



wwPDB X-ray Structure Validation Summary Report

Mar 6, 2026 – 03:05 AM UTC

PDB ID : 5LT6 / pdb_00005lt6
Title : Structure of the Epigenetic Oncogene MMSET and inhibition by N-Alkyl Sine-fungin Derivatives
Authors : Tisi, D.; Pathuri, P.; Heightman, T.
Deposited on : 2016-09-06
Resolution : 2.05 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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

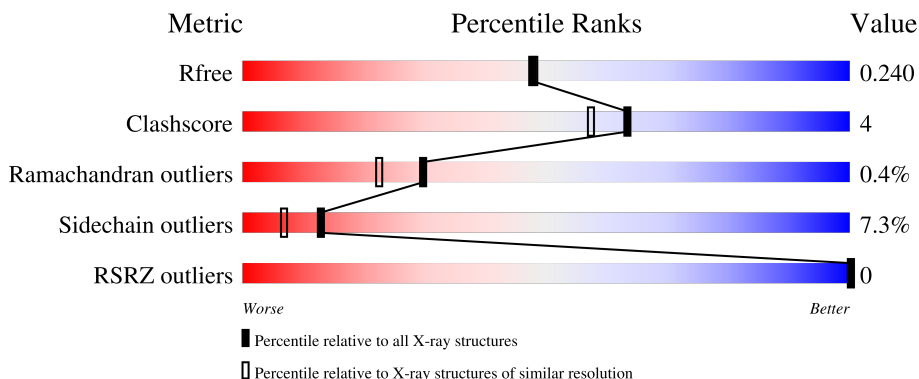
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION



The reported resolution of this entry is 2.05 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}	180053	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

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	295	
1	B	295	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	SCN	B	1804	-	-	X	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4100 atoms, of which 68 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-lysine N-methyltransferase SETD2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	234	1881	1173	333	353	22	0	6	0
1	B	227	1812	1130	315	345	22	0	3	0

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1417	MET	-	initiating methionine	UNP Q9BYW2
A	1418	HIS	-	expression tag	UNP Q9BYW2
A	1419	HIS	-	expression tag	UNP Q9BYW2
A	1420	HIS	-	expression tag	UNP Q9BYW2
A	1421	HIS	-	expression tag	UNP Q9BYW2
A	1422	HIS	-	expression tag	UNP Q9BYW2
A	1423	HIS	-	expression tag	UNP Q9BYW2
A	1424	SER	-	expression tag	UNP Q9BYW2
A	1425	SER	-	expression tag	UNP Q9BYW2
A	1426	GLY	-	expression tag	UNP Q9BYW2
A	1427	ARG	-	expression tag	UNP Q9BYW2
A	1428	GLU	-	expression tag	UNP Q9BYW2
A	1429	ASN	-	expression tag	UNP Q9BYW2
A	1430	LEU	-	expression tag	UNP Q9BYW2
A	1431	TYR	-	expression tag	UNP Q9BYW2
A	1432	PHE	-	expression tag	UNP Q9BYW2
B	1417	MET	-	initiating methionine	UNP Q9BYW2
B	1418	HIS	-	expression tag	UNP Q9BYW2
B	1419	HIS	-	expression tag	UNP Q9BYW2
B	1420	HIS	-	expression tag	UNP Q9BYW2
B	1421	HIS	-	expression tag	UNP Q9BYW2
B	1422	HIS	-	expression tag	UNP Q9BYW2
B	1423	HIS	-	expression tag	UNP Q9BYW2
B	1424	SER	-	expression tag	UNP Q9BYW2
B	1425	SER	-	expression tag	UNP Q9BYW2

