

LABORATORIJA ZA FIZIKU ATOMSKIH SUDARA

Ciklus predavanja za poslediplomce iz oblasti atomskih sudara

Predavanje br.7:

dr Bratislav Marinković
Institut za fiziku, Beograd

PARAMETRI ORIJENTACIJE I USMERENOSTI U ELEKTRON-ATOMSKIM SUDARIMA

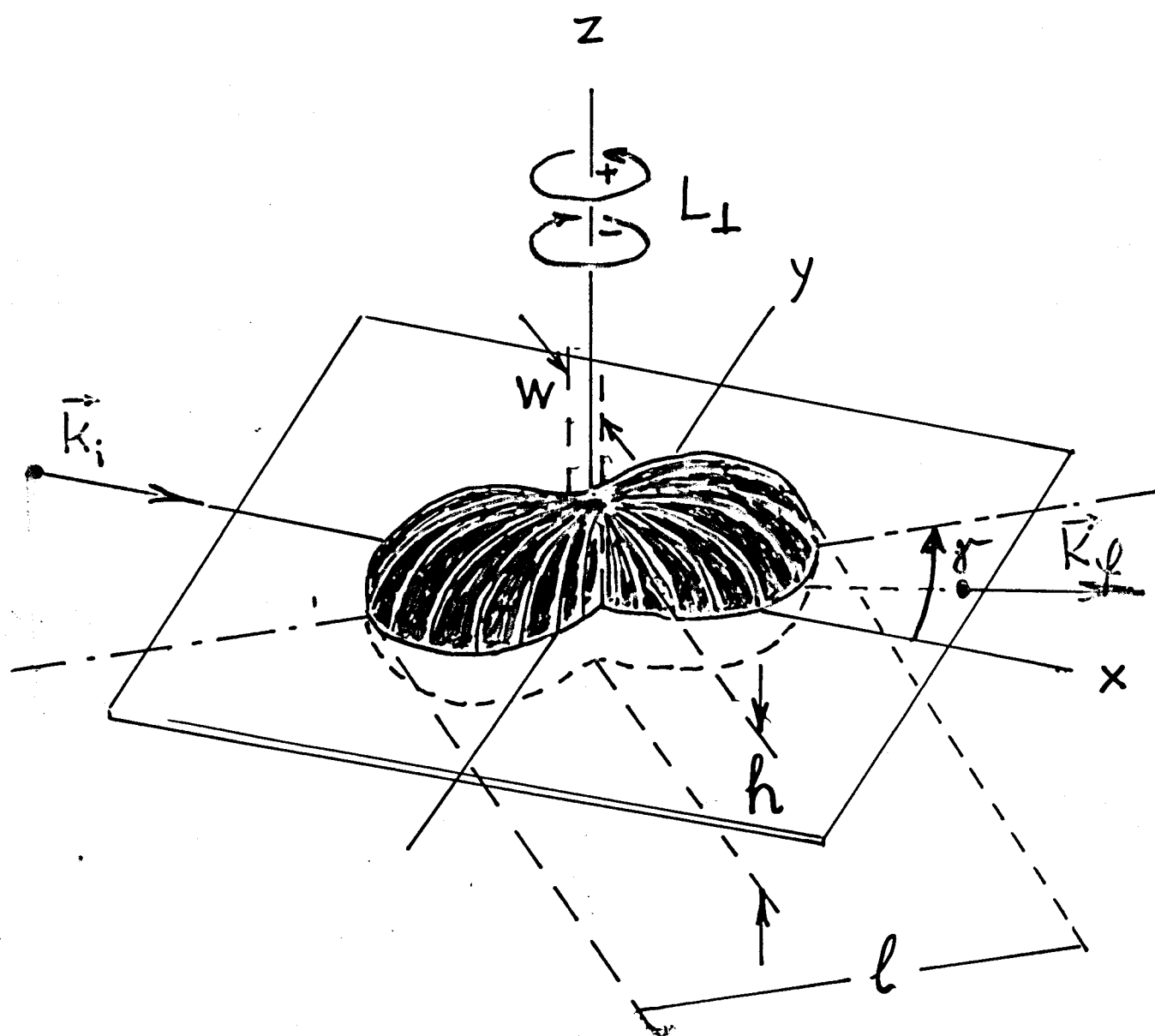
Predavanje će se održati u petak 20.III 1992. u 9^h u sali 10
Instituta za fiziku, Zemun, Maksima Gorkog 118.

