wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 25, 2020 – 03:10 PM BST

PDB ID	:	4J7C
Title	:	KtrAB potassium transporter from Bacillus subtilis
Authors	:	Vieira-Pires, R.S.; Morais-Cabral, J.H.
Deposited on	:	2013-02-13
Resolution	:	3.50 Å(reported)

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

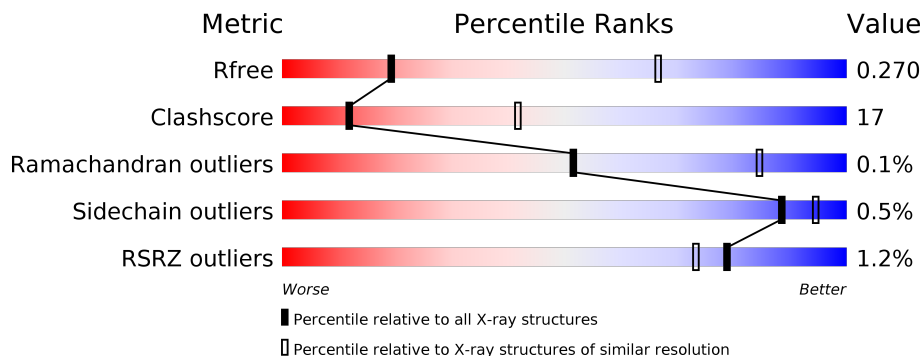|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.13
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.13

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 3.50 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.
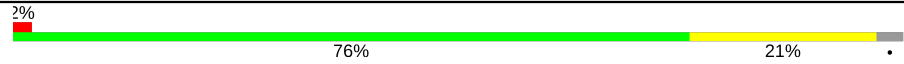
Metric	Percentile Ranks	Value
Rfree		0.270
Clashscore		17
Ramachandran outliers		0.1%
Sidechain outliers		0.5%
RSRZ outliers		1.2%

Worse   *Better*

■ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1659 (3.60-3.40)
Clashscore	141614	1036 (3.58-3.42)
Ramachandran outliers	138981	1005 (3.58-3.42)
Sidechain outliers	138945	1006 (3.58-3.42)
RSRZ outliers	127900	1559 (3.60-3.40)

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 <=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	222	5% — 77% — 20% •
1	B	222	2% — 82% — 15% •
1	C	222	4% — 76% — 20% • •
1	D	222	2% — 81% — 17% •
1	E	222	% — 75% — 22% • •
1	F	222	% — 81% — 16% •

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Mol	Chain	Length	Quality of chain
1	G	222	2% 76% 21%
1	H	222	78% 19%
2	I	465	62% 29% 8%
2	J	465	63% 28% 8%
2	K	465	60% 31% 8%
2	L	465	61% 29% 8%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 26996 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 Ktr system potassium uptake protein A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	216	Total	C	N	O	S	0	0	0
			1699	1079	292	321	7			
1	B	217	Total	C	N	O	S	0	0	0
			1707	1083	294	323	7			
1	C	216	Total	C	N	O	S	0	0	0
			1699	1079	292	321	7			
1	D	217	Total	C	N	O	S	0	0	0
			1707	1083	294	323	7			
1	E	216	Total	C	N	O	S	0	0	0
			1699	1079	292	321	7			
1	F	217	Total	C	N	O	S	0	0	0
			1707	1083	294	323	7			
1	G	216	Total	C	N	O	S	0	0	0
			1699	1079	292	321	7			
1	H	217	Total	C	N	O	S	0	0	0
			1707	1083	294	323	7			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
B	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
C	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
D	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
E	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
F	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
G	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080
H	22	VAL	CYS	ENGINEERED MUTATION	UNP O32080

- Molecule 2 is a protein called Ktr system potassium uptake protein B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	I	429	Total 3280	C 2188	N 510	O 567	S 15	0	0	0
2	J	429	Total 3280	C 2188	N 510	O 567	S 15	0	0	0
2	K	429	Total 3280	C 2188	N 510	O 567	S 15	0	0	0
2	L	429	Total 3280	C 2188	N 510	O 567	S 15	0	0	0

There are 80 discrepancies between the modelled and reference sequences:

| Chain	Residue	Modelled	Actual	Comment	Reference
I	-19	MET	-	EXPRESSION TAG	UNP O32081
I	-18	GLY	-	EXPRESSION TAG	UNP O32081
I	-17	SER	-	EXPRESSION TAG	UNP O32081
I	-16	SER	-	EXPRESSION TAG	UNP O32081
I	-15	HIS	-	EXPRESSION TAG	UNP O32081
I	-14	HIS	-	EXPRESSION TAG	UNP O32081
I	-13	HIS	-	EXPRESSION TAG	UNP O32081
I	-12	HIS	-	EXPRESSION TAG	UNP O32081
I	-11	HIS	-	EXPRESSION TAG	UNP O32081
I	-10	HIS	-	EXPRESSION TAG	UNP O32081
I	-9	SER	-	EXPRESSION TAG	UNP O32081
I	-8	SER	-	EXPRESSION TAG	UNP O32081
I	-7	GLY	-	EXPRESSION TAG	UNP O32081
I	-6	LEU	-	EXPRESSION TAG	UNP O32081
I	-5	VAL	-	EXPRESSION TAG	UNP O32081
I	-4	PRO	-	EXPRESSION TAG	UNP O32081
I	-3	ARG	-	EXPRESSION TAG	UNP O32081
I	-2	GLY	-	EXPRESSION TAG	UNP O32081
I	-1	SER	-	EXPRESSION TAG	UNP O32081
I	0	HIS	-	EXPRESSION TAG	UNP O32081
J	-19	MET	-	EXPRESSION TAG	UNP O32081
J	-18	GLY	-	EXPRESSION TAG	UNP O32081
J	-17	SER	-	EXPRESSION TAG	UNP O32081
J	-16	SER	-	EXPRESSION TAG	UNP O32081
J	-15	HIS	-	EXPRESSION TAG	UNP O32081
J	-14	HIS	-	EXPRESSION TAG	UNP O32081
J	-13	HIS	-	EXPRESSION TAG	UNP O32081
J	-12	HIS	-	EXPRESSION TAG	UNP O32081
J	-11	HIS	-	EXPRESSION TAG	UNP O32081
J	-10	HIS	-	EXPRESSION TAG	UNP O32081
J	-9	SER	-	EXPRESSION TAG	UNP O32081

