



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 16, 2021 – 11:39 PM EDT

PDB ID : 1NG9
Title : E.coli MutS R697A: an ATPase-asymmetry mutant
Authors : Lamers, M.H.; Winterwerp, H.H.K.; Sixma, T.K.
Deposited on : 2002-12-17
Resolution : 2.60 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 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 : 2.23.2
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) : 2.23.2

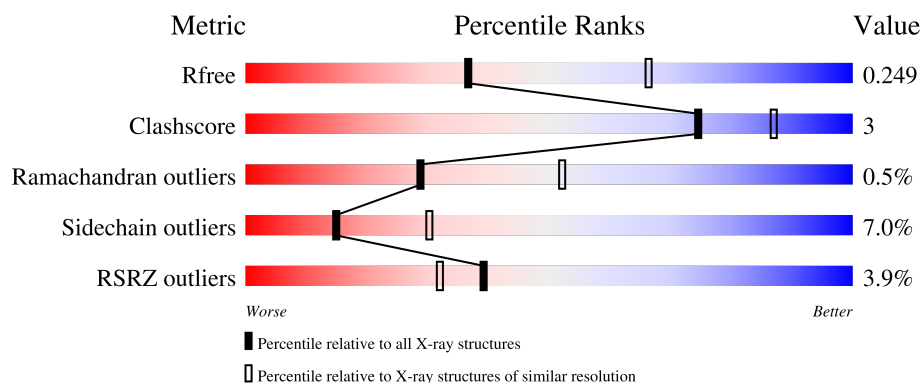
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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	E	30	<div> <div>13%</div> <div>43%</div> <div>13%</div> <div>•</div> <div>40%</div> </div>
2	F	30	<div> <div>3%</div> <div>43%</div> <div>10%</div> <div>•</div> <div>43%</div> </div>
3	A	800	<div> <div>4%</div> <div>85%</div> <div>13%</div> <div>••</div> </div>
3	B	800	<div> <div>4%</div> <div>82%</div> <div>12%</div> <div>••</div> </div>

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 13420 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 DNA chain called 5'-D(*AP*GP*CP*TP*GP*CP*CP*AP*GP*GP*CP*A
P*CP*CP*AP*GP*TP*GP*TP*CP*AP*GP*CP*GP*TP*CP*CP*TP*AP*T)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	E	18	Total	C	N	O	P	0	0	0
			367	174	72	104	17			

- Molecule 2 is a DNA chain called 5'-D(*AP*TP*AP*GP*GP*AP*CP*GP*CP*TP*GP*A
P*CP*AP*CP*TP*GP*GP*TP*GP*CP*TP*TP*GP*GP*CP*AP*GP*CP*T)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	F	17	Total	C	N	O	P	0	0	0
			347	166	62	103	16			

- Molecule 3 is a protein called DNA mismatch repair protein MutS.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	794	Total	C	N	O	S	0	0	0
			6241	3925	1109	1177	30			
3	B	766	Total	C	N	O	S	0	0	0
			6045	3808	1072	1136	29			

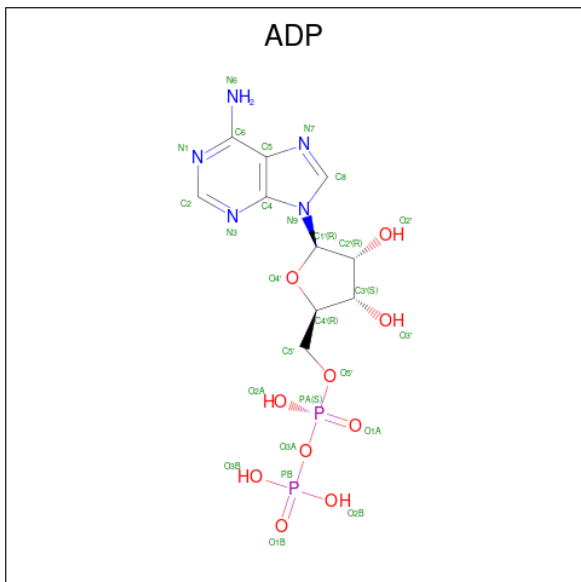
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	697	ALA	ARG	engineered mutation	UNP P23909
B	697	ALA	ARG	engineered mutation	UNP P23909

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 5 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $\text{C}_{10}\text{H}_{15}\text{N}_5\text{O}_{10}\text{P}_2$).



