



# Full wwPDB X-ray Structure Validation Report

May 13, 2020 – 06:39 pm BST

PDB ID : 3X2T  
Title : Crystal Structure of the KIF5C Motor Domain With ADP  
Authors : Inoue, S.; Nitta, R.; Hirokawa, N.  
Deposited on : 2015-01-02  
Resolution : 2.70 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

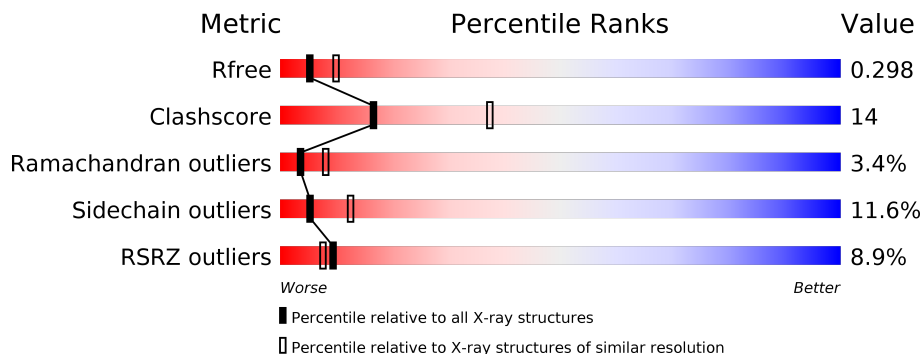
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	341	
1	B	341	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5055 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 Kinesin heavy chain isoform 5C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	311	2448	1539	425	469	15	0	0	0
1	B	326	2548	1597	448	488	15	0	0	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	335	HIS	-	expression tag	UNP P28738
A	336	HIS	-	expression tag	UNP P28738
A	337	HIS	-	expression tag	UNP P28738
A	338	HIS	-	expression tag	UNP P28738
A	339	HIS	-	expression tag	UNP P28738
A	340	HIS	-	expression tag	UNP P28738
A	341	HIS	-	expression tag	UNP P28738
B	335	HIS	-	expression tag	UNP P28738
B	336	HIS	-	expression tag	UNP P28738
B	337	HIS	-	expression tag	UNP P28738
B	338	HIS	-	expression tag	UNP P28738
B	339	HIS	-	expression tag	UNP P28738
B	340	HIS	-	expression tag	UNP P28738
B	341	HIS	-	expression tag	UNP P28738

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>).



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

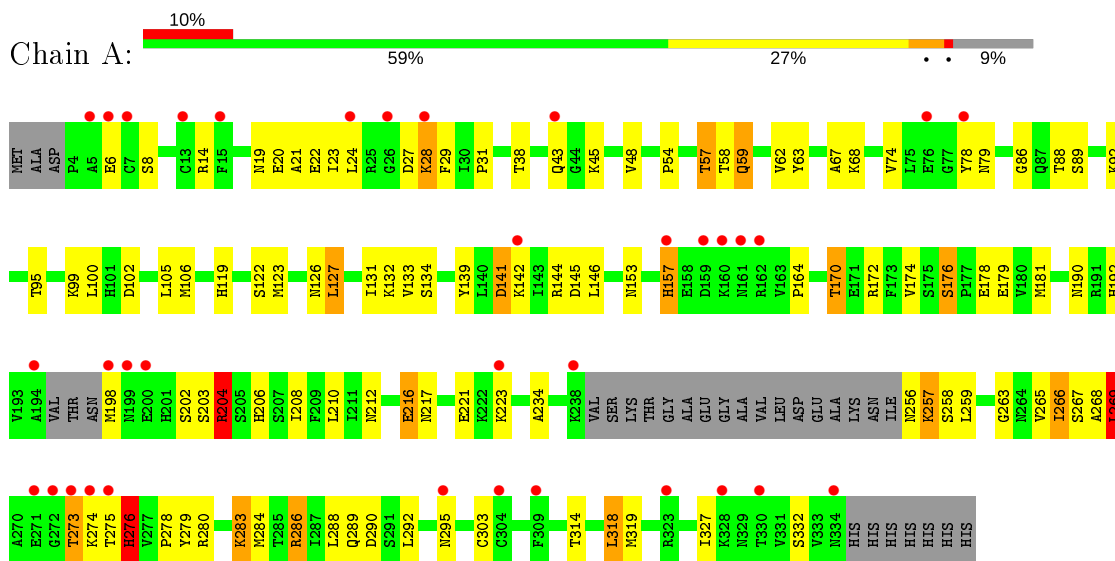
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	2	Total 2 O	0	0
3	B	3	Total 3 O	0	0

