

Recommendation

ITU-T L.1391 (01/2024)

SERIES L: Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

Energy efficiency, smart energy and green data centres

Specification of IMT-2020 network sharing and co-construction adapting to climate change mitigation

ITU-T L-SERIES RECOMMENDATIONS

Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

OPTICAL FIBRE CABLES	L.100-L.199
Cable structure and characteristics	L.100-L.124
Cable evaluation	L.125-L.149
Guidance and installation technique	L.150-L.199
OPTICAL INFRASTRUCTURES	L.200-L.299
Infrastructure including node elements (except cables)	L.200-L.249
General aspects and network design	L.250-L.299
MAINTENANCE AND OPERATION	L.300-L.399
Optical fibre cable maintenance	L.300-L.329
Infrastructure maintenance	L.330-L.349
Operation support and infrastructure management	L.350-L.379
Disaster management	L.380-L.399
PASSIVE OPTICAL DEVICES	L.400-L.429
MARINIZED TERRESTRIAL CABLES	L.430-L.449
E-WASTE AND CIRCULAR ECONOMY	L.1000-L.1199
POWER FEEDING AND ENERGY STORAGE	L.1200-L.1299
ENERGY EFFICIENCY, SMART ENERGY AND GREEN DATA CENTRES	L.1300-L.1399
ASSESSMENT METHODOLOGIES OF ICTS AND CO2 TRAJECTORIES	L.1400-L.1499
ADAPTATION TO CLIMATE CHANGE	L.1500-L.1599
CIRCULAR AND SUSTAINABLE CITIES AND COMMUNITIES	L.1600-L.1699
LOW COST SUSTAINABLE INFRASTRUCTURE	L.1700-L.1799

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T L.1391

Specification of IMT-2020 network sharing and co-construction adapting to climate change mitigation

Summary

Recommendation ITU-T L.1391 specifies IMT-2020 (also known as 5G) network sharing and co-construction (NSCC) and their contribution to climate change mitigation, identifies their key technologies and specifies how to assess NSCC in their adaptation to climate change. Recommendation ITU-T L.1391 also addresses the cost-benefit analysis and best practice for IMT-2020 NSCC.

Mobile network operators around the world are facing unprecedented difficulties in IMT-2020 deployment. Restricted by expensive spectrum resources, the need for high investment and high energy consumption of IMT-2020, the profit gap between operators and equipment manufacturers is growing, and a large number of problems related to business increment with no increase in revenue are arising. Methods of reduction in the cost of network construction and operation, adaptation to climate change mitigation and enablement of the rapid benefits of IMT-2020, especially in underdeveloped communications regions, present major challenges to the global industry and operators.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T L.1391	2024-01-13	5	11.1002/1000/15768

Keywords

5G, climate change mitigation, co-construction, network sharing, RAN.

* To access the Recommendation, type the URL <https://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents/software copyrights, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the appropriate ITU-T databases available via the ITU-T website at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2024

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Definitions	1
	3.1 Terms defined elsewhere	1
	3.2 Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	2
5	Conventions	3
6	Challenges of IMT-2020 network development.....	3
7	Benefit of IMT-2020 network sharing and co-construction	4
8	Classification of network sharing and co-construction	5
9	Key technologies of IMT-2020 sharing and co-construction.....	5
	9.1 Standard evolution of mobile network sharing and co-construction.....	5
	9.2 Key technologies for IMT-2020 network sharing.....	5
	9.3 IMT-2020 standalone international roaming under core network sharing.....	7
	9.4 Planning and construction	7
	9.5 Regulation and accounting or settlement	8
	9.6 Operation and optimization	8
10	Environmental impact assessment of network sharing and co-construction.....	8
11	The contribution of IMT-2020 network sharing and co-construction to climate change mitigation.....	9
12	Prospect of global mobile communication network sharing and co-construction.....	11
	Appendix I – The practice of IMT-2020 network sharing and co-construction in China	12
	I.1 Global best practice of IMT-2020 network sharing and co-construction in China.....	12
	I.2 Calculation of carbon-reduction by network sharing and co-construction in China Telecom and China Unicom	13
	Bibliography.....	16

Introduction

IMT-2020 (also known as 5G) is the most advanced cellular technology in commercial deployment of our era. While IMT-2020 offers much faster speed, massive connections and much lower latency, and has the potential to enable a much bigger variety of new applications for both people's lives and vertical industries, it does increase the energy consumption of mobile networks.

