



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 08:33 PM EDT

PDB ID : 5LFK / pdb_00005lfk
Title : Crystal structure of CpxAHDC (hemiphosphorylated form)
Authors : Mechaly, A.E.; Alzari, P.M.
Deposited on : 2016-07-01
Resolution : 3.09 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

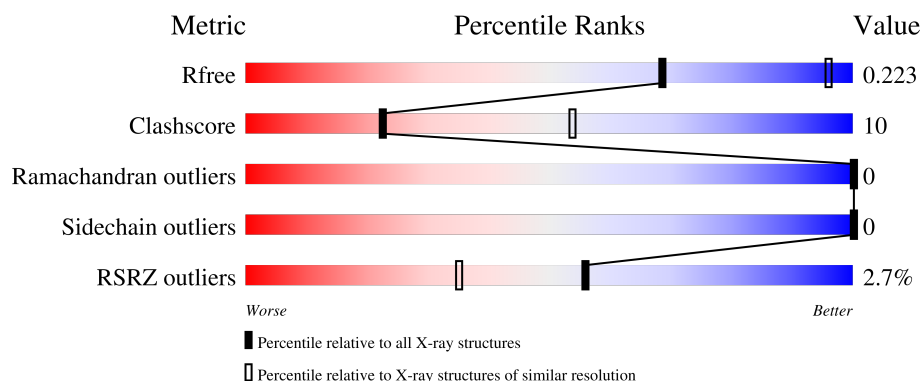
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.09 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	1456 (3.10-3.10)
Clashscore	190562	1539 (3.10-3.10)
Ramachandran outliers	187476	1467 (3.10-3.10)
Sidechain outliers	187428	1467 (3.10-3.10)
RSRZ outliers	180081	1456 (3.10-3.10)

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	298	% 62% 19% 18%
2	B	298	3% 60% 19% 21%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3863 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 Sensor histidine kinase CpxA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	243	Total	C	N	O	S	0	0	0
			1906	1190	342	369	5			

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	160	MET	-	initiating methionine	UNP P0AE82
A	161	GLY	-	expression tag	UNP P0AE82
A	162	SER	-	expression tag	UNP P0AE82
A	163	SER	-	expression tag	UNP P0AE82
A	164	HIS	-	expression tag	UNP P0AE82
A	165	HIS	-	expression tag	UNP P0AE82
A	166	HIS	-	expression tag	UNP P0AE82
A	167	HIS	-	expression tag	UNP P0AE82
A	168	HIS	-	expression tag	UNP P0AE82
A	169	HIS	-	expression tag	UNP P0AE82
A	170	SER	-	expression tag	UNP P0AE82
A	171	SER	-	expression tag	UNP P0AE82
A	172	GLY	-	expression tag	UNP P0AE82
A	173	LEU	-	expression tag	UNP P0AE82
A	174	VAL	-	expression tag	UNP P0AE82
A	175	PRO	-	expression tag	UNP P0AE82
A	176	ARG	-	expression tag	UNP P0AE82
A	177	GLY	-	expression tag	UNP P0AE82
A	178	SER	-	expression tag	UNP P0AE82
A	179	HIS	-	expression tag	UNP P0AE82
A	180	MET	-	expression tag	UNP P0AE82
A	181	GLU	-	expression tag	UNP P0AE82
A	182	ASN	-	expression tag	UNP P0AE82
A	183	LEU	-	expression tag	UNP P0AE82
A	184	TYR	-	expression tag	UNP P0AE82
A	185	PHE	-	expression tag	UNP P0AE82
A	186	GLN	-	expression tag	UNP P0AE82

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Chain	Residue	Modelled	Actual	Comment	Reference
A	187	GLY	-	expression tag	UNP P0AE82
A	228	VAL	MET	engineered mutation	UNP P0AE82

- Molecule 2 is a protein called Sensor histidine kinase CpxA.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	236	Total	C	N	O	P	S	0	0	0
			1863	1162	332	363	1	5			

