

Summary, Tunable Antenna for Global NB-IoT and LTE Coverage

This is a summary of the comprehensive white paper “Tunable Antenna for Global NB-IoT and LTE Coverage”.

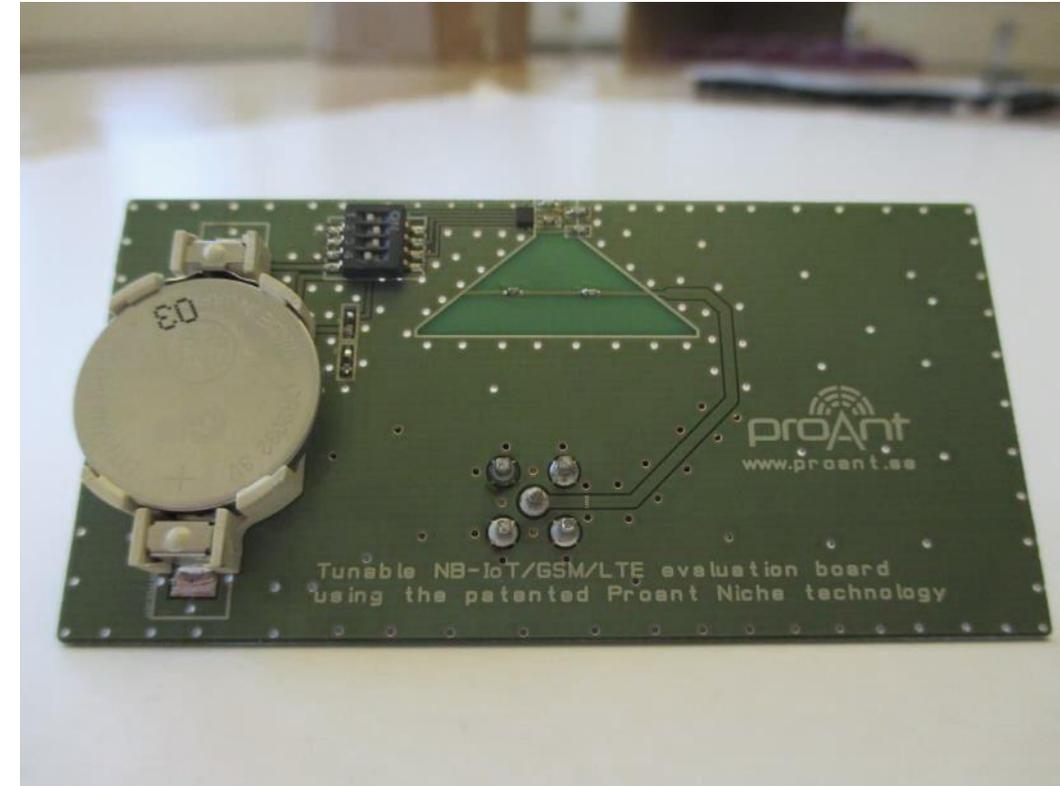
The market demand for wireless communication with multiband NB-IoT and LTE coverage is increasing. Furthermore, products tend to decrease in size, which implies less available space for the antenna. To meet these demands, Proant presents a tunable antenna solution using the patented Niche antenna concept with active switching.

By utilizing the method of active switching, Proant has reached a return loss better than -3dB and efficiency maximum of -3dB over the global NB-IoT and LTE ranges. With this, Proant proves that the Niche antenna concept is suitable to be used with active switching for extended frequency coverage.



