CHINA SATELLITE NAVIGATION OFFICE

The 4th ICG workshop on GNSS spectrum protection & IDM

Update of GNSS IDM in China

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Contents

1. *Existing limits on unintentional interference in China*
2. *Discussion on GNSS as critical infrastructure*
3. *Discussion on GNSS jammers*
4. *IDM system development and IDM techniques in China*
5. *Summary*

1. Existing limits on unintentional interference in China

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GB

中华人民共和国国家标准

GB/T 22989—2010/IEC/CISPR 11:2010
代替GB 4824—2004

工业、科学和医疗(ISM)射频设备
骚扰特性　限值和测量方法

Industrial, scientific and medical (ISM) radio-frequency equipment—
Disturbance characteristics—Limits and methods of measurement

(IEC/CISPR 11:2010, IDT)

National standard of the People's Republic of China

Taking the CISPR (international special commission on radio interference) 11 as reference, a National standard of the People's Republic of China has been made -《Industrial, scientific and medical (ISM) radio-frequency equipment - Disturbance characteristics - Limits and methods of measurement》

表 7　工作频率在 400 MHz 以上，
产生波动连续骚扰的 2 组 B 类工科医设备的电磁辐射骚扰峰值限值

频段/GHz	场强/dB/(μV/m)，测量距离 3 m
1～2.3	92
2.3～2.4	110
2.5～5.725	92
5.875～11.7	92
11.7～12.7	73
12.7～18	92

注 1：为了保护无线电业务，国家有关部门可能要求满足更低的限值。
注 2：峰值测量采用 1 MHz 分辨率带宽和不小于 1 MHz 的视频信号带宽。
注 3：本表限值已考虑到波动骚扰源，如磁控管驱动的微波炉。

frequency

field strength

The relationship between power and field strength can be defined as:

$$\frac{PG}{4\pi D^2} = \frac{E^2}{120\pi}$$

P: transmitting power in Watts
D: measuring distance in meters
E: field strength in Volts/meter
G: the numerical gain of transmitting antenna

