



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2026 – 07:52 PM EDT

PDB ID : 2P1D / pdb_00002p1d
Title : Crystal structure of dengue methyltransferase in complex with GTP and S-Adenosyl-L-homocysteine
Authors : Egloff, M.P.; Benarooch, D.; Marseilles Structural Genomics Program @ AFMB (MSGP)
Deposited on : 2007-03-05
Resolution : 2.90 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	:	FAILED
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

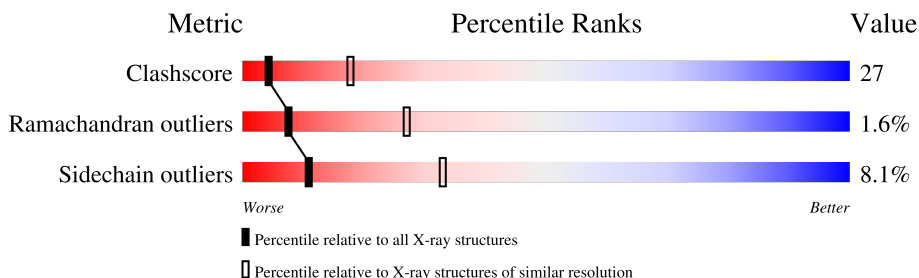
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)

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 $\leq 5\%$.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	305	49% 30% 6% 15%

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
2	SO4	A	904	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 2141 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 type II methyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	259	Total	C	N	O	S	0	0	0
			2030	1269	372	377	12			

There are 19 discrepancies between the modelled and reference sequences:

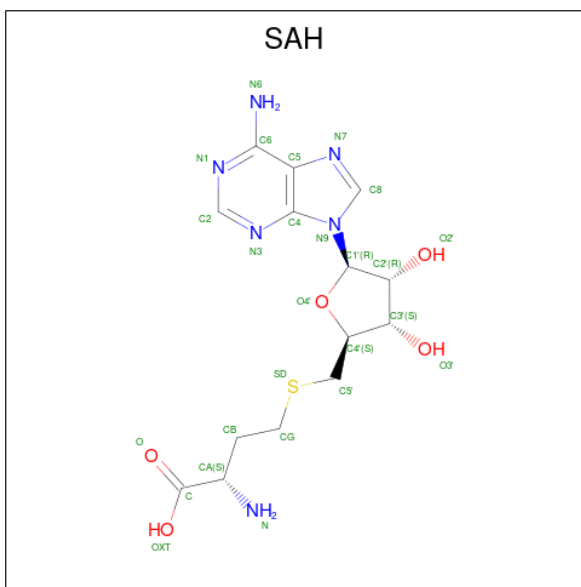
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	MET	-	expression tag	UNP Q9WLZ8
A	-7	ARG	-	expression tag	UNP Q9WLZ8
A	-6	GLY	-	expression tag	UNP Q9WLZ8
A	-5	SER	-	expression tag	UNP Q9WLZ8
A	-4	HIS	-	expression tag	UNP Q9WLZ8
A	-3	HIS	-	expression tag	UNP Q9WLZ8
A	-2	HIS	-	expression tag	UNP Q9WLZ8
A	-1	HIS	-	expression tag	UNP Q9WLZ8
A	0	HIS	-	expression tag	UNP Q9WLZ8
A	1	HIS	-	expression tag	UNP Q9WLZ8
A	2	GLY	-	expression tag	UNP Q9WLZ8
A	3	SER	-	expression tag	UNP Q9WLZ8
A	70	LEU	MET	SEE REMARK 999	UNP Q9WLZ8
A	139	ARG	LYS	SEE REMARK 999	UNP Q9WLZ8
A	173	SER	ASN	SEE REMARK 999	UNP Q9WLZ8
A	180	VAL	ILE	SEE REMARK 999	UNP Q9WLZ8
A	188	SER	PRO	SEE REMARK 999	UNP Q9WLZ8
A	201	HIS	TYR	SEE REMARK 999	UNP Q9WLZ8
A	271	THR	ILE	SEE REMARK 999	UNP Q9WLZ8