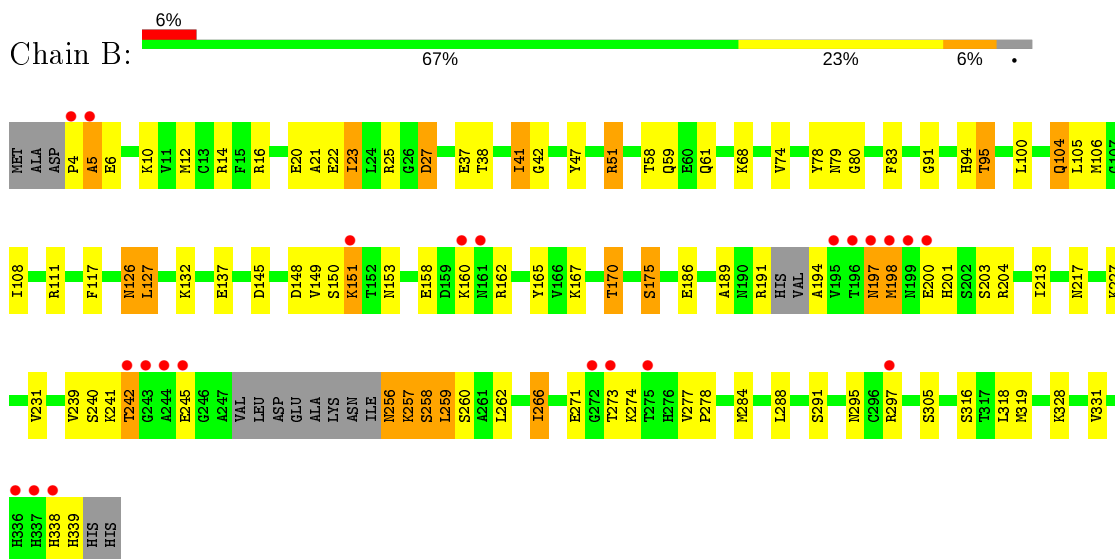
### 3 Residue-property plots [i](#)

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: Kinesin heavy chain isoform 5C



- Molecule 1: Kinesin heavy chain isoform 5C



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	71.86Å 71.83Å 176.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.70 19.93 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.1 (20.00-2.70) 99.5 (19.93-2.70)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.63 (at 2.71Å)	Xtrriage
Refinement program	REFMAC refmac_5.8.0049	Depositor
R, $R_{free}$	0.224 , 0.298 0.227 , 0.298	Depositor DCC
$R_{free}$ test set	1299 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	80.0	Xtrriage
Anisotropy	0.025	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 62.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.026 for k,h,-l	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	5055	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	85.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.62% of the height of the origin peak. No significant pseudotranslation is detected.*

<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: ADP

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	0.54	0/2489	0.75	0/3352
1	B	0.63	0/2593	0.82	0/3496
All	All	0.59	0/5082	0.79	0/6848

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	2448	0	2459	80	0
1	B	2548	0	2532	63	0
2	A	27	0	12	1	0
2	B	27	0	12	0	0
3	A	2	0	0	0	0
3	B	3	0	0	0	0
All	All	5055	0	5015	143	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 14.

