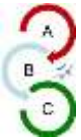

Engineering Management BMEVITMMB03

International Organizations

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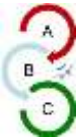
BME Department of Telecommunications and Media Informatics

Content

- Why do we need organizations for co-operations?
- Co-operations in telecommunication
- Concept and aim of standards
- International & European standardization organizations
  - ISO, IEC, ITU, CEN, CENELEC, ETSI
- Stakeholder organizations
  - UN, EC, WTO, OECD
- Technology specific organizations and associations
  - IETF, GSMA & 3GPP, IMSO/INTELSAT/EUTELSAT/INMARSAT, ACM & IEEE
- Radio waves and health: WHO, ICNIRP and myths vs. facts



WHY DO WE NEED ORGANIZATIONS FOR CO-OPERATIONS?

Why are there so many plugs and sockets?

Can we have serious troubles?

SI (Système International)

Railways

Why are there so many plugs and sockets?

- The reason is historical: cross-border compatibility was not at the forefront of needs
  - Small percentage of people were travelling
  - Electric devices were generally not very portable
- **Standardization came too late**
  - World War II put a halt to all discussions and the issue was dropped until the 1950s
- Is there any hope for the future?
  - The IEC issued its International Standard for a universal plug in the 1970s
  - But literally hundreds of millions of plugs and sockets have been installed...

Source: http://www.iec.ch/worldplugs/why_so_many.htm

Can we have serious troubles?

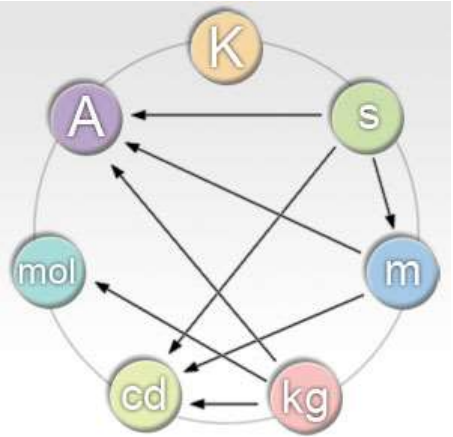
- Metric mishap caused loss of NASA orbiter (1999)
  - "NASA lost a $125 million Mars orbiter because a Lockheed Martin engineering team used English units of measurement while the agency's team used the more conventional metric system for a key spacecraft operation, according to a review finding released Thursday.“

Traditions do not mean global compatibility

Source: http://edition.cnn.com/TECH/space/9909/30/mars.metric.02/

SI (International System of Units, Système international)

- The modern form of the metric system, and is the most widely used system of measurement
  - It comprises a coherent system of units of measurement built on seven base units (ampere, kelvin, second, meter, kilogram, candela, mole) and a set of twenty decimal prefixes to the unit names and unit symbols that may be used when specifying multiples and fractions of the units
  - The system also specifies names for 22 derived units for other common physical quantities like lumen, watt, etc.



The SI base units and their interdependency

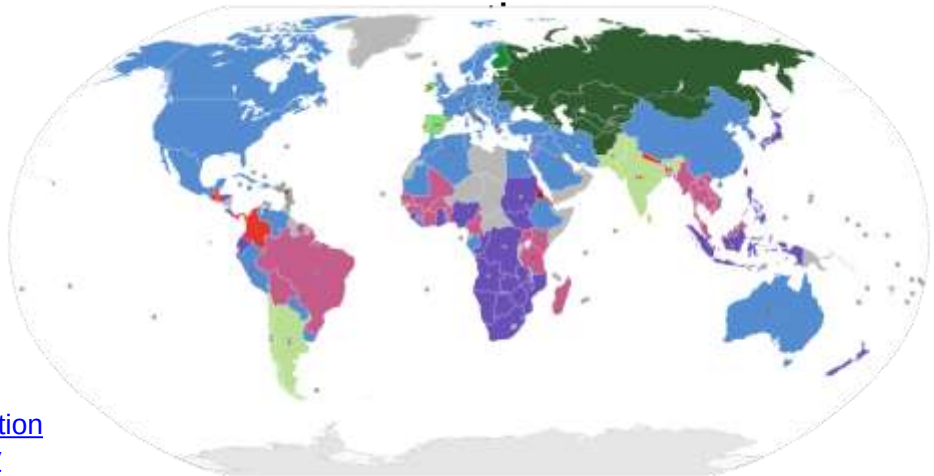
Symbol	*Name*	*Quantity*
A	ampere	electric current
K	kelvin	temperature
s	second	time
m	meter	length
kg	kilogram	mass
cd	candela	luminous intensity
mol	mole	amount of substance

Source:
https://en.wikipedia.org/wiki/International_System_of_Units
http://www.iec.ch/si

Railways

- Two foot, 600 mm
- 750 mm, Bosnian, Two foot six inch, 800 mm
- Swedish three foot, 900 mm, Three foot
- Meter
- Three foot six inch
- Four foot six inch
- **Standard (1435mm)**
- 1520 mm, Five foot
- Five foot three inch
- Iberian
- Five foot six inch
- Six foot, Brunel

- International Union of Railways (UIC) founded in 1922
  - Harmonize and improve conditions for railway constructions and



Source: https://uic.org/1922-UIC-a-long-life-organisation
https://en.wikipedia.org/wiki/Standard-gauge_railway

CO-OPERATIONS IN TELECOMMUNICATION

The role of international co-operation

Types of international co-operation

The role of international co-operation (1/2)

- In the telecommunications the **international co-operations** play **essential, dominant role** since agreement is needed in many areas
  - Network connectivity, setup connection
  - Service interworking (e.g., roaming, local break out)
  - Technical compatibility (e.g., multi-vendor networks)
  - Harmonization of the use of resources
    - Radio spectrum, satellite positions, transmission capacities
    - Numbers, e.g., country code (USA: 1, HU: 36, Serbia: 381, Croatia: 385)
    - Names, e.g., .hu, .eu
  - Tariff accounting
  - Quality partitioning, etc.

The role of international co-operation (2/2)

- Because of **liberalization and convergence,** the followings become more **complex**:
  - Many service providers even within a country (monopoly / incumbents → oligopoly market / pure competition)
  - Mobile virtual network operators (MVNOs)
  - Mobile number portability (MNP)
  - Networked interworking of computers
  - Compatibility of applications (versions)
  - Uniformity, security of business transactions (electronic signature)
  - Globalization: more and more organizations, etc.

Types of international co-operation (1/2)

- **Agreements, memorandum of understandings (MoU), contracts** (in given topics)
  - Special international co-operations of service providers
  - Bi/multilateral telecom agreements of countries, etc.
- **Standards, recommendations** (de facto / de jure)
  - Telecom standardization organizations
  - Internet standardization organizations
- **Agreements, regulations** (general, governmental, legal relevance)
  - Telecom specific world and regional organizations
  - Telecom ”sections” of international organizations

Main focus in this presentation

Types of international co-operation (2/2)

- The **competence** of the several international agreements, standards and regulations **are different**
  - They must be built into the law of each country depending on their content and the kind of agreement
- A standard **is not obligatory**, rather it is a self-imposed obligation to observe the rules
  - In multiple market player environment, it is also an economic interest
- The standards or their parts **can become obligatory by legal regulation** (inserting to a law)
  - Note: standards are **not just for compatibility, but for expected quality**!

