



# Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 12:13 pm BST

PDB ID : 4C5N  
Title : Structure of the pyridoxal kinase from *Staphylococcus aureus* in complex with AMP-PCP and pyridoxal  
Authors : Nodwell, M.; Alte, F.; Sieber, S.A.; Schneider, S.  
Deposited on : 2013-09-12  
Resolution : 1.75 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](mailto: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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

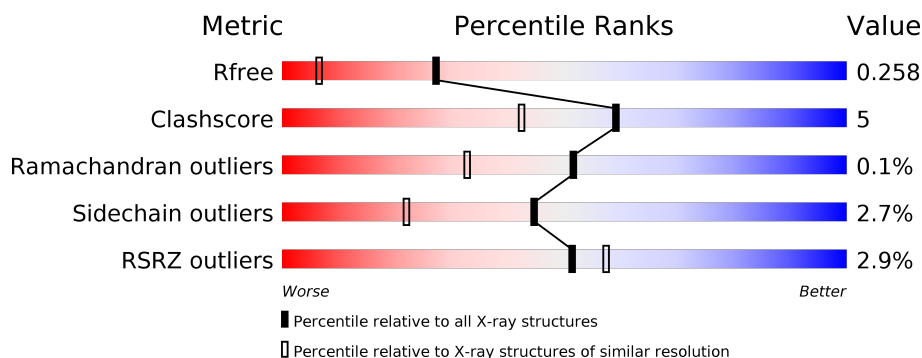
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.75 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))
$R_{free}$	130704	2340 (1.76-1.76)
Clashscore	141614	2466 (1.76-1.76)
Ramachandran outliers	138981	2437 (1.76-1.76)
Sidechain outliers	138945	2437 (1.76-1.76)
RSRZ outliers	127900	2298 (1.76-1.76)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	276	<div> <div>3%</div> <div> <div></div> <div>87%</div> <div>9%</div> <div>••</div> </div> </div>
1	B	276	<div> <div>4%</div> <div> <div></div> <div>87%</div> <div>11%</div> <div>•</div> </div> </div>
1	C	276	<div> <div>%</div> <div> <div></div> <div>88%</div> <div>8%</div> <div>•</div> </div> </div>
1	D	276	<div> <div>3%</div> <div> <div></div> <div>86%</div> <div>10%</div> <div>••</div> </div> </div>

## 2 Entry composition [i](#)

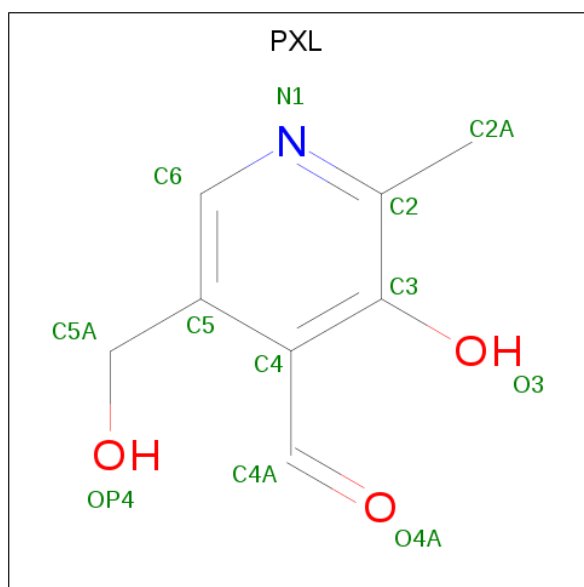
There are 6 unique types of molecules in this entry. The entry contains 8735 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PHOSPHOMETHYLPYRIMIDINE KINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	268	Total	C	N	O	S	0	6	0
			2049	1310	326	402	11			
1	B	269	Total	C	N	O	S	0	7	0
			2060	1317	328	404	11			
1	C	266	Total	C	N	O	S	0	4	0
			2036	1298	326	400	12			
1	D	269	Total	C	N	O	S	0	1	0
			2039	1297	328	402	12			

- Molecule 2 is 3-HYDROXY-5-(HYDROXYMETHYL)-2-METHYLISONICOTINALDEHYDE (three-letter code: PXL) (formula: C<sub>8</sub>H<sub>9</sub>NO<sub>3</sub>).



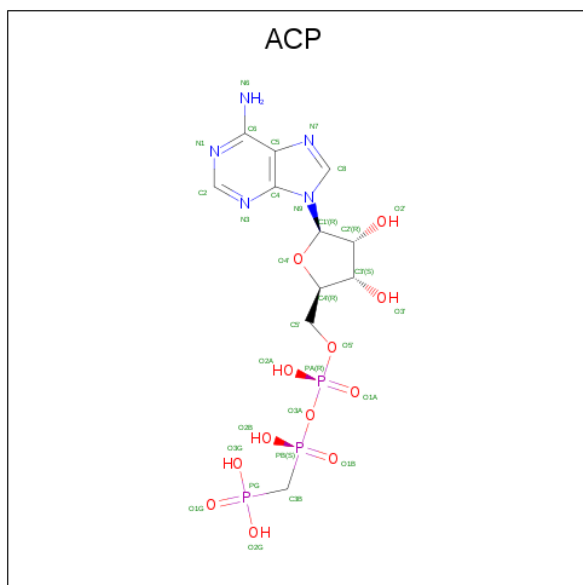
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			12	8	1	3		
2	B	1	Total	C	N	O	0	0
			12	8	1	3		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	C	1	Total	C	N	O	0	0
			12	8	1	3		

- Molecule 3 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (three-letter code: ACP) (formula:  $C_{11}H_{18}N_5O_{12}P_3$ ).



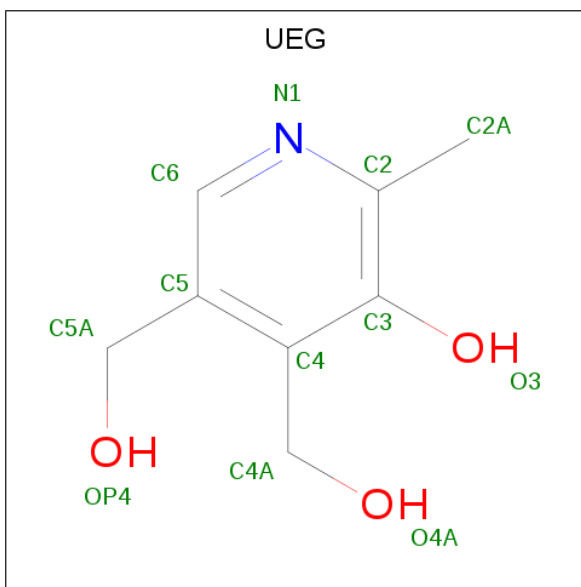
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	1
			62	22	10	24	6		
3	B	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
3	C	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
3	D	1	Total	C	N	O	P	0	0
			31	11	5	12	3		

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula:  $O_4S$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is 4,5-bis(hydroxymethyl)-2-methyl-pyridin-3-ol (three-letter code: UEG) (formula: C<sub>8</sub>H<sub>11</sub>NO<sub>3</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	D	1	Total	C	N	O	0	0
			12	8	1	3		

