



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 24, 2023 – 04:19 PM JST

PDB ID : 7Y4G
Title : sit-bound btDPP4
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Gonzalez, F.; Qiao, J.
Deposited on : 2022-06-14
Resolution : 1.97 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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)
Xtrriage (Phenix) : 1.13
EDS : 2.35
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) : 2.35

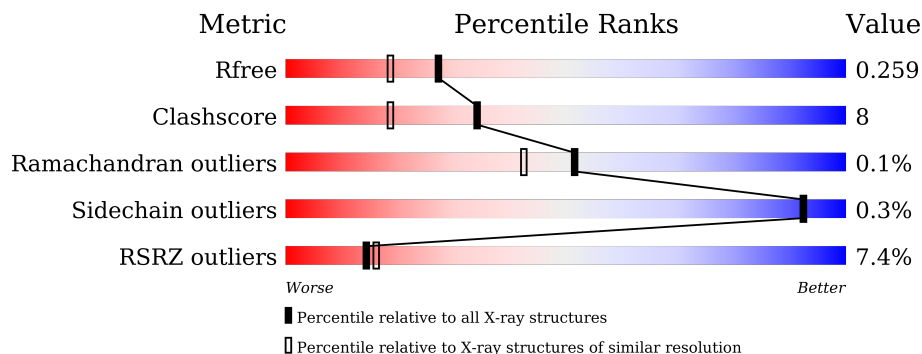
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

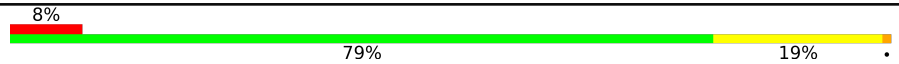

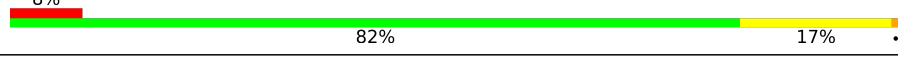
The reported resolution of this entry is 1.97 Å.

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	11647 (2.00-1.96)
Clashscore	141614	1014 (1.98-1.98)
Ramachandran outliers	138981	1006 (1.98-1.98)
Sidechain outliers	138945	1006 (1.98-1.98)
RSRZ outliers	127900	11410 (2.00-1.96)

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	715	
1	B	715	
1	C	715	

2 Entry composition [i](#)

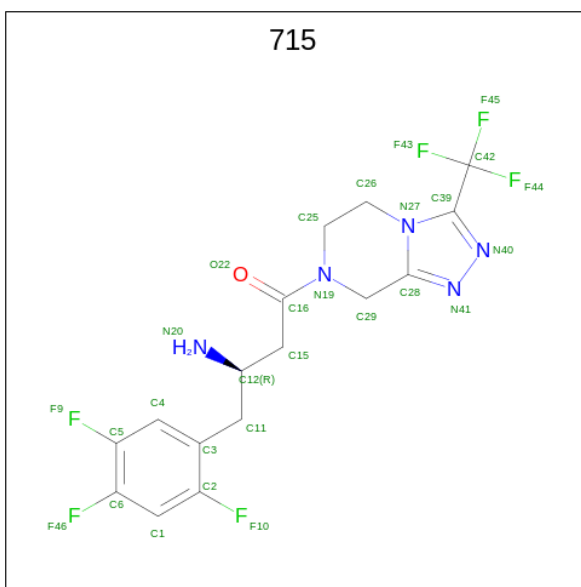
There are 3 unique types of molecules in this entry. The entry contains 18622 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 btDPP4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	715	Total 5779	C 3693	N 962	O 1098	S 26	0	0	0
1	B	715	Total 5779	C 3693	N 962	O 1098	S 26	0	0	0
1	C	715	Total 5779	C 3693	N 962	O 1098	S 26	0	0	0

- Molecule 2 is (2R)-4-OXO-4-[3-(TRIFLUOROMETHYL)-5,6-DIHYDRO[1,2,4]TRIAZOLO[4,3-A]PYRAZIN-7(8H)-YL]-1-(2,4,5-TRIFLUOROPHENYL)BUTAN-2-AMINE (three-letter code: 715) (formula: C₁₆H₁₅F₆N₅O) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	F	N	O		
2	A	1	Total 28	C 16	F 6	N 5	O 1	0	0
2	B	1	Total 28	C 16	F 6	N 5	O 1	0	0

