WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Jan 20, 2025 – 12:09 pm GMT

PDB ID	:	8S4M
Title	:	Crystal structure of Mycobacterium tuberculosis cytochrome P450 CYP125 in complex with an inhibitor
Authors	:	Snee, M.; Kavanagh, M.; Levy, C.
Deposited on	:	2024-02-21
Resolution	:	2.10 Å(reported)

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

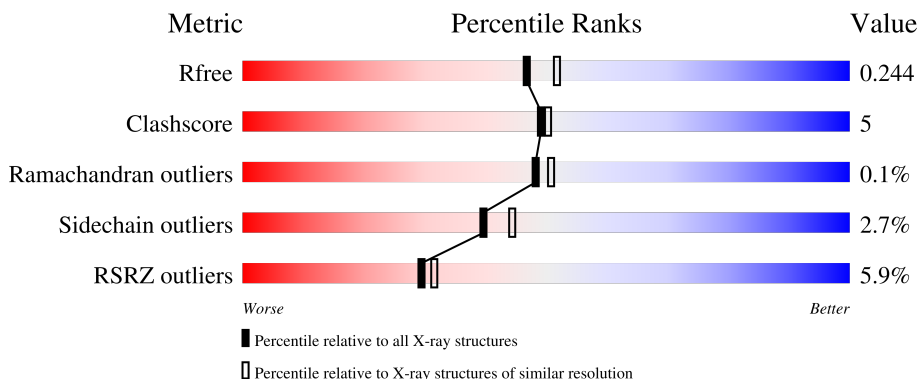|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 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	Percentile Ranks	Value
Rfree		0.244
Clashscore		5
Ramachandran outliers		0.1%
Sidechain outliers		2.7%
RSRZ outliers		5.9%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	6234 (2.10-2.10)
Clashscore	180529	6893 (2.10-2.10)
Ramachandran outliers	177936	6839 (2.10-2.10)
Sidechain outliers	177891	6840 (2.10-2.10)
RSRZ outliers	164620	6234 (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	418	2% 90% 8% ••
1	B	418	3% 88% 10% ••
1	C	418	12% 81% 12% 7%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 19479 atoms, of which 9346 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 Steroid C26-monooxygenase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	411	Total	C	H	N	O	S	0	5	0
			6439	2069	3171	577	607	15			
1	B	415	Total	C	H	N	O	S	0	4	0
			6450	2079	3166	576	613	16			
1	C	390	Total	C	H	N	O	S	0	0	0
			5949	1934	2901	530	571	13			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	16	ASN	-	expression tag	UNP P9WPP1
A	17	GLY	-	expression tag	UNP P9WPP1
B	16	ASN	-	expression tag	UNP P9WPP1
B	17	GLY	-	expression tag	UNP P9WPP1
C	16	ASN	-	expression tag	UNP P9WPP1
C	17	GLY	-	expression tag	UNP P9WPP1

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

HEM

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	Fe	H	N	O	0	0
			73	34	1	30	4	4		
2	B	1	Total	C	Fe	H	N	O	0	0
			73	34	1	30	4	4		
2	C	1	Total	C	Fe	H	N	O	0	0
			73	34	1	30	4	4		

• Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

SO4

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		

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

- Molecule 4 is {N}-(1 {H}-indol-5-ylmethyl)-3-(pyridin-4-ylamino)benzamide (three-letter code: A1H47) (formula: $C_{21}H_{18}N_4O$) (labeled as "Ligand of Interest" by depositor).

A1H47

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	C	1	Total 44	C 21	H 18	N 4	O 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	197	Total 197	O 197	0	0
5	B	70	Total 70	O 70	0	0
5	C	61	Total 61	O 61	0	0

3　Residue-property plots ⓘ

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

• Molecule 1: Steroid C26-monooxygenase

Chain A:

• Molecule 1: Steroid C26-monooxygenase

Chain B:

• Molecule 1: Steroid C26-monooxygenase

Chain C:

4 Data and refinement statistics (i)

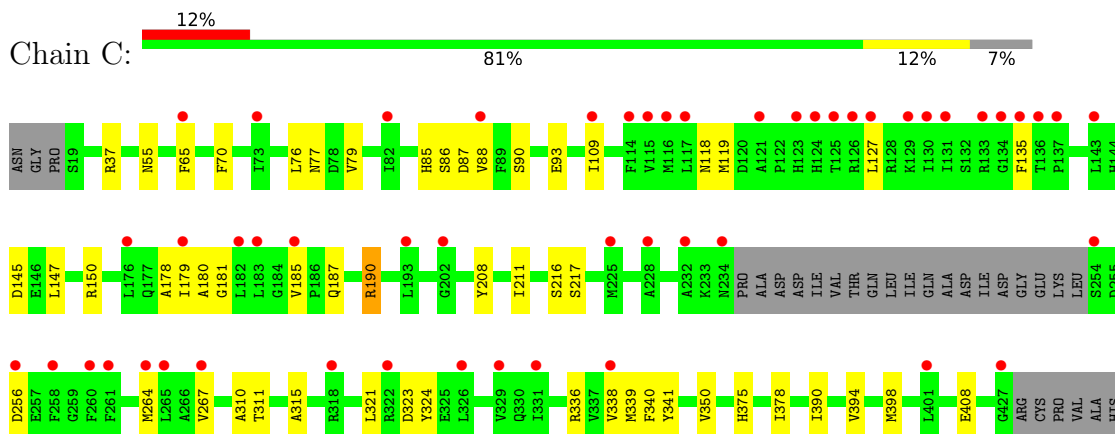| Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	136.90Å 68.85Å 144.12Å 90.00° 93.92° 90.00°	Depositor
Resolution (Å)	68.29 – 2.10 68.29 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.8 (68.29-2.10) 91.4 (68.29-2.10)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.28 (at 2.10Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.212 , 0.246 0.210 , 0.244	Depositor DCC
R_{free} test set	3948 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	34.8	Xtriage
Anisotropy	0.181	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.40 , 54.0	EDS
L-test for twinning[2]	$< |L| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	19479	wwPDB-VP
Average B, all atoms (Å^2)	64.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.31% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: A1H47, SO4, 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	0.27	0/3367	0.51	0/4564
1	B	0.25	0/3381	0.50	0/4585
1	C	0.26	0/3129	0.48	0/4247
All	All	0.26	0/9877	0.49	0/13396

