

Recommendation 11S.1 for Committee Decision

Prepared by: Working Group S

Date of Submission: 10 November 2016 (Original submission in November 2012, revised in November 2013 and 2014)

Issue Title: International Mobile Telecommunications (IMT)-GNSS Compatibility

Background/Brief Description of the Issue:

It is widely recognized that compatibility is one of the key elements to ensure interoperability between RNSS systems. In parallel it is also important to minimize non-RNSS emissions entering into RNSS spectrum so that the benefits of interoperability are not negated by reduced performance due to interference.

Because international spectrum issues are under the responsibility of the International Telecommunication Union (ITU), it is essential to keep track of activities at the ITU that could impact RNSS spectrum. In particular, when new allocations are being considered for inclusion in the Radio Regulations, it should be ensured that these do not have the potential to cause harmful interference into RNSS.

According to the decisions of World Radiocommunication Conferences 2012 and 2015, frequency bands below 3 GHz 470 – 694 MHz, 694 – 790 MHz, 790-862 MHz and 1427 – 1518 MHz were identified for the International Mobile Telecommunication (IMT) systems. In some frequency bands this identification has global status.

There are Global Navigation Satellites systems (GNSS) operating in the frequency band below 3 GHz which have allocations for radio-navigation satellite system (RNSS). At the same time according to 4.10 of Radio Regulations: "Member States recognize that the safety aspects of radionavigation and other safety services require special measures to ensure their freedom from harmful interference; it is necessary therefore to take this factor into account in the assignment and use of frequencies".

Main frequency bands of the global navigation satellite systems are 1164-1215 MHz, 1215-1300 MHz and 1559 – 1610 MHz. Frequency bands identified for IMT do not overlap by their main emission with GNSS frequency bands. However it can impact on frequency bands of global navigation systems (1164 – 1300 MHz and 1559 – 1610 MHz) by unwanted emissions from IMT including out-of-band and spurious emissions. In the GNSS frequency band 1559 – 1610 MHz impact of the second harmonic of IMT stations that use frequency

bands 694 – 790 MHz and 790 – 862 MHz is possible, as well as impact of spurious emissions of IMT stations that use frequency band 1427 – 1518 MHz. In the GNSS frequency band 1164 – 1300 MHz impact of the second harmonic of IMT stations that use frequency band 470 – 694 MHz is possible, as well as impact of spurious emissions from IMT stations that operate in the frequency band 1427 – 1518 MHz.

Discussion/Analyses:

At the 9th meeting of International Committee on Global Navigation Satellite Systems (Prague, Czech Republic 9 – 14 November 2014) theoretical estimations on this matter were presented. Theoretical estimations showed that there is a possible adverse impact of unwanted emission levels (including out-of-band, spurious and harmonic interference) from base/mobile IMT stations on the frequency bands of global navigation systems (1164 – 1300 MHz and 1559 – 1610 MHz). At the inter-sessional meeting of WG-S (Vienna, Austria, 7-10 June 2016), experimental estimations were presented. These experimental estimations confirmed the results of previously presented theoretical estimations.

WG-S also agreed to continue monitoring mobile service channel plans and recognized the importance of the activities to prevent potential harmonic interference into RNSS.

Thus, one of the main tasks of WG-S is conducting studies that are aimed to prevent potential out-of-band and harmonic interference on RNSS systems, as well as investigation of specific IMT spectrum utilization plans within relevant Administration's and regional groups.

Recommendation of Committee Action:

- *ICG members are encouraged to actively participate in the ITU-R and regional work on new IMT spectrum allocations to ensure that proposals do not impact existing and future GNSS operations.*
- *The ICG members are recommended to encourage their administrations to ensure the protection of RDSS/RNSS from the unwanted emissions of new IMT spectrum allocations including adjacent band interference, spurious interference and harmonic interference, as a result may require the implementation of more stringent limits for IMT unwanted emissions levels in RDSS/RNSS bands.*
- *Members may also consider forming links with other satellite groups already defending satellite spectrum.*

Recommendation 11S.2 for Committee Decision**Prepared by:** Working Group S**Date of Submission:** 10 November 2016**Issue Title:** Protection from Provider Signal Patents**Background/Brief Description of the Issue:**

The ICG has created an open and transparent environment among the GNSS service providers, which has led to significant accomplishments in adopting principles of compatibility, interoperability, and transparency in civil service provision since its inception in 2005. Transparency in civil service provision is a key component to ensuring that interoperability at the user level can be achieved by manufacturers developing receivers using open signals from multiple GNSS.

Discussion/Analyses:

WG-S recognizes that there have been cases where at least one GNSS Provider's open service signals were subject to signal structure design patents filed by one or more private entities working within the GNSS program of a system provider. This may have resulted in a request for payments of royalties by users of such signals and/or from manufacturers of receivers using such signals. These types of patents can undermine the ability of the ICG to encourage interoperable open civil service provision.

Recommendation:

The ICG agrees that demanding payment of any kind for open signal structure patents is contrary to the spirit of international GNSS cooperation. GNSS providers are encouraged to ensure that current and future signals will not be subject to patent claims. In addition, the ICG recommends that nations which have issued or may issue such patents, ensure that they are not used for collection of royalties.

Recommendation 11S.3 for Committee Decision

Prepared by: Working Group S

Date of Submission: 10 November 2016

Issue Title: Workshop on Performance Monitoring

Background/Brief Description of the Issue:

The ICG recommended the establishment of the IGMA Trial Project during its ICG-10 meeting in 2015. Specifically, it was recommended that the IGMA Task Force and IGS initiate a joint trial project that will demonstrate a global GNSS Monitoring and Assessment capability.

This project was successfully initiated during 2016; However, additional discussions are needed to identify the next steps, which may include real-time monitoring and expanding the list of parameters that are monitored.

Discussion/Analyses:

Building upon the work of the trial project between ICG and IGS, additional discussion is needed to examine further aspects of monitoring and to include feedback from the public.

This will include discussions on the methods and technologies for GNSS Monitoring and assessment including Signal Quality Monitoring. It will also include a report on the IGMA activities in an effort to make the public aware of the trial project and its status.

Recommendation:

The IGMA Task Force should organize a workshop on Performance Monitoring, to take place in Shanghai in conjunction with the China Satellite Navigation Conference in May 2017

The Workshop will address the following:

- *IGMA Activities and the status of the IGMA-IGS trial project*
- *Need/benefit for GNSS signal quality monitoring, and the feasibility of establishing this within the ICG in the future*

Recommendation 11S.4 for Committee Decision

Prepared by: Working Group S

Date of Submission: 10 November 2016

Issue Title: Timing Workshop

Background/Brief Description of the Issue:

ICG WG-S (WG-A) system provider (5 of 6) participants conducted five workshops on interoperability between 2013 and 2015. These workshops were designed to receive industry feedback on the technical aspects of GNSS interoperability. Among the different topics that were addressed through questions to industry were the use of GNSS time offsets between systems to maintain interoperable service provision. The feedback received led to more in depth discussion within the WG-S Interoperability and Service Standards Subgroup in 2015 and 2016.

Discussion/Analyses:

Recognizing that GNSS time offsets can affect interoperability, some Providers are broadcasting time offsets relative to other systems. In order to better assess the advantages of this type of offset, further discussion among timing experts is needed.

Recommendation:

The ICG WG-S should work with WG-D, to include BIPM and the IGS, to organize an expert workshop on timing to discuss GNSS time offsets among the systems. The workshop will take place in conjunction with the IGS Workshop, to be held in or near Paris, on 3 – 7 July 2017.