



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:52 AM UTC

PDB ID : 2XE7 / pdb_00002xe7
Title : The complete reaction cycle of human phosphoglycerate kinase: The open ternary complex with 3PG and ADP
Authors : Cliff, M.J.; Baxter, N.J.; Blackburn, G.M.; Merli, A.; Vas, M.; Waltho, J.P.; Bowler, M.W.
Deposited on : 2010-05-11
Resolution : 2.20 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

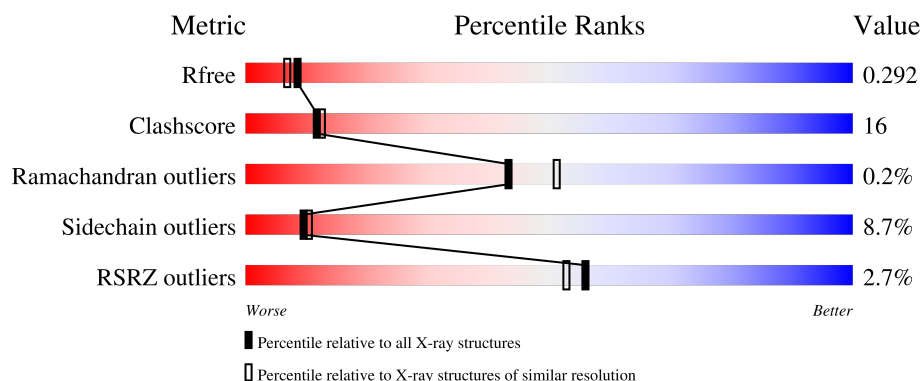
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

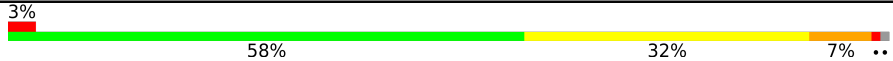
The reported resolution of this entry is 2.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	417	

2 Entry composition [i](#)

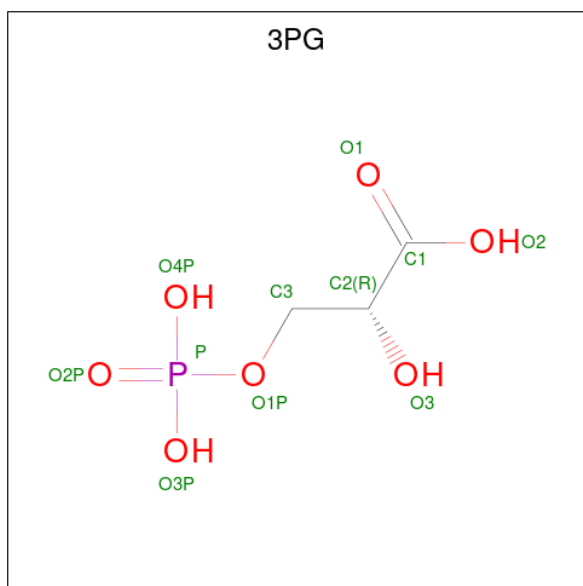
There are 4 unique types of molecules in this entry. The entry contains 3235 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called PHOSPHOGLYCERATE KINASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	413	3133	1983	539	591	20	0	7	0

- Molecule 2 is 3-PHOSPHOGLYCERIC ACID (CCD ID: 3PG) (formula: $C_3H_7O_7P$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O	P		
2	A	1	11	3	7	1	0	0

- Molecule 3 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	64	Total	O	0
			64	64	

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: PHOSPHOGLYCERATE KINASE 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	58.62Å 73.45Å 93.44Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.20 20.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.7 (20.00-2.20) 98.5 (20.00-2.20)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.53 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.224 , 0.288 0.236 , 0.292	Depositor DCC
R_{free} test set	1051 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	33.5	Xtriage
Anisotropy	0.499	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 40.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3235	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.30% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ADP, 3PG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	2.18	87/3192 (2.7%)	1.23	14/4302 (0.3%)

