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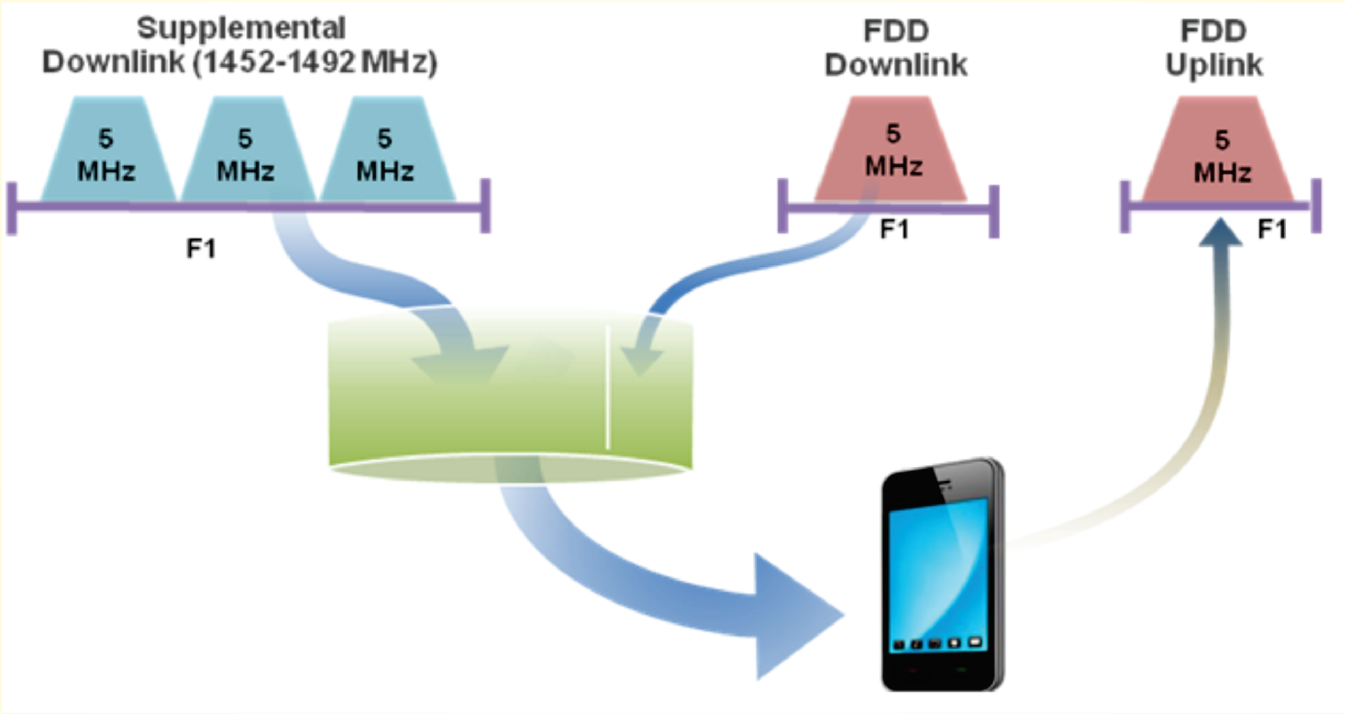
टी ई सी संचारिका

NEWSLETTER

VOL. 19 JANUARY 2015 ISSUE 1

SDL : SUPPLEMENTARY DOWNLINK



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TELECOMMUNICATION ENGINEERING CENTRE

IN THIS ISSUE

1.0 Introduction:

Mobile broadband is now rapidly becoming more important as users demand Internet-based services on the move as well as at home and in the office. In addition mobile broadband is now the cost-effective way to deliver the broadband Internet to rural communities in most cases.

As per ITU Latest release, the internet user are about 3 billion, two-thirds of them coming from the developing world, and that the number of mobile-broadband subscriptions are about 2.3 billion globally. Mobile broadband is playing an increasingly important role in our daily lives. It is changing the way we are entertained, educated, working and sharing information while improving the quality of our lives. Mobile broadband presents great opportunities for operators in both mature and new markets. To meet the ever-increasing user demands of the mobile broadband experience, networks need to be smart, simple, scalable and deliver superior performance.