LABORATORIJA ZA FIZIKU ATOMSKIH SUDARA

CIKLUS PREDAVANJA ZA POSLEDIPLOMSKE STUDIJE IZ OBLASTI _____
ATOMSKIH SUDARA

PARAMETRI USMERENOSTI I ORIJENTACIJE

U ELEKTRON - ATOMSKIM SUDARIMA



$$A(\alpha) + B(\beta) \rightarrow A(\alpha') + B(\beta')$$

$$|\alpha\rangle = \sum_{nJM} a_{nJM} |nJM\rangle$$

$$|\alpha\beta \vec{k}_i\rangle \rightarrow \sum_{\alpha'\beta'} |\alpha'\beta' \vec{k}_f\rangle = F |\alpha\beta \vec{k}_i\rangle$$

IDEALNI EKSPERIMENT RASEJANJA:

$$\langle \alpha\beta \vec{k}_i | F | \alpha'\beta' \vec{k}_f \rangle \quad \mathcal{L}_{\alpha'\beta', \alpha\beta}(\theta)$$

PARAMETRI USMERENOSTI I ORIJENTACIJE

$$\sum_{\alpha'\beta'} |\alpha'\beta' \vec{k}_f\rangle = \left\{ \sum \mathcal{L}_{J'M'}(\theta) |n'J'M'\rangle \right\} |\beta\rangle \vec{k}_f$$

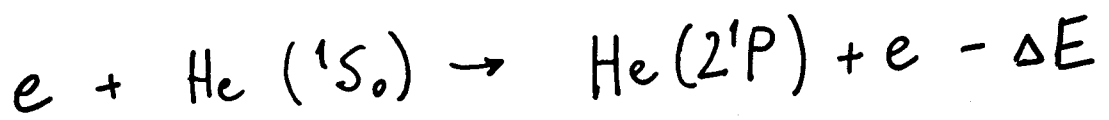
$$|A'\rangle = \mathcal{L}'_1 |1\rangle + \mathcal{L}'_2 |2\rangle + \dots$$

$$|A''\rangle = \mathcal{L}''_1 |1\rangle + \mathcal{L}''_2 |2\rangle + \dots$$

$$Y' \rightarrow \beta'$$

$$P'' \rightarrow \beta''$$

$$\mu_{12} = \frac{\mathcal{L}'_1 \mathcal{L}''_2 + \mathcal{L}''_1 \mathcal{L}'_2}{\left(\sum_i |\mathcal{L}'_i|^2 - \sum_i |\mathcal{L}''_i|^2 \right)^{1/2}}$$



$$|\psi\rangle = a_1 |p_1\rangle + a_{-1} |p_{-1}\rangle$$

$$|a_1|^2 + |a_{-1}|^2 = 1$$

$$a_H = f_H \sqrt{\frac{k_f}{k_i}} \sigma(\theta)^{-1/2}, \quad a_H = |a_H| e^{i\delta_H}$$

$$\sigma(\theta) = \frac{k_f}{k_i} (|f_1|^2 + |f_{-1}|^2)$$

$$\psi \psi^*(\varphi) \propto \frac{1}{2} [1 + P_e \cos 2(\varphi - \gamma)]$$

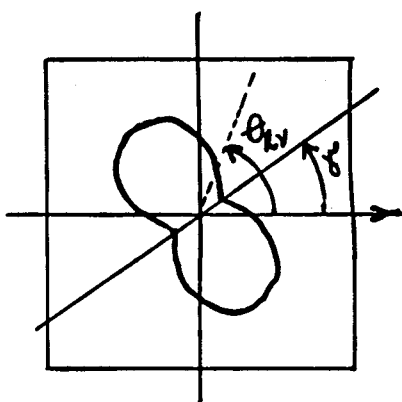
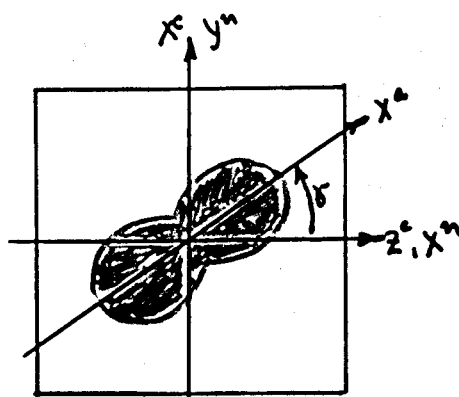
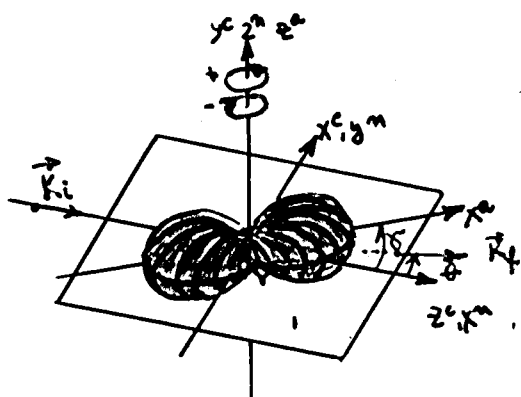
$$2\gamma = \delta_{-1} - \delta_1 + \pi$$

$$P_e = 2|a_1||a_{-1}|$$

$$P_e = \frac{|\psi|_{\max}^2 - |\psi|_{\min}^2}{|\psi|_{\max}^2 + |\psi|_{\min}^2} = \frac{e-w}{e+w}$$

