

# NGA STANDARDIZATION DOCUMENT



## NSG Data Product Levels for Spectral Datasets Information Guidance Version 1.0 31 October 2018

Developed by NGA/R and NGA/TACQ  
Under the Auspices of the NITFS Technical Board (NTB) and the  
Geospatial Intelligence Standards Working Group (GWG)

---

**NATIONAL CENTER FOR GEOSPATIAL INTELLIGENCE STANDARDS**

---



# NSG Data Product Levels for Spectral Datasets Information Guidance

## Executive Summary

The National System for Geospatial Intelligence (NSG) data product levels for spectral datasets, which are defined *ab initio* in this document, categorize spectral datasets by the degree and type of data processing and exploitation steps applied since the data were initially captured. As such, these definitions serve principally as a tool for data and system architects, system integrators and engineers, data modelers, data standards developers, and others working to improve the spectral system architecture and data flow. These NSG spectral data product levels support the goal of migrating to cloud-based service-oriented architecture (SOA), as a step toward making spectral data products interoperable by the application of consistent data standards for the processes and data common across all spectral systems. The levels also provide a means of product categorization for Commercial Cloud Services (C2S) data retention policies.

Because of the divergent history of multispectral imagery (MSI) and hyperspectral imagery (HSI) systems, MSI and HSI data product levels are not equivalent, even though the processing chains for MSI and HSI datasets are similar. For example, an MSI Level 2 product has a different processing maturity than an HSI Level 2 product. As a result, this document will provide different spectral data product level definitions for MSI and HSI datasets. Although a consistent set of data product level definitions used by all agencies for both spectral and non-spectral systems would simplify matters, developing universal data product level definitions is beyond the scope of this information guidance.



## Contact Information

### NGA/Research (NGA/R)

Mail Stop N74-IB  
7500 GEOINT Drive  
Springfield, VA 20150  
USA  
Telephone 571-557-2815

### Harris Corporation

Dr. Barbara Eckstein  
Harris Corporation  
2235 Monroe Street, Mail Stop 2-022  
Herndon, VA 20171  
USA  
Telephone (703) 673-7596  
Email [Barbara.Eckstein@harris.com](mailto:Barbara.Eckstein@harris.com)



## Change Log

Date	Author(s)	Comments	Version
31 Oct 2018	Dr. Barbara Eckstein	Version 1.0 published	1.0



## Table of Contents

Executive Summary .....	ii
Contact Information .....	iii
Change Log .....	iv
Table of Contents .....	v
List of Figures .....	v
List of Tables .....	v
1 The Concept of Data Product Levels .....	1
1.1 Introduction .....	1
1.2 Background .....	1
1.3 Data Product Levels and the Data Processing Chain .....	1
1.4 Utility of Data Product Levels .....	2
1.5 Data Product Levels in the NSG .....	2
2 NSG Data Product Levels for MSI Systems .....	3
2.1 MSI Level 0: Raw Data .....	4
2.2 MSI Level 1: Packaged Raw Data .....	4
2.3 MSI Level 2: Partially Processed Products .....	4
2.4 MSI Level 3: Primary Exploitable Products .....	5
2.5 MSI Level 4: Secondary Exploitable Products .....	5
2.6 MSI Level 5: Intelligence Products .....	6
3 NSG Data Product Levels for HSI Systems .....	7
3.1 HSI Level 0: Initial Products .....	8
3.2 HSI Level 0P: Partially Processed Products .....	8
3.3 HSI Level 1: Primary Exploitable Products .....	9
3.4 HSI Level 2: Derived Quantity Products .....	9
3.5 HSI Level 3: Intermediate Exploitation Products .....	10
3.6 HSI Level 4: Mission Products .....	11
3.7 HSI Level 5: Intelligence Products .....	11
4 Comparison of MSI and HSI Data Product Levels .....	12
Acronyms and Abbreviations .....	13

## List of Figures

Figure 1. Flow Diagram for Data Processing Levels .....	2
Figure 2. Relationships Among MSI and HSI Data Processing Levels .....	12

## List of Tables

Table 1. NSG MSI Data Product Levels .....	3
Table 2. NSG HSI Data Product Levels .....	7



