

Draadloos opladen van hulpdienstvoertuigen



Wifi Power Transfer

elincom



Power Electronics & Energy Storage event
14 juni 2022 | 1931 Congrescentrum 's-Hertogenbosch

ENERGY STORAGE
EVENT 2022



Agenda


- Ontstaan van het idee
- Draadloos laden... Een meer dan 120 jaar oud idee van Nikola Tesla (1856 – 1943)
- Waarom Draadloos?
- De techniek
- Demonstratie
- Uitdagingen
- Toepassingen



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- Beurs 
- Kabels & Stekkers ... Kan dat niet anders?
- Draadloos / techniek



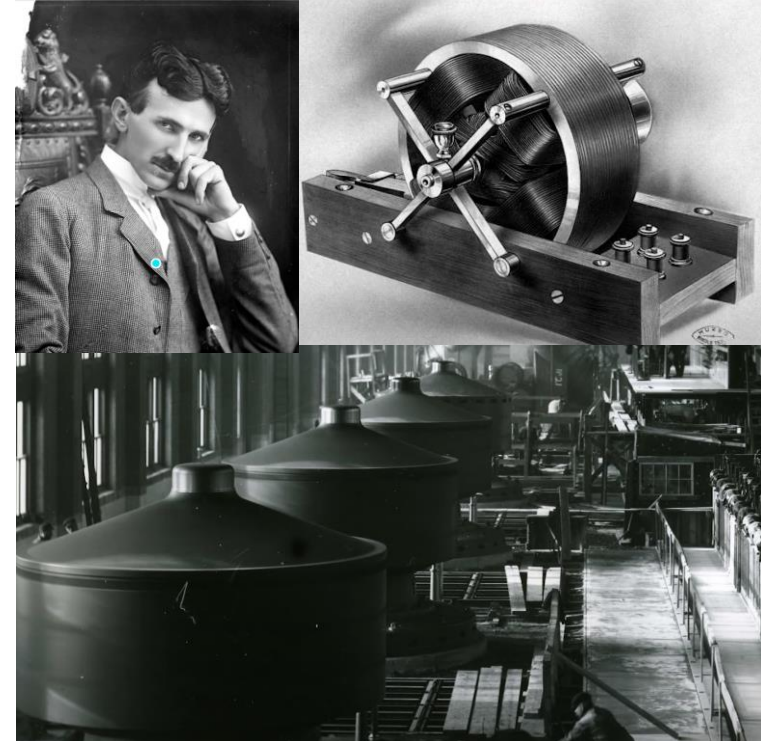
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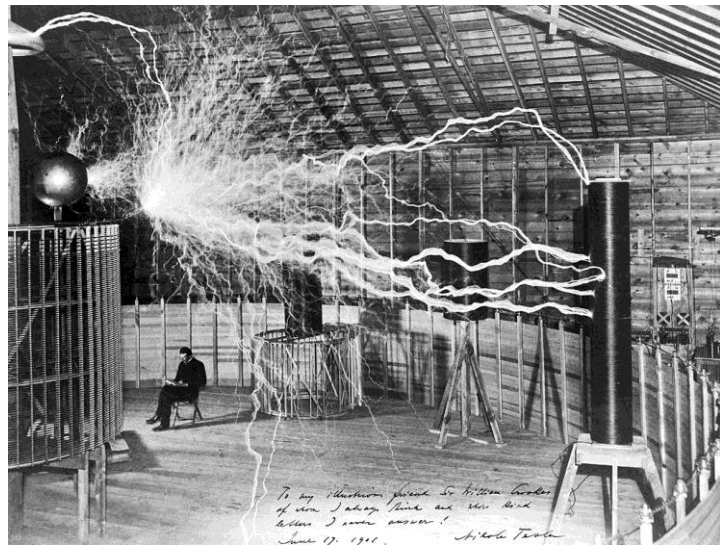
Greep uitvindingen van Nikola Tesla:

1. Radio
2. Inductie/wisselstroommotor
3. Hydro/waterkrachtcentrale
4. Neonlicht
5. Afstandbediening
6. Röntgenstraling en shadowgraphs
7. Laser (death ray / iron beam)
8. Teslaturbine
9. Teslaspoel
10. Tesla's elektriciteitszender



..... **300** patenten worldwide





To my Motherland, Nikola Tesla
of whom I have heard and who has
helped me in my work!
June 17, 1911. Nikola Tesla



