



Full wwPDB X-ray Structure Validation Report ⓘ

May 20, 2025 – 02:07 AM EDT

PDB ID : 2ZQX / pdb_00002zqx
Title : Cytochrome P450BSbeta cocrystallized with heptanoic acid
Authors : Shoji, O.; Fujishiro, T.; Nagano, S.; Hirose, T.; Shiro, Y.; Watanabe, Y.
Deposited on : 2008-08-22
Resolution : 2.37 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 : 4-5-2 with Phenix2.0rc1
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 2.0rc1
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.006 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.43.1

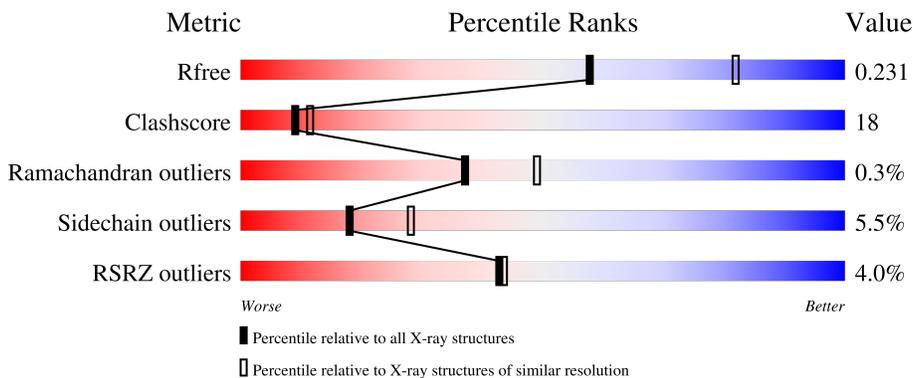
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.37 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}	164625	6699 (2.40-2.36)
Clashscore	180529	7414 (2.40-2.36)
Ramachandran outliers	177936	7337 (2.40-2.36)
Sidechain outliers	177891	7338 (2.40-2.36)
RSRZ outliers	164620	6699 (2.40-2.36)

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 $\leq 5\%$. 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	417	 8% 67% 28% 5%
1	B	417	 3% 62% 33% 5%
1	C	417	 8% 57% 36% 5%

2 Entry composition [i](#)

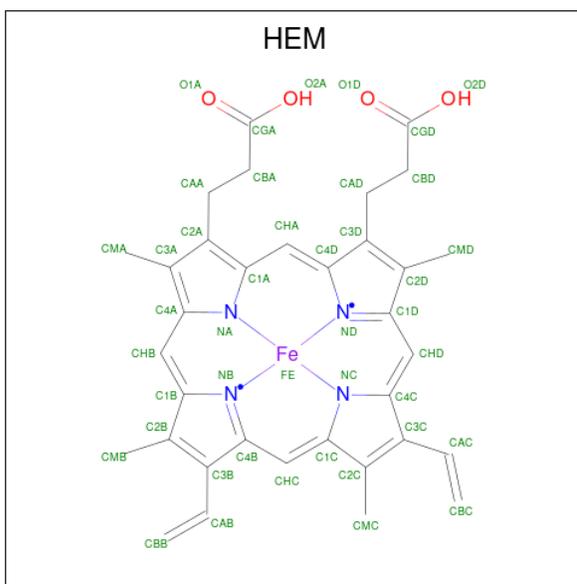
There are 3 unique types of molecules in this entry. The entry contains 10327 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 152A1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	411	Total 3339	C 2125	N 594	O 601	S 19	0	0	0
1	B	411	Total 3339	C 2125	N 594	O 601	S 19	0	0	0
1	C	411	Total 3339	C 2125	N 594	O 601	S 19	0	0	0

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



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

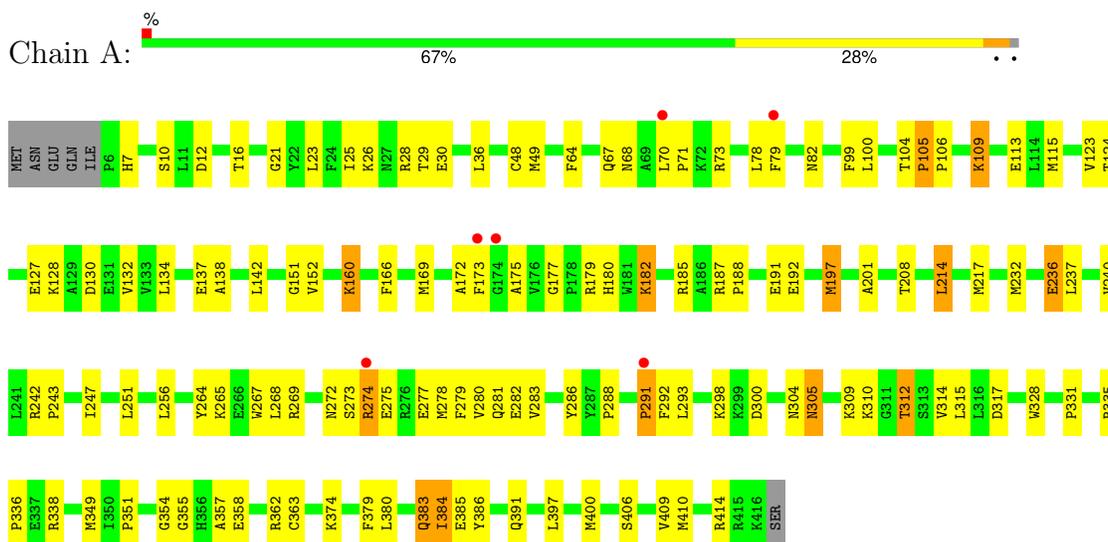
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	88	Total 88	O 88	0	0
3	B	67	Total 67	O 67	0	0
3	C	26	Total 26	O 26	0	0

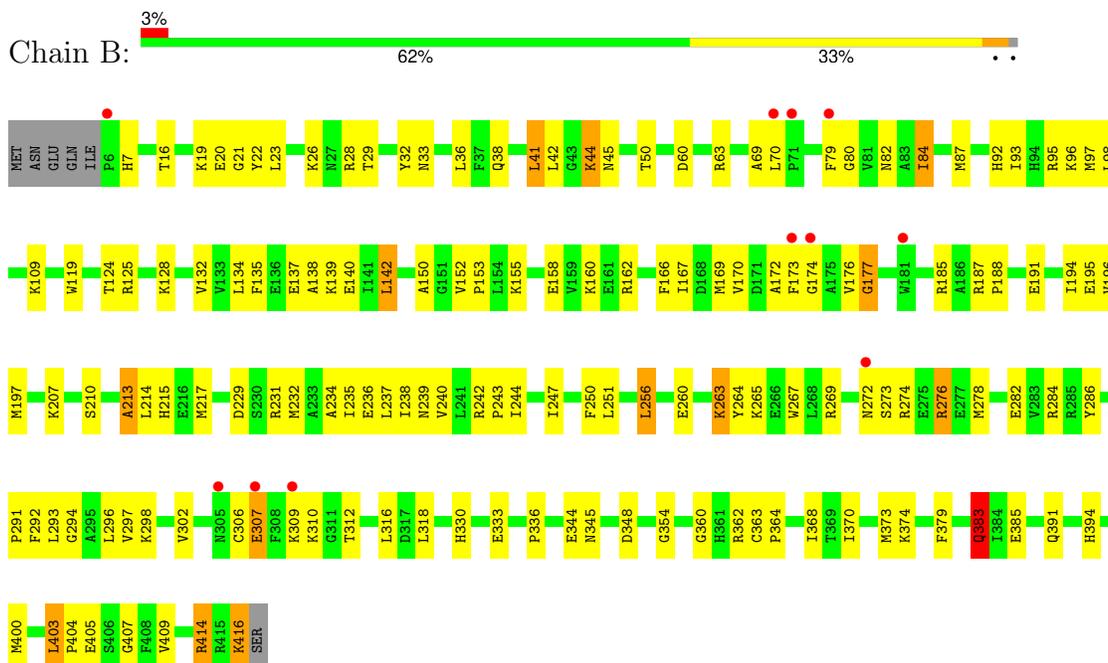
3 Residue-property plots

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.