# NSG Data Product Levels for Spectral Datasets Information Guidance

## 1 The Concept of Data Product Levels

### 1.1 Introduction

Software developers, data modelers, data storage decision makers, and other data science professionals often discuss data products in terms of broad categories, i.e., data product levels. Many organizations rely on internal definitions of data product levels, which are often very different from data product levels in use by other organizations even when all organizations are dealing with the same phenomenology. As a result, well-understood definitions of these data product levels are required. This Information Guidance (IG) standard provides the definitions of data product levels for spectral datasets, i.e., multispectral imagery (MSI) and hyperspectral imagery (HSI) data products.

### 1.2 Background

Many data processing centers use the concept of data product levels to characterize datasets created by the data processing chain. Data product levels are a means of categorizing datasets in terms of their content and utility and are a tool for quickly identifying datasets appropriate for different users' needs. For example, the National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), and International Society for Photogrammetry and Remote Sensing (ISPRS) have separately defined levels for processing data, from unprocessed Level 0 datasets to highly processed Level 4 datasets<sup>A</sup>. Although the NASA, NOAA, and ISPRS data product level definitions are similar, they are not identical. Note that data product levels are independent of product format.

The National System for Geospatial Intelligence (NSG) has developed its own definitions of data product levels for several sensor systems, from Level 0 to Level 5<sup>B</sup>, but these are not necessarily used throughout the NSG Enterprise. The NSG definition of a data product level often changes with phenomenology. For example, this Information Guidance standard defines MSI Level 0 datasets as “raw data in native format without processing or repackaging” and thus may not be formed images, whereas HSI Level 0 datasets are formed images with no corrections applied.

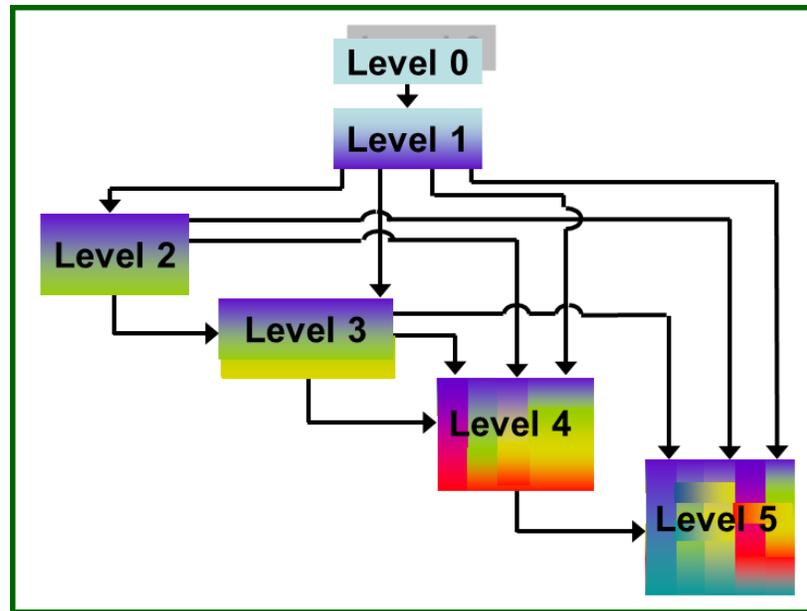
### 1.3 Data Product Levels and the Data Processing Chain

In some cases, data processing may sequentially create a dataset at each data product level. In other cases, data processing may skip product levels, either by combining multiple levels of processing in a single step to create the next dataset, or by utilizing alternate processing or procedures. As a result, depending on the mission needs, the transformation of data products from one level to the next may be simple, i.e., sequential, or complex, i.e., skipping levels (Figure 1). It is usually not possible to reverse the process, i.e., one usually cannot reverse-engineer a lower-level dataset from a higher-level dataset.

---

<sup>A</sup> Information about NASA and NOAA data product levels may be found in the “Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata”, FGDC Document Number FGDC-STD-012-2002.

<sup>B</sup> Although a consistent set of data product level definitions used by all agencies and sensor types would simplify matters, developing universal data product level definitions is beyond the scope of this IG standard.



