# RapidEye Image Product Frequently Asked Questions (FAQs)

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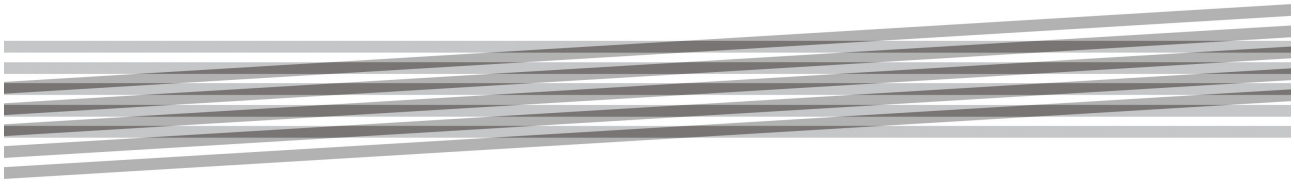

RapidEye

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# General Product Questions

### Can you supply me with customized demonstration products over a specified area?

We can provide you with data that holds similar characteristics to your area of interest and will do our best to provide you with data from the same region, however we will not produce customized test data. For the latest list of demonstration products see: http://www.rapideye.de/home/products/demonstration-products/index.html

### Does RapidEye supply multispectral data?

Yes, the RapidEye sensors provide five band multispectral images with native resolution of 6.5m. The following table lists the spectral range of the five RapidEye bands:

| Band # | Name | Spectral Range (nm) |
|---|---|---|
| 1 | Blue | 440 – 510 |
| 2 | Green | 520 – 590 |
| 3 | Red | 630 – 685 |
| 4 | Red-Edge | 690 – 730 |
| 5 | Near Infrared | 760 – 850 |

All RapidEye Standard Image products are offered with all five spectral bands. The 1B Basic product is offered at the native sensor resolution of 6.5m and the 3A Orthorectified product is offered at a resampled resolution of 5m.

### Does RapidEye supply panchromatic data?

No, the RapidEye sensors are not equipped with a panchromatic band, so we cannot supply panchromatic data.

### What is the positional accuracy of RapidEye products?

The positional accuracy of the RapidEye products varies between countries and regions, depending on available ground control data. Ground control points (GCPs) are used during the cataloging process to refine the locational accuracy of all products. The positional accuracy of the 1B Basic product can be as accurate as 11.0m 1-sigma (23.6m CE90). Our RapidEye 3A Ortho product can be as accurate as 6m 1-sigma (12.7m CE90) depending upon the GCPs and DEM used.

### What is the quality of RapidEye radiometry?

RapidEye continuously monitors acquired image data to ensure long term stability and inter-comparability among all five sensors. In addition, image data is frequently acquired from a number of calibration sites spread worldwide. These statistics are also used to ensure that each band stays within a range of $\pm$ 2.5% from the band mean value across the constellation.

Currently, an on-orbit absolute calibration campaign is underway to determine the validity of the pre-launch calibration.

