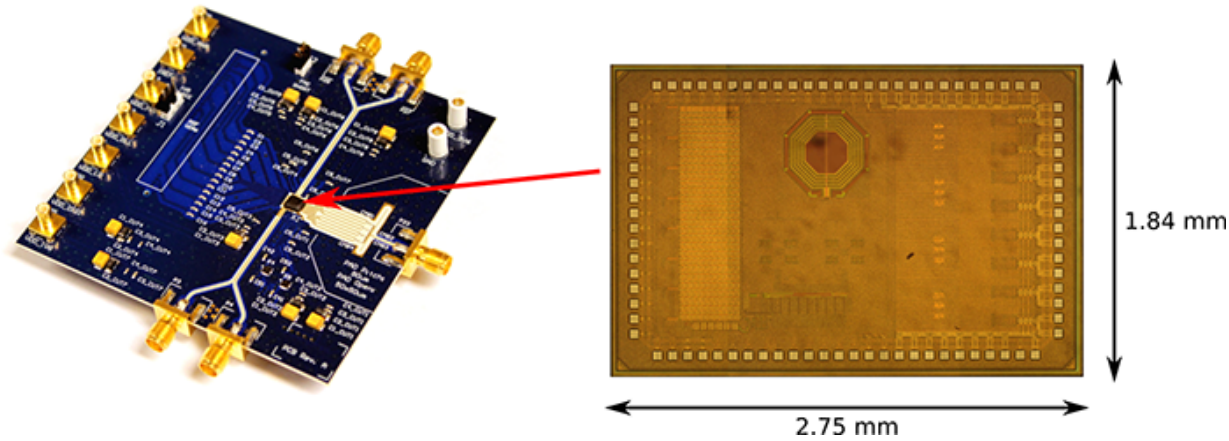
New 5G transmitter 20 times more efficient than the previous ones

March 27 2017



Prototype of the new integrated base station transmitter. Credit: Aalto University

In the future, the coverage of a single base station has to be reduced because of the rapidly increasing number of mobile devices. This reduces the size of base stations, but increases their number, which makes the price, size and power consumption requirements of base stations and mobile phones converge.

