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Joint Polar Satellite System (JPSS)
Algorithm Specification Volume I:
Software Requirement Specification (SRS)
for the OMPS TC RDR/SDR



NOAA / NASA

**Goddard Space Flight
Center Greenbelt, Maryland**

Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirement Specification (SRS) for the OMPS TC RDR/SDR

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Preface

This document is under JPSS Ground Segment (GS) configuration control. Once this document is approved, JPSS approved changes are handled in accordance with Class I and Class II change control requirements as described in the JPSS Configuration Management Procedures, and changes to this document shall be made by complete revision.

Any questions should be addressed to:

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NOTE

NOAA's Office of Low Earth Orbit (LEO) Observations encompasses the Joint Polar Satellite System (JPSS) and Near Earth Orbit Network (NEON) Programs. The JPSS Ground Segment Project has evolved to the LEO Ground Services Project and its ground system serves the needs of both JPSS and NEON missions. For efficiency, documents created prior to the formulation of LEO Ground Services will retain legacy terminology (e.g., JPSS Ground Project, JPSS Ground System).

Change History Log

Revision	Effective Date	Description of Changes (Reference the CCR & CCB/ERB Approve Date)
Rev -	August 8, 2013	This version incorporates 474-CCR-13-1117 which was approved by the JPSS Ground ERB on the effective day shown.
A	Jan 23, 2014	This version incorporates 474-CCR-14-1355 which was approved by JPSS Ground ERB on the effective date shown.
A1	Oct 23, 2014	This version incorporates 474-CCR-14-2091 which was approved by the JPSS Ground ERB for CO10 on the effective date shown.
B	Oct 23, 2014	This version incorporates 474-CCR-14-1721, 474-CCR-14-1741, 474-CCR-14-1793, 474-CCR-14-1781 and 474-CCR-14-2074 which was approved by JPSS Ground ERB on the effective date shown.
0200C	Sep 22, 2016	This version incorporates 474-CCR-14-2110, 474-CCR-15-2452 and 474-CCR-15-2480, 474-CCR-15-2657, 474-CCR-16-2939 and 474-CCR-16-3049 which was approved by JPSS Ground ERB on the effective date shown.
0200D	Jan 11, 2017	This version incorporates 474-CCR-16-3179 which was approved by JPSS Ground ERB on the effective date shown.
0200E	Feb 09, 2018	This version incorporates 474-CCR-18-3822 which was approved by JPSS Ground ERB on the effective date shown.
F	Dec 14, 2018	This version incorporates 474-CCR-18-4203. This version incorporates 0220A of 474-00448-01-04-B0220, dated 01/11/2017 to create this baseline. This was approved by the JPSS Ground ERB on the effective date shown.
G	Oct 24, 2019	This version incorporates 474-CCR-19-4584 which was approved by the JPSS Ground ERB on Oct 17, 2019 and by the JPSS Ground Segment CCB on the effective date shown.
H	Sep 14, 2020	This version incorporates 474-CCR-19-4697 which was approved by the JPSS Ground ERB on Nov 26, 2019 and by the JPSS Ground Segment CCB on Dec 5, 2019; 474-CCR-19-4719 which was approved by the JPSS Ground ERB on Mar 11, 2020 and by the JPSS Ground Segment CCB on Mar 26, 2020; 474-CCR-20-5117 which was approved by the JPSS Ground ERB on Aug 12, 2020 and by the JPSS Ground Segment CCB on Aug 27, 2020; 474-CCR-20-5127 which was approved by the JPSS Ground ERB on Jul 24, 2020 and by the JPSS Ground Segment

Revision	Effective Date	Description of Changes (Reference the CCR & CCB/ERB Approve Date)
		CCB on Jul 30, 2020; 474-CCR-20-4960 which was approved by the JPSS Ground ERB on Apr 22, 2020 and by the JPSS Ground Segment CCB on the effective date shown.
I	Mar 09, 2021	This version incorporates 474-CCR-21-5418 which was approved by the JPSS Ground ERB on Mar 09, 2021 and by the JPSS Ground Segment CCB on the effective date shown.
J	Aug 26, 2021	This version incorporates 474-CCR-21-5445 which was approved by the JPSS Ground ERB on May 07, 2021 and by the JPSS Ground Segment CCB on the effective date shown.
K	Aug 25, 2023	This version incorporates 474-CCR-23-6749 which was approved by the JPSS Ground ERB on Aug 18, 2023, and by the JPSS Ground Segment CCB on the effective date shown. This version was baselined for the LGSS contract.