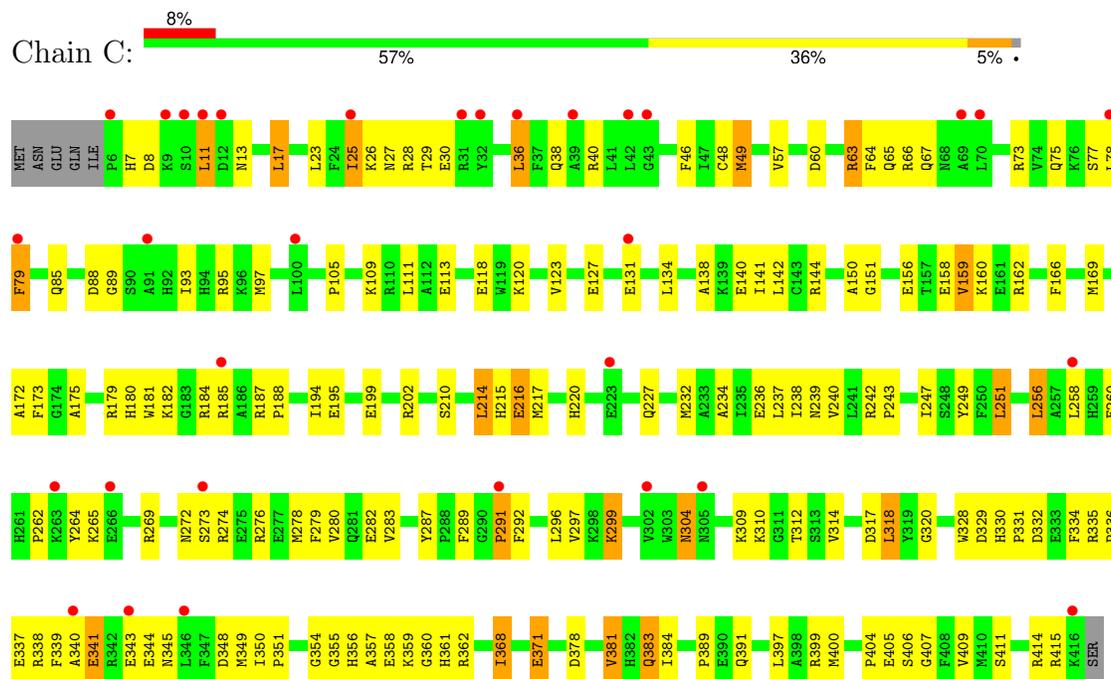
• Molecule 1: Cytochrome P450 152A1



• Molecule 1: Cytochrome P450 152A1



- Molecule 1: Cytochrome P450 152A1



4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	172.23Å 172.23Å 277.92Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.57 – 2.37 44.57 – 2.37	Depositor EDS
% Data completeness (in resolution range)	93.6 (44.57-2.37) 93.6 (44.57-2.37)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.52 (at 2.34Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.229 , 0.278 0.226 , 0.231	Depositor DCC
R_{free} test set	3061 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	35.3	Xtrriage
Anisotropy	0.190	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 38.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	10327	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.84% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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: 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	0.46	0/3422	0.89	10/4614 (0.2%)
1	B	0.44	0/3422	0.90	12/4614 (0.3%)
1	C	0.36	0/3422	0.89	10/4614 (0.2%)
All	All	0.42	0/10266	0.89	32/13842 (0.2%)

There are no bond length outliers.

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	79	PHE	N-CA-C	8.49	122.93	112.23
1	B	79	PHE	N-CA-C	8.10	121.65	111.69
1	A	383	GLN	N-CA-C	7.40	120.40	111.82
1	C	383	GLN	N-CA-C	7.17	120.14	111.82
1	A	286	TYR	N-CA-C	7.16	118.77	110.97
1	B	84	ILE	N-CA-C	6.55	118.09	110.62
1	B	383	GLN	N-CA-C	6.30	118.23	111.36
1	B	407	GLY	N-CA-C	-6.27	106.67	115.32
1	C	79	PHE	N-CA-C	6.18	120.89	113.23
1	B	286	TYR	N-CA-C	6.04	117.66	111.14
1	B	229	ASP	N-CA-C	-6.03	102.15	110.35
1	A	78	LEU	N-CA-C	5.94	117.62	111.03
1	B	177	GLY	CA-C-N	5.88	125.36	119.24
1	B	177	GLY	C-N-CA	5.88	125.36	119.24
1	C	405	GLU	N-CA-C	5.84	118.14	111.02
1	B	82	ASN	N-CA-C	5.80	119.67	112.24
1	C	407	GLY	N-CA-C	-5.78	107.34	115.32
1	C	237	LEU	N-CA-C	-5.71	105.13	111.36
1	C	384	ILE	N-CA-C	5.68	116.88	108.65
1	B	80	GLY	N-CA-C	-5.52	104.49	111.72
1	B	213	ALA	N-CA-C	5.46	117.23	111.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	240	VAL	N-CA-C	-5.34	106.97	111.56
1	A	130	ASP	N-CA-C	-5.27	105.45	111.14
1	A	177	GLY	CA-C-N	5.25	125.31	119.32
1	A	177	GLY	C-N-CA	5.25	125.31	119.32
1	A	7	HIS	N-CA-C	5.18	116.84	108.34
1	A	105	PRO	N-CA-C	5.17	117.01	110.70
1	C	159	VAL	N-CA-C	5.16	115.37	110.42
1	C	216	GLU	N-CA-C	5.09	116.91	111.36
1	C	368	ILE	CB-CA-C	-5.04	105.42	111.88
1	A	29	THR	N-CA-C	-5.03	106.41	112.54
1	C	381	VAL	N-CA-C	5.03	116.12	111.45

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	3339	0	3290	97	0
1	B	3339	0	3290	123	0
1	C	3339	0	3290	143	0
2	A	43	0	30	2	0
2	B	43	0	30	3	0
2	C	43	0	30	2	0
3	A	88	0	0	2	0
3	B	67	0	0	5	0
3	C	26	0	0	2	0
All	All	10327	0	9960	364	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 18.

