

Inputs on TRAI's Consultation Paper on DTT

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Q.1 Do you perceive the need for introduction of Digital terrestrial transmission in multiple broadcasting distribution platforms? Please provide your comments with justification.

Even in the presence of huge number of DTH and Cable TV Channels, **a strong Terrestrial platform is critical to healthy competition in the TV and Radio market and to the realisation of a wide range of social and cultural benefits** and most essentially an **all weather reliable platforms** for distribution of Radio and TV Signals. It's capability to provide local content facilitate in providing social benefits of promoting local talent, local culture & music, generating employment etc. The **Digital Terrestrial Television (DTT)** has high potential in distribution of Video and Audio signals and that is why '**no country in world has disbanded Terrestrial TV**' albeit Analogue Transmitters have been replaced with Digital Tx.

The immense reasons of adopting the DTT are briefed as below:-

- I. Digital television offers new possibilities to the viewers and broadcasters with improved technical quality of picture and sound, additional programs and additional reception modes (portable and mobile). **About 10 SDTV or 4 HDTV or combination thereof can be relayed with single Transmitter. Even UHDTV is feasible.**
- II. More robust reception for portable and mobile receivers , **T2 provide flexibility to meet the needs of different television markets like Smartphone, PC and moving vehicles** .The biggest coming trends are Portability and Mobility – watching TV anytime anywhere!!!
- III. DVB-T2 is not only suitable for mobile TV but it is also highly suitable as the future standard of digital radio instead of DAB, DRM etc. **A single DVB T2 Transmitter can relay about 100 Radio channels i.e. a single Digital Terrestrial TV Transmitter can relay Radio channels equal to capacity of 50 FM Transmitters. Great capacity indeed!!!!**
- IV. **Local content** has been common requirement in DTT Networks, being most economic mode. Up to 50% of services in Europe are typically local/regional channels. Community TV /Municipality /Health, Education and Agriculture are some areas.
- V. **Satellites broadcasting may face catastrophic failure** or frequency jamming, which may cause complete breakdown. This fact is of paramount importance during wartime or other disasters.
- VI. **DTT secures greater plurality in Platform ownership**, ensuring that no single platform owner is so powerful that they can exert undue influence on public opinion or political agendas.
- VII. The **terrestrial Transmitter continues innovations like LTE A+ Tower overlay on DVB T2 Transmitter**. Interactive services, Billboard, Text transmission and emergency information's are other features in DTT.
- VIII. Terrestrial is easiest to receive with indoor active antenna and inbuilt DVB-T2 tuner.

- IX. DVB-T2 is a evolving field and it can be used for LTE A+ overlay on it for mobile services besides linear services.
- X. It may also be used for internet and T-Commerce, payment gateway, SMS , Tracking and e-purchases, interactive/Hybrid TV etc.
- XI. Unlike OTT, the DVB-T2 reception is not effected by number of simultaneous viewers.

Every platform has its strength and weakness and as such all platform are essential for Audio-Visual distribution co-exist worldwide to supplement each other . The following Table gives portrait of above statement:-

