



Full wwPDB EM Validation Report ⓘ

Jul 15, 2025 – 10:11 PM JST

PDB ID : 8K9E / pdb_00008k9e
EMDB ID : EMD-36984
Title : Cryo-EM structure of the photosynthetic alternative complex III from *Chloroflexus aurantiacus* at 3.3 angstrom
Authors : Xu, X.
Deposited on : 2023-08-01
Resolution : 3.33 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 Phenix2.0rc1
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) : 2.44

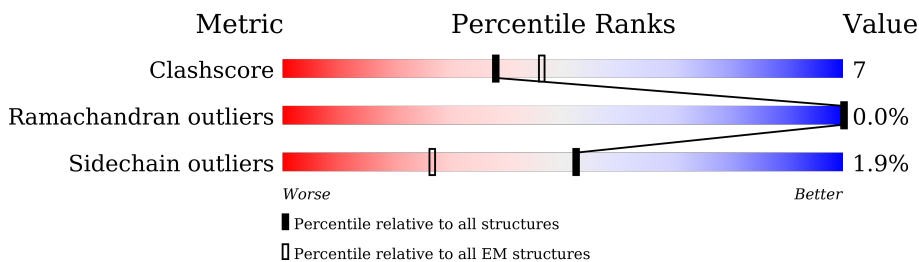
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.33 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	A	219	80% 16% .
2	B	1029	80% 12% 8%
3	C	486	76% 16% 8%
4	D	179	79% 18% ..
5	E	205	68% 11% 20%
6	F	411	81% 16% .
7	G	112	65% 6% 29%
8	I	37	70% 27% .

2 Entry composition [i](#)

There are 15 unique types of molecules in this entry. The entry contains 19954 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 Cytochrome c7-like domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	218	Total	C	N	O	S	0	0
			1763	1129	306	313	15		

- Molecule 2 is a protein called Fe-S-cluster-containing hydrogenase components 1-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	951	Total	C	N	O	S	0	0
			7350	4622	1303	1395	30		

- Molecule 3 is a protein called Polysulphide reductase NrfD.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	449	Total	C	N	O	S	0	0
			3655	2476	576	586	17		

- Molecule 4 is a protein called Quinol:cytochrome c oxidoreductase membrane protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	175	Total	C	N	O	S	0	0
			1350	884	215	245	6		

- Molecule 5 is a protein called Cytochrome c domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	164	Total	C	N	O	S	0	0
			1292	819	220	246	7		

- Molecule 6 is a protein called Quinol:cytochrome c oxidoreductase quinone-binding subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	397	Total	C	N	O	S	0	0
			3128	2091	506	514	17		

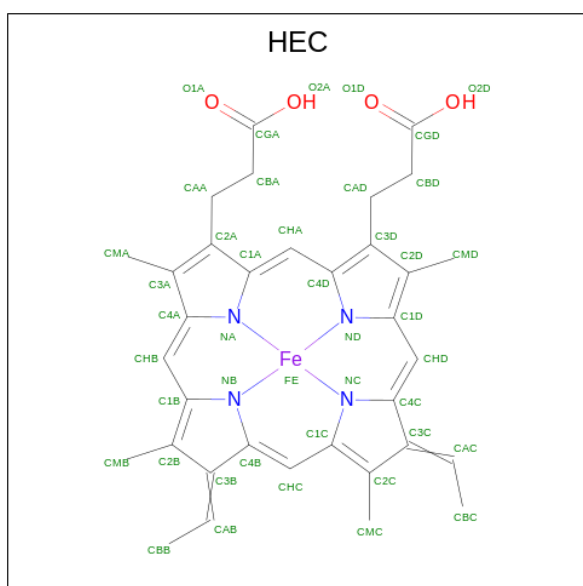
- Molecule 7 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	80	Total	C	N	O	S	0	0
			623	404	108	107	4		

- Molecule 8 is a protein called unknown.

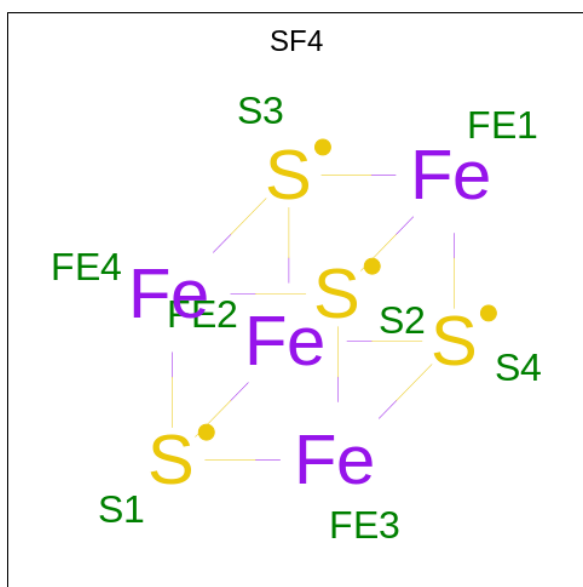
Mol	Chain	Residues	Atoms					AltConf	Trace
8	I	37	Total	C	N	O	S	0	0
			305	212	42	48	3		

- Molecule 9 is HEME C (CCD ID: HEC) (formula: $C_{34}H_{34}FeN_4O_4$).



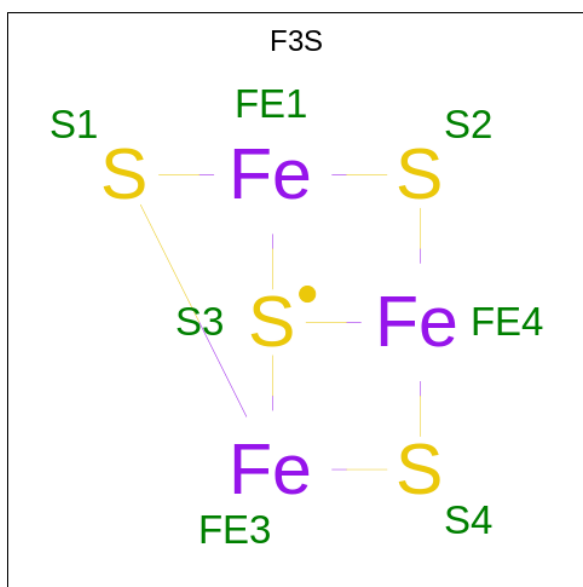
Mol	Chain	Residues	Atoms					AltConf
9	A	1	Total	C	Fe	N	O	0
			43	34	1	4	4	
9	A	1	Total	C	Fe	N	O	0
			43	34	1	4	4	
9	A	1	Total	C	Fe	N	O	0
			43	34	1	4	4	
9	A	1	Total	C	Fe	N	O	0
			43	34	1	4	4	
9	A	1	Total	C	Fe	N	O	0
			43	34	1	4	4	
9	E	1	Total	C	Fe	N	O	0
			43	34	1	4	4	

- Molecule 10 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4).



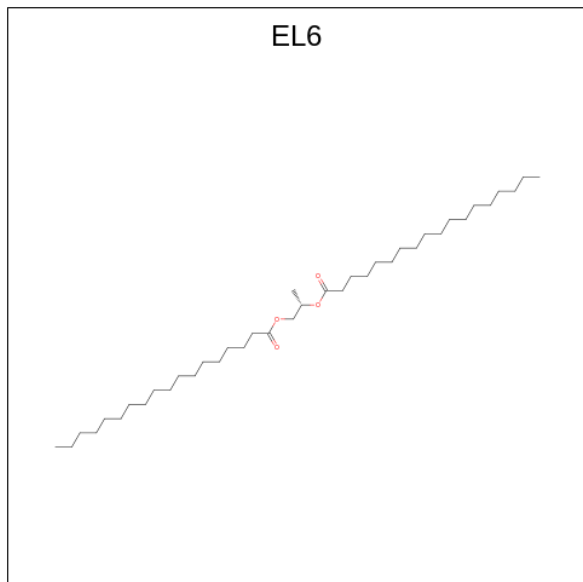
Mol	Chain	Residues	Atoms			AltConf
10	B	1	Total	Fe	S	0
			8	4	4	
10	B	1	Total	Fe	S	0
			8	4	4	
10	B	1	Total	Fe	S	0
			8	4	4	

- Molecule 11 is FE3-S4 CLUSTER (CCD ID: F3S) (formula: Fe_3S_4).



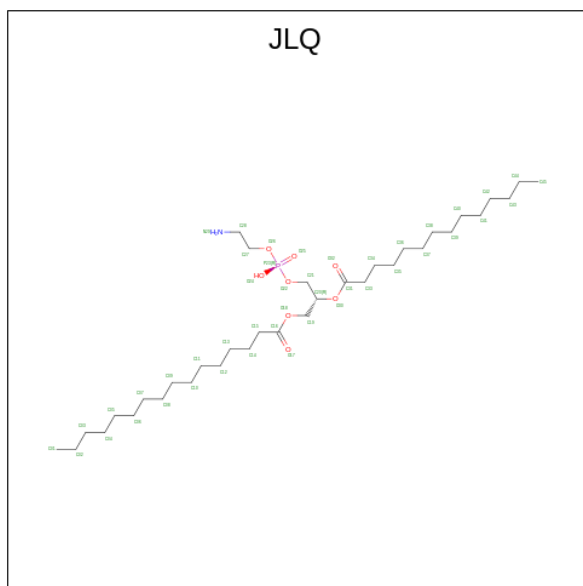
Mol	Chain	Residues	Atoms			AltConf
11	B	1	Total	Fe	S	0
			7	3	4	

- Molecule 12 is [(2S)-2-octadecanoyloxypropyl] octadecanoate (CCD ID: EL6) (formula: $C_{39}H_{76}O_4$).



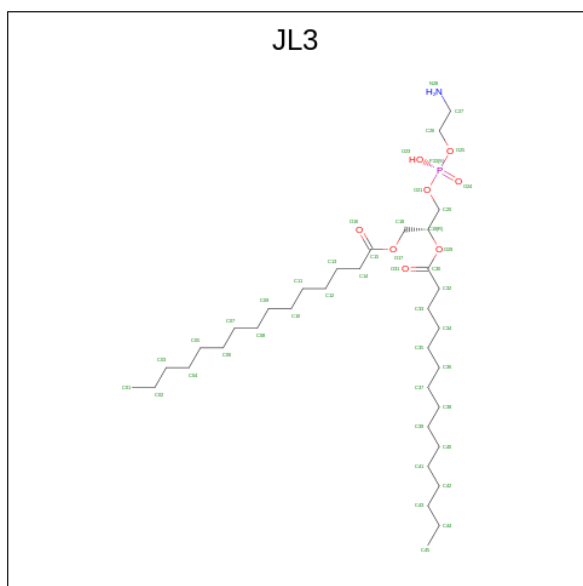
Mol	Chain	Residues	Atoms			AltConf
12	B	1	Total	C	O	0
			27	23	4	
12	E	1	Total	C	O	0
			28	24	4	

- Molecule 13 is [(2 {R})-3-[2-azanylethoxy(oxidanyl)phosphoryl]oxy-2-tetradecanoyloxy-propyl] hexadecanoate (CCD ID: JLQ) (formula: $C_{35}H_{70}NO_8P$).



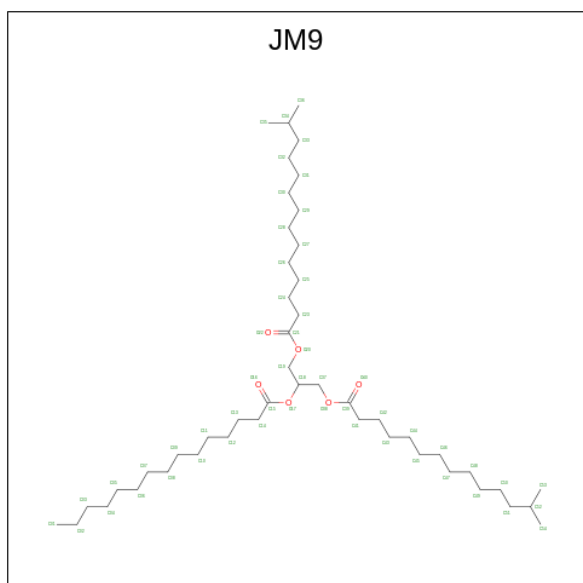
Mol	Chain	Residues	Atoms					AltConf
13	C	1	Total	C	N	O	P	0
			45	35	1	8	1	

- Molecule 14 is [(2 {R})-3-[2-azanylethoxy(oxidanyl)phosphoryl]oxy-2-pentadecanoyloxy-propyl] pentadecanoate (CCD ID: JL3) (formula: $C_{35}H_{70}NO_8P$).



Mol	Chain	Residues	Atoms					AltConf
14	F	1	Total	C	N	O	P	0
			45	35	1	8	1	

- Molecule 15 is 1,3-bis(13-methyltetradecanoyloxy)propan-2-yl pentadecanoate (CCD ID: JM9) (formula: $C_{48}H_{92}O_6$).

