



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2026 – 10:03 AM EDT

PDB ID : 7UBU / pdb_00007ubu
Title : Crystal structure of ZMET2 in complex with hemimethylated CAG DNA and a histone H3Kc9me2 peptide
Authors : Fang, J.; Song, J.
Deposited on : 2022-03-15
Resolution : 2.39 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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (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

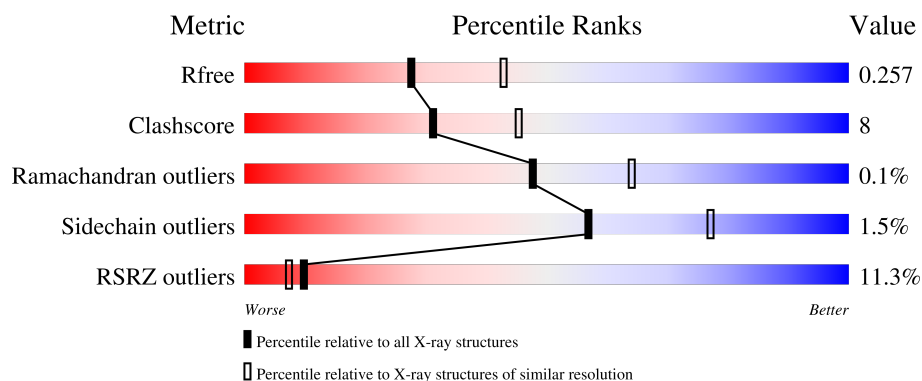
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.39 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	783	9% 73% 17% 10%
2	P	33	27% 48% 12% 39%
2	Q	33	21% 21% 12% 64%
3	B	18	67% 28% 6%
4	C	18	56% 39% 6%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 6690 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 DNA (cytosine-5)-methyltransferase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	708	Total	C	N	O	S	0	1	0
			5571	3554	944	1039	34			

- Molecule 2 is a protein called Histone H3.2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	P	20	Total	C	N	O	S	0	0	0
			148	90	31	26	1			
2	Q	12	Total	C	N	O	S	0	0	0
			92	53	20	18	1			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
P	0	SER	-	expression tag	UNP P69246
Q	0	SER	-	expression tag	UNP P69246

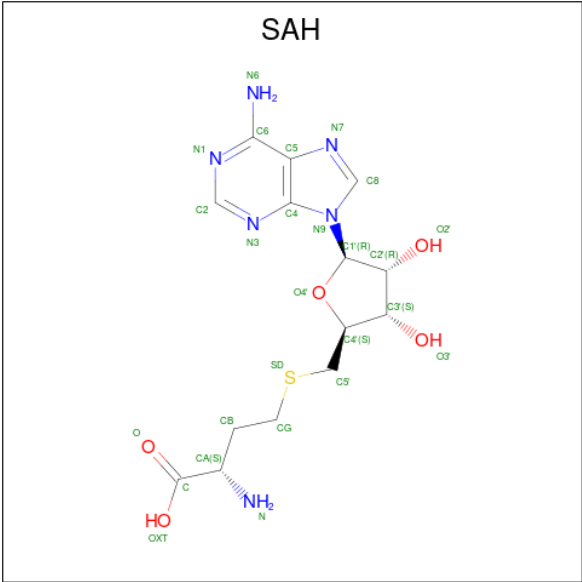
- Molecule 3 is a DNA chain called 5MC SSDNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	B	18	Total	C	N	O	P	0	0	0
			369	180	67	105	17			

- Molecule 4 is a DNA chain called C49 SSDNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	C	18	Total	C	F	N	O	P	0	0
			364	178	1	63	105	17		

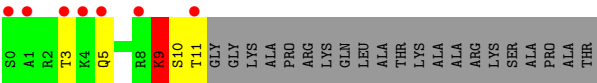
- Molecule 5 is S-ADENOSYL-L-HOMOCYSTEINE (CCD ID: SAH) (formula: C₁₄H₂₀N₆O₅S) (labeled as "Ligand of Interest" by depositor).