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1 INTRODUCTION

The Joint Polar Satellite System (JPSS) is the National Oceanic and Atmospheric Administration's (NOAA) next-generation operational Earth observation program that acquires and distributes global environmental data primarily from multiple polar-orbiting satellites. The program plays a critical role in NOAA's mission to understand and predict changes in weather, climate, oceans and coasts, and the space environment, which support the Nation's economy and protect lives and property. For information regarding the JPSS Program.

1.1 Identification

This SRS provides requirements for OMPS (Ozone Mapping and Profiler Suite) Nadir Total Column (NTC) Raw Data Records (RDRs) and Sensor Data Records (SDRs). OMPS measures stratospheric ozone through the measurement of backscattered ultraviolet (UV) radiances. OMPS Nadir (OMPS-N) system consists of two instruments, a Nadir Total Column Mapper (NM) and a Nadir Profiler (NP). The nadir total column sensor has a focal plane UV grating spectrometer that provides measurements between 300 to 420 nm (300 to 380 nm for S-NPP), with a spectral resolution of 0.45 nm. The total cross-track field of view is 110 degrees.

1.2 Algorithm Overview

The Nadir Total Column (NTC or TC) ozone SDR is generated from the RDR for the total column focal plane of the OMPS instrument. The SDR processing produces an earth-scene SDR from the backscatter of solar radiation. The nadir total column earth scene SDR provides raw counts, count corrections, and calibrated earth and sun radiances for subsequent EDR processing into a measurement of total column ozone. The OMPS system will produce two JPSS EDRs, Ozone Total Column (TC) and Ozone Nadir Profile (NP).

The OMPS algorithms include the following:

1. The Nadir Total Column Ozone SDR algorithm
2. The Nadir Profile Ozone SDR algorithm
3. The Nadir Total Column Ozone Algorithm
4. The Nadir Profile Ozone Algorithm

1.3 Document Overview

Section	Description
Section 1	Introduction - Provides a brief overview of the JPSS Ground System and the relevant algorithm, as reference material only.
Section 2	Related Documentation - Lists related documents and identifies them as Parent, Applicable, or Information Documents such as, MOAs, MOUs, technical implementation agreements, as well as Data Format specifications. This section also establishes an order of precedence in the event of conflict between two or more documents.
Section 3	Algorithm Requirements - Provides a summary of the science requirements for the products covered by this volume.

Section	Description
Appendix A	Requirements Attributes - Provides the mapping of requirements to verification methodology and attributes.

2 RELATED DOCUMENTATION

The latest JPSS documents can be obtained from URL:

https://jpssmis.gsfc.nasa.gov/frontmenu_dsp.cfm. JPSS Project documents have a document number starting with 470, 472 or 474 indicating the governing Configuration Control Board (CCB) (Program, Flight, or Ground) that has the control authority of the document.

2.1 Parent Documents

The following reference documents are the Parent Documents from which this document has been derived. Any modification to a Parent Document will be reviewed to identify the impact upon this document. In the event of a conflict between a Parent Document and the content of this document, the JPSS Program Configuration Change Board has the final authority for conflict resolution.

Doc. No.	Document Title
474-01541	Joint Polar Satellite System (JPSS) Ground System Requirements Document (GSRD)
474-01543	Joint Polar Satellite System (JPSS) Ground –Segment Data Product Specification
474-00448-01-01	Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirements Specification (SRS) for the Common Algorithms

2.2 Applicable Documents

The following documents are the Applicable Documents from which this document has been derived. Any modification to an Applicable Document will be reviewed to identify the impact upon this document. In the event of conflict between an Applicable Document and the content of this document, the JPSS Program Configuration Change Board has the final authority for conflict resolution.

