UNITED NATIONS
Office for Outer Space Affairs

International Committee on
Global Navigation Satellite Systems

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International Committee on Global Navigation Satellite Systems (ICG): Spectrum Protection and Interference Detection and Mitigation activities

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Background

- 2001 – 2004: Action Team on GNSS (Italy and the United States) – *in implementation of the recommendations of UNISPACE-III, 1999, Vienna*
  - An international framework to support operational coordination and exchange of information among system operators and national and international user communities would be important
  - The assumption was that current and future system operators would soon move from a competitive to a collaborative mode where there is a shared interest in the universal use of GNSS services regardless of the system
- 2005: Establishment of the ICG (noted by UNGA 61/111 of 14 December 2006)
  - Promote the use of GNSS and its integration into infrastructure, particularly in developing countries;
  - Encourage compatibility and interoperability among global and regional systems
- Main challenge is to provide assistance and information for those countries seeking to integrate GNSS into their basic infrastructure, including at governmental, scientific and commercial levels

Membership

- Members: 9 nations and the European Union

Current and future core, regional or augmentation systems providers: China (BeiDou), EU (Galileo/EGNOS), Russia (GLONASS/SDCM), United States (GPS/WAAS), India (IRNSS/GAGAN), and Japan (QZSS/MSAS)

State Members of the United Nations with an active programme in implementing or promoting a wide range of GNSS services and applications: Italy, Malaysia, United Arab Emirates

- Associate Members and Observers: 21 organizations

International & regional organizations and associations dealing with GNSS services and applications: UN system entities (ITU, BIPM, ICAO, IMO), IGOs, NGOs

ICG participation is open to all countries and entities that are either GNSS providers or users of GNSS services, and are interested and willing to actively be engaged in ICG work

Annual Meetings

- UNOOSA (2006), India (2007), United States (2008), Russian Federation (2009), Italy & European Union (2010), Japan (2011), China (2012), United Arab Emirates (2013), European Union (2014), United States (2015), Russian Federation (2016), **Japan (2017),** China (2018), India (2019), Vienna (2020)
- 2006: Terms of Reference and Workplan
- **Systems, Signals and Services (United States & Russian Federation):** Focused discussion on compatibility and interoperability, encouraging development of complimentary systems; Exchange detailed information on systems and service provision plans
- **Enhancement of GNSS Performance, New Services and Capabilities (India, China and European Space Agency):** Focused discussion on system enhancements (multipath, integrity, interference, etc.) to meet future needs
- **Information Dissemination and Capacity Building (UNOOSA):** Focused on education and training programmes, promoting GNSS for scientific exploration (space weather specifically)
- **Reference Frames, Timing and Applications (IAG, IGS & FIG):** Focused on monitoring and reference station networks

Providers' Forum

- 2007: **Establishment**
- Members: Current and future global and regional satellite navigation systems and Satellite-based Augmentation Systems (SBAS) providers

PF provides ways and means of promoting communication among system providers on key technical issues and operational concepts such as the GNSS spectrum protection, orbital debris, and orbit de-confliction

- Scientific and Technical Subcommittee of UNCOPUOS (UN GA Res. 62/217 of 1 February 2008) started consideration of an agenda item "Recent developments in GNSS"
- 2008: **Terms of Reference and Workplan**
- Agreement that all GNSS signals and services must be compatible and open signals and services should be interoperable to the maximum extent possible in order to maximize benefit to all GNSS users;
- Consensus reached on Principle of transparency - *every GNSS provider should publish documentation that describes the signal and system information, the policies of provision and the minimum levels of performance offered for its open services*
- 2017: **Eighteenth Meeting, 6 June 2017, Vienna, Austria**
- Open Service Information Dissemination, Open Service Performance, Spectrum Protection (interference detection and mitigation)

UNOOSA: Executive Secretariat (ICG and Providers' Forum)

