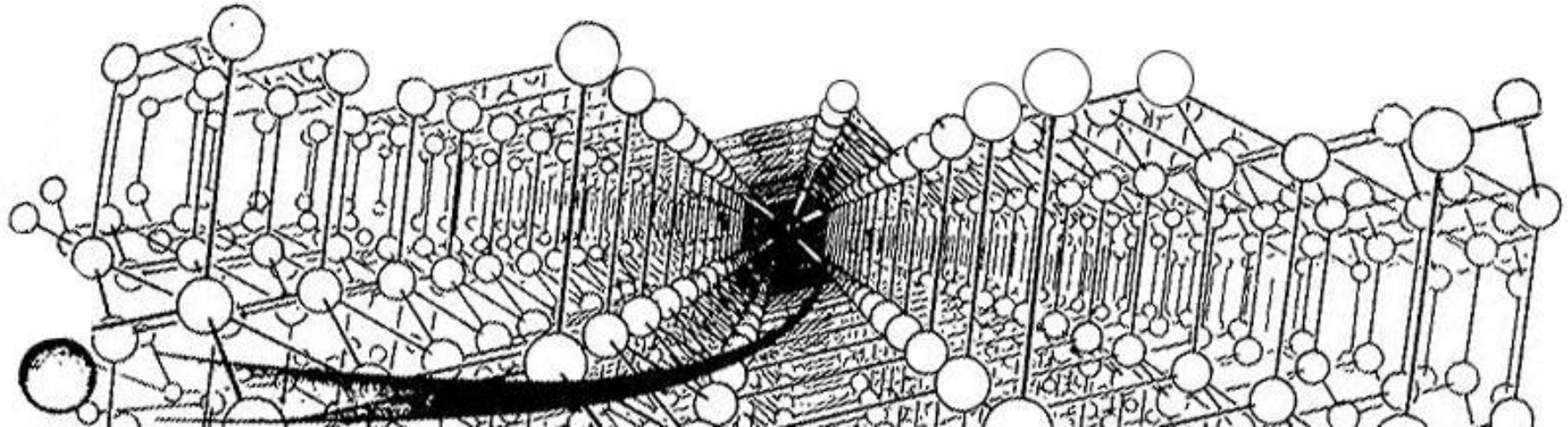
Samostalni seminar iz istraživanja u fizici

Mjerenje defekata u kristalnim materijalima pomoću RBS metode u kanalirajućem modu

Ana Petrinec

Mentor: Stjepko Fazinić

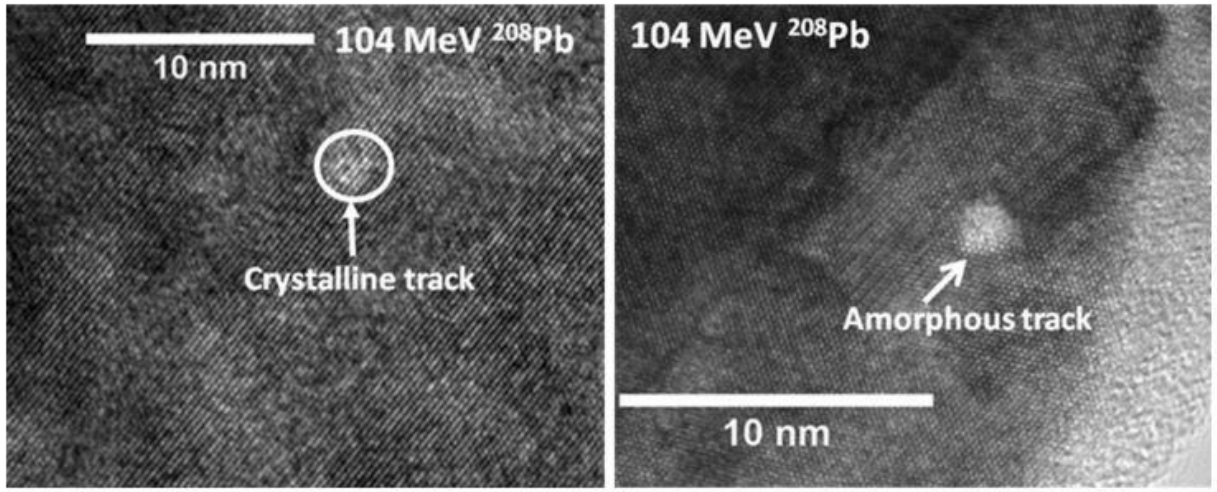


Proučavanje defekata u materijalima

DIREKTNE METODE

- AFM
- TEM

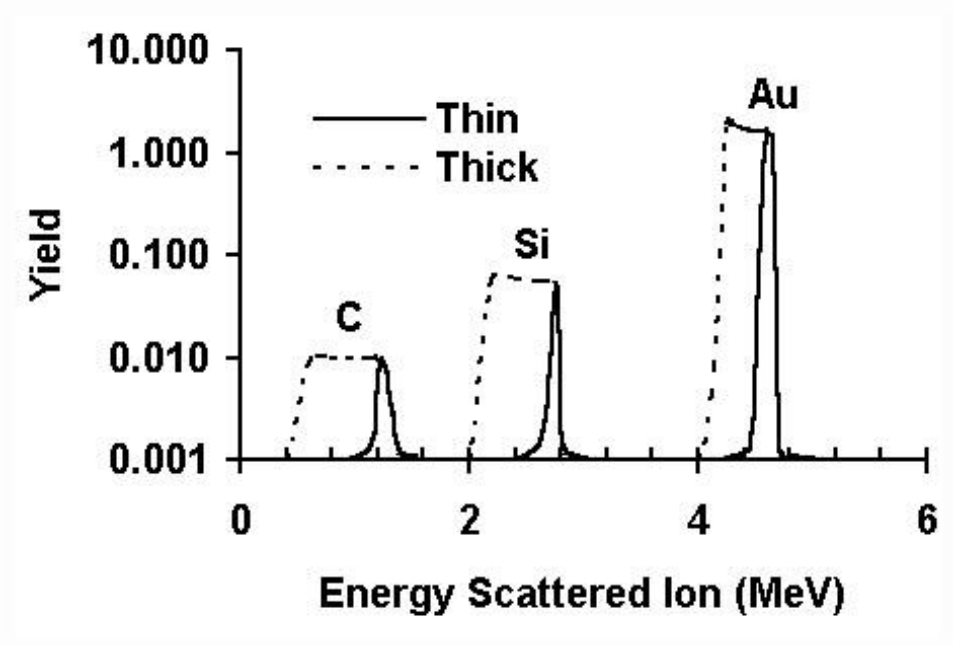
→ „slika” površine



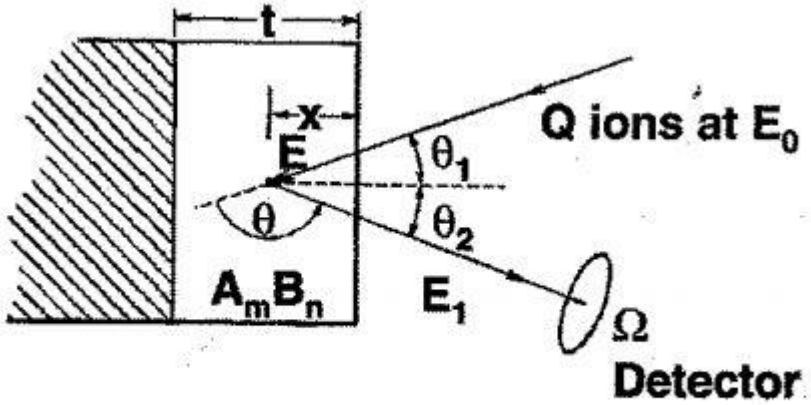
INDIREKTNE METODE

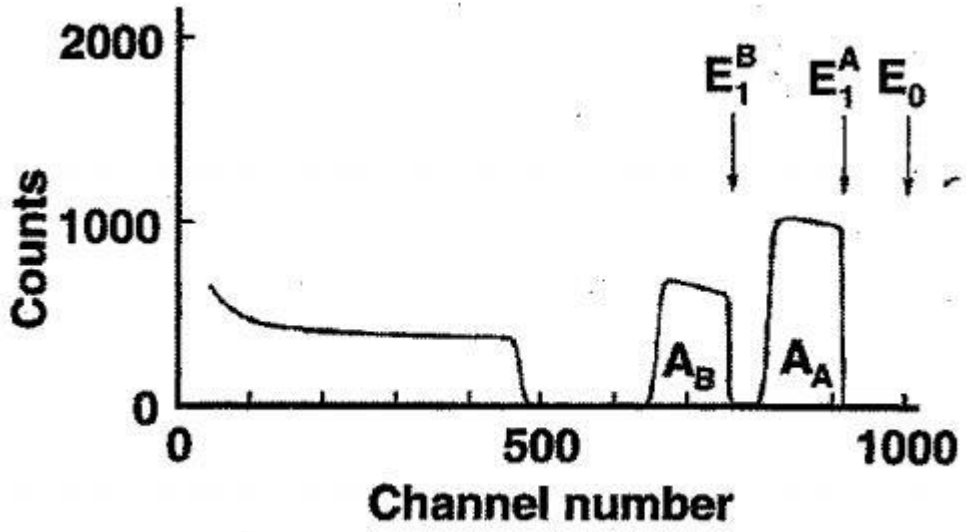
- RBS i RBS/c

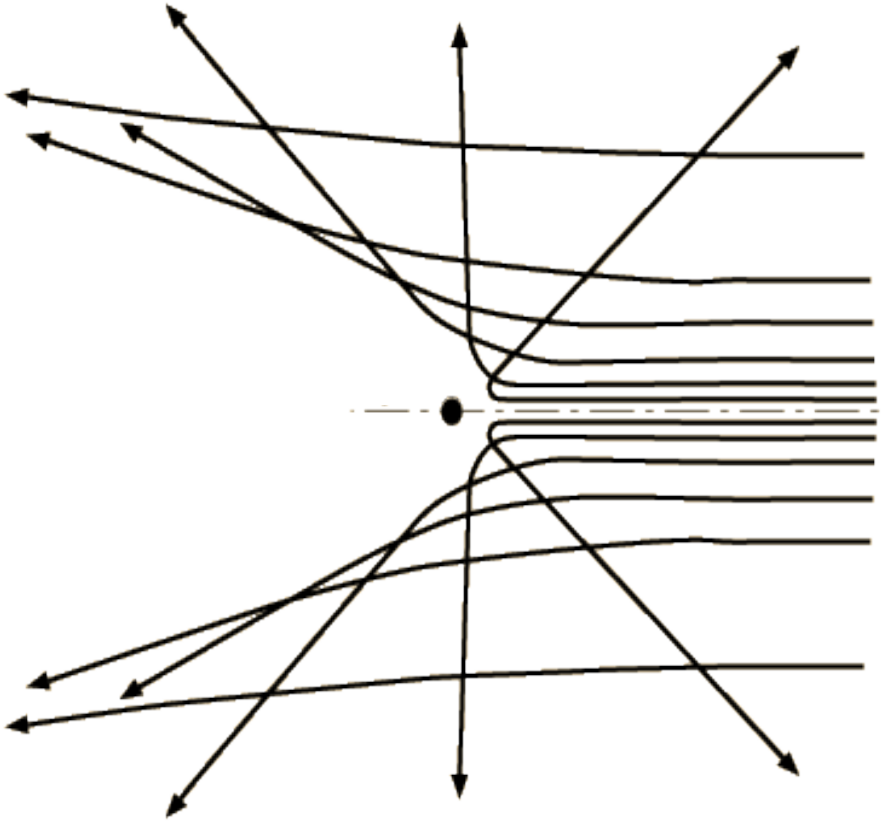
→ gubi se zor, ali podaci spremni za statističku obradu



Rutherfordova spektroskopija unatrag raspršenih iona (RBS)







$$Energija = \alpha \cdot kanal + \beta$$

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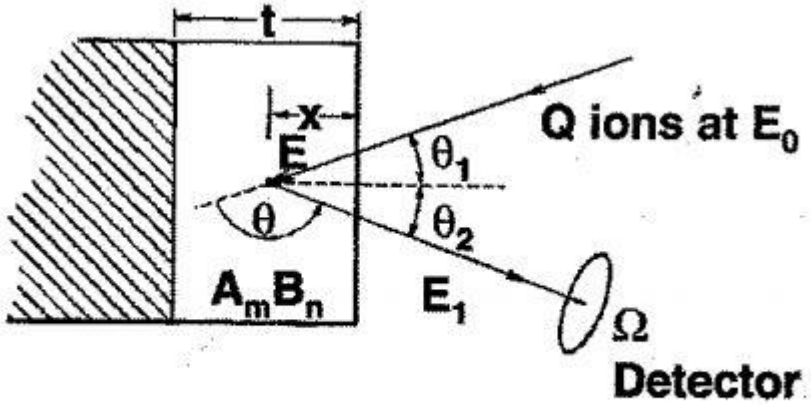
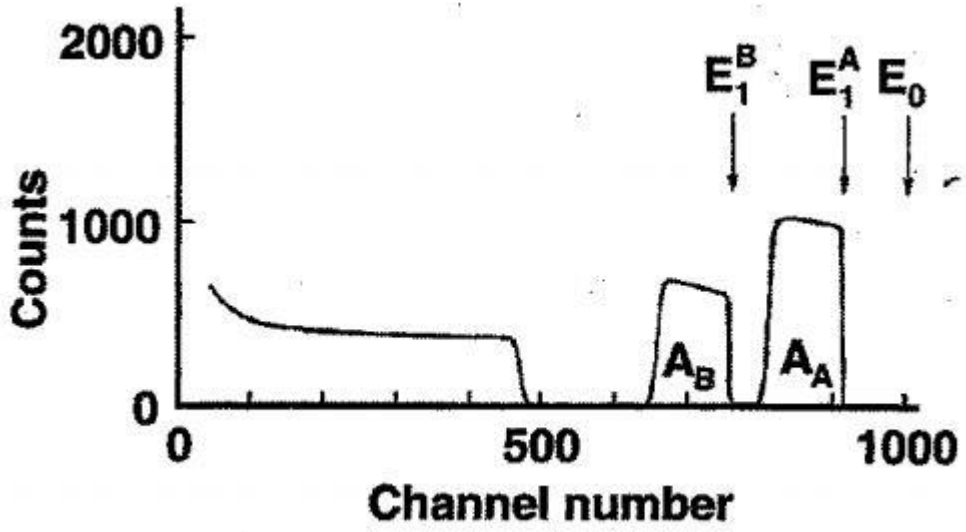


$$K \equiv \frac{E_1}{E_0} = \left(\frac{\sqrt{M_2^2 - M_1^2 \sin^2 \theta} + M_1 \cos \theta}{M_1 + M_2} \right)^2$$



