Full wwPDB X-ray Structure Validation Report (i)

Aug 28, 2023 – 02:46 PM EDT

PDB ID	:	3KOH
Title	:	Cytochrome P450 2E1 with omega-imidazolyl octanoic acid
Authors	:	Scott, E.E.; Porubsky, P.R.
Deposited on	:	2009-11-13
Resolution	:	2.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

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

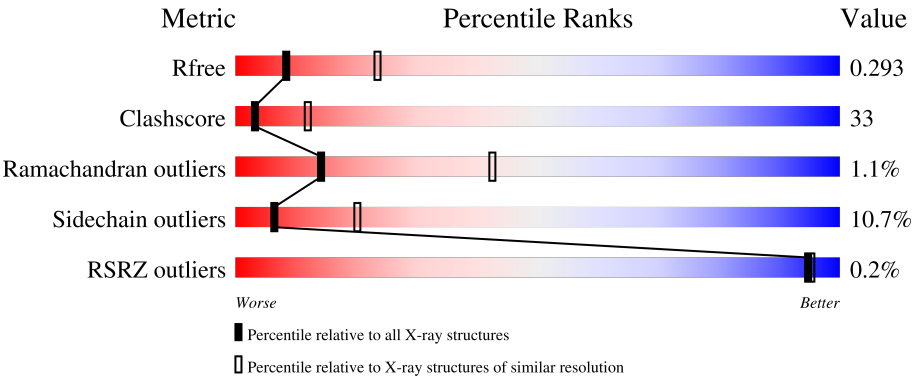
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (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 2.90 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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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	476	49% 41% 7% .
1	B	476	45% 45% 7% . .

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
3	OIO	A	1	-	-	X	-
3	OIO	B	1	-	-	X	-

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 7681 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 Cytochrome P450 2E1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	463	Total	C	N	O	S	0	0	0
			3777	2444	648	667	18			
1	B	463	Total	C	N	O	S	0	0	0
			3777	2444	648	667	18			

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	22	MET	-	expression tag	UNP P05181
A	23	ALA	-	expression tag	UNP P05181
A	24	LYS	-	expression tag	UNP P05181
A	25	LYS	-	expression tag	UNP P05181
A	26	THR	-	expression tag	UNP P05181
A	27	SER	-	expression tag	UNP P05181
A	28	SER	-	expression tag	UNP P05181
A	29	LYS	-	expression tag	UNP P05181
A	30	GLY	-	expression tag	UNP P05181
A	31	LYS	-	expression tag	UNP P05181
A	494	HIS	-	expression tag	UNP P05181
A	495	HIS	-	expression tag	UNP P05181
A	496	HIS	-	expression tag	UNP P05181
A	497	HIS	-	expression tag	UNP P05181
B	22	MET	-	expression tag	UNP P05181
B	23	ALA	-	expression tag	UNP P05181
B	24	LYS	-	expression tag	UNP P05181
B	25	LYS	-	expression tag	UNP P05181
B	26	THR	-	expression tag	UNP P05181
B	27	SER	-	expression tag	UNP P05181
B	28	SER	-	expression tag	UNP P05181
B	29	LYS	-	expression tag	UNP P05181
B	30	GLY	-	expression tag	UNP P05181
B	31	LYS	-	expression tag	UNP P05181
B	494	HIS	-	expression tag	UNP P05181

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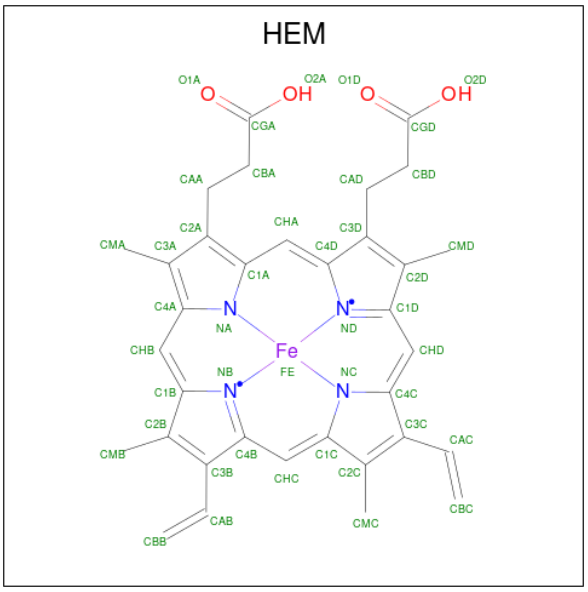
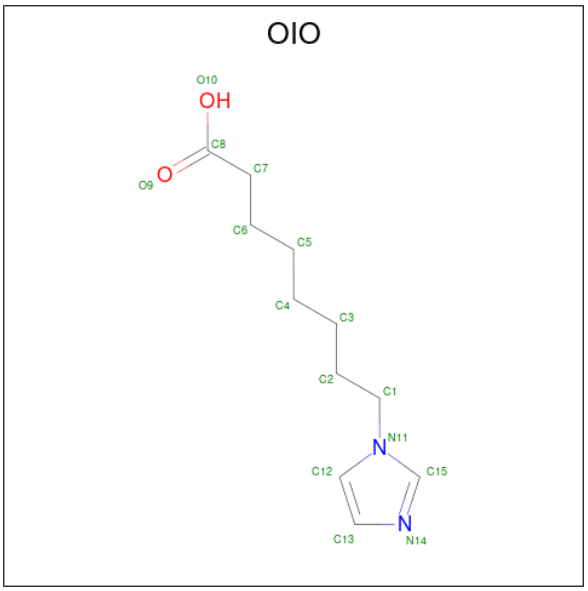
Chain	Residue	Modelled	Actual	Comment	Reference
B	495	HIS	-	expression tag	UNP P05181
B	496	HIS	-	expression tag	UNP P05181
B	497	HIS	-	expression tag	UNP P05181

- 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 8-(1H-imidazol-1-yl)octanoic acid (three-letter code: OIO) (formula: $C_{11}H_{18}N_2O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 15 11 2 2	0	0
3	B	1	Total C N O 15 11 2 2	0	0

- Molecule 4 is water.

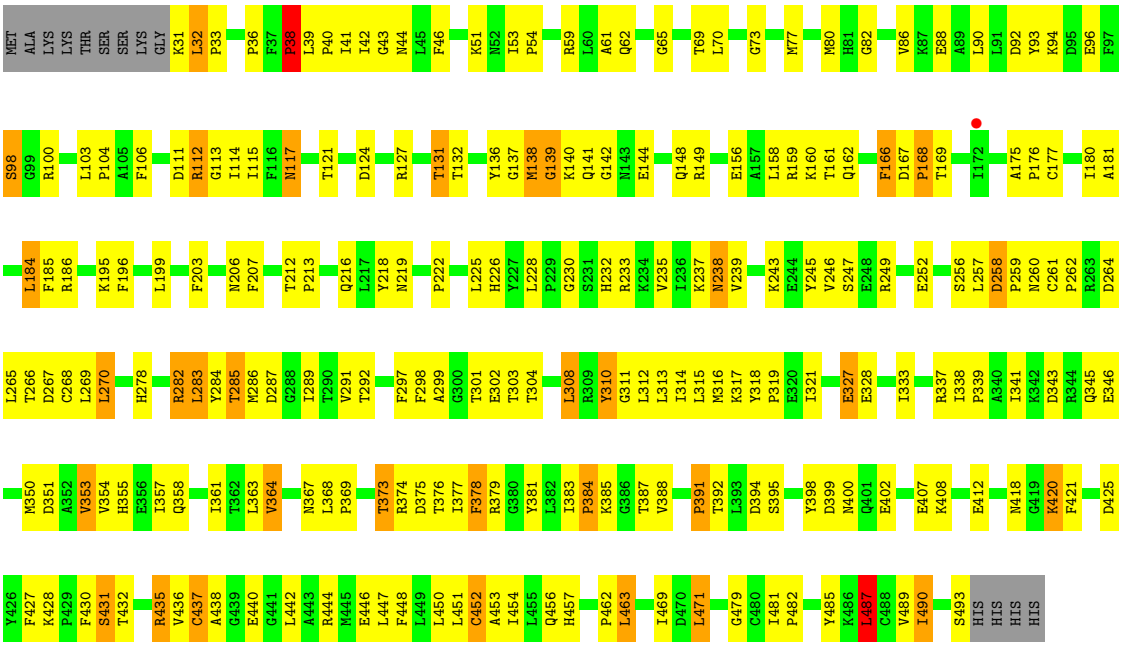
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	6	Total O 6 6	0	0
4	B	5	Total O 5 5	0	0

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.

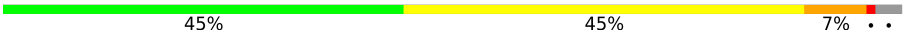
• Molecule 1: Cytochrome P450 2E1

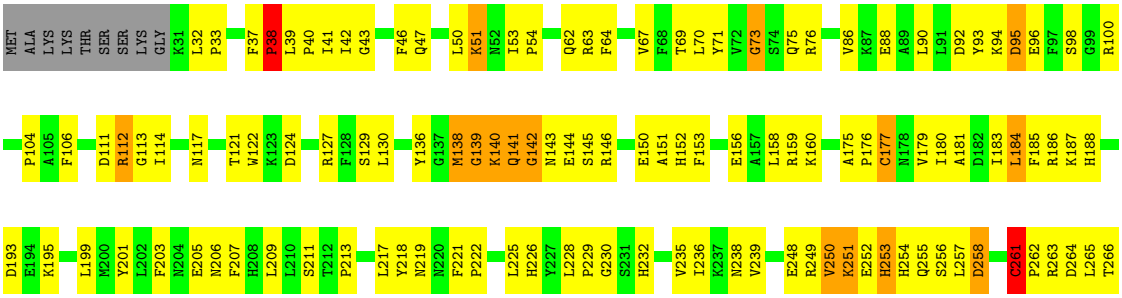
Chain A:

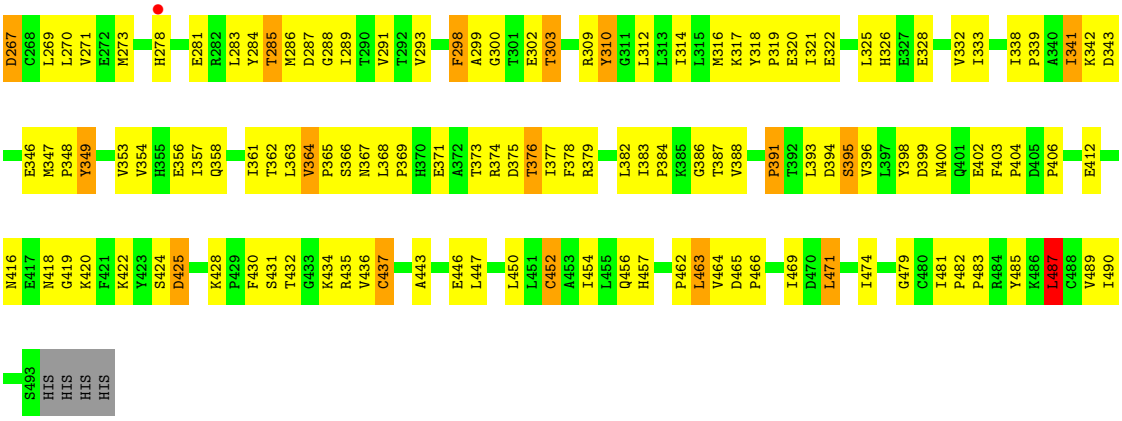


• Molecule 1: Cytochrome P450 2E1

Chain B:






D267 C268 L269 L270 V271 E272 M273 H278 E281 R282 L283 Y284 T285 M286 D287 G288 I289 T290 V291 T292 V293 F298 A299 G300 T301 E302 T303 R309 Y310 G311 L312 L313 I314 L315 M316 K317 Y318 P319 E320 I321 E322 L325 H326 E327 E328 V332 I333 I338 P339 A340 I341 K342 D343
E346 M347 P348 Y349 V353 V354 H355 E356 I357 Q358 I361 T362 L363 V364 P365 S366 N367 L368 P369 H370 E371 A372 T373 R374 D375 T376 I377 F378 R379 L382 I383 P384 K385 G386 T387 V388 P391 T392 L393 D394 S395 V396 L397 Y398 D399 N400 Q401 E402 F403 P404 D405 P406 E412
N416 E417 N418 G419 K420 F421 K422 Y423 S424 D425 K428 P429 F430 S431 T432 G433 K434 R435 V436 C437 A443 E446 L447 L450 L451 C452 A453 I454 L455 Q456 H457 P462 L463 V464 D465 P466 I469 D470 L471 I474 G479 C480 I481 P482 P483 R484 Y485 K486 L487 C488 V489 I490
S493 HIS HIS HIS HIS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α, β, γ	71.19Å 71.19Å 224.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.59 – 2.90 35.59 – 2.90	Depositor EDS
% Data completeness (in resolution range)	98.1 (35.59-2.90) 98.1 (35.59-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
$< I/\sigma(I) >$ [1]	2.50 (at 2.90Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.206 , 0.292 0.221 , 0.293	Depositor DCC
R_{free} test set	1217 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	56.8	Xtriage
Anisotropy	0.112	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 29.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.459 for h,-k,-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	7681	wwPDB-VP
Average B, all atoms (Å^2)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.99% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: OIO, 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	1.64	4/3882 (0.1%)	0.93	9/5257 (0.2%)
1	B	1.62	5/3882 (0.1%)	0.90	8/5257 (0.2%)
All	All	1.63	9/7764 (0.1%)	0.92	17/10514 (0.2%)

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	168	PRO	N-CD	-5.86	1.39	1.47
1	B	261	CYS	CB-SG	-5.52	1.72	1.81
1	B	452	CYS	CB-SG	-5.41	1.73	1.81
1	B	177	CYS	CB-SG	-5.13	1.73	1.81
1	A	218	TYR	CD1-CE1	-5.11	1.31	1.39
1	A	485	TYR	CD2-CE2	-5.10	1.31	1.39
1	B	349	TYR	CE1-CZ	-5.09	1.31	1.38
1	B	201	TYR	CD2-CE2	-5.02	1.31	1.39
1	A	378	PHE	CD1-CE1	-5.01	1.29	1.39

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	38	PRO	CA-N-CD	-8.58	99.49	111.50
1	A	384	PRO	CA-N-CD	-8.18	100.05	111.50
1	B	38	PRO	CA-N-CD	-8.03	100.26	111.50
1	A	435	ARG	O-C-N	7.95	135.41	122.70
1	B	142	GLY	N-CA-C	-7.17	95.18	113.10
1	B	271	VAL	O-C-N	-6.45	112.37	122.70
1	B	139	GLY	N-CA-C	-5.96	98.20	113.10
1	A	435	ARG	CA-C-N	-5.90	104.21	117.20
1	A	487	LEU	CB-CG-CD1	-5.86	101.04	111.00
1	A	139	GLY	N-CA-C	5.49	126.83	113.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	141	GLN	N-CA-C	-5.39	96.44	111.00
1	B	73	GLY	N-CA-C	-5.31	99.84	113.10
1	B	487	LEU	CB-CG-CD1	-5.29	102.00	111.00
1	A	73	GLY	N-CA-C	-5.09	100.36	113.10
1	A	70	LEU	CA-CB-CG	5.09	127.00	115.30
1	A	435	ARG	C-N-CA	-5.09	108.98	121.70
1	B	183	ILE	CB-CA-C	-5.03	101.53	111.60

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	3777	0	3780	263	0
1	B	3777	0	3781	248	0
2	A	43	0	30	10	0
2	B	43	0	30	4	0
3	A	15	0	17	7	0
3	B	15	0	17	10	0
4	A	6	0	0	0	0
4	B	5	0	0	0	0
All	All	7681	0	7655	511	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 33.

All (511) 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:303:THR:CG2	3:A:1:OIO:H15	1.48	1.42
1:B:257:LEU:HD12	1:B:258:ASP:N	1.36	1.34
1:B:265:LEU:HD23	1:B:265:LEU:C	1.50	1.25
1:B:265:LEU:HD23	1:B:265:LEU:O	1.37	1.24
1:A:265:LEU:O	1:A:265:LEU:HD23	1.35	1.23

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:206:ASN:ND2	3:B:1:OIO:O9	1.72	1.22
1:A:420:LYS:HD2	1:A:421:PHE:N	1.59	1.17
1:B:303:THR:HG21	3:B:1:OIO:H15	1.18	1.14
1:A:265:LEU:HD23	1:A:265:LEU:C	1.54	1.12
1:B:487:LEU:HD12	1:B:487:LEU:N	1.46	1.11
1:A:487:LEU:HD12	1:A:487:LEU:N	1.62	1.11
1:B:463:LEU:N	1:B:463:LEU:HD23	1.50	1.10
1:B:289:ILE:O	1:B:293:VAL:HG23	1.51	1.07
1:B:303:THR:CG2	3:B:1:OIO:H15	1.83	1.07
1:A:303:THR:HG21	3:A:1:OIO:H15	1.09	1.06
1:A:487:LEU:HD13	1:A:487:LEU:C	1.75	1.05
1:A:420:LYS:HD2	1:A:421:PHE:H	0.88	1.05
1:A:138:MET:HG3	1:A:139:GLY:N	1.71	1.04
1:A:136:TYR:OH	1:A:264:ASP:HA	1.58	1.04
1:A:384:PRO:HD2	1:A:387:THR:OG1	1.55	1.03
1:A:463:LEU:N	1:A:463:LEU:HD23	1.69	1.03
1:B:487:LEU:C	1:B:487:LEU:HD13	1.75	1.01
1:B:328:GLU:OE1	1:B:348:PRO:HD2	1.60	1.01
1:A:384:PRO:CD	1:A:387:THR:OG1	2.09	1.01
1:B:343:ASP:O	1:B:347:MET:HG3	1.59	1.00
1:A:487:LEU:HD12	1:A:487:LEU:H	1.17	0.99
1:A:177:CYS:O	1:A:180:ILE:HG22	1.63	0.99
1:B:303:THR:HG21	3:B:1:OIO:C15	1.93	0.98
1:A:265:LEU:C	1:A:265:LEU:CD2	2.33	0.96
1:B:265:LEU:C	1:B:265:LEU:CD2	2.30	0.96
1:B:262:PRO:HA	1:B:267:ASP:OD2	1.66	0.96
1:A:303:THR:HG21	3:A:1:OIO:C15	1.94	0.96
1:B:487:LEU:C	1:B:487:LEU:CD1	2.34	0.96
1:A:487:LEU:C	1:A:487:LEU:CD1	2.33	0.95
1:A:448:PHE:O	1:A:452:CYS:HB2	1.66	0.95
1:B:462:PRO:C	1:B:463:LEU:HD23	1.86	0.95
1:B:257:LEU:CD1	1:B:258:ASP:N	2.28	0.94
1:A:463:LEU:N	1:A:463:LEU:CD2	2.30	0.93
1:B:463:LEU:N	1:B:463:LEU:CD2	2.30	0.93
1:B:94:LYS:O	1:B:98:SER:HB3	1.70	0.91
1:B:487:LEU:HD12	1:B:487:LEU:H	1.01	0.91
1:B:261:CYS:O	1:B:261:CYS:SG	2.29	0.90
1:B:257:LEU:HD12	1:B:258:ASP:H	1.15	0.90
1:A:327:GLU:HG3	1:A:328:GLU:N	1.85	0.90
1:B:487:LEU:HD13	1:B:487:LEU:O	1.71	0.90
1:A:456:GLN:HB3	1:A:457:HIS:ND1	1.88	0.89