CONCEPT AND AIM OF STANDARDS

Aim of standardization

The concept of standard (ISO/IEC)

Standards organization

Aim of standardization

- In order to **simplify the trade and technology exchange**
  - fitting and ability for interoperability of products and services;
  - more effective production, distribution and maintenance;
  - better product quality, unified testing methods.
- **Reaching consensus** (in technical solution, process, etc.) **among the players of the economy** (vendors, service providers, users, governments, etc.)
- The world/European level standard products and services mean **safety and guarantee** to the users in the world and Europe

The concept of standard (ISO/IEC)

- A standard is created or approved by a **certified organization**,
- **accepted by public consensus of subject matter experts,**
- such a **technical document**,
- which refers to **activities** or their **results** and
- consists of such **rules, instructions** and **attributes**,
- which can be utilized **generally** and **repeatedly**,
- by its use, the **ordering effect** is the **most favorable** within given circumstances.

Standards organization

- Such a **standards body**, which is
- recognized at **national, regional or international level**, and
- its main activity is the **development and acceptance of standards** available to the community.

INTERNATIONAL & EUROPEAN STANDARDIZATION ORGANIZATIONS

International organizations

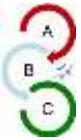
European organizations

ISO, IEC, ITU

CEN, CENELEC, ETSI

Development and types of European standards

International organizations



Focus

- **ISO: International Standardization Organization**
  - Universal standardization organization (founded in 1947), except electricity, electronics
- **IEC: International Electrotechnical Commission**
  - Standardization organization for electricity and electronics (founded in 1906)
- **ITU: International Telecommunication Union**
  - Founded in 1865 as the International Telegraph Union, took its present name in 1934, and in 1947 became a specialized agency of the United Nations
  - ITU-T: Telecommunications Standardization Sector of ITU
  - ITU-R: Radiocommunication Sector of ITU
  - ITU-D: Telecommunication Development Sector of ITU

Time

European organizations

- **CEN: Comité Européen de Normalisation**
  - European Committee for Standardization
  - The European equivalent of ISO (founded in 1961)
- **CENELEC: Comité Européen de Normalisation Electro-technique**
  - European Committee for Electrotechnical Standardization
  - The European equivalent of IEC (founded in 1973)
- **ETSI: European Telecommunication Standards Institute**
  - The European equivalent of ITU-T (founded in 1988)

Focus

Time (reverse of int. orgs.)

ISO: International Standardization Organization

- ISO is an **independent, non-governmental** international organization founded in 1947
- Members from 162 national standards bodies and 780 technical committees and subcommittees
- More than 135 people work full time for ISO's Central Secretariat in Geneva, Switzerland
- ISO has published 22136 International Standards and related documents, **covering almost every industry, from technology, to food safety, to agriculture and healthcare**
- ISO International Standards impact everyone, everywhere

ISOFIX security
Source: Tetris L

ISO 9001 Quality Management
Source: TÜV

IEC: International Electrotechnical Commission

- IEC is a **not-for-profit, quasi-governmental organization**, founded in 1906, based in Geneva, Switzerland
- The IEC's members are National Committees (from 86 countries)
  - Experts and delegates coming from industry, government bodies, associations and academia
- **Recognized by World Trade Organization (WTO)**
  - Entrusted for **monitoring organizations** agreeing to use IEC's international standards as the basis for national or regional standards as part of the **WTO's Technical Barriers to Trade Agreement**

IEC 600086 Battery numbering
Source: Wikipedia

Decimal	SI	Binary	IEC
1000	k kilo	1024	Ki kibi
1000^2	M mega	1024^2	Mi mebi
1000^3	G giga	1024^3	Gi gibi
1000^4	T tera	1024^4	Ti tebi
1000^5	P peta	1024^5	Pi pebi
1000^6	E exa	1024^6	Ei exbi
1000^7	Z zetta	1024^7	Zi zebi
1000^8	Y yotta	1024^8	Yi yobi

ITU: International Telecommunication Union (1/7)

- ITU was founded in 1865 as the **International Telegraph Union**
  - Took its present name in 1934, being an overall telecom world organization
- ITU became the **United Nations specialized agency for information and communication technologies (ICTs)** in 1947, based in Geneva, Switzerland
- Mission is to **achieve the best practical solutions for integrating new technologies as they develop, and to spread their benefits to all**
- Works
  - **3 sectors: standardization (T), radiocommunication (R), development (D)**
  - Members: states (administrations), service providers, vendors, etc.
  - Governing documents: Constitution, Convention, Decisions, **Recommendations**, Position papers (Opinions)

ITU: International Telecommunication Union (2/7)

- **Telecommunication Standardization Sector (ITU-T)**
  - Standards are critical to the interoperability of ICTs, i.e., ICT networks and devices are speaking the same language
  - Standardization work is carried out by the technical Study Groups (SGs)
    - SG2 - Operational aspects
    - SG3 - Economic and policy issues
    - SG5 - Environment and climate change
    - SG9 - Broadband cable and TV
    - SG11 - Protocols and test specifications
    - SG12 - Performance, QoS and QoE
    - SG13 - Future networks
    - SG15 - Transport and access
    - SG16 - Multimedia
    - SG17 – Security
    - SG20 - IoT, smart cities & communities
  - **Recommendations = international standards**: Networks (fiber/SDH, xDSL, IP, mobile, data, CATV…), switching, signaling, multimedia, telecom software, numbering, quality requirements (QoS), traffic sizing, tariff accounting, terminology, etc.

ITU: International Telecommunication Union (3/7)

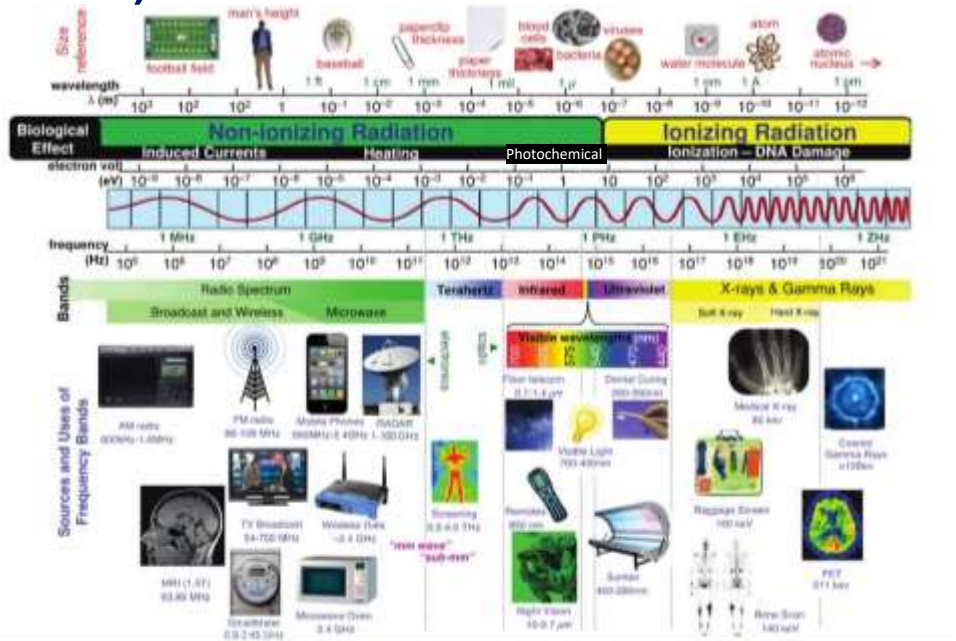
- **Radiocommunication Sector (ITU-R)**
  - Vital role in the **global management of the radio-frequency spectrum and satellite orbits** that ensure safety of life on land, at sea and in the skies
    - Limited natural resources which are increasingly in demand
  - Ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services
  - Carry out studies and approve **Recommendations on radiocommunication matters**
  - **World Radiocommunication Conferences (WRC)** are held every three to four years to **review, and, if necessary, revise the Radio Regulations**
    - Last: WRC-19, Next: WRC-23

ITU: International Telecommunication Union (4/7)

