



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 14, 2023 – 12:46 pm GMT

PDB ID : 8C6K  
Title : Double mutant A(L53)C/I(L64)C structure of Photosynthetic Reaction Center From *Cereibacter sphaeroides* strain RV  
Authors : Gabdulkhakov, A.; Selikhanov, G.; Fufina, T.; Vasilieva, L.; Atamas, A.; Uhimchuk, D.  
Deposited on : 2023-01-12  
Resolution : 2.86 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](mailto: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>.

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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  
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

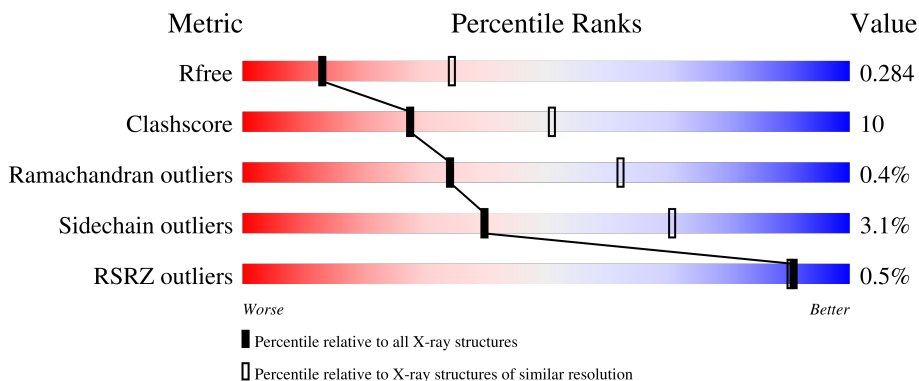
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.86 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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.

Mol	Chain	Length	Quality of chain
1	H	242	
2	L	281	
3	M	303	

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
13	HTO	L	311	-	-	-	X

## 2 Entry composition [i](#)

There are 17 unique types of molecules in this entry. The entry contains 7463 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 Reaction center protein H chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	H	240	1848	1183	317	339	9	0	3	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	L	281	2240	1511	356	363	10	0	1	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
L	53	CYS	ALA	engineered mutation	UNP P0C0Y8
L	64	CYS	ILE	engineered mutation	UNP P0C0Y8
L	178	THR	SER	conflict	UNP P0C0Y8

- Molecule 3 is a protein called Reaction center protein M chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	M	302	2436	1630	397	399	10	0	4	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
M	8	THR	SER	conflict	UNP P0C0Y9

- Molecule 4 is LAURYL DIMETHYLAMINE-N-OXIDE (three-letter code: LDA) (formula: C<sub>14</sub>H<sub>31</sub>NO).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	H	1	16	14	1	1	0	0
4	M	1	16	14	1	1	0	0
4	M	1	16	14	1	1	0	0
4	M	1	16	14	1	1	0	0
4	M	1	16	14	1	1	0	0
4	M	1	16	14	1	1	0	0

- Molecule 5 is UNKNOWN LIGAND (three-letter code: UNL) (formula: ).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	C		
5	H	4	51	51	0	0
5	L	4	49	49	0	0
5	M	2	27	27	0	0

- Molecule 6 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	H	1	Total O P 5 4 1	0	0
6	M	1	Total O P 5 4 1	0	0
6	M	1	Total O P 5 4 1	0	0

- Molecule 7 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	H	1	Total C O 4 2 2	0	0

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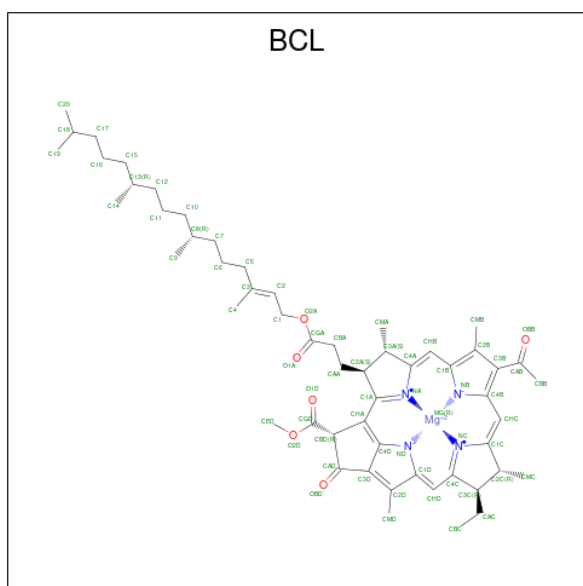
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	H	1	Total	C	O	0	0
			4	2	2		
7	H	1	Total	C	O	0	0
			4	2	2		
7	H	1	Total	C	O	0	0
			4	2	2		
7	L	1	Total	C	O	0	0
			4	2	2		
7	M	1	Total	C	O	0	0
			4	2	2		
7	M	1	Total	C	O	0	0
			4	2	2		

- Molecule 8 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	H	1	Total	K	0	0
			1	1		

- Molecule 9 is BACTERIOCHLOROPHYLL A (three-letter code: BCL) (formula: C<sub>55</sub>H<sub>74</sub>MgN<sub>4</sub>O<sub>6</sub>) (labeled as "Ligand of Interest" by depositor).



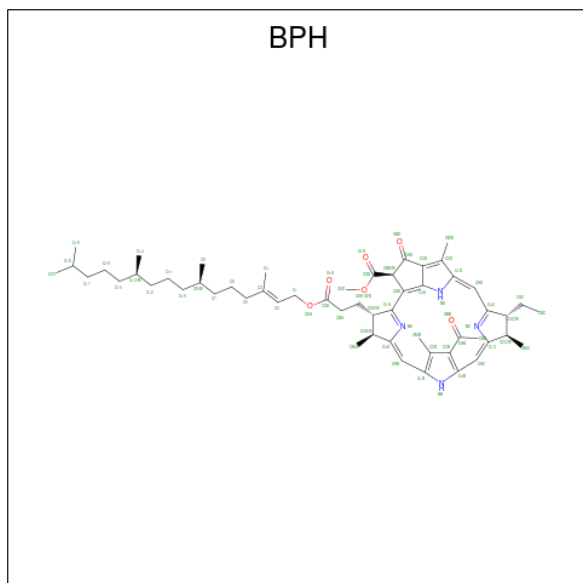
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
9	L	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		
9	L	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	M	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		
9	M	1	Total	C	Mg	N	O	0	0
			66	55	1	4	6		

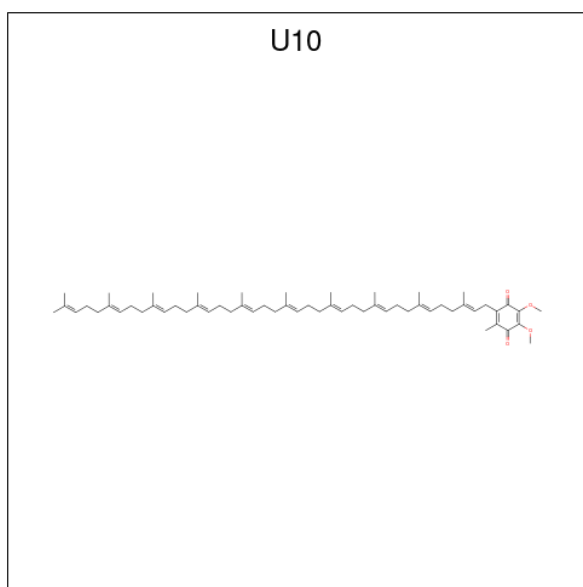
- Molecule 10 is BACTERIOPHEOPHYTIN A (three-letter code: BPH) (formula:  $C_{55}H_{76}N_4O_6$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
10	L	1	Total	C	N	O	0	0
			65	55	4	6		
10	M	1	Total	C	N	O	0	0
			65	55	4	6		

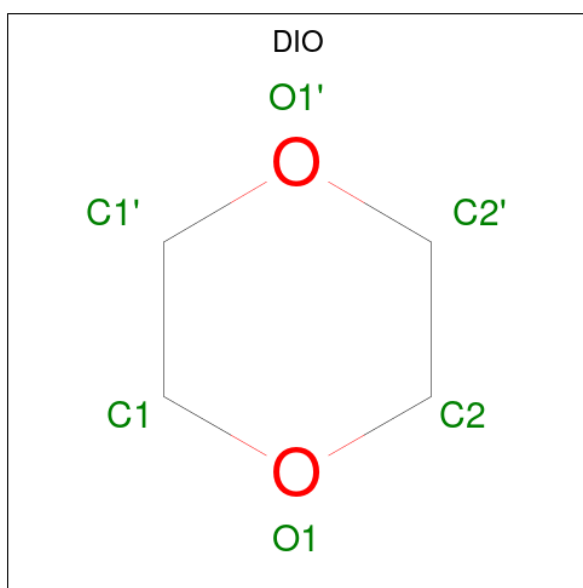
- Molecule 11 is UBIQUINONE-10 (three-letter code: U10) (formula:  $C_{59}H_{90}O_4$ ) (labeled as "Ligand of Interest" by depositor).





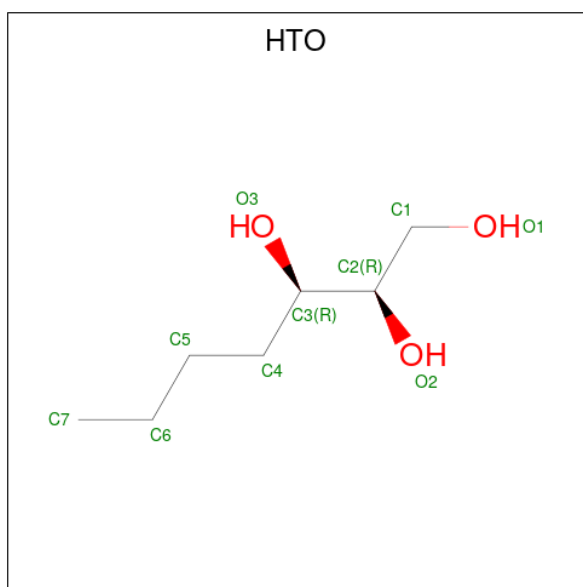
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	L	1	Total	C	O	0	0
			48	44	4		
11	M	1	Total	C	O	0	0
			48	44	4		

- Molecule 12 is 1,4-DIETHYLENE DIOXIDE (three-letter code: DIO) (formula:  $C_4H_8O_2$ ).



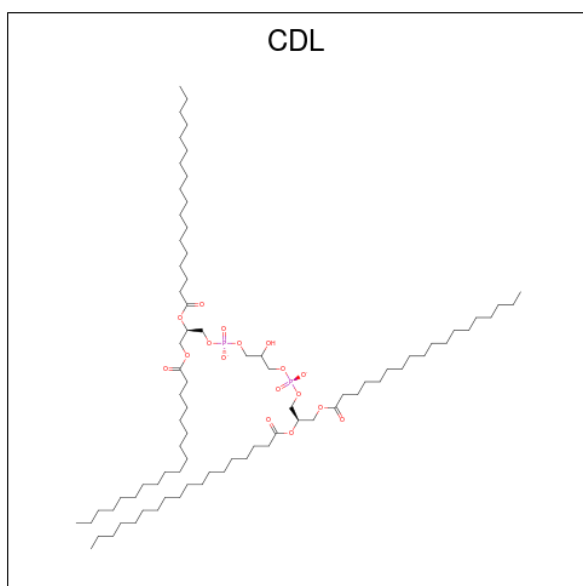
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
12	L	1	Total	C	O	0	0
			6	4	2		

- Molecule 13 is HEPTANE-1,2,3-TRIOL (three-letter code: HTO) (formula:  $C_7H_{16}O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
13	L	1	Total	C	O	0	0
			10	7	3		
13	L	1	Total	C	O	0	0
			10	7	3		

- Molecule 14 is CARDIOLIPIN (three-letter code: CDL) (formula:  $C_{81}H_{156}O_{17}P_2$ ) (labeled as "Ligand of Interest" by depositor).

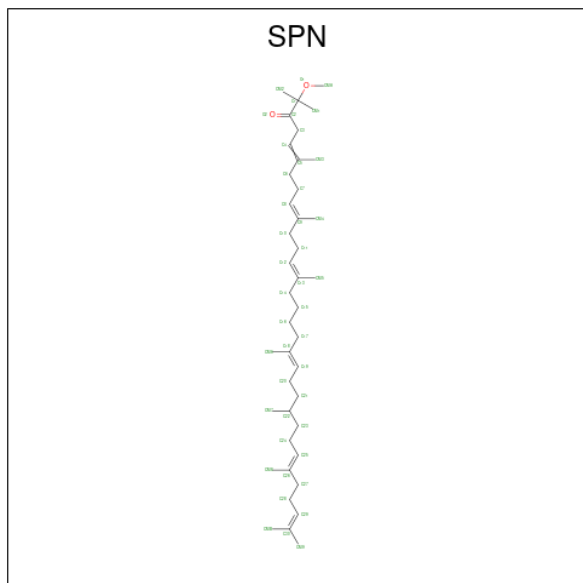


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
14	M	1	Total	C	O	P	0	0
			81	62	17	2		

- Molecule 15 is FE (III) ION (three-letter code: FE) (formula: Fe) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
15	M	1	Total Fe 1 1	0	0

- Molecule 16 is SPEROIDENONE (three-letter code: SPN) (formula: C<sub>41</sub>H<sub>70</sub>O<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
16	M	1	Total C O 43 41 2	0	0

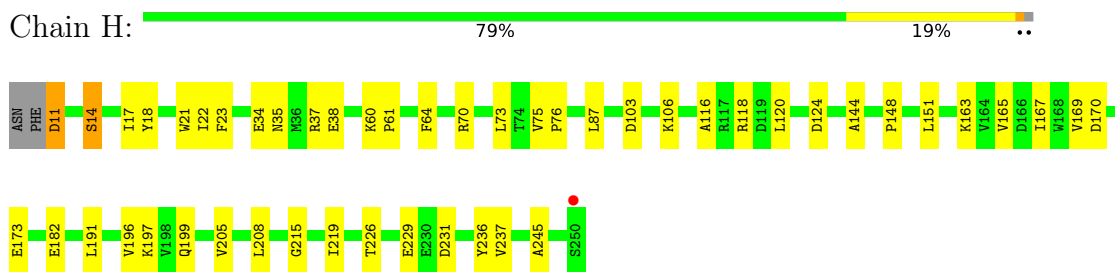
- Molecule 17 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
17	H	11	Total O 11 11	0	0
17	L	12	Total O 12 12	0	0
17	M	8	Total O 8 8	0	0

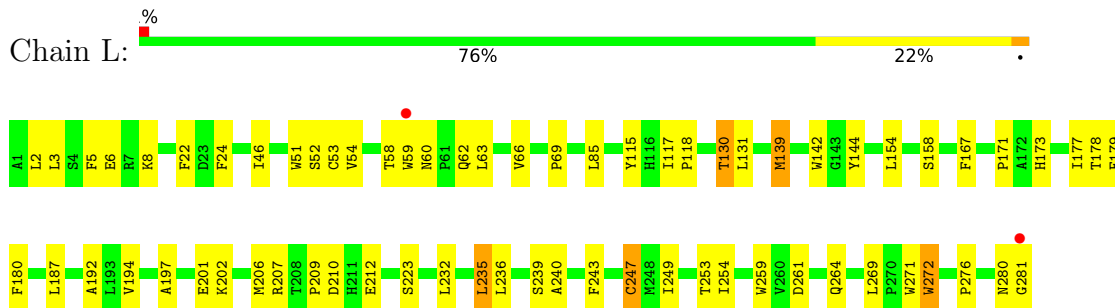
### 3 Residue-property plots [i](#)

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.