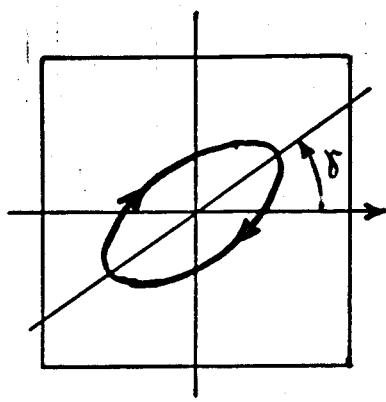
$$L_{\perp} = |a_1|^2 - |a_{-1}|^2$$

$$P_e^2 + L_{\perp}^2 = 1$$



$$\theta = 0, \varphi_{kv} = \pi$$

KORELACIJA UGLOVA



$$+z^m (\theta_{kv} = \frac{\pi}{2}, \varphi_{kv} = \frac{\pi}{2})$$

KORELACIJA POLARIZACIJE

$$I(\theta_{kv}) \propto \frac{1}{2} [1 - P_e \cos 2(\theta_{kv} - \gamma)]$$

$$(\gamma, P_e)$$

$$\sin L_{\perp} = ?$$

$$I \cdot P_1 = I(0^\circ) - I(90^\circ)$$

$$I \cdot P_2 = I(45^\circ) - I(135^\circ)$$

$$I \cdot P_3 = I(DKP) - I(LKP)$$

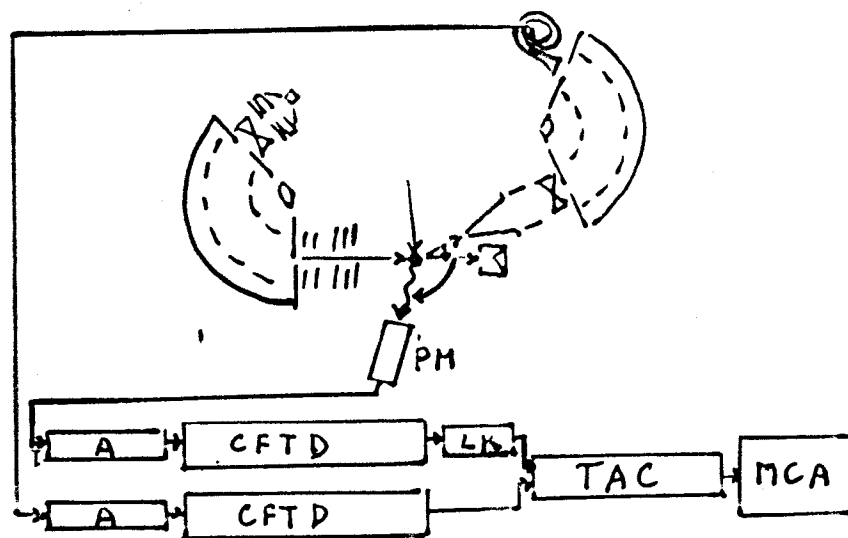
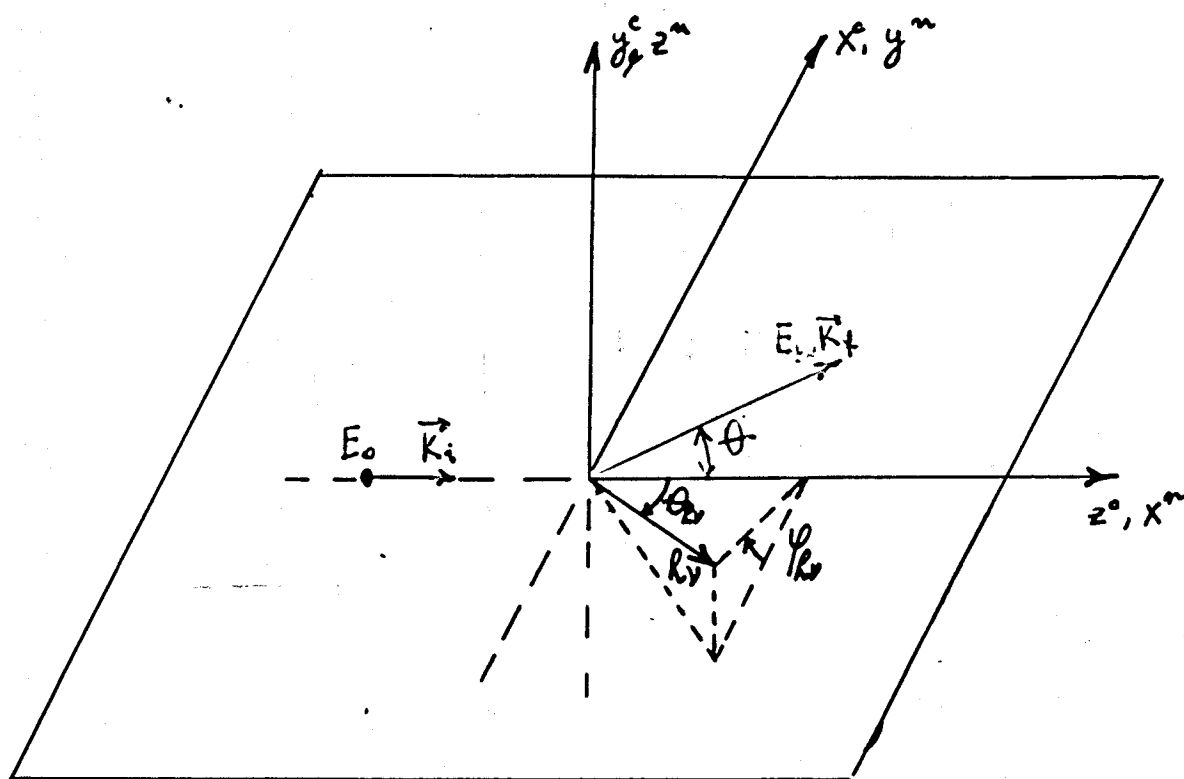
$$P_3 = -L_{\perp}$$

