Full wwPDB X-ray Structure Validation Report ⓘ

Feb 11, 2024 – 05:49 PM EST

PDB ID	:	3EEO
Title	:	M. HhaI co-crystallized with synthetic dsDNA containing a propane diol in place of the deoxycytidine residue targeted for methylation.
Authors	:	Porta, J.C.; Christman, J.K.; Borgstahl, G.E.O.
Deposited on	:	2008-09-05
Resolution	:	1.94 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:

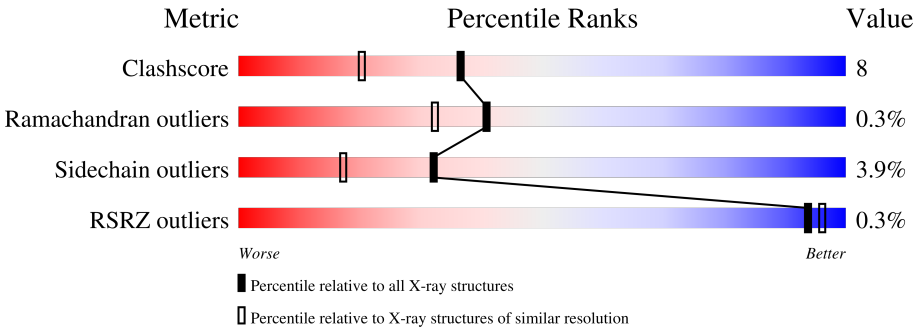
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.94 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))
Clashscore	141614	1023 (1.94-1.94)
Ramachandran outliers	138981	1007 (1.94-1.94)
Sidechain outliers	138945	1007 (1.94-1.94)
RSRZ outliers	127900	4250 (1.96-1.92)

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 <=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	C	12	8% 25% 58% 8%
2	D	12	8% 33% 33% 25%
3	A	327	85% 13% .

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 3226 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 DNA chain called 5'-D(P*DCP*DCP*DAP*DTP*DGP*DCP*DGP*DCP*DTP*DGP*DAP*DC)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	12	Total	C	N	O	P	0	0	0
			243	115	44	72	12			

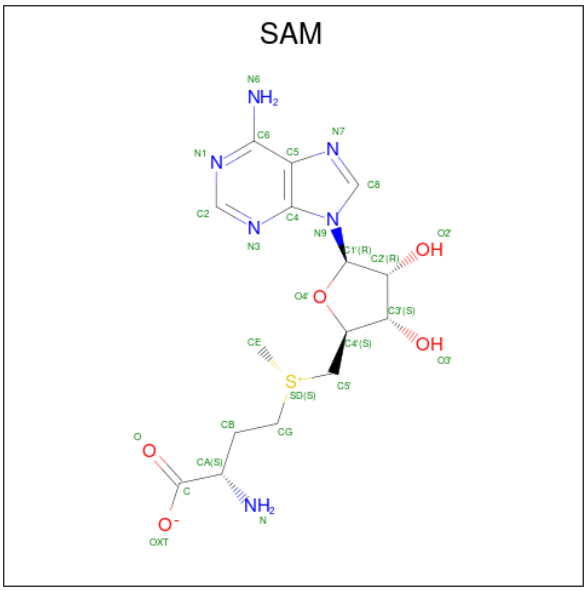
- Molecule 2 is a DNA chain called 5'-D(P*DGP*DTP*DCP*DAP*DGP*(PDI)P*DGP*DCP*DAP*DTP*DGP*DG)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	12	Total	C	N	O	P	0	0	0
			238	111	45	70	12			

- Molecule 3 is a protein called Modification methylase HhaI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	327	Total	C	N	O	S	0	0	0
			2606	1662	444	487	13			

- Molecule 4 is S-ADENOSYLMETHIONINE (three-letter code: SAM) (formula: $C_{15}H_{22}N_6O_5S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			27	15	6	5	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	12	Total	O	0	0
			12	12		
5	D	11	Total	O	0	0
			11	11		
5	A	89	Total	O	0	0
			89	89		

3 Residue-property plots (i)

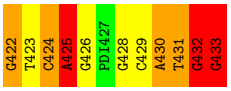
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: 5'-D(P*DCP*DCP*DAP*DTP*DGP*DCP*DGP*DCP*DTP*DGP*DAP*DC)-3
'

Chain C:

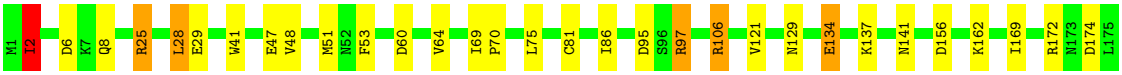
• Molecule 2: 5'-D(P*DGP*DTP*DCP*DAP*DGP*(PDI)P*DGP*DCP*DAP*DTP*DGP*DG)
-3'

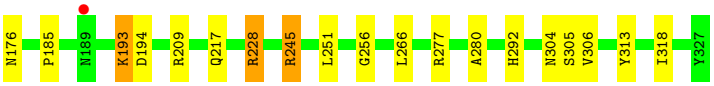
Chain D:



