



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 8, 2023 – 02:37 am GMT

PDB ID : 2BR5
Title : cmcI-N160 SAH
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Deposited on : 2005-05-01
Resolution : 2.83 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

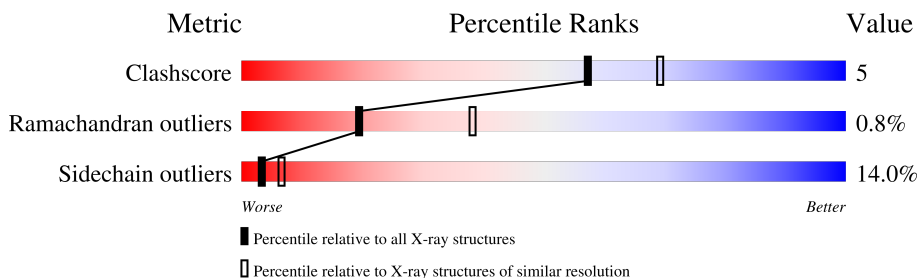
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.83 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	1078 (2.86-2.82)
Ramachandran outliers	138981	1050 (2.86-2.82)
Sidechain outliers	138945	1051 (2.86-2.82)

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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	236	
1	B	236	
1	C	236	
1	D	236	
1	E	236	
1	F	236	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 11055 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 CEPHALOSPORIN HYDROXYLASE CMCI.

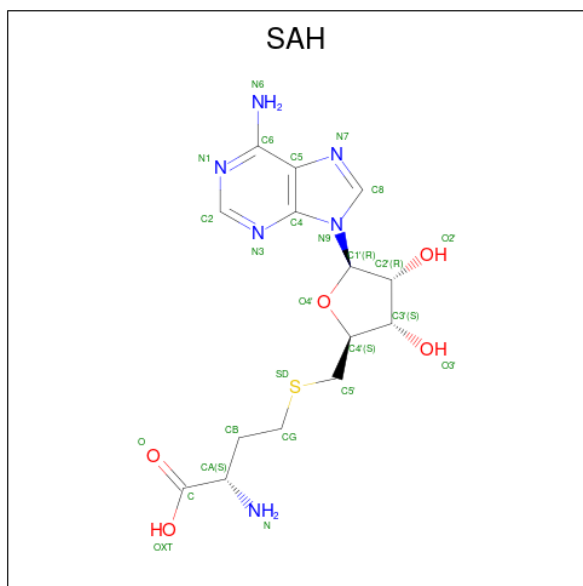
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	226	1861	1188	320	341	12	0	0	0
1	B	232	1909	1216	328	353	12	0	0	0
1	C	227	1860	1188	318	342	12	0	0	0
1	D	194	1588	1009	274	293	12	0	0	0
1	E	230	1896	1209	325	350	12	0	0	0
1	F	206	1686	1079	288	307	12	0	0	0

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	10	GLN	LEU	engineered mutation	UNP O85726
A	160	ASN	ASP	engineered mutation	UNP O85726
A	200	PHE	LEU	engineered mutation	UNP O85726
B	10	GLN	LEU	engineered mutation	UNP O85726
B	160	ASN	ASP	engineered mutation	UNP O85726
B	200	PHE	LEU	engineered mutation	UNP O85726
C	10	GLN	LEU	engineered mutation	UNP O85726
C	160	ASN	ASP	engineered mutation	UNP O85726
C	200	PHE	LEU	engineered mutation	UNP O85726
D	160	ASN	ASP	engineered mutation	UNP O85726
E	10	GLN	LEU	engineered mutation	UNP O85726
E	160	ASN	ASP	engineered mutation	UNP O85726
E	200	PHE	LEU	engineered mutation	UNP O85726
F	160	ASN	ASP	engineered mutation	UNP O85726
F	200	PHE	LEU	engineered mutation	UNP O85726

- Molecule 2 is S-ADENOSYL-L-HOMOCYSTEINE (three-letter code: SAH) (formula:

C₁₄H₂₀N₆O₅S).



