



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 16, 2023 – 12:35 pm GMT

PDB ID : 4CAS
Title : Serial femtosecond crystallography structure of a photosynthetic reaction center
Authors : Johansson, L.C.; Arnlund, D.; Katona, G.; White, T.A.; Barty, A.; DePonte, D.P.; Shoeman, R.L.; Wickstrand, C.; Sharma, A.; Williams, G.J.; Aquila, A.; Bogan, M.J.; Caleman, C.; Davidsson, J.; Doak, R.B.; Frank, M.; Fromme, R.; Galli, L.; Grotjohann, I.; Hunter, M.S.; Kassemeyer, S.; Kirian, R.A.; Kupitz, C.; Liang, M.; Lomb, L.; Malmerberg, E.; Martin, A.V.; Messerschmidt, M.; Nass, K.; Redecke, L.; Seibert, M.M.; Sjöhamn, J.; Steinbrener, J.; Stellato, F.; Wang, D.; Wahlgren, W.Y.; Weierstall, U.; Westenhoff, S.; Zatsepin, N.A.; Boutet, S.; Spence, J.C.H.; Schlichting, I.; Chapman, H.N.; Fromme, P.; Neutze, R.
Deposited on : 2013-10-09
Resolution : 3.50 Å(reported)

This is a Full wwPDB X-ray Structure 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/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13

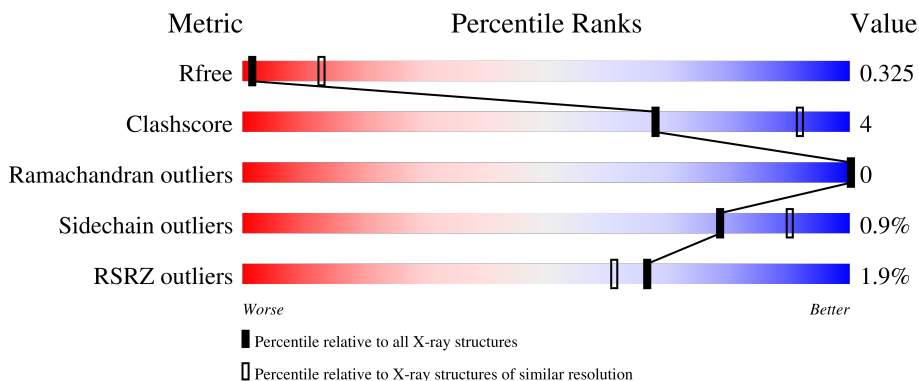
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.50 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1659 (3.60-3.40)
Clashscore	141614	1036 (3.58-3.42)
Ramachandran outliers	138981	1005 (3.58-3.42)
Sidechain outliers	138945	1006 (3.58-3.42)
RSRZ outliers	127900	1559 (3.60-3.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

EDS : 2.36
 buster-report : 1.1.7 (2018)
 Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
 Refmac : 5.8.0158
 CCP4 : 7.0.044 (Gargrove)
 Ideal geometry (proteins) : Engh & Huber (2001)
 Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
 Validation Pipeline (wwPDB-VP) : 2.36

Mol	Chain	Length	Quality of chain
1	A	356	 91% 7%
2	B	274	 92% 8%
3	C	324	 94% 5%
4	D	258	 90% 6%

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
12	NS5	C	404	-	-	-	X
6	DGA	A	405	-	-	-	X
9	MPG	B	305	-	-	-	X
9	MPG	B	306	-	-	-	X
9	MPG	C	406	-	-	-	X

2 Entry composition

There are 14 unique types of molecules in this entry. The entry contains 9890 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called PHOTOSYNTHETIC REACTION CENTER CYTOCHROME C SUBUNIT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	332	2598	1637	465	478	18	0	0	0

- Molecule 2 is a protein called REACTION CENTER PROTEIN L CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	273	2170	1458	350	355	7	0	2	0

- Molecule 3 is a protein called REACTION CENTER PROTEIN M CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	323	2546	1696	417	422	11	0	0	0

- Molecule 4 is a protein called REACTION CENTER PROTEIN H CHAIN.

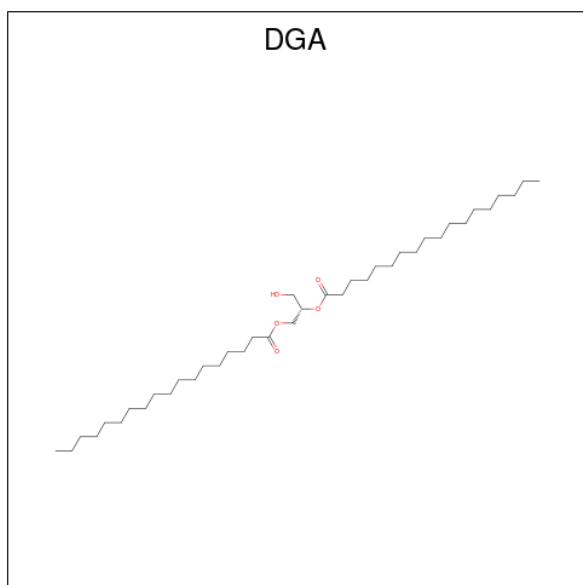
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	D	243	1771	1140	297	332	2	0	0	0

- Molecule 5 is HEME C (three-letter code: HEC) (formula: $C_{34}H_{34}FeN_4O_4$).



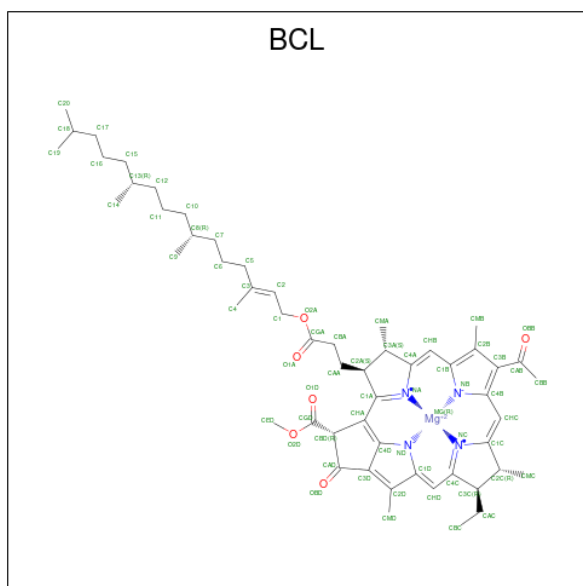
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	Fe	N			O
5	A	1	43	34	1	4	4	0	0
5	A	1	43	34	1	4	4	0	0
5	A	1	43	34	1	4	4	0	0
5	A	1	43	34	1	4	4	0	0

- Molecule 6 is DIACYL GLYCEROL (three-letter code: DGA) (formula: $C_{39}H_{76}O_5$).



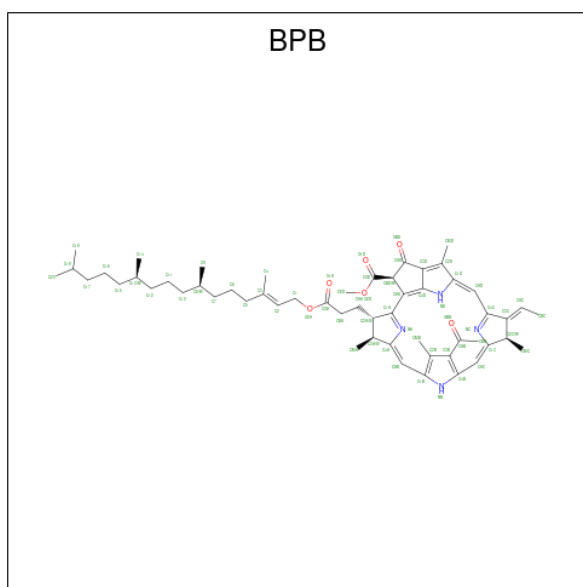
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			37	33	4		

- Molecule 7 is BACTERIOCHLOROPHYLL A (three-letter code: BCL) (formula: $C_{55}H_{74}MgN_4O_6$).



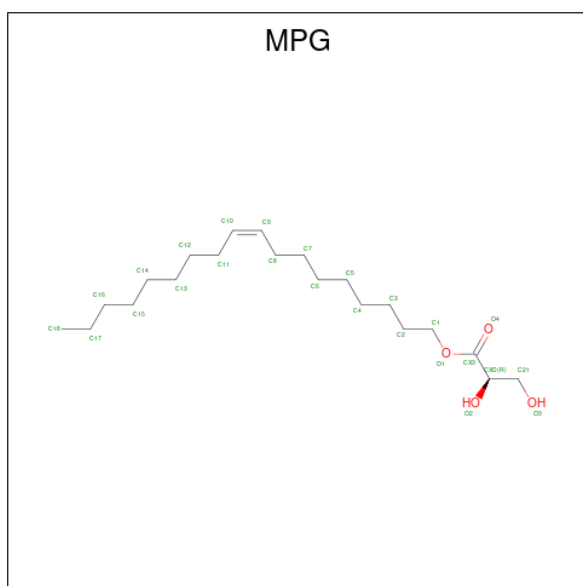
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
7	B	1	Total	C	Mg	N	O	0	0
			65	54	1	4	6		
7	B	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		
7	B	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		
7	C	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		

- Molecule 8 is BACTERIOPHEOPHYTIN B (three-letter code: BPB) (formula: $C_{55}H_{74}N_4O_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	B	1	Total	C	N	O	0	0
			65	55	4	6		
8	C	1	Total	C	N	O	0	0
			61	51	4	6		

- Molecule 9 is [(Z)-octadec-9-enyl] (2R)-2,3-bis(oxidanyl)propanoate (three-letter code: MPG) (formula: C₂₁H₄₀O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	B	1	Total	C	O	0	0
			25	21	4		

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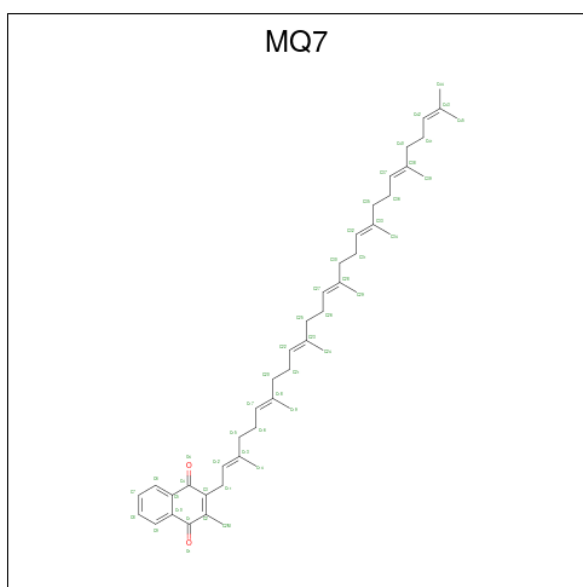
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	B	1	Total C O 25 21 4	0	0
9	C	1	Total C 17 17	0	0

- Molecule 10 is FE (II) ION (three-letter code: FE2) (formula: Fe).

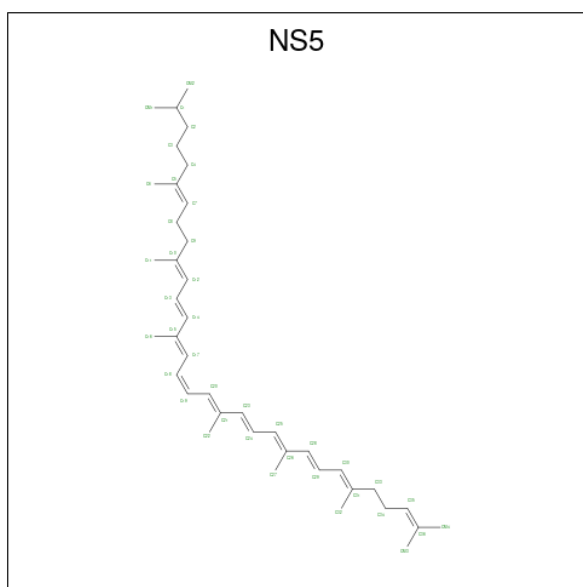
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	B	1	Total Fe 1 1	0	0

- Molecule 11 is MENAQUINONE-7 (three-letter code: MQ7) (formula: C₄₆H₆₄O₂).



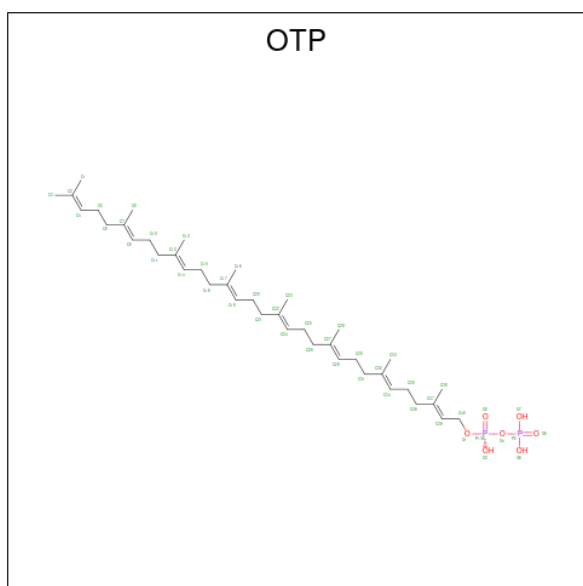
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	C	1	Total C O 48 46 2	0	0

- Molecule 12 is 15-cis-1,2-dihydroneurosporene (three-letter code: NS5) (formula: C₄₀H₆₀).



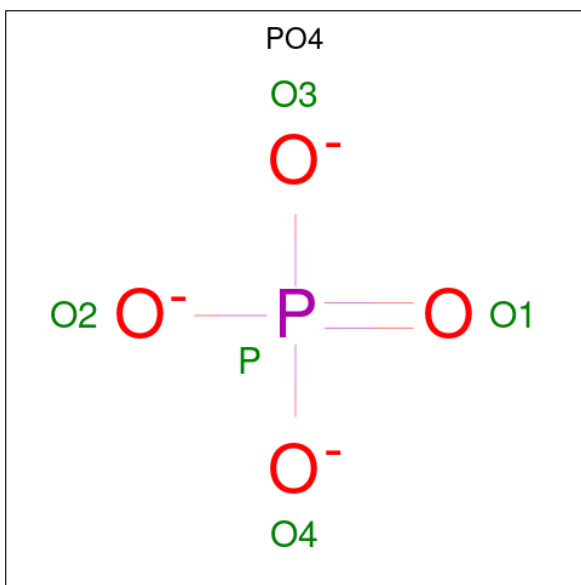
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	C	1	Total C 40 40	0	0

- Molecule 13 is (2E,6E,10E,14E,18E,22E,26E)-3,7,11,15,19,23,27,31-OCTAMETHYLD OTRIACONTA-2,6,10,14,18,22,26,30-OCTAENYL TRIHYDROGEN DIPHOSPHATE (three-letter code: OTP) (formula: $C_{40}H_{68}O_7P_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
13	C	1	Total C O 41 40 1	0	0

- Molecule 14 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
14	C	1	Total	O	P	0	0
			5	4	1		
14	C	1	Total	O	P	0	0
			5	4	1		

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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: PHOTOSYNTHETIC REACTION CENTER CYTOCHROME C SUBUNIT

Chain A: 



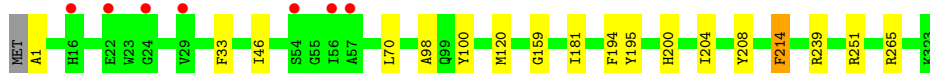
- Molecule 2: REACTION CENTER PROTEIN L CHAIN

Chain B: 

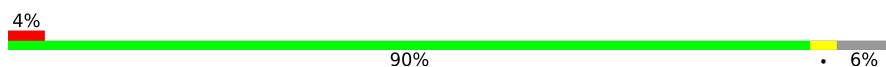


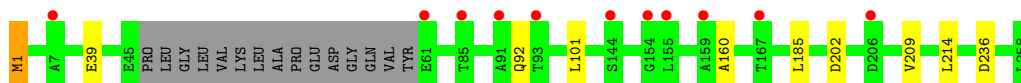
- Molecule 3: REACTION CENTER PROTEIN M CHAIN

Chain C: 



- Molecule 4: REACTION CENTER PROTEIN H CHAIN

Chain D: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	57.90Å 84.80Å 384.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.64 – 3.50 49.59 – 3.50	Depositor EDS
% Data completeness (in resolution range)	99.1 (49.64-3.50) 99.2 (49.59-3.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.00 (at 3.48Å)	Xtrriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.295 , 0.329 0.296 , 0.325	Depositor DCC
R_{free} test set	1262 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	73.5	Xtrriage
Anisotropy	0.134	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 77.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.32$, $\langle L^2 \rangle = 0.15$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.73	EDS
Total number of atoms	9890	wwPDB-VP
Average B, all atoms (Å ²)	58.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.64% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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: MQ7, HEC, MPG, FE2, BCL, BPB, FME, NS5, DGA, OTP, PO4

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	0.56	0/2665	0.67	0/3633
2	B	0.50	0/2263	0.58	0/3089
3	C	0.52	0/2650	0.58	0/3629
4	D	0.43	0/1804	0.55	0/2485
All	All	0.51	0/9382	0.60	0/12836

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2598	0	2567	7	0
2	B	2170	0	2100	22	0
3	C	2546	0	2430	19	0
4	D	1771	0	1656	5	0
5	A	172	0	120	11	0
6	A	37	0	58	0	0
7	B	197	0	217	14	0
7	C	66	0	74	8	0
8	B	65	0	74	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	C	61	0	63	5	0
9	B	50	0	80	2	0
9	C	17	0	31	1	0
10	B	1	0	0	0	0
11	C	48	0	64	2	0
12	C	40	0	60	5	0
13	C	41	0	65	7	0
14	C	10	0	0	0	0
All	All	9890	0	9659	74	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 4.