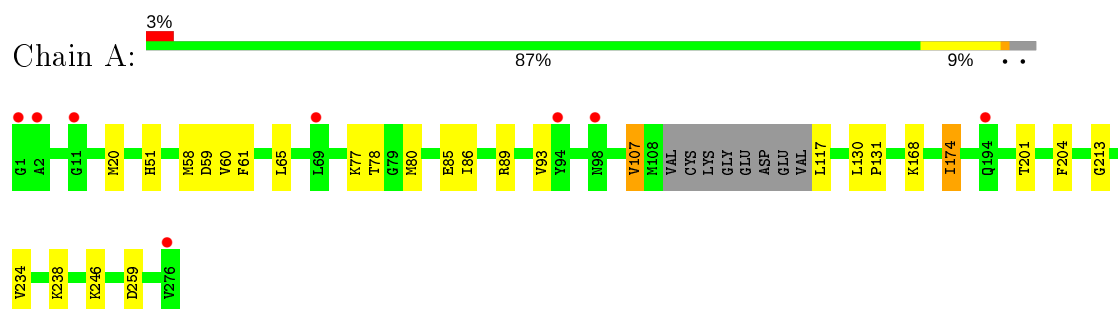
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	81	Total	O	0	0
			81	81		
6	B	85	Total	O	0	0
			85	85		
6	C	88	Total	O	0	0
			88	88		
6	D	59	Total	O	0	0
			59	59		

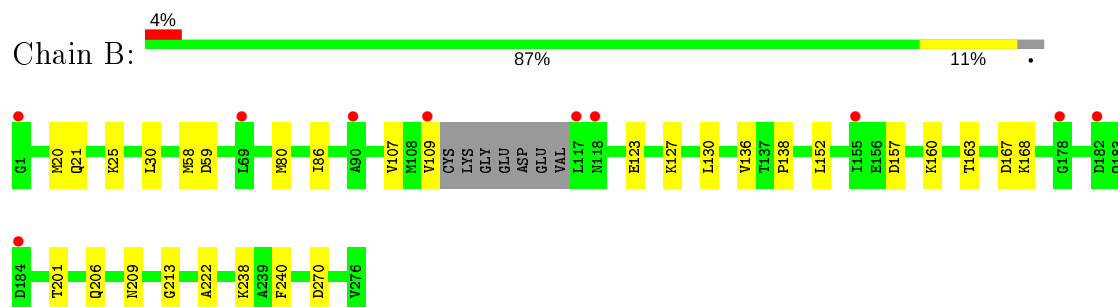
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

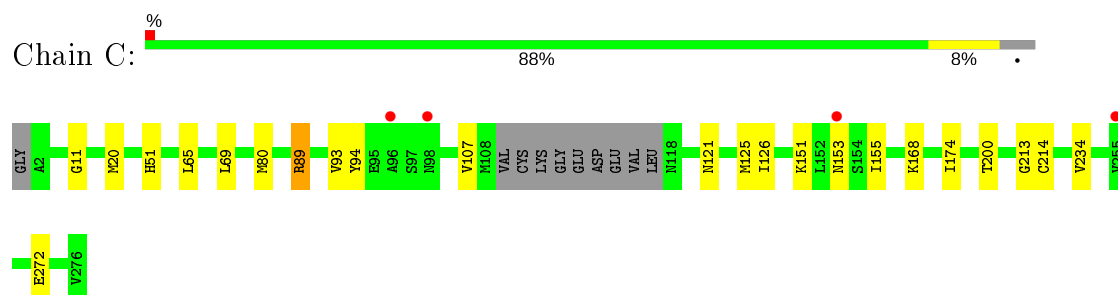
#### • Molecule 1: PHOSPHOMETHYLPYRIMIDINE KINASE



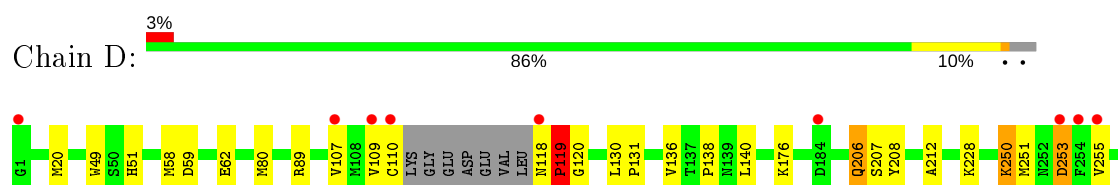
#### • Molecule 1: PHOSPHOMETHYLPYRIMIDINE KINASE



#### • Molecule 1: PHOSPHOMETHYLPYRIMIDINE KINASE



#### • Molecule 1: PHOSPHOMETHYLPYRIMIDINE KINASE







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	62.19Å 100.66Å 168.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.26 – 1.75 48.22 – 1.75	Depositor EDS
% Data completeness (in resolution range)	99.7 (48.26-1.75) 99.8 (48.22-1.75)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.16 (at 1.75Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, $R_{free}$	0.204 , 0.253 0.211 , 0.258	Depositor DCC
$R_{free}$ test set	5340 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.2	Xtriage
Anisotropy	0.470	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 38.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	8735	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 22.38 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 5.7692e-03.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: UEG, ACP, SO4, PXL

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	0.92	0/2104	0.87	0/2851
1	B	0.88	0/2118	0.88	2/2871 (0.1%)
1	C	0.96	1/2085 (0.0%)	0.93	1/2823 (0.0%)
1	D	0.95	1/2079 (0.0%)	0.95	6/2816 (0.2%)
All	All	0.93	2/8386 (0.0%)	0.91	9/11361 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	94	TYR	CE1-CZ	-7.88	1.28	1.38
1	D	119	PRO	N-CD	5.42	1.55	1.47

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	59	ASP	CB-CG-OD1	8.11	125.60	118.30
1	D	270	ASP	CB-CG-OD1	6.85	124.47	118.30
1	B	167	ASP	CB-CG-OD1	6.38	124.04	118.30
1	C	89	ARG	NE-CZ-NH1	6.35	123.47	120.30
1	D	89	ARG	NE-CZ-NH1	5.78	123.19	120.30
1	D	89	ARG	NE-CZ-NH2	-5.66	117.47	120.30
1	D	259	ASP	CB-CG-OD1	5.33	123.10	118.30
1	D	119	PRO	N-CA-C	5.20	125.61	112.10
1	D	119	PRO	CA-N-CD	-5.01	104.48	111.50

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	2049	0	2047	16	0
1	B	2060	0	2060	20	1
1	C	2036	0	2030	19	0
1	D	2039	0	2019	19	1
2	A	12	0	9	1	0
2	B	12	0	9	1	0
2	C	12	0	9	4	0
3	A	62	0	28	2	0
3	B	31	0	14	3	0
3	C	31	0	14	4	0
3	D	31	0	14	2	0
4	B	10	0	0	0	0
4	C	10	0	0	0	0
4	D	15	0	0	0	0
5	D	12	0	8	2	0
6	A	81	0	0	1	0
6	B	85	0	0	0	0
6	C	88	0	0	0	0
6	D	59	0	0	1	0
All	All	8735	0	8261	79	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 5.