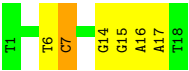
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			26	14	6	5	1		

- Molecule 6 is water.

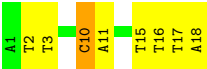
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	109	Total	O	0	0
			109	109		
6	P	4	Total	O	0	0
			4	4		
6	B	4	Total	O	0	0
			4	4		
6	C	3	Total	O	0	0
			3	3		



● Molecule 3: 5MC SSDNA



● Molecule 4: C49 SSDNA



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	64.57Å 121.39Å 160.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	96.81 – 2.39 96.81 – 2.39	Depositor EDS
% Data completeness (in resolution range)	98.9 (96.81-2.39) 98.9 (96.81-2.39)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.20 (at 2.40Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.211 , 0.256 0.212 , 0.257	Depositor DCC
R_{free} test set	2000 reflections (3.94%)	wwPDB-VP
Wilson B-factor (Å ²)	62.9	Xtriage
Anisotropy	0.377	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 51.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6690	wwPDB-VP
Average B, all atoms (Å ²)	77.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.21% 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: SAH, C49, 5MC, M2L

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	0.24	0/5707	0.45	0/7742
2	P	0.23	0/135	0.38	0/176
2	Q	0.27	0/79	0.37	0/103
3	B	0.31	0/392	0.61	0/605
4	C	0.31	0/383	0.63	0/587
All	All	0.25	0/6696	0.47	0/9213

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
2	Q	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
2	Q	9	M2L	Mainchain

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	5571	0	5386	94	0
2	P	148	0	159	5	0
2	Q	92	0	96	4	0
3	B	369	0	204	5	0
4	C	364	0	204	5	0
5	A	26	0	19	2	0
6	A	109	0	0	3	0
6	B	4	0	0	0	0
6	C	3	0	0	0	0
6	P	4	0	0	0	0
All	All	6690	0	6068	101	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 8.