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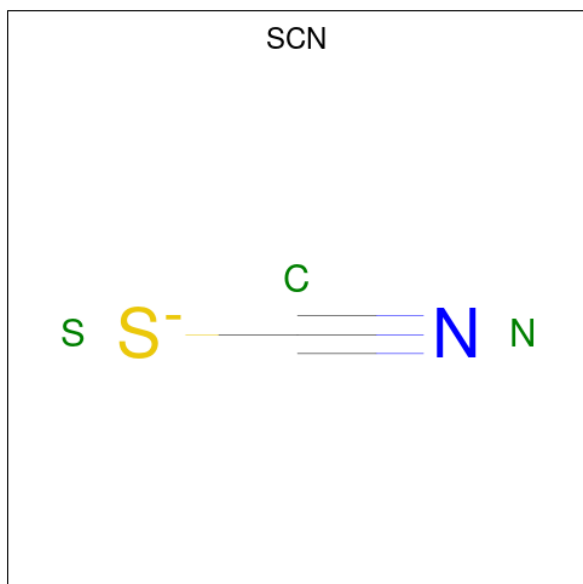
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Chain	Residue	Modelled	Actual	Comment	Reference
B	1426	GLY	-	expression tag	UNP Q9BYW2
B	1427	ARG	-	expression tag	UNP Q9BYW2
B	1428	GLU	-	expression tag	UNP Q9BYW2
B	1429	ASN	-	expression tag	UNP Q9BYW2
B	1430	LEU	-	expression tag	UNP Q9BYW2
B	1431	TYR	-	expression tag	UNP Q9BYW2
B	1432	PHE	-	expression tag	UNP Q9BYW2

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Zn	0	0
			3	3		
2	B	3	Total	Zn	0	0
			3	3		

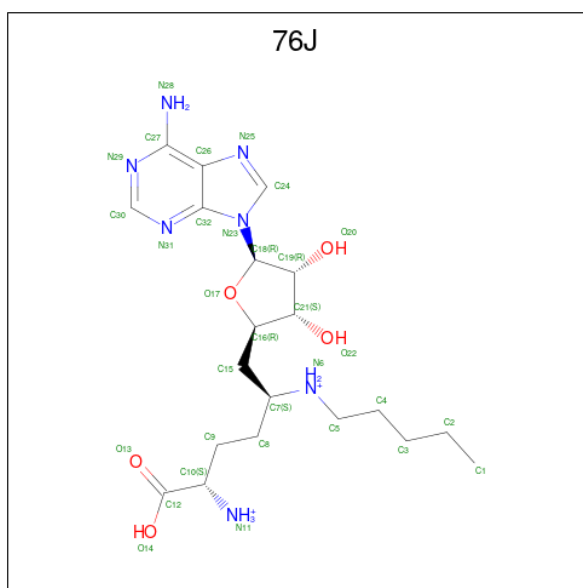
- Molecule 3 is THIOCYANATE ION (CCD ID: SCN) (formula: CNS).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	S	0	0
			3	1	1	1		
3	B	1	Total	C	N	S	0	0
			3	1	1	1		

- Molecule 4 is [(2 {S},5 {S})-1-[(2 {R},3 {S},4 {R},5 {R})-5-(6-aminopurin-9-yl)-3,4-bis(oxidanyl)oxolan-2-yl]-5-azaniumyl-6-oxidanyl-6-oxidanylidene-hexan-2-yl]-pentyl-azanium

(CCD ID: 76J) (formula: C₂₀H₃₅N₇O₅).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	H	N			O
4	A	1	66	20	34	7	5	2	0
4	B	1	66	20	34	7	5	2	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	157	157	157	0	0
5	B	106	106	106	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	57.36Å 72.70Å 61.86Å 90.00° 89.77° 90.00°	Depositor
Resolution (Å)	61.86 – 2.05 61.86 – 2.05	Depositor EDS
% Data completeness (in resolution range)	97.8 (61.86-2.05) 96.7 (61.86-2.05)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.33 (at 2.05Å)	Xtrriage
Refinement program	BUSTER 2.11.6	Depositor
R, R_{free}	0.179 , 0.231 0.192 , 0.240	Depositor DCC
R_{free} test set	1571 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å ²)	42.9	Xtrriage
Anisotropy	0.232	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 63.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.186 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	4100	wwPDB-VP
Average B, all atoms (Å ²)	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.86% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 76J, SCN, ZN

