Longer battery life for wireless devices?

Those worries about what happens when you need to make that urgent phone call on a dying cell phone, or having your laptop go blank mid-document could soon be lessened. Researchers at the University of Rochester say they've developed a chip for cell phones and WiFi laptops that means that batteries can use 10 percent of the battery power of current designs, and even less than that in any future wireless devices. With their new chip, cell phones, WiFi and other wireless devices will be able to deliver better performance and longer batter life.

When wireless devices like cell phones or laptops using WiFi or Bluetooth communicate with each other, the data is transmitted at very specific frequencies. To make sure that the device can pick up and send information on exactly the right frequency at all times, each devices holds a highly accurate and stable clock inside it, which has to be constantly maintained.

The clock is generated by a circuit called "phase-locked loop", and it is this circuit which sucks up a battery use on wireless devices. Whilst it's nowhere near as much as the power used up by the transmitter and the microprocessors, it is constant. Even when a cell phone's in standby it will still be transmitting, and it's that process that uses up the battery life.

Professor Hui Wu headed the electrical and computer engineering team that broke the barrier in wireless chip design. In research released last month, Wu and his researchers say that they've developed a circuit which uses far less energy that the current models. The circuit itself, the "injection locked frequency divider" or ILFD is nothing new -- Wu himself pioneered the circuit design over five years ago.

Even then, its ability to allow accurate data transfer using less energy than other digital methods meant that the industry applications seemed blindingly obvious. But the original design had major flaws that stopped the wireless chip manufactures picking it up: it couldn't operate beyond a tiny range of frequencies, and it wasn't possible to achieve fine enough resolution even within that range. Both of those problems have now been ironed out. The new model "Divide by Odd Number ILFD" (so-called because it can divide the clock pulses by either two or three) allows any frequency in the small range to be used, making the power-saving ILFD method viable.

The development is timely -- with increasing dependence on wireless devices in the home and office and the associated developments in broadband and 3G technologies, wireless manufacturers want to be able to move data even faster. That means moving onwards and upwards to higher frequencies. It's an ongoing trend in telephony and wireless; the 900-megahertz cordless phones of yesteryear made way for the 2.4 gigahertz, and now 5.8 gigahertz.

Wireless networks such as WiFi have been moving on up too and should soon be pushing into the proposed 60 gigahertz band. When frequencies are this high the traditional digital frequency divider's will both struggle to keep up with such speeds and the demand ever-increasing amounts of power to do so, meaning shorter battery lives. But not only would the new ILFD need less power but, as the frequencies increases, the amounts of power needed will actually proportionally decrease meaning that later generations of wireless devices could be even more energy-efficient.

The chip won't be a miracle solution for wireless users -- laptops will still only be able to be loaded up with a finite amount of power, and an uncharged cell phone will still remain an uncharged cell phone. What it does mean is that after charging their wireless devices users will be able them for longer periods of time, getting the same service but for ten times longer. And users can save money too -- a more energy-efficient cell phone needs less frequent charging, saving on the electricity bills.

Prototype chips have been designed and fabricated to show that this innovation will work as well in industry manufacture as it does in the laboratories. At the semi-conductor industry's International Solid-State Circuits Conference in February of this year, the team presented their 18-gigahertz "Divide by Three ILFD" to the delegates in San Francisco. Not content with just this one chip, Wu himself is now moving on to work on other power-saving aspects of chip design that he hopes can stretch the battery life of wireless devices even further.