Full wwPDB X-ray Structure Validation Report (i)

Aug 8, 2023 – 03:47 AM EDT

PDB ID	:	1P7Z
Title	:	Crystal structure of the D181S variant of catalase HPII from E. coli
Authors	:	Chelikani, P.; Carpena, X.; Fita, I.; Loewen, P.C.
Deposited on	:	2003-05-06
Resolution	:	2.21 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:

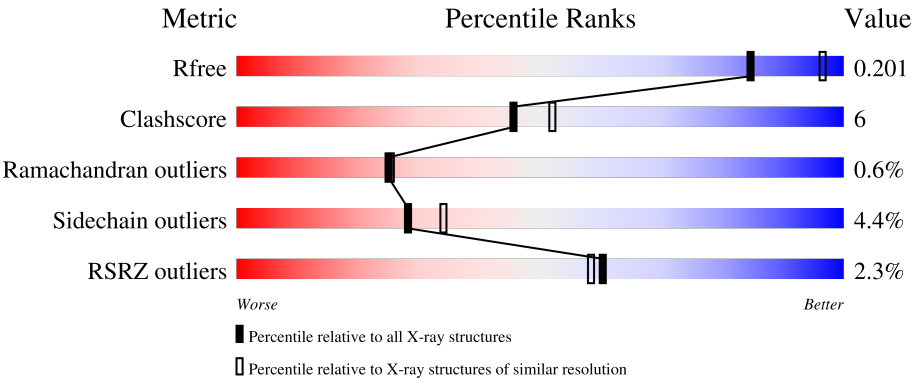
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (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 2.21 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	5912 (2.24-2.20)
Clashscore	141614	6646 (2.24-2.20)
Ramachandran outliers	138981	6543 (2.24-2.20)
Sidechain outliers	138945	6544 (2.24-2.20)
RSRZ outliers	127900	5797 (2.24-2.20)

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	753	2% 80% 15%
1	B	753	2% 76% 18%
1	C	753	2% 77% 17%
1	D	753	2% 76% 18%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 25893 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.

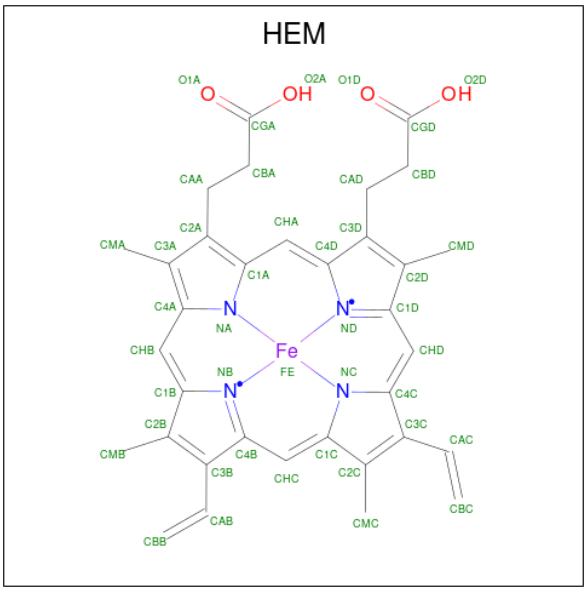
- Molecule 1 is a protein called Catalase HPII.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	727	Total 5747	C 3649	N 1005	O 1081	S 12	0	1	0
1	B	727	Total 5747	C 3649	N 1005	O 1081	S 12	0	1	0
1	C	727	Total 5747	C 3649	N 1005	O 1081	S 12	0	1	0
1	D	727	Total 5747	C 3649	N 1005	O 1081	S 12	0	1	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	181	SER	ASP	engineered mutation	UNP P21179
B	181	SER	ASP	engineered mutation	UNP P21179
C	181	SER	ASP	engineered mutation	UNP P21179
D	181	SER	ASP	engineered mutation	UNP P21179

- 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		
2	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	D	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is water.