**Figure 1. Flow Diagram for Data Processing Levels**

In general, the number of data products increases with data product level. For example, there are generally only one or two renditions of a raw dataset (MSI Level 0); hence, in Figure 1 the rectangle signifying a Level 0 dataset is filled with a single color. At MSI Level 4, many different Level 4 products are possible from a single Level 3 parent product, such as an anomalous object detection, matched filter result, and terrain categorization (TERCAT). The multi-colored Level 4 rectangle in Figure 1 reflects the multiplicity of the Level 4 products.

#### **1.4 Utility of Data Product Levels**

Data product level definitions are tools for software developers, data engineers, data modelers, systems integrators, and others who develop and maintain the infrastructure of hardware and software that composes the data processing chain. In the traditional operational and R&D realms, a data exploiter, whether an imagery analyst (IA), imagery scientist, or geospatial analyst (GA), is usually not explicitly aware of data product levels, nor is there any need to explicitly know about them. Even so, most data exploiters are knowledgeable about the processing that has created the datasets that suit their needs.

As a result, most users desire exploitation-ready data (regardless of level number), i.e., the HSI Level 1 and MSI Level 3 primary exploitable products. Users performing R&D tasks, such as developing methods to improve signal-to-noise ratio and repair bad pixels, will prefer lower level, i.e., raw or near-raw, products. Decision makers require the highest-level intelligence products, which generally are derived products that may or may not contain pixel data.

#### **1.5 Data Product Levels in the NSG**

The NSG traditionally uses data product levels to define the architecture components that process and host the data products. The NSG also often defines storage policy by data product level.



NSG definitions of data product levels are usually created independently for each sensor type, and there is no requirement for sensor-independent data product levels. Because MSI and HSI systems evolved along separate lines within the NSG, MSI and HSI data product levels were defined by different groups and are unfortunately neither the same nor standardized. One consequence is that the data product levels cited in NSG storage policy vary with sensor type. Only one NSG set of data product level definitions is known to have been registered in the NSG Standards Registry as information guidance for a particular sensor type.

## 2 NSG Data Product Levels for MSI Systems

NSG multispectral data product level definitions are included in this Information Guidance document and summarized in Table 1. The dataset names and definitions in Table 1 are deliberately designed to apply to both MSI and non-MSI systems, such as panchromatic imagery. Therefore, they may apply to satellite, airborne, ground-based, and other sensor platforms, and to both imaging and non-imaging sensors. The generality is deliberate, so that these concepts may be separated from sensor-specific details, which in turn allows designers of other sensor systems to apply these definitions to their data-processing architectures. Sensor specifics are confined to the descriptions of data, metadata, examples, and typical users.

**Table 1. NSG MSI Data Product Levels**

Level	Product Name	Definition
Level 0	Raw Data	Raw data in its native format. No processing or repackaging has taken place.
Level 1	Packaged Raw Data	Raw data are packaged, e.g., by demodulation or decryption, and may be reformatted for the purpose of standardization, understandability, storage, transmittal, etc. No processing has taken place.
Level 2	Partially Processed Products	Data are partially processed. Partial processing means that some processing has been performed but the processing required by the majority of the user community has not been applied.
Level 3	Primary Exploitable Products	Processed data suitable for the majority of exploitation tasks. Data should be standardized to the extent possible to maximize interoperability with exploitation tools and techniques and dissemination controls.
Level 4	Secondary Exploitable Products	Products derived by exploiting or manipulating one or more Level 4 or lower-level products. Products may or may not be useable for exploitation tools and techniques.
Level 5	Intelligence Products	The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information. When included in an intelligence report, briefing, etc., any sensor-derived data may be illustrative only and not intended for exploitation.



## 2.1 *MSI Level 0: Raw Data*

**Definition:** Raw data in its native format. No processing or repackaging has taken place. All sensor-induced artifacts are still present in the data.

