



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 21, 2025 – 06:17 PM EDT

PDB ID : 9D5I / pdb_00009d5i
Title : Crystal structure of the ILK mutant (R225A)/alpha-parvin core complex bound to MgATP
Authors : Fukuda, K.; Qin, J.
Deposited on : 2024-08-13
Resolution : 1.50 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 : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.46

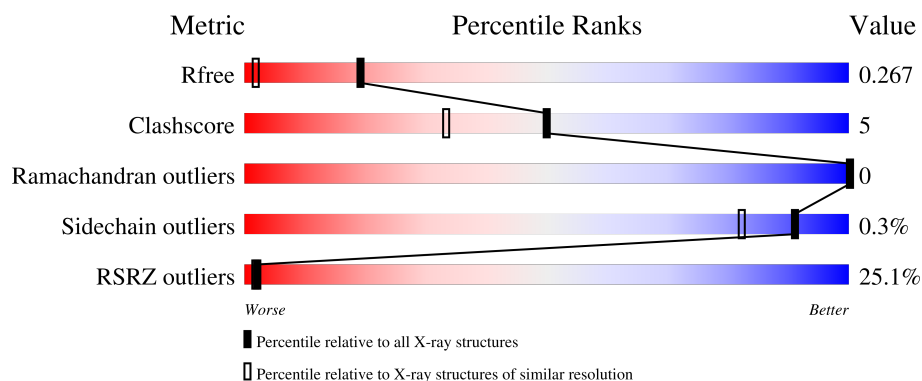
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.50 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}	164625	3717 (1.50-1.50)
Clashscore	180529	4048 (1.50-1.50)
Ramachandran outliers	177936	3970 (1.50-1.50)
Sidechain outliers	177891	3967 (1.50-1.50)
RSRZ outliers	164620	3718 (1.50-1.50)

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	271	<div> <div>10%</div> <div>92%</div> <div>8%</div> </div>
2	B	129	<div> <div>57%</div> <div>78%</div> <div>18%</div> <div>••</div> </div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3582 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 Integrin-linked protein kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	271	Total	C	N	O	S	0	0	0
			2165	1383	380	384	18			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	182	MET	-	initiating methionine	UNP Q13418
A	225	ALA	ARG	engineered mutation	UNP Q13418
A	346	SER	CYS	engineered mutation	UNP Q13418
A	422	SER	CYS	engineered mutation	UNP Q13418

- Molecule 2 is a protein called Alpha-parvin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	124	Total	C	N	O	S	1	0	0
			1011	662	160	186	3			

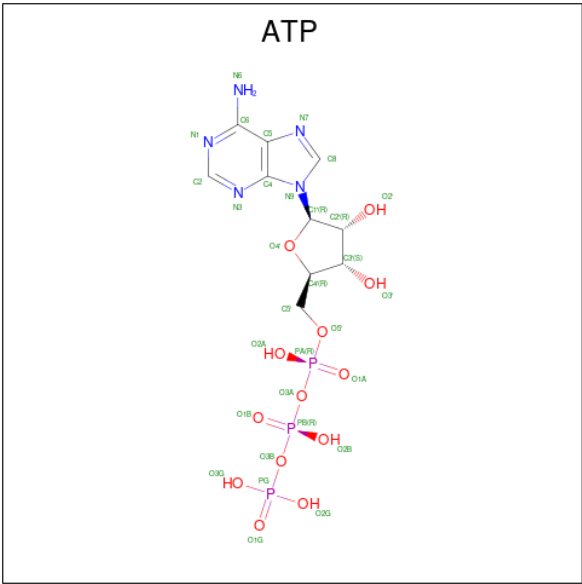
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	244	GLY	-	expression tag	UNP Q9NVD7
B	245	SER	-	expression tag	UNP Q9NVD7
B	246	HIS	-	expression tag	UNP Q9NVD7
B	247	MET	-	expression tag	UNP Q9NVD7