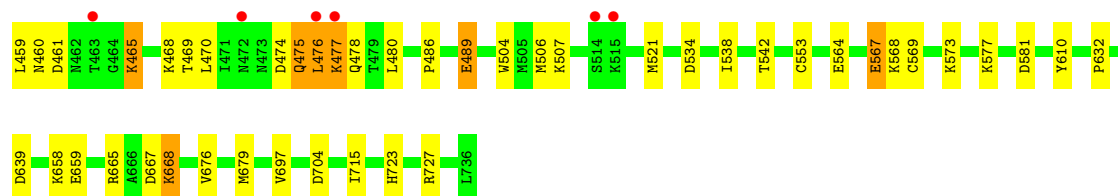
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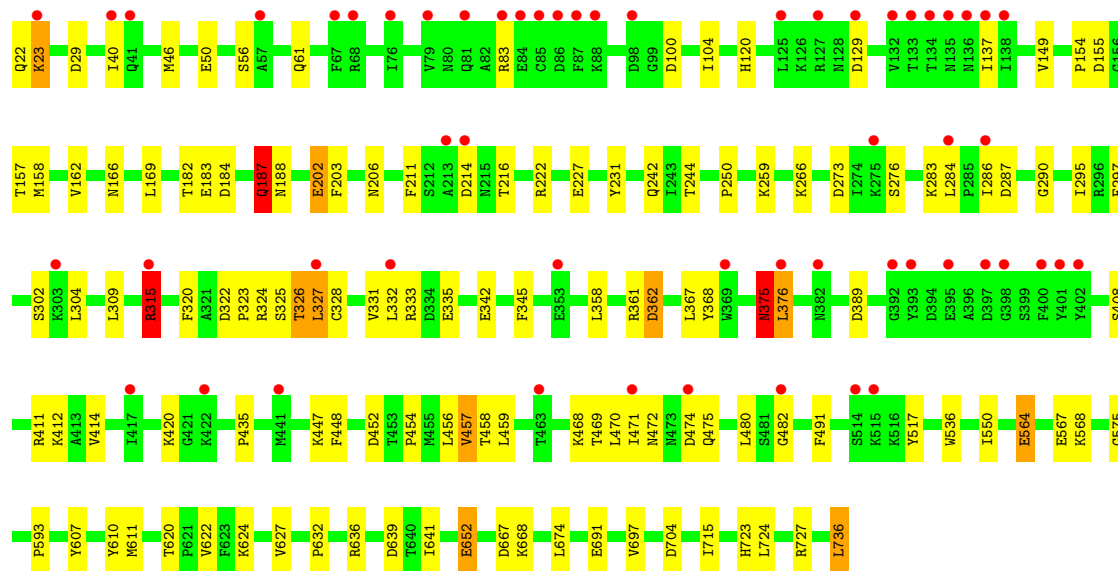
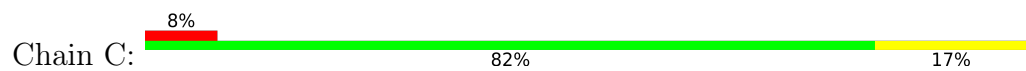
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	F	N	O		
2	C	1	28	16	6	5	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	504	Total 504	O 504	0	0
3	B	353	Total 353	O 353	0	0
3	C	344	Total 344	O 344	0	0



● Molecule 1: btDPP4



4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	165.30Å 110.99Å 134.39Å 90.00° 91.17° 90.00°	Depositor
Resolution (Å)	44.79 – 1.97 44.79 – 1.97	Depositor EDS
% Data completeness (in resolution range)	84.6 (44.79-1.97) 84.6 (44.79-1.97)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.76 (at 1.98Å)	Xtrriage
Refinement program	PHENIX 1.20_4459	Depositor
R, R_{free}	0.223 , 0.263 0.224 , 0.259	Depositor DCC
R_{free} test set	1984 reflections (1.38%)	wwPDB-VP
Wilson B-factor (Å ²)	23.9	Xtrriage
Anisotropy	0.329	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 51.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.000 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	18622	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 84.42 % 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 1.6741e-07. 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: 715

