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| Summary:  |
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| Proposal: |
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1. The following pages are intended to be compiled in one CEPT Brief on AI 9

DRAFT CEPT BRIEF ON ITEM 9.1 – ISSUE 9.1.8 – Issue 3) in the Annex to Resolution 958 (WRC-15)

# ISSUE

Resolution 958 (WRC-15) invites ITU-R to study 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.

# Preliminary CEPT position

CEPT supports 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. CEPT is of the view that no modifications to the Radio Regulations are required in order to resolve Agenda item 9.1 issue 9.1.8.

CEPT supports the consideration of IMT technologies within Agenda item 9.1 issue 9.1.8 as well as the consideration of non-IMT technologies in the purview of WPs 1B and 5A related to machine-type communications.

# Background

The significant increase of the number of connected and networking devices and machines is anticipated in the near future and already happening today. This type of connectivity is generally referred to as machine-type communications (M2M) including the Internet of Things (IoT). The majority of such devices and machines are using wireless technologies for communication corresponding to different radiocommunication services and applications. Radio applications such as private mobile radio systems (PMR), public access mobile radio (PAMR), MFCN (Mobile Fixed Communication Networks), short range devices (SRDs), radio local area networks (RLANs), standalone satellite or hybrid terrestrial/satellite NGSO/GSO systems are expected to be used extensively for M2M/IoT communications.

## Activities within ITU-R

The standardization and harmonization aspects of machine-type communications have been raised firstly within ITU-T, where Study Group 20 “IoT and its applications including smart cities and communities” has been created to address the standardization of end-to-end architectures for IoT, and mechanisms for the interoperability of IoT applications and datasets employed by various vertically-oriented industry sectors. To complement ITU-T activities within ITU-R, Radiocommunication Assembly 2015 adopted Resolution ITU-R 66 “Studies related to wireless systems and applications for the development of the Internet of Things” to foster studies on spectrum aspects of machine-type communications. Nevertheless, a number of administrations at WRC-15 proposed to have dedicated AI to focus standardization and harmonization on radio technologies for IoT, specifically to simplify equipment complexity and achieve the benefits of economies of scale. After discussion it was decided to conduct studies in this regard within AI 9.1 as Issue 9.1.8 (AI 9.1.8) and to consider the need for any appropriate action based on the results of such studies.

Within ITU-R, Working Party 5D is the responsible group for the preparation of CPM Text for AI 9.1.8 while Working Parties 1B and 5A are concerned groups, providing information on non-IMT technologies related to machine-type communications. The interrelation between IMT and non-IMT technologies for machine-type communications has been thoroughly discussed during ITU-R workshop on “Spectrum management for Internet of Things deployment” in conjunction with the ITU-R Study Groups 1 and 5 meetings at the 22nd November 2016. Based on the discussion during the workshop it could be noted that the variety of IoT applications could be already addressed by short-range devices (SRD) and IMT networks, however other types of applications in machine-type communications may require further consideration beyond general framework of SRD and IMT. One example of such applications is transport sector. In this regard Issue 9.1.8 may be interrelated with the studies under AIs 1.11 and 1.12 for railroad communications and ITS accordingly. These AIs are considered in relation to possible harmonisation of frequency bands for ITS or railroad communications at global and regional levels within existing mobile service allocations. Furthermore, studies within WP 5D related to AI 9.1 Issue 9.1.8 includes ITS applications via LTE-based V2X feature as ad hoc communication. This belongs to Agenda item 1.12 only. The part of the operation scenario via an operator network is in the scope of Issue 9.1.8. CEPT may consider other application based narrowband and broadband machine-type communications, which are not covered by AIs 1.11 and 1.12 and which may be reasonable to harmonize at global and regional levels within existing services allocations.

