

INTERNATIONAL ISSUES AND FUTURE SYSTEMS

Participants

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1. INTRODUCTION

The ITSC-18 Working Group on International Issues and Future Systems convened on Saturday 24 March 2012 and discussed the following topics:

- Frequency protection
- Global planning and CGMS baseline
- Early morning orbit sounding
- Geostationary sounding
- Data access issues

2. FREQUENCY PROTECTION

The WG considered an input from Jean Pla about passive microwave measurements, which are designated in the international Radio Regulation (RR) as “Earth Exploration Satellite Service (EESS) (passive)”. Some frequency bands are allocated to EESS (passive) only, all emissions are then prohibited in these bands; other bands are shared between passive and active services. The protection of frequency bands used by passive sensors for environmental applications has been advocated in several publications and events: “*ITU/WMO Seminar on use of radio spectrum for meteorology: weather, water and climate monitoring and prediction*” (September 2009); ITU-D report “*Utilization of ICT (Information and Communication Technologies) for disaster management, resources, and active and passive space-based sensing systems as they apply to disaster and emergency relief situations*” (December 2007); ITU-R recommendation “*ITU-D Question 24/2 on ICT*”

and climate change"; ITU-R Report RS.2165 *"Identification of degradation due to interference and characterization of possible interference mitigation techniques for passive sensors operating in the Earth Exploration Satellite Service (passive)"*.

Protection is now ensured in the 24 GHz band – after a difficult debate with the automotive industry promoting Short Range Radars. The recent World Radio Conference 2012 (WRC-12) in Geneva adopted a WRC Resolution providing the protection of the purely passive bands (86-92 GHz) from out of band emissions derived from the fixed service in operation below and above this band.

Experience shows that some passive frequency bands are contaminated by Radio Frequency Interference (RFI) of various origins: mobile, fixed, radiolocation, satellite broadcasting. The 6-7 GHz band is identified in the RR as a frequency band where measurements are carried out over oceans, and it is widely used for Sea Surface Temperature monitoring. Over land, this band is unfortunately well known to experience RFI which makes its use problematic for applications over land. Other bands with high risk of RFI are for example: 1.4, 10.6 and 18.6 GHz. In the case of 1.4 GHz, RFI are affecting the measurements acquired by SMOS (See SMOS presentation at ITSC-18) as well as SAC-D/Aquarius, and would affect the future NASA SMAP mission.

The WG clarified that strongly erroneous data can be easily detected by the monitoring and eliminated, but with the resulting impact that data will be missing. When the RFI is moderate (i.e. "low RFI levels"), as indicated in the ITSC-18 presentation and relevant ITU-R recommendation, the error may not be detected and an artificial bias can affect the measurement.

The WG agreed that all frequency protection matters of interest to the ITWG should be accessible in the ITWG website through the "frequency" page: <http://cimss.ssec.wisc.edu/itwg/groups/frequency> and recommended that the NWP survey result page, which contains some reports on RFI effects, should point to the frequency page. In addition, it will be useful to update the RFI and frequency management information taking into account the outcomes of the WRC-12.

Action 1: To draw all the frequency management and RFI information together on the ITWG web site, making the RFI issue visible on the first page. (Steve English, in consultation with Jean Pla, to provide input to the webmasters Leanne Avila and Bill Bellon),

Action 2: To update the frequency management pages taking into account the outcome of WRC-12 (Jean Pla to provide input to the webmasters Leanne Avila and Bill Bellon).

The WG stressed the importance of gathering feedback from the ITWG community on whether RFI is occurring or is increasing in some bands, in order to provide a basis for suitable regulatory action within ITU-R or CEPT. For all passive frequency bands processed by meteorological agencies, except for the band 1400-1427 MHz where RFI are monitored by ESA and relevant space and radio agencies, if certain microwave data are flagged as doubtful or wrong by NWP centres, it would be worth sharing this information. In particular, it would be useful to know for instance whether the RFI events are random or systematic over a same geographical area. If possible, ITWG should identify the consequences and operational impact of the lack of data on a specific area. This kind of information could be useful to inform radio agencies responsible for these interferences over their territory. The WG welcomed the intention of CNES to raise the following new Question within ITU-R Working Party 7C about RFI: “technical and regulatory issues on RFI within passive bands”, noting that this would involve: collection of RFI data, Radio Regulation enforcement, future possible actions for improving the situation, operational impact of RFI on the NWP models.

