

²⁰⁸Pb(³⁶S,³⁵Pγ) E=215 MeV 2015Ch56,2019Gr08

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Lijie Sun and Jun Chen		NDS 211,1 (2026)	30-Sep-2025

2015Ch56: A 215-MeV ³⁶S beam was produced using the combination of XTU tandem Van de Graaff accelerator and ALPI superconducting linear accelerator at the INFN Legnaro National Laboratory. The target was 300-μg/cm² 99.7% enriched ²⁰⁸Pb on a 20 μg/cm² carbon backing. Projectile-like fragments produced in multinucleon binary grazing reactions were separated and identified by the PRISMA spectrometer. γ rays were detected using the CLARA array of 22 EUROBALL escape-suppressed HPGe clover detectors. Doppler corrections of γ-ray energies were performed event by event. Measured E_γ, I_γ, (³⁵P)γ-coin, and γγ-coin. **2015Ch56** also revisited the γγγ-coin of ³⁶S+¹⁷⁶Yb deep-inelastic data by J. Ollier Ph.D. thesis, University of Paisley (2004) to strengthen the evidence for γ-ray placements (see Ref. [39] in **2015Ch56**). Deduced levels, J, π. Comparisons with shell-model calculations.

2019Gr08: A 225-MeV ³⁶S beam was provided by Tandem-ALPI accelerator complex at the INFN Legnaro National Laboratory. The target was 1 mg/cm² 99.7% enriched ²⁰⁸Pb with 1 mg/cm² Nb backing and mounted onto the Cologne differential plunger. Projectile-like fragments produced in binary grazing reactions were separated and identified by the PRISMA spectrometer. γ rays were detected using the AGATA demonstrator array of five triple cluster modules of 36-fold segmented Ge crystals covering backward angles from 135° to 175°. Doppler corrections of γ-ray energies were performed event by event. Measured E_γ, (³⁵P)γ-coin, and level lifetimes using the differential recoil-distance method (DRDM). Comparisons with shell-model calculations.

³⁵P Levels

E(level) ^{†‡}	J ^π [#]	T _{1/2} [@]	Comments
0	1/2 ⁺		
2386.1 8	3/2 ⁺	<0.69 ps	T _{1/2} : estimated mean lifetime τ<1 ps (2019Gr08).
3860.2 7	5/2 ⁺	<0.69 ps	T _{1/2} : estimated mean lifetime τ<1 ps (2019Gr08).
4101.2 8	(7/2 ⁻)	>69 ps	J ^π : 7/2 ⁻ proposed by 2019Gr08 based on comparisons with shell-model calculations. T _{1/2} : estimated mean lifetime τ>100 ps (2019Gr08).
4380.2 13	(5/2 ⁻)		
4493.2 9	(7/2 ⁻)	2.29 ps 49	J ^π : 7/2 ⁻ proposed by 2019Gr08 based on comparisons with shell-model calculations. T _{1/2} : measured mean lifetime τ=3.3 ps 7 (2019Gr08).
4766.2 10	(9/2 ⁻)		J ^π : 9/2 ⁻ proposed by 2019Gr08 based on comparisons with shell-model calculations.
4962.2 10	(9/2 ⁻)		J ^π : 9/2 ⁻ proposed by 2019Gr08 based on comparisons with shell-model calculations.
5089.2 12	(11/2 ⁻)		J ^π : 11/2 ⁻ proposed by 2019Gr08 based on comparisons with shell-model calculations.

[†] Additional information 1.

[‡] From a least-squares fit to γ-ray energies.

[#] From the Adopted Levels.

[@] From differential recoil-distance method (DRDM) (**2019Gr08**).

γ(³⁵P)

E _γ [†]	I _γ [†]	E _i (level)	J _i ^π	E _f	J _f ^π	E _γ [†]	I _γ [†]	E _i (level)	J _i ^π	E _f	J _f ^π
127 1	5.2 6	5089.2	(11/2 ⁻)	4962.2	(9/2 ⁻)	861 1	9.8 12	4962.2	(9/2 ⁻)	4101.2	(7/2 ⁻)
241 1	32.6 9	4101.2	(7/2 ⁻)	3860.2	5/2 ⁺	^x 1353 1	9.2 11				
273 1	12.9 8	4766.2	(9/2 ⁻)	4493.2	(7/2 ⁻)	1474 1	16.4 14	3860.2	5/2 ⁺	2386.1	3/2 ⁺
323 1	12.9 8	5089.2	(11/2 ⁻)	4766.2	(9/2 ⁻)	^x 1592 1	7.7 10				
392 1	24.9 11	4493.2	(7/2 ⁻)	4101.2	(7/2 ⁻)	1994 1	14.2 11	4380.2	(5/2 ⁻)	2386.1	3/2 ⁺
469 1	16.8 11	4962.2	(9/2 ⁻)	4493.2	(7/2 ⁻)	2386 1	99.2 28	2386.1	3/2 ⁺	0	1/2 ⁺
633 1	10.4 9	4493.2	(7/2 ⁻)	3860.2	5/2 ⁺	3860 1	100.0 32	3860.2	5/2 ⁺	0	1/2 ⁺
665 1	17.8 10	4766.2	(9/2 ⁻)	4101.2	(7/2 ⁻)	4101		4101.2	(7/2 ⁻)	0	1/2 ⁺

[†] From **2015Ch56**.

^x γ ray not placed in level scheme.

$^{208}\text{Pb}(^{36}\text{S}, ^{35}\text{P}\gamma) E=215 \text{ MeV}$ 2015Ch56,2019Gr08

Legend

Level Scheme

Intensities: Relative I_γ

- \blacktriangleright $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- $\color{blue}\blacktriangleright$ $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- $\color{red}\blacktriangleright$ $I_\gamma > 10\% \times I_\gamma^{\text{max}}$