WP 5D has progressed the consideration of AI 9.1.8. The work on machine-type communication infrastructures under AI 9.1.8 includes preparation of the draft CPM text and two new ITU-R reports under development. The new Report ITU-R M.[IMT.BY.INDUSTRIES] considers the use of terrestrial IMT by other industry sectors, providing some information on technical and operational aspects of IMT systems, when used for machine-type communication. The new Report ITU-R M.[IMT.MTC] on the use of the terrestrial component of IMT for narrowband and broadband machine-type communications is dedicated specifically to address AI 9.1.8. In addition to operational and technical aspects, this Report describes possible harmonized use of spectrum to support the implementation of narrowband and broadband MTC infrastructures. WP 5D has reached an initial conclusion that there is no necessity of identifying new spectrum dedicated exclusively for MTC applications and thus no changes are needed in the Radio Regulations under Resolution 958 (WRC-15). However, such conclusion doesn’t preclude spectrum harmonisation discussions within ITU-R Report M.[IMT.MTC] or other ITU-R deliverables. Specifically, one open issue in this Report is the treatment of contributions from different countries, describing options for MTC spectrum within IMT. Delegates from CEPT administrations proposed to treat such options as national, first of all due to inclusion of the 733-736/788-791 MHz option, which in current CEPT regulatory framework is not harmonized for MTC, but could be used for MTC as a national basis[[1]](#footnote-2). However, some Arab counties would like to interpret these options as sub-regional or even regional opportunities for harmonisation. The discussion of the issue is still ongoing in WP 5D.

WP 5A has also initiated its own work to respond to WP 5D on non-IMT technologies. WP 5A has started work on the new Report ITU-R M.[IOT/M2M\_USAGE] on technical and operational aspects of IoT and M2M applications by systems in the Mobile Service (excluding IMT), also triggered by proposal from CEPT country. The current focus of the report is on Wireless industrial automation (WIA) applications, but other applications are also under consideration. The initial material notes a number of IEEE standards, but the requirements for WIA are taken from 3GPP work on 5G. The spectrum issues are not described currently in the Report in detail. However, it is mentioned that majority of wireless systems for industrial automation applications use the bands designated for ISM applications and SRDs. The Report also mentions that the full potential of WIA systems can only be achieved if from the very beginning the setup and operation the wireless network infrastructures can be done also in a local and closed environment without the involvement of a 3rd party network provider and without sharing the infrastructure with other (potentially less controlled) users/applications.

WP 1B is the responsible group within ITU-R on harmonization for SRDs. There are no specific deliverables being prepared by WP 1B to respond to AI 9.1.8. However, WP 1B has already noted that a number of ITU-R Reports and Recommendations on SRDs could be relevant for AI 9.1.8. WP 1B maintains a correspondence group to collect possible further inputs in relation with the development of IoT applications operating under SRD regime and to consolidate the corresponding part of the draft CPM text on AI 9.1.8.

## Activities within CEPT

In CEPT the work on machine-type communications is conducted mostly as part of the regular tasks, mostly in relation to MFCN[[2]](#footnote-3), other land mobile systems used for PMR/PAMR , short-range devices and standalone satellite or hybrid terrestrial/satellite systems. These tasks have no direct relation to ITU-R or WRC-19 activities. As an example, ECC PT1 has published ECC report 266 on the suitability of the current ECC framework for MFCN in the frequency bands 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, and 2600 MHz for the future usage of LTE-based M2M and Narrowband M2M. CEPT is currently updating its regulatory framework in 900/1800 MHz in order to address M2M based on MFCN systems.

Another example is the CEPT Recommendation T/R 25-08, which describes planning criteria and coordination of frequencies for land mobile systems in the range 29.7-470 MHz, which could be used, inter alia, for M2M. CEPT is currently working on a new technology neutral ECC Decision. The new Decision is also intended to facilitate narrowband, wideband and broadband solutions (incl. IMT technology) within the 410-430 MHz and 450-470 MHz bands for those administrations wishing to designate spectrum for such systems in these bands. In addition, the Recommendation T/R 25-08 is intended to be revised to provide an improved guidance on cross-border coordination between land mobile systems with different bandwidths.