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



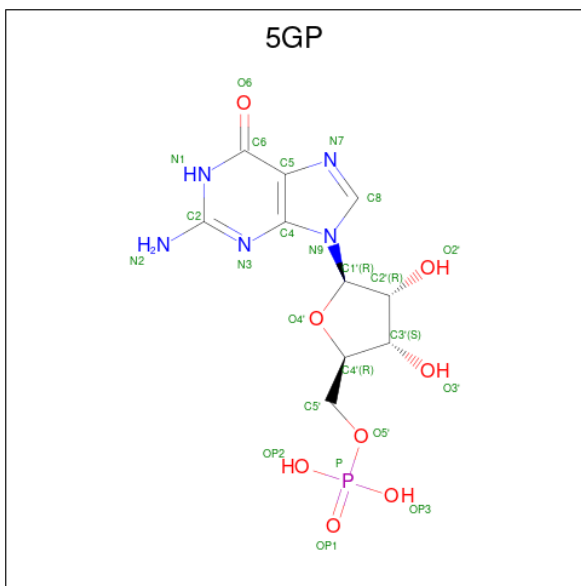
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is S-ADENOSYL-L-HOMOCYSTEINE (CCD ID: SAH) (formula: C₁₄H₂₀N₆O₅S).



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

- Molecule 4 is GUANOSINE-5'-MONOPHOSPHATE (CCD ID: 5GP) (formula: $C_{10}H_{14}N_5O_8P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			24	10	5	8	1		

- Molecule 5 is water.

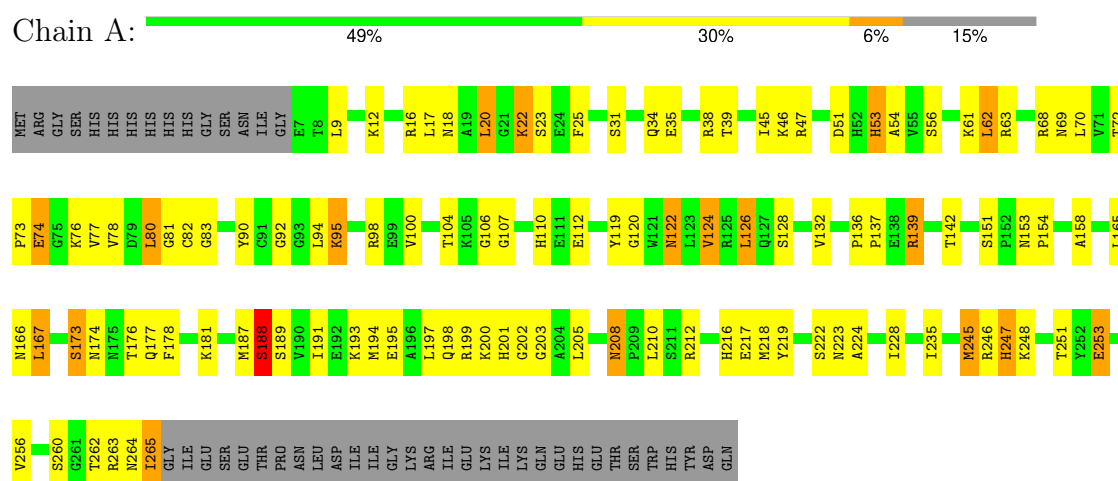
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	11	Total	O	0	0
			11	11		

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. 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. 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.

Note EDS failed to run properly.

- Molecule 1: type II methyltransferase



4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	112.20Å 112.20Å 56.46Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 2.90	Depositor
% Data completeness (in resolution range)	99.8 (30.00-2.90)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.04	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.211 , 0.246	Depositor
Wilson B-factor (Å ²)	66.4	Xtriage
Anisotropy	0.406	Xtriage
L-test for twinning ¹	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.041 for -h,-k,l	Xtriage
Total number of atoms	2141	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.14% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Theoretical 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: SO4, SAH, 5GP

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	0.46	0/2071	0.93	4/2796 (0.1%)

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	A	0	1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	70	LEU	N-CA-C	-6.06	105.37	112.89
1	A	53	HIS	N-CA-C	6.03	118.56	110.35
1	A	178	PHE	N-CA-C	5.75	118.02	108.99
1	A	124	VAL	N-CA-C	5.69	116.05	107.80

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	173	SER	Peptide

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	2030	0	2026	113	0
2	A	50	0	0	2	0
3	A	26	0	19	0	0
4	A	24	0	11	0	0
5	A	11	0	0	2	0
All	All	2141	0	2056	113	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 27.

