



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 8, 2021 – 02:06 pm GMT

PDB ID : 7PAW
Title : MALT1 in complex with compound 1
Authors : Kack, H.; Oster, L.
Deposited on : 2021-07-30
Resolution : 2.19 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.8.4 (270009), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.23.2
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.2

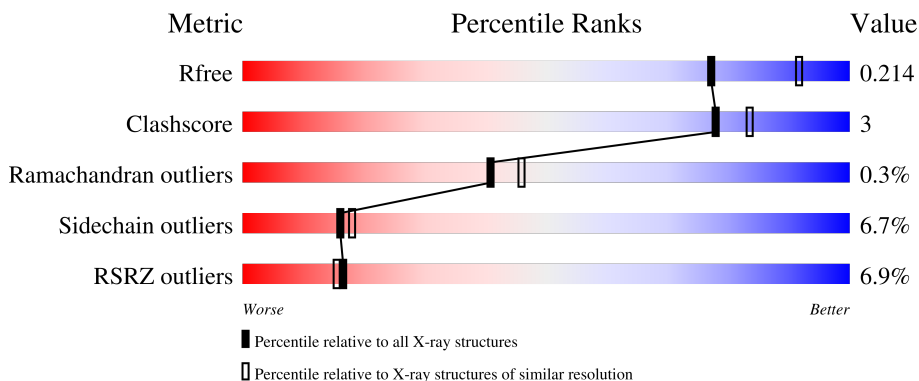
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


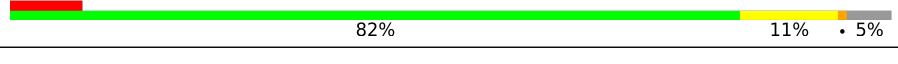
The reported resolution of this entry is 2.19 Å.

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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	388	 5% 77% 11% • 11%
1	B	388	 8% 82% 11% • 5%

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 5724 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 Mucosa-associated lymphoid tissue lymphoma translocation protein 1.

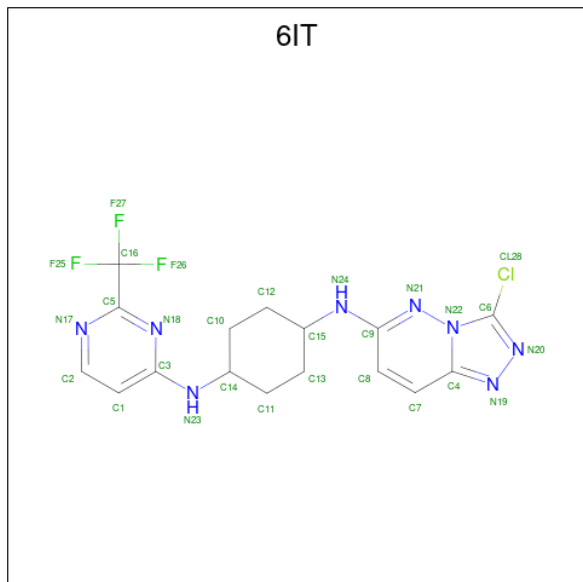
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	346	2748	1756	451	520	21	0	1	0
1	B	367	2898	1859	470	546	23	0	1	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	338	MET	-	initiating methionine	UNP Q9UDY8
A	595	LYS	ASP	engineered mutation	UNP Q9UDY8
A	617	LYS	SER	engineered mutation	UNP Q9UDY8
A	666	ALA	HIS	engineered mutation	UNP Q9UDY8
A	681	GLU	HIS	engineered mutation	UNP Q9UDY8
A	720	HIS	-	expression tag	UNP Q9UDY8
A	721	HIS	-	expression tag	UNP Q9UDY8
A	722	HIS	-	expression tag	UNP Q9UDY8
A	723	HIS	-	expression tag	UNP Q9UDY8
A	724	HIS	-	expression tag	UNP Q9UDY8
A	725	HIS	-	expression tag	UNP Q9UDY8
B	338	MET	-	initiating methionine	UNP Q9UDY8
B	595	LYS	ASP	engineered mutation	UNP Q9UDY8
B	617	LYS	SER	engineered mutation	UNP Q9UDY8
B	666	ALA	HIS	engineered mutation	UNP Q9UDY8
B	681	GLU	HIS	engineered mutation	UNP Q9UDY8
B	720	HIS	-	expression tag	UNP Q9UDY8
B	721	HIS	-	expression tag	UNP Q9UDY8
B	722	HIS	-	expression tag	UNP Q9UDY8
B	723	HIS	-	expression tag	UNP Q9UDY8
B	724	HIS	-	expression tag	UNP Q9UDY8
B	725	HIS	-	expression tag	UNP Q9UDY8

