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NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH Section A

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Institute of High Energy Physics, Chinese Academy of Sciences, Beijing 100049, China
Institute of Remote Sensing Applications, Chinese Academy of Sciences, Beijing 100101, China
Graduate University of Chinese Academy of Sciences, Beijing 100049, China

Abstract

PACS:

Keywords:

1. Introduction

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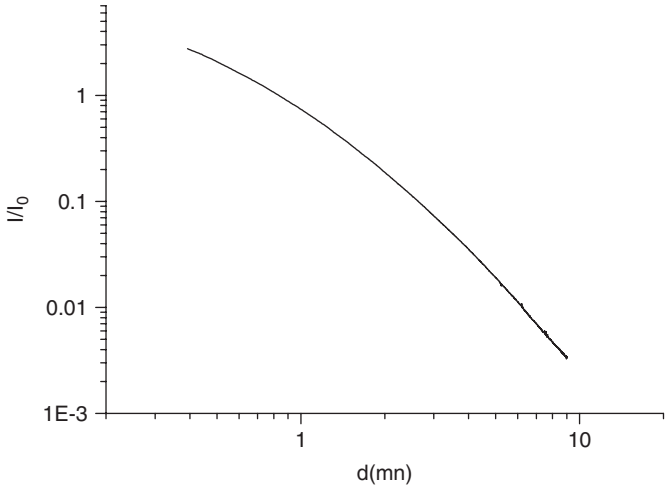
E-mail address:

2. Experiment method and mathematical model

2.1. Experimental geometry and components



2.2. Basic equations

$$I(d) = a\int_{E}^{E} f(E)\ ^{-\mu(E)d}E[\ -\ ^{-\mu_g(E)D}]\ E$$

$$I(d) = a\int_{E}^{E} \frac{f(E)[\ -\ ^{-\mu(E)w\ \ (\theta)}]}{\mu(E)w\ \ (\theta)} \times E[\ -\ ^{-\mu_g(E)D}]\ ^{-\mu(E)d}\ E \qquad (\ )$$

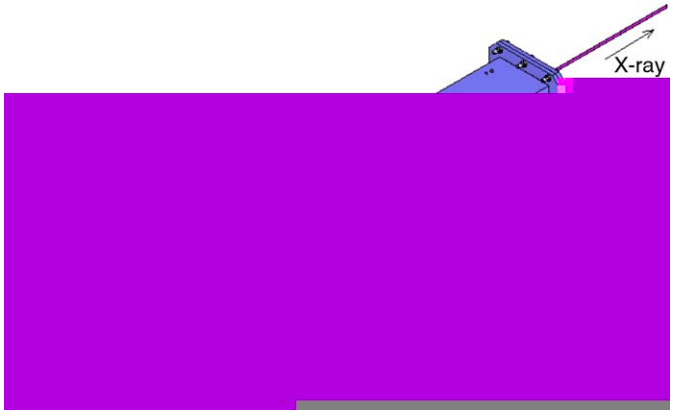
$$I(d) = a\int_{\mu}^{\mu} g(\mu)\ ^{-\mu d}\ \mu$$

$$g(\mu) = \frac{f[E(\mu)]E(\mu)\ ^{-\mu_g E(\mu)D}[\ -\ ^{-\mu w\ \ (\theta)}]}{\mu w\ \ (\theta)}\frac{E}{\mu}$$

$$y = Ax$$

$$y = \begin{pmatrix} I(d\ ) \\ \vdots \\ I(d_m) \end{pmatrix}, \quad x = \begin{pmatrix} g(\mu\ ) \\ \vdots \\ g(\mu_m) \end{pmatrix}$$

$$A = a\triangle\mu\begin{pmatrix} ^{-\mu\ d} & \cdots & ^{-\mu_n d} \\ \vdots & \vdots & \vdots \\ ^{-\mu\ d_n} & \cdots & ^{-\mu_n d_n} \end{pmatrix}. \qquad (\ )$$



3. Regularized solution methods

$(Lg)(\mu) = I(d)$.

