Consultation Paper No. 8/2016
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RESPONSE OF ZEE ENTERTAINMENT ENTERPRISES LIMITED

TO

CONSULTATION PAPER ON ISSUES RELATED TO DIGITAL TERRESTRIAL BROADCASTING IN INDIA

ISSUED BY TRAI ON 24TH JUNE 2016

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1. **Introductory Comments**

Zee Entertainment Enterprises Limited (ZEEL), welcomes the consultation Paper on Issues relating to Digital Terrestrial Broadcasting in India and note that the Television (TV) has evolved as powerful medium for the delivery of information and entertainment. The journey of TV broadcasting in the country began in 1959 with free-to-air terrestrial TV Channels by Doordarshan (DD) followed by the massive success in the sector with the introduction of Cable and Satellite Services popularly known as DTH which was launched in 2003, Internet Protocol Television (IPTV) services in 2008, followed by introduction of regulatory framework for Headend-in-the-sky (HITS) Services to enable the use of satellites for distribution of digital cable TV Services as mandated by the Government, which commenced in 2012. We further acknowledge that the Consultation Paper correctly captures the current Indian distribution sector in TV Services which mainly comprises of a) Direct to Home (DTH) services, b) cable TV services delivered through Multi-System Operators (MSOs) & Local Cable Operators (LCOs), c) Internet Protocol Television (IPTV) services d) Headend-in-the-Sky (HITS) services, e) Terrestrial TV services in addition to the newly introduced f) OTT TV which has recently started to offer its service. It is noteworthy to mention that although the broadcasting sector contributes to nearly 46% of the total size of Media and Entertainment Industry, out of 247 million households as per 2011 census, a large number of households particularly in rural and remote areas depend completely on the FTA terrestrial broadcasting TV services, currently provided by the Public Broadcaster (PB).

It is worth mentioning that the Terrestrial broadcasting continues to remain the sole & exclusive domain of DD, comprising of mainly two national FTA channels viz. DD National and DD News, in addition to regional TV channels which continue to remain in its primitive stages as against the massive hit Digitization regime of Cable TV services as mandated by the Government that commenced in 2012 has steadily progressed in a phase wise manner and is slated to be completed by December 2016 by the fourth and final phase of digitization. While the present terrestrial broadcasting sector uses only analog mode and poses the following major limitations amongst the several others:

- Transmission is susceptible to Radio Frequency (RF) interference resulting in poorer reception quality.
- Spectrally inefficient as more spectrum per TV channel is

required and frequency reuse is limited.
- Difficulty in reception of signal in portable environment such as moving vehicles and on handheld devices.

In India though work for changeover from Analog terrestrial transmission to digital terrestrial transmission (DTT) by DD has already commenced, a clear roadmap is currently unavailable. We believe that with the advent of digital media and easier availability of alternate digital distribution platforms, customers today expect a better viewing experience and high number of TV channels even on the terrestrial transmission network and therefore digital terrestrial transmission of TV signals is the need of the hour to meet consumer expectations and ensure optimum utilization of resources.

The Digital terrestrial transmission system (DTT) has many advantages over analog terrestrial broadcasting technology and a few are as enumerated below:

- Better quality TV reception - with enhanced picture and sound performance.
- Efficient use of frequency – one DTT transmitter can broadcast multiple TV channels.
- Frequency reuse possible – a single frequency network (SFN) can be implemented to cover a large geographical area.
- Efficient reception of TV channels in portable environment such as on moving vehicles.
- TV channels can also be received on mobile phones and handheld devices.
- The 7 or 8 MHz TV frequency band can accommodate 10-12 Standard Definition (SD) TV channels or it can be employed as a data pipe to deliver different type of services including radio services.
- DTT platform is flexible and content format agnostic - newer formats of TV channels such as HD TV, 3D TV, UHD TV, data and radio services etc. can thus be delivered.
- Reduced transmission power requirements.
- Digitization also allows for government bodies to reclaim spectrum and repurpose it.

While we note that many developed countries have already taken solid steps to convert the transmission mode from analogue to digital in terrestrial sector by adopting various standards and have further gone upto the extent of laying down the roadmap to switch-off analog

terrestrial TV transmission with a transition to DTT.

At this juncture, it is equally important to give due consideration to the ever increasing demand and rising popularity of mobile TV channels. It is important to note that multimedia traffic contributes to almost 70 to 80% of the total traffic on the internet which shows that there is a demand for consumption of video content on mobile and handheld devices. Effective utilization of the spectrum in the VHF and UHF bands is important especially in view of growth of Internet and developments in OTT services which require additional spectrum resources to be made available to International Mobile Telephony (IMT) services.

We further welcome the initiative of TRAI to engage various stakeholders for present consultation so as to clearly spell out a futuristic roadmap for phasing out the existing analog terrestrial transmission and also for the introduction of DTT and mobile TV. This consultation paper focuses on the development of an appropriate model for the switchover from analog terrestrial transmission to DTT/ Mobile terrestrial transmission in a time bound manner while formulating a clear road map, spectrum requirements, timeframe for switchover, and implementation methodology.

The broad objective of this Consultation Paper inherently includes the following:

- To examine the viability of DTT platform and services in the context of already existing multiple digital TV distribution platforms.
- To develop and suggest a road map for the transition to Digital terrestrial TV transmission/ Mobile TV transmission and also suggest the timelines for switching off the existing analog transmission.
- To formulate a methodology for digitization terrestrial TV networks.
- To assess the spectrum utilization for existing and future digital terrestrial broadcasting services.
- To examine the feasibility of participation of the private sector in the growth of terrestrial broadcasting ecosystem.
- To put in place a regulatory framework that encourages migration to DTT/ Mobile TV channels while ensuring transparency and a level playing field that facilitates growth in the sector.

We also note that the issue of opening up terrestrial broadcasting for DTT and Mobile TV has been the subject of consultation earlier and the Authority had recommended as far back as 2005 to open up the same for private broadcasters.

With our introductory comments and in the backdrop of the present scenario we proceed to give our response to the various Questions raised in the present consultation paper and our response herein below should not in any manner be construed as a waiver of any comments herein above.

Issue No. 1 & 2:-

Q1. Do you perceive the need for introduction of Digital terrestrial transmission in multiple broadcasting distribution platforms? Please provide your comments with justification.

Q2. If yes, what should be the appropriate strategy for DTT implementation across the country? Please provide your comments with justification.

Response to Issue No. 1 & 2 : -

1) We do agree that there is a need for introduction of Digital Terrestrial Transmission (DTT) in multiple broadcasting distribution platforms. We would like to mention that DD took an early lead on the introduction of DTT services as far back as 2000, when the field trials for introduction of DTT services were initiated. The First generation DTT transmitters using DVB-T technology were already installed in the four metro cities. However, the enabling eco-system for proliferation of DTT services could not be developed in the country and hence the early opportunity for digital migration could not be capitalized upon by DD. We would also like to mention that DD has also initiated digitization of its terrestrial network by deploying second generation DTT technologies (DVB-T2) with an estimated timeline for its completion by 2017, with the plan for setting up 630 digital transmitters out of which 23 were already been installed and another 44 are under implementation by DD. The DTT transmitters, installed already, are presently broadcasting experimental TV channels targeting static TV receivers, mobile TV receivers and also providing radio services.

2) It is noteworthy to mention at this juncture that although the TV broadcast distribution platforms in the country such as DTH, HITS and IPTV are already digital and ongoing digitization of Cable TV service distribution

sector is expected to be completed by the end of 2016. However, as on date, a very large portion of the existing terrestrial transmission network in the country continues to remain analog. The Status of DTT Broadcasting Services, at International level reveals that the process of DTT Services were undertaken by taking initiatives to accelerate the migration by formulating the national plans towards

a) setting up of DTT infrastructure and
b) switching off analog terrestrial services.

The European countries such as United Kingdom, Germany, Netherland, Spain, and France have already completed the transition. Digital switch over has also been completed in US, Canada, Japan and Australia while countries such as Russia, China, Hong Kong, Malaysia, and Singapore are witnessing steady progress towards switchover.