All (364) 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:291:PRO:HB3	1:C:400:MET:HE2	1.35	1.05
1:C:25:ILE:HD12	1:C:25:ILE:H	1.28	0.95
1:C:391:GLN:HE22	1:C:409:VAL:H	0.97	0.95
1:B:391:GLN:HE22	1:B:409:VAL:H	1.05	0.93
1:A:391:GLN:HE22	1:A:409:VAL:H	1.10	0.91
1:A:100:LEU:HD13	1:A:358:GLU:HG2	1.54	0.89
1:C:127:GLU:HG2	1:C:414:ARG:HA	1.55	0.87
1:C:67:GLN:HG3	1:C:88:ASP:OD2	1.75	0.87
1:A:160:LYS:H	1:A:160:LYS:HZ2	1.24	0.83
1:B:265:LYS:HZ2	1:B:269:ARG:HH12	1.25	0.83
1:A:265:LYS:HE2	1:A:269:ARG:HH22	1.43	0.83
1:B:84:ILE:HA	1:B:87:MET:HE2	1.62	0.82
1:B:391:GLN:NE2	1:B:409:VAL:H	1.77	0.82
1:C:391:GLN:NE2	1:C:409:VAL:H	1.77	0.81
1:B:139:LYS:HE2	1:B:167:ILE:HD12	1.62	0.80
1:B:44:LYS:HE2	1:B:45:ASN:H	1.44	0.80
1:B:69:ALA:HA	1:B:296:LEU:HD13	1.67	0.77
1:C:181:TRP:HB3	1:C:185:ARG:NH1	2.01	0.76
1:C:291:PRO:HB3	1:C:400:MET:CE	2.13	0.75
1:B:391:GLN:HE22	1:B:409:VAL:N	1.82	0.74
1:A:391:GLN:NE2	1:A:409:VAL:H	1.86	0.74
1:C:109:LYS:O	1:C:113:GLU:HG3	1.87	0.73
1:B:232:MET:HE2	1:B:236:GLU:HG2	1.70	0.73
1:A:274:ARG:HE	1:A:278:MET:HE2	1.53	0.73
1:C:234:ALA:O	1:C:238:ILE:HG12	1.89	0.73
1:A:309:LYS:O	1:A:312:THR:HG23	1.88	0.73
1:C:166:PHE:HA	1:C:169:MET:HE3	1.71	0.72
1:B:239:ASN:HD22	1:B:242:ARG:HH12	1.38	0.72
1:A:265:LYS:HE2	1:A:269:ARG:NH2	2.05	0.72
1:B:44:LYS:HE2	1:B:45:ASN:N	2.06	0.70
1:B:284:ARG:NE	1:B:370:ILE:HD11	2.07	0.69
1:C:272:ASN:ND2	1:C:273:SER:H	1.89	0.69
1:B:256:LEU:HD22	1:B:260:GLU:HG3	1.74	0.68
1:B:293:LEU:HG	1:B:318:LEU:HD11	1.74	0.68
1:B:239:ASN:ND2	1:B:242:ARG:HH12	1.91	0.68
1:C:269:ARG:NH1	1:C:269:ARG:HB2	2.09	0.68
1:C:25:ILE:HG21	1:C:317:ASP:HB2	1.76	0.67
1:B:195:GLU:OE1	1:B:231:ARG:HD3	1.95	0.67
1:C:187:ARG:HB3	1:C:188:PRO:HD3	1.75	0.67
1:B:60:ASP:OD2	1:B:63:ARG:HD3	1.95	0.66
1:C:247:ILE:HA	2:C:501:HEM:HBB1	1.76	0.66
1:A:274:ARG:HE	1:A:278:MET:CE	2.07	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:265:LYS:NZ	1:B:269:ARG:HH12	1.92	0.66
1:C:236:GLU:OE2	1:C:236:GLU:HA	1.96	0.65
1:C:65:GLN:HG2	1:C:296:LEU:HB3	1.78	0.65
1:A:100:LEU:CD1	1:A:358:GLU:HG2	2.25	0.65
1:A:391:GLN:HE22	1:A:409:VAL:N	1.91	0.64
1:C:242:ARG:HB3	1:C:243:PRO:HD3	1.78	0.64
1:B:403:LEU:HG	1:B:404:PRO:HD2	1.78	0.64
1:A:152:VAL:HG13	1:A:197:MET:SD	2.38	0.64
1:C:355:GLY:O	1:C:362:ARG:HD2	1.98	0.64
1:B:21:GLY:HA2	1:B:400:MET:HE2	1.80	0.64
1:C:156:GLU:HA	1:C:159:VAL:HG23	1.80	0.63
1:C:265:LYS:HE2	1:C:381:VAL:HG13	1.80	0.63
1:A:109:LYS:HA	1:A:109:LYS:HE3	1.81	0.63
1:B:139:LYS:HG3	1:B:140:GLU:N	2.13	0.63
1:B:394:HIS:O	1:B:405:GLU:HG3	1.98	0.63
1:B:242:ARG:HB3	1:B:243:PRO:HD3	1.79	0.63
1:B:96:LYS:HE3	1:B:364:PRO:HD3	1.81	0.63
1:C:23:LEU:HB3	1:C:27:ASN:ND2	2.14	0.63
1:C:131:GLU:HG2	1:C:411:SER:HB3	1.81	0.63
1:C:194:ILE:HG13	1:C:238:ILE:HD11	1.79	0.63
1:B:264:TYR:CZ	1:B:336:PRO:HD2	2.33	0.62
1:A:109:LYS:O	1:A:113:GLU:HG3	2.00	0.62
1:A:268:LEU:HD23	1:A:275:GLU:HB3	1.82	0.62
1:B:140:GLU:OE1	1:B:160:LYS:HE3	1.99	0.62
1:C:17:LEU:C	1:C:17:LEU:HD23	2.25	0.62
1:A:16:THR:HG21	1:A:28:ARG:NH2	2.15	0.62
1:B:187:ARG:HB3	1:B:188:PRO:HD3	1.81	0.62
1:B:194:ILE:HG13	1:B:238:ILE:HD11	1.82	0.62
1:A:236:GLU:OE1	1:A:236:GLU:HA	2.00	0.61
1:C:328:TRP:HB2	1:C:331:PRO:HB3	1.82	0.61
1:C:73:ARG:NH2	1:C:175:ALA:O	2.34	0.61
1:C:247:ILE:O	1:C:251:LEU:HD22	2.00	0.61
1:C:11:LEU:HD13	1:C:40:ARG:HG2	1.81	0.61
1:A:21:GLY:HA2	1:A:400:MET:HE2	1.82	0.61
1:A:380:LEU:HA	1:A:384:ILE:HD11	1.82	0.61
1:B:234:ALA:O	1:B:238:ILE:HG12	2.01	0.61
1:B:292:PHE:HA	1:B:318:LEU:HD13	1.82	0.60
1:A:185:ARG:O	1:A:188:PRO:HD2	2.01	0.60
1:C:25:ILE:O	1:C:29:THR:HG23	2.01	0.60
1:B:87:MET:HE3	1:B:92:HIS:HA	1.84	0.59
1:C:328:TRP:O	1:C:331:PRO:HD3	2.01	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:150:ALA:O	1:C:214:LEU:HB2	2.03	0.59
1:C:339:PHE:O	1:C:341:GLU:N	2.35	0.59
1:B:370:ILE:O	1:B:374:LYS:HG3	2.03	0.59
1:A:124:THR:HG22	1:A:128:LYS:NZ	2.18	0.59
1:A:70:LEU:HB3	1:A:71:PRO:HD2	1.84	0.59
1:A:109:LYS:HA	1:A:109:LYS:CE	2.32	0.58
1:C:120:LYS:HG2	1:C:383:GLN:HE21	1.68	0.58
1:B:152:VAL:HG13	1:B:197:MET:SD	2.44	0.58
1:C:345:ASN:HB3	1:C:348:ASP:OD1	2.02	0.58
1:B:276:ARG:CB	1:B:276:ARG:HH11	2.17	0.58
1:A:138:ALA:O	1:A:142:LEU:HD13	2.03	0.57
1:A:247:ILE:HG22	1:A:251:LEU:HD13	1.86	0.57
1:A:288:PRO:HG3	1:A:397:LEU:HD23	1.86	0.57
1:B:232:MET:HE3	1:B:232:MET:O	2.04	0.57
1:A:187:ARG:HB3	1:A:188:PRO:HD3	1.85	0.57
1:A:187:ARG:O	1:A:191:GLU:HG3	2.04	0.57
1:C:335:ARG:O	1:C:338:ARG:HG2	2.04	0.57
1:B:142:LEU:HG	1:B:244:ILE:O	2.05	0.57
1:C:354:GLY:HA2	1:C:362:ARG:NH1	2.20	0.57
1:B:22:TYR:CE1	1:B:400:MET:HG2	2.40	0.57
1:A:67:GLN:HG2	1:A:68:ASN:OD1	2.05	0.56
1:A:354:GLY:HA2	1:A:362:ARG:NH1	2.20	0.56
1:C:274:ARG:NH1	1:C:278:MET:HE2	2.20	0.56
1:C:317:ASP:OD2	1:C:320:GLY:HA3	2.05	0.56
1:A:25:ILE:HG21	1:A:317:ASP:HB2	1.86	0.56
1:A:71:PRO:HB2	3:A:528:HOH:O	2.04	0.56
1:B:360:GLY:HA3	3:B:520:HOH:O	2.05	0.56
1:C:11:LEU:HD22	1:C:40:ARG:HG2	1.88	0.56
1:B:132:VAL:HG13	1:B:137:GLU:HG3	1.87	0.56
1:C:276:ARG:HG3	1:C:276:ARG:HH11	1.69	0.56
1:A:36:LEU:C	1:A:36:LEU:HD12	2.31	0.56
1:A:328:TRP:O	1:A:331:PRO:HD3	2.06	0.56
1:C:265:LYS:HE3	1:C:381:VAL:HA	1.88	0.56
1:A:335:ARG:O	1:A:338:ARG:HG2	2.07	0.55
1:B:69:ALA:HA	1:B:296:LEU:CD1	2.36	0.55
1:C:11:LEU:CD1	1:C:40:ARG:HG2	2.37	0.55
1:C:180:HIS:NE2	1:C:184:ARG:NH1	2.50	0.55
1:B:84:ILE:HG13	1:B:87:MET:HE2	1.89	0.54
1:B:263:LYS:HB2	1:B:263:LYS:NZ	2.23	0.54
1:C:138:ALA:O	1:C:142:LEU:HD23	2.07	0.54
1:A:384:ILE:HD13	1:A:384:ILE:H	1.71	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:272:ASN:ND2	1:B:273:SER:H	2.05	0.54
1:B:298:LYS:O	1:B:310:LYS:HG3	2.07	0.54
1:B:284:ARG:CZ	1:B:370:ILE:HD11	2.38	0.54
1:A:279:PHE:O	1:A:283:VAL:HG23	2.08	0.53
1:C:391:GLN:HE22	1:C:409:VAL:N	1.82	0.53
1:C:158:GLU:HG2	1:C:162:ARG:HG2	1.90	0.53
1:A:288:PRO:HG3	1:A:397:LEU:CD2	2.38	0.53
1:B:16:THR:HA	1:B:19:LYS:HG2	1.89	0.53
1:A:36:LEU:HD12	1:A:36:LEU:O	2.08	0.53
1:A:185:ARG:C	1:A:188:PRO:HD2	2.34	0.53
1:A:282:GLU:OE1	1:A:282:GLU:HA	2.09	0.53
1:C:63:ARG:HD2	1:C:299:LYS:HE2	1.90	0.53
1:A:104:THR:OG1	1:A:106:PRO:HD2	2.09	0.53
1:B:166:PHE:HA	1:B:169:MET:HE3	1.89	0.53
1:B:93:ILE:O	1:B:97:MET:HG2	2.10	0.52
1:C:194:ILE:HG13	1:C:238:ILE:CD1	2.38	0.52
1:C:318:LEU:HD12	1:C:350:ILE:HD12	1.92	0.52
1:C:232:MET:HE3	1:C:232:MET:O	2.10	0.52
1:B:330:HIS:O	1:B:333:GLU:HB2	2.09	0.52
1:B:7:HIS:CD2	1:B:38:GLN:HG3	2.43	0.52
1:B:173:PHE:CD1	1:B:174:GLY:N	2.78	0.52
1:A:264:TYR:CZ	1:A:336:PRO:HD2	2.45	0.52
1:B:26:LYS:HG2	3:B:550:HOH:O	2.10	0.51
1:C:151:GLY:O	1:C:214:LEU:HD12	2.10	0.51
1:B:153:PRO:HD2	1:B:197:MET:SD	2.50	0.51
1:C:23:LEU:HB3	1:C:27:ASN:HD21	1.76	0.51
1:C:274:ARG:O	1:C:278:MET:HE3	2.09	0.51
1:C:343:GLU:HG3	1:C:344:GLU:H	1.75	0.51
1:A:173:PHE:CE1	1:A:291:PRO:HG2	2.46	0.51
1:B:385:GLU:OE2	1:B:416:LYS:HD3	2.11	0.51
1:C:25:ILE:H	1:C:25:ILE:CD1	2.05	0.51
1:B:276:ARG:NH1	1:B:374:LYS:HB3	2.26	0.50
1:B:403:LEU:HG	1:B:404:PRO:CD	2.42	0.50
1:C:11:LEU:CD2	1:C:40:ARG:HG2	2.41	0.50
1:A:166:PHE:HA	1:A:169:MET:HE3	1.92	0.50
1:C:332:ASP:HB2	3:C:518:HOH:O	2.10	0.50
1:A:10:SER:HB3	1:A:12:ASP:OD2	2.10	0.50
1:C:65:GLN:CG	1:C:296:LEU:HB3	2.41	0.50
1:C:335:ARG:HG3	1:C:335:ARG:HH11	1.77	0.50
1:B:416:LYS:HB3	1:B:416:LYS:NZ	2.27	0.50
1:A:73:ARG:HB2	1:A:73:ARG:NH1	2.27	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:349:MET:HG2	1:A:351:PRO:HD3	1.94	0.50
1:C:118:GLU:OE1	1:C:141:ILE:HG12	2.12	0.50
1:A:64:PHE:CE1	1:A:314:VAL:HG21	2.47	0.50
1:A:391:GLN:NE2	1:A:406:SER:OG	2.43	0.50
1:C:111:LEU:HD12	1:C:368:ILE:HD12	1.94	0.50
1:C:329:ASP:CG	1:C:330:HIS:HD1	2.20	0.50
1:A:293:LEU:O	1:A:315:LEU:HA	2.12	0.50
1:B:232:MET:HE3	1:B:235:ILE:HB	1.94	0.50
1:A:173:PHE:HE1	1:A:291:PRO:HG2	1.77	0.49
1:B:307:GLU:OE1	1:B:309:LYS:HG3	2.12	0.49
1:C:173:PHE:CD1	1:C:173:PHE:C	2.89	0.49
1:C:256:LEU:HD12	1:C:404:PRO:HG3	1.94	0.49
1:C:356:HIS:C	1:C:358:GLU:N	2.67	0.49
1:A:280:VAL:HG21	1:A:374:LYS:HG2	1.93	0.49
1:C:23:LEU:HD11	1:C:397:LEU:HD13	1.95	0.49
1:C:67:GLN:NE2	1:C:88:ASP:HB2	2.27	0.49
1:C:79:PHE:CD2	1:C:85:GLN:HG2	2.47	0.49
1:B:210:SER:HA	1:B:215:HIS:CD2	2.47	0.49
1:B:292:PHE:HA	1:B:318:LEU:CD1	2.43	0.49
