SAE INTERNATIONAL

WIRELESS POWER TRANSFER TECHNOLOGY, ALIGNMENT & TEST STANDARDIZATION

SAE J2954

CERV CONFERENCE

FEBRUARY 11TH, 2020

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TASKFORCE CHAIR SAE J2954
WIRELESS POWER TRANSFER

SAE INTERNATIONAL

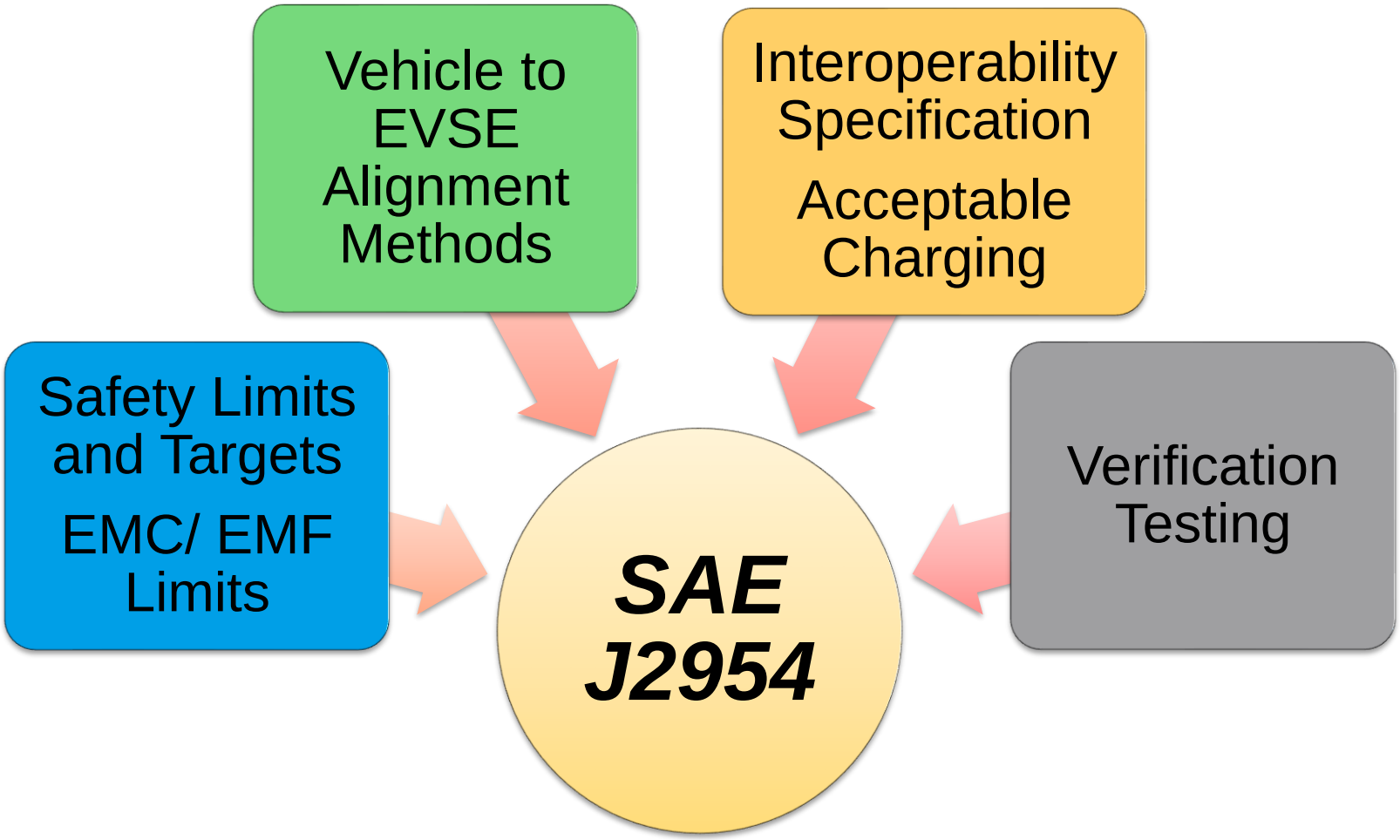
WIRELESS POWER TRANSFER FOR LIGHT-DUTY PLUG-IN/ ELECTRIC VEHICLES AND ALIGNMENT METHODOLOGY, SAE J2954

Background:

SAE J2954 is performance-based using a „Testing Station“ where vehicle OEMs and infrastructure companies can either use the J2954 coil specifications or prove performance compatability through testing.