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	1.06	2/1933 (0.1%)	1.25	4/2602 (0.2%)
1	B	0.97	1/1855 (0.1%)	1.25	8/2497 (0.3%)
All	All	1.01	3/3788 (0.1%)	1.25	12/5099 (0.2%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1593	VAL	CA-C	5.59	1.59	1.52
1	A	1451	MET	SD-CE	5.43	1.93	1.79
1	A	1593	VAL	CA-C	5.10	1.59	1.52

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1626	PHE	CA-CB-CG	-6.92	106.88	113.80
1	B	1626	PHE	CA-CB-CG	-6.89	106.91	113.80
1	B	1611	ASN	N-CA-C	-5.88	101.57	110.28
1	A	1664	PHE	CA-CB-CG	5.73	119.53	113.80
1	B	1664	PHE	CA-CB-CG	5.49	119.29	113.80

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	1881	0	1750	13	0
1	B	1812	0	1686	16	0
2	A	3	0	0	0	0
2	B	3	0	0	0	0
3	A	3	0	0	0	0
3	B	3	0	0	2	0
4	A	32	34	0	0	0
4	B	32	34	0	0	0
5	A	157	0	0	1	0
5	B	106	0	0	0	0
All	All	4032	68	3436	29	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 4.

The worst 5 of 29 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:1686:ARG:HH21	1:B:1689:LEU:HG	1.64	0.63
1:B:1499:CYS:SG	3:B:1804:SCN:S	2.98	0.60
1:A:1632:GLU:HB2	1:A:1684:ASN:HD21	1.68	0.59
1:A:1474[B]:ASP:HB3	1:A:1620:LYS:HG2	1.91	0.52
1:B:1451:MET:HE1	1:B:1549[A]:HIS:CE1	2.45	0.52

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	236/295 (80%)	230 (98%)	5 (2%)	1 (0%)	30	22
1	B	224/295 (76%)	214 (96%)	9 (4%)	1 (0%)	30	22
All	All	460/590 (78%)	444 (96%)	14 (3%)	2 (0%)	30	22

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1672	GLY
1	B	1497	MET

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	198/258 (77%)	181 (91%)	17 (9%)	10	4
1	B	194/258 (75%)	181 (93%)	13 (7%)	15	8
All	All	392/516 (76%)	362 (92%)	30 (8%)	13	6

5 of 30 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1639	LYS
1	B	1639	LYS
1	B	1449	CYS
1	B	1689	LEU
1	B	1609	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	1684	ASN
1	B	1619	GLN
1	B	1586	HIS
1	A	1684	ASN
1	B	1603	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 6 are monoatomic - leaving 4 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
4	76J	A	1805	-	33,34,34	0.69	0	38,47,47	0.71	0
3	SCN	B	1804	-	1,2,2	0.22	0	0,1,1	-	-
4	76J	B	1805	-	33,34,34	0.63	0	38,47,47	0.73	0
3	SCN	A	1804	-	1,2,2	1.08	0	0,1,1	-	-

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	76J	A	1805	-	-	7/23/39/39	0/3/3/3
4	76J	B	1805	-	-	7/23/39/39	0/3/3/3