- **Radiocommunication Sector (ITU-R) /cont'd/**

Band	Abbr.	Frequency	Wavelength
4	VLF	3 kHz – 30 kHz	10 km – 100 km
5	LF	30 kHz – 300 kHz	1 km – 10 km
6	MF	300 MHz – 3000 MHz	100 m – 1000 m
7	HF	3 MHz – 30 MHz	10 m – 100 m
8	VHF	30 MHz – 300 MHz	1 m – 10 m
9	UHF	300 MHz – 3000 MHz	10 cm – 100 cm
10	SHF	3 GHz – 30 GHz	1 cm – 10 cm
11	EHF	30 GHz – 300 GHz	1 mm – 10 mm
12	THF	300 GHz – 3000 GHz	0.1 mm – 1 mm

Table of ITU radio bands

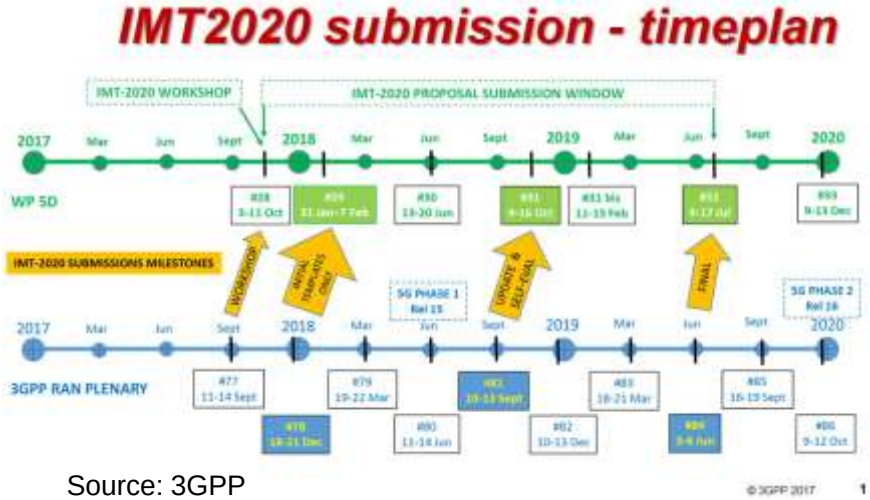


Graphic courtesy of Jerrold Bushberg. Reproduced with permission from The Essential Physics of Medical Imaging, 3rd edition, by Jerrold Bushberg et al. © Lippincott Williams & Wilkins, 2012.

ITU: International Telecommunication Union (5/7)

- **ITU-T and ITU-R example: IMT 2020**
  - ITU-T SG 13 – including International Mobile Telecommunications (IMT) systems, recently IMT 2020 and beyond
  - ITU-R SG5 – Working Party 5D (WP 5D) responsible for overall radio system aspects

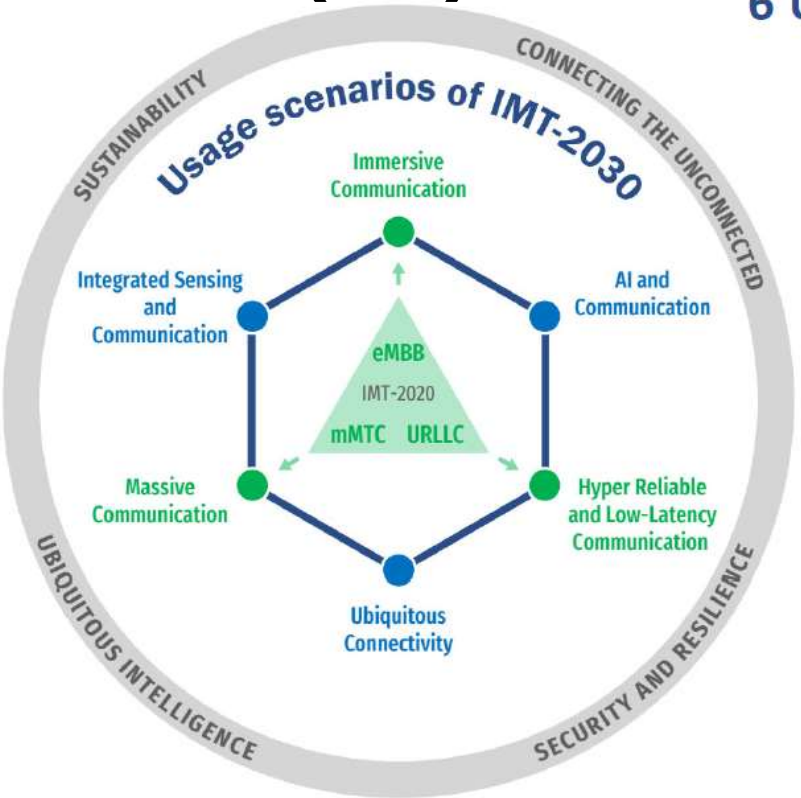
Source: ITU & Ella Harper



Source: 3GPP

ITU: International Telecommunication Union (6/7)

Source: ITU draft recommendation for IMT-2030



So called "Wheel diagram"

6 Usage scenarios

Extension from IMT-2020 (5G)

- eMBB ➡ Immersive Communication
- mMTC ➡ Massive Communication
- URLLC ➡ HRLLC (Hyper Reliable & Low-Latency Communication)

New

- Ubiquitous Connectivity
- AI and Communication
- Integrated Sensing and Communication

4 Overarching aspects:

act as design principles commonly applicable to all usage scenarios

Sustainability, Connecting the unconnected, Ubiquitous intelligence, Security/resilience

ITU: International Telecommunication Union (7/7)

- **Telecommunication Development Sector (ITU-D)**
  - **Foster international cooperation** on telecommunication and ICT development issues
  - **Foster an enabling environment** for ICT development and foster the development of telecommunication and ICT networks
  - **Enhance confidence and security** in the use of telecommunication and ICTs
  - Build human and institutional capacity, provide data and statistics, promote digital inclusion and **provide concentrated assistance to countries in special need**
  - **Enhance environmental protection, climate change adaptation and mitigation and disaster-management efforts through telecommunication and ICTs**

CEN: Comité Européen de Normalisation

- Association that brings together the **national standardization bodies** of 34 European countries (founded in 1961, based in Brussels, Belgium)
- **Officially recognized by the European Union and by the European Free Trade Association (EFTA)** as being responsible for developing and defining voluntary standards at European level
- **CEN provides a platform for the development of European Standards (EN)** and other technical documents in relation to various kinds of products, materials, services and processes (note: **EN ≠ EU standard**)

EN 71: Safety of toys
EN 71-1: Mechanical and physical properties
EN 71-2: Flammability
EN 71-3: Specification for migration of certain elements
…
EN 71-6: Graphical symbols for age warning labelling
…
EN 71-11: Organic chemical compounds – Methods of analysis
…

CENELEC: Comité Européen de Normalisation Electro-technique

- CENELEC is a **non-profit technical organization** founded in 1973, based in Brussels, Belgium
- Responsible for standardization in the electrotechnical engineering field
  - Prepares **voluntary standards**, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a **Single European Market**
  - Must be implemented in all CENELEC member countries, who must also withdraw any conflicting standard
- Creates market access at European level but also at international level, adopting international standards wherever possible, through its **close collaboration with the International Electrotechnical Commission (IEC)**

ETSI: European Telecommunication Standards Institute (1/2)

- ETSI is a **not-for-profit organization** with more than 800 member organizations worldwide, drawn from 66 countries and five continents (founded in 1988, based in Sophia-Antipolis, France)
  - **Members include the world's leading companies and innovative R&D organizations (national standards bodies, state administrations, service providers, vendors, research institutes, etc.)**
  - Condition of membership: official acceptance of ETSI standards
- Standardization work is carried out in **committees**
  - Members are technical experts from our member companies and organizations
  - Meet typically between two and six times a year

