Full wwPDB X-ray Structure Validation Report (i)

Nov 15, 2023 – 09:30 PM JST

PDB ID	:	6JS8
Title	:	Structure of the CYP102A1 Haem Domain with N-Dehydroabietoyl-L-Tryptophan
Authors	:	Stanfield, J.K.; Kasai, C.; Sugimoto, H.; Shiro, Y.; Watanabe, Y.; Shoji, O.
Deposited on	:	2019-04-07
Resolution	:	1.36 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

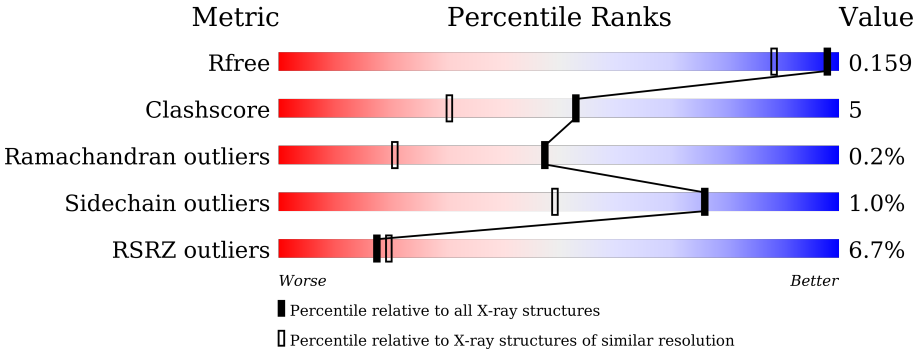
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber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

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.36 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	1509 (1.38-1.34)
Clashscore	141614	1551 (1.38-1.34)
Ramachandran outliers	138981	1530 (1.38-1.34)
Sidechain outliers	138945	1530 (1.38-1.34)
RSRZ outliers	127900	1487 (1.38-1.34)

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 >=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 <=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	456	6% 91% 8%
1	B	456	8% 93% 5% •

2 Entry composition (i)

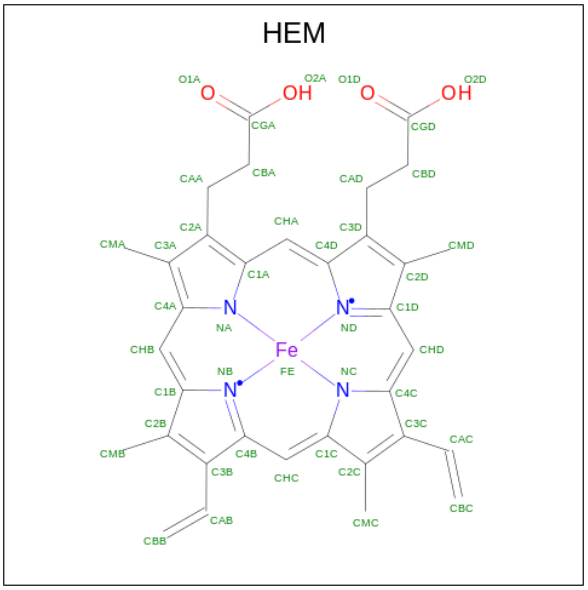
There are 6 unique types of molecules in this entry. The entry contains 8816 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Bifunctional cytochrome P450/NADPH–P450 reductase.

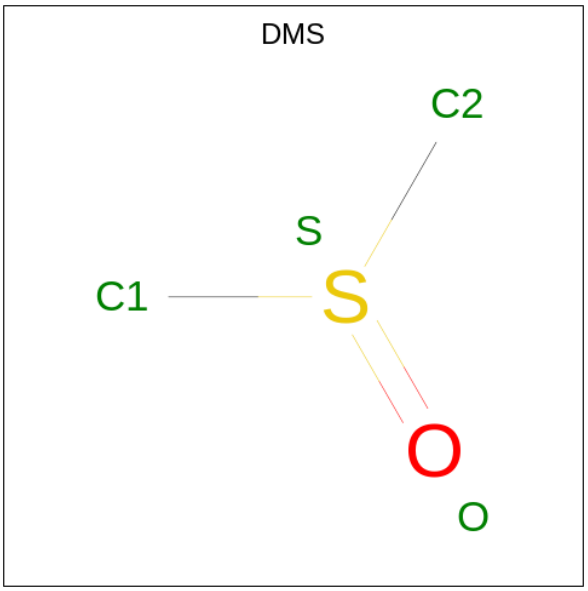
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	455	3916	2493	663	741	19	0	30	0
1	B	454	3873	2467	658	729	19	0	25	0

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



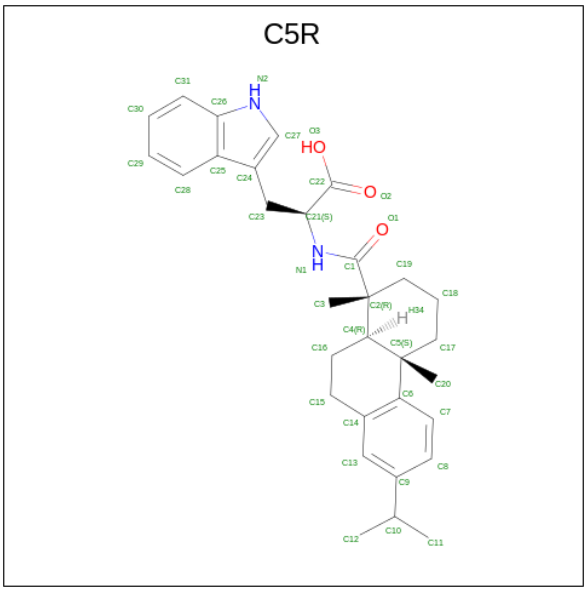
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Fe	N	O		
2	A	1	86	68	2	8	8	0	1
2	B	1	86	68	2	8	8	0	1

- Molecule 3 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C_2H_6OS).



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

- Molecule 4 is (2S)-2-[[(1R,4aS,10aR)-1,4a-dimethyl-7-propan-2-yl-2,3,4,9,10,10a-hexahydrophenanthren-1-yl]carbonylamino]-3-(1H-indol-3-yl)propanoic acid (three-letter code: C5R) (formula: $C_{31}H_{38}N_2O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	36	31	2	3	0	0

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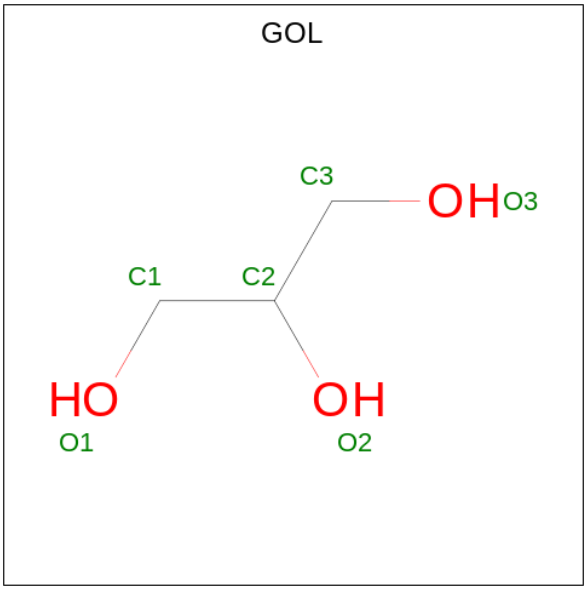
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	B	1	36	31	2	3	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	6	3	3		0	0
			Total	C	O			
5	A	1	12	6	6		0	1
			Total	C	O			
5	B	1	6	3	3		0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	6	3	3	0	0
			Total	C	O		
5	B	1	12	6	6	0	1
			Total	C	O		
5	B	1	6	3	3	0	0

- Molecule 6 is water.

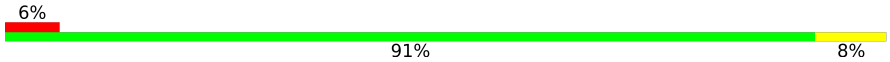
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	A	332	332	332	0	0
			Total	O		
6	B	311	311	311	0	0

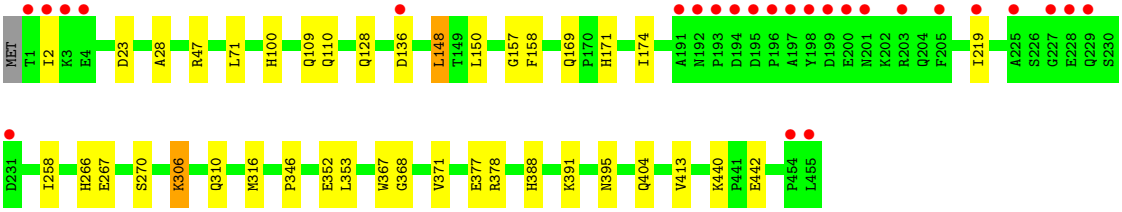
3 Residue-property plots (i)

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: Bifunctional cytochrome P450/NADPH–P450 reductase

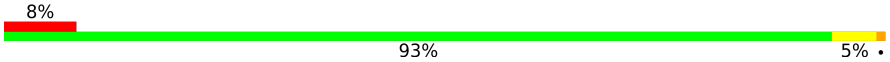
Chain A:

