

# Meeting of ICG-12 WG-B

## “Enhancement of GNSS Performance, New Services and Capabilities”

### Summary of Results

06 December, 2017  
Kyoto, Japan



International Committee on  
Global Navigation Satellite Systems

# Objectives of ICG-12 WG-B Meeting

1. Assess the progress on establishing the interoperable GNSS Space Service Volume and identify the necessary follow on steps
2. Assess the progress made by WG-B Application Subgroup chaired by China and Japan, define the next steps of the WG-B Application subgroup
3. Follow up the WG-B Workplan
4. Define work leading to ICG-13

# Sessions of WG-B

1. Ad-hoc sessions of WG-B
  - Technical session on Interoperable GNSS SSV
    - Finalisation of SSV Booklet
    - Discussion SSV Video
    - Discussion on additional outreach activities
  
2. Nominal session of WG-B covering as per Workplan
  - Application Subgroup Briefing
  - Interoperable GNSS Space Service Volume
  - Search and Rescue
  - Space Weather, Remote Sensing & Science
  - New Services and Capabilities

# Status of WG-B Application Subgroup

Subgroup Co-Chairs:

Dr. Jun Shen (China), Dr. Izumi Mikami (Japan)

## Recall of Application Subgroup Objectives

1. To monitor and review technical improvements
2. To identify additional and/or potential requirements from user/ application side
3. To identify current GNSS shortcomings on services and performances
4. To recommend GNSS performance enhancements to system providers
5. To promote multi-GNSS applications by cooperating with user communities

Request from the Co-Chairs of the SG:

Service Providers to identify points of contact to support the  
Applications Subgroup of WG-B

# Status of WG-B Application Subgroup

- DRAFT online questionnaire to identify future user needs is available for review by ICG participants
- <http://121.42.29.87/index.php/377458?lang=en>
- Way forward of the Subgroup
  - Sub-group meeting:
    - March 5 in Munich Satellite Navigation Summit
    - May CSNC 2018 conference in China
    - September IONGNSS+ 2018 in US
  - Long term:
    - Evaluate questionnaire feedback
    - Develop a Application Catalogue Report
    - Release a Report summarise Results of the Questionnaire



# Status of Space Service Volume Definition

- SSV Action Group is established and progressing very well on the Interoperable GNSS SSV



- Group held 1 interim meeting and 10 Telecons over the last year
- All service providers/space agencies are contributing to the work

# Status of Space Service Volume Definition

- SSV Booklet – Final Draft version will be available to ICG tomorrow (only editorial issues to be resolved)
- Road-map until public release:
  - 7. December '17: provision of Final Draft to ICG and Service Providers
  - January 2018: Endorsement for Publication by Service Providers
  - June 2018: Publication of SSV Booklet linked to UNISPACE+50 event

# Status of Space Service Volume Definition

- SSV outreach activities
  - SSV action group has been organised SSV in dedicated session at Munich Satellite Navigation Summit in March 2017
  - Several Paper and Presentation have been published by Members of the WG-B
  - Opportunity for a Panel Discussion on SSV as part of SATELLITE 2018 March 12-15 in Washington, D.C.
  - To asses the possibility to organise a dedicated SSV panels and keynote presentations at ION GNSS+ 2018, CNSC 2018 and IAC 2018
  - SSV Paper for SpaceOps 2018 in Marseille
  - SSV Video for additional visualization under preparation



# Future Items for Space Service Volume

- Observations leading to future work items
  - Importance to track the missions utilizing an on-board GNSS space receiver in order to follow up the actual user needs and consider them for the evolution of the GNSS systems
  - Sidelobe emissions can provide important benefits to the signal availability
  - Further mission concepts to support Space Exploration (e.g. with Beacons in Earth-Moon Lagrange points)

# Search and Rescue

- Presentations on SAR implementation in Galileo, BDS and GPS
- Galileo and GPS already implement/will implement SAR as per Cospas SARSAT standards
- For SAR applications (as per Cospas SARSAT) the availability of every SAR transponder provides important benefit to the SAR user community
- WG-B members consider it important that interoperability is also established at SAR level,
- SAR Downlink Radio Frequency compatibility to be addressed in WG-S subgroup

# Space Weather

- Space Weather aspects are a new work item of WG-B
- At ICG-12 several presentations have been made confirming the importance of this topic
- In order to progress on this area, it is important to ensure the participation of the relevant experts to the group
- Service providers are asked to nominate their Point of Contact on Space Weather to WG-B

# New Services and Capabilities

- Feedback on Scientific experimentation for Gravitational Redshift
  - Combination of ultra stable on-board clocks on navigation satellites in eccentric orbits allow for demonstrate the gravitational redshift (relativity theory)
  - Averaging measurements over long period allowed to increase current accuracy
  - Activity still ongoing, future results will be reported

# Way Forward to ICG-13

- WG-B Application SG to further advance on the online questionnaire and attempt to provide a first report on the findings
- SSV action group to continue in spirit and pace as over the last year
  - Release SSV booklet
  - Conduct identified outreach activities
  - Discuss further work as part of the interim meeting

# Way Forward to ICG-13

- Organize one WG-B Interim Meeting in June 2018 in Vienna with sessions on:
  - SSV and SSV Future work
  - Search and Rescue
  - New Services providing Integrity through non-GEO
  - Work Plan and Recommendations:
    - Emergency Warning Service
    - Interoperable Ionosphere modelling for High Accuracy
    - Discussion of new Recommendations
- Organise an additional Interim meeting of the Working Group (Event to be identified):
  - Space Weather
  - Scientific Applications and Radio Occultation of GNSS SIS
  - Work Plan and Recommendations:
    - Emergency Warning Service
    - Interoperable Ionosphere modelling for High Accuracy
    - Discussion of new Recommendations

# Recommendation ICG11-WGB-REC1

## Search and Rescue GNSS payload interoperability

### **Issue Title: Search and Rescue GNSS payload interoperability**

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

The space segment component of the international Search and Rescue program is expanding. This requires continued communication between the GNSS providers to ensure interoperability.

#### Discussion/Analyses:

Information sharing has deepened to better understand the service providers' search and rescue concept of operations using GNSS payloads. Near-term intentions of the newest SAR space segment provider, BDS, was discussed.

#### Recommendation of Committee Action:

Invite further discussions on the global interoperability of search and rescue payloads on board GNSS constellation spacecraft. This includes national and international coverage concepts as well as return link implementation progress.

# Recommendation ICG11-WGB-REC2

## GNSS for exploration in cis-Lunar space & beyond

**Issue Title: GNSS SSV – Use of GNSS for exploration activities in cis-Lunar space and beyond**

Background/Brief Description of the Issue:

During the WG-B GNSS SSV Working Group activities associated with the generation of the GNSS SSV Booklet, it became clear that the use of GNSS signals in support of missions within and beyond cis-Lunar space is possible and could contribute to improved on-board navigation capabilities.

Discussion/Analyses:

It is essential to understand the user needs for missions to cis-Lunar space and beyond, and to perform detailed analyses of the GNSS SSV capabilities and potential augmentations related to the support of missions to cis-Lunar space and beyond.

Recommendation of Committee Action:

WG-B will lead and Service providers, Space Agencies and Research Institutions are invited to contribute to investigations/developments related to use of the full potential of the GNSS SSV, also considering the support of exploration activities in cis-Lunar space and beyond.