# 21AT

# TRIPLESAT CONSTELLATION PRODUCT MANUAL
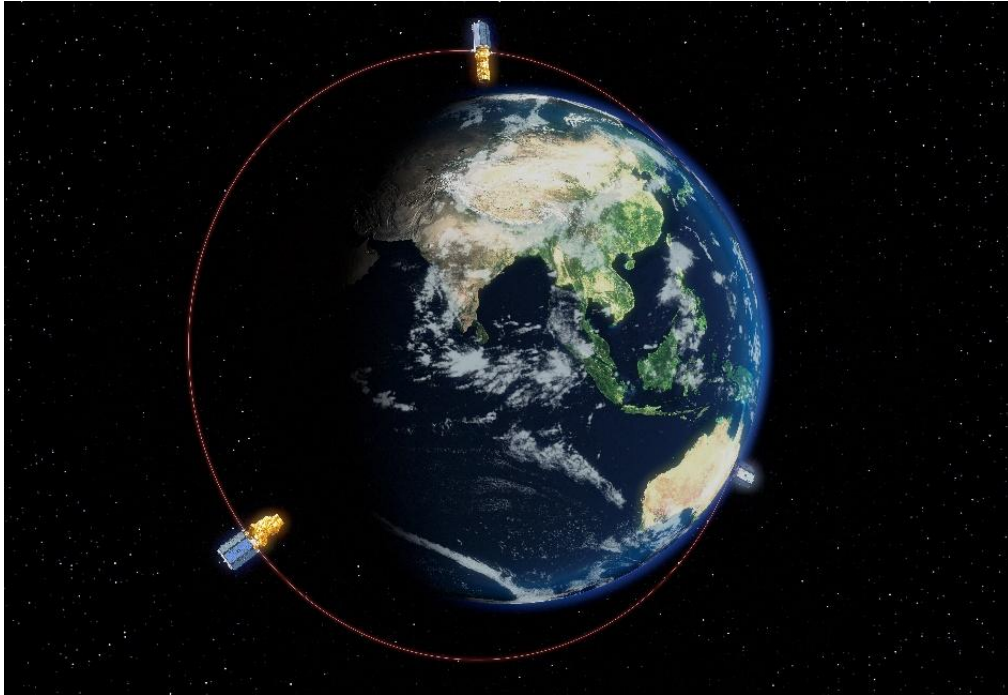
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# 1    INTRODUCTION

**This product guide provides customers with a detailed description of TripleSat Constellation, its Imagery Products, including product levels, specifications, available options, tasking levels and delivery methods. It is intended for an external audience and is 21AT's official product offering.**

# 2    TRIPLESAT   CONSTELLATION



TripleSat-1, TripleSat-2 and TripleSat-3 are phased 120°/33 minutes after each other in the same orbit

The 21AT TripleSat Constellation consists of three identical high-resolution satellites, providing 0.8m PAN and 3.2m MS imaging capabilities. TripleSat Constellation was launched on 10 July 2015. Two months after the launch, they are phased by the propulsion system to the designated positions, 33 minutes/120° apart. The propulsion system will continuously maintain the satellite positions over the lifetime of TripleSat Constellation. All three satellites had been handed over by the satellite manufacture in the end of March 2016 and the commercial operation service from TripleSat Constellation had started in the beginning of April 2016.

**The unique daily targeting capability:** The maximum off-pointing angel of TripleSat is 45.    At 35°, with three satellites in a constellation, it is capable of targeting anywhere on the Earth once per day that is illustrated in the table below:

**Information of Revisit period at different latitudes**

| Latitude | Off-pointing   / revisit period | | | |
|---|---|---|---|---|
| | 5° | 15° | 25° | 35° |

| | | | | |
|---|---|---|---|---|
| **0°** | 8 days | 3 days | 2 days | Daily |
| **±10°** | 8 days | 3 days | 2 days | Daily |
| **±20°** | 8 days | 3 days | 2 days | Daily |
| **±30°** | 7 days | 3 days | 2 days | Daily |
| **±40°** | 7 days | 2 days | 2 days | Daily |
| **±50°** | 6 days | 2 days | Daily | Daily |
| **±60°** | 4 days | 2 days | Daily | Daily |
| **±70°** | 3 days | Daily | Daily | Daily |
| **±80°** | 2 days | Daily | Daily | Daily |