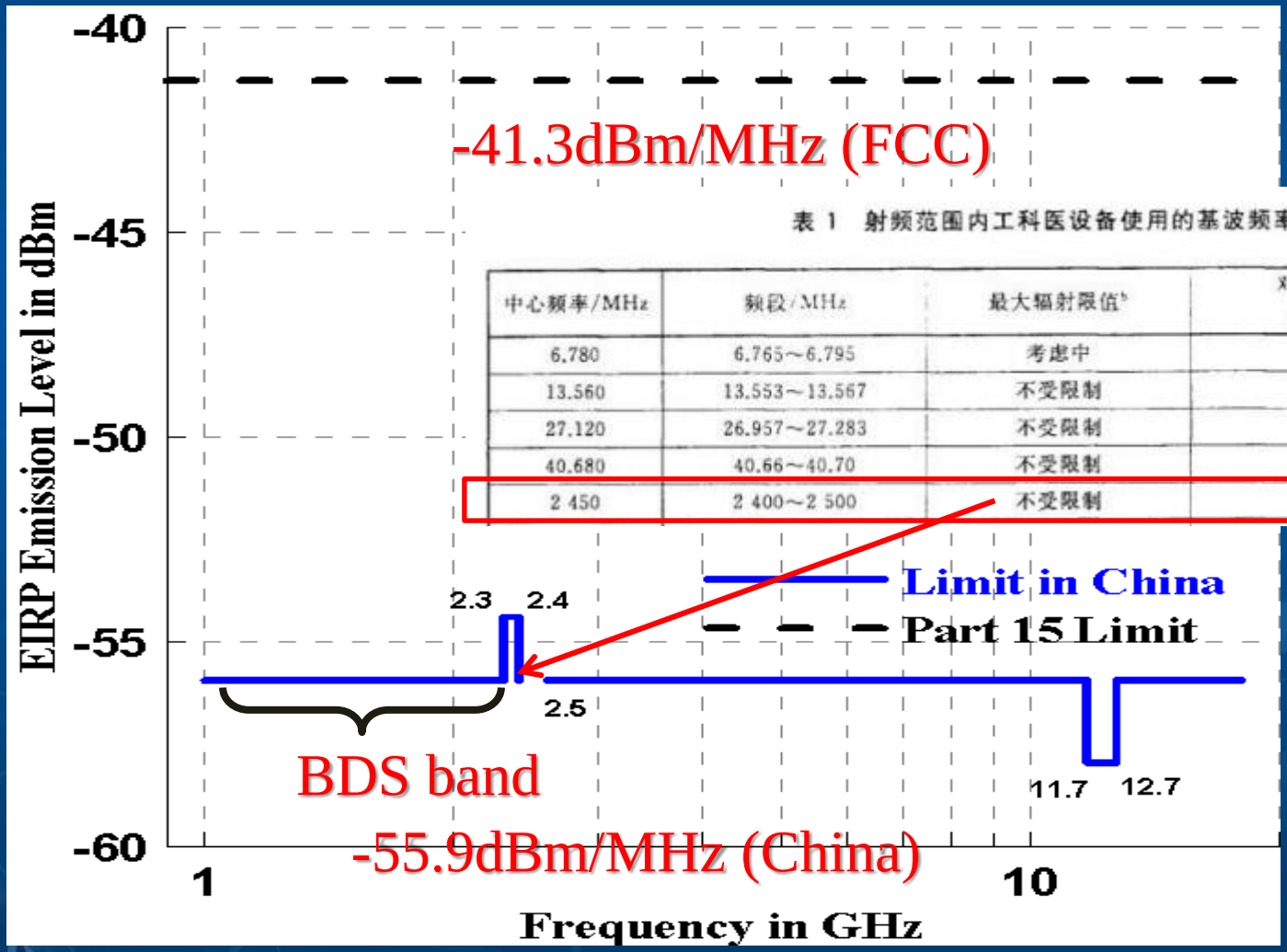


表 1　射频范围内工科医设备使用的基波频率[a]

中心频率/MHz	频段/MHz	最大辐射限值[b]	对 ITU 无线电规则的指配频率表作出的脚注编号
6.780	6.765～6.795	考虑中	5.138
13.560	13.553～13.567	不受限制	5.150
27.120	26.957～27.283	不受限制	5.150
40.680	40.66～40.70	不受限制	5.150
2 450	2 400～2 500	不受限制	5.150

Emission limits of ISM equipment in each band

Conclusions:

- *Unlicensed equipment are not allowed to operate in RNSS band.*
- *The transmitting limits of ISM equipment was -55.9dBm/MHz up to 2.3 GHz which is much more strict than FCC part 15.*
- *There is no transmitting limits in the band of 2.4~2.5 GHz.*

2. Discussion on GNSS as critical infrastructure

Question 1:

Do you consider Global Navigation Satellite System or their services to be National Critical Infrastructure? How does your answer impact the protection of GNSS and its service in your nation?

- ***BDS is national essential space infrastructure at present.***
- ***As the application increasing, the protection of BDS and its services in China is becoming vital.***

Question 2:

What do you consider to be the definition of "International Critical Infrastructure"?

- ***There's still no definition for international critical infrastructure, it needs more discussion and investigation.***

3. Discussion on GNSS jammers

Question:

