



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:01 PM UTC

PDB ID : 1M7G / pdb_00001m7g
Title : Crystal structure of APS kinase from *Penicillium Chrysogenum*: Ternary structure with ADP and APS
Authors : Lansdon, E.B.; Segel, I.H.; Fisher, A.J.
Deposited on : 2002-07-19
Resolution : 1.43 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

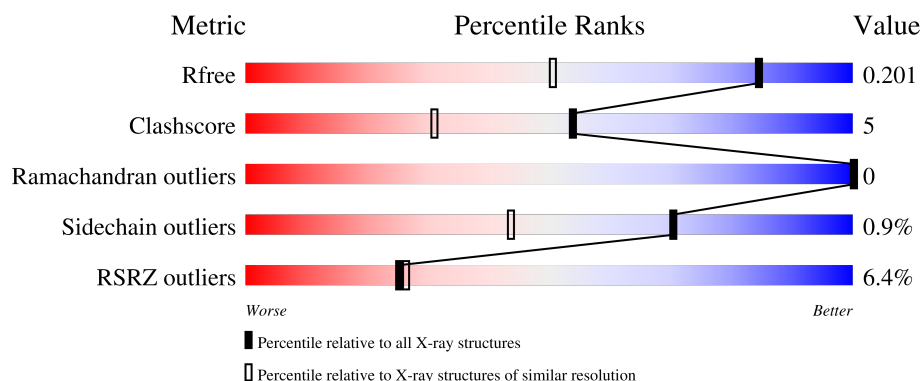
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.43 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	3234 (1.46-1.42)
Clashscore	190562	3289 (1.46-1.42)
Ramachandran outliers	187476	3248 (1.46-1.42)
Sidechain outliers	187428	3248 (1.46-1.42)
RSRZ outliers	180081	3234 (1.46-1.42)

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	211	7% 90% 9%
1	B	211	4% 78% 7% 14%
1	C	211	7% 88% 11%
1	D	211	6% 76% 9% 13%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	GOL	B	2011	-	-	X	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 7231 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 Adenylylsulfate kinase.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	208	Total	C	N	O	0	0	0
			1641	1030	293	318			
1	B	182	Total	C	N	O	0	0	0
			1446	914	256	276			
1	C	209	Total	C	N	O	0	0	0
			1646	1033	294	319			
1	D	183	Total	C	N	O	0	0	0
			1444	913	255	276			

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



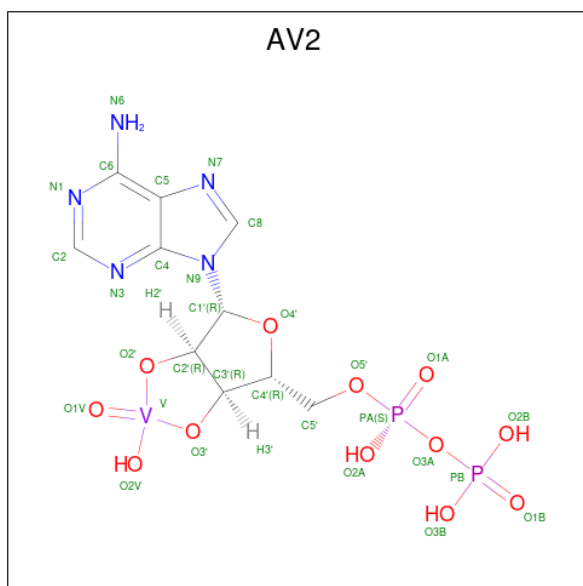
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		

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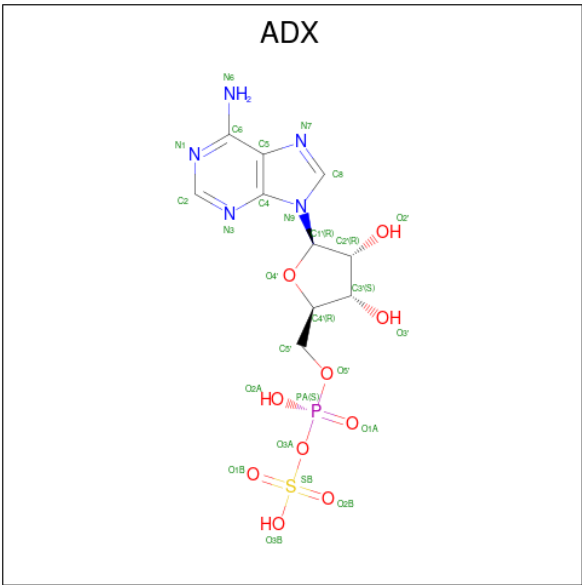
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is ADENOSINE-5'-DIPHOSPHATE-2',3'-VANADATE (CCD ID: AV2) (formula: $C_{10}H_{14}N_5O_{12}P_2V$).



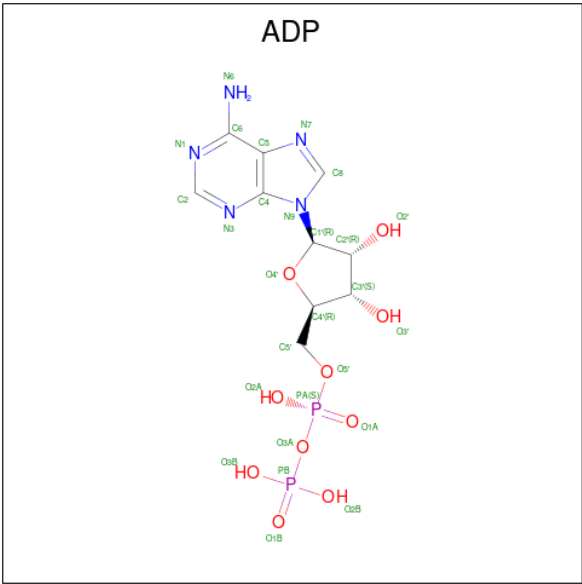
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	V	0	0
			30	10	5	12	2	1		
3	C	1	Total	C	N	O	P	V	0	0
			30	10	5	12	2	1		

- Molecule 4 is ADENOSINE-5'-PHOSPHOSULFATE (CCD ID: ADX) (formula: $C_{10}H_{14}N_5O_{10}PS$).



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

- Molecule 5 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂).



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

- Molecule 6 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			6	3	3		
6	C	1	Total	C	O	0	0
			6	3	3		

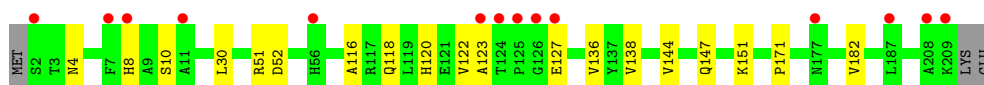
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	230	Total	O	0	0
			230	230		
7	B	189	Total	O	0	0
			189	189		
7	C	188	Total	O	0	0
			188	188		
7	D	183	Total	O	0	0
			183	183		

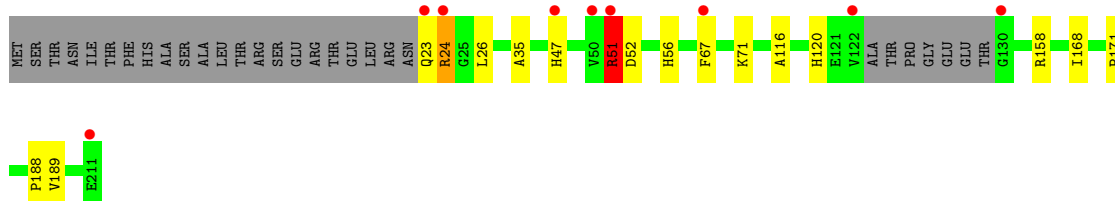
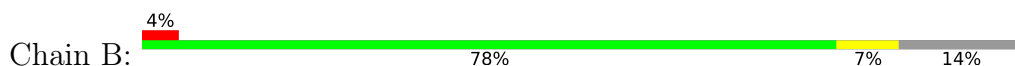
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

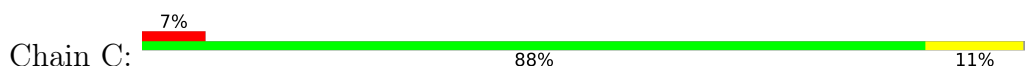
- Molecule 1: Adenylylsulfate kinase



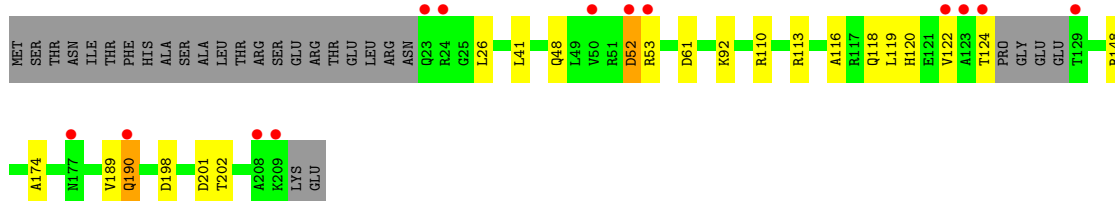
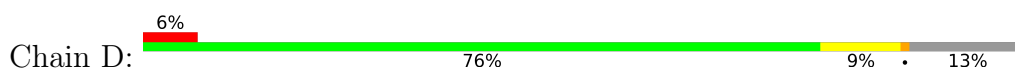
- Molecule 1: Adenylylsulfate kinase



- Molecule 1: Adenylylsulfate kinase



- Molecule 1: Adenylylsulfate kinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	81.52Å 84.32Å 137.26Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.61 – 1.43 29.61 – 1.43	Depositor EDS
% Data completeness (in resolution range)	99.1 (29.61-1.43) 99.3 (29.61-1.43)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.69 (at 1.43Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.180 , 0.205 (Not available) , 0.201	Depositor DCC
R_{free} test set	8730 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	13.4	Xtriage
Anisotropy	0.025	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 39.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.010 for k,h,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	7231	wwPDB-VP
Average B, all atoms (Å ²)	18.0	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 47.00 % 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 1.0560e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: SO4, ADX, AV2, GOL, 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	0.79	0/1672	1.08	3/2267 (0.1%)
1	B	0.78	0/1473	1.02	2/1990 (0.1%)
1	C	0.75	0/1677	1.03	2/2274 (0.1%)
1	D	0.76	0/1471	1.04	2/1993 (0.1%)
All	All	0.77	0/6293	1.04	9/8524 (0.1%)

