Report of Working Group A: Compatibility and Interoperability

1. The International Committee on Global Navigation Satellite Systems (ICG) Working Group A (WG-A) on Compatibility and Interoperability met Tuesday, Wednesday and Thursday, 11 - 13 November 2014, in Prague, Czech Republic, under the co-chairmanship of Mr. Sergey Revnivykh, Russian Federation, and Mr. David Turner, United States of America (U.S.).

2. After brief welcoming remarks, the co-chairs reviewed the agenda noting the 6 sessions corresponding to the Work Plan of the Working Group. The agenda was adopted, with the acceptance of a request for two additional presentations by the European Union (EU) to be added; one under the session on System Provider Updates and the other under the session on Interoperability.

3. The co-chairs then began **Session 1** of the agenda covering **System Provider Updates** by explaining that this session was designed to offer Providers the opportunity to present any new information that was not covered during the opening Plenary Session. Mr. Viktor Kosenko, Russian Federation, provided the first presentation under this session on "GLONASS Evolution and Performance Improvement". The presentation provided an update on the GLONASS space segment, noting that the current constellation will be renewed with Glonass-K1 and Glonass-K2 satellites. Mr. Kosenko also explained that the Ground Segment deployment will ensure a significant improvement to the GLONASS system accuracy. The U.S. followed with a question about where the L1 signals will be centered. Mr. Revnivykh explained that they will be centered in the L1 GLONASS frequency band. The EU also asked whether Glonass-K2 satellites will have search and rescue, and the answer provided was yes.

4. The second presentation given under Session 1 was made by Mr. Joerg Hahn, from the European Space Agency (ESA), titled "GALILEO System Status". This presentation discussed the current performance of GALILEO, noting that the current ranging accuracy is on the order of 1 meter, while the timing performance is around 7 nanoseconds. Mr. Hahn also presented additional information about the "Satellites 5 and 6 anomaly" resulting from a launch aberration. He noted that some performance degradation is expected with the signal in space for these satellites, but it is anticipated that they will be usable once the orbit raising maneuvers are complete. Finally, Mr. Hahn explained that they are looking at enhanced launch capability using the Ariane 5 vehicle, which could launch up to 4 satellites at a time.

5. **Session 2, GNSS Compatibility,** began with a presentation by Mr. Mike Swiek, U.S. Global Positioning System Innovation Alliance, on spectrum regulation for GNSS Pseudolites. Mr. Swiek noted that regulation of commercial pseudolites can impact Global Navigation Satellite System (GNSS) availability and uses, and recommended compliance with the International Telecommunications Union (ITU) International Table of Frequency Allocations which allocates the GNSS frequency bands. He also suggested that the ICG consider recommending that spectrum regulators ensure commercial GNSS pseudolite operations

remain outside of the ARNS and RNSS bands. A question from Japan was asked about whether pseudolites should be considered licensed or unlicensed. Mr. Swiek responded that any pseudolites allowed inside GNSS bands should be limited to only specialized, non-commercial uses and remain under strict license control.

6. Mr. Dmitry Aronov from the Russian Federation, was the next presenter under Session 2, with a proposal to update Recommendation 8A.2.1, *International Mobile Telecommunication (IMT)-GNSS Compatibility*, based on the results of the Joint Task Group 4-5-6-7 ITU-R meetings. Mr. Aronov suggested the need to take into account spurious emissions and the base station case. The WG-A co-chairs suggested that this item be discussed further by the Compatibility Subgroup. The co-chair of the Compatibility Subgroup asked if this is something that the WG-A would support. General support for this idea was acknowledged by the working group. The Compatibility Subgroup agreed to work on a revised recommendation. Mr. SHEN Jiemin from China followed with a presentation on the "Adjacent Band Compatibility Study for S-Band RDSS/RNSS". Mr. SHEN offered the premise that WLAN and IMT, which are adjacent to RDSS/RNSS bands, could cause interference. He suggested that an RDSS/RNSS adjacent frequency compatibility study in the L, S and C bands be conducted based on real system characteristics.

7. The co-chairs of the Compatibility Subgroup, Mr. Takahiro MITOME from Japan and Mr. Dominic Hayes from the EU, presented their report on the activities of the subgroup. They noted that the previous action to the Compatibility Subgroup regarding GNSS open service performance parameters will require additional time to complete. The co-chairs also agreed to update ICG-8 Recommendation 2.1, *International Mobile Telecommunications (IMT)-GNSS Compatibility,* to include encouraging ICG members to protect RDSS/RNSS from adjacent band interference when considering International Mobile Telecommunications below 3 GHz. They also noted that under WRC-15, agenda item 1.1, only bands far from RNSS are being considered for terrestrial mobile broadband applications; therefore it appears there is little danger for RNSS interference from new IMT spectrum allocations under this agenda item. However, the 700 MHz band mobile service channel plans under WRC-15, agenda item 1.2, still need to be watched. Finally, in response to the tasking from WG-A to study the feasibility of designating RDSS/RNSS allocations in each currently used band as safety of life service, the Subgroup co-chairs provided a summary of the regulatory status of RDSS/RNSS spectrum allocations and described the procedure for establishing new WRC agenda items.

