Broadcast to Mobile brings benefits to a wide range of deployments

More efficient delivery of mass data and live media content

Richer, more immersive and personalized viewer experience

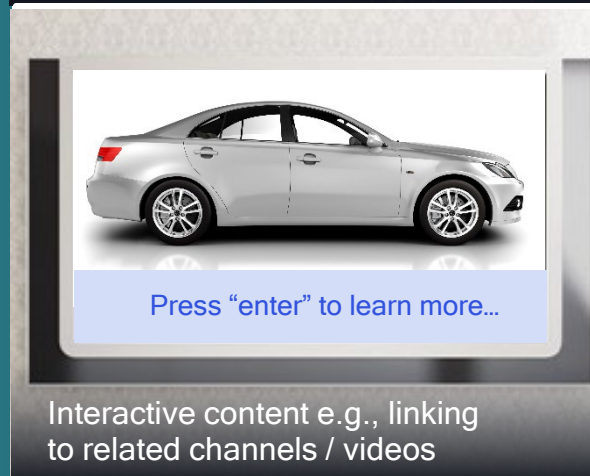Expanded use cases beyond mobile such as automotive

Video streaming for live events e.g., concerts, sports

Livestream commerce e.g., broadcast phone shopping
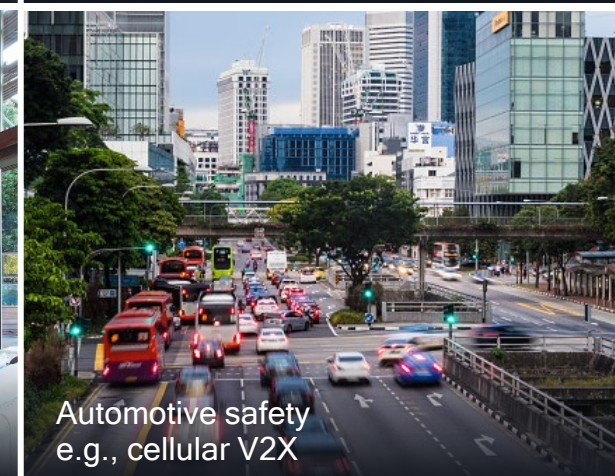

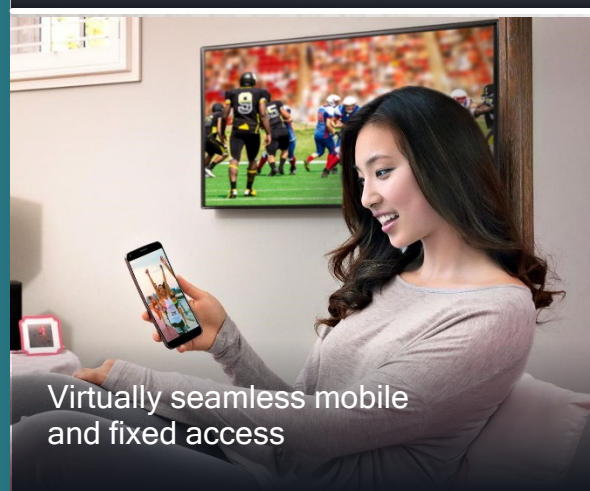Public safety communication

Press "enter" to learn more...
Interactive content e.g., linking to related channels / videos
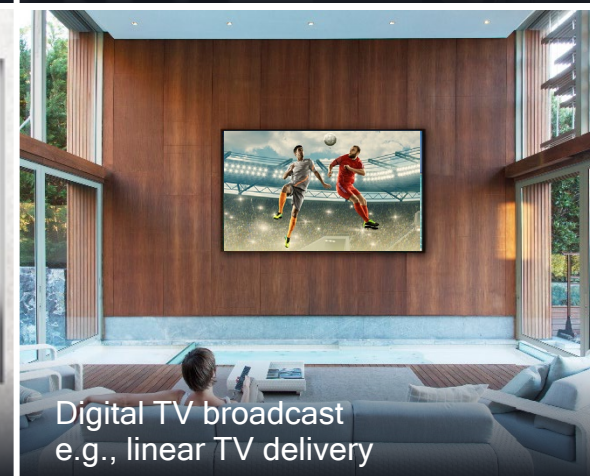
Digital TV broadcast e.g., linear TV delivery