Doc. No.	Document Title
474-00448-02-04	Joint Polar Satellite System (JPSS) Algorithm Specification Vol II: Data Dictionary for OMPS Total Column RDR/SDR
474-00448-04-04	Joint Polar Satellite System (JPSS) Algorithm Specification Vol IV: Software Requirements Specification Parameter File (SRSPF) for OMPS Total Column RDR/SDR
474-00448-04-08	JPSS Algorithm Specification Volume IV: Software Requirements Specification Parameter File (SRSPF) for the Geolocation and Spacecraft Orientation

3 ALGORITHM REQUIREMENTS

3.1 States and Modes

3.1.1 Normal Mode Performance

Not applicable

3.1.2 Graceful Degradation Mode Performance

Not applicable

3.2 Algorithm Functional Requirements

3.2.1 Product Production Requirements

Not applicable

3.2.2 Algorithm Science Requirements

Not applicable

3.2.3 Algorithm Exception Handling

SRS.01.04_107 The OMPS Nadir Total Column SDR software shall set the <FillField> values to <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04) <NTC_Science_SDR><fill>.

Rationale: The SDR software through its computing algorithm must fill the OMPS Nadir TC SDR values based on the established fill conditions to satisfy exclusion and fill conditions.

Block Start: 2.0.0 *Block End:* 3.0.0

3.3 External Interfaces

3.3.1 Inputs

SRS.01.04_100 The OMPS Nadir Total Column SDR software shall incorporate inputs specified in Table 3-1.

Rationale: The SDR generation software must be able to receive and process the resource interaction items shown in Table 3-1 in order to produce the intended OMPS TC SDR products.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_119 The OMPS Nadir Total Column SDR Geolocation software shall incorporate inputs specified in Table 3-1.

Rationale: The SDR generation software must be able to receive and process the resource interaction items shown in Table 3-1 in order to produce the intended OMPS TC SDR geolocation products.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_662 The OMPS Nadir Total Column SDR software shall ingest input tables and coefficients formatted in accordance with Section 7 of the JPSS Algorithm Specification Vol II: Data Dictionary for OMPS NP RDR/SDR (474-00448-02-04).

Rationale: This defines the formats for Lookup Tables, and Processing Coefficients for input into the algorithm module.

Block Start: 2.0.0 *Block End:* 3.0.0

Table 3-1 and Figure 3-1 are best viewed together since they describe the processes governed by this SRS in different ways. The figure diagrams the data flowing into, out of, and within the code governed by this SRS. The table lists these same data interactions as well as all downstream dependencies for outputs from this SRS.

Each row in the table describes a single software interaction - data flowing from one software item to another. The data is listed in the first column. The second column includes the mnemonic or short name for the data. Blanks indicate there is no mnemonic. The third and fourth columns contain the SRS that generates the data product(s) in the first column, and the SRS that receives those products. The final two columns contain the actual function name in Algorithm Development Library (ADL) that produces those products, and the function that inputs those products. The SRS's titled "Ingest MSD" and "Store/Retrieve" are non-existent SRS's functioning as data handling for the IDPS. The software functions "Store Products" and "Retrieve Products" are similar non-existent functions that operate as IDPS data handling.

