Full wwPDB X-ray Structure Validation Report ⓘ

Aug 28, 2023 – 06:57 AM EDT

PDB ID	:	3JX5
Title	:	Structure of rat neuronal nitric oxide synthase D597N/M336V mutant heme domain in complex with N1-{(3'S,4'R)-4'-[(6"-amino-4"-methylpyridin-2"-yl) methyl]pyrrolidin-3'-yl}-N2-(3'-fluorophenethyl)ethane-1,2-diamine
Authors	:	Delker, S.L.; Li, H.; Poulos, T.L.
Deposited on	:	2009-09-18
Resolution	:	2.15 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 ⓘ 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 ⓘ) were used in the production of this report:

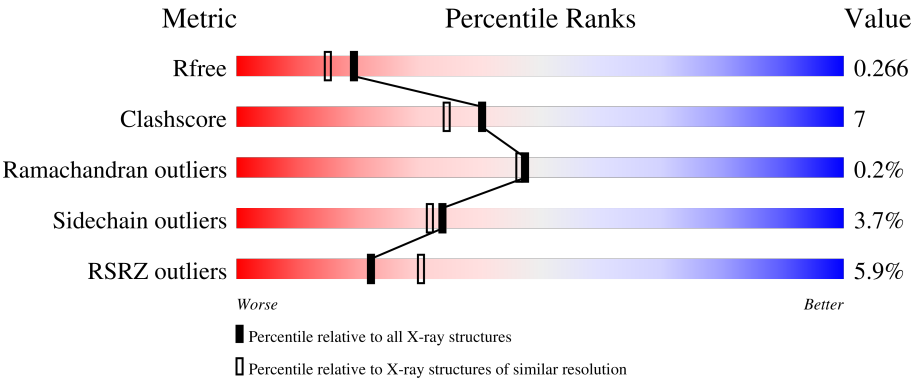
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.15 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	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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	422	8% 81% 14%
1	B	422	3% 80% 16%

2 Entry composition (i)

There are 7 unique types of molecules in this entry. The entry contains 7024 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.

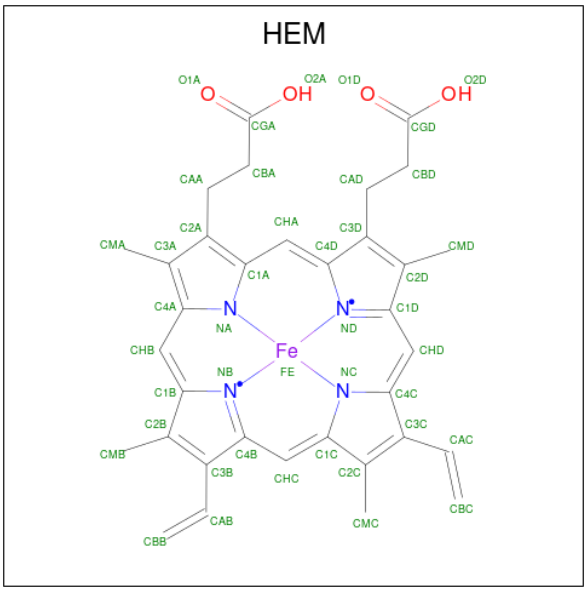
- Molecule 1 is a protein called Nitric oxide synthase, brain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	407	Total	C	N	O	S	0	0	0
			3312	2121	567	604	20			
1	B	411	Total	C	N	O	S	0	0	0
			3344	2140	575	609	20			

There are 4 discrepancies between the modelled and reference sequences:

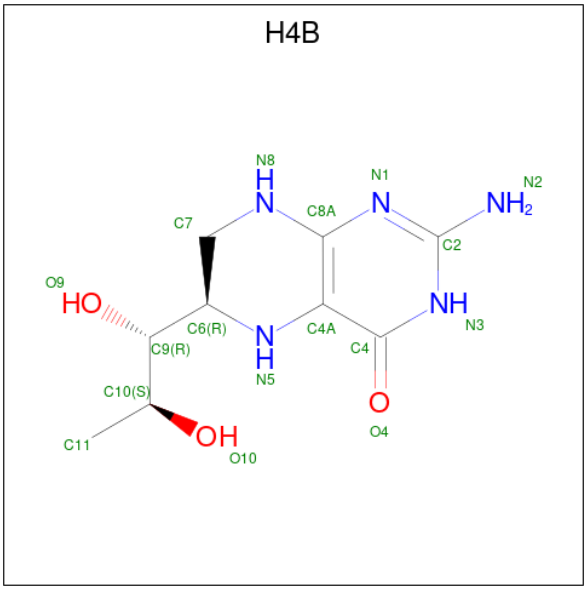
Chain	Residue	Modelled	Actual	Comment	Reference
A	336	VAL	MET	engineered mutation	UNP P29476
A	597	ASN	ASP	engineered mutation	UNP P29476
B	336	VAL	MET	engineered mutation	UNP P29476
B	597	ASN	ASP	engineered mutation	UNP P29476

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



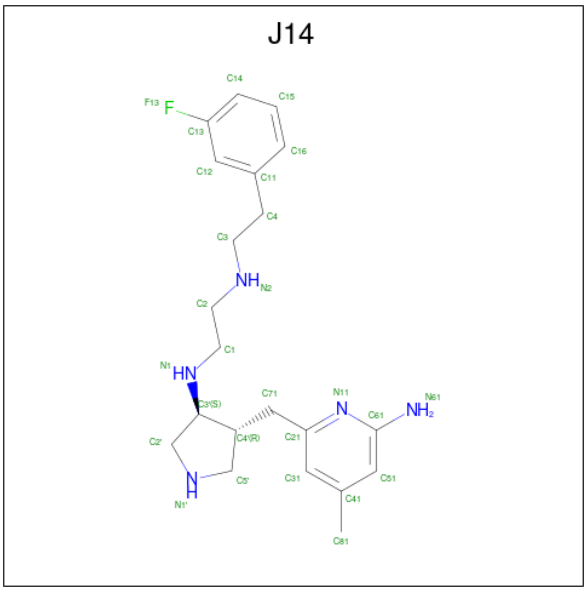
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

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



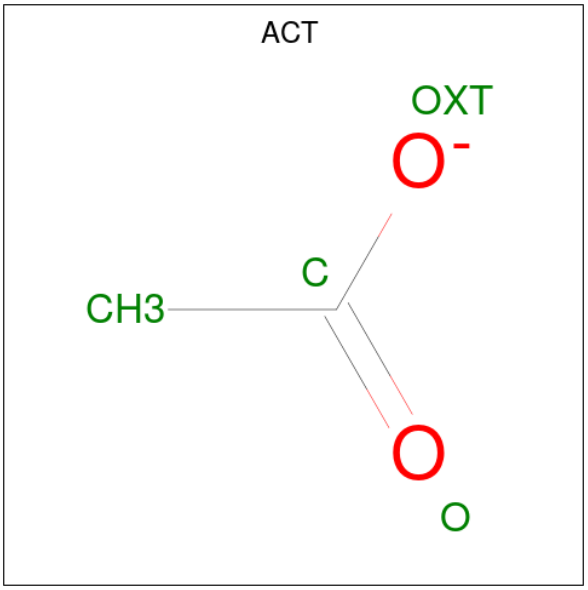
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			17	9	5	3		
3	B	1	Total	C	N	O	0	0
			17	9	5	3		

- Molecule 4 is N-{(3S,4R)-4-[(6-amino-4-methylpyridin-2-yl)methyl]pyrrolidin-3-yl}-N'-[2-(3-fluorophenyl)ethyl]ethane-1,2-diamine (three-letter code: J14) (formula: $C_{21}H_{30}FN_5$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C F N 27 21 1 5	0	0
4	B	1	Total C F N 27 21 1 5	0	0

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



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

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

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

- Molecule 7 is water.

