



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 22, 2023 – 05:16 PM EDT

PDB ID : 3BEN  
Title : Structure of N-(12-imidazolyl-dodecanoyl)-L-leucine inhibitor bound to the heme domain of Cytochrome P450-BM3  
Authors : Tomchick, D.R.  
Deposited on : 2007-11-19  
Resolution : 1.65 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>.

---

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
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) : 2.35

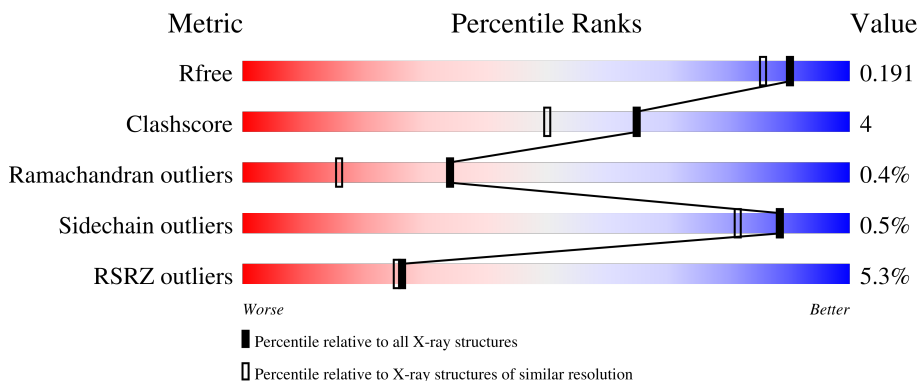
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

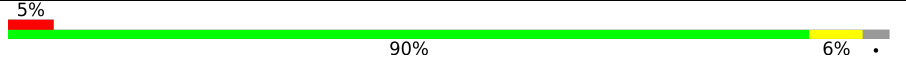
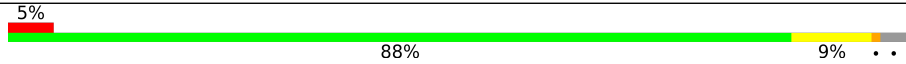
The reported resolution of this entry is 1.65 Å.

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	1827 (1.66-1.66)
Clashscore	141614	1931 (1.66-1.66)
Ramachandran outliers	138981	1891 (1.66-1.66)
Sidechain outliers	138945	1891 (1.66-1.66)
RSRZ outliers	127900	1791 (1.66-1.66)

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	A	470	 5% 90% 6% .
1	B	470	 5% 88% 9% ..







Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
5	B	1	12	6	1	4	1	0	0

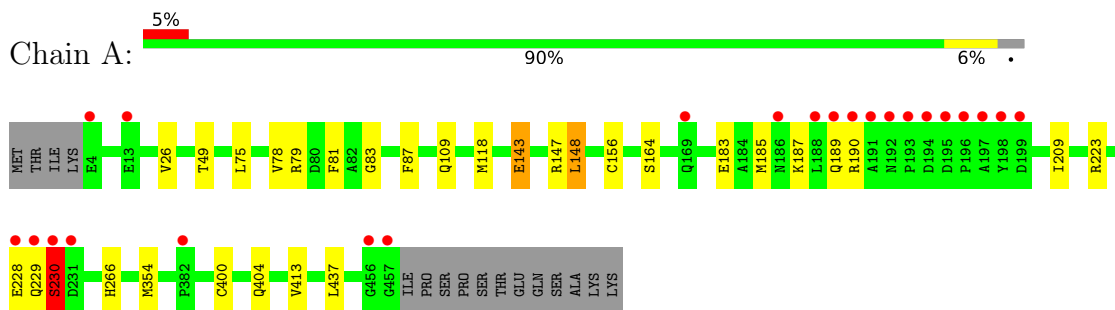
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	456	Total	O	0	0
			456	456		
6	B	448	Total	O	0	0
			448	448		

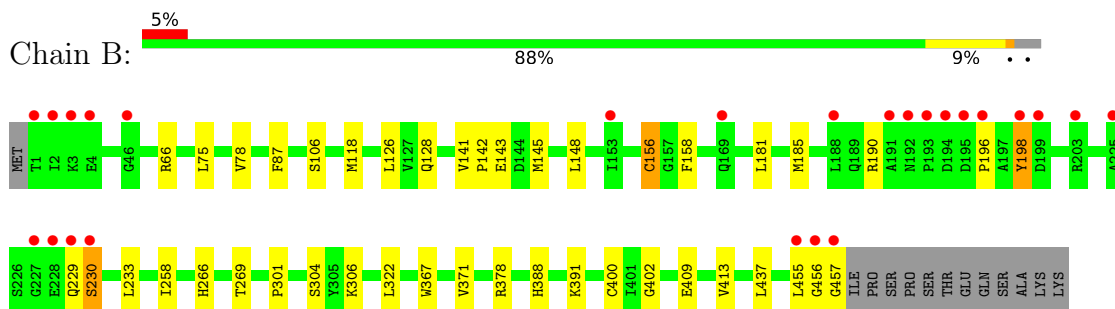
### 3 Residue-property plots [i](#)

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: Cytochrome P450 102



- Molecule 1: Cytochrome P450 102



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.82Å 148.21Å 63.79Å 90.00° 98.32° 90.00°	Depositor
Resolution (Å)	30.00 – 1.65 29.04 – 1.65	Depositor EDS
% Data completeness (in resolution range)	97.2 (30.00-1.65) 97.2 (29.04-1.65)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.68 (at 1.65Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.161 , 0.191 0.162 , 0.191	Depositor DCC
$R_{free}$ test set	3825 reflections (3.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	16.7	Xtrriage
Anisotropy	0.104	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 51.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	8685	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	18.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.38% 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: MG, LEH, MES, HEM

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	0.69	1/3863 (0.0%)	0.75	1/5219 (0.0%)
1	B	0.75	5/3849 (0.1%)	0.79	4/5199 (0.1%)
All	All	0.72	6/7712 (0.1%)	0.77	5/10418 (0.0%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	198	TYR	CG-CD2	9.37	1.51	1.39
1	B	198	TYR	CE1-CZ	8.57	1.49	1.38
1	A	156	CYS	CB-SG	-7.41	1.69	1.82
1	B	156	CYS	CB-SG	-6.32	1.71	1.82
1	B	143	GLU	CG-CD	5.58	1.60	1.51
1	B	378	ARG	CB-CG	-5.35	1.38	1.52

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	66	ARG	NE-CZ-NH1	7.80	124.20	120.30
1	B	455	LEU	CA-CB-CG	5.86	128.78	115.30
1	A	143	GLU	OE1-CD-OE2	-5.26	116.99	123.30
1	B	378	ARG	CB-CA-C	-5.19	100.02	110.40
1	B	66	ARG	NE-CZ-NH2	-5.09	117.75	120.30

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	A	3778	0	3727	24	0
1	B	3764	0	3734	35	0
2	A	86	0	60	3	0
2	B	86	0	60	6	0
3	A	27	0	36	7	0
3	B	27	0	36	5	0
4	B	1	0	0	0	0
5	B	12	0	12	0	0
6	A	456	0	0	2	0
6	B	448	0	0	6	0
All	All	8685	0	7665	64	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 (64) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:413[B]:VAL:HG13	6:B:690:HOH:O	1.48	1.12
1:A:78:VAL:HG21	3:A:500:LEH:H13	1.55	0.88
1:A:49[B]:THR:HG21	1:A:354[B]:MET:HG2	1.63	0.79
1:B:306:LYS:N	1:B:306:LYS:HD3	2.01	0.76
1:A:49[B]:THR:CG2	1:A:354[B]:MET:HG2	2.21	0.71
1:B:181:LEU:O	1:B:185[B]:MET:HG3	1.91	0.70
1:A:109:GLN:HB2	1:A:404[A]:GLN:OE1	1.91	0.69
1:A:185:MET:SD	3:A:500:LEH:H9A	2.33	0.68
1:B:413[B]:VAL:CG1	6:B:690:HOH:O	2.23	0.64
2:B:471[A]:HEM:HBC2	2:B:471[A]:HEM:HMC1	1.78	0.64
1:A:75:LEU:HD21	1:A:87:PHE:HE2	1.66	0.61
1:A:118[A]:MET:SD	6:A:711:HOH:O	2.56	0.59
1:A:437:LEU:HD23	1:A:437:LEU:H	1.69	0.57
1:B:75:LEU:HD21	1:B:87:PHE:HE1	1.70	0.57
1:B:306:LYS:N	1:B:306:LYS:CD	2.67	0.57
3:B:500:LEH:O3	3:B:500:LEH:H4	2.05	0.56
1:B:437:LEU:HB2	3:B:500:LEH:H12A	1.88	0.56