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	148	ARG	N-CA-C	-7.45	100.16	111.56
1	A	10	SER	N-CA-C	6.42	120.37	112.54
1	B	51	ARG	N-CA-C	5.83	117.71	111.36
1	D	52	ASP	N-CA-C	5.63	119.32	112.23
1	C	192	ALA	N-CA-C	-5.56	105.30	111.36
1	A	127	GLU	N-CA-C	-5.43	101.04	109.72
1	B	171	PRO	N-CA-C	5.27	120.48	111.68
1	A	171	PRO	N-CA-C	5.11	120.21	111.68
1	C	66	ARG	N-CA-C	5.06	119.30	113.18

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	1641	0	1621	15	0
1	B	1446	0	1437	18	0
1	C	1646	0	1623	18	0
1	D	1444	0	1433	11	0
2	A	15	0	0	0	0
2	B	5	0	0	0	0
2	C	10	0	0	0	0
3	A	30	0	11	0	0
3	C	30	0	11	0	0
4	A	27	0	11	0	0
4	B	27	0	13	0	0
4	C	27	0	12	0	0
4	D	27	0	12	0	0
5	B	27	0	12	1	0
5	D	27	0	12	0	0
6	B	6	0	8	5	0
6	C	6	0	8	0	0
7	A	230	0	0	2	0
7	B	189	0	0	0	0
7	C	188	0	0	3	0
7	D	183	0	0	2	0
All	All	7231	0	6224	62	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (62) 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:189:VAL:H	6:B:2011:GOL:H12	1.26	0.98
1:A:4:ASN:HD21	1:A:123:ALA:H	1.15	0.91
1:C:4:ASN:HD21	1:C:123:ALA:H	1.19	0.91
1:B:24:ARG:HB2	1:B:24:ARG:CZ	2.04	0.87
1:A:151:LYS:HA	1:A:151:LYS:HE2	1.58	0.85
1:B:23:GLN:HE22	1:B:56:HIS:H	1.26	0.80
1:D:190:GLN:NE2	1:D:190:GLN:H	1.85	0.74
1:B:189:VAL:H	6:B:2011:GOL:C1	2.02	0.73
1:A:4:ASN:ND2	1:A:123:ALA:H	1.87	0.72
1:B:189:VAL:N	6:B:2011:GOL:H12	2.02	0.70
1:C:4:ASN:ND2	1:C:123:ALA:H	1.90	0.69
1:C:51:ARG:HD2	1:C:52:ASP:OD1	1.96	0.65
1:D:53:ARG:NH2	1:D:201:ASP:OD2	2.27	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:144:VAL:O	1:C:147:GLN:HG2	1.99	0.63
1:B:23:GLN:NE2	1:B:56:HIS:H	1.96	0.63
1:A:144:VAL:O	1:A:147:GLN:HG2	2.00	0.62
1:B:158:ARG:CZ	1:B:168:ILE:HD12	2.31	0.60
1:B:51:ARG:NE	1:B:52:ASP:OD1	2.36	0.58
1:A:8:HIS:HE1	7:A:2116:HOH:O	1.88	0.55
1:B:23:GLN:HE22	1:B:56:HIS:N	2.00	0.55
1:C:41:LEU:HD23	1:C:189:VAL:HG13	1.88	0.55
1:A:151:LYS:HA	1:A:151:LYS:CE	2.34	0.54
1:C:209:LYS:O	1:C:210:LYS:C	2.50	0.54
1:B:51:ARG:HG3	1:B:52:ASP:N	2.23	0.53
1:D:92:LYS:HD2	1:D:119:LEU:HG	1.90	0.53
1:A:30:LEU:HD23	1:A:136:VAL:HB	1.91	0.53
1:C:146:GLU:OE2	1:C:158:ARG:NE	2.38	0.52
1:D:122:VAL:HG12	1:D:124:THR:HG23	1.90	0.51
1:A:51:ARG:HG2	1:A:52:ASP:OD1	2.10	0.51
1:C:182:VAL:HG11	1:C:192:ALA:HB1	1.93	0.50
1:C:56:HIS:CE1	7:D:1378:HOH:O	2.64	0.50
1:C:124:THR:O	1:C:127:GLU:HG2	2.12	0.50
1:A:116:ALA:O	1:A:120:HIS:HD2	1.95	0.49
1:A:118:GLN:O	1:A:122:VAL:HG13	2.12	0.49
1:B:47:HIS:CE1	1:B:51:ARG:NH1	2.80	0.49
1:D:48:GLN:O	1:D:52:ASP:HB2	2.12	0.49
1:D:110:ARG:HD3	1:D:174:ALA:O	2.12	0.49
1:B:24:ARG:HB2	1:B:24:ARG:NH1	2.28	0.48
1:B:188:PRO:HB3	6:B:2011:GOL:H31	1.96	0.48
1:D:41:LEU:HD23	1:D:189:VAL:HG23	1.93	0.48
1:C:155:LYS:HD3	7:C:2177:HOH:O	2.14	0.48
1:D:61:ASP:HB2	7:D:1489:HOH:O	2.13	0.48
1:A:4:ASN:HD21	1:A:123:ALA:N	1.98	0.47
1:D:116:ALA:O	1:D:120:HIS:HD2	1.97	0.47
1:C:4:ASN:HD21	1:C:123:ALA:N	2.00	0.47
1:A:138:VAL:HA	1:A:182:VAL:CG2	2.46	0.46
1:D:110:ARG:HG3	1:D:113:ARG:NH2	2.31	0.46
1:B:47:HIS:CE1	1:B:51:ARG:HH11	2.35	0.45
1:B:116:ALA:O	1:B:120:HIS:HD2	2.00	0.44
1:B:67:PHE:O	1:B:71:LYS:HD2	2.18	0.44
1:C:116:ALA:O	1:C:120:HIS:HD2	2.02	0.43
1:C:124:THR:HG21	7:C:2171:HOH:O	2.18	0.43
1:B:189:VAL:HG23	6:B:2011:GOL:H11	2.01	0.43
1:C:155:LYS:O	1:C:159:GLU:HG3	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:51:ARG:CD	1:C:52:ASP:OD1	2.65	0.42
1:A:182:VAL:O	1:A:182:VAL:HG23	2.18	0.42
1:A:51:ARG:HE	1:A:52:ASP:CG	2.27	0.42
1:C:114:ASP:HB2	7:C:2134:HOH:O	2.19	0.41
1:A:147:GLN:HG3	7:A:2219:HOH:O	2.20	0.41
1:D:198:ASP:O	1:D:202:THR:HG23	2.21	0.41
1:C:151:LYS:HD3	1:C:151:LYS:HA	1.90	0.40
1:B:35:ALA:HA	5:B:1304:ADP:H5'1	2.04	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	206/211 (98%)	200 (97%)	6 (3%)	0	100	100
1	B	178/211 (84%)	173 (97%)	5 (3%)	0	100	100
1	C	207/211 (98%)	201 (97%)	6 (3%)	0	100	100
1	D	179/211 (85%)	175 (98%)	4 (2%)	0	100	100
All	All	770/844 (91%)	749 (97%)	21 (3%)	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	175/180 (97%)	175 (100%)	0	100	100
1	B	153/180 (85%)	150 (98%)	3 (2%)	48	15
1	C	175/180 (97%)	175 (100%)	0	100	100
1	D	153/180 (85%)	150 (98%)	3 (2%)	48	15
All	All	656/720 (91%)	650 (99%)	6 (1%)	70	44

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	24	ARG
1	B	26	LEU
1	B	51	ARG
1	D	26	LEU
1	D	118	GLN
1	D	190	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	4	ASN
1	A	8	HIS
1	A	47	HIS
1	A	56	HIS
1	A	120	HIS
1	B	23	GLN
1	B	48	GLN
1	B	120	HIS
1	B	190	GLN
1	C	4	ASN
1	C	23	GLN
1	C	48	GLN
1	C	56	HIS
1	C	120	HIS
1	C	147	GLN
1	D	47	HIS
1	D	48	GLN
1	D	98	ASN
1	D	118	GLN
1	D	120	HIS
1	D	147	GLN

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Mol	Chain	Res	Type
1	D	190	GLN
1	D	195	GLN

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 oligosaccharides 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$
5	ADP	D	1309	-	28,29,29	2.03	5 (17%)	43,45,45	2.09	10 (23%)
2	SO4	A	2002	-	4,4,4	0.43	0	6,6,6	0.50	0
3	AV2	C	1306	3	31,33,33	4.51	11 (35%)	41,53,53	2.00	10 (24%)
2	SO4	C	2006	-	4,4,4	0.41	0	6,6,6	0.20	0
4	ADX	A	1302	-	29,29,29	1.89	7 (24%)	42,45,45	1.51	8 (19%)
4	ADX	C	1307	-	29,29,29	1.85	7 (24%)	42,45,45	1.46	6 (14%)
6	GOL	B	2011	-	5,5,5	0.29	0	5,5,5	0.59	0
4	ADX	B	1305	-	29,29,29	1.85	8 (27%)	42,45,45	1.46	6 (14%)
4	ADX	D	1310	-	29,29,29	1.69	7 (24%)	42,45,45	1.37	5 (11%)
2	SO4	A	2003	-	4,4,4	0.41	0	6,6,6	0.22	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	ADP	B	1304	-	28,29,29	1.37	4 (14%)	43,45,45	2.08	12 (27%)
2	SO4	C	2005	-	4,4,4	0.38	0	6,6,6	0.23	0
6	GOL	C	2010	-	5,5,5	0.33	0	5,5,5	0.88	0
3	AV2	A	1301	3	31,33,33	4.41	9 (29%)	41,53,53	1.90	11 (26%)
2	SO4	B	2004	-	4,4,4	0.43	0	6,6,6	0.13	0
2	SO4	A	2001	-	4,4,4	0.45	0	6,6,6	0.56	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
5	ADP	D	1309	-	-	2/16/32/32	0/3/3/3
4	ADX	C	1307	-	-	1/10/32/32	0/3/3/3
3	AV2	C	1306	3	-	1/16/42/42	0/4/4/4
4	ADX	A	1302	-	-	1/10/32/32	0/3/3/3
6	GOL	B	2011	-	-	2/4/4/4	-
4	ADX	B	1305	-	-	0/10/32/32	0/3/3/3
5	ADP	B	1304	-	-	2/16/32/32	0/3/3/3
6	GOL	C	2010	-	-	4/4/4/4	-
3	AV2	A	1301	3	-	1/16/42/42	0/4/4/4
4	ADX	D	1310	-	-	0/10/32/32	0/3/3/3

