Spectrum Requirement of Broadcasting Industry

Rajeev Kumar
Director (Enginnering)
Doordarshan (Prasar Bharati)

Prasar Bharati

India’s Public Service Broadcaster - an autonomous body.

Two Verticals

i. **Doordarshan** which provides TV services

ii. **Akashwani** which provides Radio services.

About Doordarshan

सत्यम् शिवम् सुन्दरम्

- ✓established on 15 September 1959
- ✓India's largest broadcasting organisations in terms of Broadcasting infrastructure,
- ✓Doordarshan has 36 satellite channels
- ✓ 5 channels (DD-National, DD-News, DD-India, DD-Sports and DD-Tamil) are also available in HD

DD Free Dish

- ✓Doordarshan's DTH platform – FTA mode
- ✓ providing 116 TV channels
- ✓ 48 Radio channels of All India Radio
- ✓bouquet also includes 302 educational channels

About Akashvani

✓Akashwani - serving to its audiences since its inception - living up to its motto – ‘Bahujan Hitaya : Bahujan Sukhaya’

✓One of the largest broadcasting organisations in the world in terms of the number of languages of broadcast and the spectrum of socio-economic and cultural diversity.

✓Akashwani originates programming in 23 languages and 179 dialects.

Importance of Broadcasting

✓**Reaching a wide audience**: can reach more people more quickly than any other media.

✓**Informing the public**: primary source of information about current events, politics, and social issues - essential for a healthy democracy.

✓**Educating the public**: can educate people about science, history, culture, and the arts. Educational programs can be especially important for people who don't have access to formal education.

✓**Entertaining the Public:** a primary source of entertainment - provides Music, Drama, Cartoon and Movies

✓Broadcasting sector is the cultural ambassador of the country and has given a unique identity to India

✓India's rich culture and heritage are valuable assets- can be promoted and amplified by enhancing the broadcasting ecosystem

Public Service Broadcasting

Role of Prasar Bharati - the Public Broadcaster of India

- To provide a variety of programs catering to a wide range of interests
- accessiblility to all citizens regardless of their social or economic status

Importance of Public Broadcasting

Encourages participation: encourages citizens to participate in public life and to better understand themselves and the world around them.

Provides balanced coverage: aims to provide a space for all sides of an issue to be heard

Presents accurate information: aims to present information in an appropriate manner that is free from bias

Covers underrepresented topics: aims to cover topics that are not provided by commercial broadcasters

Terrestrial Broadcasting- Challenges

TRAI Recommendation towards National Broadcast Policy

- ✓Exploring the expansion of digital terrestrial broadcasting to television and mobile devices as a complimentary broadcasting service to co-exist with cable and satellite broadcasting
- ✓Enabling the delivery of digital TV content on mobile devices utilizing digital terrestrial broadcasting technologies, e.g., 5G-broadcast and D2M (Direct-to-Mobile) technology
- ✓Leveraging digital terrestrial broadcasting for uninterrupted services during emergencies and natural disasters for public safety through television, radio and mobile
- ✓Ensuring effective utilization of spectrum allocated for terrestrial broadcasting and earmarking globally harmonized spectrum for Programme Making and Special Events (PMSE)

Terrestrial Broadcasting- Challenges

Spectrum requirement for Terrestrial TV Broadcasting in UHF band

✓Historically, all television delivery was by terrestrial means. The delivery mechanisms in place have evolved in subsequent decades, and have also diverged

✓Use of spectrum is regulated by Radio Regulation (RR) of ITU-R

✓The UHF band 470-694 MHz is primarily Broadcasting band for terrestrial TV broadcasting across world

- In Region-1, this band is allocated only to BROADCASTING service
- In Region-2, only BROADCASTING Service has Primary status
- In Region-3, BROADCASTING Service has Primary status along with FIXED and MOBILE