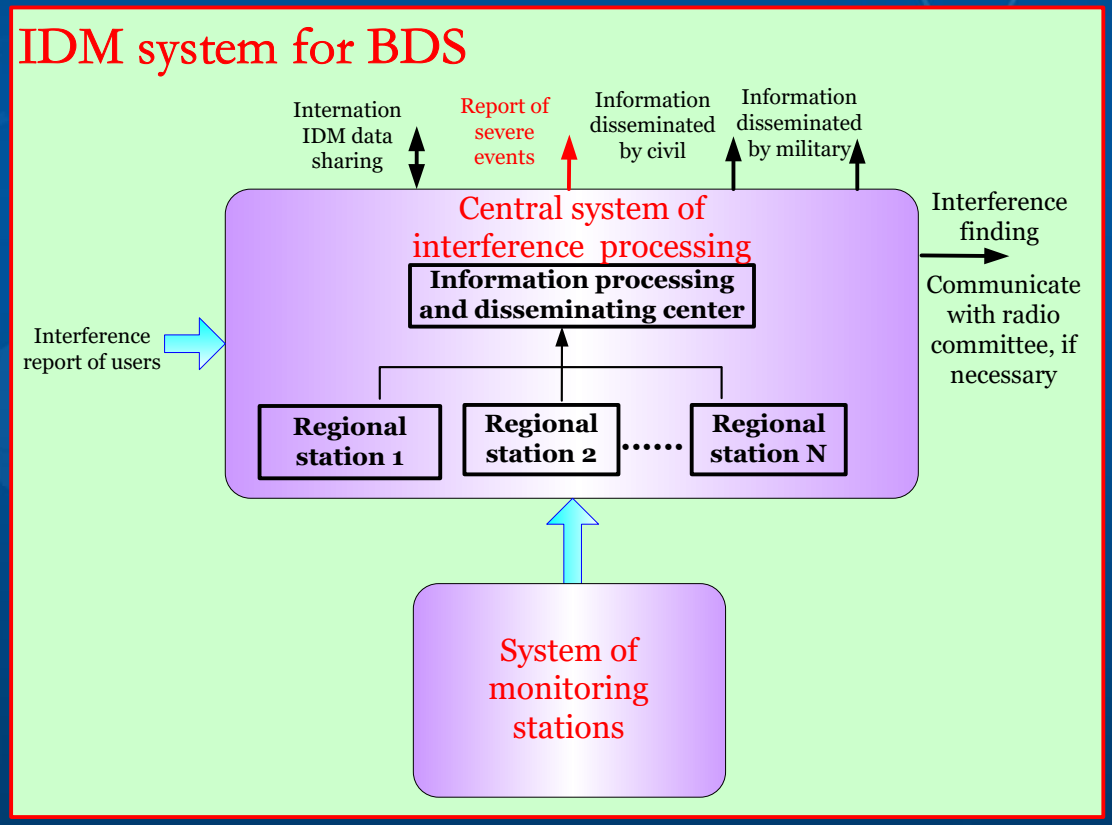
Whether it is legal within each country to manufacture, sell domestically, export, purchase, own, or use GNSS jammers?

- ***It is illegal within China to manufacture, sell domestically, export, purchase, own, or use GNSS jammers.***
- ***The government has promulgated series laws and regulations to prevent the harmful interference to legal services.***

4. IDM system development and IDM techniques in China

IDM system development

The IDM system have not been built up, but it has been programmed in China, including IDM data center and system of monitoring stations. It will be gradually completed in recent years.



IDM system structure in China

We have also installed some experimental grid monitoring systems and have studied the IDM techniques:

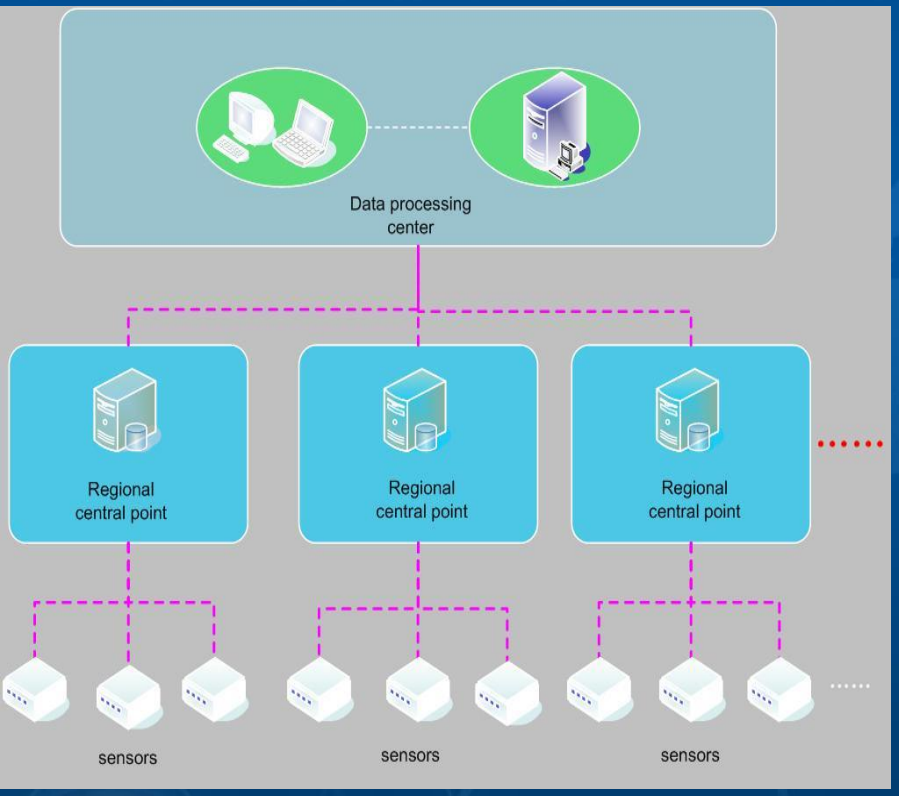
a) *Interference monitoring and localization techniques based on spectrum sensors*