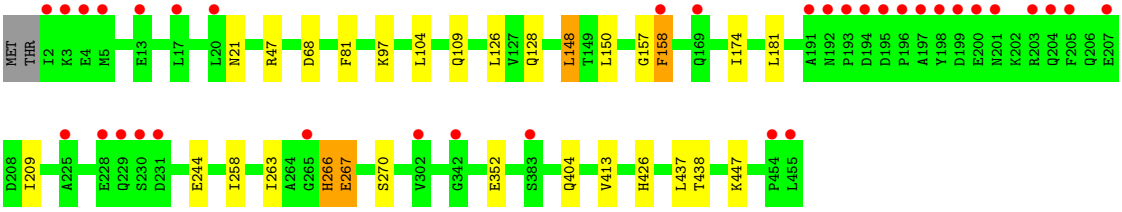




• Molecule 1: Bifunctional cytochrome P450/NADPH–P450 reductase

Chain B:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	58.89Å 148.79Å 63.20Å 90.00° 98.42° 90.00°	Depositor
Resolution (Å)	47.91 – 1.36 47.86 – 1.36	Depositor EDS
% Data completeness (in resolution range)	99.7 (47.91-1.36) 99.8 (47.86-1.36)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.66 (at 1.36Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.132 , 0.159 0.133 , 0.159	Depositor DCC
R_{free} test set	11316 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å^2)	18.5	Xtriage
Anisotropy	0.172	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 42.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	8816	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.99% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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, C5R, DMS, 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	0.62	0/4009	0.72	1/5418 (0.0%)
1	B	0.61	0/3960	0.71	0/5351
All	All	0.62	0/7969	0.72	1/10769 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	378	ARG	CB-CA-C	-5.30	99.80	110.40

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	3916	0	3854	43	0
1	B	3873	0	3818	29	0
2	A	86	0	60	8	0
2	B	86	0	60	8	0
3	A	4	0	6	0	0
3	B	4	0	6	0	0
4	A	36	0	0	1	0
4	B	36	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	60	0	80	5	0
5	B	72	0	96	2	0
6	A	332	0	0	5	0
6	B	311	0	0	2	0
All	All	8816	0	7980	88	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 5.

All (88) 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:158[B]:PHE:CE2	1:A:219[B]:ILE:HD13	1.71	1.25
1:A:158[B]:PHE:HE2	1:A:219[B]:ILE:CD1	1.80	0.92
1:A:158[B]:PHE:HE2	1:A:219[B]:ILE:HD13	1.10	0.92
2:B:501[A]:HEM:HMC2	2:B:501[A]:HEM:HBC2	1.64	0.80
1:B:157:GLY:C	1:B:158[A]:PHE:CD1	2.59	0.76
1:A:158[B]:PHE:CE2	1:A:219[B]:ILE:CD1	2.59	0.74
1:A:158[B]:PHE:CD2	1:A:219[B]:ILE:HG21	2.22	0.74
2:A:501[B]:HEM:HBB2	2:A:501[B]:HEM:HMB2	1.70	0.73
1:A:306:LYS:HD3	1:A:310[B]:GLN:HE21	1.55	0.72
1:A:157:GLY:C	1:A:158[A]:PHE:CD1	2.62	0.72
1:A:158[B]:PHE:CD2	1:A:219[B]:ILE:HD13	2.24	0.72
1:A:158[B]:PHE:HD2	1:A:219[B]:ILE:HG21	1.55	0.71
2:B:501[B]:HEM:HBB2	2:B:501[B]:HEM:HMB2	1.73	0.70
1:A:23[B]:ASP:OD2	6:A:601:HOH:O	2.09	0.70
2:B:501[B]:HEM:HMC2	2:B:501[B]:HEM:HBC2	1.74	0.69
2:A:501[B]:HEM:HMC1	2:A:501[B]:HEM:HBC2	1.75	0.68
1:A:150:LEU:HD21	1:A:174[B]:ILE:HD11	1.77	0.67
1:A:395:ASN:HA	5:A:508:GOL:H32	1.77	0.67
1:A:128[B]:GLN:HE21	1:A:128[B]:GLN:HA	1.58	0.66
1:B:128[B]:GLN:HE21	1:B:128[B]:GLN:HA	1.60	0.66
2:A:501[A]:HEM:HMC1	2:A:501[A]:HEM:HBC2	1.77	0.65
1:A:28:ALA:N	5:A:510:GOL:H31	2.12	0.64
1:A:440:LYS:HE3	1:A:442[B]:GLU:OE1	1.98	0.64
1:B:150:LEU:HD21	1:B:174:ILE:HG13	1.80	0.63
2:A:501[B]:HEM:HBB2	2:A:501[B]:HEM:CMB	2.29	0.62
1:A:71:LEU:O	5:A:509:GOL:H11	2.01	0.61
1:B:47[B]:ARG:NH1	4:B:503:C5R:C28	2.64	0.61
1:A:47[B]:ARG:NH2	4:A:503:C5R:C28	2.63	0.61
1:B:267[B]:GLU:HA	1:B:270:SER:OG	2.00	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:150:LEU:HD21	1:A:174[B]:ILE:CD1	2.30	0.61
1:B:97[A]:LYS:HE3	1:B:244[A]:GLU:OE2	2.02	0.60
2:B:501[A]:HEM:HBC2	2:B:501[A]:HEM:CMC	2.32	0.60
1:B:263:ILE:O	1:B:267[A]:GLU:HG2	2.02	0.59
1:A:109:GLN:HE21	1:A:404[B]:GLN:HE21	1.51	0.59
1:B:404[A]:GLN:NE2	6:B:602:HOH:O	2.29	0.59
1:A:148:LEU:HD21	1:A:413:VAL:HG21	1.87	0.57
1:B:157:GLY:O	1:B:158[A]:PHE:CD1	2.58	0.57
1:B:158[A]:PHE:CE1	1:B:258:ILE:HG12	2.39	0.57
1:B:157:GLY:C	1:B:158[A]:PHE:CG	2.72	0.56
1:A:157:GLY:O	1:A:158[A]:PHE:CD1	2.59	0.56
2:B:501[A]:HEM:HMB2	2:B:501[A]:HEM:HBB2	1.89	0.55
1:A:157:GLY:C	1:A:158[A]:PHE:CG	2.75	0.54
1:A:150:LEU:HD21	1:A:174[A]:ILE:HG13	1.89	0.54
2:B:501[B]:HEM:HBB2	2:B:501[B]:HEM:CMB	2.38	0.53
1:A:158[A]:PHE:CE1	1:A:258:ILE:HG12	2.44	0.53
2:B:501[A]:HEM:HBB2	2:B:501[A]:HEM:CMB	2.38	0.52
1:A:267[B]:GLU:HA	1:A:270:SER:OG	2.10	0.52
1:B:426:HIS:CD2	1:B:447:LYS:HE3	2.46	0.51
1:A:100:HIS:HE1	5:A:504:GOL:O2	1.94	0.51
1:A:128[A]:GLN:NE2	6:A:605:HOH:O	2.42	0.50
1:A:150:LEU:CD2	1:A:174[B]:ILE:CD1	2.89	0.50
1:B:266[A]:HIS:HD1	1:B:267[A]:GLU:CD	2.15	0.50
2:B:501[B]:HEM:HBC2	2:B:501[B]:HEM:CMC	2.39	0.50
1:B:150:LEU:HD11	1:B:174:ILE:HD11	1.93	0.50
1:B:104[B]:LEU:HD21	5:B:507:GOL:H2	1.93	0.50
1:A:367:TRP:HB2	1:A:371:VAL:HG12	1.94	0.50
2:A:501[A]:HEM:HBC2	2:A:501[A]:HEM:CMC	2.41	0.49
1:B:47[B]:ARG:NH2	1:B:352[B]:GLU:OE1	2.44	0.49
1:B:150:LEU:CD2	1:B:174:ILE:HG13	2.42	0.48
1:B:109:GLN:HE21	1:B:404[B]:GLN:HE21	1.60	0.47
1:A:404[A]:GLN:NE2	6:A:603:HOH:O	2.34	0.47
1:A:352[A]:GLU:OE1	5:A:509:GOL:O1	2.31	0.47
1:B:266[A]:HIS:ND1	1:B:267[A]:GLU:OE1	2.46	0.47
1:A:388:HIS:HA	1:A:391:LYS:HD3	1.97	0.47
1:B:267[A]:GLU:HB3	1:B:438:THR:HG21	1.97	0.46
1:A:109:GLN:NE2	1:A:404[B]:GLN:HE21	2.14	0.45
1:A:171:HIS:HB3	1:A:174[B]:ILE:HD12	1.98	0.45
1:B:47[B]:ARG:HH21	1:B:352[B]:GLU:CD	2.21	0.44
1:A:440:LYS:CE	1:A:442[B]:GLU:OE1	2.64	0.43
2:A:501[B]:HEM:HBC2	2:A:501[B]:HEM:CMC	2.45	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:316:MET:CE	1:A:377:GLU:HA	2.49	0.43
1:A:368:GLY:O	1:A:371:VAL:HG13	2.18	0.43
1:B:266[A]:HIS:HB3	1:B:267[A]:GLU:OE1	2.19	0.43
2:A:501[A]:HEM:CMB	2:A:501[A]:HEM:HBB2	2.49	0.43
2:A:501[A]:HEM:HBB2	2:A:501[A]:HEM:HMB2	2.01	0.42
1:A:150:LEU:CD2	1:A:174[A]:ILE:HG13	2.49	0.42
1:B:128[A]:GLN:NE2	6:B:609:HOH:O	2.45	0.42
1:B:126[B]:LEU:C	1:B:126[B]:LEU:HD13	2.39	0.42
1:A:110[A]:GLN:HG2	6:A:851:HOH:O	2.20	0.42
1:B:148:LEU:HD21	1:B:413:VAL:HG21	2.01	0.42
1:A:128[A]:GLN:NE2	6:A:615:HOH:O	2.52	0.42
1:B:181:LEU:HD22	1:B:437:LEU:HD13	2.02	0.41
1:B:68:ASP:CG	5:B:509:GOL:H32	2.41	0.41
1:B:104[B]:LEU:HA	1:B:104[B]:LEU:HD23	1.82	0.41
1:A:352[B]:GLU:HG2	1:A:353:LEU:N	2.34	0.41
1:B:81:PHE:HB3	1:B:209:ILE:HG12	2.03	0.41
1:A:2:ILE:HD12	1:A:346:PRO:HG3	2.02	0.40
1:A:148:LEU:CD2	1:A:413:VAL:HG21	2.51	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	483/456 (106%)	466 (96%)	15 (3%)	2 (0%)	34 12
1	B	477/456 (105%)	459 (96%)	16 (3%)	2 (0%)	34 12
All	All	960/912 (105%)	925 (96%)	31 (3%)	4 (0%)	47 12