- Molecule 2 is $\{N\}1-(3\text{-chloranyl-[1,2,4]triazolo[4,3-b]pyridazin-6-yl})-\{N\}4-[2-(\text{trifluorometh})$

yl)pyrimidin-4-yl]cyclohexane-1,4-diamine (three-letter code: 6IT) (formula: C₁₆H₁₆ClF₃N₈) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Cl	F	N		
2	B	1	28	16	1	3	8	0	0

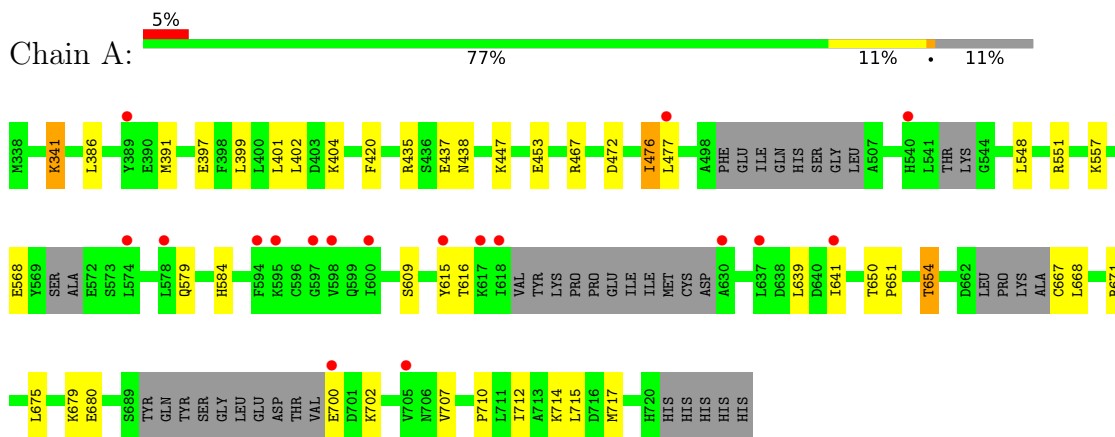
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	26	Total	O	0	0
			26	26		
3	B	24	Total	O	0	0
			24	24		

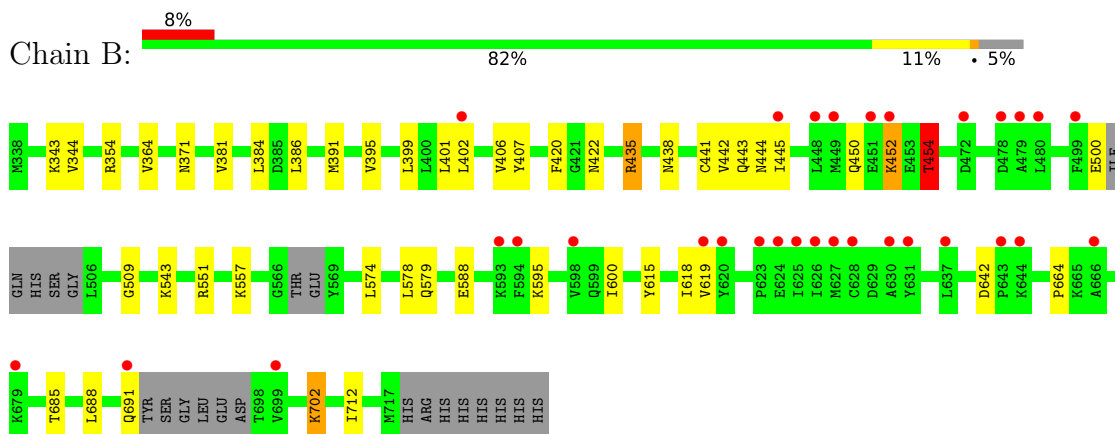
3 Residue-property plots [i](#)

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: Mucosa-associated lymphoid tissue lymphoma translocation protein 1



- Molecule 1: Mucosa-associated lymphoid tissue lymphoma translocation protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.45Å 74.97Å 106.87Å 90.00° 93.87° 90.00°	Depositor
Resolution (Å)	53.31 – 2.19 53.31 – 2.19	Depositor EDS
% Data completeness (in resolution range)	71.9 (53.31-2.19) 71.9 (53.31-2.19)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.21 (at 2.20Å)	Xtrriage
Refinement program	BUSTER 2.11.7	Depositor
R, R_{free}	0.200 , 0.235 0.215 , 0.214	Depositor DCC
R_{free} test set	1479 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	39.9	Xtrriage
Anisotropy	0.095	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	5724	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.02% 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: 6IT