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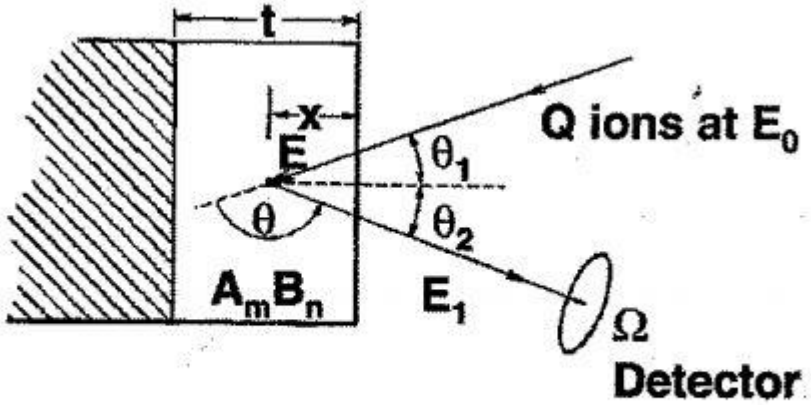

$$\theta = \Pi - |\theta_1 \pm \theta_2|$$

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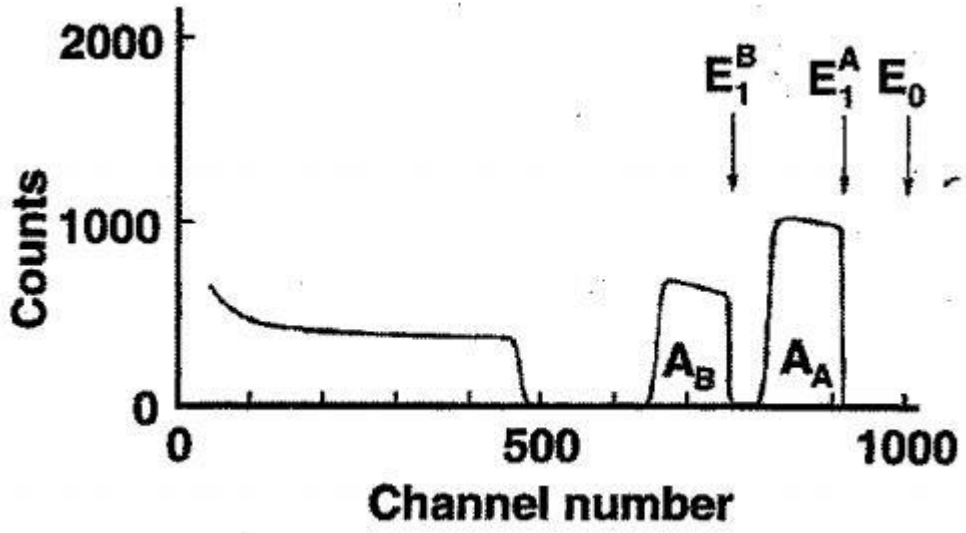

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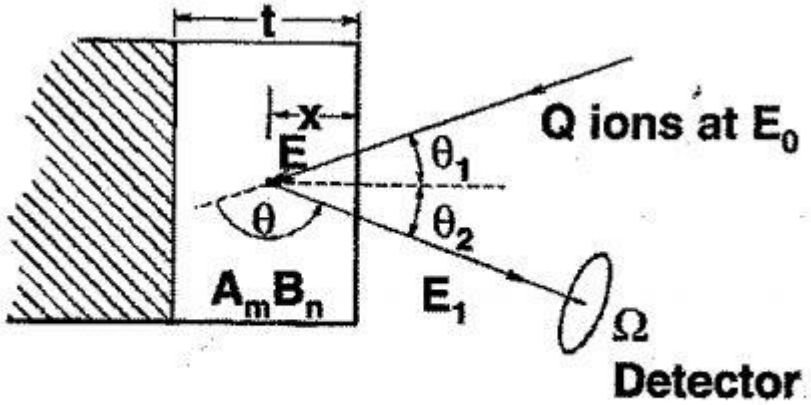

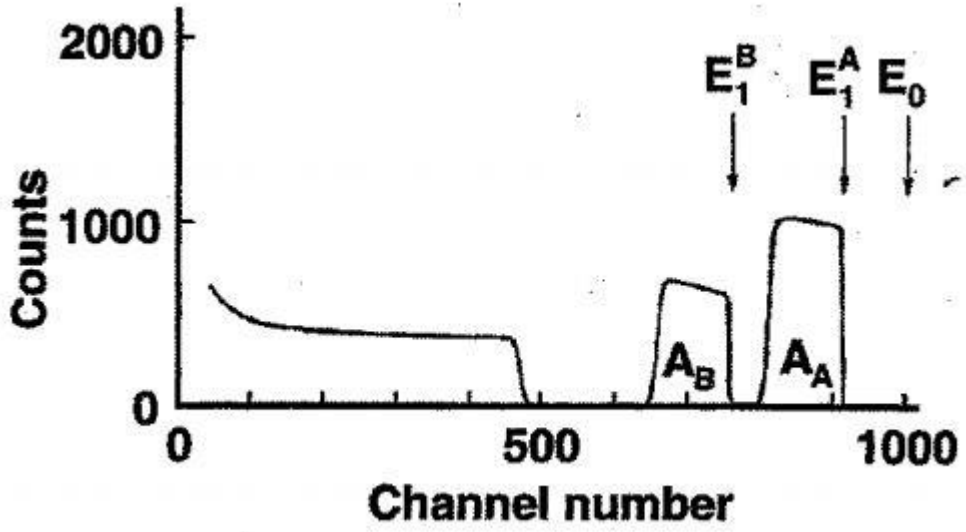

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E_0, M_1 – energija i masa iona u snopu, zadano
θ – kut raspršenja, zadan geometrijom eksp. postava
E_1 – očita se iz spektra za signal od interesa
M_2 – masa jezgre mete – nepoznato!

$$Energija = \alpha \cdot kanal + \beta$$

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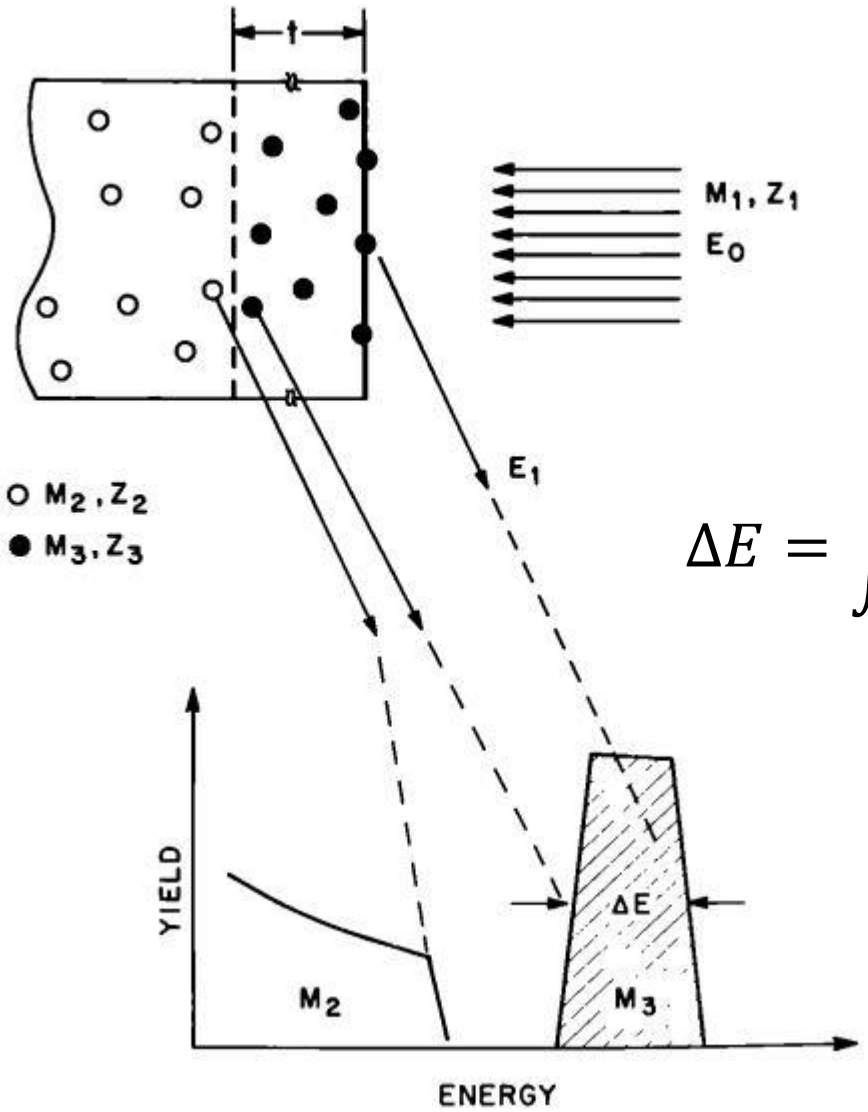

$$\Delta E = \int \frac{\mathrm{d}E}{\mathrm{d}x}(E)\,\mathrm{d}x$$

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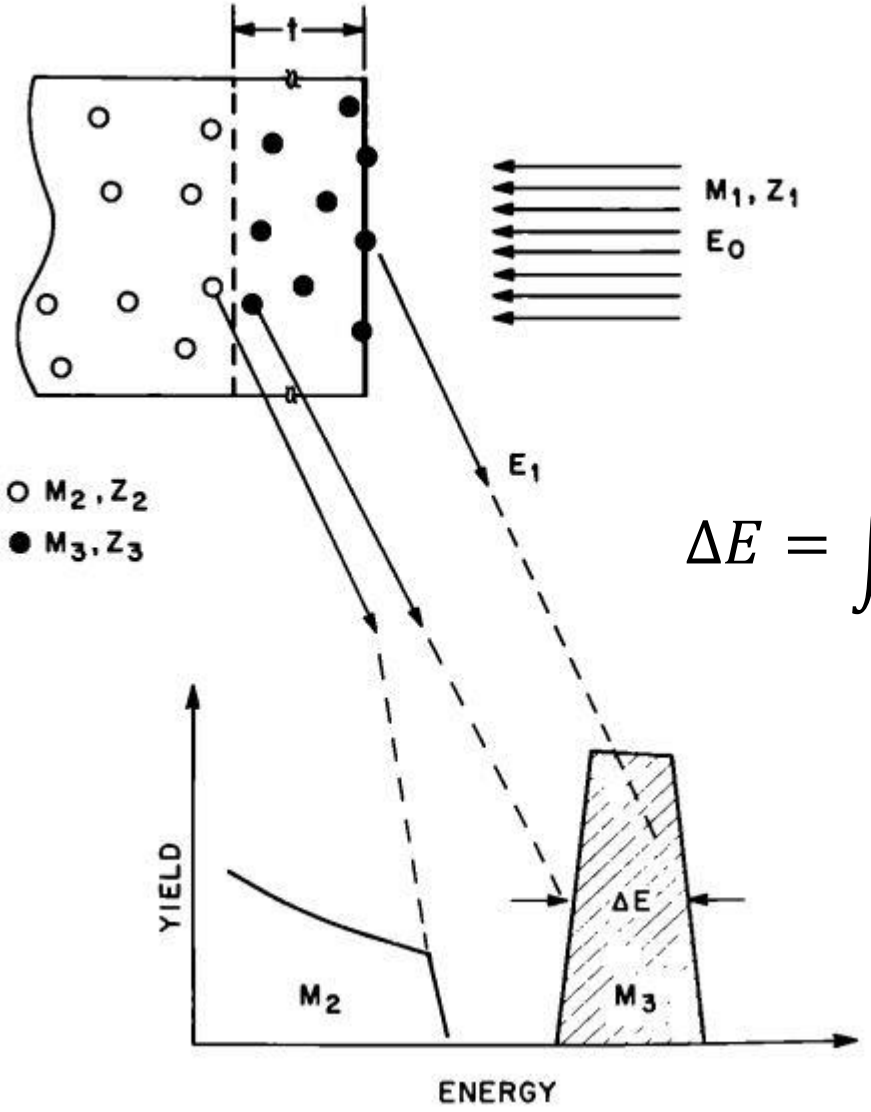

$$\Delta E = \int \frac{\mathrm{d}E}{\mathrm{d}x}(E)\,\mathrm{d}x$$

$$S = -\frac{\mathrm{d}E}{\mathrm{d}x}$$

Zaustavna moć (*stopping power*)

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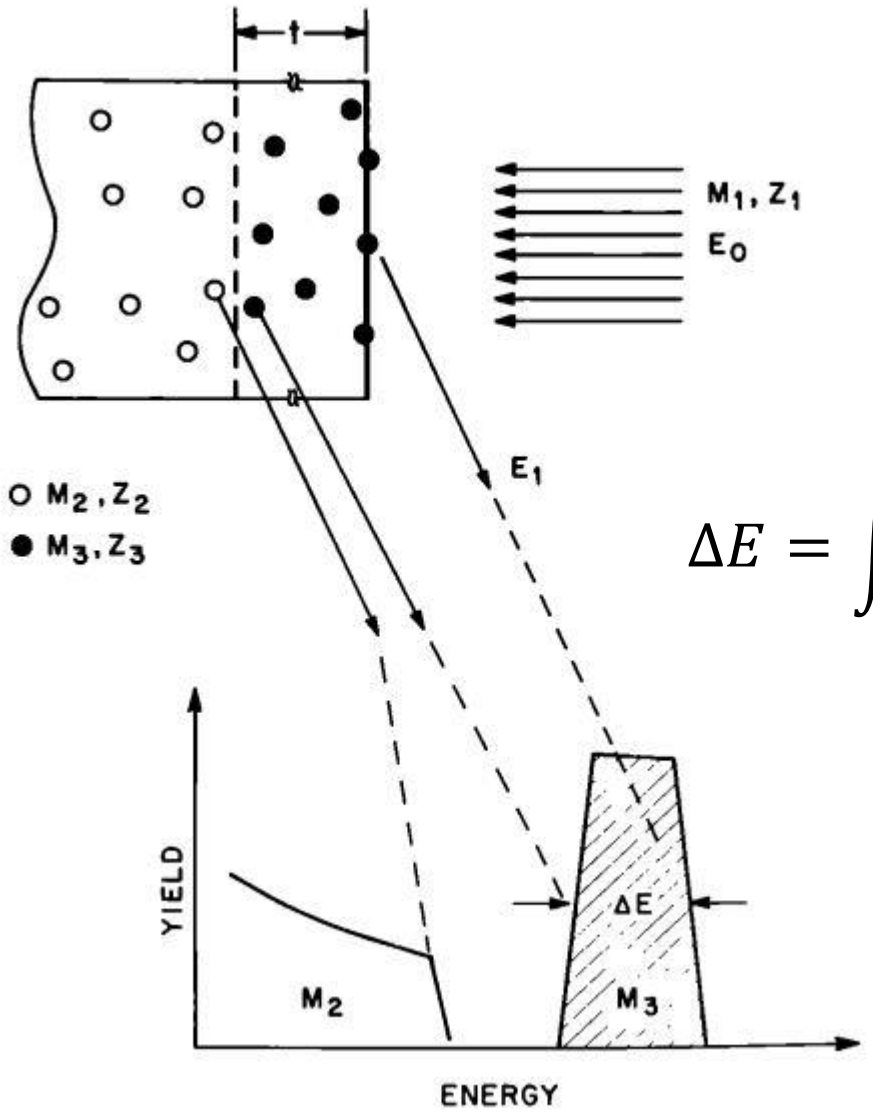