The Process of digital migration varies from nation to nation and largely depends on the National plans and priorities keeping in mind associated issues vis-à-vis infrastructure, spectrum, services and consumer acceptance. International trends reveal that in some countries it was a stage wise implementation while in a few others a particular date for Analog Switch off (ASO) has been mandated for the complete transition to DTT. In countries like China, a different switch-off date has been specified for each terrestrial TV channel. In many other countries, simulcast services have been planned wherein a broadcast is simultaneously available to viewers in both analog and digital transmission formats over a certain period. As DTT transmission gains popularity, existing analog services were planned to be gradually shut down.

The success of DTT broadcasting can easily be assessed by the fact that it has emerged as one of the popular digital television platforms in countries like UK, USA, Japan, Germany, France, Australia as it turns out to be one of the **most economical broadcast transmission systems**. It also allows broadcasters in these nation to easily provide content to an unlimited number of viewers in a given area. The unique features of the DTT platform also allow viewers to benefit from regional and local content as well as portable and mobile reception. The same platform additionally caters for provision of a number of radio services to the consumers. The Digital TV Research Ltd. has vide its Press Release dated 12th May 2016 revealed the statistics, undertaking the study of 138 countries including India:

- the global digital TV penetration at the end of 2015 stands at 74.6 percent with 1170 million digital TV households in the world.
- There are 261.9 million analog terrestrial TV and 252 million DTT TV households.
- DTT households comprise of 239.4 million FTA DTT and 12.6 million Pay DTT Households.
- Between 2010 and 2015, about 584 million digital TV homes were added, out of which 156 million came primarily from DTT.
- The Trends for DTT and analog Terrestrial TV are depicted in Fig. 1. which inter-alia indicate that FTA DTT households have almost tripled since 2010 and Pay DTT also continues to register a positive growth.

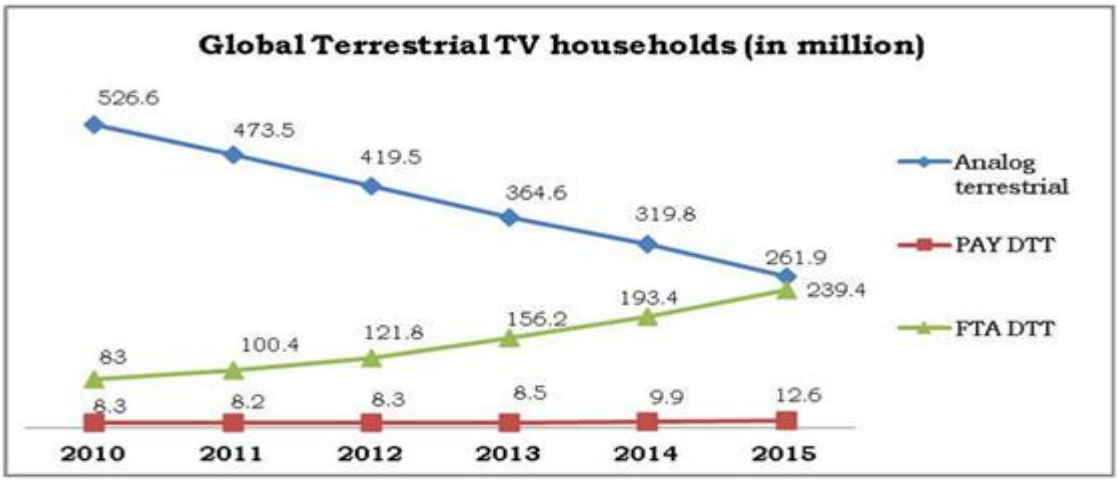


Fig. 1.: Terrestrial TV (Analog and DTT) Global Trends

- The study further reveals the global uptake of DTT services despite the presence of other digital platforms also indicates positive growth trend as shown in Figure 2.
- The DTT constituted the second highest user base worldwide among digital TV broadcast platforms next only to that of digital cable TV services at the end of 2015.
- The study further reveals that the in countries where terrestrial broadcasting was opened up to private participation, the process of digitization has also been driven by the presence of multiple terrestrial broadcasters.
- The study reveals that as on date, most developed countries have open terrestrial TV broadcasting policies allowing participation of private sector DTT services by private entities and public broadcasters provide an alternate choice to consumers with multiple

TV channels including FTA and pay, in addition to other value added services, in presence of DTH, Cable TV and other platforms.

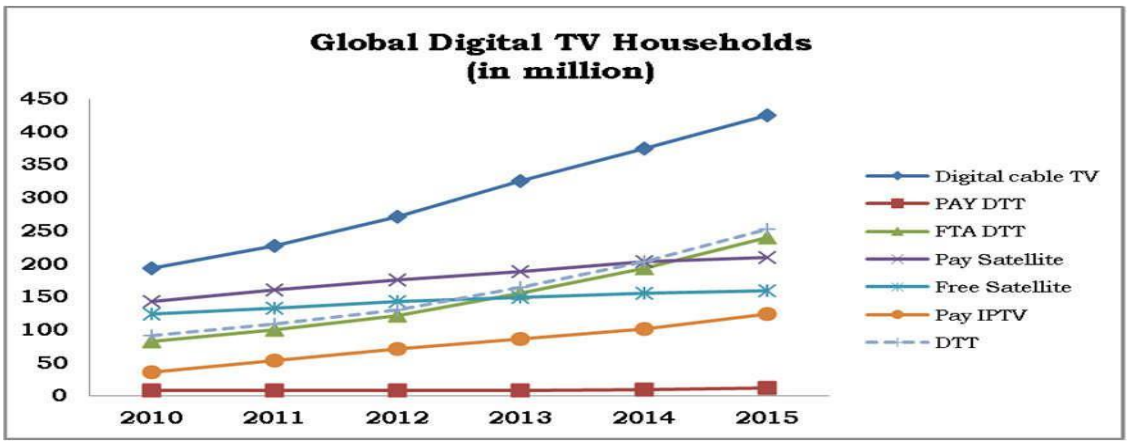


Fig. 2: Global trends for DTT and other digital platforms

3) TRAI should take into consideration the above study, the International practices for implementation of the DTT, wherein many countries have successfully implemented the 1st generation of DTT Standards and are now migrating to the 2nd generation standards. In India, since, as per the earlier recommendations of TRAI related to Terrestrial broadcasting sector had followed a technology neutral approach, leaving the choice of Technology to the stakeholders to select any mature and well established standard, TRAI should **now** consider for migration from analog terrestrial to the latest generation of DTT standards. TRAI should take into consideration the existing 4 Digital Terrestrial Broadcasting standards as follows:

   a) European standard (**DVB-T**),
   b) Japanese standard (**ISDB-T**),
   c) U.S. standard (**ATSC**) &
   d) Chinese standard (**DTMB**).

4) TRAI should also consider the major challenges for DTT implementing such as:

   a) ***DTT Infrastructure*** – the DTT standards has been designed in such a manner to maximize utilization of existing infrastructure. However, digitization of terrestrial broadcasting is cost intensive and requires creation of new infrastructure. It has been estimated by Prasar Bharati in "Prasar Bharti at Cross Roads" Yojana July 2013 that in order to install 300-400 DTT transmitters in densely populated areas, the

requirement of funds would be approximately rupees 3000 crores. The cost of complete digitization of the network using one transmitter in 630 locations each would be much higher in order to provide similar coverage across the Country.

b) ***Geo-Political Scenario*** - India is having a huge terrestrial network and therefore the process of digital migration becomes more complex as it will require huge resources and time to completely digitize the network terrestrial TV transmission for delivering traditional TV channels which may not be relevant today as other existing multiple platforms are adequate to serve the broadcasting needs of the people. Since analog terrestrial TV broadcasts primarily cater to the needs of people in rural, far flung and remote areas, it may also be argued that DTT implementation may be restricted to such areas where a mix of TV and radio services through a single small power DTT transmitter may be made available to the people. This may however require that DTT STBs are made available to them at affordable costs. The introduction of such service in presence of DD FTA DTH may also pose a challenge.

