Parity violation in atomic and molecular physics

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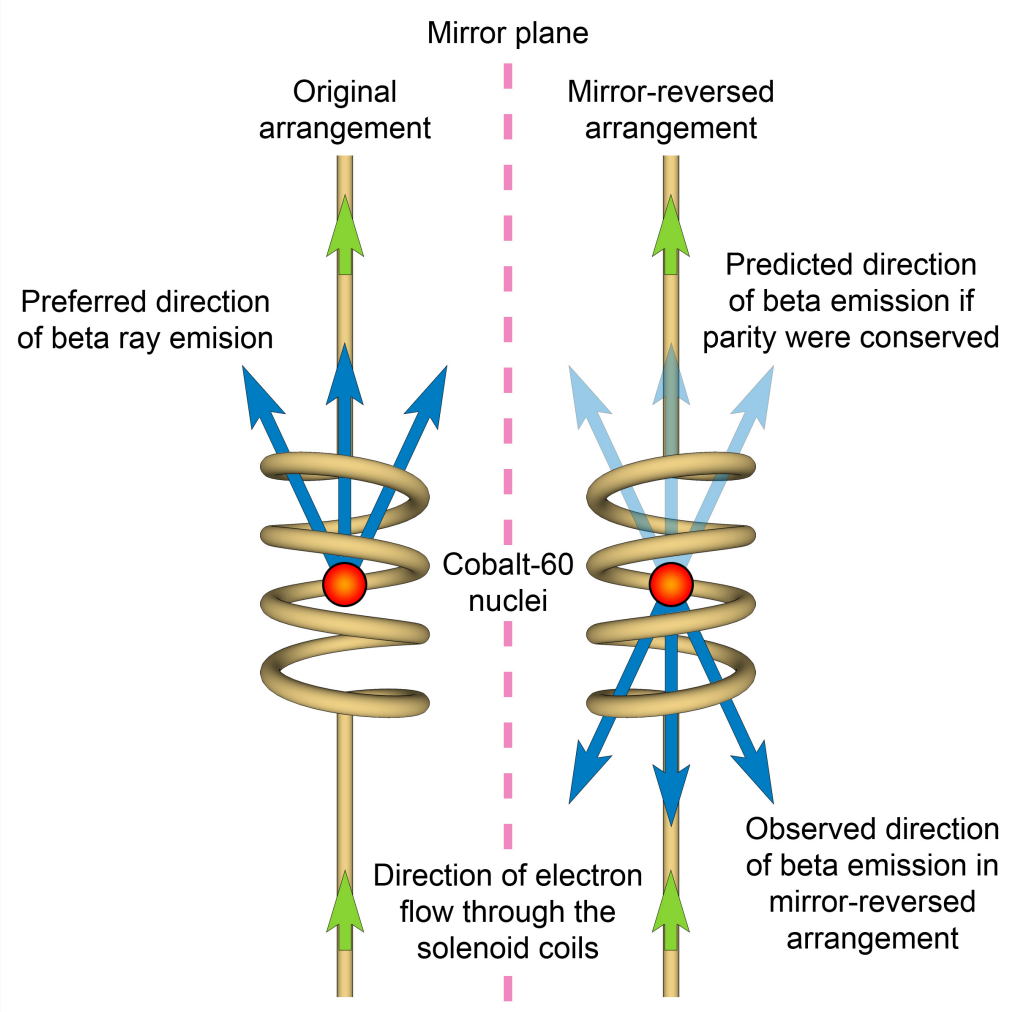
- Conservation by time reversal (T) $\Leftrightarrow$ Change of the time t by -t

The weak interaction: the interaction which violates parity

Parity non-conservation

Parity violation in the β-decay of the cobalt 60

$$Co^{60} \rightarrow Ni^{60} + e^{-} + \nu + \bar{\nu} \tag{1}$$



Intermediate vector bosons

- W^+: charge $+e$
- W^-: charge $-e$
- Z^0: neutral particle

We will focus on **neutral current weak interactions**, mediated by Z^0.

