

**Recommendation 10A.2.1 for Committee Decision****Prepared by:** WG-A Compatibility Sub-Group**Date of Submission:** 07/16/2015**Issue Title:** Campaign of protection of RNSS operations**Background/Brief Description of the Issue:**

By investigating the interference detection and monitoring for the protection GNSS, it was found that the accrual implementation of the protection measures of GNSS is becoming more important. For this purpose, it is essential to recognize the international regulations or guidelines such as ITU Radio Regulations and ITU-R Recommendations. However, it would be necessary to reflect these international Regulations/guidelines to each nation's domestic regulations/guideline, in order to enforce them in effective ways.

**Discussion/Analyses:**

In order to implement the measures for the protection of RNSS, it would be essential to completely understand both a regulatory and operational status of RNSS.

For this purpose, the followings knowledge would be required at least;

- Relevant provisions of the ITU Radio Regulations
- Relevant ITU-R Recommendations
- User's domestic/regional regulations concerning non-licensed emission limits including intentional radio emission limits and electromagnetic emission limits

**Recommendation of ICG WG-A:**

The ICG recommends that GNSS providers and GNSS user community member states promote the implementation of the protection measures of GNSS operations in their nations and/or regions as well as other parts of the world.

**Recommendation 10A.2 for ICG Decision**

**Prepared by:** Working Group A  
**Date of Submission:** 05 November 2015  
**Issue Title:** UN COPUOS Agenda Item on Spectrum Protection and IDM

**Background/Brief Description of the Issue:**

The ICG Working Group A has been discussing spectrum protection and interference detection and mitigation (IDM) for several years, and has collected information about this subject. However, the discussions and information collected have been limited to ICG members and participants. At the 2014 meeting of the United Committee on the Peaceful Uses of Outer Space (UN COPUOS) Science & Technology Subcommittee (STSC), the subject of GNSS interference detection and mitigation was raised as a topic of interest, specifically with regard to the prevalence of GNSS jammer devices. UN COPUOS has broad reach across UN countries, with [82] member states. In order to expand the discussion on this topic beyond the members of the ICG, and to further expand on what was previously discussed within the STSC, the ICG should reach out to UN COPUOS through the STSC on this topic

**Discussion/Analyses:**

The long term goal of this recommendation will be for the Science & Technology Subcommittee (STSC) or UN COPUOS to establish a multi-year agenda item focused on National Efforts to protect RNSS Spectrum, and pursue GNSS interference detection and mitigation in member states.

**Recommendation:**

Working Group A should prepare a presentation on its spectrum protection and IDM activities for the February 2016 session of the UN COPUOS STSC.

Under this agenda item, Member States will be asked to report:

- National RNSS Spectrum Allocations and consistency with ITU Allocations
- Regulations regarding Non-licensed emissions limits from RF emitters and non-emitters
- Planned or existing Laws and Regulations related to the manufacture, sale, export, import, purchase, ownership, and use of GNSS jammers
- Domestic efforts to detect and mitigate GNSS interference

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**WG-A Recommendation #3**  
**UPDATE TO:**  
**Joint Recommendation 9A.4.1 for ICG Decision**

**Prepared by:** Working Groups A, B and D  
**Date of New Submission:** 5 November 2015  
**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 the new ICG portal designed by the ICG Secretariat.

- 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.

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## Existing Civil Service Monitoring Information Sources

Name	Country	URL
Information Analysis Center	Russia	<a href="http://glonass-iac.ru/en/">http://glonass-iac.ru/en/</a>
US Coast Guard Navigation Center	U.S.	<a href="http://www.navcen.uscg.gov/">http://www.navcen.uscg.gov/</a>
William J. Hughes Technical Center WAAS Test Team	U.S.	<a href="http://www.nstb.tc.faa.gov/index.htm">http://www.nstb.tc.faa.gov/index.htm</a>
European GNSS Service Centre	EU	<a href="http://www.gsc-europa.eu/">http://www.gsc-europa.eu/</a>
IGMAS Service Center	China	
QZ-vision	Japan	<a href="http://qz-vision.jaxa.jp/USE/en/index">http://qz-vision.jaxa.jp/USE/en/index</a>
	India	
IGS portal	IGS	<a href="http://igs.org/">http://igs.org/</a>

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**WG-A Recommendation #4**  
**Joint Recommendation 9A-D.4.1 for ICG Decision**

**Prepared by:** IGMA Task Force  
**Date of New Submission:** 5 November 2015  
**Issue Title:** IGMA - IGS Joint Trial Project

**Background/Brief Description of the Issue:**

IGMA was established as a joint ICG sub-group by recommendation of WG-A (ICG-6, 4.2 and later became a Task Force of WG-A, B, and D, ICG-7 4.1, which includes the IGMA work plan and charter).