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

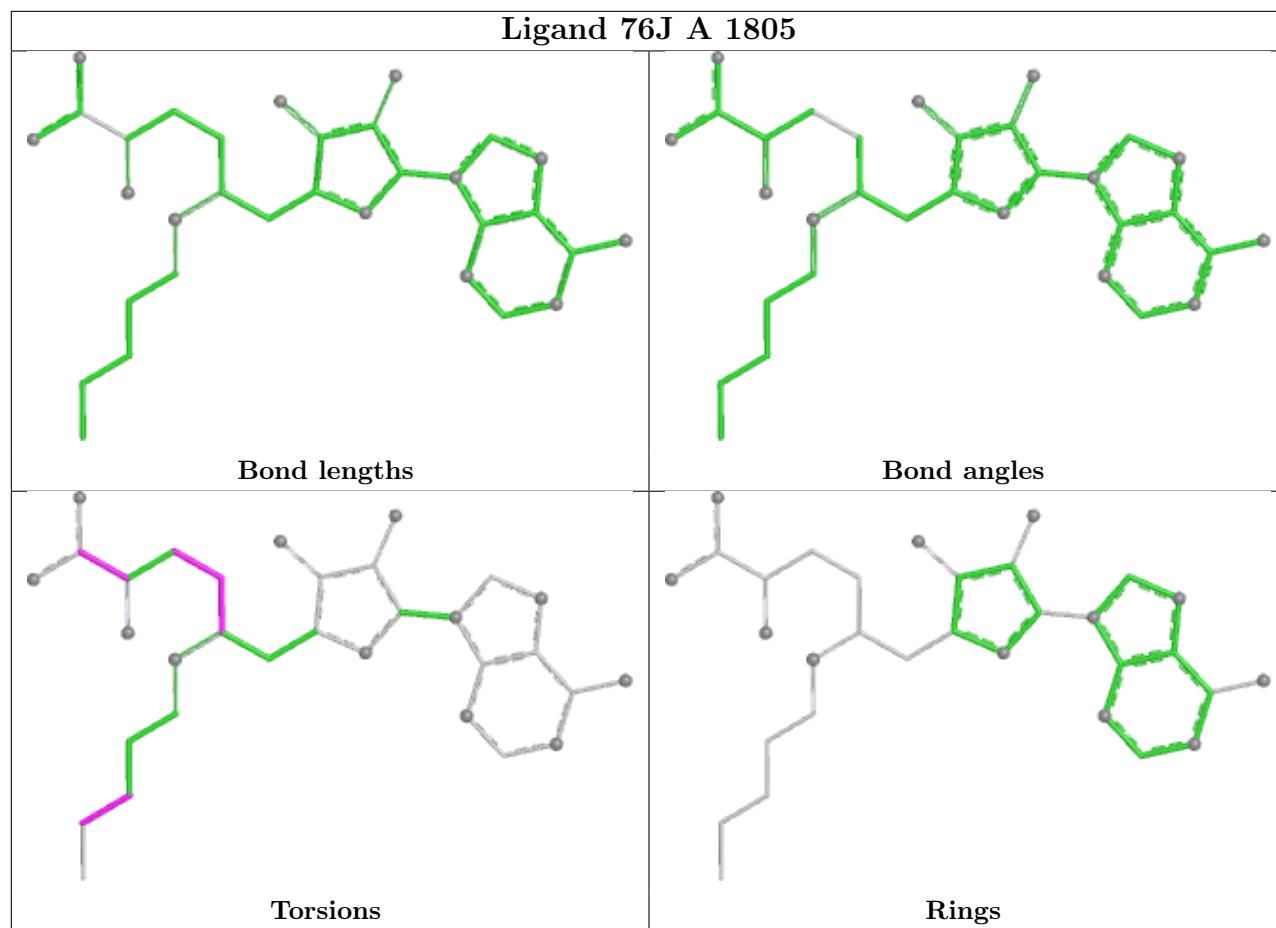
Mol	Chain	Res	Type	Atoms
4	A	1805	76J	C15-C7-C8-C9
4	A	1805	76J	C7-C8-C9-C10
4	B	1805	76J	C15-C7-C8-C9
4	B	1805	76J	C3-C4-C5-N6
4	A	1805	76J	C1-C2-C3-C4

