National Institute of Information and Communications Technology

Just Put on! Sheet Medium communication for Data and Power Transmissions

～Creating Smart Life through Microwave Surface Coupling Wireless Power Transmission～

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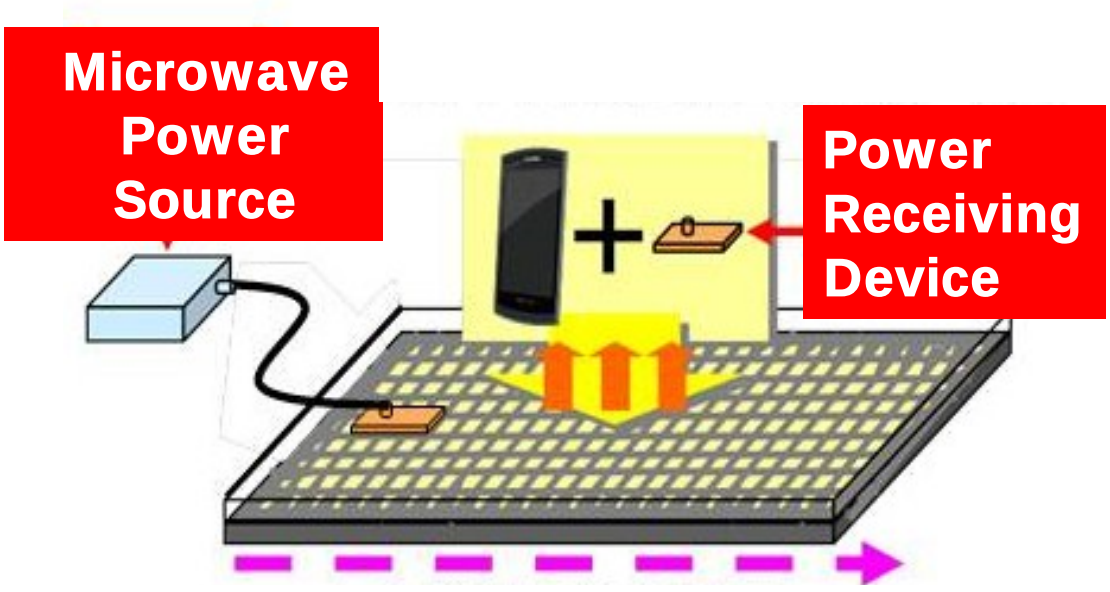
Presentation Outline

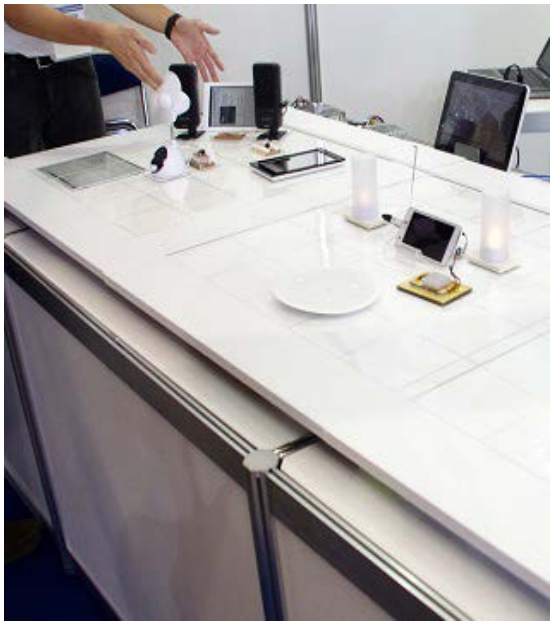
- General Descriptions
- System Overview
- Sheet Medium Construction
- Technical Requirements of the System
- Control Function for Power Transmission
- Power Transmission/Receiving Devices
- Applications
- Integrated Transmission Technology on Signal and Power by Wireless

General Descriptions

- The **ARIB STANDARD** of STD-T113 1.1 has been approved on 3 Dec., 2015.
  - ARIB_STD_T113_Part3 is newly added:
    「Surface Electromagnetic Coupling Wireless Power Transmission System for Mobile Devices」
- This **ARIB STANDARD** specifies an interface between wireless sections of wireless power transmission by surface electromagnetic coupling technology using 2.4GHz band microwave, and wireless sections of power transmission control, aiming at mobile device charging.