ETSI: European Telecommunication Standards Institute (2/2)

- ETSI's **standards-making process is based on consensus**
  - Only when consensus cannot be achieved is a vote conducted in a TC
    - Votes are considered to be successful if at least 71% of the weighted votes cast are in favour of the draft
  - **ETSI ES (ETSI Standard)**: accepted by the members
  - **ETSI EN (European Standard)**: requires national vote, because accepted EN must be inserted to the system of national standards exclusively and without any modification
- The **greatest success** of the European infocommunication standardization is the **GSM standard**
- **ETSI Partnership Project:** established to co-operate with other organizations, e.g., **Third Generation Partnership Project (3GPP™)**

Types of European standards (1/2)

- European standards are ratified standard documents by any of CEN, CENELEC or ETSI
  - Harmonized Standards is a special standard based on the request of the European Commission, and must be implemented in EU member countries

- **European Standard - EN**:
  - Obligatory implementation without any modification (as identical national standards)
  - Withdrawal of any conflicting national standard is a must

Types of European standards (2/2)

- **Harmonization Document (HD):** is a normative document
  - Normative document, however, still having national alternatives, so does not mean a uniform European standard
  - The elaboration of a HD includes a public enquiry, followed by an approval by weighted vote of national members and final ratification
  - HD is announced at national level and every conflicting national standard is withdrawn
  - A HD does not conflict with any other EN and HD and is periodically reviewed

STAKEHOLDER ORGANIZATIONS

United Nations

EC - European Commission

WTO - World Trade Organization

OECD - Organization for Economic Co-operation and Development

United Nations

- The United Nations is an international organization founded in 1945, based in New York City, USA
  - It is currently made up of 193 Member States (Hungary could join in 1955)
  - Further main offices are situated in Geneva, Nairobi, and Vienna
- Objectives
  - **Peacekeeping and security**
  - **Human rights**
  - **Economic development and humanitarian assistance**
- Telecom aspects
  - **Special agreement recognizing ITU as a UN specialized agency**

EC - European Commission

- In 1957, the Treaty of Rome creates the European Economic Community (EEC), or ‘Common Market’
- European Commission is **the permanent decision preparatory organ of the EU with 27 member countries** (27 commissioners, 53 departments and executive agencies), based in Brussels and Luxemburg
- The **EC can declare the application of given standards obligatory**, such as **GSM and DVB-H** (Digital Video Broadcasting for handheld)

WTO - World Trade Organization

- WTO is an **intergovernmental organization (with 164 members) that regulates international trade, based in Geneva, Switzerland**
  - WTO officially commenced on 1 January 1995, replacing the General Agreement on Tariffs and Trade (GATT), which commenced in 1947
  - WTO supports the creation of discrimination free trade
  - General Agreement on Trade in Services (GATS) – landmark achievement
    - The agreement was extended to the liberalized telecom services as well
- **IEC is recognized by World Trade Organization (WTO)**
  - Entrusted for monitoring organizations agreeing to use IEC's international standards as the basis for national or regional standards as part of the WTO's Technical Barriers to Trade Agreement

OECD - Organization for Economic operation and Development

- OECD is an **intergovernmental economic organization** with 35 member countries (Hungary is a member from 1996), founded in 1961 to stimulate economic progress and world trade, based in Paris
- **Consultative institution**, producing analyses, studies, yearly status reports and other brochures
  - E.g., Gross domestic spending on R&D: http://www.oecd.org/sti/msti.htm
- OECD uses its wealth of information on a broad range of topics to
  - Help governments foster prosperity and fight poverty through economic growth and financial stability
  - Help ensure the environmental implications of economic and social development are taken into account

TECHNOLOGY SPECIFIC ORGANIZATIONS AND ASSOCIATIONS

Internet: IETF

Mobile communication organizations: GSMA & 3GPP

Satellite organizations

Associations for technical professionals: ACM & IEEE

Internet

IETF - Internet Engineering Task Force (1/2)

- **IETF is a large open international community** for the evolution of the Internet architecture and the smooth operation of the Internet, founded in 1986, based in Fremont, USA
  - **Open to any** individual, network designers, operators, vendors, and researchers
  - **Voluntary technical work in working groups (WG)** organized by topic into several areas (e.g., routing, transport, security, etc.)
  - Collaboration mostly via mailing lists, meetings three times per year
- **Example Internet standards**
  - IP (STD 5, RFC 791), UDP (STD 6, RFC 768), TCP (STD 7, RFC 793), TELNET, ...
  - JavaScript Object Notation (JSON) Data Interchange Format (STD 90, RFC 8259)

Internet

IETF - Internet Engineering Task Force (2/2)

- **Internet standard process a multi-step approval process**
  1. **Internet-Drafts** are working documents
     - During the development of a specification, draft versions are made available for informal review and comment by placing them in the IETF's Internet-Draft format
  2. **RFCs (Request For Comment)** to document methods, behaviors, research, or innovations applicable to the Internet
     - If an RFC is part of a proposal that is on the Standards Track, then at the first stage, the standard is proposed and subsequently organizations decide whether to implement this Proposed Standard (can be a concatenation of more than one RFC)
  3. **Proposed Standard**
     - After the criteria in RFC 6410 is met (two separate implementations, widespread use, no errata etc.), the RFC can advance to Internet Standard
     - Note: the intermediary step called Draft Standard was discontinued in 2011
  4. **Internet Standard**

Mobile com. organizations (1/5)

GSM Association (GSMA)

- **Originally European trade body** that represents the **interests of mobile network operators worldwide**
  - Approximately 800 mobile operators are full GSMA members and a further 300 companies in the broader mobile ecosystem are associate members
  - Events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series conferences
- Main activities include programs and services, e.g.,
  - **TAC (Type Allocation Code) Allocation** only by the GSMA through their appointed reporting bodies
    - Device brand owners and manufacturers need TAC to create the first 8 digits of the International Mobile Equipment Identity (IMEI), the number that identifies each unique mobile device on all GSM networks

Mobile com. organizations (2/5)

3rd Generation Partnership Project (3GPP) (1/4)

- **3GPP unites telecommunications standard development organizations** (ARIB[1], ATIS[2], CCSA[3], **ETSI**[4], TSDSI[5], TTA[6], TTC[1]), known as “Organizational Partners”, created in 1998, based in Sophia Antipolis, France
  - More than 600 company members
  - Stable environment to produce the **Reports and Specifications** defining **cellular telecommunications network technologies**, including
    - Radio access, core transport network, and service capabilities (including codecs, security, QoS)
    - Hooks for non-radio access to the core network, and for interworking with Wi-Fi networks
- 3GPP specifications and studies are contribution-driven, by member companies, in Working Groups (WG) and at the **Technical Specification Group (TSG)** level

1 Japan, 2 USA, 3 China, 4 Europe, 5 India, 6 Korea

Mobile com. organizations (3/5)

3rd Generation Partnership Project (3GPP) (2/4)

- The three Technical Specification Groups (TSG) in 3GPP
  1. **Radio Access Networks (RAN)**

3GPP Release	Dátum	Részletek
Release 99	2000	3G UMTS
Release 4	2001	UMTS all-IP core
Release 5	2002	IMS és HSDPA
Release 6	2004	HSUPA, IMS+
Release 7	2007	HSPA+
Release 8	2008	LTE
Release 9	2009	LTE UMTS interoperation
Release 10	2011	LTE-Advanced
Release 11	2012	Hetnet, CoMP
Release 12	2015	Carrier aggregation
Release 13	2016	LTE-U, LTE-LAA, LTE-M
Release 14	2017	CUPS (i.e., CP/UP split)
Release 15	2018	5G Phase 1
Release 16	2020	5G Phase 2 (URLLC)
Release 17	2022	5G Enhancements
Release 18	2023 (?)	5G-Advanced