b) *Interference monitoring and localization techniques based on GNSS navigation receiver*

c) *Spoofing detection techniques*

a) Interference monitoring by spectrum sensors

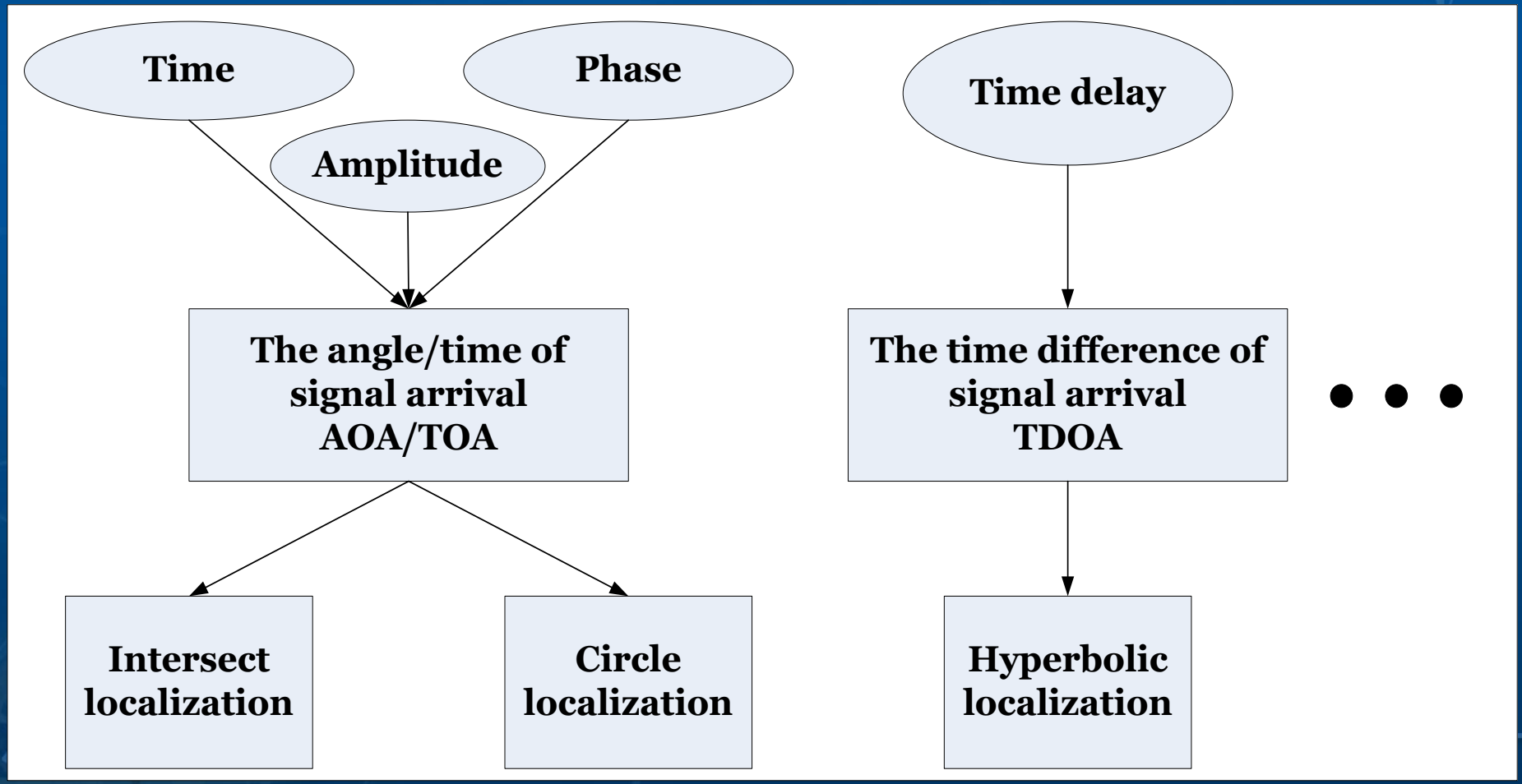
Techniques of GNSS interference monitoring and localization based on grid (multiple spectrum sensors) have been studied.