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 ⓘ

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	3268	3171	3170	23	0
1	B	3284	3166	3165	25	0
1	C	3048	2901	2900	41	0
2	A	43	30	30	5	0
2	B	43	30	30	5	0
2	C	43	30	30	7	0
3	A	30	0	0	1	0
3	B	5	0	0	0	0
3	C	15	0	0	0	0
4	C	26	18	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	197	0	0	7	0
5	B	70	0	0	0	0
5	C	61	0	0	2	0
All	All	10133	9346	9325	101	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 (101) 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:C:179:ILE:HD11	2:C:501:HEM:HBC1	1.42	0.99
1:A:30:ASP:HB3	1:A:33:ILE:HD12	1.53	0.90
1:C:77:ASN:ND2	5:C:602:HOH:O	2.08	0.86
1:A:271:GLU:OE2	5:A:601:HOH:O	1.94	0.85
1:A:172[B]:CYS:SG	5:A:751:HOH:O	2.35	0.83
1:B:201:THR:OG1	1:B:271:GLU:OE1	2.01	0.79
1:C:408:GLU:OE1	5:C:601:HOH:O	2.04	0.74
2:C:501:HEM:HBC2	2:C:501:HEM:HMC2	1.74	0.70
1:A:107:GLU:OE2	5:A:602:HOH:O	2.12	0.67
1:A:251:GLU:HA	1:A:251:GLU:OE1	1.94	0.67
1:B:322:ARG:NE	1:B:323:ASP:O	2.27	0.66
1:C:179:ILE:HD11	2:C:501:HEM:CBC	2.21	0.65
2:A:501:HEM:O1A	5:A:603:HOH:O	2.15	0.64
1:C:180:ALA:HB1	1:C:190:ARG:HD3	1.80	0.63
1:B:182:LEU:HD22	1:B:239:ILE:HD12	1.81	0.61
1:B:132:SER:HA	1:B:378:ILE:HD11	1.82	0.60
1:C:208:TYR:HB3	1:C:211:ILE:HD12	1.85	0.59
2:C:501:HEM:HBC2	2:C:501:HEM:CMC	2.33	0.58
1:C:65:PHE:CE1	1:C:109:ILE:HD13	2.38	0.58
1:C:118:ASN:ND2	4:C:502:A1H47:O1	2.37	0.58
1:B:116[B]:MET:HG2	1:B:264[B]:MET:SD	2.44	0.58
1:C:394:VAL:HG22	1:C:398:MET:HE3	1.87	0.57
1:A:185:VAL:HG21	1:A:193:LEU:HD22	1.88	0.56
1:B:153:LYS:N	1:B:153:LYS:HD3	2.21	0.56
1:B:27:ASP:HA	1:B:55:ASN:HD21	1.70	0.55
1:B:149:GLU:HG3	1:B:153:LYS:HE2	1.87	0.55
1:C:187:GLN:HA	1:C:190:ARG:HG3	1.87	0.55
1:C:65:PHE:CD2	1:C:336:ARG:NH1	2.75	0.55
1:A:196:TRP:NE1	1:A:219:GLU:OE1	2.40	0.55
1:C:390:ILE:O	1:C:394:VAL:HG23	2.06	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:65:PHE:HE1	1:C:109:ILE:HD13	1.72	0.55
1:B:225:MET:HE2	1:B:256:ASP:HA	1.91	0.52
1:B:238:ASP:OD1	1:B:241:THR:OG1	2.27	0.51
1:C:135:PHE:CD2	1:C:378:ILE:CD1	2.93	0.51
1:B:292:GLU:O	1:B:296:LYS:HD2	2.10	0.51
2:B:501:HEM:HMB2	2:B:501:HEM:HBB2	1.93	0.51
1:C:55:ASN:HB3	1:C:70:PHE:CE1	2.47	0.50
1:B:101:LYS:HE3	1:B:103:ASP:C	2.32	0.50
1:A:119:MET:SD	1:A:127:LEU:HD12	2.51	0.50
1:C:150:ARG:HG2	1:C:150:ARG:HH11	1.76	0.50
2:A:501:HEM:O2A	5:A:604:HOH:O	2.20	0.49
1:B:52:ILE:HD13	1:B:326:LEU:HD23	1.94	0.49
1:C:378:ILE:HD12	1:C:378:ILE:C	2.33	0.49
1:A:398[B]:MET:SD	1:A:401:LEU:HD12	2.53	0.49
1:B:264[B]:MET:SD	2:B:501:HEM:HMD3	2.53	0.48
1:C:65:PHE:HB2	1:C:336:ARG:NH1	2.28	0.48
1:A:428:ARG:N	1:A:428:ARG:HD3	2.29	0.48
1:C:185:VAL:O	1:C:190:ARG:CZ	2.61	0.48
1:C:76:LEU:HD13	1:C:350:VAL:HG11	1.96	0.48
1:B:28:PHE:CE2	1:B:46:LEU:HD11	2.50	0.47
1:A:30:ASP:HB3	1:A:33:ILE:CD1	2.36	0.47