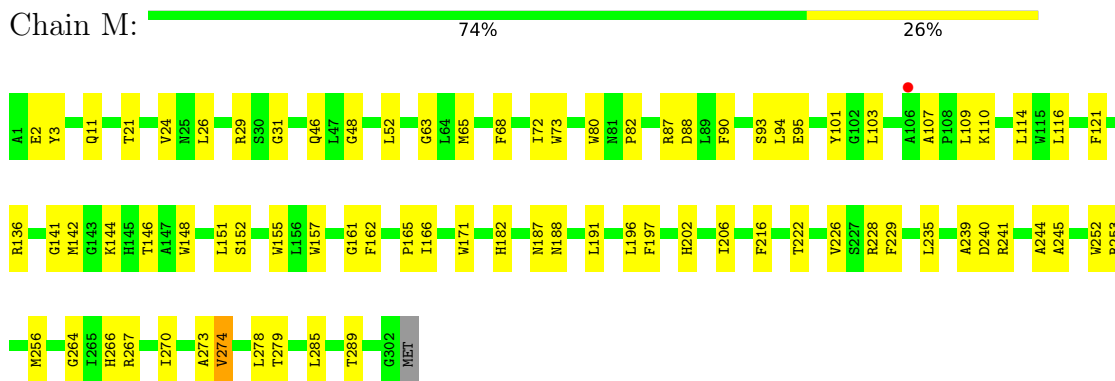
- Molecule 1: Reaction center protein H chain



- Molecule 2: Reaction center protein L chain



- Molecule 3: Reaction center protein M chain



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	139.64Å 139.64Å 185.09Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.89 – 2.86 57.48 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.6 (29.89-2.86) 99.4 (57.48-2.85)	Depositor EDS
$R_{merge}$	0.27	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.63 (at 2.86Å)	Xtrriage
Refinement program	REFMAC 5.8.0352, PHENIX 1.20.1_4487	Depositor
R, $R_{free}$	0.229 , 0.279 0.240 , 0.284	Depositor DCC
$R_{free}$ test set	2466 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	7.5	Xtrriage
Anisotropy	1.816	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 46.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	0.026 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.82	EDS
Total number of atoms	7463	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	15.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.68% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: PO4, HTO, FE, LDA, SPN, K, UNL, BCL, BPH, DIO, CDL, EDO, U10

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	H	0.47	0/1905	0.70	0/2590
2	L	0.49	0/2328	0.67	0/3186
3	M	0.46	0/2541	0.63	1/3468 (0.0%)
All	All	0.47	0/6774	0.66	1/9244 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	M	196	LEU	CA-CB-CG	5.19	127.23	115.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	H	1848	0	1866	32	0
2	L	2240	0	2191	52	0
3	M	2436	0	2362	62	0
4	H	16	0	31	3	0
4	M	80	0	155	4	0
5	H	51	0	0	0	0
5	L	49	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	M	27	0	0	0	0
6	H	5	0	0	0	0
6	M	10	0	0	0	0
7	H	16	0	24	2	0
7	L	4	0	6	0	0
7	M	8	0	12	2	0
8	H	1	0	0	0	0
9	L	132	0	148	7	0
9	M	132	0	148	11	0
10	L	65	0	76	1	0
10	M	65	0	76	5	0
11	L	48	0	63	3	0
11	M	48	0	63	2	0
12	L	6	0	8	1	0
13	L	20	0	32	0	0
14	M	81	0	106	10	0
15	M	1	0	0	0	0
16	M	43	0	70	5	0
17	H	11	0	0	0	0
17	L	12	0	0	0	0
17	M	8	0	0	0	0
All	All	7463	0	7437	148	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 10.

All (148) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:M:161:GLY:HA3	16:M:407:SPN:H201	1.60	0.82
9:L:301:BCL:H2C	9:M:403:BCL:HBC2	1.66	0.75
9:M:402:BCL:H202	16:M:407:SPN:H72	1.70	0.73
3:M:229:PHE:HB2	3:M:244:ALA:HB2	1.71	0.72
2:L:206:MET:HE3	3:M:239:ALA:HB2	1.73	0.71
1:H:196:VAL:HG12	1:H:205:VAL:HG22	1.74	0.70
3:M:65:MET:HB3	3:M:121:PHE:CD2	2.28	0.68
3:M:63:GLY:HA3	10:M:404:BPH:H5C1	1.73	0.68
9:M:402:BCL:CAB	16:M:407:SPN:H162	2.25	0.67
3:M:151:LEU:HD23	14:M:401:CDL:H781	1.77	0.66
3:M:148:TRP:HE1	14:M:401:CDL:HB32	1.60	0.65
11:M:406:U10:H212	4:M:418:LDA:H71	1.79	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:6:GLU:OE1	3:M:253[B]:ARG:NH1	2.32	0.62
2:L:46:ILE:HG12	9:L:302:BCL:H191	1.82	0.62
1:H:199:GLN:HB3	7:H:308:EDO:H22	1.82	0.62
2:L:60:ASN:HB3	2:L:63:LEU:HB2	1.82	0.61
10:M:404:BPH:H102	10:M:404:BPH:H161	1.82	0.61
4:H:301:LDA:H122	11:M:406:U10:H202	1.85	0.59
2:L:69:PRO:HG2	2:L:142:TRP:HB2	1.83	0.59
1:H:226:THR:OG1	1:H:229:GLU:HG3	2.02	0.58
3:M:278:LEU:HD11	14:M:401:CDL:H791	1.86	0.58
3:M:157:TRP:CE2	16:M:407:SPN:HM73	2.39	0.57
3:M:228:ARG:HH12	7:M:416:EDO:H22	1.69	0.57
3:M:202:HIS:CE1	3:M:206:ILE:HD11	2.39	0.57
1:H:61:PRO:HA	1:H:76:PRO:HD2	1.87	0.57
3:M:46:GLN:NE2	3:M:48:GLY:O	2.35	0.57
11:L:304:U10:H28	11:L:304:U10:H251	1.87	0.56
3:M:73:TRP:HZ3	3:M:110:LYS:HG2	1.70	0.56
1:H:38:GLU:OE1	3:M:241:ARG:NH1	2.40	0.55
3:M:285:LEU:O	3:M:289:THR:OG1	2.21	0.55
1:H:70:ARG:O	1:H:118[A]:ARG:NH2	2.39	0.55
9:M:403:BCL:HHC	9:M:403:BCL:OBB	2.06	0.55
2:L:173:HIS:CE1	2:L:177:ILE:HD11	2.42	0.54
3:M:80:TRP:O	3:M:82:PRO:HD3	2.07	0.54
2:L:139:MET:HE2	2:L:144:TYR:CG	2.42	0.54
3:M:21:THR:HG23	3:M:26:LEU:HD21	1.90	0.54
3:M:187:ASN:HA	9:M:403:BCL:HAC1	1.90	0.54
1:H:167:ILE:HG22	1:H:169:VAL:HG12	1.89	0.53
9:L:302:BCL:HBB3	10:L:303:BPH:H162	1.90	0.53
3:M:222:THR:O	3:M:226:VAL:HG22	2.09	0.53
2:L:54:VAL:CG1	2:L:59:TRP:HE1	2.21	0.53
3:M:103:LEU:HD11	3:M:166:ILE:HA	1.91	0.52
3:M:267:ARG:HA	3:M:270:ILE:HG22	1.91	0.52
3:M:197:PHE:CE1	9:M:403:BCL:HMC2	2.44	0.52
2:L:192:ALA:HB1	3:M:146:THR:N	2.25	0.52
1:H:14:SER:HA	1:H:17:ILE:HG22	1.91	0.51
2:L:167:PHE:HB3	9:L:301:BCL:HMC3	1.92	0.51
2:L:180:PHE:CD2	2:L:240:ALA:HB1	2.45	0.51
3:M:94:LEU:HD11	3:M:114:LEU:HB3	1.93	0.51
2:L:201:GLU:HG3	3:M:141:GLY:O	2.11	0.50
2:L:130:THR:HG22	2:L:131:LEU:HD23	1.92	0.50
2:L:2:LEU:HB3	2:L:6:GLU:HB3	1.92	0.50
9:M:402:BCL:HMB2	10:M:404:BPH:HMB3	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:197:ALA:HB3	3:M:235:LEU:HD21	1.94	0.50
1:H:148:PRO:HD2	1:H:167:ILE:HD11	1.94	0.50
3:M:109:LEU:HG	3:M:114:LEU:HD13	1.93	0.49
9:L:301:BCL:NA	9:M:403:BCL:HBB2	2.27	0.49
9:L:301:BCL:CGA	9:L:302:BCL:HBC1	2.42	0.49
2:L:139:MET:HE2	2:L:144:TYR:HB3	1.94	0.49
1:H:118[A]:ARG:HD2	1:H:120:LEU:HB2	1.95	0.48
14:M:401:CDL:H312	14:M:401:CDL:H521	1.94	0.48
2:L:115:TYR:O	2:L:118:PRO:HD2	2.13	0.48
1:H:148:PRO:HA	1:H:151:LEU:HD12	1.96	0.48
9:L:301:BCL:OBB	9:L:301:BCL:HHC	2.14	0.48
3:M:228:ARG:HH22	7:M:416:EDO:H22	1.78	0.48
2:L:139:MET:HE2	2:L:144:TYR:CB	2.44	0.47
3:M:31:GLY:H	4:M:410:LDA:HM11	1.80	0.47
2:L:269:LEU:HD13	2:L:271:TRP:CZ2	2.50	0.47
3:M:24:VAL:HG11	3:M:29:ARG:NH2	2.30	0.47
1:H:73:LEU:HD11	1:H:75:VAL:HG13	1.97	0.47
2:L:139:MET:CE	2:L:144:TYR:CG	2.98	0.47
14:M:401:CDL:HB61	14:M:401:CDL:OA5	2.14	0.46
3:M:252:TRP:CE3	3:M:256:MET:HE2	2.50	0.46
2:L:194:VAL:HG21	3:M:266:HIS:CD2	2.51	0.46
2:L:223:SER:HA	11:L:304:U10:H103	1.98	0.46
3:M:68[B]:PHE:CZ	3:M:72:ILE:HD11	2.51	0.46
1:H:11:ASP:OD2	1:H:14:SER:HB2	2.15	0.46
2:L:276:PRO:HA	2:L:281:GLY:O	2.14	0.46
3:M:148:TRP:NE1	14:M:401:CDL:HB32	2.28	0.46
1:H:64:PHE:HB3	2:L:206:MET:HE2	1.97	0.46
2:L:180:PHE:CE2	2:L:240:ALA:HB1	2.51	0.46
3:M:116:LEU:HD21	3:M:171:TRP:CD1	2.50	0.45
1:H:35:ASN:OD1	3:M:264:GLY:HA3	2.16	0.45
3:M:157:TRP:HE1	16:M:407:SPN:H211	1.82	0.45
3:M:188:ASN:O	3:M:191:LEU:N	2.49	0.45
2:L:171:PRO:HD2	2:L:259:TRP:CZ3	2.52	0.45
1:H:170:ASP:OD2	1:H:173:GLU:HG3	2.17	0.45
12:L:309:DIO:H21	3:M:90:PHE:CZ	2.52	0.45
2:L:22:PHE:HA	2:L:24:PHE:CE2	2.52	0.45
1:H:118[B]:ARG:HH11	1:H:118[B]:ARG:HB2	1.82	0.45
2:L:281:GLY:H	3:M:87:ARG:NH2	2.15	0.44
2:L:52:SER:OG	2:L:66:VAL:HG22	2.17	0.44
2:L:209:PRO:HA	2:L:212:GLU:OE1	2.18	0.44
3:M:148:TRP:HB3	14:M:401:CDL:H741	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:178:THR:HG21	11:L:304:U10:H321	2.00	0.44
2:L:207:ARG:HG2	3:M:142:MET:HG2	2.00	0.43
3:M:93:SER:OG	3:M:95:GLU:OE2	2.23	0.43
2:L:51:TRP:CE3	2:L:85:LEU:HD11	2.53	0.43
3:M:152:SER:O	3:M:155:TRP:HB3	2.19	0.43
2:L:53:CYS:HB3	2:L:58:THR:O	2.19	0.43
2:L:235:LEU:O	2:L:239:SER:OG	2.29	0.43
2:L:280:ASN:ND2	3:M:88:ASP:OD1	2.51	0.43
1:H:21:TRP:HZ2	4:M:408:LDA:HM11	1.84	0.43
3:M:162:PHE:C	3:M:165:PRO:HD2	2.39	0.43
4:H:301:LDA:H12	4:M:418:LDA:HM13	2.01	0.42
2:L:2:LEU:HD23	2:L:2:LEU:N	2.35	0.42
3:M:101:TYR:CG	3:M:107:ALA:HB2	2.54	0.42
9:M:402:BCL:HMB1	9:M:402:BCL:HBB2	2.01	0.42
1:H:197:LYS:HD3	3:M:3:TYR:HB2	2.00	0.42
2:L:179:PHE:HB3	2:L:240:ALA:HB2	2.01	0.42
1:H:103:ASP:OD2	1:H:106:LYS:HG3	2.20	0.42
1:H:120:LEU:HD23	1:H:120:LEU:HA	1.57	0.42
2:L:154:LEU:HD23	3:M:197:PHE:HB3	2.01	0.42
1:H:75:VAL:HA	1:H:76:PRO:C	2.40	0.42
2:L:117:ILE:HB	2:L:118:PRO:HD3	2.02	0.42
2:L:201:GLU:HG3	3:M:141:GLY:C	2.40	0.42
1:H:215:GLY:HA3	1:H:236:TYR:OH	2.20	0.41
2:L:173:HIS:N	2:L:247:CYS:HB2	2.35	0.41
4:H:301:LDA:H22	4:H:301:LDA:HM11	1.52	0.41
2:L:249:ILE:HD12	2:L:249:ILE:HA	1.83	0.41
3:M:144:LYS:N	14:M:401:CDL:OB3	2.28	0.41
1:H:34:GLU:OE2	1:H:37:ARG:NH2	2.41	0.41
2:L:261:ASP:O	2:L:264:GLN:HG2	2.20	0.41
1:H:23:PHE:CE1	14:M:401:CDL:H362	2.56	0.41
2:L:3:LEU:C	2:L:5:PHE:H	2.24	0.41
2:L:253:THR:OG1	2:L:254:ILE:N	2.51	0.41
14:M:401:CDL:HB61	14:M:401:CDL:HA4	2.03	0.41
1:H:87:LEU:HD11	2:L:8:LYS:HA	2.02	0.41
1:H:116:ALA:O	7:H:310:EDO:H12	2.20	0.41
1:H:144:ALA:HB3	3:M:11:GLN:HB2	2.02	0.41
1:H:208:LEU:HD11	1:H:237:VAL:HG22	2.02	0.41
2:L:187:LEU:HD23	3:M:273:ALA:HB2	2.02	0.41
2:L:232:LEU:HG	2:L:236:LEU:HD12	2.03	0.41
2:L:272:TRP:NE1	3:M:87:ARG:HG3	2.36	0.41
1:H:18:TYR:CZ	1:H:22:ILE:HD11	2.56	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:219:ILE:HG22	1:H:229:GLU:HB3	2.02	0.40
3:M:136:ARG:NH1	3:M:136:ARG:HA	2.36	0.40
9:M:403:BCL:H18	10:M:404:BPH:H8	2.03	0.40
9:M:402:BCL:H91	9:M:402:BCL:H111	1.77	0.40
2:L:62:GLN:O	2:L:63:LEU:HD12	2.22	0.40
2:L:243:PHE:O	2:L:247:CYS:HB3	2.22	0.40
3:M:65:MET:HB3	3:M:121:PHE:CE2	2.56	0.40
1:H:165:VAL:HG11	1:H:182:GLU:HB2	2.02	0.40
3:M:63:GLY:HA3	10:M:404:BPH:C5	2.45	0.40
3:M:114:LEU:HA	3:M:114:LEU:HD12	1.88	0.40
3:M:187:ASN:O	3:M:191:LEU:HG	2.22	0.40
3:M:241:ARG:HG3	3:M:245:ALA:HB3	2.04	0.40
3:M:270:ILE:O	3:M:274:VAL:HB	2.21	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all 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	H	241/242 (100%)	230 (95%)	9 (4%)	2 (1%)	19	46
2	L	280/281 (100%)	257 (92%)	23 (8%)	0	100	100
3	M	304/303 (100%)	285 (94%)	18 (6%)	1 (0%)	41	68
All	All	825/826 (100%)	772 (94%)	50 (6%)	3 (0%)	34	62

