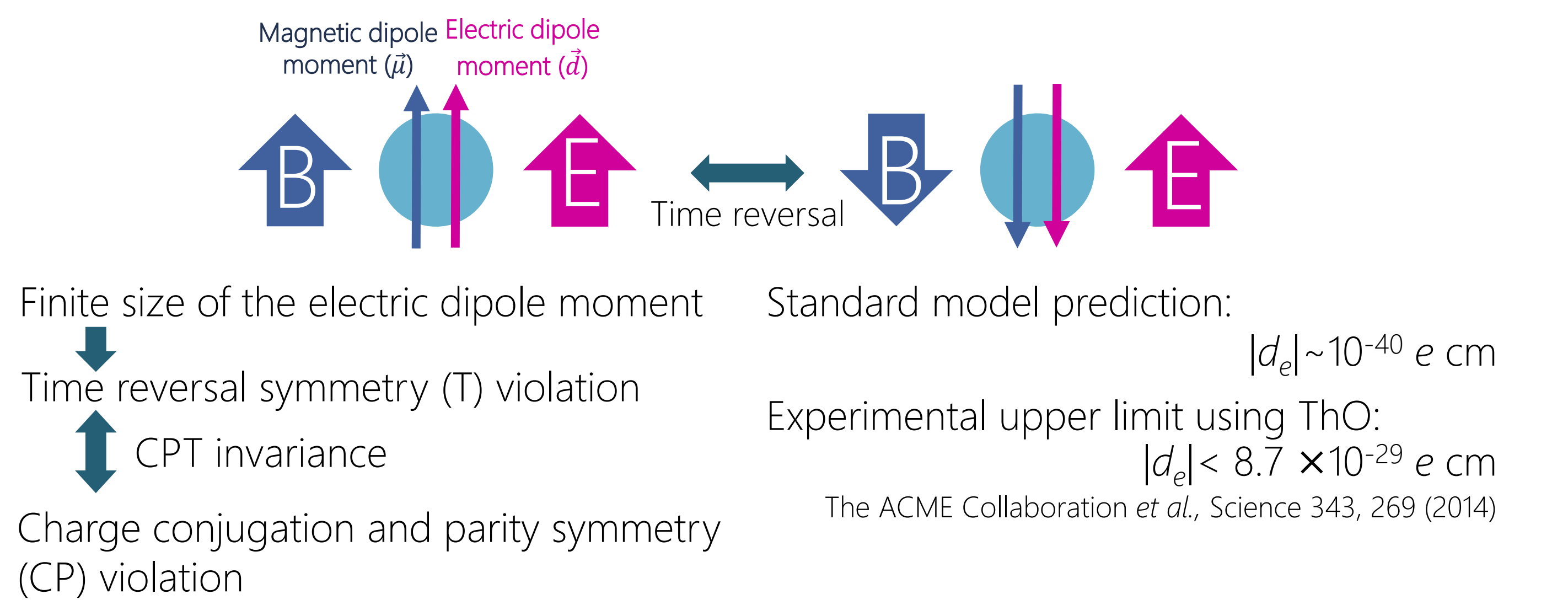


# Development of a rubidium magnetometer toward the search for the electric dipole moment of the electron using francium atoms