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	266[A]	HIS
1	A	266[B]	HIS
1	B	266[A]	HIS
1	B	266[B]	HIS

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	429/400 (107%)	424 (99%)	5 (1%)	71	42
1	B	423/400 (106%)	417 (99%)	6 (1%)	67	36
All	All	852/800 (106%)	841 (99%)	11 (1%)	76	37

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	136[A]	ASP
1	A	136[B]	ASP
1	A	148	LEU
1	A	169	GLN
1	A	306	LYS
1	B	21	ASN
1	B	148	LEU
1	B	158[A]	PHE
1	B	158[B]	PHE
1	B	267[A]	GLU
1	B	267[B]	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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)

30 ligands are modelled in this entry.

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	GOL	B	504	-	5,5,5	0.18	0	5,5,5	0.40	0
2	HEM	A	501[A]	1,3	41,50,50	1.27	5 (12%)	45,82,82	1.85	10 (22%)
5	GOL	B	513[B]	-	5,5,5	0.10	0	5,5,5	0.27	0
4	C5R	B	503	-	39,40,40	0.90	1 (2%)	53,61,61	1.20	5 (9%)
5	GOL	A	507	-	5,5,5	0.12	0	5,5,5	0.24	0
5	GOL	A	509	-	5,5,5	0.08	0	5,5,5	0.33	0
5	GOL	B	511	-	5,5,5	0.10	0	5,5,5	0.28	0
3	DMS	A	502	2	3,3,3	0.41	0	3,3,3	0.51	0
2	HEM	A	501[B]	1,3	41,50,50	1.30	6 (14%)	45,82,82	1.77	9 (20%)
4	C5R	A	503	-	39,40,40	0.93	1 (2%)	53,61,61	1.06	3 (5%)
5	GOL	B	514	-	5,5,5	0.23	0	5,5,5	0.54	0
2	HEM	B	501[A]	1,3	41,50,50	1.29	6 (14%)	45,82,82	1.88	9 (20%)
5	GOL	A	506	-	5,5,5	0.11	0	5,5,5	0.38	0
5	GOL	B	506	-	5,5,5	0.13	0	5,5,5	0.41	0
5	GOL	B	512	-	5,5,5	0.10	0	5,5,5	0.22	0
2	HEM	B	501[B]	1,3	41,50,50	1.33	8 (19%)	45,82,82	1.77	10 (22%)
3	DMS	B	502	2	3,3,3	0.66	0	3,3,3	0.69	0
5	GOL	A	508	-	5,5,5	0.12	0	5,5,5	0.36	0
5	GOL	B	507	-	5,5,5	0.10	0	5,5,5	0.27	0
5	GOL	A	512[A]	-	5,5,5	0.10	0	5,5,5	0.22	0
5	GOL	A	511	-	5,5,5	0.10	0	5,5,5	0.31	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
5	GOL	B	510	-	5,5,5	0.12	0	5,5,5	0.30	0
5	GOL	A	510	-	5,5,5	0.09	0	5,5,5	0.41	0
5	GOL	B	505	-	5,5,5	0.11	0	5,5,5	0.36	0
5	GOL	B	508	-	5,5,5	0.12	0	5,5,5	0.28	0
5	GOL	B	509	-	5,5,5	0.07	0	5,5,5	0.22	0
5	GOL	A	505	-	5,5,5	0.10	0	5,5,5	0.24	0
5	GOL	A	512[B]	-	5,5,5	0.10	0	5,5,5	0.25	0
5	GOL	B	513[A]	-	5,5,5	0.11	0	5,5,5	0.30	0
5	GOL	A	504	-	5,5,5	0.04	0	5,5,5	0.22	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	GOL	B	504	-	-	0/4/4/4	-
2	HEM	A	501[A]	1,3	-	2/12/54/54	-
5	GOL	B	513[B]	-	-	1/4/4/4	-
4	C5R	B	503	-	-	2/21/53/53	0/5/5/5
5	GOL	A	507	-	-	0/4/4/4	-
5	GOL	A	509	-	-	2/4/4/4	-
5	GOL	B	511	-	-	0/4/4/4	-
2	HEM	A	501[B]	1,3	-	2/12/54/54	-
4	C5R	A	503	-	-	2/21/53/53	0/5/5/5
5	GOL	B	514	-	-	0/4/4/4	-
2	HEM	B	501[A]	1,3	-	2/12/54/54	-
5	GOL	A	506	-	-	4/4/4/4	-
5	GOL	B	506	-	-	0/4/4/4	-
5	GOL	B	512	-	-	0/4/4/4	-
2	HEM	B	501[B]	1,3	-	2/12/54/54	-
5	GOL	A	508	-	-	4/4/4/4	-
5	GOL	B	507	-	-	2/4/4/4	-
5	GOL	A	512[A]	-	-	0/4/4/4	-
5	GOL	A	511	-	-	2/4/4/4	-
5	GOL	B	510	-	-	0/4/4/4	-
5	GOL	A	510	-	-	2/4/4/4	-
5	GOL	B	505	-	-	4/4/4/4	-
5	GOL	B	508	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	GOL	B	509	-	-	2/4/4/4	-
5	GOL	A	505	-	-	0/4/4/4	-
5	GOL	A	512[B]	-	-	0/4/4/4	-
5	GOL	B	513[A]	-	-	0/4/4/4	-
5	GOL	A	504	-	-	0/4/4/4	-

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501[A]	HEM	C1B-NB	-3.63	1.34	1.40
2	B	501[A]	HEM	C1B-NB	-3.54	1.34	1.40
2	B	501[B]	HEM	C1B-NB	-3.37	1.34	1.40
2	A	501[B]	HEM	C1B-NB	-2.89	1.35	1.40
2	A	501[B]	HEM	C4D-C3D	2.88	1.50	1.45
2	A	501[A]	HEM	CHB-C1B	2.73	1.42	1.35
2	B	501[B]	HEM	C4D-C3D	2.61	1.49	1.45
2	B	501[A]	HEM	CHB-C1B	2.47	1.41	1.35
2	B	501[A]	HEM	FE-NB	2.44	2.09	1.96
2	B	501[A]	HEM	C4D-C3D	2.38	1.49	1.45
2	B	501[B]	HEM	CHB-C1B	2.38	1.41	1.35
2	A	501[B]	HEM	C4D-ND	-2.34	1.36	1.40
2	A	501[A]	HEM	C4B-NB	-2.28	1.34	1.38
2	A	501[A]	HEM	FE-NB	2.28	2.08	1.96
2	B	501[B]	HEM	FE-NB	2.26	2.08	1.96
2	A	501[A]	HEM	C4D-C3D	2.23	1.48	1.45
2	A	501[B]	HEM	CHB-C1B	2.21	1.40	1.35
2	B	501[A]	HEM	C4B-NB	-2.20	1.34	1.38
2	B	501[B]	HEM	CHA-C4D	2.14	1.40	1.35
4	A	503	C5R	C7-C6	2.14	1.42	1.39
2	B	501[B]	HEM	C1A-NA	2.12	1.40	1.36
2	B	501[B]	HEM	C4B-NB	-2.11	1.34	1.38
2	A	501[B]	HEM	FE-NB	2.09	2.07	1.96
2	B	501[B]	HEM	C4D-ND	-2.09	1.36	1.40
2	B	501[A]	HEM	C1D-C2D	2.08	1.48	1.44
2	A	501[B]	HEM	CHA-C4D	2.08	1.40	1.35
4	B	503	C5R	C28-C25	-2.06	1.38	1.42

All (46) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	501[B]	HEM	CHC-C4B-NB	5.64	130.56	124.43
2	B	501[A]	HEM	C1B-NB-C4B	5.50	110.75	105.07