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:437:LEU:H	1:B:437:LEU:HD23	1.71	0.55
1:B:181:LEU:O	1:B:185[A]:MET:HG2	2.09	0.53
1:B:409:GLU:O	1:B:413[B]:VAL:HG22	2.09	0.53
1:B:78:VAL:HG21	3:B:500:LEH:H13	1.90	0.52
1:B:306:LYS:CD	1:B:306:LYS:H	2.24	0.51
1:A:148:LEU:HD21	1:A:413[A]:VAL:HG21	1.92	0.51
1:A:26:VAL:CG2	3:A:500:LEH:H5	2.40	0.50
1:B:304:SER:HB2	1:B:306:LYS:NZ	2.26	0.50
1:A:223:ARG:HD3	1:A:228:GLU:HG2	1.94	0.49
1:A:143:GLU:HG2	6:A:864:HOH:O	2.12	0.49
1:A:79:ARG:HG3	1:A:83:GLY:O	2.13	0.48
1:B:306:LYS:HD3	1:B:306:LYS:H	1.74	0.48
1:A:229:GLN:C	1:A:230:SER:O	2.51	0.48
1:B:126[B]:LEU:HD11	1:B:145:MET:CE	2.44	0.47
1:B:118[A]:MET:CE	1:B:156:CYS:HA	2.44	0.47
1:B:400:CYS:HA	2:B:471[A]:HEM:CHA	2.45	0.47
1:A:49[B]:THR:HG21	1:A:354[B]:MET:CG	2.39	0.47
1:A:185:MET:SD	3:A:500:LEH:C9	3.02	0.47
1:B:229:GLN:C	1:B:230:SER:O	2.49	0.47
1:B:367:TRP:HB2	1:B:371:VAL:HG12	1.97	0.46
1:B:128[A]:GLN:NE2	6:B:709:HOH:O	2.48	0.46
1:A:26:VAL:HG22	3:A:500:LEH:H5	1.98	0.45
1:A:183:GLU:HG3	1:A:187:LYS:HE3	1.99	0.45
1:B:269:THR:HA	2:B:471[A]:HEM:HAB	1.98	0.45
1:B:402:GLY:HA3	2:B:471[B]:HEM:C2B	2.51	0.45
1:B:118[A]:MET:HE1	6:B:880:HOH:O	2.17	0.44
1:B:158:PHE:CE1	1:B:258:ILE:HG12	2.53	0.44
1:B:388:HIS:HA	1:B:391:LYS:HD3	1.99	0.44
1:A:75:LEU:HD23	3:A:500:LEH:H13A	1.99	0.44
1:B:301:PRO:HB2	1:B:456:GLY:HA3	1.99	0.43
1:B:306:LYS:H	1:B:306:LYS:CE	2.31	0.43
1:B:75:LEU:HD23	3:B:500:LEH:H13A	2.00	0.43
1:B:190:ARG:HG2	1:B:198:TYR:CZ	2.53	0.43
1:B:126[B]:LEU:HD11	1:B:145:MET:HE2	2.00	0.43
1:A:75:LEU:CD2	3:A:500:LEH:H13A	2.48	0.43
2:A:470[A]:HEM:HMB2	2:A:470[A]:HEM:HBB2	2.00	0.43
1:A:147:ARG:HG2	1:A:164:SER:HB3	2.01	0.43
1:A:400:CYS:HA	2:A:470[A]:HEM:CHA	2.50	0.42
1:B:106:SER:HB3	1:B:233:LEU:HD23	2.01	0.42
1:A:81:PHE:HB3	1:A:209:ILE:HG12	2.02	0.42
2:A:470[A]:HEM:HBC2	2:A:470[A]:HEM:HMC2	2.02	0.42

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:457:GLY:HA2	6:B:904:HOH:O	2.20	0.42
1:A:189:GLN:O	1:A:190:ARG:HG3	2.19	0.42
1:B:400:CYS:HA	2:B:471[A]:HEM:C4D	2.56	0.41
1:B:141:VAL:HB	1:B:142:PRO:HD3	2.03	0.40
1:B:322:LEU:HD23	6:B:723:HOH:O	2.20	0.40
2:B:471[A]:HEM:C1D	3:B:500:LEH:H19	2.57	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	467/470 (99%)	450 (96%)	15 (3%)	2 (0%)	34	16
1	B	465/470 (99%)	452 (97%)	11 (2%)	2 (0%)	34	16
All	All	932/940 (99%)	902 (97%)	26 (3%)	4 (0%)	34	16

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	230	SER
1	B	266	HIS
1	A	266	HIS
1	B	196	PRO

### 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	411/411 (100%)	409 (100%)	2 (0%)	88	81
1	B	409/411 (100%)	407 (100%)	2 (0%)	88	81
All	All	820/822 (100%)	816 (100%)	4 (0%)	88	81

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	148	LEU
1	A	230	SER
1	B	148	LEU
1	B	230	SER

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

Mol	Chain	Res	Type
1	B	201	ASN

### 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 8 ligands modelled in this entry, 1 is monoatomic - leaving 7 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
3	LEH	A	500	2	26,27,27	1.68	3 (11%)	30,32,32	0.92	1 (3%)
5	MES	B	490	-	12,12,12	1.82	1 (8%)	14,16,16	7.11	8 (57%)
3	LEH	B	500	2	26,27,27	1.83	3 (11%)	30,32,32	1.08	3 (10%)
2	HEM	A	470[A]	1,3	41,50,50	1.89	6 (14%)	45,82,82	1.67	13 (28%)
2	HEM	B	471[A]	1,3	41,50,50	1.81	6 (14%)	45,82,82	1.55	8 (17%)
2	HEM	A	470[B]	1,3	41,50,50	1.90	6 (14%)	45,82,82	1.57	7 (15%)
2	HEM	B	471[B]	1,3	41,50,50	1.85	7 (17%)	45,82,82	1.66	12 (26%)

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
3	LEH	A	500	2	-	7/26/26/26	0/1/1/1
5	MES	B	490	-	-	2/6/14/14	0/1/1/1
3	LEH	B	500	2	-	12/26/26/26	0/1/1/1
2	HEM	A	470[A]	1,3	-	0/12/54/54	-
2	HEM	B	471[A]	1,3	-	2/12/54/54	-
2	HEM	A	470[B]	1,3	-	3/12/54/54	-
2	HEM	B	471[B]	1,3	-	2/12/54/54	-

All (32) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	470[B]	HEM	C3D-C2D	7.67	1.53	1.36
3	B	500	LEH	C20-N2	-7.49	1.23	1.37
2	B	471[B]	HEM	C3D-C2D	7.03	1.51	1.36
2	A	470[A]	HEM	C3D-C2D	7.01	1.51	1.36
3	A	500	LEH	C20-N2	-6.74	1.25	1.37
2	B	471[A]	HEM	C3D-C2D	6.68	1.50	1.36
5	B	490	MES	C8-S	-5.78	1.69	1.77
2	A	470[A]	HEM	C3C-CAC	4.28	1.56	1.47
2	A	470[A]	HEM	C3C-C2C	-4.20	1.34	1.40
2	B	471[B]	HEM	C3C-C2C	-4.18	1.34	1.40
2	A	470[B]	HEM	C3C-C2C	-4.07	1.34	1.40

