Full wwPDB X-ray Structure Validation Report ⓘ

Jun 9, 2025 – 08:54 PM JST

PDB ID	:	9JDN / pdb_00009jdn
Title	:	Crystal structure of alanyl-tRNA synthetase L219M mutant in complex with ATP and L-alanine
Authors	:	Son, S.Y.; Cha, S.S.
Deposited on	:	2024-08-31
Resolution	:	2.18 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:

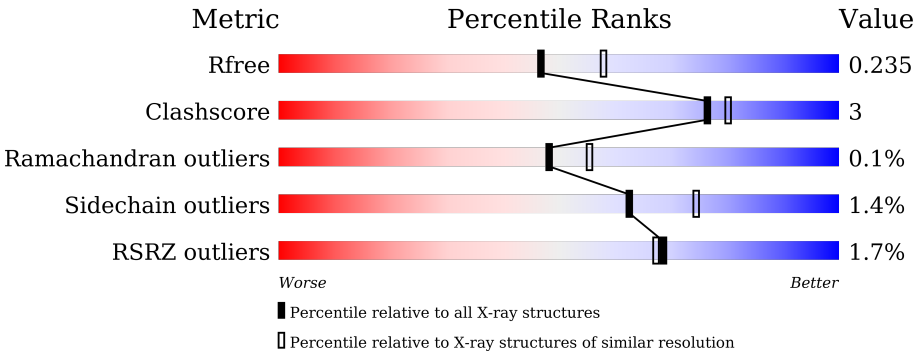
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.18 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}	164625	8336 (2.20-2.16)
Clashscore	180529	9404 (2.20-2.16)
Ramachandran outliers	177936	9297 (2.20-2.16)
Sidechain outliers	177891	9297 (2.20-2.16)
RSRZ outliers	164620	8337 (2.20-2.16)

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 <=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	435	90% 6%
1	B	435	89% 8%

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
3	ALA	A	502	-	X	-	-

2 Entry composition (i)

There are 7 unique types of molecules in this entry. The entry contains 7000 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.

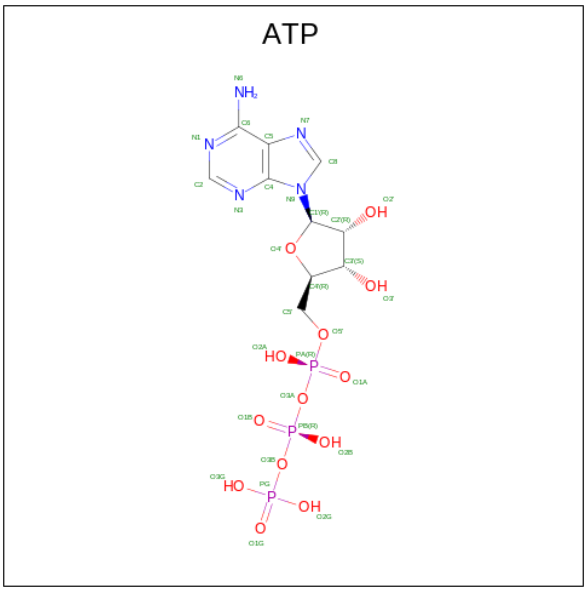
- Molecule 1 is a protein called Alanine–tRNA ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	422	Total	C	N	O	S	0	0	0
			3324	2107	578	622	17			
1	B	423	Total	C	N	O	S	0	0	0
			3328	2109	579	623	17			

There are 14 discrepancies between the modelled and reference sequences:

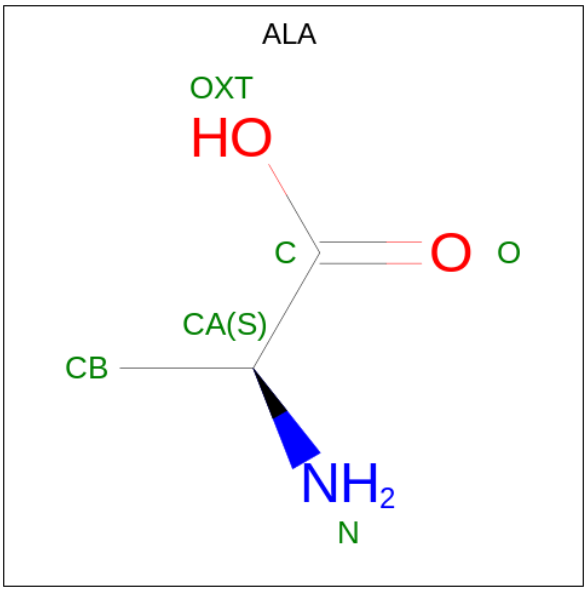
Chain	Residue	Modelled	Actual	Comment	Reference
A	219	MET	LEU	engineered mutation	UNP A0A172UEB3
A	430	HIS	-	expression tag	UNP A0A172UEB3
A	431	HIS	-	expression tag	UNP A0A172UEB3
A	432	HIS	-	expression tag	UNP A0A172UEB3
A	433	HIS	-	expression tag	UNP A0A172UEB3
A	434	HIS	-	expression tag	UNP A0A172UEB3
A	435	HIS	-	expression tag	UNP A0A172UEB3
B	219	MET	LEU	engineered mutation	UNP A0A172UEB3
B	430	HIS	-	expression tag	UNP A0A172UEB3
B	431	HIS	-	expression tag	UNP A0A172UEB3
B	432	HIS	-	expression tag	UNP A0A172UEB3
B	433	HIS	-	expression tag	UNP A0A172UEB3
B	434	HIS	-	expression tag	UNP A0A172UEB3
B	435	HIS	-	expression tag	UNP A0A172UEB3

- Molecule 2 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



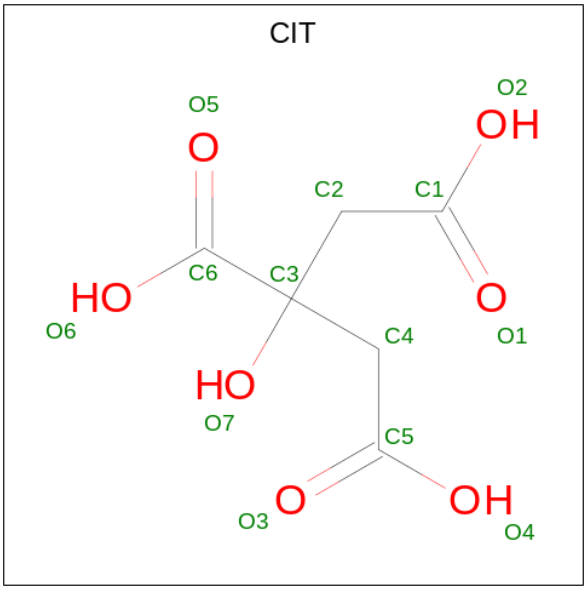
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
2	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
2	B	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

- Molecule 3 is ALANINE (CCD ID: ALA) (formula: $C_3H_7NO_2$) (labeled as "Ligand of Interest" by depositor).