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
4	A	1	31	10	5	13	3	0	0

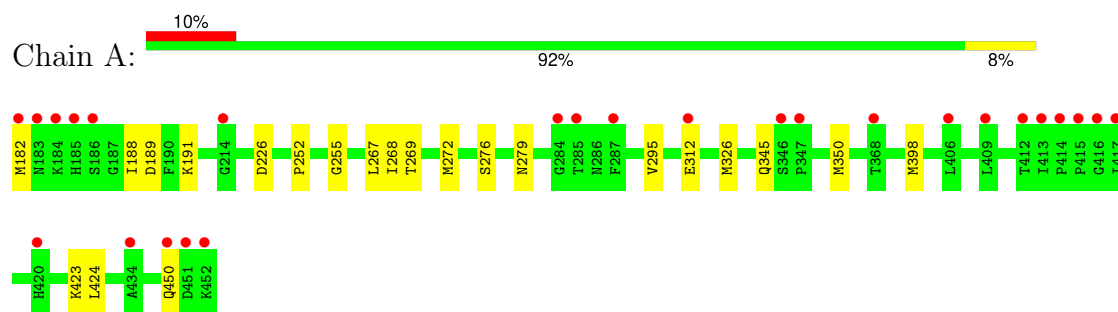
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	308	Total	O	0	0
			308	308		
5	B	66	Total	O	0	0
			66	66		

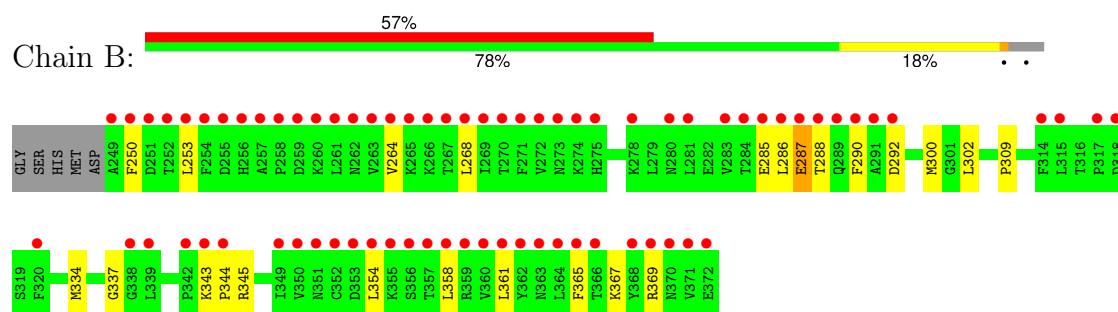
3 Residue-property plots [i](#)

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: Integrin-linked protein kinase



- Molecule 2: Alpha-parvin



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	43.82Å 116.33Å 47.41Å 90.00° 100.79° 90.00°	Depositor
Resolution (Å)	40.37 – 1.50 40.37 – 1.50	Depositor EDS
% Data completeness (in resolution range)	97.0 (40.37-1.50) 92.7 (40.37-1.50)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.90 (at 1.50Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.228 , 0.267 0.228 , 0.267	Depositor DCC
R_{free} test set	3662 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	17.6	Xtriage
Anisotropy	0.188	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 43.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3582	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.02% 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: ATP, MG

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	0.35	0/2224	0.58	0/3014
2	B	0.22	0/1034	0.47	0/1400
All	All	0.32	0/3258	0.55	0/4414

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2165	0	2172	16	0
2	B	1011	0	1019	19	0
3	A	1	0	0	0	0
4	A	31	0	12	0	0
5	A	308	0	0	4	0
5	B	66	0	0	3	0
All	All	3582	0	3203	33	0

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 5.

