Full wwPDB X-ray Structure Validation Report (i)

Nov 9, 2024 – 01:44 PM EST

PDB ID	:	6CT2
Title	:	MYST histone acetyltransferase KAT6A/B in complex with WM-1119
Authors	:	Ren, B.; Peat, T.S.
Deposited on	:	2018-03-22
Resolution	:	2.13 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 (i) 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 (i)) 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	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.13 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.

Percentile relative to all X-ray structures

Percentile relative to X-ray structures of similar resolution
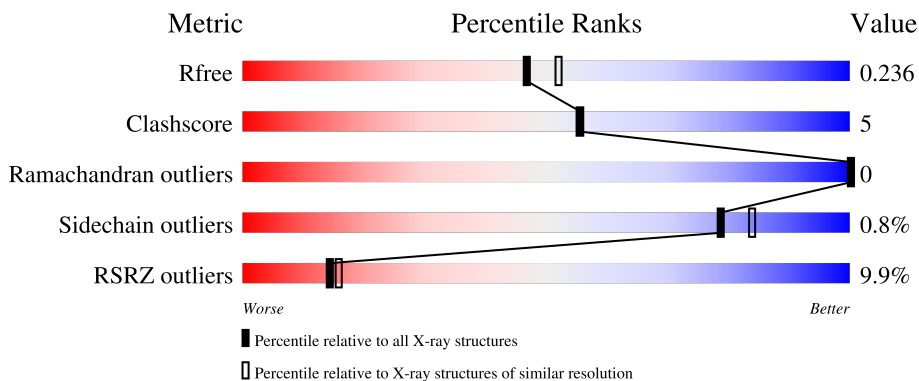
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	7689 (2.14-2.10)
Clashscore	180529	8431 (2.14-2.10)
Ramachandran outliers	177936	8366 (2.14-2.10)
Sidechain outliers	177891	8367 (2.14-2.10)
RSRZ outliers	164620	7689 (2.14-2.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	295	9% / 82% / 11% / 7%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 2449 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 Histone acetyltransferase KAT8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	274	2285	1494	369	410	12	0	5	0

There are 25 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	485	MET	-	initiating methionine	UNP Q9H7Z6
A	486	GLY	-	expression tag	UNP Q9H7Z6
A	487	SER	-	expression tag	UNP Q9H7Z6
A	488	SER	-	expression tag	UNP Q9H7Z6
A	489	HIS	-	expression tag	UNP Q9H7Z6
A	490	HIS	-	expression tag	UNP Q9H7Z6
A	491	HIS	-	expression tag	UNP Q9H7Z6
A	492	HIS	-	expression tag	UNP Q9H7Z6
A	493	HIS	-	expression tag	UNP Q9H7Z6
A	494	HIS	-	expression tag	UNP Q9H7Z6
A	495	SER	-	expression tag	UNP Q9H7Z6
A	496	SER	-	expression tag	UNP Q9H7Z6
A	497	GLY	-	expression tag	UNP Q9H7Z6
A	498	LEU	-	expression tag	UNP Q9H7Z6
A	499	VAL	-	expression tag	UNP Q9H7Z6
A	500	PRO	-	expression tag	UNP Q9H7Z6
A	501	ARG	-	expression tag	UNP Q9H7Z6
A	502	GLY	-	expression tag	UNP Q9H7Z6
A	503	SER	-	expression tag	UNP Q9H7Z6
A	579	HIS	TYR	conflict	UNP Q9H7Z6
A	645	SER	ALA	conflict	UNP Q9H7Z6
A	648	MET	LEU	conflict	UNP Q9H7Z6
A	649	ILE	THR	conflict	UNP Q9H7Z6
A	660	ARG	LYS	conflict	UNP Q9H7Z6
A	702	ASN	ILE	conflict	UNP Q9H7Z6

