



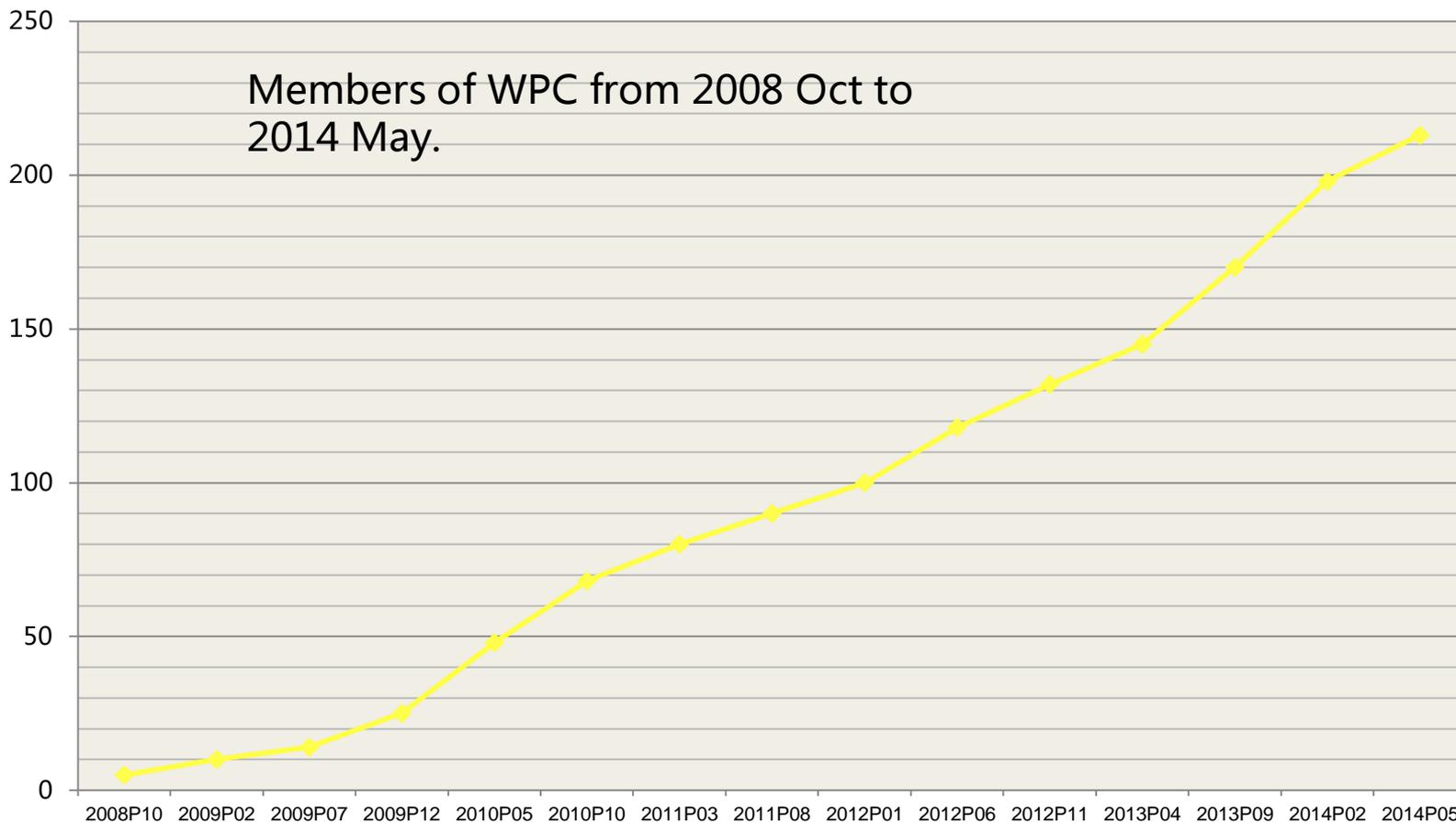
无线充电联盟和技术介绍

沙锦明

WPC大中国区市场推广组主席

WPC厨电标准工作组联合主席

WPC于2008年由FULTON, PHILIPS, CONVENIEN POWER等几家公司发起, 目标在开发无线充电的应用



- 2010 45 WPC members; 4 types of transmitters; First Qi products in market (US) ; First Qi test lab; Power levels = 5w.
- 2011 90 WPC members; 8 types of transmitters; Multiple Qi products in markets (US,JP,EU); Multiple Qi test labs; Power levels = 5w.
- 2012 120 WPC members; 8 types of transmitters; Increasing numbers of Qi products available worldwide (US, JP,EU); Power levels = 5w .
- 2013 160 WPC members ; 10+ types of transmitters; Increasing numbers of Qi products available worldwide (US,JP,EU); Higher power levels, Kitchen Application up to 2000w.
- 2014 213 WPC members; Resonant application; 62 phones of Qi products in market (US,JP,EU,GC) . Totally 583 products are certificated.