All (74) 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)
8:C:402:BPB:HHC	8:C:402:BPB:HBBB	1.62	0.81
8:B:304:BPB:HHC	8:B:304:BPB:HBBB	1.61	0.81
7:B:301:BCL:HHC	7:B:301:BCL:HBB2	1.75	0.68
2:B:181:PHE:HB3	8:C:402:BPB:HBBA	1.80	0.63
7:B:303:BCL:HMD2	7:C:401:BCL:HBB3	1.81	0.62
13:C:405:OTP:C29	13:C:405:OTP:H331	2.29	0.62
1:A:81:VAL:HG21	5:A:402:HEC:HMB3	1.82	0.61
2:B:3:LEU:HG	3:C:251:ARG:NE	2.16	0.61
3:C:159:GLY:HA3	12:C:404:NS5:C11	2.34	0.58
2:B:39:ILE:HD12	11:C:403:MQ7:H452	1.86	0.58
2:B:124:PRO:HD3	8:B:304:BPB:HAC	1.86	0.58
3:C:159:GLY:HA3	12:C:404:NS5:H113	1.86	0.58
1:A:56:TYR:HB3	5:A:401:HEC:O2A	2.04	0.57
1:A:240:LEU:HD11	5:A:404:HEC:CHB	2.36	0.56
2:B:244:GLY:O	7:B:302:BCL:HED3	2.06	0.55
9:B:305:MPG:H21C	3:C:1:ALA:HA	1.87	0.55
3:C:195:TYR:CE2	7:C:401:BCL:HMC2	2.42	0.54
2:B:62:PHE:CZ	13:C:405:OTP:H333	2.43	0.54
2:B:3:LEU:HD11	3:C:251:ARG:HD2	1.89	0.53
2:B:168:HIS:CE1	7:B:302:BCL:HMC2	2.44	0.53
4:D:92:GLN:HA	4:D:101:LEU:HD23	1.93	0.51
8:C:402:BPB:HHC	8:C:402:BPB:CBB	2.38	0.50
13:C:405:OTP:C29	13:C:405:OTP:C33	2.89	0.50
8:B:304:BPB:HBB	3:C:208:TYR:CD2	2.46	0.50
2:B:16:LEU:HD13	2:B:106:GLU:HG2	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:B:302:BCL:HMB1	7:B:302:BCL:HBB3	1.94	0.49
2:B:148:TYR:CE1	8:B:304:BPB:H14B	2.47	0.49
5:A:404:HEC:CBB	5:A:404:HEC:HMB1	2.43	0.48
2:B:181:PHE:CD2	8:C:402:BPB:HBB	2.48	0.48
2:B:39:ILE:CD1	11:C:403:MQ7:H452	2.44	0.48
5:A:401:HEC:CBC	5:A:401:HEC:HMC1	2.44	0.47
2:B:42:ILE:CD1	8:B:304:BPB:H4A	2.45	0.47
7:B:303:BCL:HED3	13:C:405:OTP:H282	1.95	0.47
3:C:195:TYR:OH	7:C:401:BCL:OBB	2.16	0.47
7:B:302:BCL:H2C	7:C:401:BCL:H2C	1.98	0.46
7:B:301:BCL:HHC	7:B:301:BCL:CBB	2.43	0.46
2:B:259:TRP:N	2:B:260:PRO:CD	2.79	0.46
7:B:303:BCL:H142	7:B:303:BCL:HMA1	1.98	0.46
1:A:212:VAL:HG11	4:D:1:FME:CE	2.45	0.46
5:A:404:HEC:HBC3	5:A:404:HEC:HMC1	1.97	0.46
4:D:160:ALA:HB3	4:D:214:LEU:HD23	1.97	0.46
9:B:306:MPG:H52C	9:C:406:MPG:H182	1.98	0.46
1:A:267:ALA:HB1	5:A:404:HEC:HMB2	1.97	0.45
3:C:120:MET:SD	7:C:401:BCL:H172	2.56	0.45
3:C:33:PHE:CE2	3:C:46:ILE:HD12	2.52	0.45
8:B:304:BPB:HHC	8:B:304:BPB:CBB	2.38	0.45
2:B:168:HIS:NE2	7:B:302:BCL:HMC2	2.31	0.45
2:B:179:PHE:HA	2:B:182:VAL:HG12	1.99	0.44
7:B:303:BCL:CBB	7:B:303:BCL:HMB1	2.47	0.44
3:C:200:HIS:CE1	3:C:204:ILE:HD11	2.53	0.43
5:A:402:HEC:CBB	5:A:402:HEC:HMB1	2.48	0.43
5:A:401:HEC:CBB	5:A:401:HEC:HMB1	2.49	0.43
7:B:303:BCL:HMD2	7:C:401:BCL:CBB	2.48	0.42
2:B:42:ILE:HD11	8:B:304:BPB:H4A	2.00	0.42
2:B:195:LEU:HD21	3:C:265:ARG:HG3	2.00	0.42
2:B:151:LEU:HD21	13:C:405:OTP:H301	2.02	0.42
12:C:404:NS5:H18	12:C:404:NS5:H161	1.81	0.42
13:C:405:OTP:C33	13:C:405:OTP:H29	2.50	0.42
2:B:177:VAL:HG11	7:B:301:BCL:CMD	2.50	0.42
1:A:264:ARG:HG2	5:A:403:HEC:HMD3	2.02	0.41
3:C:195:TYR:CZ	7:C:401:BCL:HMC2	2.55	0.41
3:C:70:LEU:HD21	12:C:404:NS5:H323	2.02	0.41
3:C:239:ARG:NH1	4:D:39:GLU:OE1	2.50	0.41
2:B:233:GLY:HA3	3:C:214:PHE:CE1	2.56	0.41
2:B:151:LEU:HD23	2:B:151:LEU:HA	1.90	0.41
7:B:303:BCL:HED3	13:C:405:OTP:C28	2.51	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:80:TRP:CD1	1:A:133:TYR:HB2	2.56	0.41
4:D:202:ASP:HB3	4:D:209:VAL:HB	2.01	0.41
5:A:401:HEC:HMC1	5:A:401:HEC:HBC3	2.03	0.40
7:C:401:BCL:CBB	7:C:401:BCL:HMB1	2.50	0.40
8:B:304:BPB:HBBA	3:C:208:TYR:HB3	2.04	0.40
3:C:98:ALA:HB3	3:C:100:TYR:CZ	2.56	0.40
3:C:181:ILE:HD13	3:C:181:ILE:HA	1.96	0.40
8:C:402:BPB:C9	12:C:404:NS5:HM32	2.51	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 X-ray entries followed by that with respect to entries of similar resolution.

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	330/356 (93%)	323 (98%)	7 (2%)	0	100	100
2	B	273/274 (100%)	266 (97%)	7 (3%)	0	100	100
3	C	321/324 (99%)	312 (97%)	9 (3%)	0	100	100
4	D	239/258 (93%)	233 (98%)	6 (2%)	0	100	100
All	All	1163/1212 (96%)	1134 (98%)	29 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	280/297 (94%)	279 (100%)	1 (0%)	91	96
2	B	218/219 (100%)	215 (99%)	3 (1%)	67	85
3	C	247/250 (99%)	245 (99%)	2 (1%)	81	91
4	D	167/212 (79%)	165 (99%)	2 (1%)	71	87
All	All	912/978 (93%)	904 (99%)	8 (1%)	78	90

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	38	TYR
2	B	160	PHE
2	B	249	ILE
2	B	272	TRP
3	C	194	PHE
3	C	214	PHE
4	D	185	LEU
4	D	236	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	37	GLN
1	A	302	GLN
2	B	183	ASN
2	B	239	ASN
3	C	200	HIS
4	D	8	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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
4	FME	D	1	4	8,9,10	0.81	0	7,9,11	3.34	3 (42%)

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
4	FME	D	1	4	-	4/7/9/11	-

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	FME	CA-N-CN	-6.92	112.18	122.82
4	D	1	FME	CE-SD-CG	4.39	115.49	100.40
4	D	1	FME	O-C-CA	-2.12	119.22	124.78

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	1	FME	O1-CN-N-CA
4	D	1	FME	C-CA-CB-CG
4	D	1	FME	N-CA-CB-CG
4	D	1	FME	CB-CG-SD-CE

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	1	FME	1	0

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 20 ligands modelled in this entry, 1 is monoatomic - leaving 19 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$
7	BCL	B	302	-	64,74,74	1.78	15 (23%)	78,115,115	2.80	28 (35%)
12	NS5	C	404	-	39,39,39	2.25	7 (17%)	44,46,46	2.17	12 (27%)
13	OTP	C	405	-	40,40,48	1.57	2 (5%)	47,47,61	2.60	14 (29%)
5	HEC	A	401	1	32,50,50	1.58	5 (15%)	24,82,82	1.62	5 (20%)
5	HEC	A	402	1	32,50,50	1.39	3 (9%)	24,82,82	1.77	8 (33%)
8	BPB	C	402	-	45,66,70	2.22	9 (20%)	42,96,101	2.11	9 (21%)
9	MPG	C	406	-	16,16,24	0.42	0	15,15,25	0.65	0
9	MPG	B	306	-	24,24,24	1.58	1 (4%)	24,25,25	1.31	3 (12%)
7	BCL	C	401	-	64,74,74	1.84	14 (21%)	78,115,115	2.65	27 (34%)
11	MQ7	C	403	-	49,49,49	1.62	3 (6%)	60,63,63	1.29	8 (13%)
8	BPB	B	304	-	49,70,70	2.17	9 (18%)	47,101,101	2.00	12 (25%)
9	MPG	B	305	-	24,24,24	1.32	1 (4%)	24,25,25	1.66	3 (12%)
7	BCL	B	303	-	64,74,74	1.84	15 (23%)	78,115,115	2.71	21 (26%)
14	PO4	C	408	-	4,4,4	0.70	0	6,6,6	0.66	0
7	BCL	B	301	-	63,73,74	1.80	15 (23%)	76,113,115	2.83	25 (32%)
6	DGA	A	405	1	36,36,43	1.23	2 (5%)	38,38,45	1.23	3 (7%)
5	HEC	A	404	1	32,50,50	1.48	4 (12%)	24,82,82	1.36	2 (8%)
14	PO4	C	407	-	4,4,4	0.85	0	6,6,6	0.61	0
5	HEC	A	403	1	32,50,50	1.37	5 (15%)	24,82,82	1.55	6 (25%)

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
7	BCL	B	303	-	-	7/37/137/137	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	BCL	B	302	-	-	4/37/137/137	-
8	BPB	C	402	-	-	16/33/101/105	0/5/6/6
12	NS5	C	404	-	-	14/43/43/43	-
7	BCL	B	301	-	-	8/36/136/137	-
11	MQ7	C	403	-	-	4/41/61/61	0/2/2/2
6	DGA	A	405	1	-	17/37/37/45	-
8	BPB	B	304	-	-	14/37/105/105	0/5/6/6
9	MPG	C	406	-	-	4/14/14/25	-
13	OTP	C	405	-	-	17/45/45/55	-
5	HEC	A	401	1	-	2/10/54/54	-
5	HEC	A	404	1	-	1/10/54/54	-
5	HEC	A	403	1	-	0/10/54/54	-
5	HEC	A	402	1	-	5/10/54/54	-
9	MPG	B	306	-	-	8/25/25/25	-
9	MPG	B	305	-	-	15/25/25/25	-
7	BCL	C	401	-	-	10/37/137/137	-

All (110) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
13	C	405	OTP	C39-C37	8.78	1.54	1.33
11	C	403	MQ7	C3-C2	8.07	1.50	1.35
8	B	304	BPB	CAC-C3C	7.76	1.53	1.33
12	C	404	NS5	C35-C36	7.70	1.54	1.32
8	C	402	BPB	CAC-C3C	7.55	1.52	1.33
12	C	404	NS5	C29-C28	7.39	1.53	1.34
9	B	306	MPG	O1-CX3	7.20	1.48	1.33
9	B	305	MPG	O1-CX3	6.09	1.45	1.33
11	C	403	MQ7	C10-C5	5.80	1.50	1.40
7	B	301	BCL	O2D-CGD	5.75	1.47	1.33
8	C	402	BPB	C3D-C2D	5.64	1.49	1.39
8	B	304	BPB	C3D-C2D	5.52	1.49	1.39
12	C	404	NS5	C9-C8	-5.40	1.35	1.53
7	B	303	BCL	O2D-CGD	5.38	1.46	1.33
7	C	401	BCL	O2D-CGD	5.38	1.46	1.33
7	B	302	BCL	CHD-C1D	5.22	1.48	1.38
8	B	304	BPB	O2D-CGD	5.10	1.45	1.33
7	B	302	BCL	C3B-C2B	5.10	1.48	1.39
8	C	402	BPB	OBD-CAD	5.03	1.29	1.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	401	BCL	OBD-CAD	4.99	1.31	1.22
6	A	405	DGA	OG1-CA1	4.99	1.47	1.33
7	B	303	BCL	CHD-C1D	4.84	1.47	1.38
8	B	304	BPB	OBD-CAD	4.82	1.29	1.22
7	B	303	BCL	C3B-C2B	4.69	1.47	1.39
8	C	402	BPB	O2D-CGD	4.67	1.44	1.33
6	A	405	DGA	OG2-CB1	4.65	1.47	1.34
8	C	402	BPB	O2A-CGA	4.58	1.46	1.33
7	C	401	BCL	C3B-C2B	4.55	1.47	1.39
7	B	301	BCL	C3B-C2B	4.52	1.47	1.39
5	A	402	HEC	CBC-CAC	-4.51	1.32	1.49
7	B	302	BCL	O2A-CGA	4.48	1.46	1.33
8	B	304	BPB	C3B-C2B	4.48	1.47	1.39
5	A	404	HEC	CBB-CAB	-4.47	1.32	1.49
8	C	402	BPB	C3B-C2B	4.44	1.47	1.39
5	A	404	HEC	CBC-CAC	-4.44	1.32	1.49
5	A	401	HEC	C4B-C3B	4.38	1.51	1.43
7	C	401	BCL	CHD-C1D	4.35	1.46	1.38
5	A	401	HEC	CBC-CAC	-4.32	1.33	1.49
7	B	302	BCL	O2D-CGD	4.31	1.43	1.33
7	B	303	BCL	O2A-CGA	4.31	1.45	1.33
8	B	304	BPB	O2A-CGA	4.31	1.45	1.33
5	A	401	HEC	CBB-CAB	-4.29	1.33	1.49
7	B	301	BCL	O2A-CGA	4.20	1.45	1.33
7	B	301	BCL	CHD-C1D	4.15	1.46	1.38
7	C	401	BCL	C3C-C4C	-4.09	1.46	1.51
5	A	403	HEC	CBC-CAC	-4.04	1.34	1.49
7	C	401	BCL	O2A-CGA	3.95	1.44	1.33
12	C	404	NS5	C12-C10	3.91	1.38	1.34
7	B	302	BCL	OBD-CAD	3.84	1.29	1.22
8	B	304	BPB	CHA-CBD	-3.77	1.47	1.52
5	A	403	HEC	CBB-CAB	-3.74	1.35	1.49
8	C	402	BPB	CHA-CBD	-3.74	1.47	1.52
5	A	402	HEC	CBB-CAB	-3.64	1.35	1.49
7	B	303	BCL	OBD-CAD	3.61	1.28	1.22
7	B	301	BCL	C3D-C2D	3.48	1.48	1.39
7	B	303	BCL	C2C-C3C	-3.46	1.44	1.54
5	A	402	HEC	C4B-C3B	3.44	1.49	1.43
8	B	304	BPB	C4C-NC	-3.37	1.27	1.37
7	B	303	BCL	C3D-C2D	3.24	1.48	1.39
8	C	402	BPB	C4C-NC	-3.22	1.27	1.37
7	C	401	BCL	C3D-C2D	3.22	1.47	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	303	BCL	C4B-CHC	3.20	1.49	1.41
7	B	301	BCL	C2C-C3C	-3.19	1.45	1.54
7	B	301	BCL	OBD-CAD	3.12	1.27	1.22
7	B	301	BCL	CAC-C3C	-3.12	1.47	1.54
7	B	302	BCL	CHD-C4C	3.11	1.48	1.39
7	C	401	BCL	C4B-CHC	3.09	1.49	1.41
7	B	303	BCL	CHD-C4C	3.05	1.47	1.39
7	B	302	BCL	C4B-CHC	3.04	1.49	1.41
7	C	401	BCL	C1D-ND	-3.02	1.34	1.37
5	A	403	HEC	C2B-C3B	-2.98	1.37	1.40
5	A	404	HEC	C4B-C3B	2.95	1.48	1.43
7	C	401	BCL	C2C-C3C	-2.95	1.46	1.54
12	C	404	NS5	C29-C30	2.94	1.52	1.43
7	B	302	BCL	C1D-ND	-2.94	1.34	1.37
7	B	301	BCL	CHD-C4C	2.93	1.47	1.39
7	B	302	BCL	C3D-C2D	2.91	1.47	1.39
7	B	302	BCL	C2C-C3C	-2.86	1.46	1.54
7	B	301	BCL	C1D-ND	-2.85	1.34	1.37
7	B	303	BCL	C3C-C4C	-2.80	1.48	1.51
7	B	302	BCL	C3C-C4C	-2.78	1.48	1.51
7	B	301	BCL	C1B-CHB	2.77	1.48	1.41
7	C	401	BCL	CHD-C4C	2.74	1.47	1.39
7	B	301	BCL	C4B-CHC	2.73	1.48	1.41
7	B	303	BCL	C1B-CHB	2.73	1.48	1.41
7	B	303	BCL	CAC-C3C	-2.72	1.48	1.54
7	B	303	BCL	C3D-C4D	-2.71	1.38	1.44
7	B	303	BCL	C1D-ND	-2.66	1.34	1.37
7	B	302	BCL	C3D-C4D	-2.59	1.38	1.44
7	B	302	BCL	CAC-C3C	-2.57	1.48	1.54
8	C	402	BPB	C3A-C2A	-2.56	1.52	1.54
5	A	404	HEC	C2B-C3B	-2.51	1.38	1.40
5	A	403	HEC	C4B-C3B	2.45	1.47	1.43
7	B	301	BCL	C3D-C4D	-2.41	1.38	1.44
13	C	405	OTP	C40-C39	2.41	1.53	1.50
7	C	401	BCL	CAC-C3C	-2.40	1.49	1.54
7	B	301	BCL	C3C-C4C	-2.36	1.48	1.51
12	C	404	NS5	C14-C15	2.31	1.50	1.45
7	B	303	BCL	C4B-NB	2.29	1.37	1.35
7	C	401	BCL	C1B-CHB	2.27	1.47	1.41
7	C	401	BCL	C3D-C4D	-2.25	1.39	1.44
12	C	404	NS5	C28-C26	2.25	1.50	1.45
7	B	302	BCL	C4D-CHA	2.23	1.46	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	301	BCL	C4D-CHA	2.18	1.46	1.38
5	A	403	HEC	O2A-CGA	-2.14	1.23	1.30
5	A	401	HEC	C2B-C3B	-2.13	1.38	1.40
8	B	304	BPB	CBD-CGD	-2.11	1.49	1.52
7	B	302	BCL	C1B-CHB	2.11	1.46	1.41
11	C	403	MQ7	C11-C12	2.11	1.53	1.50
5	A	401	HEC	O2A-CGA	-2.04	1.23	1.30

