

ANNEX A Typical results of analyses for benchmark experiments at FNG

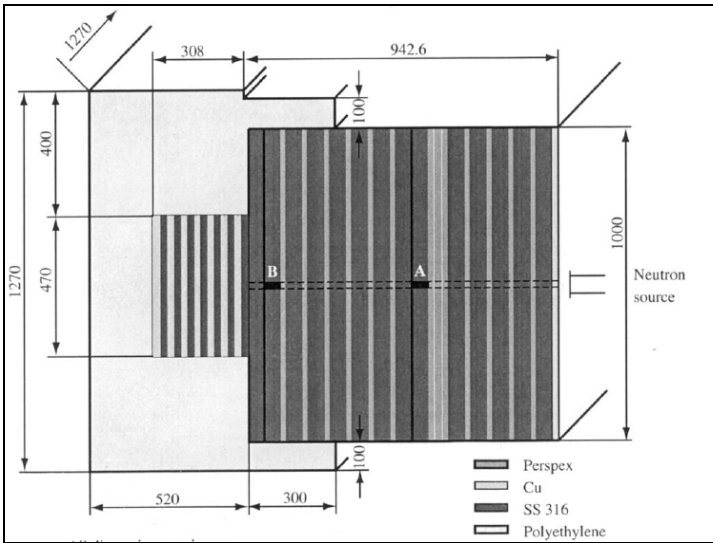


Fig. A1. Layout of the Bulk Shield Experiment

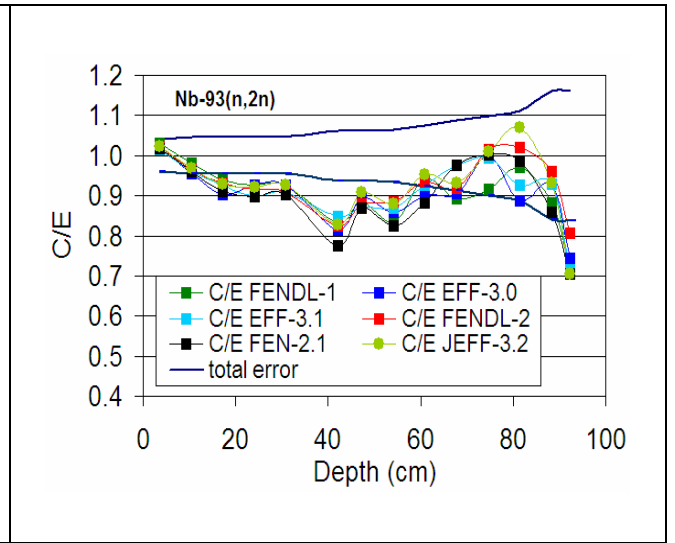


Fig. A2. C/E ratios for fast neutron flux ($E > \sim 10$ MeV) in the Bulk Shield Experiment measured by activation foils using the Nb-93(n,2n) reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

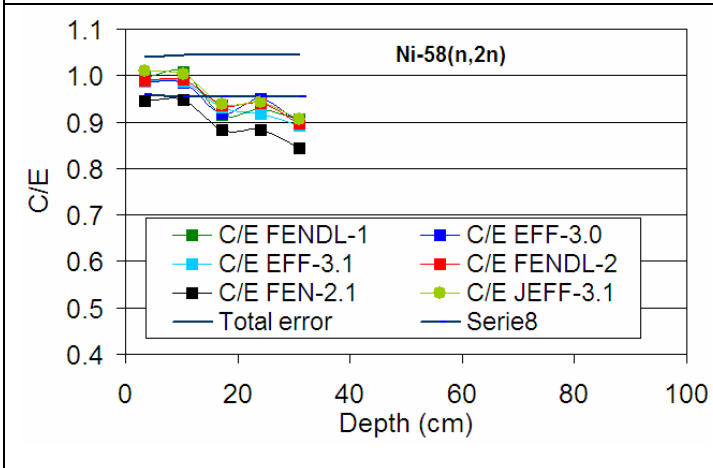


Fig. A3. C/E ratios for fast neutron flux ($E > \sim 10$ MeV) in the Bulk Shield Experiment measured by activation foils using the Ni-58(n,2n) reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

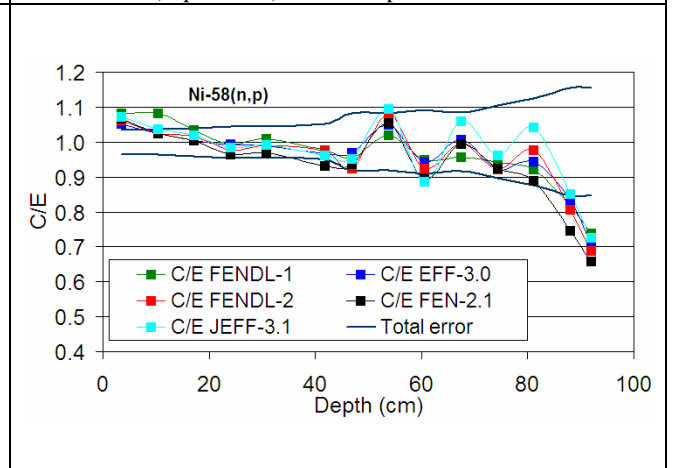


Fig. A4. C/E ratios for fast neutron flux ($E > \sim 1$ MeV) in the Bulk Shield Experiment measured by activation foils using the Ni-58(n,p) reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

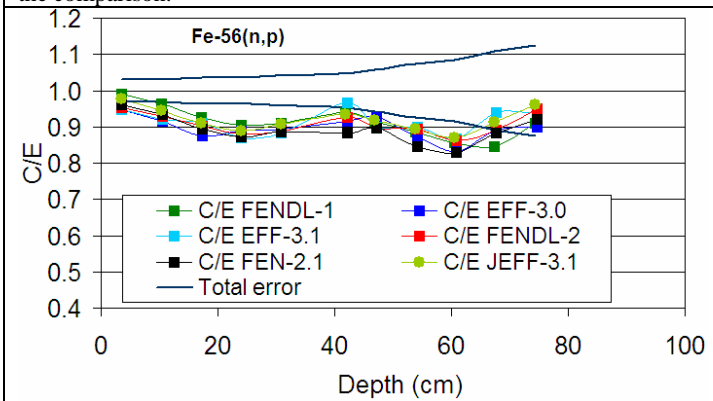


Fig. A5. C/E ratios for fast neutron flux ($E > \sim 1$ MeV) in the Bulk Shield Experiment measured by activation foils using the Fe-56(n,p) reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

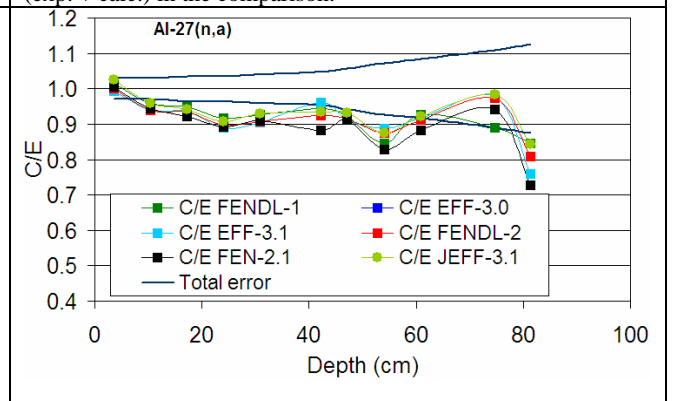


Fig. A6. C/E ratios for fast neutron flux ($E > \sim 3$ MeV) in the Bulk Shield Experiment measured by activation foils using the Al-27(n,a) reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

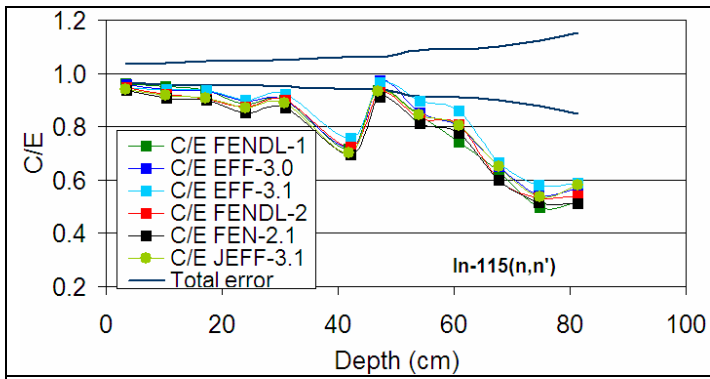


Fig. A7. C/E ratios for fast neutron flux ($E > \sim 0.5$ MeV) in the *Bulk Shield Experiment* measured by activation foils using the $\text{In-115}(n,n')$ reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

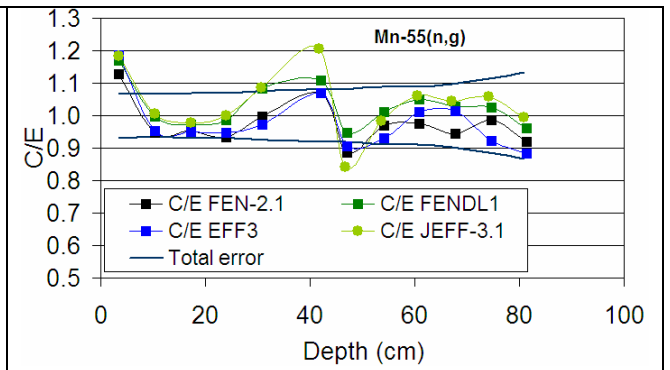


Fig. A8. C/E ratios for low energy neutron flux ($E \sim \text{eV}$) neutron flux in the *Bulk Shield Experiment* measured by activation foils using the $\text{Mn-55}(n,g)$ reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