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	H	245	ALA
1	H	124	ASP
3	M	240	ASP

### 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	H	198/197 (100%)	192 (97%)	6 (3%)	41	72
2	L	222/221 (100%)	214 (96%)	8 (4%)	35	66
3	M	240/237 (101%)	232 (97%)	8 (3%)	38	68
All	All	660/655 (101%)	638 (97%)	22 (3%)	40	68

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	11	ASP
1	H	14	SER
1	H	60	LYS
1	H	163	LYS
1	H	191	LEU
1	H	231	ASP
2	L	130	THR
2	L	139	MET
2	L	158	SER
2	L	202	LYS
2	L	210	ASP
2	L	235	LEU
2	L	247	CYS
2	L	272	TRP
3	M	2[A]	GLU
3	M	2[B]	GLU
3	M	52[A]	LEU
3	M	52[B]	LEU
3	M	182	HIS
3	M	216	PHE
3	M	274	VAL
3	M	279	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	68	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 41 ligands modelled in this entry, 10 are unknown and 2 are monoatomic - leaving 29 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	$\# Z  > 2$
11	U10	M	406	-	48,48,63	2.61	14 (29%)	58,61,79	1.93	16 (27%)
16	SPN	M	407	-	40,42,42	0.52	0	50,52,52	1.06	4 (8%)
4	LDA	M	408	-	12,15,15	2.04	1 (8%)	14,17,17	0.96	1 (7%)
7	EDO	H	309	-	3,3,3	0.65	0	2,2,2	0.23	0
9	BCL	L	302	-	64,74,74	1.38	6 (9%)	78,115,115	1.77	17 (21%)
4	LDA	M	411	-	12,15,15	2.11	1 (8%)	14,17,17	0.51	0
13	HTO	L	311	-	9,9,9	0.56	0	10,10,10	1.44	2 (20%)
4	LDA	M	410	-	12,15,15	2.09	1 (8%)	14,17,17	0.75	1 (7%)
4	LDA	M	418	-	12,15,15	2.06	1 (8%)	14,17,17	0.53	0
6	PO4	H	306	-	4,4,4	0.77	0	6,6,6	0.61	0
10	BPH	M	404	-	51,70,70	0.84	1 (1%)	52,101,101	1.45	8 (15%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
9	BCL	L	301	-	64,74,74	1.43	7 (10%)	78,115,115	1.49	13 (16%)
13	HTO	L	312	-	9,9,9	0.49	0	10,10,10	0.88	1 (10%)
6	PO4	M	415	-	4,4,4	0.80	0	6,6,6	0.99	0
7	EDO	H	308	-	3,3,3	0.55	0	2,2,2	0.14	0
7	EDO	H	310	-	3,3,3	0.56	0	2,2,2	0.30	0
14	CDL	M	401	-	80,80,99	0.59	1 (1%)	86,92,111	0.41	0
7	EDO	M	417	-	3,3,3	0.52	0	2,2,2	0.48	0
9	BCL	M	403	-	64,74,74	1.45	8 (12%)	78,115,115	1.65	13 (16%)
12	DIO	L	309	-	6,6,6	1.17	1 (16%)	6,6,6	0.40	0
9	BCL	M	402	-	64,74,74	1.49	7 (10%)	78,115,115	1.75	16 (20%)
7	EDO	M	416	-	3,3,3	0.49	0	2,2,2	0.39	0
4	LDA	M	409	-	12,15,15	2.01	1 (8%)	14,17,17	0.55	0
4	LDA	H	301	-	12,15,15	1.88	1 (8%)	14,17,17	0.80	0
7	EDO	L	310	-	3,3,3	0.48	0	2,2,2	0.37	0
6	PO4	M	414	-	4,4,4	0.69	0	6,6,6	0.67	0
10	BPH	L	303	-	51,70,70	1.04	3 (5%)	52,101,101	1.43	8 (15%)
7	EDO	H	307	-	3,3,3	0.54	0	2,2,2	0.48	0
11	U10	L	304	-	48,48,63	2.60	13 (27%)	58,61,79	1.94	12 (20%)

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
11	U10	M	406	-	-	16/45/69/87	0/1/1/1
16	SPN	M	407	-	-	11/50/51/51	-
4	LDA	M	408	-	-	8/13/13/13	-
7	EDO	H	309	-	-	0/1/1/1	-
9	BCL	L	302	-	-	3/37/137/137	-
4	LDA	M	411	-	-	7/13/13/13	-
13	HTO	L	311	-	-	8/10/10/10	-
4	LDA	M	410	-	-	3/13/13/13	-
4	LDA	M	418	-	-	7/13/13/13	-
10	BPH	M	404	-	-	13/37/105/105	0/5/6/6
9	BCL	L	301	-	-	4/37/137/137	-
13	HTO	L	312	-	-	6/10/10/10	-
7	EDO	H	308	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	EDO	H	310	-	-	0/1/1/1	-
14	CDL	M	401	-	-	51/91/91/110	-
7	EDO	M	417	-	-	0/1/1/1	-
9	BCL	M	403	-	-	3/37/137/137	-
12	DIO	L	309	-	-	-	0/1/1/1
9	BCL	M	402	-	-	4/37/137/137	-
7	EDO	M	416	-	-	1/1/1/1	-
4	LDA	M	409	-	-	6/13/13/13	-
4	LDA	H	301	-	-	4/13/13/13	-
7	EDO	L	310	-	-	1/1/1/1	-
10	BPH	L	303	-	-	6/37/105/105	0/5/6/6
7	EDO	H	307	-	-	1/1/1/1	-
11	U10	L	304	-	-	19/45/69/87	0/1/1/1

All (67) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	M	411	LDA	O1-N1	-7.25	1.25	1.42
4	M	410	LDA	O1-N1	-7.12	1.25	1.42
4	M	418	LDA	O1-N1	-7.06	1.25	1.42
4	M	408	LDA	O1-N1	-6.94	1.25	1.42
4	M	409	LDA	O1-N1	-6.87	1.26	1.42
4	H	301	LDA	O1-N1	-6.49	1.27	1.42
11	L	304	U10	C13-C14	6.48	1.48	1.33
9	M	402	BCL	C1B-NB	6.24	1.40	1.35
11	L	304	U10	C8-C9	6.10	1.47	1.33
11	M	406	U10	C13-C14	6.09	1.47	1.33
11	M	406	U10	C33-C34	6.06	1.47	1.33
11	M	406	U10	C28-C29	6.06	1.47	1.33
11	M	406	U10	C18-C19	5.96	1.47	1.33
11	L	304	U10	C18-C19	5.93	1.47	1.33
11	M	406	U10	C8-C9	5.89	1.47	1.33
11	L	304	U10	C28-C29	5.84	1.47	1.33
11	L	304	U10	C23-C24	5.77	1.46	1.33
11	L	304	U10	C38-C39	5.72	1.48	1.32
11	M	406	U10	C23-C24	5.72	1.46	1.33
11	L	304	U10	C33-C34	5.69	1.46	1.33
9	M	403	BCL	C1B-NB	5.31	1.39	1.35
9	M	402	BCL	MG-NA	5.29	2.18	2.06
9	L	302	BCL	MG-NA	5.13	2.18	2.06
11	M	406	U10	C38-C39	5.11	1.47	1.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	L	301	BCL	C1B-NB	4.97	1.39	1.35
11	L	304	U10	O4-C4	-4.86	1.25	1.36
11	M	406	U10	O3-C3	-4.79	1.25	1.36
9	L	302	BCL	C1B-NB	4.78	1.39	1.35
9	M	403	BCL	MG-NA	4.64	2.17	2.06
9	L	301	BCL	MG-NA	4.62	2.17	2.06
11	M	406	U10	O4-C4	-4.56	1.25	1.36
11	L	304	U10	O3-C3	-4.53	1.25	1.36
9	L	302	BCL	C1D-ND	4.15	1.42	1.37
9	L	301	BCL	O1A-CGA	-3.88	1.11	1.22
9	M	403	BCL	O1A-CGA	-3.81	1.11	1.22
10	L	303	BPH	CBD-CGD	-3.78	1.47	1.52
9	L	301	BCL	MG-NC	3.66	2.15	2.06
9	L	302	BCL	MG-NC	3.44	2.14	2.06
9	M	402	BCL	CHD-C1D	3.21	1.44	1.38
9	M	402	BCL	OBD-CAD	3.05	1.27	1.22
9	M	403	BCL	MG-NC	2.97	2.13	2.06
9	M	403	BCL	C1D-ND	2.92	1.41	1.37
9	M	402	BCL	C4B-NB	2.80	1.37	1.35
14	M	401	CDL	OA8-CA6	2.73	1.51	1.45
9	M	402	BCL	MG-NC	2.63	2.12	2.06
9	L	301	BCL	C5-C3	2.61	1.56	1.51
9	L	302	BCL	CHD-C1D	2.58	1.43	1.38
9	L	301	BCL	OBD-CAD	2.57	1.26	1.22
11	M	406	U10	C1-C2	-2.54	1.38	1.47
11	L	304	U10	C4-C5	-2.48	1.41	1.48
11	M	406	U10	C3-C2	-2.45	1.41	1.48
11	M	406	U10	C6-C5	-2.44	1.39	1.46
11	M	406	U10	C4-C5	-2.44	1.41	1.48
11	M	406	U10	C6-C1	2.41	1.39	1.35
11	L	304	U10	C3-C2	-2.41	1.41	1.48
10	M	404	BPH	CBD-CGD	-2.36	1.49	1.52
9	M	403	BCL	CHD-C1D	2.30	1.42	1.38
9	M	402	BCL	CAA-C2A	2.29	1.58	1.54
11	L	304	U10	C6-C1	2.27	1.39	1.35
11	L	304	U10	C6-C5	-2.26	1.40	1.46
10	L	303	BPH	OBD-CAD	2.26	1.25	1.22
9	L	301	BCL	C1D-ND	2.25	1.40	1.37
9	M	403	BCL	CMD-C2D	2.09	1.55	1.50
9	M	403	BCL	C3D-C4D	-2.07	1.39	1.44
10	L	303	BPH	C2C-C3C	-2.04	1.52	1.54
12	L	309	DIO	O1-C2	2.03	1.50	1.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	L	302	BCL	C4B-NB	2.00	1.37	1.35