In addition, location of the coil in the parking spot as well as a specification for vehicle alignment and automated charging will be provided in SAE J2954.

SAE J2954 SCOPE



Start 2007 → Standard in 2020 !!!

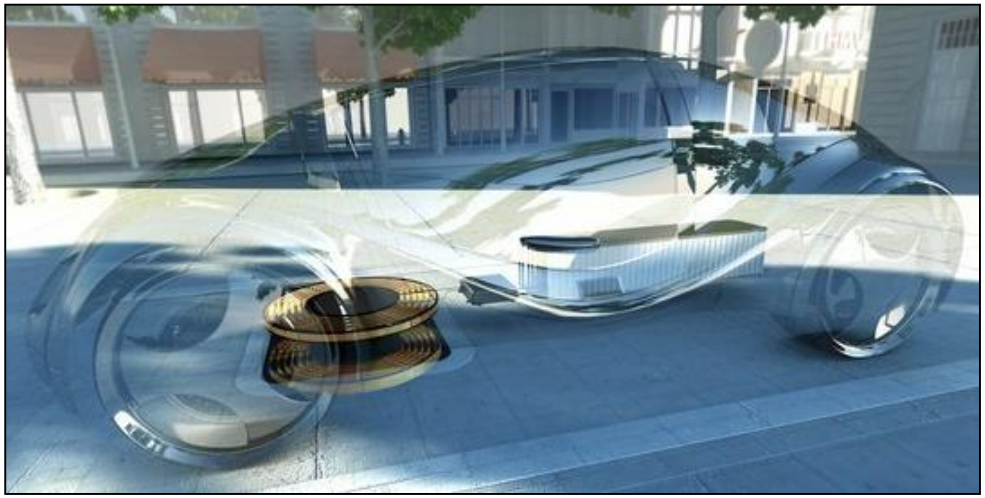
Automakers and Tier 1 participating SAE J2954 WPT Standardization

Auto OEMs:

- Audi
- BMW
- Daimler
- Faraday
- FCA
- Ford
- GM
- Honda
- Jaguar
- Karma
- Nissan
- Toyota
- Volkswagen

HD OEMs:

- BYD
- Gillig
- Nikola
- Proterra
- Scania
- Volvo



OEM Tier 1 & Technology Suppliers

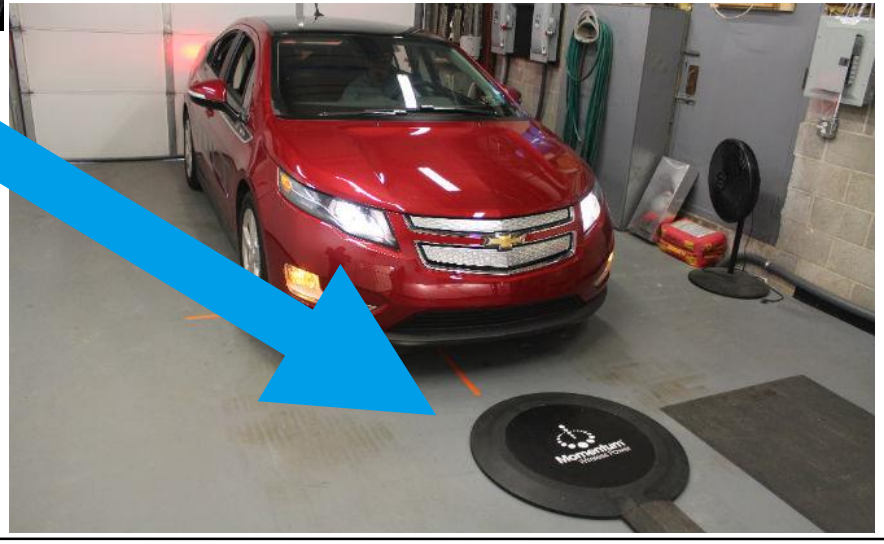
- Delphi
- Lear
- LG
- Magna
- Panasonic
- TDK
- Toshiba
- Conductix Wampfler
- Evatran
- HEVO
- Qualcomm Halo
- SEW
- Wave
- WiTricity

Goal of SAE J2954: Enable Commercialization of Wireless Power Transfer in both private and public locations

Enabling an additional charging option to Pluging-In: Wireless Charging.