Mobile com. organizations (4/5)

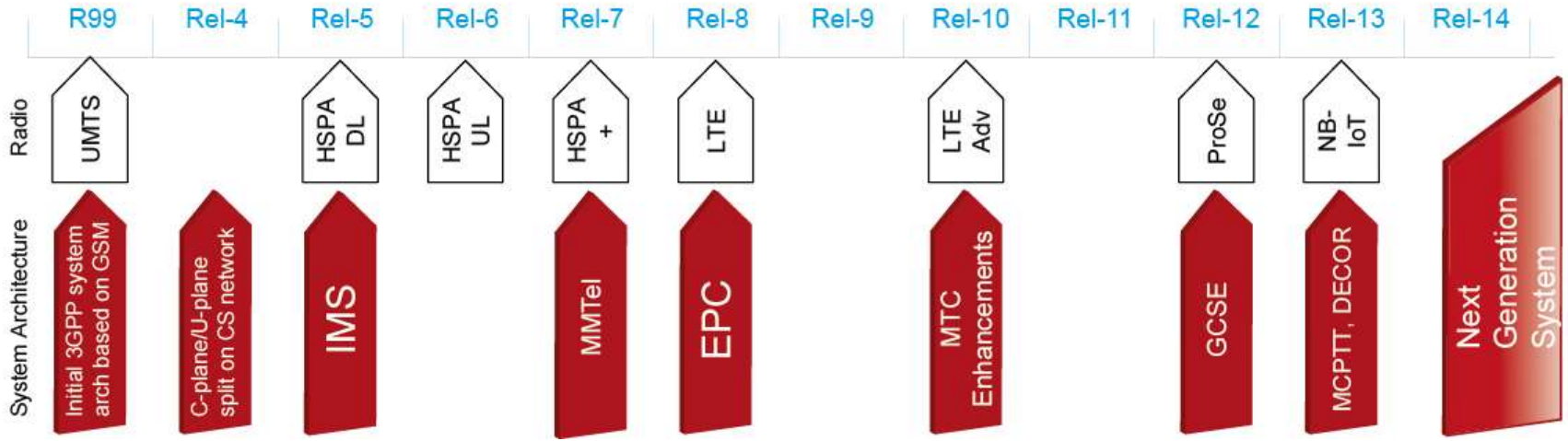
3rd Generation Partnership Project (3GPP) (3/4)

- The three Technical Specification Groups (TSG) in 3GPP
  2. **Services & Systems Aspects (SA)**
     - Definition, evolution and maintenance of the **overall system architecture** including the assignment of functions to particular subsystems (UTRAN, GERAN, CN, terminal, SIM/USIM), identification of key information flows and definition of required bearers and services offered by these different subsystems
     - Development of a framework for **services, service capabilities, service architecture, charging and consideration** of need for “default” services and/or applications
     - Definition of a **security** framework and review of security aspects of overall system
     - Management of work items including assignment of tasks to other TSGs and monitoring of progress

Mobile com. organizations (5/5)

3rd Generation Partnership Project (3GPP) (4/4)

- The three Technical Specification Groups (TSG) in 3GPP
  - **3. Core Network & Terminals (CT)**



IMS: IP Multimedia Subsystem
Packet Core
MTC: Machine-type communication
MCPTT: Mission Critical Push to Talk

MMTel: Multimedia Telephony

GCSE: Group Communication System Enablers
Dedor: Dedicated Core Network

EPC: Evolved

ProSe: Proximity-based services

Releases

‘99: 2000
‘04: 2001
’05: 2002
‘06: 2004
‘07: 2007
‘08: 2008
‘09: 2009
‘10: 2011
’11: 2012
’12: 2015
‘13: 2016
‘14: 2017
‘15: 2018
‘16: 2020
’17: 2022
’18: 2023

Satellite organizations

A complex history of organizations

>100 members of IMSO

a) International Telecommunications Satellite Organization (ITSO/ INTELSAT)

- An intergovernmental consortium for communications satellites providing international broadcast services between 1964 and 2001, then it was privatized as Intelsat Ltd.

b) European Telecommunications Satellite Organization (Eutelsat)

- An intergovernmental organization to develop and operate a satellite-based telecom infrastructure for Europe between 1977 and 2001, then it was transferred to Eutelsat S.A.

c) International Maritime Satellite Organization (INMARSAT)

- A non-profit intergovernmental organization between 1979 and 1999, after that INMARSAT's operational unit was separated as Inmarsat Ltd.

d) International Mobile Satellite Organization (IMSO) established in 1999 as successor of INMARSAT as the **intergovernmental regulatory body for satellite communications**

- Primary purpose is the oversight of certain public satellite safety and security communication services provided by mobile satellite communication systems

Associations for technical professionals 1/3

Association for Computing Machinery (ACM)

- **ACM is an international learned society for computing**
  - The world's largest scientific and educational computing society, founded in 1947
  - A not-for-profit professional membership group based in New York City, USA
  - Its membership is more than 100,000
- Organized into over 171 local chapters and 37 **Special Interest Groups (SIGs)**, having more than 500 college and university chapters
  - Such as SIGGRAPH (computer graphics), SIGPLAN (programming languages), and SIGCOMM (data communication), sponsor regular conferences
  - ACM publishes over 50 journals including the prestigious Journal of the ACM
    - E.g., joint with IEEE: IEEE/ACM Transactions on Networking (TON)

Associations for technical professionals 2/3

Institute of Electrical and Electronics Engineers (IEEE) (1/2)

- **IEEE is a professional association**
  - The world's largest association of technical professionals with more than 420,000 members in over 160 countries around the world founded in 1963
  - Core purpose is to foster technological innovation and excellence for the benefit of humanity, based in New York City and Piscataway, USA
- Various **technical areas** are addressed by IEEE's 39 **societies** providing specialized publications, conferences, business networking and services
  - Societies include Computer, Communications, Signal Processing among many
  - IEEE produces over 30% of the world's literature in the electrical and electronics engineering and computer science fields, publishing well over 100 peer-reviewed journals

Associations for technical professionals 3/3

Institute of Electrical and Electronics Engineers (IEEE) (2/2)

- **IEEE standardization activities**
  - With an active portfolio of nearly 1,300 standards and projects under development, IEEE is a leading developer of industry standards
  - One of the more notable are the IEEE 802 LAN/MAN group of standards, with the widely used computer networking standards for both wired (Ethernet, aka IEEE 802.3) and wireless (**IEEE 802.11** and IEEE 802.16) networks
    - **Wi-Fi** is a technology for wireless local area networking with devices based on the IEEE 802.11 standards, is a trademark of the Wi-Fi Alliance, which restricts the use of the term Wi-Fi Certified to products that successfully complete interoperability certification testing
  - IEEE 1284: parallel port
  - IEEE 1394: serial bus – "FireWire", "i.Link"

RADIO WAVES AND HEALTH

World Health Organization (WHO)

International Commission on Non-Ionizing Radiation Protection (ICNIRP)

including some myths and facts

WHO

Source: https://www.who.int https://en.wikipedia.org/wiki/World_Health_Organization#Membership

- World Health Organization (**WHO**) is a specialized agency of the United Nations (**UN**) responsible for international public health
  - Headquarter: Geneva, Switzerland
  - Founded: 7th April 1948, which is commemorated as World Health Day
  - Members: 194 country

ICNIRP

Source: https://www.icnirp.org https://en.wikipedia.org/wiki/International_Commission_on_Non-Ionizing_Radiation_Protection

- **International Commission on Non-Ionizing Radiation Protection (ICNIRP)** is an international commission specialized in non-ionizing radiation protection
  - Its main activities include determining exposure limits for electromagnetic fields used by devices such as cellular phones
- Formally recognized by the World Health Organization (WHO) and the International Labour Office (ILO) and European Union (EU)
  - ICNIRP is an independent nonprofit scientific organization
  - Founded: 1992

Source: https://www.who.int

WHO fact sheets

World Health Organization

- Mobile phones
  - Fact sheet 193: „A large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, **no adverse health effects** have been established as being caused by mobile phone use.”

