (<ftp://ftp.avl.class.noaa.gov/ddt/NCEI-NC/>)
Special Considerations: N/A
- B.3 Data set 3: Name:** EUVS L1b data (EXIS-L1b-SFEU)
Storage Location: PDA
Access Process: Through SPADES
Spatial Coverage: Full solar disk
Temporal Coverage: 2017 - present
Refresh Rate: Every 30 seconds
Contingency: CLASS
Special Considerations: N/A
- B.4 Data set 4: Name:** XRS L1b data (EXIS-L1b-SFXR)
Storage Location: PDA
Access Process: Through SPADES
Spatial Coverage: Full solar disk
Temporal Coverage: 2017 - present
Refresh Rate: Every second
Contingency: CLASS
Special Considerations: N/A
- B.5 Data set 5: Name:** SUVI L1b data
Storage Location: PDA
Access Process: Through SPADES
Spatial Coverage: Full solar disk
Temporal Coverage: 2017 - present

Refresh Rate: Every 90 seconds

Contingency: CLASS

Special Considerations: SUVI-L1b-Fe093, SUVI-L1b-Fe131, SUVI-L1b-Fe171, SUVI-L1b-Fe195, SUVI-L1b-Fe284, SUVI-L1b-He303

B.6 Data set 6: Name: SDO AIA images

Storage Location: GSFC archive

Access Process: <http://sdo.gsfc.nasa.gov/assets/img/browse/>

Spatial Coverage: Full solar disk

Temporal Coverage: 2010 to present

Contingency: N/A

Special Considerations: N/A

B.7 Data set 7: Name: GOES-13 XRS

Storage Location: NCEI-CO archive

Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>

Spatial Coverage: Full solar disk

Temporal Coverage: 2014 to 2020

Contingency: N/A

Special Considerations: Used for GOES-16 and GOES-17 comparisons only

B.8 Data set 8: Name: GOES-14 XRS

Storage Location: NCEI-CO archive

Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>

Spatial Coverage: Full solar disk

Temporal Coverage: 2009 to 2020

Contingency: N/A

Special Considerations: Used for GOES-16 and GOES-17 comparisons only

B.9 Data set 9: Name: GOES-15 XRS

Storage Location: NCEI-CO archive

Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>

Spatial Coverage: Full solar disk

Temporal Coverage: 2010 to 2020

Contingency: N/A

Special Considerations: Used for GOES-16 and GOES-17 comparisons only

B.10 Data set 10: Name: SDO EVE

Storage Location: LASP archive

Access Process: <http://lasp.colorado.edu/lisird/>

Spatial Coverage: Full solar disk

Temporal Coverage: 2010 to present

Contingency: N/A

Special Considerations: N/A

- B.11 Data set 11: Name:** TIMED SEE
Storage Location: LASP archive
Access Process: <http://lasp.colorado.edu/lisird/>
Spatial Coverage: Full solar disk
Temporal Coverage: 2001 to present
Contingency: N/A
Special Considerations: N/A
- B.12 Data set 12: Name:** GOME2A, B Mg II
Storage Location: University of Bremen archive
Access Process: <http://www.iup.uni-bremen.de/gome/gomemgii.html>
Spatial Coverage: Full solar disk
Temporal Coverage: 2006 to present
Contingency: N/A
Special Considerations: N/A
- B.13 Data set 13: Name:** SORCE SOLSTICE
Storage Location: LASP archive
Access Process: <http://lasp.colorado.edu/lisird/>
Spatial Coverage: Full solar disk
Temporal Coverage: 2003 to 2020
Contingency: N/A
Special Considerations: Used for GOES-16 and GOES-17 comparisons only
- B.14 Data set 14: Name:** GOES 13 EUVS
Storage Location: NCEI-CO archive
Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>
Spatial Coverage: Full solar disk
Temporal Coverage: 2006 to 2020
Contingency: N/A
Special Considerations: Used for GOES-16 and GOES-17 comparisons only
- B.15 Data set 15: Name:** GOES 14 EUVS
Storage Location: NCEI-CO archive
Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>
Spatial Coverage: Full solar disk
Temporal Coverage: 2009 to 2020
Contingency: N/A
Special Considerations: Used for GOES-16 and GOES-17 comparisons only
- B.16 Data set 16: Name:** GOES 15 EUVS
Storage Location: NCEI-CO archive
Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>
Spatial Coverage: Full solar disk
Temporal Coverage: 2010 to 2020

