



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 28, 2023 – 09:49 AM EDT

PDB ID : 3JT8  
Title : Structure of neuronal nitric oxide synthase heme domain complexed with N 5  
-3-[(1-methylethyl)sulfanyl]propanimidoyl-L-ornithine  
Authors : Li, H.; Poulos, T.L.  
Deposited on : 2009-09-11  
Resolution : 1.95 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 : 1.8.5 (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

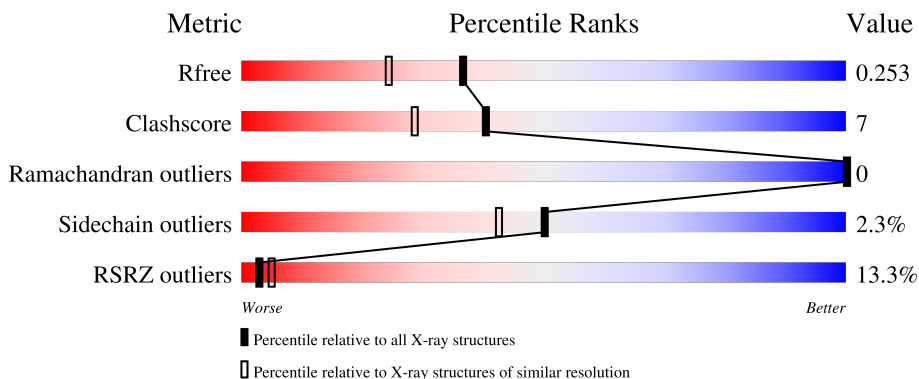
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	422	
1	B	422	

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:

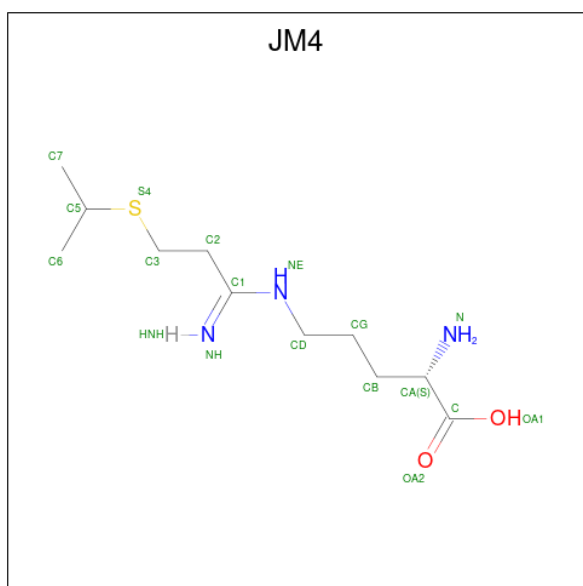
Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	JM4	A	800[A]	-	-	X	-
4	JM4	A	800[B]	-	-	X	-
4	JM4	B	800[A]	-	-	X	-
4	JM4	B	800[B]	-	-	X	-





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

- Molecule 4 is N 5 -{3-[(1-methylethyl)sulfanyl]propanimidoyl}-L-ornithine (three-letter code: JM4) (formula: C<sub>11</sub>H<sub>23</sub>N<sub>3</sub>O<sub>2</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
4	A	1	29	20	5	2	2	0	1

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
4	B	1	29	20	5	2	2	0	1

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	A	1	4	2	2	0	0
5	B	1	4	2	2	0	0

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

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

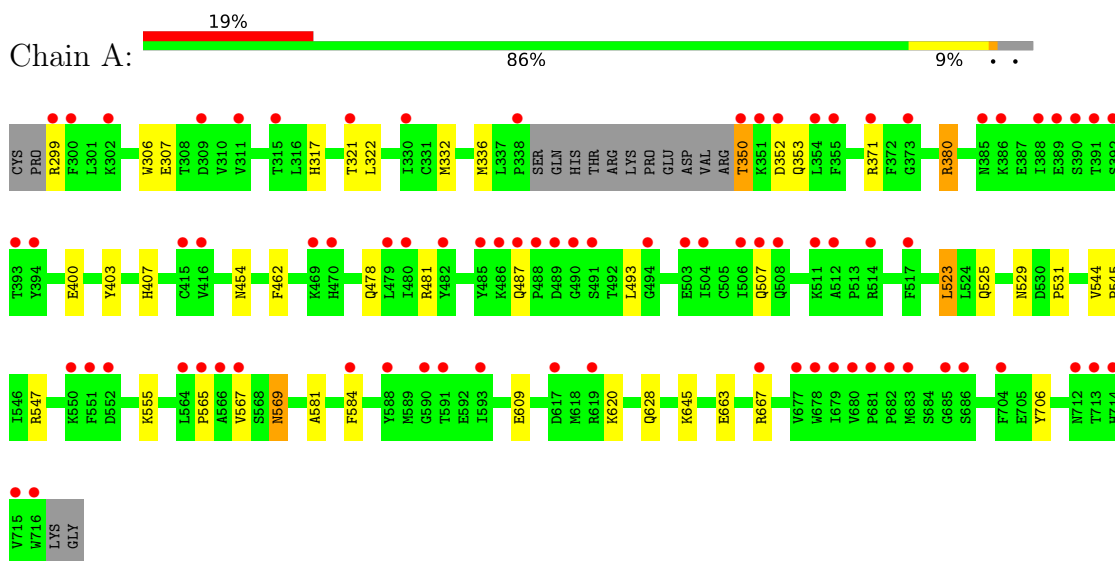
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
7	A	151	151	151	0	0
7	B	230	230	230	0	0

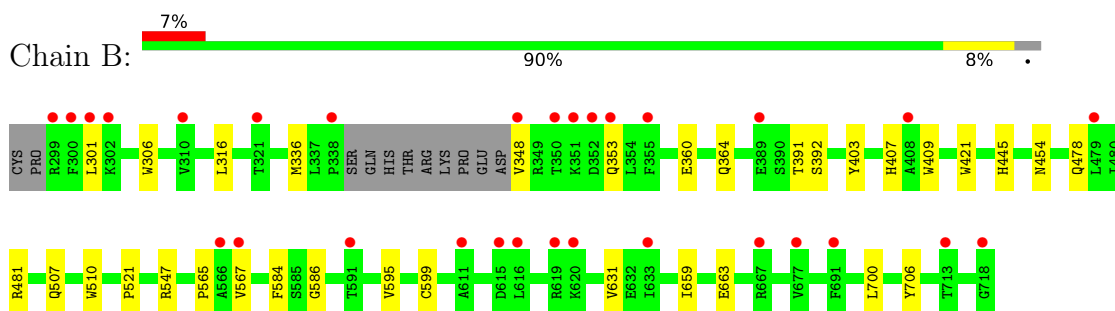
### 3 Residue-property plots [i](#)

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: Nitric oxide synthase, brain



- Molecule 1: Nitric oxide synthase, brain



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	52.19Å 111.37Å 164.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.11 – 1.95 37.82 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.0 (38.11-1.95) 99.0 (37.82-1.95)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.52 (at 1.95Å)	Xtrriage
Refinement program	REFMAC 5.5.0089, CNS	Depositor
R, $R_{free}$	0.187 , 0.222 0.223 , 0.253	Depositor DCC
$R_{free}$ test set	3484 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	34.5	Xtrriage
Anisotropy	0.182	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 46.8	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	0.95	EDS
Total number of atoms	7241	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	47.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.37% 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: H4B, ZN, JM4, HEM, ACT