All (143) 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:14:ARG:HH11	1:A:95:THR:HG22	1.18	1.09
1:A:92:LYS:NZ	2:A:2000:ADP:O2B	2.09	0.85
1:A:265:VAL:O	1:A:269:LEU:CD2	2.29	0.80
1:B:106:MET:O	1:B:111:ARG:NH1	2.18	0.77
1:B:126:ASN:O	1:B:127:LEU:CB	2.32	0.76
1:A:265:VAL:O	1:A:269:LEU:HD21	1.86	0.76
1:B:91:GLY:O	1:B:95:THR:HG23	1.87	0.75
1:B:79:ASN:HD22	1:B:227:LYS:H	1.32	0.75
1:B:126:ASN:O	1:B:127:LEU:HB3	1.88	0.73
1:A:54:PRO:O	1:A:57:THR:HG23	1.89	0.73
1:A:59:GLN:HG2	1:A:106:MET:O	1.90	0.72
1:A:127:LEU:HA	1:A:216:GLU:O	1.90	0.70
1:A:127:LEU:O	1:A:127:LEU:HD12	1.92	0.70
1:A:14:ARG:HH11	1:A:95:THR:CG2	2.00	0.69
1:B:58:THR:H	1:B:61:GLN:HE21	1.39	0.69
1:B:20:GLU:HA	1:B:23:ILE:HG22	1.74	0.68
1:A:203:SER:O	1:A:204:ARG:HB2	1.93	0.67
1:A:20:GLU:HA	1:A:23:ILE:HG22	1.77	0.66
1:A:314:THR:O	1:A:318:LEU:HD22	1.94	0.66
1:B:145:ASP:OD2	1:B:170:THR:CG2	2.43	0.66
1:A:266:ILE:HD11	1:A:292:LEU:HD22	1.77	0.66
1:A:145:ASP:OD2	1:A:170:THR:HG23	1.95	0.65
1:A:86:GLY:O	1:A:92:LYS:HE3	1.96	0.65
1:A:269:LEU:HD13	1:A:327:ILE:CD1	2.27	0.64
1:A:269:LEU:CD1	1:A:327:ILE:HD11	2.27	0.64
1:A:273:THR:HG22	1:A:274:LYS:HG3	1.80	0.64
1:B:145:ASP:OD2	1:B:170:THR:HG22	1.98	0.63
1:B:41:ILE:HD12	1:B:47:TYR:HE1	1.62	0.63
1:A:266:ILE:O	1:A:269:LEU:HD11	1.99	0.63
1:A:126:ASN:O	1:A:127:LEU:O	2.17	0.62
1:A:278:PRO:O	1:A:280:ARG:N	2.31	0.62
1:B:150:SER:OG	1:B:151:LYS:HE2	1.98	0.62
1:B:83:PHE:HB3	1:B:231:VAL:HB	1.82	0.61
1:A:269:LEU:HD13	1:A:327:ILE:HD11	1.83	0.60
1:B:20:GLU:HA	1:B:23:ILE:CG2	2.32	0.59
1:A:14:ARG:NH1	1:A:95:THR:HG22	2.02	0.59
1:A:208:ILE:HD12	1:A:208:ILE:N	2.18	0.59
1:B:22:GLU:O	1:B:27:ASP:HB2	2.03	0.58
1:A:29:PHE:CD2	1:A:31:PRO:HD2	2.38	0.58
1:B:41:ILE:HD13	1:B:41:ILE:O	2.04	0.58
1:B:74:VAL:HG11	1:B:213:ILE:HD12	1.84	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:257:LYS:NZ	1:B:258:SER:OG	2.37	0.57
1:A:20:GLU:O	1:A:21:ALA:C	2.43	0.56
1:B:284:MET:HG3	1:B:288:LEU:HD13	1.86	0.56
1:A:283:LYS:HE3	1:A:283:LYS:N	2.20	0.56
1:B:200:GLU:O	1:B:203:SER:O	2.23	0.56
1:B:4:PRO:O	1:B:5:ALA:CB	2.54	0.55
1:B:4:PRO:O	1:B:5:ALA:HB2	2.06	0.55
1:B:284:MET:HG3	1:B:288:LEU:CD1	2.36	0.55
1:B:12:MET:HG2	1:B:51:ARG:HB3	1.88	0.55
1:A:38:THR:HG22	1:A:48:VAL:HG22	1.89	0.55
1:B:203:SER:O	1:B:204:ARG:HB2	2.07	0.55
1:B:241:LYS:O	1:B:242:THR:HG22	2.07	0.54
1:A:58:THR:O	1:A:62:VAL:HG23	2.07	0.54
1:A:102:ASP:OD2	1:A:105:LEU:HD23	2.07	0.53
1:A:157:HIS:O	1:A:164:PRO:HA	2.10	0.52
1:B:145:ASP:OD2	1:B:170:THR:HG23	2.09	0.52
1:A:268:ALA:C	1:A:269:LEU:HD23	2.31	0.51
1:B:14:ARG:HH11	1:B:95:THR:HG22	1.75	0.51
1:B:126:ASN:O	1:B:127:LEU:HB2	2.09	0.51
1:B:117:PHE:CE1	1:B:175:SER:O	2.63	0.51
1:A:265:VAL:O	1:A:269:LEU:HD22	2.07	0.51
1:A:204:ARG:HA	1:A:234:ALA:HB1	1.92	0.51
1:A:141:ASP:HA	1:A:283:LYS:CD	2.41	0.50
1:A:269:LEU:HD13	1:A:327:ILE:HG12	1.93	0.50
1:B:256:ASN:HA	1:B:257:LYS:HB2	1.93	0.50
1:A:102:ASP:O	1:A:106:MET:HB3	2.11	0.49
1:A:284:MET:HG3	1:A:288:LEU:HD13	1.94	0.49
1:A:164:PRO:CG	1:A:286:ARG:O	2.60	0.49
1:B:158:GLU:HG3	1:B:162:ARG:O	2.12	0.49
1:A:141:ASP:HA	1:A:283:LYS:HD2	1.95	0.49
1:A:19:ASN:ND2	1:A:22:GLU:OE1	2.46	0.48
1:A:283:LYS:HG2	1:A:284:MET:N	2.29	0.48
1:B:59:GLN:HG3	1:B:106:MET:O	2.13	0.48
