



Full wwPDB EM Validation Report ⓘ

Nov 13, 2025 – 02:32 PM JST

PDB ID : 8YS6 / pdb_00008ys6
EMDB ID : EMD-39557
Title : Helicobacter pylori OorDABC in complex with Napabucasin
Authors : Lan, W.; Gao, Y.; Bi, H.
Deposited on : 2024-03-22
Resolution : 3.03 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : **NOT EXECUTED**
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.46

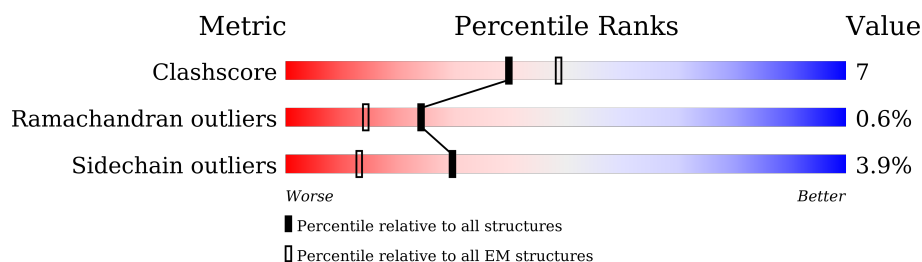
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.03 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	D	113	
1	F	113	
2	A	375	
2	G	375	
3	C	273	
3	H	273	
4	B	186	
4	I	186	

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
8	TPP	H	303	-	-	X	-

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 14637 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 2-oxoglutarate:acceptor oxidoreductase.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	D	106	Total	C	N	O	S	0	0
			811	511	139	151	10		
1	F	106	Total	C	N	O	S	0	0
			814	512	139	153	10		

- Molecule 2 is a protein called 2-oxoglutarate synthase subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	A	374	Total	C	N	O	S	0	0
			2907	1857	488	544	18		
2	G	374	Total	C	N	O	S	0	0
			2907	1857	488	544	18		

- Molecule 3 is a protein called 2-oxoglutarate ferredoxin oxidoreductase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	273	Total	C	N	O	S	0	0
			2132	1337	378	398	19		
3	H	273	Total	C	N	O	S	0	0
			2132	1337	378	398	19		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	250	ARG	LYS	conflict	UNP A0A024BZG2
H	250	ARG	LYS	conflict	UNP A0A024BZG2

- Molecule 4 is a protein called 2-oxoglutarate:acceptor oxidoreductase.

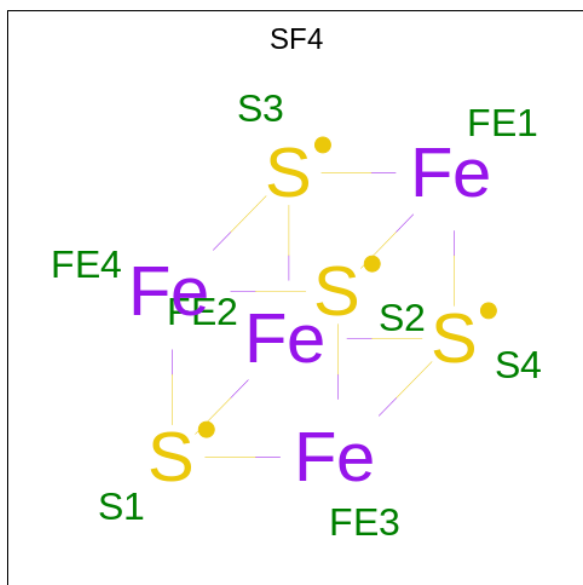
Mol	Chain	Residues	Atoms					AltConf	Trace
4	B	184	Total	C	N	O	S	0	0
			1391	891	224	272	4		

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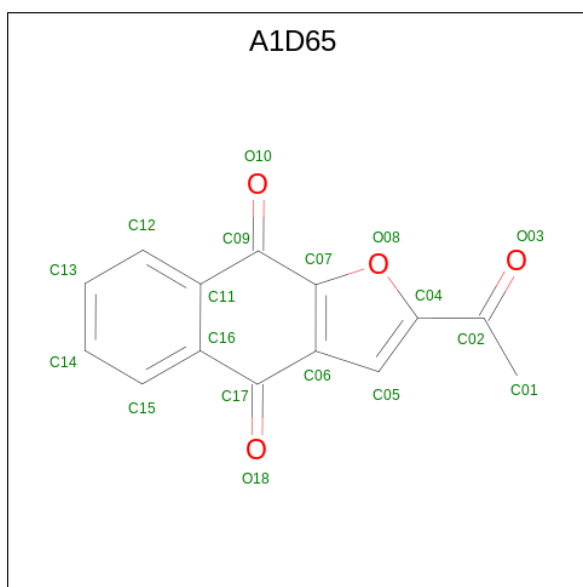
Mol	Chain	Residues	Atoms					AltConf	Trace
4	I	184	Total	C	N	O	S	0	0
			1405	902	225	274	4		

- Molecule 5 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
5	D	1	Total	Fe	S	0
			8	4	4	
5	D	1	Total	Fe	S	0
			8	4	4	
5	C	1	Total	Fe	S	0
			8	4	4	
5	F	1	Total	Fe	S	0
			8	4	4	
5	F	1	Total	Fe	S	0
			8	4	4	
5	H	1	Total	Fe	S	0
			8	4	4	

- Molecule 6 is Napabucasin (CCD ID: A1D65) (formula: $\text{C}_{14}\text{H}_8\text{O}_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
6	D	1	Total	C	O	0
			18	14	4	
6	F	1	Total	C	O	0
			18	14	4	

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
7	C	1	Total	Mg	0
			1	1	
7	H	1	Total	Mg	0
			1	1	

- Molecule 8 is THIAMINE DIPHOSPHATE (CCD ID: TPP) (formula: C₁₂H₁₉N₄O₇P₂S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						AltConf
8	C	1	Total 26	C 12	N 4	O 7	P 2	S 1	0
8	H	1	Total 26	C 12	N 4	O 7	P 2	S 1	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.

- Molecule 1: 2-oxoglutarate:acceptor oxidoreductase

Chain D: 



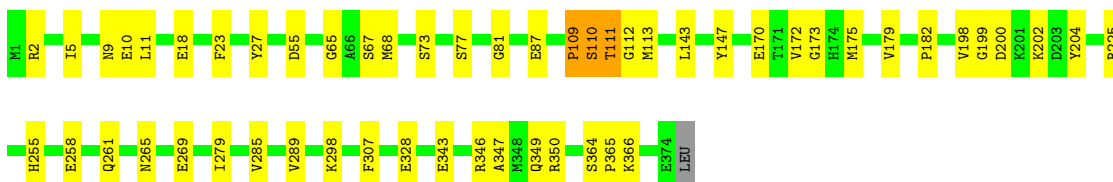
- Molecule 1: 2-oxoglutarate:acceptor oxidoreductase

Chain F: 



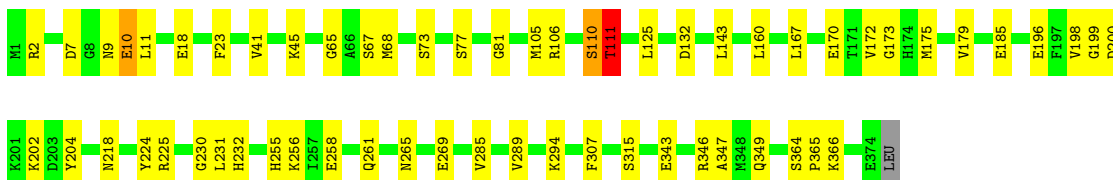
- Molecule 2: 2-oxoglutarate synthase subunit alpha

Chain A: 



- Molecule 2: 2-oxoglutarate synthase subunit alpha

Chain G: 



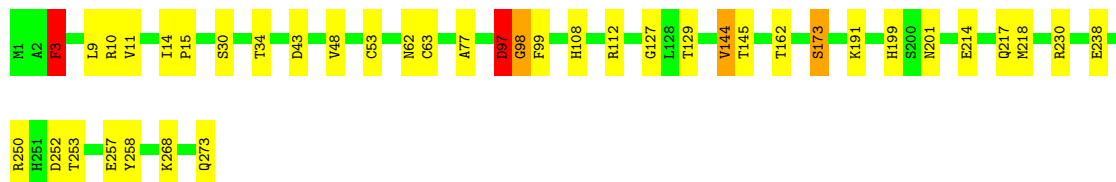
- Molecule 3: 2-oxoglutarate ferredoxin oxidoreductase subunit beta

Chain C: 



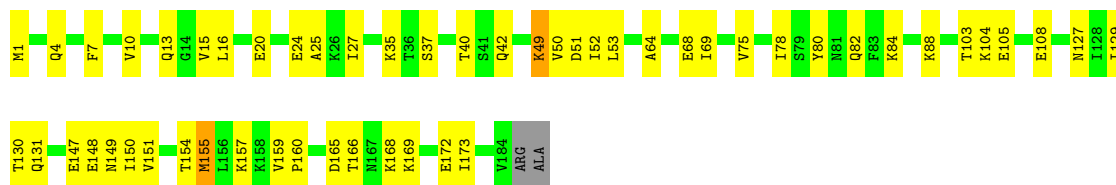
- Molecule 3: 2-oxoglutarate ferredoxin oxidoreductase subunit beta

Chain H: 85% 13% ..



