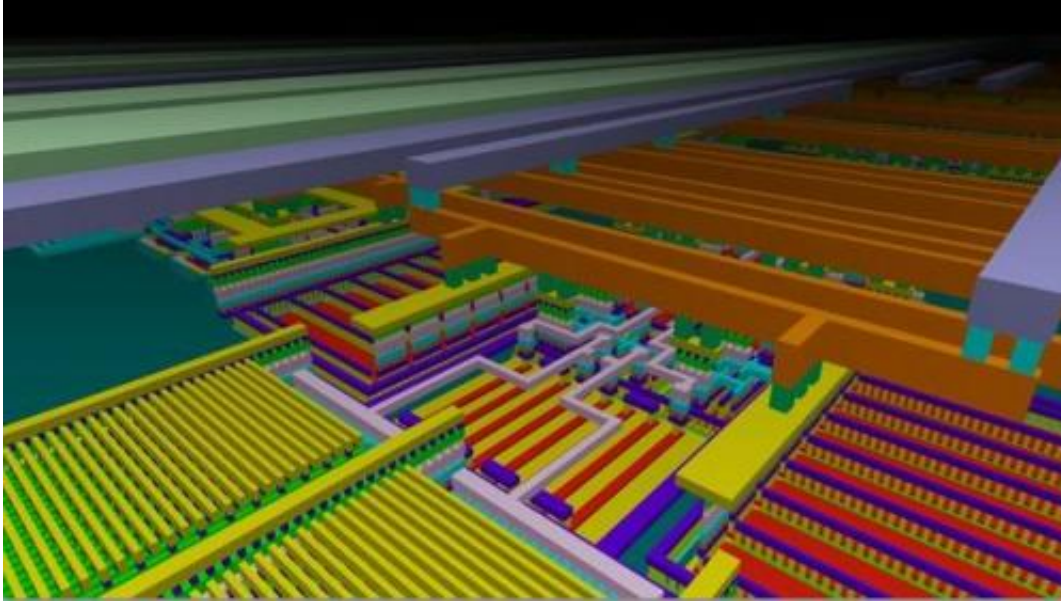


World class circuits by chip architects

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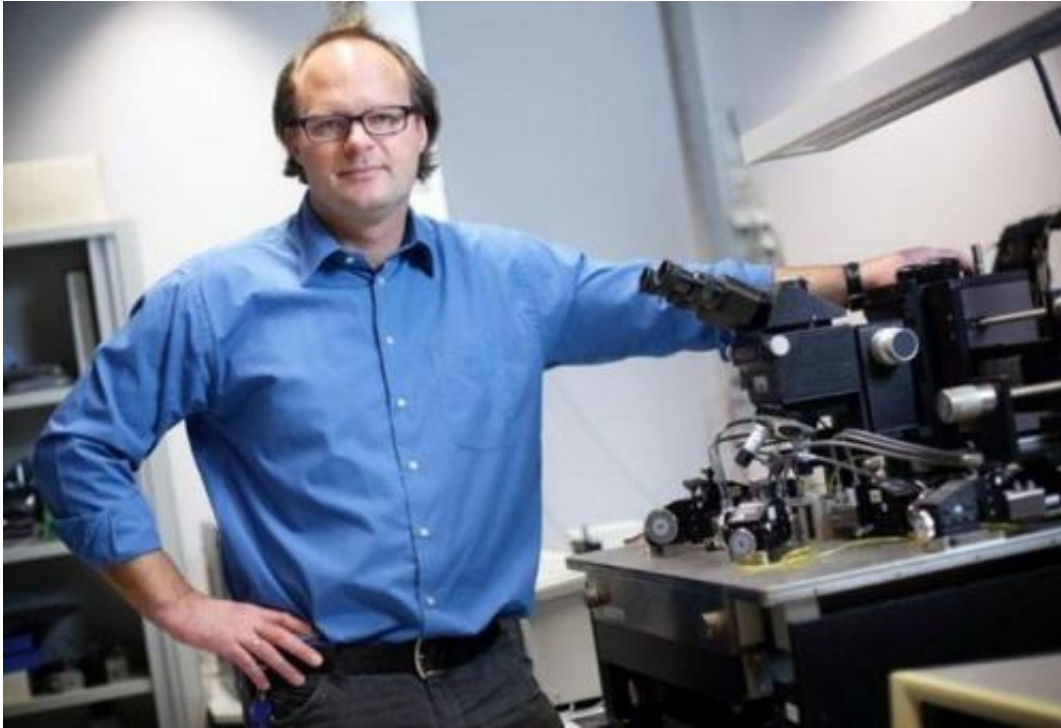
Thanks to their designs, the battery of a mobile phone stays charged for longer, the signal is better and more data can be transmitted for a lower price. The Integrated Circuit Design group headed by Prof. Bram Nauta at the University of Twente's CTIT Institute devises solutions that have helped set international standards in mobile internet and mobile telephony. In its field, the group is among the top five in the world and it is the only group in the Netherlands to achieve a maximum score in the latest independent research review.

