

More from Less

**Wireless Energy Transfer
to Multiple Small Devices**

Smallest Wirelessly Powered Car

②

*Power a H0 scale car (5cm * 1,9cm) to drive a course with magnetic guide wire*



Transmitter

- Below surface: one winding → easy to adapt to new geometries
- Demonstrator: 40cm * 75cm = 3.000 cm²

Receiver

- Coil to fit between axles: D 1,8cm = 2,55cm²

Power figures

- | | |
|-------------------------|------|
| • Micro motor 1V, 12mA | 12mW |
| • Transmitter 12V, 0,4A | 4,8W |
| • Available at receiver | 4mW |



Catch more from the magnetic field

- **Resonant tank**
 - Receiver tuned to transmitter frequency
 - High Q miniature coil and capacitor
 - → doubles received power
- **Second resonant tank**
 - At defined distance and position
 - → gives another 50% power

Running scale cars wirelessly powered

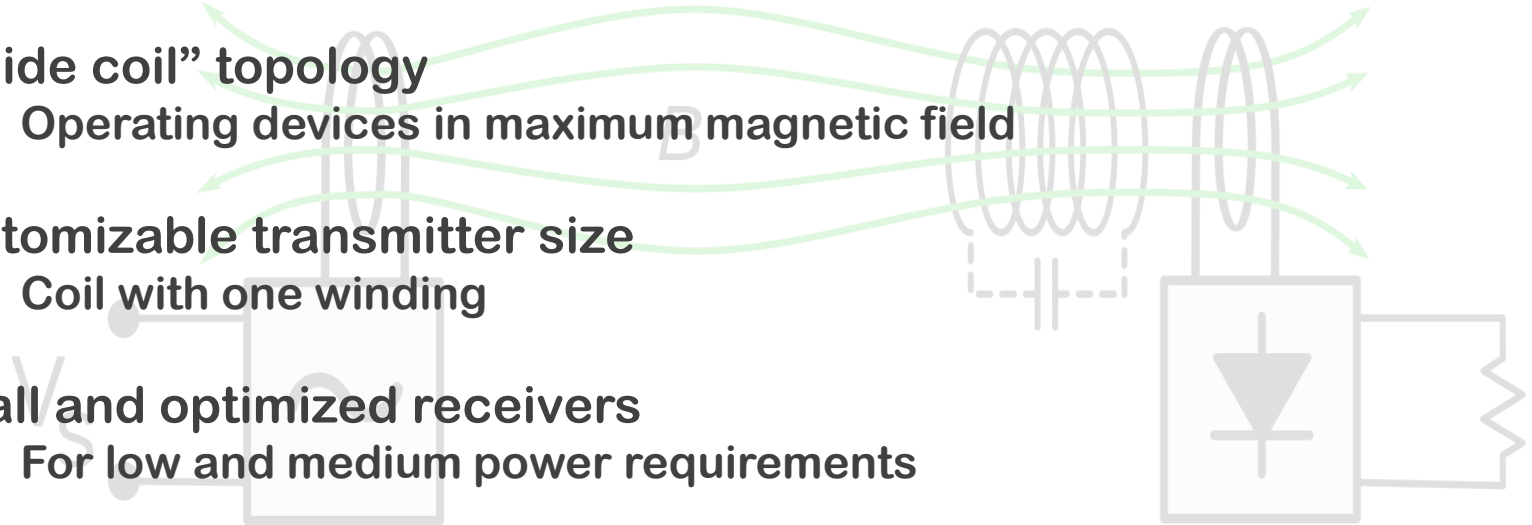
- No battery needed
 - No charging
 - Good for the environment
- Flat receiver coils
 - Better to integrate
 - In trucks invisible when placed in the chassis





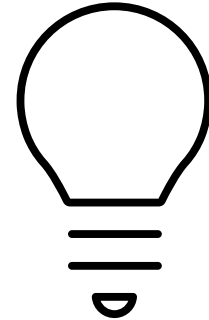
**We jointly develop applications and suitable technology
to transfers energy wirelessly from one source to multiple receivers,
achieving solutions with appropriate efficiency, size, and cost**

- Inductive resonant transfer
 - Improved coupling
 - Safe power and frequencies
 - No shading effects
- “Inside coil” topology
 - Operating devices in maximum magnetic field
- Customizable transmitter size
 - Coil with one winding
- Small and optimized receivers
 - For low and medium power requirements
- Efficient electronics
 - Low drop voltage
 - High Q components