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

- Molecule 3 is water.

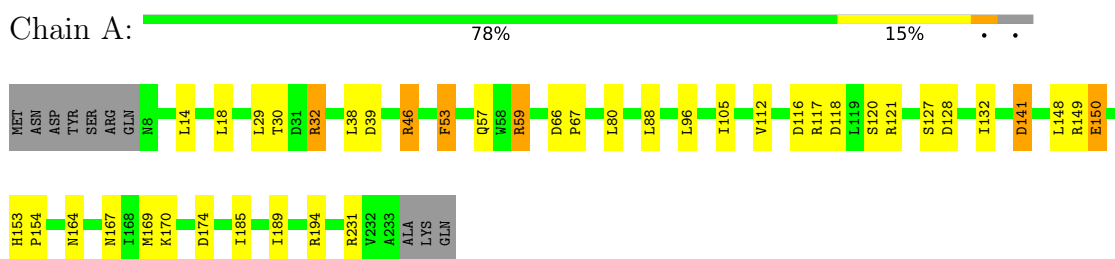
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	17	Total	O	0	0
			17	17		
3	B	28	Total	O	0	0
			28	28		
3	C	35	Total	O	0	0
			35	35		
3	D	9	Total	O	0	0
			9	9		
3	E	14	Total	O	0	0
			14	14		
3	F	22	Total	O	0	0
			22	22		

3 Residue-property plots [i](#)

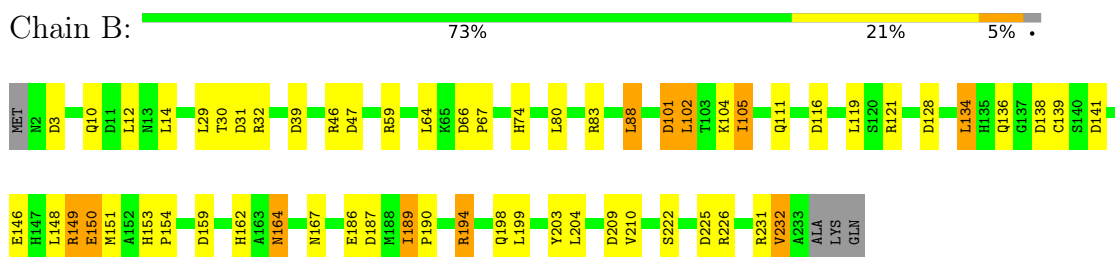
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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 was not executed.

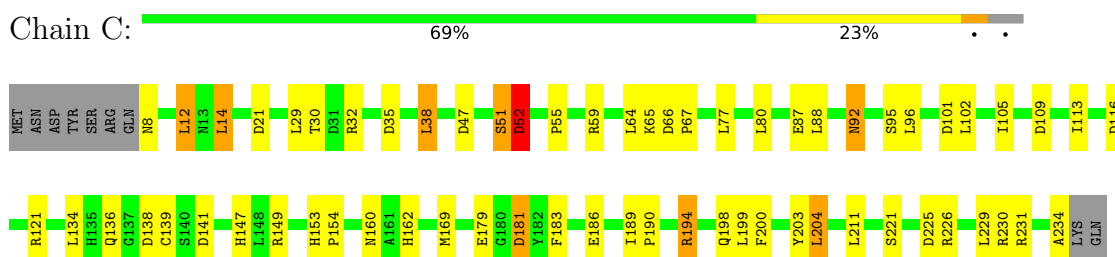
- Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI



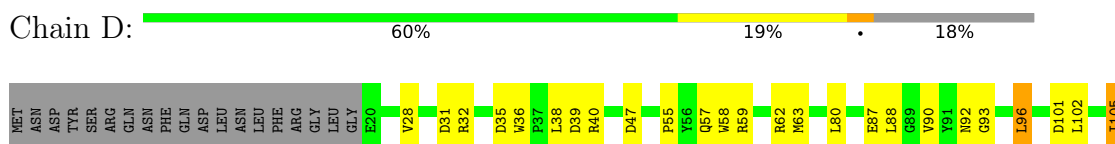
- Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