System structure diagram

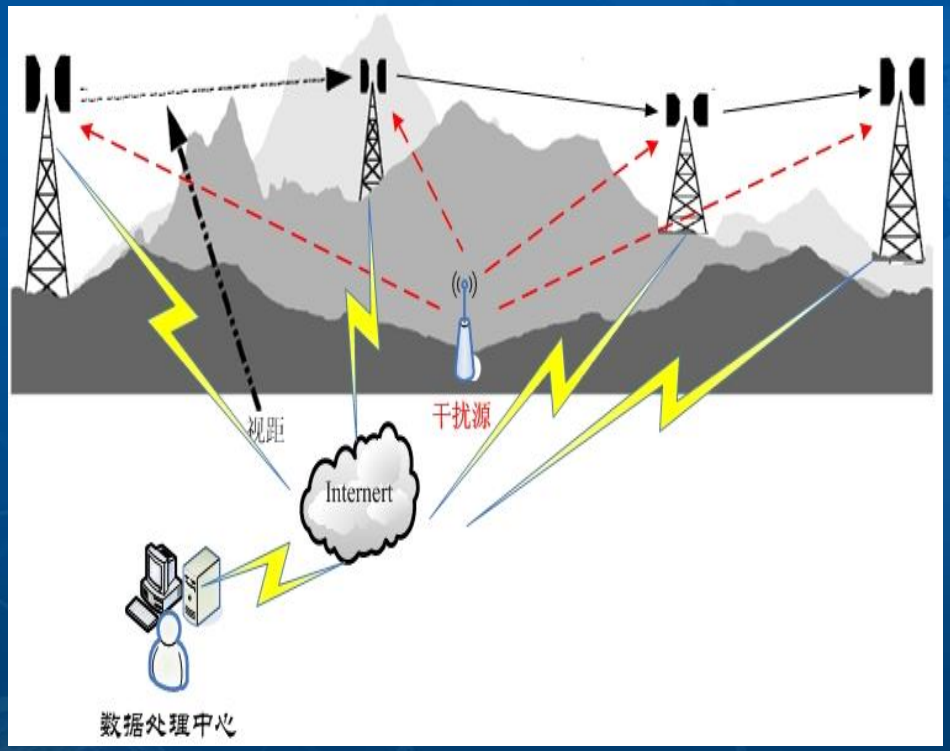
The grid of monitoring system for Qingdao Olympic center

Localization algorithms such as AOA/TOA/TDOA et al. have been used.

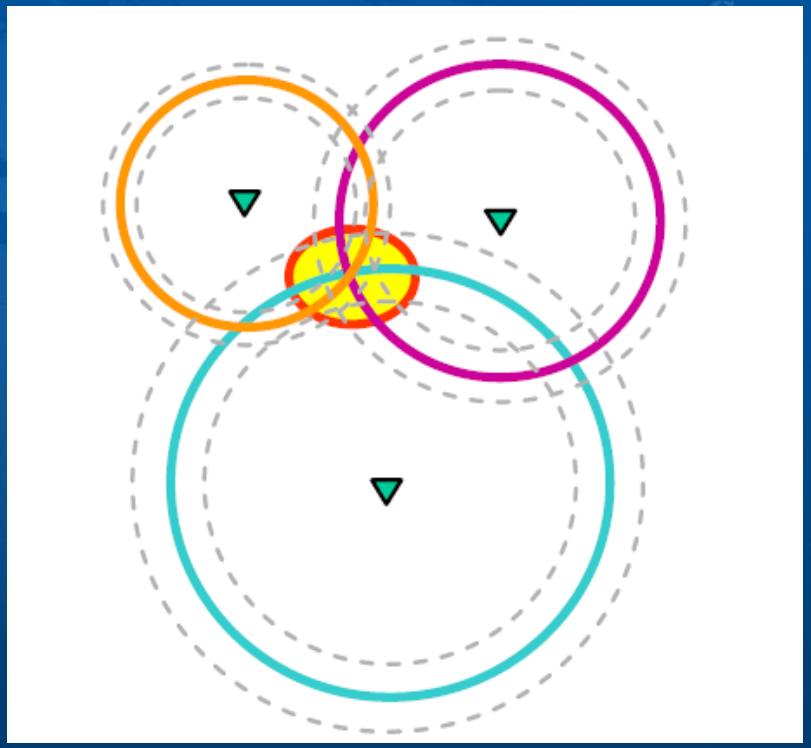


b) Interference monitoring by navigation receiver

The source of interference can be monitored and localized by utilizing the information of navigation receivers.

