

Overview of the 5G NR Broadcast trial based on TV tower and cellular tower

ZENG Qingjun, China Broadcasting Network Co.

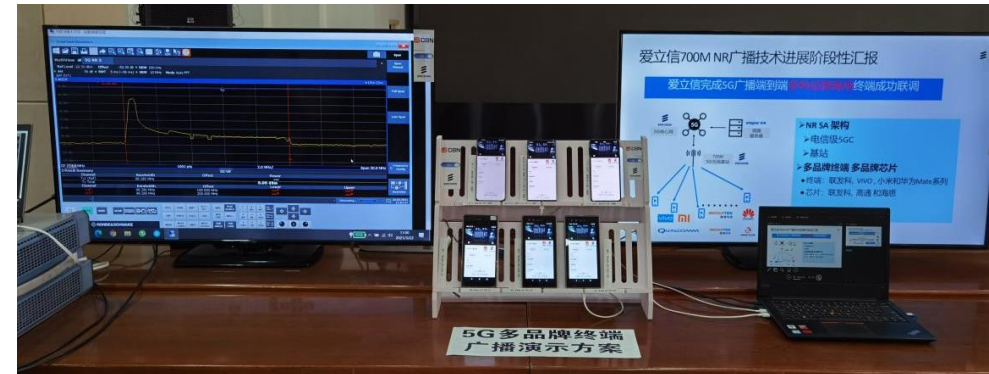
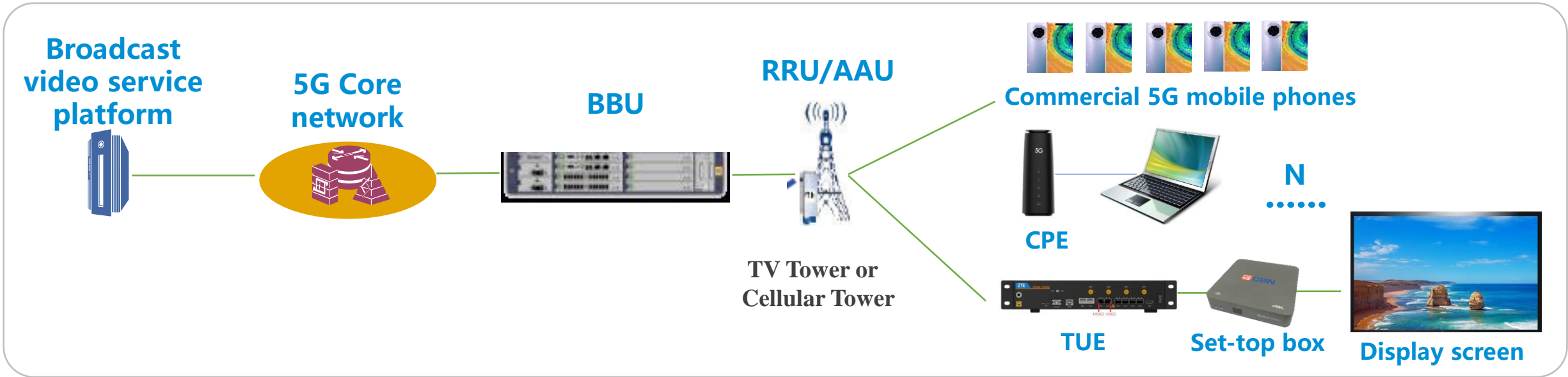
2021.4

