

Swedish researchers first with integrated receiver for high frequency applications

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As the first research group in the world, researchers at Chalmers have succeeded in combining a receiver for high frequencies with an antenna on a small chip.

The receiver is just a few square millimetre and is suitable for new safety systems, image sensors, and radio communication for high bitrates. The receiver is an electronic circuit including antenna, low noise amplifier, and frequency converter monolithically integrated on gallium arsenide.

"This is a breakthrough in our research. Our result opens the possibility to manufacture systems for very high frequencies within the so called 'THZ-electronics' area, to a relatively low cost. In the next phase of this project even more functions can be integrated on the same chip", according to Herbert Zirath, professor at the department of Microwave Electronics.

This circuit can for instance be used in radiometer systems in future safety systems looking for concealed weapons without personal visitation. Other applications for this circuit are imaging sensors that can look through darkness, smoke or fog. This is an important safety function for vehicles such as cars and aircrafts.

"Thanks to this technology, we now have the possibility of integrating imaging sensors by using circuits of a few square millimetre which is much smaller that the present technology at a lower cost. For automotive



applications such as cars, aircrafts and satellites, the size and weight is of utmost importance. The present systems consist of many pieces and demands several cubic decimetres volume", says Herbert Zirath.

The new circuit is designed to work at the frequency of 220 gigahertz, but this is not an upper limit. According to professor Zirath, the technology can be used up to and above 300GHz in a near future.

The technology is also interesting for wireless data communication because, due to the very high bandwidth, data rate well above 10 Gbit/s is possible to realize in future radio links. Together with Omnisys Instruments in Gothenburg, we are also implementing receivers for future earth observation satellites for environmental studies and weather forecasts at frequencies 118 and 183 GHz, using the same technology.

Source: Swedish Research Council

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