Full wwPDB X-ray Structure Validation Report (i)

Jun 23, 2024 – 12:18 AM EDT

PDB ID	:	5FVY
Title	:	Structure of bovine endothelial nitric oxide synthase heme domain in complex with 4-methyl-6-(2-(5-(4-methylpiperazin-1-yl)pyridin-3-yl) ethyl)pyridin-2-amine
Authors	:	Li, H.; Poulos, T.L.
Deposited on	:	2016-02-10
Resolution	:	2.10 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 (1)) were used in the production of this report:

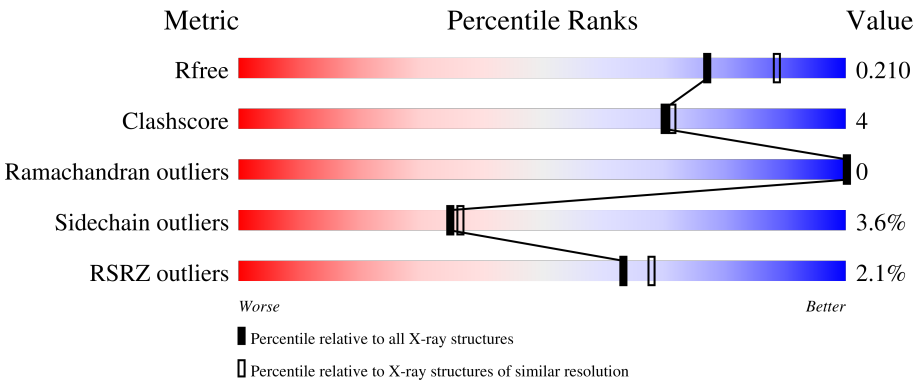
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 2.10 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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	443	2% 84% 7% 9%
1	B	443	2% 82% 8% • 9%

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
5	ACT	A	861	-	-	X	-
5	ACT	B	861	-	-	X	-

2 Entry composition (i)

There are 9 unique types of molecules in this entry. The entry contains 6994 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

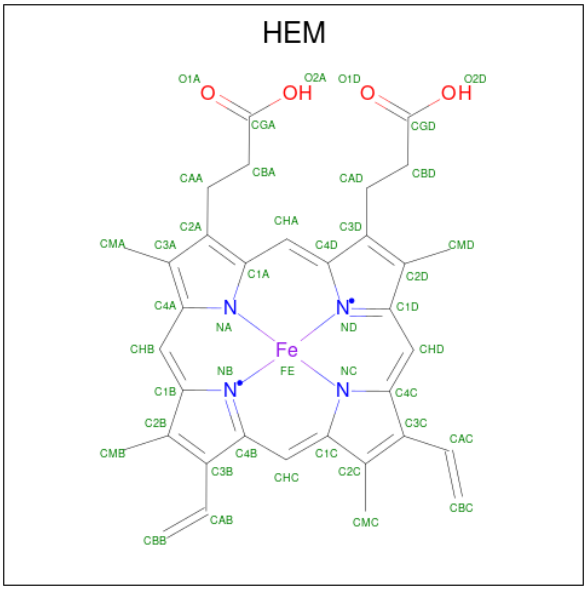
- Molecule 1 is a protein called NITRIC OXIDE SYNTHASE, ENDOTHELIAL.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	As	C	N	O	S			
1	A	405	3219	1	2048	565	589	16	0	0	0
1	B	404	3221	1	2048	568	588	16	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	100	ARG	CYS	conflict	UNP P29473
B	100	ARG	CYS	conflict	UNP P29473

- 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	43	34	1	4	4	0	0

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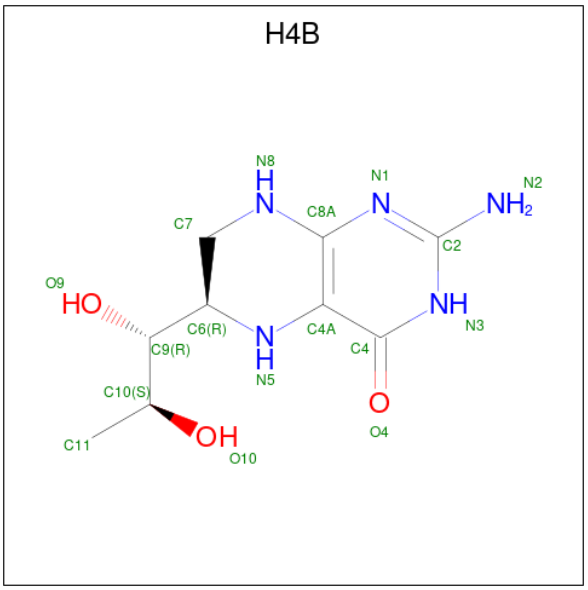
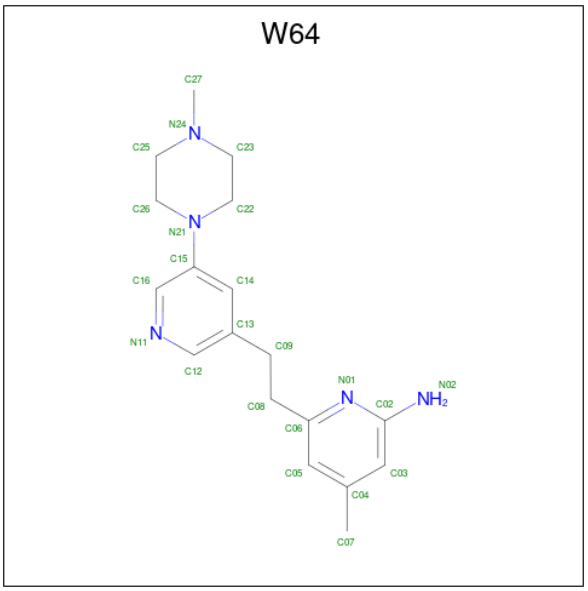
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Fe	N	O		
2	B	1	43	34	1	4	4	0	0

