4.8. Spin voltage

4.8a. The output voltage measured by the floating probe as a function of the angle \( \theta \) is given by \( (\mu_c, \vec{\mu}_s : \text{charge and spin potentials in the channel}, \vec{P} : \text{Polarization of magnet}) \)

(a) \( \vec{\mu}_c = \vec{\mu}_c + \vec{P} \cdot \vec{\mu}_s \)
(b) \( \vec{\mu}_c = \vec{\mu}_c \vec{P} \times \vec{\mu}_s \)
(c) \( \vec{\mu}_c = \vec{P} \cdot \vec{\mu}_s \)
(d) \( \vec{\mu}_c = \vec{P} \times \vec{\mu}_s \)
(e) None of the above

4.8b. The output voltage measured by the floating probe should show oscillations as a function of the Rashba constant \( \eta \) in the channel

\[
H = \left( E_c - \frac{\vec{p}^2}{2m} \right) \tau - \frac{\eta}{\hbar} \hat{\sigma} \cdot (\hat{z} \times \vec{p})
\]

if the two magnets are parallel and point along

(a) either \( z \) or \( x \)
(b) either \( z \) or \( y \)
(c) either \( x \) or \( y \)
(d) \( y \)
(e) \( x \)

Hint: The Rashba term gives an effective magnetic field along \( y \) for electrons traveling along \( x \).