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	1.23	28/5927 (0.5%)	1.41	46/8020 (0.6%)
1	B	1.08	13/5927 (0.2%)	1.23	40/8020 (0.5%)
1	C	1.06	24/5927 (0.4%)	1.23	30/8020 (0.4%)
All	All	1.13	65/17781 (0.4%)	1.29	116/24060 (0.5%)

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	3
1	B	0	4
1	C	0	4
All	All	0	11

The worst 5 of 65 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	23	LYS	CB-CG	-13.19	1.17	1.52
1	B	44	ILE	CB-CG2	11.81	1.89	1.52
1	C	187	GLN	CB-CG	-11.64	1.21	1.52
1	B	465	LYS	CB-CG	-10.38	1.24	1.52
1	C	183	GLU	CD-OE2	9.16	1.35	1.25

The worst 5 of 116 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	252	GLU	OE1-CD-OE2	-35.92	80.19	123.30
1	C	327	LEU	CB-CG-CD2	31.89	165.21	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	489	GLU	OE1-CD-OE2	-30.67	86.49	123.30
1	B	489	GLU	OE1-CD-OE2	-30.48	86.72	123.30
1	C	183	GLU	OE1-CD-OE2	-26.72	91.24	123.30

There are no chirality outliers.

5 of 11 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	375	ASN	Sidechain
1	A	428	GLN	Sidechain
1	A	489	GLU	Sidechain
1	B	36	ARG	Sidechain
1	B	361	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	5779	0	5606	110	2
1	B	5779	0	5607	89	2
1	C	5779	0	5607	91	3
2	A	28	0	15	0	0
2	B	28	0	15	0	0
2	C	28	0	15	2	0
3	A	504	0	0	34	0
3	B	353	0	0	17	1
3	C	344	0	0	14	2
All	All	18622	0	16865	287	7

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 8.

The worst 5 of 287 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:B:44:ILE:CG2	1:B:44:ILE:CB	1.89	1.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:284:LEU:CD2	1:C:286:ILE:HD11	1.48	1.42
1:C:284:LEU:HD23	1:C:286:ILE:CD1	1.49	1.41
1:A:51:HIS:HB3	1:A:64:LYS:NZ	1.54	1.21
1:B:47:PRO:HA	1:B:439:GLN:OE1	1.57	1.03

The worst 5 of 7 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)
3:C:1106:HOH:O	3:C:1106:HOH:O[2_554]	1.63	0.57
1:A:515:LYS:NZ	1:C:129:ASP:OD1[3_555]	1.77	0.43
1:C:83:ARG:NH1	1:C:83:ARG:NH1[2_555]	1.90	0.30
3:B:958:HOH:O	3:C:1207:HOH:O[3_545]	1.98	0.22
1:A:704:ASP:OD1	1:A:704:ASP:OD1[2_655]	1.99	0.21

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	713/715 (100%)	688 (96%)	24 (3%)	1 (0%)	51	42
1	B	713/715 (100%)	688 (96%)	24 (3%)	1 (0%)	51	42
1	C	713/715 (100%)	684 (96%)	28 (4%)	1 (0%)	51	42
All	All	2139/2145 (100%)	2060 (96%)	76 (4%)	3 (0%)	51	42

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	715	ILE
1	A	715	ILE
1	B	715	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	627/627 (100%)	625 (100%)	2 (0%)	92	92
1	B	627/627 (100%)	627 (100%)	0	100	100
1	C	627/627 (100%)	624 (100%)	3 (0%)	88	87
All	All	1881/1881 (100%)	1876 (100%)	5 (0%)	92	92