| Satellites Technical and Orbit Information | |
|---|---|
| **Satellite Orbit** | Sun-synchronous, altitude of 651km |
| **LTAN** | 1030hrs |
| **Optical Sensor GSD** | Panchromatic: 0.8m (nadir) \| Multispectral (R, G, B, NIR): 3.2m (nadir) |
| **Swath** | 24km |
| **Digitisation** | 10 bits |
| **Off-nadir capability** | +/- 45 degrees |
| **Projected mission life** | 10 years |
| **Image file format** | GeoTIFF/TIFF |
| **Safety & Security** | 128bit AES encryption of all command, telemetry and payload data. |
| **Compression** | JPEG-LS configurable |
| | Contract Value | In Orbit Result |
| **SNR** | All bands > 100:1 | 145 - 230 |
| **Geo-Location** | < 50m | <20m |
| **MTF at Nyquist** | Panchromatic: 10% <br> Multispectral: 20% | Panchromatic: 17.3% - 20.6% <br> Multispectral: 24.3% - 39% |

The Benefits of TripleSat Constellation to Worldwide Customers:

- Dependable data source for operational monitoring
  - Able to target anywhere on the Earth once per day with high resolution image
- The best combination of spatial resolution and time resolution
  - <1m GSD with 24km swath
- Compatible technical specifications with those of IKONOS
  - Well understood applications
- Three cross calibrated, identical satellites
  - Convenience for data integration
- Cloud free image selection for efficient download
  - Enabled by large on-board memory
- Acquisition capacity of half million km$^2$ per day

# 3 IMAGERY ACQUISITION

## 3.1 TASKING

There are three tasking options for 21AT imagery products: Standard, Priority and Emergency. As each tasking option offers varying level of service and benefits, the customer should select the option that aligns best with their needs, with regards to collection window, cloud cover protection, and price. Tasking orders have single or multiple acquisition opportunities and different customer-defined tasking parameters, depending on the selected tasking type.

For Standard and Priority, 21AT offers a 0 - 15% default cloud cover. Clouds are defined as pixels through which ground features are obscured either partially or in their entirety due to atmospheric conditions. For a pixel to be considered as cloud-covered, a definite boundary between the affected pixels and the unaffected pixels must be visible. All acquired image strips are assessed for cloud cover. Cloud shadows are not accounted for in the assessment.

### 3.1.1 COLLECTION FEASIBILITY

21AT performs physical studies on all tasking orders prior to acceptance of the order:

**Physical Feasibility** assesses the number of times that the satellites have physical access to your target based upon the parameters you provide. Items that affect physical feasibility include off-nadir angle (wider angles have more accesses than narrow angles), latitude, and collection windows (the larger the collection window, the more access the satellites will have).

### 3.1.2 STANDARD TASKING

- Standard Tasking offers flexibility to specify the collection window, or to go with our suggested window

- You may specify the length of collection window, up to a maximum of 365 days. The minimum imaging window length of the standard tasking for two along track scenes is 45 days, but longer may be required depending on the prevailing cloud forecast or the size of the area of interest.
- If the customer's collection window has a low probability of success, then 21AT will suggest an alternative collection window. You may confirm the order with your original collection window; however, the possibility of partial delivery must be accepted. It must be recognised that 21AT's suggested collection window will provide the highest likelihood of success.
- Partial delivery means that any imagery collected is delivered and is chargeable based on the proportion of the area of interest successfully imaged with low cloud.
- For orders with a high probability of success, a suggested window will not be given since the original window is feasible.
- In the scenario where 21AT is unable to collect a Standard Tasking order in the original tasking window, the customer will be contacted and given the option to cancel the order or extend the collection window.

### 3.1.3 PRIORITY TASKING

Priority Tasking offers a higher level of service to customers than offered for Standard Tasking. Customers are able to request and will be proposed shorter collection windows for Priority Tasking:

- Priority Tasking offers the customer flexibility to set their own collection window, or to go with 21AT's suggested window
- Customer may specify length of collection window that they are interested in, up to 365 days. The priority tasking minimum collection window for two along track scenes is 20 days but longer may be required depending on the cloud cover forecast or the size of the area of interest
- If the customer's collection window has a low probability of success, then 21AT will suggest an alternative collection window. You may confirm the order with your original collection window; however, the possibility of partial delivery must be accepted. It must be recognised that 21AT's suggested collection window will provide the highest likelihood of success.
- For orders with a high probability of success, a suggested window will not be given since the original window is feasible
- 21AT's feasibility assesses physical feasibility at the time of order placement; some factors may change after order confirmation that affects 21AT's ability to fulfil a Priority Tasking order. In the case that 21AT is unable to collect a Priority Tasking order in the original tasking window, the customer will be contacted and given the option to cancel the order or extend the collection window