$$P_1 = P_e \cos 2\gamma$$

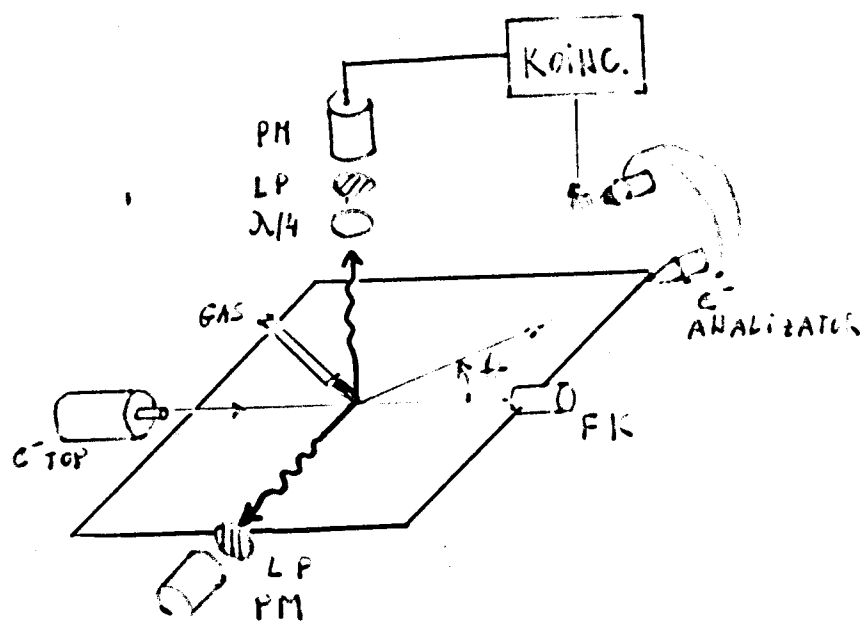
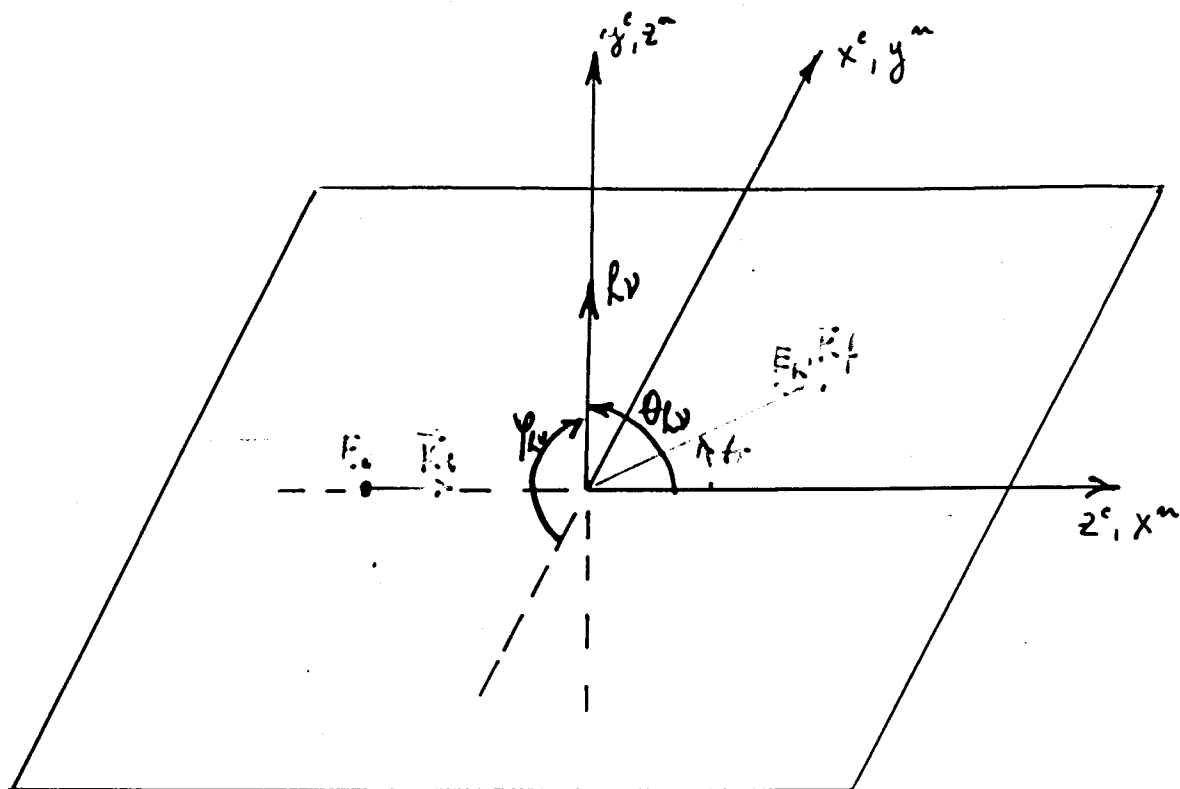
$$P_2 = P_e \sin 2\gamma$$