All (33) 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)
2:B:287:GLU:HG2	2:B:288:THR:HG23	1.64	0.79
2:B:337:GLY:O	2:B:367:LYS:NZ	2.15	0.79
2:B:292:ASP:OD1	5:B:401:HOH:O	2.08	0.72
2:B:285:GLU:OE1	2:B:288:THR:OG1	2.07	0.71
2:B:343:LYS:HG2	2:B:344:PRO:HD3	1.74	0.70
1:A:188:ILE:HD13	1:A:268:ILE:HD11	1.74	0.69
2:B:300:MET:HE2	2:B:334:MET:HA	1.75	0.67
1:A:188:ILE:HD12	1:A:255:GLY:HA3	1.86	0.57
1:A:423:LYS:HD2	1:A:424:LEU:N	2.19	0.57
2:B:365:PHE:O	2:B:369:ARG:HG3	2.04	0.57
1:A:295:VAL:HG12	1:A:450:GLN:NE2	2.21	0.55
1:A:312:GLU:OE1	5:A:602:HOH:O	2.19	0.52
2:B:287:GLU:HB2	2:B:354:LEU:HD22	1.92	0.52
1:A:276:SER:H	1:A:279:ASN:ND2	2.11	0.48
1:A:226:ASP:OD2	5:A:603:HOH:O	2.20	0.48
2:B:286:LEU:HD13	2:B:286:LEU:O	2.14	0.48
2:B:287:GLU:HB2	2:B:354:LEU:CD2	2.45	0.46
1:A:398:MET:HG2	2:B:302:LEU:HG	1.98	0.46
2:B:354:LEU:O	2:B:358:LEU:HD23	2.16	0.46
1:A:272:MET:HG3	1:A:326:MET:HB3	1.99	0.45
2:B:250:PHE:HA	2:B:253:LEU:HD12	2.00	0.44
2:B:345:ARG:HD2	5:B:430:HOH:O	2.17	0.43
1:A:182:MET:N	5:A:614:HOH:O	2.51	0.43
1:A:276:SER:H	1:A:279:ASN:HD22	1.67	0.43
2:B:345:ARG:HD3	5:B:452:HOH:O	2.19	0.42
2:B:290:PHE:CD2	2:B:361:LEU:HD11	2.54	0.42
1:A:345:GLN:NE2	5:A:601:HOH:O	2.04	0.42
2:B:264:VAL:O	2:B:268:LEU:HG	2.20	0.41
1:A:252:PRO:O	1:A:269:THR:HG23	2.21	0.41
1:A:267:LEU:C	1:A:267:LEU:HD12	2.46	0.41
1:A:350:MET:HG3	2:B:309:PRO:HG3	2.03	0.41
2:B:300:MET:HE2	2:B:334:MET:CA	2.47	0.41
1:A:189:ASP:OD1	1:A:191:LYS:HE3	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	269/271 (99%)	264 (98%)	5 (2%)	0	100	100
2	B	122/129 (95%)	119 (98%)	3 (2%)	0	100	100
All	All	391/400 (98%)	383 (98%)	8 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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	240/240 (100%)	240 (100%)	0	100	100
2	B	115/119 (97%)	114 (99%)	1 (1%)	75	57
All	All	355/359 (99%)	354 (100%)	1 (0%)	91	82

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	287	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	279	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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	$\# Z > 2$
4	ATP	A	502	3	28,33,33	2.28	10 (35%)	34,52,52	1.96	4 (11%)

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
4	ATP	A	502	3	-	2/18/38/38	0/3/3/3

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	502	ATP	O4'-C1'	7.15	1.50	1.40
4	A	502	ATP	PA-O3A	3.70	1.63	1.59
4	A	502	ATP	C5-N7	3.25	1.51	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	502	ATP	C6-N6	3.15	1.45	1.34
4	A	502	ATP	PB-O3B	2.54	1.62	1.59
4	A	502	ATP	C2-N3	2.45	1.35	1.32
4	A	502	ATP	PG-O3G	-2.41	1.45	1.54
4	A	502	ATP	C8-N7	2.39	1.39	1.34
4	A	502	ATP	PG-O2G	-2.33	1.46	1.54
4	A	502	ATP	C6-C5	-2.10	1.35	1.43

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	502	ATP	C4-C5-N7	-6.46	102.52	109.34
4	A	502	ATP	O4'-C1'-N9	5.33	115.81	108.75
4	A	502	ATP	N3-C2-N1	-4.69	122.30	128.67
4	A	502	ATP	C1'-N9-C4	-4.01	119.59	126.64

There are no chirality outliers.