All (87) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	218[A]	ASP	N-CA	-12.80	1.29	1.46
1	A	218[B]	ASP	N-CA	-12.80	1.29	1.46
1	A	32[A]	GLN	N-CA	-8.98	1.35	1.46
1	A	32[B]	GLN	N-CA	-8.98	1.35	1.46
1	A	78	GLU	C-O	-7.78	1.17	1.24
1	A	291	PHE	C-O	-7.43	1.15	1.23
1	A	303	ALA	C-O	-7.13	1.15	1.24
1	A	162	ASN	C-O	-6.95	1.16	1.24
1	A	22	VAL	C-O	-6.92	1.16	1.23
1	A	146	ILE	C-O	-6.73	1.16	1.24
1	A	200	LEU	C-O	-6.52	1.16	1.24
1	A	399	LEU	C-O	-6.38	1.16	1.24
1	A	241	PHE	C-O	-6.38	1.16	1.24
1	A	243	PHE	C-O	-6.35	1.16	1.24
1	A	185	GLY	C-O	-6.34	1.17	1.24
1	A	80	VAL	C-O	-6.33	1.16	1.24
1	A	346	ALA	C-O	-6.23	1.16	1.24
1	A	94	PHE	C-O	-6.12	1.16	1.24
1	A	144	ALA	C-O	-6.08	1.17	1.24
1	A	26	VAL	C-O	-6.04	1.16	1.24
1	A	27	PRO	C-O	-6.02	1.17	1.23
1	A	304	SER	C-O	-6.01	1.17	1.24
1	A	139	VAL	C-O	-6.00	1.18	1.24
1	A	192	GLU	C-O	-5.98	1.17	1.24
1	A	166	GLY	C-O	-5.91	1.16	1.24
1	A	220	ILE	C-O	-5.90	1.17	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	161	VAL	C-O	-5.87	1.18	1.24
1	A	410	VAL	C-O	-5.85	1.17	1.24
1	A	240	ALA	C-O	-5.84	1.16	1.24
1	A	319	SER	C-O	-5.84	1.17	1.24
1	A	197	ALA	C-O	-5.82	1.17	1.24
1	A	170	ARG	C-O	-5.81	1.17	1.24
1	A	272	ALA	C-O	-5.76	1.17	1.24
1	A	397	ALA	C-O	-5.75	1.17	1.24
1	A	361	ALA	C-O	-5.69	1.17	1.24
1	A	342	PHE	C-O	-5.65	1.16	1.24
1	A	65	ARG	C-O	-5.59	1.17	1.24
1	A	81	ALA	CA-CB	-5.59	1.44	1.53
1	A	13	VAL	CA-CB	-5.58	1.48	1.54
1	A	281	LEU	C-O	-5.55	1.17	1.23
1	A	127	GLU	C-O	-5.55	1.17	1.24
1	A	108	ALA	CA-CB	-5.51	1.44	1.53
1	A	358	VAL	C-O	-5.51	1.17	1.24
1	A	208	LEU	C-O	-5.51	1.17	1.24
1	A	150	ARG	C-O	-5.50	1.17	1.24
1	A	277	VAL	C-O	-5.49	1.18	1.24
1	A	85	LYS	C-O	-5.48	1.17	1.24
1	A	60	MET	C-O	-5.48	1.17	1.23
1	A	83	GLU	C-O	-5.46	1.17	1.24
1	A	199	ALA	CA-CB	-5.46	1.44	1.53
1	A	244	LEU	C-O	-5.45	1.17	1.24
1	A	190	LYS	C-O	-5.44	1.17	1.24
1	A	335	TRP	C-O	-5.43	1.17	1.24
1	A	71	MET	C-O	-5.42	1.17	1.23
1	A	141	ALA	CA-CB	-5.41	1.44	1.53
1	A	249	ASN	C-O	-5.40	1.16	1.23
1	A	165	PHE	C-O	-5.39	1.17	1.24
1	A	320	SER	C-O	-5.39	1.17	1.24
1	A	48	PHE	C-O	-5.38	1.17	1.24
1	A	196	PHE	C-O	-5.35	1.17	1.24
1	A	203	PRO	C-O	-5.33	1.17	1.23
1	A	257	PHE	C-O	-5.32	1.17	1.23
1	A	140	LYS	C-O	-5.32	1.17	1.24
1	A	41	ALA	C-O	-5.31	1.17	1.24
1	A	305	GLY	C-O	-5.31	1.17	1.23
1	A	37	GLN	C-O	-5.30	1.18	1.24
1	A	224	ASN	C-O	-5.29	1.18	1.24
1	A	109	ASN	C-O	-5.28	1.18	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	226	MET	C-O	-5.27	1.17	1.24
1	A	338	PRO	C-O	-5.26	1.17	1.23
1	A	332	GLN	C-O	-5.26	1.17	1.23
1	A	278	LYS	C-O	-5.25	1.17	1.24
1	A	283	VAL	C-O	-5.24	1.18	1.24
1	A	209	ALA	C-O	-5.22	1.17	1.24
1	A	391	VAL	C-O	-5.22	1.18	1.24
1	A	247	LEU	C-O	-5.21	1.18	1.24
1	A	348	ALA	CA-CB	-5.19	1.45	1.53
1	A	388	VAL	C-O	-5.17	1.18	1.23
1	A	198	LYS	C-O	-5.15	1.18	1.24
1	A	191	LYS	C-O	-5.12	1.18	1.24
1	A	359	VAL	C-O	-5.12	1.18	1.24
1	A	317	PRO	C-O	-5.12	1.17	1.24
1	A	223	ILE	C-O	-5.05	1.18	1.24
1	A	188	LEU	C-O	-5.03	1.18	1.24
1	A	245	LYS	C-O	-5.03	1.18	1.24
1	A	222	LEU	C-O	-5.02	1.18	1.24
1	A	33	ILE	C-O	-5.00	1.19	1.24

