

Recommendation 9A.2.1 for ICG Decision

Prepared by: Working Group A

Date of Submission: 13 November 2014 (Original submission in November 2012 and revised in November 2013)

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

Background/Brief Description of the Issue:

It is already 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.

Discussion/Analyses:

At the 2012 intersessional meeting of WG-A, the Compatibility Subgroup agreed to keep monitoring the ITU activities for new spectrum for IMT (WRC-15 agenda item 1.1) to avoid potential interference into RNSS.

The Sub-group also agreed on continuing to watch the 700 MHz mobile service channel plan in Europe, which is related to WRC-15 agenda item 1.2, and recognized the importance of the activities to prevent potential harmonic interference into RNSS.

The Subgroup Chairs will also modify the subgroup ToR to address the investigation of unlike service interference to GNSS (RNSS) and propose text for the WG-A work plan to also address this area of work

WG-A will investigate specific IMT spectrum utilization plans (ITU-R M.1036-4) within relevant Administration's and regional groups and investigate whether interference mitigation methods already exist within the telecommunications industry.

Recommendation:

- *ICG members are encouraged to actively participate in the ITU-R and regional WRC-15 preparatory work on new IMT spectrum allocations to ensure that proposals do not impact existing and future GNSS operations.*

- *The ICG members are recommended, when considering candidate bands for IMT below 3 GHz, to encourage their administrations to ensure the protection of RDSS/RNSS from the unwanted emissions from those candidate bands, 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 9A.3.1 for ICG Decision

Prepared by: Working Group A
Date of Submission: 13 November 2014
Issue Title: Evaluation and development of Interference Detection and Mitigation (IDM) capabilities

Background/Brief Description of the Issue:

Between 2012 and 2014, the ICG Working Group A sponsored three workshops on GNSS Interference Detection and Mitigation (IDM), offering industry and government agencies an opportunity to provide information on systems that are being developed for the purpose of GNSS interference detection, localization and characterization. Some of these systems are being developed for use by governments for enforcement purposes and some are being developed by industry in anticipation of commercial value. Several of these systems have progressed to the point of being fully operational, and at the July 2014 IDM Workshop, discussion focused on bringing these systems to the attention of ICG and UN Member States.

Discussion/Analyses:

As current and emerging GNSS systems provide increased worldwide economic benefit and improved operational efficiencies, it becomes more important that GNSS Providers work together to protect their users from unwanted interference. Several ICG Member States and GNSS companies have initiated projects to build capabilities to detect and geo-locate jammer devices in real time. Characterization of the interfering signals is a feature of some of these systems, for purposes of historical records and forensics. Example systems known to the ICG include:

- The U.S. government developed Patriot Watch system
 - The Chronos-developed UK government SENTINAL system
 - The ITT/Exelis geo-location capability
 - The EU funded DETECTOR project
 - Grid-based interference detection systems
 - Crowd-Source based interference detection techniques
- Note: additional capabilities may exist that should be considered

ICG and UN Member States need to be aware of the threat to GNSS signals from unwanted interference, and better understand the existing and emerging capabilities available for them to consider in countering these threats.

Recommendation:

The ICG recommends that GNSS providers and GNSS user community member states evaluate existing and emerging interference detection, localization, and characterization capabilities and consider developing, testing and implementing these or similar capabilities in their nations or regions of the world

Recommendation 9A.3.2 for ICG Decision

Prepared by: Working Group A
Date of Submission: 13 November 2014
Issue Title: Crowd sourcing interference detection and localization techniques

Background/Brief Description of the Issue:

GNSS is vital for many elements of the world's critical infrastructure. Because GNSS signals from space are very weak, jamming, intentional or unintentional, is a threat to potential for GNSS to best serve humanity. To minimize this threat, jammers must be quickly located and shut down.

Crowd-sourcing techniques have the potential to be a cost effective method for interference detection and geo-localization. To further pursue this method, it is necessary to work with industry groups to determine if standards for crowd sourcing interference detection and localization techniques should be developed and cost-effectively implemented by mobile telecommunication service providers.

Discussion/Analyses:

At the third ICG Working Group A (WG-A) Workshop on Interference Detection and Mitigation (IDM), a presentation was given which highlighted the capability of using crowd-sourcing techniques for interference detection and geo-location of jammer devices. Crowd sourcing techniques enabled by the proliferation and density of mobile phones may be a viable solution but would require cooperation of mobile phone makers, chip suppliers, wireless provider companies, and the federal communications regulators. Interference detection could be built into GNSS chipsets in new mobile phones, and wireless providers would collect interference reports from millions of users. These reports would be anonymous, to protect individual privacy, and the mobile providers would forward interference reports to local authorities for mitigation enforcement at the local level.

Recommendation:

System providers and user community member states are encouraged to work with industry groups to determine if standards for crowd sourcing interference detection and localization techniques should be developed and cost-effectively implemented by mobile telecom service providers.

Recommendation 9A.3.3 for ICG Decision

Prepared by: Working Group A
Date of Submission: 13 November 2014
Issue Title: United Nations workshops on RNSS spectrum protection and IDM for member nations in the GNSS user community

Background/Brief Description of the Issue:

As more and more nations of the world become dependent on GNSS, it is important to inform and educate administrations on the threat of unwanted interference, and the impact it can have on reliable use of these signals. Under the auspices of the United Nations, workshops can be organized and conducted by UNOOSA in cooperation with the ITU to educate decision makers about this issue.