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Chain	Residue	Modelled	Actual	Comment	Reference
J	-8	SER	-	EXPRESSION TAG	UNP O32081
J	-7	GLY	-	EXPRESSION TAG	UNP O32081
J	-6	LEU	-	EXPRESSION TAG	UNP O32081
J	-5	VAL	-	EXPRESSION TAG	UNP O32081
J	-4	PRO	-	EXPRESSION TAG	UNP O32081
J	-3	ARG	-	EXPRESSION TAG	UNP O32081
J	-2	GLY	-	EXPRESSION TAG	UNP O32081
J	-1	SER	-	EXPRESSION TAG	UNP O32081
J	0	HIS	-	EXPRESSION TAG	UNP O32081
K	-19	MET	-	EXPRESSION TAG	UNP O32081
K	-18	GLY	-	EXPRESSION TAG	UNP O32081
K	-17	SER	-	EXPRESSION TAG	UNP O32081
K	-16	SER	-	EXPRESSION TAG	UNP O32081
K	-15	HIS	-	EXPRESSION TAG	UNP O32081
K	-14	HIS	-	EXPRESSION TAG	UNP O32081
K	-13	HIS	-	EXPRESSION TAG	UNP O32081
K	-12	HIS	-	EXPRESSION TAG	UNP O32081
K	-11	HIS	-	EXPRESSION TAG	UNP O32081
K	-10	HIS	-	EXPRESSION TAG	UNP O32081
K	-9	SER	-	EXPRESSION TAG	UNP O32081
K	-8	SER	-	EXPRESSION TAG	UNP O32081
K	-7	GLY	-	EXPRESSION TAG	UNP O32081
K	-6	LEU	-	EXPRESSION TAG	UNP O32081
K	-5	VAL	-	EXPRESSION TAG	UNP O32081
K	-4	PRO	-	EXPRESSION TAG	UNP O32081
K	-3	ARG	-	EXPRESSION TAG	UNP O32081
K	-2	GLY	-	EXPRESSION TAG	UNP O32081
K	-1	SER	-	EXPRESSION TAG	UNP O32081
K	0	HIS	-	EXPRESSION TAG	UNP O32081
L	-19	MET	-	EXPRESSION TAG	UNP O32081
L	-18	GLY	-	EXPRESSION TAG	UNP O32081
L	-17	SER	-	EXPRESSION TAG	UNP O32081
L	-16	SER	-	EXPRESSION TAG	UNP O32081
L	-15	HIS	-	EXPRESSION TAG	UNP O32081
L	-14	HIS	-	EXPRESSION TAG	UNP O32081
L	-13	HIS	-	EXPRESSION TAG	UNP O32081
L	-12	HIS	-	EXPRESSION TAG	UNP O32081
L	-11	HIS	-	EXPRESSION TAG	UNP O32081
L	-10	HIS	-	EXPRESSION TAG	UNP O32081
L	-9	SER	-	EXPRESSION TAG	UNP O32081
L	-8	SER	-	EXPRESSION TAG	UNP O32081
L	-7	GLY	-	EXPRESSION TAG	UNP O32081

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Chain	Residue	Modelled	Actual	Comment	Reference
L	-6	LEU	-	EXPRESSION TAG	UNP O32081
L	-5	VAL	-	EXPRESSION TAG	UNP O32081
L	-4	PRO	-	EXPRESSION TAG	UNP O32081
L	-3	ARG	-	EXPRESSION TAG	UNP O32081
L	-2	GLY	-	EXPRESSION TAG	UNP O32081
L	-1	SER	-	EXPRESSION TAG	UNP O32081
L	0	HIS	-	EXPRESSION TAG	UNP O32081

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).
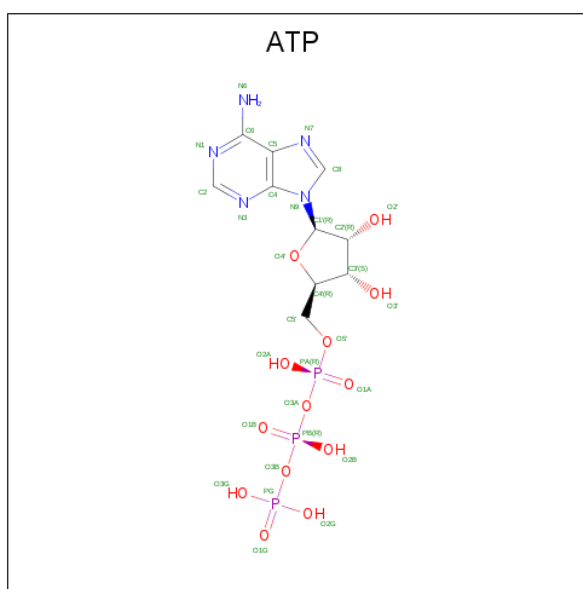
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	B	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	C	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	D	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	E	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	F	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	G	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

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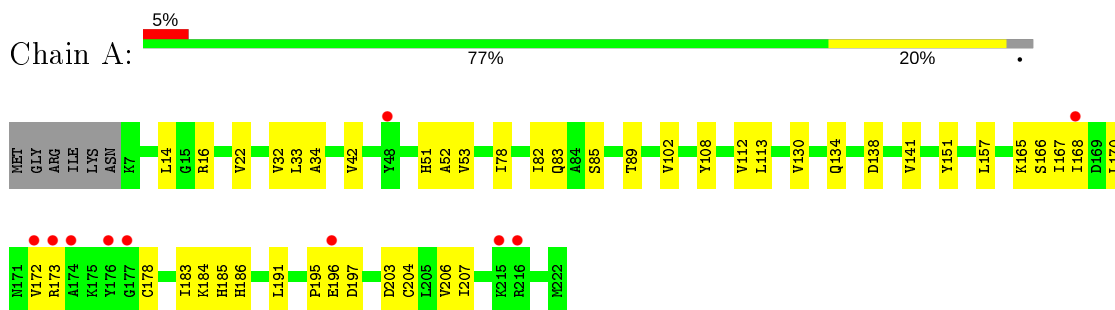| Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	H	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

- Molecule 4 is POTASSIUM ION (three-letter code: K) (formula: K).

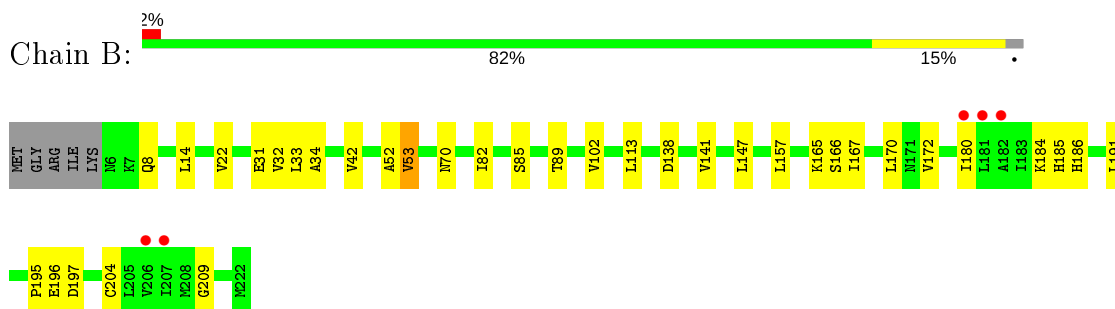| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	J	1	Total	K	0	0
			1	1		
4	I	1	Total	K	0	0
			1	1		
4	L	1	Total	K	0	0
			1	1		
4	K	1	Total	K	0	0
			1	1		

