

ISO 9001 : 2008

TEC

टी ई सी संचारिका NEWSLETTER

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Four Technical reports on Machine to Machine communication (M2M) were released on 20-11-2015 in the presence of Shri Peeyush Agarwal, Member (T), Smt. Annie Moraes, Member (F), Shri A. K. Mittal, the then Sr. DDG, TEC & others. The reports are:

- (1) M2M number resource requirement & options;**
- (2) V2V / V2I Radio communication and Embedded SIM;**
- (3) Spectrum requirements for PLC and Low power RF communications;**
- (4) ICT deployment and strategies for India's Smart Cities : A Curtain raiser**



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TELECOMMUNICATION ENGINEERING CENTRE

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Seminar on M2M Communication

A Seminar on M2M communication was organized by NTIPRIT and TEC in BSNL Conference hall on 20-11-2015. This was attended by around 120 officers/senior executives from DoT, TEC, NTIPRIT, BSNL, MTNL, TCIL, C-DoT and industry. In the inaugural session, four Technical Reports of M2M/IoT domain were released in the presence of Member (T), Member (F), the then Sr. DDG, TEC & others. These reports are available on TEC website www.tec.gov.in/technical-reports/.

The seminar was aimed at building capacity in M2M Communications. Different topics were covered in the seminar i.e. M2M Communication overview, Business Opportunities in the value chain, M2M Gateway & Architecture and Service delivery models, Global Standard Initiative, communication Technologies such as MTC/5G, challenges and Security concern, policy issues.

Brief Presentations were also given on M2M enablement in Power Sector, Intelligent Transport system, Remote Health management, Safety & surveillance, Smart Homes and Smart cities, followed by a panel discussion.

Member (T) Visits TEC

Shri Peeyush Agarwal, Member (T), DoT visited TEC on 30-12-2015. He addressed all the DDsG and Directors of TEC. His speech focused on vision & Mission of DoT. He emphasized to make the testing activities/procedure of TEC more user friendly so that industry does not face difficulty in this regard. He mentioned that ideally all testing should get completed within stipulated time.



Member (S) addressed Probationers

Shri N. K. Yadav, Member (Services), Telecom Commission had an interaction with ITS & BWS 2013 Batch Group 'A' trainee officers on 30.12.2015 at TEC. Sr. DDG(TEC), DDsG of TEC and all DDsG of NTIPRIT were also present in the meeting. Member (Services) discussed about

career prospects of the trainees and emphasized to acquire practical knowledge through hands on working. He desired that trainees should also work in PSUs under DoT for getting field exposure.



Member (S) Shri N. K. Yadav being welcomed by Sr. DDG, TEC



Trainee Officers of ITS & BWS 2013 batch

Shri D. P. De to Head TEC

Shri D. P. De took over as Sr. DDG TEC on 01.01.2016. He belongs to ITS 1979 batch. He graduated in 1979 from IIT, Roorkee with a Gold Medal. He has more than 35 years experience in the Telecom Sector in the areas of Project Implementation, Personnel Management and



Operations, etc. He has been associated with the introduction of optical fibre technology and with the implementation of new services like Intelligent Network, Internet and Broadband services in the Indian telecom network. He is a Fellow of the IETE (India). He has joined TEC after repatriation from deputation to TDSAT.

Activities at NTIPRIT

1. In-service training courses for DoT Officers were conducted at NTIPRIT on the following topics:
 - i. Training of Govt Officers in IPv6 (23-24 Nov) (10 Participants)
 - ii. Seminar on 'M2M Communications' (20 Nov 2015) held at BSNL Bhawan. [120 participants]
2. Induction Training of the following batches of Officer Trainees of ITS/BWS:
 - i. ITS-2012 Batch (2 officers)
 - ii. ITS-2013 Batch (4 officers)
 - iii. P&T BWS (Electrical)-2013 Batch (3 officers)
 - iv. P&T BWS (Civil)-2013 Batch (3 officers)
 - v. P&T BWS (Architect)-2010 Batch (2 officers)

Technical Modules of the ITS / BWS induction courses as per training calendar were conducted during this period. After completion of the classroom modules, BWS officers were relieved on 16.10.2015 for field attachment.

