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9 - 10 December 2020

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Wireless Power in RFID

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COO & CTO – Powercast Corporation

POWERCAST

Batteries & wires limit connected device ubiquity

- Batteries die
- Batteries generate waste
- Wires are restrictive
- Wires are expensive

RF Wireless Power Explained

Transmit. Radio Frequency (RF) source sends power over the air to multiple devices

Receive. Receiver chip with antenna captures power and charges each device

Different kinds of wireless power

RF	Qi
Energy harvested from radio waves in the air	Inductive power transfer created when two coils brought together
Long range	Contact-based
uW-mW received power (typical, can be more)	Watts of received power
Not alignment sensitive	Specific alignment required
One to many charging	One to one charging

The RF Around Us

Radio **F**requency (RF) energy is emitted from a range of existing sources we come into contact with every day.

- Cell phones
- Wi-Fi routers
- Bluetooth
- RFID readers

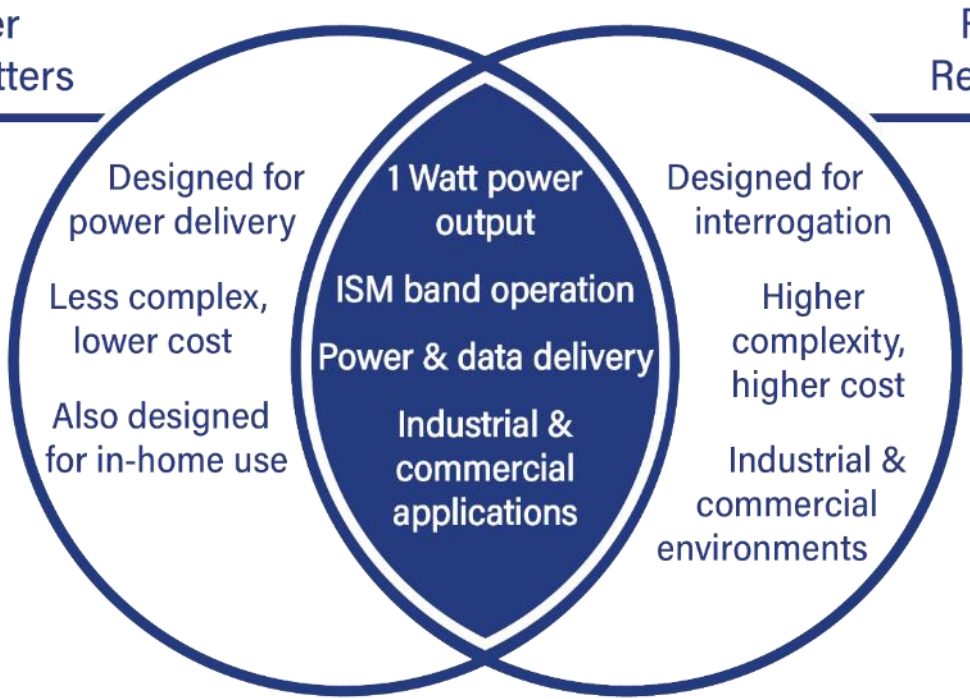
Why a Power Transmitter?

While there are many emitters of RF energy in our lives, not all of them are significant power sources, are predictable, or are stationary. A dedicated transmitter provides a robust solution.

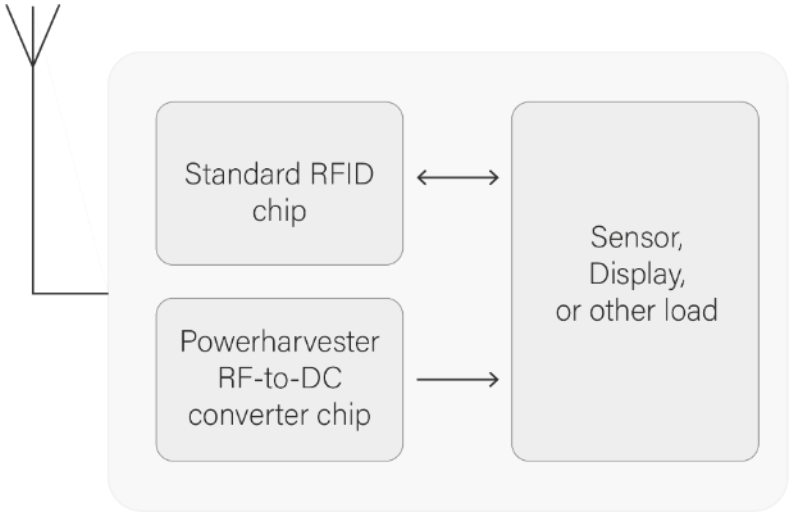
less power

more power

Comparing Power Transmitters and RFID Readers



Leveraging RFID in Wireless Power Systems



Existing RFID infrastructure can be used dually as a wireless power delivery system