**Difference From Previous Level:** Not applicable.

**Data:** Electro-optical measurements.

**Metadata:** Include but are not limited to the following:

- On-board calibration (if appropriate)
- Ephemeris
- Measurement location(s)
- View geometry
- State of health
- Tasking information
- Detector settings

**Example:** Raw downlink from the sensor system, decrypted (if applicable).

**Typical Users:**

- Engineers monitoring system health
- Automated processing algorithms
- R&D

## 2.2 *MSI Level 1: Packaged Raw Data*

**Definition:** Raw data are packaged, e.g., by demodulation or decryption, and may be reformatted for the purpose of standardization, understandability, storage, transmittal, etc. No processing has taken place. All sensor-induced artifacts are still present in the data.

**Difference From Previous Level:** Data are repackaged to facilitate data processing and interoperability, not necessarily in a unified data model.

**Data:** Same as Level 0.

**Metadata:** Same as Level 0.

**Typical Users:**

- Engineers monitoring system health
- Automated processing algorithms
- R&D

## 2.3 *MSI Level 2: Partially Processed Products*

**Definition:** Data are partially processed, i.e., some processing has been performed but the processing required by the majority of the user community has not been applied.

**Difference From Previous Level:** Data from previous level(s) are partially processed to reduce or remove sensor artifacts from the raw or near-raw data. Metadata may be added so that downstream users and algorithms can properly account for sensor artifacts and resultant corrections.



**Data:** Many combinations of optional processing, possibly with applied corrections for artifacts and noise.

**Metadata:** Same as Level 1 with the addition of artifact and/or noise correction metadata and of NSG-required metadata for processing, exploitation, storage, search, retrieval, and discovery (interoperability).

#### **Examples**

- At-aperture digital number image without bad pixel repair
- Partially formed image

**Typical Users:** Users who require specialized preprocessing, such as:

- Scientific users who apply exploitation techniques that require minimally processed data to achieve desired results
- Engineers verifying that the processing algorithms are working as designed
- Users who may require metadata not typically provided with higher-level products

### **2.4 MSI Level 3: Primary Exploitable Products**

**Definition:** Processed data suitable for the majority of exploitation tasks. Data should be standardized to the extent possible to maximize interoperability with exploitation tools, exploitation techniques, and dissemination controls.

**Difference From Previous Level:** The dataset contains information acceptable to a large portion of the user community. Data may be compensated for actual physical response of the sensor (radiometric calibration) and/or location information on a per-pixel basis. Data may be transformed into image space, normalized for sensor response, or geographically located, or the user may perform these functions by using the supplied metadata.

**Data:** Many combinations of optional processing. May include applied artifact corrections or the metadata to make these corrections.

**Metadata:** Relevant metadata from Level 2, including artifact correction metadata, perhaps with some deletions, and with additional radiometric and/or calibration and/or geolocation metadata. May combine and/or create new and/or different metadata, plus the addition of NSG-required metadata for exploitation, storage, search, retrieval, and discovery (interoperability).

**Example:** At-aperture radiance image after bad pixel repair.

**Typical Users:** Majority of analysts and scientists, both operational and R&D.

**Note 1:** These files are those typically stored in the NSG data repositories.

**Note 2:** This product level is likely the one requested most often by users as it supports a large part of the mission trade space. As a result, this level is the basis for many higher-level products. From this point forward, there is divergence in the data products. In other words, a single MSI Level 3 product may easily spawn a dozen or more Level 4 products, such as those listed in Section 2.5, as different exploitation techniques are applied.

### **2.5 MSI Level 4: Secondary Exploitable Products**

**Definition:** Products derived by exploiting or manipulating one or more Level 4 or lower-level products. Products may or may not be useable for exploitation tools and techniques. For



example, a Level 4 surface reflectance product is often further exploited, whereas a Level 4 annotated detection graphic is not usually exploited further.

**Difference From Previous Level:** The data have now been transformed for specific user needs. The application defined the data product in terms of its content and metadata.

**Data:** Unique to each product type.

**Metadata:** Unique to each product type, with the addition of NSG-required metadata for exploitation, storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- Ground leaving radiance image after atmospheric compensation
- Surface reflectance product
- Pan-sharpened MSI
- Anomalous object detection
- Annotated detection graphic
- TERCAT product
- Ortho-rectified at-aperture radiance image

**Typical Users:** Both analysts and scientists, operational and R&D.

**Note:** Product level for those using object-based production and structured observation management (OBP/SOM) approach to create products.

