



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 3, 2024 – 02:06 am GMT

PDB ID : 4USJ
Title : N-acetylglutamate kinase from Arabidopsis thaliana in complex with PII from Chlamydomonas reinhardtii
Authors : Chellamuthu, V.R.; Forchhammer, K.; Hartmann, M.D.
Deposited on : 2014-07-08
Resolution : 2.85 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

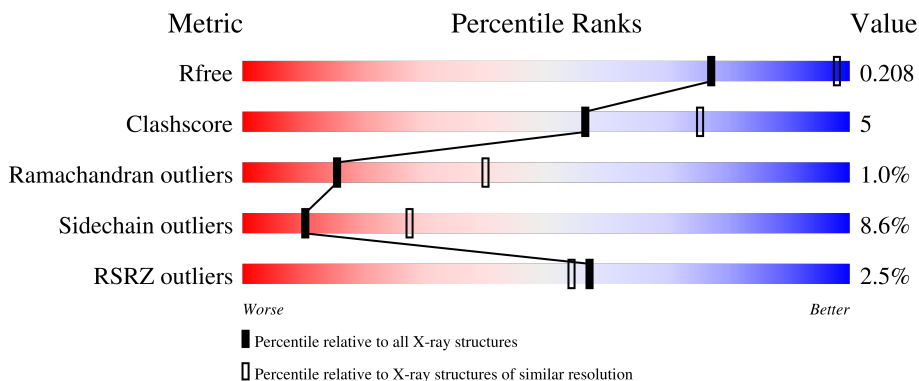
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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	318	 3% 70% 16% • 12%
1	B	318	 3% 70% 15% • 12%
2	C	154	 85% 6% • 8%
2	D	154	 2% 84% 6% • 8%

2 Entry composition i

There are 10 unique types of molecules in this entry. The entry contains 6567 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 ACETYLGLUTAMATE KINASE, CHLOROPLASTIC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	281	2066	1304	359	393	10	0	0	0
1	B	281	2058	1298	357	393	10	0	0	0

There are 42 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	expression tag	UNP Q9SCL7
A	-19	GLY	-	expression tag	UNP Q9SCL7
A	-18	SER	-	expression tag	UNP Q9SCL7
A	-17	SER	-	expression tag	UNP Q9SCL7
A	-16	HIS	-	expression tag	UNP Q9SCL7
A	-15	HIS	-	expression tag	UNP Q9SCL7
A	-14	HIS	-	expression tag	UNP Q9SCL7
A	-13	HIS	-	expression tag	UNP Q9SCL7
A	-12	HIS	-	expression tag	UNP Q9SCL7
A	-11	HIS	-	expression tag	UNP Q9SCL7
A	-10	SER	-	expression tag	UNP Q9SCL7
A	-9	SER	-	expression tag	UNP Q9SCL7
A	-8	GLY	-	expression tag	UNP Q9SCL7
A	-7	LEU	-	expression tag	UNP Q9SCL7
A	-6	VAL	-	expression tag	UNP Q9SCL7
A	-5	PRO	-	expression tag	UNP Q9SCL7
A	-4	ARG	-	expression tag	UNP Q9SCL7
A	-3	GLY	-	expression tag	UNP Q9SCL7
A	-2	SER	-	expression tag	UNP Q9SCL7
A	-1	HIS	-	expression tag	UNP Q9SCL7
A	0	MET	-	expression tag	UNP Q9SCL7
B	-20	MET	-	expression tag	UNP Q9SCL7
B	-19	GLY	-	expression tag	UNP Q9SCL7
B	-18	SER	-	expression tag	UNP Q9SCL7
B	-17	SER	-	expression tag	UNP Q9SCL7

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	HIS	-	expression tag	UNP Q9SCL7
B	-15	HIS	-	expression tag	UNP Q9SCL7
B	-14	HIS	-	expression tag	UNP Q9SCL7
B	-13	HIS	-	expression tag	UNP Q9SCL7
B	-12	HIS	-	expression tag	UNP Q9SCL7
B	-11	HIS	-	expression tag	UNP Q9SCL7
B	-10	SER	-	expression tag	UNP Q9SCL7
B	-9	SER	-	expression tag	UNP Q9SCL7
B	-8	GLY	-	expression tag	UNP Q9SCL7
B	-7	LEU	-	expression tag	UNP Q9SCL7
B	-6	VAL	-	expression tag	UNP Q9SCL7
B	-5	PRO	-	expression tag	UNP Q9SCL7
B	-4	ARG	-	expression tag	UNP Q9SCL7
B	-3	GLY	-	expression tag	UNP Q9SCL7
B	-2	SER	-	expression tag	UNP Q9SCL7
B	-1	HIS	-	expression tag	UNP Q9SCL7
B	0	MET	-	expression tag	UNP Q9SCL7

- Molecule 2 is a protein called NITROGEN REGULATORY PROTEIN PII.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	142	1087	694	188	200	5	0	1	0
2	D	142	1086	694	187	200	5	0	1	0

There are 22 discrepancies between the modelled and reference sequences:

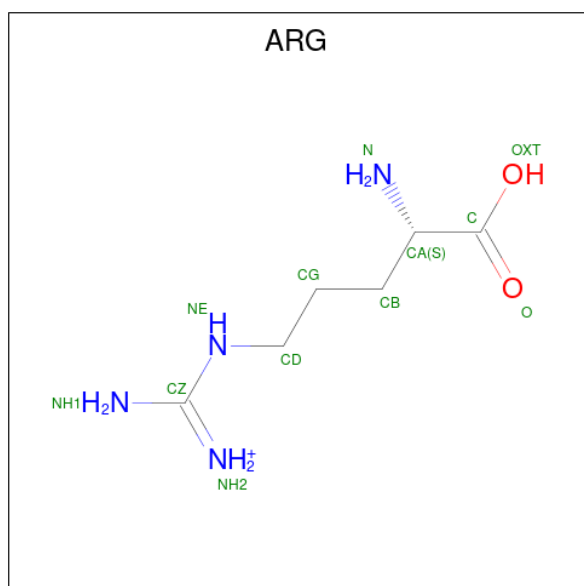
Chain	Residue	Modelled	Actual	Comment	Reference
C	1	MET	-	expression tag	UNP A8JI83
C	145	SER	-	expression tag	UNP A8JI83
C	146	ALA	-	expression tag	UNP A8JI83
C	147	TRP	-	expression tag	UNP A8JI83
C	148	SER	-	expression tag	UNP A8JI83
C	149	HIS	-	expression tag	UNP A8JI83
C	150	PRO	-	expression tag	UNP A8JI83
C	151	GLN	-	expression tag	UNP A8JI83
C	152	PHE	-	expression tag	UNP A8JI83
C	153	GLU	-	expression tag	UNP A8JI83
C	154	LYS	-	expression tag	UNP A8JI83
D	1	MET	-	expression tag	UNP A8JI83
D	145	SER	-	expression tag	UNP A8JI83

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Chain	Residue	Modelled	Actual	Comment	Reference
D	146	ALA	-	expression tag	UNP A8JI83
D	147	TRP	-	expression tag	UNP A8JI83
D	148	SER	-	expression tag	UNP A8JI83
D	149	HIS	-	expression tag	UNP A8JI83
D	150	PRO	-	expression tag	UNP A8JI83
D	151	GLN	-	expression tag	UNP A8JI83
D	152	PHE	-	expression tag	UNP A8JI83
D	153	GLU	-	expression tag	UNP A8JI83
D	154	LYS	-	expression tag	UNP A8JI83

- Molecule 3 is ARGinine (three-letter code: ARG) (formula: $C_6H_{15}N_4O_2$).



