Innovative technologies protect human being and sustainable digital development
- Big data, and AI to safeguard public from electromagnetic field (EMF) from 5G

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5G and alignment with AP-IS (2022-2026)

- 5G, next digital infrastructure featured by higher speed, lower latency, massive network capacities and more reliability
- ROK, the first commercial 5G in 2019 and connected 24 million subscribers by 2022 to shaping the 5G ecosystem across sector

Source: LG U+
The rapid diffusion of stations from LTE to 5G

- LTE from 2012
- 3.5 GHz 5G from 2019
- 28 GHz 5G
- Investing R&D and global debate on 6G

Source: MSIT (2022)
5G and growing concern over EMF human protection

• The basis of a new paradigm of electromagnetic wave management policy

• Significant reduction of social and economic costs is expected

• The potential of technology to prepare for the more complex and diversified future electromagnetic environment

• Provide EMF information wherever you want without time and space restrictions
Mandatory to measure the EMF

- Protecting human being from the station's electromagnetic fields (Radio Wave Act, Article 47-2)
EMF evaluation scheme of station

• **PI (Point of Investigation)** to verify the measurement start point
• **5R is defined by 5 times distances** of calculated compliance boundary (80-150m)

\[ R = \frac{A \cdot P \cdot 10^{6/10}}{4\pi \cdot E^2 / \eta_0} \]

\( A \): Ground reflection factor
\( P \): Transmitted power
\( G \): Antenna gain
\( E \): Field strength
\( \eta_0 \): Reference limit for general public
\( \eta_0 \): Free space impedance (377Ω)

< Compliance boundary and BS EMF measurement point >
Limitations for EMF measurement (present)

- Stations increases rapidly
- Intelligence of communication signals such as beamforming
- Complexity and diversity of base station exposure scenarios
- Increasing public interest in EMF from new communication service
Innovative technologies for EMF prediction (future)

- National project period: 2022-2026 (5 years)
- Budget: Total US $4.7 million (US$ 0.75 million in 2022)
- Key technologies: AI, Big data, open API and open data policy to transparent and reliability

- Project structure

  01 data collector (DB, Measurement, Simulation, …)
  02 data preprocessing
  03 AI Prediction Algorithm
  04 public service

  machine, deep learning
R&D Framework (2022-2026)

**data collect**
- TEST BED
- high precision data collector

**Big data preprocessor**
- EMF characteristics

**EMF analysis/modeling**
- data variable
- environmental data

**EMF Human exposure analysis**
- AI model predictions
- Collected data
- simple prediction model formula

**AI Prediction Algorithm**
- Longitude
- Latitude
- Altitude
- PCI
- Distance
- EMF strength
- Actual Maximum
- EMF prediction

**Open API / public service**
- Service Platform/Open API
- Database
- API Server
- Mobile
- PC
- Chrome

**R&D Framework (2022-2026)**
Way forward and insight to facilitate AP-IS

- The development of digital technologies including 5G is *neither optimistic nor pessimistic* but how policy makers to frame enable policy and initiative.
- **Nations and policy makers faced dual missions**: how to facilitate digital technologies and how to mitigate undesired effects.
- Despite global debate over 5G, **universal 5G overcomes the criticism** such as the lack of killer applications, the sluggish rural coverage and costly price.
- **EMS (and spectrum management) have been less attention.** Nevertheless, the **presenting case drawn attention to safeguard human being**.
- **5G and EMS is the consolidation example** of connectivity (Pillar 1 of AP-IS), digital technology (Pillar 2 of AP-IS), and data and protection (Pillar 3 of AP-IS).
THANK YOU

MOVING FORWARD TOGETHER