All (186) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	302	BCL	C1C-NC-C4C	-14.26	100.29	106.71
7	B	301	BCL	C1C-NC-C4C	-14.12	100.36	106.71
7	B	303	BCL	C1C-NC-C4C	-13.80	100.50	106.71
7	C	401	BCL	C1C-NC-C4C	-12.89	100.91	106.71
13	C	405	OTP	C40-C39-C37	-9.31	112.70	127.21
8	C	402	BPB	O2D-CGD-CBD	8.04	121.18	111.00
8	B	304	BPB	O2D-CGD-CBD	7.47	120.47	111.00
7	B	301	BCL	C2C-C3C-C4C	7.00	111.82	101.34
7	B	301	BCL	C4D-C3D-CAD	-6.88	99.99	108.10
7	B	303	BCL	CMD-C2D-C1D	6.41	136.01	124.71
7	B	303	BCL	C2C-C3C-C4C	6.29	110.76	101.34
7	B	301	BCL	C3C-C2C-C1C	-6.06	92.09	101.87
7	B	303	BCL	C4D-C3D-CAD	-6.04	100.97	108.10
7	C	401	BCL	CMD-C2D-C1D	6.04	135.35	124.71
8	C	402	BPB	CBC-CAC-C3C	-6.03	110.69	126.70
8	B	304	BPB	CBC-CAC-C3C	-5.99	110.81	126.70
7	B	302	BCL	CMD-C2D-C1D	5.98	135.26	124.71
12	C	404	NS5	C29-C28-C26	-5.95	109.70	126.42
7	C	401	BCL	C4D-C3D-CAD	-5.92	101.12	108.10
9	B	305	MPG	O1-CX3-CXD	5.75	123.14	111.68
7	B	302	BCL	C2C-C3C-C4C	5.74	109.94	101.34
7	B	303	BCL	C3D-C4D-ND	5.71	119.48	110.24
7	B	301	BCL	CAC-C3C-C4C	5.58	124.97	112.58
7	C	401	BCL	O2D-CGD-CBD	5.55	121.13	111.27
7	B	302	BCL	C4D-C3D-CAD	-5.49	101.62	108.10
7	B	301	BCL	CMD-C2D-C1D	5.31	134.07	124.71
7	B	302	BCL	C3D-C4D-ND	5.18	118.62	110.24
7	B	301	BCL	C3D-C4D-ND	5.16	118.58	110.24
7	C	401	BCL	C3D-C4D-ND	4.90	118.17	110.24
13	C	405	OTP	C38-C37-C39	-4.80	111.36	123.68
13	C	405	OTP	C38-C37-C36	-4.79	107.21	115.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	402	HEC	CBA-CAA-C2A	-4.72	104.64	112.60
13	C	405	OTP	C8-C7-C6	4.72	123.22	115.27
7	B	303	BCL	C1D-ND-C4D	-4.72	102.98	106.33
13	C	405	OTP	C23-C22-C21	4.68	123.14	115.27
7	B	302	BCL	C3C-C2C-C1C	-4.63	94.39	101.87
7	B	303	BCL	C3C-C2C-C1C	-4.59	94.46	101.87
12	C	404	NS5	C34-C35-C36	-4.58	112.08	127.75
7	B	301	BCL	O2D-CGD-CBD	4.58	119.41	111.27
5	A	401	HEC	CBA-CAA-C2A	-4.54	104.95	112.60
9	B	306	MPG	O1-CX3-CXD	4.50	120.65	111.68
6	A	405	DGA	OG2-CB1-CB2	4.44	121.06	111.50
7	C	401	BCL	C2C-C3C-C4C	4.38	107.90	101.34
7	B	302	BCL	CMD-C2D-C3D	-4.34	117.62	127.61
7	B	303	BCL	O2D-CGD-CBD	4.34	118.98	111.27
13	C	405	OTP	C36-C37-C39	-4.24	112.54	121.12
7	C	401	BCL	CMB-C2B-C3B	4.23	132.58	124.68
9	B	305	MPG	O1-CX3-O4	-4.19	116.20	124.13
7	B	303	BCL	CMD-C2D-C3D	-4.15	118.07	127.61
12	C	404	NS5	C8-C9-C10	4.09	126.43	112.98
7	B	301	BCL	C1D-ND-C4D	-4.05	103.45	106.33
7	B	303	BCL	CAC-C3C-C4C	4.02	121.51	112.58
7	C	401	BCL	C1D-ND-C4D	-4.01	103.48	106.33
7	B	302	BCL	CMB-C2B-C3B	3.97	132.11	124.68
7	B	302	BCL	C1D-ND-C4D	-3.97	103.51	106.33
7	B	301	BCL	CAD-C3D-C2D	3.93	159.77	140.80
12	C	404	NS5	C19-C20-C21	-3.90	121.74	127.31
12	C	404	NS5	CM3-C36-C35	-3.88	111.43	122.65
7	C	401	BCL	C3C-C2C-C1C	-3.86	95.64	101.87
13	C	405	OTP	C33-C32-C31	3.83	121.71	115.27
7	B	302	BCL	CAC-C3C-C4C	3.76	120.93	112.58
12	C	404	NS5	C24-C25-C26	-3.74	121.98	127.31
13	C	405	OTP	C18-C17-C19	-3.73	114.10	123.68
12	C	404	NS5	C18-C17-C15	-3.73	121.98	127.31
11	C	403	MQ7	C21-C22-C23	-3.72	118.70	127.66
7	B	303	BCL	CAD-C3D-C2D	3.72	158.73	140.80
7	B	303	BCL	CMB-C2B-C3B	3.67	131.55	124.68
7	C	401	BCL	O2D-CGD-O1D	-3.65	116.70	123.84
12	C	404	NS5	CM4-C36-C35	-3.64	112.11	122.65
7	B	302	BCL	CAD-C3D-C2D	3.63	158.32	140.80
7	B	302	BCL	CHB-C4A-NA	3.63	129.53	124.51
8	C	402	BPB	CMD-C2D-C3D	-3.58	117.98	124.68
7	B	302	BCL	O2A-CGA-CBA	3.57	123.12	111.91

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	C	401	BCL	CMD-C2D-C3D	-3.54	119.47	127.61
7	C	401	BCL	CAD-C3D-C2D	3.54	157.87	140.80
7	B	302	BCL	O2D-CGD-CBD	3.54	117.55	111.27
7	B	302	BCL	OBD-CAD-C3D	-3.53	120.04	128.52
8	B	304	BPB	O2A-CGA-CBA	3.41	122.60	111.91
7	B	301	BCL	CBC-CAC-C3C	3.40	121.04	113.47
7	B	301	BCL	CMD-C2D-C3D	-3.39	119.81	127.61
7	C	401	BCL	CBC-CAC-C3C	3.37	120.98	113.47
13	C	405	OTP	C18-C17-C16	3.37	120.95	115.27
8	B	304	BPB	CMD-C2D-C3D	-3.37	118.38	124.68
7	C	401	BCL	OBD-CAD-C3D	-3.34	120.47	128.52
12	C	404	NS5	C6-C5-C4	3.28	120.78	115.27
7	B	303	BCL	CBC-CAC-C3C	3.26	120.73	113.47
7	B	302	BCL	C1-C2-C3	-3.26	120.41	126.04
13	C	405	OTP	C21-C22-C24	-3.25	114.55	121.12
5	A	401	HEC	CBD-CAD-C3D	-3.24	107.09	112.62
7	B	301	BCL	OBD-CAD-C3D	-3.23	120.76	128.52
7	B	302	BCL	O2D-CGD-O1D	-3.17	117.64	123.84
7	B	302	BCL	C4-C3-C5	3.15	120.56	115.27
8	C	402	BPB	O2D-CGD-O1D	-3.11	117.76	123.84
8	B	304	BPB	O1D-CGD-CBD	-3.09	119.59	124.74
8	B	304	BPB	C1-C2-C3	-3.09	120.69	126.04
13	C	405	OTP	C28-C27-C26	3.06	120.43	115.27
8	C	402	BPB	C1-O2A-CGA	3.05	124.45	116.44
8	C	402	BPB	C4-C3-C5	3.04	120.39	115.27
7	B	301	BCL	CMB-C2B-C3B	3.03	130.35	124.68
7	C	401	BCL	CED-O2D-CGD	3.02	122.77	115.94
7	C	401	BCL	CHA-C4D-ND	-3.02	126.18	132.50
7	B	303	BCL	CED-O2D-CGD	3.00	122.73	115.94
7	B	303	BCL	OBD-CAD-C3D	-3.00	121.30	128.52
9	B	305	MPG	C1-O1-CX3	2.97	122.86	116.58
9	B	306	MPG	C1-O1-CX3	2.96	122.84	116.58
7	B	302	BCL	C4A-NA-C1A	2.93	108.02	106.71
7	B	302	BCL	CBC-CAC-C3C	2.88	119.87	113.47
7	B	301	BCL	CHB-C4A-NA	2.88	128.49	124.51
5	A	404	HEC	CMC-C2C-C3C	2.88	129.20	125.82
6	A	405	DGA	OG1-CA1-CA2	2.85	120.85	111.91
7	C	401	BCL	CAC-C3C-C4C	2.82	118.84	112.58
11	C	403	MQ7	C2M-C2-C3	-2.81	119.81	124.40
7	B	303	BCL	CHA-C4D-ND	-2.80	126.64	132.50
8	B	304	BPB	C4A-C3A-C2A	-2.80	100.17	102.84
11	C	403	MQ7	C19-C18-C20	2.79	119.97	115.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	303	BCL	C4A-NA-C1A	-2.79	105.45	106.71
7	B	301	BCL	CHA-C4D-ND	-2.78	126.68	132.50
5	A	404	HEC	CMC-C2C-C1C	-2.77	124.21	128.46
7	C	401	BCL	CAA-C2A-C1A	2.76	121.00	111.97
13	C	405	OTP	C30-C29-C27	-2.72	121.11	127.66
7	C	401	BCL	C2D-C1D-ND	2.67	112.07	110.10
7	B	301	BCL	C2A-C1A-CHA	-2.67	119.20	123.86
7	B	301	BCL	C1B-CHB-C4A	-2.65	124.88	130.12
5	A	403	HEC	O2A-CGA-O1A	-2.64	116.71	123.30
7	B	302	BCL	CHA-C4D-ND	-2.61	127.03	132.50
13	C	405	OTP	C13-C12-C11	2.61	119.66	115.27
5	A	402	HEC	CMB-C2B-C1B	-2.60	124.47	128.46
7	C	401	BCL	CHB-C4A-NA	2.57	128.07	124.51
8	C	402	BPB	C3D-CAD-CBD	2.56	110.97	107.61
7	B	302	BCL	CAA-C2A-C1A	2.54	120.31	111.97
11	C	403	MQ7	C11-C12-C13	-2.53	122.57	126.79
7	B	301	BCL	O1D-CGD-CBD	-2.52	119.33	124.48
5	A	401	HEC	CMB-C2B-C1B	-2.51	124.61	128.46
5	A	403	HEC	CMC-C2C-C1C	-2.50	124.63	128.46
8	B	304	BPB	O2A-CGA-O1A	-2.49	117.30	123.59
5	A	403	HEC	O2D-CGD-CBD	2.49	122.02	114.03
12	C	404	NS5	C32-C31-C33	2.46	119.42	115.27
11	C	403	MQ7	C20-C18-C17	-2.44	116.17	121.12
7	B	301	BCL	C4-C3-C5	2.42	119.34	115.27
7	B	302	BCL	C2A-C1A-CHA	-2.41	119.64	123.86
7	B	302	BCL	C1B-CHB-C4A	-2.41	125.35	130.12
7	B	303	BCL	C2A-C1A-CHA	-2.40	119.66	123.86
5	A	403	HEC	C1D-C2D-C3D	-2.39	105.33	107.00
7	C	401	BCL	O2A-CGA-O1A	-2.38	117.59	123.59
8	B	304	BPB	C4-C3-C5	2.36	119.24	115.27
11	C	403	MQ7	C2M-C2-C1	2.36	120.17	116.27
9	B	306	MPG	O4-CX3-CXD	-2.35	118.23	123.68
8	C	402	BPB	O2A-CGA-CBA	2.34	119.25	111.91
13	C	405	OTP	C10-C9-C7	-2.33	122.04	127.66
7	C	401	BCL	C4-C3-C5	2.33	119.19	115.27
5	A	401	HEC	O2D-CGD-O1D	-2.32	117.52	123.30
7	B	302	BCL	CED-O2D-CGD	2.29	121.11	115.94
11	C	403	MQ7	C34-C33-C35	2.28	119.11	115.27
5	A	402	HEC	O2D-CGD-CBD	2.28	121.35	114.03
5	A	403	HEC	CMB-C2B-C1B	-2.25	125.00	128.46
5	A	402	HEC	O2A-CGA-O1A	-2.25	117.70	123.30
12	C	404	NS5	C30-C29-C28	-2.25	116.21	123.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	402	HEC	CMB-C2B-C3B	2.23	128.45	125.82
5	A	402	HEC	CMC-C2C-C1C	-2.23	125.03	128.46
8	C	402	BPB	O1D-CGD-CBD	-2.22	121.05	124.74
7	B	302	BCL	C7-C6-C5	-2.20	107.40	113.36
5	A	401	HEC	CMB-C2B-C3B	2.17	128.37	125.82
8	B	304	BPB	CMB-C2B-C3B	2.17	128.74	124.68
7	B	301	BCL	C1-O2A-CGA	2.16	122.10	116.44
7	B	302	BCL	CHC-C1C-NC	-2.15	121.53	124.51
7	B	301	BCL	C1D-CHD-C4C	-2.15	121.43	126.62
7	B	301	BCL	CHC-C1C-NC	-2.15	121.54	124.51
7	C	401	BCL	C1B-CHB-C4A	-2.15	125.86	130.12
7	B	303	BCL	C4B-CHC-C1C	-2.13	125.90	130.12
7	B	303	BCL	C1-O2A-CGA	2.13	122.02	116.44
7	C	401	BCL	C4A-NA-C1A	2.13	107.66	106.71
7	C	401	BCL	C1D-CHD-C4C	-2.13	121.49	126.62
7	C	401	BCL	C4D-CHA-C1A	2.12	123.83	121.25
8	B	304	BPB	C3D-CAD-CBD	2.11	110.38	107.61
8	B	304	BPB	CED-O2D-CGD	2.11	120.70	115.94
5	A	402	HEC	CMD-C2D-C1D	-2.09	125.24	128.46
7	C	401	BCL	O2A-CGA-CBA	2.07	118.40	111.91
7	B	302	BCL	C1D-CHD-C4C	-2.06	121.65	126.62
7	B	301	BCL	C2D-C1D-ND	2.06	111.62	110.10
5	A	402	HEC	C3B-C4B-NB	-2.05	107.07	110.94
5	A	403	HEC	C3B-C4B-NB	-2.05	107.08	110.94
6	A	405	DGA	CG1-OG1-CA1	2.03	124.63	117.12
12	C	404	NS5	C13-C14-C15	-2.03	120.73	126.42
7	B	303	BCL	CHB-C4A-NA	2.02	127.31	124.51
7	B	301	BCL	CED-O2D-CGD	2.01	120.49	115.94
11	C	403	MQ7	C35-C33-C32	-2.00	117.06	121.12

There are no chirality outliers.