हिंदी कार्यशाला

दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली में दिनांक 29.12.2015 को हिंदी कार्यशाला का आयोजन किया गया। इस कार्यशाला के अतिथि वक्ता श्री प्रमोद कुमार शर्मा, उप निदेशक (कार्यान्वयन), राजभाषा विभाग द्वारा अनुच्छेद 343 से 351, राजभाषा अधिनियम 1963 की धारा 3 (3), राजभाषा नियम 1976, 1987 के बारे में विस्तार से उल्लेख किया गया तथा हिंदी के बारे में काफी रोचक एवं ज्ञानवर्धक जानकारियाँ उपलब्ध कराई गईं।

Approvals from Nov 2015 to Dec 2015

S. No.	Name of the Company /Name of Product & Modal No.
1	M/s Tejas Network Ltd.
1.1	STM-16 TM/TDM, TJ 1400
2	M/s Sunren Tech Solution Pvt. Ltd.
2.1	G3, FAX Model No. SCX-4521 FS
2.2	G3, FAX Model No. CLX-6260 FR
2.3	G3, FAX Model No. CLX-6260 FD
2.4	G3, FAX Model No. CLX-4195 FN
2.5	G3, FAX Model No. CLX-6260 FW
2.6	Terminal for connecting to PSTN, PR00
3	M/s Huawei Telecommunication India Pvt Ltd
3.1	Switching node with N/W-N/W Interfaces at 2048 kbps, SOFTX 3000 with UMG 8900

Retirement in TEC during NOV to DEC 2015

- (1) Shri A. K. Mittal, Sr. DDG, TEC
- (2) Shri A. K. Das, DDG (NR) & Sr DDG, TEC
- (3) Shri S. K. Taneja, DDG (SN), TEC

Broadband Deployment through TV-White Space

1.0 Introduction

The 21st century has seen the dawn of the era of ICT (Information and Communication Technology). Securing access to efficient and sustainable ICT infrastructure has become a major goal worldwide, especially considering the vital role that ICTs play across all areas of human life, such as education, health, science, financial markets, security and civil protection, media, entertainment and business development, amongst others. With the ongoing efforts to meet this goal, there has been a steep increase in the demand for bandwidth for communication systems. This has led to the development of different techniques for addressing the spectrum crunch and also to optimize the use of the available spectrum.

One alternative mode of spectrum utilization that is finding popularity world over is the use of TV White Spaces for communications systems. TV white spaces (TVWS) are "portions of spectrum left unused by broadcasting, also referred to as interleaved spectrum". The TV White spaces have excellent propagation characteristics and hence are a huge attraction worldwide for wireless communications. Countries like US, UK, Canada & Singapore have formulated regulations for the usage of TV White Spaces for wireless communications.

2.0 Definition of TV White Space

According to the CEPT (European Conference of Postal and Telecommunications Administrations) Report 24, 2008 "Technical considerations regarding harmonisation options for the Digital Dividend: A preliminary assessment of the feasibility of fitting new/future applications/services into non-harmonised spectrum of the digital dividend (namely the so-called "white spaces" between allotments)":

'White space' is a label indicating a part of the spectrum, which is available for a

radiocommunication application (service, system) at a given time in a given geographical area on a non-interfering / non-protected basis with regard to other services with a higher priority on a national basis.

The TV White Space gets its name from the fact that it falls in the spectrum range of 470-890 MHz (ITU-Region 3 Frequency Allocations) which is the band allocated mainly for Broadcasting as the primary service.

There are different ways in which TVWS can arise at any given location. The amount of spectrum available in the form of TVWS can vary significantly across different locations and will depend on various factors, including: geographical features, the level of interference potential to the incumbent TV broadcasting service, TV coverage objectives and related planning, and television channels utilization. The availability of TVWS can be mainly categorized as: i) Frequency: idle channels of a TV band plan in some geographical areas due to interference avoidance techniques like employing guard bands, ii) Height: defines the availability of TVWS at a given area in terms of the height of the TVWS transmission site and its antenna height, in relation to surrounding TV broadcasting coverage reception, iii) Space: geographical areas that are outside the current TV coverage and therefore no broadcasting signal is currently present. Also, those geographical separation areas (planned) between locations using the same TV channels, iv) Time domain: a TVWS could become available when a broadcasting emission is off-air; hence the licensed broadcasting transmitter is not using the assigned frequency channel during a specific period of time and so making it available for use as TVWS on non-interference basis.