DELIVERING MORE WIRELESS

© Proant AB



Evaluation board size: 50x80mm
Antenna cutout area: 12x25mm

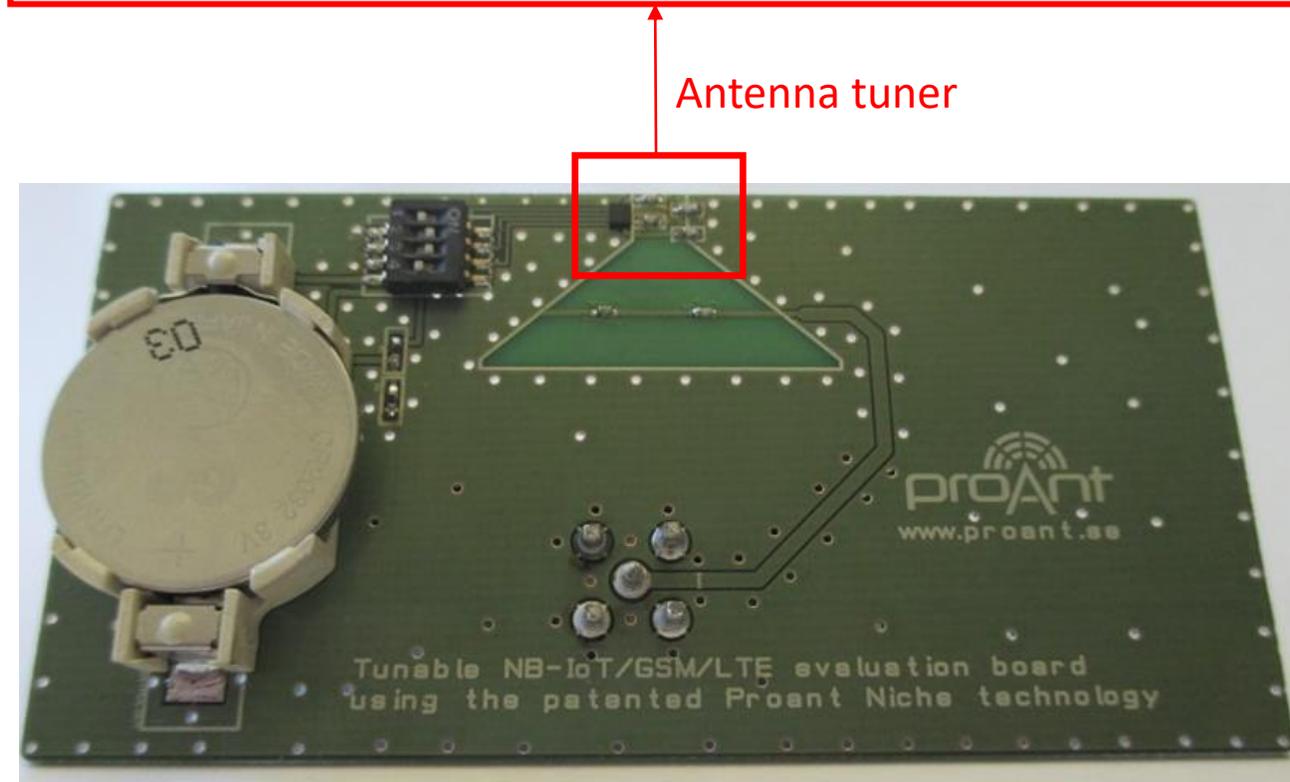
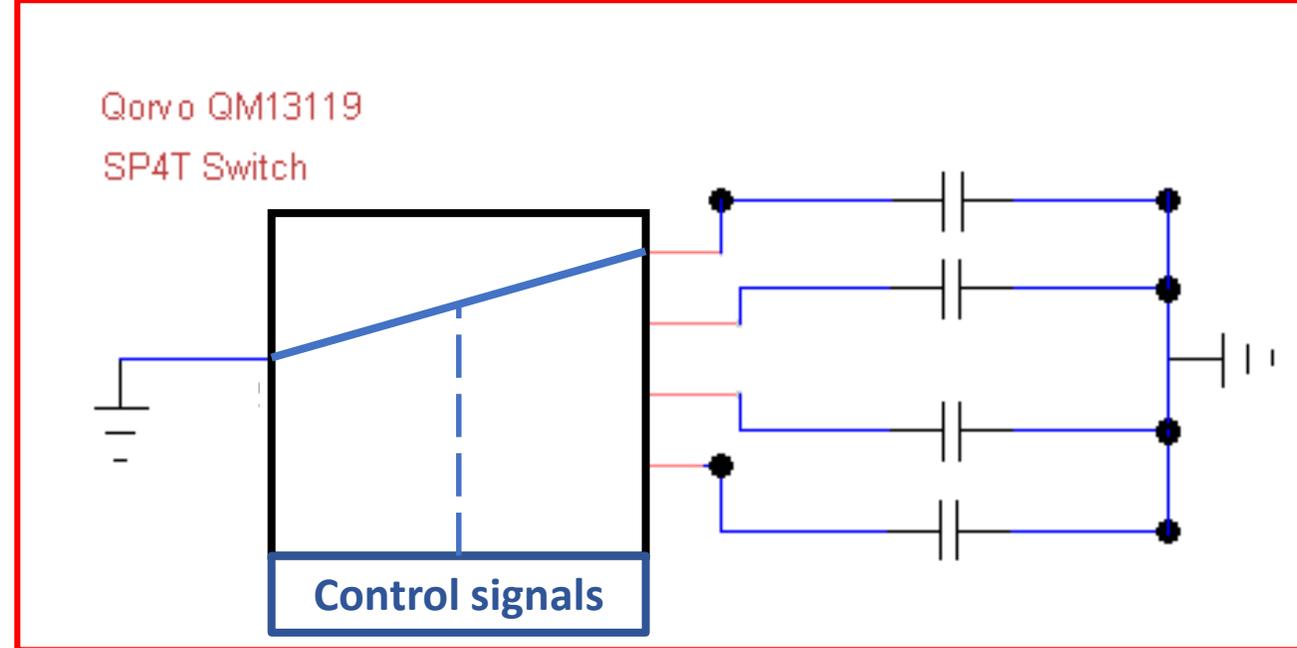