Automotive safety e.g., cellular V2X

Virtually seamless mobile and fixed access

New media formats, e.g., extended Reality (XR)

Group firmware update for IoT devices

# MBMS ➜ 5G Broadcast Evolution (RAN aspects)

Release 9

- **Mixed unicast/MBMS carrier**
- 15 kHz numerology
- Extended CP of 16.7us
- Multi-cell transmission only (MBSFN)
- Up to 60% of subframes for MBSFN transmission

Release 13

- Single-cell transmission (SC-PTM)
- Transmission on PDSCH with new group identities
- Non-synchronized transmitters

Release 14

- Longer cyclic prefixes for support of **larger ISD**
- Up to 100% of subframes for MBSFN transmission on a **dedicated carrier**
- Subframes fully dedicated to MBSFN transmission
- Targeting **rooftop and car-mounted** antennas, handheld receivers

> 15 km
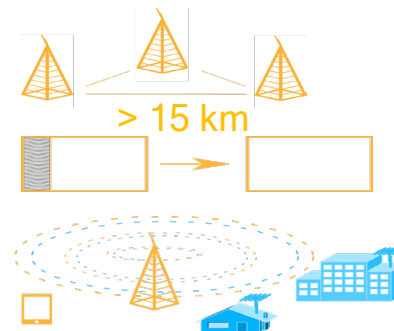
Release 16

- **New numerologies** to target **rooftop reception** with up to **125 km ISD**
- **High mobility reception**: fixed, portable and mobile receivers **up to 250 km/h**
- **Enhancements to CAS**— increased PDCCH agg. Level, PBCH repetition, CFI in MIB

Release 17/18
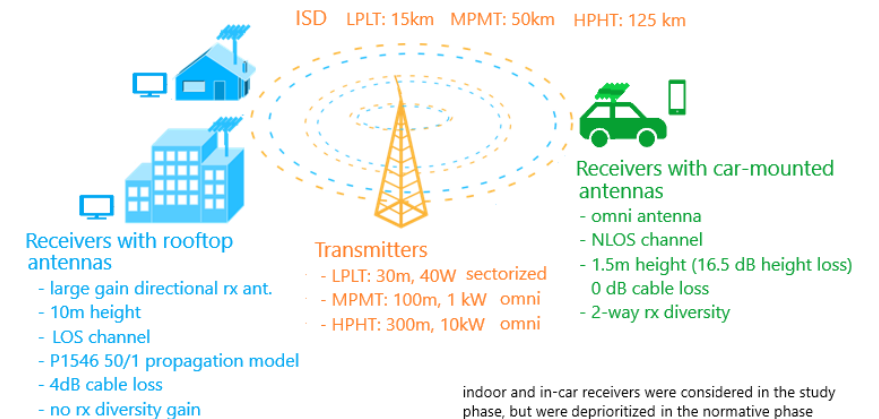
- **6/7/8 MHz channel bandwidth** to support common global channel bandwidth for broadcast systems
- **Introduction of UHF Band 108** to address RF transmitter and receiver requirements

ISD   LPLT: 15km   MPMT: 50km   HPHT: 125 km

Receivers with rooftop antennas
- large gain directional rx ant.
- 10m height
- LOS channel
- P1546 50/1 propagation model
- 4dB cable loss
- no rx diversity gain

Transmitters
- LPLT: 30m, 40W sectorized
- MPMT: 100m, 1 kW omni
- HPHT: 300m, 10kW omni

Receivers with car-mounted antennas
- omni antenna
- NLOS channel
- 1.5m height (16.5 dB height loss)
  0 dB cable loss
- 2-way rx diversity

indoor and in-car receivers were considered in the study phase, but were deprioritized in the normative phase