1:C:90:SER:HB3	1:C:321:LEU:HD13	1.95	0.47
2:A:501:HEM:HBC2	2:A:501:HEM:CMC	2.44	0.47
2:B:501:HEM:HBB2	2:B:501:HEM:CMB	2.44	0.47
2:C:501:HEM:CMB	2:C:501:HEM:HBB2	2.46	0.46
2:A:501:HEM:HBC2	2:A:501:HEM:HMC1	1.96	0.46
1:A:200:MET:HE3	1:A:220:LEU:HD12	1.96	0.46
1:C:208:TYR:HB3	1:C:211:ILE:CD1	2.44	0.46
1:B:225:MET:CE	1:B:256:ASP:HA	2.45	0.46
1:C:394:VAL:HG22	1:C:398:MET:CE	2.45	0.45
2:B:501:HEM:HMC1	2:B:501:HEM:HBC2	1.99	0.45
2:C:501:HEM:HBB2	2:C:501:HEM:HMB2	1.97	0.45
1:A:76:LEU:HA	1:A:344:ALA:HB1	1.99	0.45
1:C:180:ALA:HB1	1:C:190:ARG:HH11	1.81	0.45
1:A:200:MET:CE	1:A:220:LEU:HD12	2.47	0.44
1:B:200:MET:HE1	1:B:217:SER:HB3	1.98	0.44
1:A:255:ASP:N	3:A:506:SO4:O4	2.51	0.44
1:B:200:MET:HE3	1:B:220:LEU:HD12	2.00	0.44
1:B:155:ALA:HA	1:B:398:MET:HE1	2.00	0.43
2:B:501:HEM:HBC2	2:B:501:HEM:CMC	2.47	0.43
1:A:279:GLN:HE22	1:A:416:ASN:ND2	2.17	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:315:ALA:HA	1:C:339:MET:O	2.19	0.43
1:A:27:ASP:HA	1:A:55:ASN:HD21	1.82	0.43
1:C:65:PHE:HD2	1:C:336:ARG:NH1	2.14	0.43
1:B:101:LYS:NZ	1:B:103:ASP:HB2	2.33	0.43
1:B:71:TRP:HB2	1:B:337:VAL:HG12	2.00	0.43
1:C:88:VAL:HG11	1:C:324:TYR:CD2	2.53	0.43
1:A:176:LEU:HB3	1:A:194:PHE:CE1	2.53	0.43
1:C:310:ALA:O	1:C:311:THR:C	2.58	0.42
1:B:37:ARG:HD2	1:C:37:ARG:HD2	2.01	0.42
1:A:61:LYS:NZ	5:A:618:HOH:O	2.51	0.42
1:B:29:THR:HG23	1:B:70:PHE:CZ	2.55	0.42
1:A:264:MET:HB3	1:A:264:MET:HE2	1.95	0.42
1:B:133:ARG:NH2	1:B:247:ASP:OD2	2.53	0.41
1:B:185:VAL:HG21	1:B:193:LEU:HD22	2.02	0.41
1:C:79:VAL:HG22	1:C:339:MET:HG2	2.02	0.41
1:C:135:PHE:CD2	1:C:378:ILE:HD13	2.54	0.41
1:A:375:HIS:HE1	5:A:657:HOH:O	2.03	0.41
1:C:181:GLY:HA2	1:C:190:ARG:HH12	1.84	0.41
1:C:264:MET:HA	1:C:267:VAL:HG22	2.02	0.41
1:C:336:ARG:HE	1:C:336:ARG:HB2	1.65	0.41
1:C:147:LEU:HD21	1:C:178:ALA:HA	2.03	0.41
1:A:131:ILE:HD13	1:A:261:PHE:CD1	2.55	0.41
1:C:338:VAL:HG13	1:C:340:PHE:CE2	2.55	0.41
1:A:150[A]:ARG:HD2	1:A:177:GLN:HG3	2.03	0.40
1:C:87:ASP:N	1:C:87:ASP:OD1	2.54	0.40
1:C:339:MET:HE2	1:C:341:TYR:OH	2.20	0.40
1:C:375:HIS:HA	2:C:501:HEM:O2D	2.21	0.40
1:C:119:MET:HE3	1:C:127:LEU:HD23	2.04	0.40
2:A:501:HEM:HBB2	2:A:501:HEM:CMB	2.52	0.40
1:C:65:PHE:CB	1:C:336:ARG:NH1	2.85	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	414/418 (99%)	404 (98%)	10 (2%)	0	100	100
1	B	417/418 (100%)	403 (97%)	14 (3%)	0	100	100
1	C	386/418 (92%)	370 (96%)	15 (4%)	1 (0%)	37	37
All	All	1217/1254 (97%)	1177 (97%)	39 (3%)	1 (0%)	48	51

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	93	GLU

5.3.2 Protein sidechains ⓘ

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	341/341 (100%)	331 (97%)	10 (3%)	37	41
1	B	341/341 (100%)	329 (96%)	12 (4%)	31	34
1	C	312/341 (92%)	304 (97%)	8 (3%)	41	46
All	All	994/1023 (97%)	964 (97%)	30 (3%)	40	40

