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Nokia developing phone that recharges itself without mains electricity

Prototype harvests radiowaves from TV, radio and other mobiles

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Nokia's Research centre in Helsinki. Photograph: Antti Aimo-Koivisto/AFP/Getty Images

Standby mode is often accused of being the scourge of the planet, insidiously draining resources while offering little benefit other than a small red light and extra convenience for couch potatoes. But now Nokia reckons a mobile phone that is always left in standby mode could be just what the environment needs.

A new prototype charging system from the company is able to power itself on nothing more than ambient radiowaves – the weak TV, radio and mobile phone signals that permanently surround us. The power harvested is small but it is almost enough to power a mobile in standby mode indefinitely without ever needing to plug it into the mains, according to Markku Rouvala, one of the researchers who developed the device at the Nokia Research Centre in Cambridge, UK.

This may sound too good to be true but Oyster cards used by London commuters perform a similar trick, powering themselves from radiowaves emitted by the reader devices as they are swiped. And similarly old crystal radio sets and more recently modern radio frequency identification (RFID) tags, increasingly used in shipping and as antitheft devices, are powered purely by radiowaves.

The difference with Nokia's prototype is that instead of harvesting tiny amounts of power (a few microwatts) from dedicated transmitters, Nokia claims it is able to scavenge relatively large amounts of power —

around a thousand times as much — from signals coming from miles away. Individually the energy available in each of these signals is miniscule. But by harvesting radiowaves across a wide range of frequencies it all adds up, said Rouvala.

Such wireless transfer of energy was first demonstrated by Nikola Tesla in 1893, who was so taken with the idea he attempted to build an intercontinental transmission tower to send power wirelessly across the Atlantic. Nokia's device is somewhat less ambitious and is made possible thanks to a wide-band antenna and two very simple circuits. The antenna and the receiver circuit are designed to pick up a wide range of frequencies — from 500 megahertz to 10 gigahertz — and convert the electromagnetic waves into an electrical current, while the second circuit is designed to feed this current to the battery to recharge it.

The trick here is to ensure that these circuits use less power than is being received, said Rouvala. So far they have been able to harvest up to 5 milliwatts. Their short-term goal is to get in excess of 20 milliwatts, enough power to keep a phone in standby mode indefinitely without having to recharge it. But this would not be enough to actually use the phone to make or receive a call, he says. So ultimately the hope is to be able to get as much as 50 milliwatts which would be sufficient to slowly recharge the battery.

Steve Beeby, an expert in harvesting ambient energy at the University of Southampton, said it would be a remarkable achievement. . "Radio frequency power falls off exponentially with distance," he says. Earlier this year researchers at Intel and the University of Washington, in Seattle, showed that they could power a small sensor using a TV signal 4.1 kilometres away.

Wireless charging is not intended as a sole energy source, but rather to be used in conjunction with other energy harvesting technologies, such as handset casings embedded with solar cell materials. According to Technology Review magazine, the phone could be on the market in three to five years.

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