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	471[A]	HEM	C3C-CAC	3.84	1.55	1.47
2	B	471[A]	HEM	C3C-C2C	-3.83	1.35	1.40
3	B	500	LEH	C20-C21	-3.69	1.22	1.36
3	A	500	LEH	C20-C21	-3.48	1.23	1.36
2	B	471[B]	HEM	C3C-CAC	3.38	1.54	1.47
2	A	470[B]	HEM	C3C-CAC	3.28	1.54	1.47
2	B	471[B]	HEM	CMD-C2D	2.98	1.57	1.50
2	B	471[A]	HEM	CAB-C3B	2.95	1.55	1.47
2	A	470[B]	HEM	CAB-C3B	2.95	1.55	1.47
2	B	471[B]	HEM	CAB-C3B	2.75	1.54	1.47
2	A	470[A]	HEM	CAB-C3B	2.73	1.54	1.47
2	B	471[A]	HEM	CMA-C3A	2.62	1.57	1.51
2	B	471[B]	HEM	FE-ND	2.58	2.09	1.96
3	A	500	LEH	C21-N3	-2.57	1.25	1.37
2	B	471[A]	HEM	FE-ND	2.53	2.09	1.96
2	A	470[B]	HEM	CMB-C2B	2.38	1.55	1.50
3	B	500	LEH	C21-N3	-2.37	1.26	1.37
2	A	470[A]	HEM	O1A-CGA	2.22	1.29	1.22
2	A	470[B]	HEM	O1D-CGD	2.15	1.29	1.22
2	B	471[B]	HEM	CMB-C2B	2.10	1.55	1.50
2	A	470[A]	HEM	FE-ND	2.10	2.07	1.96

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	490	MES	O1S-S-C8	-15.84	87.84	106.92
5	B	490	MES	O2S-S-C8	-14.57	89.37	106.92
5	B	490	MES	O3S-S-C8	-12.26	85.94	105.77
5	B	490	MES	O3S-S-O1S	5.97	125.87	111.27
5	B	490	MES	C5-N4-C3	5.56	121.34	108.83
2	A	470[B]	HEM	C4D-ND-C1D	4.65	109.88	105.07
2	B	471[B]	HEM	C4D-ND-C1D	4.55	109.78	105.07
2	A	470[A]	HEM	C4D-ND-C1D	4.53	109.76	105.07
5	B	490	MES	C7-N4-C5	4.09	121.71	111.23
2	A	470[A]	HEM	CBA-CAA-C2A	-3.80	106.13	112.62
2	B	471[A]	HEM	C4D-ND-C1D	3.71	108.90	105.07
2	A	470[B]	HEM	CBA-CAA-C2A	-3.62	106.44	112.62
2	B	471[A]	HEM	CHD-C1D-ND	3.48	128.22	124.43
2	A	470[B]	HEM	C4C-CHD-C1D	3.40	127.05	122.56
3	B	500	LEH	C6-N1-C7	3.31	130.16	121.65
2	B	471[B]	HEM	CHC-C4B-NB	3.26	127.97	124.43
2	B	471[B]	HEM	C1B-NB-C4B	3.18	108.36	105.07

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	471[A]	HEM	CAD-C3D-C4D	3.16	130.17	124.66
2	A	470[B]	HEM	CAD-C3D-C4D	3.08	130.04	124.66
2	B	471[B]	HEM	CMC-C2C-C3C	2.92	130.13	124.68
2	A	470[A]	HEM	C1B-NB-C4B	2.87	108.03	105.07
2	B	471[A]	HEM	C3B-C2B-C1B	2.76	108.53	106.49
2	A	470[A]	HEM	C4B-CHC-C1C	2.70	126.11	122.56
2	A	470[A]	HEM	C4A-C3A-C2A	2.69	108.87	107.00
2	A	470[A]	HEM	CHD-C1D-ND	2.62	127.27	124.43
2	B	471[B]	HEM	C3B-C2B-C1B	2.59	108.41	106.49
2	B	471[A]	HEM	CBD-CAD-C3D	-2.51	105.65	112.63
2	A	470[A]	HEM	CAD-C3D-C4D	2.51	129.05	124.66
2	B	471[B]	HEM	CMD-C2D-C1D	2.48	128.82	125.04
2	B	471[A]	HEM	CBA-CAA-C2A	-2.43	108.48	112.62
2	B	471[B]	HEM	C4A-C3A-C2A	2.43	108.68	107.00
3	A	500	LEH	C5-C6-N1	-2.42	104.99	110.58
2	A	470[A]	HEM	C4C-CHD-C1D	2.42	125.75	122.56
2	B	471[A]	HEM	CMC-C2C-C3C	2.41	129.19	124.68
2	B	471[B]	HEM	CAD-C3D-C4D	2.36	128.79	124.66
2	B	471[B]	HEM	CHB-C1B-NB	2.27	127.19	124.38
2	A	470[A]	HEM	C3B-C2B-C1B	2.27	108.17	106.49
2	A	470[A]	HEM	CHC-C4B-NB	2.26	126.89	124.43
2	B	471[B]	HEM	C1D-C2D-C3D	-2.18	104.67	106.96
2	B	471[A]	HEM	C1B-NB-C4B	2.18	107.32	105.07
5	B	490	MES	C7-N4-C3	2.17	116.79	111.23
2	A	470[B]	HEM	CHC-C4B-NB	2.17	126.78	124.43
2	A	470[A]	HEM	O1A-CGA-CBA	-2.13	116.25	123.08
2	B	471[B]	HEM	CHA-C4D-ND	2.09	126.97	124.38
5	B	490	MES	O3S-S-O2S	2.08	116.36	111.27
2	B	471[B]	HEM	C2B-C1B-NB	-2.08	107.37	109.84
2	A	470[A]	HEM	O2A-CGA-CBA	2.07	120.67	114.03
3	B	500	LEH	C5-C6-N1	-2.04	105.87	110.58
2	A	470[A]	HEM	CBD-CAD-C3D	-2.04	106.97	112.63
3	B	500	LEH	O2-C1-O1	-2.02	119.50	124.09
2	A	470[B]	HEM	C4A-C3A-C2A	2.02	108.40	107.00
2	A	470[B]	HEM	CMC-C2C-C3C	2.01	128.43	124.68

There are no chirality outliers.

All (28) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	500	LEH	C7-C8-C9-C10
3	B	500	LEH	C7-C8-C9-C10

Continued on next page...

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms
3	B	500	LEH	C3-C4-C5-C6
3	A	500	LEH	C11-C10-C9-C8
3	A	500	LEH	C9-C10-C11-C12
3	B	500	LEH	C9-C10-C11-C12
3	B	500	LEH	C12-C13-C14-C15
3	B	500	LEH	C10-C11-C12-C13
3	A	500	LEH	C12-C13-C14-C15
3	B	500	LEH	C2-C4-C5-C6
3	B	500	LEH	C11-C10-C9-C8
3	B	500	LEH	O3-C7-C8-C9
3	B	500	LEH	N1-C7-C8-C9
5	B	490	MES	C8-C7-N4-C3
3	B	500	LEH	C14-C15-C16-C17
2	B	471[B]	HEM	CAA-CBA-CGA-O1A
5	B	490	MES	C8-C7-N4-C5
2	B	471[B]	HEM	CAA-CBA-CGA-O2A
3	B	500	LEH	C13-C14-C15-C16
2	B	471[A]	HEM	CAD-CBD-CGD-O1D
2	A	470[B]	HEM	CAA-CBA-CGA-O2A
3	B	500	LEH	C17-C18-N2-C20
3	A	500	LEH	O3-C7-C8-C9
2	A	470[B]	HEM	CAA-CBA-CGA-O1A
2	B	471[A]	HEM	CAD-CBD-CGD-O2D
3	A	500	LEH	N1-C7-C8-C9
3	A	500	LEH	C14-C15-C16-C17
2	A	470[B]	HEM	CAD-CBD-CGD-O2D

There are no ring outliers.