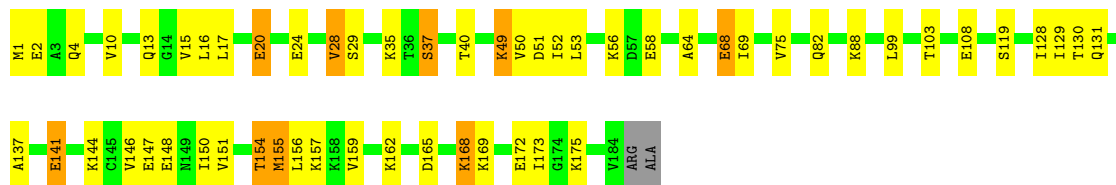
- Molecule 4: 2-oxoglutarate:acceptor oxidoreductase

Chain B: 70% 27% ..



- Molecule 4: 2-oxoglutarate:acceptor oxidoreductase

Chain I: 69% 25% 5% .



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	146076	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, TPP, SF4, A1D65

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	D	0.33	0/823	0.50	0/1106
1	F	0.16	0/826	0.43	0/1110
2	A	0.34	0/2968	0.47	2/3997 (0.1%)
2	G	0.30	0/2968	0.44	0/3997
3	C	0.31	0/2179	0.48	0/2943
3	H	0.30	0/2179	0.47	0/2943
4	B	0.23	0/1408	0.45	0/1903
4	I	0.23	0/1422	0.46	0/1920
All	All	0.29	0/14773	0.46	2/19919 (0.0%)

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
2	A	0	1
2	G	0	2
All	All	0	3

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	110	SER	N-CA-C	5.87	118.85	110.10
2	A	110	SER	CB-CA-C	-5.33	101.59	109.90

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	A	200	ASP	Peptide
2	G	110	SER	Peptide
2	G	200	ASP	Peptide

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	D	811	0	819	7	0
1	F	814	0	823	9	0
2	A	2907	0	2932	43	0
2	G	2907	0	2932	39	0
3	C	2132	0	2079	27	0
3	H	2132	0	2080	23	0
4	B	1391	0	1441	40	0
4	I	1405	0	1474	20	0
5	C	8	0	0	0	0
5	D	16	0	0	1	0
5	F	16	0	0	1	0
5	H	8	0	0	0	0
6	D	18	0	0	0	0
6	F	18	0	0	0	0
7	C	1	0	0	0	0
7	H	1	0	0	0	0
8	C	26	0	16	4	0
8	H	26	0	16	9	0
All	All	14637	0	14612	195	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 7.

