



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2024 – 08:30 pm BST

PDB ID : 6F57  
Title : Crystal structure of DNMT3A-DNMT3L in complex with single CpG-containing DNA  
Authors : Zhang, Z.M.; Song, J.  
Deposited on : 2017-12-01  
Resolution : 3.10 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](mailto: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>.

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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, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

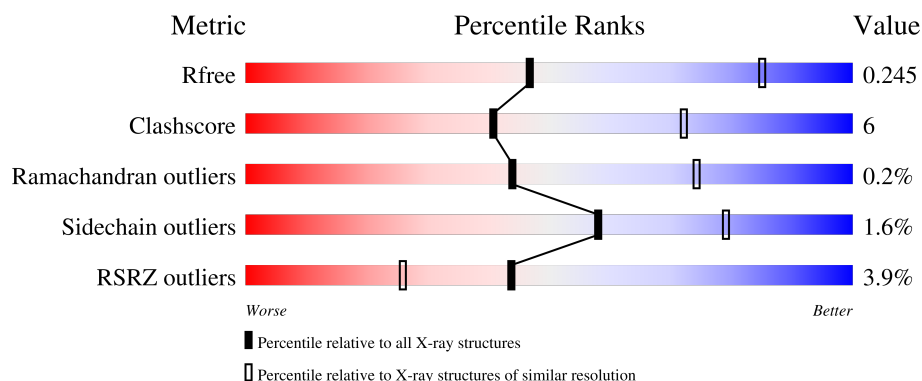
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*






The reported resolution of this entry is 3.10 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))
$R_{free}$	164625	1351 (3.10-3.10)
Clashscore	180529	1454 (3.10-3.10)
Ramachandran outliers	177936	1391 (3.10-3.10)
Sidechain outliers	177891	1391 (3.10-3.10)
RSRZ outliers	164620	1351 (3.10-3.10)

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  $\geq 3$ , 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	285	 81% 18% .
1	D	285	 80% 19% .
2	B	209	 12% 62% 10% 28%
2	C	209	 4% 60% 11% 28%
3	E	10	 80% 20%

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Mol	Chain	Length	Quality of chain
3	G	10	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>10%90%10%</div>
4	F	11	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>9%18%64%9%9%</div>
4	H	11	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <div>64%18%9%9%</div>

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7613 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 3A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	285	Total	C	N	O	S	0	0	0
			2263	1443	405	402	13			
1	D	283	Total	C	N	O	S	0	0	0
			2244	1434	400	397	13			

- Molecule 2 is a protein called DNA (cytosine-5)-methyltransferase 3-like.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	150	Total	C	N	O	S	0	0	0
			1102	724	183	193	2			
2	C	151	Total	C	N	O	S	0	0	0
			1147	760	188	197	2			

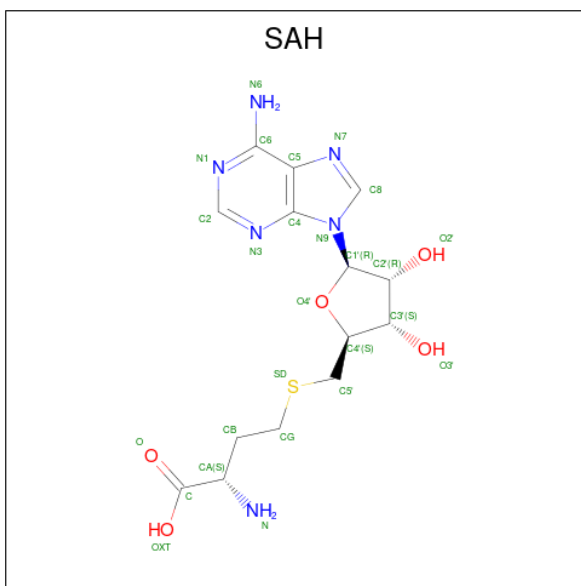
- Molecule 3 is a DNA chain called DNA (5'-D(\*AP\*GP\*AP\*GP\*CP\*GP\*CP\*AP\*TP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	10	Total	C	N	O	P	0	0	0
			206	98	43	56	9			
3	G	10	Total	C	N	O	P	0	0	0
			206	98	43	56	9			

- Molecule 4 is a DNA chain called DNA (5'-D(\*CP\*AP\*TP\*GP\*ZP\*GP\*CP\*TP\*CP\*T)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	F	10	Total	C	N	O	P	0	0	0
			197	96	32	60	9			
4	H	10	Total	C	N	O	P	0	0	0
			196	96	32	59	9			

- Molecule 5 is S-ADENOSYL-L-HOMOCYSTEINE (three-letter code: SAH) (formula:

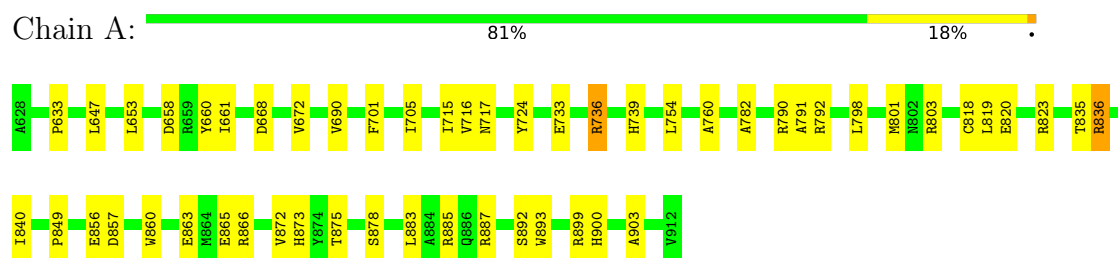
$\text{C}_{14}\text{H}_{20}\text{N}_6\text{O}_5\text{S}).$ 

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

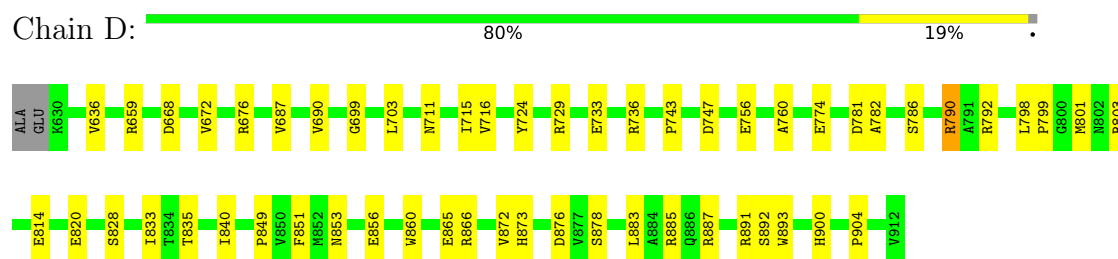
### 3 Residue-property plots

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.

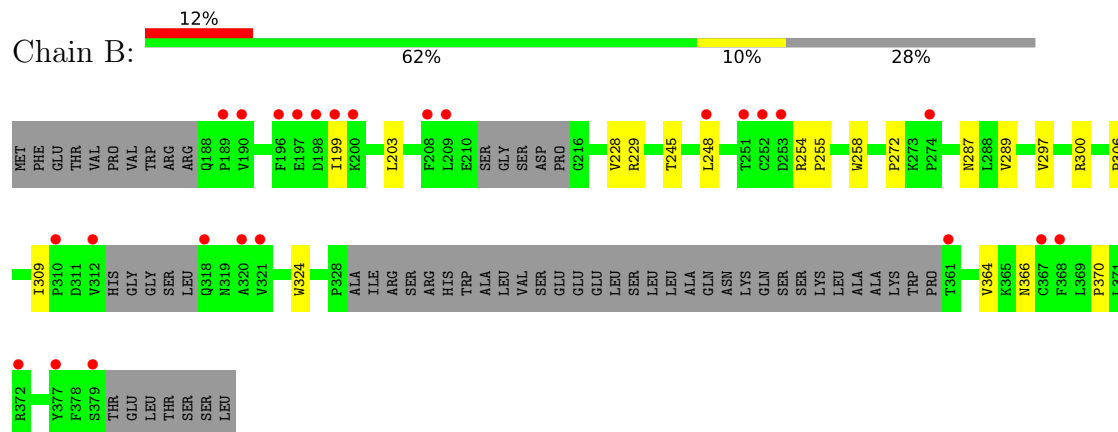
- Molecule 1: DNA (cytosine-5)-methyltransferase 3A



- Molecule 1: DNA (cytosine-5)-methyltransferase 3A

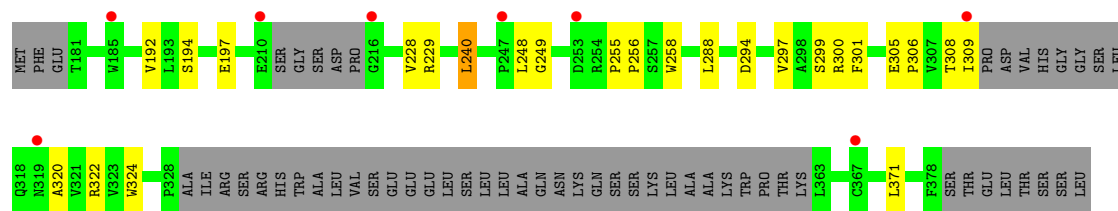


- Molecule 2: DNA (cytosine-5)-methyltransferase 3-like



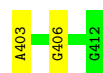
- Molecule 2: DNA (cytosine-5)-methyltransferase 3-like





- Molecule 3: DNA (5'-D(\*AP\*GP\*AP\*GP\*CP\*GP\*CP\*AP\*TP\*G)-3')

