## $^{262}$Bh $\alpha$ decay (16 ms) 2009He20,2006Fo02

| Type | Author | History Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Balraj Singh | NDS 144, 297 (2017) | 25-Aug-2017 |

Parent: $^{262}$Bh: E=210 *50*; $T_{1/2}$=16 ms *6*; Q($\alpha$)=10319 *15*; %$\alpha$ decay≈100.0

$^{262}$Bh-E: Deduced by 2017Au03 from measured alpha-energy differences.

$^{262}$Bh-$T_{1/2}$: From unweighted average of 22 ms *4* (2009He20) and 9.6 ms *+36−24* (2006Fo02). Others: 16 ms *+14−5* (2008Ne08, same laboratory (LBNL) as 2006Fo02), 8.0 ms *21* (1989Mu09), 8.2 ms *22* (1988Mu15), 4.7 ms *+23−16* (1981Mu06). 1989Mu09, 1988Mu15 and 1981Mu06 are from the same laboratory (GSI) as 2009He20. Weighted average of the two values is 14 ms *6* but with reduced $\chi^2$=6.1 as compared to critical $\chi^2$=3.8. In 2001Ak11 evaluation, $T_{1/2}$=8.0 ms *21*.

$^{262}$Bh-Q($\alpha$): From 2017Wa10, deduced from E$\alpha$=10008 *26* (2009He20) based on 156.5 level for the decay of the ground state of $^{262}$Bh.

$^{262}$Bh-%$\alpha$ decay: %$\alpha$ ≈ 100. No evidence was found by 2006Fo02 and 1989Mu09 for fission decay mode of $^{262}$Bh, 2006Fo02 give an upper limit of 24% and 1989Mu09 suggest an upper limit of 10% for SF decay mode.

All the reported measurements related to the production cross sections, E$\alpha$, half-life and decay modes of $^{262}$Bh isomer are from the GSI and LBNL accelerator laboratories.

2009He20: $^{262}$Bh produced in the $^{209}$Bi($^{54}$Cr,n) reaction, the $^{54}$Cr beam delivered by the charge state injector of the UNILAC accelerator at GSI Darmstadt. Evaporation residues were separated by the velocity filter SHIP and implanted into a 16-strip Si PIPS detector. A box of six Si-wafers was used to measure escaping $\alpha$-particles. A Ge clover detector consisting of four crystals was used to measure $\gamma$ rays in coincidence with particles. Measured E$\alpha$, E$\gamma$, $\alpha\gamma$ coin, half-lives, $\sigma$. Multiple events detected.

2008Ne08: $^{262}$Bh produced in $^{208}$Pb($^{55}$Mn,n),E=273-283 MeV; and $^{209}$Bi($^{54}$Cr,n), E=253.5-272.3 MeV; measured excitation functions, E$\alpha$, $\sigma$, $T_{1/2}$ of $^{262}$Bh decay. Single events detected.

2006Fo02: $^{262}$Bh produced in $^{208}$Pb($^{55}$Mn,n),E=260,264,268 MeV; measured E$\alpha$, (evaporation residues)$\alpha\alpha$-correlations, excitation functions, $T_{1/2}$ of $^{262}$Bh decay.

1997Ho14: $^{262}$Bh source from $\alpha$-decay of $^{266}$Mt, measured E$\alpha$. Single events detected.

1989Mu09: $^{262}$Bh from $^{209}$Bi($^{54}$Cr,n),E=4.87-5.07 MeV/nucleon, measured E$\alpha$, (evaporation residues)$\alpha\alpha$-correlations, $T_{1/2}$. deduced no evidence for SF-decay of $^{262}$Bh.

1981Mu06: $^{262}$Bh produced in $^{209}$Bi($^{54}$Cr,n),E=4.85 MeV/nucleon, measured E$\alpha$, $T_{1/2}$.

### $^{258}$Db Levels

| E(level) |
|---|
| 0+z |
| 184+z *50* |
| 561+z *50* |

### $\alpha$ radiations

1997Ho14 report separate half-lives for different observed $\alpha$ groups as follows: $T_{1/2}$=15.5 ms for E$\alpha$=1100 keV (escape); 4.8 ms for E$\alpha$=6400 keV (escape); 14.6 ms for E$\alpha$=9803; 9.8 ms for E$\alpha$=9834; 5.2 ms for E$\alpha$=9902; 31 ms for E$\alpha$=10001; 9.1 ms for E$\alpha$=10210; 8.0 ms for E$\alpha$=10213; 12.0 ms for E$\alpha$=10372; 11.6 ms for E$\alpha$=10379; 12.7 ms for E$\alpha$=10443.

$T_{1/2}$(10.37 MeV $\alpha$)=4.7 ms *+25−12*, $T_{1/2}$(10.24 MeV $\alpha$)=12.4 ms *+81−35* were measured, and $T_{1/2}$($^{262}$Bh parent state)=8.0 ms *21* assigned by 1989Mu09.

The 9902$\alpha$ and 10001$\alpha$, both with single events from 1997Ho14 are not adopted here. These could belong to the decay of the g.s. or the isomer.

| E$\alpha$[†] | E(level) | Comments |
|---|---|---|
| 9826 *15* | 561+z | E$\alpha$: from 2009He20. Other: 9834, 9803 (1997Ho14).<br>102.4 *5* $\gamma$ observed by 2009He20 in coin with 9826$\alpha$ group. |
| 10197 *15* | 184+z | E$\alpha$: from 2009He20. Others: 10067 (2008Ne08), 10231 *25* (2006Fo02), 10213 (1997Ho14), 10240 *25* (1989Mu09), 10230 *30* (1988Mu15). |

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## $^{262}$Bh $\alpha$ decay (16 ms) 2009He20,2006Fo02 (continued)

### $\alpha$ radiations (continued)

| Eα[†] | E(level) | Comments |
|---|---|---|
| 10373 *15* | 0+z | Eα: from 2009He20. Others: 10383 (2008Ne08), 10348 (2006Fo02), 10372, 10379, 10443 (1997Ho14), 10370 *25* (1989Mu09), 10376 *35* (1981Mu06). |

[†] The $\alpha$ energies were measured by 1981Mu06, 1989Mu09, 1997Ho14 and 2009He20. The $\alpha$ particles were detected following $^{266}$Mt $\alpha$ decay. All the $\alpha$ transitions were observed to be correlated with the decays of $^{258}$Db, $^{254}$Lr, $^{254}$No and $^{250}$Fm.

### $\gamma(^{258}Db)$

| $E_\gamma$ | $E_i$(level) | Comments |
|---|---|---|
| [x]102.4 *5* | | $E_\gamma$: $\gamma$ observed by 2009He20 in coin with 9826$\alpha$ group. |

[x] $\gamma$ ray not placed in level scheme.