



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 24, 2024 – 02:17 PM EDT

PDB ID : 7AGV
Title : High-resolution structure of the K⁺/H⁺ antiporter subunit KhtT in complex with c-di-AMP
Authors : Cereija, T.B.; Guerra, J.P.; Morais-Cabral, J.H.
Deposited on : 2020-09-23
Resolution : 1.85 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:

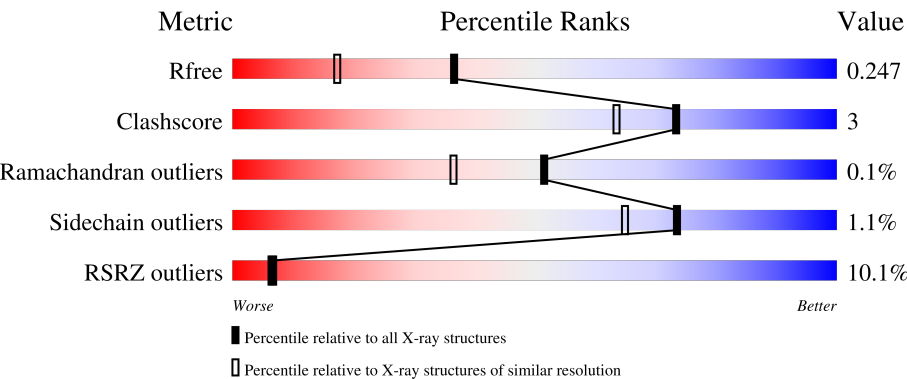
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance i

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

The reported resolution of this entry is 1.85 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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	168	<div><div>12%</div><div><div></div><div>85%</div><div>10%</div><div>5%</div></div></div>
1	B	168	<div><div>9%</div><div><div></div><div>86%</div><div>9%</div><div>• •</div></div></div>
1	C	168	<div><div>5%</div><div><div></div><div>92%</div><div>•</div><div>5%</div></div></div>
1	D	168	<div><div>7%</div><div><div></div><div>89%</div><div>5%</div><div>• 5%</div></div></div>
1	E	168	<div><div>11%</div><div><div></div><div>82%</div><div>14%</div><div>•</div></div></div>

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Mol	Chain	Length	Quality of chain
1	F	168	<div><div></div><div>5%</div><div>88%</div><div>10%</div><div></div><div></div></div>
1	G	168	<div><div></div><div>13%</div><div>81%</div><div>14%</div><div>5%</div><div></div></div>
1	H	168	<div><div></div><div>14%</div><div>86%</div><div>10%</div><div></div><div></div></div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11278 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 K(+)/H(+) antiporter subunit KhtT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	160	Total	C	N	O	S	0	14	0
			1391	870	242	275	4			
1	B	161	Total	C	N	O	S	0	2	0
			1304	819	227	254	4			
1	C	160	Total	C	N	O	S	0	2	0
			1289	808	225	253	3			
1	D	160	Total	C	N	O	S	0	1	0
			1288	810	224	251	3			
1	E	161	Total	C	N	O	S	0	2	0
			1310	822	232	253	3			
1	F	163	Total	C	N	O	S	0	2	0
			1315	827	229	256	3			
1	G	160	Total	C	N	O	S	0	11	0
			1370	857	239	270	4			
1	H	162	Total	C	N	O	S	0	1	0
			1305	821	226	255	3			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP O07535
A	-1	SER	-	expression tag	UNP O07535
A	0	GLY	-	expression tag	UNP O07535
A	1	LEU	-	expression tag	UNP O07535
B	-2	GLY	-	expression tag	UNP O07535
B	-1	SER	-	expression tag	UNP O07535
B	0	GLY	-	expression tag	UNP O07535
B	1	LEU	-	expression tag	UNP O07535
C	-2	GLY	-	expression tag	UNP O07535
C	-1	SER	-	expression tag	UNP O07535
C	0	GLY	-	expression tag	UNP O07535
C	1	LEU	-	expression tag	UNP O07535
D	-2	GLY	-	expression tag	UNP O07535

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-1	SER	-	expression tag	UNP O07535
D	0	GLY	-	expression tag	UNP O07535
D	1	LEU	-	expression tag	UNP O07535
E	-2	GLY	-	expression tag	UNP O07535
E	-1	SER	-	expression tag	UNP O07535
E	0	GLY	-	expression tag	UNP O07535
E	1	LEU	-	expression tag	UNP O07535
F	-2	GLY	-	expression tag	UNP O07535
F	-1	SER	-	expression tag	UNP O07535
F	0	GLY	-	expression tag	UNP O07535
F	1	LEU	-	expression tag	UNP O07535
G	-2	GLY	-	expression tag	UNP O07535
G	-1	SER	-	expression tag	UNP O07535
G	0	GLY	-	expression tag	UNP O07535
G	1	LEU	-	expression tag	UNP O07535
H	-2	GLY	-	expression tag	UNP O07535
H	-1	SER	-	expression tag	UNP O07535
H	0	GLY	-	expression tag	UNP O07535
H	1	LEU	-	expression tag	UNP O07535

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Ca 1 1	0	0
2	G	1	Total Ca 1 1	0	0

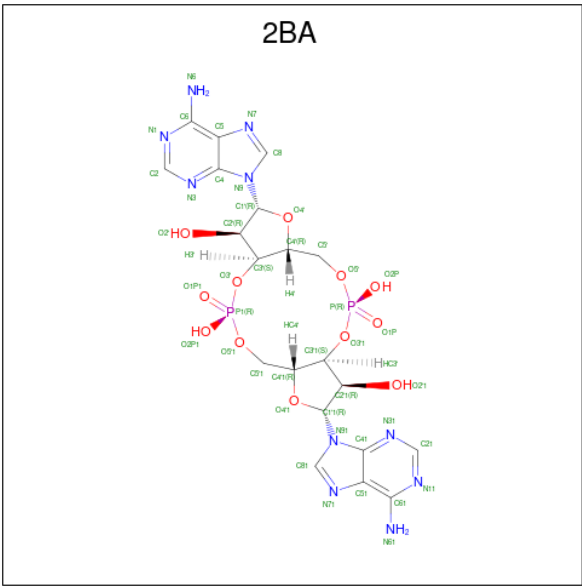
- Molecule 3 is ACETATE ION (three-letter code: ACT) (formula: C₂H₃O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	C	1	Total	C	O	0	0
			4	2	2		
3	C	1	Total	C	O	0	0
			4	2	2		
3	D	1	Total	C	O	0	0
			4	2	2		
3	E	1	Total	C	O	0	0
			4	2	2		
3	E	1	Total	C	O	0	0
			4	2	2		
3	F	1	Total	C	O	0	0
			4	2	2		
3	G	1	Total	C	O	0	0
			4	2	2		
3	H	1	Total	C	O	0	0
			4	2	2		
3	H	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is (2R,3R,3aS,5R,7aR,9R,10R,10aS,12R,14aR)-2,9-bis(6-amino-9H-purin-9-yl)octahydro-2H,7H-difuro[3,2-d:3',2'-j][1,3,7,9,2,8]tetraoxadiphosphacyclododecine-3,5,10,12-tetrol 5,12-dioxide (three-letter code: 2BA) (formula: C₂₀H₂₄N₁₀O₁₂P₂) (labeled as "Ligand of

Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	B	1	Total 44	C 20	N 10	O 12	P 2	0	0
4	C	1	Total 44	C 20	N 10	O 12	P 2	0	0
4	E	1	Total 44	C 20	N 10	O 12	P 2	0	0
4	H	1	Total 44	C 20	N 10	O 12	P 2	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	57	Total	O	0	0
			57	57		
5	B	64	Total	O	0	0
			64	64		
5	C	61	Total	O	0	0
			61	61		
5	D	77	Total	O	0	0
			77	77		
5	E	45	Total	O	0	0
			45	45		
5	F	79	Total	O	0	0
			79	79		
5	G	49	Total	O	0	1
			49	49		

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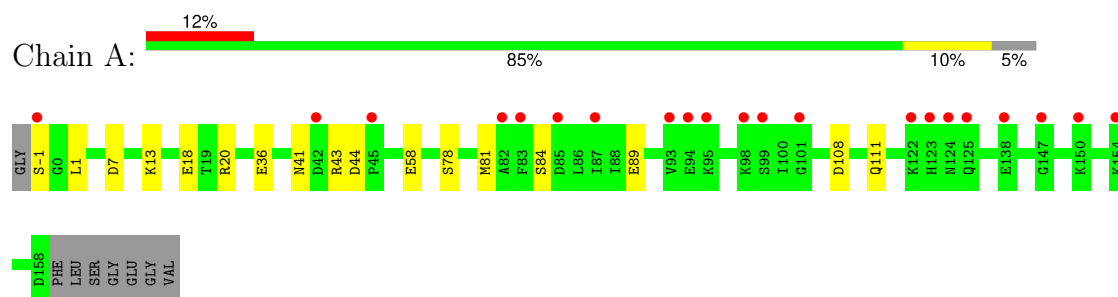
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	H	48	Total	O	0	1
			48	48		

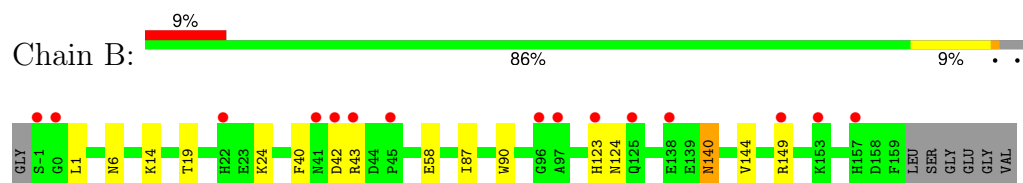
3 Residue-property plots [i](#)

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.

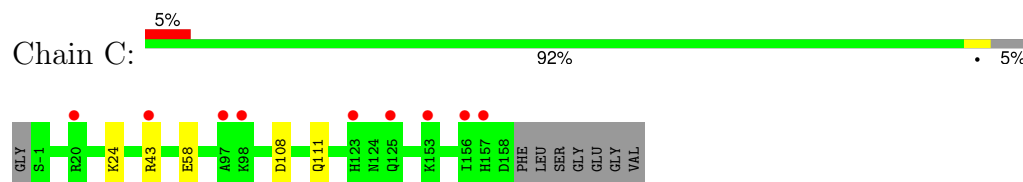
- Molecule 1: K(+)/H(+) antiporter subunit KhtT



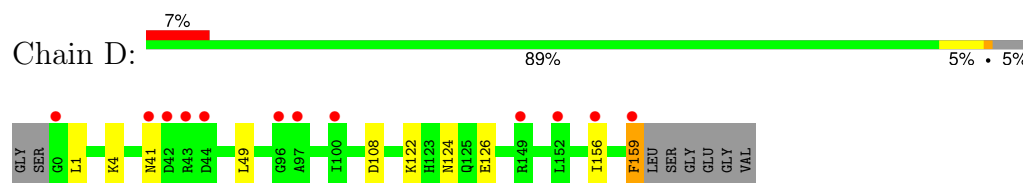
- Molecule 1: K(+)/H(+) antiporter subunit KhtT



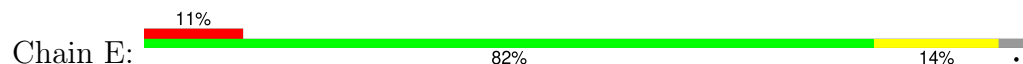
- Molecule 1: K(+)/H(+) antiporter subunit KhtT

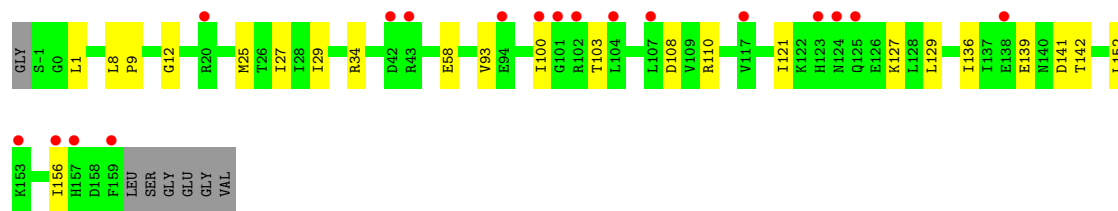


- Molecule 1: K(+)/H(+) antiporter subunit KhtT

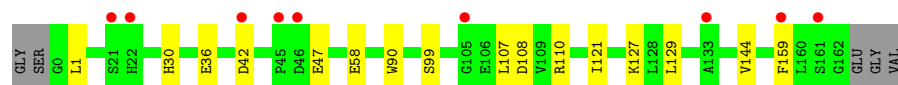
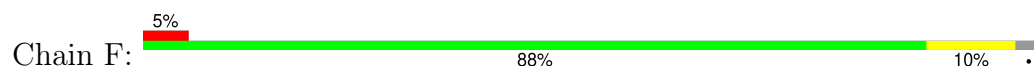


- Molecule 1: K(+)/H(+) antiporter subunit KhtT

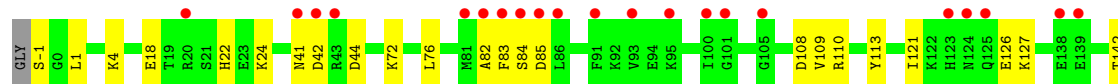
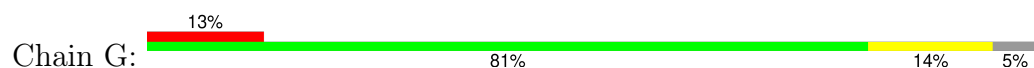