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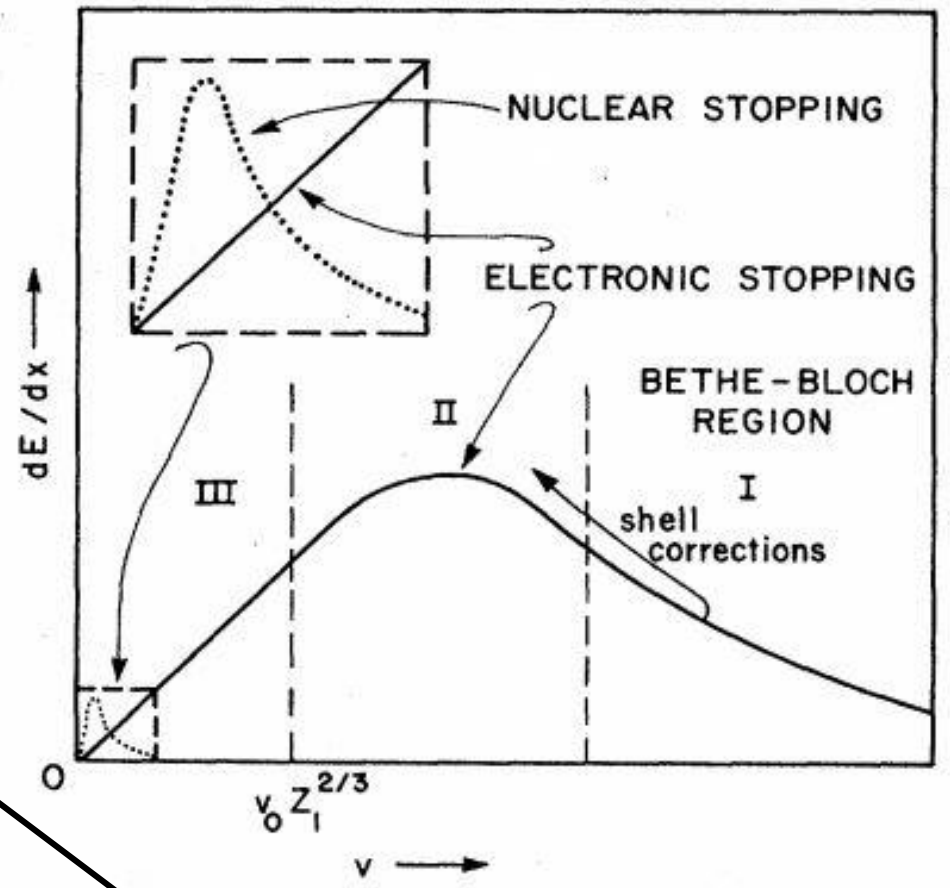

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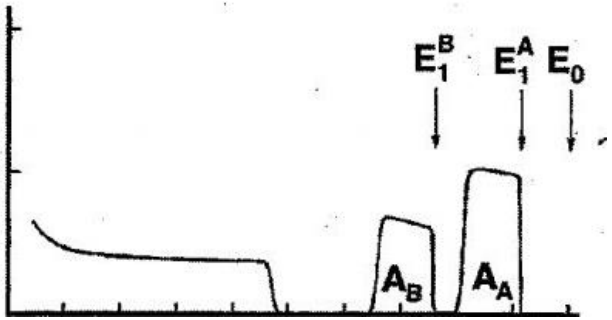
Određivanje stehiometrije uzorka:

$$\frac{n}{m} = \frac{A_B}{A_A} \cdot \frac{\sigma_A(E,\theta)}{\sigma_B(E,\theta)}$$



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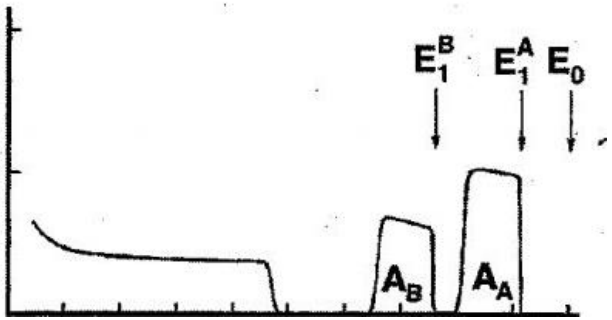

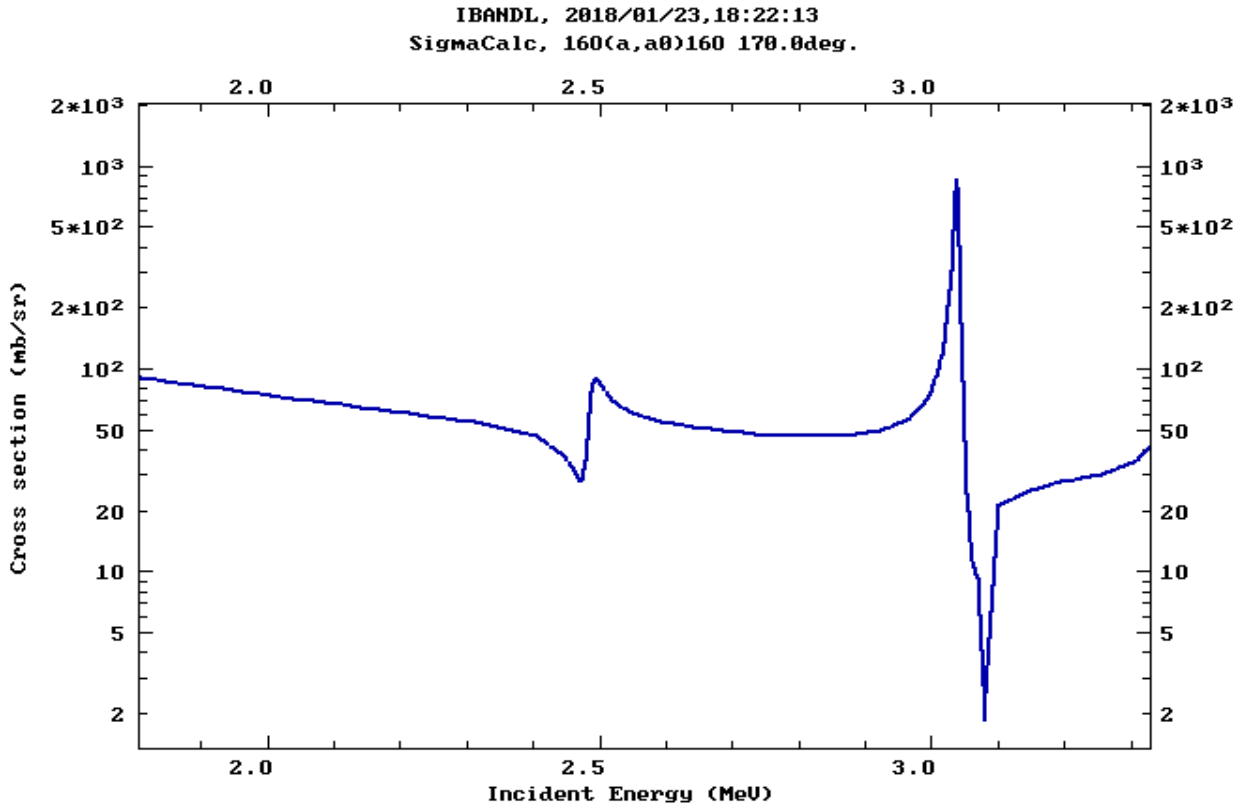

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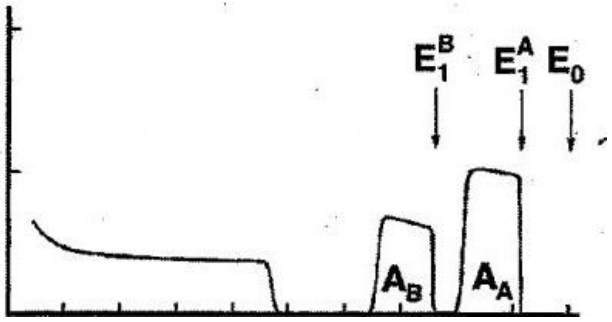
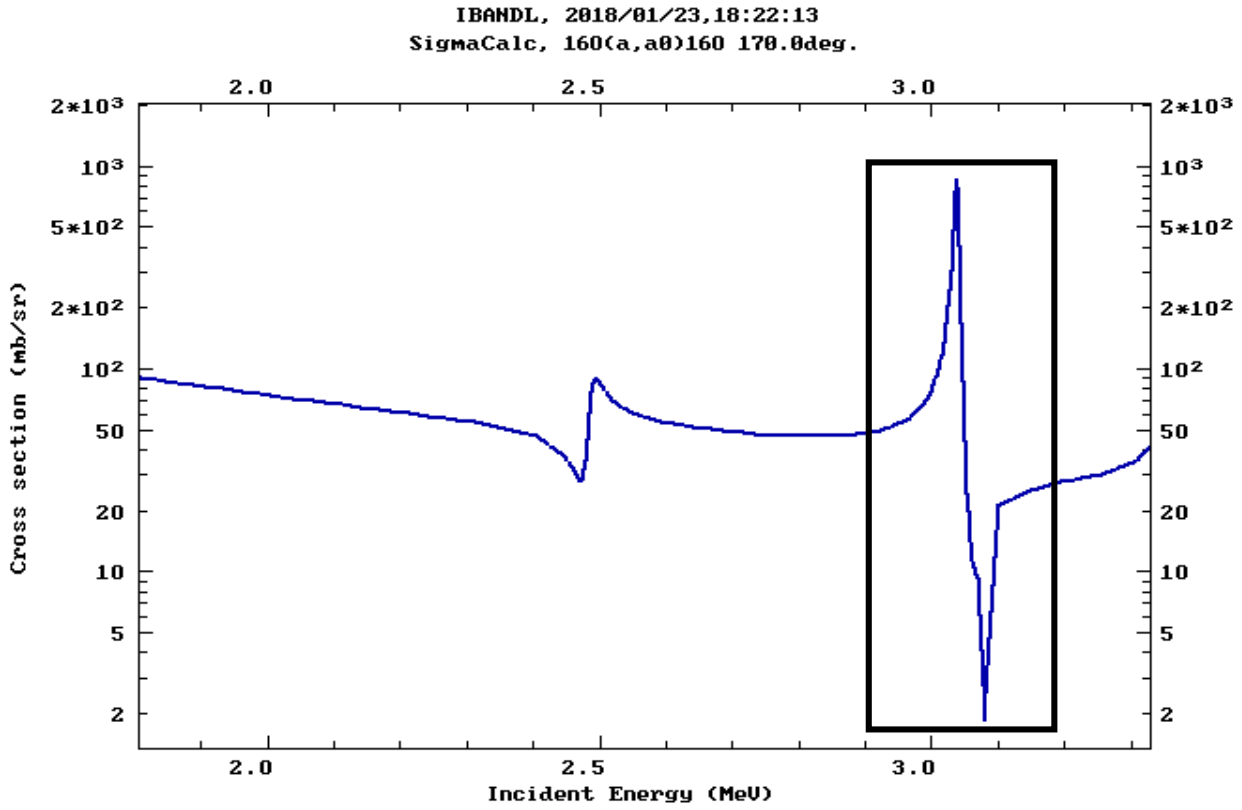
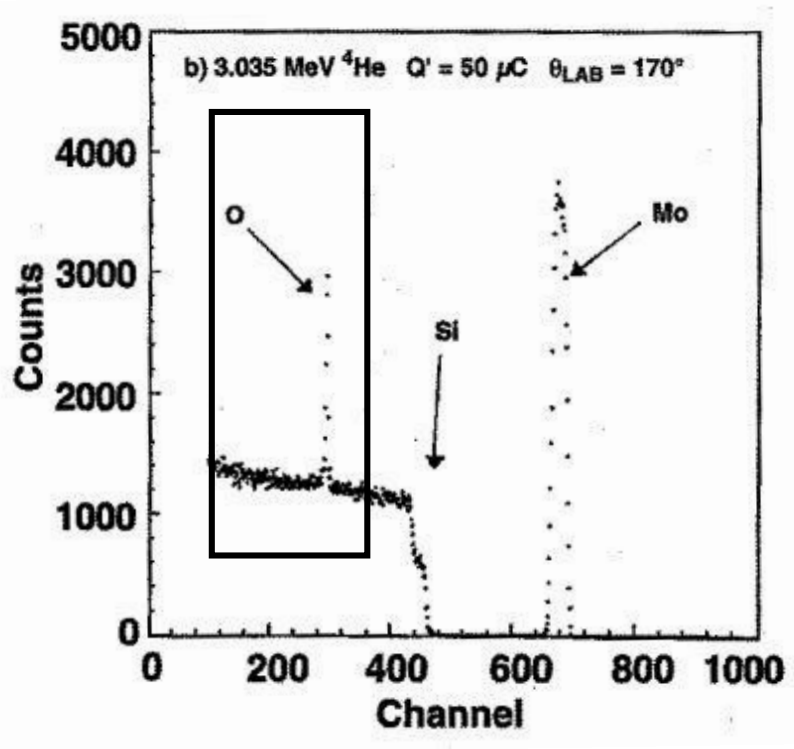
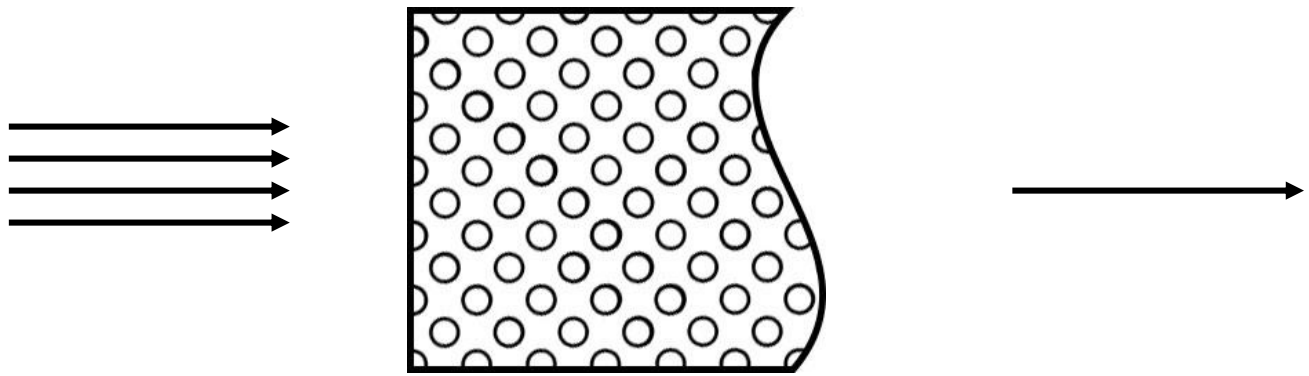
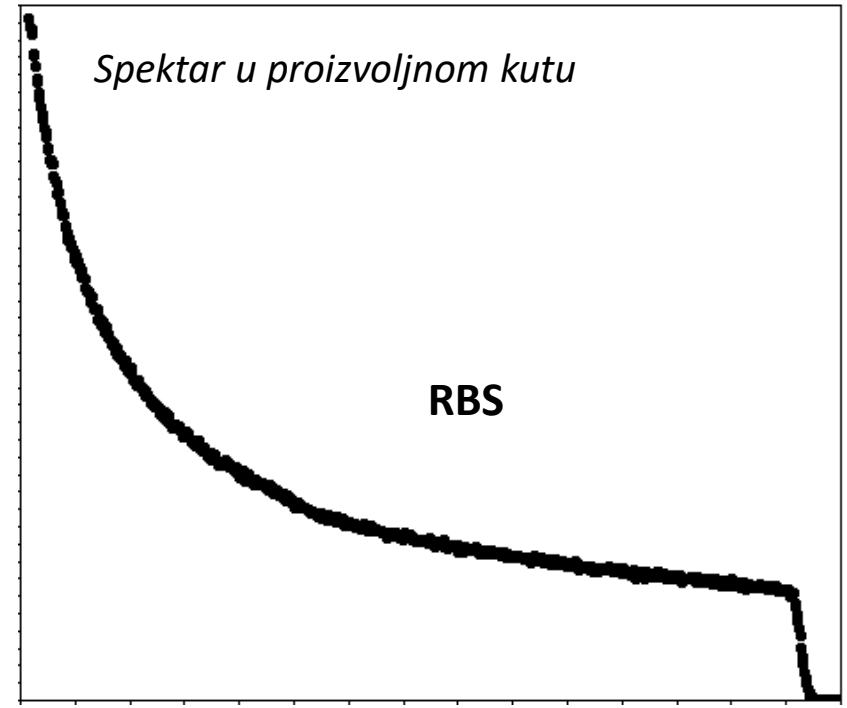