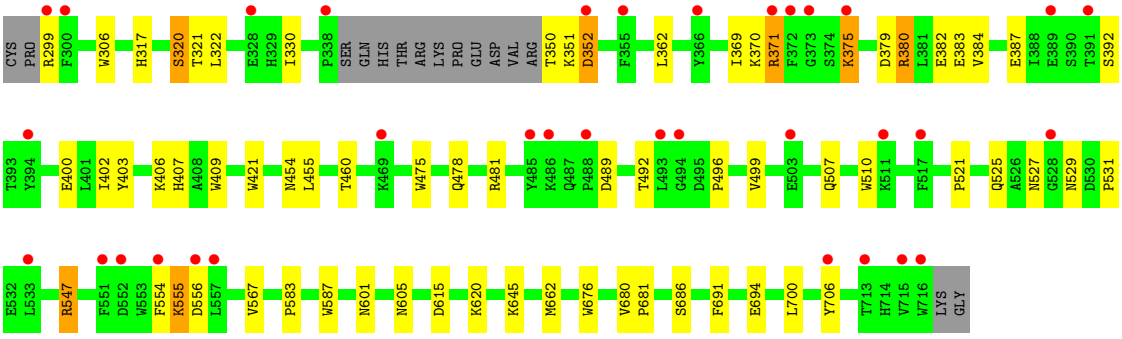
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	77	Total O 77 77	0	0
7	B	108	Total O 108 108	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

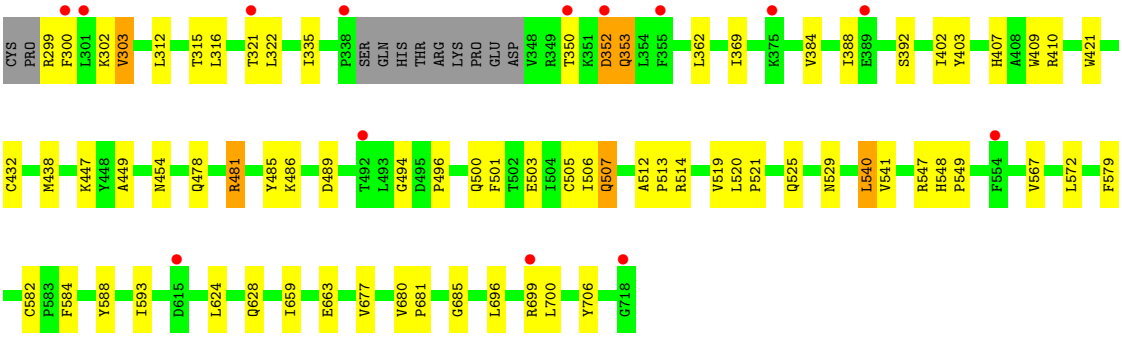
• Molecule 1: Nitric oxide synthase, brain

Chain A:



• Molecule 1: Nitric oxide synthase, brain

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	51.74Å 111.38Å 164.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.39 – 2.15 49.36 – 2.15	Depositor EDS
% Data completeness (in resolution range)	98.2 (49.39-2.15) 98.2 (49.36-2.15)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	0.08	Depositor
$< I/\sigma(I) >$ [1]	2.31 (at 2.16Å)	Xtriage
Refinement program	REFMAC 5.5.0089, CNS	Depositor
R, R_{free}	0.195 , 0.241 0.229 , 0.266	Depositor DCC
R_{free} test set	2556 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å^2)	43.1	Xtriage
Anisotropy	0.274	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 52.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7024	wwPDB-VP
Average B, all atoms (Å^2)	61.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.53% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: H4B, J14, ZN, ACT, 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	0.84	9/3405 (0.3%)	0.70	1/4621 (0.0%)
1	B	0.78	2/3437 (0.1%)	0.76	3/4661 (0.1%)
All	All	0.81	11/6842 (0.2%)	0.73	4/9282 (0.0%)

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	382	GLU	CG-CD	8.82	1.65	1.51
1	A	375	LYS	CE-NZ	7.88	1.68	1.49
1	B	582	CYS	CB-SG	7.64	1.95	1.82
1	A	382	GLU	CD-OE1	7.52	1.33	1.25
1	A	556	ASP	CG-OD2	6.58	1.40	1.25
1	A	556	ASP	CG-OD1	6.42	1.40	1.25
1	A	379	ASP	C-O	6.07	1.34	1.23
1	A	547	ARG	CZ-NH2	5.92	1.40	1.33
1	B	432	CYS	CB-SG	-5.83	1.72	1.81
1	A	383	GLU	CG-CD	5.19	1.59	1.51
1	A	387	GLU	CB-CG	5.08	1.61	1.52

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	547	ARG	NE-CZ-NH1	-7.13	116.73	120.30
1	B	410	ARG	NE-CZ-NH1	-6.43	117.08	120.30
1	B	438	MET	CG-SD-CE	5.80	109.48	100.20
1	B	489	ASP	CB-CG-OD2	5.47	123.22	118.30

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	3312	0	3223	41	0
1	B	3344	0	3261	47	0
2	A	43	0	30	6	0
2	B	43	0	30	9	0
3	A	17	0	15	0	0
3	B	17	0	15	1	0
4	A	27	0	30	6	0
4	B	27	0	30	5	0
5	A	4	0	3	0	0
5	B	4	0	3	0	0
6	A	1	0	0	0	0
7	A	77	0	0	2	0
7	B	108	0	0	1	0
All	All	7024	0	6640	97	0