All (101) 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:275:ASP:HB3	1:A:278:MET:HG3	1.46	0.98
1:A:487:GLN:HB3	2:Q:5:GLN:HE22	1.42	0.83
1:A:466:TRP:HE1	1:A:475:THR:HG22	1.54	0.70
1:A:596:CYS:HB3	1:A:623:PRO:HB3	1.76	0.68
1:A:798:VAL:HG11	1:A:829:LEU:HD13	1.76	0.68
1:A:617:LEU:HD12	1:A:618:PRO:HD2	1.76	0.67
1:A:487:GLN:HB3	2:Q:5:GLN:NE2	2.08	0.67
1:A:233:ILE:HD11	1:A:581:VAL:HG11	1.78	0.65
1:A:349:GLY:HA3	5:A:1000:SAH:HB1	1.78	0.65
1:A:641:MET:HE1	2:P:20:LEU:HD11	1.79	0.64
1:A:300:VAL:HG12	1:A:639:GLN:HG3	1.79	0.64
4:C:17:DT:H2'	4:C:18:DA:C8	2.33	0.64
1:A:385:LYS:HB2	1:A:393:VAL:HG11	1.82	0.61
1:A:466:TRP:CE2	2:Q:9:M2L:HDA	2.35	0.61
1:A:734:PRO:HB2	1:A:736:LYS:HG3	1.83	0.60
1:A:496:GLY:HA3	1:A:501:ILE:HD13	1.84	0.60
1:A:443:VAL:HG21	1:A:488:LYS:HG3	1.84	0.60
1:A:555:TYR:HE2	1:A:618:PRO:HD3	1.67	0.59
1:A:588:ARG:HG2	1:A:620:TYR:CE2	2.38	0.58
1:A:246:HIS:HE1	1:A:581:VAL:HG13	1.69	0.58
1:A:791:ARG:HD3	1:A:815:PRO:O	2.06	0.56
1:A:249:ARG:HG3	1:A:249:ARG:HH21	1.72	0.55
1:A:710:ASP:HA	1:A:713:LYS:HD2	1.90	0.54
1:A:851:ASN:HB3	5:A:1000:SAH:SD	2.47	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:202:ASP:O	1:A:227:ARG:NH2	2.37	0.53
1:A:443:VAL:CG2	1:A:488:LYS:HG3	2.38	0.53
1:A:512:CYS:HA	1:A:557:LEU:O	2.09	0.53
1:A:296:MET:HE1	6:A:1116:HOH:O	2.09	0.52
1:A:766:LEU:HD12	1:A:770:LYS:O	2.09	0.52
1:A:831:GLY:HA3	1:A:856:PRO:HD3	1.92	0.52
1:A:619:LYS:HD2	1:A:880:TYR:HB2	1.91	0.51
4:C:2:DT:H2'	4:C:3:DT:C6	2.46	0.51
1:A:296:MET:CE	6:A:1116:HOH:O	2.58	0.51
1:A:664:ASP:HB3	1:A:828:ARG:HH22	1.75	0.51
1:A:186:TYR:CE2	1:A:268:LYS:HG3	2.46	0.51
1:A:489:ILE:O	1:A:493:VAL:HG23	2.10	0.51
1:A:271:ILE:HG12	1:A:292:LEU:HB2	1.93	0.51
1:A:657:LEU:HD23	1:A:795:ASP:HA	1.92	0.51
1:A:729:ARG:NH1	1:A:771:PRO:O	2.44	0.51
1:A:447:VAL:HG23	1:A:463:LYS:HD3	1.92	0.51
1:A:296:MET:HE3	1:A:305:PHE:HB3	1.93	0.50
1:A:555:TYR:CE2	1:A:618:PRO:HD3	2.45	0.50
1:A:823:ILE:HD11	1:A:842:ILE:HG23	1.93	0.50
1:A:609:TRP:CD2	1:A:618:PRO:HG2	2.47	0.49
1:A:517:CYS:CB	4:C:10:C49:F	2.50	0.49
1:A:462:PHE:HE2	1:A:479:ILE:HD12	1.77	0.49
1:A:175:HIS:CD2	1:A:211:PHE:HB3	2.48	0.48
1:A:803:THR:HB	1:A:847:ILE:HA	1.95	0.48
1:A:144:ALA:O	1:A:148:ARG:HG3	2.14	0.48
1:A:234:ASN:CG	1:A:235:SER:H	2.20	0.48
1:A:456:ARG:HB3	1:A:461:TYR:CZ	2.48	0.48
1:A:270:LYS:HD3	1:A:290:CYS:HA	1.94	0.48
1:A:577:LEU:O	1:A:581:VAL:HG12	2.14	0.48
1:A:283:LYS:O	1:A:287:ILE:HD12	2.13	0.48
1:A:353:MET:HE2	1:A:853:VAL:HG21	1.96	0.48
1:A:233:ILE:HG23	1:A:578:SER:HB2	1.96	0.47
6:A:1105:HOH:O	2:P:18:LYS:NZ	2.43	0.47
3:B:14:DG:H2''	3:B:15:DG:C8	2.49	0.47
1:A:263:ASP:O	2:P:4:LYS:NZ	2.46	0.47
3:B:6:DT:H2''	3:B:7:5MC:H5''	1.97	0.47
1:A:434:SER:HB2	2:Q:3:THR:CG2	2.45	0.47
1:A:672:GLN:HE22	1:A:674:ASN:HB2	1.79	0.46
1:A:209:GLU:HB2	1:A:221:THR:HB	1.96	0.46
1:A:276:PRO:HB2	1:A:613:SER:HB2	1.97	0.46
3:B:16:DA:H2''	3:B:17:DA:O4'	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:735:VAL:O	1:A:735:VAL:HG23	2.16	0.45
1:A:249:ARG:HG3	1:A:249:ARG:NH2	2.31	0.45
1:A:385:LYS:HD3	1:A:393:VAL:HG12	1.98	0.45
1:A:776:TYR:HB3	3:B:7:5MC:C5'	2.47	0.45
1:A:591:MET:HE3	1:A:641:MET:HG2	1.98	0.45
1:A:670:ASN:OD1	1:A:722:LEU:HD12	2.17	0.45
1:A:625:TYR:CZ	1:A:653:LYS:HD3	2.52	0.44
1:A:541[B]:MET:HE2	1:A:541[B]:MET:HB2	1.71	0.44
1:A:664:ASP:OD2	1:A:688:GLN:HB3	2.17	0.44
1:A:790:GLY:C	1:A:811:VAL:HG13	2.42	0.44
1:A:386:TYR:OH	1:A:710:ASP:OD2	2.28	0.44
1:A:520:ILE:HD13	1:A:564:ILE:HG13	2.00	0.44
1:A:791:ARG:HA	1:A:813:ILE:HB	2.00	0.44
1:A:234:ASN:CG	1:A:235:SER:N	2.76	0.43
1:A:265:ILE:O	2:P:4:LYS:NZ	2.50	0.43
1:A:791:ARG:NH2	1:A:814:HIS:O	2.51	0.43
1:A:275:ASP:OD1	1:A:277:ASN:N	2.49	0.43
1:A:460:ILE:HD13	1:A:460:ILE:HA	1.87	0.43
1:A:353:MET:SD	1:A:512:CYS:HB2	2.59	0.42
1:A:413:LYS:HE3	1:A:413:LYS:HB2	1.74	0.42
1:A:371:ARG:HB2	1:A:372:TRP:CE3	2.55	0.42
1:A:518:GLN:NE2	4:C:11:DA:OP1	2.48	0.42
1:A:776:TYR:HB3	3:B:7:5MC:H5''	2.01	0.42
1:A:462:PHE:HB2	1:A:482:LEU:HD21	2.02	0.42
1:A:602:PHE:CE1	1:A:629:VAL:HA	2.55	0.42
1:A:766:LEU:HD11	1:A:772:LEU:HA	2.02	0.41
1:A:643:ALA:HB3	2:P:18:LYS:HB3	2.02	0.41
1:A:343:LEU:HB2	1:A:368:LEU:HD11	2.03	0.41
1:A:541[A]:MET:HB3	1:A:541[A]:MET:HE3	1.81	0.41
1:A:781:ILE:HG22	1:A:781:ILE:O	2.21	0.41
1:A:464:VAL:HG11	1:A:466:TRP:CZ2	2.55	0.41
1:A:725:ASP:HB3	1:A:729:ARG:NH2	2.36	0.41
1:A:363:LEU:HD12	1:A:363:LEU:HA	1.71	0.40
1:A:541[B]:MET:HE3	1:A:564:ILE:HD11	2.02	0.40
1:A:394:ARG:HE	1:A:396:GLU:CD	2.25	0.40
4:C:15:DT:H2'	4:C:16:DT:H71	2.02	0.40