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	0.54	0/3418	0.61	0/4637
1	B	0.61	0/3456	0.61	0/4685
All	All	0.58	0/6874	0.61	0/9322

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	3319	0	3231	32	0
1	B	3354	0	3274	31	0
2	A	43	0	30	6	0
2	B	43	0	30	4	0
3	A	17	0	15	0	0
3	B	17	0	15	0	0
4	A	29	0	38	33	0
4	B	29	0	38	27	0
5	A	4	0	3	0	0
5	B	4	0	3	0	0
6	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	151	0	0	2	0
7	B	230	0	0	4	0
All	All	7241	0	6677	98	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (98) 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)
4:B:800[B]:JM4:NE	4:B:800[B]:JM4:H6B	1.39	1.32
4:A:800[B]:JM4:H6B	4:A:800[B]:JM4:C1	1.70	1.21
4:A:800[B]:JM4:H6B	4:A:800[B]:JM4:C2	1.75	1.17
4:B:800[B]:JM4:NE	4:B:800[B]:JM4:C6	2.08	1.16
1:A:565:PRO:HB2	4:A:800[B]:JM4:H2A	1.28	1.10
4:B:800[B]:JM4:H6B	4:B:800[B]:JM4:CD	1.81	1.10
4:B:800[B]:JM4:H6A	4:B:800[B]:JM4:C1	1.80	1.10
4:A:800[B]:JM4:C2	4:A:800[B]:JM4:C6	2.34	1.03
4:A:800[B]:JM4:C1	4:A:800[B]:JM4:C6	2.35	1.02
4:B:800[B]:JM4:C6	4:B:800[B]:JM4:C1	2.38	1.01
4:A:800[B]:JM4:H6B	4:A:800[B]:JM4:H2	1.42	1.01
1:B:584:PHE:CE1	4:B:800[B]:JM4:H7B	2.01	0.96
1:B:584:PHE:HE1	4:B:800[B]:JM4:H7B	1.34	0.86
4:B:800[B]:JM4:H6B	4:B:800[B]:JM4:HDA	1.60	0.83
4:A:800[B]:JM4:H6B	4:A:800[B]:JM4:CD	2.08	0.82
1:B:586:GLY:H	4:B:800[B]:JM4:H3	1.49	0.77
4:A:800[B]:JM4:H6B	4:A:800[B]:JM4:HD	1.66	0.77
4:A:800[B]:JM4:H6B	4:A:800[B]:JM4:NE	1.99	0.76
1:A:567:VAL:HG21	4:A:800[A]:JM4:H6	1.69	0.73
1:A:523:LEU:HD22	1:A:531:PRO:HB2	1.71	0.71
1:A:584:PHE:CE1	4:A:800[B]:JM4:H7B	2.26	0.71
1:B:565:PRO:HB2	4:B:800[B]:JM4:H2	1.73	0.69
1:A:350:THR:N	1:A:353:GLN:HE21	1.93	0.66
1:A:584:PHE:HE1	4:A:800[B]:JM4:H7B	1.58	0.65
4:A:800[A]:JM4:HDA	4:A:800[A]:JM4:H6B	1.79	0.65
1:A:307:GLU:HG3	7:B:1069:HOH:O	1.98	0.63
4:A:800[B]:JM4:C1	4:A:800[B]:JM4:H6A	2.25	0.62
4:B:800[B]:JM4:H6B	4:B:800[B]:JM4:HNE	1.56	0.62
1:B:565:PRO:HG2	4:B:800[B]:JM4:H2A	1.83	0.61
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.82	0.61
1:B:584:PHE:HE1	4:B:800[A]:JM4:H5	1.65	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:565:PRO:CB	4:A:800[B]:JM4:H2A	2.19	0.61
1:B:584:PHE:HE1	4:B:800[B]:JM4:C7	2.11	0.61
2:B:750:HEM:C4D	4:B:800[A]:JM4:H6A	2.36	0.60
4:A:800[A]:JM4:CD	4:A:800[A]:JM4:H7A	2.31	0.60
1:B:478:GLN:HB2	1:B:481:ARG:HG3	1.86	0.57
1:A:663:GLU:O	1:A:667:ARG:HG2	2.04	0.56
2:B:750:HEM:C4B	4:B:800[A]:JM4:H3A	2.40	0.56
1:A:584:PHE:HE1	4:A:800[A]:JM4:H5	1.70	0.56
1:B:565:PRO:HG2	4:B:800[B]:JM4:C2	2.35	0.56
2:A:750:HEM:C4B	4:A:800[A]:JM4:H3A	2.41	0.55
4:B:800[A]:JM4:H6B	4:B:800[A]:JM4:HDA	1.88	0.55
1:A:567:VAL:HG21	4:A:800[B]:JM4:H7A	1.88	0.55
1:A:565:PRO:HG2	4:A:800[A]:JM4:H2A	1.89	0.54
1:A:567:VAL:HG21	4:A:800[A]:JM4:C6	2.37	0.54
1:B:567:VAL:HG21	4:B:800[A]:JM4:H6	1.88	0.53
4:A:800[A]:JM4:H7A	4:A:800[A]:JM4:H2	1.90	0.53
4:B:800[B]:JM4:C6	4:B:800[B]:JM4:HNE	2.17	0.53
1:A:380:ARG:HD3	1:A:400:GLU:OE1	2.10	0.52
1:A:299:ARG:O	1:A:317:HIS:CE1	2.63	0.52
2:A:750:HEM:HBB2	2:A:750:HEM:HHC	1.93	0.51
4:A:800[A]:JM4:HDA	4:A:800[A]:JM4:H7A	1.91	0.51
2:A:750:HEM:HBC2	2:A:750:HEM:CMC	2.41	0.51
4:A:800[A]:JM4:H7A	4:A:800[A]:JM4:HD	1.93	0.50
1:A:567:VAL:CG2	4:A:800[B]:JM4:H7A	2.43	0.49
2:A:750:HEM:HBC2	2:A:750:HEM:HMC1	1.94	0.49
1:B:364:GLN:NE2	7:B:1218:HOH:O	2.26	0.49
2:B:750:HEM:HHC	2:B:750:HEM:HBB2	1.94	0.49
2:A:750:HEM:C4D	4:A:800[A]:JM4:H6A	2.47	0.49
1:B:403:TYR:CE1	1:B:407:HIS:CE1	3.01	0.49
1:B:391:THR:O	1:B:392:SER:HB2	2.13	0.48
1:B:567:VAL:HG21	4:B:800[A]:JM4:C6	2.43	0.48
1:B:507:GLN:NE2	7:B:1079:HOH:O	2.46	0.48
1:A:332:MET:HE3	1:B:301:LEU:HD22	1.95	0.47
1:B:445:HIS:C	1:B:445:HIS:CD2	2.88	0.47
1:A:336:MET:HG3	1:B:306:TRP:NE1	2.29	0.47
4:A:800[B]:JM4:HD	4:A:800[B]:JM4:H7A	1.96	0.46
1:B:595:VAL:O	1:B:599:CYS:HB2	2.16	0.46
1:B:706:TYR:OH	2:B:750:HEM:O1D	2.22	0.46
1:A:569:ASN:HD22	1:A:569:ASN:H	1.63	0.46
1:A:609:GLU:HG3	7:A:1148:HOH:O	2.16	0.45
4:A:800[A]:JM4:H3	4:A:800[A]:JM4:H7B	1.80	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.52	0.45
1:A:403:TYR:CE1	1:A:407:HIS:CE1	3.05	0.45
1:A:493:LEU:HA	7:A:1103:HOH:O	2.17	0.45
4:A:800[B]:JM4:H2	4:A:800[B]:JM4:HD	1.76	0.45
1:A:706:TYR:OH	2:A:750:HEM:O1D	2.26	0.44
1:B:586:GLY:N	4:B:800[B]:JM4:H3	2.25	0.44
4:B:800[A]:JM4:H7B	4:B:800[A]:JM4:H3	1.68	0.44
1:A:321:THR:HG23	1:A:322:LEU:HG	2.00	0.44
4:A:800[B]:JM4:HNE	4:A:800[B]:JM4:HBA	1.61	0.44
4:A:800[A]:JM4:H2	4:A:800[A]:JM4:C7	2.48	0.43
1:B:565:PRO:HG2	4:B:800[A]:JM4:H2A	2.01	0.43
1:B:567:VAL:HG21	4:B:800[B]:JM4:H7A	2.00	0.43
1:B:510:TRP:CE2	1:B:521:PRO:HD3	2.53	0.43
1:B:348:VAL:HG12	7:B:1168:HOH:O	2.19	0.43
1:A:628:GLN:HG2	1:B:631:VAL:HG11	2.00	0.43
1:B:316:LEU:HD21	1:B:700:LEU:HD11	2.01	0.42
1:B:567:VAL:CG2	4:B:800[B]:JM4:H7A	2.50	0.42
1:A:306:TRP:CD2	1:B:336:MET:HE3	2.54	0.42
1:A:525:GLN:HG3	1:A:529:ASN:O	2.19	0.42
1:A:350:THR:N	1:A:353:GLN:NE2	2.66	0.41
1:A:567:VAL:CG2	4:A:800[A]:JM4:H6	2.43	0.41
1:A:462:PHE:HB2	1:A:581:ALA:HB3	2.03	0.41
4:B:800[A]:JM4:HDA	4:B:800[A]:JM4:H7A	2.03	0.40
1:A:544:VAL:HA	1:A:545:PRO:HD2	1.93	0.40
4:A:800[B]:JM4:H6A	4:A:800[B]:JM4:NH	2.37	0.40
1:B:659:ILE:O	1:B:663:GLU:HG3	2.22	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	405/422 (96%)	396 (98%)	9 (2%)	0	100	100
1	B	410/422 (97%)	402 (98%)	8 (2%)	0	100	100
All	All	815/844 (97%)	798 (98%)	17 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	365/377 (97%)	352 (96%)	13 (4%)	35	23
1	B	369/377 (98%)	365 (99%)	4 (1%)	73	71
All	All	734/754 (97%)	717 (98%)	17 (2%)	50	42