Drop your phone on the charger
No wire, no connector, simple



- "I considered wireless charging a gimmick until I picked up a wireless charging stand. After using it for a short period, I bought another one, they're pretty damn awesome especially if you pick the phone up and put it down often." - User #159443 at [Whirlpool Forums](#)
- "I will admit to believing it was a gimmick at first. 6 months later, it is a necessity. I love the wireless features, and would never buy another phone without it." - Mikado_Wu commenting on an [article about the JBL Power Up](#)
- "Nokia spoiled me with wireless charging in the Lumia 920 and now I want that in all of my devices. I have three Qi wireless charging pads at home and in the office and find it much more convenient to just set down a device on the pad rather than messing around with a microUSB cable and figuring out which end is up to plug it in." - Matthew Miller on ZDnet, explaining [Seven reasons to buy the Google Nexus 7](#).

Qi wireless charging is available today

Qi INTEGRATED, Qi READY:

NOKIA



TECHDY

Qi INTEGRATED, Qi READY:

motorola
a Google company



Google

PHILIPS

htc

SAMSUNG

PANTECI



LG



SHARP

CASIO
the unexpected extra

NEC

Panasonic

FUJITSU

BlackBerry **KYOCERA**



nexus 7

Qi wireless charging built in:
Google Nexus 5 phone
Google Nexus 7 tablet



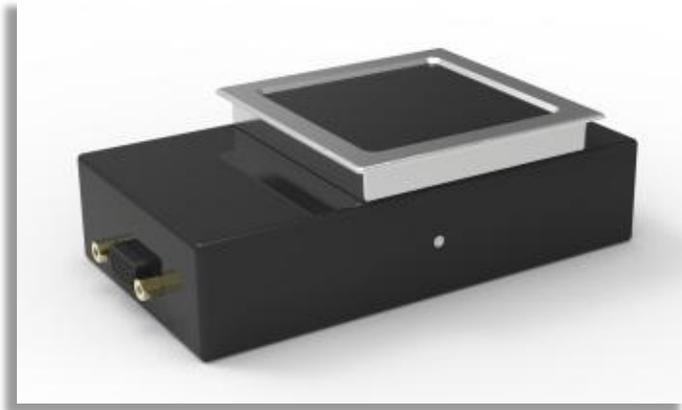
- Toyota
- Chrysler
- Audi
- Daimler
- Honda