There are no symmetry-related clashes.

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	701/783 (90%)	670 (96%)	30 (4%)	1 (0%)	48	64
2	P	15/33 (46%)	15 (100%)	0	0	100	100
2	Q	9/33 (27%)	9 (100%)	0	0	100	100
All	All	725/849 (85%)	694 (96%)	30 (4%)	1 (0%)	48	64

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	888	SER

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	589/667 (88%)	582 (99%)	7 (1%)	63	81
2	P	13/22 (59%)	13 (100%)	0	100	100
2	Q	8/22 (36%)	6 (75%)	2 (25%)	0	1
All	All	610/711 (86%)	601 (98%)	9 (2%)	57	77

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	232	VAL
1	A	241	VAL

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Mol	Chain	Res	Type
1	A	338	THR
1	A	376	PHE
1	A	393	VAL
1	A	736	LYS
1	A	767	SER
2	Q	10	SER
2	Q	11	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	395	ASN
1	A	487	GLN
1	A	540	GLN
1	A	672	GLN
1	A	674	ASN
1	A	752	ASN
1	A	867	GLN
2	P	5	GLN
2	P	19	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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	5MC	B	7	4,3	18,21,23	4.54	12 (66%)	24,30,35	1.40	3 (12%)
2	M2L	P	9	2	9,10,11	1.59	1 (11%)	7,11,13	1.17	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	M2L	Q	9	2	9,10,11	1.51	1 (11%)	7,11,13	1.40	2 (28%)
4	C49	C	10	4,1	17,22,24	4.89	10 (58%)	17,33,38	2.11	4 (23%)