All (79) 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:B:213:GLY:H	3:B:500:ACP:H3B2	1.05	1.09
1:D:118:ASN:O	1:D:120:GLY:N	1.90	1.05
1:B:213:GLY:N	3:B:500:ACP:H3B2	1.85	0.90
2:C:300:PXL:OP4	2:C:300:PXL:O4A	1.89	0.89
2:A:300:PXL:H5A1	2:A:300:PXL:O4A	1.82	0.79
1:D:109:VAL:HG12	1:D:110:CYS:H	1.46	0.78
1:C:213:GLY:H	3:C:500:ACP:H3B2	1.48	0.78
1:C:213:GLY:H	3:C:500:ACP:C3B	1.96	0.77

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:213:GLY:H	3:B:500:ACP:C3B	1.94	0.76
1:A:174:ILE:HD13	1:A:234[A]:VAL:CG1	2.20	0.71
1:C:11:GLY:HA3	1:C:80:MET:HE2	1.74	0.70
1:A:174:ILE:HD13	1:A:234[A]:VAL:HG11	1.75	0.69
1:D:80:MET:HA	1:D:107[A]:VAL:HG21	1.75	0.68
1:B:30[B]:LEU:HD23	1:B:222:ALA:HB3	1.75	0.68
1:C:151:LYS:CE	1:C:153:ASN:HD21	2.06	0.67
1:A:213:GLY:H	3:A:500[A]:ACP:H3B2	1.60	0.67
1:C:151:LYS:HE3	1:C:153:ASN:HD21	1.61	0.66
1:B:80:MET:HA	1:B:107[B]:VAL:CG2	2.28	0.63
1:D:176:LYS:NZ	3:D:500:ACP:O2A	2.30	0.62
5:D:300:UEG:C4A	5:D:300:UEG:OP4	2.48	0.62
1:D:228:LYS:HG3	6:D:2049:HOH:O	2.00	0.61
1:D:80:MET:HA	1:D:107[A]:VAL:CG2	2.31	0.60
1:C:213:GLY:N	3:C:500:ACP:H3B2	2.19	0.56
1:C:126:ILE:HG23	1:C:168:LYS:HD3	1.87	0.56
1:B:80:MET:HA	1:B:107[B]:VAL:HG21	1.88	0.56
1:C:65:LEU:HD22	1:C:93[B]:VAL:HG21	1.88	0.56
1:A:259:ASP:OD2	6:A:2067:HOH:O	2.18	0.56
1:B:136[B]:VAL:HG12	1:B:138:PRO:HD3	1.87	0.55
1:B:30[B]:LEU:HD11	1:B:240:PHE:CE2	2.42	0.55
1:A:89:ARG:O	1:A:93:VAL:HG13	2.07	0.55
1:C:151:LYS:HE3	1:C:153:ASN:ND2	2.22	0.54
1:D:80:MET:CA	1:D:107[A]:VAL:HG21	2.38	0.54
1:B:136[A]:VAL:HG22	1:B:138:PRO:HD3	1.89	0.53
1:A:61:PHE:CE2	1:A:65:LEU:HD11	2.44	0.53
1:C:69:LEU:HD13	1:C:93[A]:VAL:CG2	2.38	0.53
1:A:213:GLY:N	3:A:500[A]:ACP:H3B2	2.25	0.52
1:C:121:ASN:O	1:C:125:MET:HG3	2.11	0.51
1:A:204:PHE:CE1	1:A:246[A]:LYS:HD2	2.45	0.51
1:D:109:VAL:HG12	1:D:110:CYS:N	2.18	0.51
1:C:213:GLY:H	3:C:500:ACP:H3B1	1.75	0.50
1:D:208:TYR:CZ	1:D:250:LYS:HB2	2.46	0.50
1:B:160:LYS:O	1:B:163[B]:THR:HG22	2.12	0.49
1:A:58:MET:SD	1:A:86:ILE:HD11	2.52	0.49
2:B:300:PXL:O4A	2:B:300:PXL:O3	2.25	0.49
1:A:65:LEU:HD13	1:A:93:VAL:HG11	1.95	0.49
2:C:300:PXL:OP4	2:C:300:PXL:C4A	2.53	0.48
1:D:110:CYS:HA	5:D:300:UEG:OP4	2.14	0.48
1:C:89:ARG:O	1:C:93[B]:VAL:HG23	2.14	0.47
1:A:130:LEU:HB2	1:A:131:PRO:HD3	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:80:MET:CA	1:B:107[B]:VAL:HG21	2.45	0.46
1:B:123:GLU:O	1:B:127:LYS:HG3	2.16	0.46
1:B:58:MET:HA	1:B:58:MET:HE2	1.98	0.46
1:D:118:ASN:N	1:D:119:PRO:CD	2.79	0.46
1:D:206:GLN:HG2	1:D:206:GLN:O	2.16	0.45
1:A:85:GLU:CD	1:A:85:GLU:H	2.20	0.45
1:C:69:LEU:HD13	1:C:93[A]:VAL:HG22	1.98	0.45
1:A:59:ASP:OD1	1:A:60:VAL:N	2.50	0.44
1:B:21:GLN:O	1:B:25:LYS:HG3	2.17	0.44
1:B:58:MET:HE1	1:B:86:ILE:HG13	1.99	0.44
1:D:136:VAL:HG22	1:D:138:PRO:HD3	2.00	0.43
1:D:253:ASP:N	1:D:253:ASP:OD1	2.51	0.43
1:B:206:GLN:HA	1:B:209:ASN:HD21	1.83	0.43
1:D:251:MET:HB3	1:D:255:VAL:O	2.18	0.43
1:C:80:MET:HE2	2:C:300:PXL:H2A2	2.01	0.43
1:C:69:LEU:HD13	1:C:93[A]:VAL:HG23	2.00	0.43
1:B:152:LEU:HD22	1:B:157:ASP:HB3	2.01	0.42
1:B:130:LEU:HD22	1:B:136[B]:VAL:HG21	2.02	0.42
1:C:214:CYS:SG	2:C:300:PXL:H5A2	2.60	0.42
1:C:174:ILE:HD13	1:C:234[A]:VAL:HG11	2.02	0.41
1:D:130:LEU:HB2	1:D:131:PRO:HD3	2.02	0.41
1:D:58:MET:O	1:D:62:GLU:HG2	2.20	0.41
1:C:200:THR:HB	1:C:272:GLU:HB3	2.01	0.41
1:D:212:ALA:HB3	3:D:500:ACP:H3B2	2.02	0.41
1:A:80:MET:HA	1:A:107[A]:VAL:CG2	2.51	0.41
1:A:77:LYS:HG2	1:A:78:THR:N	2.35	0.41
1:A:201:THR:HG23	1:A:238:LYS:HE3	2.03	0.40
1:B:201:THR:HG23	1:B:238:LYS:HE3	2.03	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:B:270:ASP:OD2	1:D:118:ASN:O[2_454]	1.92	0.28

## 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	270/276 (98%)	263 (97%)	7 (3%)	0	100	100
1	B	272/276 (99%)	263 (97%)	9 (3%)	0	100	100
1	C	266/276 (96%)	260 (98%)	6 (2%)	0	100	100
1	D	266/276 (96%)	257 (97%)	8 (3%)	1 (0%)	34	17
All	All	1074/1104 (97%)	1043 (97%)	30 (3%)	1 (0%)	51	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	119	PRO