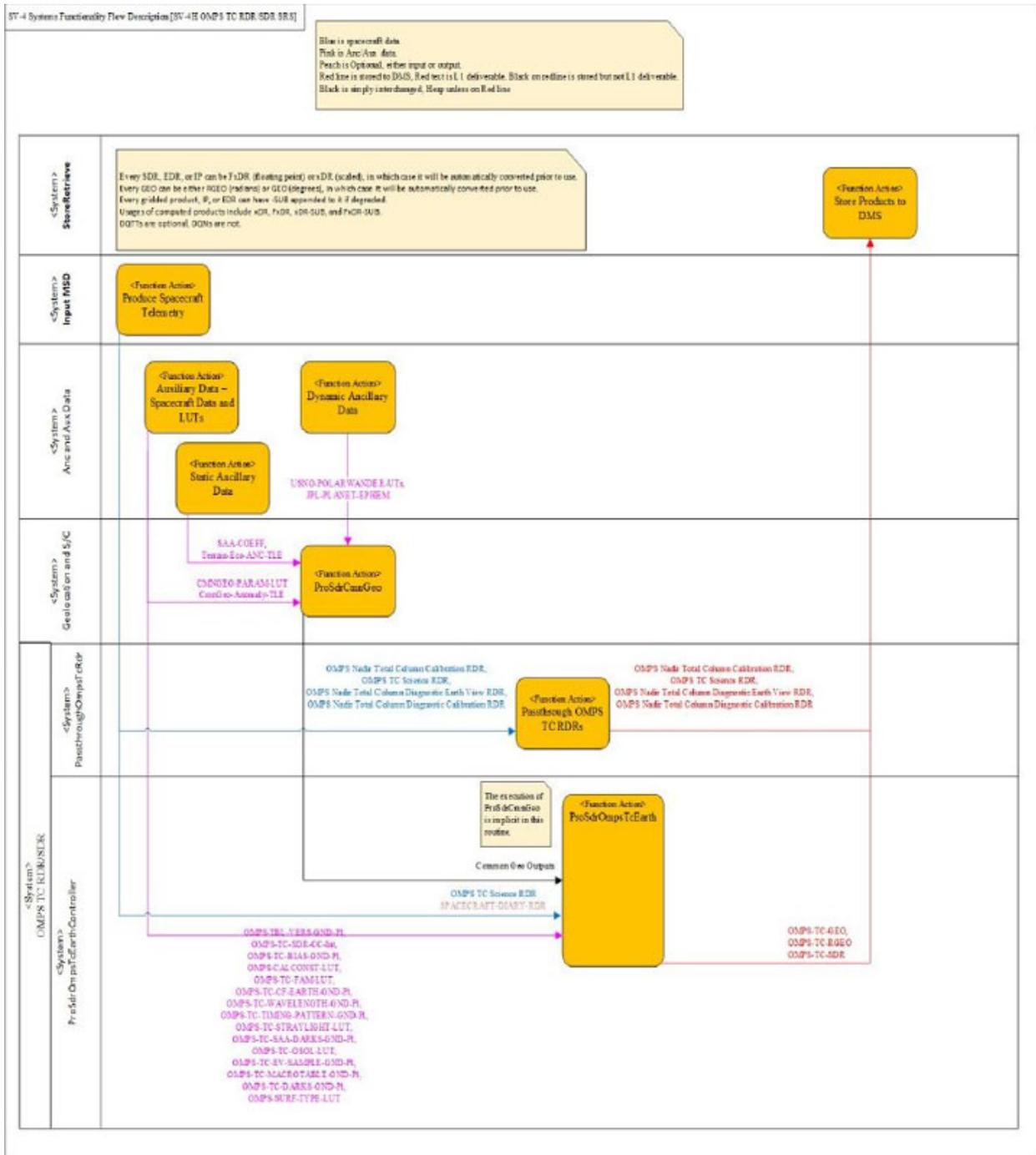


Figure: 33-11 OMPS TC RDR/SDR Data Flows

Table 3-1 SV-6 Systems Resource Flow Matrix: OMPS TC RDR/SDR

	Data Product Name	Collection Short Name	Mnemonic	Sending Function	Receiving Function	Sending SRS	Receiving SRS
1	<ul style="list-style-type: none"> •OMPS Nadir Total Column Calibration RDR •OMPS TC Science RDR •OMPS Nadir Total Column Diagnostic Earth View RDR •OMPS Nadir Total Column Diagnostic Calibration RDR 	<ul style="list-style-type: none"> •OMPS-TCCALIBRATION-RDR •OMPS-TCSCIENCE-RDR •OMPS-TCDIAGNOSTIC-RDR •OMPS-TCDIAGCAL-RDR 	<ul style="list-style-type: none"> •RDRE-OMPS-C0051 •RDRE-OMPS-C0031 •RDRE-OMPS-C0050 •RDRE-OMPS-C0038 	Produce Spacecraft Telemetry	Passthrough OMPS TC RDRs	Input MSD	OMPS TC RDR/SDR
2	<ul style="list-style-type: none"> •OMPS TC Science RDR 	<ul style="list-style-type: none"> •OMPS-TCSCIENCE-RDR 	<ul style="list-style-type: none"> •RDRE-OMPS-C0031 	Produce Spacecraft Telemetry	ProSdrOmpsT cEarth	Input MSD	OMPS TC RDR/SDR
3	<ul style="list-style-type: none"> •SPACECRAFT-DIARY-RDR 	<ul style="list-style-type: none"> •SPACECRAFT-DIARY-RDR 	<ul style="list-style-type: none"> •RDRE-SCAE-C0030 •RDRE-SCAE-C0040 •RDRE-SCAE-C0050 	Produce Spacecraft Telemetry	ProSdrOmpsT cEarth	Input MSD	OMPS TC RDR/SDR
4	<ul style="list-style-type: none"> •OMPS_TBL_VERS_GND_PI •OMPS_TC_SDR_CC_Int •OMPS_TC_BIAS_GND_PI •OMPS_TC_CALCONST_LUT •OMPS_TC_FAM_LUT •OMPS_TC_CF_EARTH_GND_PI •OMPS_TC_WAVELENGTH_GND_PI •OMPS_TC_TIMING_PATTERN_GND_PI •OMPS_TC_STRAYLIGHT_LUT •OMPS_TC_SAA_DARKS_GND_PI •OMPS TC OSOL LUT 	<ul style="list-style-type: none"> •OMPS-TBL-VERS-GND-PI •OMPS-TC-SDR-CC •OMPS-TC-BIAS-GND-PI •OMPS-TC-CALCONST-LUT •OMPS-TC-FAM-LUT •OMPS-TC-CF-EARTH-GND-PI •OMPS-TC-WAVELENGTH-GND-PI •OMPS-TC-TIMING-PATTERN-GND-PI 	<ul style="list-style-type: none"> •NP_NU-LM0240-130 •DP_NU-LM2020-005 •NP_NU-LM0240-133 •NP_NU-LM0240-008 •NP_NU-LM0240-009 •NP_NU-LM0240-027 •NP_NU-LM0240-026 •NP_NU-LM0240-020 	Auxiliary Data - Spacecraft Data and LUTs	ProSdrOmpsT cEarth	Anc and Aux Data	OMPS TC RDR/SDR