3 Residue-property plots ⓘ

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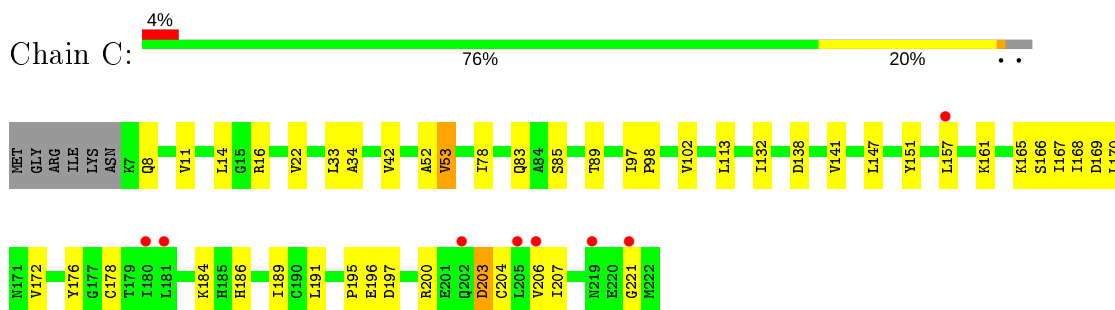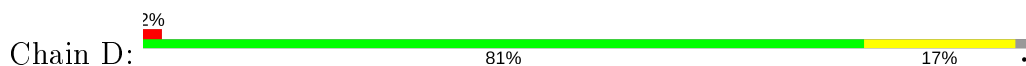
- Molecule 1: Ktr system potassium uptake protein A

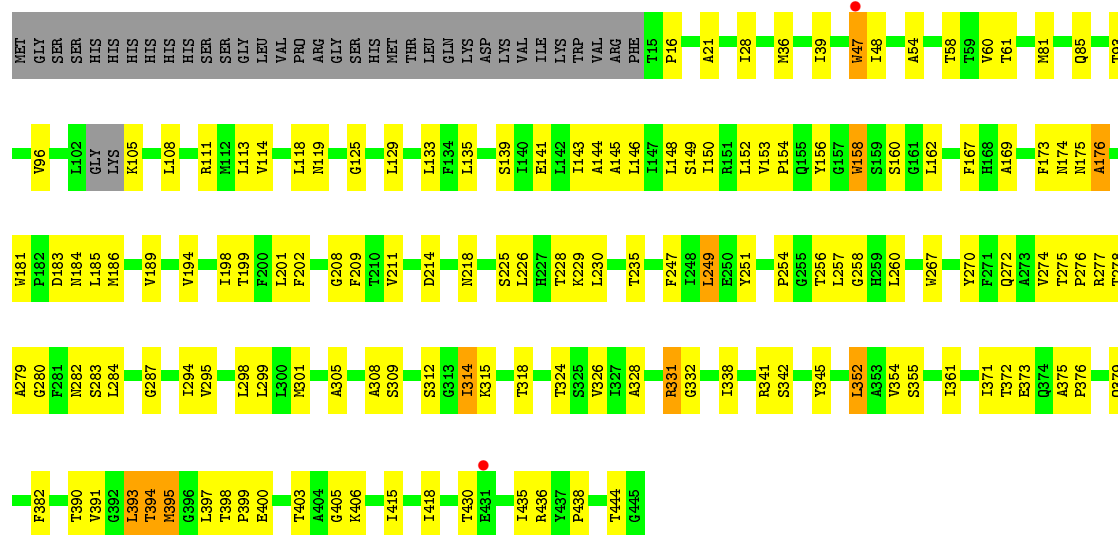- Molecule 1: Ktr system potassium uptake protein A

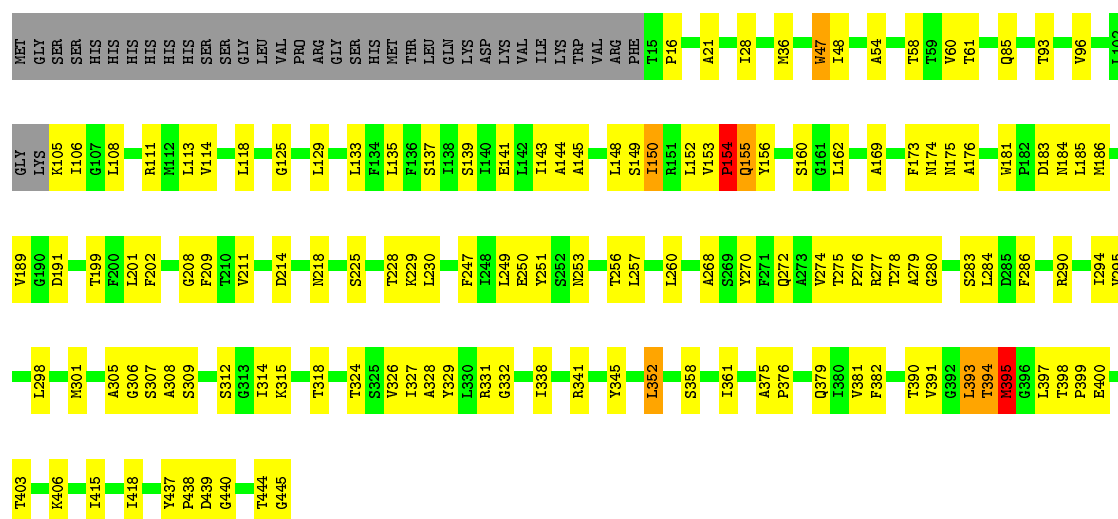- Molecule 1: Ktr system potassium uptake protein A

- Molecule 1: Ktr system potassium uptake protein A

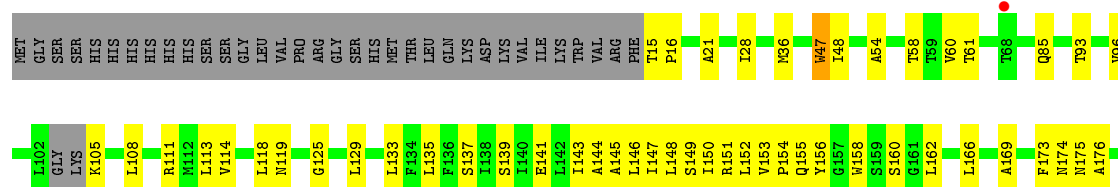- Molecule 1: Ktr system potassium uptake protein A

Chain E:

- Molecule 1: Ktr system potassium uptake protein A

Chain F:

- Molecule 1: Ktr system potassium uptake protein A

Chain G:

- Molecule 1: Ktr system potassium uptake protein A

Chain H:
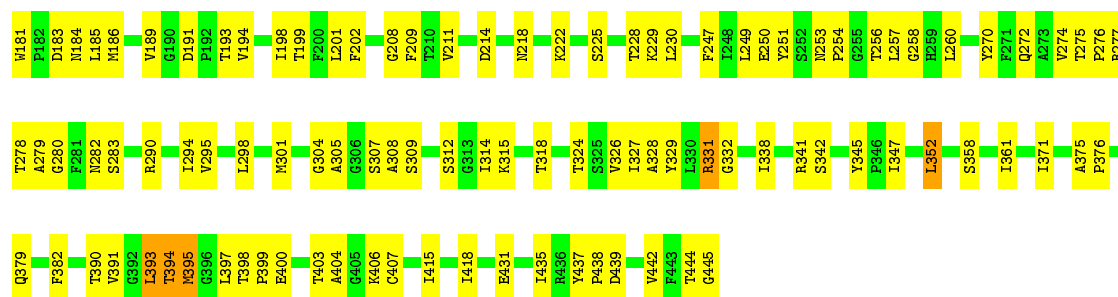

- Molecule 2: Ktr system potassium uptake protein B

Chain I:

• Molecule 2: Ktr system potassium uptake protein B

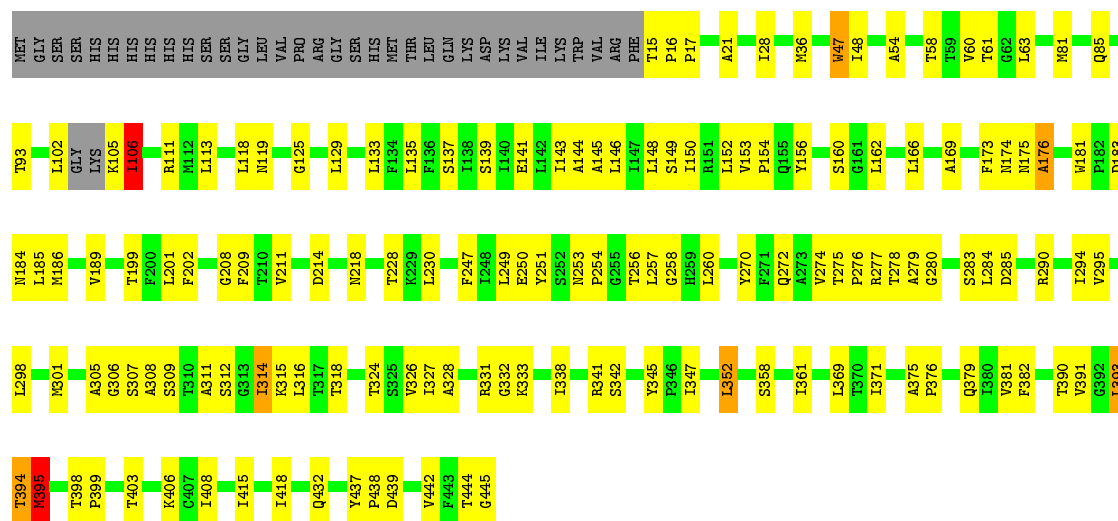Chain J:

• Molecule 2: Ktr system potassium uptake protein B

Chain K:

W181 P182 D183 N184 L185 M186 V189 G190 D191 P192 T193 V194 I198 T199 F200 L201 F202 G208 F209 T210 V211 D214 N218 K222 S225 T228 K229 L230 F247 I248 L249 E250 Y251 S252 N253 P254 G255 T256 L257 G258 H259 L260 Y270 F271 Q272 A273 V274 T275 P276 R277

T278 A279 G280 F281 N282 S283 R290 I294 V295 L298 M301 G304 A305 G306 S307 A308 S309 S312 G313 I314 K315 T318 T324 S325 V326 I327 A328 Y329 L330 R331 G332 I338 R341 S342 Y345 P346 I347 L352 S358 I361 I371 A375 P376

Q379 F382 T390 V391 G392 L393 T394 M395 G396 L397 T398 P399 E400 T403 A404 G405 K406 C407 I415 I418 E431 I435 R436 Y437 P438 D439 V442 F443 T444 G445

● Molecule 2: Ktr system potassium uptake protein B

Chain L:

61%   29%   •   8%

MET GLY SER SER HIS HIS HIS HIS HIS HIS SER SER GLY LEU VAL PRO ARG GLY SER HIS MET THR LEU GLN ASP LYS VAL ILE LYS TRP VAL ARG PHE T15 P16 P17 A21 I28 M36 W47 I48 A54 T58 T59 V60 T61 G62 L63 M81 Q85

T93 L102 GLY LYS K105 I106 R111 M112 L113 L118 N119 G125 L129 L133 F134 L135 F136 S137 I138 S139 I140 E141 L142 I143 A144 A145 L146 I147 L148 S149 I150 R151 L152 V153 P154 Q155 Y156 S160 G161 L162 L166 A169 F173 N174 N175 A176 W181 P182 D183

N184 L185 M186 V189 T199 F200 L201 F202 G208 F209 T210 V211 D214 N218 T228 K229 L230 F247 I248 L249 E250 Y251 S252 N253 P254 G255 T256 L257 G258 H259 L260 Y270 F271 Q272 A273 V274 T275 P276 R277 T278 A279 G280 S283 L284 D285 R290 I294 V295

L298 M301 A305 G306 S307 A308 S309 T310 A311 S312 G313 I314 K315 L316 T317 T318 T324 S325 V326 I327 A328 R331 G332 K333 I338 R341 S342 Y345 P346 I347 L352 S358 I361 L369 T370 I371 A375 P376 Q379 I380 V381 F382 T390 V391 G392 L393

T394 M395 T398 P399 T403 K406 C407 I408 I415 I418 Q432 Y437 P438 D439 V442 F443 T444 G445

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	146.52Å 140.19Å 153.93Å 90.00° 105.69° 90.00°	Depositor
Resolution (Å)	147.44 – 3.50 55.00 – 3.30	Depositor EDS
% Data completeness (in resolution range)	79.6 (147.44-3.50) 68.2 (55.00-3.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.16	Depositor
$< I/\sigma(I) >$ [1]	2.31 (at 3.33Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.258 , 0.273 0.256 , 0.270	Depositor DCC
R_{free} test set	3121 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å^2)	69.4	Xtriage
Anisotropy	0.033	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 10.8	EDS
L-test for twinning[2]	$< |L| > = 0.42, < L^2 > = 0.24$	Xtriage
Estimated twinning fraction	0.059 for l,-k,h	Xtriage
F_o,F_c correlation	0.84	EDS
Total number of atoms	26996	wwPDB-VP
Average B, all atoms (Å^2)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.76% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: K, 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	0.45	1/1725 (0.1%)	0.56	2/2330 (0.1%)
1	B	0.41	0/1733	0.53	0/2341
1	C	0.40	0/1725	0.51	2/2330 (0.1%)
1	D	0.43	0/1733	0.53	1/2341 (0.0%)
1	E	0.46	1/1725 (0.1%)	0.55	3/2330 (0.1%)
1	F	0.42	0/1733	0.54	0/2341
1	G	0.41	0/1725	0.55	2/2330 (0.1%)
1	H	0.47	2/1733 (0.1%)	0.59	3/2341 (0.1%)
2	I	0.48	4/3351 (0.1%)	0.65	6/4556 (0.1%)
2	J	0.53	4/3351 (0.1%)	0.66	4/4556 (0.1%)
2	K	0.48	3/3351 (0.1%)	0.64	5/4556 (0.1%)
2	L	0.48	2/3351 (0.1%)	0.65	4/4556 (0.1%)
All	All	0.46	17/27236 (0.1%)	0.60	32/36908 (0.1%)