All (146) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	405	DGA	CA2-CA1-OG1-CG1
6	A	405	DGA	OA1-CA1-OG1-CG1
6	A	405	DGA	OG1-CG1-CG2-OG2
6	A	405	DGA	OG1-CG1-CG2-CG3
7	B	302	BCL	C4-C3-C5-C6
7	C	401	BCL	CHA-CBD-CGD-O1D
7	C	401	BCL	CHA-CBD-CGD-O2D
7	C	401	BCL	CAD-CBD-CGD-O1D

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Mol	Chain	Res	Type	Atoms
7	C	401	BCL	CAD-CBD-CGD-O2D
8	B	304	BPB	C2C-C3C-CAC-CBC
8	C	402	BPB	C2C-C3C-CAC-CBC
9	B	305	MPG	CXD-CX3-O1-C1
9	B	305	MPG	O4-CX3-O1-C1
9	B	305	MPG	O3-C21-CXD-O2
9	B	305	MPG	O1-CX3-CXD-C21
9	B	305	MPG	O4-CX3-CXD-C21
9	B	306	MPG	O3-C21-CXD-O2
12	C	404	NS5	C3-C4-C5-C6
12	C	404	NS5	C3-C4-C5-C7
12	C	404	NS5	C25-C26-C28-C29
12	C	404	NS5	C27-C26-C28-C29
12	C	404	NS5	C26-C28-C29-C30
12	C	404	NS5	C28-C29-C30-C31
13	C	405	OTP	C38-C37-C39-C40
13	C	405	OTP	C30-C31-C32-C33
13	C	405	OTP	C20-C21-C22-C24
13	C	405	OTP	C20-C21-C22-C23
13	C	405	OTP	C14-C15-C16-C17
13	C	405	OTP	C5-C6-C7-C9
13	C	405	OTP	C5-C6-C7-C8
8	B	304	BPB	CBD-CGD-O2D-CED
12	C	404	NS5	C2-C3-C4-C5
12	C	404	NS5	C34-C35-C36-CM4
7	C	401	BCL	C2A-CAA-CBA-CGA
13	C	405	OTP	C36-C37-C39-C40
8	C	402	BPB	CBD-CGD-O2D-CED
12	C	404	NS5	C11-C10-C9-C8
7	B	302	BCL	C2-C3-C5-C6
12	C	404	NS5	C12-C10-C9-C8
13	C	405	OTP	C30-C31-C32-C34
13	C	405	OTP	C34-C35-C36-C37
13	C	405	OTP	C24-C25-C26-C27
8	C	402	BPB	C4-C3-C5-C6
7	B	301	BCL	C14-C13-C15-C16
8	C	402	BPB	C11-C10-C8-C9
7	B	303	BCL	CBD-CGD-O2D-CED
7	B	302	BCL	C15-C16-C17-C18
7	C	401	BCL	C11-C12-C13-C15
8	B	304	BPB	O1D-CGD-O2D-CED
8	B	304	BPB	C8-C10-C11-C12

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Mol	Chain	Res	Type	Atoms
6	A	405	DGA	CBB-CAB-CB9-CB8
9	B	305	MPG	C5-C6-C7-C8
7	B	303	BCL	C16-C17-C18-C19
9	B	305	MPG	C2-C3-C4-C5
9	B	306	MPG	C11-C12-C13-C14
9	B	305	MPG	O3-C21-CXD-CX3
11	C	403	MQ7	C23-C25-C26-C27
9	B	306	MPG	C12-C13-C14-C15
6	A	405	DGA	CEB-CFB-CGB-CHB
8	C	402	BPB	O1D-CGD-O2D-CED
9	C	406	MPG	C4-C5-C6-C7
8	C	402	BPB	C2-C3-C5-C6
6	A	405	DGA	CCB-CDB-CEB-CFB
6	A	405	DGA	CA5-CA6-CA7-CA8
8	C	402	BPB	C6-C7-C8-C10
7	B	303	BCL	C16-C17-C18-C20
9	B	305	MPG	C10-C11-C12-C13
7	B	301	BCL	C15-C16-C17-C18
13	C	405	OTP	C9-C10-C11-C12
6	A	405	DGA	CA7-CA8-CA9-CAA
9	C	406	MPG	C10-C11-C12-C13
7	C	401	BCL	C11-C12-C13-C14
8	C	402	BPB	C6-C7-C8-C9
9	B	305	MPG	C12-C13-C14-C15
6	A	405	DGA	CB9-CAB-CBB-CCB
9	B	306	MPG	O1-C1-C2-C3
6	A	405	DGA	CB6-CB7-CB8-CB9
8	C	402	BPB	C10-C11-C12-C13
12	C	404	NS5	C1-C2-C3-C4
8	B	304	BPB	C4-C3-C5-C6
13	C	405	OTP	C35-C36-C37-C39
6	A	405	DGA	CA8-CA9-CAA-CBA
6	A	405	DGA	CB4-CB5-CB6-CB7
9	B	305	MPG	C15-C16-C17-C18
8	C	402	BPB	C11-C12-C13-C14
9	B	306	MPG	O3-C21-CXD-CX3
9	B	306	MPG	C2-C1-O1-CX3
7	B	303	BCL	O1D-CGD-O2D-CED
8	B	304	BPB	C2-C3-C5-C6
9	B	306	MPG	C3-C4-C5-C6
9	B	305	MPG	C13-C14-C15-C16
8	C	402	BPB	O2A-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
6	A	405	DGA	CA3-CA4-CA5-CA6
8	C	402	BPB	C8-C10-C11-C12
7	B	303	BCL	C11-C12-C13-C14
8	B	304	BPB	C16-C17-C18-C19
7	B	303	BCL	C11-C12-C13-C15
8	C	402	BPB	C11-C10-C8-C7
8	C	402	BPB	C11-C12-C13-C15
7	B	301	BCL	C10-C11-C12-C13
7	B	301	BCL	CAD-CBD-CGD-O2D
8	C	402	BPB	CAD-CBD-CGD-O2D
9	B	305	MPG	O4-CX3-CXD-O2
6	A	405	DGA	CBB-CCB-CDB-CEB
13	C	405	OTP	C15-C16-C17-C18
5	A	404	HEC	C3D-CAD-CBD-CGD
7	B	301	BCL	C4-C3-C5-C6
12	C	404	NS5	C32-C31-C33-C34
5	A	402	HEC	CAD-CBD-CGD-O1D
9	C	406	MPG	C2-C3-C4-C5
8	B	304	BPB	O2A-C1-C2-C3
7	B	301	BCL	C2-C3-C5-C6
9	B	305	MPG	C6-C7-C8-C9
11	C	403	MQ7	C38-C40-C41-C42
5	A	402	HEC	CAD-CBD-CGD-O2D
8	B	304	BPB	C11-C12-C13-C14
13	C	405	OTP	C37-C39-C40-O1
8	B	304	BPB	O1A-CGA-O2A-C1
8	B	304	BPB	CBA-CGA-O2A-C1
8	B	304	BPB	C5-C6-C7-C8
9	B	306	MPG	C7-C8-C9-C10
5	A	401	HEC	CAA-CBA-CGA-O1A
5	A	401	HEC	CAA-CBA-CGA-O2A
5	A	402	HEC	CAA-CBA-CGA-O1A
5	A	402	HEC	CAA-CBA-CGA-O2A
6	A	405	DGA	OG2-CB1-CB2-CB3
13	C	405	OTP	C15-C16-C17-C19
8	B	304	BPB	CAD-CBD-CGD-O2D
11	C	403	MQ7	C39-C38-C40-C41
7	C	401	BCL	O2A-C1-C2-C3
9	B	305	MPG	C7-C8-C9-C10
7	B	301	BCL	CHA-CBD-CGD-O2D
7	B	303	BCL	CHA-CBD-CGD-O1D
11	C	403	MQ7	C37-C38-C40-C41

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Mol	Chain	Res	Type	Atoms
7	C	401	BCL	CBA-CGA-O2A-C1
8	C	402	BPB	C5-C6-C7-C8
9	C	406	MPG	C7-C8-C9-C10
6	A	405	DGA	OB1-CB1-CB2-CB3
12	C	404	NS5	C5-C7-C8-C9
7	C	401	BCL	O1A-CGA-O2A-C1
12	C	404	NS5	C30-C31-C33-C34
7	B	302	BCL	CAD-CBD-CGD-O1D
8	B	304	BPB	C11-C10-C8-C9
13	C	405	OTP	C35-C36-C37-C38
5	A	402	HEC	C3D-CAD-CBD-CGD
7	B	301	BCL	C6-C7-C8-C10

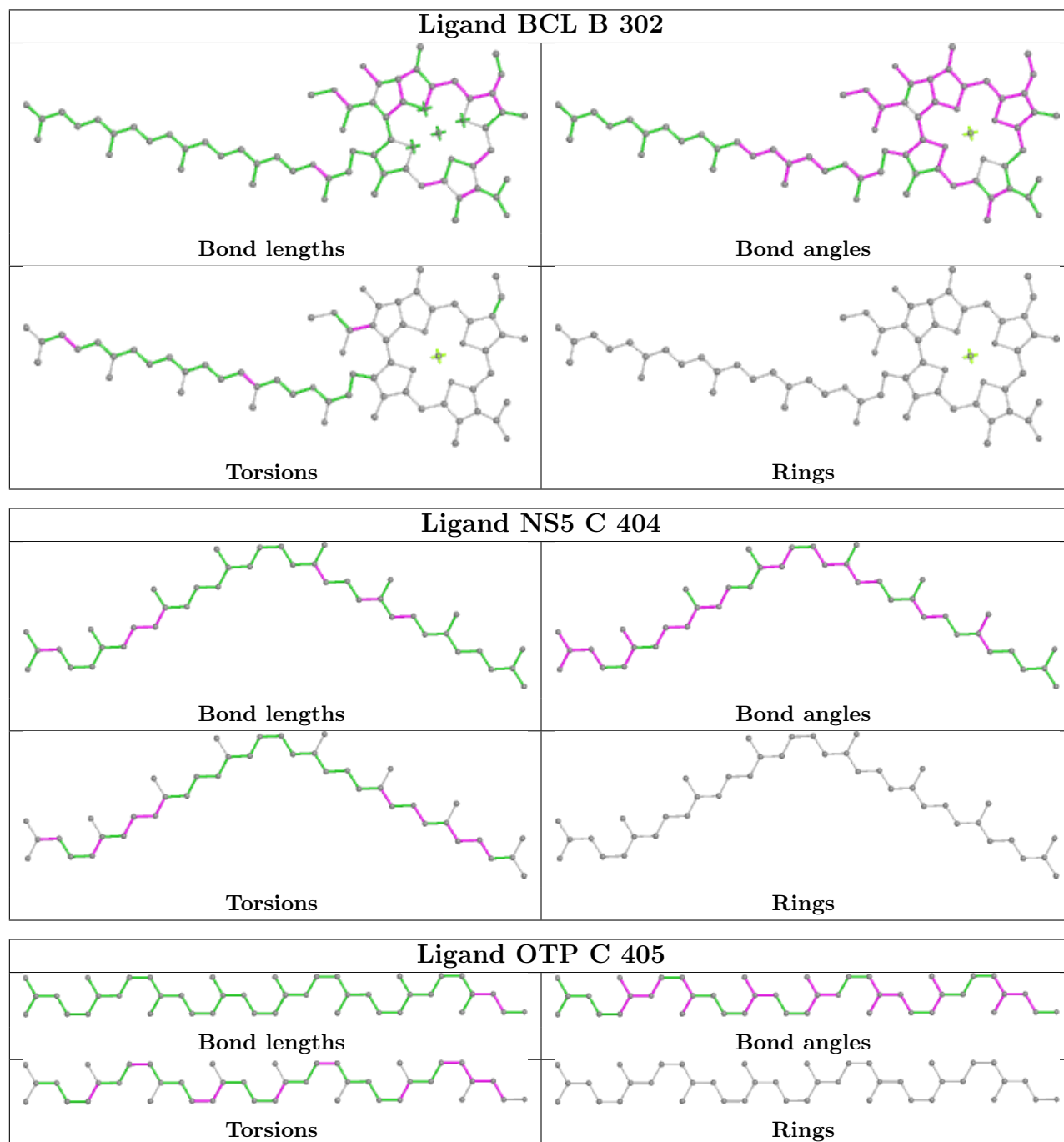
There are no ring outliers.

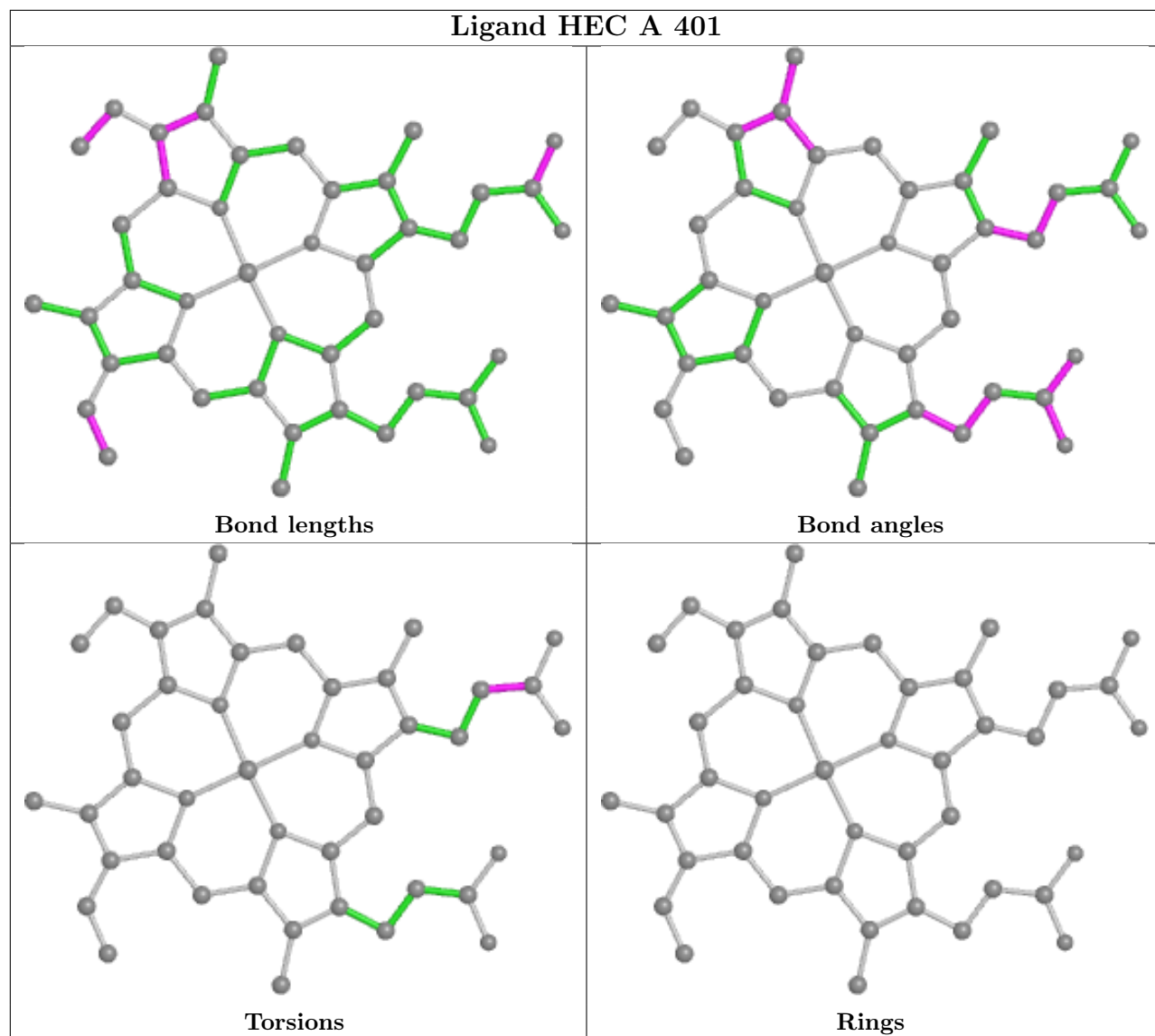
16 monomers are involved in 56 short contacts:

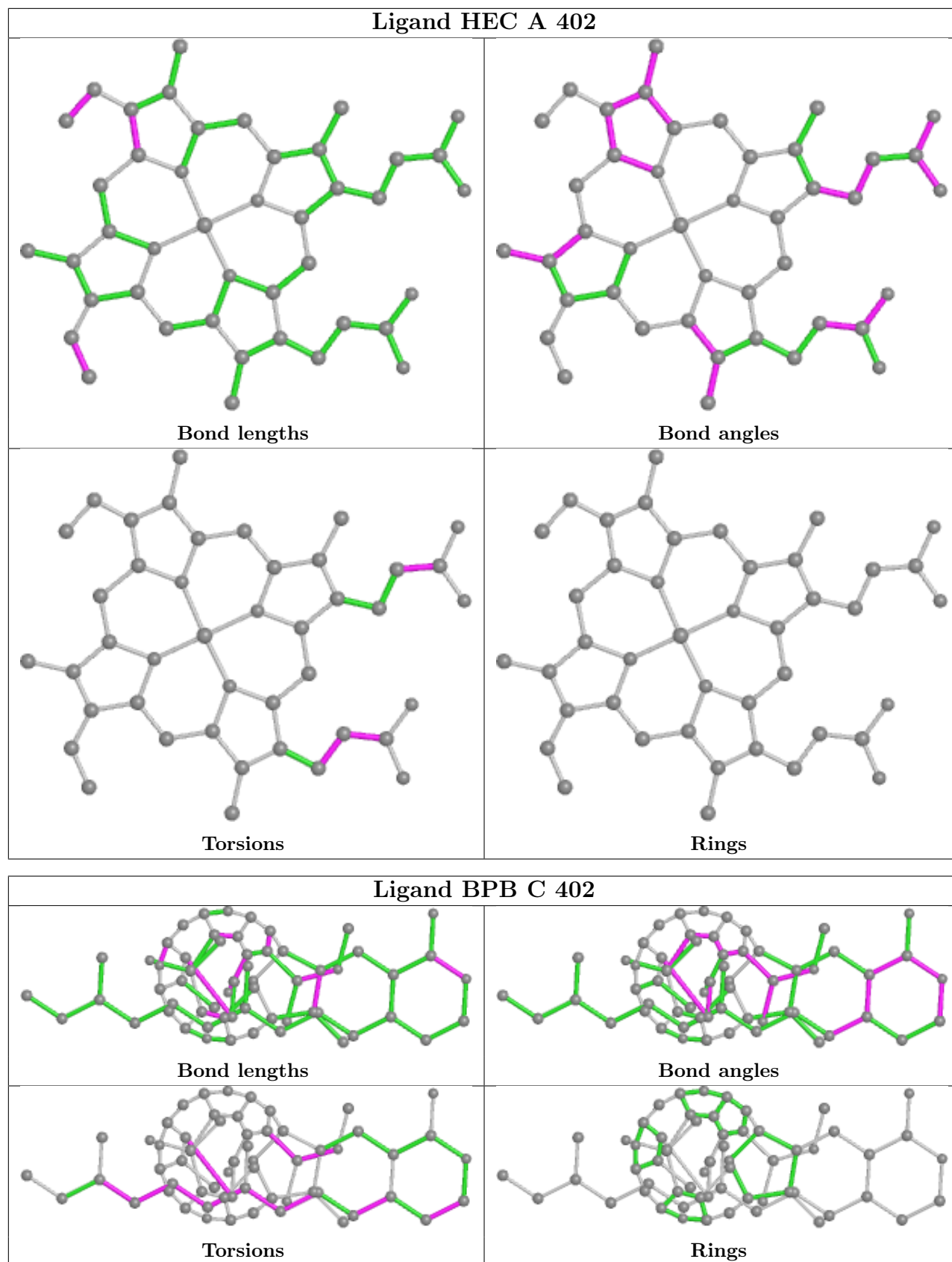
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	B	302	BCL	5	0
12	C	404	NS5	5	0
13	C	405	OTP	7	0
5	A	401	HEC	4	0
5	A	402	HEC	2	0
8	C	402	BPB	5	0
9	C	406	MPG	1	0
9	B	306	MPG	1	0
7	C	401	BCL	8	0
11	C	403	MQ7	2	0
8	B	304	BPB	8	0
9	B	305	MPG	1	0
7	B	303	BCL	6	0
7	B	301	BCL	3	0
5	A	404	HEC	4	0
5	A	403	HEC	1	0

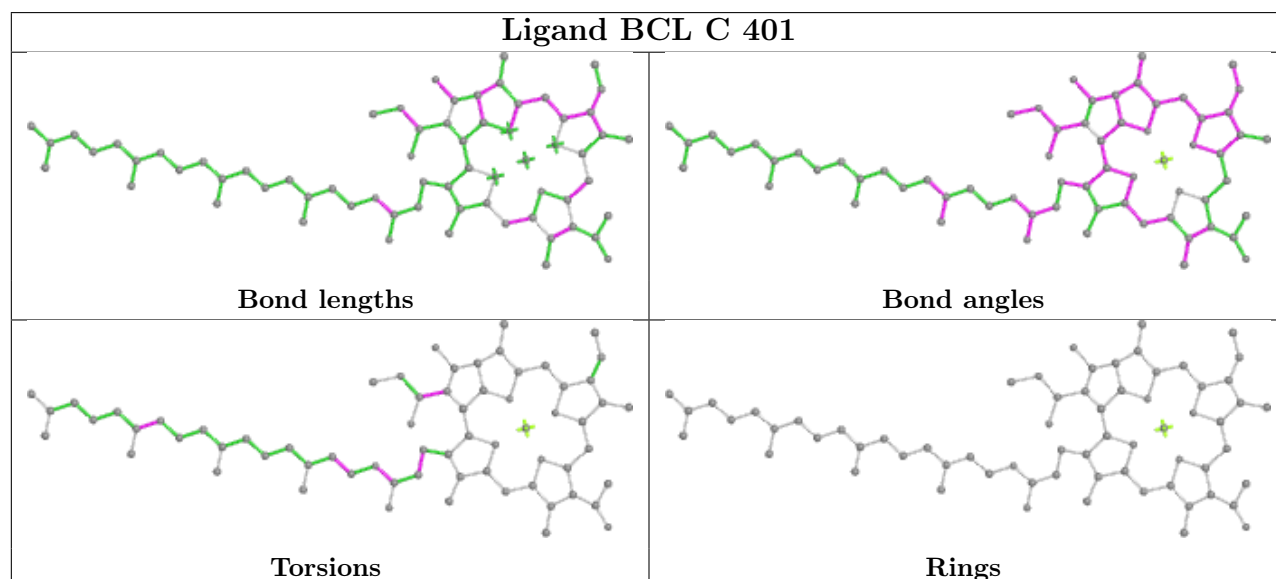
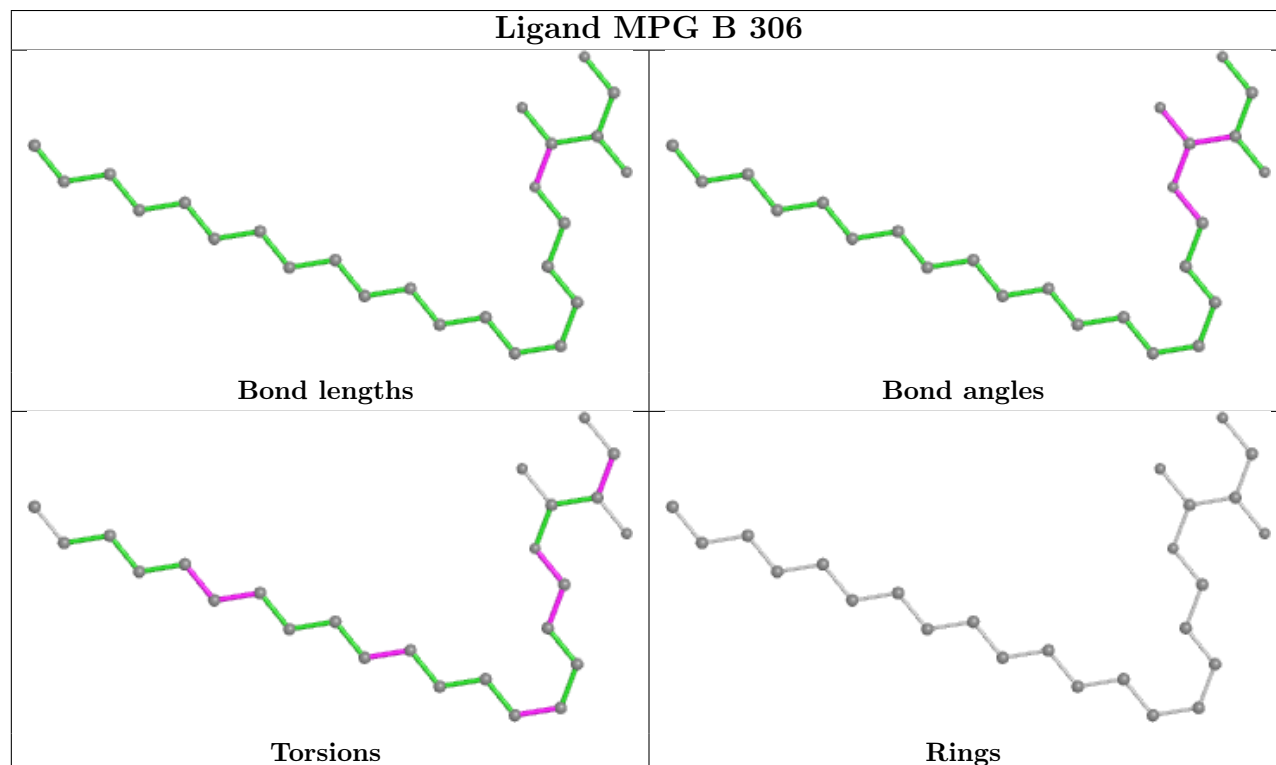
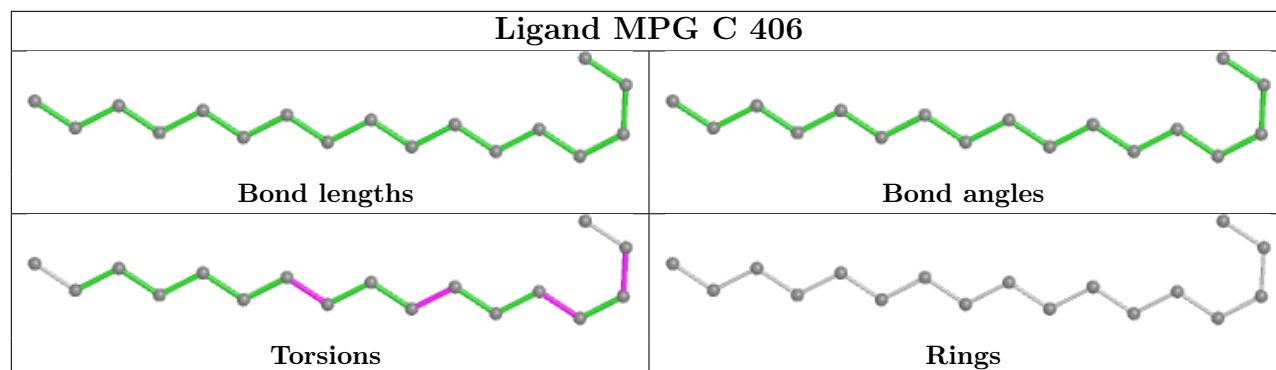
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the

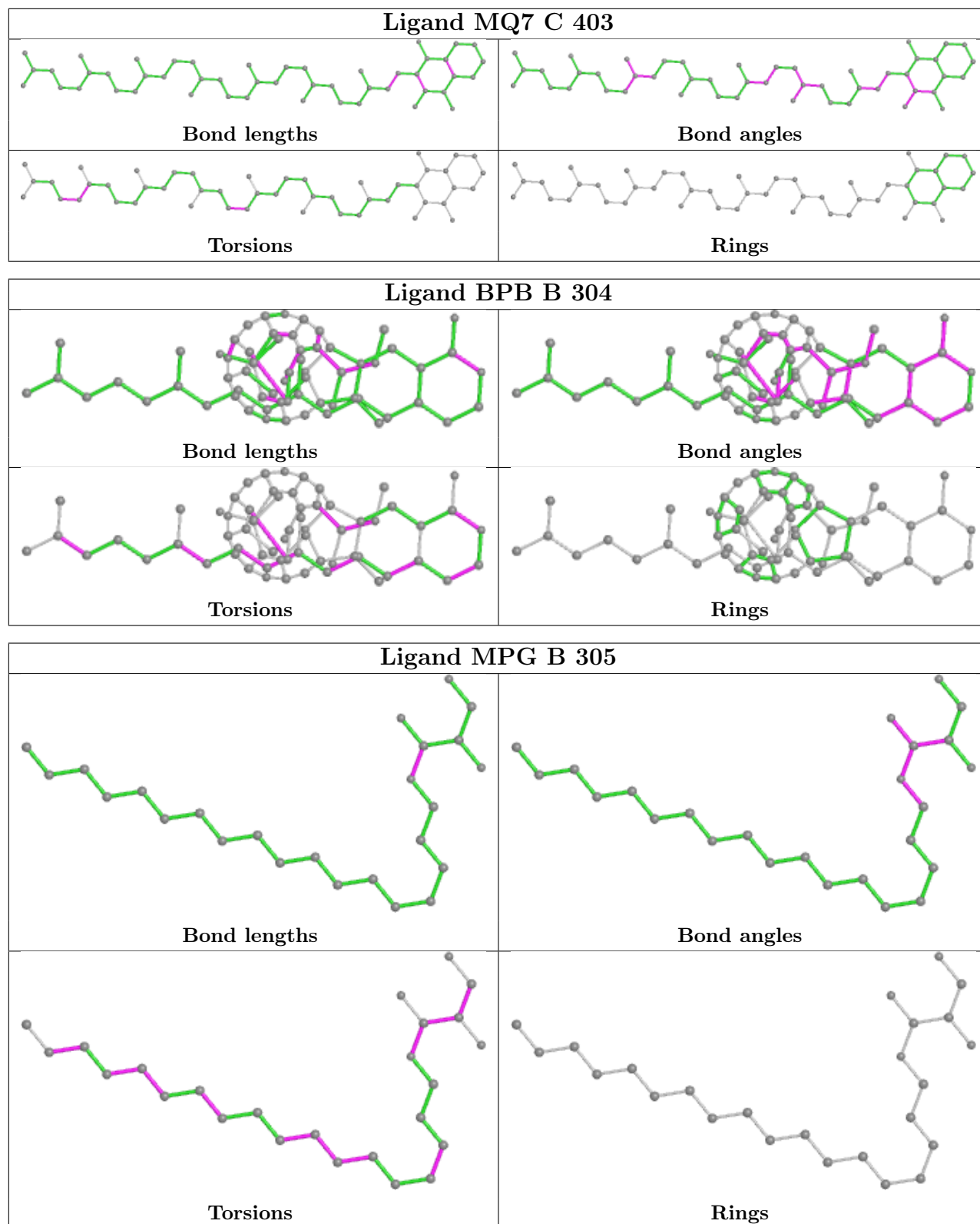
average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