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

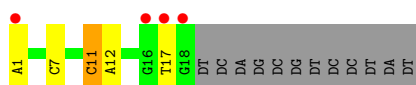
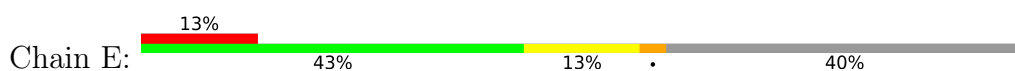
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	E	3	Total O 3 3	0	0
6	F	4	Total O 4 4	0	0
6	A	165	Total O 165 165	0	0
6	B	192	Total O 192 192	0	0

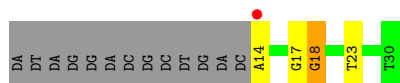
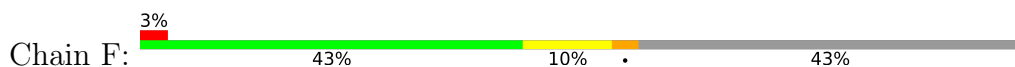
3 Residue-property plots

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.

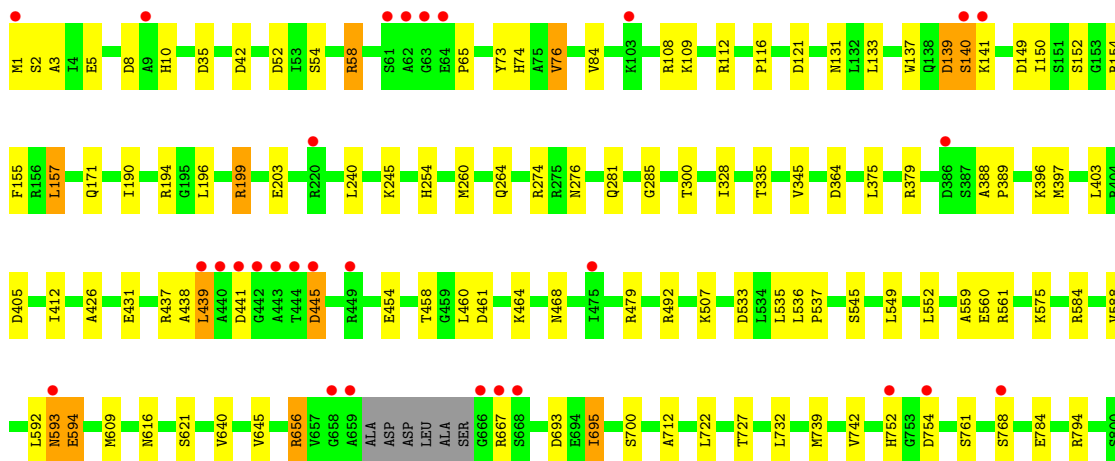
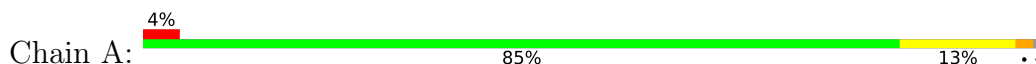
- Molecule 1: 5'-D(*AP*GP*CP*TP*GP*CP*CP*AP*GP*GP*CP*AP*CP*CP*AP*GP*TP*GP*TP*CP*AP*GP*CP*GP*TP*CP*CP*TP*AP*T)-3'



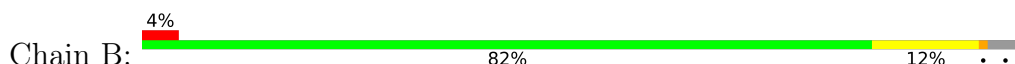
- Molecule 2: 5'-D(*AP*TP*AP*GP*GP*AP*CP*GP*CP*TP*GP*AP*CP*AP*CP*TP*GP*GP*TP*GP*CP*TP*TP*GP*GP*CP*AP*GP*CP*T)-3'