All (113) 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:83:GLY:H	1:A:104:THR:HG21	1.16	1.11
1:A:31:SER:HB3	1:A:245:MET:HE3	1.41	1.03
1:A:12:LYS:NZ	1:A:16:ARG:HE	1.64	0.96
1:A:83:GLY:N	1:A:104:THR:HG21	1.84	0.93
1:A:83:GLY:H	1:A:104:THR:CG2	1.83	0.91
1:A:12:LYS:HZ3	1:A:16:ARG:HE	1.18	0.86
1:A:194:MET:HB3	1:A:228:ILE:HD13	1.59	0.85
1:A:74:GLU:H	1:A:142:THR:HG21	1.46	0.80
1:A:154:PRO:HB2	1:A:187:MET:HE2	1.65	0.77
1:A:142:THR:HG22	1:A:177:GLN:HB2	1.65	0.76
1:A:73:PRO:HA	1:A:142:THR:HG21	1.67	0.76
1:A:38:ARG:HD3	2:A:904:SO4:O4	1.86	0.75
1:A:31:SER:CB	1:A:245:MET:HE3	2.19	0.72
1:A:208:ASN:HD22	1:A:210:LEU:H	1.36	0.71
1:A:139:ARG:HD2	1:A:139:ARG:H	1.56	0.70
1:A:72:THR:H	1:A:177:GLN:NE2	1.89	0.69
1:A:22:LYS:HG2	1:A:23:SER:H	1.58	0.67
1:A:17:LEU:O	1:A:20:LEU:HB2	1.94	0.67
1:A:68:ARG:HG3	1:A:68:ARG:HH11	1.60	0.66
1:A:72:THR:HB	1:A:177:GLN:HE21	1.62	0.65
1:A:177:GLN:HE22	1:A:223:ASN:HD21	1.44	0.65
1:A:173:SER:OG	1:A:176:THR:CG2	2.45	0.64
1:A:74:GLU:H	1:A:142:THR:CG2	2.11	0.63
1:A:22:LYS:HG2	1:A:23:SER:N	2.14	0.63
1:A:22:LYS:HD3	1:A:22:LYS:H	1.64	0.62
1:A:203:GLY:HA2	1:A:222:SER:O	2.00	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:246:ARG:O	1:A:247:HIS:HB2	2.00	0.62
1:A:139:ARG:HH11	1:A:139:ARG:HG3	1.66	0.61
1:A:187:MET:O	1:A:188:SER:C	2.44	0.61
1:A:208:ASN:ND2	1:A:210:LEU:H	1.99	0.60
1:A:78:VAL:HG12	1:A:80:LEU:HD13	1.84	0.60
1:A:122:ASN:HB3	1:A:262:THR:HG22	1.83	0.59
1:A:212:ARG:HH11	1:A:212:ARG:HG2	1.68	0.59
1:A:22:LYS:HD3	1:A:22:LYS:N	2.19	0.58
1:A:119:TYR:CZ	1:A:263:ARG:HD3	2.38	0.58
1:A:72:THR:HB	1:A:177:GLN:NE2	2.19	0.57
1:A:38:ARG:NH1	1:A:54:ALA:O	2.38	0.57
1:A:264:ASN:C	1:A:265:ILE:HD13	2.30	0.56
1:A:208:ASN:HD22	1:A:208:ASN:C	2.13	0.56
1:A:63:ARG:CZ	1:A:256:VAL:HG22	2.36	0.55
1:A:200:LYS:HB3	1:A:201:HIS:CE1	2.41	0.55
1:A:61:LYS:HD3	5:A:921:HOH:O	2.06	0.55
1:A:68:ARG:HG3	1:A:68:ARG:NH1	2.19	0.55
1:A:132:VAL:HG23	1:A:167:LEU:HD11	1.89	0.55
1:A:122:ASN:HD22	1:A:122:ASN:N	2.05	0.55
1:A:124:VAL:HG12	1:A:126:LEU:HD13	1.87	0.54
1:A:165:LEU:HD22	1:A:197:LEU:CD1	2.38	0.54
1:A:17:LEU:HD11	1:A:25:PHE:HE1	1.72	0.54
1:A:98:ARG:HD3	1:A:265:ILE:HG21	1.88	0.54
1:A:216:HIS:O	1:A:216:HIS:ND1	2.40	0.54
1:A:246:ARG:O	1:A:247:HIS:CB	2.55	0.54
1:A:166:ASN:OD1	1:A:193:LYS:NZ	2.41	0.53
1:A:212:ARG:N	1:A:212:ARG:HD2	2.24	0.53
1:A:31:SER:OG	1:A:248:LYS:HB3	2.09	0.53
1:A:82:CYS:SG	1:A:104:THR:HG23	2.48	0.53
1:A:173:SER:OG	1:A:176:THR:HG21	2.08	0.53