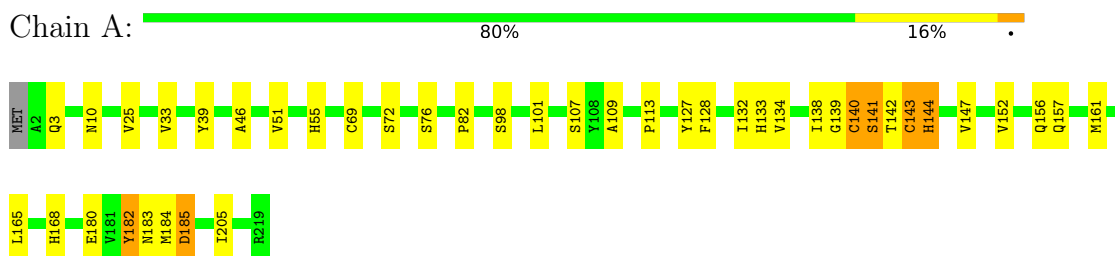


Mol	Chain	Residues	Atoms			AltConf
15	F	1	Total	C	O	0
			54	48	6	

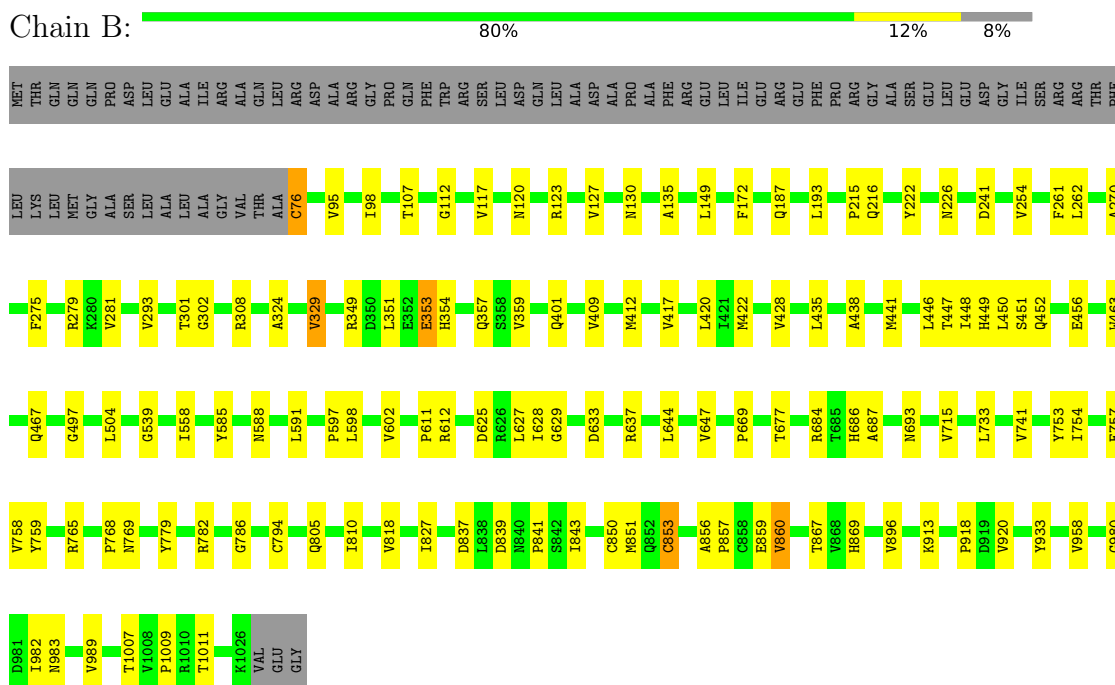
3 Residue-property plots

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.

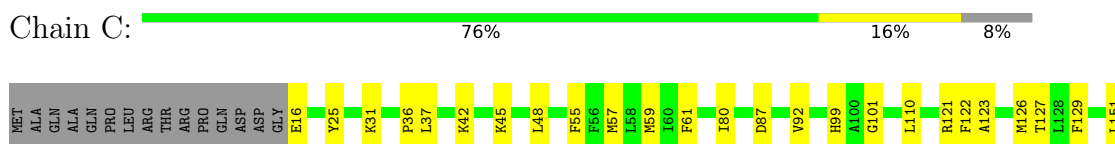
- Molecule 1: Cytochrome c7-like domain-containing protein

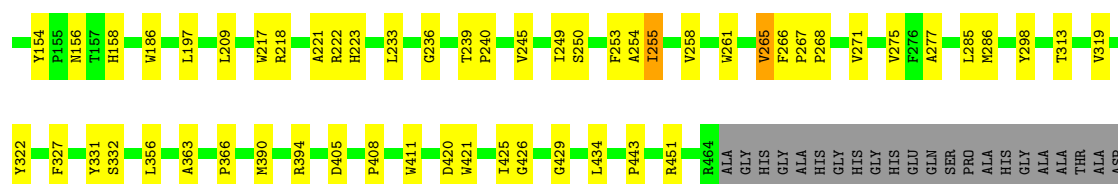


- Molecule 2: Fe-S-cluster-containing hydrogenase components 1-like protein



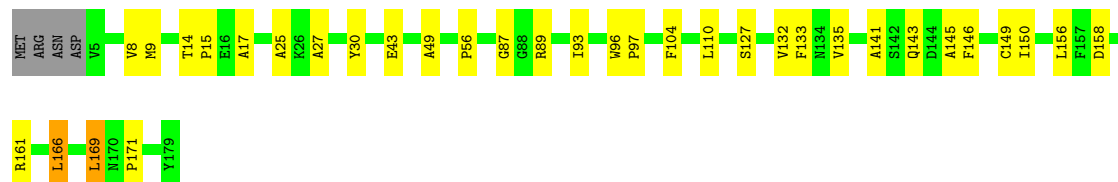
- Molecule 3: Polysulphide reductase NrfD





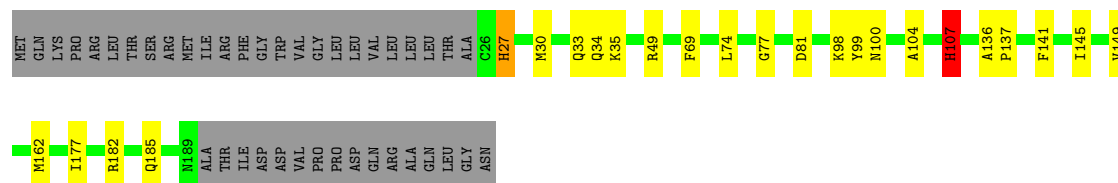
• Molecule 4: Quinol:cytochrome c oxidoreductase membrane protein

Chain D: 79% 18% ..



• Molecule 5: Cytochrome c domain-containing protein

Chain E: 68% 11% 20%



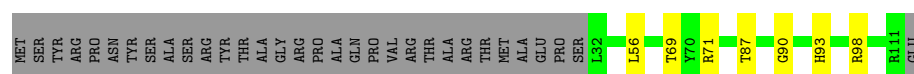
• Molecule 6: Quinol:cytochrome c oxidoreductase quinone-binding subunit 2

Chain F: 81% 16% .



• Molecule 7: Uncharacterized protein

Chain G: 65% 6% 29%



• Molecule 8: unknown

Chain I: 70% 27% .



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	425867	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1800	Depositor
Maximum defocus (nm)	2300	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (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: JLQ, EL6, JL3, F3S, JM9, HEC, 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	0.58	1/1812 (0.1%)	0.81	4/2472 (0.2%)
2	B	0.90	0/7518	1.15	7/10249 (0.1%)
3	C	0.69	0/3787	0.92	2/5179 (0.0%)
4	D	0.48	0/1388	0.74	0/1895
5	E	0.54	1/1327 (0.1%)	0.72	3/1803 (0.2%)
6	F	0.89	0/3226	1.15	2/4408 (0.0%)
7	G	0.48	0/635	0.72	1/865 (0.1%)
8	I	1.04	1/318 (0.3%)	1.13	3/436 (0.7%)
All	All	0.78	3/20011 (0.0%)	1.02	22/27307 (0.1%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	E	107	HIS	CE1-NE2	7.36	1.40	1.32
8	I	30	VAL	C-O	-5.53	1.17	1.24
1	A	144	HIS	CE1-NE2	5.43	1.38	1.32

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	693	ASN	CA-CB-CG	10.61	123.21	112.60
3	C	223	HIS	N-CA-C	-10.05	99.81	113.18
2	B	647	VAL	N-CA-C	-8.82	104.10	112.83
5	E	27	HIS	N-CA-C	7.95	120.03	111.36
1	A	185	ASP	N-CA-C	-7.91	103.20	113.17
5	E	107	HIS	CE1-NE2-CD2	-7.27	101.73	109.00
2	B	839	ASP	N-CA-C	-7.25	104.59	113.50
2	B	353	GLU	N-CA-C	-7.10	104.88	113.97
1	A	142	THR	N-CA-C	-7.07	104.53	113.02
8	I	35	PHE	N-CA-C	6.41	122.17	113.97

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	209	LEU	N-CA-C	-6.37	104.20	112.68
1	A	141	SER	N-CA-C	-6.02	105.17	113.18
7	G	98	ARG	N-CA-C	-5.91	105.73	113.12
8	I	12	LYS	CA-C-N	-5.63	112.80	119.05
8	I	12	LYS	C-N-CA	-5.63	112.80	119.05
2	B	625	ASP	N-CA-C	-5.54	106.56	113.38
5	E	107	HIS	CG-CD2-NE2	5.45	112.65	107.20
6	F	141	VAL	N-CA-CB	5.40	113.90	110.50
2	B	497	GLY	CA-C-O	-5.13	118.13	122.29
6	F	108	TYR	CA-C-O	-5.08	115.98	121.87
1	A	144	HIS	CE1-NE2-CD2	-5.06	103.94	109.00
2	B	261	PHE	N-CA-C	-5.02	107.32	113.50

There are no chirality outliers.

There are no planarity outliers.

