

An overview of IHI's electric vehicle wireless charging development activities

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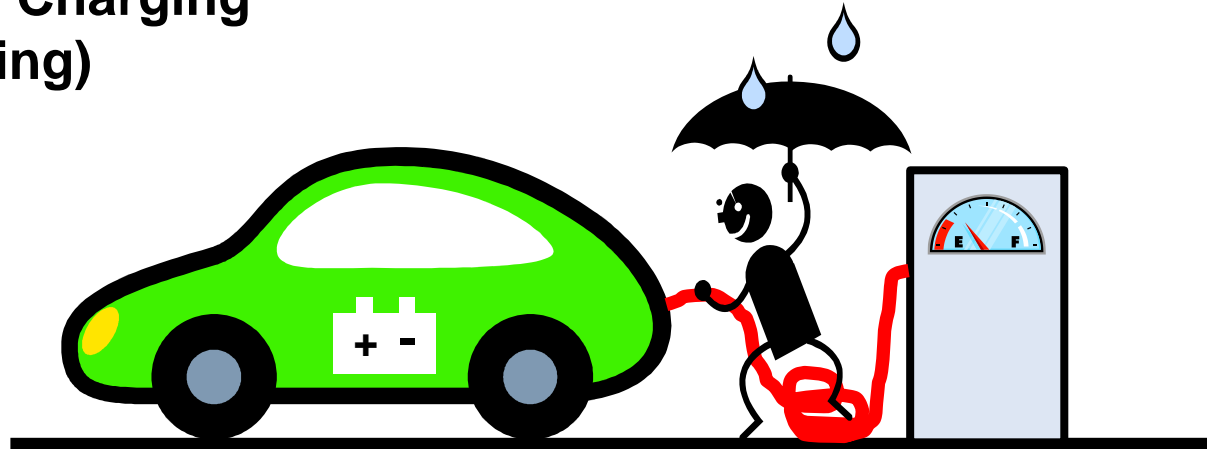
IHI Corporation

- **IHI is a heavy industry and infrastructure company in Japan.**
- **We have been developing wireless charging system since 2010.**
- **Wireless charging system can be applied to our products.**



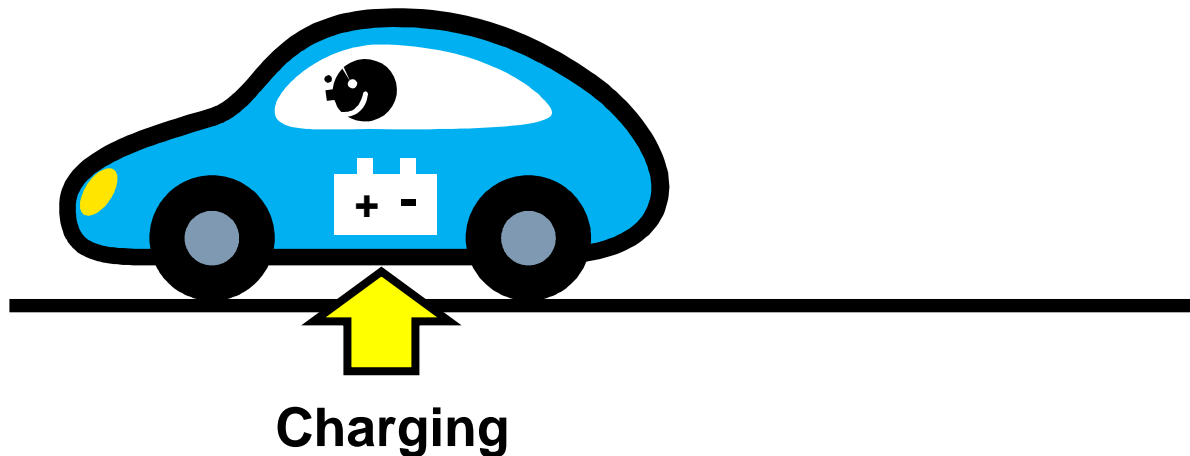
(Registered trademark in USA,China and Japan)