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	160	MET	-	initiating methionine	UNP P0AE82
B	161	GLY	-	expression tag	UNP P0AE82
B	162	SER	-	expression tag	UNP P0AE82
B	163	SER	-	expression tag	UNP P0AE82
B	164	HIS	-	expression tag	UNP P0AE82
B	165	HIS	-	expression tag	UNP P0AE82
B	166	HIS	-	expression tag	UNP P0AE82
B	167	HIS	-	expression tag	UNP P0AE82
B	168	HIS	-	expression tag	UNP P0AE82
B	169	HIS	-	expression tag	UNP P0AE82
B	170	SER	-	expression tag	UNP P0AE82
B	171	SER	-	expression tag	UNP P0AE82
B	172	GLY	-	expression tag	UNP P0AE82
B	173	LEU	-	expression tag	UNP P0AE82
B	174	VAL	-	expression tag	UNP P0AE82
B	175	PRO	-	expression tag	UNP P0AE82
B	176	ARG	-	expression tag	UNP P0AE82
B	177	GLY	-	expression tag	UNP P0AE82
B	178	SER	-	expression tag	UNP P0AE82
B	179	HIS	-	expression tag	UNP P0AE82
B	180	MET	-	expression tag	UNP P0AE82
B	181	GLU	-	expression tag	UNP P0AE82
B	182	ASN	-	expression tag	UNP P0AE82
B	183	LEU	-	expression tag	UNP P0AE82
B	184	TYR	-	expression tag	UNP P0AE82
B	185	PHE	-	expression tag	UNP P0AE82
B	186	GLN	-	expression tag	UNP P0AE82
B	187	GLY	-	expression tag	UNP P0AE82
B	228	VAL	MET	engineered mutation	UNP P0AE82

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃).



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

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Mg	0	0
			1	1		
5	B	1	Total	Mg	0	0
			1	1		

4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	145.73Å 145.73Å 225.19Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.70 – 3.09 47.70 – 3.09	Depositor EDS
% Data completeness (in resolution range)	99.6 (47.70-3.09) 99.6 (47.70-3.09)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.10	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.99 (at 3.12Å)	Xtriage
Refinement program	PHENIX (1.10_2155: ???)	Depositor
R, R_{free}	0.195 , 0.220 0.197 , 0.223	Depositor DCC
R_{free} test set	1343 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	87.0	Xtriage
Anisotropy	0.556	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 95.8	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	0.96	EDS
Total number of atoms	3863	wwPDB-VP
Average B, all atoms (Å ²)	101.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.18% 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, NEP, SO4

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	0.45	1/1939 (0.1%)	0.63	0/2627
2	B	0.44	1/1878 (0.1%)	0.63	0/2541
All	All	0.44	2/3817 (0.1%)	0.63	0/5168

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	339	GLY	C-N	7.16	1.50	1.33
2	B	339	GLY	C-N	6.80	1.49	1.33

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	1906	0	1896	47	0
2	B	1863	0	1846	40	0
3	A	20	0	0	0	0
3	B	10	0	0	0	0
4	A	31	0	12	2	0
4	B	31	0	12	1	0
5	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	1	0	0	0	0
All	All	3863	0	3766	80	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 10.