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



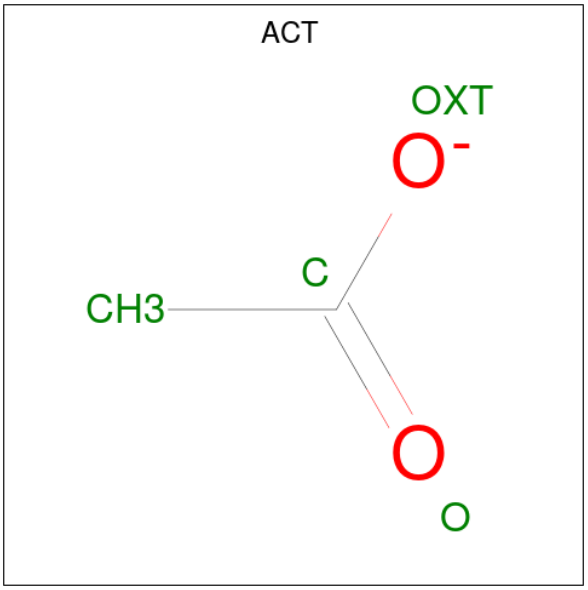
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O			
3	A	1	17	9	5	3		0	0
3	B	1	17	9	5	3		0	0

- Molecule 4 is 4-methyl-6-(2-(5-(4-methylpiperazin-1-yl)pyridin-3-yl)ethyl)pyridin-2-amine (three-letter code: W64) (formula: $C_{18}H_{25}N_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	N		
4	A	1	23	18	5	0	0
			Total	C	N		
4	B	1	23	18	5	0	0

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



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

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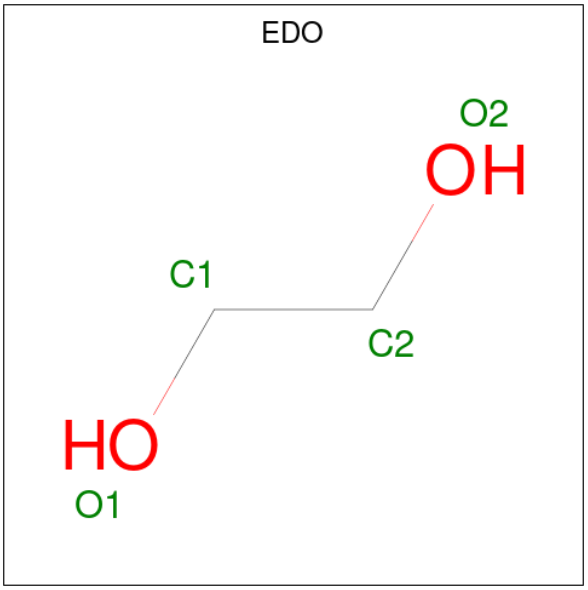
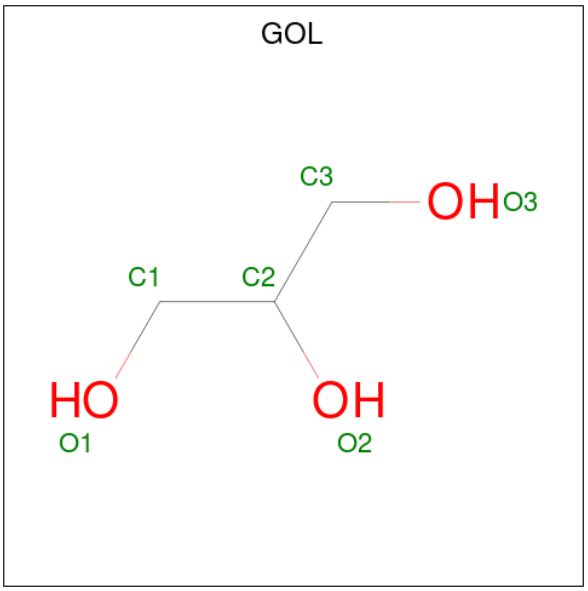
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	B	1	4	2	2	0	0
			Total	C	O		
5	B	1	4	2	2	0	0

- Molecule 6 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



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

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

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

- Molecule 9 is water.

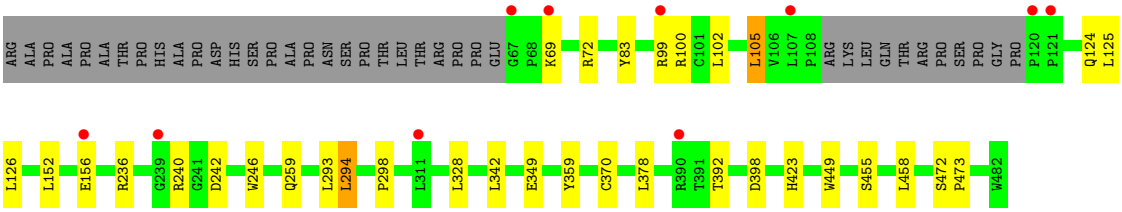
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
9	A	206	206	206	0	0
			Total	O		
9	B	145	145	145	0	0

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.

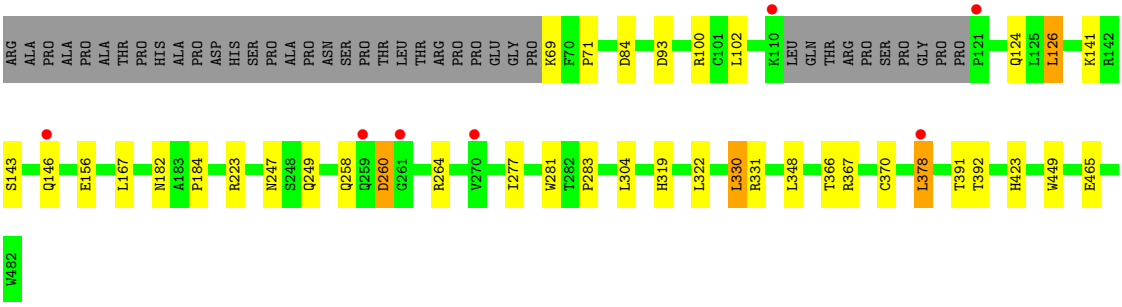
• Molecule 1: NITRIC OXIDE SYNTHASE, ENDOTHELIAL

Chain A:



• Molecule 1: NITRIC OXIDE SYNTHASE, ENDOTHELIAL

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	58.10Å 106.25Å 156.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	87.85 – 2.10 87.85 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.1 (87.85-2.10) 99.1 (87.85-2.10)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.22 (at 2.10Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.169 , 0.213 0.169 , 0.210	Depositor DCC
R_{free} test set	2848 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	37.3	Xtriage
Anisotropy	0.465	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 47.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	6994	wwPDB-VP
Average B, all atoms (Å^2)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.56% 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: EDO, W64, CAS, HEM, H4B, ACT, ZN, GOL

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	0.39	0/3300	0.54	0/4495
1	B	0.38	0/3300	0.52	0/4491
All	All	0.39	0/6600	0.53	0/8986

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	3219	0	3121	21	0
1	B	3221	0	3130	21	0
2	A	43	0	30	2	0
2	B	43	0	30	4	0
3	A	17	0	15	2	0
3	B	17	0	15	4	0
4	A	23	0	0	0	0
4	B	23	0	0	0	0
5	A	8	0	6	2	0
5	B	8	0	6	2	0
6	A	4	0	6	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	4	0	6	3	0
7	A	6	0	8	0	0
7	B	6	0	8	0	0
8	A	1	0	0	0	0
9	A	206	0	0	1	0
9	B	145	0	0	1	0
All	All	6994	0	6381	47	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (47) 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)
2:B:500:HEM:HMC2	2:B:500:HEM:HBC2	1.74	0.69
1:B:281:TRP:HB2	1:B:304:LEU:HD21	1.78	0.66
1:A:342:LEU:HD11	1:A:349:GLU:HB3	1.79	0.65
2:B:500:HEM:O1A	3:B:600:H4B:N3	2.29	0.63
1:A:105:LEU:HD22	1:B:465:GLU:HB3	1.82	0.61
5:A:861:ACT:H2	6:A:870:EDO:H22	1.83	0.61
1:A:240:ARG:HD3	1:A:298:PRO:HB3	1.83	0.59
1:B:260:ASP:OD1	1:B:260:ASP:N	2.37	0.58
1:A:458:LEU:HD22	1:B:378:LEU:HD21	1.87	0.57
2:A:500:HEM:HBB2	2:A:500:HEM:HHC	1.86	0.57
2:B:500:HEM:HBB2	2:B:500:HEM:HHC	1.88	0.56
1:A:359:TYR:HE1	6:A:870:EDO:H12	1.73	0.54
2:B:500:HEM:O1A	3:B:600:H4B:N2	2.41	0.54
1:A:240:ARG:NH2	9:A:2095:HOH:O	2.40	0.54
1:A:72:ARG:NH1	1:A:83:TYR:OH	2.42	0.52
1:A:246:TRP:HB2	1:A:294:LEU:HB3	1.92	0.52
1:A:449:TRP:HA	3:A:600:H4B:N1	2.25	0.52
1:A:236:ARG:HD3	1:A:242:ASP:OD1	2.09	0.51
1:B:71:PRO:HG2	1:B:84:ASP:HB3	1.94	0.49
1:B:249:GLN:OE1	6:B:870:EDO:H22	2.12	0.49
1:B:167:LEU:HG	1:B:348:LEU:HD12	1.93	0.49
1:B:449:TRP:HA	3:B:600:H4B:N1	2.28	0.48
5:B:861:ACT:H2	6:B:870:EDO:H11	1.96	0.47
1:B:126:LEU:HD11	1:B:156:GLU:HA	1.97	0.47
1:A:455:SER:HB3	1:A:458:LEU:HD12	1.97	0.46
1:A:370:CYS:SG	1:A:378:LEU:HD13	2.56	0.46
1:A:423:HIS:HB2	1:B:392:THR:HB	1.96	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:277:ILE:HG12	1:B:283:PRO:HG3	1.97	0.46
1:B:258:GLN:HE21	1:B:264:ARG:HB2	1.80	0.46
1:A:240:ARG:HD3	1:A:298:PRO:CB	2.45	0.46
5:B:861:ACT:CH3	6:B:870:EDO:H11	2.45	0.46
1:B:247:ASN:N	1:B:247:ASN:OD1	2.51	0.44
1:A:152:LEU:O	1:A:156:GLU:HG3	2.18	0.43
1:A:392:THR:HB	1:B:423:HIS:HB2	2.00	0.43
1:A:126:LEU:HD11	1:A:156:GLU:HA	2.00	0.43
1:B:319:HIS:CE1	1:B:322:LEU:HG	2.54	0.43
1:B:366:THR:O	1:B:370:CYS:HB2	2.18	0.43
1:B:182:ASN:O	1:B:184:PRO:HD3	2.19	0.42
1:B:378:LEU:HB2	9:B:2110:HOH:O	2.18	0.42
1:A:126:LEU:HA	1:A:126:LEU:HD12	1.88	0.41
1:A:99:ARG:NH1	1:B:93:ASP:OD1	2.53	0.41
1:B:367:ARG:HH12	3:B:600:H4B:C4	2.34	0.41
2:A:500:HEM:CGA	3:A:600:H4B:HN3	2.34	0.41
1:A:472:SER:HA	1:A:473:PRO:C	2.42	0.40
1:B:330:LEU:HD12	1:B:330:LEU:HA	1.92	0.40
1:A:378:LEU:HD12	1:A:378:LEU:HA	1.95	0.40
5:A:861:ACT:CH3	6:A:870:EDO:H22	2.50	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	400/443 (90%)	389 (97%)	11 (3%)	0	100	100
1	B	399/443 (90%)	386 (97%)	13 (3%)	0	100	100
All	All	799/886 (90%)	775 (97%)	24 (3%)	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	343/375 (92%)	332 (97%)	11 (3%)	39	41
1	B	343/375 (92%)	329 (96%)	14 (4%)	30	31
All	All	686/750 (92%)	661 (96%)	25 (4%)	35	36

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	105	LEU
1	A	124	GLN
1	A	125	LEU
1	A	259	GLN
1	A	293	LEU
1	A	294	LEU
1	A	328	LEU
1	A	398	ASP
1	B	69	LYS
1	B	100	ARG
1	B	102	LEU
1	B	124	GLN
1	B	126	LEU
1	B	141	LYS
1	B	143	SER
1	B	146	GLN
1	B	223	ARG
1	B	260	ASP
1	B	330	LEU
1	B	331	ARG
1	B	378	LEU
1	B	391	THR

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

sidechains are listed below:

Mol	Chain	Res	Type
1	B	258	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

2 non-standard protein/DNA/RNA residues 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	$\#\|Z\| > 2$
1	CAS	A	384	1	5,8,9	1.05	0	1,9,11	0.03	0
1	CAS	B	384	1	5,8,9	1.11	0	1,9,11	0.06	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
1	CAS	A	384	1	-	0/0/7/9	-
1	CAS	B	384	1	-	0/0/7/9	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 15 ligands modelled in this entry, 1 is monoatomic - leaving 14 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	W64	A	800	-	25,25,25	0.46	0	33,34,34	1.80	9 (27%)
5	ACT	B	860	-	3,3,3	0.74	0	3,3,3	0.78	0
3	H4B	A	600	-	16,18,18	0.94	0	11,26,26	2.73	6 (54%)
4	W64	B	800	-	25,25,25	0.34	0	33,34,34	2.09	12 (36%)
5	ACT	B	861	-	3,3,3	0.79	0	3,3,3	0.53	0
7	GOL	A	880	-	5,5,5	0.35	0	5,5,5	0.28	0
5	ACT	A	861	-	3,3,3	0.80	0	3,3,3	0.61	0
2	HEM	B	500	1	41,50,50	1.92	7 (17%)	45,82,82	1.92	13 (28%)
6	EDO	A	870	-	3,3,3	0.35	0	2,2,2	0.40	0
2	HEM	A	500	1	41,50,50	1.91	6 (14%)	45,82,82	1.54	8 (17%)
7	GOL	B	880	-	5,5,5	0.31	0	5,5,5	0.38	0
6	EDO	B	870	-	3,3,3	0.33	0	2,2,2	0.41	0
5	ACT	A	860	-	3,3,3	0.68	0	3,3,3	0.88	0
3	H4B	B	600	-	16,18,18	0.94	1 (6%)	11,26,26	2.64	5 (45%)

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	W64	A	800	-	-	0/9/19/19	0/3/3/3
3	H4B	A	600	-	-	0/8/17/17	0/2/2/2
4	W64	B	800	-	-	0/9/19/19	0/3/3/3
7	GOL	A	880	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	B	500	1	-	1/12/54/54	-
6	EDO	A	870	-	-	0/1/1/1	-
2	HEM	A	500	1	-	3/12/54/54	-
7	GOL	B	880	-	-	2/4/4/4	-
6	EDO	B	870	-	-	1/1/1/1	-
3	H4B	B	600	-	-	0/8/17/17	0/2/2/2

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	500	HEM	C3D-C2D	7.78	1.53	1.36
2	A	500	HEM	C3D-C2D	7.47	1.52	1.36
2	B	500	HEM	C3C-C2C	-3.89	1.35	1.40
2	A	500	HEM	C3C-CAC	3.75	1.55	1.47
2	A	500	HEM	C3C-C2C	-3.74	1.35	1.40
2	B	500	HEM	C3C-CAC	3.57	1.55	1.47
2	B	500	HEM	CAB-C3B	2.97	1.55	1.47
2	A	500	HEM	CAB-C3B	2.86	1.55	1.47
2	B	500	HEM	FE-NB	2.60	2.09	1.96
2	A	500	HEM	FE-ND	2.43	2.08	1.96
2	B	500	HEM	FE-ND	2.21	2.07	1.96
3	B	600	H4B	C4A-C4	-2.18	1.38	1.41
2	B	500	HEM	CMD-C2D	2.16	1.55	1.50
2	A	500	HEM	CMD-C2D	2.04	1.55	1.50

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	600	H4B	C8A-C4A-C4	5.53	119.49	114.57
3	B	600	H4B	C8A-C4A-C4	5.47	119.43	114.57
2	B	500	HEM	C4D-ND-C1D	5.42	110.67	105.07
4	B	800	W64	C02-N01-C06	5.38	122.18	118.10
2	A	500	HEM	C4D-ND-C1D	4.88	110.12	105.07
4	A	800	W64	C22-N21-C15	-3.98	107.34	118.09
4	A	800	W64	C02-N01-C06	3.81	120.99	118.10
4	B	800	W64	C22-N21-C15	-3.70	108.11	118.09
3	A	600	H4B	N1-C2-N3	-3.56	119.83	125.42
3	B	600	H4B	C2-N3-C4	3.55	121.58	115.93
4	A	800	W64	C26-N21-C15	-3.52	108.57	118.09
2	B	500	HEM	C1B-NB-C4B	3.50	108.69	105.07
2	B	500	HEM	C4B-CHC-C1C	3.44	127.09	122.56
3	B	600	H4B	N1-C2-N3	-3.39	120.10	125.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	B	800	W64	C23-C22-N21	-3.36	104.18	110.70
4	B	800	W64	C05-C06-N01	-3.31	119.39	122.90
2	B	500	HEM	CBD-CAD-C3D	-3.30	103.46	112.63
2	B	500	HEM	CBA-CAA-C2A	-3.25	107.07	112.62
3	A	600	H4B	C2-N3-C4	3.24	121.08	115.93
4	B	800	W64	C26-N21-C15	-3.22	109.39	118.09
4	B	800	W64	C15-C16-N11	-3.14	119.45	122.92
2	B	500	HEM	C3B-C2B-C1B	3.13	108.81	106.49
2	B	500	HEM	CHA-C4D-ND	2.94	128.01	124.38
4	B	800	W64	C08-C06-N01	2.89	120.25	115.95
3	A	600	H4B	C2-N1-C8A	2.88	121.00	114.54
4	A	800	W64	C22-C23-N24	-2.79	107.66	110.80
4	A	800	W64	C08-C06-N01	2.77	120.07	115.95
3	A	600	H4B	C4-C4A-N5	2.76	121.43	119.12
2	B	500	HEM	CMD-C2D-C1D	2.75	129.23	125.04
2	A	500	HEM	CAD-C3D-C4D	2.70	129.38	124.66
4	B	800	W64	C22-C23-N24	-2.69	107.77	110.80
2	B	500	HEM	C1D-C2D-C3D	-2.64	104.18	106.96
3	B	600	H4B	C2-N1-C8A	2.55	120.25	114.54
4	A	800	W64	C15-C16-N11	-2.54	120.11	122.92
4	B	800	W64	C25-C26-N21	-2.54	105.77	110.70
2	A	500	HEM	C3B-C2B-C1B	2.49	108.33	106.49
4	A	800	W64	C16-N11-C12	2.48	120.87	117.48
4	A	800	W64	C23-C22-N21	-2.46	105.91	110.70
4	A	800	W64	C05-C06-N01	-2.44	120.31	122.90
2	B	500	HEM	C4C-CHD-C1D	2.43	125.77	122.56
2	A	500	HEM	CBA-CAA-C2A	-2.38	108.56	112.62
3	B	600	H4B	N2-C2-N3	2.31	120.85	117.25
2	A	500	HEM	CAD-CBD-CGD	-2.31	108.64	113.60
4	B	800	W64	N02-C02-N01	2.30	120.12	116.49
2	A	500	HEM	CMA-C3A-C4A	-2.26	124.98	128.46
4	B	800	W64	C05-C04-C03	2.25	120.77	118.09
2	B	500	HEM	CMA-C3A-C4A	-2.23	125.03	128.46
2	A	500	HEM	C1D-C2D-C3D	-2.18	104.66	106.96
4	B	800	W64	C16-N11-C12	2.15	120.42	117.48
2	A	500	HEM	CMD-C2D-C1D	2.15	128.31	125.04
2	B	500	HEM	C4A-C3A-C2A	2.12	108.47	107.00
2	B	500	HEM	O2A-CGA-CBA	2.10	120.79	114.03
3	A	600	H4B	N2-C2-N3	2.09	120.50	117.25