3.0 Need for TVWS technology

Mentioned below are some of the key points that have led to the need for exploring alternative and more efficient ways of spectrum utilization like TVWS:

- Growing uptake of data-intensive applications and rapid consumer absorption of novel mobile products.
- Reaching rural and remote regions by means of fixed-line infrastructure is capital-intensive.

4.0 Technical overview of communication system employing TV White Space

A lot of studies have been carried out in European Union and ETSI and many countries have also researched on the technologies to be used in the

efficient deployment of TVWS technology. Some of the technologies related to TVWS are below;

4.1 Cognitive Radio Technology

The TVWS technology based communication system is mainly based on the Cognitive radio based architecture. ITU defines Cognitive radio system (CRS) as a radio system employing technology that allows the system to obtain knowledge of its operational and geographical environment, established policies and its internal state; to dynamically and autonomously adjust its operational parameters and protocols according to its obtained knowledge in order to achieve predefined objectives; and to learn from the results obtained.

Chief enabling technologies for the Cognitive Radio Systems are:-

4.1.1 Geolocation/Database

In this approach, cognitive devices measure their location and consult a “geo-location” database to determine which frequencies they can use at their location (location which they have indicated to the database). Parameters such as location accuracy and frequency of database enquiry are important. The devices are not allowed to transmit until they have successfully determined from the database which channels, if any, are available in their location. This requires that the initial access to the database is done either using a channel reserved for this purpose or by some other means. Geolocation is an important part of the database access approach as the location of the CRS node needs to be known to retrieve correct information from the database for the specific location. There are several ways to implement the geo-location. Fixed CRS devices such as access points can be professionally installed and their location then programmed into the device. Personal computers and other portable devices can use geo-location technologies such as GPS chips. Also triangulation methods provide sufficient accuracy to determine the location of devices at a given point and time.

4.1.2 Spectrum Sensing

With spectrum sensing, devices try to detect the presence of protected services in each of the potentially available channels. Spectrum sensing essentially involves conducting a measurement within a candidate channel, to determine whether any protected service is present. When a channel

is determined to be vacant, sensing might be applied to adjacent channels to determine what constraints there might be on transmission power, if any. A significant advantage of spectrum sensing (stand alone) would be that it does not rely on any existing local infrastructure, such as connection to a database or a beacon. This could be important in remote and rural areas. However, if sensing thresholds are to be set very low in order to protect existing services, this will result in increasing device cost and complexity as well as a reduced number of available channels.

Currently different spectrum sensing methods are considered for CRSs. These methods include energy detection, matched filtering, cyclostationary feature detection and waveform based detection etc.

4.1.3 Combined Spectrum sensing and Geolocation / Database

It is possible to use sensing in parallel with access to database. If this combined approach were to be adopted then the following process may apply;

- Identification of device location (information to be provided by the device to the centralized database).
- Identification of the usable frequencies and Effective Isotropic Radiated Power (EIRP) (information to be provided by the database to the device).
- Cross-check of availability of usable frequencies (spectrum sensing carried out by the device).
- Enable transmission (the device is transmitting). Transmission should be allowed only upon confirmation by the geolocation database and by sensing.

The combined sensing and geolocation approach, where applicable, may have the advantage of reducing the risk of interference compared to sensing or geolocation only.

4.2 TVWS Devices & Typical TVWS Architecture based on Geolocation Database technique

The Geolocation Database technique for opportunistic spectrum access has been deemed as the viable option for the TVWS technology based communication systems by industry and administrations alike. ETSI has published EN 301 598, White Space Devices, Wireless Access Systems operating in 470-790 MHz band, in which the technical requirements of a TV White Space device (TVWSD) is given in detail.

4.2.1 TVWS Devices (TVWSD)

As per the ETSI EN 301 598, it is a device controlled by a TVWSDB (TV White Space Database) and which operates in TV white spaces. The ETSI EN defines two types of TVWSDs as below:

- Equipment Type A - a device that is intended for fixed use only. This type of equipment can have integral, dedicated or external antennas.
- Equipment Type B - is a device that is not intended for fixed use and which has an integral antenna or a dedicated antenna.