All (80) 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:379:GLY:HA2	2:B:453:LEU:HG	1.66	0.76
2:B:307:THR:HG22	2:B:344:TYR:HD1	1.54	0.72
1:A:265:ARG:NH2	1:A:278:GLU:OE1	2.23	0.72
1:A:362:LEU:HD23	1:A:369:ILE:HD13	1.75	0.68
2:B:247:SER:HB2	2:B:291:LEU:HD23	1.79	0.64
1:A:383:THR:HG23	1:A:448:VAL:HG22	1.81	0.63
1:A:236:MET:HE3	1:A:303:LEU:HD23	1.80	0.62
2:B:257:LEU:O	2:B:261:THR:HG23	2.01	0.61
1:A:357:ILE:HD12	1:A:447:LEU:CD1	2.33	0.58
1:A:433:GLY:O	2:B:234:ARG:NH2	2.37	0.57
1:A:357:ILE:HG23	1:A:447:LEU:HD12	1.86	0.57
2:B:297:ASN:O	2:B:298:GLN:HB3	2.05	0.57
1:A:434:TRP:HB3	2:B:234:ARG:HH21	1.68	0.57
2:B:224:SER:OG	2:B:227:GLN:HG3	2.05	0.57
2:B:371:VAL:HG22	2:B:384:VAL:HG22	1.87	0.56
2:B:363:ARG:NH2	2:B:414:SER:HB3	2.20	0.55
2:B:405:ARG:HH12	2:B:415:GLY:HA2	1.71	0.55
1:A:407:ASP:HA	1:A:410:ARG:HB2	1.89	0.55
1:A:367:THR:OG1	1:A:387:ASP:OD2	2.23	0.54
1:A:408:GLU:N	1:A:408:GLU:OE1	2.38	0.54
1:A:385:ASP:HB2	1:A:442:LEU:HD12	1.90	0.54
1:A:343:LEU:HD21	1:A:380:ILE:HD12	1.89	0.54
2:B:265:ARG:NH2	2:B:278:GLU:OE1	2.22	0.54
1:A:346:ASN:HB3	1:A:349:ALA:HB3	1.90	0.53
1:A:357:ILE:HD12	1:A:447:LEU:HD12	1.91	0.52
2:B:405:ARG:HD2	2:B:416:GLY:O	2.11	0.51
1:A:379:GLY:HA2	1:A:453:LEU:HG	1.92	0.51
2:B:338:PRO:HD3	2:B:373:PHE:CE1	2.45	0.51
2:B:365:SER:HB3	2:B:386:ASP:HB2	1.92	0.50
2:B:265:ARG:NH1	2:B:270:GLU:HG2	2.26	0.50
1:A:325:ALA:HB2	1:A:362:LEU:HD21	1.92	0.50
1:A:361:ALA:O	1:A:365:SER:HB3	2.11	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:237:THR:HG23	1:A:303:LEU:HD22	1.93	0.49
1:A:303:LEU:HA	1:A:346:ASN:HD21	1.78	0.49
2:B:323:PHE:O	2:B:327:GLN:HG2	2.13	0.49
2:B:383:THR:HG22	2:B:448:VAL:HG22	1.94	0.49
1:A:318:LEU:HD21	1:A:371:VAL:HG11	1.96	0.48
1:A:257:LEU:HG	2:B:277:ILE:HG23	1.95	0.48
1:A:353:ALA:O	1:A:357:ILE:HG12	2.14	0.48
1:A:421:LEU:HB2	4:A:503:ATP:O2A	2.12	0.48
2:B:396:ARG:NH2	2:B:439:ASP:OD1	2.48	0.47
2:B:399:ILE:HA	2:B:404:TYR:HD2	1.80	0.47
2:B:307:THR:HG22	2:B:344:TYR:CD1	2.41	0.47
2:B:363:ARG:HH21	2:B:414:SER:HB3	1.80	0.47
2:B:406:THR:OG1	4:B:501:ATP:O2'	2.31	0.46
1:A:345:GLY:HA3	1:A:431:HIS:CD2	2.50	0.46
1:A:385:ASP:CB	1:A:442:LEU:HD12	2.45	0.46
1:A:425:GLU:HG2	1:A:429:GLN:HE21	1.80	0.46
2:B:385:ASP:HB2	2:B:442:LEU:HD12	1.99	0.45
2:B:364:TYR:O	2:B:388:GLY:HA3	2.15	0.45
2:B:328:MET:HB3	2:B:328:MET:HE2	1.64	0.45
2:B:394:GLU:H	2:B:394:GLU:CD	2.26	0.44
1:A:417:THR:OG1	4:A:503:ATP:O2G	2.30	0.44
1:A:232:LEU:O	1:A:236:MET:HG3	2.19	0.43
2:B:324:GLU:O	2:B:328:MET:HG3	2.19	0.43
1:A:294:MET:HE2	1:A:294:MET:HB3	1.74	0.43
2:B:357:ILE:HG22	2:B:447:LEU:HD13	2.00	0.43
1:A:276:ARG:HD3	1:A:276:ARG:HA	1.79	0.42
1:A:420:GLY:O	1:A:424:VAL:HG23	2.19	0.42
1:A:256:ARG:HD2	2:B:280:GLU:OE2	2.19	0.42
1:A:294:MET:HG3	1:A:423:ILE:HD11	2.01	0.42
1:A:265:ARG:C	1:A:267:ARG:H	2.28	0.42
1:A:303:LEU:HA	1:A:346:ASN:ND2	2.35	0.42
1:A:447:LEU:HD23	1:A:447:LEU:HA	1.83	0.42
1:A:256:ARG:HH11	2:B:280:GLU:CD	2.27	0.42
2:B:436:LYS:HD3	2:B:438:GLU:OE2	2.20	0.41
2:B:395:ASP:O	2:B:399:ILE:HG23	2.19	0.41
1:A:284:LEU:O	1:A:288:ILE:HG13	2.19	0.41
1:A:259:LEU:HD23	1:A:259:LEU:HA	1.83	0.41
2:B:265:ARG:HB2	2:B:274:LEU:HD21	2.03	0.41
1:A:328:MET:HE2	1:A:330:LYS:HD2	2.03	0.41
2:B:254:LEU:HD22	2:B:288:ILE:HD12	2.02	0.41
2:B:363:ARG:C	2:B:365:SER:H	2.28	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:256:ARG:NH1	2:B:280:GLU:OE1	2.53	0.40
1:A:311:ASN:HD21	1:A:340:PRO:HG3	1.86	0.40
2:B:421:LEU:HD23	2:B:421:LEU:HA	1.94	0.40
1:A:342:PRO:HG2	1:A:453:LEU:HD22	2.04	0.40
1:A:421:LEU:HA	1:A:421:LEU:HD23	1.81	0.40
1:A:254:LEU:HD12	2:B:284:LEU:HD11	2.04	0.40
1:A:425:GLU:HG2	1:A:429:GLN:NE2	2.37	0.40

