Collection of Spectra for $^{208}\text{Pb}(p,p')$ and $^{207}\text{Pb}(d,p)$ from publications.

June 27, 2012

References


8. F. Riess. [http://www.physik.uni-muenchen.de/~Riess/](http://www.physik.uni-muenchen.de/~Riess/).


Fig. 2. Inelastic proton spectra taken at 90° near the \( g_{9/2} \) analog resonance, \( E_p = 14.95 \text{ MeV} \); the \( d_{5/2} \) analog resonance, \( E_p =16.45 \text{ MeV} \); the \( s_{1/2} \) analog resonance, \( E_p =17.0 \text{ MeV} \); and the \( g_{7/2} - d_{3/2} \) analog resonance, \( E_p =17.4 \text{ MeV} \). The ground-state elastic proton group was deleted from this figure in order to expand the region of interest. Full scale is approximately 500 counts per 1 mm track. In the case where there was a gap between plates, data points from exposures at adjacent energies were used.

Fig. 1. Spectra in range \( E_x = 2500-7100 \).
Satellite Peaks from Atomic Electrons

$^{208}\text{Pb}(p, p' + n e')$

$^{208}\text{Pb}(p, p')$

$E_p = 14.92\text{ MeV}$
on g$_{9/2}$ IAR
$\Theta = 84$ deg

$Q(e_L) = 14\text{ keV}$

$Q(e_L) = 14\text{ keV}$

Fig. 2. Spectra in range $E_x = 3895-4005$.
Spectrum of $^{208}\text{Pb}(p, p')$ at $E_p = 14.92\text{ MeV}$ corresponding to the g$_{9/2}$ IAR. The line shape distinguishes the 3947 line in $^{208}\text{Pb}$ from the satellite to the 3920 line.
Fig. 3. Spectra in range $E_x = 3910-4240$.

(color online) Spectra for $3.91 < E_x < 4.24$ MeV (top) on the $g_{9/2}$ IAR, (next to top) on the $i_{11/2}$ IAR, (next before bottom) near the $d_{5/2}$ IAR, (bottom) near the $s_{1/2}$ IAR. The states with dominant $g_{9/2}f_{5/2}$, and $i_{11/2}d_{1/2}$ components are marked, the $4^-$ state with a dominant $h_{9/2}g_{7/2}$ component is marked in the spectrum taken on the $s_{1/2}$ IAR. (The 4086 $2^+$ state is also marked.) Each level has satellites in about 15 keV distance from the main peak due to the knockout of $L$-electrons in lead [2]. They are seen for the 4086 $2^+$ level here and for the 4324 $4^+$, 4424 $6^+$, 4698 $3^-$ levels in Fig. 4.
Fig. 4. Spectra in range \( E_x = 4240-4770 \). Continuation of Fig. 3 for \( 4.24 < E_x < 4.77 \) MeV. (The end of the spectrum taken on the \( s_{1/2} \) IAR is distorted.) The states with dominant \( g_{9/2} \) components are marked, the states with dominant \( h_{9/2} \) components are marked in the spectrum taken on the \( s_{1/2} \) IAR (for the 5− member see Fig. 3). The 4324 4+, 4424 6+, 4611 8+ states are marked, too.
Fig. 5. Spectra in range $E_x = 4475-4570$. Spectrum of $^{208}$Pb($p, p' + n e'$) at $E_p = 14.920$ MeV corresponding to the $g_{9/2}$ IAR. Several satellites to the 4481 line in $^{208}$Pb from the knock-out of L-electrons are seen.
Fig. 6. Spectra in range $E_x = 4580-6150$.
Spectra of the $^{208}\text{Pb}(p,p')$ reaction via the IARs $g_{9/2}$, $i_{11/2}$, $d_{5/2}$, $s_{1/2}$, $g_{7/2}+d_{3/2}$ plotted in two parts (left and right) with different Q3D settings. At the bottom, 46 out of roughly 70 observed levels are identified. The triangles at the bottom together with the corresponding figure numbers 4, 5, 6, 8, 9, 11 refer to previous data on excitation functions taken with semiconductor counters [3].
Fig. 7. Spectra in range $E_x = 4.670-5.000$.
Spectra of $^{208}\text{Pb}(p, p')$ for $E_x=4.6-5.0$ MeV taken at $\Theta = 58^\circ, 72^\circ, 54^\circ$ on the $g_{9/2}, i_{11/2}, d_{5/2}$, with targets T3, T2, T2 (see caption of Tab. ??), respectively. Six levels resonate at $E_x=15.72$ MeV on top of the $i_{11/2}$ IAR (black fill out); the doublet at 4709, 4711 keV is resolved by the computer code GASPAN only. The energies of the $i_{11/2}f_{5/2}$ multiplet are given in the middle panel and shown by bars above and below; in the lower panel the spins are given, too. The counting interval is proportional to $\sqrt{E_x}$ and one step corresponds to about 0.3 keV.
Fig. 8. Spectra in range $E_x = 4678-4722$. Spectrum of $^{208}\text{Pb}(p,p')$ at $E_p = 15.720$ MeV corresponding to the $i_{11/2}$ IAR.
Fig. 9. Spectra in range $E_x = 4830-4920$. Extract of a $^{208}$Pb($p, p'$) spectrum of 1 MeV length taken on the $j_{15/2}$ and $d_{5/2}$ IAR. The 4861 $8^+$, 4868 $7^+$ states with dominant structure $j_{15/2}p_{1/2}$ are resolved. On the logarithmic scale the line shape is asymmetric. (lower panel, magenta left arrow.) The instrumental resolution is 3 keV as determined for protons not suffering an energy loss by straggling in the target. Satellites produced by the knockout of $L_{1,II,III}$-electrons are seen near $E_x = 4.88$ MeV. (upper panel, magenta right arrow.) The width of the exponential tail depends on the effective target thickness.
Fig. 10. Spectra taken for 4.835 < $E_x$ < 4.935 MeV and fitted by GASPAN.