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
2	I	0	1
2	J	0	2
2	K	0	1
2	L	0	3
All	All	0	7

The worst 5 of 17 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	J	155	GLN	CB-CG	9.51	1.78	1.52
1	H	51	HIS	CG-CD2	-8.37	1.21	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	J	155	GLN	CD-NE2	7.49	1.51	1.32
1	E	51	HIS	CG-ND1	-6.87	1.23	1.38
1	A	51	HIS	CG-ND1	-6.34	1.24	1.38

The worst 5 of 32 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	K	151	ARG	NE-CZ-NH1	-9.48	115.56	120.30
1	H	51	HIS	CG-ND1-CE1	7.65	118.91	108.20
1	H	51	HIS	CB-CA-C	-7.31	95.78	110.40
1	E	51	HIS	CB-CA-C	-7.05	96.31	110.40
1	A	51	HIS	CB-CA-C	-6.93	96.54	110.40

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	I	394	THR	Peptide
2	J	394	THR	Peptide
2	J	395	MET	Peptide
2	K	394	THR	Peptide
2	L	314	ILE	Peptide

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	1699	0	1728	44	1
1	B	1707	0	1734	30	0
1	C	1699	0	1728	62	0
1	D	1707	0	1734	33	0
1	E	1699	0	1728	57	18
1	F	1707	0	1734	36	1
1	G	1699	0	1728	58	19
1	H	1707	0	1734	41	0
2	I	3280	0	3461	158	1
2	J	3280	0	3461	156	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	K	3280	0	3461	191	0
2	L	3280	0	3461	163	0
3	A	31	0	12	1	0
3	B	31	0	12	1	0
3	C	31	0	12	1	0
3	D	31	0	12	3	0
3	E	31	0	12	3	0
3	F	31	0	12	1	0
3	G	31	0	12	0	0
3	H	31	0	12	2	0
4	I	1	0	0	0	0
4	J	1	0	0	0	0
4	K	1	0	0	0	0
4	L	1	0	0	0	0
All	All	26996	0	27788	949	20

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 17.

The worst 5 of 949 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)
2:J:155:GLN:CB	2:J:155:GLN:CG	1.78	1.55
2:K:150:ILE:HD12	2:K:162:LEU:CD2	1.39	1.53
2:K:150:ILE:CD1	2:K:162:LEU:HD21	1.44	1.43
1:C:167:ILE:CG2	1:C:195:PRO:HA	1.59	1.30
2:K:150:ILE:CD1	2:K:162:LEU:CD2	2.06	1.25

The worst 5 of 20 symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:160:ARG:NH2	1:G:163:ASP:CA[2_646]	1.13	1.07
1:E:160:ARG:NH2	1:G:163:ASP:CB[2_646]	1.34	0.86
1:E:160:ARG:O	1:G:165:LYS:NZ[2_646]	1.40	0.80
1:E:160:ARG:NH1	1:G:163:ASP:N[2_646]	1.52	0.68
1:E:160:ARG:NH2	1:G:163:ASP:C[2_646]	1.61	0.59

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	214/222 (96%)	209 (98%)	5 (2%)	0	100	100
1	B	215/222 (97%)	211 (98%)	4 (2%)	0	100	100
1	C	214/222 (96%)	210 (98%)	4 (2%)	0	100	100
1	D	215/222 (97%)	212 (99%)	3 (1%)	0	100	100
1	E	214/222 (96%)	210 (98%)	4 (2%)	0	100	100
1	F	215/222 (97%)	210 (98%)	5 (2%)	0	100	100
1	G	214/222 (96%)	210 (98%)	4 (2%)	0	100	100
1	H	215/222 (97%)	211 (98%)	4 (2%)	0	100	100
2	I	425/465 (91%)	372 (88%)	52 (12%)	1 (0%)	47	81
2	J	425/465 (91%)	375 (88%)	49 (12%)	1 (0%)	47	81
2	K	425/465 (91%)	374 (88%)	51 (12%)	0	100	100
2	L	425/465 (91%)	375 (88%)	49 (12%)	1 (0%)	47	81
All	All	3416/3636 (94%)	3179 (93%)	234 (7%)	3 (0%)	51	84

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	J	154	PRO
2	I	176	ALA
2	L	176	ALA

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	185/190 (97%)	185 (100%)	0	100	100
1	B	186/190 (98%)	185 (100%)	1 (0%)	88	94
1	C	185/190 (97%)	185 (100%)	0	100	100
1	D	186/190 (98%)	185 (100%)	1 (0%)	88	94
1	E	185/190 (97%)	185 (100%)	0	100	100
1	F	186/190 (98%)	185 (100%)	1 (0%)	88	94
1	G	185/190 (97%)	185 (100%)	0	100	100
1	H	186/190 (98%)	185 (100%)	1 (0%)	88	94
2	I	359/391 (92%)	357 (99%)	2 (1%)	86	94
2	J	359/391 (92%)	356 (99%)	3 (1%)	81	91
2	K	359/391 (92%)	357 (99%)	2 (1%)	86	94
2	L	359/391 (92%)	356 (99%)	3 (1%)	81	91
All	All	2920/3084 (95%)	2906 (100%)	14 (0%)	88	94

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	J	150	ILE
2	J	393	LEU
2	L	106	ILE
2	I	393	LEU
2	K	439	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	51	HIS
1	H	210	HIS
2	L	155	GLN
1	G	83	GLN
1	H	6	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 12 ligands modelled in this entry, 4 are monoatomic - leaving 8 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
3	ATP	B	301	-	26,33,33	1.61	6 (23%)	31,52,52	2.31	9 (29%)
3	ATP	G	601	-	26,33,33	1.49	5 (19%)	31,52,52	2.31	9 (29%)
3	ATP	E	601	-	26,33,33	1.55	5 (19%)	31,52,52	2.16	7 (22%)
3	ATP	C	601	-	26,33,33	1.59	6 (23%)	31,52,52	2.08	6 (19%)
3	ATP	F	301	-	26,33,33	1.46	5 (19%)	31,52,52	2.22	7 (22%)
3	ATP	A	601	-	26,33,33	1.52	5 (19%)	31,52,52	2.20	8 (25%)
3	ATP	H	301	-	26,33,33	1.50	6 (23%)	31,52,52	2.00	5 (16%)
3	ATP	D	301	-	26,33,33	1.54	5 (19%)	31,52,52	2.21	7 (22%)

