WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Feb 27, 2025 – 12:17 pm GMT

PDB ID	:	9ERJ
EMDB ID	:	EMD-19916
Title	:	Cryo-EM structure of sodium pumping Rnf complex from Acetobacterium woodii reduced with low potential Ferredoxin
Authors	:	Kumar, A.; Schuller, J.M.
Deposited on	:	2024-03-23
Resolution	:	2.90 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 (i) 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 (i)) were used in the production of this report:

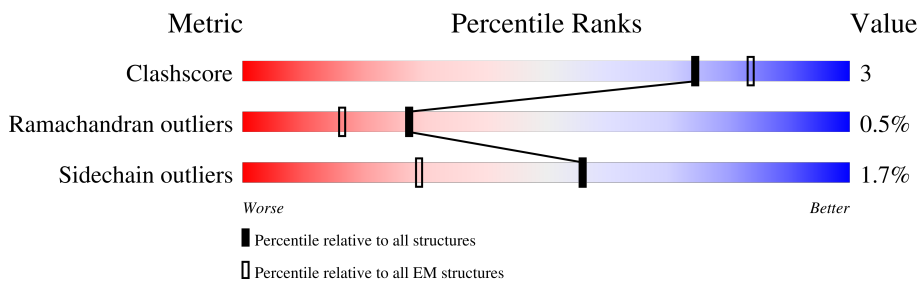|		
EMDB validation analysis	:	FAILED
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41

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 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	Percentile Ranks	Value
Clashscore		3
Ramachandran outliers		0.5%
Sidechain outliers		1.7%

Worse   *Better*

▮ Percentile relative to all structures

▯ Percentile relative to all EM structures

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	191	91% 9%
2	B	333	85% 14% •
3	C	443	95% 5%
4	D	318	97% •
5	E	196	93% 6% •
6	G	207	84% 16%

2 Entry composition (i)

There are 11 unique types of molecules in this entry. The entry contains 12663 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 Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit A.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	191	Total 1433	C 959	N 218	O 247	S 9	0	0

- Molecule 2 is a protein called Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit B.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	333	Total 2394	C 1490	N 406	O 453	S 45	0	0

- Molecule 3 is a protein called Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit C.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	443	Total 3287	C 2069	N 567	O 620	S 31	0	0

- Molecule 4 is a protein called Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit D.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	318	Total 2374	C 1566	N 379	O 415	S 14	0	0

- Molecule 5 is a protein called Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit E.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	196	Total 1439	C 954	N 230	O 243	S 12	0	0

- Molecule 6 is a protein called Na(+)-translocating ferredoxin:NAD(+) oxidoreductase com-

plex subunit G.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	G	207	Total 1531	C 968	N 247	O 311	S 5	0	0

- Molecule 7 is SODIUM ION (three-letter code: NA) (formula: Na) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
7	A	1	Total 1	Na 1	0
7	E	2	Total 2	Na 2	0

- Molecule 8 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe_2S_2) (labeled as "Ligand of Interest" by depositor).
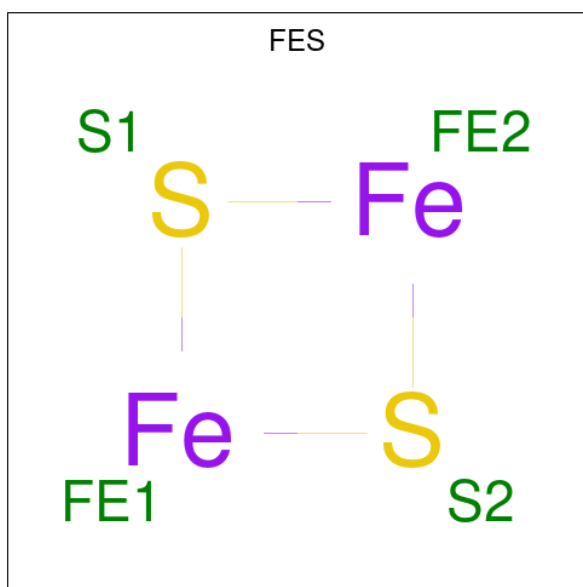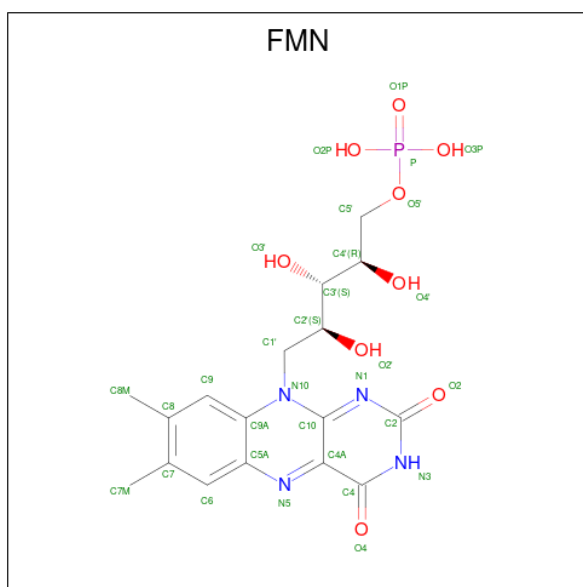