1:A:175:ALA:HB2	1:A:179:ARG:CZ	2.43	0.49
1:B:330:HIS:HB3	1:B:333:GLU:HG3	1.93	0.49
1:A:384:ILE:HD13	1:A:384:ILE:N	2.27	0.49
1:B:125:ARG:HG3	3:B:542:HOH:O	2.13	0.49
1:A:232:MET:HE2	1:A:236:GLU:OE2	2.13	0.49
1:A:240:VAL:C	1:A:243:PRO:HD2	2.38	0.49
1:C:283:VAL:HG13	1:C:287:TYR:CD2	2.47	0.49
1:C:343:GLU:HG3	1:C:344:GLU:N	2.28	0.49
1:B:28:ARG:HG3	1:B:28:ARG:HH11	1.78	0.48
1:B:28:ARG:HG3	1:B:28:ARG:NH1	2.28	0.48
1:C:389:PRO:O	1:C:391:GLN:HG2	2.13	0.48
1:B:135:PHE:CZ	1:B:167:ILE:HD13	2.48	0.48
1:C:36:LEU:HA	1:C:48:CYS:O	2.13	0.48
1:B:140:GLU:CD	1:B:160:LYS:HE3	2.38	0.48
1:C:7:HIS:HB2	1:C:38:GLN:NE2	2.29	0.48
1:C:127:GLU:CD	1:C:415:ARG:H	2.21	0.48
1:C:93:ILE:O	1:C:97:MET:HG2	2.14	0.48
1:A:386:TYR:CE1	1:A:410:MET:HE3	2.49	0.48
1:B:138:ALA:O	1:B:142:LEU:HB2	2.14	0.48
1:B:297:VAL:HG23	1:B:312:THR:O	2.13	0.48
1:C:13:ASN:HB2	1:C:40:ARG:O	2.14	0.48
1:C:291:PRO:CB	1:C:400:MET:HE2	2.25	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:309:LYS:HG2	1:C:310:LYS:N	2.27	0.48
1:C:399:ARG:HG2	1:C:399:ARG:HH11	1.78	0.48
1:C:140:GLU:OE1	1:C:160:LYS:HE3	2.13	0.48
1:C:28:ARG:HH11	1:C:28:ARG:HG3	1.79	0.47
1:B:354:GLY:HA2	1:B:362:ARG:NH1	2.28	0.47
1:B:385:GLU:HG2	1:B:416:LYS:HD3	1.95	0.47
1:B:236:GLU:HA	1:B:236:GLU:OE1	2.14	0.47
1:C:105:PRO:O	1:C:109:LYS:HD3	2.15	0.47
1:C:371:GLU:OE2	1:C:371:GLU:CA	2.62	0.47
1:A:242:ARG:HB3	1:A:243:PRO:HD3	1.96	0.47
1:C:7:HIS:ND1	1:C:8:ASP:O	2.47	0.47
1:B:124:THR:HG22	1:B:128:LYS:NZ	2.29	0.47
1:B:139:LYS:HE2	1:B:167:ILE:CD1	2.37	0.47
1:B:187:ARG:O	1:B:191:GLU:HG3	2.14	0.47
1:C:297:VAL:HG23	1:C:312:THR:O	2.14	0.47
1:A:300:ASP:OD1	1:A:310:LYS:N	2.42	0.47
1:B:276:ARG:HH11	1:B:276:ARG:HB3	1.78	0.47
1:C:11:LEU:HD13	1:C:11:LEU:O	2.15	0.47
1:C:7:HIS:HA	1:C:38:GLN:HB2	1.96	0.47
1:A:160:LYS:HZ3	1:A:160:LYS:HB2	1.80	0.47
1:B:194:ILE:HG13	1:B:238:ILE:CD1	2.45	0.47
1:C:360:GLY:HA3	3:C:527:HOH:O	2.15	0.47
1:A:272:ASN:OD1	1:A:273:SER:N	2.43	0.46
1:B:232:MET:HE3	1:B:232:MET:HA	1.96	0.46
1:B:330:HIS:HB3	1:B:333:GLU:CG	2.45	0.46
1:C:391:GLN:NE2	1:C:406:SER:OG	2.48	0.46
1:C:95:ARG:NH1	1:C:236:GLU:OE1	2.48	0.46
1:C:239:ASN:O	1:C:243:PRO:HG2	2.15	0.46
1:B:274:ARG:O	1:B:278:MET:HG3	2.16	0.46
1:C:232:MET:HE2	1:C:236:GLU:HG2	1.98	0.46
1:A:240:VAL:O	1:A:243:PRO:HD2	2.16	0.46
1:A:281:GLN:HA	1:A:281:GLN:OE1	2.15	0.46
1:A:160:LYS:H	1:A:160:LYS:NZ	2.03	0.46
1:B:232:MET:HE2	1:B:236:GLU:CG	2.42	0.46
1:C:49:MET:HE1	1:C:57:VAL:HG23	1.98	0.46
1:C:120:LYS:O	1:C:123:VAL:HG23	2.16	0.46
1:A:267:TRP:CZ2	1:A:275:GLU:HG3	2.51	0.46
1:C:25:ILE:HD12	1:C:25:ILE:N	2.12	0.46
1:A:247:ILE:HA	2:A:501:HEM:HBB1	1.96	0.46
1:A:267:TRP:CH2	1:A:278:MET:HE3	2.51	0.46
1:C:172:ALA:HB1	1:C:180:HIS:HA	1.97	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:207:LYS:HA	3:B:535:HOH:O	2.16	0.45
1:B:247:ILE:HG22	1:B:251:LEU:HD13	1.98	0.45
1:A:123:VAL:O	1:A:127:GLU:HG3	2.16	0.45
1:B:84:ILE:CA	1:B:87:MET:HE2	2.40	0.45
1:B:302:VAL:HA	1:B:306:CYS:O	2.17	0.45
1:C:272:ASN:ND2	1:C:273:SER:N	2.63	0.45
1:A:73:ARG:HH11	1:A:73:ARG:CB	2.30	0.45
1:A:232:MET:HE2	1:A:236:GLU:CD	2.42	0.45
1:B:264:TYR:CE1	1:B:336:PRO:HD2	2.51	0.45
1:B:318:LEU:N	1:B:318:LEU:HD12	2.31	0.45
1:C:276:ARG:O	1:C:280:VAL:HG23	2.17	0.45
1:C:330:HIS:N	1:C:331:PRO:CD	2.80	0.45
1:B:87:MET:HE1	1:B:95:ARG:HB3	1.99	0.45
1:B:344:GLU:OE1	1:B:344:GLU:HA	2.16	0.45
1:A:201:ALA:HB1	1:A:208:THR:HG21	1.99	0.45
1:A:385:GLU:HG3	1:A:414:ARG:HH12	1.82	0.45
1:B:414:ARG:O	1:B:414:ARG:HG2	2.15	0.45
1:B:95:ARG:O	1:B:98:LEU:HB3	2.16	0.45
1:C:356:HIS:C	1:C:358:GLU:H	2.24	0.44
1:A:172:ALA:HB1	1:A:180:HIS:HA	1.99	0.44
1:A:386:TYR:CZ	1:A:410:MET:HE3	2.51	0.44
1:A:355:GLY:O	1:A:362:ARG:HD2	2.17	0.44
1:C:63:ARG:HG2	1:C:63:ARG:HH11	1.81	0.44
1:C:240:VAL:O	1:C:243:PRO:HD2	2.17	0.44
1:C:279:PHE:O	1:C:283:VAL:HG23	2.17	0.44
1:C:79:PHE:CG	1:C:85:GLN:HG2	2.51	0.44
1:C:349:MET:HG2	1:C:351:PRO:CD	2.47	0.44
1:A:115:MET:HE1	1:A:142:LEU:HD12	2.00	0.44
1:C:357:ALA:HA	1:C:362:ARG:HB3	1.99	0.44
1:A:264:TYR:O	1:A:267:TRP:HB3	2.18	0.44
1:A:274:ARG:HG3	1:A:274:ARG:HH11	1.82	0.44
1:B:29:THR:HG21	1:B:50:THR:CG2	2.47	0.44
1:C:127:GLU:CG	1:C:414:ARG:HA	2.36	0.44
1:A:26:LYS:O	1:A:30:GLU:HG3	2.17	0.44
1:B:119:TRP:HB3	1:B:379:PHE:CE1	2.53	0.44
1:B:185:ARG:HB2	1:B:185:ARG:NH1	2.33	0.44
1:C:269:ARG:HB2	1:C:269:ARG:CZ	2.48	0.44
1:C:276:ARG:HG3	1:C:276:ARG:NH1	2.32	0.44
1:C:232:MET:CE	1:C:236:GLU:HG2	2.48	0.43
1:B:132:VAL:CG1	1:B:137:GLU:HG3	2.49	0.43
1:B:155:LYS:HB2	1:B:158:GLU:HG2	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:272:ASN:ND2	1:B:273:SER:N	2.66	0.43
1:C:26:LYS:O	1:C:30:GLU:HG3	2.17	0.43
1:B:250:PHE:HB3	1:B:373:MET:HE3	2.00	0.43
1:A:277:GLU:HG2	1:A:374:LYS:HD3	2.00	0.43
1:B:264:TYR:O	1:B:267:TRP:HB3	2.18	0.43
1:B:368:ILE:HD12	2:B:501:HEM:HBC2	2.00	0.43
1:C:276:ARG:NH2	1:C:378:ASP:OD2	2.47	0.43
1:A:305:ASN:HD22	1:A:305:ASN:HA	1.60	0.43
1:C:249:TYR:HB2	1:C:289:PHE:CE2	2.53	0.43
1:B:119:TRP:HB3	1:B:379:PHE:CD1	2.53	0.43
1:C:185:ARG:C	1:C:188:PRO:HD2	2.44	0.43
1:A:357:ALA:HA	1:A:362:ARG:HB3	2.00	0.43
1:A:104:THR:HB	1:A:105:PRO:HD2	2.01	0.43
1:A:363:CYS:HB2	2:A:501:HEM:NA	2.33	0.43
1:C:66:ARG:HG3	1:C:361:HIS:CD2	2.54	0.43
1:C:210:SER:HA	1:C:215:HIS:CD2	2.54	0.43
1:C:338:ARG:HB2	1:C:338:ARG:HH11	1.82	0.43
1:A:99:PHE:CZ	1:A:236:GLU:HG3	2.54	0.42
1:B:32:TYR:O	1:B:33:ASN:C	2.62	0.42
1:C:258:LEU:HD11	1:C:265:LYS:CD	2.49	0.42
1:A:109:LYS:HE3	1:A:109:LYS:CA	2.48	0.42
1:B:150:ALA:HB1	1:B:213:ALA:HB3	2.01	0.42
1:B:363:CYS:HB2	2:B:501:HEM:NA	2.33	0.42
1:C:195:GLU:O	1:C:199:GLU:HG3	2.19	0.42
1:C:216:GLU:O	1:C:220:HIS:HB2	2.18	0.42
1:C:338:ARG:HG3	1:C:339:PHE:CD1	2.54	0.42
1:C:78:LEU:HG	1:C:79:PHE:CD1	2.53	0.42
1:C:179:ARG:HA	1:C:182:LYS:HE2	2.01	0.42
1:B:176:VAL:HG12	1:B:177:GLY:N	2.35	0.42
1:B:302:VAL:HG13	1:B:306:CYS:O	2.20	0.42
1:B:379:PHE:O	1:B:383:GLN:HB2	2.18	0.42
1:C:158:GLU:HG2	1:C:162:ARG:CG	2.49	0.42
1:C:335:ARG:HG3	1:C:335:ARG:NH1	2.34	0.42
1:B:282:GLU:HA	1:B:282:GLU:OE1	2.20	0.42
1:A:265:LYS:CE	1:A:269:ARG:NH2	2.81	0.42
1:B:140:GLU:OE2	1:B:160:LYS:HG3	2.20	0.42
1:B:41:LEU:HD22	1:B:42:LEU:HD22	2.02	0.42
1:B:316:LEU:O	1:B:318:LEU:HD12	2.20	0.42
1:C:260:GLU:C	1:C:262:PRO:HD3	2.45	0.42
1:C:264:TYR:CZ	1:C:336:PRO:HD2	2.54	0.42
1:A:264:TYR:CE1	1:A:336:PRO:HD2	2.54	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:247:ILE:HA	2:B:501:HEM:HBB1	2.02	0.41
1:B:158:GLU:O	1:B:162:ARG:HG2	2.20	0.41
1:B:232:MET:CE	1:B:236:GLU:HG2	2.46	0.41
1:C:60:ASP:OD2	1:C:63:ARG:HB2	2.20	0.41
1:C:304:ASN:HD22	1:C:304:ASN:HA	1.52	0.41
1:A:36:LEU:HA	1:A:48:CYS:O	2.20	0.41
1:C:240:VAL:C	1:C:243:PRO:HD2	2.45	0.41
1:A:160:LYS:HB2	1:A:160:LYS:NZ	2.36	0.41
1:A:182:LYS:HG2	3:A:525:HOH:O	2.20	0.41
1:C:64:PHE:CE1	1:C:314:VAL:HG21	2.56	0.41
1:A:151:GLY:O	1:A:214:LEU:HD12	2.20	0.41
1:B:155:LYS:O	1:B:158:GLU:HG2	2.21	0.41
1:C:175:ALA:O	1:C:180:HIS:HB2	2.20	0.41
1:B:50:THR:HG21	3:B:503:HOH:O	2.20	0.41
1:B:170:VAL:C	1:B:172:ALA:H	2.29	0.41
1:C:335:ARG:HB3	1:C:337:GLU:OE1	2.21	0.41
1:A:132:VAL:HG13	1:A:137:GLU:CG	2.51	0.41
1:A:379:PHE:CD1	1:A:383:GLN:HB2	2.56	0.41
1:C:60:ASP:OD2	1:C:63:ARG:HD3	2.20	0.41
1:C:166:PHE:O	1:C:169:MET:HB2	2.21	0.41
1:B:16:THR:HG22	1:B:20:GLU:HG3	2.01	0.41
1:A:232:MET:O	1:A:232:MET:HE3	2.21	0.40
1:C:202:ARG:HD3	1:C:227:GLN:HE22	1.86	0.40
1:C:282:GLU:HG3	1:C:334:PHE:CD1	2.55	0.40
1:B:70:LEU:HD21	1:B:294:GLY:HA3	2.02	0.40
1:B:152:VAL:HA	1:B:153:PRO:HD3	1.98	0.40
1:C:28:ARG:HG3	1:C:28:ARG:NH1	2.36	0.40
2:C:501:HEM:HBC2	2:C:501:HEM:HMC2	2.02	0.40
1:C:75:GLN:C	1:C:77:SER:H	2.29	0.40
1:C:89:GLY:O	1:C:93:ILE:HG12	2.22	0.40
1:C:144:ARG:HH11	1:C:144:ARG:HG3	1.86	0.40
1:A:298:LYS:O	1:A:310:LYS:HB2	2.22	0.40
1:B:84:ILE:HA	1:B:87:MET:CE	2.43	0.40
1:B:345:ASN:HB3	1:B:348:ASP:OD1	2.20	0.40
1:B:265:LYS:CE	1:B:269:ARG:HH12	2.34	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	409/417 (98%)	395 (97%)	13 (3%)	1 (0%)	44	57
1	B	409/417 (98%)	393 (96%)	15 (4%)	1 (0%)	44	57
1	C	409/417 (98%)	385 (94%)	22 (5%)	2 (0%)	25	35
All	All	1227/1251 (98%)	1173 (96%)	50 (4%)	4 (0%)	37	49