Fig. 11. Spectra in range $E_x =$ 4920-5105. Spectra taken for 4.920 < $E_x$ < 5.105 MeV and fitted by GASPAN.
Fig. 12. Spectra in range $E_x = 5020-5290$
Spectra of $^{208}\text{Pb}(p, p')$ for the $i_{11/2}p_{3/2}$ multiplet in the region $E_x=5.0-5.3$ MeV. The energies of the multiplet are given in the middle panel, the spins in the lower panel. For other details refer to Fig. 7 and the text.
FIG. 1. Part of the scattering spectra for \((p, p')\) and \((d, d')\) at \(\theta_{\text{lab}} = 50^\circ\) (top and middle) and \((\alpha, \alpha')\) at \(\theta_{\text{lab}} = 25^\circ\) as function of the excitation energy (see text for details).

Fig. 13. Spectra in range \(E_x = 5020 - 5440\).
Fig. 14. Spectra in range $E_x = 5185 - 5290$. $^{208}\text{Pb}(p, p')$ spectra fitted by GASPAN taken on the $i_{1/2}$ IAR for the energy range $E_x = 5.185 - 5.290\text{MeV}$. The 5239 level is stronger excited at lower scattering angles $\Theta$. 
Fig. 15. Spectra in range $E_x = 5300 - 5700$. Spectrum taken at scattering angle $\Theta = 88^\circ$ for $5.3 < E_x < 5.7 \text{ MeV}$ and proton energy $E_p = 16.630 \text{ MeV}$ and $E_p = 16.405 \text{ MeV}$ (bottom: on $j_{15/2}$ IAR). Some positive parity states are identified (dotted lines), see Tables ??, ?? . In the region $5.3 < E_x < 5.6$, $5.6 < E_x < 6.0$ the major fragments of the $j_{15/2}f_{5/2}$, $j_{15/2}p_{3/2}$ multiplet are located, respectively. The structure of other strongly excited states is not discussed.
Fig. 16. Spectra in range $E_x = 5395-5455$.
(color online) Spectra for $5.40 < E_x < 5.54$ MeV, (top) near the $g_{7/2}$ IAR, (next to top) near the $d_{5/2}$ IAR, (next before bottom) on $h_{11/2}$ IAR, (bottom) on the $g_{9/2}$ IAR. The distance between the 5490 6−, 5492 4− states is determined as $1.3 \pm 0.3$ keV (Table ??). Other peaks are identified (from left to right) the 5419 6− [4] and the 5482 5−, 5512 1−, 5517 3− [5] states.