



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 14, 2020 – 01:10 am BST

PDB ID : 5UO9  
Title : Structure of human endothelial nitric oxide synthase heme domain in complex with 7-[(3-Ethyl-5-((methylamino)methyl)phenoxy)methyl]quinolin-2-amine  
Authors : Chreifi, G.; Li, H.; Poulos, T.L.  
Deposited on : 2017-01-31  
Resolution : 2.19 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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.

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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	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
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)	:	2.11

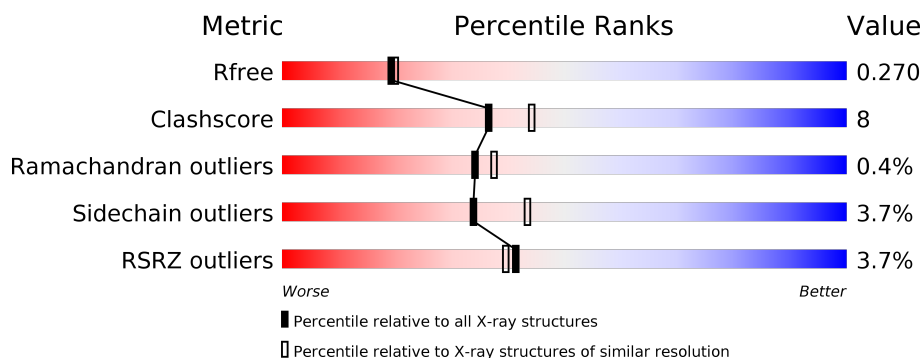
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.19 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 on 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	440	<div> <div>7%</div> <div> <div></div> <div>68%</div> <div>22%</div> <div>• 8%</div> </div> </div>
1	B	440	<div> <div>%</div> <div> <div></div> <div>79%</div> <div>11%</div> <div>• 9%</div> </div> </div>
1	C	440	<div> <div>4%</div> <div> <div></div> <div>71%</div> <div>19%</div> <div>• 9%</div> </div> </div>
1	D	440	<div> <div>%</div> <div> <div></div> <div>77%</div> <div>15%</div> <div>9%</div> </div> </div>

## 2 Entry composition [i](#)

There are 12 unique types of molecules in this entry. The entry contains 13803 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 Nitric oxide synthase, endothelial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	404	Total	C	N	O	S	0	2	0
			3237	2062	570	589	16			
1	B	402	Total	C	N	O	S	0	3	0
			3221	2051	566	587	17			
1	C	401	Total	C	N	O	S	0	2	0
			3209	2044	563	586	16			
1	D	402	Total	C	N	O	S	0	3	0
			3221	2051	566	587	17			

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula:  $C_{34}H_{32}FeN_4O_4$ ).



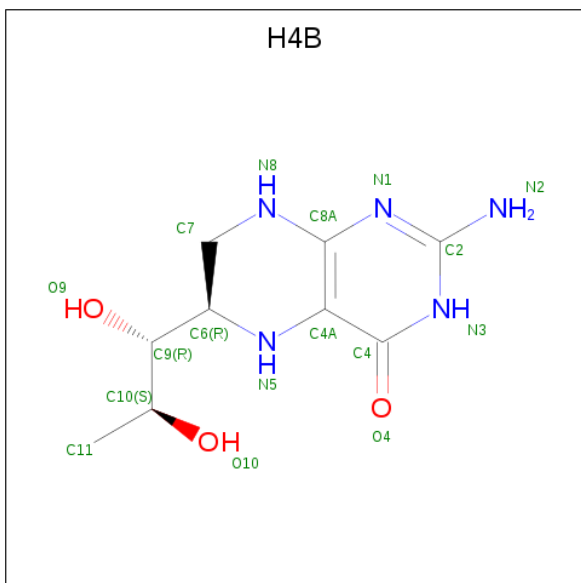
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	Fe	N O	0	0
			43	34	1	4 4		
2	B	1	Total	C	Fe	N O	0	0
			43	34	1	4 4		

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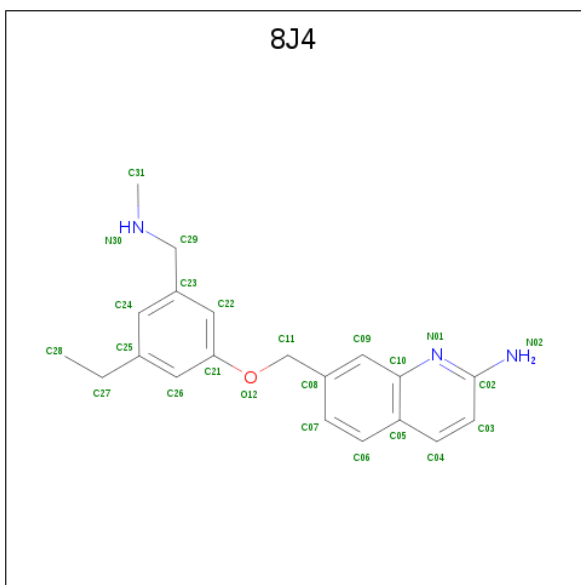
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	D	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is 5,6,7,8-TETRAHYDROBIOPTERIN (three-letter code: H4B) (formula:  $C_9H_{15}N_5O_3$ ).



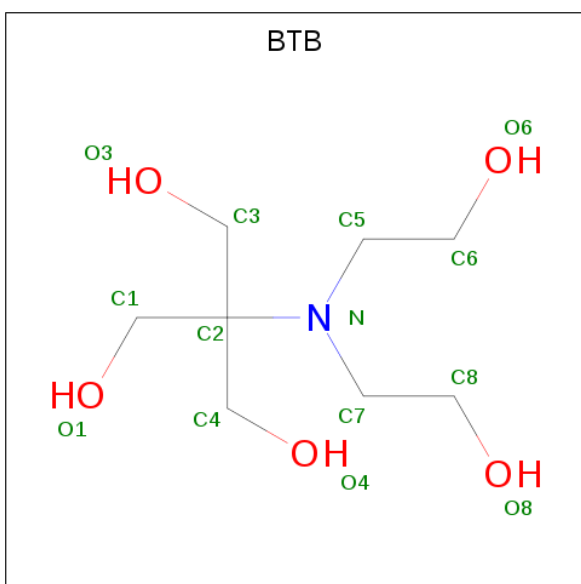
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			17	9	5	3		
3	B	1	Total	C	N	O	0	0
			17	9	5	3		
3	C	1	Total	C	N	O	0	0
			17	9	5	3		
3	D	1	Total	C	N	O	0	0
			17	9	5	3		

- Molecule 4 is 7-({3-ethyl-5-[(methylamino)methyl]phenoxy}methyl)quinolin-2-amine (three-letter code: 8J4) (formula:  $C_{20}H_{23}N_3O$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			24	20	3	1		
4	B	1	Total	C	N	O	0	0
			24	20	3	1		
4	C	1	Total	C	N	O	0	0
			24	20	3	1		
4	D	1	Total	C	N	O	0	0
			24	20	3	1		

- Molecule 5 is 2-[BIS-(2-HYDROXY-ETHYL)-AMINO]-2-HYDROXYMETHYL-PROPAN E-1,3-DIOL (three-letter code: BTB) (formula:  $C_8H_{19}NO_5$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	C	1	Total	C	N	O	0	0
			14	8	1	5		
5	D	1	Total	C	N	O	0	0
			14	8	1	5		
5	D	1	Total	C	N	O	0	0
			14	8	1	5		
5	D	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 6 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Zn	0	0
			1	1		
6	C	1	Total	Zn	0	0
			1	1		

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			6	3	3		
7	C	1	Total	C	O	0	0
			6	3	3		

- Molecule 8 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	B	1	Total	Cl	0	0
			1	1		
8	A	1	Total	Cl	0	0
			1	1		
8	D	2	Total	Cl	0	0
			2	2		
8	C	1	Total	Cl	0	0
			1	1		

- Molecule 9 is GADOLINIUM ATOM (three-letter code: GD) (formula: Gd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	B	1	Total	Gd	0	0
			1	1		
9	A	1	Total	Gd	0	0
			1	1		
9	D	1	Total	Gd	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	C	1	Total	Gd	0	0
			1	1		

- Molecule 10 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	1	Total	Ca	0	0
			1	1		

- Molecule 11 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	D	1	Total	Mg	0	0
			1	1		

- Molecule 12 is water.

