



Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 09:53 pm BST

PDB ID : 5X9H
Title : Crystal structure of the Mg²⁺ channel MgtE in complex with ATP
Authors : Tomita, A.; Hattori, M.; Nureki, O.
Deposited on : 2017-03-07
Resolution : 3.60 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

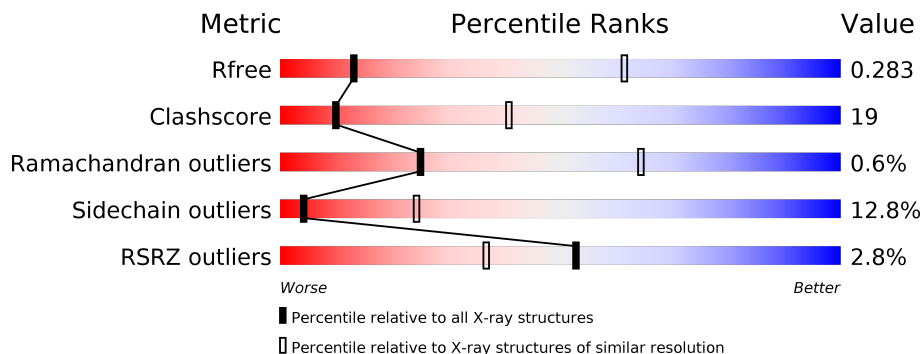
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1257 (3.70-3.50)
Clashscore	141614	1353 (3.70-3.50)
Ramachandran outliers	138981	1307 (3.70-3.50)
Sidechain outliers	138945	1307 (3.70-3.50)
RSRZ outliers	127900	1161 (3.70-3.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 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	473	 2% 53% 32% 5% 10%
1	B	473	 3% 55% 31% 10%

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	MG	A	508	-	-	-	X
3	MG	A	509	-	-	-	X
3	MG	B	503	-	-	-	X

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 6522 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 Magnesium transporter MgtE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	427	Total	C	N	O	S	0	0	0
			3248	2108	528	605	7			
1	B	426	Total	C	N	O	S	0	0	0
			3199	2084	504	604	7			

There are 46 discrepancies between the modelled and reference sequences:

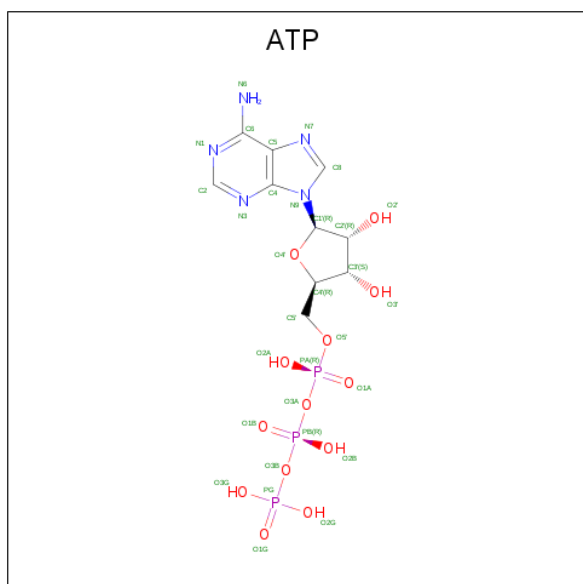
Chain	Residue	Modelled	Actual	Comment	Reference
A	-22	MET	-	expression tag	UNP Q5SMG8
A	-21	GLY	-	expression tag	UNP Q5SMG8
A	-20	SER	-	expression tag	UNP Q5SMG8
A	-19	SER	-	expression tag	UNP Q5SMG8
A	-18	HIS	-	expression tag	UNP Q5SMG8
A	-17	HIS	-	expression tag	UNP Q5SMG8
A	-16	HIS	-	expression tag	UNP Q5SMG8
A	-15	HIS	-	expression tag	UNP Q5SMG8
A	-14	HIS	-	expression tag	UNP Q5SMG8
A	-13	HIS	-	expression tag	UNP Q5SMG8
A	-12	SER	-	expression tag	UNP Q5SMG8
A	-11	SER	-	expression tag	UNP Q5SMG8
A	-10	GLY	-	expression tag	UNP Q5SMG8
A	-9	LEU	-	expression tag	UNP Q5SMG8
A	-8	GLY	-	expression tag	UNP Q5SMG8
A	-7	VAL	-	expression tag	UNP Q5SMG8
A	-6	LEU	-	expression tag	UNP Q5SMG8
A	-5	PRO	-	expression tag	UNP Q5SMG8
A	-4	GLY	-	expression tag	UNP Q5SMG8
A	-3	GLY	-	expression tag	UNP Q5SMG8
A	-2	PRO	-	expression tag	UNP Q5SMG8
A	-1	LEU	-	expression tag	UNP Q5SMG8
A	0	HIS	-	expression tag	UNP Q5SMG8
B	-22	MET	-	expression tag	UNP Q5SMG8
B	-21	GLY	-	expression tag	UNP Q5SMG8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-20	SER	-	expression tag	UNP Q5SMG8
B	-19	SER	-	expression tag	UNP Q5SMG8
B	-18	HIS	-	expression tag	UNP Q5SMG8
B	-17	HIS	-	expression tag	UNP Q5SMG8
B	-16	HIS	-	expression tag	UNP Q5SMG8
B	-15	HIS	-	expression tag	UNP Q5SMG8
B	-14	HIS	-	expression tag	UNP Q5SMG8
B	-13	HIS	-	expression tag	UNP Q5SMG8
B	-12	SER	-	expression tag	UNP Q5SMG8
B	-11	SER	-	expression tag	UNP Q5SMG8
B	-10	GLY	-	expression tag	UNP Q5SMG8
B	-9	LEU	-	expression tag	UNP Q5SMG8
B	-8	GLY	-	expression tag	UNP Q5SMG8
B	-7	VAL	-	expression tag	UNP Q5SMG8
B	-6	LEU	-	expression tag	UNP Q5SMG8
B	-5	PRO	-	expression tag	UNP Q5SMG8
B	-4	GLY	-	expression tag	UNP Q5SMG8
B	-3	GLY	-	expression tag	UNP Q5SMG8
B	-2	PRO	-	expression tag	UNP Q5SMG8
B	-1	LEU	-	expression tag	UNP Q5SMG8
B	0	HIS	-	expression tag	UNP Q5SMG8