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

All (97) 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:375:LYS:NZ	1:A:375:LYS:CE	1.68	1.53
1:B:567:VAL:HG21	4:B:800:J14:H5'A	1.46	0.97
1:B:706:TYR:OH	2:B:750:HEM:O1D	1.90	0.87
1:B:500:GLN:HA	1:B:503:GLU:OE2	1.74	0.86
1:B:300:PHE:HD2	1:B:315:THR:HG22	1.39	0.85
1:A:567:VAL:HG21	4:A:800:J14:H5'A	1.60	0.83
2:B:750:HEM:HHC	2:B:750:HEM:HBB2	1.64	0.80
1:A:317:HIS:O	1:A:320:SER:HB3	1.82	0.80
4:A:800:J14:H2'A	4:A:800:J14:H4	1.65	0.79
1:A:371:ARG:CG	1:A:371:ARG:HH21	1.99	0.76
1:B:659:ILE:O	1:B:663:GLU:HG3	1.90	0.71
1:B:501:PHE:CE2	1:B:505:CYS:SG	2.84	0.69
1:A:371:ARG:HH21	1:A:371:ARG:HG3	1.57	0.69
2:B:750:HEM:HBA2	2:B:750:HEM:CMA	2.21	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:478:GLN:HB2	1:B:481:ARG:HG3	1.76	0.67
1:B:299:ARG:HB3	1:B:299:ARG:CZ	2.25	0.67
1:A:567:VAL:CG2	4:A:800:J14:H5'A	2.25	0.66
1:A:706:TYR:OH	2:A:750:HEM:O1D	2.13	0.66
1:B:485:TYR:CE1	1:B:514:ARG:HA	2.30	0.65
2:B:750:HEM:HBA1	3:B:760:H4B:HN22	1.64	0.63
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.81	0.61
1:A:371:ARG:CG	1:A:371:ARG:NH2	2.63	0.59
1:B:350:THR:HG22	1:B:352:ASP:H	1.67	0.59
1:B:567:VAL:HG21	4:B:800:J14:C5'	2.28	0.59
1:B:706:TYR:OH	2:B:750:HEM:CGD	2.51	0.58
1:B:300:PHE:CD2	1:B:315:THR:HG22	2.29	0.58
2:A:750:HEM:HBC2	2:A:750:HEM:CMC	2.35	0.56
1:B:584:PHE:CD1	2:B:750:HEM:CAC	2.89	0.56
1:A:351:LYS:HE2	1:A:392:SER:HB3	1.88	0.54
1:A:525:GLN:HG3	1:A:529:ASN:O	2.07	0.54
1:A:555:LYS:NZ	1:A:555:LYS:HB3	2.22	0.54
1:A:455:LEU:HD12	1:A:587:TRP:HB3	1.90	0.53
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.43	0.53
4:A:800:J14:H4	4:A:800:J14:C2'	2.38	0.52
1:A:306:TRP:CZ3	4:B:800:J14:H15	2.45	0.52
1:A:299:ARG:O	1:A:317:HIS:CE1	2.64	0.50
1:A:352:ASP:OD2	1:A:352:ASP:N	2.44	0.50
1:A:299:ARG:O	1:A:317:HIS:NE2	2.45	0.50
1:A:554:PHE:HB3	7:A:1009:HOH:O	2.12	0.49
1:A:330:ILE:HD11	1:B:696:LEU:HB3	1.95	0.49
1:B:494:GLY:O	1:B:496:PRO:HD3	2.12	0.49
2:B:750:HEM:O2A	4:B:800:J14:H3'	2.13	0.49
1:B:584:PHE:CD1	2:B:750:HEM:HAC	2.48	0.48
1:B:501:PHE:CZ	1:B:505:CYS:SG	3.07	0.48
1:B:362:LEU:HD11	1:B:384:VAL:HG21	1.95	0.48
1:A:475:TRP:CZ2	1:A:531:PRO:HG3	2.48	0.48
2:A:750:HEM:HBB2	2:A:750:HEM:HHC	1.96	0.48
1:B:520:LEU:HB3	1:B:521:PRO:HD2	1.95	0.48
2:A:750:HEM:HBC2	2:A:750:HEM:HMC1	1.96	0.47
1:A:510:TRP:CE2	1:A:521:PRO:HD3	2.50	0.47
1:B:624:LEU:O	1:B:628:GLN:HG3	2.15	0.47
1:A:460:THR:O	1:A:583:PRO:HD2	2.15	0.47
1:A:403:TYR:CE1	1:A:407:HIS:CE1	3.03	0.47
1:A:680:VAL:HA	1:A:681:PRO:HD3	1.78	0.47
1:B:505:CYS:O	1:B:506:ILE:C	2.53	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:320:SER:HA	1:A:700:LEU:HD23	1.98	0.46
2:A:750:HEM:HBA2	4:A:800:J14:H71	1.98	0.46
1:A:409:TRP:CE3	1:A:421:TRP:HA	2.51	0.45
1:B:322:LEU:HD13	1:B:699:ARG:NH2	2.32	0.45
1:A:380:ARG:HD3	1:A:400:GLU:OE1	2.16	0.45
1:A:455:LEU:HD12	1:A:587:TRP:CB	2.46	0.45
1:A:375:LYS:NZ	1:A:375:LYS:CD	2.72	0.45
2:B:750:HEM:CMA	2:B:750:HEM:CBA	2.94	0.45
1:B:322:LEU:HD13	1:B:699:ARG:HH21	1.82	0.45
1:B:567:VAL:CG2	4:B:800:J14:H5'A	2.32	0.44
1:B:303:VAL:HG23	1:B:312:LEU:HB2	2.00	0.44
1:B:485:TYR:CZ	1:B:514:ARG:HA	2.53	0.44
1:B:525:GLN:HG3	1:B:529:ASN:O	2.18	0.44
1:A:686:SER:HA	1:A:691:PHE:CG	2.54	0.43
1:B:388:ILE:O	1:B:392:SER:N	2.46	0.43
1:A:321:THR:HG23	1:A:322:LEU:HG	2.00	0.43
1:B:548:HIS:CG	1:B:549:PRO:HD2	2.54	0.43
1:A:492:THR:HG21	1:A:496:PRO:HG3	2.01	0.42
1:B:519:VAL:HG21	1:B:541:VAL:HG11	2.01	0.42
1:B:588:TYR:CD1	1:B:593:ILE:HD11	2.53	0.42
1:A:496:PRO:HA	1:A:499:VAL:HG23	2.02	0.42
1:B:447:LYS:HD2	1:B:540:LEU:HD11	2.00	0.42
1:A:676:TRP:CE3	1:B:677:VAL:HG22	2.54	0.42
2:A:750:HEM:O2A	4:A:800:J14:H3'	2.19	0.42
1:B:512:ALA:HA	1:B:513:PRO:HD3	1.89	0.42
1:A:362:LEU:HD11	1:A:384:VAL:HG21	2.01	0.42
1:B:659:ILE:HD13	1:B:659:ILE:HA	1.91	0.42
1:A:605:ASN:ND2	7:A:1032:HOH:O	2.45	0.42
1:B:353:GLN:HE21	1:B:353:GLN:HB3	1.69	0.41
1:A:402:ILE:CG2	1:A:406:LYS:HE3	2.50	0.41
1:B:316:LEU:HD21	1:B:700:LEU:HD11	2.02	0.41
1:B:302:LYS:HB2	1:B:302:LYS:HE3	1.79	0.41
1:A:676:TRP:CE2	1:A:680:VAL:HG21	2.56	0.41
1:B:300:PHE:HD2	1:B:315:THR:CG2	2.21	0.41
1:B:680:VAL:HA	1:B:681:PRO:HD3	1.89	0.41
1:A:694:GLU:HB3	1:B:335:ILE:HD13	2.04	0.40
1:B:507:GLN:O	1:B:507:GLN:HG2	2.19	0.40
1:B:572:LEU:HB3	1:B:579:PHE:HB2	2.02	0.40
1:A:369:ILE:HG13	1:A:371:ARG:HB2	2.03	0.40
1:B:403:TYR:CE1	1:B:407:HIS:CE1	3.10	0.40
1:A:370:LYS:HB2	1:A:370:LYS:HE3	1.96	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:449:ALA:HB1	7:B:1026:HOH:O	2.21	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	403/422 (96%)	388 (96%)	15 (4%)	0	100	100
1	B	407/422 (96%)	396 (97%)	9 (2%)	2 (0%)	29	22
All	All	810/844 (96%)	784 (97%)	24 (3%)	2 (0%)	47	46

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	402	ILE
1	B	685	GLY

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	363/377 (96%)	347 (96%)	16 (4%)	28	25
1	B	366/377 (97%)	355 (97%)	11 (3%)	41	40
All	All	729/754 (97%)	702 (96%)	27 (4%)	34	32

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	320	SER
1	A	350	THR
1	A	352	ASP
1	A	371	ARG
1	A	380	ARG
1	A	454	ASN
1	A	489	ASP
1	A	507	GLN
1	A	527	ASN
1	A	547	ARG
1	A	555	LYS
1	A	601	ASN
1	A	615	ASP
1	A	620	LYS
1	A	645	LYS
1	A	662	MET
1	B	303	VAL
1	B	321	THR
1	B	352	ASP
1	B	353	GLN
1	B	369	ILE
1	B	454	ASN
1	B	481	ARG
1	B	486	LYS
1	B	507	GLN
1	B	540	LEU
1	B	547	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	353	GLN
1	A	364	GLN
1	A	454	ASN
1	A	507	GLN
1	A	601	ASN
1	A	605	ASN
1	A	642	GLN
1	A	697	ASN
1	A	712	ASN
1	B	364	GLN

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Mol	Chain	Res	Type
1	B	454	ASN
1	B	508	GLN
1	B	535	GLN
1	B	605	ASN
1	B	642	GLN
1	B	697	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 9 ligands modelled in this entry, 1 is monoatomic - leaving 8 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	$\#\|Z\| > 2$
2	HEM	A	750	1	41,50,50	1.87	8 (19%)	45,82,82	2.34	10 (22%)
5	ACT	B	860	-	3,3,3	0.72	0	3,3,3	0.86	0
3	H4B	B	760	-	16,18,18	1.10	2 (12%)	11,26,26	2.93	8 (72%)
4	J14	B	800	-	27,29,29	0.73	0	30,38,38	2.21	7 (23%)
4	J14	A	800	-	27,29,29	0.78	0	30,38,38	2.31	9 (30%)
2	HEM	B	750	1	41,50,50	1.93	9 (21%)	45,82,82	1.80	12 (26%)
5	ACT	A	860	-	3,3,3	0.77	0	3,3,3	0.76	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	H4B	A	760	-	16,18,18	0.86	0	11,26,26	3.19	6 (54%)