Action 3: All ITWG members detecting anomalies that are suspected to be caused by RFI in 1400-1427 MHz and other bands are requested to report to Jean Pla (jean.pla@cnes.fr) as the ITWG coordinator for frequency matters, and to their national radiofrequency management authority (Note: J. Pla can provide guidance on who the authority is and how to characterize and address the matter with the radio-frequency authorities).

3. GLOBAL PLANNING AND CGMS BASELINE

J. Lafeuille described the new baseline adopted by CGMS for the operational contribution of CGMS members to the Global Observing System (GOS), in response to the WMO Vision for the GOS in 2025. The updated baseline includes a number of missions that are new with respect to the previous baseline: GEO hyperspectral IR sounding (in some locations), lightning detection, imagery and sounding on 3 sun-synchronous orbital planes, scatterometry, radio-occultation, radar altimetry, microwave imagery, Earth Radiation budget broad band measurements, atmospheric chemistry, space weather. The new baseline also acknowledges the need for consistent calibration, contingency planning, and direct broadcast when appropriate. (See: http://www.wmo.int/pages/prog/sat/documents/CGMS_Baseline-operational-contribution-to-GOS-CGMS39-2011.pdf)

The WG expressed its high appreciation of the CGMS baseline, which was considered as a breakthrough for the Global Observing System. It then discussed the status of implementation of this baseline as concerns sounding missions, and identified particular implementation issues regarding the early morning orbit and the geostationary orbit, as discussed below.

4. EARLY MORNING ORBIT SOUNDING

The WG recalled that ITSC-17 identified a risk for sounding mission in the early morning orbit. The risk had now materialized after the recent cancellation of DWSS. Informed of CMA's consideration to redefine one of its missions to the early morning, the group strongly encouraged CMA to implement such a change. Should one of the am or pm FY-3 missions

be redeployed to this purpose, the group expressed the view that maintaining an FY-3 mission on the mid-morning orbit could have a lower priority given the well established status of the METOP/EPS programme for the time being, whereas the transition from Suomi-NPP to JPSS still appears critical.

Recommendation 1: CMA to consider the redeployment of LEO mission to an early morning orbit, in accordance with the following priority order (from an ITWG perspective): (1) Early morning, (2) Afternoon, (3) Mid-morning.

5. GEOSTATIONARY ORBIT SOUNDING

Regarding geostationary satellites the group acknowledges the need for completing the hyperspectral coverage between the MTSAT, GOES.-W and GOES-E fields of view. The Geometwatch initiative could be a mechanism to attract resources from several contributors in order to move forward in these areas, but this approach raises some concerns:

- data policy: such a mission would only contribute to the GOS if the data are made available and can be exchanged, without excluding developing countries
- global planning: such mission should not be undertaken outside of the CGMS coordination framework, in order to optimize the use of global resources.

The WG understands that the Geometwatch initiative might be an avenue for NOAA and other agencies to consider in order to have a complete international constellation of hyperspectral infrared sounders complying with the WMO Vision for the GOS in 2025. It suggested that CGMS considers the implications of such private or public-private partnership initiatives and the appropriate mechanisms or practices ensuring that global coordination and open data accessibility are secured.

Recommendation 2: CGMS to consider the potential implications of various funding schemes and public-private partnership with respect to the global technical coordination of the space-based observing system pursued by CGMS, and with respect to data policy, and to establish an appropriate mechanism to ensure that such initiatives can be globally coordinated by CGMS and open data accessibility is guaranteed.

6. DATA ACCESS

The WG reviewed the recommendations formulated at ITSC-17 and generated updated recommendations or actions.

Meteor-M global data

The WG noted that Meteor-M/MSU-MR data were disseminated in Direct Broadcast by HRPT/LRPT whilst MTVZA data were still under investigation by Roshydromet/Planeta. Furthermore, an hyperspectral IR sounder (IKFS) is planned for Meteor-M N2.

Recommendation 3: the Russian Federation to make the Meteor-M mission a fully contributing component of the GOS by providing the global data sets from this mission in a timely manner with all necessary ancillary information.

The WG reaffirmed that NWP centres were willing and interested to assist Roshydromet/Planeta for sensor validation through MTVZA and MSU-MR data monitoring, which could help to detect and diagnose sensor anomalies, e.g. in the case of permanent or transient discrepancies.