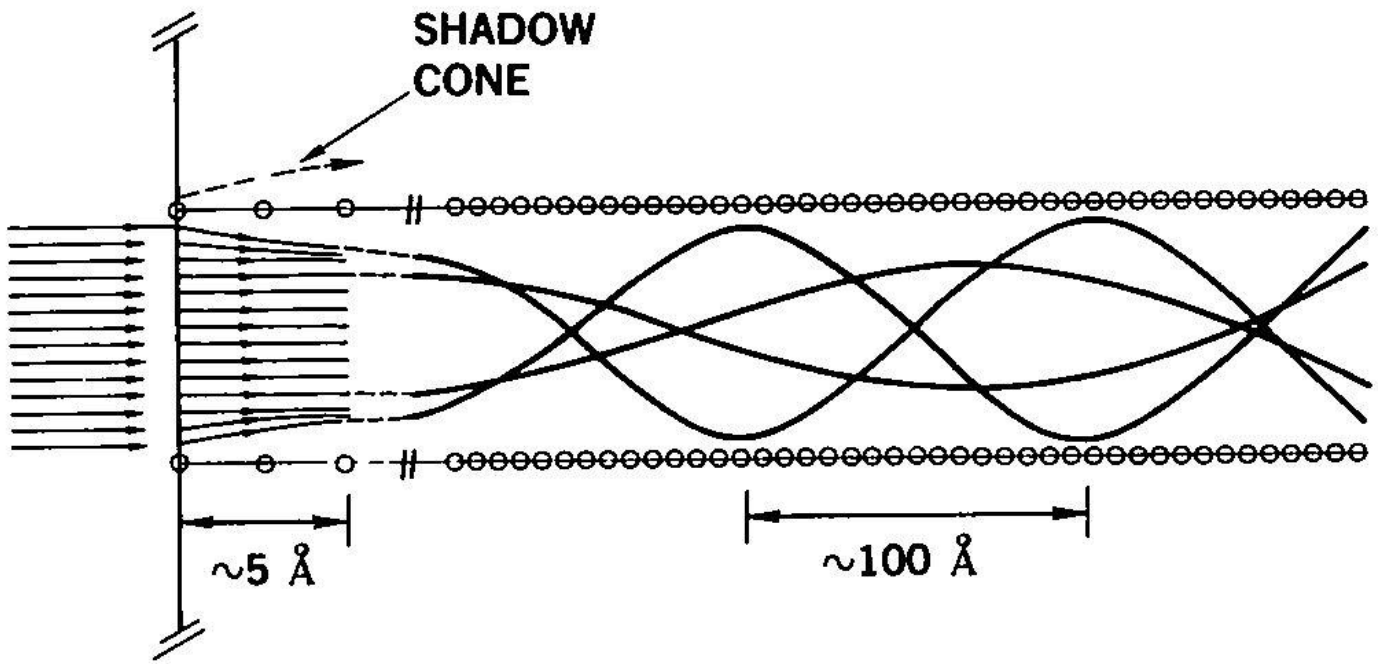


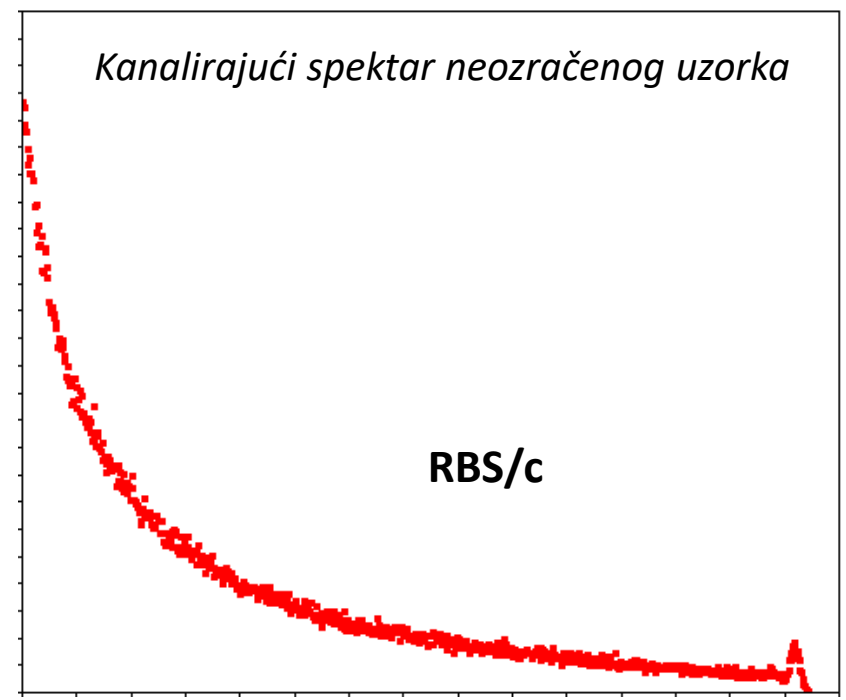


Kanaliranje i RBS/c









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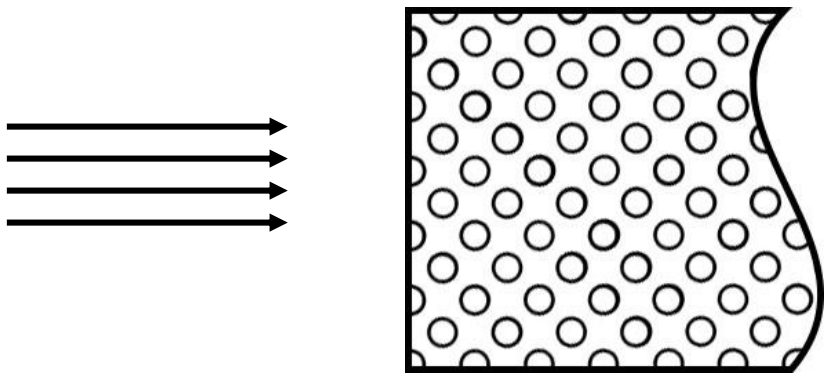