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	200	LEU	N-CA-C	7.46	119.20	111.14
1	A	201	GLU	N-CA-C	7.18	118.89	111.14
1	A	108	ALA	N-CA-C	7.11	118.68	111.07
1	A	53	GLY	N-CA-C	6.53	125.86	114.76
1	A	221	GLN	N-CA-C	-6.31	104.45	111.71
1	A	362	THR	N-CA-C	-5.95	104.80	111.28
1	A	115	VAL	CB-CA-C	-5.90	103.60	110.91
1	A	246	VAL	N-CA-C	5.88	116.05	110.53
1	A	304	SER	N-CA-C	5.74	117.61	111.36
1	A	179	ASN	N-CA-C	5.68	118.14	109.62
1	A	365	GLY	N-CA-C	5.43	122.82	115.32
1	A	400	GLU	N-CA-C	-5.37	105.43	111.28
1	A	113	GLY	CA-C-N	-5.28	113.96	121.50
1	A	113	GLY	C-N-CA	-5.28	113.96	121.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3133	0	3218	102	1
2	A	11	0	4	0	0
3	A	27	0	12	1	0
4	A	64	0	0	7	0
All	All	3235	0	3234	102	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 16.

All (102) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:13:VAL:C	1:A:16:LYS:HG3	1.90	0.96
1:A:159:VAL:HG12	4:A:2027:HOH:O	1.71	0.90
1:A:207:PHE:H	1:A:231:ASN:HD22	1.14	0.90
1:A:13:VAL:O	1:A:16:LYS:CG	2.19	0.90
1:A:220:ILE:HG23	1:A:221:GLN:N	1.88	0.86
1:A:220:ILE:CG2	1:A:221:GLN:H	1.89	0.85
1:A:55:LYS:O	1:A:111:ALA:O	1.94	0.84
1:A:214[A]:ALA:O	1:A:215[A]:LYS:CG	2.29	0.80
1:A:220:ILE:HG23	1:A:221:GLN:H	1.43	0.79
1:A:381:LYS:HE2	1:A:382:TRP:CZ2	2.19	0.77
1:A:214[A]:ALA:O	1:A:215[A]:LYS:CB	2.33	0.76
1:A:13:VAL:CA	1:A:16:LYS:HG3	2.15	0.75
1:A:211:LEU:N	1:A:211:LEU:HD22	2.01	0.75
1:A:13:VAL:HA	1:A:16:LYS:HG3	1.68	0.75
1:A:90:LYS:HG3	1:A:91:ASP:N	2.01	0.75
1:A:210:ILE:C	1:A:211:LEU:HD22	2.13	0.74
1:A:19:VAL:HG23	1:A:157:GLY:HA3	1.69	0.74
1:A:99:VAL:HG12	1:A:152:SER:HB3	1.72	0.71
1:A:13:VAL:O	1:A:16:LYS:HG3	1.87	0.70
1:A:13:VAL:C	1:A:16:LYS:CG	2.62	0.69
1:A:137:ASN:ND2	4:A:2020:HOH:O	2.18	0.69
1:A:55:LYS:HD3	1:A:109:ASN:HD22	1.59	0.67
1:A:71:MET:HE2	1:A:74:LYS:HD3	1.76	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:97:ASP:OD1	1:A:124:HIS:HE1	1.79	0.65
1:A:214[A]:ALA:O	1:A:215[A]:LYS:HG2	1.96	0.65
1:A:387:LYS:HZ2	1:A:387:LYS:HB2	1.62	0.64
1:A:381:LYS:HE3	1:A:382:TRP:NE1	2.13	0.64
1:A:403:GLU:OE1	1:A:405:LYS:NZ	2.28	0.64
1:A:13:VAL:O	1:A:16:LYS:N	2.33	0.61
1:A:211:LEU:N	1:A:211:LEU:CD2	2.64	0.61
1:A:216[A]:VAL:HG12	1:A:216[A]:VAL:O	1.99	0.61
1:A:13:VAL:O	1:A:16:LYS:CB	2.50	0.60
1:A:381:LYS:CE	1:A:382:TRP:CE2	2.85	0.59
1:A:207:PHE:H	1:A:231:ASN:ND2	1.93	0.59
1:A:214[A]:ALA:O	1:A:215[A]:LYS:HB2	2.03	0.58
1:A:293:GLU:HG3	1:A:344:TRP:CD1	2.41	0.56
1:A:219:LYS:O	1:A:223:ILE:HD12	2.07	0.55
1:A:9:ASP:OD2	1:A:10:LYS:NZ	2.39	0.55
1:A:310:TRP:CD1	1:A:310:TRP:N	2.73	0.55