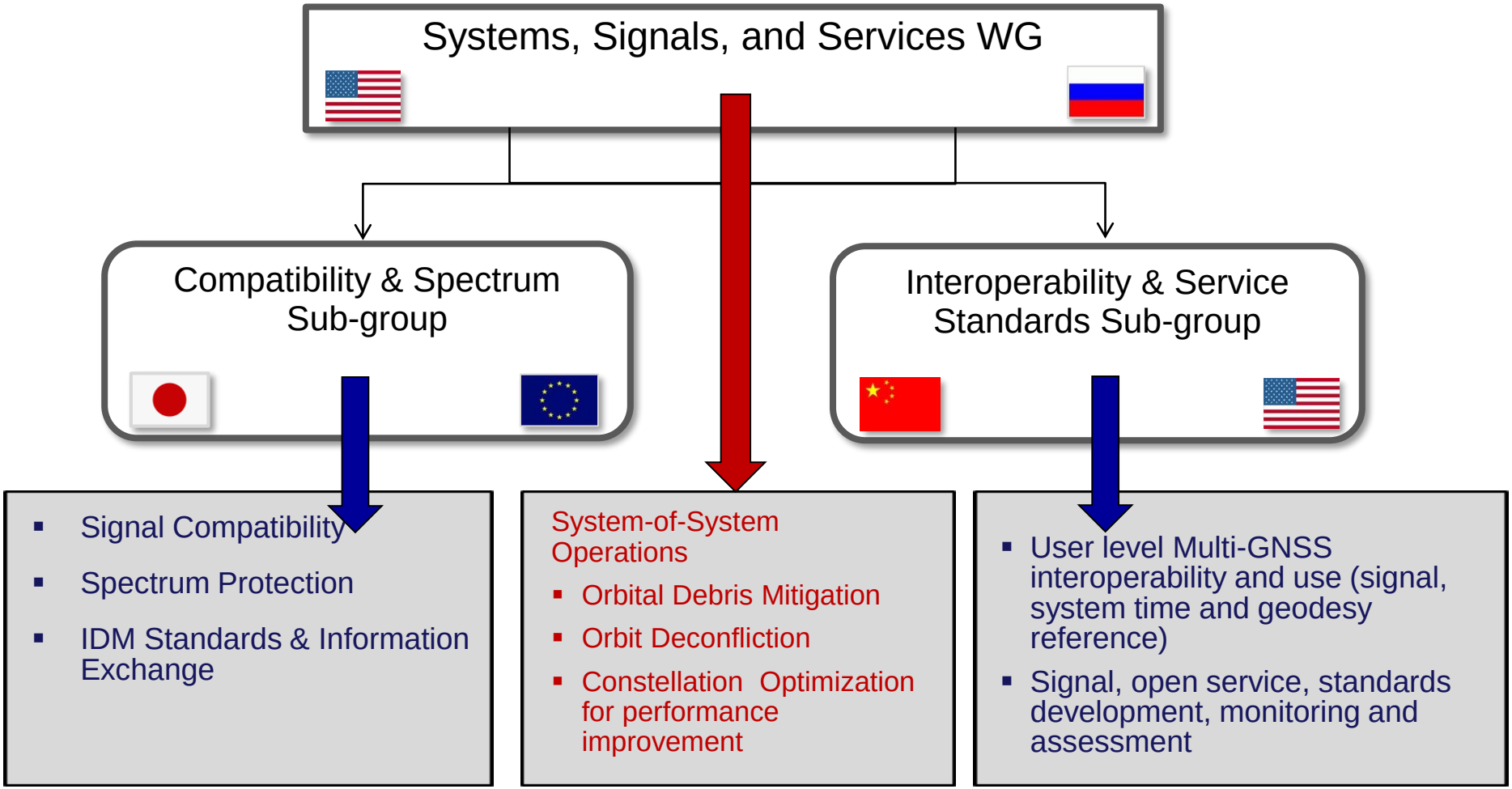
Working Group S: Recommendation

- **Interference Detection and Mitigation (IDM)**
  - To continue addressing the need for worldwide GNSS spectrum protection
  - To establish a multi-year agenda item focused on national efforts to protect RNSS spectrum, and pursue GNSS IDM in member states
- **Request for voluntary reporting on national RNSS spectrum protection practices and GNSS IDM capabilities (A/AC.105/C.1/2017/CRP.18):**