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	340	ALA
1	A	291	PRO
1	B	291	PRO
1	C	291	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	352/358 (98%)	332 (94%)	20 (6%)	17	27
1	B	352/358 (98%)	333 (95%)	19 (5%)	18	29
1	C	352/358 (98%)	333 (95%)	19 (5%)	18	29
All	All	1056/1074 (98%)	998 (94%)	58 (6%)	18	28

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	LEU
1	A	49	MET
1	A	82	ASN
1	A	109	LYS
1	A	134	LEU
1	A	160	LYS
1	A	182	LYS
1	A	192	GLU
1	A	197	MET
1	A	214	LEU
1	A	217	MET
1	A	236	GLU
1	A	237	LEU
1	A	256	LEU
1	A	274	ARG
1	A	292	PHE
1	A	304	ASN
1	A	305	ASN
1	A	312	THR
1	A	384	ILE
1	B	23	LEU
1	B	36	LEU
1	B	41	LEU
1	B	44	LYS
1	B	109	LYS
1	B	134	LEU
1	B	142	LEU
1	B	196	VAL
1	B	214	LEU
1	B	217	MET
1	B	237	LEU
1	B	256	LEU
1	B	263	LYS
1	B	276	ARG
1	B	307	GLU
1	B	383	GLN
1	B	403	LEU
1	B	414	ARG
1	B	416	LYS
1	C	11	LEU
1	C	17	LEU
1	C	25	ILE
1	C	36	LEU

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Mol	Chain	Res	Type
1	C	46	PHE
1	C	49	MET
1	C	63	ARG
1	C	134	LEU
1	C	214	LEU
1	C	217	MET
1	C	251	LEU
1	C	256	LEU
1	C	292	PHE
1	C	299	LYS
1	C	304	ASN
1	C	318	LEU
1	C	341	GLU
1	C	359	LYS
1	C	371	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	ASN
1	A	304	ASN
1	A	305	ASN
1	A	356	HIS
1	A	391	GLN
1	B	227	GLN
1	B	239	ASN
1	B	272	ASN
1	B	305	ASN
1	B	391	GLN
1	B	394	HIS
1	C	13	ASN
1	C	27	ASN
1	C	45	ASN
1	C	65	GLN
1	C	67	GLN
1	C	75	GLN
1	C	215	HIS
1	C	227	GLN
1	C	272	ASN
1	C	304	ASN
1	C	382	HIS
1	C	391	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 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	501	1	42,50,50	1.50	10 (23%)	46,82,82	2.08	9 (19%)
2	HEM	B	501	1	42,50,50	1.55	10 (23%)	46,82,82	2.19	14 (30%)
2	HEM	C	501	1	42,50,50	1.56	6 (14%)	46,82,82	2.10	8 (17%)