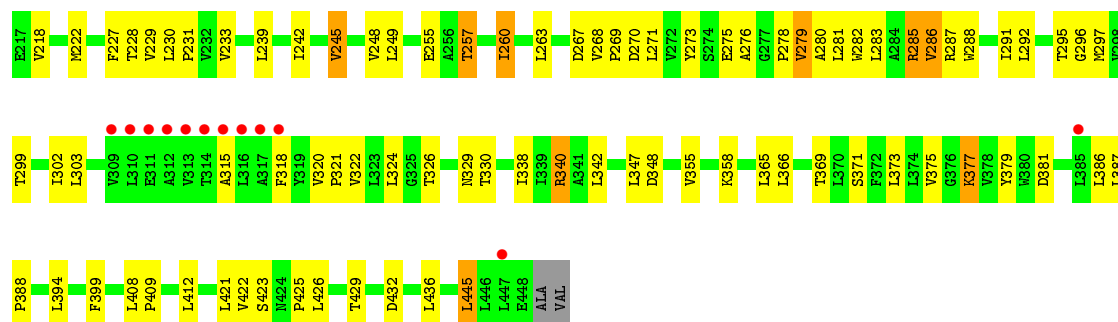
- Molecule 2 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



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

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	B	5	5	5	0	0
3	A	8	8	8	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	135.33Å 85.65Å 156.56Å 90.00° 100.02° 90.00°	Depositor
Resolution (Å)	50.33 – 3.60 50.33 – 3.60	Depositor EDS
% Data completeness (in resolution range)	98.3 (50.33-3.60) 98.3 (50.33-3.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.59 (at 3.57Å)	Xtrriage
Refinement program	PHENIX (1.10_2155)	Depositor
R, R_{free}	0.250 , 0.283 0.250 , 0.283	Depositor DCC
R_{free} test set	1993 reflections (9.79%)	wwPDB-VP
Wilson B-factor (Å ²)	152.5	Xtrriage
Anisotropy	0.338	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.25 , 101.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	6522	wwPDB-VP
Average B, all atoms (Å ²)	169.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.56% 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: MG, 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	0.47	1/3308 (0.0%)	0.67	2/4534 (0.0%)
1	B	0.45	1/3259 (0.0%)	0.64	1/4478 (0.0%)
All	All	0.46	2/6567 (0.0%)	0.66	3/9012 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	66	PRO	N-CD	5.02	1.54	1.47
1	A	178	GLY	C-O	5.02	1.31	1.23

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	114	LEU	CA-CB-CG	6.22	129.60	115.30
1	A	88	LEU	CA-CB-CG	6.01	129.12	115.30
1	B	65	SER	C-N-CD	5.85	140.69	128.40

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3248	0	3273	149	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3199	0	3187	137	0
2	A	31	0	12	1	0
2	B	31	0	12	2	0
3	A	8	0	0	0	0
3	B	5	0	0	0	0
All	All	6522	0	6484	248	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 19.