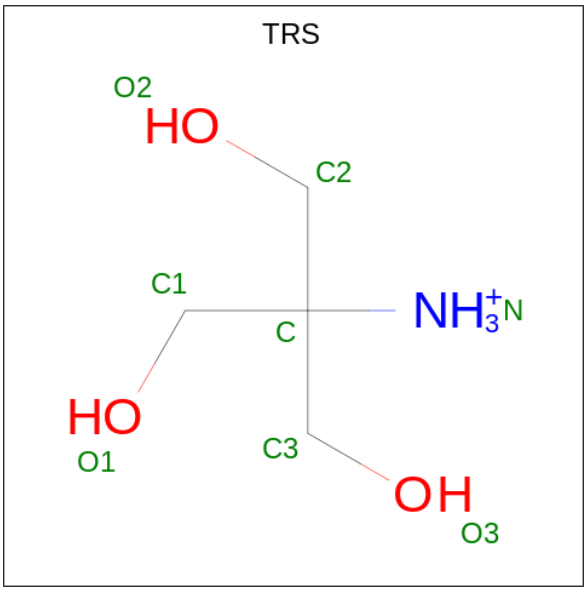
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 6 3 1 2	0	0
3	B	1	Total C N O 6 3 1 2	0	0

- Molecule 4 is CITRIC ACID (CCD ID: CIT) (formula: $C_6H_8O_7$).



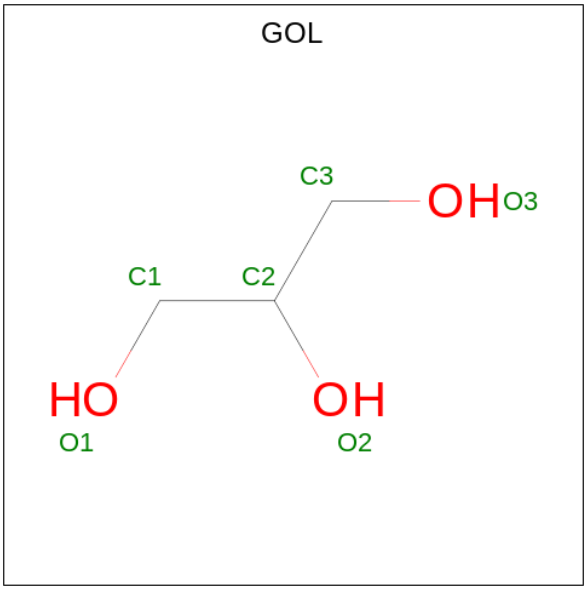
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 13 6 7	0	0
4	B	1	Total C O 13 6 7	0	0

- Molecule 5 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: $C_4H_{12}NO_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C N O 8 4 1 3	0	0
5	B	1	Total C N O 8 4 1 3	0	0

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



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

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

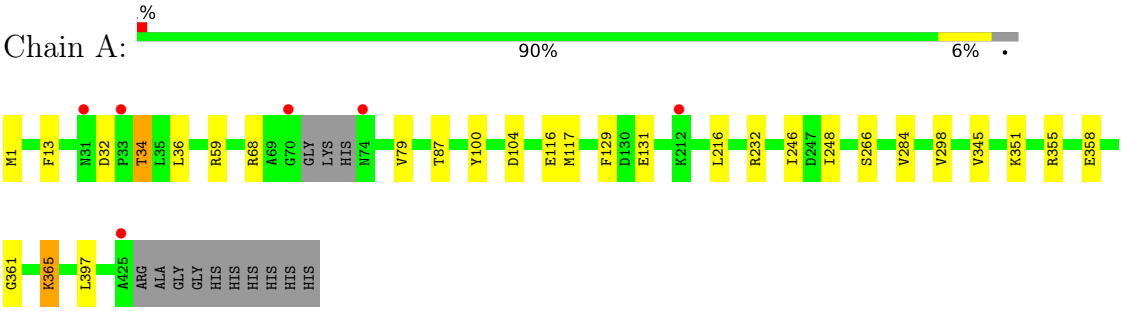
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	96	Total O 96 96	0	0
7	B	87	Total O 87 87	0	0

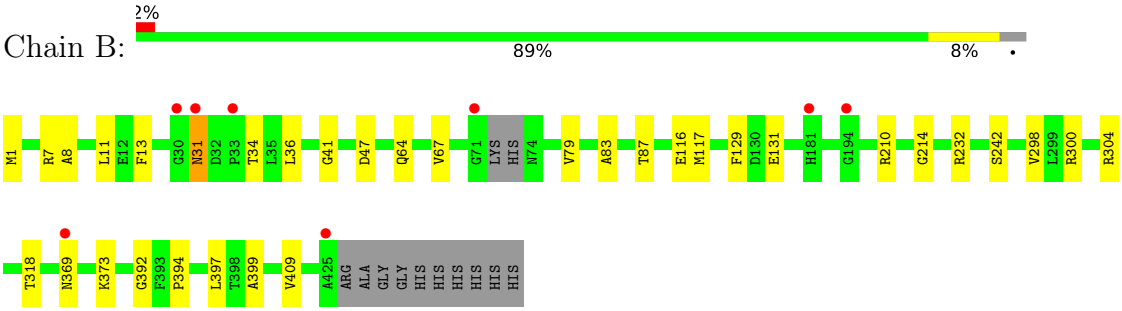
3 Residue-property plots (i)

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: Alanine–tRNA ligase



• Molecule 1: Alanine–tRNA ligase



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	78.84Å 56.57Å 125.63Å 90.00° 102.26° 90.00°	Depositor
Resolution (Å)	29.89 – 2.18 29.89 – 2.18	Depositor EDS
% Data completeness (in resolution range)	99.0 (29.89-2.18) 99.0 (29.89-2.18)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.36 (at 2.18Å)	Xtriage
Refinement program	PHENIX 1.11.1_2575	Depositor
R, R_{free}	0.201 , 0.234 0.201 , 0.235	Depositor DCC
R_{free} test set	2820 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	31.8	Xtriage
Anisotropy	0.137	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 23.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.52$, $< L^2 > = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	7000	wwPDB-VP
Average B, all atoms (Å^2)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.15% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: TRS, CIT, GOL, ATP

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	0.37	0/3402	0.55	0/4605
1	B	0.35	0/3406	0.53	0/4610
All	All	0.36	0/6808	0.54	0/9215

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

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	3324	0	3211	14	0
1	B	3328	0	3214	19	0
2	A	62	0	24	4	0
2	B	31	0	12	1	0
3	A	6	0	4	1	0
3	B	6	0	4	1	0
4	A	13	0	5	0	0
4	B	13	0	5	0	0
5	A	8	0	12	3	0
5	B	8	0	12	1	0
6	B	18	0	24	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	96	0	0	0	0
7	B	87	0	0	0	0
All	All	7000	0	6527	37	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 (37) 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:8:ALA:HB2	6:B:503:GOL:H12	1.67	0.77
1:B:232:ARG:HH12	5:B:505:TRS:H21	1.48	0.76
1:A:232:ARG:HH12	5:A:504:TRS:H11	1.51	0.75
1:B:36:LEU:HD21	1:B:298:VAL:HG21	1.69	0.75
1:A:36:LEU:HD21	1:A:298:VAL:HG21	1.67	0.75
2:A:501:ATP:O1A	3:A:502:ALA:N	2.28	0.66
5:A:504:TRS:O3	5:A:504:TRS:O1	2.12	0.65
1:B:7:ARG:HB3	6:B:503:GOL:H11	1.80	0.63
1:A:355:ARG:O	1:A:358:GLU:HG2	2.04	0.57
1:B:31:ASN:ND2	1:B:47:ASP:OD2	2.38	0.57
1:B:210:ARG:NH1	1:B:214:GLY:O	2.39	0.56
2:A:501:ATP:O1B	5:A:504:TRS:O2	2.24	0.55
1:B:13:PHE:CD2	1:B:116:GLU:HG3	2.45	0.52
1:B:129:PHE:CE2	1:B:131:GLU:HB2	2.46	0.50
1:B:83:ALA:HB1	1:B:242:SER:HA	1.94	0.50
1:A:129:PHE:CE2	1:A:131:GLU:HB2	2.49	0.48
1:A:246:ILE:HG13	1:A:248:ILE:HG22	1.95	0.48
1:B:67:VAL:HA	1:B:87:THR:O	2.14	0.47
1:A:32:ASP:OD1	1:A:34:THR:HG23	2.15	0.46
1:A:1:MET:HE1	1:A:117:MET:HE1	1.99	0.45
1:B:399:ALA:HB3	6:B:507:GOL:H2	1.98	0.45
1:A:284:VAL:HG11	1:A:345:VAL:HA	1.99	0.44
1:B:41:GLY:HA2	1:B:64:GLN:HG2	2.00	0.44
1:A:68:ARG:NH2	2:A:501:ATP:O2A	2.44	0.44
1:A:100:TYR:HB2	1:A:104:ASP:HB2	1.99	0.44
1:A:266:SER:HA	2:A:505:ATP:O4'	2.18	0.43
1:B:369:ASN:OD1	1:B:373:LYS:HE2	2.18	0.43
1:A:13:PHE:CD2	1:A:116:GLU:HG3	2.53	0.43
1:B:1:MET:HE1	1:B:117:MET:HE1	2.00	0.43
1:B:79:VAL:HG21	1:B:87:THR:HG23	2.01	0.42
1:A:361:GLY:O	1:A:365:LYS:NZ	2.48	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:300:ARG:O	1:B:304:ARG:HG3	2.20	0.41
1:B:392:GLY:O	1:B:394:PRO:HD3	2.20	0.41
1:A:79:VAL:HG21	1:A:87:THR:HG23	2.03	0.41
1:B:11:LEU:HD12	6:B:503:GOL:O2	2.20	0.41
2:B:501:ATP:O1A	3:B:502:ALA:N	2.54	0.41
1:B:399:ALA:CB	6:B:507:GOL:H2	2.51	0.41