### 3.1.4 EMERGENCY TASKING

Emergency Tasking should be used when customers have an immediate need for new imagery, and when customers need a guarantee that imagery will be collected on or near a specified date:

- A single collection attempt

- An initial collection window of 1 - 14 days may be provided by the customer. 21AT will either:
  - Perform a feasibility and report back to the customer with the first feasible access date within the customer's requested window, or
  - Accept the Order immediately as per the customer's specific requirement
- Order is guaranteed once confirmed by 21AT
- There is no cloud cover protection for the Emergency Tasking order. The delivered image could contain up to 100% cloud cover
- Only the Bundle options are available
- Orders should be confirmed with 21AT at least 48 hours in advance to ensure tasking, if requested in a shorter timeframe, tasking is not guaranteed. Order confirmation is subject to 21AT business hours. Since Emergency Tasking orders are planned on a first come, first served basis, it is to the advantage of the customer to place and confirm Emergency Tasking orders as early as possible prior to the desired collection date to ensure collection

| Tasking level | Standard Tasking | Priority Tasking | Emergency Tasking |
|---|---|---|---|
| **Minimum order size** | 100 sq km | 100 sq km | 100 sq km<br>*the AOI width should be smaller than 20 km from east to west* |
| **Cloud Cover** | ⩽ 15% | ⩽ 15% | ⩽ 100% |
| **Off nadir Angle** | 0° - 25° | 0° - 25° | 0° - 35° |
| **Standard Sun Elevation Target** | ⩾15° | ⩾15° | ⩾15° |
| **Sun Elevation Conditions** | In low lighting conditions, the quality of imagery may not meet our usual high standards; however, if you are able to use imagery acquired in low illumination conditions, this can also be arranged. | | |
| **Sun Azimuth** | 0° - 360° (as collected) | | |
| **Target Azimuth** | 0° - 360° (as collected) | | |
| **Standard Tasking Window (AOI is within 1 strip)** | 45 days<br>For up to two along track scenes | 20 days<br>For up to two along track scenes | Customer select<br>Customer should confirm order 48 hours before orbit date. |
| **Tasking Conditions** | Standard minimum tasking windows assume good cloud cover and illumination conditions.    In areas with very high cloud cover or other challenges, a longer tasking window may be suggested.    To specify a shorter window, the customer has the option to accept a partial coverage.    In this case any imagery acquired with low cloud cover will be delivered and will be payable, based on the proportion of the area of interest successfully imaged. | | |

TABLE 1: SPECIFICATIONS AND PARAMETERS OF TASKING ORDER

## 3.2    ARCHIVE IMAGE LIBRARY

21AT's TripleSat constellation has a global imagery archive. All imagery is updated in the online portal within 24 hours of collection.

The advantage of having an image library means enabling quick access to imagery needed for your project. Applications include change detection, feature extraction, base mapping or site planning. You can search the TripleSat Constellation archive to assess numerous images which will best meet your project requirements.

Upon locating the required imagery in our portal, simply generate an order form and specify your area of interest and the level of processing you need. For expected delivery times by product and tasking type, please refer to Table 6.

## 3.3 ORDER POLYGON

Each order, whether a tasking or an archive order, scene based or area based, is defined by an Order Polygon. An Order Polygon may contain a minimum of 4 vertices and a maximum of 1,000 vertices, consisting of longitude/latitude (decimal degrees) geographic coordinates on the WGS84 ellipsoid. The order polygon is also referred to as Area of Interest (AOI).

The minimum and maximum size for an order polygon depends on the order type and the product selected. Note that a minimum of 5 km is required for any edge in a polygon. Ordering through providing a *.kml file polygon (Keyhole Markup Language) is the preferred option. If an order polygon is in Shapefile format, the .shp, .shx, and .dbf files must be supplied as a minimum. A shapefile must contain only one polygon.

### 3.3.1 PRODUCT DELIVERY

21AT provides its imagery products to customers on a variety of industry standard image formats and media, as described in the product tables. In addition to imagery products, 21AT also delivers Image Support Data (ISD) files in computer readable text formats.

