

Meteosat Second Generation



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The dawn of a new era was signalled with the successful launch of Europe's newest geostationary satellite, MSG-1 on August 28, 2002. MSG-1 is the first in a new series of all-digital European geostationary meteorological satellites which will replace the original Meteosat series which has been operational since 1977.



Launch of MSG-1
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MSG is a cylindrical, spin-stabilised satellite, rotating at 100 rpm around a principal axis which is aligned nearly north-south. The spin is also a necessary feature for the operation of MSG's Earth scanning radiometer, the Spinning Enhanced Visible and Infrared Imager (SEVIRI).

This instrument scans the Earth every 15 minutes to produce full-globe images in eleven spectral channels ranging from visible light (VIS) through Infrared (IR). These images have a resolution of 3 km at the sub-satellite point (SSP) while a selected area, including Europe, is provided as a high resolution visible image (HRV) with 1 km resolution at the SSP.

MSG satellites transmit two end-user imaging channels. High Rate Information Transmission (HRIT) on 1695.15 MHz* provides all twelve SEVIRI channels at full resolution every 15 minutes. Low Rate Information Transmission (LRIT) at 1691 MHz* contains a subset of five of the SEVIRI spectral channels at reduced resolution every 30 minutes plus, in addition, relays of foreign satellite data (GOES-E and -W, Meteosat-5 IODC and GMS/MTSAT imagery) every 3 hours.

MSG-1 also carries a Geostationary Earth Radiation Budget (GERB) instrument, the first time this has been flown on a geostationary satellite. Its data, both alone and combined with that from SEVIRI, will provide vital new information on diurnal variations into the radiative balance of the planet. It will also have important applications regarding climate studies and monitoring.

Failure of the MSG-1 Power Amplifier

Following its successful launch and placement into geostationary orbit, MSG-1 commissioning tests began in late September 2002. But in mid-October, the downlink under test ceased when the Solid State Power Amplifier (SSPA) being used unexpectedly switched off and could not be reactivated. Subsequent imaging tests proved the SEVIRI instrument and the raw data downlink chain to be operating correctly, but it was eventually decided not to disseminate user services directly owing to doubt over the remaining SSPAs.

The EUMETSAT EUMETCast Service

EUMETSAT had already been testing a new data retransmission service for the Advanced TIROS Operational Vertical Sounder (ATOVS) data from sensors aboard NOAA polar orbiting satellites. Following the SSPA failure, EUMETSAT were obliged to pursue an alternative means of disseminating the MSG-1 data and trials via EUMETSAT's Multicast Distribution System (EUMETCast) began at the end of April 2003. These were transmitted by EUTELSAT's Hot Bird-6 satellite stationed at 13°E using the digital video broadcast (DVB) format used by digital satellite TV. This service was due to become fully operational as the primary 0° longitude service in late January 2004 with MSG-1 renamed Meteosat-8 and located at 3°W.

System Hardware Requirements

The main component of the hardware system is the *TechniSat SkyStar-2* PCI DVB receiver card. This is a free-to-air digital satellite-TV receiver that is installed inside your computer (there is also a USB version). The *SkyStar* unit can also receive data transmissions, including satellite Internet services. The receiving antenna recommended by EUMETSAT for most of Europe is an 85 cm offset satellite-TV dish, provided a good quality standard Universal digital satellite TV LNB is employed. Good quality satellite TV co-ax cable such as CT100 is required between the dish and the receiver. Care should be taken when stapling and routing this cable as digital signals can suffer losses due to sharp bends or cable constriction.

Aligning the dish to *Hot Bird-6* is not too difficult if you have a sensitive satellite-TV level meter at the dish. One of the *SkyStar* installation set-up screens includes a signal-strength meter which allows you to 'fine tune' your dish set-up.

Software Requirements

To receive the EUMETCast service from *Hot Bird-6* you also require software called *tq@-TELLICAST* to handle the DVB data stream. This software is available either from T-Systems in Germany for €60 plus handling charges, or from EUMETSAT, who send you purchasing details once you have applied for the service. To be able to purchase this software you must first successfully register with EUMETSAT for MSG

dissemination using the form EUM/OPS-MSG/REG/01 which is available on the *EUMETSAT* website at:

<http://www.eumetsat.de/en/dps/helpdesk/registration.html>

Once you have been successfully registered, you will be issued with the username and password required for installation of the *tq@-TELLICAST* software and notified that you may now apply for the software.