8. **Session 3, Spectrum Protection,** opened with a presentation by Ms. Karen VanDyke, who provided an update on the U.S. Adjacent Band Compatibility Study which has been ongoing since 2012. Ms. VanDyke noted that the assessment will involve conducting testing of GPS receivers in an effort to identify appropriate adjacent-band power limits necessary to ensure continued operation of all applications of GPS services. It also aims to ensure adequate protection for future receivers utilizing modernized GPS and interoperable Global Navigation Satellite System (GNSS) signals. A public workshop has been scheduled for 04 December 2014 in Los Angeles, California, to get industry feedback. The next presentation in Session 3, titled "Compatibility between Amateur Services and RNSS in E6 Band", was given by Mr. Mateo Paonni from the EU. Mr. Paonni noted that GALILEO, BeiDou and QZSS all use the

1260-1300 MHz frequency band; it is allocated to RNSS on a primary basis within the EU, while Amateur Services within this band are allocated on a secondary basis. Incidents of TV repeaters causing interference to Galileo have been identified, and the EU has several initiatives under way to try to mitigate the interference. Mr. Atilla Matas from the ITU noted that Galileo should consider looking outside of Region 1, because RNSS interference on aviation radars is also a concern. The EU responded that there is a difference between amateur services and radars because radar has a primary allocation. The WG-A co-chairs noted that the topic of non-licensed transmitters could be something for the Compatibility Subgroup to discuss in the future.

9. The co-chair of the IDM Task Force, Mr. Rick Hamilton from the U.S., presented a summary of the third IDM Workshop that took place in July 2014 in Geneva. Mr. Hamilton reviewed the eight actions and recommendations from the workshop and also shared information about recent cooperation between GNSS civil service centers. Mr. Didrik Ehrenborg, as a member of the EU delegation from Ehrenborg Networks AB, followed with a presentation on Crowd-Sourcing Interference Detection Capability. He reviewed the concept of using crowd-sourcing as a way to detect and locate sources of interference, and noted that their initial testing has yielded a large number of false detections. So far, their technique seems to work better using fixed devices, but improvements can be made to the concept in the future. Another presentation was given by the EU delegation, Mr. Francis Ielsch from LS Telecom, on "Spectrum Monitoring Applied to the Detection and Geolocation of GPS Jammers". The presentation focused on describing and comparing different geo-location methods for tracking interference sources and using automated continuous monitoring. By linking the monitoring with a control station, the source of interference can be quickly located and stopped.

10. Four presentations on critical infrastructure were made under Session 3. The first was given by Mr. Harold Martin from the U.S. He noted the U.S. definition of Critical Infrastructure and explained that there are currently 16 Critical Infrastructure Sectors. The goal is to be resilient such that if a disruption to GPS civil services were to occur, the U.S. would be able to restore the essential functions of the economy, society, and government, as quickly as possible. The second presentation on GLONASS and Critical Infrastructure was given by Ms. Tatiana Mirgorodskaya from the Russian Federation. Ms. Mirgorodskaya explained that Russia has defined critically important facilities and critical technologies. Presidential Decree addresses the special status of GLONASS and its relation to the National Infrastructure. Within Russia, navigation technologies are included on the list of critical technologies, but critical infrastructure sectors are not fixed at a regulatory level.

11. The third presentation on critical infrastructure was made by Mr. ZHEN Weimin from China. In China, national critical infrastructure includes those assets which belong to the national or public and are most important to national security. A questioner asked whether the Chinese Government has any official documentation designating BDS as critical infrastructure. China responded by saying that they currently do not have such documentation. Mr. Pieter De-Smet from the EU provided the fourth presentation on critical Infrastructure. He explained that currently the definition of critical infrastructure in the EU covers only energy and transport, with GNSS considered as part of transport. In 2013, the EU began a new

approach to critical infrastructure protection, looking at the interdependencies between different types of critical infrastructure. Once the pilot phase is complete, Galileo will be designated as a critical infrastructure.