There are no symmetry-related clashes.

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	241/298 (81%)	230 (95%)	11 (5%)	0	100	100
2	B	231/298 (78%)	217 (94%)	14 (6%)	0	100	100
All	All	472/596 (79%)	447 (95%)	25 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	205/251 (82%)	205 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	200/250 (80%)	200 (100%)	0	100	100
All	All	405/501 (81%)	405 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	226	ASN
1	A	227	GLN
1	A	240	GLN
1	A	258	GLN
1	A	298	GLN
1	A	299	GLN
1	A	301	ASN
1	A	346	ASN
1	A	429	GLN
2	B	297	ASN
2	B	366	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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	NEP	B	248	2	11,14,15	3.53	3 (27%)	8,20,22	3.15	1 (12%)

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	NEP	B	248	2	-	0/5/12/14	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	248	NEP	P-O3P	10.13	1.61	1.46
2	B	248	NEP	P-O1P	-3.77	1.46	1.56
2	B	248	NEP	CD2-CG	3.19	1.41	1.36

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	248	NEP	O2P-P-O3P	-8.54	91.93	112.95

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 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	$\# Z > 2$
3	SO4	A	501	-	4,4,4	0.27	0	6,6,6	0.28	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	SO4	B	503	-	4,4,4	0.23	0	6,6,6	0.07	0
4	ATP	B	501	5	32,33,33	1.75	7 (21%)	48,52,52	1.65	7 (14%)
4	ATP	A	503	5	32,33,33	1.48	6 (18%)	48,52,52	1.86	11 (22%)
3	SO4	A	506	-	4,4,4	0.23	0	6,6,6	0.09	0
3	SO4	A	505	-	4,4,4	0.28	0	6,6,6	0.35	0
3	SO4	A	502	-	4,4,4	0.19	0	6,6,6	0.45	0
3	SO4	B	504	-	4,4,4	0.25	0	6,6,6	0.23	0

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	B	501	5	-	2/22/38/38	0/3/3/3
4	ATP	A	503	5	-	5/22/38/38	0/3/3/3