For penetration in the broadband market, operators have to satisfy the customer who requires good service when accessing multimedia content and other internet based services.

Mobile broadband devices, such as smart phones and tablets, offer an easier way of using the broadband Internet than traditional PCs. The increasing penetration of mobile broadband devices due to their affordability is driving up the consumption of mobile broadband. Industry forecasts suggest mobile data traffic could grow by up to 30 times current levels over the next 5 years.

Most of the traffic on mobile networks is multimedia content (estimates range from 60-80%) – for example applications such as streamed audio and video, real-time broadcasts of big sporting or popular cultural events, video based news, IP radio, video based specialist magazines and clips or long form content (movies, programs, etc).

Mobile data traffic is predicted to increase exponentially over the coming years with a particular evolution towards asymmetrical traffic. This asymmetry of mobile traffic has been confirmed by measurements in today's networks which show that current data asymmetry ratio in the US, Europe and Japan ranges from 4:1 to even 9:1.Furthermore, internet is going mobile through a variety of connected devices (e.g. e-readers and tablets). Their number is projected to grow significantly in near future amplifying asymmetric mobile data traffic and the increase in mobile multimedia consumption.

2.0 What is SDL :

SDL or supplemental downlink allows the bonding of unpaired spectrum with FDD mobile broadband bands, to significantly enhance networks downlink capacity and users experience. It uses unpaired spectrum to enhance the downlink capability of mobile broadband networks by enabling significantly faster downloads and supporting a much greater number of users with mobile devices. This provides an efficient way of using spectrum because consumption of rich content and other data heavy applications is asymmetric. There is much more traffic on the downlink than on the uplink over mobile broadband networks. Supplemental downlink and carrier aggregation have now been enabled in the HSPA+ Release 9 (and beyond) and LTE Release 10 (and beyond).

The technology represents a significant step forward in traditional spectrum aggregation systems that are already used for HSPA+ and LTE networks by the 3GPP standardization group. Supplemental downlink technology can now be used in the L-Band and could also be considered in other frequency bands. In Release 9, the SDL feature allowed a single carrier in an unpaired band to be used along with the serving cell's paired spectrum. Release 10 provided for up to three supplemental carriers in the unpaired band to be used along with the serving carriers in the paired band. This feature was demonstrated at MWC 2011 by Ericsson using unpaired spectrum from the L-band (1452-1492 MHz) with paired spectrum in the 2.1 GHz band.

3.0 Benefit of SDL

The two principal benefits of SDL at 1.4 GHz:

Reduced costs: Deployment leads to avoid costs of investment in additional base station and backhaul infrastructure. Once mobile broadband demand exceeds network capacity, networks can be expanded by deploying a 1.4 GHz SDL on existing base station sites rather than building new base station sites and this leads to cost effectiveness. The scale of this benefit depends primarily how soon other spectrum is made available for mobile broadband use and how quickly demand for mobile broadband grows in each country.

Better service quality: Deployment leads to improved services – in particular better in-building coverage, higher downlink speeds and ability to support a greater number of users. The 1.4 GHz SDL when paired with low frequency spectrum behaves like sub-1 GHz spectrum in terms of propagation characteristics. So a 1.4 GHz SDL offers better in-building coverage than spectrum allocated for mobile broadband use at 2.1 or 2.6 GHz

The use of 1452-1492 MHz for a supplemental downlink for mobile broadband could generate economic benefits to the society at large and the availability of broadband and the development of e-health services such as telemedicine and mobile healthcare systems would deliver substantial benefits which include improved services and response times, cost savings and better health care.

SDL provides:

- Increased peak rate
- Improved capacity
- Effective use of existing spectrum

Supplemental Downlink (SDL) is poised to boost the downlink:

- By aggregating unpaired spectrum with typically paired spectrum
- L-Band standardized as band 32 in 3GPP and harmonized in Europe
- Band 29 in the US

This new technology will allow network operators to manage the ever-increasing demand for data service on wireless networks and provide improved performance for end users. The following figure, according to simulations carried out by Qualcomm, shows that the downlink data burst rate capacity approximately doubles for fixed number of users with use of SDL. Conversely, the number of data subscribers supported at given bit rate becomes approximately twice with use of SDL.

