ITU-APT FOUNDATION OF INDIA

12TH JUNE 2019

4TH NATIONAL PREPARATORY WORKSHOP on World Radio communications conference (WRC - 19)

सत्यमेव जयते
Department of Telecommunications
Ministry of Communications
Government of India

Venue: **Hotel shangri-La, New Delhi,india**

ITUWRC SHARM EL-SHEIKH2019
28 October - 22 November
Sharm El-Sheikh, Egypt

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LIST OF RECENT EVENTS ORGANIZED BY ITU-APT FOUNDATION OF INDIA

1. National Workshop on Advances in Satellite Technologies on Mar 27, 2019 at Hotel Shangri La, New Delhi.
2. Conference on ICT Technologies and KPIs on Mar 12, 2019 at The Park Hotel, New Delhi
3. 3rd NATIONAL WORKSHOP ON WRC-19 PREPARATIONS on Dec 15, 2018 at Hotel Le Meridian, New Delhi.
4. The 26-28 GHz India 5G Spectrum Workshop on September 27th-28th, 2018 at New Delhi
5. ITU-APT Foundation Interactive workshop on ITU PP-18 and MTCTE on 12 September 2018 at VigayanBhawan, New Delhi
6. ITU-APT Foundation Roundtable Discussions on 5G Spectrum today on June 4 at Constitution Club of India (Vice Chairman Hall), New Delhi
7. ITU-APT Foundation of India World Telecommunication and Information Society Day (WTISD) Preparatory Workshop for ITU Plenipotentiary Conference (PP-18) 17th May, 2018 at Hotel Imperial (Ball Room), Janapth, New Delhi-110001. Mr. Malcolm Johnson, Dy. Secretary General, ITU was a Chief Guest at the event.
8. ITU-APT Foundation National Workshop on Critical Telecom Infrastructure, on 25 April, 2018, at Hotel Park, New Delhi
9. ITU-APT Foundation of India NATIONAL WORKSHOP ON WRC-19 PREPARTIONS SPECTRUM FOR 5G AND OTHERAGENDA ITEMS 22nd February, 2018 at Hotel Shangri-La, Ashok Road, New Delhi
10. ITU-APT Foundation welcomes the new Wireless Advisor and gives farewell to immediate past WA. WPC on 15th February 2018 at CSOI, KG Marg, New Delhi
11. ITU-APT Foundation Meeting with delegation of ARFM Viet Nam on Tuesday 5th December 2017 at Constitution Club of India, New Delhi
12. The ITU-APT Foundation of India 14th Annual General Meeting & A National Conference on PPDR 26th October 2017 at Hotel Park, New Delhi
13. ITU-APT Foundation National Conference on In-FLIGHT CONNECTIVITY (IFC) 23rd October 2017 at Hotel TajMansingh (Long Champ), New Delhi
14. ITU-APT Foundation Preparatory Workshop on WTDC-17 on Monday 25th September 2017 at CSOI, Vinay Marg, Chankyapuri, New Delhi
15. ITU-APT Foundation National Conference on High Altitude Platform Stations, 22nd September 2017 at Hotel Taj Mansingh (Long Champ), New Delhi
16. ITU-APT FOUNDATION ROUND TABLE DISCUSSION ON NTP-2018 AT CSOI, VINAY MARG, CHANKYA PURI, NEW DELHI ON 7TH SEPTEMBER 2017
17. -APT Foundation Workshop on WRC-19 - Outcomes of APG-19/2 and preparations for TG5/1, WP5A & WP5D to be held on 30th August 2017 at the Imperial, New Delhi
18. ITU-APT FOUNDATION WORKSHOP ON NATIONAL FREQUENCY ALLOCATION PLAN(NFAP-2017) ON APRIL 2017, AT SHANGRI-LA HOTEL ,NEW DELHI
19. FIRST INDIA 5G/IMT-2020 SPECTRUM & TECHNOLOGY WORKSHOP ON 16TH MARCH 2017 AT HOTEL IMPERIAL, JAN PATH, NEW DELHI
20. ITU-APT Foundation Seminar on 'Sustainable ICT Business for Smart Cities' How Services and technologies can be leveraged for business opportunities in making Sustainable Smart Cities on 3rd March-2017 at The Park Hotel, New Delhi. the Chief Guest was Dr. Chaesub lee, director tsb-itu

CONTENT

ITU-APT FOUNDATION OF INDIA

GLIMPSE OF PREVIOUS WORKSHOP ON

WRC 19 PREPARATION

15TH DECEMBER 2018, HOTEL MERIDIAN

ITU-APT FOUNDATION OF INDIA

ITU-APT FOUNDATION OF INDIA

4TH NATIONAL PREPARATORY WORKSHOP on World Radio communications conference (WRC - 19)

12TH JUNE, HOTEL SHANGRI-LA, NEW DELHI, INDIA

The World Radio Conferences (WRCs) take place every three to four years under the UN body International Telecommunications Union (ITU).

WRC-19 is scheduled to be held from 28 October to 22 November in Sharm-el-Sheikh Egypt. WRC-19 will have a major impact on important technological issues such as 5G mobile broadband, Future driverless Cars, High Speed Trains, Earth stations on Aircraft, Ships and Vehicles and many other critical wireless services and applications?

