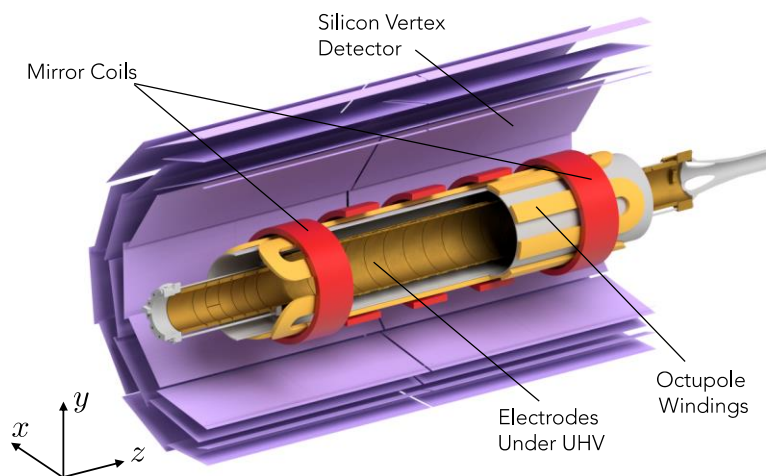


# THE PHYSICS COLLOQUIUM

Thursday 20 March 2025, 4:00 p.m.  
Bernoulliborg 5161.0253

## Beryllium assisted Antihydrogen and beyond

Prof. Niels Madsen  
*Swansea University (UK)/ALPHA*



To our surprise (and benefit), the universe seems almost entirely devoid of antimatter. There is still not agreed upon answer to this stark discrepancy with expectations from the Standard Model. Scrutinising antihydrogen, the antimatter counterpart to hydrogen, and comparing the results with hydrogen may help explain this conundrum. At the ALPHA experiment we routinely produce, trap and accumulate antihydrogen, and have started an extensive programme of careful studies that include laser and microwave spectroscopy of the internal states, as well as measurements of the influence of gravity on antihydrogen. The Standard Model predicts that the internal states should be identical in hydrogen and antihydrogen, and the expectation from General Relativity is that all objects no matter their composition responds identically to gravity. Any difference we find would therefore imply new physics and possibly help unravel the conundrum of the missing antimatter.

In this talk, I will give an overview of the techniques we use to trap, cool, and measure antihydrogen, emphasising a new technique using laser-cooled Beryllium ions that we recently deployed allowing an order of magnitude increase in numbers. I will also discuss some of our recent results from both spectroscopy and gravitational measurements as well as at how the new technique is helping us do even better.

*Join us for coffee starting 3:30 p.m. Refreshments will be served after the lecture.  
For more information contact the host: Steven Jones [s.a.jones@rug.nl]  
Website: <http://www.rug.nl/research/vsi/colloquia/>*