All (195) 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)
3:C:9:LEU:HD11	3:C:32:ILE:HD13	1.53	0.88
3:C:9:LEU:HD11	3:C:32:ILE:CD1	2.04	0.86
3:C:5:TYR:O	3:C:9:LEU:HD13	1.79	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:H:303:TPP:N4'	8:H:303:TPP:H2	1.94	0.80
2:A:5:ILE:HD12	4:B:27:ILE:HD13	1.63	0.80
2:G:125:LEU:HD12	2:G:167:LEU:HD21	1.64	0.79
8:C:303:TPP:N4'	8:C:303:TPP:H2	1.97	0.78
4:B:37:SER:OG	4:B:50:VAL:HG12	1.84	0.77
3:H:97:ASP:O	3:H:99:PHE:N	2.18	0.77
3:C:97:ASP:O	3:C:99:PHE:N	2.18	0.76
2:A:2:ARG:NH1	2:A:182:PRO:O	2.22	0.73
3:H:191:LYS:NZ	3:H:257:GLU:OE1	2.22	0.73
4:B:78:ILE:O	4:B:82:GLN:HG2	1.90	0.72
2:A:87:GLU:OE2	8:H:303:TPP:CM2	2.39	0.71
3:C:191:LYS:NZ	3:C:257:GLU:OE1	2.22	0.71
2:A:5:ILE:HD11	4:B:27:ILE:HG21	1.75	0.69
4:B:103:THR:HG22	4:B:104:LYS:N	2.08	0.69
4:B:40:THR:HG23	4:B:42:GLN:H	1.58	0.68
2:A:110:SER:O	2:A:112:GLY:N	2.26	0.68
1:F:16:GLU:O	1:F:42:ARG:NH1	2.26	0.68
3:C:9:LEU:CD1	3:C:32:ILE:HD13	2.25	0.67
4:I:24:GLU:O	4:I:28:VAL:HG22	1.95	0.66
4:B:157:LYS:O	4:B:157:LYS:HG2	1.95	0.66
8:C:303:TPP:H2	8:C:303:TPP:C4'	2.24	0.66
4:B:127:ASN:O	4:B:130:THR:HG22	1.96	0.65
4:I:1:MET:HE1	4:I:53:LEU:HB3	1.79	0.65
4:I:37:SER:HB3	4:I:50:VAL:HG12	1.78	0.65
4:B:159:VAL:HG13	4:B:160:PRO:HD2	1.79	0.64
3:H:250:ARG:NE	3:H:252:ASP:OD1	2.26	0.64
4:B:129:ILE:HG22	4:B:129:ILE:O	1.97	0.64
3:C:43:ASP:OD1	2:G:225:ARG:NH1	2.30	0.63
2:A:11:LEU:HD11	2:A:179:VAL:HG21	1.81	0.63
2:G:11:LEU:HD11	2:G:179:VAL:HG21	1.81	0.63
2:A:23:PHE:HB3	2:A:73:SER:HB3	1.81	0.63
4:B:1:MET:HE1	4:B:53:LEU:HB3	1.79	0.62
2:A:18:GLU:OE2	2:A:147:TYR:OH	2.17	0.62
4:I:64:ALA:HB1	4:I:69:ILE:HD11	1.82	0.62
2:G:23:PHE:HB3	2:G:73:SER:HB3	1.81	0.62
4:B:64:ALA:HB1	4:B:69:ILE:HD11	1.82	0.60
2:G:198:VAL:O	2:G:224:TYR:OH	2.17	0.60
3:C:214:GLU:HB3	3:C:217:GLN:HG3	1.84	0.59
2:A:364:SER:O	2:A:366:LYS:N	2.35	0.59
2:G:364:SER:O	2:G:366:LYS:N	2.35	0.59
1:F:21:GLY:HA2	1:F:36:MET:HE1	1.83	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:261:GLN:OE1	2:A:265:ASN:ND2	2.36	0.59
4:B:168:LYS:O	4:B:172:GLU:HG2	2.03	0.58
3:C:10:ARG:HG2	3:C:62:ASN:HD22	1.69	0.58
2:G:261:GLN:OE1	2:G:265:ASN:ND2	2.36	0.58
3:H:10:ARG:HG2	3:H:62:ASN:HD22	1.68	0.58
4:I:168:LYS:O	4:I:172:GLU:HG2	2.03	0.58
3:H:214:GLU:HB3	3:H:217:GLN:HG3	1.84	0.58
1:D:19:CYS:O	1:D:42:ARG:NH2	2.37	0.57
2:G:105:MET:HE3	2:G:167:LEU:HD22	1.85	0.57
2:G:172:VAL:HA	2:G:175:MET:HE2	1.86	0.57
2:G:198:VAL:HG23	2:G:199:GLY:H	1.70	0.57
2:A:172:VAL:HA	2:A:175:MET:HE2	1.86	0.56
2:A:198:VAL:HG23	2:A:199:GLY:H	1.70	0.56
3:H:53:CYS:HB2	8:H:303:TPP:O1B	2.06	0.55
2:A:9:ASN:ND2	2:A:173:GLY:O	2.39	0.55
3:C:63:CYS:HA	2:G:225:ARG:HD2	1.88	0.55
2:G:9:ASN:ND2	2:G:173:GLY:O	2.39	0.55
2:A:87:GLU:OE2	8:H:303:TPP:HM21	2.07	0.55
3:C:148:TRP:HB3	3:H:268:LYS:HE3	1.89	0.54
4:B:103:THR:CG2	4:B:104:LYS:N	2.71	0.54
1:F:106:THR:HG22	1:F:111:ARG:HB2	1.89	0.54
4:B:80:TYR:O	4:B:84:LYS:HB2	2.07	0.53
2:A:346:ARG:HB3	2:G:346:ARG:HB3	1.90	0.53
3:C:8:TYR:C	3:C:9:LEU:HD12	2.33	0.53
4:B:159:VAL:CG1	4:B:160:PRO:HD2	2.38	0.52
4:I:150:ILE:O	4:I:154:THR:OG1	2.27	0.52
2:G:106:ARG:NH2	2:G:111:THR:HG22	2.25	0.52
4:B:129:ILE:O	4:B:129:ILE:CG2	2.57	0.52
2:A:5:ILE:CD1	4:B:27:ILE:HG21	2.39	0.52
1:D:20:LYS:HD3	3:C:20:TRP:HA	1.91	0.52
4:B:20:GLU:O	4:B:24:GLU:HG2	2.11	0.51
2:A:111:THR:HG22	2:G:231:LEU:HG	1.93	0.51
3:H:127:GLY:N	8:H:303:TPP:O2B	2.42	0.51
3:H:48:VAL:HG11	3:H:77:ALA:HB2	1.92	0.51
1:F:43:VAL:HG13	4:I:13:GLN:HE21	1.75	0.51
8:C:303:TPP:C4'	8:C:303:TPP:C2	2.88	0.51
2:G:2:ARG:NH2	2:G:18:GLU:OE2	2.44	0.51
4:I:20:GLU:O	4:I:24:GLU:HG2	2.11	0.50
2:A:112:GLY:CA	2:G:232:HIS:HD2	2.24	0.50
2:A:2:ARG:NH2	2:A:18:GLU:OE2	2.44	0.50
2:G:315:SER:OG	2:G:343:GLU:OE2	2.22	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:B:40:THR:HG23	4:B:42:GLN:N	2.27	0.50
4:B:13:GLN:OE1	4:B:75:VAL:HG23	2.12	0.50
2:A:225:ARG:HD2	3:H:63:CYS:HA	1.93	0.49
3:H:214:GLU:HB2	3:H:217:GLN:HE21	1.77	0.49
3:C:214:GLU:HB2	3:C:217:GLN:HE21	1.77	0.49
2:G:7:ASP:OD1	2:G:7:ASP:N	2.39	0.49
8:H:303:TPP:H2	8:H:303:TPP:C4'	2.41	0.49
3:H:257:GLU:HG2	3:H:258:TYR:N	2.28	0.49
2:A:225:ARG:NH1	3:H:43:ASP:OD1	2.45	0.49
2:A:111:THR:CG2	2:G:231:LEU:HG	2.43	0.48
2:A:343:GLU:HA	2:A:346:ARG:HG2	1.96	0.48
4:B:103:THR:HG22	4:B:104:LYS:H	1.77	0.48
4:B:169:LYS:O	4:B:173:ILE:HG12	2.14	0.48
4:I:169:LYS:O	4:I:173:ILE:HG12	2.14	0.48
4:B:16:LEU:HD12	4:B:50:VAL:HG13	1.95	0.48
3:C:257:GLU:HG2	3:C:258:TYR:N	2.28	0.48
2:G:7:ASP:OD1	2:G:10:GLU:HG3	2.14	0.48
1:F:90:GLU:O	1:F:94:LYS:HD3	2.14	0.47
4:I:16:LEU:HD12	4:I:50:VAL:HG13	1.95	0.47
8:C:303:TPP:N4'	8:C:303:TPP:C2	2.73	0.47
2:G:202:LYS:HB2	2:G:204:TYR:CE1	2.49	0.47
4:B:105:GLU:O	4:B:108:GLU:HB2	2.15	0.47
2:G:343:GLU:HA	2:G:346:ARG:HG2	1.96	0.47
4:I:68:GLU:HA	4:I:88:LYS:HB3	1.96	0.47
1:D:58:GLY:HA3	1:D:76:ARG:HH21	1.78	0.47
2:A:202:LYS:HB2	2:A:204:TYR:CE1	2.49	0.47
4:B:68:GLU:HA	4:B:88:LYS:HB3	1.96	0.46
2:A:27:TYR:OH	3:C:70:HIS:HE1	1.98	0.46
4:B:103:THR:CG2	4:B:104:LYS:H	2.28	0.46
8:H:303:TPP:H2	8:H:303:TPP:HN42	1.76	0.46
4:B:157:LYS:O	4:B:157:LYS:CG	2.63	0.46
3:H:201:ASN:HB2	3:H:218:MET:HG2	1.98	0.46
2:G:65:GLY:HA2	2:G:68:MET:HE3	1.98	0.46
1:D:109:GLU:HG2	1:D:109:GLU:O	2.16	0.45
1:D:25:CYS:HB3	5:D:201:SF4:S1	2.56	0.45
3:C:162:THR:HG23	3:C:250:ARG:HH11	1.82	0.45
4:B:155:MET:HE3	4:B:155:MET:HB3	1.76	0.45
2:A:65:GLY:HA2	2:A:68:MET:HE3	1.98	0.45
2:G:160:LEU:O	2:G:256:LYS:HE3	2.16	0.45
3:C:9:LEU:CD1	3:C:32:ILE:CD1	2.86	0.45
3:C:201:ASN:HB2	3:C:218:MET:HG2	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:I:13:GLN:O	4:I:131:GLN:NE2	2.50	0.45
4:B:13:GLN:O	4:B:131:GLN:NE2	2.50	0.45
8:H:303:TPP:N4'	8:H:303:TPP:C2	2.73	0.45
4:B:165:ASP:OD1	4:B:166:THR:N	2.50	0.44
3:H:97:ASP:HB3	3:H:98:GLY:H	1.65	0.44
4:B:25:ALA:HB2	4:B:154:THR:HG21	1.98	0.44
1:F:22:CYS:N	5:F:201:SF4:S3	2.86	0.44
1:F:23:ASP:OD1	1:F:36:MET:HE3	2.17	0.44
2:A:112:GLY:HA2	2:G:232:HIS:HD2	1.83	0.44
4:B:15:VAL:HG23	4:B:131:GLN:NE2	2.33	0.44
2:A:269:GLU:HG2	2:A:307:PHE:HD1	1.83	0.44
4:I:4:GLN:HB3	4:I:69:ILE:HD13	1.99	0.44
2:A:55:ASP:HB3	3:C:101:ILE:HG13	2.00	0.44
4:I:15:VAL:HG23	4:I:131:GLN:NE2	2.33	0.44
3:H:129:THR:HG21	8:H:303:TPP:CM4	2.48	0.43
3:C:108:HIS:O	3:C:112:ARG:HG2	2.17	0.43
3:H:3:PHE:N	3:H:3:PHE:CD1	2.86	0.43
3:H:144:VAL:HG12	3:H:145:THR:HG23	2.00	0.43
3:H:162:THR:HG23	3:H:250:ARG:HH11	1.82	0.43
4:B:13:GLN:OE1	4:B:75:VAL:CG2	2.66	0.43
2:G:269:GLU:HG2	2:G:307:PHE:HD1	1.83	0.43
3:H:108:HIS:O	3:H:112:ARG:HG2	2.17	0.43
1:F:24:ILE:HG22	1:F:65:HIS:HB3	2.01	0.43
4:B:4:GLN:HB3	4:B:69:ILE:HD13	1.99	0.43
4:B:165:ASP:OD1	4:B:166:THR:HG23	2.18	0.43
2:A:347:ALA:C	2:A:349:GLN:H	2.27	0.43
4:I:49:LYS:HE3	4:I:51:ASP:OD1	2.19	0.43
3:C:144:VAL:HG12	3:C:145:THR:HG23	2.01	0.42
4:B:49:LYS:HE3	4:B:51:ASP:OD1	2.19	0.42
3:H:14:ILE:HA	3:H:15:PRO:C	2.43	0.42
2:A:255:HIS:HA	2:A:258:GLU:HG2	2.01	0.42
2:A:298:LYS:HA	2:A:298:LYS:HD3	1.68	0.42
2:G:347:ALA:C	2:G:349:GLN:H	2.27	0.42
4:I:137:ALA:O	4:I:141:GLU:HB2	2.19	0.42
3:C:14:ILE:HA	3:C:15:PRO:C	2.43	0.42
4:I:141:GLU:HG2	4:I:175:LYS:HG3	2.01	0.42
4:I:155:MET:HE3	4:I:155:MET:HB3	1.77	0.42
3:H:173:SER:HB3	3:H:199:HIS:HB2	2.02	0.42
2:A:67:SER:HB3	2:A:73:SER:OG	2.20	0.42
3:C:270:GLN:OE1	2:G:45:LYS:HB3	2.20	0.42
2:A:113:MET:HG3	2:G:232:HIS:CD2	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:I:175:LYS:HE2	4:I:175:LYS:HB3	1.82	0.42
2:A:109:PRO:HG3	2:G:132:ASP:O	2.20	0.41
1:F:96:LYS:HD3	1:F:96:LYS:C	2.45	0.41
2:G:143:LEU:HB3	2:G:179:VAL:HG22	2.02	0.41
4:I:147:GLU:O	4:I:151:VAL:HG23	2.20	0.41
2:A:269:GLU:HG2	2:A:307:PHE:CD1	2.56	0.41
2:A:279:ILE:HG22	2:A:279:ILE:O	2.20	0.41
2:A:143:LEU:HB3	2:A:179:VAL:HG22	2.01	0.41
3:C:30:SER:O	3:C:34:THR:HG22	2.20	0.41
3:H:30:SER:O	3:H:34:THR:HG22	2.20	0.41
2:A:328:GLU:O	2:A:350:ARG:NH2	2.53	0.41
3:C:13:LYS:HA	3:C:13:LYS:HD3	1.92	0.41
2:G:269:GLU:HG2	2:G:307:PHE:CD1	2.56	0.41
4:B:147:GLU:O	4:B:151:VAL:HG23	2.20	0.41
2:G:67:SER:HB3	2:G:73:SER:OG	2.20	0.41
2:A:77:SER:OG	2:A:81:GLY:HA3	2.21	0.41
2:A:110:SER:O	2:G:230:GLY:O	2.39	0.41
4:B:7:PHE:HB2	4:B:50:VAL:HG22	2.03	0.41
1:D:102:LEU:HD11	1:D:107:ILE:HD11	2.03	0.41
2:G:255:HIS:HA	2:G:258:GLU:HG2	2.01	0.41
1:D:26:VAL:HG21	1:D:36:MET:HG2	2.03	0.40
2:A:285:VAL:O	2:A:289:VAL:HG23	2.21	0.40
2:G:77:SER:OG	2:G:81:GLY:HA3	2.21	0.40
2:A:198:VAL:HG23	2:A:199:GLY:N	2.36	0.40
3:C:230:ARG:HA	3:C:233:GLU:HB2	2.03	0.40
4:B:149:ASN:OD1	4:B:150:ILE:N	2.54	0.40
2:G:196:GLU:HB2	2:G:218:ASN:ND2	2.36	0.40
2:G:285:VAL:O	2:G:289:VAL:HG23	2.21	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 PDB entries followed by that with respect to all EM entries.