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	501[A]	HEM	C1B-NB-C4B	5.26	110.51	105.07
2	B	501[A]	HEM	CHC-C4B-NB	5.20	130.08	124.43
2	A	501[B]	HEM	C1B-NB-C4B	5.03	110.27	105.07
2	B	501[B]	HEM	CHC-C4B-NB	4.90	129.75	124.43
2	A	501[A]	HEM	CHC-C4B-NB	4.60	129.43	124.43
2	B	501[B]	HEM	C1B-NB-C4B	4.57	109.80	105.07
4	B	503	C5R	C23-C21-N1	3.89	118.99	110.79
2	A	501[A]	HEM	CHD-C1D-C2D	-3.41	119.65	124.98
2	A	501[A]	HEM	CHD-C1D-ND	3.19	127.89	124.43
2	A	501[A]	HEM	CHB-C1B-NB	3.18	128.31	124.38
2	B	501[A]	HEM	CHD-C1D-C2D	-3.13	120.09	124.98
2	B	501[B]	HEM	CHD-C1D-C2D	-3.05	120.22	124.98
2	B	501[A]	HEM	CHD-C1D-ND	3.04	127.74	124.43
2	A	501[B]	HEM	CHD-C1D-C2D	-2.90	120.45	124.98
2	B	501[B]	HEM	CHD-C1D-ND	2.88	127.56	124.43
2	B	501[A]	HEM	CHB-C1B-NB	2.69	127.70	124.38
2	B	501[B]	HEM	CHB-C1B-NB	2.57	127.56	124.38
2	B	501[A]	HEM	O2A-CGA-CBA	2.53	122.17	114.03
4	B	503	C5R	C23-C24-C25	2.49	130.12	126.25
2	A	501[B]	HEM	CHB-C1B-NB	2.49	127.45	124.38
4	A	503	C5R	C28-C25-C24	-2.48	129.86	134.42
2	A	501[B]	HEM	C2D-C1D-ND	2.47	112.84	109.88
4	A	503	C5R	C23-C21-N1	2.43	115.91	110.79
2	B	501[B]	HEM	CBA-CAA-C2A	-2.42	108.48	112.62
2	A	501[B]	HEM	O2D-CGD-CBD	2.40	121.73	114.03
4	B	503	C5R	C22-C21-N1	-2.35	104.98	110.55
2	A	501[A]	HEM	O2A-CGA-CBA	2.33	121.51	114.03
2	B	501[B]	HEM	CHA-C4D-C3D	-2.30	121.01	125.33
4	A	503	C5R	C16-C4-C5	2.29	112.15	110.03
2	B	501[B]	HEM	CMC-C2C-C3C	2.26	128.91	124.68
4	B	503	C5R	C28-C25-C24	-2.26	130.27	134.42
2	B	501[B]	HEM	C4B-C3B-C2B	-2.25	105.33	107.11
4	B	503	C5R	C24-C23-C21	2.25	117.84	113.45
2	A	501[A]	HEM	C4B-C3B-C2B	-2.22	105.35	107.11
2	A	501[B]	HEM	CMC-C2C-C3C	2.21	128.82	124.68
2	B	501[A]	HEM	O2D-CGD-CBD	2.19	121.06	114.03
2	B	501[A]	HEM	O1A-CGA-CBA	-2.18	116.08	123.08
2	A	501[A]	HEM	CMA-C3A-C4A	-2.15	125.16	128.46
2	A	501[A]	HEM	C2D-C1D-ND	2.14	112.44	109.88
2	B	501[A]	HEM	CMA-C3A-C4A	-2.12	125.21	128.46
2	A	501[B]	HEM	CHD-C1D-ND	2.05	126.66	124.43
2	A	501[B]	HEM	CHA-C4D-C3D	-2.05	121.48	125.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	501[B]	HEM	O2A-CGA-CBA	2.03	120.56	114.03
2	A	501[A]	HEM	CMC-C2C-C3C	2.02	128.45	124.68

There are no chirality outliers.

All (37) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	511	GOL	O1-C1-C2-C3
5	B	505	GOL	C1-C2-C3-O3
5	B	505	GOL	O2-C2-C3-O3
5	B	507	GOL	O1-C1-C2-C3
5	B	508	GOL	C1-C2-C3-O3
5	B	507	GOL	O1-C1-C2-O2
5	A	506	GOL	O1-C1-C2-C3
5	A	506	GOL	C1-C2-C3-O3
5	A	508	GOL	C1-C2-C3-O3
5	A	509	GOL	O1-C1-C2-C3
5	A	510	GOL	O1-C1-C2-C3
5	B	505	GOL	O1-C1-C2-C3
5	A	506	GOL	O1-C1-C2-O2
5	A	510	GOL	O1-C1-C2-O2
5	A	511	GOL	O1-C1-C2-O2
5	B	505	GOL	O1-C1-C2-O2
5	A	508	GOL	O2-C2-C3-O3
5	A	509	GOL	O1-C1-C2-O2
5	B	508	GOL	O2-C2-C3-O3
5	B	513[B]	GOL	C1-C2-C3-O3
5	B	509	GOL	O2-C2-C3-O3
4	B	503	C5R	O1-C1-C2-C3
5	A	508	GOL	O1-C1-C2-C3
2	B	501[B]	HEM	CAA-CBA-CGA-O1A
2	B	501[B]	HEM	CAA-CBA-CGA-O2A
5	A	506	GOL	O2-C2-C3-O3
2	A	501[B]	HEM	CAA-CBA-CGA-O2A
2	B	501[A]	HEM	CAD-CBD-CGD-O2D
2	A	501[A]	HEM	CAD-CBD-CGD-O2D
2	A	501[B]	HEM	CAA-CBA-CGA-O1A
2	A	501[A]	HEM	CAD-CBD-CGD-O1D
2	B	501[A]	HEM	CAD-CBD-CGD-O1D
5	A	508	GOL	O1-C1-C2-O2
5	B	509	GOL	C1-C2-C3-O3
4	A	503	C5R	N1-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
4	A	503	C5R	O1-C1-C2-C3
4	B	503	C5R	N1-C1-C2-C3

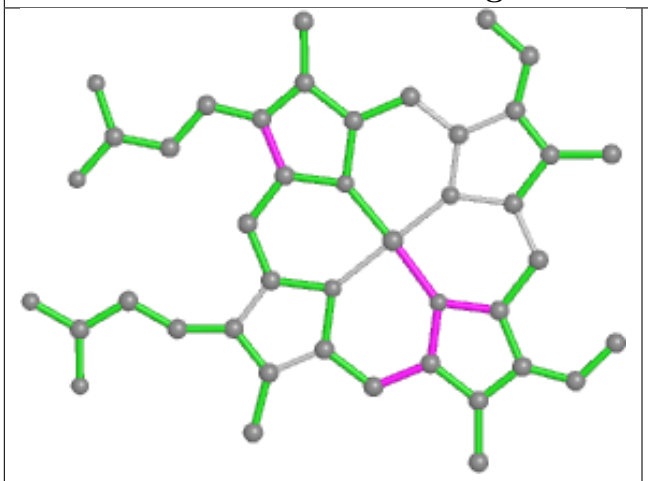
There are no ring outliers.

12 monomers are involved in 25 short contacts:

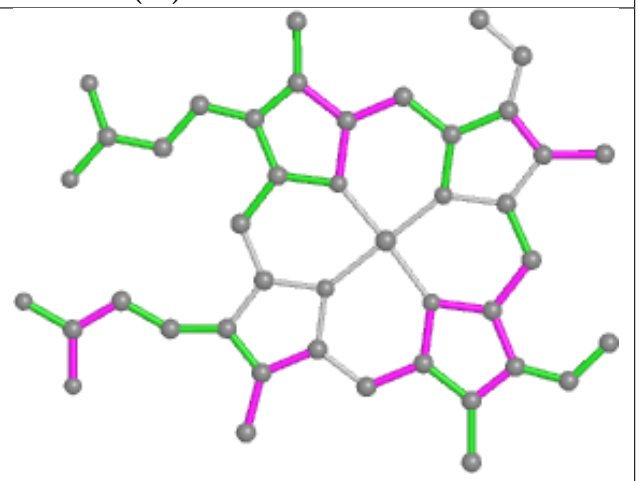
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501[A]	HEM	4	0
4	B	503	C5R	1	0
5	A	509	GOL	2	0
2	A	501[B]	HEM	4	0
4	A	503	C5R	1	0
2	B	501[A]	HEM	4	0
2	B	501[B]	HEM	4	0
5	A	508	GOL	1	0
5	B	507	GOL	1	0
5	A	510	GOL	1	0
5	B	509	GOL	1	0
5	A	504	GOL	1	0

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

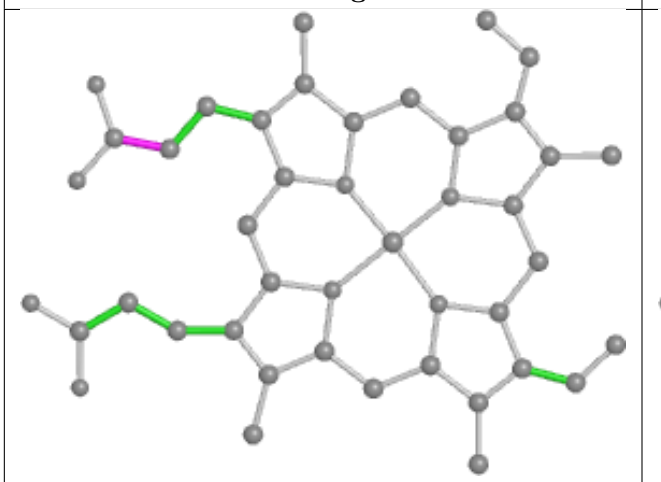
Ligand HEM A 501 (A)



