



# Full wwPDB X-ray Structure Validation Report

Feb 15, 2024 – 12:32 AM EST

PDB ID : 3NLE  
Title : Structure of endothelial nitric oxide synthase heme domain complexed with 6- $\{ \{ (3'R,4'R)-3'-[2''-(3'''-fluorophenethylamino)ethoxy]pyrrolidin-4'-yl \} methyl \}$ -4-methylpyridin-2-amine  
Authors : Ji, H.; Delker, S.L.; Li, H.; Martasek, P.; Roman, L.; Poulos, T.L.; Silverman, R.B.  
Deposited on : 2010-06-21  
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](#) ①) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

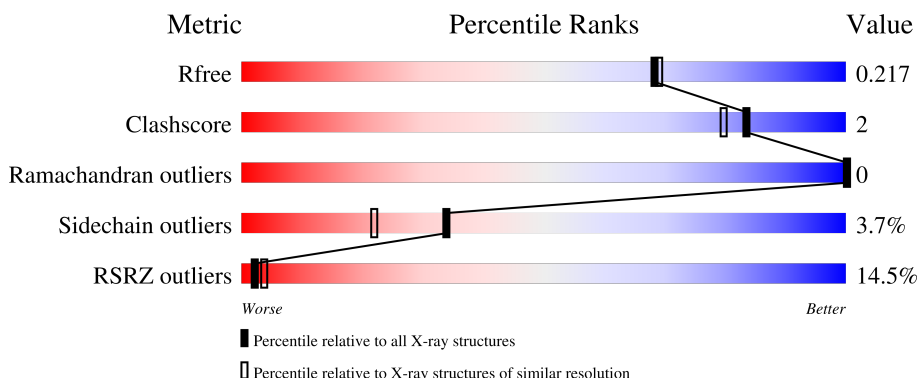
# 1 Overall quality at a glance

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	444	 17% 85% 5% • 9%
1	B	444	 9% 84% 5% • 10%

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:

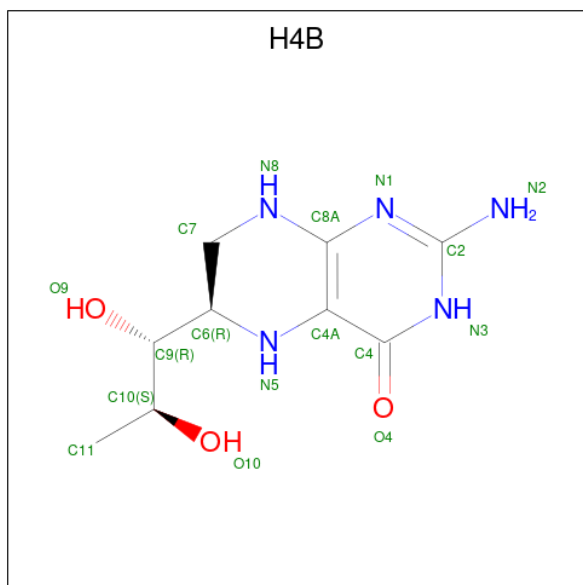
Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	CAD	B	950	-	-	-	X



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

- 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
			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 ACETATE ION (three-letter code: ACT) (formula:  $C_2H_3O_2$ ).



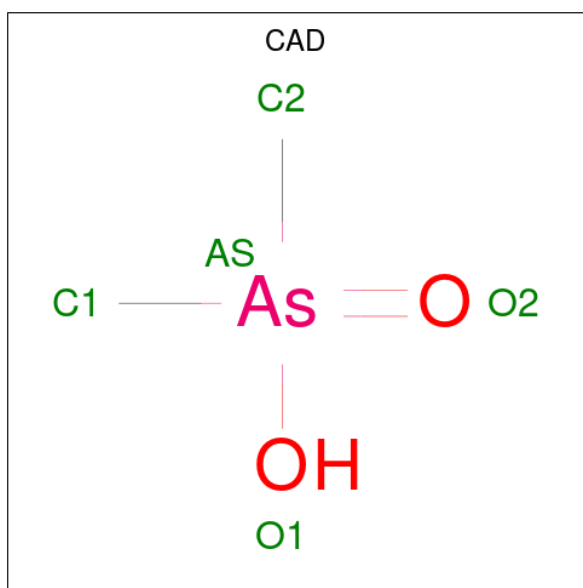
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



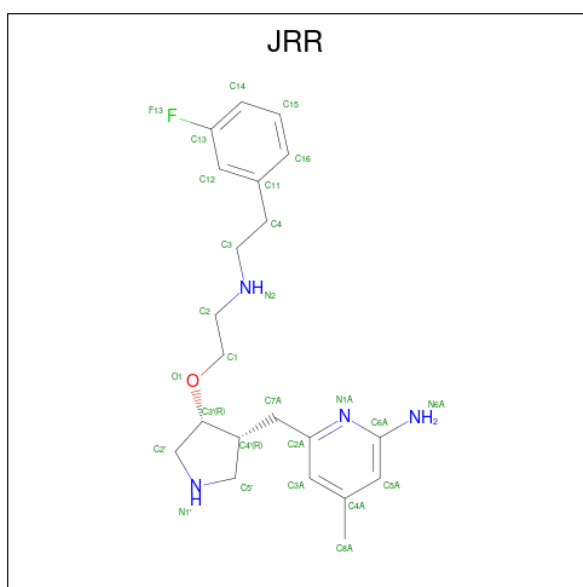
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	3	3		
5	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 6 is CACODYLIC ACID (three-letter code: CAD) (formula:  $C_2H_7AsO_2$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	As	C	0	0
			3	1	2		
6	B	1	Total	As	C	0	0
			3	1	2		

- Molecule 7 is 6-[[[(3R,4R)-4-(2-{[2-(3-fluorophenyl)ethyl]amino}ethoxy)pyrrolidin-3-yl]methyl]-4-methylpyridin-2-amine (three-letter code: JRR) (formula:  $C_{21}H_{29}FN_4O$ ).





Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	A	1	Total	C	F	N	O	0	0
			27	21	1	4	1		
7	B	1	Total	C	F	N	O	0	0
			27	21	1	4	1		

- Molecule 8 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

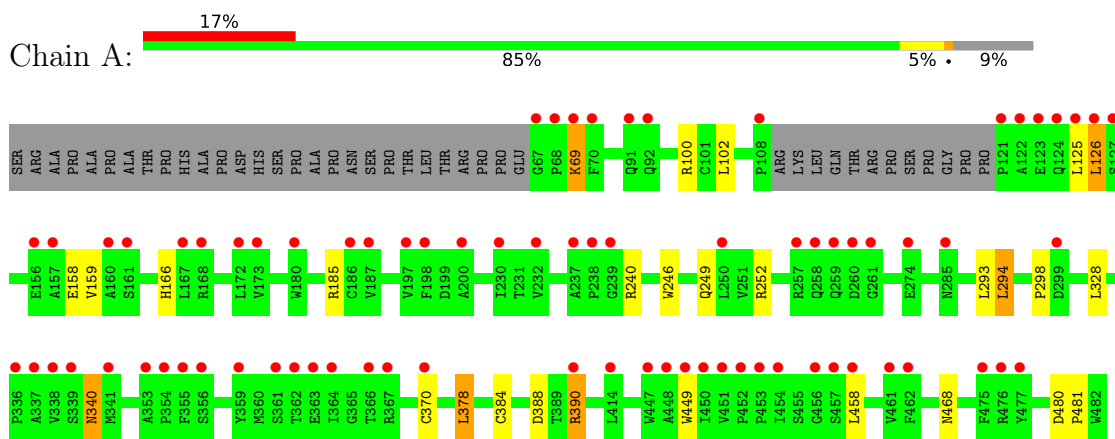
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	149	Total	O	0	2
			149	149		
9	B	143	Total	O	0	1
			143	143		

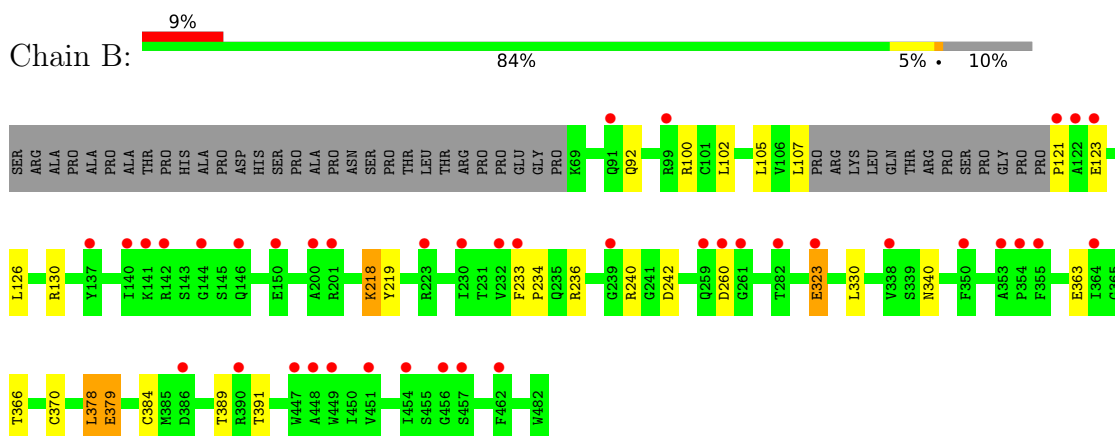
### 3 Residue-property plots

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, endothelial



- Molecule 1: Nitric oxide synthase, endothelial



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.50Å 107.56Å 158.31Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.41 – 1.95 38.41 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.2 (38.41-1.95) 99.2 (38.41-1.95)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.06 (at 1.95Å)	Xtrriage
Refinement program	REFMAC 5.5.0109, CNS	Depositor
R, $R_{free}$	0.184 , 0.206 0.197 , 0.217	Depositor DCC
$R_{free}$ test set	3665 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	47.8	Xtrriage
Anisotropy	0.291	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 42.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	6911	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.00% 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, JRR, CAD, H4B, ZN, 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	0.57	0/3308	0.61	1/4506 (0.0%)
1	B	0.59	0/3288	0.60	0/4477
All	All	0.58	0/6596	0.61	1/8983 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	378	LEU	CA-CB-CG	5.56	128.09	115.30

There are no chirality outliers.

There are no planarity outliers.

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

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3218	0	3120	14	0
1	B	3200	0	3103	14	0
2	A	43	0	30	1	0
2	B	43	0	30	2	0
3	A	17	0	15	0	0
3	B	17	0	15	0	0
4	A	4	0	3	0	0
4	B	4	0	3	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	6	0	8	0	0
5	B	6	0	8	0	0
6	A	3	0	0	1	0
6	B	3	0	0	1	0
7	A	27	0	29	1	0
7	B	27	0	29	3	0
8	A	1	0	0	0	0
9	A	149	0	0	1	0
9	B	143	0	0	1	0
All	All	6911	0	6393	31	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 2.

All (31) 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:A:384:CYS:SG	6:A:950:CAD:AS	2.75	1.04
1:A:388:ASP:OD1	1:A:390:ARG:HG3	1.79	0.83
2:B:500:HEM:HBA2	7:B:800:JRR:H4	1.76	0.67
1:A:240:ARG:HD3	1:A:298:PRO:HB3	1.81	0.63
1:B:389:THR:HG22	1:B:389:THR:O	2.03	0.58
2:B:500:HEM:HBB2	2:B:500:HEM:HHC	1.86	0.57
1:B:107:LEU:HD21	7:B:800:JRR:H8A	1.86	0.56
1:A:340:ASN:H	1:A:340:ASN:HD22	1.57	0.51
1:A:249:GLN:HB2	1:A:252:ARG:HG3	1.93	0.51
1:B:233:PHE:HB3	1:B:234:PRO:CD	2.42	0.49
1:B:389:THR:O	1:B:389:THR:CG2	2.61	0.49
1:B:121:PRO:HB2	1:B:123:GLU:OE2	2.14	0.48
1:B:363[A]:GLU:OE1	7:B:800:JRR:H16	2.14	0.47
1:A:246:TRP:HB2	1:A:294:LEU:HB3	1.96	0.47
1:A:378:LEU:HB2	9:A:1002:HOH:O	2.14	0.47
1:B:366:THR:O	1:B:370:CYS:HB2	2.15	0.47
1:A:370:CYS:SG	1:A:378:LEU:HD13	2.55	0.46
1:B:384:CYS:SG	6:B:950:CAD:AS	3.35	0.44
1:A:158:GLU:OE1	1:A:166:HIS:HD2	2.00	0.44
1:B:218:LYS:HD3	1:B:219:TYR:N	2.32	0.44
1:B:323:GLU:H	1:B:323:GLU:HG3	1.54	0.43
1:B:370:CYS:SG	1:B:378:LEU:HD13	2.58	0.43
1:B:379:GLU:HB2	9:B:1027:HOH:O	2.18	0.43
1:B:236:ARG:HD2	1:B:242:ASP:OD1	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:500:HEM:HBA2	7:A:800:JRR:H4	2.02	0.42
1:B:126:LEU:O	1:B:130:ARG:HG3	2.21	0.41
1:A:69:LYS:HA	1:A:69:LYS:HD2	1.87	0.41
1:A:480:ASP:HA	1:A:481:PRO:HD3	1.86	0.40
1:A:126:LEU:CD2	1:A:159:VAL:HG11	2.51	0.40
1:A:185:ARG:HG2	1:A:449:TRP:CG	2.56	0.40
1:A:340:ASN:HD22	1:A:340:ASN:N	2.20	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	401/444 (90%)	394 (98%)	7 (2%)	0	100	100
1	B	398/444 (90%)	389 (98%)	9 (2%)	0	100	100
All	All	799/888 (90%)	783 (98%)	16 (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	344/377 (91%)	332 (96%)	12 (4%)	36	24