1:A:269:LEU:CD1	1:A:327:ILE:HG12	2.44	0.48
1:B:197:ASN:OD1	1:B:198:MET:N	2.46	0.48
1:A:67:ALA:O	1:A:68:LYS:C	2.49	0.48
1:B:59:GLN:CG	1:B:106:MET:O	2.62	0.48
1:B:295:ASN:HA	1:B:331:VAL:HA	1.96	0.47
1:B:284:MET:O	1:B:288:LEU:HD12	2.14	0.47
1:A:269:LEU:CD1	1:A:327:ILE:CD1	2.92	0.47
1:B:95:THR:O	1:B:108:ILE:HG13	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:269:LEU:HD13	1:A:327:ILE:CG1	2.45	0.47
1:A:88:THR:O	1:A:89:SER:HB2	2.15	0.46
1:B:137:GLU:OE1	1:B:201:HIS:HE1	1.98	0.46
1:B:74:VAL:CG1	1:B:213:ILE:HD12	2.44	0.46
1:A:198:MET:SD	1:A:198:MET:C	2.94	0.46
1:A:74:VAL:HA	1:A:78:TYR:O	2.16	0.46
1:A:100:LEU:HD12	1:A:181:MET:CE	2.46	0.46
1:A:119:HIS:O	1:A:122:SER:OG	2.34	0.46
1:A:174:VAL:HG12	1:A:179:GLU:HB3	1.97	0.46
1:A:14:ARG:O	1:A:303:CYS:HA	2.15	0.46
1:A:133:VAL:HA	1:A:210:LEU:O	2.15	0.46
1:B:80:GLY:HA2	1:B:297:ARG:O	2.16	0.45
1:B:16:ARG:NH2	1:B:305:SER:HB2	2.32	0.45
1:A:256:ASN:O	1:A:258:SER:N	2.50	0.45
1:B:126:ASN:O	1:B:126:ASN:CG	2.55	0.45
1:A:263:GLY:O	1:A:267:SER:N	2.50	0.45
1:B:132:LYS:NZ	1:B:339:HIS:HB3	2.31	0.45
1:A:142:LYS:HD2	1:A:153:ASN:OD1	2.17	0.44
1:A:290:ASP:OD1	1:A:295:ASN:N	2.49	0.44
1:B:79:ASN:ND2	1:B:227:LYS:H	2.08	0.44
1:A:266:ILE:C	1:A:269:LEU:HD11	2.37	0.44
1:A:266:ILE:CA	1:A:269:LEU:HD21	2.48	0.44
1:B:83:PHE:CB	1:B:231:VAL:HB	2.47	0.44
1:B:241:LYS:C	1:B:242:THR:HG22	2.37	0.44
1:A:28:LYS:O	1:A:28:LYS:NZ	2.33	0.44
1:A:131:ILE:HA	1:A:212:ASN:O	2.18	0.43
1:B:191:ARG:O	1:B:194:ALA:N	2.52	0.43
1:A:269:LEU:CD1	1:A:327:ILE:CG1	2.97	0.43
1:A:266:ILE:HA	1:A:269:LEU:HD11	2.01	0.43
1:A:145:ASP:OD2	1:A:170:THR:CG2	2.63	0.43
1:A:146:LEU:O	1:A:190:ASN:OD1	2.37	0.43
1:B:12:MET:CG	1:B:51:ARG:HB3	2.48	0.43
1:A:276:HIS:ND1	1:A:276:HIS:O	2.52	0.42
1:B:189:ALA:O	1:B:191:ARG:N	2.52	0.42
1:A:265:VAL:C	1:A:269:LEU:HD21	2.38	0.42
1:A:63:TYR:CD1	1:A:67:ALA:HB3	2.53	0.42
1:B:104:GLN:CG	1:B:105:LEU:HG	2.49	0.42
1:A:217:ASN:OD1	1:A:217:ASN:C	2.57	0.42
1:A:314:THR:HG22	1:A:318:LEU:CD2	2.50	0.42
1:A:19:ASN:CG	1:A:22:GLU:OE1	2.58	0.42
1:A:217:ASN:O	1:A:221:GLU:N	2.49	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:102:ASP:HB3	1:A:105:LEU:HB2	2.01	0.42
1:B:14:ARG:HH11	1:B:95:THR:CG2	2.32	0.42
1:B:259:LEU:O	1:B:262:LEU:HB3	2.20	0.42
1:B:74:VAL:HA	1:B:78:TYR:O	2.20	0.42
1:B:47:TYR:HE2	1:B:319:MET:HE2	1.84	0.41
1:A:176:SER:OG	1:A:178:GLU:OE1	2.35	0.41
1:A:86:GLY:C	1:A:92:LYS:HE3	2.40	0.41
1:B:257:LYS:HA	1:B:257:LYS:HD2	1.89	0.41
1:B:59:GLN:OE1	1:B:94:HIS:NE2	2.54	0.41
1:A:206:HIS:HD1	1:A:234:ALA:H	1.68	0.41
1:A:79:ASN:HD22	1:A:79:ASN:N	2.19	0.41
1:B:148:ASP:OD1	1:B:150:SER:OG	2.38	0.41
1:B:165:TYR:HE1	1:B:167:LYS:HA	1.86	0.41
1:B:277:VAL:HA	1:B:278:PRO:HD2	1.88	0.41
1:B:217:ASN:OD1	1:B:217:ASN:C	2.59	0.41
1:A:126:ASN:O	1:A:127:LEU:C	2.59	0.40
1:A:288:LEU:O	1:A:289:GLN:C	2.58	0.40
1:B:21:ALA:O	1:B:25:ARG:HG2	2.22	0.40
1:B:266:ILE:HA	1:B:266:ILE:HD12	1.92	0.40
1:B:132:LYS:HZ3	1:B:339:HIS:HB3	1.87	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	305/341 (89%)	266 (87%)	29 (10%)	10 (3%)	<b>4</b> <b>8</b>
1	B	320/341 (94%)	284 (89%)	25 (8%)	11 (3%)	<b>3</b> <b>8</b>
All	All	625/682 (92%)	550 (88%)	54 (9%)	21 (3%)	<b>3</b> <b>8</b>