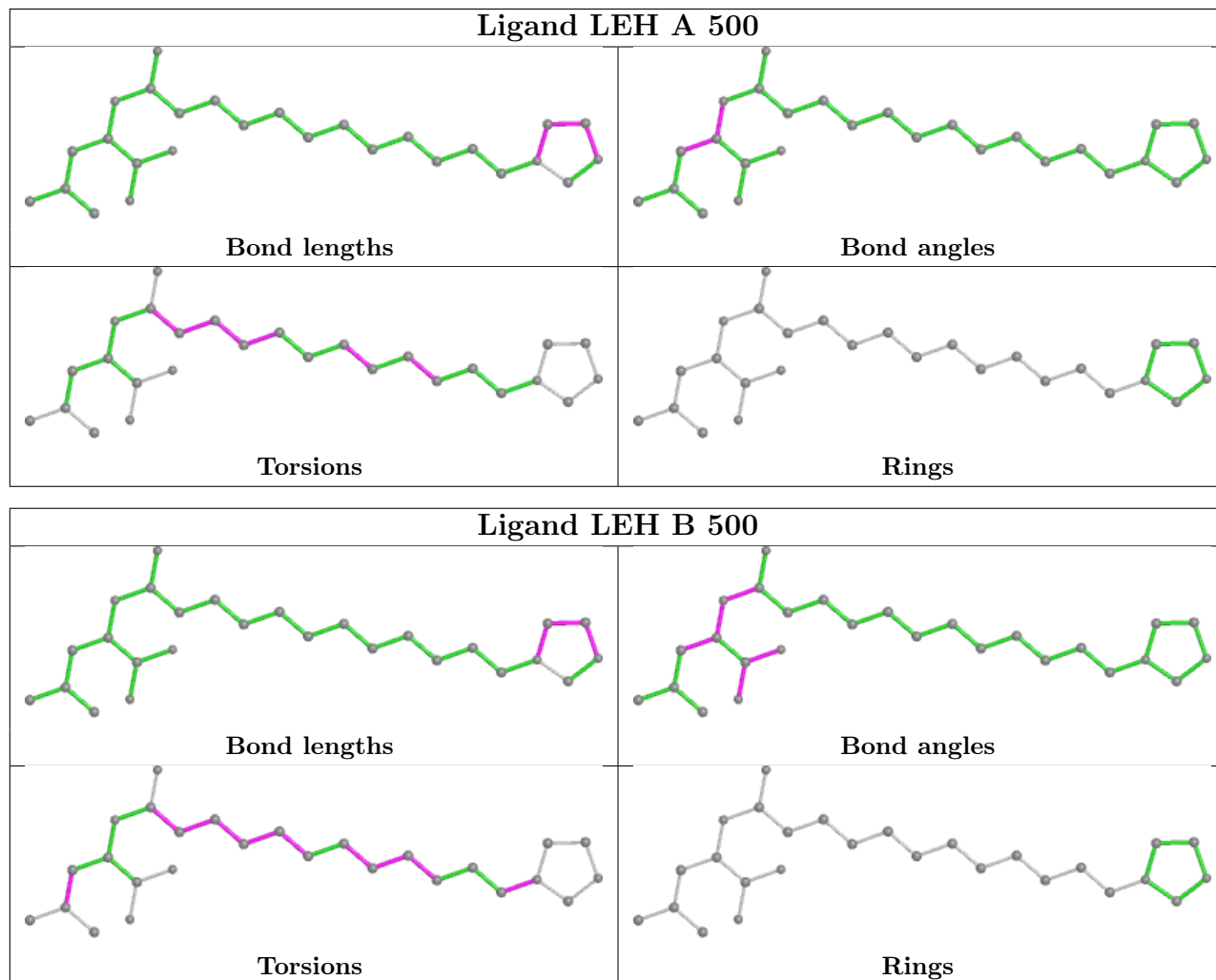
5 monomers are involved in 20 short contacts:

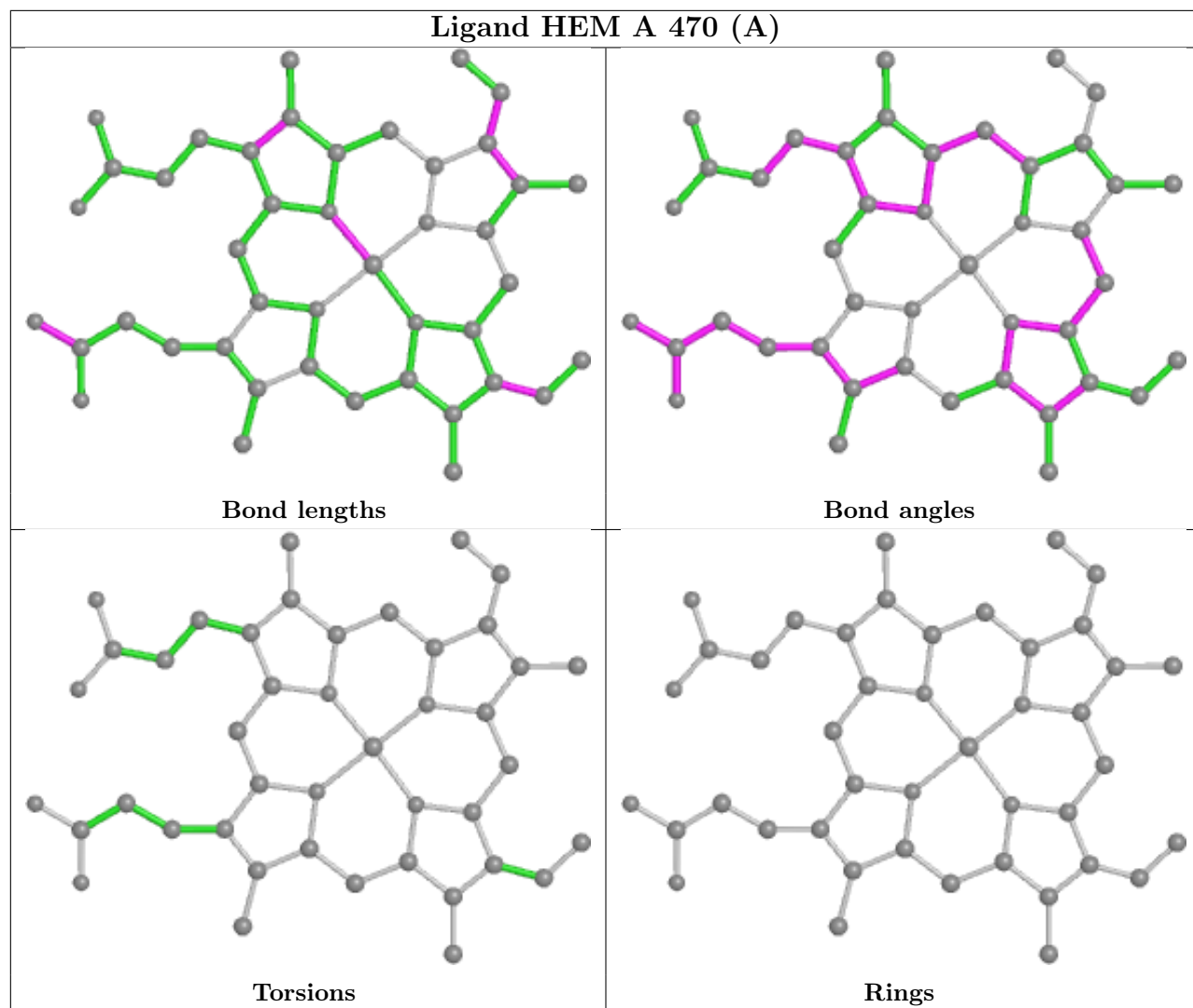
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	500	LEH	7	0
3	B	500	LEH	5	0
2	A	470[A]	HEM	3	0
2	B	471[A]	HEM	5	0
2	B	471[B]	HEM	1	0