Contingency: N/A

Special Considerations: Used for GOES-16 and GOES-17 comparisons only

- B.17 Data set 17: Name:** GOES 1-12 XRS historical record
Storage Location: NCEI-CO archive
Access Process: <http://ngdc.noaa.gov/stp/satellite/goes/dataaccess.html>
Spatial Coverage: Full solar disk
Temporal Coverage: 1976 to 2009
Contingency: N/A
Special Considerations: N/A
- B.18 Data set 18: Name:** SEISS MPS-HI L1b or L2
Storage Location: N/A
Access Process: <https://www.ngdc.noaa.gov/stp/satellite/goes-r.html>
Spatial Coverage: N/A
Temporal Coverage: 2017 to the present
Contingency: SEISS MPS-HI L1b could also be obtained from PDA or CLASS
Special Considerations: N/A
- B.19 Data set 19: Name:** Science-quality GOES 13-15 XRS
Storage Location: N/A
Access Process: <https://www.ngdc.noaa.gov/stp/satellite/goes-r.html>
Spatial Coverage: N/A
Temporal Coverage: 2014 to 2020
Contingency: N/A
Special Considerations: N/A

C. APPENDIX C: PLT DETAILS

Approved final list and details can be found in the individual PLT forms. The list is repeated here for convenience and is not necessarily the final approved list.

The star (*) in each test ID represents the satellite number (i.e., 16, 17, 18, or 19). Unless otherwise specified, each PLT is run for each satellite in the GOES-R Series.

References to a flight model (fm#) in the Ground Processing Algorithm (GPA) tables represent the flight model being tested (e.g., fm1, fm2, fm3, or fm4).

C.1 Test ID: G*-C-EXS-001

Test Name: XRS and SPS Dark

Test Duration: 15 min. a day for 14 consecutive days data collection + 7 days analysis

Objective: Compare XRS and SPS dark data to pre-flight values and establish an on-orbit baseline.

Success Criteria: Update to the GPA tables:

exis_fm#_sps_dark.cal;

exis_fm#_xrs_dark_asic1temp_aside.cal and exis_fm#_xrs_dark_asic2temp_aside.cal

or exis_fm#_xrs_dark_asic1temp_bside.cal and exis_fm#_xrs_dark_asic2temp_bside.cal depending on which instrument side is active.

Dark data is within family of ground measurements. The tables are inserted into Harris HDF5 files and provided to Configuration Management (CM) for 1st delivery on L+60.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_17 are complete. Analysis from G*-C-EXS-008 (EUVS Filter Characterization) is complete. XRS and SPS components are on and in their nominal configuration. XRS and SPS are at their operational temperatures and in a thermally steady state (board temperatures are not drifting more than 0.01° C/min.). EXIS Stored Command Tables are loaded. Sun-Pointing Platform (SPP) is in a configuration where no sunlight is detectable on the XRS or SPS. Off-point maneuver should be scheduled during the minimum of the electron flux activity, which usually occurs 1-3 hours prior to Spacecraft local midnight. SEISS must be taking nominal data with the MPS-HI channel to correlate with the XRS during the off-points for electron density classifications.

Data Requirements: Level 0 data (packets) for XRS (APID 0x03a1) and SPS (APID 0x03a0) must be available from LZSS. LASP is responsible for execution and analysis using LASP developed software. NCEI will trend post hand-over using LASP delivered tools. This would need to be repeated if the power side is switched.

C.2 Test ID: G*-C-EXS-002

Test Name: EUVS Stimulus Lamps and Gains

Test Duration: 2 hr. data collection + 14 days analysis

Objective: Test the functionality of the EUVS stimulus lamps (flat-field LEDs) and gains while the door is closed and establish an on-orbit baseline.

Success Criteria: The gain calibration circuitry functions as expected. The stimulus lamps operate as expected. Sufficient data is obtained to update the GPA tables. Gains are within family with ground measurements.

The data analysis of the gains will produce this set of calibration tables:

exis_fm#_euvs_a_gain_baseline.cal, exis_fm#_euvs_b_gain_baseline.cal.

The data analysis of the flat-fields will produce this set of calibration tables:

exis_fm#_euvs_a_flatfield_baseline.cal, exis_fm#_euvs_b_flatfield_baseline.cal,
exis_fm#_euvs_c1_flatfield_baseline.cal or exis_fm#_euvs_c2_flatfield_baseline.cal
depending on which EUVS-C channel is active.

The gains are expected to agree with the ground calibration measurements, but the flat-fields may differ from ground measurements in both absolute magnitude and relative shape. Regardless, these define the baselines for comparing future measurements.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_10 are complete. EUVS components are on and in their nominal configuration. EUVS door is closed. EXIS Stored Command Safe tables (0-2) are not loaded. EUVS channels are at their operational temperatures and in a thermally steady state (board temperatures not drifting more than 0.01° C/min.).