More importantly, sustainability has risen to the top of the agenda for many industries, including telecommunications. Mobile network operators (MNOs) need to rethink the usage of energy and its impact on the environment, and this will have a profound effect on the way they plan and deploy next generation networks. Thus, collaborative network deployment among devices, sites, networks and even MNOs will become an inevitable trend.

IMT-2020 network sharing and co-construction can effectively improve utilization efficiency of scarce spectrum resources and rapidly establish advanced mobile networks, thus circumventing the aforementioned problems. Via the quick construction of IMT-2020 full coverage networks from cities to counties, towns, and rural areas to realize universal IMT-2020 services and narrow digital gaps, this approach helps more people shake off poverty, pushing forward the UN 2030 agenda for sustainable development goals [b-UN SDG].

Recommendation ITU-T L.1391

Specification of IMT-2020 network sharing and co-construction adapting to climate change mitigation

1 Scope

This Recommendation specifies IMT-2020 (also known as fifth generation (5G)) network sharing and co-construction (NSCC) and their contribution to climate change mitigation, identifies their key technologies and specifies how to assess NSCC in their adaptation to climate change. This Recommendation also addresses the cost-benefit analysis and best practice for IMT-2020 NSCC.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T F.743.15] Recommendation ITU-T F.743.15 (2022), *Requirements for multi-operator core network enabled multimedia services*.
- [ITU-T L.1210] Recommendation ITU L.1210 (2019), *Sustainable power-feeding solutions for 5G networks*.
- [ITU-T L.1410] Recommendation ITU-T L.1410 (2014), *Methodology for environmental life cycle assessments of information and communication technology goods, networks and services*.
- [ITU-T L.1430] Recommendation ITU-T L.1430 (2013), *Methodology for assessment of the environmental impact of information and communication technology greenhouse gas and energy projects*.
- [ETSI ES 203 700] ETSI Standard ETSI ES 203 700 V.1.1.1 (2021), *Environmental engineering (EE); Sustainable power-feeding solutions for 5G network*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 carbon dioxide equivalent; CO_{2e} [b-ISO 14064-1]: Unit for comparing the radiative forcing of a GHG to that of carbon dioxide.

NOTE – The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential.

3.1.2 emission factor [ITU-T L.1430]: A factor linking GHG emissions to a level of activity or a certain quantity of inputs, products or services (e.g., tonnes of fuel consumed or units of a product).

NOTE – An electricity emission factor is commonly expressed as tonnes of CO_{2e} per MWh. For example, an electricity emission factor of 1.3 means 1.3 t CO_{2e} is emitted by consuming 1 MWh of electricity.

3.1.3 environmental impact [ITU-T L.1410]: Impact including positive and negative aspects on the environment.



3.1.4 greenhouse gas; GHG [b-ISO 14064-1]: Gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds.

NOTE 1 – For a list of GHGs, see the latest Intergovernmental Panel on Climate Change (IPCC) Assessment Report.

NOTE 2 – Water vapour and ozone are anthropogenic as well as natural GHGs, but are not included as recognized GHGs due to difficulties, in most cases, in isolating the human-induced component of global warming attributable to their presence in the atmosphere.

NOTE 3 – GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆).

3.1.5 greenhouse gas emission; GHG emission [b-ISO 14064-1]: Release of a GHG into the atmosphere.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 environmental impact assessment: A process of evaluating the positive and negative environmental impacts of a proposed project or development.

3.2.2 network infrastructure: All the active equipment and passive items needed to realize a network.

NOTE 1 – Examples of active equipment are radio access network elements, like antennae, base transceiver stations and radio network controllers.

NOTE 2 – Examples of passive elements of network infrastructure can be: masts; containers; towers; power supply; and air-conditioning equipment.

3.2.3 network sharing and co-construction: A collaborative approach in which multiple individuals or organizations come together to jointly build and share network infrastructure or resources.

NOTE 1 – Network sharing and co-construction involve active participation and contribution of all stakeholders to create and maintain the network, with the aim of achieving common goals and benefiting from shared resources and expertise.

NOTE 2 – The sharing concept is often applied in areas such as telecommunications, transportation, and information technology, where the pooling of resources and knowledge can lead to more efficient and cost-effective solutions.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

4G	fourth Generation
5G	fifth Generation
6G	sixth Generation
AI	Artificial Intelligence
CA	Carrier Aggregation
CAPEX	Capital Expenditure
DSS	Dynamic Spectrum Sharing
EF	Emission Factor
EIA	Environmental Impact Assessment
FAST	Fusion-Assisting Super Time division duplexing