



WiTricity
Wireless EV Charging

AGENDA

- Why EV/PHEV's Need Wireless Charging
- Highly Resonant Wireless Power Transfer
- Safety & Efficiency
- Demonstration

Electric Cars are BEAUTIFUL!



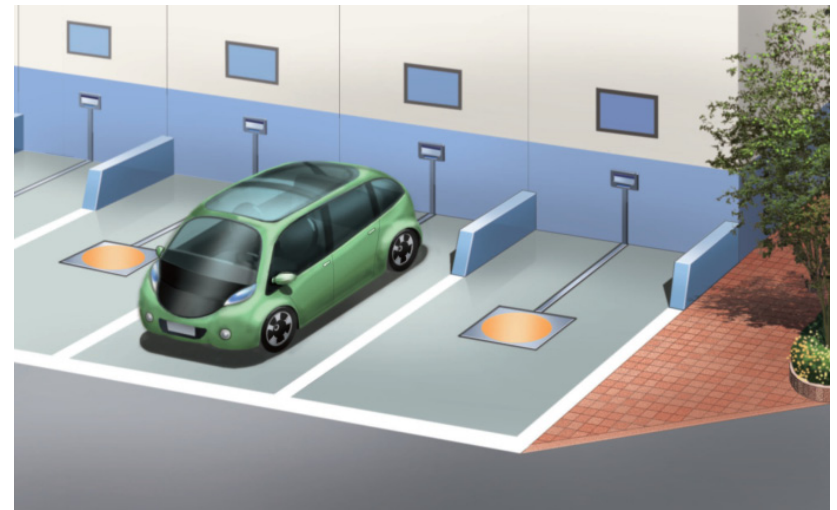
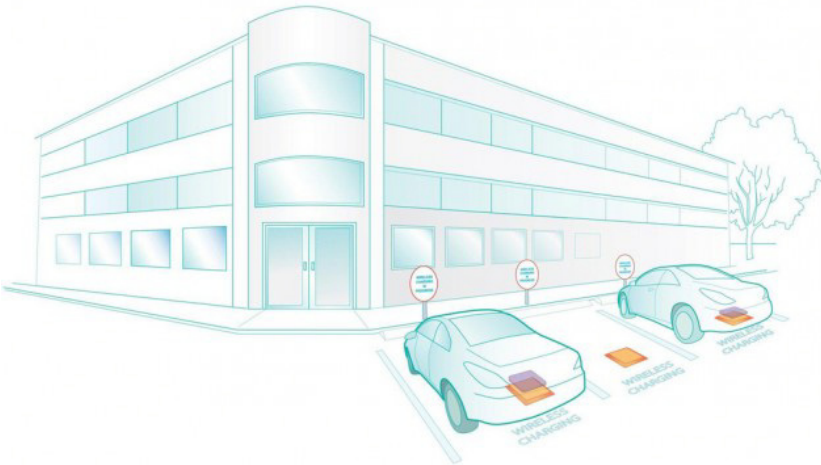
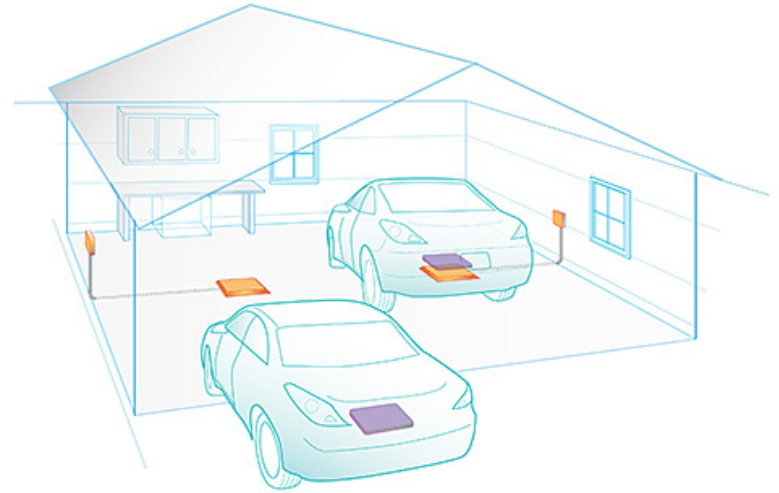
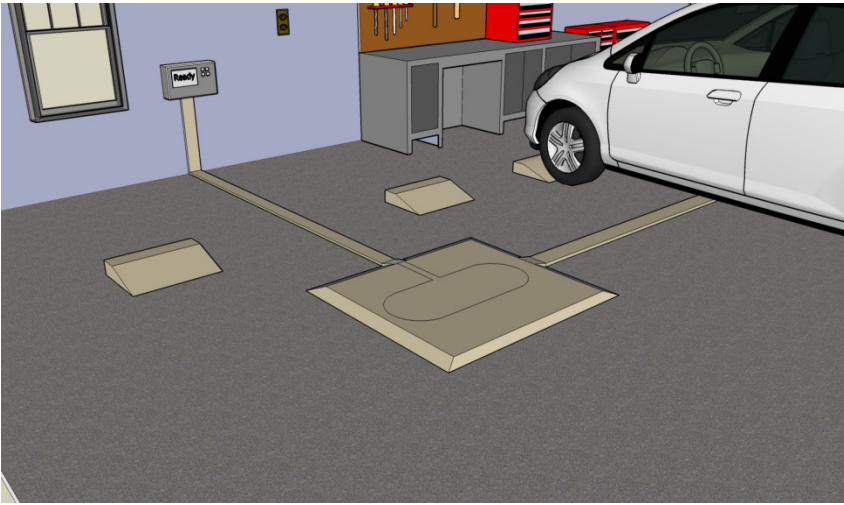
...but charging cords are ugly!



