

$^1\text{H}(^{30}\text{Ne}, ^{30}\text{Ne}'\gamma)$  2014Mi09,2016Do03

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia, A. Chakraborty	NDS 197,1 (2024)	31-May-2024

Includes C( $^{30}\text{Ne}, ^{30}\text{Ne}'\gamma$ ) and Pb( $^{30}\text{Ne}, ^{30}\text{Ne}'\gamma$ ).

**2014Mi09:**  $^1\text{H}(^{30}\text{Ne}, ^{30}\text{Ne}'\gamma) - ^{30}\text{Ne}$  was obtained from fragmentation of 63 MeV/nucleon  $^{48}\text{Ca}$  beam with  $^{181}\text{Ta}$  and enriched  $^{64}\text{Ni}$  target foils, respectively at RIKEN facility. The fragments were separated and identified from measurements of magnetic rigidity ( $B\rho$ ), time-of-flight (TOF), and energy loss ( $\Delta E$ -E). The secondary beam of  $^{30}\text{Ne}$  at 44.0 MeV/nucleon hit a liquid hydrogen target (CRYPTA). The scattered particles were analyzed by plastic scintillator,  $\Delta E$ -E telescope of a silicon detector, and a NaI(Tl) detector. Measured  $E\gamma$ ,  $I\gamma$ ,  $\gamma\gamma$ -coin using DALI2 array of 160 NaI(Tl) detectors surrounding the hydrogen target. Deduced deformation lengths and  $\beta_2$  deformation parameter.

**2016Do03:** Pb,C( $^{30}\text{Ne}, ^{30}\text{Ne}'\gamma$ ),  $E(^{30}\text{Ne})=232$  MeV/nucleon for lead target and  $E=228$  MeV/nucleon for carbon target, produced at RIBF-RIKEN in  $^9\text{Be}(^{48}\text{Ca}, X)$ ,  $E=345$  MeV/nucleon primary reaction, followed by separation of ions. Beam purity was  $\approx 66\%$ . The gamma rays were detected by DALI2 array of 186 NaI(Tl) scintillation detectors covering angles of  $18^\circ$  to  $146^\circ$ . Measured  $E\gamma$ ,  $I\gamma$ ,  $^{30}\text{Ne}$ - $\gamma$ -coin, cross section. Deduced  $B(E2)$  from data for Pb target (dominated by Coulomb excitation) and deformation length from data for carbon target (dominated by nuclear inelastic scattering). Also **2009Do10** from the same research group.

**2003Ya05** (also **2004Ya10**):  $^1\text{H}(^{30}\text{Ne}, ^{30}\text{Ne}'\gamma)$ ,  $^{30}\text{Ne}$  beam was obtained from a primary  $^{40}\text{Ar}$  beam at 94 MeV/nucleon bombarding a thick  $^{181}\text{Ta}$  target; Time-of-flight method and  $E$ - $\Delta E$  method used for particle identification; Measured  $\gamma$ - rays with DALI setup with an array of 68 NaI(Tl) detectors. Previous reports from the same research group: **2003DoZZ**, **2003YaZZ**, **2002YaZU**, **2002YaZW**.

 $^{30}\text{Ne}$  Levels

E(level)	$J\pi^\dagger$	Comments
0	$0^+$	
800 5	$(2^+)$	<p><math>B(E2)\uparrow=0.0277</math> 79 (<b>2016Do03</b>)</p> <p><math>\beta_2=0.58</math> +16-22 (<b>2003Ya05</b>)</p> <p><math>B(E2)</math>(from <math>\beta_2</math>)=<math>0.046</math> 27 (<b>2003Ya05</b>), assuming electromagnetic deformation is the same as for (p,p') scattering.</p> <p><math>\sigma=37</math> mb 4 (<b>2014Mi09</b>) for the first <math>2^+</math> state.</p> <p><math>\sigma=39</math> mb 5 (<b>2014Mi09</b>) including possible feeding from higher state; no higher state was reported in <b>2014Mi09</b>.</p> <p>A 794-1443 cascade was reported in <b>2010Fa04</b> and proposed a 2235-keV level. 1443<math>\gamma</math> was not confirmed in <b>2014Mi09</b>.</p> <p>Deformation length <math>\delta=1.59</math> fm +8-9(stat) 7(syst) (<b>2014Mi09</b>).</p> <p><math>\beta_2=0.45</math> +2-3(stat) 2(syst) (<b>2014Mi09</b>).</p> <p><math>\sigma=14.4</math> mb 14 for the carbon target and 56 6 for the lead target (<b>2016Do03</b>). Assumed feeding of 6% 6 from the higher possible levels was subtracted by authors.</p> <p>Deformation length <math>\delta_N=1.98</math> fm 11 (<b>2016Do03</b>) from data with carbon target, which implies deformation parameter <math>\beta_N=0.53</math> 3, assuming <math>R=1.2A^{1/3}</math> fm.</p> <p>Deformation length <math>\delta_C=1.87</math> fm 25 (<b>2016Do03</b>) from data with lead target, which implies <math>\beta_C=0.50</math> 7 and <math>B(E2)\uparrow=0.0277</math> 79, using <math>\beta_C=\delta_C/R</math>, and <math>B(E2)\uparrow=[(3ZeR^2)/4\pi]^2\beta_C^2</math>, assuming radius <math>R=1.2A^{1/3}</math> fm.</p>

$^\dagger$  From the Adopted Levels.

 $\gamma(^{30}\text{Ne})$ 

$E_\gamma$	$E_i$ (level)	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
800 5	800	$(2^+)$	0	$0^+$	$E_\gamma$ : weighted average of 800 7 ( <b>2014Mi09</b> ), 791 keV 26 ( <b>2003Ya05</b> ), 801 7 ( <b>2009Do10</b> ), 799 5 ( <b>2016Do03</b> - C target), and 801 6 ( <b>2016Do03</b> - Pb target).

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Level Scheme