### 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	217/221 (98%)	210 (97%)	7 (3%)	39	16
1	B	219/221 (99%)	216 (99%)	3 (1%)	67	52
1	C	217/221 (98%)	213 (98%)	4 (2%)	59	40
1	D	215/221 (97%)	205 (95%)	10 (5%)	26	7
All	All	868/884 (98%)	844 (97%)	24 (3%)	44	20

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	20	MET
1	A	51	HIS
1	A	107[A]	VAL
1	A	107[B]	VAL
1	A	117	LEU
1	A	168	LYS
1	A	174	ILE
1	B	20	MET
1	B	109	VAL
1	B	168	LYS
1	C	20	MET
1	C	51	HIS
1	C	107	VAL
1	C	155	ILE
1	D	20	MET
1	D	49	TRP
1	D	51	HIS
1	D	59	ASP
1	D	119	PRO
1	D	140	LEU
1	D	206	GLN
1	D	207	SER
1	D	250	LYS
1	D	253	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	209	ASN
1	C	100	GLN
1	C	153	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 carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

16 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	PXL	A	300	-	12,12,12	1.99	3 (25%)	15,16,16	1.63	4 (26%)
2	PXL	C	300	-	12,12,12	0.93	0	15,16,16	1.22	1 (6%)
3	ACP	A	500[A]	-	27,33,33	2.51	7 (25%)	32,52,52	2.22	11 (34%)
4	SO4	D	1278	-	4,4,4	0.46	0	6,6,6	0.53	0
3	ACP	C	500	-	27,33,33	2.76	7 (25%)	32,52,52	2.31	8 (25%)
4	SO4	B	1278	-	4,4,4	0.21	0	6,6,6	0.33	0
4	SO4	C	1278	-	4,4,4	0.31	0	6,6,6	0.25	0
3	ACP	A	500[B]	-	27,33,33	1.78	6 (22%)	32,52,52	1.32	3 (9%)
3	ACP	D	500	-	27,33,33	2.20	9 (33%)	32,52,52	1.75	8 (25%)
3	ACP	B	500	-	27,33,33	2.20	7 (25%)	32,52,52	1.53	8 (25%)
5	UEG	D	300	1	12,12,12	2.23	3 (25%)	16,16,16	2.01	5 (31%)
2	PXL	B	300	-	12,12,12	1.57	1 (8%)	15,16,16	2.32	7 (46%)
4	SO4	B	1277	-	4,4,4	0.44	0	6,6,6	0.34	0
4	SO4	C	1277	-	4,4,4	0.49	0	6,6,6	0.76	0
4	SO4	D	1279	-	4,4,4	0.82	0	6,6,6	0.27	0
4	SO4	D	1277	-	4,4,4	0.33	0	6,6,6	0.47	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
2	PXL	A	300	-	-	2/4/4/4	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PXL	C	300	-	-	3/4/4/4	0/1/1/1
3	ACP	A	500[A]	-	-	6/15/38/38	0/3/3/3
3	ACP	C	500	-	-	0/15/38/38	0/3/3/3
3	ACP	A	500[B]	-	-	1/15/38/38	0/3/3/3
3	ACP	D	500	-	-	6/15/38/38	0/3/3/3
3	ACP	B	500	-	-	3/15/38/38	0/3/3/3
5	UEG	D	300	1	-	2/4/4/4	0/1/1/1
2	PXL	B	300	-	-	1/4/4/4	0/1/1/1

All (43) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	500	ACP	PB-O3A	7.75	1.67	1.58
3	A	500[A]	ACP	PB-O3A	7.37	1.66	1.58
3	D	500	ACP	PG-O1G	6.48	1.63	1.50
3	A	500[A]	ACP	PG-O1G	6.14	1.63	1.50
3	C	500	ACP	PG-O2G	6.09	1.68	1.54
3	B	500	ACP	PB-O3A	5.97	1.65	1.58
3	B	500	ACP	PG-O2G	5.47	1.67	1.54
3	C	500	ACP	PG-O1G	5.46	1.61	1.50
5	D	300	UEG	C3-C2	-5.40	1.35	1.40
3	A	500[A]	ACP	PG-O2G	5.28	1.67	1.54
3	B	500	ACP	PG-O1G	5.20	1.61	1.50
3	D	500	ACP	PG-O2G	5.20	1.66	1.54
5	D	300	UEG	O4A-C4A	-4.95	1.20	1.41
3	C	500	ACP	O4'-C1'	4.89	1.47	1.41
2	A	300	PXL	C3-C2	-4.62	1.36	1.40
3	A	500[A]	ACP	O4'-C1'	4.41	1.47	1.41
3	C	500	ACP	C8-N7	4.27	1.42	1.34
3	A	500[B]	ACP	PB-O3A	4.23	1.63	1.58
3	A	500[B]	ACP	PG-O1G	4.10	1.58	1.50
2	B	300	PXL	C4-C3	-3.65	1.35	1.40
3	C	500	ACP	PB-O2B	3.62	1.64	1.56
2	A	300	PXL	C2-N1	3.24	1.40	1.33
3	D	500	ACP	C2-N3	3.19	1.37	1.32
3	D	500	ACP	C5-C4	3.11	1.49	1.40
3	A	500[B]	ACP	PG-O3G	-3.09	1.47	1.54
3	A	500[B]	ACP	PB-O2B	3.08	1.63	1.56
3	A	500[B]	ACP	PG-O2G	3.02	1.61	1.54
3	B	500	ACP	C2-N3	2.90	1.36	1.32
3	A	500[A]	ACP	PB-O2B	2.82	1.63	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	500	ACP	C2'-C1'	-2.77	1.49	1.53
3	D	500	ACP	C4-N3	2.77	1.39	1.35
3	B	500	ACP	C5-C4	2.56	1.47	1.40
3	D	500	ACP	PG-O3G	-2.55	1.49	1.54
3	A	500[B]	ACP	O4'-C1'	2.47	1.44	1.41
3	A	500[A]	ACP	C2'-C1'	-2.42	1.50	1.53
3	A	500[A]	ACP	PG-O3G	-2.31	1.49	1.54
3	C	500	ACP	C5-C4	2.31	1.47	1.40
3	D	500	ACP	C2-N1	2.17	1.37	1.33
2	A	300	PXL	C4-C5	-2.15	1.39	1.42
5	D	300	UEG	C4A-C4	-2.07	1.49	1.51
3	B	500	ACP	C2'-C1'	-2.04	1.50	1.53
3	B	500	ACP	PB-O2B	2.01	1.61	1.56
3	D	500	ACP	O4'-C1'	2.00	1.43	1.41

