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| U.S. Radiocommunications Sector  Fact Sheet | |
| **Working Party:** ITU-R WP1A | **Document No:** USWP1A-04 |
| **Ref:** Recommendation ITU-R SM.2110-1 | **Date:** 17 April 2023 |
| Document Title: Proposed preliminary draft revision to Recommendation ITU-R SM.2110-1 | |
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| **Purpose/Objective:** Add frequency range of 22-25 kHz for heavy-duty WPT-EV applications based on studies and a technical information report (TIR) SAE J2954/2 released in 2022. | |
| **Abstract:** The SAE J2954 taskforce has studied wireless power for electric vehicles (WPT-EV) for more than a decade. In 2016, the SAE J2954 taskforce made a world-wide recommendation for a nominal frequency of 85 kHz for light-duty WPT-EV applications (i.e., 79-90 kHz as now indicated in Recommendation ITU-R SM.2110-1), which was codified into the SAE J2954 Standard when it was released in 2020. Furthermore, the SAE J2954 committee indicated in that same 2016 recommendation that the frequency band of 21.05 kHz – 38.10 kHz could also be considered for future heavy-duty applications.  Most recently the SAE J2954 committee has studied heavy-duty applications in more depth and released a Technical Information Report (TIR) titled, [SAE J2954/2, Wireless Power Transfer for Heavy-Duty Electric Vehicles](https://www.sae.org/standards/content/j2954/2_202212/) in December, 2022. This report includes important technical information about wireless power transfer for heavy-duty vehicle applications. Specifically, it notes that two bands of frequencies are considered for heavy-duty wireless power depending on specific field applications. The frequency ranges are 79-90 kHz (same as light-duty) and 22-25 kHz (specific to some heavy-duty applications).  The SAE J2954 EMC sub-committee has noted some regional concerns with the existing frequency range of 19-21 kHz presently specified in Recommendation ITU-R SM.2110-1 since this band is designated for SFTS (although no known operational signal is active) and that the third harmonic of this band falls within active SFTS 60 kHz broadcasts in the United States, and which also may be used in other regions. Accordingly, the SAE J2954 taskforce is proposing to add the band 22-25 kHz to Recommendation ITU-R SM.2110-1. | |

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| **Radiocommunication Study Groups** | Logo  Description automatically generated |
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| Proposed Preliminary Draft Revision to Recommendation ITU-R SM.2110-1 | |
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Background

[Recommendation ITU-R SM.2110-1](https://www.itu.int/rec/R-REC-SM.2110-1-201910-I/en), *Guidance on frequency ranges for operation of non-beam wireless power transmission for electric vehicles* was published in 2019. Since being published, various standards development organizations (SDOs) have finalized and published WPT-EV standards that were referenced as preliminary in Recommendation ITU-R SM.2110. The WPT-EV SDOs have also continued to develop reports and technical information related to WPT-EV for heavy-duty and industrial applications.

Discussion

The United States of America has reviewed Recommendation ITU-R SM.2110-1 in preparation for the May / June 2023 WP1A meeting and notes that several parts of the Recommendation are out of date and therefore should be updated with the latest information. Additionally, there has been some concerns raised by WP7A in relation to the use of the 19-21 kHz band, which overlaps with an SFTS allocation as does its third harmonic around 60 kHz. The 60 kHz band is used in some countries, such as the United States of America for active SFTS operation. The SAE J2954 SDO referenced in Recommendation ITU-R SM.2110 recently released a Technical Information Report (TIR), SAE J2954/2 that identifies 22-25 kHz as a viable alternative frequency band based on magnetic resonance for some heavy-duty WPT-EV applications.

Proposal

The United States proposes creating a preliminary draft revision of ITU-R Recommendation ITU-R SM.2110-1 that includes editorial updates to Recommendation ITU-R SM.2110-1 and adding the band 22-25 kHz to Table 1 in the Recommendation.

**Attachment:** Proposed Preliminary Draft Revision to Recommendation ITU-R SM.2110-1

Attachment

Preliminary Draft Revision to RECOMMENDATION ITU-R SM.2110-1

Guidance on frequency ranges for operation of non-beam   
wireless power transmission for electric vehicles

(2017-2019)

Scope

This Recommendation provides guidelines for the use of frequency ranges for the operation of non-beam wireless power transmission (WPT) for electric vehicles.

Keywords

Wireless power transmission, short-range devices, ISM, non-beam

Abbreviations/Glossary

CISPR In French “Comité International Spécial des Perturbations Radioélectriques”,   
 International Special Committee on Radio Interference

ICNIRP International Commission on Non‑ionizing Radiation Protection

ICES International Committee on Electromagnetic Safety

IEC International Electrotechnical Commission

IEEE Institute of Electrical and Electronics Engineers

ISO International Organization for Standardization

ISM Industrial, scientific, medical

RR Radio Regulations

SAE Society of Automotive Engineers

SFTSS Standard frequency and time signal service

WHO World Health Organization

WPT wireless power transmission

WPT-EV Wireless power transmission for electric vehicles

Related ITU Recommendations, Reports

Recommendation ITU-R SM.1056; Recommendation ITU-R SM.1896; Recommendation ITU-R SM.2129; Report ITU-R SM.2153; Report ITU-R SM.2303; Report ITU‑R SM.2451.