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	129	ASP
1	A	342	GLU
1	C	40	ILE
1	C	100	ASP
1	C	214	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	375	ASN
1	C	472	ASN
1	C	478	GLN
1	A	439	GLN
1	B	136	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 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
2	715	A	801	-	27,30,30	3.54	11 (40%)	32,45,45	2.18	15 (46%)
2	715	B	801	-	27,30,30	3.13	10 (37%)	32,45,45	2.29	13 (40%)
2	715	C	801	-	27,30,30	3.32	9 (33%)	32,45,45	2.20	15 (46%)

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	715	A	801	-	-	1/18/27/27	0/2/3/3
2	715	B	801	-	-	1/18/27/27	0/2/3/3
2	715	C	801	-	-	0/18/27/27	0/2/3/3

The worst 5 of 30 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	715	C4-C5	9.01	1.53	1.37
2	C	801	715	C4-C5	8.49	1.52	1.37
2	B	801	715	C1-C2	7.12	1.49	1.37
2	A	801	715	C3-C2	6.85	1.50	1.38
2	C	801	715	C1-C2	6.72	1.49	1.37

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	801	715	F43-C42-C39	-6.81	104.00	111.32
2	C	801	715	F43-C42-C39	-4.81	106.16	111.32
2	A	801	715	C25-C26-N27	4.26	117.74	109.07
2	A	801	715	C4-C3-C2	4.22	121.49	116.58
2	B	801	715	F44-C42-C39	-3.92	107.11	111.32

There are no chirality outliers.

All (2) torsion outliers are listed below:

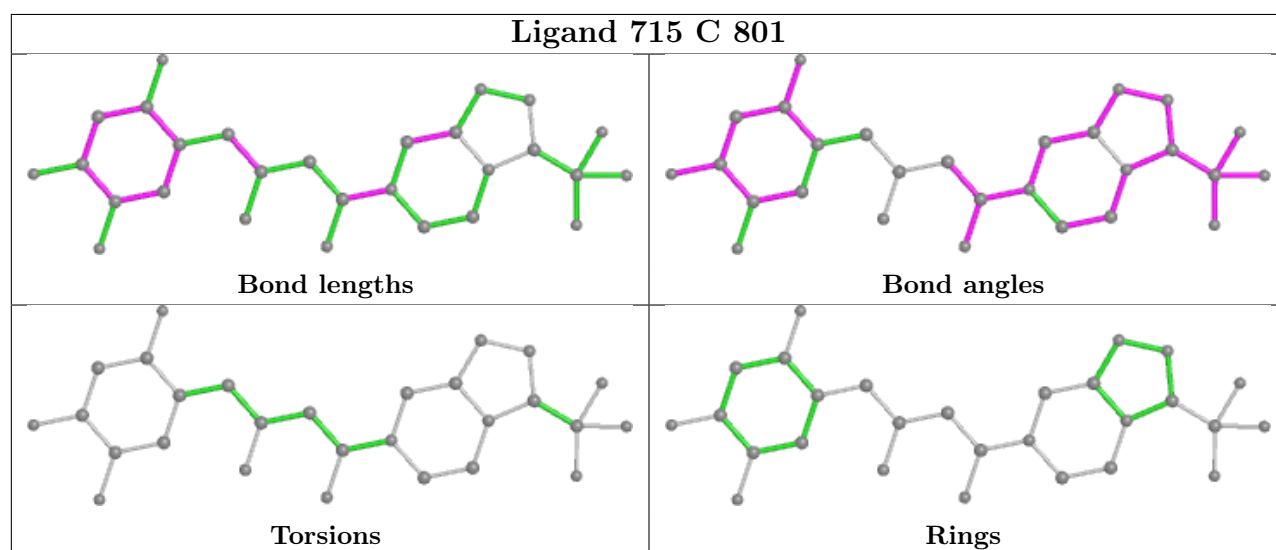
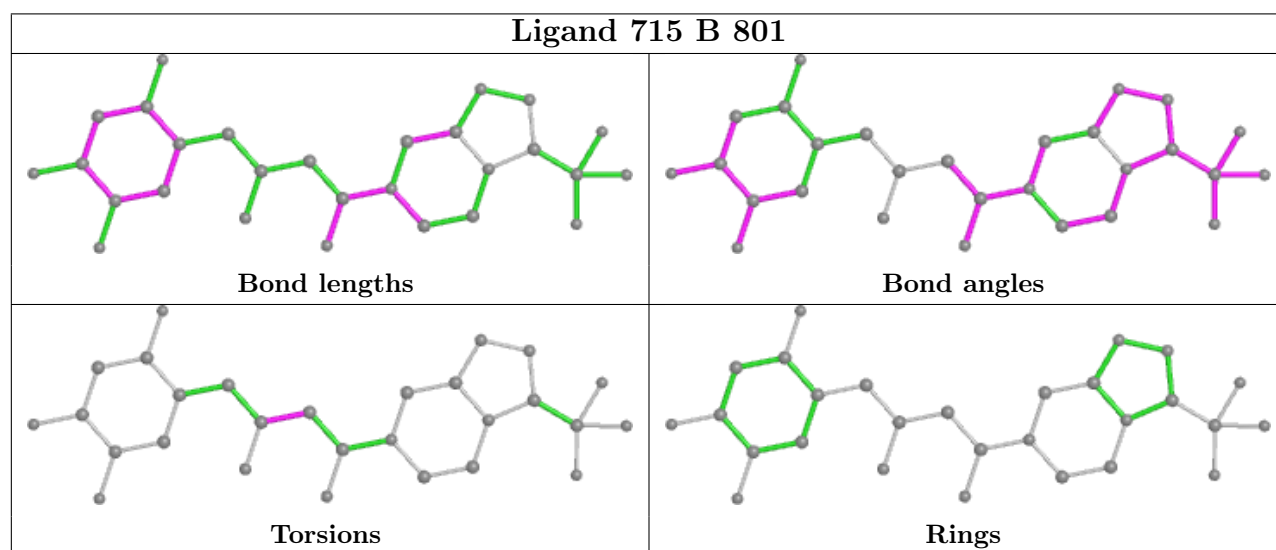
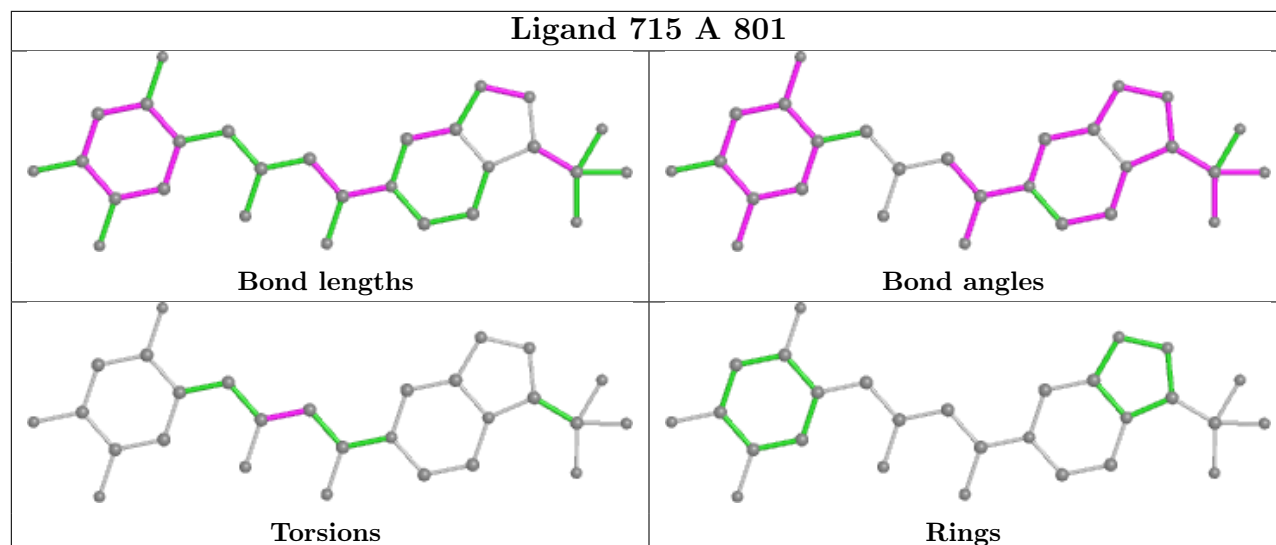
Mol	Chain	Res	Type	Atoms
2	B	801	715	N20-C12-C15-C16
2	A	801	715	N20-C12-C15-C16