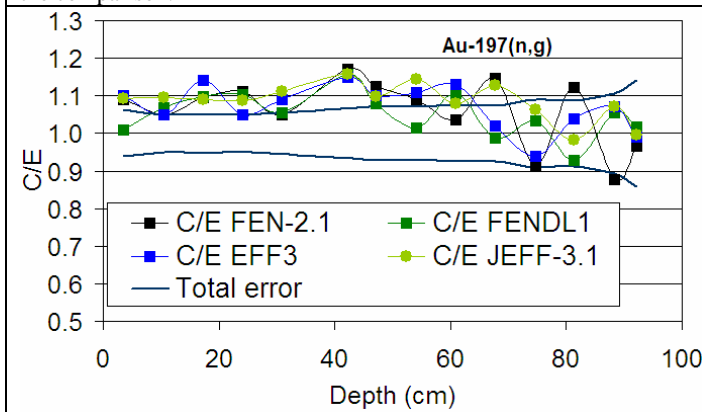


Fig. A9. C/E ratios for low energy neutron flux ($E \sim \text{eV}$) in the *Bulk Shield Experiment* measured by activation foils using the $\text{Au-197}(n,g)$ reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

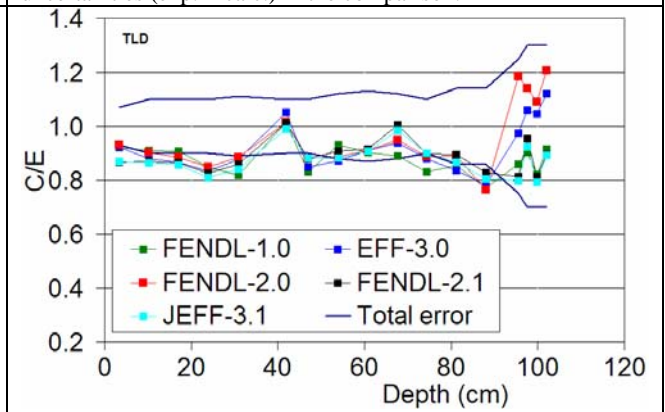


Fig. A10. C/E for nuclear heating in the *Bulk Shield Experiment*, as measured by thermoluminescent dose meters (TLD-300).

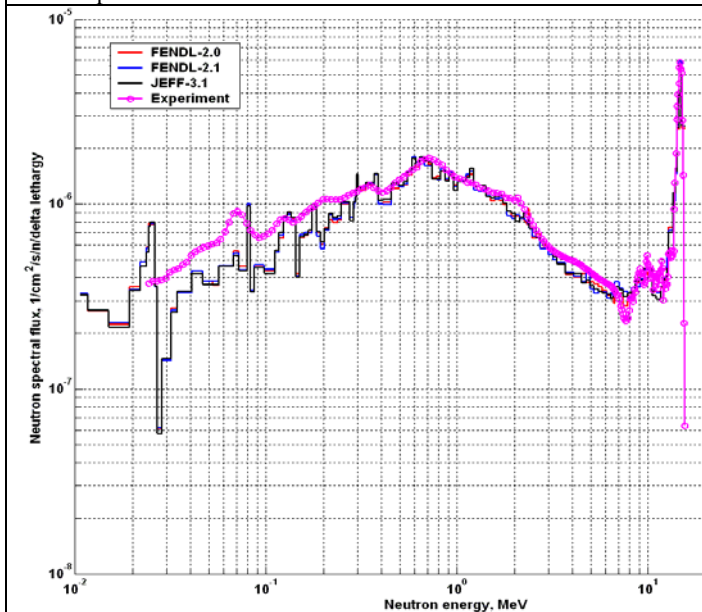


Fig. A11. Measured and calculated neutron flux spectrum in the *Bulk Shield Experiment* in Pos.A

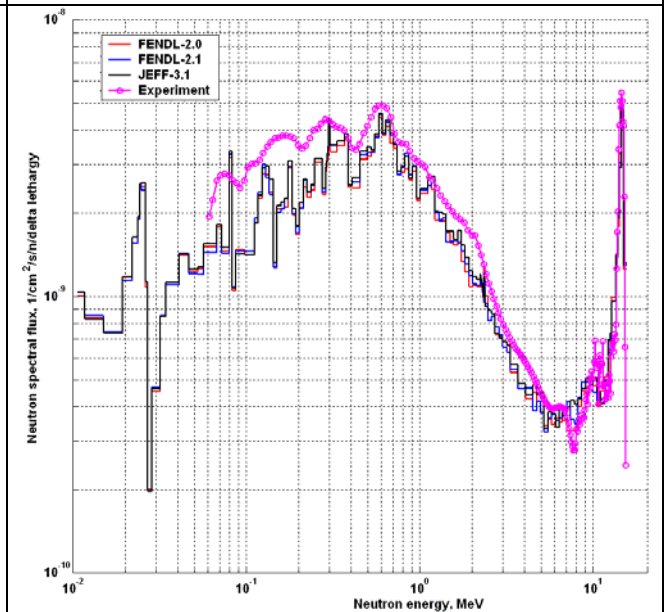


Fig. A12. Measured and calculated neutron flux spectrum in the *Bulk Shield Experiment* in Pos.B

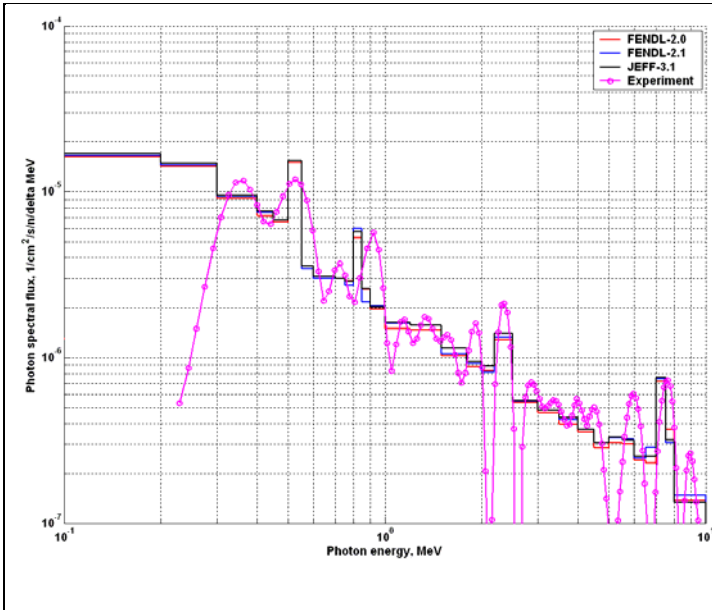


Fig. A13. Measured and calculated γ -ray flux spectrum in the Bulk Shield Experiment in Pos.A

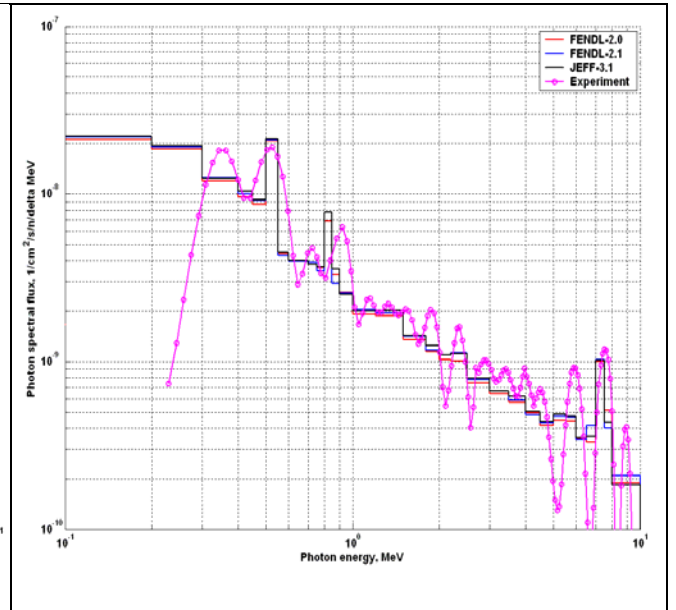


Fig. A14. Measured and calculated γ -ray flux spectrum in the Bulk Shield Experiment in Pos.B

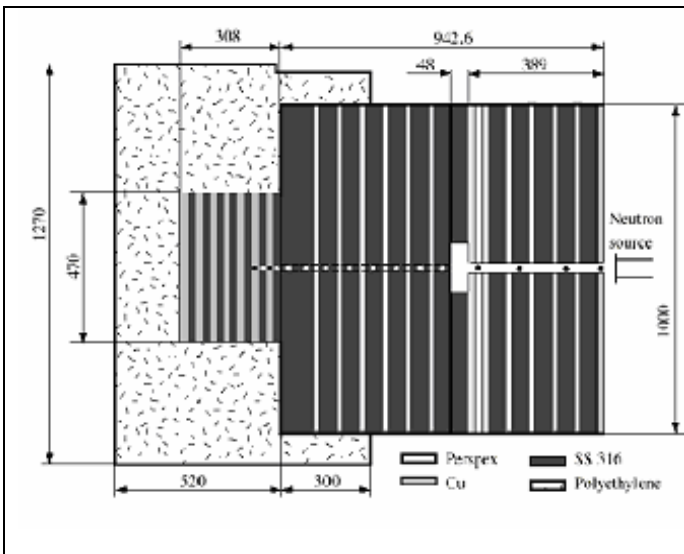


Fig. A15. Layout of the *Streaming Experiment* showing the position of activation foils and thermoluminescent detectors .

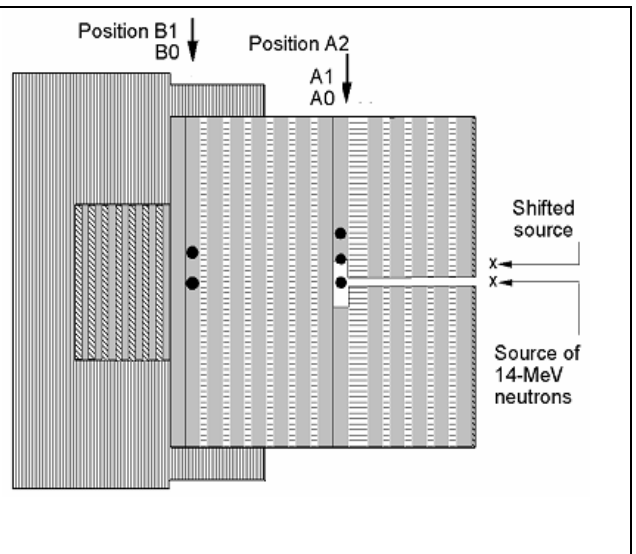


Fig. A16. Layout of the *Streaming Experiment* showing the position of detectors for neutron/ γ flux spectra measurements

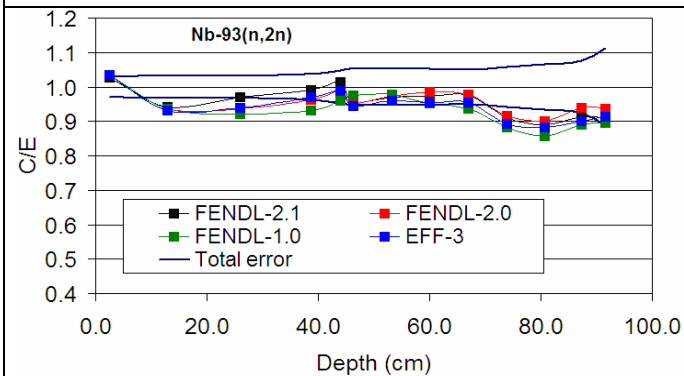


Fig. A17. C/E ratios for fast neutron flux ($E > \sim 10$ MeV) in the *Streaming Experiment* measured using the Nb-93(n,2n) activation reaction in the channel and in the shield behind the channel.