Wired Charging (existing)



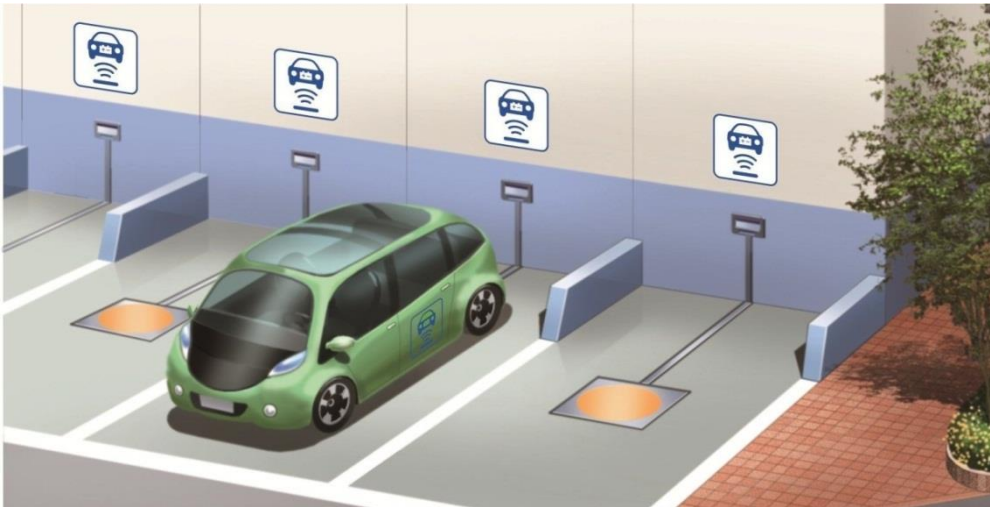
Getting out of the car.
Rain...
Dirty cables...
Inconvenience...

Wireless Charging (future)