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:364:VAL:HG22	1:B:364:VAL:O	1.71	0.88
1:A:140:LYS:O	1:A:141:GLN:HB2	1.71	0.88
1:A:303:THR:HB	2:A:500:HEM:HBB2	1.56	0.88
1:B:283:LEU:HD23	1:B:284:TYR:HE2	1.37	0.88
1:B:186:ARG:O	1:B:186:ARG:HG2	1.70	0.88
1:A:303:THR:CG2	3:A:1:OIO:C15	2.45	0.87
1:A:420:LYS:CD	1:A:421:PHE:H	1.82	0.87
1:A:303:THR:HG22	3:A:1:OIO:H15	1.56	0.87
1:A:487:LEU:HD13	1:A:487:LEU:O	1.74	0.86
1:A:350:MET:HE2	1:A:451:LEU:HD23	1.56	0.86
1:A:407:GLU:HG2	1:A:408:LYS:HD3	1.57	0.86
1:B:206:ASN:HD22	3:B:1:OIO:C8	1.89	0.85
1:B:387:THR:HG22	1:B:388:VAL:N	1.89	0.85
1:A:282:ARG:HA	1:A:282:ARG:NE	1.92	0.85
1:A:137:GLY:O	1:A:142:GLY:HA2	1.77	0.85
1:B:283:LEU:HD23	1:B:284:TYR:CE2	2.12	0.84
1:A:427:PHE:C	1:A:428:LYS:HD3	1.98	0.84
1:B:50:LEU:HD11	1:B:217:LEU:HD13	1.59	0.83
1:B:450:LEU:O	1:B:454:ILE:HG13	1.78	0.83
1:A:136:TYR:OH	1:A:264:ASP:CA	2.26	0.83
1:A:318:TYR:CB	1:A:321:ILE:HD12	2.09	0.83
1:A:269:LEU:HD13	1:A:289:ILE:HG23	1.62	0.82
1:A:177:CYS:O	1:A:180:ILE:CG2	2.28	0.81
1:A:364:VAL:HG22	1:A:364:VAL:O	1.79	0.81
1:B:456:GLN:OE1	1:B:457:HIS:NE2	2.14	0.81
1:A:206:ASN:ND2	3:A:1:OIO:O9	2.13	0.81
1:A:32:LEU:N	1:A:32:LEU:CD2	2.45	0.80
1:A:138:MET:CG	1:A:139:GLY:N	2.44	0.80
1:A:487:LEU:CD1	1:A:487:LEU:O	2.30	0.80
1:A:82:GLY:O	1:A:86:VAL:HG23	1.81	0.80
1:A:442:LEU:O	1:A:446:GLU:HG3	1.80	0.80
1:B:425:ASP:O	1:B:428:LYS:NZ	2.14	0.80
1:B:487:LEU:CD1	1:B:487:LEU:O	2.30	0.80
1:A:437:CYS:HB2	2:A:500:HEM:NA	1.99	0.78
1:B:257:LEU:HD12	1:B:257:LEU:C	2.02	0.78
1:A:462:PRO:C	1:A:463:LEU:HD23	2.02	0.78
1:A:317:LYS:O	1:A:319:PRO:HD3	1.83	0.78
1:A:318:TYR:HB3	1:A:321:ILE:HD12	1.64	0.78
1:A:350:MET:CE	1:A:451:LEU:HD23	2.13	0.78
1:A:302:GLU:OE2	1:A:302:GLU:HA	1.82	0.78
1:A:357:ILE:O	1:A:361:ILE:HG12	1.83	0.77