12. Session 3 continued with several presentations on GNSS jammer regulations. The first was given by Mr. Rick Hamilton on U.S. Regulations Regarding Jammers. The presentation summarized the U.S. Federal Communications Commission (FCC) regulations, which make it illegal to manufacture, sell, export, purchase or use a GPS jammer in the U.S. However, under current rules it is legal to possess a GPS jammer. Mr. Stanislav Kizima from the Russian Federation followed with a presentation on "Regulatory Aspects of Spectrum Protection in Russia". Mr. Kizima stated that under current law of communication in Russia it is illegal to manufacture, sell, purchase, export and use a GNSS jammer, but the regulation to own such a device is undefined. Mr. LI Jianshi from China presented on the Rules of Spectrum Protection in China. Mr. LI reviewed the relevant laws in China and noted that it is illegal to manufacture, sell, export, purchase, own or use any GNSS jammer. He also indicated that a draft revision to the Radio Regulations of the People's Republic of China has been made, which further specifies the regulations on developing, manufacturing and importing radio transmission equipment. The EU followed with some remarks about regulatory laws within Europe, where it is illegal to sell, import and use GNSS jammers within the European Union. However, the laws are less clear with regard to manufacture and export of these devices. Given that it is legal to own a GNSS jammer within the EU, enforcement of the other laws is more difficult.

13. The WG-A co-chairs reviewed the three draft recommendations related to IDM that resulted from discussions at the July 2014 inter-sessional meeting. Recommendation 9A.3.1, *Evaluation and Development of IDM Capabilities*, was adopted by the Working Group. Recommendation 9A.3.2, *Crowd Sourcing Interference Detection and Localization Techniques*, was also agreed upon by the Working Group. And finally, the Working Group endorsed Recommendation 9A.3.3, *United Nations Workshops on RNSS Spectrum Protection and IDM for Member Nations in the GNSS User Community*.

14. Members from Working Groups B and D joined WG-A for **Session 4, Open Service Information Sharing and Service Performance Monitoring (International GNSS Monitoring and Assessment).** Mr. Alexey Bolkunov from the Russian Federation opened the session with a presentation, "GLONASS Open Service Performance Parameters Standard and GNSS Open Service Performance Parameters Template Status". The presentation provided an update on the GLONASS Open Service Performance Standard, indicating that it is currently undergoing internal review. Mr. Bolkunov also offered a proposal to add Parameters Calculation Methods as a necessary amendment to the GNSS Open Service template based on the draft proposed by Russia. He also offered to create and adopt a GNSS OS PS Template Development Roadmap. The co-chair of the IGMA Task Force, Mr. Satoshi Kogure, commented that the Task Force is currently assessing the parameters to monitor. The next presentation, "Proposals on the Development of the GNSS Monitoring and Assessment System", was given by Mr. Igor Silvestrov, from the Russian Federation. The presentation provided perspective on the GNSS parameters that should be monitored, and the monitoring that is being done on GLONASS in Russia. Mr. Silvestrov also

expressed Russia's support for the proposed ICG recommendation regarding establishing a portal for GNSS monitoring and assessment, and the recommendation regarding an IGMA workshop in 2015.

15. Session 4 continued with a presentation from Mr. YANG Yong from China on "New Development of iGMAS". The presentation described the task of iGMAS: to provide a real-time network to track the orbits of BDS, GPS, GLONASS and Galileo, and to provide data collection, storage and analysis capability. Mr. YANG also described the stages of the project, and indicated that the goal is to have 30 stations by 2016. He noted that an open architecture is used and China welcomes additional input. Mr. Revnivykh asked a question about how the monitoring parameters are determined. Mr. YANG explained that they use their own internal methods.

16. A presentation on the status of the International GNSS Monitoring and Assessment (IGMA) Task Force was given by the tri-chair, Mr. Satoshi Kogure. He reviewed the new recommendation 9A(D).4.2, calling for an IGMA workshop to discuss parameters, the open service monitoring information portal, infrastructure and methodology. He also noted that the Task Force agreed to accept China's offer to host the workshop in Xi'an on 12 May 2015. A question was asked about the overall objective of the workshop. The Task Force tri-chair, Ms. Ruth Neilan, explained that the idea is to put the parameters into a matrix, and figure out how to examine and analyze all the data that is collected. Mr. Kogure also reviewed recommendation 9A(D).4.1, proposing the establishment of a new ICG GNSS monitoring portal. No objections were noted to either of the two joint Working Group A, B and D recommendations from this session.

17. **Session 5, GNSS Interoperability**, began with a joint presentation by the co-chairs of the Interoperability Task Force, Mr. Jeffrey Auerbach from the U.S., and Ms. LU Xiaochun from China. The presentation provided a review of previous meetings of the Task Force, and the action from the July 2014 WG-A inter-sessional meeting calling on Task Force members to analyze the results from industry obtained through the four interoperability workshops that took place in 2013 and 2014. Japan followed next with a presentation by Mr. Masao Nagamori on the report of the Japan GNSS Interoperability Workshop. The workshop took place on 01 August 2014 with participation from industry and GNSS providers. The results include responses from six receiver manufacturers. Mr. Nagamori noted that in general the results indicate that Japanese receiver manufacturers are against big change.

