

**Appendix G - MCNP Data Libraries**  
**S(alpha,beta) DATA FOR USE WITH THE MTn CARD**

Table G.1 - Thermal S(alpha,beta) Cross-Section Libraries Maintained by X-1 NAD

ZAID	Library Name	Source	Eval Date	Temp (K)	Num of Angles	Num of Energies	Elastic Date
<b>***** Aluminum-27 (13027) *****</b>							
al27.10t	endf70sab	endf7.0	2005	20	20	80	coh
al27.11t	endf70sab	endf7.0	2005	80	20	80	coh
al27.12t	endf70sab	endf7.0	2005	293.6	20	80	coh
al27.13t	endf70sab	endf7.0	2005	400	20	80	coh
al27.14t	endf70sab	endf7.0	2005	600	20	80	coh
al27.15t	endf70sab	endf7.0	2005	800	20	80	coh
<b>***** Beryllium Metal (4009) *****</b>							
be.01t	tmccs	endf5	1964	300	8	20	coh
be.04t	tmccs	endf5	1964	600	8	20	coh
be.05t	tmccs	endf5	1964	800	8	20	coh
be.06t	tmccs	endf5	1964	1200	8	20	coh
be.10t	endf70sab	endf7.0	1993	293.6	20	80	coh
be.11t	endf70sab	endf7.0	1993	400	20	80	coh
be.12t	endf70sab	endf7.0	1993	500	20	80	coh
be.13t	endf70sab	endf7.0	1993	600	20	80	coh
be.14t	endf70sab	endf7.0	1993	700	20	80	coh
be.15t	endf70sab	endf7.0	1993	800	20	80	coh
be.16t	endf70sab	endf7.0	1993	1000	20	80	coh
be.17t	endf70sab	endf7.0	1993	1200	20	80	coh
be.60t	sab2002	endf6.3	1993	294	16	64	coh
be.61t	sab2002	endf6.3	1993	400	16	64	coh
be.62t	sab2002	endf6.3	1993	600	16	64	coh
be.63t	sab2002	endf6.3	1993	800	16	64	coh
be.64t	sab2002	endf6.3	1993	1000	16	64	coh
be.65t	sab2002	endf6.3	1993	1200	16	64	coh
be.69t	sab2002	endf6.3	1993	77	16	64	coh
<b>***** Beryllium in Beryllium Oxide (4009) *****</b>							
be/o.10t	endf70sab	endf7.0	2005	293.6	20	80	coh
be/o.11t	endf70sab	endf7.0	2005	400	20	80	coh
be/o.12t	endf70sab	endf7.0	2005	500	20	80	coh
be/o.13t	endf70sab	endf7.0	2005	600	20	80	coh
be/o.14t	endf70sab	endf7.0	2005	700	20	80	coh
be/o.15t	endf70sab	endf7.0	2005	800	20	80	coh
be/o.16t	endf70sab	endf7.0	2005	1000	20	80	coh
be/o.17t	endf70sab	endf7.0	2005	1200	20	80	coh
<b>***** Benzene (1001, 6000, 6012) *****</b>							
benz.01t	tmccs	endf5	<1969	300	8	32	none
benz.02t	tmccs	endf5	<1969	400	8	32	none
benz.03t	tmccs	endf5	<1969	500	8	32	none
benz.04t	tmccs	endf5	<1969	600	8	32	none
benz.05t	tmccs	endf5	<1969	800	8	32	none
benz.10t	endf70sab	endf7.0	1969	293.6	20	80	none
benz.11t	endf70sab	endf7.0	1969	350	20	80	none
benz.12t	endf70sab	endf7.0	1969	400	20	80	none
benz.13t	endf70sab	endf7.0	1969	450	20	80	none
benz.14t	endf70sab	endf7.0	1969	500	20	80	none

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ZAID	Library Name	Source	Eval Date	Temp (K)	Num of Angles	Num of Energies	Elastic Date