*写真およびイラストは説明のためのイメージです。



Aviation Approved



Charging in public spaces



Beijing Airport
Qi Coffee in
Beijing

US Airports

- Houston, TX
- Los Angeles, CA
- Miami, FL
- New York, NY (JFK)
- Newark, NJ

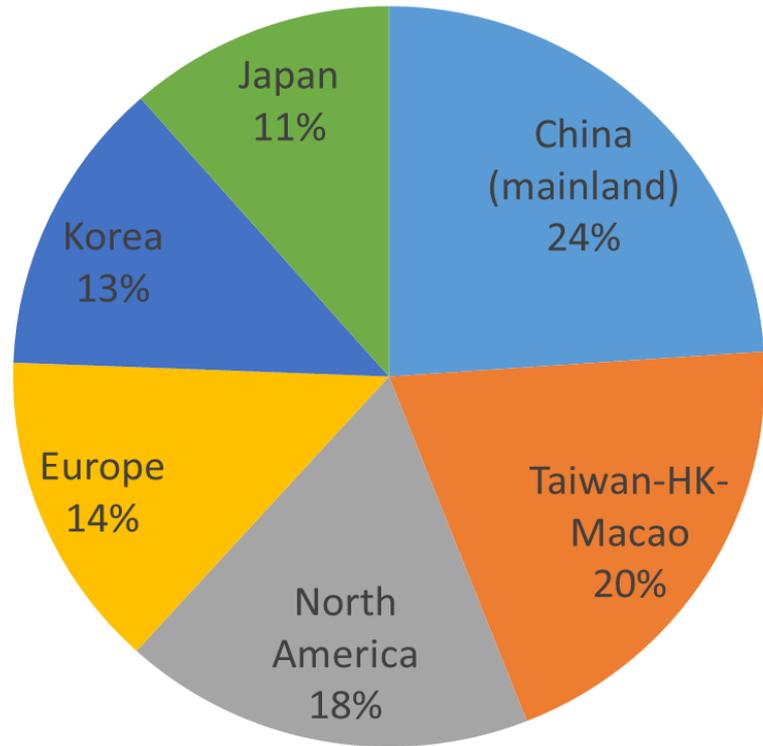


French Open:
Qi chargers in the guest area
Amsterdam:
Deloitte new renovated office, 1300
Qi charging points

	27店舗
	11店舗
	5店舗
	5店舗
	35店舗
	3店舗
	2店舗
	5店舗

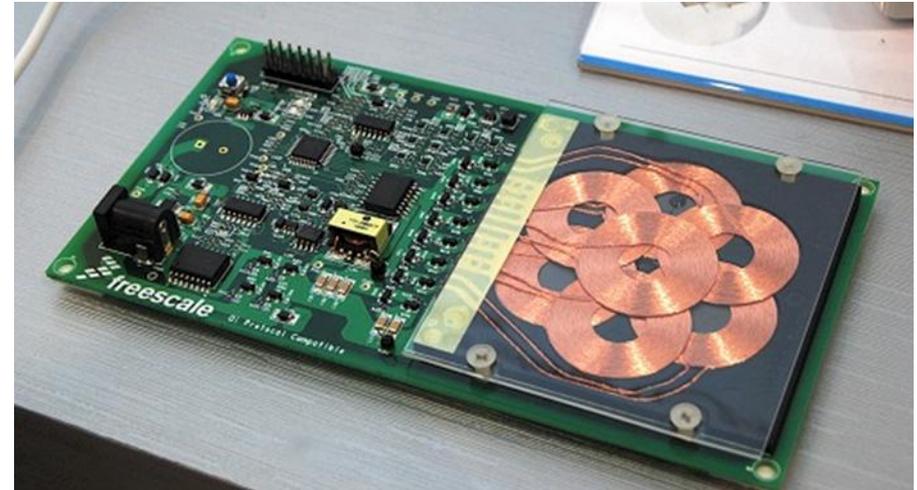
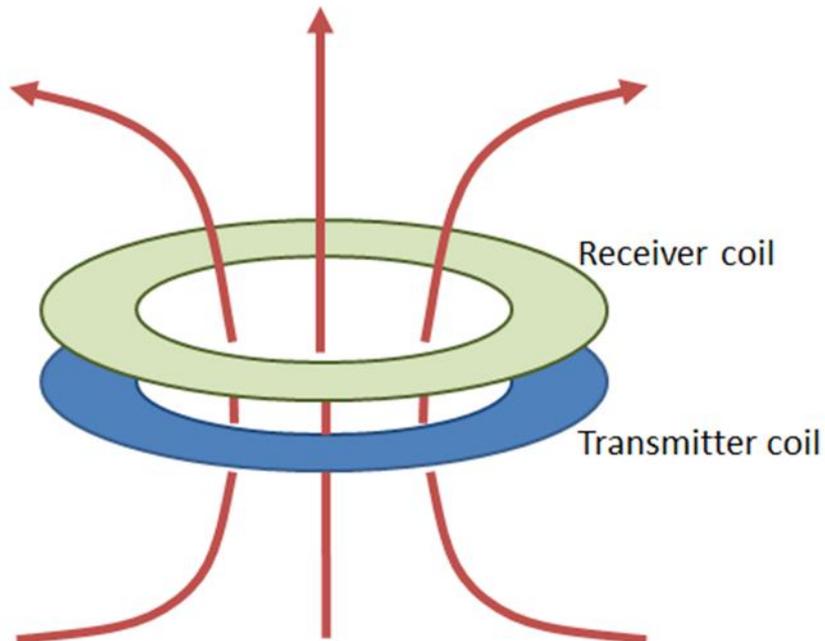
3300 public locations in Japan

More than 200 member companies from 17 countries



How does it work?