Data Requirements: Level 0 data (packets) for EUVS-A (APID 0x03a2), EUVS-B (APID 0x03a3) and EUVS-C (APIDs 0x3b0-0x3b7) must be available from LZSS. LASP is responsible for execution and analysis using LASP developed software. NCEI will trend post hand-over using LASP provided software. This would need to be repeated if the power side is switched.

C.3 Test ID: G*-C-EXS-003

Test Name: EUVS-AB Dark

Test Duration: 24 hr. passive data collection + 7 days analysis

Objective: Compare EUVS dark data to pre-flight values and establish an on-orbit baseline.

Success Criteria: 24 hr. of usable data is obtained to update the GPA tables:

exis_fm#_euvs_a_dark_aside.cal and exis_fm#_euvs_b_dark_aside.cal
or exis_fm#_euvs_a_dark_bside.cal and exis_fm#_euvs_b_dark_bside.cal
depending on which instrument side is active.

Dark data measurements are within family of ground measurements.

The tables are inserted into Harris HDF5 files and provided to CM for 1st delivery on L+60.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_10 have been completed. EUVS components are on and in their nominal configuration. EUVS door is closed. EUVS channels are at their operational temperatures and in a thermally steady state (board temperatures not drifting more than 0.01° C/min.).

Data Requirements: Level 0 data (packets) for EUVS-A (APID 0x03a2) and EUVS-B (APID 0x03a3) must be available from LZSS. LASP is responsible for execution and analysis using LASP developed software. NCEI will trend post hand-over using LASP delivered tools. This would need to be repeated if the power side is switched.

C.4 Test ID: G*-C-EXS-004

Test Name: EUVS-A/B/C Wavelength Scale and Line Masks

Test Duration: 15 min. data collection + 7 days analysis

Objective: Determine the wavelength of each diode on the detectors using the solar spectrum, and update the corresponding GPA tables.

Success Criteria: Complete Analysis Tasks and update the 7 GPA tables with new wavelength and diode mask definitions. These tables are:

exis_fm#_euvs_a_mask.cal, exis_fm#_euvs_a_wavelength.cal,
exis_fm#_euvs_b_mask.cal, exis_fm#_euvs_b_wavelength.cal,
exis_fm#_euvs_c_dark_masks.cal,

and either

exis_fm#_euvs_c1_hk_masks.cal, exis_fm#_euvs_c1_wing_masks.cal

or

exis_fm#_euvs_c2_hk_masks.cal, exis_fm#_euvs_c2_wing_masks.cal depending on which EUVS-C channel is active.

The table contents are inserted into GPA LUTs, delivered, applied to the ground system DE, confirmed, then promoted to the OE and confirmed again.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_17 are complete. Analysis from EXIS PLT G*-C-EXS-005 (EUVS-C Integration Time Optimization) is complete. The EUVS-C data used in this test (C-EXS-004) is derived from the optimal integration time analysis to ensure no pixels are saturated. EUVS components are on and in their nominal configuration. EXIS is pointed at the sun. EUVS Door is open. EUVS filter is in a position to expose the EUVS channels to sunlight. Requires that the SUVI Guide Telescope is calibrated, aligned, and controlling the SPP. All EUVS channels (A, B, & C) are at their operational temperatures and in a thermally steady state (board temperatures not drifting more than 0.01° C/min.).

Data Requirements: At least 10 minutes of level 0 data (packets) for EUVS-A and EUVS-B (APID 0x03a2 and 0x3a3) must be available. At least 10 minutes of EUVS-C data (APIDs 0x3b0-0x3b7) from the optimal integration time test must be available. LASP is responsible for execution and analysis, using LASP developed software accessing the LZSS.

C.5 Test ID: G*-C-EXS-005

Test Name: EUVS-C Integration Time Optimization

Test Duration: 2 hr. data collection + 1 day analysis

Objective: Determine the optimal integration rate of the Extreme Ultraviolet Sensor C (EUVS-C) detectors.

Success Criteria: Optimal EUVS-C integration rate has been determined for each EUVS-C channel. If necessary, stored EXIS command tables and configuration table are updated to reflect the new value.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_15 have been completed. EUVS-C components are on and in their nominal configuration. EUVS-C channels are at their operational temperatures and in a thermally steady state (temperatures not drifting more than 0.01° C/min.). SPP is Sun pointed using either the Fine Sun Sensor (FSS) or the SUVI Guide Telescope (GT). EXIS

script G*_EXIS_PLT_3_15_EUVS_C is complete, i.e., the EUVS filter is in a position to expose the EUVS channels to sunlight.