1:A:343:GLU:OE2	3:A:1418:ADP:O2'	2.13	0.55
1:A:381:LYS:HE2	1:A:382:TRP:CE2	2.42	0.55
1:A:205:ARG:HH21	1:A:231:ASN:HD21	1.55	0.53
1:A:167:THR:O	1:A:167:THR:HG22	2.10	0.52
1:A:245:LYS:HD2	1:A:257:PHE:CE1	2.45	0.51
1:A:48:PHE:CD2	1:A:48:PHE:C	2.89	0.50
1:A:386:ASP:OD1	1:A:387:LYS:HD3	2.11	0.50
1:A:205:ARG:HA	1:A:206:PRO:C	2.37	0.50
1:A:13:VAL:O	1:A:16:LYS:HG2	2.07	0.50
1:A:109:ASN:O	1:A:109:ASN:CG	2.53	0.49
1:A:4:ASN:HB2	4:A:2001:HOH:O	2.12	0.49
1:A:90:LYS:CG	1:A:91:ASP:N	2.73	0.48
1:A:97:ASP:OD1	1:A:124:HIS:CE1	2.65	0.48
1:A:109:ASN:N	1:A:110:PRO:CD	2.76	0.48
1:A:167:THR:O	1:A:175:MET:HE2	2.13	0.48
1:A:175:MET:HB3	1:A:175:MET:HE3	1.80	0.48
1:A:37:GLN:HE21	1:A:37:GLN:HB2	1.45	0.47
1:A:387:LYS:HZ2	1:A:387:LYS:CB	2.21	0.47
1:A:200:LEU:HD21	1:A:402:LEU:HD23	1.98	0.46
1:A:310:TRP:N	1:A:310:TRP:HD1	2.13	0.46
1:A:293:GLU:HG3	1:A:344:TRP:CG	2.51	0.46
1:A:387:LYS:HB2	1:A:387:LYS:NZ	2.27	0.45
1:A:99:VAL:CG1	1:A:152:SER:HB3	2.44	0.45
1:A:118:LEU:HD11	1:A:156:LEU:CD1	2.47	0.45
1:A:307:PRO:HG2	4:A:2043:HOH:O	2.15	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:205:ARG:HH21	1:A:231:ASN:ND2	2.14	0.45
1:A:416:ILE:HD11	4:A:2001:HOH:O	2.16	0.45
1:A:62:HIS:HB2	1:A:122:ARG:HG3	1.98	0.44
1:A:20:MET:HG2	1:A:22:VAL:HG13	1.98	0.44
1:A:60:MET:SD	1:A:153:LEU:HD22	2.57	0.44
1:A:85:LYS:HG3	1:A:90:LYS:O	2.18	0.44
1:A:227:LEU:HD23	1:A:227:LEU:HA	1.72	0.43
1:A:9:ASP:OD1	1:A:9:ASP:N	2.50	0.43
1:A:308:ALA:HA	1:A:309:GLY:HA2	1.46	0.43
1:A:31:ASN:O	1:A:32[A]:GLN:NE2	2.51	0.43
1:A:36:ASN:ND2	1:A:83:GLU:OE2	2.52	0.43
1:A:400:GLU:OE2	1:A:405:LYS:HE2	2.18	0.43
1:A:216[A]:VAL:O	1:A:216[A]:VAL:CG1	2.66	0.43
1:A:416:ILE:CD1	4:A:2001:HOH:O	2.67	0.43
1:A:88:LEU:HD23	1:A:88:LEU:HA	1.75	0.42
1:A:43:VAL:N	1:A:44:PRO:HD2	2.34	0.42
1:A:70:PRO:HA	1:A:123:PHE:CG	2.54	0.42
1:A:251:GLU:HB3	4:A:2035:HOH:O	2.19	0.42
1:A:200:LEU:HD21	1:A:402:LEU:CD2	2.49	0.42
1:A:349:ARG:HH11	1:A:349:ARG:HG2	1.84	0.42
1:A:364:ARG:NH1	1:A:366:CYS:HB2	2.34	0.42
1:A:381:LYS:CE	1:A:382:TRP:NE1	2.81	0.42
1:A:16:LYS:HE2	1:A:16:LYS:HB3	1.72	0.41
1:A:226:MET:HE2	1:A:226:MET:HA	2.02	0.41
1:A:161:VAL:HA	1:A:184:ALA:O	2.21	0.41
1:A:109:ASN:N	1:A:110:PRO:HD3	2.35	0.41
1:A:78:GLU:HB3	1:A:79:PRO:HD3	2.03	0.41
1:A:216[B]:VAL:O	1:A:216[B]:VAL:HG12	2.21	0.41
1:A:406:VAL:HG22	1:A:407:LEU:N	2.36	0.40
1:A:220:ILE:HG22	1:A:221:GLN:H	1.78	0.40
1:A:254:THR:HG23	1:A:309:GLY:O	2.21	0.40
1:A:310:TRP:CD1	1:A:310:TRP:H	2.37	0.40
1:A:99:VAL:HG12	1:A:152:SER:CB	2.46	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:308:ALA:CB	1:A:308:ALA:CB[2_445]	1.63	0.57