1:A:81:GLY:HA2	1:A:104:THR:HG22	1.91	0.52
1:A:12:LYS:HZ1	1:A:16:ARG:HE	1.54	0.52
1:A:74:GLU:N	1:A:142:THR:HG21	2.20	0.52
1:A:139:ARG:HG3	1:A:139:ARG:NH1	2.25	0.51
1:A:98:ARG:HG3	1:A:98:ARG:HH11	1.76	0.50
1:A:212:ARG:N	1:A:212:ARG:CD	2.75	0.50
1:A:165:LEU:HB3	1:A:197:LEU:HD11	1.93	0.50
1:A:94:LEU:O	1:A:95:LYS:C	2.55	0.49
1:A:46:LYS:O	1:A:46:LYS:HG2	2.12	0.48
1:A:69:ASN:O	1:A:223:ASN:HB2	2.13	0.48
1:A:106:GLY:O	1:A:110:HIS:HB2	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:191:ILE:O	1:A:195:GLU:HG3	2.14	0.48
1:A:92:GLY:O	1:A:120:GLY:HA3	2.15	0.47
1:A:12:LYS:HZ3	1:A:16:ARG:NE	2.00	0.47
1:A:165:LEU:HD22	1:A:197:LEU:HD13	1.97	0.47
1:A:104:THR:O	1:A:128:SER:HA	2.14	0.47
1:A:139:ARG:HD2	1:A:139:ARG:N	2.25	0.46
1:A:51:ASP:OD1	1:A:260:SER:HB2	2.15	0.46
1:A:73:PRO:HG2	1:A:94:LEU:CD1	2.46	0.46
1:A:77:VAL:HG13	1:A:142:THR:OG1	2.15	0.46
1:A:98:ARG:HG3	1:A:98:ARG:NH1	2.30	0.46
1:A:77:VAL:HB	1:A:100:VAL:HG22	1.98	0.46
1:A:153:ASN:HA	1:A:154:PRO:HD2	1.82	0.46
1:A:212:ARG:HG2	1:A:212:ARG:NH1	2.30	0.46
1:A:82:CYS:N	1:A:104:THR:CG2	2.79	0.45
1:A:53:HIS:HA	5:A:923:HOH:O	2.17	0.45
1:A:181:LYS:HB2	1:A:219:TYR:CE2	2.52	0.45
1:A:222:SER:O	1:A:224:ALA:N	2.43	0.45
1:A:17:LEU:HD11	1:A:25:PHE:CE1	2.49	0.44
1:A:181:LYS:HE3	1:A:217:GLU:OE2	2.17	0.44
1:A:218:MET:HE3	1:A:235:ILE:HG13	1.99	0.44
1:A:107:GLY:H	1:A:112:GLU:CD	2.25	0.44
1:A:82:CYS:N	1:A:104:THR:HG23	2.32	0.44
1:A:62:LEU:HD13	1:A:90:TYR:HD2	1.82	0.44
1:A:72:THR:N	1:A:177:GLN:NE2	2.63	0.44
1:A:173:SER:OG	1:A:176:THR:HG23	2.17	0.44
1:A:45:ILE:C	1:A:47:ARG:H	2.26	0.44
1:A:187:MET:O	1:A:189:SER:N	2.51	0.43
1:A:165:LEU:HD13	1:A:197:LEU:HD12	2.00	0.43
1:A:142:THR:HA	1:A:177:GLN:O	2.19	0.43
1:A:136:PRO:HA	1:A:137:PRO:HD3	1.89	0.43
1:A:78:VAL:HG12	1:A:80:LEU:CD1	2.48	0.43
1:A:198:GLN:O	1:A:202:GLY:N	2.49	0.43
1:A:72:THR:CB	1:A:177:GLN:HE21	2.28	0.42
1:A:151:SER:C	1:A:153:ASN:N	2.77	0.42
1:A:173:SER:HB2	1:A:174:ASN:H	1.64	0.42
1:A:45:ILE:C	1:A:47:ARG:N	2.73	0.42
1:A:194:MET:HE2	1:A:205:LEU:HD21	2.01	0.42
1:A:61:LYS:HA	1:A:210:LEU:HD12	2.01	0.42
1:A:200:LYS:HB3	1:A:201:HIS:ND1	2.35	0.42
1:A:158:ALA:HB2	1:A:187:MET:HG3	2.02	0.42
1:A:56:SER:HA	2:A:904:SO4:O3	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:122:ASN:N	1:A:122:ASN:ND2	2.68	0.41
1:A:188:SER:O	1:A:191:ILE:HB	2.20	0.41
1:A:18:ASN:C	1:A:20:LEU:H	2.29	0.41
1:A:35:GLU:O	1:A:253:GLU:HG3	2.20	0.41
1:A:34:GLN:NE2	1:A:253:GLU:OE2	2.54	0.41