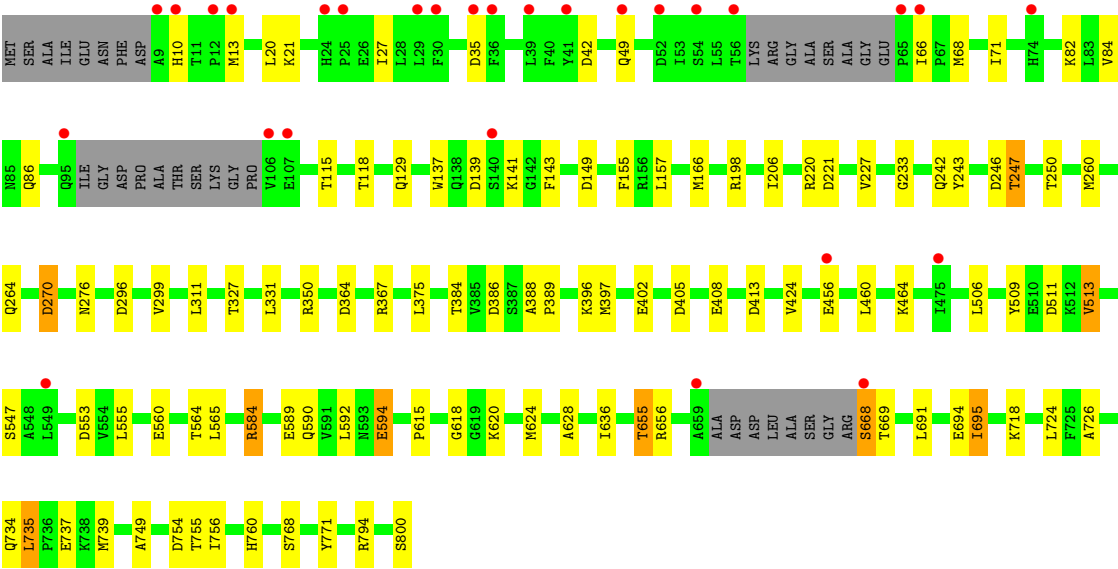


- Molecule 3: DNA mismatch repair protein MutS



- Molecule 3: DNA mismatch repair protein MutS





4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	89.90Å 92.40Å 261.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.60 20.00 – 2.60	Depositor EDS
% Data completeness (in resolution range)	98.2 (20.00-2.60) 98.2 (20.00-2.60)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	0.12	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.09 (at 2.59Å)	Xtriage
Refinement program	REFMAC 5.1.19	Depositor
R, R_{free}	0.215 , 0.249 0.212 , 0.249	Depositor DCC
R_{free} test set	1283 reflections (1.93%)	wwPDB-VP
Wilson B-factor (Å ²)	39.1	Xtriage
Anisotropy	0.790	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 39.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.024 for k,h,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	13420	wwPDB-VP
Average B, all atoms (Å ²)	11.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.07% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ADP, 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	E	0.75	0/412	1.40	4/634 (0.6%)
2	F	0.71	0/388	1.50	4/598 (0.7%)
3	A	0.40	0/6347	0.73	12/8591 (0.1%)
3	B	0.42	0/6146	0.71	13/8318 (0.2%)
All	All	0.44	0/13293	0.79	33/18141 (0.2%)

There are no bond length outliers.

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	14	DA	O4'-C1'-N9	9.82	114.87	108.00
2	F	23	DT	O4'-C1'-N1	-7.59	102.69	108.00
1	E	1	DA	O4'-C1'-N9	7.51	113.26	108.00
2	F	18	DG	O4'-C4'-C3'	-7.22	101.61	104.50
3	B	270	ASP	CB-CG-OD2	6.55	124.20	118.30
3	B	754	ASP	CB-CG-OD2	6.36	124.02	118.30
3	B	149	ASP	CB-CG-OD2	6.30	123.97	118.30
1	E	17	DT	O4'-C1'-N1	5.83	112.08	108.00
3	B	364	ASP	CB-CG-OD2	5.82	123.54	118.30
3	A	441	ASP	CB-CG-OD2	5.79	123.51	118.30
3	B	246	ASP	CB-CG-OD2	5.75	123.48	118.30
3	B	221	ASP	CB-CG-OD2	5.68	123.42	118.30
3	A	754	ASP	CB-CG-OD2	5.65	123.39	118.30
3	A	445	ASP	CB-CG-OD2	5.58	123.32	118.30
3	B	35	ASP	CB-CG-OD2	5.47	123.22	118.30
1	E	7	DC	C1'-O4'-C4'	-5.45	104.65	110.10
3	A	149	ASP	CB-CG-OD2	5.42	123.18	118.30
3	B	296	ASP	CB-CG-OD2	5.38	123.14	118.30
3	B	42	ASP	CB-CG-OD2	5.37	123.13	118.30
3	B	511	ASP	CB-CG-OD2	5.36	123.12	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	121	ASP	CB-CG-OD2	5.33	123.09	118.30
3	A	139	ASP	CB-CG-OD2	5.28	123.05	118.30
3	A	8	ASP	CB-CG-OD2	5.28	123.05	118.30
1	E	11	DC	O4'-C4'-C3'	5.28	109.17	106.00
3	B	413	ASP	CB-CG-OD2	5.26	123.03	118.30
3	B	405	ASP	CB-CG-OD2	5.22	123.00	118.30
3	A	364	ASP	CB-CG-OD2	5.18	122.96	118.30
3	A	405	ASP	CB-CG-OD2	5.14	122.92	118.30
3	B	386	ASP	CB-CG-OD2	5.13	122.92	118.30
3	A	52	ASP	CB-CG-OD2	5.12	122.91	118.30
3	A	533	ASP	CB-CG-OD2	5.09	122.89	118.30
2	F	23	DT	C4-C5-C7	5.04	122.02	119.00
3	A	461	ASP	CB-CG-OD2	5.01	122.81	118.30

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	E	367	0	202	1	0
2	F	347	0	194	1	0
3	A	6241	0	6288	43	0
3	B	6045	0	6095	38	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	27	0	12	0	0
5	B	27	0	12	1	0
6	A	165	0	0	9	0
6	B	192	0	0	5	0
6	E	3	0	0	1	0
6	F	4	0	0	0	0
All	All	13420	0	12803	82	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 3.