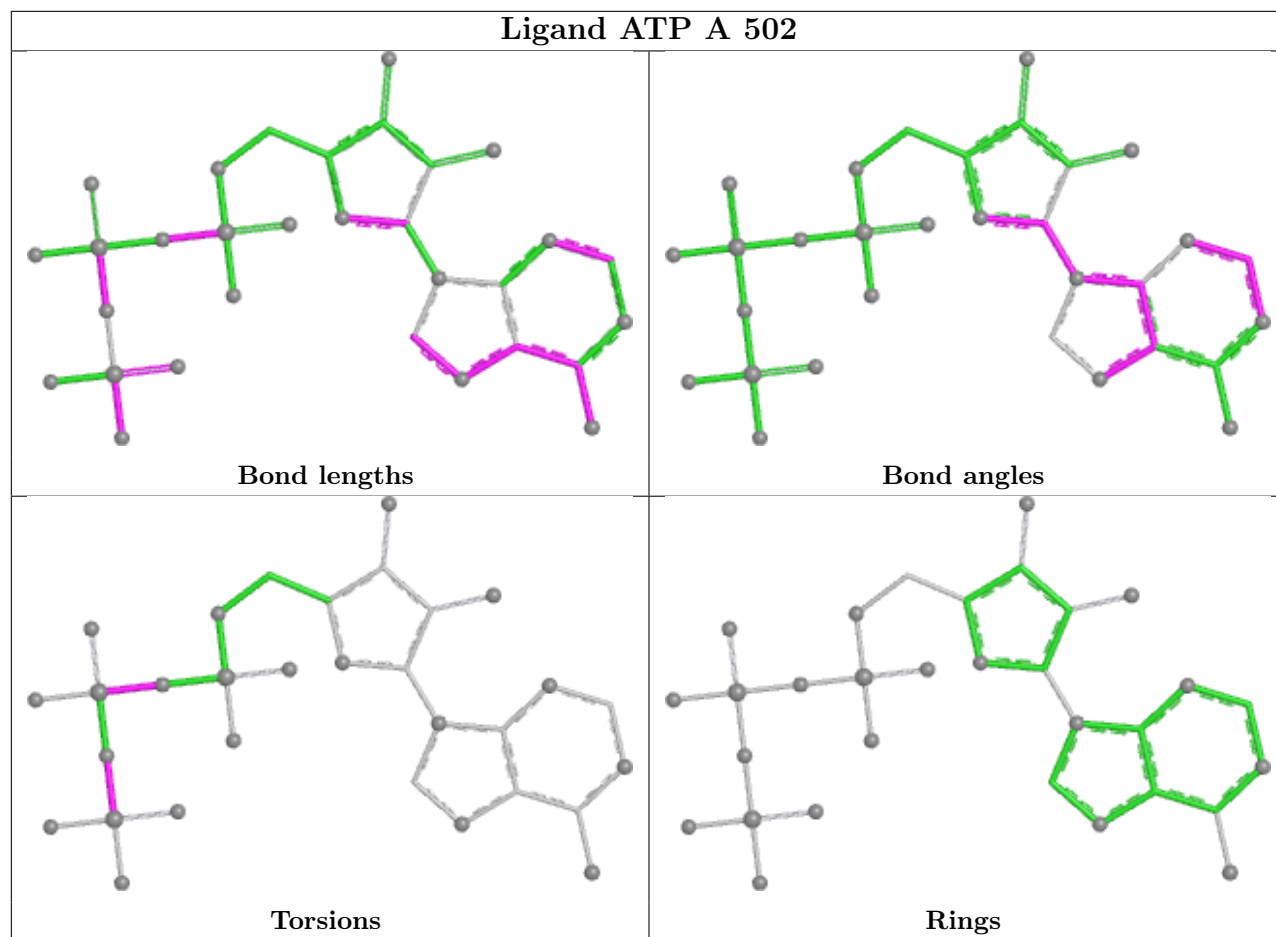
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	502	ATP	PB-O3B-PG-O2G
4	A	502	ATP	PA-O3A-PB-O2B

There are no ring outliers.

