

The future of 470-694 MHz use

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Demand considerations

With ever improving broadband connectivity to homes, DTT becomes less attractive not being able to serve any non-linear delivery. Less audience for DTT makes it costly and energy-inefficient per viewer, wasting spectrum. As good broadband connectivity can serve any linear needs, the DTT platform may become fully redundant for fixed reception.

Broadcasters and other content providers require growing distributions capabilities to serve audiences on the move on mobile devices. 5G broadcast may serve to efficiently address linear delivery. Mobile networks need to be prepared for substantially higher performance and capacity in DL to address non-linear needs where spectrum in 470-694 MHz is ideally suited to upgrade existing site grids in rural areas and hard-to-reach locations.

PMSE has very local demand and typically in densely populated areas.

Broadband PPDR has demand for nationwide networks with UL and DL.

Defence in peace times has demand for communication at low-to-medium power in limited areas, e.g. training grounds, and occasionally in wider areas during manoeuvres.

Radio Astronomy (RA) has demand in 606-614 MHz at a limited number of sites

Coexistence and Sharing considerations

Mobile DL and 5G Broadcast use on macro-cellular infrastructure in one country can well coexist with DTT in another country within the rights granted by the Geneva 06 agreement. As 5G Broadcast from HPHT network topologies designed for fixed rooftop reception cannot reach mobile devices on the move, it will require to move to macro-cellular network topologies operated by MNOs or by their tower rental partners (c.f. EBU technical report 054 <https://tech.ebu.ch/publications/tr054>).

Mobile DL and 5G Broadcast use on macro-cellular infrastructure can even coexist with DTT in the same country, subject to the targeted DTT reception scenarios. I.e. in countries not relying on rooftop DTT aerials, but rather on portable indoor reception, mobile DL can fill gaps in the DTT frequency plan. As e.g. 6 MUXes use only 48 MHz of the total 224 MHz in 470-694 MHz, more than 75% of the resource can be investigated for additional use.

PMSE with its main demand limited to densely populated areas could well coexist with additional mobile use in rural areas. For PMSE demand during e.g. festivals in rural areas, MNOs can provide additional temporary capacity e.g. using C-Band and thus temporarily free channels in 470-694 MHz range during the event for PMSE.

Broadband PPDR would require clearance of e.g. the 600 MHz range to support nationwide UL operation. Advanced video codecs like HEVC H.265 (since ~2015) or even

better VVC H.266 (~2025 onwards, ~factor 2x efficiency over H.265) can help to reduce the number of DTT MUXes while maintaining the number of carried TV channels, thus potentially allowing to clear the 600 MHz range. Broadband PPDR services could be implemented in spectrum and network infrastructure shared with MNOs.

Defence could use pieces of spectrum in 470-694 MHz in training areas exempted from other use. For larger operations, concepts like Licensed Shared Access (LSA) can be used to temporarily free the required resources from other use.

Radio Astronomy continues to be protected in 606-614 MHz where required

Spectrum Framework considerations

As DTT and e.g. GE06 are built around an 8 MHz channel raster from 470-694 MHz, additional use in the band could consider adhering to that at least below 614 MHz.

PMSE is used to coexist with DTT in 8 MHz channels in the band and could do so with 8 MHz channels of 5G Broadcast and/or Mobile SDL.

3GPP band n108 is specified to support the range 470-698 MHz with channel bandwidths of 6, 7 and 8 MHz, thus fitting into any DTT frequency plan. n108 can serve as a starting point for a common ecosystem for 5G broadcast and mobile DL (supplemental DL, SDL)

Licensing of additional spectrum in form of 8 MHz channels for 5G Broadcast and/or mobile SDL would not be nationwide exclusive, but regionally as governed by the DTT use in the specific country and adhering to GE 06 rights along country borders.

Any additional use in 470-694 MHz shall consider 3GPP band n71 (UL 663-698 MHz, DL 617-652 MHz) with an existing ecosystem for global economies of scale. Once the 600 MHz band can be cleared, PPDR and mobile can benefit for bi-directional communication.

Conclusions

The above considerations would allow Europe to innovate and more efficiently use the valuable spectrum range 470-694 MHz while allowing for maximum flexibility. European countries can determine their own pace of progress and choose their individual balance between DTT, mobile, PMSE, PPDR, Defence and RA while not holding back their neighbour countries. Broadcast content providers can benefit from upgrades of existing mobile networks site infrastructure with the RF resources required to carry both linear and non-linear content. Consumers can benefit from better performance and much higher capacity for delivery of AV-content on the move, outside well served densely populated areas. Using the dimensions of location and time, PMSE and new Defence use can be accommodated by innovative sharing. Clear political signals and innovative approaches in licensing can trigger the ecosystem development, starting from the existing 3GPP band definition n108.

Broadband PPDR, shared with public network use, eventually can benefit from clearance from the 600 MHz range and implementing the ecosystem around 3GPP band n71.

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