All (112) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	M	402	BCL	CHD-C1D-ND	-6.39	118.58	124.45
9	L	302	BCL	CHD-C1D-ND	-5.93	119.00	124.45
9	M	402	BCL	C1D-ND-C4D	-5.11	102.70	106.33
9	M	403	BCL	CHD-C1D-ND	-5.00	119.86	124.45
11	L	304	U10	C7-C8-C9	-4.89	118.65	126.79
9	L	302	BCL	C4D-CHA-C1A	4.88	127.19	121.25
11	L	304	U10	C22-C23-C24	-4.87	115.94	127.66
9	M	403	BCL	C4D-CHA-C1A	4.78	127.06	121.25
9	L	301	BCL	CHD-C1D-ND	-4.65	120.18	124.45
10	L	303	BPH	C11-C10-C8	-4.55	101.20	115.92
9	M	402	BCL	C4D-CHA-C1A	4.54	126.77	121.25
11	M	406	U10	C22-C23-C24	-4.09	117.80	127.66
11	L	304	U10	C32-C33-C34	-4.09	117.82	127.66
9	L	302	BCL	C1D-ND-C4D	-4.07	103.44	106.33
11	M	406	U10	C15-C14-C16	4.07	122.11	115.27
11	L	304	U10	C25-C24-C26	4.04	122.07	115.27
11	M	406	U10	C32-C33-C34	-3.96	118.13	127.66
9	L	301	BCL	C4D-CHA-C1A	3.88	125.98	121.25
9	M	403	BCL	C1D-ND-C4D	-3.88	103.58	106.33
11	M	406	U10	C35-C34-C36	3.84	121.73	115.27
10	M	404	BPH	C17-C16-C15	3.84	130.86	113.24
9	M	402	BCL	CMB-C2B-C1B	-3.80	122.63	128.46
9	L	302	BCL	CMB-C2B-C1B	-3.78	122.65	128.46
11	L	304	U10	C35-C34-C36	3.71	121.51	115.27
11	L	304	U10	C12-C13-C14	-3.62	118.94	127.66
9	L	302	BCL	C11-C10-C8	3.61	127.58	115.92
9	M	403	BCL	C11-C10-C8	-3.57	104.38	115.92
9	M	403	BCL	C4B-C3B-CAB	-3.51	120.35	127.13
11	L	304	U10	C1M-C1-C6	-3.48	118.72	124.40
9	L	301	BCL	O2A-CGA-O1A	-3.43	114.94	123.59
10	M	404	BPH	OBD-CAD-CBD	-3.40	120.83	125.82
10	M	404	BPH	O2D-CGD-CBD	3.39	115.29	111.00
11	M	406	U10	C17-C18-C19	-3.38	119.51	127.66
9	L	301	BCL	C1-C2-C3	-3.38	120.20	126.04
9	M	402	BCL	OBB-CAB-CBB	-3.37	112.59	120.17
10	L	303	BPH	C6-C7-C8	-3.36	105.05	115.92
10	M	404	BPH	C1-C2-C3	-3.35	120.24	126.04

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	L	302	BCL	CHA-C1A-NA	-3.34	118.76	126.40
9	L	302	BCL	C2A-C1A-CHA	3.28	129.60	123.86
9	M	402	BCL	C6-C7-C8	3.28	126.52	115.92
11	L	304	U10	C30-C29-C31	3.20	120.66	115.27
10	L	303	BPH	OBD-CAD-CBD	-3.19	121.14	125.82
9	M	403	BCL	CHA-C1A-NA	-3.14	119.20	126.40
9	L	302	BCL	O2D-CGD-CBD	3.12	116.82	111.27
11	M	406	U10	C12-C13-C14	-3.11	120.18	127.66
11	M	406	U10	C41-C39-C40	3.10	121.45	114.60
9	M	402	BCL	C2A-C1A-CHA	3.10	129.27	123.86
9	L	301	BCL	C1D-ND-C4D	-3.09	104.14	106.33
11	M	406	U10	C30-C29-C31	3.08	120.46	115.27
11	M	406	U10	O2-C2-C1	-3.07	111.68	120.73
9	M	403	BCL	CMB-C2B-C1B	-3.06	123.76	128.46
11	M	406	U10	O5-C5-C6	-3.04	116.21	121.55
11	M	406	U10	C25-C24-C26	3.03	120.36	115.27
9	M	403	BCL	O2D-CGD-O1D	-3.03	117.92	123.84
11	L	304	U10	C17-C18-C19	-3.02	120.39	127.66
10	L	303	BPH	CMD-C2D-C3D	2.98	130.26	124.68
9	L	301	BCL	C2A-C1A-CHA	2.98	129.07	123.86
11	L	304	U10	C20-C19-C21	2.98	120.28	115.27
11	M	406	U10	C10-C9-C11	2.97	120.26	115.27
9	L	302	BCL	OBB-CAB-CBB	-2.90	113.64	120.17
13	L	311	HTO	O3-C3-C4	2.86	115.39	109.15
9	M	403	BCL	C2A-C1A-CHA	2.86	128.87	123.86
9	L	302	BCL	O2A-C1-C2	-2.85	101.14	108.64
9	L	301	BCL	CHA-C1A-NA	-2.85	119.88	126.40
9	M	403	BCL	C4A-NA-C1A	2.82	107.97	106.71
9	L	302	BCL	CMB-C2B-C3B	2.82	129.94	124.68
9	L	301	BCL	C1-O2A-CGA	2.81	123.82	116.44
9	M	402	BCL	CAA-CBA-CGA	2.79	121.42	113.25
10	M	404	BPH	CAC-C3C-C2C	-2.79	107.30	114.26
9	M	402	BCL	CHA-C1A-NA	-2.78	120.02	126.40
9	M	402	BCL	O2A-CGA-O1A	-2.77	116.60	123.59
11	M	406	U10	C26-C27-C28	-2.75	102.84	111.88
16	M	407	SPN	C17-C18-C19	-2.75	115.56	121.12
11	L	304	U10	C25-C24-C23	-2.71	116.72	123.68
10	L	303	BPH	CMB-C2B-C3B	2.70	129.73	124.68
9	M	402	BCL	C16-C15-C13	2.63	124.43	115.92
16	M	407	SPN	CM6-C18-C17	2.63	119.69	115.27
4	M	408	LDA	CM1-N1-C1	2.62	115.75	110.23
11	M	406	U10	C37-C38-C39	-2.62	118.80	127.75

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	M	407	SPN	C20-C21-C22	-2.61	106.72	115.76
9	L	301	BCL	C4B-C3B-CAB	-2.59	122.13	127.13
11	M	406	U10	C4M-O4-C4	2.58	125.61	116.47
11	M	406	U10	C7-C8-C9	-2.56	122.53	126.79
9	M	402	BCL	OBB-CAB-C3B	2.55	124.51	119.99
9	L	302	BCL	C11-C12-C13	-2.54	107.72	115.92
9	L	302	BCL	O2D-CGD-O1D	-2.54	118.88	123.84
9	M	402	BCL	CMB-C2B-C3B	2.53	129.41	124.68
9	M	403	BCL	CMB-C2B-C3B	2.52	129.39	124.68
9	M	403	BCL	C2D-C1D-ND	2.51	111.96	110.10
9	L	301	BCL	CMB-C2B-C1B	-2.51	124.61	128.46
9	L	302	BCL	OBB-CAB-C3B	2.45	124.34	119.99
9	M	402	BCL	C1C-NC-C4C	2.45	107.81	106.71
9	L	302	BCL	C2D-C1D-ND	2.45	111.91	110.10
10	M	404	BPH	O2D-CGD-O1D	-2.40	119.15	123.84
9	L	302	BCL	C16-C17-C18	-2.39	104.72	115.98
13	L	311	HTO	C5-C4-C3	2.37	118.07	114.18
10	M	404	BPH	CMD-C2D-C3D	2.36	129.09	124.68
13	L	312	HTO	O1-C1-C2	-2.36	105.94	111.07
10	M	404	BPH	CAA-CBA-CGA	2.35	120.13	113.25
9	L	301	BCL	CAC-C3C-C2C	-2.32	108.47	114.26
10	L	303	BPH	O2D-CGD-CBD	2.28	113.89	111.00
9	M	402	BCL	C2D-C1D-ND	2.28	111.78	110.10
9	L	302	BCL	C16-C15-C13	2.27	123.24	115.92
9	L	301	BCL	O2A-CGA-CBA	2.20	118.80	111.91
9	M	402	BCL	O2A-C1-C2	-2.19	102.87	108.64
10	L	303	BPH	C4C-C3C-C2C	-2.19	100.76	102.84
4	M	410	LDA	CM1-N1-C1	2.13	114.71	110.23
9	L	301	BCL	CMB-C2B-C3B	2.13	128.66	124.68
16	M	407	SPN	C3-C4-C5	-2.13	123.25	126.79
9	M	403	BCL	OBB-CAB-CBB	-2.11	115.42	120.17
10	L	303	BPH	O2D-CGD-O1D	-2.07	119.79	123.84
11	L	304	U10	C37-C38-C39	-2.06	120.72	127.75

There are no chirality outliers.

All (182) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	M	408	LDA	C2-C1-N1-CM1
4	M	409	LDA	C2-C1-N1-CM1
4	M	410	LDA	C2-C1-N1-CM2
4	M	418	LDA	C2-C1-N1-O1

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Mol	Chain	Res	Type	Atoms
4	M	418	LDA	C2-C1-N1-CM1
9	L	301	BCL	C2C-C3C-CAC-CBC
9	L	301	BCL	C4C-C3C-CAC-CBC
9	L	302	BCL	C4C-C3C-CAC-CBC
9	M	403	BCL	C2C-C3C-CAC-CBC
9	M	403	BCL	C4C-C3C-CAC-CBC
10	M	404	BPH	C4C-C3C-CAC-CBC
10	M	404	BPH	C2C-C3C-CAC-CBC
11	L	304	U10	C12-C13-C14-C15
11	L	304	U10	C12-C13-C14-C16
11	M	406	U10	C14-C16-C17-C18
11	M	406	U10	C27-C28-C29-C30
11	M	406	U10	C27-C28-C29-C31
11	M	406	U10	C37-C38-C39-C40
13	L	311	HTO	O1-C1-C2-O2
13	L	311	HTO	O1-C1-C2-C3
13	L	311	HTO	C1-C2-C3-O3
13	L	311	HTO	C1-C2-C3-C4
13	L	311	HTO	O2-C2-C3-O3
13	L	311	HTO	O2-C2-C3-C4
13	L	311	HTO	O3-C3-C4-C5
13	L	312	HTO	O1-C1-C2-O2
13	L	312	HTO	C1-C2-C3-O3
13	L	312	HTO	C1-C2-C3-C4
13	L	312	HTO	O2-C2-C3-O3
13	L	312	HTO	O2-C2-C3-C4
14	M	401	CDL	CB2-C1-CA2-OA2
14	M	401	CDL	CA2-OA2-PA1-OA3
14	M	401	CDL	CA2-OA2-PA1-OA4
14	M	401	CDL	CA3-OA5-PA1-OA4
14	M	401	CDL	CB3-OB5-PB2-OB3
14	M	401	CDL	CB3-OB5-PB2-OB4
14	M	401	CDL	OB6-CB4-CB6-OB8
16	M	407	SPN	C16-C17-C18-CM6
16	M	407	SPN	C16-C17-C18-C19
11	M	406	U10	C37-C38-C39-C41
13	L	312	HTO	O1-C1-C2-C3
14	M	401	CDL	O1-C1-CA2-OA2
14	M	401	CDL	C39-C40-C41-C42
11	L	304	U10	C37-C38-C39-C40
11	L	304	U10	C29-C31-C32-C33
11	M	406	U10	C19-C21-C22-C23

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>Atoms</b>
11	M	406	U10	C24-C26-C27-C28
11	M	406	U10	C29-C31-C32-C33
11	L	304	U10	C32-C33-C34-C35
10	M	404	BPH	C5-C6-C7-C8
16	M	407	SPN	C26-C27-C28-C29
9	M	402	BCL	C8-C10-C11-C12
14	M	401	CDL	CA2-OA2-PA1-OA5
14	M	401	CDL	CA3-OA5-PA1-OA2
14	M	401	CDL	CB3-OB5-PB2-OB2
14	M	401	CDL	C31-CA7-OA8-CA6
16	M	407	SPN	C11-C10-C9-CM4
14	M	401	CDL	C71-CB7-OB8-CB6
11	L	304	U10	C37-C38-C39-C41
4	M	411	LDA	C6-C7-C8-C9
4	M	418	LDA	C2-C3-C4-C5
14	M	401	CDL	C78-C79-C80-C81
4	M	418	LDA	C4-C5-C6-C7
4	H	301	LDA	C3-C4-C5-C6
14	M	401	CDL	C11-C12-C13-C14
11	M	406	U10	C32-C33-C34-C35
14	M	401	CDL	CA5-C11-C12-C13
14	M	401	CDL	C80-C81-C82-C83
14	M	401	CDL	OA9-CA7-OA8-CA6
14	M	401	CDL	C71-C72-C73-C74
14	M	401	CDL	C51-C52-C53-C54
14	M	401	CDL	C72-C73-C74-C75
11	L	304	U10	C9-C11-C12-C13
14	M	401	CDL	C17-C18-C19-C20
14	M	401	CDL	C20-C21-C22-C23
4	H	301	LDA	C7-C8-C9-C10
14	M	401	CDL	OB9-CB7-OB8-CB6
10	L	303	BPH	O2A-C1-C2-C3
11	M	406	U10	C25-C24-C26-C27
11	M	406	U10	C23-C24-C26-C27
4	M	418	LDA	C5-C6-C7-C8
14	M	401	CDL	CB7-C71-C72-C73
4	M	409	LDA	C1-C2-C3-C4
14	M	401	CDL	C36-C37-C38-C39
4	M	411	LDA	C7-C8-C9-C10
14	M	401	CDL	C16-C17-C18-C19
7	L	310	EDO	O1-C1-C2-O2
7	M	416	EDO	O1-C1-C2-O2