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	342/377 (91%)	329 (96%)	13 (4%)	33	21
All	All	686/754 (91%)	661 (96%)	25 (4%)	34	23

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	69	LYS
1	A	100	ARG
1	A	102	LEU
1	A	125	LEU
1	A	126	LEU
1	A	293	LEU
1	A	294	LEU
1	A	328	LEU
1	A	340	ASN
1	A	390	ARG
1	A	458	LEU
1	A	468	ASN
1	B	92	GLN
1	B	100	ARG
1	B	102	LEU
1	B	105	LEU
1	B	218	LYS
1	B	240	ARG
1	B	260	ASP
1	B	323	GLU
1	B	330	LEU
1	B	340	ASN
1	B	378	LEU
1	B	379	GLU
1	B	391	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	166	HIS
1	A	191	GLN
1	A	340	ASN
1	A	376	ASN
1	A	413	GLN
1	A	468	ASN

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Mol	Chain	Res	Type
1	B	178	GLN
1	B	191	GLN
1	B	222	ASN
1	B	225	ASN
1	B	340	ASN
1	B	376	ASN
1	B	405	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 13 ligands modelled in this entry, 1 is monoatomic - leaving 12 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
7	JRR	A	800	-	28,29,29	0.68	1 (3%)	31,38,38	1.60	5 (16%)
5	GOL	A	880	-	5,5,5	0.44	0	5,5,5	0.34	0
4	ACT	A	860	-	3,3,3	0.80	0	3,3,3	0.75	0
2	HEM	A	500	1	41,50,50	2.03	11 (26%)	45,82,82	1.64	7 (15%)
6	CAD	B	950	-	0,2,4	-	-	0,1,6	-	-
4	ACT	B	860	-	3,3,3	0.75	0	3,3,3	0.81	0



Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	H4B	A	600	-	16,18,18	1.06	1 (6%)	11,26,26	2.98	6 (54%)
2	HEM	B	500	1	41,50,50	1.98	10 (24%)	45,82,82	1.91	11 (24%)
5	GOL	B	880	-	5,5,5	0.32	0	5,5,5	0.50	0
6	CAD	A	950	-	0,2,4	-	-	0,1,6	-	-
3	H4B	B	600	-	16,18,18	1.02	2 (12%)	11,26,26	2.55	5 (45%)
7	JRR	B	800	-	28,29,29	0.64	0	31,38,38	1.54	4 (12%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	JRR	A	800	-	-	1/13/23/23	0/3/3/3
5	GOL	A	880	-	-	1/4/4/4	-
2	HEM	A	500	1	-	0/12/54/54	-
3	H4B	A	600	-	-	0/8/17/17	0/2/2/2
2	HEM	B	500	1	-	2/12/54/54	-
5	GOL	B	880	-	-	0/4/4/4	-
3	H4B	B	600	-	-	0/8/17/17	0/2/2/2
7	JRR	B	800	-	-	1/13/23/23	0/3/3/3

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	500	HEM	C3D-C2D	7.74	1.53	1.36
2	B	500	HEM	C3D-C2D	7.54	1.52	1.36
2	A	500	HEM	C3C-C2C	-4.42	1.34	1.40
2	B	500	HEM	C3C-CAC	3.68	1.55	1.47
2	B	500	HEM	C3C-C2C	-3.32	1.35	1.40
2	A	500	HEM	FE-ND	3.23	2.12	1.96
2	A	500	HEM	C3C-CAC	3.09	1.54	1.47
2	B	500	HEM	CAB-C3B	3.02	1.55	1.47
2	B	500	HEM	CAA-C2A	2.90	1.56	1.52
2	A	500	HEM	CAB-C3B	2.72	1.54	1.47
2	B	500	HEM	CMB-C2B	2.52	1.56	1.50
2	B	500	HEM	FE-NB	2.48	2.09	1.96
2	A	500	HEM	CMA-C3A	2.46	1.56	1.51
2	B	500	HEM	CMD-C2D	2.45	1.56	1.50
2	A	500	HEM	CMB-C2B	2.30	1.55	1.50
2	A	500	HEM	CMD-C2D	2.26	1.55	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	600	H4B	C7-C6	2.26	1.54	1.52
3	A	600	H4B	C7-C6	2.24	1.54	1.52
2	A	500	HEM	FE-NB	2.21	2.07	1.96
3	B	600	H4B	C4A-C4	-2.12	1.38	1.41
2	A	500	HEM	C4A-NA	2.12	1.40	1.36
2	B	500	HEM	FE-ND	2.10	2.07	1.96
2	A	500	HEM	CAA-C2A	2.10	1.55	1.52
7	A	800	JRR	C14-C13	2.09	1.41	1.37
2	B	500	HEM	CMA-C3A	2.06	1.55	1.51

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	500	HEM	CBA-CAA-C2A	-6.57	101.41	112.62
2	A	500	HEM	C4D-ND-C1D	6.42	111.71	105.07
7	B	800	JRR	C6A-N1A-C2A	5.22	122.05	118.10
7	A	800	JRR	C6A-N1A-C2A	4.77	121.71	118.10
3	B	600	H4B	C8A-C4A-C4	4.76	118.80	114.57
3	A	600	H4B	C2-N3-C4	4.63	123.28	115.93
3	A	600	H4B	C4-C4A-N5	4.52	122.91	119.12
2	B	500	HEM	C4D-ND-C1D	4.33	109.54	105.07
3	A	600	H4B	N1-C2-N3	-4.08	119.01	125.42
3	A	600	H4B	C8A-C4A-C4	3.80	117.94	114.57
2	A	500	HEM	CBA-CAA-C2A	-3.68	106.34	112.62
2	A	500	HEM	C1B-NB-C4B	3.60	108.79	105.07
3	B	600	H4B	C4-C4A-N5	3.52	122.07	119.12
7	B	800	JRR	C5'-N1'-C2'	3.45	113.58	105.42
3	B	600	H4B	C2-N3-C4	3.44	121.40	115.93
2	B	500	HEM	C4B-CHC-C1C	3.31	126.93	122.56
7	A	800	JRR	C5'-N1'-C2'	3.09	112.71	105.42
3	B	600	H4B	N1-C2-N3	-3.06	120.62	125.42
2	B	500	HEM	CMA-C3A-C4A	-2.99	123.86	128.46
7	B	800	JRR	C3A-C2A-N1A	-2.92	119.80	122.90
2	B	500	HEM	C1B-NB-C4B	2.91	108.08	105.07
2	B	500	HEM	CBD-CAD-C3D	-2.81	104.81	112.63
2	B	500	HEM	C4A-C3A-C2A	2.77	108.92	107.00
3	A	600	H4B	C2-N1-C8A	2.74	120.68	114.54
7	A	800	JRR	C14-C13-C12	-2.70	119.78	123.29
2	A	500	HEM	C4C-CHD-C1D	2.64	126.05	122.56
2	B	500	HEM	CMD-C2D-C1D	2.50	128.84	125.04
7	A	800	JRR	C3A-C2A-N1A	-2.49	120.26	122.90
2	B	500	HEM	C3B-C2B-C1B	2.48	108.33	106.49

