

$F^{22}$  (4.0 s):

$\beta^-$ : 11 scint spect,  $\beta\gamma$  coinc (VauF65a)

$\gamma$ : 1.28 ( $\dagger_{\gamma}15$ ), 2.06 ( $\dagger_{\gamma}10$ ) scint spect,  $\beta\gamma$  coinc (VauF65a)

$Ne^{22}$ :

$\mu$ :  $\approx 0$  atomic spect (LindgI64)

1.275 level of  $Ne^{22}$ :  $t_{1/2}$   $2 \times 10^{-12}$  s Coulomb excit (AndrD60c)

$3 \times 10^{-12}$  s Coulomb excit (AlkD59a)

$4 \times 10^{-12}$  s Doppler broadening (EswM64)

3.34 level of  $Ne^{22}$ :  $t_{1/2}$   $3 \times 10^{-13}$  s Doppler broadening (EswM64)

$Na^{22}$  (2.60 y):

I: 3,  $\mu$ : +1.746 atomic beam (LindgI64)

$\beta^+$ :  $\beta_2$  0.545 (DaniH58a); 0.543 (HamiJ58a); 0.542 (MackP50a); 0.540 (WonC54);

mag spect

$\beta_1$  1.83 ( $\dagger$  0.06),  $\beta_2$  0.540 ( $\dagger$  100) mag spect (WriB53)

others (GooW46, MorgK49, LeuH61, BranW64a, CharP65)

$\gamma$ :  $\gamma_1$  1.2746 semicond spect (RobiR65)

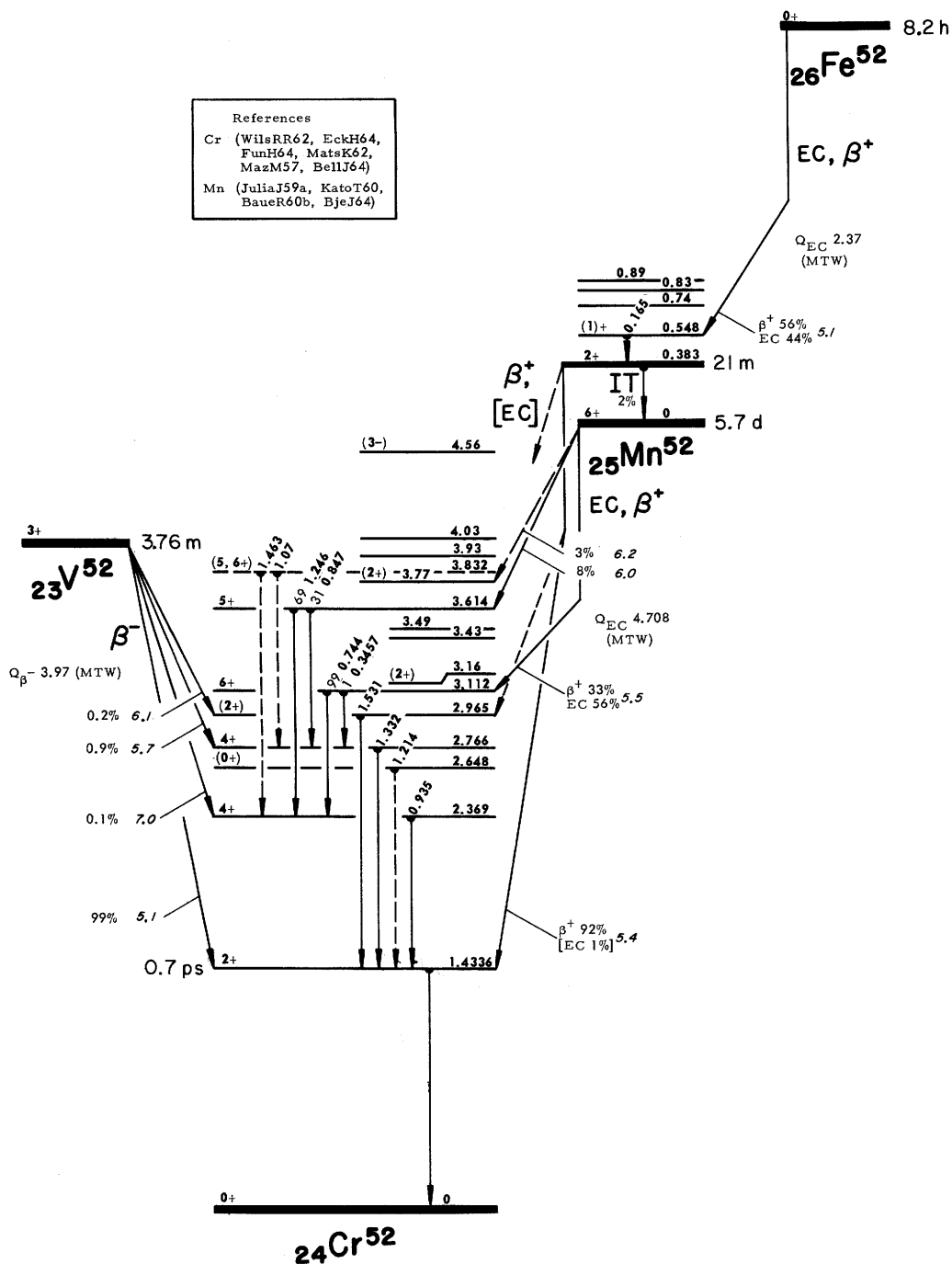
$\gamma_1$  ( $e/\gamma$   $6.7 \times 10^{-6}$ ) (NakY63, LeamR54)

