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Annexes: 2

Ms Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554
United States of America

GENEVA, 24 June 2010

Subject: WMO submission to FCC Public Notice ET Docket No. 10-123 Information on Use of 1675-1710 MHz Band

Dear Ms Dortch,

The World Meteorological Organization (WMO) has noted the FCC Public Notice (ET Docket No. 10-123) requesting information on the use of the 1675-1710 MHz band and wishes to thank FCC for the opportunity to comment on this critical issue.

As you are no doubt aware, the 1675-1710 MHz band is allocated on a co-primary basis to the Meteorological Aids Service (METAIDS) and the Meteorological Satellite Service (METSAT) (Space-to-earth). We are, therefore, extremely concerned that a decision by the US Administration to either transfer or share this band for mobile broadband use would have significant short-, medium- and long-term negative impacts on global operations. Since this band is used for meteorological operations as part of a globally coordinated system, a waiver granted at the national level is likely to impact the harmonization and interoperability of the overall system. We also foresee a high risk of regional and/or global propagation of such a decision that would put at risk meteorological and hydrological activities worldwide, including with respect to the quality of early warnings in case of extreme meteorological events.

The essential nature of radio-frequency spectrum for meteorology is regularly reiterated by the WMO Congress[1]. It was also highlighted in the ITU-WMO Handbook [2] that was jointly signed by the Secretary-General of WMO and the Secretary-General of the International Telecommunications Union (ITU), and was similarly stressed during the ITU-WMO seminar on radio-frequencies held in September 2009. Finally, the importance of radio frequencies for Earth Observation has also been recognized by the Group on Earth Observations (co-chaired by Dr Sherburne Abbott, Associate Director, U.S. Office of Science and Technology Policy); and was stressed at the Earth Observation Ministerial Summit (Cape Town, South Africa, November 2007).

We have prepared detailed responses to the specific questions 1-9 (Annex 1) in the Public Notice, as well as a background paper (Annex 2) which more fully describes our interest, involvement, and concerns in this important issue.

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[1] « Radio Frequencies for Meteorological and Related Environmental Activities », Resolution 4 (Cg-XV).
[2] « Use of radio spectrum for meteorology: weather, water and climate monitoring and prediction", ITU/WMO Handbook, Edition 2008.

WMO sincerely hopes that the information contained herein will assist the FCC in understanding the importance of the 1675-1710 MHz band to the meteorological, hydrological and Earth observation communities, as well as the user communities and public that we serve. As a consequence, we request that the use of this frequency band be protected.

While recognizing the benefits of improving telecommunication availability, WMO therefore urges FCC and other bodies in charge of frequency management in the USA to withdraw the 1675-1710 MHz frequency band from any plan for mobile broadband telecommunications.

Should additional technical information be required, please contact Dr Wenjian Zhang, Director, WMO Observing and Information Systems Department (Tel.: +41 (22) 730 85 67, Email: WZhang@wmo.int).

Yours sincerely,

(M. Jarraud)
Secretary-General

cc: Dr John L. Hayes, Permanent Representative of United States of America with WMO
Dr José Achache, Director, Group on Earth Observations Secretariat
Dr Sherburne Abbott, Associate Director, U.S. Office of Science and Technology Policy

ANNEX 1

FCC Public Notice ET Docket No. 10-123

Specific responses from WMO to questions 1 to 9

1. A description of the utility of the 1675-1710 MHz band for wireless broadband services, including any pairing, band plan, or other licensing approaches that would maximize this utility;

N/A

2. Identity of the non-federal entities accessing the services operating in the 1675-1710 MHz band;

Worldwide National Meteorological and Hydrological Services (NMHSs), and meteorological satellite operators, represented by the World Meteorological Organization (WMO) and the Coordination Group for Meteorological Satellites (CGMS).

3. A description of the purpose of such use (*i.e.*, the equipment is used to support TV weather forecasting or for conducting university research);

Meteorological satellites and related METSAT Earth stations, as well as atmospheric sounding by radiosondes, in support of operational meteorological activities that in turn support a number of downstream applications (including e.g. civil protection, flood and hurricane warnings, aviation, marine, road transportation, energy, nuclear emergency, media reports, advice to the population at large).

