Full wwPDB X-ray Structure Validation Report ⓘ

Dec 8, 2023 – 02:37 am GMT

PDB ID	:	2BR5
Title	:	cmcI-N160 SAH
Authors	:	Oster, L.M.; Lester, D.R.; Terwisscha van Scheltinga, A.; svenda, M.; Genereux, C.; Andersson, I.
Deposited on	:	2005-05-01
Resolution	:	2.83 Å(reported)

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)	:	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.
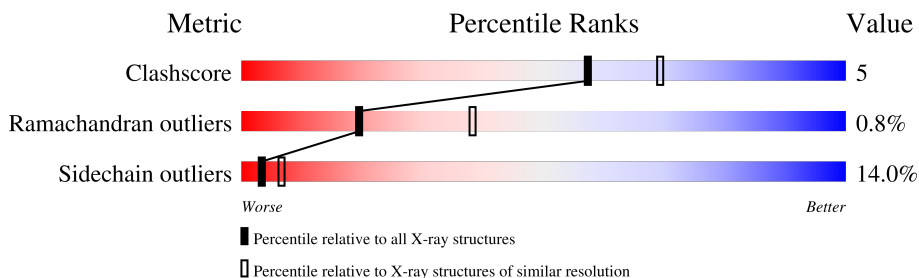
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1078 (2.86-2.82)
Ramachandran outliers	138981	1050 (2.86-2.82)
Sidechain outliers	138945	1051 (2.86-2.82)

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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	236	78% 15% • •
1	B	236	73% 21% 5% •
1	C	236	69% 23% • •
1	D	236	60% 19% • 18%
1	E	236	71% 25% • •
1	F	236	67% 17% • 13%

2 Entry composition ⓘ

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.

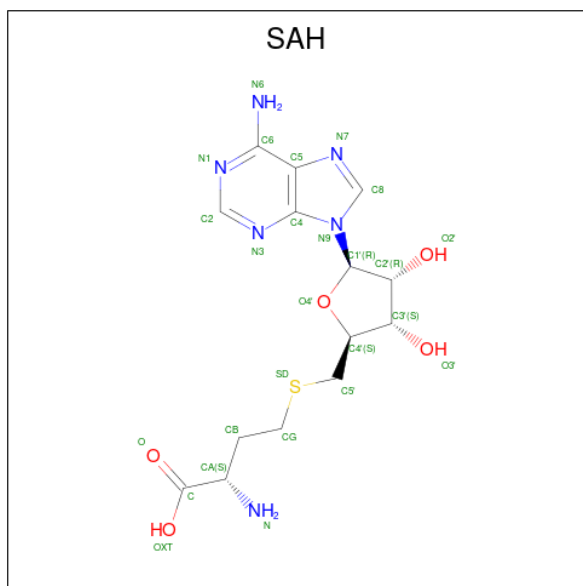- Molecule 1 is a protein called CEPHALOSPORIN HYDROXYLASE CMCI.

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

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:

$C_{14}H_{20}N_6O_5S$).

SAH

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

- Molecule 3 is water.

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

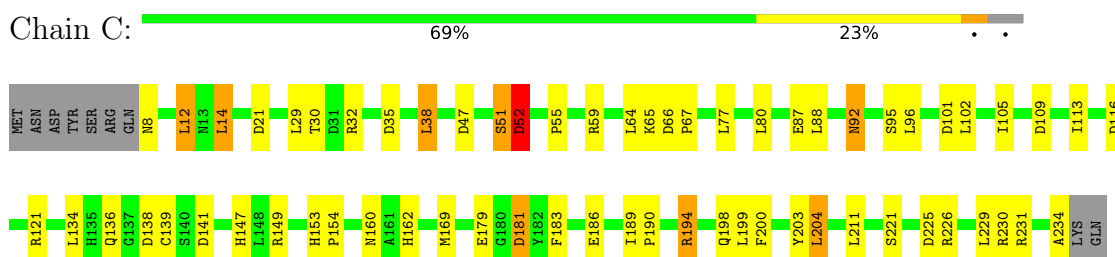Note EDS was not executed.