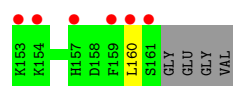
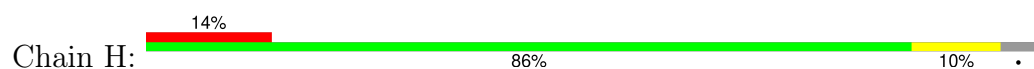
- Molecule 1: K(+)/H(+) antiporter subunit KhtT



- Molecule 1: K(+)/H(+) antiporter subunit KhtT



- Molecule 1: K(+)/H(+) antiporter subunit KhtT



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	72.94Å 127.60Å 81.88Å 90.00° 95.80° 90.00°	Depositor
Resolution (Å)	81.46 – 1.85 81.46 – 1.85	Depositor EDS
% Data completeness (in resolution range)	98.4 (81.46-1.85) 98.5 (81.46-1.85)	Depositor EDS
R_{merge}	0.03	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.69 (at 1.84Å)	Xtriage
Refinement program	PHENIX 1.8.2_1309	Depositor
R, R_{free}	0.204 , 0.242 0.212 , 0.247	Depositor DCC
R_{free} test set	6263 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	39.7	Xtriage
Anisotropy	0.050	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 52.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11278	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 34.45 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.8068e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 2BA, ACT, CA

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	0.39	0/1409	0.55	0/1892
1	B	0.36	0/1322	0.52	0/1776
1	C	0.40	0/1309	0.56	0/1759
1	D	0.38	0/1306	0.56	0/1755
1	E	0.35	0/1328	0.52	0/1783
1	F	0.37	0/1333	0.53	0/1790
1	G	0.34	0/1389	0.54	0/1866
1	H	0.33	0/1323	0.51	0/1778
All	All	0.37	0/10719	0.54	0/14399

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [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	1391	0	1391	9	0
1	B	1304	0	1313	11	0
1	C	1289	0	1303	4	0
1	D	1288	0	1299	6	0
1	E	1310	0	1324	16	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	1315	0	1330	13	0
1	G	1370	0	1364	16	0
1	H	1305	0	1316	11	0
2	A	1	0	0	0	0
2	G	1	0	0	0	0
3	A	8	0	6	0	0
3	B	4	0	3	0	0
3	C	8	0	6	0	0
3	D	4	0	3	0	0
3	E	8	0	6	0	0
3	F	4	0	3	0	0
3	G	4	0	3	0	0
3	H	8	0	6	0	0
4	B	44	0	23	0	0
4	C	44	0	23	0	0
4	E	44	0	23	0	0
4	H	44	0	23	1	0
5	A	57	0	0	1	0
5	B	64	0	0	0	0
5	C	61	0	0	1	0
5	D	77	0	0	0	0
5	E	45	0	0	1	0
5	F	79	0	0	1	0
5	G	49	0	0	1	0
5	H	48	0	0	0	0
All	All	11278	0	10768	72	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (72) 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:E:110[A]:ARG:HH12	1:F:110:ARG:HH22	1.15	0.93
1:E:110[A]:ARG:HH22	1:F:110:ARG:HH12	1.37	0.71
1:G:24:LYS:HE3	1:G:42[B]:ASP:HA	1.71	0.71
1:E:110[A]:ARG:NH1	1:F:110:ARG:HH22	1.89	0.69
1:H:143:LEU:HD12	1:H:160:LEU:HD21	1.72	0.69
1:C:58:GLU:HG2	1:D:1:LEU:HG	1.82	0.61
1:G:72:LYS:NZ	1:G:76:LEU:O	2.34	0.59
1:E:110[A]:ARG:HH12	1:F:110:ARG:NH2	1.93	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:43:ARG:NH1	1:F:42:ASP:OD2	2.35	0.59
1:G:-1:SER:HB2	1:H:55:ASP:OD2	2.04	0.58
1:H:103:THR:HG22	1:H:136:ILE:HG12	1.86	0.57
1:G:1:LEU:HG	1:H:58:GLU:HG2	1.86	0.57
1:H:30:HIS:NE2	1:H:36:GLU:OE1	2.31	0.56
1:A:1:LEU:HG	1:B:58:GLU:HG2	1.86	0.56
1:E:100:ILE:HD13	1:E:139:GLU:HG3	1.85	0.56
1:G:4:LYS:NZ	5:G:302:HOH:O	2.39	0.56
1:F:99:SER:HB2	1:F:107:LEU:HD11	1.88	0.56
1:B:123:HIS:HB2	1:B:140:ASN:HB3	1.88	0.54
1:F:47:GLU:HG2	5:F:317:HOH:O	2.06	0.54
1:F:121:ILE:HG12	1:F:127[B]:LYS:HG3	1.89	0.53
1:A:41:ASN:HB3	1:A:44:ASP:O	2.07	0.53
1:E:58:GLU:HG2	1:F:1:LEU:HG	1.90	0.52
1:B:6[B]:ASN:OD1	1:B:14:LYS:NZ	2.42	0.52
1:G:121:ILE:HG12	1:G:127:LYS:HG3	1.92	0.52
1:E:103:THR:HG22	1:E:136:ILE:HG13	1.92	0.51
1:E:93:VAL:HG12	1:E:141:ASP:O	2.12	0.50
1:G:121:ILE:HB	1:G:142:THR:HB	1.93	0.49
1:E:34[B]:ARG:NH2	5:E:301:HOH:O	2.31	0.49
1:G:18:GLU:OE1	1:G:24:LYS:HE2	2.13	0.49
1:B:1:LEU:HD23	1:B:19:THR:HA	1.95	0.49
1:G:85[B]:ASP:N	1:G:85[B]:ASP:OD1	2.46	0.49
1:A:111:GLN:NE2	5:A:304:HOH:O	2.45	0.48
1:D:156:ILE:HA	1:D:159:PHE:HB2	1.94	0.48
1:A:7[A]:ASP:HA	1:A:13[A]:LYS:HD3	1.93	0.48
1:H:18:GLU:OE2	1:H:24:LYS:HE2	2.14	0.48
1:D:41:ASN:HB2	1:D:49:LEU:HD11	1.95	0.47
1:A:-1:SER:N	1:A:20:ARG:HE	2.13	0.47
1:G:22:HIS:O	1:G:42[B]:ASP:HB2	2.14	0.47
1:A:58:GLU:HG2	1:B:1:LEU:HG	1.95	0.47
1:F:127[A]:LYS:HD3	1:F:129:LEU:HD21	1.97	0.47
1:D:124:ASN:OD1	1:D:126:GLU:HG2	2.15	0.46
1:D:4:LYS:HB3	1:D:4:LYS:HE2	1.75	0.46
1:F:30:HIS:NE2	1:F:36:GLU:OE2	2.38	0.46
1:B:124:ASN:OD1	1:B:124:ASN:N	2.41	0.46
1:E:12:GLY:HA3	1:E:29:ILE:O	2.16	0.46
1:E:121:ILE:HB	1:E:142:THR:HB	1.97	0.46
1:E:127:LYS:HE3	1:E:129:LEU:HD21	1.99	0.45
1:G:41[A]:ASN:HB3	1:G:44:ASP:O	2.16	0.45
1:A:81[A]:MET:HB2	1:A:84[A]:SER:HB3	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:152:LEU:O	1:E:156:ILE:HG12	2.17	0.44
1:H:113:TYR:O	1:H:151:HIS:HB3	2.18	0.44
1:A:-1:SER:H2	1:A:20:ARG:HE	1.65	0.43
1:F:90:TRP:CD1	1:F:144:VAL:HG22	2.54	0.43
1:B:87:ILE:HD12	1:B:149:ARG:HG2	2.00	0.43
1:E:25:MET:HE1	1:E:27:ILE:HD11	2.00	0.43
1:C:111:GLN:NE2	5:C:301:HOH:O	2.33	0.43
1:G:109:VAL:O	1:G:113:TYR:HB2	2.19	0.43
1:H:24:LYS:HB2	1:H:40:PHE:HB2	1.99	0.43
1:A:78:SER:HB3	1:A:89:GLU:HG3	2.00	0.42
1:C:43:ARG:HH12	1:G:149:ARG:HD2	1.84	0.42
1:E:1:LEU:HG	1:F:58:GLU:HG2	2.01	0.42
1:B:90:TRP:CD1	1:B:144:VAL:HG22	2.54	0.42
1:D:122:LYS:HE2	1:D:122:LYS:HB3	1.78	0.42
1:E:8:LEU:HA	1:E:9:PRO:HD2	1.76	0.42
1:C:24:LYS:HE2	1:G:83[B]:PHE:O	2.19	0.42
1:B:24:LYS:HE3	1:B:42:ASP:HA	2.01	0.41
1:G:110:ARG:HB3	4:H:201:2BA:H2'	2.02	0.41
1:B:24:LYS:HG3	1:B:40:PHE:HB2	2.02	0.41
1:H:2:ASN:HB2	1:H:18:GLU:HB3	2.02	0.41
1:H:91:PHE:CE1	1:H:160:LEU:HB3	2.56	0.41
1:G:82[B]:ALA:O	1:G:84[B]:SER:N	2.51	0.40
1:H:88:ILE:HA	1:H:145:LEU:O	2.21	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	172/168 (102%)	166 (96%)	6 (4%)	0	100	100
1	B	161/168 (96%)	157 (98%)	4 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	160/168 (95%)	158 (99%)	2 (1%)	0	100	100
1	D	159/168 (95%)	156 (98%)	3 (2%)	0	100	100
1	E	161/168 (96%)	151 (94%)	10 (6%)	0	100	100
1	F	163/168 (97%)	160 (98%)	3 (2%)	0	100	100
1	G	169/168 (101%)	159 (94%)	9 (5%)	1 (1%)	25	12
1	H	161/168 (96%)	154 (96%)	7 (4%)	0	100	100
All	All	1306/1344 (97%)	1261 (97%)	44 (3%)	1 (0%)	51	36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	126	GLU