4. Which portions of the 1675-1710 MHz band are used;

Detailed frequencies used for Direct Broadcast from current and planned Geostationary (GSO) and Non-Geostationary polar-orbiting (N-GSO) satellites are shown in Annex 2, Tables 1 and 2, additional frequencies may be used in the future in this band.

Radiosondes are typically operated in the 1675-1700 MHz.

5. How often the service is used (*e.g.*, every day, scheduled times of day, duration, etc.);

The METSAT service is used on a 24/7/365 basis. Direct Broadcast services from meteorological satellites are permanent data streams.

Radiosondes are routinely operated for daily observations with typically 2 launches per day. It is estimated that the annual number of radiosondes in the 1680 MHz band is on the order of 100,000.

6. An estimate of the current investment in wireless equipment, including when it was obtained and put into use;

Considering satellite manufacturing, launch, ground segment, operations, and major Earth observation stations operated by national weather services, the average yearly cost of the global meteorological constellation of the WMO Global Observing System (GOS) is estimated between two and three billion USD.

This amount does not include the cost of the numerous receiving stations deployed worldwide by local users.

7. A description of whether and how the information and services currently accessed can be obtained from other means; and if so, the anticipated costs and timeframes for implementing any alternatives;

There is no alternative to spectrum for METSAT operations, and no alternative frequency band that can provide similar reliable and available service.

8. Confirmation that, if the information currently available from the meteorological satellite service were received at only a few receive sites and distributed via terrestrial services, this would be a functionally equivalent substitute for the direct reception of the satellite and radiosonde services;

WMO does not agree with this assessment. See details in Annex 2.

9. Any other information interested parties would like to identify regarding use of the meteorological satellite and radiosonde services.

See background paper (Annex 2).

ANNEX 2

FCC Public Notice ET Docket No. 10-123

Background Paper on WMO Use of 1675-1710 MHz Band

Radio-frequencies represent scarce and key resources used by National Meteorological and Hydrological Services (NMHSs) to perform and collect the observations upon which analyses and predictions, including warnings, are based or processed, and to disseminate this information to governments, policy makers, disaster management organizations, commercial enterprises and the general public. The essential nature of radio-frequency spectrum for meteorology is regularly reiterated by the WMO Congress[1]. It was also highlighted in the ITU-WMO Handbook [2] that was jointly signed by the Secretary-General of WMO and the Secretary-General of the International Telecommunications Union (ITU), and was similarly stressed during the ITU-WMO seminar on radio-frequencies held in September 2009. Finally, the importance of radio frequencies for Earth Observation has also been recognized by the Group on Earth Observations (co-chaired by Dr Sherburne Abbott, Associate Director, U.S. Office of Science and Technology Policy); and was stressed at the Earth Observation Ministerial Summit (Cape Town, South Africa, November 2007).

More specifically, considering Public Notice ET Docket No. 10-123, the FCC should be aware that the 1675-1710 MHz frequency band (referred to below as "the L-Band") is used worldwide for both meteorological satellites as part of the Meteorological Satellite Service (METSAT) and for radiosondes as part of the Meteorological Aids Service (METAIDS).

As concerns METSAT, all operational Geostationary (GSO) and polar-orbiting Non-Geostationary (N-GSO) meteorological satellites, part of the WMO Global Observing System (GOS), are relying on the L-band. This constellation, illustrated in Figure 1, currently comprises 13 GSO satellites (with 10 other GSO satellites to be launched over the next six years) and seven operational polar-orbiting satellites (with another 10 planned for launch over the next 10 years). The corresponding overall investment including spacecraft, launch, ground segment, and operations during their lifetime, represent a global annual average cost between two and three billion USD.