Efficiency

1W of power monitors & controls much larger, more power-hungry systems

Building Automation

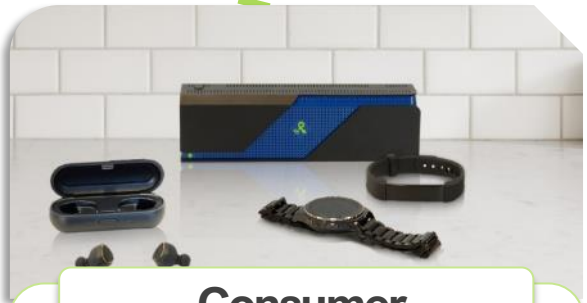
Control heating & AC systems

Monitor area lighting

Factories

Negate equipment down time

Limit defective products

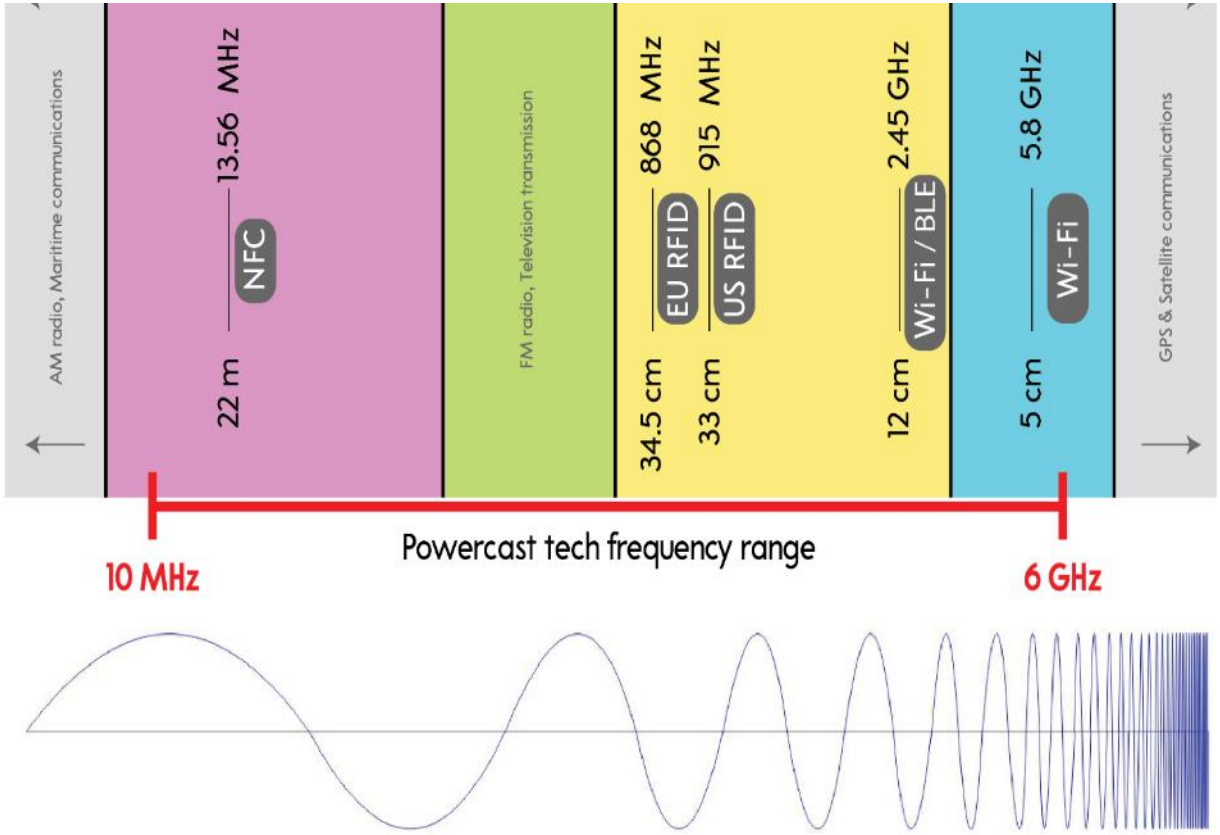


Consumer

Make rechargeable batteries the industry standard

Reduce E-waste

What frequencies can be used?