Chain E: 80% 20%



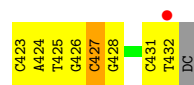
- Molecule 3: DNA (5'-D(\*AP\*GP\*AP\*GP\*CP\*GP\*CP\*AP\*TP\*G)-3')

Chain G: 10% 90% 10%



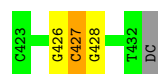
- Molecule 4: DNA (5'-D(\*CP\*AP\*TP\*GP\*ZP\*GP\*CP\*TP\*CP\*T)-3')

Chain F: 9% 18% 64% 9% 9%



- Molecule 4: DNA (5'-D(\*CP\*AP\*TP\*GP\*ZP\*GP\*CP\*TP\*CP\*T)-3')

Chain H: 64% 18% 9% 9%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	176.61Å 49.56Å 162.26Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.72 – 3.10 47.72 – 3.10	Depositor EDS
% Data completeness (in resolution range)	99.3 (47.72-3.10) 99.2 (47.72-3.10)	Depositor EDS
$R_{merge}$	0.18	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.57 (at 3.12Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.211 , 0.242 0.215 , 0.245	Depositor DCC
$R_{free}$ test set	24821 reflections (7.58%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	61.3	Xtriage
Anisotropy	0.437	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 64.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	7613	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	70.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.79% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: Z, SAH

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	0.26	0/2317	0.42	0/3134
1	D	0.25	0/2298	0.42	0/3110
2	B	0.23	0/1136	0.43	0/1559
2	C	0.26	0/1186	0.44	0/1626
3	E	0.53	0/232	0.77	0/357
3	G	0.53	0/232	0.80	0/357
4	F	0.51	0/198	0.93	0/301
4	H	0.49	0/197	0.92	0/300
All	All	0.29	0/7796	0.50	0/10744

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 [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	2263	0	2216	33	0
1	D	2244	0	2202	39	0
2	B	1102	0	968	10	0
2	C	1147	0	1016	15	0
3	E	206	0	113	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	G	206	0	113	2	0
4	F	197	0	113	7	0
4	H	196	0	110	4	0
5	A	26	0	19	0	0
5	D	26	0	19	1	0
All	All	7613	0	6889	93	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 6.