Solution

Since the operational frequency of the Niche antenna is determined by the capacitance on the top load. A neat solution is to use a single SP4T switch to change the capacitance value, hence tune the antenna to extend the frequency range and maintain performance.

The complete evaluation board is shown in the bottom right figure. The antenna tuner, including the SP4T switch and the antenna top load, is marked in red.

A detailed electrical schematic of the top load tuning functionality is displayed in the top right figure. Four capacitors in parallel, each connected to an output of the switch. The switch can combine the capacitive loads in different combinations *or states*. In this study, five states were utilized to cover the intended bands.



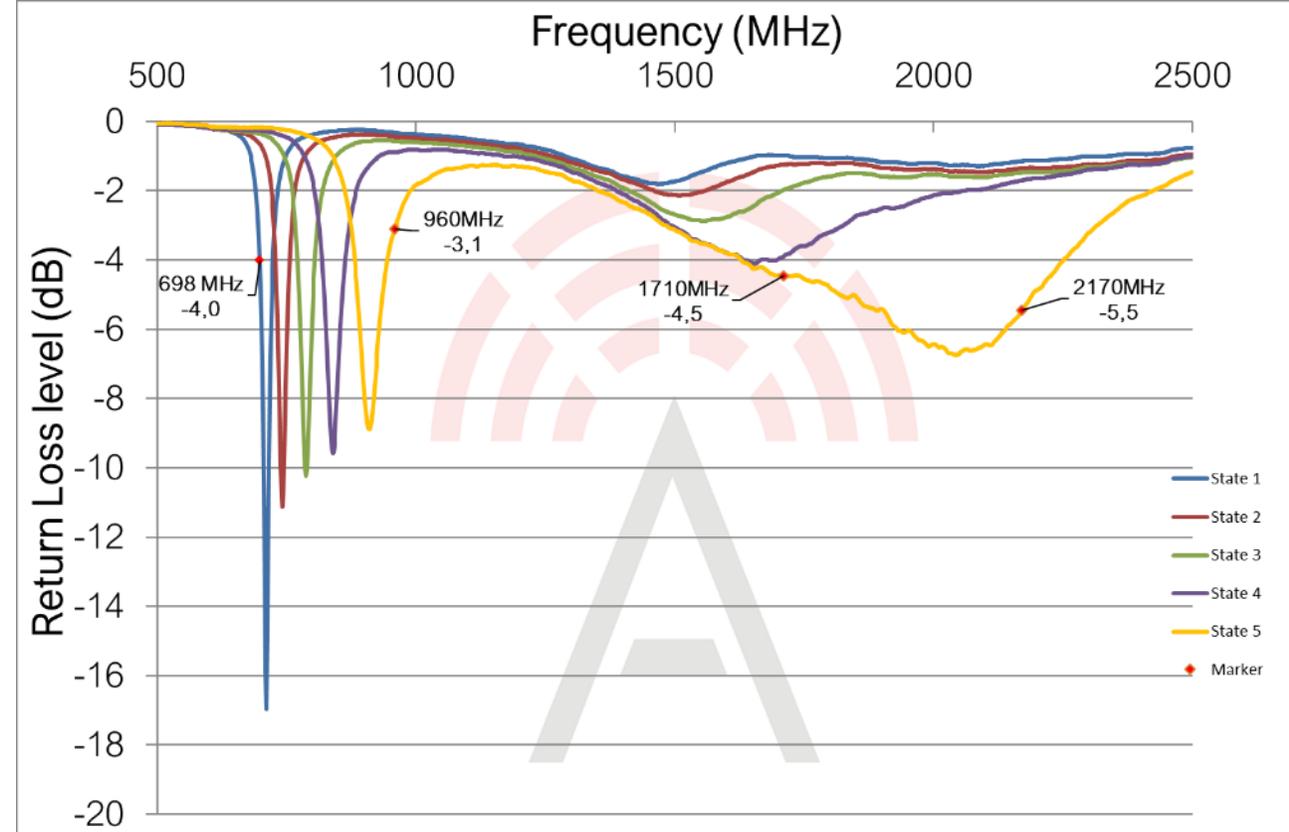
Results, Active Switching

The top right figure shows the return loss for different output states of the SP4T switch.

The bottom right table summarizes the return loss data.

The table below shows which NB-IoT and LTE communication bands that are covered with a return loss of at least -3dB.

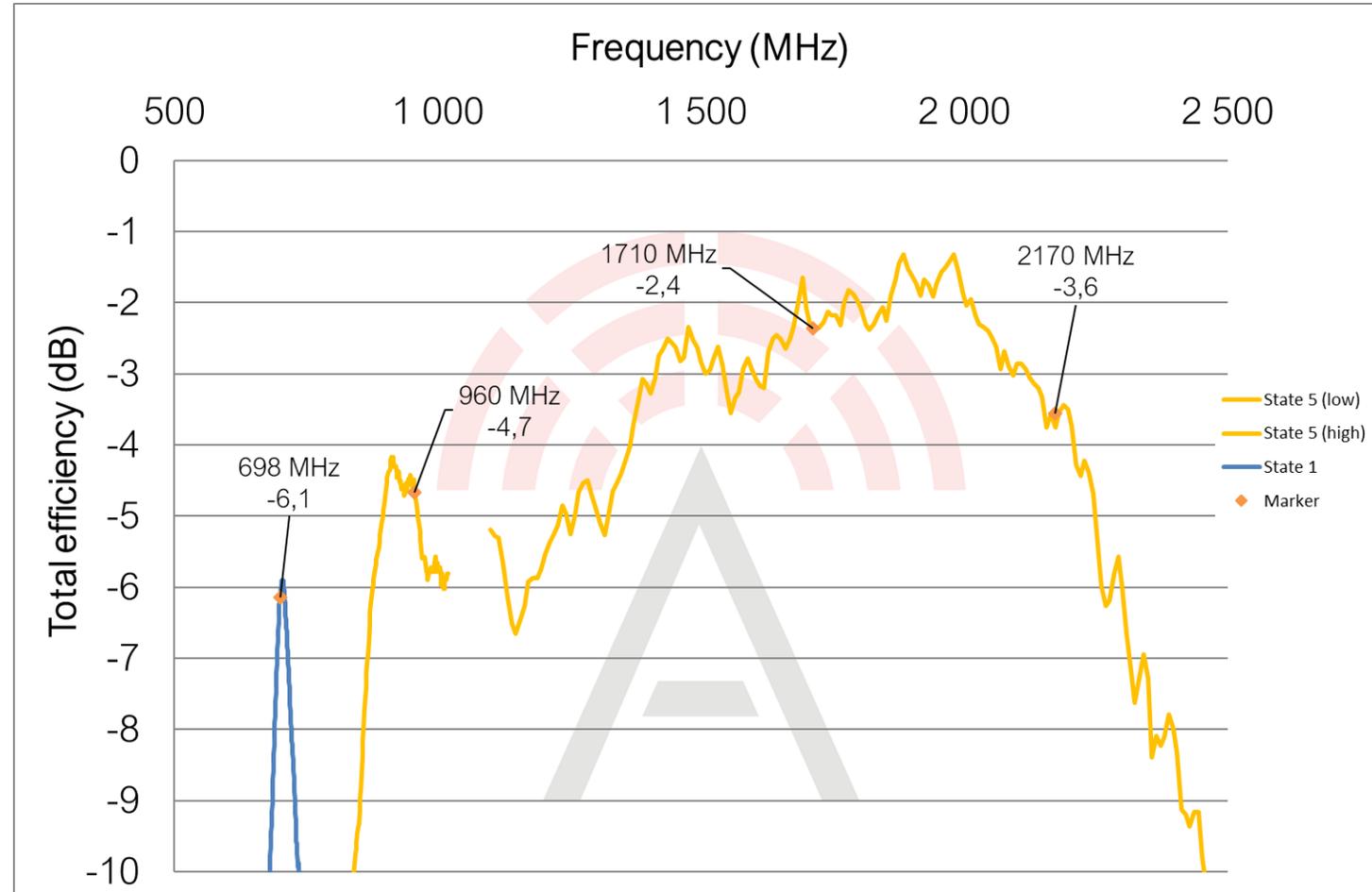
Protocol	Communication Bands (within -3dB return loss frequency range)
NB-IoT	1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 18, 19, 20, 26, 70, 85
LTE	1,2 ,3 ,4 ,5, 8, 12, 13, 14, 17, 18, 19, 20, 24, 25, 26, 28, 68, 70, 85