## What is your band to band registration and multi-temporal pixel to pixel registration accuracy?

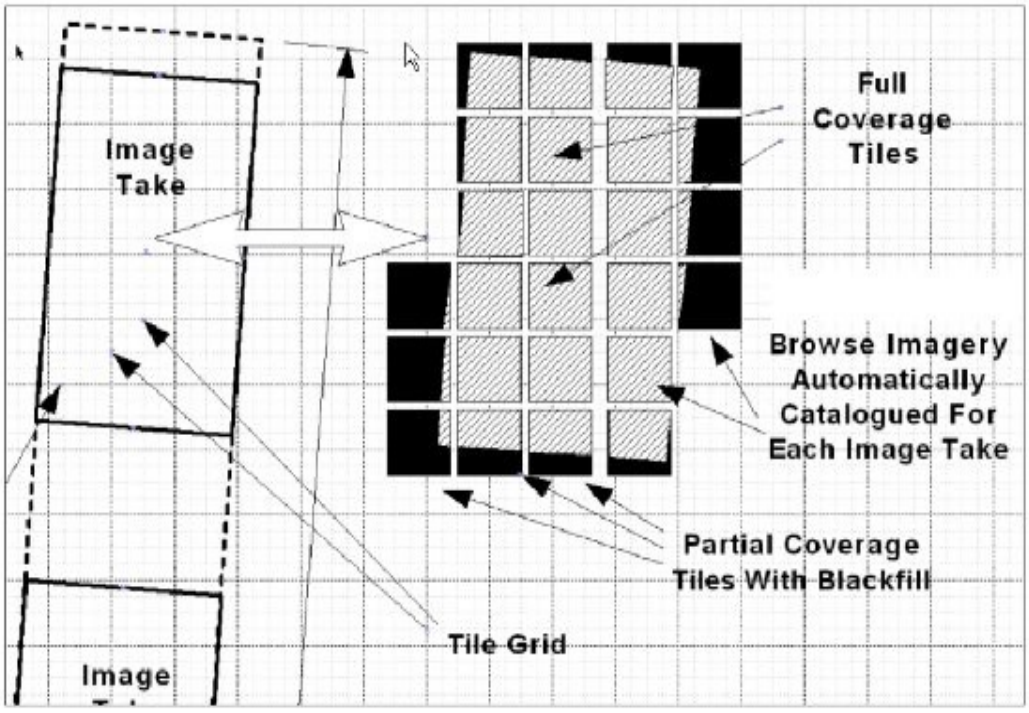
For areas where the terrain slope is below 10°, the band to band co-registration should be within 0.2 pixels or less (1-sigma). For areas with a slope angle of more than 10° and/or areas with a very poor image structure (e.g. sand dunes, water bodies, areas with significant snow cover) the co-registration accuracy may not be met.

The co-registration accuracy of two products from different dates (multi-temporal) is directly related to the accuracy of the products being used. Since each product is produced independently, their geolocation accuracy will vary.

## What is blackfill? Why does my order contain 3A tiles with blackfill and some without blackfill?

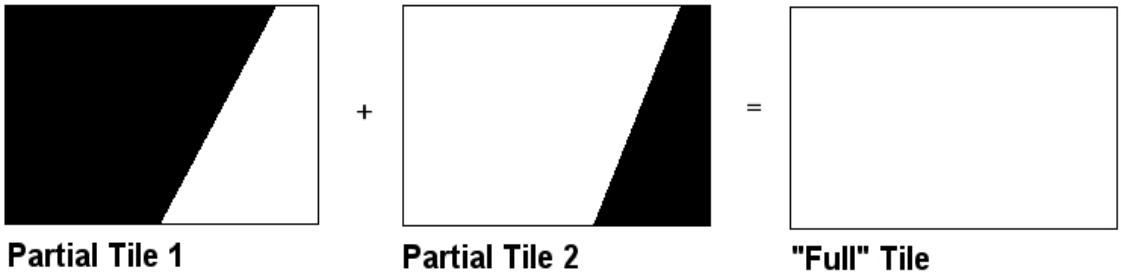
Blackfill within an image product are areas that do not contain valid imagery for that area.

Blackfill in 3A orthorectified tiles is due to the fact that the RapidEye image data, collected in 77km wide Image Takes at a certain inclination, is processed for the 3A products in tiles, that are based on a fixed grid (see also the next FAQ). This results in tiles not always filled with imaged data, as illustrated in the diagram below:




Blackfill within the Area Of Interest (AOI) specified for an order indicates that not all the tiles within the AOI could be collected in a single imaging attempt. In most cases, for tiles with blackfill,

RapidEye will provide complementary tile(s) that will contain the missing data, thus providing full coverage. An example of complementary tiles is shown below:




Blackfill outside of the AOI may or may not occur, and no attempt will be made to provide valid imagery for those areas.