***** Benzene (1001, 6000, 6012) *****							
benz.15t	endf70sab	endf7.0	1969	600	20	80	none
benz.16t	endf70sab	endf7.0	1969	800	20	80	none
benz.17t	endf70sab	endf7.0	1969	1000	20	80	none
benz.60t	sab2002	endf6.3	1969	294	16	64	none
benz.61t	sab2002	endf6.3	1969	400	16	64	none
benz.62t	sab2002	endf6.3	1969	600	16	64	none
benz.63t	sab2002	endf6.3	1969	800	16	64	none
***** Beryllium Oxide (4009, 8016) *****							
beo.01t	tmccs	endf5	<1969	300	8	32	coh
beo.04t	tmccs	endf5	<1969	600	8	32	coh
beo.05t	tmccs	endf5	<1969	800	8	32	coh
beo.06t	tmccs	endf5	<1969	1200	8	32	coh
beo.60t	sab2002	endf6.3	1993	294	16	64	coh
beo.61t	sab2002	endf6.3	1993	400	16	64	coh
beo.62t	sab2002	endf6.3	1993	600	16	64	coh
beo.63t	sab2002	endf6.3	1993	800	16	64	coh
beo.64t	sab2002	endf6.3	1993	1000	16	64	coh
beo.65t	sab2002	endf6.3	1993	1200	16	64	coh
***** Ortho Deuterium (1002) *****							
dortho.01t	therxs	lanl89	<1969	20	8	8	none
dortho.10t	endf70sab	endf7.0	1993	19	20	80	none
dortho.60t	sab2002	endf6.3	1993	19	16	64	none
***** Para Deuterium (1002) *****							
dpara.01t	therxs	lanl89	<1969	20	8	8	none
dpara.10t	endf70sab	endf7.0	1993	19	20	80	none
dpara.60t	sab2002	endf6.3	1993	19	16	64	none
***** Iron-56 (26056) *****							
fe56.10t	endf70sab	endf7.0	2005	20	20	80	coh
fe56.11t	endf70sab	endf7.0	2005	80	20	80	coh
fe56.12t	endf70sab	endf7.0	2005	293.6	20	80	coh
fe56.13t	endf70sab	endf7.0	2005	400	20	80	coh
fe56.14t	endf70sab	endf7.0	2005	600	20	80	coh
fe56.15t	endf70sab	endf7.0	2005	800	20	80	coh
***** Graphite (6000, 6012) *****							
grph.01t	tmccs	endf5	1965	300	8	32	coh
grph.04t	tmccs	endf5	1965	600	8	32	coh
grph.05t	tmccs	endf5	1965	800	8	32	coh
grph.06t	tmccs	endf5	1965	1200	8	32	coh
grph.07t	tmccs	endf5	1965	1600	8	32	coh
grph.08t	tmccs	endf5	1965	2000	8	32	coh
grph.10t	endf70sab	endf7.0	1993	293.6	20	80	coh
grph.11t	endf70sab	endf7.0	1993	400	20	80	coh
grph.12t	endf70sab	endf7.0	1993	500	20	80	coh
grph.13t	endf70sab	endf7.0	1993	600	20	80	coh
grph.14t	endf70sab	endf7.0	1993	700	20	80	coh

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ZAID	Library Name	Source	Eval Date	Temp (K)	Num of Angles	Num of Energies	Elastic Date
***** Graphite (6000, 6012) *****							
grph.15t	endf70sab	endf7.0	1993	800	20	80	coh
grph.16t	endf70sab	endf7.0	1993	1000	20	80	coh
grph.17t	endf70sab	endf7.0	1993	1200	20	80	coh
grph.18t	endf70sab	endf7.0	1993	1600	20	80	coh