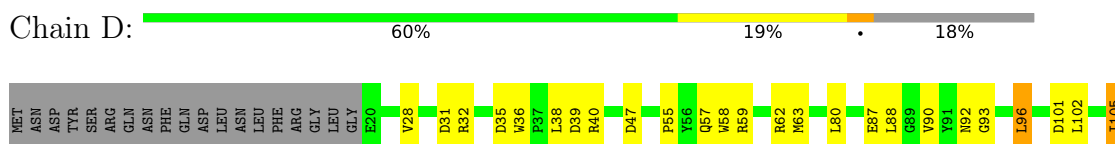• Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI
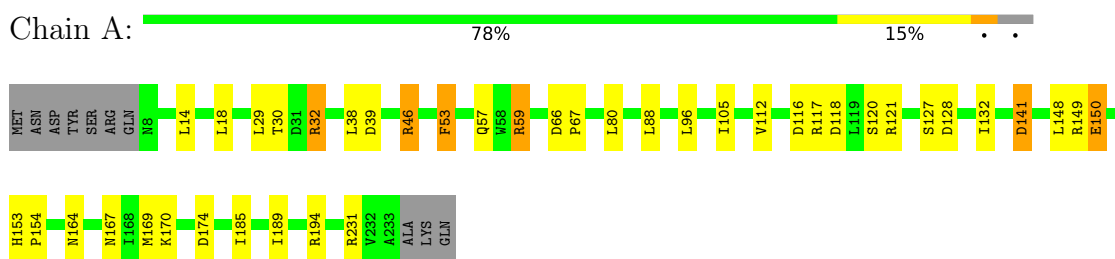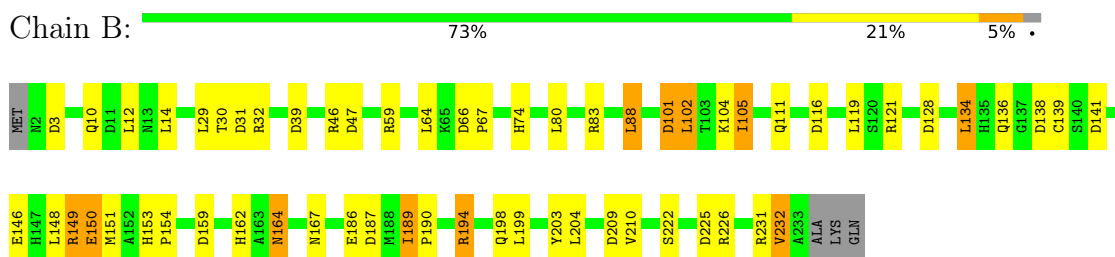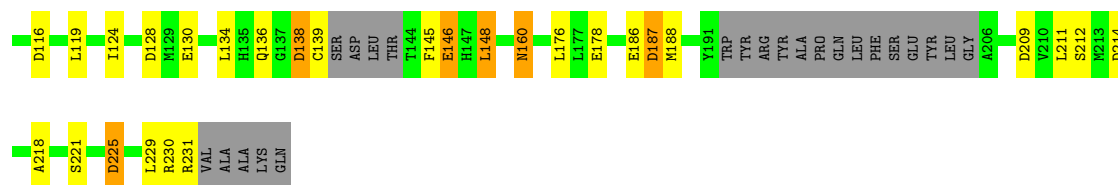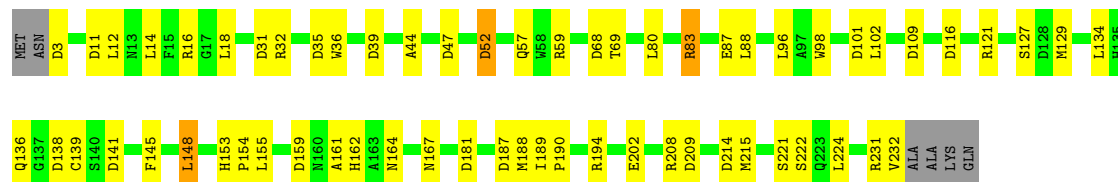
Chain A:

• Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain B:

• Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain C:

• Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain D:

D116 L119 I124 D128 M129 E130 L134 H135 Q136 G137 D138 C139 SER ASP LEU THR T144 F145 E146 H147 L148 N160 L176 L177 E178 E186 D187 M188 Y191 TRP TYR ARG TYR ALA PRO GLN LEU PHE SER GLU TYR LEU GLY A206 D209 V210 L211 S212 M213 D214

A218 S221 D225 L229 R230 R231 VAL ALA ALA LYS GLN

• Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain E:

71%   25%   • •

MET ASN D3 D11 L12 N13 L14 F15 R16 G17 L18 D31 R32 D35 W36 D39 A44 D47 D52 Q57 W58 R59 D68 T69 L80 R83 E87 L88 L96 A97 W98 D101 L102 D109 D116 R121 S127 D128 M129 L134 H135

Q136 G137 D138 C139 S140 D141 F145 L148 H153 P154 L155 D159 N160 A161 H162 A163 N164 N167 D181 D187 M188 I189 P190 R194 E202 R208 D209 D214 M215 S221 S222 Q223 L224 R231 V232 ALA ALA LYS GLN

• Molecule 1: CEPHALOSPORIN HYDROXYLASE CMCI

Chain F:

67%   17%   •   13%

MET ASN ASP TYR SER ARG GLN ASN PHE GLN ASP LEU ASN LEU PHE ARG GLY LEU GLY GLU D21 L29 T30 D31 P37 L38 D39 R40 R46 D47 S51 D52 F53 L61 H74 E79 L80 R81 E87 L88 N92 L102 I105 D109 C122 Q123

S127 L134 D138 C139 SER ASP LEU THR THR PHE GLU H147 M151 A152 H153 P154 D159 N164 T165 F166 N167 I168 M169 K170 D181 R194 L204 F207 R208 D209 V210 L211 S212 V232 A233 ALA LYS GLN
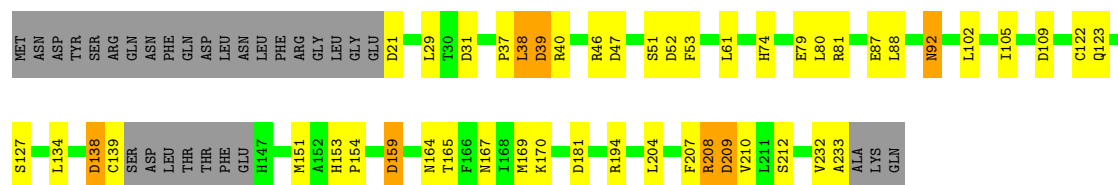
4 Data and refinement statistics ⓘ

Xtriage (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.	Xtriage
Total number of atoms	11055	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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.