c) ***Consumer demand*** - Consumer will have to either buy set top box (STB) or a TV receiver with inbuilt set top box and an antenna. The acceptability and popularity of DTT services is like to become more challenging in the presence of multiple delivery platforms which provide large number as well as variety of TV channels to the Consumers. One DTT transmitter can provide only 10-12 TV channels in Standard Definition (SD) format which may not offer significant value proposition to the consumers. This transmitter can also provide services such as mobile TV, radio channels, etc. However, in that case the number of TV channels provided will get reduced according to the capacity consumed by other services. The consumers are used to receiving multiple TV channels. In such situation, optimum bouquet of DTT services may be required for which more number of transmitters and other associated infrastructure would be required to be installed as a multiplex at a particular location. Such a multiplex may comprise of more than one transmitter installed in a particular location each operating at different frequencies. A multiplex is created to increase the number of channels and to provide an optimal composition of different types of services such as TV channels, Mobile TV, Radio channels, etc. If a multiplex of, say 4 DTT transmitters, at each location is to be considered, the estimated funds requirement will be to the tune of several thousand crores. It should therefore be borne in mind that in presence of multiple

platforms, this kind of investment may be attracted only when there are enough business opportunities. We are of the view that the Popularity of DTT Services can be increased by initiating consumer awareness program wherein the consumer will not pay any recurring subscription charges atleast for free to air channels, mainly targeting the viewers in Rural and far flung markets. The DTT services will become relevant in Urban markets since the DTT offers several potential benefits for introducing new services and efficient utilization of scare spectrum resource not only by accommodating more data rates within the same 7/8 MHz channel bandwidth, but also by offering opportunities for developing hybrid mobile platforms, thus creating new business opportunities making it more viable option available for Urban areas.

In light of our aforesaid submission, we would like to conclude by stating that we are of the view that the answer to this question is undoubtedly yes, but it needs to be qualified by the need for government to also allocate sufficient spectrum so that there are sufficient number of channels for encouraging customers to buy STBs or DTT receivers.

Even with the introduction of DTT using DVB-T2, and MPEG-4/AVC the number of channels per carrier would be about 15, and for encouraging customers to buy DTT receivers in preference to DD-Direct Freedish or other services, there would be a need to provide at least 15-20 frequencies for a sizable bouquet to be built up. This is particularly true owing to the growth of HD services.

We would therefore suggest the following to be the building blocks of the DTT Policy:

i. Clearly earmark Spectrum and the number of DTT Multiplexes which will be permitted to be used by the Government for long term DTT use. In this connection our response to questions 8, 9 and 10 may be seen.
ii. Make available the Infrastructure developed by DD for use by private operators. Hence the Transmitting Antennas, HPTs, LPTs etc so far deployed and which can be spared should be made available for use.

iii. The Spectrum charges should be fixed based on the criteria which is different from a mobile use.

iv. In case of mobiles, the same spectrum is used by a factor of thousands of times as the number of towers can be deployed in a dense

configuration. However, the same is not the case for Terrestrial transmission. To give an example, an 8 MHz slot can be used to transmit at most about 20 channels using DVB-S2 and MPEG-4/AVC. If the terrestrial transmissions across the country serve 8 million customers, as an example, the 8 MHz spectrum of 20 channels need to be paid for in some manner by the 8 million customers. At Rs. 100 per year, the revenues are Rs. 800 Million or Rs. 100 Million per MHz. based on a gross operating margin of 10%, the cost which can be borne by a broadcaster cannot exceed Rs. 10 Million per Mhz. There may be a revenue share mechanism or a fixed license fee. It can be in the range similar to the just concluded auction of FM Radios for Phase-III.

v. **FDI should be restricted in this segment and that foreign companies should not be eligible to participate in the allocation of spectrum for terrestrial broadcasting as it involves the usages of Indian resources and as is the case with Indian companies abroad where they are not eligible for spectrum allocation. We can suggest the similar restrictions as are applicable in news segment.**

vi. The allocation of frequency should be through auction/bidding for which the suitable bidding criteria should be developed based on the pricing model and capability of a broadcaster or a platform operator of having at least 5 million customers on a DTH/ Cable Platform or for a broadcaster to have at least 10 million customers via aggregated broadcast platforms.

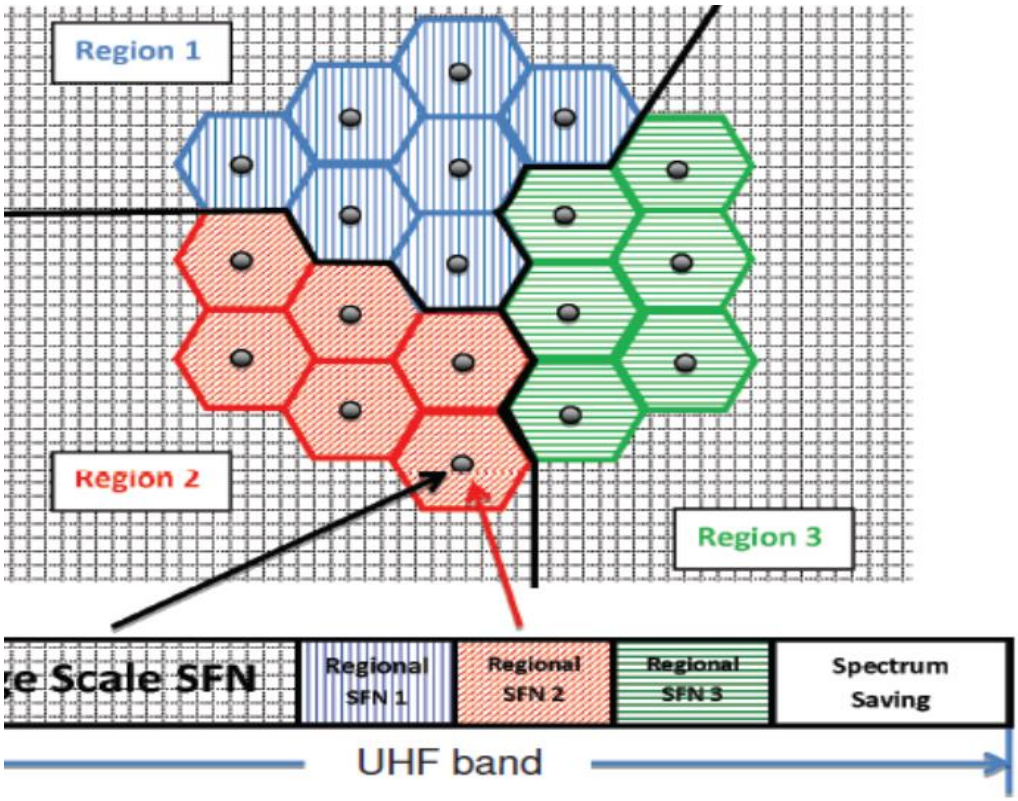
vii. Spectrum earmarked for DTT should not be used for LTE Broadcasting. LTE's broadcast mode, LTE Broadcast (based on LTE evolved Multimedia Broadcast Multicast Service, eMBMS), can be used to provide broadcast for linear near and non-linear content delivery.

viii. LTE Broadcast enables free-to-air or pay-TV services that can be received by anybody with a suitable device, similar to traditional TV broadcasting. LTE Broadcast, or eMBMS, is standardized in 3GPP Rel. 9 and relies on the same signal being received by many users at the same time.

ix. It will not be out of place to remind the Authority that earlier the spectrum which was earmarked for WiMAX services in India (20 MHz in the range of 2500 MHz) was not utilized by some operators for this purpose and instead converted to LTE which placed them on an

unequal footing with the other set of operators who had acquired LTE spectrum at much higher rates.

x. Now with the availability of eMBMS, there could be a repeat of the same story unless the guidelines are properly formulated and strictly enforced.



Spectrum allocation of CellTV with pure broadcast.

xi. eMBMS can provide functionalities similar to DTT. However, the reserve prices fixed for the 700 MHz spectrum auction are much higher than those likely for DTT and this can entice some operators to bid for DTT frequency slots and then change use to eMBMS.

