DAFTAR PUSTAKA

[1] R. D. Riupassa dan K. Basar. "Simulasi Interaksi Elektron dengan Bahan Berbasis Single Scattering Model". *Seminar Fisika Nasional*, hal. 398-403, Bandung, 14-15 Desember 2016.

[2] R. D. Riupassa dan M. M. Mutoffar. "Studi Interaksi Partikel Beta Dari Sumber Ni-63 Dengan Sambungan p-n Si Pada Baterai Nuklir Betavoltaic". *SISTEMIK*, Vol. 6, hal. 1–6, 2018.

[3] Suharni, dkk. "Kajian penentuan kedalaman penetrasi berkas elektron 350 keV pada hidrogel untuk pembalut luka", *PPI-PDIPTN*, 399-406, Yogyakarta, 10 Juli 2007.

[4] R. Saptaaji. "Penentuan Kedalaman Penetrasi Berkas Elektron 800 keV Dalam Gas Buang PLTU Pada Sistem Pengolahan Gas Buang Menggunakan Mesin Berkas Elektron". *Jurnal Forum Nuklir (JFN)*, Vol. 2, No.1:51-62, 2008.

[5] O. Kurniawan dan V. K. S. Ong. "Investigation of Range-energy Relationships for Low energy Electron Beams in Silicon and Gallium Nitride". *Scanning*, Vol. 29, No. 6: 280–286, 2007.

[6] A. Bentabet dan N. Bouarissa. "Backscattering coefficients and mean penetration depths of 1–4 keV electron scattering in solids". *Applied Physics A*, Vol. 88, No.2: 353–358, 2007.

[7] J. Goldstein *dkk*. "*Scanning Electron Microscopy and X-Ray Microanalysis*". Springer, New York, 2003.

[8] R. Gautreau dan W. Saavin. "*Teori dan soal-soal Fisika Modern*", Erlangga, Jakarta, 1995.

[9] T. A. Manik. *Perhitungan Cross Section Hamburan Elektron-Atom dengan menggunakan Analisi Gelombang Parsial*. Skripsi, Universitas Sumatra Utara, hatra Utara, 2010.

F. Kapraun. "*Monte Carlo Techniques for Predicting Electron kscattering*", Tesis, Departemen Fisika, North Carolina University, New k, 2001.

[11] H. Y. Chang, A. Alvarado, dan J. Marian. “Calculation of secondary electron emission yields from low-energy electron deposition in tungsten surfaces”, *Applied Surface*, Vol. 450, No.2: 190–199, 2018.

[12] B. G. Mendis. *Electron Beam-Specimen Interactions and Simulation Methods in Microscopy*. Wiley, Hoboken, 2018.

[13] D. C. Joy. “*Monte Carlo Modelling for Electron Microscopy and Microanalysis*”, Oxford University Press, England, 1995.

[14] M. Dapor. *Computer simulation of electron transport in solids with applications to materials analysis and characterization*. Doctoral Thesis, University of Trento, Department of Industrial Engineering, Italy, 2013.

[15] J. He. *A Study of the Electron Beam Scattering Under Various Gaseous Environment*. Thesis, University of Tennessee, Knoxville, 2003.

LAMPIRAN 1

1. Program Simulasi

```
clear
clc

//Nama Atom bahan
Na=6*10^23
E=10//Energi Kinetik
Rho=2.7//Densitas
A=27//nomor massa
Zm=13//nomor atom
N=1000//Jumlah Elektron Awal
m=1
t=2//Jumlah Iterasi(Tunggal)
tebal=1*(1E8)//Dalam Satuan Nano Meter

X=zeros(N,2)
Y=zeros(N,2)
Z=zeros(N,2)
c=sqrt(2*E/m)
J=(9.67*Zm+(58.5/Zm^0.19))*10^-3//potensial ionisasi
alfa=3.4*(10^-3)*(Zm^0.67/E)//screening factor
cros=((5.21*(10^-
21))*(Zm^2/E^2)*(4*%pi/(alfa*(1+alfa)))*((E+511/E+1024)^2))//rutherford
elastic cross section
RND=rand(N,t)
cospi=1-((2*alfa*RND)./(1+alfa-RND))//Sudut Hamburan
lambda=(A/Na*Rho*cros)*(10^7)//Jarak Bebas Rerata
step=-lambda*log(RND)//Jarak Hamburan satu dengan yang lain
sins=sqrt(1-cospi.*cospi)
psi=2*%pi*RND//sudut azimut
S=(-78500)*(Zm/(A*E))*log((1.66*(E+(0.85*J)))/J)//Daya Perlambatan
for mt=2:1:t//Iterasi Mulai
cz(:,mt-1)=c*cos(psi(:,mt-1))
cx(:,mt-1)=c*sin(psi(:,mt-1)).*cospi(:,mt-1)
cy(:,mt-1)=c*sin(psi(:,mt-1)).*sins(:,mt-1)
                /cz)
                qrt(1+(An.*An))
                1)=An(:,mt-1).*sins(:,mt-1)
                1)=An(:,mt-1).*Am(:,mt-1).*sins(:,mt-1)
                1)=cos(psi(:,mt-1))
```

```
V4(:,mt-1)=sin(psi(:,mt-1))
ca(:,mt-1)=(cx(:,mt-1).*cospi(:,mt-1))+(V1(:,mt-1).*V3(:,mt-1))+(cy(:,mt-
1).*V2(:,mt-1).*V4(:,mt-1))
cb(:,mt-1)=(cy(:,mt-1).*cospi(:,mt-1))+(V4(:,mt-1).*((cz(:,mt-1).*V1(:,mt-1))-
(cx(:,mt-1).*V2(:,mt-1))))
cc(:,mt-1)=(cz(:,mt-1).*cospi(:,mt-1))+(V2(:,mt-1).*V3(:,mt-1))-(cy(:,mt-
1).*V1(:,mt-1).*V4(:,mt-1))
for mN=1:1:N
    if Z(mN,mt-1)<= tebal
X(mN,mt)=X(mN,mt-1)+step(mN,mt-1).*ca(mN,mt-1)
Y(mN,mt)=Y(mN,mt-1)+step(mN,mt-1).*cb(mN,mt-1)
Z(mN,mt)=Z(mN,mt-1)+abs(step(mN,mt-1).*cc(mN,mt-1))
end
 if Z(mN,mt-1)> tebal
X(mN,mt)=X(mN,mt-1)
Y(mN,mt)=Y(mN,mt-1)
Z(mN,mt)=Z(mN,mt-1)
end
end
end
mt=1
for mt1=2:1:t
    for mt2=1:1:N

    mt=mt+1
end
end

for mt=1:1:N
    if Z(mt,t)>tebal

    end
end

for mt=1:1:N*(t-1)

end
Zhd=Z(:,t)
Zd=abs(Zhd)
zmd=min(min(Zhd))
zMd=max(max(Zhd))

)
:1:40
,1)=0
,1)=l*(mk-0.5)
```

```
for m=1:1:N
   if Zhd(m,1)>(mk-1)*l
      if Zhd(m,1)<mk*l
         kol(mk,1)=kol(mk,1)+1
      end
   end
end
end
plot(el1,kol,)
```