- Molecule 2 is 3-fluoro-N'-[(2-fluorophenyl)sulfonyl]-5-(pyridin-2-yl)benzohydrazid

e (three-letter code: FCV) (formula: $C_{18}H_{13}F_2N_3O_3S$) (labeled as "Ligand of Interest" by depositor).
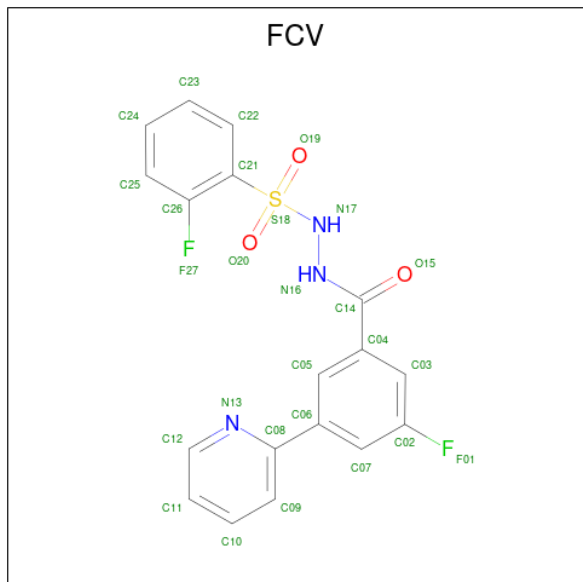
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	F	N	O	S		
2	A	1	27	18	2	3	3	1	0	0

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
3	A	1	1	1	0	0

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
4	A	1	1	1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	135	135	135	0	0

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: Histone acetyltransferase KAT8
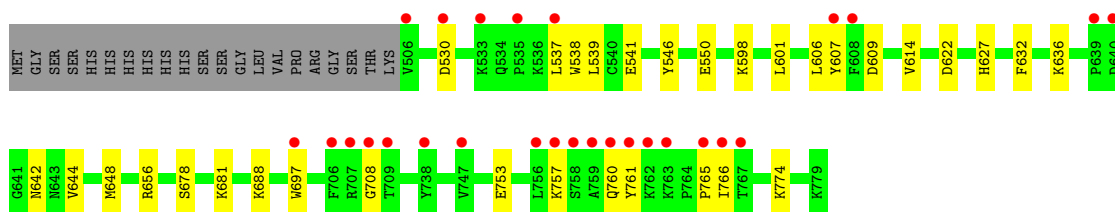
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	45.89Å 56.08Å 120.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.91 – 2.13 42.91 – 2.13	Depositor EDS
% Data completeness (in resolution range)	99.7 (42.91-2.13) 92.6 (42.91-2.13)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.43 (at 2.12Å)	Xtriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, R_{free}	0.201 , 0.235 0.201 , 0.236	Depositor DCC
R_{free} test set	16311 reflections (10.07%)	wwPDB-VP
Wilson B-factor (Å^2)	25.2	Xtriage
Anisotropy	0.418	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 47.1	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	2449	wwPDB-VP
Average B, all atoms (Å^2)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.68% 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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ALY, FCV, ZN, MG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$|Z|$ >5	RMSZ	#$|Z|$ >5
1	A	0.26	0/2352	0.45	0/3185

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

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

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	765	PRO	Peptide

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2285	0	2271	21	0
2	A	27	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	1	0	0	0	0
4	A	1	0	0	0	0
5	A	135	0	0	5	1
All	All	2449	0	2271	21	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (21) 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:537:LEU:HD21	1:A:546:TYR:HB2	1.69	0.74
1:A:766[B]:ILE:O	5:A:902:HOH:O	2.11	0.68
1:A:656:ARG:NH1	5:A:906:HOH:O	2.29	0.66
1:A:537:LEU:HD23	1:A:539:LEU:CD2	2.27	0.65
1:A:708:GLY:O	5:A:903:HOH:O	2.16	0.60
1:A:541:GLU:OE1	1:A:627:HIS:HD2	1.93	0.52
1:A:622:ASP:OD1	1:A:627:HIS:HE1	1.92	0.52
1:A:606:LEU:HD21	1:A:609:ASP:O	2.10	0.52
1:A:614[B]:VAL:HG23	1:A:636:LYS:HG2	1.91	0.51
1:A:697:TRP:CE3	1:A:761:TYR:HB3	2.46	0.50
1:A:537:LEU:HD23	1:A:539:LEU:HD21	1.94	0.49
1:A:538:TRP:CH2	1:A:550:GLU:HG3	2.49	0.47
1:A:530:ASP:OD1	1:A:530:ASP:N	2.42	0.47
1:A:642:ASN:HA	1:A:678:SER:O	2.16	0.45
1:A:537:LEU:CD2	1:A:539:LEU:HD21	2.46	0.45
1:A:760:GLN:O	5:A:904:HOH:O	2.21	0.44
1:A:598:LYS:HD3	1:A:607:TYR:HE1	1.82	0.44
1:A:753:GLU:OE1	1:A:757:LYS:HE3	2.17	0.44
1:A:632:PHE:CD2	1:A:644:VAL:HG22	2.53	0.43
1:A:601:LEU:HD11	1:A:648:MET:HB2	2.01	0.42
1:A:774:LYS:NZ	5:A:905:HOH:O	2.28	0.40