RF to DC Converter Chips

- Converts radio frequency (RF) energy to direct current (DC) power
- Can harvest power from large range of sources
- Operates from 10MHz to 6GHz
- Up to 75% RF to DC conversion efficiency

RF Wireless Charging

vs.

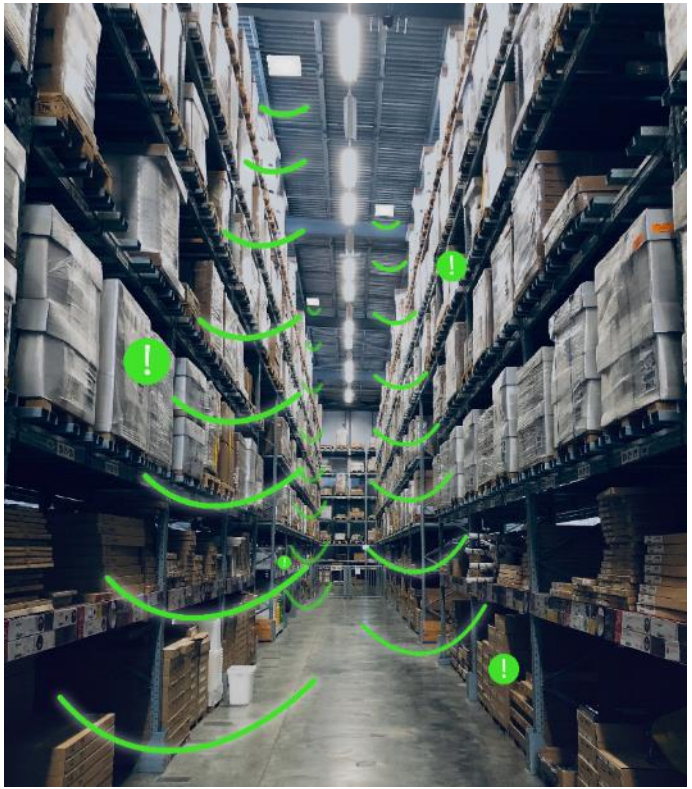
RF Harvesting

RF Wireless Charging

- Dedicated Power Transmitter
- Recommended for mobile and computer peripherals:
  - Headphones
  - Game controllers
  - Wearable Tech
  - Keyboards and Mice
- Power over several inches to several feet

RF Harvesting

- Multiple RF power source options
  - Commercial power transmitter
  - Fixed RFID reader
  - Handheld RFID reader
- Range of use cases
  - Sensor readings
  - Bi-stable display updates
  - Identification / Authentication
- Power to **80 ft** for some use cases



Deployments

TAG

By ViewTag | Launched with British Airways

ViewTag is a permanent, electronic alternative to paper-based bag tags that utilizes airport RFID equipment to update travelers' information and track their baggage.

- Power & data delivery at 915 MHz
- Utilizes standard airport RFID equipment
- Power harvesting technology significantly extends battery life

Sensor Tags

PCT wireless sensor tags harvest energy from standard RAIN RFID readers and are typically used in environmentally controlled shipments and for building automation control.

- Power & data delivery at 915 MHz
- Temperature, light, & humidity readings
- Two tag styles available
  - Battery free – instantaneous readings
  - Wirelessly rechargeable – data logging

SmartBall

By SportCor | Launched by Kookaburra

The Kookaburra SmartBall reports revolutions, speed, and bounce in real time and is wirelessly rechargeable using RF wireless charging technology.

- Power & data delivery at 2.45 GHz
- Single antenna design
- Charging cradle for convenient storage

RFID Journal's 2020 "Best Use of RFID to Enhance a Product or Service"

Wireless Charging Grip

Powercast's Wireless Charging Grip is the world's first truly wirelessly rechargeable gaming accessory. It recharges over the air using the PowerSpot RF wireless power transmitter.