In addition to above, from operation point of view, the EN also lays down the following category of devices:

- Master TVWSD which has geo-location capability and communicates with a TVWS Database for operation in the TV White Space.
- Slave TVWSD which doesn't have geo-location capability essentially and communicates with the master TVWSD and other slave TVWSD while in operation.

4.2.2 TVWS Database (TVWSDB)

As per the ETSI EN 301 598, it is the database system approved by the relevant national regulatory authority which can communicate with TVWSDs and provide information on TV white space availability. The TVWSDB formulates a set of Operational Parameters like Lists of DTT (Digital Terrestrial Television) channel edge frequency pairs, Maximum in-block RF EIRP, Maximum in-block RF EIRP for each DTT channel edge frequency pair, Maximum nominal channel bandwidth, Maximum total bandwidth, Time validity start, Time validity end, Location validity, Simultaneous channel operation power restriction, Update timer etc. which it communicates to the master TVWSD (which subsequently passes these parameters to its slave TVWSDs) before it can start operating in the TVWS frequency and configure itself according to these parameters to avoid any kind of interference to the primary service operators.

4.2.3 Typical Architecture of TVWS technology

One of the implementations of operation of TVWSD and TVWSDB, adopted by the Ofcom, UK for the deployment of TVWS technology based networks in the country, is shown in fig 1.

In this typical implementation, the TVWSD has to communicate with a data repository to get the listing of the certified TVWSDBs. In this case, the TVWSD

uses a web-listing hosted on a server to get the information about the TVWSDBs and also how to communicate with them. The TVWSDB stores information relating to the Terrestrial frequencies in a geographical area, Information related to operation of Microphones in an area, Interference Management Tools etc. These sets of information/parameters can be managed in different databases which in turn can be linked to a main TVWSDB.



Figure 1: Typical implementation of Geolocation Database based TVWS technology

Before radiating in the TVWS band, the TVWSDs communicate with the TVWSDB and declare their location parameters to the TVWSDB, in accordance with which the TVWSDB allots a certain set of operational parameters to the TVWSD for commencing operation. The slave devices, as they cannot directly communicate with the TVWSDB, get their operational parameters through the master device. Message flows between the TVWSDB and the master/slave TVWSDs is depicted in Figure 2.

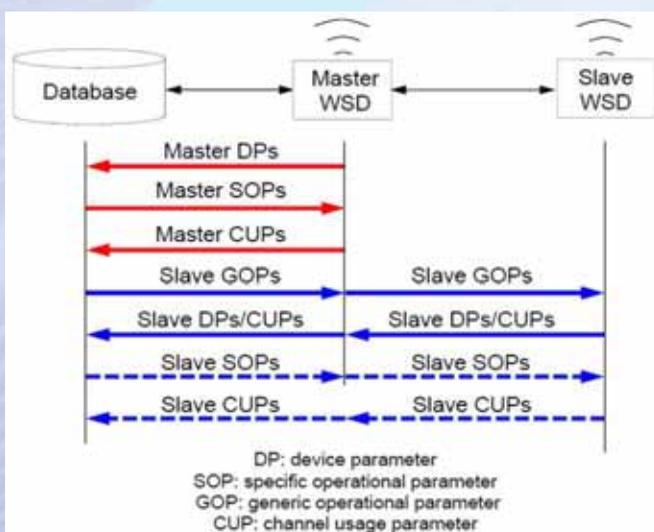


Figure 2: Typical operational parameters exchange between TVWSDB and TVWSD

4.3 Standards for Use of TV Band White Spaces

Many international Standards Development Organizations are working on creating a wide variety of inter-operable standards and specifications for the use of TV Band white spaces. Some of them are described below:

- Institute of Electronics and Electrical Engineers (IEEE) 802 LAN MAN Standards Committee is a leading consensus-based industry standards body, and it produces standards for wireless networking devices, including wireless local area networks (“WLANs”), wireless personal area networks (“WPANs”), wireless metropolitan area networks (“Wireless MANs”), and wireless regional area networks (“WRANs”). Included in the IEEE 802 standards development activity is an emphasis on coexistence, which is the focus of the Wireless Coexistence working group.
- Some of the IEEE 802 standards that are relevant to TV Broadcast Bands include IEEE 802.11 AF (WLAN), IEEE 802.15.4m (WPAN), IEEE Std. 802.22-2011 (WRAN), and IEEE 802.19.1 (Coexistence).
- WhiteSpace Alliance has created inter-operability tests and certification procedures for the IEEE 802.22 systems which is called Wi-FAR™. The Wi-Fi Alliance has given the inter-operable IEEE 802.11 systems a commercial name of Wi-Fi®.
- The IETF Protocol to Access White Spaces (PAWS) Working Group is working on creating a standard for interfaces and access to the White Space Database by a White Space device operating in the Television Broadcast Band.
- WhiteSpace Alliance has also created inter-operability tests and certification procedures for the IETF PAWS protocol which is called as the WSAConnect™ Specification.