...and Charging Cords aren't user friendly!

- Will I forget to plug in?
- Will I forget to un-plug?
- Am I physically capable of plugging in?
- Do I want to plug-in, in bad weather?
- Do I want to get my hands & clothes dirty?
- Do I want to plug-in, in a public setting?
- Do I want my sleek EV to have an ugly extension cord?

Visions of a wireless EV future



WiTricity is delivering solutions across a wide range of industries



Industrials

Schlumberger



Transportation



IHI DELPHI

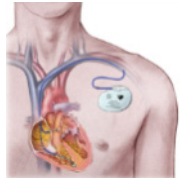


Consumer
Electronics

MEDIATEK

Haier
Inspired living

OSRAM
SYLVANIA



Medical



Defense &
Government



WiTricity Corp: *Highly Resonant Wireless Power Transfer*

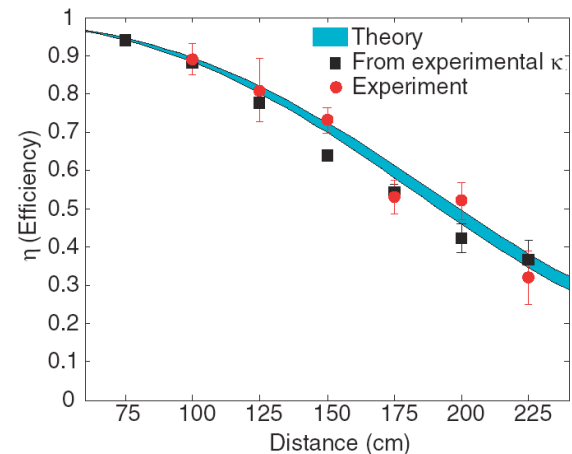
WiTricity founder, Prof. Marin Soljagic, pursued what most thought was impossible

- Original MIT research team powered a 60W light bulb safely and efficiently at a distance of 2m using *highly resonant wireless power transfer*
- The research team is pictured standing between the source and capture coils