Agenda

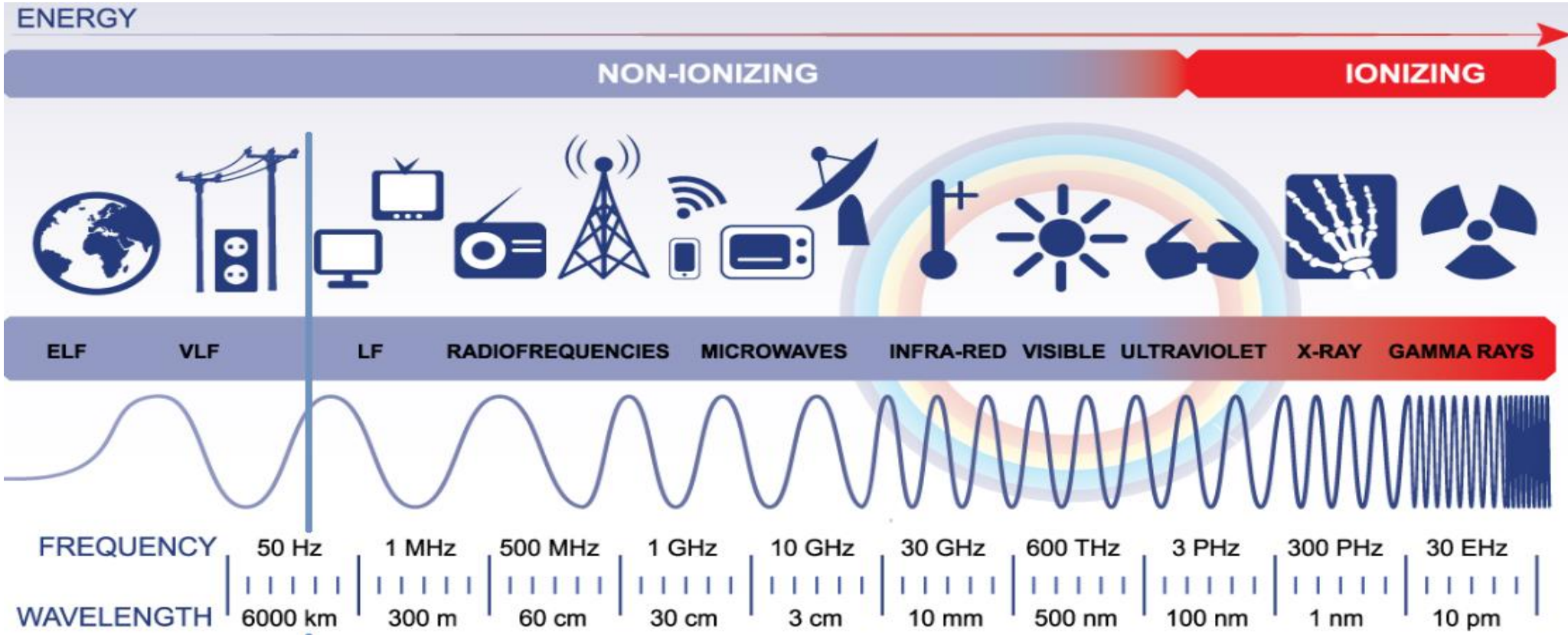
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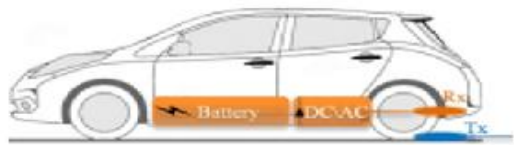
- *Universeel*
- *Veilig & Vonkvrij*
- *Waterbestendig*
- *Vandalisme bestendig*
- *Gemak*
- *Design vrijheid*
- *Lange levensduur*