All (1) 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)
5:A:906:HOH:O	5:A:1018:HOH:O[4_445]	2.13	0.07

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	276/295 (94%)	268 (97%)	8 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	255/271 (94%)	253 (99%)	2 (1%)	79	84

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	681	LYS
1	A	688	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	627	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

1 non-standard protein/DNA/RNA residue is modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
1	ALY	A	604	1	10,11,12	0.85	0	7,12,14	0.80	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
1	ALY	A	604	1	-	0/9/10/12	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	FCV	A	801	-	29,29,29	2.17	6 (20%)	41,41,41	2.88	10 (24%)

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	FCV	A	801	-	-	5/20/20/20	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	FCV	C06-C08	-6.73	1.38	1.49
2	A	801	FCV	C14-N16	6.20	1.45	1.35
2	A	801	FCV	S18-N17	3.57	1.70	1.65
2	A	801	FCV	C21-S18	3.35	1.82	1.77
2	A	801	FCV	O20-S18	2.94	1.47	1.43
2	A	801	FCV	O19-S18	2.84	1.46	1.43

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	FCV	O20-S18-O19	-14.77	101.58	119.52
2	A	801	FCV	C25-C26-C21	-4.79	119.90	122.22
2	A	801	FCV	O19-S18-N17	3.23	111.52	105.51
2	A	801	FCV	C07-C02-C03	-3.03	119.82	123.50
2	A	801	FCV	O20-S18-N17	2.86	110.84	105.51
2	A	801	FCV	C11-C10-C09	-2.52	117.13	120.24
2	A	801	FCV	O19-S18-C21	2.41	111.66	107.68
2	A	801	FCV	O20-S18-C21	2.39	111.63	107.68
2	A	801	FCV	C12-N13-C08	2.38	120.57	117.24
2	A	801	FCV	C22-C21-C26	2.18	119.95	118.53

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	801	FCV	C05-C06-C08-C09
2	A	801	FCV	C07-C06-C08-C09
2	A	801	FCV	C05-C06-C08-N13
2	A	801	FCV	C07-C06-C08-N13
2	A	801	FCV	C05-C04-C14-N16

There are no ring outliers.

No monomer is involved in short contacts.