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	418/435 (96%)	407 (97%)	11 (3%)	0	100 100
1	B	419/435 (96%)	406 (97%)	12 (3%)	1 (0%)	44 49
All	All	837/870 (96%)	813 (97%)	23 (3%)	1 (0%)	48 55

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	31	ASN

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	346/355 (98%)	340 (98%)	6 (2%)	56 68
1	B	346/355 (98%)	342 (99%)	4 (1%)	67 78
All	All	692/710 (98%)	682 (99%)	10 (1%)	62 74

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	34	THR
1	A	59	ARG
1	A	216	LEU
1	A	351	LYS
1	A	365	LYS
1	A	397	LEU
1	B	34	THR
1	B	318	THR
1	B	397	LEU
1	B	409	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	107	ASN
1	A	158	ASN
1	A	421	GLN
1	B	158	ASN
1	B	243	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

12 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	$\#\|Z\| > 2$
6	GOL	B	507	-	5,5,5	0.38	0	5,5,5	0.75	0
2	ATP	A	505	-	26,33,33	1.08	3 (11%)	31,52,52	1.37	5 (16%)
5	TRS	B	505	-	7,7,7	0.14	0	9,9,9	0.70	0
4	CIT	A	503	-	12,12,12	1.18	0	17,17,17	1.48	2 (11%)
2	ATP	B	501	-	26,33,33	0.95	1 (3%)	31,52,52	1.34	4 (12%)
4	CIT	B	506	-	12,12,12	1.22	0	17,17,17	1.62	5 (29%)
6	GOL	B	504	-	5,5,5	0.46	0	5,5,5	0.32	0
5	TRS	A	504	-	7,7,7	0.33	0	9,9,9	0.63	0
6	GOL	B	503	-	5,5,5	0.51	0	5,5,5	1.01	0
3	ALA	A	502	-	5,5,5	1.01	0	6,6,6	1.95	3 (50%)
2	ATP	A	501	-	26,33,33	0.91	0	31,52,52	1.34	3 (9%)
3	ALA	B	502	-	5,5,5	0.98	0	6,6,6	1.78	2 (33%)

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
6	GOL	B	507	-	-	4/4/4/4	-
2	ATP	A	505	-	-	5/18/38/38	0/3/3/3
5	TRS	B	505	-	-	6/9/9/9	-
4	CIT	A	503	-	-	7/16/16/16	-
2	ATP	B	501	-	-	1/18/38/38	0/3/3/3
4	CIT	B	506	-	-	8/16/16/16	-
6	GOL	B	504	-	-	4/4/4/4	-
5	TRS	A	504	-	-	9/9/9/9	-
6	GOL	B	503	-	-	4/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	ALA	A	502	-	-	4/4/4/4	-
2	ATP	A	501	-	-	2/18/38/38	0/3/3/3
3	ALA	B	502	-	-	2/4/4/4	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	505	ATP	C5-C4	2.86	1.48	1.40
2	B	501	ATP	C5-C4	2.42	1.47	1.40
2	A	505	ATP	O4'-C1'	2.41	1.44	1.41
2	A	505	ATP	C2-N3	2.11	1.35	1.32

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	503	CIT	O6-C6-C3	4.18	120.31	113.05
4	B	506	CIT	O6-C6-C3	4.04	120.07	113.05
2	A	501	ATP	N3-C2-N1	-3.87	122.63	128.68
3	A	502	ALA	OXT-C-O	-3.39	116.38	124.09
2	B	501	ATP	PA-O3A-PB	-3.14	122.06	132.83
2	A	505	ATP	N3-C2-N1	-3.12	123.80	128.68
3	B	502	ALA	OXT-C-O	-3.11	117.03	124.09
2	B	501	ATP	C4-C5-N7	-2.99	106.28	109.40
2	A	505	ATP	C3'-C2'-C1'	2.80	105.19	100.98
2	B	501	ATP	N3-C2-N1	-2.76	124.37	128.68
2	A	505	ATP	C4-C5-N7	-2.67	106.61	109.40
3	A	502	ALA	OXT-C-CA	2.47	123.00	114.06
2	A	501	ATP	O3G-PG-O2G	2.47	117.07	107.64
3	B	502	ALA	OXT-C-CA	2.43	122.82	114.06
2	A	505	ATP	PB-O3B-PG	-2.34	124.81	132.83
2	B	501	ATP	C3'-C2'-C1'	2.32	104.47	100.98
4	B	506	CIT	O6-C6-O5	-2.30	116.49	123.82
4	B	506	CIT	O4-C5-O3	-2.28	117.62	123.30
4	B	506	CIT	O4-C5-C4	2.23	121.52	114.35
2	A	501	ATP	PA-O3A-PB	-2.22	125.22	132.83
3	A	502	ALA	C-CA-N	2.18	115.74	107.60
4	B	506	CIT	O2-C1-O1	-2.15	117.95	123.30
2	A	505	ATP	PA-O3A-PB	-2.10	125.63	132.83
4	A	503	CIT	O6-C6-O5	-2.05	117.31	123.82

There are no chirality outliers.