## 3.4 FILE FORMATS

Imagery Products are currently available in 2 image formats:

- GeoTIFF 1.0
- TIFF 1.0

An example of the files included within our basic product, and the level of data available is shown in Table 2 and Figure 1 below.

| Item | Folder | File-naming | Data Format |
|---|---|---|---|
| Image Data | MS and/or PAN | <imagename>.tif | GeoTIFF |
| Detail Image Metadata | MS and/or PAN | <imagename>.xml | XML |
| Small Browse Image | MS and/or PAN | <imagename>_browser.jpg | JPEG |
| Medium Browse Image | MS and/or PAN | <imagename>_browser.png | PNG |
| Large Browse Image | MS and/or PAN | <imagename>_browser.tif | GeoTIFF |
| Briefly Image Metadata | MS and/or PAN | <imagename>_meta.xml | XML |

| | | | |
|---|---|---|---|
| Rational Polynomial Coefficients | MS and/or PAN | <imagename>_rpc.txt | TXT |
| Thumbnail Image | MS and/or PAN | <imagename>_thumb.jpg | JPEG |

**TABLE 2: 21AT IMAGERY PRODUCTS CONFORM TO WIDELY RECOGNISED STANDARDS OF IMAGERY PRODUCT FORMAT**



► TRIPLESAT_3_PMS_L1_20160407135800_000312VI_012_20160517008001_001001 ► MS

- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001.tif
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001.xml
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001_browser.jpg
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001_browser.png
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001_browser.tif
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001_meta.xml
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001_rpc.txt
- TRIPLESAT_3_MS_L1_20160407135800_000312VI_012_20160517008001_001001_thumb.jpg
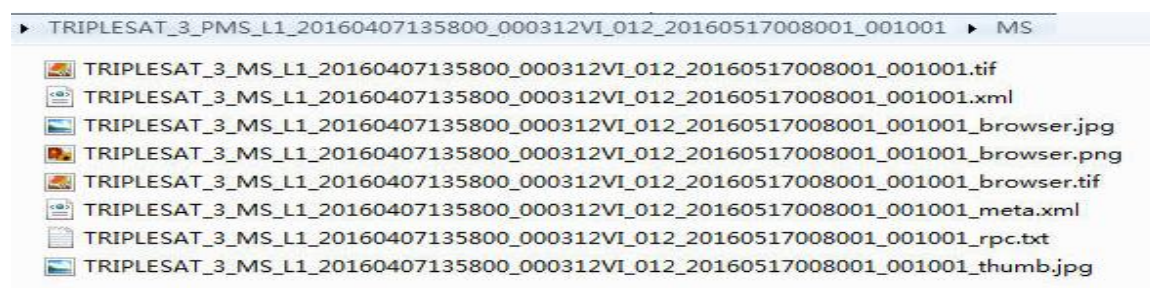
**FIGURE 1: EXAMPLE OF DELIVERABLE FILES WITH 21AT'S STANDARD PRODUCTS**

## 3.5 DELIVERY OPTIONS

21AT provides a variety of direct and timely delivery options for delivering Imagery Products. These options include:

**Standard Delivery Service (Electronic)**: Electronic delivery is used as standard. 21AT supports FTP (pull), where the customer logs on to the 21AT system to retrieve their imagery.

**Physical Delivery Service**: 21AT uses delivery services (FedEx, DHL, UPS) to deliver media directly to the customer in a timely manner. 21AT selects the most reliable and quickest service based on customer location.

## 3.6 MEDIA

21AT supports delivery on DVD and Hard Drives for its imagery products. Customers who select electronic delivery via FTP (pull) can also receive imagery as a physical delivery of media, at an extra charge.

| | PAN | MS (4-band) | Colour (3-band pansharpened) | Pansharpened (4-band) | Bit Depth |
|---|---|---|---|---|---|
| Level 1 Imagery | 934 MB | 233 MB | 2.8 GB | 3.64 GB | 8 |
| (One scene) | 1.82 GB | 467 MB | 5. 6 GB | 7.28 GB | 16 |
| Level 2 Imagery | 1.23 GB | 317 MB | 3.7 GB | 4.92 GB | 8 |
| (One scene) | 2.47 GB | 633 MB | 7.4 GB | 9.84 GB | 16 |