No monomer is involved in short contacts.

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

6.1 Protein, DNA and RNA chains

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	271/271 (100%)	0.62	26 (9%)	15 14	12, 20, 37, 70	0
2	B	124/129 (96%)	3.11	73 (58%)	0 0	18, 42, 74, 87	1 (0%)
All	All	395/400 (98%)	1.41	99 (25%)	2 2	12, 25, 66, 87	1 (0%)

All (99) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	263	VAL	11.1
2	B	264	VAL	8.1
2	B	250	PHE	7.9
2	B	269	ILE	7.3
2	B	354	LEU	6.9
2	B	365	PHE	6.8
1	A	183	ASN	6.7
2	B	286	LEU	6.4
2	B	288	THR	6.2
2	B	249	ALA	6.0
2	B	271	PHE	5.9
2	B	267	THR	5.9
2	B	361	LEU	5.8
2	B	259	ASP	5.8
2	B	261	LEU	5.7
2	B	258	PRO	5.7
2	B	369	ARG	5.6
2	B	270	THR	5.6
2	B	254	PHE	5.3
2	B	283	VAL	5.3
2	B	358	LEU	5.3
2	B	268	LEU	5.3
1	A	182	MET	5.2
2	B	257	ALA	5.1

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Mol	Chain	Res	Type	RSRZ
1	A	185	HIS	5.1
2	B	370	ASN	5.1
2	B	272	VAL	5.0
2	B	266	LYS	5.0
2	B	284	THR	5.0
2	B	349	ILE	4.9
2	B	290	PHE	4.9
2	B	360	VAL	4.9
2	B	362	TYR	4.8
2	B	371	VAL	4.8
2	B	350	VAL	4.7
2	B	253	LEU	4.7
2	B	366	THR	4.6
2	B	256	HIS	4.5
2	B	255	ASP	4.5
2	B	339	LEU	4.4
2	B	260	LYS	4.4
2	B	252	THR	4.3
2	B	357	THR	4.3
2	B	262	ASN	4.3
2	B	368	TYR	4.2
2	B	265	LYS	4.2
2	B	364	LEU	4.1
1	A	451	ASP	4.1
1	A	413	ILE	4.1
2	B	352	CYS	4.1
1	A	285	THR	3.9
2	B	251	ASP	3.7
2	B	363	ASN	3.6
1	A	416	GLY	3.6
1	A	415	PRO	3.5
2	B	353	ASP	3.5
2	B	291	ALA	3.5
2	B	273	ASN	3.4
2	B	281	LEU	3.4
1	A	184	LYS	3.3
2	B	317	PRO	3.3
2	B	356	SER	3.1
2	B	355	LYS	3.1
2	B	287	GLU	3.0
1	A	287	PHE	3.0
1	A	452	LYS	3.0

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Mol	Chain	Res	Type	RSRZ
2	B	344	PRO	3.0
2	B	278	LYS	2.9
1	A	420	HIS	2.9
2	B	289	GLN	2.8
1	A	412	THR	2.8
2	B	275	HIS	2.8
2	B	359	ARG	2.8
1	A	417	ILE	2.8
1	A	434	ALA	2.7
2	B	318	ASP	2.7
1	A	406	LEU	2.7
2	B	351	ASN	2.7
1	A	414	PRO	2.6
1	A	368	THR	2.6
2	B	320	PHE	2.5
2	B	342	PRO	2.5
2	B	315	LEU	2.5
2	B	292	ASP	2.5
2	B	274	LYS	2.4
1	A	347	PRO	2.4
1	A	186	SER	2.3
2	B	285	GLU	2.3
1	A	346	SER	2.3
1	A	214	GLY	2.3
1	A	450	GLN	2.3
1	A	312	GLU	2.2
2	B	338	GLY	2.1
1	A	409	LEU	2.1
2	B	280	ASN	2.1
1	A	284	GLY	2.1
2	B	343	LYS	2.0
2	B	314	PHE	2.0
2	B	372	GLU	2.0