Lighting

- for shelves
- and showcases
 - with low and mid power LEDs



Drives

- for dioramas
- scale models
- and RC cars
 - with micro motors



Application areas

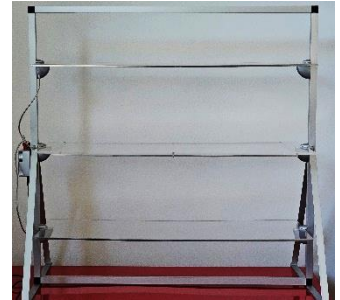
- Point-of-Sale
- Exhibitions
- Private homes

- **Easy to arrange**
 - Power where needed
 - Re-fitting in decorated setups
 - Re-arrangement for new exhibition designs
- **Clean and sleek**
 - No cables
 - No holes in cases
 - Thin receivers
- **New possibilities**
 - Functionality “in” / “over” / “under” objects
 - Functionality “in the air”
- **Enhanced reliability and reduced maintenance**
 - No connectors
 - No batteries
 - Unlimited / uninterrupted operation



Power on the surface

- Three levels @ 80cm * 30cm
- 9W (9V, 1A) *
- multiple lighting elements



Power in the volume

- 100cm * 50cm * 50cm
- 15W (18V, 0,8A) *
- lighting elements, multiple drives



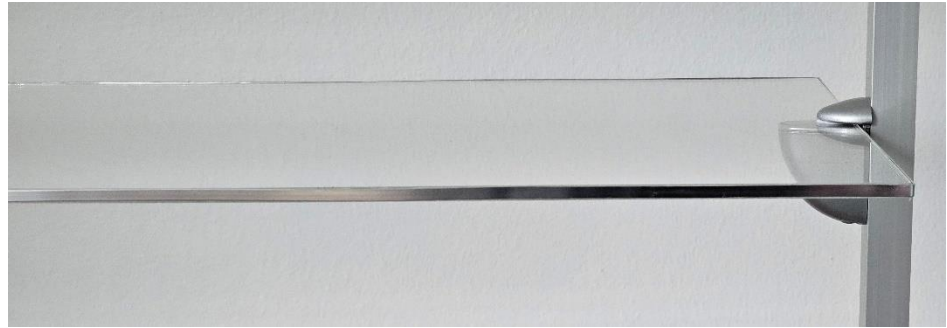
Power from the track

- 6 segments with total 400cm * 20cm
- 12W (24V, 0,5A) *
- operation of multiple moving cars



* Numbers valid for actual demonstrator

Transmitter coil surrounding glass shelf
Preferable for OEM integration



Transmitter coil clip-on under glass shelf
Preferable for retro-fitting



Helmholtz coil inspired set-up

- Resonant tanks at bottom and top of glass display case
- In-phase supply of HF to both tanks



Street segments

- two straight wires
- Connectors at either end

Connection segment

- Termination of coil
- Track-dependent tank capacitor



Low-power applications

- Coil $d=25\text{mm}$, $h=2\text{mm}$
- Usage
 - Single micro-motor *
 - Up to four low-power LEDs *

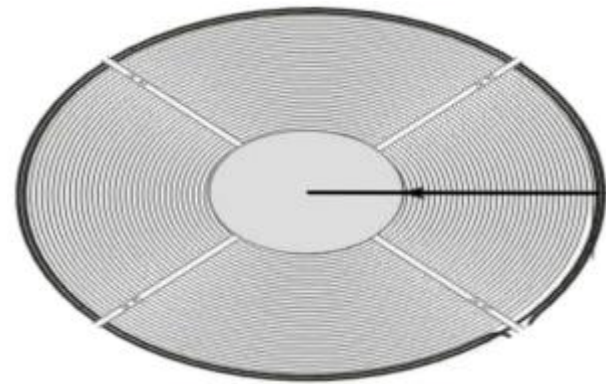
Mid-power applications

- Coil $d=52\text{mm}$, $h=2\text{mm}$
- Usage
 - >1 micro-motors *
 - Mid-power LED ($<200\text{mA}$) *

Special demands

- Customized coils/receivers: size, geometry, power

Receivers can be combined for higher power provision



* When used in our demonstrators

Example Receiver Integration (1)

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Flat lighting element

- Mid-power receiver
- $d=53\text{mm}$, $h=5\text{mm}$



Light sculpture

- Mid-power receiver



Small lighting element

- Low-power receiver
- $d=28\text{mm}$, $h=18\text{mm}$



Tealight

- Low-power receiver



Example Receiver Integration (2)

(15)

Scale model Twin Otter (1:72)