Regional meetings to prepare common regional positions on various WRC-19 agenda items are being held during this summer. Within asia, the 5th and final Meeting of Asia Pacific preparatory Group for WRC-19 (APG-19/5) is schedules to be held in Tokyo from 31st july to 6th August, 2019

To help with India's preparations in this final round of preparatory meetings ITU-APT Foundation of India (IAFI) is organizing this fourth National Workshop on WRC-19 on 12th June 2019 at Hotel Shangri La New Delhi.
This is fourth such workshop being organized by IAFI, which has been recognized as a international/regional Telecommunications organization by the ITU. IAFI is working for last 15 years in development of Indian Telecom sector in the activities of the ITU and the Asia Pacific Telecommunity (APT). IAFI is a sector Member of the ITU Development Bureau (ITU-D) and ITU Telecommunication Standardization Bureau (ITU-T) which manifests its usefulness to its members from the Indian Telecom industry in free participation of such members in the meetings and conferences of ITU

This booklet contains the agenda for the workshop, short bios of the speakers and summary agenda for the WRC-19 as well as actual text of all WRC-19 agenda items.

PROGRAM AGENDA

ITU-APT FOUNDATION OF INDIA

4TH NATIONAL WORKSHOP ON WRC-19 PREPARTIONS

SPECTRUM FOR 5G AND OTHER WRC-19 AGENDA ITEMS

12th June 2019

Hotel Shangri La, Ashoka Road, New Delhi-110001

Agenda

9.00 - 10.00 AM	**Registration and Tea/coffee**
Inaugural Session :Spectrum for 5G and Future Broadband - Lamp lighting and felicitations	
10:00-11:30	**Opening session and Panel Discussions on key WRC -19 agenda items** • Welcome address by Shri T R Dua, Chair man, ITU-APT • Introduction to WRC-19 by Mr. Bharat Bhatia, President ITU APT • Opening address by Shri G K Agarwal, Wireless Advisor to the Govt of India • Key note Address by Ms. T K Anuradha, Director, ISRO • Opening of the workshop by the Chief Guest Mrs. Aruna Sundarajan, Chairman, Digital Communications C ommission and Secretary DOT **Key Note Presentations on 5G and Mobile Broadband related WRC -19 agenda items** • Mobile Industry Perspective on Agenda item 1.13 by Sh. Jitendra Singh, Global Mobile Suppliers Association (GSA) and Qualcomm • Satellite Industry Perspective on Agenda item 1.13 by Mr. K Krishna, Hughes Networks • Presentation on Agenda item 10 by Mr. Shiro Fukumoto Softbank, Japan **Concluding Remarks on Agenda item 1.13 and 1.10 by Shri R B Prasad, Joint Wireless Advisor to the Gov ernment of India**
11:30:11:45 Networking Tea/Coffee	

11:45-12:15 Session 2-WRC-19 Fixed and Mobile services related Agenda items	
	Opening address by Session chair Mr. A K Sanghi, Advisor, TEC * **Key Note Presentations –** • **Presentation on N ational Preparations by Shri MPS Alawa, Sr. Deputy Wireless Advisor to the Government of India** • **Presentation on ITU-APT preparation for WRC - 19 and Agenda item 1.3 , 1.11 and 1.14 by Shri Bharat Bhatia , President ITU-APT Foundation of India**
12:15-13:40- Session 3 - WRC-19 Satellite related Agenda items	
	Opening address by session chair Mr. U K Srivastava, Principal advisor TRAI **Key Note Presentations –** • **Presen tation on Agenda item 7 (ISSUE A) – Mr. Tony Azzarelli, One web** • **Presentation on Agenda item 1.5 - ESIM by Shri Diwakar Sharma Samsung** • **Presentation on Agenda items including 1.5 - ESIM Sh. Bashir Patel , Global Satellite Consortium (GSC) and Inmarsat** • **Presentation on Agenda item 1.6 – Mr. Sathya Narayanaswamy Viasat** • **Presentation on Satellite related issues by Mr. Tare Brisibe , SES** • **ISRO views on satellite Agenda items Dr P K Jain ISRO** **Concluding Remarks By Shri U K Srivastava**
13:40 -14:15 Networking Lunch -	
14:15 – 16:00	**Panel discussions on WRC-19 agenda Items coordinated by Shri Bharat Bhatia President ITU -APT Foundation of India** • Col. Rajneesh Sethi Director, JCES • Mr. Kishore Babu , DDG Policy DOT • Mr. P V Kumaramohan , ISRO • Mr. Vikram Tiwathia, COAI • Mr. Deepak Yadav, Nokia • Mr. Punit Rathod, Intel • Mr. Parag Kar, Qualcomm • Mr. Diwakar Sharma, Samsung • Mr. R N Agarwal, Co-Chairman, ITU-APT Foundation • Mr. Pawan Garg, Vice President, ITU-APT Foundation • Mr. Rajesh Mehrotra, ITU-APT Foundation • Mr. Rajeev Kumar, Doordarshan Plus all session Chairs and Keynote Speakers
16.00 – 16.30 Concluding and Summary – Mr. Bharat Bhatia, President ITU APT Foundation of India	