5.3.2 Protein sidechains ⓘ

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	154/146 (106%)	150 (97%)	4 (3%)	46	30
1	B	144/146 (99%)	143 (99%)	1 (1%)	84	79
1	C	143/146 (98%)	142 (99%)	1 (1%)	84	79
1	D	142/146 (97%)	140 (99%)	2 (1%)	67	55
1	E	144/146 (99%)	143 (99%)	1 (1%)	84	79
1	F	145/146 (99%)	143 (99%)	2 (1%)	67	55
1	G	151/146 (103%)	150 (99%)	1 (1%)	84	79
1	H	144/146 (99%)	144 (100%)	0	100	100
All	All	1167/1168 (100%)	1155 (99%)	12 (1%)	73	69

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	GLU

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Mol	Chain	Res	Type
1	A	36	GLU
1	A	43	ARG
1	A	108	ASP
1	B	140	ASN
1	C	108	ASP
1	D	108	ASP
1	D	159	PHE
1	E	108	ASP
1	F	108	ASP
1	F	159	PHE
1	G	108	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 18 ligands modelled in this entry, 2 are monoatomic - leaving 16 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	ACT	C	203	-	3,3,3	0.86	0	3,3,3	0.66	0
3	ACT	G	202	-	3,3,3	0.84	0	3,3,3	0.65	0
3	ACT	F	201	-	3,3,3	0.72	0	3,3,3	1.00	0
3	ACT	H	202	-	3,3,3	0.92	0	3,3,3	0.46	0
3	ACT	E	202	-	3,3,3	0.74	0	3,3,3	0.94	0
3	ACT	C	202	-	3,3,3	0.74	0	3,3,3	0.90	0
4	2BA	E	201	-	42,50,50	0.90	2 (4%)	48,78,78	1.20	4 (8%)
3	ACT	B	202	-	3,3,3	0.92	0	3,3,3	0.55	0
3	ACT	A	203	-	3,3,3	0.92	0	3,3,3	0.50	0
3	ACT	E	203	-	3,3,3	0.76	0	3,3,3	0.79	0
4	2BA	C	201	-	42,50,50	0.89	2 (4%)	48,78,78	1.29	6 (12%)
4	2BA	H	201	-	42,50,50	0.88	1 (2%)	48,78,78	1.26	4 (8%)
3	ACT	H	203	-	3,3,3	0.93	0	3,3,3	0.64	0
3	ACT	A	202	-	3,3,3	0.88	0	3,3,3	0.72	0
4	2BA	B	201	-	42,50,50	0.91	3 (7%)	48,78,78	1.20	3 (6%)
3	ACT	D	201	-	3,3,3	0.84	0	3,3,3	1.07	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	2BA	C	201	-	-	0/22/62/62	0/6/7/7
4	2BA	E	201	-	-	3/22/62/62	0/6/7/7
4	2BA	B	201	-	-	0/22/62/62	0/6/7/7
4	2BA	H	201	-	-	0/22/62/62	0/6/7/7

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	201	2BA	C21-N31	2.25	1.35	1.32
4	B	201	2BA	C2-N3	2.24	1.35	1.32
4	H	201	2BA	C21-N31	2.14	1.35	1.32
4	C	201	2BA	O4'-C1'	2.10	1.43	1.40
4	B	201	2BA	O4'1-C1'1	2.05	1.43	1.40
4	E	201	2BA	C21-N31	2.03	1.35	1.32
4	E	201	2BA	O4'1-C1'1	2.02	1.43	1.40
4	C	201	2BA	C21-N31	2.00	1.35	1.32