Microwave spreads across the entire sheet



System Overview

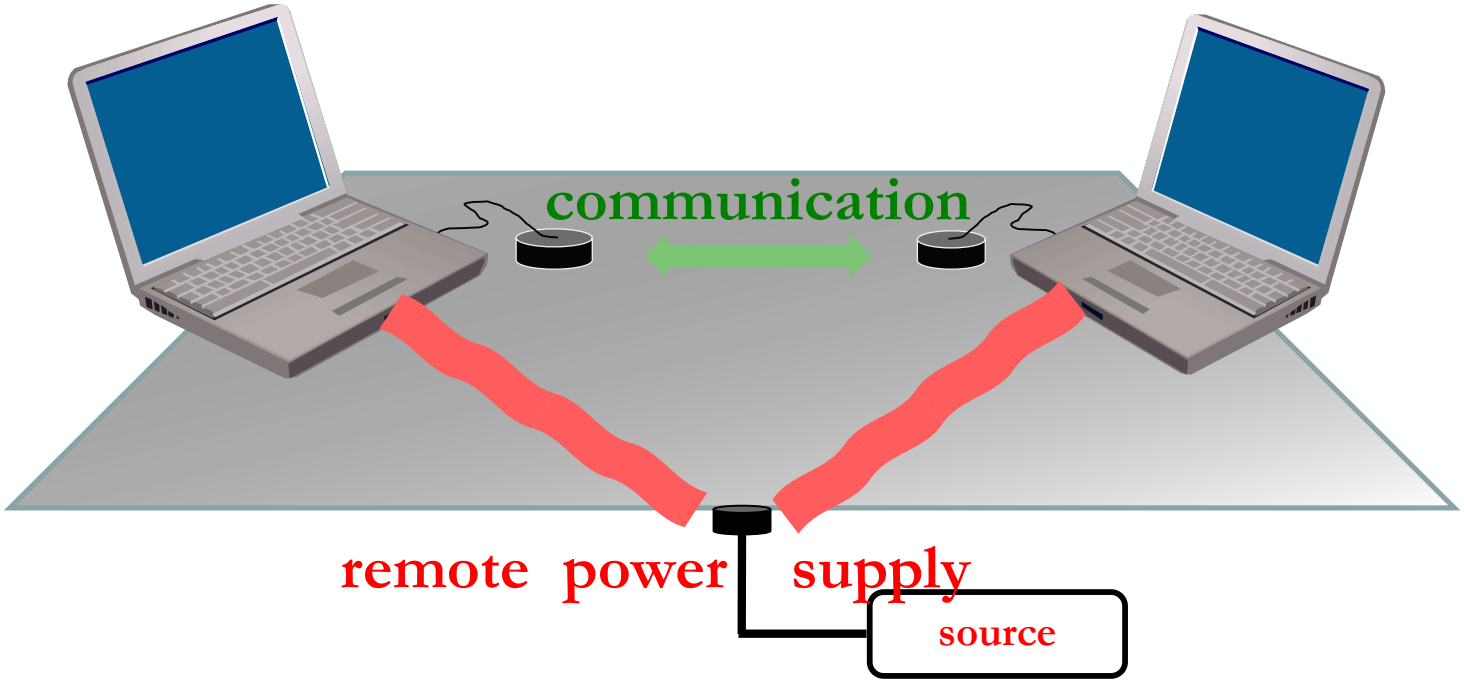
- Providing WPT(Wireless Power Transfer) function to mobile device users based on surface electromagnetic coupling by utilizing induction field of 2.4GHz band microwave.

- Surface Electromagnetic Coupling WPT system applies Star topology network consisted by one PTD(Power Transmission Device) and multiple PRDs(Power Receiving Devices). This network allows one PTD to transmit power to multiple PRDs simultaneously.

Allowing multiple PRDs to receive power simultaneously, which are placed on the sheet medium.

What is the sheet medium communication system?

