

# ENSDF MODEL EXAMPLES

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**Lecture I. Reaction Datasets**

**Lecture II. Adopted Levels, Gammas Datasets**

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## Lecture I. Reaction Dataset Examples:

$^{186}\text{Os}$ : from  $^{176}\text{Yb}(^{14}\text{C},4n\gamma)$

$^{186}\text{W}$ : from Coulomb Excitation

$^{59}\text{Fe}$ : from  $^{58}\text{Fe}(d,p)$ , (pol d,p)

$^{59}\text{Fe}$ : from  $^{58}\text{Fe}(d,p\gamma)$

$^{59}\text{Fe}$ : from  $^{59}\text{Co}(n,p)$

$^{170}\text{Tm}$ : from  $^{169}\text{Tm}(n,\gamma)$  E=thermal

$^{170}\text{Tm}$ : from  $^{169}\text{Tm}(n,\gamma)$  E=thermal: two-photon cascades

$^{170}\text{Tm}$ : from  $^{169}\text{Tm}(n,\gamma)$  E=2, 24 keV

$^{170}\text{Tm}$ : from  $^{169}\text{Tm}(d,p)$

$^{170}\text{Tm}$ : from  $^{170}\text{Er}(^3\text{He},t)$

$^{170}\text{Tm}$ : from  $^{170}\text{Tm}(d,d')$

$^{170}\text{Tm}$ : from  $^{171}\text{Yb}(t,\alpha)$

$^{170}\text{Er}$ : from  $^{170}\text{Er}(\gamma,\gamma')$ , ( $\gamma$ , pol  $\gamma'$ ) (resonance fluorescence)

$^{59}\text{Co}$ : from  $^{58}\text{Fe}(p,p')$

## $^{176}\text{Yb}(^{14}\text{C}, 4n\gamma)$

1860S 176YB(14C, 4NG) 1999WH02, 1999WH01  
1860S H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 99, 1 (2003)\$CUT=4-Apr-2003\$  
1860S C 1999WH02: E=67 MEV; 95.7%  $^{176}\text{Yb}$  TARGET; ^NORDBALL DETECTOR ARRAY (18  
1860S2C COMPTON-SUPPRESSED COAXIAL Ge DETECTORS, 2 PLANAR COMPTON-SUPPRESSED  
1860S3C Ge DETECTORS, 50-ELEMENT BALL OF BaF{-2} DETECTORS FOR G-MULTIPLICITY  
1860S4C DETERMINATION, 30-ELEMENT Si-detector INNER BALL FOR CHARGED-PARTICLE  
1860S5C EVAPORATION CHANNEL IDENTIFICATION). MEASURED EG, IG, GG COIN (550 NS  
1860S6C TIME WINDOW), G-X COIN, G-G-t, G(T), ^DCO RATIOS (79 DEG OR 101 DEG,  
1860S7C 37 DEG OR 143 DEG). BAND MIXING ANALYSIS AND BLOCKED ^BCS AND  
1860S8C CONFIGURATION-CONSTRAINED POTENTIAL-ENERGY-SURFACE CALCULATIONS.  
1860S9C SEE ALSO 1999WH01.  
1860S C THEORY: FOR CALCULATION OF HINDRANCE FOR high-^K ISOMER DECAY, SEE  
1860S2C 2002SH41.  
1860S CG E FROM 1999WH02; UNCERTAINTY UNSTATED BY AUTHORS.  
1860S CG M FROM MEASURED ^DCO RATIOS (79 DEG (OR 101 DEG), 37 DEG (OR  
1860S2CG 143 DEG)). THE VALUES GIVEN IN COMMENTS ARE FOR STRETCHED Q GATING  
1860S3CG TRANSITIONS, UNLESS NOTED OTHERWISE, AND EXPECTED VALUES ARE AP 0.56  
1860S4CG FOR STRETCHED ^D TRANSITIONS AND AP 1.00 FOR STRETCHED Q (OR ^D, DJ=0)  
1860S5CG TRANSITIONS (1999WH02). DPI=NO IS ASSUMED FOR IN-BAND Q TRANSITIONS.  
1860S CG E(W) EG IS SHOWN IN PARENTHESES IN TABLE 1 OF 1999WH02;  
1860S2CG EVALUATOR INTERPRETS THIS AS AN INDICATION THAT THE PLACEMENT IS  
1860S3CG UNCERTAIN. HOWEVER, TRANSITION IS NOT SHOWN AS UNCERTAIN IN FIG. 1.  
1860S CG M(Z) ^DCO RATIO IS HIGHER THAN EXPECTED FOR A PURE ^D TRANSITION.  
1860S2CG 1999WH02 SUGGEST THAT THIS MAY BE A RESULT OF NUCLEAR DEORIENTATION,

1860S3CG SINCE MOST OF THE INTENSITY FEEDING THE 5- PARENT LEVEL IS DELAYED  
 1860S4CG BY THE 7- AND 9- ISOMERS.  
 1860S CL E FROM LEAST-SQUARES ADJUSTMENT OF EG, ALLOWING 1 KEV  
 1860S2CL UNCERTAINTY IN EG (1999WH02 DO NOT STATE UNCERTAINTY).  
 1860S CL J AUTHORS' VALUES, BASED ON TRANSITION MULTIPOLARITY DEDUCED  
 1860S2CL FROM MEASURED  $\Delta$ DCO RATIOS AND BAND STRUCTURE.  
 1860S CL T FROM  $|g-t$  (TIME CENTROID SHIFTS) OR  $|g-|g-t$  (PROJECTED TIME  
 1860S2CL SPECTRA FITTED WITH PROMPT GAUSSIAN CONVOLUTED WITH AN EXPONENTIAL  
 1860S3CL DECAY) (1999WH02).  
 1860S CL J(X) PROBABLY A FOUR-QUASINEUTRON INTRINSIC TRIAXIAL ( $|q=23$  DEG)  
 1860S2CL STATE; BLOCKED  $\Delta$ BCS CALCULATIONS PREDICT A LOW-LYING 18+ STATE WITH  
 1860S3CL CONFIGURATION= $((11/2[615])+(9/2[624])+(9/2[505])+(7/2[503]))$ . THE  
 1860S4CL SHORT T, DESPITE PREDOMINANTLY DK=8 DEEXCITATION, FOR THIS YRAST STATE  
 1860S5CL IS CONSISTENT WITH THE ONSET OF TRIAXIALITY.  
 1860S CL J(Y) PROBABLY A SIX-QUASIPARTICLE INTRINSIC TRIAXIAL ( $|g=26$  DEG)  
 1860S2CL STATE; BLOCKED  $\Delta$ BCS CALCULATIONS PREDICT A LOW-LYING 28+ STATE WITH  
 1860S3CL CONFIGURATION= $((18+ 4495 \text{ LEVEL})\sim\#((|p 11/2[505])+(|p 9/2[514])))$ . THE  
 1860S4CL SHORT  $T\{-1/2\}$  FOR THIS YRAST STATE MAY RESULT FROM THE ONSET OF  
 1860S5CL TRIAXIALITY.  
 1860S CL BAND(A) KPI=0+ GS BAND.  
 1860S2CL YRAST FOR J LE 12.  
 1860S CL BAND(H) KPI=10+,  $|a=0$  tilted-axis BAND.  
 1860S2CL LIKELY CONFIGURATION= $((|n 11/2[615])+(|n 9/2[624]))$ , CONSISTENT WITH  
 1860S3CL THE RELATIVELY LARGE ALIGNMENT AND THE INTRABAND E2-TO-M1  
 1860S4CL BRANCHING RATIOS OBSERVED. CROSSES GS BAND; yrast for J=14-16.  
 1860S CL BAND(h) KPI=10+,  $|a=1$  tilted-axis BAND.  
 1860S2CL SIGNATURE PARTNER OF KPI=10+,  $|a=0$  BAND, EXHIBITING PRONOUNCED

1860S3CL SIGNATURE SPLITTING.  
 1860S CL BAND (B) KPI=2+ GAMMA BAND.  
 1860S CL BAND (C) KPI=0+ BETA BAND.  
 1860S2CL THE 0+ BANDHEAD (KNOWN TO LIE AT AP 1061 KEV) WAS NOT OBSERVED BY  
 1860S3CL 1999WH02.  
 1860S CL BAND (D) POSSIBLE KPI=4+ HEXADECAPOLE BAND.  
 1860S2CL COULD ALTERNATIVELY BE INTERPRETED AS A TWO |g PHONON EXCITATION.  
 1860S CL BAND (E) KPI=5- BAND.  
 1860S2CL SIMILARITY OF ALIGNMENT CURVE TO THAT FOR THE 11/2+ BAND IN 1850S  
 1860S3CL FAVORS CONFIGURATION= $((|n 11/2[615])-(|n 1/2[510]))$ , ANALOGOUS TO  
 1860S4CL THE 8.3 US, 5- ISOMER WITH THIS CONFIGURATION IN 184W.  
 1860S CL BAND (F) KPI=7- BAND.  
 1860S2CL LIKELY CONFIGURATION= $((|n 11/2[615])+(|n 3/2[512]))$ ; ALIGNMENT IS  
 1860S3CL CONSISTENT WITH THAT FOR OTHER  $(|n i\{-13/2\})$  BANDS. ANALOGOUS TO  
 1860S4CL BAND WITH SAME CONFIGURATION BUILT ON 7-, 2.4 NS ISOMER IN 184W  
 1860S5CL ISOTONE.  
 1860S CL BAND (G) KPI=9- BAND.  
 1860S2CL LIKELY CONFIGURATION= $((|n 11/2[615])+(|n 7/2[503]))$ , SUPPORTED BY  
 1860S3CL SIMILARITY OF ALIGNMENT CURVE TO THAT FOR OTHER  $(|n 11/2[615])$   
 1860S4CL BANDS.  
 1860S CL BAND (I) KPI=(12+) four-quasineutron band.  
 1860S2CL POSSIBLE  
 1860S3CL CONFIGURATION= $((11/2[615])+(9/2[624])+(3/2[512])+(1/2[510]))$  BASED  
 1860S4CL ON COMPARISONS WITH ^BCS CALCULATIONS.  
 1860S CL BAND (J) KPI=(15+) four-quasineutron band.  
 1860S2CL POSSIBLE  
 1860S3CL CONFIGURATION= $((11/2[615])+(9/2[624])+(7/2[503])+(3/2[512]))$ .

1860S CL BAND (K) PI=+, |a=0 BAND.  
 1860S2CL POSSIBLE ROTATIONAL ALIGNED low-<sup>^</sup>K s-band; ALIGNMENT MUCH LARGER THAN  
 1860S3CL THAT OF GS BAND.  
 1860S CL BAND (L) KPI=(18-) FOUR-QUASIPARTICLE BAND.  
 1860S2CL POSSIBLE  
 1860S3CL CONF=((|n 11/2[615])+(|n 9/2[624])+(|p 5/2[402])+(|p 11/2[505])) BASED  
 1860S4CL ON COMPARISONS WITH BLOCKED <sup>^</sup>BCS CALCULATIONS.  
 1860S CL BAND (M) KPI=(19-) FOUR-QUASIPARTICLE BAND.  
 1860S2CL POSSIBLE  
 1860S3CL CONF=((|n 11/2[615])+(|n 7/2[503])+(|p 9/2[514])+(|p 11/2[505])) BASED  
 1860S4CL ON COMPARISONS WITH BLOCKED <sup>^</sup>BCS CALCULATIONS.  
 1860S PN 5  
 1860S L 0.0 0+ A  
 1860S L 137.0 8 2+ A  
 1860S G 137.3 799 26 E2  
 1860S CG M <sup>^</sup>DCO=1.00 1.  
 1860S L 433.6 9 4+ A  
 1860S G 296.9 1000 30 E2  
 1860S CG M <sup>^</sup>DCO=0.98 1.  
 1860S L 768.1 8 2+ B  
 1860S G 630.6 125 4  
 1860S CG M <sup>^</sup>DCO=0.86 2.  
 1860S G 767.8 140 5 Q  
 1860S CG M <sup>^</sup>DCO=1.03 3.  
 1860S L 868.4 10 6+ A  
 1860S G 434.9 822 25 E2  
 1860S CG M <sup>^</sup>DCO=1.02 1.

Out-of-band  $\gamma$



186W 7C 1986Bi13 (E(32S)=100 MEV), 2000WHZZ(E(238U)=1600 MEV).  
 186W C For determinations of **transient-field strength and precession**, see,  
 186W 2C e.g., 1991St04, 1988St16, 1987St14.  
 186W C 1971Mi08: (X,X'G); x=p, E=5.0, 5.08 MEV; x=a, E=14, 15 MEV; x=160,  
 186W 2C E=45.1, 45.5 MEV.  
 186W C 1977Mc11: (X,X'G); x=|a, E=15 MEV; x=160, E=42 MEV.  
 186W C 1979Hu01: (84KR,84KR'G) E=340 MEV, 98.5% 186W target.  
 186W C 1989Ku04: (208PB,208PB'G), E(208PB)=4.9 MeV/u; AP 95% 186W target;  
 186W 2C measured EG, yield at 12 angles;  
 186W 3C observed multiple COULOMB excitation of GS band (J LE 14),  
 186W 4C |g band (J LE 12) and quasi-|b band (J=0 and 2); extracted  
 186W 5C electromagnetic matrix elements for PI=+ yrast band.  
 186W C See also 1996Wu10 for extraction and  
 186W 2C discussion of intrinsic E2 matrix elements between |DK=2 bands.  
 186W CG E From 1977Mc11, unless noted otherwise.  
 186W CG RI Relative photon branching from 1971Mi08, except as noted.  
 186W CG M From 1971Mi08, based on G anisotropy, except as noted.  
 186W CG E(J) 1989Ku04 give EG=264.2 in table 1; evaluator presumes this is  
 186W 2CG **typographical error** for EG=274.2 (based on spectrum of fig. 1 and  
 186W 3CG systematics of EG for analogous transitions in 182W, 184W, 186W).  
 186W 4CG EG=274 in both 1979Hu01 and 1977Mc11.  
 186W CG E(K) From 1989Ku04; uncertainty not stated by authors.  
 186W CG E(L) Approximate value read by evaluator from spectrum in fig.1  
 186W 2CG of 1989Ku04 (DE AP 5 KEV); authors do not quote EG or E(level).  
 186W CG M(M) From 1977Mc11.  
 186W CL **Band assignments** shown here are from **adopted levels**. Note  
 186W 2CL that 1989Ku04 assign the 1006 level as the **J=4 member of the |g**

186W 3CL band, whereas 1977Mc11 suggest that it is the J=2 member of the |b  
 186W 4CL band. The basis for the latter assignment is unclear; such an  
 186W 5CL assignment is inconsistent with adopted JPI(1006), so it is presumed  
 186W 6CL to be in error. The 1030 level is adopted as the J=2 member of the  
 186W 7CL |b band.

186W CL E From least-squares adjustment of EG, allowing DE=1 KEV  
 186W 2CL for transitions for which authors do not quote DE.

186W CL T Calculated by the evaluator from measured BE2 and adopted  
 186W 2CL branching.

186W CL J From direct E2 COULOMB excitation (1977Mc11), except as  
 186W 2CL noted.

186W CL E(L) Reported to have been observed by 1989Ku04; E(level) is  
 186W 2CL rounded-off value from adopted levels.

186W CL J(M) From band structure deduced by 1989Ku04, based on GG coin  
 186W 2CL data and energy and intensity systematics.

186W CL J(N) E2 G to (J-2) member of same band in multiple COULOMB  
 186W 2CL excitation.

186W CL BAND(A) GS BAND (1989Ku04).

186W CL BAND(B) K=2 |g BAND (1989Ku04).  
 186W 2CL Note that the 1006 level, adopted here as the 4+ member of this band,  
 186W 3CL was presumed to be the 2+ member of the |b band in 1977Mc11.

186W CL BAND(C) K=0 |b BAND.  
 186W 2CL Only weakly populated (J=0 and 2 members) in 1989Ku04. Authors do not  
 186W 3CL indicate E(level) or deexciting transitions for either member.

186W CL BAND(D) KPI=2- BAND.  
 186W 2CL K=2 based on Alaga rules for transitions from the 3- member to  
 186W 3CL the J=2 and 3 members of the |g band (1977Mc11).