Mol	Chain	Residues	Atoms			AltConf
8	A	1	Total 4	Fe 2	S 2	0

- Molecule 9 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe_4S_4) (labeled as "Ligand of Interest" by depositor).
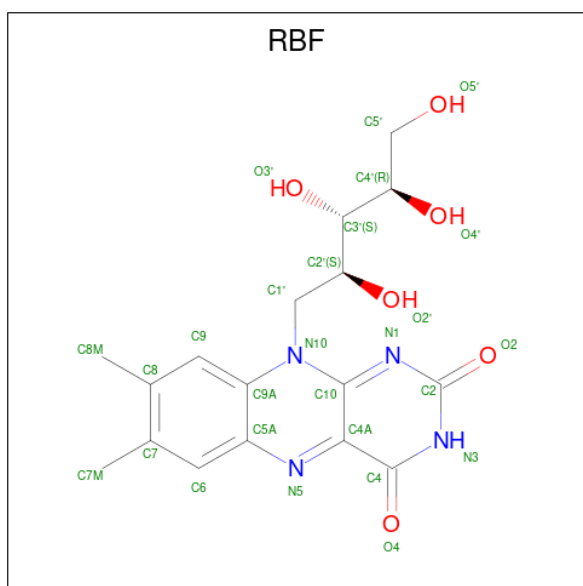
Mol	Chain	Residues	Atoms			AltConf
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	B	1	Total	Fe	S	0
			8	4	4	
9	C	1	Total	Fe	S	0
			8	4	4	
9	C	1	Total	Fe	S	0
			8	4	4	

- Molecule 10 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$) (labeled as "Ligand of Interest" by depositor).

FMN

Mol	Chain	Residues	Atoms					AltConf
10	C	1	Total	C	N	O	P	0
			31	17	4	9	1	
10	D	1	Total	C	N	O	P	0
			30	17	4	8	1	
10	G	1	Total	C	N	O	P	0
			30	17	4	8	1	

- Molecule 11 is RIBOFLAVIN (three-letter code: RBF) (formula: $C_{17}H_{20}N_4O_6$) (labeled as "Ligand of Interest" by depositor).

RBF

Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
11	D	1	27	17	4	6	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.
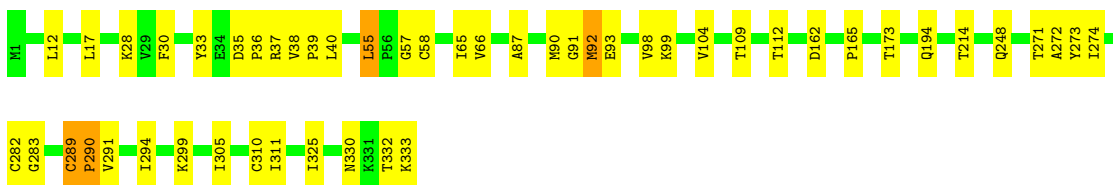
• Molecule 1: Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit A

Chain A:

• Molecule 2: Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit B

Chain B:

• Molecule 3: Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit C

Chain C:

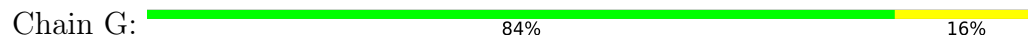• Molecule 4: Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit D

Chain D:

• Molecule 5: Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit E

Chain E:

• Molecule 6: Na(+)-translocating ferredoxin:NAD(+) oxidoreductase complex subunit G

Chain G:

84%   16%

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	260238	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 $(e^-/\text{Å}^2)$	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor

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: FES, FMN, RBF, NA, SF4

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	0.27	0/1458	0.46	0/1984
2	B	0.26	0/2429	0.60	2/3281 (0.1%)
3	C	0.25	0/3346	0.48	0/4530
4	D	0.25	0/2427	0.46	0/3315
5	E	0.27	0/1464	0.47	0/1989
6	G	0.29	0/1548	0.51	1/2098 (0.0%)
All	All	0.26	0/12672	0.50	3/17197 (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	B	0	1
5	E	0	1
All	All	0	2

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	55	LEU	CA-CB-CG	7.32	132.12	115.30
6	G	86	GLU	CA-CB-CG	6.71	128.17	113.40
2	B	65	ILE	C-N-CA	5.09	134.43	121.70

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	289	CYS	Peptide
5	E	9	ARG	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	1433	0	1533	7	0
2	B	2394	0	2386	25	0
3	C	3287	0	3365	13	0
4	D	2374	0	2502	8	0
5	E	1439	0	1554	8	0
6	G	1531	0	1575	18	0
7	A	1	0	0	0	0
7	E	2	0	0	0	0
8	A	4	0	0	0	0
9	B	64	0	0	1	0
9	C	16	0	0	1	0
10	C	31	0	19	0	0
10	D	30	0	19	0	0
10	G	30	0	19	1	0
11	D	27	0	20	1	0
All	All	12663	0	12992	76	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 3.