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:262:PRO:CA	1:B:267:ASP:OD2	2.32	0.77
1:B:364:VAL:O	1:B:364:VAL:CG2	2.30	0.77
1:B:187:LYS:HG2	1:B:188:HIS:N	2.00	0.77
1:A:137:GLY:O	1:A:142:GLY:CA	2.33	0.77
1:A:144:GLU:O	1:A:148:GLN:HG3	1.83	0.77
1:A:121:THR:HG22	1:A:283:LEU:HD12	1.65	0.77
1:A:427:PHE:O	1:A:428:LYS:HD3	1.83	0.77
1:A:490:ILE:HG22	1:A:490:ILE:O	1.85	0.77
1:B:463:LEU:O	1:B:464:VAL:CG1	2.33	0.76
1:B:456:GLN:HB3	1:B:457:HIS:CD2	2.21	0.76
1:A:40:PRO:O	1:A:41:ILE:HB	1.86	0.75
1:B:302:GLU:HA	1:B:302:GLU:OE2	1.86	0.75
1:A:364:VAL:O	1:A:364:VAL:CG2	2.30	0.75
1:A:93:TYR:HA	1:A:96:GLU:OE1	1.85	0.75
1:B:281:GLU:O	1:B:281:GLU:HG2	1.87	0.75
1:B:463:LEU:C	1:B:464:VAL:HG13	2.08	0.74
1:A:124:ASP:OD1	1:A:127:ARG:NH2	2.20	0.74
1:A:32:LEU:N	1:A:32:LEU:HD23	2.02	0.74
1:B:310:TYR:O	1:B:314:ILE:HG13	1.88	0.73
1:B:184:LEU:O	1:B:266:THR:OG1	2.07	0.73
1:A:446:GLU:O	1:A:450:LEU:HB2	1.89	0.73
1:A:303:THR:CB	2:A:500:HEM:HBB2	2.17	0.73
1:A:156:GLU:HG2	1:A:160:LYS:HE3	1.72	0.72
1:A:111:ASP:HA	1:A:117:ASN:HB3	1.70	0.72
1:A:317:LYS:HD3	1:A:471:LEU:HD21	1.72	0.72
1:B:400:ASN:HB3	1:B:406:PRO:HG3	1.71	0.72
1:A:100:ARG:HH12	1:A:368:LEU:HB3	1.55	0.72
1:A:282:ARG:HA	1:A:282:ARG:HE	1.52	0.72
1:B:303:THR:HG23	3:B:1:OIO:H2A	1.72	0.72
1:A:140:LYS:O	1:A:141:GLN:CB	2.37	0.71
1:B:235:VAL:O	1:B:239:VAL:HG23	1.91	0.71
1:A:378:PHE:O	1:A:379:ARG:HB2	1.91	0.70
1:B:341:ILE:C	1:B:343:ASP:H	1.94	0.70
1:A:282:ARG:NH2	1:A:283:LEU:H	1.88	0.70
1:A:384:PRO:CG	1:A:387:THR:OG1	2.40	0.70
1:A:400:ASN:C	1:A:400:ASN:OD1	2.30	0.70
1:B:387:THR:CG2	1:B:388:VAL:N	2.54	0.70
1:A:235:VAL:O	1:A:239:VAL:HG23	1.92	0.70
1:B:264:ASP:OD1	1:B:264:ASP:C	2.30	0.69
1:A:258:ASP:OD1	1:A:258:ASP:C	2.30	0.69
1:A:317:LYS:HD3	1:A:471:LEU:CD2	2.22	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:258:ASP:C	1:B:258:ASP:OD2	2.29	0.69
1:A:100:ARG:HD3	1:A:369:PRO:O	1.92	0.69
1:A:270:LEU:HD13	1:A:270:LEU:N	2.07	0.69
1:B:141:GLN:OE1	1:B:141:GLN:HA	1.93	0.69
1:A:98:SER:O	1:A:435:ARG:NH2	2.24	0.69
1:B:144:GLU:OE2	1:B:341:ILE:HG12	1.92	0.69
1:A:384:PRO:HD2	1:A:387:THR:CB	2.23	0.69
1:A:462:PRO:C	1:A:463:LEU:CD2	2.61	0.69
1:A:121:THR:HG22	1:A:283:LEU:CD1	2.22	0.69
1:B:341:ILE:O	1:B:343:ASP:N	2.26	0.69
1:B:435:ARG:O	2:B:500:HEM:HBA2	1.94	0.68
1:A:450:LEU:O	1:A:454:ILE:HG13	1.92	0.68
1:B:38:PRO:HD2	1:B:38:PRO:O	1.93	0.68
1:B:262:PRO:HB2	1:B:267:ASP:HB3	1.75	0.68
1:A:269:LEU:CD1	1:A:289:ILE:HG23	2.24	0.67
1:B:387:THR:HG22	1:B:388:VAL:H	1.56	0.67
1:B:33:PRO:HB3	1:B:67:VAL:HG12	1.76	0.67
1:B:266:THR:O	1:B:270:LEU:HD22	1.93	0.67
1:B:418:ASN:O	1:B:420:LYS:N	2.23	0.67
1:B:136:TYR:OH	1:B:264:ASP:C	2.32	0.67
1:A:77:MET:HB3	1:A:388:VAL:HB	1.76	0.67
1:A:177:CYS:C	1:A:180:ILE:HG22	2.14	0.67
1:A:310:TYR:O	1:A:314:ILE:HG13	1.95	0.67
1:A:333:ILE:HG22	1:A:333:ILE:O	1.94	0.67
1:A:297:PHE:O	1:A:301:THR:OG1	2.06	0.67
1:A:367:ASN:HB2	1:A:391:PRO:O	1.94	0.67
1:A:339:PRO:HD3	1:A:456:GLN:OE1	1.95	0.66
1:B:283:LEU:HB3	1:B:284:TYR:HD2	1.60	0.66
1:A:93:TYR:CA	1:A:96:GLU:OE1	2.43	0.65
1:A:394:ASP:OD1	1:A:395:SER:N	2.29	0.65
1:B:283:LEU:HB3	1:B:284:TYR:CD2	2.30	0.65
1:B:285:THR:HG23	1:B:288:GLY:H	1.60	0.65
1:B:431:SER:OG	1:B:432:THR:N	2.29	0.65
1:A:88:GLU:O	1:A:92:ASP:HB2	1.97	0.65
1:A:384:PRO:HG2	1:A:387:THR:OG1	1.95	0.65
1:B:175:ALA:HB3	1:B:176:PRO:CD	2.27	0.65
1:B:222:PRO:O	1:B:226:HIS:HB2	1.97	0.65
1:A:345:GLN:HG3	1:A:346:GLU:HG2	1.78	0.65
1:B:281:GLU:OE1	1:B:281:GLU:N	2.30	0.64
1:B:463:LEU:O	1:B:464:VAL:HG13	1.95	0.64
1:A:308:LEU:HD22	1:A:447:LEU:HD23	1.79	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:437:CYS:HA	2:A:500:HEM:CHA	2.28	0.64
1:B:141:GLN:C	1:B:142:GLY:O	2.29	0.64
1:B:251:LYS:O	1:B:252:GLU:C	2.36	0.64
1:B:387:THR:CG2	1:B:388:VAL:H	2.08	0.64
1:A:38:PRO:HD2	1:A:38:PRO:O	1.97	0.64
1:B:394:ASP:OD1	1:B:395:SER:N	2.31	0.63
1:A:283:LEU:O	1:A:284:TYR:CD2	2.52	0.63
1:B:32:LEU:HD12	1:B:32:LEU:H	1.62	0.63
1:B:374:ARG:O	1:B:376:THR:HG22	2.00	0.62
1:B:300:GLY:CA	2:B:500:HEM:HBC2	2.29	0.62
1:B:309:ARG:O	1:B:485:TYR:OH	2.14	0.62
1:A:112:ARG:NH1	1:A:287:ASP:OD2	2.32	0.62
1:A:313:LEU:HA	1:A:316:MET:HE3	1.81	0.61
1:B:378:PHE:HB3	1:B:383:ILE:HD11	1.83	0.61
1:A:100:ARG:NH1	1:A:368:LEU:HB3	2.15	0.61
1:B:357:ILE:O	1:B:361:ILE:HG12	2.00	0.61
1:A:206:ASN:HD22	3:A:1:OIO:C8	2.13	0.61
1:A:430:PHE:O	1:A:431:SER:HB3	2.00	0.60
1:A:203:PHE:CE1	1:A:298:PHE:HB3	2.36	0.60
1:B:139:GLY:C	1:B:141:GLN:H	2.04	0.60
1:A:265:LEU:O	1:A:265:LEU:CD2	2.30	0.60
1:A:437:CYS:HA	2:A:500:HEM:C4D	2.35	0.60
1:B:263:ARG:N	1:B:267:ASP:OD2	2.33	0.60
1:B:466:PRO:HA	1:B:469:ILE:HD12	1.83	0.60
1:A:243:LYS:O	1:A:247:SER:N	2.35	0.60
1:B:73:GLY:HA2	1:B:221:PHE:CE1	2.37	0.60
1:A:267:ASP:HA	1:A:270:LEU:HD22	1.82	0.60
1:B:104:PRO:C	1:B:106:PHE:H	2.02	0.60
1:B:446:GLU:O	1:B:450:LEU:HB2	2.01	0.60
1:A:140:LYS:C	1:A:142:GLY:H	2.04	0.60
1:A:184:LEU:O	1:A:266:THR:OG1	2.11	0.60
1:A:425:ASP:O	1:A:428:LYS:HE3	2.03	0.59
1:B:341:ILE:C	1:B:343:ASP:N	2.56	0.59
1:A:282:ARG:NE	1:A:282:ARG:CA	2.60	0.59
1:B:226:HIS:O	1:B:226:HIS:ND1	2.32	0.59
1:B:284:TYR:CD2	1:B:284:TYR:N	2.70	0.59
1:B:141:GLN:OE1	1:B:141:GLN:CA	2.50	0.59
1:B:186:ARG:O	1:B:186:ARG:CG	2.44	0.59
1:B:463:LEU:O	1:B:464:VAL:HG12	2.03	0.59
1:B:328:GLU:O	1:B:332:VAL:HG23	2.02	0.59
1:B:136:TYR:OH	1:B:264:ASP:CA	2.51	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:349:TYR:O	1:B:353:VAL:HG23	2.03	0.58
1:B:96:GLU:OE1	1:B:96:GLU:N	2.30	0.58
1:B:299:ALA:O	1:B:303:THR:OG1	2.20	0.58
1:A:111:ASP:HA	1:A:117:ASN:CB	2.33	0.58
1:A:318:TYR:HB2	1:A:321:ILE:HD12	1.84	0.58
1:B:363:LEU:O	1:B:479:GLY:HA2	2.04	0.58
1:A:185:PHE:O	1:A:186:ARG:C	2.38	0.58
1:B:436:VAL:O	1:B:436:VAL:HG13	2.03	0.58
1:B:436:VAL:O	1:B:437:CYS:C	2.43	0.58
1:B:318:TYR:HB3	1:B:321:ILE:HG13	1.85	0.57
1:A:337:ARG:O	1:A:456:GLN:NE2	2.33	0.57
1:A:407:GLU:HG2	1:A:408:LYS:N	2.19	0.57
1:A:177:CYS:HG	1:A:196:PHE:HE1	1.52	0.57
1:A:267:ASP:O	1:A:270:LEU:N	2.38	0.57
1:A:131:THR:HG22	1:A:132:THR:N	2.17	0.57
1:A:230:GLY:HA3	1:A:232:HIS:CE1	2.40	0.57
1:B:312:LEU:O	1:B:316:MET:HG3	2.05	0.57
1:A:222:PRO:O	1:A:226:HIS:HB2	2.05	0.56
1:B:104:PRO:C	1:B:106:PHE:N	2.57	0.56
1:A:32:LEU:HD23	1:A:32:LEU:H	1.67	0.56
1:A:245:TYR:C	1:A:245:TYR:CD2	2.79	0.56
1:A:258:ASP:OD1	1:A:261:CYS:N	2.26	0.56
1:A:177:CYS:HB2	1:A:301:THR:HG23	1.88	0.56
1:B:71:TYR:CD1	1:B:76:ARG:HB2	2.40	0.56
1:A:384:PRO:HD2	1:A:384:PRO:O	2.04	0.56
1:A:436:VAL:O	1:A:437:CYS:C	2.44	0.56
1:B:71:TYR:CE1	1:B:76:ARG:HB2	2.41	0.56
1:B:95:ASP:OD2	1:B:434:LYS:HE3	2.06	0.56
1:B:463:LEU:C	1:B:464:VAL:CG1	2.69	0.56
1:B:230:GLY:HA3	1:B:232:HIS:CE1	2.40	0.56
1:B:32:LEU:HD12	1:B:32:LEU:N	2.20	0.55
1:B:53:ILE:HB	1:B:54:PRO:HD3	1.89	0.55
1:A:39:LEU:N	1:A:39:LEU:HD23	2.19	0.55
1:A:32:LEU:N	1:A:32:LEU:HD22	2.21	0.55
1:B:117:ASN:HB3	1:B:122:TRP:HB2	1.87	0.55
1:A:113:GLY:HA2	1:A:292:THR:OG1	2.07	0.55
1:B:142:GLY:HA2	1:B:146:ARG:H	1.72	0.55
1:B:180:ILE:HG13	1:B:184:LEU:HD22	1.89	0.55
1:A:333:ILE:O	1:A:333:ILE:CG2	2.54	0.55
1:A:166:PHE:CD2	1:A:487:LEU:O	2.59	0.55
1:A:420:LYS:CD	1:A:421:PHE:N	2.52	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:42:ILE:HG13	1:B:43:GLY:N	2.22	0.54
1:B:322:GLU:HG2	1:B:326:HIS:CD2	2.42	0.54
1:A:489:VAL:HG23	1:A:489:VAL:O	2.05	0.54
1:B:377:ILE:HG22	1:B:377:ILE:O	2.06	0.54
1:A:180:ILE:HG23	1:A:181:ALA:N	2.22	0.54
1:A:338:ILE:HG23	1:A:339:PRO:O	2.08	0.54
1:B:289:ILE:O	1:B:293:VAL:CG2	2.41	0.54
1:B:180:ILE:O	1:B:184:LEU:HB2	2.08	0.53
1:B:400:ASN:CB	1:B:406:PRO:HG3	2.37	0.53
1:A:285:THR:OG1	1:A:286:MET:N	2.42	0.53
1:B:39:LEU:HD12	1:B:42:ILE:HD11	1.90	0.53
1:B:430:PHE:O	1:B:431:SER:HB3	2.08	0.53
1:B:142:GLY:HA2	1:B:143:ASN:C	2.29	0.53
1:B:262:PRO:CB	1:B:267:ASP:HB3	2.37	0.53
1:B:228:LEU:HB3	1:B:229:PRO:CD	2.39	0.53
1:B:303:THR:HG23	3:B:1:OIO:H15	1.84	0.53
1:A:96:GLU:OE1	1:A:96:GLU:N	2.30	0.53
1:B:113:GLY:HA3	1:B:291:VAL:HG12	1.91	0.53
1:B:38:PRO:O	1:B:38:PRO:CD	2.56	0.52
1:A:136:TYR:CZ	1:A:264:ASP:HA	2.43	0.52
1:B:124:ASP:HB3	1:B:283:LEU:HD21	1.92	0.52
1:A:61:ALA:O	1:A:65:GLY:N	2.40	0.52
1:A:230:GLY:HA3	1:A:232:HIS:ND1	2.23	0.52
1:B:251:LYS:O	1:B:254:HIS:N	2.42	0.52
1:A:440:GLU:OE1	1:A:444:ARG:NH1	2.42	0.52
1:A:166:PHE:CD2	1:A:166:PHE:N	2.77	0.52
1:A:438:ALA:O	2:A:500:HEM:HBC2	2.09	0.52
1:B:317:LYS:O	1:B:319:PRO:HD3	2.08	0.52
1:B:333:ILE:HG22	1:B:333:ILE:O	2.09	0.52
1:A:226:HIS:O	1:A:226:HIS:ND1	2.38	0.52
1:B:93:TYR:HB3	1:B:96:GLU:HB2	1.91	0.52
1:A:351:ASP:O	1:A:355:HIS:ND1	2.43	0.52
1:A:376:THR:HG22	1:A:377:ILE:N	2.25	0.52
1:A:437:CYS:HB2	2:A:500:HEM:C4A	2.44	0.52
1:B:100:ARG:HD3	1:B:369:PRO:O	2.10	0.51
1:B:186:ARG:HD2	1:B:263:ARG:HB3	1.93	0.51
1:B:195:LYS:O	1:B:199:LEU:HD22	2.10	0.51
1:A:435:ARG:O	2:A:500:HEM:HBA2	2.11	0.51
1:B:203:PHE:HA	3:B:1:OIO:H7A	1.91	0.51
1:B:285:THR:HG23	1:B:288:GLY:N	2.25	0.51
1:B:376:THR:OG1	1:B:377:ILE:N	2.42	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:93:TYR:HB3	1:A:96:GLU:HB2	1.93	0.51
1:A:238:ASN:OD1	1:A:238:ASN:N	2.42	0.51
1:A:354:VAL:O	1:A:358:GLN:HG3	2.11	0.51
1:B:300:GLY:HA2	2:B:500:HEM:HBC2	1.93	0.51
1:B:416:ASN:HB3	1:B:422:LYS:HD3	1.92	0.51
1:B:317:LYS:HD3	1:B:471:LEU:CD2	2.41	0.51
1:B:249:ARG:N	1:B:249:ARG:HH11	2.09	0.50
1:A:427:PHE:O	1:A:428:LYS:CD	2.58	0.50