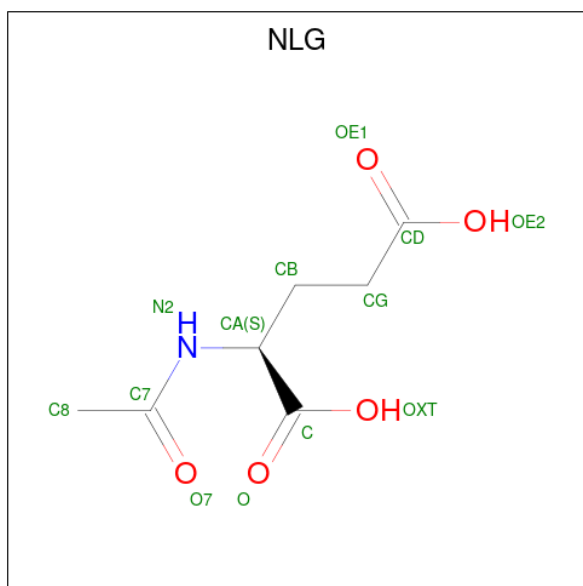
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	Total	6	4	2	0	0
3	B	1	Total	6	4	2	0	0

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



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

- Molecule 5 is N-ACETYL-L-GLUTAMATE (three-letter code: NLG) (formula: $C_7H_{11}NO_5$).

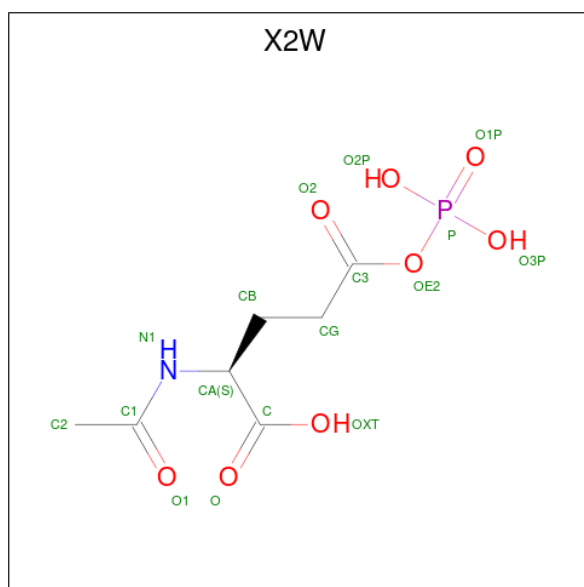


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	A	1	13	7	1	5	0	0

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

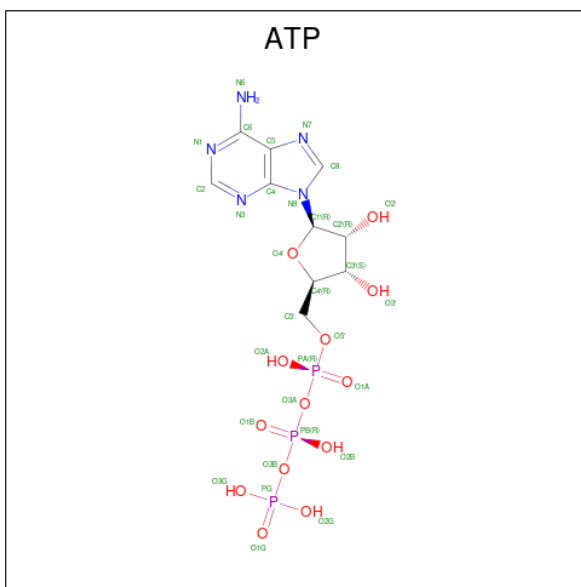
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total Mg 1 1	0	0
6	C	1	Total Mg 1 1	0	0
6	D	1	Total Mg 1 1	0	0

- Molecule 7 is N-ACETYL-L-GLUTAMYL 5-PHOSPHATE (three-letter code: X2W) (formula: $C_7H_{12}NO_8P$).



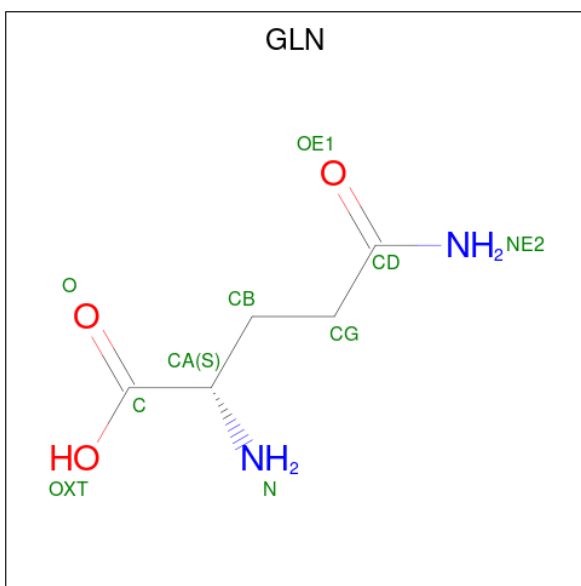
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
7	B	1	Total	C	N	O	P	0	0
			17	7	1	8	1		

- Molecule 8 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			
8	C	1	Total	31	10	5	13	3	0	0
8	D	1	Total	31	10	5	13	3	0	0

- Molecule 9 is GLUTAMINE (three-letter code: GLN) (formula: C₅H₁₀N₂O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			
9	C	1	Total	10	5	2	3	0	0
9	D	1	Total	10	5	2	3	0	0

- Molecule 10 is water.

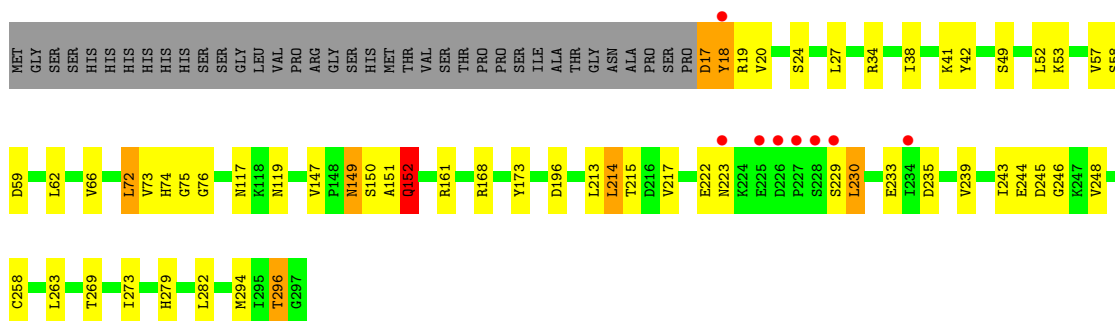
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	37	Total 37	O 37	0	0
10	B	30	Total 30	O 30	0	0
10	C	20	Total 20	O 20	0	0
10	D	17	Total 17	O 17	0	0

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.