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	257/305 (84%)	236 (92%)	17 (7%)	4 (2%)	7 27

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	95	LYS
1	A	247	HIS
1	A	188	SER
1	A	39	THR

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	223/265 (84%)	205 (92%)	18 (8%)	11	33

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LEU
1	A	20	LEU
1	A	22	LYS
1	A	62	LEU
1	A	74	GLU
1	A	76	LYS
1	A	80	LEU
1	A	122	ASN
1	A	126	LEU
1	A	139	ARG
1	A	167	LEU
1	A	188	SER
1	A	199	ARG
1	A	208	ASN
1	A	245	MET
1	A	251	THR
1	A	253	GLU
1	A	265	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	34	GLN
1	A	177	GLN
1	A	198	GLN
1	A	208	ASN
1	A	247	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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](#)

12 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	SO4	A	908	-	4,4,4	0.44	0	6,6,6	0.17	0
2	SO4	A	906	-	4,4,4	0.43	0	6,6,6	0.11	0
2	SO4	A	903	-	4,4,4	0.42	0	6,6,6	0.13	0
2	SO4	A	910	-	4,4,4	0.42	0	6,6,6	0.23	0
2	SO4	A	905	-	4,4,4	0.44	0	6,6,6	0.05	0
2	SO4	A	902	-	4,4,4	0.41	0	6,6,6	0.13	0
2	SO4	A	901	-	4,4,4	0.39	0	6,6,6	0.09	0
2	SO4	A	907	-	4,4,4	0.42	0	6,6,6	0.21	0
4	5GP	A	912	-	26,26,26	3.34	14 (53%)	39,40,40	3.13	19 (48%)
2	SO4	A	909	-	4,4,4	0.40	0	6,6,6	0.13	0
2	SO4	A	904	-	4,4,4	0.44	0	6,6,6	0.11	0
3	SAH	A	911	-	27,28,28	0.69	0	36,40,40	1.13	2 (5%)

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	5GP	A	912	-	-	2/10/26/26	0/3/3/3
3	SAH	A	911	-	-	2/15/31/31	0/3/3/3

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	912	5GP	C6-N1	10.39	1.58	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	912	5GP	C2-N2	7.25	1.51	1.34
4	A	912	5GP	C2'-C1'	4.06	1.66	1.53
4	A	912	5GP	C1'-N9	3.85	1.58	1.47
4	A	912	5GP	P-OP2	3.61	1.68	1.54
4	A	912	5GP	C4-N3	3.55	1.42	1.34
4	A	912	5GP	C5'-C4'	3.44	1.61	1.51
4	A	912	5GP	C5-C6	-3.35	1.32	1.44
4	A	912	5GP	O2'-C2'	-3.24	1.34	1.43
4	A	912	5GP	C8-N9	2.37	1.42	1.37
4	A	912	5GP	P-O5'	2.23	1.67	1.60
4	A	912	5GP	O6-C6	2.19	1.27	1.23
4	A	912	5GP	C3'-C4'	-2.17	1.47	1.53
4	A	912	5GP	C8-N7	2.07	1.38	1.32