1:B:150:GLU:O	1:B:151:ALA:C	2.45	0.50
1:B:273:MET:CE	1:B:286:MET:HG2	2.41	0.50
1:B:400:ASN:OD1	1:B:400:ASN:C	2.49	0.50
1:A:82:GLY:O	1:A:86:VAL:CG2	2.55	0.50
1:A:270:LEU:N	1:A:270:LEU:CD1	2.68	0.50
1:B:88:GLU:O	1:B:92:ASP:HB2	2.11	0.50
1:B:141:GLN:O	1:B:142:GLY:O	2.30	0.50
1:B:218:TYR:O	1:B:219:ASN:C	2.44	0.50
1:A:367:ASN:HD22	1:A:391:PRO:HB2	1.77	0.50
1:B:142:GLY:C	1:B:144:GLU:N	2.64	0.50
1:B:285:THR:OG1	1:B:286:MET:N	2.43	0.50
1:B:264:ASP:O	1:B:267:ASP:HB2	2.12	0.50
1:B:86:VAL:O	1:B:86:VAL:CG1	2.59	0.50
1:A:430:PHE:O	1:A:431:SER:CB	2.59	0.49
1:B:303:THR:CG2	3:B:1:OIO:C15	2.67	0.49
1:B:248:GLU:HB2	1:B:249:ARG:HH12	1.75	0.49
1:B:317:LYS:HD3	1:B:471:LEU:HD21	1.94	0.49
1:A:159:ARG:HH21	1:A:159:ARG:CG	2.24	0.49
1:B:474:ILE:N	1:B:481:ILE:O	2.46	0.49
1:B:489:VAL:HG23	1:B:489:VAL:O	2.12	0.49
1:A:96:GLU:O	1:A:373:THR:OG1	2.31	0.49
1:A:246:VAL:O	1:A:246:VAL:HG12	2.13	0.49
1:B:98:SER:HB2	1:B:434:LYS:HG2	1.93	0.49
1:A:113:GLY:HA3	1:A:291:VAL:HG12	1.95	0.49
1:A:137:GLY:O	1:A:142:GLY:HA3	2.12	0.49
1:B:33:PRO:HD2	1:B:69:THR:OG1	2.13	0.49
1:B:362:THR:O	1:B:362:THR:OG1	2.29	0.48
1:B:75:GLN:HG3	1:B:76:ARG:N	2.27	0.48
1:B:124:ASP:OD1	1:B:127:ARG:NH2	2.47	0.48
1:A:38:PRO:O	1:A:38:PRO:CD	2.60	0.48
1:A:233:ARG:O	1:A:237:LYS:HG3	2.13	0.48
1:A:96:GLU:H	1:A:96:GLU:CD	2.12	0.48
1:A:258:ASP:OD1	1:A:258:ASP:O	2.30	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:317:LYS:HD2	1:A:469:ILE:HB	1.95	0.48
1:A:337:ARG:HD2	1:A:338:ILE:O	2.13	0.48
1:B:393:LEU:O	1:B:394:ASP:C	2.51	0.48
1:A:317:LYS:C	1:A:319:PRO:HD3	2.31	0.48
1:B:300:GLY:HA3	2:B:500:HEM:HBC2	1.94	0.48
1:A:246:VAL:O	1:A:246:VAL:CG1	2.61	0.48
1:A:257:LEU:HD12	1:A:258:ASP:N	2.28	0.48
1:B:284:TYR:HD2	1:B:284:TYR:N	2.11	0.48
1:B:450:LEU:HA	1:B:450:LEU:HD23	1.52	0.48
1:B:251:LYS:O	1:B:253:HIS:N	2.47	0.48
1:B:257:LEU:CD1	1:B:258:ASP:C	2.82	0.48
1:A:111:ASP:CA	1:A:117:ASN:HB3	2.40	0.48
1:A:437:CYS:HB2	2:A:500:HEM:C1A	2.49	0.48
1:B:402:GLU:OE1	1:B:424:SER:OG	2.28	0.48
1:B:464:VAL:O	1:B:465:ASP:C	2.49	0.48
1:A:51:LYS:HG2	1:A:213:PRO:HG3	1.94	0.48
1:A:363:LEU:O	1:A:479:GLY:HA2	2.13	0.48
1:B:257:LEU:HD11	1:B:258:ASP:C	2.33	0.48
1:B:158:LEU:HD23	1:B:158:LEU:HA	1.73	0.48
1:A:136:TYR:HH	1:A:264:ASP:HA	1.75	0.47
1:A:487:LEU:HD12	1:A:487:LEU:O	2.10	0.47
1:B:51:LYS:HB3	1:B:213:PRO:HG3	1.96	0.47
1:B:251:LYS:C	1:B:253:HIS:N	2.65	0.47
1:A:206:ASN:HD21	1:A:238:ASN:HB2	1.80	0.47
1:B:156:GLU:O	1:B:160:LYS:HG3	2.15	0.47
1:B:462:PRO:C	1:B:463:LEU:CD2	2.70	0.47
1:A:111:ASP:HA	1:A:117:ASN:HA	1.96	0.47
1:A:175:ALA:HB3	1:A:176:PRO:CD	2.44	0.47
1:B:98:SER:CB	1:B:434:LYS:HG2	2.45	0.47
1:B:273:MET:HE3	1:B:286:MET:HG2	1.96	0.47
1:A:298:PHE:O	1:A:299:ALA:C	2.44	0.47
1:B:338:ILE:HG23	1:B:339:PRO:N	2.25	0.47
1:B:393:LEU:O	1:B:396:VAL:N	2.48	0.47
1:A:167:ASP:OD2	1:A:169:THR:OG1	2.32	0.47
1:A:195:LYS:HE3	1:A:245:TYR:HD1	1.79	0.46
1:A:167:ASP:CG	1:A:169:THR:HG1	2.19	0.46
1:B:111:ASP:HA	1:B:117:ASN:HA	1.97	0.46
1:B:366:SER:O	1:B:367:ASN:CB	2.64	0.46
1:A:408:LYS:HD3	1:A:408:LYS:N	2.31	0.46
1:A:489:VAL:O	1:A:489:VAL:CG2	2.63	0.46
1:B:346:GLU:O	1:B:348:PRO:HD3	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:398:TYR:O	1:A:399:ASP:C	2.53	0.46
1:A:148:GLN:OE1	1:A:338:ILE:CG2	2.64	0.46
1:B:367:ASN:HB2	1:B:391:PRO:O	2.15	0.46
1:B:265:LEU:O	1:B:265:LEU:CD2	2.32	0.46
1:A:225:LEU:HA	1:A:228:LEU:HD12	1.96	0.46
1:B:226:HIS:HD1	1:B:226:HIS:C	2.15	0.46
1:A:311:GLY:HA2	1:A:314:ILE:HG13	1.97	0.46
1:A:384:PRO:CD	1:A:384:PRO:O	2.64	0.46
1:B:436:VAL:O	1:B:436:VAL:CG1	2.63	0.46
1:A:53:ILE:HB	1:A:54:PRO:HD3	1.98	0.46
1:A:258:ASP:OD1	1:A:260:ASN:N	2.49	0.46
1:A:338:ILE:HG23	1:A:339:PRO:N	2.30	0.46
1:A:353:VAL:HG12	1:A:354:VAL:N	2.29	0.45
1:A:428:LYS:HD3	1:A:428:LYS:N	2.26	0.45
1:B:142:GLY:CA	1:B:143:ASN:C	2.84	0.45
1:A:115:ILE:HG22	1:A:115:ILE:O	2.17	0.45
1:B:403:PHE:N	1:B:404:PRO:CD	2.80	0.45
1:A:62:GLN:H	1:A:62:GLN:HG2	1.38	0.45
1:A:104:PRO:C	1:A:106:PHE:N	2.69	0.45
1:A:156:GLU:O	1:A:160:LYS:HG3	2.17	0.45
1:B:318:TYR:CB	1:B:321:ILE:HG13	2.46	0.45
1:B:50:LEU:HD11	1:B:217:LEU:CD1	2.39	0.45
1:A:148:GLN:OE1	1:A:338:ILE:HG21	2.17	0.45
1:B:177:CYS:O	1:B:181:ALA:HB2	2.17	0.45
1:A:167:ASP:HA	1:A:168:PRO:HD3	1.76	0.44
1:B:138:MET:C	1:B:140:LYS:H	2.15	0.44
1:B:187:LYS:CG	1:B:188:HIS:N	2.72	0.44
1:A:138:MET:HG3	1:A:139:GLY:CA	2.44	0.44
1:B:179:VAL:O	1:B:179:VAL:CG1	2.57	0.44
1:B:249:ARG:HA	1:B:249:ARG:HD3	1.70	0.44
1:B:487:LEU:HD12	1:B:487:LEU:O	2.13	0.44
1:A:377:ILE:HA	1:A:381:TYR:O	2.17	0.44
1:B:285:THR:OG1	1:B:287:ASP:N	2.50	0.44
1:B:482:PRO:HA	1:B:483:PRO:HD3	1.77	0.44
1:A:316:MET:HB3	1:A:462:PRO:HG3	1.99	0.44
1:A:327:GLU:HG3	1:A:328:GLU:H	1.72	0.44
1:B:320:GLU:H	1:B:320:GLU:HG2	1.51	0.44
1:A:166:PHE:CE2	1:A:487:LEU:O	2.70	0.44
1:A:180:ILE:CG2	1:A:181:ALA:N	2.79	0.44
1:B:53:ILE:N	1:B:54:PRO:CD	2.80	0.44
1:B:249:ARG:NH1	1:B:249:ARG:HG2	2.31	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:350:MET:HE1	1:A:451:LEU:HD23	1.97	0.44
1:B:378:PHE:O	1:B:379:ARG:HB2	2.18	0.44
1:A:408:LYS:HA	1:A:408:LYS:HD2	1.49	0.44
1:B:298:PHE:CD1	1:B:298:PHE:C	2.91	0.44
1:A:442:LEU:O	1:A:446:GLU:CG	2.58	0.44
1:B:398:TYR:O	1:B:399:ASP:C	2.52	0.44
1:A:367:ASN:CB	1:A:391:PRO:O	2.66	0.44
1:B:264:ASP:OD1	1:B:264:ASP:O	2.35	0.44
1:B:490:ILE:HD12	1:B:490:ILE:HG23	1.70	0.44
1:B:150:GLU:O	1:B:153:PHE:N	2.51	0.43
1:B:436:VAL:O	1:B:437:CYS:O	2.36	0.43
1:A:270:LEU:HD12	1:A:270:LEU:HA	1.75	0.43
1:B:71:TYR:HA	1:B:76:ARG:HA	2.00	0.43
1:B:254:HIS:O	1:B:257:LEU:HB3	2.19	0.43
1:A:338:ILE:HG12	1:A:339:PRO:HD2	2.01	0.43
1:B:175:ALA:CB	1:B:176:PRO:CD	2.94	0.43
1:B:286:MET:HE2	1:B:286:MET:HB3	1.61	0.43
1:A:53:ILE:N	1:A:54:PRO:CD	2.79	0.43
1:A:341:ILE:C	1:A:343:ASP:N	2.71	0.43
1:A:399:ASP:HB3	1:A:402:GLU:HB3	2.01	0.43
1:B:209:LEU:HD23	1:B:209:LEU:HA	1.83	0.43
1:A:149:ARG:HD2	1:A:149:ARG:HA	1.86	0.43
1:A:212:THR:O	1:A:216:GLN:HG2	2.18	0.43
1:A:258:ASP:HA	1:A:259:PRO:HD2	1.90	0.43
1:B:257:LEU:HD12	1:B:258:ASP:CA	2.37	0.43
1:A:33:PRO:HB2	1:A:69:THR:OG1	2.19	0.43
1:A:267:ASP:O	1:A:268:CYS:C	2.55	0.43
1:B:40:PRO:O	1:B:41:ILE:HB	2.17	0.43
1:B:354:VAL:O	1:B:358:GLN:HG3	2.18	0.43
1:B:356:GLU:OE1	1:B:356:GLU:HA	2.19	0.43
1:A:115:ILE:HG23	2:A:500:HEM:HAD2	2.01	0.43
1:A:374:ARG:O	1:A:375:ASP:C	2.56	0.43
1:A:226:HIS:HD1	1:A:226:HIS:C	2.18	0.43
1:A:158:LEU:O	1:A:161:THR:OG1	2.31	0.42
1:A:408:LYS:N	1:A:408:LYS:CD	2.79	0.42
1:B:256:SER:O	1:B:256:SER:OG	2.36	0.42
1:A:266:THR:O	1:A:270:LEU:HD22	2.18	0.42
1:A:431:SER:OG	1:A:432:THR:N	2.52	0.42
1:A:456:GLN:CB	1:A:457:HIS:ND1	2.70	0.42
1:B:341:ILE:HG12	1:B:341:ILE:H	1.48	0.42
1:A:257:LEU:O	1:A:257:LEU:HG	2.10	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:93:TYR:C	1:A:96:GLU:OE1	2.58	0.42
1:A:456:GLN:CD	1:A:457:HIS:CE1	2.93	0.42
1:B:193:ASP:OD1	1:B:193:ASP:C	2.57	0.42
1:B:393:LEU:H	1:B:393:LEU:HG	1.47	0.42
1:A:373:THR:O	1:A:385:LYS:HG3	2.20	0.42
1:B:187:LYS:HG2	1:B:188:HIS:H	1.83	0.42
1:B:322:GLU:O	1:B:325:LEU:HB2	2.19	0.42
1:A:32:LEU:HD22	1:A:32:LEU:HA	1.82	0.42
1:A:156:GLU:O	1:A:159:ARG:HB2	2.20	0.42
1:B:250:VAL:HG12	1:B:251:LYS:N	2.33	0.42
1:A:377:ILE:N	1:A:377:ILE:HD12	2.35	0.42
1:B:175:ALA:HB3	1:B:176:PRO:HD2	1.97	0.42
1:B:264:ASP:OD1	1:B:267:ASP:N	2.33	0.42
1:B:185:PHE:O	1:B:186:ARG:C	2.57	0.42
1:A:36:PRO:HB2	1:A:44:ASN:ND2	2.35	0.42
1:A:53:ILE:HA	1:A:53:ILE:HD13	1.69	0.42
1:A:149:ARG:HH11	1:A:149:ARG:HG2	1.85	0.42
1:B:257:LEU:HD11	1:B:258:ASP:O	2.20	0.42
1:A:462:PRO:C	1:A:463:LEU:HD22	2.38	0.41
1:A:481:ILE:HA	1:A:482:PRO:HD2	1.93	0.41
1:B:383:ILE:HA	1:B:384:PRO:HD2	1.71	0.41
1:A:140:LYS:C	1:A:141:GLN:HG3	2.40	0.41
1:A:177:CYS:HA	1:A:180:ILE:HG22	2.03	0.41
1:A:195:LYS:O	1:A:199:LEU:CD2	2.68	0.41
1:A:383:ILE:N	1:A:383:ILE:HD12	2.34	0.41
1:B:361:ILE:HD13	1:B:361:ILE:HG21	1.80	0.41
1:A:112:ARG:HG2	1:A:112:ARG:HH11	1.85	0.41
1:A:400:ASN:OD1	1:A:400:ASN:O	2.38	0.41
1:A:463:LEU:HD22	1:A:463:LEU:HA	1.57	0.41
1:B:63:ARG:HB3	1:B:64:PHE:CE2	2.56	0.41
1:B:150:GLU:C	1:B:152:HIS:N	2.71	0.41
1:B:228:LEU:HB3	1:B:229:PRO:HD2	2.02	0.41
1:B:298:PHE:HB2	3:B:1:OIO:H7	2.03	0.41
1:B:302:GLU:OE2	1:B:302:GLU:CA	2.49	0.41
1:A:315:LEU:HA	1:A:315:LEU:HD23	1.78	0.41
1:B:333:ILE:O	1:B:333:ILE:CG2	2.68	0.41
1:A:453:ALA:O	1:A:454:ILE:C	2.56	0.41
1:B:205:GLU:OE1	1:B:238:ASN:ND2	2.37	0.41
1:B:378:PHE:HB3	1:B:383:ILE:CD1	2.50	0.41
1:A:103:LEU:HD23	1:A:219:ASN:OD1	2.20	0.41
1:A:195:LYS:O	1:A:199:LEU:HD23	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:42:ILE:HG13	1:A:43:GLY:N	2.35	0.41
1:B:175:ALA:HB3	1:B:176:PRO:HD3	2.02	0.41
1:A:249:ARG:NH1	1:A:252:GLU:OE2	2.53	0.41
1:B:298:PHE:O	1:B:299:ALA:C	2.56	0.41
1:B:364:VAL:HA	1:B:365:PRO:HD2	1.77	0.41
1:A:341:ILE:HG21	1:A:341:ILE:HD13	1.85	0.40
1:A:392:THR:O	1:A:395:SER:OG	2.35	0.40
1:B:112:ARG:CA	1:B:117:ASN:ND2	2.84	0.40
1:B:371:GLU:OE1	1:B:386:GLY:O	2.39	0.40
1:A:111:ASP:HA	1:A:117:ASN:CA	2.52	0.40
1:A:166:PHE:CE2	1:A:487:LEU:CD1	3.04	0.40
1:B:266:THR:O	1:B:269:LEU:HB2	2.21	0.40
1:B:443:ALA:O	1:B:447:LEU:HG	2.22	0.40
1:A:94:LYS:O	1:A:98:SER:OG	2.35	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	461/476 (97%)	444 (96%)	12 (3%)	5 (1%)	14 42
1	B	461/476 (97%)	445 (96%)	11 (2%)	5 (1%)	14 42
All	All	922/952 (97%)	889 (96%)	23 (2%)	10 (1%)	14 42