Country	No. of Terrestrial TV Transmitters	DTH	Cable TV/LTE
Italy	24000	Sky Italia	Telecom Italia , FASTWEB
U.K	1556	Sky Freesat iSat LTD	Virgin Media (known as Virgin TV)
Australia	420 and many repeaters	Viewer Access Satellite Television (VAST) , Austar, Foxtel, SelecTV, UBI World TV, Australia TV PLUS	SKY Network Television Ltd (SKT)
South Africa	556 and 144 repeaters	MultiChoice	M-Net South Africa
Japan	211 plus 7,341 repeaters	SKY PerfecTV	Nippon BS Broadcasting Corp
Russia	7,306	Kosmos TV, NTV Plus, Orion Express, RIKOR TV, Russian TV Time, Tricolor TV Sibir, NTV Plus Vostok, Tricolor TV	ER-Telecom, Golden Telecom, Beeline CenterTelecom, Uralsvyazinform, VolgaTelecom
USA	2,218	Pittsburgh International Telecommunications DirecTV, DISH Network, Glorystar, Spiritcast, Sky Angel, GlobeCast ,World TV, Home2US	Time Warner Cable Inc., Cablevision Systems Corp (CVC), Charter Communications Inc (CHTR), Comcast Corp(CMCSA), Here Media Inc(HRDI)
Sweden	252	Canal Digital, Viasat	Com Hem, Tele2Vision, Canal Digital
Spain	224 plus 2,105 repeaters	Digital+	Ono, Canal plus, Movistar TV
Sri Lanka	14	Dialog TVWireless Peo TVcable TV	Dialog TV, LBN Cable TV
Vietnam	61	Audio Visual Company JSC (AVG)	Vietnam Cable TV , SCTV
South Korea	57 plus repeaters	Skylife	KBS cable channel operator KBS N (149 operators)
France	584 & plus 9,676 repeaters	ABSat, CanalSat, TPS	Lyonnaise, FT Câble
China	3,240	Phoenix Satellite Television	Hubei Broadcasting & Television Information Network Co Ltd

India	1412 (Analogue) DTT: 63 DTTs (approved)	Airtel Digital TV, Bharat Business Channel (Videocon D2H), DD Direct, Dish TV, Reliance Digital TV, Sun Direct, Tata Sky	Hathway Cable & Datacom Ltd (HATH), Hinduja Ventures Ltd (HVL), Ortel Communications Ltd (ORTEL) and many more
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Q.2 If yes, what should be the appropriate strategy for DTT implementation across the country? Please provide your comments with justification.

The leverage of DTT is on following vertices:-

- Signal reach for all type of audiences in fixed and mobile mode.
- Conservation and Enriching local culture
- Delivering the current and future, advanced linear broadcast services,
- Fulfilling the ever increasing requirements for quality and choice of services, including T-Commerce and other software services.
- Emergency and disaster services
- Radio Services

The appealing content and its nation-wide all weather coverage, for bouquet of variety of content are key factors to provide a successful DTT platform. Worldwide trend is to have 4-6 DTT multiplexes to meet consumers demand.

Multifarious use of National resources like Land, Towers and staff of Doordarshan is essentially good opportunity for broadcasters. If all broadcasters forms a consortium and provide funds to establish and expand DTT Transmitter Network, the same may be optimally used by all.

Q.3 Should digital terrestrial television broadcasting be opened for participation by the private players? Please provide your comments with justification.

Yes. The success story of FM Transmitters in India is the classical example for permission to Private broadcasters in terrestrial TV. Initially when AIR Started its FM Services, there was big concern of FM Receivers non-availability. But subsequently air time was sold to Times group and the FM Receiver scarcity was vanished. With more private participation with their terrestrial FM Transmitter, the receiver growth was boosted and even mobile manufacturers chipped the FM Tuner. The rest is the history. Another example is 9 Gold Channel a Hindi-language terrestrial television channel in India. The channel was a joint venture of both DD Metro and Nine Gold of Kerry Packer and Vinay Maloo HFCL - Nine Broadcasting India; hence known as Metro Gold. During its first launch, the channel was more likely known as DD Metro channel's "primetime block" from 7 pm to 10 pm IST, where it showed its

programmes only in the given three-hour span on DD Metro Channel. It was a big success and hugely popular.

The Private participation can guarantee the following:-

- a. Appealing and unique contents.
- b. Variety of Localised/regional content
- c. Fast development of receiver echo-system .
- d. The fast expansion and National reach is feasible with Pvt. Broadcasters.
- e. Indian Citizens will be immensely benefitted with all kind of contents in Fixed, portable and mobiles.
- f. The vehicles on roads- Taxi, Auto, Local Bus etc. will become viewer's liveliness with News, sports and entertainments etc.

Q.4 Which model or a combination thereof for Digital terrestrial transmission will be most suitable in Indian context? Please furnish your comments with justification.