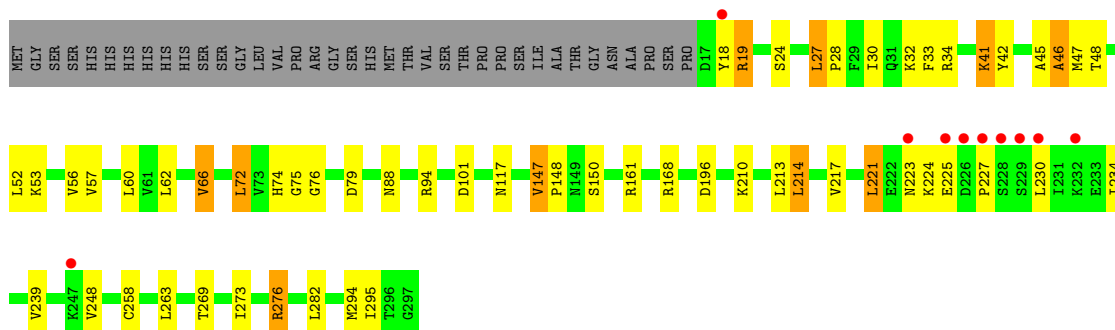
- Molecule 1: ACETYLGLUTAMATE KINASE, CHLOROPLASTIC

Chain A: 3% 70% 16% 12%



- Molecule 1: ACETYLGLUTAMATE KINASE, CHLOROPLASTIC

Chain B: 3% 70% 15% 12%



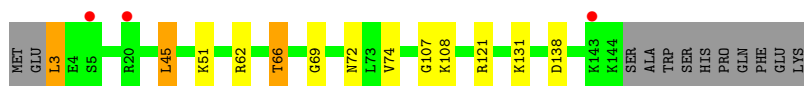
- Molecule 2: NITROGEN REGULATORY PROTEIN PII

Chain C: 85% 6% 8%



- Molecule 2: NITROGEN REGULATORY PROTEIN PII

Chain D: 2% 84% 6% 8%



4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 3	Depositor
Cell constants a, b, c, α , β , γ	171.43Å 171.43Å 171.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.36 – 2.85 39.33 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.0 (39.36-2.85) 99.2 (39.33-2.85)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.50 (at 2.86Å)	Xtrriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.189 , 0.220 0.173 , 0.208	Depositor DCC
R_{free} test set	2027 reflections (5.19%)	wwPDB-VP
Wilson B-factor (Å ²)	56.7	Xtrriage
Anisotropy	0.000	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 45.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.035 for l,-k,h	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6567	wwPDB-VP
Average B, all atoms (Å ²)	60.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.78% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NLG, ATP, X2W, 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	A	0.83	0/2091	0.98	4/2832 (0.1%)
1	B	0.78	0/2083	0.96	5/2824 (0.2%)
2	C	0.75	0/1109	0.92	2/1496 (0.1%)
2	D	0.77	0/1108	0.95	5/1495 (0.3%)
All	All	0.79	0/6391	0.96	16/8647 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	101	ASP	CB-CG-OD1	5.95	123.65	118.30
2	D	3	LEU	CA-CB-CG	5.92	128.91	115.30
2	D	62	ARG	NE-CZ-NH1	5.87	123.24	120.30
1	A	214	LEU	CA-CB-CG	5.84	128.73	115.30
1	B	19	ARG	NE-CZ-NH1	5.79	123.20	120.30
2	C	62	ARG	NE-CZ-NH2	-5.64	117.48	120.30
1	A	152	GLN	CB-CA-C	-5.35	99.70	110.40
1	B	94	ARG	NE-CZ-NH1	5.30	122.95	120.30
1	A	196	ASP	CB-CG-OD1	5.27	123.04	118.30
1	B	276	ARG	NE-CZ-NH1	5.25	122.92	120.30
2	D	45	LEU	CA-CB-CG	5.22	127.31	115.30
2	C	45	LEU	CA-CB-CG	5.21	127.28	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	230	LEU	CA-CB-CG	5.20	127.26	115.30
2	D	62	ARG	NE-CZ-NH2	-5.20	117.70	120.30
1	B	94	ARG	NE-CZ-NH2	-5.10	117.75	120.30
2	D	121	ARG	NE-CZ-NH1	5.09	122.85	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	150	SER	Peptide

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	2066	0	2153	26	0
1	B	2058	0	2131	27	0
2	C	1087	0	1096	7	0
2	D	1086	0	1091	7	0
3	A	12	0	12	0	0
3	B	12	0	12	2	0
4	A	27	0	12	0	0
5	A	13	0	9	0	0
6	A	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
7	B	17	0	9	0	0
8	C	31	0	12	2	0
8	D	31	0	12	2	0
9	C	10	0	7	0	0
9	D	10	0	7	0	0
10	A	37	0	0	0	0
10	B	30	0	0	1	0
10	C	20	0	0	0	0
10	D	17	0	0	0	0
All	All	6567	0	6563	65	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 (65) 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:161:ARG:HA	2:C:66:THR:HB	1.68	0.76
2:C:69:GLY:H	2:C:72:ASN:HD22	1.31	0.76
1:A:161:ARG:HA	2:D:66:THR:HB	1.68	0.74
2:D:69:GLY:H	2:D:72:ASN:HD22	1.37	0.73
1:A:74:HIS:HE1	1:A:117:ASN:HD22	1.36	0.71
1:A:149:ASN:H	1:A:149:ASN:HD22	1.43	0.66
1:A:269:THR:HB	1:A:294:MET:HE2	1.78	0.64
1:B:217:VAL:HA	1:B:276:ARG:HH21	1.63	0.64
1:B:41:LYS:HD2	1:B:196:ASP:OD1	1.97	0.64
1:B:74:HIS:HE1	1:B:117:ASN:HD22	1.46	0.62
1:A:17:ASP:OD1	1:A:18:TYR:N	2.33	0.61
2:C:69:GLY:N	2:C:72:ASN:HD22	1.98	0.61
2:D:69:GLY:N	2:D:72:ASN:HD22	1.99	0.60
1:B:74:HIS:HD2	1:B:75:GLY:O	1.88	0.56
2:C:69:GLY:H	2:C:72:ASN:ND2	2.02	0.56
1:A:214:LEU:HD22	1:A:273:ILE:HD11	1.86	0.56
1:B:234:ILE:O	1:B:295:ILE:HA	2.06	0.55
1:A:269:THR:HB	1:A:294:MET:CE	2.36	0.55
1:B:30:ILE:HG23	1:B:66:VAL:HG13	1.89	0.55
1:A:17:ASP:OD1	1:A:17:ASP:C	2.46	0.54
1:A:74:HIS:HD2	1:A:75:GLY:O	1.92	0.53
1:A:269:THR:CG2	1:A:294:MET:HE2	2.39	0.53
1:B:214:LEU:HD22	1:B:273:ILE:HD11	1.90	0.52
2:D:131:LYS:NZ	2:D:138:ASP:OD1	2.40	0.51
1:A:62:LEU:HD23	1:A:282:LEU:HD11	1.93	0.51
1:A:149:ASN:O	1:A:152:GLN:HG2	2.11	0.51
1:B:210:LYS:HE3	3:B:301:ARG:OXT	2.11	0.50
1:A:42:TYR:OH	1:A:53:LYS:HA	2.10	0.50
1:A:269:THR:CB	1:A:294:MET:HE2	2.41	0.50
1:B:45:ALA:O	1:B:47:MET:N	2.45	0.50
2:C:108:LYS:HE3	8:C:301:ATP:O1B	2.11	0.50
1:B:32:LYS:HD3	10:B:2002:HOH:O	2.11	0.50
1:A:243:ILE:HG12	1:A:248:VAL:HG22	1.94	0.49
1:A:149:ASN:HB2	1:A:152:GLN:HG2	1.94	0.49
1:B:41:LYS:HB3	1:B:213:LEU:HD23	1.94	0.48
1:A:41:LYS:HA	1:A:73:VAL:O	2.13	0.48
2:D:69:GLY:H	2:D:72:ASN:ND2	2.07	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:108:LYS:HE3	8:D:301:ATP:O1B	2.14	0.47
1:A:42:TYR:HB2	1:A:72:LEU:HD21	1.96	0.47
1:B:60:LEU:HD11	1:B:72:LEU:HG	1.97	0.47
1:B:294:MET:HB2	3:B:301:ARG:NH1	2.30	0.46
1:A:53:LYS:NZ	1:A:119:ASN:HD21	2.14	0.46
2:D:107:GLY:HA2	8:D:301:ATP:H5'1	1.95	0.46
1:A:222:GLU:HB3	1:A:229:SER:HB2	1.97	0.46
1:B:52:LEU:O	1:B:56:VAL:HG23	2.16	0.46
1:B:45:ALA:O	1:B:46:ALA:C	2.56	0.44
1:A:41:LYS:HB3	1:A:213:LEU:HD23	2.00	0.43
2:C:107:GLY:HA2	8:C:301:ATP:H5'1	1.99	0.43
1:B:32:LYS:HG2	1:B:33:PHE:CZ	2.54	0.43
1:B:223:ASN:HD21	1:B:225:GLU:HG2	1.84	0.42
1:B:221:LEU:CD2	1:B:227:PRO:HA	2.49	0.42
1:B:42:TYR:OH	1:B:53:LYS:HA	2.18	0.42
1:B:269:THR:CG2	1:B:294:MET:HE2	2.49	0.42
1:B:269:THR:HB	1:B:294:MET:HE2	2.02	0.42
1:B:45:ALA:C	1:B:47:MET:N	2.73	0.41
1:A:59:ASP:OD2	1:A:279:HIS:HA	2.19	0.41
1:B:27:LEU:N	1:B:28:PRO:CD	2.84	0.41
1:B:62:LEU:HD23	1:B:282:LEU:HD11	2.03	0.41
1:A:244:GLU:O	1:A:246:GLY:N	2.54	0.41
1:A:215:THR:HG23	1:A:217:VAL:H	1.86	0.41
1:A:52:LEU:HD23	1:A:52:LEU:HA	1.74	0.40
1:B:147:VAL:HG22	1:B:148:PRO:HD2	2.02	0.40
1:A:282:LEU:HD23	1:A:282:LEU:HA	1.90	0.40
2:C:30:LEU:HB3	2:C:31:PRO:HD3	2.04	0.40
1:B:282:LEU:HD23	1:B:282:LEU:HA	1.93	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	279/318 (88%)	261 (94%)	13 (5%)	5 (2%)	8	25
1	B	279/318 (88%)	262 (94%)	14 (5%)	3 (1%)	14	38
2	C	141/154 (92%)	135 (96%)	6 (4%)	0	100	100
2	D	141/154 (92%)	134 (95%)	7 (5%)	0	100	100
All	All	840/944 (89%)	792 (94%)	40 (5%)	8 (1%)	15	40