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	342	LYS
1	B	419	GLY
1	B	437	CYS
1	A	38	PRO

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Mol	Chain	Res	Type
1	A	437	CYS
1	A	431	SER
1	B	391	PRO
1	B	38	PRO
1	A	262	PRO
1	A	391	PRO

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	417/428 (97%)	376 (90%)	41 (10%)	8 24
1	B	417/428 (97%)	369 (88%)	48 (12%)	5 17
All	All	834/856 (97%)	745 (89%)	89 (11%)	6 20

All (89) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	LYS
1	A	32	LEU
1	A	46	PHE
1	A	59	ARG
1	A	80	MET
1	A	90	LEU
1	A	98	SER
1	A	112	ARG
1	A	114	ILE
1	A	117	ASN
1	A	131	THR
1	A	138	MET
1	A	162	GLN
1	A	166	PHE
1	A	184	LEU
1	A	207	PHE
1	A	238	ASN

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Mol	Chain	Res	Type
1	A	256	SER
1	A	258	ASP
1	A	270	LEU
1	A	278	HIS
1	A	282	ARG
1	A	283	LEU
1	A	285	THR
1	A	304	THR
1	A	308	LEU
1	A	310	TYR
1	A	312	LEU
1	A	327	GLU
1	A	353	VAL
1	A	364	VAL
1	A	373	THR
1	A	412	GLU
1	A	418	ASN
1	A	420	LYS
1	A	452	CYS
1	A	463	LEU
1	A	471	LEU
1	A	487	LEU
1	A	490	ILE
1	A	493	SER
1	B	37	PHE
1	B	46	PHE
1	B	47	GLN
1	B	51	LYS
1	B	62	GLN
1	B	70	LEU
1	B	90	LEU
1	B	95	ASP
1	B	112	ARG
1	B	114	ILE
1	B	121	THR
1	B	129	SER
1	B	130	LEU
1	B	138	MET
1	B	140	LYS
1	B	145	SER
1	B	159	ARG
1	B	184	LEU

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Mol	Chain	Res	Type
1	B	207	PHE
1	B	211	SER
1	B	225	LEU
1	B	236	ILE
1	B	250	VAL
1	B	251	LYS
1	B	253	HIS
1	B	255	GLN
1	B	258	ASP
1	B	261	CYS
1	B	267	ASP
1	B	278	HIS
1	B	285	THR
1	B	298	PHE
1	B	303	THR
1	B	310	TYR
1	B	341	ILE
1	B	364	VAL
1	B	368	LEU
1	B	373	THR
1	B	375	ASP
1	B	376	THR
1	B	382	LEU
1	B	395	SER
1	B	412	GLU
1	B	425	ASP
1	B	452	CYS
1	B	463	LEU
1	B	471	LEU
1	B	487	LEU

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

Mol	Chain	Res	Type
1	A	206	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

4 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	$\#\|Z\| > 2$
2	HEM	A	500	3,1	41,50,50	1.95	6 (14%)	45,82,82	1.83	10 (22%)
3	OIO	A	1	2	14,15,15	1.17	2 (14%)	15,17,17	1.16	2 (13%)
2	HEM	B	500	3,1	41,50,50	1.96	7 (17%)	45,82,82	1.74	9 (20%)
3	OIO	B	1	2	14,15,15	1.17	2 (14%)	15,17,17	1.16	2 (13%)

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	500	3,1	-	9/12/54/54	-
3	OIO	A	1	2	-	5/10/10/10	0/1/1/1
2	HEM	B	500	3,1	-	3/12/54/54	-
3	OIO	B	1	2	-	5/10/10/10	0/1/1/1