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	501	ATP	C5-C4	5.21	1.48	1.39
4	A	503	ATP	C5-C4	4.75	1.47	1.39
4	B	501	ATP	PA-O3A	3.96	1.63	1.59
4	B	501	ATP	PB-O3B	3.31	1.63	1.59
4	B	501	ATP	PB-O3A	3.21	1.63	1.59
4	A	503	ATP	PA-O3A	2.86	1.62	1.59
4	B	501	ATP	C5-C6	2.76	1.48	1.41
4	A	503	ATP	C5-C6	2.53	1.48	1.41
4	A	503	ATP	C5-N7	-2.49	1.34	1.39
4	B	501	ATP	C8-N7	2.37	1.36	1.31
4	A	503	ATP	C8-N7	2.30	1.36	1.31
4	B	501	ATP	C5-N7	-2.25	1.35	1.39
4	A	503	ATP	PB-O3A	2.11	1.61	1.59

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	503	ATP	C5-C4-N3	-6.01	118.45	126.72
4	B	501	ATP	C5-C4-N3	-5.96	118.52	126.72
4	B	501	ATP	N3-C4-N9	4.72	135.20	127.17
4	A	503	ATP	N3-C4-N9	4.26	134.41	127.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	503	ATP	C2-N3-C4	3.65	120.75	111.83
4	B	501	ATP	C2-N3-C4	3.33	119.97	111.83
4	A	503	ATP	C4-C5-N7	-3.33	106.78	110.58
4	B	501	ATP	C4-C5-N7	-3.24	106.87	110.58
4	A	503	ATP	O4'-C1'-N9	3.18	114.20	108.09
4	A	503	ATP	N3-C2-N1	-3.06	123.95	128.58
4	A	503	ATP	C2'-C1'-N9	-2.83	106.28	113.30
4	A	503	ATP	C2'-C3'-C4'	-2.77	97.25	102.61
4	A	503	ATP	O2A-PA-O1A	2.58	124.43	112.44
4	B	501	ATP	N3-C2-N1	-2.46	124.86	128.58
4	A	503	ATP	O3'-C3'-C4'	2.45	118.11	111.08
4	A	503	ATP	O2'-C2'-C3'	-2.44	103.99	111.82
4	B	501	ATP	C4-N9-C8	2.14	107.98	105.74
4	B	501	ATP	C5-N7-C8	2.09	106.74	103.45

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	503	ATP	PB-O3B-PG-O3G
4	A	503	ATP	PB-O3B-PG-O2G
4	A	503	ATP	PB-O3B-PG-O1G
4	B	501	ATP	PA-O3A-PB-O1B
4	B	501	ATP	PA-O3A-PB-O2B
4	A	503	ATP	PG-O3B-PB-O2B
4	A	503	ATP	PA-O3A-PB-O2B