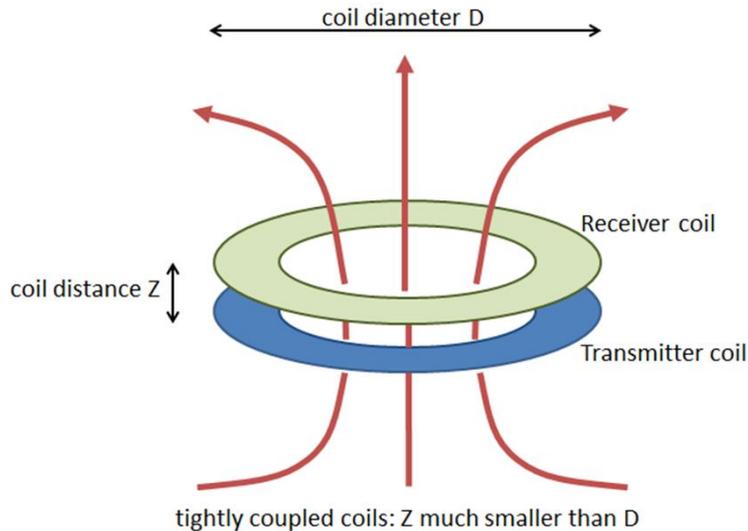
Power is transmitted over air gap by transmitter coil that induces a current in the receiver coil



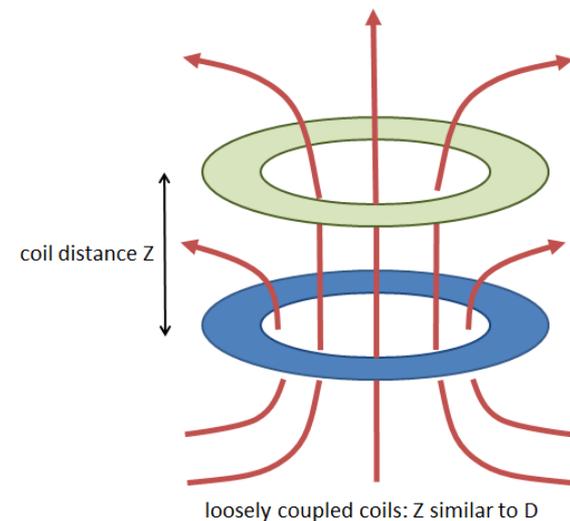
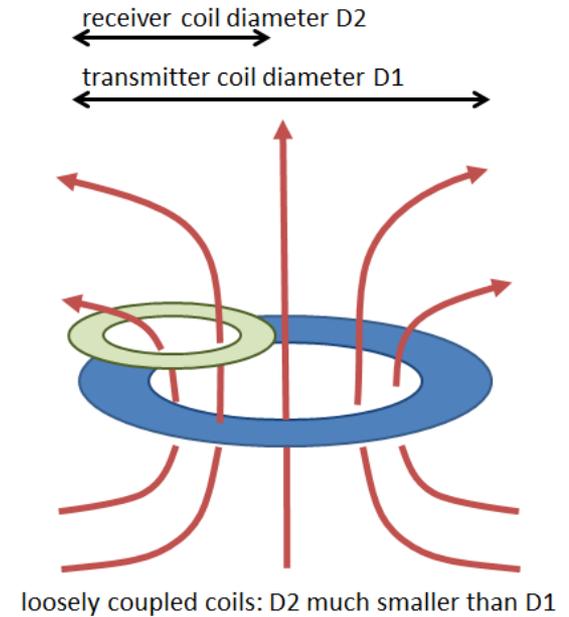
Design considerations

- Ease of use
 - Horizontal (X-Y axis) alignment accuracy
 - Operating distance (Z axis)
 - Responsiveness
- Safety
 - Need to limit human exposure to Electro-Magnetic Fields (EMF)
 - Need to limit the heating of metal objects near the transmitter
- Other regulatory constraints
 - Efficiency of energy transfer
 - Standby power
 - Electro-Magnetic Interference (EMI)
- Cost

Choice 1: tight or loose coupling



Trade-offs:
 Tight coupling: low EMF, energy-efficient
 Loose coupling: larger X-Y-Z flexibility