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
3	ATP	B	301	-	-	6/18/38/38	0/3/3/3
3	ATP	G	601	-	-	4/18/38/38	0/3/3/3
3	ATP	E	601	-	-	4/18/38/38	0/3/3/3
3	ATP	C	601	-	-	7/18/38/38	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	ATP	F	301	-	-	5/18/38/38	0/3/3/3
3	ATP	A	601	-	-	6/18/38/38	0/3/3/3
3	ATP	H	301	-	-	4/18/38/38	0/3/3/3
3	ATP	D	301	-	-	4/18/38/38	0/3/3/3

The worst 5 of 43 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	301	ATP	C2'-C1'	-3.81	1.48	1.53
3	C	601	ATP	C2'-C1'	-3.33	1.48	1.53
3	H	301	ATP	C2'-C1'	-3.22	1.48	1.53
3	A	601	ATP	C2'-C1'	-3.09	1.49	1.53
3	D	301	ATP	C2'-C1'	-2.87	1.49	1.53

The worst 5 of 58 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	G	601	ATP	O5'-PA-O1A	-6.62	83.22	109.07
3	F	301	ATP	O2A-PA-O1A	-6.41	80.57	112.24
3	B	301	ATP	O5'-PA-O1A	-6.40	84.06	109.07
3	D	301	ATP	O5'-PA-O1A	-6.32	84.38	109.07
3	C	601	ATP	O2A-PA-O1A	-6.25	81.33	112.24

There are no chirality outliers.

5 of 40 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	601	ATP	PB-O3A-PA-O5'
3	E	601	ATP	C5'-O5'-PA-O1A
3	E	601	ATP	C5'-O5'-PA-O3A
3	C	601	ATP	C5'-O5'-PA-O2A
3	C	601	ATP	C5'-O5'-PA-O3A

There are no ring outliers.

7 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	301	ATP	1	0
3	E	601	ATP	3	0
3	C	601	ATP	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	301	ATP	1	0
3	A	601	ATP	1	0
3	H	301	ATP	2	0
3	D	301	ATP	3	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 B 301

Bond lengths   Bond angles

Torsions   Rings

Ligand ATP G 601

Bond lengths

Bond angles

Torsions

Rings

Ligand ATP E 601

Bond lengths

Bond angles

Torsions

Rings

Ligand ATP C 601

Bond lengths

Bond angles

Torsions

Rings

Ligand ATP F 301

Bond lengths

Bond angles

Torsions

Rings

Ligand ATP A 601

Bond lengths

Bond angles

Torsions

Rings

Ligand ATP H 301

Bond lengths

Bond angles

Torsions

Rings

Ligand ATP D 301

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 (i)

6.1 Protein, DNA and RNA chains (i)

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	216/222 (97%)	-0.03	10 (4%)	32	28	27, 62, 143, 176	0
1	B	217/222 (97%)	-0.34	5 (2%)	60	54	38, 59, 142, 166	0
1	C	216/222 (97%)	-0.12	8 (3%)	41	37	38, 63, 163, 177	0
1	D	217/222 (97%)	-0.19	5 (2%)	60	54	35, 69, 153, 178	0
1	E	216/222 (97%)	-0.25	2 (0%)	84	79	25, 54, 138, 163	0
1	F	217/222 (97%)	-0.19	2 (0%)	84	79	27, 56, 140, 169	0
1	G	216/222 (97%)	-0.31	5 (2%)	60	54	28, 49, 127, 155	0
1	H	217/222 (97%)	-0.40	0	100	100	30, 50, 113, 154	0
2	I	429/465 (92%)	-0.35	2 (0%)	91	88	32, 58, 96, 139	0
2	J	429/465 (92%)	-0.42	0	100	100	28, 48, 88, 136	0
2	K	429/465 (92%)	-0.41	1 (0%)	95	93	29, 60, 105, 139	0
2	L	429/465 (92%)	-0.41	0	100	100	31, 51, 88, 138	0
All	All	3448/3636 (94%)	-0.31	40 (1%)	79	73	25, 56, 133, 178	0

The worst 5 of 40 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	198	ILE	5.3
1	A	173	ARG	4.6
1	F	196	GLU	4.6
2	K	68	THR	4.2
1	D	170	LEU	4.1