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>Atoms</b>
9	M	403	BCL	C15-C16-C17-C18
10	M	404	BPH	C4-C3-C5-C6
10	M	404	BPH	C2-C3-C5-C6
4	M	418	LDA	C9-C10-C11-C12
4	M	409	LDA	C3-C4-C5-C6
4	M	418	LDA	C7-C8-C9-C10
11	L	304	U10	C34-C36-C37-C38
14	M	401	CDL	C11-CA5-OA6-CA4
4	M	408	LDA	C1-C2-C3-C4
16	M	407	SPN	C11-C10-C9-C8
14	M	401	CDL	C77-C78-C79-C80
14	M	401	CDL	OA7-CA5-OA6-CA4
14	M	401	CDL	C74-C75-C76-C77
4	M	411	LDA	C1-C2-C3-C4
14	M	401	CDL	CB3-CB4-CB6-OB8
14	M	401	CDL	C55-C56-C57-C58
4	H	301	LDA	C1-C2-C3-C4
4	M	409	LDA	C4-C5-C6-C7
16	M	407	SPN	CM2-C1-O1-CMA
10	M	404	BPH	C10-C11-C12-C13
4	M	410	LDA	C4-C5-C6-C7
14	M	401	CDL	OB5-CB3-CB4-CB6
11	L	304	U10	C30-C29-C31-C32
16	M	407	SPN	CM3-C5-C6-C7
4	M	408	LDA	C6-C7-C8-C9
14	M	401	CDL	C40-C41-C42-C43
14	M	401	CDL	C19-C20-C21-C22
11	L	304	U10	C28-C29-C31-C32
14	M	401	CDL	OB5-CB3-CB4-OB6
11	M	406	U10	C20-C19-C21-C22
10	M	404	BPH	C6-C7-C8-C9
10	M	404	BPH	C6-C7-C8-C10
11	M	406	U10	C18-C19-C21-C22
11	M	406	U10	C32-C33-C34-C36
9	L	302	BCL	C15-C16-C17-C18
9	L	302	BCL	CAD-CBD-CGD-O2D
10	L	303	BPH	CAD-CBD-CGD-O2D
10	M	404	BPH	CAD-CBD-CGD-O2D
11	L	304	U10	C5-C4-O4-C4M
4	M	410	LDA	C2-C1-N1-CM1
10	M	404	BPH	C16-C17-C18-C19
10	M	404	BPH	C8-C10-C11-C12

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>Atoms</b>
11	L	304	U10	C32-C33-C34-C36
14	M	401	CDL	CA3-OA5-PA1-OA3
10	L	303	BPH	C4-C3-C5-C6
10	L	303	BPH	C2-C3-C5-C6
13	L	311	HTO	C3-C4-C5-C6
4	M	411	LDA	C5-C6-C7-C8
16	M	407	SPN	C4-C5-C6-C7
4	M	409	LDA	C7-C8-C9-C10
4	H	301	LDA	N1-C1-C2-C3
10	M	404	BPH	C16-C17-C18-C20
16	M	407	SPN	CM5-C13-C14-C15
9	M	402	BCL	C2-C1-O2A-CGA
10	M	404	BPH	C2-C1-O2A-CGA
14	M	401	CDL	OB7-CB5-OB6-CB4
14	M	401	CDL	C14-C15-C16-C17
11	L	304	U10	C20-C19-C21-C22
14	M	401	CDL	C52-C53-C54-C55
11	L	304	U10	C3-C4-O4-C4M
11	M	406	U10	C3-C4-O4-C4M
14	M	401	CDL	CB5-C51-C52-C53
14	M	401	CDL	C51-CB5-OB6-CB4
4	M	411	LDA	C11-C10-C9-C8
11	M	406	U10	C5-C4-O4-C4M
10	L	303	BPH	C8-C10-C11-C12
9	M	402	BCL	C4-C3-C5-C6
11	L	304	U10	C35-C34-C36-C37
11	L	304	U10	C18-C19-C21-C22
4	M	408	LDA	C9-C10-C11-C12
14	M	401	CDL	C32-C31-CA7-OA8
14	M	401	CDL	C18-C19-C20-C21
9	L	301	BCL	CAD-CBD-CGD-O2D
9	M	402	BCL	CAD-CBD-CGD-O2D
10	L	303	BPH	C16-C17-C18-C19
4	M	408	LDA	C5-C6-C7-C8
4	M	408	LDA	C2-C1-N1-CM2
11	L	304	U10	C15-C14-C16-C17
14	M	401	CDL	C72-C71-CB7-OB8
14	M	401	CDL	OA5-CA3-CA4-CA6
9	L	301	BCL	C2A-CAA-CBA-CGA
4	M	411	LDA	C9-C10-C11-C12
14	M	401	CDL	C32-C31-CA7-OA9
16	M	407	SPN	C2-C3-C4-C5

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Mol	Chain	Res	Type	Atoms
4	M	409	LDA	N1-C1-C2-C3
14	M	401	CDL	C72-C71-CB7-OB9
4	M	408	LDA	C7-C8-C9-C10
7	H	307	EDO	O1-C1-C2-O2
4	M	411	LDA	C4-C5-C6-C7
4	M	408	LDA	C2-C1-N1-O1
11	L	304	U10	C16-C17-C18-C19
11	L	304	U10	C33-C34-C36-C37
14	M	401	CDL	OA5-CA3-CA4-OA6
16	M	407	SPN	C12-C13-C14-C15

There are no ring outliers.

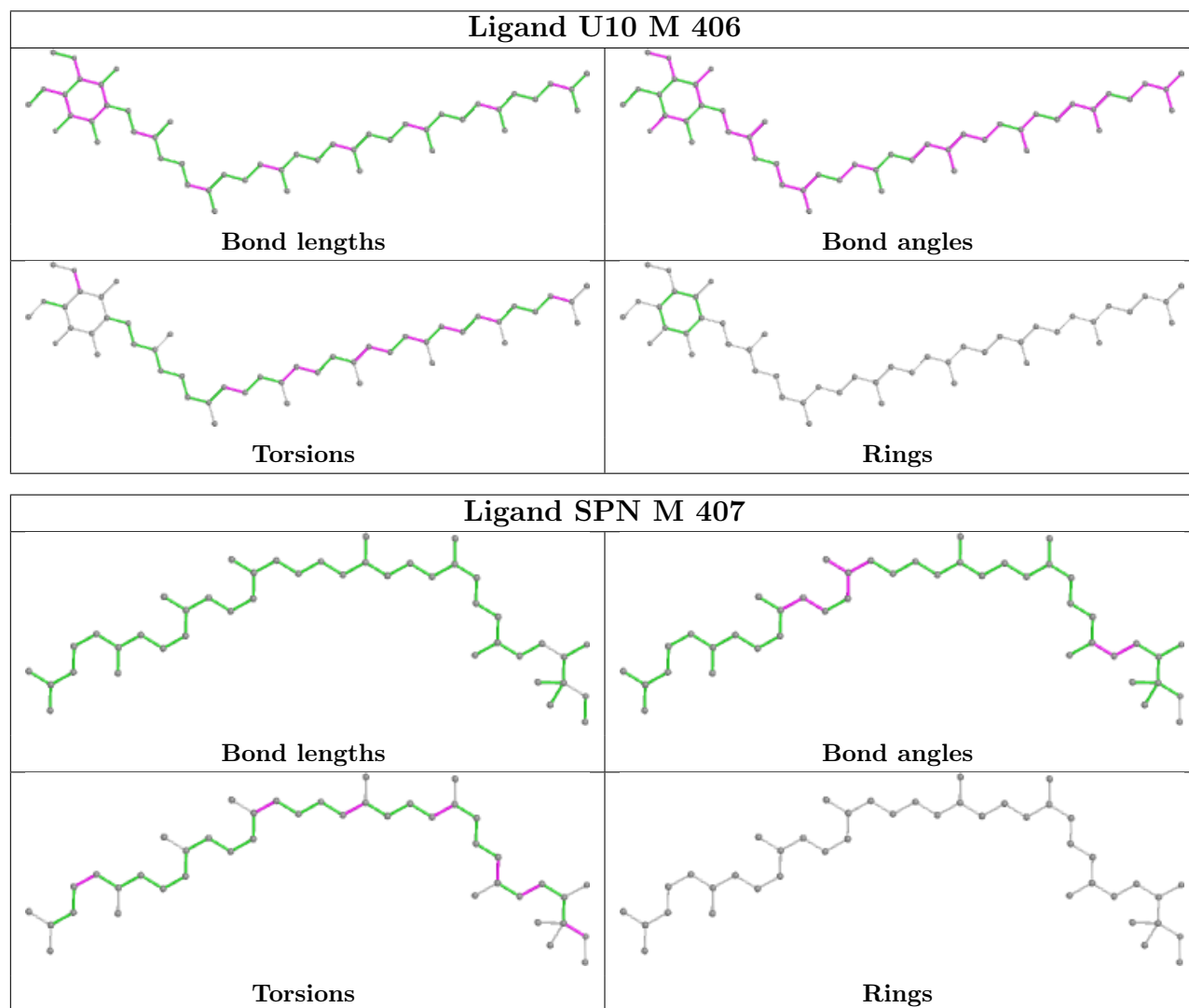
18 monomers are involved in 46 short contacts:

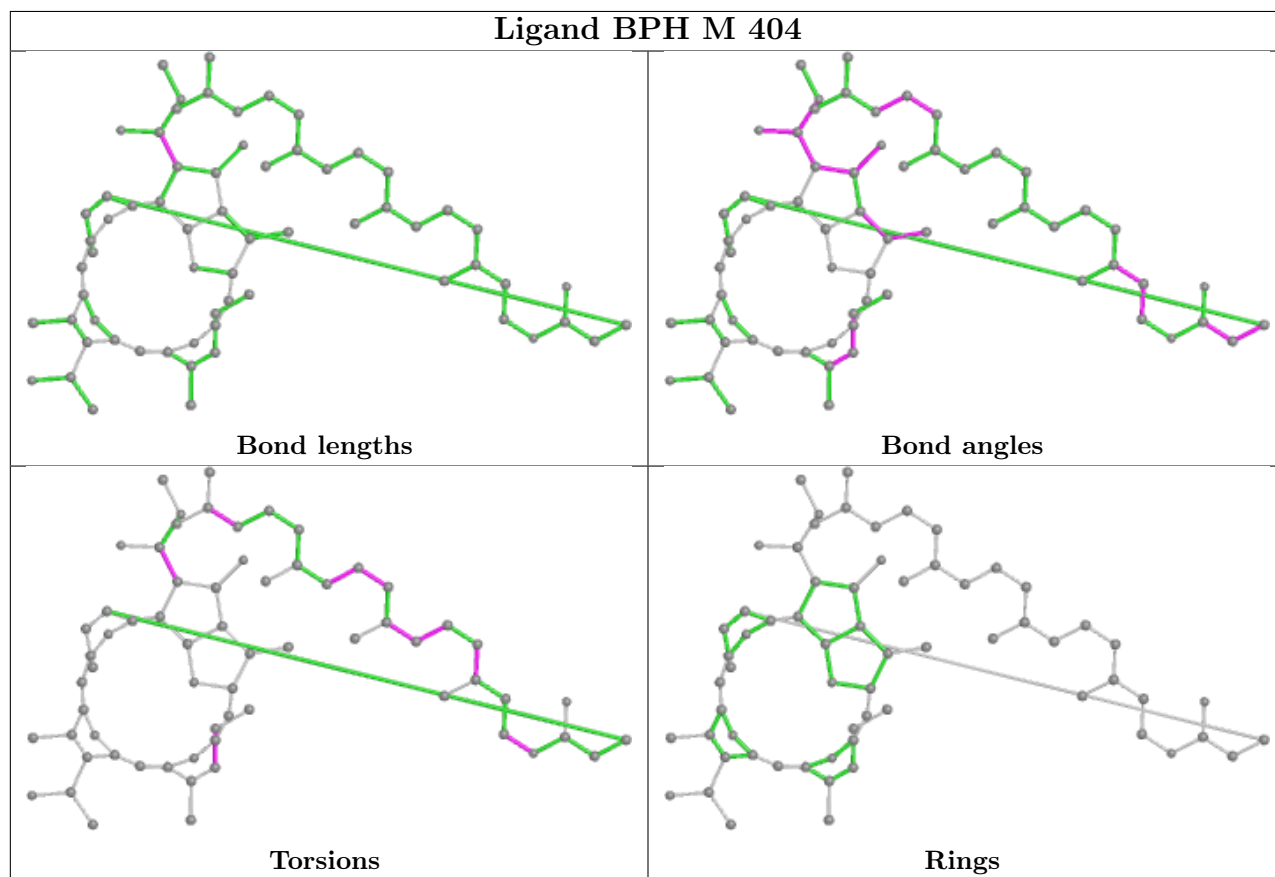
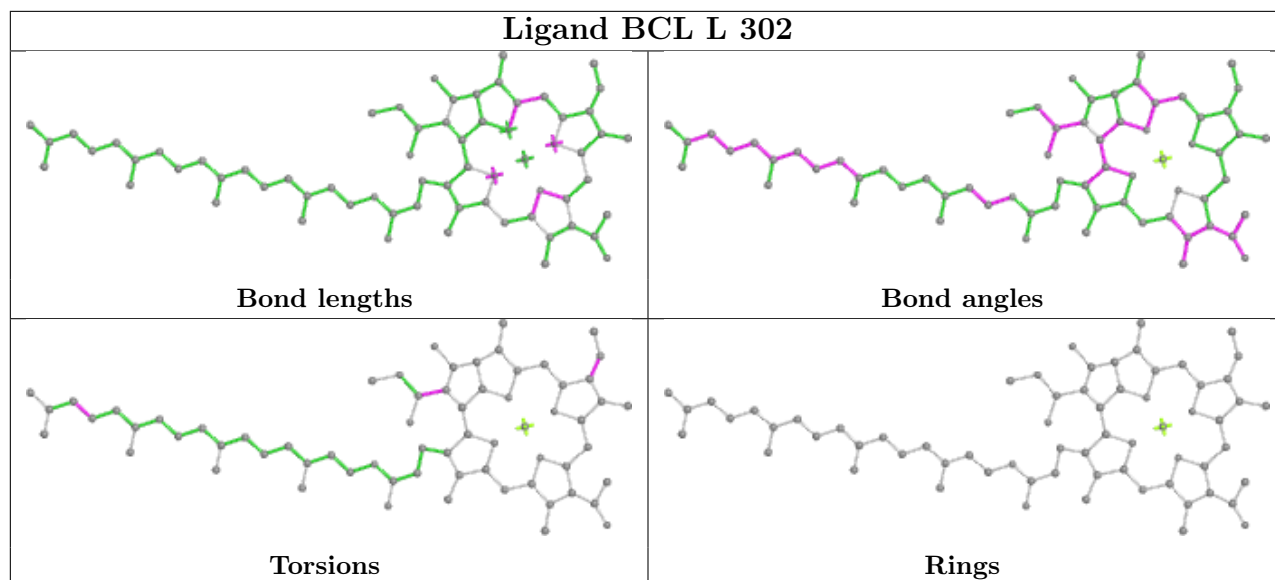
Mol	Chain	Res	Type	Clashes	Symm-Clashes
11	M	406	U10	2	0
16	M	407	SPN	5	0
4	M	408	LDA	1	0
9	L	302	BCL	3	0
4	M	410	LDA	1	0
4	M	418	LDA	2	0
10	M	404	BPH	5	0
9	L	301	BCL	5	0
7	H	308	EDO	1	0
7	H	310	EDO	1	0
14	M	401	CDL	10	0
9	M	403	BCL	6	0
12	L	309	DIO	1	0
9	M	402	BCL	5	0
7	M	416	EDO	2	0
4	H	301	LDA	3	0
10	L	303	BPH	1	0
11	L	304	U10	3	0