All (21) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	6	GLU
1	A	127	LEU
1	A	204	ARG
1	A	257	LYS
1	A	279	TYR
1	B	5	ALA
1	B	6	GLU
1	B	27	ASP
1	B	127	LEU
1	B	240	SER
1	B	338	HIS
1	A	27	ASP
1	A	269	LEU
1	A	276	HIS
1	B	42	GLY
1	B	245	GLU
1	B	273	THR
1	A	192	HIS
1	A	273	THR
1	B	160	LYS
1	B	239	VAL

### 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	277/301 (92%)	244 (88%)	33 (12%)	5	12
1	B	285/301 (95%)	253 (89%)	32 (11%)	6	13
All	All	562/602 (93%)	497 (88%)	65 (12%)	5	12

All (65) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	8	SER
1	A	24	LEU
1	A	28	LYS

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	43	GLN
1	A	45	LYS
1	A	57	THR
1	A	59	GLN
1	A	99	LYS
1	A	123	MET
1	A	132	LYS
1	A	134	SER
1	A	139	TYR
1	A	141	ASP
1	A	144	ARG
1	A	157	HIS
1	A	170	THR
1	A	172	ARG
1	A	176	SER
1	A	202	SER
1	A	204	ARG
1	A	216	GLU
1	A	223	LYS
1	A	257	LYS
1	A	259	LEU
1	A	266	ILE
1	A	269	LEU
1	A	275	THR
1	A	276	HIS
1	A	283	LYS
1	A	286	ARG
1	A	318	LEU
1	A	319	MET
1	A	332	SER
1	B	10	LYS
1	B	23	ILE
1	B	37	GLU
1	B	38	THR
1	B	41	ILE
1	B	51	ARG
1	B	68	LYS
1	B	95	THR
1	B	100	LEU
1	B	104	GLN
1	B	126	ASN
1	B	149	VAL

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Mol	Chain	Res	Type
1	B	151	LYS
1	B	153	ASN
1	B	170	THR
1	B	175	SER
1	B	186	GLU
1	B	197	ASN
1	B	198	MET
1	B	242	THR
1	B	256	ASN
1	B	257	LYS
1	B	258	SER
1	B	259	LEU
1	B	260	SER
1	B	266	ILE
1	B	271	GLU
1	B	274	LYS
1	B	291	SER
1	B	316	SER
1	B	318	LEU
1	B	328	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	79	ASN
1	A	190	ASN
1	A	295	ASN
1	A	310	ASN
1	A	329	ASN
1	B	59	GLN
1	B	61	GLN
1	B	79	ASN
1	B	130	HIS
1	B	190	ASN
1	B	201	HIS
1	B	215	GLN
1	B	256	ASN
1	B	322	GLN
1	B	329	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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

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	ADP	A	2000	-	24,29,29	1.03	2 (8%)	29,45,45	1.65	6 (20%)
2	ADP	B	2000	-	24,29,29	1.19	3 (12%)	29,45,45	1.57	6 (20%)

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	ADP	A	2000	-	-	4/12/32/32	0/3/3/3
2	ADP	B	2000	-	-	4/12/32/32	0/3/3/3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2000	ADP	C5-C4	3.01	1.48	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	2000	ADP	C5-C4	2.57	1.47	1.40
2	B	2000	ADP	C2-N3	2.52	1.36	1.32
2	A	2000	ADP	O4'-C1'	2.32	1.44	1.41
2	B	2000	ADP	O4'-C1'	2.17	1.44	1.41

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	2000	ADP	PA-O3A-PB	-4.02	119.03	132.83
2	B	2000	ADP	PA-O3A-PB	-3.93	119.35	132.83
2	A	2000	ADP	N3-C2-N1	-3.73	122.85	128.68
2	B	2000	ADP	N3-C2-N1	-3.26	123.58	128.68
2	A	2000	ADP	C4-C5-N7	-2.84	106.44	109.40
2	B	2000	ADP	N6-C6-N1	2.66	124.10	118.57
2	A	2000	ADP	C2-N1-C6	2.64	123.27	118.75
2	B	2000	ADP	C3'-C2'-C1'	2.57	104.85	100.98
2	A	2000	ADP	C3'-C2'-C1'	2.53	104.79	100.98
2	B	2000	ADP	O3B-PB-O2B	2.44	116.97	107.64
2	A	2000	ADP	O2A-PA-O1A	2.24	123.30	112.24
2	B	2000	ADP	O2A-PA-O1A	2.16	122.94	112.24

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	2000	ADP	PA-O3A-PB-O2B
2	A	2000	ADP	PA-O3A-PB-O3B
2	B	2000	ADP	C5'-O5'-PA-O3A
2	B	2000	ADP	O4'-C4'-C5'-O5'
2	B	2000	ADP	C3'-C4'-C5'-O5'
2	A	2000	ADP	C5'-O5'-PA-O2A
2	B	2000	ADP	C5'-O5'-PA-O1A
2	A	2000	ADP	C5'-O5'-PA-O3A

There are no ring outliers.