others (MarlK65, SinP59, AlbuD49, AjzF55, GooW46)

$\beta\gamma(0)$ : (GrabZ65, DaniH60a, SubB61b, StevD51, MullH65)

$\beta\gamma$ polariz(0): (StefR59, BloS62, AppH59, BhaS65, SchoH57)





$\text{V}^{52}$  (3.76 m):

$\beta^-$ : 2.47 scint spect (MegD63); abs (KoesL54, KohW65)

$\gamma$ :  $\gamma_3$  1.433 scint spect (MarlK64)

$\gamma_1$  0.935 ( $\gamma$  0.14%),  $\gamma_2$  1.331 ( $\gamma$  0.9%),  $\gamma_4$  1.531 ( $\gamma$  0.16%) scint spect, YY coinc (EckH64)

$\gamma_2$  1.21 ( $\gamma$  0.3%),  $\gamma_3$  1.43 ( $\gamma$  100%),  $\gamma_4$  1.53 ( $\gamma$  0.53%) scint spect, YY coinc (MalmS63)

others (LBlaJ54, KikS42)

YY( $\theta$ ): (MalmS63)

$V^{54}$  (55 s):

$\beta^-$ : 3.3 scint spect (SchaA56)

$\gamma$ : 0.84 († 1), 0.99 († 1), 2.21 scint spect (SchaA56)

$Cr^{54}$ :

0.835 level of  $Cr^{54}$ :  $t_{1/2}$   $1.2 \times 10^{-11}$  s Coulomb excit (AndrD60c)  
 $7 \times 10^{-12}$  s Coulomb excit (AlkD59)

$Mn^{54}$  (303 d):

I: 3,  $\mu$ :  $\pm 3.3$  nucl align (LindgI64)

$\gamma$ :  $\gamma_1$  0.8355 (ParsD65); 0.8350 (RobiR65); semicond spect

$\gamma_1$  (e/ $\gamma$  0.00025) mag spect, mag spect conv (HamiJ66)

$\gamma_1$  0.838 (K/L+M+... 8) mag spect conv (KatoT58)

no other  $\gamma$ , lim 0.1% (KatoT58)