MIT team confirmed the theory with experimental results

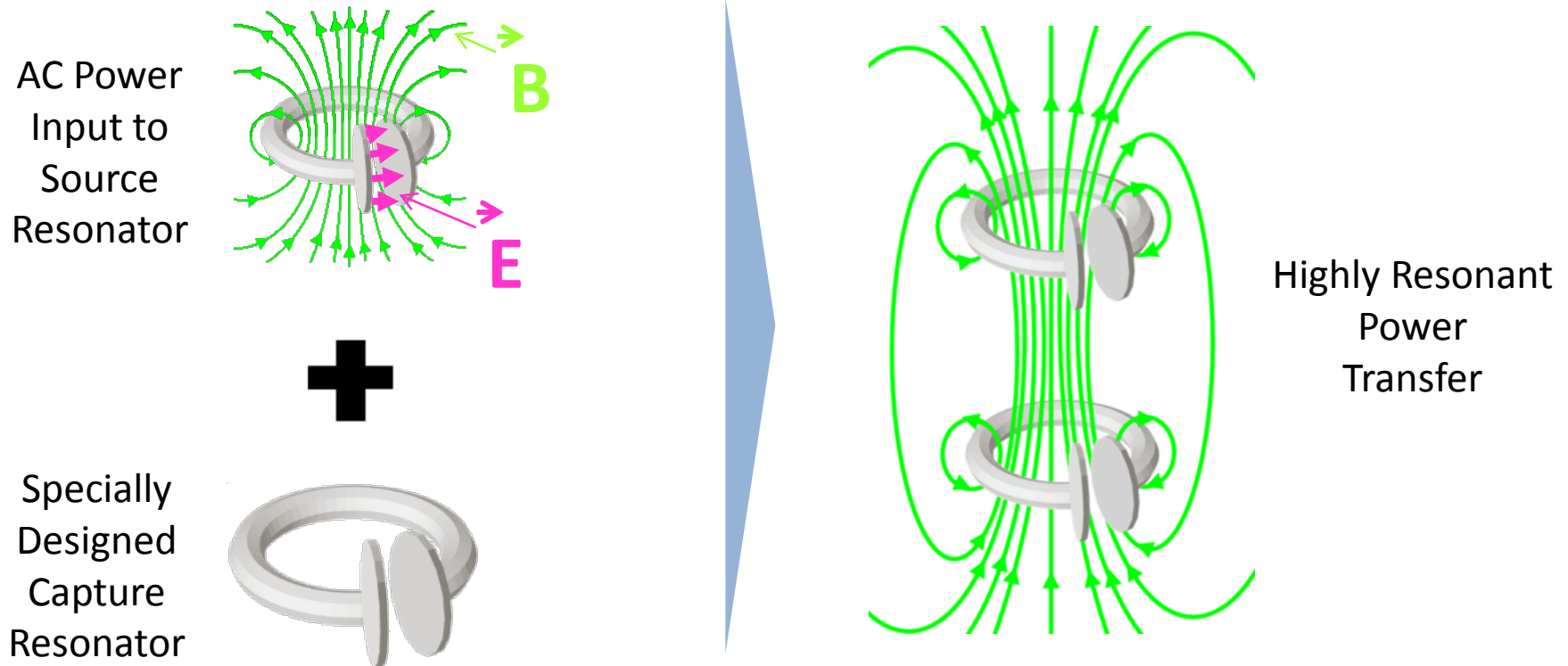
- Original experiments showed that theoretical efficiency levels could be achieved in practice
- WiTricity Corp. is the exclusive licensee of the MIT technology



WiTricity Corporation

How it works:

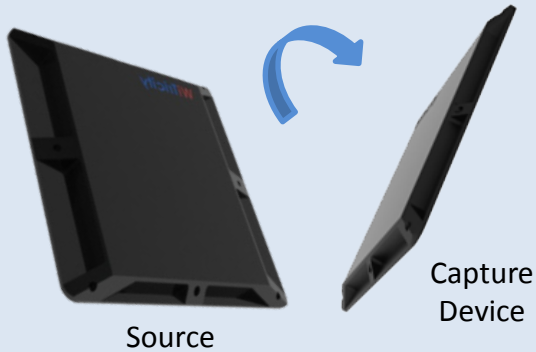
Highly resonant devices are tuned to the same frequency and exchange power via an oscillating magnetic field



Highly resonant devices transfer electrical energy over distance through coupled magnetic field