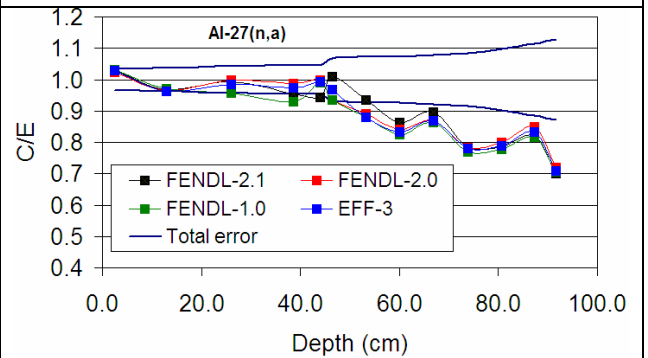


Fig. A18. C/E ratios for fast neutron flux ($E > \sim 3$ MeV) in the *Streaming Experiment* measured by the Al-27(n,a) activation reaction in the channel and in the shield behind the channel.

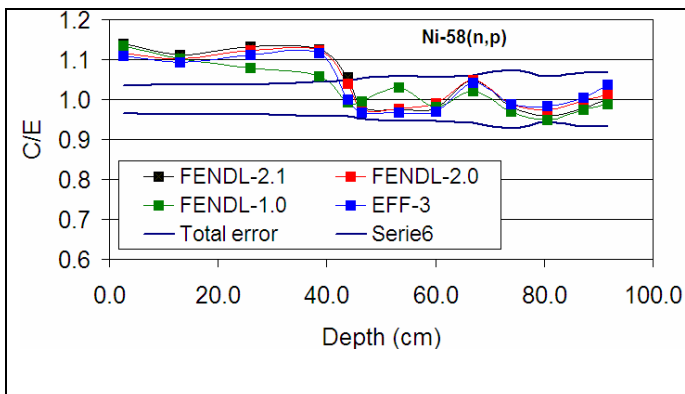


Fig. A19. C/E ratios for fast neutron flux ($E > 1$ MeV) in the *Streaming Experiment* measured by the Ni-58(n,p) activation reaction in the channel and in the shield behind the channel.

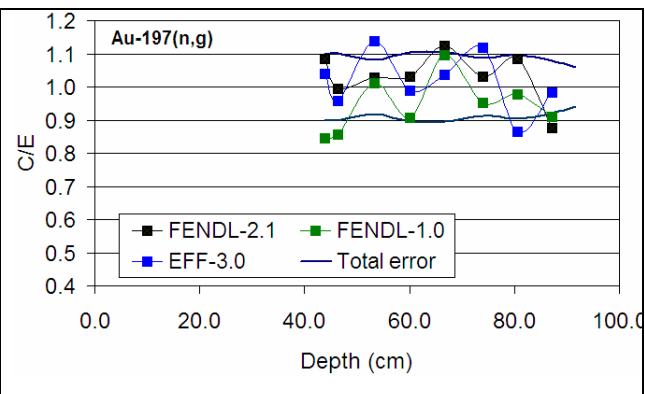


Fig. A20. C/E ratios for low energy neutron flux ($E \sim eV$) in the *Bulk Shield Experiment* measured using the Au-197(n,g) activation reaction behind the channel.

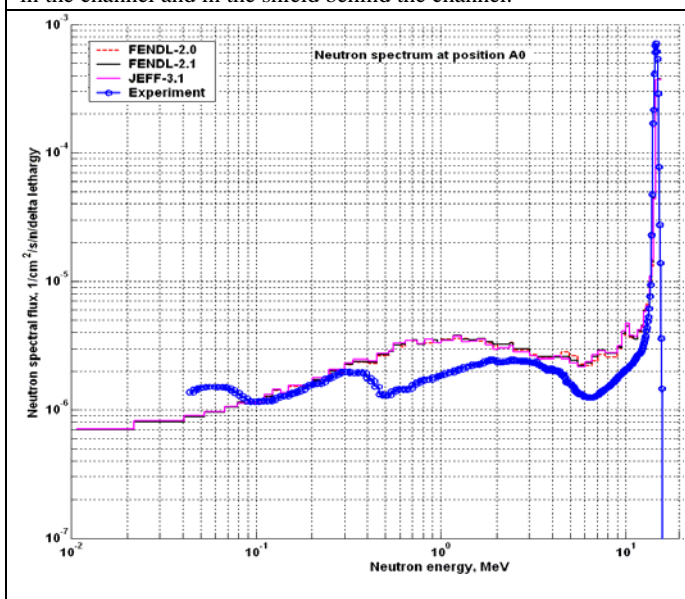


Fig. A21. Measured and calculated neutron flux spectrum in the *Streaming Experiment* in Position A0

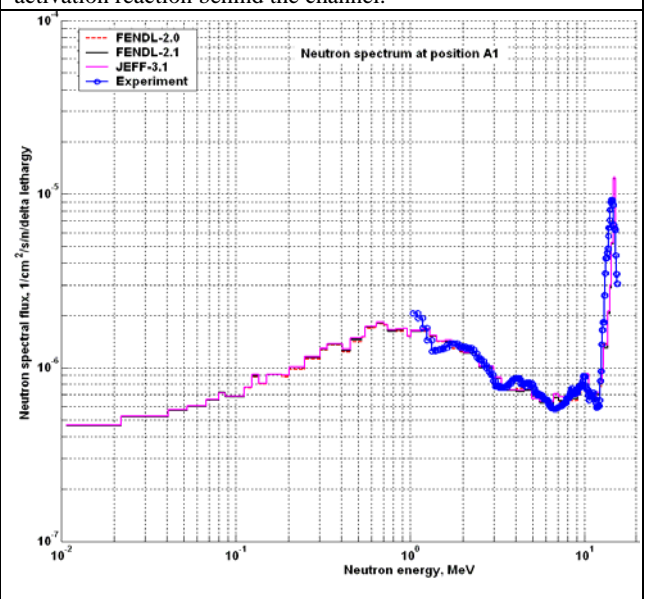


Fig. A22. Measured and calculated neutron flux spectrum in the *Streaming Experiment* in Position A1

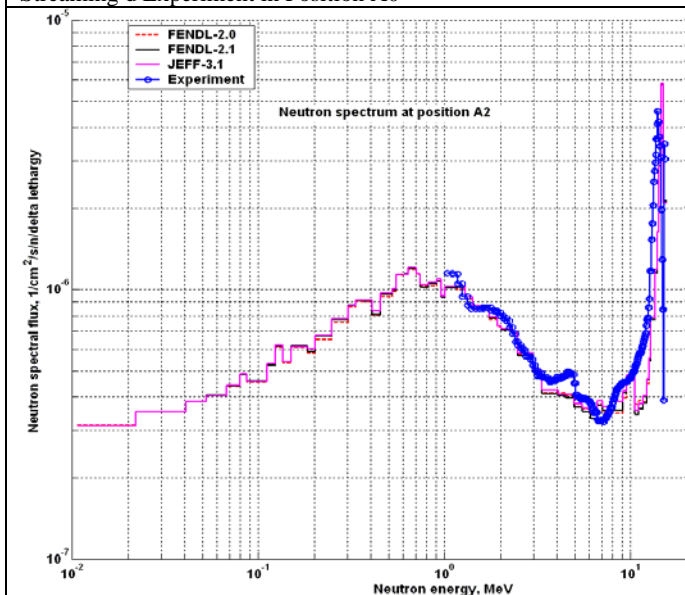


Fig. A23. Measured and calculated neutron flux spectrum in the *Streaming Experiment* in Position A2

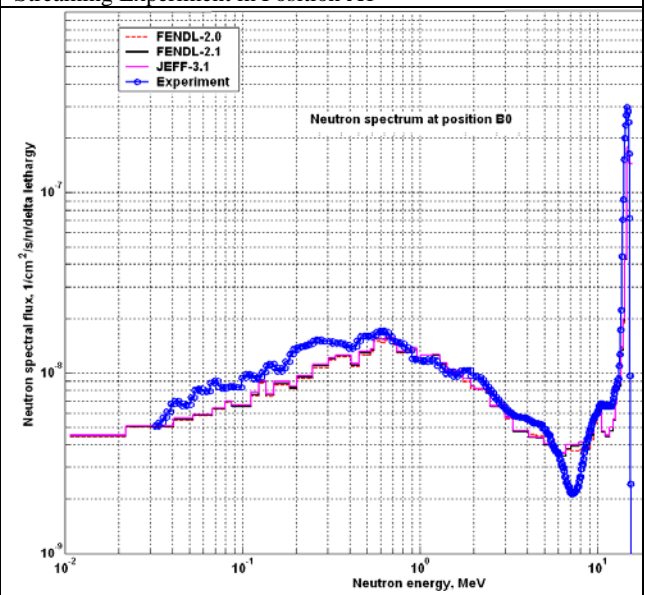


Fig. A24. Measured and calculated neutron flux spectrum in the *Streaming Experiment* in Position B0