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
2	HEM	A	750	1	-	2/12/54/54	-
3	H4B	B	760	-	-	1/8/17/17	0/2/2/2
4	J14	B	800	-	-	8/13/23/23	0/3/3/3
4	J14	A	800	-	-	8/13/23/23	0/3/3/3
2	HEM	B	750	1	-	6/12/54/54	-
3	H4B	A	760	-	-	0/8/17/17	0/2/2/2

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	750	HEM	C3D-C2D	7.48	1.52	1.36
2	B	750	HEM	C3D-C2D	7.15	1.51	1.36
2	B	750	HEM	C3C-C2C	-5.28	1.33	1.40
2	A	750	HEM	C3C-C2C	-3.87	1.35	1.40
2	B	750	HEM	C3C-CAC	3.38	1.54	1.47
2	A	750	HEM	CAB-C3B	2.82	1.55	1.47
2	A	750	HEM	CAA-C2A	2.76	1.56	1.52
2	A	750	HEM	CMC-C2C	2.72	1.58	1.51
2	B	750	HEM	CMB-C2B	2.65	1.56	1.50
3	B	760	H4B	C7-C6	2.57	1.54	1.52
2	B	750	HEM	CAB-C3B	2.51	1.54	1.47
2	A	750	HEM	CMB-C2B	2.49	1.56	1.50
2	B	750	HEM	CMD-C2D	2.44	1.56	1.50
2	A	750	HEM	C3C-CAC	2.35	1.52	1.47
2	B	750	HEM	C3B-C2B	-2.25	1.32	1.37
3	B	760	H4B	C7-N8	2.21	1.48	1.44
2	B	750	HEM	CMC-C2C	2.12	1.56	1.51
2	A	750	HEM	CMD-C2D	2.10	1.55	1.50
2	B	750	HEM	CMA-C3A	2.04	1.55	1.51

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	750	HEM	CBA-CAA-C2A	-9.28	96.78	112.62
4	A	800	J14	C61-N11-C21	7.25	123.60	118.10
3	A	760	H4B	C4-C4A-N5	6.71	124.75	119.12
4	B	800	J14	C61-N11-C21	6.49	123.02	118.10
3	B	760	H4B	C8A-C4A-C4	6.29	120.16	114.57
2	A	750	HEM	C4D-ND-C1D	5.54	110.79	105.07
4	A	800	J14	C31-C21-N11	-5.21	117.38	122.90
4	B	800	J14	C31-C21-N11	-4.92	117.68	122.90
2	A	750	HEM	C2C-C3C-C4C	4.83	110.27	106.90
4	A	800	J14	C1-N1-C3'	4.41	120.44	114.20
4	B	800	J14	C2'-C3'-N1	-4.36	105.97	113.73
2	B	750	HEM	C4D-ND-C1D	4.02	109.23	105.07
3	A	760	H4B	C8A-C4A-C4	4.01	118.13	114.57
3	B	760	H4B	C2-N3-C4	3.83	122.02	115.93
2	B	750	HEM	CBA-CAA-C2A	-3.75	106.22	112.62
3	A	760	H4B	C2-N3-C4	3.70	121.80	115.93
3	A	760	H4B	N1-C2-N3	-3.64	119.71	125.42
2	B	750	HEM	CMA-C3A-C4A	-3.53	123.05	128.46
4	B	800	J14	C5'-N1'-C2'	3.51	113.72	105.42
2	A	750	HEM	CHA-C4D-ND	3.47	128.67	124.38
4	B	800	J14	C1-N1-C3'	3.46	119.09	114.20
3	A	760	H4B	C2-N1-C8A	3.40	122.16	114.54
2	A	750	HEM	CMC-C2C-C3C	3.28	130.82	124.68
4	A	800	J14	C5'-N1'-C2'	3.24	113.08	105.42
3	B	760	H4B	N1-C2-N3	-3.07	120.60	125.42
2	B	750	HEM	C2C-C3C-C4C	2.95	108.96	106.90
2	A	750	HEM	CMD-C2D-C1D	2.91	129.47	125.04
2	A	750	HEM	C4C-CHD-C1D	2.81	126.26	122.56
2	A	750	HEM	CAD-CBD-CGD	-2.76	107.66	113.60
3	B	760	H4B	C4-C4A-N5	2.75	121.43	119.12
2	B	750	HEM	CAA-CBA-CGA	-2.75	106.06	113.76
2	B	750	HEM	CMA-C3A-C2A	2.74	130.10	124.94
3	B	760	H4B	N2-C2-N3	2.71	121.47	117.25
2	B	750	HEM	C1D-C2D-C3D	-2.63	104.19	106.96
3	A	760	H4B	N2-C2-N3	2.62	121.32	117.25
4	A	800	J14	C14-C13-C12	-2.57	119.95	123.29
3	B	760	H4B	C2-N1-C8A	2.54	120.23	114.54
2	B	750	HEM	C4B-CHC-C1C	2.49	125.85	122.56
2	B	750	HEM	CHB-C1B-NB	2.45	127.41	124.38
4	A	800	J14	C71-C21-C31	2.42	126.19	121.04
2	A	750	HEM	CHB-C1B-NB	2.37	127.31	124.38
4	B	800	J14	C14-C13-C12	-2.34	120.25	123.29
2	A	750	HEM	C3C-C4C-NC	-2.28	106.64	110.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	750	HEM	CHD-C1D-ND	2.26	126.88	124.43
3	B	760	H4B	C4A-C4-N3	-2.24	117.64	124.01
4	A	800	J14	C2-C1-N1	2.24	114.70	111.06
2	B	750	HEM	CMD-C2D-C1D	2.14	128.30	125.04
2	B	750	HEM	C4C-CHD-C1D	2.14	125.38	122.56
4	A	800	J14	C2'-C3'-N1	-2.12	109.96	113.73
4	B	800	J14	C71-C21-C31	2.11	125.53	121.04
3	B	760	H4B	C4A-N5-C6	-2.09	115.46	121.16
4	A	800	J14	C21-C71-C4'	2.07	122.36	115.55

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	750	HEM	C1A-C2A-CAA-CBA
2	B	750	HEM	C3A-C2A-CAA-CBA
2	B	750	HEM	C2A-CAA-CBA-CGA
4	A	800	J14	N11-C21-C71-C4'
4	A	800	J14	C31-C21-C71-C4'
4	A	800	J14	C3'-C4'-C71-C21
4	A	800	J14	C5'-C4'-C71-C21
4	B	800	J14	N11-C21-C71-C4'
4	B	800	J14	C31-C21-C71-C4'
4	B	800	J14	C3'-C4'-C71-C21
4	B	800	J14	C5'-C4'-C71-C21
4	A	800	J14	N2-C3-C4-C11
4	B	800	J14	N2-C3-C4-C11
4	A	800	J14	N1-C1-C2-N2
4	B	800	J14	N1-C1-C2-N2
4	A	800	J14	C2-C1-N1-C3'
4	B	800	J14	C2-C1-N1-C3'
4	B	800	J14	C1-C2-N2-C3
2	B	750	HEM	C4B-C3B-CAB-CBB
2	A	750	HEM	CAA-CBA-CGA-O2A
2	B	750	HEM	CAA-CBA-CGA-O2A
2	B	750	HEM	CAA-CBA-CGA-O1A
2	A	750	HEM	CAA-CBA-CGA-O1A
4	A	800	J14	C4-C3-N2-C2
3	B	760	H4B	N5-C6-C9-O9

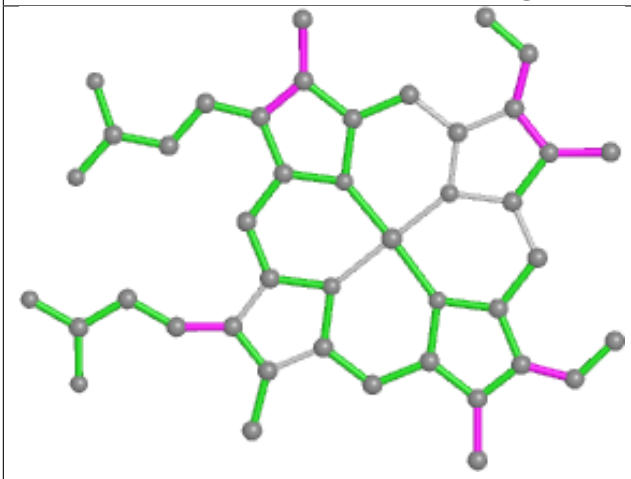
There are no ring outliers.