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	500	ACP	C5-C6-N6	-7.09	109.58	120.35
3	A	500[A]	ACP	O2G-PG-C3B	7.06	123.52	106.40
3	D	500	ACP	O2G-PG-C3B	5.11	118.81	106.40
2	B	300	PXL	O4A-C4A-C4	-4.99	114.04	124.91
3	C	500	ACP	N6-C6-N1	4.89	128.73	118.57
3	A	500[A]	ACP	N3-C2-N1	-4.50	121.65	128.68
3	C	500	ACP	O1B-PB-C3B	4.11	119.93	109.07
3	A	500[B]	ACP	N3-C2-N1	-4.08	122.31	128.68
3	C	500	ACP	O2G-PG-C3B	4.06	116.25	106.40
3	A	500[A]	ACP	O1G-PG-C3B	-3.87	102.89	111.24
3	C	500	ACP	N3-C2-N1	-3.81	122.72	128.68
5	D	300	UEG	O4A-C4A-C4	3.77	121.88	111.66
3	C	500	ACP	C1'-N9-C4	-3.70	120.14	126.64
3	C	500	ACP	O2G-PG-O1G	-3.67	102.67	112.39
3	A	500[A]	ACP	N6-C6-N1	3.62	126.08	118.57
3	D	500	ACP	N3-C2-N1	-3.46	123.27	128.68
2	A	300	PXL	O4A-C4A-C4	-3.35	117.62	124.91
2	B	300	PXL	C3-C4-C5	3.28	120.78	118.26
3	A	500[A]	ACP	C5-C6-N6	-3.14	115.58	120.35
5	D	300	UEG	C4A-C4-C3	-3.12	115.73	121.58
2	B	300	PXL	C5-C6-N1	-3.12	118.63	123.82
2	B	300	PXL	C5A-C5-C4	-3.07	118.00	122.37
2	A	300	PXL	C2A-C2-C3	-2.99	117.20	120.89
2	C	300	PXL	O4A-C4A-C4	-2.88	118.64	124.91

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	500	ACP	O2G-PG-O1G	-2.85	104.85	112.39
3	D	500	ACP	C1'-N9-C4	-2.84	121.65	126.64
3	D	500	ACP	O2B-PB-C3B	2.78	117.93	106.58
3	C	500	ACP	O3'-C3'-C4'	-2.74	103.11	111.05
3	A	500[A]	ACP	O2G-PG-O1G	-2.69	105.27	112.39
3	B	500	ACP	N3-C2-N1	-2.67	124.51	128.68
5	D	300	UEG	C5-C6-N1	-2.65	119.41	123.82
3	A	500[A]	ACP	O3'-C3'-C4'	-2.58	103.58	111.05
3	B	500	ACP	O3G-PG-C3B	2.56	112.60	106.40
3	B	500	ACP	C4-C5-N7	-2.54	106.75	109.40
3	A	500[B]	ACP	C4-C5-N7	-2.49	106.81	109.40
3	B	500	ACP	N6-C6-N1	2.45	123.65	118.57
3	B	500	ACP	O4'-C1'-C2'	-2.44	103.35	106.93
5	D	300	UEG	C6-N1-C2	2.37	123.56	119.17
3	D	500	ACP	O1G-PG-C3B	-2.33	106.22	111.24
5	D	300	UEG	C4A-C4-C5	2.29	123.61	120.00
3	A	500[B]	ACP	C1'-N9-C4	-2.26	122.67	126.64
2	B	300	PXL	C3-C4-C4A	-2.24	116.71	119.90
3	B	500	ACP	O5'-PA-O1A	-2.24	100.31	109.07
3	D	500	ACP	O3G-PG-O1G	-2.20	106.57	112.39
3	A	500[A]	ACP	C2'-C3'-C4'	2.17	106.85	102.64
3	B	500	ACP	O3G-PG-O1G	-2.16	106.68	112.39
2	A	300	PXL	C3-C4-C4A	-2.16	116.84	119.90
3	A	500[A]	ACP	C1'-N9-C4	-2.15	122.86	126.64
2	B	300	PXL	C2A-C2-N1	2.14	121.86	117.67
2	A	300	PXL	C2A-C2-N1	2.14	121.85	117.67
3	B	500	ACP	O2A-PA-O1A	2.13	122.77	112.24
3	A	500[A]	ACP	C4-C5-N7	-2.09	107.22	109.40
3	A	500[A]	ACP	O3G-PG-C3B	2.07	111.41	106.40
3	D	500	ACP	O3'-C3'-C4'	-2.06	105.09	111.05
2	B	300	PXL	C5A-C5-C6	2.03	122.67	119.37

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	300	PXL	C6-C5-C5A-OP4
2	C	300	PXL	C4-C5-C5A-OP4
3	A	500[A]	ACP	PB-C3B-PG-O1G
3	A	500[A]	ACP	PB-C3B-PG-O2G
3	A	500[A]	ACP	PB-C3B-PG-O3G
3	A	500[A]	ACP	PG-C3B-PB-O1B

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Mol	Chain	Res	Type	Atoms
3	A	500[A]	ACP	PG-C3B-PB-O2B
3	A	500[A]	ACP	PG-C3B-PB-O3A
3	D	500	ACP	PB-C3B-PG-O1G
3	D	500	ACP	PB-C3B-PG-O2G
3	D	500	ACP	PG-C3B-PB-O1B
3	D	500	ACP	PG-C3B-PB-O2B
3	D	500	ACP	PG-C3B-PB-O3A
5	D	300	UEG	C6-C5-C5A-OP4
3	B	500	ACP	PG-C3B-PB-O1B
3	B	500	ACP	PG-C3B-PB-O2B
5	D	300	UEG	C4-C5-C5A-OP4
2	A	300	PXL	C6-C5-C5A-OP4
2	A	300	PXL	C4-C5-C5A-OP4
3	D	500	ACP	PB-C3B-PG-O3G
2	C	300	PXL	C3-C4-C4A-O4A
2	B	300	PXL	C3-C4-C4A-O4A
3	A	500[B]	ACP	PG-C3B-PB-O1B
3	B	500	ACP	PB-C3B-PG-O1G

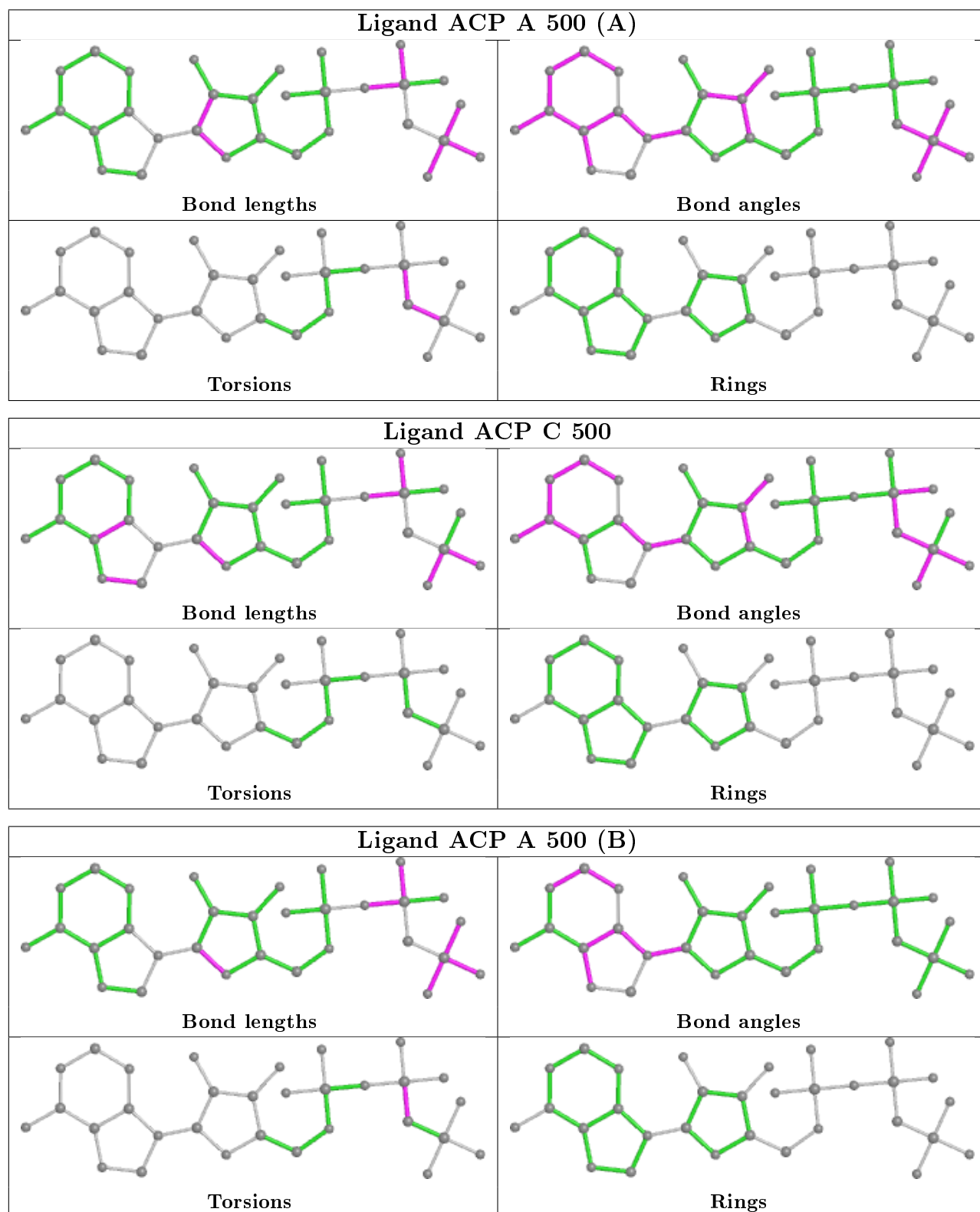
There are no ring outliers.