18. The next presentation under Session 5 was given by Mr. Auerbach and Mr. Tom Stansell, from the U.S., on a Proposed Approach to Analyzing the Results of the Interoperability Workshops. This approach would involve looking at the questions that were posed to industry and determining the relevance to each Provider, then reporting on the results and conclusions. Ms. Mirgorodskaya and Mr. Sergey Silin continued with a presentation on "Interoperability Workshops Results Interpretation by Russian Federation". They noted that interoperability is hard to implement for Providers who have an established system, and therefore the focus should be on timing and geodesy going forward because this is easier to implement. The proposed idea would be to define interoperability parameters that can be implemented by the Providers.

19. The Interoperability session continued with a presentation from Mr. Jose Rodriguez on the European Union Views on Interoperability. The presentation explained that the EU plans to hold an interoperability forum on 18 November 2014, with an estimated 60 manufacturers participating. They plan to pose the same questions used in the other workshops plus some additional ones, to the industry for feedback. This will not be considered an official interoperability workshop under WG-A, because the members will not have an opportunity to participate, but it is an opportunity for the EU to receive industry feedback to their questions. Ms. LU Xiaochun gave the last presentation under Session 5, providing an analysis of ten common questions from the workshops by looking at the similarities between the answers. She also proposed that the Task Force consider encouraging more industry/user input, research the differences in answers to the questions, and discuss potential evaluation methods.

20. The WG-A co-chairs facilitated a discussion on the next steps for the Interoperability Task Force. The Working Group agreed to the following Guidance to the Task Force: 1) reach a consensus on the need for additional analysis; 2) identify issues (questions and answers) that should continue to be addressed collectively, and issues that appear relevant only to specific providers; and 3) begin development of recommendations to providers for WG-A consideration. The Working Group also suggested that Providers offer the following input to the Task Force: 1) interest in specific interoperability questions and answers; 2) all relevant future system and service plans related to signals, time and geodesy; and 3) information as to whether further interactions with industry will be pursued on issues of interest. Finally, the EU noted that they will work with the Interoperability Task Force to have some form of workshop in 2015 that falls under the WG-A prevue.

21. **Session 6, Conclusion**, was held on 13 November 2014. The WG-A co-chairs began by reviewing the recommendations, noting that the objective was to reach consensus for presentation to the full ICG at the Plenary session. The updated language for Recommendation 9A.2.1, *International Mobile Telecommunications (IMT)-GNSS Compatibility*, was presented and adopted by the working group. Recommendations 9A.3.1, *Evaluation and Development of IDM Capabilities*, and 9A.3.2, *Crowd Sourcing Interference Detection and Localization Techniques*, were also approved without further comment. Recommendation 9A.3.3, *United Nations Workshops on RNSS Spectrum Protection and IDM for Member Nations in the GNSS User Community*, was presented with a small change, adding the word "import" to the list that participants are encouraged to report on with regard to the legality of GNSS jammers. The co-chairs also noted that this recommendation does not preclude WG-A from holding other technical IDM workshops. The Task Force co-chairs concurred with the recommendation and suggested that they would begin planning for another technical workshop in 2015. Joint WG-A, B and D Recommendation 9.4.1, *ICG Open Service Monitoring Information Portal*, was adopted by WG-A without comment. And Joint WG-A, B and D Recommendation 9.4.2, *IGMA Workshop*, was also approved with an update indicating that the workshop would take place in Xi'an, China, 12 May 2015.

22. Session 6 continued with a review of the new WG-A Guidance to the Interoperability Task Force. The co-chairs also reviewed the suggested input that Providers offer to the Task Force. No comments were noted. Finally, the meeting was wrapped up with a review of the upcoming meetings associated with Working Group A. The potential meetings discussed include:

    - EU Interoperability Workshop
    - IGMA Workshop – confirmed 12 May 2014, Xi'an, China
    - WG-A Inter-sessional Meeting
    - 4th IDM Workshop (WG-A IDM Task Force)

    The co-chairs noted that with the exception of the IGMA Workshop, the dates and venues for the other meetings will be provided at a later time as soon as they are determined.

The full set of WG-A recommendations as adopted by the Committee at ICG-9 are enclosed.

Recommendation 9A.2.1

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

Prepared by: **Working Group A**

Date of Submission: **13 November 2014**

Issue Title: **Evaluation and Development of 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 Nations.

Discussion/Analyses:

As current and emerging GNSS systems provide increased world-wide 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

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

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 UN 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

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.r*u*	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

Prepared by:	**Working Groups A, B and D**
Date of Submission:	**13 November 2014**
Issue Title:	**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