



# iGMAS: Status & Progress

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- **Review on international GNSS monitoring and assessment**
- **Updates on China's iGMAS**
- **Proposals**
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# Review on international GNSS monitoring & assessment

## ICG supports GNSS OS performance monitoring

- The Providers Forum has agreed to (ICG7, WG-A decision 11072012V1)
  - ✓ consider the proposals to widely monitor the performance of their open signals
  - ✓ provide timely updates to users regarding critical performance characteristics
- WG-A supports this activity by (ICG7, WG-A decision 11072012V1)
  - ✓ focusing on potential cooperation in the development of the necessary ground infrastructure to monitor signal and service performance
  - ✓ recognizing that the actual implementation of this infrastructure is subject to the budgetary limitations of each system provider,
  - ✓ Establishing subgroup on IGMA (International GNSS Monitoring and Assessment) in 6th meeting of ICG



## ● Objective of IGMA:

- ✓ Promote the sharing of the GNSS monitoring resource worldwide
- ✓ Coordinate discussions on information sharing, dissemination, collaboration and standardization
- ✓ Support related activities and proposals to optimize existing and planned capabilities for providing better GNSS monitoring service

## ● Work Plan of ICG IGMA, 2013-2015:

- ✓ define the purpose for monitoring and assessing the parameters;
- ✓ determine what parameters are necessary to be monitored for individual systems and inter-GNSS;
- ✓ define responsibilities for monitoring and assessment;
- ✓ determine what level and methods are needed, etc.



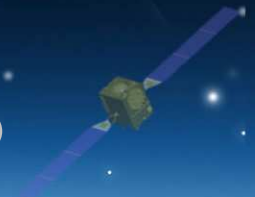
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# Updates on China's iGMAS



## 1. Brief on iGMAS

China is developing the iGMAS to support the activities for International GNSS Monitoring and Assessment.

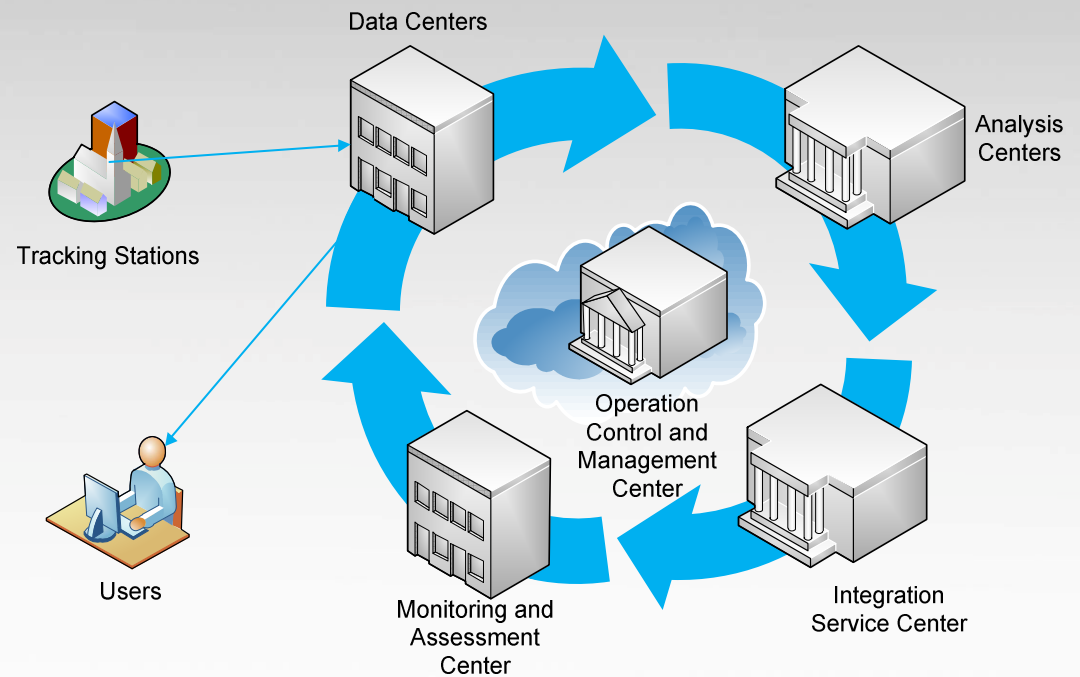
- ✓ Originally for monitoring and evaluating BDS signal quality and system performance in 2007;
- ✓ Now to provide service for monitoring and assessment of Multi-GNSS SIS, navigation data , positioning performance, etc.