### What is the RapidEye tiling system? How does this correspond to the UTM grid?

The RapidEye tiling system divides the world between +/- 84º into zones based the UTM grid. Each tile is defined by a respective UTM zone, and then by a RapidEye defined row and column number. For example a tile with the ID number of 3354105 is located in UTM zone 33, row 541 and column 05. The tile grid defines 24km by 24km tiles with a 1km overlap, resulting in 25km by 25km tiles.

### Which areas cannot be acquired by RapidEye satellites and why?

All land areas of the world between 84 degrees North and 84 degrees South can be acquired by the RapidEye satellites in normal operational mode. We do exclude water and ice regions, because they do not contain identifiable landmarks. Landmarks (features or points with well known geo-locations) are needed to band align the images and are also used to improve the geo-referencing of the image data.

There are, however, seasonal restrictions on imaging, driven by the need for sufficient illumination levels. In higher latitudes, imaging is restricted during the hemisphere's winter to areas with a sun elevation angle of 30 degrees or more.

The low sun elevation negatively affects our image quality and not the capability to acquire images. Generally speaking, the lower the sun elevation, the darker the image becomes. This affects Central and Northern Europe, Northern Asia and Northern U.S./ Canada in the northern hemisphere's winter and Southern Argentina and Chili, Tasmania and New Zealand in southern hemisphere's winter. Please contact RapidEye if your needs involve imaging areas during low illumination conditions. We will consider every request and advise you on the to be expected image quality.

### What is the difference between the RapidEye Geodata Kiosk and the RapidEye Library?

The RapidEye Geodata Kiosk is an online service for the purchase of ready-to-use satellite imagery. The data is available immediately upon a secure credit card payment. The Geodata Kiosk contains a selected subset of the RapidEye Library. Only ready-to-use, RapidEye level 3A

data, ortho-rectified with five meter pixel imagery is available. The minimum order value is 50 EUR, allowing people to purchase small areas at a reasonable cost. The RapidEye Geodata Kiosk can be accessed through: www.geodatakiosk.com

The RapidEye Library contains the full archive of all acquired and processed 3A and 1B data. The minimum order size for data from the RapidEye Library is 2,500 EUR. Contact your local distributor or RapidEye to learn how to order products from the RapidEye Library.

### What factors are considered when acquiring imagery for the RapidEye Library? I have noticed that some areas are acquired several times a month and other areas haven't been acquired at all!

The RapidEye Library contains all the image data acquired by the RapidEye satellites, as long as it meets the quality standards outlined in the RapidEye Product Specification document and is not restricted by special agreement. This includes all the data acquired in response to customer orders, as long as it meets the two criteria above.

### How can I purchase DEMs from RapidEye?

While the RapidEye system is capable of collecting stereo images and producing digital elevation models (DEMs), they are currently not offered as a standard product. Contact your local distributor or RapidEye directly regarding future availability of DEM products.

### How can I translate the radiance values of a RapidEye image product into reflectance values?

The digital numbers of the RapidEye image pixels represent

- absolute calibrated radiance values for non atmospheric corrected images
- reflectance values for atmospheric corrected images (currently not offered for delivery)

To convert the Digital Number (DN) of a pixel to radiance it is necessary to multiply the DN value by the radiometric scale factor, as follows:

$$RAD(i) = DN(i) * radiometricScaleFactor(i)$$

The resulting value is the Top of Atmosphere (TOA) radiance of that pixel in watts per steradian per square meter ($W/m^2$ sr µm). The radiometric scale factor for each band can be found in the image XML metadata file under the band specific metadata.

Reflectance is generally the ratio of the reflected radiance divided by the incoming radiance. Note, that this ratio has a directional aspect. To turn radiances into a reflectance it is necessary to relate the radiance values (i.e. the pixel DNs) to the radiance the object is illuminated with. This is often done by applying an atmospheric correction software to the image, because this way the impact of the atmosphere to the radiance values is eliminated at the same time. But it would also be possible to neglect the influence of the atmosphere by calculating the Top Of Atmosphere (TOA) reflectance taking into consideration only the sun distance and the geometry of the incoming solar radiation.