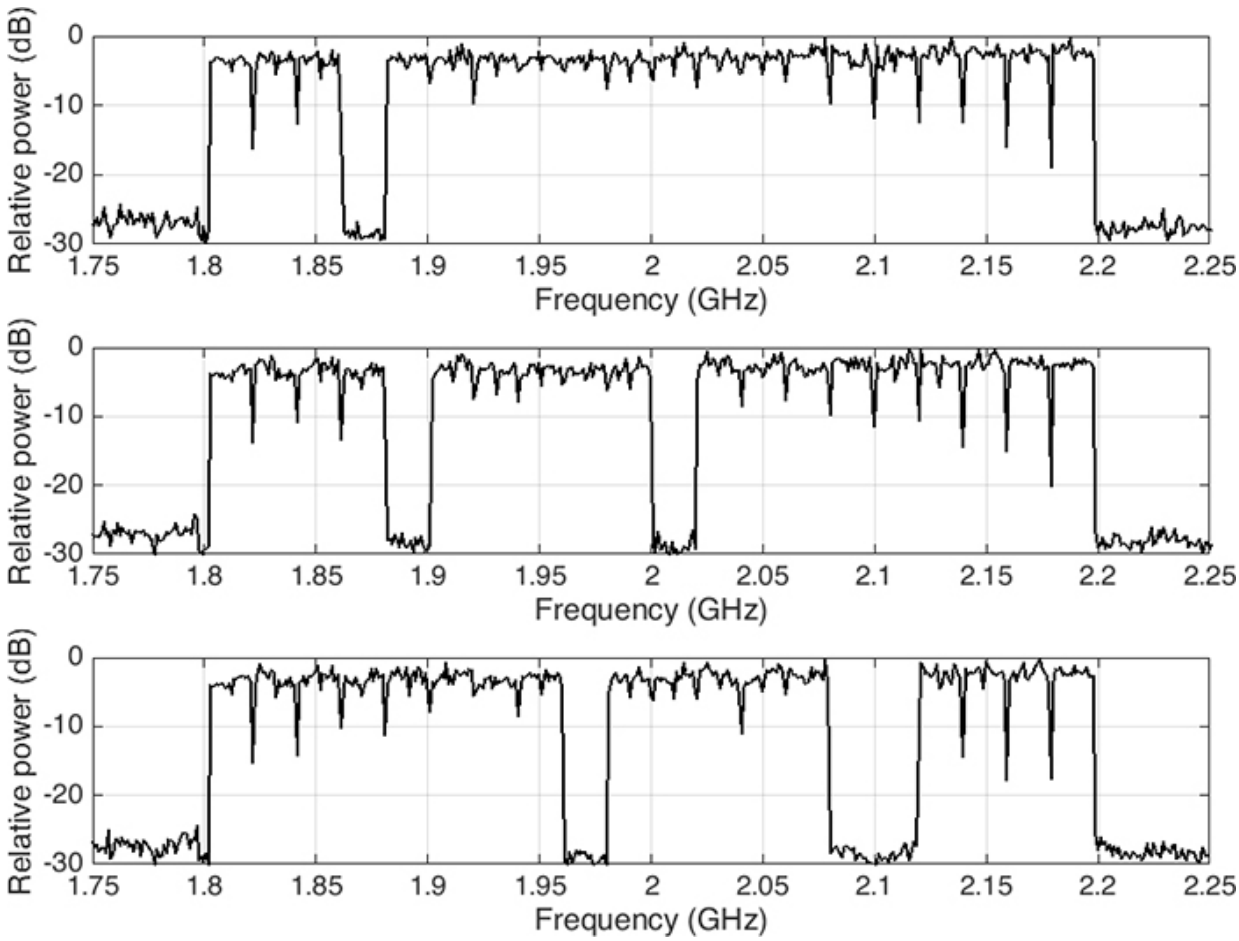
Aalto University researchers have developed a novel 5G radio transmitter in collaboration with Tampere University of Technology and Nokia Bell Labs. The operating principle of the transmitter is as digital as possible; the signal is converted to the analog form at the final

amplification stage. The development of semiconductor processes has enabled processing the signal in the digital form in the radio transmitter almost up to the antenna, where it is converted to electromagnetic radiation.

'A completely new integrated electronic circuit has been developed for the transmitter to enable a notable increase in the frequency bandwidth. This makes the data transmission capacity of the base stations up to 20 times larger,' says Aalto University Department of Electronics and Nanoengineering Professor Jussi Ryynänen.

'The data transfer bandwidth of 4G transmitters is approximately 20 MHz, whereas our digital 5G transmitter can achieve a bandwidths of up to 400 MHz.'

The developed electronic circuit enables flexible modification of the transmitted signal



The new transmitter enables flexible specification of carrier waves in a wide frequency band of 400 MHz. Credit: Aalto University

Flexibility has often been realised by utilising parallel transmitters that can be turned on or off depending on the location of the base station and the required data transfer bandwidth.

'The 5G base station transmitter we developed enables new possibilities for modifying and programming the transmitted signal. The quality of the transmitted signal can be enhanced and we can freely choose the frequencies the transmitter uses without parallel radio transmitters,' says

Tampere University of Technology Communications Engineering Professor Mikko Valkama.

The new generation base stations enable the operators to choose which devices they share the signal to and how. This can be done by adjusting the parameters. Until now, targeting has been done in a fixed frequency band.

Aalto University has developed the technology together with Tampere University of Technology and Nokia Bell Labs. The research project has been funded by Nokia and Tekes, the Finnish Funding Agency for Innovation. The research results were published at the International IEEE Solid-State Circuits conference in the United States in early February. The conference is an event in which the semiconductor industry and the academic research community present their best results in the field of integrated electronic circuits.

Provided by Aalto University

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