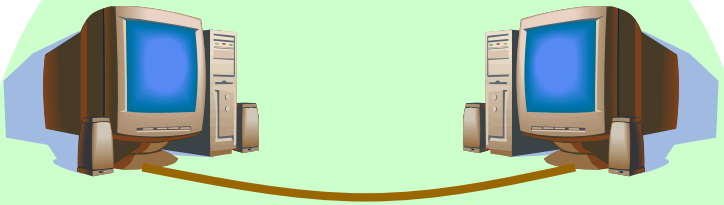
- thin planar sheet containing a dielectric layer and metallic cover layers
- network terminals are placed on this sheet



The layer serves as a medium for wireless communications, as well as the propagation of electromagnetic microwaves, which remotely power the terminals.

Integrated Transmission Technology on Signal and Power by Wireless

1D communication



Cable, wire, optical fiber

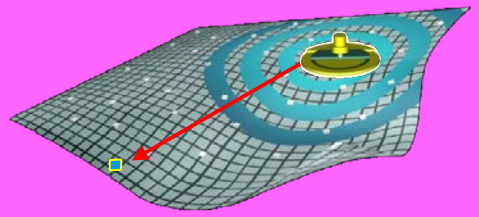
- Complexity of wires
- Effort of connection
- Lack of mobility

3D communication

Wireless, microwave, infra red

- Effect of Interference and noise
- Battery need to recharge
- Security problem
- Low capacity