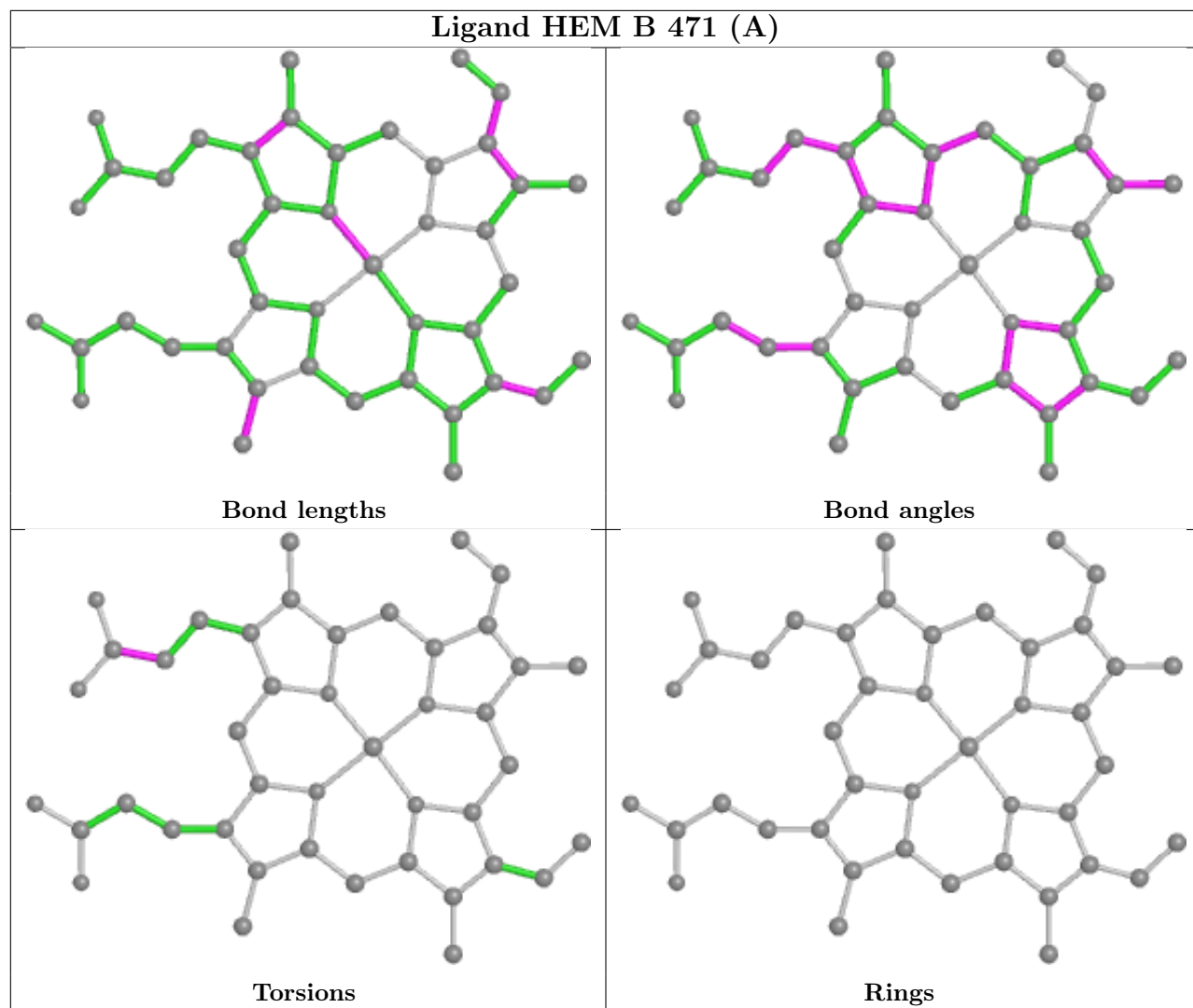
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