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 FCV A 801

Bond lengths

Bond angles

Torsions

Rings
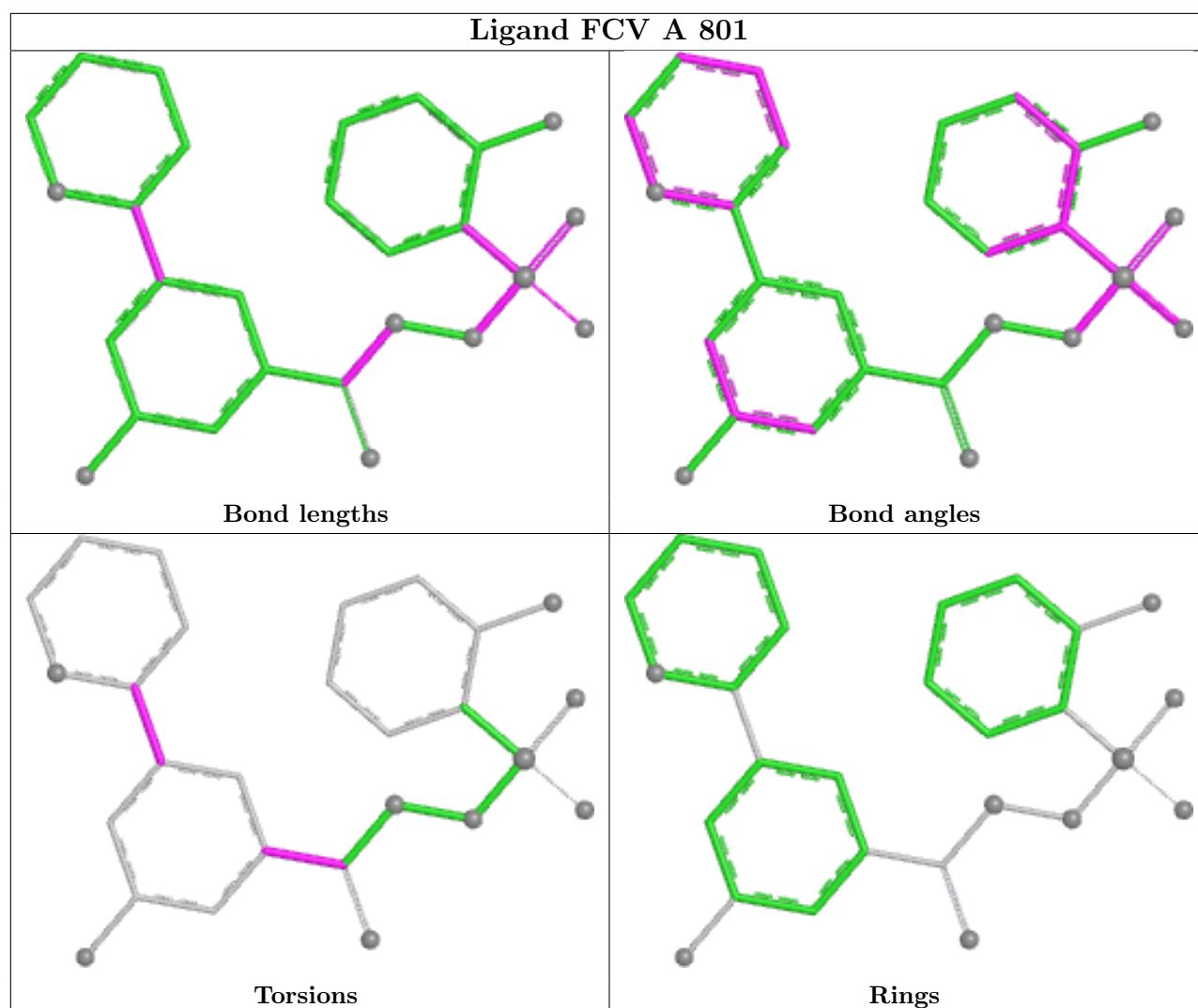
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	273/295 (92%)	0.41	27 (9%)	14	16	16, 30, 59, 83	5 (1%)

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	761	TYR	4.2
1	A	760	GLN	4.1
1	A	766[A]	ILE	3.8
1	A	706	PHE	3.8
1	A	709	THR	3.8
1	A	640	ASP	3.7
1	A	506	VAL	3.6
1	A	708	GLY	3.5
1	A	759	ALA	3.5
1	A	707	ARG	3.5
1	A	697	TRP	3.2
1	A	757	LYS	3.2
1	A	765	PRO	3.0
1	A	758	SER	2.8
1	A	639	PRO	2.6
1	A	747	VAL	2.3
1	A	537	LEU	2.3
1	A	763	LYS	2.3
1	A	535	PRO	2.3
1	A	607	TYR	2.3
1	A	738	TYR	2.3
1	A	756	LEU	2.2
1	A	762	LYS	2.2
1	A	608	PHE	2.2
1	A	533	LYS	2.2
1	A	530	ASP	2.1
1	A	767	THR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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.