- Base stations
  - Fact sheet 304: „Considering the very low exposure levels and research results collected to date, there is **no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects**.”

Dare to ask, be smart!

Facts with completely bad interpretation

Water can be chemically synthetized by burning rocket fuel

The leading cause of drowning

100% of all serial killers and drug dealers have admitted to drinking water

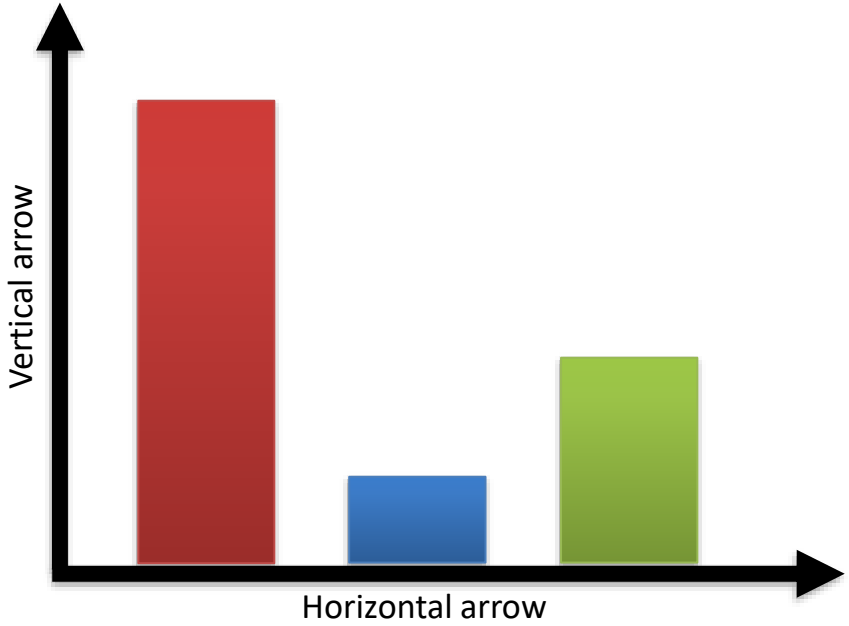
One of the primary ingredients in herbicides and pesticides

Overconsumption can cause excessive sweating, urination and even death

100% of all people exposed to water will die

Dare to ask, be smart!

Having a nice graph does not prove anything itself



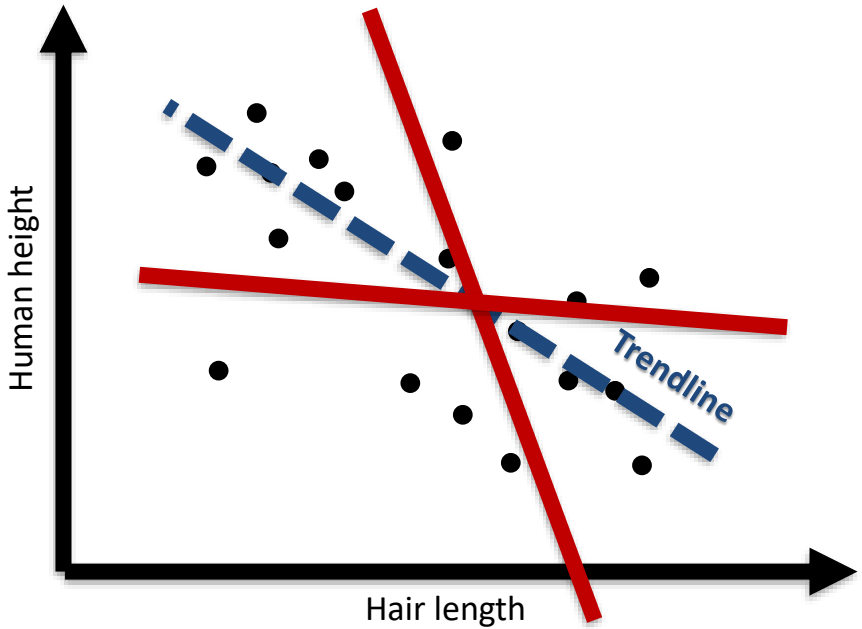
Large red bar

Small blue bar, smaller than red and green, as well

Middle sized green bar, roughly the half of the red one

Dare to ask, be smart!

Aware of conditional probability is a key factor when drawing conclusions

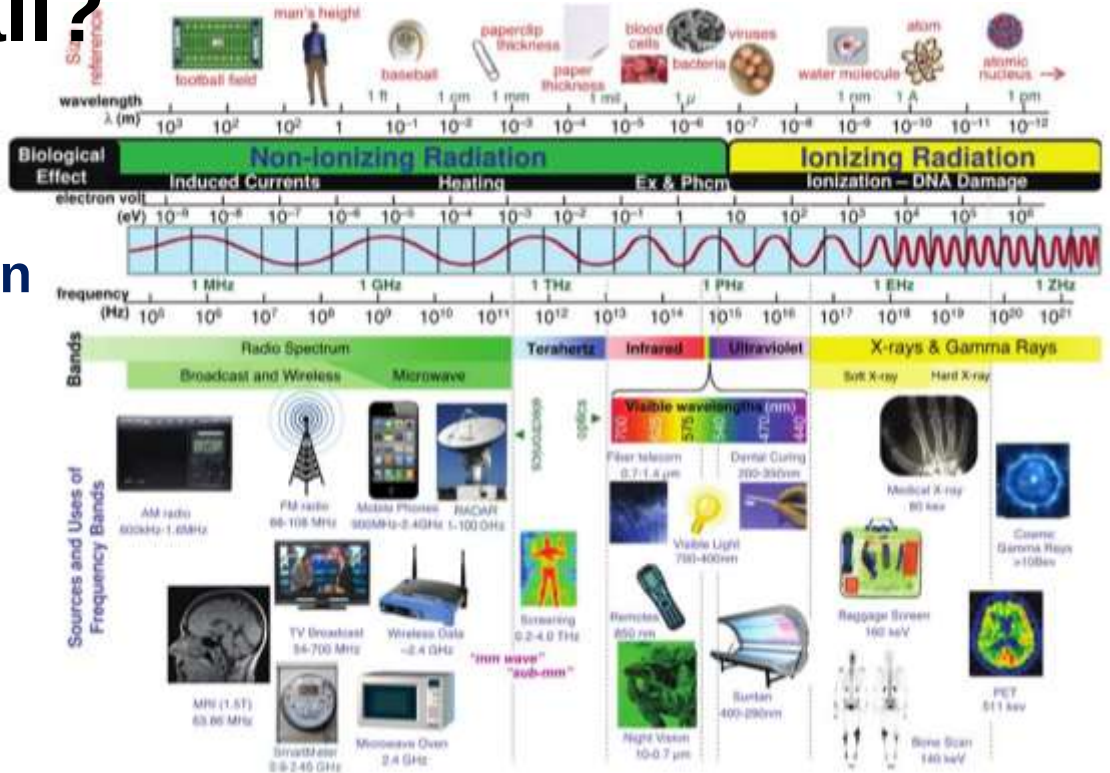


Bad conclusion: people with shorter hair will be taller

Actual fact: according to current fashion men typically have shorter hair than women, while women are typically not so tall as men

What type of radiation are we (1/2) talking about at all?