„One Standard Philosopy“, where any SAE J2954 WPT equipped vehicle can pull up to any SAE J2954 WPT Ground Assembly to charge automatically.

Public-Private Applications (SAE J2954)



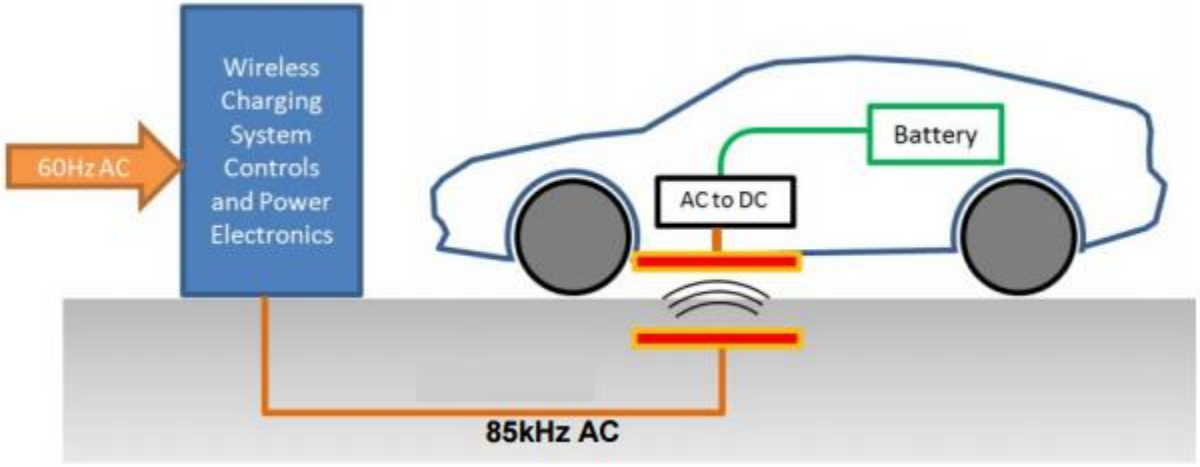
SAE J2954 will assist Autonomous vehicles to find a parking spot and with communications automate alignment, charging and payment. The only way for automous vehicles to park and charge automatically (all weather) is with Wireless Power Transfer.

Wireless Power Transfer (Charging) for PH-EV using SAE J2954

SAE J2954 enables Wireless Power Transfer (WPT) in the kW range.

Light Duty WPT Specification

- Power Transfer in 3 power levels WPT 1-3 (3.7kW, 7.7kW, up to 11kW)
- Air Gaps based on three categories from 100-250mm (up to 10 inches)
- Minimum Efficiency 80-85% misaligned/aligned
- Tested efficiencies to 93% reported
- Operating Frequency Band: 85kHz (working with the US FCC and ITU)