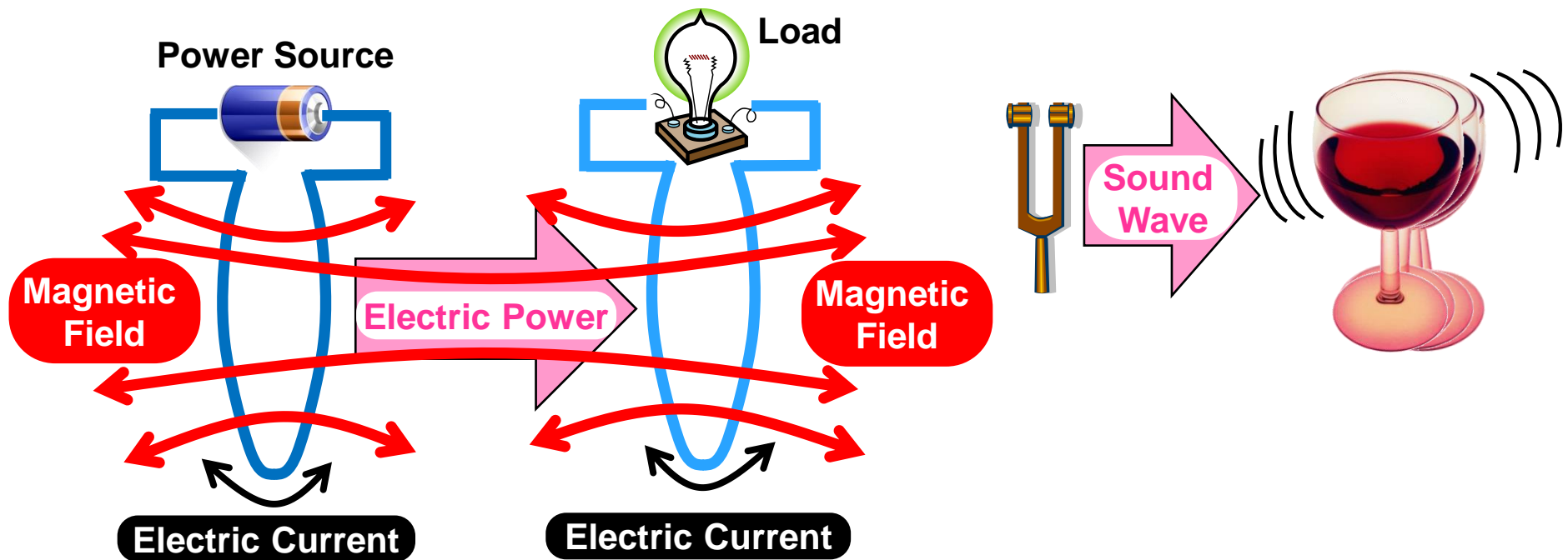


Staying inside of the car.
No problem!

How a parking lot equipped with EV charging facility will look in the near future...

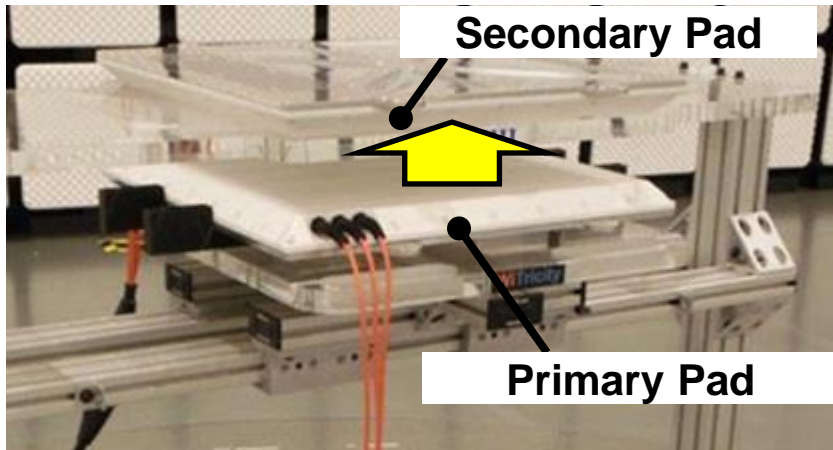


- We use “highly coupled magnetic resonance” which was originally invented by MIT, and licensed by WiTricity Corporation.