STSC agreed that, a general exchange of information should be included on issues related to GNSS IDM, with a view to raising awareness of efforts to achieve the overall goal of promoting effective use of GNSS open services by the global community.

http://www.unoosa.org/res/oosadoc/data/documents/2017/aac_105c_12017crp/aac_105c_12017crp_18_0_html/AC105_C1_2017_CRP18E.pdf

Systems, Signals, and Services WG (WG-S)



IDM Task Force will continue under the sub-group

Specific Tasks to be managed by Co-chairs until the need for a permanent sub-group can be determined

IGMA Task Force will continue under the sub-group

ICG International Committee on Global Navigation Satellite Systems

The Problem

- A jammer can *block all radio communications* on any device that operates on radio frequencies within its range.
- Generally *does not discriminate* between desirable and undesirable communications.
- Jammers can:
  - prevent your cell phone from making or receiving calls, text messages, and emails;
  - prevent your Wi-Fi enabled device from connecting to the Internet;
  - prevent your GPS/GNSS unit from receiving correct positioning signals; and
  - prevent a first responder from locating you in an emergency.

Working Group S: IDM Task Force

- At the inception of the ICG, the Working Group on Compatibility and Interoperability was tasked to develop a strategy supporting mechanisms to detect and mitigate sources of electromagnetic interference, taking features of GNSS signals and existing regulatory mechanisms into consideration
- An IDM Task Force was formed by the working group to undertake this work
- Under the newly structured ICG Working Group on Systems, Signals and Services, IDM efforts have been combined with Compatibility and Spectrum Protection under a Sub-group chaired by Japan and the EU
- 6 IDM workshops and 2 IDM& Spectrum seminars have been conducted to date
  - Seminar on GNSS Spectrum Protection and Interference Detection and Management, Kathmandu, Nepal, 12 – 16 December 2016

http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2016/2016-workshop-on-IDM_-presentations.html

Your Role

- We encourage you to go back to your national regulators and find out how they are protecting GNSS from interferers.
- Do they realize the vulnerability of GNSS reception?
- Do they appreciate the economic impact of GNSS loss?
- Are they doing enough to protect GNSS spectrum from interference?

Cooperation and Information Sharing Between Provider Service Centers

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	http://www.csno_tarc.com
QZ-vision	Japan	http://qz-vision.jaxa.jp/USE/en/index
	India	
IGS portal	IGS	http://igs.org/

Significant IDM Technologies

UK Research into GPS Jamming

Handheld Detection

JammerCam™ testing in the UK

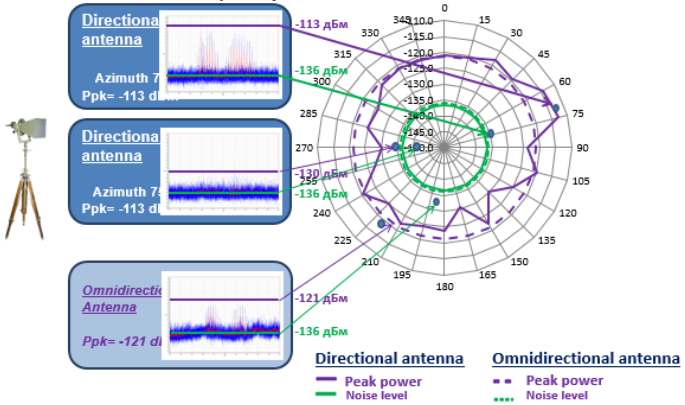
Chronos Technology Research Projects with Innovate UK
GAARDIAN – 2008 - Technology to detect Jamming
SENTINEL – 2011 - Technology to geolocate Jamming
AJR – 2013 – Technology to photograph vehicle with Jammer

Chronos GPS jamming detection technology used in the **Harris Signal Sentry™ 1000** System for geolocation

Recommendations for estimation of electromagnetic environment and Interference environment in GNSS frequency Bands. Content suggestions

