



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 15, 2024 – 06:33 PM EDT

PDB ID : 8TR4
Title : Crystal Structure of Mtb Pks13 Thioesterase domain in complex with inhibitor X20404
Authors : Krieger, I.V.; Sacchettini, J.C.
Deposited on : 2023-08-09
Resolution : 2.10 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36.1
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) : 2.36.1

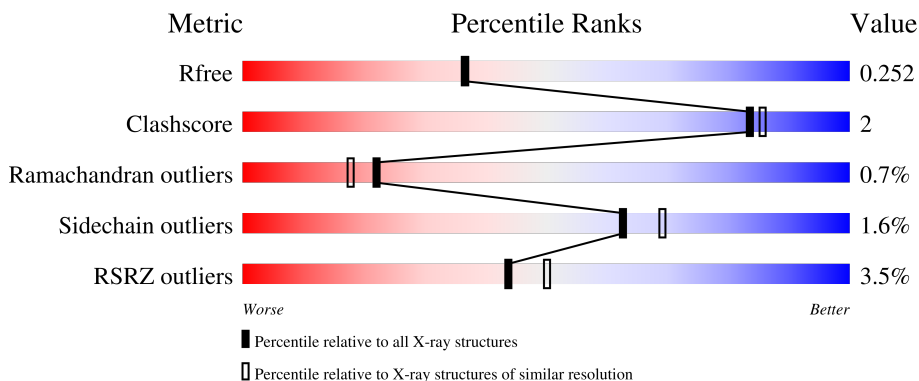
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


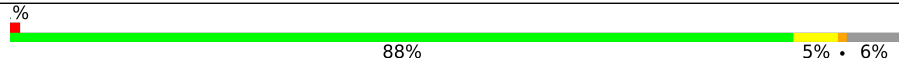
The reported resolution of this entry is 2.10 Å.

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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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 $\leq 5\%$. 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	286	
1	B	286	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4683 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.

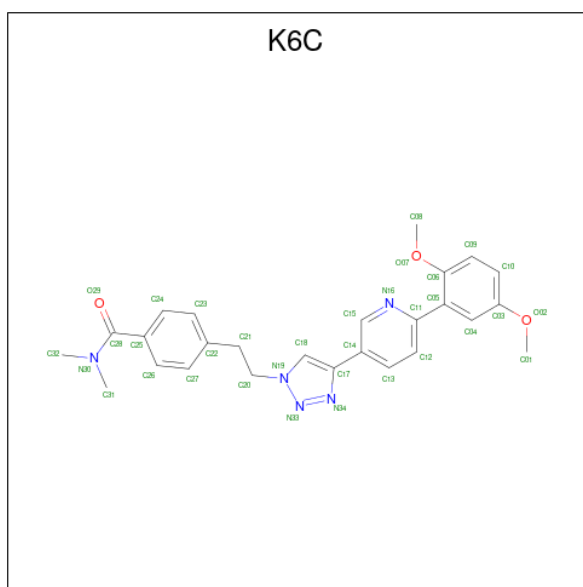
- Molecule 1 is a protein called Polyketide synthase Pks13.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	276	Total	C	N	O	S	0	2	0
			2178	1383	378	411	6			
1	B	270	Total	C	N	O	S	0	2	0
			2135	1355	374	400	6			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1448	SER	-	expression tag	UNP I6X8D2
A	1449	ASN	-	expression tag	UNP I6X8D2
A	1450	ALA	-	expression tag	UNP I6X8D2
B	1448	SER	-	expression tag	UNP I6X8D2
B	1449	ASN	-	expression tag	UNP I6X8D2
B	1450	ALA	-	expression tag	UNP I6X8D2

- Molecule 2 is 4-(2-((4M)-4-[(6M)-6-(2,5-dimethoxyphenyl)pyridin-3-yl]-1H-1,2,3-triazol-1-yl)ethyl)-N,N-dimethylbenzamide (three-letter code: K6C) (formula: C₂₆H₂₇N₅O₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	34	26	5	3	0	0
2	B	1	34	26	5	3	0	0