- DTT require Tower, Transmitters and Building, besides operation staff. These infrastructures are available with Prasar Bharati- DD and AIR. These National resources may be tapped by all broadcasters.
- Moreover DD and AIR have expertise in project implementation and operation. DD has glorious history of commissioning of one TV Transmitter each day.
- DD has expertise in Network planning and selection of equipments and same can be used by any broadcasters.
- DD's contents may also be curated suitably for new platform of DTT.
- Tower erection of above 100 M is a gigantic task, which is costly and time consuming. So DD and AIR Towers (numbering about 1600) is a readily available critical resource.

Therefore DD and AIR resources can be useful fulcrum for DTT Services in India. India may go for using above infrastructure and all pvt broadcasters may fund the equipts and share the benefits with PB.

There can be following two models for successful implementation of DTT:

- i) DTT may be implemented by Doordarshan (PB) which has infrastructure. Govt may fund as a crash plan for nationwide coverage. This may be shared by pvt broadcasters on auction basis.
- ii) DTT may be implemented by DD by generation the revenue generated by auctioning the channels in advance and this revenue may be used for timebound implemetion .
- iii) Pvt Operators may use DD Towers, space etc like case of FM Model. They may invest in their Transmitter set up and common infrastructure-tower, Antenna,

Cable and combiner etc. may be arranged by DD on advance payment from the successful auctioneers of the channel.

Q.5 What should be the approach for implementing DTT network (MFN/SFN/Hybrid)? Please furnish your comments with justification.

Most of the nations have adopted MFN with local/regional plan for SFN. MFN is easy to implement but requires relatively more spectrum. SFN saves the spectrum but is complex to implement. SFN also puts restriction of broadcasting the same content from all transmitters working in the SFN. The insertion of local content may be difficult to implement in this case.

If we consider regional SFN, the particular region should have same content, that also limit the insertion of local content in flexible manner. Flexibility in deciding the channels would be more required if we consider allowing private channels for DTT.

The network complexity of SFN put lot of constraint for its usage.

So best option is for Hybrid model , with main transmitters in MFN and associated gap fillers in SFN with main transmitter. The gap fillers would be required to provide coverage in the shadow areas.

Q.6 What should be the criteria for arriving at optimum size of DTT multiplex at any location? Please furnish your comments with justification.

Quantity and Quality of content with local programme is key requirement of TV viewers. The SD/HD/UHD channels in fixed/Mobile mode having all possible genre, e.g., entertainment, news, sports, music etc. DTT will certainly require all these options so as to make it attractive and competitive. The genre criteria need to be given priority over commercial considerations. BBC has 8 Mux including 2 Mux for HDTV. The most of the countries have opted for 4-6 DTT Multiplexes. India should learn from International Experiences.

There is an immediate requirement of two DVB-T2 multiplex at each of the locations to provide a reasonable bouquet of channels having mix of DD and private channels. To make it a competitive platform and to meet the future requirement of consumers and broadcasters, it would be appropriate to plan for 5 DTT multiplex in longer term. Further requirement may be re-ascertained after completion of two multiplex at each locations. The following table give detail of international scenario of Muxes:

Country	Number of Multiplexes at launch	Number of multiplexes envisaged in the future	SFN/MFN	Reception objectives	Date of revision
HNG	3	6	MFN & SFN		06-10-00
CZE	2	6	SFN & MFN	Fixed Portable Mobile	14-06-01
D	Possibly 3 to 4 at launch	6 – 8	Mainly SFN	Mainly portable Mobile	30-05-01*