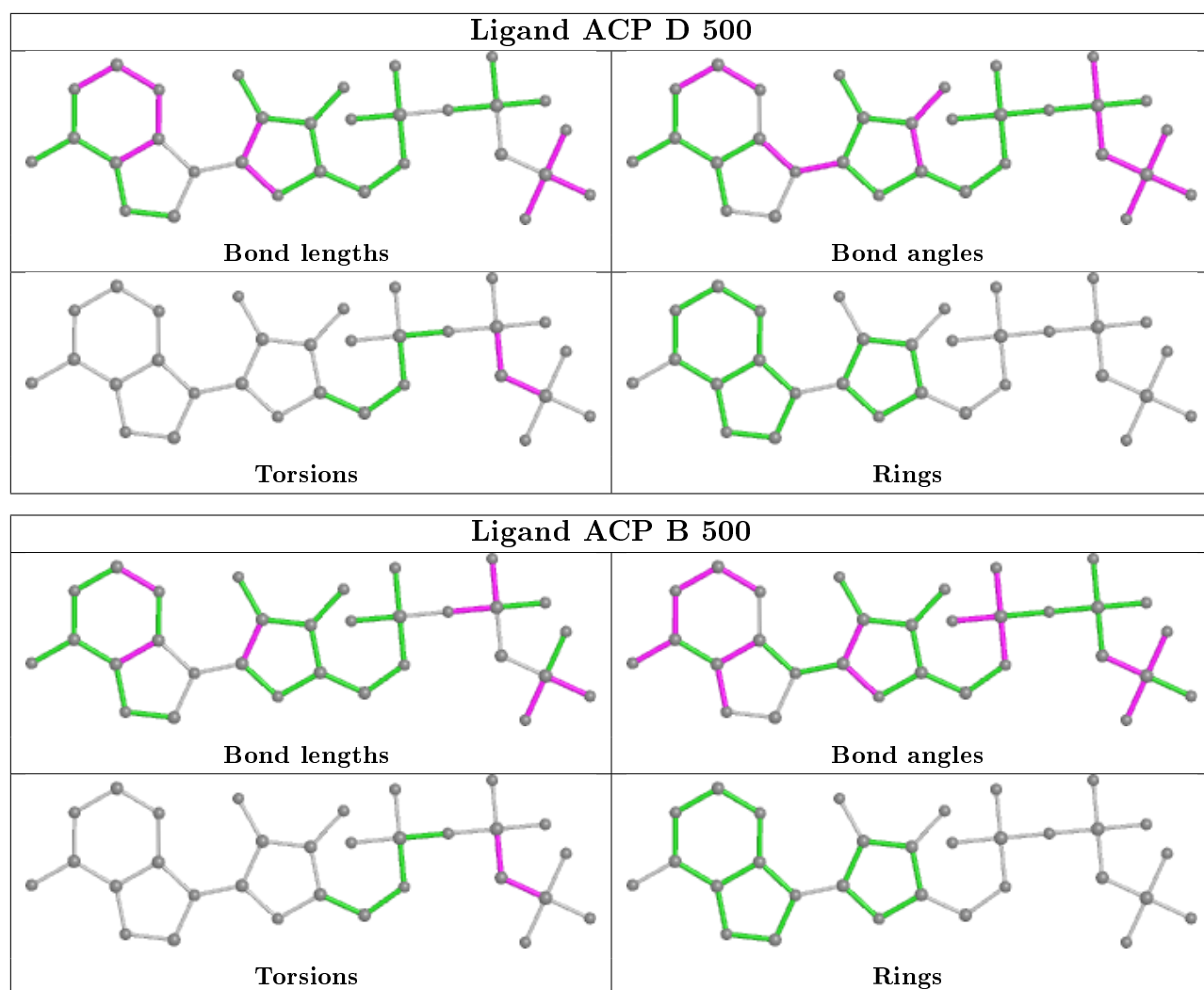
8 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	300	PXL	1	0
2	C	300	PXL	4	0
3	A	500[A]	ACP	2	0
3	C	500	ACP	4	0
3	D	500	ACP	2	0
3	B	500	ACP	3	0
5	D	300	UEG	2	0
2	B	300	PXL	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 ⓘ

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	268/276 (97%)	0.33	8 (2%) 50 56	16, 27, 43, 55	0
1	B	269/276 (97%)	0.20	10 (3%) 41 48	16, 26, 43, 75	0
1	C	266/276 (96%)	0.01	4 (1%) 73 80	13, 22, 35, 65	0
1	D	269/276 (97%)	0.23	9 (3%) 46 53	15, 24, 40, 60	0
All	All	1072/1104 (97%)	0.19	31 (2%) 51 57	13, 24, 41, 75	0