All (76) 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)
6:G:68:VAL:HG12	6:G:70:ALA:H	1.59	0.67
5:E:59:ARG:HH21	5:E:122:GLY:HA2	1.61	0.66
2:B:273:TYR:HE2	2:B:330:ASN:HD21	1.47	0.62
2:B:274:ILE:HG12	2:B:325:ILE:HG12	1.82	0.62
5:E:45:MET:HG3	5:E:134:GLY:HA3	1.82	0.61
4:D:313:LYS:HG3	4:D:314:LYS:H	1.64	0.61
2:B:109:THR:HB	2:B:162:ASP:HB2	1.83	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:G:160:ALA:HA	6:G:199:ILE:HD11	1.84	0.59
1:A:102:LEU:HD12	1:A:106:LEU:HB2	1.85	0.58
1:A:122:ASN:HB3	1:A:132:THR:HG22	1.86	0.56
2:B:87:ALA:O	2:B:91:GLY:N	2.35	0.56
2:B:28:LYS:O	2:B:30:PHE:N	2.38	0.55
5:E:6:ASN:OD1	5:E:9:ARG:NH2	2.40	0.55
2:B:104:VAL:HG21	2:B:165:PRO:HG2	1.89	0.54
2:B:289:CYS:O	2:B:291:VAL:N	2.40	0.54
2:B:91:GLY:O	2:B:93:GLU:N	2.41	0.54
2:B:294:ILE:O	2:B:299:LYS:NZ	2.34	0.54
6:G:7:VAL:O	6:G:9:ILE:N	2.41	0.54
2:B:332:THR:HG22	2:B:333:LYS:HD3	1.90	0.54
3:C:293:THR:HA	3:C:300:PRO:HB3	1.89	0.54
3:C:212:ASP:N	3:C:212:ASP:OD1	2.40	0.53
2:B:283:GLY:N	9:B:408:SF4:S1	2.82	0.52
2:B:35:ASP:OD2	2:B:36:PRO:HD3	2.10	0.51
3:C:43:ILE:HD11	3:C:144:PHE:HD1	1.76	0.50
6:G:3:THR:HG23	6:G:6:LYS:HE3	1.92	0.50
3:C:414:CYS:HB3	9:C:502:SF4:S4	2.51	0.50
1:A:153:ILE:HD11	4:D:293:VAL:HG13	1.94	0.50
2:B:112:THR:HB	2:B:214:THR:HB	1.94	0.50
1:A:111:THR:HG23	5:E:106:VAL:HB	1.96	0.48
4:D:131:PHE:HD1	5:E:171:LEU:HD22	1.78	0.48
2:B:310:CYS:SG	2:B:311:ILE:N	2.86	0.48
4:D:95:PRO:HD2	4:D:98:ILE:HD12	1.95	0.48
6:G:95:LYS:NZ	6:G:98:GLY:O	2.40	0.48
3:C:208:ASP:OD1	3:C:234:THR:OG1	2.30	0.47
2:B:37:ARG:HG2	2:B:39:PRO:HD2	1.97	0.47
5:E:192:LYS:HD3	5:E:192:LYS:HA	1.60	0.47
4:D:204:LYS:HE3	4:D:204:LYS:HB3	1.69	0.47
2:B:55:LEU:O	2:B:57:GLY:N	2.48	0.47
3:C:8:PHE:HZ	3:C:237:PRO:HD2	1.79	0.47
6:G:9:ILE:HA	6:G:12:LYS:HD3	1.95	0.47
6:G:172:LYS:NZ	6:G:177:GLU:O	2.48	0.47
6:G:121:THR:HG23	6:G:132:ILE:HG22	1.97	0.46
6:G:183:GLY:O	10:G:301:FMN:O2'	2.34	0.45
6:G:68:VAL:HG11	6:G:73:VAL:HG23	1.99	0.45
1:A:105:TYR:HA	1:A:108:LEU:HB2	1.99	0.45
2:B:272:ALA:HB3	2:B:305:ILE:HD13	1.98	0.45
6:G:76:ILE:HA	6:G:79:GLU:HG2	1.98	0.45
6:G:206:SER:O	6:G:206:SER:OG	2.28	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:81:LYS:HB2	3:C:81:LYS:HE2	1.79	0.44
6:G:79:GLU:O	6:G:80:ILE:HG22	2.18	0.44
4:D:311:LYS:HE2	4:D:311:LYS:HB2	1.89	0.44
2:B:333:LYS:HE2	2:B:333:LYS:HB2	1.89	0.43
5:E:27:THR:O	5:E:31:THR:OG1	2.30	0.43
6:G:80:ILE:HD12	6:G:80:ILE:HA	1.89	0.43
6:G:192:THR:O	6:G:196:ASN:ND2	2.52	0.43
2:B:90:MET:N	2:B:90:MET:SD	2.92	0.43
1:A:59:GLN:HG2	1:A:123:ILE:HD12	2.01	0.42
3:C:399:LYS:HE3	3:C:399:LYS:HB3	1.84	0.42
6:G:79:GLU:OE2	6:G:204:ASN:ND2	2.46	0.42
3:C:251:ARG:NH1	3:C:262:ALA:O	2.51	0.42
2:B:12:LEU:HD23	2:B:12:LEU:HA	1.84	0.41
4:D:78:SER:OG	11:D:402:RBF:O2'	2.39	0.41
5:E:22:LEU:HB3	5:E:109:ILE:HG22	2.03	0.41
2:B:87:ALA:HB3	2:B:93:GLU:HB2	2.02	0.41
3:C:157:LYS:HE3	3:C:157:LYS:HB3	1.88	0.41
2:B:173:THR:O	2:B:173:THR:OG1	2.28	0.41
2:B:194:GLN:HA	2:B:248:GLN:HE22	1.85	0.41
2:B:38:VAL:O	2:B:40:LEU:N	2.49	0.41
1:A:36:THR:HA	1:A:99:TYR:HE1	1.86	0.41
2:B:330:ASN:OD1	2:B:330:ASN:N	2.53	0.41
3:C:129:LYS:HB3	3:C:129:LYS:HE2	1.82	0.41
3:C:362:LYS:HE3	3:C:362:LYS:HB3	1.76	0.41
6:G:75:LYS:HA	6:G:75:LYS:HD3	1.77	0.41
6:G:83:GLU:OE1	6:G:83:GLU:N	2.44	0.41
3:C:85:VAL:HG13	3:C:99:VAL:HG22	2.04	0.40
4:D:17:LYS:HA	4:D:17:LYS:HD3	1.89	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 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	A	189/191 (99%)	169 (89%)	18 (10%)	2 (1%)	12	37
2	B	331/333 (99%)	290 (88%)	37 (11%)	4 (1%)	11	35
3	C	441/443 (100%)	419 (95%)	22 (5%)	0	100	100
4	D	316/318 (99%)	304 (96%)	12 (4%)	0	100	100
5	E	194/196 (99%)	179 (92%)	15 (8%)	0	100	100
6	G	205/207 (99%)	186 (91%)	17 (8%)	2 (1%)	13	40
All	All	1676/1688 (99%)	1547 (92%)	121 (7%)	8 (0%)	27	56

