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WMO

FREQUENCY ISSUES FOR WMO INFORMATION SYSTEMS

(SFCG Agenda Item 8.2)

Abstract

The WMO Information System (WIS), including the Global Telecommunication System (GTS), provides the mechanism for the collection and sharing of information between all WMO Members and is essential to their core activities. WIS relies heavily on satellite distribution systems for Members access to space based observations and products as well as supplementing terrestrial communications systems for distribution of other essential data and products. The satellite-related component of WIS is the Integrated Global Data Dissemination Service (IGDDS) and uses a range of frequency bands for communications including the Ku-Band, C-Band and L-Band. This paper describes WIS, IGDDS and highlights an international concern about new practices to share L-Band frequencies of 1695-1710 MHz between the current meteorological services and mobile broadband operators. This affects in particular the real-time collection of satellite sounding data for Numerical Weather Prediction models which relies extensively on L-Band frequencies. It is argued that proposals to share the L-Band will have an adverse affect on many more users than regulators expect.

FREQUENCY ISSUES FOR WMO INFORMATION SYSTEMS

WMO Information System (WIS)

1. The WMO Information System (WIS) provides the mechanism for the collection and sharing of information between all WMO Members and is essential to their core activities. Based on information and telecommunication systems owned and operated by Members, WIS is fundamentally a collaboration of many countries using a set of agreed international industry standards, including those established within WMO community, for protocols, hardware and software. WIS includes the Global Telecommunication System (GTS) which functions as a private wide area network between Members. More information on WIS and the GTS can be found online at www.wmo.int/wis. WIS also relies heavily on satellite distribution systems for Members distribution of and access to space based observations and products as well as supplementing terrestrial communications systems for distribution of other essential data and products.

Integrated Global Data Dissemination Service (IGDDS)

2. The satellite component of WIS is known as the WMO Integrated Global Data Dissemination Service (IGDDS). The goal of IGDDS is to ensure the efficient circulation of space-based observation data and products meeting the needs of WMO programmes, in the context of the WMO Information System (WIS). IGDDS addresses different functions of the data circulation scheme:
    - User requirements review mechanism in every region
    - Data concentration (see dedicated RARS project for timely availability of polar-data high-level products) and inter-regional data exchange
    - Data dissemination (via telecom satellite broadcast, via Direct Broadcast, via Internet or via the GTS point-to-point network)
    - Data access on request, allowing data discovery and delivery to authorized users

3. The distribution of satellite data and products is supported by several regional dissemination services using the Digital Video Broadcast by Satellite standard (DVB-S or DVB-S2) coordinated in the framework of GEONetcast : EUMETCast, CMACast (replacing Feng-YunCast), MITRA and GEONETCAST-Americas. Table 1 below summarizes a few characteristics of these systems, as discussed by the IGDDS Implementation Group at its fourth meeting.

Service Name	**Eumetcast (1)**	**Eumetcast (2)**	**Eumetcast (3)**	**CMAcast**	**MITRA**	**Geonetcast-America**
Operator	EUMETSAT			CMA	Roshydromet	NOAA
Satellite	HotBird-6	Atlantic Bird-3	NSS-806	Asiasat-4	ExpressAM1 ExpressAM33 ExpressAM3	Intelsat-9
Frequency Band	10.8 GHz Ku Band	3.7 GHz C Band	3.8GHz C Band	C Band	3.7 GHz C Band	C Band

Standard	DVB-S	DVB-S	DVB-S	DVB-S2	DVB-S	DVB-S
Footprint	Europe+ middle East RA VI	Africa, Caribbean Western Asia	Americas	Asia and West Pacific	Asia (except South)	Americas
Max data rate	16 Mbps	3 Mbps	2 Mbps	72 Mbps	1 Mbps	2 Mbps

Table 1: Summary characteristics of DVB-S services (from IGDDS-IG-4, March 2010)