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	55	ASN
1	A	150[A]	ARG
1	A	150[B]	ARG
1	A	214	LYS
1	A	322[A]	ARG
1	A	322[B]	ARG
1	A	398[A]	MET
1	A	398[B]	MET
1	A	402	LYS

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Mol	Chain	Res	Type
1	A	428	ARG
1	B	55	ASN
1	B	101	LYS
1	B	142	ARG
1	B	150	ARG
1	B	153	LYS
1	B	214	LYS
1	B	229	GLU
1	B	234	ASN
1	B	245	GLN
1	B	296	LYS
1	B	322	ARG
1	B	323	ASP
1	C	85	HIS
1	C	86	SER
1	C	145	ASP
1	C	190	ARG
1	C	216	SER
1	C	217	SER
1	C	256	ASP
1	C	323	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	375	HIS
1	B	55	ASN
1	B	203	ASN
1	B	330	GLN
1	C	55	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

14 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	#$|Z| > 2$
3	SO4	A	502	-	4,4,4	0.13	0	6,6,6	0.14	0
2	HEM	A	501	1	41,50,50	1.45	3 (7%)	45,82,82	1.35	8 (17%)
3	SO4	A	505	-	4,4,4	0.14	0	6,6,6	0.06	0
3	SO4	C	503	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	A	504	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	C	505	-	4,4,4	0.14	0	6,6,6	0.06	0
2	HEM	B	501	1	41,50,50	1.48	4 (9%)	45,82,82	1.37	6 (13%)
3	SO4	A	507	-	4,4,4	0.14	0	6,6,6	0.07	0
3	SO4	B	502	-	4,4,4	0.14	0	6,6,6	0.05	0
4	A1H47	C	502	2	27,29,29	0.45	0	35,39,39	0.68	1 (2%)
2	HEM	C	501	1,4	41,50,50	1.44	3 (7%)	45,82,82	1.39	7 (15%)
3	SO4	A	506	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	C	504	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	A	503	-	4,4,4	0.14	0	6,6,6	0.05	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
2	HEM	C	501	1,4	-	2/12/54/54	-
4	A1H47	C	502	2	-	7/13/13/13	0/4/4/4
2	HEM	B	501	1	-	0/12/54/54	-
2	HEM	A	501	1	-	0/12/54/54	-

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	HEM	C3C-C2C	-4.24	1.34	1.40
2	B	501	HEM	C3C-C2C	-4.13	1.34	1.40
2	C	501	HEM	C3C-C2C	-3.97	1.34	1.40
2	B	501	HEM	C3C-CAC	3.65	1.55	1.47
2	A	501	HEM	C3C-CAC	3.60	1.55	1.47
2	C	501	HEM	C3C-CAC	3.33	1.54	1.47
2	C	501	HEM	CAB-C3B	2.92	1.55	1.47
2	B	501	HEM	CAB-C3B	2.90	1.55	1.47
2	A	501	HEM	CAB-C3B	2.85	1.55	1.47
2	B	501	HEM	CAA-C2A	2.07	1.55	1.52

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	501	HEM	C1B-NB-C4B	2.97	108.14	105.07
2	C	501	HEM	C4D-ND-C1D	2.95	108.12	105.07
2	B	501	HEM	C4D-ND-C1D	2.70	107.86	105.07
2	C	501	HEM	C1B-NB-C4B	2.68	107.85	105.07
2	C	501	HEM	C4C-CHD-C1D	2.59	125.98	122.56
2	B	501	HEM	C4C-CHD-C1D	2.59	125.97	122.56
2	A	501	HEM	C4C-CHD-C1D	2.57	125.94	122.56
4	C	502	A1H47	C4-C5-C6	-2.51	117.68	120.84
2	B	501	HEM	C4B-CHC-C1C	2.48	125.83	122.56
2	A	501	HEM	C1B-NB-C4B	2.34	107.49	105.07
2	A	501	HEM	CBA-CAA-C2A	-2.31	108.68	112.62
2	A	501	HEM	C4D-ND-C1D	2.30	107.45	105.07
2	C	501	HEM	C2C-C3C-C4C	2.29	108.50	106.90
2	B	501	HEM	C3B-C2B-C1B	2.24	108.15	106.49
2	A	501	HEM	CMA-C3A-C4A	-2.23	125.03	128.46
2	C	501	HEM	CAA-CBA-CGA	-2.19	107.63	113.76
2	C	501	HEM	CMC-C2C-C3C	2.18	128.76	124.68
2	A	501	HEM	C4B-CHC-C1C	2.17	125.42	122.56
2	C	501	HEM	C3B-C2B-C1B	2.16	108.09	106.49
2	B	501	HEM	CMA-C3A-C4A	-2.13	125.19	128.46
2	A	501	HEM	C3B-C2B-C1B	2.11	108.05	106.49
2	A	501	HEM	CAD-CBD-CGD	-2.07	109.14	113.60