186W PN 6  
 186W L 0 0+ A  
 186W CL J from adopted levels.  
 186W L 122.6 7 2+ 1.05 NS 3 A  
 186W B L BE2=3.42 5  
 186W CL BE2 weighted average of 3.50 6 (1968St13), 3.37 8 (1974Br31) and  
 186W 2CL 3.35 7 (1975Le22). Others: 3.6 4 (1958Mc02), 3.57 25 (1961Ha21),  
 186W 3CL 3.35 11 (1974Le16), 3.4 3 (1989Ku04) from coulomb excitation, and 3.46  
 186W 4CL 12 from muonic atom (1970Hi03)  
 186W CL g-factor=0.308 17 FROM g-factor/g-factor(184W, 111)=1.07 5  
 186W 2CL (1991ST04) IF g-factor(184W, 111)= 0.289 7. Others: 0.350 35  
 186W 3CL (1967Gi02), 0.35 3 (1967Ku07).  
 186W CL Q/Q(2+ 182W)=0.908 24 (1969Ch23), 0.906 18 (1971Ob02).  
 186W CL T \$from BE2. Other values: 1.12 NS 7 (P,P'G) (1959Bi10); 1.01 NS 4  
 186W 2CL (A,A'G) (1962Bi05); 1.30 NS 21 (1967As03), 1.116 NS 21 pulsed beam  
 186W 3CL (1967Ku07); 1.38 NS 12 (1970Me09, MOSSBAUER); 1.39 NS 12 (1971Ob02,  
 186W 4CL MOSSBAUER); GE 1.15 NS 6 (1972Hi14, MOSSBAUER).  
 186W CL Static matrix element <2+ M(E2) 2+> =-2.19 +28-11 (1989Ku04).  
 186W G 122.5 E2 K  
 186W L 396.7 12 4+ 36.4 PS 25 A  
 186W B L BE2=1.63 11 (1971MI08)\$BE4=0.14 +15-10\$  
 186W CL Static matrix element <4+ M(E2) 4+> =-2.89 +37-14 (1989Ku04).  
 186W CL BE2 for 2+(123) to 4+(397) excitation. Other: 2.7 4 (1989Ku04).  
 186W CL BE4 from <0+ M(E4) 4+> =-0.37 17, weighted average of -0.27 10  
 186W 2CL (1974Le16) and -0.64 16 (1974Br31). Other <0+ M(E4) 4+>: -0.25 25  
 186W 3CL (1975Le22).  
 186W CL J E2 G to 2+; J=0 inconsistent with measured T.

186W CL g-factor/g-factor(122, 2+)=1.04 7 (1985St07).  
186W CL Other T: 38 PS 3 from nuclear deorientation for ions  
186W 2CL recoiling in vacuum (1986Bi13).  
186W G 274.2 E2 J  
186W L 737.2 7 2+ 4.78 PS 16 B  
186W B L BE2=0.140 4  
186W CL BE2 Weighted average of 0.146 8 (1977Mc11; supersedes 0.150 8  
186W 2CL from 1971Mi08) and 0.139 4 (1974Ba81).  
186W CL g-factor/g-factor(122, 2+)=0.63 13 (1985St07).  
186W G 615 94 3 M1+E2 -11 -4+3  
186W CG MR from 1971Mi08; A2=-0.140 15 (1971Mi08).  
186W G 737 100 E2  
186W L 810.1 16 6+ 4.0 PS 3 A  
186W B L BE2=1.70 12  
186W F L FLAG=N  
186W CL Static matrix element  $\langle 6+ M(E2) 6+ \rangle = -3.25 +17-42$  (1989Ku04).  
186W CL BE2 Weighted average of 1.89 29 (1971Mi08) and 1.66 13  
186W 2CL (1979Hu01); for 4+(397) to 6+(810) excitation. Other: 1.21 +14-12  
186W 3CL (1989Ku04).  
186W CL g-factor/g-factor(122, 2+)=1.03 20 (1985St07).  
186W G 413.4 E2 K  
186W L 861.8 9 (3)+ B  
186W CL J E1 G from 3-; band structure.  
186W G 739  
186W L 884 (0+) C  
186W F L FLAG=L  
186W CL J from adopted levels.

186W L 952.1 10 (2)- D  
186W CL J anisotropies of G to 2+ and G from 3-.  
186W G 215 E1 M  
186W CG M G(|q) corrected for contamination by 184W line (1977Mc11).  
186W L 1006.7 15 4+ B  
186W CL BE2 1977Mc11 report BE2=0.0030 6 for 0+(GS) to 2+(1007)  
186W 2CL excitation, based on 610G yield and the assumption that the 1007  
186W 3CL level is the 2+ member of the |b band; however level is currently  
186W 4CL designated as the J=4 member of the |g band.  
186W CL J 1989Ku04 observe the gammas known to deexcite this level, and  
186W 2CL designate them as transitions from the 4+ member of the |g band  
186W 3CL rather than from the 2+ member of the |b band (as supposed in  
186W 4CL 1977Mc11). The J=4 assignment is consistent with expected strong  
186W 5CL excitation of |g band levels in 1989Ku04 and with band systematics in  
186W 6CL nearby ^W and Os even-^A nuclei.  
186W G 269  
186W CG E rounded-off value from adopted gammas; |g not evident in  
186W 2CG spectrum shown in 1989Ku04 (possibly masked by intense 274G), but  
186W 3CG authors imply that it was observed.  
186W G 610 100  
186W G 884 5 12 LT L  
186W CG RI from |g yields in 1977Mc11 (G not observed).  
186W 2CG However, |g is prominent in spectrum in 1989Ku04.  
186W L 1030 2+ C  
186W F L FLAG=L  
186W CL J from adopted levels.  
186W L 1045.0 7 3- D

186W S L BE3=0.101 8  
 186W CL BE3 From 1977Mc11 (based on yields of 308G, 183G and 215G).  
 186W G 93 M1+E2 1.3 5 M  
 186W CG |d{+2}=1.8 +150-11 (1977Mc11), from analysis of  
 186W 2CG 0+(E3)3-(M1+E2 93G)2-(E1 215G)2+ sequence.  
 186W G 183 33.5 E1 M  
 186W CG RI from G yield (relative to 308G) in 1977Mc11.  
 186W CG Anisotropy=1.29 6 (1977Mc11); consistent with 0+(E3)3-(E1)3+  
 186W 2CG sequence.  
 186W G 308 100 E1 M  
 186W CG Anisotropy=0.761 14 (1977Mc11); consistent with  
 186W 2CG 0+(E3)3-(E1)2+ sequence.  
 186W G 1045 [E3] S  
 186W CG M 1045 level directly populated by E3 COULOMB excitation  
 186W 2CG (1977Mc11).  
 186W L 1196 6 (5+) B  
 186W F L FLAG=M  
 186W G 799 5 L

## <sup>58</sup>Fe(d,p), (pol d,p)

59FE 58FE(D,P), (POL D,P) 1964SP03,1972MC18,1980TA05  
 59FE H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 95,215 (2002)\$CUT=8-Feb-2002\$  
 59FE C Others: 1968GR18, 1967KL03, 1964BJ01.  
 59FE C 1980TA05: E(POL D)=10 MEV, measured SIGMA(THETA) and analyzing  
 59FE2C power, 12 angles from 25 DEG to 80 DEG (lab), enriched targets

59FE3C (82.48%), 8 SI(LI)-detectors at 15 DEG intervals, FWHM=30-50 KEV for  
59FE4C 15-MEV protons,  $|s(|q)$  and analyzing power compared with DWBA  
59FE5C calculations.

59FE C 1972MC18: E(D)=10 MEV and 12 MEV, measured SIGMA(THETA), THETA(c.m)  
59FE2C from AP 5 DEG to AP 90 DEG, enriched targets (85.4%), multigap  
59FE3C spectrograph, FWHM=16 KEV for 16-MEV protons.

59FE C 1968GR18: E(D)=6 MEV. DWBA analysis of SIGMA(THETA); levels at 730,  
59FE2C 1020, 1230, 1910 and 3590; deduced  $(2JF+1)^S$  for each level.

59FE C 1967KL03: E(D)=10 MEV, measured SIGMA(THETA), 34 angles from 7.5 DEG to  
59FE2C 165 DEG, surface-barrier detector for protons at 25 DEG to 165 DEG with  
59FE3C FWHM (GS)=44 KEV, magnetic spectrograph at 5 angles from 7.5 DEG to  
59FE4C 35 DEG.

59FE C 1964SP03: E(D)=6.55 MEV, THETA=30 DEG and 45 DEG; for E(D)=7.0 MEV,  
59FE2C THETA=10 DEG. Measured EP, enriched target (75.1%), single-gap  
59FE3C spectrograph.

59FE C 1964BJ01: E(D)=3-4.3 MEV, THETA=145.5 DEG, levels at 0, 290, 477,  
59FE2C 614, 639, 732 KEV, DE=8 KEV.

59FE C Spectroscopic factors from 1967KL03 are in very poor agreement with  
59FE2C those from 1972MC18 and 1980TA05. The results of 1980TA05 and 1968GR18  
59FE3C are in fair agreement with 1972MC18.

59FE CL L,S L values and spectroscopic factors are from 1972MC18, based  
59FE2CL on comparison of 10 MEV data with DWBA calculations, except as noted.

59FE CL E From 1964SP03, except as noted.

59FE CL J From L value and measured analyzing power (1980TA05).

59FE CL S\$LABEL=S'

59FE CL E(A), S(A) From 1972MC18. Value of ^S' shown assumes L=1.

59FE CL L(B), S(B)\$From 1980TA05.

59FE CL E(D) Doublet.  
 59FE CL E(E) From 1964BJ01.  
 59FE CL J(F),L(F)\$Weakly excited state; |s(|q) corrected for JPI=3/2- 58FE  
 59FE2CL contaminant nearby. Analyzing power compatible with 3/2- or 5/2-.  
 59FE3CL |s(|q) poorly fitted by L=1 or L=3 DWBA in 1980TA05, and deviates  
 59FE4CL significantly from |s(|q) for other levels at |q>60 DEG. Consequently,  
 59FE5CL evaluator considers authors' L=1 assignment to be uncertain; it also  
 59FE6CL conflicts with adopted JPI(574)=5/2-.

|       |   |        |    |              |        |       |     |
|-------|---|--------|----|--------------|--------|-------|-----|
| 59FE  | L | 0      |    | 3/2-         | 1      | 1.45  |     |
| 59FE  | L | 287    | 10 | 1/2-         | 1      | 0.09  |     |
| 59FE  | L | 473    | 10 | 5/2-         | 3      | 2.10  |     |
| 59FE  | L | 574    |    | (3/2-, 5/2-) | (1, 3) | 0.017 | A   |
| 59FE3 | L | FLAG=F |    |              |        |       |     |
| 59FE  | L | 614    | 8  |              |        |       | E ? |
| 59FE  | L | 639    | 8  |              |        |       | E ? |
| 59FE  | L | 728    | 10 | 3/2-         | 1      | 0.50  |     |
| 59FE  | L | 1026   | 10 | (7/2)-       | 3      | 0.19  |     |
| 59FE  | L | 1081   |    |              | 1      | 0.010 |     |
| 59FE  | L | 1162   | 10 |              | 1      | 0.009 |     |
| 59FE  | L | 1214   | 10 | 1/2-         | 1      | 1.19  |     |

<sup>58</sup>Fe(d,pγ)

Separated from (d,p) data set because γ rays observed

59FE 58FE (D, PG) 1977PA18  
 59FE H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 95,215 (2002)\$CUT=8-Feb-2002\$  
 59FE C E(D)=3.5 MEV. Measured EG, natural and enriched (83.5%) targets, GELI

59FE2C (1977PA18) .  
 59FE CL E From EG.  
 59FE L 0  
 59FE L 287.3 10  
 59FE G 287.3 10  
 59FE L 472 3  
 59FE G 472 3  
 59FE L 570.9 10  
 59FE G 570.9 10  
 59FE L 727.1 10  
 59FE G 727.1 10  
 59FE L 1210.6 10  
 59FE G 1210.6 10

## <sup>59</sup>Co(n,p)

59FE 59CO (N, P) 1993AL21, 1963MO13  
 59FE H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 95,215 (2002)\$CUT=8-Feb-2002\$  
 59FE C 1993AL21: EN=198 MEV, |q(lab)=0 DEG-20 DEG (4 DEG steps), 99.99% 59CO  
 59FE2C targets, magnetic spectrometer, FWHM AP 900 KEV; measured energy  
 59FE3C spectra at 6 angles for protons exciting levels with E<30 MEV; ^DWIA  
 59FE4C analysis. Decomposed strength function into L=0,1,2,3 components;  
 59FE5C ^GT resonance (L=0) observed with centroid at 4.1 MEV. See 2001LA12  
 59FE6C and 1999CA29 for further discussion of these results.  
 59FE C 1963MO13: measured energy and angular distribution of protons emitted  
 59FE2C from 59CO when bombarded by 14.8-MEV 3H(D,N) neutrons.

## $^{169}\text{Tm}(n,\gamma)$ E=thermal

170TM 169TM(N,G) E=0-136 EV 1996HO12,1989DU03,1968LO09  
170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$  
170TM C Target JPI=1/2+.  
170TM C This dataset includes 169TM(D,PG).  
170TM C For data from (N,G) E=thermal: two-photon cascade measurements, see  
170TM2C separate data set.  
170TM C Others: 1966SH03, 1967AN04, 1967BA17, 1970BH03 [(N,G) E=res].  
170TM C 1996HO12: 169TM(N,G) E=thermal; ^GAMS1 and ^GAMS2/3 curved-crystal  
170TM2C spectrometers, FWHM<5.6x10<sup>{+-6}</sup>E<sup>{-|g}{+2}</sup> for first-order diffraction;  
170TM3C ^BILL B spectrometer; Ge and X-RAY detectors for GG  
170TM4C coin measurements; natural TM oxide  
170TM5C and metal targets; measured secondary G (AP 570 transitions) EG, IG,  
170TM6C Ice, GG coin. These data supersede most data from 1994HOZZ and 1995HOZZ  
170TM C 1989DU03: 169TM(N,G) E=thermal; Si(Li) detector, FWHM=0.35 KEV at  
170TM2C 30 KEV.  
170TM C 1968LO09: 169TM(N,G) E LE 136 EV (resonant and nonresonant);  
170TM2C measured primary EG, IG; deduced ^S(n)=6593.8 14 (cf.  
170TM3C 6593.3 11 (1995AU04)).  
170TM C 1967AN04: 169TM(D,PG) E=9 MeV, 169TM(N,G) E=thermal; measured  
170TM2C ^T<sup>{-1/2}</sup>, Ice, IG, GG-delayed coin; deduced conversion coefficients  
170TM3C assuming E2-theory value for ELC(115G).  
170TM C 1967BA17: 169TM(N,G) E=thermal, double-focusing |b spectrometer;  
170TM2C measured E(ce), Ice.  
170TM C 1966SH03: 169TM(N,G) E=thermal; measured EG, IG for primary

170TM2C transitions and EG, IG, Ice for secondary transitions.  
 170TM3C Assigned nuclear configurations.  
 170TM C For neutron resonance parameters and thermal n cross section,  
 170TM2C see 1984MUZY.  
 170TM C The **level scheme is based on** 1996HO12.  
 170TM C Nuclear band configurations: see 1966SH03, 1996HO12.  
 170TM CG **Conversion electron data** are from 1994HOZZ and 1996HO12,  
 170TM2CG unless indicated otherwise.  
 170TM **CL E** For E<1380: from least-squares adjustment of EG, omitting  
 170TM2CL multiply-placed gammas and the 960.6G which fits its placement poorly.  
 170TM3CL For E GE 1380: from primary transition EG and  $^S(n)$ .  
 170TM **CL J** For E<1380: from adopted levels. For E GE 1380:  
 170TM2CL based on primary transition intensities to state from various 0+ and 1+  
 170TM3CL resonances corresponding to  $E(n) | < 136$  EV, assuming mult=E1 for observed  
 170TM4CL primary transitions (1968L009). The latter assumption implies  $J | < 2-$   
 170TM5CL for all final states observed by 1968L009, limits J to 1 for levels fed  
 170TM6CL from J=0 resonances, and suggests  $J | = 1$  for levels fed from J=1 but  
 170TM7CL not from J=0 resonances. Note that J=0 for the 17.5-EV resonance  
 170TM8CL (1970BH03); this differs from the value used in 1968L009, and the  
 170TM9CL evaluator has modified those authors' JPI conclusions accordingly.  
 170TM CL **BAND(A)** KPI=0- BAND.  
 170TM2CL **Configuration**=(|p 1/2[411])-(|n 1/2[521])  
 170TM CL BAND(B) KPI=1- GS BAND.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 1/2[521])  
 170TM CL BAND(C) KPI=1- BAND.  
 170TM2CL Configuration=(|p 3/2[411])-(|n 1/2[521]) plus (|p 7/2[404])-(|n  
 170TM3CL 5/2[512]).