← **"Operator controlled" MBMS** →

← **"Broadcaster controlled" MBMS** →

5G Broadcast: General technology introduction

- 5G Broadcast is a broadcasting standard defined by 3GPP, the mobile standards body
  - 3GPP has expanded into new *verticals* (e.g., broadcast, automotive, satellite, etc.) hence it should not be regarded as a surprise that a broadcasting tech is coming out of 3GPP

- Even though 5G Broadcast has been standardized by 3GPP, it is a broadcasting technology
  - i.e., meant to be used by broadcasting operators, in broadcasting spectrum
  - No need of supporting a unicast network. 5G Broadcast does not have anything to do with unicast
  - In terms of technologies, 5G Broadcast competes with / complements non-3GPP technologies like ATSC 3.0 and DVB-T2

- The main "reason for being" of 5G Broadcast is to enable operation of a broadcast network where the receivers are hardware-compatible with cellular modems
  - Broadcasting tech and broadcast providers have tried to have native access to mobile devices for a very long time
  - "Hardware compatible" means lower barrier to adoption in mobile devices compared to other broadcasting technologies
    - This is because several 5G Broadcast building blocks are already there in a 4G/5G modem, hence the additions are marginal.
    - For other technologies, a separate piece of silicon / die area would be required

5G Broadcast – Core Features / USP

- SIM-less reception with simplified architecture
- Receive-Only Mode (ROM) & Free-to-Air (FTA)
- Different spectrum options (e.g., UHF, SDL), as well as SFN/MFN
- Service layer integration (DVB-I, Dash, CMAF, App, etc.)
- Using existing infrastructure (HPHT, MPMT and LPLT)
- Highly flexible velocities (up to 250 KM/h Vs up to 300 µS)
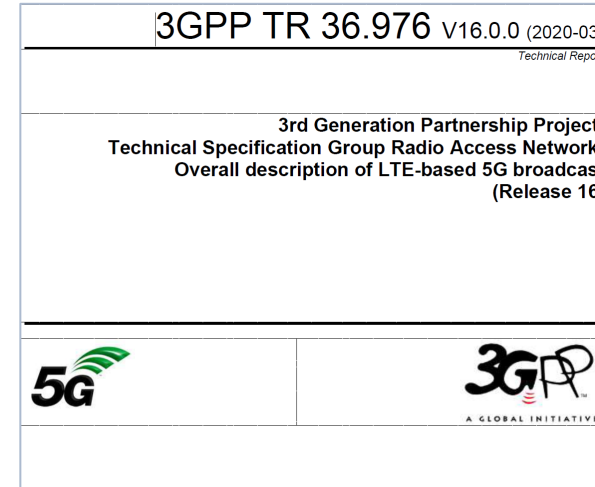- Can be combined with existing 4G and 5G features (unicast, PWS)

For more information on 5G broadcast standards...

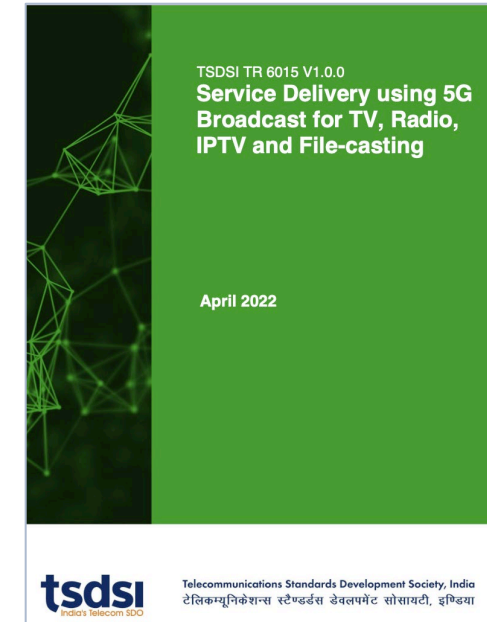**ETSI TS 103 720**: Profile of 3GPP specification containing the necessary parts to deploy 5G broadcast