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	GLY	8.2
1	B	109	VAL	5.7
1	D	109	VAL	4.8
1	A	276	VAL	4.7
1	A	98	ASN	4.7
1	D	254	PHE	4.7
1	B	184	ASP	3.9
1	B	1	GLY	3.4
1	D	110	CYS	3.3
1	D	107[A]	VAL	3.1
1	D	1	GLY	3.0
1	D	253	ASP	2.9
1	A	69	LEU	2.9
1	B	117	LEU	2.9
1	B	155	ILE	2.7
1	A	194	GLN	2.6
1	A	94	TYR	2.6
1	A	2	ALA	2.5
1	D	184	ASP	2.5
1	B	69	LEU	2.5
1	D	255	VAL	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	182	ASP	2.5
1	B	118	ASN	2.4
1	C	255	VAL	2.4
1	C	98	ASN	2.4
1	C	153	ASN	2.3
1	B	178	GLY	2.2
1	C	96	ALA	2.1
1	B	90	ALA	2.1
1	A	11	GLY	2.1
1	D	118	ASN	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 carbohydrates 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, 95<sup>th</sup> 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
5	UEG	D	300	12/12	0.84	0.12	24,33,38,43	0
4	SO4	B	1278	5/5	0.89	0.19	41,42,43,44	5
3	ACP	B	500	31/31	0.90	0.12	26,29,52,52	0
2	PXL	B	300	12/12	0.90	0.14	21,29,40,43	0
4	SO4	D	1279	5/5	0.90	0.16	35,47,52,52	0
4	SO4	C	1278	5/5	0.91	0.19	34,37,39,39	5
3	ACP	D	500	31/31	0.92	0.12	20,28,60,76	0
4	SO4	D	1278	5/5	0.92	0.26	53,54,55,57	0
2	PXL	A	300	12/12	0.92	0.13	23,30,43,54	0
4	SO4	B	1277	5/5	0.92	0.33	49,53,54,54	0
3	ACP	A	500[A]	31/31	0.92	0.13	18,20,54,59	31
3	ACP	A	500[B]	31/31	0.92	0.13	16,24,29,30	31
3	ACP	C	500	31/31	0.94	0.09	14,18,42,61	0

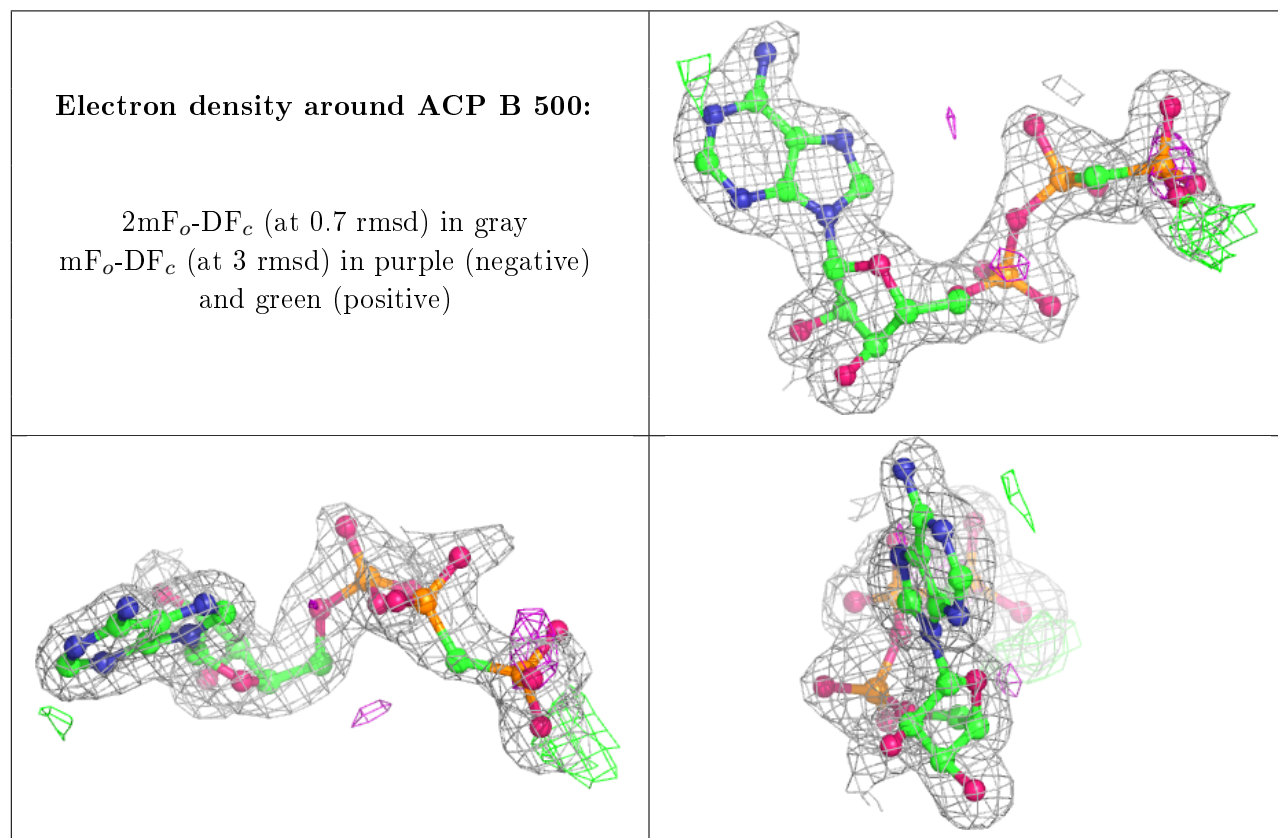
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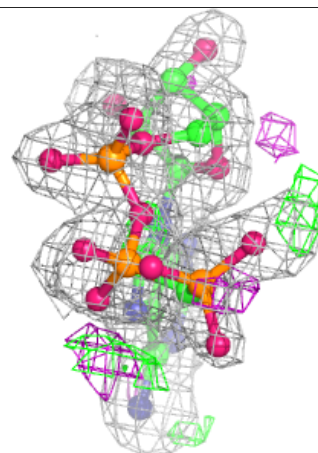
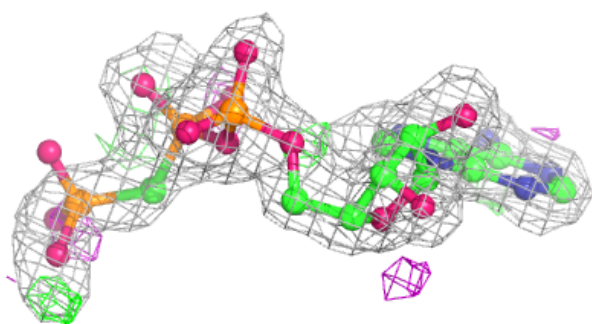
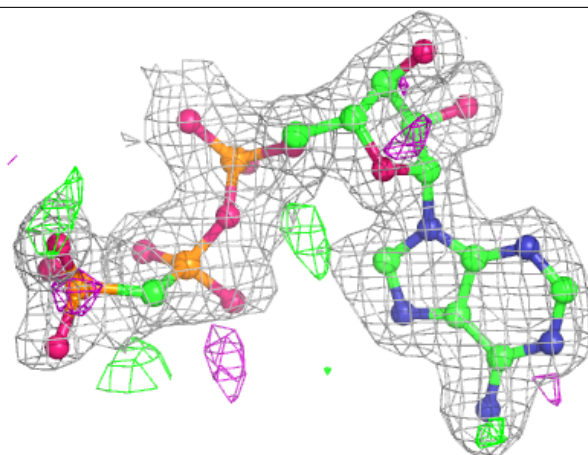
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	PXL	C	300	12/12	0.94	0.09	21,28,41,42	0
4	SO4	C	1277	5/5	0.97	0.08	27,33,35,36	0
4	SO4	D	1277	5/5	0.97	0.13	45,50,51,53	0

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.