5 monomers are involved in 23 short contacts:

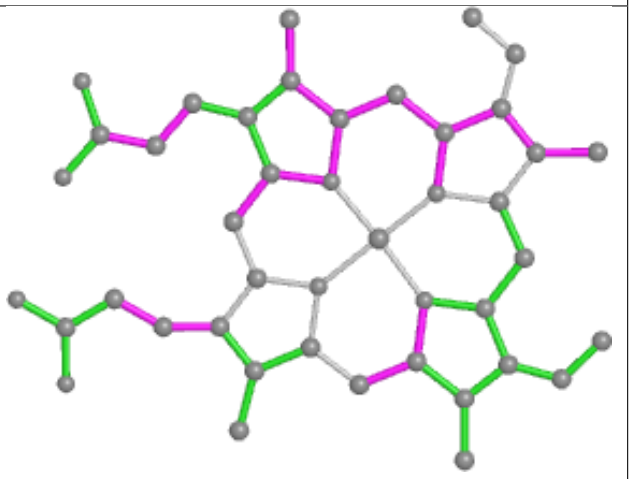
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	750	HEM	6	0
3	B	760	H4B	1	0
4	B	800	J14	5	0
4	A	800	J14	6	0
2	B	750	HEM	9	0

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.

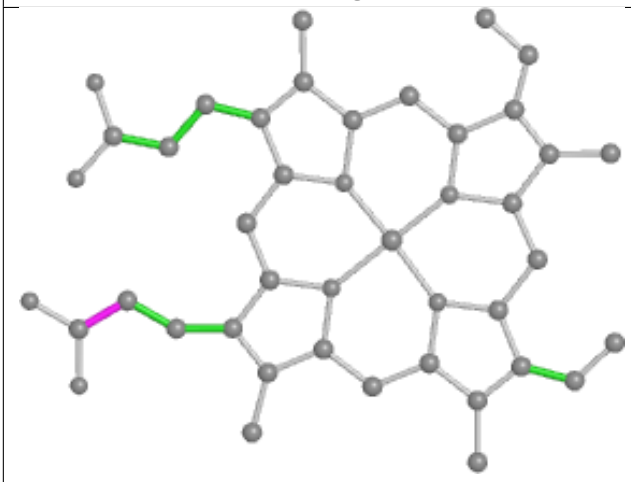
Ligand HEM A 750



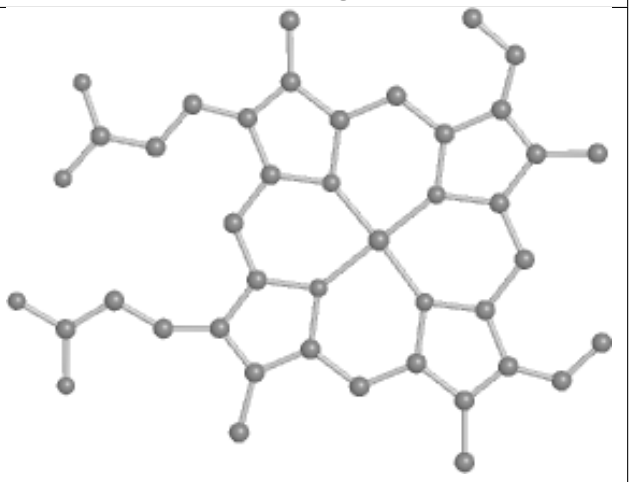
Bond lengths



Bond angles

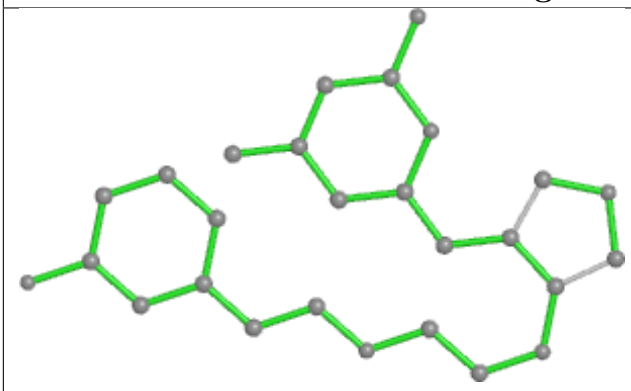


Torsions

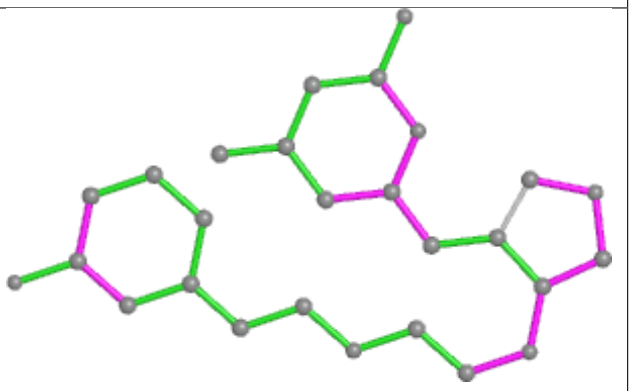


Rings

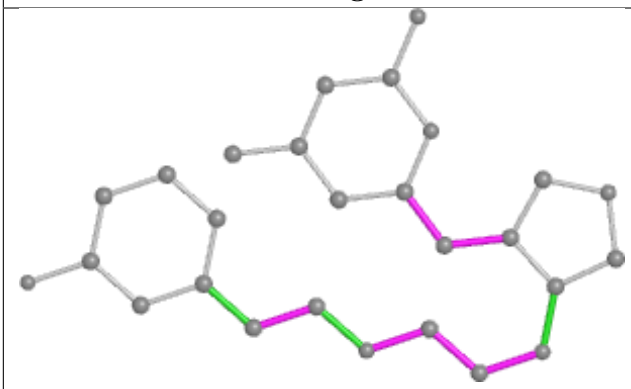
Ligand J14 B 800



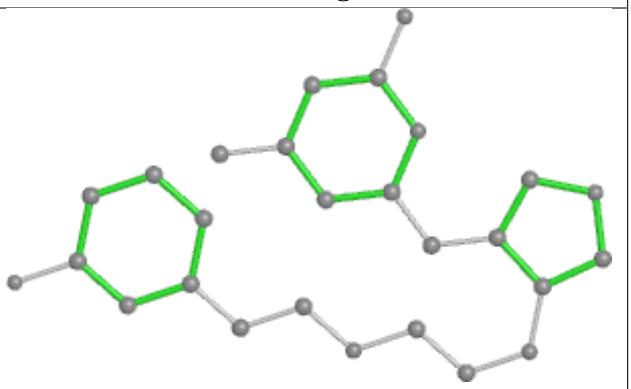
Bond lengths



Bond angles

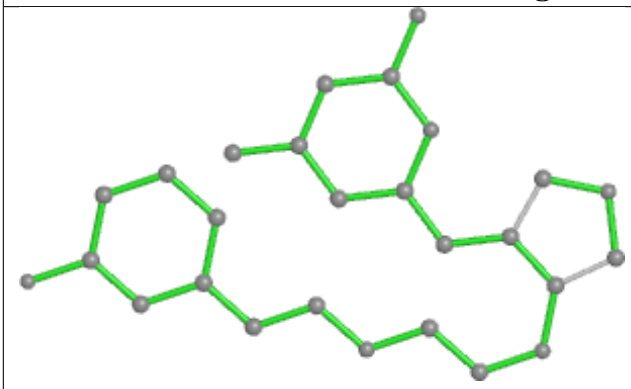


Torsions

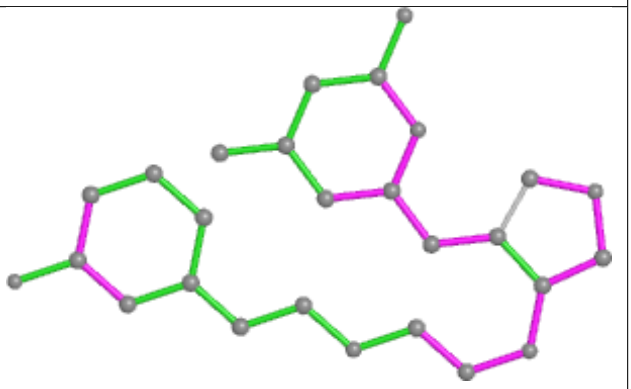


Rings

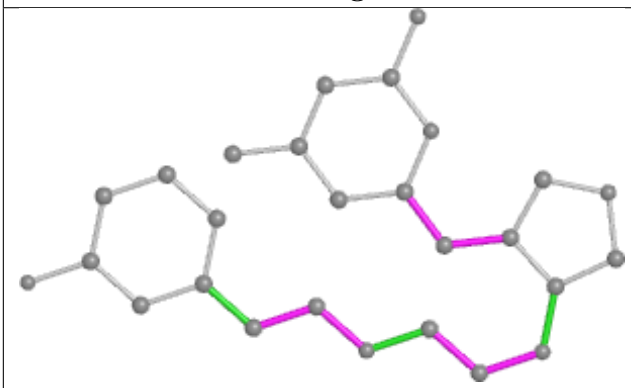
Ligand J14 A 800



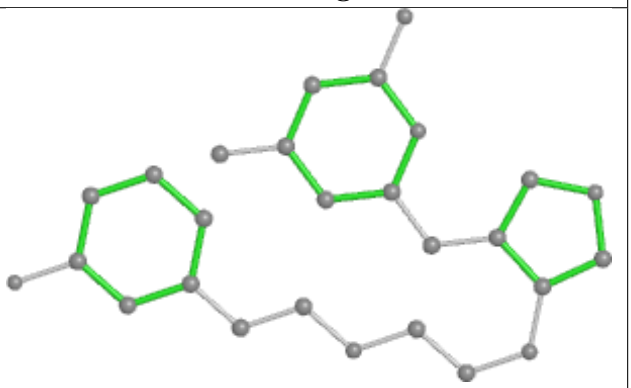
Bond lengths



Bond angles

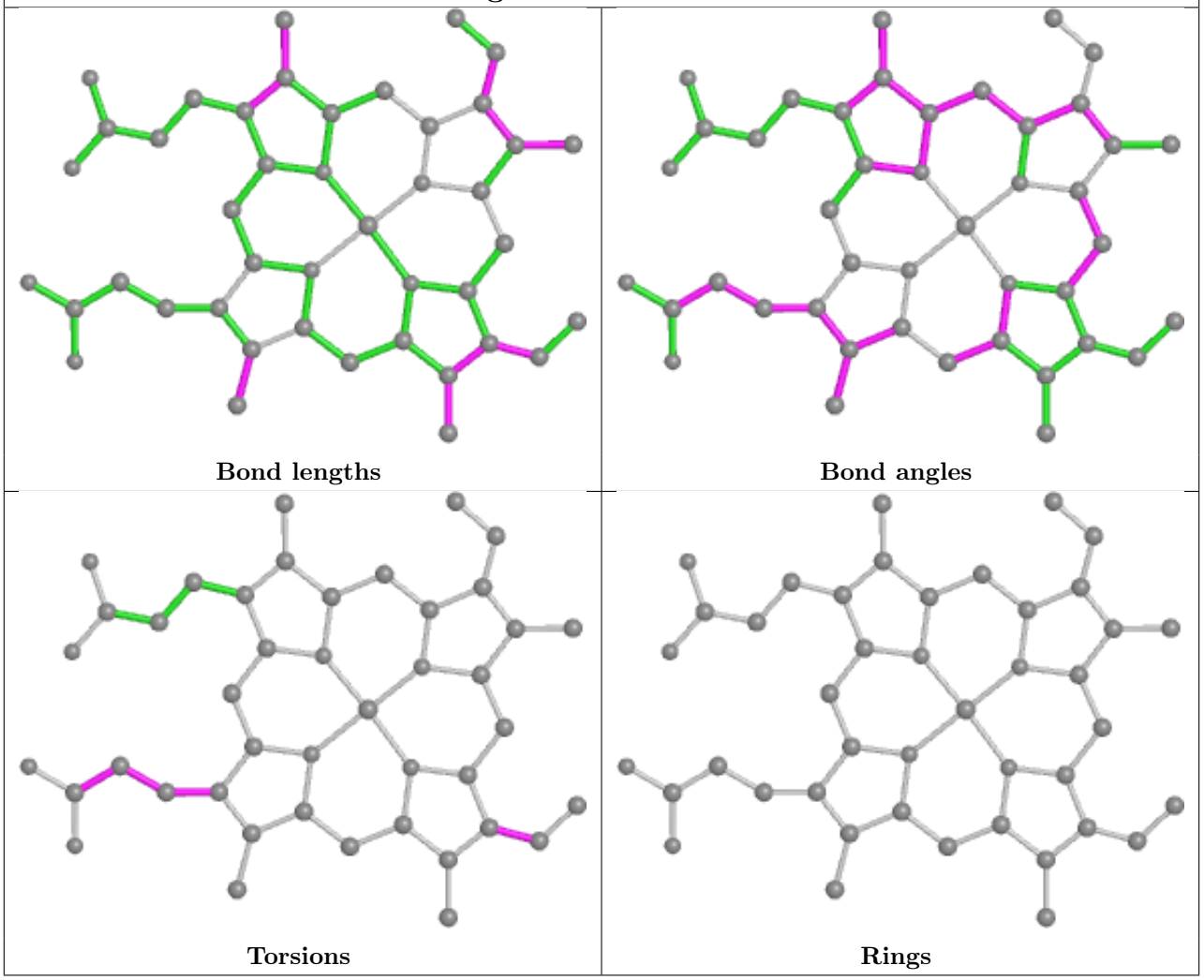


Torsions



Rings

Ligand HEM B 750



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	407/422 (96%)	0.61	34 (8%)	11	15	32, 64, 119, 150	0
