

THE PHYSICS COLLOQUIUM

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Nijenborgh 4, Lecture Hall **5111.0022**

Precision quantum metrology with trapped Ba⁺ ions for tests of fundamental physics

Laura Dreissen

LaserLaB, Department of Physics and Astronomy, Vrije Universiteit Amsterdam,



Quantum metrology with trapped ions offers unique opportunities for precision measurements that probe physics beyond the Standard Model [1].

In this talk, I will present our efforts to develop a Ba⁺-based quantum sensor that exploits the exceptionally long 80 s radiative lifetime of the Ba^+ state, enabling coherence times that support sub-10 mHz frequency resolution.

By combining entangled states with a decoherence-free subspace, we aim to suppress correlated noise and reduce uncontrolled systematic effects. This platform enables high-precision isotope shift measurements for searches for new bosons through King plot analyses [2], as well as atomic parity non-conservation (PNC) [3], providing a sensitive low-energy test of the electroweak interaction. Because PNC effects are intrinsically weak, achieving long coherence times and excellent control over systematics is essential.

I will discuss the underlying concepts and present our recent experimental progress toward realizing this trapped-ion quantum sensor.

Join us for coffee starting 3:30 p.m. Refreshments will be served after the lecture.
For more information contact the hosts: Anastasia Borschevsky (a.borschevsky@rug.nl)
Website: <https://www.rug.nl/research/fse/colloquia/physics-colloquia>