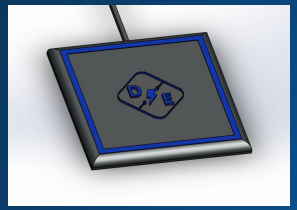

PowerPad Primary Transmitter

PowerPad

Brought to you by *Disconnect Electronics*, in partnership with *Delta-Q Technologies Corp.*
April 5th 2017

Contact: pvu@sfu.ca

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Paul Vu

What is the PowerPad?

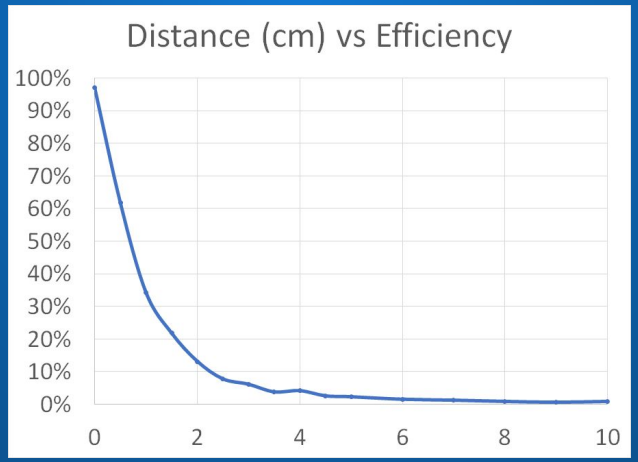
- Wireless power transfer solution
- Power range: 300-1500W
- Composed of primary transmitter, secondary receiver
- Proprietary coil technology achieves >80% efficiency [1]
- Global inductive charging revenue set to eclipse $11.8 billion by 2020 [2]

What can the Alpha-prototype do?

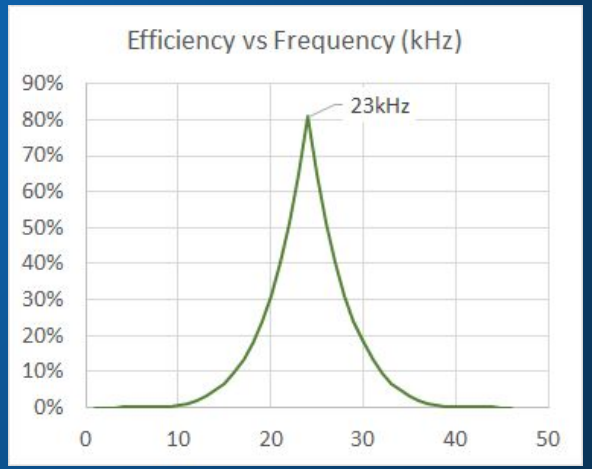
- Up to 95% efficient depending on distance
  - Low power test
  - Efficiency will increase at higher power due to better resonance
- Inter-terminal communications (Bluetooth)
- Secondary terminal temperature monitoring

The Alpha Hardware

- NMOS transistors are used in a half bridge configuration for simplicity
  - Half bridge creates adjustable frequency AC signal
- Resonance
  - Avoid adding capacitance & inductance
  - Resonance depends on inductance of coils and resonant capacitors
  - Resonant frequency at approximately 23 kHz
- Proprietary coil topology
  - Optimizes power transfer efficiency
- Challenges in maximizing efficiency
  - Avoid parasitic resistances
- Low power trials for proof of concept



Plot of power transfer efficiency as a function of distance between terminals at 3.5A p-p current in the primary coil



Projected plot of power transfer efficiency as a function of IGBT switching frequency

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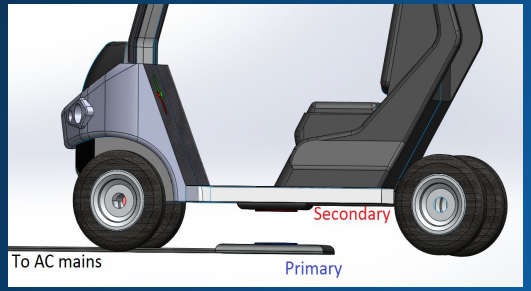


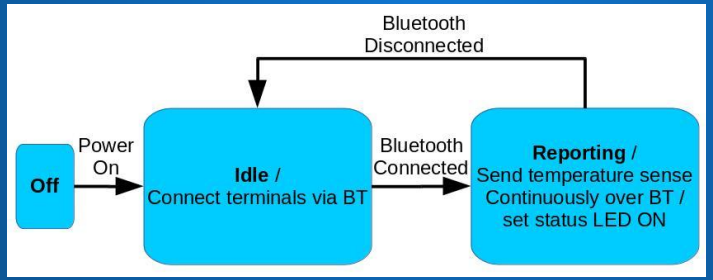
Final PowerPad Concept

The Alpha Software

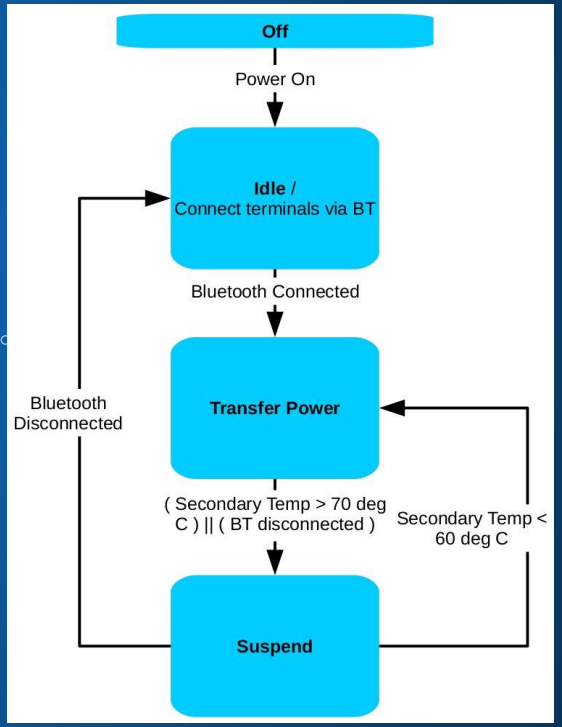
- Connect BT → begin power transfer
- Secondary: report temperature to primary
- Temperature too high → primary suspends IGBT control
  - Temperature drops → power transfer resumes

The Future of the PowerPad

- The gamma prototype will have increased functionality & efficiency
  - Efficiency goal: >80% at 15cm
  - Monitor efficiency in real time
  - Automatically align terminals
  - Detect foreign objects



Secondary receiver state machine



Primary transmitter state machine

References

[1] C. Botting, "Delta-Q Wireless Power Transfer Meeting," Delta-Q Office, 3755 Willingdon Ave, Burnaby, BC V5G 3H3, 2017.
[2] D. Lin, "State of Wireless Charging 2016: Mobile Devices - ChargeSpot," *ChargeSpot*, 2017. [Online]. Available: https://www.chargespot.com/news/state-of-wireless-charging-2016-mobile-devices/. [Accessed: Jan 30, 2017]