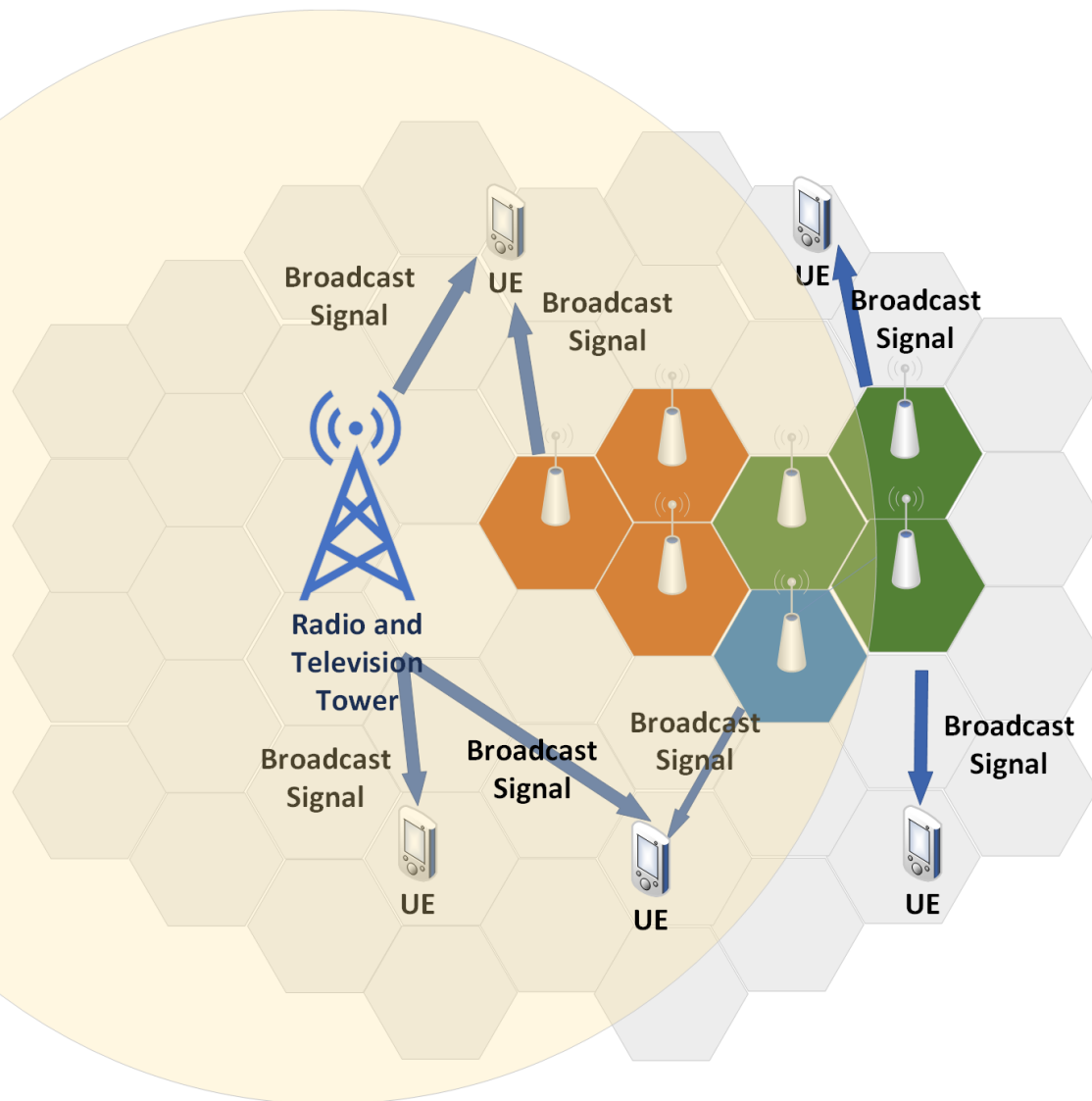
5G New Radio (NR) Multicast and Broadcast Service



- 5G NR multicast and broadcast service (MBS), which is part of 3GPP Release 17, could provide efficient delivery of services like radio and television programs, public safety, IoT, V2X applications, etc. to regular 5G mobile devices over broadcast/multicast transmission based on 5G network.
- To verify the system design and the performance of 5G NR MBS, China Broadcast Network has developed a prototype trial system following the design principal of 5G NR MBS. Field experiments were conducted in Beijing, with high-tower deployment and regular base station deployment. The following are preliminary results of related experiments.