## **2.6 MSI Level 5: Intelligence Products**

**Definition:** The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information. When included in an intelligence report, briefing, etc., any sensor-derived data may be illustrative only and not intended for exploitation.

**Difference From Previous Level:** For a Level 5 product, a user or machine has taken a Level 1, 2, 3, or 4 MSI product and added the ancillary information to complete the intelligence product.

**Data:** Unique to each product type.

**Metadata:** Unique to each product type, with the addition of NSG-required metadata for storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- First Look (FL)
- NGA Intelligence Brief (NIB)
- Supplemental Intelligence Report (SUPIR)

**Typical Users:** Both analysts and scientists, operational and R&D, as well as senior officials and decision makers who may not be subject matter experts for the particular sensor system(s) used to create the intelligence product.

**Note:** This type of product will likely be used in a decision-making process, and may also be used in an R&D effort. These products should be accessible to members of the broader Intelligence and DoD communities, including senior officials, who may not be experts in the specifics of the particular sensor system.



### 3 NSG Data Product Levels for HSI Systems

NSG hyperspectral data product level definitions are included here and summarized in Table 2 below. The dataset names and definitions in Table 2 are deliberately designed to apply to state-of-the-art HSI systems. They may apply to satellite, airborne and ground-based HSI sensors.

**Table 2. NSG HSI Data Product Levels**

Level	Product Name	Definition
Level 0	Initial Products	Initially collected radiometric data that represent information in the spatial, spectral, and temporal order observed by the instrument; often the first representation of an image. No processing has been performed outside of possible reformatting. Metadata required to produce subsequent data products are included.
Level 0P	Partially Processed Products	Data are partially processed. Partial processing means that some processing has been performed but the processing required by the majority of the user community has not been applied. For example, spectral smile may not yet be corrected.
Level 1	Primary Exploitable Products	Best representation of at-aperture radiance suitable for the majority of exploitation tasks with system-induced artifacts corrected (e.g., non-uniformities, spectral smile, bad pixels). Metadata have been reduced to those required only for exploitation and subsequent processing. Data should be standardized to the extent possible to maximize interoperability with exploitation tools and techniques and dissemination controls.
Level 2	Derived Quantity Products	At-aperture radiance (Level 1) data converted into units characterizing a physical quantity related to scene materials. For example, deriving a ground-leaving radiance image by estimating and then compensating for atmospheric effects. Examples include reflectance, emissivity, temperature, and ground-leaving radiance. Some data providers deliver this product for analysis and/or exploitation.
Level 3	Intermediate Exploitation Products	Intermediate analysis products derived by exploiting or manipulating one or more lower-level products. Level 3 HSI products provide information for further evaluation, processing, and assessment within context. Examples include spectral matched filter results, shapefiles denoting detected regions of interest (ROIs), and signature plots.
Level 4	Mission Products	Mission- and customer-specific exploitation products, either standard or advanced research products. Includes annotated graphics indicating material identification, data fusion products, TERCAT products, etc.
Level 5	Intelligence Products	The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information. When included in an intelligence report, briefing, etc., any sensor-derived data may be illustrative only and not intended for exploitation.



### **3.1 HSI Level 0: Initial Products**

**Definition:** Initially collected radiometric data that represent information in the spatial, spectral, and temporal order observed by the instrument after decompression (if applicable). Level 0 products are often the first representation of an image. No processing has been performed outside of possible reformatting, and all sensor-induced artifacts are still present in the data. Metadata required to produce subsequent data products are included.

**Difference From Previous Level:** Not applicable.

**Data:** Electro-optical measurements.

**Metadata:** Include but are not limited to the following:

- On-board calibration (if appropriate)
- Ephemeris
- Measurement location(s)
- View geometry
- State of health
- Tasking information
- Detector settings

**Example:** At-aperture digital number image without bad pixel repair.

**Typical Users:**

- Engineers monitoring system health
- Automated processing algorithms
- R&D

**Note:** HSI Level 0 is typically an engineering product, not an exploitation product.

### **3.2 HSI Level 0P: Partially Processed Products**

**Definition:** Data are partially processed, i.e., some processing has been performed but the processing required by the majority of the user community has not been applied. For example, spectral smile, bad pixels, non-uniformities, and other sensor-induced artifacts may not yet be corrected.