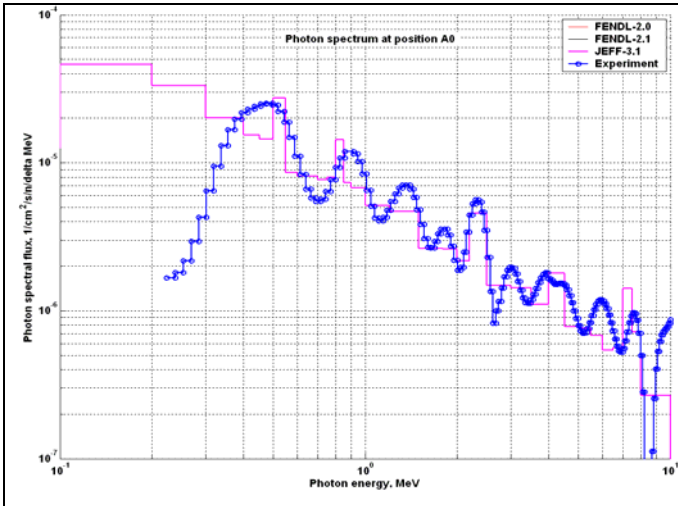


Fig. A25. Measured and calculated γ -ray flux spectrum in the Streaming d Experiment in Position A0

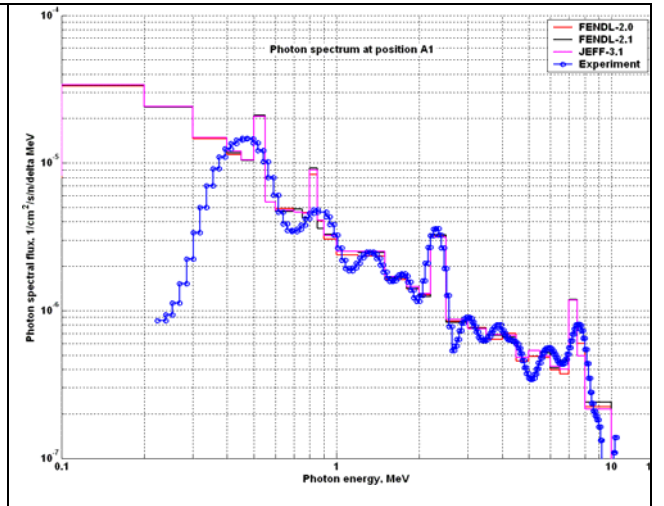


Fig. A26. Measured and calculated γ -ray flux spectrum in the Streaming Experiment in Position A1

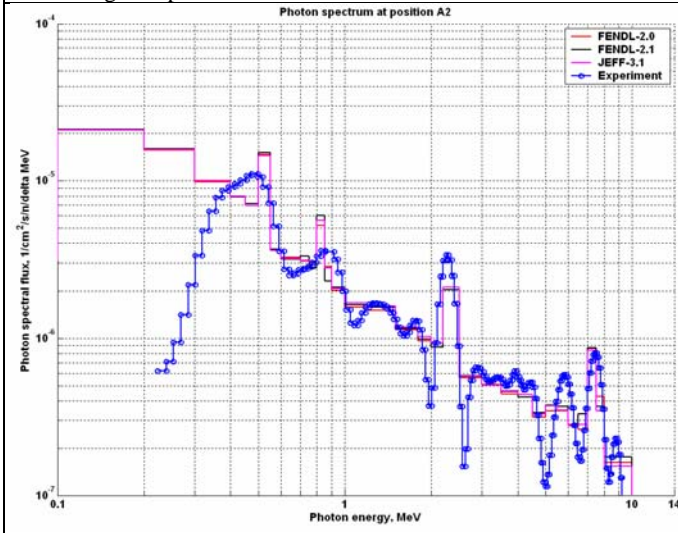


Fig. A27. Measured and calculated γ -ray flux spectrum in the Streaming d Experiment in Position A2

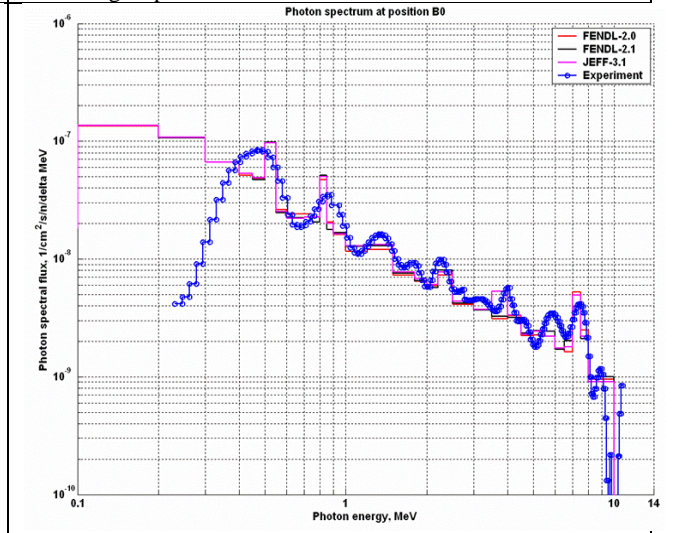


Fig. A28. Measured and calculated γ -ray flux spectrum in the Streaming Experiment in Position B0

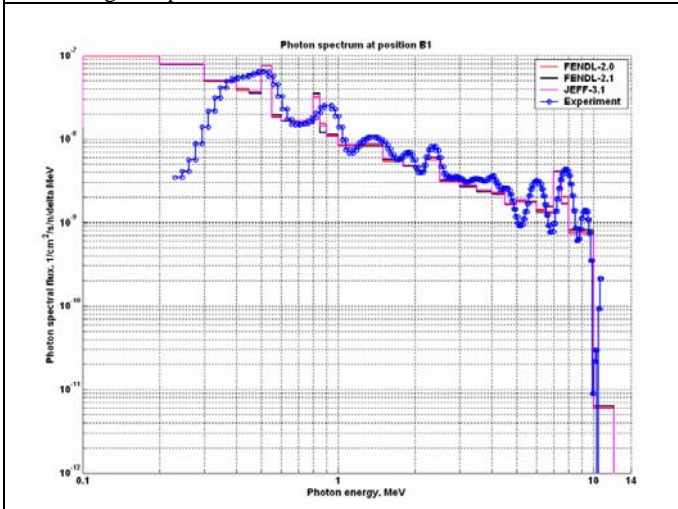


Fig. A29. Measured and calculated γ -ray flux spectrum in the Streaming Experiment in Position B1

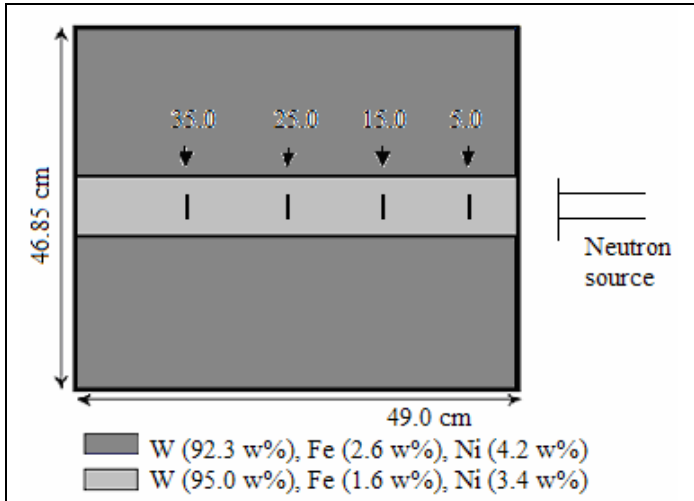


Fig. A30. Layout of *Tungsten Experiment* with detector positions *TBM-HCPB Experiment* (FNG).

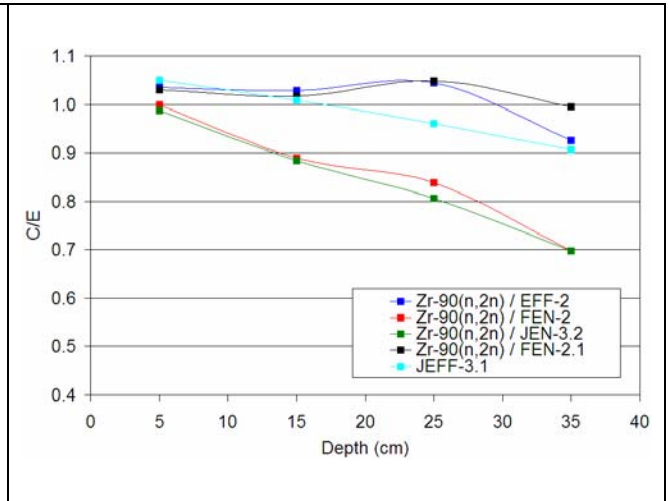


Fig. A31. C/E ratios for fast neutron flux ($E > 10$ MeV) in the *Tungsten Experiment* measured by activation foils using the $Zr-90(n,2n)$ reaction.

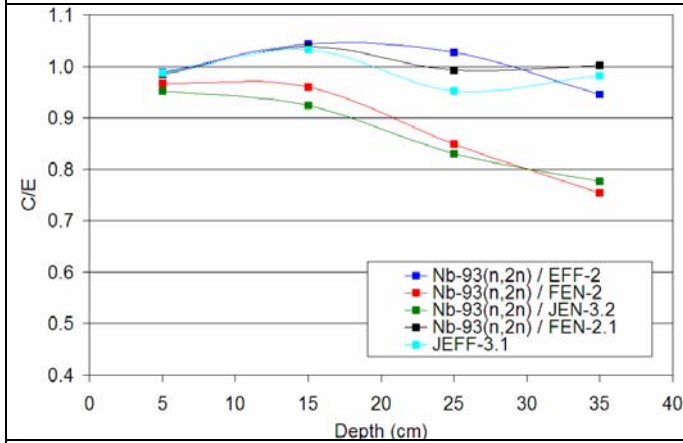


Fig. A32. C/E ratios for fast neutron flux ($E > 10$ MeV) in the *Tungsten Experiment* measured by activation foils using the $Nb-93(n,2n)$ reaction.