All (248) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:29:HIS:ND1	1:A:30:PRO:HD2	1.28	1.39
1:A:29:HIS:ND1	1:A:30:PRO:CD	1.96	1.26
1:B:132:ASP:HA	1:B:215:GLN:OE1	1.07	1.23
1:B:132:ASP:CA	1:B:215:GLN:OE1	1.96	1.11
1:B:216:GLU:HG2	1:B:255:GLU:HG2	1.40	1.03
1:B:132:ASP:O	1:B:215:GLN:CG	2.14	0.95
1:B:132:ASP:O	1:B:215:GLN:HG3	1.74	0.87
1:A:29:HIS:ND1	1:A:30:PRO:HD3	1.91	0.84
1:B:132:ASP:O	1:B:215:GLN:HG2	1.78	0.82
1:A:93:LEU:HD23	1:A:123:VAL:HG21	1.61	0.81
1:A:31:GLN:HG3	1:A:34:LEU:HD12	1.65	0.79
1:B:216:GLU:HG2	1:B:255:GLU:CG	2.13	0.79
1:A:400:PHE:O	1:A:404:VAL:HG23	1.83	0.77
1:A:29:HIS:CE1	1:A:30:PRO:CD	2.69	0.75
1:B:216:GLU:HG3	1:B:255:GLU:OE2	1.86	0.75
1:B:93:LEU:HD21	1:B:115:LEU:HD21	1.67	0.75
1:B:132:ASP:C	1:B:215:GLN:HG2	2.08	0.74
1:A:73:LEU:O	1:A:107:TYR:OH	2.05	0.74
1:B:147:GLU:HB2	1:B:199:ALA:HB2	1.70	0.74
1:B:324:LEU:HD12	1:B:432:ASP:HA	1.70	0.73
1:A:29:HIS:CE1	1:A:30:PRO:HD2	2.20	0.72
1:B:81:LEU:HD11	1:B:114:LEU:HD13	1.71	0.72
1:B:379:TYR:HB2	1:B:387:LEU:HD21	1.72	0.71
1:B:132:ASP:HA	1:B:215:GLN:CD	2.08	0.70
1:B:24:VAL:HG13	1:B:25:LEU:HD23	1.72	0.70
1:B:185:SER:HB3	2:B:501:ATP:H3'	1.73	0.69
1:B:216:GLU:CG	1:B:255:GLU:OE2	2.40	0.69
1:A:315:ALA:HA	1:A:318:PHE:CD2	2.29	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:332:ASN:O	1:A:336:THR:HG23	1.94	0.67
1:A:215:GLN:HE21	1:A:251:VAL:HG13	1.59	0.66
1:B:184:LEU:HD22	1:B:189:LEU:HD21	1.78	0.66
1:B:208:TYR:HD1	1:B:208:TYR:H	1.43	0.65
1:A:91:ASP:OD1	1:A:92:ASP:N	2.29	0.65
1:A:359:GLU:OE1	1:B:285:ARG:NH2	2.29	0.65
1:B:180:LEU:HD13	1:B:239:LEU:HD13	1.80	0.64
1:A:371:SER:HA	1:A:394:LEU:HD23	1.80	0.64
1:A:31:GLN:HA	1:A:34:LEU:HB2	1.81	0.63
1:B:280:ALA:HA	1:B:283:LEU:HD12	1.78	0.63
1:A:78:PRO:HA	1:A:81:LEU:HB2	1.80	0.63
1:B:173:VAL:HG21	1:B:202:MET:SD	2.38	0.63
1:B:112:LYS:NZ	1:B:124:GLU:OE2	2.28	0.62
1:A:219:ALA:HB1	1:A:252:LEU:HD12	1.82	0.61
1:A:423:SER:HB2	1:A:425:PRO:HD2	1.83	0.61
1:B:209:VAL:HG21	1:B:218:VAL:HG22	1.82	0.61
1:A:378:VAL:HG11	1:A:387:LEU:HA	1.83	0.60
1:A:176:GLU:HG2	1:A:177:LYS:HG3	1.81	0.60
1:A:30:PRO:HD2	1:A:31:GLN:H	1.65	0.59
1:A:293:ILE:HD11	1:B:326:THR:HG23	1.83	0.59
1:B:132:ASP:C	1:B:215:GLN:CG	2.69	0.59
1:A:336:THR:HB	1:A:340:ARG:HH22	1.68	0.59
1:A:30:PRO:CD	1:A:31:GLN:H	2.16	0.58
1:A:303:LEU:HD23	1:A:440:LEU:HD11	1.85	0.58
1:A:348:ASP:OD1	1:A:349:LEU:N	2.36	0.58
1:A:318:PHE:HA	1:B:303:LEU:HD13	1.85	0.58
1:A:360:MET:HA	1:A:403:LEU:HD11	1.86	0.57
1:A:417:VAL:O	1:A:419:PRO:HD3	2.04	0.57
1:B:71:GLU:O	1:B:75:THR:OG1	2.23	0.57
1:A:54:LYS:HA	1:A:80:ARG:HH12	1.69	0.57
1:A:29:HIS:CG	1:A:30:PRO:CD	2.83	0.57
1:B:175:ASP:OD1	1:B:178:GLY:N	2.37	0.57
1:A:323:LEU:HD23	1:A:397:ILE:HD12	1.86	0.57
1:B:132:ASP:CB	1:B:215:GLN:OE1	2.53	0.56
1:B:288:TRP:HZ3	1:B:426:LEU:HD12	1.70	0.56
1:A:320:VAL:N	1:A:321:PRO:CD	2.69	0.55
1:A:319:TYR:C	1:A:321:PRO:HD2	2.27	0.55
1:B:109:GLN:HA	1:B:112:LYS:HG2	1.87	0.55
1:A:222:MET:HE3	1:A:230:LEU:HD22	1.88	0.55
1:B:66:PRO:O	1:B:69:GLN:HB2	2.07	0.55
1:B:142:TYR:HB3	1:B:242:ILE:HG12	1.89	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:145:VAL:HG22	1:B:149:MET:HG3	1.90	0.54
1:B:408:LEU:N	1:B:409:PRO:HD2	2.22	0.54
1:A:309:VAL:HG12	1:A:447:LEU:HD12	1.90	0.54
1:A:340:ARG:CZ	1:B:260:ILE:HB	2.38	0.54
1:A:24:VAL:HG12	1:A:28:ILE:HG23	1.88	0.54
1:A:282:TRP:O	1:A:286:VAL:HB	2.08	0.54
1:B:81:LEU:O	1:B:85:LEU:HB2	2.07	0.54
1:B:145:VAL:O	1:B:173:VAL:HA	2.08	0.53
1:A:184:LEU:HD21	1:A:189:LEU:HD21	1.91	0.53
1:A:285:ARG:NH2	1:B:330:THR:O	2.41	0.53
1:B:371:SER:HA	1:B:394:LEU:HD23	1.90	0.53
1:B:222:MET:HE2	1:B:230:LEU:HG	1.90	0.53
1:A:132:ASP:O	1:A:215:GLN:HB2	2.09	0.52
1:B:37:TRP:CE2	1:B:45:ARG:HD2	2.44	0.52
