



International Committee on
Global Navigation Satellite Systems

ICG Working Group A

ICG-9 Meeting
Prague, Czech Republic

11-12 November 2014



ICG International Committee on
Global Navigation Satellite Systems

WG-A Focus Areas

- Compatibility (to include spectrum protection) & Open Service Performance Standards
- Interoperability
- Interference Detection and Mitigation
- International Open Service Monitoring & Assessment



2014 WG-A Events

- ✓ Russia Interoperability Workshop, April 24
- ✓ China Interoperability Workshop, May 23
- ✓ IGMA Meeting/Workshop, June 23-27, Pasadena, CA, USA
- ✓ IDM Workshop, July 14-15, Geneva (ITU)
- ✓ Inter-sessional Meeting, July 16-18, Geneva (ITU)
- ✓ Japan Interoperability Workshop, Aug 01, Osaka
- ☐ ICG-9, Prague, November 10-14, 2014



AGENDA

- INTRODUCTION
- SESSION 1 — GNSS Updates from System Providers
- SESSION 2 — GNSS Compatibility
- SESSION 3 — Spectrum Protection - Interference Detection, and Mitigation
- SESSION 4 — Open Service Information Sharing & Service Performance Monitoring
- SESSION 5 — Interoperability
- SESSION 6 — Conclusion



Session 1 - GNSS Provider Updates

1. Beidou (BDS)
2. Galileo
3. QZSS
4. GLONASS
5. GPS



SESSION 2

COMPATIBILITY, SPECTRUM PROTECTION AND PERFORMANCE STANDARDS



ICG International Committee on
Global Navigation Satellite Systems

Compatibility & Performance Standard Sub-group

- Co-chairs:
 - **Takahiro MITOME**
 - **Dominic HAYES**
- Members:
 - China: Jianwen LI, Zhijian LIU
 - European Union: Dominic HAYES
 - India: S. SAYEENATHAN
 - Japan: Ryo IWAMA
 - Russia: Dmitry ARONOV, Alexey BOLKUNOV
 - United States: Doug PEDERSON



Work Plan - Compatibility

- Considering the principle of compatibility and its definition, the working group will:
 - In particular, review existing ITU regulations and recommendations related to the avoidance of harmful interference;
 - Seek common understanding on appropriate methods to determine compatibility among all GNSS; and,
 - If necessary, propose new questions or studies for ITU consideration, through appropriate mechanisms, to further protect the noise floor impacting all GNSS, and to define methodology used between GNSS providers to ensure compatibility.



WG-A Work Plan – Spectrum Protection & IDM

- The Providers Forum has agreed to pursue the protection of radionavigation satellite service (RNSS) spectrum through appropriate domestic and international regulation.
 - When necessary and appropriate, the Working Group will facilitate Provider discussions on their individual views and actions related to RNSS spectrum issues and agenda items under consideration by the ITU and its Working Parties.
- The Working Group will develop a strategy for ICG support of mechanisms to detect and mitigate sources of electromagnetic interference, taking existing regulatory mechanisms into consideration. This could lead to concrete proposals for detecting interference.



ICG-8 Recommendation 8A.2.1

- ICG members are encouraged to actively participate in the ITU-R and regional WRC-15 preparatory work on new IMT spectrum allocations (*including JTG 4-5-6-7 until August 2014*), to ensure that proposals do not impact existing and future GNSS operations. Members may also consider forming links with other satellite groups already defending satellite spectrum.



Work Plan – Open Service Information Sharing

- 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 on a non-discriminatory basis. The Working Group will develop a template to promote common terminology and definitions in individual GNSS Open Service Signal Specifications.
- The Working Group 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.
- As requested by a provider or providers, the working group will assist in exchanging information with ICG participants important to resolving GNSS open service anomalies that impact users.