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	800	JRR	N6A-C6A-N1A	2.39	120.26	116.49
3	B	600	H4B	C2-N1-C8A	2.33	119.77	114.54
2	A	500	HEM	CBD-CAD-C3D	-2.33	106.16	112.63
3	A	600	H4B	N2-C2-N1	2.32	120.86	117.25
2	B	500	HEM	CAD-C3D-C4D	2.28	128.64	124.66
2	B	500	HEM	C4C-CHD-C1D	2.25	125.53	122.56
2	A	500	HEM	CMD-C2D-C1D	2.25	128.46	125.04
7	B	800	JRR	C14-C13-C12	-2.19	120.45	123.29
2	A	500	HEM	CAD-C3D-C4D	2.17	128.45	124.66

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	880	GOL	O1-C1-C2-C3
7	A	800	JRR	C1-C2-N2-C3
7	B	800	JRR	C1-C2-N2-C3
2	B	500	HEM	CAA-CBA-CGA-O2A
2	B	500	HEM	CAA-CBA-CGA-O1A

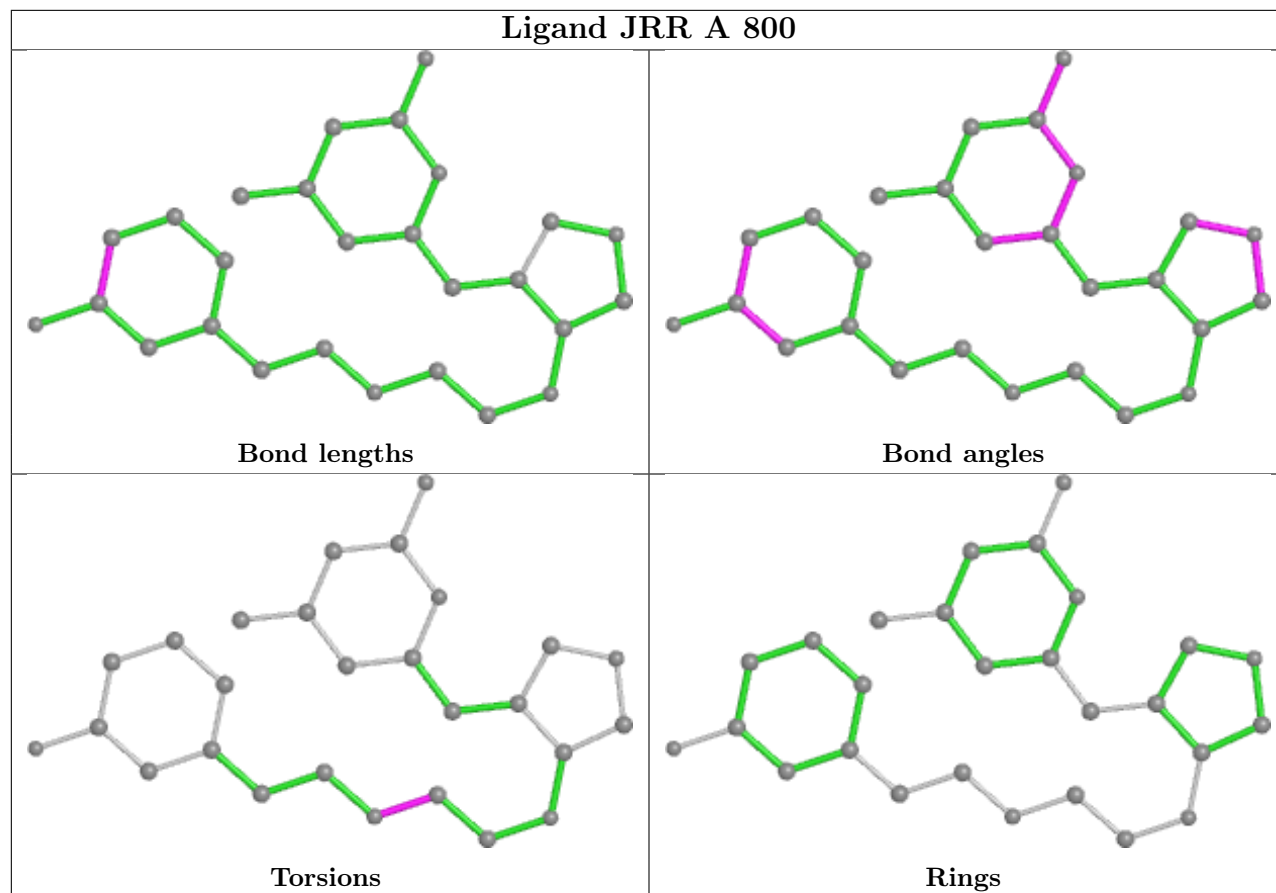
There are no ring outliers.