**Difference From Previous Level:** Data from previous level(s) are partially processed to reduce or remove sensor artifacts from the raw or near-raw data. Metadata may be added so that downstream users and algorithms can properly account for sensor artifacts and resultant corrections.

**Data:** Many combinations of optional processing, possibly with applied corrections for artifacts and noise.

**Metadata:** Same as Level 0 with the addition of artifact and/or noise correction metadata and of NSG-required metadata for processing, exploitation, storage, search, retrieval, and discovery (interoperability).

**Examples**

- At-aperture radiance image without spectral smile correction
- At-aperture digital numbers with non-uniformity correction



**Typical Users:** Users who require specialized preprocessing, such as:

- Scientific users who apply exploitation techniques that require minimally processed data to achieve desired results
- Engineers verifying that the processing algorithms are working as designed
- Users who may require metadata not typically provided with higher-level products

**Note:** The “P” in the term “Level 0P” is a mnemonic that stands for “partial” or “partially processed.”

### **3.3 HSI Level 1: Primary Exploitable Products**

**Definition:** Best representation of at-aperture radiance suitable for the majority of exploitation tasks, with system-induced artifacts corrected, such as non-uniformity correction, spectral smile compensation, spectral keystone compensation, and/or bad pixel repair. Metadata have been reduced to those required only for exploitation and subsequent processing. Data should be standardized to the extent possible to maximize interoperability with exploitation tools and techniques and dissemination controls.

**Difference From Previous Level:** The dataset contains information acceptable to a large portion of the user community. Data are compensated for actual physical response of the sensor (radiometric calibration), and geocoordinates are available for all pixels. Data may be transformed into image space, normalized for sensor response, or geographically located, or the user may perform these functions by using the supplied metadata.

**Data:** Measurements have been transformed from raw units, e.g., digital numbers, to at-aperture radiometric values.

**Metadata:** Relevant metadata from Level 0 and/or Level 0P, including artifact correction metadata, perhaps with some deletions, and with additional radiometric and/or calibration and/or geolocation metadata. May combine and/or create new and/or different metadata, plus the addition of NSG-required metadata for exploitation, storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- At-aperture radiance image after bad pixel repair and spectral smile correction

**Typical Users:** Majority of analysts and scientists, both operational and R&D.

**Note:** This product level is likely the one that users would most often request as it supports a large part of the mission trade space. As a result, this level is the basis for many higher-level products, i.e., a single HSI Level 1 product may easily spawn a dozen or more HSI Level 2 products as different exploitation techniques are applied.

### **3.4 HSI Level 2: Derived Quantity Products**

**Definition:** Level 1 at-aperture radiance converted into units characterizing a physical quantity related to scene materials. For example, deriving a ground-leaving radiance (or reflectance) image by estimating and then compensating for atmospheric effects. Products include but are not limited to reflectance, emissivity, temperature, and ground-leaving radiance images. Some data providers deliver this product for exploitation.



**Difference From Previous Level:** Data from previous level(s) are atmospherically compensated to remove atmospheric effects between the sensor and the object(s) in the sensor's field of view.

**Data:** Radiometric at-aperture values have been transformed to ground measurements.

**Metadata:** Unique to each product type, with the addition of NSG-required metadata for exploitation, storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- Ground-leaving radiance image after atmospheric compensation
- Surface reflectance image
- Surface emissivity image
- Sea surface temperature image

**Typical Users:** Majority of analysts and scientists, both operational and R&D.

### **3.5 HSI Level 3: Intermediate Exploitation Products**

**Definition:** Intermediate analysis products derived by exploiting or manipulating one or more lower-level products. Level 3 HSI products provide information for further evaluation, processing, and assessment within context.

**Difference From Previous Level:** The data have now been transformed for specific user needs. The application defined the data product in terms of its content and metadata.