Frequentie 85kHz / Golflengte 3.500m



Het elektromagnetisch spectrum



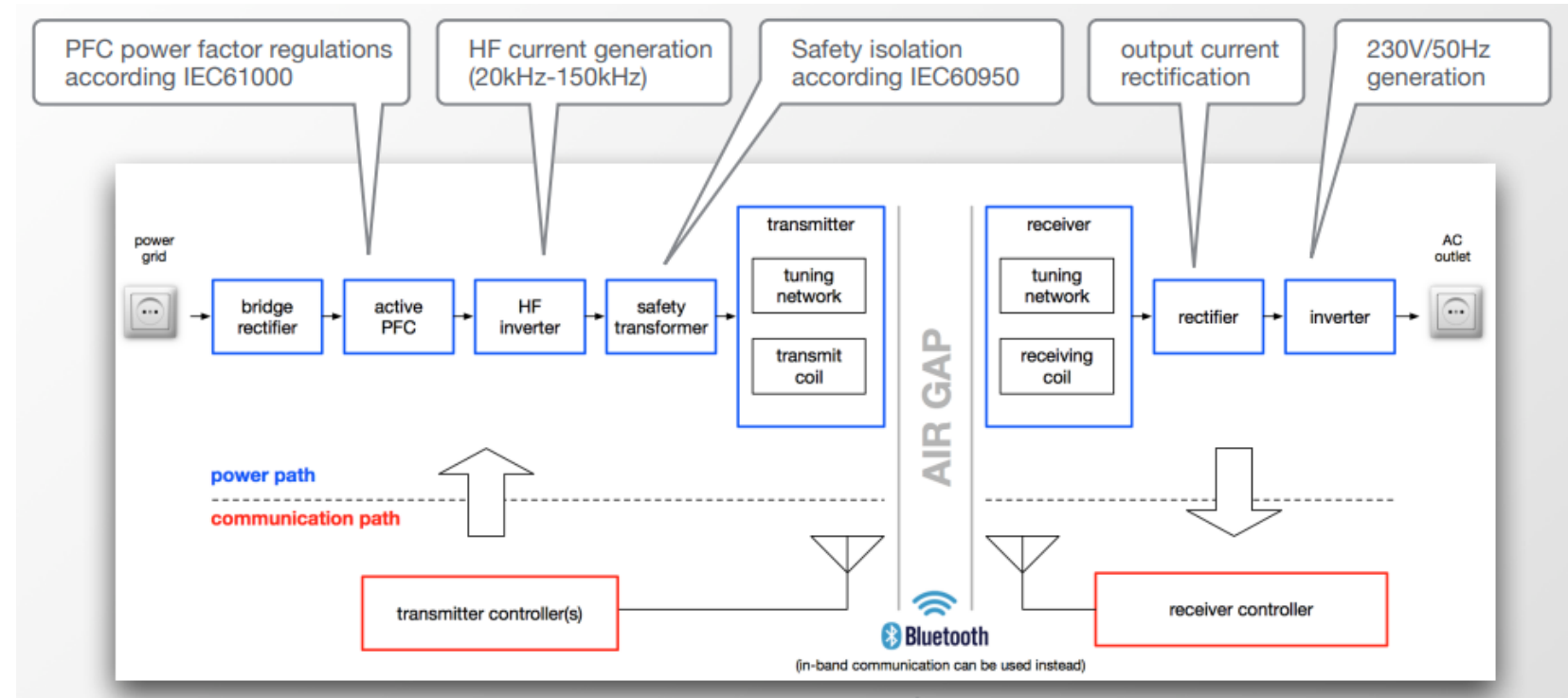
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De kunst der techniek

1. Input: 230V AC
2. AC => DC
3. Freq. generator 85kHz
4. Draadloze overdracht
5. HF => DC => AC
6. Output: 230V AC zuivere sinus



Standardization in wireless charging of BEVs/PHEVs



- IEC 61980: Electric vehicle wireless power transfer (WPT) systems
 - ❖ Part 1: General requirements (**Published - July 2015**)
 - ❖ Part 2: specific requirements for communication between electric road vehicle (EV) and infrastructure with respect to wireless power transfer (WPT) systems
 - ❖ Part 3: specific requirements for the magnetic field power transfer systems
 - ❖ Part 4: specific requirements for the electric field power transfer systems
 - ❖ Part 5: specific requirements for the microwave power transfer systems



- ISO 19363: Electrically propelled road vehicles -- Magnetic field wireless power transfer -- Safety and interoperability requirements
- ISO 15118: Road vehicles – Vehicle to grid communication interface
 - ❖ Part 6: General information and use-case definition for wireless communication
 - ❖ Part 7: Network and application protocol requirements for wireless communication
 - ❖ Part 8: Physical layer and data link layer requirements for wireless communication



- SAE J2954: Wireless Charging of Electric and Plug-in Hybrid Vehicles
- SAE J1773: Electric Vehicle Inductively Coupled Charging (**Published - June 2014**)
(Recommended practice for North America)



De kunst der techniek

- Input: 230V AC => output 230V AC
- Electronica
 - Resonante inductieve koppeling
 - Couplers (Ferrite + Lytze)
 - TX zender + RX ontvanger
- Tuning
- Hoge magnetische koppeling en koppelingsrendement
 $\eta \approx 1-2/kQ$: hoger 90 - 96 %.