1:A:276:ALA:O	1:B:358:LYS:NZ	2.24	0.52
1:A:321:PRO:CD	1:A:322:VAL:H	2.22	0.52
1:A:358:LYS:NZ	1:B:276:ALA:O	2.37	0.52
1:A:436:LEU:HD11	1:B:321:PRO:HG2	1.92	0.52
1:B:281:LEU:O	1:B:285:ARG:HG3	2.10	0.52
1:A:319:TYR:OH	1:A:378:VAL:HA	2.10	0.52
1:A:185:SER:HB2	2:A:501:ATP:H3'	1.91	0.52
1:B:279:VAL:O	1:B:282:TRP:HB3	2.09	0.52
1:A:322:VAL:HG22	1:B:296:GLY:C	2.30	0.51
1:A:407:MET:O	1:A:408:LEU:C	2.49	0.51
1:A:179:ARG:HA	1:A:238:ARG:HA	1.93	0.51
1:A:55:ALA:HB2	1:A:87:GLU:OE2	2.10	0.51
1:A:134:ALA:O	1:A:135:GLY:C	2.47	0.51
1:A:142:TYR:CE2	1:A:239:LEU:HG	2.45	0.51
1:A:377:LYS:O	1:A:381:ASP:N	2.44	0.51
1:B:208:TYR:HA	1:B:231:PRO:HD2	1.92	0.51
1:A:140:PRO:HD2	1:A:141:GLU:OE1	2.10	0.51
1:B:387:LEU:N	1:B:388:PRO:HD2	2.26	0.51
1:B:315:ALA:HA	1:B:318:PHE:CD2	2.45	0.51
1:A:292:LEU:HD23	1:B:329:ASN:ND2	2.25	0.51
1:B:287:ARG:O	1:B:291:ILE:HG12	2.11	0.51
1:A:29:HIS:O	1:A:30:PRO:C	2.46	0.50
1:A:77:PRO:HG2	1:A:80:ARG:HB2	1.94	0.50
1:A:321:PRO:CG	1:A:322:VAL:N	2.73	0.50
1:A:250:ASP:N	1:A:250:ASP:OD1	2.40	0.50
1:B:214:ASP:O	1:B:215:GLN:C	2.49	0.50
1:A:333:GLN:OE1	1:B:285:ARG:HD2	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:145:VAL:HG21	1:B:154:VAL:HG22	1.94	0.50
1:B:222:MET:SD	1:B:245:VAL:HG23	2.52	0.50
1:A:288:TRP:HA	1:A:291:ILE:HD12	1.94	0.50
1:A:249:LEU:HD22	1:B:249:LEU:HD13	1.95	0.49
1:A:142:TYR:HE2	1:A:239:LEU:HG	1.76	0.49
1:A:79:TRP:CG	1:A:80:ARG:N	2.81	0.49
1:B:134:ALA:HA	1:B:137:LEU:HD11	1.94	0.49
1:B:282:TRP:CE2	1:B:286:VAL:HG21	2.48	0.49
1:B:47:VAL:HA	1:B:50:THR:HG22	1.95	0.49
1:A:29:HIS:CE1	1:A:30:PRO:HD3	2.41	0.48
1:A:77:PRO:HB2	1:A:79:TRP:HD1	1.78	0.48
1:A:167:THR:HG21	1:A:229:VAL:HG21	1.94	0.48
1:A:359:GLU:HG3	1:A:402:ASN:HD21	1.78	0.48
1:B:74:LYS:HA	1:B:107:TYR:CE2	2.48	0.48
1:A:400:PHE:O	1:A:404:VAL:CG2	2.58	0.48
1:B:112:LYS:HZ2	1:B:120:ARG:HE	1.62	0.48
1:B:184:LEU:HD22	1:B:189:LEU:CD2	2.44	0.48
1:A:336:THR:HB	1:A:340:ARG:NH2	2.28	0.48
1:A:176:GLU:CG	1:A:177:LYS:HG3	2.44	0.48
1:B:183:VAL:HG12	1:B:206:VAL:HB	1.96	0.47
1:B:193:ASP:O	1:B:196:THR:OG1	2.25	0.47
1:A:289:LEU:HD12	1:B:366:LEU:HD22	1.95	0.47
1:A:365:LEU:HB2	1:B:282:TRP:CD1	2.49	0.47
1:A:193:ASP:HB3	1:A:196:THR:HG23	1.96	0.47
1:A:30:PRO:CD	1:A:31:GLN:N	2.77	0.47
1:A:296:GLY:O	1:B:322:VAL:HG22	2.15	0.47
1:A:321:PRO:CG	1:A:322:VAL:H	2.27	0.47
1:A:282:TRP:HZ2	1:B:369:THR:HG21	1.78	0.47
1:A:322:VAL:HG23	1:B:299:THR:OG1	2.14	0.47
1:A:370:LEU:HD12	1:A:398:VAL:HG21	1.96	0.47
1:A:52:LEU:O	1:A:80:ARG:NH2	2.46	0.47
1:A:273:TYR:CD2	1:B:347:LEU:HD11	2.50	0.47
1:B:112:LYS:NZ	1:B:120:ARG:HH21	2.13	0.46
1:B:296:GLY:O	1:B:299:THR:N	2.48	0.46
1:A:187:ARG:HB2	1:B:168:ILE:HD11	1.96	0.46
1:B:377:LYS:HG3	1:B:381:ASP:HB2	1.97	0.46
1:A:303:LEU:HD13	1:B:318:PHE:HA	1.97	0.46
1:A:319:TYR:OH	1:A:381:ASP:OD2	2.24	0.46
1:A:383:HIS:C	1:A:385:LEU:H	2.19	0.46
1:A:44:HIS:O	1:A:48:VAL:HG23	2.15	0.46
1:A:115:LEU:HA	1:A:115:LEU:HD12	1.78	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:257:THR:HA	1:B:260:ILE:HG13	1.98	0.46
1:B:216:GLU:HG2	1:B:255:GLU:OE2	2.16	0.46
1:B:296:GLY:O	1:B:297:MET:C	2.53	0.46
1:A:169:TYR:HB3	1:B:169:TYR:HE2	1.81	0.46
1:A:383:HIS:O	1:A:385:LEU:N	2.49	0.46
1:A:424:ASN:HB2	1:A:425:PRO:HD3	1.98	0.46
1:A:138:MET:SD	1:A:232:VAL:HG11	2.56	0.46
1:A:219:ALA:HB1	1:A:252:LEU:CD1	2.46	0.45
1:B:118:ARG:O	1:B:122:GLU:HG2	2.16	0.45
1:B:216:GLU:CG	1:B:255:GLU:CD	2.84	0.45
1:A:134:ALA:O	1:A:137:LEU:N	2.43	0.45
1:A:142:TYR:H	1:A:142:TYR:HD1	1.62	0.45
1:A:321:PRO:HG2	1:A:322:VAL:N	2.30	0.45
1:B:320:VAL:HG13	1:B:324:LEU:HD23	1.98	0.45
1:A:71:GLU:O	1:A:75:THR:OG1	2.33	0.45
1:A:90:LEU:HD13	1:A:141:GLU:OE1	2.17	0.45
1:B:208:TYR:CD2	1:B:233:VAL:HG21	2.51	0.45