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	151	ALA
1	B	46	ALA
1	A	245	ASP
1	B	19	ARG
1	A	76	GLY
1	A	173	TYR
1	A	296	THR
1	B	76	GLY

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	223/256 (87%)	198 (89%)	25 (11%)	6	16
1	B	221/256 (86%)	199 (90%)	22 (10%)	7	21
2	C	113/127 (89%)	109 (96%)	4 (4%)	36	67
2	D	112/127 (88%)	107 (96%)	5 (4%)	27	57
All	All	669/766 (87%)	613 (92%)	56 (8%)	10	28

All (56) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	ASP
1	A	18	TYR
1	A	19	ARG

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Mol	Chain	Res	Type
1	A	20	VAL
1	A	24	SER
1	A	27	LEU
1	A	34	ARG
1	A	38	ILE
1	A	49	SER
1	A	57	VAL
1	A	58	SER
1	A	66	VAL
1	A	72	LEU
1	A	147	VAL
1	A	149	ASN
1	A	152	GLN
1	A	168	ARG
1	A	223	ASN
1	A	230	LEU
1	A	233	GLU
1	A	235	ASP
1	A	239	VAL
1	A	258	CYS
1	A	263	LEU
1	A	296	THR
1	B	18	TYR
1	B	24	SER
1	B	27	LEU
1	B	34	ARG
1	B	41	LYS
1	B	48	THR
1	B	57	VAL
1	B	66	VAL
1	B	72	LEU
1	B	79	ASP
1	B	88	ASN
1	B	147	VAL
1	B	150	SER
1	B	168	ARG
1	B	214	LEU
1	B	221	LEU
1	B	224	LYS
1	B	230	LEU
1	B	239	VAL
1	B	248	VAL

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Mol	Chain	Res	Type
1	B	258	CYS
1	B	263	LEU
2	C	45	LEU
2	C	51	LYS
2	C	66	THR
2	C	74	VAL
2	D	3	LEU
2	D	45	LEU
2	D	51	LYS
2	D	66	THR
2	D	74	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	74	HIS
1	A	119	ASN
1	A	149	ASN
1	B	74	HIS
1	B	119	ASN
1	B	223	ASN
2	C	47	ASN
2	C	72	ASN
2	C	87	GLN
2	D	47	ASN
2	D	72	ASN
2	D	87	GLN

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 monosaccharides in this entry.

5.6 Ligand geometry

Of 12 ligands modelled in this entry, 3 are monoatomic - leaving 9 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
9	GLN	D	303	-	8,9,9	0.89	0	10,11,11	1.32	1 (10%)
5	NLG	A	303	-	12,12,12	0.96	0	15,15,15	1.05	0
3	ARG	A	301	-	10,11,11	0.85	1 (10%)	11,13,13	1.74	3 (27%)
3	ARG	B	301	-	10,11,11	0.66	0	11,13,13	1.72	2 (18%)
8	ATP	C	301	6	26,33,33	0.95	1 (3%)	31,52,52	1.77	8 (25%)
8	ATP	D	301	6	26,33,33	1.15	2 (7%)	31,52,52	1.74	10 (32%)
9	GLN	C	303	-	8,9,9	0.87	0	10,11,11	0.95	1 (10%)
4	ADP	A	302	6	24,29,29	1.09	1 (4%)	29,45,45	1.72	5 (17%)
7	X2W	B	303	-	15,16,16	2.63	1 (6%)	19,22,22	1.77	5 (26%)

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
9	GLN	D	303	-	-	2/9/9/9	-
5	NLG	A	303	-	-	0/13/13/13	-
3	ARG	A	301	-	-	2/11/11/11	-
3	ARG	B	301	-	-	4/11/11/11	-
8	ATP	C	301	6	-	4/18/38/38	0/3/3/3
8	ATP	D	301	6	-	4/18/38/38	0/3/3/3
9	GLN	C	303	-	-	2/9/9/9	-
4	ADP	A	302	6	-	5/12/32/32	0/3/3/3
7	X2W	B	303	-	-	0/16/18/18	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	303	X2W	P-OE2	9.36	1.73	1.59
4	A	302	ADP	C5-C4	3.02	1.48	1.40
8	D	301	ATP	C5-C4	2.35	1.47	1.40
3	A	301	ARG	OXT-C	-2.08	1.23	1.30
8	C	301	ATP	C5-C4	2.04	1.46	1.40
8	D	301	ATP	C2'-C1'	-2.01	1.50	1.53