All (58) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1301	AV2	O3'-V	17.33	2.00	1.71
3	C	1306	AV2	O3'-V	17.11	1.99	1.71
3	C	1306	AV2	O2'-V	15.74	1.97	1.71
3	A	1301	AV2	O2'-V	15.08	1.96	1.71
5	D	1309	ADP	PA-O3A	7.69	1.67	1.59
4	A	1302	ADX	O2'-C2'	5.97	1.57	1.43
4	C	1307	ADX	O2'-C2'	5.94	1.57	1.43
4	B	1305	ADX	O2'-C2'	5.80	1.57	1.43
4	D	1310	ADX	O2'-C2'	5.26	1.56	1.43
3	C	1306	AV2	O1V-V	5.19	1.68	1.62
5	D	1309	ADP	C5-N7	-4.07	1.31	1.39
5	B	1304	ADP	PA-O3A	3.95	1.63	1.59
4	C	1307	ADX	O4'-C1'	3.79	1.50	1.42
4	A	1302	ADX	C4-N3	3.34	1.40	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	1307	ADX	C4-N3	3.22	1.40	1.34
3	A	1301	AV2	C4-N3	3.18	1.40	1.34
4	A	1302	ADX	O4'-C1'	3.15	1.49	1.42
3	C	1306	AV2	C4-N9	-3.15	1.31	1.37
3	C	1306	AV2	C5-N7	-3.07	1.33	1.39
5	B	1304	ADP	C5-N7	-3.03	1.33	1.39
3	A	1301	AV2	C5-N7	-3.03	1.33	1.39
4	D	1310	ADX	C4-N9	2.90	1.43	1.37
4	A	1302	ADX	C4-N9	2.89	1.43	1.37
4	B	1305	ADX	O3A-SB	-2.89	1.52	1.65
4	A	1302	ADX	C2'-C1'	-2.84	1.44	1.53
4	B	1305	ADX	O4'-C1'	2.79	1.48	1.42
4	B	1305	ADX	PA-O3A	2.77	1.66	1.59
3	C	1306	AV2	O3'-C3'	2.74	1.45	1.43
4	C	1307	ADX	C2'-C1'	-2.71	1.45	1.53
4	C	1307	ADX	C4-N9	2.70	1.43	1.37
4	B	1305	ADX	O4'-C4'	2.62	1.50	1.45
3	A	1301	AV2	C5-C4	2.61	1.43	1.39
3	A	1301	AV2	PA-O3A	2.60	1.62	1.59
4	B	1305	ADX	C3'-C4'	2.58	1.59	1.53
5	D	1309	ADP	C5-C4	2.56	1.43	1.39
3	C	1306	AV2	PA-O2A	-2.54	1.43	1.55
3	A	1301	AV2	C4-N9	-2.54	1.32	1.37
4	A	1302	ADX	O3'-C3'	-2.52	1.36	1.43
3	C	1306	AV2	C4-N3	2.51	1.39	1.34
3	A	1301	AV2	C2-N1	2.51	1.38	1.33
4	D	1310	ADX	O4'-C4'	2.45	1.50	1.45
5	D	1309	ADP	C4-N3	2.44	1.39	1.34
5	B	1304	ADP	C4-N9	-2.43	1.32	1.37
5	D	1309	ADP	C4-N9	-2.37	1.32	1.37
3	A	1301	AV2	O3'-C3'	2.29	1.45	1.43
4	D	1310	ADX	C3'-C4'	2.24	1.58	1.53
4	D	1310	ADX	O3A-SB	-2.23	1.55	1.65
4	D	1310	ADX	C4-N3	2.23	1.38	1.34
4	D	1310	ADX	C2'-C1'	-2.19	1.46	1.53
5	B	1304	ADP	C5-C4	2.18	1.43	1.39
4	A	1302	ADX	C2-N3	2.17	1.37	1.33
4	B	1305	ADX	O3'-C3'	-2.10	1.37	1.43
3	C	1306	AV2	C2-N1	2.08	1.37	1.33
4	C	1307	ADX	O3'-C3'	-2.06	1.37	1.43
4	B	1305	ADX	C2'-C1'	-2.05	1.47	1.53
3	C	1306	AV2	C5-C4	2.03	1.42	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	1307	ADX	C5-C4	-2.03	1.35	1.39
3	C	1306	AV2	C2'-C3'	-2.03	1.48	1.53

All (68) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1304	ADP	N3-C2-N1	-6.98	118.02	128.58
5	D	1309	ADP	N3-C2-N1	-6.69	118.45	128.58
3	C	1306	AV2	N3-C2-N1	-6.13	119.31	128.58
3	A	1301	AV2	N3-C2-N1	-5.83	119.75	128.58
5	D	1309	ADP	C5-C4-N3	-5.18	119.58	126.72
3	C	1306	AV2	C5-C4-N3	-4.96	119.88	126.72
3	A	1301	AV2	C5-C4-N3	-4.69	120.27	126.72
4	D	1310	ADX	C3'-C2'-C1'	4.65	110.26	101.46
5	B	1304	ADP	C5-C4-N3	-4.63	120.34	126.72
4	C	1307	ADX	C3'-C2'-C1'	4.61	110.18	101.46
4	B	1305	ADX	C3'-C2'-C1'	4.45	109.89	101.46
5	D	1309	ADP	C2-N3-C4	4.33	122.40	111.83
5	D	1309	ADP	N3-C4-N9	4.21	134.33	127.17
5	B	1304	ADP	C2-N3-C4	4.20	122.09	111.83
3	C	1306	AV2	N3-C4-N9	4.18	134.28	127.17
4	A	1302	ADX	C3'-C2'-C1'	4.02	109.06	101.46
3	C	1306	AV2	C2-N3-C4	3.77	121.04	111.83
3	A	1301	AV2	N3-C4-N9	3.77	133.58	127.17
5	B	1304	ADP	N3-C4-N9	3.74	133.53	127.17
3	A	1301	AV2	C2-N3-C4	3.66	120.76	111.83
5	B	1304	ADP	C4-N9-C1'	-3.44	118.58	126.63
5	D	1309	ADP	C5-N7-C8	3.30	108.63	103.45
5	B	1304	ADP	C5-N7-C8	3.21	108.49	103.45
3	C	1306	AV2	N9-C8-N7	-3.16	109.45	113.94
4	D	1310	ADX	O2'-C2'-C1'	-3.14	99.30	110.10
4	A	1302	ADX	C2-N1-C6	3.13	123.87	118.73
5	D	1309	ADP	C4-N9-C1'	-3.10	119.39	126.63
4	B	1305	ADX	O2'-C2'-C1'	-3.06	99.55	110.10
4	C	1307	ADX	C2-N1-C6	2.96	123.59	118.73
3	C	1306	AV2	C4-N9-C8	2.93	108.81	105.74
5	B	1304	ADP	C4-C5-N7	-2.93	107.23	110.58
3	C	1306	AV2	C5-N7-C8	2.87	107.97	103.45
5	B	1304	ADP	C1'-N9-C8	2.81	133.34	127.09
4	B	1305	ADX	C2-N1-C6	2.78	123.30	118.73
3	A	1301	AV2	C4-C5-N7	-2.78	107.40	110.58
4	A	1302	ADX	O2'-C2'-C1'	-2.77	100.57	110.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	1309	ADP	N9-C8-N7	-2.75	110.03	113.94
5	B	1304	ADP	C2-N1-C6	2.75	123.25	118.73
4	C	1307	ADX	O2'-C2'-C1'	-2.74	100.67	110.10
5	B	1304	ADP	N9-C8-N7	-2.73	110.07	113.94
3	A	1301	AV2	C5-N7-C8	2.70	107.70	103.45
5	D	1309	ADP	C1'-N9-C8	2.65	132.99	127.09
5	D	1309	ADP	C4-C5-N7	-2.58	107.63	110.58
4	B	1305	ADX	C4-N9-C1'	2.52	132.51	126.63
4	A	1302	ADX	O3B-SB-O3A	-2.47	100.73	106.02
3	A	1301	AV2	C2-N1-C6	2.46	122.78	118.73
3	A	1301	AV2	N9-C8-N7	-2.46	110.45	113.94
3	A	1301	AV2	C4-N9-C8	2.43	108.29	105.74
4	D	1310	ADX	C2-N1-C6	2.41	122.70	118.73
4	B	1305	ADX	N3-C2-N1	-2.40	124.95	128.58
3	C	1306	AV2	C4-N9-C1'	-2.39	121.04	126.63
4	A	1302	ADX	C4-N9-C1'	2.37	132.17	126.63
4	C	1307	ADX	C4-N9-C1'	2.32	132.06	126.63
3	C	1306	AV2	C4-C5-N7	-2.31	107.94	110.58
3	A	1301	AV2	O4'-C1'-C2'	-2.29	102.65	106.59
4	C	1307	ADX	O2'-C2'-C3'	-2.25	104.60	111.82
5	B	1304	ADP	C4-N9-C8	2.23	108.08	105.74
4	D	1310	ADX	N3-C2-N1	-2.18	125.28	128.58
4	A	1302	ADX	N6-C6-N1	2.18	123.22	118.38
5	B	1304	ADP	O2'-C2'-C1'	2.14	117.46	110.10
5	D	1309	ADP	C2-N1-C6	2.11	122.19	118.73
4	D	1310	ADX	C4-N9-C1'	2.09	131.52	126.63
4	A	1302	ADX	O2'-C2'-C3'	-2.08	105.16	111.82
3	A	1301	AV2	C4-N9-C1'	-2.07	121.80	126.63
4	A	1302	ADX	C5-C4-N3	2.07	129.56	126.72
4	B	1305	ADX	N6-C6-N1	2.04	122.93	118.38
4	C	1307	ADX	O3B-SB-O3A	-2.02	101.69	106.02
3	C	1306	AV2	C2-N1-C6	2.02	122.05	118.73