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
3	A	1	5	4	1	0	0
3	A	1	5	4	1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		

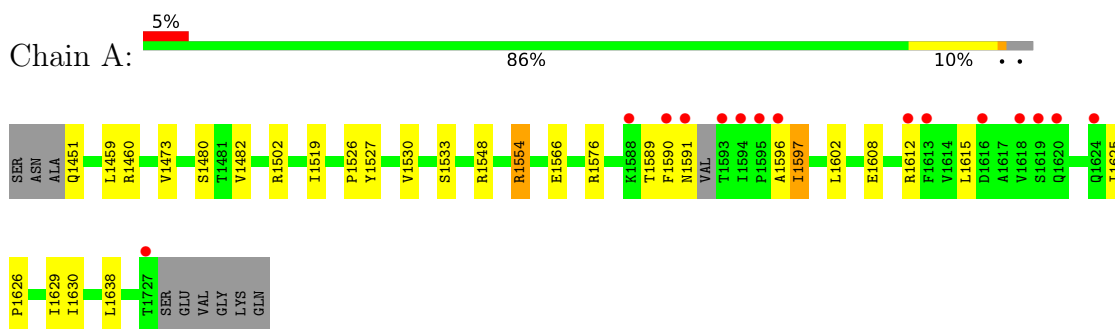
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	146	Total	O	0	0
			146	146		
4	B	126	Total	O	0	0
			126	126		

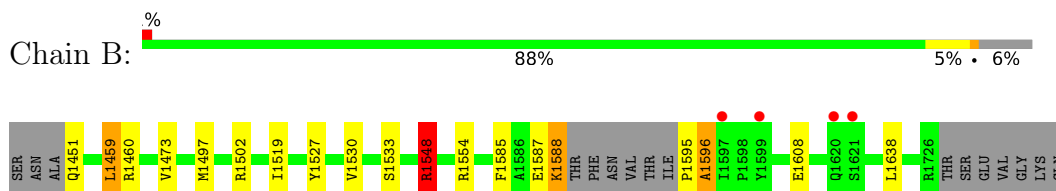
3 Residue-property plots [i](#)

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: Polyketide synthase Pks13



- Molecule 1: Polyketide synthase Pks13



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α , β , γ	57.94Å 87.59Å 109.38Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.37 – 2.10 48.33 – 2.10	Depositor EDS
% Data completeness (in resolution range)	91.4 (48.37-2.10) 91.4 (48.33-2.10)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.77 (at 2.10Å)	Xtrriage
Refinement program	PDB-REDO	Depositor
R, R_{free}	0.185 , 0.238 0.196 , 0.252	Depositor DCC
R_{free} test set	1511 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	29.0	Xtrriage
Anisotropy	0.203	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 38.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4683	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.91% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: K6C, SO4

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	0.35	0/2233	0.60	0/3030
1	B	0.35	0/2189	0.60	0/2967
All	All	0.35	0/4422	0.60	0/5997

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	6
1	B	0	4
All	All	0	10

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (10) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1460	ARG	Sidechain
1	A	1502	ARG	Sidechain
1	A	1548	ARG	Sidechain
1	A	1554	ARG	Sidechain
1	A	1576	ARG	Sidechain
1	A	1612	ARG	Sidechain
1	B	1460	ARG	Sidechain
1	B	1502	ARG	Sidechain
1	B	1548	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	B	1554	ARG	Sidechain

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	2178	0	2133	12	0
1	B	2135	0	2095	9	0
2	A	34	0	0	0	0
2	B	34	0	0	0	0
3	A	20	0	0	0	0
3	B	10	0	0	0	0
4	A	146	0	0	2	0
4	B	126	0	0	0	0
All	All	4683	0	4228	21	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 2.