Discussion/Analyses:

For several years, UNOOSA has been conducting GNSS workshops for the purpose of increasing knowledge of the benefits and efficiencies available through the use of GNSS. Unwanted interference from natural, unintentional and criminal sources can have a detrimental effect on the use of these signals, and therefore it is critical that administrations of nations who use and rely on GNSS are educated on these risks and the threats. Distinguishing the difference between sources of interference presents a challenge to user communities. Interference detection, localization and characterization capabilities are being developed by governments and commercial companies for consideration. Additionally, Member States should be encouraged to align laws regarding import, export, manufacture, and use of jammer devices, with those of other countries. One way to help accomplish this is by bringing together experts to educate and discuss solutions through United Nations Workshops on Interference Detection and Mitigation (IDM). These workshops would be organized and conducted by UNOOSA in coordination with the ICG IDM Task Force and in cooperation with the ITU.

Recommendation:

The ICG Executive Secretariat, in coordination with the IDM taskforce, should organize United Nations workshops on RNSS spectrum protection and IDM for governments of user community member nations in order to protect the worldwide utility and benefits of GNSS.

- *A proposal focused on educating UN member state administrations regarding RNSS spectrum management approaches and IDM capabilities will be developed for consideration by the ICG;*
- *Participating member state administration representatives will be encouraged to Provide information as to whether it is legal within their country to: manufacture, sell domestically, export, import, purchase, own, or use GNSS jammers.*

Joint Recommendation 9A.4.1 for ICG Decision

Prepared by: Working Groups A, B and D
Date of Submission: 13 November 2014
Issue Title: ICG Open Service Monitoring Information Portal

Background/Brief Description of the Issue:

1. Currently GNSS monitoring activities are conducted by each Provider through its own service/analysis center with different information services
 - These centers may be associated under the ICG umbrella
 - Information about each center may be available on the ICG portal
2. Both existing and prospective system's centers may provide raw data, products, and information about the service of GNSS OS monitoring, free of charge
3. To archive the goal of international recognition of monitoring and assessment results, these centers should use a unified list of characteristics to be monitored: with unified definitions; unified calculation methods; the technical capability to assure international recognition of the accuracy and other characteristics based on national standards.

Discussion/Analyses:

At the present time, GNSS Providers do their own service monitoring through service/analysis centers. As the Providers work to make their systems more interoperable, the users gravitate toward solutions that use signals from multiple GNSS constellations. As a result, there is an increased need to be able to access standardized data produced by the service/analysis centers, for all GNSS signals. Additionally, having this information available at a single location makes it much easier and quicker to access the information that is needed. Multilateral cooperation by all GNSS Providers can enable this kind of service to be offered through the creation of an ICG portal.

Recommendation:

WG-A recommends that existing monitoring service centers for GNSS open services establish a link to a new ICG portal designed by the IGMA Task Force.

- *This portal will allow GNSS users worldwide to easily find GNSS monitoring information and products by just looking for the ICG webpage.*
- *Eventually, open service monitoring and analysis centers linked to the ICG portal will use an ICG-recommended list of open service parameters to be monitored that are defined and calculated using accepted techniques and procedures based on a consensus among GNSS service providers.*

System name	System participant name	GNSS being monitored	Internet address
iGMA	IAC	GLONASS GPS GALILEO BeiDou QZSS ...	www.glonass-iac.ru
	IGS	GLONASS GPS GALILEO BeiDou QZSS ...	http://igs.org/components/prods.html
	iGMAS	GLONASS GPS GALILEO BeiDou QZSS ...	

iGMA participant name, Internet address	List of parameters available	Methods of calculation	Technical means of monitoring	International recognition basis for measurement results
IAC www.glonass-iac.ru	Unified list of parameters, defined under the umbrella of ICG (all or some), links to parameters description	Unified list of calculation methods, defined under the umbrella of ICG (all or some), links to methods description	List of GNSS receivers, SLR stations, etc links to technical means characteristics	Mutual recognition through national standards of Russia (list of them, calibration techniques etc)

Joint Recommendation 9A.4.2 for ICG Decision

Prepared by: Working Groups A, B and D
Date of Submission: 13 November 2014
Issue Title: International GNSS Monitoring and Assessment (IGMA) Workshop

Background/Brief Description of the Issue:

4. The ICG Providers' Forum Workplan includes:
 - a) The Providers Forum has agreed to consider the development and discussion of proposals to widely monitor the performance of their open signals and provide timely updates to users regarding critical performance characteristics such as timing accuracy, positioning accuracy and service availability.
 - b) Working Group A will support this activity by focusing on potential cooperation in the development of the necessary ground infrastructure to monitor signal and service performance for open services, recognizing that the actual implementation of this infrastructure is subject to the budgetary limitations of each system provider, and the completion of provider-to-provider agreements as necessary and appropriate.
5. WG-A established the IGMA Task Force jointly with WG-B and D, and defined its tasks at the ICG-6 meeting in 2011. The updated recommendation 8A 4.1 redefined tasks to be taken by the TF, and includes the TF "Consider organizing a workshop on IGMA parameters, services and methodologies."

Recommendation:

- *An IGMA Workshop should be held in 2015 for potential users and service providers in order to discuss the following:*
 - *Goal and purpose*
 - *Parameters to be monitored using the "Matrices" prepared by the TF*
 - *Organizational approach*
 - *Sharing portal*
- *The workshop will be held in Xi'an China, May 12, 2015 immediately preceding CSNC 2015*
- *Participation from the following organizations is expected:*
 - *Existing monitoring network operators, service providers*
 - *GNSS Providers*
 - *SBAS Operators*
 - *International network operators*
 - *Commercial service operators*

- *User community representatives*
- *TF members should prepare the “Matrices”, categorizing the parameters to be monitored by the IGMA*