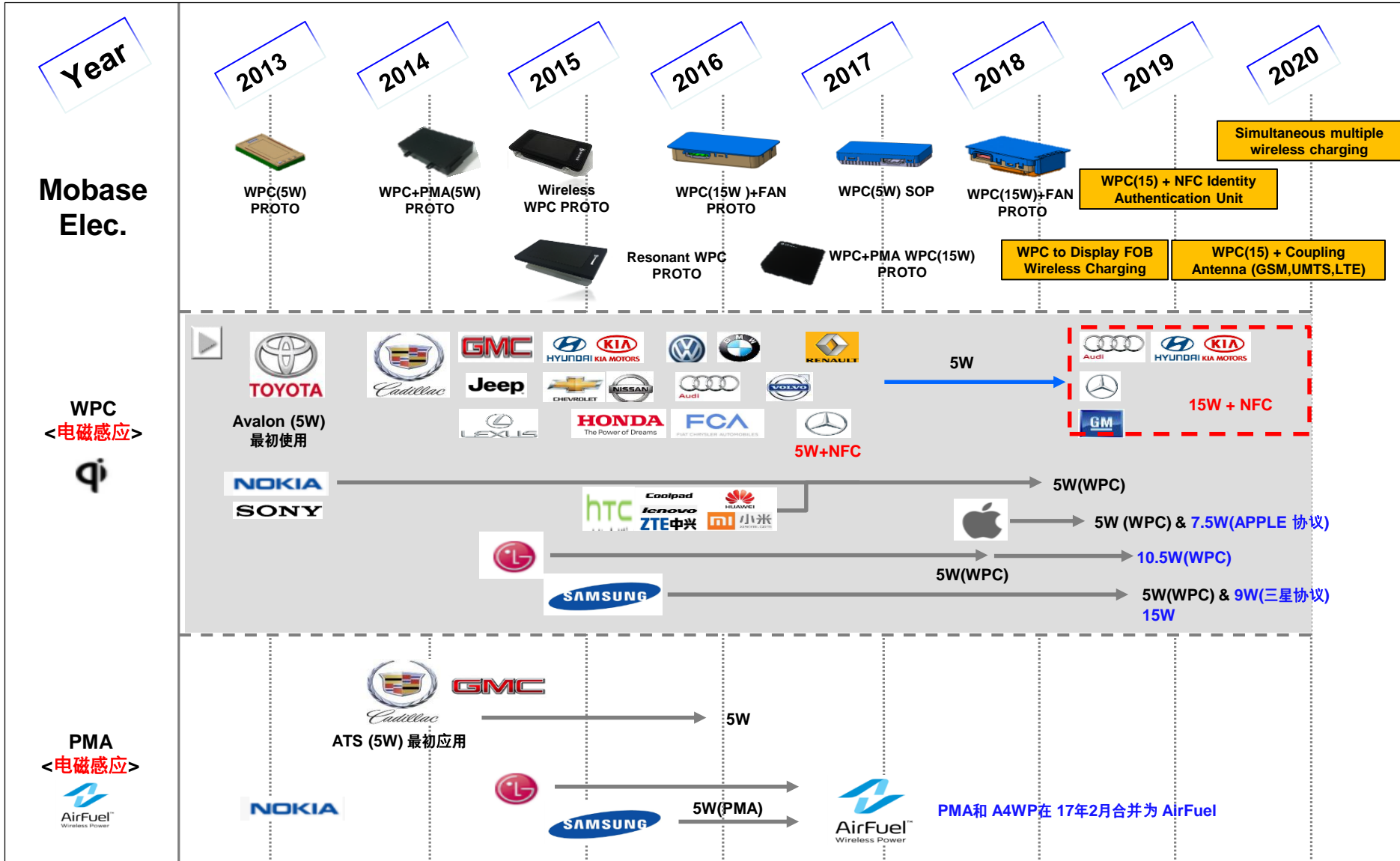




# 1 Mobase Elec. Road Map & Market Trend

Prior development plan

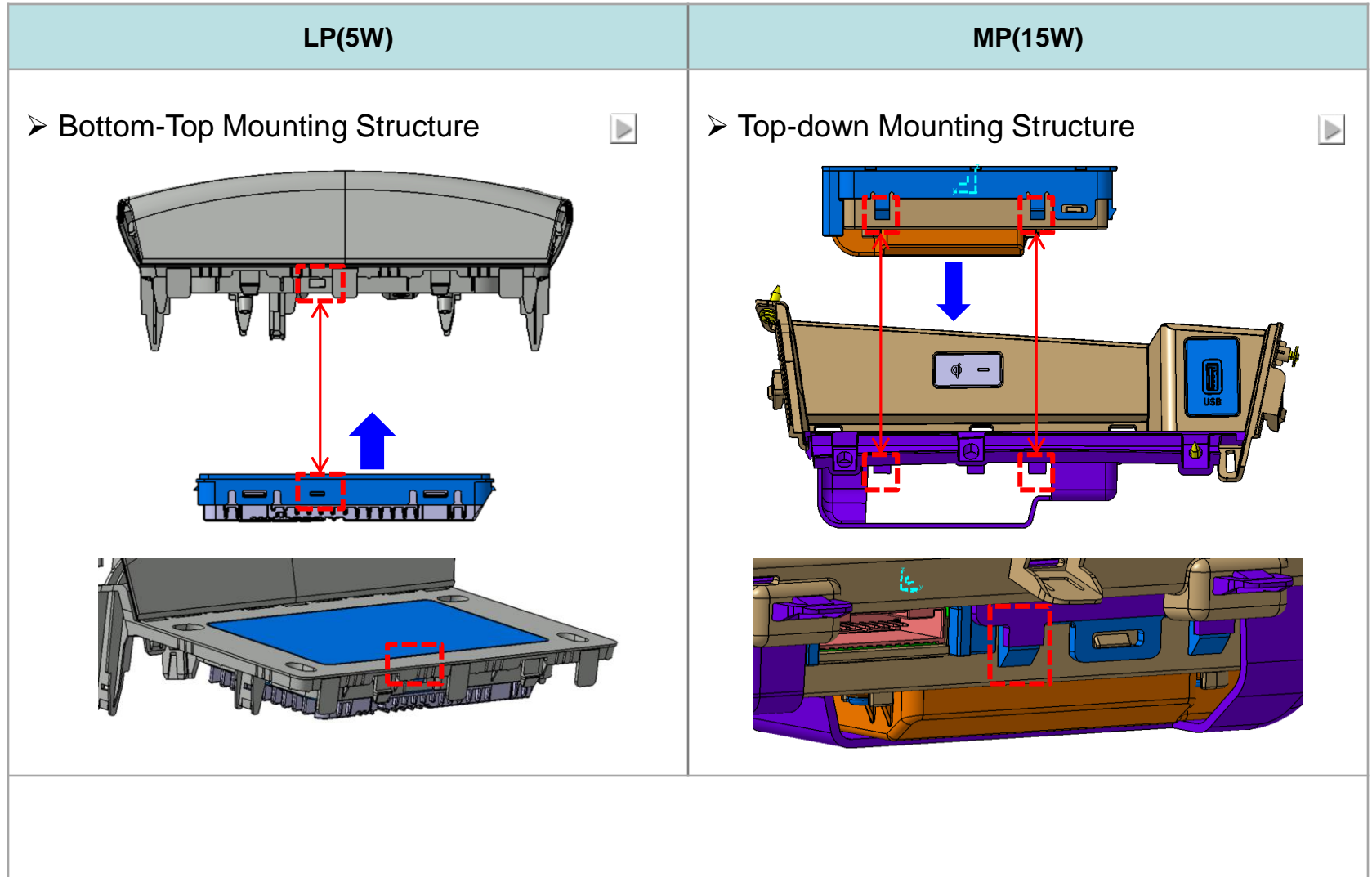


## 2-1. Wireless Charging Unit Specification

\* LP : Low Power \* MP : Middle Power

Specification	区分	Product specifications		Remark
		LP(5W)	MP(15W)	
electric	Operating Voltage	9V ~ 16V		
	Operating temperature	-40°C ~ 85°C		
	Storage temperature	-40°C ~ 85°C		
	Dark current	1mA 以下		
	Charging area	66 x 27 mm (Pad 内 充电领域 : 83 x 173 mm)		
	Charging efficiency LP (5W)	50 %	58 %	▶
	Charging efficiency MP (15W)	-	65 %	
	working frequency	115~205 KHz	115~205 KHz	
	Coil	LP - A13 (3Coil)	MP - A13 (3Coil)	
	NFC PEPS	Does not support	Does not support	
	NFC Recognition distance	-	-	
Heat dissipation structure	ADC	ADC + FAN	Automotive FAN	
Exterior	size	124 x 70 x 25.2 mm	139.6 × 83.8 × 41.25 mm	
	weight	230 g	340 g	
	Connector	MG645877 (KET)		