1:B:423:SER:HB2	1:B:425:PRO:HD2	1.99	0.45
1:A:142:TYR:N	1:A:142:TYR:CD1	2.81	0.45
1:A:162:ALA:HB1	1:B:187:ARG:NH1	2.32	0.45
1:A:183:VAL:HB	1:A:206:VAL:HG13	1.99	0.45
1:A:321:PRO:HD2	1:A:322:VAL:H	1.81	0.45
1:B:282:TRP:CZ2	1:B:286:VAL:HG21	2.52	0.45
1:B:37:TRP:CZ2	1:B:45:ARG:HD2	2.52	0.45
1:A:340:ARG:CD	1:B:260:ILE:HD12	2.46	0.45
1:A:322:VAL:CG2	1:B:296:GLY:O	2.65	0.45
1:B:30:PRO:HG3	1:B:56:LYS:HD2	1.99	0.45
1:B:91:ASP:OD1	1:B:91:ASP:N	2.48	0.45
1:A:180:LEU:HD11	1:A:231:PRO:HB2	1.99	0.44
1:B:170:TYR:HE2	2:B:501:ATP:H8	1.64	0.44
1:A:190:ILE:O	1:B:159:ARG:HG2	2.17	0.44
1:B:207:VAL:CG1	1:B:227:PHE:HE2	2.31	0.44
1:A:221:LEU:HD23	1:A:221:LEU:HA	1.85	0.44
1:A:321:PRO:HG2	1:A:322:VAL:H	1.82	0.44
1:A:301:SER:HB2	1:B:377:LYS:NZ	2.33	0.44
1:A:334:SER:OG	1:A:405:GLY:HA3	2.18	0.44
1:A:340:ARG:HD2	1:B:260:ILE:HD12	1.99	0.44
1:B:199:ALA:HA	1:B:202:MET:HG2	1.99	0.44
1:A:142:TYR:N	1:A:142:TYR:HD1	2.16	0.44
1:B:175:ASP:OD1	1:B:179:ARG:N	2.50	0.43
1:A:151:VAL:HB	1:A:194:PRO:HA	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:446:LEU:HA	1:A:446:LEU:HD23	1.86	0.43
1:B:216:GLU:HG2	1:B:255:GLU:CD	2.39	0.43
1:B:278:PRO:O	1:B:282:TRP:HB2	2.18	0.43
1:A:383:HIS:HB3	1:A:386:LEU:CD2	2.49	0.43
1:B:134:ALA:O	1:B:137:LEU:HD12	2.18	0.43
1:B:375:VAL:HB	1:B:387:LEU:HD23	1.99	0.43
1:A:273:TYR:HE2	1:B:355:VAL:HG22	1.82	0.43
1:A:338:ILE:HD11	1:B:273:TYR:CZ	2.54	0.43
1:B:338:ILE:O	1:B:342:LEU:HG	2.18	0.43
1:A:377:LYS:HB3	1:B:297:MET:CE	2.49	0.42
1:A:333:GLN:OE1	1:B:285:ARG:HB3	2.19	0.42
1:B:436:LEU:HA	1:B:436:LEU:HD23	1.80	0.42
1:B:77:PRO:HB2	1:B:79:TRP:NE1	2.35	0.42
1:B:98:GLN:NE2	1:B:127:ALA:HA	2.34	0.42
1:A:402:ASN:ND2	1:A:403:LEU:HD12	2.35	0.42
1:A:64:LEU:HA	1:A:64:LEU:HD12	1.81	0.42
1:B:228:THR:HG23	1:B:229:VAL:HG23	2.01	0.42
1:A:222:MET:CE	1:A:230:LEU:HB2	2.50	0.42
1:A:401:ALA:HA	1:A:404:VAL:HG23	2.02	0.42
1:B:445:LEU:HD23	1:B:445:LEU:HA	1.81	0.42
1:B:107:TYR:O	1:B:111:LEU:HB2	2.19	0.42
1:A:187:ARG:NH2	1:B:162:ALA:O	2.49	0.42
1:A:321:PRO:CD	1:A:322:VAL:N	2.83	0.42
1:A:374:LEU:O	1:A:378:VAL:HG23	2.20	0.42
1:B:299:THR:O	1:B:302:ILE:HG22	2.19	0.42
1:A:340:ARG:HD3	1:A:340:ARG:N	2.32	0.42
1:A:209:VAL:HG11	1:A:218:VAL:HG22	2.02	0.42
1:B:216:GLU:CG	1:B:255:GLU:CG	2.92	0.42
1:A:49:LEU:HD23	1:A:49:LEU:HA	1.93	0.41
1:B:295:THR:HB	1:B:429:THR:HG21	2.02	0.41
1:A:303:LEU:HA	1:A:303:LEU:HD23	1.83	0.41
1:A:408:LEU:O	1:A:412:LEU:HG	2.20	0.41
1:A:172:TYR:OH	1:A:229:VAL:HG12	2.20	0.41
1:A:289:LEU:O	1:A:293:ILE:HD13	2.20	0.41
1:B:320:VAL:O	1:B:324:LEU:HD23	2.21	0.41
1:A:186:LEU:HD21	1:B:190:ILE:HD12	2.00	0.41
1:A:214:ASP:OD1	1:A:215:GLN:N	2.53	0.41
1:B:98:GLN:HE21	1:B:127:ALA:HA	1.85	0.41
1:B:157:PHE:HA	1:B:160:ARG:HG2	2.01	0.41
1:B:230:LEU:HA	1:B:231:PRO:HD3	1.74	0.41
1:A:273:TYR:CZ	1:B:338:ILE:HD11	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:412:LEU:HD21	1:B:421:LEU:HB2	2.02	0.41
1:A:296:GLY:O	1:A:299:THR:HG23	2.20	0.41
1:A:340:ARG:NE	1:B:260:ILE:HB	2.36	0.41
1:A:302:ILE:HD11	1:A:437:LEU:HD21	2.03	0.41
1:B:135:GLY:HA2	1:B:138:MET:SD	2.61	0.41
1:A:249:LEU:CD2	1:B:249:LEU:HD13	2.50	0.41
1:A:180:LEU:HD23	1:A:180:LEU:HA	1.75	0.41
1:A:408:LEU:N	1:A:409:PRO:HD2	2.37	0.40
1:A:401:ALA:CA	1:A:404:VAL:HG23	2.51	0.40
1:A:179:ARG:CA	1:A:238:ARG:HA	2.50	0.40
1:A:377:LYS:HB3	1:B:297:MET:HE2	2.03	0.40
1:B:86:GLU:C	1:B:88:LEU:H	2.24	0.40
1:B:130:GLU:HB2	1:B:133:GLU:HG3	2.04	0.40
1:B:263:LEU:HA	1:B:263:LEU:HD23	1.83	0.40
1:A:257:THR:HG23	1:B:340:ARG:HG3	2.03	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	425/473 (90%)	392 (92%)	30 (7%)	3 (1%)	22	61
1	B	424/473 (90%)	395 (93%)	27 (6%)	2 (0%)	29	68
All	All	849/946 (90%)	787 (93%)	57 (7%)	5 (1%)	25	64