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	418/417 (100%)	408 (98%)	9 (2%)	1 (0%)	43	51

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	307	PRO

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	336/336 (100%)	306 (91%)	30 (9%)	9	10

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	LYS
1	A	14	LYS
1	A	16	LYS
1	A	37	GLN
1	A	78	GLU
1	A	90	LYS
1	A	99	VAL
1	A	109	ASN
1	A	155	LYS
1	A	181	PRO

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Mol	Chain	Res	Type
1	A	198	LYS
1	A	208	LEU
1	A	211	LEU
1	A	218[A]	ASP
1	A	218[B]	ASP
1	A	220	ILE
1	A	226	MET
1	A	264	ILE
1	A	265	VAL
1	A	278	LYS
1	A	336	ASN
1	A	343	GLU
1	A	349	ARG
1	A	359	VAL
1	A	363	SER
1	A	370	ILE
1	A	387	LYS
1	A	399	LEU
1	A	405	LYS
1	A	416	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	30	ASN
1	A	37	GLN
1	A	109	ASN
1	A	124	HIS
1	A	225	ASN
1	A	231	ASN
1	A	299	GLN
1	A	336	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	3PG	A	1417	-	9,10,10	1.28	1 (11%)	11,14,14	1.51	4 (36%)
3	ADP	A	1418	-	28,29,29	1.58	6 (21%)	43,45,45	1.70	8 (18%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	3PG	A	1417	-	-	0/10/10/10	-
3	ADP	A	1418	-	-	4/16/32/32	0/3/3/3

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1418	ADP	C5-C4	5.03	1.48	1.39
3	A	1418	ADP	PA-O3A	2.91	1.62	1.59
3	A	1418	ADP	C5-C6	2.78	1.48	1.41
3	A	1418	ADP	C8-N7	2.55	1.36	1.31
3	A	1418	ADP	C5-N7	-2.45	1.34	1.39
3	A	1418	ADP	C4-N9	-2.27	1.33	1.37
2	A	1417	3PG	P-O4P	-2.15	1.46	1.54