SUMMARY AND FULL TEXT OF ALL WRC-19 AGENDA ITEMS

CPM CHAPTER	AGENDA ITEM NUMBER	SUMMARY AGENDA
1 Land mobile and fixed services	1.11	Spectrum harmonization for railway communications
	1.12	Spectrum for intelligent transport (driverless cars)
	1.14	New spectrum for haps
	1.15	Land mobile above 275 GHz
2 Broadband applications in the mobile service	1.13	5G – IMT2020 mm wave bands above 24.25 GHz
	1.16	5 GHz radio LANS (wifi)
	9.1.1	Implementation of IMT in the bands 1 885-2 025 MHz and 2 110-2 200 MHz
	9.1.5	5 GHz RLAN vs. radiolocation –Reference of Rec. ITU-R.M.1638-1 and M.1849-1 in nos. 5.447F and 5.450A
	9.1.8	Spectrum for IoT/MTC
	9.1.X	4.8-4.99 GHz foot note
3 Satellite services	1.4	App-30 limits review
	1.5	ESIMS
	1.6	Non GSO FSS bands
	7	Satellite regulators framework
	9.1.2	L band
	9.1.3	NGSO -C band
	9.1.9	Fss-51-52 GHz
4 Science services	1.2	Met sat in 399-403 MHz
	1.7	TTC for space operations for NGSO
	1.1	Primary amateur service in region 1 in 50-54 MHz
5 Maritime, aeronautical and amateur	1.8	GMDSS regulations
	1.9	GMDSS –VDES
	1.10	GADSS
	9.1.4	Suborbital vehicles
6 General issues	2	Consequential changes
	4	Review resolutions
	9.1.6	WPT
	9.1.7	Unauthorized operations
	10	Agenda for wrc-23

WRC-19 agenda item		Chapter of the draft CPM Report to WRC-19
1	on the basis of proposals from administrations, taking account of the results of WRC-15 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:	–
1.1	to consider an allocation of the frequency band 5054 MHz to the amateur service in Region 1, in accordance with Resolution **658 (WRC-15)**;	5
1.2	to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution **765 (WRC-15)**;	4
1.3	to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution **766 (WRC-15)**;	4
1.4	to consider the results of studies in accordance with Resolution **557 (WRC-15)**, and review, and revise if necessary, the limitations mentioned in Annex 7 to Appendix **30 (Rev.WRC-15)**, while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and the List and the future development of the broadcasting-satellite service within the Plan, and existing and planned fixed-satellite service networks;	3
1.5	to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution **158 (WRC-15)**;	3
1.6	to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**;	3
1.7	to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution **659 (WRC-15)**;	4
1.8	to consider possible regulatory actions to support Global Maritime Distress Safety Systems (GMDSS) modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with Resolution **359** (**Rev.WRC-15**);	5

WRC-19 agenda item		Chapter of the draft CPM Report to WRC-19
1.9	to consider, based on the results of ITU-R studies:	–
1.9.1	regulatory actions within the frequency band 156-162.05 MHz for autonomous maritime radio devices to protect the GMDSS and automatic identifications system (AIS), in accordance with Resolution **362 (WRC-15)**;	5
1.9.2	modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth-to-space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix **18**, to enable a new VHF data exchange system (VDES) satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, applications specific messages (ASM) and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in *recognizing d)* and *e)* of Resolution **360** (**Rev.WRC-15**);	5
1.10	to consider spectrum needs and regulatory provisions for the introduction and use of the Global Aeronautical Distress and Safety System (GADSS), in accordance with Resolution **426 (WRC-15)**;	5
1.11	to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and trackside within existing mobile service allocations, in accordance with Resolution **236 (WRC-15)**;	1
1.12	to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution **237 (WRC-15)**;	1
1.13	to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;	2
1.14	to consider, on the basis of ITU-R studies in accordance with Resolution **160 (WRC-15)**, appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations;	1
1.15	to consider identification of frequency bands for use by administrations for the land-mobile and fixed services applications operating in the frequency range 275-450 GHz, in accordance with Resolution **767 (WRC-15)**;	1
1.16	to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution **239 (WRC-15)**;	2
2	to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-15)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution **27 (Rev.WRC-12)**;	6
3	to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the conference;	Not in scope of CPM
4	in accordance with Resolution **95 (Rev.WRC-07)**, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;	6

WRC-19 agenda item		Chapter of the draft CPM Report to WRC-19
5	to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;	Not in scope of CPM
6	to identify those items requiring urgent action by the radiocommunication study groups in preparation for the next world radiocommunication conference;	Not in scope of CPM
7	to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;	3
8	to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;	Not in scope of CPM
9	to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:	–
9.1	on the activities of the Radiocommunication Sector since WRC-15;	–
	9.1.1[a)] Res. **212 (Rev.WRC-15)** - *Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz*	2
	9.1.2[a)] Res.**761 (-15)** - *Compatibility of International Mobile Telecommunications and broadcasting-satellite service (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3*	3
	9.1.3[a)] Res.**157 (WRC-15)** - *Study of technical and operational issues and regulatory provisions for new non-geostationary-satellite orbit systems in the 3 700-4 200 MHz, 4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz frequency bands allocated to the fixed-satellite service*	3
	9.1.4[a)] Res.**763 (WRC-15)** - *Stations on board sub-orbital vehicles*	5
	9.1.5[a)] Res.**764 (WRC-15)** - *Consideration of the technical and regulatory impacts of referencing Recommendations ITU-R M.1638 1 and ITU R M.1849 1in Nos. 5.447F and 5.450A of the Radio Regulations*	2
	9.1.6[a)] Issue 1) in the Annex to Resolution **958 (WRC-15)** - *Urgent studies required in preparation for the 2019 World Radiocommunication Conference* *1) Studies concerning Wireless Power Transmission (WPT) for electric vehicles:* *a) to assess the impact of WPT for electric vehicles on radiocommunication services;* *b) to study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles.* *These studies should take into account that the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) are in the process of approving standards intended for global and regional harmonization of WPT technologies for electric vehicles.*	6

a) Issue identified by CPM19-1 under WRC-19 agenda item 9.1 (see Administrative Circular CA/226of 23 December 2015).