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	104	VAL
2	B	66	VAL
2	B	92	MET
6	G	8	GLN
6	G	80	ILE
2	B	98	VAL
2	B	290	PRO
1	A	163	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	A	153/153 (100%)	150 (98%)	3 (2%)	50	79
2	B	257/257 (100%)	249 (97%)	8 (3%)	35	70
3	C	365/365 (100%)	361 (99%)	4 (1%)	70	90
4	D	252/252 (100%)	250 (99%)	2 (1%)	79	93
5	E	152/152 (100%)	152 (100%)	0	100	100
6	G	168/168 (100%)	162 (96%)	6 (4%)	30	65
All	All	1347/1347 (100%)	1324 (98%)	23 (2%)	56	83

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	64	ASP
1	A	156	ARG
1	A	186	PHE
2	B	17	LEU
2	B	33	TYR
2	B	58	CYS
2	B	92	MET
2	B	99	LYS
2	B	271	THR
2	B	282	CYS
2	B	290	PRO
3	C	104	ASP
3	C	123	ASP
3	C	231	SER
3	C	407	ASP
4	D	119	GLN
4	D	314	LYS
6	G	4	LYS
6	G	72	ASP
6	G	128	VAL
6	G	171	THR
6	G	184	SER
6	G	207	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 18 ligands modelled in this entry, 3 are monoatomic - leaving 15 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	$\#|Z| > 2$
9	SF4	C	501	3	0,12,12	-	-	-		
8	FES	A	202	5,1	0,4,4	-	-	-		
9	SF4	B	406	2	0,12,12	-	-	-		
10	FMN	G	301	6	29,32,33	0.57	0	40,47,50	0.69	1 (2%)
9	SF4	B	401	2	0,12,12	-	-	-		
9	SF4	B	405	2	0,12,12	-	-	-		
9	SF4	B	407	2	0,12,12	-	-	-		
9	SF4	C	502	3	0,12,12	-	-	-		
10	FMN	C	503	-	33,33,33	0.58	0	48,50,50	0.66	1 (2%)
9	SF4	B	404	2	0,12,12	-	-	-		
9	SF4	B	408	2	0,12,12	-	-	-		
11	RBF	D	402	-	29,29,29	0.99	1 (3%)	41,43,43	0.97	1 (2%)
9	SF4	B	402	2	0,12,12	-	-	-		
9	SF4	B	403	2	0,12,12	-	-	-		
10	FMN	D	401	4	29,32,33	0.59	0	40,47,50	0.67	0

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
9	SF4	C	501	3	-	-	0/6/5/5
8	FES	A	202	5,1	-	-	0/1/1/1
9	SF4	B	406	2	-	-	0/6/5/5
10	FMN	G	301	6	-	0/15/17/18	0/3/3/3
9	SF4	B	401	2	-	-	0/6/5/5
9	SF4	B	405	2	-	-	0/6/5/5
9	SF4	B	407	2	-	-	0/6/5/5
9	SF4	C	502	3	-	-	0/6/5/5
10	FMN	C	503	-	-	0/18/18/18	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	SF4	B	404	2	-	-	0/6/5/5
9	SF4	B	408	2	-	-	0/6/5/5
11	RBF	D	402	-	-	<mark>5/14/14/14</mark>	0/3/3/3
9	SF4	B	402	2	-	-	0/6/5/5
9	SF4	B	403	2	-	-	0/6/5/5
10	FMN	D	401	4	-	1/15/17/18	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	D	402	RBF	C5A-N5	-2.34	1.35	1.39

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
11	D	402	RBF	C10-N1-C2	2.25	121.39	116.90
10	G	301	FMN	C4-N3-C2	-2.04	121.87	125.64
10	C	503	FMN	C4-N3-C2	-2.02	121.91	125.64

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
11	D	402	RBF	C1'-C2'-C3'-O3'
11	D	402	RBF	C1'-C2'-C3'-C4'
11	D	402	RBF	O2'-C2'-C3'-O3'
10	D	401	FMN	C4'-C5'-O5'-P
11	D	402	RBF	O2'-C2'-C3'-C4'
11	D	402	RBF	C2'-C1'-N10-C10

There are no ring outliers.

4 monomers are involved in 4 short contacts:

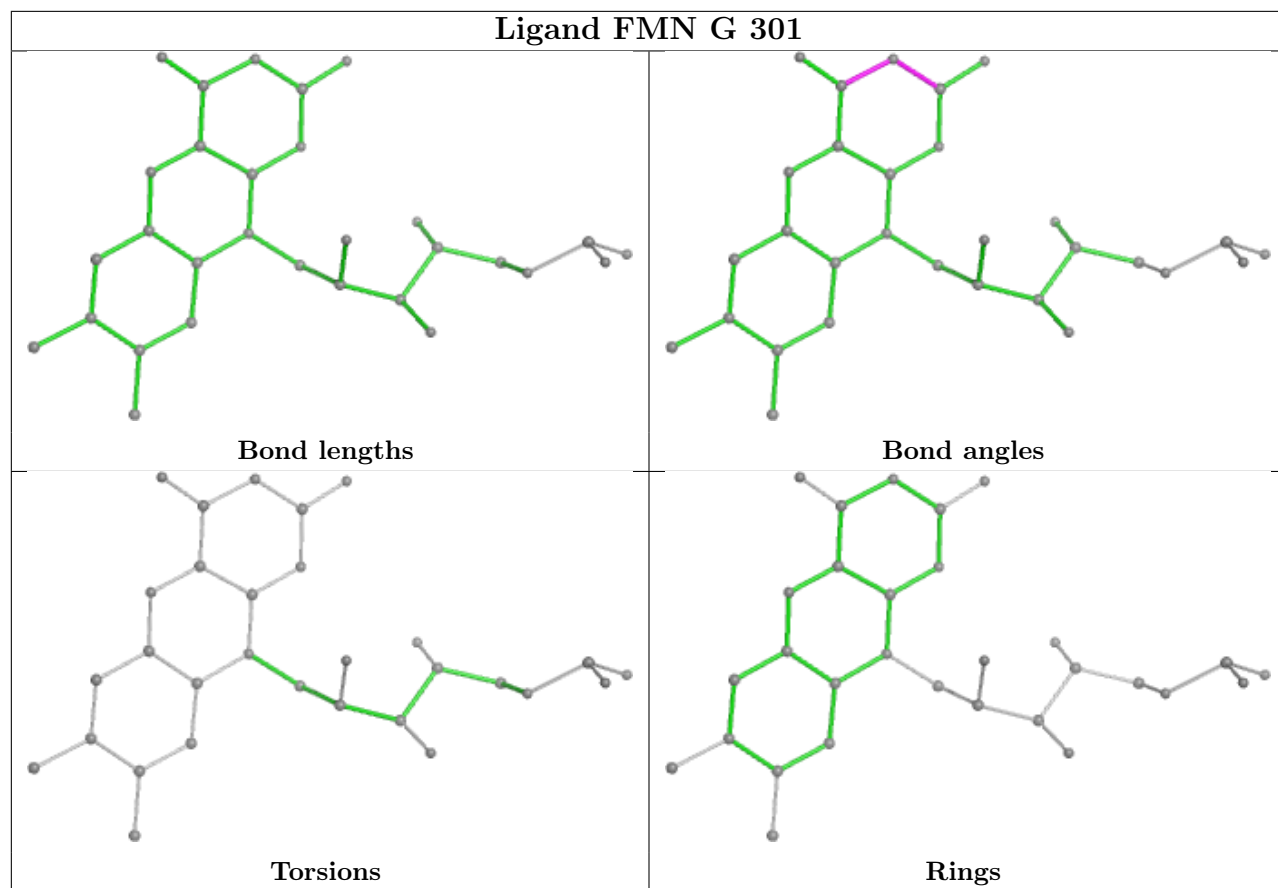| Mol	Chain	Res	Type	Clashes	Symm-Clashes
10	G	301	FMN	1	0
9	C	502	SF4	1	0
9	B	408	SF4	1	0
11	D	402	RBF	1	0