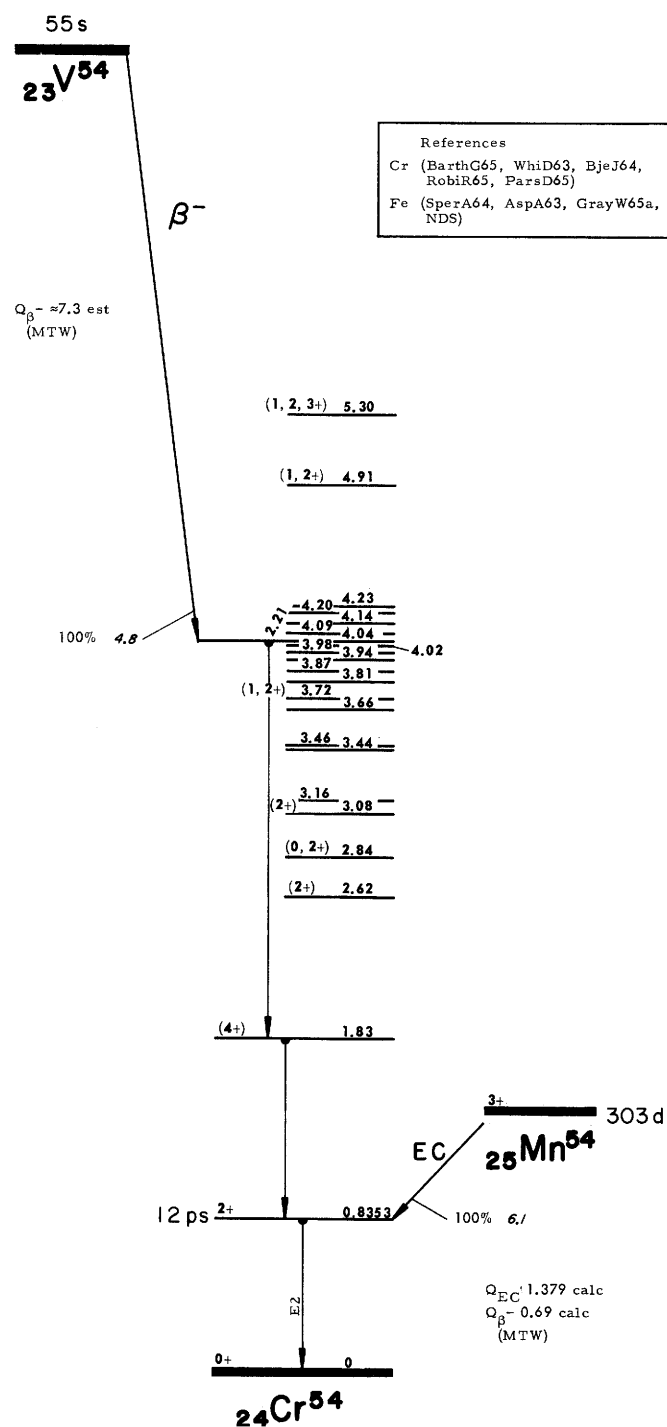
others (WilsRR63, RaoG63b, MaeD54a, DeuM44)