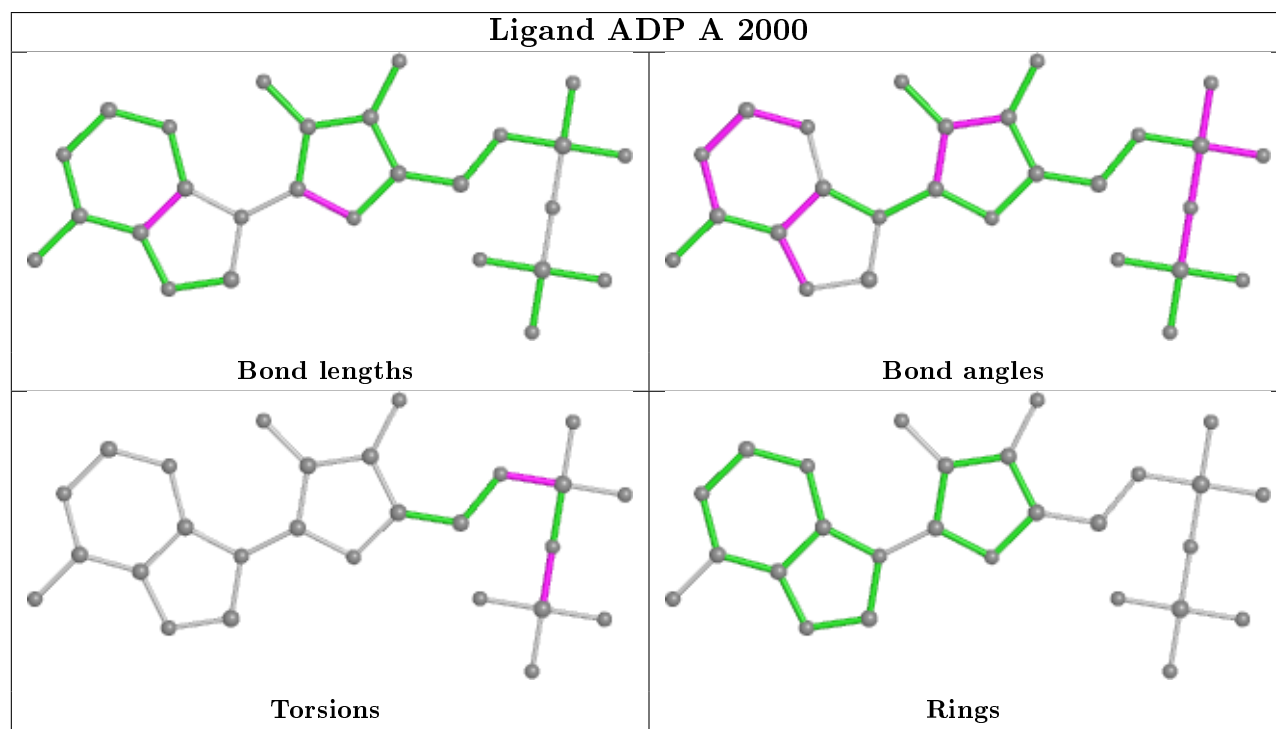
1 monomer is involved in 1 short contact:

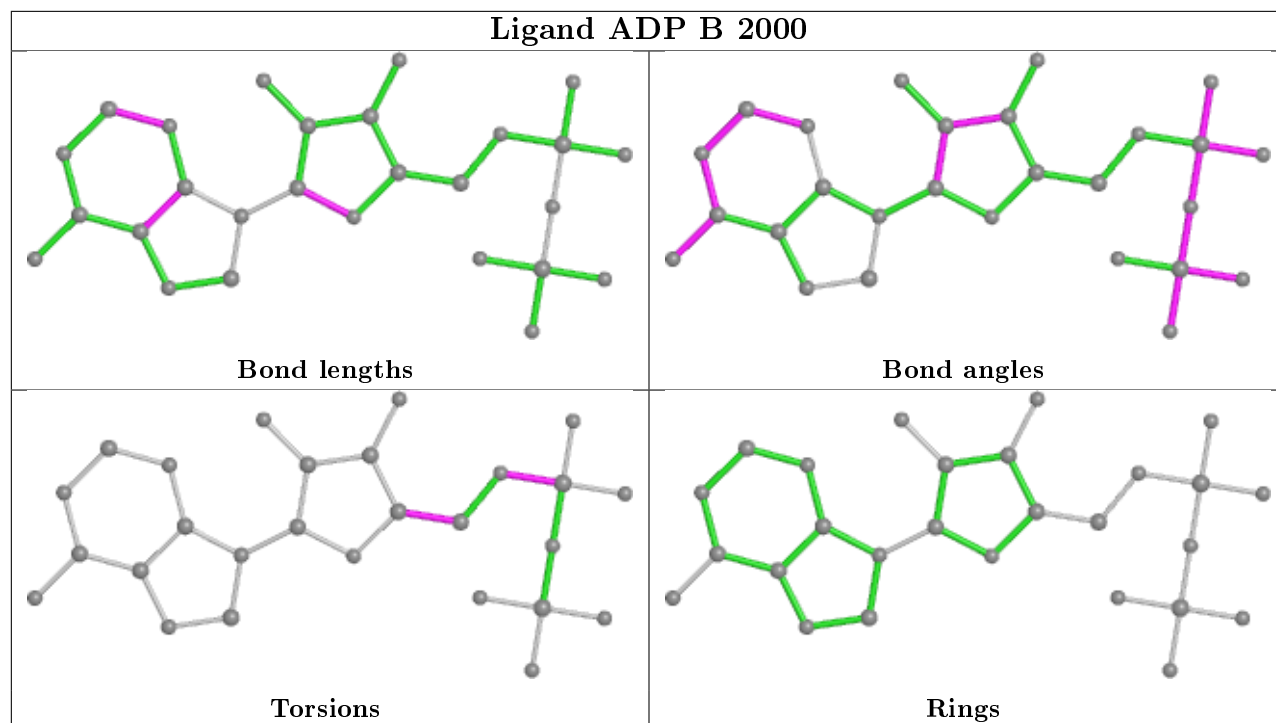
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	2000	ADP	1	0