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

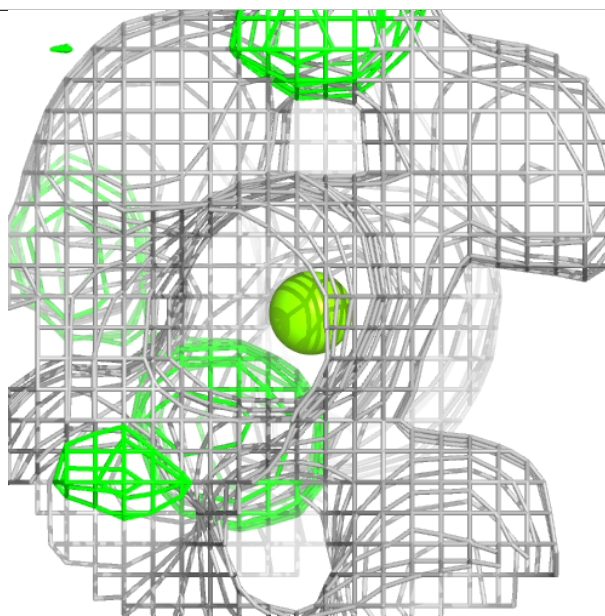
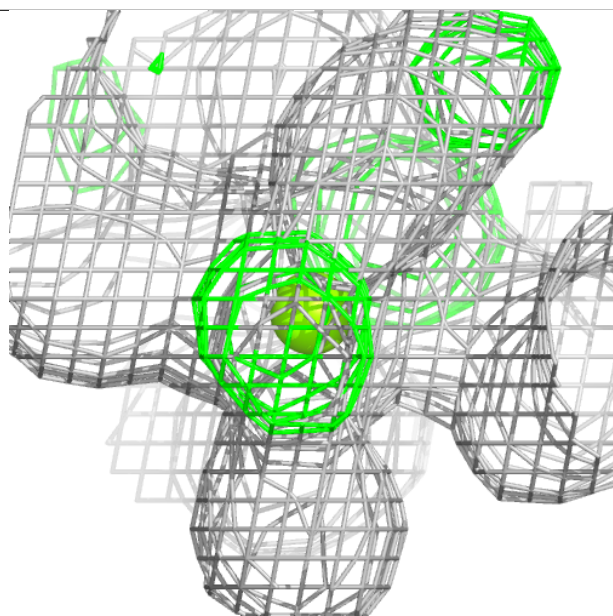
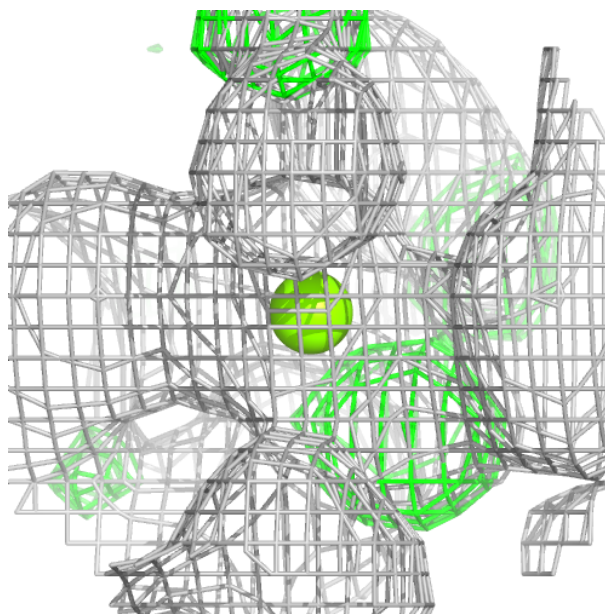
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