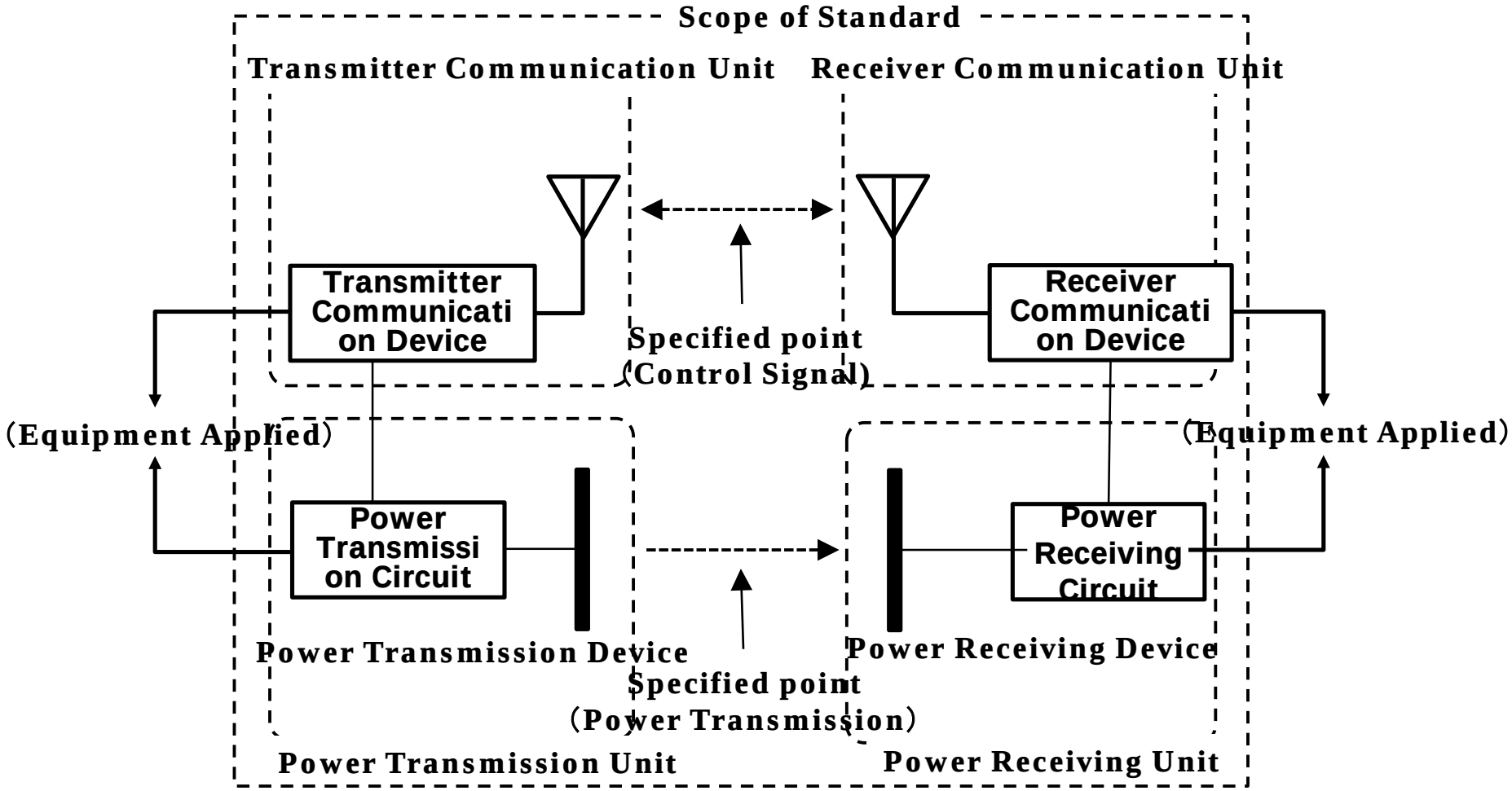
2D communication



- Gigabit data transmission

- **Combining the best features of both technologies of wired and wireless networking.**
- **Data communication and power transmission.**

