**Alliance for Wireless Power**

An Overview of Market Outlook, Technology Direction and Membership Benefits

# Contents

# Summary

What will it take for wireless power to get off the ground?

Consumers are ready for it. They understand the advantages of a charging method that does not involve wires. They like the idea of setting down their mobile phones, tablets, computer, headsets and similar devices wherever they are and having those devices simply start charging. Yet they are not adopting the technology.

Electronics manufacturers are ready for it. They have built and shipped platforms and multiple device types incorporating wireless power. But they are still looking for an approach that offers them increased freedom to design wireless charging into applications that include automobiles, furniture, industrial applications, and buildings.

The technology is ready for it. Conductive mats and inductive (tight) coupling were early market entrants for wireless power implementations. Now a wireless power technology that can deliver spatial freedom is emerging as the way of wirelessly transferring power to devices.

This paper is an overview of the Alliance for Wireless Power (A4WP), an international consortium of companies focused on promoting the adoption of wireless power technologies that enable spatial freedom. Readers can take away an understanding of the market outlook for wireless power, the direction of A4WP, and the benefits of membership in the alliance.
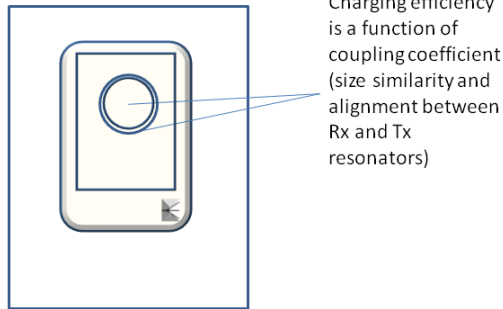
## Main Messages

- The tightly coupled approach to wireless power has helped raise awareness and start conversations among manufacturers, providers, and consumers.

- The A4WP's wireless power technology delivers a rich consumer experience because it can deliver spatial freedom. The ability to simultaneously charge multiple devices; have the devices charge through surfaces such as nightstands, automobile consoles, and office desks; and be able to place them in the general area on those surfaces defines spatial freedom.

- Enabling spatial freedom overcomes many of the technical obstacles that have impeded broader adoption of wireless power.

- Through A4WP, member companies promote the technical standardization, testing, interoperability, and regulatory harmonization that wireless power needs to gain widespread acceptance at last.
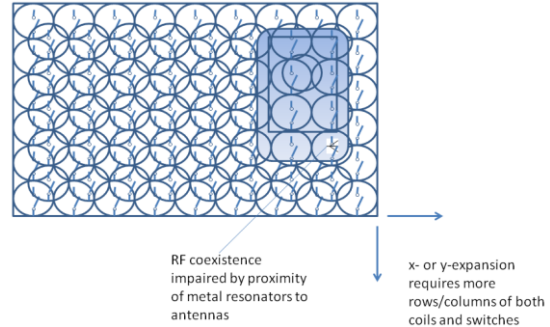
# Wireless power – market outlook and trends

For the last few years, the most talked-about approach to transferring power wirelessly to electronic devices has been so-called "tight coupling."

This approach sets up induction between a single resonator (coil) in the device (Rx) and either a single, similarly sized resonator or a matrix of similarly sized resonators in the charger (Tx) platform, as illustrated in Figure 1 and Figure 2.



Charging efficiency is a function of coupling coefficient (size similarity and alignment between Rx and Tx resonators)

RF coexistence impaired by proximity of metal resonators to antennas

x- or y-expansion requires more rows/columns of both coils and switches

**Figure 1 Tight coupling, single resonator**    **Figure 2 Tight coupling, resonator matrix**

These forms of wireless power have helped create a market[1] and raise consumer awareness about the possibility of charging everyday devices without the use of cradles or USB cables. Tight coupling has nudged the technology and the conversation toward an approach to wireless power that will find market acceptance beyond its current early adopters.