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
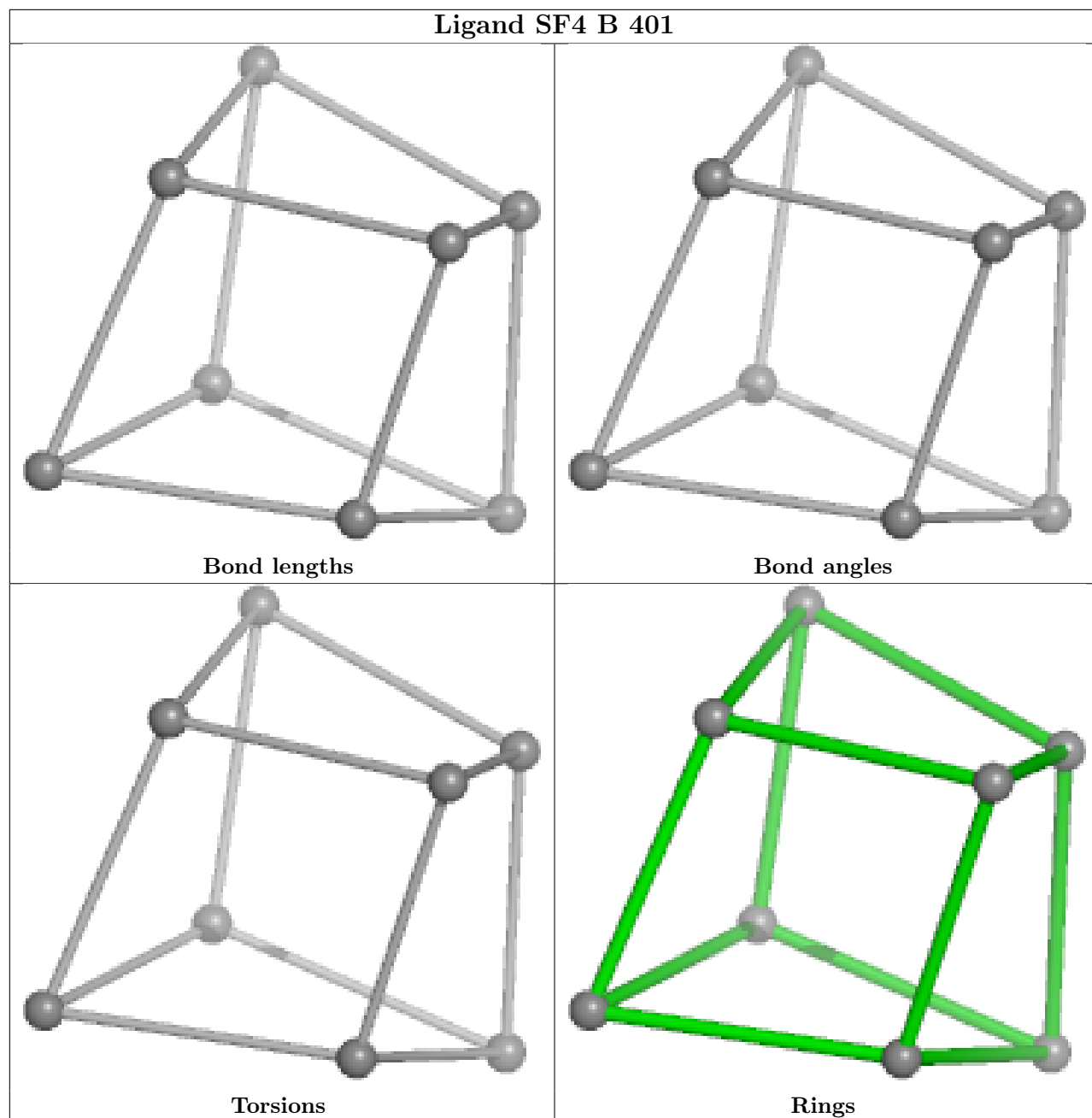
addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. 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.