WRC-19 agenda item	Chapter of the draft CPM Report to WRC-19
9.1.7[a)] Issue 2) in the Annex to Resolution **958 (WRC-15)** - *Urgent studies required in preparation for the 2019 World Radiocommunication Conference* *2) Studies to examine:* *a) whether there is a need for possible additional measures in order to limit uplink transmissions of terminals to those authorized terminals in accordance with No. 18.1;* *b) the possible methods that will assist administrations in managing the unauthorized operation of earth station terminals deployed within its territory, as a tool to guide their national spectrum management programme, in accordance with Resolution ITU-R 64 (RA 15).*	6
9.1.8[a)] Issue 3) in the Annex to Resolution **958 (WRC-15)** - *Urgent studies required in preparation for the 2019 World Radiocommunication Conference* *3) Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU Radiocommunication Sector (ITU-R) scope of work.*	2
9.1.9[a)] Res.**162 (WRC-15)** - *Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)*	3
on any difficulties or inconsistencies encountered in the application of the Radio Regulations [*]; and	–
on action in response to Resolution **80 (Rev.WRC-07)**;	–
to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention,	6

[*] This agenda item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations.

SPEAKERS BIO

ARUNA SUNDARAJAN
Telecom Commission

Aruna Sundararajan is India's Telecom Secretary and Chairman of the Telecom Commission. A 1982 batch IAS officer from Kerala Cadre, Ms Sundararajan, is one of the most senior civil servants of the Indian Administrative Service (IAS) in the country. Ms Sundararajan has over three decades of experience in a variety of leadership roles in the Central and State Governments, especially in Economic and Development Administration, Investment Promotion and IT/Telecom Domains.

BHARAT BHATIA
President ITU-APT Foundation of India

Mr. Bharat Bhatia has over 43 years of experience in Telecom and ICT policy, regulations and spectrum management.

He is the President of ITU-APT Foundation of India and the founder President of the Core Group of Telecom Industries Association of India (CTIA).
Mr. Bhatia currently heads International spectrum and Regulatory team at Motorola Solutions' Government Affairs and leads a global team of Spectrum and regulatory resources in Motorola Solutions.
Mr. Bhatia is also the Chair of the Public Safety and Disaster Relief communications -PPDR working group under the ITU-R study group 5D .as well as the Chair of the APT Task Group on -PPDR and Earlier he was also the President of TEMA (Telecom Equipment Manufacturers Association of India) and a Vice President of Association of Telecom Industries of Singapore (ATIS). Mr. Bhatia is an expert on spectrum, ICT Policy, Regulations, public safety and emergency and disaster relief communications.

U.K.SRIVASTAVAIS
Principal Advisor (NSL), TRAI

Mr. U.K.Srivastavais Principal Advisor in Telecom Regulatory Authority of India, looking after telecom networks, spectrum and licensing.

He is a graduate in Electronics Engineering and possesses Diploma in Management. He belongs to the 1983 batch of Indian Telecom Service an distrained in transmission technologies, including optical, radio and satellite communications. He has managed various telecom activities including operations, maintenance, training, quality assurance, standardization and policy. He has been a member of various standing committees on satellite communications.

He was deputed to ITU to serve in Iraq for two years and at ITU HQ in Geneva for a year and half.

He has been associated with various standards development activities of ITU-T and ITU-Rand has represented India in various conferences of the se organizations. He also served as Vice Chairm an of Study group – 7 of ITU – R for a period of four years.

SHIRO FUKUMOTO
(Director of Standardization Department) SoftBank.

Shiro Fukumoto is Director of Standardization Department at SoftBank Corp.,responsible for international standardization work on spectrum aspects in ITU-R, APT and 3GPP.

Anuradha TK
Indian Geosat Programme Director

Anuradha TK is one dynamic woman who not only debunked myths surrounding women's lack of inclination towards fields related to science but also risen to the topmost position of India's space agency. She joined ISRO in 1982 and has been working since then. Anuradha is now the seniormost woman scientist at ISRO.

- At present, Anuradha TK works as an Indian GeosatProgramme Director at ISRO Satellite Centre. She works in the area of geo-synchronous satellites, which are crucial to telecom and data links.
- Anuradha played a pivotal role in developing and launching ISRO communication satellite GSAT-12 into space from the SatishDhawan Space Centre on 15 July, 2011. Besides that, she also led the technical group of 20 engineers working for the same.
- In September 2012, Anuradha TK led the launch of GSAT-10.
- As the project director at ISRO, she supervised the launch of the GSAT-9, GSAT-17 and GSAT-18 communication satellites.
- She has also worked in the capacity of Project Manager, Deputy Project Director and Associate Project Director for the Indian Remote Sensing and the Indian Regional Navigation Satellite System programs.

K. KRISHNA
(Vice President & CTO) Hughes.

K Krishna is the Vice President and the Chief Technology Officer of Hughes in India. He has been with Hughes and the Satellite Industry for more than 25 years. He has been one of the founding members of the India operations of Hughes. He is responsible for the technology roadmap of the Company and spearheads the various strategic initiatives of the Company. He also heads the defense business for Hughes. He also plays the role of a Chief Regulatory Officer. Krishna represents Hughes and the Satellite industry in various forums. He is Co-chairman of the Satellite Committee for Broadband India Forum and active member of Society for Satellite Professionals International. In addition to this, he also represents the Global VSAT Forum in India. He activitely drives the IT direction for the company.

