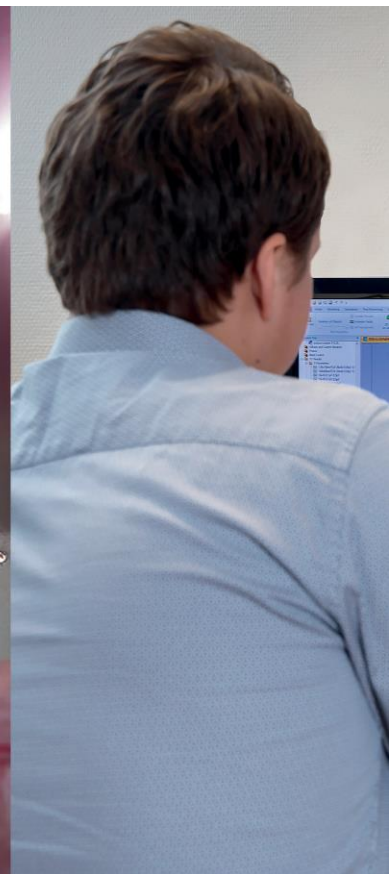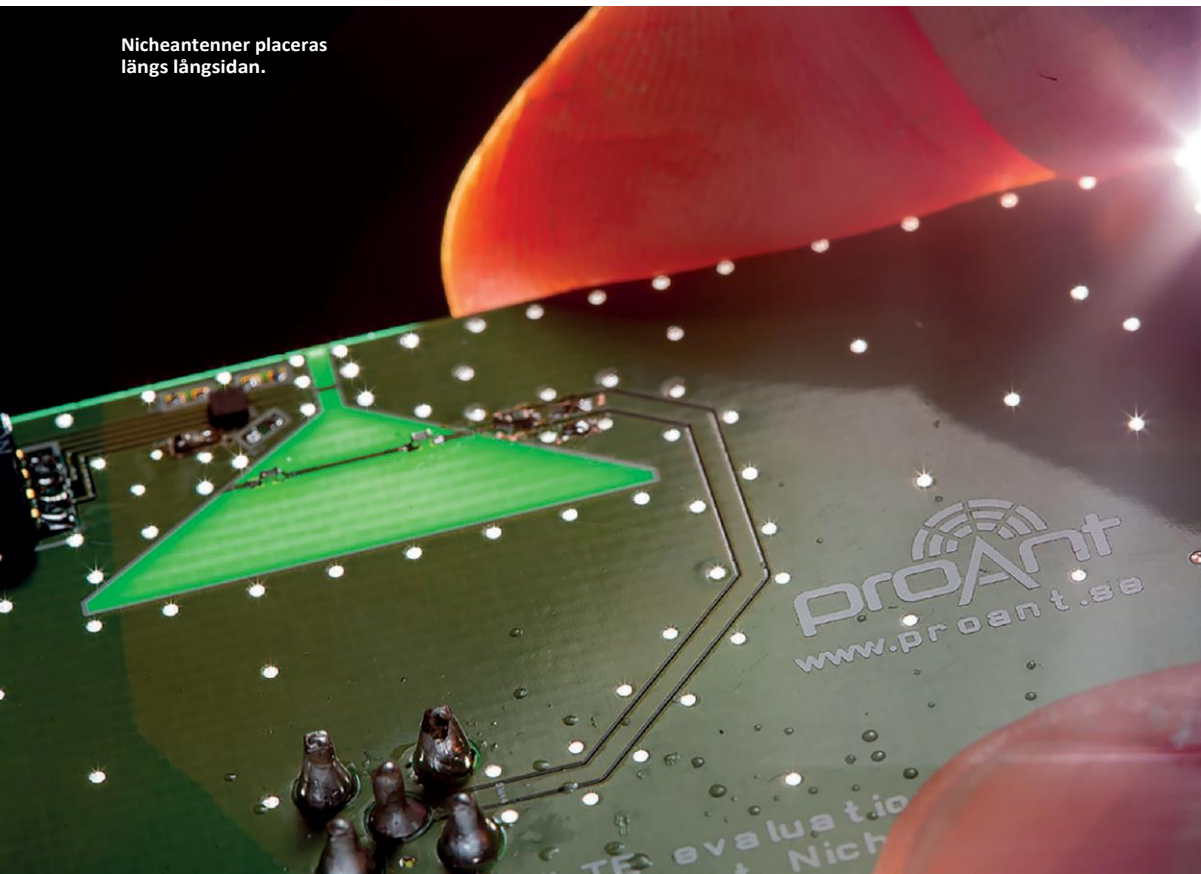Nicheantenner placeras
längs långsidan.

This is why Raspberry

On Proant in Umeå, we have had great success with a self-designed antenna concept we call Niche. In this article we told you about principle design and how it can be used in practical applications. Niche has mainly been used for Bluetooth and WiFi but we also see great potential for other apps such as LTE/NB-IoT/5G, positioning and sub-GHz as 868 MHz and LoRa.