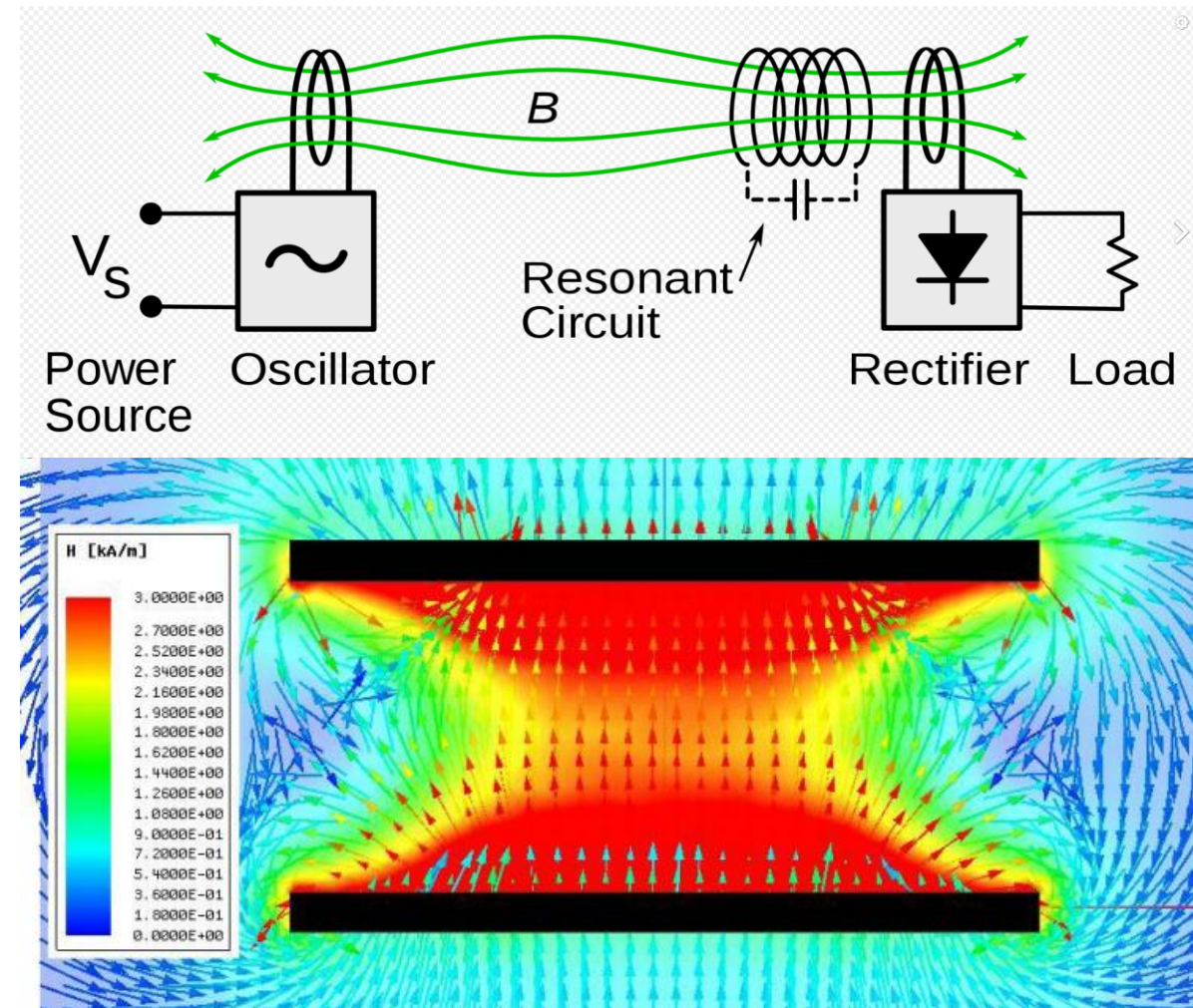


Table 1 - SAE J2954 WPT power classifications

	WPT1	WPT2	WPT3
Range of Input Volt-Amps	0 to 3.7 kVA	0 to 7.7 kVA	0 to 11.1 kVA

Additional WPT power classes, with maximum input
volt-amps of

22 kVA (WPT4) & 60 kVA (WPT5)

are under consideration for the next version of this
standard



WPT Z-Classes & GA Coil mounted height

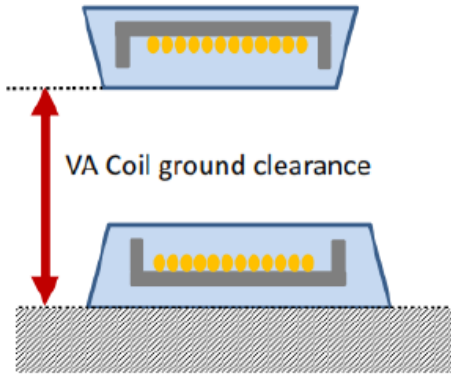


Figure 2 - VA coil ground clearance

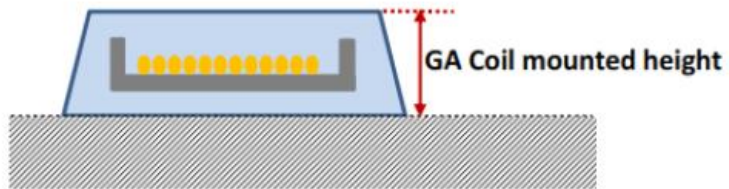


Figure 5 - Definition of GA coil mounted height

Maximum recommended allowable protrusion above the ground surface is 70 mm.