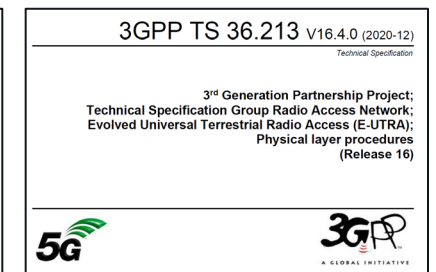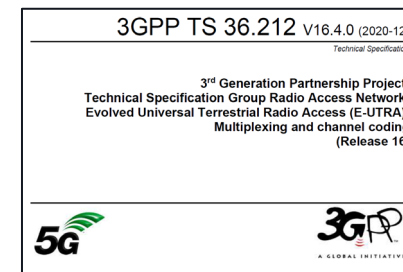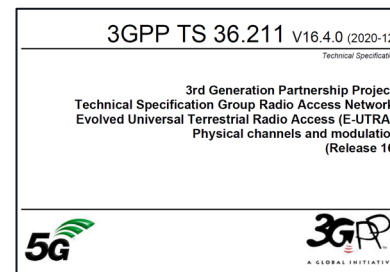ETSI TS 103 720 V1.1.1 (2020-12)

TECHNICAL SPECIFICATION

5G Broadcast System for linear TV and radio services;
LTE-based 5G terrestrial broadcast system

EBU

ITU-R System L

3GPP TR 36.976: Overall description of enhanced TV (enTV) for 5G broadcast

3GPP TR 36.976 V16.0.0 (2020-03)
Technical Report

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Overall description of LTE-based 5G broadcast
(Release 16)

5G   3GPP
A GLOBAL INITIATIVE

TSDSI TR 6015: Service Delivery using 5G Broadcast for TV, Radio, IPTV and File-casting

TSDSI TR 6015 V1.0.0
Service Delivery using 5G Broadcast for TV, Radio, IPTV and File-casting

April 2022

tsdsi
Telecommunications Standards Development Society, India
टेलिकम्युनिकेशन्स स्टैण्डर्ड्स डेवलपमेंट सोसायटी, इण्डिया
India's Telecom SDO

Various specifications of 5G PHY supporting broadcast together with unicast in TS 36.211, 36.212, 36.213

3GPP TS 36.211 V16.4.0 (2020-12)
Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Physical channels and modulation
(Release 16)

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3GPP TS 36.212 V16.4.0 (2020-12)
Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Multiplexing and channel coding
(Release 16)

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3GPP TS 36.213 V16.4.0 (2020-12)
Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Physical layer procedures
(Release 16)

5G   3GPP
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Note: the Telecom Engineering Center (TEC) has adopted these into Indian standards

Qualcomm Roadmap
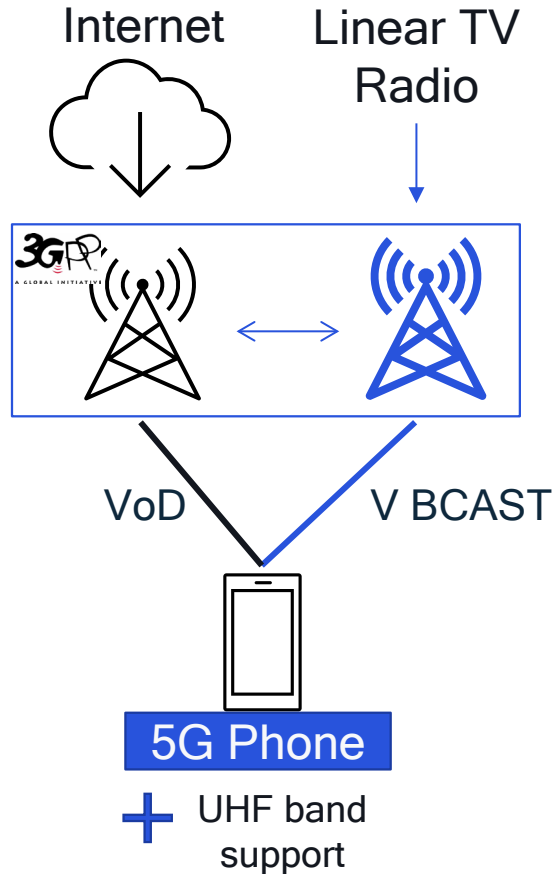
b108 (470-698 MHz)

b107 (612-652 MHz)

n71 (617-698 MHz)