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	500	HEM	C3D-C2D	7.22	1.52	1.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	500	HEM	C3D-C2D	7.00	1.51	1.36
2	A	500	HEM	C3C-C2C	-5.48	1.32	1.40
2	B	500	HEM	C3C-C2C	-5.32	1.33	1.40
2	A	500	HEM	C3C-CAC	3.96	1.55	1.47
3	A	1	OIO	C12-N11	-3.51	1.31	1.37
3	B	1	OIO	C12-N11	-3.48	1.31	1.37
2	B	500	HEM	C3C-CAC	3.07	1.54	1.47
2	B	500	HEM	CAB-C3B	2.85	1.55	1.47
2	A	500	HEM	FE-NB	2.75	2.10	1.96
2	A	500	HEM	CAA-C2A	2.75	1.56	1.52
2	A	500	HEM	CAB-C3B	2.54	1.54	1.47
2	B	500	HEM	FE-NB	2.26	2.08	1.96
2	B	500	HEM	CAA-C2A	2.19	1.55	1.52
3	B	1	OIO	O10-C8	-2.06	1.23	1.30
2	B	500	HEM	CMB-C2B	2.05	1.55	1.50
3	A	1	OIO	O10-C8	-2.04	1.23	1.30

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	500	HEM	C4D-ND-C1D	6.62	111.91	105.07
2	B	500	HEM	C4D-ND-C1D	5.87	111.14	105.07
2	A	500	HEM	C4C-CHD-C1D	3.58	127.28	122.56
2	B	500	HEM	CAD-CBD-CGD	-3.49	106.09	113.60
2	A	500	HEM	C4B-CHC-C1C	2.96	126.47	122.56
2	B	500	HEM	C4A-C3A-C2A	2.80	108.94	107.00
2	B	500	HEM	C4C-CHD-C1D	2.78	126.23	122.56
2	A	500	HEM	CHC-C4B-NB	2.64	127.30	124.43
2	A	500	HEM	CAD-CBD-CGD	-2.58	108.04	113.60
2	B	500	HEM	CHC-C4B-NB	2.56	127.21	124.43
2	B	500	HEM	C2C-C3C-C4C	2.46	108.61	106.90
2	A	500	HEM	CMD-C2D-C1D	2.39	128.68	125.04
2	B	500	HEM	O1D-CGD-CBD	-2.30	115.69	123.08
2	A	500	HEM	C4A-C3A-C2A	2.18	108.52	107.00
3	A	1	OIO	C2-C1-N11	-2.16	105.67	111.64
3	B	1	OIO	C2-C1-N11	-2.15	105.69	111.64
2	B	500	HEM	O2D-CGD-CBD	2.12	120.83	114.03
2	A	500	HEM	C1B-NB-C4B	2.09	107.23	105.07
2	A	500	HEM	O1D-CGD-CBD	-2.07	116.45	123.08
2	A	500	HEM	CBA-CAA-C2A	2.06	116.14	112.62
3	A	1	OIO	C6-C7-C8	-2.06	109.28	114.47
2	B	500	HEM	CHA-C4D-ND	2.05	126.91	124.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	1	OIO	C6-C7-C8	-2.04	109.33	114.47

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	500	HEM	C2B-C3B-CAB-CBB
2	A	500	HEM	C4B-C3B-CAB-CBB
3	A	1	OIO	C2-C3-C4-C5
3	B	1	OIO	C2-C3-C4-C5
3	A	1	OIO	C1-C2-C3-C4
3	B	1	OIO	C1-C2-C3-C4
2	A	500	HEM	C4D-C3D-CAD-CBD
2	A	500	HEM	CAA-CBA-CGA-O1A
2	B	500	HEM	CAD-CBD-CGD-O1D
2	A	500	HEM	C2D-C3D-CAD-CBD
2	A	500	HEM	CAA-CBA-CGA-O2A
2	A	500	HEM	C3D-CAD-CBD-CGD
2	B	500	HEM	CAD-CBD-CGD-O2D
3	A	1	OIO	C6-C7-C8-O10
2	A	500	HEM	CAD-CBD-CGD-O1D
3	A	1	OIO	C6-C7-C8-O9
3	B	1	OIO	C6-C7-C8-O9
2	A	500	HEM	CAD-CBD-CGD-O2D
3	B	1	OIO	C6-C7-C8-O10
3	A	1	OIO	C4-C5-C6-C7
3	B	1	OIO	C4-C5-C6-C7
2	B	500	HEM	CAA-CBA-CGA-O2A

There are no ring outliers.

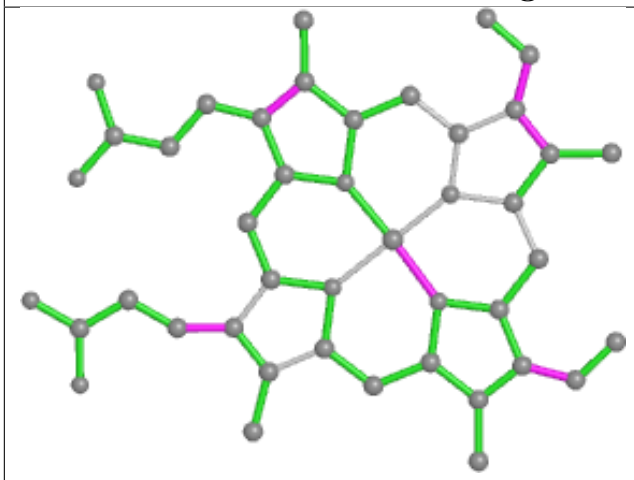
4 monomers are involved in 31 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	500	HEM	10	0
3	A	1	OIO	7	0
2	B	500	HEM	4	0
3	B	1	OIO	10	0

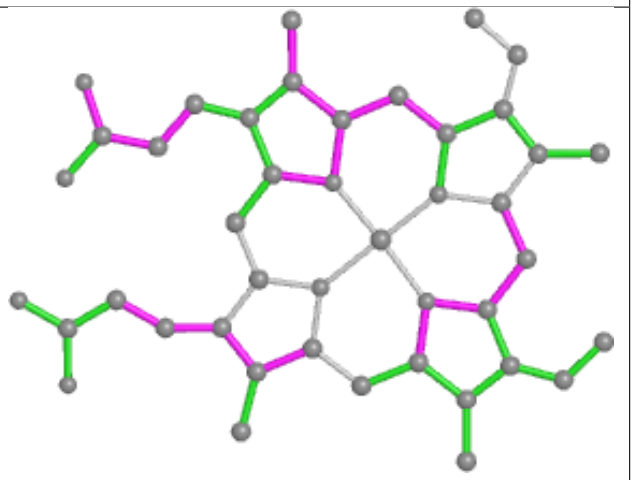
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

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.