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	912	5GP	N9-C8-N7	-7.31	99.85	113.40
4	A	912	5GP	O6-C6-N1	-6.46	107.97	120.11
4	A	912	5GP	C8-N7-C5	6.22	115.35	104.26
4	A	912	5GP	OP2-P-O5'	5.33	120.56	106.67
4	A	912	5GP	O6-C6-C5	5.02	139.79	126.53
4	A	912	5GP	O4'-C4'-C5'	4.93	125.12	109.33
3	A	911	SAH	OXT-C-O	-4.86	113.06	124.08
4	A	912	5GP	C2-N1-C6	-4.80	116.41	125.11
4	A	912	5GP	N1-C2-N3	4.28	131.16	123.32
4	A	912	5GP	C6-C5-C4	4.18	125.11	118.83
4	A	912	5GP	C4-C5-N7	-3.96	104.39	110.67
4	A	912	5GP	C2'-C3'-C4'	3.63	109.63	102.61
4	A	912	5GP	N2-C2-N3	-3.50	112.84	119.67
4	A	912	5GP	C8-N9-C4	3.28	112.18	106.03
4	A	912	5GP	O5'-C5'-C4'	-3.09	98.48	108.99
4	A	912	5GP	C4'-O4'-C1'	2.90	115.86	109.47
4	A	912	5GP	OP2-P-OP3	-2.75	97.51	107.80
4	A	912	5GP	O4'-C1'-C2'	-2.30	101.69	106.62
4	A	912	5GP	C2-N3-C4	-2.25	108.41	112.30
4	A	912	5GP	OP3-P-OP1	2.24	119.55	110.83
3	A	911	SAH	C2'-C3'-C4'	2.21	106.88	102.61

There are no chirality outliers.

All (4) torsion outliers are listed below:

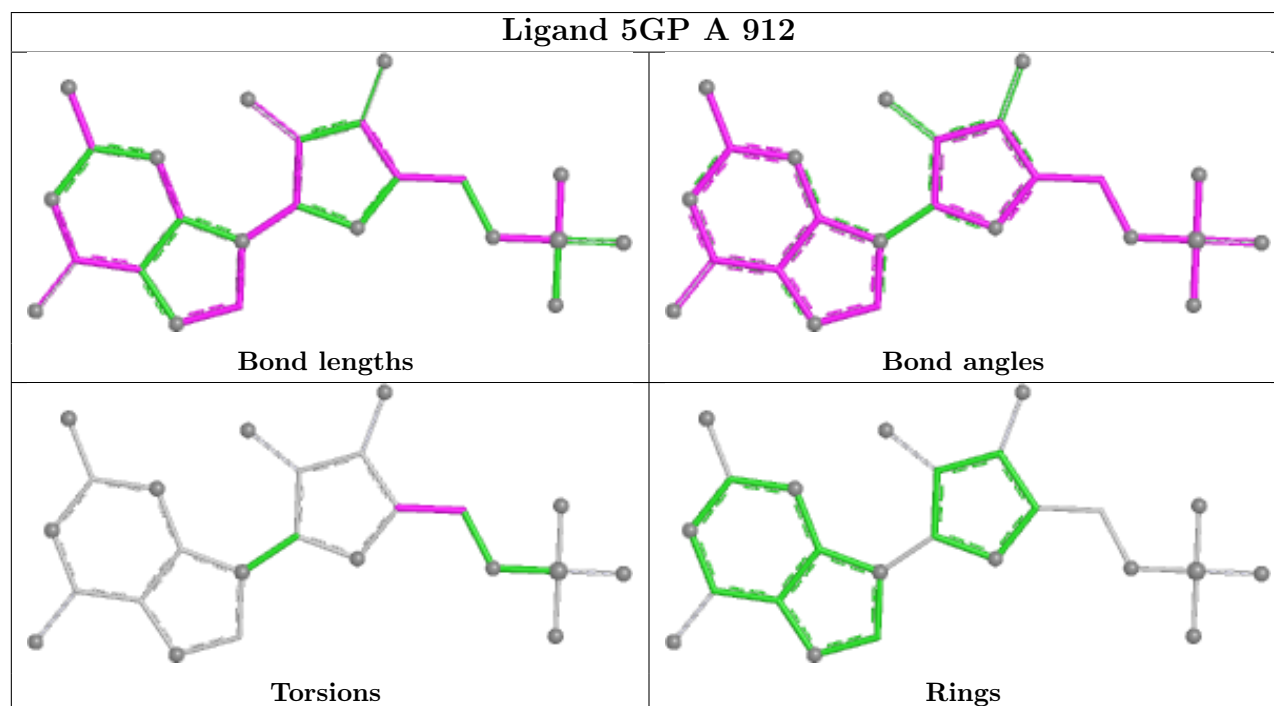
Mol	Chain	Res	Type	Atoms
4	A	912	5GP	O4'-C4'-C5'-O5'
4	A	912	5GP	C3'-C4'-C5'-O5'
3	A	911	SAH	C-CA-CB-CG
3	A	911	SAH	OXT-C-CA-N