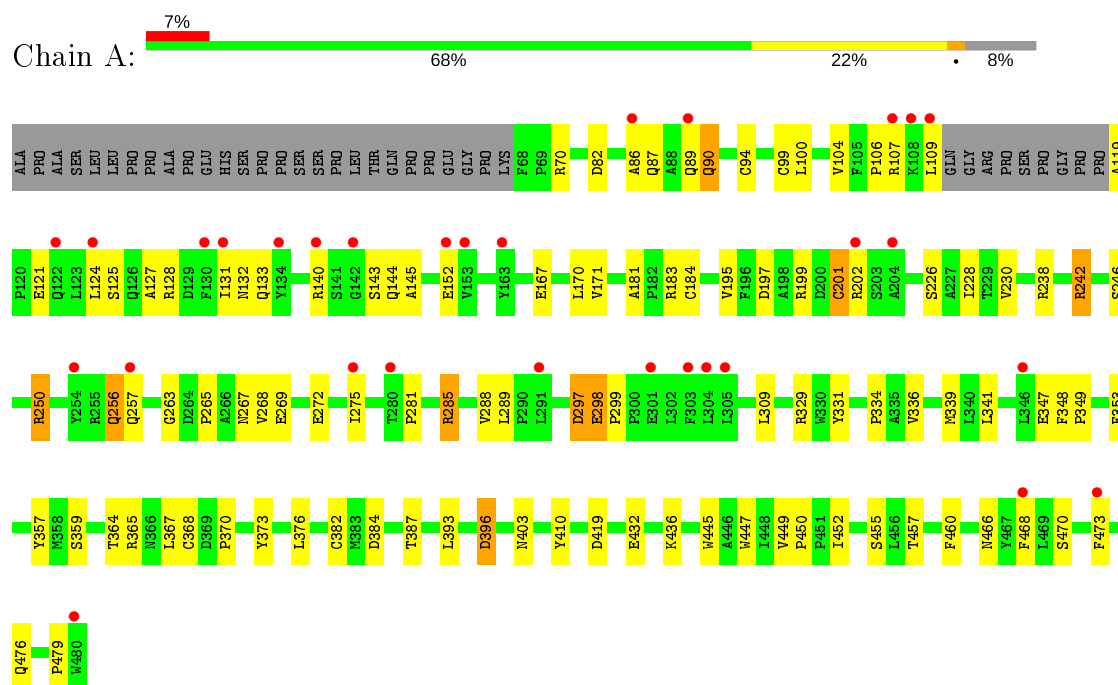
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	78	Total	O	0	0
			78	78		
12	B	118	Total	O	0	0
			118	118		
12	C	76	Total	O	0	0
			76	76		
12	D	114	Total	O	0	0
			114	114		



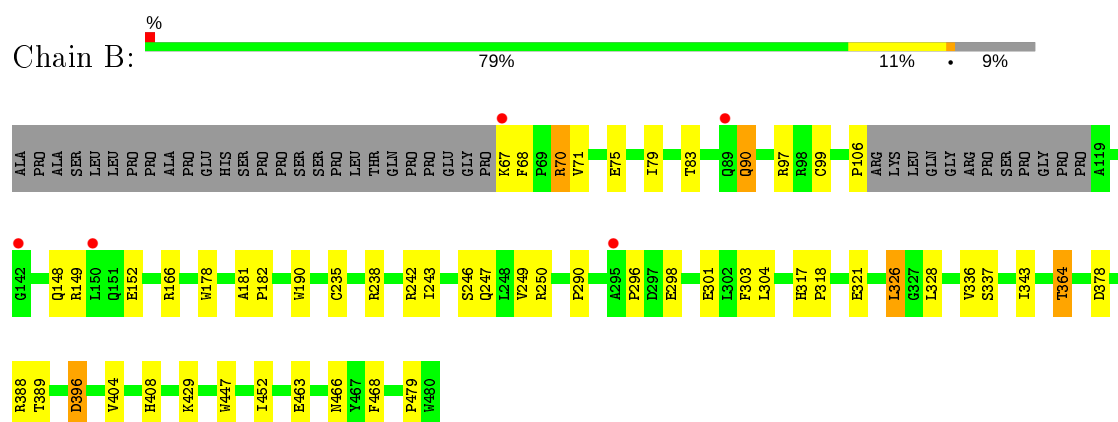
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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: Nitric oxide synthase, endothelial

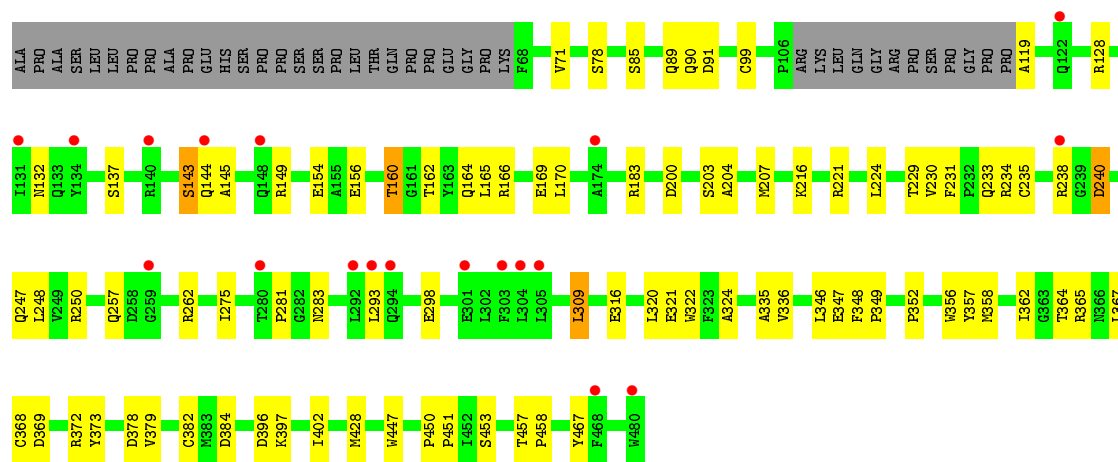


- Molecule 1: Nitric oxide synthase, endothelial

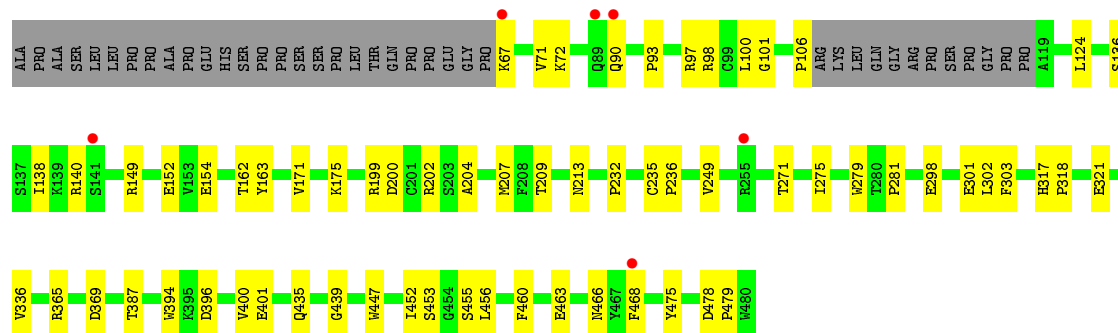
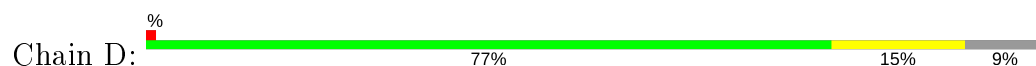


- Molecule 1: Nitric oxide synthase, endothelial





- Molecule 1: Nitric oxide synthase, endothelial



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.38 Å 152.09 Å 108.22 Å 90.00° 90.59° 90.00°	Depositor
Resolution (Å)	38.87 – 2.19 38.86 – 2.19	Depositor EDS
% Data completeness (in resolution range)	94.0 (38.87-2.19) 92.3 (38.86-2.19)	Depositor EDS
$R_{merge}$	0.16	Depositor
$R_{sym}$	0.16	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.40 (at 2.20 Å)	Xtriage
Refinement program	PHENIX 1.8.2_1309	Depositor
R, $R_{free}$	0.212 , 0.276 0.207 , 0.270	Depositor DCC
$R_{free}$ test set	4651 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	44.0	Xtriage
Anisotropy	0.457	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 35.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.177 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	13803	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.45% 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: GOL, MG, H4B, CL, CA, ZN, 8J4, GD, BTB, 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	0.37	0/3335	0.55	0/4543
1	B	0.43	0/3319	0.56	0/4523
1	C	0.38	0/3307	0.55	0/4507
1	D	0.44	0/3319	0.57	0/4523
All	All	0.40	0/13280	0.56	0/18096

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	3237	0	3146	59	0
1	B	3221	0	3126	35	0
1	C	3209	0	3109	53	0
1	D	3221	0	3126	41	0
2	A	43	0	30	4	0
2	B	43	0	30	2	0
2	C	43	0	30	2	0
2	D	43	0	30	3	0
3	A	17	0	15	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	17	0	15	1	0
3	C	17	0	15	1	0
3	D	17	0	15	1	0
4	A	24	0	0	1	0
4	B	24	0	0	1	0
4	C	24	0	0	1	0
4	D	24	0	0	1	0
5	A	28	0	38	5	0
5	B	84	0	111	12	0
5	C	14	0	19	4	0
5	D	42	0	54	10	0
6	A	1	0	0	0	0
6	C	1	0	0	0	0
7	A	6	0	8	1	0
7	C	6	0	8	0	0
8	A	1	0	0	0	0
8	B	1	0	0	0	0
8	C	1	0	0	0	0
8	D	2	0	0	1	0
9	A	1	0	0	0	0
9	B	1	0	0	0	0
9	C	1	0	0	0	0
9	D	1	0	0	0	0
10	A	1	0	0	0	0
11	D	1	0	0	0	0
12	A	78	0	0	11	0
12	B	118	0	0	6	0
12	C	76	0	0	6	0
12	D	114	0	0	4	0
All	All	13803	0	12925	207	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 8.