5.0 TV White Space deployment Scenario

A number of deployment scenarios/use cases have been envisaged for communication systems based on TVWS. The industry has already done many pilot projects and proof of concepts to show case the effectiveness of TVWS based communication systems in these deployment scenarios. Some of these deployment scenarios include:

5.1 Rural Broadband

The rural or remote areas can benefit to a great extent by the deployment of TVWS because of the sheer nature of the TV band waves having propagation characteristics to reach tens of kilometers. These systems could be fast in deployment with minimal number of repeaters.

Figure 3 depicts how a TVWS based communication network can be deployed in the rural areas. Two main types of deployment options have been shown here. One depicts the master-slave kind of communication between the WSDs, mainly a point to multipoint type of deployment scenario. The slave WSD may then emulate Wi-Fi or any other communication technology compatible with the User Equipment. The other scenario depicts the TV band being used to provide middle mile connectivity to the base stations and repeaters to reach the far flung rural areas which are then served by Wi-Fi in the last mile.

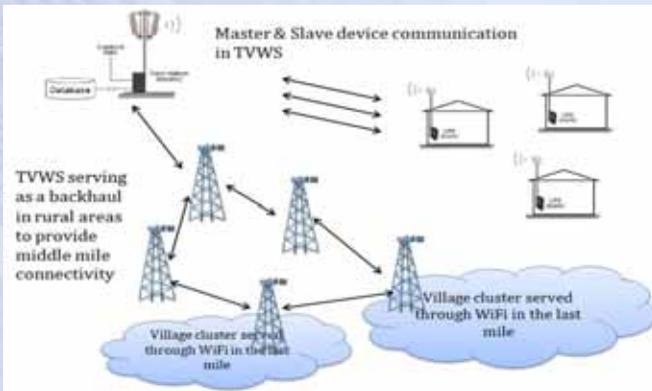


Figure 3: Typical implementation of rural broadband using TVWS technology

5.2 Hotspot coverage/In-building solutions for multimedia & broadband

TVWS owing to their inherent ability to penetrate deep inside buildings can serve as an excellent candidate for providing Hotspot coverage and in-building solutions for broadband applications. Since TVWSs operate in the UHF band so they have a greater coverage as compared to the devices in the ISM bands and hence an individual device in TVWS can serve larger coverage area than the one in ISM band. Figure below shows the typical deployment scenario for In-building solutions in TVWS.

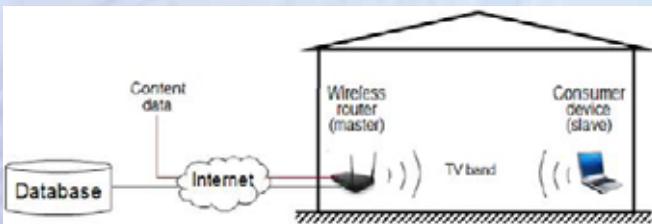


Figure 4: In-building solution with TVWS

5.3 Smart Grid Applications of TVWS

Some companies are using TVWS to provide middle mile connectivity to facilitate smart metering and

other smart grid solutions. Singapore has deployed a number of TVWS based Smart Grid solutions in their country. Figure below depicts such an implementation.