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	0.49	0/2792	0.68	0/3761
1	B	0.48	0/2947	0.70	0/3977
All	All	0.48	0/5739	0.69	0/7738

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

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	2748	0	2770	16	0
1	B	2898	0	2951	19	0
2	B	28	0	0	1	0
3	A	26	0	0	0	0
3	B	24	0	0	0	0
All	All	5724	0	5721	33	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 (33) 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:397:GLU:HG3	1:A:717:MET:HG2	1.41	0.97
1:A:435:ARG:H	1:A:438:ASN:HD22	1.33	0.77
1:B:435:ARG:H	1:B:438:ASN:HD22	1.36	0.73
1:A:616:THR:O	1:A:667:CYS:HB2	1.91	0.70
1:B:395:VAL:HG11	1:B:445:ILE:HG12	1.74	0.70
1:A:551:ARG:HG2	1:B:551:ARG:HG2	1.74	0.70
1:B:600:ILE:HD11	1:B:688:LEU:HD13	1.75	0.67
1:B:441:CYS:HB3	1:B:444:ASN:HD22	1.60	0.65
1:B:402:LEU:HB3	1:B:454:THR:HG23	1.79	0.63
1:A:386:LEU:HB2	1:A:391:MET:HG3	1.84	0.59
1:B:442:VAL:HA	1:B:445:ILE:HD12	1.89	0.55
1:B:343:LYS:HG2	1:B:407:TYR:HB2	1.90	0.53
1:A:420:PHE:HB3	1:B:420:PHE:HB3	1.91	0.51
1:A:654:THR:HG23	1:A:671:ARG:HB2	1.93	0.50
1:A:341:LYS:HE2	1:A:568:GLU:HB2	1.94	0.50
1:B:500:GLU:HA	1:B:509:GLY:HA2	1.95	0.49
1:A:639:LEU:HB3	1:A:641:ILE:HG12	1.95	0.49
1:A:399:LEU:HD23	1:A:402:LEU:HD12	1.95	0.48
1:A:615:TYR:HA	1:A:668:LEU:O	2.15	0.47
1:B:422:ASN:HD22	1:B:443:GLN:HG2	1.80	0.47
1:B:344:VAL:HG13	2:B:801:6IT:CL28	2.52	0.45
1:A:584:HIS:HE1	1:A:609:SER:OG	1.98	0.45
1:B:386:LEU:HB2	1:B:391:MET:HG3	1.99	0.45
1:A:404:LYS:HA	1:A:453:GLU:O	2.17	0.45
1:B:402:LEU:O	1:B:452:LYS:HB3	2.17	0.44
1:B:600:ILE:HG12	1:B:618:ILE:HD13	1.98	0.44
1:B:406:VAL:O	1:B:454:THR:HG22	2.18	0.43
1:B:685:THR:HG21	1:B:702:LYS:HD3	2.01	0.43
1:B:615:TYR:CZ	1:B:664:PRO:HG2	2.53	0.43
1:A:651:PRO:O	1:A:654:THR:HG22	2.18	0.43
1:A:675:LEU:HD22	1:A:710:PRO:HG2	2.01	0.43
1:A:476:ILE:H	1:A:476:ILE:HG13	1.65	0.42
1:B:399:LEU:HD21	1:B:445:ILE:HG23	2.03	0.41

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	333/388 (86%)	320 (96%)	12 (4%)	1 (0%)	41	46
1	B	360/388 (93%)	341 (95%)	18 (5%)	1 (0%)	41	46
All	All	693/776 (89%)	661 (95%)	30 (4%)	2 (0%)	41	46

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	477	LEU
1	B	454	THR

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	305/344 (89%)	285 (93%)	20 (7%)	16	19
1	B	323/344 (94%)	301 (93%)	22 (7%)	16	17
All	All	628/688 (91%)	586 (93%)	42 (7%)	16	18

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	341	LYS
1	A	401	LEU
1	A	437	GLU
1	A	447	LYS
1	A	467	ARG
1	A	472	ASP
1	A	476	ILE
1	A	548	LEU
1	A	557	LYS
1	A	579	GLN