170TM CL BAND(D) K|p=3- band.  
170TM2CL Configuration=(|p 1/2[541])-(|n 7/2[633]).  
170TM CL BAND(E) KPI=2- BAND.  
170TM2CL Configuration=(|p 1/2[411])-(|n 5/2[512]).  
170TM CL BAND(H) KPI=0+ BAND.  
170TM2CL Configuration=(|p 7/2[404])-(|n 7/2[633]).  
170TM CL BAND(J) KPI=3- BAND.  
170TM2CL Configuration=(|p 1/2[411])+(|n 5/2[512]).  
170TM CL BAND(O) KPI=1- BAND.  
170TM2CL Configuration=(|p 3/2[411])-(|n 5/2[512]) plus (|p 1/2[411])+(|n  
170TM3CL 1/2[510]) plus ((|p 1/2[411])-(|n 5/2[512]) -|g vibration).  
170TM CL BAND(Q) KPI=1+ BAND.  
170TM2CL Configuration=(|p 1/2[541])+(|n 1/2[521]).  
170TM CL BAND(S) KPI=0+ BAND.  
170TM2CL Configuration=(|p 1/2[541])-(|n 1/2[521]).  
170TM CL BAND(T) KPI=1- BAND.  
170TM2CL Configuration=(|p 1/2[411])-(|n 3/2[521]) plus (|p 7/2[404])-(|n  
170TM3CL 5/2[512]) plus (|p 3/2[411])-(|n 1/2[521]).  
170TM CL BAND(U) KPI=2- BAND.  
170TM2CL Configuration=(|p 1/2[411])+(|n 3/2[521]) plus (|p 3/2[411])+(|n  
170TM3CL 1/2[521]) plus ((|p 1/2[411])+(|n 1/2[521]) -|g vibration).  
170TM CL BAND(V) KPI=0- BAND.  
170TM2CL Configuration=(|p 7/2[523])-(|n 7/2[633]).  
170TM DL BAND(W) KPI=(1)- BAND.  
170TM2DL BUILT ON KPI=1- GS BAND.  
170TM CL BAND(Z) KPI=3+ BAND.  
170TM2CL Configuration=(|p 1/2[411])-(|n 7/2[633]).

170TM CL BAND(a) KPI=1+ BAND.  
170TM2CL Configuration=(|p 7/2[523])-(|n 5/2[512]).  
170TM CG E From curved-crystal spectrometer data of 1996HO12, except  
170TM2CG as noted, for secondary transitions; calibrated assuming E=50.7416 for  
170TM3CG TM XKA1 line.  
170TM4CG From 1968LO09 for primary transitions, except as noted.  
170TM CG RI Photon intensities/100 thermal n captures; from 1996HO12 for  
170TM2CG secondary transitions, except as noted; from  
170TM3CG 1968LO09 for primary transitions, except  
170TM4CG as noted. Primary transition IG data are also available from 1968LO09  
170TM5CG for resonant capture (3.92, 14.4, 17.5, 29.1, 34.8, 38.0, 44.8, 50.7,  
170TM6CG 54+59.2, 63.0+65.8, 83.4, 93.5+94.0, 115, 125+132+136 EV resonances).  
170TM CG M,MR Based on ce data from 1996HO12.  
170TM CG E(A) Not reported in thermal n capture.  
170TM CG E(C) Apparent doublet (1968LO09); however, only one possible final  
170TM2CG state in 170TM has been identified.  
170TM CG RI(D) Absolute IG from 1989DU03, scaled by a factor of 0.56 so  
170TM2CG I(38G)=0.196 as reported in 1996HO12; includes 4% uncertainty in  
170TM3CG absolute IG in 1989DU03 but not the 11% uncertainty in I(38G) in  
170TM4CG 1996HO12.  
170TM CG RI(E),M(E)\$Divided intensity and mult for both components of doublet  
170TM2CG deduced by 1996HO12 from subshell ratios for doublet,  
170TM3CG assuming any E1 component to be pure. In the case of the 144.5G, the  
170TM4CG E2 component was also assumed to be pure.  
170TM CG M(F) Based on CC<640 from intensity balance.  
170TM CG M(G) Based on CC<235 from intensity balance.  
170TM CG M(H) Based on CC<76 from intensity balance.

170TM CG RI(I) From IG=0.403 7, EKC=0.0069 7 for the  
170TM2CG doubly-placed transition and mult as indicated.  
170TM CG RI(J) Placements in level scheme require mult=E1 for 818 level and  
170TM2CG mult=M1,E2 for 908 level. From I(ce) and IG one can deduce  
170TM3CG IG(E1)=0.70 5, IG(M1)=0.26 6 for E1-M1, and IG(E1)=0.21 10,  
170TM4CG IG(E2)=0.75 11 for E1-E2.  
170TM CG E(K) PLACED BY EVALUATOR BASED ON EG; UNPLACED IN 1996HO12.  
170TM CG E(X) From fig. 5 of 1996HO12; observed in GG coin only.  
170TM CG M(Y) Nonobservance of ce(K) line accompanied by significant IG  
170TM2CG suggests mult=E1.  
170TM N 1.00 3  
170TM CN NR from 1996HO12, based on |S(TI feeding GS)=92%, which assumes  
170TM2CN that AP 33% of unplaced gammas feed the GS; consistent  
170TM3CN with data from 1966SH03. However, note that IG normalization=1.79  
170TM4CN based on I(38.7G)=0.35 1 per 100 n captures from 1989DU03; source  
170TM5CN of discrepancy not understood. SIGMAN=103 B (1984MUZY).  
170TM PN 5  
170TM G 46.202 3 0.031 14  
170TM G 47.017 5 0.017 8  
170TM G 47.043 2 0.038 12  
170TM G 56.279 3 0.090 6  
170TM G 117.057 2 0.018 3  
170TM G 119.313 1 0.041 2 E2+M1 2.1 +9-5 1.66 7  
170TM2 G EKC=0.86 8 \$  
170TM G 124.875 1 0.056 3M1+E2 0.81 +19-161.55 4  
170TM CG EKC=1.09 8.  
170TM G 129.065 7 0.015 4

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170TM G 129.376 1 0.40 5E1 0.170
170TM CG EKC=0.029 4.
170TM G 138.170 6 0.016 4
170TM G 169.494 1 0.045 3 M1+E2 0.67 15 0.63 3
170TM CG EKC=0.49 3; K:L1=0.492 10:0.095 13 (1994HOZZ) .
170TM CG MR from EKC. However, MR LE 0.15 from |a(L1)exp.
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170TM G 1632.04 140.21 3
170TM G 1658.65 130.23 3
170TM L 0.0 1- B
170TM L 38.7139 5 (2)- B
170TM G 38.714 1 0.196 21 E2 197
170TM CG |a(L2)exp=68 7; L1:L2:L3:M1:M2:M3:M4:M5=5.80 12:67.6
170TM2CG 14:82.8 17: 0.979 20:17.5 4:22.4 4:0.300 18:0.311 12.
170TM3CG |a(L1)exp, |a(M1)exp inconsistent with other ce data; may
170TM4CG include impurities. Others: L1:L2:L3=100 15:1160 90:1450 110
170TM5CG (1967BA17) .
170TM CG OTHER EG: 38.713 2 (1966SH03), 38.712 6 (1989DU03) .
170TM CG OTHER IG: 0.170 17 (1966SH03); 0.35 1 (1989DU03) .
170TM CG Other mult: M1+E2 with MR=1.01 +11-8 from 1967BA17.
170TM L 114.5440 6 (3)- B
170TM G 75.831 1 0.81 7M1+E2 0.85 5 7.97 7
170TM CG |a(L2)exp=1.18 11; L1:L2:L3:M1:M2:M3=
170TM2CG 0.585 12:1.180 24:1.180 24:0.1070 21:0.269 5:0.284 6.
170TM3CG Other: L1:L2:L3=100 10:197 20:200 14 (1967BA17)
170TM CG Other MR: 0.80 6 (1967BA17) .
170TM G 114.544 1 4.016 18 E2 1.87

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170TM CG EKC=0.63 6; K:L1:L2:L3:M1:M2:M3=  
170TM2CG 0.63 6:0.0702 21:0.305 6:0.280 6:0.0133 3:0.112 2:0.0725 15.  
170TM L 149.7180 6 (0)- A  
170TM G 111.005 1 0.356 16 E2 2.10  
170TM CG EKC=0.59 3; K:L1:L2:L3:M1:M2:M3=  
170TM2CG 0.588 12:0.0637 13:0.369 7:0.604 12:0.0136 10:0.0866 17:0.0892 18.  
170TM G 149.718 1 6.5 5 M1 1.01 C  
170TM CG EKC=0.80 6; K:L1:L2:L3:M1:M2=  
170TM2CG 0.795 16:0.1020 20:0.00882 18:0.00121 5:0.0225 5:0.00233 14.  
170TM L 183.1897 14 (4)- B  
170TM G 68.6491 4 0.008 4E2 13.9 @  
170TMF G FLAG=E  
170TML G FL=114.5440  
170TM CG E FROM 1994HOZZ; EG=68.649 0 IN 1996HO12.  
170TM CG For doublet: |a(L1)exp=0.074 4; L1:L2:L3:M1:M2:M3=  
170TM2CG 0.0738 15:0.0422 8:0.0519 10:0.0131 10:0.0107 3:0.0137 4.  
170TM G 144.480 1 0.94 11E2 0.804 @C  
170TMF G FLAG=E  
170TM CG E 144.480 1 for doublet.  
170TM CG For doublet ce data, see comment on 144.5G from 183.197  
170TM2CG level.  
170TM L 183.197 4 (3)+ 4.12 US 13 Z  
170TM CL T from G(T) in (D,PG) and (N,G) E=thermal (1967AN04).  
170TM2CL Other: 3.2 US 3 (delayed spectrum, 1970BH03).  
170TM G 68.6491 4 2.08 10E1 0.90 @  
170TMF G FLAG=E  
170TM CG E FROM 1994HOZZ; EG=68.649 0 IN 1996HO12.

170TM CG For doublet ce data, see comment on 68.6G from 183.190  
170TM2CG level.  
170TM G 144.480 1 5.0 3E1 0.127 @  
170TMF G FLAG=E  
170TM CG For doublet, EKC=0.157 9; K:L1:L2:L3:M1:M2:M3=  
170TM2CG 0.157 3:0.0150 3:0.0232 5:0.0204 4:0.00377 15:0.00629 13:0.00615 25.  
170TM L 204.4486 7 (2)- 1 NS LT E  
170TM CL T from absence of delayed ce or G from level (1967AN04).  
170TM G 89.906 3 0.056 6M1 4.32  
170TM CG EKC=4.4 4; K:L1:L2=4.44 9:0.388 12:0.081 8.  
170TM CG M M1 from EKC; however, L subshell data indicate some E2  
170TM2CG admixture.  
170TM G 165.735 1 2.87 16M1(+E2) 0.7 LE 0.71 5 C  
170TM CG EKC=0.62 3; K:L1:L2:L3:M1:M2:M3=  
170TM2CG 0.616 12:0.0772 15:0.00760 15:0.00214 15:0.0159  
170TM3CG 5:0.00183 9:0.00064 10.  
170TM CG MR subshell data not mutually consistent; deduced MR values  
170TM2CG range from 0 to 0.6 1.  
170TM G 204.448 1 6.58 4M1 0.421 C  
170TM CG EKC=0.341 17; K:L1:L2:L3:M1:M2=  
170TM2CG 0.341 7:0.0466 9:0.00410 16:0.00063 8:0.01060 21:0.00119 14.  
170TM L 219.7060 6(2)- A  
170TM G 69.988 1 0.146 21 E2 12.9  
170TM CG |a(L2)exp=4.0 6; L1:L2:L3:M1:M2:M3=  
170TM2CG 0.261 10:3.95 8:4.00 8:0.053 5:0.885 18:0.992 20.  
170TM G 105.162 1 1.002 10M1+E2 0.4 3 2.72 3  
170TM CG EKC=1.84 9; K:L1:L2:L3:M1:M2:M3=

170TM2CG 1.84 4:0.236 5:0.0333 7:0.0213 9:0.0676 14:0.0147 13:0.0101 15.  
170TM CG MR based on 0.72 11 from EKC, 0.25 2 from M subshell  
170TM2CG data, and 0.10 2 to 0.74 9 from L subshell data.  
170TM G 180.994 1 3.5 3 M1+E2 0.28 3 0.575 4 C  
170TM CG EKC=0.44 4; K:L1:L2:M1:M2:M3=  
170TM2CG 0.443 9:0.0564 11:0.00745 15:0.01240 25:0.00184  
170TM3CG 18:0.00102 9. Other: K:L1:L2=800 120:100 7:32 6  
170TM4CG (1967BA17)  
170TM CG Other MR: 0.58 +12-7 (1967BA17).  
170TM G 219.705 1 2.701 22E2+M1 1.29 10 0.250 6 C  
170TM CG EKC=0.191 10; K:L1:L2:L3:M1:M2:M3=  
170TM2CG 0.191 4:0.0240 5:0.0157 3:0.01150 23:0.0060 4:0.0041  
170TM3CG 3:0.00280 25. Other: K:L1:L2:L3=630 60:100 10:65 10:45 10  
170TM4CG (1967BA17)  
170TM CG Other MR: 1.32 +26-16 (1967BA17).  
170TM L 237.2396 6 (1)- A  
170TM G 17.554 8 0.012 1 (M1(+E2))0.24 LT D  
170TM3 G FLAG=F  
170TM CG E from 1989DU03.  
170TM CG CC(M1)=88, CC(E2)=10090.  
170TM G 87.521 1 1.29 3 M1 4.66 C  
170TM CG EKC=3.98 20; K:L1:L2:M1:M2=  
170TM2CG 3.98 8:0.577 17:0.0600 24:0.103 3:0.0171 14.  
170TM G 198.524 1 0.569 15M1 0.457  
170TM CG EKC=0.411 21; K:L1:L2:M1:M2=  
170TM2CG 0.411 8:0.0544 11:0.0035 6:0.0174 10:0.0024 5.  
170TM G 237.241 1 4.08 8M1 0.280 C

170TM CG |a(L1)exp=0.238 12; K:L1:L2:L3:M1:M2=  
170TM2CG 0.238 5:0.0342 7:0.00241 17:0.00063 11:0.00658 26:0.00071 8.  
170TM L 247.147 6 (4)+ Z  
170TM G 63.959 4 0.177 23M1+E2 0.65 13.7 @  
170TML G FL=183.197  
170TMF G FLAG=E  
170TM CG For doublet: |a(L1)exp=0.93 11; L1:L2:L3:M1:M2:M3=  
170TM2CG 0.930 19:1.60 3:1.99 4:0.172 3:0.355 7:0.372 7.  
170TM CG MR from authors' analysis (1996HO12).  
170TM G 63.959 4 0.027 4E1 1.08 @  
170TML G FL=183.1897  
170TMF G FLAG=E  
170TM CG For doublet ce data, see comment on 64.0G to 183.197 level.  
170TM L 270.5466 8 (3)- E  
170TM G 66.098 1 0.39 4M1(+E2) 0.33 LE 10.8 3  
170TM CG |a(L1)exp=1.42 14; L1:L2:L3:M1:M2:M3=  
170TM2CG 1.42 3:0.575 12:0.573 11:0.275 6:0.157 3:0.155 3.  
170TM G 87.5 X  
170TML G FL=183.1897  
170TM CG E PRESUMABLY DIFFERS FROM 87.521G AND 87.571G SEEN IN SINGLES  
170TM2CG SPECTRUM AND PLACED ELSEWHERE.  
170TM G 156.003 1 0.116 9M1+E2 0.32 7 0.87 1  
170TM CG EKC=0.45 4; K:L1:L2:M1=  
170TM2CG 0.45 3:0.097 3:0.0170 26:0.027 3.  
170TM CG MR from |a(L2)exp; EKC and |a(M1)exp not consistent.  
170TM G 231.834 2 0.392 24M1 0.298  
170TM CG EKC=0.254 15; K:L1:M1=0.254 5:0.0349 7:0.0092 8 (1994HOZZ).