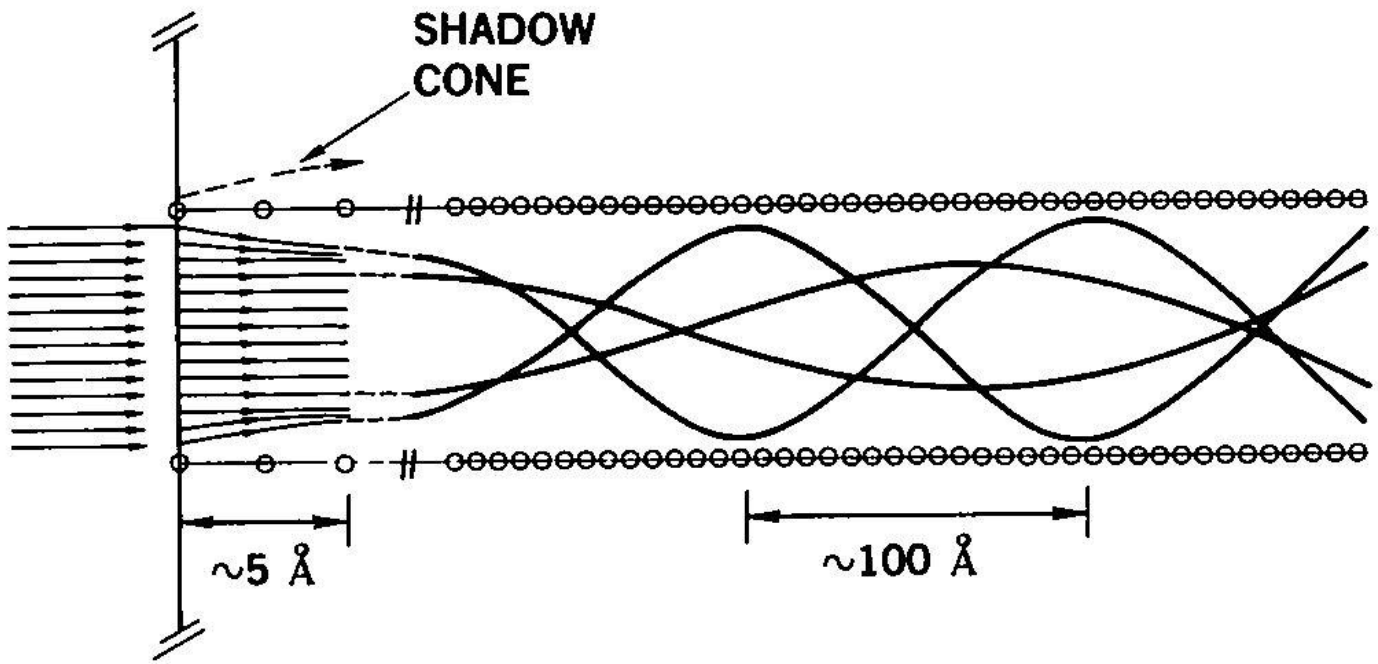

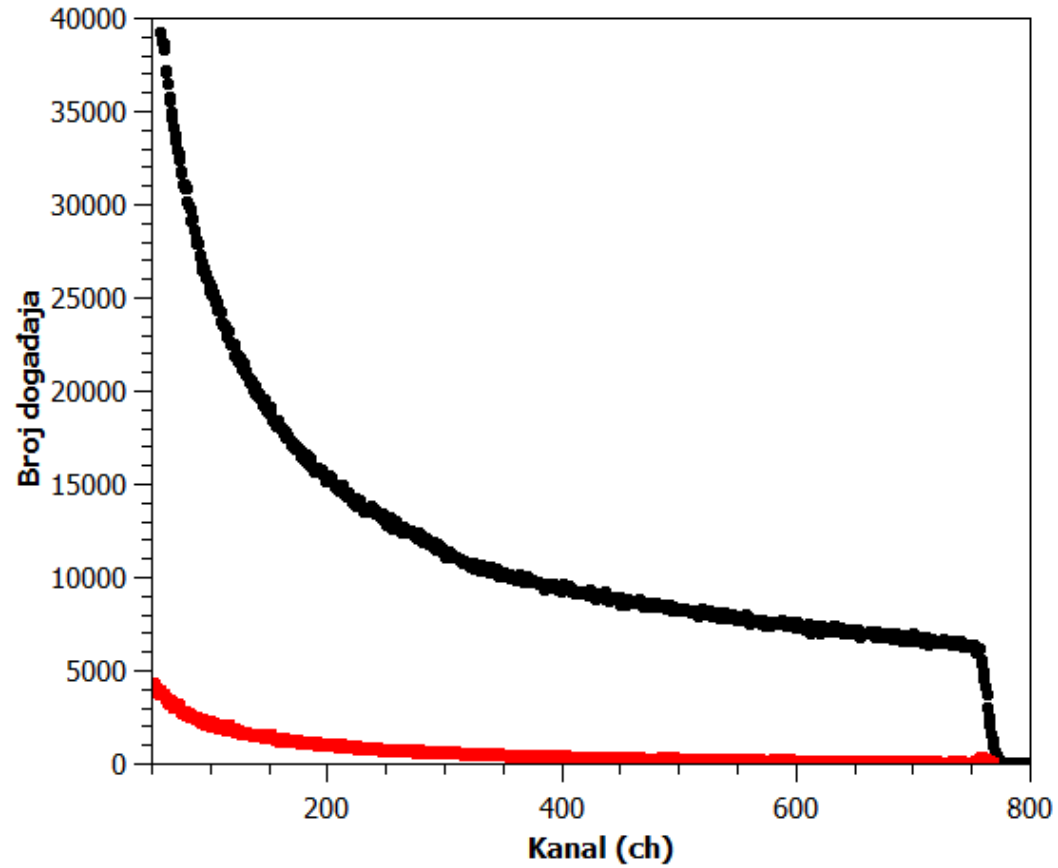

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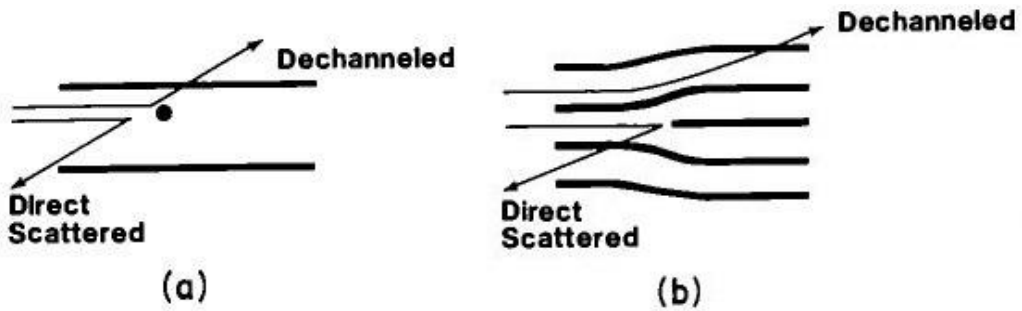
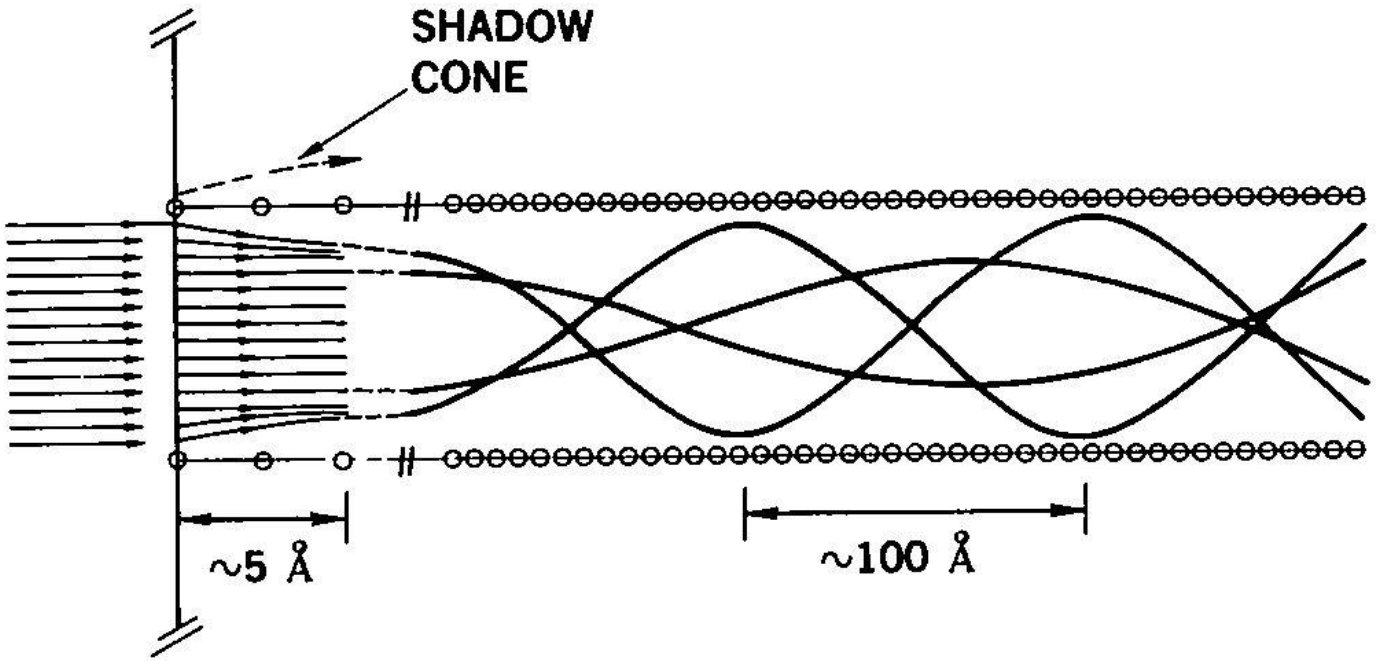
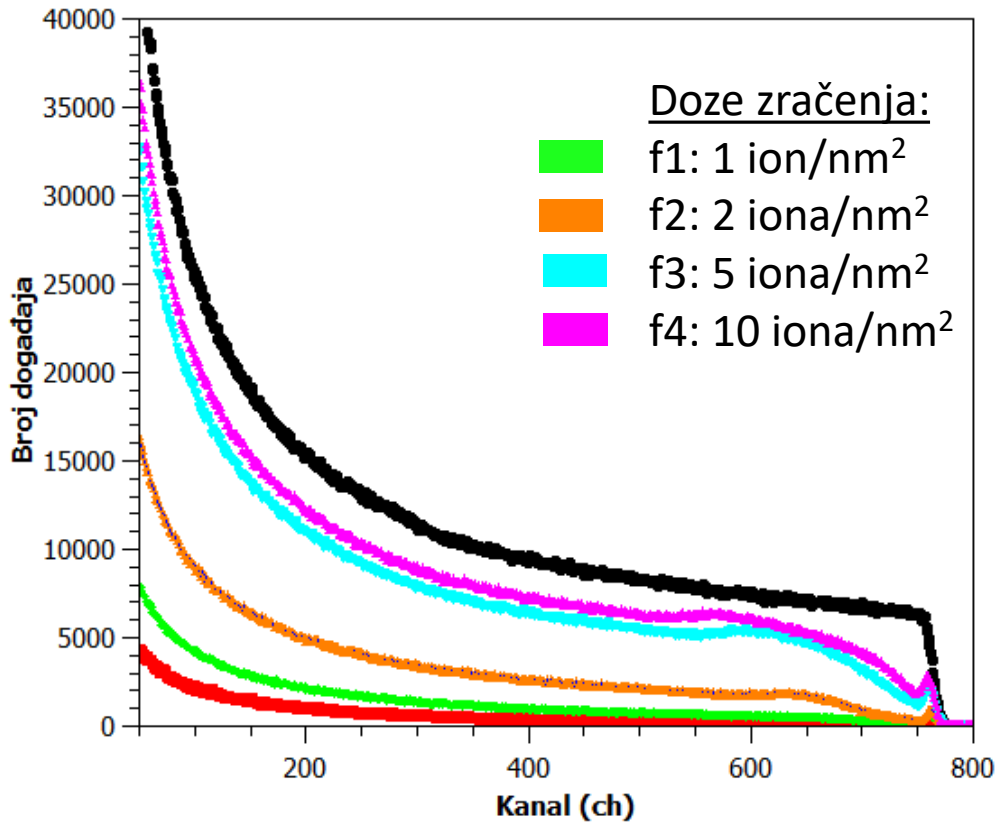
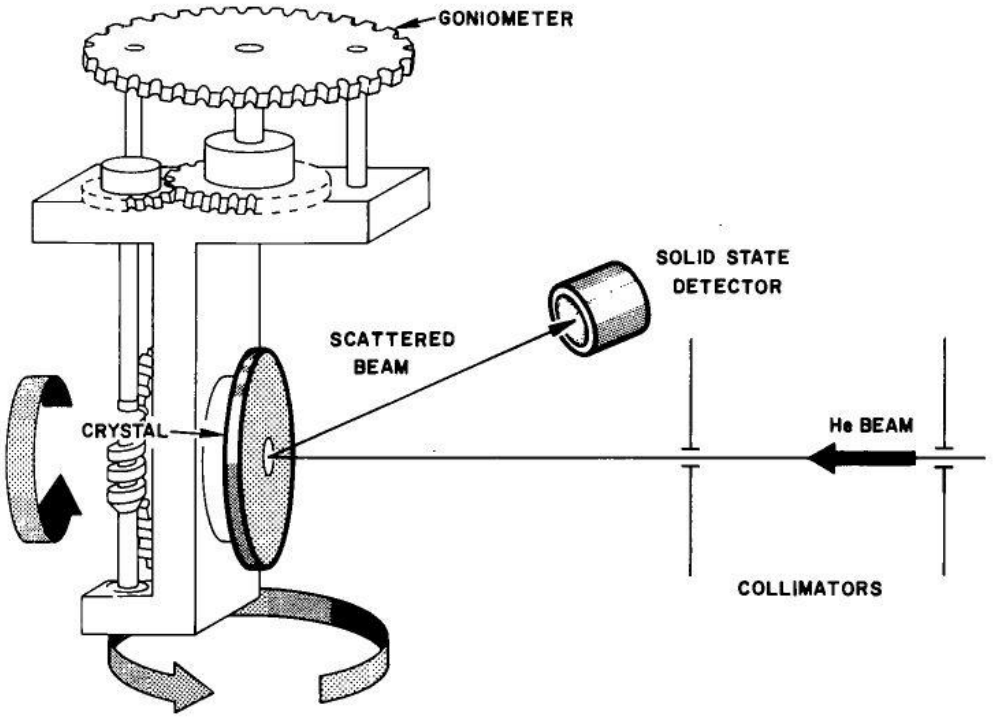
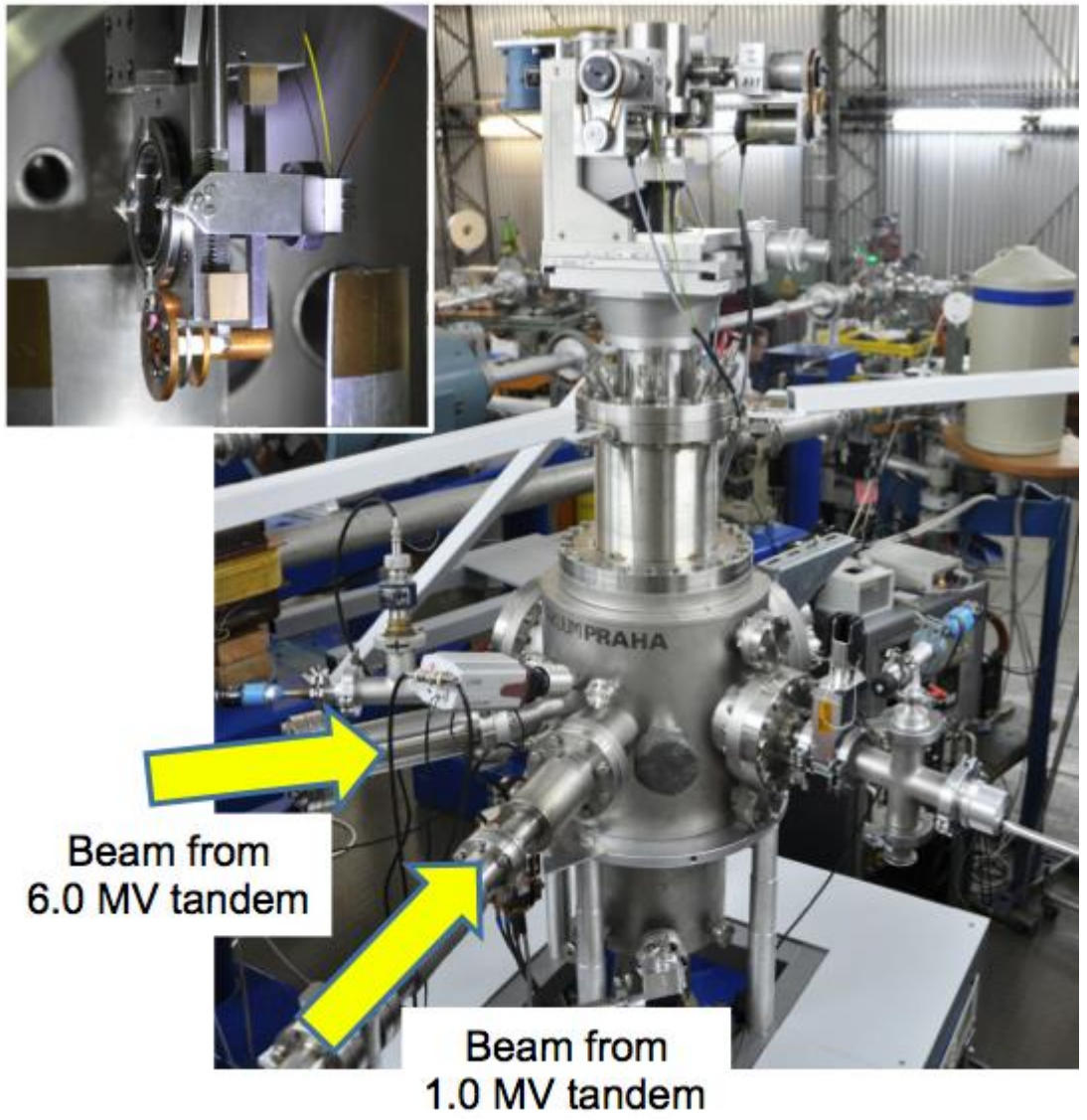






