

Heating and cooling the human body with wirelessly powered devices - Category 4 (2+3)

Team members

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David Culler	Professor EECS, UC Berkeley
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Commercialization partners

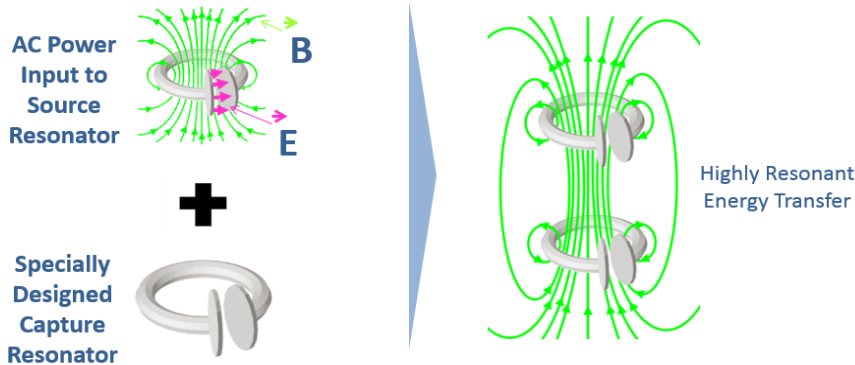
Charles Lundy	R&D Dir, Foot Health (Dr Scholls)
Daniel Reilly	Dir, Design and Innovation, Staples
Peter Rumsey	CEO, Personal Comfort Systems Inc.

Duration: May 2015 – April 2018

Description of Technology

Wireless electrical power transfer

Highly resonant devices are tuned to the same frequency and exchange energy via an oscillating magnetic field



Safe and Efficient Energy Transfer Over Distance

DELTA cooling/heating system



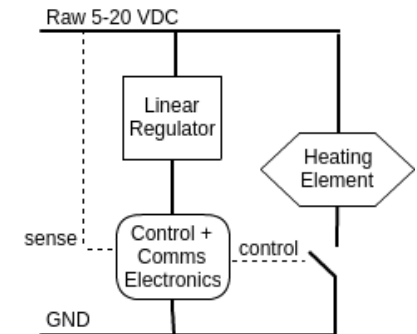
Resistive Heater Top

POC Resonating Coil Bottom

Flexible, ultra-thin resonators can be embedded directly in insoles

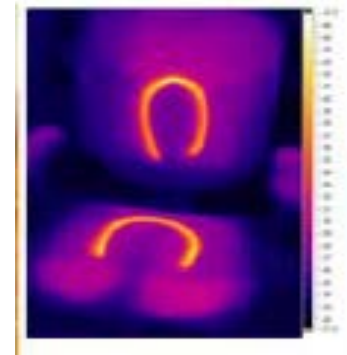
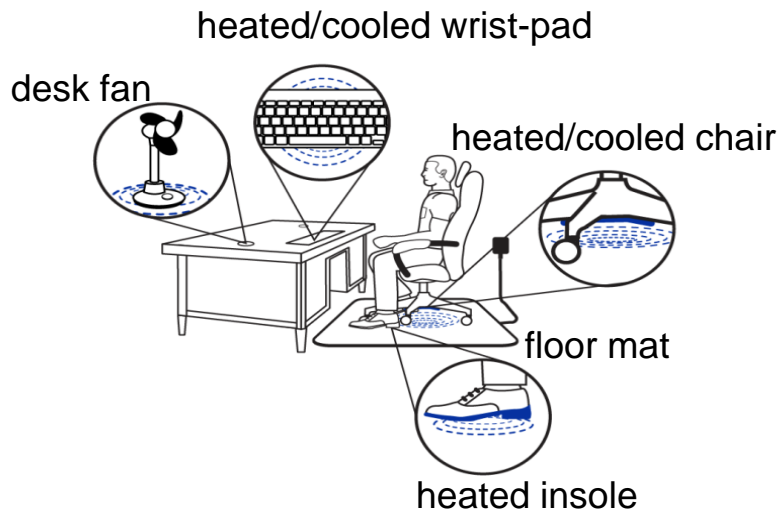
- self-contained
- fully-integrated
- installs in seconds
- warms instantly
- hot in seconds
- no batteries/wires
- inexpensive

Heating		COP
Insole	6W resistance heating, power transfer efficiency 0.6	0.60
Wrist-pad	5W resistance heat array	0.65
Chair	14W resistance heating, power transfer efficiency 0.8	0.75
Cooling		COP
Desk fan	2W at fan provides 12W of body cooling	4.8
Wrist-pad	Convectively cooled from below; 2W fan input to wrist-pad provides 5W of body cooling	2.0
Chair	3.6W to chair provides a minimum of 21.5W of body cooling	4.8



Value Proposition

- For DELTA to compete with conventional HVAC, occupants must feel unencumbered by electrical power cords, unburdened by batteries or battery-charging tasks as they work
- DELTA devices must be both electrically and thermally efficient
- Electrical power transfer from floor and under-desk transmitters must be optimized
- Heat transfer between devices and important parts of the body must be optimized for both COP and comfort



Validation Plan & Performance Targets

Tangible Assets for demonstration

• Four DELTA prototypes: heated insole; h/c chair; h/c wristpad; cooling fan	Q8
• Two power transmitters: floor mat for heated insole and h/c chair; under-desk transmitter for h/c wrist-pad and fan	Q8

Major targets and schedules for the final deliverables

• Design initial integrated prototypes together with Dr. Scholls, Staples, Personal Comfort Systems Inc.	Q1-Q4
• Build wireless power transfer DELTA prototypes (insole, wrist-pad, chair, fan) and test key performance index targets	Q5-Q8
• Human subject tests and manikin tests to validate the heat transfer and thermal comfort targets	Q9-Q10
• Refine the 4 final DELTA designs ready for marketing	Q11-Q12

How the DELTA Community Can Help Your Project

- These workstation-based wireless power transmitters might be used to power other projects' DELTA devices, such as clothing and worn devices. Any opportunities here?
- We would enjoy talking with Nike and Herman Miller about other market channels