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	201	2BA	N31-C21-N11	-4.36	122.75	128.67
4	B	201	2BA	N31-C21-N11	-4.36	122.75	128.67
4	H	201	2BA	N3-C2-N1	-4.05	123.17	128.67
4	C	201	2BA	N3-C2-N1	-4.05	123.17	128.67
4	H	201	2BA	N31-C21-N11	-3.95	123.31	128.67
4	E	201	2BA	N3-C2-N1	-3.91	123.37	128.67
4	B	201	2BA	N3-C2-N1	-3.84	123.45	128.67
4	E	201	2BA	N31-C21-N11	-3.77	123.55	128.67
4	H	201	2BA	C41-C51-N71	-2.67	106.51	109.34
4	E	201	2BA	C4-C5-N7	-2.61	106.58	109.34
4	C	201	2BA	C4-C5-N7	-2.32	106.88	109.34
4	B	201	2BA	C4-C5-N7	-2.31	106.90	109.34
4	C	201	2BA	N61-C61-N11	2.22	123.08	118.33
4	H	201	2BA	N6-C6-N1	2.19	123.01	118.33
4	C	201	2BA	C1'1-N91-C41	-2.08	122.99	126.64
4	E	201	2BA	C3'1-C2'1-C1'1	2.04	104.39	99.89
4	C	201	2BA	C3'1-C2'1-C1'1	2.01	104.30	99.89

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	201	2BA	C5'-O5'-P-O2P
4	E	201	2BA	C5'-O5'-P-O3'1
4	E	201	2BA	C3'-C4'-C5'-O5'

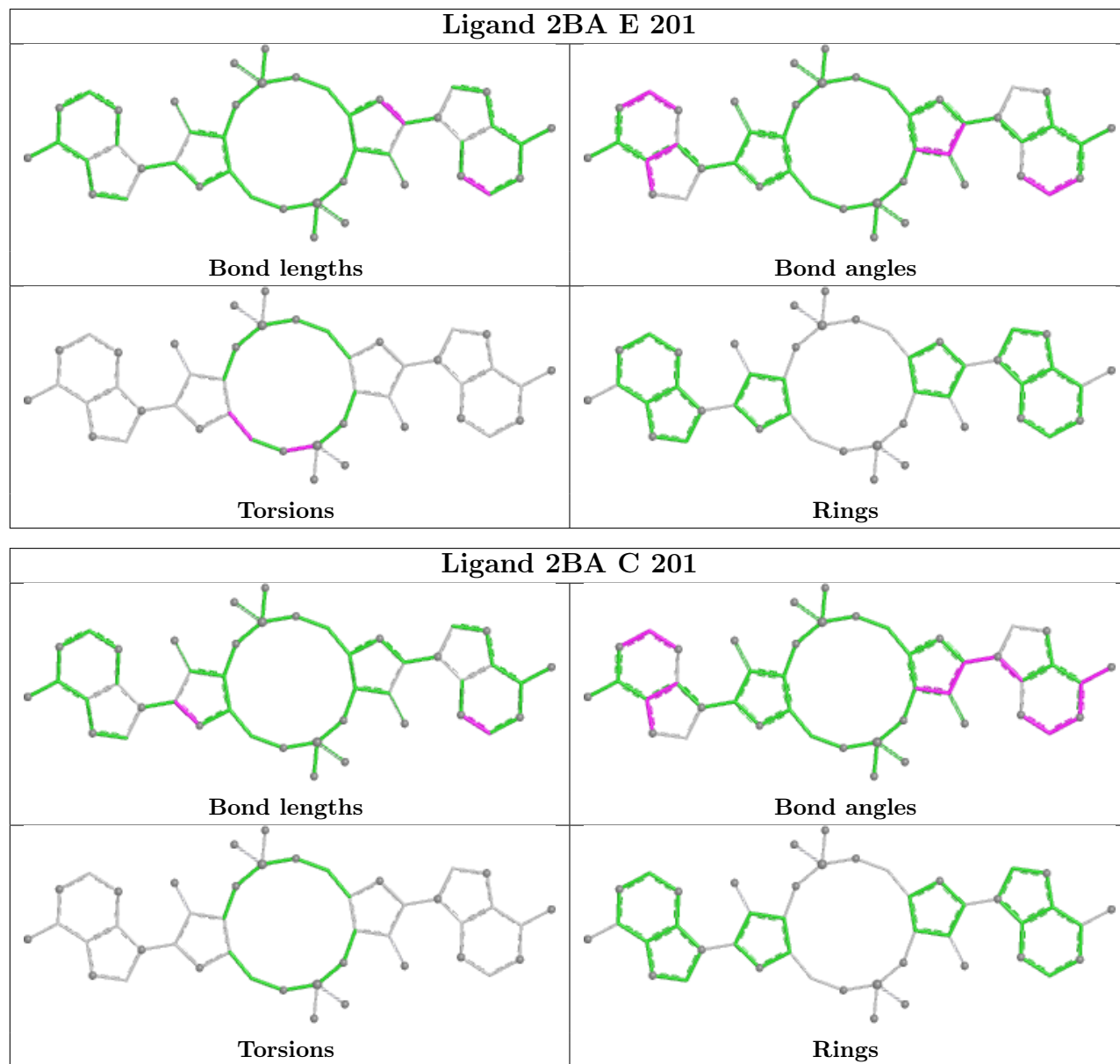
There are no ring outliers.

