

validating SOURCES4

Input - Alpha Beam (5.5 MeV) on Mg

Title: Alpha Beam (5.5 MeV) on Mg
Beam problem input (idd = 3)
Magnitudes and spectra computed (id = 2)
Ascending energy structure for output (erg = 1)
Number of elemental constituents: 1
Solid stopping cross-sections used (isg = 0)

Elemental Constituents:

Z-value	Atom Fraction
-----	-----
12	1.000000000000

Number of neutron spectrum energy groups: 81
Maximum neutron energy is 8.150E+00 MeV.
Minimum neutron energy is 5.000E-02 MeV.

Alpha beam energy is 5.500E+00 Mev.

Number of target nuclides to be used: 2
4000 Alpha energy groups used.

Target Nuclides:

ZAID	Atom Fraction
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120250	1.000E-01
120260	1.101E-01

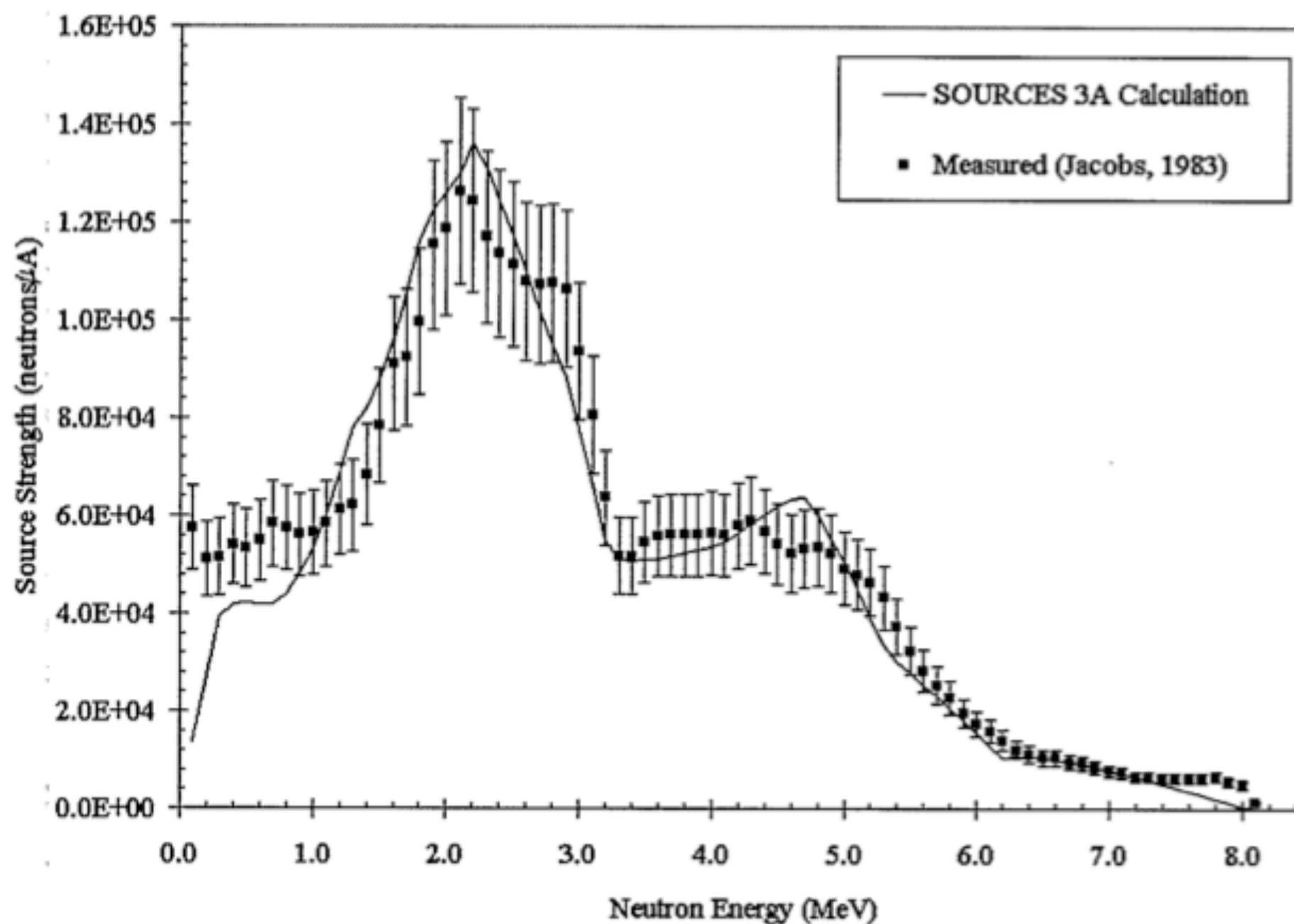


Fig. 21. Energy-Dependent Neutron Source Strength from 5.5 MeV α -Particles Incident on Magnesium Slab as Calculated by SOURCES 4A and Compared to Measured Data.

Output - 4A(modified) vs 3A(original)

Total (alpha,n) neutron source from all sources and targets: 3.992E+06 n/sec-microamp.

Average (alpha,n) neutron energy: 3.039E+00 MeV.