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	302	ADP	O5'-PA-O1A	4.87	128.08	109.07
8	D	301	ATP	C4-C5-N7	-4.17	105.06	109.40
4	A	302	ADP	N3-C2-N1	-4.07	122.32	128.68
7	B	303	X2W	CB-CA-C	4.05	120.12	110.35
8	C	301	ATP	C4-C5-N7	-3.98	105.25	109.40
3	B	301	ARG	OXT-C-O	-3.74	115.60	124.09
3	A	301	ARG	OXT-C-O	-3.63	115.85	124.09
8	C	301	ATP	C5-C6-N6	3.60	125.82	120.35
3	B	301	ARG	OXT-C-CA	3.58	125.57	113.38
9	D	303	GLN	OXT-C-O	-3.53	116.07	124.09
8	C	301	ATP	N3-C2-N1	-3.37	123.41	128.68
8	C	301	ATP	PB-O3B-PG	-3.23	121.75	132.83
8	D	301	ATP	PB-O3B-PG	-3.07	122.28	132.83
7	B	303	X2W	O2-C3-CG	-3.07	111.77	123.73
8	C	301	ATP	C2-N1-C6	3.05	123.97	118.75
7	B	303	X2W	C-CA-N1	-2.90	103.67	110.55
4	A	302	ADP	C2-N1-C6	2.90	123.71	118.75
8	D	301	ATP	O3G-PG-O2G	2.89	118.70	107.64
8	D	301	ATP	C3'-C2'-C1'	2.89	105.33	100.98
8	C	301	ATP	PA-O3A-PB	-2.85	123.04	132.83
3	A	301	ARG	OXT-C-CA	2.52	121.96	113.38
8	D	301	ATP	PA-O3A-PB	-2.48	124.32	132.83
9	C	303	GLN	OXT-C-O	-2.45	118.53	124.09
4	A	302	ADP	O2B-PB-O1B	2.40	120.07	110.68
8	D	301	ATP	N3-C2-N1	-2.37	124.98	128.68
8	C	301	ATP	C3'-C2'-C1'	2.30	104.44	100.98
8	D	301	ATP	C5-C6-N6	2.28	123.81	120.35
7	B	303	X2W	CB-CG-C3	2.27	119.88	113.25
8	D	301	ATP	C5-C6-N1	-2.14	115.51	120.35
3	A	301	ARG	CG-CB-CA	2.12	120.16	113.35
8	D	301	ATP	O2A-PA-O1A	2.09	122.55	112.24
8	D	301	ATP	O2'-C2'-C1'	-2.06	103.25	110.85
8	C	301	ATP	O2A-PA-O1A	2.06	122.41	112.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	302	ADP	C5-C6-N6	2.03	123.44	120.35
7	B	303	X2W	OXT-C-O	-2.01	119.52	124.09

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	301	ARG	N-CA-CB-CG
3	B	301	ARG	C-CA-CB-CG
4	A	302	ADP	PA-O3A-PB-O3B
8	C	301	ATP	C5'-O5'-PA-O2A
8	C	301	ATP	C5'-O5'-PA-O3A
8	D	301	ATP	C5'-O5'-PA-O2A
8	D	301	ATP	C5'-O5'-PA-O3A
3	A	301	ARG	NE-CD-CG-CB
4	A	302	ADP	O4'-C4'-C5'-O5'
4	A	302	ADP	C3'-C4'-C5'-O5'
3	B	301	ARG	NE-CD-CG-CB
4	A	302	ADP	C4'-C5'-O5'-PA
3	B	301	ARG	CA-CB-CG-CD
8	C	301	ATP	PG-O3B-PB-O1B
9	D	303	GLN	O-C-CA-N
4	A	302	ADP	PA-O3A-PB-O2B
3	A	301	ARG	CA-CB-CG-CD
9	C	303	GLN	O-C-CA-N
9	D	303	GLN	OXT-C-CA-N
8	D	301	ATP	PB-O3B-PG-O3G
9	C	303	GLN	OXT-C-CA-N
8	C	301	ATP	PG-O3B-PB-O2B
8	D	301	ATP	PB-O3A-PA-O1A

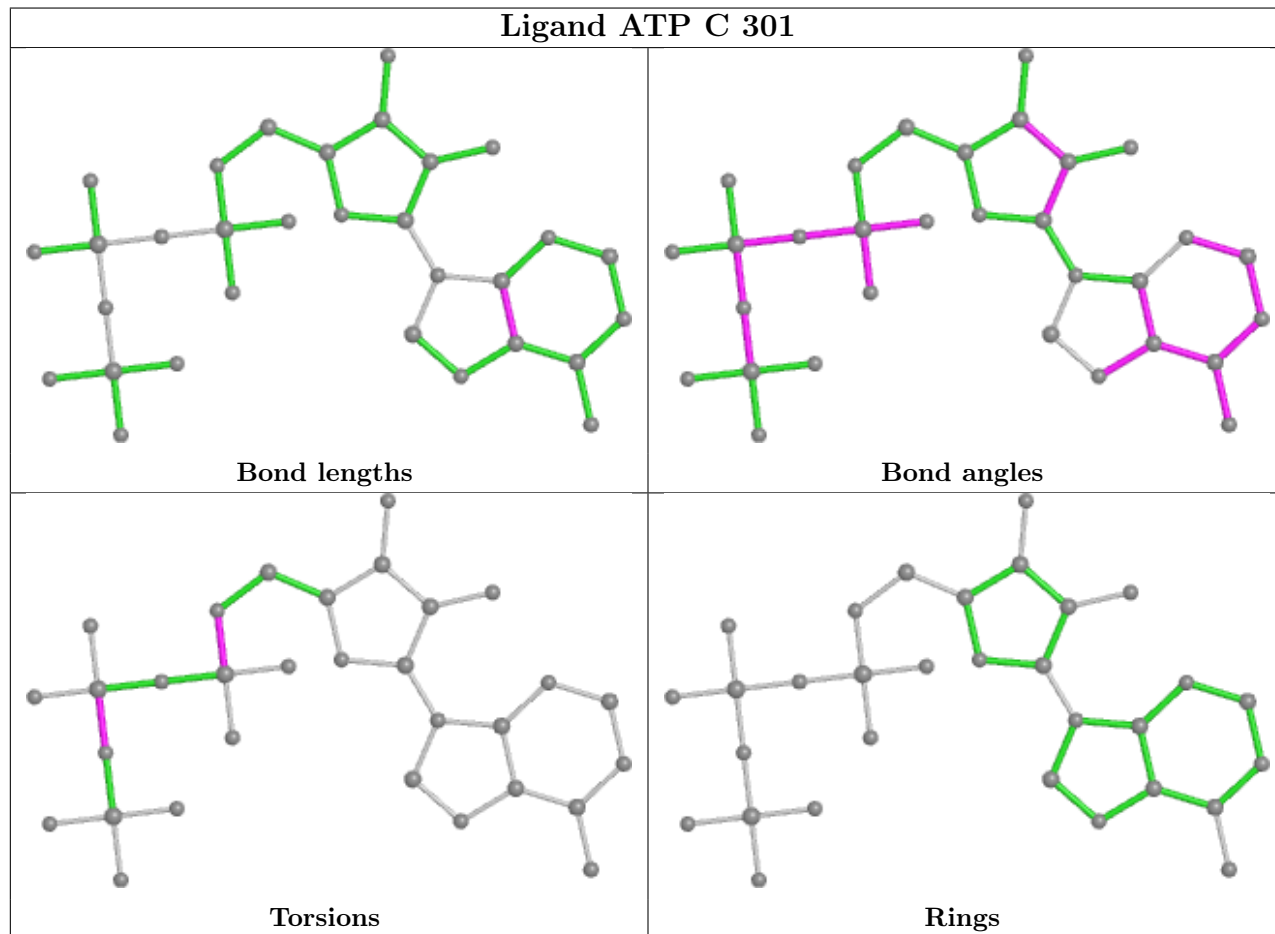
There are no ring outliers.