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

### 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	311/341 (91%)	0.47	35 (11%) <b>5</b> <b>4</b>	53, 87, 135, 177	1 (0%)
1	B	326/341 (95%)	0.18	22 (6%) <b>17</b> <b>16</b>	50, 72, 118, 143	1 (0%)
All	All	637/682 (93%)	0.33	57 (8%) <b>9</b> <b>7</b>	50, 79, 130, 177	2 (0%)

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	195	VAL	5.9
1	A	273	THR	5.9
1	B	245	GLU	5.4
1	A	162	ARG	4.9
1	B	161	ASN	4.8
1	B	273	THR	4.8
1	B	5	ALA	4.7
1	A	24	LEU	4.7
1	A	161	ASN	4.6
1	B	196	THR	4.6
1	A	272	GLY	4.5
1	A	274	LYS	4.4
1	B	337	HIS	4.4
1	A	199	ASN	4.4
1	B	4	PRO	4.1
1	A	238	LYS	4.0
1	B	199	ASN	4.0
1	B	244	ALA	3.9
1	B	243	GLY	3.8
1	B	160	LYS	3.8
1	A	43	GLN	3.8
1	A	198	MET	3.6
1	A	295	ASN	3.6
1	A	200	GLU	3.4

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Mol	Chain	Res	Type	RSRZ
1	B	198	MET	3.4
1	A	5	ALA	3.4
1	A	6	GLU	3.2
1	A	330	THR	3.0
1	A	194	ALA	3.0
1	A	159	ASP	2.9
1	B	272	GLY	2.9
1	A	26	GLY	2.8
1	A	160	LYS	2.7
1	A	304	CYS	2.7
1	A	223	LYS	2.6
1	A	157	HIS	2.6
1	B	242	THR	2.6
1	B	197	ASN	2.6
1	B	338	HIS	2.6
1	A	309	PHE	2.6
1	B	200	GLU	2.5
1	B	275	THR	2.5
1	A	275	THR	2.5
1	A	334	ASN	2.4
1	A	7	CYS	2.4
1	A	76	GLU	2.4
1	B	151	LYS	2.3
1	A	271	GLU	2.2
1	A	28	LYS	2.2
1	B	297	ARG	2.2
1	A	328	LYS	2.1
1	B	336	HIS	2.1
1	A	15	PHE	2.1
1	A	13	CYS	2.1
1	A	78	TYR	2.1
1	A	323	ARG	2.0
1	A	142	LYS	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](#)

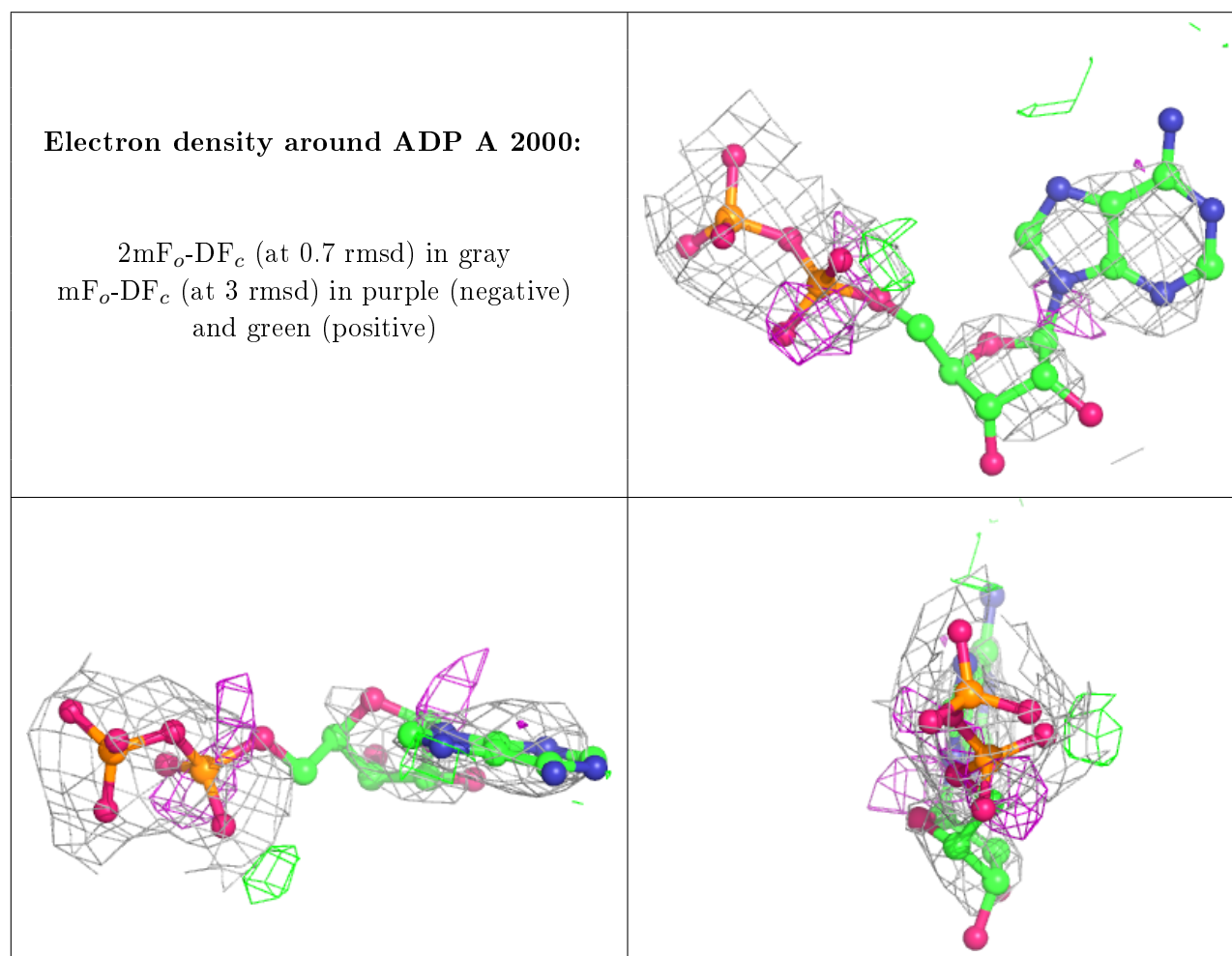
There are no carbohydrates in this entry.