Section 8. Total estimation of electromagnetic and interference environment

The basis of the methodological approach - the construction and analysis of special diagrams of the spatial distribution of energy emission in the GNSS frequency bands

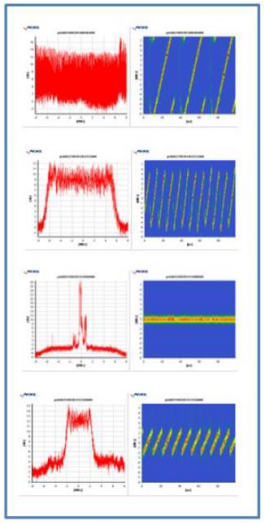


DETECTOR Characterisation

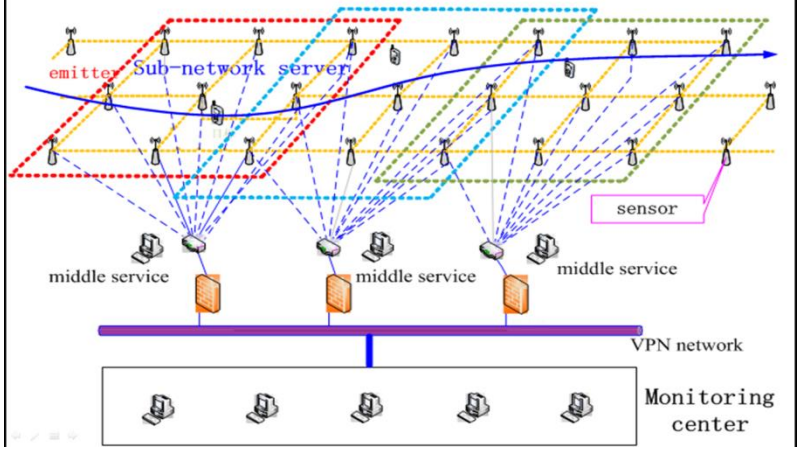
Characterisation and parameterisation of incoming signals

1. Determine likely **impact** on users
2. Differentiate **unintentional** interference from **jamming**
3. **Differentiate** between jammer types
4. Identify **multiple detections** of the same interference versus one-offs
5. Identify **trends** in the evolving threat
6. Develop **countermeasures**
7. **Catalogue** the threats

DETECTOR captures and characterises the threat



Grid Radio Monitoring Network in Shanghai



Crowd Sourcing

Every cell phone can be a GPS jamming detector.
Requires a Public/Private Partnership.

GNSS Jammers – National Legal Status (As Reported at ICG-9)

Jammers	US	RU	China	EU
manufacture	illegal	illegal	illegal	Nation-by-nation
sell	illegal	illegal	illegal	illegal
export	illegal	illegal	illegal	Nation-by-nation
purchase	Undefined (consumer import illegal)	illegal	illegal	illegal
own	legal	Undefined	Undefined	legal
use	illegal	illegal	illegal	illegal

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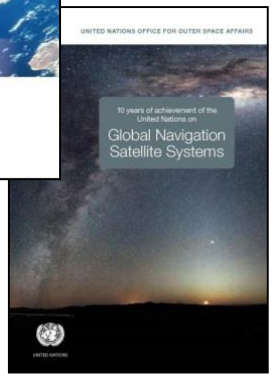
ICG Information Portal



WWW.UNOOSA.ORG

WWW.UNOOSA.ORG/OOSA/EN/OURWORK/ICG/ICG.HTML

Conclusion

- ICG has encouraged tangible international cooperation, and leading global satellite operators have coordinated their GNSS services to provide global coverage in satellite-based positioning, navigation and timing, for the benefit of all.
- The establishment of ICG serves as a model for how the United Nations can undertake action to follow up on global conferences and yield tangible results within a fixed time frame.

2018: UNISPACE+50 years of space cooperation and development

UNISPACE+50 will take stock of the contributions of the three UNISPACE conferences (UNISPACE I, held in 1968, UNISPACE II, held in 1982 and UNISPACE III, held in 1999) to global space governance

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THANK YOU

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