# Updates on China's iGMAS

## 2. System Structure



- ✓ Tracking stations
- ✓ Data Centers
- ✓ Analysis Centers
- ✓ Integration Service Center
- ✓ Monitoring and Assessment Center
- ✓ Operation Control and Management Center





# Updates on China's iGMAS

## 3. tracking stations and tracking equipment

### Tracking Stations

- ✓ ten domestic tracking stations established.
- ✓ another 25 tracking stations planned to be setup worldwide.
- ✓ establishing stations with Russia, Pakistan and other countries is on progress







# Updates on China's iGMAS

## 10 established tracking stations



BeiJing



Changchun



Kunming



Urumqi



The Arctic



Xi'an



Shanghai



Lasa



Wuhan



The Antarctic



## one signal quality monitoring station



In 2009, 7.3m-antenna installed, for GNSS signal monitoring.



a 40m-antenna expected to be installed at Xi'an in Aug.2014.



# Updates on China's iGMAS

## tracking facilities



KVM

Multi-GNSS Receiver

Ionosphere  
scintillation Receiver

Frequency Counter

Router & Firewall &  
Switch

Industrial Personal  
Computer



# Updates on China's iGMAS

- ✓ Receivers with BDS/GPS/GLONASS/Galileo Tracking capability.



Observe All-in-view GNSS signals

- BDS: B1, B2 and B3
- GPS: L1, L2, L5
- GLONASS: L1, L2
- GALILEO: E1, E5a, E5b

Measurement Accuracy	Code	10cm
	Carrier phase	1mm
Data Output Format	RINEX	
Timing Accuracy(RMS)	20ns	
Velocity Accuracy (RMS)	0.03m/s	
Memory	16G	
Network Protocol	NTRIP、 HTTP、 FTP	





# Updates on China's iGMAS

## 5. Data centers and analysis centers

- ✓ two data centers are under construction at Wuhan University and National Time Service Center.
- ✓ five analysis centers in Shanghai, Wuhan, etc.





# Updates on China's iGMAS

## 6. Monitoring and assessment center





# Updates on China's iGMAS

## 7. Operation control and management center



Test and assessment research center of CSNO





# Updates on China's iGMAS

## 8. Integration Service Center



iGMAS Product and service center

Chinese | English

Home Introduction Products station Analysis News FAQ contact us user WebService

**OUR BEIDOU OUR DREAM**

OUR BEIDOU OUR DREAM

Comprehensive analysis and evaluation of product service center is the world's continuous detection system of high precision products processing center. It also is the center of foreign products, directly to all types of users. Use beidou public signal of interoperability, and by publishing the ICD files, promoting foreign IGS stations also track the beidou navigation satellite.

**News** more >>

- Fourth annual China satellite navigation academic 2012-07-30
- Hainan municipal government visit to plough through 2012-07-04
- Wang Zhongde general line to plough through survey 2012-07-02
- Cooperation and win-win development - the former deputy 2012-06-21
- Plough through surveying deployment conference 2012-06-16
- 2012 zhongguonian digger was named "the top ten 2012-06-04

**Services**

Name:

Time:  -

**Products** more >>

current task	past task	future task
(2011.9-2013.8)	(2013.9-2016.6)	(2016.7-2020.1)
IGSS tracking station 20 key construction in the Asia Pacific region (domestic eight, two)	Build ten foreign IGSS tracking station, a data center, analysis center, two Foreign inspection	Use beidou public signal of interoperability, and by publishing the ICD files

**Satellite navigation Services Conference**

2012.09.23—2012.09.25  
Beijing national convention center

**Links**

IGSS, CNSA, CASC, etc.

**Composition** more >>

Tracking station	Analysis center	Testing center	Data center
Implementation of beidou tracking observation function, meet the needs of the beidou system.	Data centers are in raw observation data collecting remote system focus, is also a data provider.	Analysis center to deep processing of the original observation data.	Testing analysis center of large system running state to realize accurate detection and evaluation.

