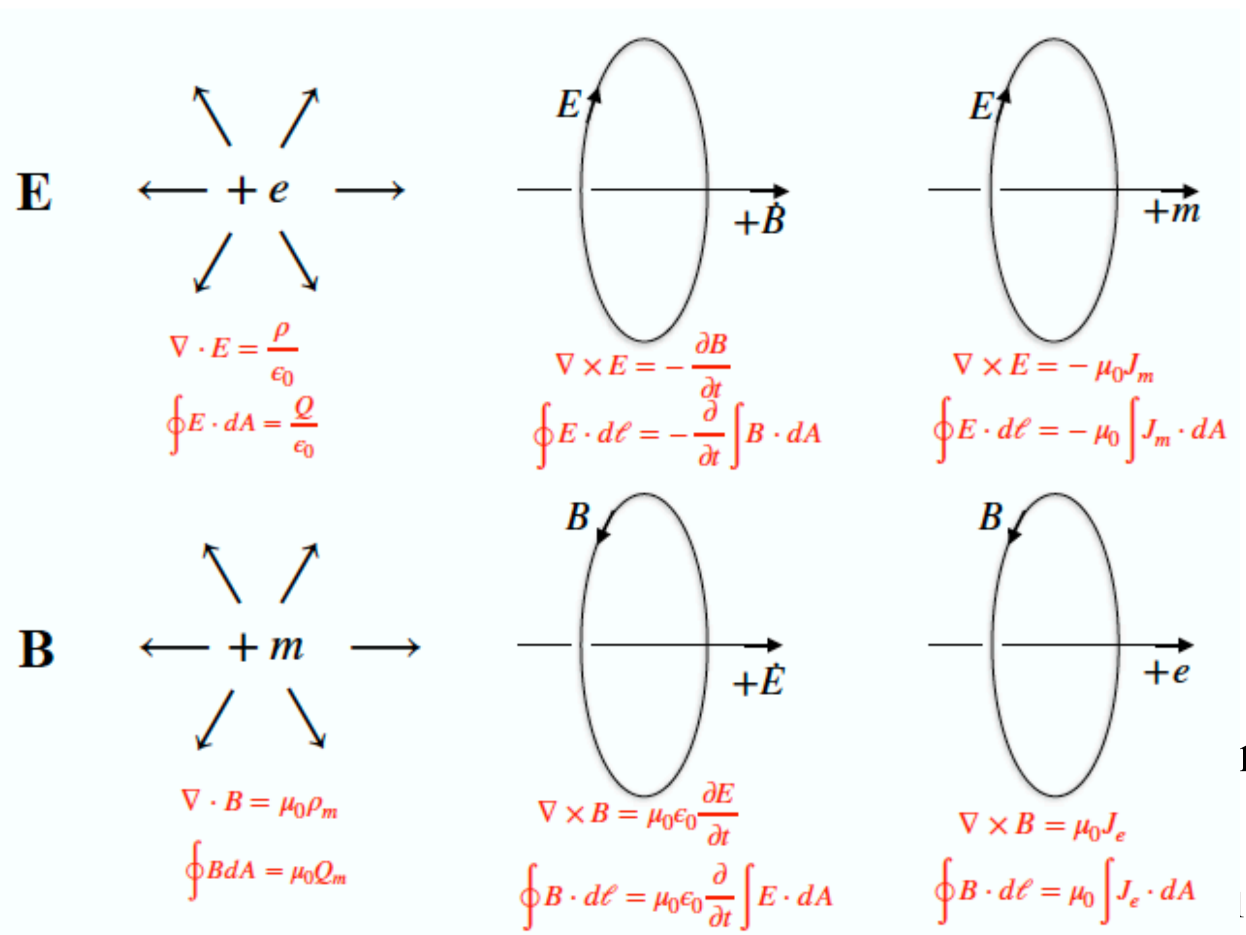
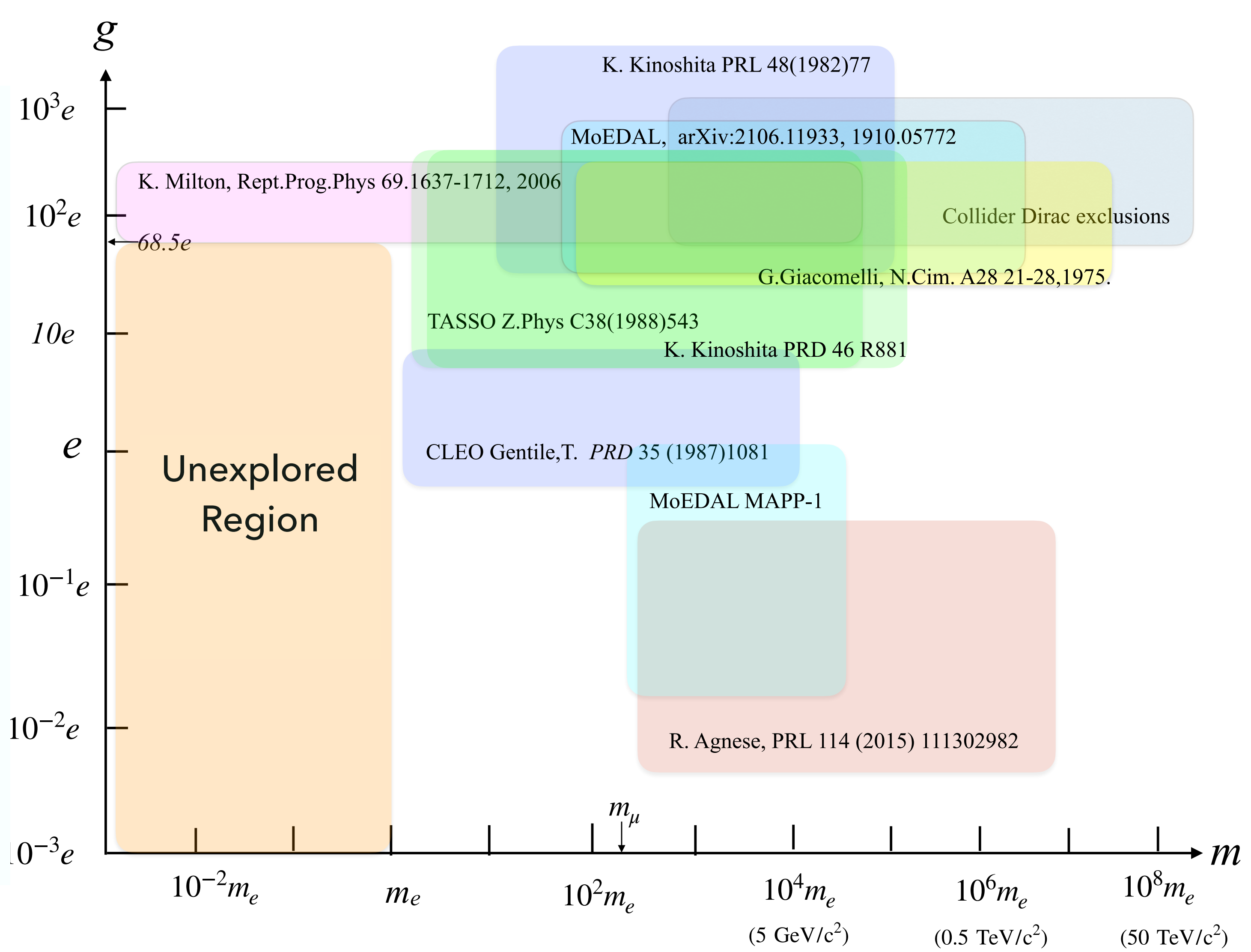
Introduction and Motivation