All (82) 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)
6:E:358:HOH:O	3:A:58:ARG:HD3	1.85	0.76
3:B:327:THR:HG21	3:B:555:LEU:HD13	1.71	0.73
3:A:74:HIS:ND1	6:A:2120:HOH:O	2.20	0.72
3:A:74:HIS:CE1	6:A:2120:HOH:O	2.47	0.68
3:A:133:LEU:HG	3:A:240:LEU:HD11	1.78	0.64
3:B:276:ASN:HD22	3:B:655:THR:HG22	1.64	0.63
3:A:73:TYR:O	3:A:76:VAL:HG22	1.99	0.62
3:A:190:ILE:HG23	3:A:196:LEU:HD11	1.82	0.61
3:A:396:LYS:NZ	6:A:2108:HOH:O	2.28	0.60
3:A:616:ASN:ND2	3:B:668:SER:OG	2.31	0.59
3:A:593:ASN:O	3:A:594:GLU:HB3	2.02	0.59
3:B:157:LEU:HD13	3:B:233:GLY:HA3	1.87	0.56
3:A:141:LYS:HE3	6:A:2154:HOH:O	2.05	0.55
3:A:458:THR:HG22	3:A:460:LEU:HG	1.89	0.55
3:B:242:GLN:NE2	6:B:2124:HOH:O	2.39	0.55
3:A:609:MET:HE3	3:A:712:ALA:HB1	1.90	0.54
3:A:199:ARG:HD3	3:A:203:GLU:OE1	2.06	0.54
3:B:618:GLY:O	3:B:760:HIS:HD2	1.91	0.54
3:A:640:VAL:HG11	3:A:645:VAL:HG21	1.87	0.54
3:B:143:PHE:HB3	3:B:166:MET:CE	2.38	0.54
3:B:227:VAL:HG12	3:B:260:MET:HB2	1.89	0.53
3:A:454:GLU:O	3:A:458:THR:HB	2.09	0.53
3:B:82:LYS:O	3:B:86:GLN:HG3	2.08	0.52
3:B:276:ASN:HB2	3:B:655:THR:HG21	1.92	0.52
3:B:327:THR:HG22	3:B:331:LEU:HD12	1.90	0.52
3:B:276:ASN:HD22	3:B:655:THR:CG2	2.23	0.51
3:A:328:ILE:HG23	3:A:559:ALA:HA	1.92	0.51
3:B:624:MET:CE	3:B:724:LEU:O	2.58	0.51
3:B:565:LEU:HD22	3:B:590:GLN:NE2	2.26	0.51
3:A:345:VAL:HG11	3:A:549:LEU:HD13	1.92	0.51
3:A:281:GLN:HE21	3:A:285:GLY:HA2	1.76	0.50
3:B:749:ALA:HB3	3:B:771:TYR:CE1	2.47	0.49
3:B:584:ARG:HD2	3:B:589:GLU:OE1	2.12	0.49
3:A:560:GLU:OE1	3:A:561:ARG:HD2	2.13	0.49
3:A:116:PRO:O	3:A:131:ASN:ND2	2.45	0.49
3:B:509:TYR:O	3:B:513:VAL:HG13	2.13	0.49
3:A:403:LEU:HD22	3:A:535:LEU:HD23	1.95	0.48
3:B:311:LEU:HD23	3:B:636:ILE:HD13	1.95	0.48
3:A:621:SER:OG	3:A:693:ASP:OD1	2.32	0.48
3:A:412:ILE:HD13	3:A:426:ALA:HB2	1.95	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:245:LYS:NZ	6:A:2116:HOH:O	2.44	0.47
3:A:656:ARG:CZ	3:A:695:ILE:HG21	2.45	0.47