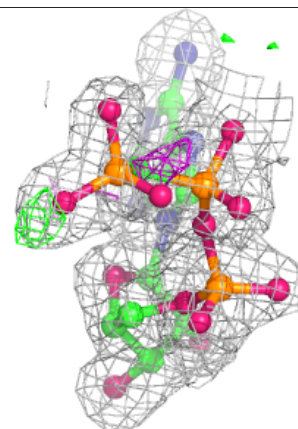
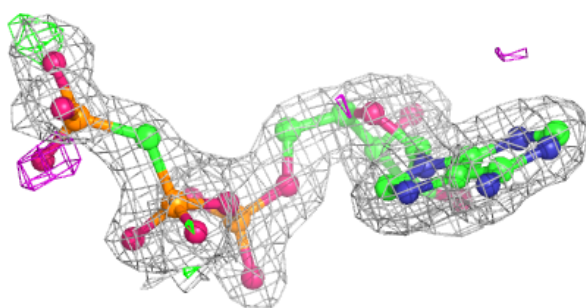
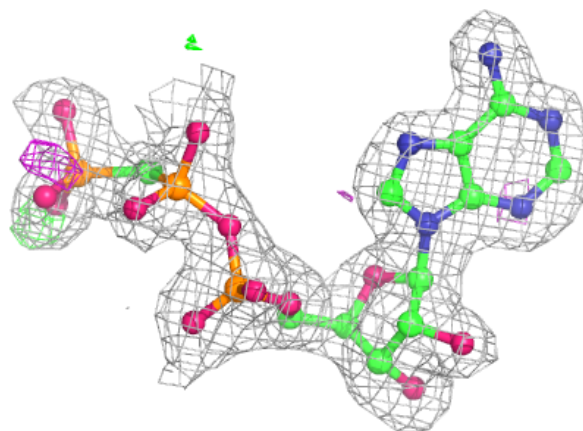
**Electron density around ACP D 500:**

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



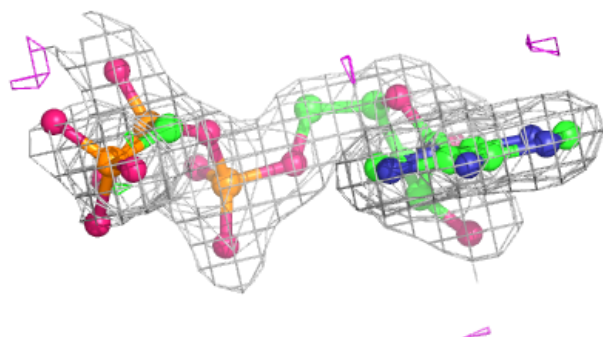
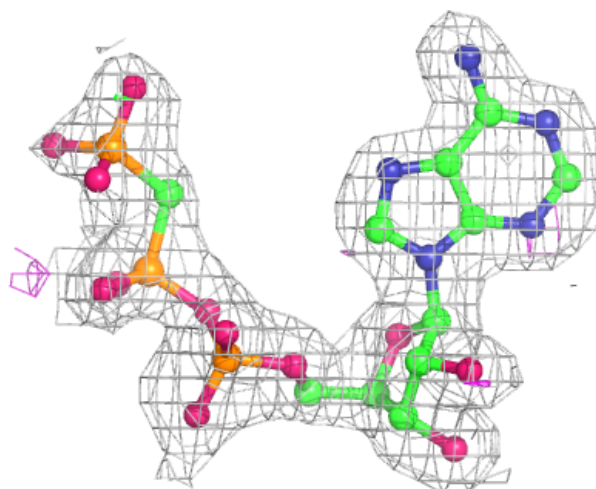
**Electron density around ACP A 500 (A):**

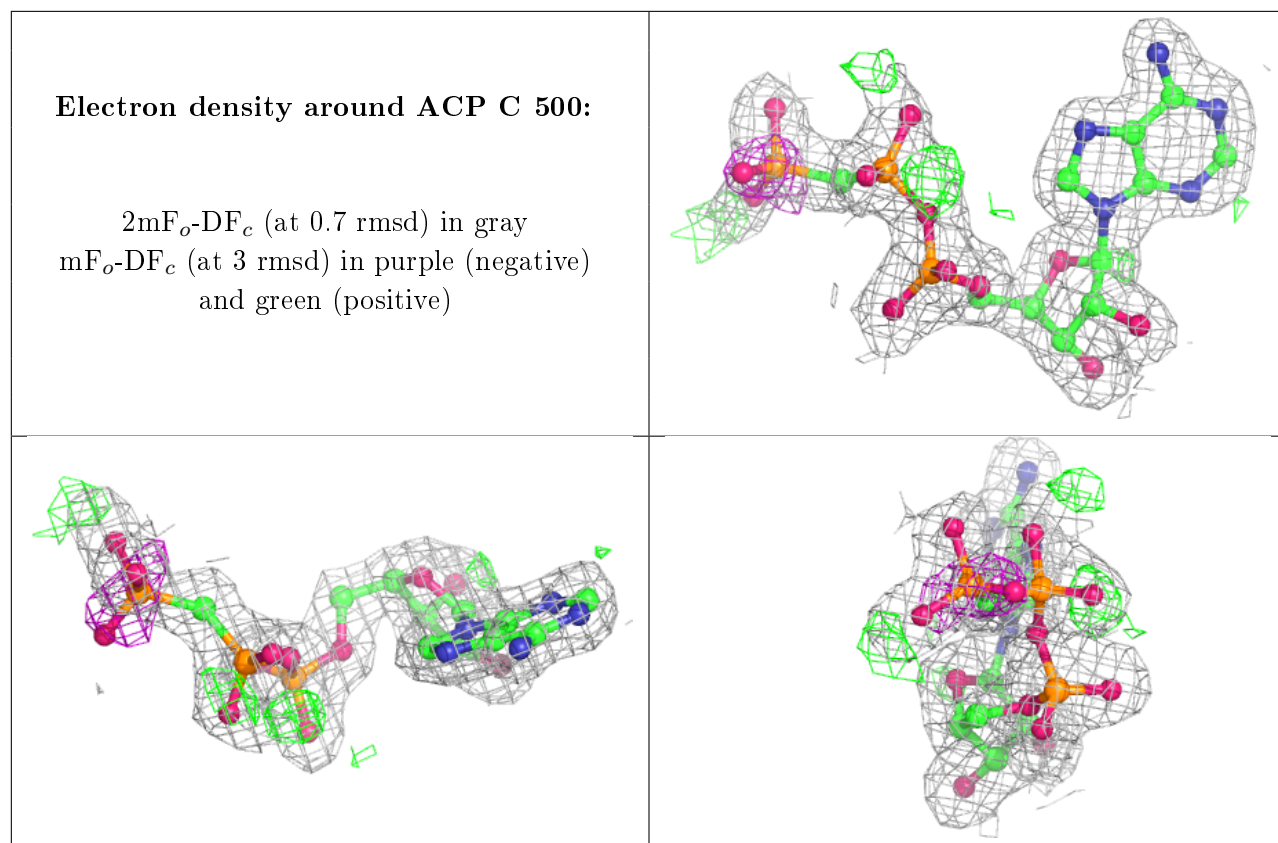
$2mF_o - DF_c$  (at 0.7 rmsd) in gray  
 $mF_o - DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around ACP A 500 (B):**

$2mF_o-DF_c$  (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.