grph.19t	endf70sab	endf7.0	1993	2000	20	80	coh
grph.60t	sab2002	endf6.3	1993	294	16	64	coh
grph.61t	sab2002	endf6.3	1993	400	16	64	coh
grph.62t	sab2002	endf6.3	1993	600	16	64	coh
grph.63t	sab2002	endf6.3	1993	800	16	64	coh
grph.64t	sab2002	endf6.3	1993	1000	16	64	coh
grph.65t	sab2002	endf6.3	1993	1200	16	64	coh
***** Hydrogen in Zirconium Hydride (1001) *****							
h/zr.01t	tmccs	endf5	<1969	300	8	20	inco
h/zr.02t	tmccs	endf5	<1969	400	8	20	inco
h/zr.04t	tmccs	endf5	<1969	600	8	20	inco
h/zr.05t	tmccs	endf5	<1969	800	8	20	inco
h/zr.06t	tmccs	endf5	<1969	1200	8	20	inco
h/zr.10t	endf70sab	endf7.0	1993	293.6	20	80	inco
h/zr.11t	endf70sab	endf7.0	1993	400	20	80	inco
h/zr.12t	endf70sab	endf7.0	1993	500	20	80	inco
h/zr.13t	endf70sab	endf7.0	1993	600	20	80	inco
h/zr.14t	endf70sab	endf7.0	1993	700	20	80	inco
h/zr.15t	endf70sab	endf7.0	1993	800	20	80	inco
h/zr.16t	endf70sab	endf7.0	1993	1000	20	80	inco
h/zr.17t	endf70sab	endf7.0	1993	1200	20	80	inco
h/zr.60t	sab2002	endf6.3	1993	294	16	64	inco
h/zr.61t	sab2002	endf6.3	1993	400	16	64	inco
h/zr.62t	sab2002	endf6.3	1993	600	16	64	inco
h/zr.63t	sab2002	endf6.3	1993	800	16	64	inco
h/zr.64t	sab2002	endf6.3	1993	1000	16	64	inco
h/zr.65t	sab2002	endf6.3	1993	1200	16	64	inco
***** Ortho Hydrogen (1001) *****							
hortho.01t	therxs	lanl89	<1969	20	8	8	none
hortho.10t	endf70sab	endf7.0	1993	20	20	80	none
hortho.60t	sab2002	endf6.3	1993	19	16	64	none
hortho.61t	sab2002	endf6.3	1993	20	16	64	none
hortho.62t	sab2002	endf6.3	1993	21	16	64	none
hortho.63t	sab2002	endf6.3	1993	22	16	64	none
hortho.64t	sab2002	endf6.3	1993	23	16	64	none
hortho.65t	sab2002	endf6.3	1993	24	16	64	none
hortho.66t	sab2002	endf6.3	1993	25	16	64	none
***** Para Hydrogen (1001) *****							
hpara.01t	therxs	lanl89	<1969	20	8	8	none
hpara.10t	endf70sab	endf7.0	1993	20	20	80	none
hpara.60t	sab2002	endf6.3	1993	19	16	64	none
hpara.61t	sab2002	endf6.3	1993	20	16	64	none

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ZAID	Library Name	Source	Eval Date	Temp (K)	Num of Angles	Num of Energies	Elastic Date
<b>***** Para Hydrogen (1001) *****</b>							
hpara.62t	sab2002	endf6.3	1993	21	16	64	none
hpara.63t	sab2002	endf6.3	1993	22	16	64	none
hpara.64t	sab2002	endf6.3	1993	23	16	64	none
hpara.65t	sab2002	endf6.3	1993	24	16	64	none
hpara.66t	sab2002	endf6.3	1993	25	16	64	none
<b>***** Deuterium in Heavy Water (1002) *****</b>							
hwtr.01t	tmccs	endf5	1969	300	8	20	none
hwtr.02t	tmccs	endf5	1969	400	8	20	none