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	501	1	-	0/12/54/54	-
2	HEM	B	501	1	-	1/12/54/54	-
2	HEM	C	501	1	-	6/12/54/54	-

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	HEM	CHA-C4D	4.28	1.45	1.34
2	B	501	HEM	C3C-CAC	-4.20	1.37	1.47
2	B	501	HEM	CHA-C4D	4.02	1.44	1.34
2	C	501	HEM	C3C-CAC	-3.91	1.38	1.47
2	A	501	HEM	CHA-C4D	3.45	1.43	1.34
2	C	501	HEM	CHB-C1B	3.25	1.42	1.34
2	C	501	HEM	C3C-C4C	3.21	1.46	1.41
2	A	501	HEM	C3C-CAC	-3.10	1.40	1.47
2	B	501	HEM	CAB-C3B	-2.82	1.39	1.47
2	A	501	HEM	C1D-ND	2.72	1.44	1.38
2	C	501	HEM	CAB-C3B	-2.53	1.40	1.47
2	B	501	HEM	C3B-C4B	2.40	1.49	1.44
2	A	501	HEM	CAD-C3D	2.39	1.57	1.51
2	B	501	HEM	C3C-C4C	2.37	1.44	1.41
2	A	501	HEM	CHB-C1B	2.35	1.40	1.34
2	B	501	HEM	CMB-C2B	2.29	1.55	1.50
2	B	501	HEM	C3C-C2C	2.22	1.43	1.40
2	B	501	HEM	CHB-C1B	2.22	1.40	1.34
2	A	501	HEM	C3C-C2C	2.19	1.43	1.40
2	B	501	HEM	CHD-C1D	2.17	1.47	1.40
2	B	501	HEM	C1D-ND	2.17	1.43	1.38
2	A	501	HEM	CAB-C3B	-2.11	1.41	1.47
2	A	501	HEM	C4B-NB	2.10	1.43	1.38
2	A	501	HEM	C3C-C4C	2.10	1.44	1.41
2	A	501	HEM	CMB-C2B	2.04	1.54	1.50
2	C	501	HEM	C4B-NB	2.01	1.42	1.38

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	HEM	C4B-CHC-C1C	8.06	133.20	122.56
2	B	501	HEM	C4C-CHD-C1D	7.18	132.03	122.56
2	C	501	HEM	C4B-CHC-C1C	7.17	132.02	122.56
2	C	501	HEM	C4C-CHD-C1D	6.73	131.45	122.56
2	B	501	HEM	C4B-CHC-C1C	6.54	131.19	122.56
2	A	501	HEM	C4C-CHD-C1D	6.38	130.97	122.56
2	C	501	HEM	CHD-C1D-ND	4.88	129.68	124.44
2	B	501	HEM	CMC-C2C-C3C	4.35	133.38	124.68
2	C	501	HEM	CMC-C2C-C3C	3.67	132.01	124.68
2	C	501	HEM	CHC-C4B-NB	3.60	128.30	124.44
2	A	501	HEM	CMC-C2C-C3C	3.42	131.52	124.68
2	A	501	HEM	CHD-C1D-ND	3.19	127.86	124.44
2	B	501	HEM	CHD-C1D-ND	3.08	127.75	124.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	HEM	C2D-C1D-ND	-2.90	106.55	109.90
2	B	501	HEM	C3C-C4C-NC	-2.83	105.60	110.94
2	C	501	HEM	CMA-C3A-C4A	-2.73	124.46	128.46
2	B	501	HEM	CHC-C4B-NB	2.69	127.32	124.44
2	B	501	HEM	CAB-C3B-C2B	-2.62	119.93	128.43
2	A	501	HEM	CMA-C3A-C4A	-2.59	124.66	128.46
2	B	501	HEM	C2B-C1B-NB	2.55	112.77	109.84
2	B	501	HEM	C4A-C3A-C2A	-2.39	105.33	107.00
2	A	501	HEM	C3C-C4C-NC	-2.39	106.44	110.94
2	B	501	HEM	CMD-C2D-C1D	2.31	128.64	125.03
2	A	501	HEM	CMD-C2D-C1D	2.30	128.63	125.03
2	A	501	HEM	CAB-C3B-C2B	-2.25	121.10	128.43
2	B	501	HEM	CBA-CAA-C2A	-2.14	108.94	112.54
2	C	501	HEM	C2C-C3C-C4C	-2.13	105.41	106.90
2	B	501	HEM	C3B-C4B-NB	-2.11	107.95	109.47
2	A	501	HEM	C1D-C2D-C3D	2.07	109.16	106.98
2	C	501	HEM	C1D-C2D-C3D	2.04	109.13	106.98
2	B	501	HEM	CHB-C1B-C2B	-2.00	121.28	126.94

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	501	HEM	C2B-C3B-CAB-CBB
2	C	501	HEM	C4B-C3B-CAB-CBB
2	C	501	HEM	CAD-CBD-CGD-O2D
2	C	501	HEM	CAD-CBD-CGD-O1D
2	C	501	HEM	CAA-CBA-CGA-O2A
2	B	501	HEM	CAA-CBA-CGA-O2A
2	C	501	HEM	CAA-CBA-CGA-O1A

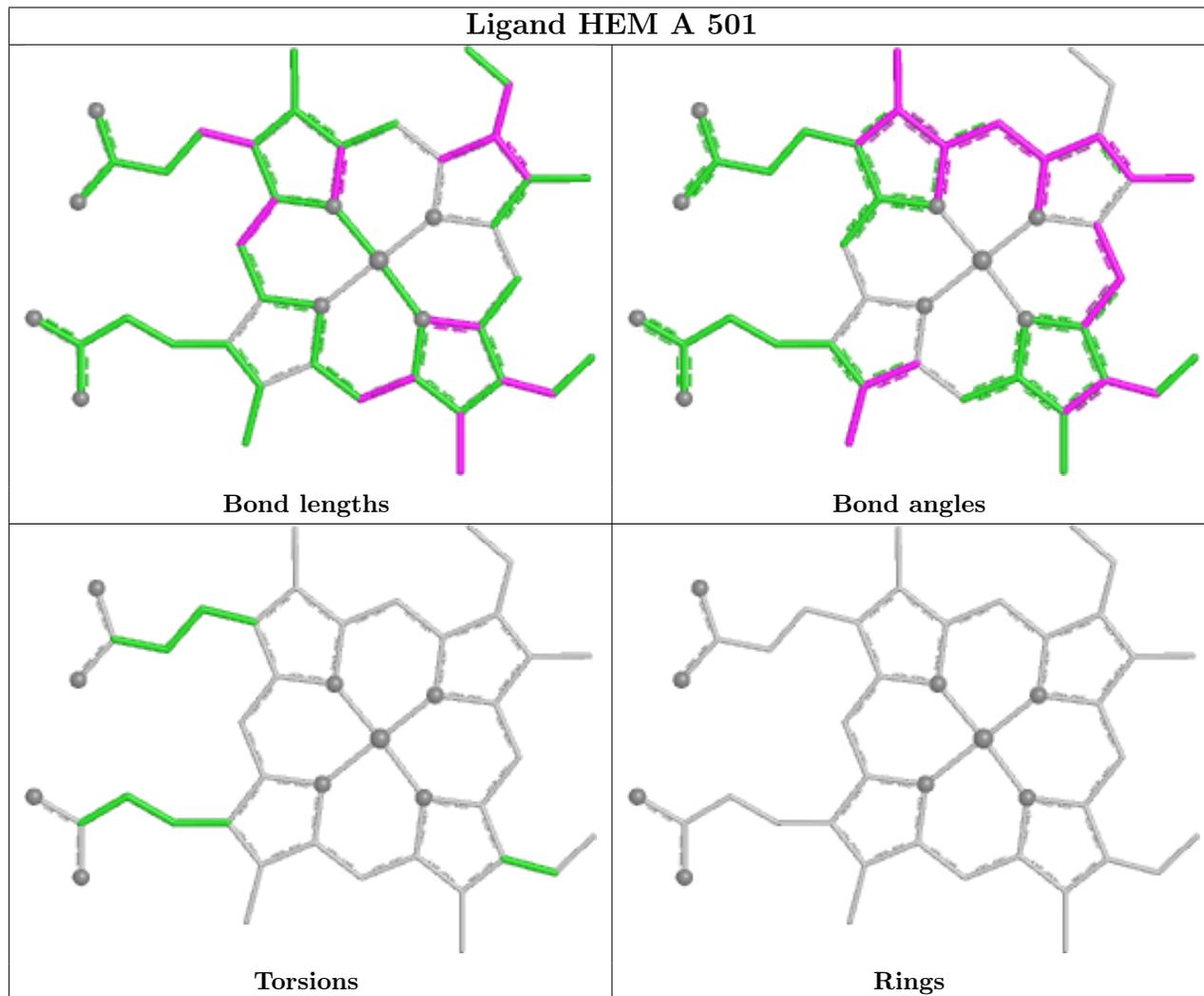
There are no ring outliers.