NR broadcast trial with industrial partners





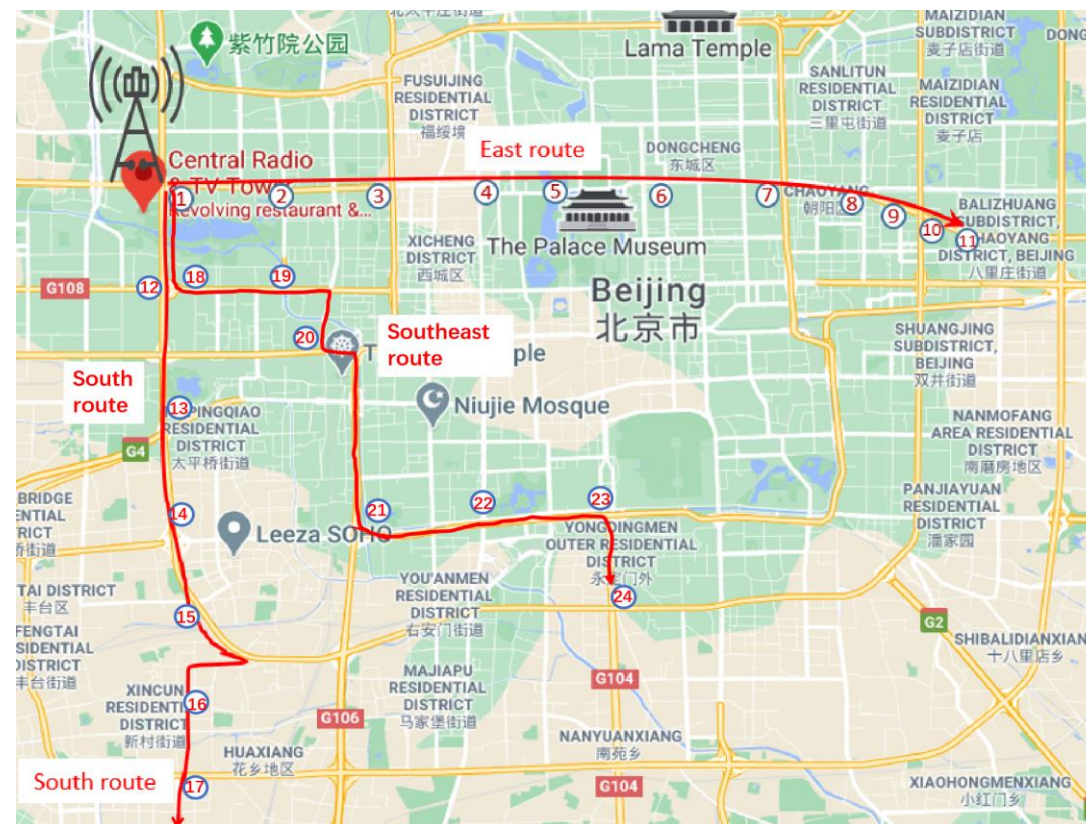
Key features to verify

- 5G NR unicast/multicast/broadcast flexible switching feature.
- The non-SIM Card receiving function in FTA mode.
- Dynamic and differentiated cell-based broadcast feature
- Collaborative coverage with High-tower and regular gNB
- Frequency arrangement optimization for various scenarios:
 1. High-tower coverage and regular cell overlap
 2. Adjacent regular cells with same broadcast service
 3. Adjacent regular cells with different broadcast services

Initial Experiments for 5G NR MBS

Testing Frequency range	758-768 MHz
Carrier bandwidth	10 MHz
Base station transmission power	240Watts (4*60Watts)
modulation mode	QPSK
MCS	4
RANK	1
Base station height	207m
Antenna direction	90 degrees (due east), 180 degrees(due south)
Antenna dip angle	2 degrees
Device	Huawei Mate 30 pro
Receiving device location	In the car
Receiving device height	1 m
Receiving conditions	On-board road test in the car, hand-held
Testing date	From October, 2020 to January, 2021

Test setup for 5G NR multicast and broadcast system



Field experiments for 5G NR MBS

The experiments revealed that regular 5G base station can be deployed on high-towers and efficiently provide FTA broadcasting video services. And 5G MBS based on regular cellular deployment can provide more flexible, interactive and dynamic broadcasting/multicasting/unicast services based on regular 5G devices. Live video streaming service could be offered anytime, anywhere on various 5G devices based on 5G mobile networks in all scenarios



Initial Experimental Results for 5G NR MBS on High-tower Deployment



➤ Initial test results show that test devices can receive video broadcast service with good quality from more than 10 km away from the central radio & TV tower for east route and south route as well as southeast route. Due to speed limitation in the city, the highest speed tested is 80 km/h. For such relatively high-speed scenario, no performance degradation was observed. The test adopts 10MHz channel bandwidth. Testing video format is 576*720, 1Mbps bitrate (Note: The testing video uses around 1.66MHz, MCS=4), and H.264 encoding profile. Detailed test results can be found in Tables below.

Test point	SSB RSRP(Reference Signal Received Power)(dBm)	Distance from base station (Kilometer)	Video experience	Test point	SSB RSRP (Reference Signal Received Power)(dBm)	Distance from base station (Kilometer)	Video experience	Test point	SSB RSRP (Reference Signal Received Power)(dBm)	Distance from base station (Kilometer)	Video experience	
1	-87	0.636	smooth	Test results for south route	12	-85	1.3	18	-89	1.3	smooth	
2	-86	2.2	smooth		13	-103	3.8	smooth	19	-100	2.8	smooth
3	-91	4.2	smooth		14	-93	5.8	smooth	20	-103	3.9	smooth
4	-112	6.0	smooth		15	-106	7.7	stalling	21	-104	4.4	smooth
5	-97	7.1	smooth		16	-107	8.4	stopped	22	-106	6.7	stalling
6	-102	8.8	smooth		17	-116	9.5	stopped	23	-107	8.7	stalling
7	-103	10.8	smooth						24	-111	9.8	stopped
8	-115	12.1	smooth									
9	-113	12.7	stalling									
10	-119	13.2	stalling									
11	-117	13.7	stopped									

Test results for east route

Test results for south route

Test results for southeast route

5G NR MBS APP on Regular 5G Cell Phone



➤ The 5G NR MBS video experiments based on cellular base station have proved that under R17 NR MBS architecture we can realize the dynamic switch between unicast/multicast/broadcast on a regular 5G cell phone.