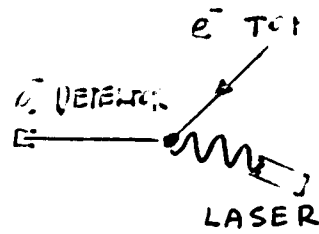
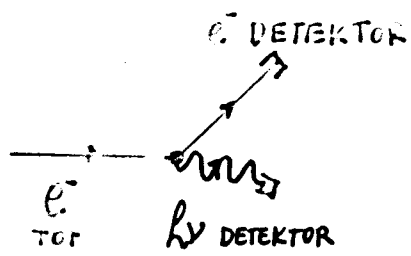
$$P_e = \sqrt{P_1^2 + P_2^2}$$

$$P_4 = \frac{I'' - I^{\perp}}{I'' + I^{\perp}}$$



Emmerson et al (1975)



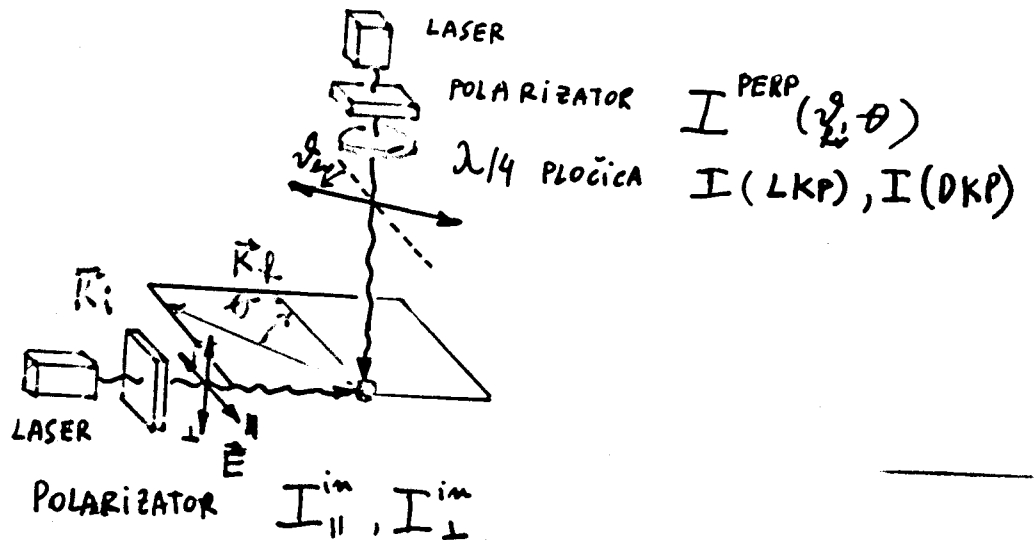


$$e^- + A(\alpha) \rightarrow A(\alpha') + e^- + \Delta E$$

$$A(\alpha) + h\nu(\text{POLARIZOVANO}) \rightarrow A(\alpha')$$

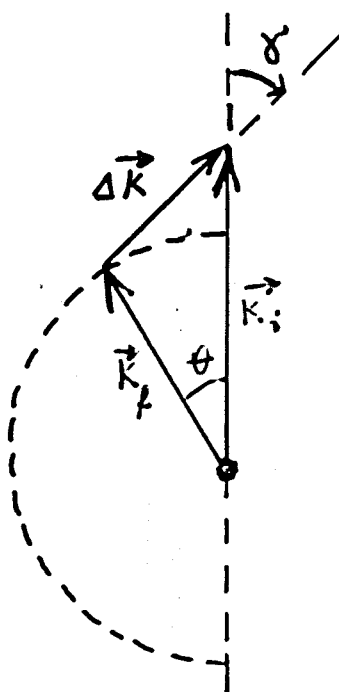
$$A(\alpha') \rightarrow A(\alpha) + h\nu(\text{POLARIZOVANO})$$

$$e^- + A(\alpha') \rightarrow A(\alpha) + e^- + \Delta E$$



PRVA BORNOVA APROKSIMACIJA

PREDVIĐANJE: $\Delta \vec{k} = \vec{k}_i - \vec{k}_f$ $L_{\perp}^{FBA} = 0$ $P_e^{FBA} = 1$