The worst 5 of 207 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:C:347:GLU:OE2	12:C:601:HOH:O	2.03	0.76
1:A:144:GLN:O	12:A:601:HOH:O	2.03	0.75
1:C:235:CYS:H	1:C:238:ARG:HD3	1.51	0.75
1:D:93:PRO:HG3	1:D:106:PRO:HB3	1.67	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:501:HEM:HHC	2:A:501:HEM:HBB2	1.70	0.72

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	402/440 (91%)	369 (92%)	29 (7%)	4 (1%)	15	14
1	B	401/440 (91%)	387 (96%)	14 (4%)	0	100	100
1	C	399/440 (91%)	380 (95%)	16 (4%)	3 (1%)	19	19
1	D	401/440 (91%)	388 (97%)	13 (3%)	0	100	100
All	All	1603/1760 (91%)	1524 (95%)	72 (4%)	7 (0%)	34	37

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	144	GLN
1	A	90	GLN
1	C	89	GLN
1	C	143	SER
1	A	297	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	A	345/373 (92%)	323 (94%)	22 (6%)	17	20
1	B	344/373 (92%)	332 (96%)	12 (4%)	36	46
1	C	342/373 (92%)	330 (96%)	12 (4%)	36	46
1	D	344/373 (92%)	339 (98%)	5 (2%)	65	78
All	All	1375/1492 (92%)	1324 (96%)	51 (4%)	34	43

5 of 51 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	90	GLN
1	B	298	GLU
1	D	97	ARG
1	B	235[A]	CYS
1	B	326	LEU

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

Mol	Chain	Res	Type
1	D	213	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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 39 ligands modelled in this entry, 13 are monoatomic - leaving 26 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
5	BTB	A	505	-	13,13,13	0.37	0	7,16,16	0.55	0
2	HEM	B	501	1	27,50,50	2.10	5 (18%)	17,82,82	2.23	4 (23%)
5	BTB	B	510	9	13,13,13	0.44	0	7,16,16	0.56	0
7	GOL	A	507	-	5,5,5	0.45	0	5,5,5	0.31	0
3	H4B	C	502	-	16,18,18	0.88	0	11,26,26	2.66	6 (54%)
4	8J4	A	503	-	26,26,26	0.88	0	33,35,35	0.92	0
5	BTB	A	504	9	13,13,13	0.38	0	7,16,16	0.40	0
3	H4B	D	502	-	16,18,18	0.91	0	11,26,26	2.86	5 (45%)
3	H4B	B	502	-	16,18,18	0.89	0	11,26,26	2.75	6 (54%)
2	HEM	A	501	1	27,50,50	2.06	5 (18%)	17,82,82	1.49	3 (17%)
5	BTB	B	505	-	13,13,13	0.34	0	7,16,16	0.43	0
5	BTB	B	507	-	13,13,13	0.37	0	7,16,16	0.68	0
5	BTB	B	504	9	13,13,13	0.40	0	7,16,16	0.38	0
3	H4B	A	502	-	16,18,18	0.88	0	11,26,26	2.68	6 (54%)
2	HEM	C	501	1	27,50,50	2.19	6 (22%)	17,82,82	1.51	4 (23%)
7	GOL	C	506	-	5,5,5	0.42	0	5,5,5	0.49	0
4	8J4	C	503	-	26,26,26	0.92	0	33,35,35	1.10	3 (9%)
4	8J4	B	503	-	26,26,26	0.94	0	33,35,35	1.10	2 (6%)
5	BTB	D	505	-	13,13,13	0.42	0	7,16,16	0.75	0
5	BTB	B	506	-	13,13,13	0.69	0	7,16,16	0.73	0
5	BTB	D	506	-	13,13,13	0.43	0	7,16,16	0.76	0
4	8J4	D	503	-	26,26,26	0.81	0	33,35,35	1.01	1 (3%)
2	HEM	D	501	1	27,50,50	2.08	5 (18%)	17,82,82	2.19	5 (29%)
5	BTB	B	511	-	13,13,13	0.62	0	7,16,16	0.95	0
5	BTB	C	504	-	13,13,13	0.34	0	7,16,16	0.36	0
5	BTB	D	504	9	13,13,13	0.45	0	7,16,16	0.40	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	BTB	A	505	-	-	5/21/21/21	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	B	501	1	-	0/6/54/54	-
5	BTB	B	510	9	-	5/21/21/21	-
7	GOL	A	507	-	-	3/4/4/4	-
3	H4B	C	502	-	-	0/8/17/17	0/2/2/2
4	8J4	A	503	-	-	2/9/19/19	0/3/3/3
5	BTB	A	504	9	-	7/21/21/21	-
3	H4B	D	502	-	-	1/8/17/17	0/2/2/2
3	H4B	B	502	-	-	3/8/17/17	0/2/2/2
2	HEM	A	501	1	-	3/6/54/54	-
5	BTB	B	505	-	-	8/21/21/21	-
5	BTB	B	507	-	-	4/21/21/21	-
5	BTB	B	504	9	-	3/21/21/21	-
3	H4B	A	502	-	-	1/8/17/17	0/2/2/2
2	HEM	C	501	1	-	5/6/54/54	-
7	GOL	C	506	-	-	4/4/4/4	-
4	8J4	C	503	-	-	2/9/19/19	0/3/3/3
4	8J4	B	503	-	-	0/9/19/19	0/3/3/3
5	BTB	D	505	-	-	9/21/21/21	-
5	BTB	B	506	-	-	4/21/21/21	-
5	BTB	D	506	-	-	5/21/21/21	-
4	8J4	D	503	-	-	2/9/19/19	0/3/3/3
2	HEM	D	501	1	-	0/6/54/54	-
5	BTB	B	511	-	-	6/21/21/21	-
5	BTB	C	504	-	-	0/21/21/21	-
5	BTB	D	504	9	-	8/21/21/21	-

The worst 5 of 21 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	HEM	C3D-C2D	5.50	1.54	1.37
2	B	501	HEM	C3D-C2D	5.08	1.52	1.37
2	D	501	HEM	C3D-C2D	5.06	1.52	1.37
2	A	501	HEM	C3D-C2D	4.94	1.52	1.37
2	B	501	HEM	C3B-C2B	-4.79	1.33	1.40

The worst 5 of 45 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	501	HEM	CBD-CAD-C3D	-6.44	100.61	112.48
3	D	502	H4B	C4-C4A-C8A	6.09	119.97	114.57
2	B	501	HEM	CBA-CAA-C2A	-5.35	102.61	112.49
3	C	502	H4B	C4-C4A-C8A	5.26	119.24	114.57
3	A	502	H4B	C4-C4A-C8A	5.24	119.22	114.57

There are no chirality outliers.

5 of 90 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	505	BTB	C1-C2-C4-O4
5	A	505	BTB	C3-C2-C4-O4
5	A	505	BTB	N-C2-C4-O4
5	B	510	BTB	O1-C1-C2-C3
5	B	510	BTB	O1-C1-C2-C4

There are no ring outliers.