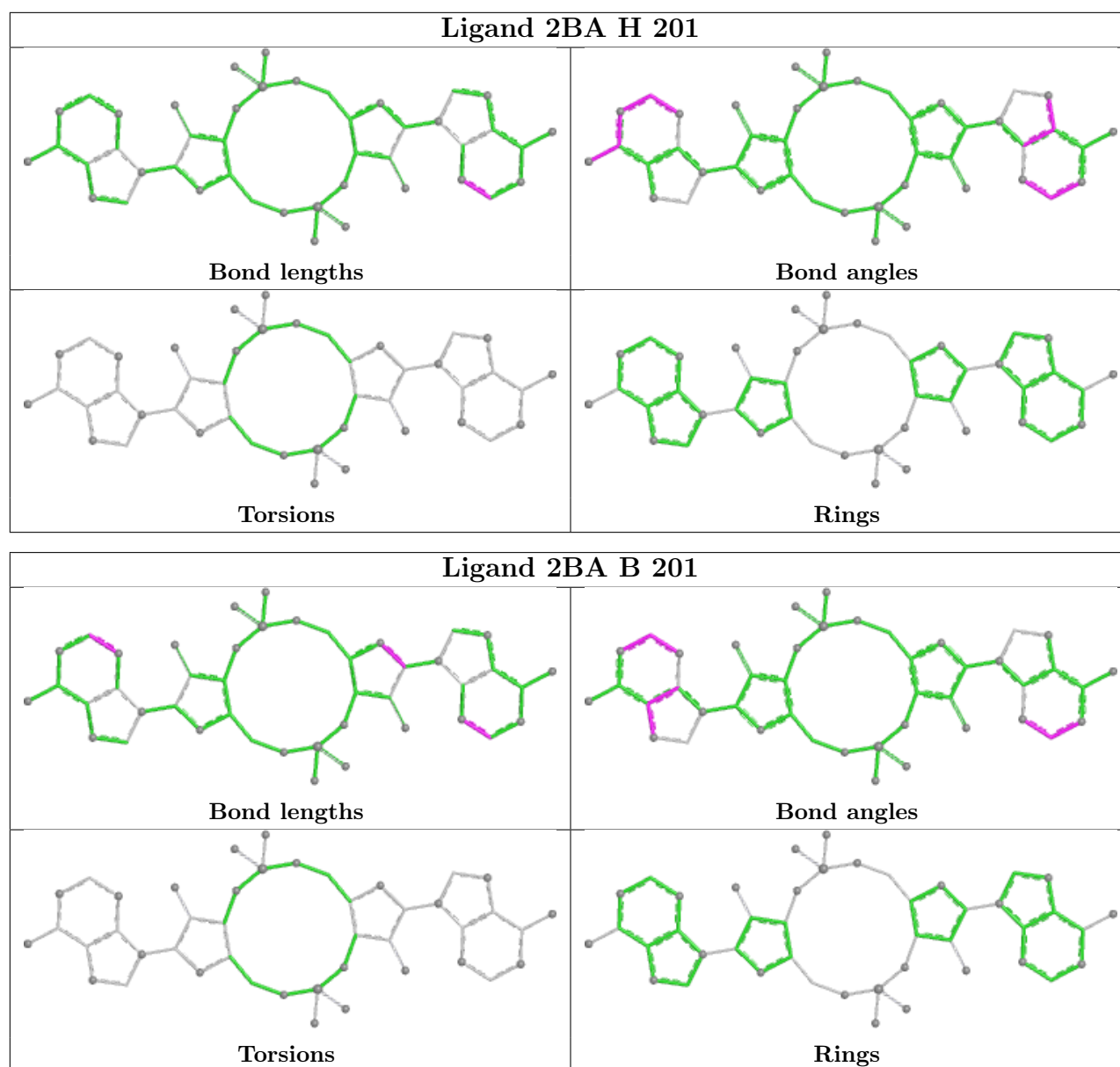
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	H	201	2BA	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	160/168 (95%)	0.84	21 (13%) 3 3	28, 61, 111, 146	0
1	B	161/168 (95%)	0.63	15 (9%) 8 8	28, 63, 104, 115	0
1	C	160/168 (95%)	0.49	9 (5%) 24 23	27, 55, 109, 129	0
1	D	160/168 (95%)	0.54	12 (7%) 14 14	24, 60, 106, 118	0
1	E	161/168 (95%)	0.70	18 (11%) 5 5	28, 62, 118, 143	0
1	F	163/168 (97%)	0.53	9 (5%) 25 24	27, 59, 95, 137	0
1	G	160/168 (95%)	0.83	22 (13%) 2 3	30, 69, 116, 148	0
1	H	162/168 (96%)	0.74	24 (14%) 2 2	28, 69, 117, 148	0
All	All	1287/1344 (95%)	0.66	130 (10%) 7 6	24, 62, 110, 148	0

All (130) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	83[A]	PHE	8.6
1	G	125	GLN	8.3
1	E	125	GLN	7.3
1	D	159	PHE	7.2
1	G	123	HIS	6.6
1	H	45	PRO	6.2
1	D	96	GLY	6.0
1	E	159	PHE	6.0
1	E	157	HIS	5.9
1	G	124	ASN	5.9
1	E	124	ASN	5.6
1	E	100	ILE	5.3
1	D	42	ASP	5.3
1	D	43	ARG	5.1
1	F	161	SER	5.1
1	A	83[A]	PHE	5.1

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Mol	Chain	Res	Type	RSRZ
1	C	125	GLN	5.0
1	H	22	HIS	5.0
1	C	123	HIS	4.8
1	H	91	PHE	4.7
1	G	93	VAL	4.7
1	H	159	PHE	4.6
1	F	159	PHE	4.4
1	A	82[A]	ALA	4.4
1	D	156	ILE	4.4
1	H	161	SER	4.4
1	A	123	HIS	4.2
1	A	125	GLN	4.2
1	A	98	LYS	4.2
1	H	42	ASP	4.2
1	G	100	ILE	4.2
1	E	156	ILE	4.1
1	G	42[A]	ASP	4.1
1	G	139	GLU	4.1
1	G	82[A]	ALA	3.8
1	G	95	LYS	3.6
1	G	41[A]	ASN	3.6
1	D	152	LEU	3.6
1	E	153	LYS	3.6
1	A	85[A]	ASP	3.5
1	E	117	VAL	3.5
1	H	160	LEU	3.5
1	A	122	LYS	3.4
1	D	41	ASN	3.4
1	D	44	ASP	3.4
1	B	97	ALA	3.4
1	G	101	GLY	3.4
1	C	43	ARG	3.4
1	B	42	ASP	3.4
1	C	157	HIS	3.3
1	A	93	VAL	3.3
1	G	43[A]	ARG	3.3
1	B	123	HIS	3.3
1	A	124	ASN	3.2
1	E	94	GLU	3.2
1	B	45	PRO	3.1
1	H	43	ARG	3.1
1	H	24	LYS	3.1

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Mol	Chain	Res	Type	RSRZ
1	B	-1	SER	3.1
1	C	156	ILE	3.1
1	G	85[A]	ASP	3.0
1	B	125	GLN	3.0
1	C	20	ARG	3.0
1	A	154	LYS	3.0
1	A	95	LYS	3.0
1	E	107	LEU	3.0
1	A	45	PRO	2.9
1	F	22	HIS	2.9
1	B	153	LYS	2.8
1	E	138	GLU	2.8
1	H	1	LEU	2.8
1	H	20	ARG	2.7
1	B	138	GLU	2.7
1	B	22	HIS	2.7
1	H	157	HIS	2.7
1	E	102	ARG	2.7
1	F	42	ASP	2.7
1	B	0	GLY	2.6
1	H	10	GLY	2.6
1	A	101	GLY	2.6
1	E	123	HIS	2.5
1	H	97	ALA	2.5
1	A	42	ASP	2.5
1	G	84[A]	SER	2.5
1	E	104	LEU	2.5
1	E	42	ASP	2.5
1	H	41	ASN	2.5
1	G	155	LEU	2.5
1	D	97	ALA	2.5
1	G	91	PHE	2.5
1	A	150	LYS	2.4
1	D	0	GLY	2.4
1	F	46	ASP	2.4
1	G	138	GLU	2.4
1	A	94	GLU	2.4
1	F	133	ALA	2.4
1	A	138	GLU	2.4
1	E	43	ARG	2.3
1	G	86	LEU	2.3
1	A	147	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	41	ASN	2.3
1	H	96	GLY	2.3
1	H	98	LYS	2.3
1	H	124	ASN	2.3
1	H	123	HIS	2.3
1	E	101	GLY	2.3
1	F	105	GLY	2.3
1	D	100	ILE	2.3
1	F	45	PRO	2.2
1	H	149	ARG	2.2
1	G	20	ARG	2.2
1	B	43	ARG	2.2
1	A	87	ILE	2.2
1	A	99	SER	2.2
1	B	157	HIS	2.1
1	D	149	ARG	2.1
1	C	97	ALA	2.1
1	C	98	LYS	2.1
1	H	154	LYS	2.1
1	F	21	SER	2.1
1	H	120	ILE	2.1
1	B	96	GLY	2.1
1	C	153	LYS	2.1
1	H	153	LYS	2.1
1	B	149	ARG	2.0
1	E	20	ARG	2.0
1	H	94	GLU	2.0
1	A	-1	SER	2.0
1	G	105	GLY	2.0
1	G	81[A]	MET	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