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1418	ADP	C5-C4-N3	-5.18	119.59	126.72
3	A	1418	ADP	N3-C4-N9	4.12	134.17	127.17
3	A	1418	ADP	N3-C2-N1	-3.65	123.06	128.58
3	A	1418	ADP	C2-N3-C4	3.64	120.71	111.83
3	A	1418	ADP	C4-C5-N7	-2.74	107.44	110.58
3	A	1418	ADP	C2-N1-C6	2.62	123.03	118.73
2	A	1417	3PG	O2-C1-C2	2.57	118.19	112.74
3	A	1418	ADP	C4-N9-C8	2.29	108.15	105.74
2	A	1417	3PG	O1P-P-O2P	-2.12	100.70	106.44
2	A	1417	3PG	O4P-P-O3P	2.10	115.69	107.80
2	A	1417	3PG	O1-C1-C2	-2.10	118.40	122.60
3	A	1418	ADP	C6-C5-N7	2.01	135.96	132.09

There are no chirality outliers.

All (4) torsion outliers are listed below:

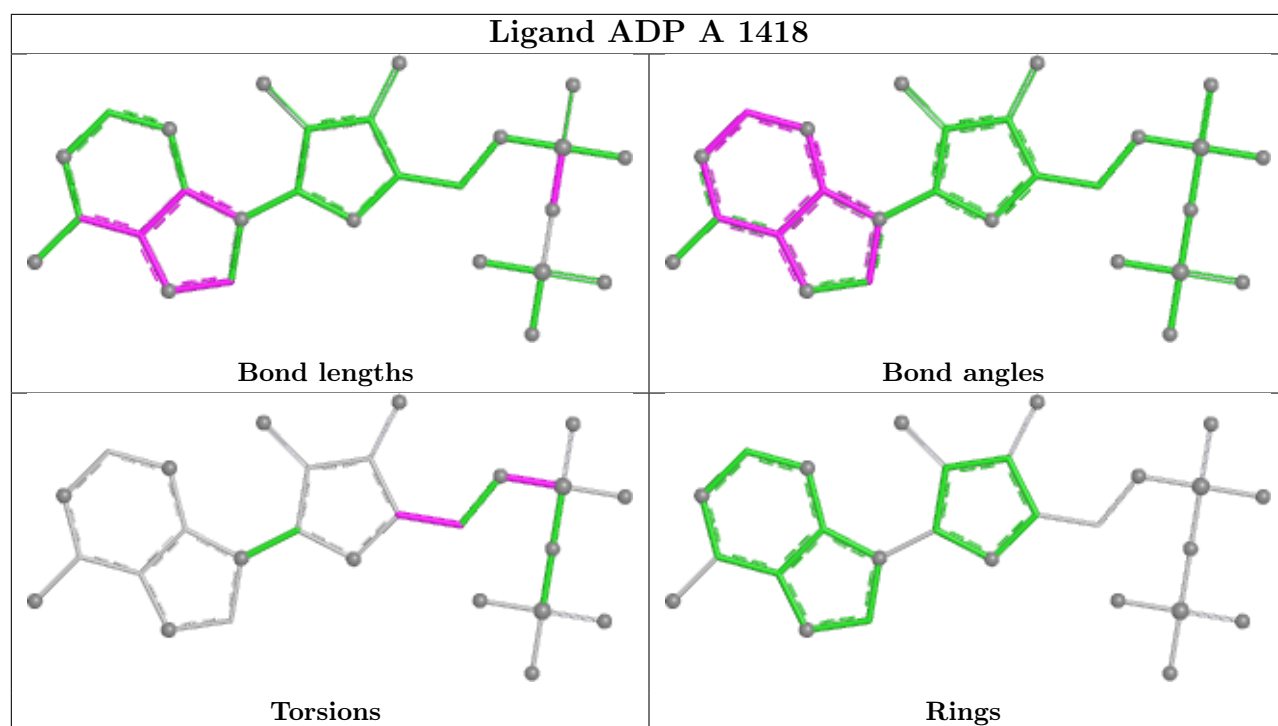
Mol	Chain	Res	Type	Atoms
3	A	1418	ADP	C5'-O5'-PA-O1A
3	A	1418	ADP	C5'-O5'-PA-O2A
3	A	1418	ADP	C5'-O5'-PA-O3A
3	A	1418	ADP	C3'-C4'-C5'-O5'