25 monomers are involved in 51 short contacts:

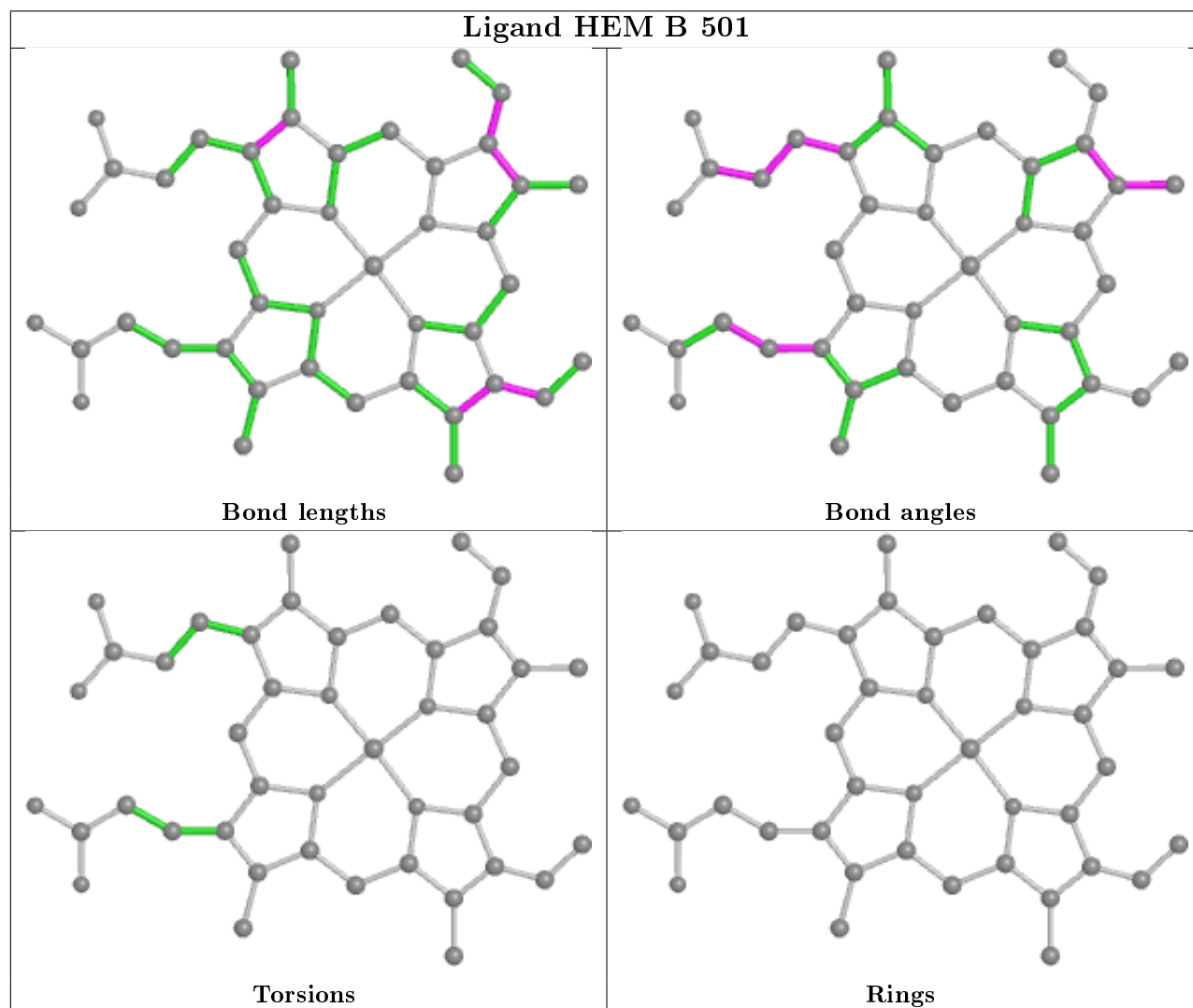
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	505	BTB	3	0
2	B	501	HEM	2	0
5	B	510	BTB	3	0
7	A	507	GOL	1	0
3	C	502	H4B	1	0
4	A	503	8J4	1	0
5	A	504	BTB	2	0
3	D	502	H4B	1	0
3	B	502	H4B	1	0
2	A	501	HEM	4	0
5	B	505	BTB	2	0
5	B	507	BTB	3	0
5	B	504	BTB	1	0
3	A	502	H4B	1	0
2	C	501	HEM	2	0
4	C	503	8J4	1	0
4	B	503	8J4	1	0
5	D	505	BTB	4	0
5	B	506	BTB	1	0
5	D	506	BTB	2	0
4	D	503	8J4	1	0
2	D	501	HEM	3	0

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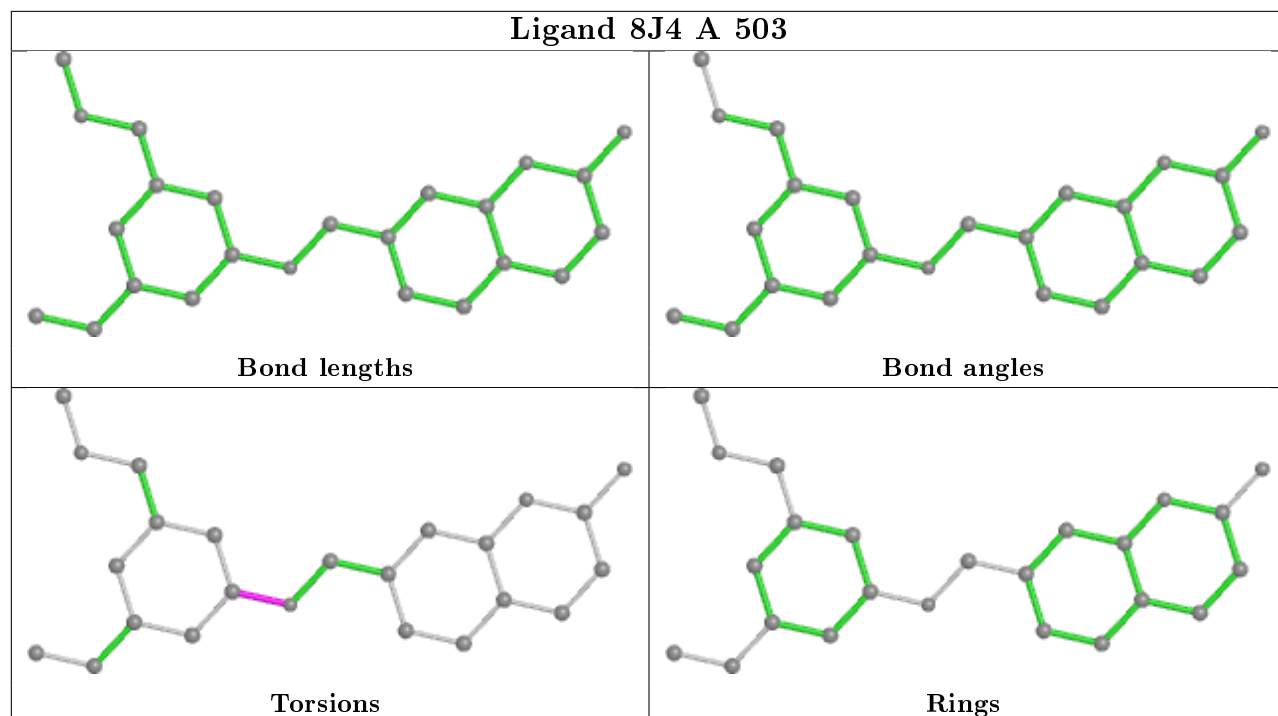
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	511	BTB	2	0
5	C	504	BTB	4	0
5	D	504	BTB	4	0

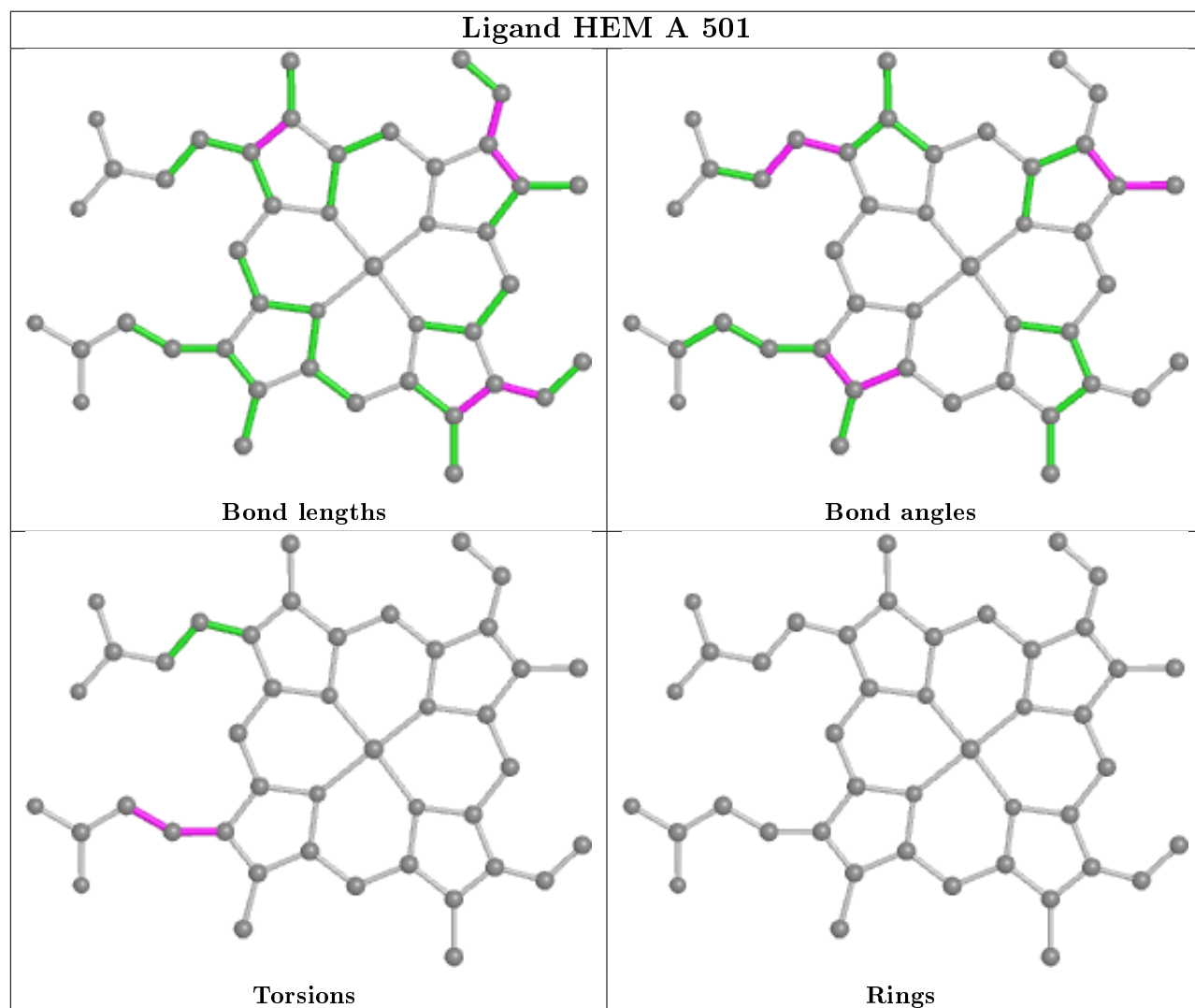
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