Open Service Performance Template

- First Step: Identify a point of contact from each system provider
- Second Step: Meet together with the Sub-group co-chairs
- Third Step: Agree on parameters that will be common to all GNSS open service performance documents
- Fourth Step: Agree on methodology for each parameter



ICG-8 Recommendation 8A.2.2

- System Providers should provide updated information regarding global and regional navigation satellite systems and augmentations in time for the publication of a new edition of the Providers Forum's *Current and planned global and regional navigation satellite systems and satellite-based augmentation systems* before ICG-10. The updated information should include observed or expected open service performance



SESSION 3

SPECTRUM PROTECTION & IDM



ICG International Committee on
Global Navigation Satellite Systems

Interference Detection Task Force

- Co-Chairs:

- Rick Hamilton, USCG, Co-lead stephen.r.hamilton@uscg.mil
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- Members:

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WG-A Work Plan – Spectrum Protection & IDM

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 - When necessary and appropriate, the Working Group will facilitate Provider discussions on their individual views and actions related to RNSS spectrum issues and agenda items under consideration by the ITU and its Working Parties.
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ICG-8 Recommendation 8A.3.1

Education & Outreach Regarding Sources of GNSS Interference

- The ICG should develop educational material such as a downloadable pamphlet or other web content on sources of interference to GNSS. The material should include an explanation why radio navigation satellite services (RNSS) are different than radio communications services and more vulnerable to interference, and will emphasize the importance of GNSS services to critical public and private sector functions, infrastructure, and economic activity

The WG-A Task Force on Interference Detection will lead the development of sample educational material on GNSS Interference for ICG consideration



ICG-8 Recommendation 8A.3.2

- Working Group A should form a Task Force on GNSS Interference Detection reporting procedures and system development
 - Initially, the task force will focus on developing a common set of information to be reported to GNSS civil service centers
 - Next, the task force will focus on establishing routine communications among the centers
 - Finally the task force will develop guidelines for common capabilities to be considered in the development of future national IDM networks



Interference Detection Task Force Preliminary Work Plan (to implement ICG-8 Recommendation 8A.3.2)

Initially the task force will focus on developing a common set of information to be reported to GNSS civil service centers.

- The U.S., China and the ITU have presented existing interference reporting forms that are used to report interference
- The task force leaders will distribute the forms to the members of the task force and coordinate by e-mail. Findings and decisions will be reported to the next IDM workshop

Next the task force will focus on establishing routine communications among the (provider service) centers.

- Some center activities are more mature than other emerging providers organizations. Best practices will be shared by e-mail and the task force members agreed to share “after action reports” of interference activity on a regular basis.

Finally, the task force will develop guidelines for common capabilities to be considered in the development of future national IDM networks.

- The task force agreed that presentations could be made at future IDM workshops and that providers will come prepared to brief capabilities being considered.



SESSION 3

NEW ACTIONS AND RECOMMENDATIONS



ICG International Committee on
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WG-A REQUESTED ACTIONS TO ICG MEMBERS (1)

1. Prepare a presentation for the ICG-9 WG-A meeting addressing the following questions:
 - Do you consider Global Navigation Satellite Systems or their services to be National Critical Infrastructure? How does your response impact the protection of GNSS and its services in your nation?
 - What do you consider to be the definition of “International Critical Infrastructure”?
2. Provide information to WG-A at ICG-9 as to whether it is legal within their country to: manufacture, sell domestically, export, purchase, own, or use GNSS jammers



WG-A REQUESTED ACTIONS TO ICG MEMBERS (2)

3. Review/Complete existing Adjacent Band Compatibility Studies (for example, services such as mobile broadband)[, including from harmonic interference products,] to identify threats to GNSS reception. As needed, initiate additional studies for all RDSS/RNSS bands (L, S, and C) to refine [existing] RDSS/RNSS protection criteria
4. Review existing electromagnetic emissions limits from all non-licensed transmitters (for example, hairdryers, escalators) in all RNSS bands and determine whether existing unwanted emissions limits are sufficient to protect GNSS reception

The results of these investigations should be shared with all ICG participants, beginning at ICG-9, in order to inform possible regulatory decisions in national administrations and the ITU

TASKING TO THE WG-A COMPATIBILITY SUB-GROUP

In the interest of increasing GNSS spectrum protection, study the feasibility of designating RDSS/RNSS allocations in each currently used band as safety of life service.

- In the future, pending the outcome of the sub-group's assessment, the ICG could encourage its members' administrations to initiate studies in the ITU-R related to potential regulatory changes regarding the RDSS/RNSS safety of life allocations/service.

Proposed Recommendation 9A.3.1

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

Proposed Recommendation 9A.3.2

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.