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	880	GOL	C1-C2-C3-O3
2	B	500	HEM	C2A-CAA-CBA-CGA
7	B	880	GOL	O2-C2-C3-O3
2	A	500	HEM	C3D-CAD-CBD-CGD
2	A	500	HEM	CAD-CBD-CGD-O2D
2	A	500	HEM	CAD-CBD-CGD-O1D
6	B	870	EDO	O1-C1-C2-O2

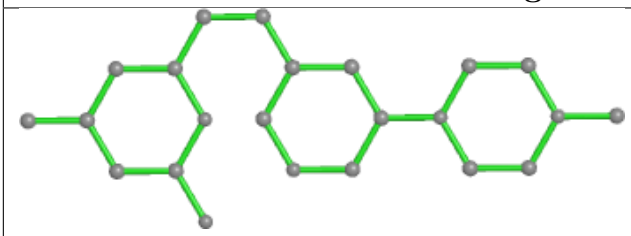
There are no ring outliers.

8 monomers are involved in 15 short contacts:

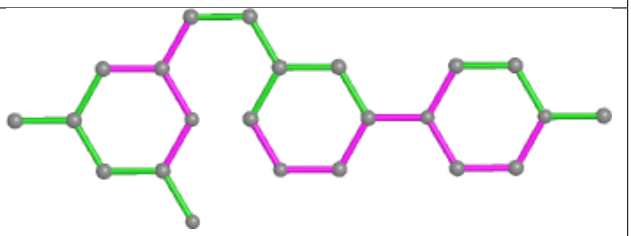
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	600	H4B	2	0
5	B	861	ACT	2	0
5	A	861	ACT	2	0
2	B	500	HEM	4	0
6	A	870	EDO	3	0
2	A	500	HEM	2	0
6	B	870	EDO	3	0
3	B	600	H4B	4	0