## What do consumers want?

Recent research[2] indicates that consumers are interested in and willing to adopt wireless charging for consumer electronic devices. Among the criteria identified for adoption:

- **Easy, convenient charging of multiple devices** – Consumers associate the charging function with an excess of "wall wart" chargers and wires, and with the need to find or carry a charger and plug it in.

- **Streamlined, transparent implementation** – In the current, accessory-based phase of wireless power, tightly coupled products are designed around sleeves, dongles, or charging mats. The most compelling opportunities for industry to meet consumer demand are in integrating and embedding wireless charging.

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[1] "Global Wireless Power Market Will See 86.5 Percent Annual Growth to Reach $4.5 Billion in 2016," August 2011, IMS Research

[2] Qualcomm Chip Technologies Market Research, 2009: online survey of 2351 Western European mobile phone users and qualitative research in 7 U.S. focus groups

- **Environmental safety** – Any approach to wireless power must comply with existing applicable regulations and must be prepared to address actual or perceived risks of exposure to radio frequencies and electromagnetic fields, whether to people, medical devices, or the environment.

- **Attractive pricing**[3] – While early adopters may have been willing to pay premium prices (US$100+) for a wireless device and charger, mainstream consumers are willing to pay about half that much.

- **Product diversity** – Besides looking to wireless power for the almost daily practice of charging a mobile phone, consumers want it for charging other portable electronic devices such as digital cameras, music players, tablets, navigation devices, game players, and headsets.

- **Ubiquitous charging** – Since these devices go anywhere (around the house, car, office, cafés, airport), consumers envision wireless power waiting there for them.

## What will it take to accelerate adoption?

The industry's task is to deliver a more convenient, more desirable wireless power product that better reflects the behavior and conditions around real-world device charging.

For users, this means products that:

- Allow random placement of the device on the charging surface, instead of strict alignment between the charger and device;

- Detect and ignore foreign objects, such as keys, coins, pens, magnetic strips, etc. that may be present in a charging field; and

- Charge on other than flat surfaces, allowing the vertical separation ("z-freedom") for new applications in automobiles, furniture, machinery, and buildings.

For manufacturers, this means an interoperability specification and, in time, a formal international technical standard sufficiently flexible to allow them to differentiate their devices and chargers from those of their competitors.

Consumers are ready.

The industry is ready.

The technology for flexibly coupled wireless power is ready.

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[3] "Wireless Phone Charging — Worth $50," October 2010, In-Stat research as reported by GigaOm

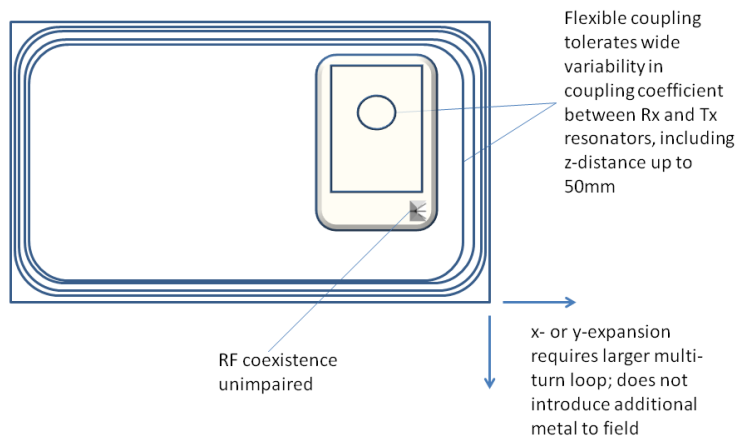# The Alliance for Wireless Power (A4WP) – delivering spatial freedom

A4WP is an international consortium of companies focused on promoting the adoption of a wireless power technology that delivers spatial freedom. Its goals are to provide a supportive environment for the development of wireless charging systems, to ensure interoperability among the products of Alliance members, and to promote the global standardization of wireless power.

The Alliance recognizes the market opportunity pioneered by previous forms of wireless power, though differentiates itself by delivering a single specification that delivers spatial freedom for simultaneous charging of multiple devices and device types and therefore accelerating market adoption.