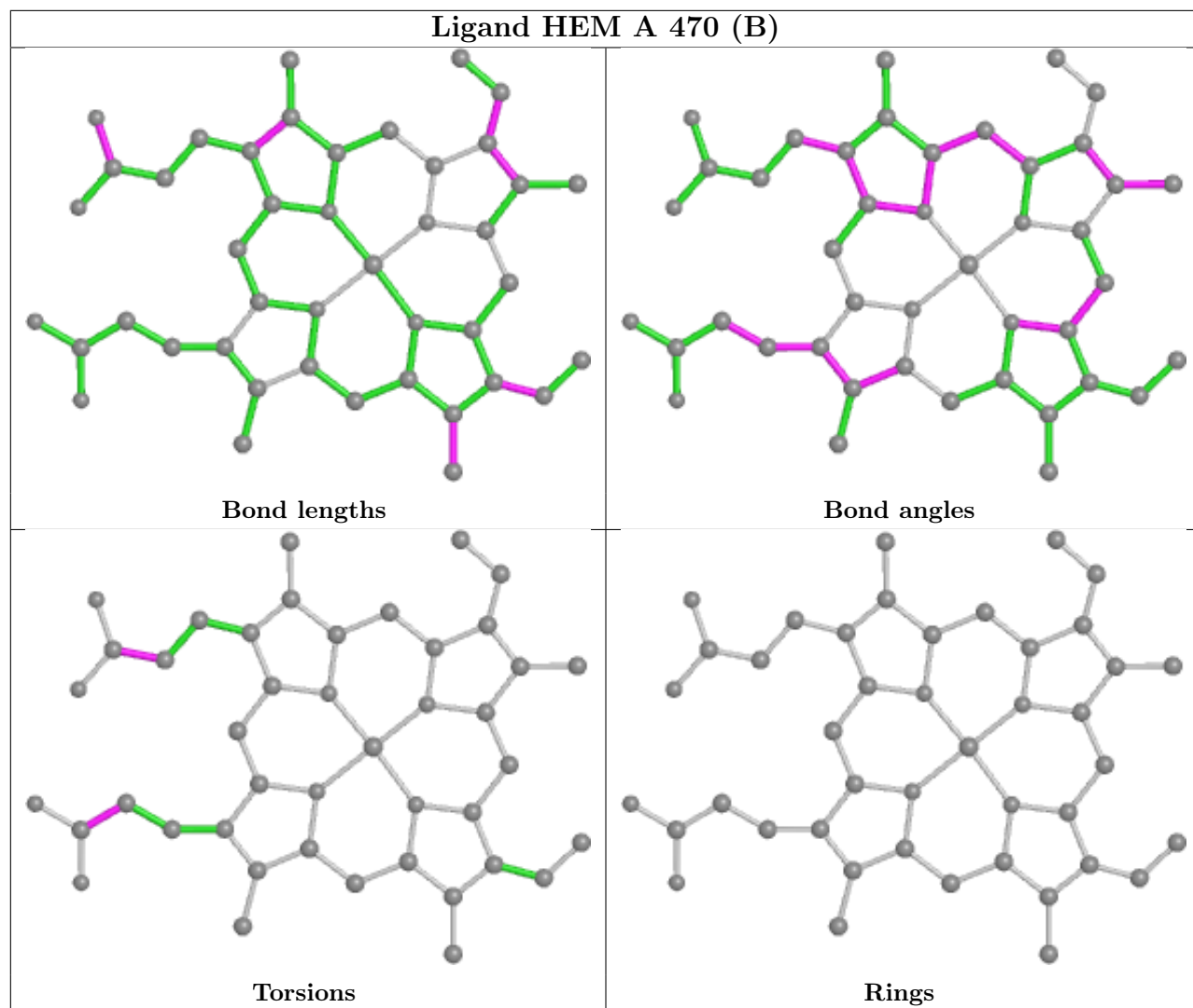


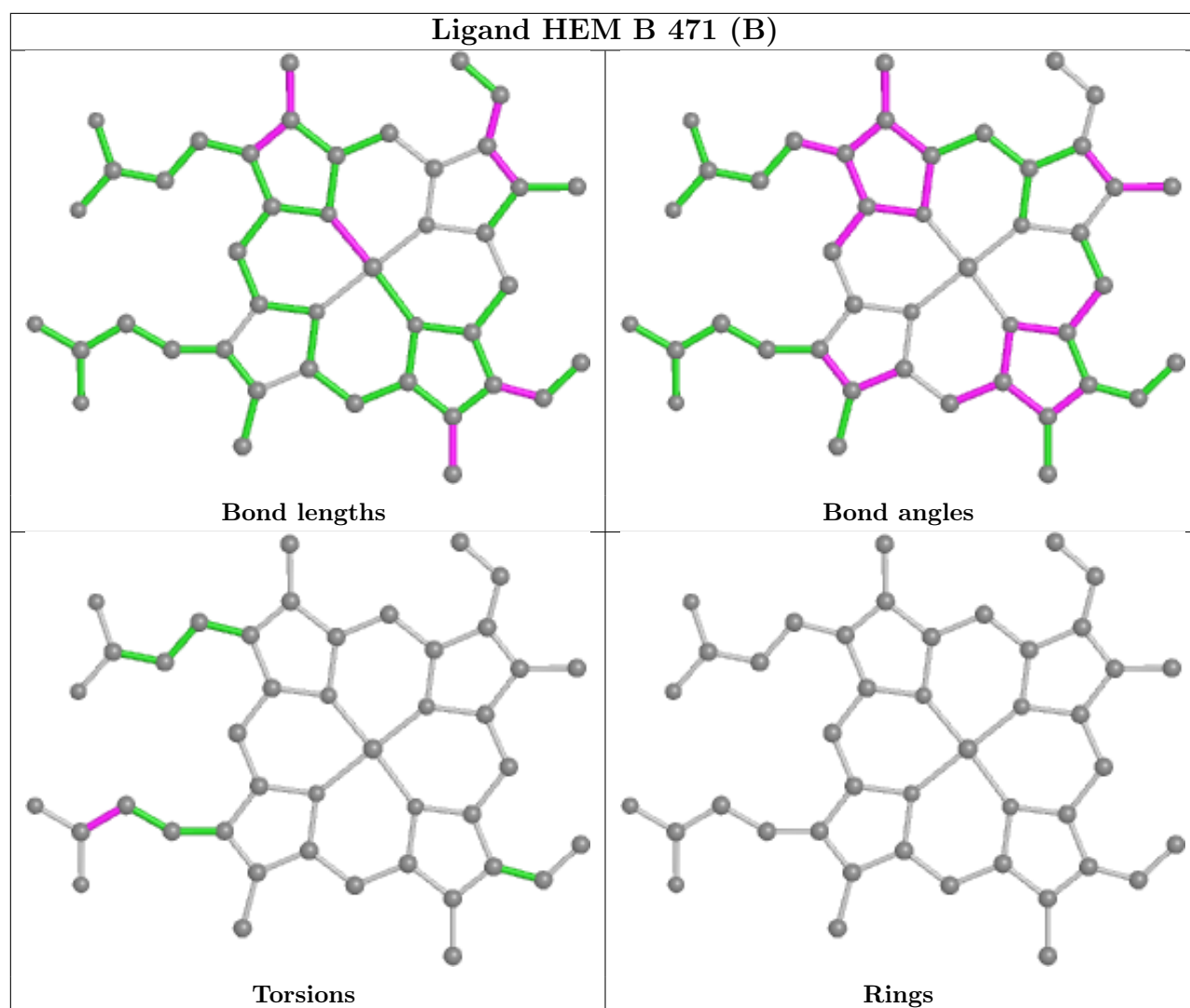
Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD 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, 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	A	454/470 (96%)	-0.18	23 (5%) 28 27	7, 15, 31, 40	0
1	B	457/470 (97%)	-0.12	25 (5%) 25 24	7, 14, 35, 46	0
All	All	911/940 (96%)	-0.15	48 (5%) 26 25	7, 15, 33, 46	0

All (48) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1	THR	8.2
1	B	2	ILE	6.5
1	A	196	PRO	5.8
1	B	457	GLY	5.1
1	A	198	TYR	4.9
1	B	191	ALA	4.9
1	A	194	ASP	4.6
1	A	4	GLU	4.3
1	B	225	ALA	4.1
1	A	191	ALA	4.0
1	B	169	GLN	4.0
1	A	457	GLY	4.0
1	B	229	GLN	3.8
1	B	203	ARG	3.7
1	B	227	GLY	3.6
1	A	193	PRO	3.5
1	B	193	PRO	3.5
1	A	231	ASP	3.3
1	B	198	TYR	3.3
1	B	4	GLU	3.3
1	A	230	SER	3.3
1	A	189	GLN	3.2
1	A	229	GLN	3.1
1	B	199	ASP	2.9

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	228	GLU	2.9
1	A	188	LEU	2.7
1	B	230	SER	2.7
1	B	196	PRO	2.7
1	A	195	ASP	2.6
1	B	455	LEU	2.6
1	A	228	GLU	2.6
1	A	199	ASP	2.5
1	B	194	ASP	2.5
1	A	197	ALA	2.4
1	A	192	ASN	2.4
1	B	188	LEU	2.2
1	B	3	LYS	2.2
1	A	190	ARG	2.2
1	A	456	GLY	2.2
1	A	382	PRO	2.2
1	A	186	ASN	2.2
1	B	192	ASN	2.1
1	A	169	GLN	2.1
1	B	195	ASP	2.1
1	B	46	GLY	2.1
1	A	13	GLU	2.1
1	B	153	ILE	2.0
1	B	456	GLY	2.0