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:1451:GLN:N	4:A:1904:HOH:O	2.40	0.55
1:A:1625:ILE:HB	1:A:1630:ILE:HD11	1.94	0.50
1:B:1459[B]:LEU:HD12	1:B:1497:MET:SD	2.52	0.50
1:A:1608:GLU:HG3	1:A:1638:LEU:HD13	1.92	0.49
1:A:1615:LEU:HD22	1:A:1630:ILE:HD12	1.94	0.49
1:A:1480:SER:OG	1:A:1482:VAL:HG22	2.12	0.48
1:B:1608:GLU:HG3	1:B:1638:LEU:HD13	1.96	0.47
1:B:1585:PHE:O	1:B:1588:LYS:HG3	2.14	0.47
1:B:1595:PRO:O	1:B:1596:ALA:HB2	2.16	0.46
1:B:1548:ARG:HH11	1:B:1548:ARG:HG2	1.80	0.45
1:A:1597:ILE:CG2	1:A:1602:LEU:HD12	2.47	0.45
1:B:1588:LYS:C	1:B:1588:LYS:HD2	2.38	0.44
1:A:1519:ILE:HA	1:A:1527:TYR:OH	2.18	0.44
1:B:1519:ILE:HA	1:B:1527:TYR:OH	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1566:GLU:OE1	4:A:1901:HOH:O	2.21	0.43
1:B:1587:GLU:O	1:B:1588:LYS:C	2.58	0.42
1:A:1526:PRO:HB3	1:A:1554:ARG:HG3	2.02	0.42
1:A:1473:VAL:HA	1:A:1530:VAL:O	2.20	0.41
1:B:1473:VAL:HA	1:B:1530:VAL:O	2.20	0.41
1:A:1590:PHE:O	1:A:1591:ASN:C	2.59	0.41
1:A:1626:PRO:HG2	1:A:1629:ILE:HD12	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	274/286 (96%)	268 (98%)	3 (1%)	3 (1%)	14	9
1	B	268/286 (94%)	264 (98%)	3 (1%)	1 (0%)	34	32
All	All	542/572 (95%)	532 (98%)	6 (1%)	4 (1%)	22	18

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	1596	ALA
1	A	1589	THR
1	A	1596	ALA
1	A	1597	ILE

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	225/231 (97%)	223 (99%)	2 (1%)	78	84
1	B	219/231 (95%)	213 (97%)	6 (3%)	44	48
All	All	444/462 (96%)	436 (98%)	8 (2%)	62	65

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1459	LEU
1	A	1533	SER
1	B	1451	GLN
1	B	1459[A]	LEU
1	B	1459[B]	LEU
1	B	1533	SER
1	B	1548	ARG
1	B	1588	LYS

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

Mol	Chain	Res	Type
1	A	1591	ASN
1	B	1654	HIS

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

8 ligands are 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
3	SO4	B	1802	-	4,4,4	0.39	0	6,6,6	0.04	0
2	K6C	B	1801	-	36,37,37	1.93	5 (13%)	47,51,51	1.28	7 (14%)
3	SO4	A	1805	-	4,4,4	0.37	0	6,6,6	0.05	0
3	SO4	A	1804	-	4,4,4	0.36	0	6,6,6	0.05	0
3	SO4	B	1803	-	4,4,4	0.37	0	6,6,6	0.06	0
2	K6C	A	1801	-	36,37,37	1.64	3 (8%)	47,51,51	1.42	8 (17%)
3	SO4	A	1803	-	4,4,4	0.38	0	6,6,6	0.07	0
3	SO4	A	1802	-	4,4,4	0.37	0	6,6,6	0.04	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
2	K6C	B	1801	-	-	1/25/25/25	0/4/4/4
2	K6C	A	1801	-	-	4/25/25/25	0/4/4/4