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	350	THR
1	A	352	ASP
1	A	371	ARG
1	A	380	ARG
1	A	454	ASN
1	A	487	GLN
1	A	507	GLN
1	A	523	LEU
1	A	547	ARG
1	A	555	LYS
1	A	569	ASN
1	A	620	LYS
1	A	645	LYS
1	B	353	GLN
1	B	360	GLU
1	B	454	ASN
1	B	547	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	385	ASN
1	A	454	ASN
1	A	508	GLN
1	A	569	ASN
1	A	628	GLN
1	A	642	GLN
1	A	697	ASN
1	B	454	ASN
1	B	507	GLN
1	B	508	GLN
1	B	601	ASN
1	B	605	ASN
1	B	628	GLN
1	B	642	GLN
1	B	697	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 11 ligands modelled in this entry, 1 is monoatomic - leaving 10 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
4	JM4	B	800[B]	-	14,16,16	4.50	3 (21%)	12,19,19	1.18	2 (16%)
4	JM4	B	800[A]	-	14,16,16	4.34	3 (21%)	12,19,19	1.19	2 (16%)
3	H4B	B	760	-	16,18,18	1.28	3 (18%)	11,26,26	2.65	6 (54%)
5	ACT	B	860	-	3,3,3	0.66	0	3,3,3	1.06	0
2	HEM	A	750	1	41,50,50	1.87	7 (17%)	45,82,82	1.96	10 (22%)
2	HEM	B	750	1	41,50,50	1.87	7 (17%)	45,82,82	1.77	7 (15%)
5	ACT	A	860	-	3,3,3	0.78	0	3,3,3	0.77	0
4	JM4	A	800[B]	-	14,16,16	4.55	3 (21%)	12,19,19	1.12	1 (8%)
4	JM4	A	800[A]	-	14,16,16	4.47	3 (21%)	12,19,19	1.10	1 (8%)
3	H4B	A	760	-	16,18,18	0.88	0	11,26,26	2.81	7 (63%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	JM4	B	800[B]	-	-	2/16/17/17	-
4	JM4	B	800[A]	-	-	5/16/17/17	-
3	H4B	B	760	-	-	0/8/17/17	0/2/2/2
2	HEM	A	750	1	-	1/12/54/54	-
2	HEM	B	750	1	-	0/12/54/54	-
4	JM4	A	800[B]	-	-	7/16/17/17	-
4	JM4	A	800[A]	-	-	3/16/17/17	-
3	H4B	A	760	-	-	0/8/17/17	0/2/2/2

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	800[B]	JM4	C2-C1	-16.05	1.34	1.50
4	B	800[B]	JM4	C2-C1	-15.99	1.34	1.50
4	A	800[A]	JM4	C2-C1	-15.78	1.34	1.50
4	B	800[A]	JM4	C2-C1	-15.48	1.34	1.50
2	A	750	HEM	C3D-C2D	7.61	1.52	1.36
2	B	750	HEM	C3D-C2D	6.77	1.51	1.36
4	A	800[B]	JM4	C3-S4	-4.32	1.75	1.81
4	A	800[A]	JM4	C3-S4	-4.31	1.75	1.81
2	B	750	HEM	C3C-C2C	-4.23	1.34	1.40
4	B	800[B]	JM4	C3-S4	-4.06	1.76	1.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	750	HEM	C3C-CAC	3.46	1.54	1.47
4	B	800[A]	JM4	C3-S4	-3.45	1.77	1.81
2	A	750	HEM	C3C-C2C	-3.10	1.36	1.40
2	A	750	HEM	C3C-CAC	3.00	1.54	1.47
2	A	750	HEM	CAB-C3B	2.75	1.54	1.47
2	B	750	HEM	CAB-C3B	2.64	1.54	1.47
4	A	800[B]	JM4	C1-NH	2.52	1.34	1.27
3	B	760	H4B	C4-N3	2.48	1.37	1.33
2	B	750	HEM	CMD-C2D	2.41	1.55	1.50
2	B	750	HEM	CMB-C2B	2.39	1.55	1.50
2	A	750	HEM	FE-NB	2.37	2.08	1.96
2	A	750	HEM	CAA-C2A	2.27	1.55	1.52
3	B	760	H4B	C7-C6	2.27	1.54	1.52
2	A	750	HEM	CMD-C2D	2.26	1.55	1.50
3	B	760	H4B	C7-N8	2.24	1.48	1.44
4	B	800[A]	JM4	C1-NH	2.19	1.33	1.27
4	B	800[B]	JM4	C1-NH	2.13	1.33	1.27
4	A	800[A]	JM4	C1-NH	2.04	1.33	1.27
2	B	750	HEM	FE-ND	2.01	2.06	1.96