- **Electro-magnetic radiation (i.e., photons)**
- **NON-ionizing**
- **NOT radioactive**



Graphic courtesy of Jerrold Bushberg. Reproduced with permission from The Essential Physics of Medical Imaging, 3rd edition, by Jerrold Bushberg et al. © Lippincott Williams & Wilkins, 2012.

What type of radiation are we (2/2) talking about at all?

- Possible interactions with human body in the corresponding frequency ranges
  - Radiation is reflected from the body
  - Radiation bypasses the body
  - Absorbed by the body
    - May induce currents (on low frequencies): such frequencies are not used in telecommunication
    - **Can heat the body**: frequencies used in telecommunications belongs to this region
      - The absorbed energy transformed to heat
      - Living body's heat balance can handle it under certain limits
      - Regulated limits ensure that this heat can be handled

Source: https://www.icnirp.org

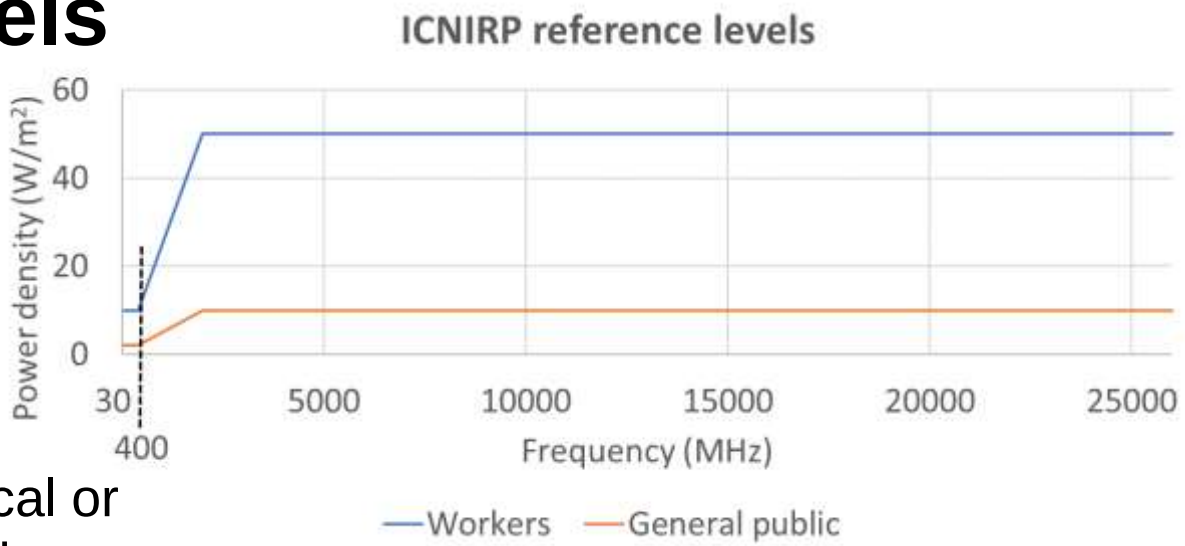
How the limits are calculated

- Heat levels were measured at different frequencies to see when it cannot be compensated by a living body in a natural way
  - Similarly: putting a warm stone in our packet or eating hot soups were never ever considered as dangerous

- The limits was calculated with a **considerable safety margin**
  - 10x for workers as temporary radiation (e.g., maintenance staff)
  - 50x for the general public

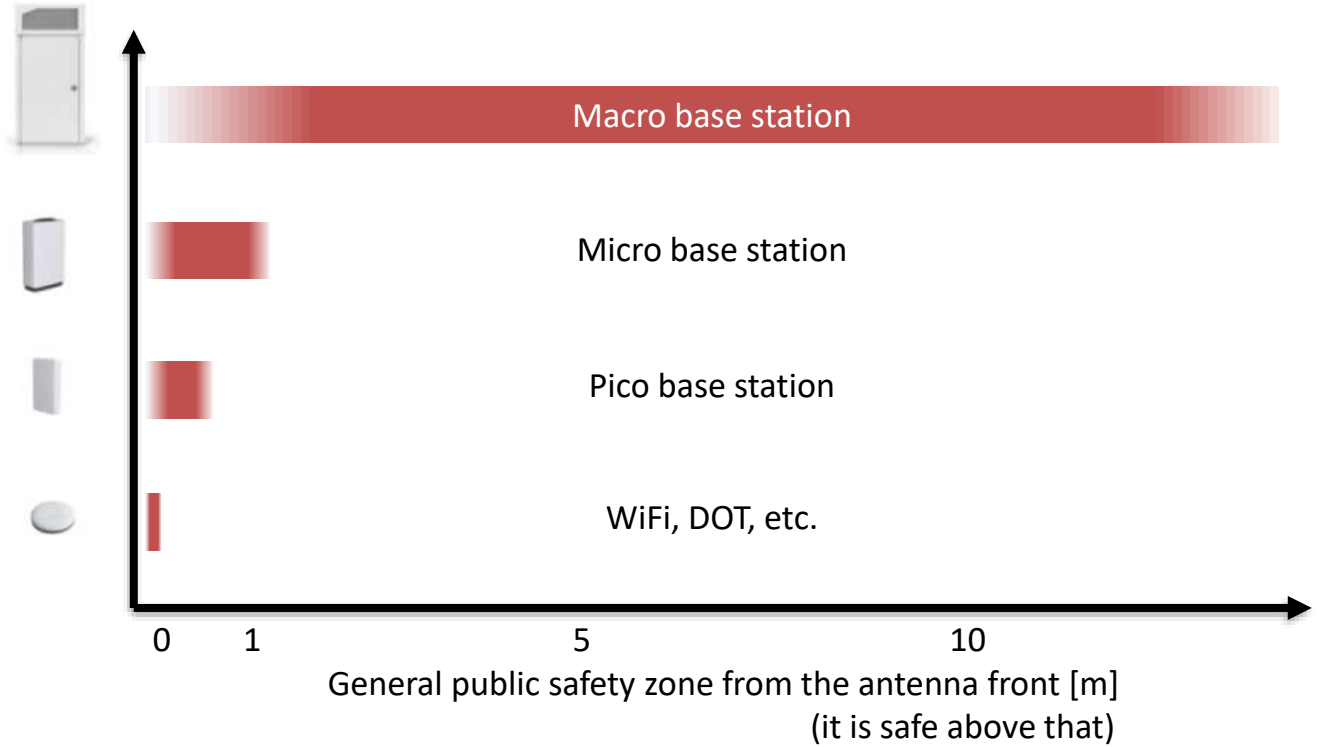
Reference levels

- Reference levels are given as function of frequency
- Can be given as power density, electrical or magnetic field strength
- Specific Absorption Rate (SAR)
  - The absorbed RF energy in body [W/kg]



	Workers			General public
Frequency (MHz)	E (V/m)	H (A/m)	S (W/m^2)	S (W/m^2)
400	61	0.16	10	2
900	90	0.24	22.5	4.5
1800	127	0.34	45	9
1900	131	0.35	47.5	9.5
2100	137	0.36	50	10
26000	137	0.36	50	10

What does it mean in practice?