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	1763	0	1713	52	0
2	B	7350	0	7179	73	0
3	C	3655	0	3688	56	0
4	D	1350	0	1341	27	0
5	E	1292	0	1216	20	0
6	F	3128	0	3175	57	0
7	G	623	0	660	3	0
8	I	305	0	302	8	0
9	A	215	0	153	25	0
9	E	43	0	30	4	0
10	B	24	0	0	1	0
11	B	7	0	0	0	0
12	B	27	0	0	1	0
12	E	28	0	0	0	0
13	C	45	0	0	10	0
14	F	45	0	0	2	0
15	F	54	0	0	17	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	19954	0	19457	281	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 (281) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:140:CYS:SG	9:A:303:HEC:CAB	2.02	1.45
2:B:76:CYS:SG	12:B:1105:EL6:C1	2.16	1.32
1:A:140:CYS:SG	9:A:303:HEC:CBB	1.14	1.23
6:F:272:VAL:HG23	15:F:502:JM9:C31	1.70	1.19
6:F:272:VAL:CG2	15:F:502:JM9:C31	2.23	1.16
1:A:140:CYS:SG	9:A:303:HEC:C3B	2.33	1.14
1:A:140:CYS:SG	9:A:303:HEC:HBB2	0.96	1.14
13:C:501:JLQ:O32	6:F:71:THR:HG21	1.58	1.02
13:C:501:JLQ:O32	6:F:71:THR:CG2	2.11	0.96
1:A:140:CYS:SG	9:A:303:HEC:HBB3	1.15	0.94
1:A:168:HIS:CE1	9:A:301:HEC:HBC1	2.02	0.94
1:A:140:CYS:SG	9:A:303:HEC:HBB1	2.05	0.93
6:F:265:LYS:HE3	14:F:501:JL3:C13	2.01	0.90
6:F:272:VAL:HG21	15:F:502:JM9:C31	2.04	0.87
8:I:16:LEU:C	8:I:16:LEU:HD13	2.00	0.86
3:C:313:THR:HG21	13:C:501:JLQ:C11	2.07	0.85
3:C:233:LEU:HD23	15:F:502:JM9:O16	1.77	0.84
3:C:313:THR:HG21	13:C:501:JLQ:C13	2.07	0.84
1:A:133:HIS:HD1	9:A:303:HEC:HAC	1.44	0.83
9:A:301:HEC:HMC1	9:A:301:HEC:CBC	2.09	0.82
9:A:301:HEC:HMC1	9:A:301:HEC:HBC2	1.64	0.79
5:E:162:MET:HE1	9:E:301:HEC:C4B	2.12	0.79
1:A:168:HIS:ND1	9:A:301:HEC:HBC1	1.98	0.78
4:D:104:PHE:CD1	15:F:502:JM9:C54	2.67	0.78
8:I:16:LEU:HD13	8:I:16:LEU:O	1.82	0.77
6:F:262:ASP:HB3	14:F:501:JL3:O16	1.85	0.77
6:F:56:THR:HG21	6:F:351:MET:HE1	1.67	0.75
4:D:104:PHE:HD1	15:F:502:JM9:C54	2.02	0.72
2:B:602:VAL:HG21	2:B:818:VAL:HG11	1.72	0.71
6:F:272:VAL:HG21	15:F:502:JM9:C30	2.21	0.70
6:F:321:PHE:CE1	15:F:502:JM9:C06	2.74	0.70
6:F:321:PHE:HE1	15:F:502:JM9:C07	2.05	0.70
13:C:501:JLQ:C31	6:F:71:THR:HG22	2.23	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:F:272:VAL:CG2	15:F:502:JM9:C30	2.71	0.68
2:B:786:GLY:HA3	2:B:982:ILE:HD11	1.75	0.67
2:B:324:ALA:HB1	2:B:329:VAL:HG22	1.75	0.67
1:A:140:CYS:HB3	1:A:144:HIS:HD2	1.59	0.67
8:I:16:LEU:C	8:I:16:LEU:CD1	2.67	0.67
5:E:162:MET:HE1	9:E:301:HEC:NB	2.10	0.66
1:A:133:HIS:ND1	9:A:303:HEC:HAC	2.11	0.65
6:F:321:PHE:HE1	15:F:502:JM9:C06	2.08	0.65
13:C:501:JLQ:O30	6:F:71:THR:HG22	1.97	0.64
1:A:132:ILE:HD13	9:A:302:HEC:HAA2	1.79	0.64
2:B:628:ILE:HA	2:B:837:ASP:HA	1.80	0.64
2:B:733:LEU:HD12	2:B:733:LEU:O	1.97	0.63
13:C:501:JLQ:O32	6:F:71:THR:HG22	1.93	0.63
3:C:99:HIS:CD2	3:C:275:VAL:HG22	2.34	0.63
1:A:69:CYS:HB3	1:A:82:PRO:HG3	1.80	0.62
3:C:233:LEU:CD2	15:F:502:JM9:O16	2.47	0.62
1:A:51:VAL:HG12	1:A:51:VAL:O	1.99	0.62
8:I:8:ASP:HB3	8:I:11:VAL:HG23	1.81	0.62
3:C:390:MET:HE3	3:C:394:ARG:HH12	1.63	0.62
13:C:501:JLQ:C31	6:F:71:THR:CG2	2.79	0.61
2:B:120:ASN:HD22	2:B:123:ARG:NH2	1.99	0.61
1:A:168:HIS:HD1	9:A:301:HEC:CBC	2.15	0.60
1:A:140:CYS:H	9:A:303:HEC:HBB3	1.68	0.59
3:C:222:ARG:HG3	4:D:49:ALA:HB2	1.85	0.58
1:A:39:TYR:HH	2:B:76:CYS:N	2.01	0.58
6:F:116:PRO:HG2	6:F:122:ASN:HA	1.86	0.57
2:B:450:LEU:HG	2:B:467:GLN:HB2	1.86	0.57
6:F:90:LEU:HD13	6:F:160:TRP:HB3	1.87	0.57
1:A:46:ALA:HB1	1:A:152:VAL:CG1	2.35	0.57
5:E:149:VAL:H	5:E:162:MET:HB3	1.70	0.56
2:B:293:VAL:HG11	2:B:302:GLY:HA2	1.86	0.56
2:B:611:PRO:HB3	2:B:644:LEU:HD21	1.88	0.56
3:C:255:ILE:HG23	6:F:287:SER:HB3	1.88	0.56
2:B:241:ASP:OD1	2:B:241:ASP:O	2.23	0.56
3:C:57:MET:HB2	3:C:429:GLY:HA3	1.87	0.56
3:C:255:ILE:HD12	6:F:287:SER:HB2	1.88	0.56
2:B:117:VAL:HG22	2:B:127:VAL:HG22	1.86	0.55
2:B:187:GLN:HB2	2:B:216:GLN:HG3	1.87	0.55
1:A:168:HIS:ND1	9:A:301:HEC:CBC	2.69	0.55
2:B:422:MET:HE1	2:B:441:MET:HE3	1.88	0.55
4:D:87:GLY:O	4:D:89:ARG:NH1	2.40	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:33:VAL:HG22	8:I:32:LEU:HD13	1.88	0.55
2:B:779:TYR:HD1	2:B:782:ARG:HD2	1.72	0.55
1:A:168:HIS:HD1	9:A:301:HEC:HBC1	1.71	0.55
3:C:101:GLY:HA2	3:C:123:ALA:HB1	1.89	0.55
7:G:69:THR:HG23	7:G:71:ARG:H	1.72	0.55
6:F:53:VAL:HG11	6:F:374:PRO:HB3	1.88	0.54
6:F:378:ILE:O	6:F:382:ILE:HG12	2.08	0.54
2:B:172:PHE:HE1	2:B:448:ILE:HD13	1.73	0.54
3:C:363:ALA:O	3:C:366:PRO:HD2	2.07	0.53
6:F:256:SER:O	6:F:259:PRO:HD2	2.08	0.53
1:A:3:GLN:HB2	4:D:133:PHE:HB3	1.90	0.53
2:B:794:CYS:HG	10:B:1101:SF4:FE4	1.25	0.53
4:D:169:LEU:O	4:D:171:PRO:HD3	2.08	0.53
2:B:222:TYR:HA	2:B:401:GLN:HB3	1.90	0.52
2:B:172:PHE:CE1	2:B:448:ILE:HD13	2.45	0.52
2:B:351:LEU:C	2:B:353:GLU:H	2.17	0.52
1:A:156:GLN:HB3	1:A:157:GLN:OE1	2.09	0.52
6:F:312:LEU:O	6:F:316:ALA:HB3	2.09	0.52
3:C:245:VAL:O	3:C:249:ILE:HG12	2.10	0.52
6:F:272:VAL:HG21	15:F:502:JM9:C29	2.39	0.52
1:A:82:PRO:HG2	9:A:304:HEC:HHD	1.91	0.51
1:A:161:MET:HE2	3:C:158:HIS:HB3	1.93	0.51
2:B:187:GLN:HB3	2:B:215:PRO:HD2	1.92	0.51
2:B:293:VAL:HG13	2:B:308:ARG:HG3	1.91	0.51
5:E:107:HIS:HD2	9:E:301:HEC:NC	2.04	0.51
1:A:128:PHE:HE1	1:A:133:HIS:CE1	2.29	0.51
5:E:107:HIS:CE1	9:E:301:HEC:NA	2.77	0.51
5:E:149:VAL:HG12	5:E:162:MET:H	1.75	0.51
3:C:126:MET:HE3	3:C:285:LEU:HD12	1.92	0.51
3:C:277:ALA:HB2	3:C:390:MET:HG3	1.91	0.51
3:C:25:TYR:HD1	3:C:451:ARG:HB2	1.77	0.50
1:A:72:SER:OG	1:A:76:SER:OG	2.28	0.50
3:C:390:MET:HE3	3:C:394:ARG:NH1	2.27	0.50
1:A:134:VAL:HG13	1:A:180:GLU:HG3	1.93	0.50
2:B:449:HIS:HD1	2:B:451:SER:HB2	1.76	0.50
6:F:276:TYR:CD1	15:F:502:JM9:C36	2.95	0.50
6:F:96:LEU:O	6:F:99:PRO:HD2	2.12	0.49
2:B:135:ALA:HA	2:B:270:ALA:HB2	1.94	0.49
3:C:87:ASP:OD1	3:C:87:ASP:N	2.43	0.49
2:B:612:ARG:HH21	2:B:628:ILE:HD11	1.77	0.49
2:B:446:LEU:HD11	2:B:463:TRP:HD1	1.77	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:913:LYS:HG2	5:E:34:GLN:HB3	1.94	0.49
3:C:254:ALA:HB1	6:F:284:ILE:HG12	1.93	0.49
3:C:313:THR:CG2	13:C:501:JLQ:C13	2.86	0.49
5:E:182:ARG:NH1	5:E:185:GLN:OE1	2.46	0.49
1:A:140:CYS:N	9:A:303:HEC:HBB3	2.26	0.49
2:B:412:MET:HG2	2:B:417:VAL:HG21	1.94	0.49
3:C:253:PHE:O	3:C:261:TRP:HB3	2.12	0.49
4:D:141:ALA:HA	4:D:145:ALA:HB3	1.95	0.49
4:D:96:TRP:CG	4:D:97:PRO:HD3	2.48	0.48
2:B:120:ASN:ND2	2:B:123:ARG:NH2	2.61	0.48
1:A:51:VAL:O	1:A:51:VAL:CG1	2.61	0.48
2:B:187:GLN:HB2	2:B:216:GLN:CG	2.44	0.48
1:A:141:SER:HB2	1:A:184:MET:HB3	1.96	0.48
3:C:122:PHE:HB3	3:C:286:MET:HE1	1.94	0.48
5:E:74:LEU:HD22	5:E:77:GLY:C	2.39	0.48
2:B:149:LEU:HB3	2:B:588:ASN:HD21	1.78	0.48
2:B:805:GLN:HG3	2:B:810:ILE:HB	1.95	0.48
1:A:127:TYR:OH	5:E:35:LYS:NZ	2.47	0.48
2:B:409:VAL:HG21	2:B:435:LEU:HD22	1.94	0.48
3:C:258:VAL:HB	3:C:261:TRP:HB2	1.95	0.48
4:D:56:PRO:HB3	15:F:502:JM9:C42	2.44	0.48
2:B:324:ALA:HB1	2:B:329:VAL:CG2	2.43	0.48
6:F:81:ARG:HG2	6:F:396:PRO:HD3	1.96	0.48
3:C:121:ARG:HD3	3:C:186:TRP:HE1	1.78	0.47
2:B:226:ASN:HD22	2:B:401:GLN:HB2	1.79	0.47
4:D:25:ALA:C	4:D:27:ALA:H	2.22	0.47
1:A:98:SER:OG	1:A:101:LEU:HB2	2.14	0.47
1:A:140:CYS:SG	9:A:303:HEC:C4B	3.00	0.47
2:B:422:MET:HB2	2:B:449:HIS:CD2	2.49	0.47
6:F:81:ARG:NH2	6:F:396:PRO:HB3	2.29	0.47
3:C:92:VAL:HG12	3:C:394:ARG:HE	1.80	0.47
1:A:205:ILE:HG23	9:A:302:HEC:HBD1	1.96	0.47
3:C:36:PRO:O	3:C:37:LEU:HB2	2.15	0.47
3:C:250:SER:OG	3:C:266:PHE:HB3	2.15	0.47
4:D:96:TRP:CD1	4:D:97:PRO:HD3	2.50	0.47
3:C:123:ALA:O	3:C:127:THR:HG23	2.14	0.47
5:E:30:MET:HB3	5:E:33:GLN:HE21	1.80	0.47
2:B:853:CYS:HA	2:B:1009:PRO:HA	1.97	0.47
4:D:132:VAL:HG12	4:D:133:PHE:H	1.80	0.47
1:A:128:PHE:CE1	1:A:133:HIS:CE1	3.03	0.46
6:F:243:SER:HB2	6:F:246:ARG:HH21	1.80	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:F:276:TYR:HB2	15:F:502:JM9:C36	2.46	0.46
1:A:55:HIS:HE1	9:A:304:HEC:C4D	2.28	0.46
9:A:301:HEC:HMC1	9:A:301:HEC:HBC3	1.95	0.46
4:D:104:PHE:CE1	15:F:502:JM9:C54	2.97	0.46
1:A:182:TYR:O	1:A:183:ASN:C	2.59	0.46
2:B:733:LEU:HD12	2:B:733:LEU:C	2.40	0.46
7:G:87:THR:HG23	7:G:90:GLY:H	1.81	0.46
5:E:98:LYS:HB3	5:E:177:ILE:HD11	1.98	0.46
2:B:354:HIS:HB3	2:B:357:GLN:HB2	1.98	0.46
2:B:684:ARG:HE	2:B:687:ALA:HB2	1.81	0.46
3:C:221:ALA:O	3:C:222:ARG:HB2	2.16	0.46
6:F:315:PHE:O	6:F:320:PRO:HD3	2.16	0.46
1:A:25:VAL:HG13	8:I:29:MET:HE2	1.97	0.46
1:A:165:LEU:HD23	1:A:165:LEU:HA	1.77	0.46
2:B:585:TYR:HB3	2:B:591:LEU:HD12	1.98	0.46
3:C:61:PHE:HB2	3:C:426:GLY:CA	2.45	0.46
2:B:856:ALA:H	4:D:87:GLY:HA2	1.81	0.45
3:C:197:LEU:HD11	3:C:443:PRO:HD3	1.96	0.45
4:D:9:MET:HG3	4:D:135:VAL:HG21	1.99	0.45
3:C:61:PHE:HB2	3:C:426:GLY:HA3	1.98	0.45
1:A:10:ASN:OD1	4:D:127:SER:HA	2.16	0.45
2:B:980:GLY:N	2:B:989:VAL:HG21	2.31	0.45
3:C:421:TRP:O	3:C:425:ILE:HD12	2.17	0.45
2:B:782:ARG:O	2:B:983:ASN:ND2	2.47	0.45
3:C:45:LYS:HA	3:C:48:LEU:HD12	1.99	0.45
3:C:405:ASP:H	3:C:411:TRP:NE1	2.14	0.45
3:C:408:PRO:HA	3:C:411:TRP:CE2	2.52	0.45
3:C:420:ASP:OD1	3:C:420:ASP:N	2.50	0.45
8:I:3:PRO:HG2	8:I:6:SER:HB3	1.99	0.45
5:E:99:TYR:O	5:E:104:ALA:N	2.50	0.44
2:B:107:THR:HG22	2:B:112:GLY:HA2	1.99	0.44
2:B:449:HIS:ND1	2:B:451:SER:HB2	2.32	0.44
2:B:275:PHE:CE2	2:B:279:ARG:HD2	2.52	0.44
2:B:669:PRO:HB2	2:B:841:PRO:HG3	1.99	0.44
1:A:107:SER:C	1:A:109:ALA:H	2.26	0.44
2:B:254:VAL:HG22	2:B:359:VAL:HG12	1.99	0.44
2:B:117:VAL:CG2	2:B:127:VAL:HG22	2.47	0.44
3:C:265:VAL:O	3:C:268:PRO:HD2	2.18	0.44
3:C:332:SER:HB3	6:F:218:PHE:CE1	2.52	0.44
9:A:301:HEC:CBC	9:A:301:HEC:CMC	2.85	0.44
3:C:322:TYR:OH	3:C:356:LEU:HD11	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:E:141:PHE:O	5:E:145:ILE:HG13	2.18	0.44
4:D:14:THR:HG23	4:D:17:ALA:H	1.82	0.44
1:A:161:MET:HB3	3:C:158:HIS:HA	2.00	0.43
2:B:629:GLY:HA3	2:B:637:ARG:HD3	1.99	0.43
2:B:850:CYS:HA	2:B:896:VAL:HG21	2.00	0.43
3:C:327:PHE:O	3:C:331:TYR:HB2	2.17	0.43
6:F:315:PHE:HB3	6:F:342:TRP:HZ2	1.82	0.43
1:A:138:ILE:HG21	9:A:302:HEC:HBC2	2.00	0.43
2:B:757:GLU:O	2:B:758:VAL:HB	2.19	0.43
3:C:55:PHE:O	3:C:59:MET:HG2	2.18	0.43
7:G:87:THR:HB	7:G:93:HIS:NE2	2.34	0.43
2:B:853:CYS:HB3	2:B:1007:THR:HB	2.00	0.43
6:F:14:LEU:HD21	6:F:389:VAL:HG13	1.99	0.43
6:F:108:TYR:O	6:F:109:LYS:HB2	2.18	0.43
5:E:136:ALA:O	5:E:182:ARG:NH2	2.52	0.43
1:A:33:VAL:HG22	8:I:32:LEU:CD1	2.48	0.43
4:D:8:VAL:O	4:D:149:CYS:HA	2.18	0.43
6:F:137:ILE:HG12	6:F:215:PRO:HB2	2.01	0.43
2:B:633:ASP:O	2:B:637:ARG:HG3	2.18	0.43
4:D:110:LEU:HD23	4:D:110:LEU:HA	1.83	0.43
5:E:149:VAL:N	5:E:162:MET:HB3	2.32	0.43
1:A:140:CYS:HB3	1:A:144:HIS:CD2	2.47	0.43
2:B:627:LEU:O	2:B:637:ARG:HD2	2.19	0.43
6:F:56:THR:CG2	6:F:351:MET:HE1	2.41	0.43
3:C:313:THR:CG2	13:C:501:JLQ:C11	2.88	0.43
6:F:83:LEU:HD21	6:F:238:LEU:HD11	2.01	0.43
1:A:157:GLN:OE1	1:A:157:GLN:N	2.52	0.42
4:D:132:VAL:HG12	4:D:133:PHE:N	2.34	0.42
2:B:420:LEU:HB3	2:B:447:THR:HG22	2.01	0.42
6:F:65:LEU:HD12	6:F:68:GLN:HE21	1.83	0.42
2:B:262:LEU:HD12	2:B:301:THR:HA	2.01	0.42
3:C:239:THR:HB	3:C:240:PRO:HD3	2.01	0.42
2:B:428:VAL:HG13	2:B:438:ALA:HB2	2.00	0.42
6:F:360:ARG:HD3	6:F:366:ILE:HA	2.00	0.42
2:B:765:ARG:HH21	2:B:769:ASN:H	1.67	0.42
6:F:31:VAL:HG13	6:F:372:ALA:HB1	2.01	0.42
2:B:851:MET:HA	2:B:1011:THR:HB	2.02	0.42
3:C:217:TRP:O	3:C:218:ARG:C	2.62	0.42
6:F:110:ALA:C	6:F:112:GLY:H	2.27	0.42
3:C:154:TYR:CE2	3:C:156:ASN:HB3	2.53	0.42
4:D:30:TYR:CD2	4:D:150:ILE:HD13	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:139:GLY:O	1:A:143:CYS:HB2	2.20	0.42
1:A:183:ASN:C	1:A:185:ASP:H	2.28	0.42
4:D:8:VAL:HG12	4:D:166:LEU:HD12	2.02	0.42
6:F:291:ALA:O	6:F:295:PRO:HD3	2.19	0.42
4:D:43:GLU:HA	4:D:43:GLU:OE2	2.20	0.42
6:F:348:PHE:CE2	6:F:374:PRO:HB2	2.55	0.42
2:B:149:LEU:HB3	2:B:588:ASN:ND2	2.35	0.41
2:B:860:VAL:HG11	4:D:89:ARG:NH2	2.34	0.41
3:C:110:LEU:HD11	3:C:236:GLY:HA2	2.01	0.41
1:A:46:ALA:HB1	1:A:152:VAL:HG11	2.02	0.41
6:F:250:LEU:HD23	6:F:250:LEU:HA	1.86	0.41
3:C:129:PHE:CD1	3:C:434:LEU:HD23	2.56	0.41
1:A:134:VAL:HG13	1:A:180:GLU:CG	2.50	0.41
3:C:31:LYS:HD2	3:C:298:TYR:CE2	2.56	0.41
3:C:42:LYS:HE2	3:C:42:LYS:HB2	1.81	0.41
6:F:81:ARG:HH21	6:F:396:PRO:HB3	1.85	0.41
1:A:113:PRO:HB3	5:E:49:ARG:HH11	1.85	0.41
2:B:95:VAL:HB	2:B:98:ILE:HD12	2.03	0.41
2:B:918:PRO:HA	5:E:35:LYS:HD2	2.02	0.41
6:F:32:LEU:HG	6:F:43:PHE:HD1	1.86	0.41
2:B:456:GLU:HG3	2:B:686:HIS:HB2	2.02	0.41
2:B:597:PRO:O	2:B:598:LEU:HB2	2.21	0.41
4:D:15:PRO:HD3	4:D:146:PHE:CZ	2.56	0.41
2:B:130:ASN:ND2	2:B:539:GLY:HA3	2.36	0.41
2:B:859:GLU:HA	2:B:867:THR:HG23	2.03	0.41
3:C:99:HIS:CE1	3:C:271:VAL:HG13	2.56	0.41
6:F:343:ILE:O	6:F:347:ARG:HG2	2.21	0.41
3:C:319:VAL:HA	3:C:322:TYR:CD2	2.56	0.41
6:F:65:LEU:O	6:F:68:GLN:HG3	2.21	0.41
6:F:90:LEU:N	6:F:91:PRO:HD2	2.36	0.41
3:C:80:ILE:HD13	3:C:80:ILE:HA	1.89	0.40
6:F:405:LEU:HD23	6:F:405:LEU:HA	1.89	0.40
2:B:451:SER:O	2:B:452:GLN:HB3	2.22	0.40
2:B:759:TYR:CD2	2:B:768:PRO:HD3	2.56	0.40
3:C:267:PRO:HB2	3:C:268:PRO:HD3	2.02	0.40
4:D:93:ILE:HD12	4:D:93:ILE:HA	1.91	0.40
5:E:100:ASN:HA	5:E:104:ALA:HB2	2.02	0.40
6:F:70:LEU:HD11	6:F:192:GLY:HA2	2.02	0.40
6:F:182:LYS:O	6:F:183:LEU:HB2	2.21	0.40
2:B:856:ALA:HA	2:B:857:PRO:HD2	1.98	0.40
6:F:80:ARG:HE	6:F:80:ARG:HB2	1.77	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:158:ASP:CG	4:D:161:ARG:HB2	2.47	0.40
5:E:81:ASP:N	5:E:137:PRO:HB3	2.36	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	A	216/219 (99%)	200 (93%)	16 (7%)	0	100	100
2	B	949/1029 (92%)	911 (96%)	38 (4%)	0	100	100
3	C	447/486 (92%)	434 (97%)	13 (3%)	0	100	100
4	D	173/179 (97%)	160 (92%)	13 (8%)	0	100	100
5	E	162/205 (79%)	155 (96%)	6 (4%)	1 (1%)	22	53
6	F	395/411 (96%)	379 (96%)	16 (4%)	0	100	100
7	G	78/112 (70%)	73 (94%)	5 (6%)	0	100	100
8	I	35/37 (95%)	34 (97%)	1 (3%)	0	100	100
All	All	2455/2678 (92%)	2346 (96%)	108 (4%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	E	107	HIS