Terrestrial Broadcasting- Challenges

Spectrum requirement for Terrestrial TV Broadcasting in UHF band

✓The use of these bands are further governed by RR footnote mentioned below :

> ***5.296A*** *In* ***Micronesia, the Solomon Islands, Tuvalu and Vanuatu****, the frequency band 470-698 MHz, or portions thereof, and in* ***Bangladesh, Lao P.D.R., Maldives, New Zealand and Viet Nam,*** *the frequency band 610-698 MHz, or portions thereof, are identified for use by these administrations wishing to implement International Mobile Telecommunications (IMT) – see Resolution 224 (Rev.WRC-23). This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. The mobile allocation in this frequency band shall not be used for IMT systems unless subject to agreement obtained under No. 9.21 and shall not cause harmful interference to, or claim protection from, the broadcasting service of neighbouring countries. Nos. 5.43 and 5.43A apply. (WRC-23)*

✓This implies that the countries mentioned in the footnote can use specified frequencies for IMT services

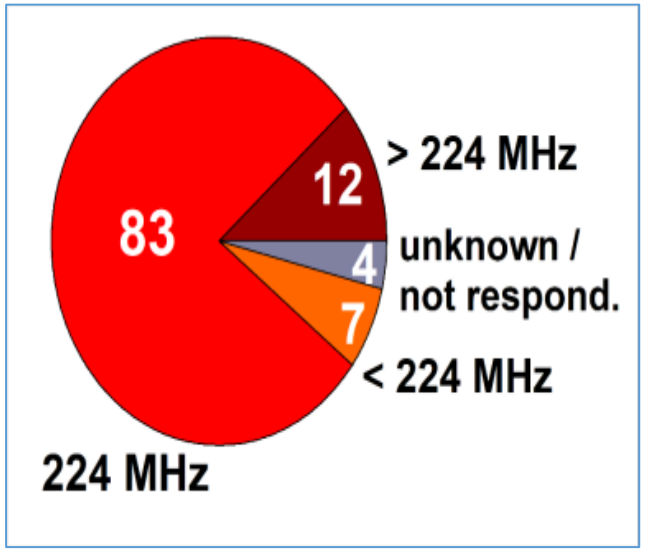
✓most of the countries are willing to use the band 610-698 MHz band, popularly called as 600 MHz band

Terrestrial Broadcasting- Challenges

Spectrum requirement for Terrestrial TV Broadcasting in UHF band

✓ITU-R Report BT2302-1, provides following facts for R1

- The band above 694 MHz is still used by 22 countries for DTTB. With the switch to digital in many areas within Region 1, though not all, broadcast services successively moved out of the 790-862 MHz band (“800 MHz band”) and the 694-790 MHz band (“700 MHz band”).
- In response to spectrum requirement for Terrestrial TV Broadcasting, 12 expressed a requirement for more than 224 MHz, 83 require exactly 224 MHz and 7 Administrations indicate a requirement for less than 224 MHz.



Terrestrial Broadcasting- Challenges

Spectrum requirement for Terrestrial TV Broadcasting in UHF band

✓The UHF band 470-698 MHz is primarily Broadcasting band for terrestrial TV broadcasting across world. In India, This is limited to 582 MHz. In this band also there is restriction imposed for the use of 526-582 MHz

✓Availability of spectrum for terrestrial TV broadcasting has already been constrained by:

- Identifying 2 parts of broadcasting band, i.e., 700MHz band (698-804 MHz)and 610-698 MHz for IMT services
- segment of TV broadcasting bands, namely, VHF Band-I (54-68 MHz) has already been released

✓Availability of spectrum is very crucial for planning DD TV Transmitters

✓Thus, the availability of Frequency Band 470-582 for Terrestrial TV Broadcasting need to be continued

Satellite Broadcasting

Initial Phase

- ✓Actually, use of satellite communication for TV broadcasting started much before our imaginations
- ✓ISRO launched an experimental satellite communications project in India in 1975 named Satellite Instructional Television Experiment or SITE
- ✓The project made available informational television programs to rural India

Satellite Broadcasting

Use cases

- ✓Presently, Satellite is used for Contribution using DSNGs, i.e., Digital Satellite News Gathering units. This is also used for Live coverage of events.
- ✓Satellites are also used for distribution purpose wherein programme is uplinked from a point and Cable operators or DTH operators or Terrestrial Relay Transmitters or OTT service providers, can receive it and then further distribute it to actual consumer.
- ✓Direct to Home service is purely a satellite-based service.