- KoreA Experiment on Magnetic Monopole (KAEM) searches for low mass ($m \leq m_e$) and low magnetic charge ($g \leq 1e$) magnetic monopoles in e^+e^- annihilation at rest.
- A lot of experiments try to discover the Dirac magnetic monopole ($g = \frac{\hbar c}{2e} \approx 68.5e$) but without success.





Magnetic Monopole

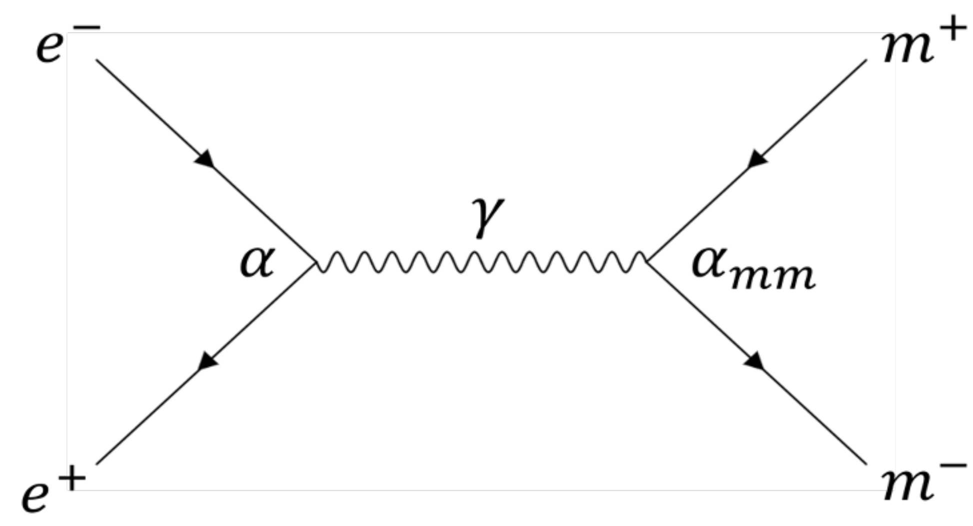
- Magnetic monopoles pair production in e⁺e⁻ annihilation at rest.
- The magnetic monopole pair production cross-section is

$$\sigma\left(e^+e^- \to m\bar{m}\right) = \frac{4\pi}{3}\frac{\alpha\alpha_{m\bar{m}}}{s}\sqrt{\frac{1-4m_m^2/s}{1-4m_e^2/s}}\left(1+2m_e^2/s\right)\left(1+2m_m^2/s\right)$$

