York Society of Engineers

7:30 pm. Wednesday 9 December 2026

Live Lecture

Room P/L/002, Physics/Electronics Building, Campus West,

University of York

Accurate time, atomic clocks and their role in Navigation and GPS

by

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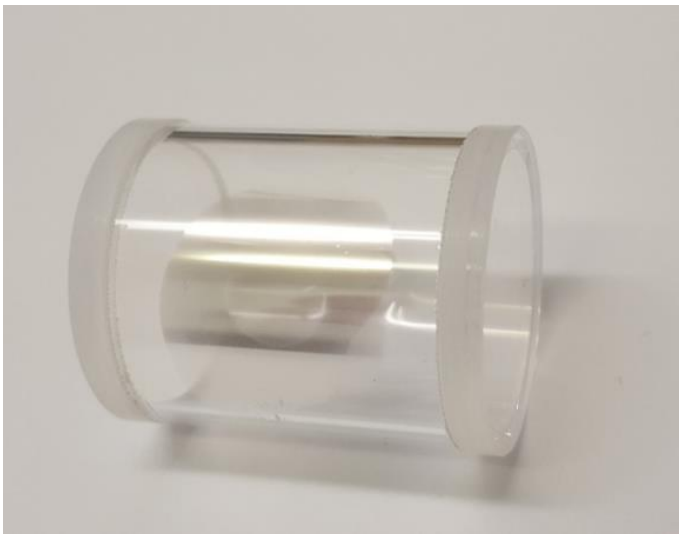

Rubidium atom vapour cell

So, when to start?

8 July 1714. The original “Longitude Prize” was established by the British government through the Longitude Act to solve the deadly and difficult problem of determining a ship's longitude at sea.

£20,000 was offered for ½° accuracy (30 miles) for a trip to Jamaica which took about 6 weeks. The talk will start with John Harrison, the Yorkshire carpenter and clockmaker.

Accurate time is required in all aspects of our modern lives and therefore in all electronic systems including, for example, personal computers, mobile communications systems, radar, and a system we all use - navigation using the GPS, the Global Positioning Satellite system.

Since the 1950s the most accurate time pieces have been atomic clocks which typically use a quartz crystal oscillator, similar to your wrist-watch, locked to the hyperfine energy levels in certain atoms. Currently, the length of 1 second is defined using caesium-133 atoms where one second is defined as: 9,192,631,770 cycles per second.

This talk will describe the key ideas behind atomic clocks, and how they are used in GPS to tell us where we are anywhere in the world with sub-metre accuracy, and how GPS works.

We will discuss the University of York’s research on compact atomic clocks with planned accuracies/stabilities of 1 nanosecond per day.

We are also developing an atomic clock kit for schools with the ultimate aim of enabling students to observe time dilation due to gravity. This talk will mention the University of York’s online Outreach talks on this topic to Yr12, 16-year-old school students and show their high-level responses.

CPD: This talk is considered to be relevant to Physics, and Electronic Engineering.

Please note, this lecture will be a live talk in Room P/L/002, Physics/Electronics Building, Campus West, University of York.

Wearing of masks is encouraged (but not mandatory); taking a lateral flow test prior to the meeting (with negative result) is also recommended. There is plenty of space in the lecture theatre for “social distancing”.

Please see the Covid-19 guidance below from the University of York:

The safety of our audience members and staff is our priority, and the University of York continues to have strict cleaning regimes and enhanced ventilation in place.

Please note that the University of York is promoting a message of protect, respect and be kind in relation to Covid-19 and we therefore politely ask that all attendees consider wearing a face covering whilst moving around indoors, washing hands regularly and taking a lateral flow test in advance of the event.
We also ask that you do not attend if you experience any symptoms that could relate to a Covid-19 infection OR if you are self-isolating. Events staff will wear face coverings (unless exempt) and clear signage will be available to access hand sanitizer and hand-washing facilities.

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