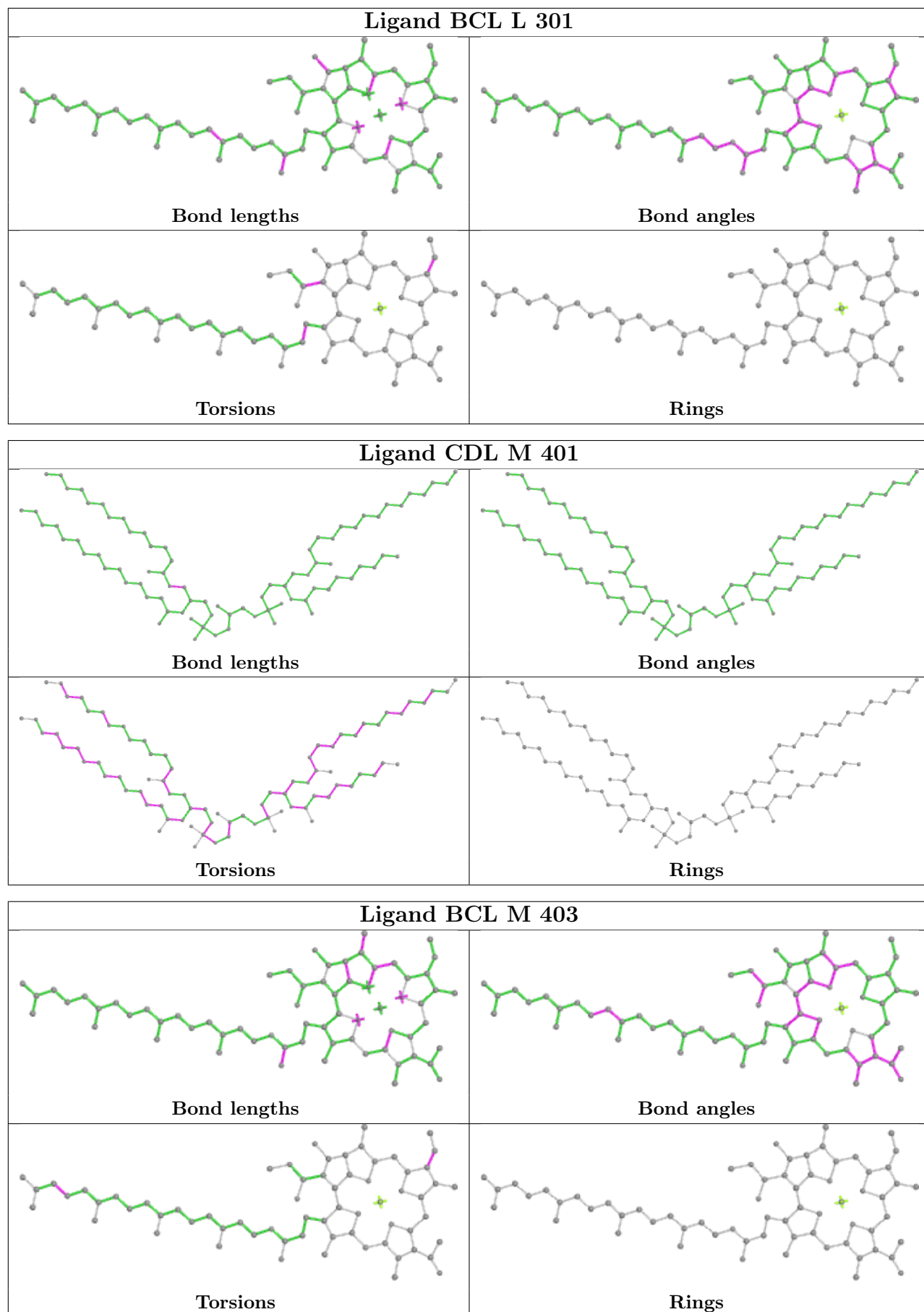
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

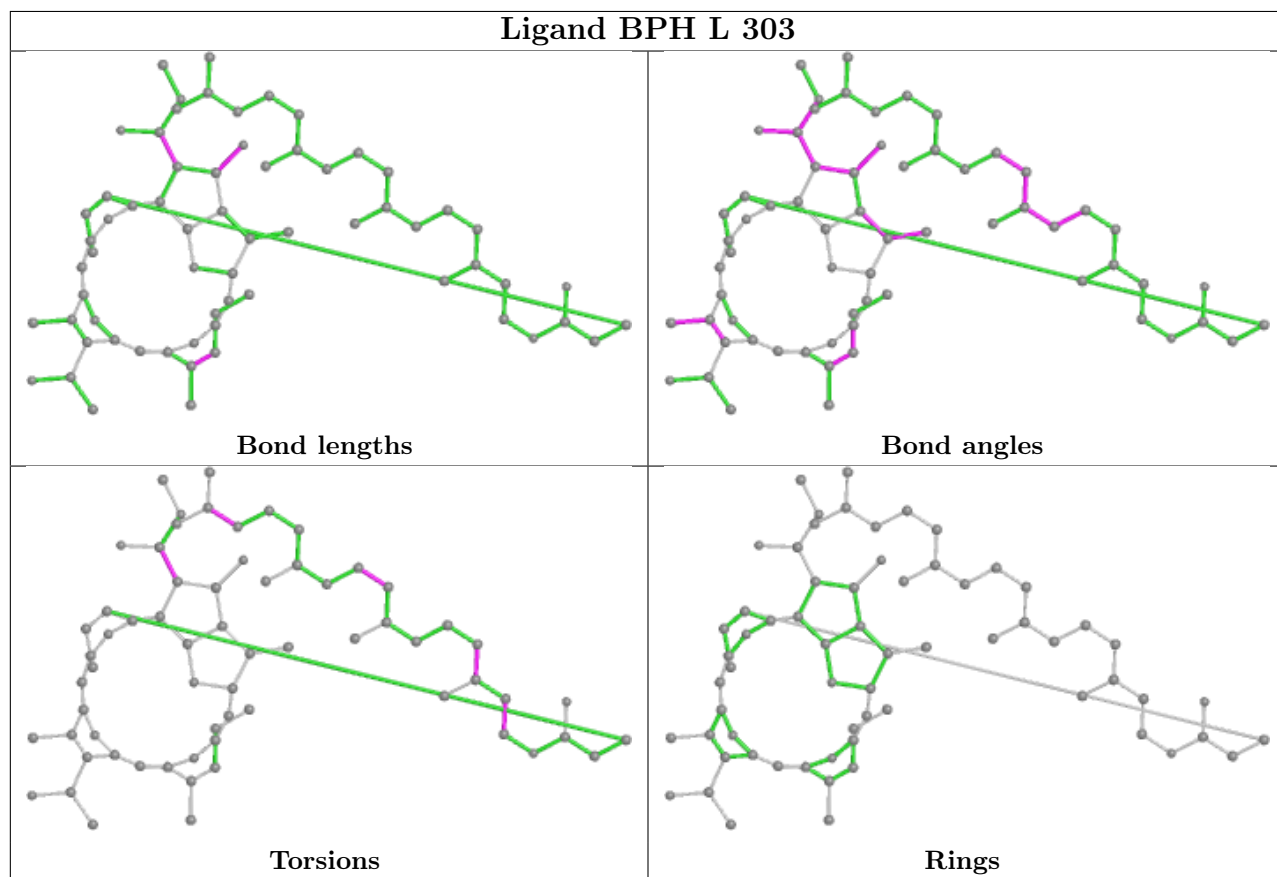
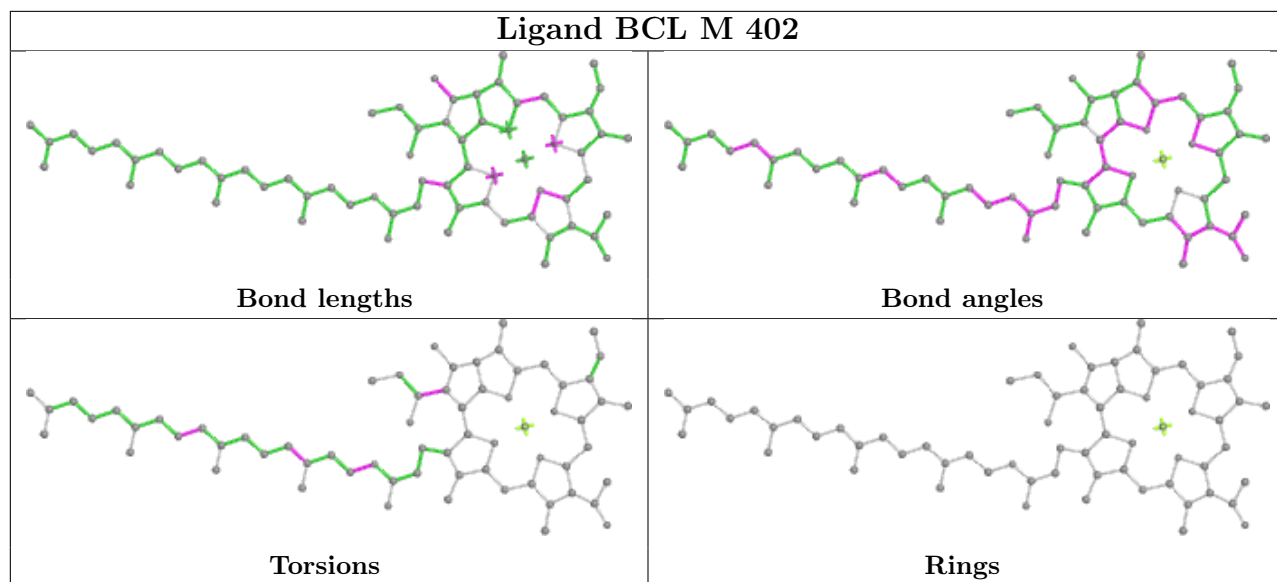


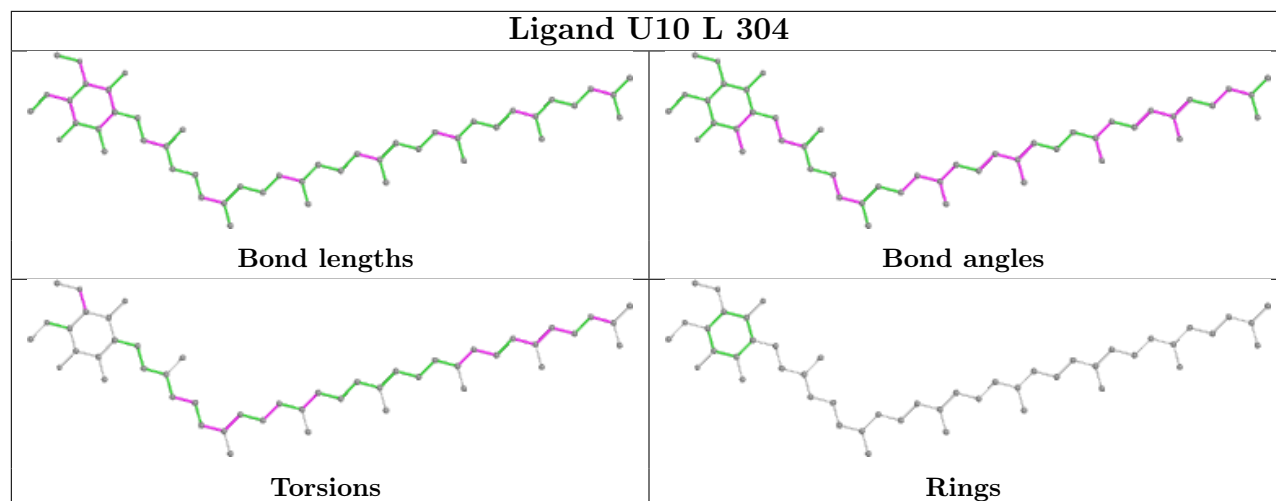
average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents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