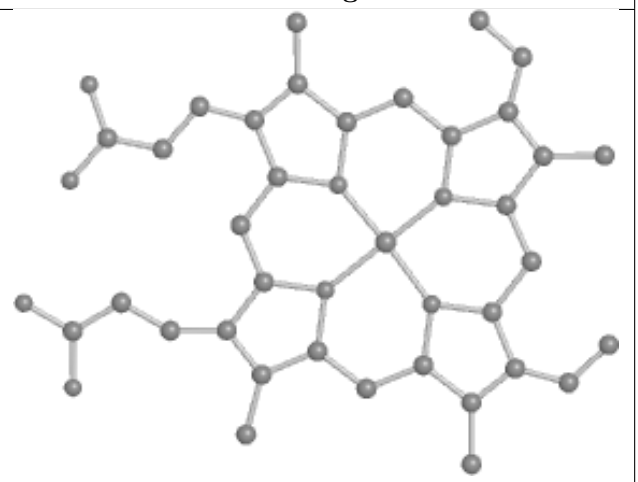
Bond lengths



Bond angles

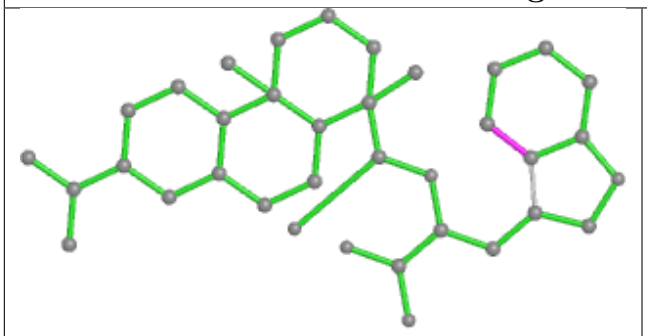


Torsions

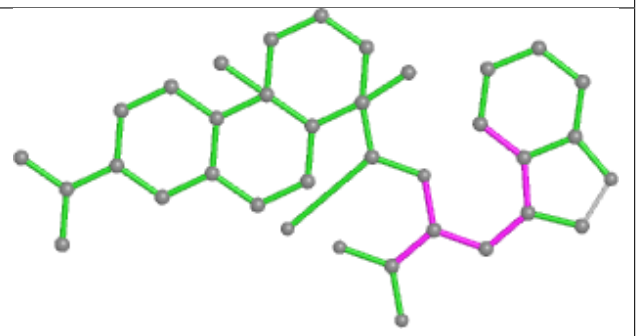


Rings

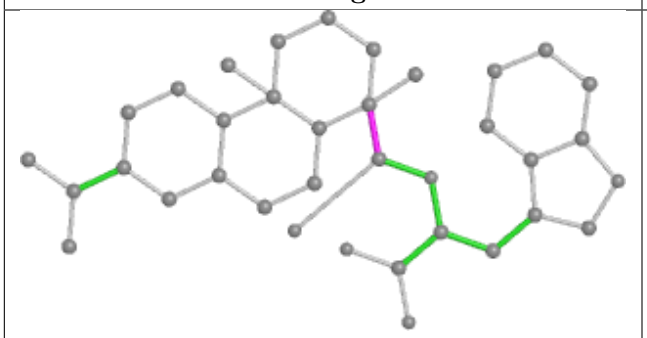
Ligand C5R B 503



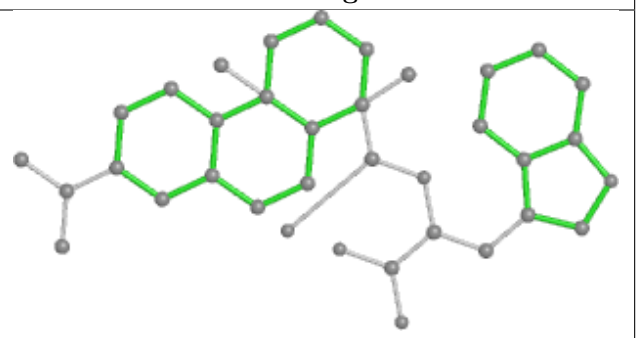
Bond lengths



Bond angles

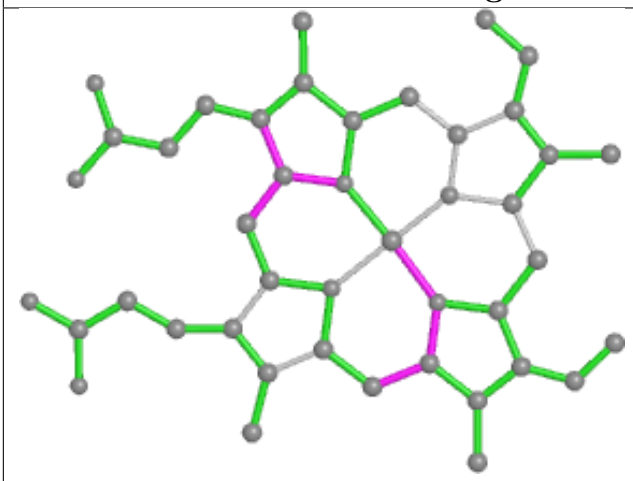


Torsions

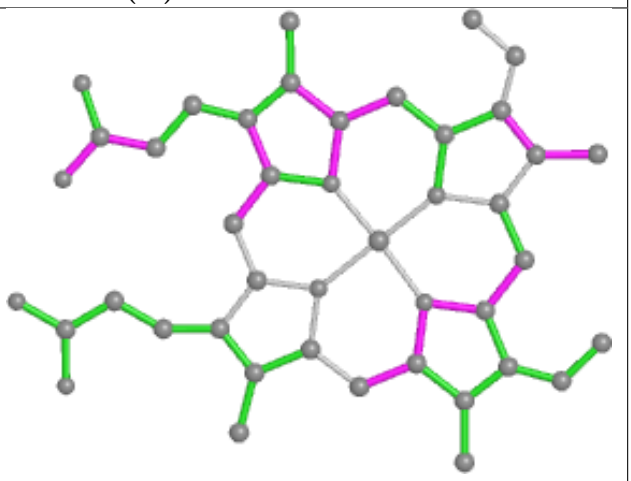


Rings

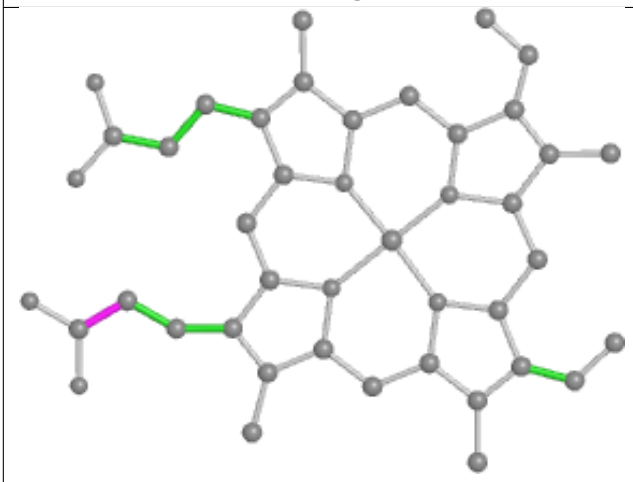
Ligand HEM A 501 (B)