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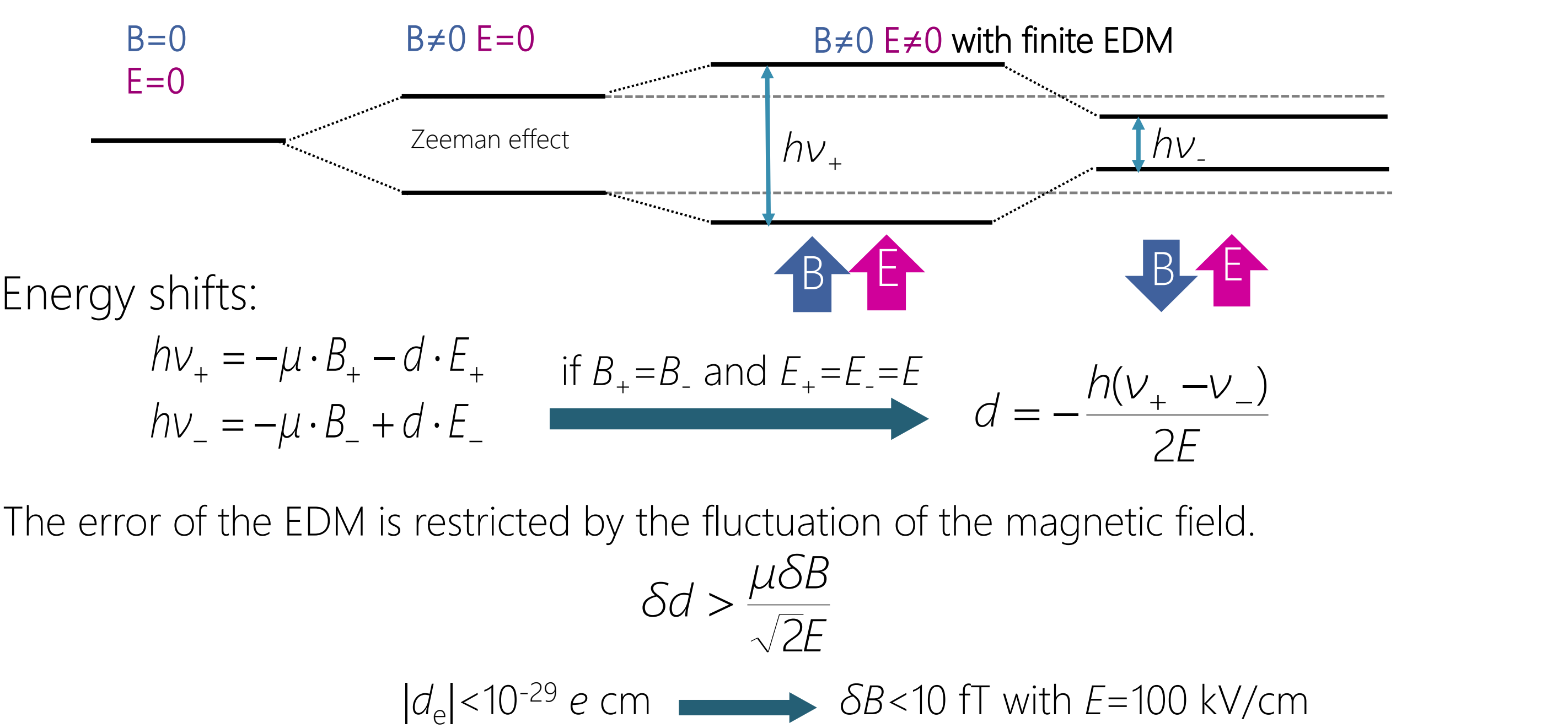
A rubidium magnetometer based on a nonlinear magneto-optical rotation effect is developing in Cyclotron and radioisotope center for the electron electric dipole moment search using Fr atoms. Frequency modulated light is used to measure the non-zero magnetic field. We studied the laser frequency and light power dependences of the magnetometer performance.