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

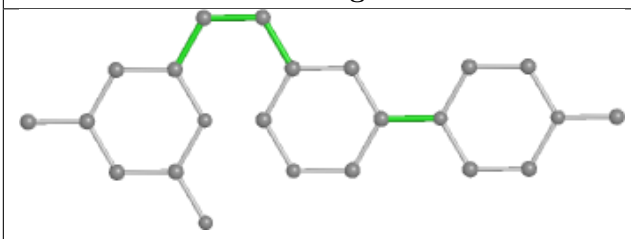
Ligand W64 A 800



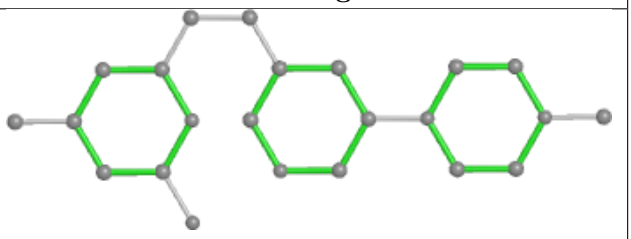
Bond lengths



Bond angles

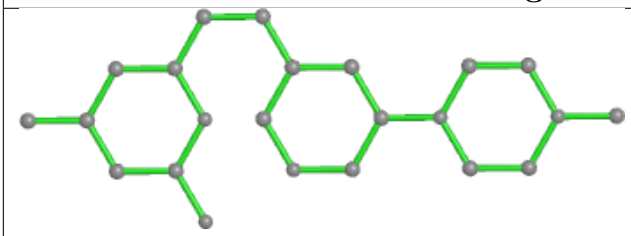


Torsions

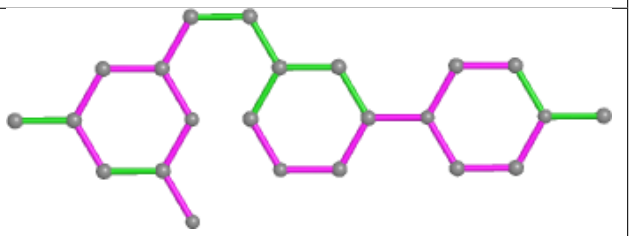


Rings

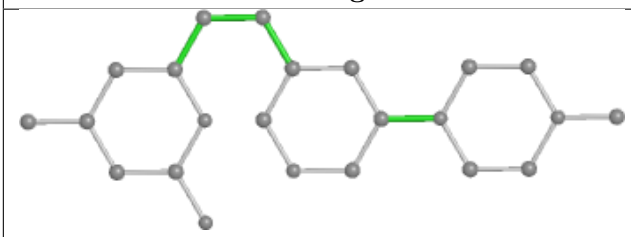
Ligand W64 B 800



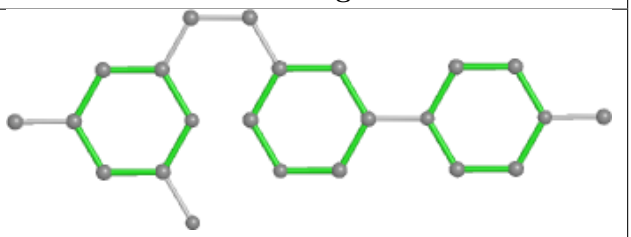
Bond lengths



Bond angles

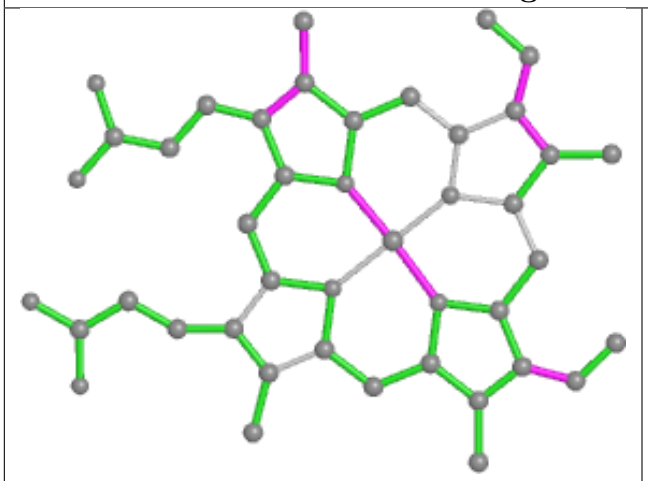


Torsions

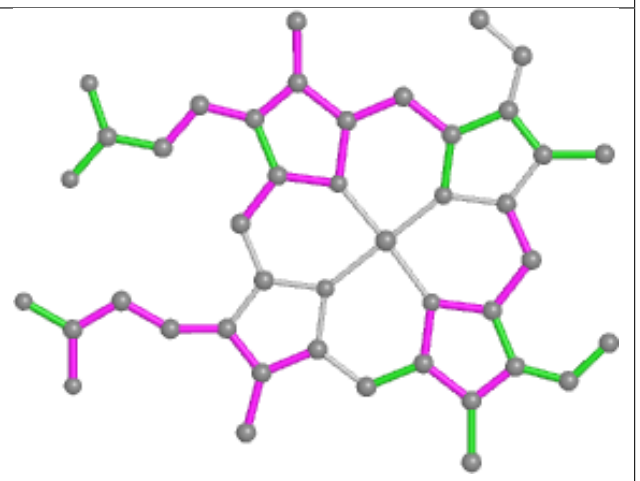


Rings

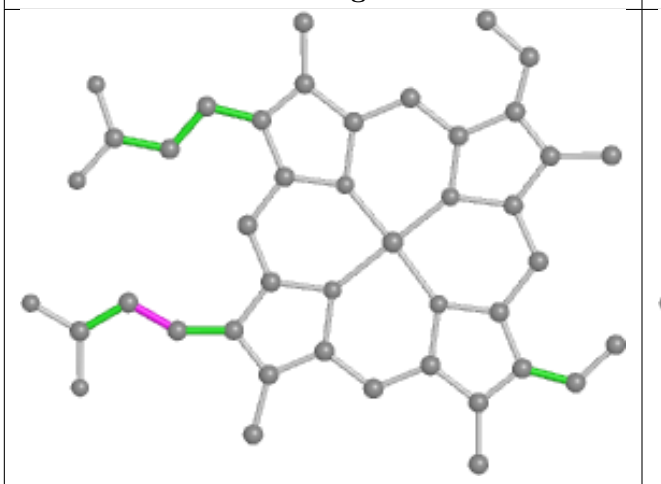
Ligand HEM B 500



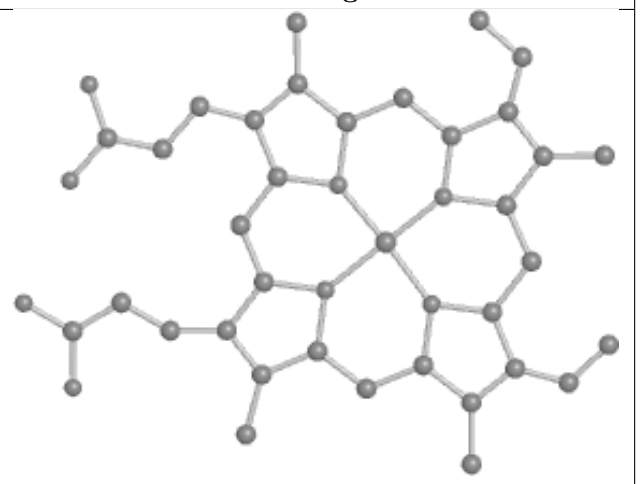
Bond lengths



Bond angles

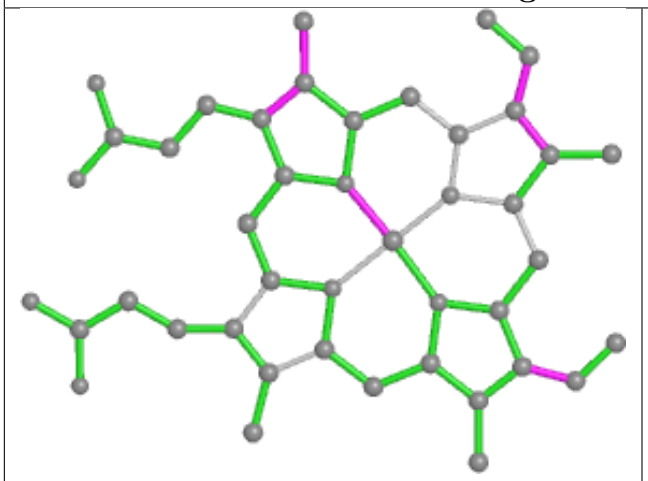


Torsions



Rings

Ligand HEM A 500



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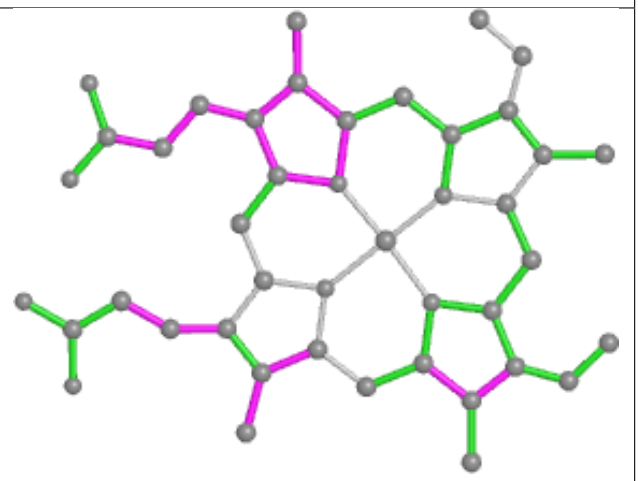
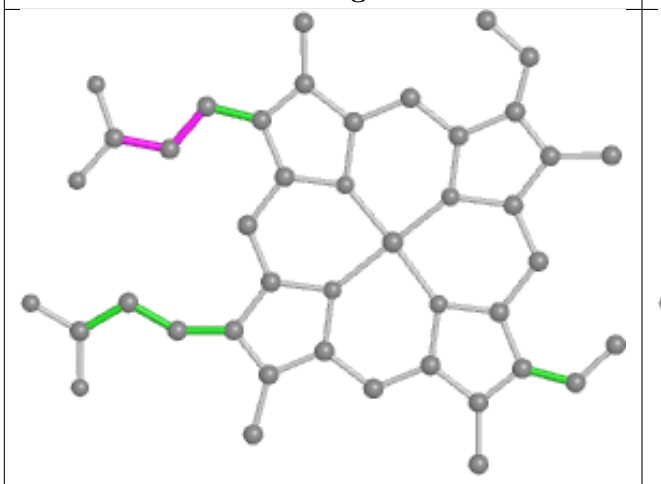
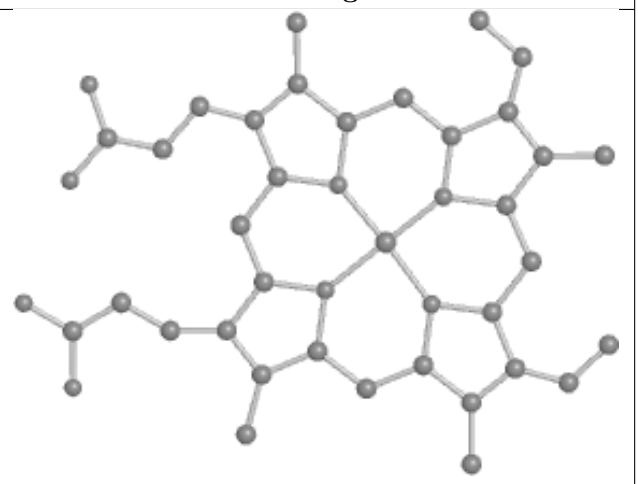


Bond angles



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	404/443 (91%)	0.18	10 (2%)	57	62	22, 36, 70, 100	0
1	B	403/443 (90%)	0.25	7 (1%)	70	74	23, 41, 71, 104	0
All	All	807/886 (91%)	0.22	17 (2%)	63	68	22, 38, 71, 104	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	110	LYS	4.6
1	A	107	LEU	4.1
1	A	67	GLY	3.6
1	A	121	PRO	2.9