Benefits over traditional magnetic induction

1. **Flexible orientation** between source and capture device



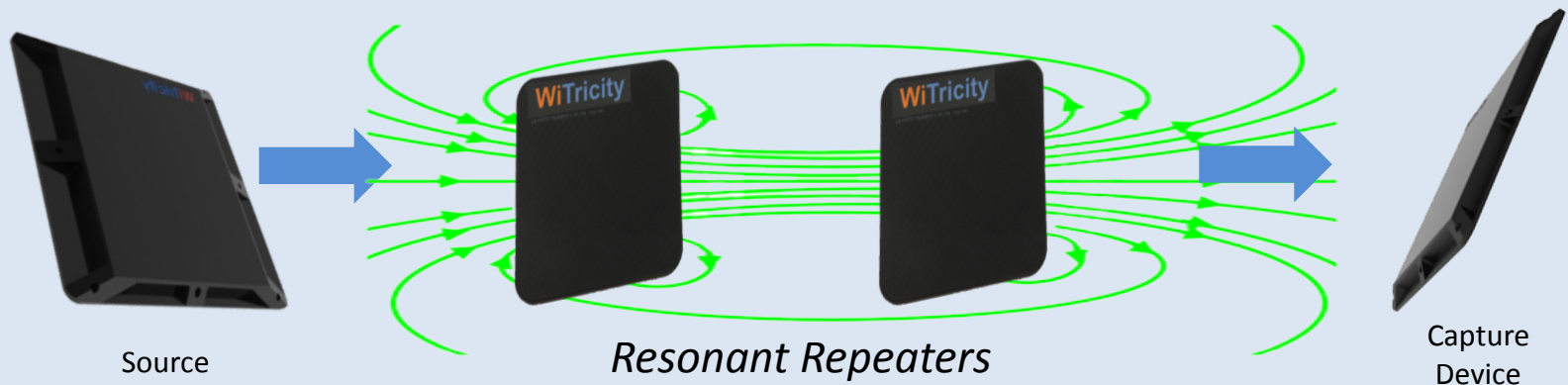
2. **Multiple devices** can couple to a single source



3. **Different sizes** source and capture devices



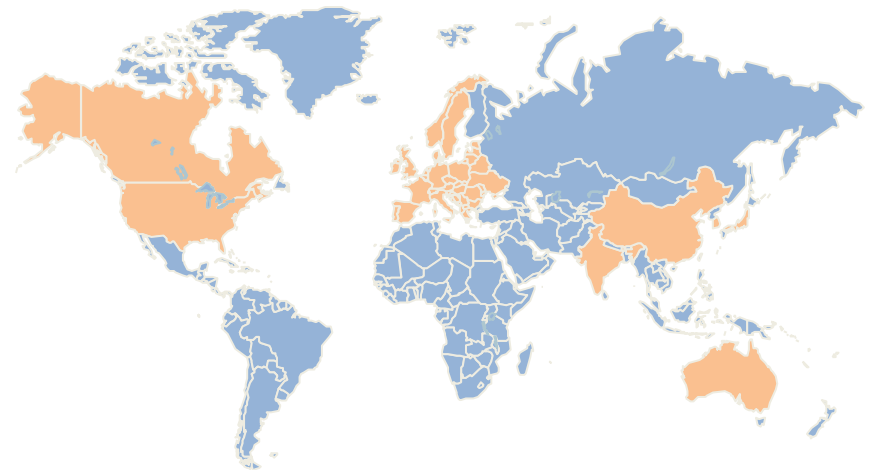
4. **Extended wireless range** with WiTricity *Resonant Repeaters*



WiTricity Holds Fundamental IP for *Highly Resonant Wireless Charging*

- Over 300 Patents and Patent applications worldwide
- Substantial and continuous effort fortifying our IP

- 15 Patents Issued as of May 2012
- Published Patents in **Key Countries**



WiTricity seeks broad adoption of highly resonant wireless charging via IP licensing