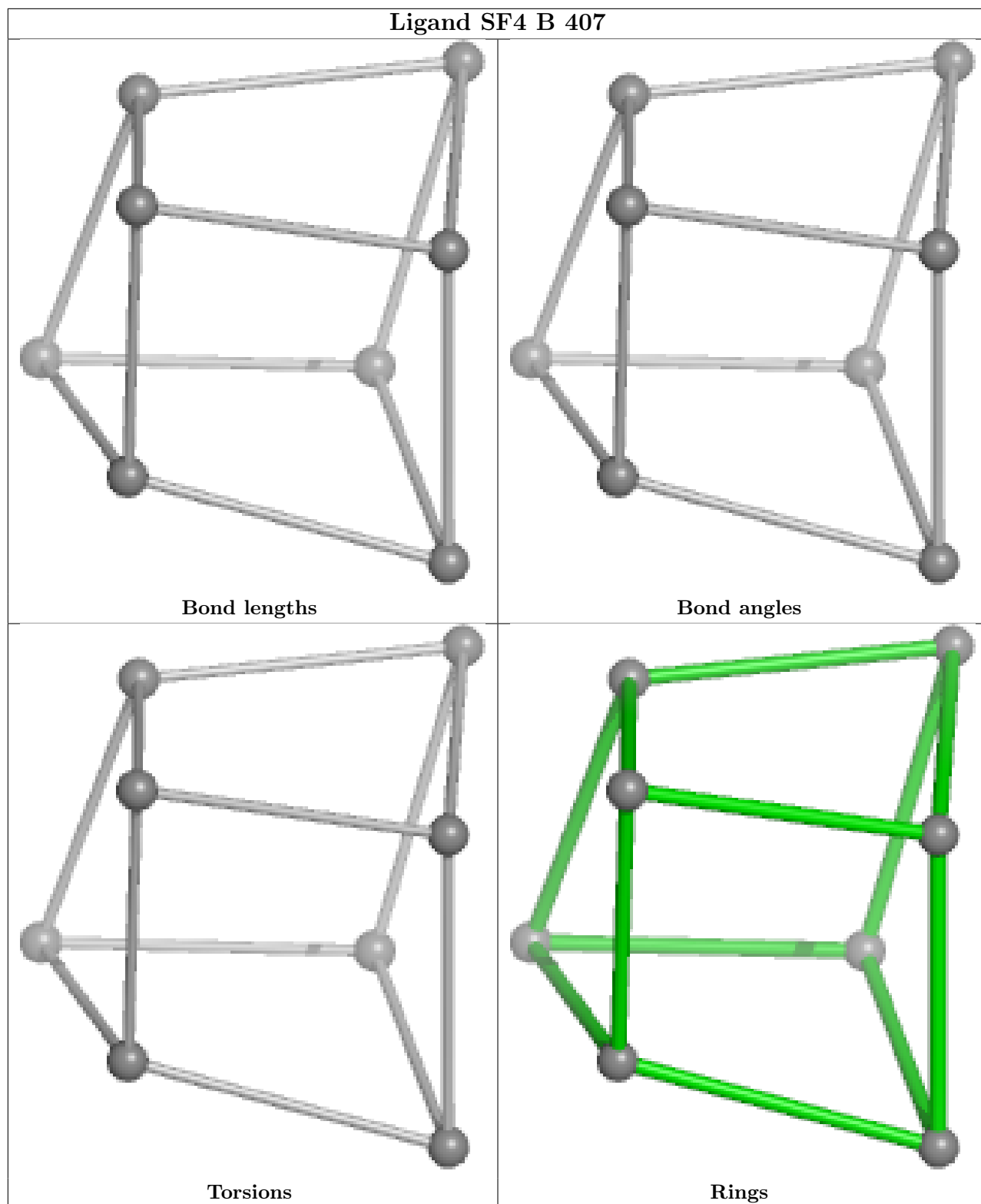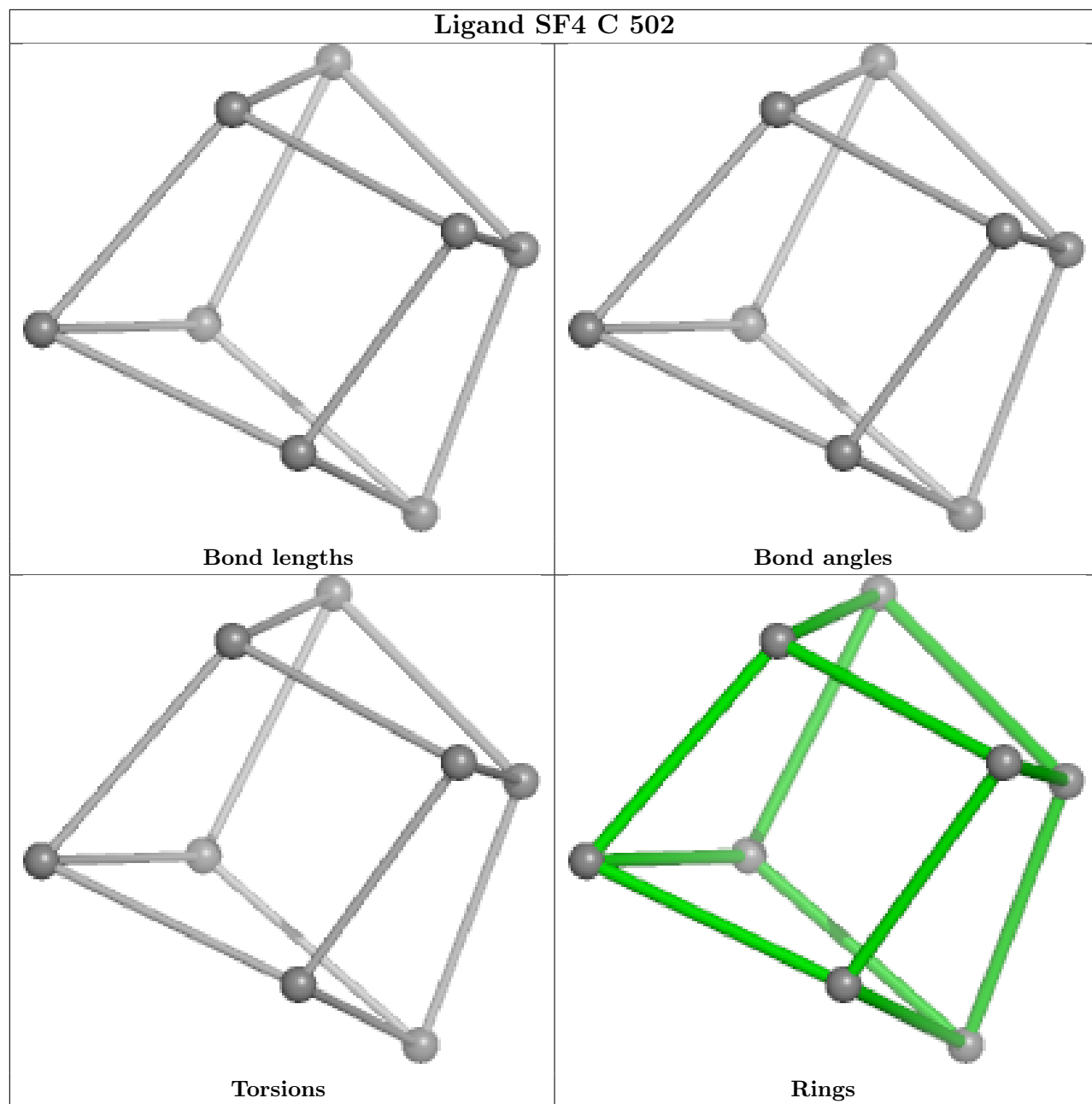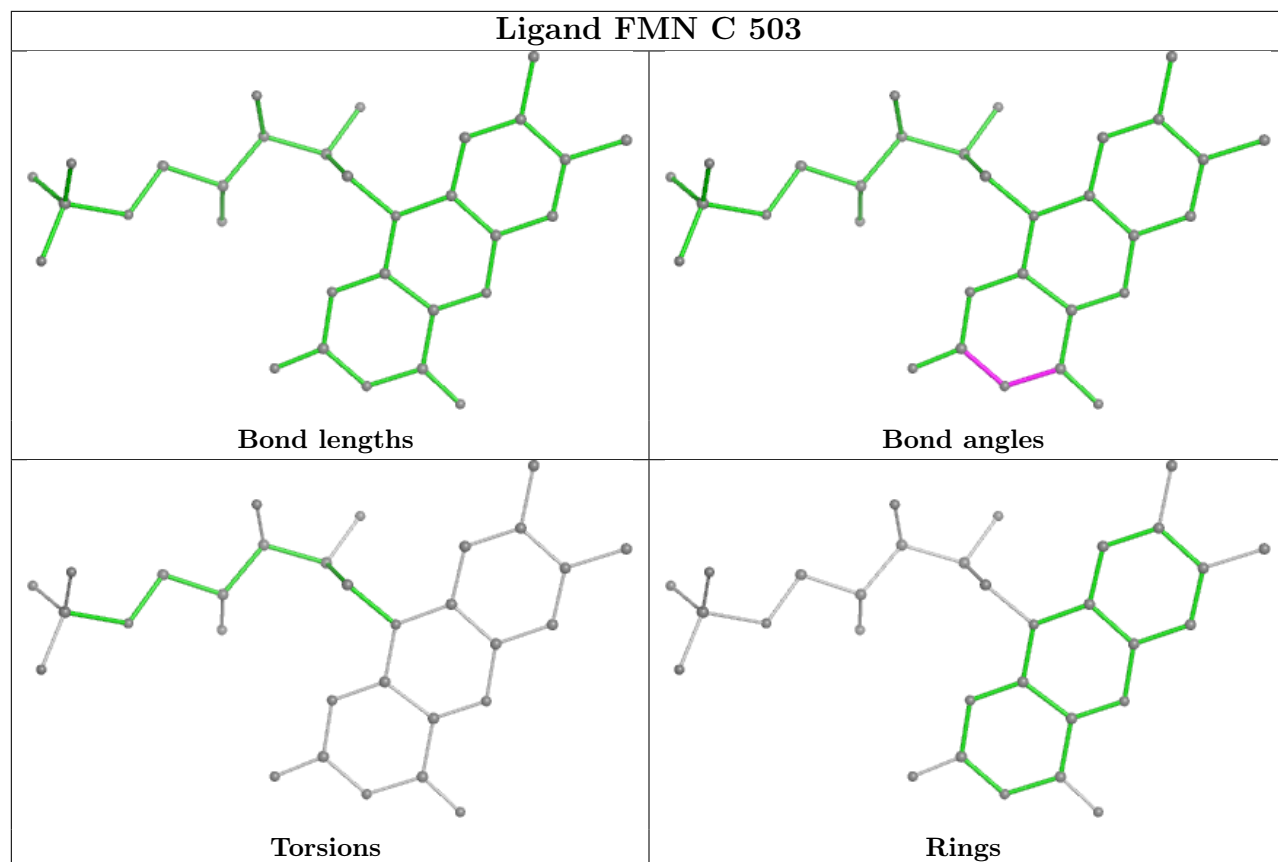
Ligand SF4 C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand FES A 202