170TM L 319.3256 9 (5)- B  
170TM G 204.782 1 0.188 18E2 0.242  
170TM CG EKC=0.127 17; K:L2=0.127 11:0.0269 13 (1994HOZZ).  
170TM L 349.7330 8 (3)- A  
170TM G 112.494 2 0.033 3 E2 2.00  
170TM CG EKC=0.80 7; K:L3:M2=0.80 3:0.48 3:0.112 16 (1994HOZZ).  
170TM G 130.027 1 1.02 3M1+E2 0.55 9 1.42 2 C  
170TM CG E FROM 1994HOZZ; EG=130.027 0 IN 1996HO12.  
170TM CG EKC=1.09 5; K:L1:L2:M1:M2=  
170TM2CG 1.090 22:0.145 3:0.0163 3:0.0313 6:0.0040 5.  
170TM CG MR from |a(L1)exp and EKC; |a(L2)exp inconsistent.  
170TM G 145 X  
170TM G 235.193 2 0.942 24M1 0.286 C  
170TM CG EKC=0.249 12; K:L1:L2=662 18:100:7.4 10 (1996HO12).  
170TM G 311.018 2 2.01 8M1(+E2) 0.23 LE 0.133 2 C  
170TM CG EKC=0.106 5; K:L1:L2:M1=0.1060 21:0.0157 3:0.0035:0.00348 14.  
170TM L 355.047 6 (4)+  
170TM CL J probable configuration=(|p 1/2[411])+(|n 7/2[633]) bandhead  
170TM2CL (1996HO12).  
170TM G 107.901 2 0.038 3 E2+M1 1.3 +3-4 2.42 3  
170TM CG EKC=1.37 14.  
170TM G 171.855 1 0.056 9E1 0.0802 @  
170TML G FL=183.1897  
170TMF G FLAG=E  
170TM CG For doublet ce data, see comment on 171.9G to 183.197 level.  
170TM G 171.855 1 0.27 3M1(+E2) 0.20 0.674 @  
170TML G FL=183.197

170TMF G FLAG=E  
 170TM CG For doublet: EKC=1.38 12 (1994HOZZ,1996HO12); K:L1:L2:M1:M2=  
 170TM2CG 1.38 3:0.0741 15:0.0103 11:0.0152 8:0.0052 10 (1994HOZZ). HOWEVER, EKC  
 170TM3CG APPEARS TO BE TOO HIGH AND IS INCONSISTENT WITH L1/K=0.17 3 IN  
 170TM4CG 1966HO12; THE LATTER IMPLIES EKC AP 0.44 BASED ON EL1C=0.0741 15 IN  
 170TM5CG 1994HOZZ.  
 170TM CG MR from authors' analysis (1996HO12).  
 170TM L 358.1163 9 (4)- E  
 170TM G 87.571 2 0.219 6M1+E2 0.27 5.17  
 170TM CG |a(L3)exp=0.103 6; L3:M2:M3=0.103 5:0.051 11:0.049 6  
 170TM2CG (1994HOZZ).  
 170TM CG MR from |a(L3)exp; however, MR=0.38 7 from |a(M2)exp, 0.40 6  
 170TM2CG from |a(M3)exp and 0.15 5 from L3/M2.  
 170TM G 153.667 1 0.101 8 E2 0.64  
 170TM CG EKC=0.350 25; K:L1=0.350 7:0.084 14 (1994HOZZ).  
 170TM CG M EKC consistent with pure E2 (expected from placement);  
 170TM2CG |a(L1)exp implies MR(E2,M1)=0.7 4 suggesting ce line contamination.  
 170TM G 174.927 2 0.028 3 M1+E2 0.53 12  
 170TML G FL=183.1897  
 170TM CG EKC=0.40 4: K:L1=0.403 12:0.081 10 (1994HOZZ).  
 170TM CG MR 0.9 3 from EKC; LE 0.4 from |a(L1)exp.  
 170TM G 243.573 3 0.036 5 M1+E2 0.9 +4-3 0.21 3  
 170TM CG EKC=0.166 23.  
 170TM L 381.4258 8 (4)- A  
 170TM G 31.713 90.013 1 (M1(+E2))0.87 LT D  
 170TMF G FLAG=G  
 170TM CG E FROM 1989DU03.

170TM CG CC(M1)=15.1, CC(E2)=529.  
 170TM G 161.721 1 0.228 11E2 0.54  
 170TM CG |a(L2)exp=0.067 4; L1:L2:L3=  
 170TM2CG 0.0314 16:0.067 3:0.0629 13. L1/K=0.033 2 (1996HO12).  
 170TM CG M,MR E2(+M1), MR GE 2.2 from (N,G) consistent with pure E2  
 170TM2CG as required by placement.  
 170TM G 198.237 2 0.071 4E2+M1 1.23 +25-190.34 2  
 170TML G FL=183.1897  
 170TM CG MR from EKC; however, |a(L1)exp gives 0.54 19.  
 170TM CG EKC=0.255 18; K:L1=0.255 10:0.045 4 (1994HOZZ).  
 170TM G 266.881 1 0.130 14M1+E2 0.9 3 0.158 19  
 170TM CG EKC=0.126 14;  
 170TM2CG K:L1:L2:M1=0.126 4:0.0176 23:0.0050 23:0.0063 19 (1994HOZZ).  
 170TM G 342.711 4 0.106 5 E2 0.0485  
 170TM CG EKC=0.0309 25.  
 170TM L 402.7281 19 (3,4)-  
 170TM G 288.185 2 0.095 8 M1+E2 0.64 20 0.141 11  
 170TM CG EKC=0.115 10; K:L1=0.115 5:0.016 3 (1994HOZZ).  
 170TM G 364.012 4 0.014 1  
 170TM L 447.0707 8 (3)-  
 170TM G 88.954 1 0.035 7 M1 4.45  
 170TM CG |a(L1)exp=1.02 20; L1:M1:M2=1.02 4:0.21 3:0.139 13  
 170TM2CG (1994HOZZ).  
 170TM G 176.525 1 0.294 9M1+E2 0.65 12 0.56 2  
 170TM CG EKC=0.443 22; K:L1:L2:L3:M1=  
 170TM2CG 0.443 9:0.0530 11:0.0133 12:0.0075 9:0.0092 9.  
 170TM CG MR from EKC; however, subshell ratios do not give an

J

170TM2CG internally consistent value for MR.

170TM G 242.623 1 0.910 16M1(+E2) 0.30 +15-300.25 1 C

170TM CG EKC=0.210 11; K:L1:L2:L3:M1=

170TM2CG 0.210 4:0.0303 9:0.0073 8:0.0020 3:0.0074 3.

170TM G 263.877 5 0.016 1

170TML G FL=183.1897

170TM G 332.522 5 0.035 1 M1(+E2) 0.60 LE 0.105 8

170TM CG EKC=0.088 8.

170TM G 408.348 3 0.143 2 M1+E2 0.47 13 0.059 3

170TM CG EKC=0.0493 25.

170TM L 467.8607 12 (5)- E

170TM G 109.744 3 0.021 4

170TM G 197.314 1 0.028 3 E2 0.274

170TM CG EKC=0.17 3.

170TM L 539.7223 17 (4)- J

170TM G 92.654 3 0.073 5 M1+E2 0.23 3 3.97

170TM CG EKC=3.38 20; K:L1:L2=3.38 7:0.412 8:0.085 12.

170TM CG MR from L1/L2.

170TM G 269.173 2 0.063 8M1+E2 1.0 4 0.149 23

170TM CG EKC=0.121 16; K:L1=0.121 5:0.024 4 (1994HOZZ).

170TM G 335.274 8 0.012 2

170TM L 544.050 8 (3+)

170TM G 505.344 150.106 7

170TM G 544.043 110.060 3

170TM CG EKC=0.0187 21.

170TM CG M,MR E2+M1 (MR=1.0 +4-3) from EKC is inconsistent with  
 170TM2CG placement; either the G is misplaced or the mult is incorrect.

170TM L 550.7473 17 (5)- A  
 170TM G 169.321 2 0.022 3 M1+E2 0.7 +4-3 0.63 7  
 170TM CG EKC=0.49 7.  
 170TM G 192.633 3 0.016 1 M1 0.497  
 170TM CG EKC=0.47 4.  
 170TM G 231.418 6 0.010 1  
 170TM G 367.556 4 0.084 4 M1+E2 0.34 +16-250.082 5  
 170TML G FL=183.1897  
 170TM CG EKC=0.068 4.  
 170TM L 590.2286 17 (1)- C  
 170TM G 352.997 9 0.46 3 M1+E2 0.63 13 0.081 5  
 170TM CG EKC=0.067 4; K:L1=0.0673 13:0.0096 5 (1994HOZZ).  
 170TM G 370.530 4 0.088 4 M1+E2 0.38 +15-250.079 5  
 170TM CG EKC=0.066 4.  
 170TM G 440.516 5 0.048 3 M1 0.054  
 170TM CG EKC=0.051 9.  
 170TM G 475 X  
 170TM G 551.514 3 0.973 15 M1+E2 0.70 11  
 170TM CG EKC=0.0206 10; K:L1=0.0206 4:0.00302 6 (1994HOZZ).  
 170TM G 590.226 6 1.21 3 M1(+E2)  
 170TM CG EKC=0.0188 9; K:L1=0.0188 4:0.00336 24 (1994HOZZ).  
 170TM CG MR 0.52 12 from EKC; however, |a(L1)exp indicates pure  
 170TM2CG M1.  
 170TM L 6593.8 14 0+,1+ S  
 170TM CL E cf. SN=6593.3 11 (1995AU04).  
 170TM CL J L=0 neutron capture by JPI=1/2+ target.  
 170TM G 6003 3 0.600 15

|       |    |        |                |       |    |
|-------|----|--------|----------------|-------|----|
| 170TM | G  | 6356   | 3              | 0.190 | 12 |
| 170TM | G  | 6375   | 3              | 0.079 | 16 |
| 170TM | CG | RI     | from 1966SH03. |       |    |
| 170TM | G  | 6389   | 3              | 0.800 | 14 |
| 170TM | G  | 6444.2 | 10             | 0.200 | 11 |
| 170TM | CG | E      | from 1966SH03. |       |    |
| 170TM | G  | 6556.4 | 5              | 0.490 | 15 |
| 170TM | CG | E      | from 1966SH03. |       |    |
| 170TM | G  | 6594   | 3              | 0.021 | 10 |

## **$^{169}\text{Tm}(n,\gamma)$ E=thermal: two-photon cascades**

170TM 169TM(N,G) E=THERMAL: G COIN 1996VA23,1996HO12  
 170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$  
 170TM C Others: 2001VA11 (level density and strength function deductions from  
 170TM2C two-photon cascade data), 1999BO14.  
 170TM C This dataset contains (N,G) E=thermal data obtained from measurements  
 170TM2C of two-photon cascades only; for all other (N,G) E=thermal data,  
 170TM3C please see the (N,G) E=0-136 EV dataset.  
 170TM C 1996VA23: EN=thermal; GELI and HPGe detectors, FWHM=3-4 KEV at E=1332,  
 170TM2C time resolution 10-12 NS; measured EG, (high-energy G)-(low-energy G)  
 170TM3C coin, I(GG coin) for two-photon cascades from capture state.  
 170TM C 1996VA23 and 1996HO12 have several authors in common and report on  
 170TM2C the same two-photon cascade experiment. Apparently 1996HO12 present  
 170TM3C only a subset of the data reported in 1996VA23; however, both EG and  
 170TM4C IG data differ slightly from one paper to the other. The order in  
 170TM5C which these papers were submitted for publication is unclear, so the

170TM6C evaluator has chosen to present the data from the much more extensive  
 170TM7C listing in 1996VA23. The differences between the two sets of data  
 170TM8C are almost never of statistical significance.

170TM CG RI 1996VA23 report (high-energy G)-(low-energy G) coincidence  
 170TM2CG photon intensities, normalized so the area of the experimental  
 170TM3CG distribution in the interval  $520 < EG < (E(\text{cascade}) - 520)$  is 100% for each  
 170TM4CG two-photon energy-sum gated spectrum. Data were reported for 14 strong  
 170TM5CG energy sums, corresponding to two-photon cascades terminating at  
 170TM6CG the GS and the 39, 115, 150, 183, 204, 220, 237, 271, 350, 447, 590,  
 170TM7CG 604 and 638?+649+650 levels. For completeness, these sum spectrum  
 170TM8CG intensities are shown here under the label  $I\{-|g1|g2\}$  opposite  
 170TM9CG the relevant  $G\{-2\}$  energy. Note that, due to experimental conditions,  
 170TMACG these intensities are only lower limits if  $EG < 520$  for one of the  
 170TMBCG coincident gammas (1996HO12); this affects a number of transitions  
 170TMCCG deexciting levels with  $E \leq 760$ .

170TM CG RI \$LABEL=I\{-|g1|g2\}

170TM CL E From 1996VA23. In many cases, E(level) values based on a  
 170TM2CL least-squares adjustment of EG have significantly smaller  
 170TM3CL and apparently less realistic uncertainties; also, it should be noted  
 170TM4CL that an extraordinarily large number of EG data differ  
 170TM5CL by at least 4|s from the least-squares adjusted values.

170TM CG E From 1996VA23. EG values for many secondary gammas differ  
 170TM2CG significantly ( $\geq 4|s$ ) from the least-squares adjusted values; such  
 170TM3CG cases are noted. The EG values given for the primary gammas are the  
 170TM4CG average of all values listed in 1996VA23. The authors do not give  
 170TM5CG uncertainties for these; it should be noted, however, that in the  
 170TM6CG worst cases, there can be a 6 KEV spread in the values averaged.

