



**The 4th Meeting of International Committee on GNSS**

**COMPASS/BeiDou Navigation Satellite System  
Development**

**China Satellite Navigation Project Center**

Sep. 13<sup>rd</sup>-18<sup>th</sup>, 2009, Saint Petersburg Russia

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- 1. Basic principles**
- 2. System General Description**
- 3. System Deployment**
- 4. Applications**
- 5. Compatibility and Interoperability**
- 6. Conclusion**

# Contents

## 1. *Basic principles*

## 2. System General Description

## 3. System Deployment

## 4. Applications

## 5. Compatibility and Interoperability

## 6. Conclusions

**China determined to build an independent satellite navigation system in 1980s’.**

**The COMPASS/BeiDou navigation demonstration system was completed in 2003, since then it has been used in many areas. Now the COMPASS/BeiDou navigation satellite system is under construction.**

# Basic Principles

- **Openness**
- **Independency**
- **Compatibility**
- **Gradualness**

# Basic Principles

## ◆ Openness

**COMPASS/BeiDou will provide high quality open services free of charge from direct users, and worldwide use of COMPASS/BeiDou is encouraged.**

**China will widely and thoroughly communicate with other countries on satellite navigation issues to facilitate the development of GNSS technologies and the industry.**

# Basic Principles

## ◆Independency

China will develop and operate COMPASS/BeiDou system independently, and COMPASS/BeiDou can independently provide services for global users and particularly provide high quality services in Asia-Pacific region .

# Basic Principles

## ◆ Compatibility

COMPASS/BeiDou will pursue solutions to realize compatibility and interoperability with other satellite navigation systems.



# Basic Principles

## ◆ Gradualness

The construction of COMPASS/BeiDou system follows a step-by-step pattern based on technical and economic evolution in China.

COMPASS/BeiDou will provide long-term continuous services for users, improve system performance and ensure smooth transition during all life cycle.

# Contents

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# System Description

- **System Structure**
- **Signal Characteristics**
- **Time System**
- **Coordinate System**
- **Services and Performances**

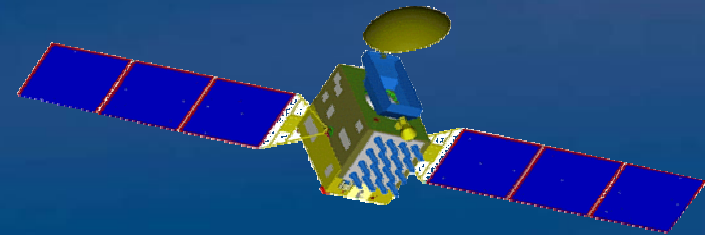
# System Structure

## ◆ *Space Segment*

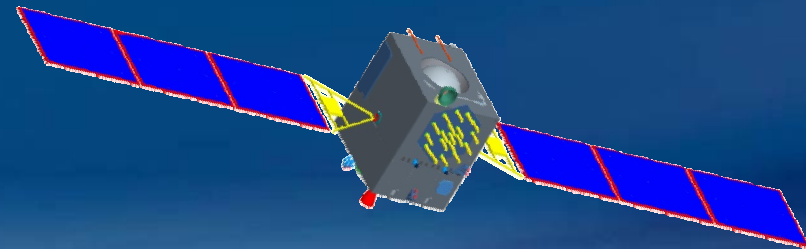
5 GEO satellites and 30 Non-GEO satellites



**Constellation**



**GEO Satellite**



**MEO Satellite**

# System Structure

## ◆ *Ground Segment*

The ground segment consists of Master Control Station, Upload Stations and Monitor Stations.



# System Structure

## ◆ *User Segment*

The user segment consists of COMPASS user terminals and interoperable terminals with other GNSS.



**User terminals of COMPASS/BeiDou system**

# System structure

## ◆ *User Segment*

The development of user terminals is making progress steadily. And policymakers are studying associated issues to shape the domestic application environment .

COMPASS ICD has already been compiled and is about to be published step by step.

# Signal Characteristics

## ◆ Frequencies

**B1: 1559.052~1591.788MHz**

**B2: 1166.22~1217.37MHz**

**B3: 1250.618~1286.423MHz**



# Signal Characteristics

## ◆ *Already transmitted: B1, B1-2, B2, and B3*

Component	Carrier Frequency (MHz)	Chip Rate (cps)	Bandwidth (MHz)	Modulation Type	Service Type
B1(I)	1561.098	2.046	4.092	QPSK	Open
B1(Q)		2.046			Authorized
B1-2(I)	1589.742	2.046	4.092	QPSK	Open
B1-2(Q)		2.046			Authorized
B2(I)	1207.14	2.046	24	QPSK	Open
B2(Q)		10.23			Authorized
B3	1268.52	10.23	24	QPSK	Authorized

◆ **To be transmitted: B1, B2 and B3**

Component	Carrier Frequency (MHz)	Chip Rate (cps)	Data/Symbol Rate (bps/sps)	Modulation Type	Service Type	
B1-C <sub>D</sub>	1575.42	1.023	50/100	MBOC(6,1,1/11)	Open	
B1-C <sub>P</sub>			No			
B1	1575.42	2.046	50/100	BOC (14, 2)	Authorized	
			No			
B2a <sub>D</sub>	1191.795	10.23	25/50	AltBOC(15,10)	Open	
B2a <sub>P</sub>			No			
B2b <sub>D</sub>			50/100			
B2b <sub>P</sub>			No			
B3	1268.52	10.23	500bps	QPSK(10)	Authorized	
B3-A <sub>D</sub>			2.5575	50/100	BOC(15,2.5)	Authorized
B3-A <sub>P</sub>				No		

# Time System

- ◆ **COMPASS/BeiDou time is named as BDT, traced to UTC, and synchronized with UTC within 100ns. The epoch time of BDT is UTC 00d 2006.**
- ◆ **Interoperability of BDT with GPS/Galileo time was considered in the design of COMPASS/BeiDou time system. The offset between BDT and GPST/ GST will be measured and broadcasted.**

# Coordinate System

- ◆ **COMPASS/BeiDou uses China Geodetic System 2000 (CGS2000)**
- ◆ **Coinciding with ITRF at a few cm level, and for most applications the difference between CGS2000 and ITRF can be ignored.**

# Services and Performances

- ◆ **Two kinds of global services**
  - **Open Service: free and open to users**
    - **Positioning Accuracy: 10 m**
    - **Timing Accuracy: 20 ns**
    - **Velocity Accuracy: 0.2 m/s**
  - **Authorized Service: ensure high reliable use even in complex situation.**

# Services and Performances

- ◆ **Two kinds of regional services**
  - **Wide area differential service**
    - **Positioning accuracy: 1 m**
  - **short message service**



China Satellite Navigation Project Center

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