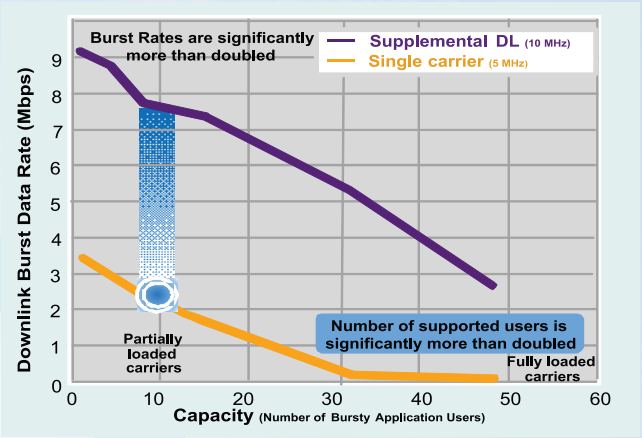

Figure 1 : Gains from Supplemental Downlink (from Qual comm. Simulations)

The mean C/I value is generally greater than 12 dB, so the OSC may be used typically for over 50% of calls. Dynamic Frequency and Channel Allocation (DFCA) excels at pairing and allocating two users in the optimal channel, and can further improve spectral and hardware efficiency.

4.0 Functioning of SDL

A cell typically consists of two component carriers: uplink and downlink. Supplementary downlink only cells are an exception where there is only a downlink component carrier. This feature allows a carrier aggregation capable UE to use the supplementary downlink only cell as a secondary component carrier.

For HSPA+, since the SDL carrier is not paired with an uplink, it cannot support UEs configured in pre-Release 9 modes (legacy UEs). It can only be used as the secondary serving cell (carrier) by Release 9, or later, UEs. The SDL operation is different from traditional Release 8 DC-HSDPA. In traditional

Release 8 DC-HSDPA, both the carriers can support SC UEs as well as DC-HSDPA UEs. Hence, the Radio Network Controller (RNC) can assign an SC UE to either of the two carriers. In contrast, the SDL carrier cannot support single carrier (pre-Release 9) operation.

For LTE Release 10 onwards, the Supplementary Downlink for Carrier Aggregation feature makes it possible to add and unlock an FDD E-UTRAN Cell with a downlink carrier only, no uplink carrier, for example: Band 29. This downlink only cell is utilized as a downlink secondary cell by the Carrier Aggregation feature. When a cell is configured as downlink only, it is barred and incoming S1 and X2 handover are rejected.

The Dynamic SCell Selection and Supplementary Downlink for Carrier Aggregation features can operate together.

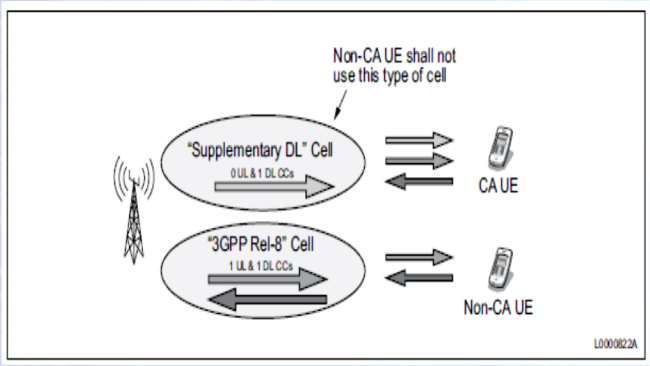

Figure 2 : Carrier Aggregation Function

4.1 The Carrier Aggregation function

Carrier aggregation provides the ability to transmit data to a single UE on more than one carrier simultaneously. A UE configured for carrier aggregation has one Primary Cell (PCell) and one or more Secondary Cells (SCell). The PCell is the cell where the UE is connected and has established the RRC connection. The SCell is configured once the RRC connection is established.

To facilitate UE battery savings, dynamic activation and deactivation of the secondary cell is done on a need basis.

The SCell is only activated when there is DL data demand that could benefit from transmitting on more than just one carrier and if the channel quality is above a certain threshold.