• Molecule 3: Modification methylase HhaI

Chain A:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α, β, γ	95.48Å 95.48Å 318.35Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	40.99 – 1.94 41.00 – 1.94	Depositor EDS
% Data completeness (in resolution range)	99.5 (40.99-1.94) 99.5 (41.00-1.94)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.32 (at 1.94Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.237 , 0.275 0.245 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	30.2	Xtriage
Anisotropy	0.004	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 48.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	3226	wwPDB-VP
Average B, all atoms (Å^2)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.99% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: SAM, PDI

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	C	3.30	34/271 (12.5%)	7.39	102/415 (24.6%)
2	D	3.66	44/257 (17.1%)	7.04	110/393 (28.0%)
3	A	0.92	2/2661 (0.1%)	0.99	14/3586 (0.4%)
All	All	1.65	80/3189 (2.5%)	3.22	226/4394 (5.1%)

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	C	0	2
2	D	0	5
All	All	0	7

All (80) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	425	DA	C5-C6	-14.39	1.28	1.41
2	D	431	DT	N1-C6	-13.69	1.28	1.38
2	D	423	DT	N1-C6	-13.31	1.28	1.38
1	C	405	DT	N1-C6	-12.45	1.29	1.38
1	C	410	DT	N1-C6	-12.12	1.29	1.38
1	C	412	DA	N9-C8	11.67	1.47	1.37
2	D	430	DA	N9-C8	11.58	1.47	1.37
1	C	410	DT	C5-C6	-10.73	1.26	1.34
2	D	432	DG	C8-N7	10.64	1.37	1.30
1	C	411	DG	C5-C6	-10.45	1.31	1.42
1	C	406	DG	C8-N7	10.42	1.37	1.30
1	C	404	DA	C5-C6	-9.69	1.32	1.41
2	D	426	DG	N7-C5	-9.50	1.33	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	404	DA	N9-C8	9.30	1.45	1.37
2	D	426	DG	N9-C4	-9.22	1.30	1.38
2	D	426	DG	C6-N1	-9.02	1.33	1.39
2	D	430	DA	C5-C6	-8.98	1.32	1.41
1	C	405	DT	C5-C6	-8.69	1.28	1.34
2	D	431	DT	C4-C5	8.61	1.52	1.45
2	D	431	DT	C5-C6	-8.54	1.28	1.34
2	D	433	DG	C5-C6	-8.34	1.34	1.42
2	D	424	DC	C5-C6	8.31	1.41	1.34
2	D	425	DA	N9-C8	8.23	1.44	1.37
2	D	422	DG	C8-N7	8.09	1.35	1.30
1	C	405	DT	N3-C4	-7.86	1.32	1.38
2	D	422	DG	C2-N3	7.78	1.39	1.32
2	D	432	DG	N7-C5	-7.67	1.34	1.39
1	C	410	DT	C4-C5	7.63	1.51	1.45
1	C	409	DC	C5-C6	7.60	1.40	1.34
1	C	411	DG	N9-C4	-7.52	1.31	1.38
2	D	430	DA	N9-C4	-7.38	1.33	1.37
2	D	423	DT	C5-C6	-7.27	1.29	1.34
2	D	422	DG	C5-C6	-7.26	1.35	1.42
1	C	405	DT	C4-C5	7.20	1.51	1.45
2	D	432	DG	C6-N1	-7.16	1.34	1.39
2	D	433	DG	C2-N3	7.07	1.38	1.32
1	C	407	DC	C5-C6	7.01	1.40	1.34
1	C	412	DA	C8-N7	6.98	1.36	1.31
1	C	413	DC	C5'-C4'	6.69	1.58	1.51
1	C	404	DA	N9-C4	-6.60	1.33	1.37
2	D	423	DT	C2-O2	6.59	1.27	1.22
1	C	404	DA	C8-N7	6.52	1.36	1.31
1	C	408	DG	C8-N7	6.49	1.34	1.30
2	D	429	DC	C5-C6	6.44	1.39	1.34
2	D	433	DG	C2-N2	6.31	1.40	1.34
2	D	423	DT	C4-C5	6.30	1.50	1.45
2	D	433	DG	N7-C5	-6.28	1.35	1.39
1	C	404	DA	N7-C5	-6.25	1.35	1.39
2	D	425	DA	C8-N7	6.06	1.35	1.31
2	D	431	DT	C4-O4	5.99	1.28	1.23
1	C	405	DT	C4-O4	5.98	1.28	1.23
1	C	405	DT	C5-C7	5.95	1.53	1.50
2	D	431	DT	N3-C4	-5.93	1.33	1.38
1	C	411	DG	C2-N3	5.83	1.37	1.32
1	C	408	DG	C6-N1	-5.68	1.35	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	413	DC	N3-C4	5.68	1.38	1.33
3	A	280	ALA	CA-CB	5.60	1.64	1.52
2	D	433	DG	C6-N1	-5.59	1.35	1.39
2	D	425	DA	N9-C4	-5.55	1.34	1.37
1	C	413	DC	N1-C2	5.54	1.45	1.40
3	A	134	GLU	CB-CG	-5.44	1.41	1.52
1	C	412	DA	C5-C6	-5.43	1.36	1.41
2	D	422	DG	N9-C4	-5.42	1.33	1.38
2	D	424	DC	N1-C2	5.42	1.45	1.40
2	D	424	DC	C4-N4	5.38	1.38	1.33
1	C	408	DG	C2-N3	5.35	1.37	1.32
1	C	402	DC	C5-C6	5.32	1.38	1.34
1	C	413	DC	C5-C6	5.26	1.38	1.34
1	C	408	DG	N9-C4	-5.25	1.33	1.38
2	D	424	DC	N1-C6	-5.24	1.34	1.37
2	D	432	DG	N9-C8	-5.18	1.34	1.37
2	D	428	DG	N9-C4	-5.18	1.33	1.38
2	D	430	DA	C8-N7	5.16	1.35	1.31
2	D	430	DA	N7-C5	-5.14	1.36	1.39
2	D	422	DG	C2-N2	5.12	1.39	1.34
2	D	433	DG	N9-C4	-5.12	1.33	1.38
1	C	407	DC	C2-O2	5.12	1.29	1.24
2	D	432	DG	N9-C4	-5.10	1.33	1.38
1	C	406	DG	C6-N1	-5.01	1.36	1.39
2	D	425	DA	N7-C5	-5.01	1.36	1.39