**Data:** Unique to each product type.

**Metadata:** Unique to each product type, with the addition of NSG-required metadata for exploitation, storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- Scene spectral characterizations
- Spectral detection of signatures of interest
- Anomalous object detection
- Anomalous object group or cluster analysis
- Principal components analysis (PCA) result
- Covariance matrix
- Whitened data cube
- Text describing features of interest
- Regions of interest with annotated graphics highlighting features of interest
- Spectral matched filter result
- Spectral analysis of objects of interest
- Visual reference images
- Spreadsheet
- A combination of standard products

**Typical Users:** Majority of analysts and scientists, both operational and R&D.



### **3.6 HSI Level 4: Mission Products**

**Definition:** Mission- and customer-specific exploitation products, either standard or individually unique research products. Products may be in hardcopy and/or softcopy. Form and function are dependent upon user requirements.

**Difference from Previous Level:** The data have now been transformed for specific mission needs. The application defined the data product in terms of its content and metadata.

**Data:** Unique to each product type.

**Metadata:** Unique to each product type, with the addition of NSG-required metadata for exploitation, storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- Annotated detection graphic
- Identification graphic
- Data fusion products
- TERCAT product
- Lines of communication (LOC) identification map
- Target characterization and quantification
- Camouflage concealment index

**Typical Users:** Both analysts and scientists, operational and R&D, as well as senior officials and decision makers who may not be subject matter experts for the particular sensor system(s) used to create the intelligence product.

**Note:** This type of product will likely be used in a decision-making process, and may also be used in an R&D effort. These datasets should be accessible to members of the broader Intelligence and DoD communities, including senior officials, who may not be experts in the specifics of the particular sensor system.

**Note:** As algorithms evolve, automated processes may generate HSI Level 4 products.

### **3.7 HSI Level 5: Intelligence Products**

**Definition:** The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information. When included in an intelligence report, briefing, etc., any sensor-derived data may be illustrative only and not intended for exploitation.

**Difference from Previous Level:** For a Level 5 product, a user or machine has taken a Level 1, 2, 3, or 4 HSI product and added the ancillary information to complete the intelligence product.

**Data:** Unique to each product type.

**Metadata:** Unique to each product type, with the addition of NSG-required metadata for storage, search, retrieval, and discovery (interoperability).