Rectifier

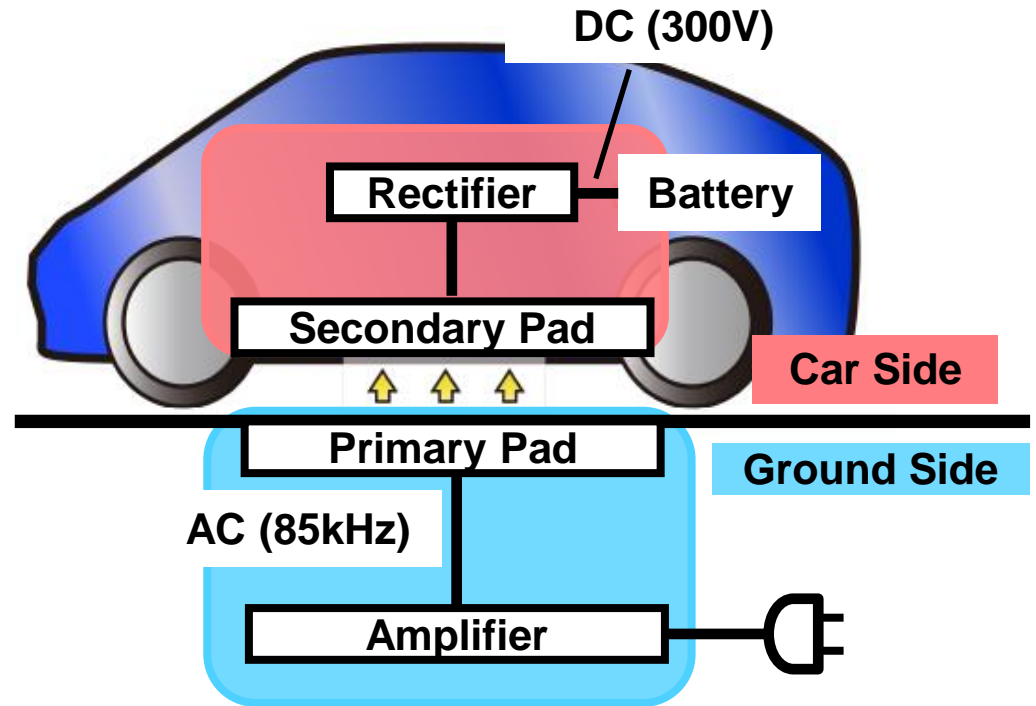


Secondary Pad

Primary Pad



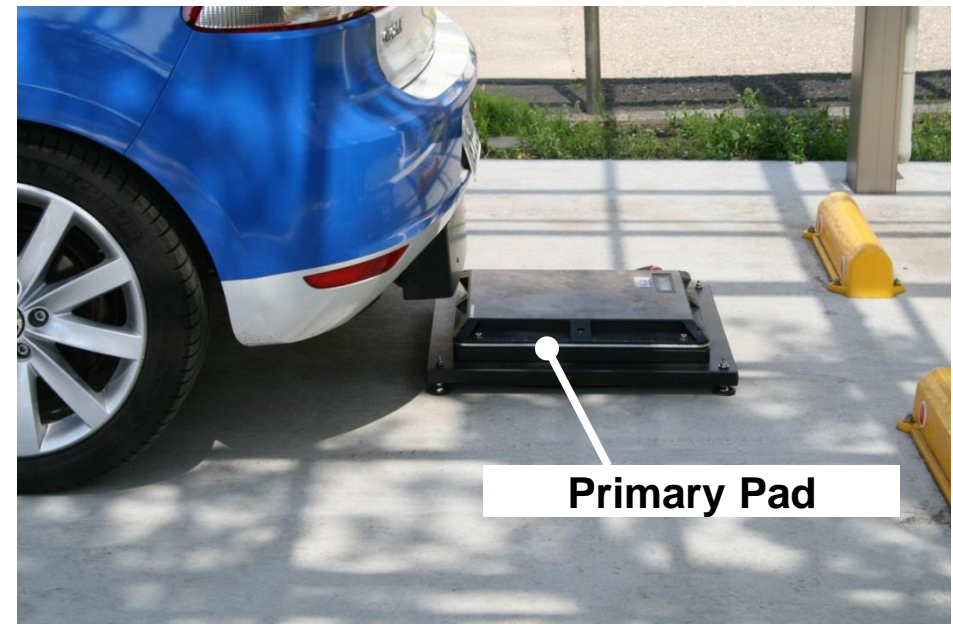
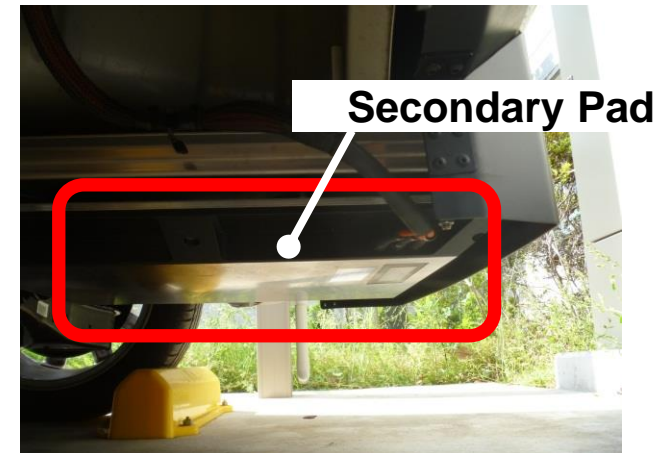
Amplifier