In this regard the Authority needs to bring transparency and clarity.

Issue No. 3:-

Q3. Should digital terrestrial television broadcasting be opened for participation by the private players? Please provide your comments with justification.

Response to Issue No. 3: -

1) We are of the view that the DTT broadcasting should be opened for participation by the Private Players. We have witnessed that the Indian broadcasting sector has seen phenomenal growth, ever since private sector was allowed to participate in DTH and FM services. The cable TV sector in the country has also been driven by private operators. The Entry of private operators in the FM sector has not only rejuvenated the scene of radio listening in the country, but also increased the reach of FM services in far flung areas. This success story can therefore be primarily attributed to the private players who offer wider choices to the consumers in a competitive environment. DTT migration world over has also been influenced by private sector as there were private terrestrial TV broadcasters already operating in the analogdomain.

2) We should consider the fact that efforts to digitize terrestrial networks were initiated in India in the year 2000. DTT transmitters using DVB-T technology were installed in each of the four metro cities. This expansion could not continue as enabling eco-system could not be developed. Introduction of DTT services requires concerted effort on the part of various stakeholders to make available DTT STBs, TV receivers, infrastructure and appealing services to drive migration process. We would therefore recommend the entry of private players in DTT sector willhelp developing necessary ecosystem.

3) We are in agreement to the various advantages/reasons in favour of allowing private sector participation in terrestrial TV broadcasting considered in the Consultation Paper as follows:

   a) Since large investment is required for migration to digital, sole dependence on government funded approach may not be feasible. Allowing the private sector in terrestrial TV broadcasting would result in inflow of private capital in the sector and growth of terrestrial services. Private sector may develop DTT as competitive and viable optional alternative platform to consumers.

   b) Presently, terrestrial broadcasting is under the exclusive domain of DD and there is no competitive platform in terrestrial TV services. By allowing the private sector in terrestrial TV broadcasting, innovation in services will get encouraged. As of now there is little content

differentiation between platforms. Private sector may develop new business models for commercial utilization of DTT services. Content differentiation between terrestrial and other platform may improve as private sector may bring in new services.

c) Even today a large number of free to air Satellite Channels are available to the viewers. However, to avail these channels a person has to pay monthly subscription fee to DPOs. Therefore, even though a broadcaster may be offering a channel as free to air, the viewer can get it only after payment of certain recurring fee. In case of terrestrial broadcasting, the viewers may get such Free to Air channels without having to pay any subscription fee in case of FTA DTT services.

d) Currently, the Satellite TV Channels have programmes directed at the national/regional audience. It is expected that private terrestrial television broadcasting will lead to enhanced coverage of local issues, events, music and culture.

e) The public service broadcasting may get strengthened as private service operators will provide new socially relevant programming such as education, health, etc. Private terrestrial television broadcasters may complement the services of DD by generating more content.

Our response to this question is therefore Yes, DTT should be opened for private broadcasters, but post bringing clarity on the number of frequency slots which can be made available for auction. Unless a bouquet of about 200 channels can be built up, it will be difficult to compete with established services such as cable TV and DTH.

Issue No. 4

Q4. Which model or a combination thereof for Digital terrestrial transmission will be most suitable in Indian context? Please furnish your comments with justification.

Response to Issue No. 4: -

1) In Indian context, based on the legacy terrestrial network and the evolving scenario, there can be different models for implementing DTT services. In

most of the countries, terrestrial television services are FTA which are being provided both by public service broadcaster and private operators. Pay DTT services are also available in some countries. In India, terrestrial television channels provided by DD are free-to-air. In case of DTT, new business models may also evolve depending up on its commercial viability. Some of the possible models for implementing DTT infrastructure are discussed below : -

a) **INTEGRATED DTT BROADCASTING MODEL**:

In this model, it is envisaged that both infrastructure and services are provided by an entity that will plan, set up and operate the DTT network and services in an area. Theoretically, the entity can either be a new private body (consortium) or PB itself. However, it may not be feasible for a new entity to set up parallel terrestrial networks as it involves creation of infrastructure like buildings and towers for setting up new DTT transmitters which is capital intensive and time consuming process. PB has already huge infrastructure such as land, building, networks etc., for its terrestrial transmission. It has also initiated setting up of DTT transmitters. It is therefore a better placed entity for setting up Integrated DTT Broadcasting network. This scenario thus assumes that PB continues be the sole terrestrial broadcaster and it will be responsible for setting up and operating DTT platform in the country. This model will have following pros and cons:

Pros

- Public service broadcasting can be strengthened in the country.
- Dissemination of social, educational programmes to masses though various services such as mobile TV can be increased.
- Reach of services from public broadcaster will enhance immensely.
- No new regulatory framework required for implementation of DTT.

Cons

- Arranging of huge funds for digitization process.
- No clear cut road map is available for DTT services
- Manpower for operation and maintenance of the digital infrastructure.
- In absence of commercial motive, the DTT platform may not become popular and viable
- Acceptance of DTT services by the consumers may be a challenge
- Early analog switch off may be difficult to achieve
- For new content creation huge resources may be required.

- Monopoly of PB in terrestrial TV broadcasting will continue.
- Due to lack of competition, no scope for bringing in efficiency and innovation in terrestrial TV broadcasting.
- Development of conducive eco system for DTT may be a challenge.

In the approach, PB may also become a content aggregator for sharing transmitter capacity with private service providers to give variety of contents while platform remains with PB. This approach is however likely to have following challenges: -

- Mismatch between infrastructure needs of service providers and platform capabilities.
- Management of services in case of pay services
- Ensuring quality of service as per the requirement of service providers
- Innovation in DTT platform and services may get affected.
-

b) **TRANSMISSION NETWORK MODEL**:

There will be huge requirement of digital terrestrial transmission network considering the vast size of the country. One way to address this issue may be to separate the terrestrial network infrastructure and services being provided. This means that in terrestrial domain, there may be DTT network operator(s) and DTT service providers. DTT network may be set up and operated by a separate transmission entity authorized to do digital terrestrial transmission. The entity may be a government body or consortium formed by several stakeholders. Keeping in view the huge size of the country, there could be single or multiple entities for DTT transmission network on regional /state basis. In this case all DTT infrastructures will be planned and implemented by the entity and the service providers may seek required capacity on the network for providing their services. This model will have following pros and cons:-

Pros

- Less dependence on government funding in case of PPP model.
- Existing infrastructure will be optimally utilized
- Investment into the sector may get encouraged.
- Private participation will bring technological excellence and operational efficiency.

- Introduction of wide variety of services making DDT more competitive.
- Development of new business model such as subscription based services, value added services, etc.
- Speeding up of digitization process
- Competition in terrestrial TV broadcasting sector
- Opportunity for integration of telecom and terrestrial networks, hybrid services.

Cons

- Technology choice may need to be harmonized for inter-operability of services.
- Quality of service provided will depend on network infrastructure though its maintenance is expected from service providers.
- Greater level of coordination is required for planning services and infrastructure.
- It needs to be ensured that Public service broadcasting channels are carried on the DTT networks.

c) **COMMON TRANSMISSION INFRASTRUCTURE (CTI) MODEL**:

This model is similar to the model followed for introduction of private FM services. The existing infrastructure like tower, building etc. will be shared with the private operators. The private operator interested in launching DTT services may have to seek license to start terrestrial broadcasting services (TV channel/mobile TV/Radio, etc) and install their infrastructure (Transmitter and other associated accessories) at the existing facilities of PB. This model will have following pros and cons:-

Pros

- Easy to implement since basic framework is already available for FM services
- This will reduce the cost of setting up of infrastructure for private operators by avoiding investment in common infrastructure like *tower, building, etc.*

Cons

- The existing infrastructure is already overloaded due to sharing with private FM and in house expansion of DD.
- There may not be enough capacity available for accommodating the needs of private operators.

- Demand for infrastructure sharing may be huge in major cities, which may require creation of new CTI infrastructure affecting the digitization process.
- Coordination issues for sharing of infrastructure.
- Introduction of DTT in rural areas may be a challenge.

We would like to suggest implementation of DVB-T2 with channels encoded in MPEG-4/AVC.

