



# Temperature gauge sensor for sheep

## Purpose and aim

The aim of my master's project was to create a temperature sensor for sheep that would not cause any discomfort or harm to the animals. The solution to the problem involved designing a circuit board that could be placed inside an ear tag on the sheep. This circuit board would receive temperature data from a sensor using NFC technology. The data would then be processed and interpreted by a microcontroller, transmitting via Bluetooth to an IoT system. The reason for addressing this issue was to help farmers monitor the body temperatures of their flocks more effectively. Sheep are good at hiding illness, often leading to late detection by farmers. Hence, the goal was to provide timely temperature data to prevent such scenarios.

## Results, important findings

Significant progress has been achieved in developing the prototype, which includes a custom-designed NFC antenna and Bluetooth antenna integrated into a circuit board. Both antennas underwent comprehensive simulations and measurements using a network analyzer to characterize their operating ranges. The obtained results closely align with the desired specifications, validating the effectiveness of the antenna design.

Moreover, associated software has been developed and implemented on the microcontroller to facilitate interaction with the NFC antenna. Successful communication and data exchange have been established, demonstrating the functionality and reliability of the system. This milestone underscores the feasibility and efficacy of the proposed approach in realizing a non-invasive temperature monitoring solution for sheep.



Helene Bjørkedal  
bjorkedalhelene@gmail.com  
MSc – Micro and Nano System Technology

Erik Andrew Johannessen  
[Erik.A.Johannessen@usn.no](mailto:Erik.A.Johannessen@usn.no)  
Geir Morten Wold  
[geir.morten.wold@7sense.no](mailto:geir.morten.wold@7sense.no)

*7sense*

USN Universitetet  
i Sørøst-Norge