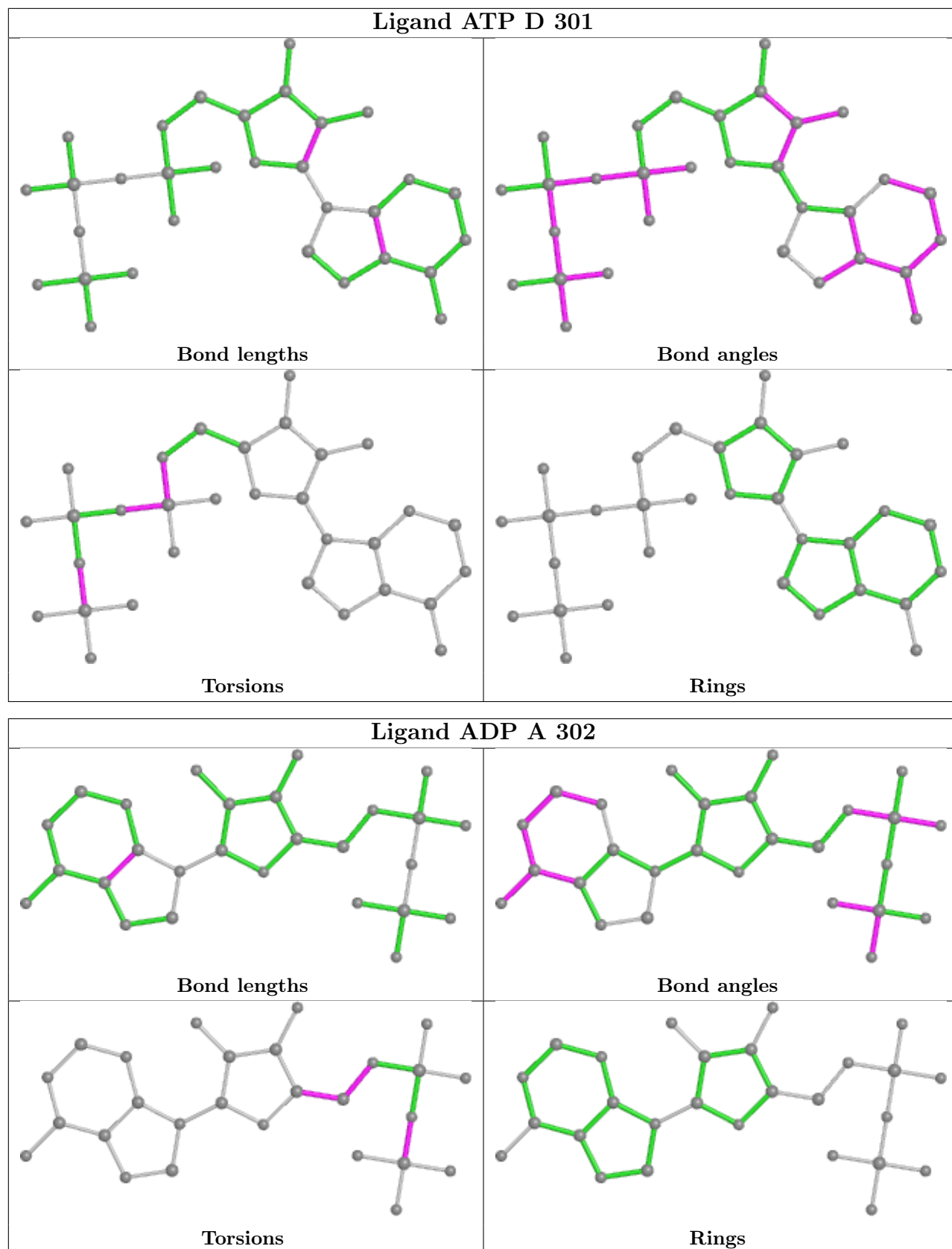
3 monomers are involved in 6 short contacts:

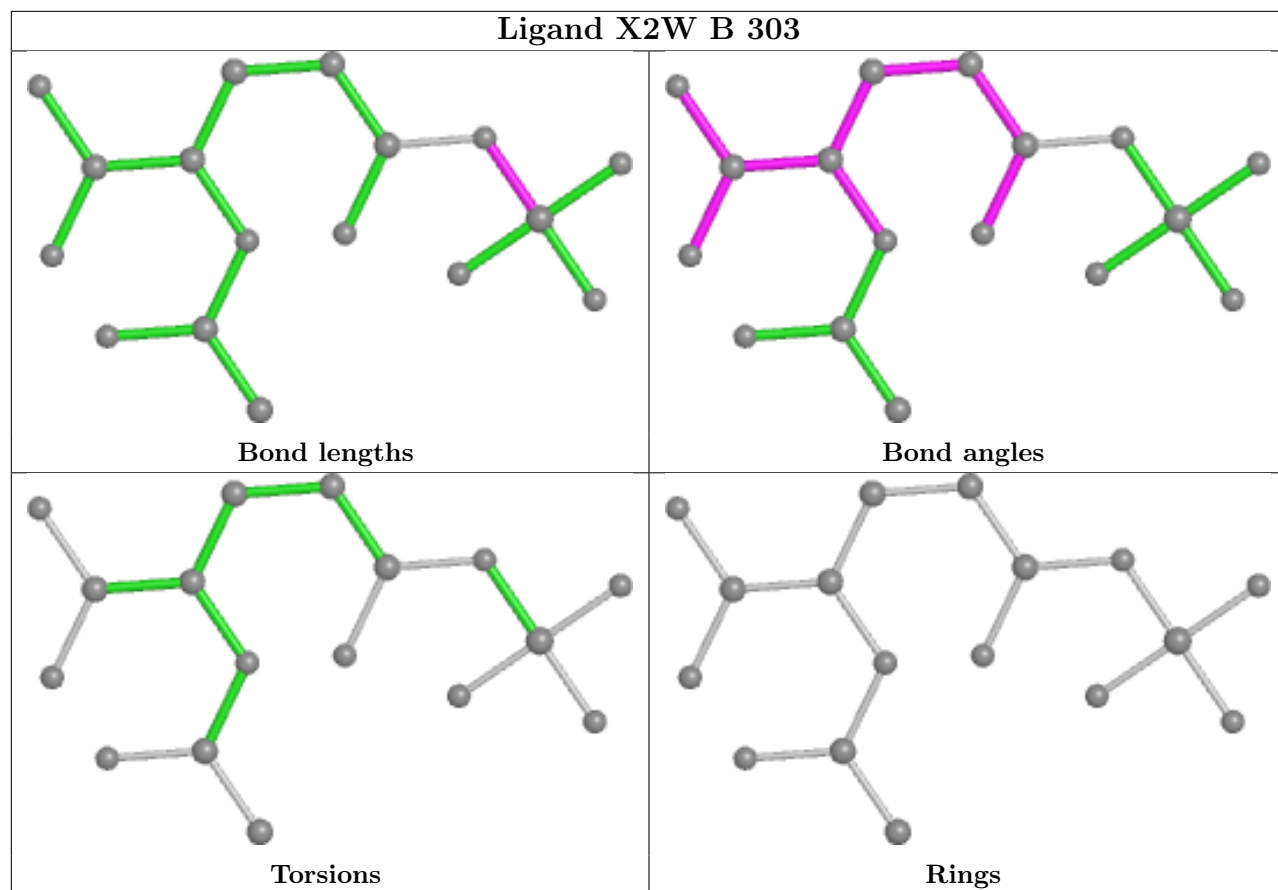
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	301	ARG	2	0
8	C	301	ATP	2	0
8	D	301	ATP	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	281/318 (88%)	-0.24	8 (2%) 53 48	36, 53, 89, 132	0
1	B	281/318 (88%)	-0.23	10 (3%) 42 37	38, 56, 110, 143	0
2	C	142/154 (92%)	-0.33	0 100 100	40, 58, 80, 102	0
2	D	142/154 (92%)	-0.20	3 (2%) 63 60	39, 56, 76, 115	0
All	All	846/944 (89%)	-0.25	21 (2%) 57 54	36, 56, 98, 143	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	225	GLU	5.3
1	B	18	TYR	3.5
1	B	226	ASP	3.4
1	B	227	PRO	3.3
2	D	143	LYS	2.9
2	D	5	SER	2.8
1	B	228	SER	2.8
1	B	223	ASN	2.7
1	B	229	SER	2.7
1	A	228	SER	2.7
1	B	232	LYS	2.5
1	A	18	TYR	2.4
1	A	226	ASP	2.3
1	A	234	ILE	2.3
1	A	225	GLU	2.3
1	B	230	LEU	2.2
1	B	247	LYS	2.1
2	D	20	ARG	2.1
1	A	223	ASN	2.0
1	A	229	SER	2.0
1	A	227	PRO	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](#)