All (56) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	505	ATP	C5'-O5'-PA-O1A
4	B	506	CIT	O7-C3-C6-O5
4	B	506	CIT	O7-C3-C6-O6
4	B	506	CIT	C4-C3-C6-O5
4	B	506	CIT	C4-C3-C6-O6
5	A	504	TRS	C3-C-C1-O1
5	A	504	TRS	N-C-C1-O1
5	A	504	TRS	N-C-C3-O3
5	B	505	TRS	C1-C-C2-O2
5	B	505	TRS	C3-C-C2-O2
5	B	505	TRS	N-C-C2-O2
5	B	505	TRS	C1-C-C3-O3
6	B	503	GOL	O1-C1-C2-C3
6	B	504	GOL	O1-C1-C2-C3
6	B	504	GOL	C1-C2-C3-O3
6	B	504	GOL	O2-C2-C3-O3
6	B	507	GOL	O1-C1-C2-O2
6	B	507	GOL	O1-C1-C2-C3
6	B	507	GOL	C1-C2-C3-O3
6	B	503	GOL	O1-C1-C2-O2
6	B	507	GOL	O2-C2-C3-O3
4	A	503	CIT	C4-C3-C6-O6
6	B	504	GOL	O1-C1-C2-O2
3	A	502	ALA	OXT-C-CA-N
3	B	502	ALA	OXT-C-CA-N
4	B	506	CIT	C1-C2-C3-C6
5	A	504	TRS	C2-C-C1-O1
5	A	504	TRS	C1-C-C3-O3
5	B	505	TRS	C2-C-C3-O3
3	A	502	ALA	O-C-CA-CB
3	A	502	ALA	OXT-C-CA-CB
2	A	505	ATP	PG-O3B-PB-O1B
6	B	503	GOL	O2-C2-C3-O3
4	B	506	CIT	C1-C2-C3-O7
2	A	505	ATP	C5'-O5'-PA-O3A
2	A	501	ATP	PB-O3A-PA-O2A
5	A	504	TRS	C1-C-C2-O2
5	A	504	TRS	C3-C-C2-O2
5	B	505	TRS	N-C-C3-O3
2	A	505	ATP	C5'-O5'-PA-O2A
3	A	502	ALA	O-C-CA-N
3	B	502	ALA	O-C-CA-N

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Mol	Chain	Res	Type	Atoms
4	A	503	CIT	C2-C3-C6-O6
4	B	506	CIT	C2-C3-C6-O5
4	B	506	CIT	C2-C3-C6-O6
4	A	503	CIT	C1-C2-C3-O7
2	B	501	ATP	PB-O3A-PA-O2A
4	A	503	CIT	C1-C2-C3-C6
4	A	503	CIT	O7-C3-C6-O6
5	A	504	TRS	C2-C-C3-O3
4	A	503	CIT	C2-C3-C6-O5
4	A	503	CIT	C4-C3-C6-O5
2	A	501	ATP	PB-O3A-PA-O1A
2	A	505	ATP	PG-O3B-PB-O2B
5	A	504	TRS	N-C-C2-O2
6	B	503	GOL	C1-C2-C3-O3

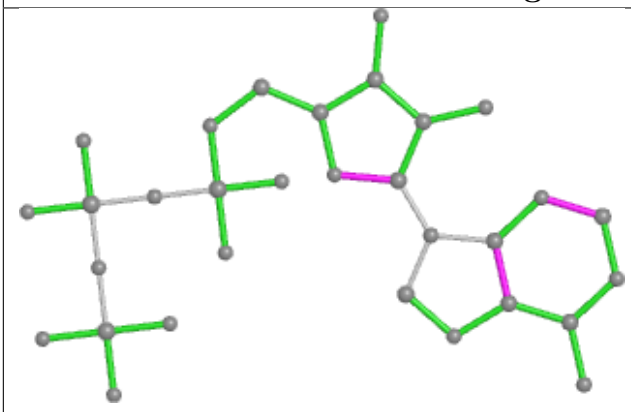
There are no ring outliers.

9 monomers are involved in 13 short contacts:

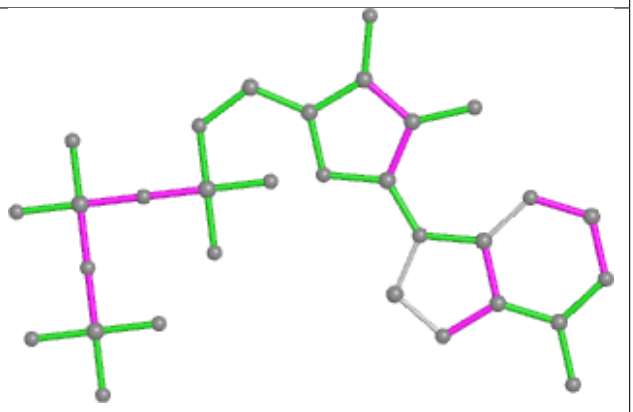
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	507	GOL	2	0
2	A	505	ATP	1	0
5	B	505	TRS	1	0
2	B	501	ATP	1	0
5	A	504	TRS	3	0
6	B	503	GOL	3	0
3	A	502	ALA	1	0
2	A	501	ATP	3	0
3	B	502	ALA	1	0

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 then 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.