170TM7CG Data for unplaced gammas are not included here; please see 1996VA23  
170TM8CG for those (AP 80 GAMMA pairs).  
170TM CG E(A),RI(A)\$From 1996HO12. Not reported in 1996VA23.  
170TM CL E(B) Rounded-off value from adopted levels.  
170TM CG E(C) 1996VA23 place a 428.6G and a 532.6G from an otherwise  
170TM2CG unknown E=647.9 6 level, but 1996HO12 place them from the adopted  
170TM3CG 648.75 level which is known to be deexcited by a 429.0G.  
170TM CG E(D) Value differs by at least 4|s from that expected based on  
170TM2CG least-squares adjusted level energies.  
170TM3CG Possibly the precision of EG data has been overestimated  
170TM4CG for some secondary transitions. Almost certainly, some closely-spaced  
170TM5CG intermediate or final levels involved in the cascades have not been  
170TM6CG resolved; for example, a large number of transitions to E(level) AP 640  
170TM7CG KEV may be unresolved doublets comprised of G's feeding the adopted  
170TM8CG 648.7 and 637.9 levels.  
170TM CL E(E) Added by evaluator. Although 1996VA23 do not include this  
170TM2CL level and the spread of EG(primary) values suggests that only the  
170TM3CL 648.6 level is significantly populated by the relevant primary G,  
170TM4CL many G's which feed a level in the vicinity of 640 KEV have EG values  
170TM5CL intermediate between those expected for transitions to the 648.6 and  
170TM6CL 637.9 levels.  
170TM CL E(Y) From SN (1995AU04).  
170TM CL J(Z) L=0 neutron capture by JPI=1/2+ target.  
170TM PN C6  
170TM2PN I{-|g1|g2}  
170TM L 0.0  
170TM L 38.7 B



170TM 169TM(N,G) E=2, 24 KEV 1996HO12  
 170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$  
 170TM C Target JPI=1/2+.  
 170TM C 1996HO12: three-crystal pair spectrometer, FWHM=5.5 KEV at 6.5 MEV;  
 170TM2C oxide target; measured EG, IG for average resonance capture primary  
 170TM3C transitions; deduced  $\sigma(n)=6591.8$  12 (cf. 6593.3 11 in 1995AU04).  
 170TM4C Supersedes 1994HOZZ.  
 170TM CL E Authors' best values based on both 2-KEV and 24-KEV data,  
 170TM2CL except as noted. EG data for primary transitions  
 170TM3CL are based on a chlorine calibration, and DE  
 170TM4CL ranges between 0.1 KEV and 1.6 KEV for these. E(level) values from  
 170TM5CL these data deviate by at most 1.2 KEV from adopted values for E<1160.  
 170TM6CL The evaluator, therefore, assigns DE=1.5 KEV to E(level) values which  
 170TM7CL have been adopted from this data set. Note that the level indicated  
 170TM8CL at 1.2 KEV is, in reality, the ground state.  
 170TM CL J J LE 2 is expected for all levels fed by primary gammas  
 170TM2CL in this reaction. PI is based on reduced intensity of primary G  
 170TM3CL feeding level (PI=+ states are less strongly fed).  
 170TM CG RI\$LABEL=IG/(EG{+5})  
 170TM CG RI Reduced photon intensity (i.e., IG/(EG{+5})) for EN=2 KEV.  
 170TM CG TI\$LABEL=IG(2)/IG(24)  
 170TM CG TI G intensity for E(n)=2 KEV divided by G intensity for  
 170TM2CG E(n)=24 KEV.  
 170TM CG E(A) Doublet.  
 170TM CL E(A) Based on EG for 14 strong primary transitions in the 2-KEV  
 170TM2CL measurements and the knowledge that the effective neutron energy

170TM3CL would be AP 1.2 KEV (presumably as a result of moderation of the  
 170TM4CL neutrons in the target assembly), 1996HO12 deduce SN=6591.8 9 (cf.  
 170TM5CL 6593.1 11 in 1995AU04). The evaluator, therefore, estimates  
 170TM5CL  $E=(6591.8+1.2)$  for the capture state in the 2-KEV measurement and  
 170TM6CL assigns an uncertainty of 2 KEV. Since the effective neutron energy  
 170TM7CL for the 24-KEV measurement is not known, the evaluator estimates  
 170TM8CL the capture state(s) energy from EG for the primary to the GS and  
 170TM9CL again assigns an uncertainty of 2 KEV.  
 170TM CL J(J) Reduced IG(E(n)=2 KEV) for primary G to this level favors  
 170TM2CL PI=+, but DRI is unstated.

170TM N

170TM PN

C5

170TM2PN REDUCED INTENSITY, IG/EG{+5} FOR EN=2 KEV

|       |   |       |           |
|-------|---|-------|-----------|
| 170TM | L | 1.2   | 4 (LE 2-) |
| 170TM | L | 39.6  | 1 (LE 2-) |
| 170TM | L | 150.0 | 2 (LE 2-) |
| 170TM | L | 203.8 | 2 (LE 2-) |
| 170TM | L | 219.9 | 2 (LE 2-) |
| 170TM | L | 237.3 | 1 (LE 2-) |
| 170TM | L | 589.7 | 1 (LE 2-) |
| 170TM | L | 6593  | 2         |

S

170TMF L FLAG=A

170TM CL E resonance capture state(s) for average n energy of 2 KEV.

|       |   |        |   |      |   |
|-------|---|--------|---|------|---|
| 170TM | G | 6012.4 | 3 | 0.17 | 2 |
| 170TM | G | 6026.8 | 1 | 0.46 | 7 |
| 170TM | G | 6379.2 | 1 | 0.39 | 6 |
| 170TM | G | 6397.1 | 1 | 0.25 | 4 |

|       |   |        |   |      |      |   |
|-------|---|--------|---|------|------|---|
| 170TM | G | 6412.7 | 1 |      | 0.41 | 6 |
| 170TM | G | 6466.8 | 1 |      | 0.39 | 6 |
| 170TM | G | 6577.8 | 1 |      | 0.45 | 6 |
| 170TM | G | 6616.3 | 1 | 0.30 |      | 4 |

## <sup>169</sup>Tm(d,p)

170TM 169TM(D,P) 1996HO12,1966SH03,1966RY01

170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$

170TM C Target JPI=1/2+.

170TM C 1996HO12: E=12, 20, 26 MEV; |q(lab)=20|', 25|', 30|', 40|',

170TM2C 45|'; magnetic spectrograph; measured E(p), d|s/d|W(|q).

170TM4C Supersedes 1995HOZZ.

170TM C 1966SH03: E=12 MEV; measured |s(E(p),|q) in 5 DEG steps from

170TM2C 10|' to 45|' and 10|' steps from 45|' to 135|', magnetic

170TM3C spectrograph with nuclear emulsions, FWHM|?12 KEV; DWBA analysis.

170TM C 1966RY01: E=11, 12 MEV; narrow range magnetic spectrograph,

170TM2C FWHM AP 18 KEV; measured |s(E(p)), |q=90|' for

170TM3C 11 MEV, |q=90, 60 DEG for 12 MEV.

170TM CL E From 1996HO12. Other data are given in comment on relevant

170TM2CL level. (For data from 1966SH03, DE for E LE 270 is statistical

170TM2CL uncertainty only, and reasonable DE for E>350 is 1 to 4 KEV. E from

170TM3CL 1966RY01 is quoted relative to E=0 for g.s.)

170TM CL L From DWBA analysis of |s(|q) (1966SH03).

170TM CL S\$LABEL=d|s/d|W(30 DEG) ← Relabel 'S' field

170TM CL S d|s/d|W(30|') in |mb/sr for E(d)=20 MeV (1996HO12). See

170TM2CL 1996HO12 for additional cross section data for E(d)=12 MeV (45|'),  
 170TM3CL E(d)=20 MeV (20|', 40|') and E(d)=26 MeV (25|').  
 170TM CL BAND(A) KPI=0- BAND.  
 170TM2CL Configuration=(|p 1/2[411])-(|n 1/2[521])  
 170TM CL BAND(B) KPI=1- GS BAND.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 1/2[521])  
 170TM CL BAND(E) KPI=2- BAND.  
 170TM2CL Configuration=(|p 1/2[411])-(|n 5/2[512])  
 170TM CL BAND(J) KPI=3- BAND.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 5/2[512])  
 170TM CL BAND(O) KPI=1- BAND.  
 170TM2CL Configuration=(|p 3/2[411])-(|n 5/2[512]) plus (|p 1/2[411])+(|n  
 170TM3CL 1/2[510]) plus ((|p 1/2[411])-(|n 5/2[512]))-|g vibration).  
 170TM CL BAND(T) KPI=1- BAND.  
 170TM2CL Configuration=(|p 1/2[411])-(|n 3/2[521]) plus (|p 7/2[404])-(|n  
 170TM3CL 5/2[512]) plus (|p 3/2[411])-(|n 1/2[521]).  
 170TM CL BAND(U) KPI=2- BAND.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 3/2[521]) plus (|p 3/2[411])+(|n  
 170TM3CL 1/2[521]) plus ((|p 1/2[411])+(|n 1/2[521]))-|g vibration).  
 170TM CL BAND(Z) KPI=3+ BAND.  
 170TM2CL Configuration=(|p 1/2[411])-(|n 7/2[633])  
 170TM CL BAND(b) KPI=4+ BAND.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 7/2[633])  
 170TM L -0.03 18 1 112 3 B  
 170TM CL Ground state. Other E: 2.5 15 (1966SH03).  
 170TM L 38.8 3 1 17.1 15B  
 170TM CL Other E: 39.5 6 (1966SH03); 38 3 (1966RY01).

|          |        |          |                      |                      |      |     |
|----------|--------|----------|----------------------|----------------------|------|-----|
| 170TM L  | 114.30 | 19       |                      | 3                    | 29.9 | 17B |
| 170TM CL |        | Other E: | 115.0 6 (1966SH03);  | 115 3 (1966RY01).    |      |     |
| 170TM L  | 149.80 | 9        |                      | 1                    | 71   | 3 A |
| 170TM CL |        | Other E: | 149.6 3 (1966SH03);  | 153 3 (1966RY01).    |      |     |
| 170TM L  | 183.21 | 15       |                      | 3                    | 27.0 | 16B |
| 170TM CL |        | Other E: | 183.3 6 (1966SH03);  | 185 3 (1966RY01).    |      |     |
| 170TM L  | 204.73 | 21       |                      |                      | 14.0 | 12E |
| 170TM CL |        | Other E: | 208.2 9 (1966SH03;   | 45 ' spectrum only). |      |     |
| 170TM L  | 219.68 | 12       |                      |                      | 29.6 | 20A |
| 170TM CL |        | Other E: | 218.2 12 (1966SH03); | 226 6 (1966RY01).    |      |     |
| 170TM L  | 237.21 | 16       |                      | 1                    | 84   | 4 A |
| 170TM CL |        | Other E: | 236.6 3 (1966SH03);  | 240 3 (1966RY01).    |      |     |
| 170TM L  | 247.0  | 5        |                      |                      | 9.4  | 20Z |
| 170TM L  | 270.49 | 12       |                      |                      | 219  | 13E |
| 170TM CL |        | Other E: | 269.6 3 (1966SH03);  | 274 4 (1966RY01).    |      |     |
| 170TM L  | 318.6  | 5        |                      |                      | 3.9  | 8 B |
| 170TM L  | 327.1  | 7        |                      |                      |      | Z   |
| 170TM CL |        | Other E: | 329 5 (1966RY01).    |                      |      |     |
| 170TM L  | 349.68 | 20       |                      |                      | 55.3 | 20A |
| 170TM L  | 358.38 | 23       |                      |                      | 45.0 | 23E |
| 170TM CL |        | Other E: | 353 (1966SH03);      | 357 4 (1966RY01).    |      |     |
| 170TM L  | 381.47 | 18       |                      |                      | 43.6 | 21A |
| 170TM CL |        | Other E: | 380 (1966SH03);      | 384 4 (1966RY01).    |      |     |
| 170TM L  | 409.4  | 8        |                      |                      | 4.0  | 10B |
| 170TM L  | 419.2  | 5        |                      |                      | 8.0  | 13  |
| 170TM L  | 426.5  | 3        |                      |                      | 17.0 | 15Z |
| 170TM CL |        | Other E: | 427 (1966SH03);      |                      |      |     |

|       |    |        |    |  |      |     |
|-------|----|--------|----|--|------|-----|
| 170TM | L  | 439.8  | 4  |  | 19.6 | 17b |
| 170TM | L  | 446.93 | 17 |  | 29.5 | 19J |
| 170TM | CL |        |    | Other E: 446 (1966SH03); 443 5 (1966RY01). |      |     |
| 170TM | L  | 456.8  | 8  |  | 7.8  | 11  |
| 170TM | L  | 467.1  | 3  |  | 12.3 | 13E |
| 170TM | L  | 476.9  | 5  |  | 2.6  | 7   |
| 170TM | L  | 539.83 | 23 |  | 270  | 6 J |
| 170TM | CL |        |    | Other E: 542 (1966SH03).                   |      |     |
| 170TM | L  | 545.05 | 17 |  |      |     |
| 170TM | L  | 550.0  | 8  |  | 13.9 | 13A |

↑ No Jπ

↑ Record L

↑ No S, so give dσ/dω

### $^{170}\text{Er}(^3\text{He},t)$

170TM 170ER(3HE, T) 1983JA03  
 170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$  
 170TM C E(3HE)=60.5 MEV; magnetic spectrograph, 96.1% 170ER target,  
 170TM2C |q(lab)=0|'; measured reaction Q and |G for IAS.  
 170TM L 15492 7 0+ 104 KEV 8  
 170TM CL E from reaction Q of -15825 KEV 6.  
 170TM CL J isobaric analog of 170ER G.S.

### $^{170}\text{Tm}(d,d')$

170TM 170TM(D, D') 1968FR01  
 170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$  
 170TM C E(d)=12 MeV; measured |s(E(d')), |q), |q=90|', 125|', 150|'.

170TM CL J Authors' values, based on comparison of  $|s(|q)$  and  
 170TM2CL E(level) with E,  $|s(|q)$  and excitation probability expected on the  
 170TM3CL basis of likely collective band structure.  
 170TM CL BAND(A) KPI=1- BAND  
 170TM CL BAND(B) KPI=0- BAND  
 170TM CL BAND(Z) POSSIBLE KPI=1- GAMMA-VIBRATIONAL BAND (1968Fr01).  
 170TM2CL Band assignment not adopted by evaluator.  
 170TM CL BAND(Y) POSSIBLE KPI=3- GAMMA-VIBRATIONAL BAND (1968Fr01).  
 170TM CL E(D) Rounded-off value from adopted levels.  
 170TM L 0.0 1- A  
 170TM L 39 2- A  
 170TM3 L FLAG=D  
 170TM L 115 3- A  
 170TM3 L FLAG=D  
 170TM L 182.0 9 4- A  
 170TM L 220 2- B  
 170TM3 L FLAG=D  
 170TM L 320.0 16 5- A  
 170TM L 380.0 19(4-) B  
 170TM L 411.0 21 6- A

## <sup>171</sup>Yb(t, $\alpha$ )

170TM 171YB(T,A) 1981DE29  
 170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$

170TM C Target JPI=1/2-.  
 170TM C E=17 MEV; 88.2% 171Yb target, FWHM 16 KEV, Q3D spectrometer;  
 170TM2C measured EA and  $|s(q)|$  in 5 steps from 15 to 50;  
 170TM3C DWBA analysis of  $|s(q)|$ ; assigned Nilsson configurations.  
 170TM CL J Authors' values, based on  $|s(q)|$ , and on band  
 170TM2CL configuration analysis. Note that several of these differ from  
 170TM3CL values in adopted levels.  
 170TM CL L Based on comparison of measured  $|s(q)|$  with DWBA  
 170TM2CL calculations (normalization factor=5.5).  
 170TM CL S\$LABEL=d|s/d|W(30 DEG)  
 170TM CL S  $d|s/d|W(30)$  in mb/sr; uncertainties not stated by  
 170TM2CL authors.  
 170TM CL BAND(A) KPI=0- BAND.  
 170TM2CL Configuration= $(|p 1/2[411]) - (|n 1/2[521])$ .  
 170TM CL BAND(B) KPI=1- GS BAND.  
 170TM2CL Configuration= $(|p 1/2[411]) + (|n 1/2[521])$ .  
 170TM CL BAND(C) KPI=1- BAND.  
 170TM2CL Configuration= $(|p 3/2[411]) - (|n 1/2[521])$ .  
 170TM CL BAND(E) KPI=2- BAND.  
 170TM2CL Configuration= $(|p 1/2[411]) - (|n 5/2[512])$ . The authors note that this  
 170TM3CL configuration can not be excited in (T,A) via a one-step mechanism;  
 170TM4CL the admixture of configuration= $(|p 5/2[413]) - (|n 1/2[521])$  required  
 170TM5CL for consistency with experiment is much larger than predicted by  
 170TM6CL authors' residual interaction mixing calculations.  
 170TM CL BAND(F) KPI=2- BAND.  
 170TM2CL Configuration= $(|p 5/2[402]) - (|n 1/2[521])$ .  
 170TM3CL Level's excitation is stronger than expected for this configuration.