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 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	198/199 (100%)	194 (98%)	4 (2%)	50	72
2	B	768/830 (92%)	748 (97%)	20 (3%)	41	66
3	C	382/405 (94%)	378 (99%)	4 (1%)	73	84
4	D	143/147 (97%)	139 (97%)	4 (3%)	38	64
5	E	135/171 (79%)	132 (98%)	3 (2%)	47	70
6	F	318/330 (96%)	317 (100%)	1 (0%)	91	94
7	G	69/95 (73%)	68 (99%)	1 (1%)	62	78
8	I	32/32 (100%)	30 (94%)	2 (6%)	15	42
All	All	2045/2209 (93%)	2006 (98%)	39 (2%)	52	72

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	140	CYS
1	A	143	CYS
1	A	147	VAL
1	A	182	TYR
2	B	76	CYS
2	B	193	LEU
2	B	281	VAL
2	B	329	VAL
2	B	349	ARG
2	B	504	LEU
2	B	558	ILE
2	B	677	THR
2	B	715	VAL
2	B	741	VAL
2	B	753	TYR
2	B	754	ILE
2	B	827	ILE
2	B	843	ILE
2	B	853	CYS
2	B	860	VAL
2	B	869	HIS
2	B	920	VAL
2	B	933	TYR
2	B	958	VAL

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Mol	Chain	Res	Type
3	C	16	GLU
3	C	151	LEU
3	C	255	ILE
3	C	265	VAL
4	D	143	GLN
4	D	156	LEU
4	D	166	LEU
4	D	169	LEU
5	E	27	HIS
5	E	69	PHE
5	E	107	HIS
6	F	107	THR
7	G	56	LEU
8	I	16	LEU
8	I	24	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (28) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	124	ASN
1	A	146	GLN
1	A	170	ASN
2	B	82	GLN
2	B	120	ASN
2	B	145	GLN
2	B	187	GLN
2	B	206	GLN
2	B	216	GLN
2	B	357	GLN
2	B	375	HIS
2	B	391	HIS
2	B	449	HIS
2	B	790	ASN
2	B	808	ASN
2	B	817	GLN
2	B	869	HIS
2	B	880	ASN
2	B	900	ASN
3	C	225	HIS
3	C	302	HIS
4	D	143	GLN
5	E	33	GLN

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Mol	Chain	Res	Type
5	E	147	ASN
6	F	139	HIS
6	F	216	HIS
6	F	261	HIS
6	F	407	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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