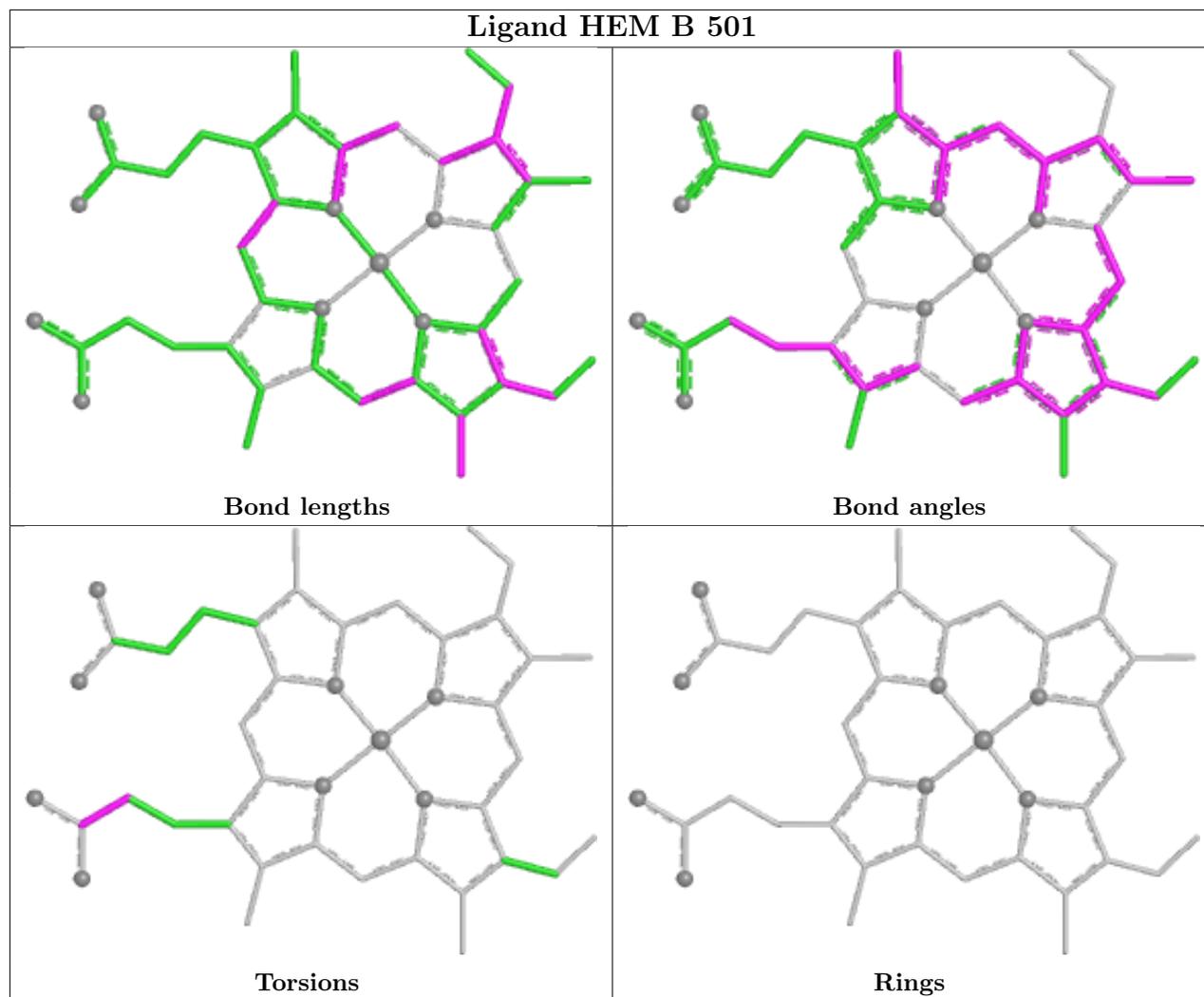
3 monomers are involved in 7 short contacts:

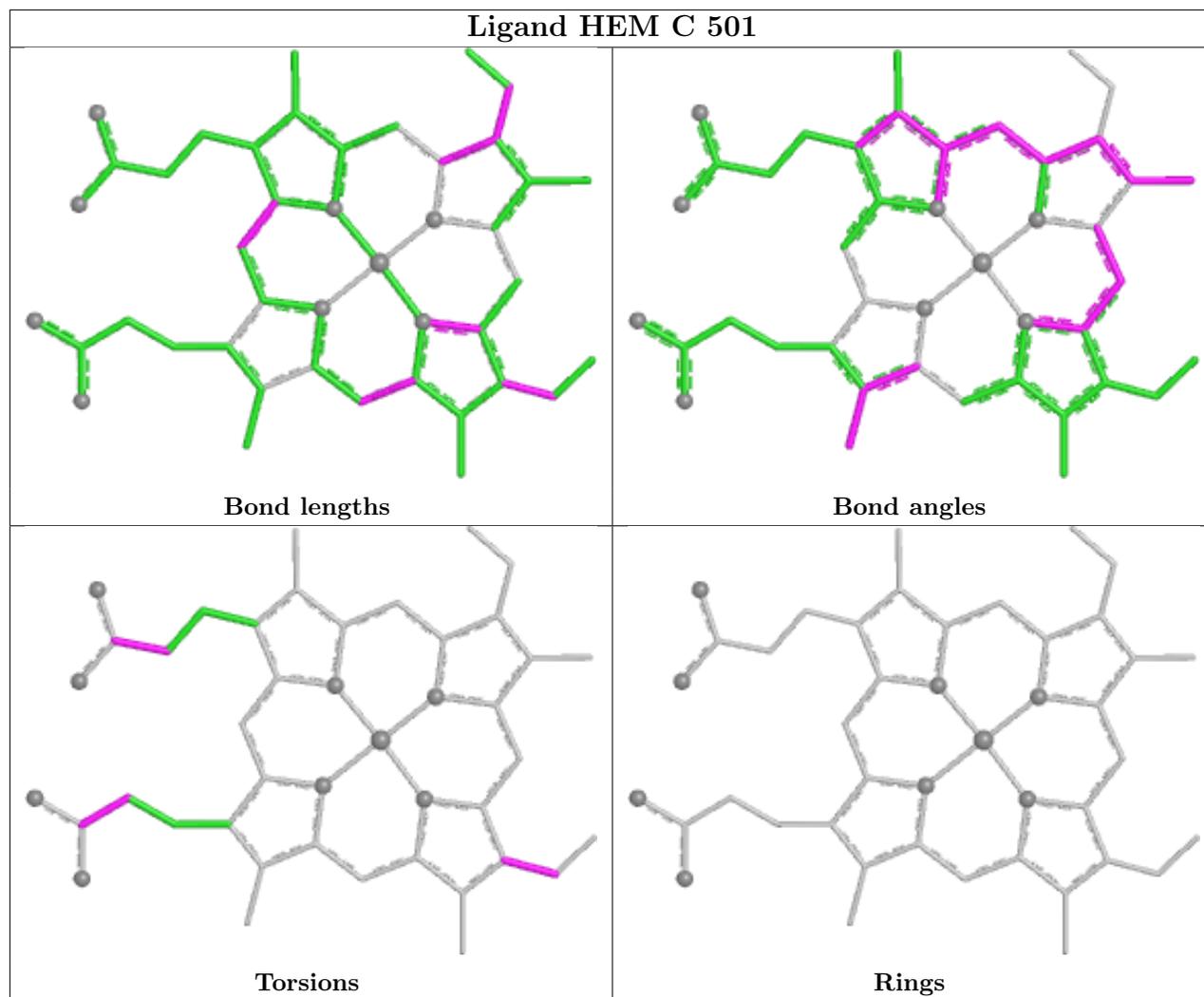
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	HEM	2	0
2	B	501	HEM	3	0
2	C	501	HEM	2	0

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 than 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.







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, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	411/417 (98%)	-0.00	6 (1%) 71 71	17, 30, 49, 63	0
1	B	411/417 (98%)	0.15	11 (2%) 56 55	18, 33, 52, 70	0
1	C	411/417 (98%)	0.91	32 (7%) 20 20	34, 52, 69, 78	0
All	All	1233/1251 (98%)	0.35	49 (3%) 43 43	17, 38, 63, 78	0

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	11	LEU	5.2
1	C	79	PHE	3.4
1	C	100	LEU	3.4
1	B	272	ASN	3.2
1	C	273	SER	3.2
1	C	346	LEU	3.2
1	B	181	TRP	3.0
1	B	70	LEU	2.9
1	C	9	LYS	2.9
1	C	10	SER	2.8
1	B	71	PRO	2.8
1	C	42	LEU	2.7
1	C	78	LEU	2.7
1	A	173	PHE	2.7
1	C	302	VAL	2.7
1	B	6	PRO	2.6
1	C	343	GLU	2.6
1	C	32	TYR	2.4
1	A	70	LEU	2.4
1	C	305	ASN	2.4
1	A	79	PHE	2.4
1	C	291	PRO	2.4
1	C	263	LYS	2.3

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Mol	Chain	Res	Type	RSRZ
1	C	25	ILE	2.3
1	C	36	LEU	2.3
1	B	173	PHE	2.3
1	B	174	GLY	2.3
1	B	305	ASN	2.3
1	A	291	PRO	2.2
1	B	79	PHE	2.2
1	C	12	ASP	2.2
1	C	131	GLU	2.2
1	A	274	ARG	2.2
1	C	39	ALA	2.2
1	C	416	LYS	2.2
1	C	185	ARG	2.2
1	B	307	GLU	2.1
1	C	43	GLY	2.1
1	B	309	LYS	2.1
1	C	69	ALA	2.1
1	C	70	LEU	2.1
1	C	31	ARG	2.1
1	A	174	GLY	2.1
1	C	6	PRO	2.1
1	C	258	LEU	2.1
1	C	91	ALA	2.1
1	C	340	ALA	2.1
1	C	266	GLU	2.0
1	C	223	GLU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [\(i\)](#)