## 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](#)

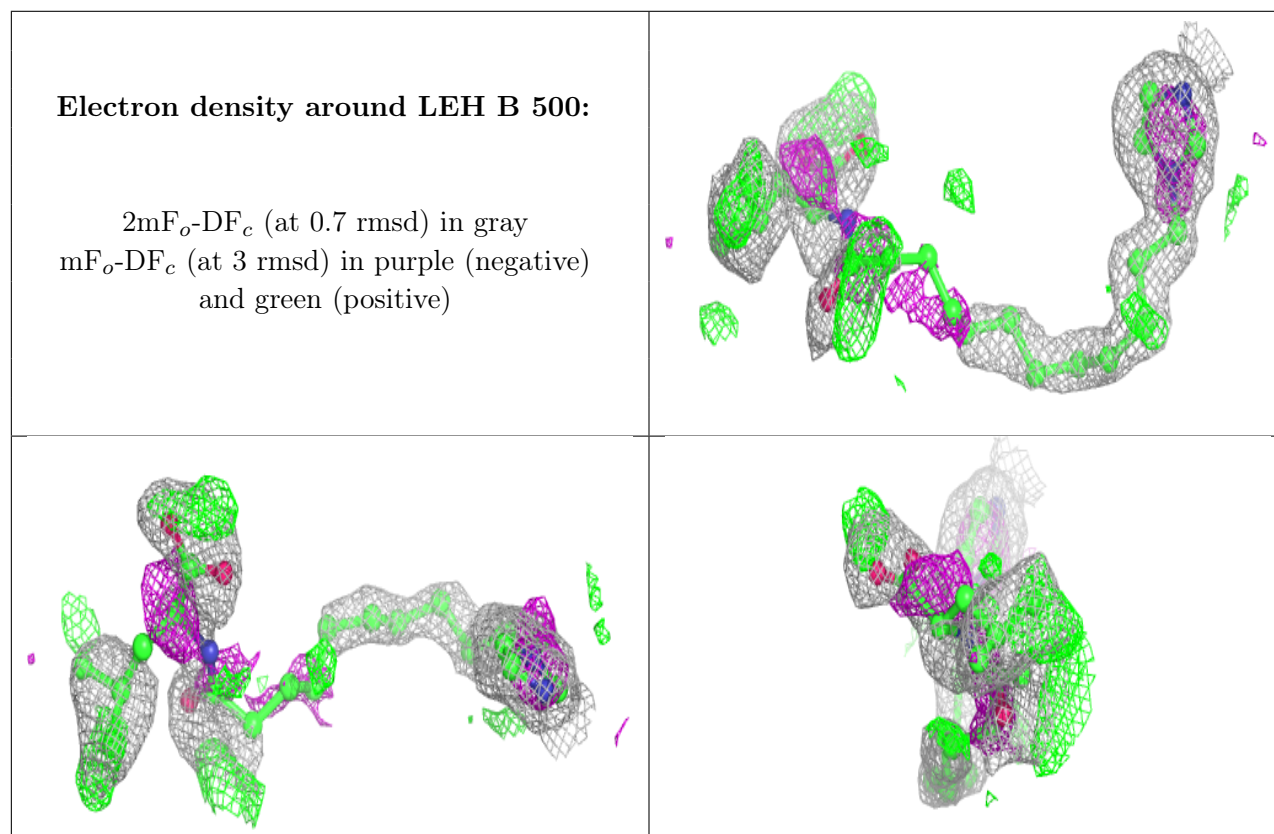
There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

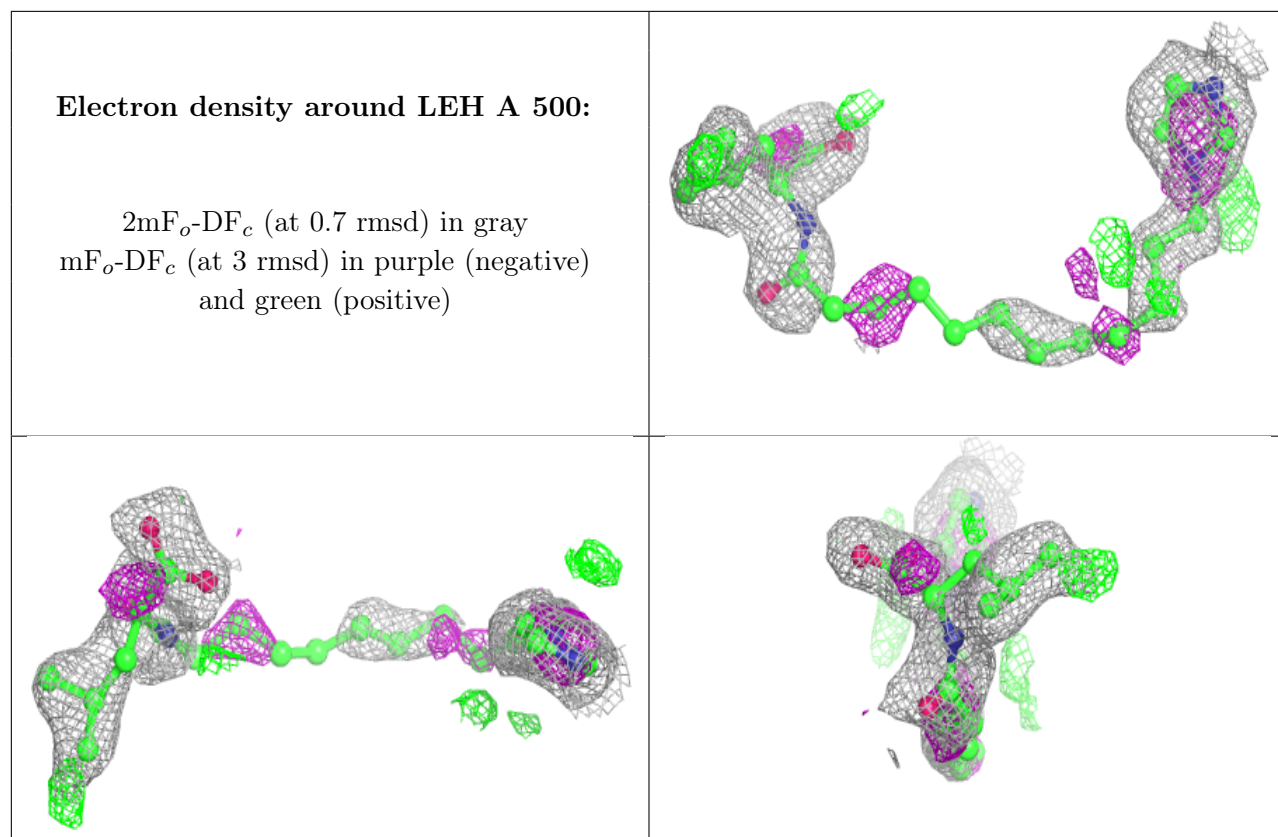
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
5	MES	B	490	12/12	0.78	0.31	57,58,60,61	0
3	LEH	B	500	27/27	0.80	0.22	17,50,58,59	0
3	LEH	A	500	27/27	0.86	0.21	15,50,55,56	0
4	MG	B	470	1/1	0.97	0.24	38,38,38,38	0
2	HEM	A	470[A]	43/43	0.99	0.09	10,11,13,16	43
2	HEM	A	470[B]	43/43	0.99	0.09	8,9,11,12	43
2	HEM	B	471[A]	43/43	0.99	0.09	7,11,12,16	43
2	HEM	B	471[B]	43/43	0.99	0.09	10,12,14,16	43

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.

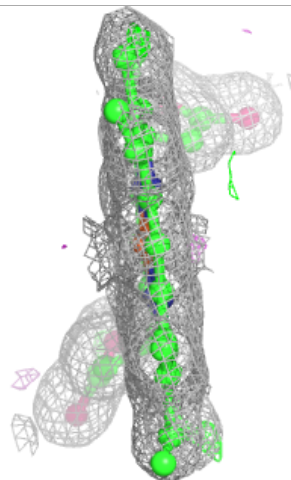
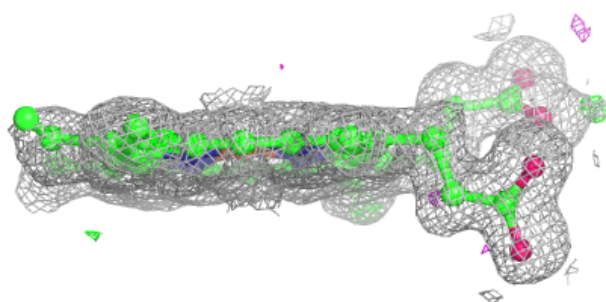
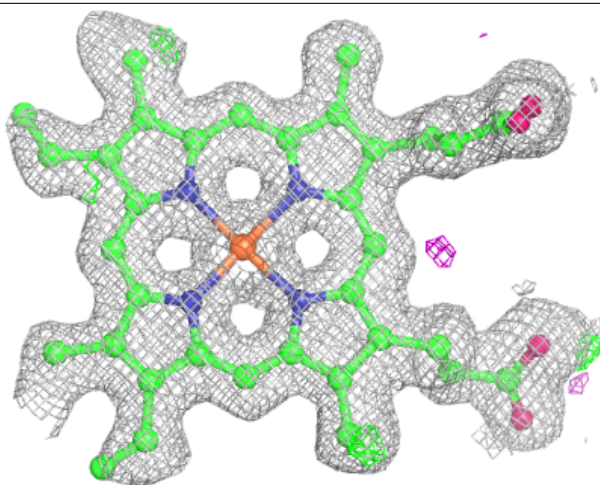