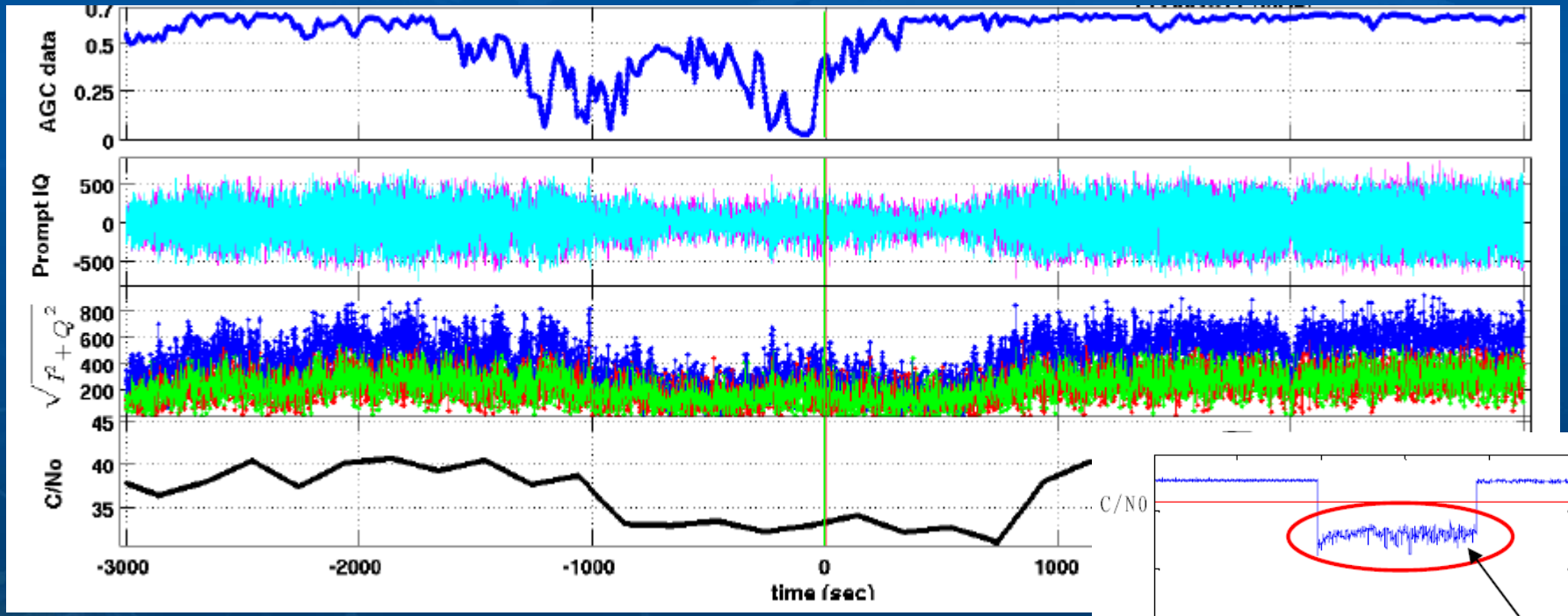


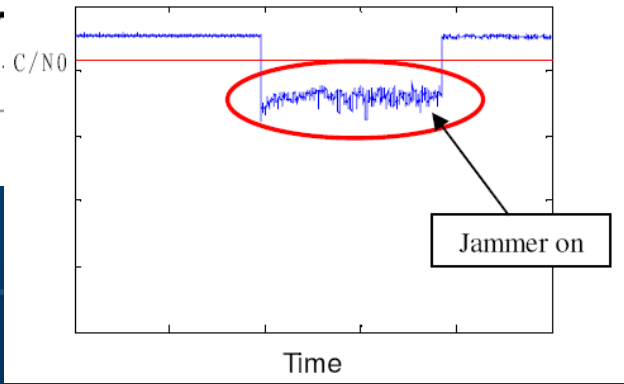
monitoring network topology based on navigation receivers



Interference localization by multiple receivers

The carrier to noise ratio, AGC, received power of receiver will vary significantly when interference occurs. Interference can be monitored and distinguished by the combination of these information.