## 2-2. Wireless Charging Unit Mounting Structure



## 2-3. History of Wireless Charging Unit Development

■ Current production ■ Future production

Grade	Project Name	Car Maker	S.O.P	Car/Year (10,000)	specifications		Function Specifications						Body-CAN Comm. Speed
					LP (≤5W)	MP (≤15W)	NFC	Card burn-out prevention	Foreign Object Detection	Charging Display	SMK interference prevention	Cell phone neglect alarm	
Small Cars	KONA	HMC	Jun.2017	4.6	●	-	-	-	●	●	●	●	500kbps
	Veloster		Nov.2017	1.6	●	-	-	-	●	●	●	●	100kbps
	KONA EV		Apr.2018	0.5	●	-	-	-	●	●	●	●	500kbps
	New Car	KMC	Apr.2019	1.0	-	●	●	●	●	●	●		
	New Car(i)		Jul.2019	1.6	-	●	●	●	●	●	●		
Midsize Cars	Sorento	HMC	Jul.2017	5.5	●	-	-	-	●	●	●	●	100kbps
	Santa Fe		Feb.2018	7.4	●	-	-	-	●	●	●	●	500kbps
	Santa Fe(a)		Aug.2018	8.5	●	-	-	-	●	●	●	●	
	Sorento(a)	KMC	Jan.2018	9.9	●	-	-	-	●	●	●	●	100kbps
	Carnival		Feb.2018	2.1	●	-	-	-	●	●	●	●	
	Hydrogen Car	HMC	Mar.2018	0.3	●	-	-	-	●	●	●	●	500kbps
	Sonata		Mar.2019	6.2	-	●	●	●	●	●	●	●	
	Sonata(a)		Sep.2019	5.5	-	●	●	●	●	●	●	●	
	Optima	KMC	Sep.2019	6.5	-	●	●	●	●	●	●	●	
	Optima(a)		Jan.2020	1.5	-	●	●	●	●	●	●	●	
FullSize Cars	Genesis	HMC	Sep.2019	5.0	-	●	●	●	●	●	●	●	
	Genesis(a)		Mar.2020	3.3	-	●	●	●	●	●	●	●	
	Genesis SUV		Nov.2019	2.9	-	●	●	●	●	●	●	●	
<b>Total</b>				<b>73.9</b>									

## 2-3. History of Wireless Charging Unit Development\_china

■ Future production

Project Name	Car Maker	S.O.P	Car/Year (10,000)	specifications		Function Specifications						Body-CAN Comm. Speed
				LP (≤5W)	MP (≤15W)	NFC	Card burn-out prevention	Foreign Object Detection	Charging Display	SMK interference prevention	Cell phone neglect alarm	
SU2	BHMC	Sep.2019	6	-	●	-	-	●	●	●	●	500kbps
SP2C	DYK	Oct.2019	0.1	-	●	-	-	●	●	●	●	500kbps
DN8C	BHMC	Mar.2018	8.5	-	●	-	-	●	●	●	●	500kbps
DU2	BHMC	Nov.2020	3.75	-	●	-	-	●	●	●	●	500kbps
DL3C	DYK	Jul.2020	5	-	●	-	-	●	●	●	●	500kbps
KU	BHMC	Jun.2021	0.3	-	●	-	-	●	●	●	●	500kbps
NP FL	DYK	Mar.2021	6.8	-	●	-	-	●	●	●	●	500kbps
NQ5C	DYK	Aug.2022	1.5	-	●	-	-	●	●	●	●	500kbps
VF35	VIN FAST	Sep.2019	9	-	●	-	-	●	●	●	●	LIN
<b>Total</b>			<b>40.95</b>									



量产时间 SP2C (SOP 19.3Q~)

北京现代 SU2 (ix25后续车型, SOP 19.3Q~)



## 2-4. Status of LP(5W) Development

✓ Current production    ✓ Future production

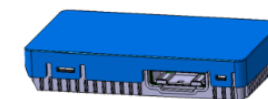
VEHICLE	HMC	Kona, Kona EV, Veloster , Santa Fe , Hydrogen Car
	KMC	Sorento, Carnival
Wireless Charging		LP(5W)



### Wireless Charger Description

Wireless Charging Unit

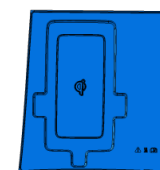
◆ UNIT



◆ INDICATOR



◆ PAD



▶ Main Function

- (FOD) Foreign object detection
- SMK interference prevention
- Cell phone neglect alarm
- Over Temperature protection