Issue No. 5

Q5. What should be the approach for implementing DTT network (MFN/SFN/Hybrid)? Please furnish your comments with justification.

Response to Issue No. 5: -

1) The answer to this question requires an integrated look at the following:
   a) The Spectrum made available for analog, DTT and LTE services respectively within this band.
   b) Whether LTE services are permitted to operate in the same band as SFN.
   c) Whether or not eMBMS services are permitted.

2) In terms of technology, it is possible to go for a SFN implementation. However, owing to legacy usage and potential interference issues, the allocation of spectrum cannot be viewed as merely the allocation of frequencies for certain applications. Additional dimensions to the frequency include the maximum power which can be transmitted, out of band interference caused by such transmission and the tolerance of the licensed system to interference from other systems. Moreover such spectrum allocations may be subject to channeling plans which prescribe bandwidths and associated center frequencies. In addition, the use of spectrum would be subject to regulatory provisions which are country specific.

3) The spectrum can also be reused based on the transmission characteristics. For example base stations in cellular systems may reuse frequencies in adjacent cells in case of CDMA or in COFDM SFN networks (such as DVB-H). In other cases (i.e. GSM) the frequencies may be reused only in alternate cells where the transmission has weakened sufficiently so as not to cause any interference.

4) In the extant case we would like to cite the report of the EBU (tr015) where similar issues which are being faced by India today, were discussed and solutions planned for ITU region-1.
To Cite from the report:

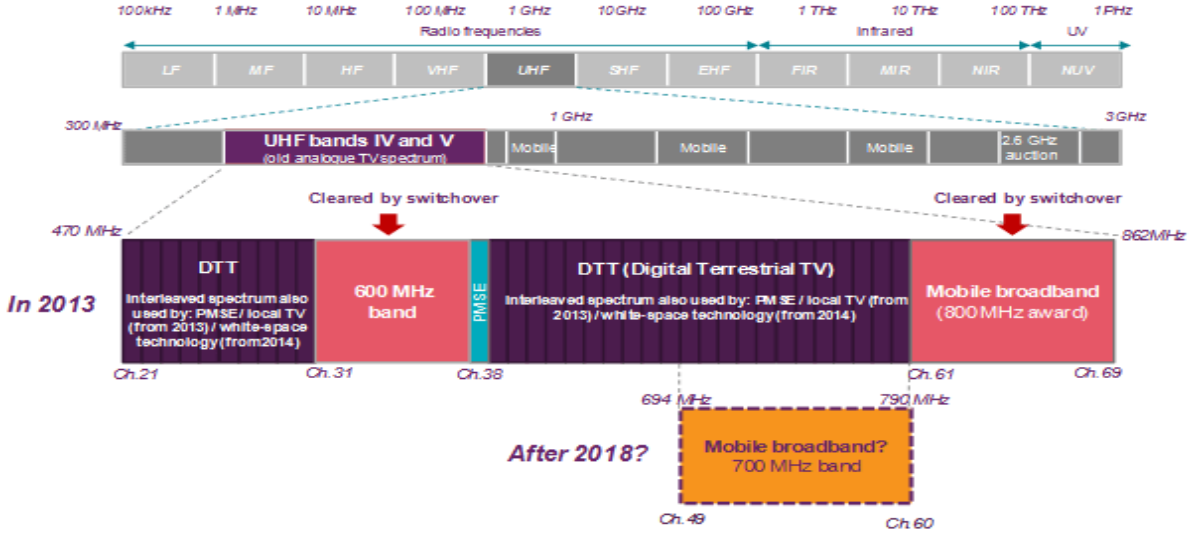
"If the 700 MHz band (or more) were to be released from broadcasting then this would question the long term viability of the terrestrial television broadcasting platform. This is a very serious threat for the broadcasting community, so any preparation towards WRC-15 cannot be envisaged without the joint forces of all stakeholders to support and develop a vibrant and sustainable terrestrial television broadcasting platform.

Furthermore, spectrum policy needs to take account of the specific circumstances in each country. Any further reduction of the available spectrum for terrestrial broadcasting would have negative consequences for the public and broadcasters alike, for instance through increased interference levels, decreased coverage, fewer services and a reduced possibility for future development.

***Degradation of the terrestrial platform is likely to entail a large-scale migration to other platforms**. This will inevitably incur very high costs, much of which would have to be borne by the public. Terrestrial broadcast networks are optimised for the delivery of linear media services to large audiences and they will continue to be important in delivering these services in the future"*

Frequency planning for terrestrial broadcasting in ITU Region 1 is governed by the GE06 Agreement. This contains a frequency plan for broadcasting networks in the Bands III, IV and V for Region 1 which includes Europe. Intentions to make use of this spectrum and bringing transmitters into operation are subject to the application of the procedures contained in GE06. It is important to understand that the approach of defining nationwide coverage layers is a direct consequence of the principle of equitable access to the spectrum.
*The planning effort resulted in a **frequency plan providing 7 nationwide coverage layers for each country** across Europe in the UHF band. To this end, the entire spectrum between 470 and 862 MHz was consumed. This **corresponds to 49 channels with a bandwidth of 8 MHz each**. Therefore, 7 channels per layer have been used on average.*

Our intention of referring to the report is only to highlight the complexity of planning in a mixed LTE, DTT and Analog environment. While LTE and DTT on their own permit SFN networks, the implementation of LTE+DTT as SFN is not directly possible.



5) DTT will comprise of channels 38 to 48 in upper UHF band while LTE will occupy channels 49 to 60.

6) There are case studies of Columbia where a SFN of 290 Km was achieved for DTT. However, several protections were needed such as frequency filters to prevent LTE interference.

Issue No. 6

Q6. What should be the criteria for arriving at optimum size of DTT multiplex at any location? Please furnish your comments with justification.

Response to Issue No. 6: -

1) The DTT transmitters have a limited range which may extend from 30-70 Km based on the height of the transmitting tower and repeaters. Primarily we believe that it will be only in the Cities which are covered in DAS-I, II

and III where DTT will be practical and will be able to develop a minimum critical mass of users.

2) We would therefore like to suggest that a minimum of 200 channels should be made available.

Issue No. 7

Q7. How many digital multiplex per DTT operator should be planned for metro, major cities, urban and rural areas and why? Please furnish your comments with justification.

Response to Issue No. 7: -

1) We are of the view that the WPC in coordination should first outline the spectrum plan which they intend to allocate to terrestrial broadcasting across the country.

2) As initially the analog, DTT and LTE will coexist. We recommend 15-20 DTT multiplexes as a minimum.

Issue No. 8, 9 & 10

Q8. What should be most appropriate frequency band as per National Frequency Allocation Plan 2011 for implementation of Digital terrestrial transmission including mobile TV? Give your comments with justification.

Q9. Should spectrum be exclusively earmarked for roll out of DTT services? If so, what should be the quantum considering the broadcasting sector requirement in totality?

Q10. What should be the roadmap for digitization of terrestrial TV network in the country? Please provide your comments with justification.