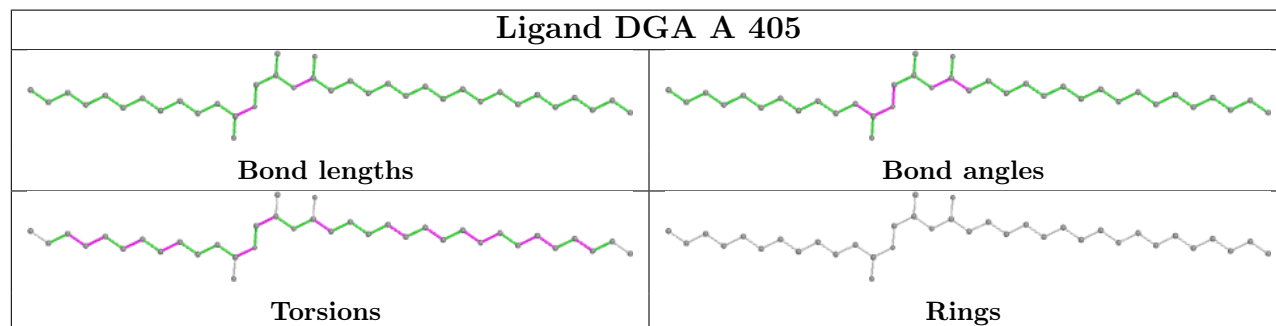
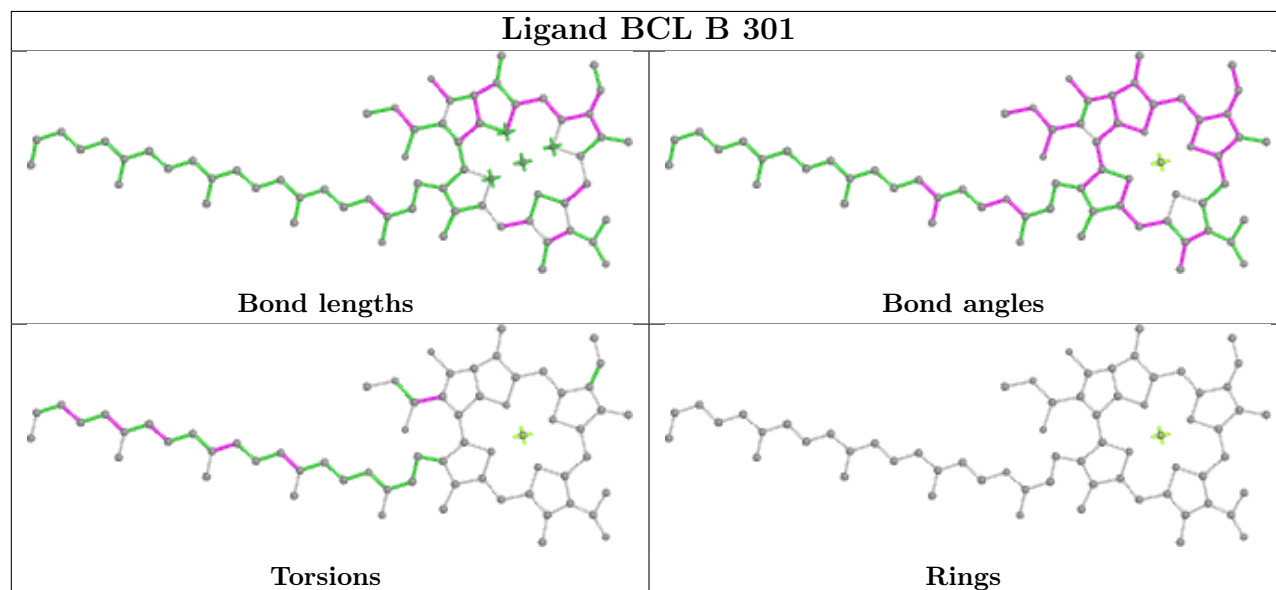
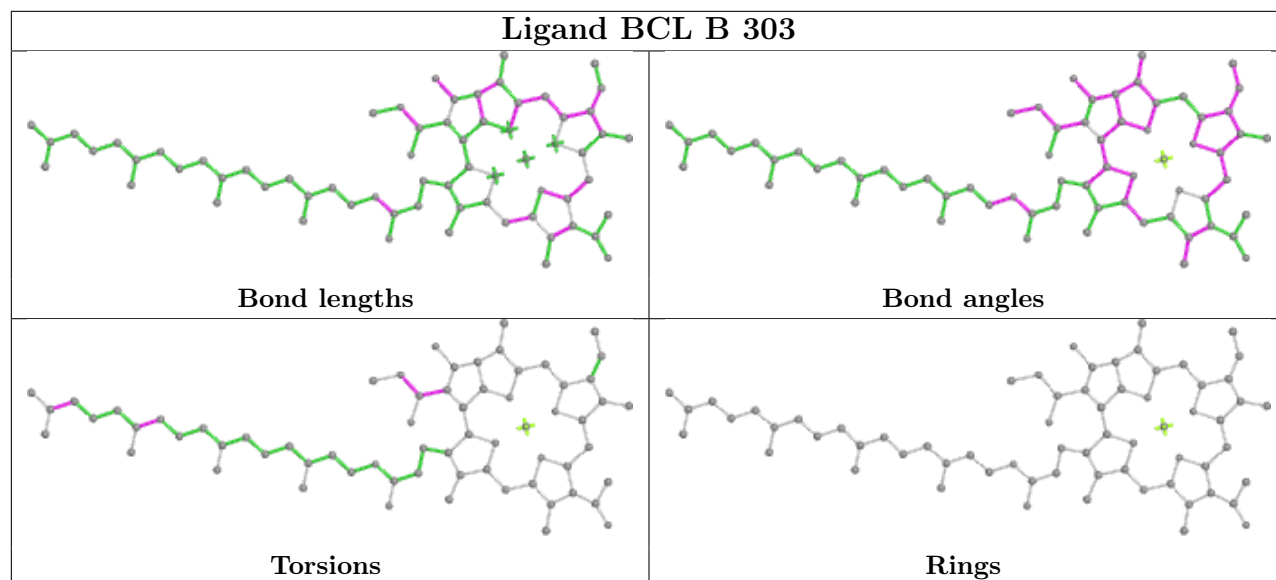


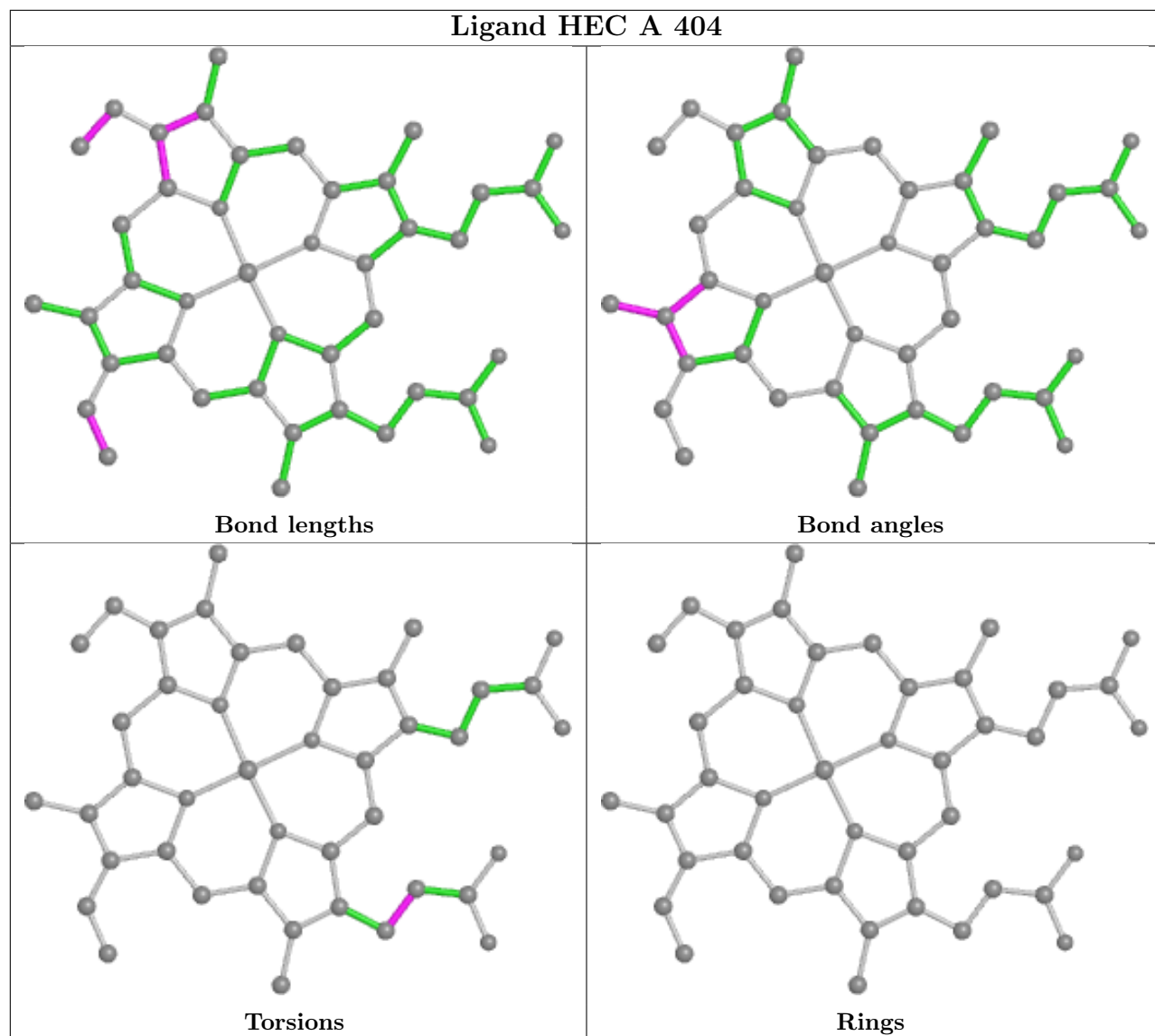


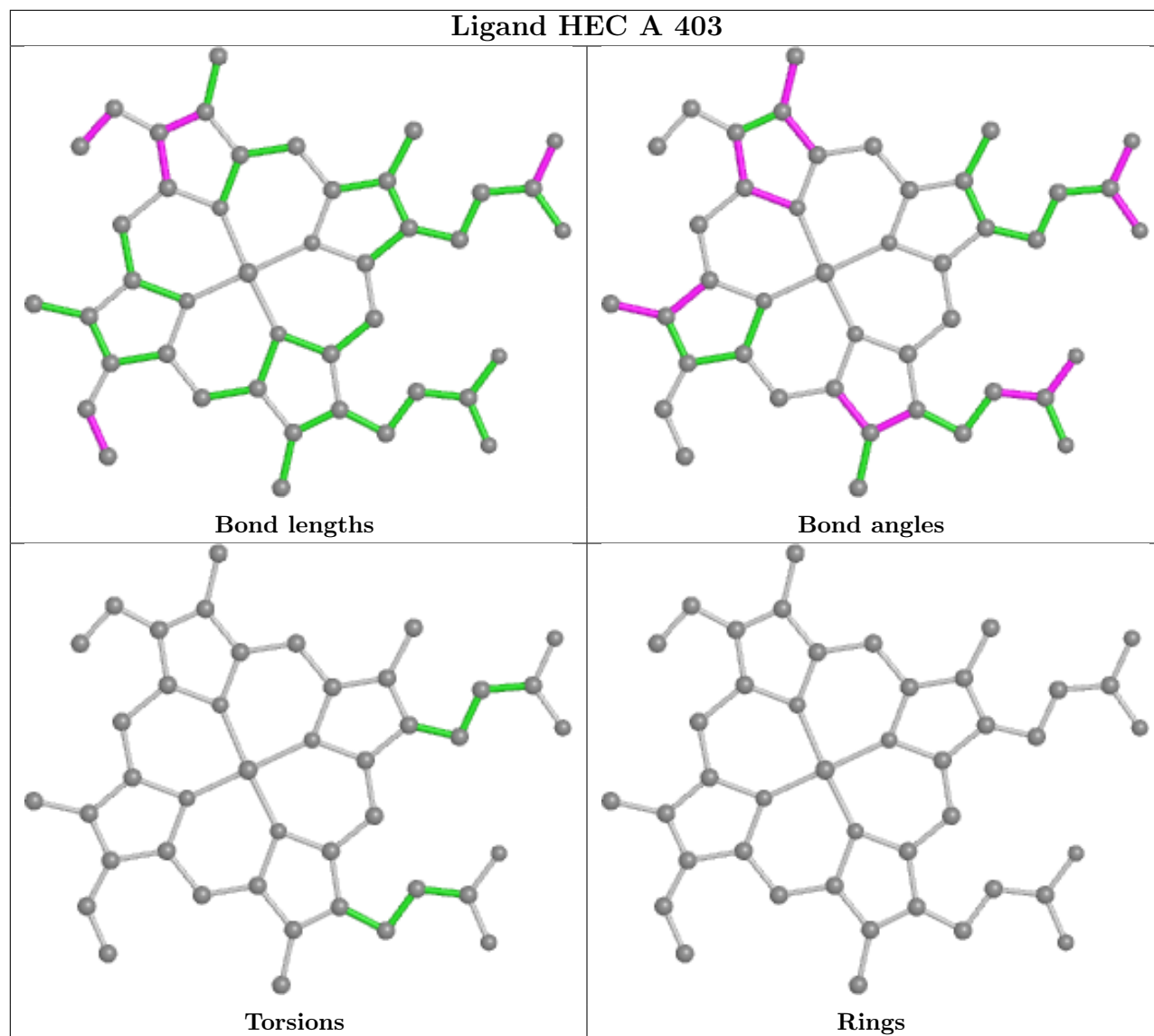












5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	332/356 (93%)	-0.11	3 (0%) 84 79	21, 38, 56, 78	0
2	B	273/274 (99%)	-0.09	1 (0%) 92 90	27, 55, 89, 113	0
3	C	323/324 (99%)	0.01	7 (2%) 62 56	28, 56, 88, 109	0
4	D	242/258 (93%)	0.48	11 (4%) 33 29	63, 92, 115, 136	0
All	All	1170/1212 (96%)	0.05	22 (1%) 66 61	21, 54, 101, 136	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	85	THR	4.5
2	B	202	ASP	3.4
3	C	54	SER	3.3
4	D	159	ALA	2.9
4	D	144	SER	2.8
4	D	206	ASP	2.6
3	C	24	GLY	2.4
4	D	61	GLU	2.4
1	A	161	THR	2.4
4	D	93	THR	2.3
4	D	155	LEU	2.3
3	C	22	GLU	2.3
4	D	154	GLY	2.2
4	D	167	THR	2.2
4	D	7	ALA	2.2
3	C	16	HIS	2.2
3	C	57	ALA	2.2
4	D	91	ALA	2.1
3	C	29	VAL	2.1
3	C	56	ILE	2.1
1	A	168	THR	2.0
1	A	46	LYS	2.0

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	FME	D	1	10/11	0.86	0.38	64,69,72,73	0

6.3 Carbohydrates [i](#)

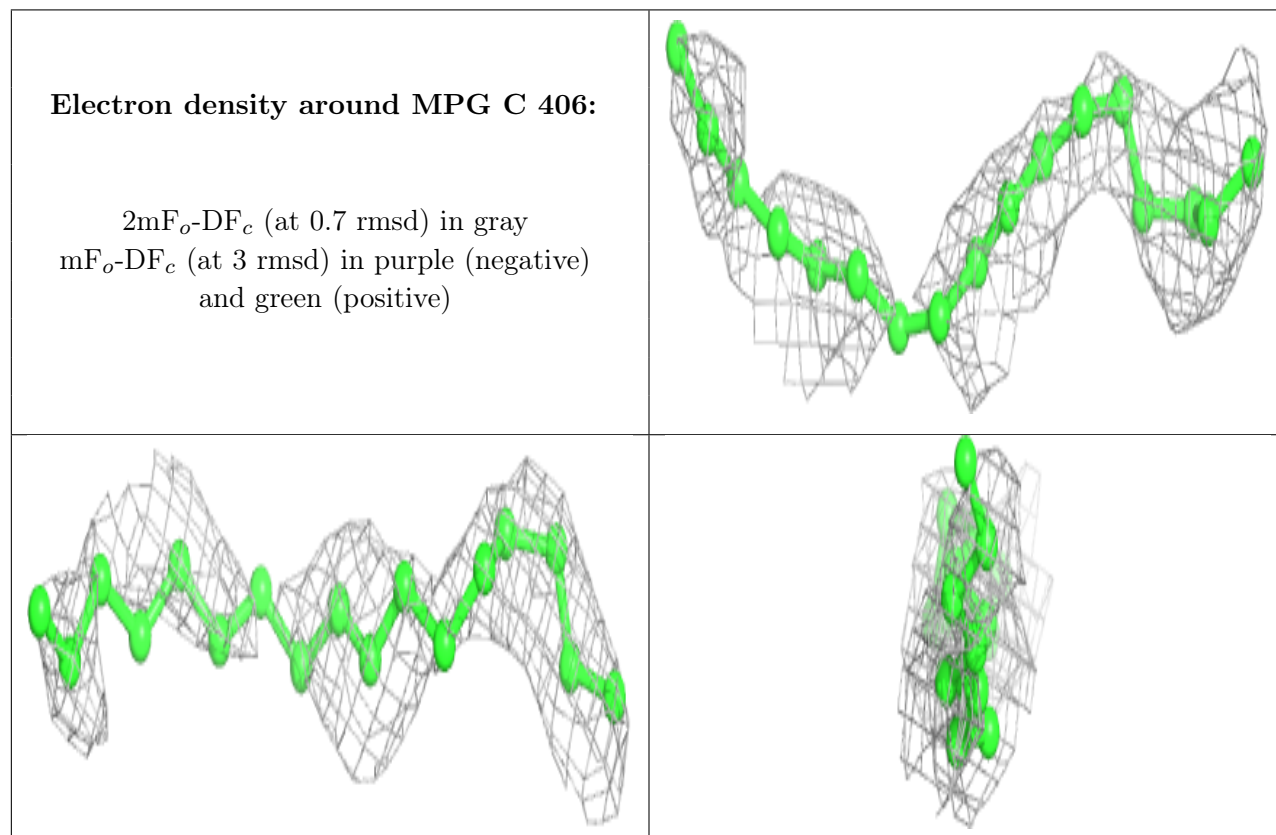
There are no monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