Recognizing the on-going activities of Providers to expand their monitoring capability to track and monitor multiple constellations.

The Subgroup/Task Force has conducted a number of meetings and collected proposals on the parameters set to be monitored by IGMA.

**Discussion/Analyses:**

Recognizing:

- The need for a global GNSS monitoring and assessment capability to assist with public confidence in GNSS service provision and interoperability
- The role the International GNSS Service (IGS) has played in producing precise GNSS products since its inception in 1994, noting the evolution of products and services over time to meet user segment requirements
- Utilizing existing resources such as IGS and providers monitoring and assessment systems (which may include signal quality monitoring) could maximize benefits in the early stage of the IGMA roadmap

**Recommendation:**

The ICG recommends that the IGMA TF and IGS initiate a joint trial project that will demonstrate a global GNSS Monitoring and Assessment capability

In advance of launching the joint trial project, the following items are to be determined:

- ToR for the Trial project
- Status of Trial Project and list of participating organizations (existing monitoring systems and/or providers), operation modes
- Short list of stations to be used in Trial Project, providing 1X coverage (to provide collecting all measurement data from all satellites of all GNSS)

- Requirements for receivers and related equipment
- Short list of monitored parameters for Trial Project and calculation methods for them
- Organizational procedures (reference data validation for parameters calculations, measurement data exchange, monitoring results exchange, etc.)

An example of IGMA - IGS joint Trial project as a reference for making further definition:

- IGS is well placed to establish a Trial Project for IGMA
- Invite participation from existing non-IGS analysis groups, networks and data centres,
- Develop benchmarking between Groups and generate analysis products
- Cross sharing between existing IGS functional streams and IGMA activities benefit both

## Recommendation for Committee Decision

**Prepared by:** Working Group A

**Date of Submission:** 11/05/2015

**Issue Title:** Updated Work Plan Nomenclature for Working Group A

**Background/Brief Description of the Issue:**

The original ICG work plan from UN General Assembly Document A/AC.105/879 - 29 December 2006 - *Meeting of the International Committee on Global Navigation Satellite Systems, Vienna, 1 and 2 November 2006* assigned five actions to the Working Group on Compatibility and Interoperability (WG-A)

**Discussion/Analyses:**

One of the five original WG-A actions has been completed, two are being actively pursued, one remains critically important as an area of future work, and one is no longer considered essential to pursuing compatibility and interoperability among all GNSS.

The revised work plan for WG-A maintains a focus on compatibility and interoperability and adds additional areas of work consistent with the work plan of the Providers Forum.

**Recommendation of Committee Action:**

The ICG should adopt the attached work plan for WG-A

**Updated Work Plan of the International Committee on Global Navigation Satellite Systems  
WORKING GROUP ON SYSTEMS, SIGNALS, AND SERVICES  
Leads: United States, Russia**

**PREAMBLE**

1. Global and regional system providers agree that GNSS has become an essential international positioning, navigation, and timing infrastructure operating in a manner that benefits users worldwide.
2. GNSS has become a key component of critical infrastructure in many countries and the world's economy relies more and more on the services that it enables.
3. To provide reliable global navigation service and meet the user needs, the Committee, Providers Forum, and Working Group seek ways to generate recommendations for how to coordinate system development and provide reliability, compatibility, and interoperability of their systems and services , for peaceful purposes, for users worldwide.
4. Activity of WG-A follows the principles of compatibility and interoperability and the definitions were adopted at the first Providers Forum meeting held in Bangalore, India, September 2007. The Third Providers Forum meeting, held in Pasadena, CA, USA, December, 2008, updated these principles and their definition, as attached.
5. Global and regional system providers agree that at a minimum, all GNSS signals must be compatible. To the maximum extent possible, open signals and services should also be interoperable, in order to maximize benefit to all GNSS users. Each individual Provider has also agreed that they will strive to publish and disseminate all signal and system information necessary to allow manufacturers to design and develop GNSS receivers on a non-discriminatory basis.
6. Since compatibility and interoperability are highly dependent on the establishment of standards for service provision and user equipment, the Committee and associated Providers Forum will consider guidelines and standards developed by existing standard-setting bodies applicable to GNSS service provision and use, such as the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the International Telecommunication Union (ITU) and potentially, the International Organization for Standardization (ISO).



## TASKS AND SCOPE OF WORK

7. In order to assist the Providers Forum in accomplishing its objectives, as described in the Terms of Reference, and in order to further the work of the committee focused on compatibility, interoperability, and provision of open service through a system of global, and regional navigation satellite systems, the Systems, Signals, and Services Working Group, co-led by the United States of America and the Russian Federation, will pursue the activities described below.