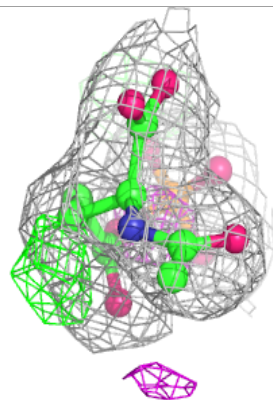
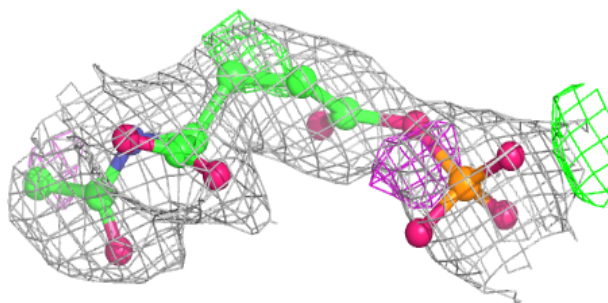
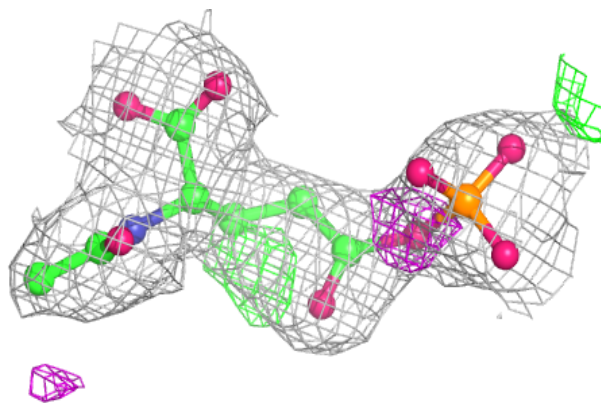
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
7	X2W	B	303	17/17	0.92	0.19	47,51,102,105	0
9	GLN	C	303	10/10	0.93	0.18	54,62,76,82	0
9	GLN	D	303	10/10	0.93	0.18	44,59,71,80	0
6	MG	A	304	1/1	0.96	0.24	41,41,41,41	0
3	ARG	A	301	12/12	0.96	0.23	66,68,71,77	0
3	ARG	B	301	12/12	0.96	0.25	69,75,86,86	0
4	ADP	A	302	27/27	0.96	0.14	45,59,63,64	0
8	ATP	D	301	31/31	0.97	0.14	41,48,52,54	0
6	MG	C	302	1/1	0.97	0.04	58,58,58,58	0
5	NLG	A	303	13/13	0.97	0.17	40,45,49,50	0
8	ATP	C	301	31/31	0.98	0.11	42,48,52,56	0
6	MG	D	302	1/1	0.98	0.05	53,53,53,53	0

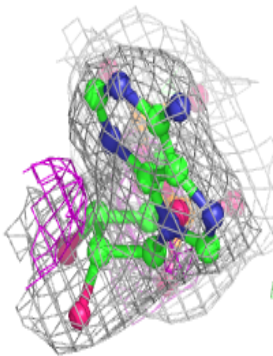
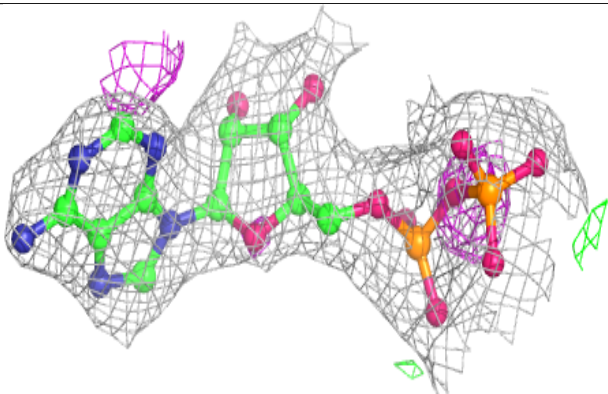
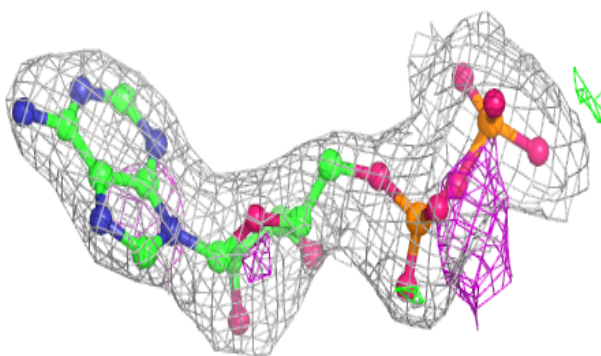
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