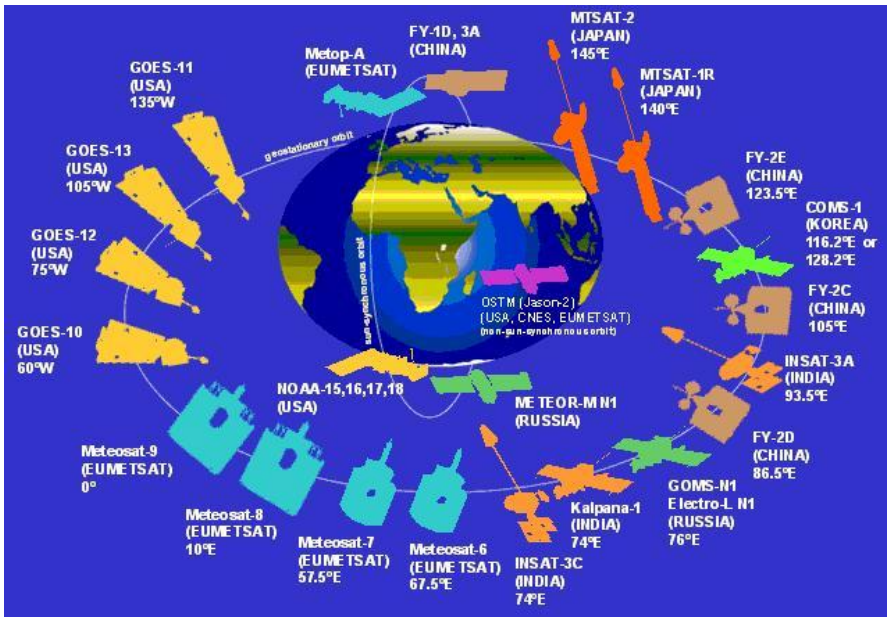

Figure 1: Schematic illustration of the operational, space-based, component of the WMO Global Observing System (GOS).

[1] « Radio Frequencies for Meteorological and Related Environmental Activities », Resolution 4 (Cg-XV).
[2] « Use of radio spectrum for meteorology: weather, water and climate monitoring and prediction", ITU/WMO Handbook, Edition 2008.

The operational meteorological satellite system is coordinated globally through the WMO and the Coordination Group for Meteorological Satellites (CGMS), with the aim to ensure interoperability and continuity of service. This coordination entails mutual back-up arrangements among satellite operators, as well as standardization of the dissemination services provided to the global operational user community. There is thus great concern that, even if some arrangements were found at a national level over the US territory, this would undermine the global coordination effort which has been key to the reliability and efficiency of the space-based GOS over the past forty years.

The L-band is used by operational meteorological satellites for Direct Broadcast services to the users and for data downlink to their Command and Data Acquisition (CDA) stations that are vital to the integrity of the respective missions (see Tables 1 and 2 below).

As concerns Direct Broadcast services it should be emphasized that they are serving a widespread community across the entire footprint of each respective satellite. Corresponding Earth stations in the 1675-1710 MHz band are operated by most of the National Meteorological and Hydrological Services (NMHSs) of the 189 WMO Members (States and Territories). These stations and the data they provide are essential tools enabling the NMHSs to fulfil their critical operational missions in support of protection of life and property, and of other societal needs related to e.g. aviation, marine, ground transportation, agriculture, energy, water resources, health, the media, or direct advice to the public. For each of these NMHSs, the typical number of METSAT receiving stations ranges between a few to several tens. Beyond the NMHSs, several thousands of such METSAT receiving stations (fixed as well as mobile) are operated around the globe by public or private organizations with operational and research activities related, among others to meteorology, hydrology, oceanography, disaster management, public security, defence, education/research, search and rescue.

The Direct Broadcast services also support other specific environmental missions. For example the EMWIN service, a weather information service tailored to local emergency managers, currently covers three quarters of the globe and plays a significant role in the alert chain thanks to its extreme robustness and portability.

Although some portions of the 1675-1710 MHz band are currently allocated to the Mobile Service in the Radio Regulations, WMO is not aware of any country having authorized such use. In most countries, including the USA, this means that the 1675-1710 MHz is exclusively used for METSAT and METAIDS. In this regard, the assumption that the band is “relatively lightly used” as noted in the FCC Public Notice likely stems from the lack of registrations for the receiving stations since these stations are receive-only equipment and in most countries are not subject to registration. This leads to the illusion of light use, whereas in fact the band is quite heavily used globally.

Furthermore, a fundamental practice for meteorological operations is to share essential data in a free and unrestricted manner at the global scale. Organizations wishing to receive meteorological satellite Direct Broadcast data (e.g. HRIT or HRPT) can equip themselves with a receiving Earth station, without requesting authorization from the satellite operator. It is therefore impossible to provide, in any country, even the USA, an exhaustive list of receiving Earth Stations in the 1675-1710 MHz band. However, enquiries performed by WMO a few years ago on a voluntary basis within the meteorological community indicated more than six thousands L-band receiving stations, 975 of them being located in the USA. This is most probably below the actual number, which is generally estimated of the order of 10,000 operational installations around the globe. In addition, the EMWIN system alone is assumed to count several thousands of users.