Proposed Recommendation 9A.3.3

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, purchase, own, or use GNSS jammers



SESSION 4

INTERNATIONAL OPEN SERVICE MONITORING AND ASSESSMENT



ICG International Committee on
Global Navigation Satellite Systems

IGMA Sub-Group

- Co-Chairs:
 - Satoshi Kogure, JAXA, Japan
 - Xurong Dong, CSNO, China
 - Ruth Neilan/Urs Hugentobler, IGS
- Members:
 - Oleg Denisenko, Russia
 - Igor Silvestrov, Russia
 - LI Jianwen, China
 - Hideshi KAKIMOTO, Japan kakimoto.hideshi@jaxa.jp
 - Nobuo HIROE, Japan n-hiroe@cj.jp.nec.com
 - Karen Van Dyke, United States



Work Plan - Service Performance Monitoring

- 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.
- 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.



ICG-8 Recommendation 8A.4.1

- The task of the joint IGMA sub-group of WG-A, B & D will be to:
 - Determine Service Parameters to Monitor – definition and methodology to be coordinated with WG-A Compatibility sub group study
 - Determine what gaps exist in current and planned monitoring and assessment
 - Consider organizing workshop on IGMA parameters, services and methodologies
 - Recommend what should be monitored by:
 - Individual GNSS monitoring/control segments
 - Shared sites of 2 or more GNSS through bilateral agreements
 - Global monitoring of Multi-GNSS parameters
 - Propose an Organizational Approach that:
 - Avoids Duplication
 - Coordinates and integrates the related activities for identifying parameters
 - Considers the role of the current/planned IGS and
 - Defines the Relationship of the proposed organization to ICG
 - Explore methods to disseminate monitoring and assessment results, considering specific proposals from system providers



SESSION 4

NEW ACTIONS AND RECOMMENDATIONS



ICG International Committee on
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Proposed Recommendation 9A(D).4.1

- *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.*



Proposed Recommendation 9A(D).4.2

- 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
- Time and Location will be decided at the ICG-9 meeting in Prague
- 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



SESSION 5

INTEROPERABILITY



ICG International Committee on
Global Navigation Satellite Systems

Interoperability Task Force

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Interoperability Tasks from Work Plan

- Consistent with the principle of interoperability and its definition, **consider the perspective of various user applications and equipment manufacturers**
- **Continue efforts to survey** industry and user community experts
- **Sponsor and participate in workshops and meetings** designed to solicit GNSS user input



ICG-8 Recommendation 8A.5.1

- Consistent with the principle of interoperability and its definition, and the implementation of previous ICG recommendations related to interoperability, Working Group A should form a task force to complete efforts to collect and analyze user community and industry views on interoperability
 - The task force will analyze the results of the April 2013 interoperability workshop and adjust the questions for industry accordingly, in preparation for additional workshops to be hosted by each system provider
 - The results of each workshop will be consolidated and analyzed by the Task Force in preparation for the 2014 inter-sessional meeting of Working Group A and ICG-9



Russia Interoperability Workshop

- In conjunction with Moscow Navigation Forum – Moscow EXPO Center, April 23-25
- Purpose: GNSS user community and industry views on interoperability - based on questions prepared by Interoperability Task Force
- Additional subjects to address:
 - interoperability and interference resistance



China Interoperability Workshop

- In conjunction with CSNC 2014 – Nanjing, China, May 21-23
- Purpose: GNSS user community and industry views on interoperability - based on questions prepared by Interoperability Task Force
- Additional subjects to address:
 - Interoperable Signals
 - GNSS Differential System Interoperability
 - Time System Interoperability
 - Role of Monitoring networks in interoperability (IGS, iGMAS, MGM-net)



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Dates and locations for additional workshops are to be determined

Next Steps

- Encourage workshops to be held by Europe and Japan
- **Task Force** to analyze the results of the United States, Russia, and China workshops to prepare for the Inter-sessional meeting of Working Group A:
 - Compile a full listing of all questionnaire respondents
 - Correlate questions asked to develop a subset that is common to all three workshops held to date
 - Agree on categorization of respondents for analysis: [Proposed: Aviation, Medium/High precision, Consumer]
 - Analyze responses to questions in this category to determine if there are conclusions that can be easily reached
 - Prepare results to share with respondents for a second round of input