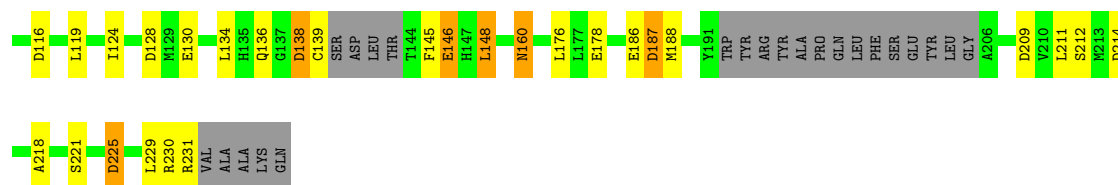


- Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI



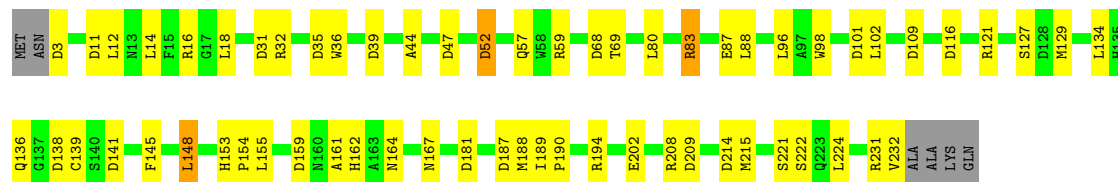
- Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI





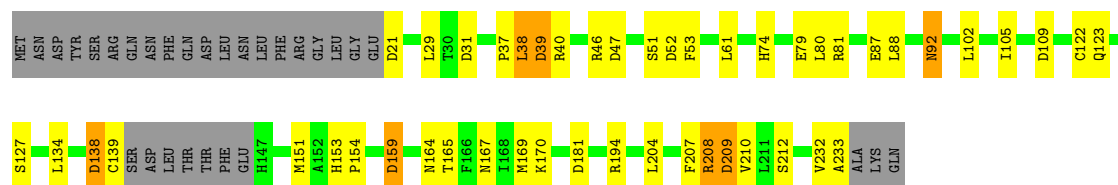
- Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain E: 71% 25% ..



- Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain F: 67% 17% . 13%



4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	90.91Å 102.52Å 181.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.39 – 2.83	Depositor
% Data completeness (in resolution range)	99.0 (49.39-2.83)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.231 , 0.301	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	11055	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

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: 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	0.48	0/1915	0.84	6/2605 (0.2%)
1	B	0.54	0/1964	0.87	10/2672 (0.4%)
1	C	0.56	0/1914	0.87	9/2605 (0.3%)
1	D	0.45	0/1631	0.84	9/2216 (0.4%)
1	E	0.51	0/1951	0.86	14/2654 (0.5%)
1	F	0.53	0/1736	0.84	8/2364 (0.3%)
All	All	0.51	0/11111	0.86	56/15116 (0.4%)

There are no bond length outliers.

The worst 5 of 56 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	138	ASP	CB-CG-OD2	7.09	124.68	118.30
1	D	39	ASP	CB-CG-OD2	6.97	124.58	118.30
1	C	141	ASP	CB-CG-OD2	6.67	124.30	118.30
1	B	116	ASP	CB-CG-OD2	6.37	124.03	118.30
1	E	159	ASP	CB-CG-OD2	6.24	123.91	118.30

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	1861	0	1771	16	0
1	B	1909	0	1805	23	0
1	C	1860	0	1765	26	0
1	D	1588	0	1508	17	0
1	E	1896	0	1794	17	0
1	F	1686	0	1599	16	0
2	A	26	0	19	1	0
2	B	26	0	19	0	0
2	C	26	0	19	1	0
2	D	26	0	19	1	0
2	E	26	0	19	3	0
3	A	17	0	0	0	0
3	B	28	0	0	0	0
3	C	35	0	0	3	0
3	D	9	0	0	0	0
3	E	14	0	0	3	0
3	F	22	0	0	0	0
All	All	11055	0	10337	104	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 5.