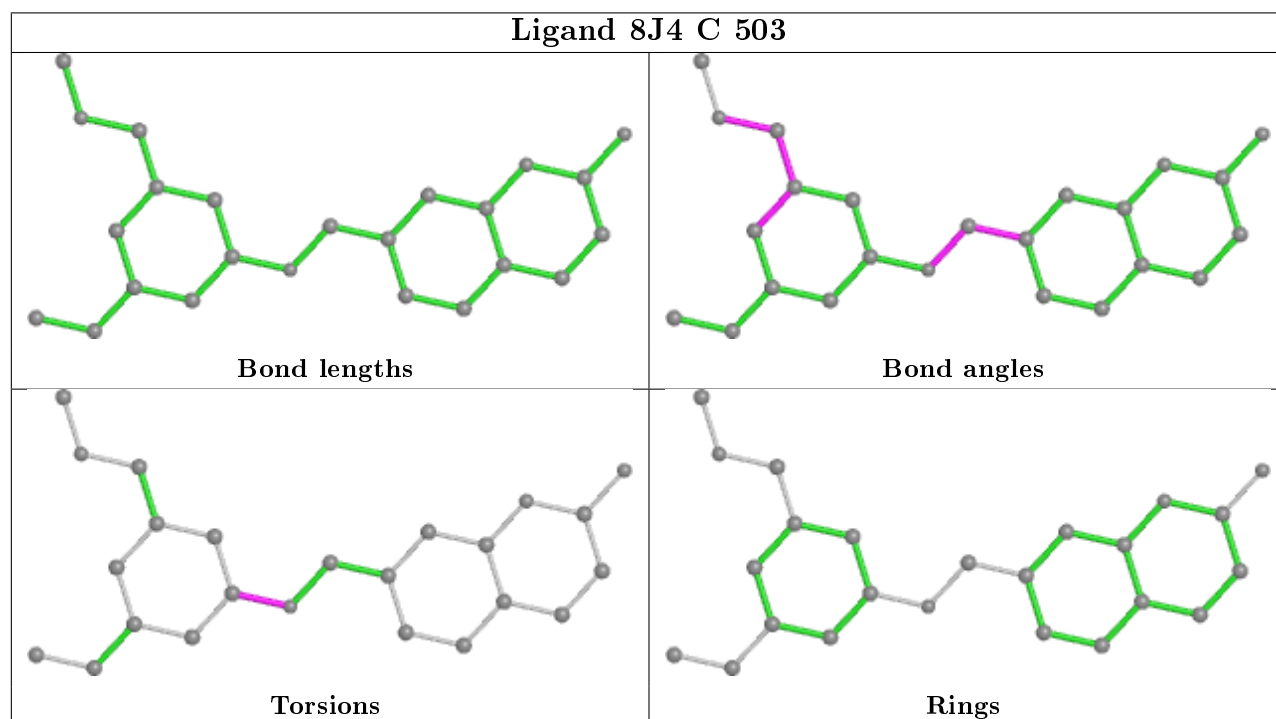
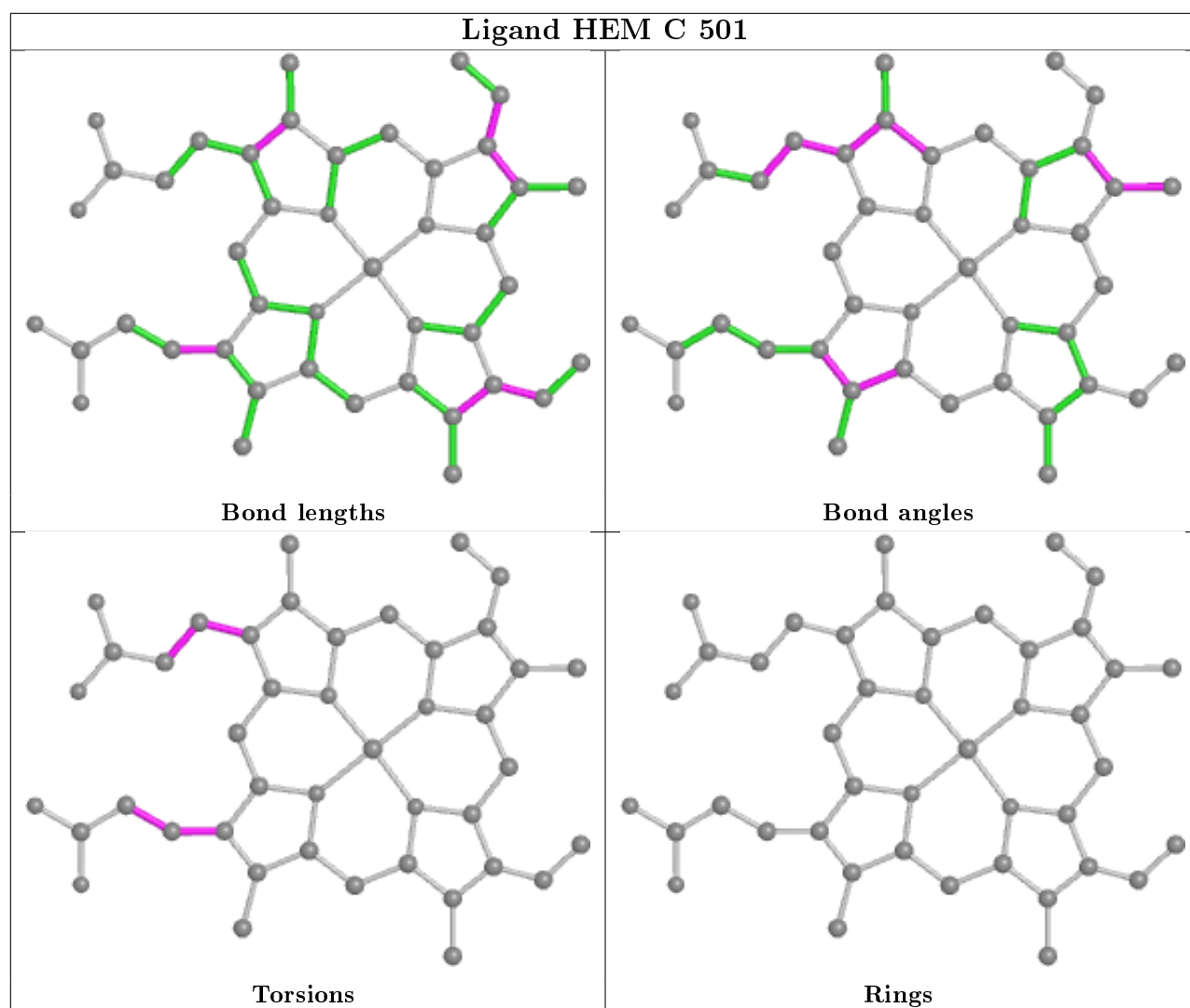