1	B	411/422 (97%)	0.37	14 (3%)	45	53	31, 51, 84, 105	0
All	All	818/844 (96%)	0.49	48 (5%)	22	30	31, 57, 108, 150	0

All (48) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	352	ASP	5.9
1	B	300	PHE	5.1
1	B	352	ASP	4.1
1	B	338	PRO	4.0
1	A	551	PHE	4.0
1	A	355	PHE	3.9
1	A	488	PRO	3.9
1	B	321	THR	3.9
1	A	366	TYR	3.8
1	A	493	LEU	3.6
1	A	299	ARG	3.5
1	A	375	LYS	3.5
1	A	716	TRP	3.4
1	A	556	ASP	3.3
1	B	389	GLU	3.1
1	A	557	LEU	3.1
1	A	511	LYS	3.0
1	A	373	GLY	3.0
1	A	706	TYR	2.9
1	B	554	PHE	2.8
1	A	371	ARG	2.8
1	B	301	LEU	2.7
1	A	715	VAL	2.6
1	B	615	ASP	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	350	THR	2.6
1	A	494	GLY	2.6
1	A	517	PHE	2.5
1	A	389	GLU	2.5
1	A	503	GLU	2.5
1	A	372	PHE	2.5
1	A	469	LYS	2.5
1	B	375	LYS	2.5
1	A	300	PHE	2.4
1	A	533	LEU	2.3
1	A	528	GLY	2.3
1	B	492	THR	2.3
1	A	486	LYS	2.3
1	A	328	GLU	2.2
1	A	554	PHE	2.2
1	B	355	PHE	2.2
1	A	394	TYR	2.1
1	A	391	THR	2.1
1	B	718	GLY	2.1
1	A	485	TYR	2.1
1	A	713	THR	2.1
1	A	552	ASP	2.1
1	B	699	ARG	2.0
1	A	338	PRO	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)