- Three separate receivers
 - One low-power for each motor, integrated in wings
 - One low-power for position and landing lights, fitted in cabin

→ 2 motors, 4 LEDs



RC model Unimog (ca. 1:43)

- Two receivers in parallel
 - One low-power receiver in cabin
 - One mid-power receiver in flatbed

→ 2 motors, radio electronics, 2 LEDs

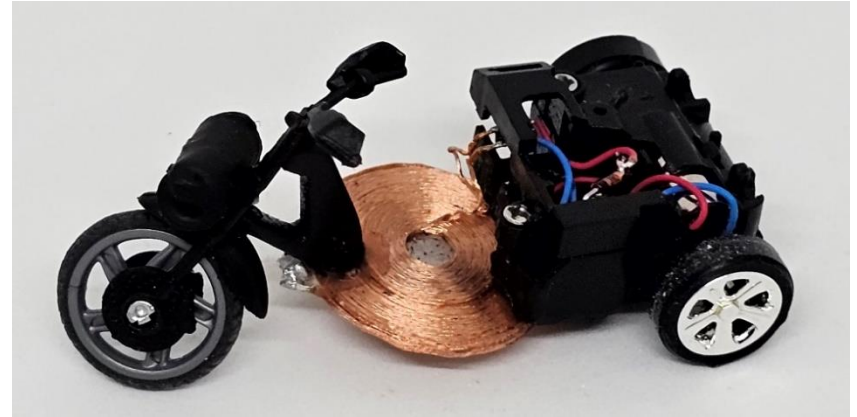


Example Receiver Integration (3)

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“Naked Trike” (6,5cm)

- Low-power receiver as part of chassis
- 1 motor



Truck (1:87)

- Low-power receiver in chassis
- 1 motor



Museum

Point-of-Sale

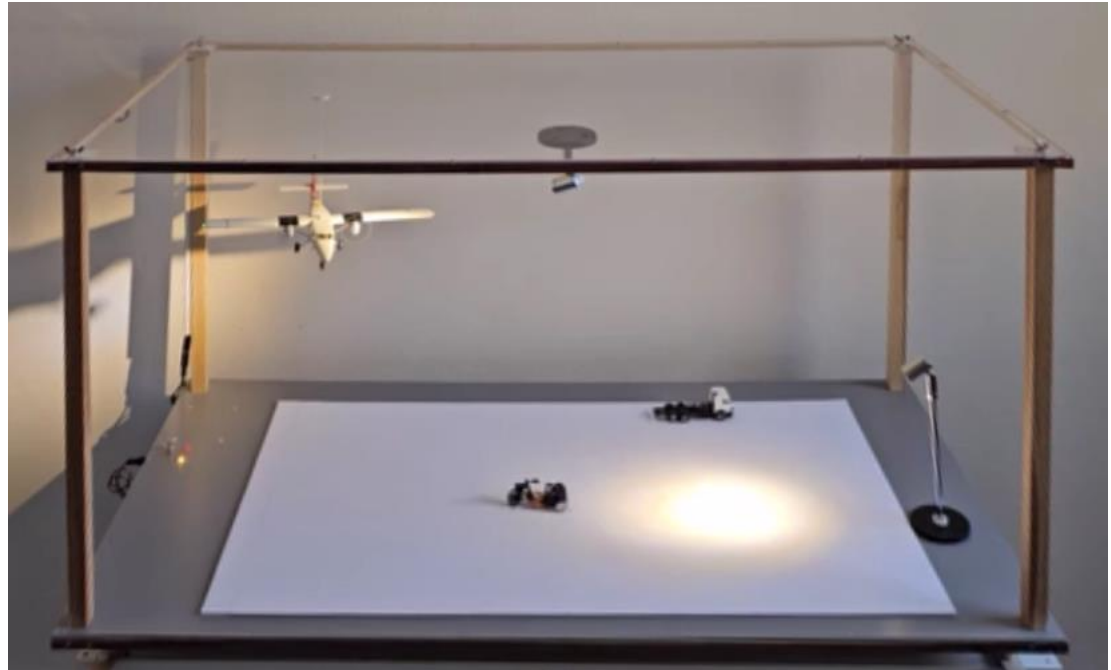


Home



- Spots
- Flat lights
- Downlights
- Light sculptures

- Plane with lights and spinning propellers
- Spot from upper plane
- Moving truck following guard wire
- Free circling trike
- Spot from bottom right



- Steerable RC truck: players car
- Guardrail cleaning car (constant low speed): moving obstacle