Power	3.3kW
Air gap	10-20cm
Coil Type	Solenoid, Circular

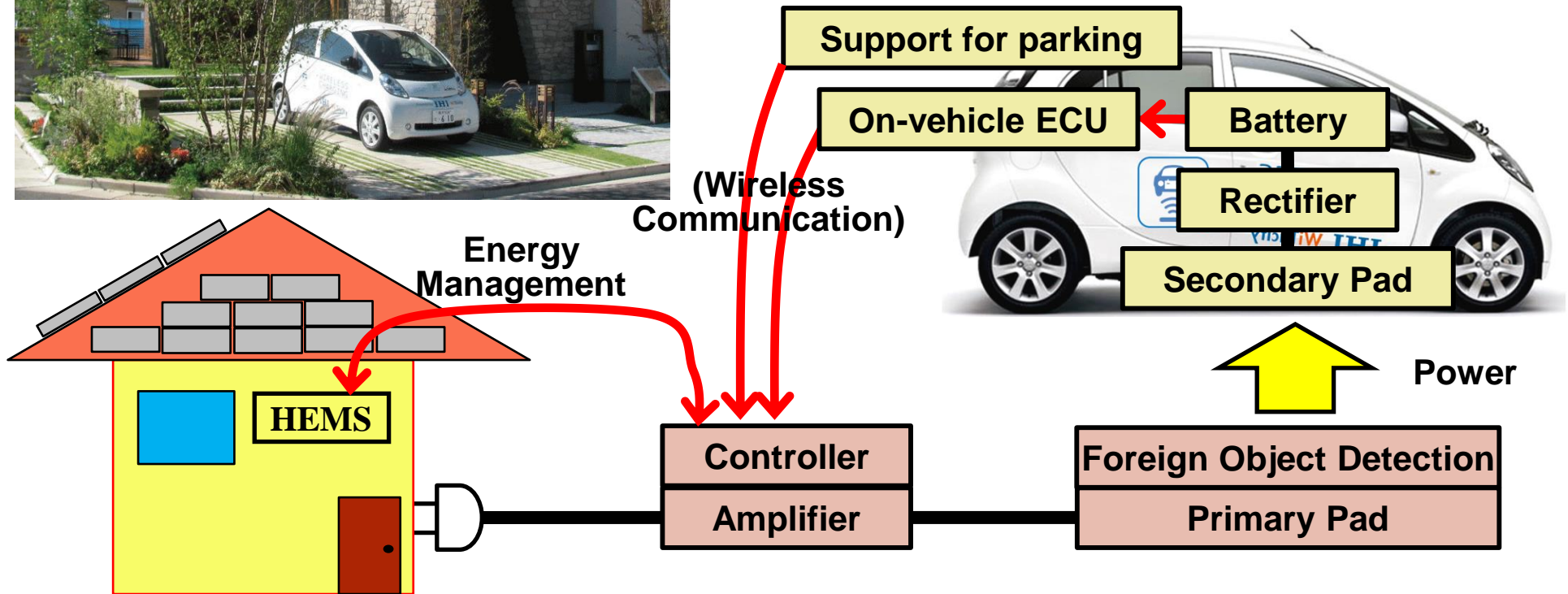
Application

The implementation of our system on EV





The implementation of our system in home use

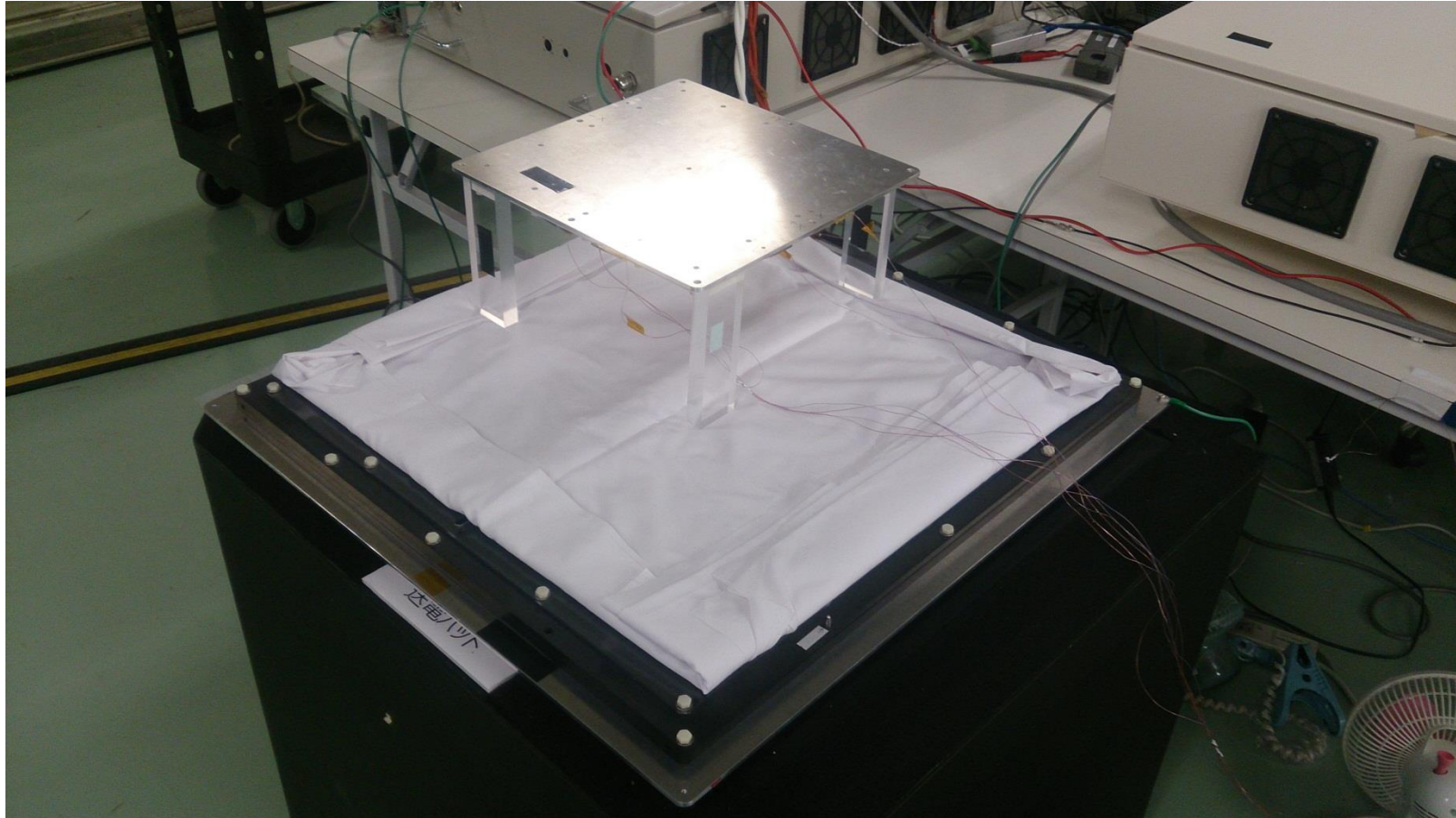


HEMS: Home Energy Management System
ECU: Electronic Control Unit

- Coil design within the tight space limitations on a car
- Resonant circuit design to achieve high efficiency, low EMC
- Magnetic design to realize low magnetic losses in coils
- Mechanical design and material selection to make the pad withstand water, temperature change, and vibration
- Control system that works in realistic situations
- Foreign object detection to detect objects between these pads