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
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
1	E	39	ASP	CB-CG-OD2	6.23	123.91	118.30
1	B	39	ASP	CB-CG-OD2	6.21	123.89	118.30
1	F	21	ASP	CB-CG-OD2	6.19	123.87	118.30
1	F	159	ASP	CB-CG-OD2	6.10	123.79	118.30
1	F	209	ASP	CB-CG-OD2	6.06	123.75	118.30
1	B	159	ASP	CB-CG-OD2	6.04	123.73	118.30
1	C	181	ASP	CB-CG-OD2	6.02	123.71	118.30
1	B	31	ASP	CB-CG-OD2	5.96	123.67	118.30
1	E	209	ASP	CB-CG-OD2	5.94	123.64	118.30
1	D	35	ASP	CB-CG-OD2	5.85	123.57	118.30
1	B	209	ASP	CB-CG-OD2	5.83	123.55	118.30
1	D	101	ASP	CB-CG-OD2	5.80	123.52	118.30
1	B	3	ASP	CB-CG-OD2	5.79	123.52	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	52	ASP	CB-CG-OD2	5.62	123.36	118.30
1	C	47	ASP	CB-CG-OD2	5.61	123.35	118.30
1	E	101	ASP	CB-CG-OD2	5.60	123.34	118.30
1	E	68	ASP	CB-CG-OD2	5.60	123.34	118.30
1	F	31	ASP	CB-CG-OD2	5.58	123.32	118.30
1	C	35	ASP	CB-CG-OD2	5.57	123.31	118.30
1	C	101	ASP	CB-CG-OD2	5.52	123.27	118.30
1	F	109	ASP	CB-CG-OD2	5.52	123.27	118.30
1	E	52	ASP	CB-CG-OD2	5.49	123.24	118.30
1	A	59	ARG	NE-CZ-NH1	5.46	123.03	120.30
1	E	214	ASP	CB-CG-OD2	5.43	123.19	118.30
1	E	47	ASP	CB-CG-OD2	5.42	123.18	118.30
1	D	128	ASP	CB-CG-OD2	5.41	123.17	118.30
1	A	116	ASP	CB-CG-OD2	5.39	123.15	118.30
1	C	109	ASP	CB-CG-OD2	5.35	123.11	118.30
1	C	21	ASP	CB-CG-OD2	5.33	123.09	118.30
1	C	138	ASP	CB-CG-OD2	5.32	123.09	118.30
1	A	39	ASP	CB-CG-OD2	5.32	123.08	118.30
1	B	101	ASP	CB-CG-OD2	5.30	123.07	118.30
1	F	39	ASP	CB-CG-OD2	5.29	123.06	118.30
1	D	138	ASP	CB-CG-OD2	5.27	123.04	118.30
1	E	83	ARG	NE-CZ-NH1	5.27	122.94	120.30
1	E	109	ASP	CB-CG-OD2	5.27	123.04	118.30
1	F	47	ASP	CB-CG-OD2	5.23	123.01	118.30
1	B	47	ASP	CB-CG-OD2	5.22	123.00	118.30
1	D	31	ASP	CB-CG-OD2	5.21	122.98	118.30
1	D	214	ASP	CB-CG-OD2	5.20	122.98	118.30
1	D	209	ASP	CB-CG-OD2	5.19	122.97	118.30
1	B	187	ASP	CB-CG-OD2	5.18	122.96	118.30
1	E	11	ASP	CB-CG-OD2	5.18	122.96	118.30
1	E	138	ASP	CB-CG-OD2	5.14	122.93	118.30
1	B	128	ASP	CB-CG-OD2	5.13	122.92	118.30
1	A	174	ASP	CB-CG-OD2	5.12	122.91	118.30
1	E	181	ASP	CB-CG-OD2	5.10	122.89	118.30
1	A	128	ASP	CB-CG-OD2	5.07	122.86	118.30
1	E	31	ASP	CB-CG-OD2	5.05	122.84	118.30
1	A	141	ASP	CB-CG-OD2	5.02	122.82	118.30
1	D	47	ASP	CB-CG-OD2	5.02	122.82	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.