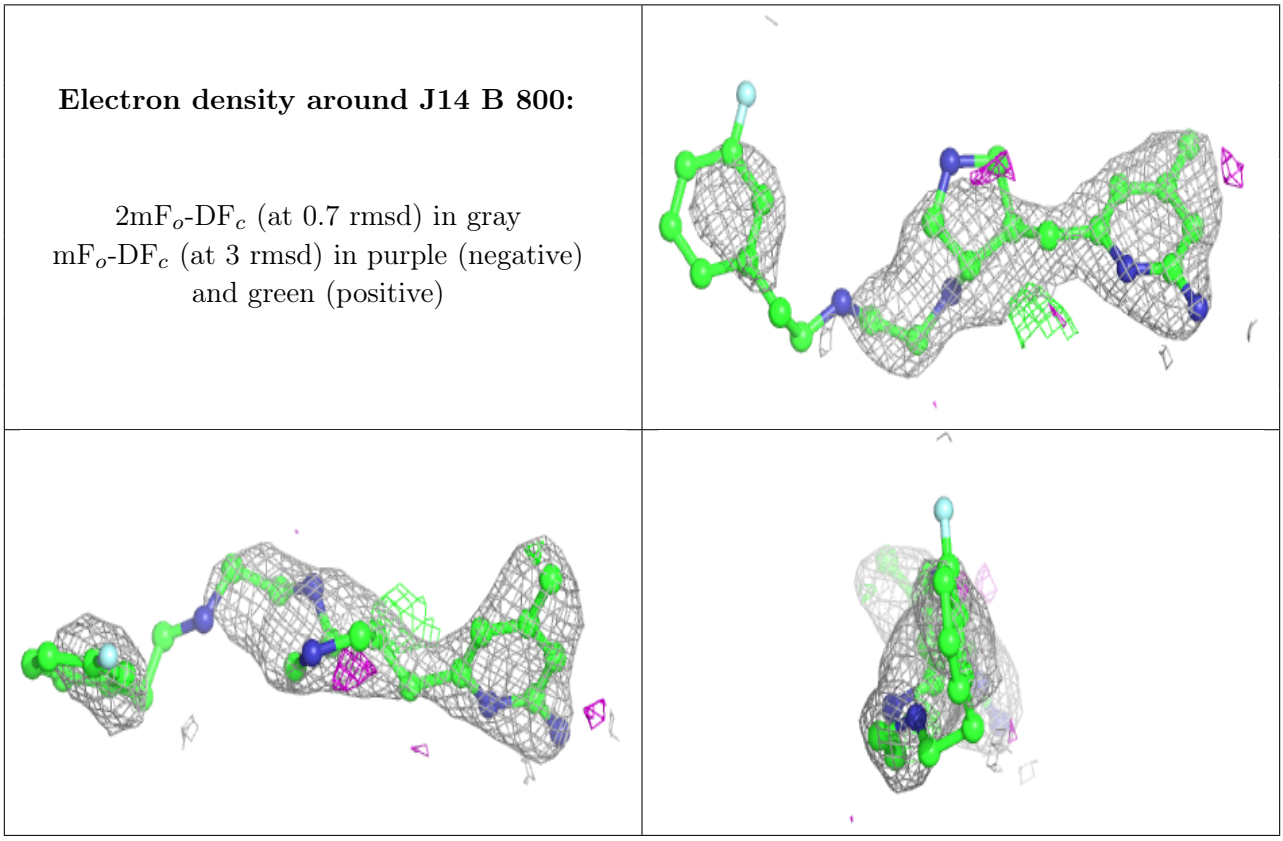
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	J14	B	800	27/27	0.81	0.31	68,87,111,112	0
4	J14	A	800	27/27	0.85	0.28	68,89,125,126	0
5	ACT	A	860	4/4	0.91	0.32	84,87,87,88	0
3	H4B	B	760	17/17	0.93	0.12	33,40,48,48	0
5	ACT	B	860	4/4	0.94	0.24	90,91,91,92	0
3	H4B	A	760	17/17	0.95	0.12	38,43,49,49	0
2	HEM	A	750	43/43	0.97	0.14	35,39,60,61	0
2	HEM	B	750	43/43	0.97	0.17	34,40,58,63	0
6	ZN	A	900	1/1	0.97	0.13	48,48,48,48	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.

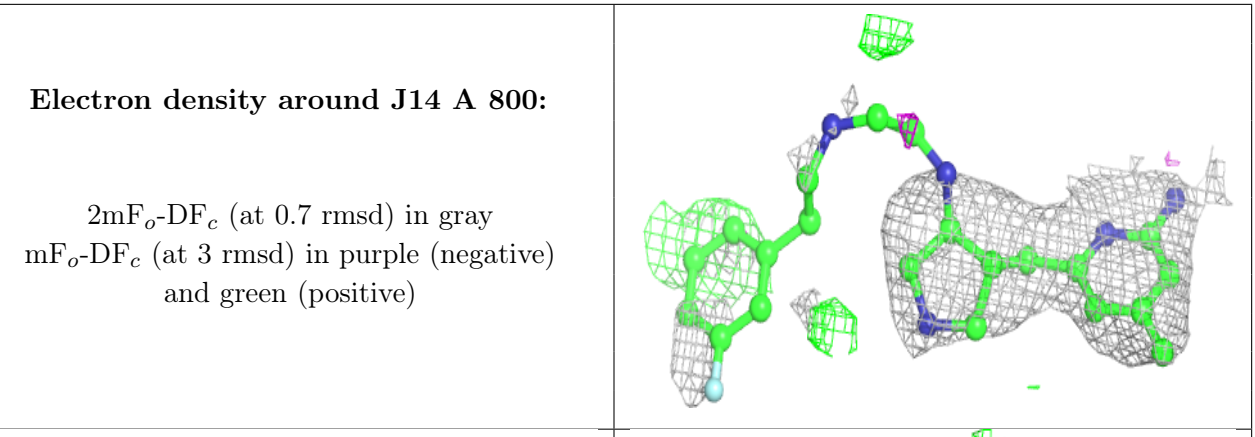
Electron density around J14 B 800:

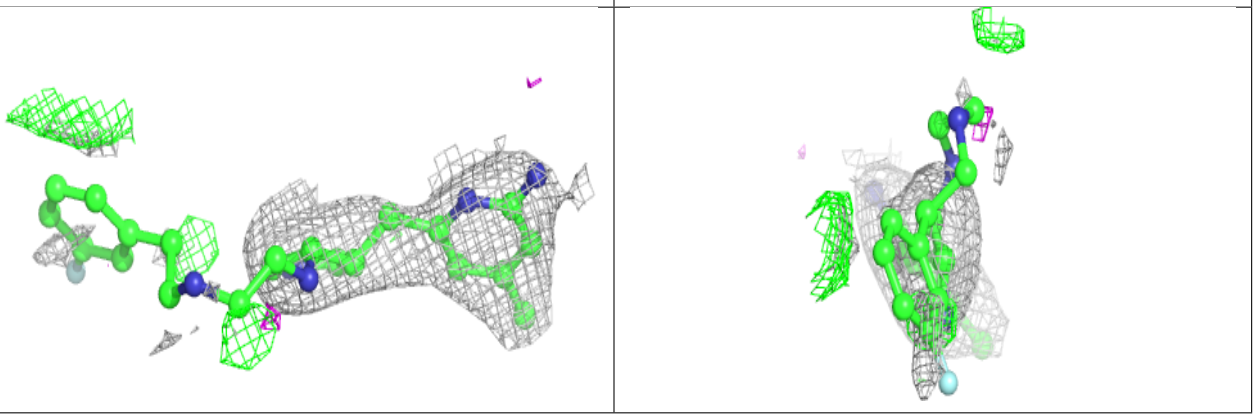
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