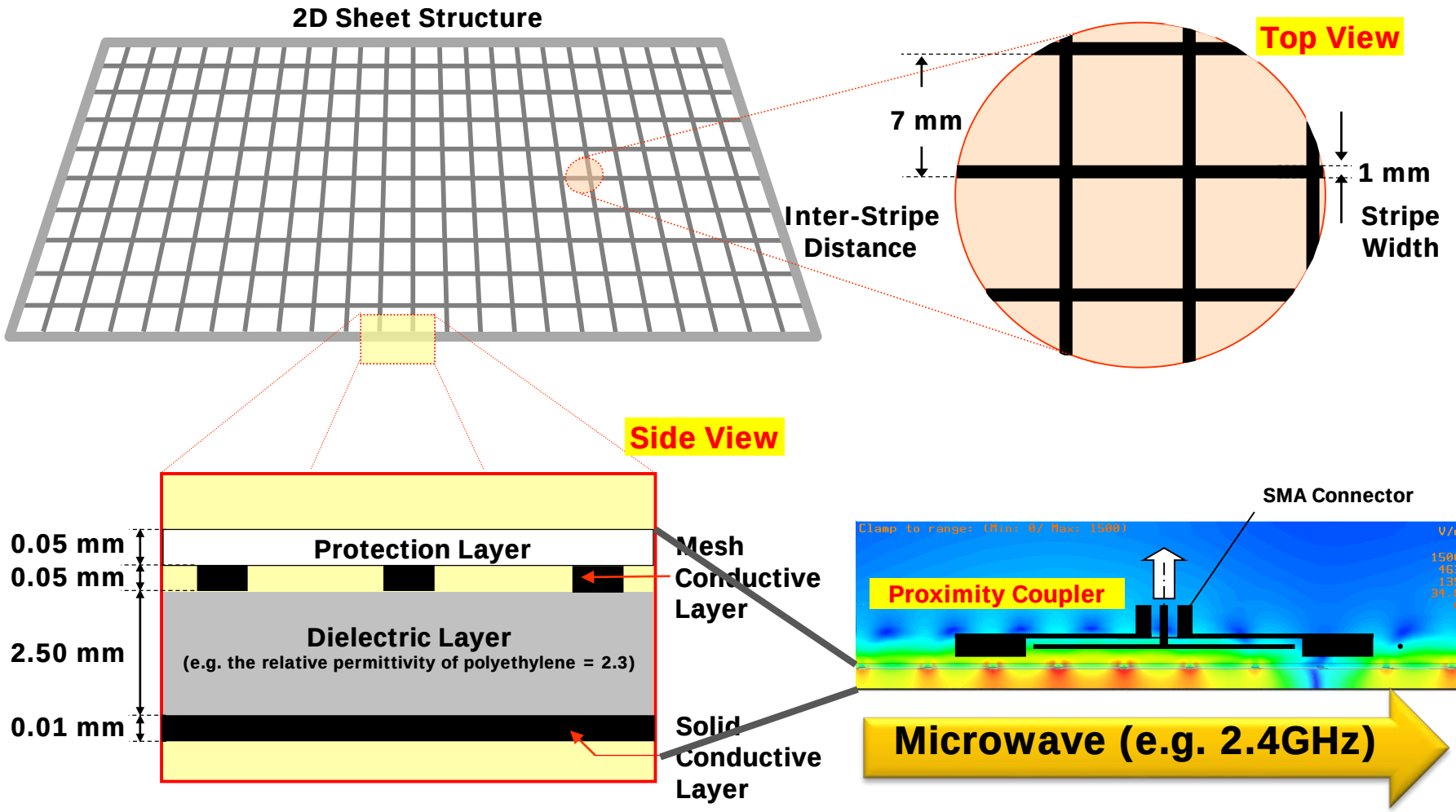
System Overview



Framework of surface electromagnetic coupling WPT

(ARIB_STD_T113_Part3)

2D Sheet Construction



Technical Requirements of the System

Power Transmission Method	Performing power transmission using continuous carrier wave
Power Transmission Frequency	**2.497GHz～2.499GHz**, in which the central frequency is **2.498GHz.**

Radiated Emission Limits

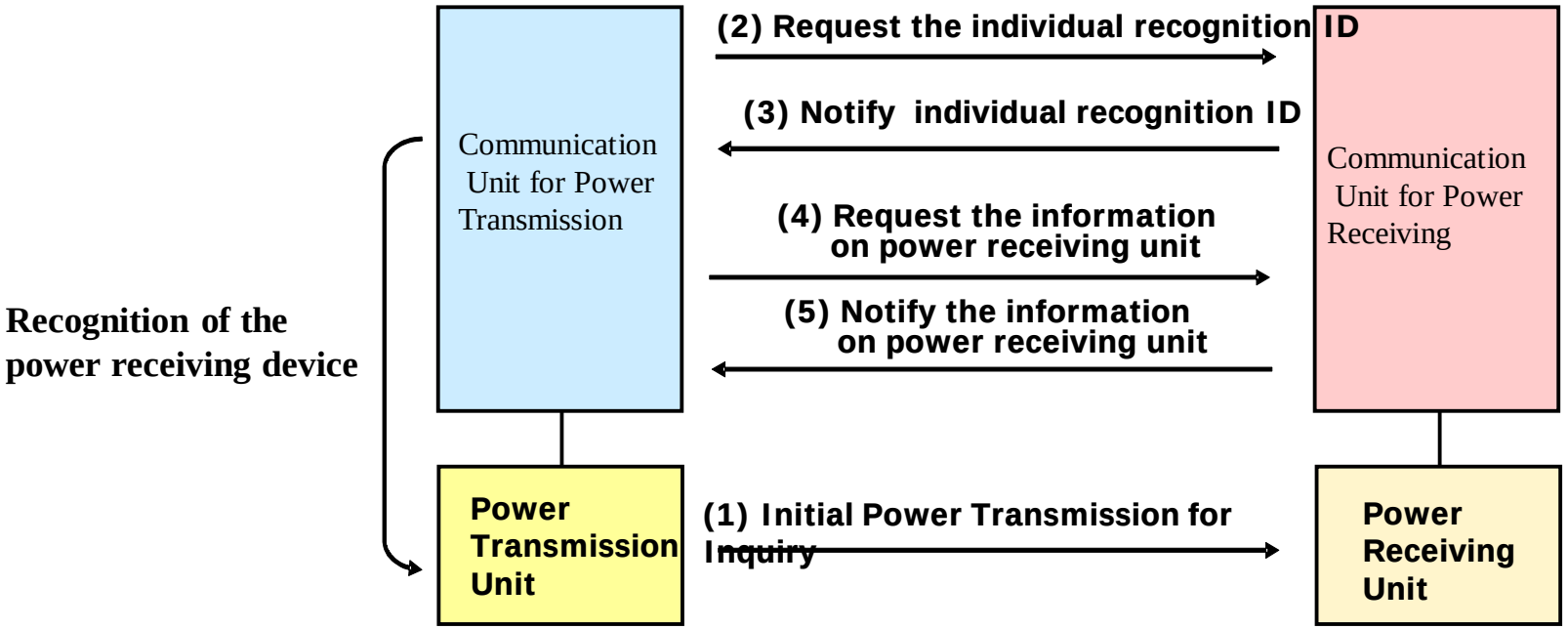
Frequency range	Measurement distance	Limit (peak)
90MH≦ f ≦108MHz & 170MH≦ f ≦222MHz	30m	30μV/m
2.497GH≦ f ≦2.499GHz		**283mV/m**
2.500GH≦ f ≦2.535GHz		30μV/m
Otherwise (≦10GHz)		100μV/m