**TABLE 3: TRIPLESAT CONSTELLATION FILE SIZE ESTIMATES IN MB**

## 3.8 FILE NAMING RULES

All TripleSat Constellation imagery products follow naming rules. The names of a TIFF file should include the satellite name and number, band, processing level, image date, tasking ID, scene reference

number, order number and processing reference. For example:

TRIPLESAT_2_MS_L1_20151031015744_0000FBVI_002_20160510003001_004001.tif

**Satellite name：** TripleSat Constellation
**Satellite number：** 1，2，3
**Bands：** MS (Multi-spectral, B, G, R, NIR)
PAN (Panchromatic)
PSH (Pansharpened)
**Processing Level：** L1 (Level 1)
L2 (Level 2)
**Image Date:** UTC time of scene centre
**Tasking ID：** MPS Tasking ID (unique identifier)
**Scene Reference number：** 002 (scene number of full strip)
**Order number**: 20160510003001
**Processing reference**: 004001

## 3.9 RESAMPLING KERNELS

Resampling is necessary to align the pixels in an image to a coordinate grid. 21AT offers the following resampling options:

| Resampling Kernel | Description |
|---|---|
| Nearest Neighbour (NN) | Selects the radiance value from the nearest pixel in the input image; does not alter the radiance values of the original image. This method can result in a blocky or disjointed image because no averaging is performed. |
| 4x4 Cubic Convolution (CC) | Considers nearest 16 pixels synthesizing digital numbers using a polynomial calculation; the default kernel. This method produces a smoother appearance than nearest neighbour method while providing slightly sharper edge detail than the bilinear interpolation method. |

**TABLE 4: TRIPLESAT CONSTELLATION RESAMPLING KERNELS**

## 3.10 PROJECTIONS AND DATUMS

21AT supports the following map projections, ellipsoids, and datums as standard (Table 5):

| Map Projections | Ellipsoids and Datums Supported |
|---|---|
| Geographic (Lat/ Long) | WGS 84 |
| Universal Transverse Mercator (UTM) | WGS 84 |

**TABLE 5: TRIPLESAT CONSTELLATION SUPPORT MAP PROJECTIONS, ELLIPSOIDS AND DATUMS**

## 3.11 DELIVERY TIMELINES

The delivery time for Level 1 and 2 products is 3 working days; For big area orders 21 AT need more time to processing image, the customer will be informed in advance.

# 4 21AT IMAGERY PRODUCTS

## 4.1 PRODUCT OVERVIEW

21AT's imagery products are derived from the high-resolution TripleSat Constellation. Our main products vary depending on processing level and geolocation accuracy. Each product is delivered with a set of support files to assist in analysing or further processing the imagery. All 21AT products are already corrected for radiometric and sensor distortions. Radiometric corrections include relative radiometric response adjustment between detectors, non-responsive detector fill and conversion for absolute radiometry. Sensor corrections include corrections for internal detector geometry, optical distortion, scan distortion, line-rate variations and registration of the multispectral bands.

The product specifications should be specified at the time of order, as reprocessing and redelivery will incur an additional charge.

| Products | Accuracy: CE90 (Circular error at 90% confidence) | Processing | | | Geographic Availability |
| --- | --- | --- | --- | --- | --- |
| | | Radiometrically and sensor corrected | Georectified | Orthorectified | |
| Level 1 | <50m excl. terrain effects | Yes | | | Worldwide |
| Level 2 | <20m excl. terrain effects | Yes | Yes | | Worldwide |

**TABLE 7: CORE PRODUCTS SUITE**

## 4.2 BAND COMBINATIONS OF DATA PRODUCTS

21AT offers three band combination options:

- **Panchromatic (PAN)** - Products include only one band, often referred to as black and white. The ground sampling distance (GSD) (pixel size) is less than 1m.
- **Multispectral (MS)** - Products include 4 MS bands located in the blue, green, red and near infrared (NIR) spectral regions. The GSD (pixel size) is less than 4m.
- **Bundle**- Products include both PAN and MS in one package.
- **Pansharpened** - Products combine the visual spectral information of the MS data with the detailed spatial information of the PAN data channel, resulting in a detailed very high resolution colour product.
- 