- 915MHz operation
- 1 Watt power output from Tx

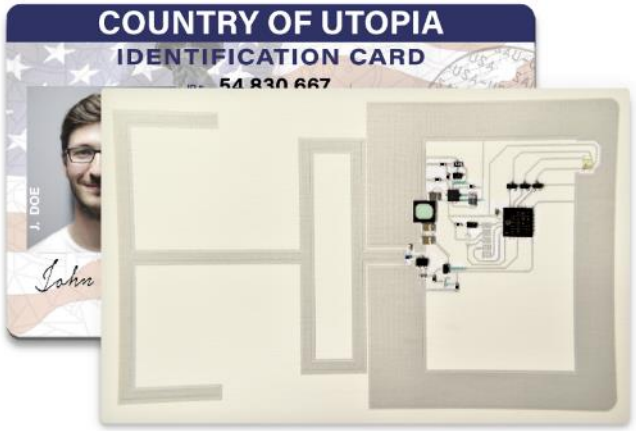
Future Uses

RFID Batteryless Price Tags

Completely battery free and utilizing bi-stable displays, these price tags utilize installed or handheld RAIN RFID readers to write the screen over the air.

- Segmented & active matrix displays
- Single antenna design
- Optimized for both fixed and handheld readers
- Indefinite operational life

Smart Cards



Integration of RF power harvesting technology removes or reduces the need for a battery, allowing the card to remain ultra thin while supporting additional advanced features.

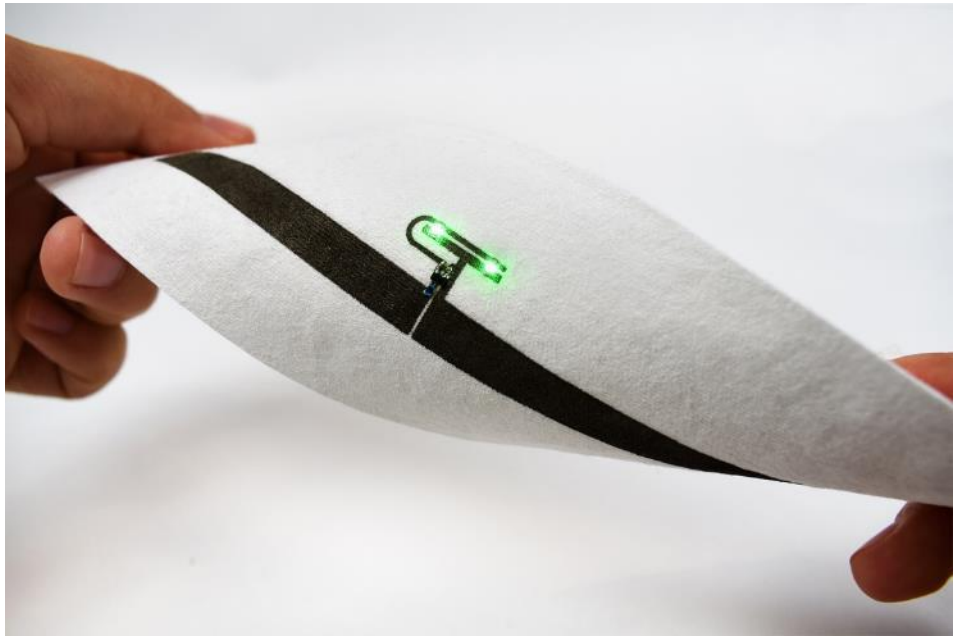
- Enable additional security features
  - Fingerprint scanner
  - Bi-stable displays
  - Buttons / keypads
  - BLE tracking
- RAIN RFID & NFC compatible

Battery Free Temperature Scanner

In response to the COVID-19 pandemic, this fob device utilizes energy from existing RFID infrastructure to monitor access via forehead temperature readings.

- Seamlessly integrates into existing RAIN RFID systems
- Single antenna design
- Low cost and easy to use

Wearables



Textile printed circuitry that is fully waterproof, flexible, and wirelessly powered.

- Circuitry becomes inherent part of overall garment
- Common failure points solved
  - Charging ports
  - Battery size restrictions
- Opportunity for additional antennas

Illuminated Labels

Using PPG's TESLIN® substrate and conductive coatings, circuitry and antennas can be directly printed onto labels or other packaging materials.

- Indefinite illumination or other functionality
- High volume, low-cost printing
- One label, multiple functionalities
  - Product differentiation
  - RFID
  - Sensor readings – humidity, temperature

Powercast is changing the way the world charges.

Thank You.

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Powercast's IP portfolio includes 63 patents worldwide (32 in the US) and 34 patents pending.

Thank you for Attending

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Presentations will be available on-line soon. You will receive an email with a link when they are available.