MIT Research Reproduced at Major Industrial R&D Labs



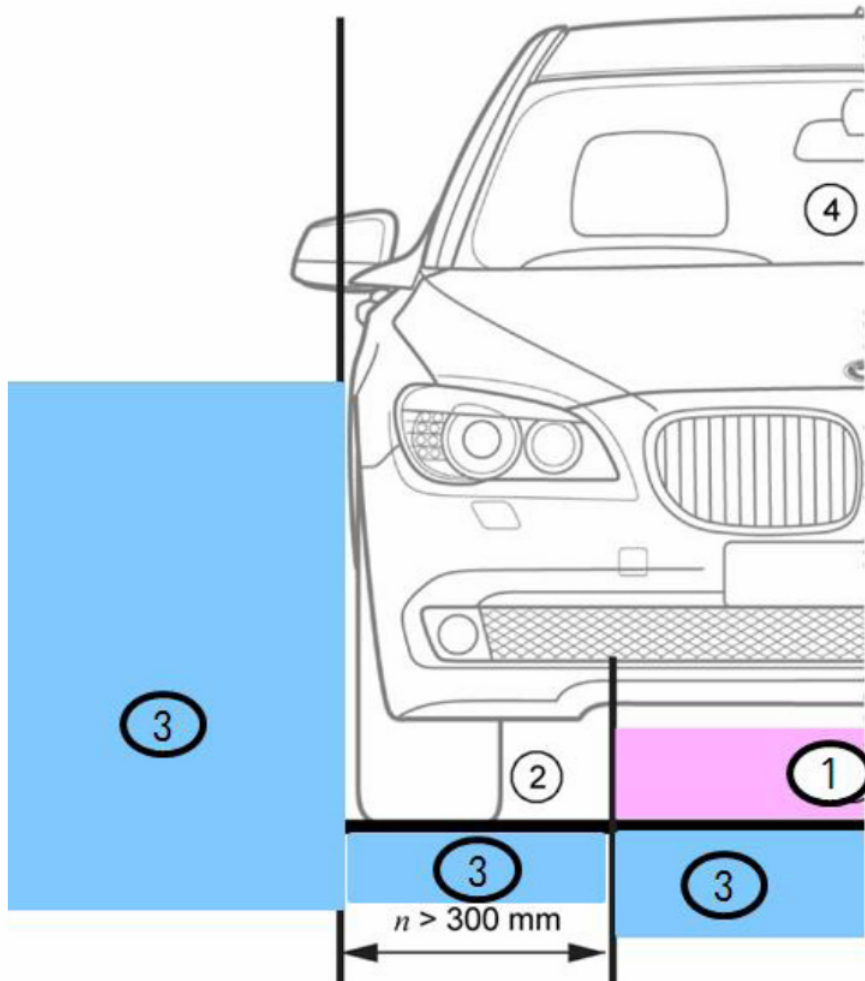
WiTricity Safety

- Non-radiative power transfer—uses magnetic near field
- Magnetic fields are safe for people and animals, meets IEEE, FCC, ICNIRP guidelines
- Detects and prevents heating of metallic foreign objects & debris (FOD)

WiTricity Efficiency

- AC Mains-load efficiency = 90% at 18 cm air gap; (coil-coil efficiency 95%-98%)
- Energy not transferred is dissipated as heat at coils (~ 75 watts per coil @ 3.3 kW)
- Small efficiency loss due to power electronics, 3% (60 watts at RF amp, 30 watts at rectifier)
- Reasonable cost for vastly improved ergonomics, and thus EV/PHEV adoption rate

Magnetic Field Strengths



- **Zone 1: Energy Transfer Region**
 - Largest B field
 - No prolonged human exposure
- **Zone 2: Under Vehicle Region**
 - B rapidly decreasing
 - No prolonged human exposure
- **Zone 3: Exterior Region**
 - $B < \text{ICNIRP MPE}$
 - Unlimited human exposure
- **Zone 4: Vehicle Interior**
 - $B < \text{ICNIRP MPE}$
 - Unlimited human exposure

WiT-3300 Metallic FOD Detection

- ✓ WiTricity patented sensor array integrated with source resonator
- ✓ Detects large and small metallic debris & objects
- ✓ OEM selectable thresholds for shut down of system to prevent heating
- ✓ Sensor array is active during full power charging, and during pre-charge safety scan
- ✓ Patented Resonator design minimizes high flux density zone



Examples of FOD test samples

Demonstration