Satellite Broadcasting

Present Scenario

- ✓Presently there are around 900 private Satellite Channels in India. Besides, Doordarshan is also providing 36 TV channels.
- ✓In addition, there are 4 Private DTH operators and one being provided by Doordarshan, i.e., DD-Free Dish.
- ✓Presently it has 116 TV channels, 302 Educational channels and 48 Radio Channels of All India Radio.
- ✓There are around 65 millions pay DTH subscribers and 45 millions estimated DD-free-dish subscribers.

Satellite Broadcasting - Challenges

✓**Availability of sufficient transponders for broadcasting**

- Broadcasters are trying to create new applications and services to provide enhanced experience to the viewers.
- There is constant effort to increase the number of channels in the bouquet and also to provide more and more HD quality channels.
- These will certainly require more transponder.

✓**Availability of sufficient spectrum for having more broadcasting transponders**

- Number of particular type of transponder depends on the amount of spectrum available in particular band
- for example --- C-band has 500 MHz bandwidth -- in uplink and downlink both and that determines number of C-band transponders which can be accommodated on a satellite.
- So, sufficient spectrum shall be made available in each satellite band

Satellite Broadcasting - Challenges

✓**Interference from other users**

- With the advent of new technologies newer and better services are evolving on regular basis.
- In order to accommodate all such requirements, the Guard Band between various allocations being reduced
- and, in some cases, there is sharing of spectrum for two or more services.
- This increases the chances of interreference among such services.
- Satellite based services are more likely to get affected from such mutual interreferences.

Satellite Broadcasting - Challenges

C- Band (3700-4200 MHz) Issues

- ✓C- band provides an all weather transmission, which is more important for a very reliable broadcasting services
- ✓The C-band spectrum being utilized by Broadcasters and MSOs in India and all over the world.
- ✓Cable and Satellite Sector (C&S) provides communication and entertainment services to over 200 million TV households
- ✓The sector consists of almost 900 registered TV channels which are all transmitted through C-band satellites
- ✓In view of the socio-economic importance of the broadcasting sector, the satellite service operations in the C-band should be fully protected from any interference in this part of the band from any new services.

Satellite Broadcasting - Challenges

C- Band (3700-4200 MHz) Issues

- ✓Initially, 3.3-3.5-3.6 GHz was allocated for IMT This has created problem for C-band reception and badly affecting the Satellite TV industry
- ✓Later on it was further extended to 3.670 GHz leaving only 30 MHz as Guard band between IMT and satellite services
- ✓Further, there is demand for allocation of 3700-3800 MHz band to IMT
- ✓ The impact will be felt across the entire Broadcasting industry of India. This will require huge additional investment, and resolution is still being worked out

Satellite Broadcasting - Challenges

C- Band (3700-4200 MHz) Issues

✓Several studies show that when 5G and FSS operate in adjacent bands, interference to FSS receivers will occur

✓The two main cause of interference between IMT operations and FSS receive earth stations are :

(i) immense disparity in signal level between the terrestrially based IMT/5G and the faint satellite signals being received from 36000 km above the equator

(ii) Out of Band Emissions (OOBE) produced by 5G transmissions. Tests have shown that either of these interference mechanisms can result in complete loss of the Satellite (FSS) signal