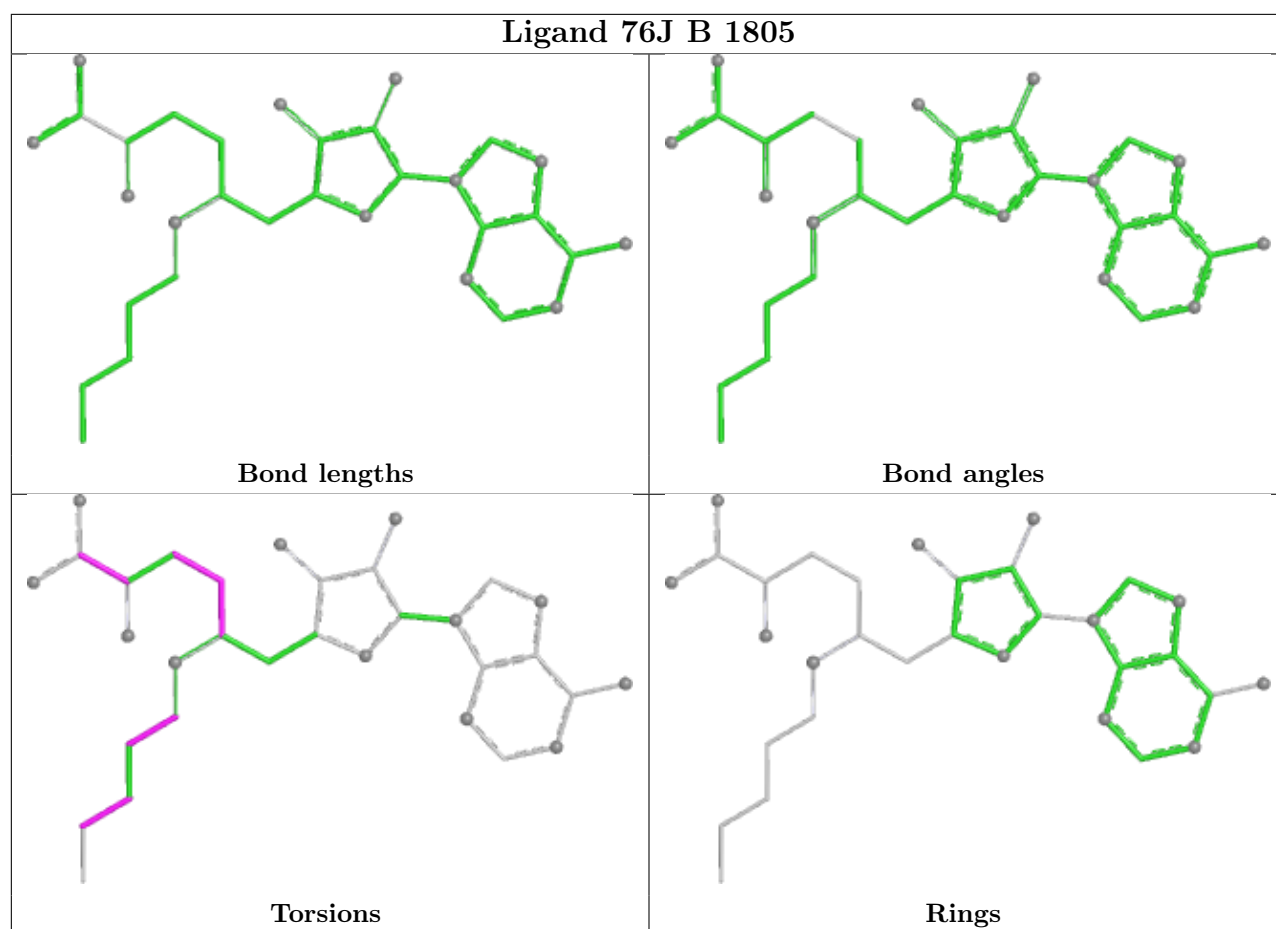
There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	1804	SCN	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	234/295 (79%)	-1.06	0 100 100	23, 49, 92, 115	6 (2%)
1	B	227/295 (76%)	-0.90	0 100 100	25, 60, 98, 111	3 (1%)
All	All	461/590 (78%)	-0.98	0 100 100	23, 55, 96, 115	9 (1%)

There are no RSRZ outliers to report.

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 oligosaccharides 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.