Proant develops, manufactures and sells antennas. We have headquarters and development in Umeå and a subsidiary in Hong Kong that sells and delivers products to customers all over the world. The goal is to offer antennas, mainly built-in, that meet customers' requirements for secure communication. The range covers most of the needs of customers and we are constantly developing new concepts for future standards.

Antennas are available in a variety of designs depending on the application and the type of characteristic of the radiation needed. For products sold in large quantities, the cost is also important and it is customary to integrate an antenna pattern into the production PCB. In general, they need to be placed on the short or corner of the product, thereby making the product longer

By Tomas Rutfors, Proant

Tomas Rutfors, founder and CEO of Proant AB and Proant Asia Ltd. Tomas holds a Master of Science in Electrical Engineering from Luleå University of Technology. Among other things, he has worked with antenna development for mobile phones at Allgon Mobile Communications AB before he started Proant AB in 2005.

to set aside space for the antenna.

To avoid enlarging the product, you can instead place antenna in the middle of a side, often a long side. However, it is not possible to just move the antenna pattern from short edge and place it in a recess on the just move the antenna pattern from short edge and place it in a recess on the long edge as these antennas do not work with this location. It was therefore desirable to create a small but well-functioning antenna structure that can be placed along the long edge of products.

EN ANNAN VIKTIG PARAMETER is that the ant should not go too deep into the PCB but only use the surface along the outer edge of the PCB.

These were the starting points when Proant developed the Niche concept. The outcome was an antenna that passed a frequency band for 2.4 GHz. It was quickly picked up by Raspberry Pi for your Zero W module. When there was then need for antenna for two separated frequency ranges, the concept was further developed to cope with both 2.4 and 5 GHz areas for WiFi. It is used today on Raspberry Pi's newer modules, like Pi 3 Model B+ and Pi 4 Model B, see figure 1.

Niche can also be used for other frequency bands and protocols in addition to Bluetooth and WiFi, such as cellular data for 2G, 3G, lte, NB-IoT and 5G protocols, as well as UHF bands 868 and 915 MHz, which other lora uses. Positioning systems such as GPS, Glonass, Galileo and Beidou can also use the Niche concept.

**Proant hjälper kunden optimera antennen.**
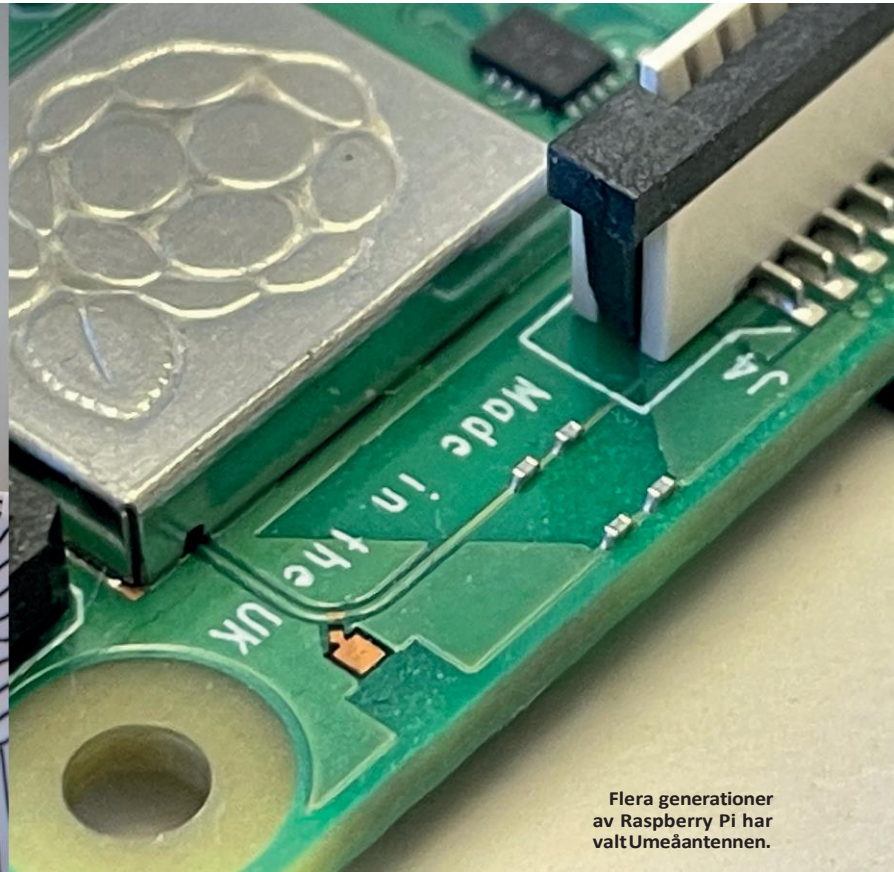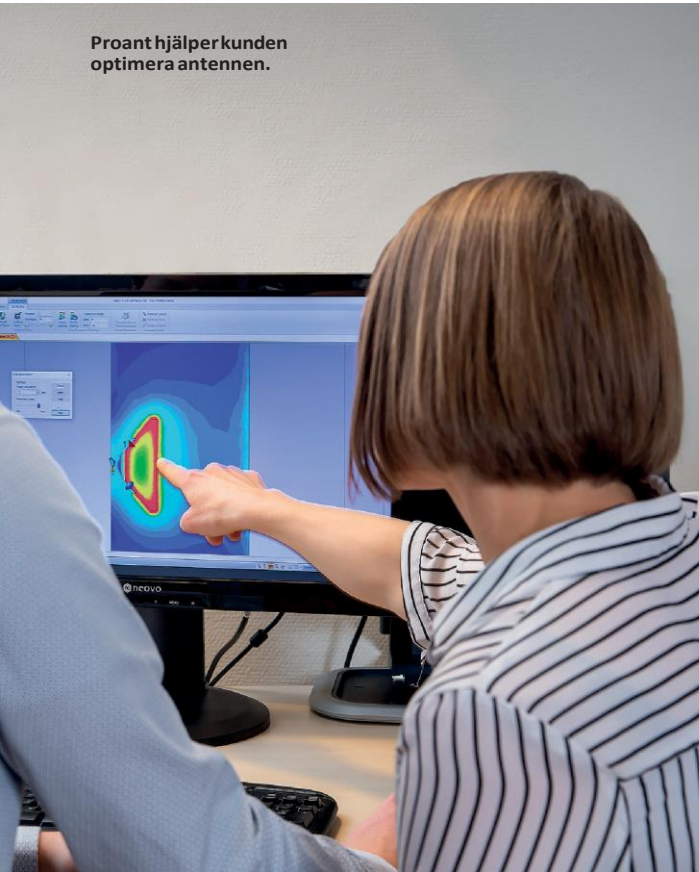
Flera generationer av Raspberry Pi har valt Umeåantennen.