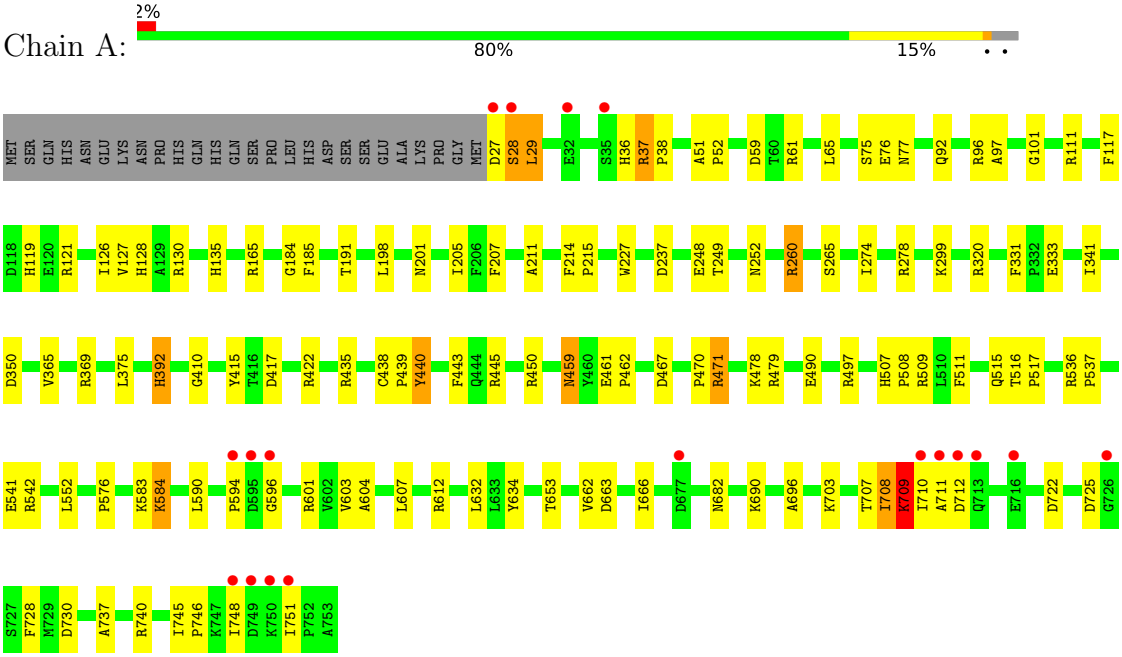
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	739	Total	O	0	0
			739	739		
3	B	610	Total	O	0	0
			610	610		
3	C	674	Total	O	0	0
			674	674		
3	D	710	Total	O	0	0
			710	710		

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.

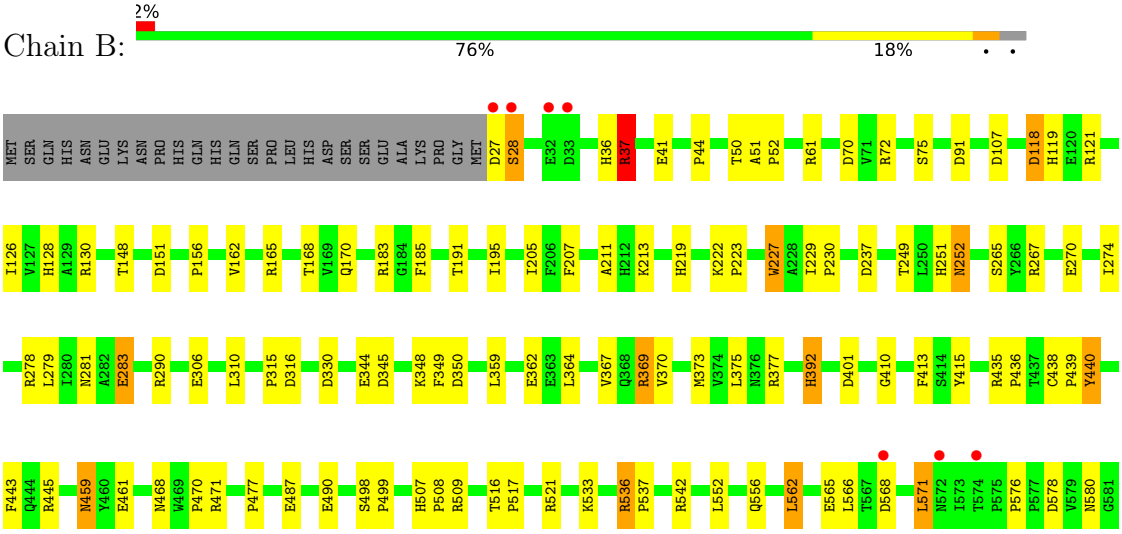
• Molecule 1: Catalase HPII

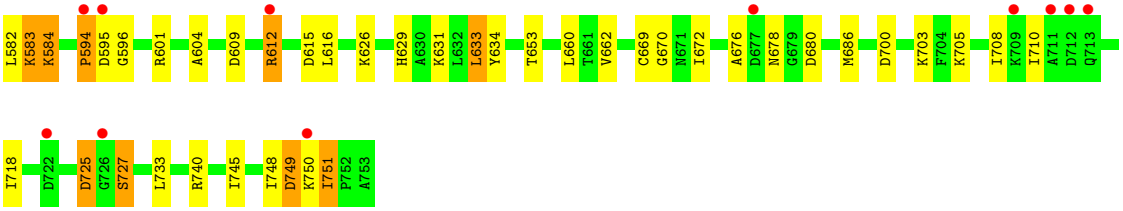
Chain A:



• Molecule 1: Catalase HPII

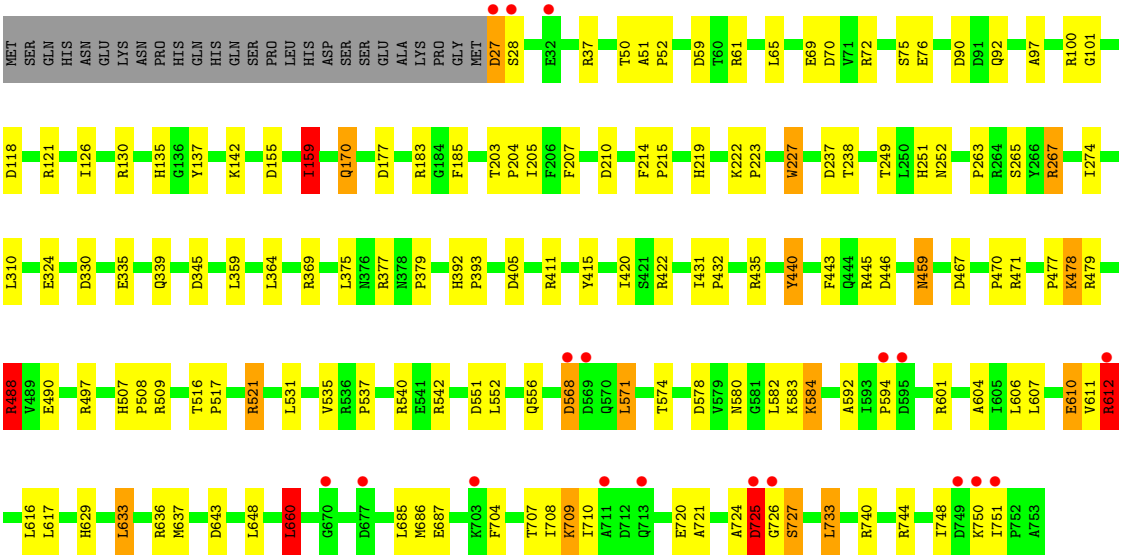
Chain B:





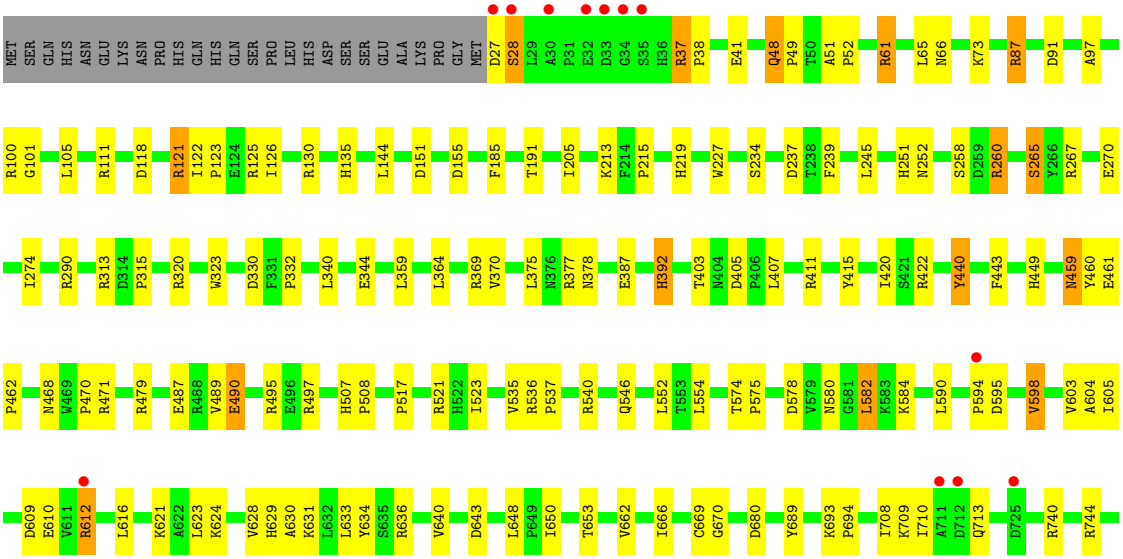
• Molecule 1: Catalase HPII

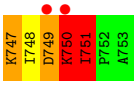
Chain C:



• Molecule 1: Catalase HPII

Chain D:




K747
I748
D749
K750
I751
P752
A753

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	93.34Å 132.88Å 121.45Å 90.00° 109.40° 90.00°	Depositor
Resolution (Å)	29.80 – 2.21 17.93 – 2.21	Depositor EDS
% Data completeness (in resolution range)	99.6 (29.80-2.21) 99.1 (17.93-2.21)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.10	Depositor
$< I/\sigma(I) >$ [1]	4.21 (at 2.21Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.144 , 0.211 0.142 , 0.201	Depositor DCC
R_{free} test set	6965 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	18.0	Xtriage
Anisotropy	0.528	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 62.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	25893	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.43% 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: 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	0.56	0/5908	1.34	42/8032 (0.5%)
1	B	0.55	0/5908	1.35	44/8032 (0.5%)
1	C	0.55	0/5908	1.35	55/8032 (0.7%)
1	D	0.56	0/5908	1.42	56/8032 (0.7%)
All	All	0.55	0/23632	1.37	197/32128 (0.6%)

There are no bond length outliers.

All (197) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	612	ARG	CD-NE-CZ	30.99	166.98	123.60
1	B	37	ARG	CD-NE-CZ	18.81	149.94	123.60
1	A	542	ARG	NE-CZ-NH2	-16.78	111.91	120.30
1	C	445	ARG	NE-CZ-NH1	15.90	128.25	120.30
1	D	61	ARG	NE-CZ-NH2	13.58	127.09	120.30
1	B	542	ARG	NE-CZ-NH2	-13.56	113.52	120.30
1	A	435	ARG	NE-CZ-NH2	-12.11	114.24	120.30
1	D	61	ARG	CD-NE-CZ	11.83	140.16	123.60
1	D	740	ARG	NE-CZ-NH1	11.16	125.88	120.30
1	B	542	ARG	NE-CZ-NH1	11.05	125.82	120.30
1	D	61	ARG	NE-CZ-NH1	-10.91	114.85	120.30
1	A	278	ARG	NE-CZ-NH1	-10.29	115.15	120.30
1	A	601	ARG	NE-CZ-NH1	10.28	125.44	120.30
1	A	479	ARG	CD-NE-CZ	10.24	137.94	123.60
1	C	445	ARG	NE-CZ-NH2	-9.77	115.41	120.30
1	C	540	ARG	NE-CZ-NH1	-9.52	115.54	120.30
1	D	497	ARG	NE-CZ-NH1	9.41	125.00	120.30
1	D	449	HIS	CA-CB-CG	9.38	129.55	113.60
1	B	72	ARG	NE-CZ-NH2	-9.28	115.66	120.30
1	A	111	ARG	NE-CZ-NH1	-9.20	115.70	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	28	SER	N-CA-CB	9.11	124.16	110.50
1	C	744	ARG	NE-CZ-NH2	-9.04	115.78	120.30
1	A	479	ARG	NE-CZ-NH1	8.96	124.78	120.30
1	D	422	ARG	NE-CZ-NH1	8.94	124.77	120.30
1	D	680	ASP	CB-CG-OD2	8.94	126.34	118.30
1	D	313	ARG	NE-CZ-NH2	8.89	124.75	120.30
1	C	540	ARG	NE-CZ-NH2	8.84	124.72	120.30
1	D	100	ARG	CD-NE-CZ	8.77	135.87	123.60
1	A	471	ARG	NE-CZ-NH2	8.60	124.60	120.30
1	A	479	ARG	NE-CZ-NH2	-8.53	116.03	120.30
1	C	726	GLY	N-CA-C	-8.36	92.19	113.10
1	B	401	ASP	CB-CG-OD1	-8.29	110.84	118.30
1	B	740	ARG	NE-CZ-NH1	8.23	124.42	120.30