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Mol	Chain	Res	Type
1	A	650	THR
1	A	654	THR
1	A	679	LYS
1	A	680	GLU
1	A	700	GLU
1	A	702	LYS
1	A	707	VAL
1	A	712	ILE
1	A	714	LYS
1	A	715	LEU
1	B	354	ARG
1	B	364	VAL
1	B	371	ASN
1	B	381	VAL
1	B	384	LEU
1	B	401	LEU
1	B	435	ARG
1	B	450	GLN
1	B	452	LYS
1	B	454	THR
1	B	543	LYS
1	B	557	LYS
1	B	574	LEU
1	B	578	LEU
1	B	579	GLN
1	B	588	GLU
1	B	595	LYS
1	B	619	VAL
1	B	642	ASP
1	B	691	GLN
1	B	702	LYS
1	B	712	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	422	ASN
1	A	438	ASN
1	A	508	ASN
1	A	584	HIS
1	B	371	ASN
1	B	422	ASN

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Mol	Chain	Res	Type
1	B	438	ASN
1	B	444	ASN
1	B	584	HIS
1	B	601	GLN

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](#)

1 ligand is modelled in this entry.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

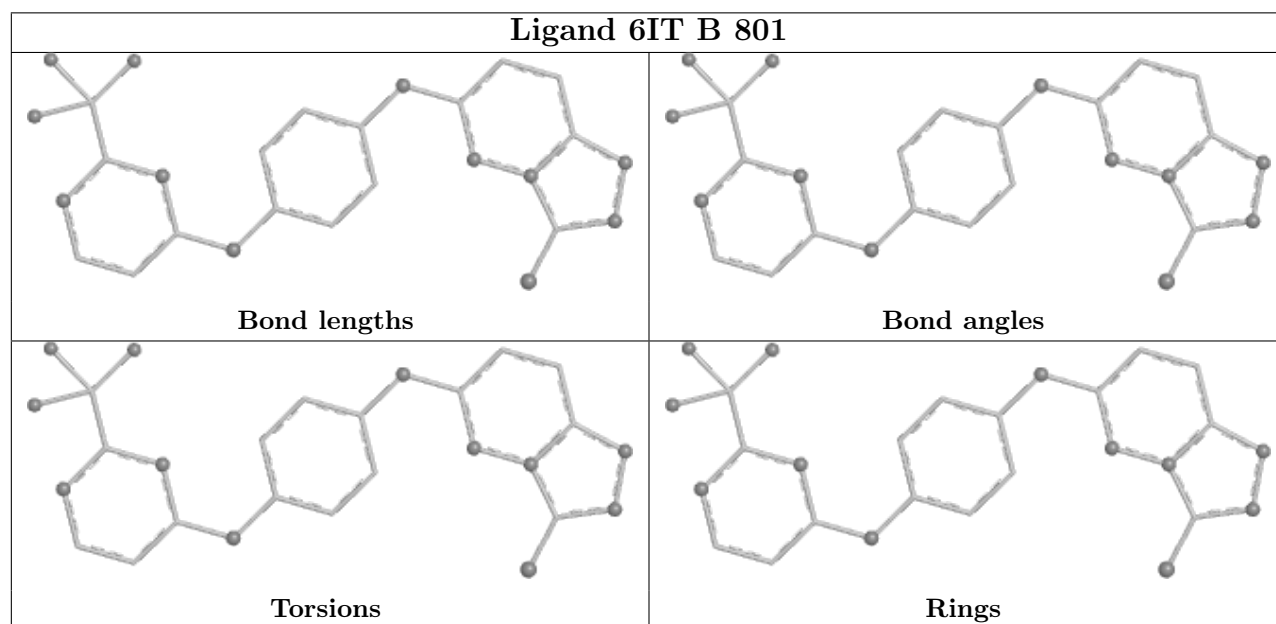
There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	346/388 (89%)	0.29	18 (5%) 27 26	27, 50, 93, 119	0
1	B	367/388 (94%)	0.53	31 (8%) 11 9	22, 52, 96, 138	0
All	All	713/776 (91%)	0.41	49 (6%) 16 15	22, 51, 96, 138	0