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	269	PRO
1	B	422	VAL
1	A	422	VAL

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Mol	Chain	Res	Type
1	A	384	PRO
1	A	390	VAL

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	340/400 (85%)	292 (86%)	48 (14%)	3	21
1	B	333/400 (83%)	295 (89%)	38 (11%)	5	29
All	All	673/800 (84%)	587 (87%)	86 (13%)	4	24

All (86) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	GLN
1	A	40	LEU
1	A	64	LEU
1	A	75	THR
1	A	80	ARG
1	A	81	LEU
1	A	103	GLU
1	A	108	PHE
1	A	111	LEU
1	A	112	LYS
1	A	115	LEU
1	A	116	ASP
1	A	128	ARG
1	A	142	TYR
1	A	149	MET
1	A	174	VAL
1	A	175	ASP
1	A	179	ARG
1	A	187	ARG
1	A	206	VAL
1	A	210	ARG

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Mol	Chain	Res	Type
1	A	222	MET
1	A	244	THR
1	A	249	LEU
1	A	250	ASP
1	A	252	LEU
1	A	255	GLU
1	A	272	VAL
1	A	281	LEU
1	A	286	VAL
1	A	292	LEU
1	A	293	ILE
1	A	299	THR
1	A	302	ILE
1	A	308	SER
1	A	313	VAL
1	A	340	ARG
1	A	345	ARG
1	A	353	ARG
1	A	357	LEU
1	A	392	VAL
1	A	400	PHE
1	A	407	MET
1	A	421	LEU
1	A	429	THR
1	A	441	SER
1	A	447	LEU
1	A	448	GLU
1	B	23	GLU
1	B	25	LEU
1	B	59	GLU
1	B	62	SER
1	B	67	GLU
1	B	75	THR
1	B	82	ARG
1	B	111	LEU
1	B	123	VAL
1	B	130	GLU
1	B	137	LEU
1	B	160	ARG
1	B	171	ILE
1	B	207	VAL
1	B	208	TYR

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Mol	Chain	Res	Type
1	B	209	VAL
1	B	215	GLN
1	B	245	VAL
1	B	248	VAL
1	B	257	THR
1	B	260	ILE
1	B	267	ASP
1	B	268	VAL
1	B	270	ASP
1	B	271	LEU
1	B	275	GLU
1	B	279	VAL
1	B	285	ARG
1	B	286	VAL
1	B	292	LEU
1	B	340	ARG
1	B	348	ASP
1	B	365	LEU
1	B	373	LEU
1	B	377	LYS
1	B	386	LEU
1	B	399	PHE
1	B	445	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	63	HIS
1	B	424	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 13 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	ATP	B	501	-	26,33,33	0.96	1 (3%)	31,52,52	1.41	6 (19%)
2	ATP	A	501	-	26,33,33	0.99	1 (3%)	31,52,52	1.68	8 (25%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ATP	B	501	-	-	1/18/38/38	0/3/3/3
2	ATP	A	501	-	-	1/18/38/38	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	ATP	C5-C4	2.71	1.48	1.40
2	A	501	ATP	C5-C4	2.34	1.47	1.40

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	ATP	N3-C2-N1	-3.47	123.25	128.68
2	A	501	ATP	PA-O3A-PB	-3.47	120.91	132.83
2	B	501	ATP	N3-C2-N1	-3.27	123.57	128.68
2	A	501	ATP	PB-O3B-PG	-2.61	123.86	132.83
2	B	501	ATP	C3'-C2'-C1'	2.57	104.85	100.98

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	ATP	O5'-C5'-C4'	-2.51	100.37	108.99
2	B	501	ATP	PA-O3A-PB	-2.40	124.58	132.83
2	A	501	ATP	C1'-N9-C4	-2.36	122.49	126.64
2	A	501	ATP	N6-C6-N1	2.29	123.33	118.57
2	A	501	ATP	O2A-PA-O1A	2.05	122.36	112.24
2	A	501	ATP	O3G-PG-O2G	2.03	115.38	107.64
2	B	501	ATP	C2-N1-C6	2.02	122.21	118.75
2	B	501	ATP	N6-C6-N1	2.02	122.77	118.57
2	B	501	ATP	C5'-C4'-C3'	-2.01	107.65	115.18

There are no chirality outliers.

All (2) torsion outliers are listed below:

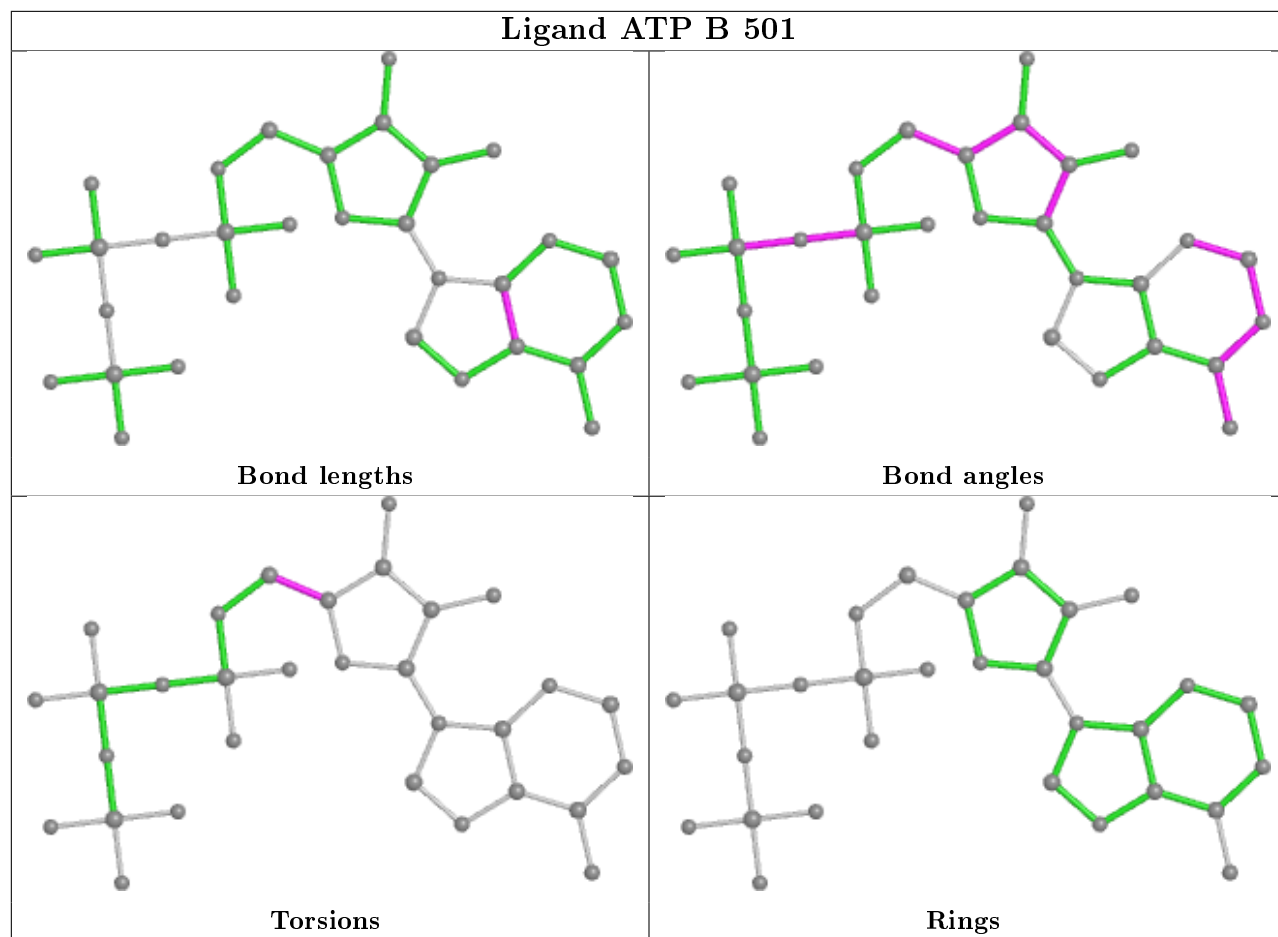
Mol	Chain	Res	Type	Atoms
2	B	501	ATP	O4'-C4'-C5'-O5'
2	A	501	ATP	O4'-C4'-C5'-O5'

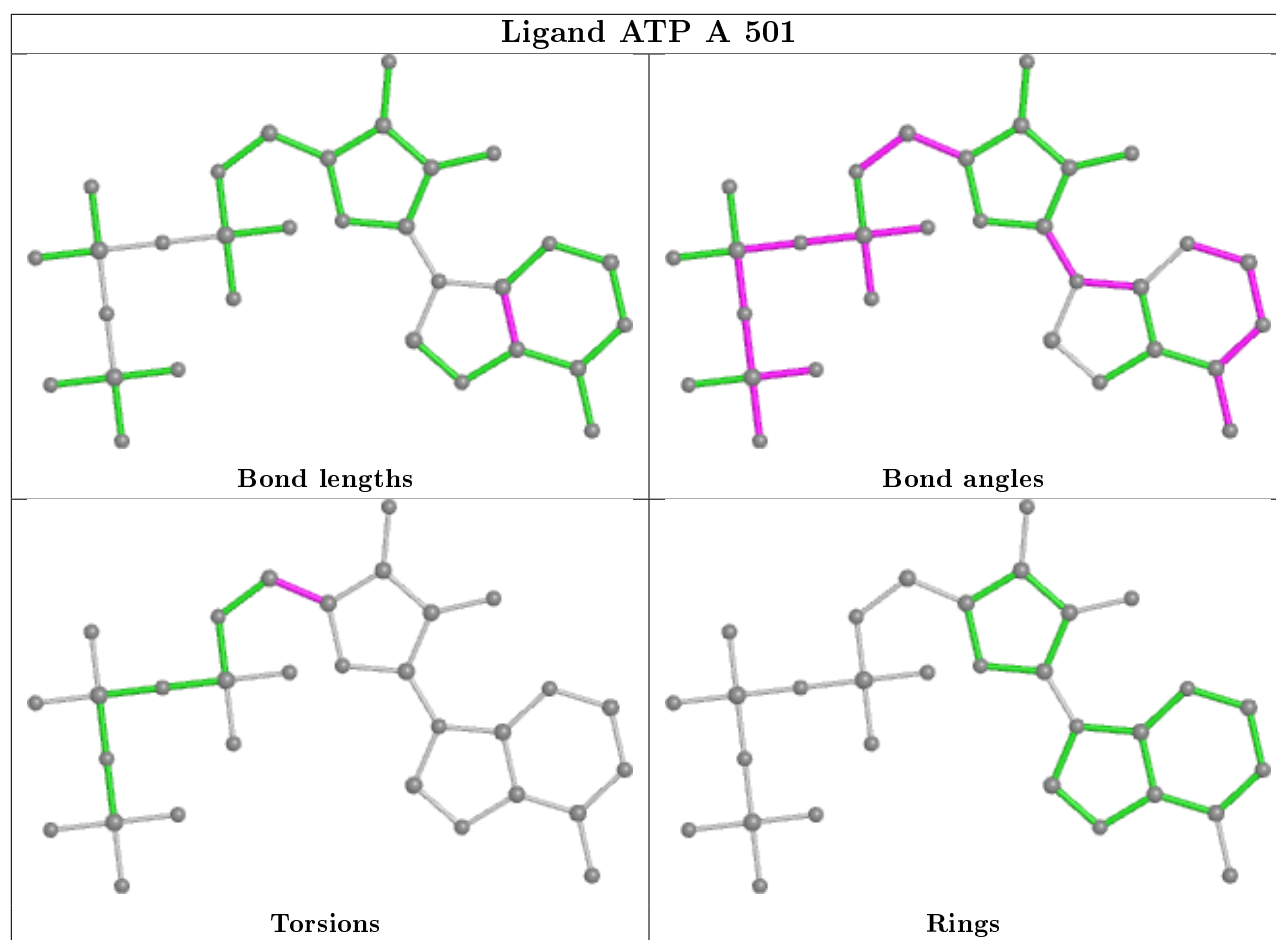
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	ATP	2	0
2	A	501	ATP	1	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	427/473 (90%)	-0.29	10 (2%) 60 44	110, 165, 220, 264	0
1	B	426/473 (90%)	-0.22	14 (3%) 46 31	115, 165, 235, 283	0
All	All	853/946 (90%)	-0.26	24 (2%) 53 37	110, 165, 227, 283	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	316	LEU	6.3
1	B	315	ALA	5.0
1	A	267	ASP	4.0
1	B	314	THR	3.7
1	A	271	LEU	3.5
1	A	23	GLU	3.4
1	A	268	VAL	3.4
1	B	310	LEU	3.4
1	B	318	PHE	3.3
1	B	309	VAL	3.2
1	B	447	LEU	3.2
1	B	385	LEU	3.0
1	B	317	ALA	3.0
1	A	269	PRO	3.0
1	A	273	TYR	2.8
1	B	311	GLU	2.7
1	B	313	VAL	2.6
1	A	315	ALA	2.5
1	A	385	LEU	2.4
1	B	312	ALA	2.3
1	A	77	PRO	2.1
1	A	78	PRO	2.1
1	B	23	GLU	2.0
1	B	176	GLU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.4 Ligands [i](#)

