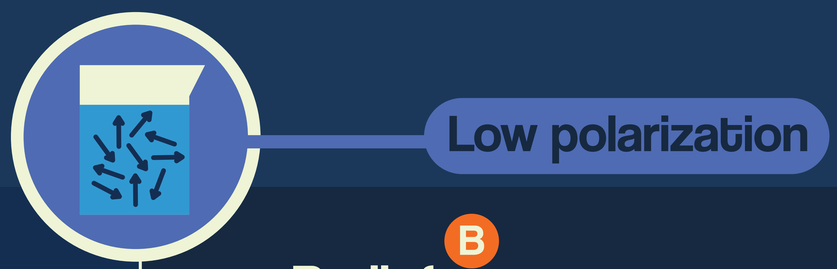
ICFO

Atomic Sensors

For monitoring hyperpolarization

When molecules in a substance have their magnetic moments *(like tiny arrows)* pointing in the same direction, the substance is said to have high polarization, creating a significant magnetic field—similar to lining up many small magnets.

In a hyperpolarized substance, this alignment is almost 100%, resulting in a strongly enhanced magnetic field.



Experiment

The polarization of the sample must be measured to determine if the molecules are hyperpolarized optimally.

A. Atomic sensors' read-outs are:
- Non-destructive: the polarization level is preserved.
- Continuous and in real-time: every detail of the polarization evolution is captured in the moment. *(like a video recording)*

B. Traditional read-out methods are:
- Destructive: each measurement reduces the polarization level.
- Snapshots: can only measure from time to time. *(like a polaroid picture)*

Application

* Magnetic Resonance Imaging (MRI) is used in hospitals to create detailed images of a patient anatomy, and in some cases metabolism inside tissues.

Generally, metabolites have weak magnetic responses. For clear MRI results, doctors must inject a hyperpolarized sample into the patient.

Clear MRI results when:
1. Optimized polarization of the sample.
2. Maintained polarization during transport to the MRI machine.

Atomic sensors can achieve 1 and monitor 2 in real-time and non-destructively

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MRI costs could be reduced.

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Technology more accessible to hospitals.