### 6.1 Protein, DNA and RNA chains [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	H	240/242 (99%)	-0.60	1 (0%) 92   92	3, 12, 31, 88	0
2	L	281/281 (100%)	-0.56	2 (0%) 87   87	2, 11, 45, 99	0
3	M	302/303 (99%)	-0.57	1 (0%) 94   94	2, 12, 33, 64	0
All	All	823/826 (99%)	-0.58	4 (0%) 91   90	2, 12, 36, 99	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	250	SER	4.9
2	L	59	TRP	4.1
2	L	281	GLY	3.3
3	M	106	ALA	2.3

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

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

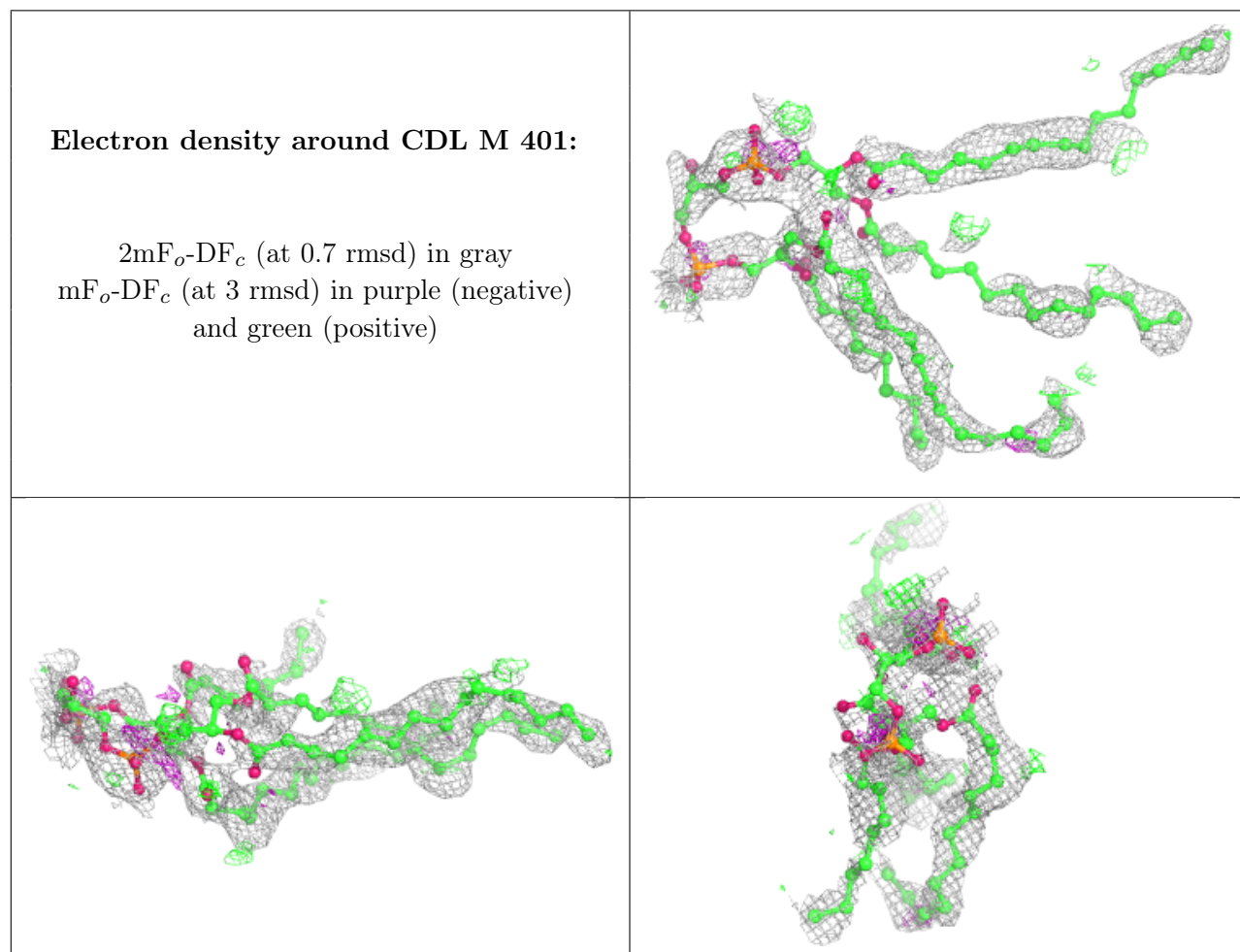
### 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
13	HTO	L	311	10/10	0.79	0.46	13,40,50,61	10
7	EDO	H	310	4/4	0.81	0.25	17,21,30,33	0
14	CDL	M	401	81/100	0.81	0.37	5,45,99,121	0
4	LDA	M	410	16/16	0.83	0.28	12,22,71,79	0
5	UNL	L	307	10/-	0.84	0.57	19,42,59,70	0
4	LDA	M	411	16/16	0.84	0.57	22,46,70,71	0
4	LDA	M	418	16/16	0.85	0.48	31,42,60,62	0
11	U10	L	304	48/63	0.85	0.26	7,25,39,51	0
5	UNL	L	308	12/-	0.86	0.28	6,30,58,62	0
5	UNL	M	413	12/-	0.86	0.30	12,25,37,40	0
4	LDA	M	409	16/16	0.86	0.28	6,25,61,69	0
6	PO4	M	415	5/5	0.88	0.27	16,32,55,61	5
5	UNL	H	303	12/-	0.89	0.38	18,25,44,56	0
5	UNL	M	412	15/-	0.89	0.18	15,20,35,39	0
5	UNL	H	305	15/-	0.90	0.33	1,31,51,60	0
12	DIO	L	309	6/6	0.90	0.24	25,31,37,37	0
7	EDO	H	309	4/4	0.90	0.26	12,16,34,35	0
5	UNL	L	305	12/-	0.90	0.35	15,30,40,48	0
5	UNL	L	306	15/-	0.91	0.32	5,18,41,48	0
13	HTO	L	312	10/10	0.91	0.67	22,64,78,78	0
4	LDA	H	301	16/16	0.91	0.24	14,27,43,44	0
7	EDO	H	308	4/4	0.92	0.41	20,43,44,55	0
5	UNL	H	304	12/-	0.93	0.27	14,34,46,52	0
16	SPN	M	407	43/43	0.93	0.21	2,14,30,56	0
8	K	H	311	1/1	0.94	0.08	19,19,19,19	0
10	BPH	M	404	65/65	0.94	0.16	2,12,48,64	0
4	LDA	M	408	16/16	0.94	0.17	1,9,25,26	0
11	U10	M	406	48/63	0.94	0.17	1,8,26,43	0
5	UNL	H	302	12/-	0.94	0.20	6,17,24,39	0
7	EDO	H	307	4/4	0.94	0.15	9,14,15,19	0
7	EDO	L	310	4/4	0.94	0.33	19,31,40,44	0
7	EDO	M	416	4/4	0.94	0.27	19,23,27,36	0
7	EDO	M	417	4/4	0.94	0.21	6,8,9,10	0
6	PO4	M	414	5/5	0.95	0.09	22,24,52,58	0
6	PO4	H	306	5/5	0.95	0.15	29,55,63,72	0
9	BCL	M	402	66/66	0.95	0.15	1,7,30,41	0
9	BCL	M	403	66/66	0.95	0.15	1,4,19,28	0
9	BCL	L	301	66/66	0.96	0.14	1,3,11,24	0
9	BCL	L	302	66/66	0.96	0.15	1,7,18,30	0
10	BPH	L	303	65/65	0.97	0.12	1,5,13,22	0
15	FE	M	405	1/1	0.99	0.06	6,6,6,6	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

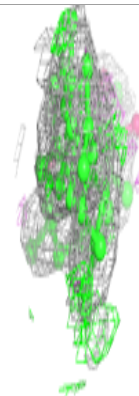
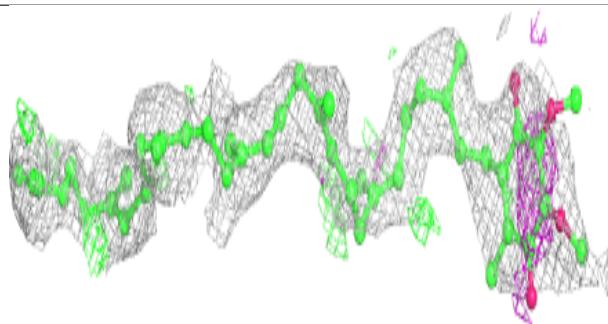
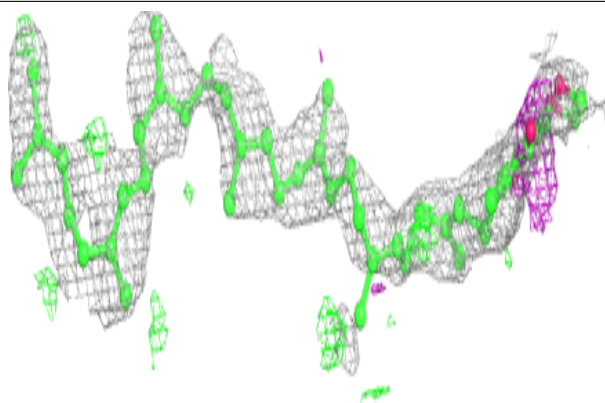
as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



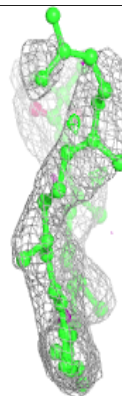
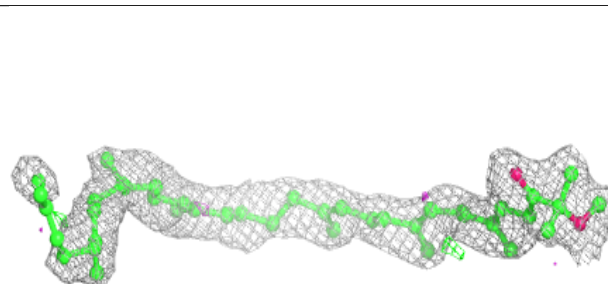
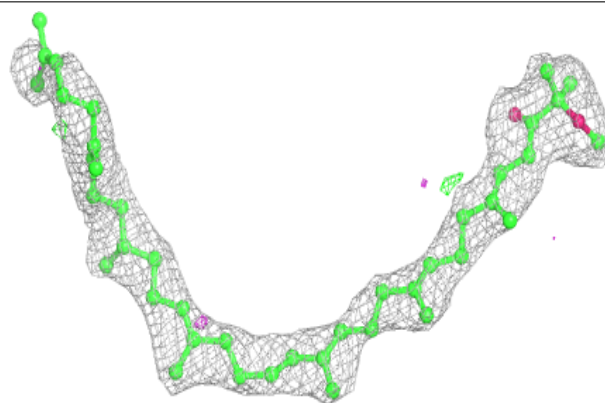


**Electron density around U10 L 304:**

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

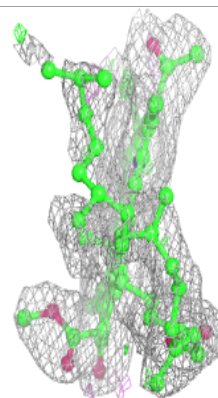
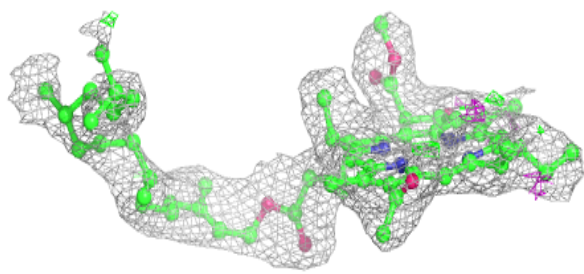
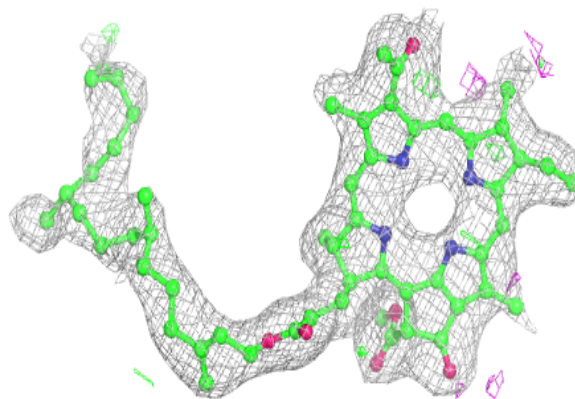
**Electron density around SPN M 407:**

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

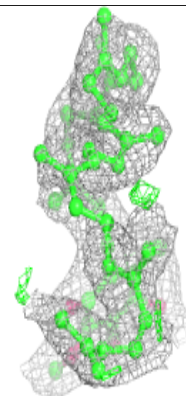
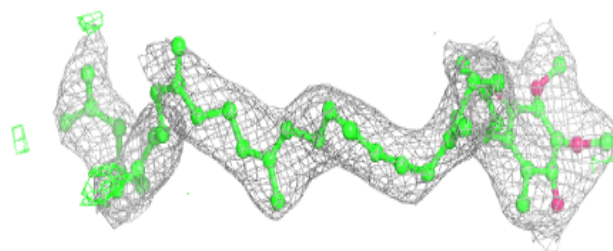
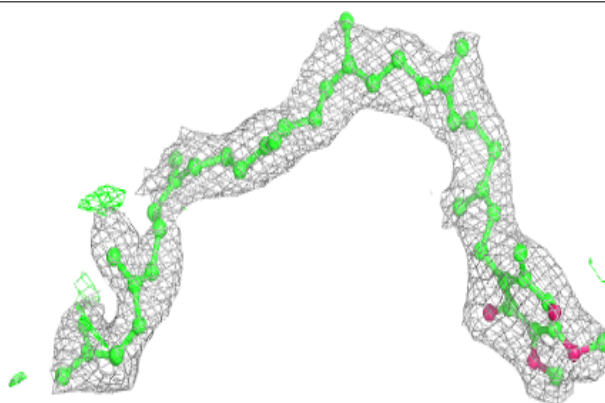