## Motivation to search for the electric dipole moment

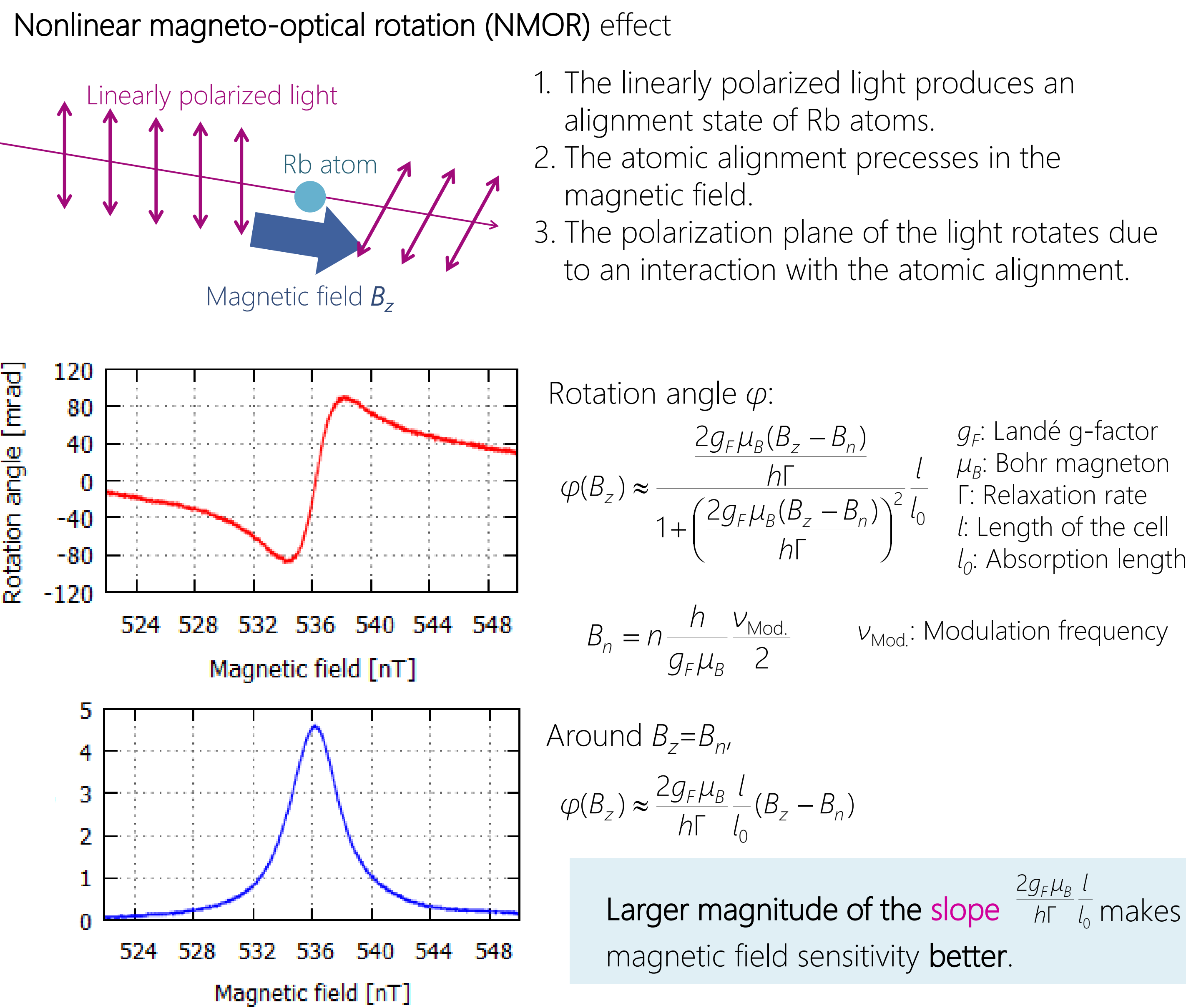


## EDM search using francium atoms

Francium (Fr)  
 Fr has **large enhancement factor** (~895) of the electron EDM.  
 Laser cooled and trapped Fr atoms can achieve **long interaction time**.