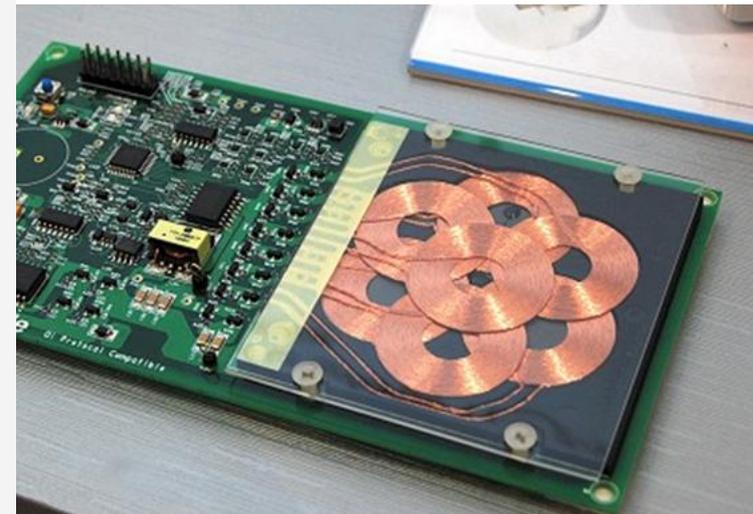
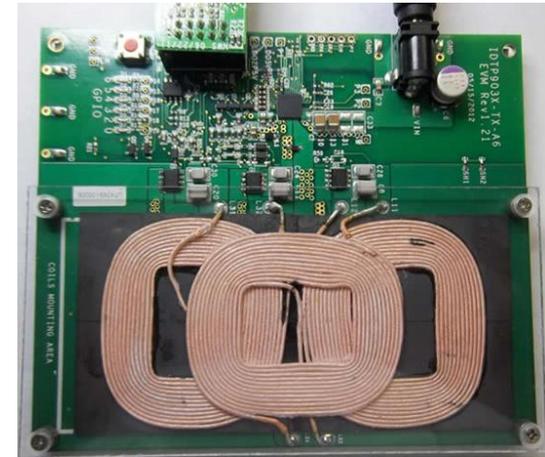


Choice 2: Single coil or multi-coil?

Trade-offs:

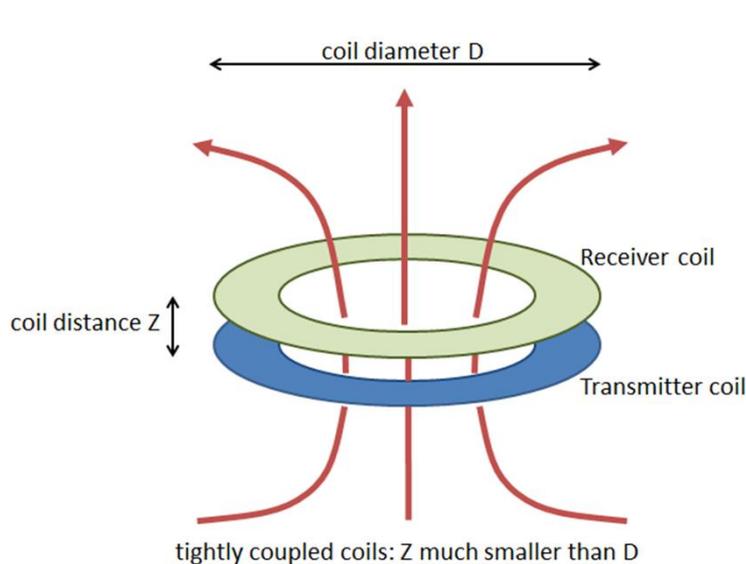
Single coil: low cost

Multi-coil: larger X-Y flexibility

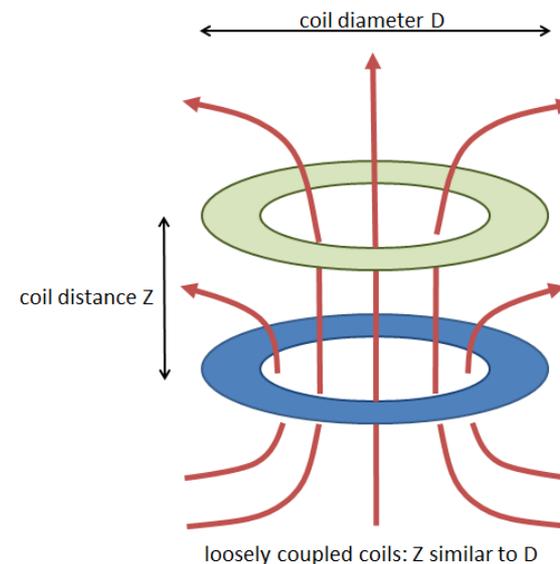


Choice 3: resonant or non-resonant operation

- Choice follows from choice in coupling:
 - Loosely coupled coils must be operated at resonance
 - Tightly coupled coils are operated close to, but not at, resonance.