### 4.2.1 MULTISPECTRAL PRODUCTS

The band sequence for 4-band MS products is in order of shortest wavelength to longest wavelength. The band order in a 4-band MS product is Blue, Green, Red, and NIR. The centre wavelength and band passes (Full Width at Half Maximum, FWHM) are summarized in the table as follows (Table 8):
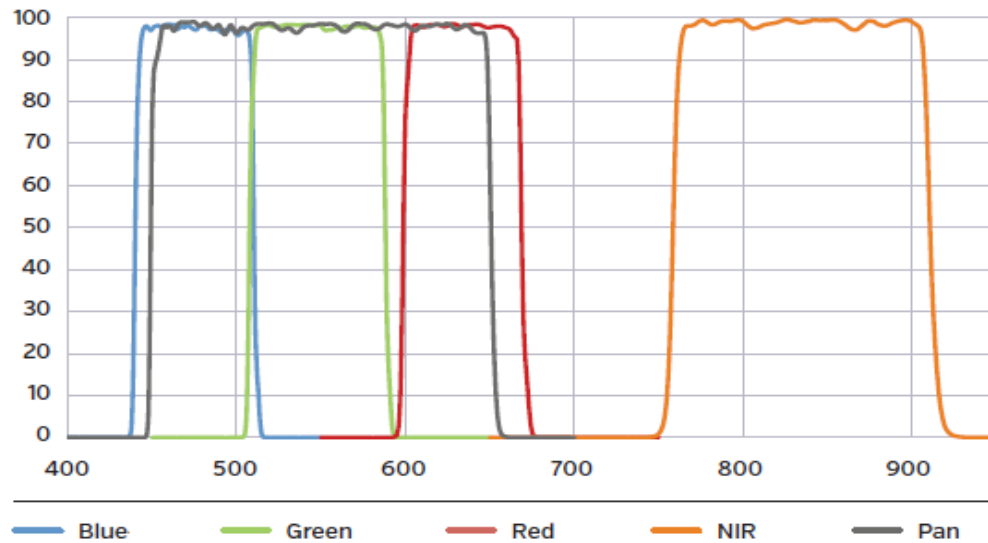
| | Blue | Green | Red | NIR | Pan |
|---|---|---|---|---|---|
| Centre Wavelength | 475 | 548 | 634 | 834 | 550 |
| Band Width FWHM | 70 | 80 | 70 | 151 | 202 |

**TABLE 8: SPECTRAL CHARACTERISTICS**

### 4.2.2 PANSHARPENED PRODUCTS

Pansharpened products are offered as 3-band and 4-band combination products. The 3-band composites are available in Natural Colour (Blue, Green and Red bands) and in Colour Infrared (Green, Red and NIR bands). The 4-band pansharpened version uses the Blue, Green, Red, and NIR bands.

### 4.2.3 BAND OPTION SUMMARY

| Product Type | Pixel Resolution | Image Bands |
|---|---|---|
| PAN | <1 m | Panchromatic |
| MS | <4 m | Blue, Green, Red, NIR |
| Bundle (PAN + 4 bands) | <1 m, < 4 m | Panchromatic, Blue, Green, Red, NIR |
| Natural Colour | <1 m | Blue, Green, Red |
| Colour Infrared | <1 m | Green, Red, NIR |
| Pansharpened (4 bands) | <1 m | Blue, Green, Red, NIR |

**TABLE9: SUMMARY OF PRODUCT BAND OPTIONS**

## 4.3 LEVEL 1 IMAGERY PRODUCTS

Level 1 Products are designed for customers with advanced image processing capabilities. These imagery products, when combined with the supplied attitude, ephemeris and camera model information, are suitable for advanced photogrammetric processing (i.e. orthorectification).

Each unique image in a Level 1 Product is processed individually; seamlines may be visible in products requiring multiple images to cover the area of interest. Level 1 products are available in Pan, MS, and Bundle. Pansharpening option is not available with a Level 1 Product.

**Processing**: Level 1 imagery products are (1) radiometrically corrected and (2) sensor corrected, but not projected to a plane using a map projection or datum. The sensor correction process projects each pixel into the synthetic array to form the image. The resulting GSD varies over the entire image because the look angle gradually changes across the field of view.

**Accuracies**: The Level 1 imagery product is in the satellite frame of reference; it is not tied to ground location, and is therefore a geometrically raw product with no implied accuracy. However, when the data is processed with the supplied refined Image Support Data (ISD) (Table 10) and user-supplied DEMs and GCPs, horizontal accuracies of at least 50 m (CE90), can be achieved.