There are no chirality outliers.
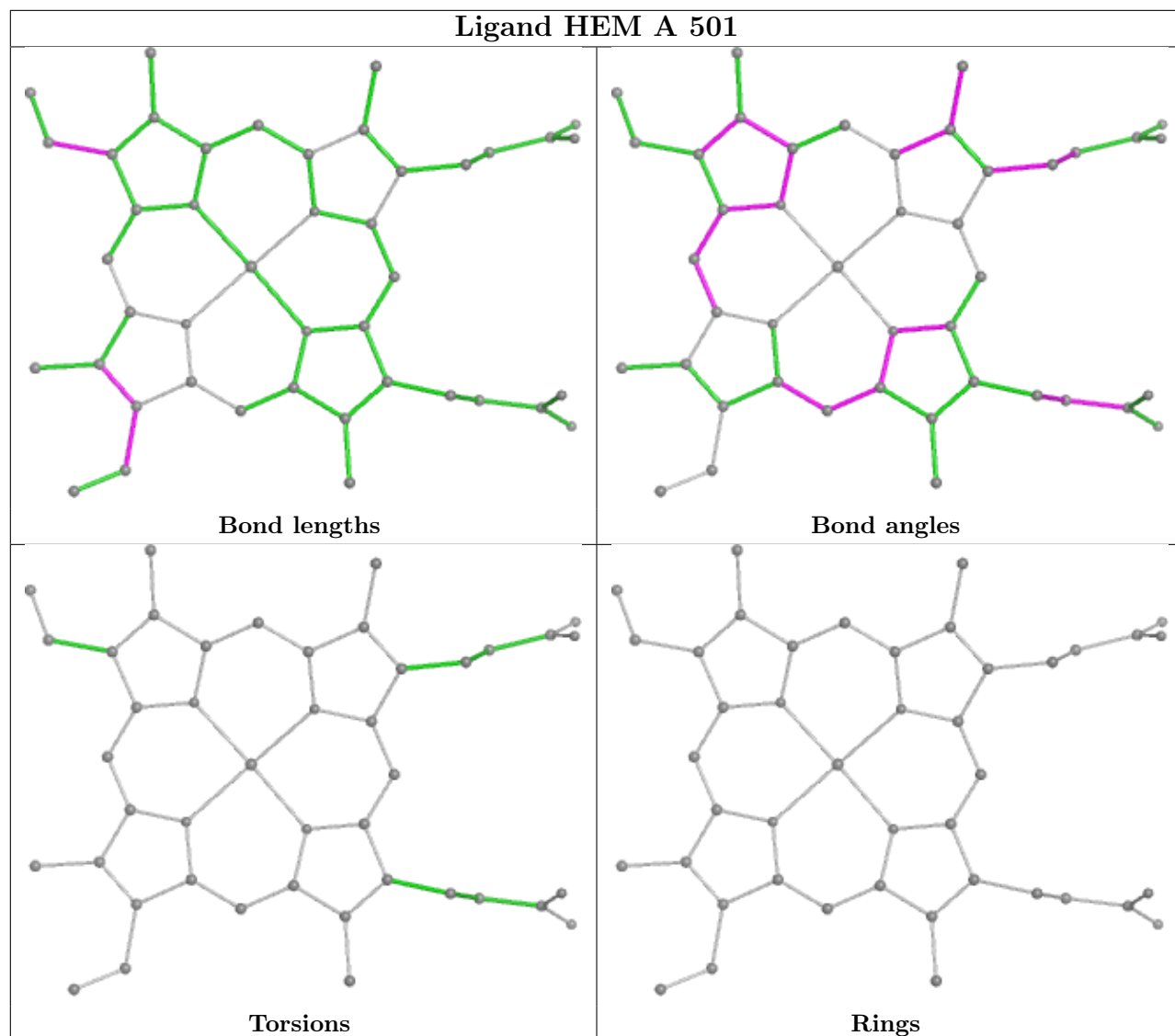
All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	502	A1H47	N1-C1-C11-C21
4	C	502	A1H47	N1-C1-C11-C12
4	C	502	A1H47	O1-C1-C11-C21
4	C	502	A1H47	O1-C1-C11-C12
4	C	502	A1H47	C21-C15-N3-C16
2	C	501	HEM	CAA-CBA-CGA-O2A
2	C	501	HEM	CAA-CBA-CGA-O1A
4	C	502	A1H47	C14-C15-N3-C16
4	C	502	A1H47	C11-C1-N1-C2

There are no ring outliers.

5 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	HEM	5	0
2	B	501	HEM	5	0
4	C	502	A1H47	1	0
2	C	501	HEM	7	0
3	A	506	SO4	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

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand A1H47 C 502

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM C 501

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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, 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(Å²)	Q<0.9
1	A	411/418 (98%)	-0.07	8 (1%)	66	67	20, 41, 73, 125	5 (1%)
1	B	415/418 (99%)	0.46	13 (3%)	51	53	31, 66, 100, 132	4 (0%)
1	C	390/418 (93%)	0.93	51 (13%)	8	9	43, 79, 132, 154	0
All	All	1216/1254 (96%)	0.43	72 (5%)	29	31	20, 60, 114, 154	9 (0%)