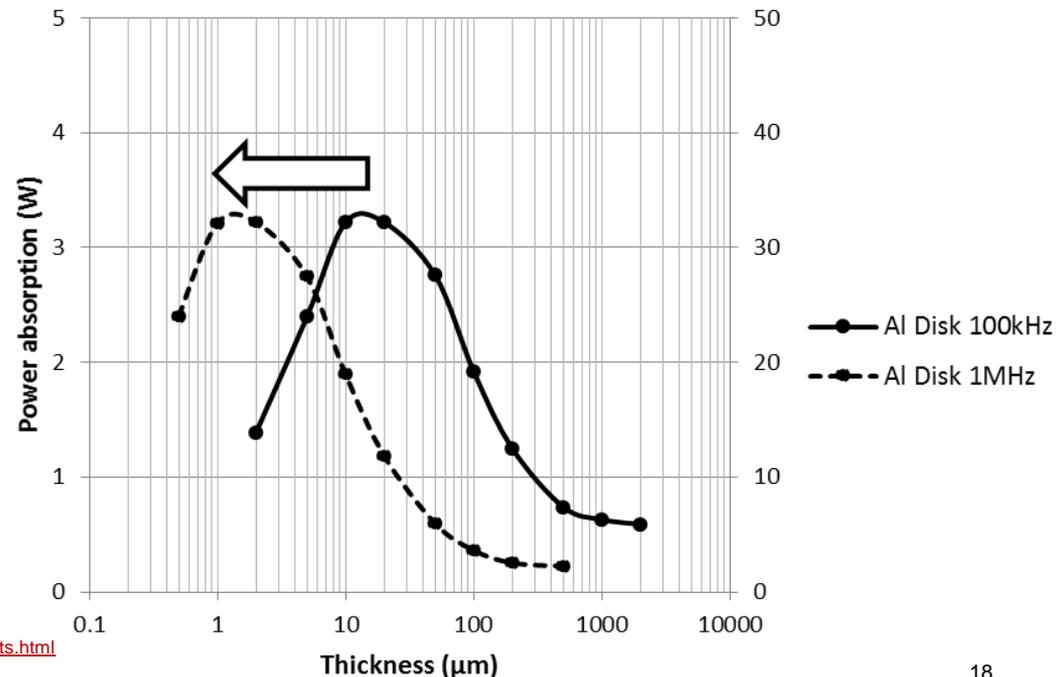
non-resonant operation



resonant operation

Choice 4: Operate at 100-200 kHz or 6.78 MHz?

- 100-200 kHz:
 - higher system efficiency because **switching losses** increases with increasing switching frequency,
 - less absorption in **thin** metal layers
- 6.78 MHz:
 - less absorption in **thick** metal objects



Choices offered by the Qi system

- Tightly coupled: Yes, in products today
- Loosely coupled: Yes, demonstrated in prototypes

- Single coil: Yes, in products today
- Multi-coil: Yes, in products today

- Non-resonant operation: Yes
- Resonant operation: Yes, demonstrated in prototypes

- 100 - 200 kHz: Yes
- 6.78 MHz: No, because the system efficiency at this frequency is lower.

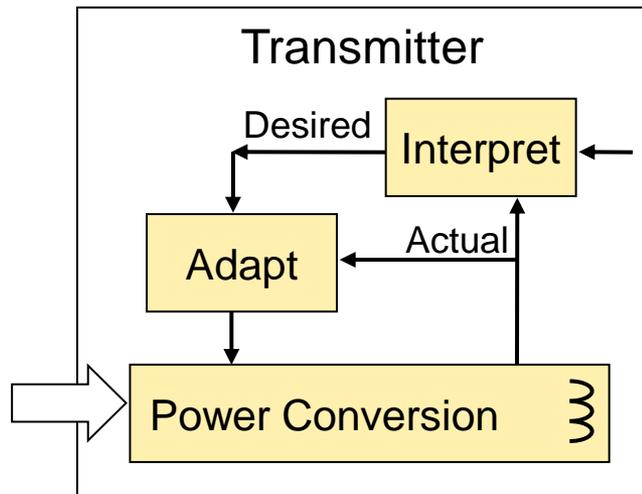
What choice would you make?