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	750	HEM	CBA-CAA-C2A	-6.77	101.06	112.62
2	A	750	HEM	C4D-ND-C1D	6.76	112.05	105.07
2	A	750	HEM	CBA-CAA-C2A	-5.76	102.78	112.62
3	A	760	H4B	C8A-C4A-C4	5.01	119.02	114.57
2	B	750	HEM	C4D-ND-C1D	4.84	110.07	105.07
3	B	760	H4B	C8A-C4A-C4	4.47	118.54	114.57
3	B	760	H4B	N1-C2-N3	-3.60	119.78	125.42
3	A	760	H4B	N1-C2-N3	-3.59	119.79	125.42
3	B	760	H4B	C2-N3-C4	3.58	121.62	115.93
3	A	760	H4B	C4-C4A-N5	3.58	122.13	119.12
2	B	750	HEM	C4B-CHC-C1C	3.38	127.02	122.56
3	A	760	H4B	C2-N3-C4	3.33	121.21	115.93
3	A	760	H4B	C2-N1-C8A	3.21	121.74	114.54
3	B	760	H4B	C4-C4A-N5	3.13	121.75	119.12
2	A	750	HEM	CBD-CAD-C3D	-3.11	103.99	112.63
2	A	750	HEM	CMC-C2C-C3C	3.07	130.42	124.68
2	B	750	HEM	CBD-CAD-C3D	-3.04	104.19	112.63
2	A	750	HEM	C2C-C3C-C4C	2.77	108.83	106.90
3	B	760	H4B	C2-N1-C8A	2.67	120.52	114.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	750	HEM	C4C-CHD-C1D	2.60	125.98	122.56
4	B	800[A]	JM4	OA1-C-CA	2.58	122.17	113.38
4	B	800[B]	JM4	OA1-C-CA	2.58	122.17	113.38
3	A	760	H4B	N2-C2-N3	2.55	121.21	117.25
2	A	750	HEM	C3B-C2B-C1B	2.43	108.29	106.49
3	B	760	H4B	N2-C2-N3	2.37	120.93	117.25
2	B	750	HEM	CAD-C3D-C4D	2.34	128.74	124.66
4	B	800[A]	JM4	OA1-C-OA2	-2.25	118.99	124.09
4	B	800[B]	JM4	OA1-C-OA2	-2.25	118.99	124.09
4	A	800[A]	JM4	OA1-C-CA	2.22	120.95	113.38
4	A	800[B]	JM4	OA1-C-CA	2.22	120.95	113.38
2	A	750	HEM	CHD-C1D-ND	2.12	126.73	124.43
2	A	750	HEM	C4B-CHC-C1C	2.08	125.31	122.56
2	B	750	HEM	CMD-C2D-C1D	2.08	128.21	125.04
2	B	750	HEM	CHA-C4D-ND	2.06	126.92	124.38
3	A	760	H4B	C4A-N5-C6	-2.02	115.66	121.16
2	A	750	HEM	C1B-NB-C4B	2.00	107.14	105.07

There are no chirality outliers.

All (18) torsion outliers are listed below:

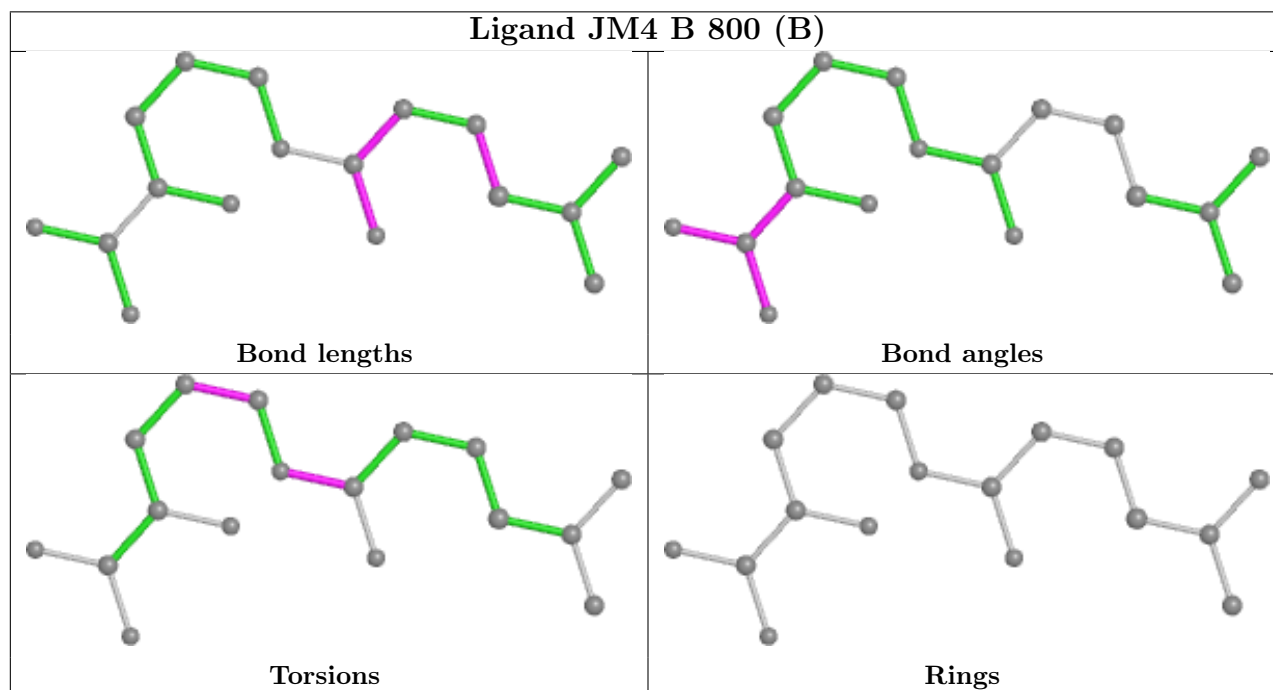
Mol	Chain	Res	Type	Atoms
4	A	800[A]	JM4	C7-C5-S4-C3
4	A	800[B]	JM4	NH-C1-NE-CD
4	A	800[B]	JM4	C1-C2-C3-S4
4	A	800[B]	JM4	C6-C5-S4-C3
4	A	800[B]	JM4	C7-C5-S4-C3
4	B	800[A]	JM4	C1-C2-C3-S4
4	B	800[A]	JM4	C7-C5-S4-C3
4	A	800[B]	JM4	C2-C1-NE-CD
4	A	800[A]	JM4	C2-C1-NE-CD
4	B	800[B]	JM4	C2-C1-NE-CD
4	A	800[B]	JM4	NE-CD-CG-CB
4	B	800[B]	JM4	NE-CD-CG-CB
4	A	800[B]	JM4	CA-CB-CG-CD
4	B	800[A]	JM4	C2-C1-NE-CD
2	A	750	HEM	C4B-C3B-CAB-CBB
4	B	800[A]	JM4	C6-C5-S4-C3
4	B	800[A]	JM4	C2-C3-S4-C5
4	A	800[A]	JM4	C1-C2-C3-S4