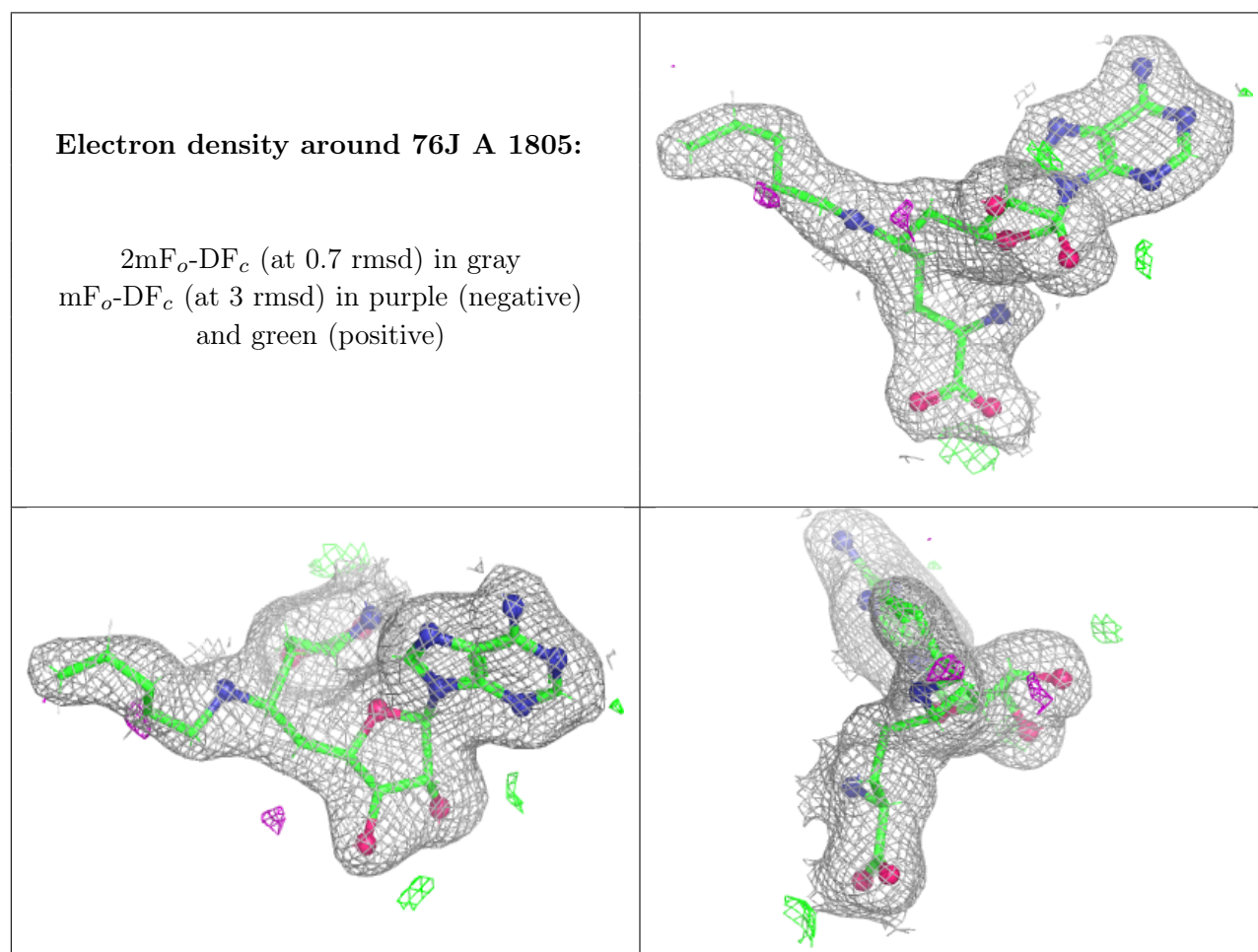
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	SCN	A	1804	3/3	0.99	0.05	67,67,67,75	0
3	SCN	B	1804	3/3	0.99	0.03	65,65,66,67	0
4	76J	A	1805	32/32	0.99	0.04	31,44,58,61	2
4	76J	B	1805	32/32	0.99	0.04	33,53,61,62	66
2	ZN	B	1802	1/1	1.00	0.01	54,54,54,54	0
2	ZN	B	1803	1/1	1.00	0.02	65,65,65,65	0
2	ZN	A	1801	1/1	1.00	0.01	42,42,42,42	0