**Examples:** Include but are not limited to the following:

- FL
- NIB
- SUPIR

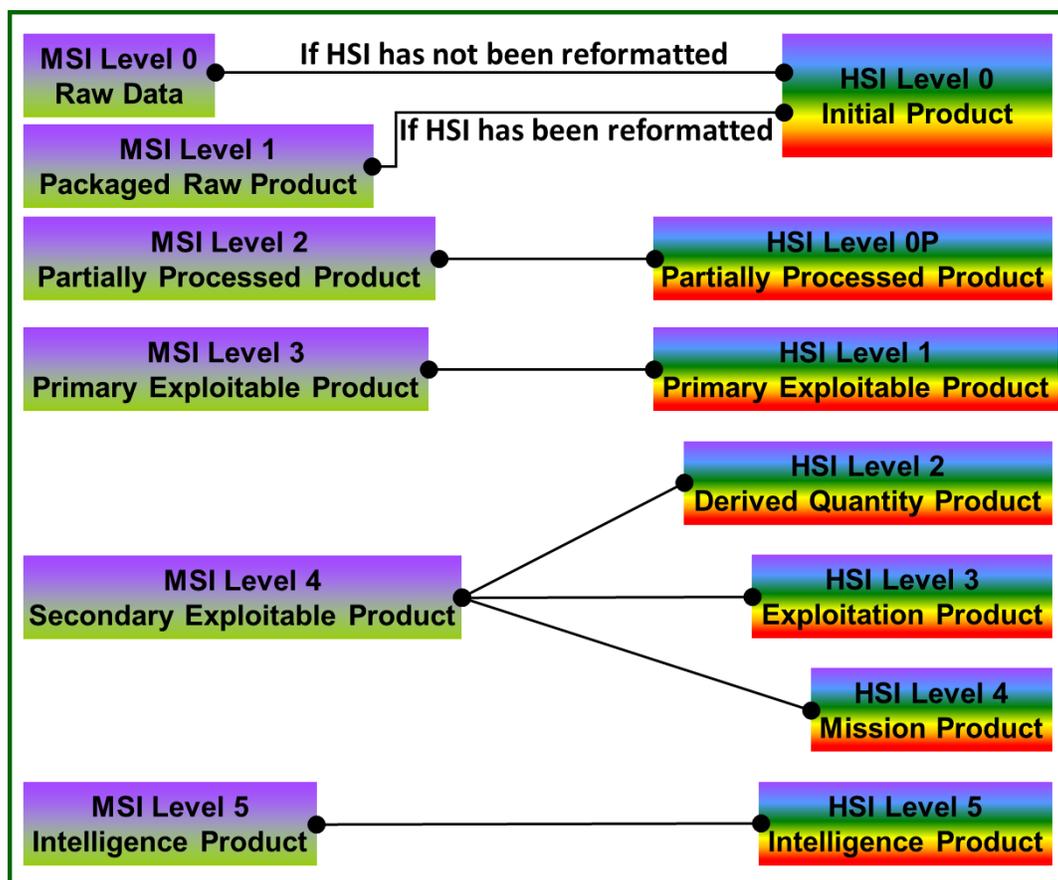


**Typical Users:** Both analysts and scientists, operational and R&D, as well as senior officials and decision makers may not be subject matter experts for the particular sensor system(s) used to create the intelligence product.

**Note:** This type of product will likely be used in a decision-making process, and may also be used in an R&D effort. These datasets should be accessible to the broader Intelligence and DoD communities, including senior officials, who may not be experts in the specifics of the particular sensor system.

## 4 Comparison of MSI and HSI Data Product Levels

Even though MSI and HSI data processing chains are similar, the MSI and HSI data product levels sometimes have different definitions. As a result, there is not always a one-to-one relationship among the MSI and HSI data product levels (Figure 2).



**Figure 2. Relationships Among MSI and HSI Data Processing Levels**

The MSI and HSI Level 0 products are equivalent if the HSI Level 0 products have not been reformatted. If the HSI Level 0 products have been reformatted, then the reformatted HSI Level 0 products equate to the MSI Level 1 products.

The MSI Level 2 and HSI Level 0P products are both characterized as partially processed and thus are equivalent.

Because both MSI and HSI have a primary exploitable product level, MSI Level 3 equates to HSI Level 1.



The MSI Level 4 secondary exploitable products relate to HSI product Levels 2, 3, and 4, because all three HSI product levels are exploitation products created from one or more lower-level products.

Level 5 is the same for both MSI and HSI, i.e., an intelligence product.

## Acronyms and Abbreviations

DoD	U.S. Department of Defense
FGDC	Federal Geographic Data Committee
FL	First Look
GEOINT	Geospatial Intelligence
GWG	Geospatial Intelligence Standards Working Group
HSI	Hyperspectral Imagery
ISPRS	International Society for Photogrammetry and Remote Sensing
IT	Information Technology
Level 0P	Level 0 Partial
MSI	Multispectral Imagery
NASA	National Aeronautics and Space Administration
NGA	National Geospatial-Intelligence Agency
NGA/R	NGA, Research Directorate
NGA/TACQ	NGA, Chief Information Office and IT Services Directorate, Transformation Services Group, Enterprise Test Evaluation and Certification Office, Image Quality Division, aka NIQU
NIB	NGA Intelligence Brief
NIQU	NGA Image Quality and Utility, i.e., NGA/TACQ
NITF	National Imagery Transmission Format
NITFS	National Imagery Transmission Format Standard
NOAA	U.S. National Oceanic and Atmospheric Administration
NSG	National System for Geospatial Intelligence
NTB	NITFS Technical Board
R&D	Research and Development
SIG	Standards Information Guidance
SPECTDL	Spectral Data product Levels
STD	Standard
SUPIR	Supplemental Imagery Report
TERCAT	Terrain Categorization
U.S.	United States of America
U.S.A.	United States of America
VA	Virginia