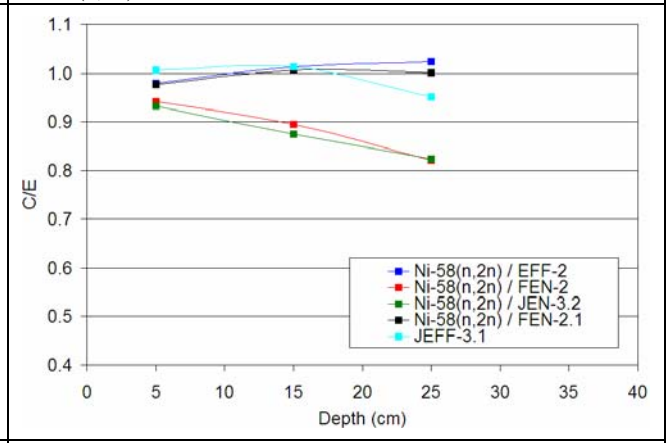


Fig. A33. C/E ratios for fast neutron flux ($E > 10$ MeV) in the *Tungsten Experiment* measured by activation foils using the $Ni-58(n,2n)$ reaction.

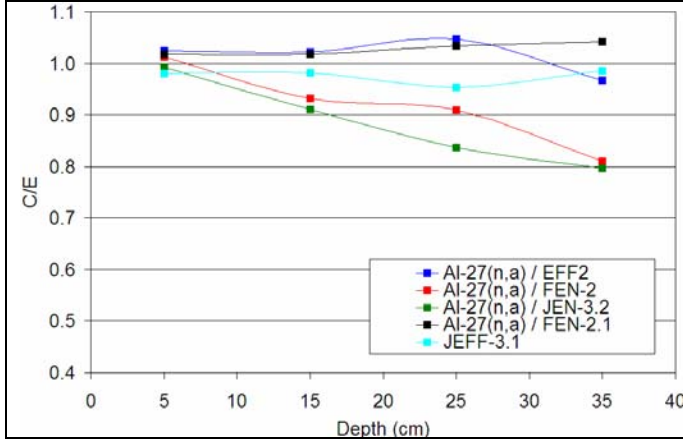


Fig. A34. C/E ratios for fast neutron flux ($E > 3$ MeV) in the *Tungsten Experiment* measured by activation foils using the $Al-27(n,a)$ reaction.

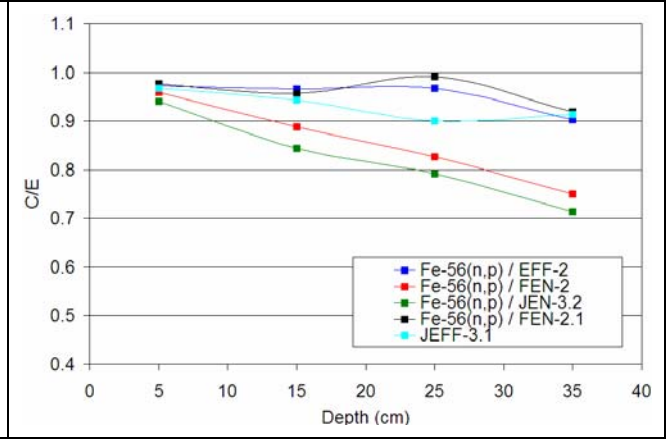


Fig. A35. C/E ratios for fast neutron flux ($E > 1$ MeV) in the *Tungsten Experiment* measured by activation foils using the $Fe-56(n,p)$ reaction.

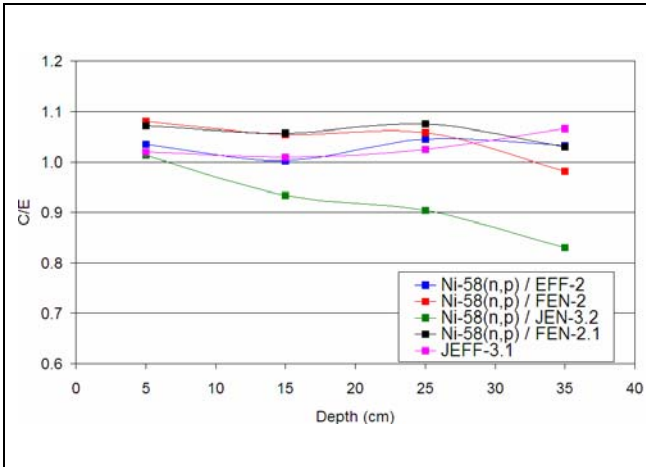


Fig. A36. C/E ratios for fast neutron flux ($E > 1$ MeV) in the *Tungsten Experiment* measured by activation foils using the Ni-58(n,p) reaction.

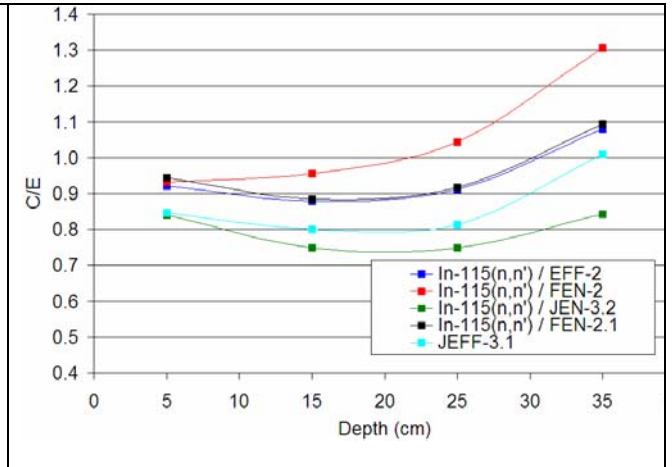


Fig. A37. C/E ratios for fast neutron flux ($E > 0.5$ MeV) in the *Tungsten Experiment* measured by activation foils using the In-115(n,n') reaction.

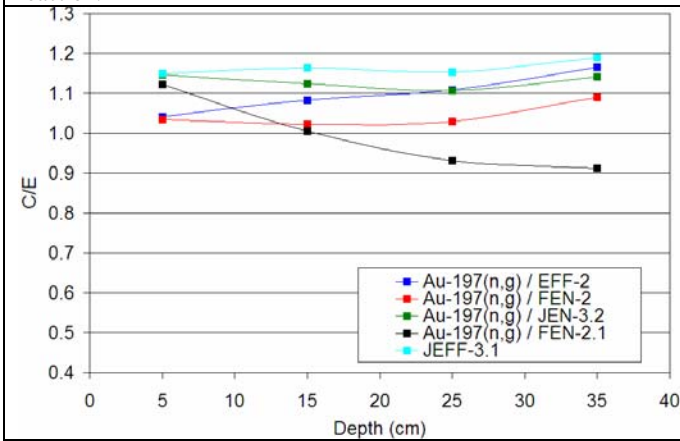


Fig. A38. C/E ratios for low energy neutron flux ($E \sim eV$) in the *Tungsten Experiment* measured by activation foils using the Au-197(n,g) reaction.

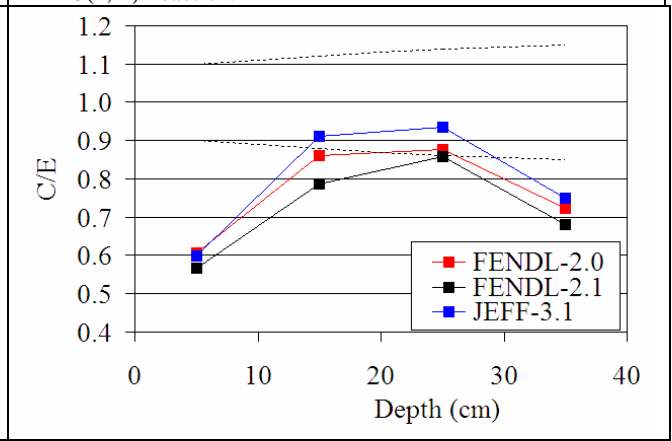


Fig. A39. C/E for nuclear heating in tungsten in the *Tungsten Experiment*.

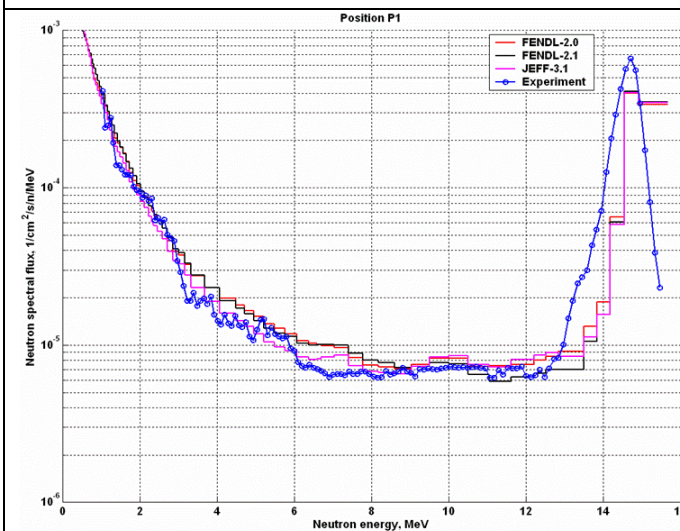


Fig. A40. Measured and calculated neutron flux spectrum in the *Tungsten Experiment* in Position P1

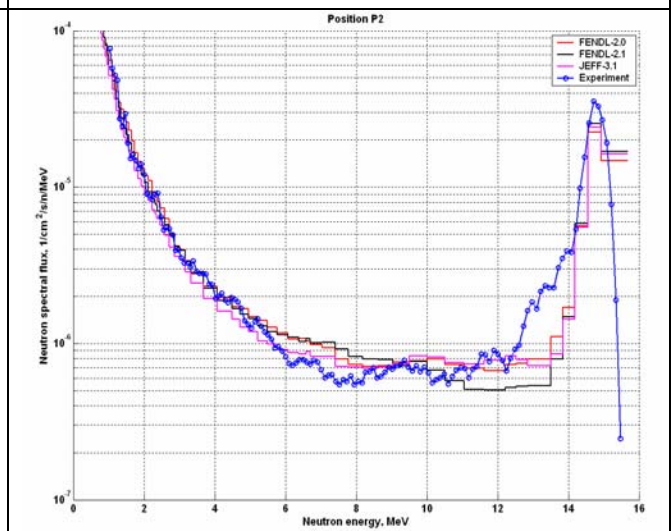


Fig. A41. Measured and calculated neutron flux spectrum in the *Tungsten Experiment* in Position P2