All (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
1:D:186:GLU:O	1:D:187:ASP:HB2	1.95	0.67
1:C:52:ASP:HA	1:C:55:PRO:HG3	1.78	0.65
1:F:159:ASP:OD1	1:F:165:THR:HG23	1.98	0.64
1:B:102:LEU:HA	1:B:105:ILE:HD12	1.79	0.62
1:C:65:LYS:HZ1	1:C:160:ASN:HD21	1.47	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:38:LEU:HG	1:F:204:LEU:HD22	1.84	0.59
1:C:234:ALA:C	3:C:2034:HOH:O	2.41	0.58
1:C:162:HIS:HE1	1:C:186:GLU:O	1.86	0.58
1:F:164:ASN:HD21	1:F:167:ASN:HD22	1.51	0.58
1:C:204:LEU:HD13	1:F:38:LEU:HG	1.85	0.57
1:E:44:ALA:HA	3:E:2003:HOH:O	2.06	0.54
1:C:189:ILE:HG23	1:C:200:PHE:CZ	2.43	0.54
1:B:88:LEU:HD22	1:B:139:CYS:SG	2.48	0.53
1:E:18:LEU:HD21	2:E:301:SAH:CG	2.38	0.53
1:E:98:TRP:CE2	1:E:102:LEU:HD12	2.44	0.53
1:F:153:HIS:HD2	1:F:181:ASP:OD2	1.91	0.53
1:C:88:LEU:HD22	1:C:139:CYS:SG	2.49	0.53
1:F:232:VAL:O	1:F:233:ALA:HB2	2.10	0.52
1:E:116:ASP:O	1:E:136:GLN:HA	2.10	0.52
1:C:51:SER:O	1:C:51:SER:OG	2.27	0.51
1:D:186:GLU:O	1:D:187:ASP:CB	2.59	0.51
1:E:18:LEU:HD21	2:E:301:SAH:HG2	1.92	0.51
1:B:164:ASN:HD21	1:B:167:ASN:HD22	1.58	0.51
1:C:199:LEU:HD22	1:C:203:TYR:CE2	2.46	0.51
1:A:59:ARG:HH11	1:A:59:ARG:HG2	1.76	0.50
1:A:164:ASN:HD21	1:A:167:ASN:HD22	1.59	0.50
1:F:208:ARG:HG2	1:F:209:ASP:N	2.26	0.50
1:F:37:PRO:HB2	1:F:39:ASP:OD1	2.13	0.49
1:A:118:ASP:OD1	1:A:120:SER:HB3	2.13	0.49
1:B:189:ILE:N	1:B:190:PRO:CD	2.76	0.49
1:D:160:ASN:HD21	1:D:186:GLU:CD	2.16	0.49
2:C:301:SAH:H5'1	3:C:2035:HOH:O	2.13	0.48
1:D:36:TRP:HB2	1:E:215:MET:HE3	1.95	0.48
1:C:225:ASP:OD1	1:C:226:ARG:HG3	2.13	0.48
1:E:69:THR:HG23	1:E:224:LEU:HG	1.95	0.48
1:D:218:ALA:O	1:D:225:ASP:O	2.31	0.48
1:C:183:PHE:O	1:C:229:LEU:HB2	2.14	0.48
1:B:119:LEU:HD22	1:B:134:LEU:HG	1.95	0.47
1:D:116:ASP:OD1	2:D:301:SAH:H1'	2.15	0.47
1:B:162:HIS:HE1	1:B:186:GLU:O	1.97	0.46
1:C:194:ARG:NE	3:C:2029:HOH:O	2.34	0.46
1:D:62:ARG:H	1:D:92:ASN:HD21	1.62	0.46
1:B:153:HIS:HA	1:B:154:PRO:C	2.36	0.46
1:D:90:VAL:HG13	1:D:96:LEU:HD22	1.98	0.46
1:E:145:PHE:HA	1:E:148:LEU:HD23	1.96	0.46
1:A:32:ARG:HG2	1:A:32:ARG:HH11	1.81	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:105:ILE:HD11	1:B:105:ILE:HD11	1.96	0.45
1:A:66:ASP:HB2	1:A:67:PRO:CD	2.46	0.45
1:D:93:GLY:O	1:D:124:ILE:HD11	2.17	0.45
1:C:199:LEU:HD22	1:C:203:TYR:CZ	2.51	0.45
1:B:199:LEU:HD22	1:B:203:TYR:CE2	2.51	0.45
1:D:105:ILE:HG23	1:E:59:ARG:HD3	1.97	0.45
1:D:58:TRP:CD1	1:D:59:ARG:HG3	2.52	0.44
1:B:88:LEU:CD2	1:B:139:CYS:SG	3.06	0.44
1:A:112:VAL:O	1:A:132:ILE:HA	2.18	0.44
1:C:77:LEU:CD2	1:C:102:LEU:HD23	2.48	0.44
1:E:187:ASP:O	1:E:190:PRO:HD2	2.18	0.44
1:B:74:HIS:ND1	1:B:74:HIS:C	2.71	0.43
1:C:153:HIS:ND1	1:C:181:ASP:OD2	2.51	0.43
1:C:59:ARG:H	1:F:74:HIS:CE1	2.37	0.43
1:B:199:LEU:HD23	1:B:199:LEU:HA	1.87	0.43
1:C:92:ASN:H	1:C:92:ASN:HD22	1.66	0.43
1:A:185:ILE:HD12	1:A:189:ILE:HD11	2.01	0.43
1:B:101:ASP:O	1:B:105:ILE:HG13	2.18	0.43
1:B:149:ARG:HD3	1:B:149:ARG:HA	1.80	0.43
1:F:92:ASN:HD22	1:F:92:ASN:H	1.66	0.43
1:B:210:VAL:O	1:B:232:VAL:HG23	2.19	0.43
1:D:211:LEU:HD23	1:D:230:ARG:O	2.19	0.43
1:F:153:HIS:HB3	1:F:154:PRO:HA	2.01	0.43
1:D:62:ARG:N	1:D:92:ASN:HD21	2.17	0.42
1:F:169:MET:HG2	1:F:207:PHE:CE2	2.54	0.42
1:C:189:ILE:HB	1:C:190:PRO:HD3	2.00	0.42
1:A:18:LEU:HD21	2:A:301:SAH:SD	2.60	0.42
1:D:58:TRP:CH2	1:E:102:LEU:HD21	2.53	0.42
1:A:164:ASN:ND2	1:A:167:ASN:HD22	2.17	0.42
1:C:66:ASP:HB2	1:C:67:PRO:CD	2.50	0.42
1:C:211:LEU:O	1:F:38:LEU:HD22	2.19	0.42
1:D:145:PHE:O	1:D:146:GLU:CB	2.68	0.42
1:E:3:ASP:N	3:E:2001:HOH:O	2.53	0.42
1:E:36:TRP:CE2	3:E:2003:HOH:O	2.72	0.42
1:A:32:ARG:HG2	1:A:32:ARG:NH1	2.35	0.42
1:A:53:PHE:CD2	1:A:53:PHE:C	2.92	0.42
1:C:153:HIS:HA	1:C:154:PRO:C	2.40	0.42
1:D:145:PHE:O	1:D:146:GLU:HB2	2.20	0.41
1:C:77:LEU:HD22	1:C:102:LEU:HD23	2.02	0.41
1:A:105:ILE:HD11	1:B:105:ILE:HD13	2.00	0.41
1:B:194:ARG:HH11	1:B:194:ARG:HG3	1.86	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:46:ARG:NE	1:B:226:ARG:NH1	2.68	0.41
1:A:153:HIS:HA	1:A:154:PRO:C	2.41	0.41
1:C:38:LEU:HD13	1:F:212:SER:HA	2.02	0.41
1:C:116:ASP:O	1:C:136:GLN:HA	2.21	0.41
1:B:162:HIS:CE1	1:B:186:GLU:O	2.74	0.41
1:B:204:LEU:HD23	1:B:204:LEU:HA	1.89	0.41
1:F:61:LEU:HD22	1:F:123:GLN:HB2	2.01	0.41
1:E:153:HIS:HA	1:E:154:PRO:C	2.42	0.41
1:E:161:ALA:HA	2:E:301:SAH:H5'2	2.03	0.40
1:B:164:ASN:HD22	1:B:164:ASN:HA	1.74	0.40
1:D:148:LEU:HD22	1:D:148:LEU:HA	1.94	0.40
1:F:92:ASN:HA	1:F:122:CYS:HA	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	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