170TM CL BAND(G) KPI=2- BAND.  
 170TM2CL Configuration= $(|p \ 3/2[411]) + (|n \ 1/2[521])$ ).  
 170TM CL BAND(I) KPI=2- BAND.  
 170TM2CL Configuration= $(|p \ 5/2[413]) - (|n \ 1/2[521])$ ).  
 170TM CL BAND(J) KPI=3- BAND.  
 170TM2CL Configuration= $(|p \ 1/2[411]) + (|n \ 5/2[512])$ ). The authors note that this  
 170TM3CL configuration can not be excited in (T,A) via a one-step mechanism;  
 170TM4CL the admixture of configuration= $(|p \ 5/2[413]) + (|n \ 1/2[521])$  required  
 170TM5CL for consistency with experiment is much larger than predicted by  
 170TM6CL authors' residual interaction mixing calculations.  
 170TM CL BAND(K) KPI=3- BAND.  
 170TM2CL Configuration= $(|p \ 7/2[404]) - (|n \ 1/2[521])$ ).  
 170TM CL BAND(L) KPI=3- BAND.  
 170TM2CL Configuration= $(|p \ 5/2[402]) + (|n \ 1/2[521])$ ).  
 170TM3CL Level's excitation is stronger than expected for this configuration.  
 170TM CL BAND(M) KPI=3+ BAND.  
 170TM2CL Configuration= $(|p \ 7/2[523]) - (|n \ 1/2[521])$ ).  
 170TM CL BAND(N) KPI=3- BAND.  
 170TM2CL Configuration= $(|p \ 5/2[413]) + (|n \ 1/2[521])$ ).  
 170TM CL BAND(o) KPI=4- BAND.  
 170TM2CL Configuration= $(|p \ 7/2[404]) + (|n \ 1/2[521])$ ).  
 170TM CL BAND(P) KPI=4+ BAND.  
 170TM2CL Configuration= $(|p \ 7/2[523]) + (|n \ 1/2[521])$ ).  
 170TM CL BAND(Y) KPI=1- BAND. GAMMA-VIBRATION BUILT ON KPI=1- GS BAND.  
 170TM L 0.0 1- 6.9 B  
 170TM L 40.0 18 2- 44.2 B  
 170TM L 114.7 18 3- 4.6 B

|       |   |       |    |      |   |      |     |
|-------|---|-------|----|------|---|------|-----|
| 170TM | L | 148   | 4  | 0-   |   | 2.2  | A   |
| 170TM | L | 182   | 3  | 4-   |   | 5.1  | B   |
| 170TM | L | 194   | 6  | (2-) |   |      | E   |
| 170TM | L | 220.1 | 9  | 2-   |   | 32.9 | A   |
| 170TM | L | 238.6 | 18 | 1-   | 2 | 20.4 | A   |
| 170TM | L | 270.4 | 10 | (3-) |   | 1.3  | E   |
| 170TM | L | 318   | 15 | (5-) |   | 4.4  | B   |
| 170TM | L | 332   | 5  |      |   | 5.0  |     |
| 170TM | L | 351   | 3  | 3-   |   | 12.3 | A   |
| 170TM | L | 381   | 3  | 4-   |   | 2.4  | A   |
| 170TM | L | 420   | 7  |      |   | 2.0  | AP  |
| 170TM | L | 449   | 20 | (3-) |   | 3.0  | APJ |
| 170TM | L | 559   | 8  | (5-) |   | 3.0  | APA |

**$^{170}\text{Er}(\gamma, \gamma'), (\gamma, \text{pol } \gamma')$  (resonance fluorescence)**

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TABLE III. Results for the reaction  $^{140}\text{Er}(\gamma, \gamma')$ . The measured excitation energies  $E_x$ , the integrate scattering cross sections  $I_s$ , and decay branching ratios  $R_{\text{expt}}$  are summarized. Ground-state transition width  $\Gamma_0$ , spins  $J$ , and  $K$  quantum numbers were deduced. Quoted parities are taken from Refs. [10,11]. The quoted reduced transition probabilities  $B(M1)\uparrow$  and  $B(E1)\uparrow$ , given in the table, were calculated assuming negative parities for  $K=0$  levels and positive parities for  $K=1$  levels, respectively. For levels which do not exhibit a decay branching to the first  $2^+$  state reduced transition probabilities are alternatively given for both parities.

| $E_x$<br>[keV] | $I_s$<br>[eV b] | $\Gamma_0$<br>[meV] | $R_{\text{expt}}$ | $K$ | Spin<br>$J^\pi$ | $B(M1)\uparrow$<br>[ $\mu_N^2$ ] | $B(E1)\uparrow$<br>[ $10^{-3} e^2 \text{ fm}^2$ ] |
|----------------|-----------------|---------------------|-------------------|-----|-----------------|----------------------------------|---|
| 1825           | $41.7 \pm 6.5$  | $31.8 \pm 5.5$      | $1.87 \pm 0.09$   | 0   | $1^-$           | -                                | $14.99 \pm 2.59$                                  |
| 2133           | $9.5 \pm 1.2$   | $3.8 \pm 0.9$       | -                 | -   | 1               | $0.100 \pm 0.025$                | $1.11 \pm 0.27$                                   |
| 2701           | $13.4 \pm 1.7$  | $12.5 \pm 2.5$      | $0.52 \pm 0.08$   | 1   | 1               | $0.164 \pm 0.033$                | -   |
| 2789           | $38.5 \pm 2.2$  | $41.3 \pm 3.9$      | $0.64 \pm 0.04$   | (1) | $1^+$           | $0.493 \pm 0.047$                | -   |
| 2897           | $6.4 \pm 1.3$   | $4.7 \pm 1.4$       | -                 | -   | 1               | $0.050 \pm 0.015$                | $0.55 \pm 0.16$                                   |
| 2930           | $4.5 \pm 0.9$   | $8.4 \pm 2.7$       | $1.68 \pm 0.39$   | 0   | 1               | -                                | $0.96 \pm 0.31$                                   |
| 2938           | $7.6 \pm 1.1$   | $9.1 \pm 2.6$       | $0.65 \pm 0.15$   | 1   | 1               | $0.093 \pm 0.027$                | -   |
| 3019           | $17.4 \pm 1.4$  | $13.8 \pm 3.1$      | -                 | -   | 1               | $0.130 \pm 0.029$                | $1.43 \pm 0.32$                                   |

$$\Gamma\gamma_0^2/\Gamma=0.26 E_\gamma^2 I_s / (2J+1) \text{ meV} \quad \Gamma\gamma_1/\Gamma\gamma_0=R_{\text{expt}} (E\gamma_1/E\gamma_0)^3$$

$$\Gamma = \Gamma\gamma_0^2/\Gamma \times (1 + \Gamma\gamma_1/\Gamma\gamma_0)^2 \text{ if } \Gamma=\Gamma\gamma_0+\Gamma\gamma_1; \quad T_{1/2} (\text{ps}) = 0.4561 / \Gamma (\text{meV})$$

170ER 170ER (G,G'), (G,POL G') 1996MA18,1976ME04  
 170ER H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$  
 170ER C Others: 1973ME17, 1991ZI01.  
 170ER C 1996MA18: bremsstrahlung endpoint energy=3.80 MEV; 96.9% 170ER  
 170ER2C oxide target; HPGe detector, 3 Ge detectors, true-coaxial HPGe  
 170ER3C COMPTON polarimeter with 8-crystal ^BGO COMPTON shield; |q=95 DEG,  
 170ER4C 127 DEG; measured EG, integrated cross section, G anisotropy, G  
 170ER5C polarization; deduced WIDTH0, |G{-|g0}{+2}/|G, |G{-|g1}/|G{-|g0},  
 170ER6C JPI, K.  
 170ER C 1991ZI01: measured 1824G(|q), |G{-|g0}{+2}/|G; deduced |G{-|g0}.  
 170ER C 1976ME04: E(e)=1.6-4.2 MEV bremsstrahlung; 96.9% 170ER target;  
 170ER2C measured |s(E; EG, |q), |q=98|' and 127|', and G linear polarization.  
 170ER C 1973ME17: E(e)=1.93 MEV bremsstrahlung; 96.9% 170ER target; measured  
 170ER2C E|g', G(|q) (|q=98 DEG and 127 DEG), G linear polarization.  
 170ER CL Values of K, deduced by 1996MA18 from measured  
 170ER2CL |G{-|g1}/|G{-|g0}, are given in comments on the relevant levels.  
 170ER CL E From 1996MA18 if DE unstated, from 1976ME04 if DE=2.  
 170ER CL J J from G(|q) and PI from G linear polarization, except  
 170ER2CL as noted; only states having J=1 or 2 can be excited (1976ME04).  
 170ER CL T Deduced from |G{-|g0}{+2}/|G and adopted G-ray branching  
 170ER2CL assuming |G=|G{-|g0}+|G{-|g1}; consequently, these represent upper  
 170ER3CL limits for any level which has significant branching to states other  
 170ER4CL than the ground or first excited states.  
 170ER CL \$\$LABEL=|G{-|g0}{+2}/|G (meV)  
 170ER CL S From 1996MA18, except as noted. Calculated by evaluator  
 170ER2CL from integrated cross section data of 1996MA18 assuming J indicated,  
 170ER3CL unless indicated otherwise.

170ER CG RI Relative branching, based on measured  $|G_{-|g1}|/|G_{-|g0}|$ .  
 170ER2CG Calculated by evaluator from  $R=(|G_{-|g1}|/|G_{-|g0}|)(E_{-|g0}|/E_{-|g1}|)^{+3}$   
 170ER3CG in 1996MA18, except as noted.  
 170ER CG E From E(level) difference, except for 1824G (from 1991ZI01).  
 170ER2CG Presumably  $DE_{-|g}| \leq 2 \text{ KEV}$  for transitions from levels given in  
 170ER3CG 1976ME04 since authors indicate  $|DE(\text{level})|=2 \text{ KEV}$ . 1996MA18 do not  
 170ER4CG state uncertainty, but their level energies are within 1 KEV of  
 170ER5CG those from 1976ME04 for levels reported in both studies.  
 170ER CG M DJ from G anisotropy (1996MA18), except as noted. DPI  
 170ER2CG from linear polarization (1976ME04).  
 170ER CG RI (A) Weak  
 170ER CL E (A), J (A) \$From adopted levels.  
 170ER CL E (B), J (B) \$From 1973ME17.  
 170ER CG RI (B), M (B) \$From 1973ME17.  
 170ER CL T (D) From weighted average of  $|G|=0.080 \text{ EV } 7$  (from adopted  
 170ER2CL  $|G_{-|g0}|/|G$  and  $(|G_{-|g0}|)^{+2}/|G|=11.6 \text{ meV } 10$  (1973ME17, 1996MA18))  
 170ER3CL and  $0.094 \text{ EV } 7$  (from  $|G_{-|g1}|/|G_{-|g0}|=1.64 \text{ } 7$  and  $|G_{-|g0}|=35.8 \text{ meV } 24$   
 170ER4CL (1991ZI01)).  
 170ER PN 6  
 170ER G 3059  
 170ER CG  $(|G_{-|g0}|)^{+2}/|G|=5 \text{ meV}$  (1976ME04) if J=1 to GS transition.  
 170ER G 3157  
 170ER CG  $(|G_{-|g0}|)^{+2}/|G|=14 \text{ meV}$  if J=1 to GS transition; however,  
 170ER2CG this G probably includes a contribution from the 3238 to 79 transition.  
 170ER G 3237  
 170ER CG  $(|G_{-|g0}|)^{+2}/|G|=18 \text{ meV}$  if J=1 to GS transition; however,  
 170ER2CG probable doublet feeding GS and 79 level (1976ME04). Too strong for

170ER3CG known (1996MA18) transition to GS alone.

170ER G 3317

170ER CG  $(|G{-}|g_0)\{+2\}/|G=11$  meV if J=1 to GS transition; nominated  
 170ER2CG as a GS transition because a 79 KEV lower EG(=3237) line is also  
 170ER3CG present (1976ME04).

170ER G 3564

170ER CG  $(|G{-}|g_0)\{+2\}/|G=24$  meV (1976ME04) if J=1 to GS transition.

170ER G 3619

170ER CG  $(|G{-}|g_0)\{+2\}/|G=90$  meV if J=1 to GS transition; however,  
 170ER2CG probable doublet feeding 0 and 79 levels (1976ME04). Presumably  
 170ER3CG includes 3623 to GS and 3695 to 79 transitions reported in 1996MA18.

170ER G 3704

170ER CG  $(|G{-}|g_0)\{+2\}/|G=15$  meV (1976ME04) if J=1 to GS transition.

170ER G 3917

170ER CG  $(|G{-}|g_0)\{+2\}/|G=25$  meV (1976ME04) if J=1 to GS transition.

170ER G 4013

170ER CG  $(|G{-}|g_0)\{+2\}/|G=35$  meV (1976ME04) if J=1 to GS transition.

|              |      |        |   |          |
|--------------|------|--------|---|----------|
| 170ER L 0.0  | 0+   |        |   | A        |
| 170ER L 78.6 | 2+   |        |   | A        |
| 170ER L 1824 | 1 1- | 5.7 FS | 5 | 11.6 10B |

170ER3 L FLAG=D

170ER CL  $(|G{-}|g_0)\{+2\}/|G$ : weighted average of 11.4 meV 11 (1976ME04)  
 170ER2CL and 12.0 meV 19 (1996MA18).

170ER CL K=0 (1996MA18).

170ER G 1745 163 5 From  $\Gamma_1/\Gamma_0$

170ER CG E from 1973ME17.

170ER CG Branching: from weighted average of  $|G{-}|g_1\rangle/|G{-}|g_0\rangle=1.64$  8

170ER2CG (1996MA18), 1.63 7 (1976ME04)

170ER G 1824 1 100 E1 From W( $\theta$ ) and lin. pol. B

170ER CG E from 1991ZI01.

170ER L 1973 2 0.6 5

170ER CL ( $|G\{-|g_0\}\{+2\}/|G$ : from 1976ME04, assuming J=1.

170ER G 1973 A

170ER L 2039 2 1,2 0.10 PS 3 1.2 3

170ER CL  $^T\{-1/2\}$  and ( $|G\{-|g_0\}\{+2\}/|G$ : if J=1 (1976ME04).

170ER G 1960 93 10

170ER CG Branching: from adopted gammas.

170ER G 2039 100 10

170ER L 2133 2 1 62 FS 9 3.8 4

170ER CL ( $|G\{-|g_0\}\{+2\}/|G$ : weighted average of 3.7 meV 5 (1976ME04)

170ER2CL and 3.8 meV 5 (1996MA18).

170ER G 2054 39 10

170ER CG Branching: from  $|G\{-|g_1\}/|G\{-|g_0\}$  in 1976ME04.

170ER G 2133 100 D

170ER L 2685 2 0.1 9 ?

170ER CL ( $|G\{-|g_0\}\{+2\}/|G$ : assuming J=1 (1976ME04).

170ER G 2685 A ?

170ER L 2701 2 1 23 FS 3 9.1 12

170ER CL ( $|G\{-|g_0\}\{+2\}/|G$ : weighted average of 11.5 meV 22 (1976ME04)

170ER2CL and 8.5 meV 11 (1996MA18).

170ER CL K=1 (1996MA18).

170ER G 2622 48 6

170ER CG Branching: from weighted average of  $|G\{-|g_1\}/|G\{-|g_0\}=0.48$  7

170ER2CG (1996MA18), 0.49 13 (1976ME04).

170ER G 2701 100 D  
 170ER L 2751 2 (1) 0.15 PS AP 3 1  
 170ER G 2672 0 AP  
 170ER G 2751 100 AP (D)  
 170ER L 2789 2 1+ 7.7 FS 5 25.6 13  
 170ER CL (|G{-|g0}){+2}/|G: weighted average of 24.4 meV 25 (1976ME04)  
 170ER2CL and 26.0 meV 15 (1996MA18).  
 170ER CL K=(1) (1996MA18).  
 170ER G 2710 52 5  
 170ER CG Branching: from weighted average of |G{-|g1}/|G{-|g0}=0.59 6  
 170ER2CG (1996MA18), 0.49 4 (1976ME04).  
 170ER G 2789 100 M1

## <sup>58</sup>Fe(p,p')

59CO 58FE(P,P') 1971LI14  
 59CO H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 95,215 (2002)\$CUT=8-Feb-2002\$  
 59CO C Others: 1975BR29 (58FE(P,P'G)), 1972PE23.  
 59CO C 1971LI14: EP=2.0-3.1 MEV, but data not analyzed beyond 2.65 MEV;  
 59CO2C measured SIGMA(EP,THETA), THETA=90 DEG, 120 DEG,  
 59CO3C 135 DEG, and 160 DEG, beam resolution 300-400 EV.  
 59CO C See 1972PE23 for correlations between fine structure widths of 14  
 59CO2C 59FE(GS) analog fragments in (P,P), (P,P') and (P,G), EP AP 2210-2300.  
 59CO CL Data are from 1971LI14. The fragmented analogs of  
 59CO2CL 59FE(GS) (JPI=3/2-, 14 fragments) and 59FE(287) (JPI=1/2-, 10  
 59CO3CL fragments) have their centroids at EP(lab)=2220 5 and 2512 5,

59CO4CL respectively. A third analog near EP=2.98 MEV was identified but not  
 59CO5CL analyzed. Since EP is well below the COULOMB barrier, only s-, p- and  
 59CO6CL d-wave resonances are expected.