The SCell is deactivated if the DL data demand drops so much that it can be handled by only one component carrier, or when the channel quality of the SCell goes below the threshold for a certain time.

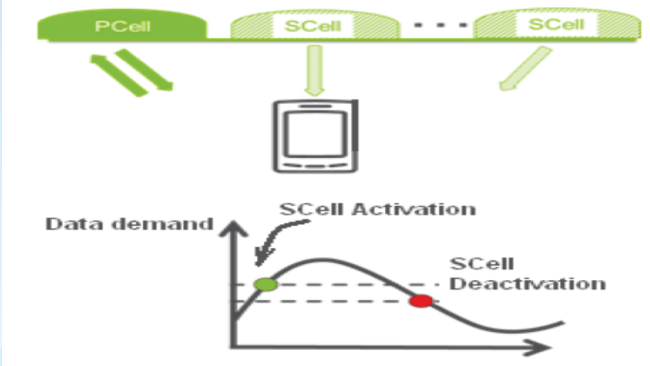

Figure3: Dynamic Activation

Using a low band as PCell and high band as SCell, it's possible to leverage the low band UL for boosting DL and thus improve the application coverage. Some use case scenarios showing the benefit of SDL are shown below:

a) F1 and F2 cells are co-located and overlaid. F1 provides sufficient coverage and F2 is used to improve throughput. Mobility is performed based on F1 coverage. A likely scenario is when F1 and F2 are of different bands, e.g., F1=2.1GHz, F2= 1.4GHz SDL band.

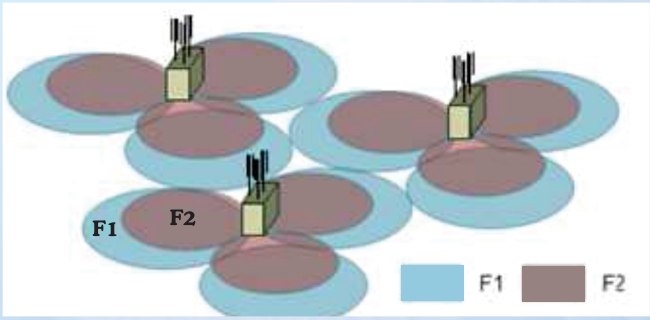

Figure 4 : F1 & F2 cells are collocated & overlaid

b) F1 provides macro coverage and on F2 Remote Radio Heads (RRHs) are used to improve throughput at hot spots. Mobility is performed

based on F1 coverage. A likely scenario is when F1 and F2 are of different bands, e.g., F1=2.1GHz, F2= 1.4GHz SDL band.

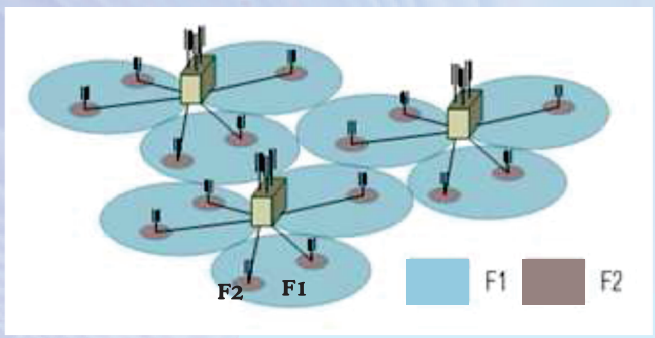

Figure 5 : F1 provides macro coverage & F2 provides throughput at hotspots

5.0 L-BAND STANDARDIZATION WORK in EU

The progress made by Europe towards standardization of this concept is as follows-

Frequency Management (FM) group of Electronic Communications Committee (ECC) approved the draft ECC Report on SDL.

The ECC Decision which cancels the use of satellite in L-band within CEPT in favor of SDL was approved for public consultation by the last WG FM in February 2013.

FM group also decided to proceed with the harmonization of the band for SDL in Europe, as concluded by the ECC Report.

The ECC Decision on L-Band SDL harmonization enables optimal SDL deployment, increasing the value of this spectrum. It encompasses

1) higher in-band SDL power to match 800/900 MHz coverage,
2) a harmonized downlink-only (no TDD) band plan
3) technology neutral rules enabling both HSPA+ and LTE and
4) unconstrained out-of-band SDL emissions limits for the compatibility with services in adjacent bands.