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1801	K6C	C28-N30	8.60	1.45	1.34
2	A	1801	K6C	C28-N30	7.56	1.44	1.34
2	B	1801	K6C	C18-N19	-3.79	1.31	1.35
2	B	1801	K6C	C14-C17	3.14	1.53	1.48
2	A	1801	K6C	C18-N19	-2.82	1.32	1.35
2	B	1801	K6C	O07-C06	2.76	1.41	1.37
2	A	1801	K6C	C14-C17	2.75	1.53	1.48
2	B	1801	K6C	C25-C28	2.58	1.54	1.50

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1801	K6C	C25-C28-N30	3.87	123.32	119.00
2	A	1801	K6C	C13-C14-C17	-2.99	116.57	121.28
2	A	1801	K6C	C14-C15-N16	-2.95	119.45	124.32
2	B	1801	K6C	C14-C15-N16	-2.74	119.80	124.32
2	B	1801	K6C	C21-C20-N19	2.67	115.88	111.35
2	B	1801	K6C	C04-C05-C06	2.59	122.21	117.97
2	A	1801	K6C	C12-C13-C14	-2.58	117.42	121.13
2	B	1801	K6C	C12-C13-C14	-2.47	117.57	121.13
2	A	1801	K6C	C21-C22-C27	-2.41	115.13	121.23
2	B	1801	K6C	O07-C06-C05	2.31	119.70	116.26
2	B	1801	K6C	C13-C14-C17	-2.21	117.79	121.28
2	A	1801	K6C	C15-N16-C11	2.06	120.62	117.90
2	A	1801	K6C	C26-C25-C24	2.05	121.51	118.59
2	A	1801	K6C	O29-C28-C25	-2.02	116.30	120.23
2	B	1801	K6C	C09-C06-C05	-2.01	117.29	121.13

There are no chirality outliers.