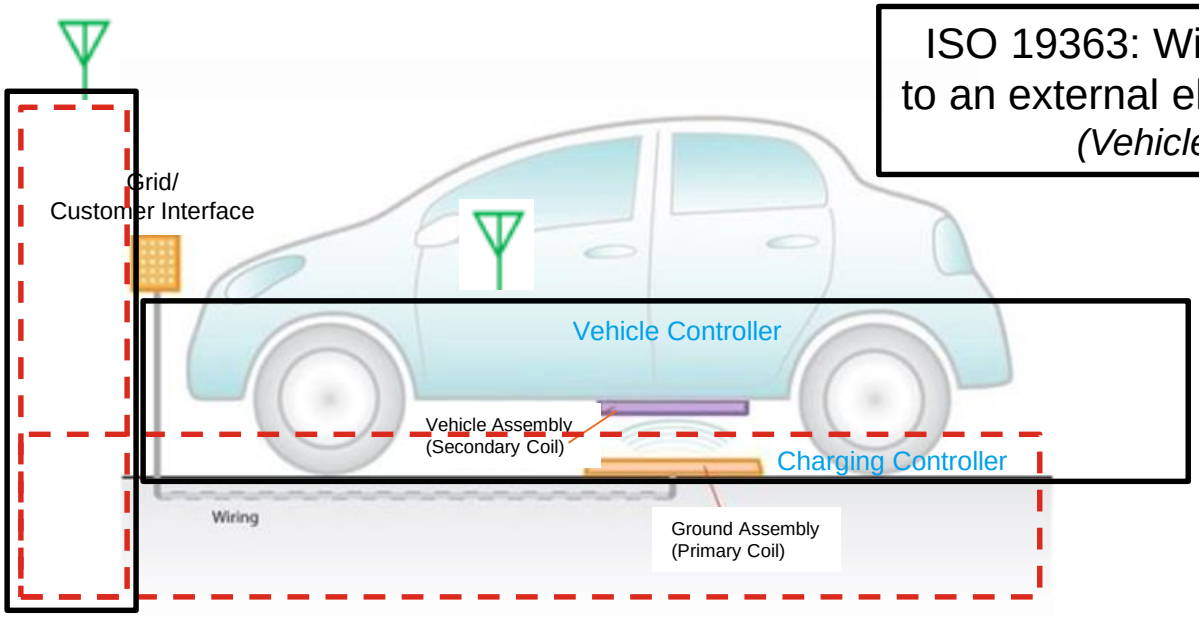


Vehicle-Infrastructure Wireless Charging Standards
SAE, UL, ISO, IEC

Communi cation

SAE J2836/6: Use Cases and Communications
SAE J2847/6: WPT Communication PHEV and the Utility Grid
SAE J2931/6: Digital Communication for WPT for PHEV
ISO 15118-2, Ed. 2: V2G Use Cases and Communications

Vehicle Assembly



ISO 19363: Wireless connection to an external electric power supply *(Vehicle Side Only)*

PSDO Agreement

Ground Assembly

UL 2750:(Draft) Verification WPT GA Safety &
IEC 61980-3 WPT for GA
(Infrastructure Only)

MOU

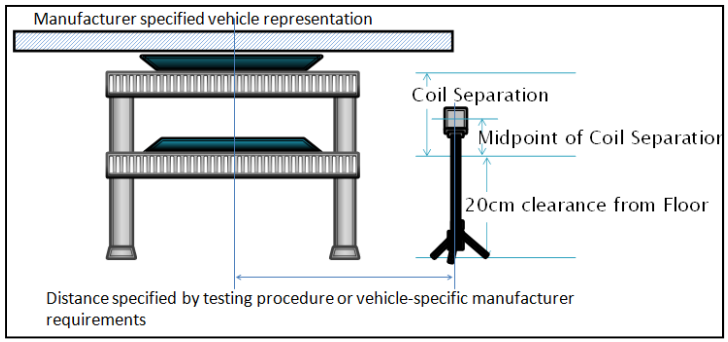
SAE J2954: Wireless Power Transfer and Alignment
(BOTH Vehicle and Infrastructure)

J2954 Testing Scope: Bench and Vehicle Testing

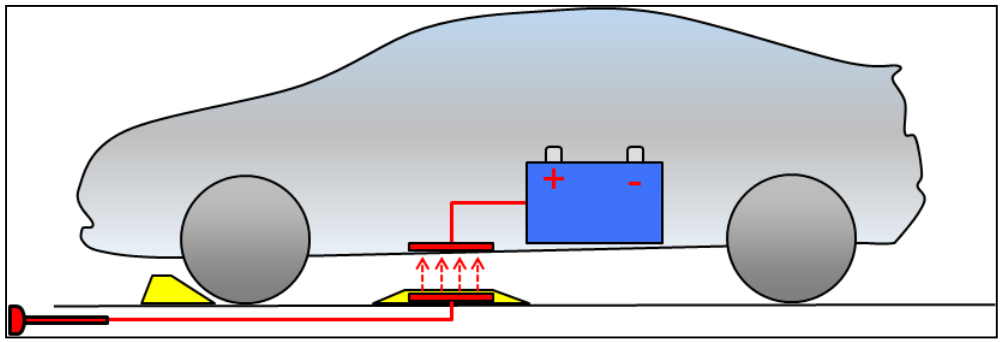
SAE J2954 Ratings Test

Test for Matching Coils		Test for Mismatched Coils	
Design Validation Test – Bench Level	Design Validation Test – Vehicle Level	Design Validation Test - Bench Level	Design Validation Test – Vehicle Level