Response to Issue No. 8, 9 & 10: -

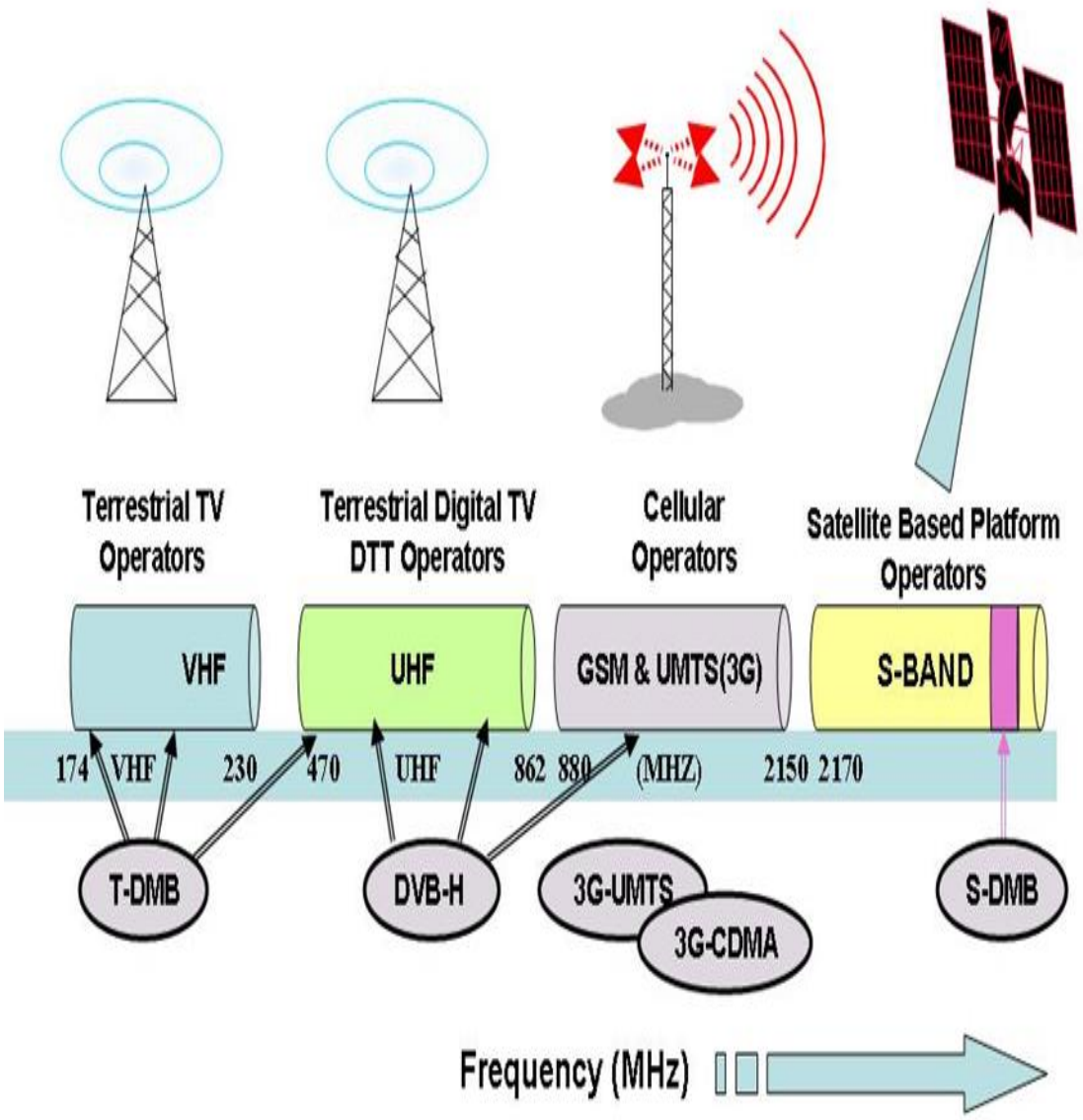
1) We are of the view that Allocation of Spectrum for various services has always been an area of considerable attention by the service providers as well as the users. This is not surprising considering that the Spectrum is a limited resource. The approach for allocation of spectrum is now globally harmonized with ITU, through a consultative process allocating globally

harmonized bands for various services while leaving country specific allocations to the governments. The specific allocations vary from country to country with the underlying principle of optimizing the utilization of this resource, non-interference with other users and development of new services. There is also a need to coordinate the use of spectrum beyond the national borders, i.e. internationally. The allocation of spectrum goes hand in hand with the Technical Specifications for the services and intended usage. The International coordination of Spectrum is done under the aegis of the International Telecommunications Union (ITU).

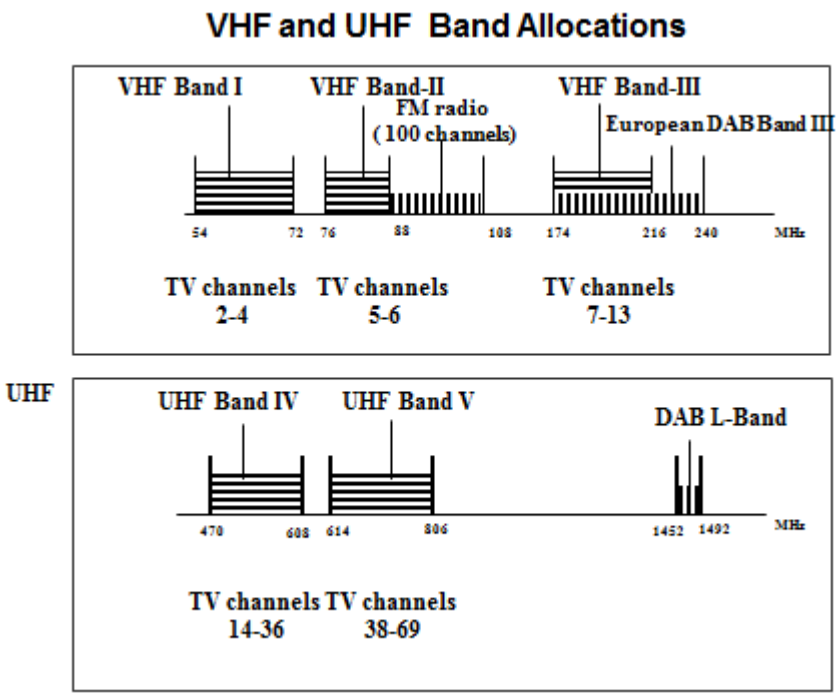
2) The challenge of spectrum allocation lies in the fact that there is need to cater to a range of continuously evolving new technologies; Mobile phones, 3G, WCDMA, Mobile broadcasting, Wireless, Digital TV and others. Moreover the evolution of technologies continues to bring forth new requirements on the use of spectrum which need to be coordinated and allocated.

3) **ITU-R (ITU-Radio communication)** is the body responsible for management of the Radio Frequency Spectrum and a large number of services such as Fixed services, Mobile Services, Broadcasting, Amateur radio, Broadband and GPS as well as a range of other services.

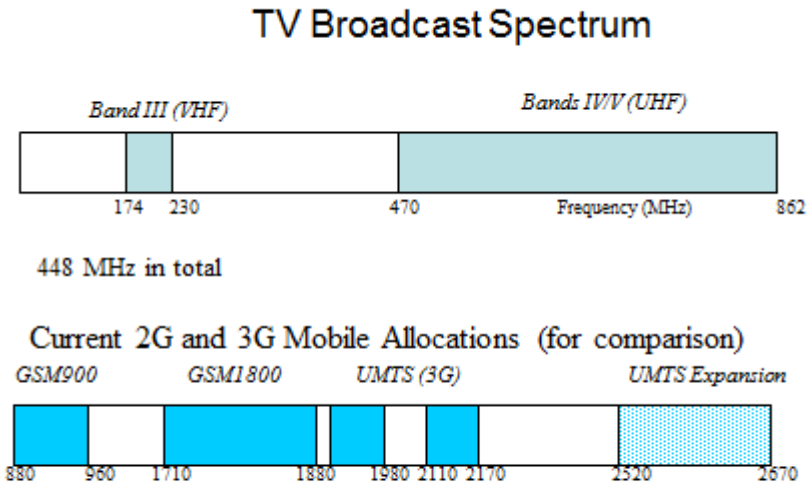
4) Allocation of spectrum for varying services has always been a consultative process with all stake holders from all countries meeting under the aegis of WARC (World Administrative Radio Conference) and recommending spectrum use for various services. The individual countries are then responsible for making allocations within their own country based on criteria which they wish to adapt such as auction or license or need based allocation. Following ITU based recommendations for internationally coordinated frequencies makes it possible to use the services uniformly in all countries. The use of GSM spectrum in the 800 MHz, 1800 MHz bands is an example of such coordinated allocation which makes possible the roaming worldwide. There have been exceptions to such allocations being done globally due to historical reasons such as the USA where GSM networks operate in the 1900 MHz band.