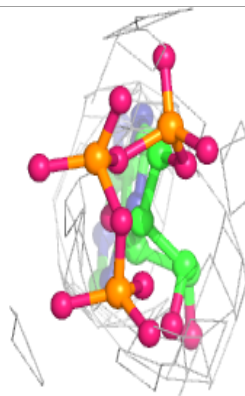
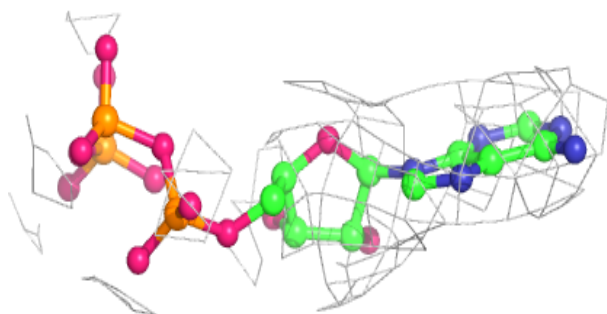
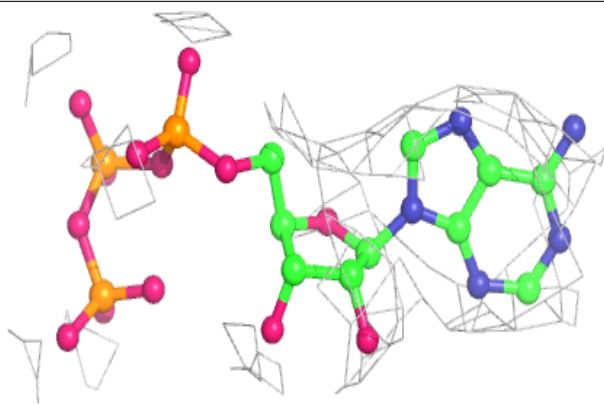
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	MG	A	508	1/1	0.38	0.59	143,143,143,143	0
3	MG	B	503	1/1	0.48	1.28	137,137,137,137	0
3	MG	A	509	1/1	0.74	0.82	106,106,106,106	0
2	ATP	A	501	31/31	0.80	0.32	107,127,203,214	0
3	MG	B	504	1/1	0.83	0.78	150,150,150,150	0
2	ATP	B	501	31/31	0.86	0.24	140,155,218,226	0
3	MG	A	503	1/1	0.89	1.32	129,129,129,129	0
3	MG	B	505	1/1	0.90	0.67	100,100,100,100	0
3	MG	A	504	1/1	0.92	0.72	136,136,136,136	0
3	MG	A	502	1/1	0.92	2.07	157,157,157,157	0
3	MG	A	507	1/1	0.93	0.43	131,131,131,131	0
3	MG	A	505	1/1	0.95	0.70	117,117,117,117	0
3	MG	B	506	1/1	0.95	0.30	111,111,111,111	0
3	MG	B	502	1/1	0.97	0.66	133,133,133,133	0
3	MG	A	506	1/1	0.98	0.68	104,104,104,104	0

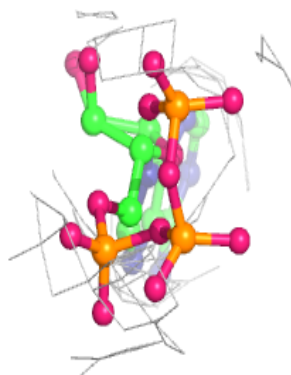
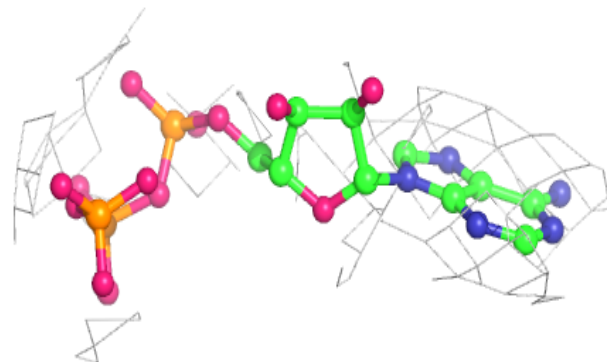
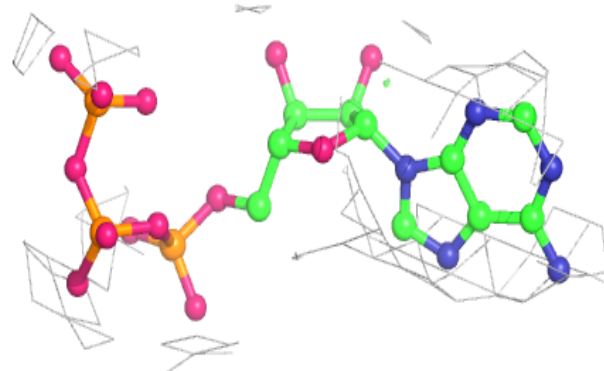
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around 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

There are no such residues in this entry.