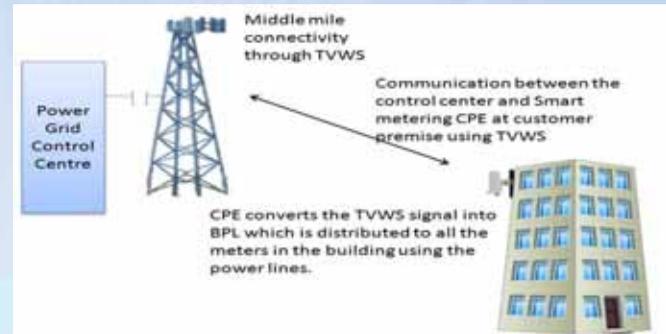


Figure 5: TVWS in Smart Metering

5.4 TVWS in M2M communications

M2M communication consists of very low-power radio transmitters used for low-data rate industrial and commercial applications such as monitoring, tracking, metering and control. Recently, a specification for M2M devices, intended for operation in TVWS, has been agreed at a preliminary stage in the UK under the umbrella of a Special Interest Group (SIG): Weightless SIG. This group released in April 2013 a draft specification for low-data rates M2M devices (hence the name “weightless”) to operate in the terrestrial television bands, transmitting data over idle television frequency channels in geographical areas where TVWS can be found (also querying a master frequency database). As the use of M2M devices grow, and more applications connect to the “Internet of Things”, it is expected that numbers of M2M devices deployed will grow exponentially, especially considering the higher coverage ranges offered by the terrestrial television frequency bands.

6.0 Conclusion

TVWS is one of the candidates to curb the spectrum crunch that is being faced by the global communication scene. It not only offers better spectrum management but due to the inherent propagation characteristics of the UHF band is an economically viable solution. Not only developed nations are cashing on the advantages of TVWS technology but countries with minimal communication infrastructure are going for it because of its ease of deployment, being mainly in the license exempt regime, and serving large coverage areas. The TVWS device ecosystem and other standardization initiatives are coming up fast and this technology is likely to be a pervasive phenomenon in the global telecommunication landscape.

Important Activities of TEC during NOV 15 to DEC 15

New GRs/IRs issued

- IR on USIM Rel 8 for LTE networks including ISIM
- GR on NMS
- GR on 20, 30 and 40 mtr Guyed wire supporting Mast for cellular Mobile System
- SD on IP based Interconnection between service providers network

Revised GRs/IRs issued

- GR on ENUM Server, GR on Wi-Fi Access points
- GR on Subscriber Identity Module
- GR on NZ - Dispersion shifted metal free optical cable
- GR on High precision Cleaver for Ribbon fibre
- GR on Hot Jacket Remover for Ribbon fibre
- GR on STM-1 CPE for Access Network Application

DCC Meeting conducted

- IR on Point of Sales (POS) Terminal with PSTN/CDMA/GSM/GPRS Interface
- IR on Conference Facility Device
- GR on Lithium Ion Battery for Telecom Application

Sub DCC cum MF meeting conducted

- GR on Satellite Block up Converter (BUC)
- GR on Low Noise Block Converter in C-band
- GR on 4.5m and 6.0m Earth Station antenna operating in C-band
- GR on Hand Held Spectrum Analyser (100 Khz-3.0 GHz) & GR on Radio Modem in ISM

Study/White Papers issued

- Broadband deployment through TV White Space
- Automatically Switched Optical Network (ASON)
- SDN & Network Function Virtualization
- Study Paper on 5G
- Study of Open source Fuzzing Tools
- Best Practices for Handling Fibre Optics Component (Fibre & Connector)

Representation of TEC in Training/Seminar/Meetings

- Remotely participated in ITU-T SG-11 meeting
- International Conference on Smart Automotive held in New Delhi in Nov 2015
- World Radio Conference meeting held in Geneva in Nov 2015



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Certifications

issued by TEC

Type Approval (TA)

Interface Approval (IA)

Certificate of Approval (CoA)

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Regional TEC Contact :

Eastern Region	:	033-23570008
Western Region	:	022-26610900
Northern Region	:	011-23329464
Southern Region	:	080-26642900

Other Activity

- National Working Group 12 & M2M security Group meetings held in TEC.
- Name of Service & Development Division changed to Internet of Things (IoT) Division
- New Certification Procedure of TEC released in Nov. 15
- Seminar on M2M Communications organised by NTIPRIT on 20th Nov. 2015 in New Delhi

Approvals issued by TEC during the period from Nov 2015 to Dec 2015

Interface Approvals.....	08
Type Approvals	0
Certificate of Approval.....	0

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Editor : Sunil Purohit, DDG (NGS) Phone : 23329354 Fax : 23318724 E-mail : ddgs.tec@gov.in