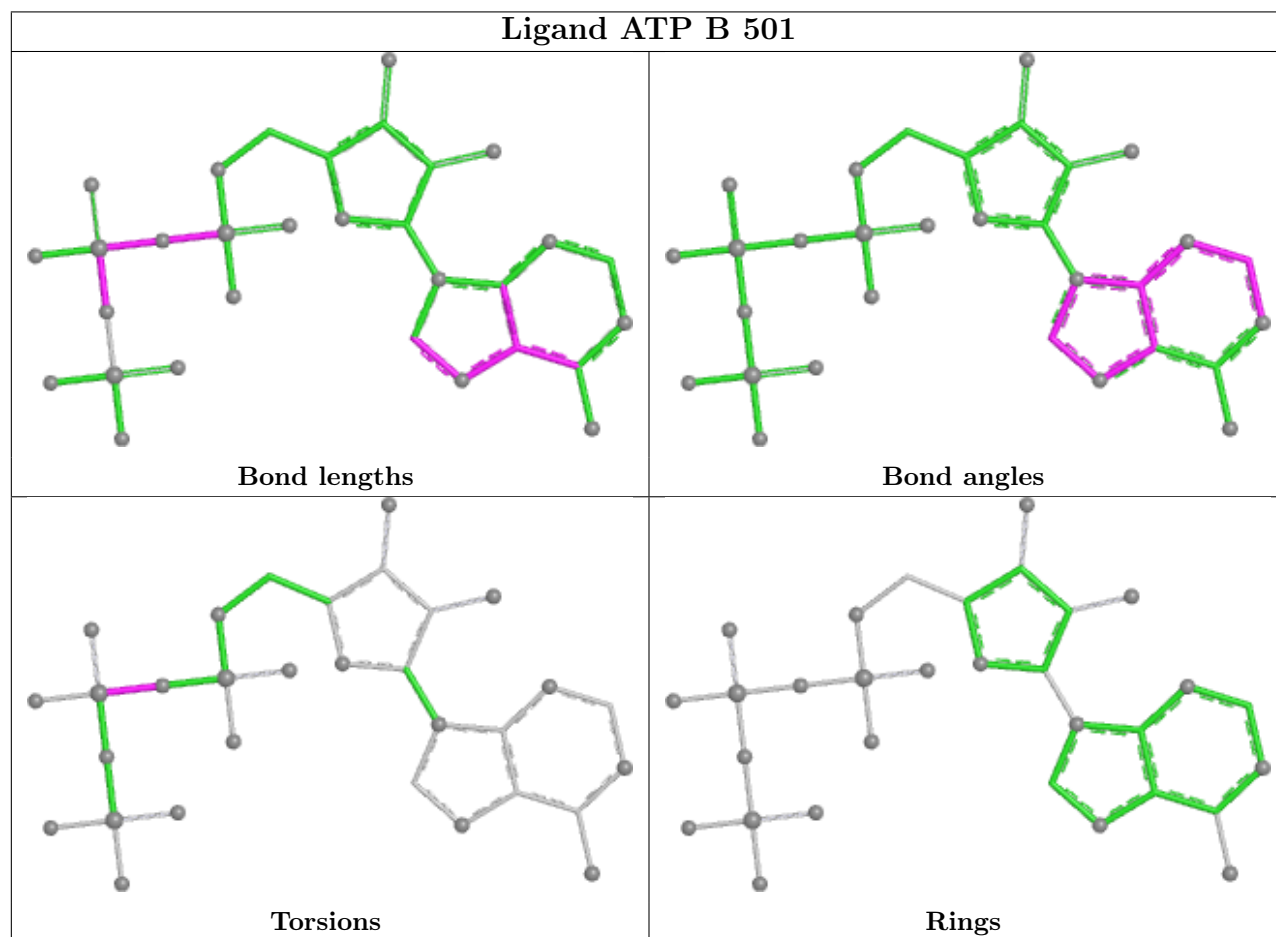
There are no ring outliers.