All (93) 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:690:VAL:O	1:A:736:ARG:NH2	2.07	0.87
1:A:803:ARG:NH2	1:A:900:HIS:O	2.20	0.74
2:C:308:THR:HG22	2:C:322:ARG:HG2	1.70	0.73
1:D:883:LEU:HD21	3:G:403:DA:H2'	1.73	0.70
2:C:194:SER:OG	2:C:197:GLU:O	2.11	0.66
2:B:309:ILE:HD12	2:B:364:VAL:HG12	1.77	0.66
2:C:294:ASP:OD1	1:D:729:ARG:NH2	2.31	0.63
2:C:297:VAL:HG22	2:C:300:ARG:HH12	1.63	0.63
1:A:885:ARG:NH2	1:D:876:ASP:OD1	2.31	0.62
2:C:240:LEU:HD13	2:C:371:LEU:HD11	1.82	0.62
2:B:248:LEU:HD13	2:B:289:VAL:HG23	1.81	0.61
1:D:756:GLU:OE1	1:D:893:TRP:NE1	2.34	0.61
1:D:840:ILE:HG22	1:D:849:PRO:HG3	1.83	0.60
1:A:782:ALA:HB3	1:A:790:ARG:HB2	1.82	0.60
2:C:229:ARG:NH1	1:D:774:GLU:OE1	2.36	0.58
2:B:297:VAL:HG22	2:B:300:ARG:HH12	1.68	0.58
1:D:792:ARG:NH2	4:H:427:Z:O4'	2.38	0.57
1:D:799:PRO:HG2	1:D:904:PRO:HB2	1.87	0.57
2:B:228:VAL:HG12	2:B:229:ARG:H	1.71	0.56
2:B:199:ILE:O	2:B:203:LEU:N	2.36	0.56
1:A:647:LEU:HD12	1:A:660:TYR:CG	2.40	0.56
1:D:892:SER:OG	1:D:893:TRP:N	2.39	0.55
1:A:840:ILE:HG22	1:A:849:PRO:HG3	1.88	0.55
1:D:790:ARG:NH2	1:D:833:ILE:O	2.40	0.54
1:D:715:ILE:HG12	1:D:760:ALA:HB1	1.90	0.54
1:A:705:ILE:HG22	1:A:754:LEU:HB3	1.91	0.53
1:D:820:GLU:OE2	1:D:866:ARG:NH2	2.41	0.52
1:A:724:TYR:CZ	2:B:258:TRP:HD1	2.28	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:633:PRO:HB2	1:A:658:ASP:HB2	1.91	0.52
1:D:690:VAL:O	1:D:736:ARG:NH2	2.44	0.51
1:A:791:ALA:O	1:A:792:ARG:HD2	2.09	0.51
1:A:878:SER:HA	1:D:860:TRP:CE2	2.46	0.51
1:A:836:ARG:NH1	3:E:406:DG:N7	2.59	0.50
1:D:743:PRO:HB3	1:D:747:ASP:HB3	1.94	0.50
1:D:798:LEU:O	1:D:801:MET:HG3	2.12	0.50
1:D:716:VAL:HB	4:H:426:DG:H1'	1.94	0.50
1:A:835:THR:HG22	1:A:887:ARG:HA	1.94	0.49
1:A:883:LEU:HD21	3:E:403:DA:H2'	1.95	0.49
2:B:306:PRO:HB3	2:B:324:TRP:CE2	2.47	0.49
2:C:228:VAL:HG12	2:C:229:ARG:N	2.26	0.49
2:C:258:TRP:HD1	1:D:724:TYR:CZ	2.30	0.49
2:C:306:PRO:HB3	2:C:324:TRP:CE2	2.47	0.49
1:A:883:LEU:HD12	1:A:883:LEU:H	1.78	0.49
2:B:245:THR:O	2:B:287:ASN:ND2	2.45	0.49
1:A:819:LEU:HA	1:A:863:GLU:HG2	1.94	0.48
2:C:248:LEU:HD12	2:C:249:GLY:H	1.79	0.48
2:C:305:GLU:HG3	2:C:306:PRO:HD2	1.96	0.48
1:A:823:ARG:NH1	1:A:857:ASP:OD2	2.30	0.47
1:D:659:ARG:HH22	1:D:699:GLY:HA3	1.79	0.47
1:D:883:LEU:HD12	1:D:883:LEU:H	1.79	0.47
1:A:716:VAL:HB	4:F:426:DG:H1'	1.97	0.47
1:D:711:ASN:HA	4:H:428:DG:H5''	1.96	0.47
1:D:781:ASP:HA	1:D:790:ARG:O	2.15	0.47
1:D:636:VAL:HG22	1:D:703:LEU:HB3	1.97	0.47
2:C:192:VAL:HG12	2:C:240:LEU:HB3	1.97	0.46
1:D:835:THR:OG1	4:H:428:DG:OP1	2.22	0.46
1:A:803:ARG:HH22	1:A:903:ALA:HB3	1.80	0.46
1:D:799:PRO:O	1:D:904:PRO:HG2	2.15	0.46
1:A:661:ILE:HD12	1:A:701:PHE:HZ	1.81	0.45
1:A:823:ARG:HH21	1:A:863:GLU:CD	2.19	0.45
1:A:875:THR:O	1:A:885:ARG:HD3	2.16	0.45
1:D:668:ASP:O	1:D:672:VAL:HG23	2.17	0.45
1:A:715:ILE:HG12	1:A:760:ALA:HB1	1.97	0.45
1:D:803:ARG:NH2	1:D:900:HIS:O	2.50	0.45
1:A:798:LEU:O	1:A:801:MET:HG3	2.17	0.45
4:F:425:DT:H2''	4:F:426:DG:C8	2.52	0.45
1:A:653:LEU:HD21	1:A:899:ARG:HG3	1.99	0.44
1:D:814:GLU:OE1	1:D:828:SER:OG	2.35	0.44
1:D:883:LEU:HD11	3:G:403:DA:H5''	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:892:SER:OG	1:A:893:TRP:N	2.50	0.44
1:A:818:CYS:O	1:A:866:ARG:HD2	2.17	0.44
1:D:887:ARG:O	1:D:891:ARG:HG3	2.17	0.44
1:D:865:GLU:OE2	1:D:885:ARG:NH1	2.45	0.44
4:F:428:DG:H2'	4:F:428:DG:OP2	2.18	0.43
4:F:423:DC:H2''	4:F:424:DA:C8	2.53	0.43
1:D:687:VAL:HG22	5:D:1001:SAH:N1	2.33	0.43
2:B:366:ASN:O	2:B:370:PRO:HD3	2.19	0.43
1:D:851:PHE:CD2	1:D:856:GLU:HG3	2.54	0.43
1:D:676:ARG:HA	1:D:676:ARG:HD3	1.82	0.42
1:A:860:TRP:CE2	1:D:878:SER:HA	2.53	0.42
1:A:872:VAL:HG12	1:A:873:HIS:CD2	2.54	0.42
1:A:717:ASN:HB2	4:F:428:DG:O4'	2.19	0.42
1:A:668:ASP:O	1:A:672:VAL:HG23	2.20	0.42
1:D:872:VAL:HG12	1:D:873:HIS:CD2	2.55	0.41
2:B:254:ARG:HA	2:B:255:PRO:HD3	1.94	0.41
1:A:792:ARG:NH1	4:F:427:Z:O4'	2.54	0.41
4:F:431:DC:H2''	4:F:432:DT:C6	2.56	0.41
2:C:288:LEU:HD11	2:C:320:ALA:HB3	2.03	0.40
2:C:255:PRO:HA	2:C:256:PRO:HD3	1.91	0.40
1:A:865:GLU:OE1	1:A:875:THR:OG1	2.38	0.40
2:C:301:PHE:CE1	1:D:736:ARG:HB2	2.57	0.40
1:D:782:ALA:HB3	1:D:790:ARG:HB2	2.03	0.40
1:D:782:ALA:O	1:D:786:SER:N	2.54	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	283/285 (99%)	268 (95%)	14 (5%)	1 (0%)	30 63