59CO CL E Calculated as EP(C.M.)+SP, assuming SP=7363.7 6 (1995AU04).

59CO CL J From multilevel, multichannel R-matrix analysis of

59CO2CL SIGMA(EP, THETA).

59CO CL S |G{-p0} in EV (1971LI14). |G{-p'}(811) was neglected in  
 59CO2CL analysis by 1971LI14 and, typically, WIDTHG<<|G{-p0} (see (P,G)), so  
 59CO3CL |G{-p0} AP WIDTH. See 1972PE23 for additional |G{-p0} and |G{-p1}  
 59CO4CL data.

59CO CL L Laboratory proton energy of resonance (1971LI14); DE AP 3  
 59CO2CL KEV (absolute), 0.2 KEV (relative). EP from 1972PE23, 1975BR29 AP 5 KEV  
 59CO3CL higher.

59CO CL L\$LABEL=EP(LAB)

59CO CL S\$LABEL=|G{-p0} EV

59CO CL E(A) Possible 59FE(GS) analog fragment (1971LI14). Analog energy  
 59CO2CL estimated to be 9545 5 (1971LI14).

59CO CL E(B) Possible 59FE(287 level) analog fragment (1971LI14). Analog  
 59CO2CL energy estimated to be 9835 5 (1971LI14).

|      |   |        |           |        |    |     |
|------|---|--------|-----------|--------|----|-----|
| 59CO | L | 9465.3 | 30 (3/2-) | 2137.8 | 10 | 5A  |
| 59CO | L | 9491.3 | 30 1/2+   | 2164.3 | 30 | 10  |
| 59CO | L | 9513.7 | 30 (3/2-) | 2187.1 | 30 | 10A |
| 59CO | L | 9523.1 | 30 1/2+   | 2196.6 | 15 | 8   |
| 59CO | L | 9525.4 | 30 1/2+   | 2199.0 | 15 | 8   |
| 59CO | L | 9534.9 | 30 (3/2-) | 2208.6 | 30 | 10A |
| 59CO | L | 9538.3 | 30 (3/2-) | 2212.1 | 25 | 10A |

↑  $S_p + E_{res}(c.m.)$

↑  $E_{p,res} (lab)$

↑  $\Gamma_{p0}$

## Lecture II. Adopted Levels, Gammas Dataset Examples:

### (i) $^{59}\text{Fe}$

59FE **ADOPTED LEVELS, GAMMAS**  
59FE **H** TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 95,215 (2002)\$CUT=8-Feb-2002\$  
59FE CL E From least-squares adjustment of EG, excluding primary  
59FE2CL transitions from (N,G). See (N,P) source dataset for energy  
59FE3CL centroid for GAMOW-TELLER strength.  
59FE CL T From 48CA(15N,3NPG), (180,3NAG) recoil distance or  
59FE2CL DSA (1977WA10), except as noted.  
59FE CG E,RI FROM 58FE(N,G), (POL N,G) E=THERMAL, EXCEPT AS NOTED.  
59FE CG M From G(|q) in (180,3NAG) or (15N,3NPG) and adopted DPI.  
59FE CL T(A) Weighted average of 44.472 D 8 (1997MA75), 44.507 D 7  
59FE2CL (1992UN01 and 2002Un02 which supersede 1982HOZJ), 44.530 D 21  
59FE3CL (1983WA26) and 44.496 D 7 (1980HO17). Others:  
59FE4CL 1960SU10 (46.5 D 10), 1959PI43 (45.60 D 8), 1958KE26 (44.56 D 3),  
59FE5CL 1960FU03, 1957WR37, 1956RU45, 1953TO17, 1951SC56.  
59FE CG E(B),RI(B)\$FROM 48CA(15N,3NPG), (180,3NAG).  
59FE CG E(DE),RI(D)\$WEIGHTED AVERAGE FROM B- DECAY AND (N,G) E=THERMAL.  
59FE **XA59MN B- DECAY**  
59FE **XB48CA(15N,3NPG), (180,3NAG)**  
59FE **XC57FE(T,P)**  
59FE **XD58FE(N,G), (POL N,G) E=THERMAL**  
59FE **XE58FE(N,G) E=RES**  
59FE **XF58FE(D,P), (POL D,P)**

59FE XG58FE (D, PG)  
 59FE XH60NI (14C, 15O)  
 59FE XI59CO (N, P)  
 59FE Q 1565.2 6 6580.90 20 12045 30 1995AU04  
 59FE PN 6  
 59FE L 0.0 3/2- 44.495 D 9 A  
 59FE2 L %B-=100\$MOMM1=-0.3358 4\$  
 59FEX L XREF=ABCDEFGH  
 59FE CL MOMM1 From |b-NMR on oriented nuclei (1996OH02).  
 59FE2CL Other: 0.29 3 from low-temperature nuclear orientation (1989RA17).  
 59FE CL J 3/2 from atomic beam (1965DO11); L(D,P)=1.  
 59FE L 287.021 19 1/2-  
 59FEX L XREF=ACDEFG  
 59FE CL J (POL D,P), L(D,P)=1.  
 59FE G 287.03 2 100 [M1,E2]  
 59FE L 472.74 8 5/2-  
 59FEX L XREF=ACDEFG  
 59FE CL J (POL D,P), L(D,P)=3.  
 59FE G 472.71 8 100 (M1+E2)  
 59FE CG E WEIGHTED AVERAGE FROM B- DECAY AND  
 59FE2CG 48CA(15N, 3NPG), (180, 3NAG).  
 59FE CG MR(^D,Q)=-0.02 4 or -3.8 6 from (180, 3NAG)  
 59FE L 570.86 4 (5/2)-  
 59FEX L XREF=ACDEFG  
 59FE CL J L(T,P)=2 for 1/2- target; ^D+Q G from 7/2-. Conflicts  
 59FE2CL with L(D,P)=1, but |s(|q) poorly fitted in (D,P). Also inconsistent  
 59FE3CL with primary G from 1/2+ in (N,G) E=thermal,

59FE4CL but EG of primary is AP 2 KEV too high, so G may be misplaced.

59FE G 570.81 5 100 (M1+E2)

59FE CG E WEIGHTED AVERAGE FROM B- DECAY, (N,G) E=THERMAL AND

59FE2CG 48CA(15N,3NPG), (18O,3NAG).

59FE CG MR(^D,Q)=+0.15 to +2.1 from (18O,3NAG).

59FE L 613.04 16 ?

59FEX L XREF=DF

59FE G 613.1 3 100 ?

59FE L 642.8 3 ?

59FEX L XREF=DF

59FE G 642.9 3 100 ?

59FE L 726.41 5 3/2-

59FEX L XREF=ACDEFGH

59FE CL J (POL D,P), L(D,P)=1.

59FE G 439.42 5 3.73 22 D

59FE G 726.6 5 100 D

59FE L 1023.14 10 7/2-

59FEX L XREF=ABCEF

59FE CL J L(D,P)=3; L(T,P)=4 for 1/2- target.

59FE G 452.31 11 73 5 (M1+E2) B

59FE CG MR(^D,Q)=+0.19 to +2.0 from (18O,3NAG).

59FE G 550.4 9 4 B

59FE G 1023.07 17 100 5 B

59FE L 1077.79 12 1/2-, 3/2-

59FEX L XREF=ADF

59FE CL J L(D,P)=1.