WMO notes that broadband telecommunication requirements are not limited to the USA and therefore, maintain that authorizing mobile operators to make use of the 1675-1710 MHz band in one major country like the USA, the telecommunication industry (manufacturers and operators) would seek to expand service, requesting similar authorization in other countries, if not worldwide. This would inevitably put the national telecommunications Regulators under pressure to accede to the wishes of the telecommunications industry although WMO hopes that these Regulators would recognize the benefit of meteorology and Earth Observation.

Solutions to ensure protection of METSAT reception, such as imposing large protection distances, seem however unlikely to be workable due to the large number of METSAT stations and the impracticality of defining where all these stations are located. Moreover, for a number of

countries worldwide, imposing large protection distances could constrain the deployment of mobile service over large portions or even all of their territory. This would inevitably lead to a detrimental situation whereby either the expectations of the telecommunications industry will not be fulfilled or the reliability of the global meteorological observation system would be seriously affected.

Past experiences have unfortunately shown that mobile applications cannot be easily accommodated in frequency sharing schemes. We may recall the case of the 2.5-2.69 GHz band that was allocated to the mobile service (IMT-2000) at WRC-2000 in perfect knowledge of a sharing situation with the Broadband Satellite Service (BSS), for which the mobile community then obtained at WRC-03 that additional constraints be put on this service leading to a *de facto* exclusion of the BSS service from this band. We also recall that, when WRC-03 decided to allocate the 1668.5-1675 MHz to Mobile Satellite Service, severe constraints were added to the existing meteorological services (METSAT and METAIDS) operations in this band leading to an exclusion situation in the medium-term.

WMO does not support the proposal in the FCC public notice that a combination of a few METSAT or radiosondes receiving sites and data distribution via terrestrial services would be equivalent to the direct reception of the satellite and radiosondes services. At first, such a proposal does not work for radiosondes that are by definition relying only on radio for transmitting their data to their launch site. These sites need to be geographically distributed in order to ensure relevant sampling of the atmosphere, which leads to a large number of receiving stations. It should be noted that, despite the value of satellite observations, radiosondes continue to provide unique and highly valued *in-situ* measurements of the atmosphere, which are critical to numerical models and support the calibration of satellite remote-sensing measurements for both weather forecasting and climate monitoring.

As concerns METSAT, distribution via terrestrial services cannot fully replace the Direct Broadcast services, which retain an unique role because of their robustness, timeliness and completeness of their coverage over the whole satellite footprint. Meteorological satellite data distribution requires a high level of reliability and availability that could not be ensured by terrestrial networks, internet in particular. This is particularly true in severe weather situations (hurricanes, tornadoes, storms) or any other disaster situation for which meteorological and satellite monitoring support play a central role, and in which terrestrial networks are more likely to be in failure or saturated. In this regard, one may also note that rain attenuation in the 1675-1710 MHz is almost negligible and renders this band unique for reception in severe meteorological conditions.

Timeliness is another essential requirement for real time severe weather detection, monitoring, forecasting and warning. A warning may be generated at any time of the day or night and it is essential that all warnings and watches be received as quickly and close as possible. Considerable efforts were made to bring down the geostationary imagery and sounding refresh cycles to a few minutes, with “rapid scan “ procedures over critical areas in order to monitor rapidly evolving severe situations. METSAT reception must comply with stringent timeliness requirements, which cannot be guaranteed by terrestrial networks. Direct Broadcast is also currently the only practical way to collect near-real time data from low-Earth orbit satellites without the latency resulting of on-board storage during one orbital revolution.

Overall, any threat on the 1675-1710 MHz band could cause both data degradation and less availability that would have the following impacts:

- Degradation of severe weather monitoring from satellites (e.g. hurricane tracking);
- Degradation of weather-forecast quality for protection of life and property from severe weather and floods;
- Reduction in quality of critical data required for aviation and maritime transport;
- Severe degradation of meteorological services in developing countries;
- Reduced predictive skill in fire weather situations;

- Reduced quality in the regional and/or global climate data sets required for climate monitoring and prediction;
- Possible impacts on the ARGOS applications which use the METSAT L-band HRPT.