Technical support: Satellite application System  
Recommended site resolution: 1024\*768



# Updates on China's iGMAS

- ✓ R&D of the tracking equipment already finished, and site-installation on going
- ✓ Hardware integration and testing in all centers is undergoing
- ✓ IOC of iGMAS is expected in June 2014





# Updates on China's iGMAS

## 9. Preliminary GNSS monitoring results

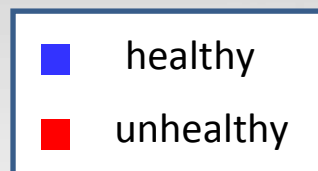
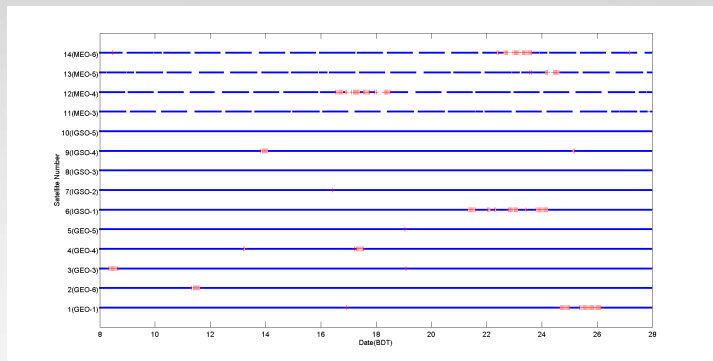
- ✓ Satellite Health Status
- ✓ Signal quality
- ✓ SIS URE
- ✓ Positioning Performance



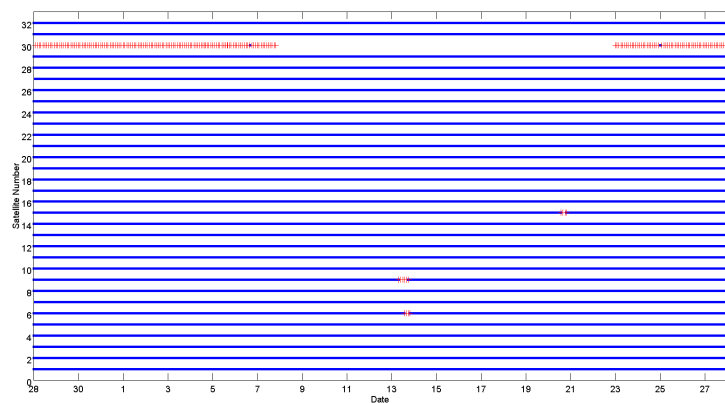


# Updates on China's iGMAS

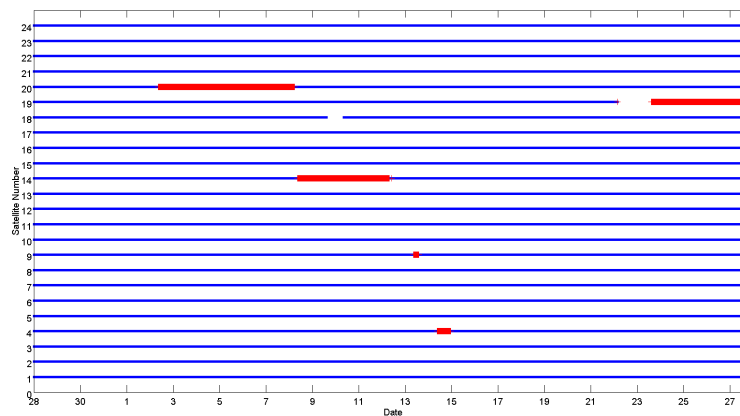
## ● Satellite Health Status (2013.7.27—2013.8.27)