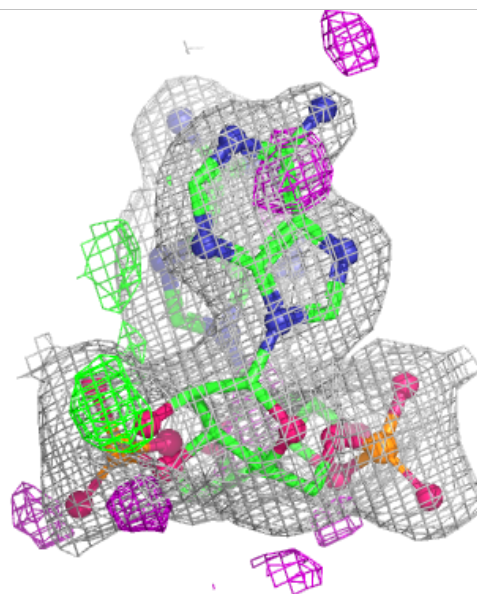
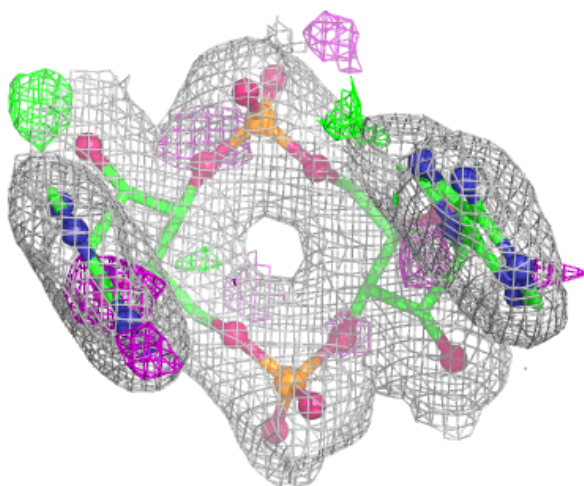
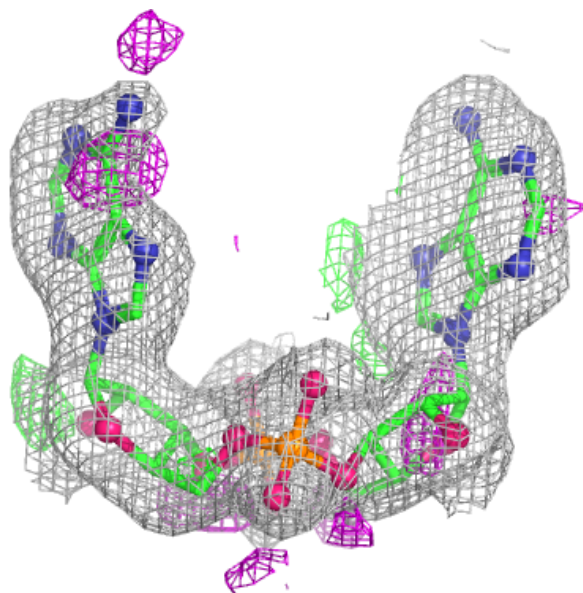
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	ACT	H	202	4/4	0.80	0.17	59,62,64,66	0
3	ACT	C	202	4/4	0.81	0.14	55,62,66,68	0
3	ACT	A	203	4/4	0.81	0.21	48,53,54,67	0
3	ACT	E	202	4/4	0.84	0.17	61,62,62,63	0
4	2BA	B	201	44/44	0.91	0.12	39,48,53,61	0
2	CA	G	201	1/1	0.93	0.05	54,54,54,54	0
4	2BA	C	201	44/44	0.93	0.11	34,50,57,70	0
4	2BA	E	201	44/44	0.93	0.12	41,52,61,69	0
4	2BA	H	201	44/44	0.93	0.12	36,49,55,57	0
2	CA	A	201	1/1	0.94	0.11	54,54,54,54	0
3	ACT	F	201	4/4	0.96	0.16	36,36,41,42	0
3	ACT	A	202	4/4	0.97	0.10	38,44,48,51	0
3	ACT	H	203	4/4	0.97	0.15	44,48,56,56	0
3	ACT	C	203	4/4	0.97	0.12	33,37,39,42	0
3	ACT	D	201	4/4	0.98	0.14	31,34,34,38	0
3	ACT	G	202	4/4	0.98	0.09	42,44,46,50	0
3	ACT	B	202	4/4	0.98	0.13	37,45,50,54	0
3	ACT	E	203	4/4	0.98	0.14	36,41,42,48	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.

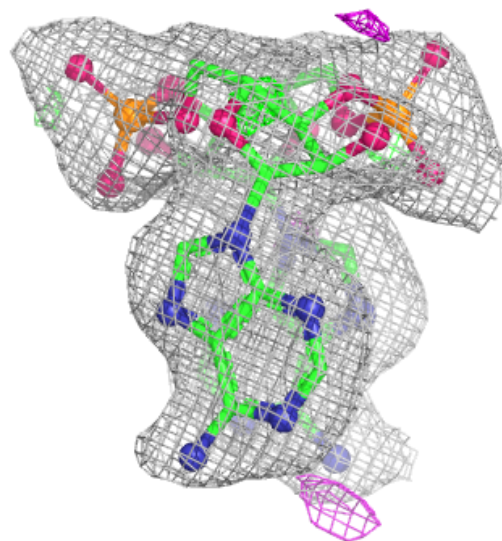
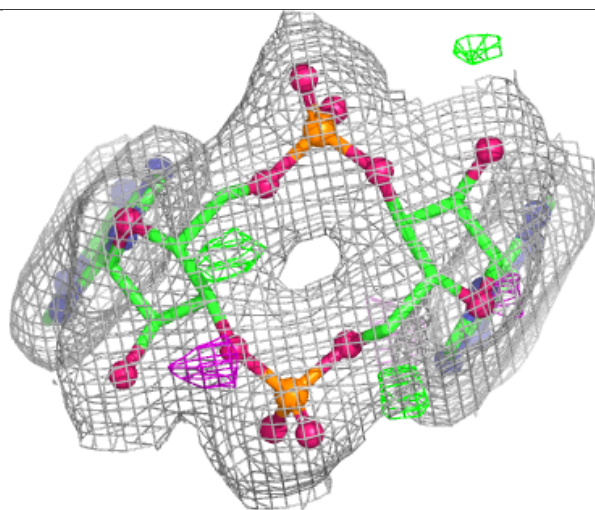
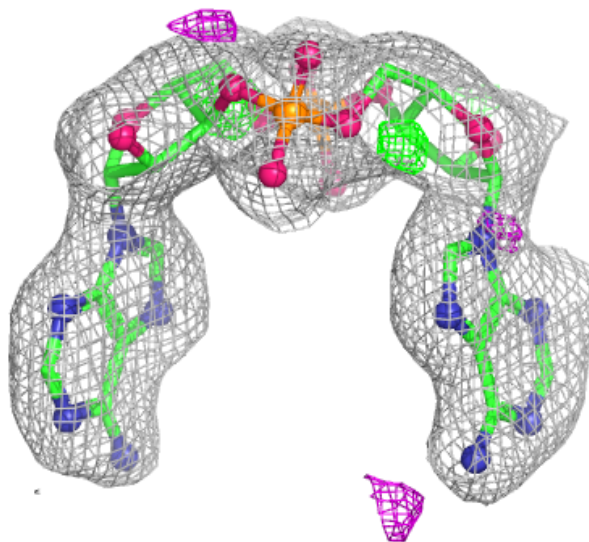
Electron density around 2BA B 201:

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



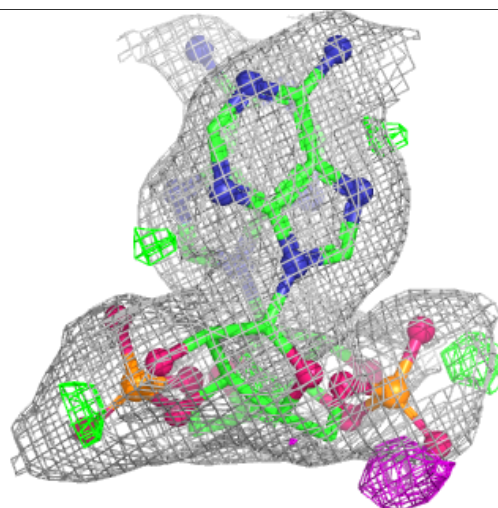
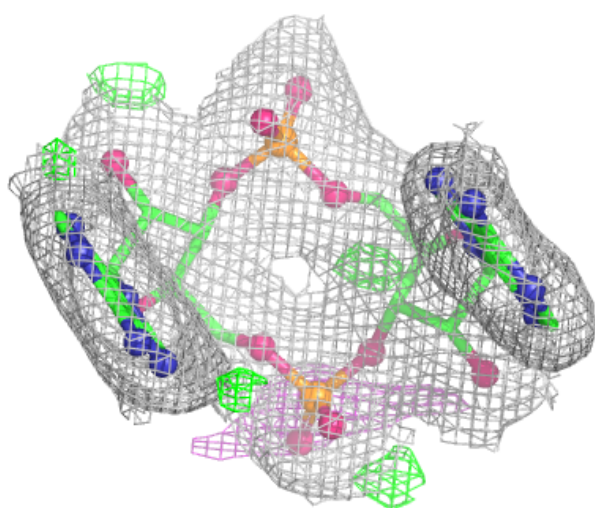
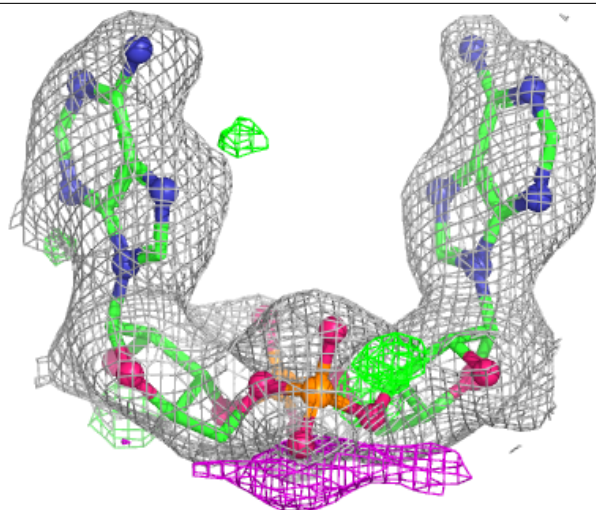
Electron density around 2BA C 201:

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



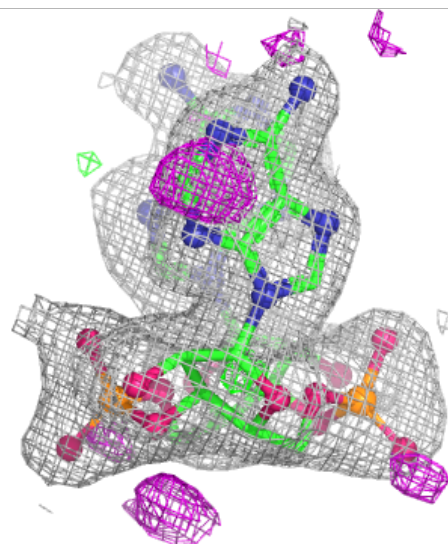
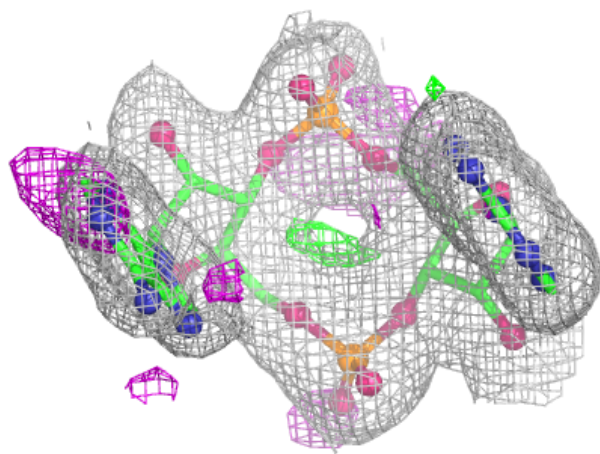
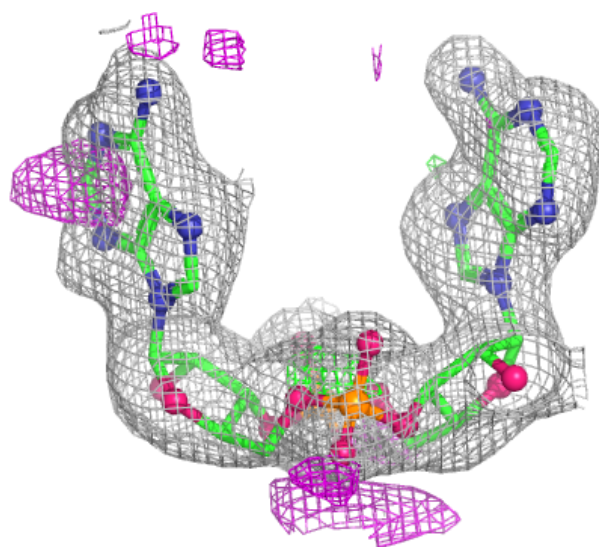
Electron density around 2BA E 201:

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



Electron density around 2BA H 201:

$2mF_o-DF_c$ (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.