Data Requirements: Level 0 data (packets) for EUVS-C (APIDs 0x3b0-0x3b7) must be available from LZSS. LASP is responsible for execution and analysis using LASP developed software.

C.6 Test ID: G*-C-EXS-006

Test Name: Cruciform Scan Slew

Test Duration: 2 hr. data collection + 7 days analysis

Objective: Run the EXIS cruciform scan slew coordinated calibration to obtain optical Field-Of-View (FOV) centers for the EXIS channels.

Success Criteria: Obtain FOV centers for all of the EXIS channels.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_20 are complete. Analyses from EXIS PLT G*-C-EXS-005: EUVS-C Integration Time Optimization and G*-C-EXS-008: EUVS Filter Characterization are complete. All EXIS science components are on and in their nominal configuration. All science components are at their operational temperatures and in a thermally steady state (temperatures not drifting more than approx. 0.01° C/min.). This calibration will require coordination with SUVI, as it will impact SUVI data. Perform calibration within ±1.5 hours of Spacecraft local noon. If adverse space weather conditions occurred during the calibration, this test will need to be repeated.

Data Requirements: Level 0 data (packets) for the SPS, XRS, EUVS-A, EUVS-B, and primary EUVS-C channels (APIDs 0x03a0, 0x03a1, 0x03a2, 0x3a3, 0x3b0-0x3b7) must be available. LASP is responsible for data analysis using LASP developed software accessing level 0 data in LZSS. NCEI will trend post hand-over using LASP delivered tools.

C.7 Test ID: G*-C-EXS-007

Test Name: Field of View Mapping

Test Duration: 1 hr. 30 min. data collection + 7 days analysis

Objective: Generate a field-of-view (FOV) map for each channel. This will establish the baseline for all future FOV map comparisons.

Success Criteria: Verification that the EXIS FOV map slews performed as expected. Spacecraft pointing information will be analyzed to confirm acceptable pointing. Sufficient data has been obtained to update the FOV correction table.

The following 56 GPA tables containing regularly spaced maps of the correction factors will be baselined:

exis_fm#_euvsa_fov_01-a1-dark.cal, exis_fm#_euvsa_fov_02-a2-25.cal,
exis_fm#_euvsa_fov_03-a3-25.cal, exis_fm#_euvsa_fov_04-a4-25.cal,
exis_fm#_euvsa_fov_05-a5-25.cal, exis_fm#_euvsa_fov_06-a6-25.cal,
exis_fm#_euvsa_fov_07-a13-28.cal, exis_fm#_euvsa_fov_08-a14-28.cal,
exis_fm#_euvsa_fov_09-a15-28.cal, exis_fm#_euvsa_fov_10-a16-28.cal,
exis_fm#_euvsa_fov_11-a17-28.cal, exis_fm#_euvsa_fov_12-a24-dark.cal,
exis_fm#_euvsa_fov_13-a23-30.cal, exis_fm#_euvsa_fov_14-a22-30.cal,
exis_fm#_euvsa_fov_15-a21-30t.cal, exis_fm#_euvsa_fov_16-a20-30b.cal,

exis_fm#_euvsa_fov_17-a19-30.cal, exis_fm#_euvsa_fov_18-a18-30.cal,
exis_fm#_euvsa_fov_19-a12-25.cal, exis_fm#_euvsa_fov_20-a11-25.cal,
exis_fm#_euvsa_fov_21-a10-25.cal, exis_fm#_euvsa_fov_22-a9-25.cal,
exis_fm#_euvsa_fov_23-a8-25.cal, exis_fm#_euvsa_fov_24-a7-25.cal,
exis_fm#_euvsb_fov_01-b2-140.cal, exis_fm#_euvsb_fov_02-b3-140.cal,
exis_fm#_euvsb_fov_03-b4-140.cal, exis_fm#_euvsb_fov_04-b5-140.cal,
exis_fm#_euvsb_fov_05-b6-140.cal, exis_fm#_euvsb_fov_06-b7-140.cal,
exis_fm#_euvsb_fov_07-b13-121.cal, exis_fm#_euvsb_fov_08-b14-121.cal,
exis_fm#_euvsb_fov_09-b15-121t.cal, exis_fm#_euvsb_fov_10-b16-121b.cal,
exis_fm#_euvsb_fov_11-b17-121.cal, exis_fm#_euvsb_fov_12-b18-121.cal,
exis_fm#_euvsb_fov_13-b24-dark.cal, exis_fm#_euvsb_fov_14-b23-117.cal,
exis_fm#_euvsb_fov_15-b22-117.cal, exis_fm#_euvsb_fov_16-b21-117.cal,
exis_fm#_euvsb_fov_17-b20-117.cal, exis_fm#_euvsb_fov_18-b19-117.cal,
exis_fm#_euvsb_fov_19-b12-133.cal, exis_fm#_euvsb_fov_20-b11-133.cal,
exis_fm#_euvsb_fov_21-b10-133.cal, exis_fm#_euvsb_fov_22-b9-133.cal,
exis_fm#_euvsb_fov_23-b8-133.cal, exis_fm#_euvsb_fov_24-b1-dark.cal,
exis_fm#_xrs_fov_a1.cal, exis_fm#_xrs_fov_a2.cal,
exis_fm#_xrs_fov_b1.cal, and exis_fm#_xrs_fov_b2.cal.