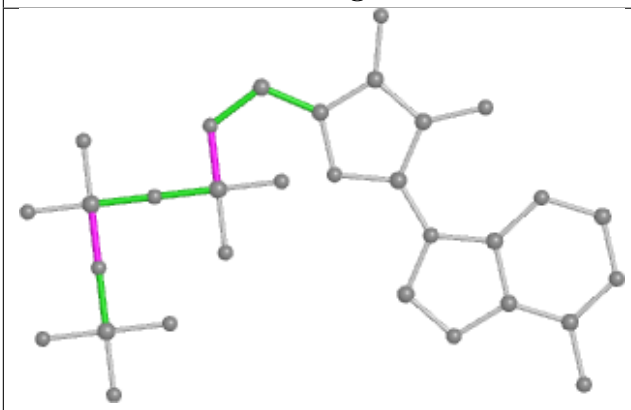
Ligand ATP A 505



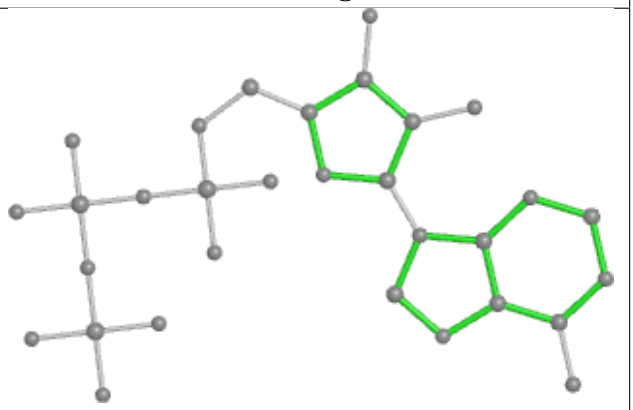
Bond lengths



Bond angles

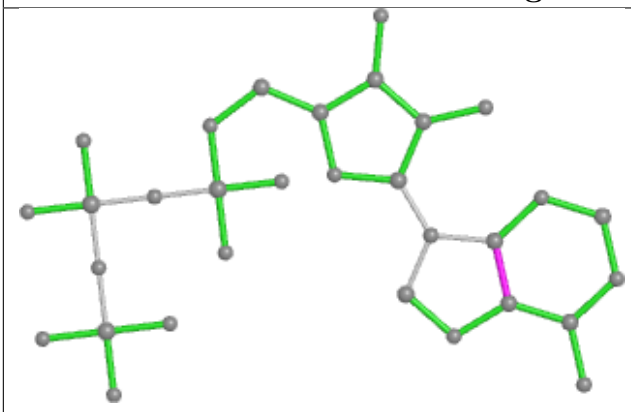


Torsions

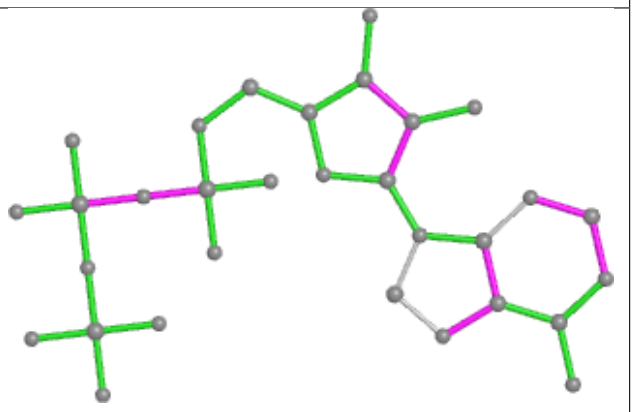


Rings

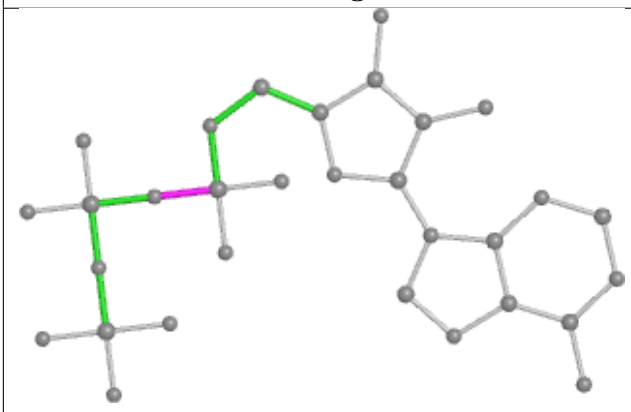
Ligand ATP B 501



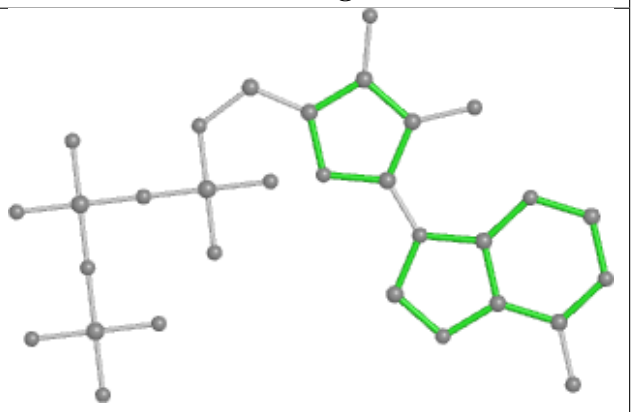
Bond lengths



Bond angles

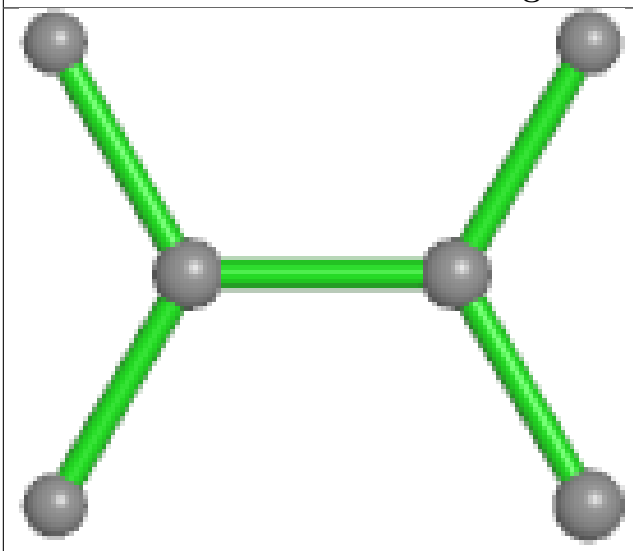


Torsions

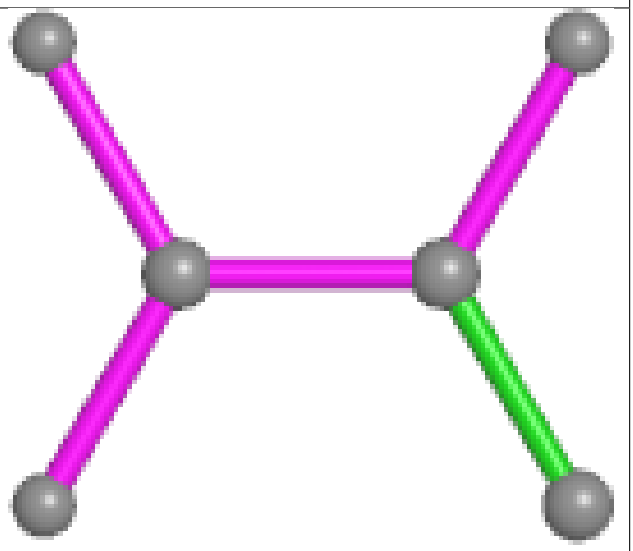


Rings

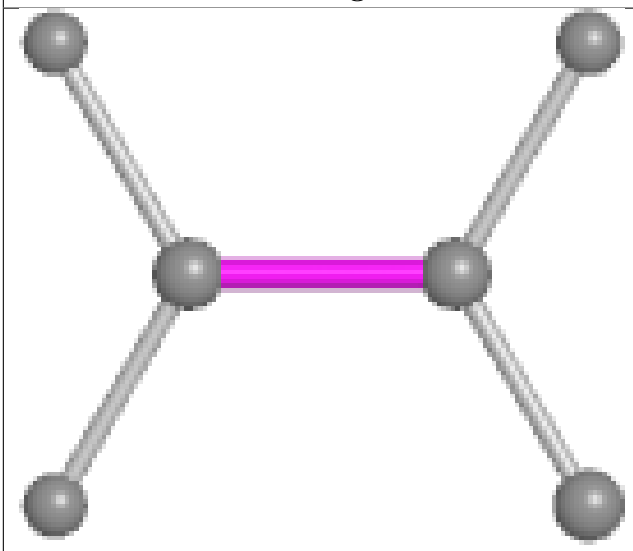
Ligand ALA A 502



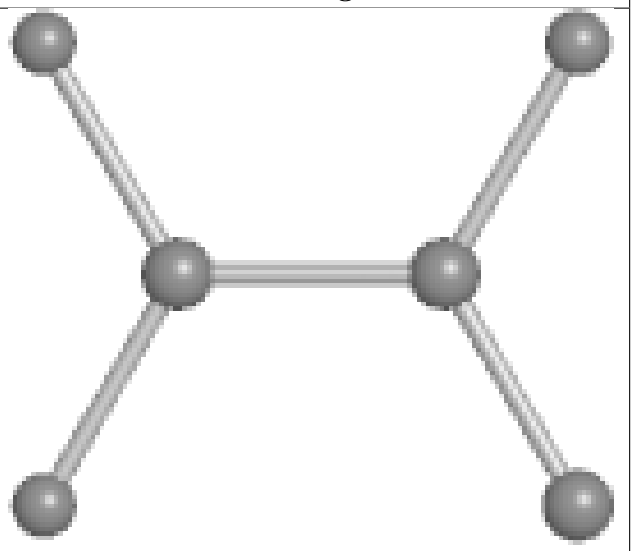
Bond lengths



Bond angles

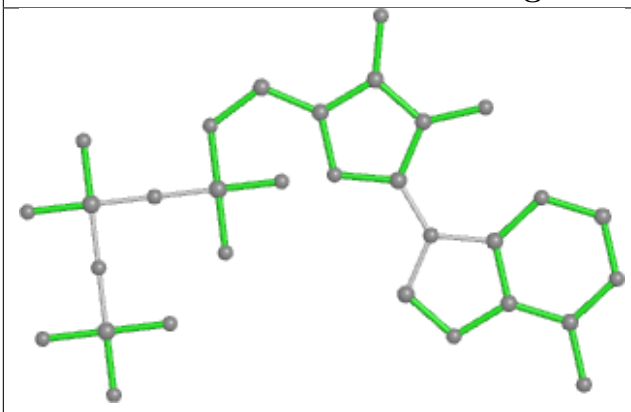


Torsions

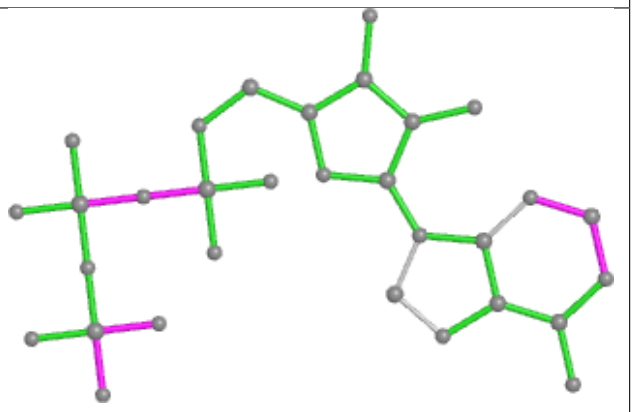


Rings

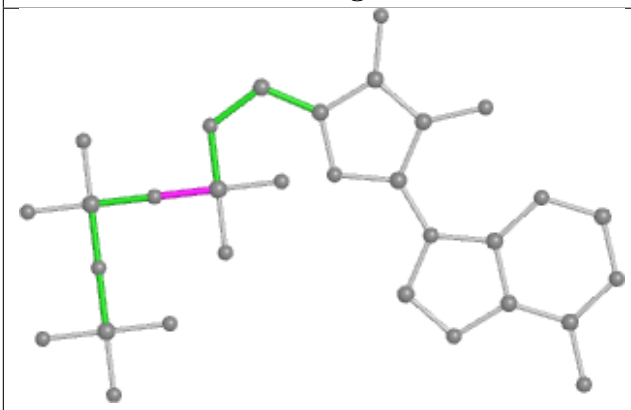
Ligand ATP A 501