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
3	5MC	B	7	4,3	-	2/7/21/26	0/2/2/2
2	M2L	P	9	2	-	1/7/9/11	-
2	M2L	Q	9	2	-	3/7/9/11	-
4	C49	C	10	4,1	-	7/7/40/46	0/2/2/2

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	10	C49	C2-N1	9.86	1.49	1.35
4	C	10	C49	C3'-C4'	-8.69	1.30	1.53
3	B	7	5MC	C2'-C3'	-8.25	1.31	1.52
4	C	10	C49	O4'-C4'	7.79	1.62	1.45
3	B	7	5MC	C6-C5	7.63	1.47	1.34
3	B	7	5MC	O4'-C4'	-7.48	1.28	1.45
3	B	7	5MC	C1'-N1	-6.96	1.30	1.48
4	C	10	C49	C2-N3	6.59	1.49	1.38
3	B	7	5MC	O4'-C1'	6.40	1.56	1.42
4	C	10	C49	CM5-C5	6.17	1.64	1.51
4	C	10	C49	O4'-C1'	-5.19	1.30	1.42
3	B	7	5MC	C2-N3	5.06	1.46	1.36
4	C	10	C49	C6-N1	-4.75	1.41	1.46
3	B	7	5MC	C4-N3	4.74	1.41	1.34
4	C	10	C49	F-C5	-4.55	1.33	1.42
2	P	9	M2L	O-C	4.27	1.36	1.20
2	Q	9	M2L	O-C	4.04	1.35	1.20
3	B	7	5MC	C3'-C4'	3.27	1.61	1.53
3	B	7	5MC	C2-N1	3.20	1.46	1.40
3	B	7	5MC	C4-N4	3.14	1.42	1.34
3	B	7	5MC	C5-C4	3.03	1.46	1.44
4	C	10	C49	O3'-C3'	3.03	1.49	1.43
3	B	7	5MC	C6-N1	2.53	1.42	1.38
4	C	10	C49	C4-N4	2.07	1.31	1.27

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	10	C49	F-C5-CM5	-5.57	98.85	106.49
4	C	10	C49	N3-C2-N1	4.68	121.35	116.65
4	C	10	C49	O2-C2-N1	-3.43	118.97	123.10
3	B	7	5MC	C2'-C3'-C4'	3.19	109.28	102.80
3	B	7	5MC	C5-C6-N1	-3.10	119.95	123.31
2	Q	9	M2L	CB-SG-CD	-2.44	95.01	102.26
2	Q	9	M2L	CM2-NZ-CM1	2.34	115.72	109.72
3	B	7	5MC	C5'-C4'-C3'	-2.20	102.36	114.64
4	C	10	C49	C2'-C1'-N1	-2.11	113.08	115.59

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	10	C49	O4'-C1'-N1-C6
3	B	7	5MC	C3'-C4'-C5'-O5'
4	C	10	C49	C3'-C4'-C5'-O5'
2	Q	9	M2L	SG-CD-CE-NZ
3	B	7	5MC	O4'-C4'-C5'-O5'
4	C	10	C49	O4'-C4'-C5'-O5'
4	C	10	C49	C2'-C1'-N1-C6
2	Q	9	M2L	CA-CB-SG-CD
2	Q	9	M2L	CD-CE-NZ-CM2
4	C	10	C49	C2'-C1'-N1-C2
4	C	10	C49	O4'-C1'-N1-C2
4	C	10	C49	C4'-C5'-O5'-P
2	P	9	M2L	CA-CB-SG-CD

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	7	5MC	3	0
2	Q	9	M2L	1	0
4	C	10	C49	1	0

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

1 ligand 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
5	SAH	A	1000	-	27,28,28	1.01	3 (11%)	36,40,40	2.06	9 (25%)