※ Developed by models



## 2-5. Status of MP(15W) Development

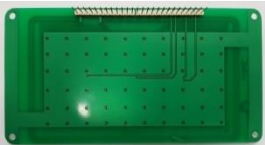

✓ Current production    ✓ Future production

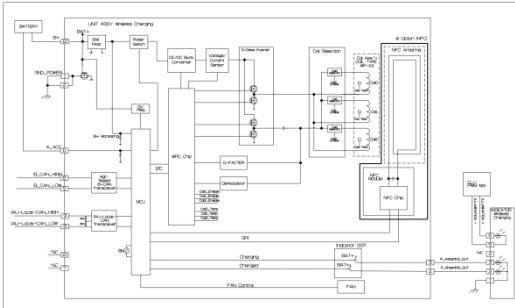
VEHICLE	HMC	Sonata, Genesi, Genesis SUV(NEW)
	KMC	Optim, New Small Car
Wireless Charging		MP(15W)



### Wireless Charger Description

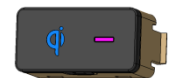
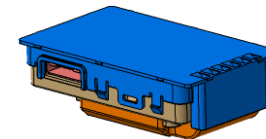



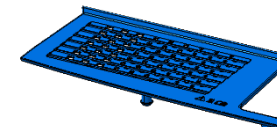


◆ UNIT

◆ INDICATOR



◆ PAD



<Sonata 下一代>

※ Development of other models

#### ▶ Main Function

- (FOD) Foreign object detection
- SMK interference prevention
- Cell phone neglect alarm
- Over Temperature protection
- Card burn-out prevention
- (NFC) Vehicle Key Authentication
- Mobile phone heat sink FAN



## 3-1. System Function – Wireless charging

### - . Wireless Charging Status

➤ Working sequence (normal wireless charging)



Start button ON

ACC ON  
&  
Door Close



Cell phone on the WPC pad



Cell phone charging status  
(LED lights during charging time)

## 3-2. System Function - Foreign Object Detection

- Foreign Object Detection Status

➤ Working sequence (abnormal wireless charging)

FO(FOREIGN OBJECT)

- Metal Case

- Coin

- Card Key



Start button ON

ACC ON  
&  
Door Close



Cell phone on  
the Wireless Charging Pad



Object Detection status  
(AMBER Blanking  
for 10 seconds)

## 3-3. System Function - Cell phone neglect alarm

- Cell phone neglect alarm Status

### ➤ Cell phone neglect alarm



ACC OFF



Cell phone on  
the Wireless Charging Pad

Door Open

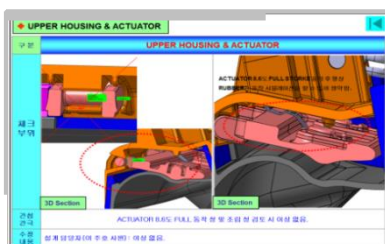


# 4 Design Process & Verification Capability

## 4-1. R&D Development Equipment – For Design, Verification and Analysis

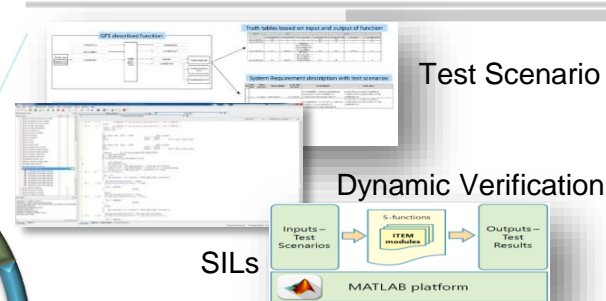
- ◇ To pursue High Performance and High Quality
- ◇ To make Robust Design