	Total of the leak electric power
In the case of power transmission	**0.15W**
In the case of inquiry	0.02W

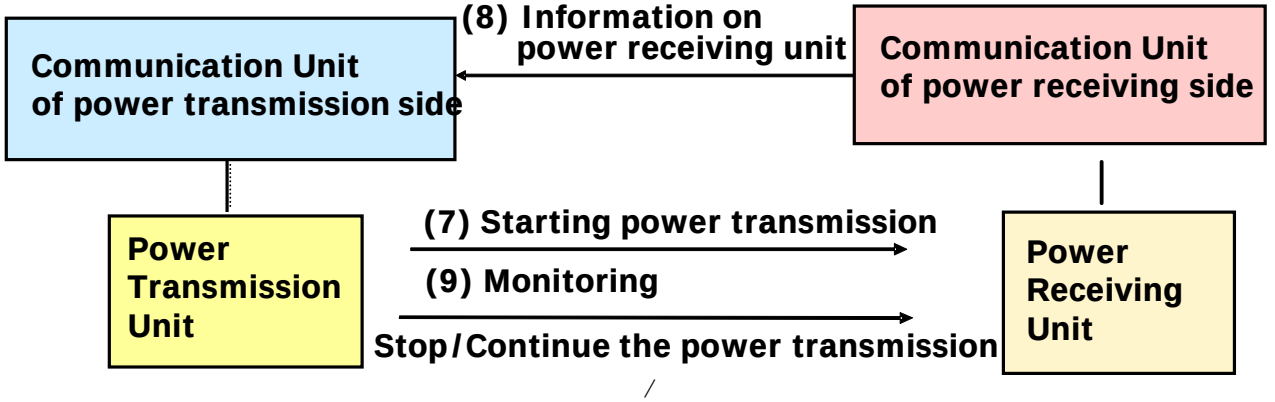
(ARIB_STD_T113_Part3)

Control Function for Power Transmission

Connection establishment procedure:



Control Procedure:



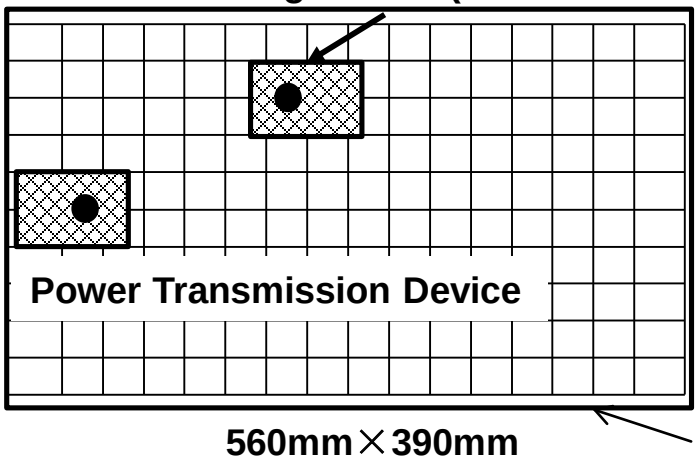
(ARIB_STD_T113_Part3)