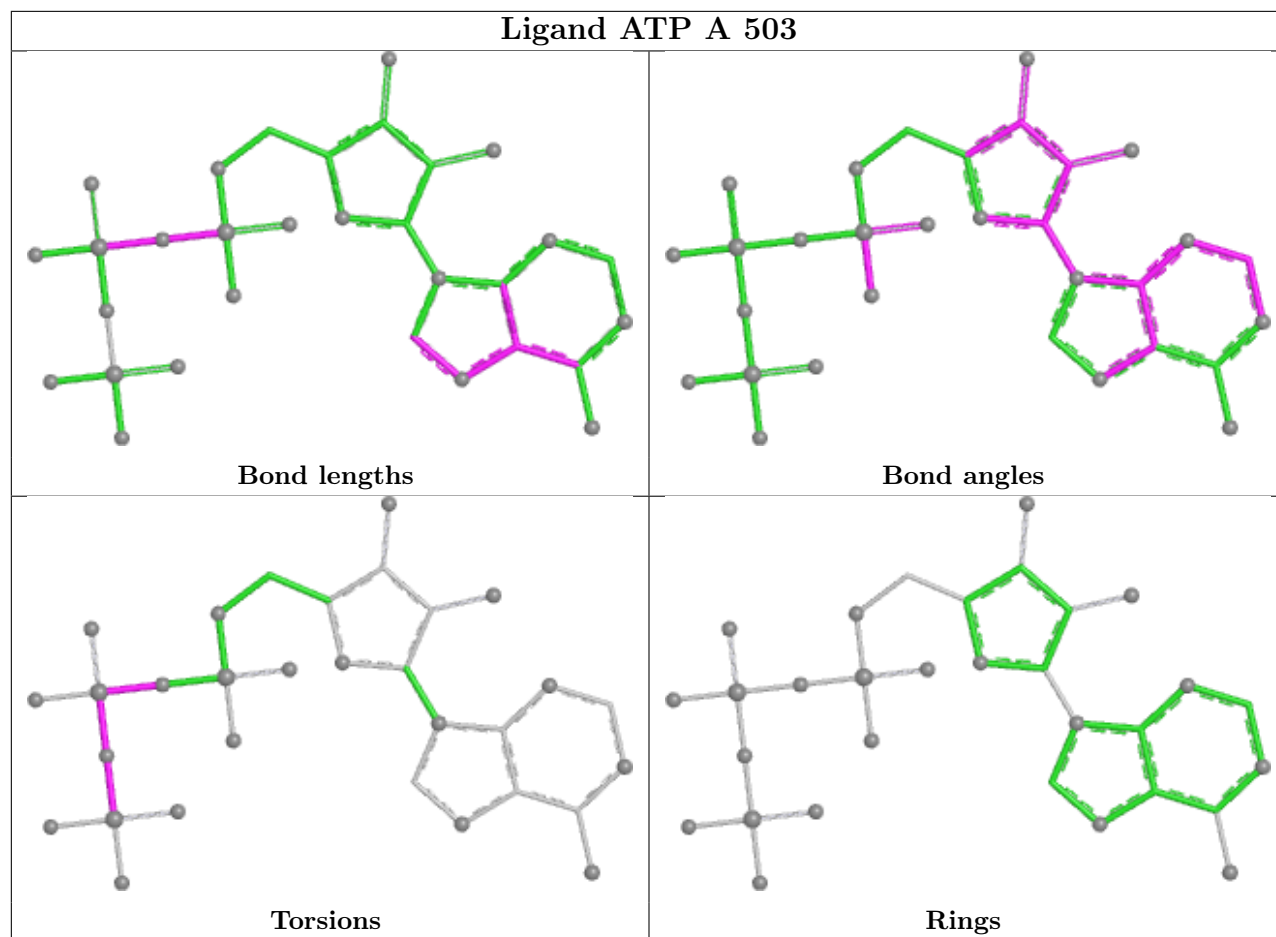
2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	501	ATP	1	0
4	A	503	ATP	2	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	340:PRO	C	341:TRP	N	1.17

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	243/298 (81%)	-0.33	3 (1%) 76 58	65, 94, 137, 227	0
2	B	235/298 (78%)	-0.13	10 (4%) 40 22	67, 96, 160, 188	0
All	All	478/596 (80%)	-0.23	13 (2%) 56 35	65, 95, 148, 227	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	298	GLN	5.1
2	B	296	ARG	4.9
2	B	303	LEU	4.8
2	B	216	GLN	3.3
1	A	213	ALA	3.2
2	B	304	VAL	2.9
2	B	217	GLU	2.8
1	A	455	LYS	2.7
2	B	455	LYS	2.4
2	B	414	SER	2.3
2	B	410	ARG	2.2
1	A	414	SER	2.1
2	B	295	SER	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
2	NEP	B	248	14/15	0.82	0.18	81,129,159,162	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