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	D	104/113 (92%)	97 (93%)	7 (7%)	0	100	100
1	F	104/113 (92%)	99 (95%)	5 (5%)	0	100	100
2	A	372/375 (99%)	337 (91%)	32 (9%)	3 (1%)	16	47
2	G	372/375 (99%)	336 (90%)	33 (9%)	3 (1%)	16	47
3	C	271/273 (99%)	246 (91%)	22 (8%)	3 (1%)	12	40
3	H	271/273 (99%)	246 (91%)	22 (8%)	3 (1%)	12	40
4	B	182/186 (98%)	172 (94%)	10 (6%)	0	100	100
4	I	182/186 (98%)	172 (94%)	10 (6%)	0	100	100
All	All	1858/1894 (98%)	1705 (92%)	141 (8%)	12 (1%)	24	54

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	98	GLY
3	H	98	GLY
2	A	111	THR
2	G	111	THR
3	C	97	ASP
3	H	97	ASP
2	A	365	PRO
2	G	110	SER
2	G	365	PRO
3	C	3	PHE
3	H	3	PHE
2	A	109	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 PDB entries followed by that with respect to all EM entries.

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	D	88/94 (94%)	88 (100%)	0	100	100
1	F	89/94 (95%)	89 (100%)	0	100	100
2	A	313/314 (100%)	311 (99%)	2 (1%)	84	92

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	G	313/314 (100%)	307 (98%)	6 (2%)	52	76
3	C	231/231 (100%)	228 (99%)	3 (1%)	65	83
3	H	231/231 (100%)	221 (96%)	10 (4%)	25	55
4	B	151/156 (97%)	145 (96%)	6 (4%)	27	58
4	I	155/156 (99%)	120 (77%)	35 (23%)	1	3
All	All	1571/1590 (99%)	1509 (96%)	62 (4%)	30	59

All (62) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	10	GLU
2	A	170	GLU
3	C	11	VAL
3	C	97	ASP
3	C	144	VAL
4	B	10	VAL
4	B	35	LYS
4	B	49	LYS
4	B	52	ILE
4	B	148	GLU
4	B	155	MET
2	G	10	GLU
2	G	41	VAL
2	G	111	THR
2	G	170	GLU
2	G	185	GLU
2	G	294	LYS
3	H	3	PHE
3	H	9	LEU
3	H	11	VAL
3	H	97	ASP
3	H	144	VAL
3	H	173	SER
3	H	230	ARG
3	H	238	GLU
3	H	253	THR
3	H	273	GLN
4	I	2	GLU
4	I	10	VAL
4	I	17	LEU

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Mol	Chain	Res	Type
4	I	20	GLU
4	I	28	VAL
4	I	29	SER
4	I	35	LYS
4	I	37	SER
4	I	40	THR
4	I	49	LYS
4	I	52	ILE
4	I	56	LYS
4	I	58	GLU
4	I	68	GLU
4	I	75	VAL
4	I	82	GLN
4	I	99	LEU
4	I	103	THR
4	I	108	GLU
4	I	119	SER
4	I	128	ILE
4	I	129	ILE
4	I	130	THR
4	I	141	GLU
4	I	144	LYS
4	I	146	VAL
4	I	148	GLU
4	I	154	THR
4	I	155	MET
4	I	156	LEU
4	I	157	LYS
4	I	159	VAL
4	I	162	LYS
4	I	165	ASP
4	I	168	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (30) such sidechains are listed below:

Mol	Chain	Res	Type
2	A	127	HIS
2	A	218	ASN
2	A	265	ASN
2	A	297	HIS
2	A	339	GLN
2	A	367	GLN

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Mol	Chain	Res	Type
3	C	62	ASN
3	C	64	ASN
3	C	70	HIS
3	C	84	ASN
3	C	139	ASN
3	C	150	ASN
3	C	199	HIS
3	C	217	GLN
3	C	251	HIS
4	B	131	GLN
2	G	127	HIS
2	G	232	HIS
2	G	265	ASN
2	G	297	HIS
2	G	367	GLN
3	H	62	ASN
3	H	64	ASN
3	H	84	ASN
3	H	150	ASN
3	H	199	HIS
3	H	217	GLN
3	H	251	HIS
4	I	13	GLN
4	I	131	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 12 ligands modelled in this entry, 2 are monoatomic - leaving 10 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	SF4	F	201	-	0,12,12	-	-	-		
8	TPP	C	303	7	22,27,27	2.50	6 (27%)	29,40,40	1.92	10 (34%)
6	A1D65	F	203	-	16,20,20	2.18	6 (37%)	21,30,30	0.95	1 (4%)
5	SF4	H	301	-	0,12,12	-	-	-		
5	SF4	D	202	1	0,12,12	-	-	-		
5	SF4	C	301	3	0,12,12	-	-	-		
6	A1D65	D	203	-	16,20,20	2.12	7 (43%)	21,30,30	0.96	1 (4%)
5	SF4	D	201	-	0,12,12	-	-	-		
5	SF4	F	202	1	0,12,12	-	-	-		
8	TPP	H	303	7	22,27,27	2.59	4 (18%)	29,40,40	1.74	9 (31%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	SF4	F	201	-	-	-	0/6/5/5
8	TPP	C	303	7	-	7/16/17/17	0/2/2/2
6	A1D65	F	203	-	-	0/0/20/20	0/3/3/3
5	SF4	H	301	-	-	-	0/6/5/5
5	SF4	D	202	1	-	-	0/6/5/5
5	SF4	C	301	3	-	-	0/6/5/5
6	A1D65	D	203	-	-	0/0/20/20	0/3/3/3
5	SF4	D	201	-	-	-	0/6/5/5
5	SF4	F	202	1	-	-	0/6/5/5
8	TPP	H	303	7	-	10/16/17/17	0/2/2/2

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	H	303	TPP	C4-N3	-8.14	1.32	1.39
8	C	303	TPP	C4-N3	-8.02	1.32	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	H	303	TPP	C6-C5	5.84	1.53	1.50
6	F	203	A1D65	C07-C09	4.92	1.54	1.49
8	H	303	TPP	C4'-N4'	4.57	1.45	1.34
6	D	203	A1D65	C07-C09	4.49	1.54	1.49
8	C	303	TPP	C4'-N4'	4.42	1.45	1.34
8	C	303	TPP	C6-C5	4.03	1.52	1.50
6	F	203	A1D65	C16-C17	3.30	1.55	1.48
6	D	203	A1D65	C16-C17	3.22	1.55	1.48
6	D	203	A1D65	C06-C17	3.06	1.54	1.48
6	F	203	A1D65	C06-C17	2.98	1.54	1.48
6	F	203	A1D65	C11-C09	2.98	1.54	1.48
6	D	203	A1D65	C11-C09	2.97	1.54	1.48
8	C	303	TPP	C5'-C4'	-2.67	1.38	1.42
8	C	303	TPP	C2-N3	-2.43	1.30	1.36
8	H	303	TPP	C5'-C4'	-2.23	1.39	1.42
6	D	203	A1D65	O10-C09	-2.22	1.18	1.22
6	F	203	A1D65	O10-C09	-2.15	1.18	1.22
6	F	203	A1D65	O18-C17	-2.12	1.19	1.22
6	D	203	A1D65	C16-C11	-2.11	1.37	1.40
8	C	303	TPP	C7'-N3	-2.10	1.44	1.48
6	D	203	A1D65	O18-C17	-2.03	1.19	1.22