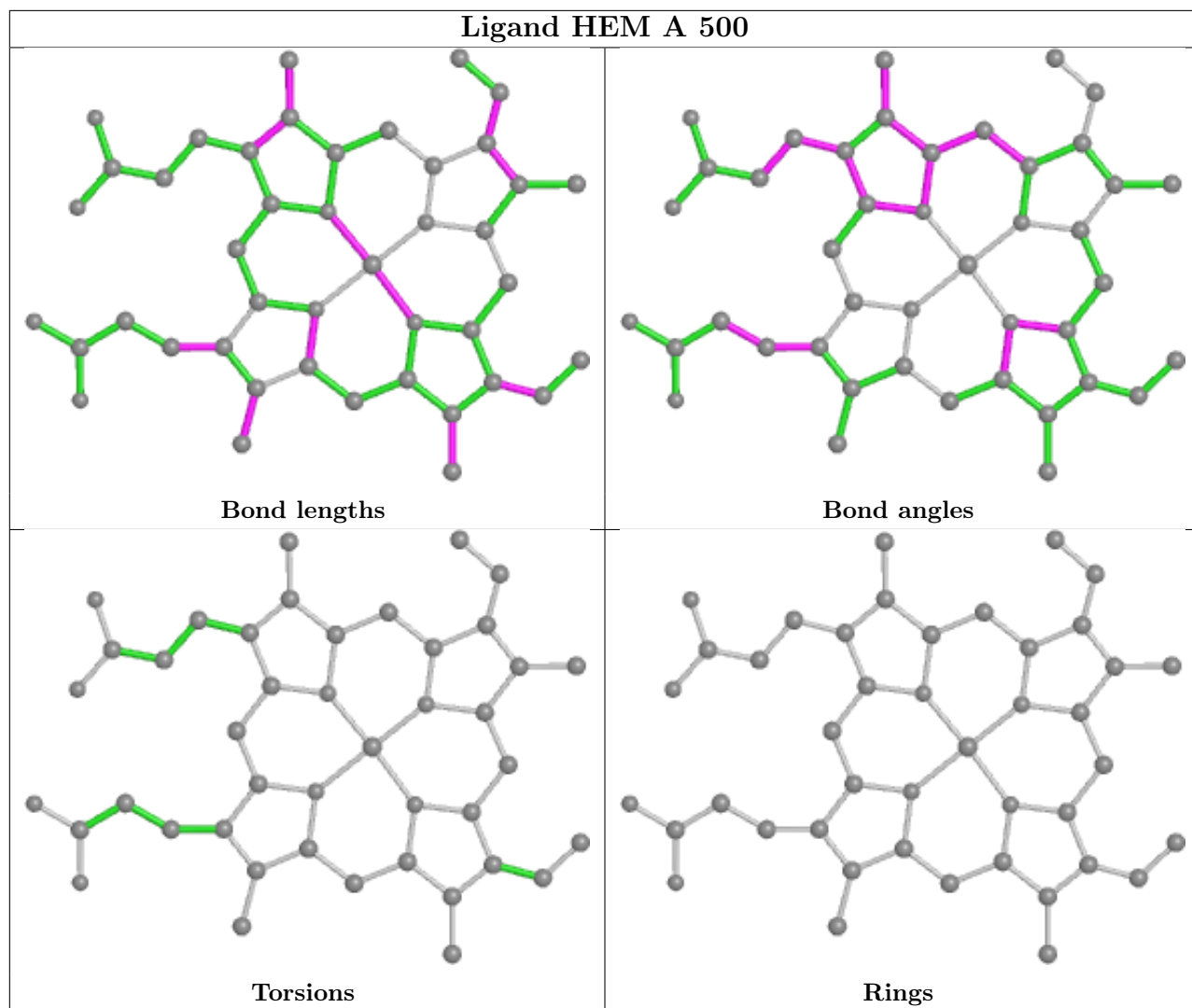
6 monomers are involved in 7 short contacts:

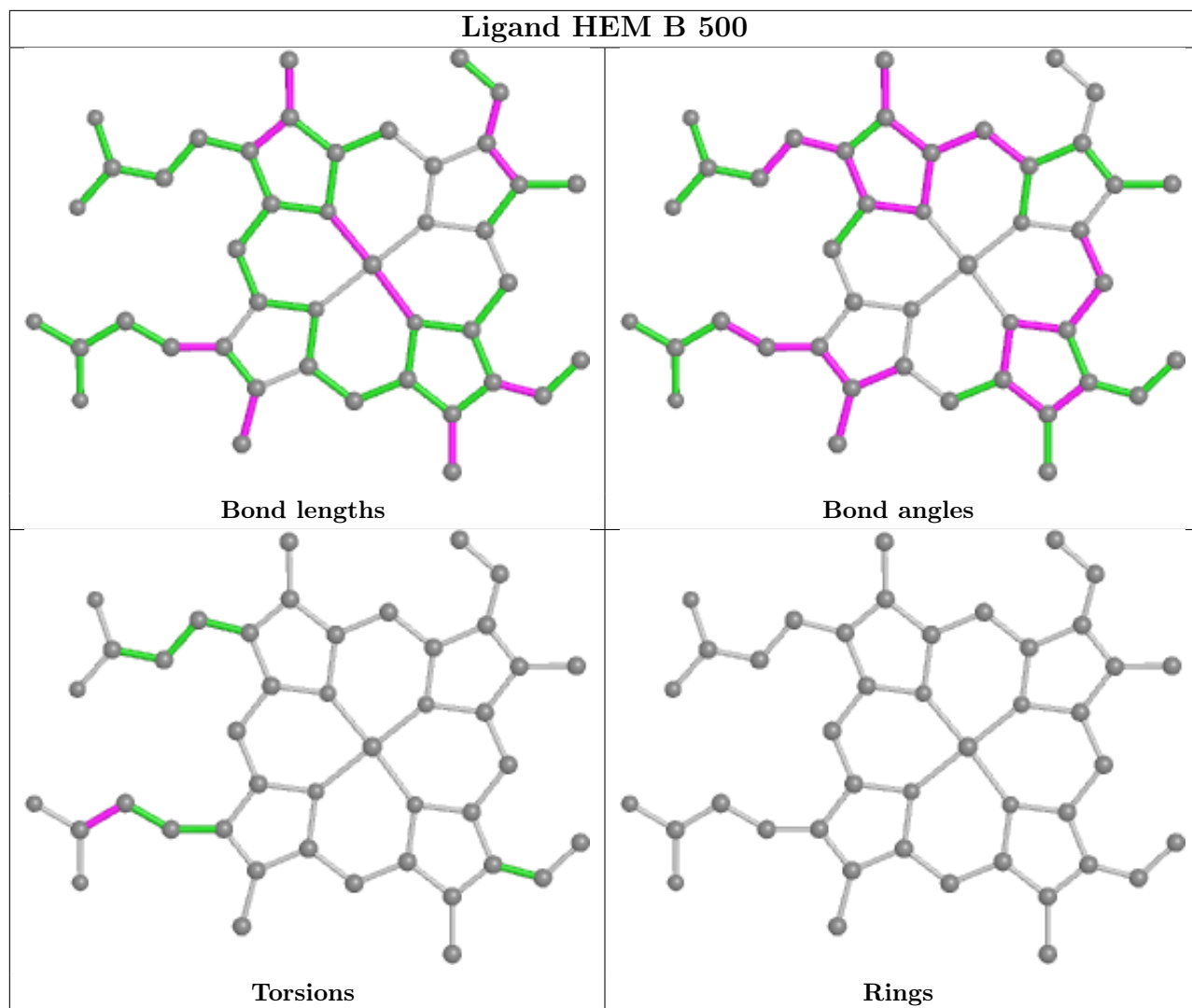
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	800	JRR	1	0
2	A	500	HEM	1	0
6	B	950	CAD	1	0
2	B	500	HEM	2	0
6	A	950	CAD	1	0
7	B	800	JRR	3	0