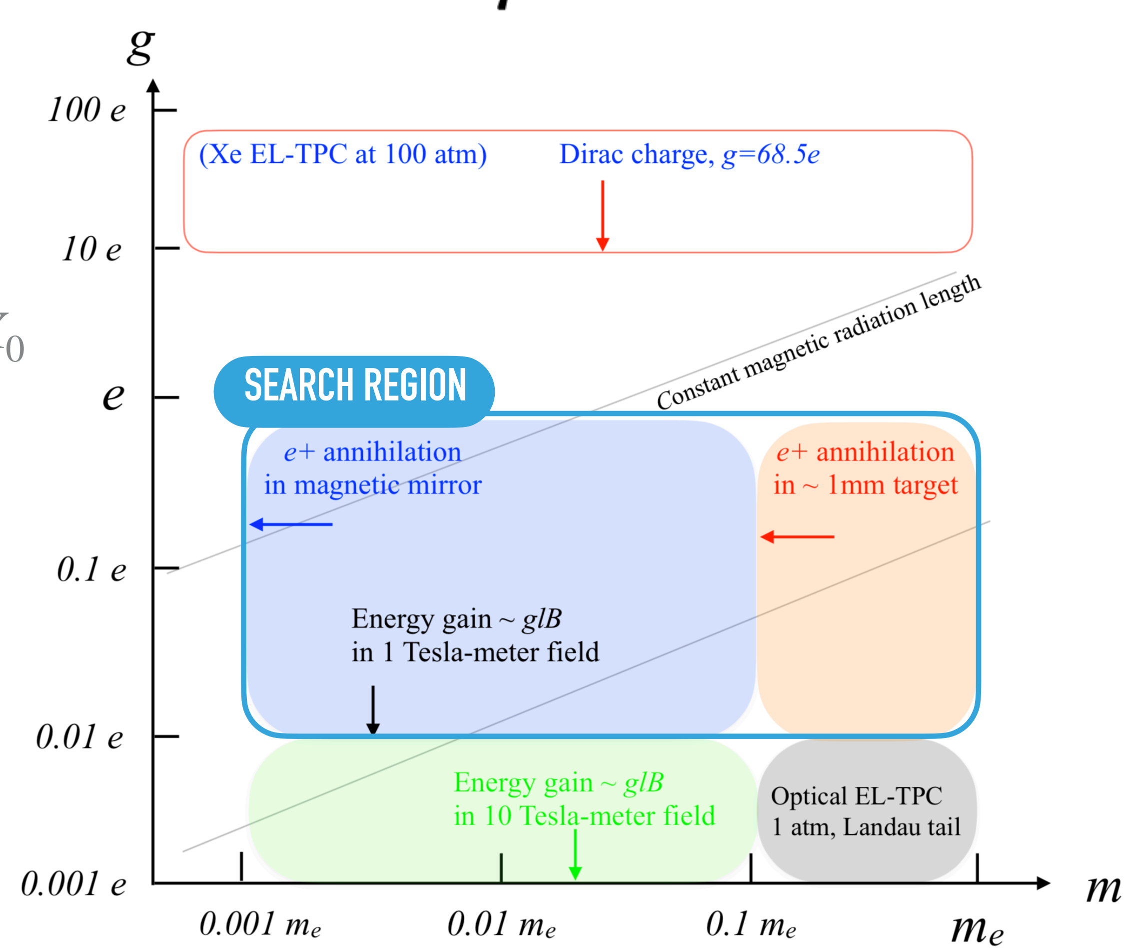
$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c} \approx \frac{1}{137}, \alpha_{m\bar{m}} = \frac{g^2}{4\pi\epsilon_0\hbar c}$$

- The radiation length of the magnetic monopole is

$$X_m = \left[\frac{4}{3\pi}\frac{\rho}{A}\frac{\alpha K}{mc^2}\frac{(g/e)^4}{(m/m_e)^2} ln\left(\frac{233\gamma\,(m/m_e)}{Z^{1/3}}\right)\right]^{-1} = \frac{(m/m_e)^2}{(g/e)^4}X_0$$



$$e^+e^- \to \gamma^* \to m^+m^-$$



KAEM experiments

- The e^+s from ^{22}Na interact with a **thin aluminum** target (10 μm) and produce the magnetic monopole pairs.
- Magnetic monopoles are accelerated under an 1 T magnetic field and measured in the end-cap calorimeters.
- The **1274 keV γ** from ^{22}Na decay is the **trigger** signal in the trigger veto detector.
- **LYSO, CsI, CsI(Tl)** crystals are candidates of trigger veto detector and end-cap calorimeter.