The ECC Decision includes the technical rules for the harmonized use of band for SDL (band plan, spectrum mask, cross border coordination etc.).

FM tasked two project teams, SE7 and PT1, to assist FM50.

The completion of the technical studies lead to an approval of the final ECC Decision. With this, countries can then start auctioning the band later in 2013/beginning 2014.

As concluded in the ECC Report, FM also decided to withdraw ECC Decision (03)02, which currently harmonizes part of the band for satellite digital radio in Europe.

ECC Plenary in November 13 has published the following Decision, as given in ECC DEC 13/(03) report:

1) This ECC Decision harmonises the use of the 1452-1492 MHz band for terrestrial mobile/fixed communications networks supplemental downlink (MFCN SDL) while allowing individual countries to adapt to specific national circumstances in part of the band for terrestrial broadcasting and other terrestrial applications. It provides the harmonised technical conditions for the deployment of MFCN SDL within CEPT.
2) This ECC Decision contains annexes defining the harmonised frequency arrangement and applicable least restrictive technical conditions for the use of the band by MFCN SDL within CEPT.

CEPT started liaising with 3GPP in February 2013 to prepare the ground for the inclusion of L-band SDL in the standard.

6.0 L-BAND STANDARDIZATION WORK in 3GPP

The objective of the Work Item in 3GPP (3GPP TR 37.814 V0.5.0 (2014-05) is to:

- Specify the band numbering and RF characteristics of the L-band for UTRA, E-UTRA and MSR.
  - o E-UTRA channel bandwidths 5, 10, 15 and 20 MHz.
  - o The L-band is restricted to be used on CA configuration for E-UTRA or dual band configuration for UTRA

- Specify the UE RF requirements for frequency range of L-band as 1452 – 1496 MHz based on assumption that UE Rx filter is optimized for 1452 – 1492 MHz
- Specify the RF requirements for the support of E-UTRA Carrier Aggregation between Band 20 + L-band (1452- 1496 MHz):

E-UTRA band / channel bandwidth							
CA Configuration	E-UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
CA_20A-xA	20			Yes	Yes		
	X			Yes	Yes	Yes	Yes

The requirements should be based on the functionality currently defined for DL-only carrier Aggregation.

- Specify the RF requirements for the support of UTRA dual band for the band combinations of Band I (2.1 GHz) + L-band (1452- 1496 MHz).

The requirements should be based on the functionality currently defined for DB-DC HSDPA and 4C-HSDPA:

UTRA SDL	Anchor Band (DL and UL)		Supplemental Band (DL only)	
Configuration	Band	Bandwidth	Band	Bandwidth
1a	I (2.1 GHz)	5MHz	L-band (1452- 1492 MHz)	5MHz
1b		5MHz		10MHz
1c		10 MHz		5 MHz

It is important to note that quality uplink is critical for maintaining the QoS. The right mix of UL and DL spectrum in different frequency bands will be critical to reach higher levels of QoS in the future. The supplemental downlink for traffic asymmetry is being considered at 3GPP for following frequency bands in chunks of 5 MHz-

UTRA:

- Band I (2.1 GHz) + L-band (SDL)
- Band VIII (900 MHz) + L-band (SDL)

E-UTRA:

- Band 8 (900 MHz) + L-band (SDL)
- Band 3 (1800 MHz) + L-band (SDL)

3GPP TS 36.104 V12.4.0 (2014-06) has included L Band as Band 32, which is likely to be frozen soon.

7.0 CONCLUSION

In India, the adoption of mobile broadband is also growing at fast pace because of adoption of smart phones with their affordability and ease of use. The Government spending on e-governance projects and SWAN initiatives is likely to drive the growth of the networking market further. Going forward, advanced wireless technologies like 3G and 4G are expected to pace up the broadband growth in India.

Wireless broadband also has attractive elements, particularly in a market like India's, which lacks a fixed network of any credible size. Mobile broadband is relatively easy to roll out and offers increasingly acceptable speeds. Wireless for last-mile connectivity in rural India and growth in broadband penetration will drive market growth and eventually help India transition to a fully networked economy.

