# $^{181}$Ta($^{18}$O,$^{18}$N$\gamma$) 2020Zi03

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | R. Spitzer, J. H. Kelley | ENSDF | 30-Jun-2021 |

2020Zi03: XUNDL dataset compiled at TUNL (2020).

The authors investigated the level structure of $^{18}$N and measured the lifetime of the $E_x$=2404 keV state in $^{18}$N via DSAM techniques.

A beam of 126 MeV $^{18}$O ions from the GANIL cyclotrons impinged on a 6.64 mg/cm$^2$ $^{181}$Ta target. The $^{18}$N ions that scattered at $\theta$=45° (±6°) were momentum analyzed using the VAMOS++ ion tracking system. A collection of $\gamma$-ray detectors from the AGATA and PARIS arrays plus two large-volume $LaBr_3$ detectors provided a high granularity for $\gamma$-ray energy and angle measurement. The $\gamma$-ray detectors were aligned along the VAMOS++ axis at $\theta_{rel.}$=115°−175° (AGATA) and $\theta_{rel.}$=90°(PARIS+$LaBr_3$). The $\gamma$ rays detected in coincidence with $^{18}$N ions in the VAMOS++ spectrometer were analyzed.

The authors developed a Monte Carlo analysis of the Doppler shift attenuation spectrum that accounts for population (and subsequent deexcitation) of levels via low-momentum transfer and deep-inelastic reaction processes. The accuracy of the method relies on the precise angle determination between the scattered projectile and the Doppler-shifted $\gamma$ ray.

2020Zi01: Extension of analysis presented in (2020Zi03) except the $\gamma$-ray spectrum is shown over a broader range. Additional unplace transitions are discussed corresponding to $E_\gamma$=1720, 2073, 2301 keV.

See analysis of the $^{18}$O+$^{181}$Ta fragmentation process in (2010Mi08).

## $^{18}$N Levels

| E(level)† | $J^\pi$ | $T_{1/2}$ | Comments |
|---|---|---|---|
| 0.0 | $1^-$ | | |
| 114.6 | $(2^-)$ | | |
| 587.3 | $(2^-)$ | | |
| 741.6 | $(3^-)$ | | |
| 2404.6 | | 0.11 ps *+51−7* | $T_{1/2}$: From $\tau=0.16^{+74}_{-10}$ ps and $E_\gamma$=1663.0 keV *8* (2020Zi03). |

† From (2020Zi03) Figure 5.

## $\gamma$($^{18}$N)

| $E_\gamma$† | $E_i$(level) | $J^\pi_i$ | $E_f$ | $J^\pi_f$ | Comments |
|---|---|---|---|---|---|
| 114.6 *1* | 114.6 | $(2^-)$ | 0.0 | $1^-$ | |
| 154.6 *3* | 741.6 | $(3^-)$ | 587.3 | $(2^-)$ | |
| 472.7 *2* | 587.3 | $(2^-)$ | 114.6 | $(2^-)$ | $E_\gamma$: From $^{18}$C $\beta^-$ (1991Pr03). |
| 627 *1* | 741.6 | $(3^-)$ | 114.6 | $(2^-)$ | $E_\gamma$: From $^9$Be($^{11}$B,2p$\gamma$) (2008Wi05). |
| x1566‡ *1* | | | | | |
| 1663.0 *8* | 2404.6 | | 741.6 | $(3^-)$ | $E_\gamma$: From (2020Zi03); see also 1662.3 keV *3* in (2020Zi01). |
| x1720‡ | | | | | |
| x2073.4 *8* | | | | | |
| x2300.9 *8* | | | | | |

† From (2020Zi03) except where indicated.

‡ Placement of transition in the level scheme is uncertain.

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

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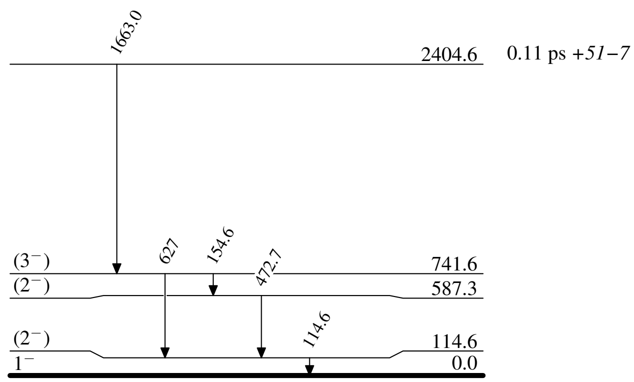
Level Scheme




$^{18}_{7}N_{11}$