This maximum protrusion height may be subject to local installation rules and may be more or less than the value recommended here

Specification of the SAE J2954 VA Z-classes:

Z-Class	VA Coil Ground Clearance Range (mm)
Z1	100 to 150
Z2	140 to 210
Z3	170 to 250

Z-Class Related to Test Station and Product GAs:

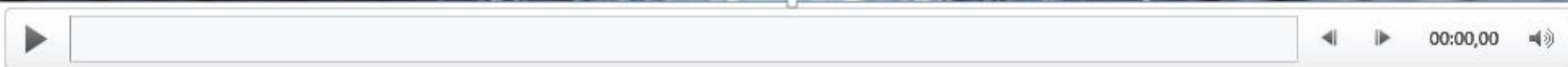
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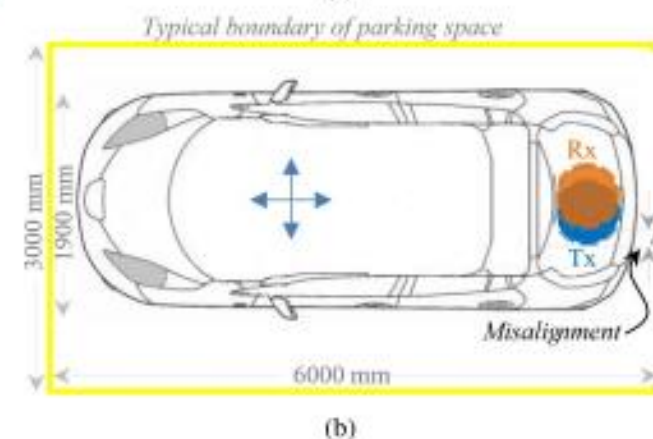
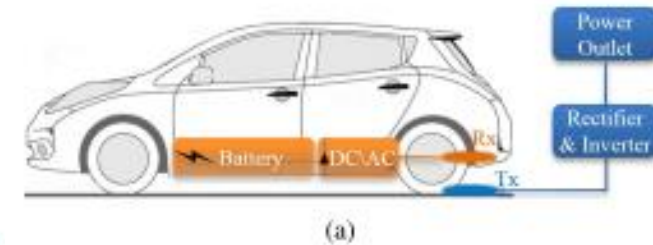
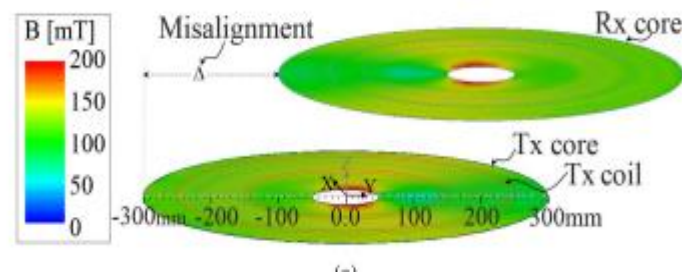
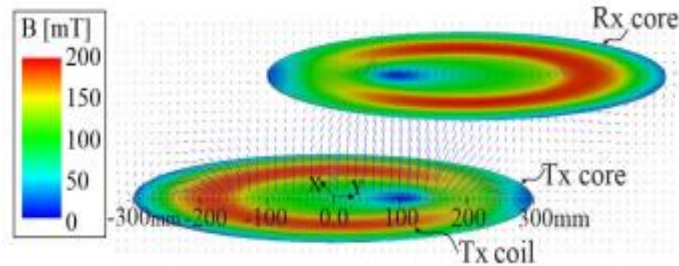