Looking at the spectrum crunch and the demand from operators for more spectrum to support increased number of users and to provide better quality services, SDL in L band may be good technology option for faster downloads.

With freeze of 3GPP Release 12, L band has been standardized as Band 32 and carrier aggregation involving Band I/II/VIII with Band 32 has been approved for HSPA+ and LTE-A. Since carrier aggregation band combinations are a release independent feature, the commercial availability of products can be expected from 2015 onwards.

Use of SDL requires support in handset and network side:

i) HSPA+: Handsets and network elements that support Release -9 and higher releases

ii) LTE-A: Handsets and network elements that support Release -10 and higher releases

The use of SDL depends on the commercial availability of handsets that can support this feature and also on availability of spectrum in the L-Band.

WPC may review the current status and usage of L-Band i.e. 1.4 GHz band in the country and may identify the same for IMT/IMT-A services.

Activities at NTIPRIT

1. In-service training courses for DOT Officers conducted on NGN Basics, Security in Wireless Systems, Advanced security aspects in Wireless Systems, Electrical Inspection, Indian Electricity Rules, Safety and Testing of Telecom Installations, Electromagnetic Radiation & e-governance. Total 73 participants underwent training under the above courses.
2. Induction Training courses for Officer Trainees of ITS-2012 batch were conducted on Cyber Security and Mobile communications Part-II (LTE/WiMax).
3. Apart from classroom training courses, the OTs underwent attachment to different divisions of DoT H/Q and TEC for practical exposure. They were also attached to C-DoT, BBNL and TRAI H/Qs at New Delhi during this period.
4. A one day Workshop on 'Vigilance Awareness' was organised at TEC for officers of TEC, DoT H/Q and NTIPRIT.
5. A two-days training course on 'Internet Technology & Cyber Security' for Indian Postal Service Grp-A Probationers of Postal Academy, Ghaziabad was conducted at NTIPRIT.
6. The ITS-2012 Batch OTs also went on a 1-week study visit to the North-Eastern states to study the communication facilities in the region.
7. Shri Amit Jha, Director (WA-2) attended the APT Training course on 'Smart City' at Shanghai, China.
8. Three faculty members attended 'Direct Trainer Skills' (DTS) Course at Mahatma Gandhi State Institute of Public Administration (MGSIPA), Chandigarh.
9. The Detailed Project Report for setting up of physical infrastructure for NTIPRIT at Integrated Institutional Campus, Ghitorni, New Delhi was submitted to Telecom Commission, DoT H/Q.

(Shri Rakesh Garg, Secretary (T) addressing the audience during seminar)

10. Seminar on "Innovation in Telecom Sector – Opportunities and Challenges" was organised on December 02, 2014 at Bharat Sanchar Bhawan, New Delhi by NTIPRIT, in association with TEMA, this seminar was inaugurated by Shri Rakesh Garg, Secretary (T).

हिंदी कार्यशाला

दूरसंचार अभियांत्रिकी केंद्र में दिनांक 23.12.2014 को एक हिंदी कार्यशाला का आयोजन किया गया। कार्यशाला के वक्ता श्री राजेश कुमार त्रिपाठी, सहायक महानिदेशक (एन.जी.एस.) द्वारा राजभाषा अधिनियम–1963, राजभाषा नियम–1976, राजभाषा संकल्प–1968 के बारे में बताया गया तथा हिंदी के बारे में काफी रोचक जानकारियाँ उपलब्ध कराई।

(हिन्दी कार्यशाला मे भाग लेते अधिकारी/कर्मचारी गण)