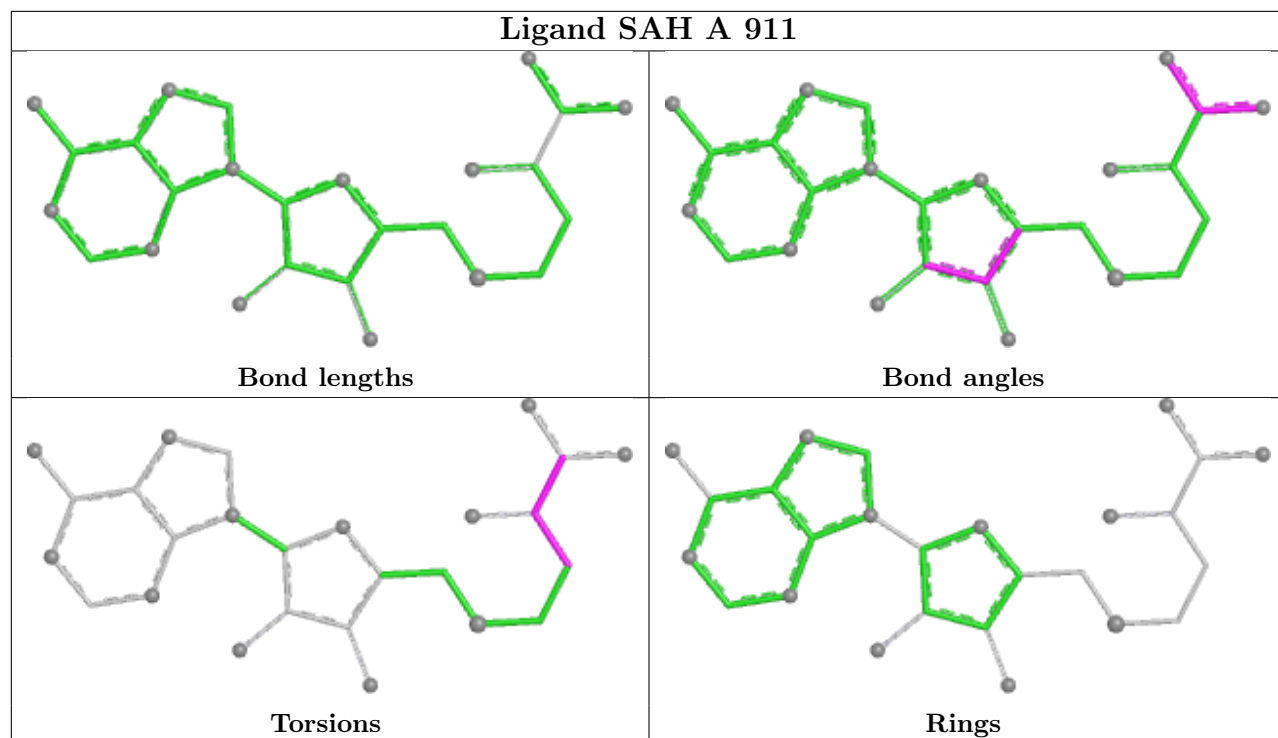
There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	904	SO4	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

EDS failed to run properly - this section is therefore empty.

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

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

6.4 Ligands

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers

EDS failed to run properly - this section is therefore empty.