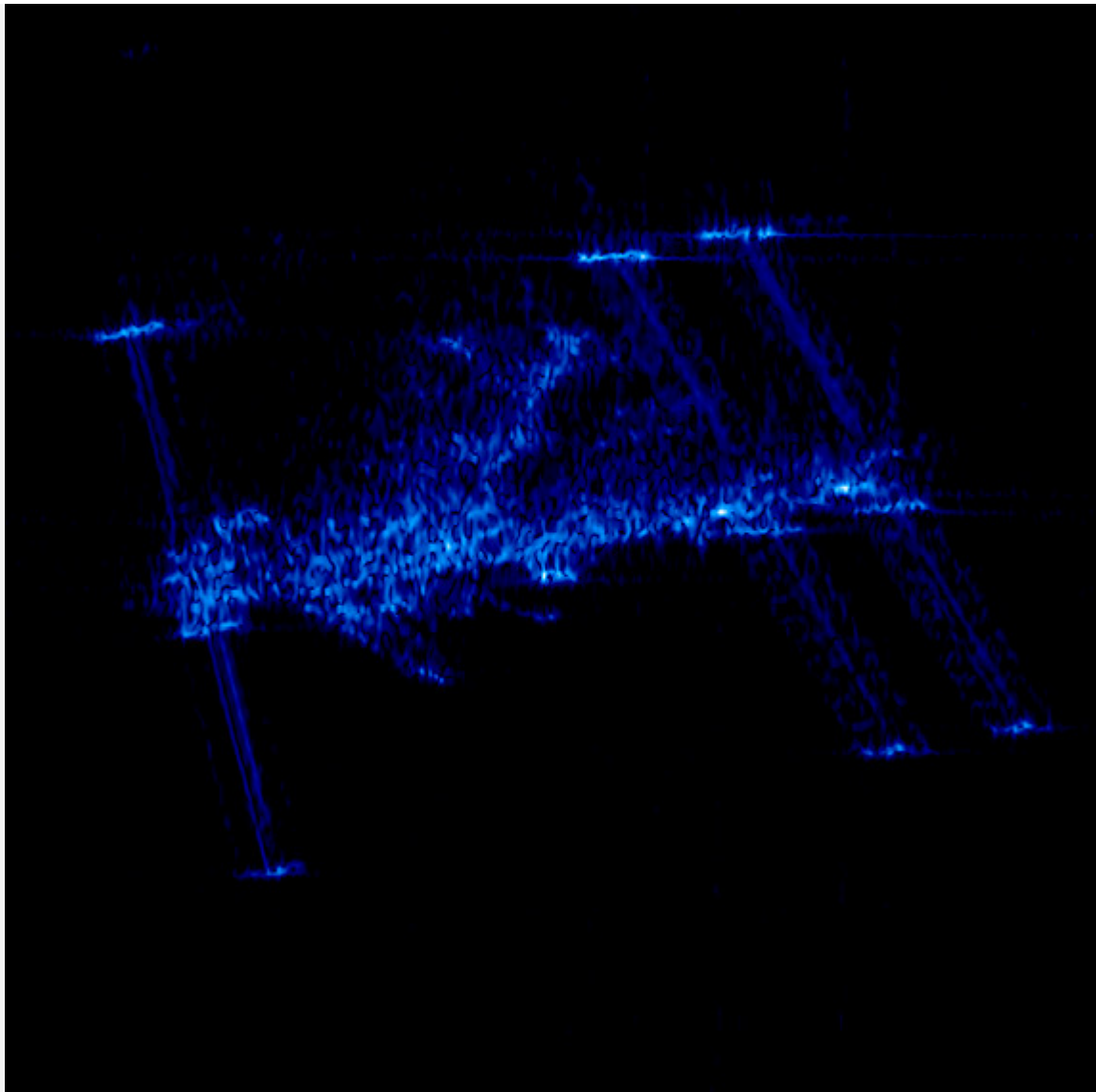


News Archive

TerraSAR-X image of the month: The International Space Station (ISS)

4 March 2010

On 13 March 2008, the International Space Station (ISS) passed across the field-of-view of Germany's remote sensing satellite, TerraSAR-X, at a distance of 195 kilometres (122 miles) and at a relative speed of 34,540 kilometres per hour (over 22,000 mph). The encounter lasted for about three seconds, but this brief moment was long enough for the synthetic aperture radar on TerraSAR-X to acquire an image of the ISS, a structure measuring about 110 metres by 100 metres by 30 metres.



Radar snapshot of the International Space Station (ISS)

Just a few hours before this image was taken, Space Shuttle Endeavour was docked with the ISS as part of the 1J/A mission; its payload was the Japanese Logistics Module. At the time this picture was taken, the ISS was already truly international: the Russian and American modules as well as the European 'Columbus' laboratory were all installed. The impressive solar power plant on the Space Station was almost ready for operation, with six of its eight panels already in position. The orbital configuration that provides the opportunity for a picture like this occurs between 10 and 11 times each month, but there is absolutely no risk of a collision because TerraSAR-X and the ISS are on very different orbits.

Radar image of the ISS

In contrast to optical cameras, radar does not 'see' surfaces. Instead, the microwave signals transmitted by the radar are reflected back much more intensely by edges and corners. Smooth surfaces such as those on the solar power generators of the ISS or the radiator panels used to dissipate excess heat, unless directly facing the radar antenna, tend to deflect rather than reflect the radar beam, causing these features to appear as dark areas on the radar image. The radar image of the ISS therefore looks like a dense collection of bright spots from which the outlines of the Space Station can be identified clearly. The central element on the ISS, to which all the modules are docked, has a lattice grid structure with several surfaces to reflect the radar beam, making it readily identifiable.

This image has a resolution of about one metre. In other words, objects can be depicted as discrete units - that is, shown separately - provided that they are at least one metre apart. If they are closer together, they tend to merge into a single block on a radar image. However, if they have good reflective properties, objects measuring less than one metre can be portrayed effectively. Having said that, the radar image will always enlarge them to at least one metre - there being no way around the laws of physics in this case.

The TerraSAR-X mission

TerraSAR-X is the first German satellite that has been manufactured under what is known as a Public-Private Partnership (PPP) between DLR and Astrium GmbH in Friedrichshafen. The satellite travels around Earth in a polar orbit and records unique, high-quality X-band radar data about the entire planet using its active antenna. TerraSAR-X works regardless of weather conditions, cloud cover or the absence of daylight and is able to provide radar data with a resolution down to one metre.

DLR is responsible for using TerraSAR-X data for scientific purposes. It is also responsible for planning and implementing the mission as well as controlling the satellite. Astrium built the satellite and shares the costs of developing and using it. Infoterra GmbH, a subsidiary company founded specifically for this purpose by Astrium, is responsible for marketing the data commercially.

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