Dissemination frequency issues

4. Whilst the services above rely mainly on commercial telecommunications, there are other functions for which it is essential to have dedicated frequency bands. For polar-orbiting satellites, which are the main source of data of global Numerical Weather Prediction models on the vertical structure of the atmosphere, the only practical way to collect data in near-real-time is to use a Direct Broadcast (also called Direct Readout) function aboard the satellite, which transmits the data in its field of view in the same time as it is acquired. For the Direct Readout user community worldwide, for whom real-time availability is a fundamental requirement, it is essential that direct readout frequencies remain available and coordinated. In this respect, WMO and the CGMS both have expressed high concern about the plan of the United States telecommunication authorities to authorize mobile broadband services over the US territory in the 1695-1710 MHz band which is part of the L-Band allocated to Meteorological Satellites and Meteorological Aids (radiosondes) on a co-primary basis. This would generate harmful interferences preventing operational reception unless a large protection zone is enforced around each receiving site. There is a risk that such measure propagates to other countries. Table 2 below indicates the frequencies used by meteorological satellites worldwide for Direct Broadcast and other services. It shows that the portion of the band currently targeted by mobile broadband services is used or planned to be used by all polar-orbiting systems, which are particularly dependent on direct broadcast for real-time applications.

Direct Broadcast services in the 1675 - 1695 MHz band		Direct Broadcast services in the 1695 - 1710 MHz band	
GOES-11,12,13,14,15 WEFAX	1691	NOAA-16,17,18,19	1702.5
GOES-11,12,13,14,15 GVAR	1685.7		1698
GOES-11,12,13,14,15 EMWIN	1690.7/1692		1707
GOES-R,S GRB	1690.2	Metop-A, B, C	1701.3
FY-2C,2D,2E,2F,2G,2H LRIT	1691		1707
FY-2C,2D,2E,2F,2G,2H SVISSR	1685.7	Meteor-M1, M2	1700
Meteosat-7 HRI	1685.7	FY-1D	1700.4
Meteosat-8,9,10,11 LRIT	1691	FY-3A, 3B, 3C, 3D, 3E, 3F	1704.5
MTSAT-1R, 2 LRIT	1691	JPSS-1, 2 LRD	1707
MTSAT-1R, 2 HRIT	1687.1	DWSS LRD	(TBC)

GOMS-Elektro-L 1,2 LRIT	1691	GOES-R, S EMWIN/HRIT	1697 (*)
GOMS-Elektro-L 1,2 HRIT	TBD	COMS-1 HRIT	1695.4
COMS-1 LRIT	1692.1		
INSAT-3D LRIT/HRIT	TBD		
Other meteorological satellite services in the 1675-1695 MHz band		Other meteorological satellite services in the 1695-1710 MHz band	
Data collection Platform (DCP)	*1694.5*	*DCP*	*1709.1* *1709.9*
Downlink	*1676, 1677, 1681, 1686*		

Table 2: L-Band frequencies used for Direct Broadcast services and other services from meteorological satellites currently on orbit or planned for the coming decade. Note: (*) the future GOES-R,S EMWIN/HRIT service might be moved to frequency below 1695 MHz to avoid interference.

Issues

5. The meteorological satellite community has worked with agencies and coordination groups such as the SFCG to help build a sustainable and cost effective earth monitoring space infrastructure. Countries, through the International Telecommunications Union (ITU), have agreed to allocate L-band to METAIDS and METSAT (Space to Earth) on a co-primary basis. This has facilitated the widespread use of L-Band in current and planned low earth orbit satellite services over the next decade or more enabling countries to access and share earth observations in real-time.

6. For countries implementing sharing of L-Band, it should be noted that L-Band receiving stations and users are not required to register their sites so many users will not be protected by exclusion zones allowed for in current plans for sharing of L-Band. Also, Numerical Weather Prediction users need to access more than just their national satellites: indeed the whole constellation is necessary to provide the adequate temporal and spatial sampling of the atmosphere, so not only will mitigation plans have to include retransmitting national based satellite data but also internationally based data. That is, for the current USA initiative, how will data from NOAA satellites, but also from Metop, FY3 AM and PM (and their successors throughout the decade) be retransmitted to their users in real-time? Should this retransmission be implemented by radio broadcasts, this would not only incur additional cost but also generate a new need for reliable, interference free radio frequency spectrum

7. WMO respects the sovereignty of radio communication laws, but is concerned that the USA initiative to share L-Band with mobile broadband services will be detrimental to the global standardization efforts of space based observation systems. Also, it is concerned that such a lead will be followed by other countries and affect the usability of LEO satellite systems worldwide, and the ability of the global meteorological community to serve the society.

8. SFCG members are requested to review the impact of such initiatives in their country and to alert their radiocommunication and frequency management authorities to the likely impact of such an approach to their own environmental services. Members should also consider other environmental services that will be impacted by such decisions, including some radiosonde stations, which already share the L-Band frequencies.