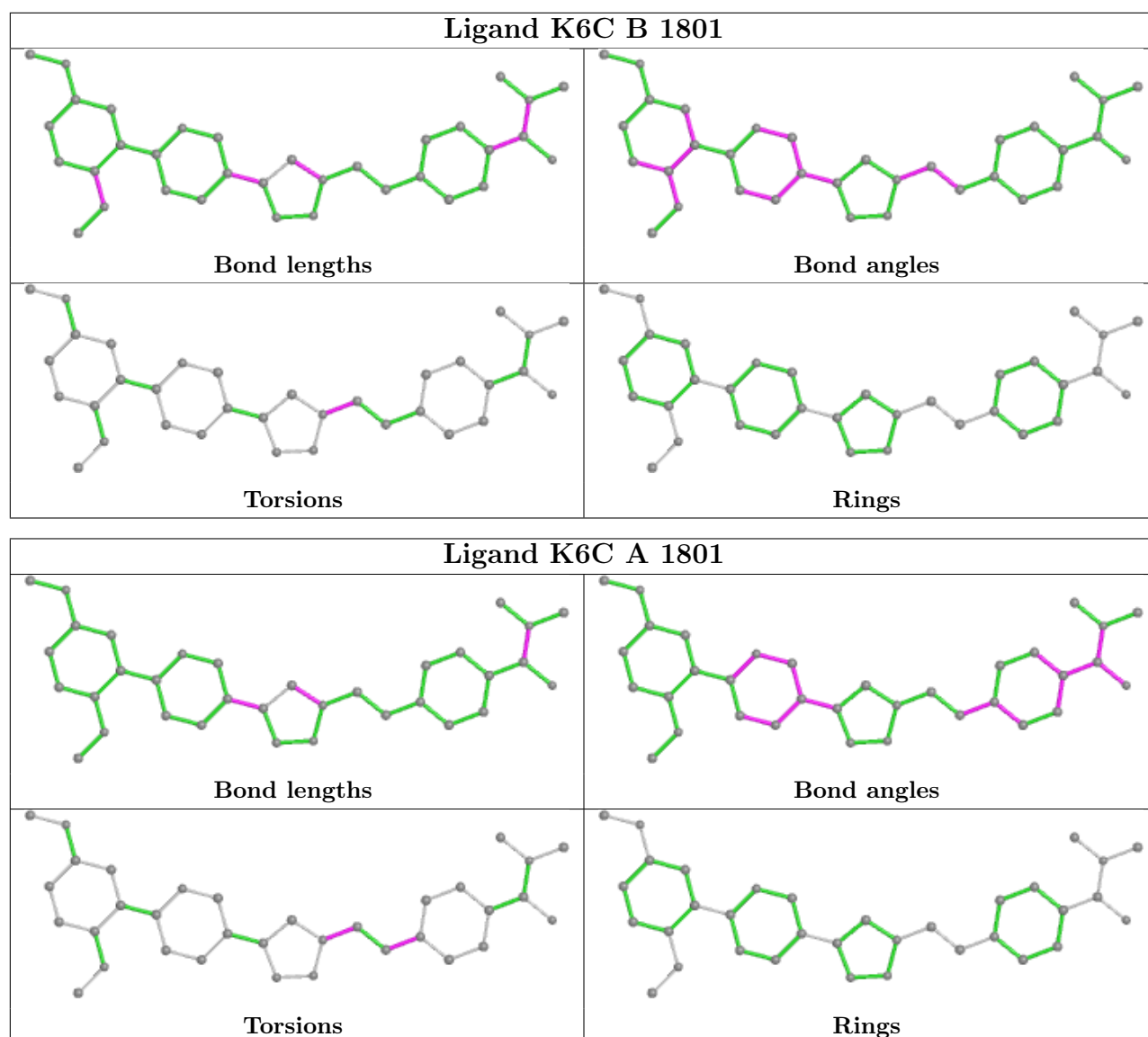
All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1801	K6C	C20-C21-C22-C23
2	A	1801	K6C	C20-C21-C22-C27
2	A	1801	K6C	C21-C20-N19-N33
2	B	1801	K6C	C21-C20-N19-N33
2	A	1801	K6C	C21-C20-N19-C18

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 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 [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	276/286 (96%)	0.04	15 (5%) 25 31	20, 31, 77, 115	0
1	B	270/286 (94%)	-0.06	4 (1%) 73 77	20, 32, 72, 94	0
All	All	546/572 (95%)	-0.01	19 (3%) 44 50	20, 32, 76, 115	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1590	PHE	7.5
1	B	1597	ILE	4.6
1	A	1595	PRO	4.6
1	A	1594	ILE	4.0
1	B	1599	TYR	3.4
1	A	1593	THR	3.2
1	A	1624	GLN	3.1
1	A	1616	ASP	2.9
1	A	1618	VAL	2.6
1	B	1621	SER	2.6
1	A	1588	LYS	2.6
1	A	1613	PHE	2.6
1	A	1620	GLN	2.6
1	A	1727	THR	2.5
1	B	1620	GLN	2.4
1	A	1596	ALA	2.2
1	A	1591	ASN	2.1
1	A	1619	SER	2.0
1	A	1612	ARG	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

