



International Committee on
Global Navigation Satellite Systems

ICG WG A with B,D
IGMA Task Force

Progress and Status after ICG-9 IGMA Task Force activities

**3 November, 2015 @ ICG-10
IGMA TF co-chairs**



ICG International Committee on
Global Navigation Satellite Systems

IGMA Task Force

- Co-Chairs:
 - Satoshi Kogure, JAXA, Japan
 - Xurong Dong, CSNO, China
 - Ruth Neilan/Urs Hugentobler, IGS
- Members:
 - Oleg Denisenko, Igor Silvestrov, Timur Zhamaletdinov, Russia
 - LI Jianwen, China
 - Yoshihiro Iwamoto, Japan
 - Karen Van Dyke, John W. Lavrakas, Andrew J. Hansen, United States
 - Hillar Tork, Werner Enderle, European Union

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1. Background

- International GNSS Monitoring and Assessment (IGMA) Task Force was established at ICG-6 meeting in Tokyo, 2011. (At that moment, it was called IGMA Sub Group)
- Discussion through several meetings, tasks were defined and re-named as IGMA Task Force of ICG WG A with B,D at ICG-8 in Dubai. (see Rec. 8A.4.1, and its action status is shown in later slides)
- An IGMA Workshop should be held in 2015 for potential users and service providers in order to discuss the following(see Joint WG-A, B, D Recommendation 9.4.2):
 - Goal and purpose
 - Parameters to be monitored using the “Matrices” prepared by the TF
 - Organizational approach
 - Sharing portal



2. Status of TF activities for past Rec

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



2. Status of TF activities for past Rec

I. Status ICG-8 Recommendation 8A.4.1 (1/2)

- 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

Open: Action is required. Create new recommendation 10A.4.1

- Determine what gaps exist in current and planned monitoring and assessment

Open: Action is required. Create new recommendation 10A.4.1

- Consider organizing workshop on IGMA parameters, services and methodologies

Closed: Two workshops were held;

- June 2014, Pasadena in conjunction with IGS Workshop 2014
- May 2015, Xian in conjunction with CSNC 2015



2. Status of TF activities for past Rec

I. Status ICG-8 Recommendation 8A.4.1 (2/2)

- 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

Open: Action is required. Create new recommendation 10A.4.1

- 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

Open: Action is required. Create new recommendation 10A.4.2

- Explore methods to disseminate monitoring and assessment results, considering specific proposals from system providers

Open: Note relative recommendation is 9A.4.1



2. Status of TF activities for past Rec II. Recommendation 9A.4.1

ICG Open Service Monitoring Information Portal

- *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.*

Status: Open

- TF agreed that links shown in the next slide are to be linked on the new ICG web portal which is being created by UN.
- *TF Co-chairs communicate with Secretariat of ICG to request the listed service centers' URL to be linked with UN ICG Portal in collaboration with WGC related action.*



2. Status of TF activities for past Rec III. Recommendation 9A.4.2

IGMA Workshop

- *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*



2. Status of TF activities for past Rec III. Recommendation 9A.4.2

IGMA Workshop (Cont.)

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

Status: Closed

- The Workshop was held on May 12 in Xian in conjunction with China Satellite Navigation Conference (CSNC) 2015.
- 26 participants from US, Russia, China, Japan and IGS
- Goal and purpose, How to create the “Matrix” were discussed.
- Proposed matrix was simplified and set timeline to be submitted to co-chairs after filling out.

- ***The detail report from China is attached to this report as an appendix.***
- ***To follow up the discussion, draft new Rec. 10A.4.1 are created.***



3. Output from WGA intersessional meeting

IGMA TF is requested to complete establishing Matrix until ICG-10 in the following ways;

1. TF co-chairs update the Matrix based on inputs provided by IGS and China.

- Add to four columns inquiring if provider would like to monitor or not, and would like to ask other organization to monitor the parameter in order to distinct which parameters would be monitored in the proposed IGS pilot project. (ref. draft Rec 10A.7)

2.[Consult with the Compatibility subgroup regarding the inclusion of monitoring parameters derived from the current open service performance standards template]

3. Distribute the above updated matrix to TF members requesting to fill it out.

4. If No feedback from providers, the updated matrix by co-chairs is decided as final draft to be presented at ICG-10.



3. Output from WGA intersessional meeting **REVISED** Joint WG-A, B, D Recommendation 9.4.1

- *WG-A recommends that existing monitoring service centers for GNSS open services establish a link to [the a] new ICG portal designed by the [ICG Secretariat ~~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.*