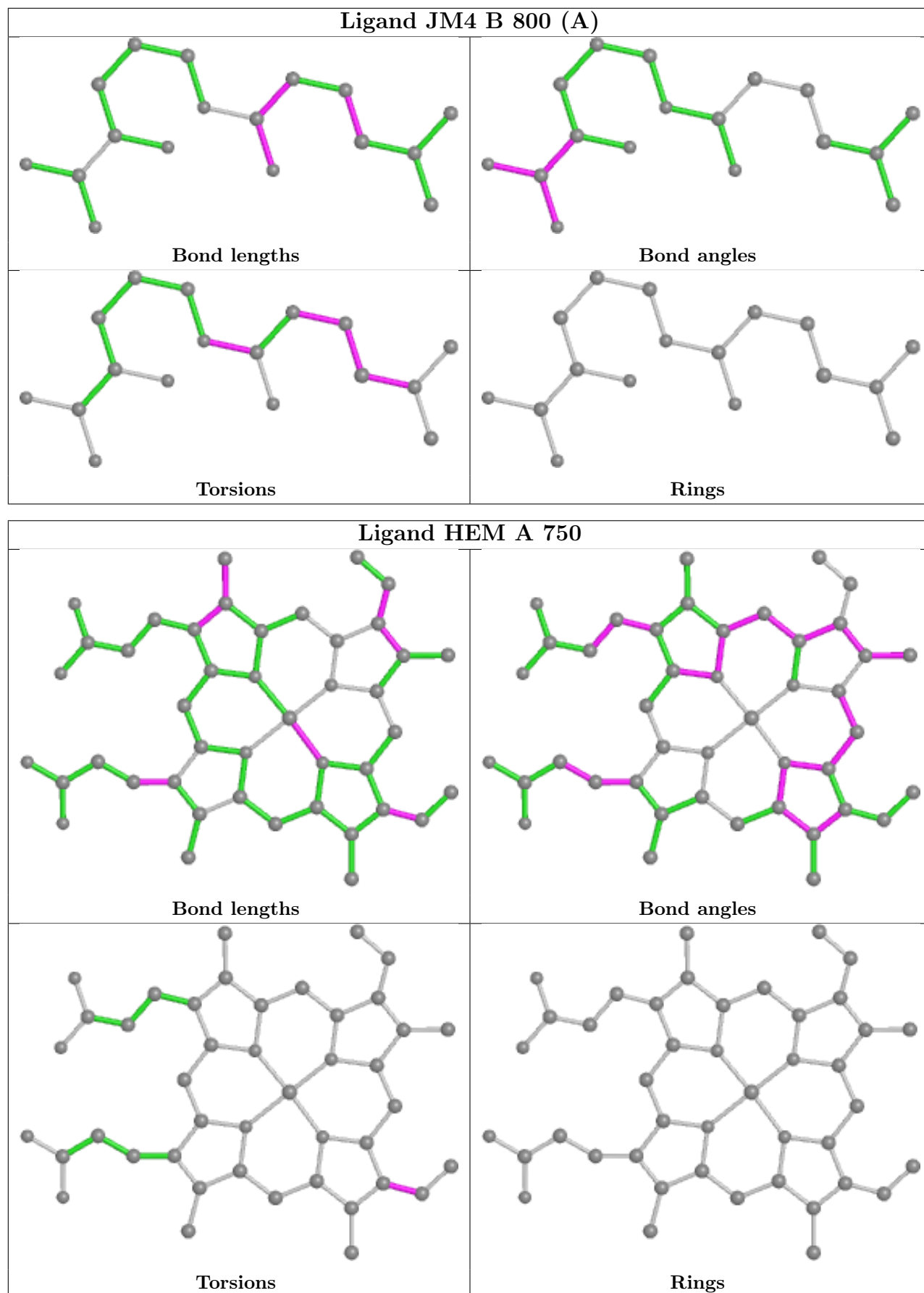
There are no ring outliers.

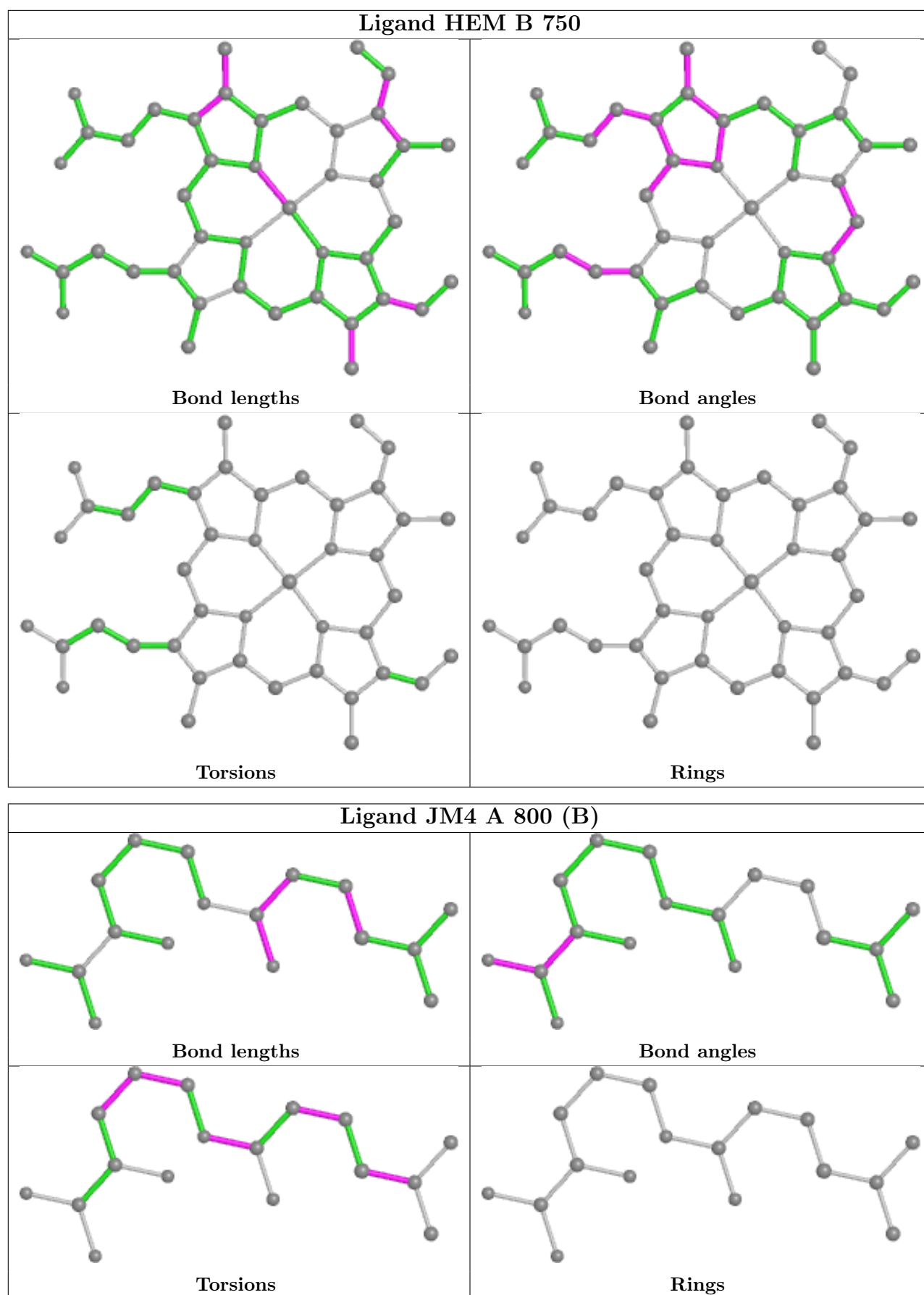
6 monomers are involved in 66 short contacts:

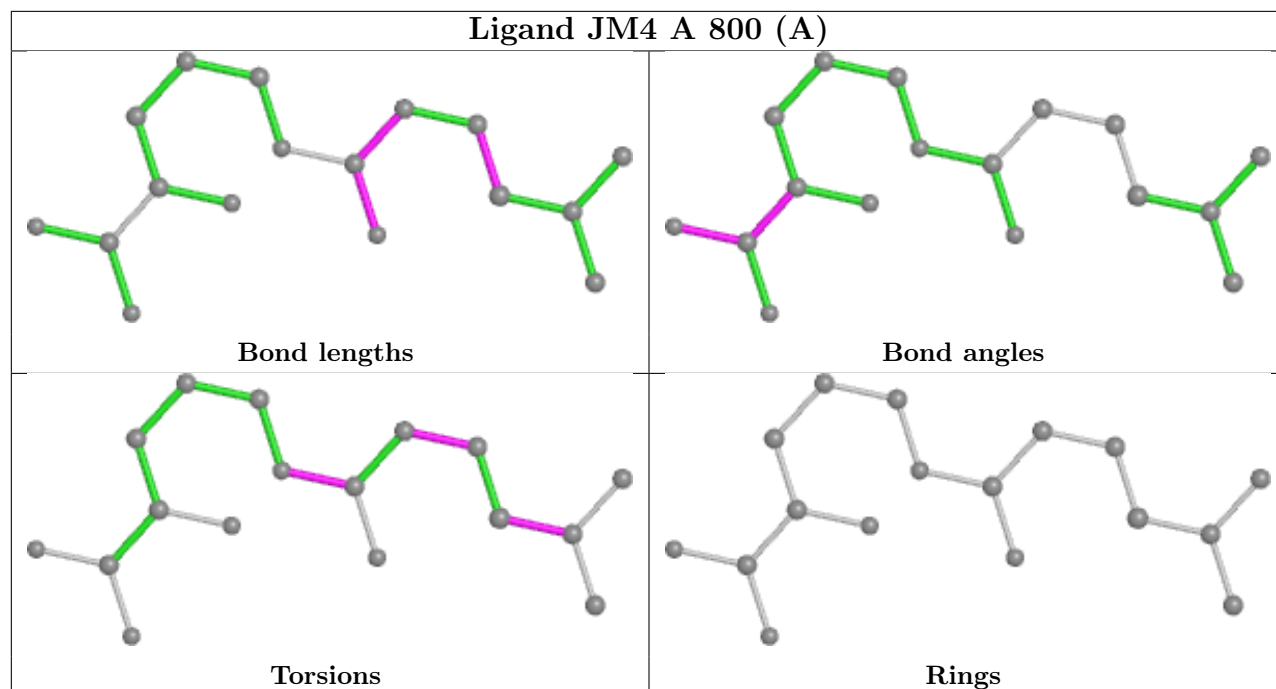
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	800[B]	JM4	18	0
4	B	800[A]	JM4	9	0
2	A	750	HEM	6	0
2	B	750	HEM	4	0
4	A	800[B]	JM4	19	0
4	A	800[A]	JM4	14	0

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	407/422 (96%)	1.08	79 (19%) <b>1</b> <b>1</b>	25, 52, 94, 123	0
1	B	411/422 (97%)	0.55	30 (7%) <b>15</b> <b>23</b>	25, 40, 63, 81	0
All	All	818/844 (96%)	0.81	109 (13%) <b>3</b> <b>5</b>	25, 45, 88, 123	0

All (109) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	300	PHE	8.8
1	A	716	TRP	7.5
1	A	715	VAL	7.4
1	A	352	ASP	6.7
1	A	355	PHE	6.4
1	B	348	VAL	5.9
1	B	718	GLY	5.4
1	A	488	PRO	5.0
1	A	351	LYS	4.7
1	A	486	LYS	4.7
1	A	300	PHE	4.4
1	A	350	THR	4.2
1	A	507	GLN	4.1
1	B	619	ARG	4.0
1	A	390	SER	4.0
1	A	619	ARG	3.9
1	B	299	ARG	3.8
1	A	388	ILE	3.8
1	A	511	LYS	3.8
1	A	506	ILE	3.8
1	A	514	ARG	3.7
1	A	392	SER	3.7
1	A	712	ASN	3.7
1	B	352	ASP	3.6

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	350	THR	3.6
1	A	678	TRP	3.6
1	A	491	SER	3.6
1	A	667	ARG	3.6
1	A	593	ILE	3.6
1	A	503	GLU	3.5
1	B	338	PRO	3.4
1	A	489	ASP	3.4
1	A	299	ARG	3.4
1	A	386	LYS	3.3
1	A	385	ASN	3.3
1	A	567	VAL	3.3
1	A	490	GLY	3.2
1	A	485	TYR	3.2
1	A	714	HIS	3.2
1	A	487	GLN	3.2
1	A	389	GLU	3.1
1	B	620	LYS	3.1
1	B	615	ASP	3.1
1	B	310	VAL	3.0
1	A	504	ILE	3.0
1	A	394	TYR	3.0
1	A	680	VAL	3.0
1	A	584	PHE	2.9
1	A	469	LYS	2.9
1	B	351	LYS	2.9
1	B	616	LEU	2.9
1	B	389	GLU	2.9
1	A	338	PRO	2.9
1	A	551	PHE	2.9
1	B	355	PHE	2.9
1	A	508	GLN	2.8
1	A	588	TYR	2.8
1	B	321	THR	2.8
1	A	470	HIS	2.8
1	A	679	ILE	2.7
1	A	565	PRO	2.7
1	A	321	THR	2.7
1	A	391	THR	2.7
1	A	494	GLY	2.6
1	B	567	VAL	2.6
1	B	667	ARG	2.6

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	704	PHE	2.6
1	A	713	THR	2.6
1	B	566	ALA	2.6
1	A	682	PRO	2.6
1	A	591	THR	2.6
1	B	611	ALA	2.5
1	A	479	LEU	2.5
1	A	393	THR	2.5
1	A	517	PHE	2.4
1	A	677	VAL	2.4
1	B	677	VAL	2.4
1	A	686	SER	2.4
1	B	591	THR	2.4
1	B	408	ALA	2.4
1	A	415	CYS	2.4
1	A	552	ASP	2.4
1	A	550	LYS	2.3
1	A	564	LEU	2.3
1	A	302	LYS	2.3
1	A	681	PRO	2.3
1	A	315	THR	2.3
1	A	617	ASP	2.3
1	A	590	GLY	2.2
1	B	302	LYS	2.2
1	A	309	ASP	2.2
1	B	301	LEU	2.2
1	B	479	LEU	2.2
1	A	371	ARG	2.2
1	A	482	TYR	2.2
1	A	373	GLY	2.1
1	A	566	ALA	2.1
1	B	353	GLN	2.1
1	A	416	VAL	2.1
1	A	512	ALA	2.1
1	A	685	GLY	2.1
1	A	354	LEU	2.1
1	A	480	ILE	2.1
1	B	713	THR	2.1
1	B	633	ILE	2.0
1	A	311	VAL	2.0
1	B	691	PHE	2.0
1	A	330	ILE	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	683	MET	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](#)