$\|Lg - I\|_L + \alpha\|g\|_W \rightarrow$

$\|\bullet\|$

g

L . α

g

$[\mu\ , \mu\ ]$. g

$[\mu\ , \mu\ ]$.

$$\alpha[g''(r) - g(r)] - \int_{\mu}^{\mu} \bar{k}(\mu, v)g(v)\ \ v = \bar{I}(d)$$

$g'(\mu\ ) =\ ,\quad g'(\mu\ ) =$

$$\bar{k}(\mu, v) = \int_{\mu}^{\mu} k(\mu, d)k(v, d)\ \ d$$
$$\bar{I}(d) = -\int_{\mu}^{\mu} k(\mu, d)I(d)\ \ d$$
$k(\mu, d) = a^{\ -\mu d}$.

g.

$$L^*Lg + \alpha Hg = L^*I$$

L^* L H

$$H = \begin{pmatrix} +\ /h & -\ /h & & & \\ -\ /h & +\ /h & -\ /h & & \\ & \ddots & \ddots & \ddots & \\ & & -\ /h & +\ /h & -\ /h \\ & & & -\ /h & +\ /h \end{pmatrix}$$

h

$L^*L + \alpha H$

$\alpha >$.

α

α^*

$\Psi(\alpha) = \|Lg_\alpha - I\|_L - \delta$

δ (,).

$\Psi(\alpha)$

α^*

$$\alpha_{k+\ } = \alpha_k - \frac{\Psi(\alpha_k)}{\Psi'(\alpha_k) + (\Psi'(\alpha_k)\ -\ \Psi(\alpha_k)\Psi''(\alpha_k))^{\ /}}$$

$\beta(\alpha) = \|g_\alpha\|$

$\Psi'(\alpha) = -\alpha\beta'(\alpha)$

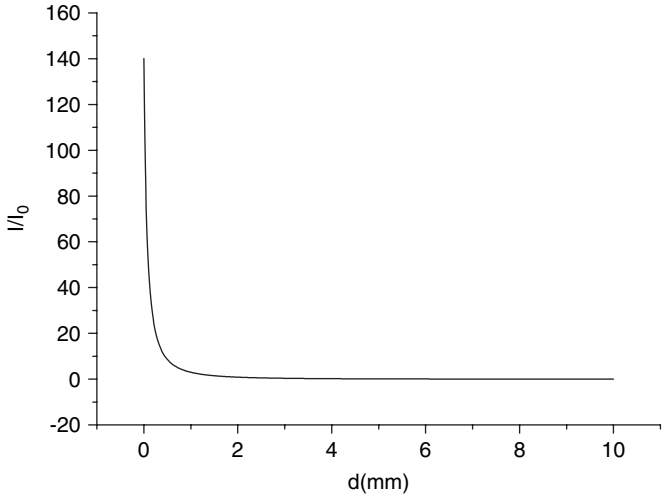
$$\Psi''(\alpha) = -\beta'(\alpha) -\ \alpha\left[\left\|\frac{g_\alpha}{\alpha}\right\|\ + \left(g_\alpha, \frac{g_\alpha}{\alpha}\right)\right]$$

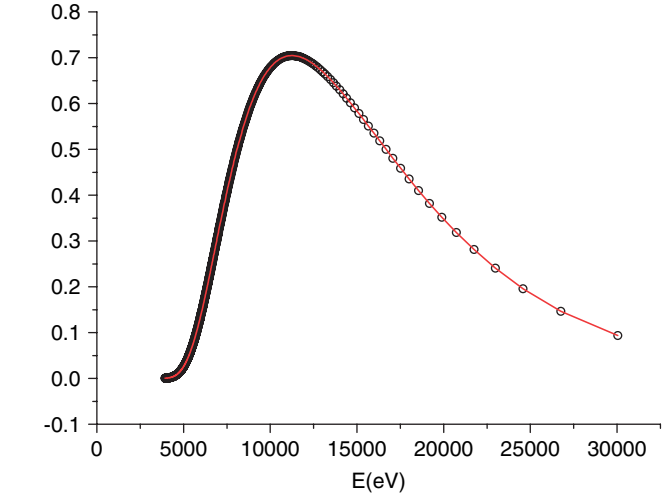
$g_\alpha,\ \ g_\alpha/\ \alpha,\quad g_\alpha/\ \alpha$

$$(A\ \ A + \alpha H)g_{\alpha_k} = A\ \ I \qquad (\ \ )$$
$$(A\ \ A + \alpha H)g'_{\alpha_k} = -Hg_{\alpha_k} \qquad (\ \ )$$
$$(A^TA + \alpha H)g''_{\alpha_k} = -\ Hg'_{\alpha_k}. \qquad (\ \ )$$