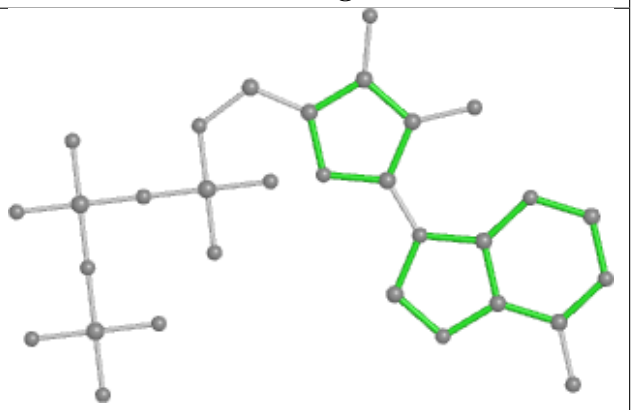
Bond lengths



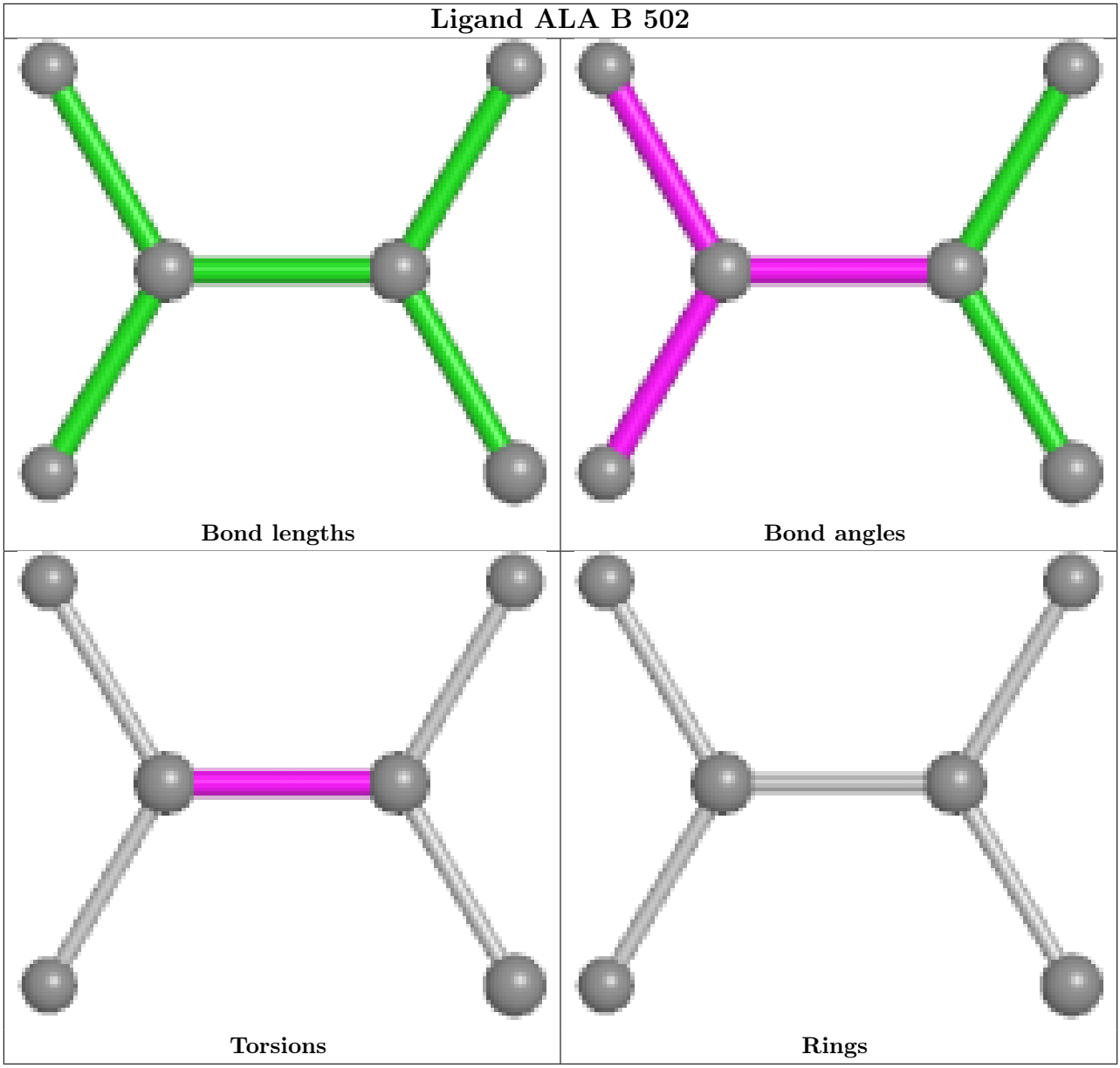
Bond angles



Torsions



Rings



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^{th} 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	422/435 (97%)	0.05	6 (1%)	73	72	22, 30, 48, 67	0
1	B	423/435 (97%)	0.12	8 (1%)	66	65	22, 33, 54, 71	0
All	All	845/870 (97%)	0.08	14 (1%)	69	67	22, 32, 51, 71	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	31	ASN	4.6
1	A	74	ASN	3.8
1	A	425	ALA	3.7
1	B	425	ALA	3.3
1	B	30	GLY	3.2
1	A	33	PRO	3.0
1	B	33	PRO	2.8
1	B	181	HIS	2.6
1	A	31	ASN	2.1
1	A	70	GLY	2.0
1	B	369	ASN	2.0
1	A	212	LYS	2.0
1	B	71	GLY	2.0
1	B	194	GLY	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 monosaccharides in this entry.