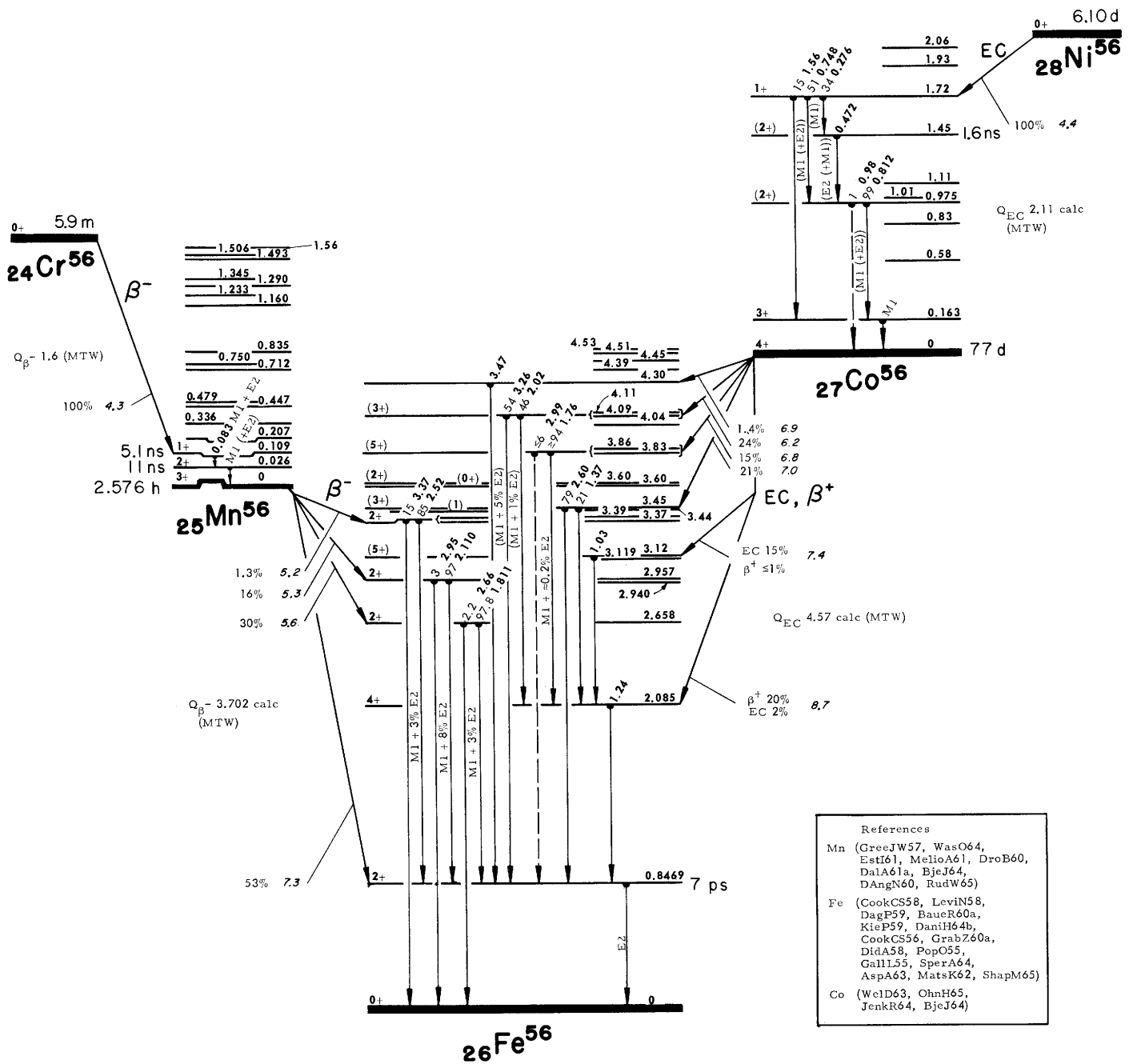
nucl align: (BaueR60b, GracM54)

EC(L)/EC(K): 0.106 ion ch (ManduG63)

0.10 ion ch (MolR63)

EC(L+M+...)/EC(K): 1.1 ion ch (KraP62)





$\text{Mn}^{56}$  (2.576 h):

I:  $3, \mu: +3.2403$  atomic beam (LindI64)

$\beta^-$ :  $\beta_1$  2.84 (47%),  $\beta_2$  1.03 (34%),  $\beta_3$  0.72 (18%),  $\beta_4$  0.30 (1%) mag spect (HowD62a)

$\beta_1$  2.86 (60%),  $\beta_2$  1.05 (25%),  $\beta_3$  0.75 (15%) mag spect (ElliL43a)