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

6.3 Carbohydrates [\(i\)](#)

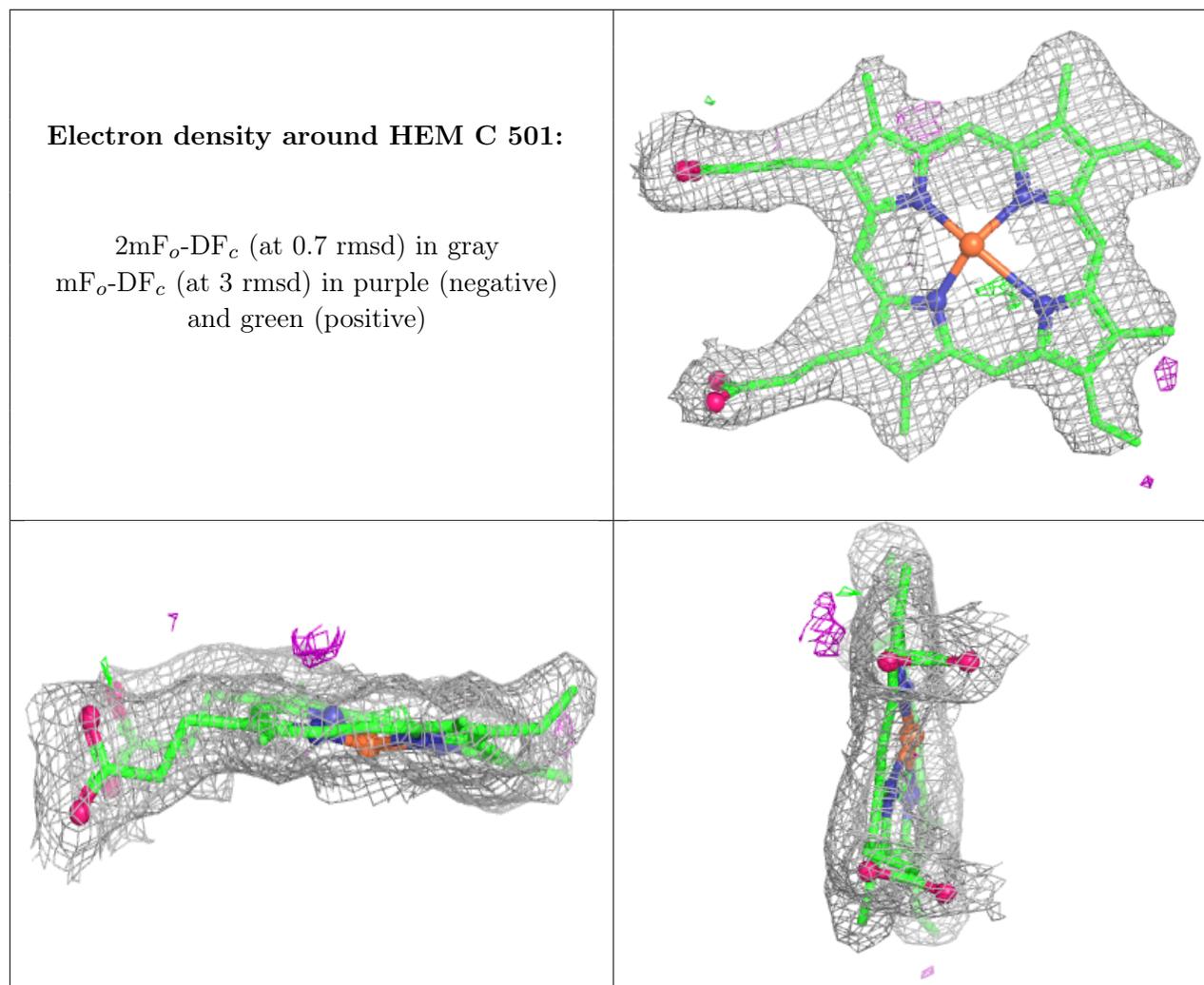
There are no monosaccharides in this entry.

6.4 Ligands [\(i\)](#)

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

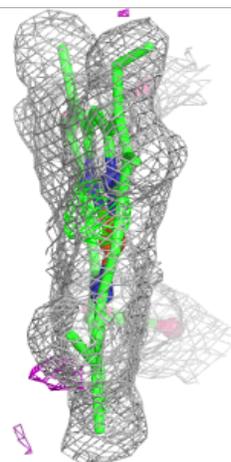
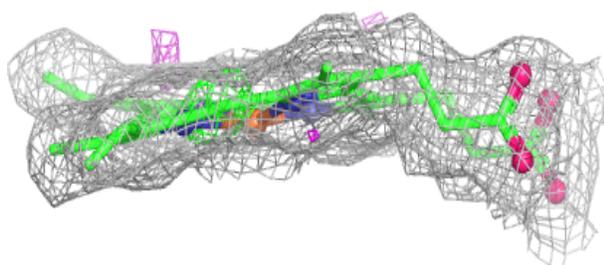
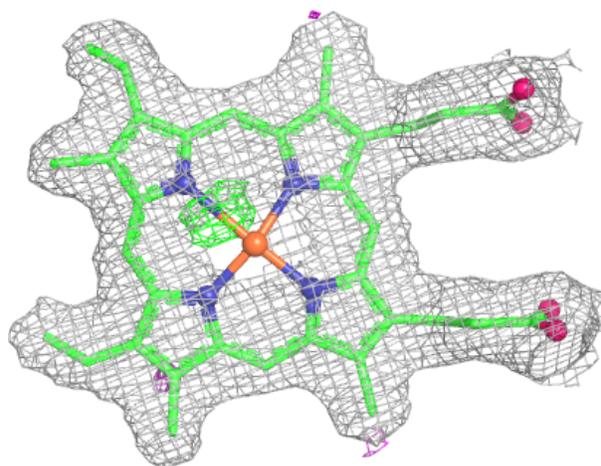
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	HEM	C	501	43/43	0.95	0.10	29,35,43,48	0
2	HEM	A	501	43/43	0.97	0.07	12,17,22,26	0
2	HEM	B	501	43/43	0.98	0.06	17,19,22,26	0

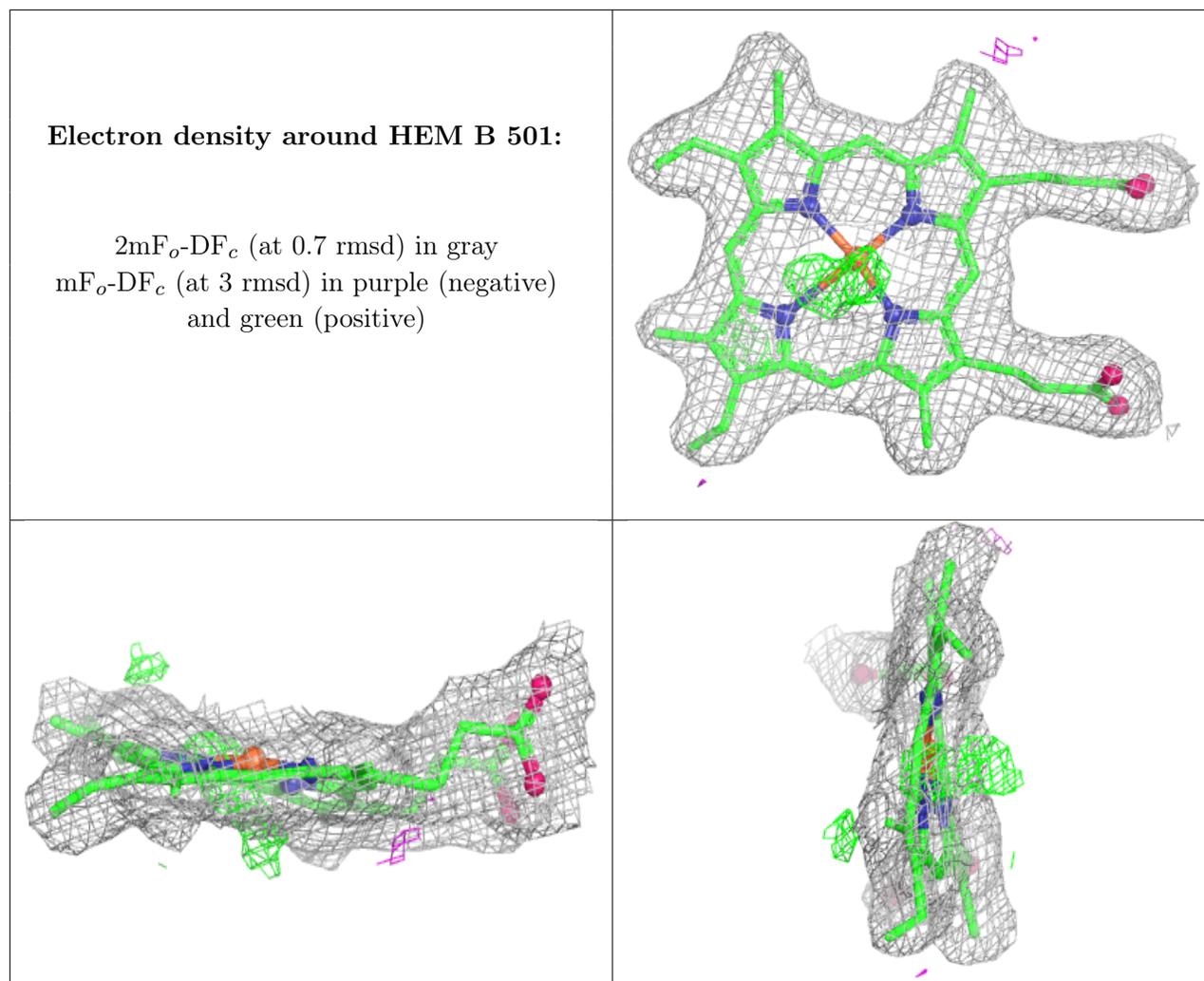
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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



Electron density around HEM 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 [i](#)

There are no such residues in this entry.