	Data Product Name	Collection Short Name	Mnemonic	Sending Function	Receiving Function	Sending SRS	Receiving SRS
	<ul style="list-style-type: none"> •OMPS_TC_EV_SAMPLE_GND_PI •OMPS_TC_MACROTABLE_GND_PI •OMPS_TC_DARKS_GND_PI •OMPS_SURFTYPE_LUT 	<ul style="list-style-type: none"> •OMPS-TC-STRAYLIGHT-LUT •OMPS-TC-SAA-DARKS-GND-PI •OMPS-TC-OSOL-LUT •OMPS-TC-EV-SAMPLE-GND-PI •OMPS-TC-MACROTABLE-GND-PI •OMPS-TC-DARKS-GND-PI •OMPS_SURFTYPE_LUT 	<ul style="list-style-type: none"> •NP_NU-LM0240-129 •NP_NU-LM0240-132 •NP_NU-LM0240-010 •NP_NU-LM0240-022 •NP_NU-LM0240-023 •NP_NU-LM0240-131 				
7	•Common Geo Outputs	•None	•None	ProSdrCmnGeo	ProSdrOmpsTcEarth	Geolocation and S/C	OMPS TC RDR/SDR
14	•OMPS_TC_SDR	•OMPS-TC-SDR	•SDRE-OMTC-C0030	ProSdrOmpsTcEarth	Store Products to DMS	OMPS TC RDR/SDR	Store/Retrieve
15	<ul style="list-style-type: none"> •OMPS Nadir Total Column Calibration RDR •OMPS TC Science RDR •OMPS Nadir Total Column Diagnostic Earth View RDR •OMPS Nadir Total Column Diagnostic Calibration RDR 	<ul style="list-style-type: none"> •OMPS-TCCALIBRATION-RDR •OMPS-TCSCIENCE-RDR •OMPS-TCDIAGNOSTIC-RDR •OMPS-TCDIAGCAL-RDR 	<ul style="list-style-type: none"> •RDRE-OMPS-C0051 •RDRE-OMPS-C0031 •RDRE-OMPS-C0050 •RDRE-OMPS-C0038 	Passthrough OMPS TC RDRs	Store Products to DMS	OMPS TC RDR/SDR	Store/Retrieve
16	<ul style="list-style-type: none"> •OMPS_TC_GEO •OMPS-TC-RGEO 	<ul style="list-style-type: none"> •OMPS-TC-GEO •OMPS-TC-GEO 	<ul style="list-style-type: none"> •None •None 	ProSdrOmpsTcEarth	Store Products to DMS	OMPS TC RDR/SDR	Store/Retrieve

3.3.2 Outputs

SRS.01.04_67 The OMPS RDR software shall generate the OMPS Nadir Total Column Diagnostic Calibration RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04)<NTC_RDR><DiagCal>.