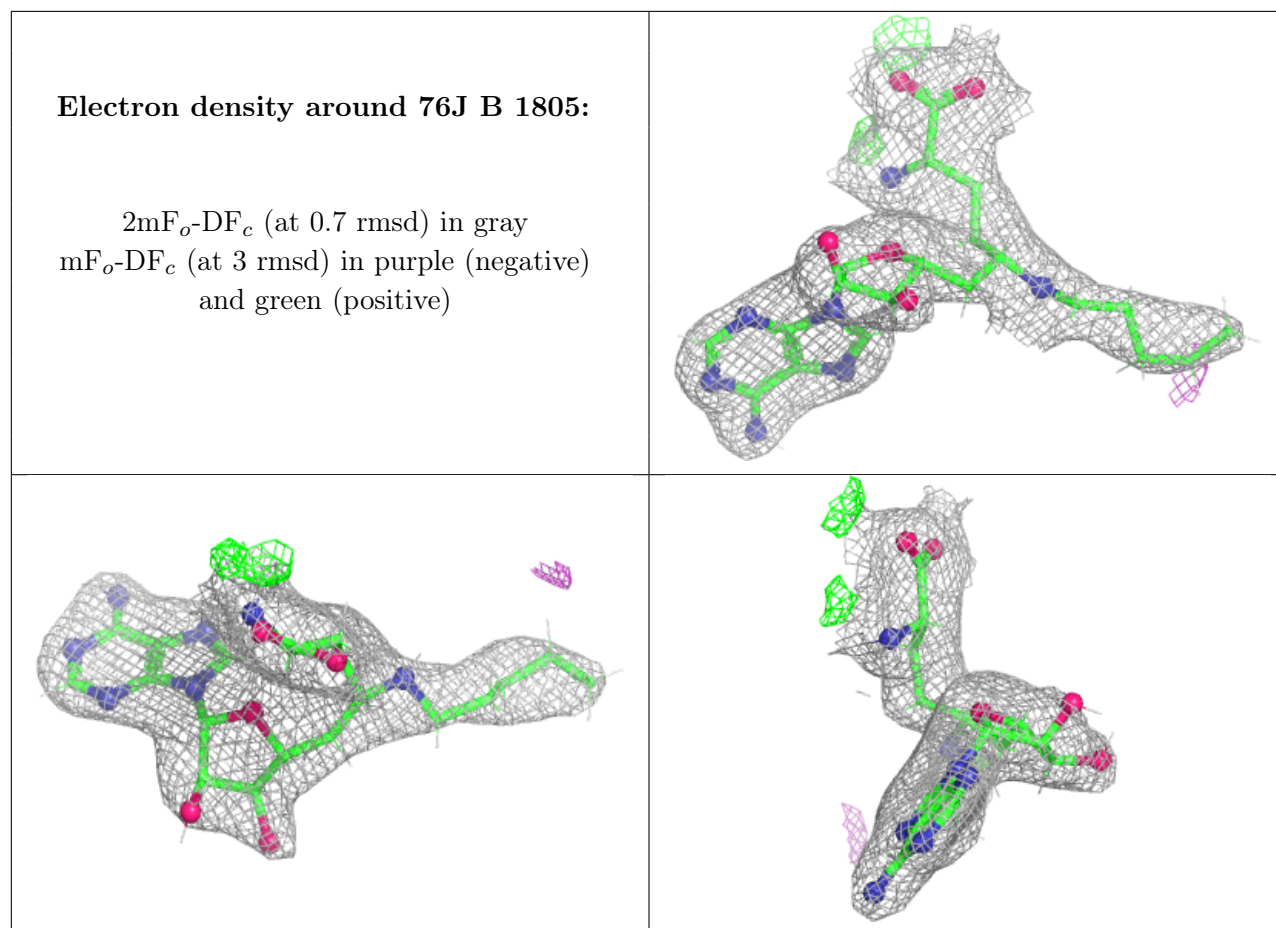
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	ZN	A	1802	1/1	1.00	0.01	52,52,52,52	0
2	ZN	A	1803	1/1	1.00	0.01	51,51,51,51	0
2	ZN	B	1801	1/1	1.00	0.01	51,51,51,51	0

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.