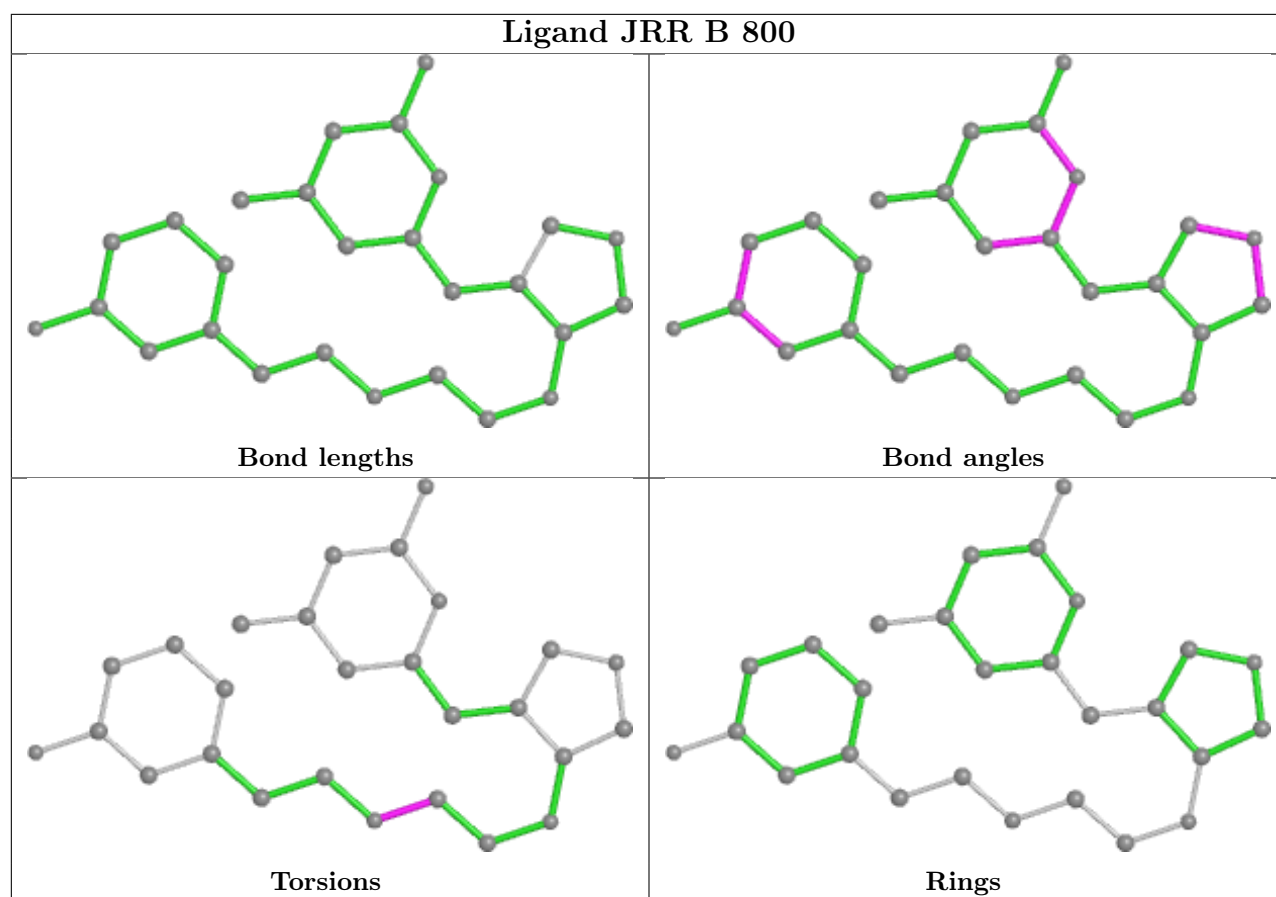
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

equivalents in the CSD to analyse the geometry.









## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	404/444 (90%)	0.90	77 (19%) <b>1</b> <b>1</b>	41, 50, 69, 85	0
1	B	401/444 (90%)	0.65	40 (9%) <b>7</b> <b>11</b>	40, 53, 71, 83	0
All	All	805/888 (90%)	0.77	117 (14%) <b>2</b> <b>4</b>	40, 52, 70, 85	0

All (117) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	239	GLY	9.5
1	A	67	GLY	6.3
1	A	259	GLN	5.9
1	A	121	PRO	5.5
1	A	125	LEU	4.7
1	A	454	ILE	4.6
1	A	108	PRO	4.5
1	B	259	GLN	4.4
1	B	121	PRO	4.4
1	A	364	ILE	4.4
1	A	450	ILE	4.4
1	B	122	ALA	4.3
1	A	338	VAL	4.2
1	A	355	PHE	4.2
1	A	260	ASP	4.2
1	A	337	ALA	4.2
1	A	123	GLU	4.1
1	A	449	TRP	4.1
1	A	91	GLN	4.0
1	A	69	LYS	3.9
1	A	124	GLN	3.9
1	A	156	GLU	3.8
1	B	142	ARG	3.7
1	B	260	ASP	3.7

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Mol	Chain	Res	Type	RSRZ
1	A	160	ALA	3.6
1	A	126	LEU	3.6
1	A	68	PRO	3.6
1	A	122	ALA	3.5
1	A	362	THR	3.5
1	A	451	VAL	3.5
1	B	451	VAL	3.5
1	B	123	GLU	3.5
1	A	172	LEU	3.5
1	B	146	GLN	3.5
1	A	186	CYS	3.4
1	A	261	GLY	3.3
1	A	452	PRO	3.3
1	B	239	GLY	3.3
1	A	70	PHE	3.3
1	B	233	PHE	3.2
1	A	353	ALA	3.2
1	A	453	PRO	3.2
1	A	359	TYR	3.2
1	A	363[A]	GLU	3.1
1	A	448	ALA	3.1
1	B	448	ALA	3.1
1	B	200	ALA	3.1
1	B	454	ILE	3.0
1	A	257	ARG	3.0
1	A	390	ARG	3.0
1	A	187	VAL	3.0
1	A	200	ALA	3.0
1	B	447	TRP	3.0
1	A	92	GLN	3.0
1	B	323	GLU	2.9
1	A	447	TRP	2.9
1	B	137	TYR	2.9
1	B	386	ASP	2.9
1	B	150	GLU	2.9
1	A	285	ASN	2.9
1	B	140	ILE	2.9
1	A	198	PHE	2.8
1	A	477	TYR	2.8
1	B	390	ARG	2.8
1	A	476	ARG	2.7
1	B	223	ARG	2.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	232	VAL	2.7
1	A	457	SER	2.7
1	A	367	ARG	2.7
1	A	232	VAL	2.7
1	A	336	PRO	2.7
1	A	230	ILE	2.6
1	A	354	PRO	2.6
1	A	238	PRO	2.6
1	B	91	GLN	2.6
1	B	230	ILE	2.6
1	B	354	PRO	2.6
1	B	456	GLY	2.6
1	A	157	ALA	2.5
1	B	141	LYS	2.5
1	A	462	PHE	2.5
1	B	462	PHE	2.5
1	A	341	MET	2.5
1	A	414	LEU	2.5
1	A	161	SER	2.5
1	A	339	SER	2.5
1	B	364	ILE	2.4
1	A	461	VAL	2.4
1	B	355	PHE	2.4
1	B	449	TRP	2.4
1	A	167	LEU	2.3
1	B	99	ARG	2.3
1	B	338	VAL	2.3
1	A	458	LEU	2.3
1	A	475	PHE	2.3
1	A	274	GLU	2.3
1	A	168	ARG	2.3
1	A	250	LEU	2.2
1	A	180	TRP	2.2
1	A	361	SER	2.2
1	A	456	GLY	2.2
1	A	299	ASP	2.2
1	A	237	ALA	2.2
1	B	353	ALA	2.2
1	A	173	VAL	2.2
1	A	197	VAL	2.1
1	A	370	CYS	2.1
1	A	366	THR	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	127	SER	2.1
1	B	350	PHE	2.1
1	B	144	GLY	2.1
1	B	261	GLY	2.1
1	B	282	THR	2.1
1	B	457	SER	2.0
1	A	258	GLN	2.0
1	A	356	SER	2.0
1	B	201	ARG	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](#)