Verification Testing

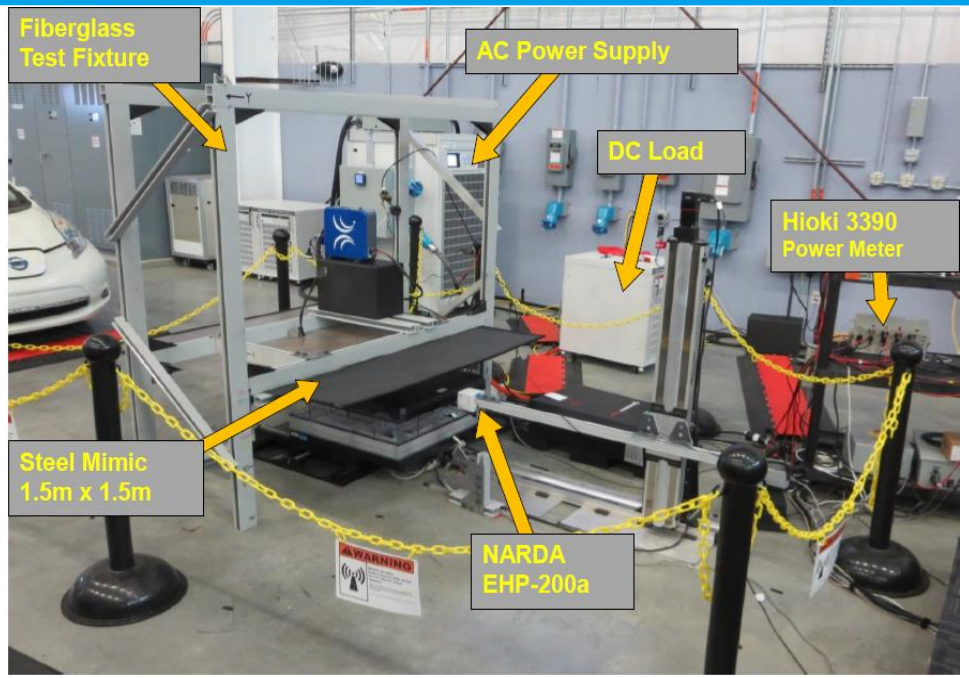


Component Bench Testing



Vehicle Testing

SAE J2954 Station Test Stand
Bench Testing at Idaho National Lab



Verification Testing:

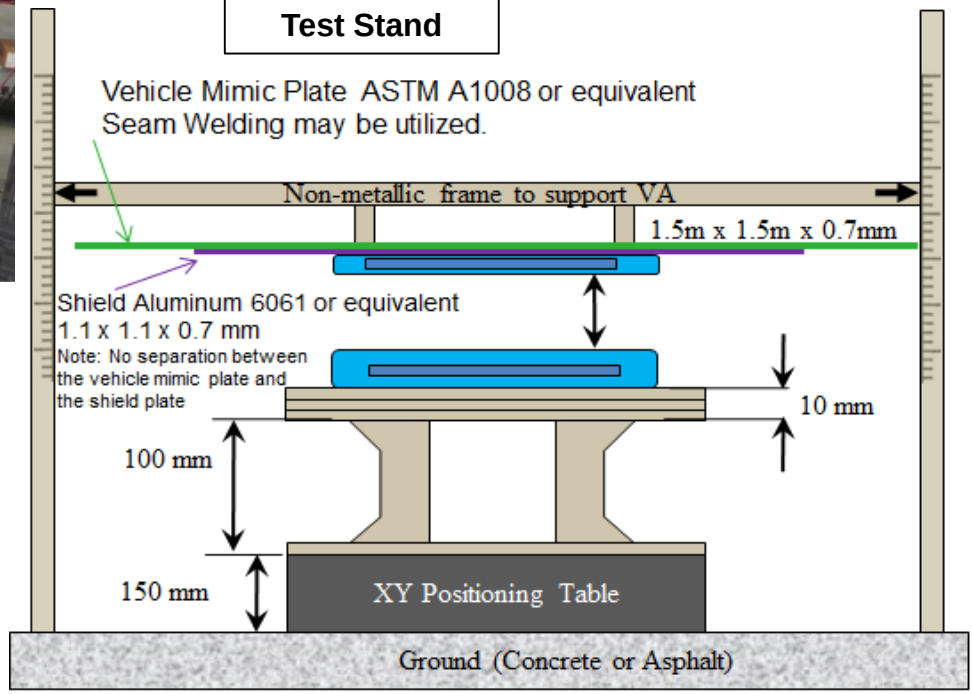
Bench Tests

2018-2019

Goals:

- Establish Baseline for Bench Testing for the industry to evaluate WPT
- Confirm performance, safety and interoperability specification.

SAE J2954 INL Test Stand

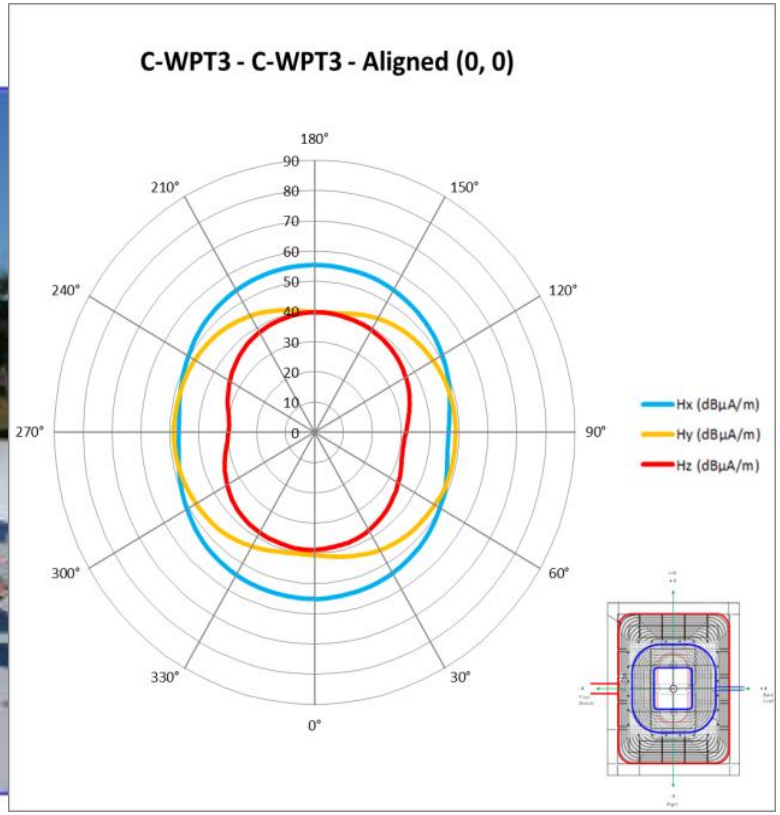


SAE J2954 EMC Measurements (Circular Example)

Two major influencing parameters on the H-field emissions have been identified:

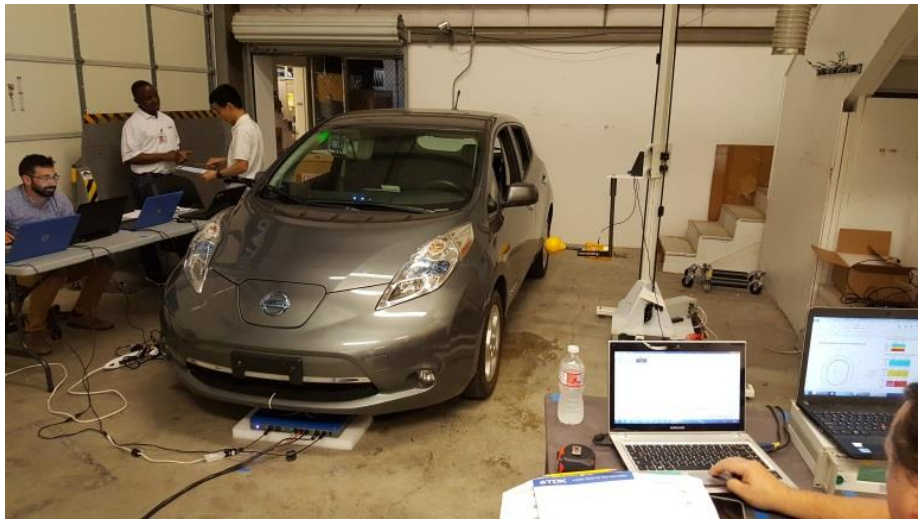
the type of the ground (PEC – perfectly electrically conductive vs. „real earth“, i.e. soil/grass)