Portion of Total Neutron Source Rate Accounted for
in the Total Energy Spectrum: 99.9%. target alpha

m: 99.9%	target	alpha	alpha	alphas/sec	p(e)	neuts/sec	
	target	atom frac.	source	energy	/microamp	neut/alpha	/microamp
+							
mg 25	1.0000E-01	beam	5.500	3.1209E+12	5.2789E-07	1.6475E+06	
mg 26	1.1010E-01	beam	5.500	3.1209E+12	7.5131E-07	2.3448E+06	
	+						
				Total (all targets):		3.9923E+06	

Portion of Total Neutron Source Rate Accounted for in the Total Energy Spectrum: 95.6%. target alpha alp

: 95.6%.							
	target	alpha	alpha	alphas/sec	p(e)	neuts/sec	
	target	atom frac.	source	energy	/microamp	neut/alpha	/microamp
+							
	mg 25	1.0000E-01	beam	5.500	3.1209E+12	4.5949E-07	1.4340E+06
	mg 26	1.1010E-01	beam	5.500	3.1209E+12	6.9817E-07	2.1789E+06
		+					
				Total (all targets):		3.6129E+06	

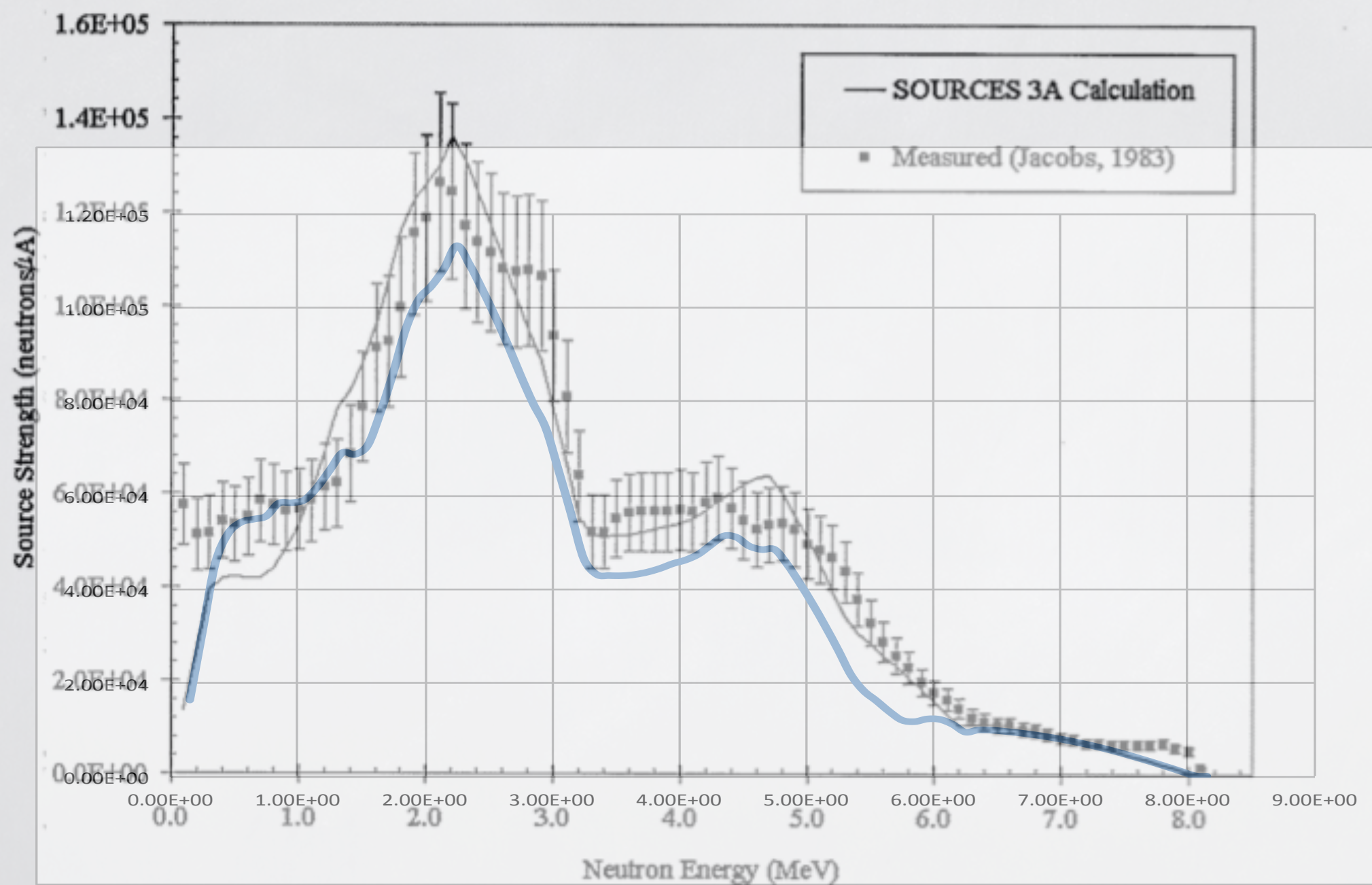


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Conclusion

- Cross check of one examples within the SOURCES validation (Alpha Beam 5.5MeV on Mg)
- SOURCES4A - currently used by SMU - versus SOURCE3A
- SOURCES4A shows slightly different results compatible with SOURCES3A and with data. It shows better agreement with data at low energy
- Another check?!