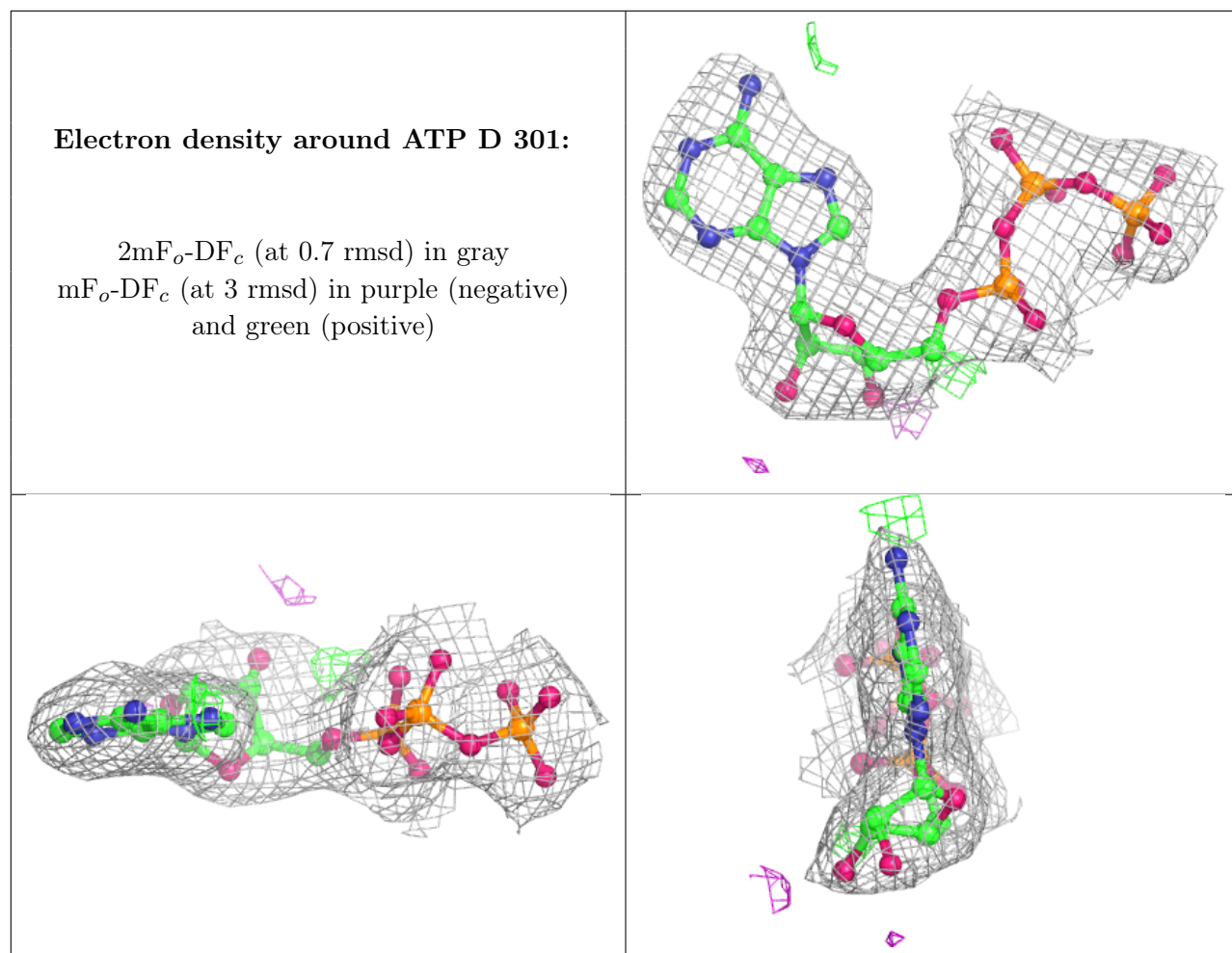
Electron density around X2W B 303:

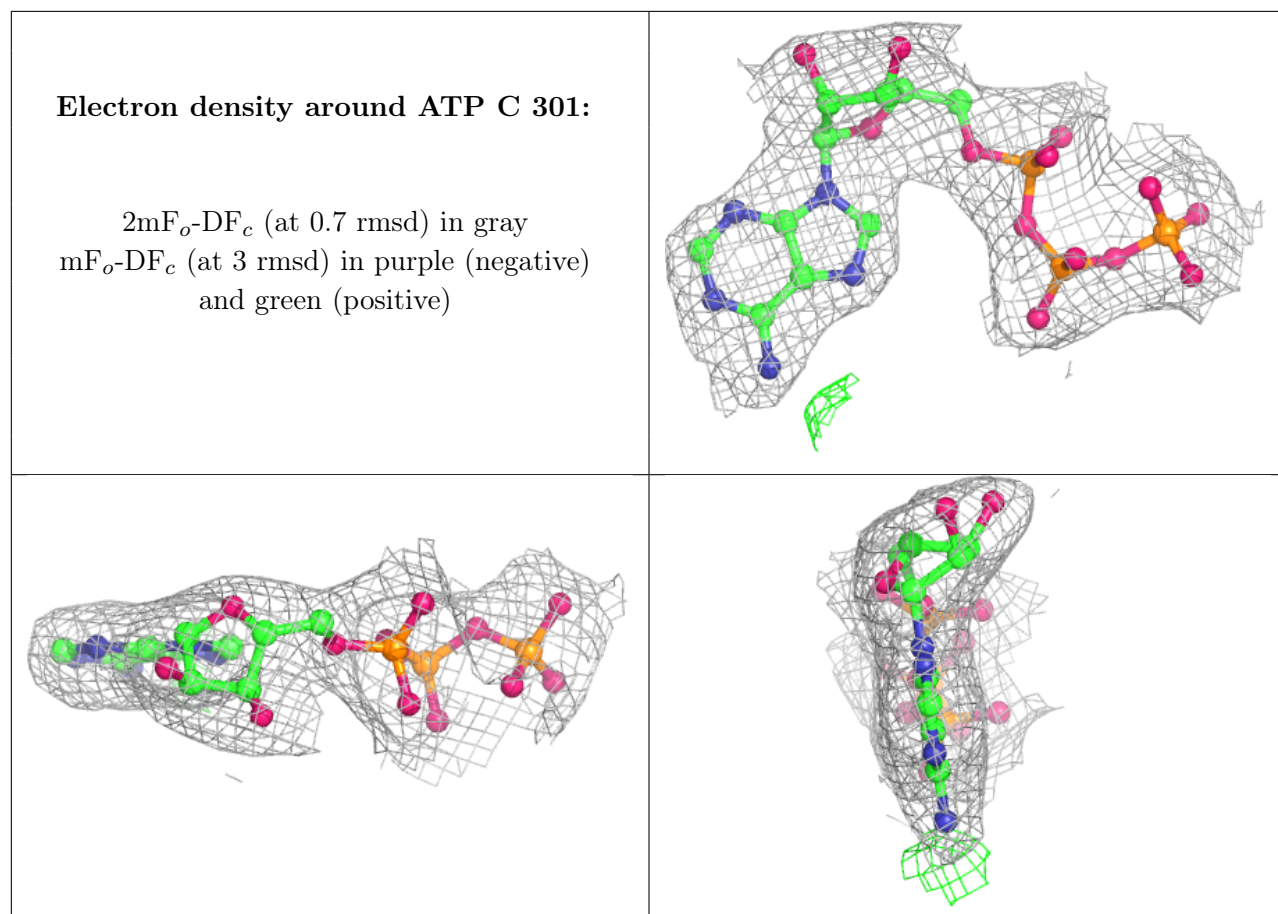
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around ADP A 302:**

$2mF_o-DF_c$ (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.