TARE BRISIBE
Senior Legal & Regulatory Counsel Asia Pacific, Ses, Singapore.

Tare Brisibe, is Senior Legal & Regulatory Counsel, with SES. A global satellite operator headquartered in Luxembourg. He is based in Singapore and responsible for SES's government policy and regulatory activities in the Asia-Pacific region. Tare has nearly two decades of experience in the satellite industry, having previously served as Regulatory Information Officer for Inmarsat (UK) and Director of Regulatory Affairs for SITAOnAir (Geneva). He also served as: Chair of the Legal Subcommittee, UN Committee on the Peaceful Uses of Outer Space; Deputy Director (Legal), National Space Research and Development Agency of Nigeria; and Vice Rapporteur, ITU Study Group 1. He holds multiple degrees, including a Ph.D in International law from Leiden University.

G. K. AGRAWAL
Wireless Advisor at Department of Telecommunications, Ministry of Communication & IT (INDIA)

Widely experienced in the field of radio spectrum management and radio monitoring, after having majored in Electronics Engineering from Indian Institute of Technology, BHU, Varanasi and research in the area of Theoretical Bio-Physics at the School of Environmental Sciences at JNU under the celebrated Prof J. Subbarao and after having been awarded the Sr. Research Fellowship through a nationally competetive examination conducted by CSIR, Govt of India, I have had the opportunity in most of the work areas of Wireless Planning & Coordination (WPC) Wing and Wireless Monitoring Organization of the Department of Telecom of Ministry of Communications in the Govt of India. Have had the opportunity of extensive participation in International technical and regulatoey meetings under ITU and APT and other forums.

R.B.PRASAD
Joint Wireless Advisor Department of Telecom

Sri R.B.Prasad is an officer of 1983 batch of Indian Engineering Service. He has graduated in Electronics and Communication Engineering from BIT Sindri. He has done post graduation in Electronics and Communication Engineering from IIT Roorkee. He has also worked as lecturer in NIT Jamshedpur. He has worked in various capacity in Wireless Monitoring Organisation for verifying the technical and operational characteristics of Wireless Stations operating in fixed services, mobile services, aeronautical services, maritime mobile services, satellite services and broadcasting services. He has ensured interference free operation from harmful interference. He has gone through many courses in the field of spectrum management in USA, Canada, France and ITU Geneva. He has further worked in the field of spectrum management in planning, engineering and licensing. He has played a key role in auction of spectrum for mobile service 1912 on ward. He has also been responsible for spectrum policy planning and licensing of Safety, Security, Defense and police organisation.

BASHIR PATEL
Senior Regional Advisor & Gsc Coolrdinator South Asia, Middle East & Africa (samea)regulatory & Spectrum Team.

Bashir Patel is Inmarsat's Regional Advisor for the South Asia, Middle East and Africa (SAMEA) region. He is widely recognized as a highly experienced executive in ICT, satellite systems and defence aerospace. He has over 35 years experience in the high tech industry, working mainly in the telecom sector including satellites and defence industries, both in management consulting as well as in regional regulatory policy, business and market development.He has been working with the Governments throughout the regions and launched satellite communications technologies as far back as mid 1980 's.He is a passionate technologist with experience gained from his time spent in advance aerospace projects in BAe Systems, Inmarsat, ICO Global Communications and prior to re-joining Inmarsat in 2013 as the Chief Operating Officer (COO) of the Commonwealth Telecommunications Organisation (CTO), dealing with 54 Commonwealth Governments around the world.

VIKRAM TIWATHIA
Deputy Director General At Cellular Operator Association of India - COAI.

Vikram, is the Deputy Director General, of the COAI. This is India's leading industry association for Telecom, Broadband and Digital services. In his current assignment, he works extensively on telecom and broadband policy, regulatory compliance aspects. He works closely with senior government officials and private sector executives to further augment mobile, broadband and digital services business. He interacts extensively with the ICT industry leadership and senior officials at DoT, MeitY & TRAI and other government offices for regulatory and policy matters. He is a member of the Joint Working Group on Cyber Security chaired by Deputy National Security Advisor. Is a frequent speaker at Cyber, and Telecom Network Security workshops / conferences. An active member of Telecom and Broadband Committees of national industry associations - CII, FICCI, Assocham, TSDSI Committees. He participates in many International Workshops / conferences being conducted by ITU, APT etc. He is a non-executive director of the Board of the Global Certification Forum.

DIWAKAR SHARMA
SAMSUNG R&D INSTITUTE, BANGALORE

Diwakar Sharma has 18 years of experiencein telecom and embedded domain specific to 3G, 4G, 5G and IoT. He has been instrumental in seeding system engineering, LTE and 5G incubation projects in SRI-B. He has more than 30 patents, 7 research papers published at IEEE conferences, and 10+ 3GPP Standard contributions in physical layer, MAC and systems area. He was leading technical efforts of System engineering in analyzing baseband and RF performance issues in commercial devices. He is currently contributing in spectrum and sharing study efforts in SRI-B standards team. He has specific research interest in application of signal processing in PHY, MAC and cross layer aspect of cellular wireless.