The worst 5 of 104 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:E:164:ASN:HD21	1:E:167:ASN:HD22	1.22	0.85
1:B:66:ASP:HB2	1:B:67:PRO:HD2	1.66	0.76
1:E:88:LEU:HD22	1:E:139:CYS:SG	2.30	0.72
1:A:105:ILE:HD11	1:B:105:ILE:CD1	2.21	0.70
1:C:87:GLU:OE1	1:C:160:ASN:ND2	2.23	0.67

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	224/236 (95%)	215 (96%)	8 (4%)	1 (0%)	34	56
1	B	230/236 (98%)	218 (95%)	9 (4%)	3 (1%)	12	26
1	C	225/236 (95%)	217 (96%)	6 (3%)	2 (1%)	17	34
1	D	188/236 (80%)	170 (90%)	15 (8%)	3 (2%)	9	21
1	E	228/236 (97%)	211 (92%)	17 (8%)	0	100	100
1	F	202/236 (86%)	188 (93%)	13 (6%)	1 (0%)	29	51
All	All	1297/1416 (92%)	1219 (94%)	68 (5%)	10 (1%)	19	38

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	146	GLU
1	A	150	GLU
1	C	14	LEU
1	D	187	ASP
1	F	138	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	
1	A	198/207 (96%)	176 (89%)	22 (11%)	6	12
1	B	203/207 (98%)	171 (84%)	32 (16%)	2	4
1	C	197/207 (95%)	169 (86%)	28 (14%)	3	6
1	D	170/207 (82%)	142 (84%)	28 (16%)	2	3
1	E	202/207 (98%)	174 (86%)	28 (14%)	3	7
1	F	178/207 (86%)	155 (87%)	23 (13%)	4	8
All	All	1148/1242 (92%)	987 (86%)	161 (14%)	3	6

5 of 161 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	52	ASP
1	F	52	ASP
1	E	87	GLU
1	E	189	ILE
1	F	92	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	57	GLN
1	F	175	HIS
1	D	219	ASN
1	F	136	GLN
1	D	136	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](#)

5 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	SAH	C	301	-	24,28,28	1.15	3 (12%)	25,40,40	2.04	7 (28%)
2	SAH	D	301	-	24,28,28	1.20	3 (12%)	25,40,40	1.81	5 (20%)
2	SAH	E	301	-	24,28,28	1.16	2 (8%)	25,40,40	2.02	5 (20%)
2	SAH	B	301	-	24,28,28	1.17	2 (8%)	25,40,40	1.63	3 (12%)
2	SAH	A	301	-	24,28,28	1.23	3 (12%)	25,40,40	1.80	3 (12%)

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
2	SAH	C	301	-	-	3/11/31/31	0/3/3/3
2	SAH	D	301	-	-	0/11/31/31	0/3/3/3
2	SAH	E	301	-	-	4/11/31/31	0/3/3/3
2	SAH	B	301	-	-	3/11/31/31	0/3/3/3
2	SAH	A	301	-	-	5/11/31/31	0/3/3/3

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	301	SAH	C2-N3	3.99	1.38	1.32
2	A	301	SAH	C2-N3	3.88	1.38	1.32
2	B	301	SAH	C2-N3	3.58	1.37	1.32
2	E	301	SAH	C2-N3	3.46	1.37	1.32
2	C	301	SAH	C2-N3	2.99	1.36	1.32

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	301	SAH	N3-C2-N1	-6.27	118.89	128.68
2	B	301	SAH	N3-C2-N1	-5.87	119.50	128.68
2	C	301	SAH	N3-C2-N1	-5.86	119.51	128.68
2	D	301	SAH	N3-C2-N1	-5.73	119.72	128.68
2	A	301	SAH	N3-C2-N1	-5.43	120.19	128.68

There are no chirality outliers.