## Technology

A4WP is based on flexible coupling between the charger and device components (see Figure 3).

The essential difference between tight and flexible coupling lies in the design of the charging source. In tight coupling, the source consists of a small (0.6 – 2.5 cm in diameter) coil whose performance (power transfer efficiency) is extremely sensitive to the precise positioning of the device to be charged. In flexible coupling, the source is a larger loop (up to 30 cm in diameter) that accommodates randomly placed devices. Consequently, a single charging area can handle multiple devices, different types of devices, and different power requirements. Such a flexible configuration delivers wireless power in ways that match real-world conditions and pave the way for new applications and devices.

Flexible coupling tolerates wide variability in coupling coefficient between Rx and Tx resonators, including z-distance up to 50mm

RF coexistence unimpaired

x- or y-expansion requires larger multi-turn loop; does not introduce additional metal to field

**Figure 3  Flexible coupling**

A4WP is developing a technical specification for flexible coupling, which supports spatial freedom capabilities such as:

- Z-freedom up to 50 mm away from the charging surface

- X/Y-freedom (planer) up to 210 mm by 140 mm across the charging surface

- Multiple devices of different sizes, all charging simultaneously

- Operation at 6.78 MHz

- Ability to charge devices ranging from very low-power products, such as Bluetooth headsets, to sophisticated tablets

- Foreign object detection and thermal effect mitigation

- Active near-field communications (NFC) during charging

- Electromagnetic compliance (EMC) and control of electromagnetic interference (EMI)

## Design flexibility and new applications

Flexible coupling frees designers from the need for precise positioning and direct, physical contact between device and charger. A4WP member companies can more easily design a wide range of devices that differentiate them from their competitors, and even from their fellow A4WP members.

Z-freedom helps to minimize the design rules that result in most wireless power products looking nearly identical. Working from a specification instead of an implementation requirement, members can design new applications around consumers' preferences for ubiquitous charging.

The specification also provides for multiple receiver classifications based on maximum output power and desired charge area, which accommodate consumer electronics from headsets up to tablets.

## Intellectual property rights

A4WP models its intellectual property rights (IPR) policy on those of major international standards development organizations, such as the Consumer Electronics Association (USA), ETSI (EU), ARIB (Japan), TTA (Korea), and CCSA (China), among many others.

- Among Alliance members, licensing of rights to A4WP-related innovations must be reasonable and non-discriminatory (RAND).

- From Alliance members to non-Alliance companies, members are free to monetize A4WP-related innovations according to their own licensing model. A4WP does not dictate terms for licensing these rights.

## Technical program and relationship to SDOs

A4WP plans to submit as promptly as possible its specifications as technical contributions to both international and selected regional standards development organizations (SDO) whose authority and activities are derived from governmental mandates. Even though the market will determine the pace of adoption of competing wireless charging technologies, A4WP strives to ensure that the spatial freedom offered by the flexibly coupled approach enjoys the benefits of global harmonization, such as:

- Greater economies of scale for manufacturers, resulting in products designed for a global market with assurance of interoperability.

- Cost efficiency and improved supply chain management, to source components globally and develop core hardware designs as global "platforms."

- Regulatory clarity, with a globally harmonized technical standard that fosters a more uniform and predictable regulatory environment.

- Consumer choice, as companies focus on new product design and user experience built on interoperable wireless charging components.

A4WP also encourages its member companies to participate independently in the global technical standardization process.

**Testing, Certification and Regulatory Program**

Critical to the widespread adoption of the A4WP's wireless power technology is consumer confidence that products from different manufacturers will interoperate. A4WP's program includes common testing, logo, and certification.

**Technical Marketing and Communications Program**
A4WP's scope extends beyond establishing technical specifications. The Alliance plans include responsibility for global marketing and promotion of the benefits of this technology to the industry and to consumers.