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	H	303	TPP	C5-C4-N3	4.64	116.87	107.57
8	C	303	TPP	C5-C4-N3	4.63	116.84	107.57
8	C	303	TPP	C7'-N3-C2	-3.52	118.99	125.35
8	C	303	TPP	CM4-C4-C5	-3.20	120.61	127.60
8	C	303	TPP	C5'-C7'-N3	-3.18	107.98	113.28
6	D	203	A1D65	C11-C09-C07	2.92	120.19	117.00
8	H	303	TPP	C6'-N1'-C2'	2.80	120.73	115.96
6	F	203	A1D65	C11-C09-C07	2.79	120.05	117.00
8	H	303	TPP	CM4-C4-C5	-2.75	121.59	127.60
8	H	303	TPP	PA-O3A-PB	-2.72	123.51	132.83
8	C	303	TPP	C6'-N1'-C2'	2.63	120.44	115.96
8	C	303	TPP	N4'-C4'-N3'	2.61	120.72	117.03
8	C	303	TPP	C5'-C6'-N1'	-2.48	119.69	123.82
8	H	303	TPP	C5'-C6'-N1'	-2.47	119.70	123.82
8	H	303	TPP	N1'-C2'-N3'	-2.28	121.62	125.54
8	C	303	TPP	N1'-C2'-N3'	-2.20	121.75	125.54
8	H	303	TPP	C7'-N3-C2	-2.11	121.54	125.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	H	303	TPP	N4'-C4'-N3'	2.11	120.01	117.03
8	H	303	TPP	C5'-C7'-N3	-2.10	109.77	113.28
8	C	303	TPP	C6-C5-C4	2.08	129.10	127.43
8	C	303	TPP	PA-O3A-PB	-2.07	125.72	132.83

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	C	303	TPP	C5-C6-C7-O7
8	C	303	TPP	C7-O7-PA-O3A
8	H	303	TPP	C4-C5-C6-C7
8	H	303	TPP	C5-C6-C7-O7
8	H	303	TPP	C7-O7-PA-O1A
8	H	303	TPP	C7-O7-PA-O2A
8	H	303	TPP	C7-O7-PA-O3A
8	H	303	TPP	PA-O3A-PB-O1B
8	C	303	TPP	C7-O7-PA-O1A
8	C	303	TPP	C7-O7-PA-O2A
8	C	303	TPP	C4-C5-C6-C7
8	C	303	TPP	C5'-C7'-N3-C4
8	H	303	TPP	C5'-C7'-N3-C2
8	H	303	TPP	C5'-C7'-N3-C4
8	H	303	TPP	PB-O3A-PA-O2A
8	H	303	TPP	PB-O3A-PA-O1A
8	C	303	TPP	PA-O3A-PB-O3B

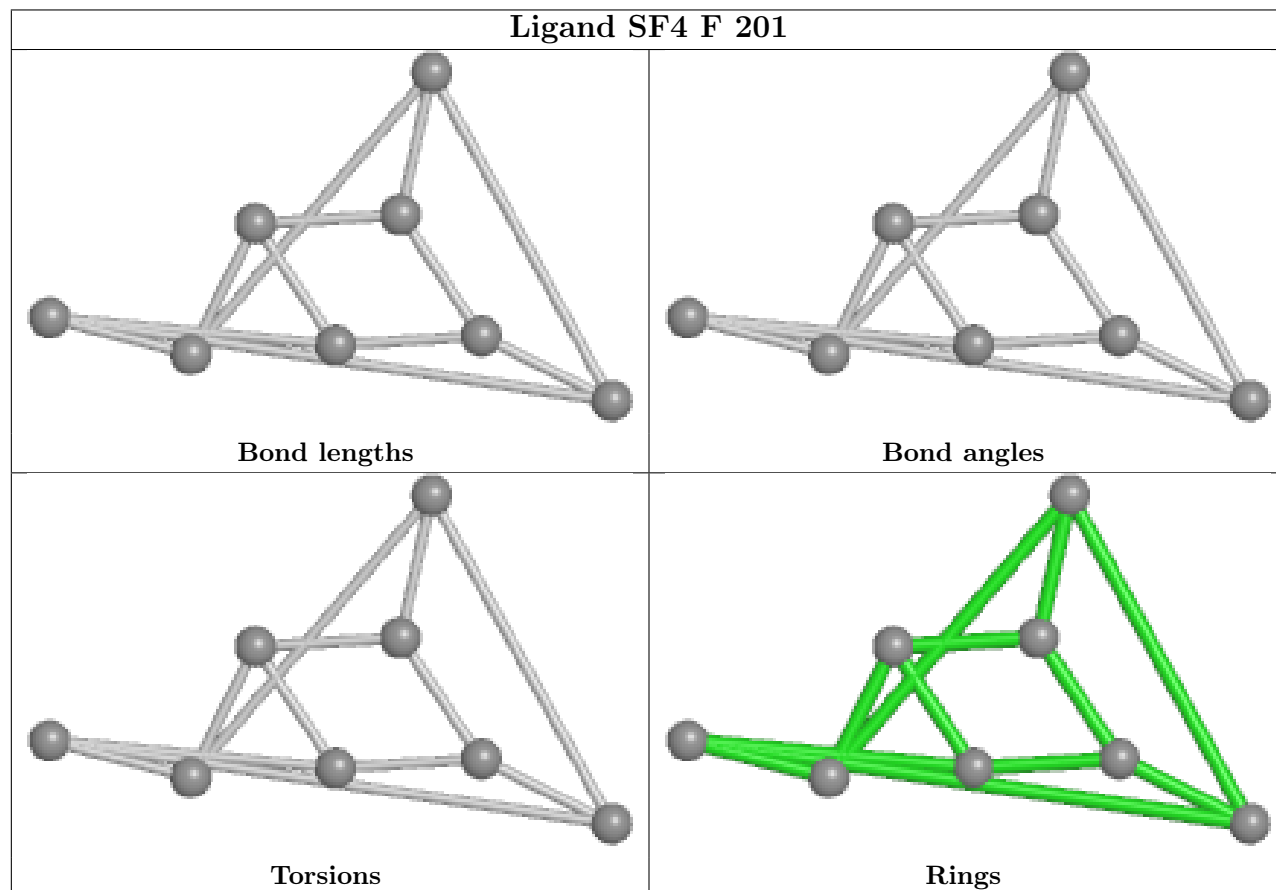
There are no ring outliers.