- It will depend on your application
- What is most important in your application?
 - **Cost**: single coil, tightly coupled
 - **Efficiency**: tightly coupled, 100-200 kHz
 - **X-Y flexibility**: coil-array
 - **Largest Z distance**: loosely coupled, resonant
 - **Low EMI / EMF**: tightly coupled, or loosely coupled coil array
- Qi offers you all these possibilities

Power Transfer Control

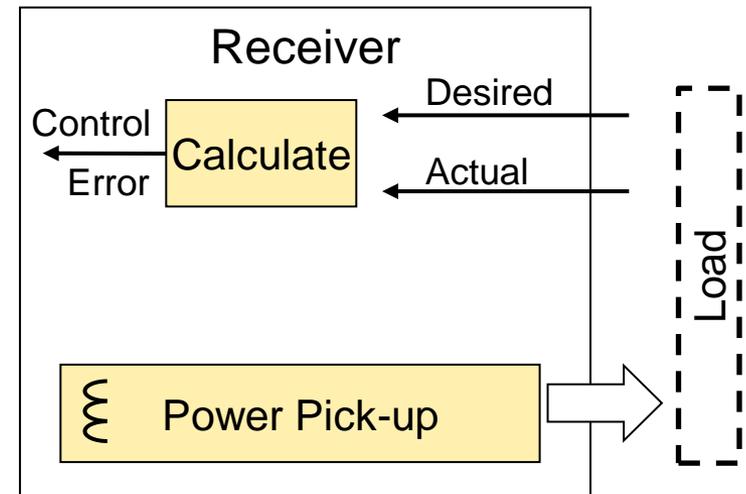
Transmitter

- Interpret desired control point from
 - Control error message
 - Actual control point
- Adapt power towards zero difference between
 - Desired control point
 - Actual control point



Receiver

- Calculate control error
 - = difference between
 - Desired control point
 - Actual control point
- Communicate control error message



Compatibility is important for everyone

- The Qi specification guarantees compatibility
 - Independent of the choices you made
- All products that carry the Qi logo have been tested and certified



- You see the Qi logo?
 - This product will work with all other products that carry the logo

产品认证

Working Group CCT is responsible for developing certification technology and procedures with test labs.

Product Certification Procedure

Step 1: The product must be tested by an Authorized Test Lab. If the product passes all tests, the Test Lab will issue a test report.

Step 2: [Register the product](#) on this website. You will need to upload the summary of the test report and provide information that identifies the product, such as its brand name and type number. Details are in the "[manual for product registration](#)"

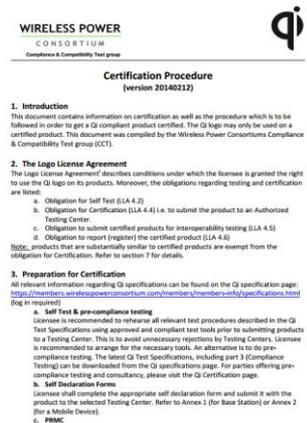
认证的流程

2. The Logo License Agreement

The Logo License Agreement¹ describes conditions under which the licensee is granted the right to use the Qi logo on its products. Moreover, the obligations regarding testing and certification are listed:

- a. Obligation for Self Test (LLA 4.2)
- b. Obligation for Certification (LLA 4.4) i.e. to submit the product to an Authorized Testing Center.
- c. Obligation to submit certified products for interoperability testing (LLA 4.5)
- d. Obligation to report (register) the certified product (LLA 4.6)

Note: products that are substantially similar to certified products are exempt from the obligation for Certification. Refer to section 7 for details.



批准的认证实验室

7 Layers	7 Layers Korea Ltd
CATR	China Academy of Telecommunication Research of MIT (CATR)
CETECOM	CETECOM GmbH
D.L.S. Electronic Systems, Inc.	D.L.S. Conformity Assessment, Inc
Intertek Group plc.	Intertek Testing Services Hong Kong Ltd.
National Technical Systems	NTS
	SGS Korea
SGS	SGS Taiwan Ltd Electronics & Communication Lab
Sporton International Inc.	Sporton Taiwan, Hwaya Lab
	TÜV Rheinland Taiwan Ltd.
TÜV Rheinland	TÜV Rheinland Korea Ltd.
	TÜV Rheinland (Shenzen) Co. Ltd
UL Japan	Yokowa EMC Lab