3:B:118:THR:CB	3:B:247:THR:HG21	2.45	0.47
3:A:536:LEU:N	3:A:537:PRO:HD2	2.30	0.46
3:A:133:LEU:HG	3:A:240:LEU:CD1	2.45	0.46
3:B:755:THR:OG1	3:B:756:ILE:N	2.49	0.46
3:A:588:VAL:O	3:A:592:LEU:HB2	2.15	0.46
3:A:375:LEU:O	3:A:379:ARG:HG3	2.16	0.45
3:B:656:ARG:O	3:B:656:ARG:HG3	2.16	0.45
3:A:388:ALA:HB3	3:A:389:PRO:HD3	1.99	0.45
3:A:458:THR:CG2	3:A:460:LEU:HD12	2.47	0.45
3:B:615:PRO:O	6:B:2179:HOH:O	2.21	0.45
3:A:468:ASN:ND2	6:A:2008:HOH:O	2.49	0.45
3:A:5:GLU:HB3	3:A:10:HIS:HE1	1.83	0.44
3:A:171:GLN:HG2	3:A:274:ARG:HD2	1.99	0.44
3:B:760:HIS:HB3	5:B:2002:ADP:C6	2.53	0.44
3:B:620:LYS:HD3	3:B:726:ALA:HB1	1.98	0.44
3:B:735:LEU:HD12	3:B:739:MET:SD	2.57	0.44
3:B:143:PHE:HB3	3:B:166:MET:HE3	1.99	0.43
3:B:375:LEU:HD22	3:B:397:MET:HG2	1.99	0.43
3:B:594:GLU:HG3	6:B:2018:HOH:O	2.18	0.43
3:A:157:LEU:C	3:A:157:LEU:HD23	2.39	0.43
3:A:727:THR:HG21	3:A:732:LEU:HD12	2.00	0.42
3:B:21:LYS:NZ	3:B:27:ILE:O	2.51	0.42
3:A:397:MET:HA	3:A:545:SER:HA	2.01	0.42
3:A:794:ARG:HD2	6:A:2104:HOH:O	2.19	0.42
3:B:628:ALA:HB2	3:B:691:LEU:HD11	2.00	0.42
3:B:695:ILE:O	3:B:695:ILE:HG13	2.19	0.42
3:A:722:LEU:HG	6:A:2159:HOH:O	2.19	0.42
3:B:243:TYR:O	3:B:247:THR:HB	2.19	0.42
1:E:11:DC:H2''	1:E:12:DA:H5'	2.01	0.42
3:A:276:ASN:ND2	6:A:2160:HOH:O	2.52	0.41
3:A:139:ASP:O	3:A:140:SER:C	2.59	0.41
3:A:609:MET:HE2	3:A:742:VAL:HG13	2.02	0.41
3:B:384:THR:HB	6:B:2073:HOH:O	2.20	0.41
3:A:375:LEU:HD22	3:A:397:MET:HE3	2.03	0.41
3:B:367:ARG:HD3	6:B:2186:HOH:O	2.19	0.41
3:B:157:LEU:C	3:B:157:LEU:HD12	2.41	0.41
3:B:299:VAL:HG22	3:B:553:ASP:OD1	2.20	0.41
3:B:388:ALA:N	3:B:389:PRO:CD	2.84	0.41
3:B:560:GLU:OE2	3:B:564:THR:OG1	2.37	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:17:DG:H1'	2:F:18:DG:C8	2.56	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	
3	A	790/800 (99%)	765 (97%)	18 (2%)	7 (1%)	17	35
3	B	758/800 (95%)	733 (97%)	25 (3%)	0	100	100
All	All	1548/1600 (97%)	1498 (97%)	43 (3%)	7 (0%)	29	52