1	B	146	GLN	2.7
1	A	69	LYS	2.7
1	A	120	PRO	2.6
1	B	121	PRO	2.5
1	B	259	GLN	2.4
1	A	390	ARG	2.4
1	A	239	GLY	2.3
1	A	99	ARG	2.2
1	A	156	GLU	2.2
1	B	270	VAL	2.1
1	B	261	GLY	2.1
1	B	378	LEU	2.1
1	A	311	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (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
1	CAS	A	384	9/10	0.92	0.14	34,40,82,98	0
1	CAS	B	384	9/10	0.93	0.12	53,55,104,143	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

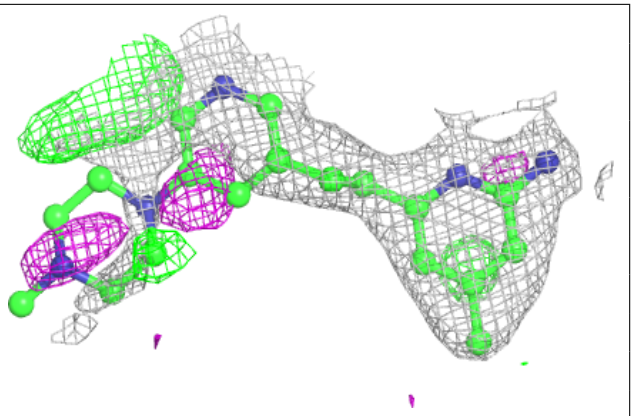
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

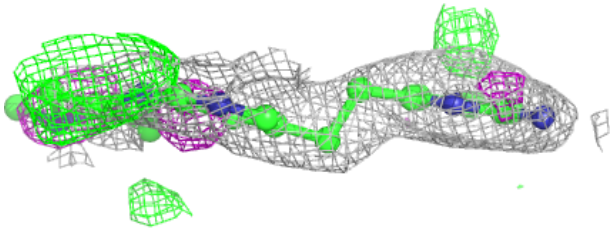
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	W64	B	800	23/23	0.83	0.36	31,71,97,101	0
7	GOL	A	880	6/6	0.84	0.31	75,79,83,87	0
5	ACT	B	861	4/4	0.85	0.45	41,50,51,51	0
7	GOL	B	880	6/6	0.86	0.27	59,62,65,70	0
5	ACT	A	861	4/4	0.87	0.25	42,44,47,48	0
4	W64	A	800	23/23	0.93	0.25	23,64,87,90	0
3	H4B	A	600	17/17	0.93	0.21	33,43,48,49	0
5	ACT	A	860	4/4	0.95	0.17	47,52,52,53	0
6	EDO	A	870	4/4	0.95	0.26	33,40,41,41	0
6	EDO	B	870	4/4	0.95	0.31	38,39,41,50	0
3	H4B	B	600	17/17	0.95	0.17	37,42,47,47	0
5	ACT	B	860	4/4	0.95	0.28	47,48,48,56	0
2	HEM	A	500	43/43	0.97	0.17	15,23,60,74	0
2	HEM	B	500	43/43	0.98	0.17	19,27,65,77	0
8	ZN	A	900	1/1	1.00	0.10	35,35,35,35	0