Rationale: The Diagnostic Calibration RDR is one of OMPS Nadir Total Column RDR products and is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_68 The OMPS RDR software shall generate the OMPS Nadir Total Column Diagnostic Earth View RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04)<NTC_RDR><DiagEarthView>.

Rationale: The Diagnostic Earth View RDR is one of OMPS Nadir Total Column RDR products and is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_69 The OMPS RDR software shall generate the OMPS Science Nadir Total Column Calibration RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04)<NTC_RDR><Cal>.

Rationale: The Calibration RDR is one of OMPS Nadir Total Column RDR products and is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_70 The OMPS RDR software shall generate the OMPS Science Nadir Total Column Earth View RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04)<NTC_RDR><Science>.

Rationale: The Science Earth View RDR is one of OMPS Nadir Total Column RDR products and is generated from the specified mission data packet APIDs. APIDs 0, 8, and 11 are part of the Spacecraft Diary which is included in the deliverable RDR.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_99 The OMPS Nadir Total Column SDR software shall generate the OMPS Nadir Total Column Science SDR, conforming to the XML format file in Attachment A.4 of the JPSS Algorithm Specification Vol II: Data Dictionary for OMPS Total Column RDR/SDR (474-00448-02-04).

Rationale: The product profile must conform to the XML format file.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_118 The OMPS Nadir Total Column SDR software shall generate the OMPS Nadir Total Column Science SDR geolocation in conformance with the XML format file in Attachment A.3 of the JPSS Algorithm Specification Vol II: Data Dictionary for OMPS Total Column RDR/SDR (474-00448-02-04).

Rationale: The product profile must conform to the XML format file.

Block Start: 2.0.0 *Block End:* 3.0.0

3.4 Science Standards

Not applicable

3.5 Metadata Output

Not applicable

3.6 Quality Flag Content Requirements

SRS.01.04_116 The OMPS Nadir Total Column SDR software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04) <NTC_Science_SDR><QF>.

Rationale: Quality Flags must be generated based on the established flag conditions, logic, and format.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_499 The OMPS Nadir Total Column SDR GEO software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for OMPS Total Column RDR/SDR (474-00448-04-04) <NTC_Sci_GEO><QF>.

Rationale: Quality Flags must be generated based on the established flag conditions, logic, and format.

Block Start: 2.0.0 *Block End:* 3.0.0

3.7 Data Quality Notification Requirements

Not applicable

3.8 Adaptation

Not applicable

3.9 Provenance Requirements

Not applicable

3.10 Computer Software Requirements

Not applicable

3.11 Software Quality Characteristics

Not applicable

3.12 Design and Implementation Constraints

SRS.01.04_495 The JPSS Common Ground System shall execute the OMPS Nadir Total Column earth view radiance algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor.

Block Start: 2.0.0 *Block End:* 3.0.0

SRS.01.04_496 The JPSS Common Ground System shall execute the OMPS Nadir Total Column science SDR geolocation algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor.

Block Start: 2.0.0 *Block End:* 3.0.0

3.13 Personnel Related Requirements

Not applicable

3.14 Training Requirements

Not applicable

3.15 Logistics Related Requirements

Not applicable

3.16 Other Requirements

Not applicable

3.17 Packaging Requirements

Not applicable

3.18 Precedence and Criticality

Not applicable

Appendix A. Requirements Attributes

The Requirements Attributes can be found in the VCRMs at Ground > Mission System Engineering > Ground SEIT Unrestricted > VCRM

<https://jpss.gsfc.nasa.gov/sites/ground/MSE/9/Forms/AllItems.aspx?RootFolder=%2Fsites%2Fground%2FMSE%2F9%2FVCRM&FolderCTID=0x012000D0555EA1A211E64A9A7DE7CBCE72DE8B&View=%7B4267AEFE%2D7E8B%2D402D%2D919D%2D41BED55BA4E7%7D>