All (226) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	410	DT	C5-C6-N1	43.61	149.87	123.70
2	D	431	DT	C5-C6-N1	38.61	146.87	123.70
2	D	423	DT	C5-C6-N1	38.40	146.74	123.70
1	C	405	DT	C5-C6-N1	38.24	146.65	123.70
1	C	410	DT	C6-N1-C2	-37.62	102.49	121.30
1	C	405	DT	C6-N1-C2	-36.66	102.97	121.30
2	D	431	DT	C6-N1-C2	-33.83	104.39	121.30
1	C	411	DG	C5-C6-O6	-30.01	110.59	128.60
1	C	412	DA	N1-C2-N3	-27.23	115.69	129.30
2	D	423	DT	C4-C5-C6	-26.51	102.09	118.00
2	D	425	DA	N1-C6-N6	25.04	133.62	118.60
1	C	405	DT	N3-C2-O2	-22.85	108.59	122.30
2	D	423	DT	C6-N1-C2	-22.66	109.97	121.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	433	DG	C5-C6-O6	-22.44	115.14	128.60
1	C	410	DT	C4-C5-C6	-22.22	104.67	118.00
2	D	422	DG	C5-C6-O6	-20.48	116.31	128.60
2	D	431	DT	C4-C5-C6	-20.17	105.90	118.00
1	C	405	DT	C4-C5-C6	-19.40	106.36	118.00
1	C	412	DA	N7-C8-N9	-18.88	104.36	113.80
1	C	406	DG	N3-C4-C5	-18.36	119.42	128.60
1	C	413	DC	O4'-C1'-N1	18.08	120.66	108.00
2	D	431	DT	N3-C2-O2	-18.00	111.50	122.30
1	C	412	DA	C2-N3-C4	17.89	119.55	110.60
2	D	433	DG	C5-C6-N1	17.50	120.25	111.50
1	C	406	DG	C2-N3-C4	17.42	120.61	111.90
2	D	425	DA	C5-C6-N6	-17.42	109.77	123.70
1	C	410	DT	O4'-C1'-N1	17.37	120.16	108.00
1	C	410	DT	P-O3'-C3'	17.11	140.23	119.70
1	C	406	DG	C5-C6-N1	16.90	119.95	111.50
1	C	411	DG	N1-C6-O6	16.84	130.01	119.90
2	D	430	DA	N1-C6-N6	16.82	128.69	118.60
1	C	405	DT	N1-C2-N3	16.73	124.64	114.60
2	D	432	DG	C2-N3-C4	16.55	120.18	111.90
1	C	408	DG	P-O3'-C3'	16.50	139.50	119.70
2	D	432	DG	N3-C4-C5	-16.50	120.35	128.60
1	C	410	DT	N1-C2-N3	16.46	124.48	114.60
2	D	430	DA	N1-C2-N3	-16.35	121.12	129.30
2	D	425	DA	N7-C8-N9	-16.24	105.68	113.80
2	D	430	DA	N7-C8-N9	-16.13	105.73	113.80
2	D	432	DG	C5-C6-N1	16.06	119.53	111.50
1	C	410	DT	N3-C2-O2	-16.03	112.68	122.30
2	D	433	DG	C2-N3-C4	16.03	119.91	111.90
1	C	411	DG	C5-C6-N1	15.79	119.40	111.50
1	C	408	DG	C5-C6-O6	-15.66	119.20	128.60
1	C	409	DC	P-O3'-C3'	15.66	138.50	119.70
1	C	408	DG	N3-C4-C5	-15.59	120.81	128.60
1	C	413	DC	C1'-O4'-C4'	-15.33	94.77	110.10
1	C	408	DG	C5-C6-N1	15.25	119.13	111.50
1	C	412	DA	C5-N7-C8	15.15	111.47	103.90
2	D	433	DG	N3-C4-N9	15.04	135.02	126.00
1	C	404	DA	N1-C6-N6	15.00	127.60	118.60
2	D	424	DC	N3-C2-O2	-14.96	111.43	121.90
2	D	433	DG	N3-C4-C5	-14.85	121.18	128.60
1	C	411	DG	O4'-C1'-N9	-14.77	97.66	108.00
2	D	422	DG	C5-C6-N1	14.70	118.85	111.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	431	DT	N1-C2-N3	14.59	123.35	114.60
2	D	428	DG	C5-C6-N1	14.52	118.76	111.50
2	D	424	DC	O4'-C1'-N1	14.38	118.07	108.00
2	D	428	DG	N3-C4-C5	-14.29	121.45	128.60
2	D	426	DG	N3-C4-C5	-14.19	121.51	128.60
2	D	428	DG	C2-N3-C4	14.17	118.98	111.90
1	C	404	DA	N1-C2-N3	-14.15	122.23	129.30
1	C	411	DG	C8-N9-C4	14.08	112.03	106.40
1	C	412	DA	P-O3'-C3'	14.07	136.59	119.70
1	C	404	DA	N7-C8-N9	-14.01	106.79	113.80
2	D	426	DG	C5-C6-N1	13.89	118.44	111.50
1	C	412	DA	O4'-C1'-N9	13.41	117.39	108.00
1	C	402	DC	N3-C2-O2	-13.21	112.65	121.90
1	C	409	DC	O4'-C1'-N1	13.06	117.14	108.00
1	C	411	DG	N3-C4-N9	13.06	133.84	126.00
1	C	413	DC	N1-C2-O2	12.88	126.63	118.90
3	A	97	ARG	NE-CZ-NH1	12.77	126.68	120.30
2	D	431	DT	C4-C5-C7	12.66	126.59	119.00
3	A	97	ARG	NE-CZ-NH2	-12.57	114.02	120.30