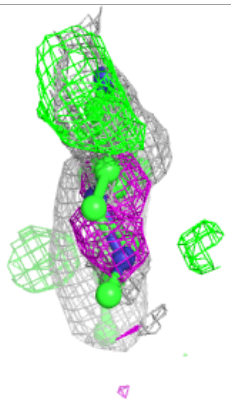
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around W64 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)

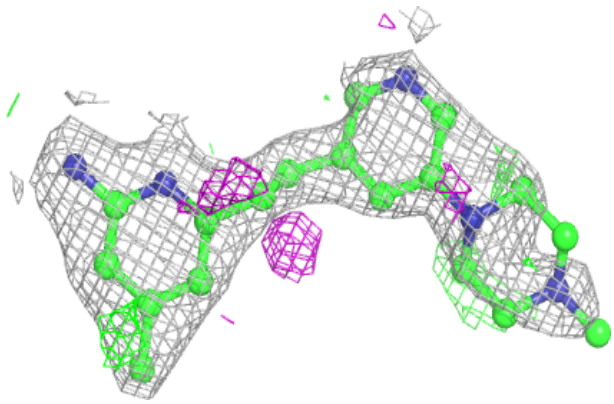


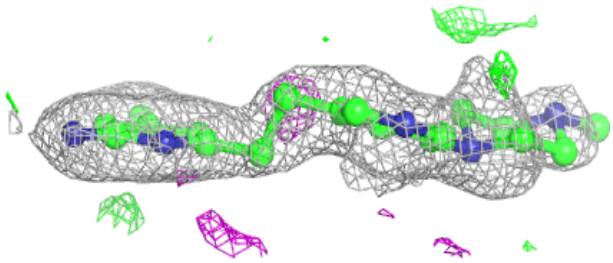


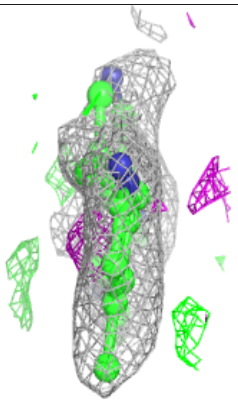


Electron density around W64 A 800:

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

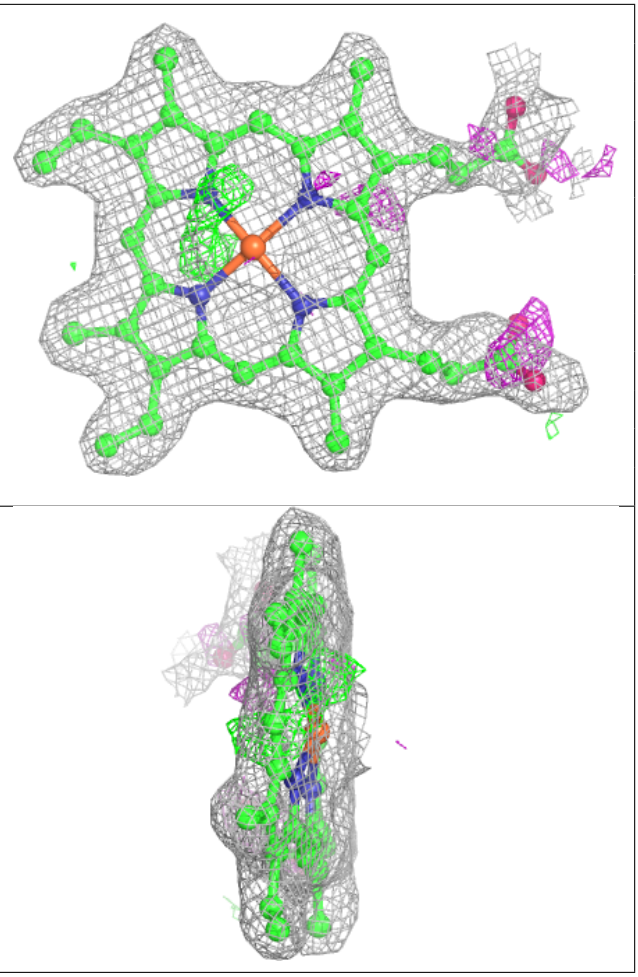






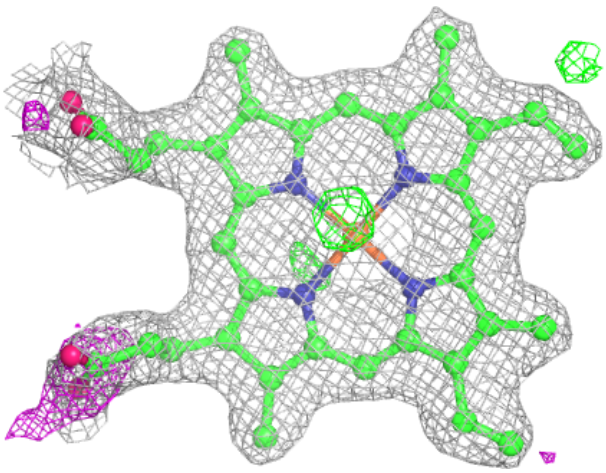
Electron density around HEM A 500:

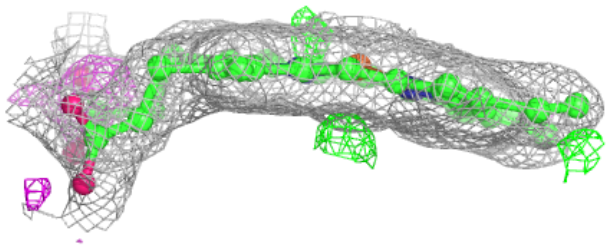
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

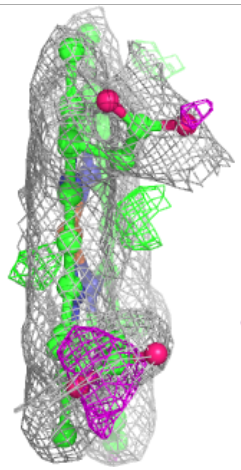


Electron density around HEM B 500:

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.