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	1304	ADP	PA-O3A-PB-O2B
6	B	2011	GOL	O1-C1-C2-O2
6	B	2011	GOL	O1-C1-C2-C3
6	C	2010	GOL	O1-C1-C2-C3
6	C	2010	GOL	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
5	B	1304	ADP	PA-O3A-PB-O1B
5	D	1309	ADP	PA-O3A-PB-O1B
3	A	1301	AV2	PA-O3A-PB-O1B
3	C	1306	AV2	PA-O3A-PB-O1B
6	C	2010	GOL	C1-C2-C3-O3
5	D	1309	ADP	PA-O3A-PB-O2B
6	C	2010	GOL	O2-C2-C3-O3
4	A	1302	ADX	O4'-C1'-N9-C8
4	C	1307	ADX	O4'-C1'-N9-C8

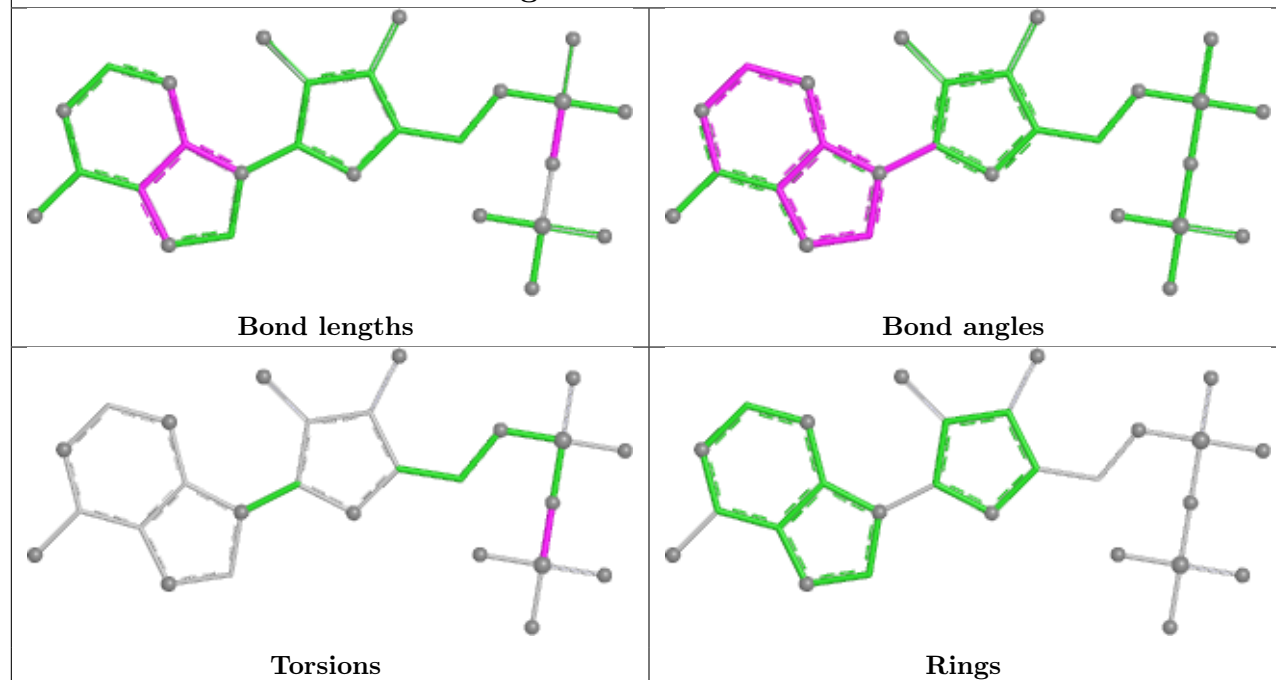
There are no ring outliers.

2 monomers are involved in 6 short contacts:

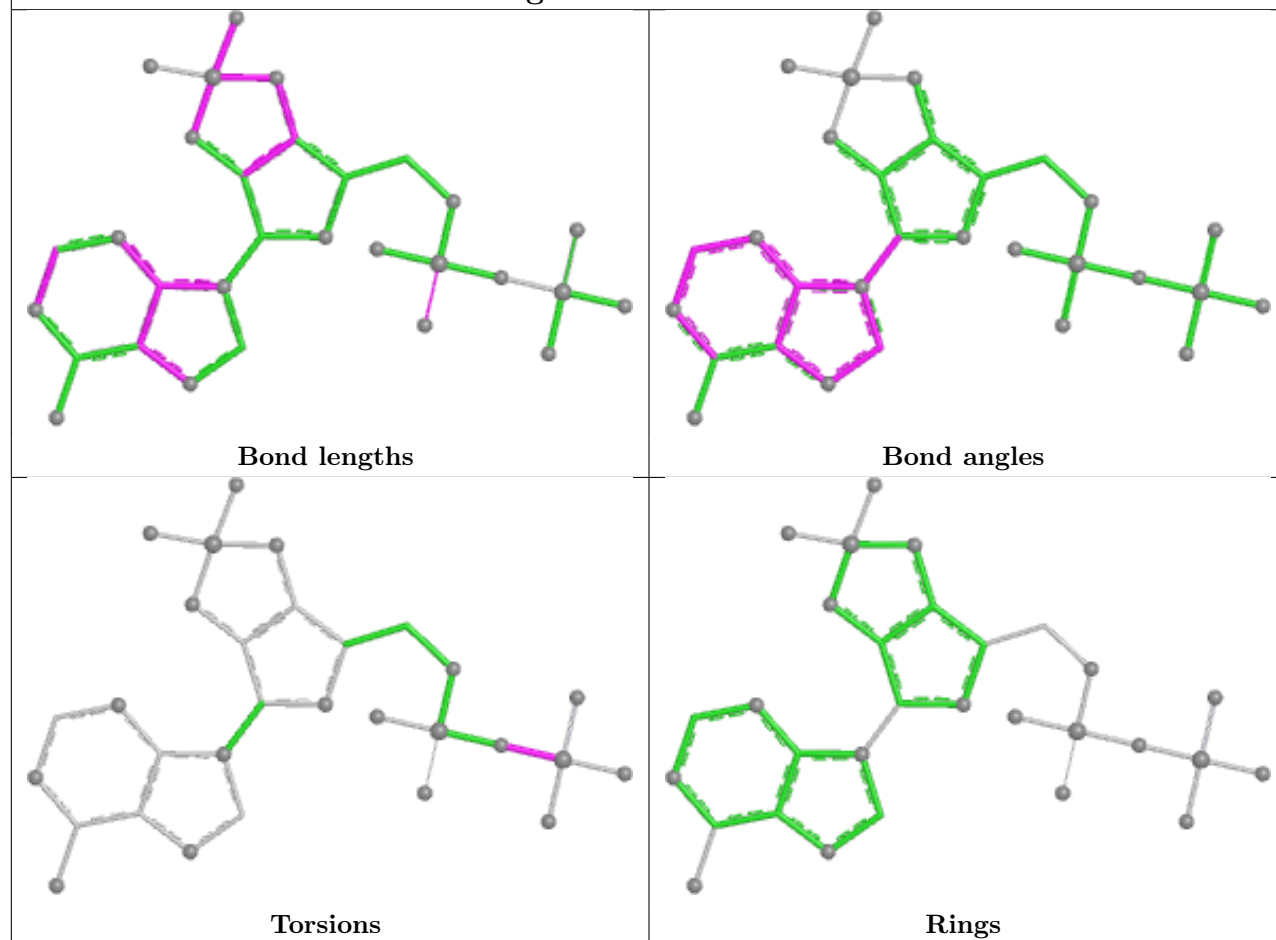
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	2011	GOL	5	0
5	B	1304	ADP	1	0

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.