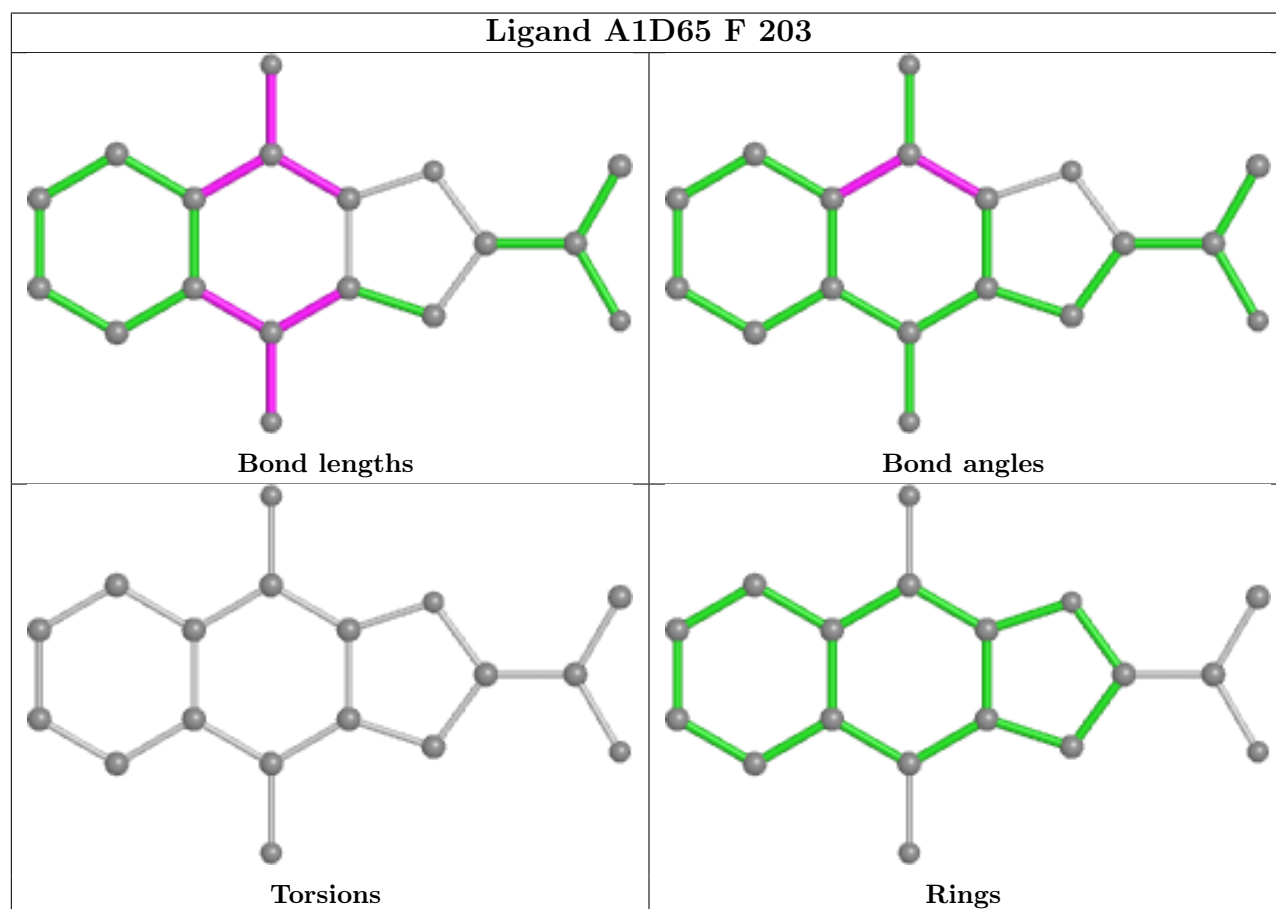
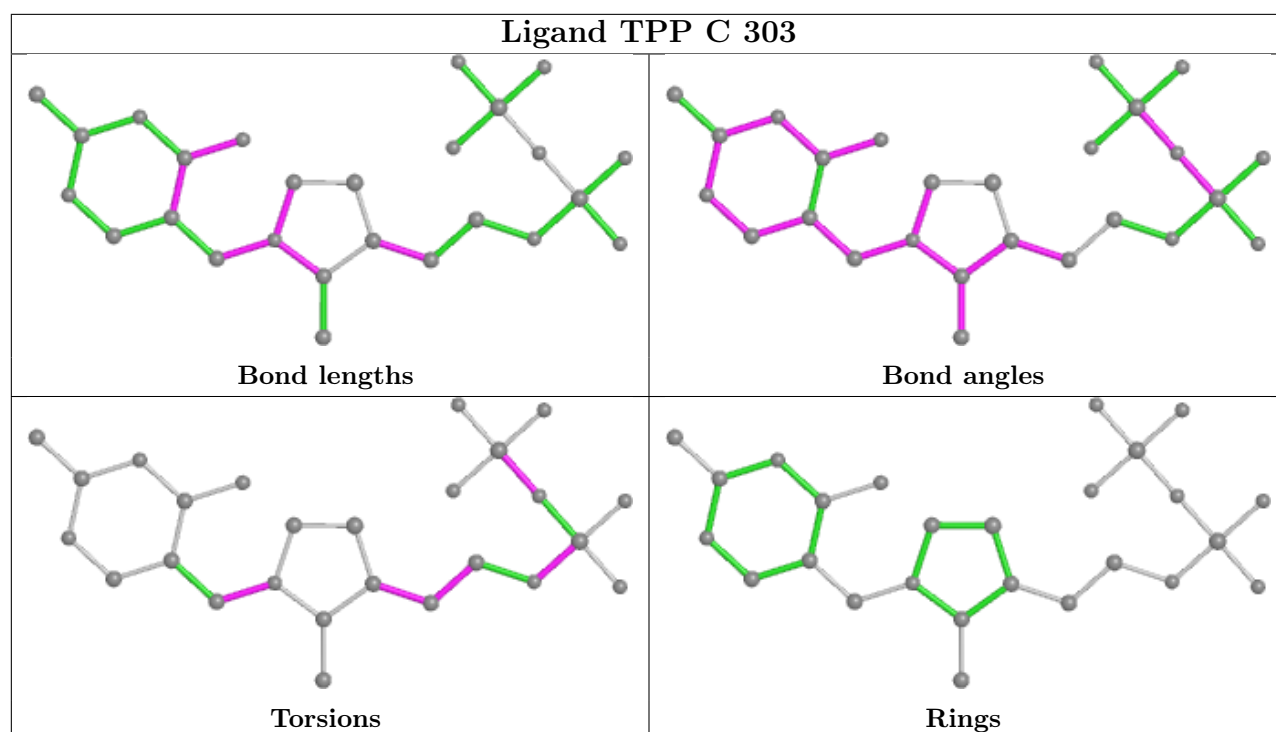
4 monomers are involved in 15 short contacts:

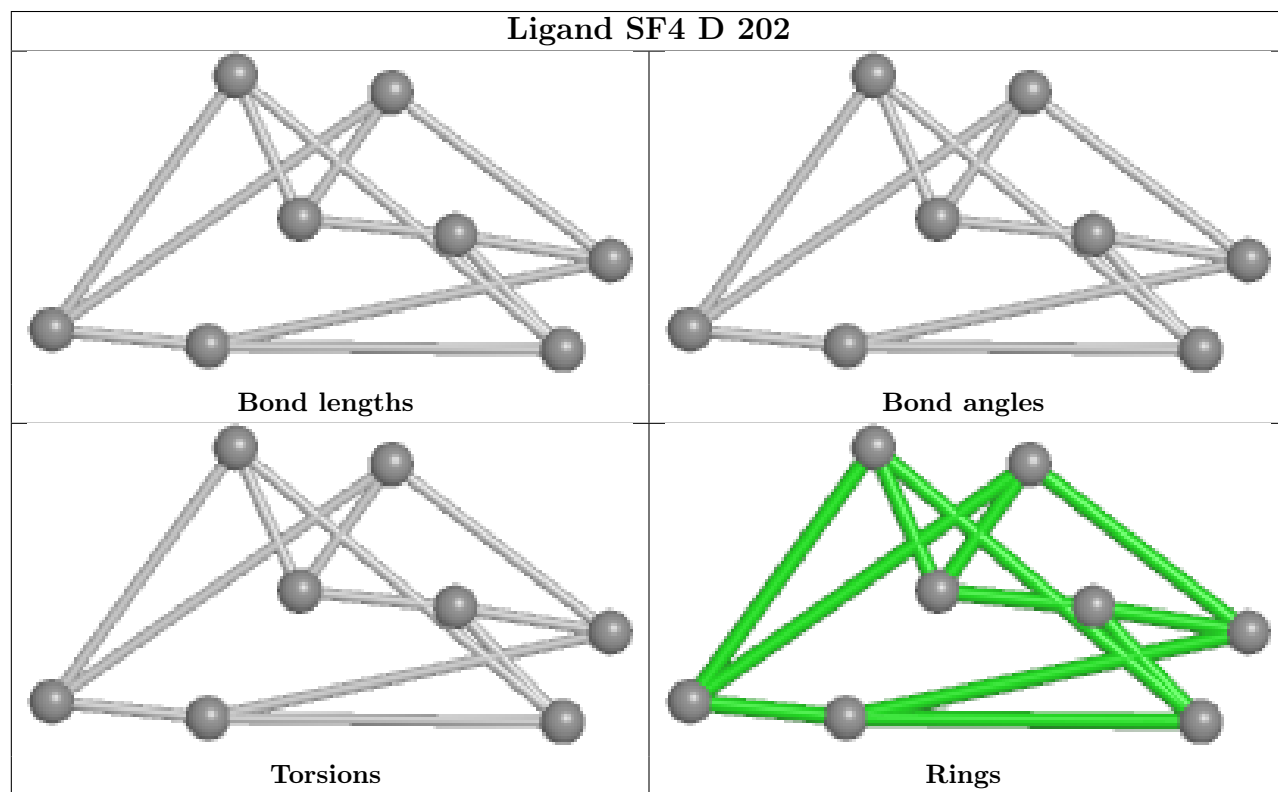
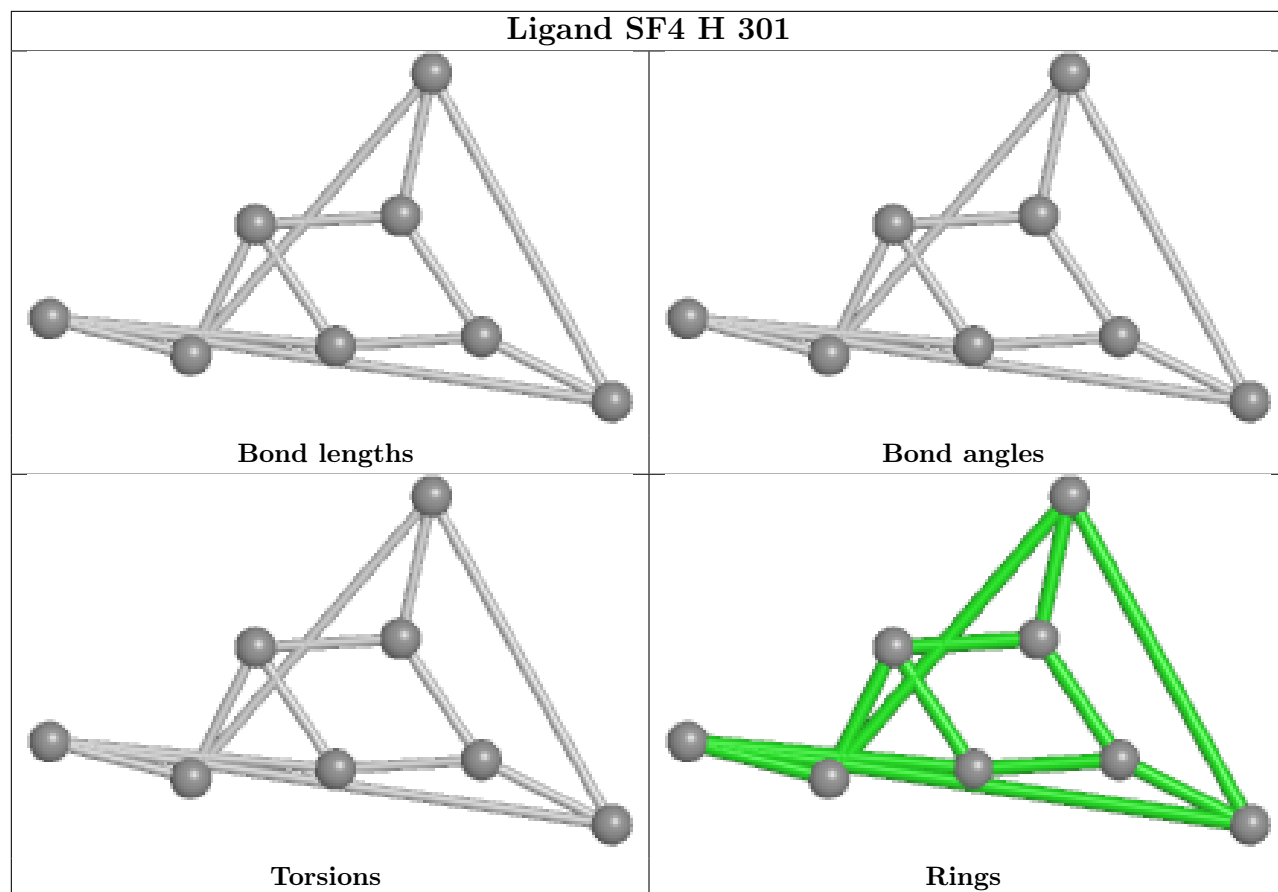
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	F	201	SF4	1	0
8	C	303	TPP	4	0
5	D	201	SF4	1	0
8	H	303	TPP	9	0