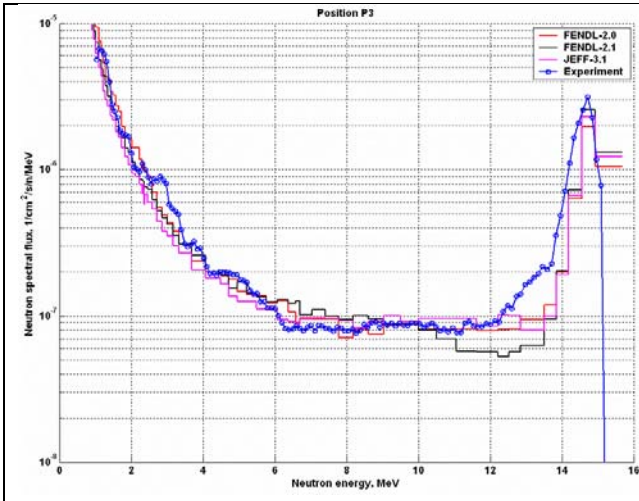


Fig. A42. Measured and calculated neutron flux spectrum in the Tungsten Experiment in Position P3

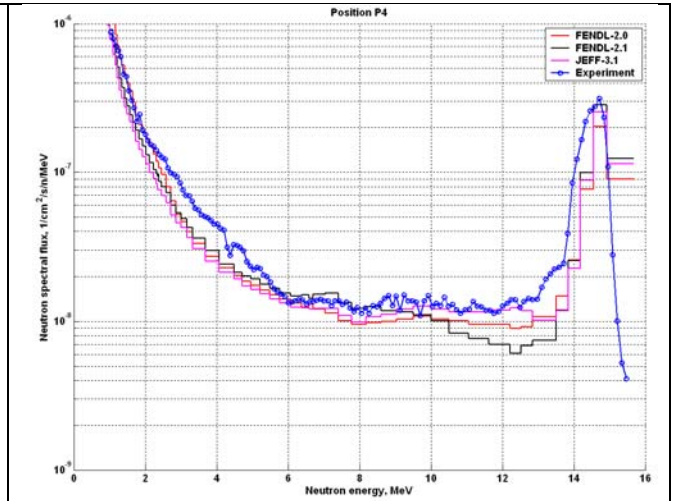


Fig. A43. Measured and calculated neutron flux spectrum in the Tungsten Experiment in Position P4

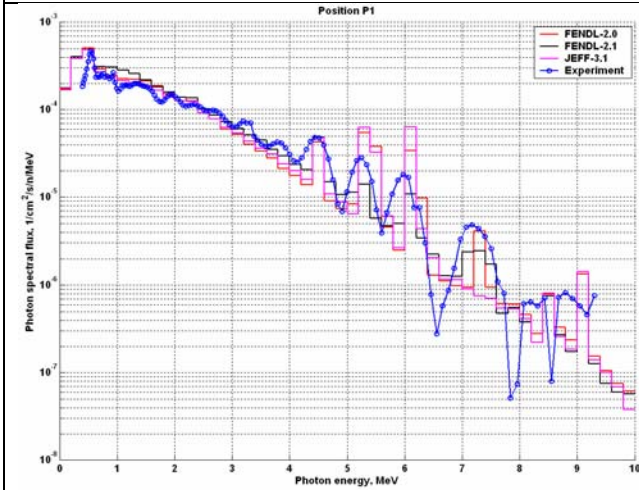


Fig. A44. Measured and calculated γ -ray flux spectrum in the Tungsten Experiment in Position P1

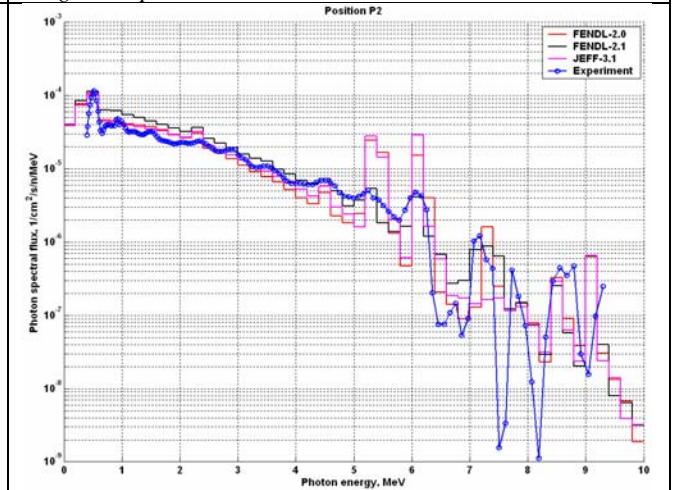


Fig. A45. Measured and calculated γ -ray flux spectrum in the S Tungsten Experiment in Position P2

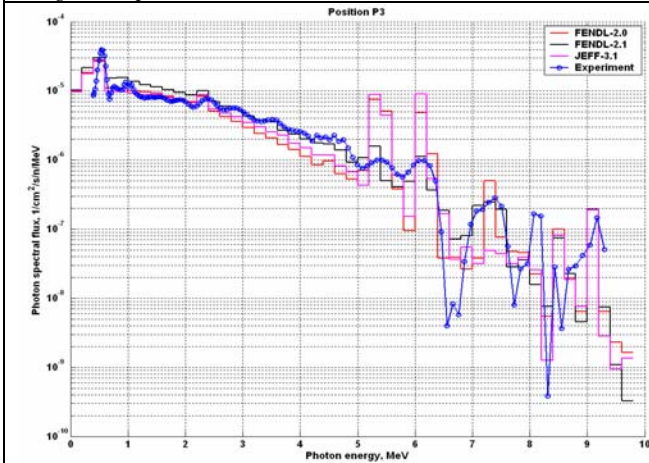


Fig. A46. Measured and calculated γ -ray flux spectrum in the Tungsten Experiment in Position P3

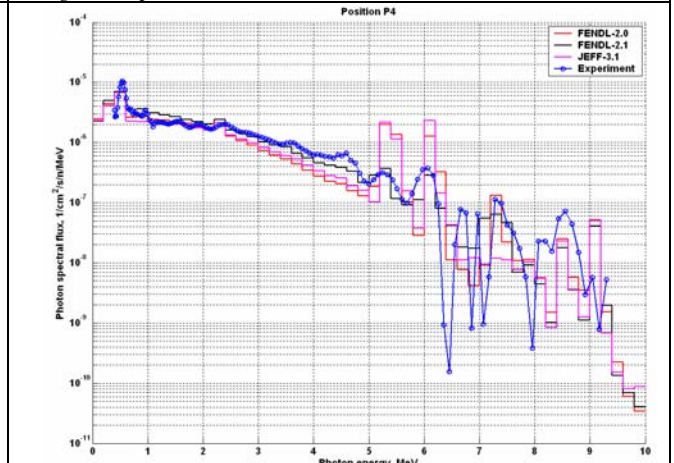


Fig. A47. Measured and calculated γ -ray flux spectrum in the Tungsten Experiment in Position P4

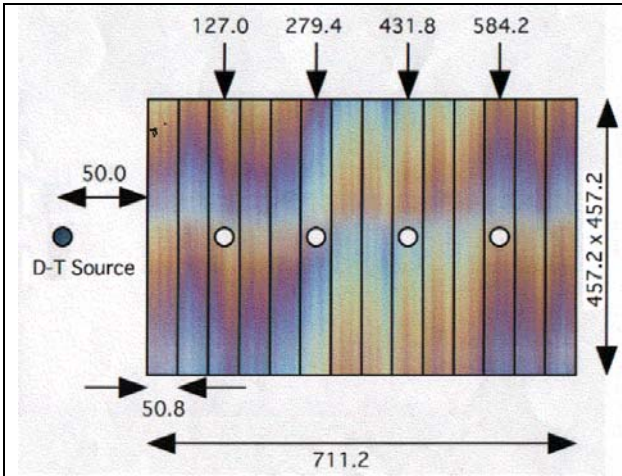


Fig. A48. Layout of SiC Experiment with detector positions (FNG).

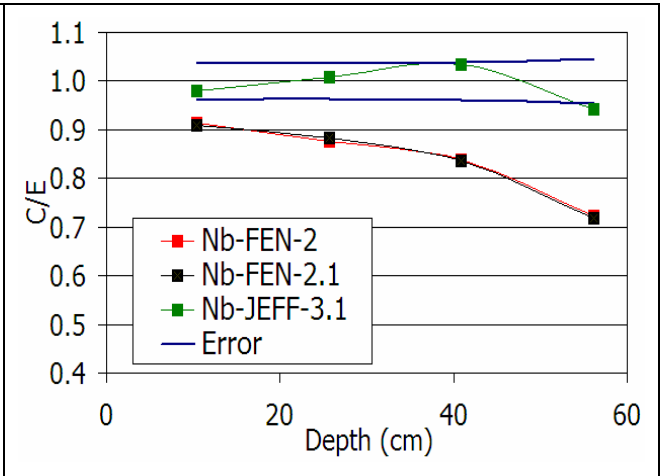


Fig. A49. C/E ratios for fast neutron flux ($E > 10$ MeV) in the SiC Experiment measured by activation foils using the Nb-93(n,2n) reaction.

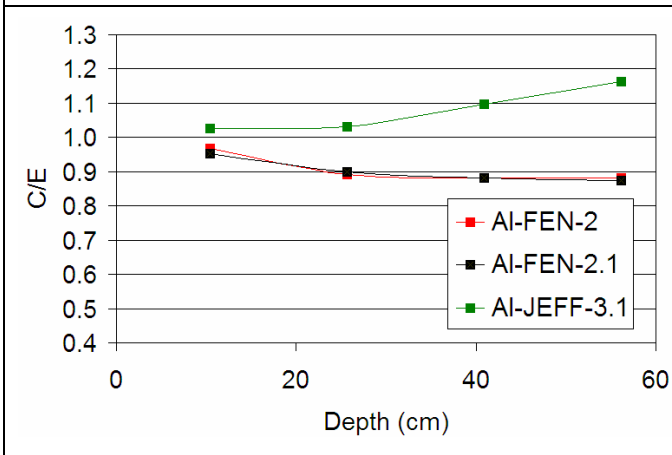


Fig. A50. C/E ratios for fast neutron flux ($E > 3$ MeV) in the SiC Experiment measured by activation foils using the Al-27(n,a) reaction.