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
5	SAH	A	1000	-	-	4/15/31/31	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	1000	SAH	C2-N1	2.22	1.37	1.33
5	A	1000	SAH	C2-N3	2.22	1.37	1.33
5	A	1000	SAH	C8-N7	2.15	1.35	1.31

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1000	SAH	N3-C2-N1	-5.62	120.07	128.58
5	A	1000	SAH	C5-C4-N3	-4.65	120.31	126.72
5	A	1000	SAH	N9-C8-N7	-4.20	107.98	113.94
5	A	1000	SAH	C5-N7-C8	3.80	109.42	103.45
5	A	1000	SAH	C2-N3-C4	3.59	120.60	111.83
5	A	1000	SAH	N3-C4-N9	2.83	131.99	127.17
5	A	1000	SAH	C4-C5-N7	-2.81	107.37	110.58
5	A	1000	SAH	OXT-C-O	-2.66	118.06	124.08
5	A	1000	SAH	C5'-SD-CG	-2.57	94.64	102.26

There are no chirality outliers.

All (4) torsion outliers are listed below:

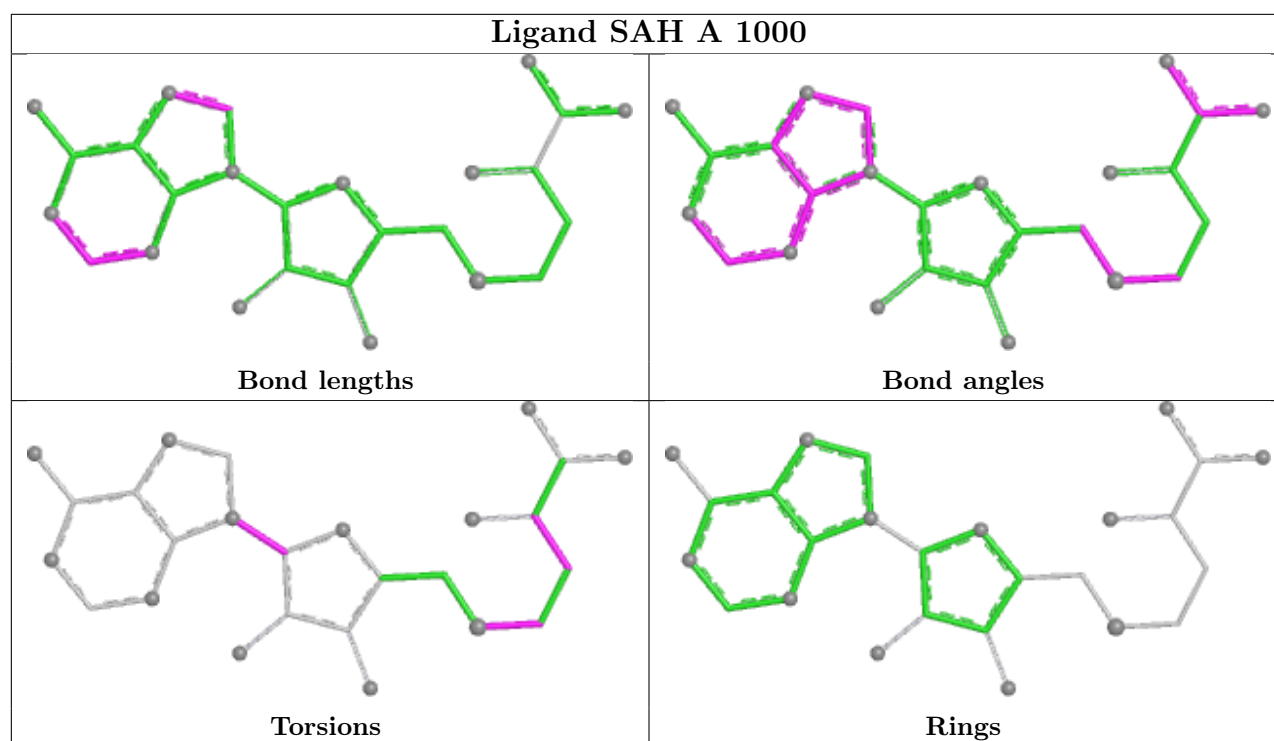
Mol	Chain	Res	Type	Atoms
5	A	1000	SAH	N-CA-CB-CG
5	A	1000	SAH	C-CA-CB-CG
5	A	1000	SAH	CB-CG-SD-C5'
5	A	1000	SAH	C2'-C1'-N9-C8