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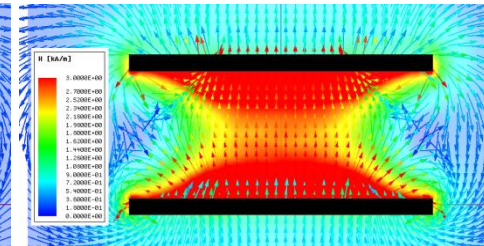
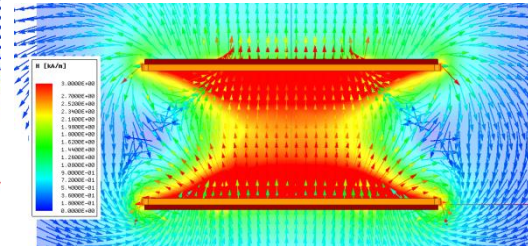
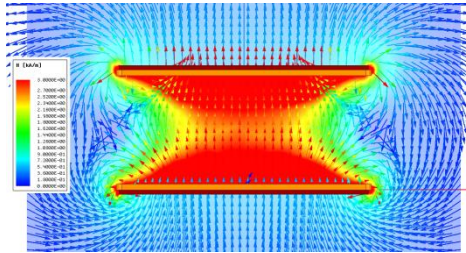
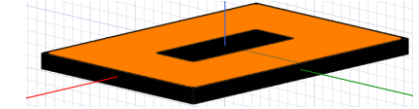
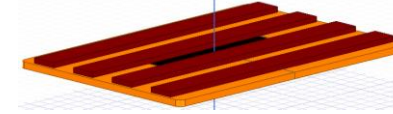
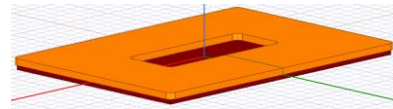
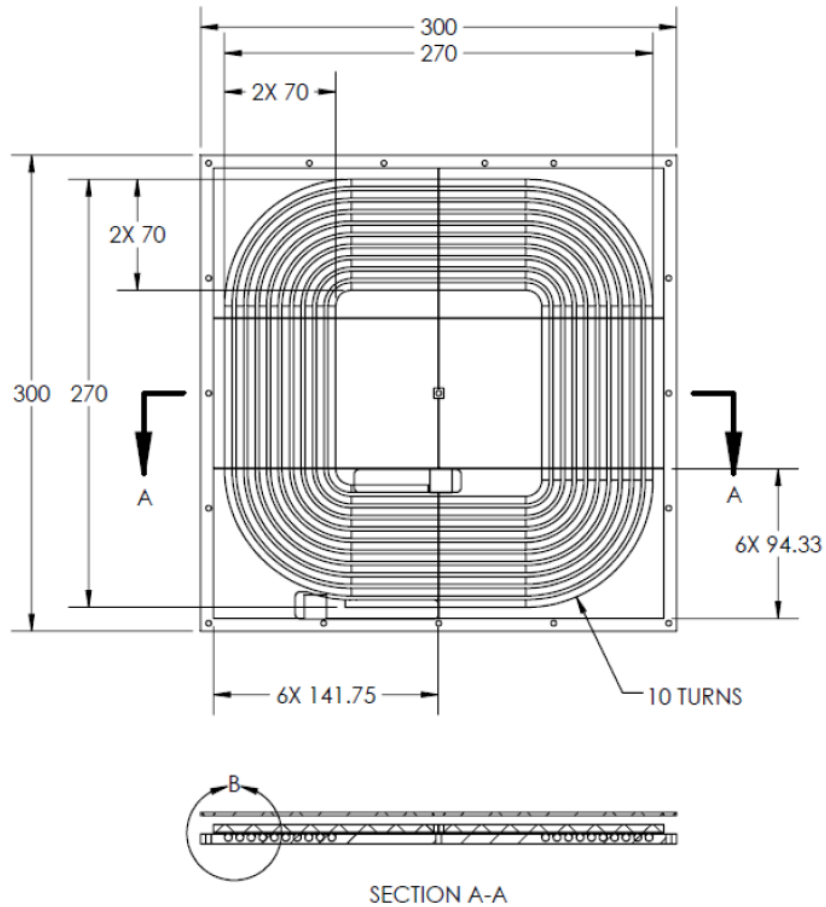
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Wat voor uitdagingen zijn er?

- Misalignment 50mm
- Handmatig of automatisch uitlijnen?
- Vreemde objecten detectie (FOD): Q-factor of capaciteitsverandering
- Draadloze communicatie (wifi / bluetooth)