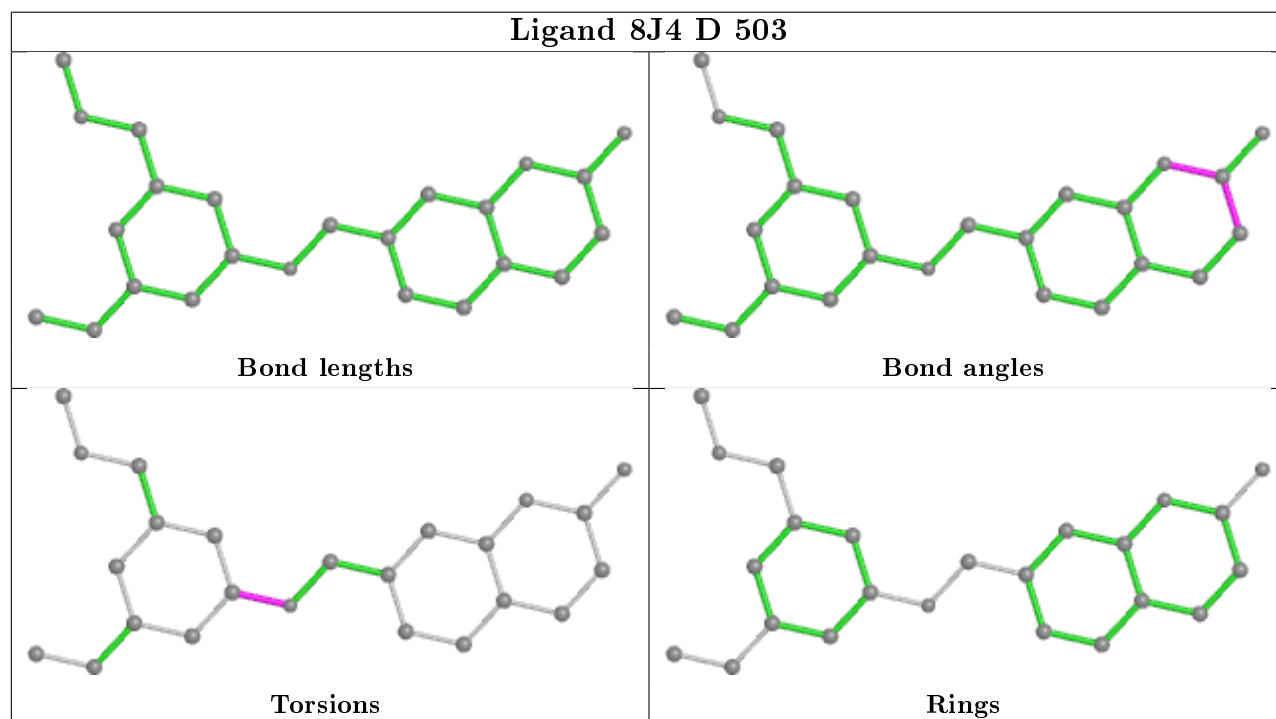
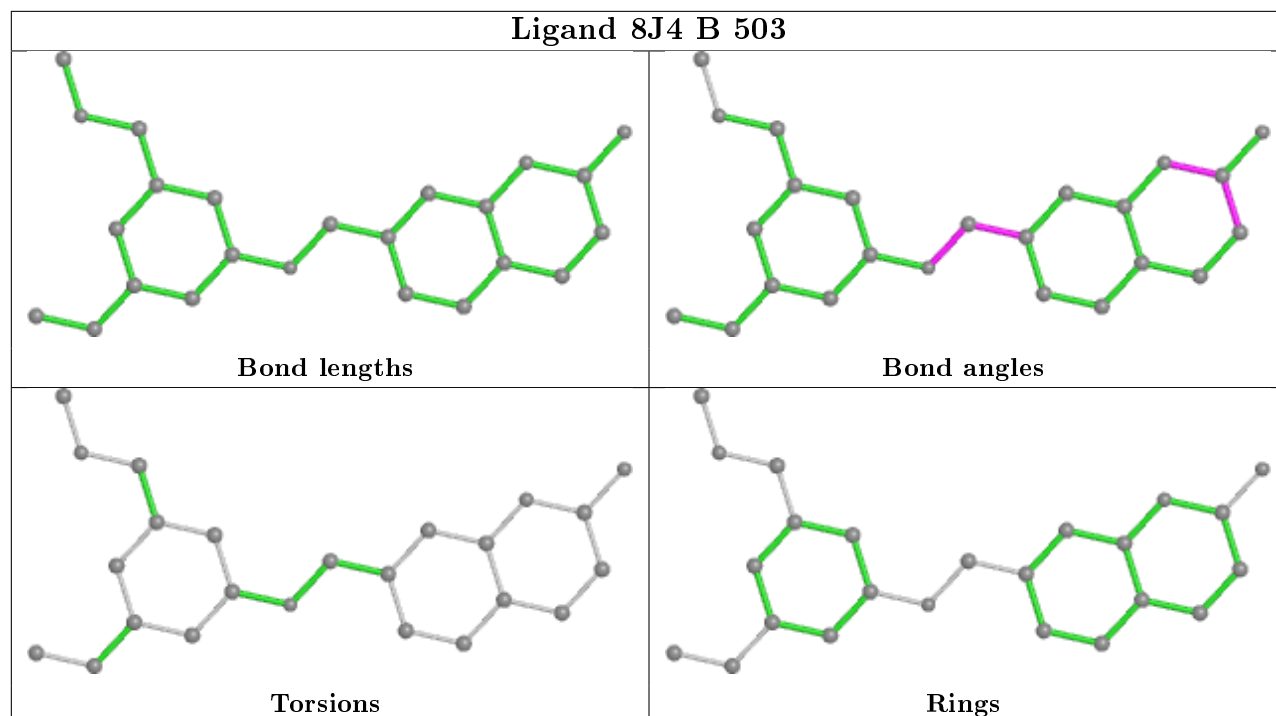
## Ligand 8J4 A 503

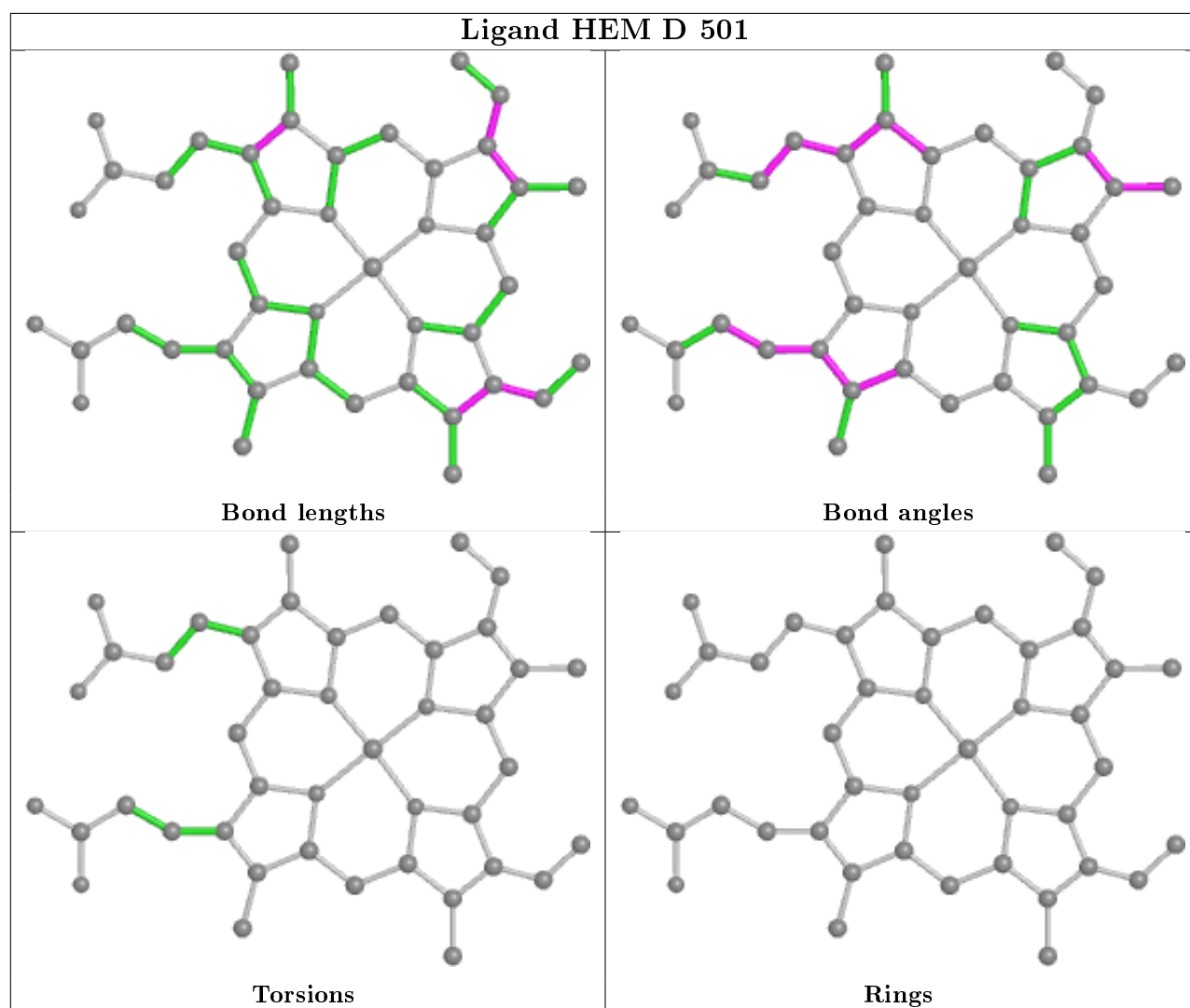


## Ligand HEM A 501









## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 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	A	404/440 (91%)	0.53	30 (7%) 14 13	31, 60, 107, 126	0
1	B	402/440 (91%)	0.10	5 (1%) 79 77	29, 44, 77, 108	0
1	C	401/440 (91%)	0.28	19 (4%) 31 30	32, 55, 95, 118	0
1	D	402/440 (91%)	0.04	6 (1%) 73 72	28, 43, 71, 117	0
All	All	1609/1760 (91%)	0.24	60 (3%) 41 39	28, 50, 93, 126	0

The worst 5 of 60 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	480	TRP	6.9
1	A	107	ARG	6.1
1	A	109	LEU	6.1
1	A	142	GLY	5.2
1	D	67	LYS	4.9

### 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 carbohydrates 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.

