

Tour de l'IGS Stop 4: BDS Constellation Spotlight

BDS Short Message Communication

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OUTLINE

- 1. BDS-1 Short Message
- 2. BDS-2 Short Message
- 3. BDS-3 Short Message
- 4. Application of BDS-3 Short Messag



I. Basic design of BDS-1

- Started in 2000, completed in 2003 and ended in 2013.
- Constellation: 3 GEO satellites with 2 work satellites and 1 backup satellite.



Service: Regional positioning, timing and short Message Communication Service (MCS).



II. Coverage area and performance of BDS-1

- Coverage Area:
 - Longitude: 70°~140° E
 - Latitude: 5°~55° N
- Positioning and reporting are done in the same channel.



Performance Characteristics	Performance Specification
Timing accuracy	20ns
Response time	several seconds
Positioning accuracy	20m
Capability per Message	≤240bits

III. Message communication service (MCS) of BDS-1

— Characteristics of short message communication



Realize two-way digital message communication between user machine and user machine, user machine and ground control center.



III. Message communication service (MCS) of BDS-1

— The principle of short message communication

From transmitter to ground central station

The transmitter of the short message first forwards the communication signal inbound through the satellite.

From ground central station to receiver

The ground central station forwards the received communication application to the user via satellite broadcasting. The receiver's user computer receives the outbound signal, demodulates and decrypts the outbound message.





III. Message communication service (MCS) of BDS-1

—— Application of short message communication

Based on RDSS and Message communication service, BDS-1 has been widely used in various fields.



Landslide monitoring

Automatic acquisition, transmission and processing of monitoring data

Meteorological data communication

Make up for the traditional way of network blind area

I. BDS-2 Navigation Satellite System

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The project was started in 2004, and by the end of 2012 a total of 14 satellites, which contains 5 GEOs, 5 IGSOs and 4 MEOs. BDS-2 inherits the active positioning and short message communication services of BDS-1, and adds passive positioning.



II. BDS-2 RDSS (Radio Determination Satellite System)

➢ BDS-2 RDSS services include:

- Rapid positioning
- Regional Short Message Communication(RSMC)
- Precise timing
- RSMC—— The most important and valuable service of RDSS
 - Position Report
 - Users Communication (Send short message)

Performance Characteristics	Performance Specification
RMSC Service Capability	1680 bits per time (about 120 Chinese characters)
Service Success Rate	≥95%

III. The applications of **BDS-2 RSMC**

Applicable Scene :

Areas that are not covered by communication signals: wild, sea, etc

Emergency search and rescue

Communication Safety monitoring IoT applications



III. The applications of **BDS-2 RSMC**

Representative Application :











地质数据传输



I. Basic design of BDS-3

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- Started in 2016 and completed in 2020
- Constellation: 30 satellites with 3 GEO, 3 IGSO and 24 MEO are on orbit.



Service: Regional short message communication(RSMC), **Global short message** communication(GSMC), Reginal PPP, Global SAR, etc.

II. Signal of BDS-3

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Service t	ype	Signal frequency	Satellite	
DNCC	Open	B1I, B3I, B1C, B2a, B2b	3GEO+3IGSO+	
KINSS	Authorized	B1A, B3Q, B3A	24MEO	• 3 signals inherited
CDAC	Open	B1C, B2a	2010	from DDS 2
SDAS	Authorized	B1A	JGEO	
Regional message communication services(RMCS)	Authorized	L(uplink), S(downlink)	3GEO	B1I, B3I, B3Q5 new signals:
Global short message services(GS	communication MCS)	L(uplink), B2b(downlink)	14MEO	✓ B1C, B1A, B2a,
International SA	AR service	Uplink: 406MHz Downlink: 1544-1545MHZ	6MEO	B20 and B3A
Transmission of prec information	ise positioning ion	B2b	3GEO	

Performance Improvement:

- ✓ Advanced modulation method, channel coding and multiplexing
- ✓ Optimized navigation message structure
- ✓ Improved accuracy and anti-interference ability

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III. Message communication service (MCS) of BDS-3



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III. Message communication service (MCS) of BDS-3

— Regional short message communication(RSMC)



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- Coverage Area: China and surrounding areas
- Maximum length of a single message:
 14,000bits (around 1,000 Chinese characters)



Performance Characteristics	Performance Specification
Service Success Rate	≥95%
Service Time Delay	better than 2s on average
Service Frequency	30s per time
Capability per Message	≤14000bits

III. Message communication service (MCS) of BDS-3

— Global short message communication(GSMC)

 Satellites: 14 MEO satellites
 Coverage Area: Global
 Method: Global Random Access
 Maximum length of a single message: 560bits (40 Chinese characters)

Performance Characteristics	Performance Specification
Service Capability	Uplink 300,000 times/hour Downlink 200,000 times/hour
Service Success Rate	≥95%

IV. BDS-3 Search and Rescue (SAR) Service

➤ Main functions of BDS-3 SAR are nearly the same as the international SAR service.

BDS-3 SAR Service	Characteristics
 Satellite: 6 MEO & SAR Payloads Standard : COSPAS-SARSAT Service area: Global 	Two differences of BDS SAR Return link Inter-satellite link



Application of BDS-3 Short Message

Compared with BDS-2, BDS-3 short message service capacity has been increased by 10 times, the transmission power of the user machine has been reduced to 1 / 10, and the single communication capacity has reached 1000 Chinese characters (14000bit), which guarantees the feasibility of voice and image transmission.



Application of BDS-3 Short Message

Coding and enhancement technology for very low rate speech compression

Image compression and transmission technology with error resistance and high compression ratio in narrow bandwidth

Efficient and reliable voice and image transmission protocol optimization technology

RDSS signal compatible receiving and processing technology LPC analysis based on clear / voiced voice judgment in speech transition

Beamforming speech enhancement algorithm based on Ensemble Learning

Optimization of image transmission strategy with high compression ratio in narrow bandwidth

Speech and image transmission protocol resistant to long delay

Main innovations

key technology

> Application of BDS-3 Short Message



Experimental video

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Completed at the end of 2021:

Beidou major project - Research on voice and image transmission

technology based on Beidou-3 RDSS Service.

4 Application of BDS-3 Short Message

Application

Application product of beidou-3 voice and image transmission technology



Beidou Bluetooth box Geological survey forestry



Beidou law enforcement instrument Patrol inspection - border defense



Beidou field call Post National Park - scenic spot



Beidou field camera Reservoir - earthquake



Beidou vehicle mounted direct terminal Forest defense - off road



Beidou handheld terminal Fire fighting - electricity



Beidou multimode intercom Border defense - Outdoor



Beidou infrared camera Wildlife Conservation - animals



Huawei Mate 50 BDS satellite messager



Application of BDS-3 Short Message

Beidou is an integrated navigation and communication system. Based on Beidou RDSS satellite short message, it expands "Beidou +" satellite Internet of things applications such as Tiantong / Starlink satellite network .



Thanks for your attention!

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