Provedba RBS/c eksperimenta





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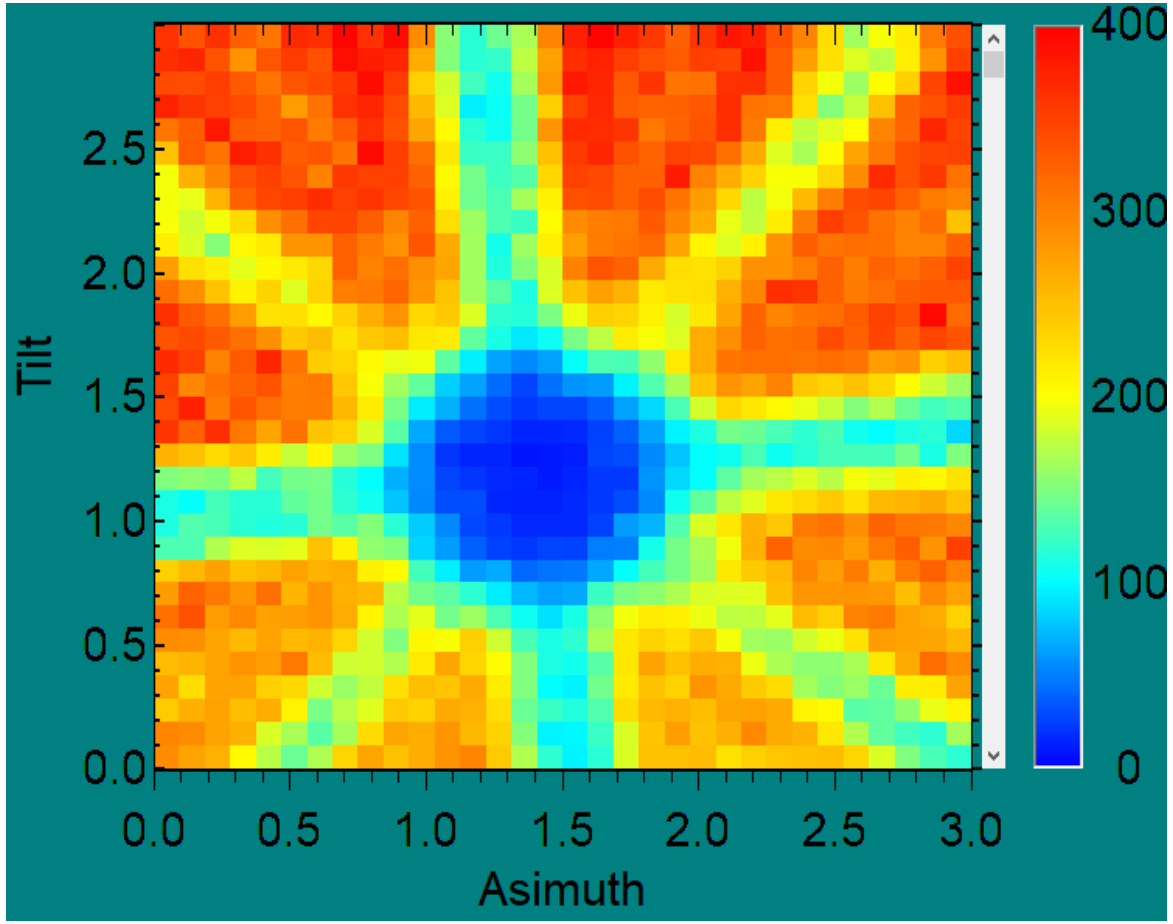
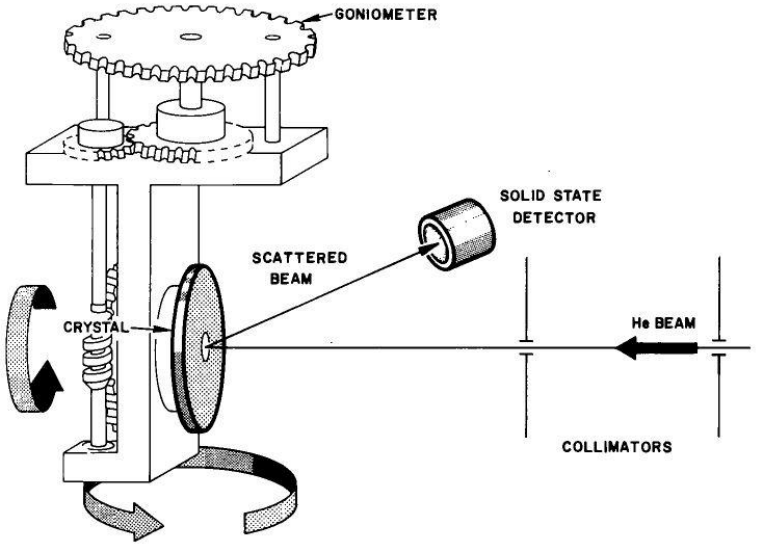
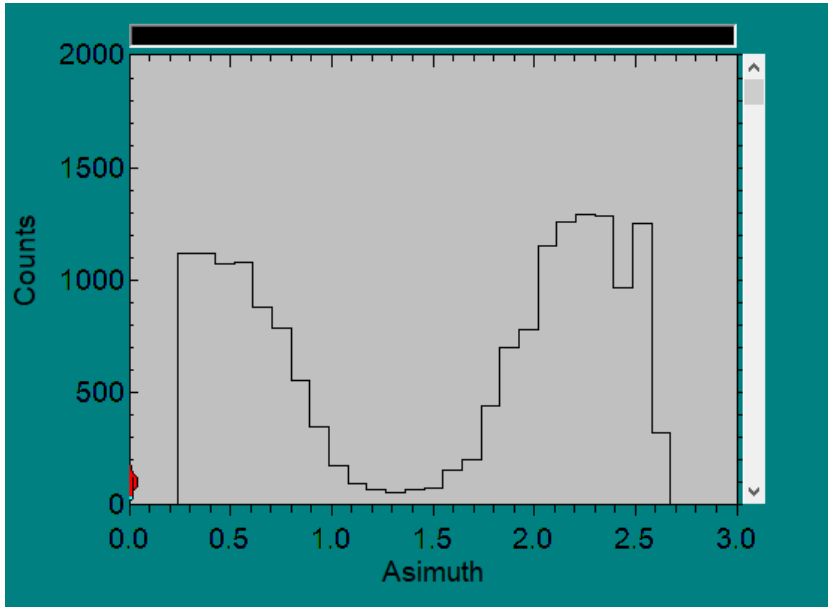
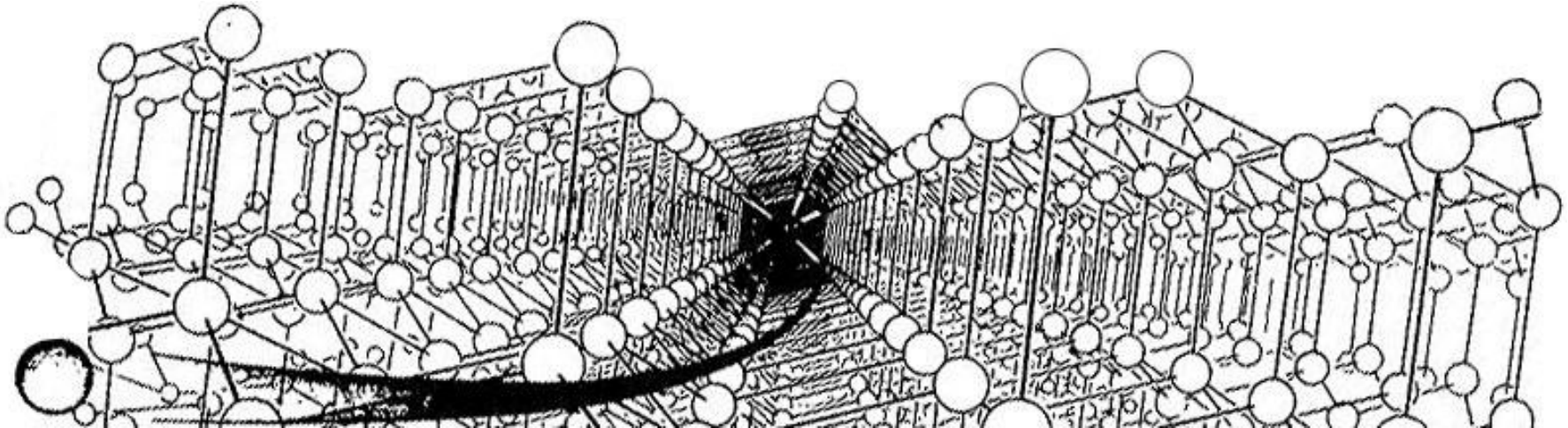




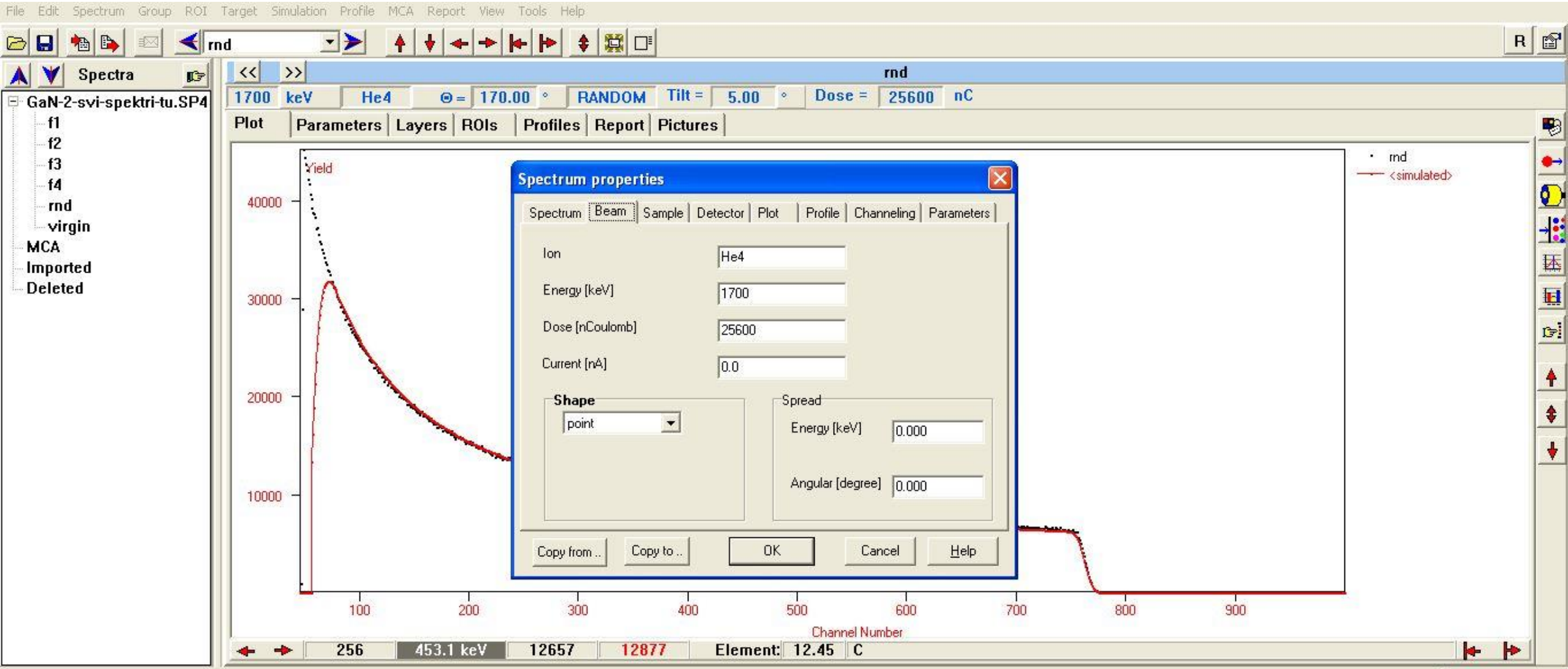


Slijed mjerenja: RBS, RBS/c na neozračenom uzorku, RBS, RBS/c na ozračenom uzorku, RBS

Analiza spektara



RBX – program za simulaciju i analizu spektara



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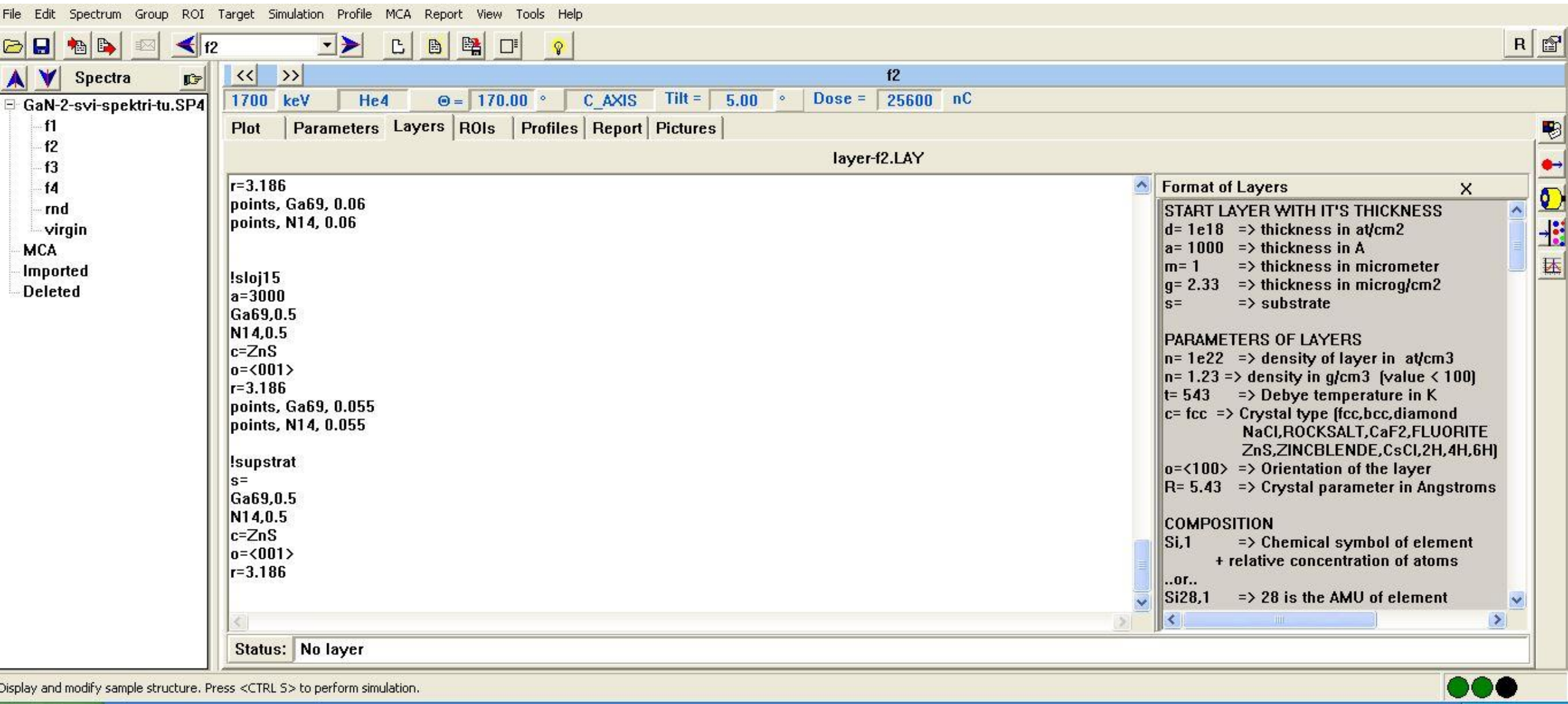