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	281/285 (99%)	265 (94%)	16 (6%)	0	100	100
2	B	142/209 (68%)	131 (92%)	10 (7%)	1 (1%)	19	51
2	C	143/209 (68%)	137 (96%)	6 (4%)	0	100	100
All	All	849/988 (86%)	801 (94%)	46 (5%)	2 (0%)	44	74

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	272	PRO
1	A	736	ARG

### 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	239/250 (96%)	234 (98%)	5 (2%)	48	72
1	D	238/250 (95%)	235 (99%)	3 (1%)	65	82
2	B	102/191 (53%)	102 (100%)	0	100	100
2	C	107/191 (56%)	104 (97%)	3 (3%)	38	66
All	All	686/882 (78%)	675 (98%)	11 (2%)	58	79

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	733	GLU
1	A	739	HIS
1	A	820	GLU
1	A	836	ARG
1	A	856	GLU
2	C	240	LEU
2	C	299	SER
2	C	309	ILE
1	D	733	GLU

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Mol	Chain	Res	Type
1	D	790	ARG
1	D	853	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	287	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 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
4	Z	F	427	4,1	15,19,20	3.89	8 (53%)	20,26,29	1.76	4 (20%)
4	Z	H	427	4,1	15,19,20	3.84	9 (60%)	20,26,29	1.89	5 (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
4	Z	F	427	4,1	-	4/7/21/22	0/2/2/2
4	Z	H	427	4,1	-	4/7/21/22	0/2/2/2

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	F	427	Z	C3'-C4'	-8.33	1.30	1.53
4	H	427	Z	C3'-C4'	-7.77	1.31	1.53
4	H	427	Z	O4'-C4'	7.22	1.61	1.45
4	F	427	Z	O4'-C4'	6.56	1.59	1.45
4	H	427	Z	O4'-C1'	-5.38	1.30	1.42
4	F	427	Z	C6-C5	5.13	1.47	1.35
4	F	427	Z	O4'-C1'	-5.12	1.30	1.42
4	F	427	Z	C5-C4	4.68	1.49	1.40
4	H	427	Z	C6-C5	4.56	1.45	1.35
4	H	427	Z	C5-C4	4.49	1.49	1.40
4	H	427	Z	C2-N1	3.90	1.48	1.40
4	F	427	Z	C2-N1	3.72	1.48	1.40
4	H	427	Z	O3'-C3'	3.38	1.50	1.43
4	F	427	Z	O3'-C3'	3.31	1.50	1.43
4	H	427	Z	C4-N3	2.07	1.41	1.33
4	F	427	Z	C1'-N1	2.05	1.53	1.48
4	H	427	Z	C6-N1	2.01	1.42	1.38

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	427	Z	C5-C4-N3	-5.05	118.09	124.29
4	H	427	Z	C5-C4-N3	-3.93	119.47	124.29
4	H	427	Z	O4'-C1'-N1	3.77	114.59	107.86
4	F	427	Z	C6-C5-C4	3.23	122.69	118.84
4	F	427	Z	C5-C6-N1	-3.13	118.02	121.19
4	H	427	Z	C2'-C1'-N1	-2.76	107.41	113.77
4	H	427	Z	C5-C6-N1	-2.55	118.61	121.19
4	H	427	Z	O3'-C3'-C2'	-2.40	102.32	110.90
4	F	427	Z	C4'-O4'-C1'	-2.31	103.87	109.45

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	F	427	Z	C2'-C1'-N1-C6
4	H	427	Z	C2'-C1'-N1-C6
4	H	427	Z	C2'-C1'-N1-C2
4	F	427	Z	C2'-C1'-N1-C2
4	H	427	Z	O4'-C1'-N1-C6
4	F	427	Z	O4'-C1'-N1-C6
4	F	427	Z	O4'-C1'-N1-C2
4	H	427	Z	O4'-C1'-N1-C2

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	F	427	Z	1	0
4	H	427	Z	1	0

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

2 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
5	SAH	D	1001	-	24,28,28	1.22	3 (12%)	25,40,40	1.66	5 (20%)
5	SAH	A	1001	-	24,28,28	1.20	3 (12%)	25,40,40	1.67	5 (20%)

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	D	1001	-	-	5/11/31/31	0/3/3/3
5	SAH	A	1001	-	-	2/11/31/31	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	1001	SAH	C2-N3	4.04	1.38	1.32
5	A	1001	SAH	C2-N3	4.04	1.38	1.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	1001	SAH	C2-N1	2.56	1.38	1.33
5	A	1001	SAH	C2-N1	2.34	1.38	1.33
5	A	1001	SAH	OXT-C	-2.11	1.23	1.30
5	D	1001	SAH	OXT-C	-2.08	1.23	1.30