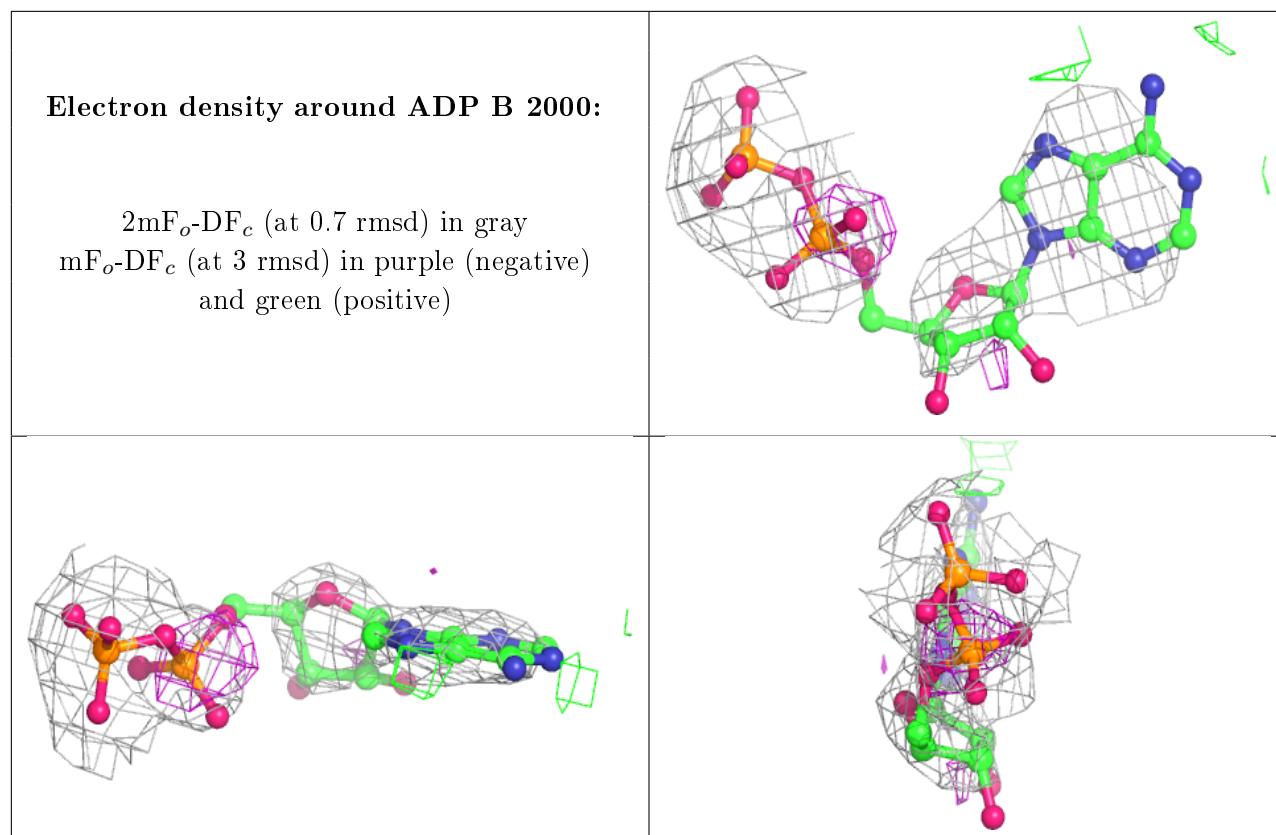
## 6.4 Ligands [i](#)

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(Å <sup>2</sup> )	Q<0.9
2	ADP	A	2000	27/27	0.92	0.31	67,113,130,131	0
2	ADP	B	2000	27/27	0.92	0.31	55,106,120,126	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.