DNK	4	6	MFN & SFN	Portable	14-11-01
E	5	6	MFN & SFN		30-05-01*
F	6		MFN & gap SFN	Fixed Portable in urban areas Mobile	30-05-01*
FIN	<4	<4	MFN Gap SFN		30-05-01*
G	6	6	MFN	Fixed Portable in urban areas	30-05-01*
HOL	5	5	SFN & MFN	Portable Mobile	30-05-01*
I	4		SFN & MFN	Fixed Portable Mobile	30-05-01*
IRL	6	6	MFN Gap SFN	Fixed Portable in urban areas	30-05-01
NOR	4	4	MFN Gap SFN	Fixed Portable Mobile	30-05-01*
POR	4	6	SFN & MFN		06-10-00
S	4	6	MFN & SFN	Fixed Portable Mobile	14-11-01
SVK	2	6	Mainly SFN	Fixed Portable in urban areas Mobile	14-06-01
SVN	6		MFN & SFN		06-10-00
BEL	4	5 - 6	Mainly SFN	Portable Mobile	12-06-01

Q.7 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.

Total multiplex at a location should be 5 as per following details:

- Two for SDTV
- One for HDTV
- One for Mobile
- One for Radio.

The above composition can provide variety of options in terrestrial mode to the viewers.

Q.8 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.

Worldwide DTT has been implemented in UHF band 470-860 MHz or part thereof. Therefore fully developed eco-system is available for DTT in UHF band. NFAP-2011 also specifies that frequency band 470-698 MHz is available for DTT service. However, it is also to mention that practically only 470-646 MHz is available for terrestrial broadcasting purpose. VHF Band III (174-230 MHz) may be used for 1.7 MHz Raster for Radio services and small broadcasters and municipality channels.

Q.9 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?

It will be difficult to earmark exclusive spectrum for DTT as Doordarshan is already using the UHF band-IV for analog TV service. Besides, Doordarshan is also using Band-IV for DTT and has planned utilization of Band-IV and Band-V frequencies for already approved DVB-T2 transmitters. It has also planned DTT transmitter network at 630 locations with 2 MUXs, in Band-IV and Band-V.

For the simulcast period, additional spectrum is required for the parallel transmission of TV services in analog and digital mode. The required amount of spectrum will heavily depend on the introduction strategy adopted for DTT. ITU-R studies has concluded that 224 MHz spectrum would be required in UHF band for implementation of 4-5 DTT Multiplex at each locations. Whereas, in India, practically only 176 MHz (470-646 MHz) spectrum is available in UHF band.

Q.10 What should be the roadmap for digitization of terrestrial TV network in the country? Please provide your comments with justification.

Answer to Q4 provides detailed roadmap for implementation of DTT in India.

Q.11 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.

The analog and DTT are simulcasted to ensure development of receiving ecosystem and awareness by the viewers, so that viewers can get time to switch to digital reception before analog switch off (ASO).

The important requirement is availability of receiving eco system for DTT such as TV receiver, STBs and services etc are to be put in place by the stakeholders well in advance so that consumers are not put to any inconvenience.

So at least 1.5 to 2 Years should be the simulcast period. The ASO can be region wise also. India would certainly need such concerted efforts to popularize digital reception and achieve ASO.

Q.12 Stakeholders may also provide their comments on any other issue relevant to the present consultation paper?

Three issues on Digital Radio, Device diversity and Regulations & Subsidies are mentioned as below:

- I. **DVB-T2 Radio:** The DVB-T2 platform has capabilities to transmit Radio services on it. About 37 Countries have started digital Radio using DVB-T/T2 Transmitters , some of them are noted as below:
 - Asia** • IndiaT2; 3 radios AIR • Myanmar DVB-T2; 7 radios • Vietnam DVB-T-> DVB-T2; 2 radios VOV • IndonesiaDVB-T2; 1 radio Nex
 - Media Europe** • Albania DVB-T- > DVB-T2 6 radios rtsh • Armenia DVB-T2 4 radios • Austria DVB-T2 1 radio • CopenhagenT2 Lite ~10 radios • RussiaDVB-T2 3 radios • Montenegro DVB-T2 2 radios RTCG • Northern Ireland DVB-T2 1 radio RTE
 - Middle East & Africa** • Emirates DVB-T2 2 radios • Kenya DVB-T2 7 radios KBC • Madagascar DVB-T2 6 radios • Namibia DVB-T2 10 radios NBC
 - South Africa** DVB-T2 19 radios • Swaziland DVB-T2 1-2 radios SBIS • Togo DVB-T2 x radios
 - South America & Caribbean Islands** • Colombia DVB-T2 5 radios • Trinidad & Tobago DVB-T->T2 16 radios • Grenada DVB-T2 on the road
2. After 20 years only ~20 countries broadcast digital radio with DAB/DAB+.