hwtr.03t	tmccs	endf5	1969	500	8	20	none
hwtr.04t	tmccs	endf5	1969	600	8	20	none
hwtr.05t	tmccs	endf5	1969	800	8	20	none
hwtr.10t	endf70sab	endf7.0	2004	293.6	20	80	none
hwtr.11t	endf70sab	endf7.0	2004	350	20	80	none
hwtr.12t	endf70sab	endf7.0	2004	400	20	80	none
hwtr.13t	endf70sab	endf7.0	2004	450	20	80	none
hwtr.14t	endf70sab	endf7.0	2004	500	20	80	none
hwtr.15t	endf70sab	endf7.0	2004	550	20	80	none
hwtr.16t	endf70sab	endf7.0	2004	600	20	80	none
hwtr.17t	endf70sab	endf7.0	2004	650	20	80	none
hwtr.60t	sab2002	endf6.3	1969	294	16	64	none
hwtr.61t	sab2002	endf6.3	1969	400	16	64	none
hwtr.62t	sab2002	endf6.3	1969	600	16	64	none
hwtr.63t	sab2002	endf6.3	1969	800	16	64	none
hwtr.64t	sab2002	endf6.3	1969	1000	16	64	none
<b>***** Hydrogen in Liquid Methane (1001) *****</b>							
lmeth.01t	therxs	lanl89	<1969	100	8	8	none
lmeth.10t	endf70sab	endf7.0	1993	100	20	80	none
lmeth.60t	sab2002	endf6.3	1993	100	16	64	none
<b>***** Hydrogen in Light Water (1001) *****</b>							
lwtr.01t	tmccs	endf5	<1969	300	8	20	none
lwtr.02t	tmccs	endf5	<1969	400	8	20	none
lwtr.03t	tmccs	endf5	<1969	500	8	20	none
lwtr.04t	tmccs	endf5	<1969	600	8	20	none
lwtr.05t	tmccs	endf5	<1969	800	8	20	none
lwtr.10t	endf70sab	endf7.0	2006	293.6	20	80	none
lwtr.11t	endf70sab	endf7.0	2006	350	20	80	none
lwtr.12t	endf70sab	endf7.0	2006	400	20	80	none
lwtr.13t	endf70sab	endf7.0	2006	450	20	80	none
lwtr.14t	endf70sab	endf7.0	2006	500	20	80	none
lwtr.15t	endf70sab	endf7.0	2006	550	20	80	none
lwtr.16t	endf70sab	endf7.0	2006	600	20	80	none
lwtr.17t	endf70sab	endf7.0	2006	650	20	80	none
lwtr.18t	endf70sab	endf7.0	2006	800	20	80	none
lwtr.60t	sab2002	endf6.3	1993	294	16	64	none
lwtr.61t	sab2002	endf6.3	1993	400	16	64	none
lwtr.62t	sab2002	endf6.3	1993	600	16	64	none

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ZAID	Library Name	Source	Eval Date	Temp (K)	Num of Angles	Num of Energies	Elastic Date
***** Hydrogen in Light Water (1001) *****							
lwtr.63t	sab2002	endf6.3	1993	800	16	64	none
lwtr.64t	sab2002	endf6.3	1993	1000	16	64	none
***** Oxygen in Beryllium Oxide (8016, 8017, 8018) *****							
o/be.10t	endf70sab	endf7.0	2005	293.6	20	80	coh
o/be.11t	endf70sab	endf7.0	2005	400	20	80	coh
o/be.12t	endf70sab	endf7.0	2005	500	20	80	coh
o/be.13t	endf70sab	endf7.0	2005	600	20	80	coh
o/be.14t	endf70sab	endf7.0	2005	700	20	80	coh
o/be.15t	endf70sab	endf7.0	2005	800	20	80	coh
o/be.16t	endf70sab	endf7.0	2005	1000	20	80	coh
o/be.17t	endf70sab	endf7.0	2005	1200	20	80	coh