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1001	SAH	N3-C2-N1	-5.56	119.99	128.68
5	D	1001	SAH	N3-C2-N1	-5.52	120.05	128.68
5	D	1001	SAH	C5'-SD-CG	-3.38	92.13	102.27
5	A	1001	SAH	C5'-SD-CG	-3.20	92.67	102.27
5	A	1001	SAH	OXT-C-O	-2.70	117.95	124.09
5	D	1001	SAH	OXT-C-O	-2.62	118.13	124.09
5	D	1001	SAH	C3'-C2'-C1'	2.60	104.90	100.98
5	A	1001	SAH	C3'-C2'-C1'	2.60	104.89	100.98
5	A	1001	SAH	OXT-C-CA	2.26	121.08	113.38
5	D	1001	SAH	OXT-C-CA	2.06	120.41	113.38

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1001	SAH	N-CA-CB-CG
5	A	1001	SAH	C-CA-CB-CG
5	D	1001	SAH	N-CA-CB-CG
5	D	1001	SAH	C-CA-CB-CG
5	D	1001	SAH	O-C-CA-CB
5	D	1001	SAH	OXT-C-CA-CB
5	D	1001	SAH	CB-CG-SD-C5'

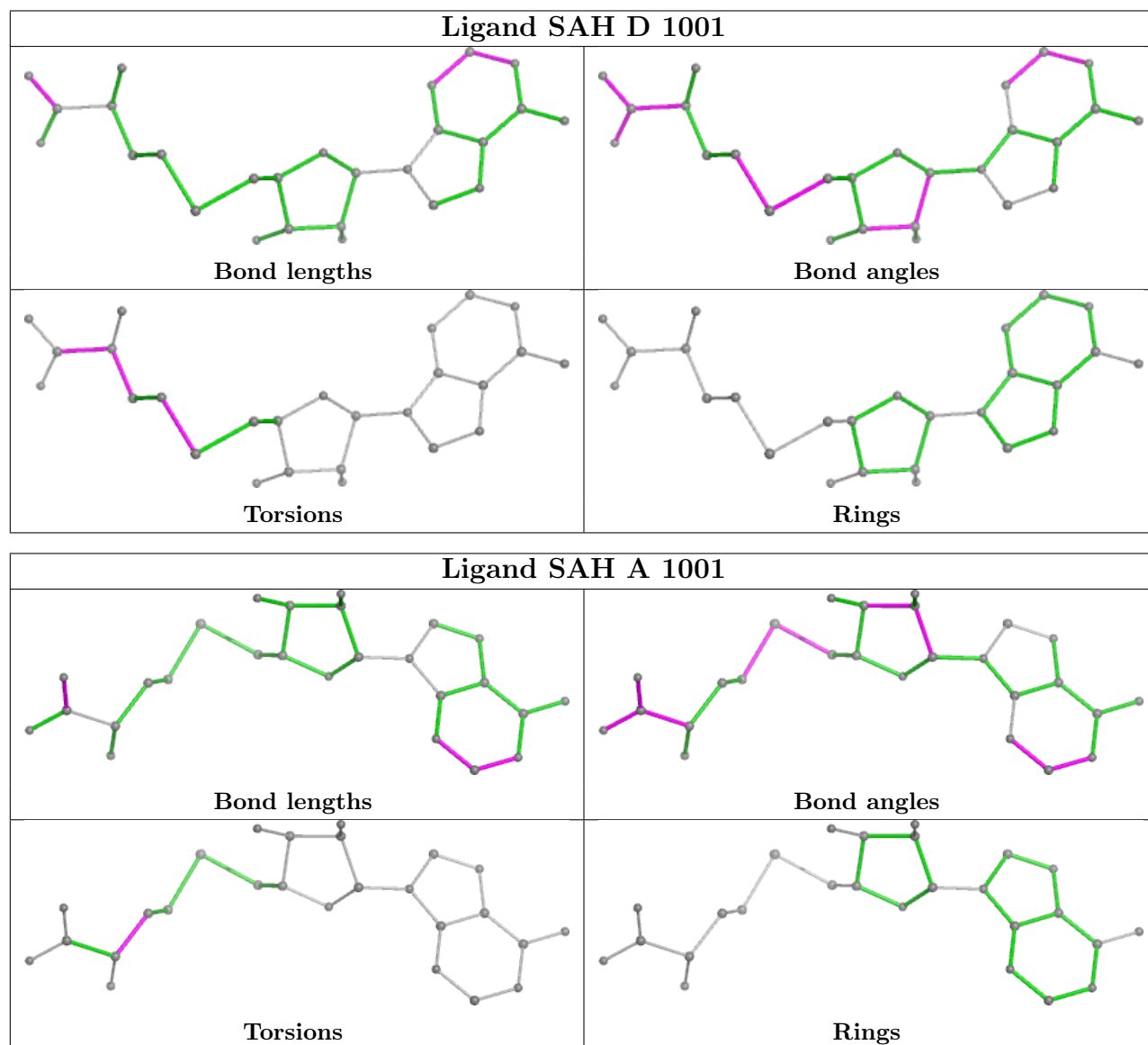
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	1001	SAH	1	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 ⓘ