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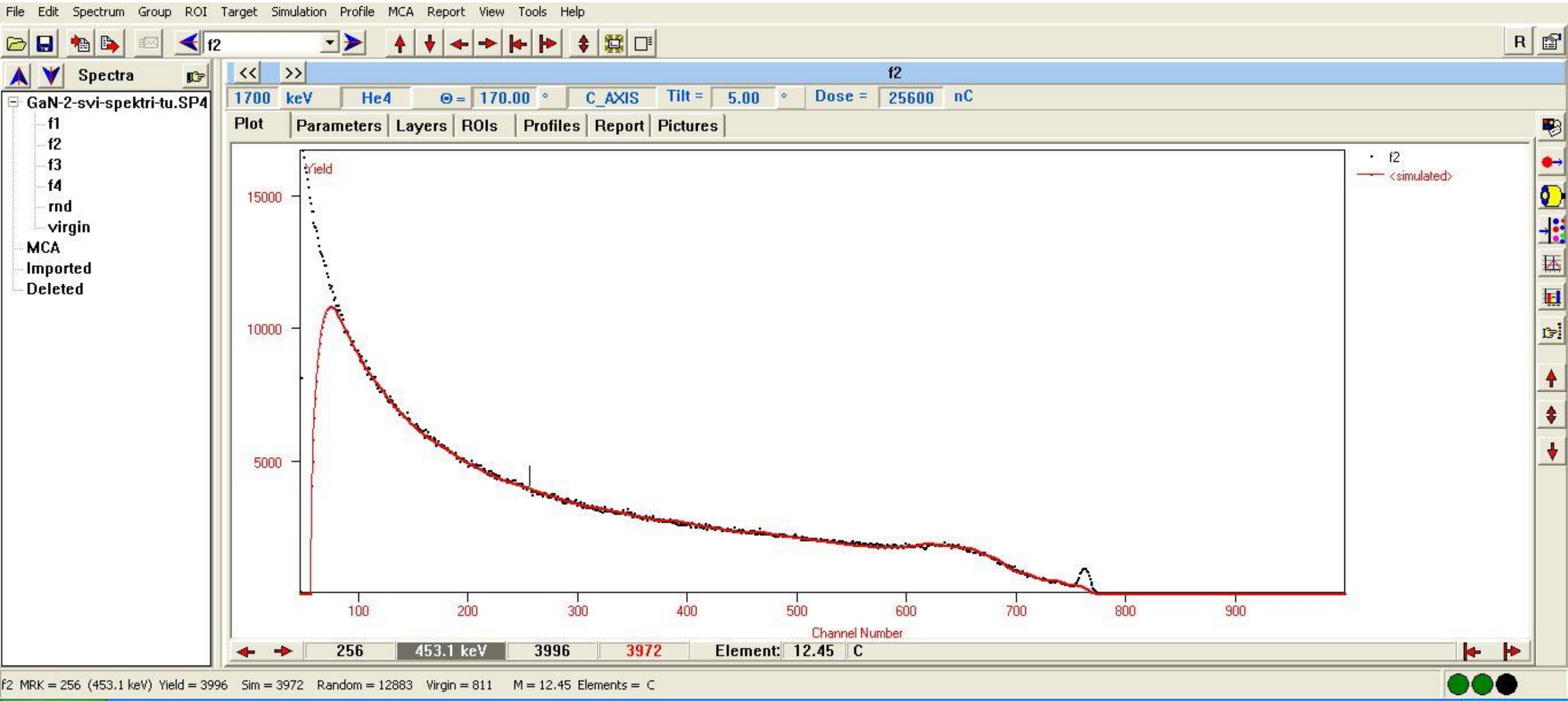
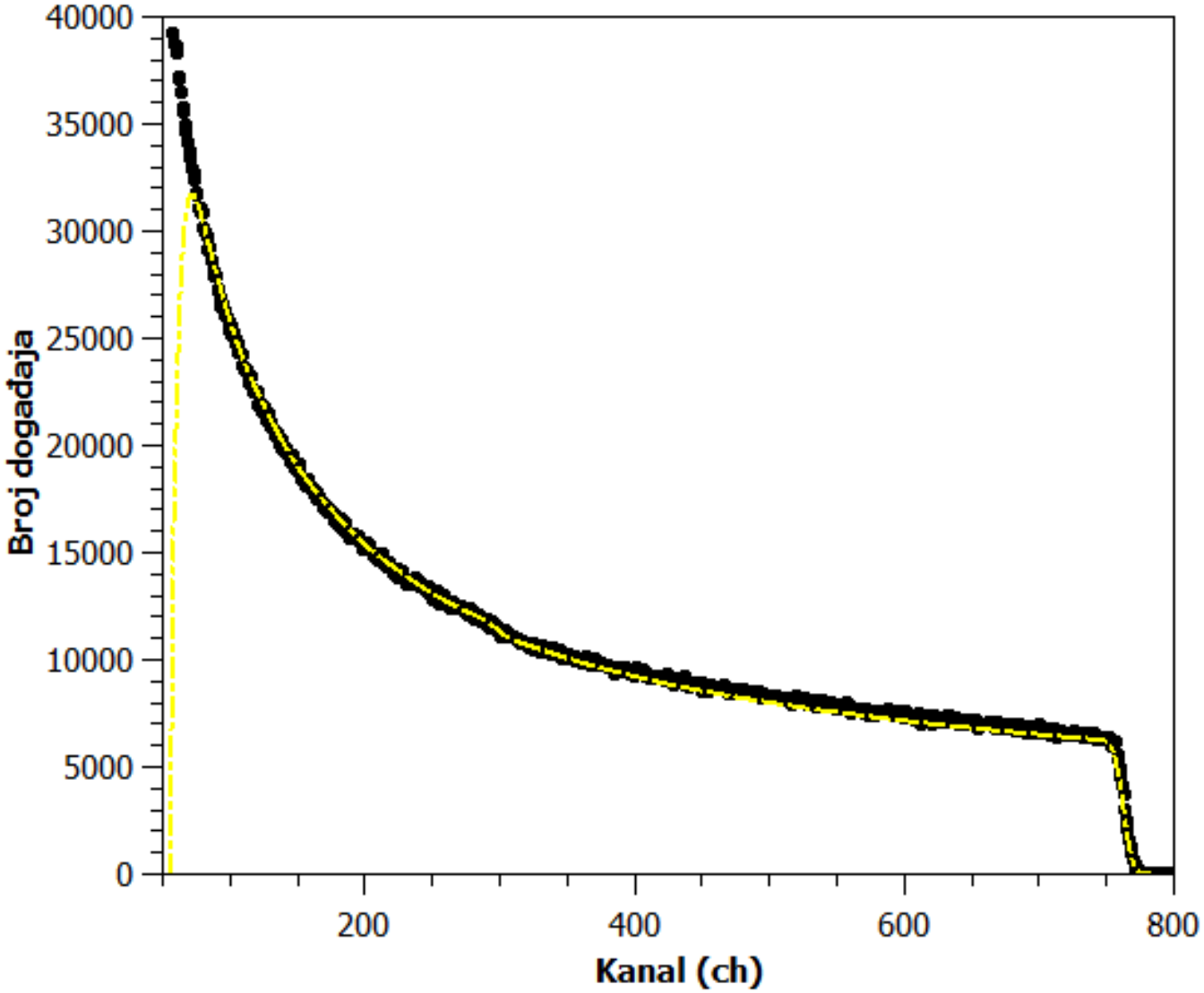


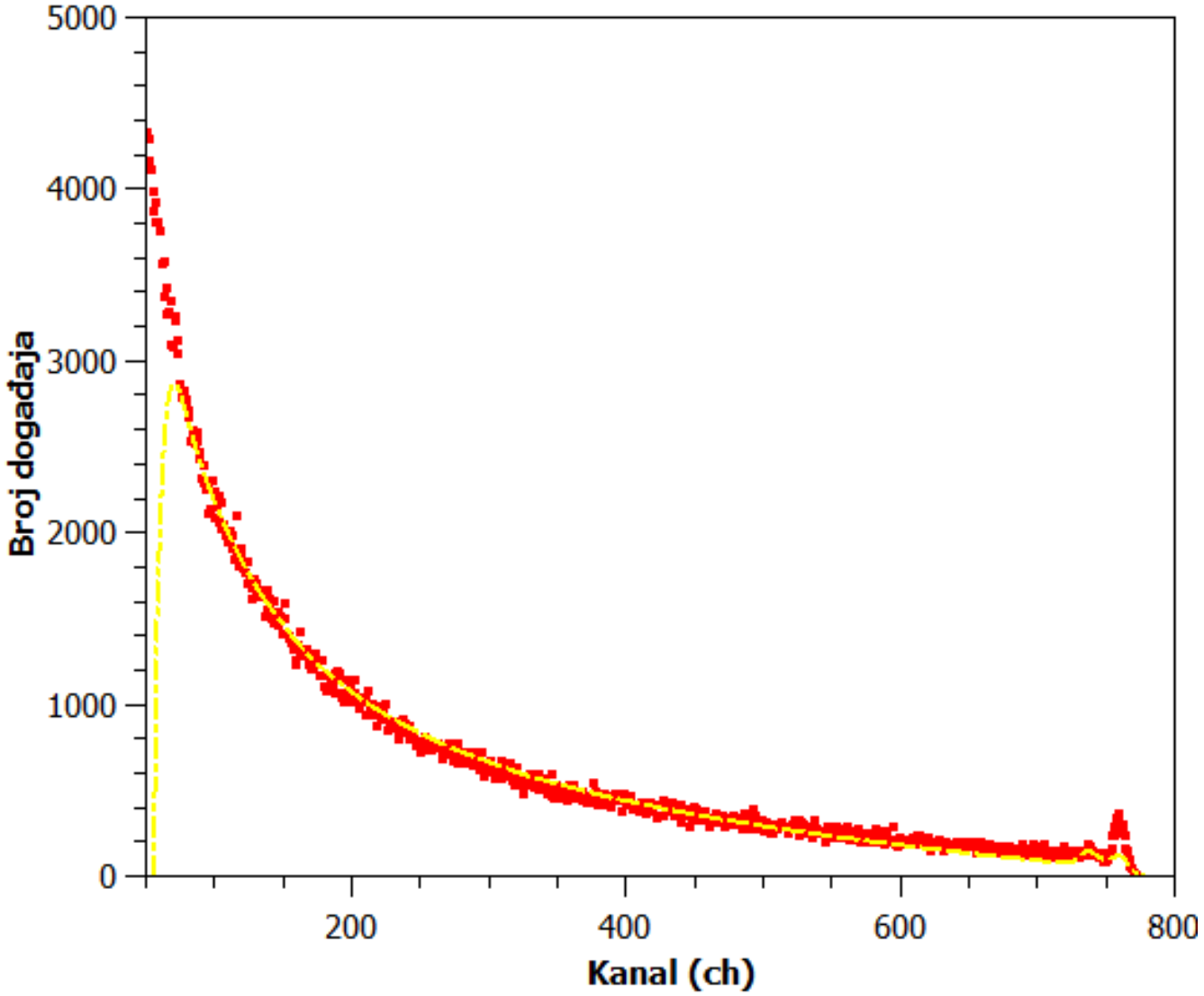
GaN: spektar u proizvoljnom kutu

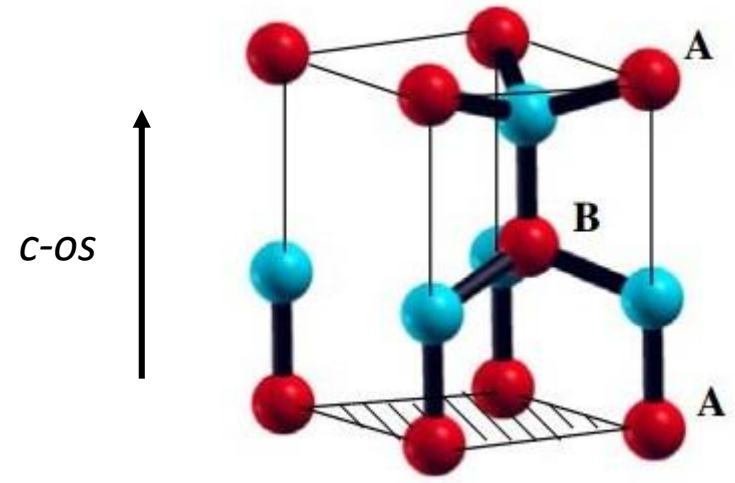


<u>Doza</u>: 25600 nC

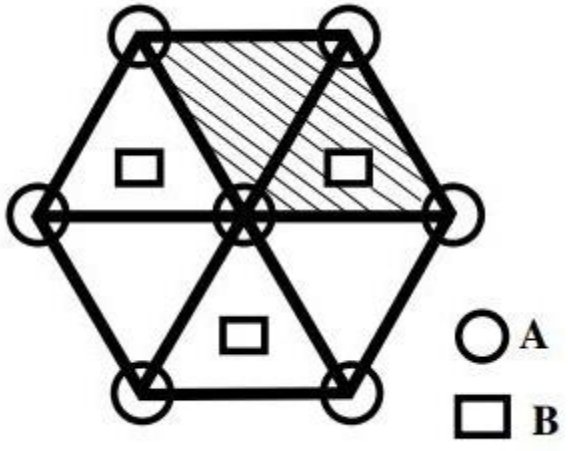
<u>Energijska kalibracija</u>: 1.770 keV/kanal