Approvals from OCT 2014 to DEC 2014

S.No	Name of the Company /Name of Product & Modal No.
1	M/s Huawei Telecommunications India Co Pvt Ltd
1.1	Switching Node with Network-Network Interface at 2048 kbps, CSOFTX 3000 with UMG 8900
1.2	Switching Node with Network-Network Interface at STM-1, MSOFTX 3000 with UMG 8900
2	M/s Matrix Comsec Pvt Ltd
2.1	PABX,ETERNITY LE
2.2	PABX,ETERNITY ME
2.3	PABX,ETERNITY GE
3	M/s Cisco Systems (india) Pvt. Ltd
3.1	Router, Cisco 2921
3.2	Router, Cisco 2911
3.3	Router, Cisco 2901
3.4	Router, Cisco 1921
4	M/s V Link Systems (P) Limited
4.1	PABX., AEONIX
5	M/s Alcatel - Lucent India Ltd
5.1	PABX, Omni PCXEnterprise
6	M/s Polycom Unified Communications Solutions Pvt. Ltd.
6.1	ISDN Conferencing Premise equipment, RMX 1500
7	M/s MRO TEK Limited
7.1	High Speed Line Driver, WL/E1/S/2W/AC/DC
8	M/s Hewlett Packard India (Sales) Pvt.Ltd.,
8.1	Router, BJNGA –BB0007
8.2	Router, HP HSR6602-G
8.3	Router, HP HSR6602-XG
8.4	Router, HP A-MSR20-12
8.5	Router, HP A-MSR20-10
8.6	Router, HP A-MSR20-11
9	M/s Sunren Technical Solutions Pvt. Ltd.
9.1	G - 3 FAX Card, SL-FAX 2501
9.2	G - 3 FAX Card, CLX-FAX 160
9.3	G - 3 FAX Card, LEX-M03-002
9.4	G - 3 FAX Machine, C441A
9.5	PABX Mediant 1000 AMC
9.6	G-3 FAX Machine, XPRESS M2071F
9.7	G-3 FAX Machine, XPRESS M2071FW
9.8	V.90 MODEM (Analog), RD02-D330
10	M/s Kyocera Document Solutions India Pvt Ltd
10.1	G-3 FAX Machine, FS-1120 MFP
10.2	G-3 FAX Machine, FS-1135 MFP
11	M/s Nomus Comm-Systems
11.1	High Speed Line Driver, Gateway e1.00
12	M/s One Network Consulting Pvt Ltd
12.1	V.90 Modem(Analog), MT 5656RJ

Important Activities of TEC during OCT 14 to DEC 14

New GRs/IRs issued on
- IR on LAN Switch, Firewall system
- IR on UTP to Optical converter
- IR on Set top Box
- GR on WAN optimization for Satellite Network

Revised GRs/IRs issued on
- IR on Data interface to G.703 converter
- IR on 2048 kbps Interface
- IR on STM-1 Interface
- IR on IP based media gateway
- GR on Optical converter
- GR on 6 GHz High Performance Antenna
- GR on Optical Variable Attenuator
- GR on Optical Fixed Attenuator
- GR on Optical Talk Set

DCC Meeting conducted on
- IR on Universal Subscriber Identity Module
- IR on Subscriber Identity Module
- GR on Universal Subscriber Identity Module
- GR on Short Message Service Cell Broadcast
- GL on Planning & Maintenance guideline for Solar Photovoltaic (SPV) Power Supply
- GL on Planning guideline for Switch Mode Power Supply (SMPS) Power Plant

SUB DCC cum MF Meeting conducted on
- IR on PABX for Network Connectivity
- IR on V.90 Modem
- IR on Terminal for Connectivity to PSTN
- GR on Hybrid M/W Radio equipment for 6GHz
- GR on STM-1 CPE for Access Network

Approvals issued by TEC during the period from OCT 2014 to DEC 2014

Interface Approvals..... 31
Type Approvals 0
Certificate of Approvals.....0

ISO : 9001-2008

Certifications issued by TEC

Type Approval (TA)

Interface Approval (IA)

Certificate of Approval (CoA)

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

Other Activity
- ITU-T Study Group 5 meeting attended by Dir (R) TEC in Banglore.
- IPv6 Ready Logo Forum issued certificate for CDOT GPON after testing in NGN Lab.
- Testing of CISCO & HP MSR/HSR Routers in NGN Lab
- Field Trial Teting for Mini OLT based GPON equipment of CDOT

टी ई सी संचारिका : दूरसंचार अभियांत्रिकी केन्द्र
जनवरी 2015 : खुर्शीद लाल भवन
भाग19 : जनपथ
अंक 1 : नई दिल्ली-110001

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