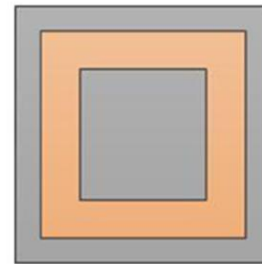




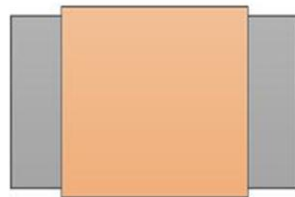
Ferrite pad

Ferrite bars

PBM-Ferrite bars +
PBM coil formed



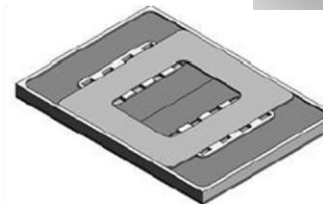
(a) circular/square non-polarized



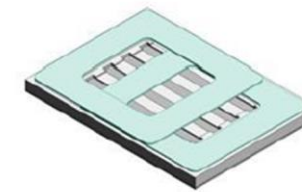
(b) Solenoid polarized



(c) DD polarized

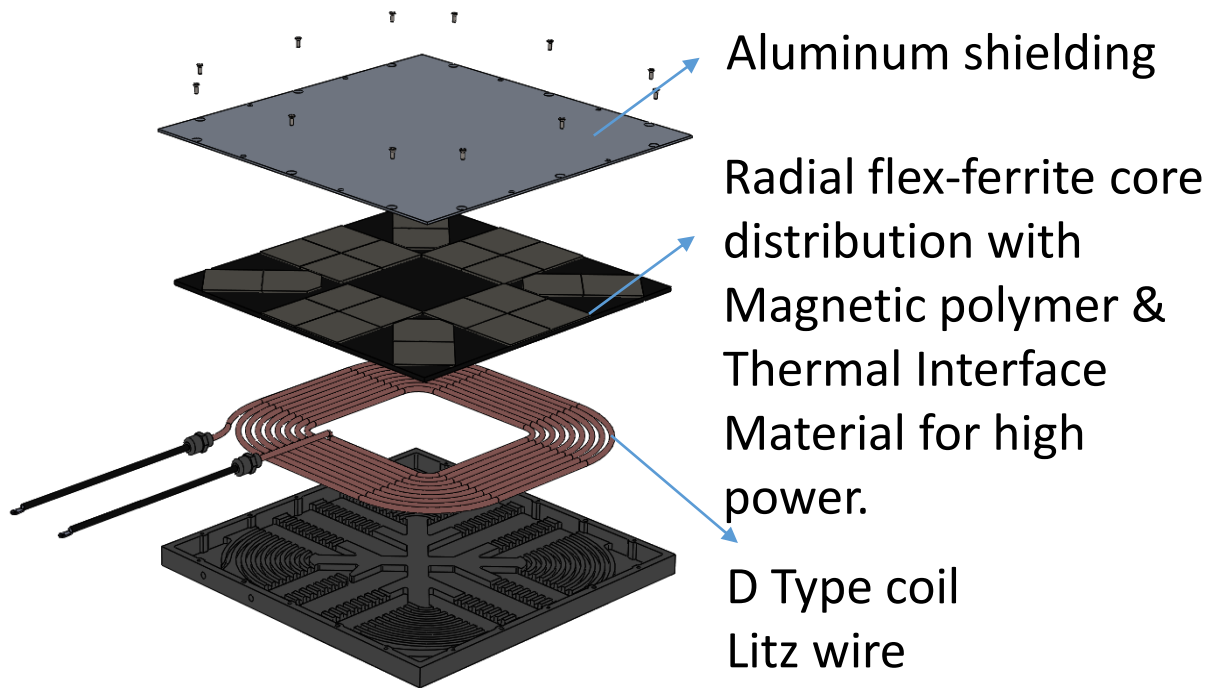


(d) Multi-coil DDQ



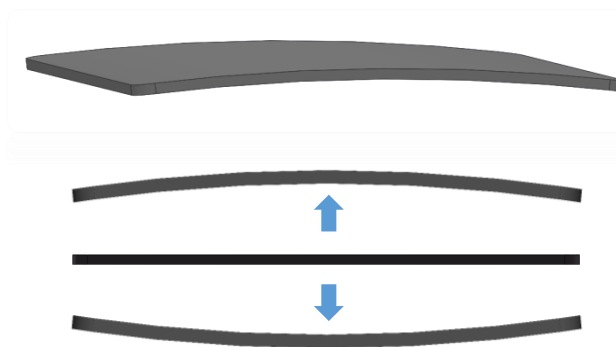
(e) Multi-coil Bipolar





Magnetic core:

- ✓ Unbreakable.
- ✓ Flexible.
- ✓ Compact.