All (72) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	261	PHE	4.6
1	B	432	ALA	4.4
1	C	114	PHE	4.0
1	C	183	LEU	3.7
1	C	256	ASP	3.5
1	B	431	VAL	3.5
1	C	401	LEU	3.4
1	C	134	GLY	3.2
1	B	201	THR	3.1
1	C	265	LEU	3.1
1	C	130	ILE	3.1
1	A	18	PRO	3.0
1	C	88	VAL	3.0
1	C	127	LEU	3.0
1	C	318	ARG	3.0
1	C	125	THR	2.9
1	C	121	ALA	2.9
1	C	131	ILE	2.9
1	C	179	ILE	2.9
1	B	433	HIS	2.9
1	C	260	PHE	2.9
1	B	429	CYS	2.9
1	C	123	HIS	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	248	ILE	2.8
1	C	254	SER	2.8
1	C	109	ILE	2.8
1	C	329	VAL	2.7
1	A	236	ALA	2.7
1	C	264	MET	2.7
1	C	135	PHE	2.7
1	C	202	GLY	2.6
1	C	322	ARG	2.6
1	C	126	ARG	2.5
1	C	65	PHE	2.5
1	C	225	MET	2.5
1	B	331	ILE	2.5
1	C	326	LEU	2.5
1	A	268	ALA	2.5
1	C	129	LYS	2.4
1	A	248	ILE	2.4
1	C	228	ALA	2.4
1	C	232	ALA	2.4
1	C	117	LEU	2.4
1	A	203	ASN	2.4
1	B	69	GLY	2.4
1	C	427	GLY	2.4
1	C	143	LEU	2.4
1	C	115	VAL	2.4
1	C	133	ARG	2.4
1	A	238	ASP	2.4
1	C	338	VAL	2.3
1	C	82	ILE	2.3
1	B	125	THR	2.3
1	C	137	PRO	2.3
1	C	124	HIS	2.3
1	B	236	ALA	2.3
1	A	267	VAL	2.2
1	C	258	PHE	2.2
1	C	136	THR	2.2
1	C	331	ILE	2.2
1	A	235	PRO	2.2
1	B	428	ARG	2.2
1	C	185	VAL	2.2
1	C	116	MET	2.2
1	C	182	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	267	VAL	2.1
1	C	73	ILE	2.1
1	C	234	ASN	2.1
1	B	103	ASP	2.1
1	C	193	LEU	2.1
1	B	253	LEU	2.0
1	C	176	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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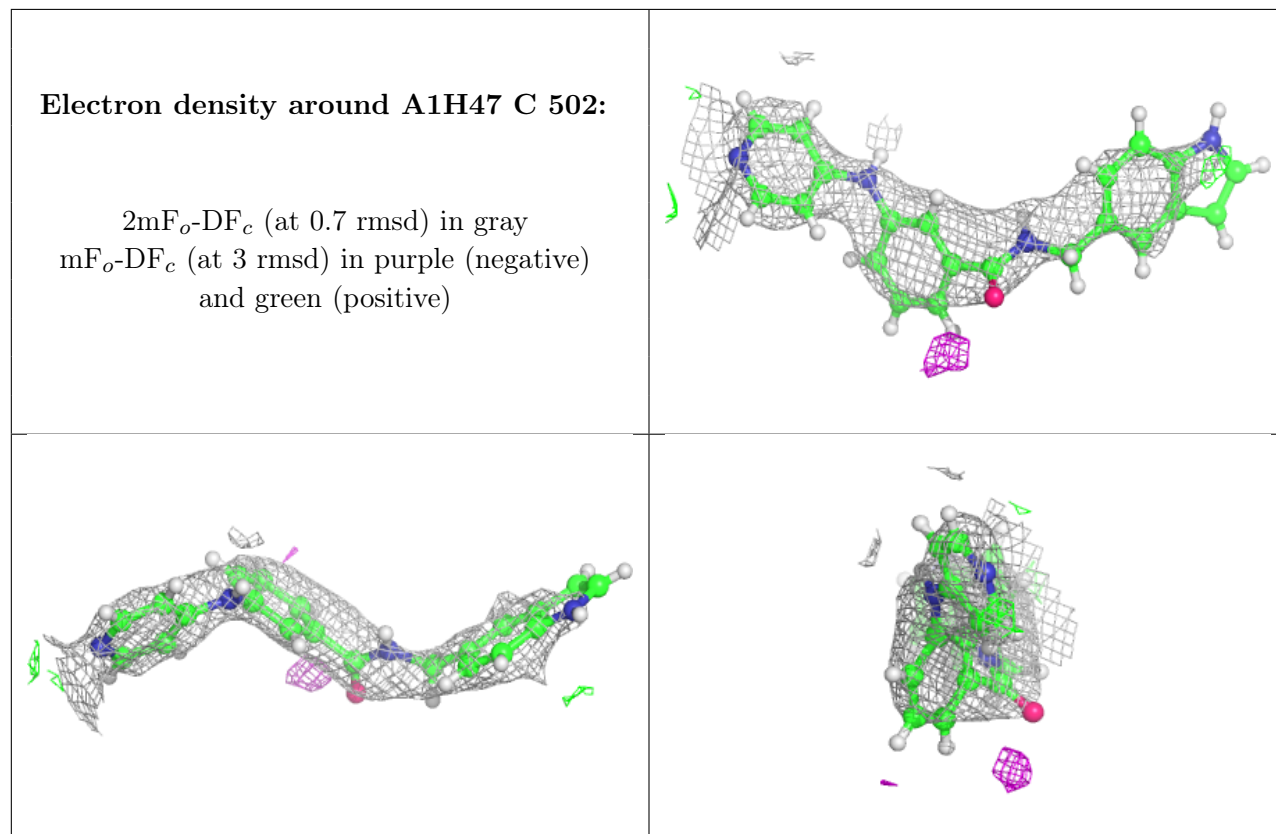
6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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
3	SO4	C	503	5/5	0.55	0.14	109,113,121,142	0
3	SO4	A	506	5/5	0.60	0.18	109,110,113,117	0
3	SO4	A	505	5/5	0.71	0.10	88,98,125,128	0
3	SO4	C	505	5/5	0.73	0.10	102,105,110,110	0
3	SO4	C	504	5/5	0.78	0.09	96,98,112,114	0
3	SO4	A	504	5/5	0.80	0.11	64,67,85,95	5
3	SO4	A	503	5/5	0.81	0.10	67,72,82,101	5
3	SO4	A	502	5/5	0.81	0.12	42,48,56,72	5
3	SO4	B	502	5/5	0.81	0.08	97,97,101,107	0
4	A1H47	C	502	26/26	0.82	0.17	71,102,138,147	0
3	SO4	A	507	5/5	0.89	0.08	55,55,69,71	0
2	HEM	C	501	43/43	0.94	0.13	58,76,97,111	0
2	HEM	B	501	43/43	0.97	0.08	42,53,65,67	0
2	HEM	A	501	43/43	0.98	0.07	21,29,35,38	0