Direct Broadcast

Satellite agencies operating environmental polar satellites should provide, or continue to provide, a Direct Broadcast capability in their polar environmental satellite systems, and make available in a timely manner the Direct Broadcast data processing (L0 to L1, and/or L1 to L2) software, documentation, and related training. The WG suggested that this requirement to provide Direct Broadcast and detailed software, documentation and training be incorporated in a set of “CGMS best practice”.

Direct Broadcast is actually available on NOAA, Metop, Meteor-3M, FY-3-B, Suomi-NPP. The group welcomes the availability of AAPP and the announced release of CSPP and FY3L0/L1PP. The WG noted that a BUFR conversion module for NPP data would be included within AAPP, which is interfaced with CSPP. The WG appreciated that CMA has published an installation users’ guide (http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_TEC-CMA-Guide-FY3L0PP-FY4L1PP.pdf) and a procedure to request the software, but some users were still experiencing difficulties to obtain the FY3L0/L1PP software.

Recommendation 4: CGMS to consider defining a set of “best practices” that could include implementing Direct Broadcast capability, and provision of ingest and pre-processing software tools, documentation and training.

Recommendation 5: CMA to facilitate the delivery of FY3 software and user support.

Noting the important role that GCOM-W plays for MW imagery in the new CGMS baseline, it would be very useful to include a Direct Broadcast capability on GCOM-W2.

Recommendation 6: JAXA to consider including a Direct Broadcast capability aboard GCOM-W2.

X-Band and L-Band

The WG noted that future generation LEO sun-synchronous, are planned to use X-Band for Direct Broadcast, either as the single frequency band or in combination with L-Band. It acknowledged that this evolution was motivated by the need to convey considerable higher data rate than HRPT, but noted that these new services would no longer be compatible with any CGMS standard for LEO data dissemination.

The WG welcomed the action taken by EUMETSAT, on behalf of CGMS and in response to ITWG, to consider harmonization of the appropriate layers of the future LEO Direct Broadcast services in X-Band, for instance as concerns frequency or transmission protocols based on CCSDS standards. The WG wished to be kept informed of the progress of this action and would be ready to provide feedback.

Recommendation 7: CGMS to inform the ITWG of the draft standard for LEO Direct Broadcast in X-Band and seek feedback from ITWG.

Furthermore, if a high data rate service were implemented it is not clear whether there would remain a requirement for Low Data Rate service in L-Band. On one hand, moving to X-Band is a technological trend that goes along with the increased data throughput of advanced sensors and which renders X-Band reception more affordable than it used to be; users interested in low rate data can access reduced data sets in many

cases via Internet or via retransmission systems (possibly based on RARS. On the other hand, L-Band remains less expensive because geometrical specifications for L-Band antenna are less demanding than for X-Band, L-Band is also less sensitive to atmospheric attenuation and is assigned to EESS space-to-Earth use by the ITU. WMO wishes to consult the user community before providing guidance in this respect, and the WG supported this approach.

Action 4: WMO to perform a survey on whether there remains a requirement for a low data rate service in L-Band in addition to the X-Band High Data Rate for future LEO missions.

Near-real time data retransmission

NOAA and DOD had been invited to consider the use of the SafetyNet as a joint ground system ensuring timely availability of data from the JPSS and DMSP-Follow-on missions. Noting that the SafetyNet is not confirmed, the group stressed the need to put appropriate resources and priority in the expansion of RARS to mitigate the impact on data timeliness. In this respect the need was identified to optimize the information retransmitted from hyperspectral sensors such as CrIS and IASI.

Recommendation 8: Satellite operators, ITWG Members and WMO to advance the extension of RARS to new satellite systems.

Recommendation 9: NOAA and EUMETSAT to explore dissemination of Principal Components of the full CrIS spectrum in the context of RARS.

The WG also renewed its recommendations regarding geostationary data dissemination.

Recommendation 10: JMA to consider a broadcast service to facilitate access to Himawari-8 and -9 data in particular for users in Pacific islands that have limited Internet connectivity.

*"And our imagers and sounders, whirling silently in space
Like a clock sweeping its hands past the minutes of its face
As the images unwind...
Like the circles that you find
In the windmills of your mind."*