Table 1: L-Band Frequencies (1675-1710 MHz) Used for Direct Broadcast from Current and Planned Operational Geostationary Satellites (June 2010)

Satellite	Operator	Launch date	Service	Frequency	Data rate
Meteosat-7	European Org.	2/09/1997	HRI	1694.5 MHz	166 kbps
Meteosat-8	European Org.	28/08/2002	LRIT	1691.0 MHz	128 kbps
Meteosat-9	European Organization	21/12/2005	LRIT	1691.0 MHz	128 kbps
			HRIT	1695.15 MHz	1.0 Mbps
Meteosat-10	European Organization	2012 (Planned)	LRIT	1691.0 MHz	128 kbps
			HRIT	1695.15 MHz	1.0 Mbps
Meteosat-11	European Organization	2014 (Planned)	LRIT	1691.0 MHz	128 kbps
			HRIT	1695.15 MHz	1.0 Mbps
GOES-11	USA	3/05/2000	WEFAX	1691.0 MHz	
			GVAR	1685.7 MHz	2.1 Mbps
			EMWIN	1690.725 MHz	9.6 kbps
GOES-12	USA	23/07/2001	WEFAX/LRIT	1691.0 MHz	128 kbps
			GVAR	1685.7 MHz	2.1 Mbps
			EMWIN	1690.725 MHz	9.6 kbps
GOES-13	USA	24/05/2006	WEFAX/LRIT	1691.0 MHz	128 kbps
			GVAR	1685.7 MHz	2.1 Mbps
			EMWIN	1692.7 MHz	19.2 kbps
GOES-14	USA	28/06/2009	WEFAX/LRIT	1691.0 MHz	128 kbps
			GVAR	1685.7 MHz	2.1 Mbps
			EMWIN	1692.7 MHz	19.2 kbps
GOES-15	USA	4/03/2010	WEFAX/LRIT	1691.0 MHz	128 kbps
			GVAR	1685.7 MHz	2.1 Mbps
			EMWIN	1692.7 MHz	19.2 kbps
GOES-R	USA	2015 (Planned)	HRIT/EMWIN	1697.4 MHz	400 kbps
			e-GVAR	1685.0 MHz	2.11 Mbps
			GRB	1690.2 MHz	31 Mbps
GOES-S	USA	2016 (Planned)	HRIT/EMWIN	1697.4 MHz	400 kbps
			e-GVAR	1685.0 MHz	2.11 Mbps
			GRB	1690.2 MHz	31 Mbps
MTSAT-1R	Japan	26/02/2005	LRIT	1691.0 MHz	75 kbps
			HRIT	1687.1 MHz	3.5 Mbps
MTSAT-2	Japan	18/02/2006	LRIT	1691.0 MHz	75 kbps
			HRIT	1687.1 MHz	3.5 Mbps
GOMS-N2	Russian Federation	2010 (Planned)	LRIT	1691.0 MHz	64-128 kbps

Satellite	Operator	Launch date	Service	Frequency	Data rate
			HRIT	1691.0 MHz	0.665-1 Mbps
GOMS-N3	Russian Federation	2016 (Planned)	LRIT	1691.0 MHz	64-128 kbps
			HRIT	1691.0 MHz	0.665-1 Mbps
FY-2C	China	19/10/2004	LRIT	1691.0 MHz	150 kbps
			S-VISSR	1687.5 MHz	660 kbps
FY-2D	China	08/12/2006	LRIT	1691.0 MHz	150 kbps
			S-VISSR	1687.5 MHz	660 kbps
FY-2E	China	23/12/2008	LRIT	1691.0 MHz	150 kbps
			S-VISSR	1687.5 MHz	660 kbps
FY-2F	China	2011 (Planned)	LRIT	1691.0 MHz	150 kbps
			S-VISSR	1687.5 MHz	660 kbps
FY-2G	China	2013 (Planned)	LRIT	1691.0 MHz	150 kbps
			S-VISSR	1687.5 MHz	660 kbps
FY-2H	China	2015 (Planned)	LRIT	1691.0 MHz	150 kbps
			S-VISSR	1687.5 MHz	660 kbps
INSAT 3D	India	2010 (Planned)	LRIT	1.7 GHz (TBC)	(TBD)
			HRIT	1.7 GHz (TBC)	(TBD)
COMS-1	S. Korea	23/06/2010	LRIT	1692.14 MHz	256 kbps
			HRIT	1695.4 MHz	3 Mbps