BDS



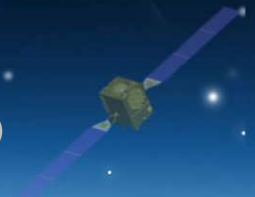
GPS



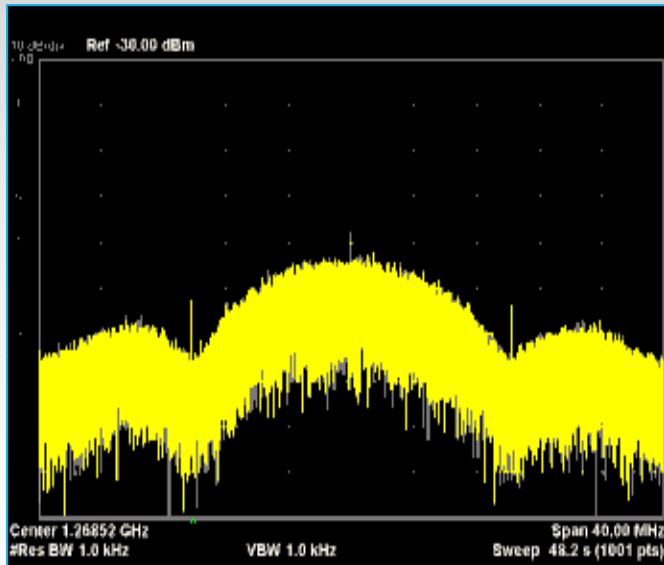
GLONASS



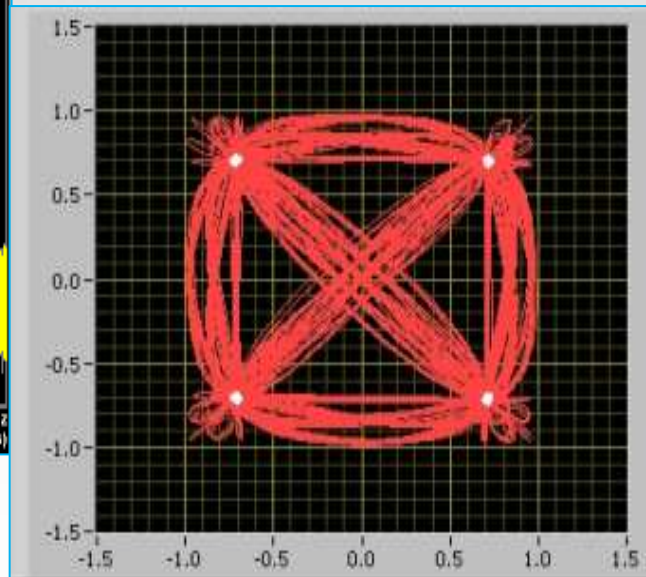
# Updates on China's iGMAS



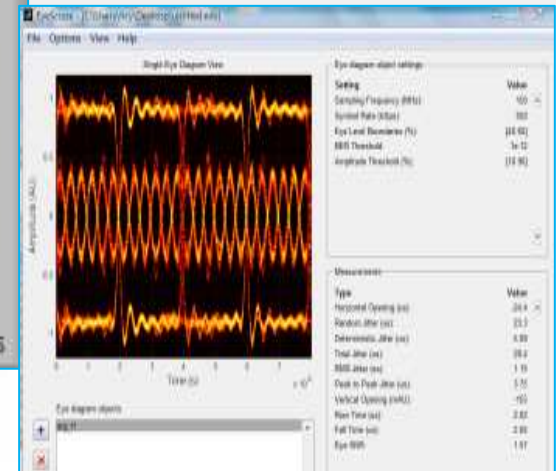
- Signal Quality



PSD



Scatter plot



Eye diagram

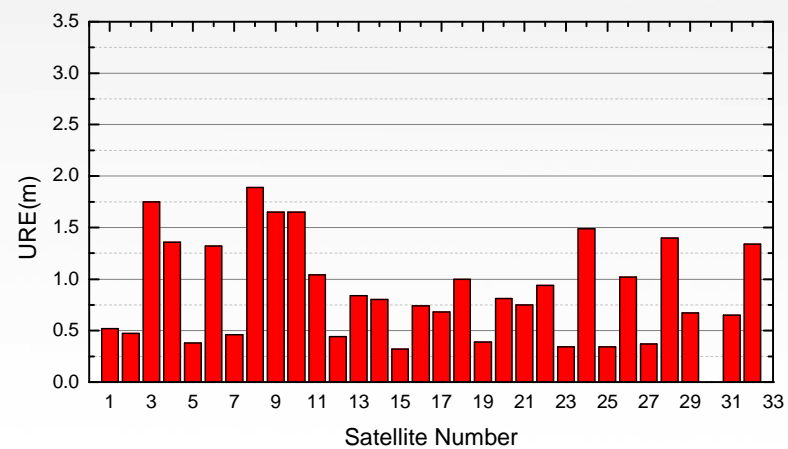
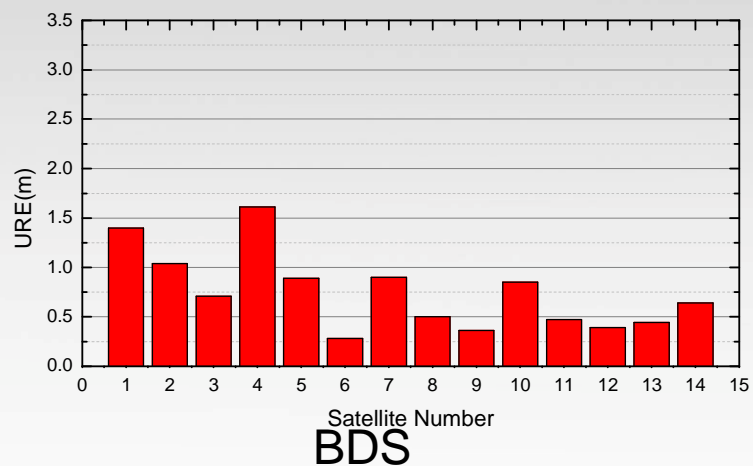