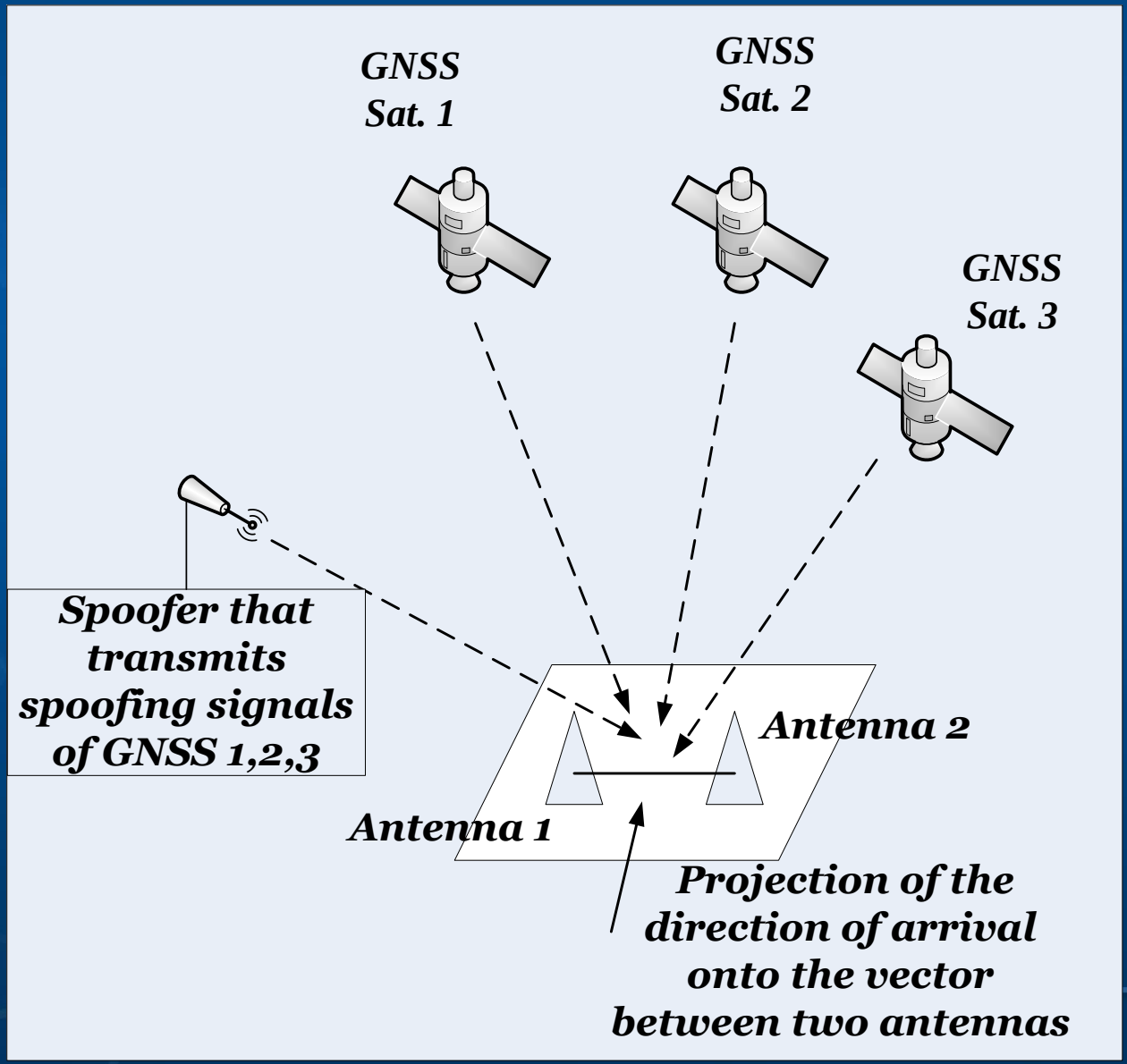


c) Spoofing detection techniques

Meanwhile, we have also studied the spoofing detection techniques based on phase measurements:

- ***Spoofing is a kind of interference signal with evil intention, of which aim is to force the GNSS receivers to make false localization results.***

It is implemented by phase measurements of received signals which has unique advantage since the phase measurements with high precision can be achieved by most common receivers.



4. Summary

- *The existing limitation of unintentional interference levels has been reviewed.*
- *GNSS as critical infrastructure and GNSS jammers have been discussed.*
- *IDM system development and IDM techniques in China have been introduced.*

Thank you!

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