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	801	715	2	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 [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	715/715 (100%)	0.46	57 (7%) 12 14	12, 33, 56, 74	0
1	B	715/715 (100%)	0.47	46 (6%) 19 21	14, 38, 67, 83	0
1	C	715/715 (100%)	0.48	56 (7%) 13 14	15, 42, 77, 114	0
All	All	2145/2145 (100%)	0.47	159 (7%) 14 16	12, 36, 70, 114	0

The worst 5 of 159 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	132	VAL	6.5
1	C	327	LEU	6.3
1	C	79	VAL	5.6
1	C	129	ASP	5.6
1	A	418	ASP	5.5

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](#)

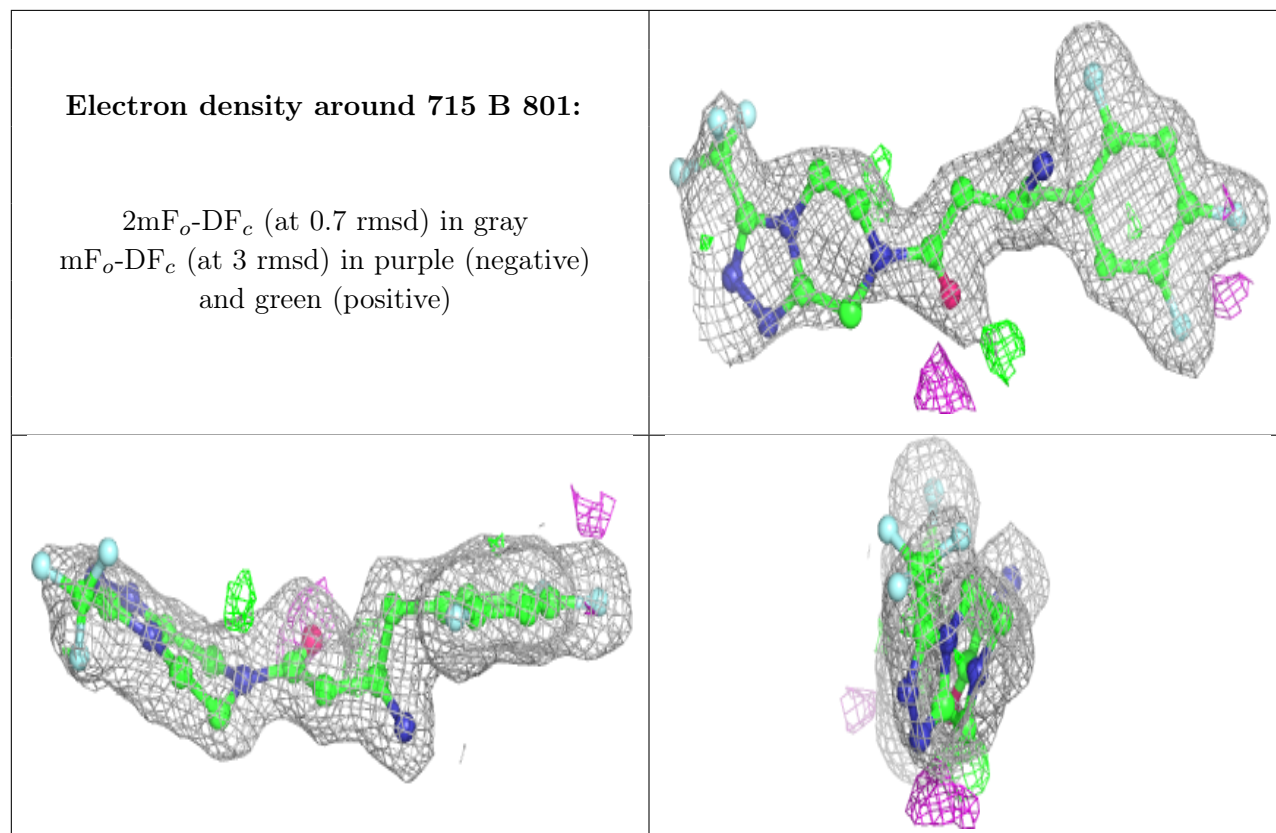
There are no monosaccharides in this entry.