# Updates on China's iGMAS

## ● SIS URE(2013.7.27—2013.8.27)



GPS



# Updates on China's iGMAS

- positioning performance

BDS, B1I,  
2013.7.27  
—8.27

Name	Horizontal (95%,m)	Vertical (95%,m)	3D (95%,m)
CCHU	3.91	7.16	8.16
CLIN	3.11	4.95	5.84
CKUN	6.15	12.22	13.68
CSHA	3.90	7.44	8.41
GUA1	4.54	7.89	9.10
KUN1	6.66	11.03	12.88
BJF2	2.94	6.43	7.07
WHU2	4.35	7.99	9.09
CNY1	8.19	10.34	13.19
CUT0	3.73	4.89	6.15
GMSD	3.02	10.71	11.13
JFNG	4.18	6.77	7.95





# Updates on China's iGMAS

GPS,L1C/A,  
2013.7.27  
—8.27

Name	Horizontal (95%,m)	Vertical (95%,m)	3D (95%,m)
BJF1	2.53	5.52	6.07
WHU1	4.38	7.33	8.54
GUA1	2.27	4.89	5.39
KUN1	7.18	7.08	10.08
CNY1	1.98	4.48	4.90
BRST	2.54	4.97	5.58
CUTO	2.63	4.89	5.56
GMSD	5.18	5.03	7.22
JFNG	4.37	7.48	8.67
KIR8	2.10	3.92	4.45
KZN2	2.55	4.11	4.84
LMMF	5.32	8.08	9.67
ONS1	2.40	3.58	4.31
REUN	2.27	5.35	5.82
SIN1	3.79	8.28	9.11
UNB3	2.51	4.54	5.18
UNX3	2.40	5.07	5.61
WARK	2.33	3.83	4.48



# Updates on China's iGMAS

GLONASS,  
G1,  
2013.7.27  
—8.27

Name	Horizontal (95%,m)	Vertical (95%,m)	3D (95%,m)
BJF1	7.03	13.81	15.49
WHU1	8.26	15.54	17.60
GUA1	6.60	12.03	13.72
KUN1	9.20	15.33	17.88
CNY1	5.26	12.21	13.30
BRST	6.89	12.30	14.10
CUTO	5.71	11.22	12.59
GMSD	8.18	14.58	16.71
JFNG	8.20	15.96	17.94
KIR8	5.92	11.57	13.00
KZN2	6.98	11.43	13.40
LMMF	7.83	14.57	16.53
ONS1	6.31	10.95	12.64
REUN	6.62	13.97	15.46
SIN1	7.33	14.22	16.00
UNB3	6.97	12.58	14.38
WARK	5.56	10.99	12.31



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# Proposals

## 1. Background/considerations

- Among current GNSS monitoring activities, each has its own service center with different information service
- those service centers may be coordinated under ICG's umbrella, with a view to form a 'service net'
  - To provide a coordinated and efficient service of performance monitoring
- our iGMAS' service center can play a role of
  - a node on this 'service net'
  - Providing raw data, products and information service of GNSS OS monitoring with free access , free of charge



# Proposals

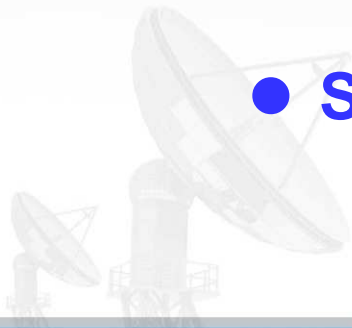
## 2. Suggestion

- A coordinating team in this regard is proposed to keep this ‘service net’ working efficiently
  - With members from each GNSS provider, and International Organizations
  - By coordinating the cooperation and technical issues, and organizing meetings, workshops and so on
- CSNO would like to host the first meeting of this coordinating team during the CSNC2014, discussing
  - cooperation on ‘service net’
  - Possible working mechanism etc.



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# Summary

1. IOC of iGMAS is expected in June 2014
2. The tracking equipment have been developed and gradually installed on sites, and hardware integration and testing in all centers is undergoing.
3. ten domestic tracking stations and one signal quality monitoring station have already been established, another 25 tracking stations are planed to be setup in succession.
4. ICG may coordinate current GNSS monitoring service centers to form a 'service net'
5. A coordinating team is proposed to keep this 'service net' working efficiently





***Thank you for your attention!***

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