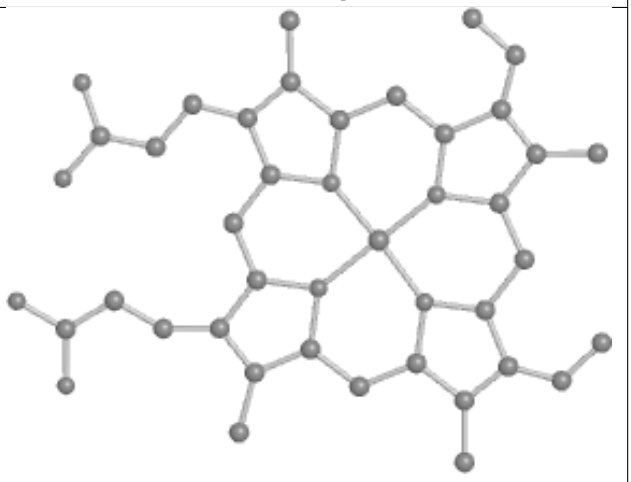
Bond lengths



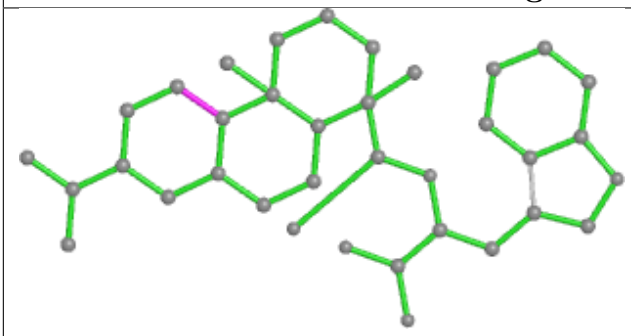
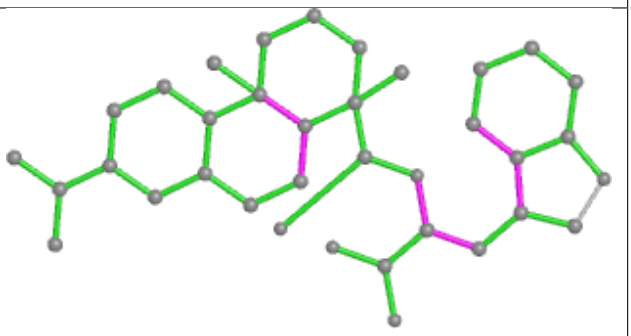
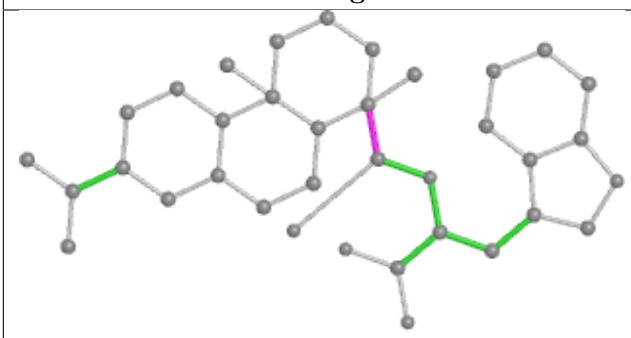
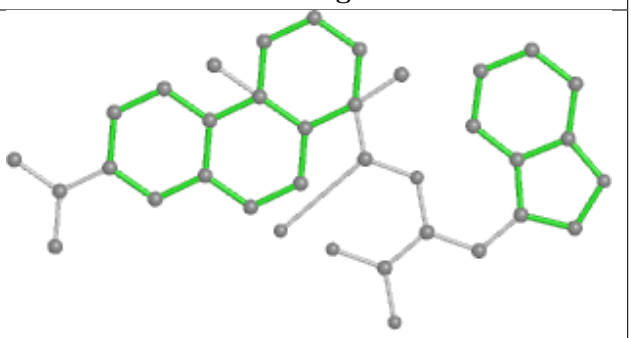
Bond angles



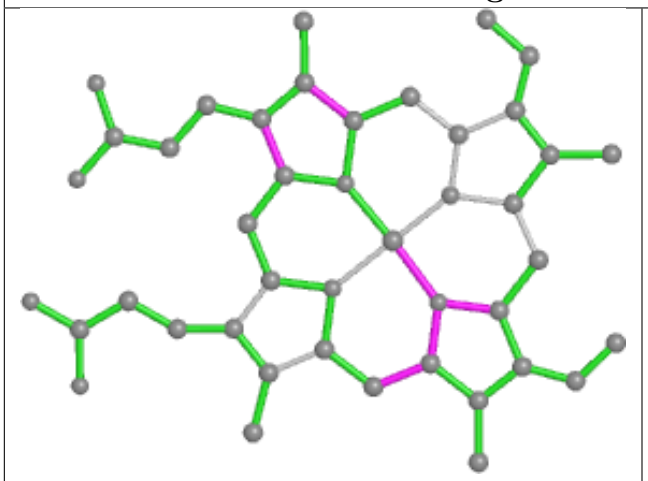
Torsions



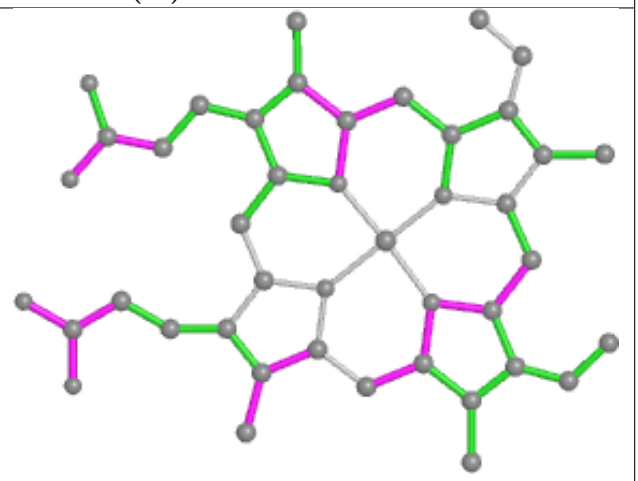
Rings

Ligand C5R A 503	
 Bond lengths	 Bond angles
 Torsions	 Rings

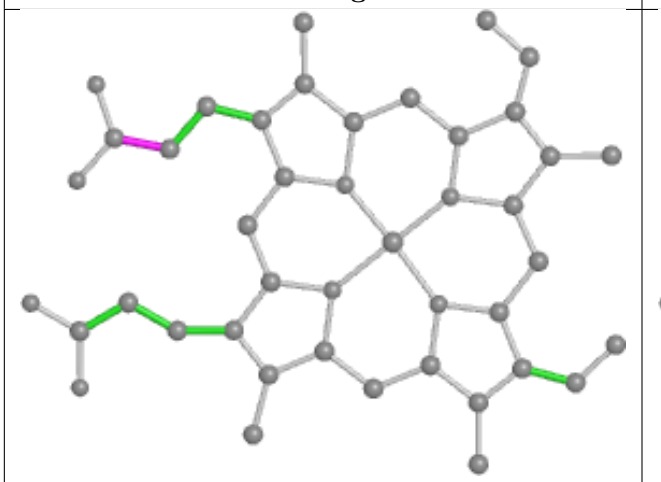
Ligand HEM B 501 (A)



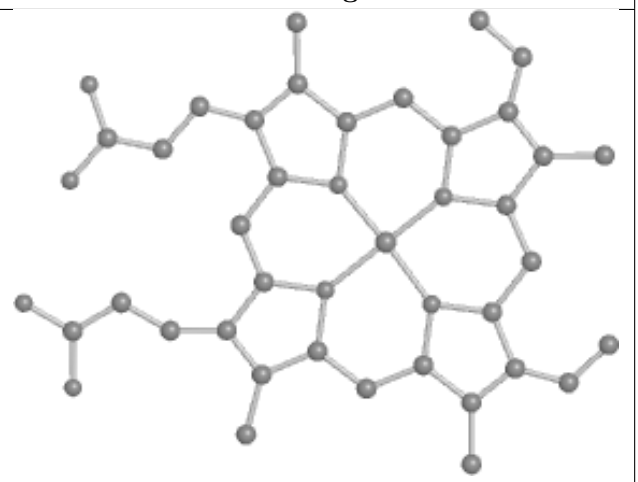
Bond lengths



Bond angles

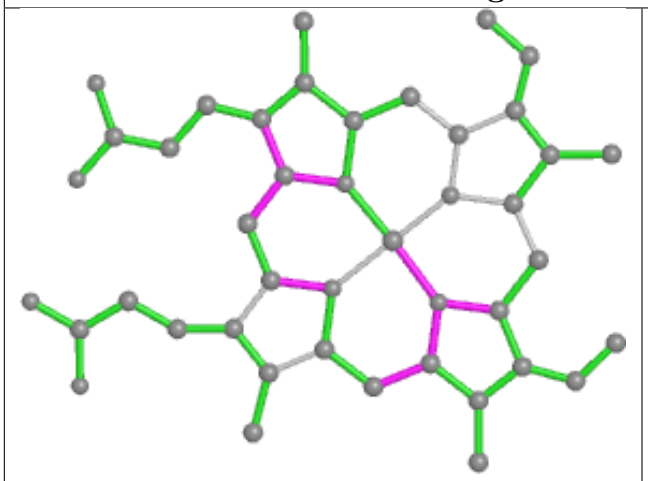


Torsions

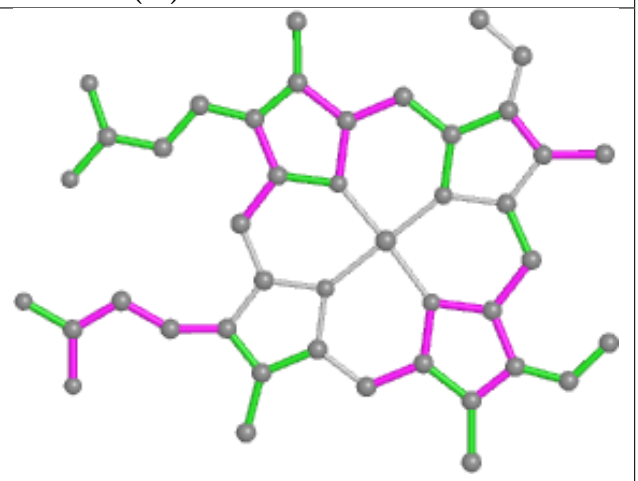


Rings

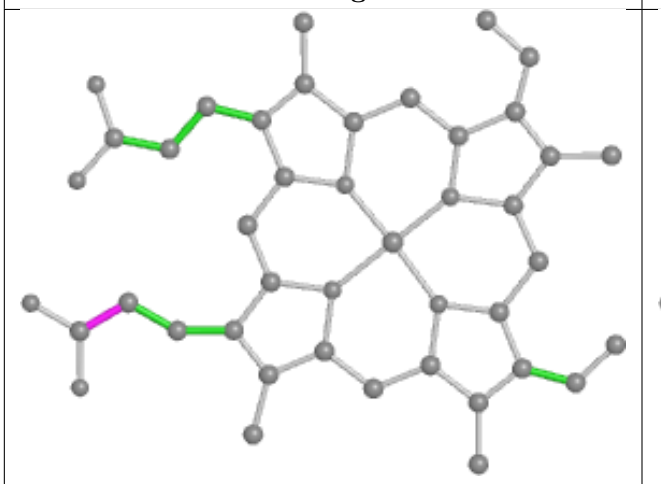
Ligand HEM B 501 (B)