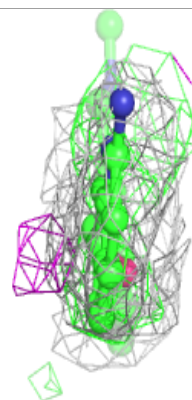
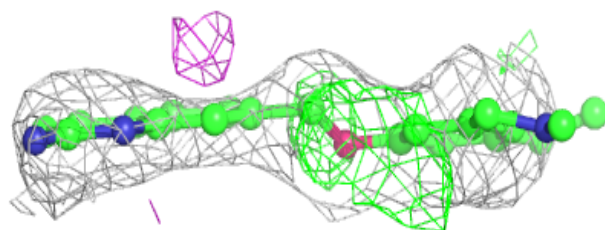
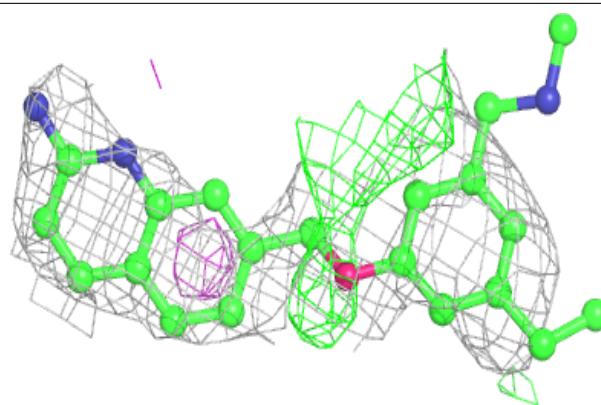


Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	BTB	B	507	14/14	0.66	0.17	77,82,89,90	0
9	GD	A	509	1/1	0.68	0.10	129,129,129,129	1
4	8J4	A	503	24/24	0.72	0.29	79,97,117,122	0
5	BTB	B	506	14/14	0.72	0.25	74,83,88,90	0
4	8J4	C	503	24/24	0.73	0.23	67,76,92,96	0
5	BTB	D	504	14/14	0.76	0.21	46,65,77,81	0
5	BTB	B	505	14/14	0.77	0.16	82,95,103,105	0
5	BTB	C	504	14/14	0.79	0.16	75,87,92,94	0
5	BTB	B	504	14/14	0.82	0.15	35,55,72,73	0
5	BTB	D	506	14/14	0.83	0.17	95,101,106,106	0
5	BTB	B	511	14/14	0.83	0.23	59,63,87,90	0
4	8J4	B	503	24/24	0.84	0.26	50,66,103,106	0
3	H4B	C	502	17/17	0.86	0.20	55,66,78,80	0
7	GOL	C	506	6/6	0.86	0.21	57,65,71,71	0
5	BTB	A	505	14/14	0.86	0.16	72,84,90,90	0
4	8J4	D	503	24/24	0.87	0.23	48,61,96,108	0
9	GD	C	508	1/1	0.88	0.11	111,111,111,111	1
3	H4B	A	502	17/17	0.89	0.14	48,60,66,69	0
5	BTB	B	510	14/14	0.89	0.18	39,68,83,83	0
3	H4B	D	502	17/17	0.90	0.13	27,46,52,52	0
5	BTB	A	504	14/14	0.92	0.19	75,85,93,96	0
3	H4B	B	502	17/17	0.92	0.11	34,46,54,61	0
5	BTB	D	505	14/14	0.92	0.24	65,74,78,79	0
7	GOL	A	507	6/6	0.93	0.20	64,72,77,80	0
2	HEM	A	501	43/43	0.95	0.15	39,50,73,80	0
2	HEM	C	501	43/43	0.95	0.15	35,54,73,86	0
8	CL	C	507	1/1	0.95	0.09	71,71,71,71	0
2	HEM	D	501	43/43	0.96	0.15	31,41,68,71	0
8	CL	D	510	1/1	0.96	0.19	79,79,79,79	0
8	CL	B	508	1/1	0.96	0.07	50,50,50,50	0
2	HEM	B	501	43/43	0.96	0.14	30,38,61,67	0
8	CL	A	508	1/1	0.97	0.09	67,67,67,67	0
6	ZN	C	505	1/1	0.98	0.13	45,45,45,45	0
11	MG	D	509	1/1	0.98	0.20	35,35,35,35	0
8	CL	D	508	1/1	0.98	0.06	47,47,47,47	0
9	GD	B	509	1/1	0.99	0.18	52,52,52,52	0
10	CA	A	510	1/1	0.99	0.22	37,37,37,37	0
6	ZN	A	506	1/1	0.99	0.13	46,46,46,46	0
9	GD	D	507	1/1	1.00	0.15	51,51,51,51	0

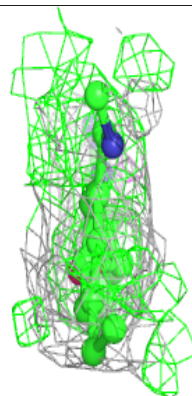
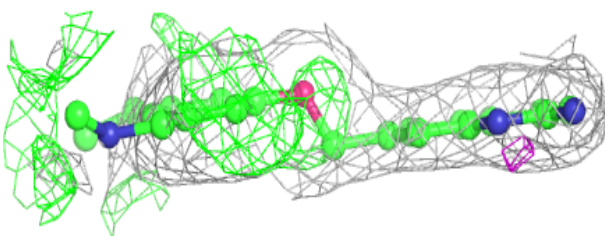
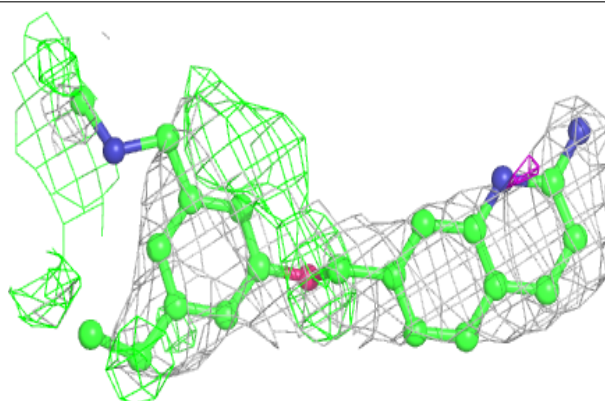
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around 8J4 A 503:**

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

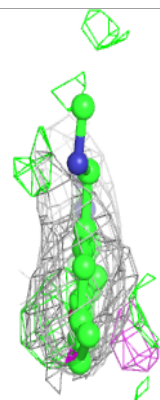
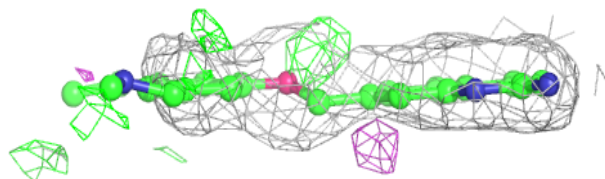
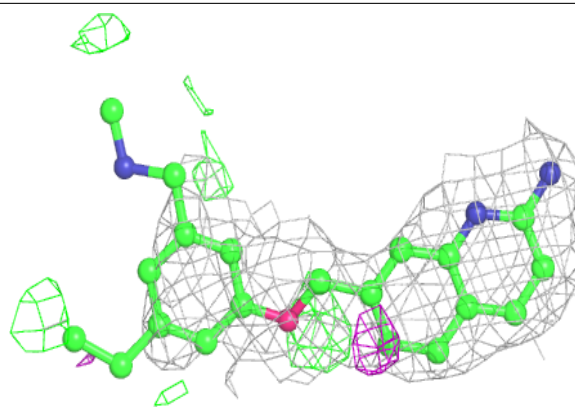
**Electron density around 8J4 C 503:**