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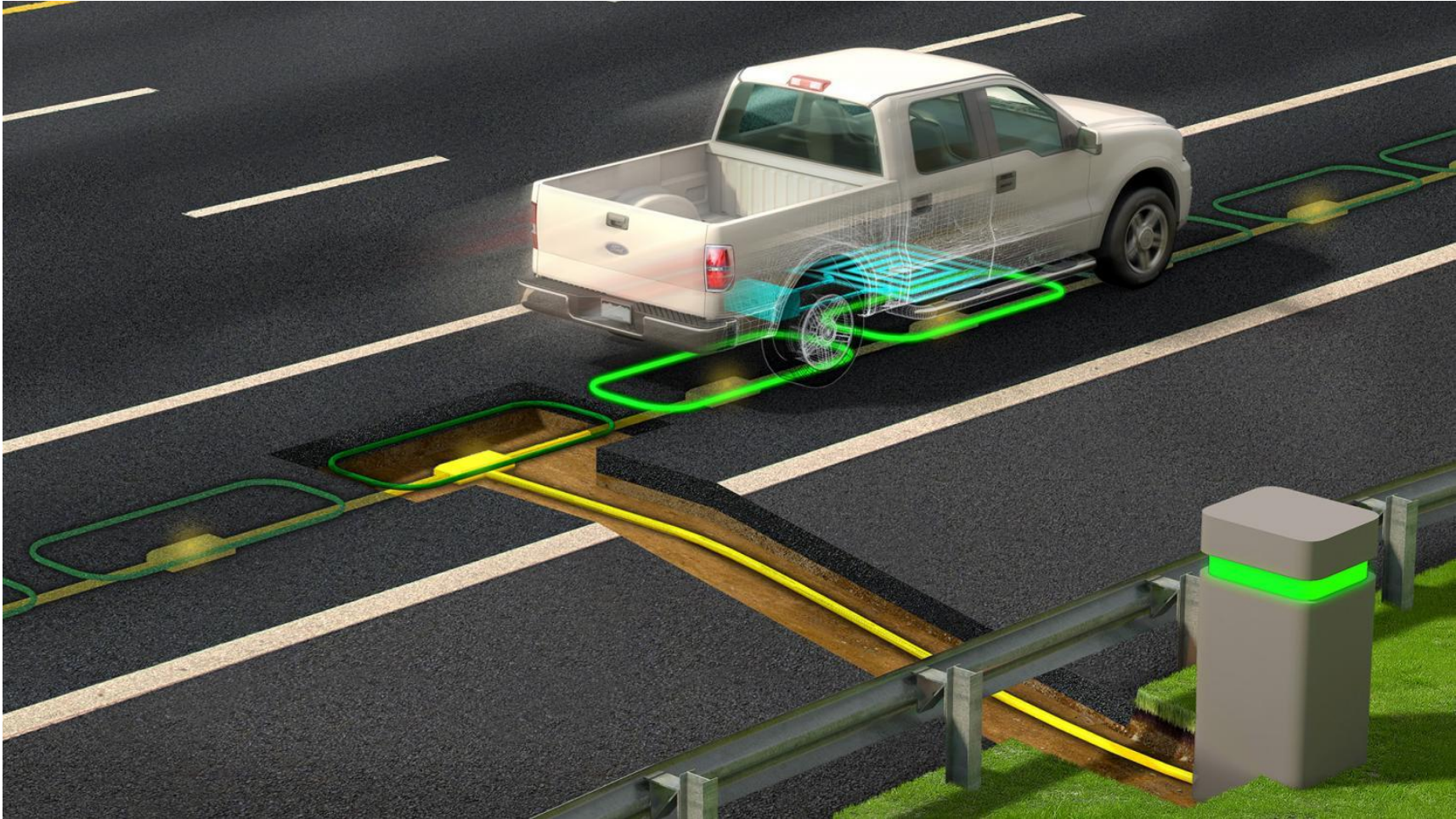
- Hulpdiensten in garage
Brandweer
Ambulance
- Robots /drones
-?

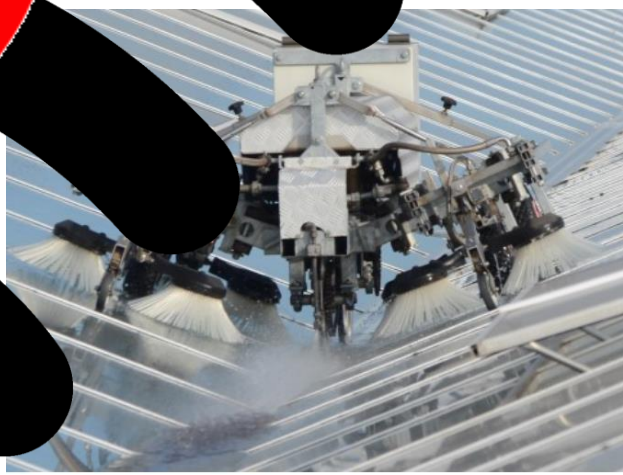


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Charge lanes om voertuigen te laden tijdens het rijden.







Wifi Power Transfer



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