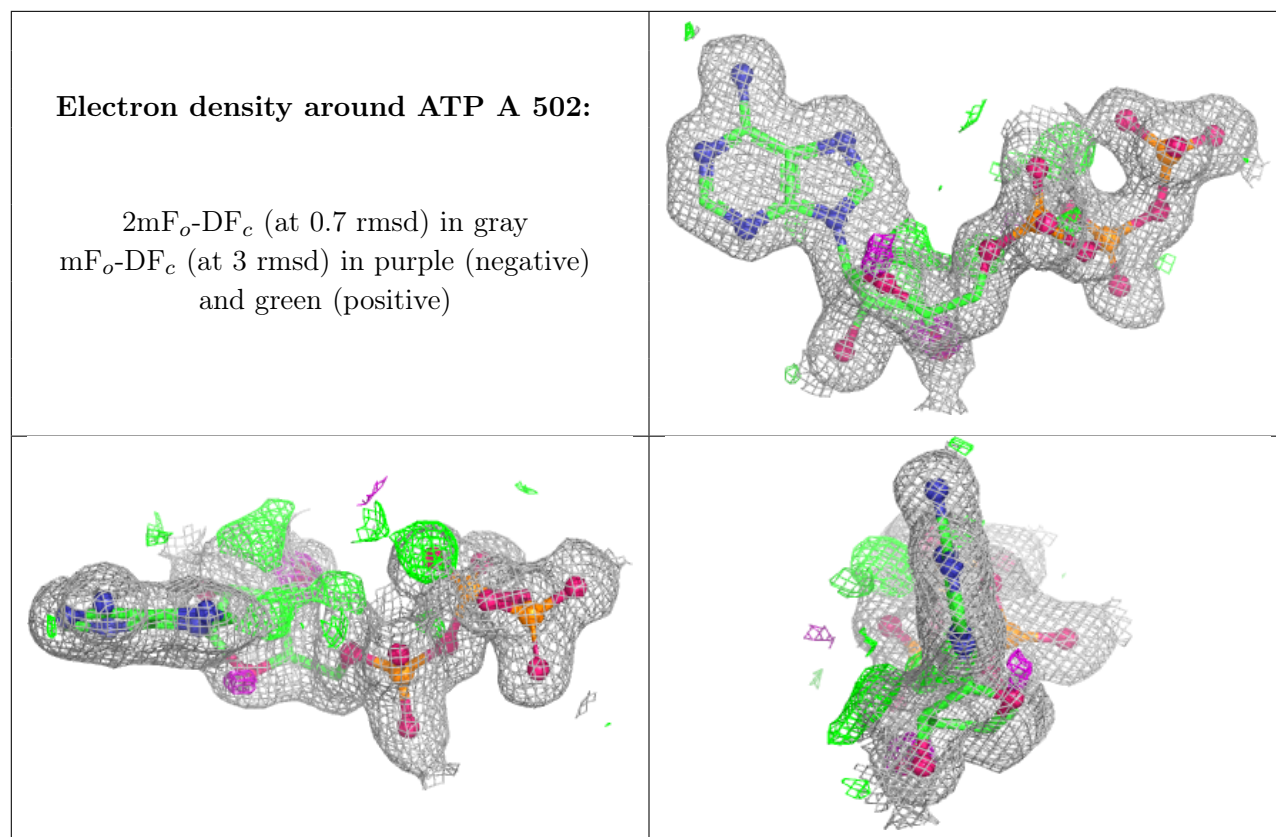
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	MG	A	501	1/1	0.91	0.08	21,21,21,21	0
4	ATP	A	502	31/31	0.97	0.07	14,19,23,26	0

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.

Electron density around MG A 501:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers ⓘ

There are no such residues in this entry.