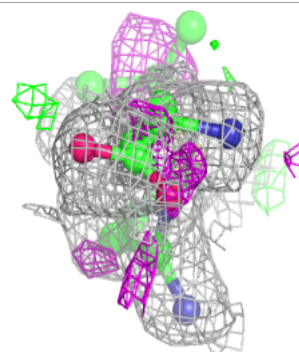
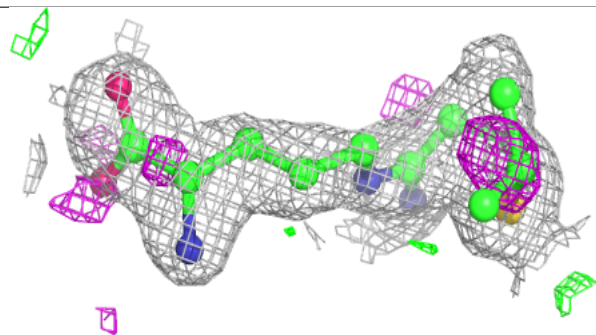
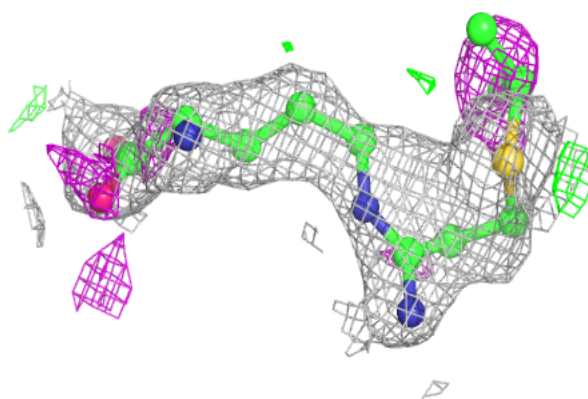
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	JM4	B	800[A]	17/17	0.83	0.26	43,47,49,50	12
4	JM4	B	800[B]	17/17	0.83	0.26	47,51,62,63	12
4	JM4	A	800[A]	17/17	0.84	0.30	42,47,51,53	12
4	JM4	A	800[B]	17/17	0.84	0.30	48,49,51,53	12
5	ACT	A	860	4/4	0.95	0.19	65,67,67,68	0
5	ACT	B	860	4/4	0.95	0.15	50,50,51,51	0
3	H4B	A	760	17/17	0.96	0.15	27,29,35,36	0
3	H4B	B	760	17/17	0.96	0.16	27,30,34,34	0
2	HEM	A	750	43/43	0.97	0.20	26,30,35,37	0
2	HEM	B	750	43/43	0.98	0.16	24,29,35,37	0
6	ZN	A	900	1/1	0.99	0.08	34,34,34,34	0

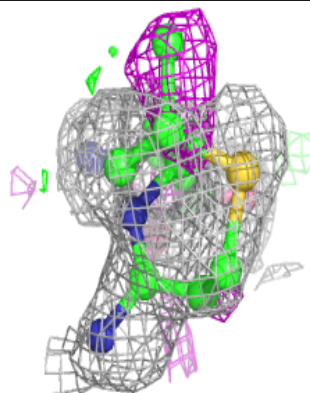
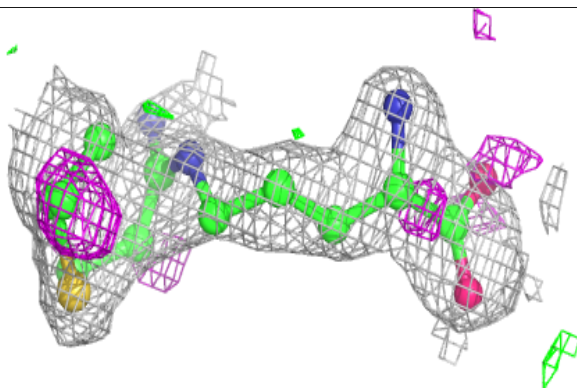
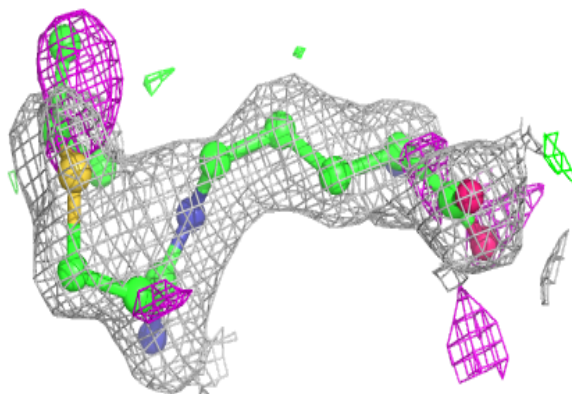
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around JM4 B 800 (A):**

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

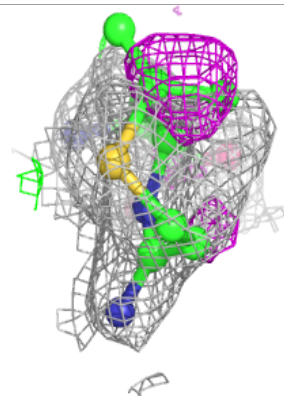
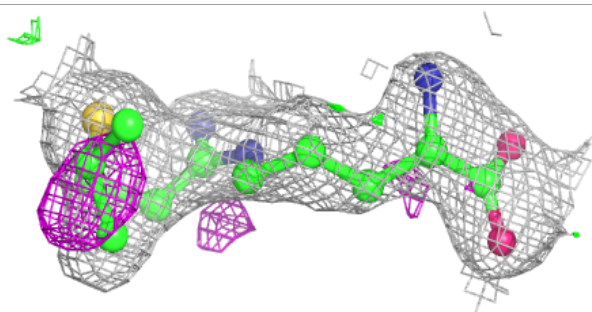
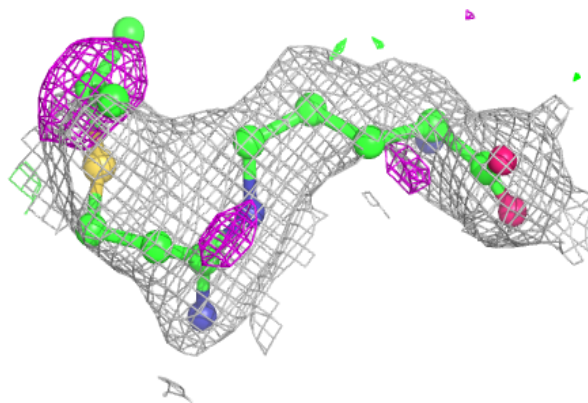
**Electron density around JM4 B 800 (B):**