15 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	$\# Z > 2$
9	HEC	A	303	1	32,50,50	2.56	4 (12%)	24,82,82	1.24	1 (4%)
9	HEC	A	302	1	32,50,50	2.52	5 (15%)	24,82,82	1.44	3 (12%)
9	HEC	A	305	1	32,50,50	2.53	5 (15%)	24,82,82	1.45	4 (16%)
10	SF4	B	1101	2	0,12,12	-	-	-	-	-
9	HEC	A	301	1	32,50,50	2.53	5 (15%)	24,82,82	1.56	6 (25%)
10	SF4	B	1102	2	0,12,12	-	-	-	-	-
11	F3S	B	1104	2	0,9,9	-	-	-	-	-
9	HEC	A	304	1	32,50,50	2.51	5 (15%)	24,82,82	1.41	4 (16%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
12	EL6	B	1105	-	26,26,42	1.19	4 (15%)	28,28,44	1.49	4 (14%)
12	EL6	E	302	-	27,27,42	1.17	4 (14%)	29,29,44	1.47	3 (10%)
14	JL3	F	501	-	44,44,44	0.97	4 (9%)	47,49,49	1.06	4 (8%)
15	JM9	F	502	-	53,53,53	0.98	4 (7%)	58,58,58	0.76	3 (5%)
13	JLQ	C	501	-	44,44,44	0.96	3 (6%)	47,49,49	1.22	6 (12%)
10	SF4	B	1103	2	0,12,12	-	-	-	-	-
9	HEC	E	301	5	32,50,50	2.52	5 (15%)	24,82,82	1.52	4 (16%)

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	HEC	A	303	1	-	2/10/54/54	-
9	HEC	A	302	1	-	1/10/54/54	-
9	HEC	A	305	1	-	1/10/54/54	-
10	SF4	B	1101	2	-	-	0/6/5/5
9	HEC	A	301	1	-	0/10/54/54	-
14	JL3	F	501	-	-	18/48/48/48	-
10	SF4	B	1102	2	-	-	0/6/5/5
9	HEC	A	304	1	-	2/10/54/54	-
12	EL6	B	1105	-	-	9/27/27/43	-
12	EL6	E	302	-	-	10/28/28/43	-
15	JM9	F	502	-	-	21/56/56/56	-
11	F3S	B	1104	2	-	-	0/3/3/3
13	JLQ	C	501	-	-	19/48/48/48	-
10	SF4	B	1103	2	-	-	0/6/5/5
9	HEC	E	301	5	-	1/10/54/54	-

All (48) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	A	303	HEC	C2B-C3B	-8.15	1.32	1.40
9	A	301	HEC	C3C-C2C	-8.10	1.32	1.40
9	A	303	HEC	C3C-C2C	-7.94	1.32	1.40
9	A	304	HEC	C3C-C2C	-7.94	1.32	1.40
9	A	305	HEC	C3C-C2C	-7.88	1.32	1.40
9	A	302	HEC	C3C-C2C	-7.87	1.32	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	E	301	HEC	C3C-C2C	-7.79	1.32	1.40
9	E	301	HEC	C2B-C3B	-7.73	1.32	1.40
9	A	302	HEC	C2B-C3B	-7.73	1.32	1.40
9	A	301	HEC	C2B-C3B	-7.71	1.32	1.40
9	A	304	HEC	C2B-C3B	-7.70	1.32	1.40
9	A	305	HEC	C2B-C3B	-7.68	1.32	1.40
9	A	305	HEC	C3D-C2D	4.99	1.52	1.37
9	E	301	HEC	C3D-C2D	4.92	1.52	1.37
9	A	303	HEC	C3D-C2D	4.90	1.52	1.37
9	A	302	HEC	C3D-C2D	4.89	1.52	1.37
9	A	304	HEC	C3D-C2D	4.84	1.52	1.37
9	A	301	HEC	C3D-C2D	4.81	1.51	1.37
12	E	302	EL6	O21-C2	-3.79	1.40	1.47
12	B	1105	EL6	O21-C2	-3.59	1.40	1.47
15	F	502	JM9	O20-C21	3.14	1.42	1.33
15	F	502	JM9	O17-C15	2.81	1.42	1.34
14	F	501	JL3	O29-C19	-2.59	1.40	1.46
15	F	502	JM9	O38-C39	2.52	1.40	1.33
12	B	1105	EL6	O31-C31	2.37	1.40	1.33
12	E	302	EL6	O31-C31	2.33	1.40	1.33
9	A	301	HEC	C1D-ND	2.29	1.40	1.36
13	C	501	JLQ	O18-C16	2.28	1.40	1.33
12	B	1105	EL6	O21-C21	2.28	1.40	1.34
13	C	501	JLQ	O30-C31	2.25	1.40	1.34
14	F	501	JL3	O17-C18	-2.25	1.40	1.45
14	F	501	JL3	O17-C15	2.24	1.39	1.33
12	B	1105	EL6	O31-C3	-2.23	1.40	1.45
12	E	302	EL6	O21-C21	2.22	1.40	1.34
12	E	302	EL6	O31-C3	-2.22	1.40	1.45
13	C	501	JLQ	O18-C19	-2.21	1.40	1.45
9	A	301	HEC	C4D-ND	2.20	1.40	1.36
9	A	302	HEC	C4D-ND	2.19	1.40	1.36
9	E	301	HEC	C1D-ND	2.17	1.40	1.36
9	A	305	HEC	C4D-ND	2.16	1.40	1.36
9	A	305	HEC	C1D-ND	2.14	1.40	1.36
9	E	301	HEC	C4D-ND	2.12	1.40	1.36
9	A	302	HEC	C1D-ND	2.11	1.40	1.36
9	A	303	HEC	C4D-ND	2.11	1.40	1.36
15	F	502	JM9	O17-C18	-2.10	1.41	1.46
9	A	304	HEC	C4D-ND	2.06	1.40	1.36
9	A	304	HEC	C1D-ND	2.05	1.40	1.36
14	F	501	JL3	O29-C30	2.05	1.40	1.34

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	B	1105	EL6	O21-C21-C22	4.50	121.19	111.50
13	C	501	JLQ	O30-C31-C33	4.41	121.01	111.50
12	E	302	EL6	O21-C21-C22	4.30	120.76	111.50
14	F	501	JL3	O29-C30-C32	3.89	119.89	111.50
9	E	301	HEC	CMC-C2C-C1C	-3.51	123.07	128.46
9	A	305	HEC	C1D-C2D-C3D	-3.44	104.60	107.00
9	E	301	HEC	C1D-C2D-C3D	-3.42	104.62	107.00
9	A	304	HEC	C1D-C2D-C3D	-3.31	104.69	107.00
9	A	301	HEC	C1D-C2D-C3D	-3.18	104.78	107.00
13	C	501	JLQ	O30-C20-C19	3.16	119.85	108.40
9	A	302	HEC	C1D-C2D-C3D	-3.16	104.80	107.00
9	A	302	HEC	CMC-C2C-C1C	-3.13	123.65	128.46
14	F	501	JL3	C01-C02-C03	3.03	136.40	113.42
9	A	301	HEC	CMC-C2C-C1C	-3.02	123.83	128.46
13	C	501	JLQ	O30-C20-C21	2.87	118.80	108.40
9	A	303	HEC	C1D-C2D-C3D	-2.86	105.01	107.00
12	E	302	EL6	C2-O21-C21	-2.83	114.24	117.88
15	F	502	JM9	O38-C39-C41	2.80	120.70	111.91
9	A	304	HEC	CBD-CAD-C3D	-2.72	107.98	112.62
13	C	501	JLQ	C21-C20-C19	2.69	118.16	111.79
15	F	502	JM9	O17-C15-C14	2.68	117.29	111.50
12	B	1105	EL6	O31-C31-C32	2.62	120.14	111.91
9	A	301	HEC	CMB-C2B-C1B	-2.44	124.72	128.46
13	C	501	JLQ	O18-C16-C15	2.41	119.47	111.91
14	F	501	JL3	O17-C15-C14	2.38	119.37	111.91
9	A	301	HEC	CBA-CAA-C2A	-2.38	108.60	112.60
9	A	305	HEC	CMC-C2C-C1C	-2.37	124.82	128.46
9	A	302	HEC	CMB-C2B-C1B	-2.36	124.84	128.46
12	E	302	EL6	O31-C31-C32	2.31	119.16	111.91
12	B	1105	EL6	C2-O21-C21	-2.28	114.95	117.88
12	B	1105	EL6	O21-C2-C3	2.28	111.40	106.13
13	C	501	JLQ	O24-P23-O25	-2.24	101.18	112.24
14	F	501	JL3	O23-P22-O24	-2.23	101.21	112.24
9	A	305	HEC	CMB-C2B-C1B	-2.19	125.10	128.46
9	A	301	HEC	CMB-C2B-C3B	2.17	128.37	125.82
9	A	305	HEC	CBA-CAA-C2A	-2.17	108.94	112.60
9	A	304	HEC	CMC-C2C-C1C	-2.13	125.19	128.46
9	E	301	HEC	CMB-C2B-C1B	-2.13	125.19	128.46
9	A	304	HEC	CMB-C2B-C1B	-2.09	125.25	128.46
15	F	502	JM9	O20-C21-C23	2.06	118.38	111.91
9	A	301	HEC	CMC-C2C-C3C	-2.01	123.46	125.82
9	E	301	HEC	CBA-CAA-C2A	-2.00	109.23	112.60

There are no chirality outliers.

All (84) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
12	B	1105	EL6	C1-C2-C3-O31
12	B	1105	EL6	O21-C2-C3-O31
13	C	501	JLQ	O18-C19-C20-O30
13	C	501	JLQ	O32-C31-O30-C20
13	C	501	JLQ	C33-C31-O30-C20
14	F	501	JL3	C20-O21-P22-O24
14	F	501	JL3	C32-C30-O29-C19
15	F	502	JM9	O17-C18-C19-O20
14	F	501	JL3	O16-C15-O17-C18
14	F	501	JL3	O31-C30-O29-C19
14	F	501	JL3	C14-C15-O17-C18
15	F	502	JM9	C41-C39-O38-C37
12	B	1105	EL6	C22-C21-O21-C2
15	F	502	JM9	O40-C39-O38-C37
12	B	1105	EL6	O22-C21-O21-C2
12	B	1105	EL6	C32-C31-O31-C3
13	C	501	JLQ	C15-C16-O18-C19
12	B	1105	EL6	O32-C31-O31-C3
13	C	501	JLQ	O17-C16-O18-C19
12	E	302	EL6	C21-C22-C23-C24
13	C	501	JLQ	C31-C33-C34-C35
14	F	501	JL3	C30-C32-C33-C34
13	C	501	JLQ	C27-O26-P23-O22
14	F	501	JL3	C20-O21-P22-O25
14	F	501	JL3	C05-C06-C07-C08
15	F	502	JM9	C06-C07-C08-C09
13	C	501	JLQ	C34-C35-C36-C37
15	F	502	JM9	C08-C09-C10-C11
15	F	502	JM9	C45-C46-C47-C48
15	F	502	JM9	C27-C28-C29-C30
14	F	501	JL3	C35-C36-C37-C38
15	F	502	JM9	C47-C48-C49-C50
15	F	502	JM9	C41-C42-C43-C44
14	F	501	JL3	C08-C09-C10-C11
15	F	502	JM9	C23-C21-O20-C19
15	F	502	JM9	O22-C21-O20-C19
15	F	502	JM9	C24-C25-C26-C27
12	E	302	EL6	C22-C21-O21-C2
12	E	302	EL6	O22-C21-O21-C2
14	F	501	JL3	C01-C02-C03-C04

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Mol	Chain	Res	Type	Atoms
13	C	501	JLQ	C36-C37-C38-C39
14	F	501	JL3	C33-C34-C35-C36
14	F	501	JL3	C37-C38-C39-C40
14	F	501	JL3	O17-C18-C19-C20
14	F	501	JL3	C10-C11-C12-C13
12	E	302	EL6	C32-C33-C34-C35
14	F	501	JL3	O17-C18-C19-O29
12	B	1105	EL6	C31-C32-C33-C34
13	C	501	JLQ	C40-C41-C42-C43
15	F	502	JM9	C37-C18-C19-O20
13	C	501	JLQ	C12-C13-C14-C15
15	F	502	JM9	C03-C04-C05-C06
13	C	501	JLQ	C27-O26-P23-O24
13	C	501	JLQ	C27-O26-P23-O25
12	E	302	EL6	C31-C32-C33-C34
15	F	502	JM9	C05-C06-C07-C08
15	F	502	JM9	C46-C47-C48-C49
13	C	501	JLQ	C21-O22-P23-O26
13	C	501	JLQ	O18-C19-C20-C21
12	E	302	EL6	C27-C28-C29-C2A
13	C	501	JLQ	C01-C02-C03-C04
9	A	304	HEC	C2A-CAA-CBA-CGA
9	A	305	HEC	C3D-CAD-CBD-CGD
15	F	502	JM9	C43-C44-C45-C46
15	F	502	JM9	O38-C39-C41-C42
9	A	304	HEC	C3D-CAD-CBD-CGD
9	A	303	HEC	CAD-CBD-CGD-O2D
13	C	501	JLQ	C42-C43-C44-C45
15	F	502	JM9	C30-C31-C32-C33
9	A	302	HEC	C2A-CAA-CBA-CGA
12	E	302	EL6	O21-C21-C22-C23
13	C	501	JLQ	O30-C31-C33-C34
12	E	302	EL6	C24-C25-C26-C27
9	A	303	HEC	CAD-CBD-CGD-O1D
15	F	502	JM9	C13-C14-C15-O17
12	B	1105	EL6	C33-C34-C35-C36
12	E	302	EL6	C23-C24-C25-C26
14	F	501	JL3	O29-C30-C32-C33
15	F	502	JM9	C13-C14-C15-O16
12	E	302	EL6	O22-C21-C22-C23
9	E	301	HEC	CAA-CBA-CGA-O2A
13	C	501	JLQ	O32-C31-C33-C34