$$k_i \propto \sqrt{E_i}$$

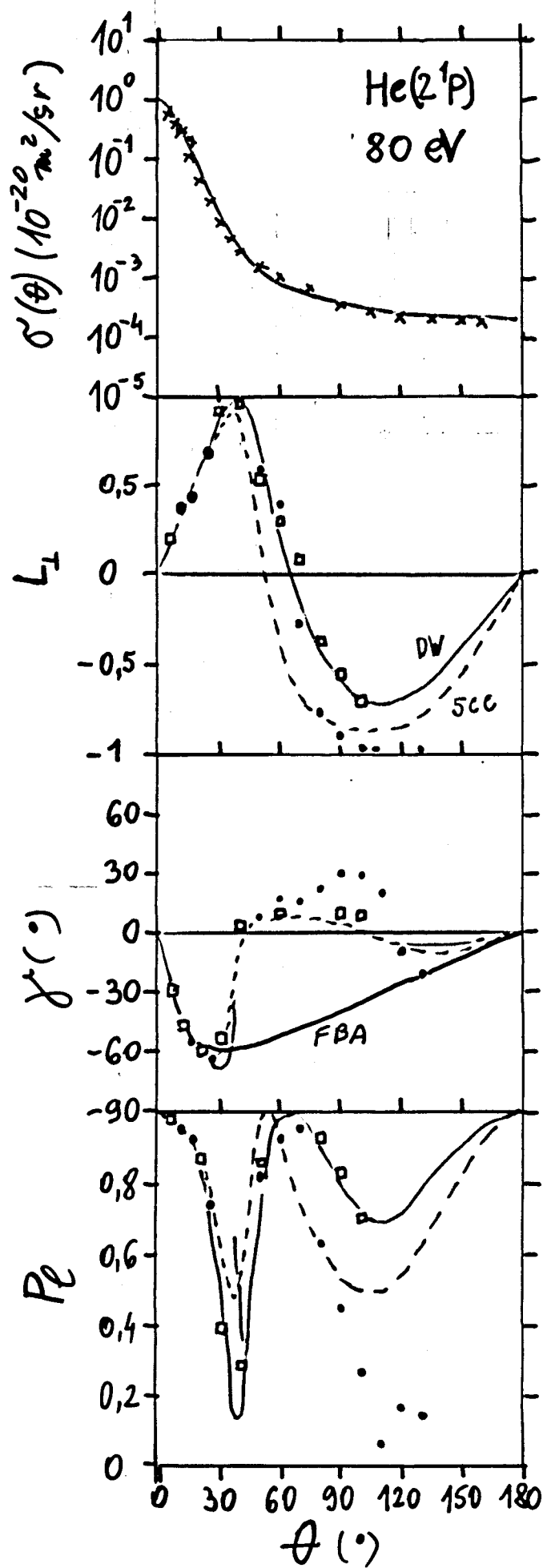
$$k_f \propto \sqrt{E_i - \Delta E}$$

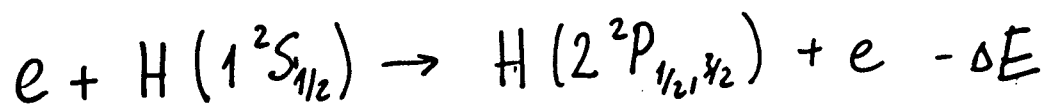
$$\tan \gamma^{FBA} = \frac{\sin \theta}{\cos \theta - x}$$

$$x = \sqrt{\frac{E_0}{E_0 - \Delta E}}$$

$$\gamma^{FBA} < 0 \quad \forall \theta$$

$$\gamma_{min}^{FBA} \quad \Delta \vec{k} \perp \vec{k}_i$$





$$L-S \checkmark \quad S = S_A \pm \frac{1}{2} = 1, 0 \quad + \text{IZMENA}$$