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1418	ADP	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	413/417 (99%)	0.04	11 (2%) 56 53	16, 34, 61, 88	7 (1%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	308	ALA	9.0
1	A	112	ALA	8.1
1	A	111	ALA	5.6
1	A	108	ALA	3.6
1	A	307	PRO	3.4
1	A	218[A]	ASP	3.2
1	A	309	GLY	3.0
1	A	215[A]	LYS	2.7
1	A	386	ASP	2.3
1	A	134	ALA	2.2
1	A	101	PRO	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

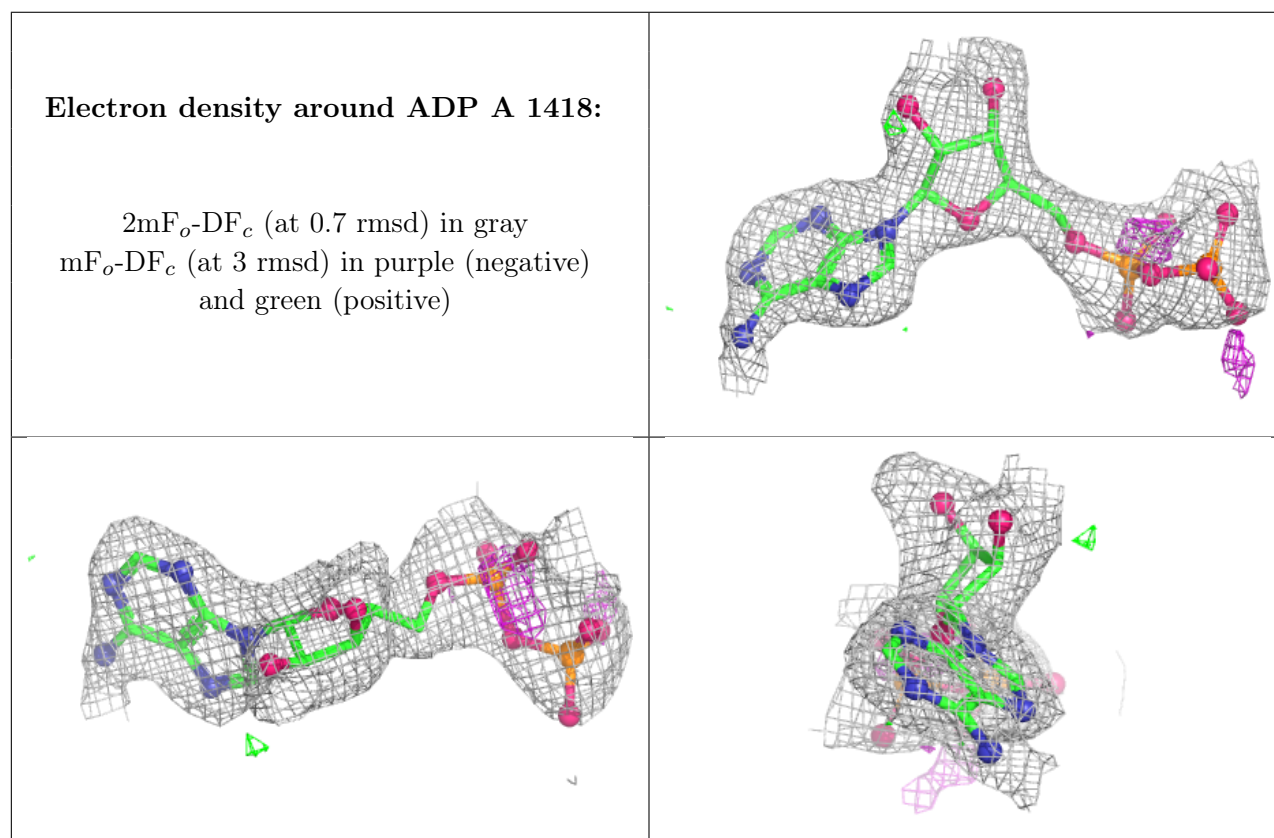
6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	ADP	A	1418	27/27	0.87	0.09	35,38,47,48	0
2	3PG	A	1417	11/11	0.97	0.06	22,26,30,33	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers [i](#)

There are no such residues in this entry.