One of the following sets of calibration files will be baselined depending on which EUVS-C channel is designated to be the primary channel.

exis_fm#_euvsc_c1_fov_blue_wing.cal, exis_fm#_euvsc_c1_fov_h_line.cal,
exis_fm#_euvsc_c1_fov_k_line.cal, and exis_fm#_euvsc_c1_fov_red_wing.cal.
exis_fm#_euvsc_c2_fov_blue_wing.cal, exis_fm#_euvsc_c2_fov_h_line.cal,
exis_fm#_euvsc_c2_fov_k_line.cal, and exis_fm#_euvsc_c2_fov_red_wing.cal.

Additionally, the first analysis will generate the baseline relative values at each FOV map position (not used in the GPA). Trending during normal operations will also calculate the relative values at each FOV map position for tracking changes in the FOV points.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_20 are complete. Analyses from EXIS PLT G*-C-EXS-005: EUVS-C Integration Time Optimization and G*-C-EXS-008: EUVS Filter Characterization are complete. All EXIS science components are powered on and in their nominal configuration. All EXIS science components are at their operational temperatures and in a thermally steady state (temperatures not drifting more than 0.01° C/min.). Spacecraft Fine Sun Sensor (FSS) is available for fine-track control. Requires that the SUVI Guide Telescope (GT) is calibrated, aligned and controlling the SPP. This calibration will require coordination with SUVI, as it will impact SUVI data. Perform calibration within ±1.5 hours of Spacecraft local noon. If adverse space weather conditions occurred during the calibration, this test will need to be repeated. Refer to the Ops Handbook (CDRL 120) section 4.7.2.2.6 for rules on postponing this maneuver.

Data Requirements: Level 0 data (packets) for the SPS, XRS, EUVS-A, EUVS-B, and primary EUVS-C channels (APIDs 0x03a0, 0x03a1, 0x03a2, 0x03a3, 0x3b0-0x3b7) must be available. LASP is responsible for data analysis using LASP developed software accessing level 0 data in LZSS. NCEI will trend post hand-over using LASP delivered tools.

C.8 Test ID: G*-C-EXS-008

Test Name: EUVS Filter Characterization

Test Duration: 2 hr. 45 min. data collection + 7 days analysis

Objective: Determine the EUVS-A relative transmission of all the filters as the ratio to the primary filter position. Evaluate EUVS-B and EUVS-C primary channel open positions.

Success Criteria: Sufficient EUVS-A science data is collected for all EUVS filter positions and the baseline filter transmission data is recorded and the corresponding dark position and ratios have been established for long-term trending. No sources of glint and light scatter are evident for EUVS-B and EUVS-C primary channel open positions.

The `exis_fm#_euvsa_filter_trans_baseline.cal` calibration file is baselined using data from this activity. During the normal mission the baseline data is compared to another file, `exis_fm#_euvsa_filter_trans.cal` that is used for trending. This is part of the degradation used in the GPA table `exis_fm#_degradation.cal`.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_16 are complete. Analyses from EXIS PLT G*-C-EXS-003: EUVS-AB Dark and G*-C-EXS-005: EUVS-C Integ. Time Optimization are known. EUVS components are on and in their nominal configuration. EUVS is pointed at the sun. EUVS door is open. EUVS channels are at their operational temperatures and in a thermally steady state (temperatures not drifting more than approx. 0.01° C/min.).

Data Requirements: Level 0 data (packets) for the EUVS-A, EUVS-B, and primary EUVS-C channels (APIDs 0x03a2, 0x3a3, 0x3b0-0x3b7) must be available. Solar flares larger than C class could bias the ratio, so the test may need to be repeated a few hours later if flares are detected during the measurement. Very short impulsive flares can cause EUVS-A lines to increase suddenly (impulsive phase in 28.4 and 30.4 nm), while other flares can cause sudden decreases (coronal dimming in 28.4 nm). LASP is responsible for data analysis using LASP developed software accessing level 0 data in LZSS. NCEI will trend post hand-over using LASP delivered tools.