Measuring parity non-conservation in neutral atoms

Optical activity of an atomic gas

The Z^3 law

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The Z^3 law

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The anapole moment

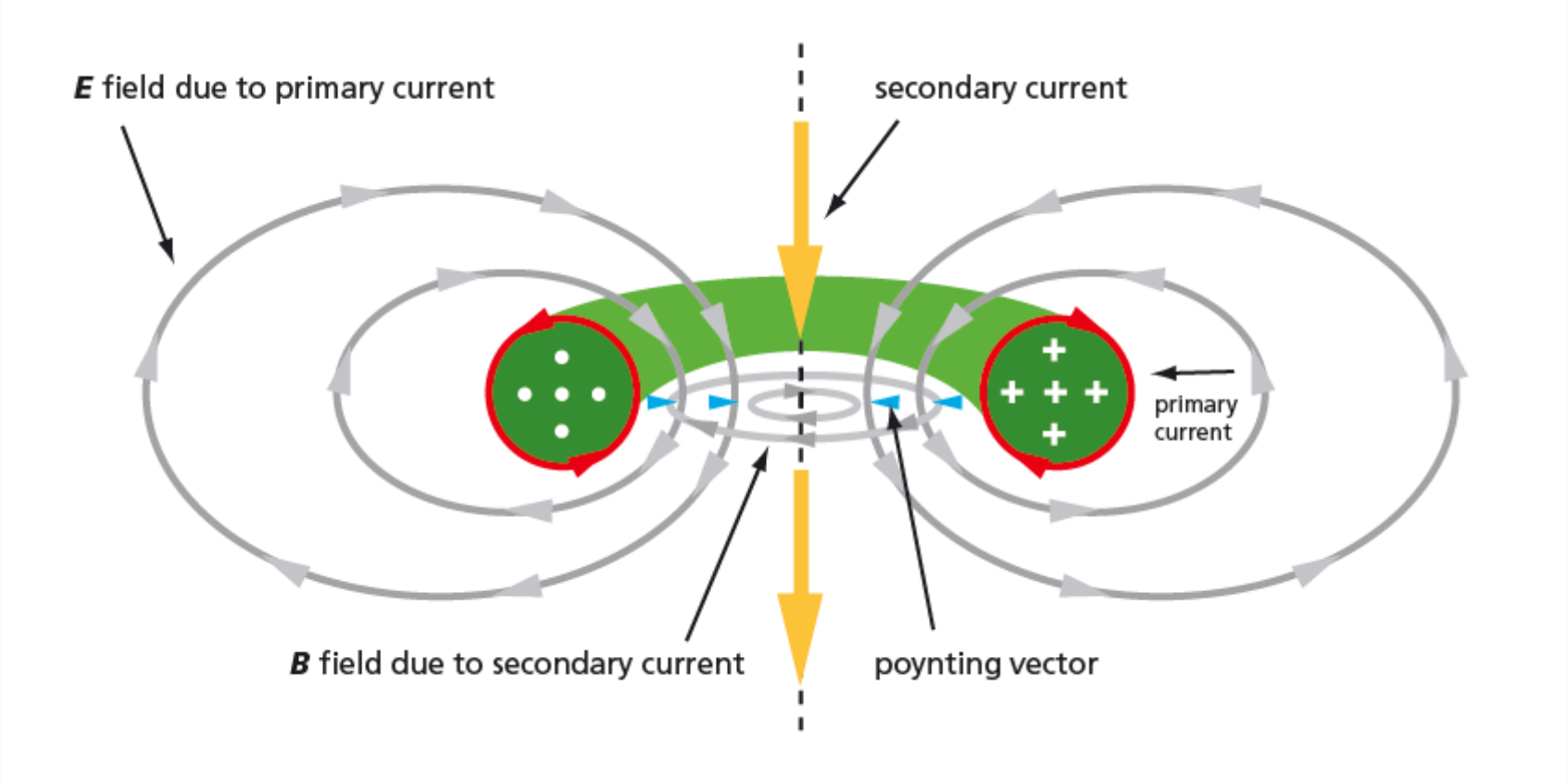