> *"Consensus is that a move to a loosely coupled solution is required."*
>
> Farouk Balouchi,
> Pike Research, February 2012
>
> *"Future transmitter offerings will be more efficient and flexible in terms of device placement."*
>
> Jason dePreaux,
> IMS Research, November 2011

## Ecosystem

A4WP envisions an ecosystem of member companies developing and promoting wireless power that delivers spatial freedom while simultaneously charging multiple devices and device types (see Figure 4). The ecosystem encompasses:

- Infrastructure – Mobile network operators join service providers specializing in wireless power transfer (WPT).

- Market foundation elements – Member companies provide the core technology, silicon, platform, and testing/certification services needed to produce charger and device components for wireless charging.

- Mass-market, vertical applications – One size of wireless power does not fit all, especially with the versatility promised by the A4WP's wireless power technology. A broad range of member companies designs and markets applications for widely varying verticals, including consumer electronics, mobile, automotive, and retail.
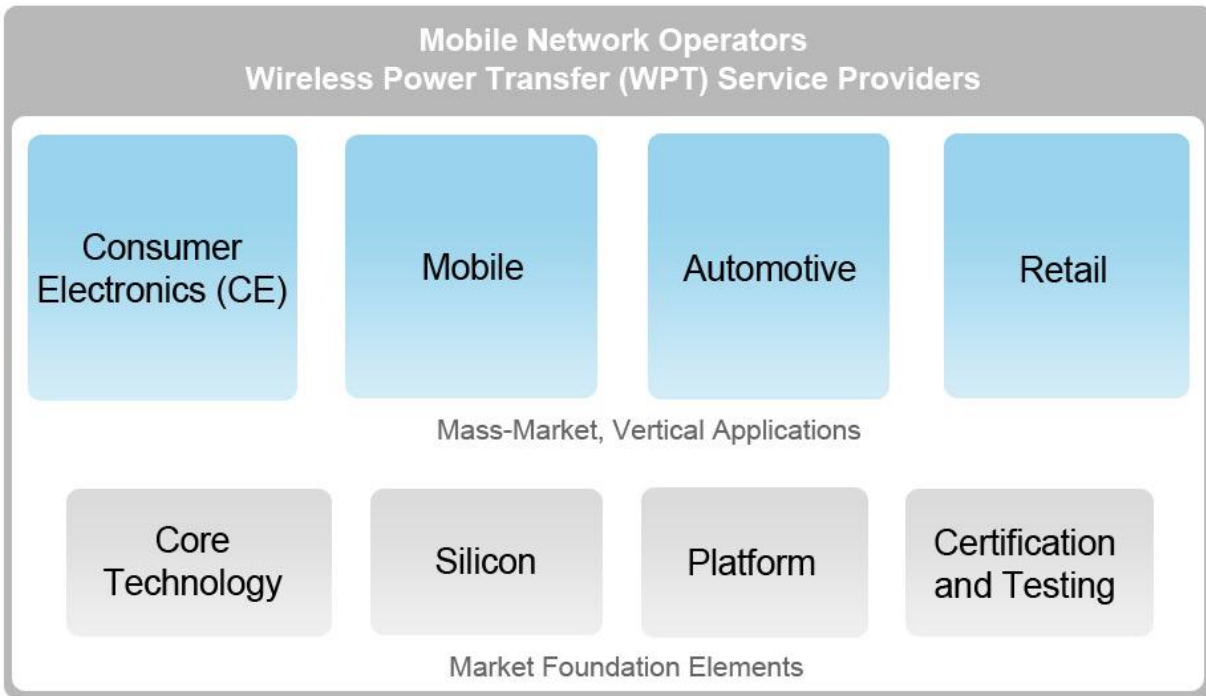
**Figure 4 A4WP ecosystem**

## Membership categories and benefits

A4WP offers three membership levels based on individual company objectives:

- Sponsor membership is for global leaders committed to broad, deep, and direct contribution to the creation, definition, and architecture of wireless power, and to the launch of a new WPT market.

- Full membership is for market leaders whose primary interest is adoption and fast time-to-market commercialization in the new WPT market. They may also specialize in a particular form of direct contribution for use in vertical applications.