$A\ \ A + \alpha H$
$g_\alpha,\ \ g_\alpha/\ \alpha,\quad g_\alpha/\ \alpha$

4. Numerical theoretical simulation


160
140
120
100
80
60
40
20
0
-20
I/I0
0
2
4
6
8
10
d(mm)


0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
0
5000
10000
15000
20000
25000
30000
E(eV)

5. Results and discussion

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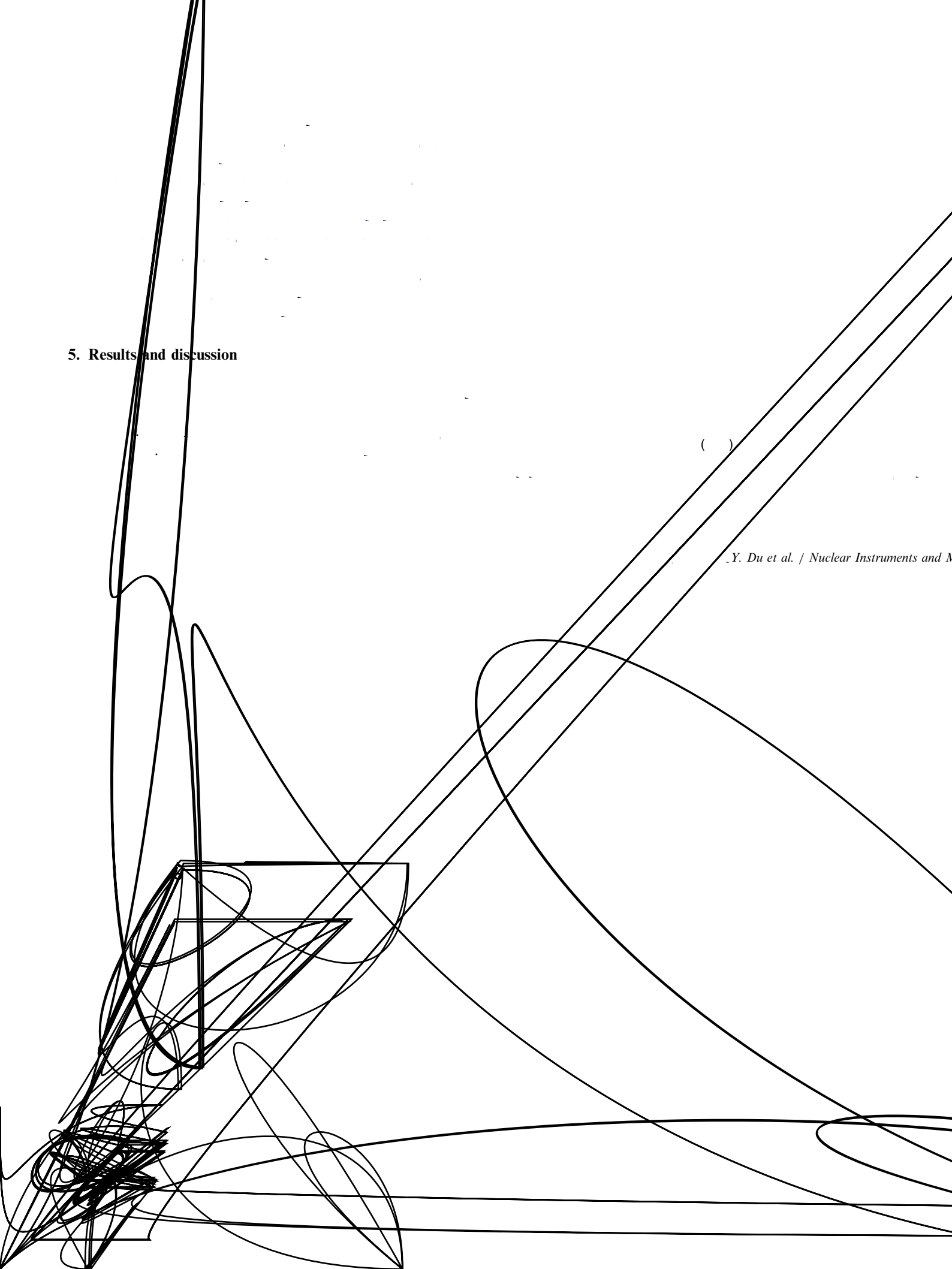

References

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Acknowledgment