$\beta_1$  2.81 (50%),  $\beta_2$  1.04 (30%),  $\beta_3$  0.65 (20%) mag spect (SiegK46a)

others (TownA41, VasiSS61, CharP65)

$\gamma$ :  $\gamma_1$  0.8468,  $\gamma_2$  1.811,  $\gamma_3$  2.110 cryst spect (ReidyJ65)

$\gamma_1$  0.845 ( $\Gamma_{\gamma}$  100),  $\gamma_2$  1.81 ( $\Gamma_{\gamma}$  30),  $\gamma_3$  2.12 ( $\Gamma_{\gamma}$  15.3),  $\gamma_4$  2.52 ( $\Gamma_{\gamma}$  1.2),  $\gamma_5$  2.65 ( $\Gamma_{\gamma}$  0.7),  $\gamma_6$  2.95 ( $\Gamma_{\gamma}$  0.4),  $\gamma_7$  3.39 ( $\Gamma_{\gamma}$  0.21) scint spect (CookCS58)

$\gamma_2$  ( $e^{\pm}/\gamma$  0.0006),  $\gamma_3$  ( $e^{\pm}/\gamma$  0.0005) mag spect conv (SlaH52)

others (DagP59, GroshL57a, KieP59, BieJ64a, LeviN58, ElliL43a, SiegK46a, MunM55, KikS42, GermE53, MetF53c)

$\gamma\gamma(\theta)$ : (DagP59, LeviN58, MetF53c, MaliS59)

$\beta\gamma(\theta)$ ,  $\beta\gamma$  polariz( $\theta$ ): (LobV62) nucl align: (DagP59, BaueR60a)

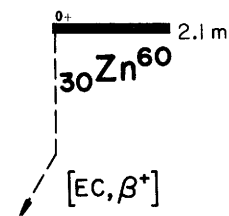
0.026 level of  $\text{Mn}^{56}$ :  $t_{1/2}$   $1.14 \times 10^{-8}$  s delay coinc (DToiS61)

$1.04 \times 10^{-8}$  s delay coinc (BoniM64)