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

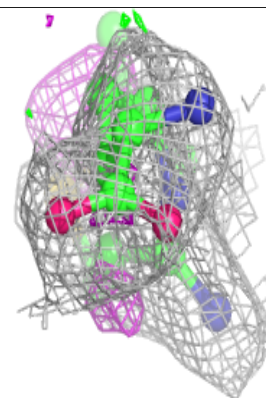
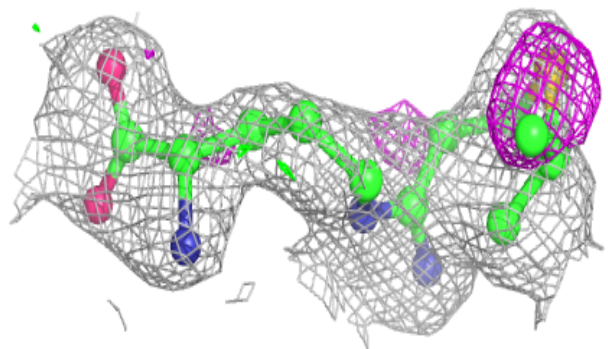
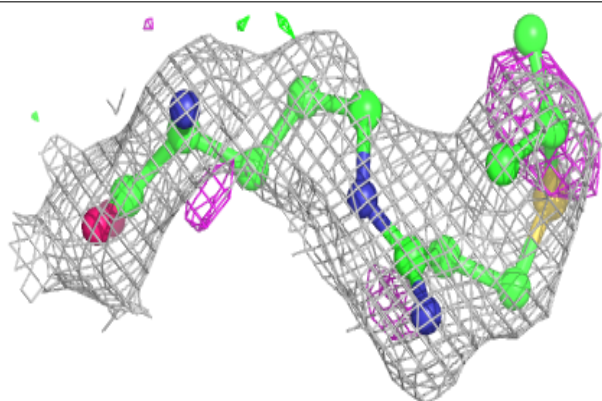


**Electron density around JM4 A 800 (A):**

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

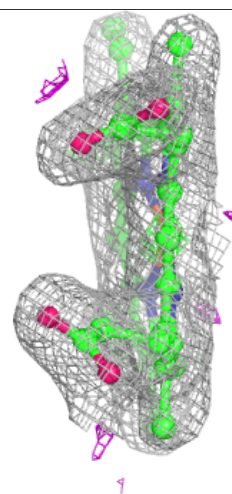
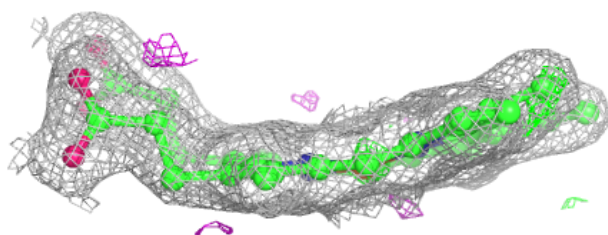
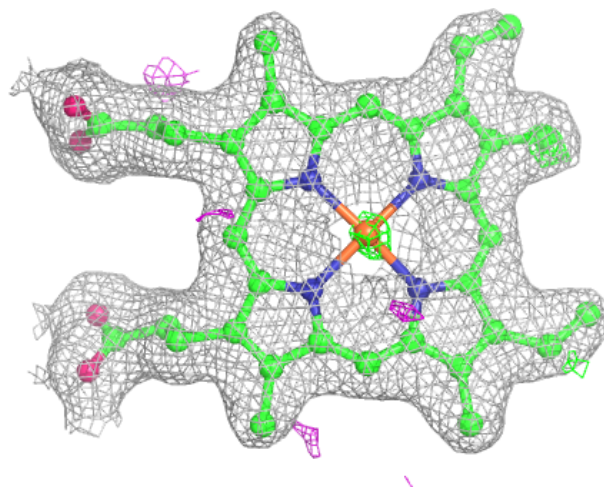
**Electron density around JM4 A 800 (B):**

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

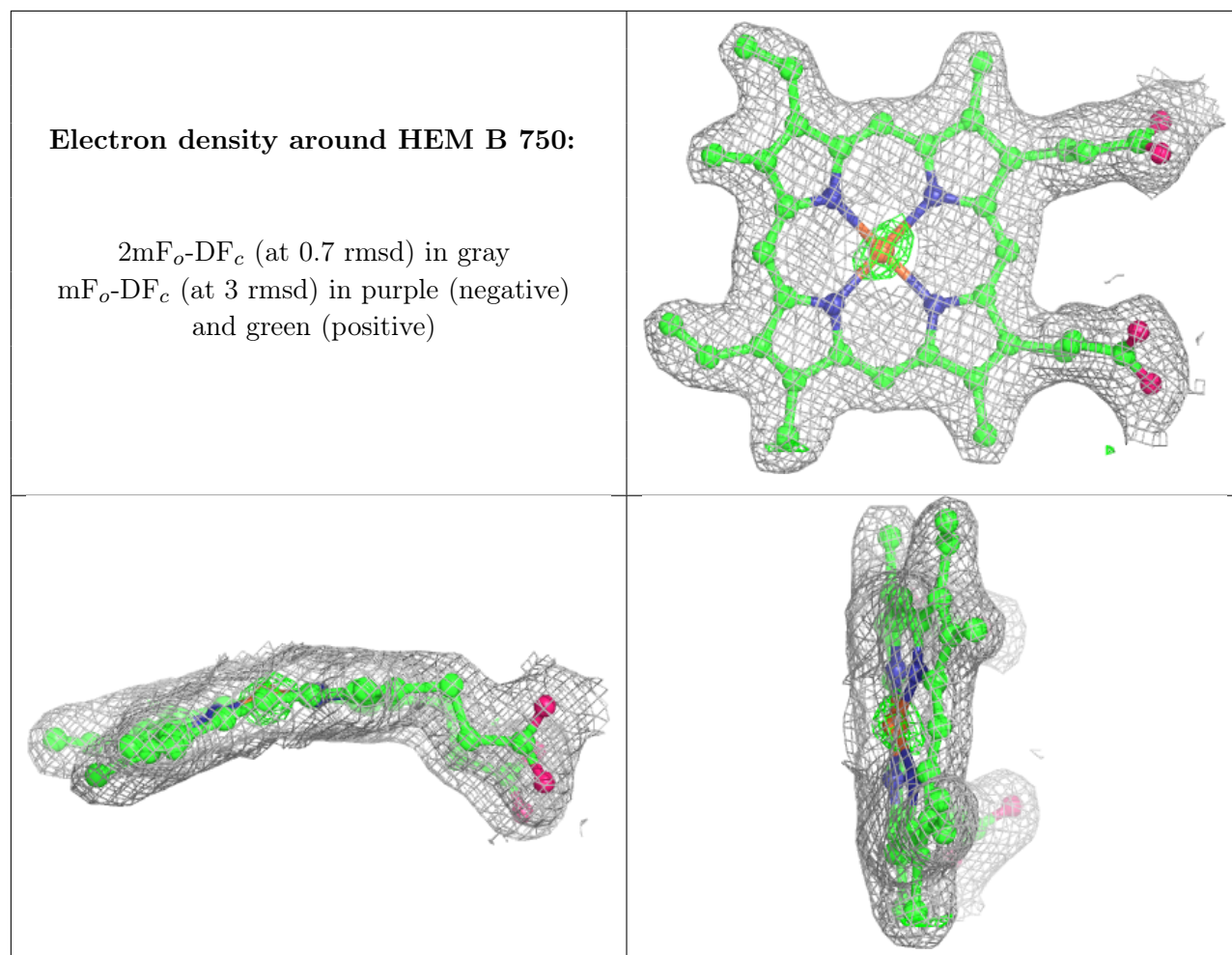


**Electron density around HEM A 750:**

$2mF_o-DF_c$  (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.