### ❖ Mechanical Analysis



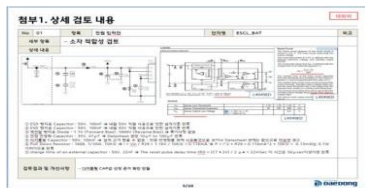
DMU/CAE

### ❖ Software Analysis



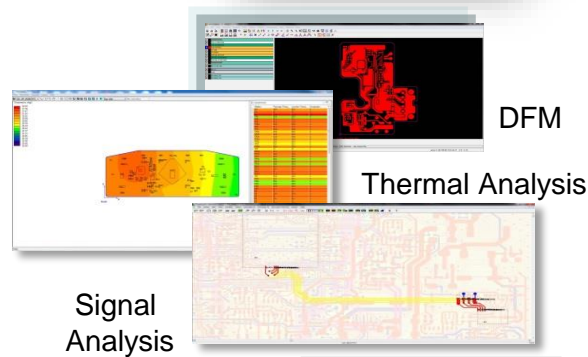
Design F/Back

Circuit Verification



PCB Verification

### ❖ H/W Verification

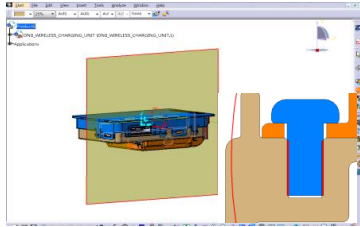


### ❖ Electronic Analysis

# 4 Design Process & Verification Capability

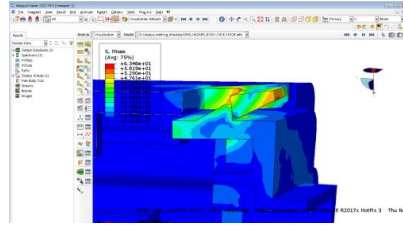
## 4-2. Mechanical & Hardware Verification

### Mechanical Analysis



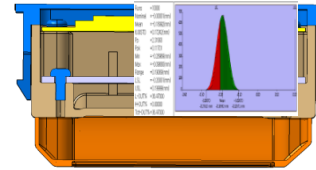
#### Digital Mock-up

- Check Interference of Assembly with Mating Parts
- TOOL : CATIA DMU



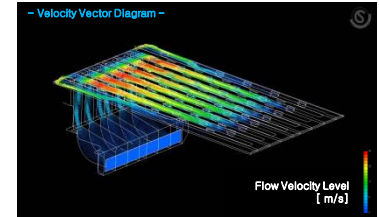
#### Structural Analysis

- Check Requirement and Specification of Customer
- Strength, Dynamics, Vibration
- TOOL : ABAQUS



#### Tolerance Analysis

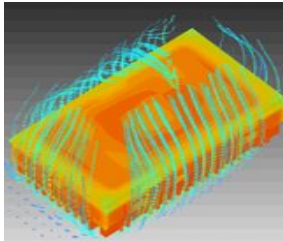
- Sensitivity Analysis
- TOOL : 3DCS



#### Flow Analysis

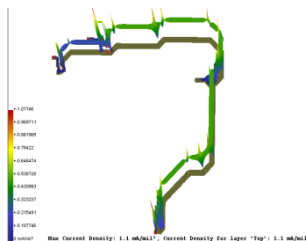
- Calculation Grid Used for Analysis
- SCRYU/Tetra V13

### Electronic Analysis



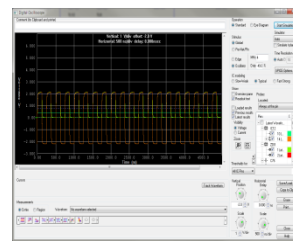
#### Heat Flow Analysis

- Heat Characteristic and Heat Transfer Analysis
- Tool : FloTHERM



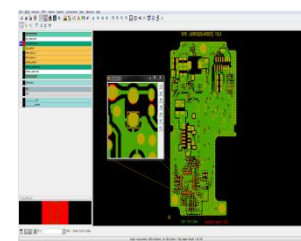
#### Power Integrity

- Voltage Drop, Current Density Analysis
- Tool : HyperLynx PI



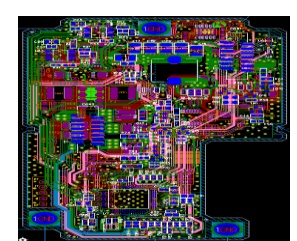
#### Signal Integrity

- Signal Phase and Frequency Modulation Analysis
- Tool : HyperLynx SI



#### DFM

- Verification of Circuit Design
- Tool : Valor NPI



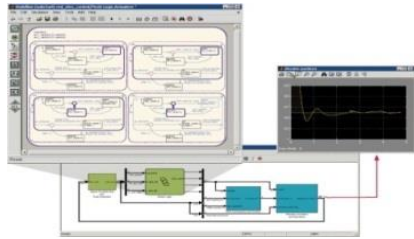
#### PCB Verification

- PCB Circuit Verification, Power Transfer and Connection
- Tool : PADS

# 4 Design Process & Verification Capability

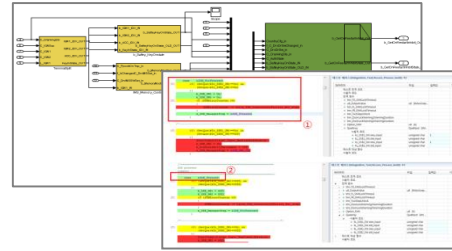
## 4-3. Software & System Verification

### Software Tests



#### MIL (Model-In-the-Loop)

- Validation of Software Design based on Software Model
- TOOL : MATLAB & SIMULINK