5 of 15 torsion outliers are listed below:

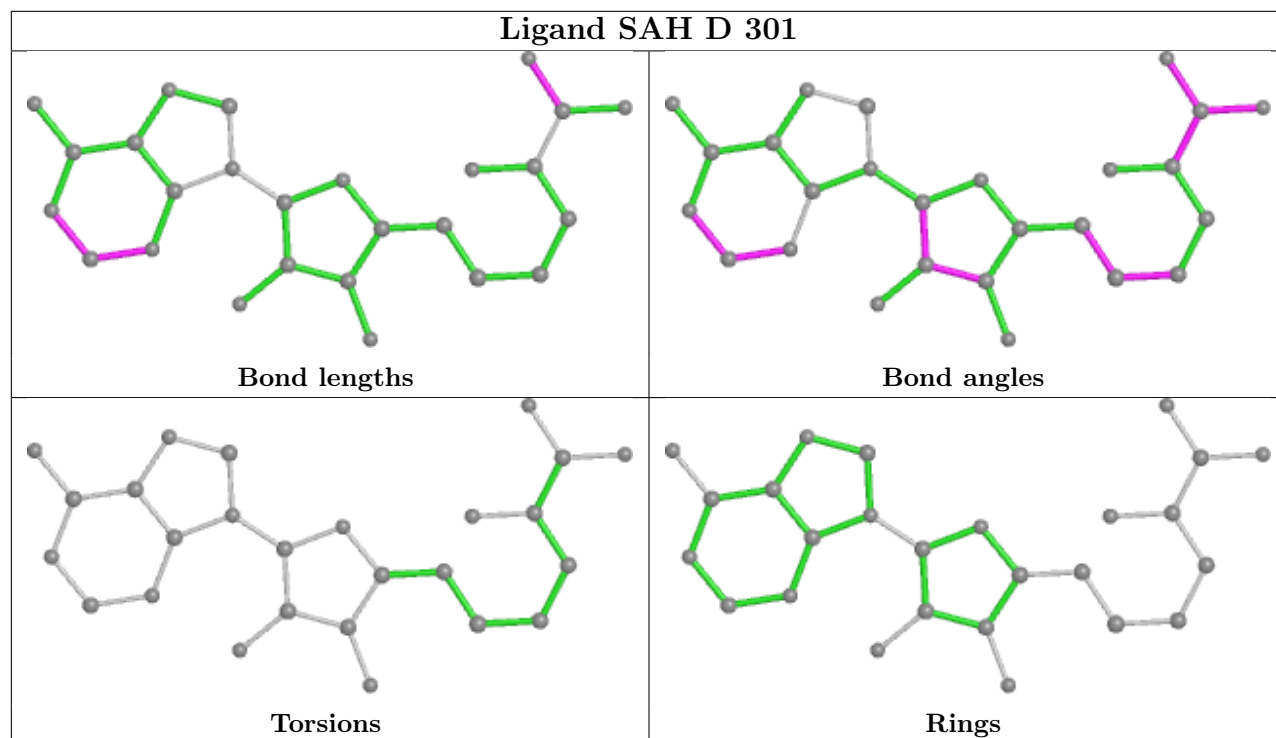
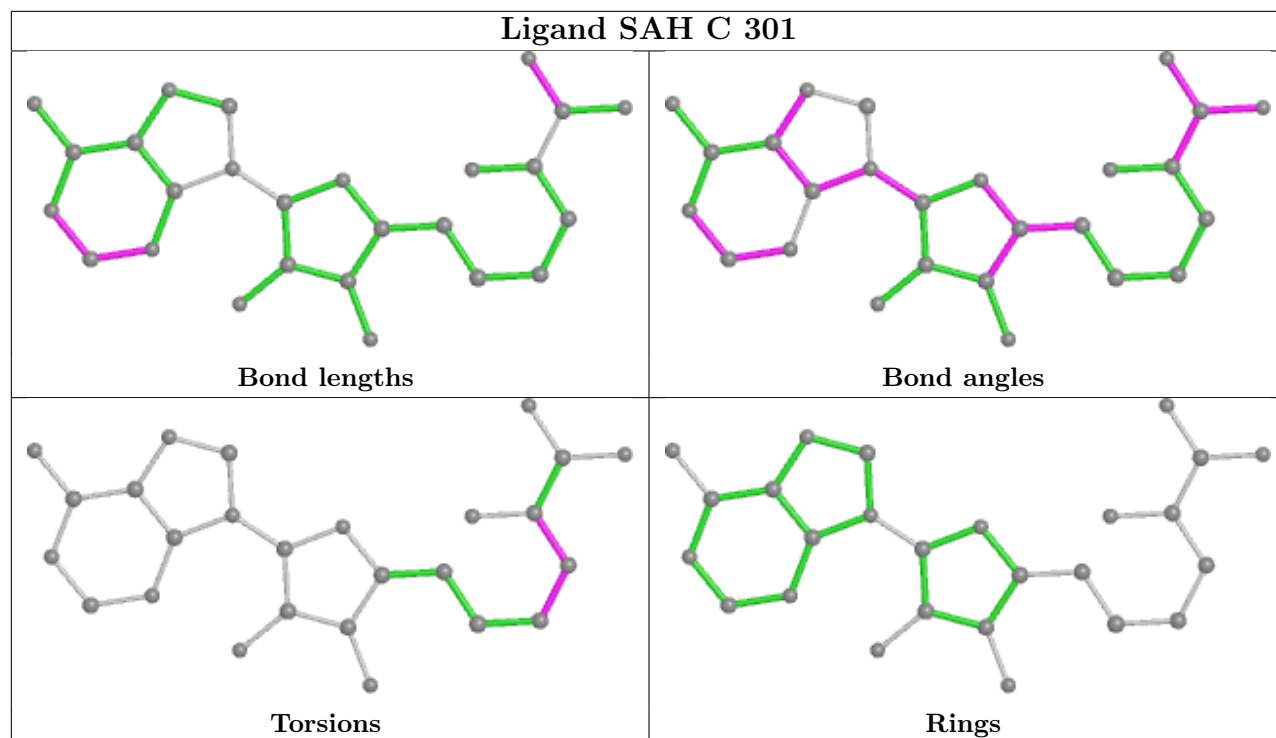
Mol	Chain	Res	Type	Atoms
2	C	301	SAH	N-CA-CB-CG
2	E	301	SAH	N-CA-CB-CG
2	E	301	SAH	C-CA-CB-CG
2	E	301	SAH	O4'-C4'-C5'-SD
2	E	301	SAH	C3'-C4'-C5'-SD

