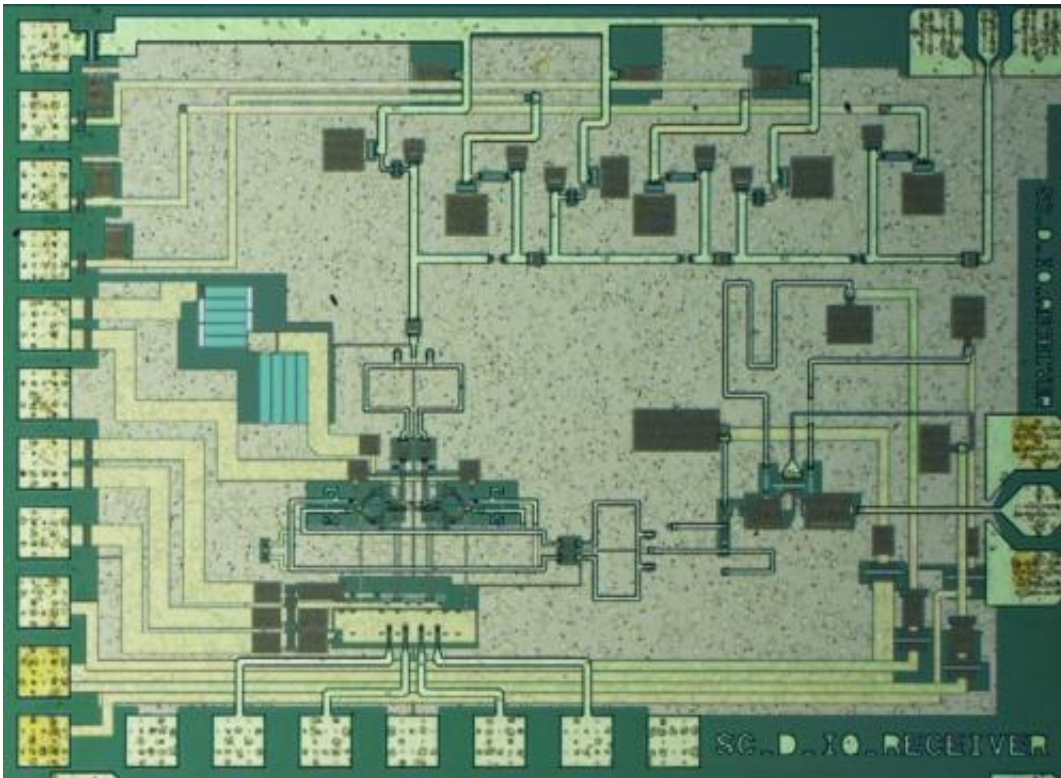


World record in data transmission with smart circuits

October 21 2014



The photo shows the 140 GHz transmitter chip, containing an I-Q modulator, a 3-stage amplifier, and a x3 frequency multiplier for the local oscillator. The chip was designed by Sona Carpenter, Herbert Zirath, and Mingquan Bao. Data-transmission measurements was done by Simon He. The chip size is 1.6x1.2 mm². Credit: Sona Carpenter

Fewer cords, smaller antennas and quicker video transmission. This may

be the result of a new type of microwave circuit that was designed at Chalmers University of Technology. The research team behind the circuits currently holds an attention-grabbing record. Tomorrow the results will be presented at a conference in San Diego.

Every time we watch a film clip on our phone or tablet, an entire chain of advanced technology is involved. In order for the film to start playing in an even sequence when we press the play button, the data must reach us quickly via a long series of devices, antennas and receivers. With an increasing number of users, higher demands on image quality and more wireless systems, producing methods for transmitting the enormous amounts of data through the air with the right speed poses a major challenge.

The solution might be to use higher frequencies than today, from 100 Gigahertz and higher, since this would give access to a larger band of empty frequencies, enabling a higher data rate. Researchers all over the world are working to produce data [circuits](#) that can transmit and receive signals that are strong enough at higher frequencies. A Swedish group from Chalmers University of Technology and Ericsson has already been successful.

"We have designed circuits for signals at 140 Gigahertz, where we have a large bandwidth. In laboratory testing, we have achieved a [transmission](#) rate of 40 Gigabit data per second, which is twice as fast as the previous world record at a comparable frequency," says Herbert Zirath, who is a professor in high speed electronics at Chalmers. He is also employed by Ericsson Research on a part-time basis.

As a result of the record, the researchers have been asked to talk about their results together with a few other researchers under the heading "Breaking News" on Wednesday at the Compound Semiconductor Integrated Circuits Symposium conference in San Diego.

"Just being asked to present research results at the conference at all is a mark of quality. For our research to then be selected as one of the most important items to be presented as breaking news is naturally huge."

Herbert Zirath says that semiconductor materials development has enabled manufacture of circuits that can transmit high frequency signals with sufficiently high power. The circuits, which are made of the semiconductor material indium phosphide, are so small that a microscope is needed to distinguish the details.

Some of the applications for quicker wireless [data transmission](#) that Herbert Zirath envisions include major cultural and sports events where high-resolution live films need to be transmitted to screens without any delay or long cables, and communication within and between the large computer rooms where our digital files end up when we place them in "the cloud". Improved wireless transmission can also mean fewer cords in our homes and at our workplaces. The quick circuits are of interest to Ericsson in terms of transmitting signals to and from base stations and cellular towers.

"This is a very exciting area to be involved in, since the heavily increasing amount of data demands new solutions all the time. The fact that an increasing number of people are watching films wirelessly is the primary reason underlying the need for quicker transmission today."

The project is being funded by the Swedish Foundation for Strategic Research, and the next step for the project's researchers involves moving from the laboratory to the outdoors to test the circuits under real circumstances. Even though there are many aspects that have to fall into place for successful data transmission, Herbert Zirath is not nervous. Within a few years, the goal within the project is to demonstrate wireless data transfer of 100 Gigabit per second.

"I believe it is only a matter of a couple of years before our circuits will be used in practical applications."

Provided by Chalmers University of Technology

Citation: World record in data transmission with smart circuits (2014, October 21) retrieved 3 May 2024 from <https://phys.org/news/2014-10-world-transmission-smart-circuits.html>

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