Satellite Broadcasting - Challenges

C- Band (3700-4200 MHz) Issues

✓ **Mitigation by Broadcasters**

- Cost of filter and implementation rollout in thousands of earth stations
- If the guard band is less than 100 MHz, tailor-made BPF filter is required which will drive up the cost of the filter
- elevated insertion losses from special enhanced BPF may require a new antenna to maintain the original G/T and avoid service interruption
- According to calculations made by satellite operators, for systems employing adaptive coding and modulation, the introduction of the enhanced filter will reduce the throughput by over 30% in some cases

Satellite Broadcasting - Challenges

C- Band (3700-4200 MHz) Issues

✓**Mitigation by Telecom Operators**

- Mobile Network Operators (MNOs) may use following tools to reduce the aggregate OOBE from base stations to acceptable levels
  - Use lower transmit power levels for the base station and user equipment.
  - Install better transmit OOBE mask.
  - Use Multiple-Input Multiple-Output (MIMO) technology to null the radiation pattern in the direction of earth stations.
  - Deploy microcells near FSS earth stations which have lower transmit powers.

WRC-2027 Agenda Items & Broadcasting

✓The Conference Preparatory Meeting for WRC-27 (CPM27-1) organized the preparatory studies for WRC-27

✓It includes entries for the identification of the ITU-R “responsible groups” and “contributing groups” for the WRC-27 agenda items

✓The “responsible groups” are invited to communicate on a regular basis the progress and results of their studies to the “contributing groups”.

✓WP6A of SG-6 is dealing with the Agenda Items concerning Broadcasting

WRC-2027 Agenda Items Relevant To Broadcasting

WRC-27 AI 1.6	to consider technical and regulatory measures for fixed-satellite service satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-to-space), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) for equitable access to these frequency bands, in accordance with Resolution **131 (WRC-23)**;
WRC-27 AI 1.9	to consider appropriate regulatory actions to update Appendix **26** to the Radio Regulations in support of aeronautical mobile (OR) high frequency modernization, in accordance with Resolution **411** (**WRC-23)**;
WRC-27 AI 1.10	to consider developing power flux-density and equivalent isotropically radiated power limits for inclusion in Article **21** of the Radio Regulations for the fixed-satellite, mobile-satellite and broadcasting-satellite services to protect the fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz, in accordance with Resolution **775 (Rev.WRC-23)**;
WRC-27 AI 1.11	to consider the technical and operational issues, and regulatory provisions, for space-to-space links among non-geostationary and geostationary satellites in the frequency bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660 MHz, 1 670-1 675 MHz and 2 483.5-2 500 MHz allocated to the mobile-satellite service, in accordance with Resolution **249(Rev.WRC-23)**;
WRC-27 AI 1.13	to consider studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage, in accordance with Resolution **253 (WRC-23)**;
WRC-27 AI 1.17	to consider regulatory provisions for receive-only space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU Radiocommunication Sector studies, in accordance with Resolution **682 (WRC-23)**;

Satellite Broadcasting - Challenges

✓Studies are underway by Responsible Groups and Contributing Groups

✓During the March 2024, WP6A meeting, the Director of the Radiocommunications Bureau, draws attention to the following matter which was considered by WRC-23 (Document 6A/7):

> *-that it is beneficial to take into account any sharing and compatibility studies carried out in previous cycles, to avoid repeating studies previously performed*

✓There was general consensus that for the WRC-31 preliminary agenda items, it is sufficient that one group should be identified as collector of study information and it is not necessary to identify contributing groups (with the exception of preliminary agenda item 2.14)

Satellite Broadcasting - Challenges

CPM27-1 has attributed Working Party 6A as the "responsible" group for WRC-31 agenda item 2.14

*2.14to review spectrum use and needs of applications of broadcasting and mobile services and consider possible regulatory actions in the frequency band 470-694 MHz or parts thereof, in accordance with Resolution **235 (Rev.WRC-23)**;*

✓ITU studies and meetings are in progress ----

सत्यम् शिवम् सुन्दरम्

THANK YOU