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	2	SER
3	A	594	GLU
3	A	439	LEU
3	A	3	ALA
3	A	140	SER
3	A	152	SER
3	A	438	ALA

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	
3	A	659/663 (99%)	615 (93%)	44 (7%)	16	33
3	B	640/663 (96%)	593 (93%)	47 (7%)	14	28
All	All	1299/1326 (98%)	1208 (93%)	91 (7%)	15	30

All (91) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	1	MET
3	A	35	ASP
3	A	42	ASP
3	A	54	SER
3	A	58	ARG
3	A	65	PRO
3	A	76	VAL
3	A	84	VAL
3	A	108	ARG
3	A	109	LYS
3	A	112	ARG
3	A	137	TRP
3	A	150	ILE
3	A	154	ARG
3	A	155	PHE
3	A	157	LEU
3	A	194	ARG
3	A	199	ARG
3	A	254	HIS
3	A	260	MET
3	A	264	GLN
3	A	300	THR
3	A	335	THR
3	A	431	GLU
3	A	437	ARG
3	A	439	LEU
3	A	445	ASP
3	A	464	LYS
3	A	479	ARG
3	A	492	ARG
3	A	507	LYS
3	A	552	LEU
3	A	575	LYS
3	A	584	ARG
3	A	593	ASN

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Mol	Chain	Res	Type
3	A	656	ARG
3	A	667	ARG
3	A	695	ILE
3	A	700	SER
3	A	739	MET
3	A	752	HIS
3	A	761	SER
3	A	768	SER
3	A	784	GLU
3	B	10	HIS
3	B	13	MET
3	B	20	LEU
3	B	49	GLN
3	B	66	ILE
3	B	68	MET
3	B	71	ILE
3	B	84	VAL
3	B	115	THR
3	B	129	GLN
3	B	137	TRP
3	B	139	ASP
3	B	141	LYS
3	B	155	PHE
3	B	198	ARG
3	B	206	ILE
3	B	220	ARG
3	B	247	THR
3	B	250	THR
3	B	264	GLN
3	B	270	ASP
3	B	350	ARG
3	B	396	LYS
3	B	402	GLU
3	B	408	GLU
3	B	424	VAL
3	B	456	GLU
3	B	460	LEU
3	B	464	LYS
3	B	506	LEU
3	B	513	VAL
3	B	547	SER
3	B	584	ARG

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Mol	Chain	Res	Type
3	B	592	LEU
3	B	594	GLU
3	B	655	THR
3	B	668	SER
3	B	669	THR
3	B	694	GLU
3	B	695	ILE
3	B	718	LYS
3	B	734	GLN
3	B	735	LEU
3	B	737	GLU
3	B	768	SER
3	B	794	ARG
3	B	800	SER

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

Mol	Chain	Res	Type
3	A	281	GLN
3	A	430	ASN
3	A	471	HIS
3	A	538	HIS
3	A	593	ASN
3	A	616	ASN
3	B	49	GLN
3	B	214	ASN
3	B	276	ASN
3	B	289	ASN
3	B	332	GLN
3	B	344	GLN
3	B	370	HIS
3	B	590	GLN
3	B	760	HIS

5.3.3 RNA ⓘ

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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$
5	ADP	A	2001	4	24,29,29	1.26	2 (8%)	29,45,45	1.69	4 (13%)
5	ADP	B	2002	4	24,29,29	1.18	2 (8%)	29,45,45	1.44	3 (10%)

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
5	ADP	A	2001	4	-	2/12/32/32	0/3/3/3
5	ADP	B	2002	4	-	5/12/32/32	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	2001	ADP	C2-N3	4.18	1.38	1.32
5	B	2002	ADP	C2-N3	4.06	1.38	1.32
5	A	2001	ADP	C2-N1	2.93	1.39	1.33
5	B	2002	ADP	C2-N1	2.39	1.38	1.33

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	2001	ADP	N3-C2-N1	-6.10	119.14	128.68
5	B	2002	ADP	N3-C2-N1	-5.43	120.19	128.68
5	A	2001	ADP	O3B-PB-O3A	3.56	116.56	104.64
5	A	2001	ADP	PA-O3A-PB	-3.13	122.07	132.83
5	A	2001	ADP	C3'-C2'-C1'	2.84	105.25	100.98
5	B	2002	ADP	O2B-PB-O3A	2.40	112.70	104.64
5	B	2002	ADP	C3'-C2'-C1'	2.25	104.36	100.98

There are no chirality outliers.

All (7) torsion outliers are listed below:

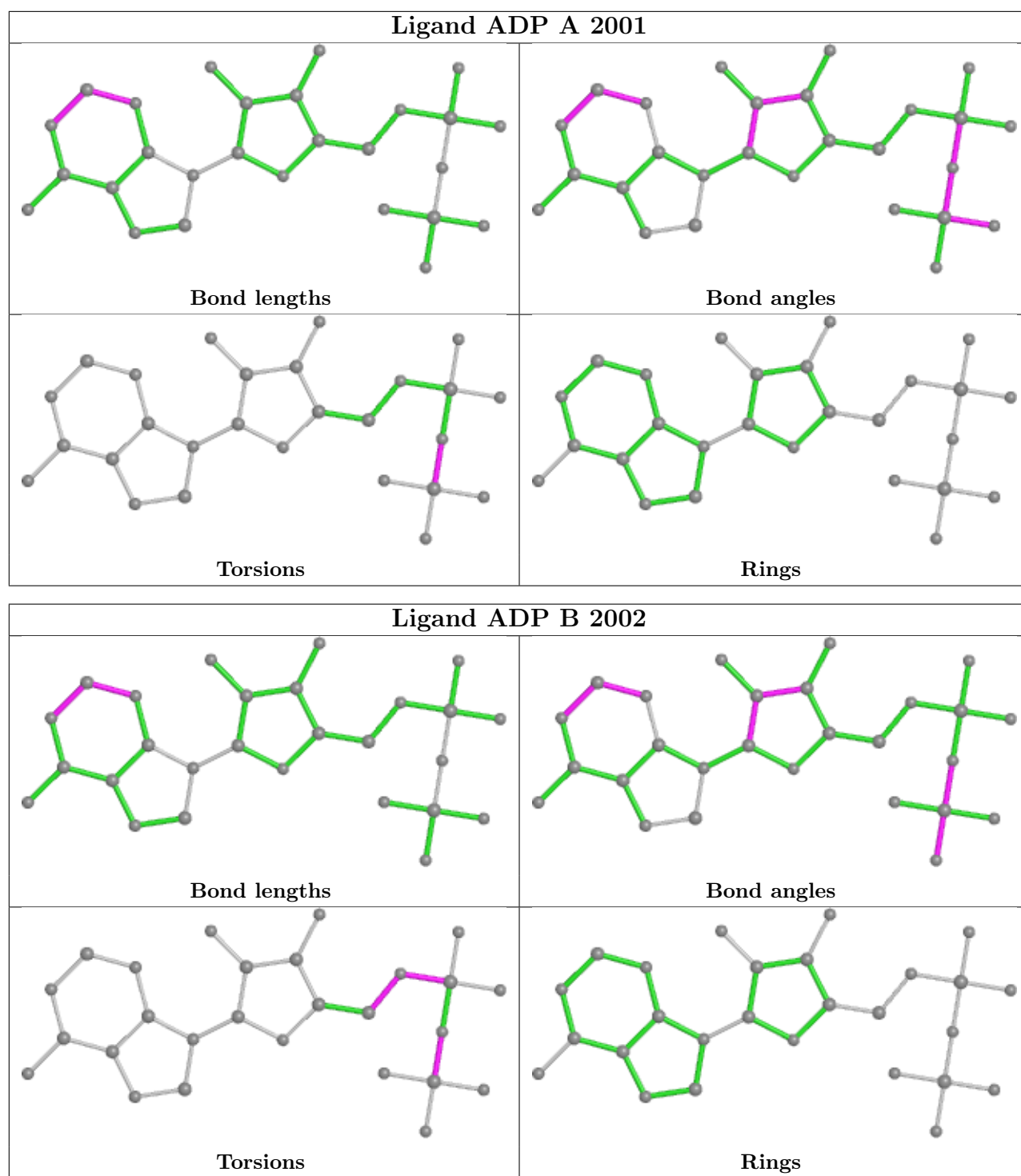
Mol	Chain	Res	Type	Atoms
5	A	2001	ADP	PA-O3A-PB-O2B
5	B	2002	ADP	C5'-O5'-PA-O1A
5	B	2002	ADP	C5'-O5'-PA-O2A
5	B	2002	ADP	C5'-O5'-PA-O3A
5	B	2002	ADP	C4'-C5'-O5'-PA
5	B	2002	ADP	PA-O3A-PB-O1B
5	A	2001	ADP	PA-O3A-PB-O1B

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	2002	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	E	18/30 (60%)	0.84	4 (22%) 0 0	4, 10, 16, 19	0
2	F	17/30 (56%)	0.33	1 (5%) 22 17	5, 10, 15, 18	0
3	A	794/800 (99%)	-0.02	29 (3%) 41 34	4, 10, 14, 20	0
3	B	766/800 (95%)	0.03	28 (3%) 41 34	4, 10, 14, 23	0
All	All	1595/1660 (96%)	0.02	62 (3%) 39 32	4, 10, 14, 23	0

All (62) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	B	106	VAL	6.4
3	B	12	PRO	6.3
1	E	18	DG	6.2
3	B	659	ALA	6.2
3	A	667	ARG	5.1
1	E	1	DA	5.1
3	A	441	ASP	5.1
3	A	666	GLY	5.0
3	B	65	PRO	4.6
3	A	444	THR	4.6
3	A	659	ALA	4.4
2	F	14	DA	4.2
3	A	445	ASP	3.9
3	B	668	SER	3.8
3	A	593	ASN	3.6
1	E	17	DT	3.6
3	B	49	GLN	3.5
3	B	9	ALA	3.5
3	B	29	LEU	3.5
3	A	443	ALA	3.4
3	B	56	THR	3.4