KISHORE BABU
DDG (Policy), DoT

Mr Kishore Babu has more than 28 years of experience in diverse leadership positions in Information & Communication Technologies (ICTs), Telecommunications. He have Multilateral Cooperation from the Department of Telecommunications with International and Regional Organizations and also Important contributions on ITU, APT and other Platforms for ITU WTDC, ITSO Assembly Parties meeting, ITU WCIT, WSIS, APTmeetings. He is Chairman, Working Group on Policy, Legal – APT Preparatory Process and Vice Chairman, APT , Telecommunications Development and Advisory Group (TDAG) of ITU-D..He is also Vice Chairman of Council Working Group (CWG) Internet, ITU Preparatoryprocess for WTDC-17. He has Post Graduate in Public Policy and Management, Focus area – Strategy from Indian Institute of Management (IIMB), Bangalore& Syracuse University, NY, USA. He has graduate in in Electronics & Communications Engineering .He has published books like **Long view on Enterprise telecom services** and **ICT use and Household surveys in India.**

M.REVATHI
Senior Deputy Wireless Adviser (Sat), DoT

Ms M.Revathi is officer of 1996 batch of Indian Engineering Services (IES) exam. Cadre is IRRS (Indian Radio Regulatory Services) and joined Wireless Planning and Coordination (WPC) Wing as a Group A officer. She has graduatedin in Electronic and Communications Engineering from Jawaharlal Nehru Technological University, Hyderabad and did her Post Graduation Programme in Public Policy Management fromManagement Development Institute (MDI), Gurgaon. As part ofInternational component of the programme, completed one moduleat Sciences Po University, Paris.She is Underwent trainers training on repair and maintenance of radiofrequency spectrum monitoring equipment at Thales, Cholet, France. She also Representing as Frequency Expert from Asia Pacific Region in theFrequency Working Party (FWP) of International Telecommunications Satellite Organisation,Headquarter at Washington,USA.She was Assisted DoS as spectrum regulatory expert in dealing Internationalarbitration cases at the International Court of Justice, The Hague. She has Contributed and attended various meetings on spectrummanagement at International Telecommunications (ITU) level andalso at Asia Pacific Telecommunity (APT) regional level .She has wide experience in Radio frequency interference resolution, SpectrumAuctions. Presently as head of Satellite section looking after all theissues related to management of satellite spectrum like Notificationand coordination for orbital slots at ITU as well as Coordination with othercountries.countries.

DR. PUNIT RATHOD
Wireless Networking Researcher, Intel, Bengaluru

Dr. Punit is currently working as a Researcher with the Next Generation and Standards of Intel. He completed his PhD from IIT Bombay and has had a brief stint with entrepreneurship in developing solutions for PPDR. He is currently involved with 5G standards, spectrum and policy related activities of Intel in India.

SATHYA NARAYANASWAMY
Viasat (Country Manager).

Sathya Narayanaswamy is Country Manager, India for Viasat, a global broadband and satellite communications company. He is responsible for business development in India, and also growing the Viasat India R&D center, which he helped establish. In a previous role, Sathya also worked in Viasat's COMSAT Labs division and was in the original design team for the Linkway product line. Sathya has also held other roles in Cisco, and Lucent.

ANIL KUMAR SANGHI
Advisor TEC

- Advisor
  National Telecommunication institute for Policy Research,Innovation and Training,DOT
  May 2019 – Present 2 months
  Ghāziābād Area, India
  Senior Deputy Director General
  National Telecommunication Institute for Policy Research,Innovation and Training
  December 2018 – Present 7 months
  New Delhi Area, India
- Joint Secretary
  National Disaster Management Authority (NDMA)INDIA
  December 2013 – December 2018 5 years 1 month
  New Delhi Area, India

JITENDRA SINGH
Senior Director Government Affairs (India & South Asia)

Jitendra Singh is working with Qualcomm since 2009. His responsibilities include interfacing with regulatory and policy making agencies in the region on behalf of Qualcomm. Jitendra has more than 30 years of experience in the field of communications management. Prior to his appointment at Qualcomm he served in the government. He has been actively involved in National Working Groups of the ITU-R in India and has been a key contributor in all the Standards related activities of the Industry. This includes the advocacy and planning of identification of additional spectrum for IMT and mobile broadband at various forums – National as well as Global. He had been an active contributor by introducing a number of papers in ITU-R on behalf of India. He plays a key role in APT region telecom industry coordination activities. He is part of many industry associations. He has created and submitted many spectrum policy related papers in ITU and APT on behalf of India. He also heads GSA India team.

DR P K JAIN
Associate Director (ISRO)

Dr. P K Jain has been working in ISRO Headquarters, Bangalore as Associate Director for Frequency Management &Satcom Planning. Before this, he was responsible for the implementation of Satcom Policy, capacity allocation & transponders management and Navigation programme. He has also held the responsibility of implementing various Application-Programmes of ISRO like Tele-education, Search and Rescue, DTH based Disaster Warning Dissemination System, etc. He started his career with National Remote Sensing Centre (ISRO), Hyderabad in 1989 and worked for the design and development of remote sensing satellite earth station communication equipment. As a Project Manager, he contributed for the commissioning of various national and international remote sensing satellite ground stations. He also worked in Space Applications Centre (ISRO), Ahmedabad for the establishment of C-, Ext. C-, Ku- and Ka-band SATCOM earth stations in the capacity of the Project Manager-System Engineering.

RN AGARWAL
Co-Chairman ITU-APT Foundation of India

RN Agarwal is the former wireless advisor to government of India and has been actively involved with Indian national satellite system, spectrum management, radio regulatory, and electromagnetic compatibility studies. He was instrumental in developing handbook on Spectrum Monitoring as chairman, ITU-R working party on spectrum monitoring techniques. He was twice awarded Diploma of Recognition by ITU for outstanding contributions to the work of the ITU-R study group on spectrum management and work for conference preparatory meeting for world telecommunications conferences.