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	285/285 (100%)	-0.47	0 100 100	24, 40, 68, 92	0
1	D	283/285 (99%)	-0.22	0 100 100	34, 58, 91, 132	0
2	B	150/209 (71%)	0.84	25 (16%) 5 3	48, 104, 150, 178	0
2	C	151/209 (72%)	0.46	8 (5%) 33 20	67, 104, 136, 147	0
3	E	10/10 (100%)	0.20	0 100 100	72, 76, 100, 107	0
3	G	10/10 (100%)	0.19	1 (10%) 14 8	87, 94, 114, 115	0
4	F	9/11 (81%)	0.18	1 (11%) 12 7	44, 55, 90, 129	0
4	H	9/11 (81%)	0.21	0 100 100	60, 77, 109, 128	0
All	All	907/1030 (88%)	0.01	35 (3%) 44 26	24, 64, 133, 178	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	210	GLU	3.8
4	F	432	DT	3.3
2	B	197	GLU	3.1
2	B	209	LEU	3.0
2	B	379	SER	3.0
2	B	253	ASP	2.9
2	B	252	CYS	2.8
2	B	318	GLN	2.7
2	B	321	VAL	2.6
2	B	312	VAL	2.6
2	C	247	PRO	2.5
2	B	190	VAL	2.5
2	C	216	GLY	2.5
2	B	198	ASP	2.4
2	B	377	TYR	2.4
2	C	309	ILE	2.4

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Mol	Chain	Res	Type	RSRZ
2	B	361	THR	2.4
2	B	248	LEU	2.4
2	B	274	PRO	2.3
2	B	208	PHE	2.3
2	B	368	PHE	2.3
2	B	310	PRO	2.3
3	G	403	DA	2.3
2	C	319	ASN	2.2
2	B	367	CYS	2.2
2	B	372	ARG	2.2
2	B	251	THR	2.2
2	B	200	LYS	2.2
2	C	253	ASP	2.2
2	B	320	ALA	2.1
2	B	189	PRO	2.1
2	B	196	PHE	2.1
2	C	185	TRP	2.1
2	B	199	ILE	2.0
2	C	367	CYS	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
4	Z	F	427	18/19	0.96	0.11	41,49,66,76	0
4	Z	H	427	18/19	0.96	0.09	46,55,66,70	0

## 6.3 Carbohydrates [i](#)

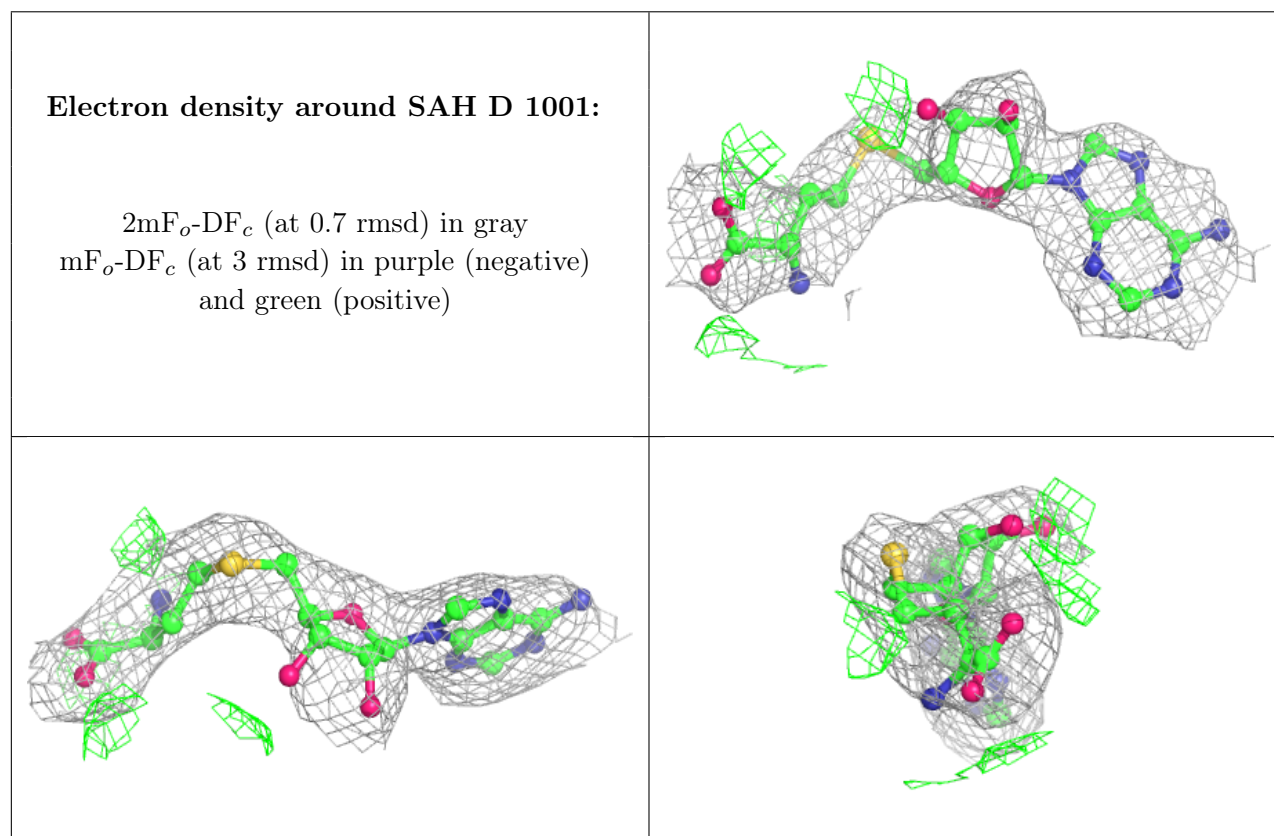
There are no monosaccharides in this entry.