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	146	GLU

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Mol	Chain	Res	Type
1	A	150	GLU
1	C	14	LEU
1	D	187	ASP
1	F	138	ASP
1	B	10	GLN
1	B	150	GLU
1	B	225	ASP
1	C	12	LEU
1	D	55	PRO

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	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

All (161) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	14	LEU
1	A	29	LEU
1	A	30	THR
1	A	32	ARG
1	A	38	LEU
1	A	46	ARG
1	A	53	PHE
1	A	57	GLN
1	A	80	LEU

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Mol	Chain	Res	Type
1	A	88	LEU
1	A	96	LEU
1	A	117	ARG
1	A	121	ARG
1	A	127	SER
1	A	141	ASP
1	A	148	LEU
1	A	149	ARG
1	A	150	GLU
1	A	169	MET
1	A	170	LYS
1	A	194	ARG
1	A	231	ARG
1	B	12	LEU
1	B	14	LEU
1	B	29	LEU
1	B	30	THR
1	B	32	ARG
1	B	46	ARG
1	B	59	ARG
1	B	64	LEU
1	B	80	LEU
1	B	83	ARG
1	B	88	LEU
1	B	102	LEU
1	B	104	LYS
1	B	105	ILE
1	B	111	GLN
1	B	121	ARG
1	B	134	LEU
1	B	136	GLN
1	B	138	ASP
1	B	141	ASP
1	B	146	GLU
1	B	148	LEU
1	B	149	ARG
1	B	150	GLU
1	B	151	MET
1	B	164	ASN
1	B	189	ILE
1	B	194	ARG
1	B	198	GLN

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Mol	Chain	Res	Type
1	B	222	SER
1	B	231	ARG
1	B	232	VAL
1	C	8	ASN
1	C	12	LEU
1	C	14	LEU
1	C	29	LEU
1	C	30	THR
1	C	32	ARG
1	C	38	LEU
1	C	51	SER
1	C	52	ASP
1	C	64	LEU
1	C	80	LEU
1	C	92	ASN
1	C	95	SER
1	C	96	LEU
1	C	105	ILE
1	C	113	ILE
1	C	121	ARG
1	C	134	LEU
1	C	147	HIS
1	C	149	ARG
1	C	169	MET
1	C	179	GLU
1	C	194	ARG
1	C	198	GLN
1	C	204	LEU
1	C	221	SER
1	C	230	ARG
1	C	231	ARG
1	D	28	VAL
1	D	32	ARG
1	D	38	LEU
1	D	40	ARG
1	D	57	GLN
1	D	63	MET
1	D	80	LEU
1	D	87	GLU
1	D	88	LEU
1	D	96	LEU
1	D	102	LEU

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Mol	Chain	Res	Type
1	D	105	ILE
1	D	119	LEU
1	D	130	GLU
1	D	134	LEU
1	D	136	GLN
1	D	138	ASP
1	D	139	CYS
1	D	148	LEU
1	D	160	ASN
1	D	176	LEU
1	D	178	GLU
1	D	188	MET
1	D	212	SER
1	D	221	SER
1	D	225	ASP
1	D	229	LEU
1	D	231	ARG
1	E	12	LEU
1	E	14	LEU
1	E	16	ARG
1	E	32	ARG
1	E	35	ASP
1	E	52	ASP
1	E	57	GLN
1	E	80	LEU
1	E	83	ARG
1	E	87	GLU
1	E	96	LEU
1	E	121	ARG
1	E	127	SER
1	E	129	MET
1	E	134	LEU
1	E	141	ASP
1	E	148	LEU
1	E	155	LEU
1	E	162	HIS
1	E	188	MET
1	E	189	ILE
1	E	194	ARG
1	E	202	GLU
1	E	208	ARG
1	E	221	SER

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Mol	Chain	Res	Type
1	E	222	SER
1	E	231	ARG
1	E	232	VAL
1	F	29	LEU
1	F	38	LEU
1	F	40	ARG
1	F	46	ARG
1	F	51	SER
1	F	52	ASP
1	F	53	PHE
1	F	79	GLU
1	F	80	LEU
1	F	81	ARG
1	F	87	GLU
1	F	88	LEU
1	F	92	ASN
1	F	102	LEU
1	F	105	ILE
1	F	127	SER
1	F	134	LEU
1	F	139	CYS
1	F	151	MET
1	F	170	LYS
1	F	194	ARG
1	F	208	ARG
1	F	210	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (29) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	25	HIS
1	A	111	GLN
1	A	131	ASN
1	A	135	HIS
1	A	160	ASN
1	A	162	HIS
1	A	164	ASN
1	B	111	GLN
1	B	162	HIS
1	B	164	ASN
1	C	8	ASN
1	C	92	ASN