#### SIL (Software-In-the-Loop)

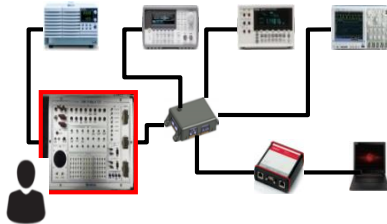
- Test Implemented Code to confirm Unit Design and Interfaces
- TOOL : VECTORCAST



#### PIL (Processor-In-the-Loop)

- Confirm Software Operation after downloading to real MCU
- TOOL : MATLAB & SIMULINK

### System Tests



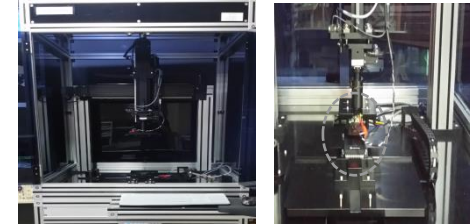
#### Simulation Test

- To test each functions in virtual environment of vehicle



#### In-Vehicle Test

- To measure input/output of vehicle which can be possible to occur at real vehicle environment



#### Automated Functional Test

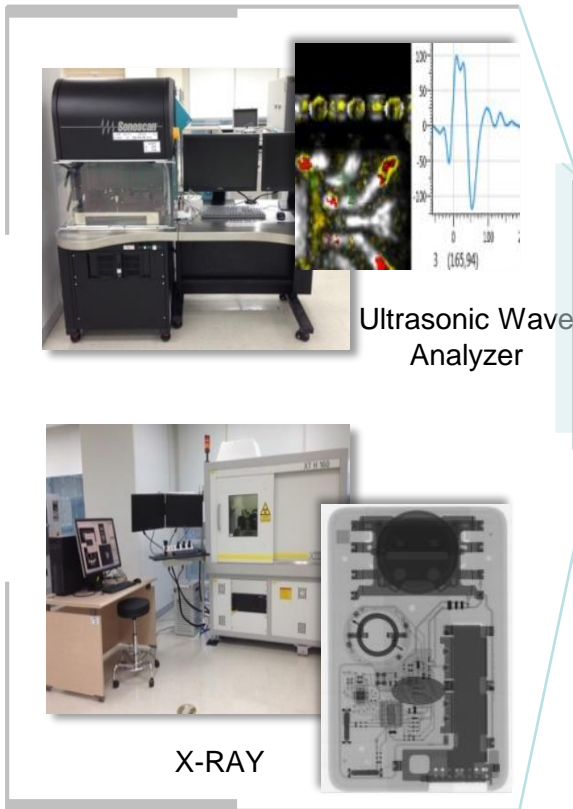
- To test automatic function by each controllers
- Automated Fault-injection testing

# 4 Design Process & Verification Capability

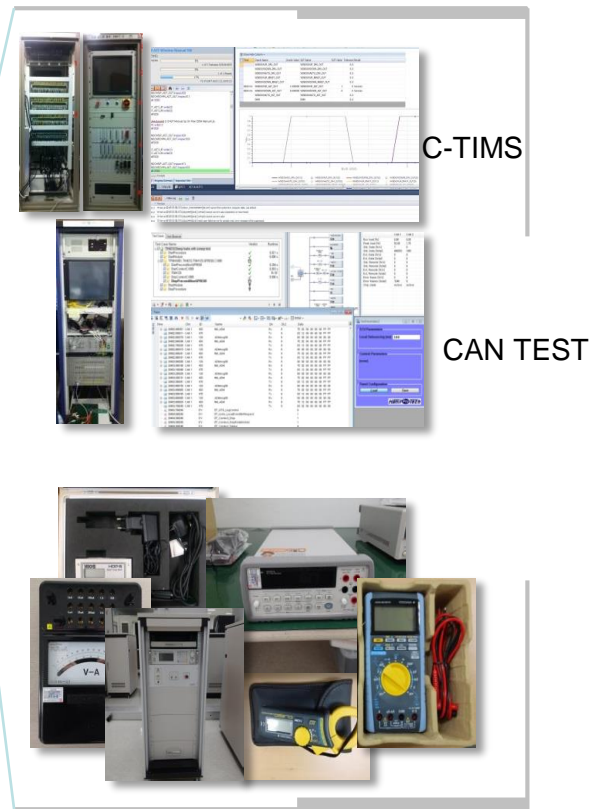
## 4-4. Test & Measurement Equipment in R&D Test Lab. (1/2)

- ◇ High Performance and Quality
- ◇ Robust Design , Flawless Launch, Zero Defect