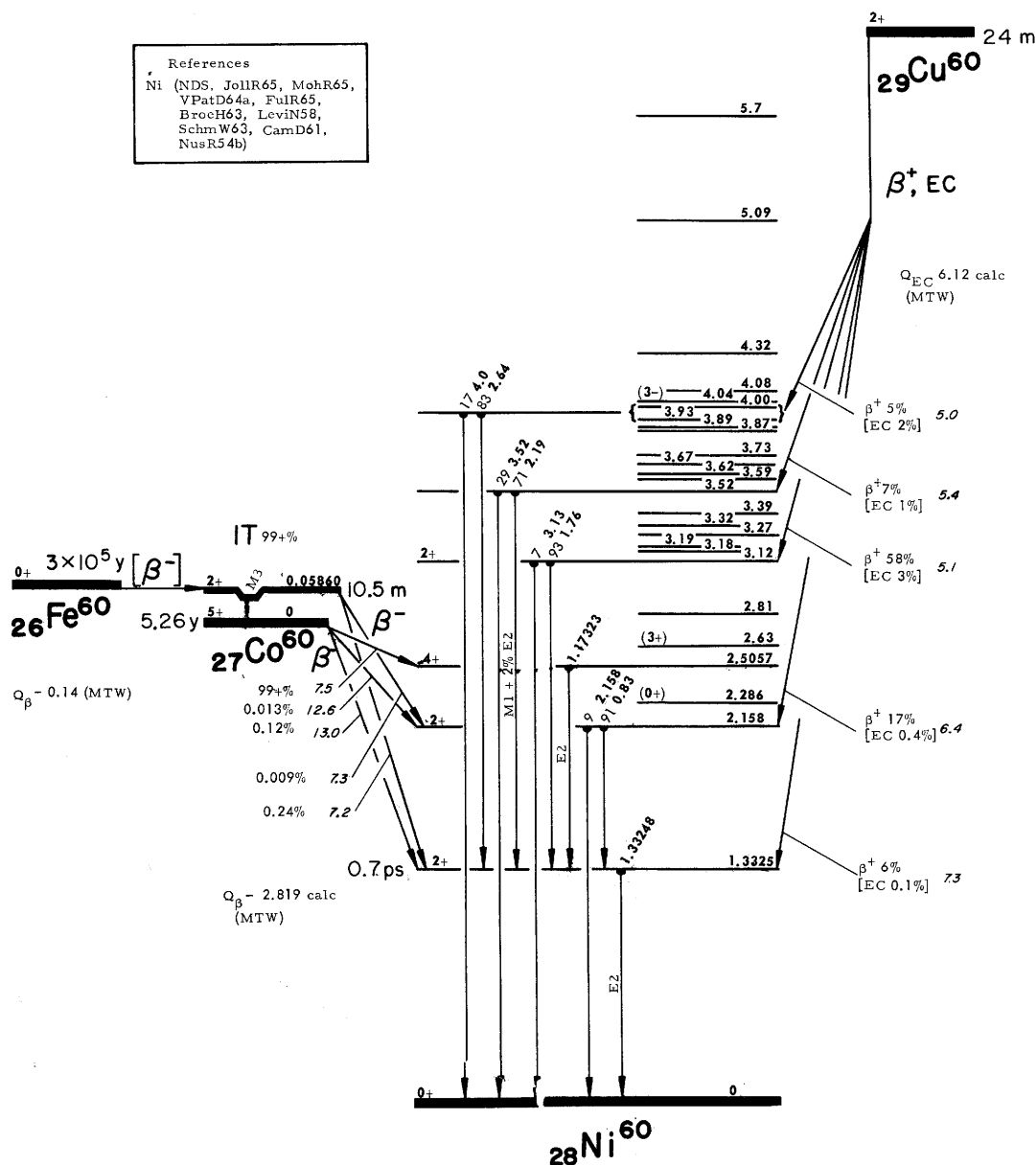
others (DAngN60)

0.109 level of  $\text{Mn}^{56}$ :  $t_{1/2}$   $5.1 \times 10^{-9}$  s delay coinc (DToiS61, BoniM64)

others (DAngN60)



References  
 Ni (NDS, JollR65, MohR65,  
 VPatD64a, FulR65,  
 BroeH63, LeviN58,  
 SchmW63, CamD61,  
 NusR54b)



$\text{Co}^{60}$  (5.26 y):