Table 2: L-Band Frequencies (1675-1710 MHz) Used for Direct Broadcast from Current and Planned Operational Satellites in Polar Orbit (June 2010)

Satellite	Operator	Launch date	Service	Frequency	Data rate
NOAA-17	USA	24/06/2002	HRPT	1698 MHz	665.4 kbps
NOAA-18	USA	20/05/2005	HRPT	1698 or 1707 MHz	665.4 kbps
NOAA-19	USA	6/02/2009	HRPT	1698 or 1707 MHz	665.4 kbps
MetOp-A	European Org.	19/10/2006	AHRPT	1701.3 MHz (1707 MHz backup)	3.5 Mbps
MetOp-B	European Org.	2012 (planned)	AHRPT	1701.3 MHz (1707 MHz backup)	3.5 Mbps
MetOp-C	European Org.	2016 (planned)	AHRPT	1701.3 MHz (1707 MHz backup)	3.5 Mbps
Meteor-M-1	Russian Fed.	17/09/2009	HRPT	1700 MHz	665 kbps
Meteor-M-2	Russian Fed.	2011 (planned)	HRPT	1700 MHz	665 kbps
FY-1D	China	17/05/2002	HRPT	1700.4 MHz	1.33 Mbps
FY-3A	China	27/05/2008	AHRPT	1704.5 MHz	4.2 Mbps
FY-3B	China	2010 (planned)	AHRPT	1704.5 MHz	4.2 Mbps
FY-3C	China	2012 (planned)	AHRPT	1704.5 MHz	4.2 Mbps
FY-3D	China	2014 (planned)	AHRPT	1704.5 MHz	4.2 Mbps
FY-3E	China	2016 (planned)	AHRPT	1704.5 MHz	4.2 Mbps
FY-3F	China	2018 (planned)	AHRPT	1704.5 MHz	4.2 Mbps
NPOESS-1	USA	(being redefined)	LRD	1707 MHz	3.88 Mbps

Satellite	Operator	Launch date	Service	Frequency	Data rate
NPOESS-2	USA	(being redefined)	LRD	1707 MHz	3.88 Mbps
NPOESS-3	USA	(being redefined)	LRD	1707 MHz	3.88 Mbps
NPOESS-4	USA	(being redefined)	LRD	1707 MHz	3.88 Mbps

Table 3: Other METSAT Uses of L-band frequencies (Space to Earth)

High rate raw data downlink to CDAs	1676MHz, 1677 MHz, 1681 MHz, 1686 MHz
DCP data retransmission	1694.5 MHZ , 1709.15 MHz 1709.95 MHz

GLOSSARY

AHRPT	Advanced High Resolution Picture Transmission	CGMS standard for high-rate dissemination from polar satellites
CDA	Command and Data Acquisition	Primary ground station used in satellite operations for uplink and downlink
CGMS	Coordination Group for Meteorological Satellites	International body including all operators of operational meteorological satellites, WMO and IOC
DCP	Data Collection Platform	Satellite collection of environmental data from an automatic station, generally in a remote area
e-GVAR	Emulated-GVAR	Subset of GOES-R data in GVAR-like format for GVAR users (transition)
EMWIN	Emergency Manager Weather Information Network	Operational live stream of weather information for the emergency management community
GRB	GOES Re-Broadcast	Dissemination of GOES-R,-S,-T high-resolution data
GVAR	GOES Variable Format	Dissemination of GOES-I-P high resolution data
HRI	High Resolution Information	Dissemination of Meteosat (First generation) high resolution data
HRIT	High Rate Information Transmission	CGMS standard for high-rate dissemination from geostationary satellites
HRPT	High Resolution Picture Transmission	Previous version of the CGMS standard for high-rate dissemination from polar satellites
LRD	Low Rate Data	Low-rate dissemination channel from NPOESS.
LRIT	Low Rate Information Transmission	CGMS standard for low-rate dissemination from geostationary satellites
LRPT	Low Resolution Picture Transmission	CGMS standard for low-rate dissemination from polar satellites
S-VISSR	Stretched-Visible and Infrared Spin Scan Radiometer	Geostationary Imagery format used on current China's FY-2 series
WEFAX	Weather facsimile	Former CGMS standard for analogue imagery dissemination from geostationary satellites (now replaced by LRIT)