- Adopter membership is for market participants whose primary interest is adoption and fast time-to-market commercialization in the new WPT market.

Table 1 summarizes the benefits and privileges corresponding to each level of membership.[4]

**Table 1 A4WP membership benefits**

| Benefit | Sponsor | Full | Adopter |
| --- | :---: | :---: | :---: |
| Annual Members General Meeting session participation | • | • | • |
| Attend Marketing events and conferences | • | • | • |
| Attend Interoperability events and conferences | • | • | • |
| Attend Developers events and conferences | • | • | • |
| Access A4WP logo usage (per Policy) | • | • | • |
| Access A4WP Marketing collateral | • | • | • |
| Access members-only website | • | • | • |
| Access Technical Program (TP) published specs. [5] | • | • | • |
| Access Technical Program (TP) email reflectors | • | • | |
| Access Technical Program (TP) working documents | • | • | |
| Access Testing, Certification & Regulatory (TCR) Program published specs | • | • | • |
| Access Testing, Certification & Regulatory (TCR) Program email reflectors | • | • | |
| Access Testing, Certification & Regulatory (TCR) Program working docs. | • | • | |
| Access Technical Marketing & Communications (TMC) Program published docs. | • | • | • |
| Access Technical Marketing & Communications (TMC) Program email reflectors | • | • | • |
| Access Technical Marketing & Communications (TMC) Program working docs. | • | • | • |
| | | | |
| Board of Directors voting membership | • | | |
| Board-level Committee leadership | • | | |
| Board-level Committee voting participation | • | | |
| Technical Program (TP) leadership | • | • | |
| Technical Program (TP) voting participation | • | • | |
| Technical Program (TP) non-voting participation | • | • | |
| Contribute to Technical Program (TP) deliverables (e.g., technical specs.) | • | • | |
| Preview and vote on Technical Program (TP) deliverables (e.g., technical specs) | • | • | |
| Testing, Certification & Regulatory (TCR) Program leadership | • | • | |
| Testing, Certification & Regulatory (TCR) Program voting participation | • | • | |
| Testing, Certification & Regulatory (TCR) Program non-voting participation | • | • | |
| Contribute to TCR Program deliverables | • | • | |
| Preview TCR Program deliverables | • | • | |
| Vote on TCR Program deliverables | • | • | |
| Technical Marketing & Communications (TMC) Program leadership | • | • | |

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[4] Adopter Member privileges are subject to approval by the A4WP Board of Directors.

[5] TP, TCR, and TMC Programs may establish an organizational hierarchy: Committee, Subcommittee, Working Group, Task Group.

| Benefit | Sponsor | Full | Adopter |
|---|:---:|:---:|:---:|
| Technical Marketing & Communications (TMC) Program voting participation | • | • | |
| Technical Marketing & Communications (TMC) Program non-voting participation | • | • | • |
| Contribute to TMC Program deliverables | • | • | • |
| Preview TMC Program deliverables | • | • | • |
| Vote on TMC Program deliverables | • | • | |

### Membership and membership dues

For more information about A4WP membership and dues, contact A4WP at info@a4wp.org.

# Conclusion

Wireless power that delivers spatial freedom stands ready to continue what tightly coupled wireless power has started. The technology is ready, the consumer's mindset is established, and the industry is overdue for the next phase in charging and powering electronic devices.

A4WP members have a short-time-to-market opportunity to develop and commercialize new applications built around this capability. Alliance benefits include participation in the development of and early access to draft technical specifications, and the inside track on shaping the future of wireless power.

# About the Alliance for Wireless Power

The Alliance for Wireless Power (A4WP) – www.a4wp.org, is an industry association open to companies interested in advancing the field of wireless power by delivering a specification that permits spatial freedom. The specification, based on magnetic resonance, goes beyond current charging methods to transfer power wirelessly through surfaces to portable devices such as mobile phones, tablets, computers, headsets, digital cameras and e-readers. A4WP combines the research and design capabilities of some of the world's leading electronics companies to promote a specification for wireless power technology, products and services.