Furthermore, CEPT has initiated a study assessing the feasibility of M2M/IoT operation through satellites from a technical and regulatory point of view and is developing an ECC Report regarding the implementation of M2M/IoT operation via satellites including uplinks and downlinks to enhance terrestrial networks with satellite connectivity. This study will explore technical and frequency band opportunities for the introduction of M2M/IoT applications via satellite extending terrestrial networks and creating complementary services. The advantage of M2M/IoT via satellite is mainly foreseen to establish connectivity for areas having no or poor terrestrial coverage. CEPT has already conducted preliminary works on M2M via satellite identifying the need to better study complements to networks based on low powered devices like SRD, but other frequency bands and other technology are also under consideration.

The current SRD framework, as per the ERC Recommendation 70-03 and the Commission Implementing Decision 2017/1483/EU, offers already the possibility to roll out M2M/IoT systems in various harmonised bands for SRD. As long as they fulfil the technical parameters set out in the regulatory framework, new innovative M2M/IoT applications can be rolled out in any of the harmonised bands. For example, M2M/IoT applications could be used within the 169.4-169.475 MHz which is harmonised in CEPT for SRD by ECC Dec (05)02. In particular, SRD harmonised bands identified for the category “non-specific short-range devices” are the most favourable for new innovative usages. Among those, spectrum within the 865-870 MHz can be highlighted with regard to so called low power wide-area networks[[3]](#footnote-4) dependent on national implementation.

Furthermore, improvement of the soft-harmonisation in the frequency bands 870-876 MHz and 915-921 MHz could be foreseen in the future in the Recommendation ERC 70-03 with expected national implementation. In addition, some different spectrum within the frequency bands 870-876 MHz and 915-921 MHz are considered for such use, taking into account the existing and planned usage of these bands by other applications/services. Further harmonization at EU level of these bands has been studied in the addendum to CEPT Report 59 and is currently under development.

Finally, issues related to AI 9.1.8 have been also discussed during CEPT Workshop on Machine-to-Machine Communications (M2M) held on 21-22 March 2016 in Mainz, Germany, which gave an opportunity to collect information on different aspects of M2M development (see [CEPT M2M Workshop Results](https://cept.org/files/16667/M2M%20Workshop%20-%20Results%20-%20APs%20for%20ongoing%20activities%20-%20Final.pptx)[[4]](#footnote-5)). One option clearly indicated in this workshop was to consider shared spectrum access (especially in 400 MHz bands as well as frequency bands used by SRD). New technologies should try to use current spectrum utilisation in an opportunistic way. Some elements relevant to machine-type communications have been also discussed during CEPT Workshop on 5G Mobile Communications on 2-4 November 2016 in Mainz, Germany, where among other matters specific needs for vertical industries were presented.

# List of relevant documents

ITU Documentation (Recommendations, Reports, other)

* Doc. [5D/758, Attachment 3.11](https://www.itu.int/dms_ties/itu-r/md/15/wp5d/c/R15-WP5D-C-0758%21H03%21MSW-E.docx) Working document towards draft CPM text for WRC-19 issue 9.1.8.
* Doc. [5D/758, Attachment 3.13](https://www.itu.int/dms_ties/itu-r/md/15/wp5d/c/R15-WP5D-C-0758%21H03%21MSW-E.docx) Working document towards a preliminary draft new Report M.[IMT.BY.INDUSTRIES] “The use of terrestrial component of International Mobile Telecommunication (IMT) by industry sectors”.
* Doc. [5D/758, Attachment 3.2](https://www.itu.int/dms_ties/itu-r/md/15/wp5d/c/R15-WP5D-C-0758%21H03%21MSW-E.docx) Working document towards a preliminary draft new Report ITU-R M.[IMT.MTC] “The use of the terrestrial component of International Mobile Telecommunication (IMT) for Narrowband and Broadband Machine-Type Communication”
* Recommendation ITU-R M.2083-0 IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond.
* Doc.[1B/193, Annex 10](https://www.itu.int/dms_ties/itu-r/md/15/wp1b/c/R15-WP1B-C-0193%21N10%21MSW-E.docx) Working document towards a preliminary draft new
 Report ITU-R SM.[LPWAN.MTC] “Low Power Wide Area Networks (LPWAN) for Machine-Type Communication and the Internet of Things and potential harmonization opportunities”
* Doc. [5A/469 Annex 36](https://www.itu.int/dms_pub/itu-r/md/15/wp5a/c/R15-WP5A-C-0469%21N36%21MSW-E.docx) Working document towards a preliminary draft new
 Report ITU-R M.[IOT/M2M\_USAGE] “Technical and operational aspects of Internet of Things and Machine-to-Machine applications by systems in the Mobile Service (excluding IMT)”