### 4.3.1    SPECIFICATIONS TABLE FOR LEVEL 1 IMAGERY

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for Level 1 imagery products.

| Physical Characteristics - Level 1 Imagery | |
|---|---|
| Minimum Orderable Area | 25 km$^2$ |
| Product Framing | AOI-based |
| **Processing Specifications** | |
| Absolute Geolocation Accuracy (Nadir) | Geometrically raw. With supplied image support data imagery can be processed to <50 m (CE90), excluding terrain effects. |
| **Product Parameters** | |
| Product Options | Pan, 4 bands, Bundle |
| Number of Bits per Pixel in Delivered Product | 8 or 16 |
| Resampling Options | 4x4 CC |
| Output Pixel Spacing | <1m, <4m |
| Cloud Cover | 0 - 15% default, other options available upon request |
| **Delivery Parameters** | |
| Output Product Delivery Media Options | File Transfer Protocol (FTP) Pull, DVD, Hard Drive |
| Image Data Format Options | TIFF |
| **Image Support Data** | |
| ISD Files Supplied to Customer | Shape files, browse image, image metadata file (include ephemeris, attitude and geometric calibration); RPC file; |

**TABLE10: PHYSICAL CHARACTERISTICS OF LEVEL 1 IMAGERY**

## 4.4    LEVEL 2 IMAGERY PRODUCTS

Level 2 imagery products are suitable for users requiring modest absolute accuracy and/or large area coverage, or those wishing to use a product out-of-the-box with minimal further requirement for processing. Users of Level 2 imagery products can use relatively simple applications to exploit the imagery for a wide variety of applications.

**Processing**: Level 2 Imagery products are radiometrically corrected, sensor corrected, and projected to a plane using the map projection and datum of the customer's choice. Level 2 imagery products are available as black & white, colour, or pansharpened with less than 1 m GSD, or MS with less than 4 m GSD.

Level 2 imagery has no topographic relief applied with respect to the reference ellipsoid, making it suitable for further orthorectification. Level 2 imagery is projected to a constant base elevation, which is calculated on the average terrain elevation per order polygon or can be supplied by the customer.

**Accuracies:** For Level 2 imagery product, the geolocation accuracy specification is <20 m (CE90) at nadir. These accuracies are excluding any topographic displacement and off-nadir viewing angle. Ground location is derived from refined satellite attitude and ephemeris information without requiring the use of Ground Control Points (GCPs).

When Level 2 imagery is subsequently processed using supplied RPCs, a high quality Digital Elevation Model (DEM), e.g. DTED Level 2, and sub meter GCPs, accuracies are determined by the sources of the references.

**Physical Structure:** If the order polygon crosses more than one scene, one product is made for each image scene that is used to fulfil the order. As the Level 1 and Level 2 Product is not mosaicked, one product will be delivered for each scene the order polygon intersects. The delivered area for Level 2 Products is the order polygon, black-filled to the Minimum Bounding Rectangle. The following figures show the final product structure for order polygons that fall within a single scene (Figure 3), and that cross multiple scenes (Figure 4).
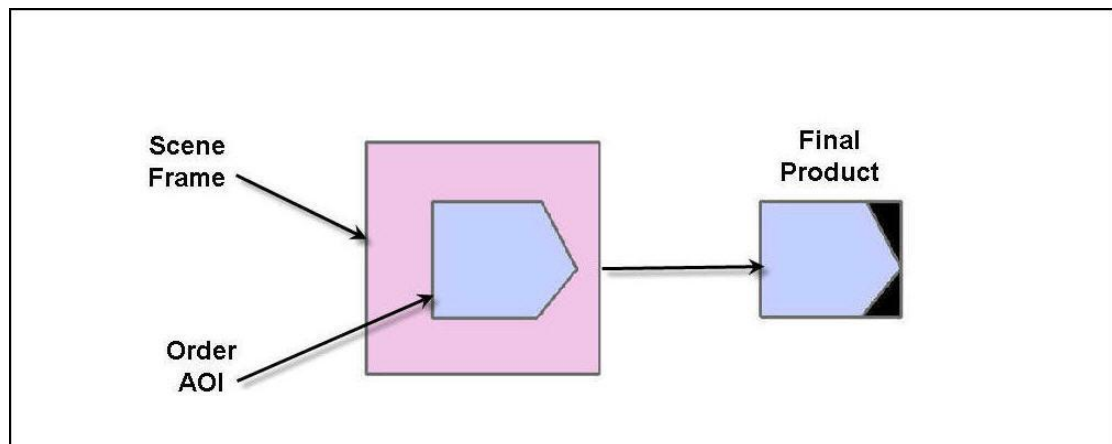