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

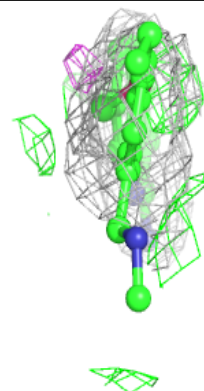
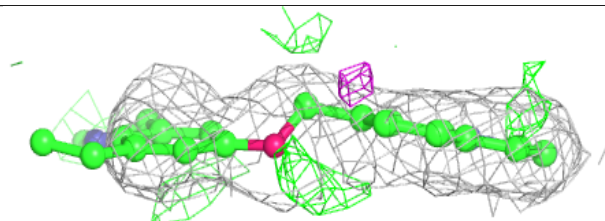
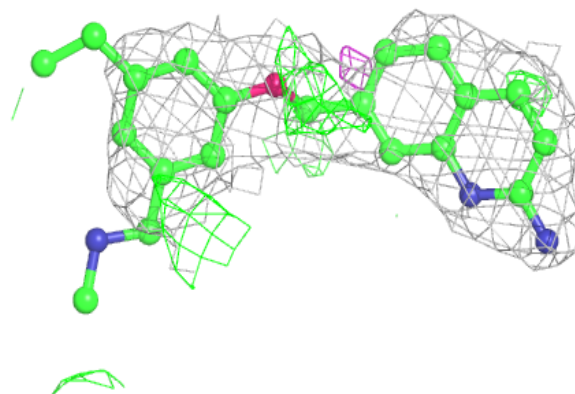


**Electron density around 8J4 B 503:**

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

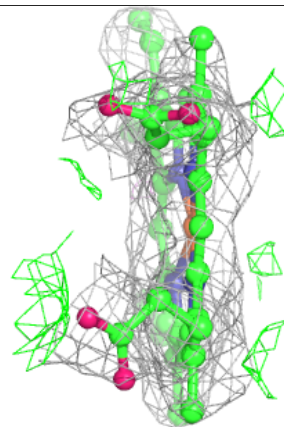
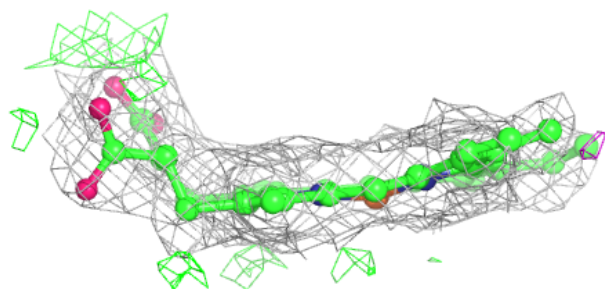
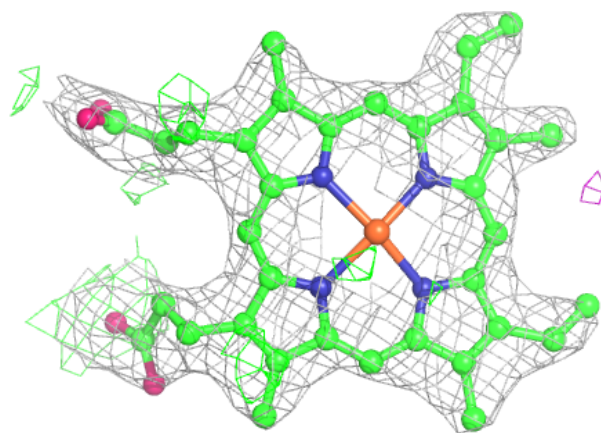
**Electron density around 8J4 D 503:**

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



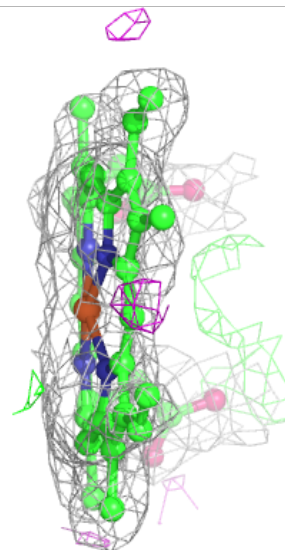
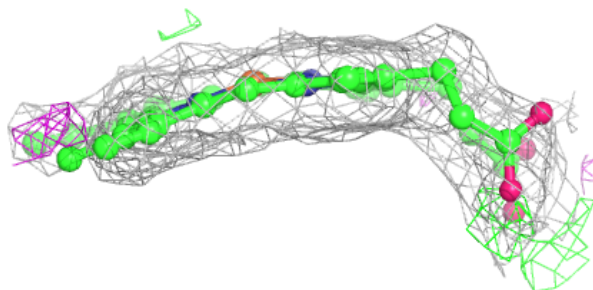
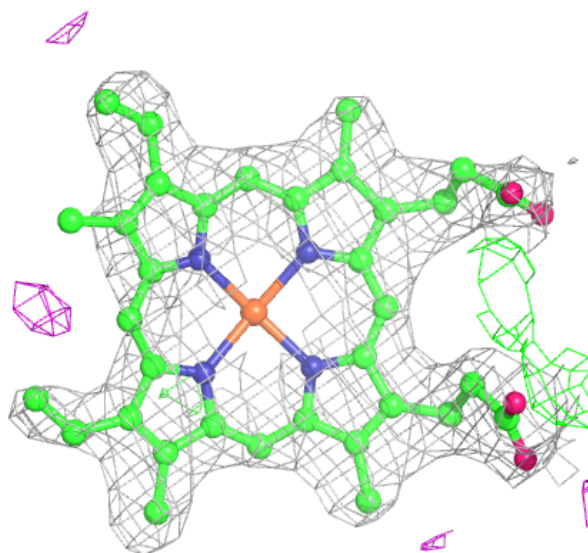
**Electron density around HEM A 501:**

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



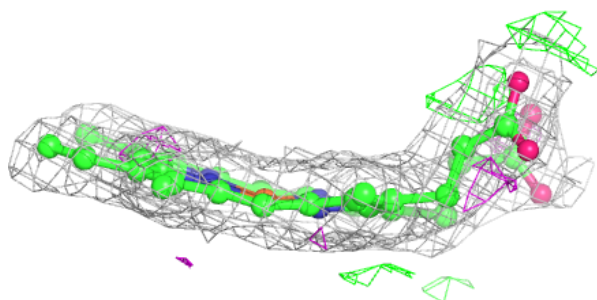
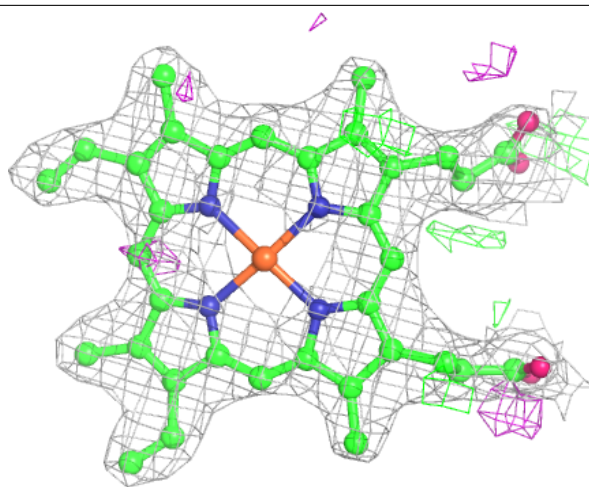
**Electron density around HEM C 501:**

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and green (positive)



**Electron density around HEM D 501:**

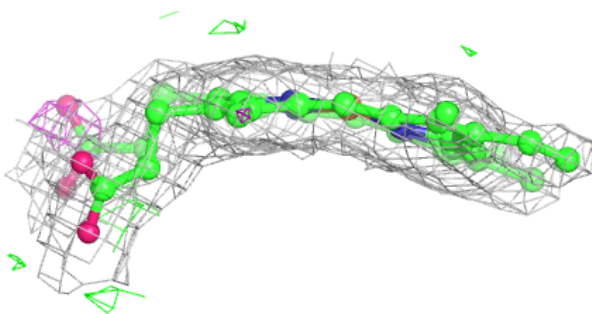
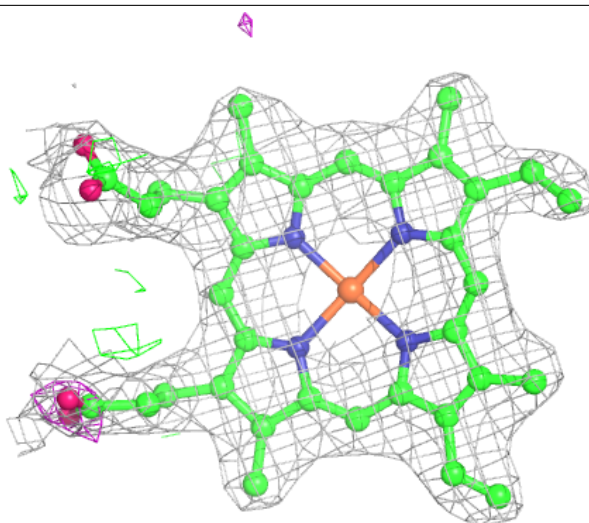
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





**Electron density around HEM B 501:**

$2mF_o-DF_c$  (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.