### ❖ Test (32 EA)



### ❖ Evaluation (3 EA)



# 5 Test & Validation

## 5-1. EMC Test Lab. (Certified by KOLAS and HKMC)

### EMI (Electro-Magnetic Interference) Test System



- The intensity of electromagnetic noise generated from the controller is measured in a facility having a characteristic of blocking / absorbing external electromagnetic noise
- ✓ Test items : RE (Radiated emission), CE (Conduction emission), MFE (Magnetic field emission)
- ✓ Equipment Specifications (Measurable range)
  - RE : Maximum 7 GHz / CE : Maximum 200 MHz

### EMS (Electro-Magnetic Susceptibility) Test System



- Test in a facility that has the property of intercepting / absorbing internal / external electromagnetic noise with resistance to external noise from the outside
- ✓ Test items : RI (Radiation immunization), GSM
- ✓ Equipment Specifications (Test coverage)
  - Frequency : Maximum 6 GHz / Field strength : Maximum 200 V/m

### Shield room #1

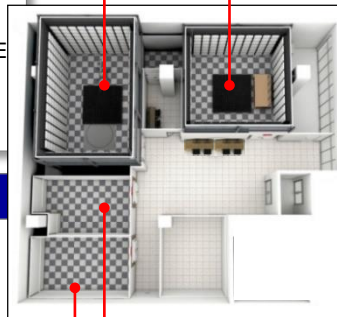


- Resistance to low-frequency noise introduced from the outside is tested in a facility having external noise blocking and internally generated low-frequency noise absorption characteristics
- ✓ Test items : BCI (Total Current Injection), MFI (Magnetic field immunity)
- ✓ Equipment Specifications (Measurable range)
  - BCI : 300 mA / MFI : 190 dB $\mu$ A/m

### Shield room #2



- Resistance to noise such as static electricity or surge that flows into the product from the outside is tested in a facility having external noise blocking characteristics
- ✓ Test items : ESD (Static), TI (Surge), TE (conducted emission)
- ✓ Equipment Specifications (Measurable range)
  - ESD : Maximum 30kV / TI : ISO7637-2

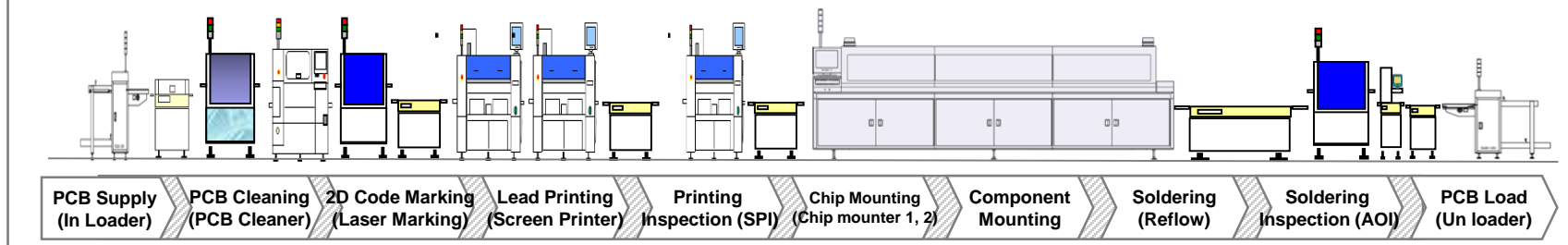




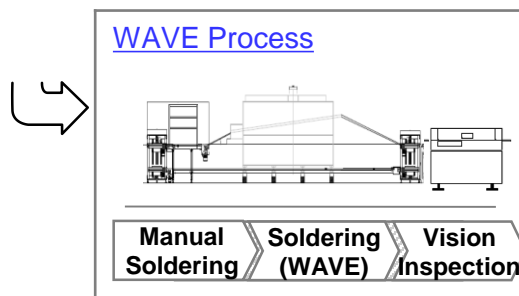
## 6-1. Wireless Power Charging Unit Process