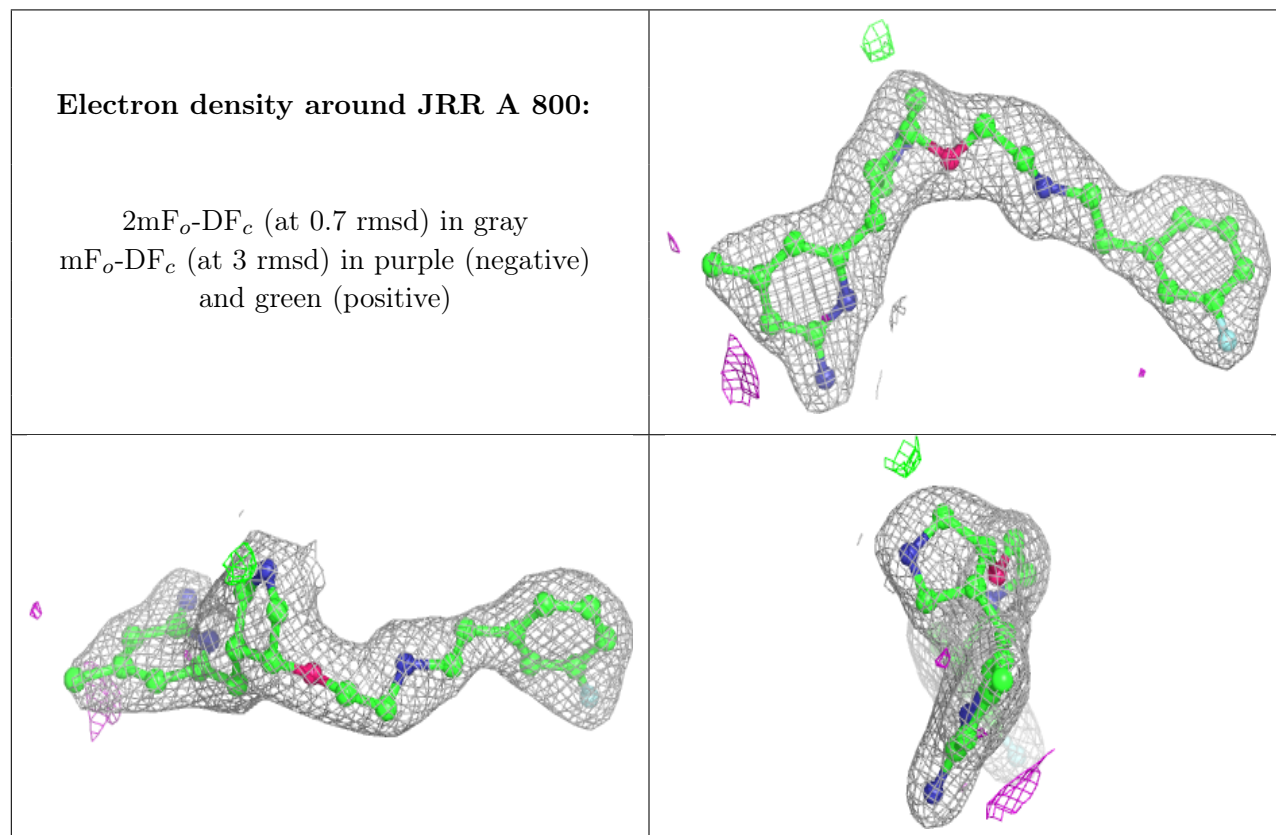
There are no monosaccharides in this entry.

## 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.

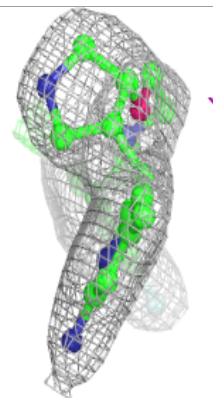
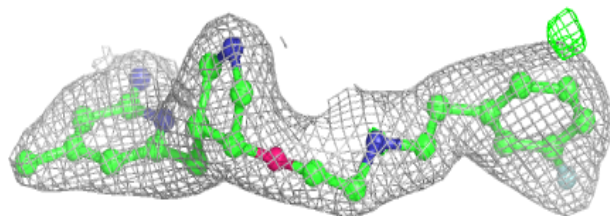
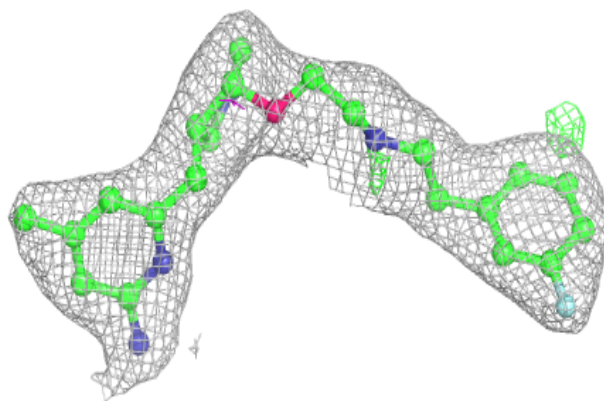
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	CAD	B	950	3/5	0.70	0.52	176,176,176,176	0
5	GOL	B	880	6/6	0.84	0.21	61,64,64,65	0
5	GOL	A	880	6/6	0.86	0.30	72,73,73,74	0
7	JRR	A	800	27/27	0.87	0.25	51,54,55,56	0
7	JRR	B	800	27/27	0.90	0.20	52,55,56,57	0
4	ACT	A	860	4/4	0.94	0.18	61,63,64,65	0
6	CAD	A	950	3/5	0.96	0.22	102,102,103,103	0
4	ACT	B	860	4/4	0.96	0.48	67,68,68,69	0
3	H4B	B	600	17/17	0.96	0.19	39,43,47,48	0
3	H4B	A	600	17/17	0.96	0.23	41,43,48,48	0
2	HEM	A	500	43/43	0.98	0.24	39,43,48,50	0
2	HEM	B	500	43/43	0.98	0.18	39,43,50,51	0
8	ZN	A	900	1/1	0.99	0.11	44,44,44,44	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.