Summary comparison of various Radio Standards:

	DRM+	DAB	T2 Lite
Programme channels	Approx 2-3 programmes	Approx. 16 programmes	Approx. 36 programmes
Additional services	Simple web pages (Jourmaline) rich multimedia programme guides, slideshows, traffic information etc.		
Date rate	37-186 kbit/s	~ 1125 kbit/s (PL=3A)	~ 3300 Kbit/s
Audio encoding	MPEG-4 HE-AACv2		
Frequency range	VHF band II (FM band 87.5-108 MHz) & VHF Band III (174-230 MHz)		VHF Band III (174-230 MHz) UHF (470-698 MHz)
Available transmitter network configurations	Multi Frequency Network (MFN) or Single Frequency Network (SFN)		
Modulation	Digital COFDM		
Bandwidth	96kHz	1536kHz	1.7 MHz ,

Therefore, DVB-T2 may also be used for digitalization of radio services in India.

II. Receiving devices:

- a. There is no dearth of receiving devices ranging from pocket size TV receiver to 120" Projector TV. Multistandard chips like Octopus 3, Parrot "O3+" takes digital and analog radio reception to the next level. The current generation is already deployed

- through major European, Japanese and Chinese OEMs and enables global radio reception: AM, FM, DAB, DAB+, DRM, DRM+, DVB-T2 Lite and HD Radio standards.
- Integrated Digital TV(iDTV)(In-built DVB-T2 Tuner) Brands like Samsung, LG, VU, Sony etc. already available in Indian Market. Few Dongles and Wi-Fi Dongles for DVB-T2 available for mobiles and tablets. Mobiles with Embedded Chips for DVB-T2 available in France, Thailand etc.
 - Small size(@3" diagonal size) Radio receivers of DAB+ are available. Chip can be modified and these can facilitate reception of FM and DVB-T2 Radio. This match box type digital receiver can change the receiving game of Radio listeners. The task may be assigned to any PSU like BEL, BECIL or others.

iii. Regulations and subsidies:

- Provision of DVB-T2 Tuner mandatory on all TV imported/manufactured in India after say 1.4.2018. Similarly Embedding of DVB-T2/T2 Lite tuner in mobile phones should also be mandated say w.e.f 1.4.2018.
- DVB-T2 Standard should be deployed by any broadcaster in terrestrial mode in India , so that growth of receiving eco-system can be homogeneous. Subsidies provided in receiving devices by various countries is as below:

Country	Description
Thailand	NBTC has proposed a value of 690 baht (\$22) for the digital TV subsidy coupons that it will distribute by mail to 22 million households in the country.
USA	<ul style="list-style-type: none"> • Coupons for free STBs, eligible to any household (2 per HH) • \$1.5bn total funding
France	<ul style="list-style-type: none"> • Help Scheme focused at marketing • Funding allocated where required as problems arose during DSO
UK	<ul style="list-style-type: none"> • Subsidised STB and installations for senior and disabled population • STB + installation guide of £40
Argentina	<ul style="list-style-type: none"> • 1.2m STBs distributed among low income (30% of non Pay-TV households) in first year of DTT transmission

- One Mux should for Fixed SDTV, another for Fixed SDTV, yet another for Mobile TV and last one for Radio. The Radio Mux should be in VHF Band III in 1.7 MHz Raster for effective and economic operations even by small broadcasters.
- HEVC compression should be used by all broadcasters to maximise the channel capacity and encourage device manufacturers for homogeneity.