2	D	422	DG	N3-C4-N9	12.29	133.38	126.00
1	C	408	DG	C2-N3-C4	12.26	118.03	111.90
1	C	408	DG	N3-C4-N9	12.25	133.35	126.00
2	D	424	DC	C4-C5-C6	12.16	123.48	117.40
1	C	412	DA	C6-N1-C2	12.14	125.89	118.60
1	C	413	DC	N3-C2-O2	-11.84	113.61	121.90
2	D	422	DG	N3-C4-C5	-11.82	122.69	128.60
1	C	405	DT	C6-C5-C7	11.67	129.90	122.90
2	D	425	DA	N1-C2-N3	-11.62	123.49	129.30
2	D	432	DG	C5-C6-O6	-11.58	121.65	128.60
2	D	433	DG	N1-C2-N3	-11.56	116.97	123.90
2	D	431	DT	O4'-C1'-N1	11.52	116.06	108.00
1	C	406	DG	C5-C6-O6	-11.45	121.73	128.60
3	A	106	ARG	NE-CZ-NH2	-11.29	114.66	120.30
2	D	426	DG	C2-N3-C4	11.27	117.53	111.90
1	C	413	DC	C5'-C4'-O4'	11.25	130.67	109.30
2	D	425	DA	C8-N9-C4	11.24	110.30	105.80
1	C	406	DG	N3-C4-N9	11.24	132.74	126.00
2	D	430	DA	C6-N1-C2	11.08	125.25	118.60
1	C	404	DA	C5-C6-N6	-10.99	114.91	123.70
2	D	422	DG	C2-N3-C4	10.74	117.27	111.90
2	D	430	DA	C5-C6-N6	-10.74	115.11	123.70
2	D	428	DG	C5-C6-O6	-10.66	122.20	128.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	406	DG	N7-C8-N9	-10.61	107.80	113.10
2	D	428	DG	C4-C5-N7	-10.51	106.60	110.80
1	C	406	DG	C4-C5-N7	-10.28	106.69	110.80
3	A	25	ARG	NE-CZ-NH1	10.23	125.42	120.30
1	C	413	DC	C4'-C3'-O3'	-10.12	84.40	109.70
1	C	405	DT	O4'-C1'-N1	10.10	115.07	108.00
2	D	426	DG	C4-C5-N7	-9.89	106.84	110.80
2	D	432	DG	C4-C5-N7	-9.89	106.84	110.80
1	C	410	DT	C2-N3-C4	-9.60	121.44	127.20
1	C	405	DT	C6-N1-C1'	9.56	134.75	120.40
1	C	408	DG	N7-C8-N9	-9.43	108.39	113.10
2	D	422	DG	C8-N9-C4	9.40	110.16	106.40
1	C	411	DG	N3-C4-C5	-9.38	123.91	128.60
1	C	411	DG	C6-N1-C2	-9.34	119.50	125.10
2	D	431	DT	N3-C4-O4	-9.27	114.34	119.90
2	D	428	DG	N3-C4-N9	9.16	131.50	126.00
2	D	432	DG	N9-C4-C5	9.15	109.06	105.40
1	C	405	DT	N3-C4-O4	-9.11	114.43	119.90
1	C	402	DC	N1-C2-O2	9.09	124.36	118.90
2	D	432	DG	N7-C8-N9	-9.09	108.56	113.10
2	D	430	DA	N9-C1'-C2'	-9.08	95.34	112.60
2	D	431	DT	C6-N1-C1'	9.03	133.95	120.40
2	D	430	DA	OP1-P-O3'	-9.03	85.33	105.20
1	C	408	DG	C8-N9-C4	8.96	109.98	106.40
2	D	422	DG	N1-C2-N3	-8.87	118.58	123.90
2	D	431	DT	C5-C4-O4	8.83	131.08	124.90
2	D	424	DC	C5-C6-N1	-8.79	116.61	121.00
1	C	404	DA	O4'-C1'-N9	8.73	114.11	108.00
3	A	106	ARG	NE-CZ-NH1	8.70	124.65	120.30
3	A	25	ARG	NE-CZ-NH2	-8.55	116.03	120.30
1	C	406	DG	C5-N7-C8	8.52	108.56	104.30
2	D	428	DG	N7-C8-N9	-8.50	108.85	113.10
2	D	426	DG	N7-C8-N9	-8.47	108.86	113.10
1	C	411	DG	C2-N3-C4	8.47	116.14	111.90
2	D	424	DC	N1-C2-O2	8.34	123.91	118.90
1	C	402	DC	C4-C5-C6	8.24	121.52	117.40
2	D	422	DG	N1-C6-O6	8.23	124.84	119.90
1	C	405	DT	C5-C4-O4	8.10	130.57	124.90
2	D	428	DG	C6-C5-N7	8.09	135.25	130.40
2	D	433	DG	C8-N9-C4	8.09	109.64	106.40
1	C	406	DG	C6-N1-C2	-8.00	120.30	125.10
1	C	405	DT	C4-C5-C7	7.89	123.74	119.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	411	DG	N9-C4-C5	-7.87	102.25	105.40
2	D	433	DG	N1-C6-O6	7.85	124.61	119.90
1	C	410	DT	C6-N1-C1'	7.85	132.17	120.40
2	D	426	DG	C5-C6-O6	-7.83	123.91	128.60
2	D	424	DC	N1-C2-N3	7.81	124.66	119.20
3	A	277	ARG	NE-CZ-NH1	7.80	124.20	120.30
2	D	424	DC	C5-C4-N4	7.78	125.64	120.20
2	D	425	DA	N9-C1'-C2'	-7.75	97.87	112.60
2	D	428	DG	C8-N9-C4	7.70	109.48	106.40
2	D	432	DG	C6-N1-C2	-7.70	120.48	125.10