The formula to calculate the TOA reflectance not taking into account any atmospheric influence is as follows:

$$REF(i) = RAD(i) \frac{\pi * SunDist}{EAI(i) * \cos(SolarZenith)}$$

with:

i: Number of the spectral band

REF: reflectance value

RAD: Radiance value

SunDist: Earth-Sun Distance at the day of acquisition in Astronomical Units

Note: This value is not fix, it varies between 0.983 289 8912 AU and 1.016 710 3335 AU and has to be calculated for the image acquisition point in time.

EAI: Exo-Atmospheric Irradiance

SolarZenit: Solar Zenith angle in degrees (= 90° – sun elevation)

For RapidEye the EAI values for the 5 bands are:

Blue: 1997.8 W/m²µm

Green: 1863.5 W/m²µm

Red: 1560.4 W/m²µm

RE: 1395.0 W/m²µm

NIR: 1124.4 W/m²µm

# Product Viewing Questions

### What is the best way to view the products?

The best and most convenient way to view the products is to use a GIS/remote sensing software such as ArcGIS ERDAS IMAGINE, PCI Geomatica or others. These software packages allow the user to exploit the full potential of our Standard Image Products with their georeferencing, five image bands and 16 bit data depth. Other image processing programs such as Adobe Photoshop will allow the user to open and view the images but cannot take advantage of the images' georeferencing feature, that places every point in its correct geographic location.

### What can I do if I do not have a suitable GIS/remote sensing software package?

Most of the software companies provide basic viewer programs that are free of charge. Most can be downloaded from the Internet, e.g. for the PCI free viewer go to: http://www.pcigeomatics.com/index.php?option=com_content&view=article&id=91&Itemid=12

### Can I view the products with a common image viewer because I do not want to download or install a special GIS/remote sensing software package?

The GIS/remote sensing programs referred to above are the best approach. Most common basic image processing viewers cannot handle our products with their five bands and 16 bit data. It may happen that these image viewers will only display a black square. In this case, the one remaining option is to view the reduced resolution browse image that accompanies all products. These browse images do not fully represent all the attributes of the parent images.

Note also that few if any of the common viewers will open the NITF files of the 1B product.

### When I view the products with my GIS/remote sensing software the colors I see are very pale and/or dark. What can I do?

For proper viewing please use the image enhancement tools of your image viewer package and adjust the contrast of the imagery as necessary.

### When I view the products with an image processing software like Adobe Photoshop I see the colors very pale and/or dark and the bands seem to be mixed up. What can I do?

Advanced image software programs, like newer versions of Adobe Photoshop, will be able to read and view the first three bands of the RapidEye products. Adjusting the levels and changing the channel combination using the channel mixer might be necessary to achieve a natural look for the imagery. Furthermore, try adjusting the contrast of the imagery for proper viewing.

## Purchasing Products

### Do you grant research/scientific use discounts?

RapidEye does not offer a standard research discount. RapidEye is involved in a DLR RESA program that offers scientific use imagery grants on a case by case basis for researchers associated with German institutions. For more information see: http://www.dlr.de/caf/desktopdefault.aspx/tabid-2657/3990_read-10570/ For researchers not associated with a German institution, please contact RapidEye directly.

### Can you provide me with both 1B and 3A data over my AOI?

Yes, we can provide you with both 1B and 3A data for the same AOI, according to the price list. Please note that each product is priced separately.

### How do I buy data if there is no distributor for my area?

You can purchase data directly from RapidEye if your region does not have a designated distributor. You can email your request and additional questions to: sales@rapideye.de

### What license types does RapidEye offer?

RapidEye offers multiple different license types. For more details of licenses, please contact your local distributor.

# Distributor Information

### How do I become a distributor?

Contact us at: info@rapideye.de for further information.

### How do I find out who the distributor is in my area?

Navigate to http://www.rapideye.de/home/about-us/distributors/index.html to find out who the distributor is for your region. If a distributor for your region does not exist, please contact RapidEye directly at: sales@rapideye.de