6.4 Ligands (i)

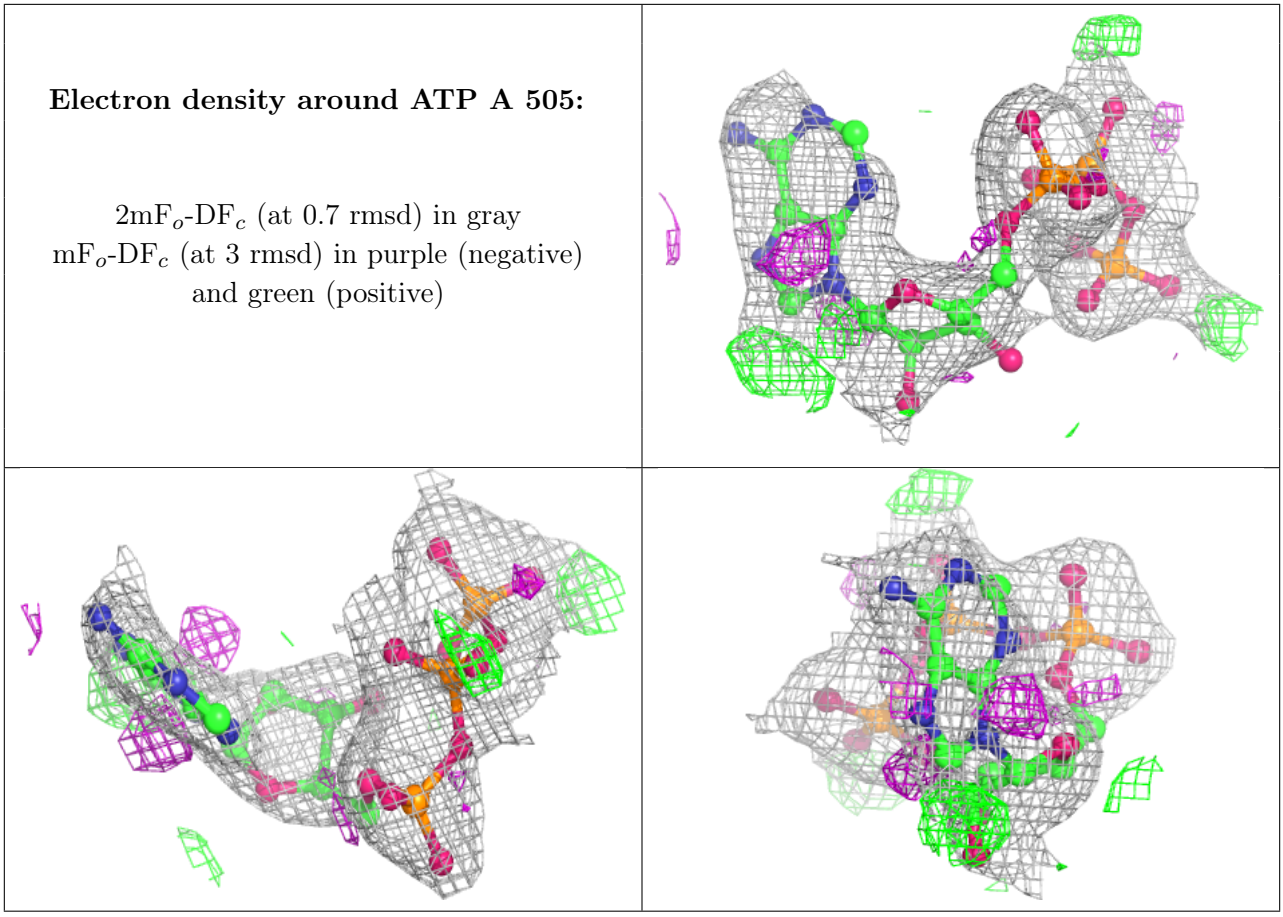
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
5	TRS	B	505	8/8	0.70	0.17	35,44,48,48	0
2	ATP	A	505	31/31	0.75	0.14	52,60,71,76	0
4	CIT	B	506	13/13	0.79	0.11	38,44,50,53	0
3	ALA	A	502	6/6	0.81	0.24	35,39,51,55	0
5	TRS	A	504	8/8	0.82	0.13	35,42,47,49	0
3	ALA	B	502	6/6	0.83	0.27	38,45,51,56	0
4	CIT	A	503	13/13	0.84	0.11	35,43,48,48	0
6	GOL	B	507	6/6	0.84	0.23	29,39,42,48	0
6	GOL	B	504	6/6	0.85	0.27	39,41,45,45	0
6	GOL	B	503	6/6	0.88	0.20	30,38,42,46	0
2	ATP	A	501	31/31	0.93	0.09	24,29,56,70	0
2	ATP	B	501	31/31	0.94	0.09	26,29,50,55	14

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

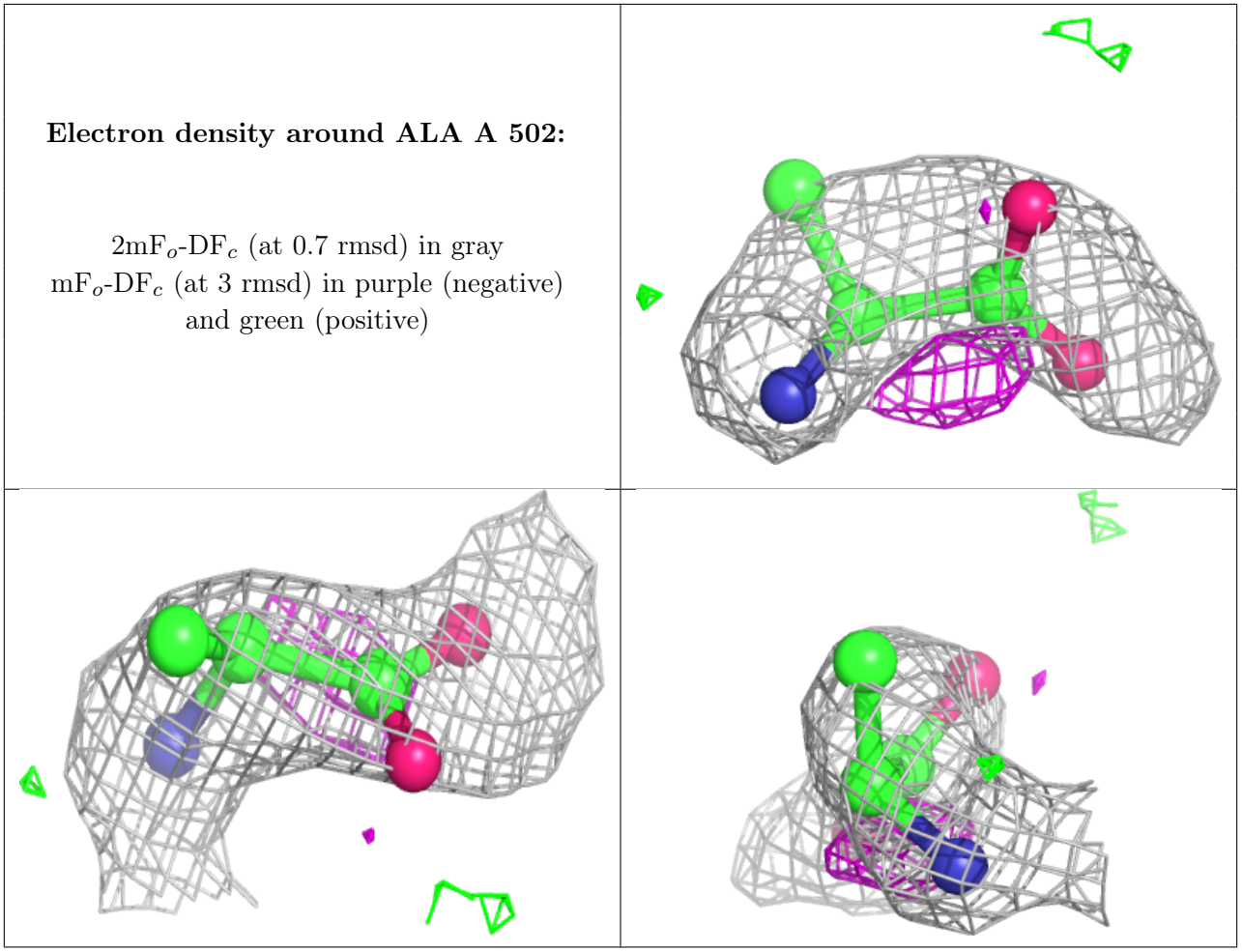
Electron density around ATP A 505:

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



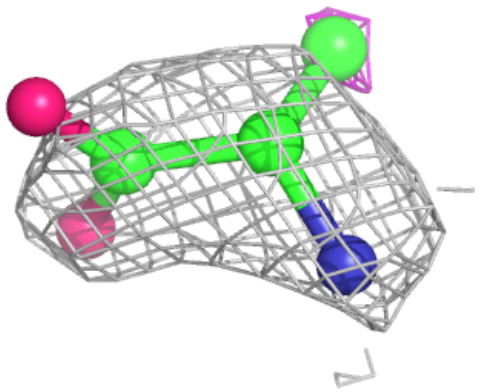
Electron density around ALA A 502:

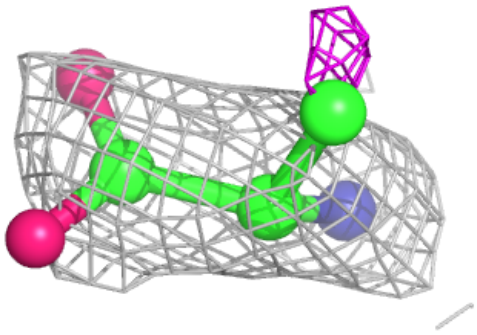
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

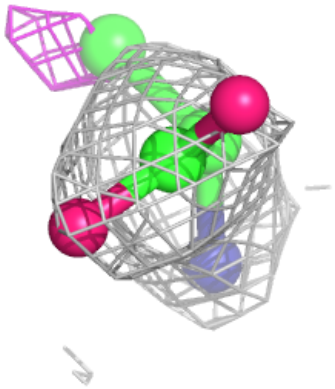


Electron density around ALA B 502:

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

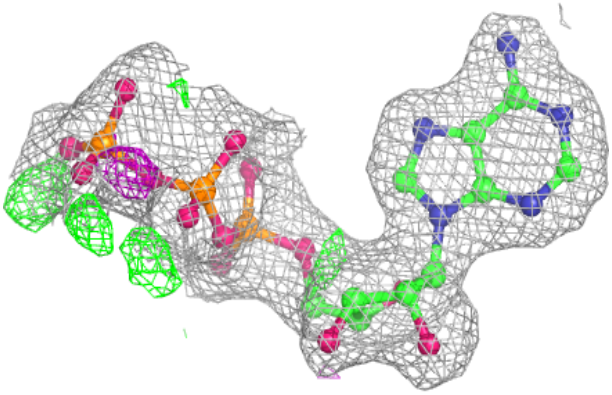


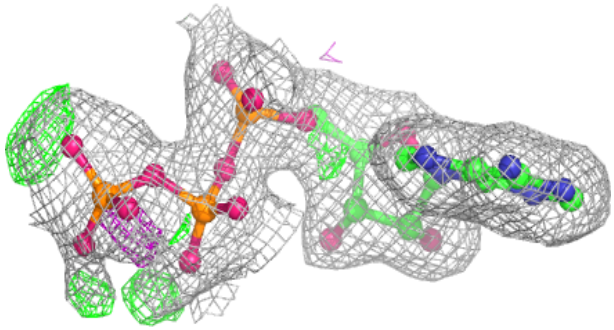


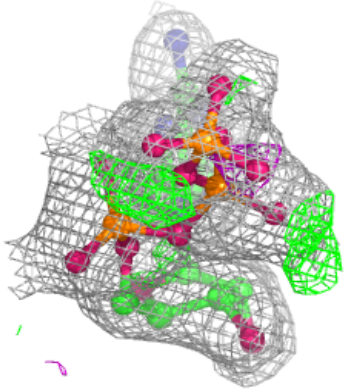


Electron density around ATP A 501:

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

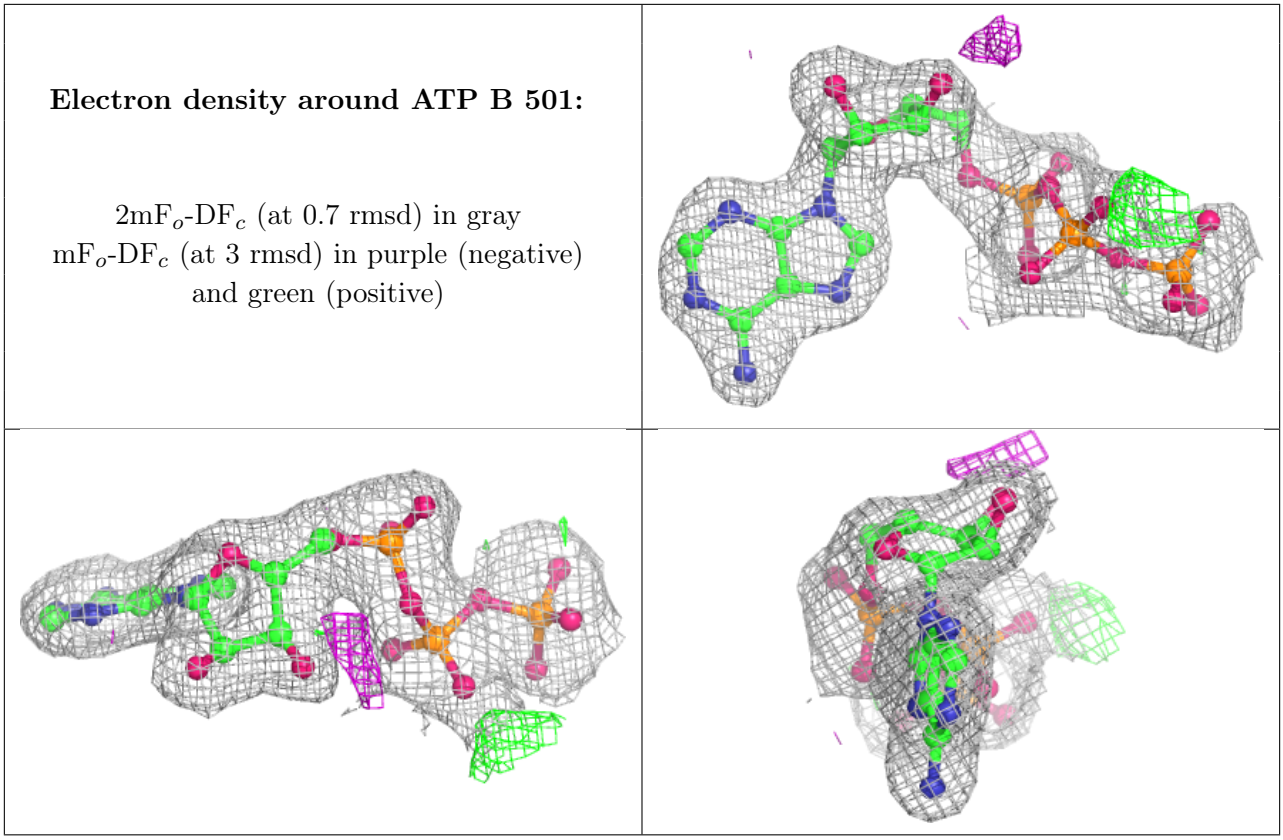






Electron density around ATP B 501:

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



6.5 Other polymers (i)

There are no such residues in this entry.