Electron density around J14 A 800:

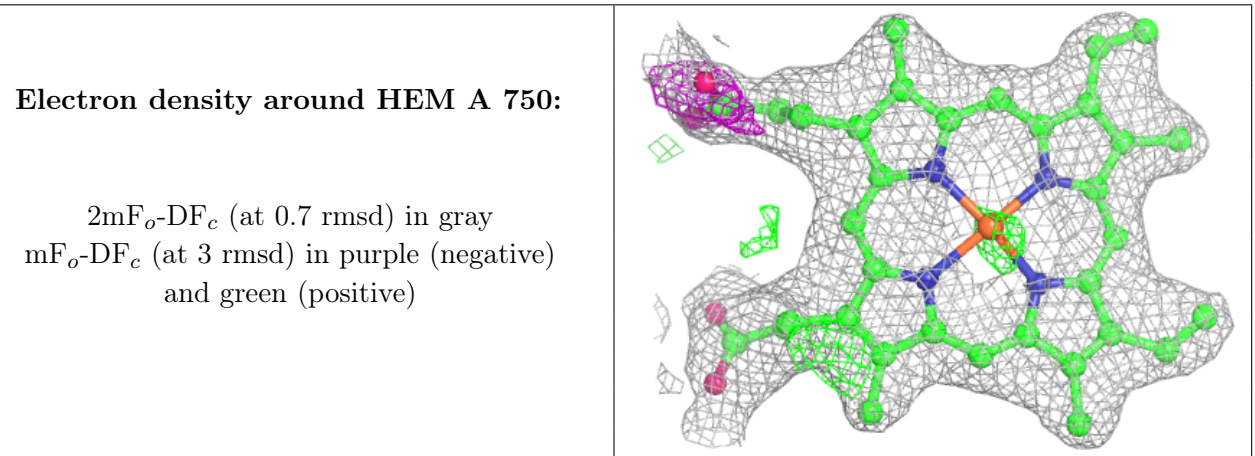
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

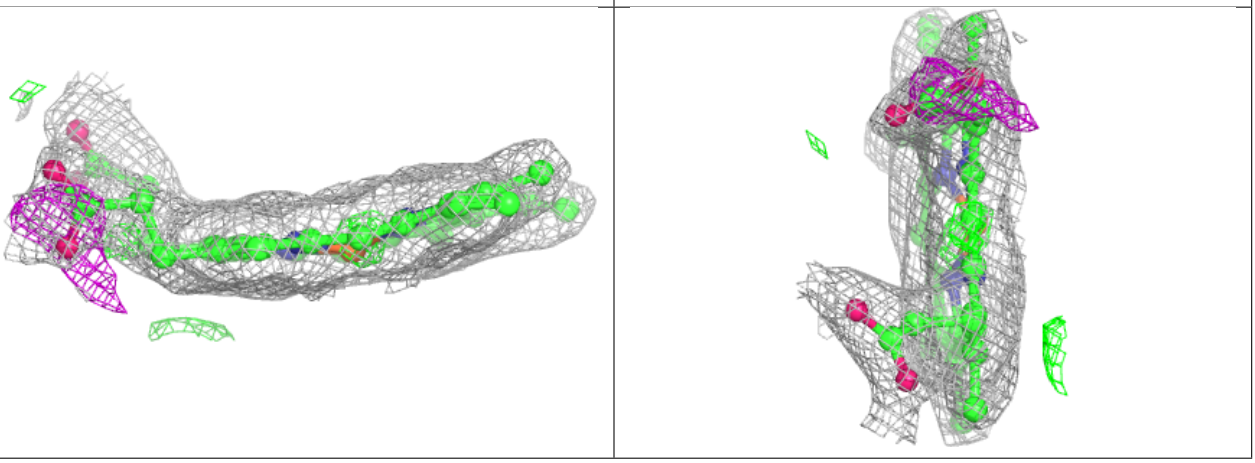




Electron density around HEM A 750:

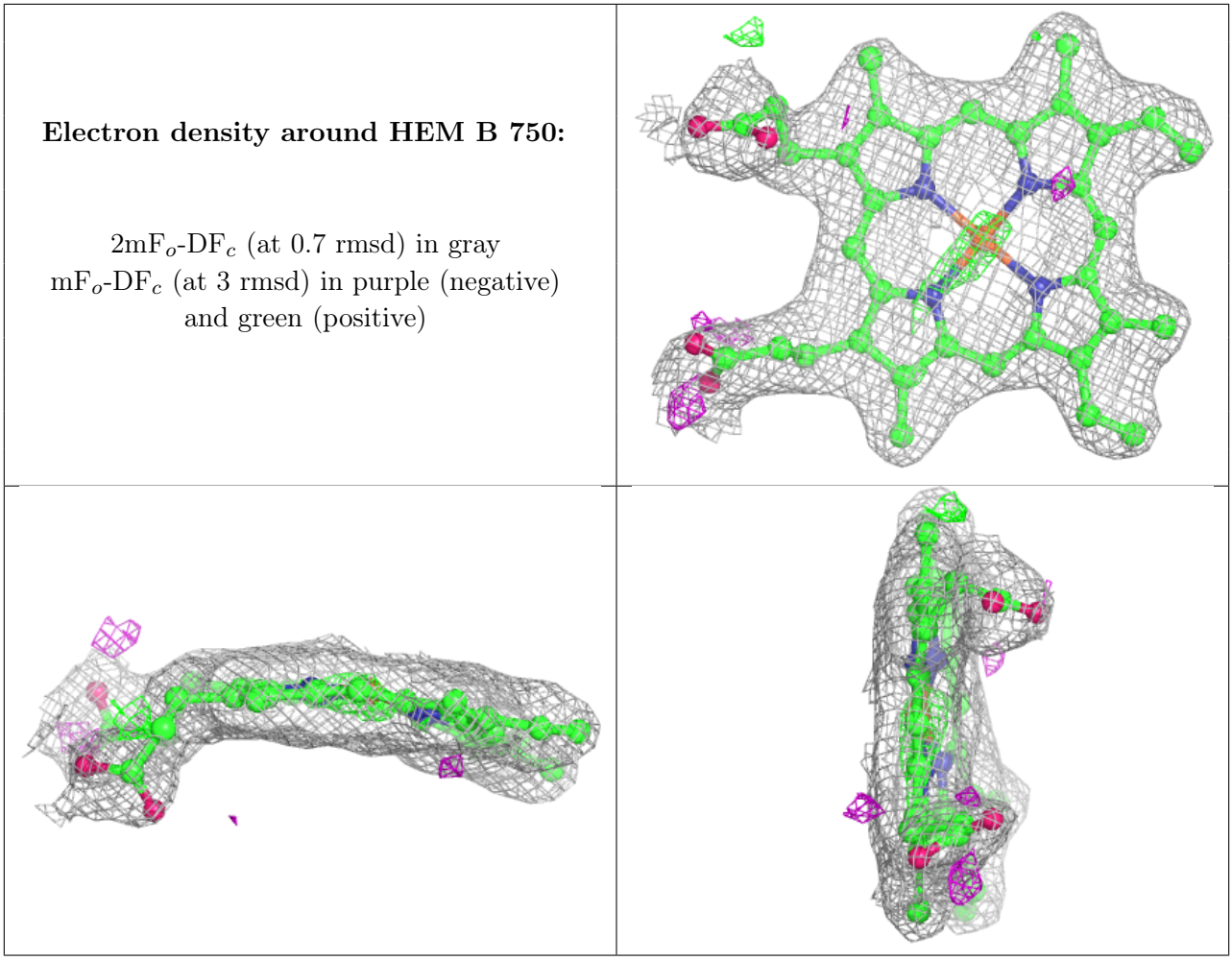
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)





Electron density around HEM B 750:

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



6.5 Other polymers (i)

There are no such residues in this entry.