C.9 Test ID: G*-E-EXS-009

Test Name: Filter-Wheel Torque Margin

Test Duration: 10 min. data collection + 1 day analysis

Objective: Verify filter motor torque margin and establish baseline health of filter motor.

Success Criteria: Filter wheel rotates completely and stops at index position.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_9 are complete. EXIS is on and in RAM mode. All components are at nominal operational temperatures. Filter wheel at the primary position (FLTR_12). EXIS Stored Command Safe tables (0-2) are not loaded. Avoid running procedure during eclipse.

Data Requirements: Ram Medium telemetry (APID 0x0385) must be available. Test evaluation will be performed using the command procedure and CASSIE.

C.10 Test ID: G*-E-EXS-010

Test Name: XRS Signal to Noise

Test Duration: 3 days data collection + 14 days analysis

Objective: Determine the XRS signal to noise at minimum (threshold) irradiance levels over 10-minute intervals.

Success Criteria: Sufficient data is collected for all channels such that a signal-to-noise ratio (SNR) can be computed and compared against ground estimates. Data must contain a range of solar conditions as measured by the XRS to allow the SNR to be estimated near solar minimum. The analysis can be repeated through the normal mission as needed. An annual reanalysis would be prudent. The SNR measurements are obtained.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_17 are complete. Analysis from EXIS PLT G*-C-EXS-001: XRS and SPS Dark is complete. XRS components are on and in their nominal configuration. XRS is pointed at the sun. XRS channels are at their operational temperatures and in a thermally steady state (temperatures not drifting more than approx. 0.01° C/min.).

Data Requirements: Three days of level 0 data (packets) for XRS (APID 0x03a1) and SPS (APID 0x03a0) must be available from LZSS. The 10-minute data collection periods do not have to be contiguous, and the 3 days do not need to be consecutive. A two-week separation may be best to obtain the maximum and minimum of a solar rotation. Larger differences in solar activity are better. LASP is responsible for execution and analysis using LASP developed software.

C.11 Test ID: G*-E-EXS-011

Test Name: EUVS Signal to Noise

Test Duration: 3 days data collection + 14 days analysis

Objective: Determine the EUVS-A/B/C signal to noise at minimum (threshold) irradiance levels over 10-minute intervals.

Success Criteria: Sufficient data is collected for all channels such that a signal-to-noise ratio (SNR) can be computed. Data must contain a range of solar conditions as measured by the EUVS to allow the SNR to be estimated near solar minimum. The analysis can be repeated through the normal mission as needed. An annual reanalysis would be prudent. The SNR is expected to be within family of the other EUVS instruments in the GOES-R series.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_17 are complete. Analyses from EXIS PLT G*-C-EXS-003: EUVS-A/B Dark and G*-C-EXS-008: EUVS Filter Characterization are complete. EUVS components are on and in their nominal configuration. EXIS is pointed at the sun. EUVS channels are at their operational temperatures and in a thermally steady state (temperatures not drifting more than approx. 0.01° C/min.). Data must contain a range of solar conditions as measured by the EUVS to allow the SNR to be estimated near solar minimum.

Data Requirements: Three days of level 0 data (packets) for EUVS-A (APID 0x03a2), EUVS-B (APID 0x03a3) and EUVS-C (APIDs 0x3b0-0x3b7) must be available from the LZSS. The 10-minute data collection periods do not have to be contiguous, and the 3 days do not need to be consecutive. A two-week separation may be best to obtain a solar rotation minimum and maximum. Larger differences in solar activity are better. LASP is responsible for execution and analysis using LASP developed software.

C.12 Test ID: G*-C-EXS-012

Test Name: EXIS XRS Inter-Channel Comparison

Test Duration: 3 days passive data collection + 14 days analysis

Objective: Compare XRS A1 to A2 channels and XRS B1 to B2 channels.

Success Criteria: 24 hours of usable data is obtained to perform the comparison. The comparison should show the same variability for A1 and A2, and also with B1 and B2. The XRS Irradiances are expected to be within family of the other XRS instruments in the GOES-R series. This can be repeated during the normal mission as needed.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_17 are complete. XRS components are on and in their nominal configuration. XRS is pointed at the sun (the SUVI Guide Telescope does not need to be calibrated). XRS channels are at their operational temperatures and in a thermally steady state (temperatures not drifting more than approx. 0.01° C/min The thermal stability is usually achieved every day. Exceptions occur following anomalies (like power off events), eclipse and post eclipse exit, or very large off points like the 70 degree off point used to drain the S/C battery. Don't perform this PLT immediately after power up. Wait for the instrument to reach normal temperature. Avoid running procedure during eclipse season.