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.

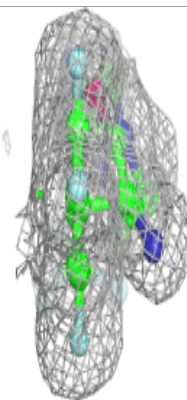
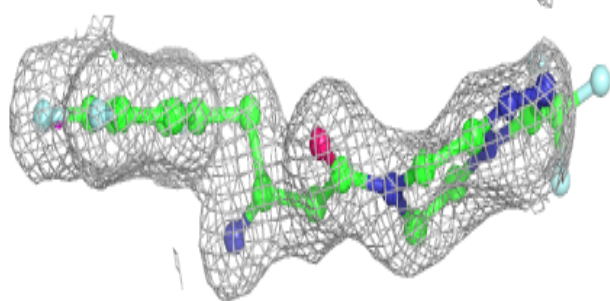
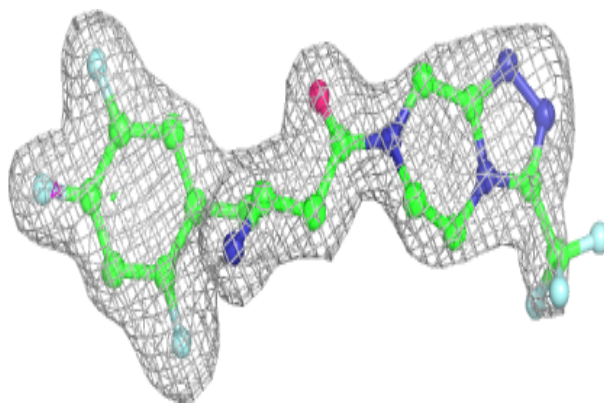
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	715	B	801	28/28	0.93	0.16	19,35,53,55	7
2	715	C	801	28/28	0.95	0.14	18,29,49,50	7
2	715	A	801	28/28	0.96	0.14	17,27,43,44	9

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.

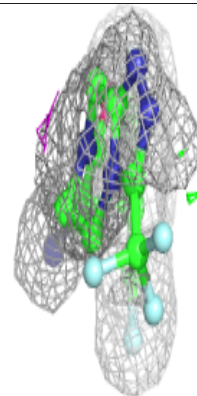
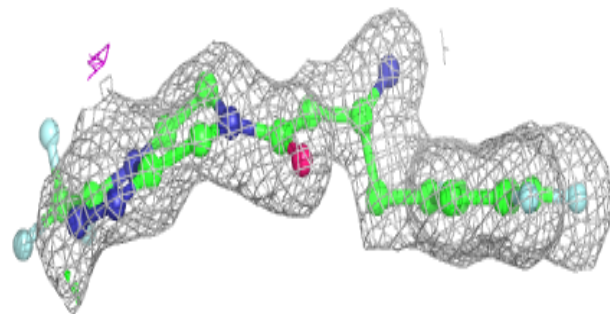
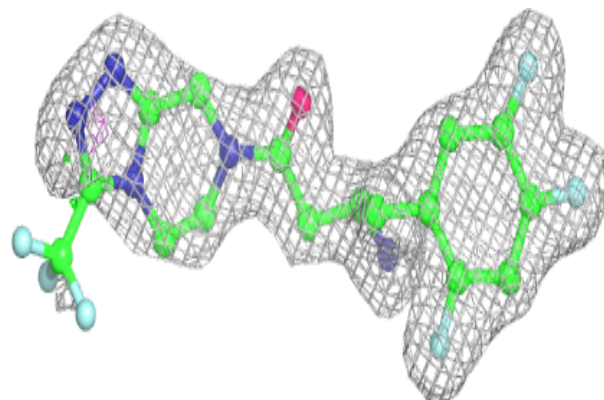


Electron density around 715 C 801:

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

**Electron density around 715 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 [i](#)

There are no such residues in this entry.