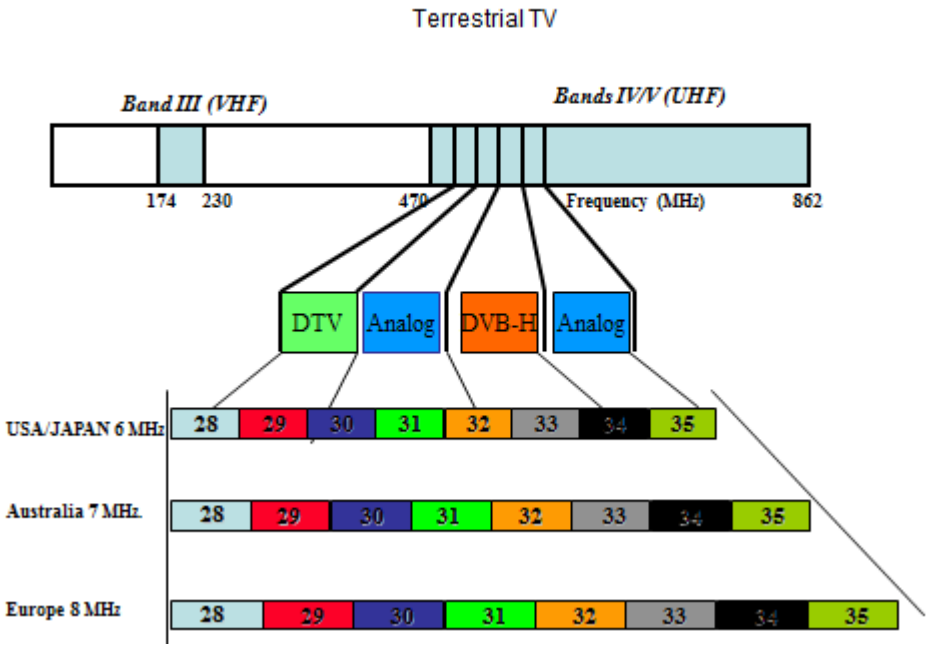
5) In Europe, the VHF and UHF frequencies are used for Terrestrial Broadcasting as per the following broad allocations:

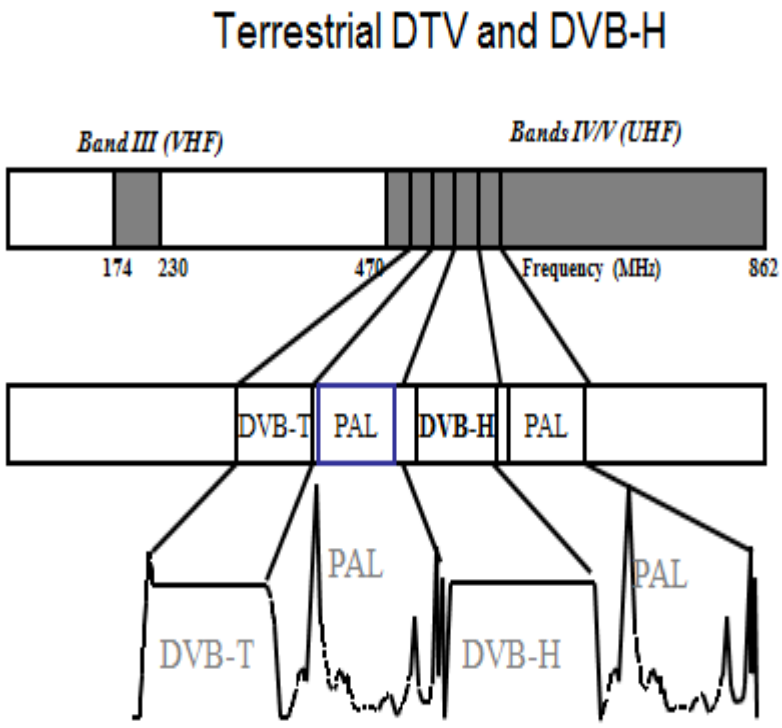


6) It is evident that about 69 Terrestrial Multiplexes can be derived based on allocations and national priorities. With DVB-T2 these can give over 500 channels.



7) Further, in Europe, during the period of transition, from analogue to Digital, the carriers for analog, DVB-T and DVB-H were co-located in the same band.


Terrestrial TV
Band III (VHF)
Bands IV/V (UHF)
174
230
470
Frequency (MHz)
862
DTV
Analog
DVB-H
Analog
USA/JAPAN 6 MHz
Australia 7 MHz
Europe 8 MHz
28
29
30
31
32
33
34
35


Terrestrial DTV and DVB-H
Band III (VHF)
Bands IV/V (UHF)
174
230
470
Frequency (MHz)
862
DVB-T
PAL
DVB-H
PAL
PAL
DVB-T
DVB-H
PAL

8) As per the National Frequency Allocation Plan (NFAP)-2011, the frequencies are earmarked for Terrestrial broadcasting/ Mobile use with no clarity on exclusive use for Terrestrial broadcasting or Mobile Broadcasting as per data available publicly. We would like to review responses from WPC on this issue.

9) Further there is complexity on the mixed use of frequencies with LTE in the 700 MHz band. WPC should bring out a spectrum planning paper which outlines the national plan.

International Frequency Allocation Table
410-460 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
410-420	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-space) 5.268	
420-430	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271	
430-432 AMATEUR RADIOLOCATION 5.271 5.272 5.273 5.274 5.275 5.276 5.277	**430-432** RADIOLOCATION Amateur 5.271 5.276 5.277 5.278 5.279	
432-438 AMATEUR RADIOLOCATION Earth exploration-satellite (active) 5.279A 5.138 5.271 5.272 5.276 5.277 5.280 5.281 5.282	**432-438** RADIOLOCATION Amateur Earth exploration-satellite (active) 5.279A 5.271 5.276 5.277 5.278 5.279 5.281 5.282	
438-440 AMATEUR RADIOLOCATION 5.271 5.273 5.274 5.275 5.276 5.277 5.283	**438-440** RADIOLOCATION Amateur 5.271 5.276 5.277 5.278 5.279	
440-450	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271 5.284 5.285 5.286	
450-455	FIXED MOBILE 5.286 A A 5.209 5.271 5.286 5.286A 5.286B 5.286C 5.286D 5.286E	
455-456 FIXED MOBILE 5.286 A A 5.209 5.271 5.286A 5.286B 5.286C 5.286E	**455-456** FIXED MOBILE 5.286 A A MOBILE-SATELLITE (Earth-to-space) 5.286A 5.286B 5.286C 5.209	**455-456** FIXED MOBILE 5.286 A A 5.209 5.271 5.286A 5.286B 5.286C 5.286E
456-459	FIXED MOBILE5.286 A A 5.271 5.287 5.288	
459-460 FIXED MOBILE 5.286 A A 5.209 5.271 5.286A 5.286B 5.286C 5.286E	**459-460** FIXED MOBILE 5.286 A A MOBILE-SATELLITE (Earth-to-space) 5.286A 5.286B 5.286C 5.209	**459-460** FIXED MOBILE 5.286 A A 5.209 5.271 5.286A 5.286B 5.286C 5.286E