Data Requirements: Level 0 data (packets) for XRS (APID 0x03a1) must be available. Enough data is needed to compare 2 different activity levels of the sun. Data does not have to be contiguous. Data must be larger than the minimum values for XRS A2 and XRS B2, but not larger than the saturation values for XRS A1 and XRS B1. Usable data includes two different levels of solar activity (a modest C or M class flare would suffice). The irradiances must be within the irradiance overlap region of XRS A1 and A2 and also XRS B1 and B2; specifically, large enough to register good signal on XRS A2 and XRS B2, but not so large as to saturate XRS A1 and XRS B1. The B1/B2 overlap need not be coincident with the A1/A2 overlap data. Any 24-hour period with one flare would be sufficient, but non-flaring data spread over multiple days with different activity levels would also sufficient.

C.13 Test ID: G*-C-EXS-013

***Required for GOES-R Series satellites:** 18, 19

Test Name: EUVS Heater

Test Duration: (20 min. active commanding + 12 hr. thermal stabilization + 10 min. data collection) per day over 3 days + 7 days analysis

Objective: Change internal heater setpoint to different temperatures, darken EUVS-A and EUVS-B channels, and establish an on-orbit baseline response to heater changes.

Success Criteria: EXIS data is collected at nominal temperature and 2 different stable temperatures. Off-line analysis by LASP will update the initial Ground Processing Algorithm (GPA) tables: exis_fm#_euvs_a_gamma_omega.cal and exis_fm#_euvs_b_gamma_omega.cal. Values are incorporated into EUVSA_Cal_INR and EUVSB_Cal_INR HDF5 files for use in the ground system. The table contents are inserted into GPA LUTs, delivered, applied to the ground system DE, confirmed, then promoted to the OE and confirmed again.

Prerequisites/Dependencies: PLT activities G*_EXIS_PLT_3_1 through G*_EXIS_PLT_3_13_1 are complete. EXIS science components are powered on and in

nominal operations configuration. Initially EXIS is at the operational temperature for the first data collection. EXIS must remain sun-pointed throughout the duration of the test. Normal operations sun-pointing is needed. Requires that the static alignment errors between SUVI Guide Telescope (GT), Fine Sun Sensor (FSS), and EXIS Sun Pointing Sensor (SPS) boresight have been removed. Analysis from SUVI PLT G18-C-SUV-001: Guide Telescope Calibration is complete. No maneuvers that could impact EXIS temperatures should occur to keep pointing at sun center within +/-7 arcminutes. If this is performed during eclipse season, then thermal stability for the cooler setpoint will take much longer to achieve. All temperatures should occur with the same spacecraft yaw orientation. Requires successful data downlink, ground receipt, and availability of data collected to support post-test off-line analysis.

Data Requirements: Level 0 data (packets) for all EXIS APIDs must be available from LZSS. Laboratory for Atmospheric and Space Physics (LASP) is responsible for execution and analysis using LASP developed software. National Centers for Environmental Information (NCEI) will trend post hand-over using LASP delivered tools. This would need to be repeated if the power side is switched and also after exiting on-orbit storage.

D. APPENDIX D: TOOLS

D.1 Tool #1: QuickLook Tool Suite – Analysis and Trending

Location: LASP

Description: Tool suite to analyze and trend EXIS data

Developer: Don Woodraska (LASP)

Development schedule & handover plan: Developed by LASP and most tools in the suite have been handed over to NCEI-CO. A couple of the more complicated tools (XRS time-dependent darks, cruciform scan analysis) will be handed over to NCEI-CO in FY21.

Data Dependencies: EXIS L0 data from LZSS

Testing accomplished or planned: Instrument vendor tested in-house. NCEI-CO have installed and tested tools provided by vendor on in-house systems. NCEI-CO have upgraded some of the tools in this suite and used them to produce revised LUTs.