470 MHz · 582 MHz · 612 MHz · 703 MHz

Mumbai · Kolkata · Aurangabad, Bhopal, Raipur, Ranchi · Bangalore, Patna, Hyderabad, Srinagar · Indore · Thiruvananthapuram · Chennai, Cuttack, Guwahati · Lucknow · Ahmedabad, Jalandhar · Delhi

Band V (Lower)

APT600 MHz IMT Band

21 22 23 24 25 26 27 28 29 30 31 32 33 34

40 MHz · 40 MHz

8 MHz

112 MHz
Band IV

30 MHz

91 MHz

Antenna design is complicated here

WORK IN PROGRESS

Reference designs

Commercial grade devices

Xiaomi OnePlus +2

CPE

Manufactured in India
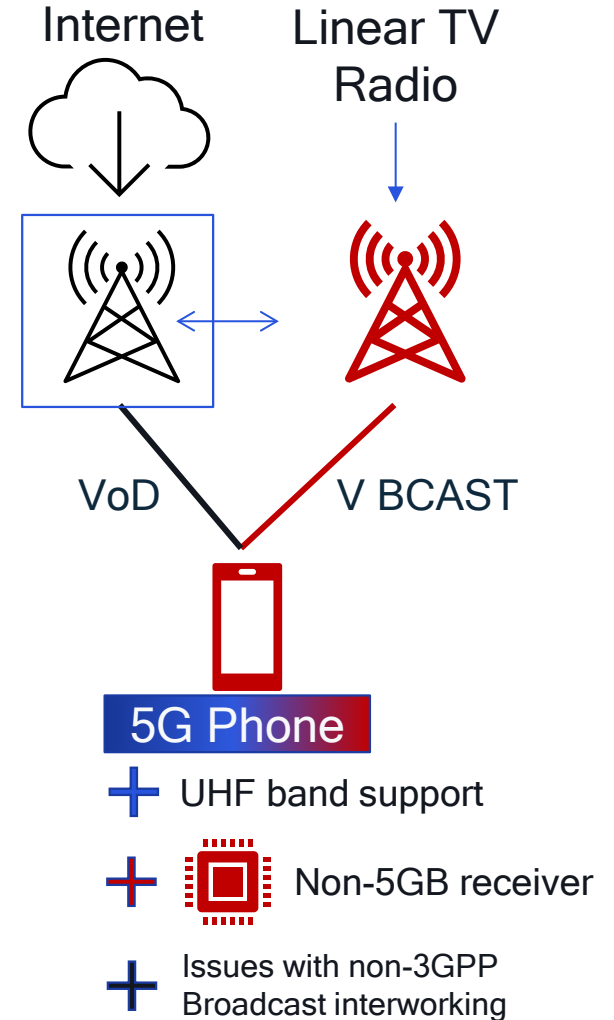
Hardware compatibility with mobile in devices

5G Broadcast reuses several "building blocks" as 4G/5G

- 4G/5G silicon is already there "by definition"

- Commonality is of extreme importance to facilitate mass market adoption

		5G Broadcast	Non 5GB (e.g., ATSC 3.0)
RF	*Hardware*	May need new components, depending on band	
OFDM IFFT	*Hardware*	Can reuse hardware components from 4G/5G	May reuse hardware components from 4G/5G
Searcher	*Hardware / Firmware*	Same as 4G/5G	Different
Tone/LLR mapping	*Hardware*	Same as 4G/5G	Different
Modulation de-mapper	*Hardware*	Same as 4G/5G	Different
Coding / packet segmentation	*Hardware*	Same as 4G/5G	Different
Scrambling	*Hardware*	Same as 4G/5G	Different
RAN protocol stack	*Software*	Same as 4G/5G	Different

Making Terrestrial Broadcast Work in India

Commonality and standards-based ecosystem is of extreme important to facilitate mass market adoption