Pi a Swedish antenna

The antenna structure is for lower frequencies. It also gets bigger if bandwidth need to be expanded. For 2G, 3G and LTE, the size is approximately 14 × 24 mm. For applications such as requires less bandwidth as LoRa is enough it with a size of 8 × 16 mm. For Bluetooth, the size is 4 × 8 mm is större. Den blir också större om bandbredd behöver utökas. För 2G, 3G och LTE är storle- ken cirka 14×24 mm.

The antenna technology can probably best be described as a hybrid between notch and loop antenna. It mainly has magnetic excitation of the EM fields, which gives the fine property that it is insensitive to dielectric load. In other words, it can be cast into silicone or similar castings without significantly altering its resonance frequency. Even performance stays almost intact. This makes the technology well suited for modules, as it stays frequency stable for most implements in customers' products. We have this on the u-blox modules that contain niche technology.

WE HAVE ALSO EXPLORED the ability to frequency adjust the frequency range of the antenna. This may be appropriate when a wide frequency range is needed, for example for global LTE or NB-IoT use .
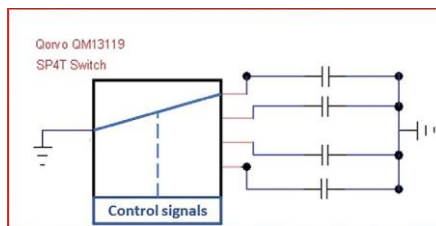
Figur 1. Switchning där olika kapacitanser ger olika resonansfrekvenser.
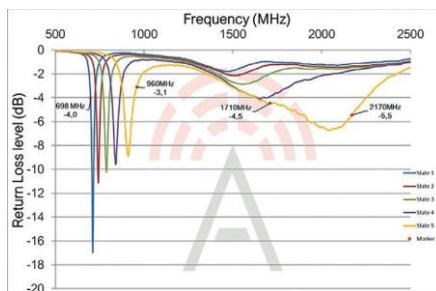
Figur 2. Antennens Return loss med olika kapacitanser valda av switch.

With a very simple shifting mechanism you can move the frequency range of the antenna so that it is possible to perform well with cover 699-960 MHz and 1710-2 170 MHz even for small applications. In this example, we place the antenna on an 80 × 40 mm pcb, which is a relatively small Application.

With the help of switching with a Sp4T switch and 4 capacitances, the antenna can still cover the entire frequency range, see Figures 1 and 2.

The capacitances are located over the antenna opening in the ground plane (see also www.proant.se/technology for more detailed description).

IT IS ALSO POSSIBLE TO COPE WITH these bands without switching if you have access to a larger area for antenna and if the application card is larger. With a 140 × 60 mm size PCB and an antenna size of 20 × 40 mm covers all LTE bands from 699 MHz up to 2,700MHz without having to frequency adjust Antenna.

As this technology is patented in the EU and patent proceedings are underway in several other countries such as the US, China, Japan, South Korea, customers will have to pay a license fee to use the technology. So far, we have seen that cost does not deter when annual quantity is more than 100,000.

We have a partner program for product development consultants where they receive the license fee for their customers' products. We also support customers in the introduction of the technology, which is appreciated by most customers as it requires some special technology to optimize the antenna in the design stage.