***** Oxygen in UO2 (8016, 8017, 8018) *****							
o2/u.10t	endf70sab	endf7.0	2005	293.6	20	80	coh
o2/u.11t	endf70sab	endf7.0	2005	400	20	80	coh
o2/u.12t	endf70sab	endf7.0	2005	500	20	80	coh
o2/u.13t	endf70sab	endf7.0	2005	600	20	80	coh
o2/u.14t	endf70sab	endf7.0	2005	700	20	80	coh
o2/u.15t	endf70sab	endf7.0	2005	800	20	80	coh
o2/u.16t	endf70sab	endf7.0	2005	1000	20	80	coh
o2/u.17t	endf70sab	endf7.0	2005	1200	20	80	coh
***** Hydrogen in Polyethylene (1001) *****							
poly.01t	tmccs	endf5	1969	300	8	20	inco
poly.10t	endf70sab	endf7.0	1969	293.6	20	80	inco
poly.11t	endf70sab	endf7.0	1969	350	20	80	inco
poly.60t	sab2002	endf6.3	1969	294	16	64	inco
***** Hydrogen in Solid Methane (1001) *****							
smeth.01t	therxs	lanl89	<1969	22	8	8	inco
smeth.10t	endf70sab	endf7.0	1993	22	20	80	inco
smeth.60t	sab2002	endf6.3	1993	22	16	64	inco
***** Uranium-238 in UO2 (92238) *****							
u/o2.10t	endf70sab	endf7.0	2005	293.6	20	80	coh
u/o2.11t	endf70sab	endf7.0	2005	400	20	80	coh
u/o2.12t	endf70sab	endf7.0	2005	500	20	80	coh
u/o2.13t	endf70sab	endf7.0	2005	600	20	80	coh
u/o2.14t	endf70sab	endf7.0	2005	700	20	80	coh
u/o2.15t	endf70sab	endf7.0	2005	800	20	80	coh
u/o2.16t	endf70sab	endf7.0	2005	1000	20	80	coh
u/o2.17t	endf70sab	endf7.0	2005	1200	20	80	coh
***** Zirconium in Zirconium Hydride (40000, 40090, 40091, 40092, 40094, 40096) *****							
zr/h.01t	tmccs	endf5	<1969	300	8	32	inco
zr/h.02t	tmccs	endf5	<1969	400	8	32	inco
zr/h.04t	tmccs	endf5	<1969	600	8	32	inco
zr/h.05t	tmccs	endf5	<1969	800	8	32	inco
zr/h.06t	tmccs	endf5	<1969	1200	8	32	inco
zr/h.10t	endf70sab	endf7.0	1993	293.6	20	80	inco

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ZAID	Library Name	Source	Eval Date	Temp (K)	Num of Angles	Num of Energies	Elastic Date
***** Zirconium in Zirconium Hydride (40000, 40090, 40091, 40092, 40094, 40096) *****							
zr/h.11t	endf70sab	endf7.0	1993	400	20	80	inco
zr/h.12t	endf70sab	endf7.0	1993	500	20	80	inco
zr/h.13t	endf70sab	endf7.0	1993	600	20	80	inco
zr/h.14t	endf70sab	endf7.0	1993	700	20	80	inco
zr/h.15t	endf70sab	endf7.0	1993	800	20	80	inco
zr/h.16t	endf70sab	endf7.0	1993	1000	20	80	inco
zr/h.17t	endf70sab	endf7.0	1993	1200	20	80	inco
zr/h.60t	sab2002	endf6.3	1993	294	16	64	inco
zr/h.61t	sab2002	endf6.3	1993	400	16	64	inco
zr/h.62t	sab2002	endf6.3	1993	600	16	64	inco
zr/h.63t	sab2002	endf6.3	1993	800	16	64	inco
zr/h.64t	sab2002	endf6.3	1993	1000	16	64	inco
zr/h.65t	sab2002	endf6.3	1993	1200	16	64	inco