$$2p |M\rangle \quad a_M^D = a_M^{(0)} + a_M^{(1)} \quad ; \quad a_M^E = -a_M^{(0)} + a_M^{(1)}$$

$\neq$ NEZAVISNIH PARAMETARA

$$\tau_{kv} \sim 10^{-9} s \quad \tau_{Larmor} \sim 10^{-12} s \quad \text{DEPOLARIZACIJA}$$

NEKOHERENTAN SLUČAJ

$$P^+ = P_1^2 + P_2^2 \leq 1$$

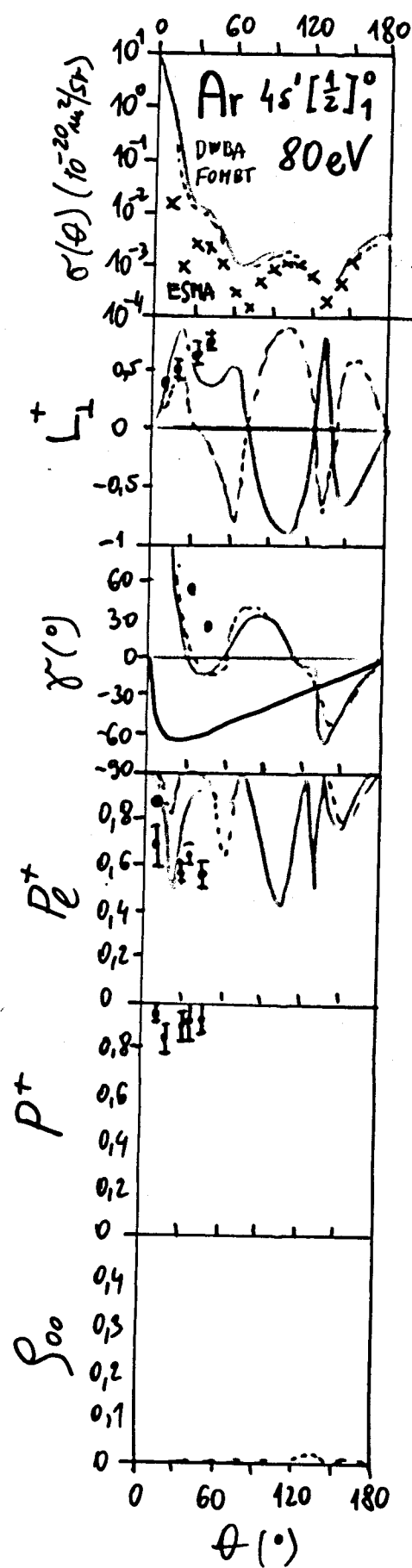
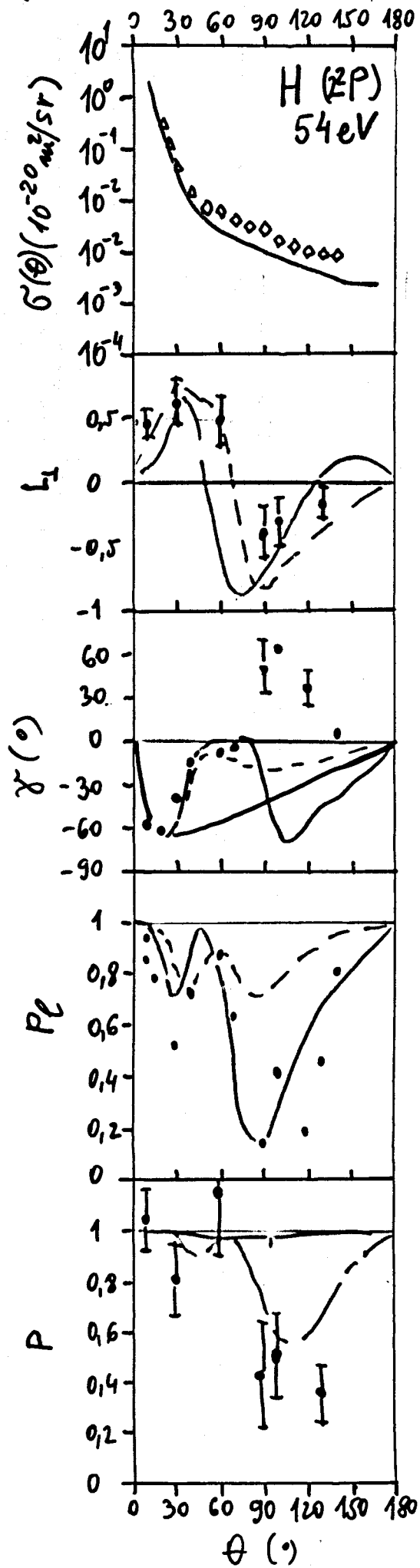
$$3: \quad L_{\perp} = -P_3, \quad P_e, \quad \gamma \quad P^+ = 1 \text{ ALI KENJE IZMENA}$$