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 406

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN G 301

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 401

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 405

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 407

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 C 502

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN C 503

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 404

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 408

Bond lengths

Bond angles

Torsions

Rings

Ligand RBF D 402

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 402

Bond lengths

Bond angles

Torsions

Rings

Ligand SF4 B 403

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN D 401

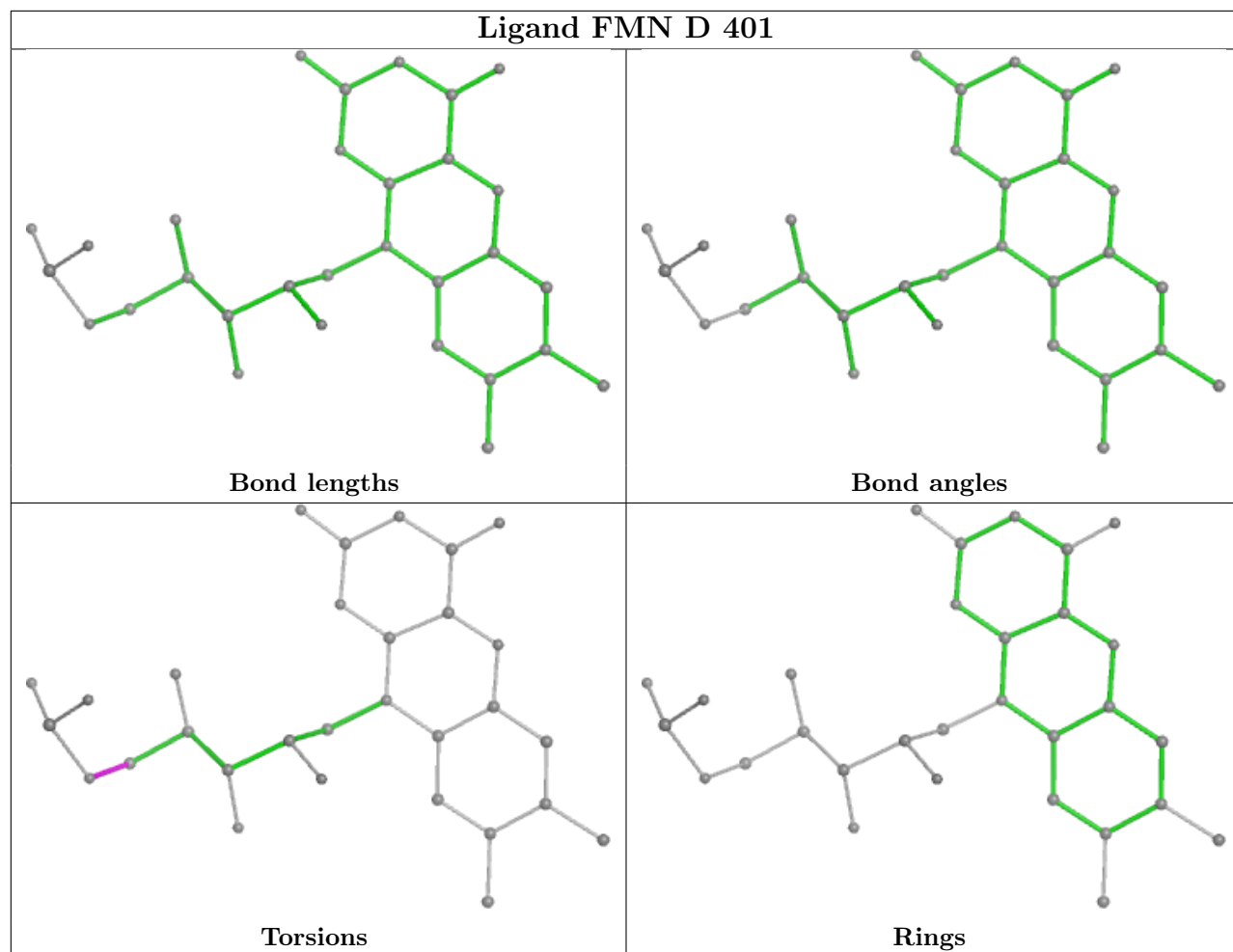Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.