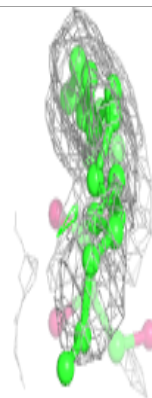
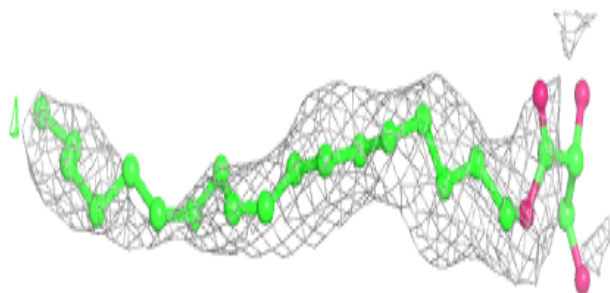
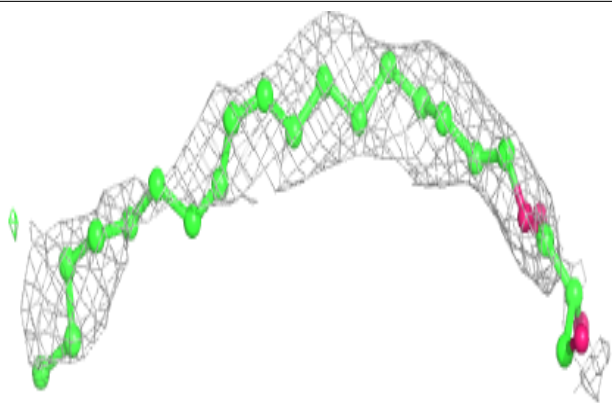
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
9	MPG	C	406	17/25	0.64	0.46	60,84,100,103	0
9	MPG	B	306	25/25	0.68	0.47	67,77,97,98	0
12	NS5	C	404	40/40	0.71	0.48	50,79,103,106	0
6	DGA	A	405	37/44	0.72	0.40	53,77,94,103	0
9	MPG	B	305	25/25	0.73	0.45	80,101,116,120	0
13	OTP	C	405	41/49	0.81	0.38	48,60,78,84	0
8	BPB	C	402	61/65	0.89	0.31	51,68,83,88	0
11	MQ7	C	403	48/48	0.89	0.29	32,42,66,70	0
14	PO4	C	407	5/5	0.91	0.49	93,95,102,104	0
7	BCL	B	301	65/66	0.92	0.27	32,43,164,175	0
14	PO4	C	408	5/5	0.92	0.27	66,68,71,71	0
7	BCL	B	302	66/66	0.94	0.23	27,33,42,50	0
7	BCL	C	401	66/66	0.94	0.23	29,37,54,66	0
8	BPB	B	304	65/65	0.94	0.23	27,35,47,60	0
7	BCL	B	303	66/66	0.95	0.23	18,27,47,48	0
5	HEC	A	404	43/43	0.95	0.21	32,37,53,58	0
5	HEC	A	401	43/43	0.95	0.29	23,31,34,35	0
5	HEC	A	402	43/43	0.96	0.23	23,25,29,35	0
5	HEC	A	403	43/43	0.96	0.20	22,25,27,30	0
10	FE2	B	307	1/1	0.98	0.05	48,48,48,48	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

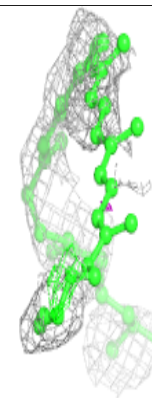
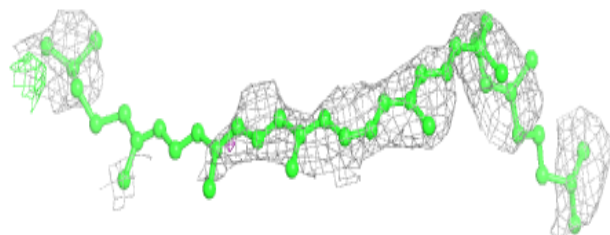


Electron density around MPG B 306:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

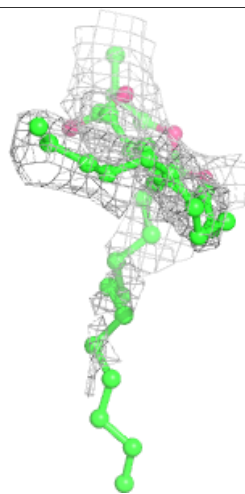
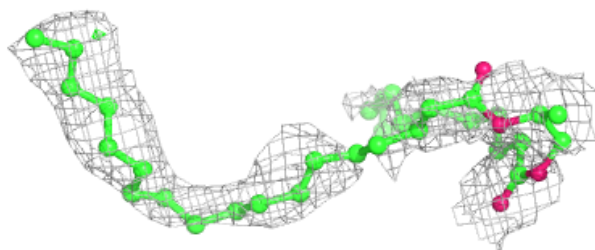
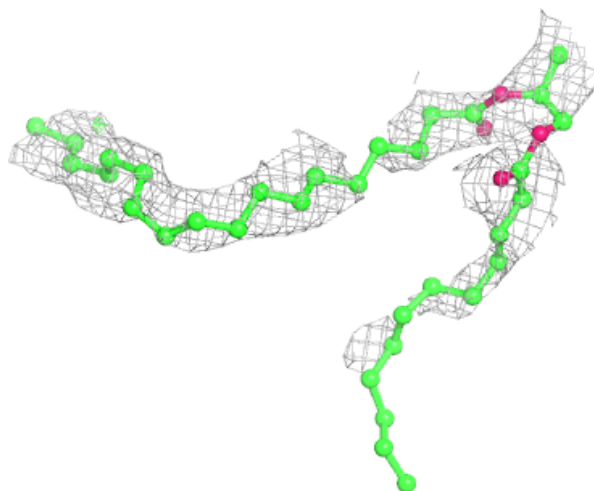
**Electron density around NS5 C 404:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



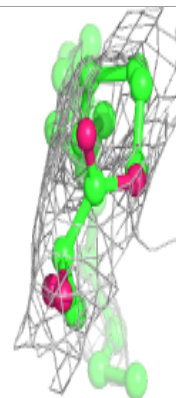
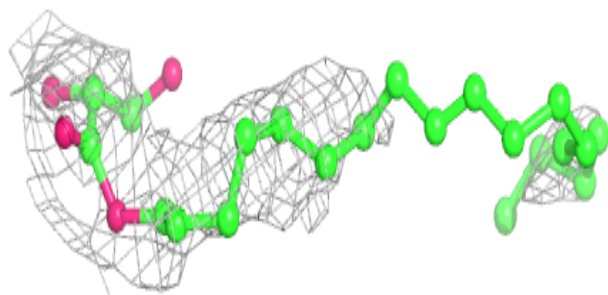
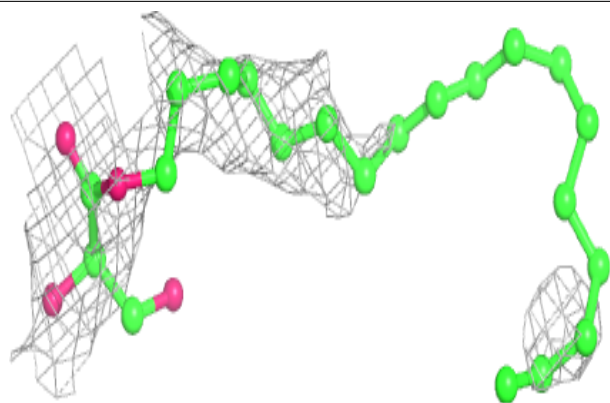
Electron density around DGA A 405:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

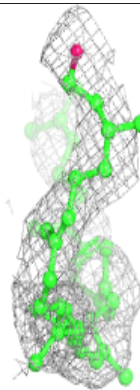
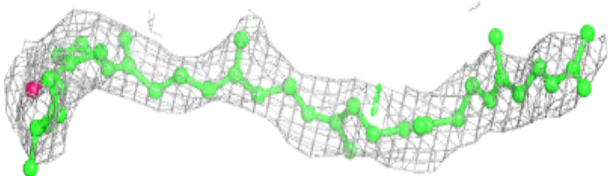
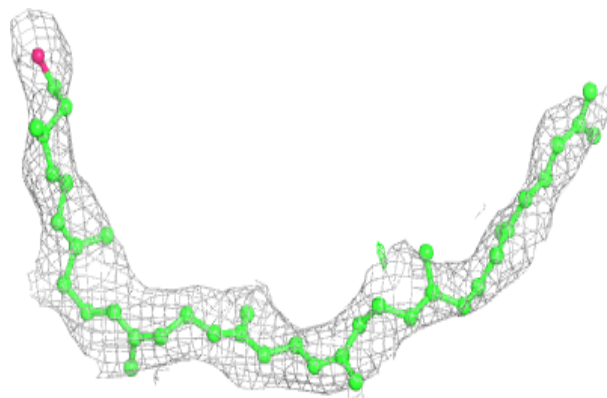


Electron density around MPG B 305:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

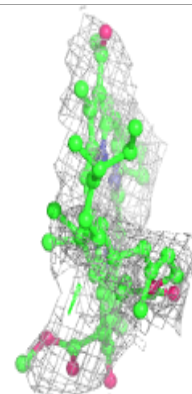
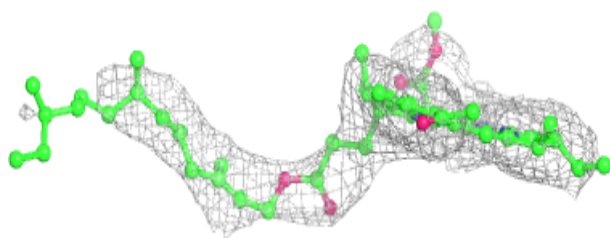
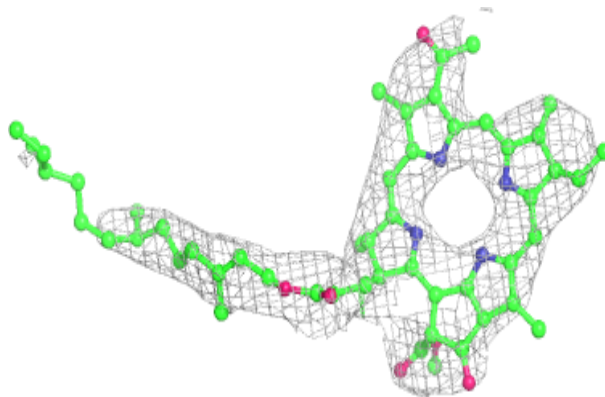
**Electron density around OTP C 405:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

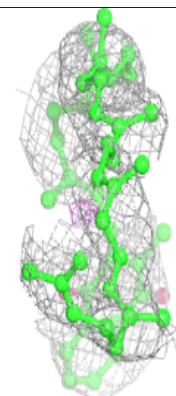
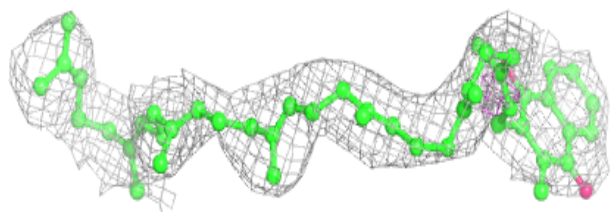
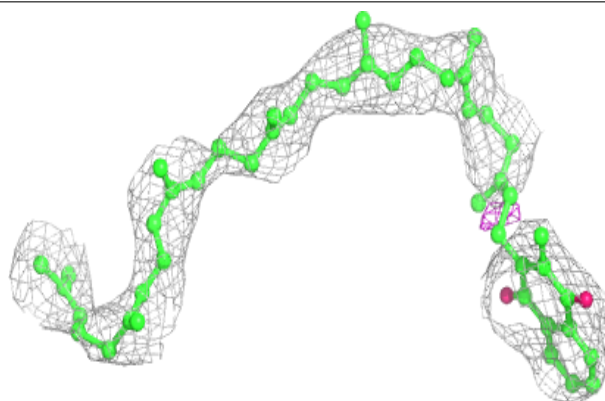


Electron density around BPB C 402:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

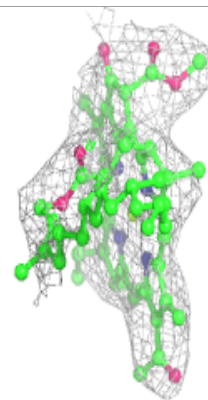
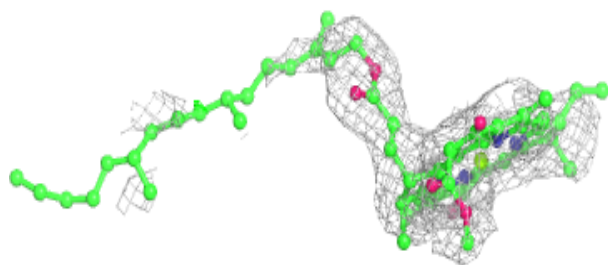
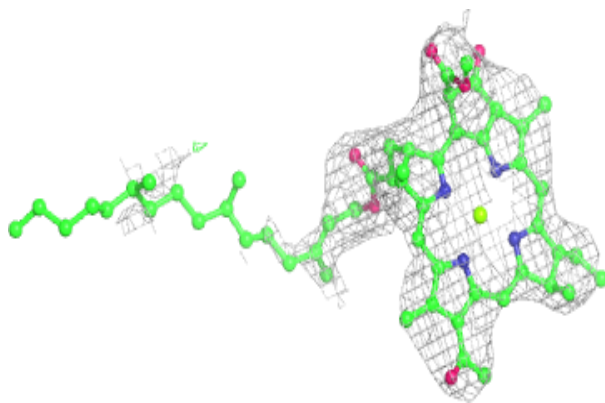
**Electron density around MQ7 C 403:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

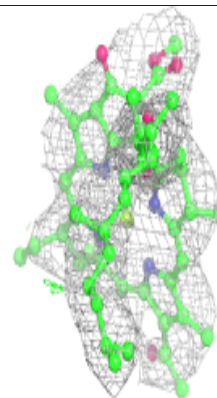
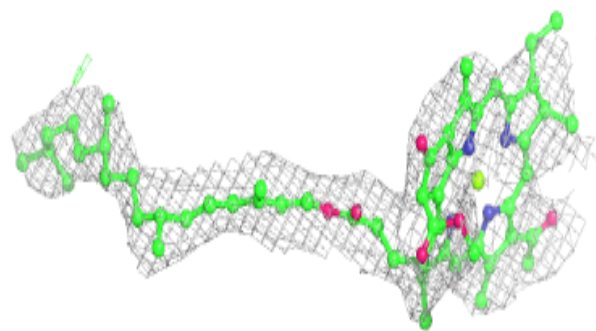
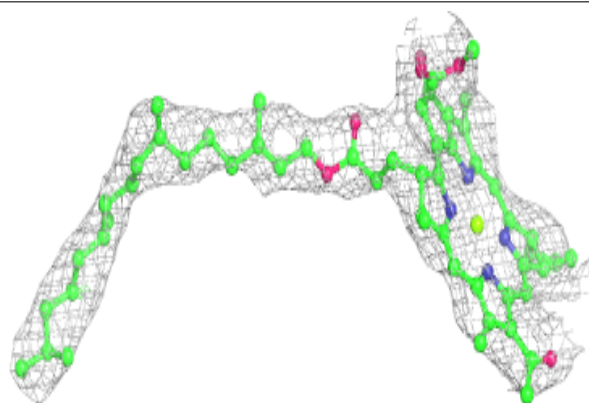


