

The Problem with Software Defined Radio

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<html> <p>There's a problem with software defined radio. It's not that everyone needs to re-learn what TEMPEST shielding is, and it's not that Bluetooth is horribly broken. SDR's biggest problem is one of bandwidth and processing. With a simple USB TV Tuner, you can listen in on aircraft, grab Landsat images from hundreds of miles up, or sniff the low-power radios used in Internet of Things things. What you can't do is make your own WiFi adapter, and you can't create your own LTE wireless network. This is simply a problem of getting bits from the air to a computer for processing.</p> <p>At HOPE last weekend, the folks behind the very capable LimeSDR and a new company working with Lime's hardware laid out the possibilities of what software defined radio can do if you make a link to a computer very fast, and add some processing on the SDR itself.</p> <p>The key feature of the LimeSDR, and all boards derived from Lime Micro's tech is the LMS7002M. It's a Field Programmable RF transceiver with coverage from 100kHz to 3.8GHz, a programmable IF filtering from 600kHz to 80MHz, and this one is important: on-chip reconfigurable signal processing; and a fast USB 3.0 interface to a computer.</p> <figure id="attachment_215995" style="width: 260px" class="wp-caption alignright"><figcaption class="wp-caption-text">The Fairwaves XTRX</figcaption></figure><p>Aside from the Lime, another company was also at HOPE showing off the latest SDR wares they have to offer. Fairwaves was there with the XTRX, a software defined radio built around the same Lime Micro LMS7002M chip in a miniPCIe form factor.</p> <p>This tiny card uses the same tech found in the LimeSDR with one key difference. Instead of a USB 3.0 port, the XTRX connects to a computer

through the PCI bus, sending data to RAM at 8Gb/s. That's fast.

The miniPCIe form factor also has another interesting application. The folks at Fairwaves are working on putting this device in a miniPCIe to PCIe x1 adapter; that makes sense, it's all the same signals, just a different form factor.

This also means you can run four XTRX boards with a yet-to-be-designed PCIe 16x adapter. Putting four of these SDRs in a single card means phased array antennas, 8×8 MIMO, and other techniques that make this massive SDR very interesting. The Fairwaves team only had a handful of these boards assembled, but when this goes on sale, you'll be able to build a rig that blows the roof off the price/performance ratio of any other SDR.

In the talk presented at HOPE (not available independently of other talks yet, but [starting 1:46:12 into this live recording](http://livestream.com/internetsociety3/hopeconf/videos/130824120)), the folks behind the LimeSDR talked about the possible applications of this hardware. In a year or two, you'll be able to build a portable 3G or 4G base station for about \$2500. That's an incredible advancement in the state of the art, and something that's only possible because of on-chip processing and very fast access to a computer's memory.

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Last update: **2021/12/06 15:24**