CEPT and/or ECC Documentation (Decisions, Recommendations, Reports)

* ERC Recommendation 70-03 related to the use of Short Range Devices (SRD);
* ECC Report 266 – The suitability of the current ECC regulatory framework for the usage of Wideband and Narrowband M2M in the frequency bands 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz
* CEPT Recommendation T/R 25-08 on ‘Planning criteria and coordination of frequencies for land mobile systems in the range 29.7-470 MHz’
* CEPT Report 59 and its addendum: annual update of the technical annex of the Commission Decision on the technical harmonisation of radio spectrum for use by short range device
* EU Documentation (Directives, Decisions, Recommendations, other), if applicable Commission Implementing Decision (EU) 2017/1483 of 8 August 2017 amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices and repealing Decision 2006/804/EC

# Actions to be taken

No need for any further action.

# Relevant information from outside CEPT (examples of these are below)

## European Union (date of proposal)

## Regional telecommunication organisations

APT (APG19-3, March 2018)

Key points raised during the meeting: APT Members endorse the current conclusion of draft CPM text that no change to the Radio Regulations is required under this issue. (Document 5D/666-Chapter 3-Attachment 3.11).

APT Preliminary View(s):

APT Members support 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, in accordance with Resolution 958 (WRC-15).

APT Members are of the view that the possible harmonized use of spectrum to support MTC can be achieved through ITU-R Recommendations/Reports and there is no need to make any changes to the Radio Regulations nor for any identification of spectrum to support MTC.

ATU (June 2018)

During the 2nd Meeting of ATU WRC-19 Working Groups that was held 4-7 June 2018 in Victoria Falls (Zimbabwe) 2 proposals were prepared for draft ATU position I regard to AI 9.1.8 (It will be considered at the next APM-19 meeting scheduled 10-14 September in Cairo (Egypt)).

* Note that the existing frequency arrangements for IMT as detailed in Rec. ITU-R M.1036 are sufficient to help enable a wide range of narrowband and broadband MTC applications and devices, both above and below 1 GHz, and a consequence,
* Take and support a No Change position regarding this issue.

ASMG (The 23nd meeting of ASMG, 7-11 April 2018)

Initial position: Support the use of regionally or globally harmonized frequency bands in the frequency bands identified for IMT systems for Internet of Things (IoT) applications and systems.

The new contribution has been received within ASMG to update the position and is on under consideration:

- Narrowband IoT and MTC: Support the harmonised use of the A9 arrangement In ITU-R Recommendation M.1036 (2x3 MHz, 733-736 / 788-791 MHz) which is identified for IMT in the 700 MHz band for narrow band IoT and MTC, with the possibility of using this arrangement (2x3) in the 700 MHz band for other applications within IMT systems, and the possibility of using existing bands identified for (IMT) systems, such as (694 –960 MHz).

- Broadband IoT and MTC: Support the use of existing bands identified for IMT systems to support the implementation of broadband communications infrastructure for IoT and MTC.

CITEL (June 29, 2017)

Inter-American Proposal

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| Brazil, Colombia, Dominican Republic, Mexico, United States, Guatemala, Panama, Uruguay | NOC IAP/9.1 Issue 9.1.8/1 Radio Regulations Volumes 1, 2 and 4Reasons: Analysis of the current and future spectrum use for narrowband and broadband machine type communications (MTC), also known as machine-to-machine (M2M) or Internet of Things (IoT), concluded that there is no need to identify specific spectrum for those applications. Therefore, no change to the Radio Regulations or regulatory action is required.SUP IAP/9.1 Issue 9.1.8/2ANNEX 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.Reasons: Analysis of the current and future spectrum use for narrowband and broadband machine type communications (MTC), also known as machine-to-machine (M2M) or Internet of Things (IoT), concluded that there is no need to identify specific spectrum for those applications. Therefore, no change to the Radio Regulations or regulatory action is required. No changes also apply to RR Volume 3, apart from the suppression proposed to parts of Resolution 958 (WRC-15). |

RCC (15 March 2018)

The RCC Administrations consider that any modifications to the Radio Regulations provisions related to regulation of using narrowband and broadband machine-type communication applications are not necessary.