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1000	SAH	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

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	708/783 (90%)	1.05	71 (10%) 12 9	34, 69, 109, 160	1 (0%)
2	P	19/33 (57%)	2.35	9 (47%) 0 0	75, 95, 131, 142	0
2	Q	11/33 (33%)	2.27	7 (63%) 0 0	81, 108, 127, 135	0
3	B	17/18 (94%)	0.55	0 100 100	77, 90, 136, 138	0
4	C	17/18 (94%)	0.56	0 100 100	73, 95, 131, 137	0
All	All	772/885 (87%)	1.08	87 (11%) 10 7	34, 71, 116, 160	1 (0%)

All (87) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	889	VAL	7.5
1	A	309	SER	5.8
2	P	24	ALA	5.5
2	P	2	ARG	5.1
1	A	416	VAL	4.9
1	A	888	SER	4.3
1	A	680	GLY	4.3
1	A	417	GLN	4.2
1	A	338	THR	4.1
1	A	430	ALA	4.0
1	A	751	ALA	3.9
2	Q	11	THR	3.7
1	A	429	GLN	3.6
1	A	285	GLN	3.5
2	Q	1	ALA	3.4
1	A	133	HIS	3.4
2	P	6	THR	3.4
2	P	3	THR	3.3
1	A	735	VAL	3.3
1	A	432	GLU	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	749	VAL	3.3
2	P	15	ALA	3.2
1	A	750	GLY	3.2
2	Q	4	LYS	3.2
2	Q	0	SER	3.2
1	A	282	ALA	3.1
1	A	157	ARG	3.1
1	A	777	ALA	3.0
1	A	753	ASN	2.9
2	Q	3	THR	2.9
1	A	277	ASN	2.9
2	P	10	SER	2.8
1	A	287	ILE	2.7
1	A	885	SER	2.7
1	A	798	VAL	2.7
1	A	664	ASP	2.7
2	P	14	LYS	2.6
1	A	280	PRO	2.6
1	A	701	TRP	2.6
1	A	248	PRO	2.6
1	A	570	GLY	2.6
1	A	675	ASP	2.6
1	A	757	TRP	2.5
1	A	755	VAL	2.5
1	A	475	THR	2.4
1	A	138	ILE	2.4
1	A	249	ARG	2.4
1	A	433	ASP	2.4
1	A	745	LYS	2.4
1	A	780	PHE	2.4
1	A	198	GLU	2.4
2	P	23	LYS	2.3
1	A	457	GLU	2.3
1	A	435	PRO	2.3
1	A	673	PRO	2.3
1	A	631	GLY	2.3
1	A	171	LYS	2.3
1	A	243	GLY	2.3
1	A	705	GLU	2.2
1	A	438	LYS	2.2
1	A	541[A]	MET	2.2
1	A	244	HIS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	665	LEU	2.2
2	Q	8	ARG	2.2
1	A	747	VAL	2.2
2	Q	5	GLN	2.2
1	A	767	SER	2.2
2	P	17	ARG	2.1
1	A	715	LEU	2.1
1	A	281	LYS	2.1
1	A	453	GLY	2.1
1	A	748	ARG	2.1
1	A	308	ILE	2.1
1	A	781	ILE	2.1
1	A	730	VAL	2.1
1	A	236	LEU	2.1
1	A	242	ASP	2.1
1	A	550	TYR	2.1
1	A	758	ASP	2.1
1	A	276	PRO	2.1
1	A	443	VAL	2.1
1	A	168	GLU	2.1
1	A	766	LEU	2.1
1	A	431	ASP	2.1
1	A	707	ALA	2.0
1	A	439	ASP	2.0
1	A	498	LYS	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
2	M2L	Q	9	11/12	0.89	0.17	77,87,92,95	0
3	5MC	B	7	20/22	0.91	0.12	75,83,89,91	0
4	C49	C	10	21/23	0.92	0.14	61,71,80,83	0
2	M2L	P	9	11/12	0.97	0.11	57,67,82,85	0