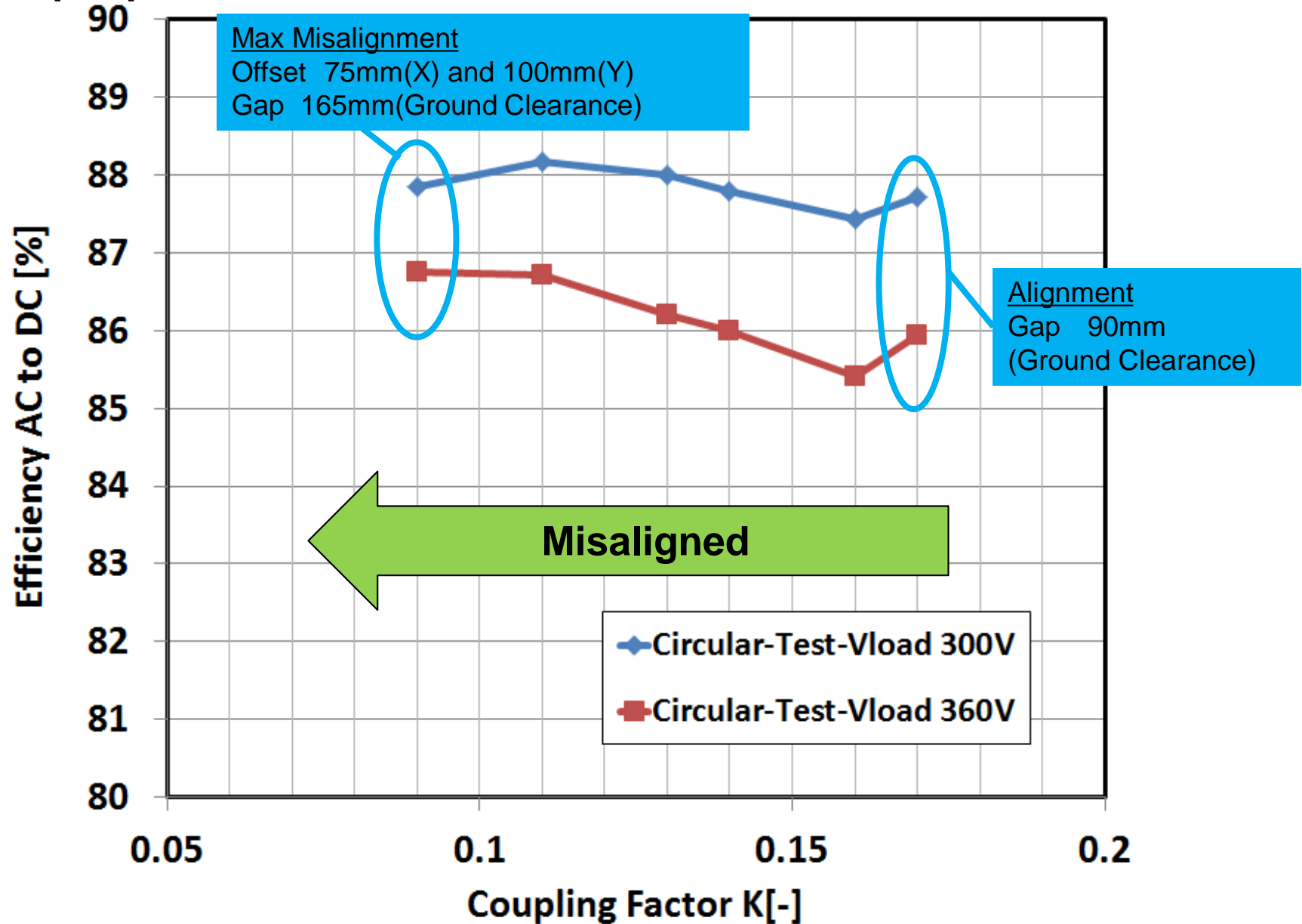
Coil design

A photo of the improved coils during misalignment test

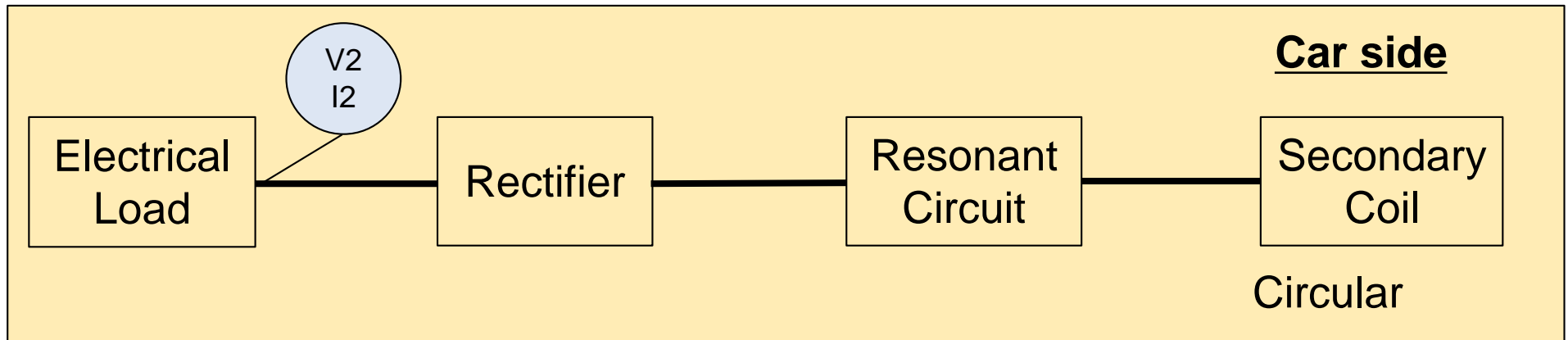


Efficiency measurement

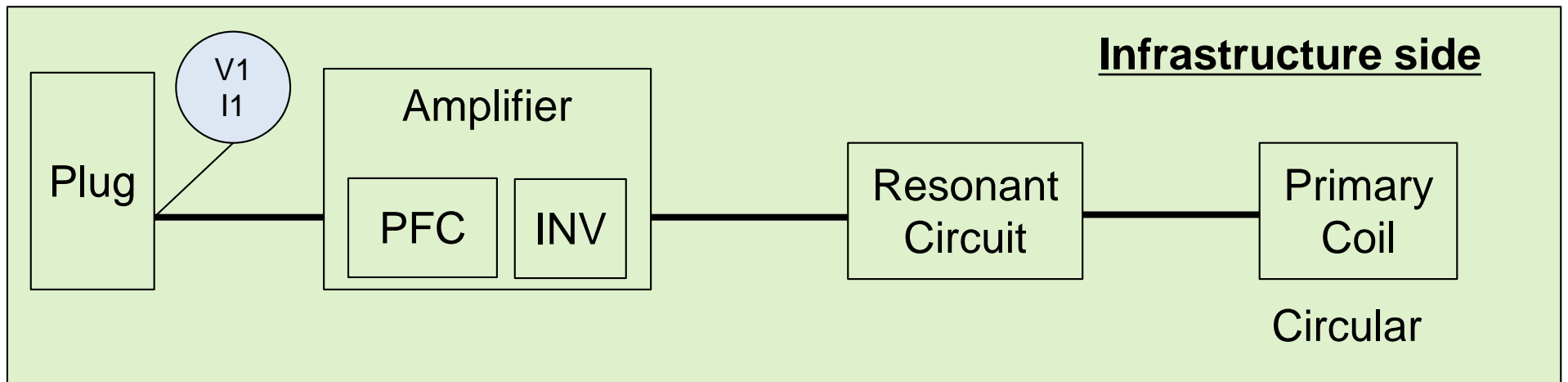
- Output power: 3.3 kW



Measurement equipment



Wireless 



 Measurement point of Voltage, Current, and Power (AC to DC)

- **We are developing wireless charging system as infrastructure maker.**
- **We have accumulated much knowledge cooperating with car and home makers.**
- **We tested a smaller secondary coil and new resonant circuit.**
- **Measured efficiency was over 85 percent with misalignments.**

- **Automobile-manufacturers plan to sell EVs/PHEVs with wireless charging capability by 2017/2018. IHI aims to develop wireless charging systems to meet this target date.**
- **Wireless charging involves many assets of standardizations (IEC, ITU-R, ISO, etc). We will commercialize our system meeting the standards.**

IHI

Realize your dreams