**FIGURE 3: PRODUCT STRUCTURE FOR LEVEL 2 IMAGERY PRODUCTS WITHIN A SINGLE STRIP**
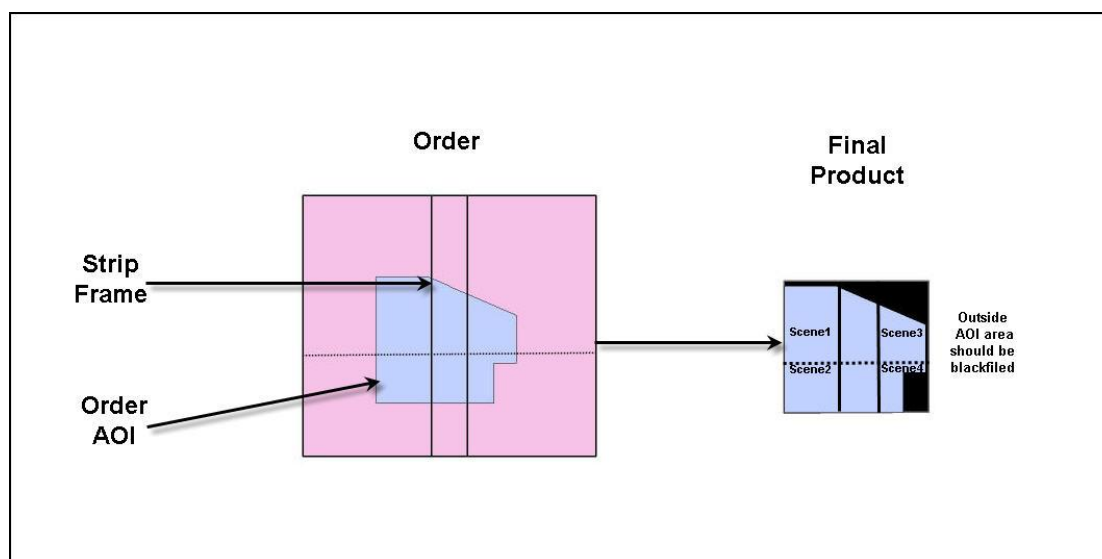
**FIGURE 4: PRODUCT STRUCTURE FOR PROJECTED MULTI-STRIP PRODUCTS**

4.4.1    SPECIFICATION TABLE FOR LEVEL 2 IMAGERY PRODUCTS

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for Level 2 imagery products.

| Physical Characteristics - Level 2 Imagery | |
|---|---|
| Minimum orderable area | 25 km$^2$ (Image library); 100 km$^2$ (New tasking) |
| Product Framing | AOI-based |
| **Processing Specifications** | |
| Absolute geolocation accuracy(nadir) | Geolocation accuracy specification of <20 m CE90 at nadir, excluding terrain effects. |
| **Product Parameters** | |
| Product Options | Pan, 4 bands, Bundle, Natural Colour, Colour Infrared, 4 bands Pansharpened |
| Number of bits per pixel in delivered product | 8 or 16 |
| Resampling option | 4x4 cubic convolution, nearest neighbour, Pansharpening |
| Output file size options | None; Tiling |
| Output pixel spacing | <1 m for pan <4m for MS |
| Output alignment | Rotated to Map North up |
| Cloud Cover | 0-15% default, other options available upon request |
| **Delivery Parameters** | |
| Output product delivery media options | FTP Pull, DVD, Hard Drive |
| Image data format options | TIFF, GeoTIFF 1.0 |
| **Image Support Data** | |
| ISD files supplies to customer | Shape files, browse image, image metadata file(include ephemeris, attitude and geometric calibration ); |

# 5  GLOSSARY

AOI:      Area of Interest

CC:       Cubic Convolution

CE90:     Circular Error at 90% Confidence

DEM:      Digital Elevation Model

DRA:      Dynamic Range Adjustment

DTED:     Digital Terrain Elevation Data (File Format)

FTP:      File Transfer Protocol

GCP:      Ground Control Point

GSD:      Ground Sampling Distance

ISD:      Image Support Data

MS:       Multispectral

MTF:      Modulation Transfer Function

NIR:      Near-Infrared

PAN:      Panchromatic

PSH:       Pan-sharpened Image

UTM:      Universal Transverse Mercator