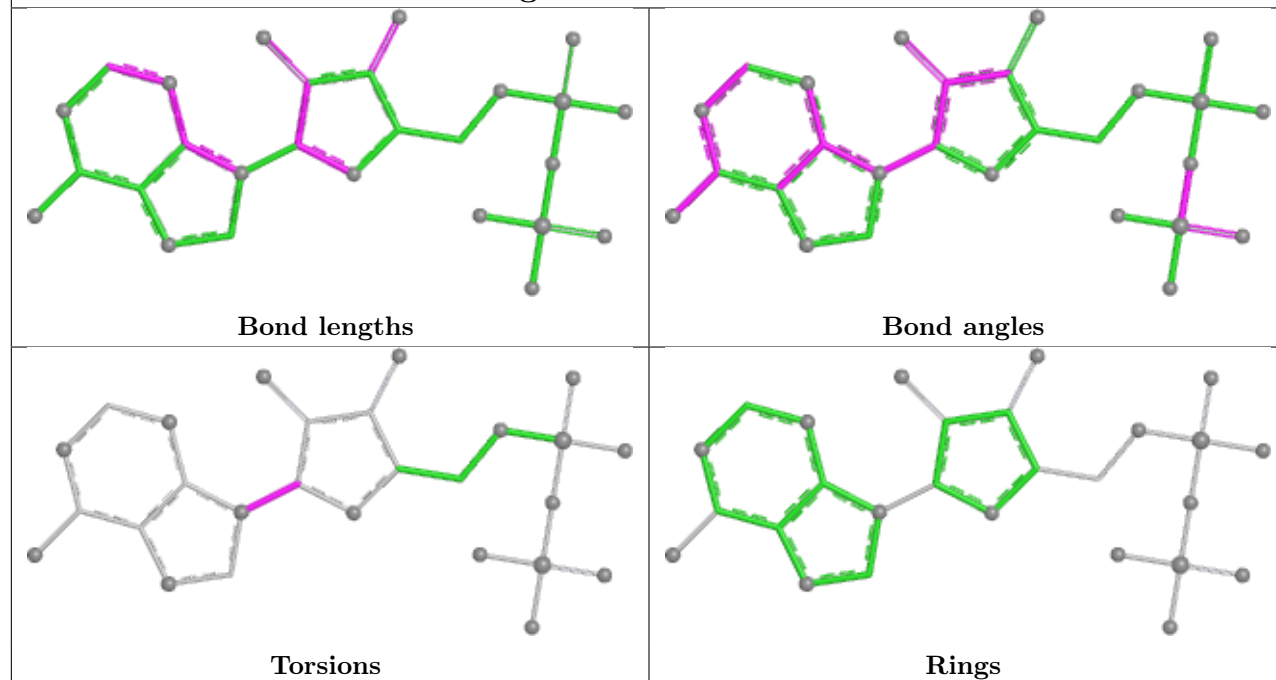
Ligand ADP D 1309



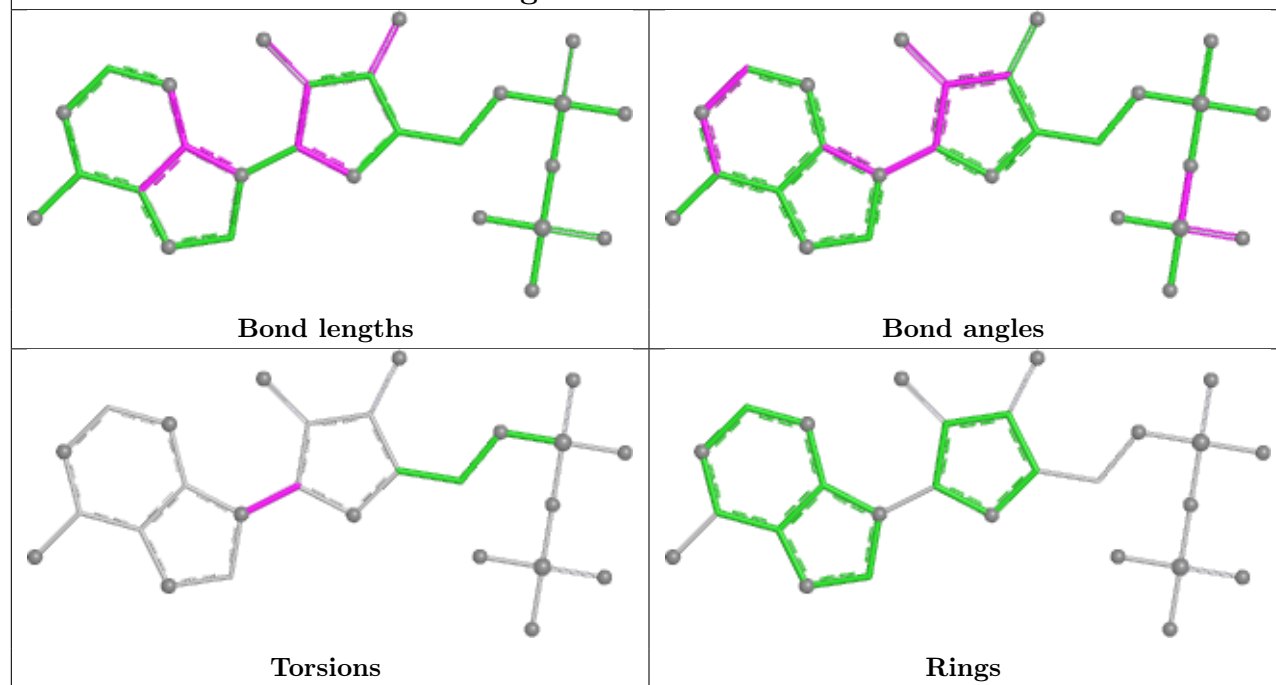
Ligand AV2 C 1306



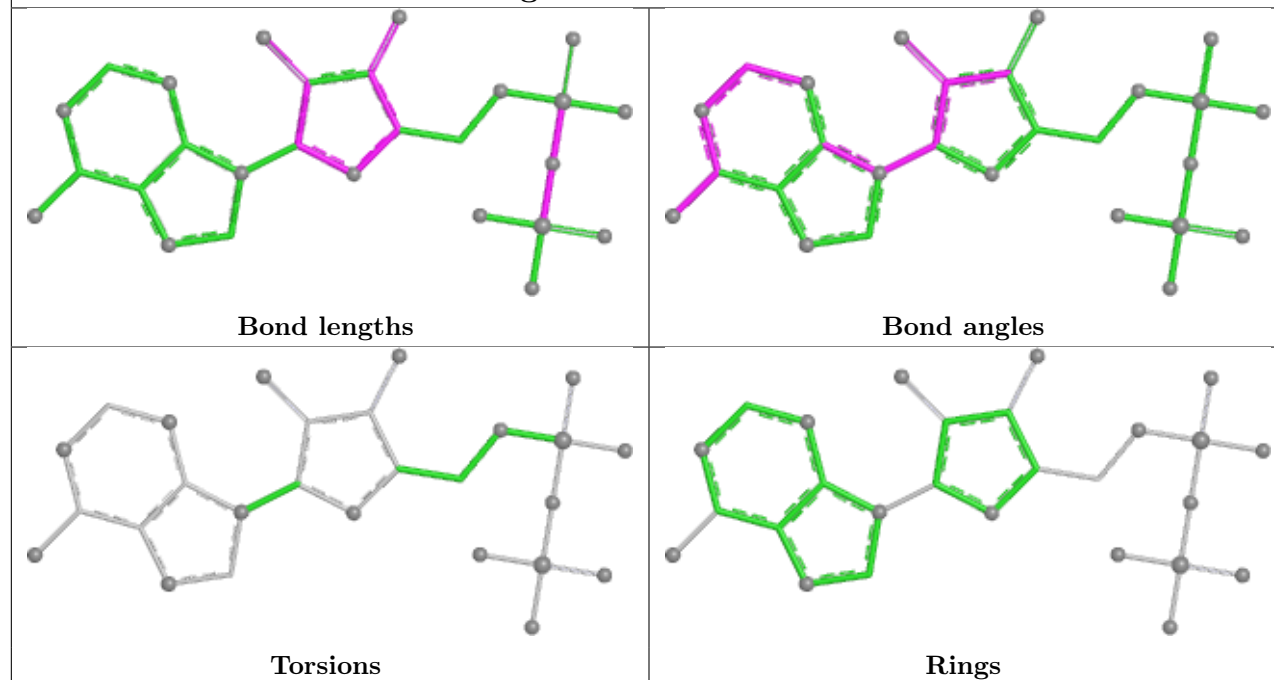
Ligand ADX A 1302



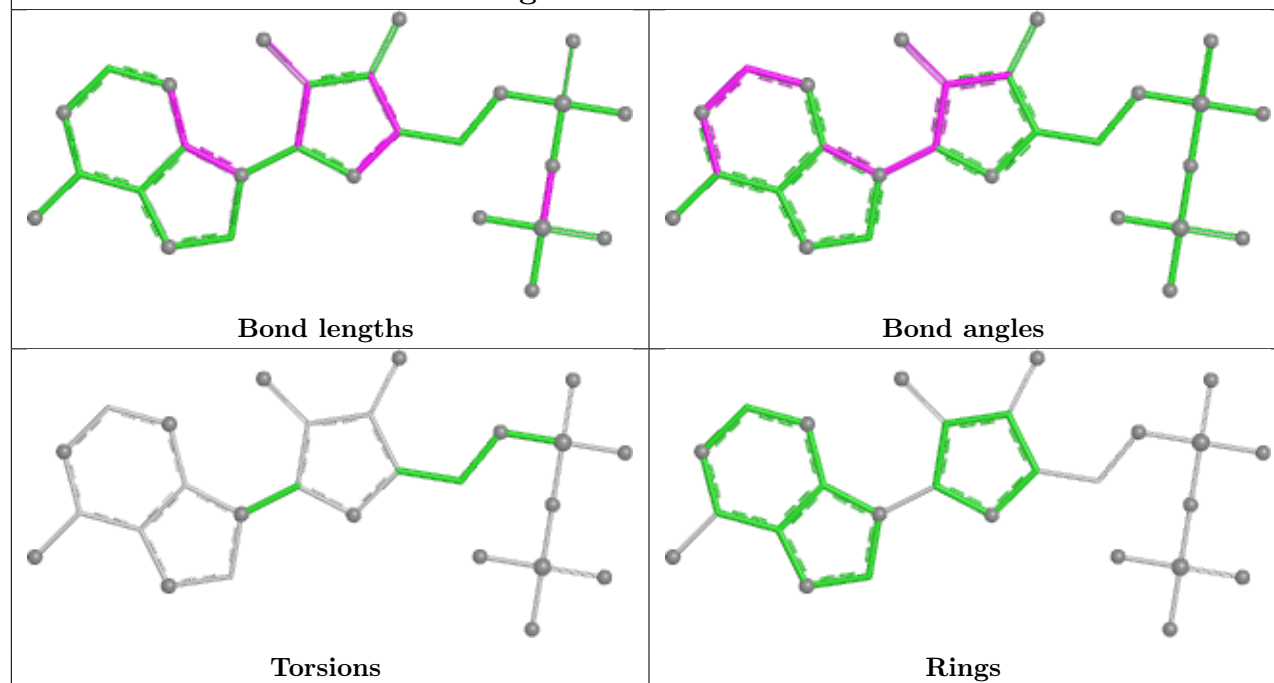
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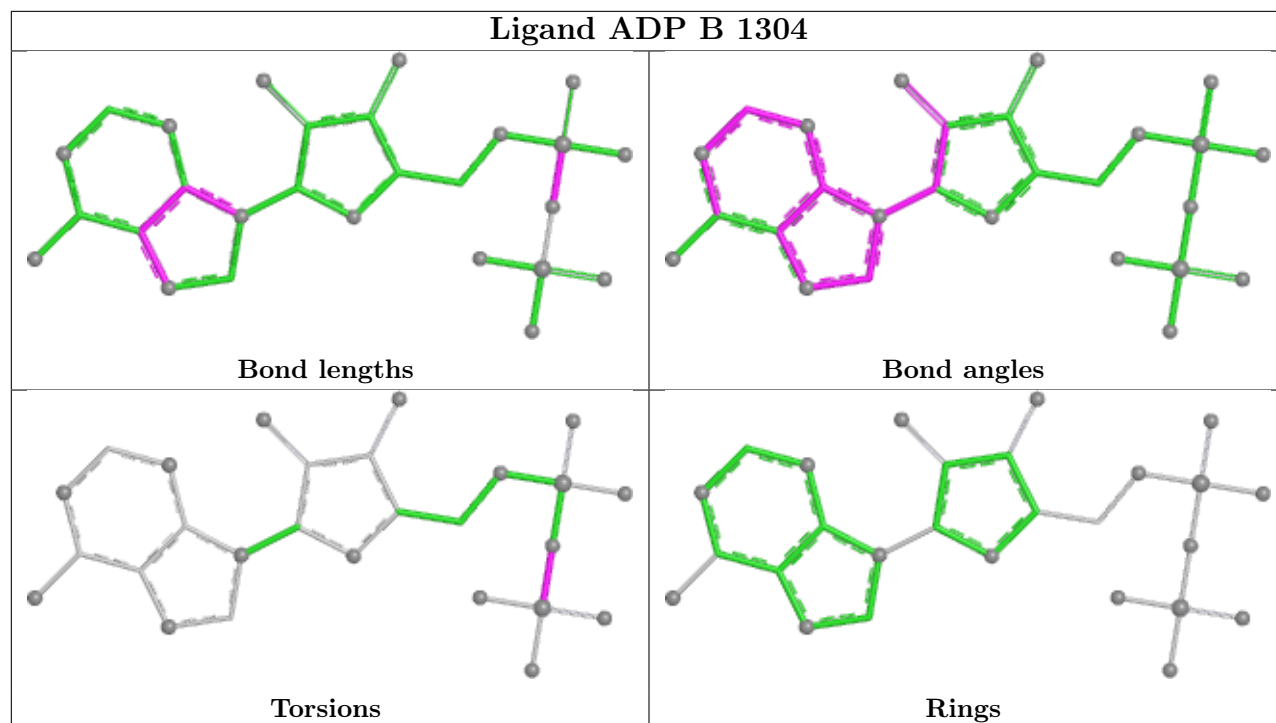
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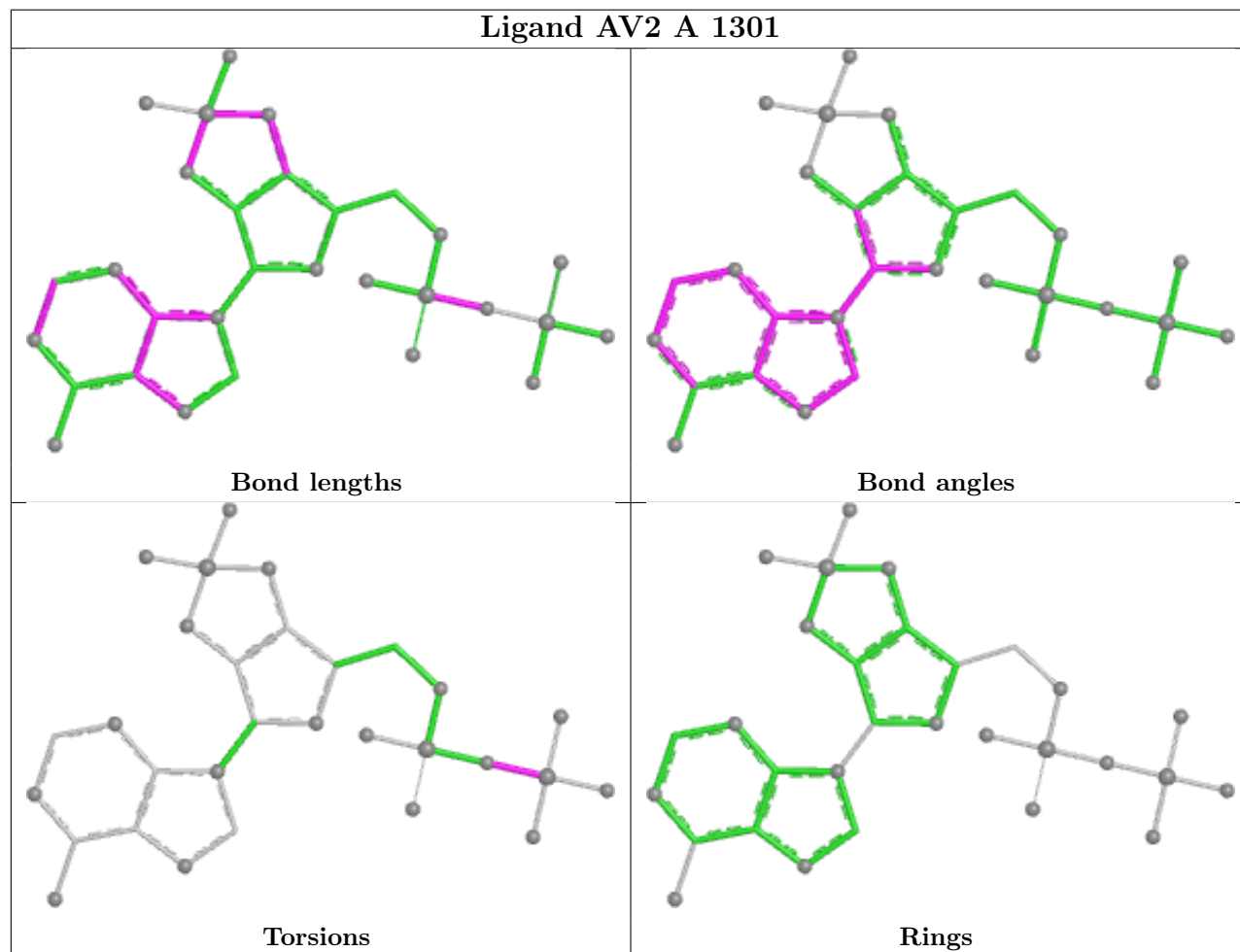
Ligand ADX D 1310



Ligand ADP B 1304



Ligand AV2 A 1301



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	208/211 (98%)	-0.01	14 (6%) 24 25	8, 14, 34, 49	0
1	B	182/211 (86%)	-0.02	9 (4%) 35 37	10, 15, 31, 53	0
1	C	209/211 (99%)	0.12	14 (6%) 24 25	8, 16, 34, 61	0
1	D	183/211 (86%)	0.03	13 (7%) 22 24	8, 14, 34, 69	0
All	All	782/844 (92%)	0.03	50 (6%) 25 26	8, 15, 34, 69	0

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	124	THR	6.2