The following is a graphical depiction of the model fit to experimental electron density of all
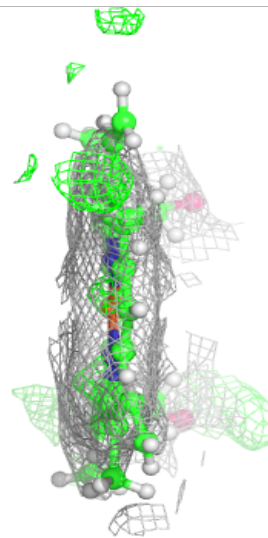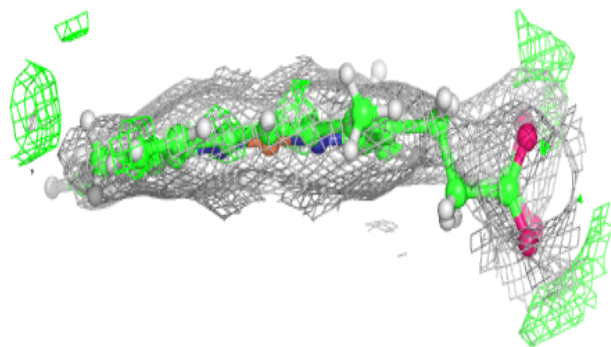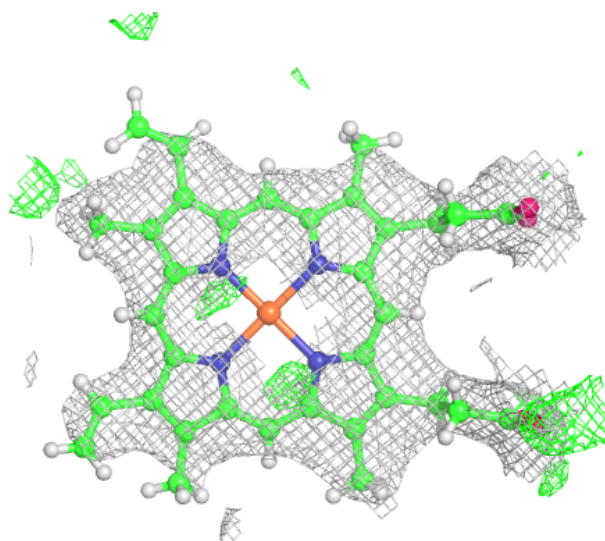
instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.
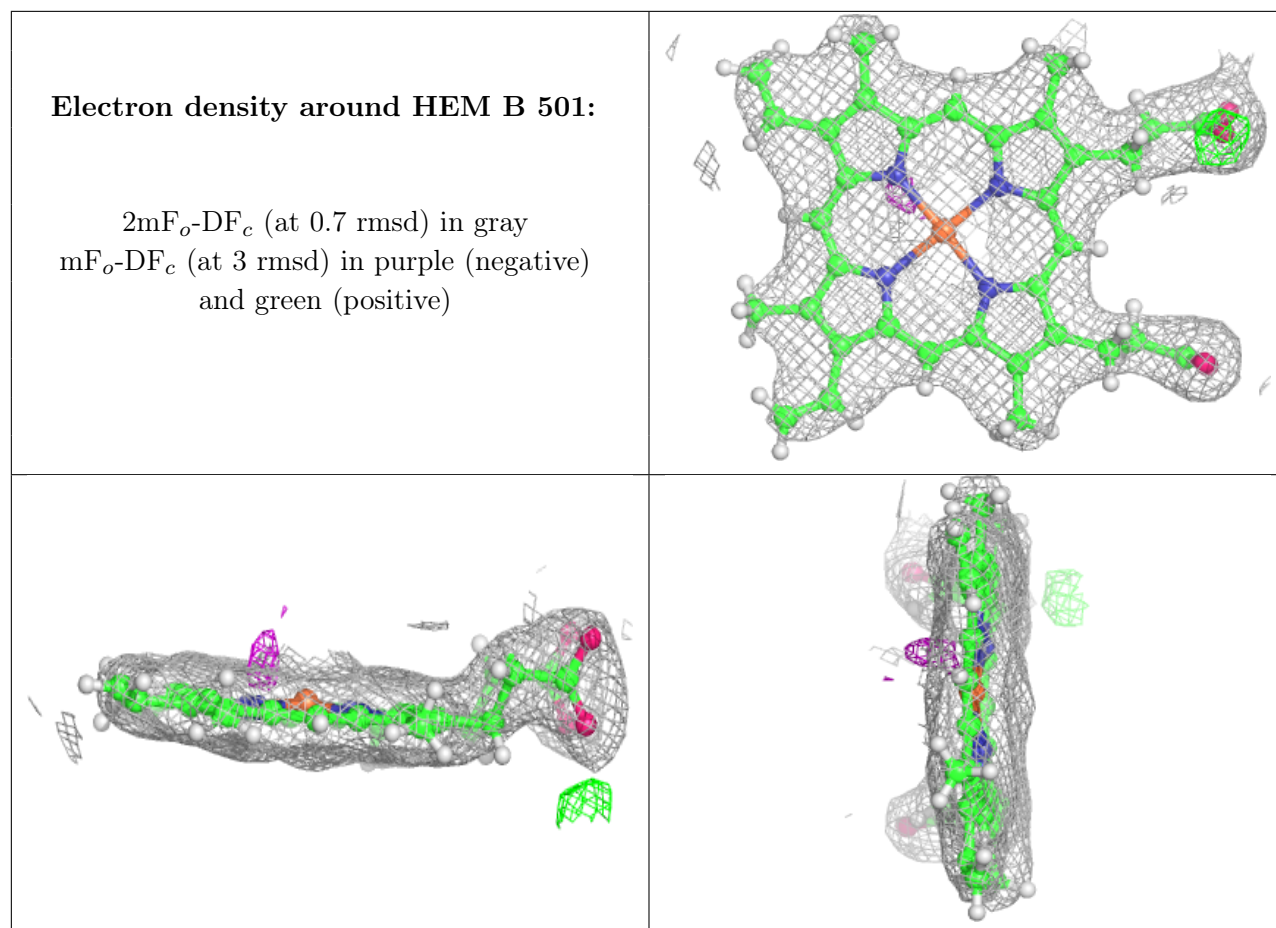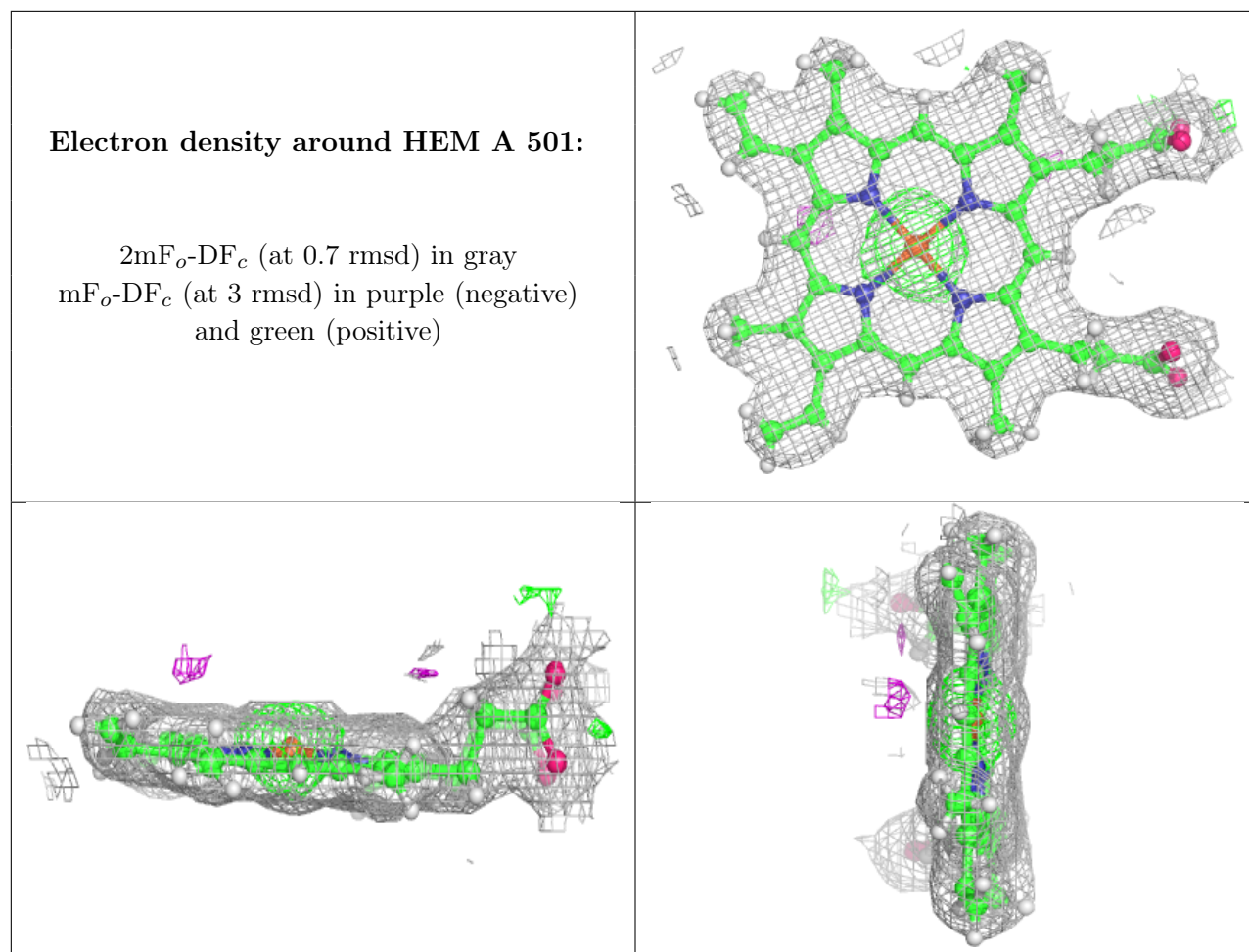
Electron density around A1H47 C 502:

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

Electron density around HEM C 501:

$2mF_o$-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:

$2mF_o$-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:

$2mF_o$-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 ⓘ

There are no such residues in this entry.