To assemble, save and display the files generated by the *T-Systems* software you will also require David Taylor's *MSG Data Manager* software. This can be obtained from David Taylor for £44 at:

<http://www.satsignal.net>

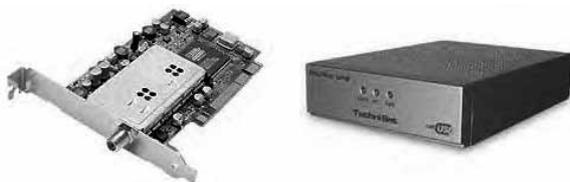
It is also strongly recommended that you download and read *EUMETSAT*'s technical document EUM TD 15, Issue No 3. A link is available from our website at:

http://www.geo-web.org.uk/eumet_docs.html

as it contains much useful information concerning the *EUMETCast* service.

The Fully Operational Service

This began in January 2004 and contains the complete 12-channel SEVIRI HRIT data every 15 minutes plus full LRIT data every 30 minutes, as well as foreign satellite relays. With the exception of the WMO requirement of 'free' 6-hourly HRIT and LRIT data sets, this data will be encrypted from March 2004. To receive the full encrypted data sets an *Aladdin eToken PRO* decryption unit (a USB dongle) will be required, together with associated software to control access to the data in accordance with the *EUMETSAT* Data Access Policy and your user category as applied for at registration. The current price is around £40 for the dongle and software. All users who have applied for the *EUMETCast* service will be contacted regarding application for the decryption unit and software before the service is encrypted in March 2004.



The *Skystar-2* card (left) and USB unit (right)

C-band MSG-1 EUMETCast Service

Although Europe is now catered for with the Ku-band *EUMETCast* service via *Hot Bird-6*, *EUMETSAT* also have an obligation to supply African States with MSG meteorological data under the EU-funded *PUMA* Agreement, which had equipped African States with MSG receiving stations.



A typical 85 cm offset satellite-TV dish

For technical reasons, C-band

transmission was preferable and, following tests, *EUTELSAT*'s Atlantic Bird-3 satellite stationed at 5°W was chosen. These tests proved successful, and a trial service began late in 2003. The C-band beam covers the whole of Europe and Africa, all of which, with the exception of parts of Morocco, southern Algeria, Mali and Niger, lie within the 39 dBW footprint.

The format of the C-band dissemination will be *DVB EUMETCast*, the same as for the *Hot Bird-6* Ku-Band dissemination. The data will be uplinked to *Atlantic Bird-3* via the Fucino ground station in Italy and will be a re-broadcast of the Hot Bird *EUMETCast* service.

Access to the C-band *EUMETCast* trial dissemination both within and outside *EUMETSAT* Member States is subject to applications using the same MSG Image Data Service registration form described above.

The same *T-Systems tq@-TELLICAST* software will be required, as will *MSG Data Manager* to deal with file management and image viewing.

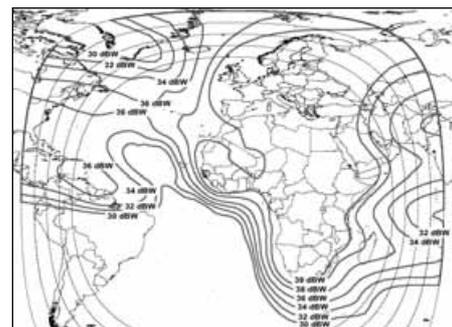
The *Atlantic Bird-3* C-band footprint over Europe and Africa is only 39 dBW compared with *Hot Bird-6*'s Ku-band spot beam of 53 dBW over SE England and central Europe, This means that a significantly larger antenna will be required to receive this service, and *EUMETSAT* recommend a 2.4 metre dish.

The *Atlantic Bird-3* C-band *EUMETCast* footprint also extends into the eastern part of the USA at reduced levels and *EUMETSAT* recommend that a dish size of 3.7 m will be required in most US locations.

* No longer relevant to *MSG1* due to *SSPA* failure.



The Ku-band signal power level footprint for *Hot Bird-6*. Most of central Europe and S and SE England lie within the 53 dBW contour.



Footprint diagram for *Atlantic Bird-3* C-band transmission