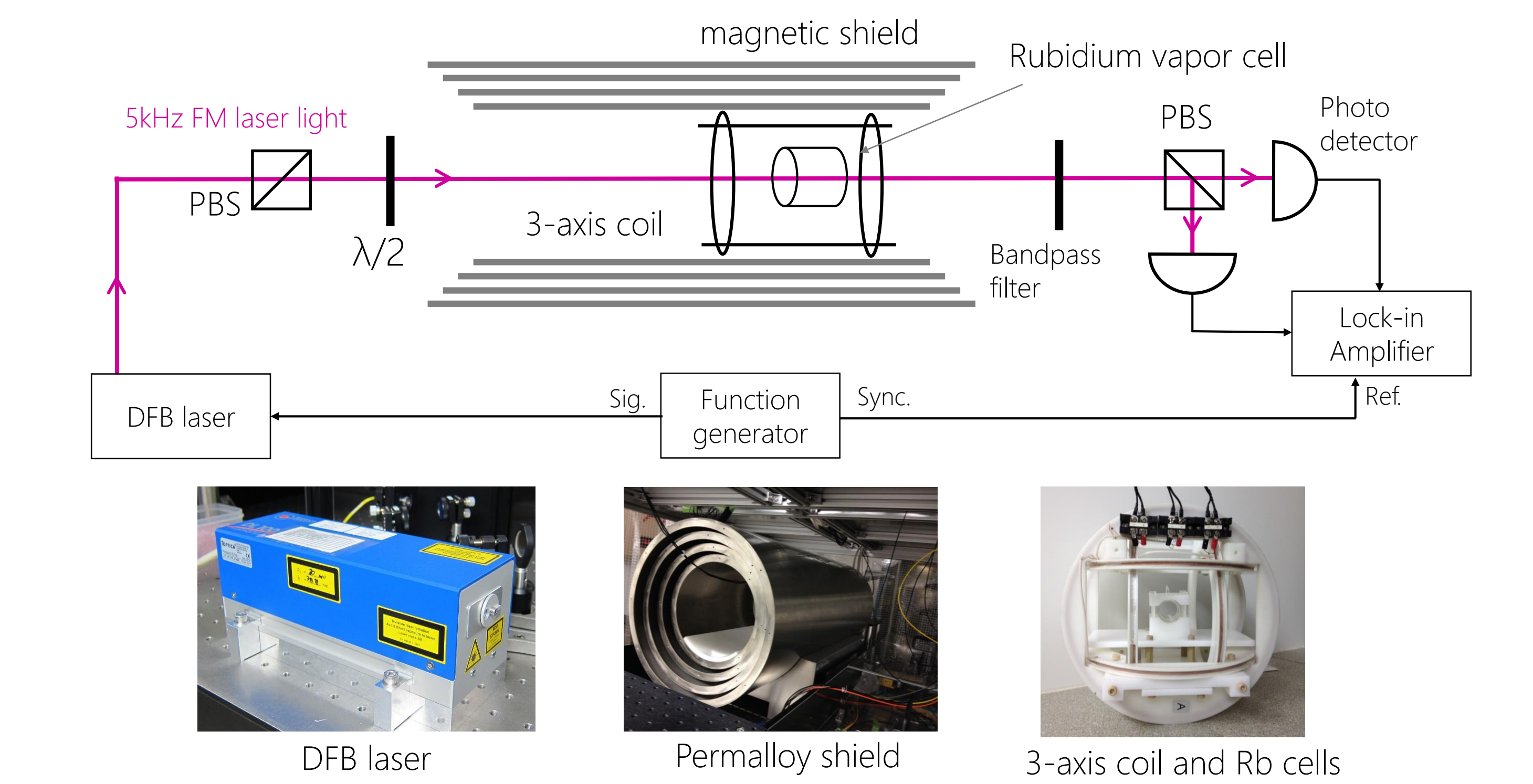
## Nonlinear magneto-optical rotation effect with a frequency modulated light