59FE G 465.0 2 100

59FE L 1162.08 4 3/2-  
59FEX L XREF=ACDEF  
59FE CL J L(D,P)=1; J NE 1/2 from (POL N,G).  
59FE G 591.20 3 100 4  
59FE G 689.0 3 3.1 9 E  
59FE G 875.10 7 29.1 3 E  
59FE G 1162.17 8 14.7 12  
59FE L 1211.33 11 1/2-  
59FEX L XREF=CDEFGH  
59FE CL J (POL D,P), L(D,P)=1.  
59FE G 1211.22 11 100  
59FE L 1517.23 179/2+ 145 PS 25  
59FEX L XREF=BCF  
59FE CL J L(D,P)=4; L(T,P)=5 for 1/2- target.  
59FE G 494.09 13100 (E1) B  
59FEB G BE1W=2.6E-5 4 \$  
59FE L 1569.90 8 5/2-  
59FEX L XREF=ACDF  
59FE CL J L(D,P)=3; L(T,P)=2 for 1/2- target. Inconsistent with  
59FE2CL primary G from 1/2+ in (N,G) E=thermal, but EG of primary is 2 KEV too  
59FE3CL low, so G may be misplaced.  
59FE G 1569.88 8 100  
59FE L 1648 105/2+  
59FEX L XREF=CFH  
59FE CL J (POL D,P), L(D,P)=2.  
59FE L 1749.78 143/2-, 5/2-  
59FEX L XREF=ACDEF

```

59FE CL J          L(T,P)=2 for 1/2- target.
59FE  G  537.4     7 50      25
59FE  G  1749.5    3 100     13
59FE  L 1918.90   5 3/2,5/2+
59FEX L XREF=ACDEFH
59FE CL J          J NE 1/2 from (POL N,G); primary G from 1/2+ in
59FE2CL (N,G) E=thermal.
59FE  G  756.92    124.4     5
59FE  G  841.24    1213.5    11
59FE  G  1192.50   5 12.8     7
59FE  G  1918.71   8 100      3
59FE  L 1961.96    6 1/2-
59FEX L XREF=ACDEF
59FE CL J          L(T,P)=0 for 1/2- target.
59FE  G  1235.54   4 100      4
59FE  G  1348.4    3 10       3
59FE  G  1961.92   1836      8
59FE  L 2161.9     9 1/2,3/2,5/2+
59FEX L XREF=DF
59FE CL J          primary G from 1/2+ in (N,G) E=thermal.
59FE  G 1548.8     8 100
59FE  L 2277.9     4
59FEX L XREF=DF
59FE  G  1551.7    10100     50
59FE  G  2279.3    8 83      33
59FE  L 2312.24   22 13/2+      4.7 PS      6
59FEX L XREF=B

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B

59FE CL J stretched E2 G to 9/2+ in (180,3NAG) .  
59FE G 795.00 15100 E2  
59FEB G BE2W=28 4 \$  
59FE L 2322.4 6 1/2,3/2,5/2+  
59FEX L XREF=DF  
59FE CL J primary G from 1/2+ in (N,G) E=thermal .  
59FE G 2322.4 6 100  
59FE L 2348.2 4 (1/2,3/2,5/2-)  
59FEX L XREF=D  
59FE CL E Must differ from (7/2)- level excited in (D,P); otherwise,  
59FE2CL mult(1137G) to 1/2- would be M3 and transition could not compete  
59FE3CL with the [E2] 2349G observed in B- decay.  
59FE CL J G to 1/2- .  
59FE G 1136.9 3 100  
59FE L 2349.0 9 (7/2)-  
59FEX L XREF=AF  
59FE CL J L(D,P)=3, (POL D,P) for E=2345 10 level. See comment on  
59FE2CL 2348 level .  
59FE G 2348.9 9 100  
59FE CG E FROM 59MN B- DECAY.

## (ii) <sup>170</sup>Tm

170TM ADOPTED LEVELS, GAMMAS

170TM H TYP=FUL\$AUT=CORAL M. BAGLIN\$CIT=NDS 96,611 (2002)\$CUT=15-Aug-2002\$

170TM CG E,RI,M,MR\$Data are from (N,G) E=0-136 EV, unless noted  
 170TM2CG otherwise.  
 170TM CG E(YZ),RI(Y)\$From (N,G) E=thermal: G coin. Uncertainty in EG may be  
 170TM2CG underestimated.  
 170TM CL For neutron resonance parameters and thermal cross sections  
 170TM2CL see 1984MUZY.  
 170TM CL For nuclear band configurations see 1981DE29 and 1996HO12.  
 170TM CL E From least-squares adjustment of EG from (N,G) E=0-136 EV  
 170TM2CL whenever G deexcitation of level has been observed in that reaction.  
 170TM2CL For levels reported only in (N,G) E=thermal: G coin, authors'  
 170TM4CL E(level) values are adopted.  
 170TM CL BAND(B) KPI=1- GS BAND.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 1/2[521]).  
 170TM3CL Rotational parameters: A=11.4 (for J odd), 10.3 (for J even).  
 170TM CL BAND(A) KPI=(0)- BAND.  
 170TM2CL Configuration=(|p 1/2[411])-(|n 1/2[521]). Rotational parameters:  
 170TM3CL A=11.67 (for J even), 11.25 (for J odd); Newby shift is +32 KEV  
 170TM4CL (1996HO12).  
 170TM CL BAND(C) KPI=(1)- BAND.  
 170TM2CL Configuration=(|p 3/2[411])-(|n 1/2[521]) plus (|p 7/2[404])-(|n  
 170TM3CL 5/2[512]). Rotational parameter: A=11.8 (for J odd).  
 170TM CL BAND(D) KPI=(3)- BAND.  
 170TM2CL Configuration=(|p 1/2[541])-(|n 7/2[633]) from (n,|g); rotational  
 170TM3CL parameter: A=5.1.  
 170TM CL BAND(E) KPI=(2)- BAND.  
 170TM2CL Configuration=(|p 1/2[411])-(|n 5/2[512]). Rotational parameter:  
 170TM3CL A=11.0. Band is anomalously populated in (T,A).

170TM CL BAND(H) KPI=(0)+ BAND.  
 170TM2CL Configuration=(|p 7/2[404])-(|n 7/2[633]). Rotational parameter: A=7.2  
 170TM3CL (J=even); +36 KEV Newby shift.  
 170TM CL BAND(I) KPI=(2)- BAND.  
 170TM2CL Configuration=(|p 5/2[413])-(|n 1/2[521]). Rotational parameter:  
 170TM3CL A=11.0.  
 170TM CL BAND(J) KPI=(3)- band.  
 170TM2CL Configuration=(|p 1/2[411])+(|n 5/2[512]). Band is anomalously  
 170TM3CL populated in (T,A). Rotational parameter: A=11.58.  
 170TM CL BAND(K) KPI=(3)- BAND.  
 170TM2CL Configuration=(|p 7/2[404])-(|n 1/2[521]).  
 170TM CL BAND(L) KPI=(3-) BAND.  
 170TM2CL Configuration=(|p 5/2[402])+(|n 1/2[521]) suggested in (T,A), but  
 170TM3CL level's excitation is stronger than expected for this configuration.  
 170TM CL BAND(M) KPI=(3)+ BAND.  
 170TM2CL Configuration=(|p 7/2[523])-(|n 1/2[521]). Rotational parameter:  
 170TM3CL A=10.0.  
 170TM CL BAND(N) KPI=(3)- band.  
 170TM2CL Configuration=(|p 5/2[413])+(|n 1/2[521]). Rotational parameter:  
 170TM3CL A=9.75.  
 170TM CL BAND(O) KPI=(1)- band.  
 170TM2CL Configuration=(|p 3/2[411])-(|n 5/2[512]) plus (|p 1/2[411])+(|n  
 170TM3CL 1/2[510]) plus ((|p 1/2[411])-(|n 5/2[512]) - |g vibration).  
 170TM4CL Rotational parameter: A=11.3.  
 170TM CL BAND(P) KPI=(4)+ BAND.  
 170TM2CL Configuration=(|p 7/2[523])+(|n 1/2[521]). Rotational parameter: A=9.9.  
 170TM CL BAND(Q) KPI=(1)+ BAND.

170TM2CL Configuration= $(|p\ 1/2[541])+(|n\ 1/2[521])$ . Coriolis-mixed band.  
 170TM CL BAND(S) KPI=(0)+ BAND.  
 170TM2CL Configuration= $(|p\ 1/2[541])-(|n\ 1/2[521])$ . Coriolis-mixed band.  
 170TM3CL -44 KEV Newby SHIFT.  
 170TM CL BAND(T) KPI=(1)- BAND.  
 170TM2CL Configuration= $(|p\ 1/2[411])-(|n\ 3/2[521])$  plus  $(|p\ 7/2[404])-(|n\ 1/2[512])$  plus  $(|p\ 3/2[411])-(|n\ 1/2[521])$ .  
 170TM3CL 5/2[512] plus  $(|p\ 3/2[411])-(|n\ 1/2[521])$ .  
 170TM4CL Rotational parameter: A=10.1 (for J=odd).  
 170TM CL BAND(U) KPI=(2)- BAND.  
 170TM2CL Configuration= $(|p\ 1/2[411])+(|n\ 3/2[521])$  plus  $(|p\ 3/2[411])+(|n\ 1/2[521])$  plus  $(|p\ 1/2[411])+(|n\ 1/2[521])$ -|g vibration).  
 170TM3CL Rotational parameter: A=11.4 (for J=even).  
 170TM CL BAND(V) KPI=(0)- BAND.  
 170TM2CL Configuration= $(|p\ 7/2[523])-(|n\ 7/2[633])$ . Rotational parameter: A=8.4  
 170TM3CL (even J), 8.2 (odd J); band exhibits Newby shift of +41 KEV (1996HO12).  
 170TM CL BAND(Y) KPI=(1)- BAND. GAMMA-VIBRATION  
 170TM2CL built on K|p=1- g.s. band. Rotational parameter: A=10.1.  
 170TM CL BAND(Z) KPI=(3)+ BAND.  
 170TM2CL Configuration= $(|p\ 1/2[411])-(|n\ 7/2[633])$ . Rotational parameter: A=8.0.  
 170TM CL BAND(a) KPI=(1)+ BAND.  
 170TM2CL Configuration= $(|p\ 7/2[523])-(|n\ 5/2[512])$ . Rotational parameter:  
 170TM3CL A=10.4.  
 170TM CL BAND(b) KPI=(4)+ band.  
 170TM2CL Configuration= $(|p\ 1/2[411])+(|n\ 7/2[633])$ . Rotational parameter: A=8.5.  
 170TM CL E(c) Configuration= $(|p\ 3/2[411])+(|n\ 1/2[521])$  was suggested  
 170TM2CL in (T,A).  
 170TM CL J(d) L(T,A)=2 for E=716 4 level, with J=2 favored by |s(|q) and

170TM2CL possible configuration= $((|p\ 5/2[402])-(|n\ 1/2[521]))$ .  
 170TM3CL However, if  $J \leq 2$ , level should have been populated in (N,G)  $E=2$ ,  
 170TM4CL 24 KEV and it was not, so  $J=3$  seems more likely. 1996HO12 suggest  
 170TM5CL that this level is the  $J=3$  member of the  $(|p\ 3/2[411])-(|n\ 1/2[521])$   
 170TM6CL band; its energy is a little high for that, however.  
 170TM CL J(R) Based on (N,G)  $E=2$  primary-transition intensities to  
 170TM2CL state from various  $1+$  and/or  $0+$  resonances for which  $E(n) \leq 136$  EV,  
 170TM3CL assuming  $\text{mult}=E1$  for primary G.  
 170TM CL E(W) From (N,G)  $E=2$ , 24 KEV.  
 170TM CL J(X) PI from L transfer; J from L and/or  $|s(|q)$   
 170TM2CL in (T,A) and plausible band structure.  
 170TM PN

|        |    |                    |   |        |          |         |    |          |
|--------|----|--------------------|---|--------|----------|---------|----|----------|
| 170TM  | Q  | 968.0              | 8   | 6593.3 | 116162.1 | 14850.8 | 16 | 1995AU04 |
| 170TM  | XA | 169TM(N,G)         | E=0-136 EV  |        |          |         |    |          |
| 170TM  | XB | 171YB(T,A)         |   |        |          |         |    |          |
| 170TM  | XC | 170TM(D,D')        |   |        |          |         |    |          |
| 170TM  | XD | 169TM(D,P)         |   |        |          |         |    |          |
| 170TM  | XF | COULOMB EXCITATION |   |        |          |         |    |          |
| 170TM  | XG | 170ER(3HE,T)       |   |        |          |         |    |          |
| 170TM  | XH | 169TM(N,G)         | E=2, 24 KEV   |        |          |         |    |          |
| 170TM  | XI | 169TM(N,G)         | E=THERMAL: G COIN                                   |        |          |         |    |          |
| 170TM  | L  | 0.0                | 1-  | 128.6  | D        | 3       |    | B        |
| 170TM2 | L  | XREF=ABCFHI        |   |        |          |         |    |          |
| 170TM  | CL | J                  | J=1 from atomic beam magnetic resonance (1976FU06); |        |          |         |    |          |
| 170TM2 | CL | L(D,P)=1.          |   |        |          |         |    |          |
| 170TM  | CL | T                  | from 1968RE04. Others: 125 D 2 (1962BO12),          |        |          |         |    |          |
| 170TM2 | CL | 134.2 D 8          | (1965FL02), 128 D 1 (1967KE13), 127.1 D 9           |        |          |         |    |          |

6

B

170TM3CL (1969LA34).  
170TM4 L MOMM1=+0.2468 12  
170TM5 L MOME2=+0.74 2  
170TM6 L %EC=0.131 10\$ %B-=99.869 10  
170TM CL %EC,%B- see 170TM EC decay.  
170TM CL MOMM1 weighted average of 0.2476 16 (1990SH18, |b radiation  
170TM2CL detected optical pumping) and +0.2458 17 (1988DY02, atomic beam  
170TM3CL resonance fluorescence). Other: +0.248 4 (1989RA17).  
170TM CL MOME2 from resonance ionization mass spectroscopy (1989RA17,  
170TM2CL from 1988AL04, 1987MI31). Others: 0.72 5 (1988DY02, atomic beam  
170TM3CL resonance fluorescence).  
170TM L 38.7139 5(2)- 1.71 NS 17 B  
170TM2 L XREF=ABCFHI  
170TM CL J L(D,P)=1; GS band member.  
170TM CL T from B(E2)=3.2 3 in Coulomb excitation.  
170TM G 38.714 1 100 E2 197  
170TMB G BE2W=343 35  
170TM CG BE2W: from measured BE2.  
170TM L 114.5440 6 (3)- 0.60 NS 3 B  
170TM2 L XREF=ABCDFI  
170TM CL J E2 G to 1-; L(D,P)=3; band assignment.  
170TM CL T from BE2=2.38 10 in Coulomb excitation and adopted  
170TM2CL branching.  
170TM G 75.831 1 20.2 17M1+E2 0.85 5 7.97 7  
170TMB G BM1W=0.00211 19\$BE2W=122 12  
170TM G 114.544 1 100.0 4 E2 1.87  
170TMB G BE2W=182 8

170TM CG BE2W: from measured BE2.  
170TM L 149.7180 6(0)- A  
170TM2 L XREF=ABDHI  
170TM CL J M1 149G to 1- g.s.; J=0 from  
170TM2CL |s(|q) and expected band structure in (T,A).  
170TM G 111.005 1 5.48 25 E2 2.10  
170TM G 149.718 1 100 8 M1 1.01  
170TM L 183.1897 14(4)- B  
170TM2 L XREF=ABCD\$  
170TM CL J L(D,P)=3; J=4 from  
170TM2CL |s(|q) and expected band structure in (T,A).  
170TM G 68.6491 0.9 4 E2 13.9 @  
170TM G 144.480 100 12 E2 0.804 @  
170TM CG E 144.480 1 for doublet.  
170TM L 183.197 4(3)+ 4.12 US 13 Z  
170TM2 L XREF=AI  
170TM CL J E1 gammas to (3)- 115 and (2)- 39;  
170TM2CL band assignment in (N,G) E=0-136 EV.  
170TM CL T from G(t) and pulsed beam technique in (N,G), (D,PG).  
170TM G 68.6491 4 41.6 20 E1 0.90 @  
170TMB G BE1W=3.6E-8 3  
170TM G 144.4797 5 100 6 E1 0.127 @  
170TMB G BE1W=0.93E-8 8  
170TM CG E 144.4797 5 for doublet.  
170TM L 204.4486 7 (2)- 1 NS LT E  
170TM2 L XREF=AB(194)DHI  
170TM CL J M1 gammas to 1- g.s. and (3)- 115.

170TM CL T from |g(t) measurement in (N,G) E=0-136 eV.  
 170TM G 89.906 3 0.85 9 M1 4.32  
 170TM G 165.735 1 43.6 24M1(+E2) 0.7 LE 0.71 5  
 170TM G 204.448 1 100.0 6 M1 0.421  
 170TM L 219.7060 6 (2)- 0.25 NS 3 A  
 170TM2 L XREF=ABCFHI  
 170TM CL J 220G to 1- g.s. and 105G to (3)- 115 are M1+E2.  
 170TM CL T from BE2=0.085 10 in Coulomb excitation and adopted MR and  
 170TM2CL branching.  
 170TM G 69.988 1 4.2 6 E2 12.9  
 170TMB G BE2W=240 50  
 170TM G 105.162 1 28.6 3M1+E2 0.4 3 2.72 3  
 170TMB G BM1W=0.0045 11\$BE2W=30 +40-30  
 170TM G 180.994 1 100 9 M1+E2 0.28 3 0.575 4  
 170TMB G BM1W=0.0033 6\$BE2W=3.6 10  
 170TM G 219.705 1 77.2 6 M1+E2 1.29 10 0.250 6  
 170TMB G BM1W=0.00058 10\$BE2W=9.1 11  
 170TM CG BE2W: from measured BE2.  
 170TM L 237.2396 6(1)- A  
 170TM2 L XREF=ABDHI  
 170TM CL J 88G to (0)- 150 is M1.  
 170TM G 17.554 8 0.294 25 (M1(+E2))0.24 LE  
 170TM CG CC(M1)=88, CC(E2)=10090.  
 170TM G 87.521 1 31.6 7 M1 4.66  
 170TM G 198.524 1 13.9 4 M1 0.457  
 170TM G 237.241 1 100.0 20 M1 0.280  
 170TM L 247.147 6 (4)+ Z

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170TMX L XREF=AD
170TM CL J          M1+E2 G to (3)+; E1 G to (4)-; band assignment.
170TM  G 63.959    4 100      13M1+E2      0.65      13.7      @
170TM3 G FL=183.197
170TM  G 63.960    4 15.3     23E1              1.08      @
170TM3 G FL=183.1897
170TM  L 270.5466  8(3)-
170TM2 L XREF=ABDI
170TM CL J          M1 G to (2)- 38; M1+E2 G to (3)- 115; J=3 from
170TM2CL |s(|q) and expected band structure in (T,A).
170TM  G 66.098    1 99      10 M1(+E2)    0.33    LE    10.8    3
170TM  G 87.5
170TML G FL=183.1897
170TM  G 156.003   1 29.6    23 M1+E2      0.32    7     0.87    1
170TM  G 231.834   2 100      6 M1              0.298
170TM  L 319.3260  12(5)-
170TM2 L XREF=ABCDF
170TM CL J          E2 205G to (3)- 115;
170TM2CL J=5 from |s(|q) and expected band structure in (T,A).
170TM  G 204.782   1 100      E2              0.242
170TM  L 327.1     7 (5+)
170TM2 L XREF=BD
170TM CL J          band assignment in (D,P).
170TM  L 349.7330  8(3)-
170TM2 L XREF=ABDI
170TM CL J          M1 G to (3)- 115; M1(+E2) G to (2)- 38; J=3 from
170TM2CL |s(|q) and expected band structure in (T,A).

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170TM G 112.494 2 1.64 15 E2 2.00  
170TM G 130.027 1 50.7 15 M1+E2 0.55 9 1.42 2  
170TM G 145  
170TM G 235.193 2 46.9 12 M1 0.286  
170TM G 311.018 2 100 4 M1(+E2) 0.23 LE 0.133 2  
170TM L 355.047 6 (4)+ b  
170TMX L XREF=A  
170TM CL J M1+E2 G to (4)+; M1(+E2) G to (3)+; possible  
170TM2CL configuration=(|p 1/2[411])+(|n 7/2[633]) bandhead from (N,G) E=0-136  
170TM3CL eV.  
170TM G 107.901 2 14.1 11 E2+M1 1.3 +3-4 2.42 3  
170TM G 171.855 1 21 3E1 0.0802 @  
170TM3 G FL=183.1897  
170TM G 171.855 1 100 11M1(+E2) 0.20 0.674 @  
170TM3 G FL=183.197  
170TM L 358.1163 9(4)- E  
170TM2 L XREF=AD  
170TM CL J M1+E2 |g's to (4)- and (3)-; band assignment.  
170TM G 87.571 2 100 3 M1+E2 0.27 5.17  
170TM G 153.667 1 46 4 E2 0.64  
170TM CG M E2(+M1) from (N,G) E=0-136 eV; M1 component inconsistent  
170TM2CG with placement.  
170TM G 174.927 2 12.8 14 M1+E2 0.53 12  
170TM G 243.573 3 16.4 23 M1+E2 0.9 +4-3  
170TM L 381.4258 8 (4)- A  
170TM2 L XREF=ABCD  
170TM CL J E2 G to (2)-; M1+E2 G to (4)-;

170TM2CL |s(|q) and expected band structure in (T,A).

170TM G 31.713 9 5.7 4 (M1(+E2))0.87 LT

170TM CG |a(M1)=15.1, |a(E2)=529.

170TM G 161.721 1 100 5 E2 0.54

170TM CG M,MR E2(+M1), MR GE 2.2 from (N,G) consistent with pure E2

170TM2CG as required by placement.

170TM G 198.237 2 31.1 18E2+M1 1.23 +25-190.34 2

170TM3 G FL=183.1897

170TM G 266.881 1 57 6M1+E2 0.9 3 0.158 19

170TM G 342.711 4 46.5 22 E2 0.0485

170TM L 402.7281 19 (3,4)-

170TMX L XREF=A

170TM CL J M1+E2 G to (3)-; not fed by primary in (N,G) E=2, 24 keV.

170TM G 288.185 2 100 8 M1+E2 0.64 20 0.141 11

170TM G 364.012 4 14.7 11

170TM L 409.4 8 (6-) B

170TM2 L XREF=CD

170TM CL J |s(|q) in (D,D') and E(level) are consistent with

170TM2CL expectations for J=6 member of GS band.

170TM L 419.2 5

170TM2 L XREF=BD

170TM L 426.5 3 (6+) Z

170TMX L XREF=D

170TM CL J band assignment in (D,P).

170TM L 439.8 4 (5+) b

170TMX L XREF=D

170TM CL J band assignment in (D,P).



170TM CL J absence of state in (N,G) E=2, 24 KEV suggests  
 170TM2CL J>2; DPI=no 667G from level for which (N,G) E=2, 24 KEV implies  
 170TM3CL PI=+. However, placement of M1+E2 544G to 1- is inconsistent with  
 170TM4CL this.

|          |  |             |  |      |         |      |             |       |   |
|----------|--|-------------|--|------|---------|------|-------------|-------|---|
| 170TM    | G  | 505.344     | 15   | 100  | 7       |      |             |       |   |
| 170TM    | G  | 544.043     | 11   | 57   | 3       |      |             |       |   |
| 170TM    | CG   | M,MR        | E2+M1 (MR=1.0 +4-3) from EKC is inconsistent with          |      |         |      |             |       |   |
| 170TM2CG | placement; either G is misplaced or mult is incorrect. |             |  |      |         |      |             |       |   |
| 170TM    | L  | 550.7473    | 17   | (5)- |         |      |             |       | A |
| 170TMX   | L  | XREF=ABD    |  |      |         |      |             |       |   |
| 170TM    | CL   | J           | M1 G to (4)-;  s( q) and expected band structure in (T,A). |      |         |      |             |       |   |
| 170TM    | G  | 169.321     | 2  | 26   | 4M1+E2  | 0.7  | +4-3        | 0.63  | 7 |
| 170TM    | G  | 192.633     | 3  | 19.0 | 12M1    |      |             | 0.497 |   |
| 170TM    | G  | 231.418     | 6  | 11.9 | 12      |      |             |       |   |
| 170TM    | G  | 367.556     | 4  | 100  | 5 M1+E2 | 0.34 | +16-250.082 | 5     |   |
| 170TM3   | G  | FL=183.1897 |  |      |         |      |             |       |   |
| 170TM    | L  | 590.2286    | 17   | (1)- |         |      |             |       | C |

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|        |    |        |                   |    |         |   |  |  |  |
|--------|----|--------|-------------------|----|---------|---|--|--|--|
| 170TM  | L  | 15492  | 7                 | 0+ | 104 KEV | 8 |  |  |  |
| 170TMX | L  | XREF=G |                   |    |         |   |  |  |  |
| 170TM  | CL | J      | ^IAS of 170ER GS. |    |         |   |  |  |  |