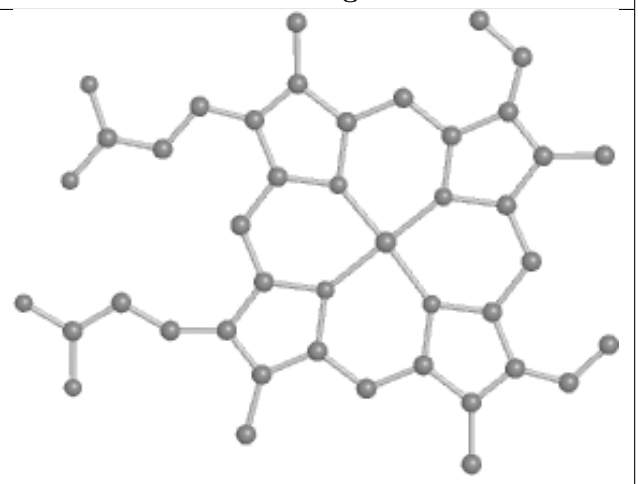
Bond lengths



Bond angles



Torsions



Rings

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, 95th 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^2)	Q<0.9
1	A	455/456 (99%)	0.20	26 (5%)	23	26	13, 21, 42, 66	0
1	B	454/456 (99%)	0.30	35 (7%)	13	14	14, 22, 43, 67	0
All	All	909/912 (99%)	0.25	61 (6%)	17	20	13, 21, 43, 67	0

All (61) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	2	ILE	8.7
1	A	1	THR	7.8
1	B	196	PRO	7.3
1	A	2	ILE	6.8
1	B	191	ALA	6.8
1	B	4	GLU	5.9
1	A	191	ALA	5.8
1	B	197	ALA	5.7
1	A	196	PRO	5.7
1	B	192	ASN	4.7
1	B	231	ASP	4.7
1	A	198	TYR	4.6
1	A	194	ASP	4.6
1	A	231	ASP	4.5
1	A	200	GLU	4.3
1	B	3	LYS	4.2
1	B	199	ASP	4.2
1	B	193	PRO	4.1
1	A	199	ASP	4.1
1	A	192	ASN	4.1
1	B	455	LEU	4.0
1	B	194	ASP	4.0
1	A	203	ARG	3.9
1	A	193	PRO	3.9

Continued on next page...

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Mol	Chain	Res	Type	RSRZ
1	B	203	ARG	3.8
1	B	198	TYR	3.7
1	B	13	GLU	3.5
1	B	229	GLN	3.1
1	A	4	GLU	3.1
1	A	455	LEU	3.0
1	B	228	GLU	3.0
1	A	225	ALA	3.0
1	B	200	GLU	3.0
1	B	195	ASP	2.9
1	A	227	GLY	2.8
1	A	3	LYS	2.8
1	A	195	ASP	2.7
1	B	158[A]	PHE	2.7
1	B	207	GLU	2.6
1	A	197	ALA	2.5
1	A	205	PHE	2.5
1	B	230	SER	2.5
1	B	383[A]	SER	2.4
1	B	265	GLY	2.4
1	B	169	GLN	2.4
1	B	342	GLY	2.4
1	A	201	ASN	2.3
1	A	229	GLN	2.3
1	B	20	LEU	2.3
1	B	17	LEU	2.3
1	A	454	PRO	2.2
1	A	228	GLU	2.2
1	A	219[A]	ILE	2.2
1	B	454	PRO	2.1
1	B	204	GLN	2.1
1	B	5	MET	2.1
1	B	201	ASN	2.1
1	A	136[A]	ASP	2.0
1	B	205	PHE	2.0
1	B	302	VAL	2.0
1	B	225	ALA	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, 95th 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.

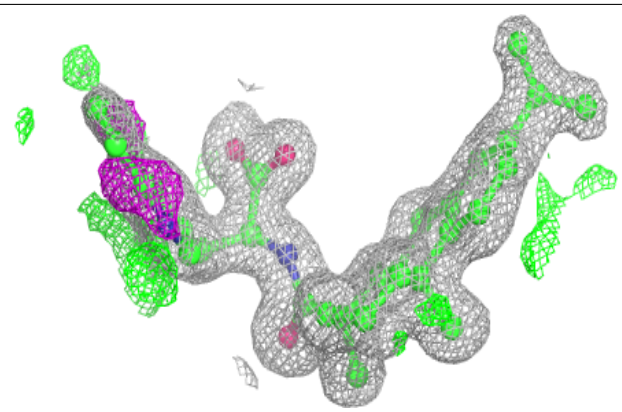
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	GOL	A	510	6/6	0.57	0.32	40,48,56,59	0
5	GOL	B	514	6/6	0.75	0.24	21,25,27,27	0
5	GOL	B	513[A]	6/6	0.76	0.23	43,51,52,57	6
5	GOL	B	513[B]	6/6	0.76	0.23	49,49,54,59	6
5	GOL	A	508	6/6	0.76	0.15	35,45,57,58	0
5	GOL	B	509	6/6	0.79	0.24	37,44,56,62	0
5	GOL	B	508	6/6	0.79	0.13	45,50,50,55	0
5	GOL	B	512	6/6	0.81	0.15	44,49,53,56	0
5	GOL	B	505	6/6	0.81	0.33	35,48,49,51	0
5	GOL	B	507	6/6	0.84	0.21	26,37,38,54	0
5	GOL	A	512[A]	6/6	0.86	0.14	29,34,40,44	6
5	GOL	A	512[B]	6/6	0.86	0.14	42,44,53,58	6
5	GOL	A	509	6/6	0.87	0.18	41,46,55,55	0
5	GOL	A	505	6/6	0.88	0.17	28,34,41,42	0
5	GOL	B	504	6/6	0.88	0.12	27,41,44,45	0
5	GOL	A	507	6/6	0.88	0.21	42,43,44,44	0
5	GOL	B	510	6/6	0.88	0.14	34,37,41,42	0
5	GOL	B	511	6/6	0.89	0.16	39,46,48,50	0
4	C5R	B	503	36/36	0.90	0.11	21,25,48,49	0
4	C5R	A	503	36/36	0.92	0.10	19,25,37,41	0
5	GOL	A	511	6/6	0.92	0.12	34,47,51,54	0
5	GOL	A	504	6/6	0.92	0.13	24,27,35,49	0
5	GOL	A	506	6/6	0.93	0.13	23,38,48,58	0
3	DMS	B	502	4/4	0.93	0.19	17,18,20,21	4
5	GOL	B	506	6/6	0.93	0.12	23,24,31,45	0
3	DMS	A	502	4/4	0.96	0.18	16,17,18,22	4
2	HEM	B	501[A]	43/43	0.99	0.09	12,13,15,17	43
2	HEM	B	501[B]	43/43	0.99	0.09	12,13,16,17	43
2	HEM	A	501[A]	43/43	0.99	0.10	12,13,15,17	43
2	HEM	A	501[B]	43/43	0.99	0.10	11,13,15,16	43

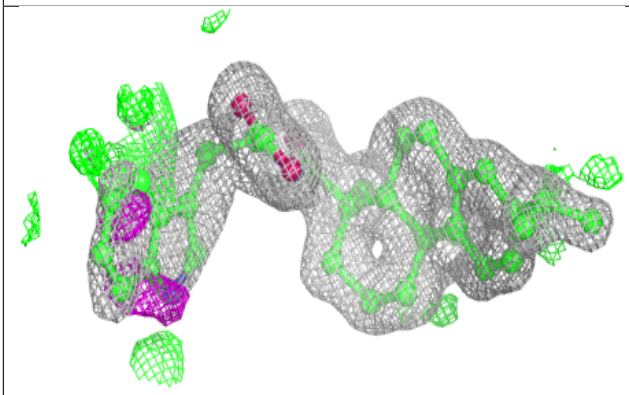
The following is a graphical depiction of the model fit to experimental electron density of all

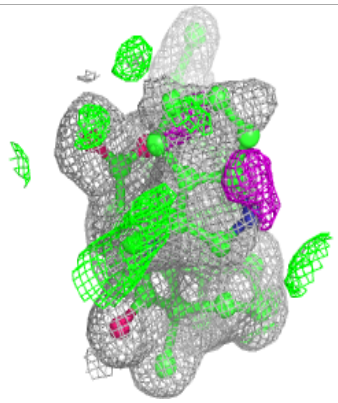
instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around C5R 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)