5G data and 5G Broadcast Convergence
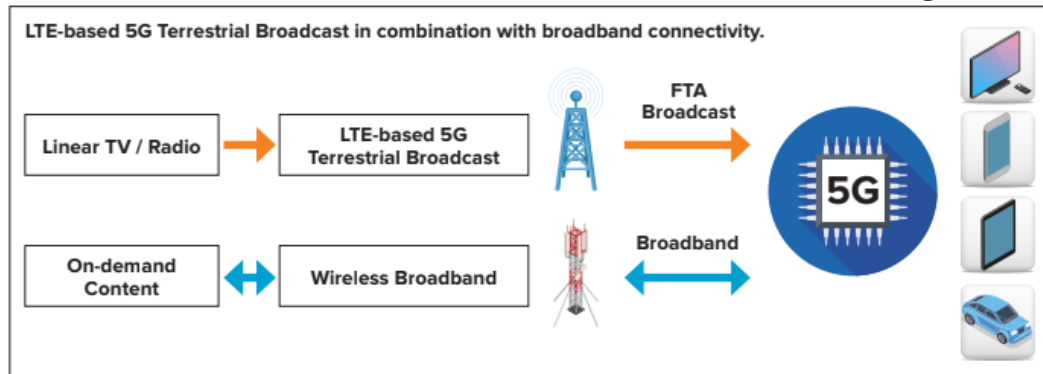
Designed with hardware reuse of cellular modems in mind

Re-use 4G/5G building blocks

- Coding
- Tone Mapping
- Searcher
- Etc.

Integration with the 3GPP stack, **inherits** features of cellular systems
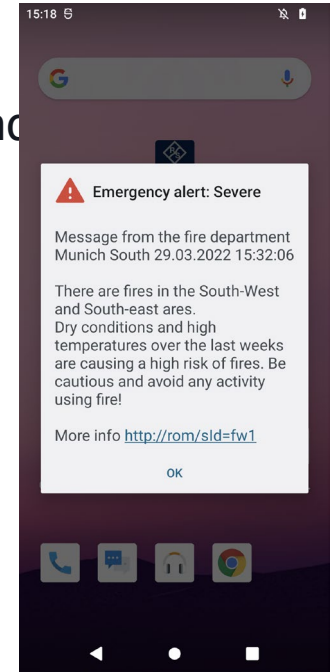
Service Layer Integration

Allows Broadcaster apps, DVB-I[1], CMAF[2], DASH/HLS[3], as well as unicast to be deployed with/on top of 5G broadcast
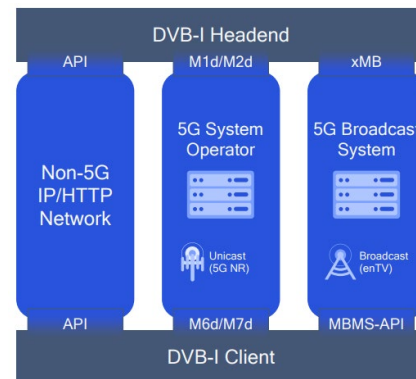
Standards Based Ecosystem

Leverage existing investments made on DVB

1 Digital Video Broadcasting;
2 Common Media Application Format
3 Dynamic Adaptive Streaming over HTTP and HTTP Live Streaming;

Key takeaways

- 5G Broadcast is a broadcasting technology from 3GPP designed with hardware reuse of cellular modems in mind.

- Features needed for broadcasters (HPHT deployments, operation without SIM card, support of UHF spectrum, support of fixed reception) are supported by 5G Broadcast.

- Integration with the 3GPP stack allows for advanced features such as emergency notifications, interactive broadcast, etc.

- The 5G Broadcast system, apart from its ease of integration in handsets, inherits features of cellular systems such as support of multiple antennas, carrier aggregation, etc.

- Continuous innovation in 3GPP, including new band definitions for Introducing 6/7/8MHz channel bandwidth, time-frequency interleaver, and may be further enhanced if new use cases / requirements arise.

Qualcomm

Thank you

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