2	D	430	DA	OP2-P-O3'	7.68	122.09	105.20
2	D	432	DG	N3-C4-N9	7.65	130.59	126.00
3	A	245	ARG	NE-CZ-NH2	-7.64	116.48	120.30
2	D	426	DG	N3-C4-N9	7.63	130.58	126.00
1	C	404	DA	C5-N7-C8	7.59	107.69	103.90
2	D	426	DG	C6-C5-N7	7.58	134.95	130.40
1	C	402	DC	C5-C4-N4	7.57	125.50	120.20
1	C	404	DA	N9-C1'-C2'	-7.53	98.29	112.60
2	D	426	DG	C5-N7-C8	7.47	108.03	104.30
2	D	428	DG	C5-N7-C8	7.42	108.01	104.30
2	D	430	DA	C8-N9-C4	7.40	108.76	105.80
1	C	411	DG	C1'-O4'-C4'	-7.32	102.78	110.10
1	C	412	DA	N9-C4-C5	7.29	108.72	105.80
1	C	411	DG	N7-C8-N9	-7.27	109.47	113.10
2	D	431	DT	OP1-P-O3'	-7.18	89.40	105.20
2	D	423	DT	O4'-C1'-N1	7.17	113.02	108.00
2	D	432	DG	C6-C5-N7	7.02	134.61	130.40
1	C	405	DT	P-O3'-C3'	7.00	128.10	119.70
2	D	432	DG	C5-N7-C8	6.98	107.79	104.30
2	D	423	DT	N3-C4-C5	6.87	119.32	115.20
2	D	428	DG	C6-N1-C2	-6.87	120.98	125.10
1	C	406	DG	C6-C5-N7	6.87	134.52	130.40
1	C	408	DG	C6-N1-C2	-6.81	121.01	125.10
1	C	406	DG	C8-N9-C4	6.80	109.12	106.40
2	D	425	DA	C6-C5-N7	-6.72	127.60	132.30
1	C	411	DG	P-O3'-C3'	6.68	127.72	119.70
3	A	245	ARG	NE-CZ-NH1	6.65	123.63	120.30
1	C	404	DA	C6-N1-C2	6.58	122.55	118.60
2	D	424	DC	C6-N1-C2	-6.57	117.67	120.30
1	C	412	DA	C4-C5-N7	-6.53	107.43	110.70
1	C	412	DA	C6-C5-N7	6.38	136.77	132.30
2	D	422	DG	N3-C2-N2	6.34	124.34	119.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	402	DC	C6-N1-C2	-6.33	117.77	120.30
2	D	426	DG	N9-C4-C5	6.28	107.91	105.40
2	D	426	DG	C6-N1-C2	-6.25	121.35	125.10
2	D	422	DG	OP2-P-O3'	6.20	118.83	105.20
2	D	429	DC	C5-C6-N1	-6.18	117.91	121.00
1	C	402	DC	N3-C4-C5	-6.17	119.43	121.90
2	D	430	DA	C5-N7-C8	6.14	106.97	103.90
1	C	404	DA	N9-C4-C5	6.12	108.25	105.80
2	D	422	DG	N7-C8-N9	-6.11	110.05	113.10
3	A	228	ARG	NE-CZ-NH2	-6.10	117.25	120.30
1	C	404	DA	O3'-P-O5'	-6.09	92.43	104.00
1	C	406	DG	N9-C4-C5	6.06	107.83	105.40
2	D	429	DC	O4'-C1'-N1	-6.04	103.77	108.00
1	C	411	DG	O3'-P-O5'	-6.01	92.58	104.00
2	D	425	DA	C6-N1-C2	6.00	122.20	118.60
2	D	423	DT	O3'-P-O5'	-5.94	92.72	104.00
1	C	410	DT	C6-C5-C7	5.90	126.44	122.90
2	D	423	DT	C6-N1-C1'	5.80	129.10	120.40
1	C	404	DA	C4-N9-C1'	-5.77	115.91	126.30
2	D	430	DA	C4-N9-C1'	-5.74	115.97	126.30
1	C	408	DG	OP1-P-O3'	5.73	117.80	105.20
3	A	228	ARG	NE-CZ-NH1	5.72	123.16	120.30
1	C	405	DT	O4'-C1'-C2'	-5.66	101.37	105.90
1	C	411	DG	C6-C5-N7	-5.66	127.01	130.40
3	A	277	ARG	NE-CZ-NH2	-5.66	117.47	120.30
1	C	410	DT	OP1-P-O3'	5.65	117.63	105.20
2	D	432	DG	N1-C2-N2	5.64	121.28	116.20
2	D	424	DC	N3-C4-C5	-5.61	119.66	121.90
1	C	408	DG	C5-N7-C8	5.60	107.10	104.30
1	C	404	DA	OP2-P-O3'	5.57	117.45	105.20
2	D	425	DA	C5-N7-C8	5.57	106.68	103.90
2	D	432	DG	O4'-C1'-N9	5.54	111.88	108.00
2	D	425	DA	P-O3'-C3'	5.46	126.25	119.70
1	C	412	DA	C5-C6-N6	-5.42	119.36	123.70
1	C	402	DC	N1-C2-N3	5.41	122.99	119.20
2	D	422	DG	OP1-P-O3'	-5.37	93.38	105.20
1	C	411	DG	C4-C5-N7	5.30	112.92	110.80
2	D	431	DT	C6-C5-C7	5.29	126.08	122.90
1	C	408	DG	C4-C5-N7	-5.27	108.69	110.80
3	A	2	ILE	CG1-CB-CG2	5.22	122.89	111.40
2	D	431	DT	P-O3'-C3'	5.17	125.91	119.70
2	D	423	DT	C2-N3-C4	-5.17	124.10	127.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	423	DT	N1-C2-N3	5.17	117.70	114.60
3	A	28	LEU	CB-CG-CD2	5.14	119.73	111.00
2	D	425	DA	C4-C5-C6	5.02	119.51	117.00