TONY AZZARELLIIS
OneWeb (Vice President Global Licensing & Spectrum).

Tony Azzarelliis OneWeb's Vice President of Spectrum Licensing Affairs, responsible for global licensing, spectrum and international policy development.He also is Founder and CEO of Azzurra Telecom Limited (UK), providing strategic advice in market access, licensing and spectrum matters.

He holdsa Doctor's degree in Electronics and has more than 25 years experience in the telecommunication sectorwith appointments at the UK Regulator Ofcom, Inmarsat, The Boeing Company, the European Space Agency andICO Global Communications.

Tony has always strived to initiate, develop and promote global harmonized licensing and spectrum policies for space and terrestrial wireless technologies, and believes that this is necessary for the proper economic and societal growth and development of a country and its industry.

MAHENDRA PAL SINGH ALAWA
Sr. Deputy Wireless Advisor Wireless Planning and Coordination Wing (DOT)

Currently working as a Senior Deputy Wireless Advisor (Conference), WPC Wing. Before this he worked in SACFA unit for more than a year. This unit deals with siting clearance of wireless Installation at various geolocation.Having More than 15 years of experience of working in Wireless Monitoring Organisation. The function of which has involved us to carry out monitoring of various type of radio- frequency assignments such as monitoring of : Radio-spectrum occupancy, Radio Technical parameters etc and Monitoring was also carried out to resolve radio interference to adhere various wireless users to their licensing parameters.

PAWAN GARG
Vice President of ITU-APT Foundation of India

Mr. Pawan Garg is former Wireless Adviser to the Government of India (head of national spectrum management organization) and was internationally elected Member* of the Radio Regulations Board (RRB) of International Telecommunication Union (ITU), Geneva from 2006 to 2014 (elected as Chairman of the Board for 2013). ITU is the specialized body of UN system for ICT issues.
Mr Garg has more than 45 years of experience in spectrum management and planning of various radiocommunication services – both terrestrial as well satellite based services. Also during his term as Wireless Adviser to Govt. of India (2002 – 2008), exponential growth of cellular mobile services took place in India and achieved the critical mass for further large growth.

RAJESH MEHROTRA
Founder And Principal Consultant For `redbooks Consulting Pvt. Ltd

Mr. Rajesh Mehrotra has been a Senior ITU expert, Counsellor and Senior Radiocommunication Engineer at the ITU HQ in Geneva for about 14 years. The work was primary related to management of the radio frequency spectrum and coordination of space networks at the international level. He has authored a number of technical papers that relate to management of the two natural resources viz radio spectrum and the geostationary orbit. He has conducted international seminars and workshops on behalf of the ITU at various countries, including India (ISRO/DoS) and provided assistance to many administration in the use ITU's Radio Regulations. He has participated as ITU Counsellor, speaker and also as a member of the Indian delegation in various ITU World Radio Conferences & biennial Radiocommunication Seminars.

Since 2013 he is the founder and Principal Consultant for `RedBooks Consulting Pvt. Ltd.', a Radiocommunication and Satellite Advisory and has undertaken many consultancy projects for many important international clients.

NOTES

THANK YOU

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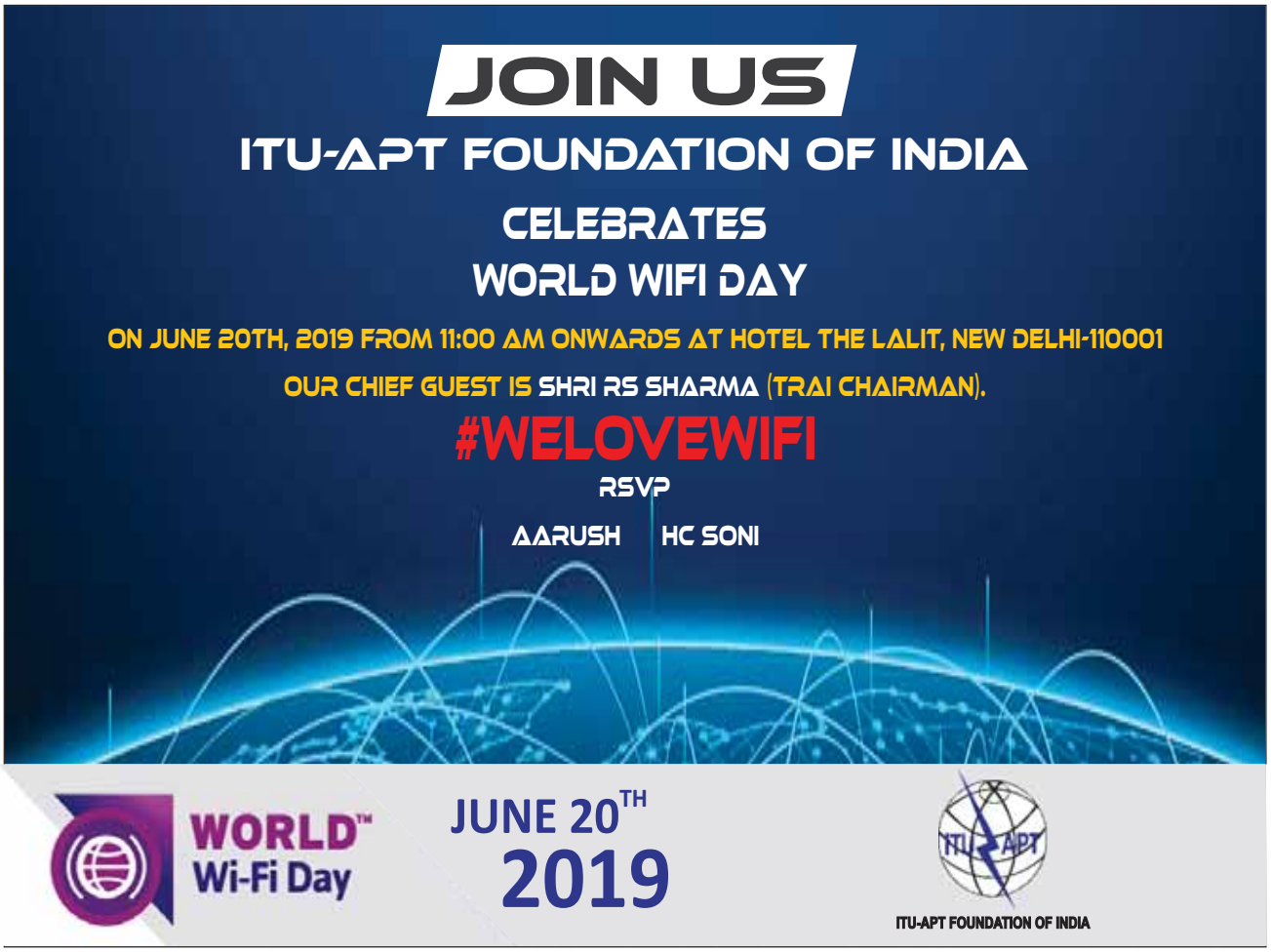