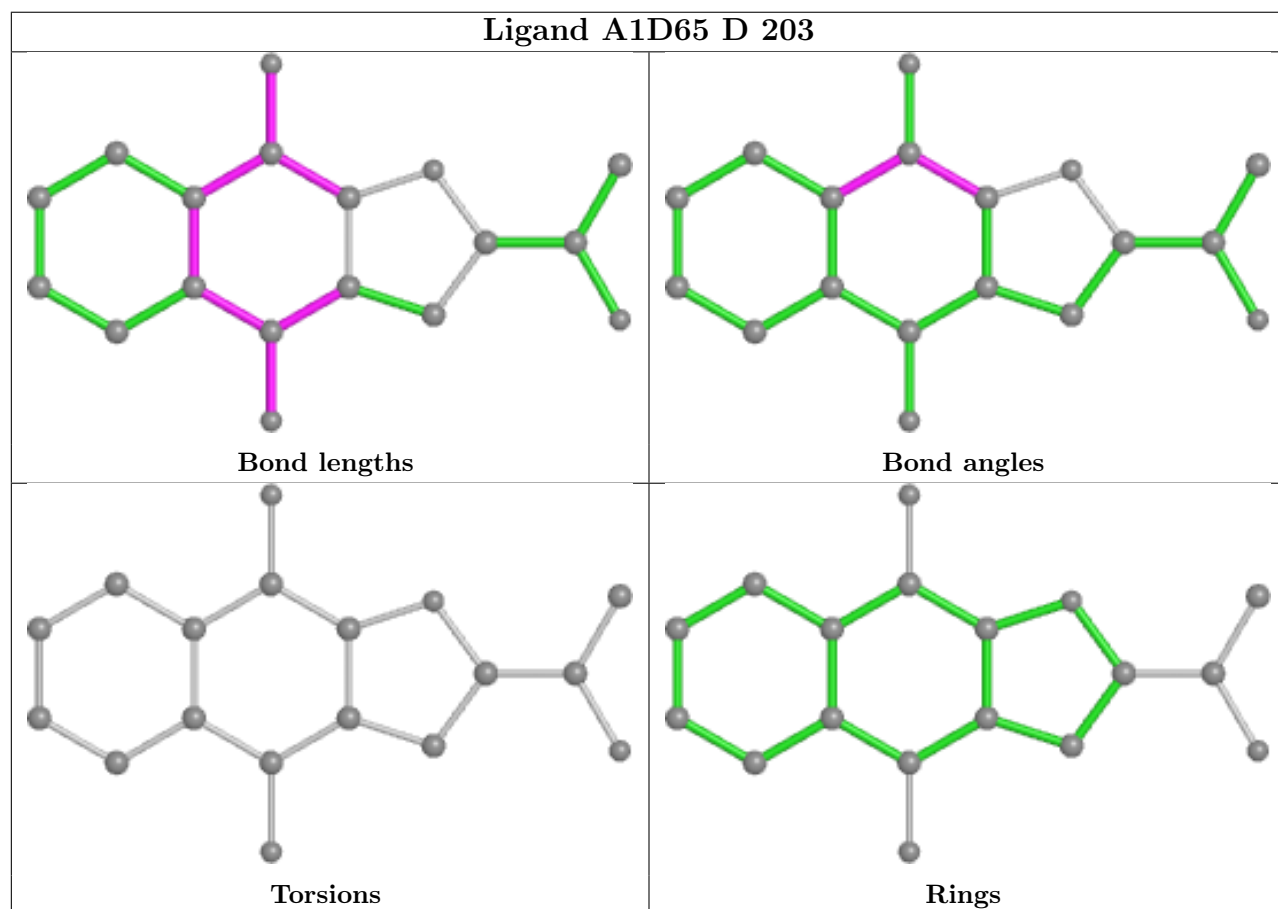
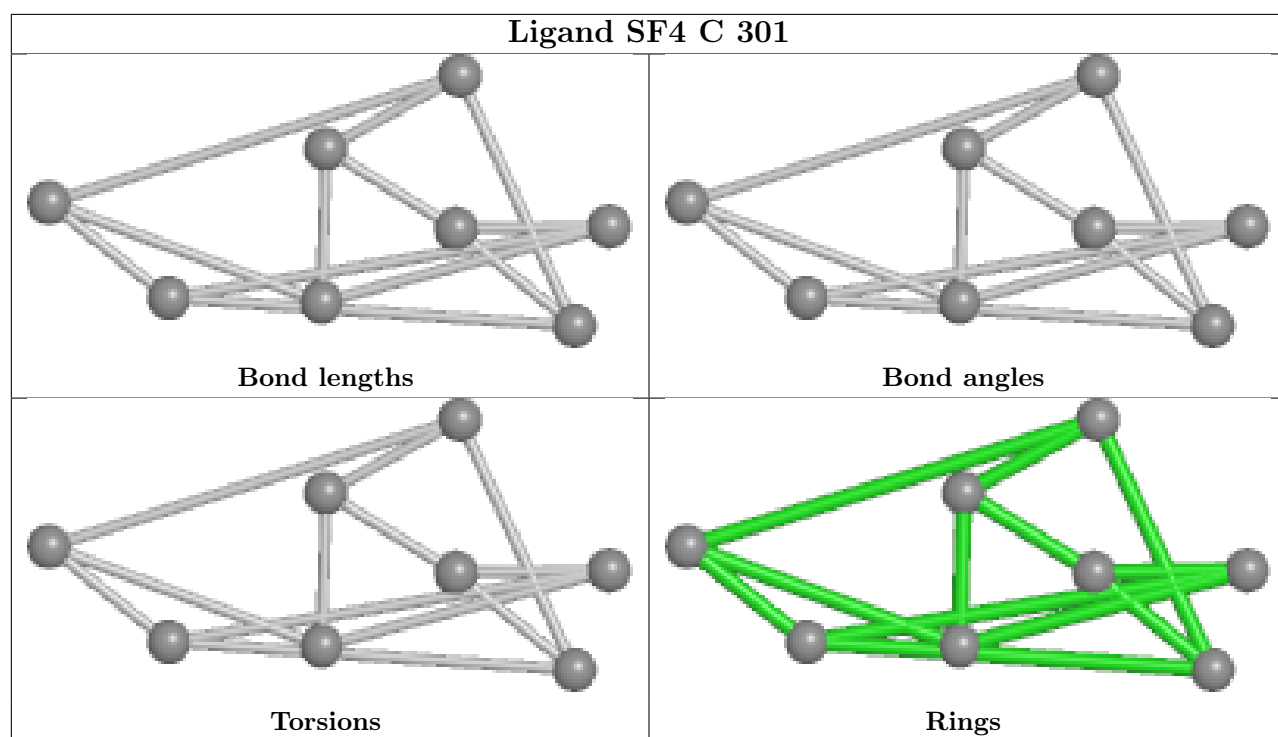
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