Output (color code)	Center Frequency (rounded to nearest MHz)	Bandwidth (at -3dB return loss)
State 1 (Blue)	711 MHz	32 MHz
State 2 (Red)	743 MHz	35 MHz
State 3 (Green)	788 MHz	42 MHz
State 4 (Purple)	842 MHz	59 MHz
State 5, low (Yellow)	917 MHz	87 MHz
State 5, high (Yellow)	1901 MHz	830 MHz

Results, Performance

The figure shows the total efficiency for the lowest (State 1) and highest (State 5) output state of the SP4T switch. Datapoints are added to indicate points of importance.



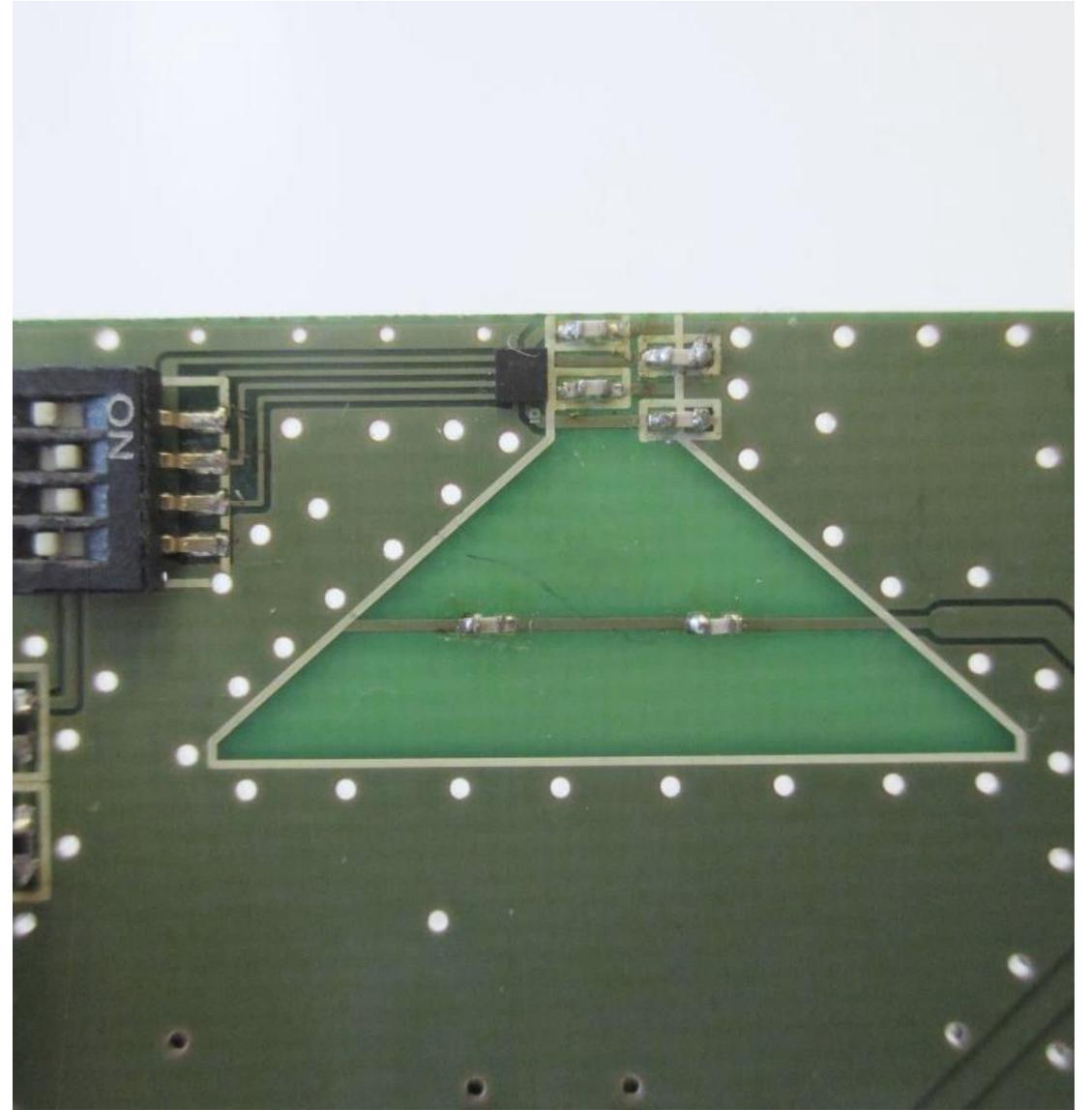
The Niche Antenna Concept

The Niche antenna concept is a patented antenna technology by Proant.

The antenna is a triangular cutout with two reactive loads crossing the cutout, the feed and the top load. The unique shape and reactive loads gives the antenna magnetic radiation properties.

In implementation, the antenna should be “open” towards an edge of the application board and the preferable placement is in the center of the longest side.

The size of the application board and the Niche antenna cutout together with its reactive loads, determine the operational frequency, bandwidth and efficiency.



Conclusions & Epilogue

Proant has proved that active switching of the Niche antenna concept is a viable method to extend the antenna frequency range. In this study, *global NB-IoT and LTE bands*.

The Niche antenna is highly efficient, require a small area and have unique placement options. Due to its magnetic radiating properties it is very frequency stable close to dielectric materials such as potting or plastic.

The Niche concept is a Proant patented technology available for multiple applications such as **Bluetooth, WiFi, GNSS, LoRA, 868 MHz, 915 MHz, 2G, 3G, LTE, NB-IoT and 5G** and is available through license.

Do not hesitate to contact Proant for more information. We will stand by to support with evaluating the technology for your application and with implementation and provide knowledge regarding our Niche business model. Proant supports you throughout your development process.

To get the full version, please [click this link](#) and fill in a tiny bit of information before receiving the “Tunable Antenna for Global NB-IoT and LTE Coverage” white paper. Add the phrase “Niche White Paper” in the message bar.

[Web: www.proant.se](http://www.proant.se)

Email: info@Proant.se