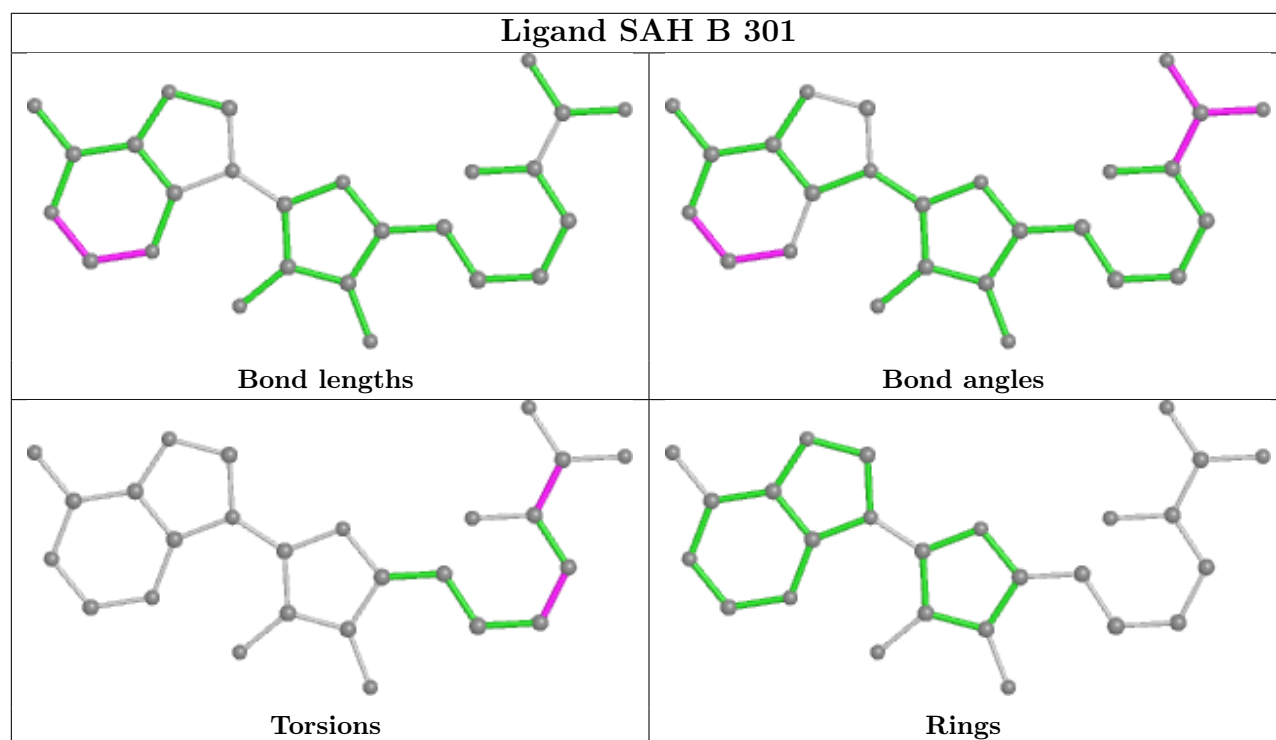
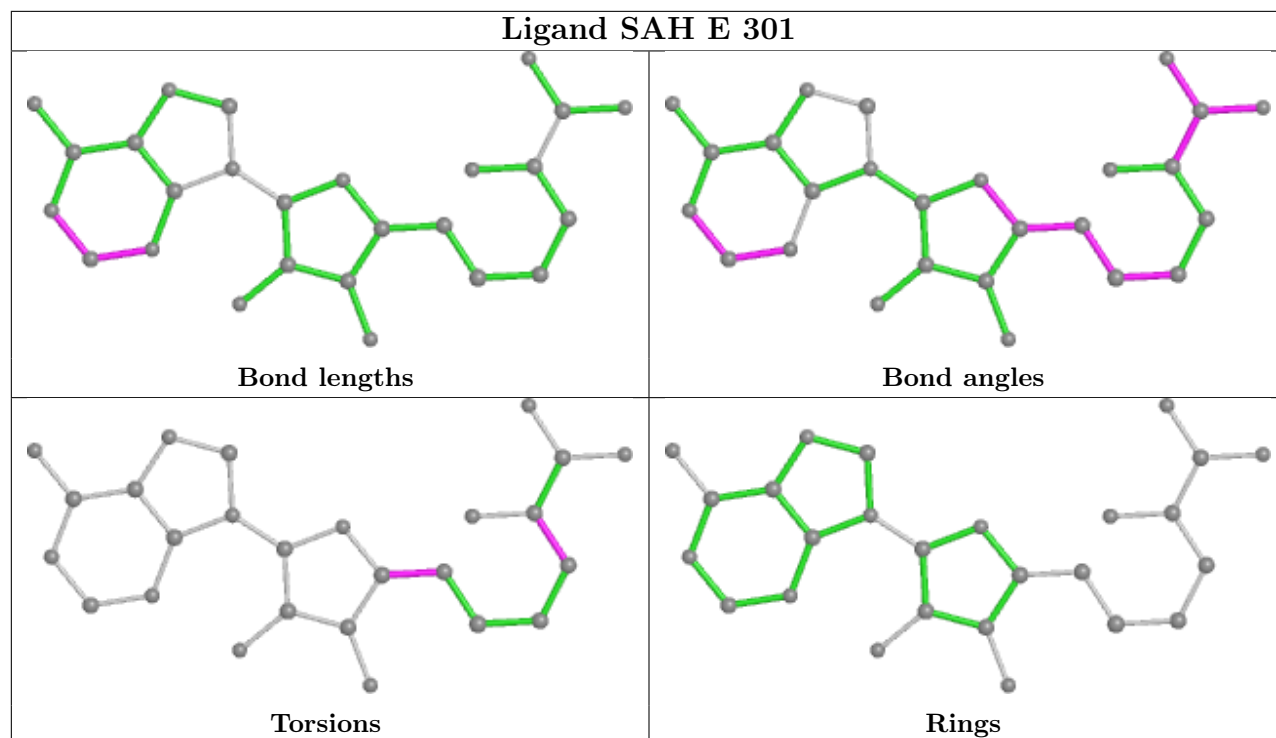
There are no ring outliers.