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	404	DA	Sidechain
1	C	412	DA	Sidechain
2	D	425	DA	Sidechain
2	D	430	DA	Sidechain
2	D	431	DT	Sidechain
2	D	432	DG	Sidechain
2	D	433	DG	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	C	243	0	135	13	0
2	D	238	0	130	12	0
3	A	2606	0	2587	30	0
4	A	27	0	22	4	0
5	A	89	0	0	2	0
5	C	12	0	0	0	0
5	D	11	0	0	1	0
All	All	3226	0	2874	44	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 (44) 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:C:402:DC:H42	2:D:433:DG:H1	1.04	0.97

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:64:VAL:O	3:A:106:ARG:NH2	1.99	0.96
3:A:95:ASP:OD1	3:A:97:ARG:HD3	1.67	0.93
1:C:402:DC:N3	2:D:433:DG:N2	2.24	0.84
1:C:402:DC:N4	2:D:433:DG:H1	1.77	0.82
3:A:2:ILE:HD12	3:A:313:TYR:OH	1.81	0.81
1:C:411:DG:H1	2:D:424:DC:H42	1.28	0.80
3:A:48:VAL:HG13	3:A:292:HIS:HD2	1.48	0.78
3:A:25:ARG:HD3	3:A:29:GLU:OE2	1.88	0.73
3:A:172:ARG:HD2	3:A:174:ASP:OD1	1.89	0.73
3:A:48:VAL:HG13	3:A:292:HIS:CD2	2.23	0.72
3:A:25:ARG:HD2	3:A:53:PHE:CE1	2.25	0.72
3:A:48:VAL:HG11	3:A:292:HIS:HB2	1.72	0.71
1:C:413:DC:O2	2:D:422:DG:N1	2.24	0.69
2:D:422:DG:H5'	5:D:100:HOH:O	1.94	0.67
3:A:48:VAL:CG1	3:A:292:HIS:HB2	2.27	0.65
1:C:411:DG:H1	2:D:424:DC:N4	1.95	0.63
3:A:156:ASP:HB3	3:A:185:PRO:HB3	1.81	0.63
3:A:47:GLU:O	3:A:51:MET:HG3	2.05	0.56
3:A:304:ASN:O	4:A:328:SAM:HB2	2.07	0.54
3:A:137:LYS:NZ	3:A:141:ASN:OD1	2.41	0.53
3:A:306:VAL:HG22	4:A:328:SAM:O	2.10	0.52
4:A:328:SAM:H8	5:A:393:HOH:O	2.08	0.52
1:C:402:DC:C2	2:D:433:DG:N2	2.68	0.51
3:A:228:ARG:NH2	5:A:383:HOH:O	2.41	0.49
1:C:411:DG:N2	2:D:424:DC:N3	2.57	0.47
3:A:81:CYS:HB2	3:A:121:VAL:HG13	1.97	0.47
3:A:25:ARG:HD2	3:A:53:PHE:CD1	2.50	0.46
1:C:411:DG:H4'	3:A:86:ILE:HG21	1.98	0.46
1:C:407:DC:H2'	1:C:408:DG:C8	2.51	0.45
1:C:412:DA:H2"	1:C:413:DC:H6	1.82	0.45
3:A:193:LYS:HE2	3:A:194:ASP:OD1	2.17	0.45
1:C:406:DG:O6	3:A:256:GLY:HA3	2.17	0.44
3:A:2:ILE:CD1	3:A:313:TYR:OH	2.60	0.43
2:D:432:DG:H2'	2:D:433:DG:C8	2.52	0.43
3:A:48:VAL:CG1	3:A:292:HIS:CB	2.95	0.43
3:A:305:SER:HA	4:A:328:SAM:HB2	2.01	0.43
1:C:413:DC:N3	2:D:422:DG:O6	2.52	0.42
2:D:425:DA:H4'	3:A:162:LYS:HE3	2.01	0.42
3:A:209:ARG:HH11	3:A:209:ARG:HD2	1.68	0.41
3:A:6:ASP:OD2	3:A:8:GLN:NE2	2.54	0.41
3:A:69:ILE:HA	3:A:70:PRO:HD3	1.97	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:75:LEU:C	3:A:75:LEU:HD23	2.41	0.41
3:A:169:ILE:HD12	3:A:318:ILE:HD11	2.02	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
3	A	325/327 (99%)	315 (97%)	9 (3%)	1 (0%)	41 32