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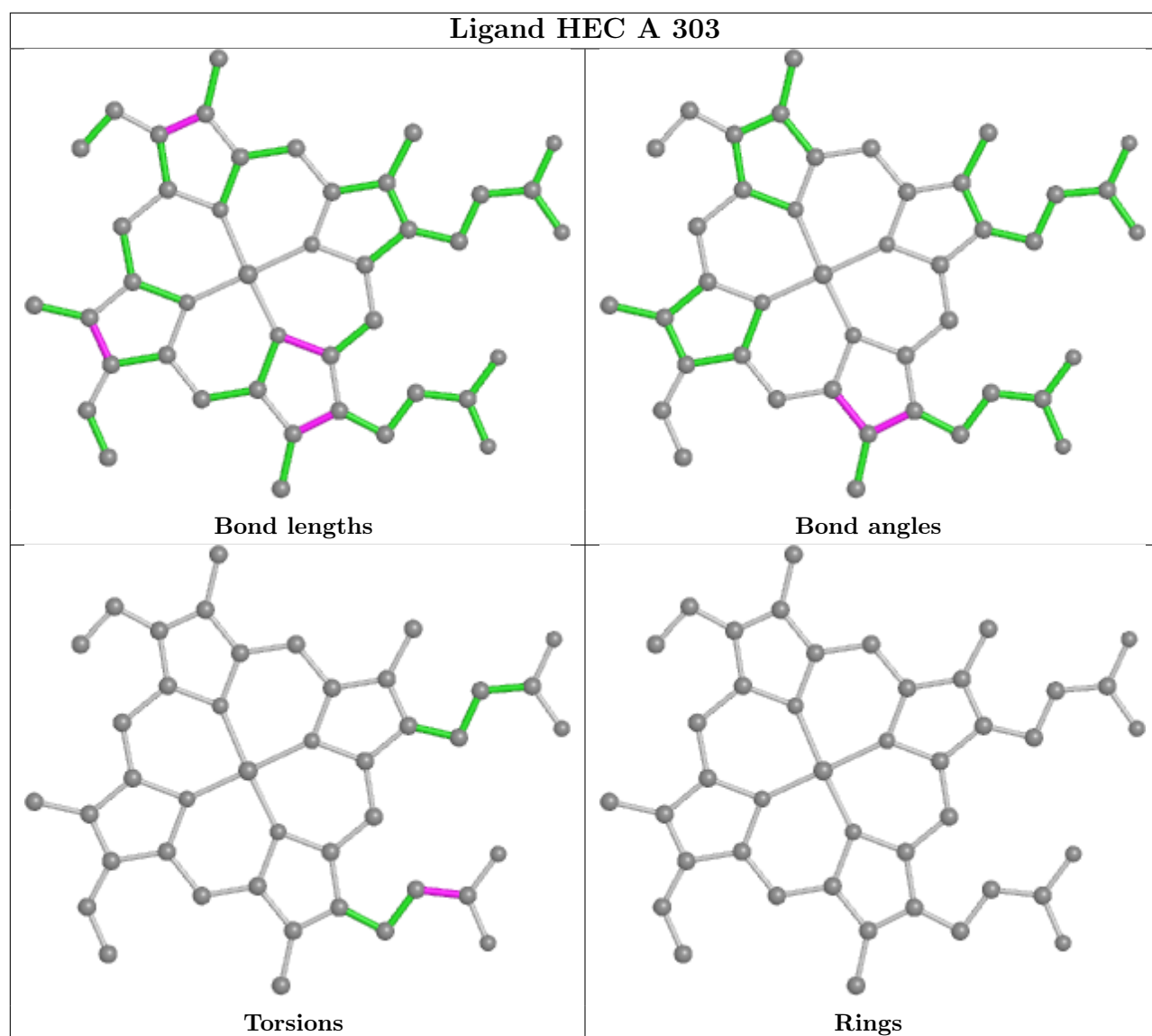
Mol	Chain	Res	Type	Atoms
12	B	1105	EL6	C35-C36-C37-C38
14	F	501	JL3	O31-C30-C32-C33

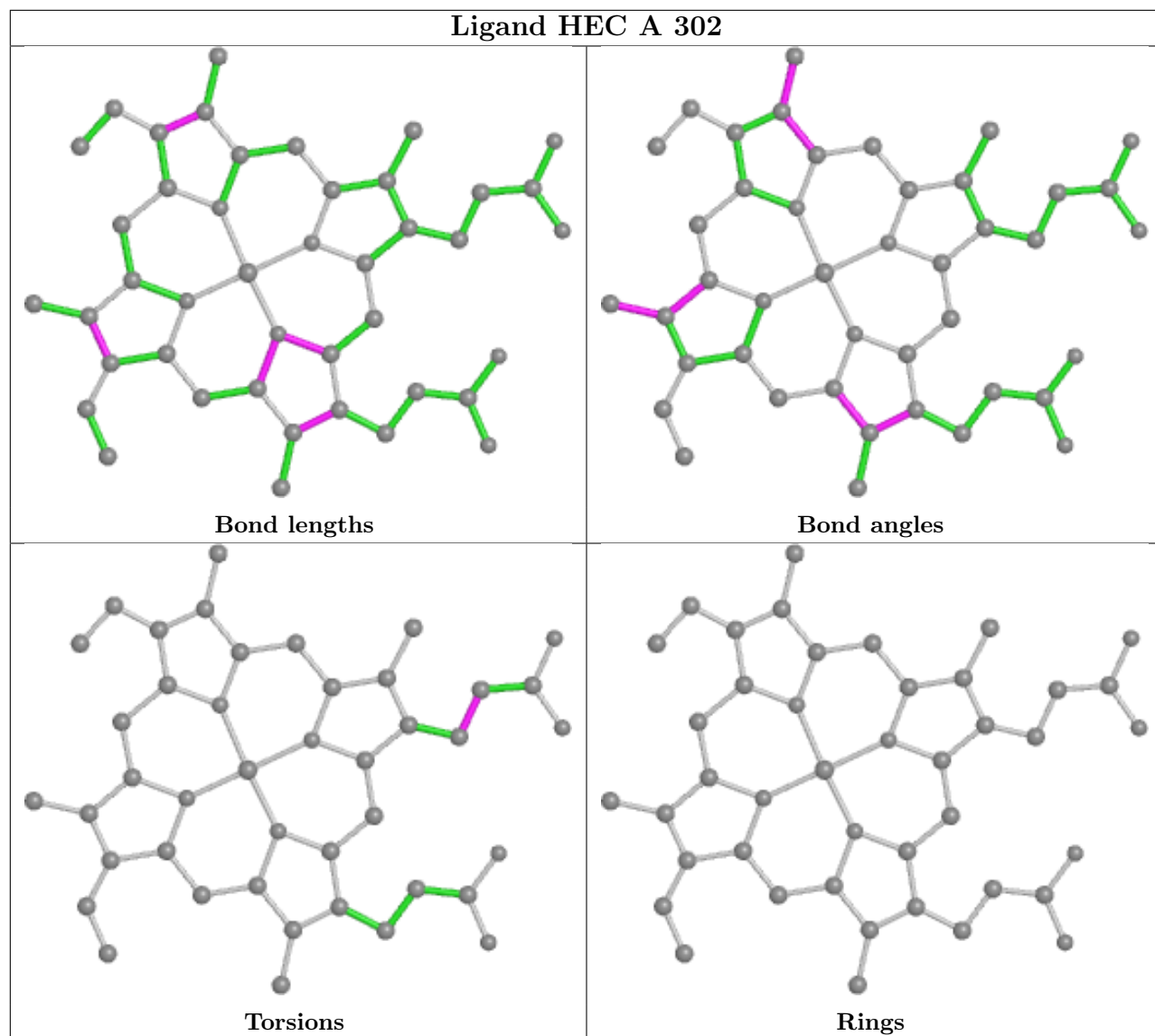
There are no ring outliers.

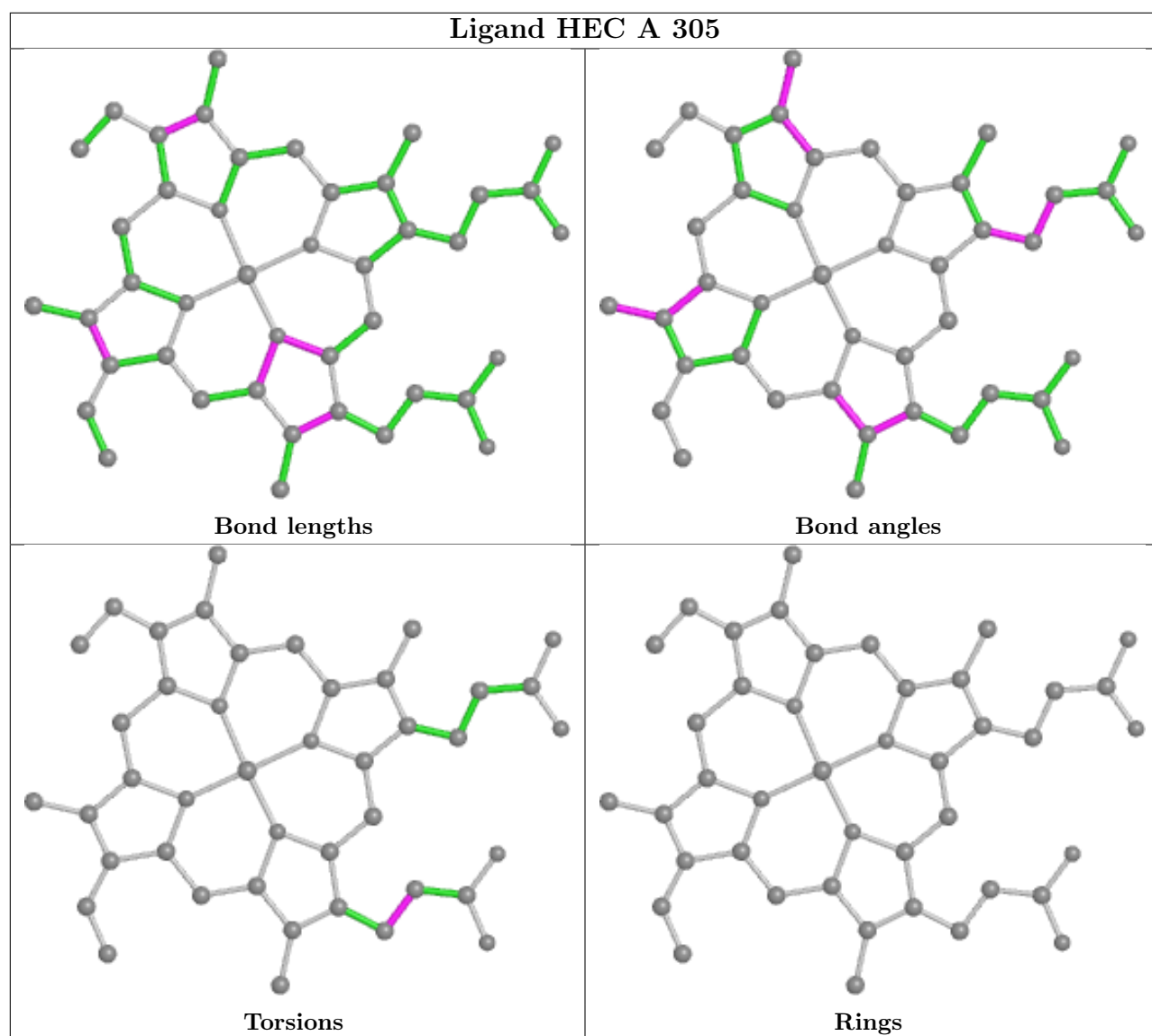
10 monomers are involved in 60 short contacts:

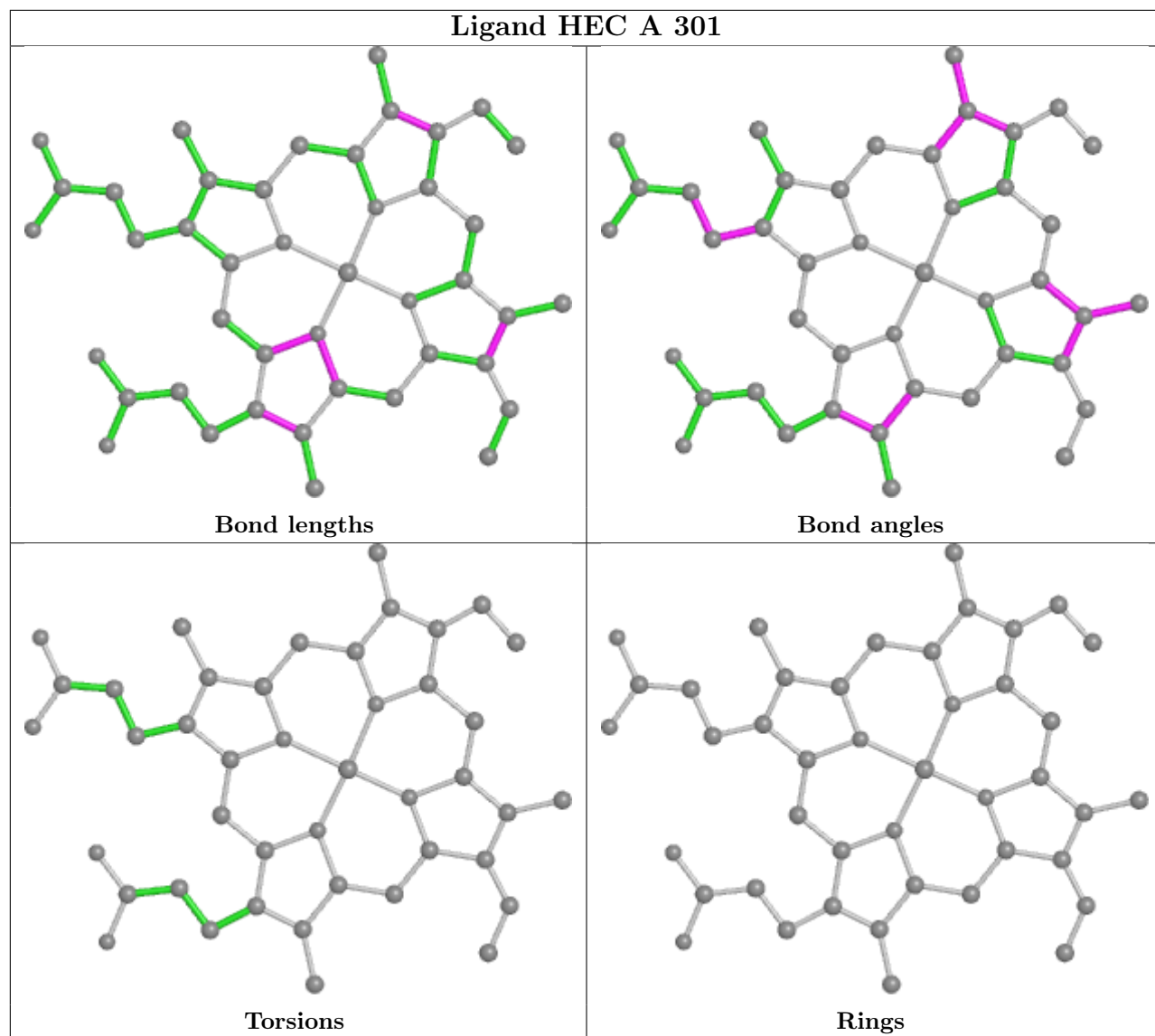
Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	A	303	HEC	11	0
9	A	302	HEC	3	0
10	B	1101	SF4	1	0
9	A	301	HEC	9	0
9	A	304	HEC	2	0
12	B	1105	EL6	1	0
14	F	501	JL3	2	0
15	F	502	JM9	17	0
13	C	501	JLQ	10	0
9	E	301	HEC	4	0

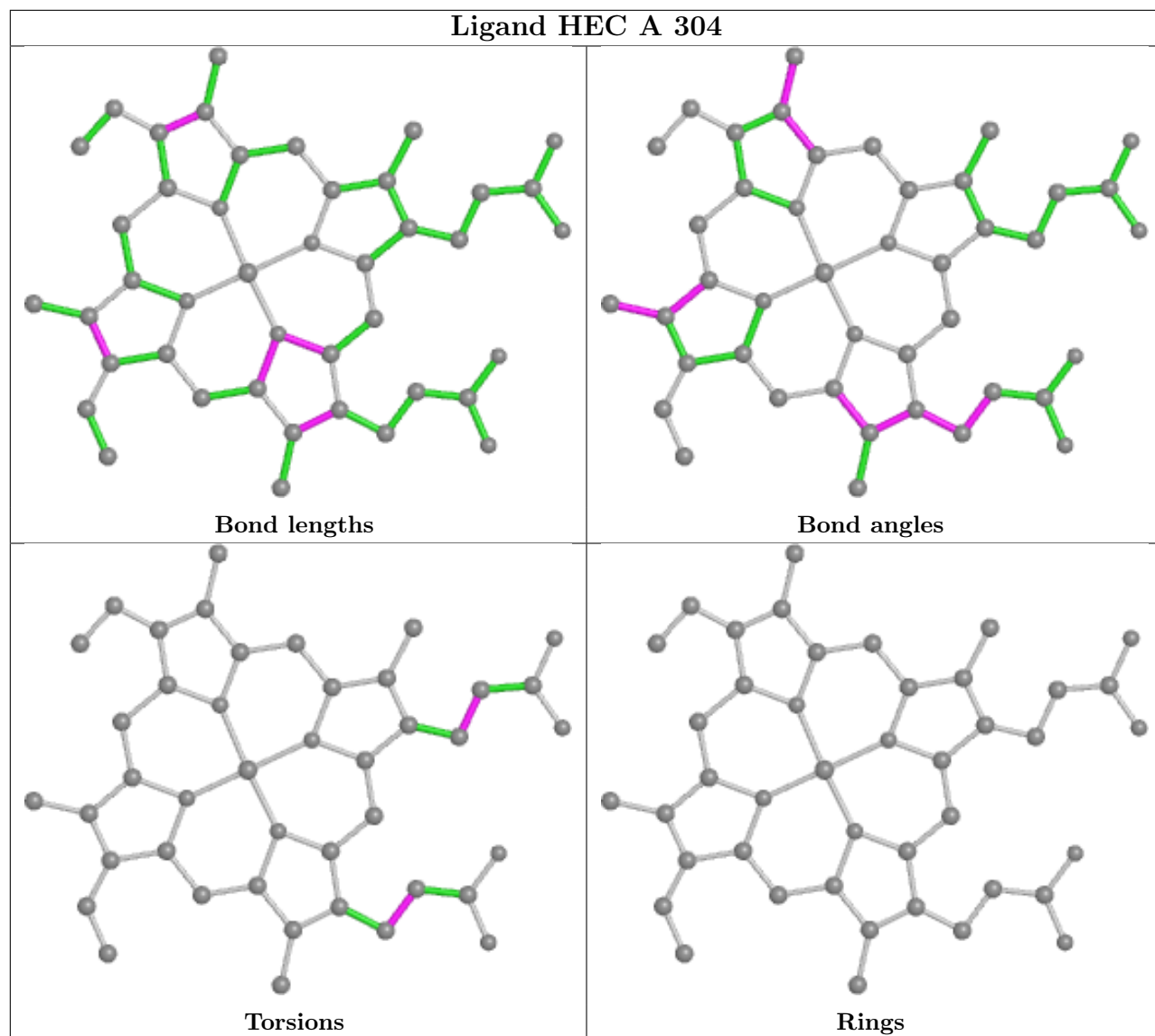
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