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	626	ILE	7.4
1	A	477	LEU	6.2
1	B	628	CYS	5.7
1	A	578	LEU	5.7
1	B	623	PRO	4.7
1	B	627	MET	4.7
1	B	594	PHE	4.6
1	B	480	LEU	4.6
1	B	666	ALA	4.5
1	B	479	ALA	4.3
1	A	600	ILE	4.2
1	B	691	GLN	4.0
1	B	699	VAL	3.7
1	B	449	MET	3.7
1	A	574	LEU	3.7
1	B	451	GLU	3.6
1	B	679	LYS	3.6
1	A	630	ALA	3.5
1	B	644	LYS	3.5
1	A	618	ILE	3.3
1	A	617	LYS	3.2
1	A	705	VAL	3.2
1	A	615	TYR	3.0
1	A	540	HIS	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	620	TYR	2.8
1	A	594	PHE	2.8
1	B	637	LEU	2.8
1	A	595	LYS	2.6
1	B	402	LEU	2.6
1	B	499	PHE	2.6
1	B	598	VAL	2.6
1	A	389	TYR	2.5
1	B	445	ILE	2.4
1	A	598	VAL	2.4
1	B	472	ASP	2.4
1	B	478	ASP	2.4
1	A	641	ILE	2.3
1	A	597	GLY	2.3
1	B	630	ALA	2.3
1	B	625	ILE	2.3
1	B	452	LYS	2.2
1	B	619	VAL	2.2
1	B	624	GLU	2.2
1	A	637	LEU	2.1
1	A	700	GLU	2.1
1	B	643	PRO	2.1
1	B	631	TYR	2.1
1	B	448	LEU	2.0
1	B	593	LYS	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](#)

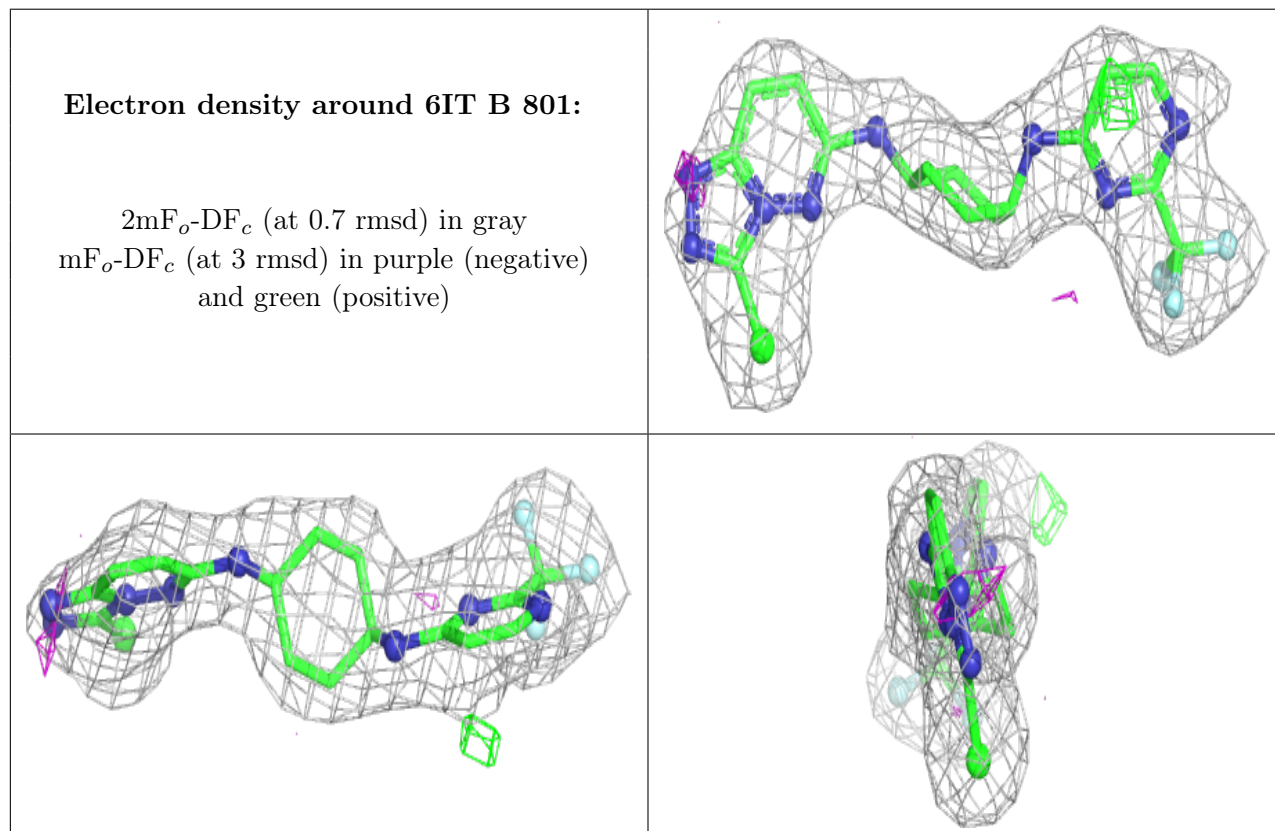
There are no monosaccharides in this entry.

6.4 Ligands [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(\AA^2)	Q<0.9
2	6IT	B	801	28/28	0.92	0.13	47,53,56,57	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.