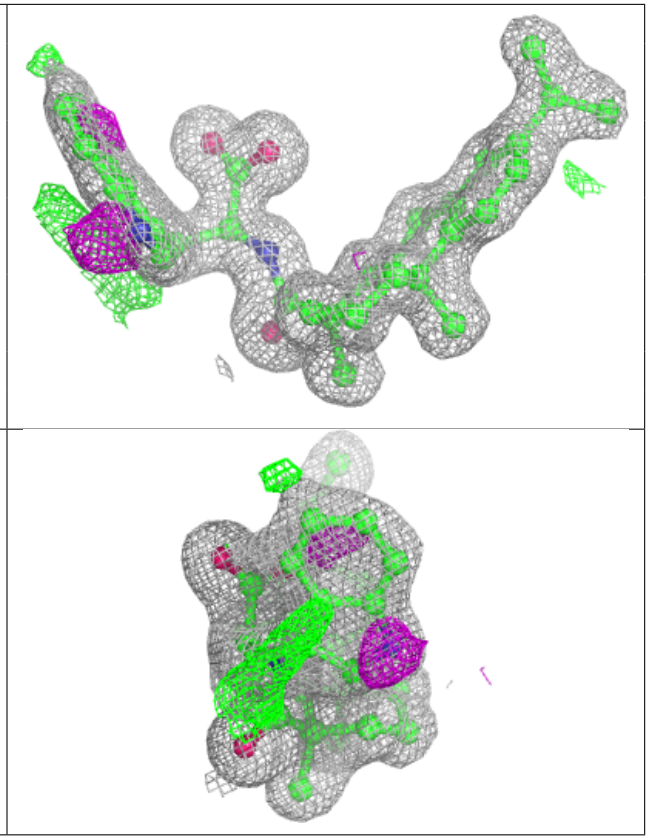


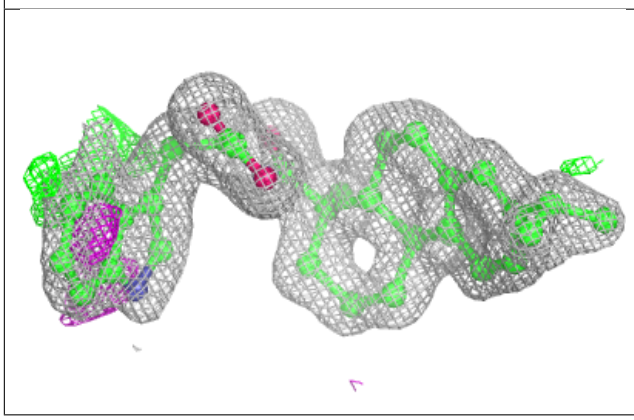




Electron density around C5R A 503:

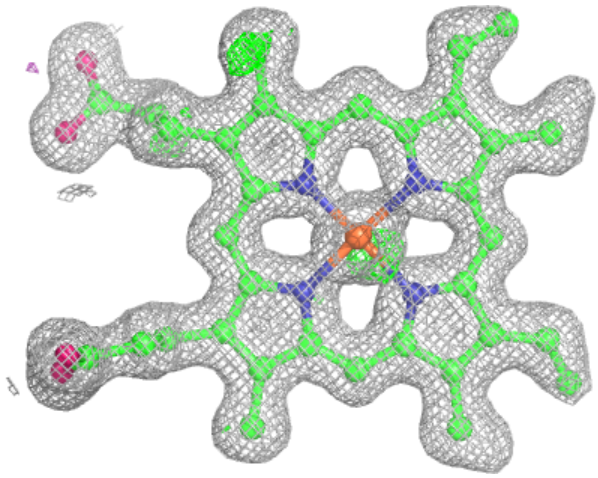
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

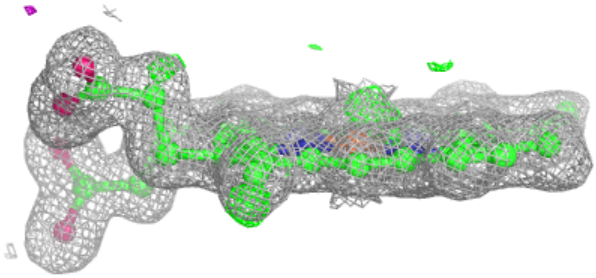


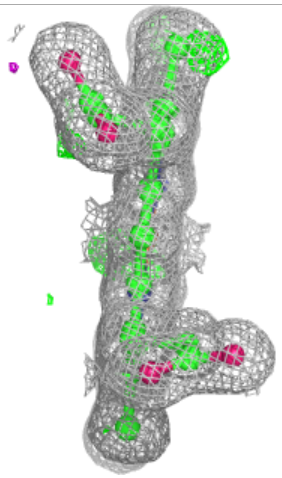


Electron density around HEM B 501 (A):

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

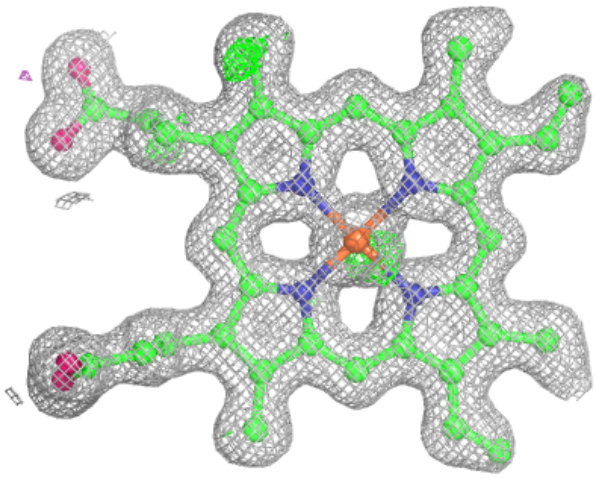


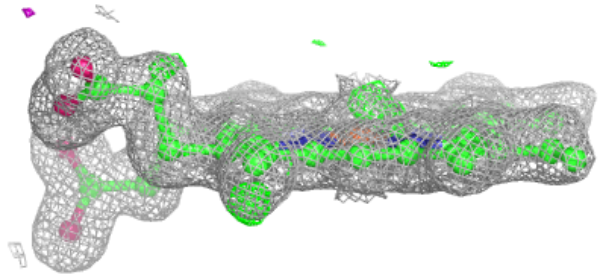


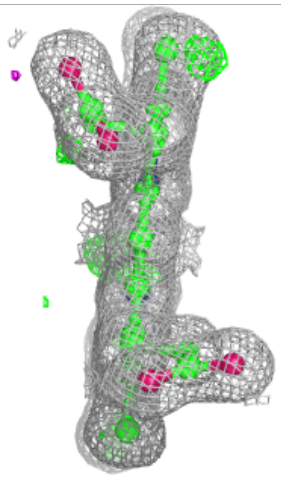


Electron density around HEM B 501 (B):

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

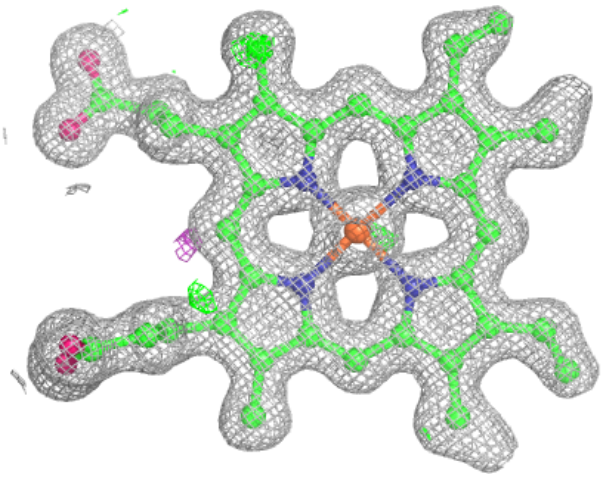


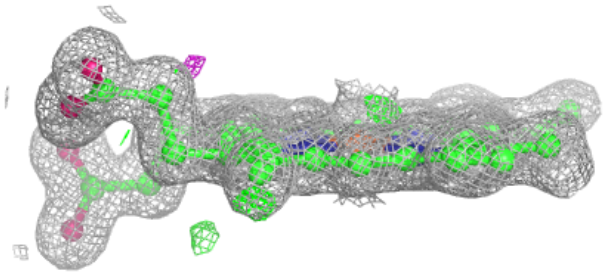


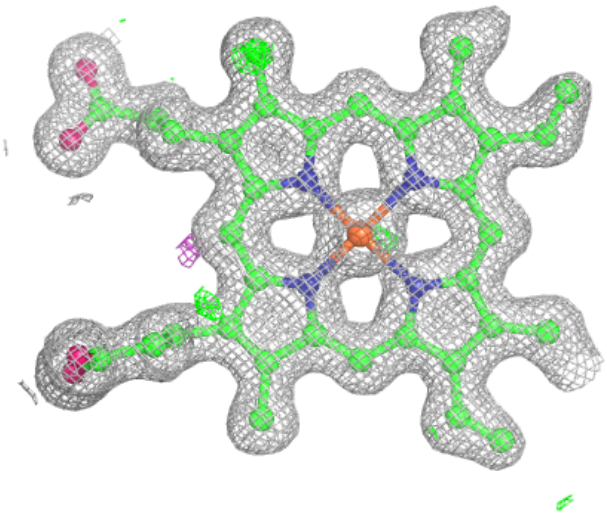
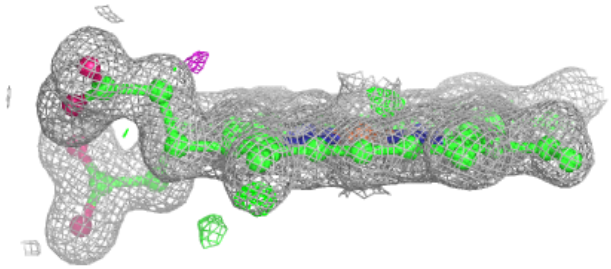


Electron density around HEM A 501 (A):

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





Electron density around HEM A 501 (B): 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.