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Mol	Chain	Res	Type
1	C	160	ASN
1	C	162	HIS
1	D	57	GLN
1	D	92	ASN
1	D	136	GLN
1	D	219	ASN
1	E	8	ASN
1	E	74	HIS
1	E	111	GLN
1	E	131	ASN
1	E	160	ASN
1	E	164	ASN
1	F	136	GLN
1	F	153	HIS
1	F	164	ASN
1	F	175	HIS
1	F	219	ASN

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 ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

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

All (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
2	D	301	SAH	C2-N1	2.49	1.38	1.33
2	A	301	SAH	C2-N1	2.49	1.38	1.33
2	C	301	SAH	C2-N1	2.32	1.38	1.33
2	C	301	SAH	OXT-C	-2.18	1.23	1.30
2	B	301	SAH	C2-N1	2.16	1.37	1.33
2	A	301	SAH	OXT-C	-2.15	1.23	1.30
2	D	301	SAH	OXT-C	-2.13	1.23	1.30
2	E	301	SAH	C2-N1	2.08	1.37	1.33

All (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

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
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
2	A	301	SAH	OXT-C-O	-4.83	113.12	124.09
2	D	301	SAH	OXT-C-O	-4.15	114.67	124.09
2	E	301	SAH	C5'-SD-CG	-3.75	91.01	102.27
2	E	301	SAH	OXT-C-O	-3.75	115.58	124.09
2	C	301	SAH	OXT-C-O	-3.58	115.97	124.09
2	C	301	SAH	C5'-C4'-C3'	3.45	123.68	115.06
2	A	301	SAH	OXT-C-CA	3.22	124.37	113.38
2	D	301	SAH	OXT-C-CA	2.87	123.15	113.38
2	B	301	SAH	OXT-C-O	-2.82	117.69	124.09
2	C	301	SAH	OXT-C-CA	2.69	122.55	113.38
2	B	301	SAH	OXT-C-CA	2.60	122.25	113.38
2	D	301	SAH	C5'-SD-CG	-2.55	94.60	102.27
2	C	301	SAH	C1'-N9-C4	-2.45	122.33	126.64
2	E	301	SAH	O4'-C4'-C5'	-2.45	102.52	108.83
2	E	301	SAH	OXT-C-CA	2.37	121.47	113.38
2	C	301	SAH	O4'-C4'-C5'	-2.11	103.41	108.83
2	C	301	SAH	C4-C5-N7	-2.09	107.22	109.40
2	D	301	SAH	C3'-C2'-C1'	2.00	104.00	100.98

There are no chirality outliers.

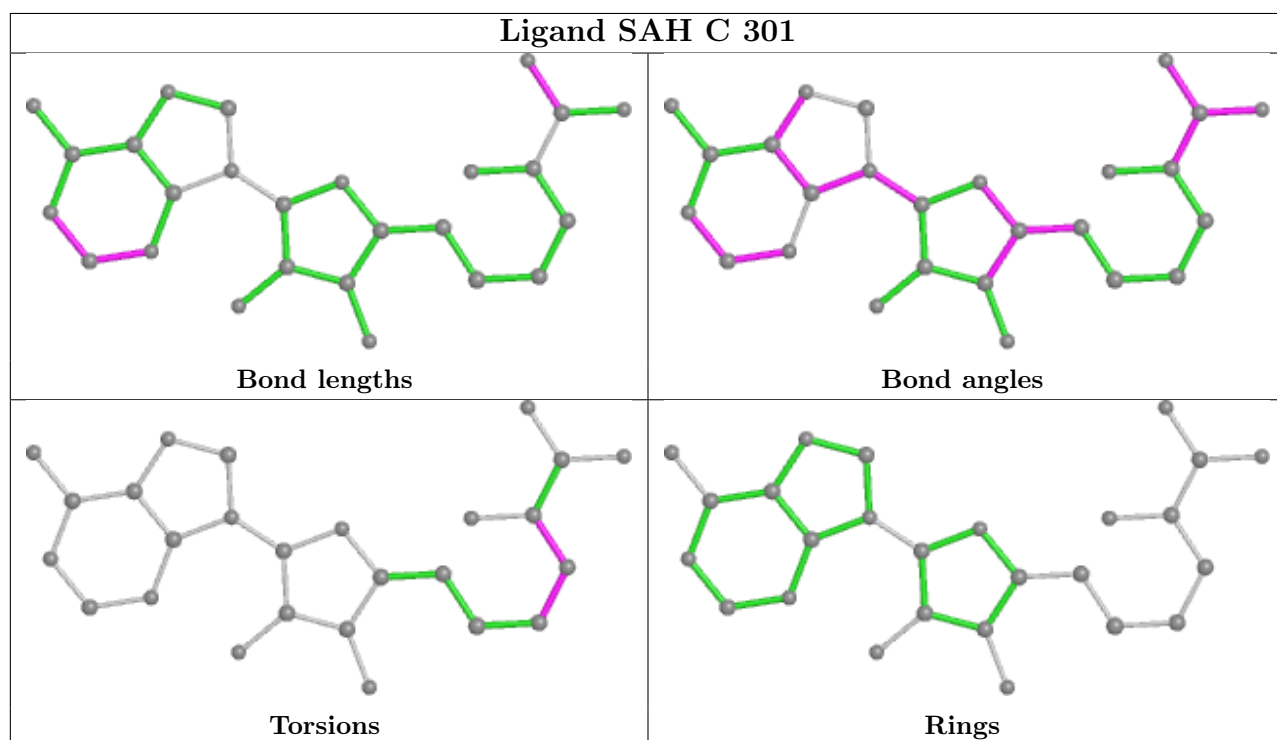All (15) torsion outliers are listed below:

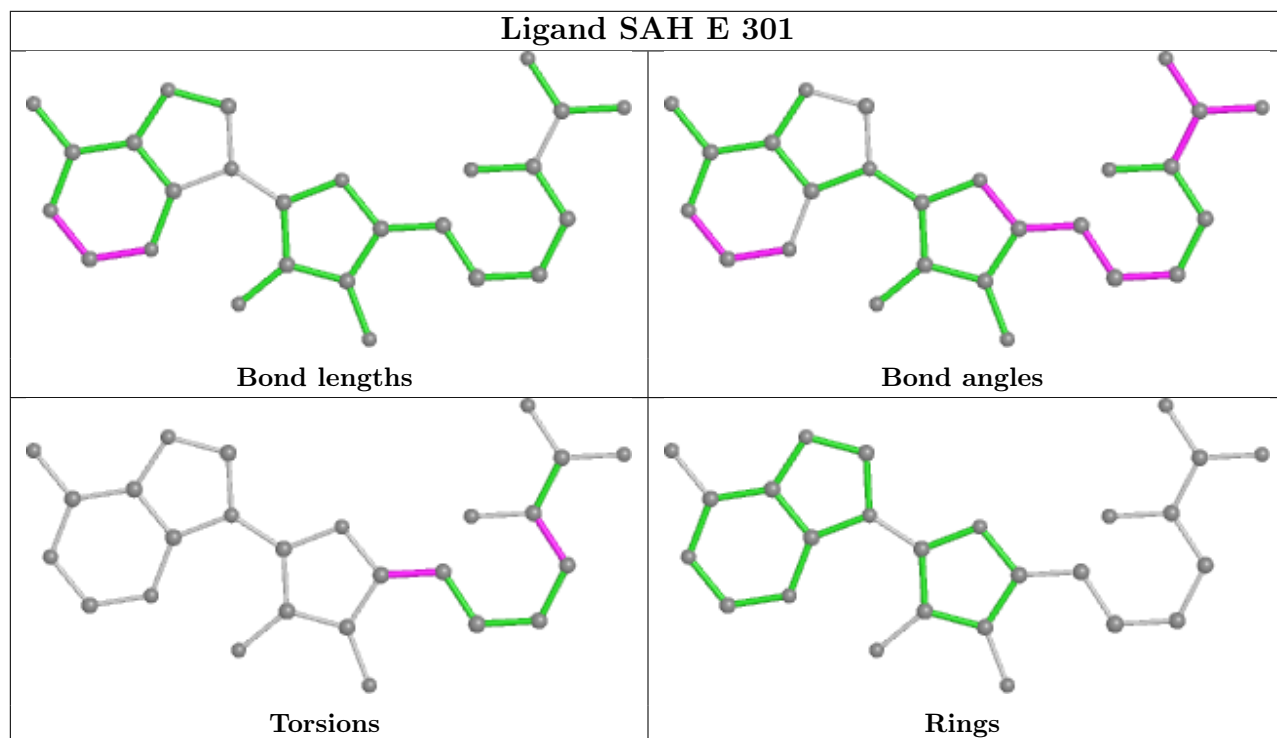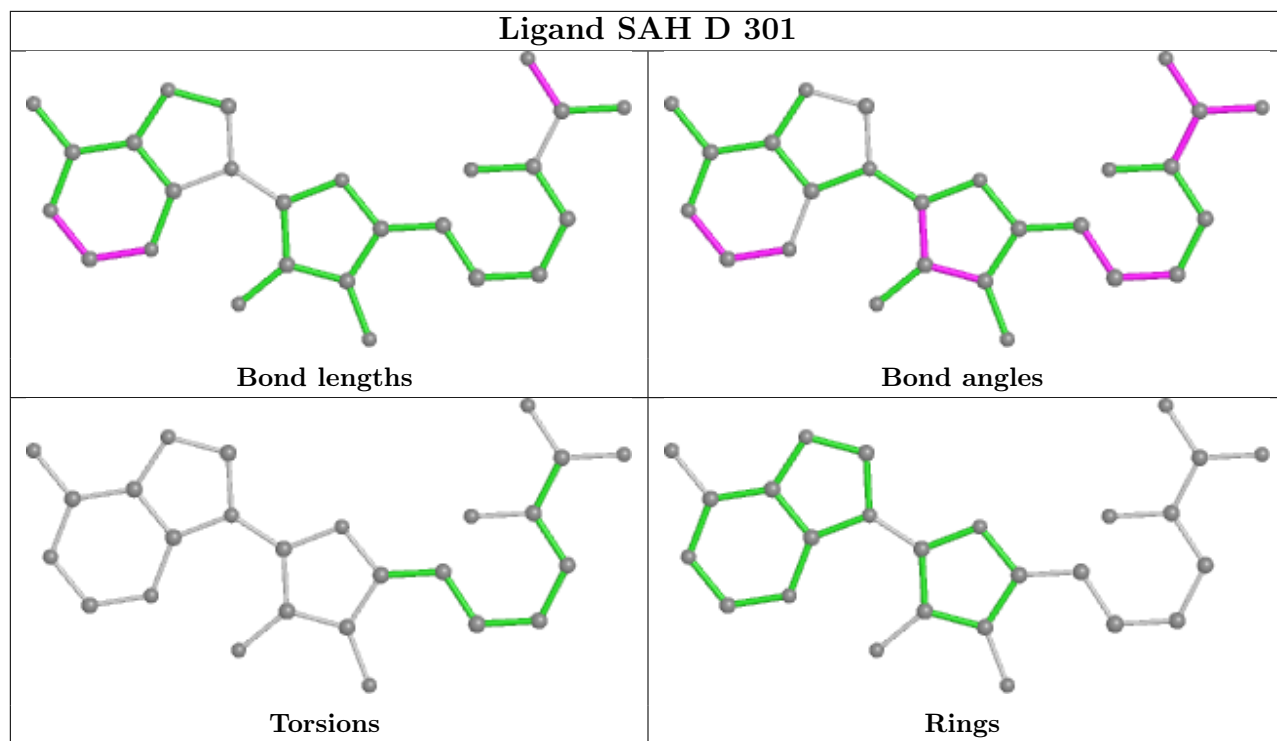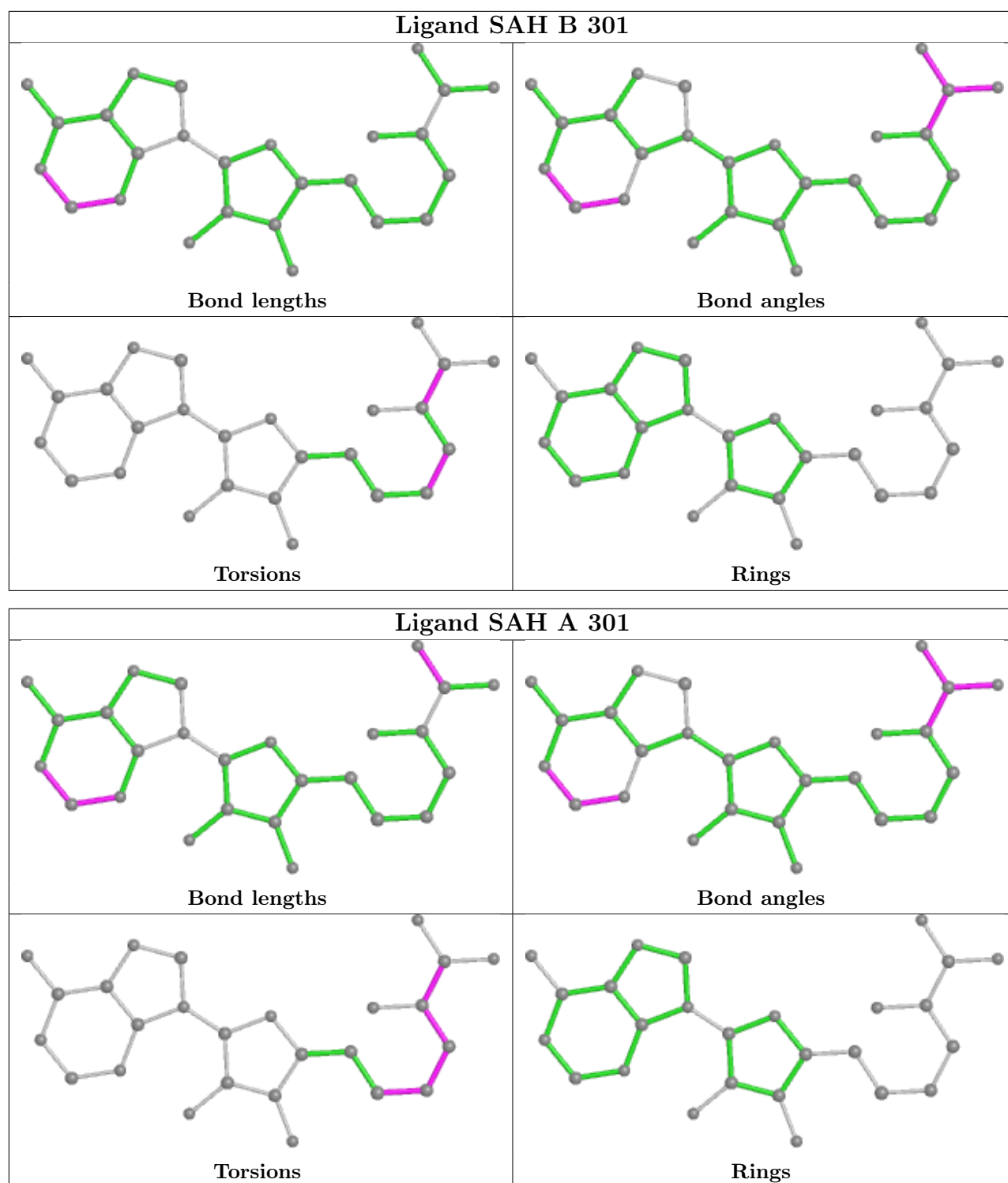| Mol	Chain	Res	Type	Atoms
2	C	301	SAH	N-CA-CB-CG
2	E	301	SAH	N-CA-CB-CG
2	E	301	SAH	C-CA-CB-CG
2	E	301	SAH	O4'-C4'-C5'-SD
2	E	301	SAH	C3'-C4'-C5'-SD
2	A	301	SAH	CA-CB-CG-SD
2	C	301	SAH	C-CA-CB-CG
2	B	301	SAH	OXT-C-CA-N
2	A	301	SAH	OXT-C-CA-CB
2	B	301	SAH	O-C-CA-N
2	A	301	SAH	O-C-CA-CB
2	B	301	SAH	CA-CB-CG-SD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

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 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 SAH C 301

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH D 301

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH E 301

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH B 301

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH A 301

Bond lengths

Bond angles

Torsions

Rings

5.7　Other polymers ⓘ

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 was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.