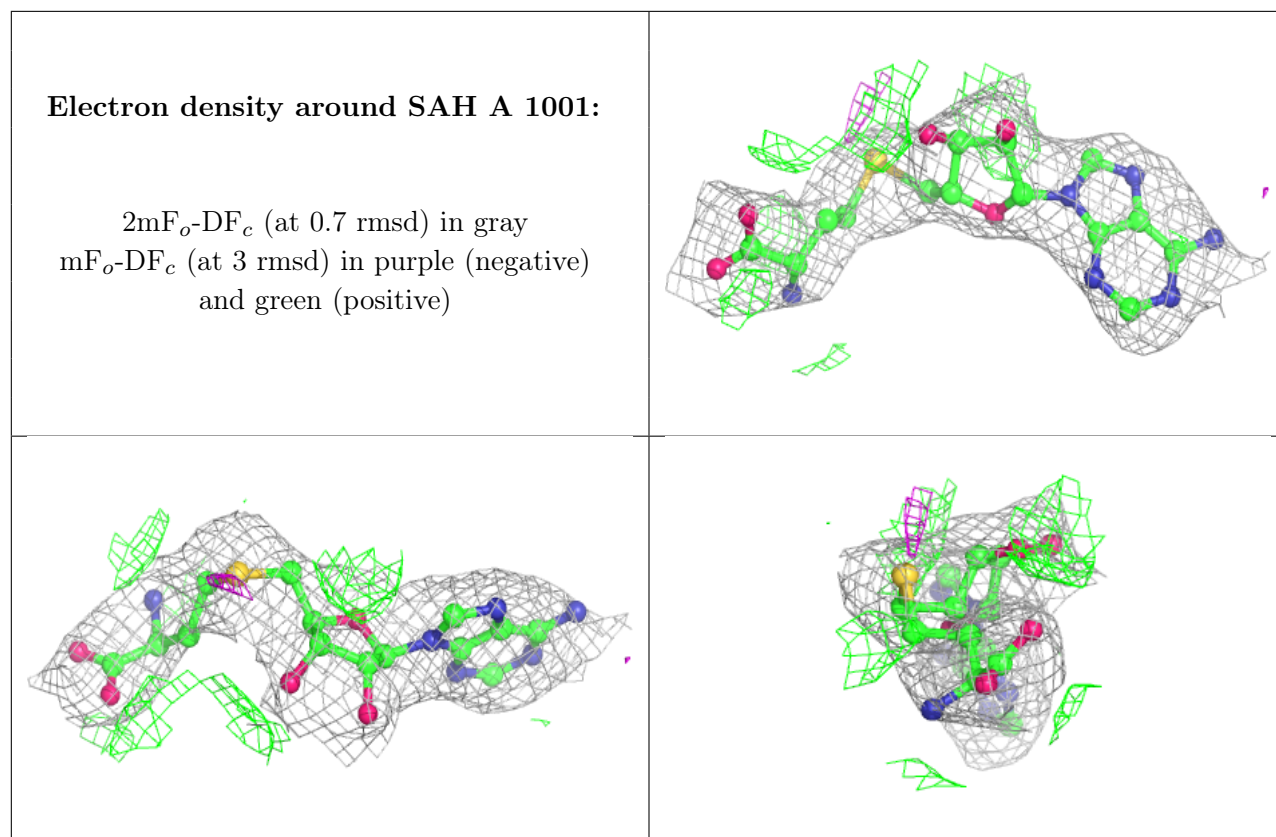
## 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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	D	1001	26/26	0.87	0.14	37,59,78,86	0
5	SAH	A	1001	26/26	0.93	0.10	30,45,55,58	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.