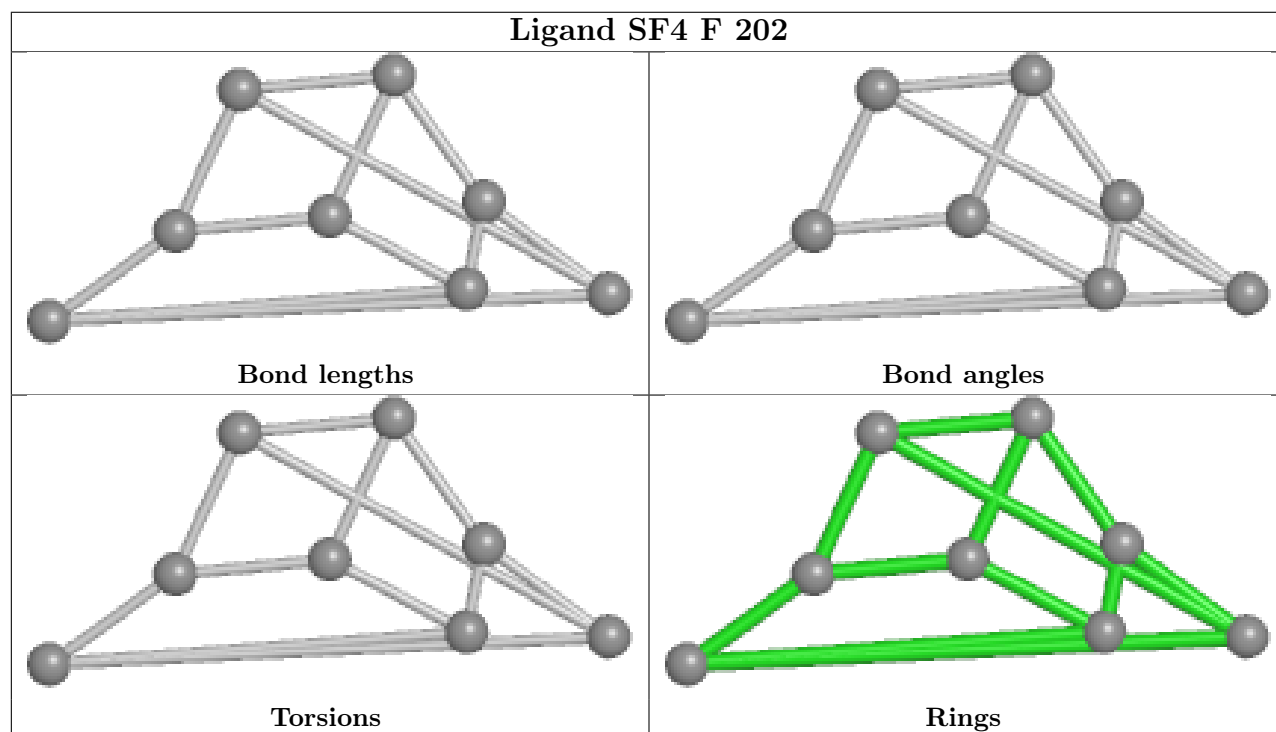
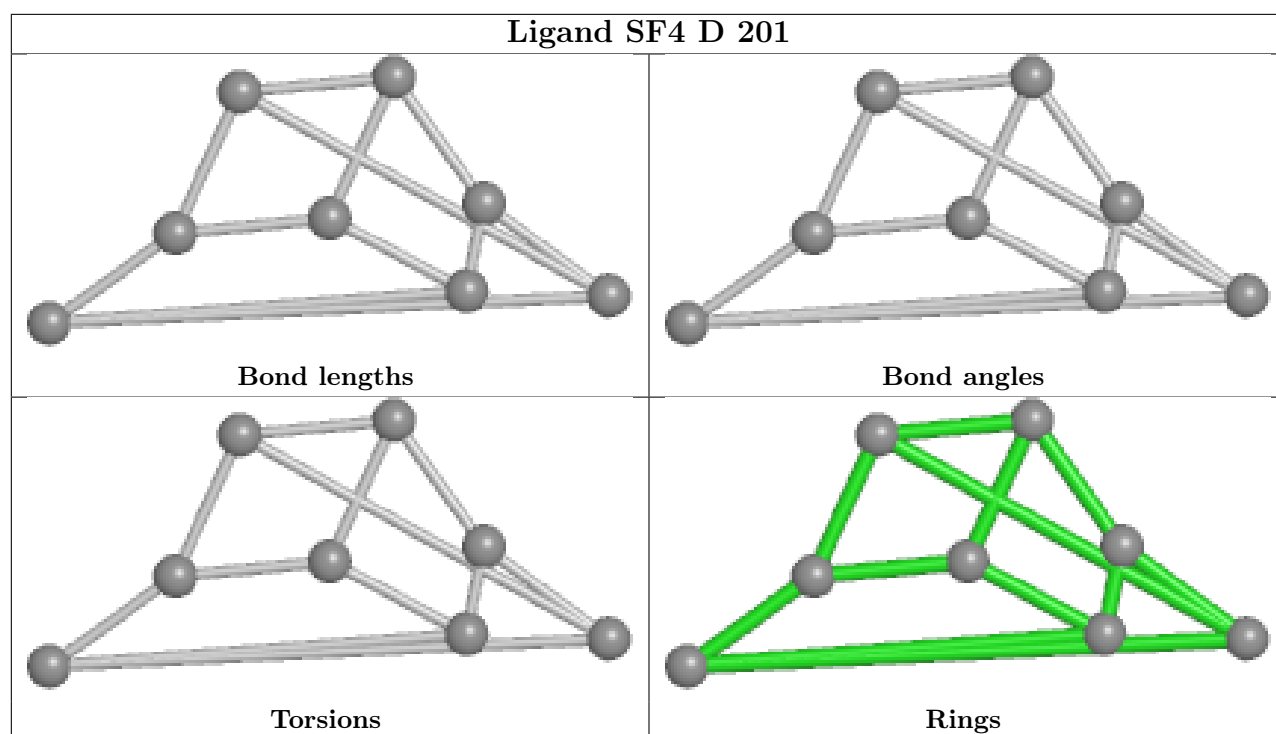
highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified 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.

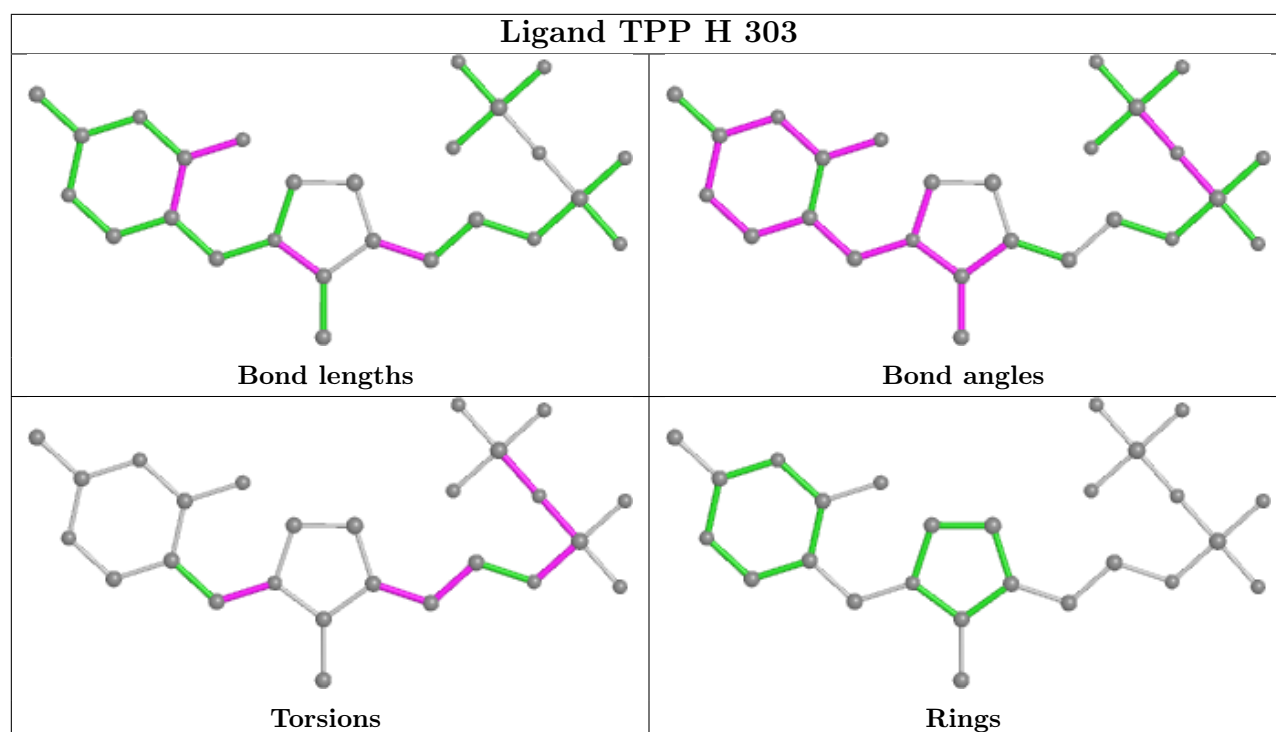












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.