Initial Experimental Results for 5G NR MBS



无SIM卡 10:35

5G NR广播试验

码率
4806kb/s

视频编解码器
H.265

视频分辨率
2560x1440

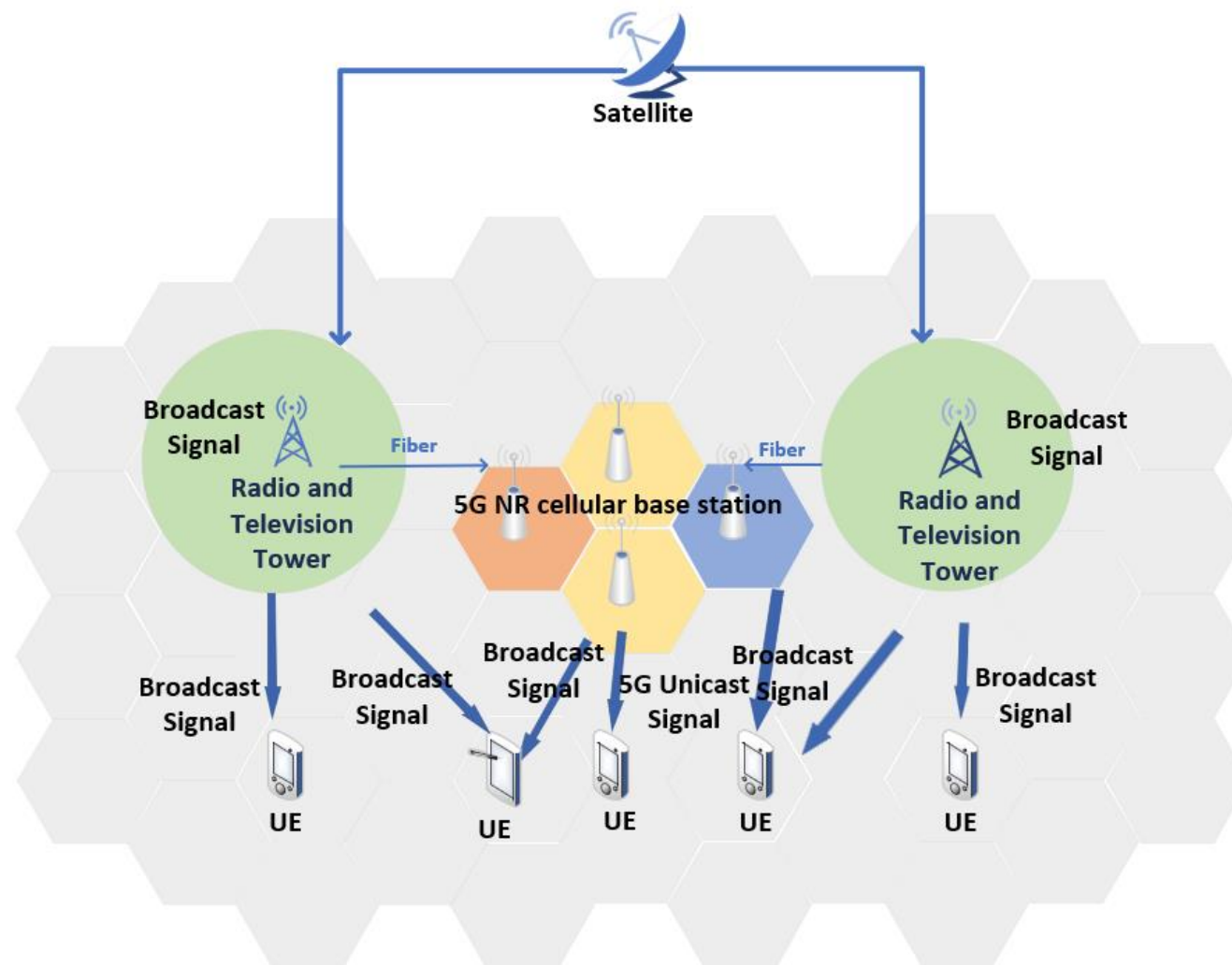
视频帧率
25

音频编解码器
mp4a.40.1

音频采样率
48000Hz

CBN 5G LAB
中国广电5G实验室

- The experiments reveal that regular 5G base station can be deployed on radio & TV towers and efficiently provide multicast and broadcast video services. And NR MBS based on regular cellular 5G base station can provide dynamic switching between unicast/multicast/broadcast on regular 5G devices. As the experimental test is based on the hardware of commercial devices, it also proves that 5G NR multicast and broadcast system does not require extensive change of 5G NR devices and can hence have short time-to-market.
- 5G NR MBS could be deployed jointly with TV and cellular towers, which is flexible for both wireless carriers and broadcasters.





Thank you