the offset between BP and VP (0/0 or 75/100)

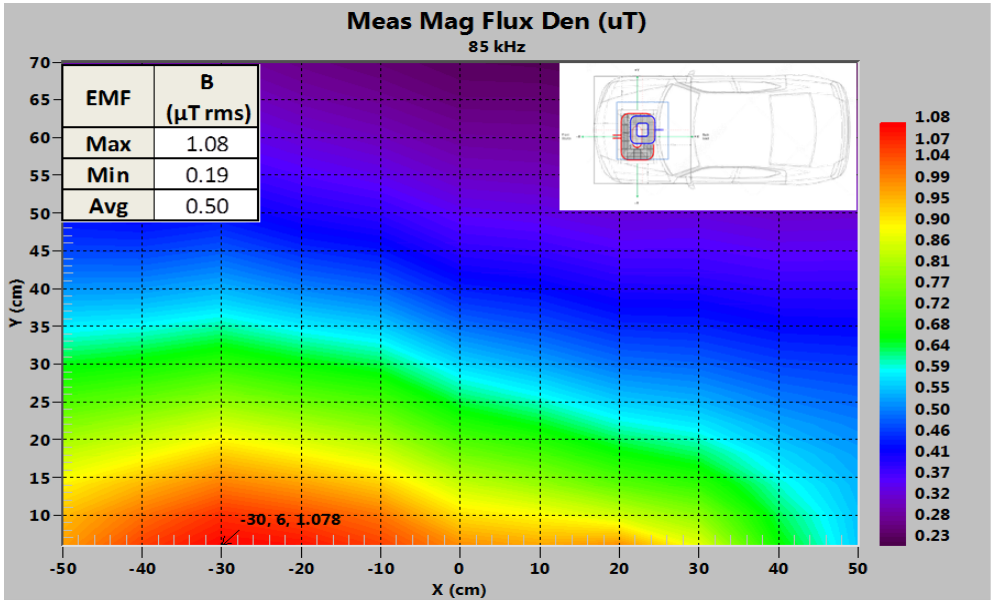


Picture source: TDK

EMF Staging site with WPT and measuring equipment – Vehicle.



Circular topology, WPT3 EMF xz-plane contour graph – Vehicle



SAE J2954 Standardization

- **J2954 Standard to be published in 2020**
  - Above Ground Light Duty WPT 1-3 up to 200mm
  - Establishes a universal Ground Assembly up to WPT 3
  - Interoperability Guideline for entire industry
  - Standard Normative Ground Assembly
  - EMC/ EMF/ EMI Limits
  - 85kHz Frequency Band
  - Validation Testing Specification
  - Common Parking Lot Location

- **J2954-2 TIR Heavy Duty Wireless Power Transfer to be published in 2021**

- **SAE J2954 Validation Reports**
  - Bench Testing Validation of Wireless Power Transfer up to 7.7kW Based on SAE J2954
  - https://www.sae.org/publications/technical-papers/content/07-11-02-0009/
  - Validation of Wireless Power Transfer up to 11kW Based on SAE J2954 with Bench and Vehicle Testing
  - https://www.sae.org/publications/technical-papers/content/2019-01-0868/

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The SAE Main Wireless Power Team

J2954 Press Releases: 2016-2017

- http://www.prweb.com/releases/2017/01/prweb14005112.htm
- http://www.sae.org/servlets/pressRoom?OBJECT_TYPE=PressReleases&PAGE=showRelease&RELEASE_ID=3415

THANK YOU

QUESTIONS?:

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