1	D	123	ALA	5.9
1	C	56	HIS	4.4
1	B	24	ARG	4.3
1	B	122	VAL	4.3
1	C	209	LYS	3.8
1	A	209	LYS	3.8
1	A	126	GLY	3.6
1	C	210	LYS	3.5
1	D	122	VAL	3.4
1	C	8	HIS	3.3
1	A	187	LEU	3.3
1	A	125	PRO	3.3
1	D	129	THR	3.2
1	D	209	LYS	3.2
1	C	55	VAL	3.1
1	A	8	HIS	3.1
1	A	2	SER	3.1
1	B	23	GLN	3.1
1	A	7	PHE	3.1
1	B	67	PHE	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	208	ALA	3.0
1	D	190	GLN	2.9
1	A	177	ASN	2.8
1	D	50	VAL	2.8
1	D	24	ARG	2.8
1	C	187	LEU	2.8
1	B	51	ARG	2.7
1	C	126	GLY	2.7
1	A	127	GLU	2.7
1	B	50	VAL	2.6
1	D	208	ALA	2.5
1	C	11	ALA	2.5
1	A	124	THR	2.5
1	A	56	HIS	2.5
1	A	11	ALA	2.4
1	C	190	GLN	2.4
1	B	211	GLU	2.4
1	C	191	ASP	2.4
1	D	52	ASP	2.3
1	C	189	VAL	2.2
1	D	177	ASN	2.2
1	C	208	ALA	2.2
1	C	186	GLU	2.2
1	B	130	GLY	2.2
1	D	53	ARG	2.1
1	D	23	GLN	2.1
1	C	147	GLN	2.1
1	A	123	ALA	2.0
1	B	47	HIS	2.0