Figure 2: The fields generated by the current around a toroid

Motivations

Explaining biological homochirality

Testing the standard model

Measurement of parity non-conservation and an anapole moment in cesium

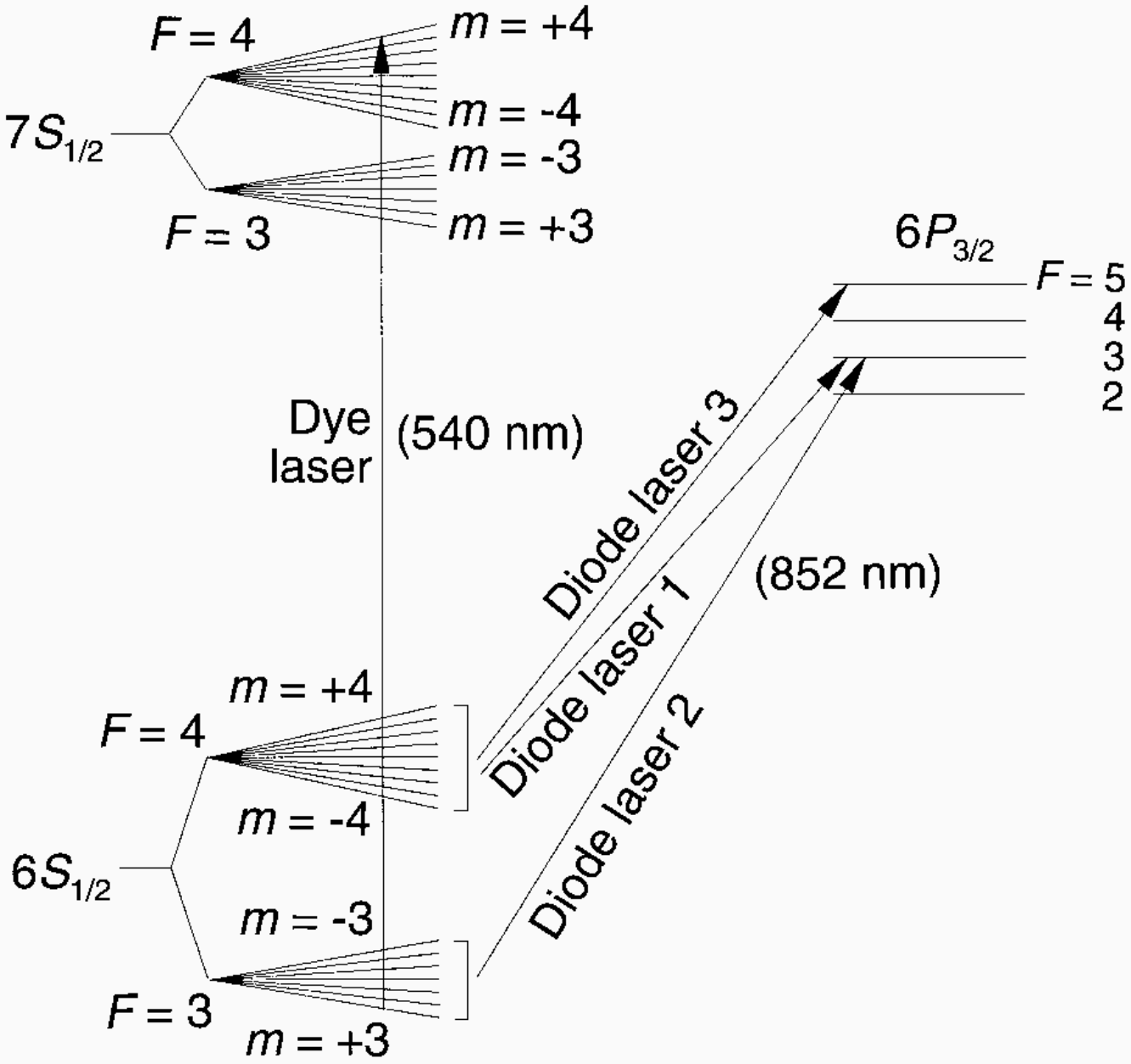

Figure 3: The energy level diagram of cesium

Principle

Experiment