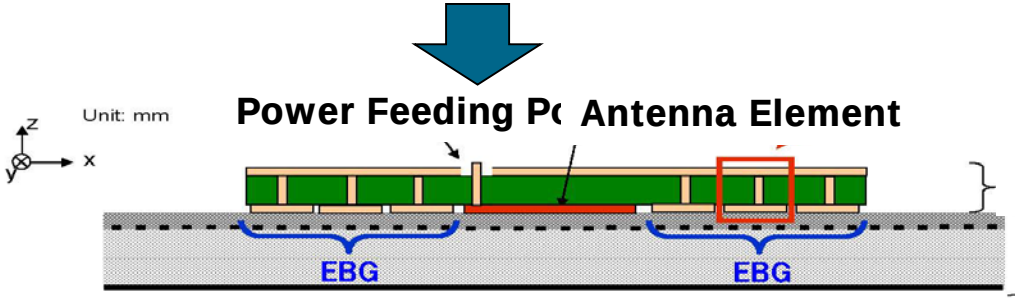
Power Transmission/Receiving Devices

Front

Back

Power Receiving Device (SMA Connector)





Material	Material Constant
dielectric	ε_r =1.1; tanδ=0.1×10^{-2}

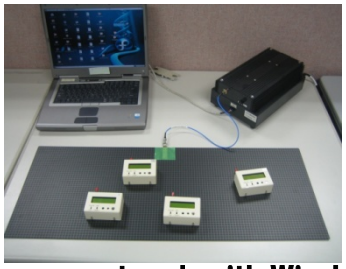
ε_r: relative permittivity
Tanδ: dielectric tangent

(ARIB_STD_T113_Part3)

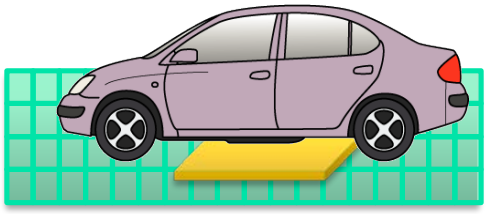
Integrated Transmission Technology on Signal and Power by Wireless

Application systems using sheet medium

PC peripheral equipment
on signal and power by wireless



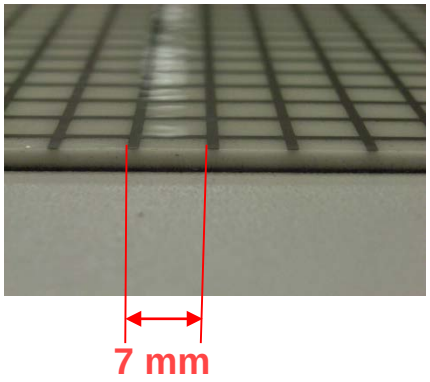
Sensor network with Wireless
Power and Data Transmission