6.3 Carbohydrates [i](#)

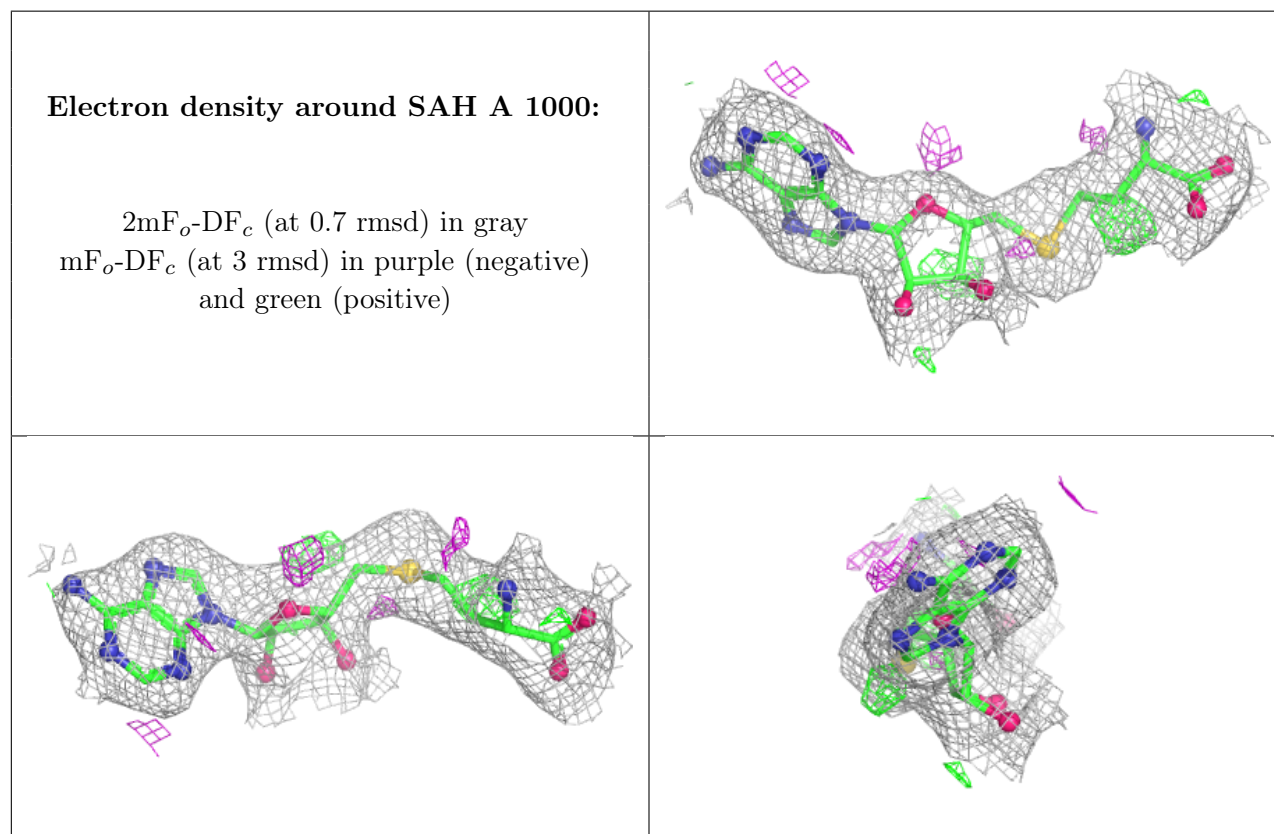
There are no oligosaccharides in this entry.

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($\text{\AA}^2$)	Q<0.9
5	SAH	A	1000	26/26	0.93	0.11	55,64,69,75	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.