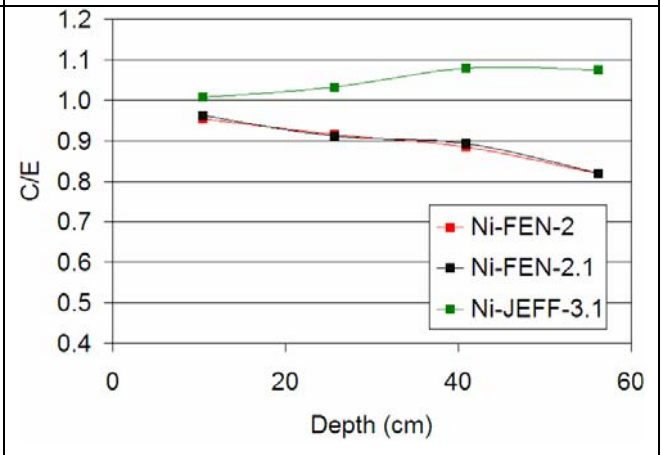


Fig. A51. C/E ratios for fast neutron flux ($E > 1$ MeV) in the SiC Experiment measured by activation foils using the Ni-58(n,p) reaction.

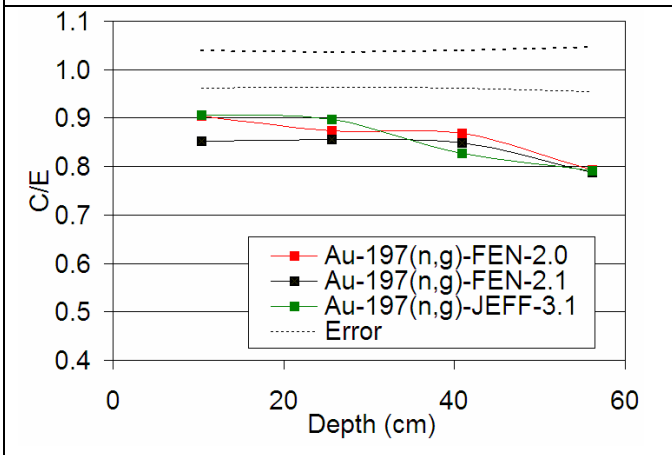


Fig. A52. C/E ratios for low energy ($E \sim eV$) neutron flux in the SiC Experiment. In this example the flux is measured by activation foils using the Au-197(n,g) reaction. Dotted lines represent the total uncertainties (exp. + calc.) in the comparison.

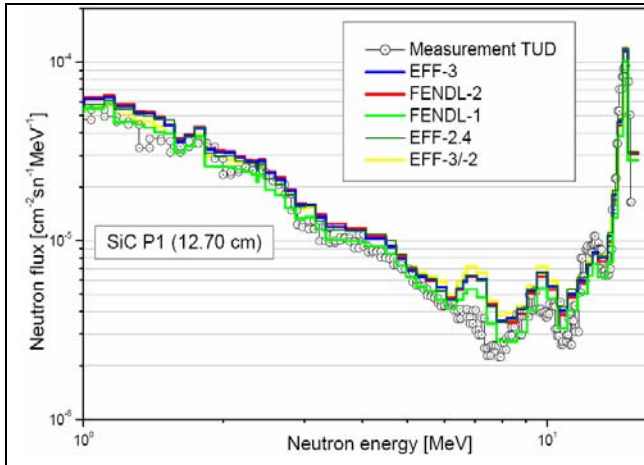


Fig. A53. Measured and calculated neutron flux spectrum in the SiC Experiment in Position P1

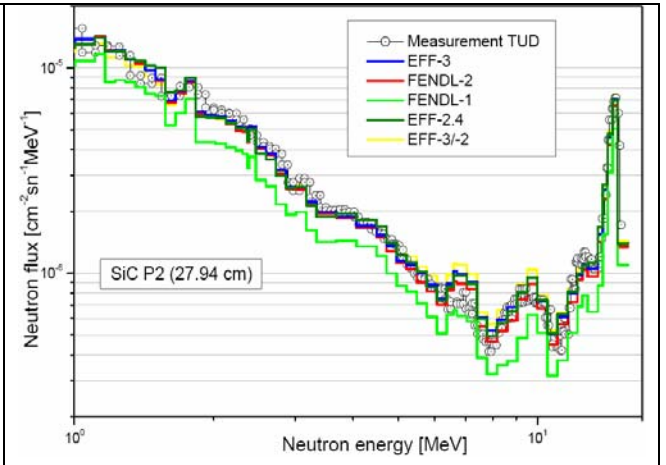


Fig. A54. Measured and calculated neutron flux spectrum in the SiC Experiment in Position P2

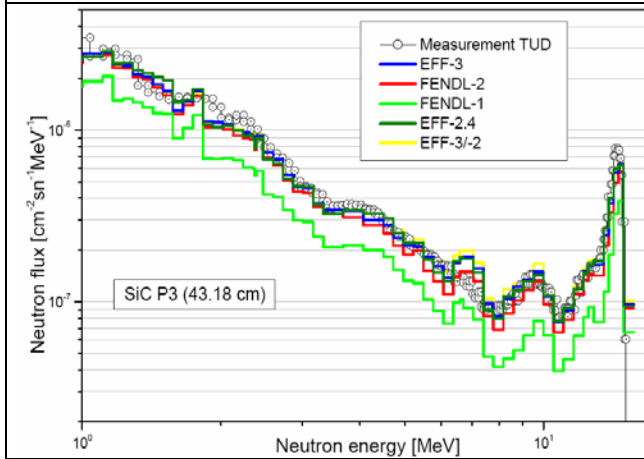


Fig. A55. Measured and calculated neutron flux spectrum in the SiC Experiment in Position P1

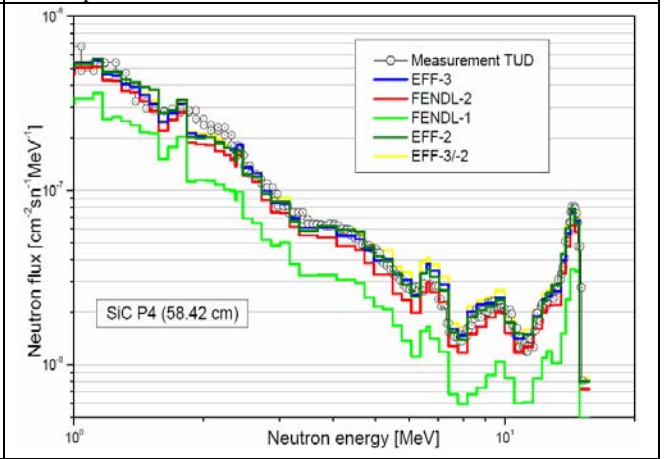


Fig. A56. Measured and calculated neutron flux spectrum in the SiC Experiment in Position P2

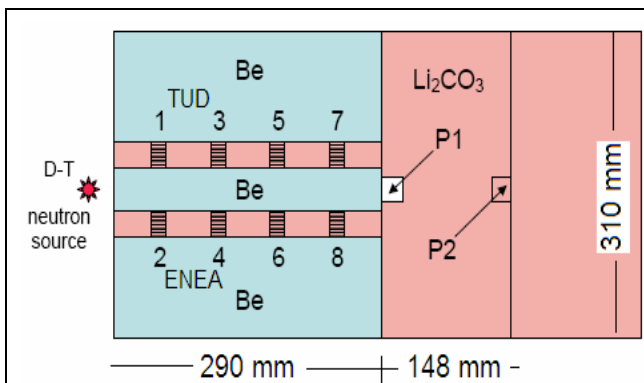


Fig. A57. Layout of the TBM-HCPB Experiment.

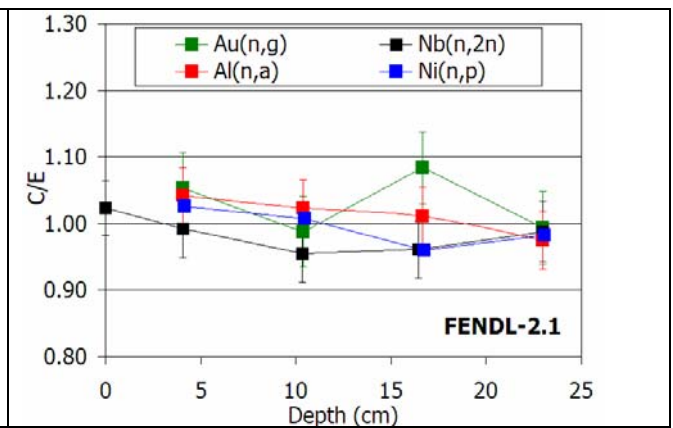


Fig. A58. C/E ratios for neutron flux measurements using activation reactions in the TBM-HCPB Experiment. The calculated values are obtained using FENDL-2.1

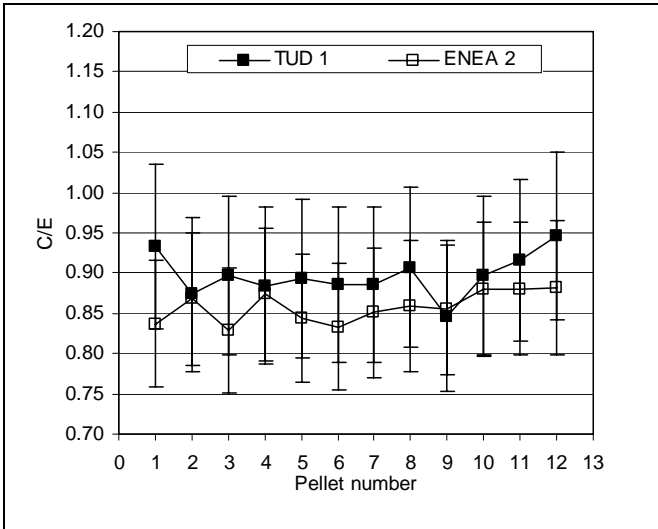


Fig. A59. Calculated (C) over measured (E) tritium production rates as a function of depth in the lower cassette in positions TUD 1 and ENEA 2 in *TBM-HCPB Experiment*. Errors represent the total uncertainties (experiment + calculation) in the comparison. The calculated values are obtained using FENDL-2.1