The RCC Administrations support the development of ITU-R Recommendations, Reports and/or Handbooks on technical and operational aspects of using different radio systems and technologies, as well as on spectrum needed and experience in spectrum use, to support the implementation of narrowband and broadband machine-type communication infrastructures.

The RCC Administrations understood that the practicability for harmonization of any frequency bands for narrowband or broadband machine-type communication within ITU-R Recommendations, Reports and/or Handbooks shall be justified taking into account features and prospects of the introduction of such applications both within IMT systems and non-IMT technologies.

## International organisations

IARU (April 2017)

The IARU supports the use of spectrum efficient technologies for MTC. Because MTC devices typically will be co-located with stations in the amateur service, the use of spectrum allocated to the amateur service would be problematic for both uses.

IATA (date of proposal)

ICAO (date of proposal)

IMO (date of proposal)

NATO (19 June 2018)

The NATO Civil/Military Spectrum Capability Panel (CaP 3) has agreed the NATO Position statements and the military assessments for the agenda items of WRC-19:

NATO Military Assessment

Given that this technology is fairly new, from a military perspective, any regulatory changes may cause undue risk to military systems, specifically those operating in NJFA bands and would be premature. Harmonised use of spectrum to support machine type communication could be achieved through other actions including ITU R Recommendations, Reports and or Handbooks as appropriate.

NATO Position

NATO supports no change to the ITU Radio Regulations to accommodate machine type communication systems.

SFCG (SFCG-36, 7-15 June 2016, Mainz, Germany)

SFCG should continue to monitor the developments of this agenda item in WP 5D for any spectrum requirements identified that could impact space science services operations. Although no specific frequency ranges are identified to exclusively provide for the enhanced services, these services may be considered to be within the definition of IMT-2020 and, as such, add to the total amount of spectrum to be sought under AI 1.13.

WMO and EUMETNET (12-15 February 2018)

WMO will monitor this AI to ensure that the results of these studies will not adversely impact any service used for meteorological operations.

## Regional organisations

ESA (date of proposal)

Eurocontrol (date of proposal)

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU (date of proposal)

GSMA (date of proposal)

CRAF (date of proposal)

1. In relation to frequency bands 733-736/788-791 MHz discussed under AI 9.1.8, in 2016 CEPT has harmonised the technical conditions for the usage of BB-PPDR within 700 MHz range (see ECC DEC(16)02). This includes among others frequency bands the 733-736/ 788-791 MHz frequency bands. There is no CEPT harmonisation for M2M in 733-736/ 788-791 MHz. Any usage of these bands for M2M is done on national basis. [↑](#footnote-ref-2)
2. In recent ECC Decisions, spectrum has been designated to MFCN (mobile/fixed communications networks), which includes IMT and other communications networks in the mobile and fixed services which would include fixed wireless access but not point-to-point links. [↑](#footnote-ref-3)
3. Low power wide-area networks or LPWAN is a type of wireless telecommunication wide area network designed to allow long range communications at a low bit rate with connected objects (e.g. sensors) operated on a battery. LPWAN technologies could operate under SRDs regime, as well as under individual authorization regime in MFCN addressing M2M/IoT. [↑](#footnote-ref-4)
4. Speakers from a variety of sectors made clear that building, home automation, smart metering, intelligent transport systems, and wireless industrial sectors will be key areas when it comes to M2M/IoT in PMR/PAMR. Even new market sectors could be developed by M2M/IoT applications such as remote healthcare and smart agriculture. With this in mind, extra high voltage and high voltage smart grids will require enhanced communications and resilient systems. A low voltage smart grid could be appropriate for licence-exempt M2M/IoT spectrum [↑](#footnote-ref-5)