D.2 Tool #2: Stored Command Table Generator

Location: LASP

Description: Tool to generate stored command table

Developer: Karen Bryant (LASP)

Development schedule & handover plan: Developed by LASP

Data Dependencies: EXIS L0 data from LZSS

Testing accomplished or planned: Instrument vendor tested in-house

D.3 Tool #3: Tlm Bandwidth Calculator

Location: LASP

Description: Tool to calculate telemetry bandwidth

Developer: Karen Bryant (LASP)

Development schedule & handover plan: Developed by LASP

Data Dependencies: EXIS L0 data from LZSS

Testing accomplished or planned: Instrument vendor tested in-house

D.4 Tool #4: Memory Load Generator

Location: LASP

Description: Tool to generate memory load

Developer: Karen Bryant (LASP)

Development schedule & handover plan: Developed by LASP

Data Dependencies: EXIS L0 data from LZSS

Testing accomplished or planned: Instrument vendor tested in-house

D.5 Tool #5: Config Table Command Builder

Location: LASP

Description: Tool to build configuration table command

Developer: Karen Bryant (LASP)

Development schedule & handover plan: Developed by LASP

Data Dependencies: EXIS L0 data from LZSS

Testing accomplished or planned: Instrument vendor tested in-house

- D.6 Tool #6: XRS Flare Location Comparison Tool**
Location: NCEI-CO
Description: Tool to quantify XRS-derived flare location to the SUVI flare location
Developer: Laurel Rachmeler
Development schedule & handover plan: Development at NCEI complete; no handover required
Data Dependencies: XRS L1b data from PDA
Testing accomplished or planned: NCEI-CO in-house
- D.7 Tool #7: EXIS Satellite Inter-comparisons Tool**
Location: NCEI-CO
Description: Tool to inter-calibrate EXIS data with other available satellite datasets
Developer: Janet Machol
Development schedule & handover plan: Initial development completed for GOES-16 and GOES-17 PLPT analyses. More development required.
Data Dependencies: EXIS L1b data from PDA
Testing accomplished or planned: NCEI-CO in-house
- D.8 Tool #8: EUVS-B Trending Tool**
Location: NCEI-CO
Description: Tool to trend EUVS-B channels relative to Mg II measurements
Developer: Erika Zetterlund
Development schedule & handover plan: NCEI is currently developing this tool for GOES-16 and GOES-17 with an expected completion date of January 2021.
Data Dependencies: Mg II data must be available
Testing accomplished or planned: NCEI-CO will test on GOES-16 and GOES-17 data

E. APPENDIX E: ACRONYMS

The acronym list below covers a select set of acronyms associated with EXIS and general GOES-R procedures. To see a more comprehensive list of acronyms used within the GOES-R Program, see the GOES-R Series Acronyms webpage at <https://www.goes-r.gov/resources/acronyms.html>.

Acronym	Definition
AART	Algorithm Action Review Team
ACMP	Algorithm Change Management Plan
ADR	Algorithm Design Review
AIA	Atmospheric Imaging Assembly
AWG	Algorithm Working Group
cal/val	Calibration and Validation
CLASS	Comprehensive Large Array-data Stewardship System
CM	Configuration Management
CR	Change Request
CWG	Calibration Working Group
DOE	Data Operations Exercise
ECI	Extended Corona Imaging
eGRES	electronic GOES-R Export Service
ERB	Engineering Review Board
EUVS	Extreme Ultraviolet Sensor
EVE	Extreme Ultraviolet Variability Experiment
EXIS	EUV and X-ray Irradiance Sensors
fm	Flight Model
FOV	Field of View
FSS	Fine Sun Sensor
GOES	Geostationary Operational Environment Satellite
GORWG	GOES-R Operational Readiness Working Group
GPA	Ground Processing Algorithm
GRB	GOES Rebroadcast
GRE	Ground Readiness Exercise
GS	Ground Segment
GT	Guide Telescope
L0	Level 0
L1b	Level 1b
L2	Level 2
LASP	Laboratory for Atmospheric and Space Physics
LUT	Look Up Table
MIT LL	Massachusetts Institute of Technology – Lincoln Laboratory

MOST	Mission Operations Support Team
MPS-HI	Magnetospheric Particle Sensor (high energy)
MRD	Mission Requirements Document
NASA	National Aeronautics and Space Administration
NCEI	National Centers for Environmental Information
NESDIS	NOAA Satellite and Information Service
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OSPO	Office of Satellite and Product Operations
PAL	Product Area Lead
PASS	Product Algorithm Science Support
PDA	Product Distribution and Access
PLPT	Post-Launch Product Test
PLT	Post-Launch Test
PRO	Product Readiness and Operations
PSE	Program System Engineering
PS-PVR	Peer Stakeholder–Product Validation Review
PTDR	Post Test Data Review
RIMP	Readiness, Implementation, and Management Plan
SDO	Solar Dynamics Observatory
SEISS	Space Environment In-Situ Suite
SMEs	Subject Matter Experts
SNR	Signal to Noise Ratio
SOE	Sequence Of Events
SPP	Sun-Pointing Platform
SPS	Sun Pointing Sensor
SUVI	Solar Ultraviolet Imager
SWPC	Space Weather Prediction Center
WR	Work Request
XRS	X-Ray Sensor