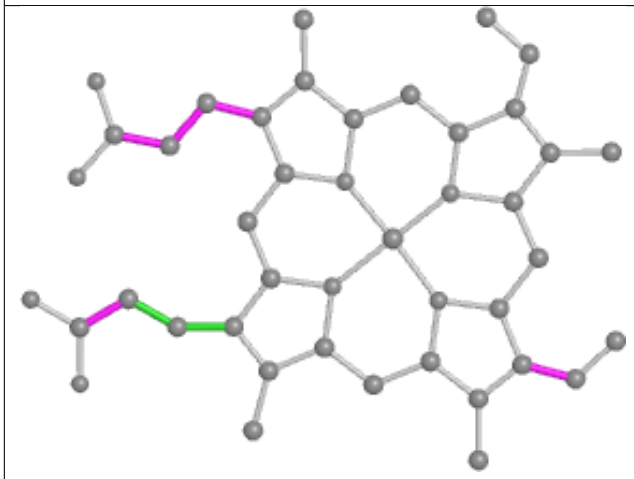
Ligand HEM A 500



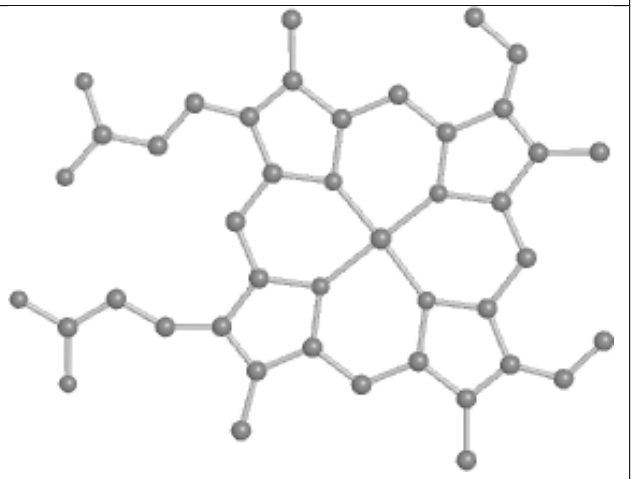
Bond lengths



Bond angles

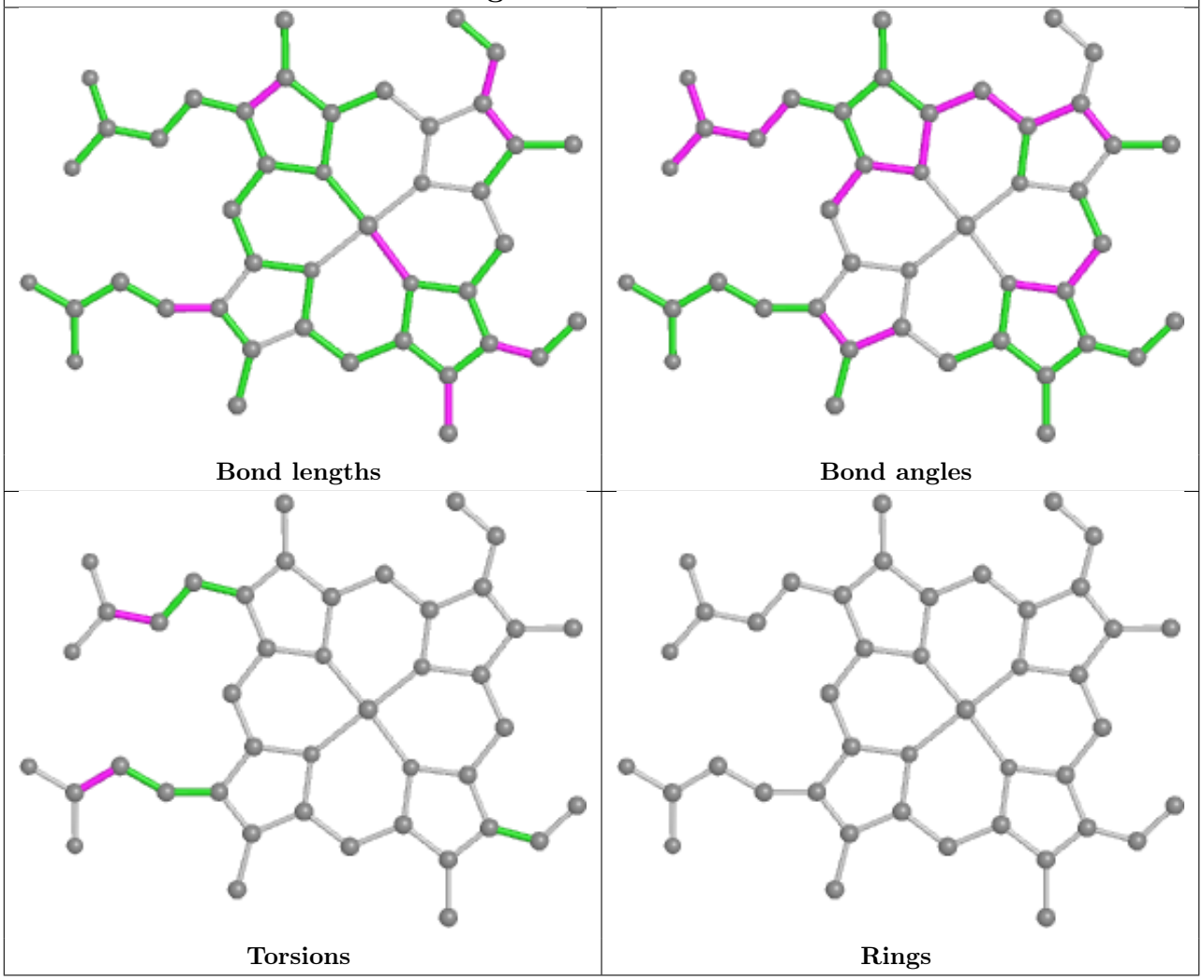


Torsions



Rings

Ligand HEM B 500



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	463/476 (97%)	-0.11	1 (0%)	95	95	24, 48, 76, 92	0
1	B	463/476 (97%)	-0.12	1 (0%)	95	95	27, 48, 74, 91	0
All	All	926/952 (97%)	-0.12	2 (0%)	95	95	24, 48, 75, 92	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	278	HIS	2.5
1	A	172	ILE	2.1

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, 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
3	OIO	A	1	15/15	0.87	0.41	56,61,62,63	0
3	OIO	B	1	15/15	0.87	0.49	56,61,62,63	0
2	HEM	B	500	43/43	0.97	0.25	37,41,44,44	0

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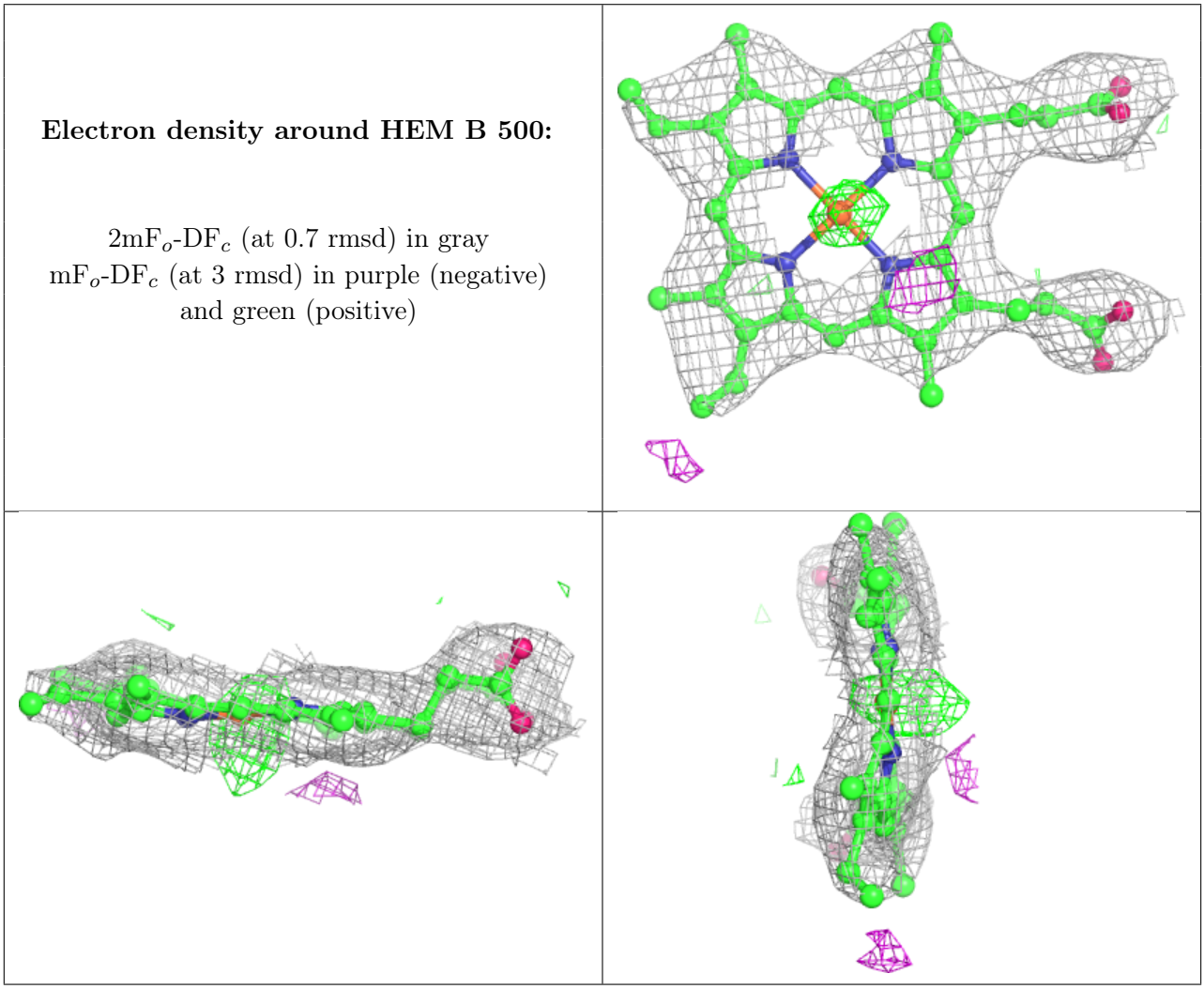
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	HEM	A	500	43/43	0.98	0.21	25,30,37,41	0

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.

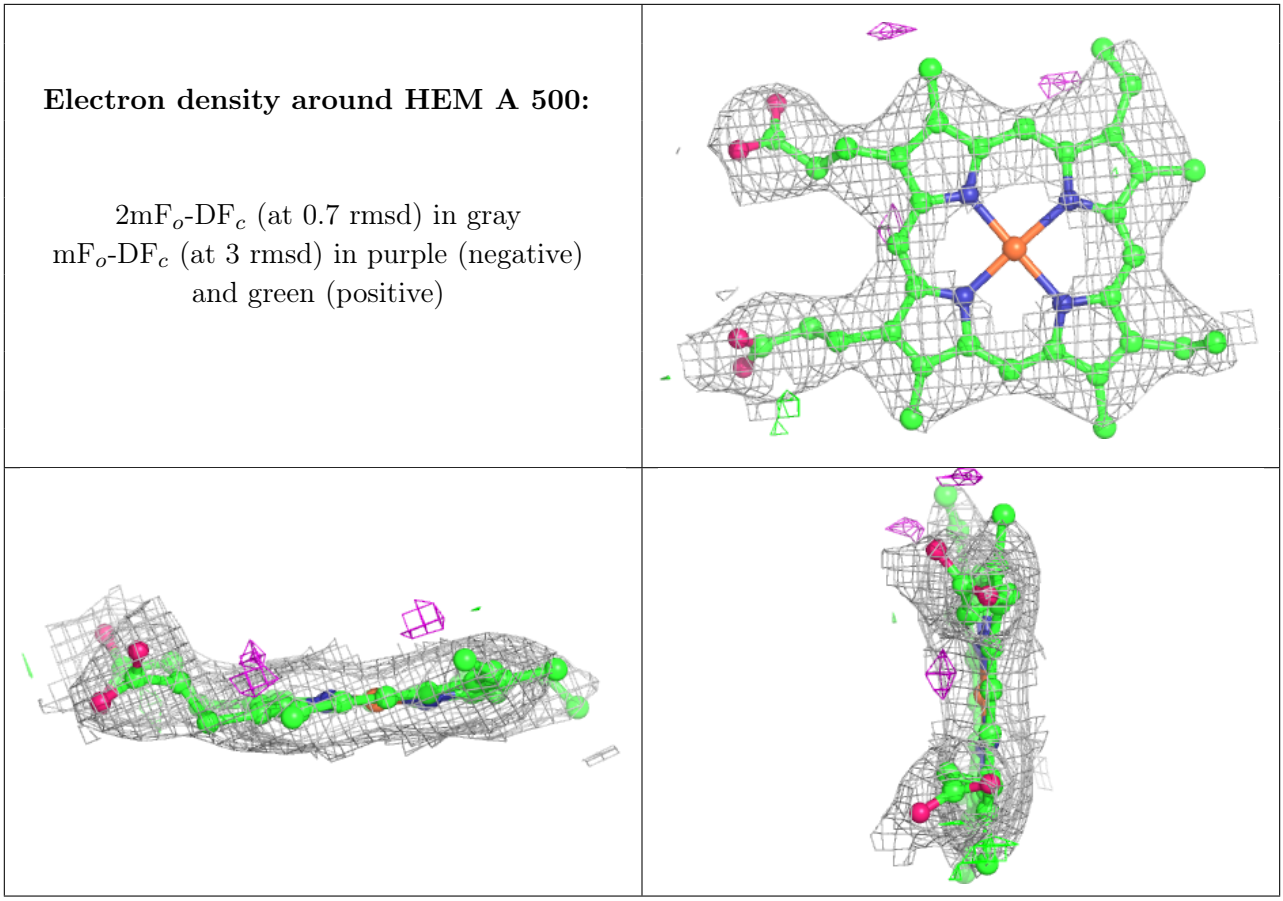
Electron density around HEM B 500:

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



Electron density around HEM A 500:

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



6.5 Other polymers

There are no such residues in this entry.