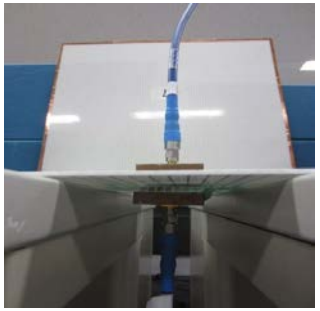


Wireless power transmission
for EV

Biometric study via
sheet medium

Communication Sheet Medium

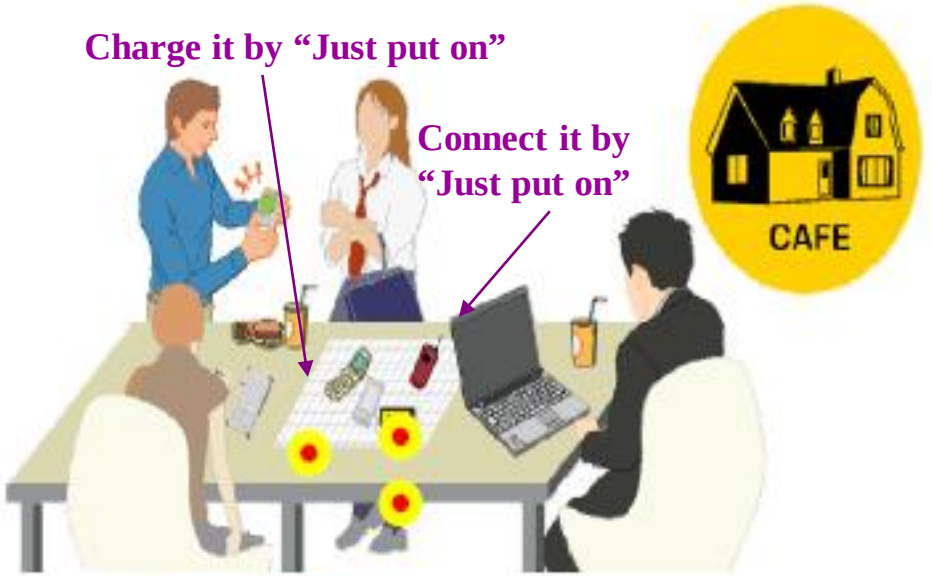


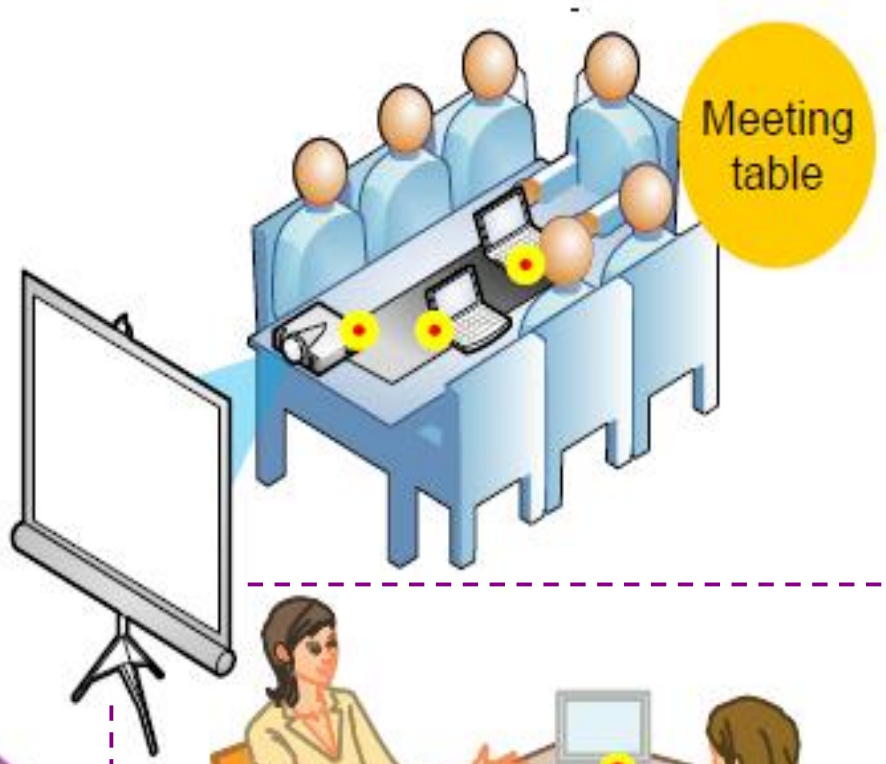


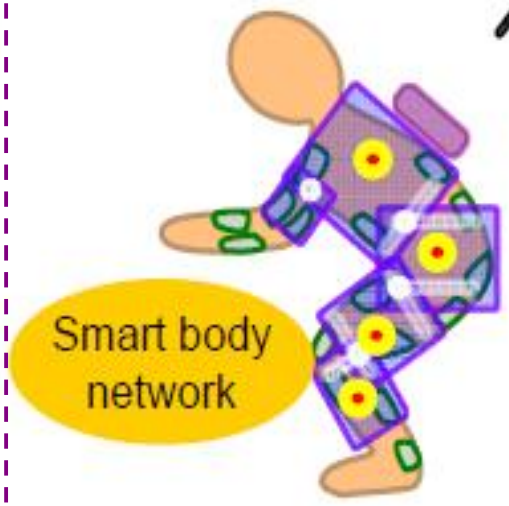
High efficiency power transmission system
via two-side mesh sheet medium

Flexible communication
sheet medium

Applications







Thank you for your attention!

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