I:  $5, \mu: \pm 3.75$  ESR (LindG164)  
 $\beta^-$ :  $\beta_2$  **0.319** (KamaK58); **0.309** (BolG54); **0.318** (WagM50); **0.306** (FanC52),  
**0.314** (KeiG54); mag spect  
 $\beta_1$  **1.48** (0.12%) (CamD61); **1.48** (0.010%) (WolfsJ56); **1.48** (0.15%)  
 (KeiG54); mag spect  
 others (DeuM45, BonhF59, YosY53, MillL47)  
 $\gamma$ :  $\gamma_1$  **1.17323**,  $\gamma_2$  **1.33248** mag spect, mag spect conv (MurG65)  
 $\gamma_1$  ( $e_K/\gamma$  0.000165) mag spect, mag spect conv (FreyW62)  
 $\gamma_1$  ( $e_K/\gamma$  0.000173),  $\gamma_2$  ( $e_K/\gamma$  0.000129) mag spect conv (WagM50,  
 WagM50a)  
 $\gamma_1$  ( $e_K/\gamma$  0.000150, K/L+M+... 9.1),  $\gamma_2$  ( $e_K/\gamma$  0.000116, K/L+M+...  
 9.1) mag spect conv (KamaK58)  
 $\gamma_1$  ( $e_K/\gamma$  0.000173),  $\gamma_2$  ( $e_K/\gamma$  0.000124) mag spect conv (FanC52)  
 $\gamma_1 + \gamma_2$  ( $e^\pm/\gamma$  0.004)  $\gamma^\pm\gamma^\pm$  coinc (LanghH61a)  
 $\gamma_3$  **2.158** ( $\gamma$  0.0012%) mag spect (WolfsJ56)  
**2.5** ( $\approx 0.00004\%$ ) D- $\gamma$ -n (MoriH59)  
 others (AvoM58, LindsG53, HornW49, KlemE53, AepH52a, ChatS53,  
 LawJS53, LemH54, WieT54, ColoS55, DzhB51, SiegK50a)  
 $\gamma\gamma(\theta)$ : (GargJ60, BradE50, KlorS52, ChatS53, KlemE53, LawJS53, WieT54)  
 $\gamma\gamma$ polariz( $\theta$ ): (MetF50, WilliAH50, KlorS52)  
 $\beta\gamma(\theta)$ : (DaniH60a, LobV62b, GarwR49, AllerS50, BeysJ50a, NovetS50,  
 SinW51)  
 $\beta\gamma$ polariz( $\theta$ ): (JagP60, BloS62, AppH59, LobV59, Stefr59, PagL58,  
 BhaS65, DebP57, LunA57, SchoH57)  
 nucl align: (SamB61, LeviM60, DaniJ61, GracM59, KogA58, BisG52,  
 DaniJ52)

## Decay Scheme\* of $^{90}\text{Sr} \rightarrow ^{90}\text{Y} \rightarrow ^{90}\text{Zr}$

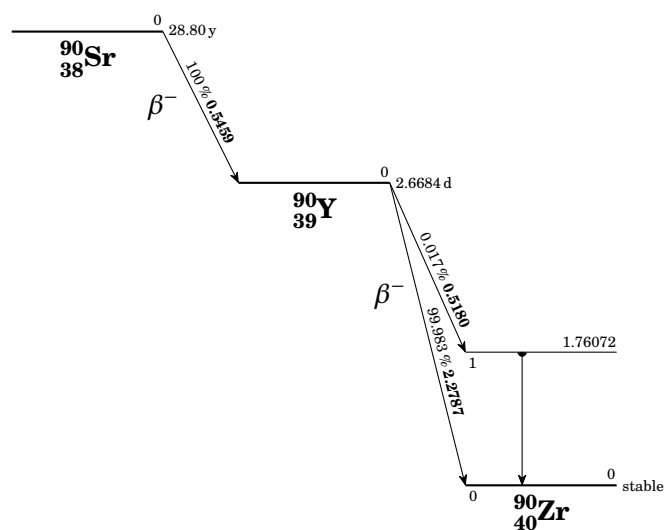


Figure 1: Decay scheme of strontium-90, yttrium-90 to zirconium-90. For decays, probabilities are denoted in percentages and the energy of the resulting particle is given in MeV and written in bold. The values of energy levels are also in MeV and written above the level, flushed right. The lifetime is given to the right of an energy level.

\*Ref. M. M. Bé *et al.*, *Table of Radionuclides* Vol. 3 (2006) <<http://www.lnhb.fr/nuclear-data/nuclear-data-table/>>.

$I^{137}$  (23 s):

n: average energy **0.56** abs paraffin (HugD48)  
**0.67** p recoil in cl ch (BurgM46)

$Ba^{137}$ :

I: **3/2** atomic beam, atomic spect;  $\mu$ : **+0.93654** NMR; q: **+0.28** opt double res (LindgI64)

$Xe^{137}$  (3.9 m):