3. Output from WGA intersessional meeting

II. Recommendation 9A.4.1

Existing monitoring service centers for GNSS open services

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



3. Output from WGA intersessional meeting

Draft Recommendation 10A(D).7 for ICG-10

- Recognising:
 - 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
- The ICG recommends that the IGS initiate a Pilot project that will demonstrate a global GNSS Monitoring and Assessment capability
 - The results to date of the IGMA Task Force, such as the completed matrix of monitoring parameters, should be utilized by the IGS to design their multi-GNSS Monitoring and Assessment pilot project



3. Output from WGA intersessional meeting

IGS – IGMA Pilot project

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

4. Discussion

- Three proposals on additional recommendations to the prepared one at WGA intersessional Mtg.
 - Matrix finalization (Chinese co-chair's proposal)
 - Feed back from Japan, China
 - Need recommendation to urge provider to submit?
 - Establishment of formal documentation to define IGMA (Russia)
 - Defining tasks to be completed before launching pilot project (Russia)



Proposal from Xurong

Discussion/Analyses:

- During these two years several parameter lists have been proposed and discussed by IGMA members.
- And the IGMA parameter matrix by TF co-chairs has been fully discussed and revised participant's suggestions. The updated excel version of the matrix was distributed to TF members with meeting minutes in May. All members agreed to have an additional meeting to conclude the parameter matrix study and make a proposal of recommendation to ICG -10.
- At the WGA intersessional meeting of Australia, TF meeting was held to discuss the parameter matrix added by 4 columns, and decided that if no feedback from providers the updated matrix by co-chairs is decided as final draft to be presented to ICG-10.

Recommendation and action:

- ICG recommend the final draft of IGMA parameter matrix by IGMA TF to ICG members.

Proposal from Russia (1/2)

- Taking into account that currently there are no official definitions, goals and tasks for the IGMA it is necessary to create, harmonize and adopt IGMA Terms of Reference.

Recommended:

- To use draft proposed by Russia as basis for further discussion.

Proposal from Russia (2/2)

- Recognising the need for a global GNSS monitoring and assessment capability to assist with public confidence in GNSS service provision and interoperability
- The ICG recommends that the IGMA task force initiate the discussion including the GNSS providers and existing monitoring network centers of the Pilot project that will demonstrate a global GNSS Monitoring and Assessment capability.
- It is recommended to determine prior to the ICG-11 the following aspects before conducting the Pilot Project:
 - Status of Pilot Project and list of participating organizations (existing monitoring systems and/or providers), operation modes
 - Pilot Project Roadmap agreed by all participants
 - Short list of stations to be used in Pilot Project, providing 1X coverage (to provide collecting all measurement data from all satellites of all GNSS)
 - Requirements for navigation equipment and antenna systems types
 - Short list of monitored parameters for Pilot Project and calculation methods for them
 - List of organizations and institutions responsible for calibration and certification procedures for navigation equipment and antenna systems used
 - Organizational procedures (reference data validation for parameters calculations, measurement data exchange, monitoring results exchange, etc.)
 - Regulatory framework for Pilot Project



Appendix:

Detail Summary of IGMA Workshop 2015

- The workshop was held in Xi'an, hosted by China, May 12, 2015 immediately preceding CSNC 2015
- Totally 60 participants including Co-chairs of ICG WGA&D, Co-chairs and members of IGMA TF, experts from US, Russia, Japan, China, IGS, ITRS, as well as 34 students etc.

(David Turner, Sergey Revnivykh, Jeffrey Auerbach, Tom Stansell, Chris Rizos, Zuheir Altamimi, Gary Johnston, Aleksey Bolkunov, Igor Silvestrov Jian Yang, Wenhai Jiao, Mudan Su, Hanrong Sun, Xiaolin Jia, Yamin Dang, Xiaochun Lu, Jianwen Li,

Dong Xurong, Satoshi Kogure, Urs Hugentobler)

- More than 6 TF members accessed the Workshop by Goto meeting

Appendix:

Detail Summary of IGMA Workshop 2015

➤ Session 1: IGMA System, Methodology and Results

- 1) Monitoring in the IGS
 - by Urs Hugentobler, Technical University Munich
 - Presentation: description of IGS network as basis for monitoring, tracked signals by different receivers in MGEX and DCB generation as example for monitoring in IGS. High precision product generation requires monitoring, though done mostly implicitly, i.e., without provision of immediate monitoring results to users.
 - Questions raised: What is required by users, who are the users, how to provide monitoring results?
- 2) The purpose and goal of IGMA
 - Satoshi Kogure, JAXA Satellite Navigation Unit
 - Presentation: The goal is monitoring of the performance of open signals with respect to performance standards for multi-GNSS users by international collaboration. Goal of IGMA is to provide results of assessment such that users can select best signals, common reference frame and common time system. List of parameters and methodology shall be defined.



Appendix:

Detail Summary of IGMA Workshop 2015

➤ Session 1: IGMA System, Methodology and Results

- 3) GNSS Monitoring and Assessment in Russia
 - by Aleksey Bolkunov, TsNIImash, Igor Silvestrov (Russia),
 - Presentation: current status and future plans for monitoring and assessment in the Russian Federation. IAC PNT hosts official monitoring portal. Presentation of the status of the system of differential corrections and monitoring for aerial navigation, and of the GNSS monitoring and assessment system and GLONASS metrological assurance system. GLONASS and GPS monitoring and assessment results are available, BeiDou and Galileo monitoring and assessment results are under development.
- 4) Update on China's iGMAS
 - by Hanrong Sun, TARC of CSNO
 - Presentation: current status on iGMAS which is running in test operations since July 2014 and providing basic monitoring services. It will commence its global open service through web interface and smartphone app before ICG-10



Appendix:

Detail Summary of IGMA Workshop 2015

➤ Session 2: IGMA Parameters List and Matrix

- 1) Progress of the IGS's M-GEX Project and Real-Time Service
 - by Chris Rizos, President of IAG
 - Presentation: Discussion of MGEX project and IGS Real-Time Service and future challenges. Underlining the fact that the IGS is a federation, and inviting other organizations and initiatives to participate in generating IGS products, which would be used (in some way) for future monitoring applications.
- 2) The future activities of the International GNSS Service (IGS), and plans for IGS activities in Asia Pacific
 - by Gary Johnston Community Safety & Earth Monitoring Division, Geoscience Australia
 - Presentation: The presentation was skipped for the sake of saving time. Gary, the new Chair of the IGS GB, presented the IGS strategy and commenced a process to define the strategy for the next decade. He invited the audience to participate in the next IGS workshop in Sydney in February, 2016

Appendix:

Detail Summary of IGMA Workshop 2015

➤ Session 2: IGMA Parameters List and Matrix

- 3) Parameters of Russia's IGMA
 - by Aleksey Bolkunov, TsNIImash,
 - Presentation: the performance parameter list and structure. Comments: Document defining the status, role, function, responsibilities is required and has to be approved. List of parameters has to be approved. Parameter calculation methods have to be approved.
- 4) Monitoring Parameters and Implementation of China's iGMAS
 - by Xiaolin Jia, Xi'an Research Institute of Surveying and Mapping
 - Presentation: the structure and list of performance parameters to be monitored, classified into constellation status, signal quality, signal accuracy, service performance and preliminary results of monitoring and assessment. iGMAS parameters are a subset of the parameters to be monitored.
- 5) IGMA Parameters Matrix,
 - by Xurong Dong , IGMA TF
 - Presentation: Summary of current proposals for parameters and proposal for a simplified excel matrix.



Appendix:

Detail Summary of IGMA Workshop 2015

➤ Main conclusions of the Workshop:

1. IGMA Parameters Matrix was fully discussed, and revised with participants' suggestions.
2. The updated excel sheet was distributed to the TF members with meeting minutes in the beginning of the week starting May 18.
3. The comments on the distributed excel sheet was collected, filled out sheet by May 31.
4. TF members agreed to have an additional TF meeting to conclude parameter study as well as to make a proposal of the recommendation to ICG WG-A. Australia, in July, 2015.

Recommendation 9A.4.1

Action

- *TF members inform Co-chairs the existing monitoring service centers for GNSS open services if their web site are not be listed on the previous slide*
- *TF Co-chairs communicate with Secretariat of ICG to request the listed service centers' URL to be linked with UN ICG Portal.*