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Mol	Chain	Res	Type	RSRZ
3	B	74	HIS	3.3
3	B	140	SER	3.3
1	E	16	DG	3.2
3	B	39	LEU	3.2
3	B	41	TYR	3.1
3	A	386	ASP	3.1
3	A	442	GLY	3.1
3	B	107	GLU	3.1
3	A	754	ASP	3.0
3	B	30	PHE	3.0
3	B	35	ASP	2.9
3	B	54	SER	2.9
3	A	475	ILE	2.9
3	A	62	ALA	2.9
3	A	768	SER	2.8
3	A	1	MET	2.7
3	A	9	ALA	2.7
3	B	36	PHE	2.7
3	A	140	SER	2.6
3	B	25	PRO	2.6
3	A	220	ARG	2.5
3	B	10	HIS	2.5
3	B	52	ASP	2.5
3	A	658	GLY	2.5
3	A	63	GLY	2.4
3	B	13	MET	2.4
3	A	103	LYS	2.4
3	B	66	ILE	2.4
3	A	668	SER	2.3
3	A	141	LYS	2.3
3	A	61	SER	2.2
3	A	439	LEU	2.2
3	B	456	GLU	2.2
3	B	549	LEU	2.1
3	A	64	GLU	2.1
3	A	449	ARG	2.1
3	A	752	HIS	2.1
3	B	95	GLN	2.1
3	B	475	ILE	2.1
3	B	24	HIS	2.0
3	A	440	ALA	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 monosaccharides in this entry.

6.4 Ligands [i](#)

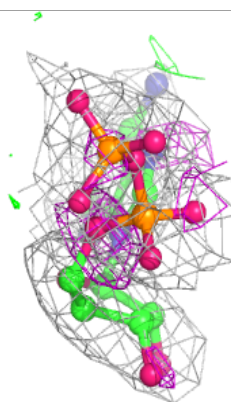
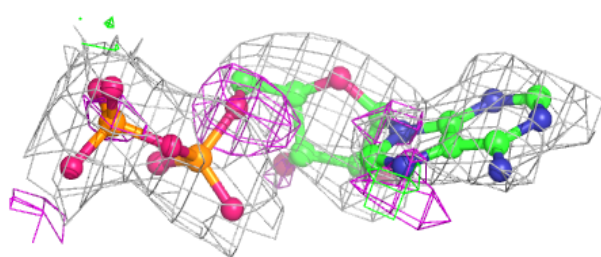
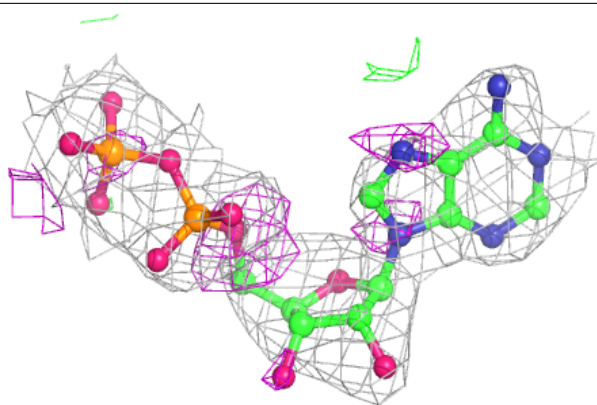
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	MG	A	1001	1/1	0.89	0.05	41,41,41,41	0
4	MG	B	1002	1/1	0.90	0.45	54,54,54,54	0
5	ADP	B	2002	27/27	0.90	0.20	64,71,73,76	0
5	ADP	A	2001	27/27	0.96	0.14	50,56,58,58	0

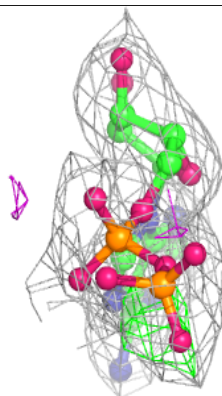
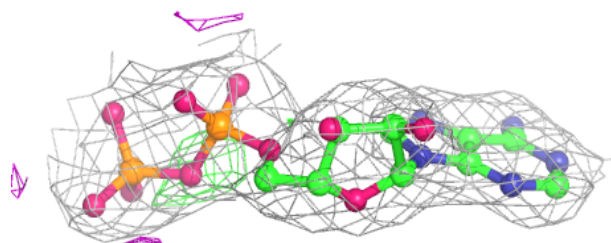
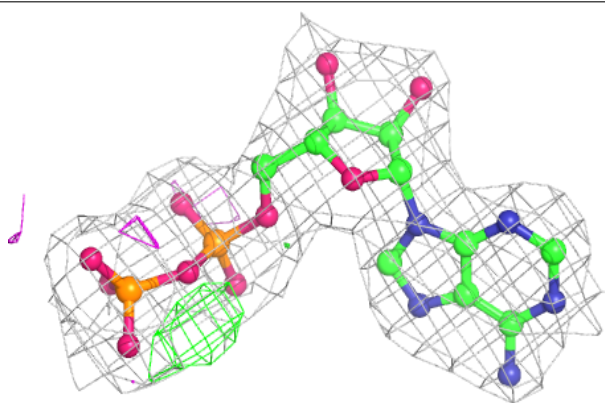
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around ADP B 2002:

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

**Electron density around ADP A 2001:**

$2mF_o-DF_c$ (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.