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	60	ASP

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
3	A	283/283 (100%)	272 (96%)	11 (4%)	32 17

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

Mol	Chain	Res	Type
3	A	2	ILE

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Mol	Chain	Res	Type
3	A	28	LEU
3	A	41	TRP
3	A	129	ASN
3	A	134	GLU
3	A	176	ASN
3	A	193	LYS
3	A	217	GLN
3	A	245	ARG
3	A	251	LEU
3	A	266	LEU

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

Mol	Chain	Res	Type
3	A	217	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

1 ligand is modelled in this entry.

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	SAM	A	328	-	24,29,29	1.54	6 (25%)	23,42,42	1.03	2 (8%)

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	SAM	A	328	-	-	3/12/33/33	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	328	SAM	O-C	3.25	1.32	1.22
4	A	328	SAM	CE-SD	-3.14	1.59	1.78
4	A	328	SAM	C2-N3	2.51	1.36	1.32
4	A	328	SAM	C4-N3	2.48	1.39	1.35
4	A	328	SAM	C2-N1	2.28	1.38	1.33
4	A	328	SAM	C8-N7	-2.25	1.30	1.34

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	328	SAM	O4'-C1'-C2'	-2.46	103.33	106.93
4	A	328	SAM	O3'-C3'-C4'	-2.17	104.78	111.05

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	328	SAM	O-C-CA-CB
4	A	328	SAM	CB-CG-SD-CE
4	A	328	SAM	CB-CG-SD-C5'