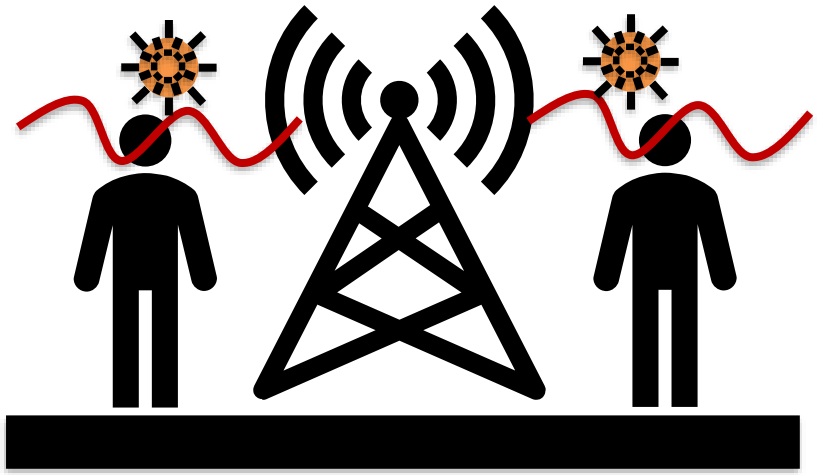


What does it mean compared telecom to other technologies?

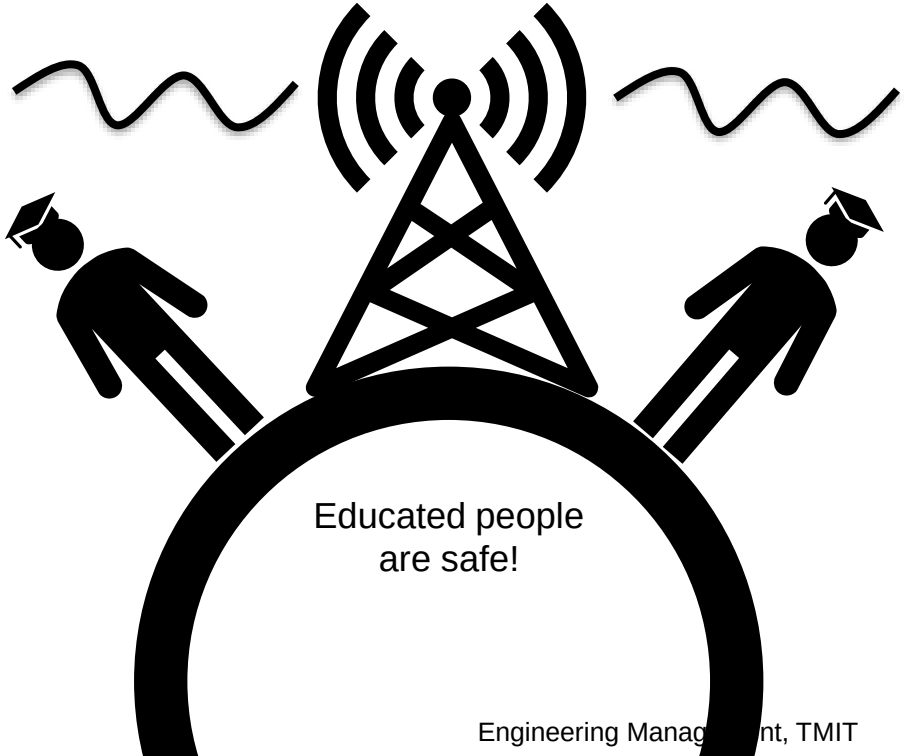
- Mobile phone: <0.5 W
- Walkie-talkie: 10x greater than mobile phones
- Base station: 0.1 – 200 W
  (theoretical maximum, in practice typically just 25% of these values)
- Solarium: 160 W
- Infrared sauna: 2000W
- Radio / TV transmission tower: 100x – 1000x greater than base stations

Dare to ask, be smart!

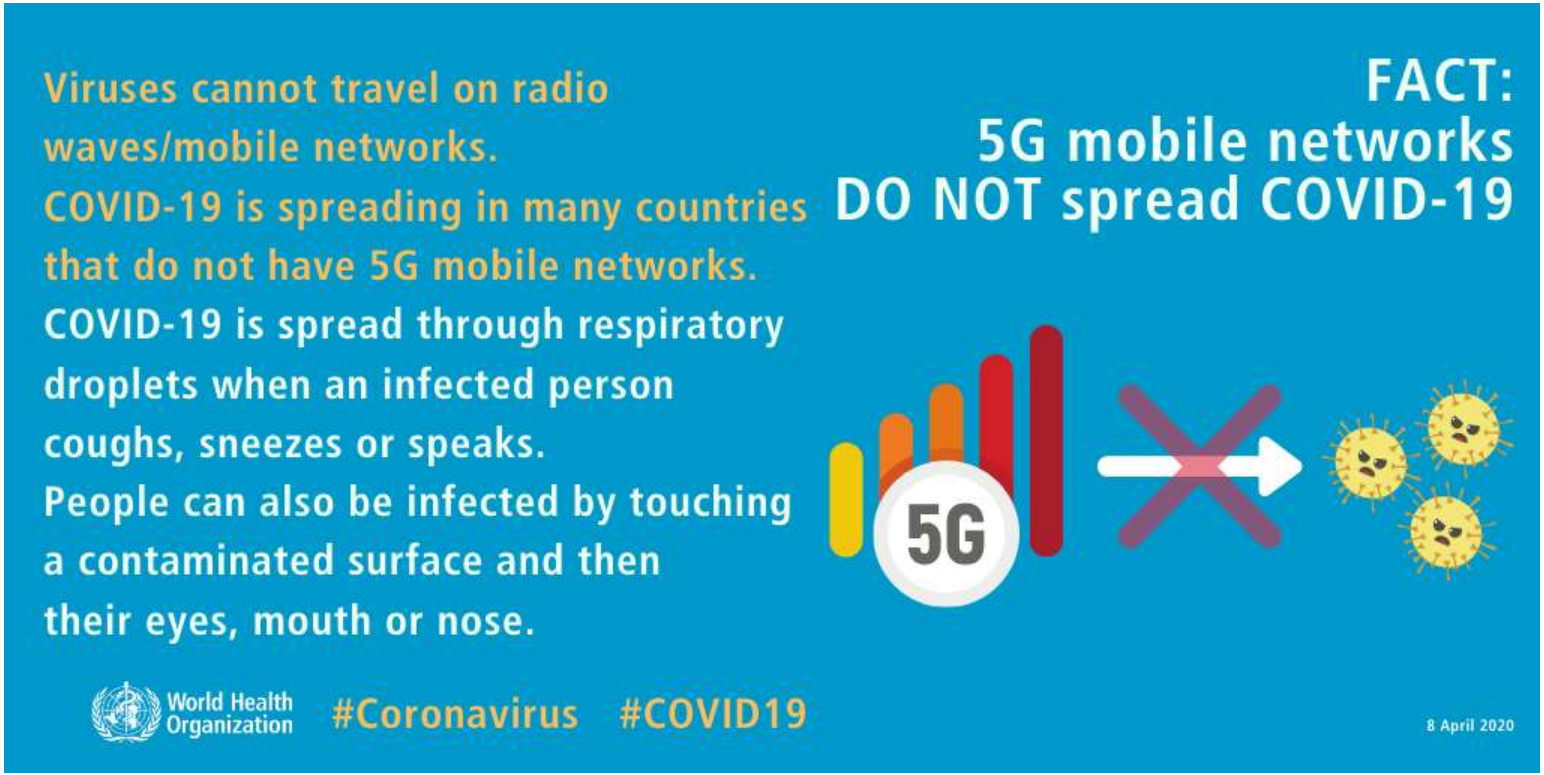
Conspiracy theories are rarely true…



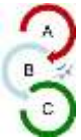
Only the lack of knowledge can damage the brain!



Educated people are safe!



Source: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters



THANK YOU FOR YOUR ATTENTION!