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(Å^2)	Q<0.9
3	ATP	B	301	31/31	0.97	0.20	37,41,52,53	0
3	ATP	G	601	31/31	0.98	0.18	28,30,35,36	0
3	ATP	E	601	31/31	0.98	0.19	23,27,32,33	0
3	ATP	C	601	31/31	0.98	0.17	35,37,43,44	0
3	ATP	F	301	31/31	0.98	0.18	33,38,47,47	0
3	ATP	A	601	31/31	0.98	0.18	32,35,38,39	0
3	ATP	H	301	31/31	0.98	0.18	29,30,32,32	0
3	ATP	D	301	31/31	0.98	0.18	32,34,40,40	0
4	K	L	501	1/1	0.99	0.31	25,25,25,25	0
4	K	K	501	1/1	0.99	0.26	32,32,32,32	0
4	K	J	501	1/1	0.99	0.30	22,22,22,22	0
4	K	I	501	1/1	1.00	0.28	29,29,29,29	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 B 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
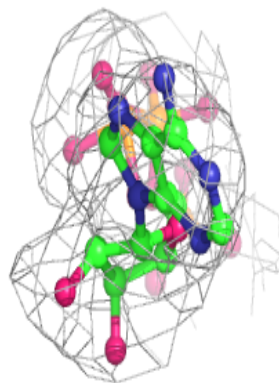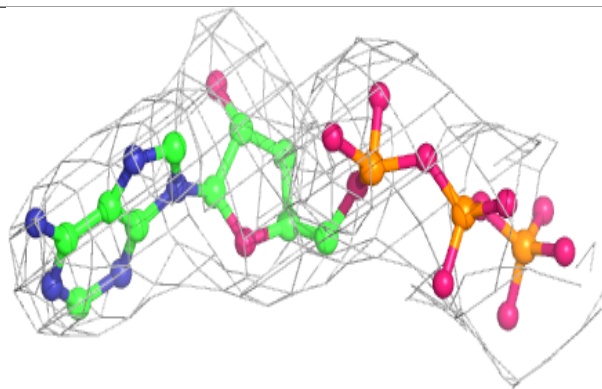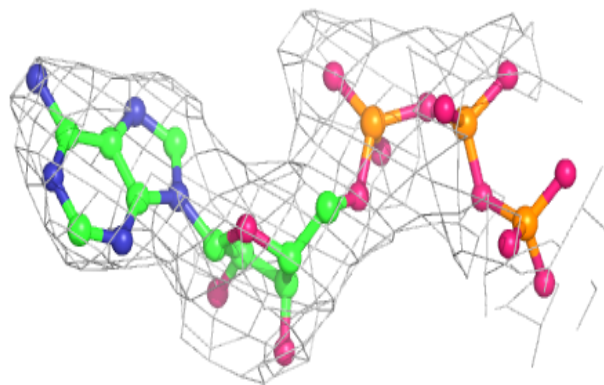
Electron density around ATP G 601:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
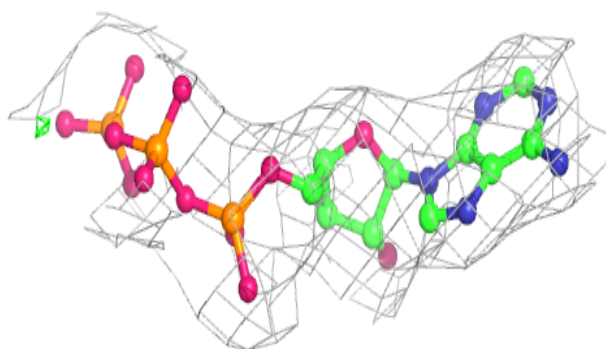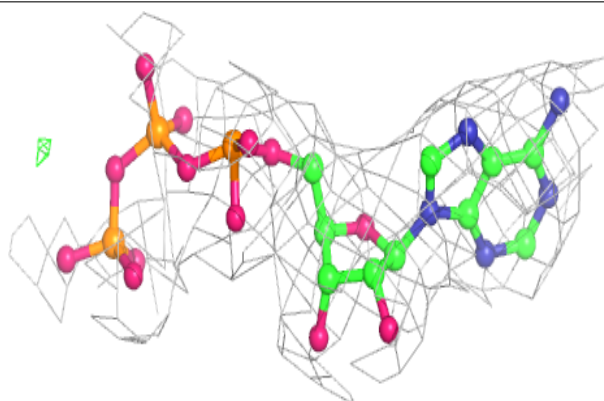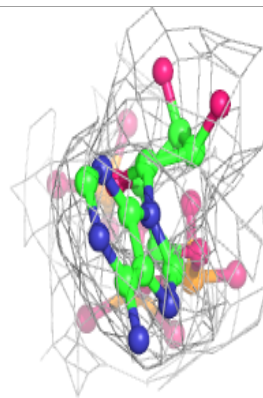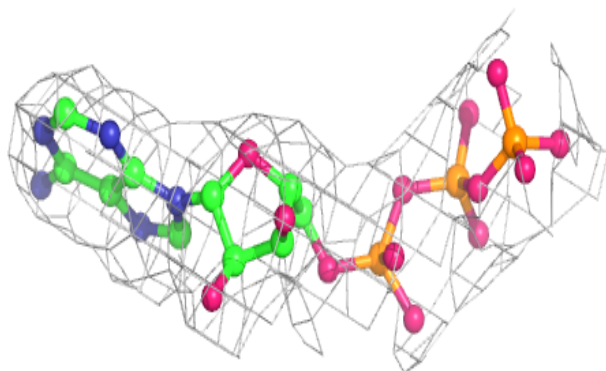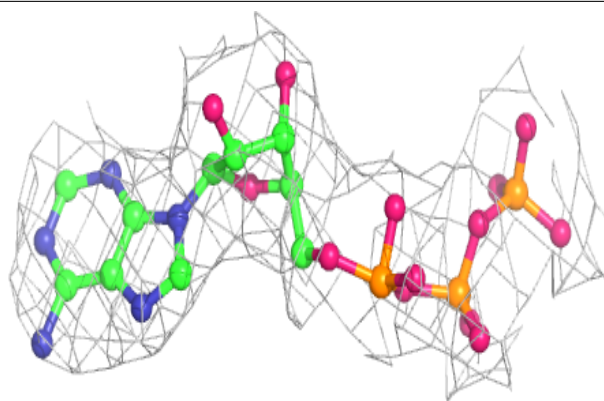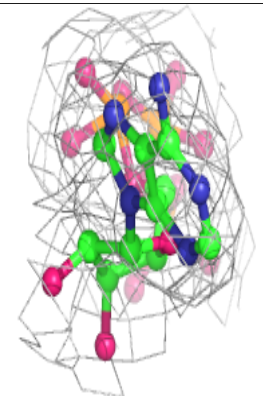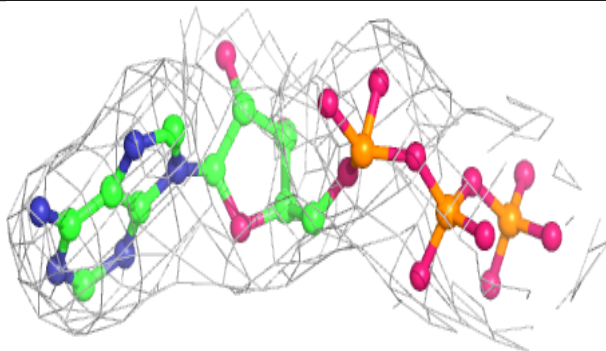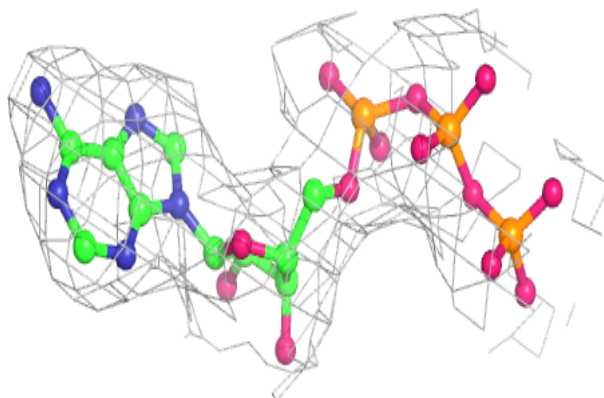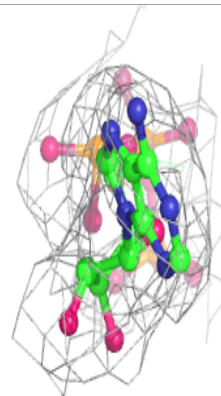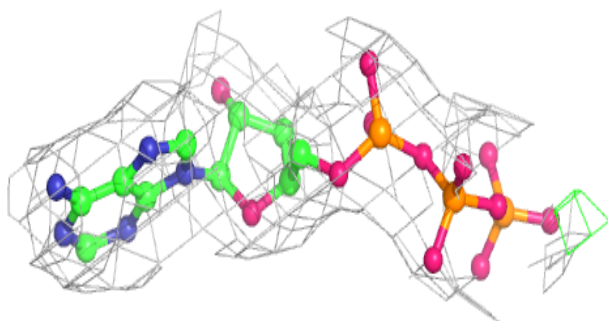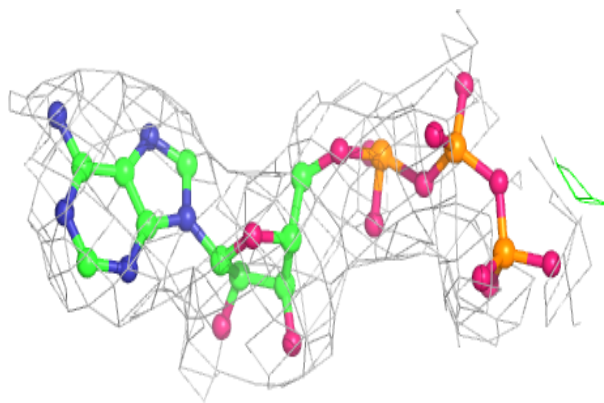mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
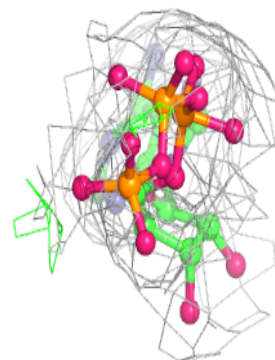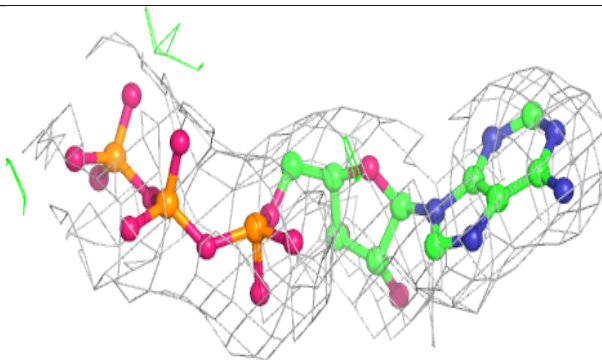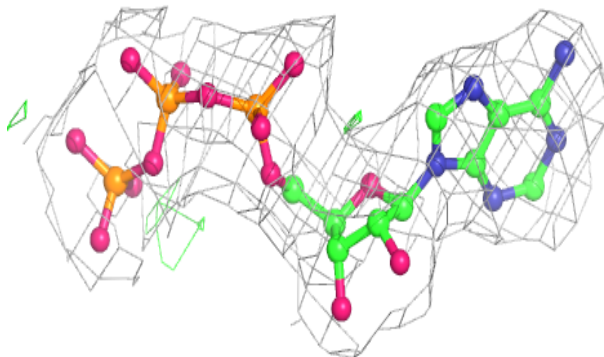
Electron density around ATP E 601:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
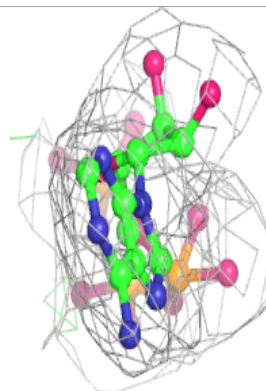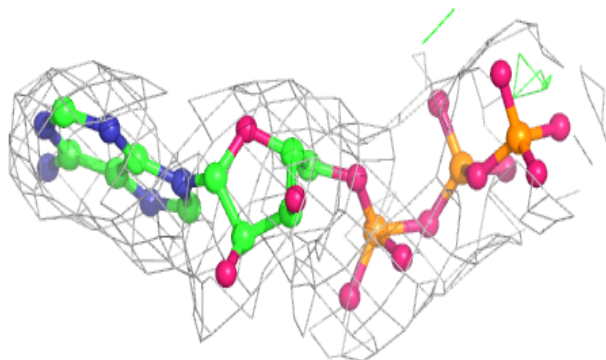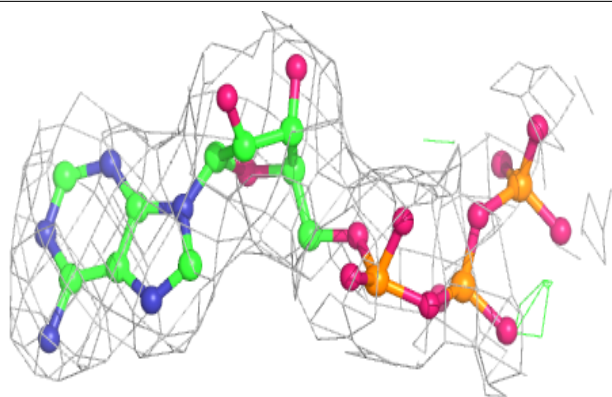
Electron density around ATP C 601:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
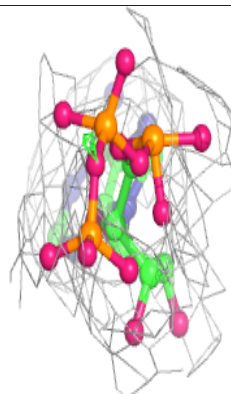
Electron density around ATP F 301:

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

Electron density around ATP A 601:

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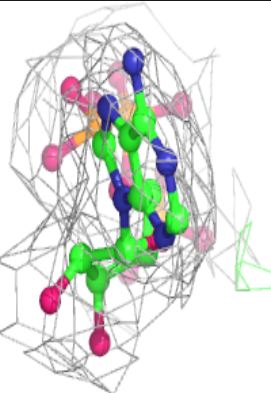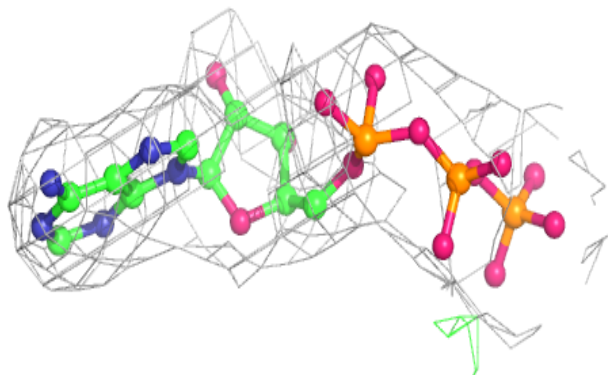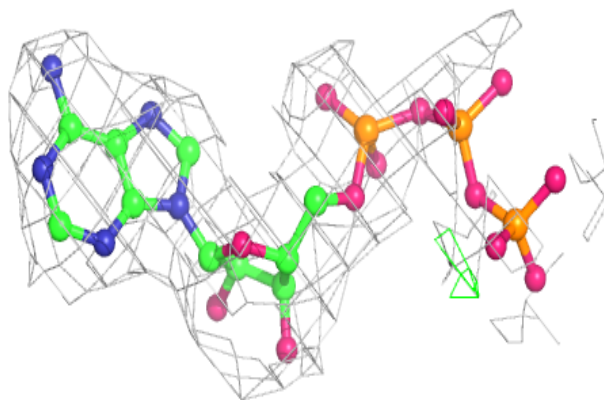$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around ATP H 301:

$2mF_o$-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 D 301:

$2mF_o$-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.