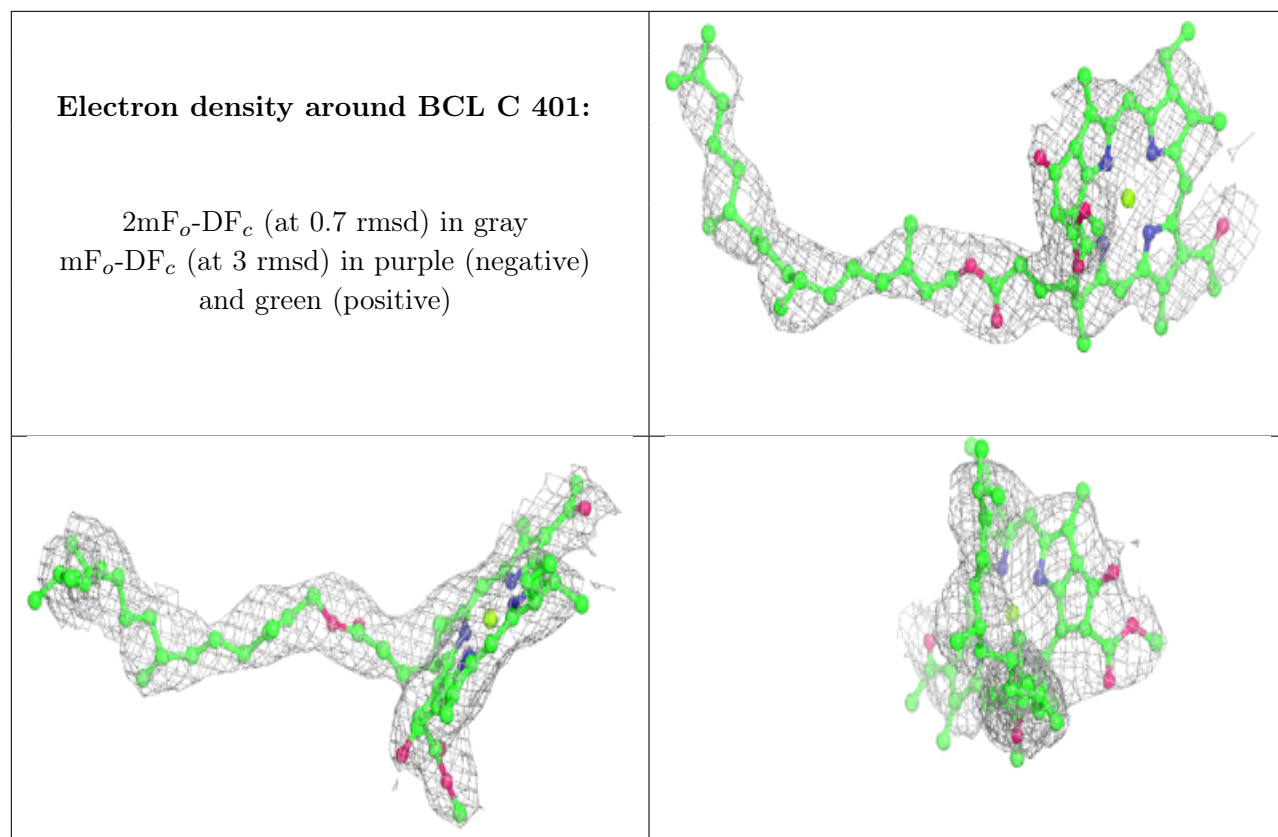
Electron density around BCL B 301:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around BCL B 302:**

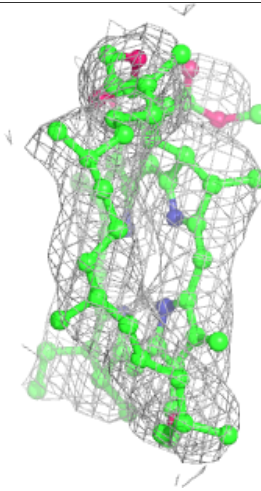
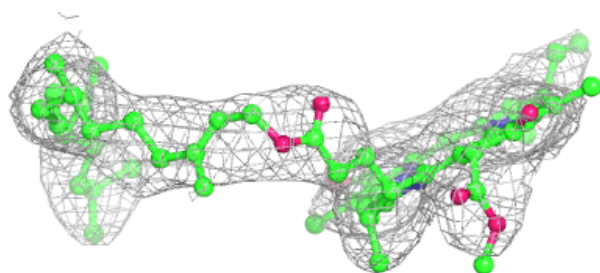
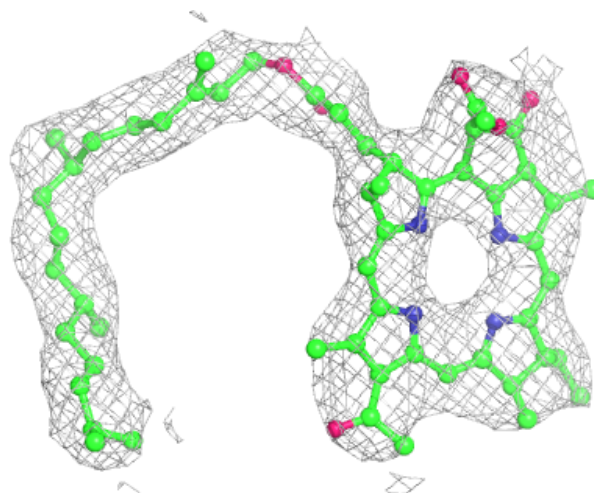
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





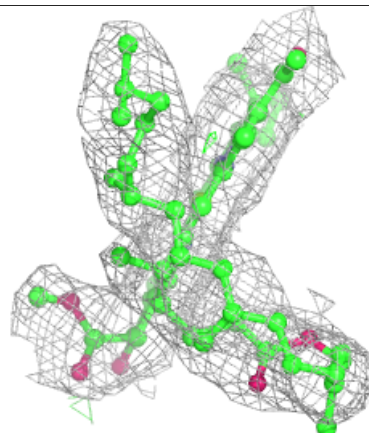
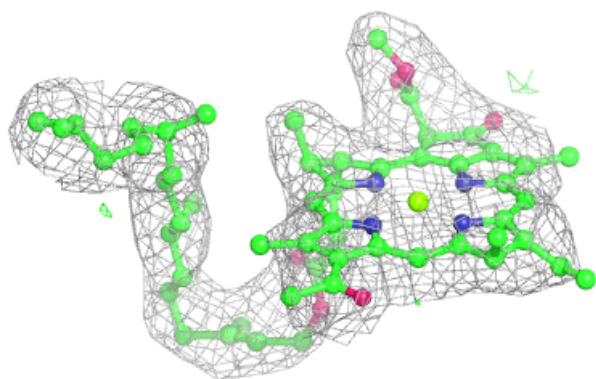
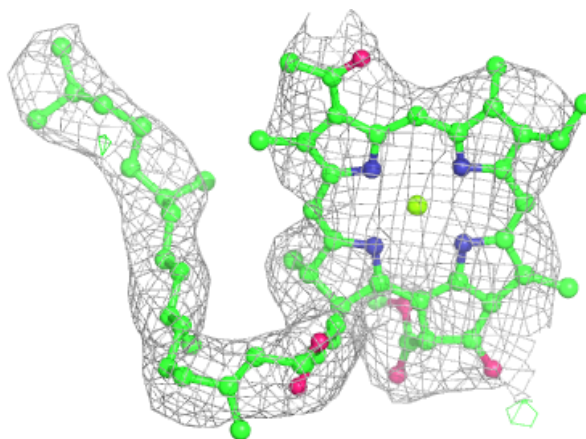
Electron density around BPB B 304:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



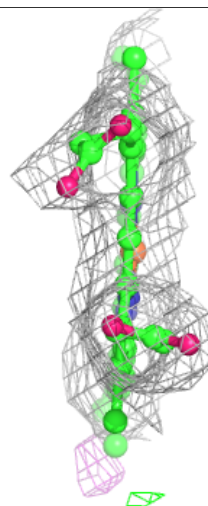
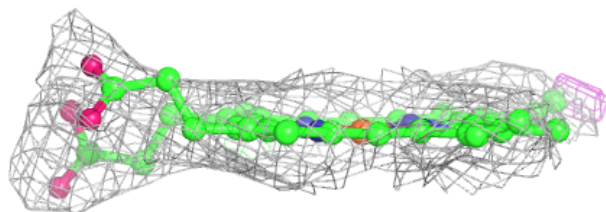
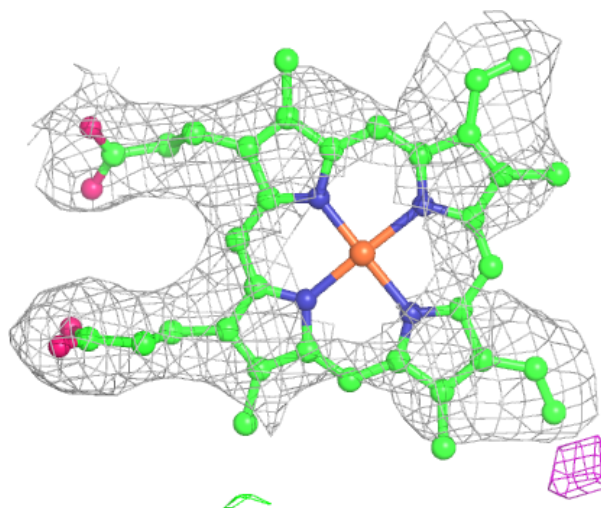
Electron density around BCL B 303:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



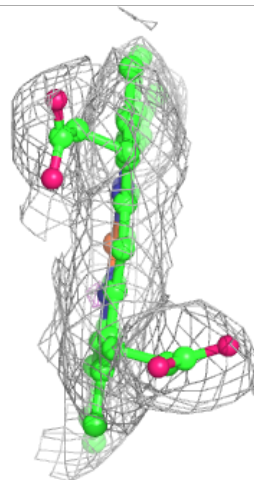
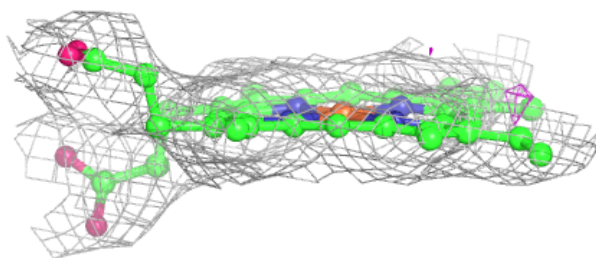
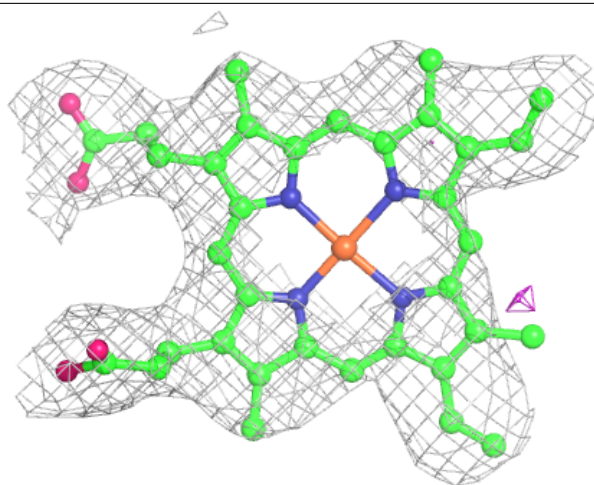
Electron density around HEC A 404:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



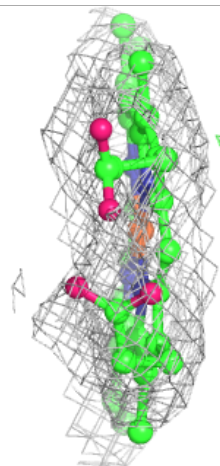
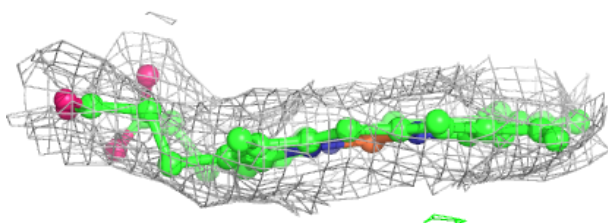
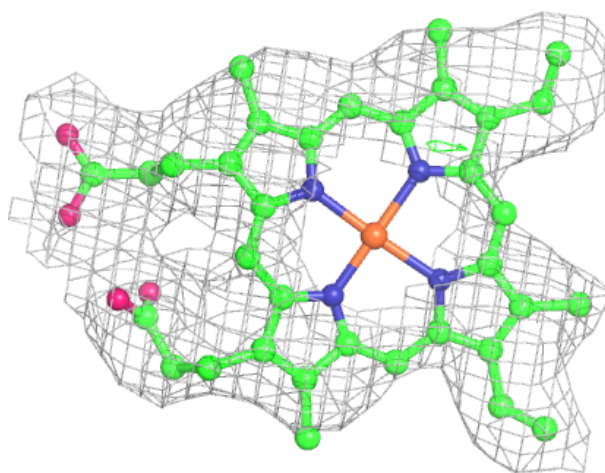
Electron density around HEC A 401:

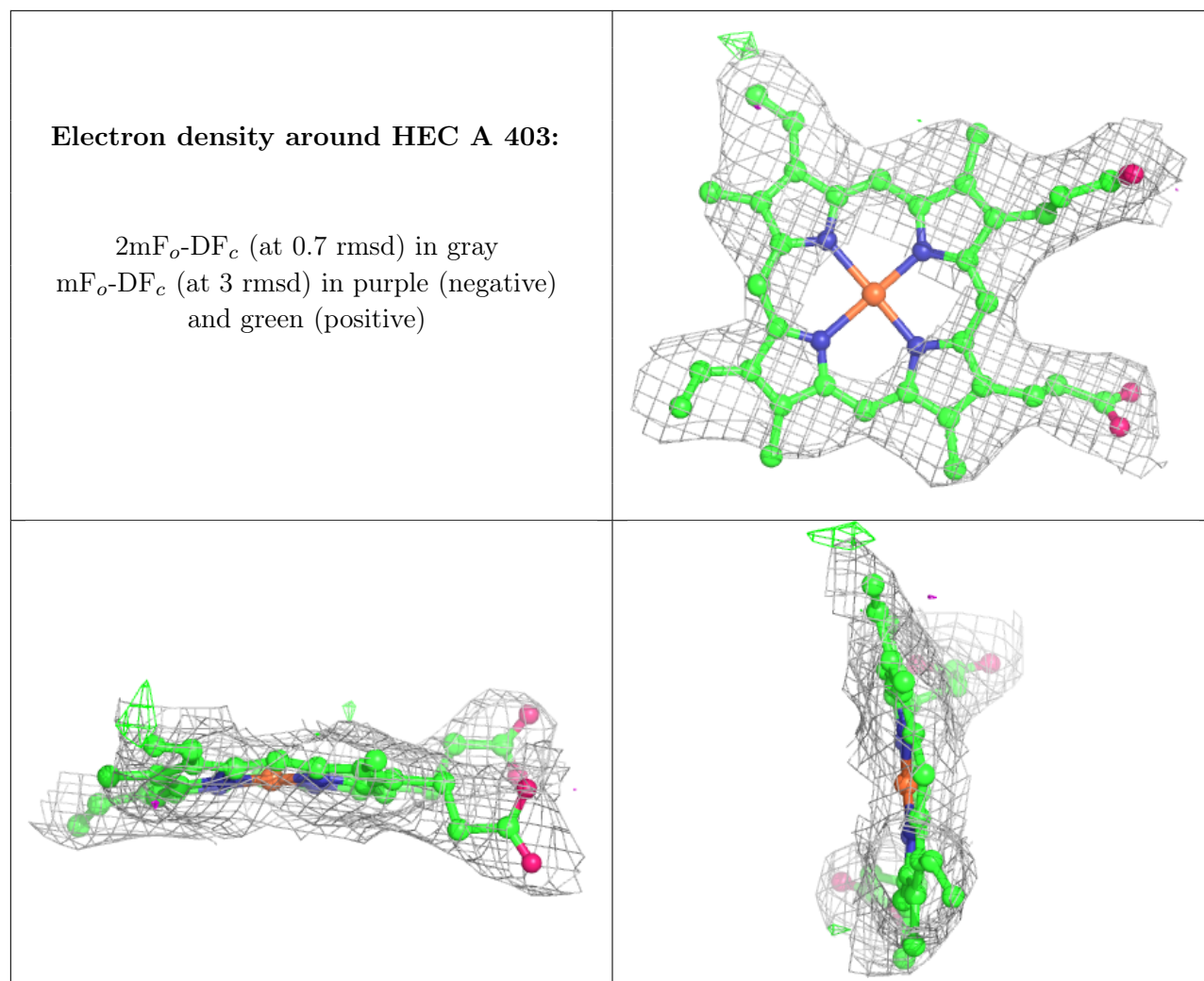
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEC A 402:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers [i](#)

There are no such residues in this entry.