$\beta^-$ : **4.1** (67%), **3.6** (33%, coinc  $\gamma_1$ ) scint spect,  $\beta\gamma$  coinc (OnegR64)  
others (HolmGB63, NasS55, SeeW43, BornH43a)  
 $\gamma$ :  $\gamma_1$  **0.455**, no other  $\gamma$  rays (lim 3% of  $\gamma_1$ ) scint spect (OnegR64)  
**0.15** ( $t_{\gamma 16}$ ),  $\gamma_1$  **0.44** ( $t_{\gamma 100}$ ) scint spect (OveV64)  
others (HolmGB63, JohnN59, OckD62, PraS60)

$Ba^{137m}$  (2.55 m):

$\gamma$ :  $\gamma_1$  **0.6616** (K/L<sub>I</sub>/L<sub>II</sub>/L<sub>III</sub> 1000/151/22/19) mag spect conv (GeiJ62)  
 $\gamma_1$  ( $e_K/\gamma$  0.093, K/L+M+... 4.5) mag spect conv (DaniH62b)  
 $\gamma_1$  ( $e_K/\gamma$  0.095) mag spect, mag spect conv (HulS61)  
 $\gamma_1$  (K/L/M 56/10/2.2) mag spect conv (ChuY64a)  
 $\gamma_1$  (K/L/M 566/100/26.0) mag spect conv (YosY58)  
 $\gamma_1$  ( $\gamma$  86%,  $e/\gamma$  0.1100) semicond spect (MerJ65)  
 $\gamma_1$  ( $t_{\gamma\gamma}/t_{\gamma}$   $6 \times 10^{-6}$ ) (BeuW60)  
others (MullD52, LindsG53a, GravG52, LangeL50b, DVriC60b, HulS59, SubB61c, KureT63, WapA54a, WagM51, MGowF57a, KatoT57, MaerS53, AzuT54, BendW52, KruP52, MitA49, OsoJ49, TownJ48, RiccR57, VerhJ54, AntoiS6a, AntoiS6b, DolV53, BhaS54, DrabG55, BosH63a, RaoMR65)

$La^{137}$  ( $6 \times 10^4$  y):

$\gamma$ : no  $\gamma$  (BrosA56)  
**0.010** level of  $La^{137}$ :  $t_{1/2}$   $8.9 \times 10^{-8}$  s delay coinc (RubyS63)

$Ce^{137}$  (9.0 h):

$\gamma$ :  $\gamma_2$  **0.433** ( $t_{\gamma 5}$ ),  $\gamma_3$  **0.436** ( $t_{\gamma 31}$ ,  $e_K/\gamma$  0.015),  $\gamma_4$  **0.446** ( $t_{\gamma 204}$ ,  $e_K/\gamma$  0.013),  $\gamma_5$  **0.479** ( $t_{\gamma} \approx 1.7$ ),  $\gamma_6$  **0.481** ( $t_{\gamma} \approx 4.0$ ),  $\gamma_7$  **0.492** ( $t_{\gamma} \approx 1.0$ ),  $\gamma_8$  **0.698** ( $t_{\gamma} \approx 3.5$ ,  $e_K/\gamma$  0.005),  $\gamma_9$  **0.771** ( $t_{\gamma} \approx 0.9$ ),  $\gamma_{10}$  **0.781** ( $t_{\gamma} \approx 0.4$ ),  $\gamma_{11}$  **0.916** ( $t_{\gamma} \approx 6.7$ ,  $e_K/\gamma$  0.0020),  $\gamma_{12}$  **0.926** ( $t_{\gamma} \approx 3.4$ ,  $e_K/\gamma$  0.0024) semicond spect, semicond spect conv,  $\gamma\gamma$  coinc (StonN65a)  
 $\gamma_1$  **0.010** ( $e/\gamma \approx 140$ ),  $\gamma_3 + \gamma_4$  **0.445** ( $\gamma$  3%,  $e_K/\gamma \approx 0.02$ ) mag spect conv, ion ch, scint spect,  $\gamma\gamma$  coinc (BrosA56, BrosA55)  
others (DanbG58, DzhB63a, RubyS63, DanbG56)  
nucl align: (FranR64a, HaaJ63)