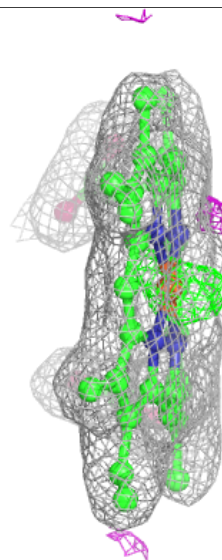
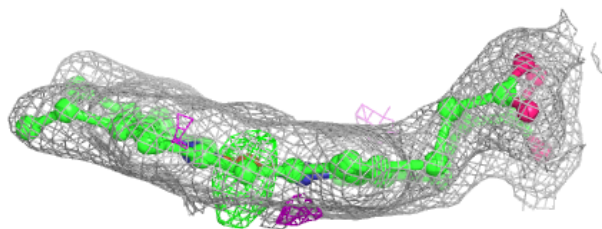
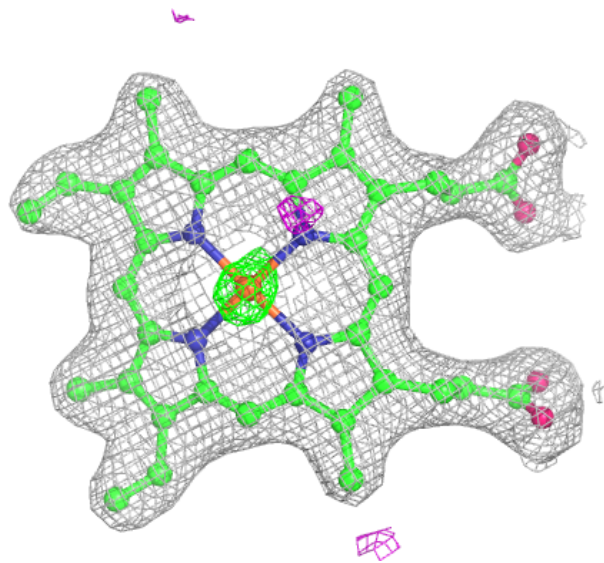
**Electron density around JRR B 800:**

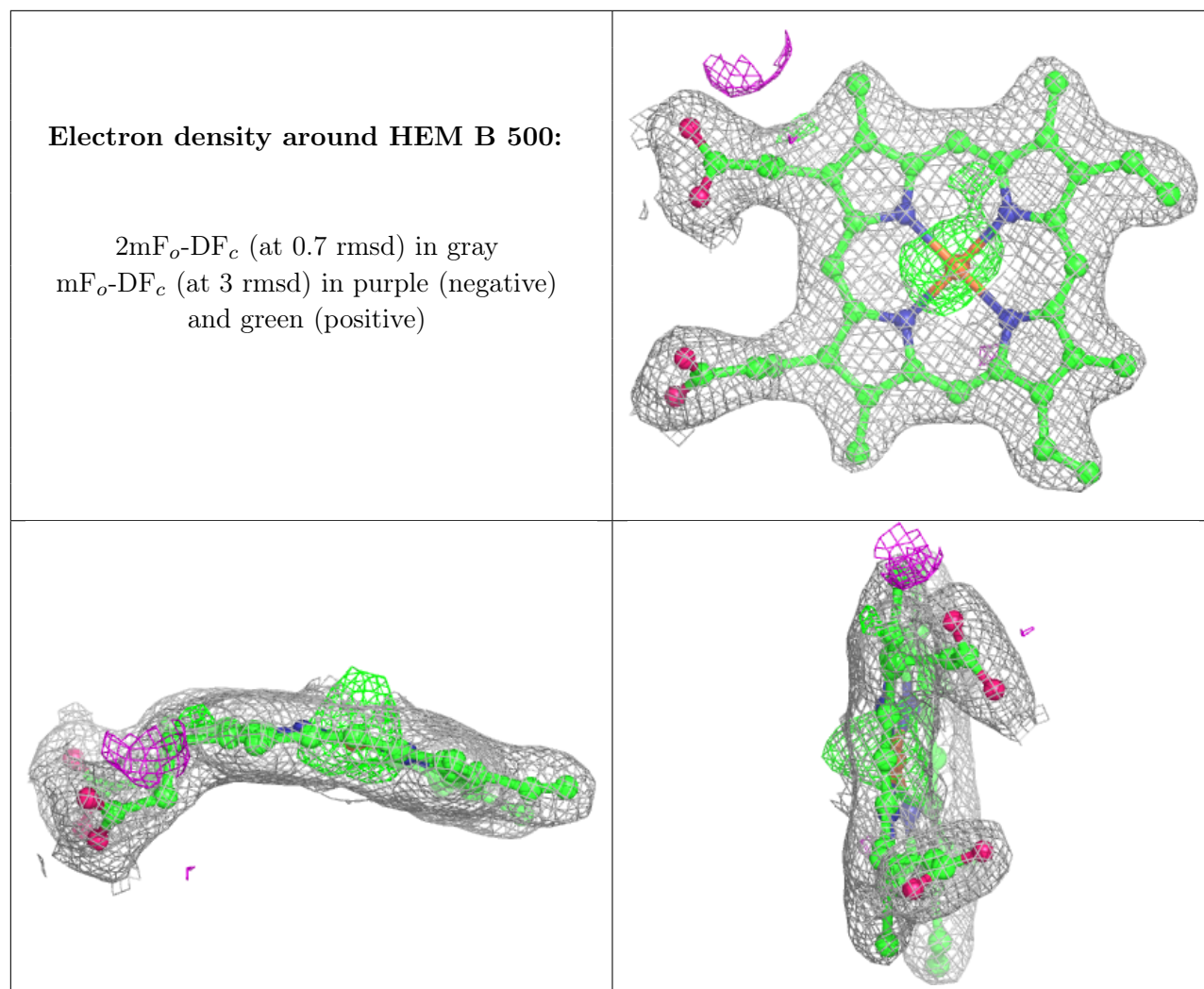
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around HEM A 500:**

$2mF_o-DF_c$  (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.