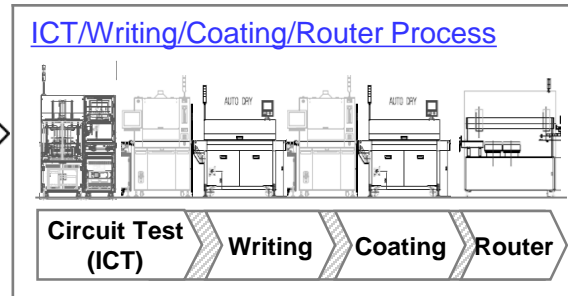
## SMD Process



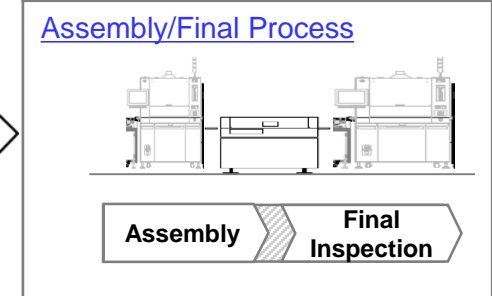
## WAVE Process

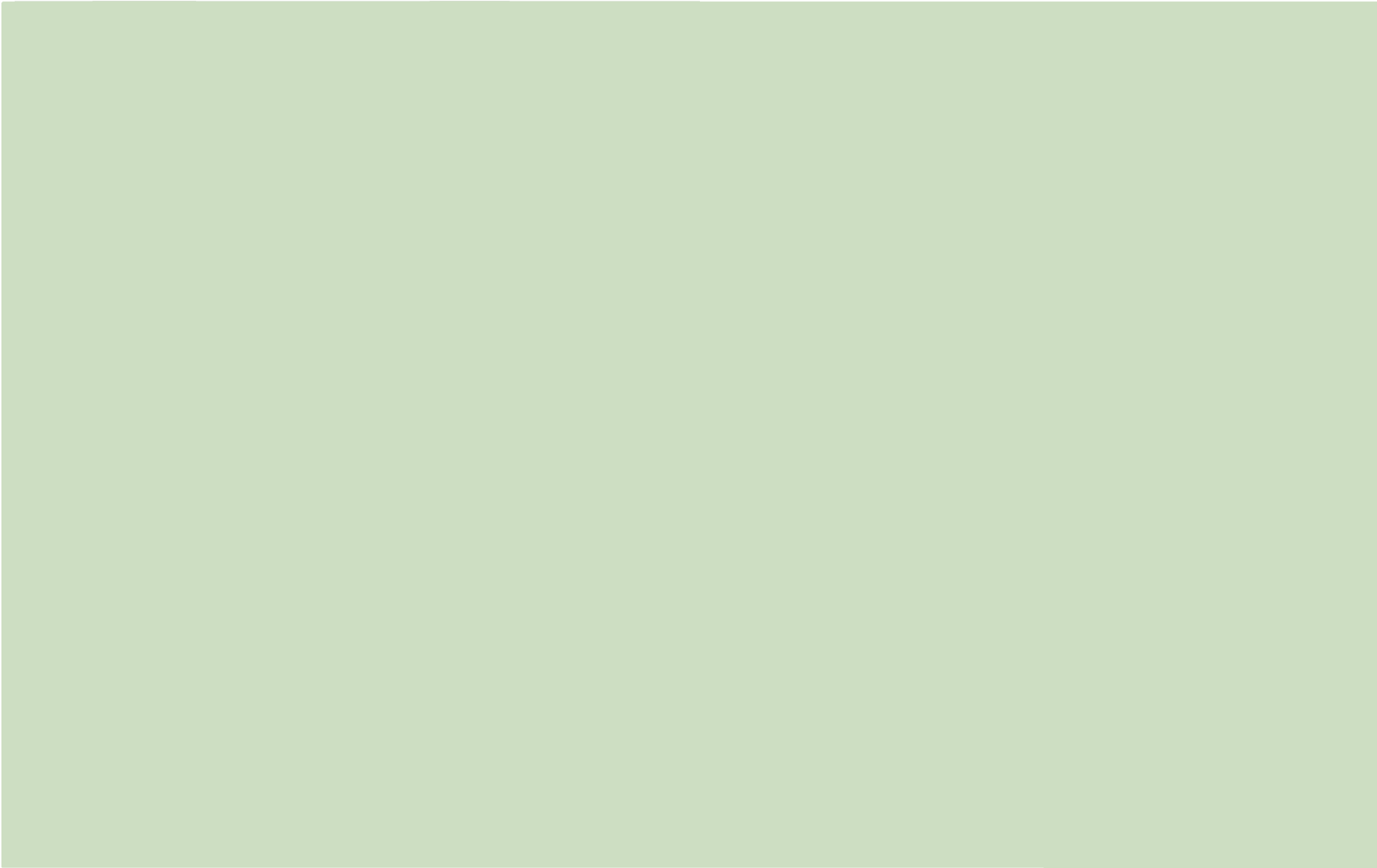


## ICT/Writing/Coating/Router Process



## Assembly/Final Process





This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

#### Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.