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands

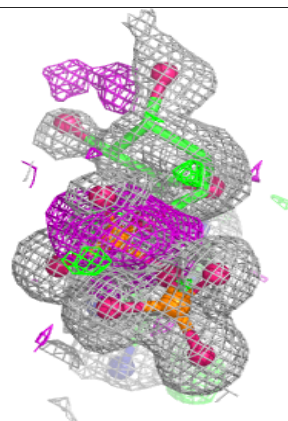
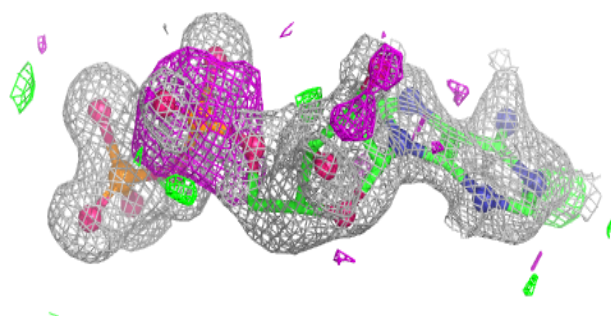
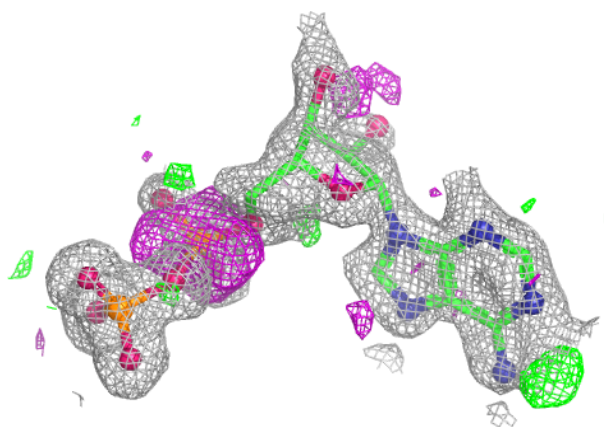
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	SO4	B	2004	5/5	0.63	0.26	63,63,66,66	5
6	GOL	B	2011	6/6	0.74	0.18	47,49,49,50	0
2	SO4	A	2003	5/5	0.80	0.20	55,57,59,59	0
2	SO4	C	2006	5/5	0.82	0.17	49,53,54,54	0
6	GOL	C	2010	6/6	0.84	0.15	23,29,31,34	0
2	SO4	C	2005	5/5	0.93	0.11	38,40,42,42	0
5	ADP	D	1309	27/27	0.95	0.14	11,45,47,50	0
5	ADP	B	1304	27/27	0.97	0.09	12,26,30,32	0
2	SO4	A	2001	5/5	0.98	0.09	18,19,22,26	0
2	SO4	A	2002	5/5	0.98	0.06	24,26,28,31	0
3	AV2	A	1301	30/30	0.98	0.06	9,13,18,18	3
3	AV2	C	1306	30/30	0.98	0.06	10,15,19,21	3
4	ADX	A	1302	27/27	0.99	0.03	9,10,11,14	0
4	ADX	B	1305	27/27	0.99	0.04	10,11,14,15	0
4	ADX	C	1307	27/27	0.99	0.03	8,10,12,15	0
4	ADX	D	1310	27/27	0.99	0.04	8,10,12,15	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.

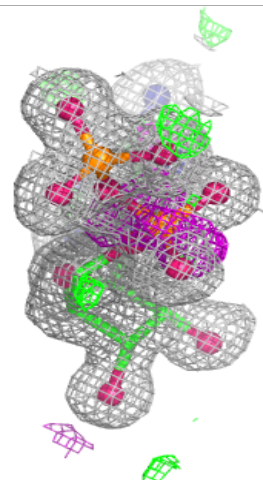
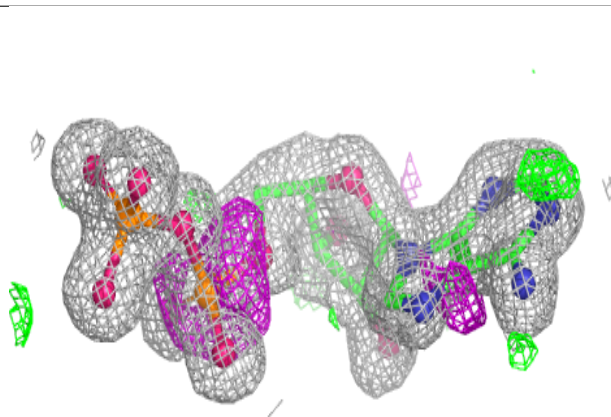
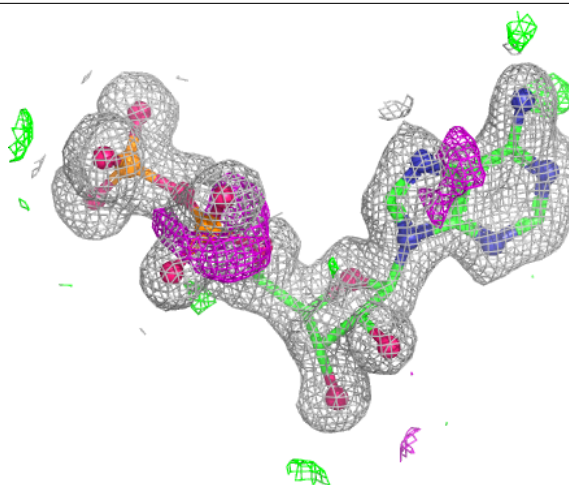
Electron density around ADP D 1309:

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



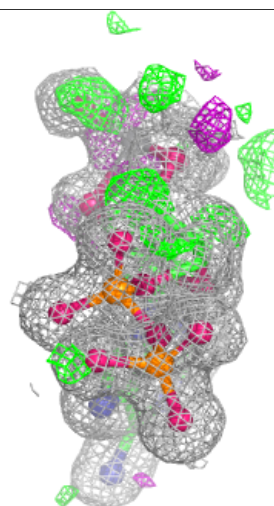
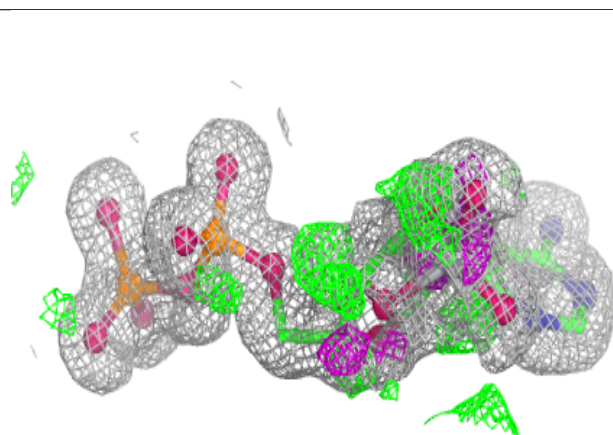
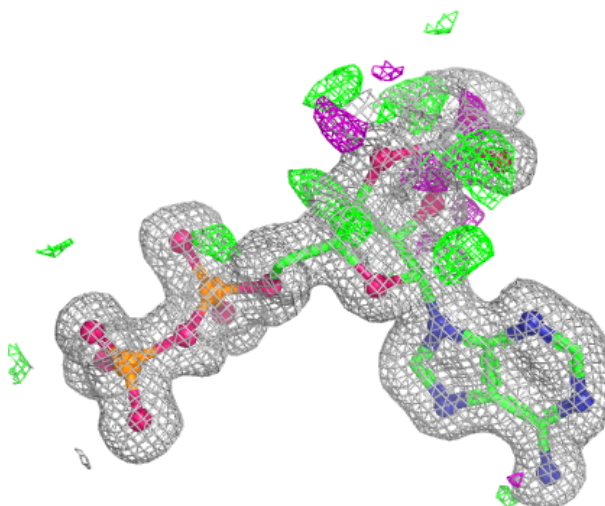
Electron density around ADP B 1304:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



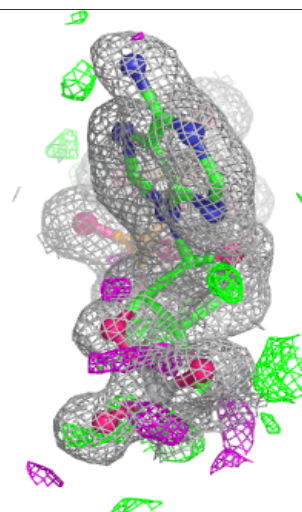
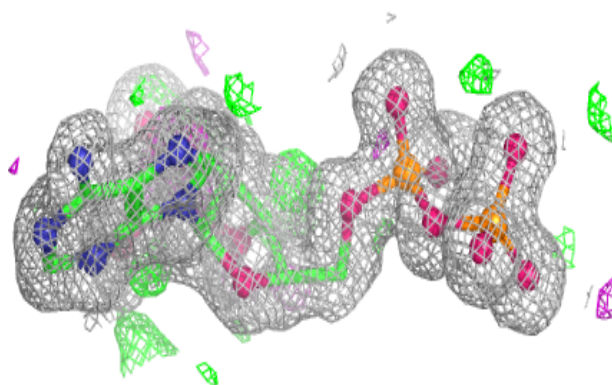
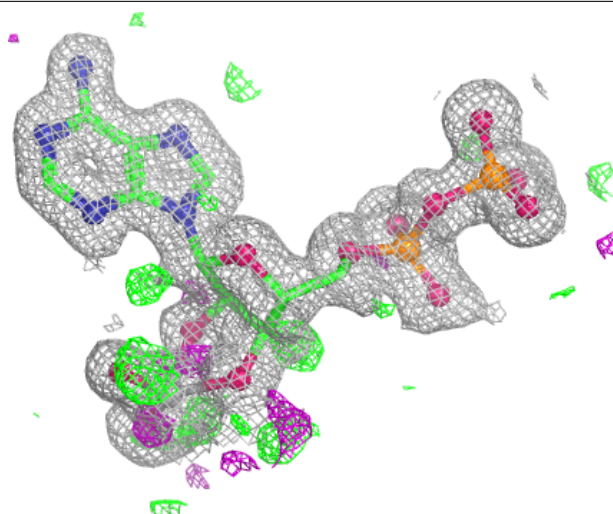
Electron density around AV2 A 1301:

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



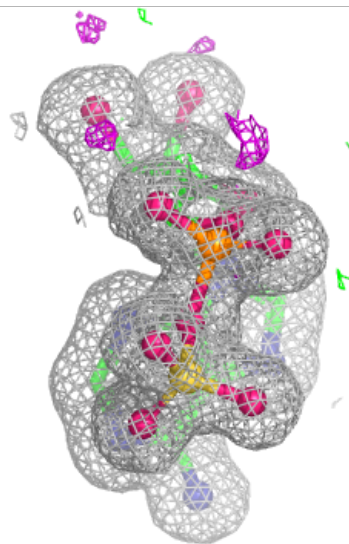
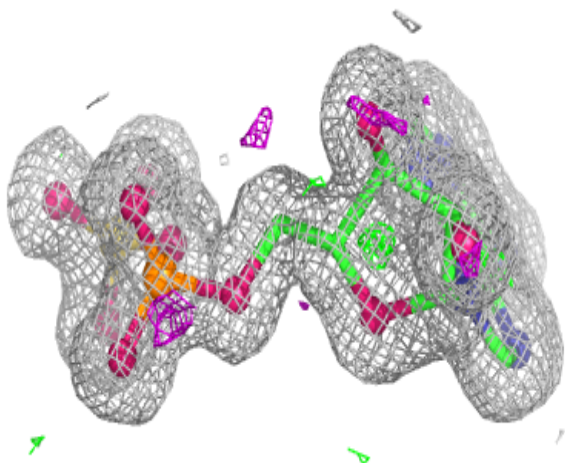
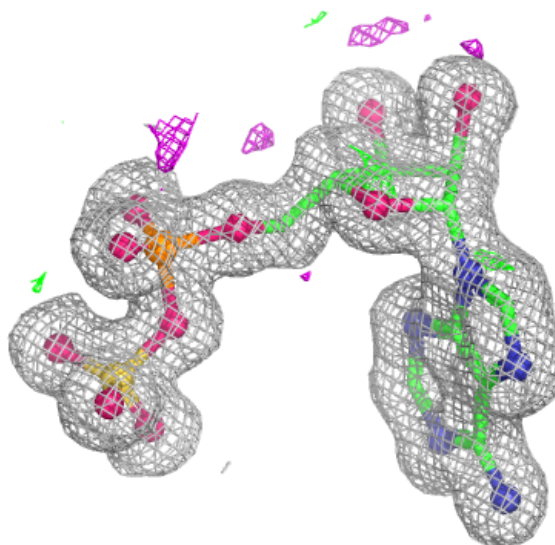
Electron density around AV2 C 1306:

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



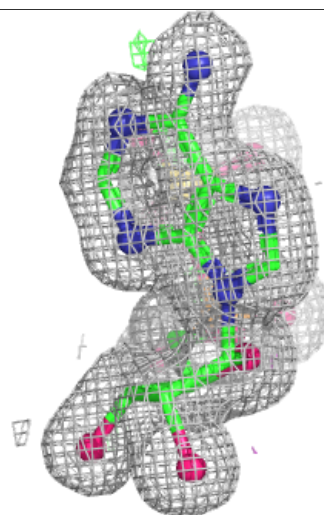
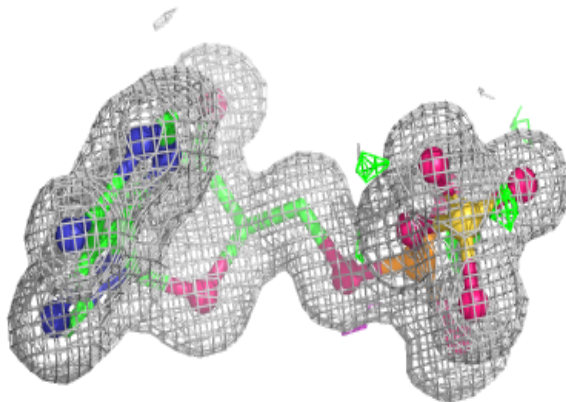
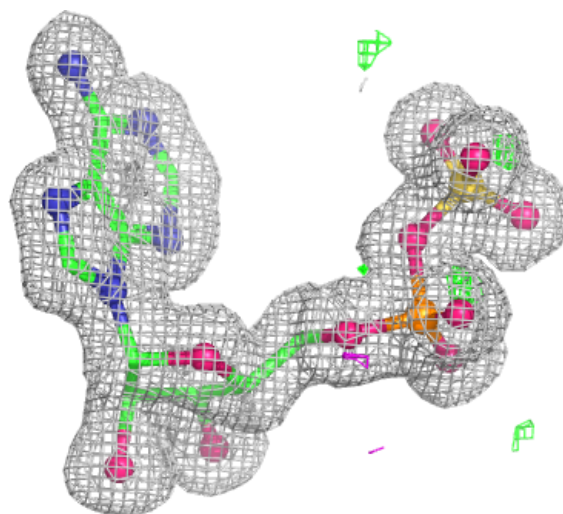
Electron density around ADX A 1302:

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



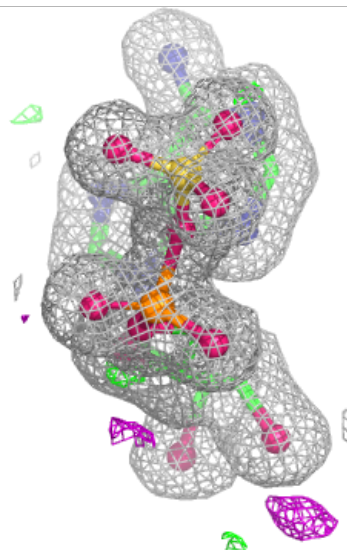
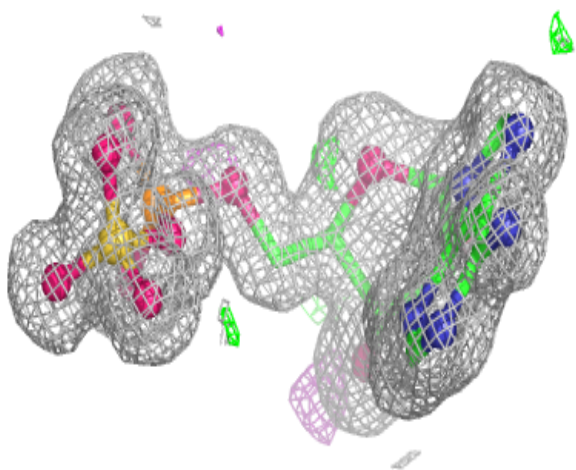
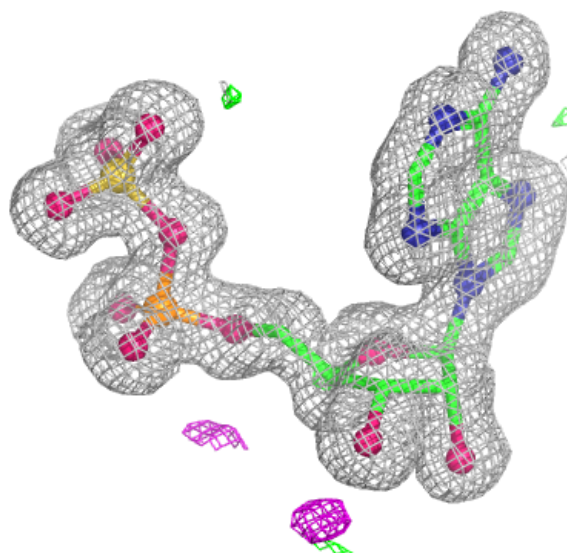
Electron density around ADX B 1305:

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



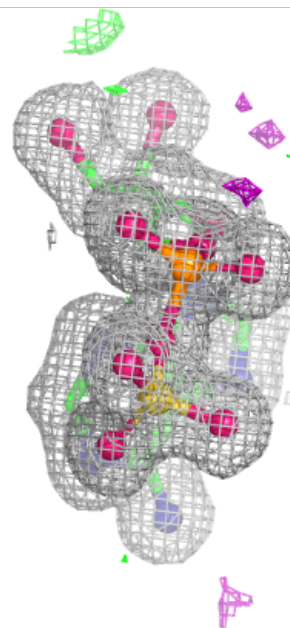
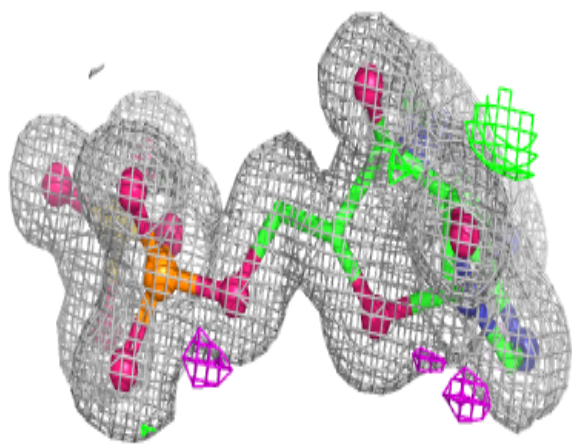
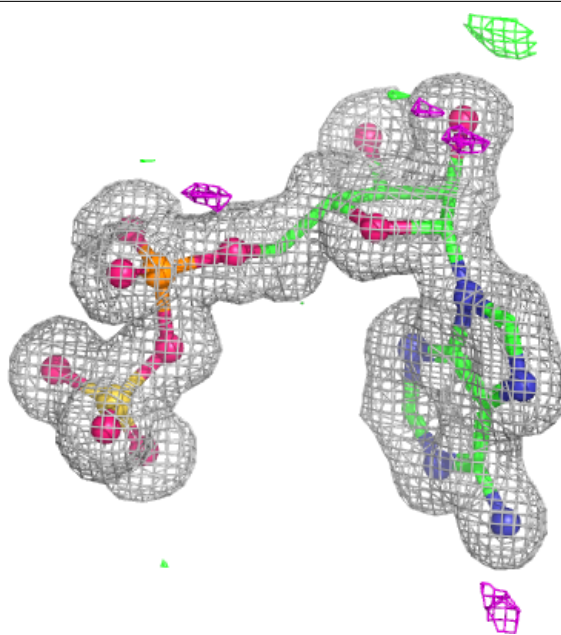
Electron density around ADX C 1307:

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



Electron density around ADX D 1310:

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



6.5 Other polymers ⓘ

There are no such residues in this entry.