GaN: RBS/c spektar neozračenog uzorka





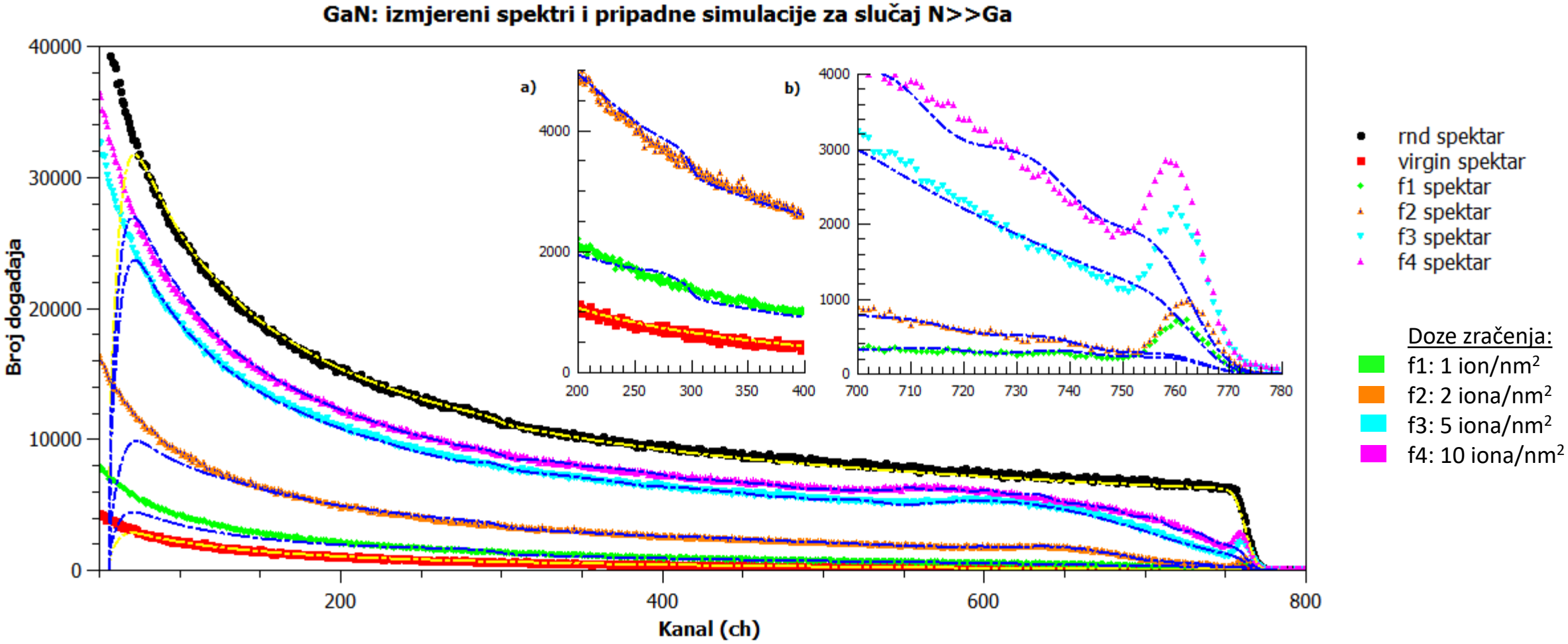
Wurtzitska struktura



⊙ *c-os*

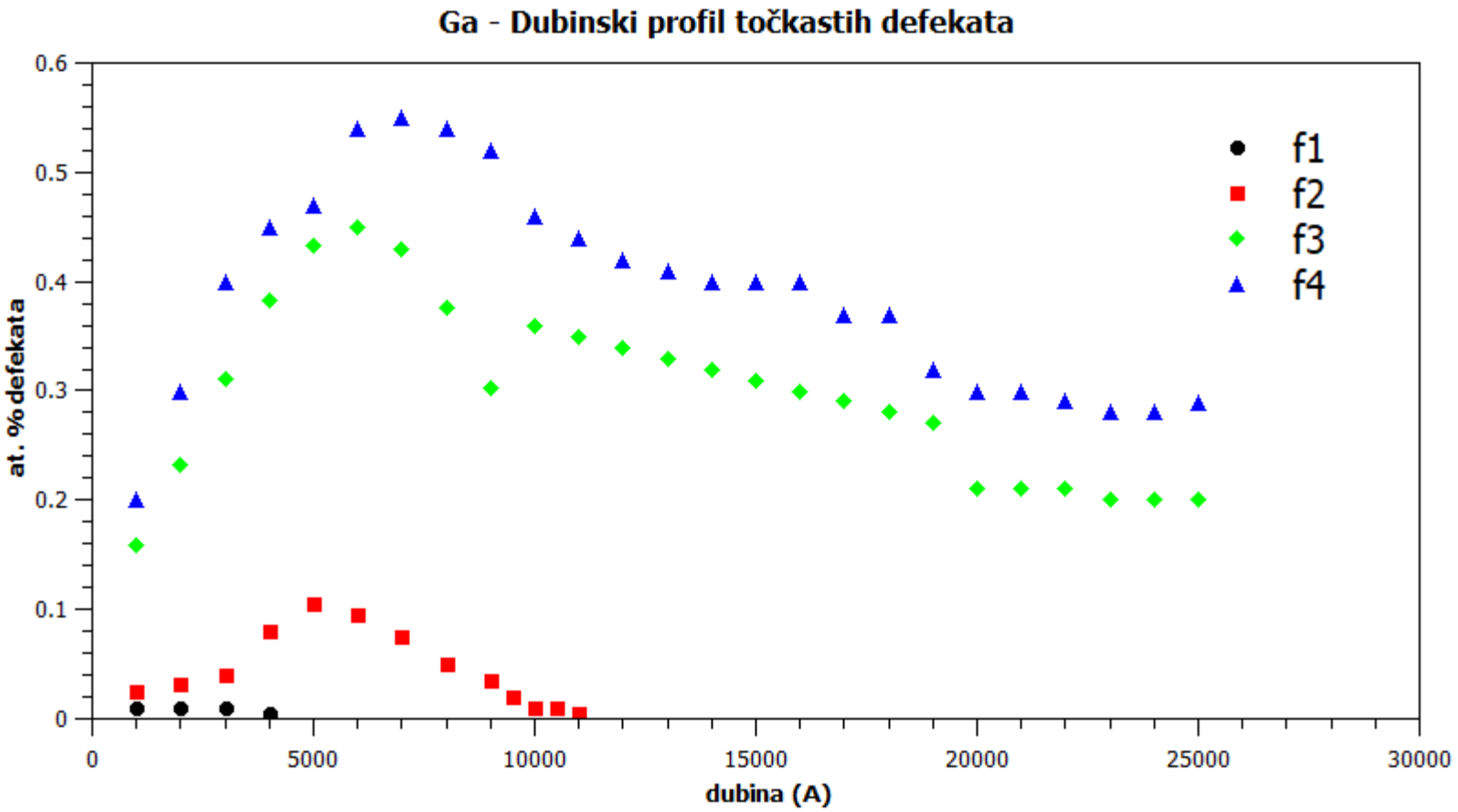
GaN: RBS/c spektri ozračenih uzoraka

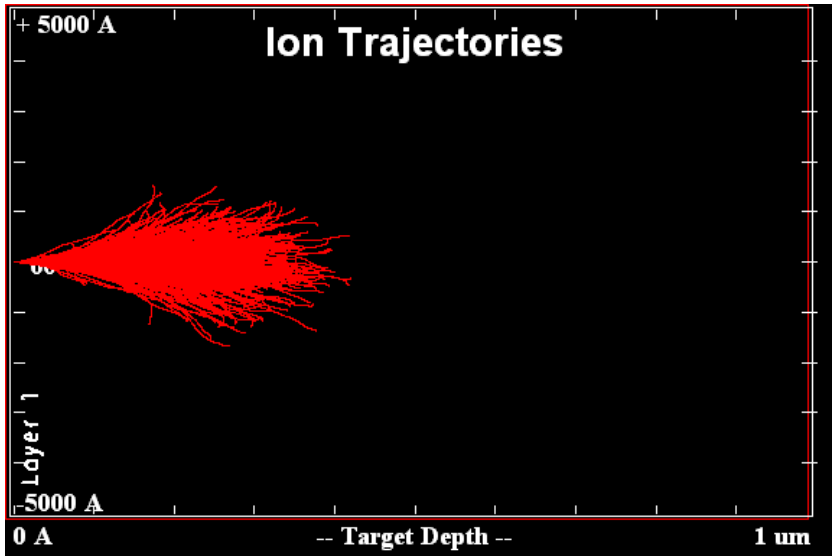
Udio defekata N>>Ga



GaN: RBS/c spektri ozračenih uzoraka

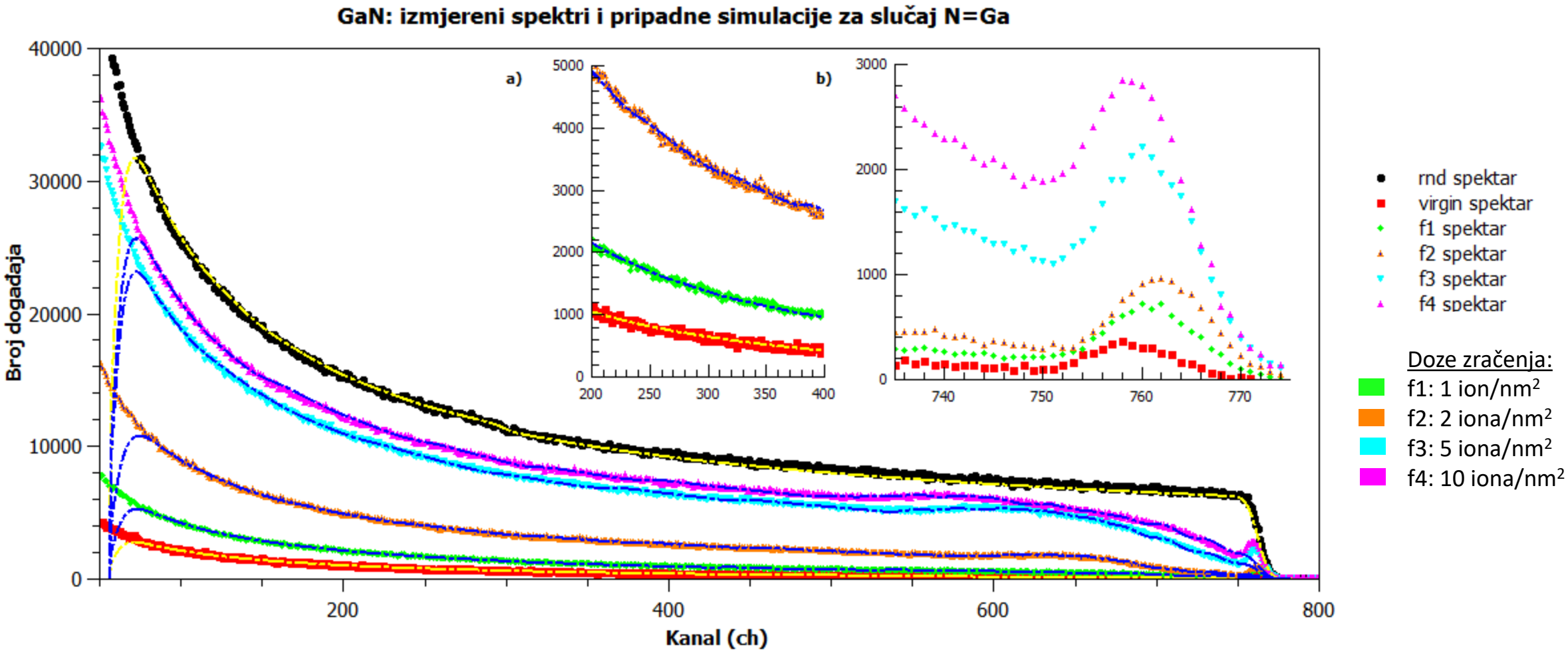
Udio defekata N>>Ga





GaN: RBS/c spektri ozračenih uzoraka

Udio defekata N=Ga



GaN: RBS/c spektri ozračenih uzoraka

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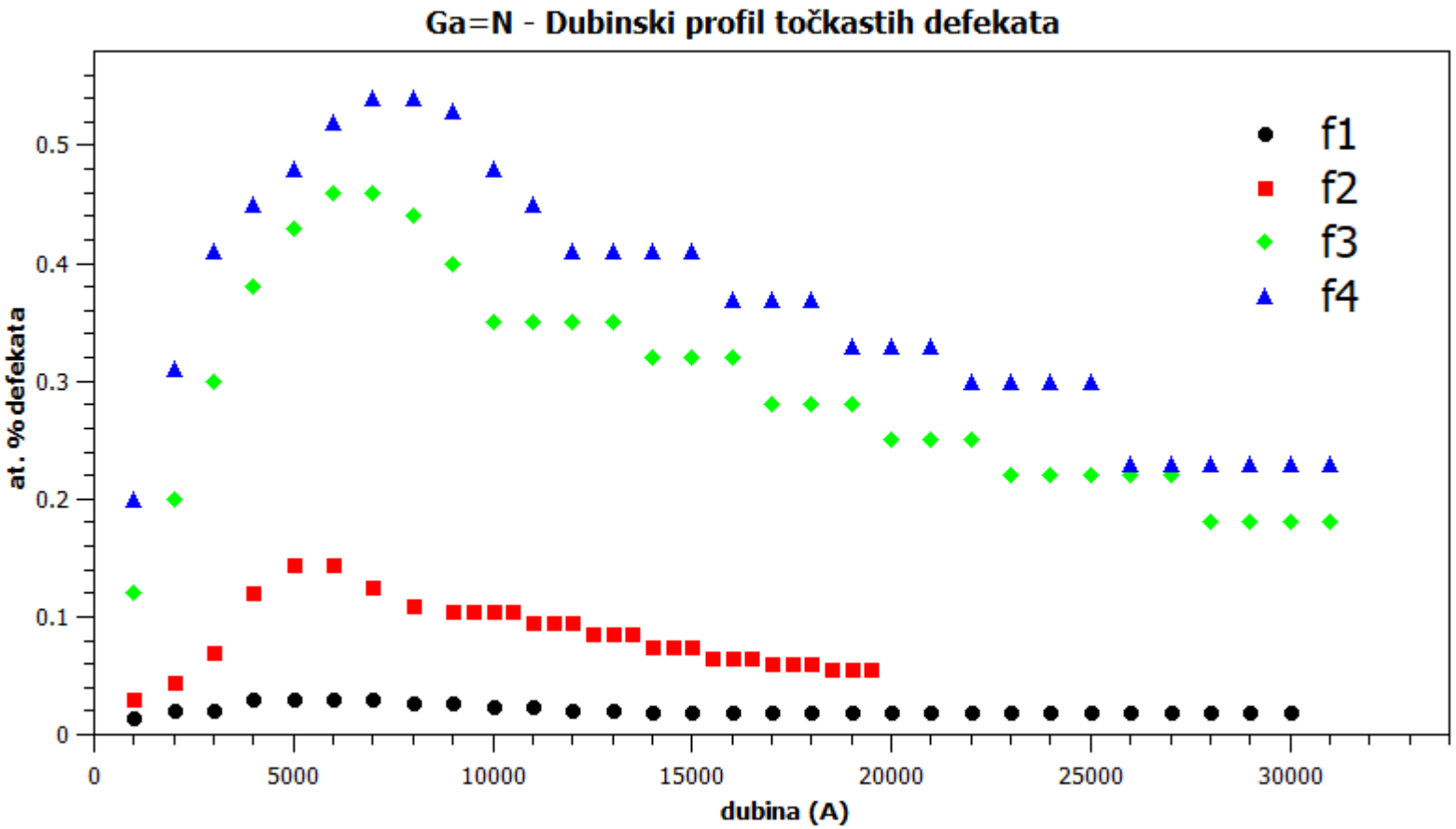

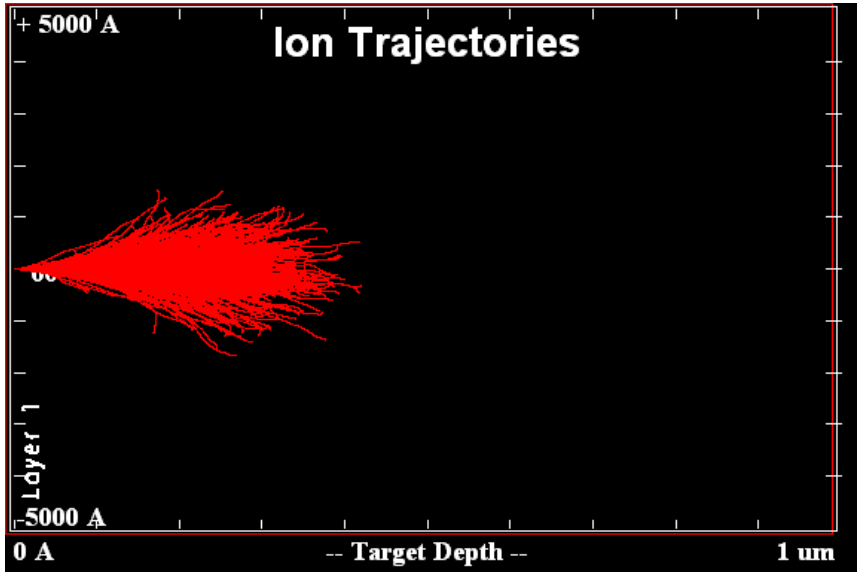

Hvala na pozornosti!

Pitanja?