When buying a new mobile device, the consumer has come to expect a

new version that can do more, can stay charged for longer and which costs less if at all possible. "All this seems to happen automatically but nothing could be further from the truth," says Professor Bram Nauta. "The current generation of devices contain circuits that we developed between five and ten years ago. It's hard work to stay at the forefront. We are not product developers. We come up with partial solutions that have a significant impact on how new devices work. It's a process that also involves [fundamental science](#). And a lot of calculations."

Riding the same airwaves

The latest project is being carried out at European level and goes by the name of DUPLO. It is about making better use of the scarce and expensive frequencies for [mobile telephony](#). Nowadays if you call someone, you use a different frequency than the person you are calling. But Prof. Nauta calls this into question: "Why shouldn't we be able to use the same frequency to transmit and receive, travelling back and forth on the same airwaves? The software in the phone can work out when there's enough room."



The current generation of smartphones need to cope with a lot of [frequency bands](#), from GSM to [WiFi](#) and [Bluetooth](#). But mightn't it be possible to do all that with a single receiver and a smart filter that picks out the weak signal you want to receive, even if it happens to be right next to a strong signal? The chip designers are hard at work to create just such a filter.

Disbelief

One of the Integrated Circuit Design group's most exciting achievements is noise cancelling, an advance that put it well and truly on the map. A smartphone contains a radio that transmits and receives internet and telephone signals. If you manage to reduce the background noise in the signal at the point of entry, you not only have better reception but you

also save energy. Ten years ago, Nauta's group came up with a stunningly simple solution, involving only three transistors. "The first reaction is disbelief, then people give it a try regardless, and now it's become a textbook example of how to eliminate noise. And all that is in the phone you buy in the store!" The group also holds a long-running world record for the most economical analogue-to-digital converter, 20 times more efficient than its predecessors. "Now the competition are beginning to catch up. That was another improvement that met with disbelief at first. People thought it was impossible. But it is possible, and our record has now stood for five years."

Prof. Nauta does not manufacture chips in-house. The major chip manufacturers take care of that. "We design chips with transistors no larger than 28 nanometres (a nanometre is one millionth of a millimetre). It's technology that requires a level of investment that's much too high for us." However, the group does have advanced testing facilities to assess the chips' performance as soon as they get back from the factory.

The group has spawned a successful spin-off, Axiom IC: a design house which currently employs 20 people. And Prof. Nauta has regular meetings with the major producers of [mobile devices](#). "We are among the best in the world. MIT and Berkeley have good groups, but we're right behind them. And of course, this latest recognition at national level is also something to be proud of." In the independent review of Electrical Engineering research in the Netherlands (at TU Delft, TU Eindhoven and the University of Twente), Prof. Nauta's group was the only one to achieve the maximum score for the criteria of quality, productivity, relevance and viability. The report is available to download [here](#).

The Integrated Circuit Design group is part of the Centre for Telematics and Information Technology (CTIT) at the University of Twente.

Provided by University of Twente

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