**Electron density around BPH M 404:**

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

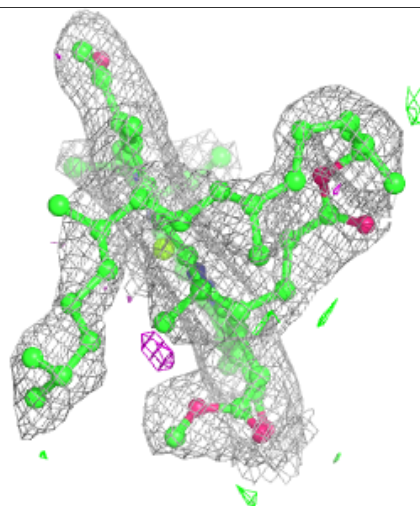
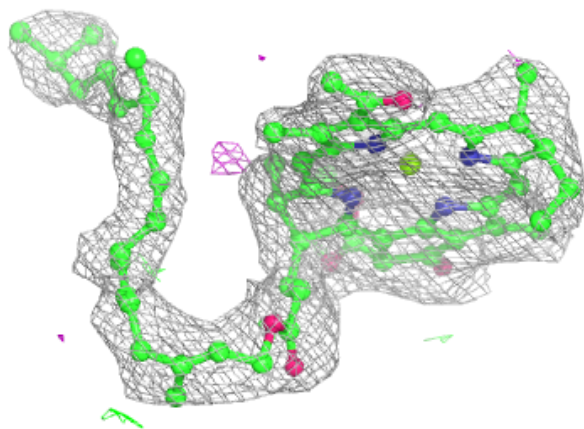
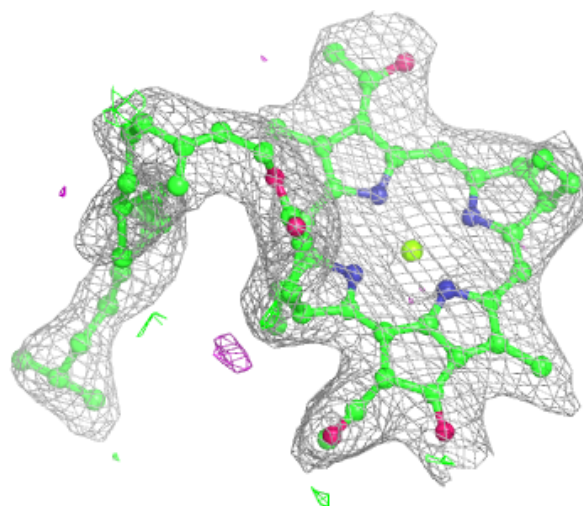
**Electron density around U10 M 406:**

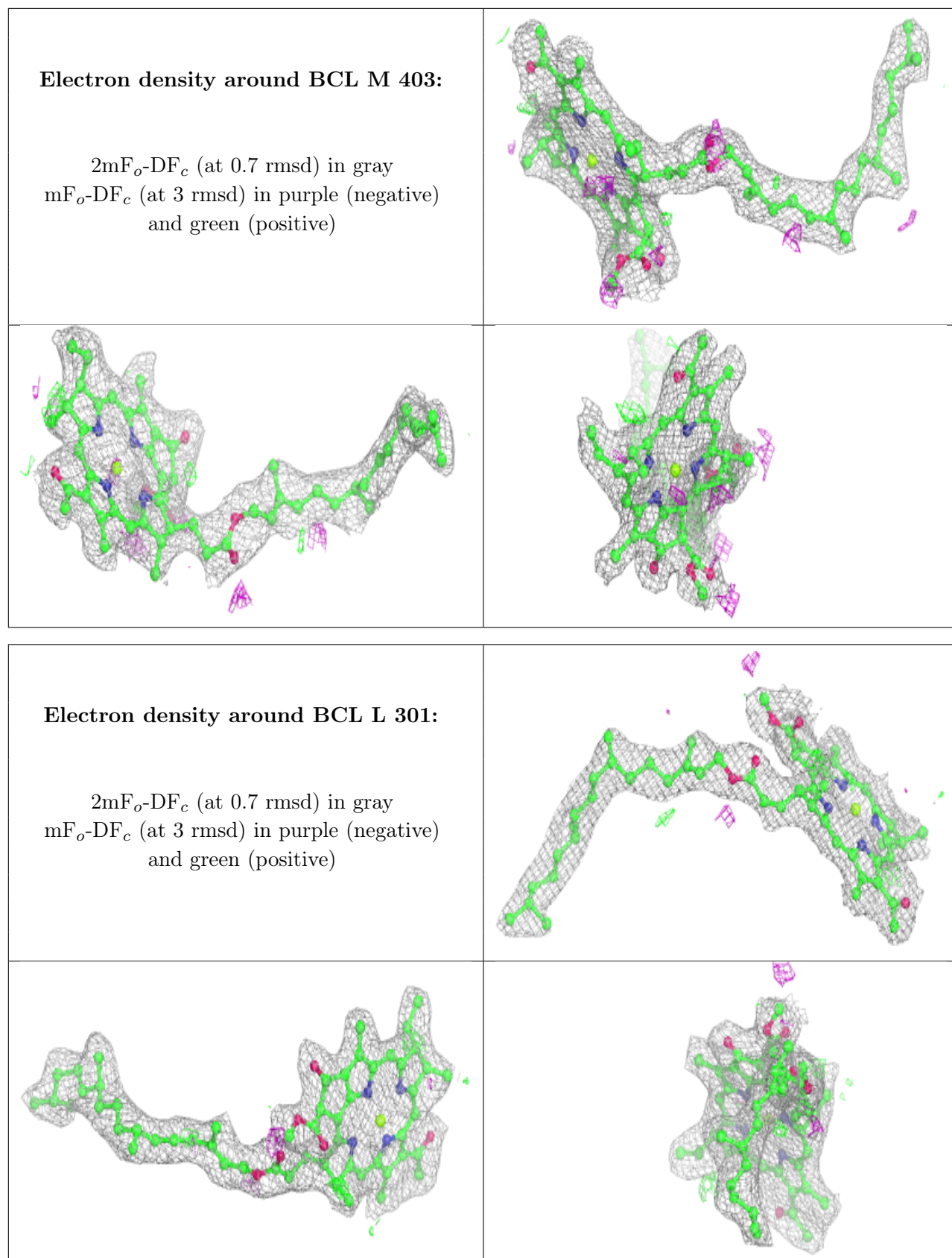
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around BCL M 402:**

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

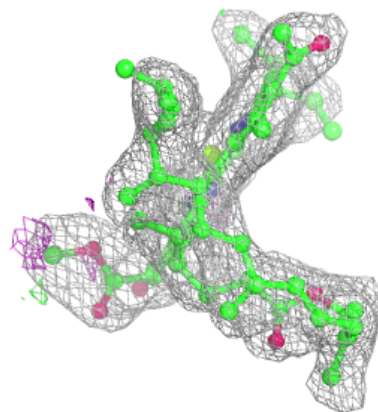
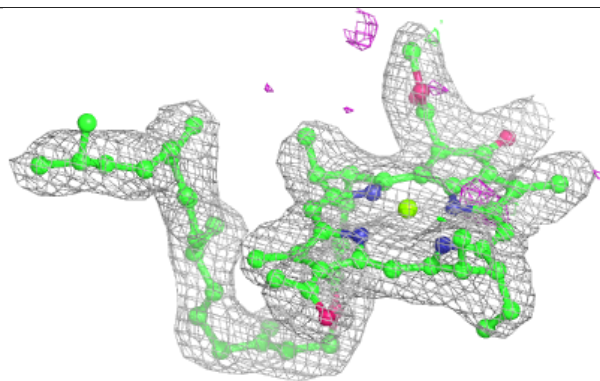
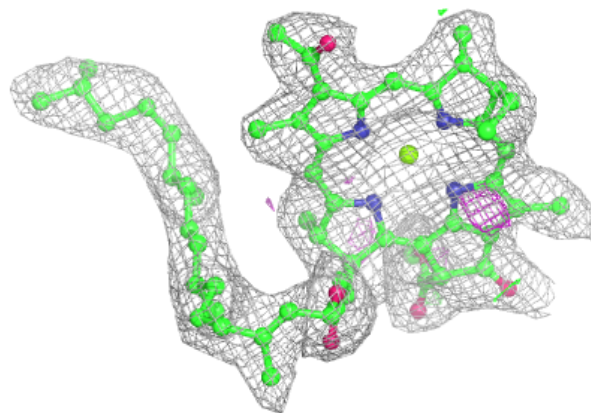






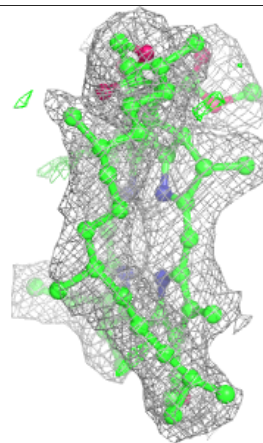
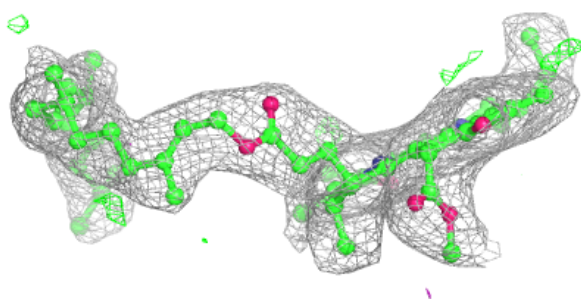
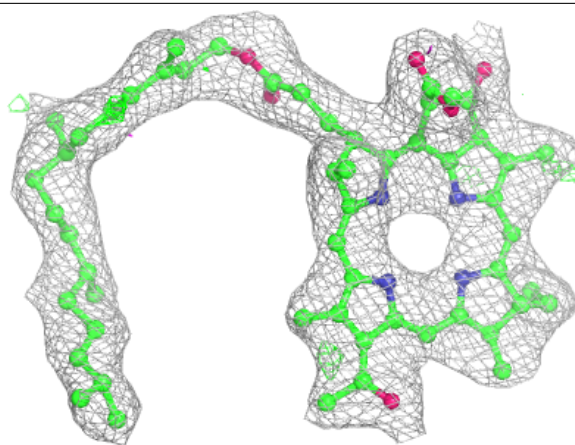
**Electron density around BCL L 302:**

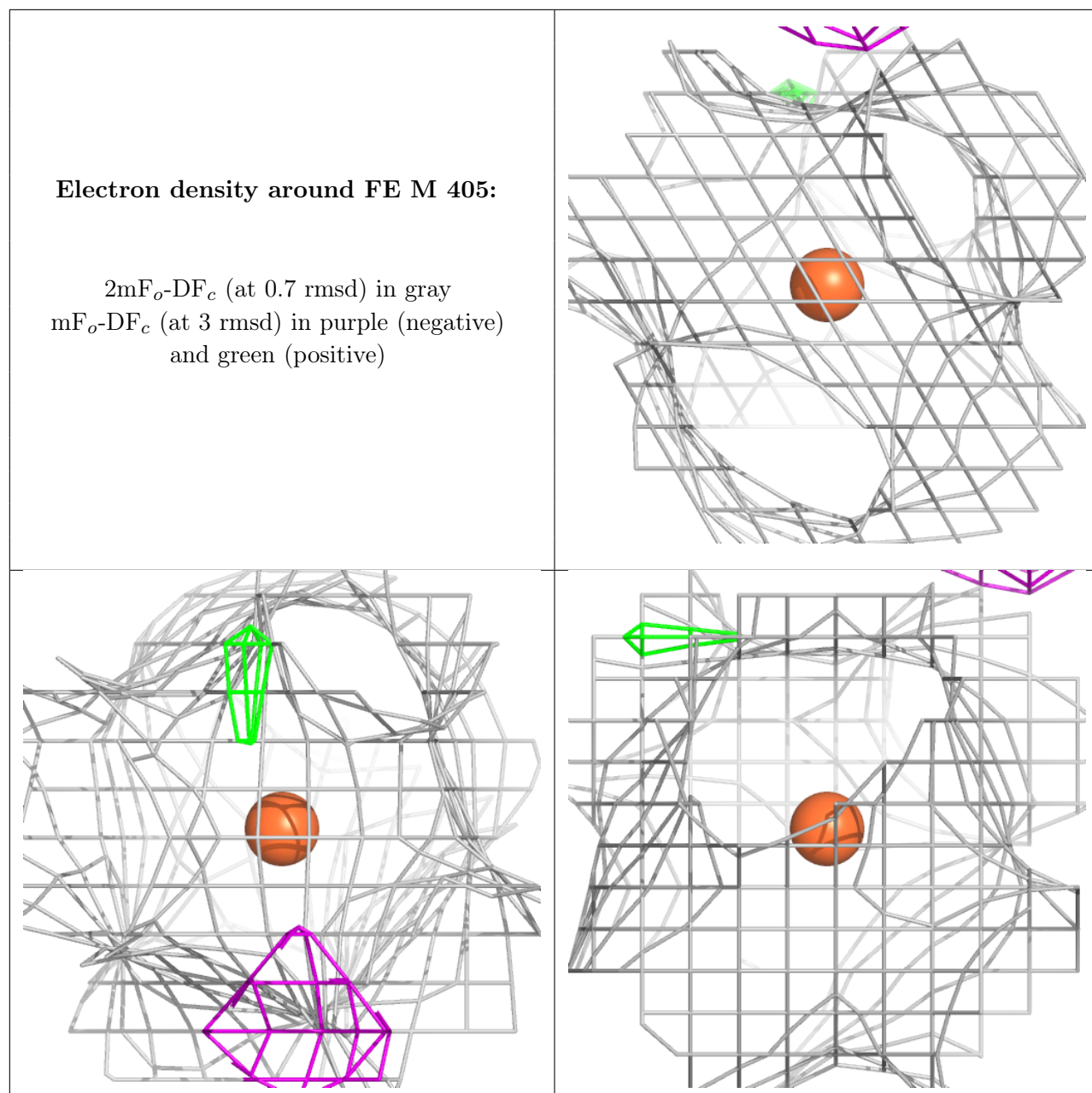
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around BPH L 303:**

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





## 6.5 Other polymers [i](#)

There are no such residues in this entry.