S-O EFEKTI $\rightarrow$ SPIN FLIP $\therefore$ PARUŠENA + SIM. REFLEKSIJE

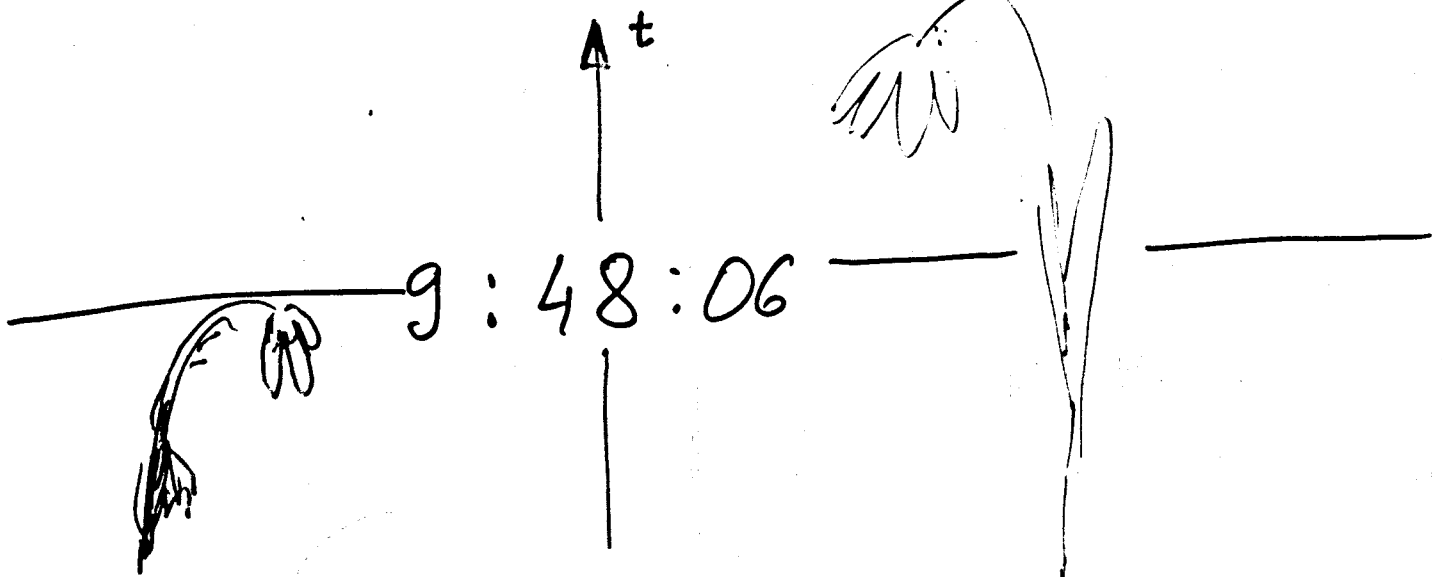
$$a_{m_{s_f} M_J m_{s_i}}$$

$$4: \quad L_{\perp}^+ = \langle J^+ \rangle = -P_3 \quad P_e^+ \quad \gamma \quad f_{00} = h$$



PORUKA POST DIPLOMACIMA
"KO GURA PROGURACE"

PROLECE 92



ZIMA 92