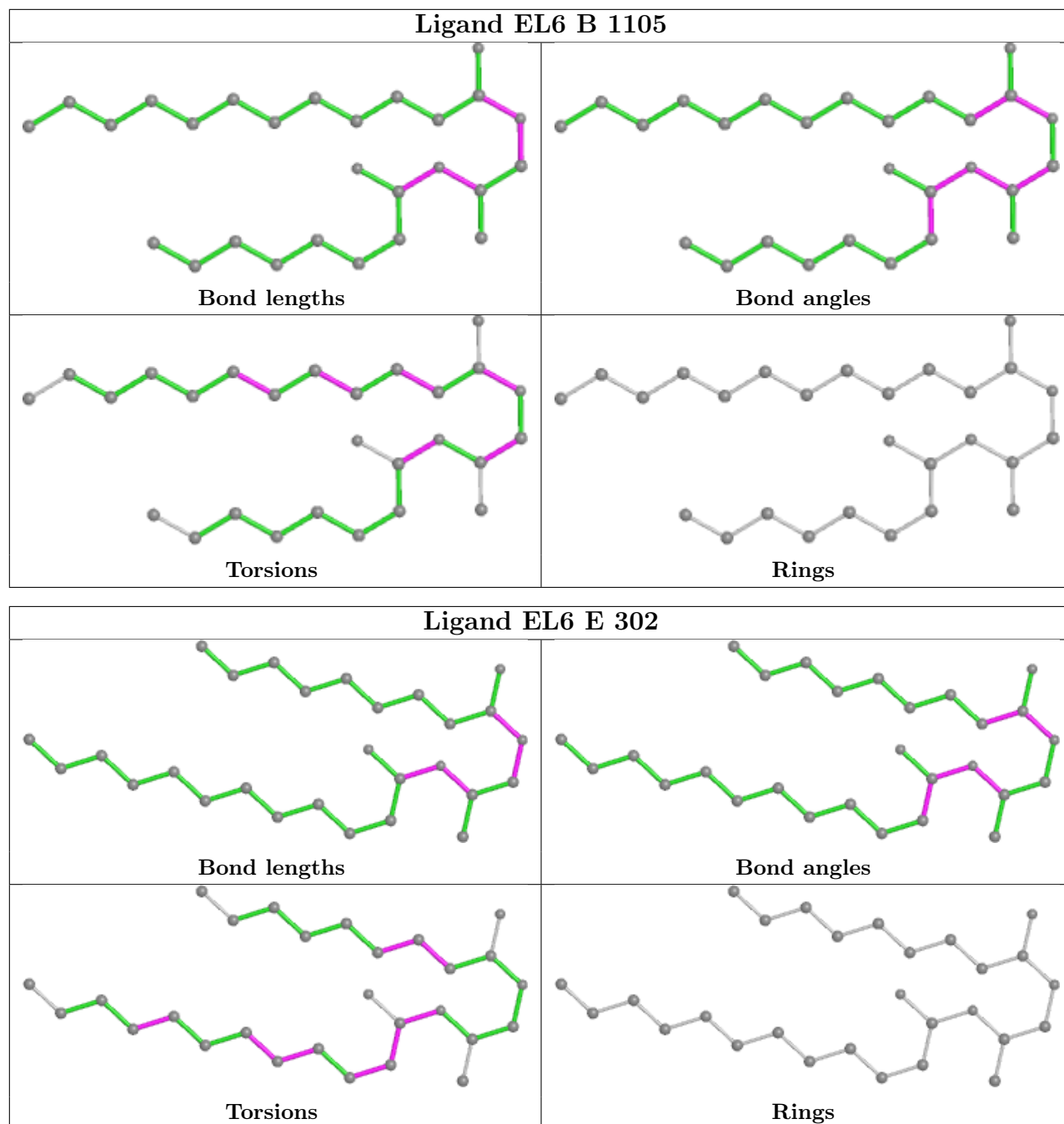


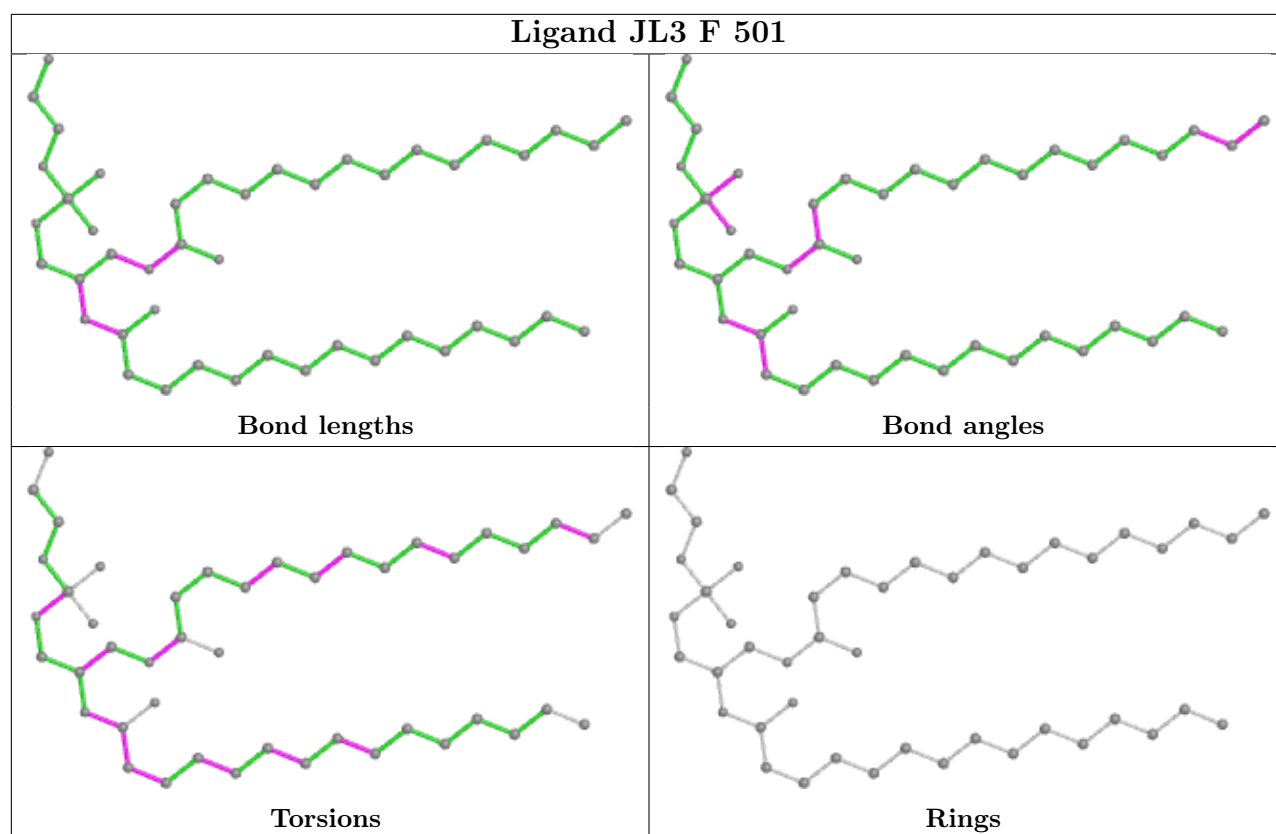




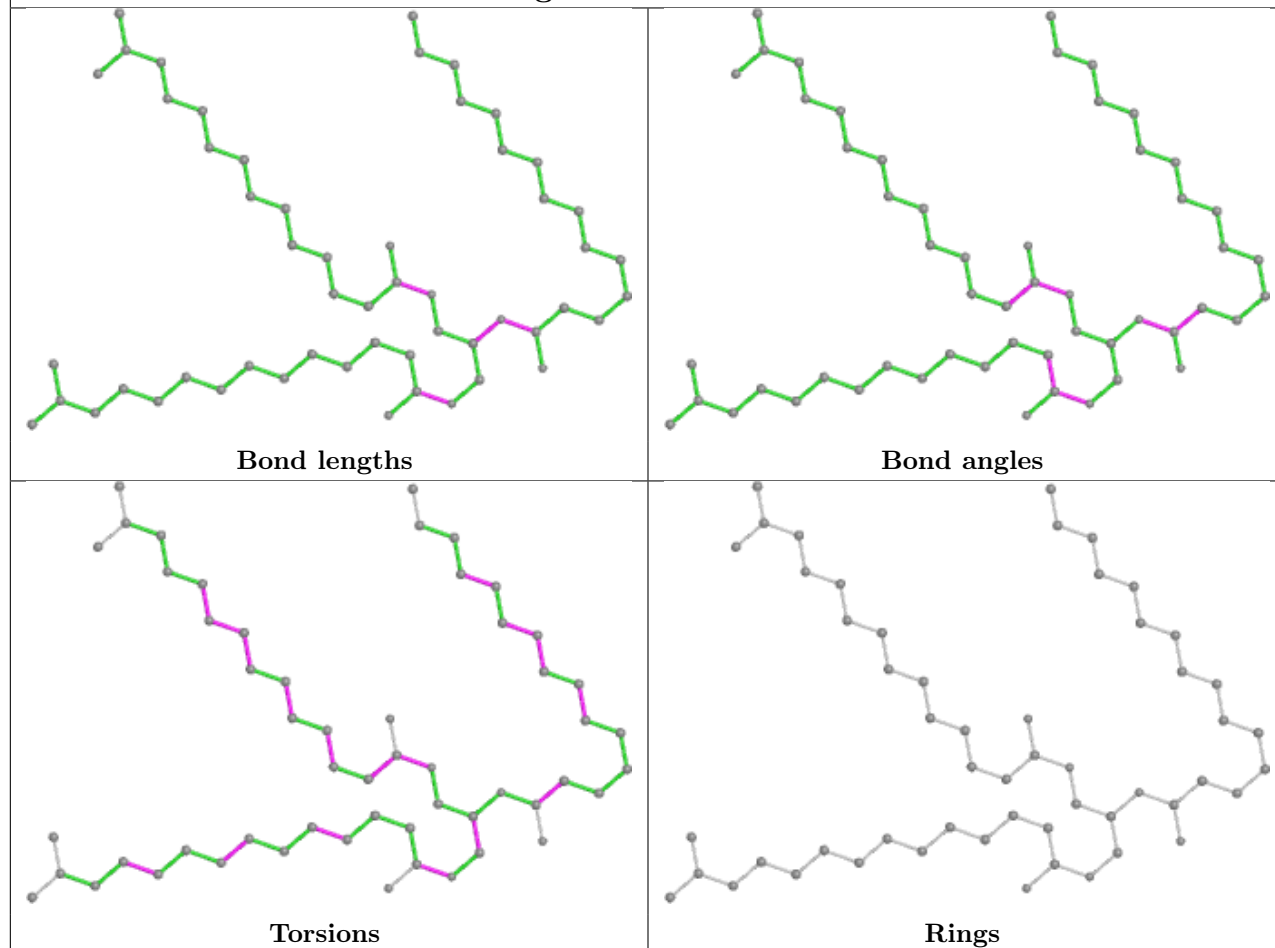




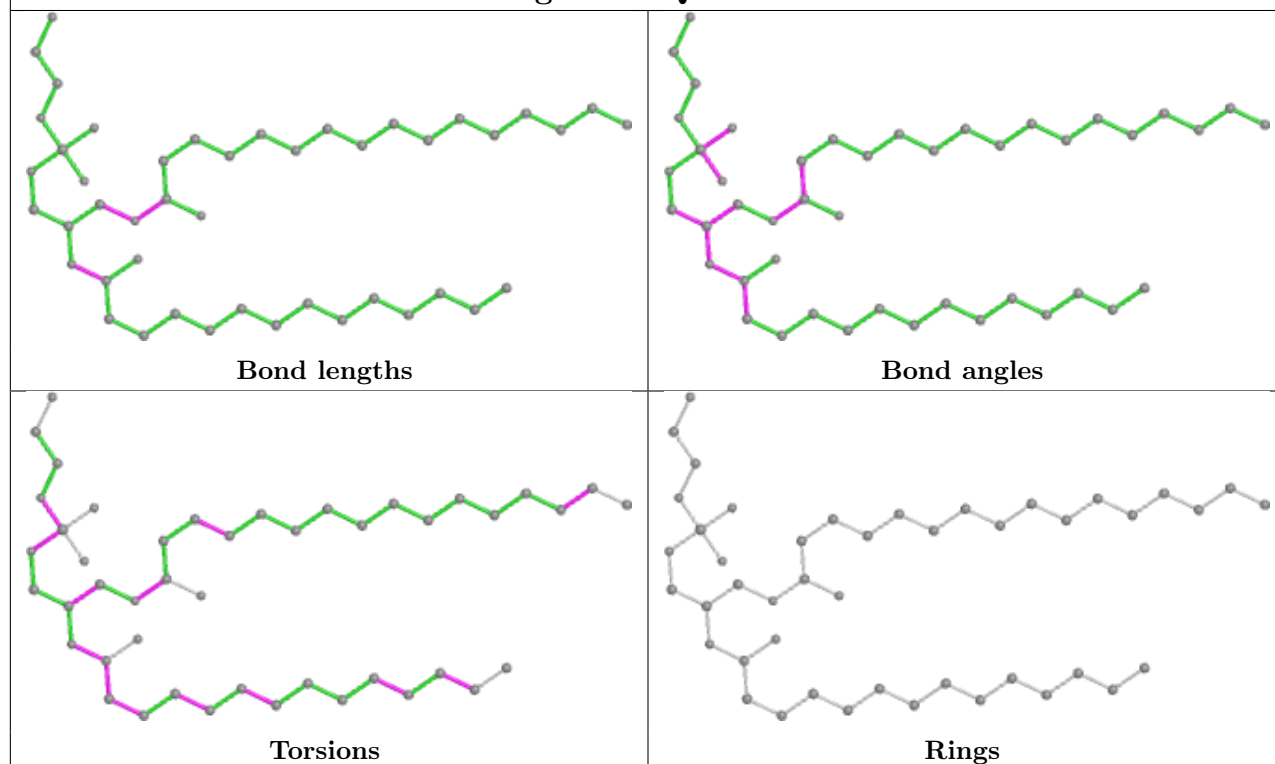


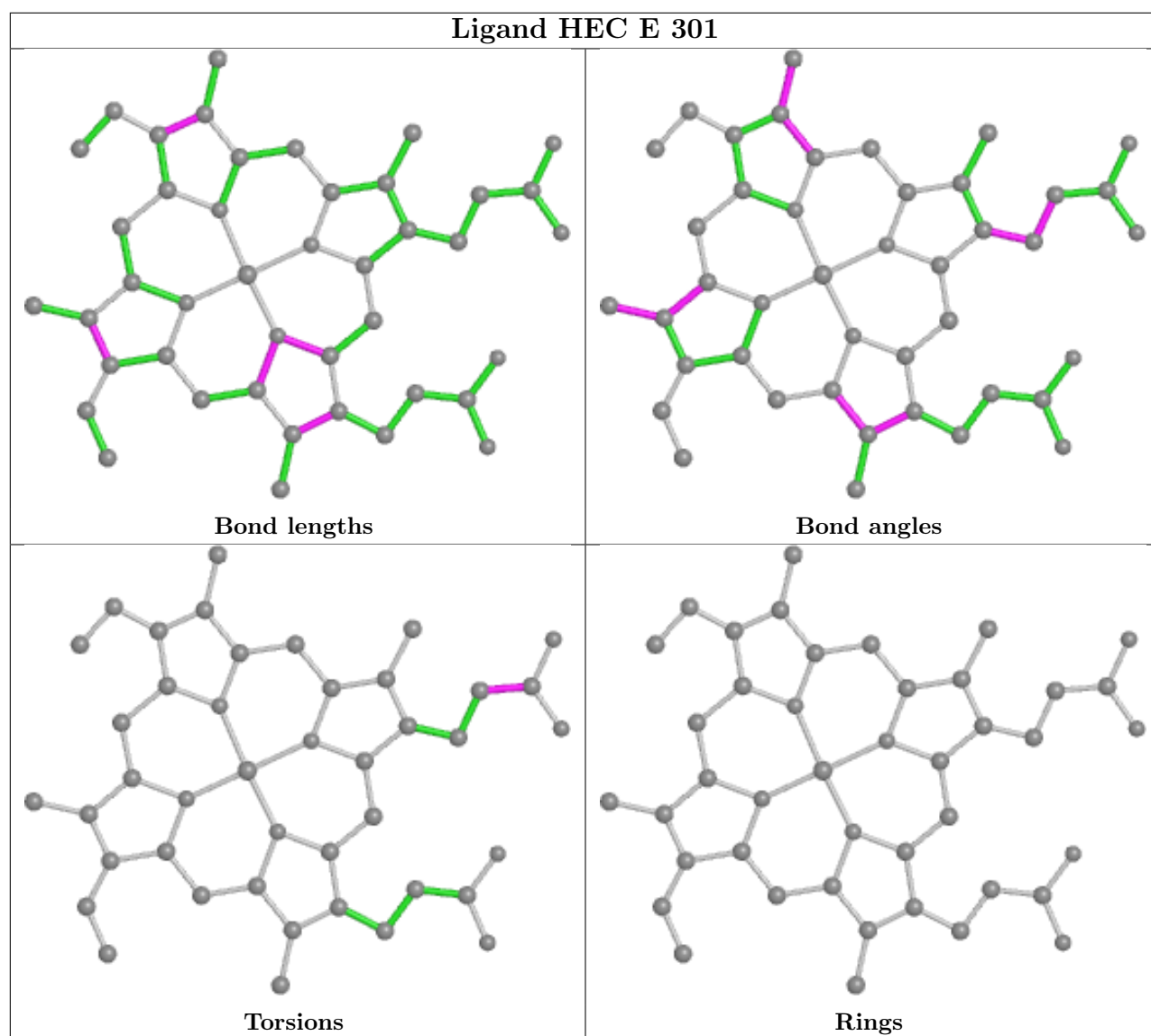


Ligand JM9 F 502



Ligand JLQ C 501





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.