The ITU Radiocommunication Assembly,

considering

*a)* that wireless power transmission (WPT) is defined as the transmission of power from a power source to an electrical load wirelessly using the electromagnetic field;

*b)* that WPT technologies utilize various mechanisms, such as transmission via radio frequency radiated transmissions in the far-field (WPT beams) and near-field inductive, resonant and capacitive coupling (WPT non-beam);

*c)* that such WPT technologies are being considered for applications such as charging of electric vehicles;

*d)* that WPT standards are currently being developed at national, regional, and international levels;

*e)* that industrial alliances, consortia, and academia have investigated several frequency bands for WPT technologies, including; 19‑21 kHz and 55‑65 kHz for the shaped magnetic field in resonance for electric vehicles, 22-25 kHz and 79‑90 kHz for magnetic resonant technology for electric vehicles;

*f)* that for the purpose of WPT studies the standard frequency and time signal and the radio astronomy services are to be treated as radiocommunication service;

*g)* that studies have been conducted on the impact of non-beam WPT to radiocommunication services in the bands 19-21 kHz, 55-57 kHz, 63-65 kHz and 79‑90 kHz;

*h)* that as more WPT devices proliferate globally, the use of WPT technologies may have an impact on radiocommunication services including the standard frequency and time signal service and the radio astronomy service, WPT must not cause harmful interference to radio communication services;

*i)* that to mitigate the impact of WPT devices on the operation of radiocommunication services some solutions utilize frequency bands designated for industrial, scientific, medical (ISM) applications,

recognizing

*a)* that WPT is not a radiocommunication service and has no status in the Radio Regulations (RR), but may be regarded as subject to RR Nos **15.12** or **15.13** as the case may be;

*b)* that the criteria to protect various radiocommunication services from harmful interference are specified in existing ITU-R Recommendations;

*c)* that both consumers and manufacturers may benefit from harmonized frequency ranges and technical conditions WPT technologies;

*d)* that some Administrations classify the non-beam WPT energy transfer as an ISM application, even for operation outside bands designated for ISM use;

*e)* that some Administrations classify non-beam WPT systems as radio application such as short-range devices;

*f)* that some non-ISM bands are taken into consideration for the global or regional harmonized use of specific WPT applications;

*g)* that the WPT energy transfer can be treated separately from data communications, especially when the receiving device receives data communications at a frequency different from that for the energy transfer;

*h)* that in the absence of a load, the WPT-EV does not transmit;

*i)* that for non-beam WPT-EV, the radiated power is much lower than RF power transferred. Most power is transferred to the receiver through mechanisms such as capacitive, resonant and inductive coupling;

*j)* that Recommendation ITU-R SM.1056 on the limitation of radiation from ISM equipment recommends that administrations consider the use of the latest edition of CISPR publication 11. These limits do not necessarily protect radiocommunication services,

noting

*a)* that the IEC TC 69 published IEC International Standard (IS) 61980-1 on general requirement of electric vehicle wireless power transfer systems, is publishing IEC IS 61980-2 on communication and control of electric vehicle wireless power transfer systems in 2023, and published IEC IS 61980-3 on specific requirements for the magnetic field power transfer systems of electric vehicle wireless power transfer systems;

*b)* that the International Organization for Standardization (ISO/TC22/SC37) published ISO International Standard (IS) 19363 on electrically propelled road vehicles – magnetic field wireless power transfer;

*c)* that the Society of Automotive Engineers (SAE) International published SAE J2954, a Standard for wireless power transfer for light-duty electric vehicles;

*d)* that issues of non-ionizing radiation exposure are dealt with by international organizations such as the World Health Organization (WHO), the International Commission on Non‑ionizing Radiation Protection (ICNIRP), the International Electrotechnical Commission TC106, and the International Committee on Electromagnetic Safety (ICES), and that ICNIRP 2010 provides guidelines for limiting exposure (1 Hz to 100 kHz), and ICNIRP 2020 provides Guidelines for limiting exposure (100 kHz to 300 GHz), and IEEE C95.1 provides a Standard for limiting exposure (0 Hz to 300 GHz);

recommends

**1** that the use of the frequency range, or portions thereof, listed in Table 1 below should be considered as guidance for the operation of non-beam WPT-EV systems;

**2** that the following Note is considered as integral part of this Recommendation.

NOTE – Additional guidance can be found in Table 1 on necessary steps that should be taken to ensure that non-beam WPT-EV applications and equipment minimize the potential for harmful interference to radiocommunication services including the standard frequency and time signal service (SFTSS) and the radio astronomy service, so that these remain protected from radio frequency energy emanating from WPT-EV falling into all bands.

TABLE 1

Frequency range for operation of non-beam WPT systems for electric vehicles

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| Frequency range | Suitable non-beam WPT-EV |
| 19-21 kHz | Magnetic induction technology or Magnetic resonant technology |
| 22-25 kHz | Magnetic resonant technology |
| 55-57 kHz(1) | Magnetic induction technology or Magnetic resonant technology |
| 63-65 kHz(1) | Magnetic induction technology or Magnetic resonant technology |
| 79-90 kHz | Magnetic resonant technology |
| (1) Not to be used for the fundamental frequency of WPT-EV. Assuming a minimum separation distance of 50 m between WPT-EV and SFTS receivers, the third harmonic must fall within the 64-65 kHz and 55‑56 kHz frequency range and the WPT emission be limited to 35 dBµA/m at 10 m. Where a separation distance of greater than 100 m between WPT-EV and SFTS receivers can be guaranteed, the third harmonic may fall within the 63-65 kHz and 55‑57 kHz and the WPT emission be limited to 44 dBµA/m at 10 m. | |
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