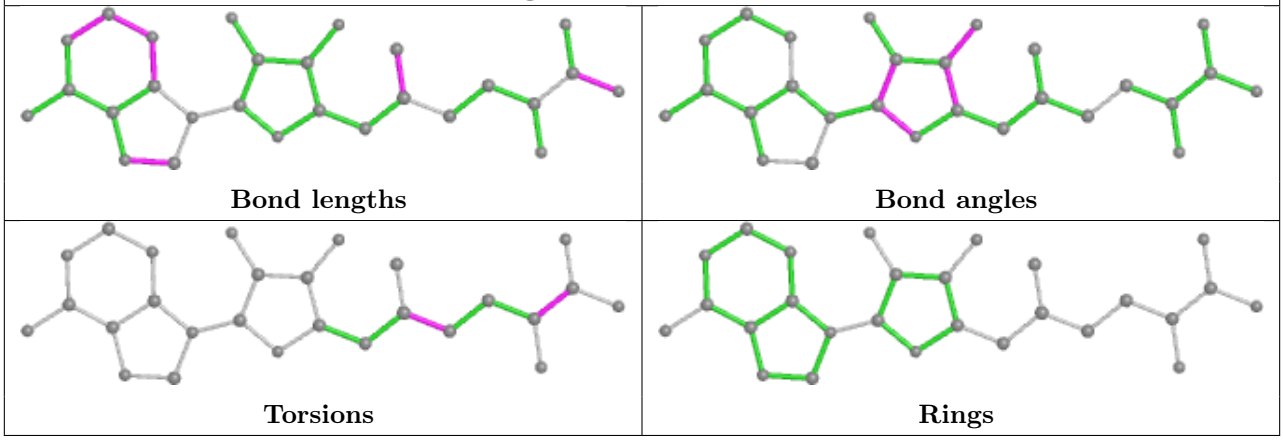
There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	328	SAM	4	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 then 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.

Ligand SAM A 328



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, 95^{th} 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	C	12/12 (100%)	-0.13	0	100	100	27, 31, 35, 37	0
2	D	11/12 (91%)	0.19	0	100	100	21, 34, 43, 43	0
3	A	327/327 (100%)	0.09	1 (0%)	94	96	18, 25, 35, 41	0
All	All	350/351 (99%)	0.09	1 (0%)	94	96	18, 25, 36, 43	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	A	189	ASN	3.7

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

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^{th} 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.

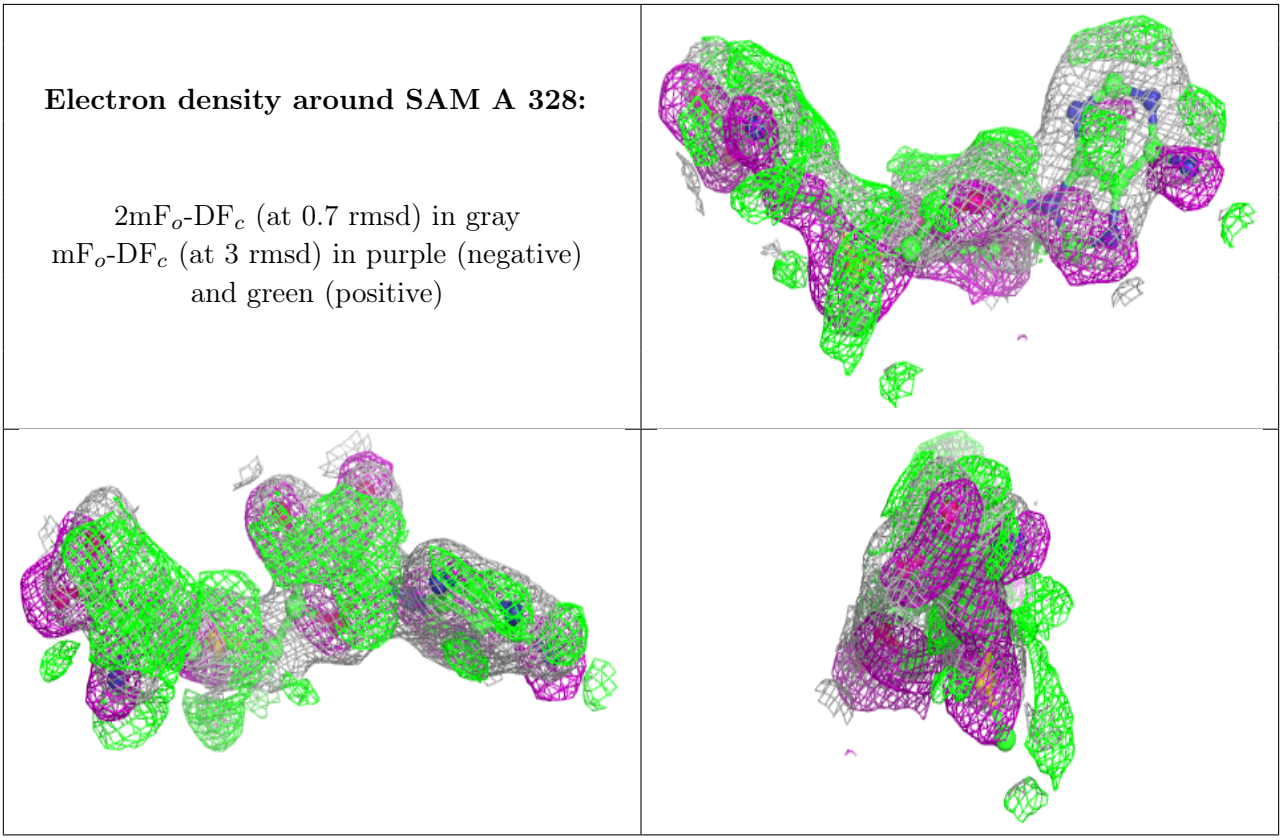
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	SAM	A	328	27/27	0.66	0.29	2,8,13,15	1

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 SAM A 328:

$2mF_o$-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.