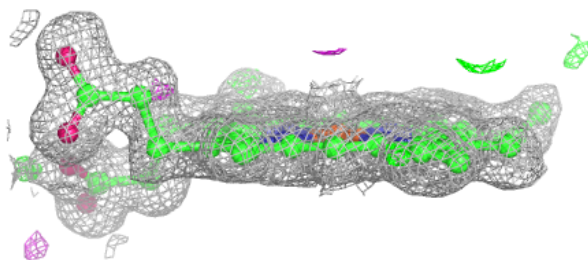
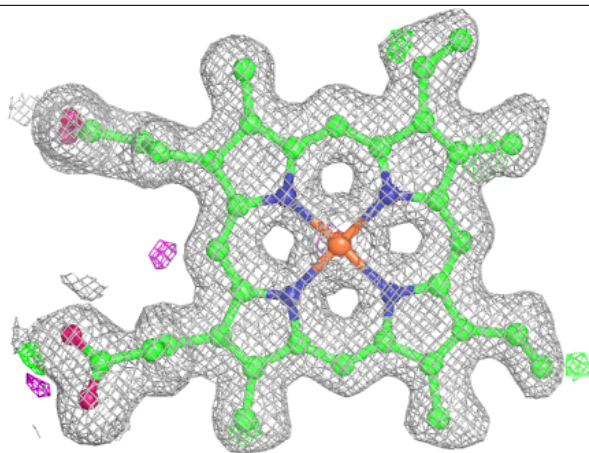
**Electron density around HEM A 470 (A):**

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



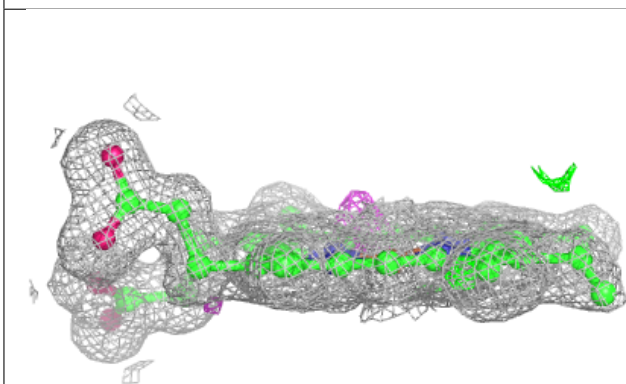
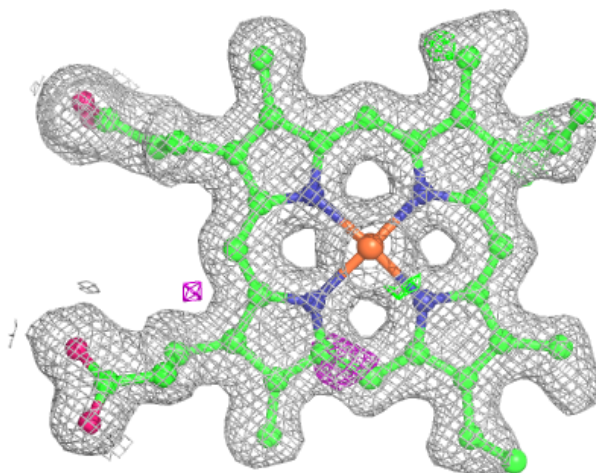
**Electron density around HEM A 470 (B):**

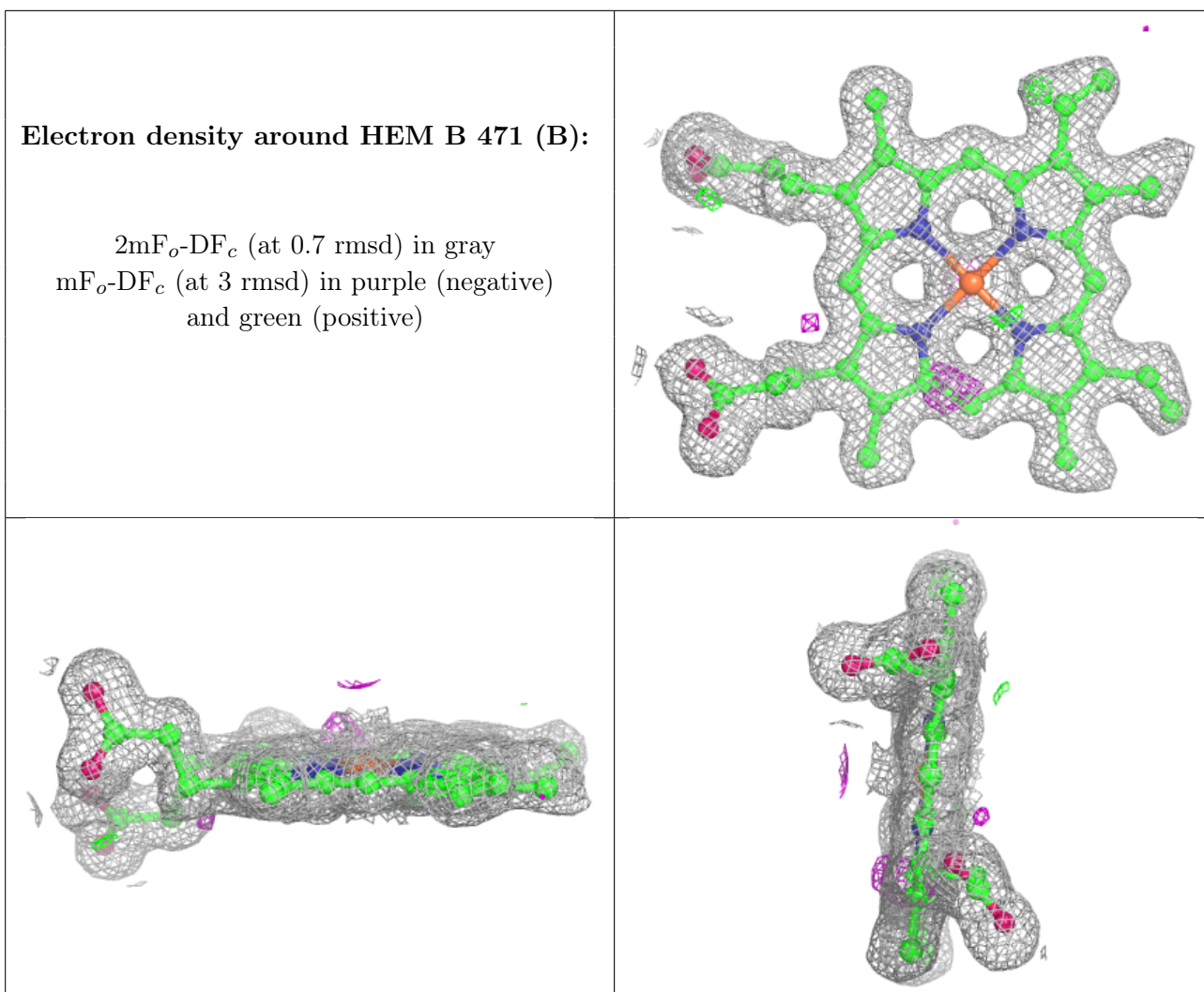
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around HEM B 471 (A):**

$2mF_o-DF_c$  (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.