International Frequency Allocation Table

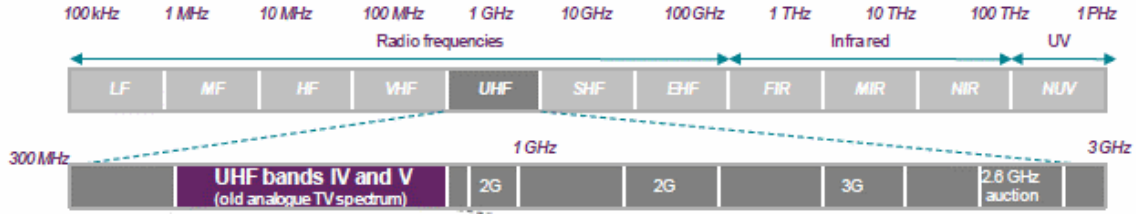
460-890 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
460-470	FIXED MOBILE 5.286 A A Meteorological-Satellite (space-to-Earth) 5.287 5.288 5.289 5.290	
470-790 BROADCASTING 5.149 5.291A 5.294 5.296 5.300 5.302 5.304 5.306 5.311A 5.312	**470-512** BROADCASTING Fixed Mobile 5.292 5.293	**470-585** FIXED MOBILE BROADCASTING 5.291 5.298
	512-608 BROADCASTING 5.297	**585-610** FIXED MOBILE BROADCASTING RADIONAVIGATION 5.149 5.305 5.306 5.307
	608-614 RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)	
	614-698 BROADCASTING Fixed Mobile 5.293 5.309 5.311A	**610-890** FIXED MOBILE 5.313 A 5.317A BROADCASTING
	698-806 BROADCASTING Fixed MOBILE 5.3131 B 5.317A 5.293 5.309 5.311A	
790-862 FIXED BROADCASTING MOBILE except aeronautical mobile ADD 5.XXX MOD 5.317A 5.312 5.314 5.315 5.316 5.316 A 5.319	**806-890** FIXED MOBILE 5.317A BROADCASTING 5.317 5.318	
862-890 FIXED MOBILE except aeronautical mobile MOD 5.317A BROADCASTING 5.322 5.319 5.323		5.149 5.305 5.306 5.307 5.311A 5.320

10) Further there is a plan to auction part of the 700 MHz Spectrum. Historically the use of spectrum in the VHF and the UHF bands has

been reserved for Terrestrial Television Broadcasting. The UHF Bands IV and V occupy the spectrum from 470-MHz to 700 MHz and comprise of UHF channels 21 to 61.

Figure 1 - UHF bands IV and V and the 700 MHz band

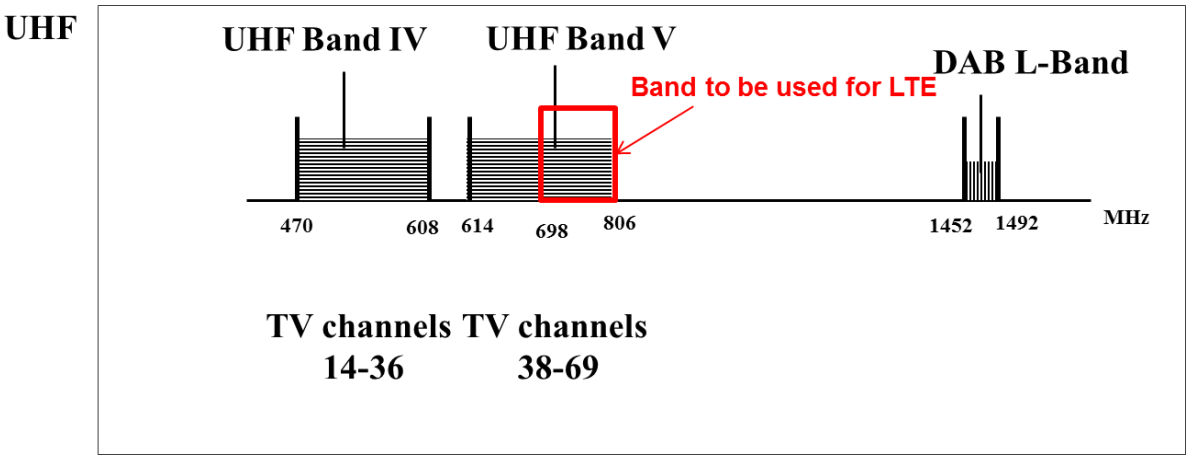


11) The CATV networks, when these were analog, also operated in the same band of VHF and UHF going up to 750 MHz in analog systems. The Mobile Networks were allocated frequencies which are outside this band:

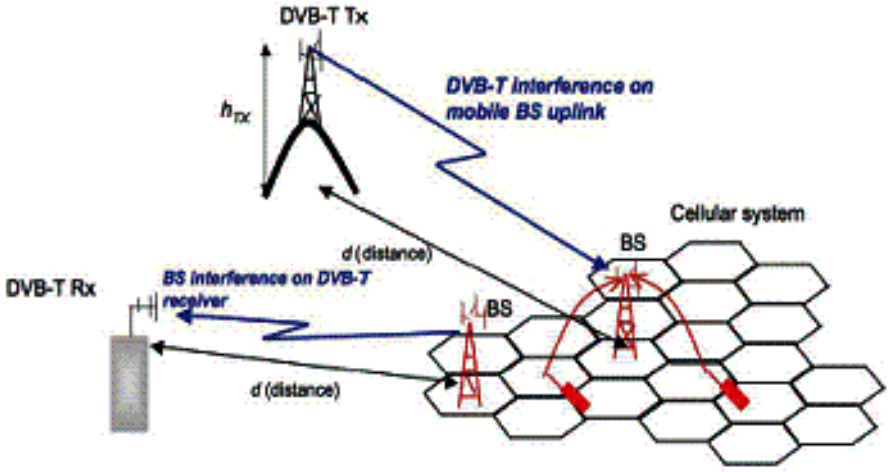
Common name	Uplink	Downlink
GSM/CDMA/WCDMA850	869-894 MHz	824-849MHz
GSM900	880-915 MHz	925-960 MHz
GSM1800	1710-1785 MHz	1805-1880 MHz
GSM/CDMA1900	1850-1910 MHz	1930-1990 MHz
WCDMA2100	1710-1755 MHz	2110-2170 MHz
LTE-4G, BWA	2300-2360	2300-2360

12) The band to be auctioned is the APT700 band plan (698-806 MHz) with FDD based 2x45 MHz frequency arrangement. In essence, there is a spectrum band of 108 MHz (698-806) MHz which TRAI has proposed be adopted for use of LTE and be auctioned.

13) Consequently only a part of the UHF spectrum will be left for Terrestrial broadcasting:



14) Moreover due to high power transmissions by LTE transmitters which will have thousands of towers placed in close vicinity to customers, as against the DVB-T transmissions, which will have much lower powers as distance from the transmitter increases, the DVB-T signals will find significant interference beyond a few kilometers of the transmitter. In such areas, the adjacent channels which are close to the 698-806 MHz band will not be usable.



Issue No. 11

Q11. What should be the Analog Switch off date(s) for the terrestrial TV channels in context with the suggested roadmap for DTT implementation? Please provide your comments with justification.

Response to Issue No. 11: -

1) We are of the view that owing to the time which is likely to be taken for the finalization of DVB-T spectrum, policies, auction and finally implementation of the Terrestrial broadcasting system, we think it will be imperative to give time till end Dec 2018 for this switchover.

2) The DAS-3 and DAS-4 switchovers which should be complete by Dec 2018 are also bogged into problems, albeit which are not related to digitalization alone but also the charging, pricing and RIOs etc.

Issue No. 12

Q12. Stakeholders may also provide their comments on any other issue relevant to the present consultation paper?

Response to Issue No. 12: -

1) There is an imperative need to have a concerted policy decision on whether Terrestrial frequency spectrum will be finally earmarked for Television or mobile and there would need to be policy consistency so that private investments can flow in based on a long term visibility.

2) As already outlined there need to be sufficient number of slots auctioned so that bouquets with a critical mass can be built up to encourage customers to buy digital terrestrial decoders as against a cable box or a DTH box.

3) Frequencies earmarked for DTT should not be allowed to be used under any other technology except DVB-T2 as specified for national implementation. Specifically, eMBMS (LTE broadcast) should be prohibited to be used by any operator after taking a DVB-T2 license.

Conclusion:

We are of the opinion that the authority should comprehensively consider our submissions and in conclusion would like to reiterate our recommendations as follows:

a. FDI should be restricted in this segment and that foreign companies should not be eligible to participate in the allocation of spectrum for terrestrial broadcasting as it involves the usages of Indian resources and as is the case with Indian companies abroad where they are not eligible for spectrum allocation.
b. The allocation of frequency should be through auction/bidding.
c. There may be a revenue share mechanism or a fixed license fee. It can be in the range similar to the just concluded auction of FM Radios for Phase-III.
d. The dongles which are used for accessing this terrestrial mode should be made customs duty free in order to encourage and push up this mode of distribution.

We reserve our rights to offer counter comments and supplementing response at a later date.

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