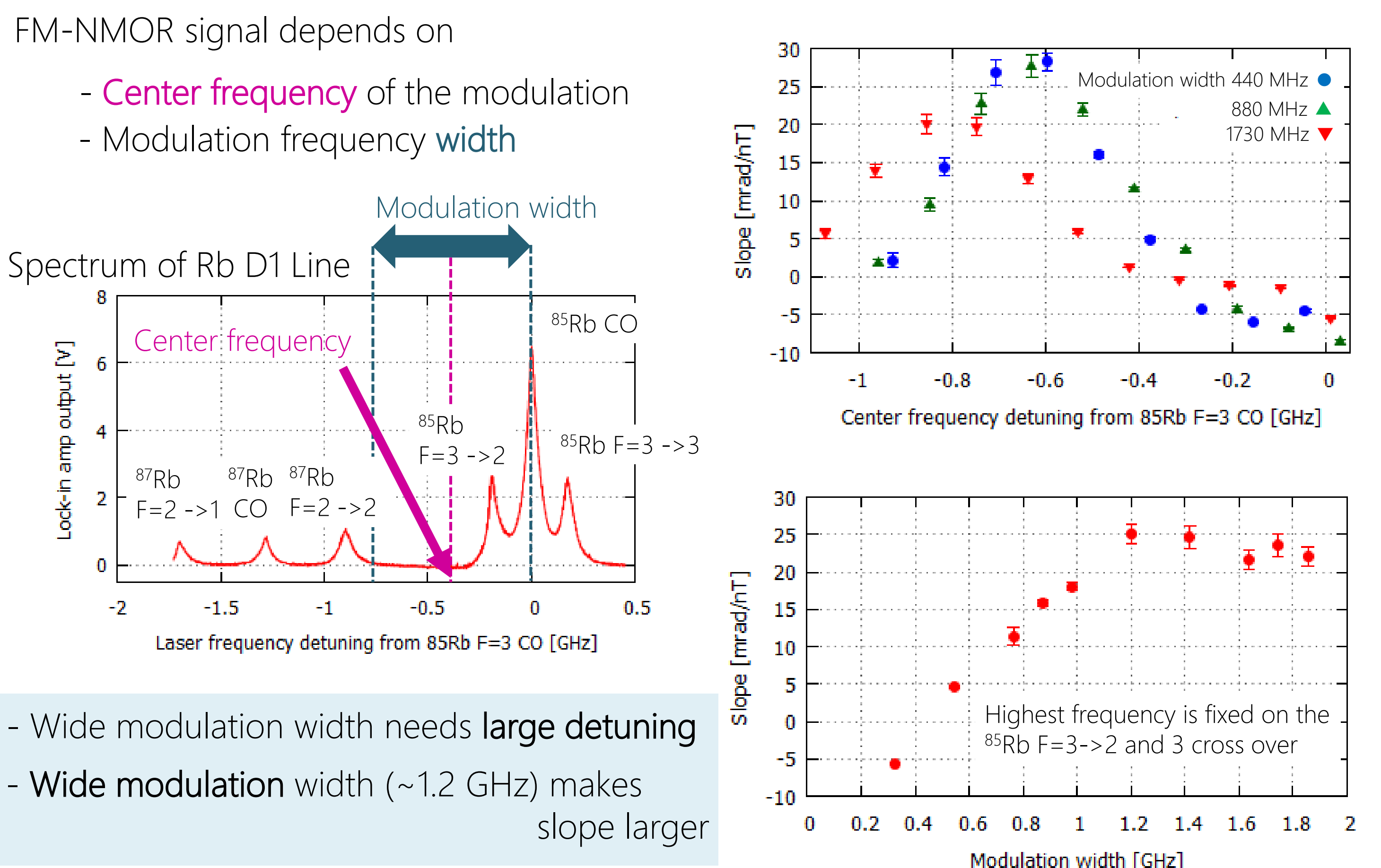
## Summary

The conditions to realize large magnitude of the slope of the nonlinear magneto-optical rotation with frequency modulated light (FM-NMOR) were studied for the magnetometer to search for the electron EDM. A large modulation width realized a large magnitude of the slope and needed wide detuning. The best sensitivity of the present setup is 0.7 pT/√Hz.

## Magnetometer based on FM-NMOR effect



## FM-NMOR dependence on the frequency modulation



## FM-NMOR dependence on the laser power