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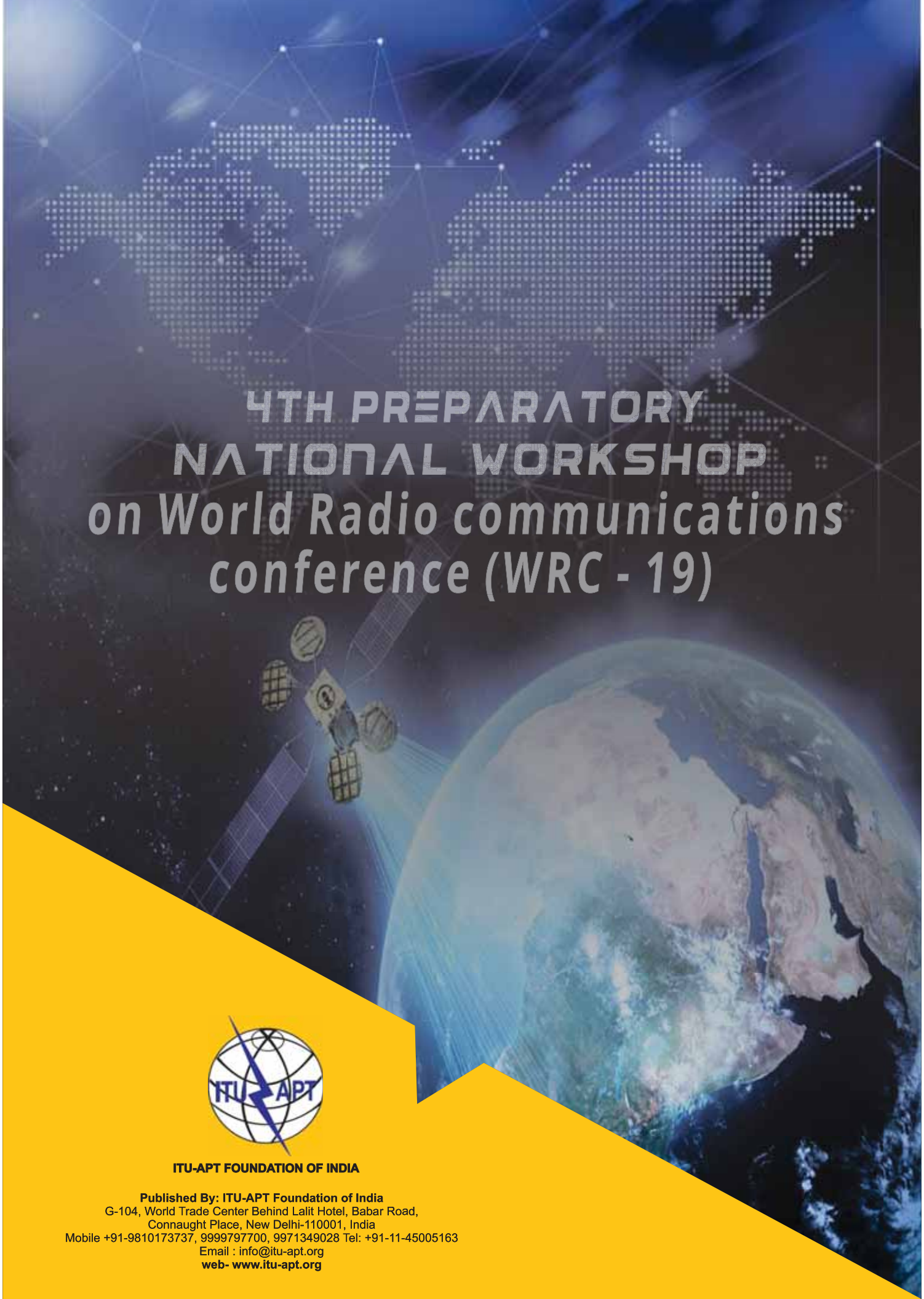

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