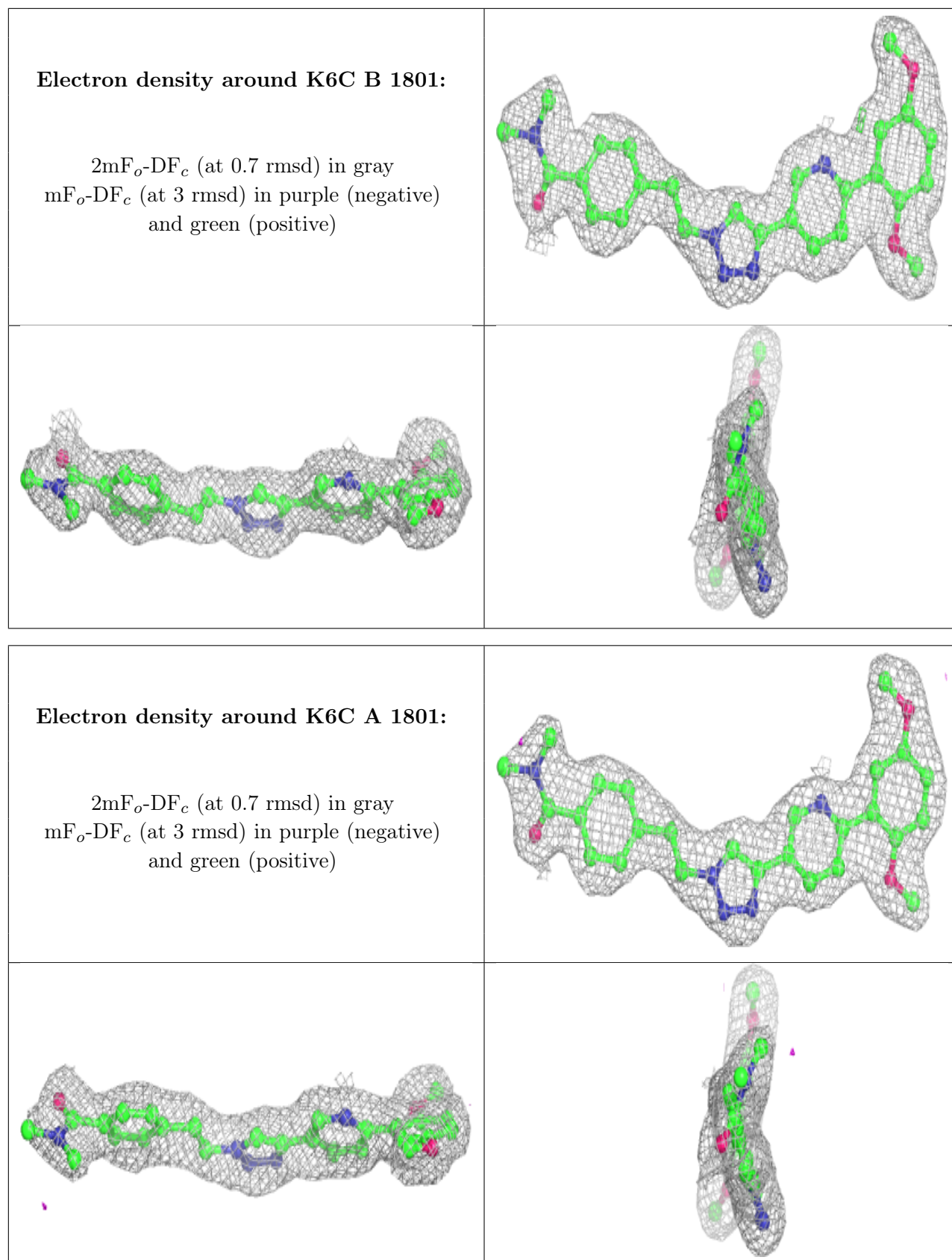
There are no monosaccharides in this entry.

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(\AA^2)	Q<0.9
3	SO4	A	1804	5/5	0.76	0.26	80,94,106,113	0
3	SO4	A	1803	5/5	0.83	0.26	53,74,89,94	0
3	SO4	B	1803	5/5	0.84	0.26	70,75,92,94	0
3	SO4	A	1805	5/5	0.91	0.27	76,90,95,101	0
3	SO4	A	1802	5/5	0.92	0.14	65,73,88,93	0
2	K6C	B	1801	34/34	0.96	0.11	20,25,36,41	0
3	SO4	B	1802	5/5	0.97	0.11	48,50,55,56	5
2	K6C	A	1801	34/34	0.97	0.11	19,23,36,43	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.