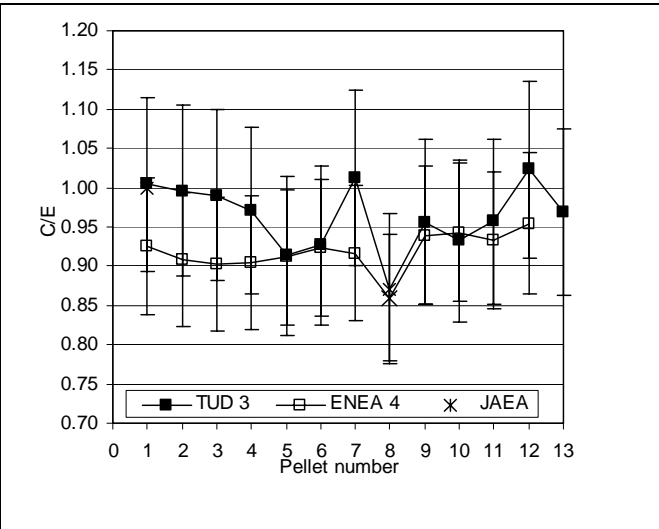


Fig. A60. Calculated (C) over measured (E) tritium production rates as a function of depth in the lower cassette in positions TUD 3 and ENEA 4 in *TBM-HCPB Experiment*. Errors represent the total uncertainties (experiment + calculation) in the comparison. The calculated values are obtained using FENDL-2.1

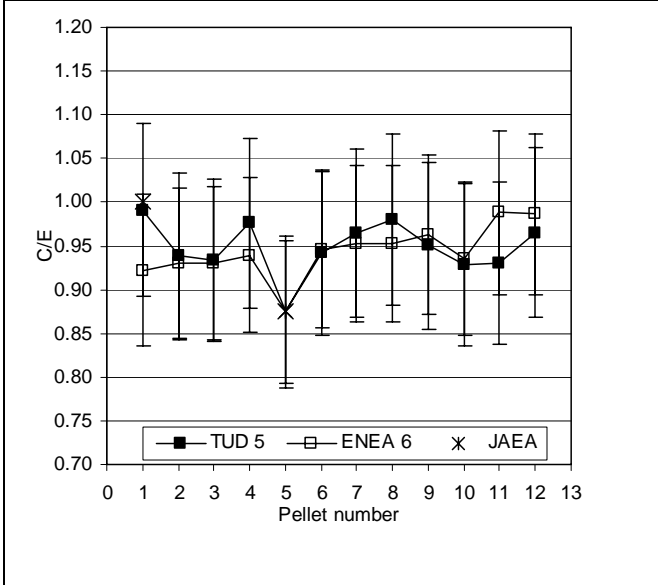


Fig. A61. Calculated (C) over measured (E) tritium production rates as a function of depth in the lower cassette in positions TUD 5 and ENEA 6 in *TBM-HCPB Experiment*. Errors represent the total uncertainties (experiment + calculation) in the comparison. The calculated values are obtained using FENDL-2.1.

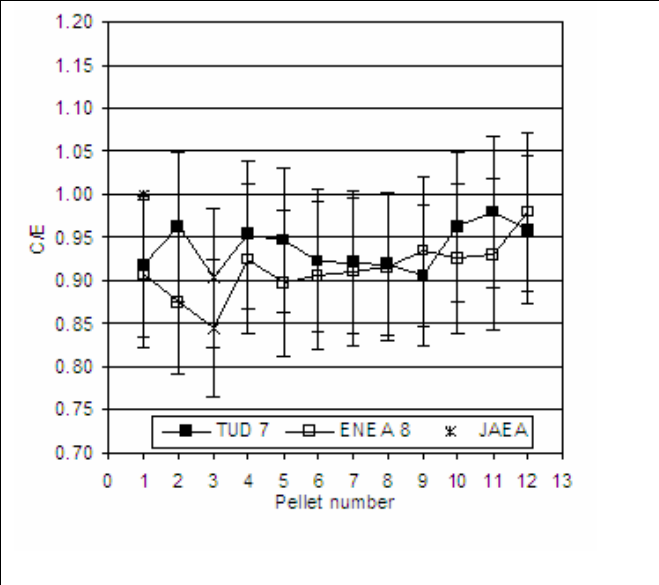


Fig. A62. Calculated (C) over measured (E) tritium production rates as a function of depth in the lower cassette in positions TUD 7 and ENEA 8 in *TBM-HCPB Experiment*. Errors represent the total uncertainties (experiment + calculation) in the comparison. The calculated values are obtained using FENDL-2.1.

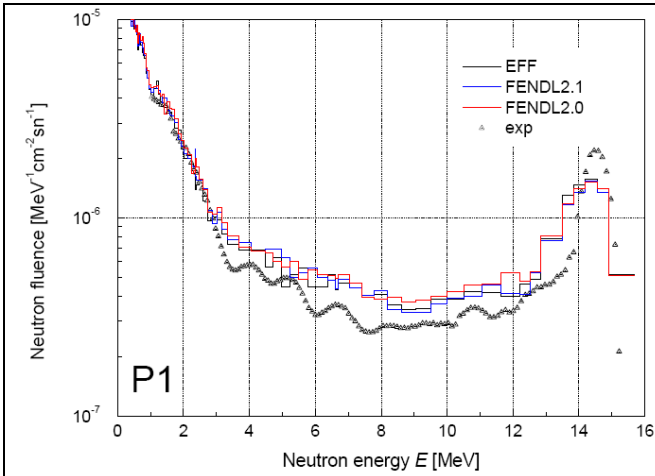


Fig. A63. Measured and calculated neutron flux spectrum in the *TBM-HCPB Experiment* in Position P1

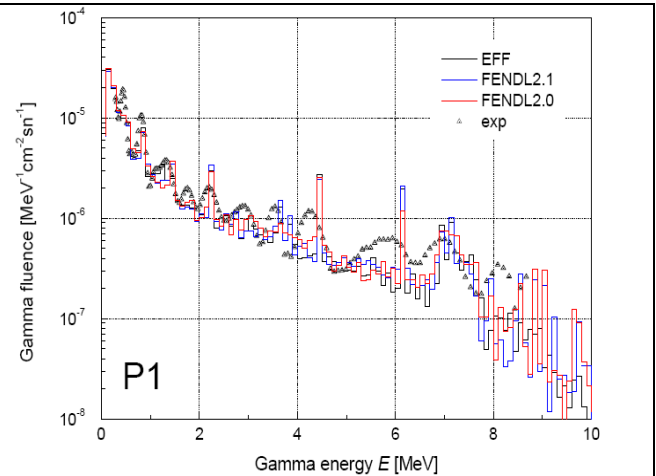


Fig. A64. Measured and calculated gamma ray flux spectrum in the *TBM-HCPB Experiment* in Position P1

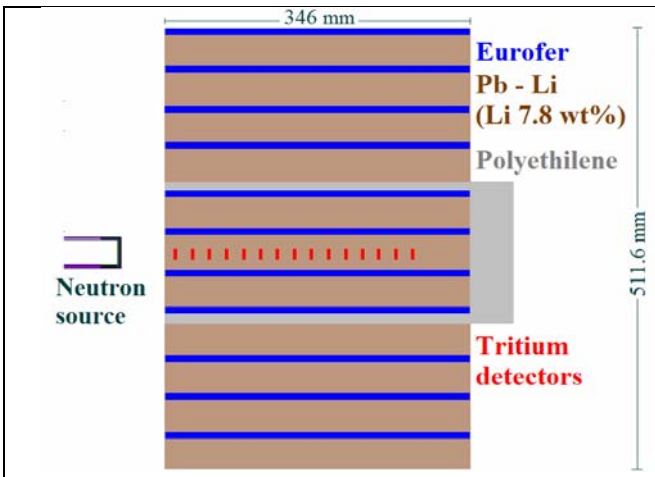


Fig. A65. Layout of the *TBM-HCPB Experiment*.

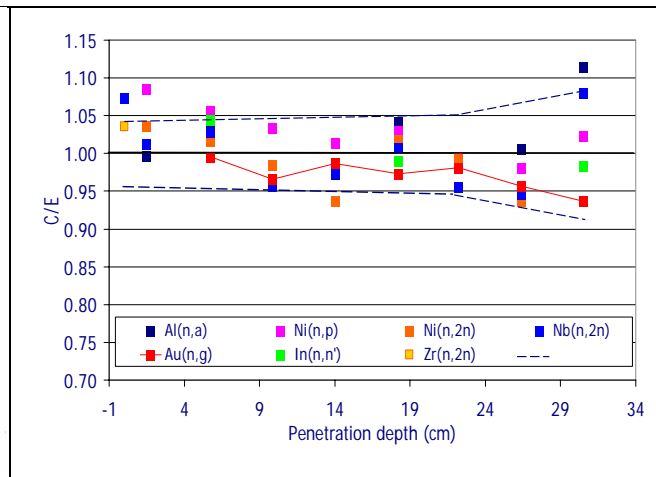


Fig. A66. C/E ratios for neutron flux measurements using activation reactions in the *TBM-HCLL Experiment*. The calculated values are obtained using FENDL-2.1.

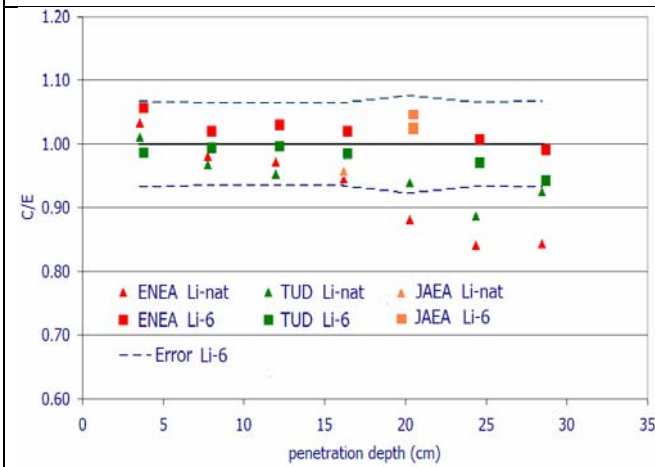


Fig. A67. Calculated (C) over measured (E) tritium production rates as a function of depth in the *TBM-HCLL Experiment*. Dotted lines represent the total uncertainties (experiment + calculation) in the comparison. The calculated values are obtained using FENDL-2.1.