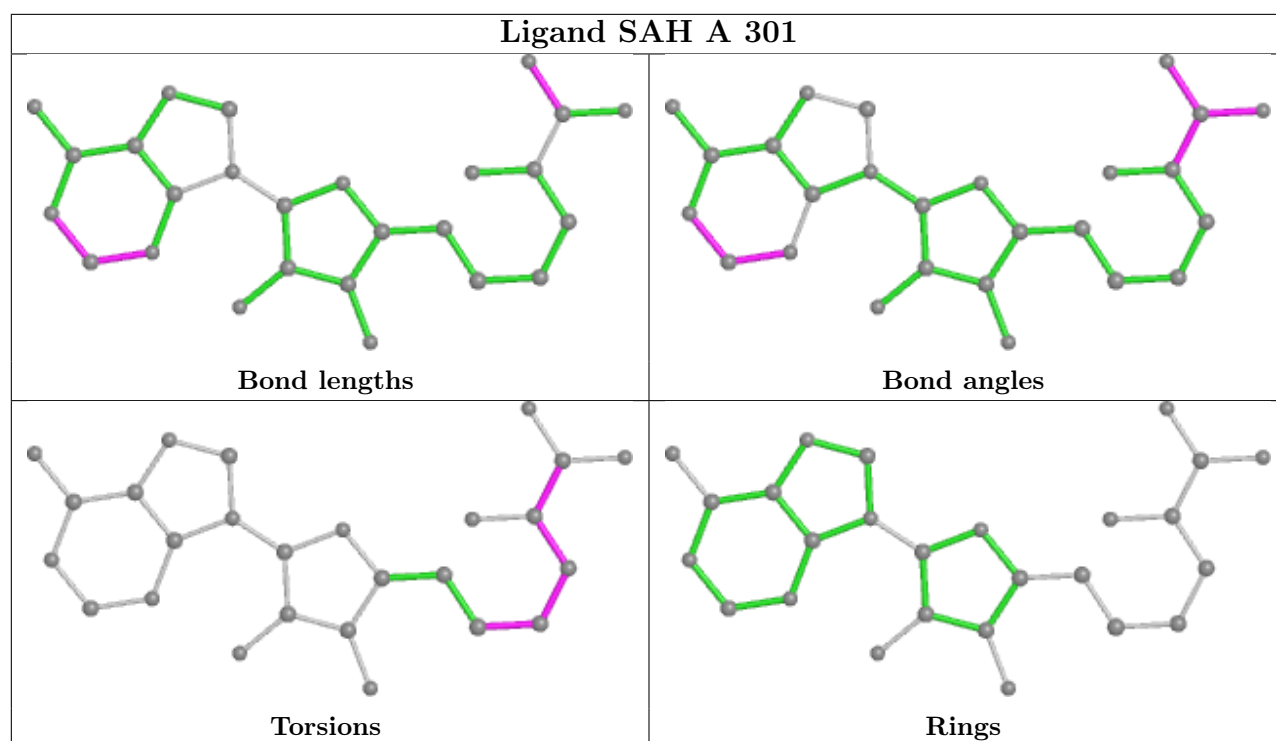
4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	SAH	1	0
2	D	301	SAH	1	0
2	E	301	SAH	3	0
2	A	301	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 [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.