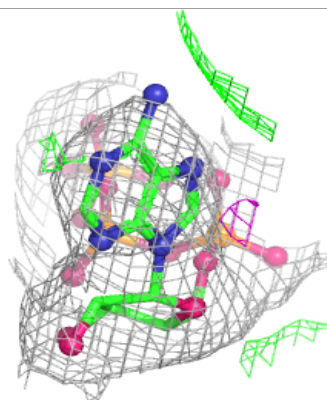
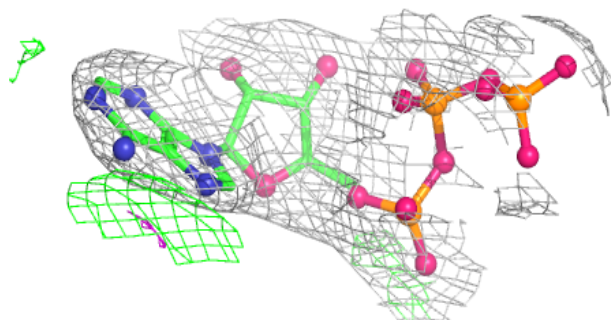
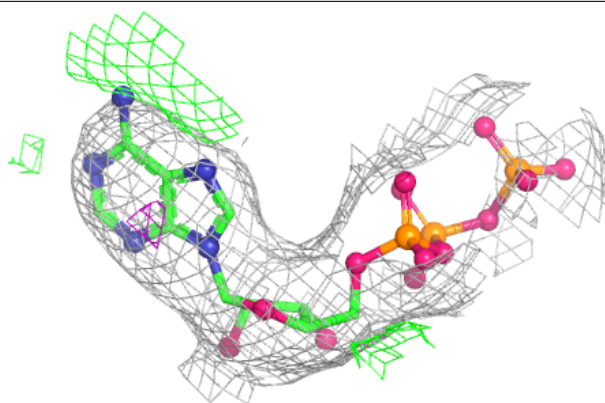
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	SO4	B	503	5/5	0.66	0.14	206,206,206,213	5
3	SO4	A	506	5/5	0.67	0.10	189,189,194,194	0
3	SO4	B	504	5/5	0.71	0.11	172,177,178,180	0
3	SO4	A	505	5/5	0.82	0.10	143,147,150,158	0
5	MG	A	504	1/1	0.90	0.18	92,92,92,92	0
3	SO4	A	502	5/5	0.91	0.16	107,110,111,115	0
3	SO4	A	501	5/5	0.94	0.11	107,110,118,119	0
4	ATP	B	501	31/31	0.98	0.06	82,99,118,120	0
4	ATP	A	503	31/31	0.98	0.07	73,103,118,121	0
5	MG	B	502	1/1	0.98	0.04	77,77,77,77	0

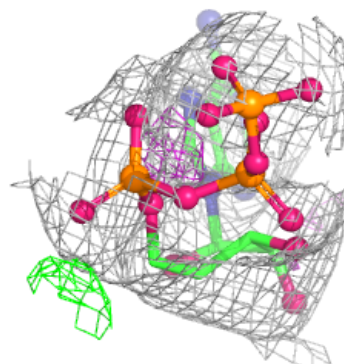
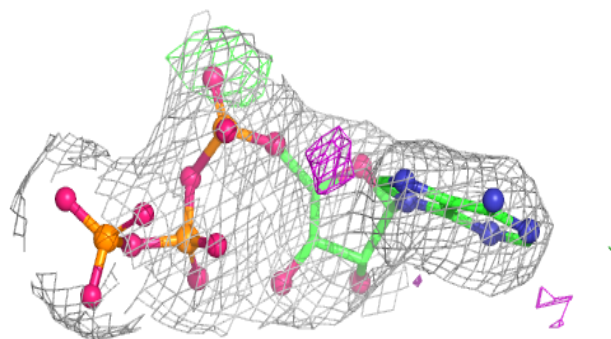
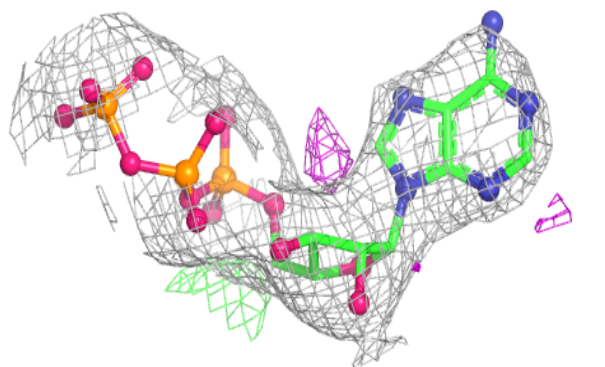
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around ATP B 501:

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

**Electron density around ATP A 503:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.