### **Compatibility and Spectrum Protection**

8. The principle of compatibility and its definition was adopted at the first Providers Forum meeting held in Bangalore, India, in September 2007. The Third Providers Forum meeting, held in Pasadena, CA, USA, in December, 2008, updated this principle and its definition.
9. The Providers Forum has also agreed to pursue the protection of radionavigation satellite service (RNSS) spectrum through appropriate domestic and international regulation.
10. Considering the principle of compatibility and its definition, and the importance of RNSS spectrum protection, the working group, through a subgroup co-chaired by Japan and the European Union will:
  - a. Seek common understanding on appropriate methods to determine compatibility among all GNSS;
  - b. In particular, review existing ITU regulations and recommendations related to the avoidance of harmful interference to GNSS; and,
  - c. If necessary, propose new questions or studies for ITU consideration, through appropriate mechanisms, to further protect all GNSS from harmful interference, and to define methodology used between GNSS providers to ensure compatibility;
  - d. Develop educational material on sources of interference to GNSS as recommended by the Committee at its 8th meeting, and assist the working group and ICG Secretariat in training and educating governments of user community member nations on RNSS spectrum protection and management, consistent with ITU regulations and recommendations.
11. The Sub-group will develop a strategy for ICG to support mechanisms to detect and mitigate sources of electromagnetic interference, taking features of GNSS signals and existing regulatory mechanisms into consideration. This should lead to increased efforts worldwide to implement coordinated interference detection and mitigation capabilities at the national level. Specifically, the Sub-group will:
  - a. Develop standards for interference reports submitted to GNSS Civil Service National Centers and establish routine communications among the centers;
  - b. Recommend standards for IDM capabilities to be implemented by national governments and industry;
  - c. Facilitate information exchange among system providers on positioning, navigation, and timing capabilities to complement GNSS.

12. If necessary, the sub-group will establish ad hoc task forces to implement concrete tasks and reach objectives in schedule.

### **Interoperability and Service Standards**

13. As with the principle of compatibility, the principle of interoperability and its definition was adopted at the first Providers Forum meeting and updated at the third meeting. Consistent with this principle and its definition, the working group, through a subgroup co-chaired by the United States and China, will consider the perspective of various user applications and equipment manufacturers, and will:
  - a. Continue efforts to interact with industry experts and user community representatives in order to solicit input on improving the overall open service provided by global and regional navigation satellite systems in a manner that allows for effective multi-GNSS use at the user level;
  - b. Maintain a focus on the open service signal development and broadcast plans of the system providers; and,
  - c. In cooperation with [Working Group D], consider the role of system time and geodetic reference frames in enabling interoperable multi-GNSS service
14. Consistent with the principle of transparency in the provision of open services, each individual Provider will strive to publish and disseminate all signal and system information necessary to allow manufacturers to design and develop GNSS receivers. The Subgroup will develop a template to promote common terminology and definitions in individual GNSS Open Service Signal Specifications as published in Interface Standards and Interface Control Documents. The Subgroup will also develop a template that each individual GNSS provider may consider using in their publication of signal and system information, the policies of provision, and the minimum levels of performance offered for open services used on the Earth and in outer space (Open Service Performance Standards).
15. 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.
16. The Working Group, through the Interoperability and Service Standards Subgroup, will support this activity by translating open service performance standards into parameters for multi-GNSS monitoring. Recommendations on the necessary monitoring infrastructure and organizational approaches may be made to Providers and international organizations in coordination with other ICG working groups as necessary and appropriate.
17. When requested by a provider or providers, the Subgroup will assist in exchanging information with ICG participants to help resolve GNSS open service anomalies that impact users. The Subgroup will also facilitate cooperation and information exchanges between providers and scientific organizations that engage in open service signal quality monitoring.
18. If necessary, the sub-group will establish ad hoc task forces to implement concrete tasks and

reach objectives in schedule.

### **System-of-System Operations**

19. As requested by the Providers Forum, the Working Group will investigate methods to ensure orbital de-confliction among constellations in medium Earth orbit (MEO) and appropriate application of United Nations Orbital Debris Mitigation guidelines to this regime implemented through national practices. In this regard, the working group will coordinate with the Inter-Agency Space Debris Coordination Committee.
20. Overall open service performance provided by the system of global and regional navigation satellite systems may also be improved through coordination of constellation configurations and replenishment of satellites in specific orbital locations. The Working Group will assist providers in this area as desired and appropriate.
21. The Working Group will investigate the overall GNSS open service volume in order to consider improvement in terms of accuracy, integrity, availability, reliability and service coverage.

### **METHOD OF WORK**

22. If necessary, the working group will establish ad hoc task forces to implement concrete tasks and reach objectives in schedule.
23. The working group will conduct at least one meeting each year between the previous and next meeting of the ICG in order to develop draft conclusions and recommendations for Committee consideration.
24. This work plan will be reviewed on an annual basis and revised as necessary in order to address important issues that require the attention and focus of the system providers.