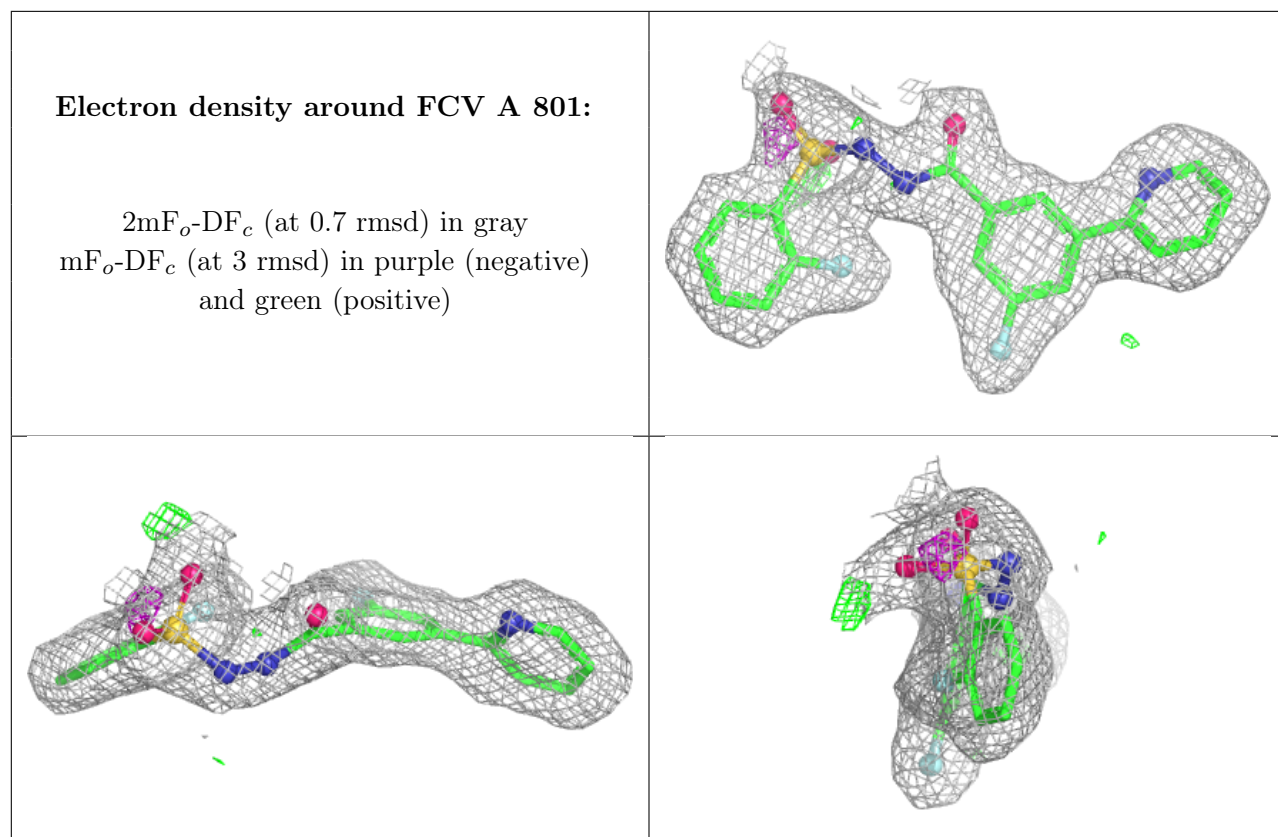| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
1	ALY	A	604	12/13	0.94	0.09	19,24,29,30	0

6.3 Carbohydrates ⓘ

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
2	FCV	A	801	27/27	0.94	0.08	18,23,25,28	0
3	ZN	A	802	1/1	0.99	0.02	20,20,20,20	0
4	MG	A	803	1/1	1.00	0.08	14,14,14,14	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.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

Electron density around FCV A 801:

$2mF_o$-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.