1	D	612	ARG	NE-CZ-NH2	8.13	124.36	120.30
1	C	467	ASP	CB-CG-OD1	8.12	125.61	118.30
1	A	740	ARG	NE-CZ-NH1	8.10	124.35	120.30
1	D	87	ARG	NE-CZ-NH1	8.09	124.34	120.30
1	B	121	ARG	NE-CZ-NH2	-8.04	116.28	120.30
1	D	440	TYR	CB-CG-CD2	-8.02	116.19	121.00
1	D	636	ARG	NE-CZ-NH1	7.97	124.28	120.30
1	C	542	ARG	NE-CZ-NH1	-7.96	116.32	120.30
1	C	72	ARG	CD-NE-CZ	7.93	134.70	123.60
1	D	260	ARG	NE-CZ-NH1	-7.92	116.34	120.30
1	A	542	ARG	NE-CZ-NH1	7.86	124.23	120.30
1	D	87	ARG	NE-CZ-NH2	-7.81	116.39	120.30
1	A	130	ARG	NE-CZ-NH2	-7.79	116.41	120.30
1	C	488	ARG	NE-CZ-NH2	-7.63	116.49	120.30
1	C	59	ASP	CB-CG-OD1	7.58	125.12	118.30
1	B	369	ARG	NE-CZ-NH2	7.53	124.06	120.30
1	A	471	ARG	NE-CZ-NH1	-7.52	116.54	120.30
1	D	495	ARG	NE-CZ-NH1	7.45	124.02	120.30
1	B	107	ASP	CB-CG-OD1	7.35	124.91	118.30
1	C	267	ARG	NE-CZ-NH1	-7.28	116.66	120.30
1	C	70	ASP	CB-CG-OD2	7.28	124.85	118.30
1	B	615	ASP	CB-CG-OD2	7.22	124.80	118.30
1	D	377	ARG	NE-CZ-NH2	-7.20	116.70	120.30
1	B	61	ARG	NE-CZ-NH1	7.20	123.90	120.30
1	B	37	ARG	NE-CZ-NH1	7.19	123.89	120.30
1	B	118	ASP	CB-CG-OD2	7.09	124.68	118.30
1	D	405	ASP	CB-CG-OD1	7.08	124.67	118.30
1	C	601	ARG	NE-CZ-NH2	-7.02	116.79	120.30
1	B	283	GLU	CB-CG-CD	7.02	133.15	114.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	450	ARG	NE-CZ-NH2	6.97	123.78	120.30
1	D	440	TYR	CB-CG-CD1	6.91	125.14	121.00
1	D	387	GLU	OE1-CD-OE2	-6.88	115.04	123.30
1	C	345	ASP	CB-CG-OD1	6.88	124.49	118.30
1	D	521	ARG	NE-CZ-NH2	6.83	123.72	120.30
1	B	700	ASP	CB-CG-OD2	-6.79	112.19	118.30
1	C	551	ASP	CB-CG-OD2	-6.78	112.20	118.30
1	D	151	ASP	CB-CG-OD2	6.71	124.34	118.30
1	C	130	ARG	NE-CZ-NH1	6.70	123.65	120.30
1	D	740	ARG	NE-CZ-NH2	-6.70	116.95	120.30
1	B	41	GLU	OE1-CD-OE2	-6.63	115.35	123.30
1	D	100	ARG	CG-CD-NE	6.61	125.67	111.80
1	B	316	ASP	CB-CG-OD2	6.60	124.24	118.30
1	D	422	ARG	NE-CZ-NH2	-6.56	117.02	120.30
1	B	740	ARG	NE-CZ-NH2	-6.55	117.02	120.30
1	B	151	ASP	CB-CG-OD2	6.54	124.18	118.30
1	C	725	ASP	N-CA-CB	6.53	122.36	110.60
1	A	37	ARG	NE-CZ-NH1	6.52	123.56	120.30
1	A	730	ASP	CB-CG-OD1	6.40	124.06	118.30
1	D	130	ARG	NE-CZ-NH2	-6.38	117.11	120.30
1	D	125	ARG	NE-CZ-NH2	-6.34	117.13	120.30
1	A	59	ASP	CB-CG-OD1	6.34	124.00	118.30
1	B	72	ARG	NE-CZ-NH1	6.33	123.47	120.30
1	C	445	ARG	CD-NE-CZ	6.33	132.46	123.60
1	D	369	ARG	CD-NE-CZ	6.28	132.40	123.60
1	A	265	SER	N-CA-CB	-6.27	101.10	110.50
1	D	377	ARG	NE-CZ-NH1	-6.26	117.17	120.30
1	D	479	ARG	CD-NE-CZ	6.26	132.37	123.60
1	D	643	ASP	CB-CG-OD1	6.24	123.92	118.30
1	B	265	SER	N-CA-CB	-6.22	101.17	110.50
1	B	440	TYR	CB-CG-CD1	6.21	124.72	121.00
1	D	540	ARG	NE-CZ-NH1	6.21	123.40	120.30
1	D	609	ASP	CB-CG-OD2	6.20	123.88	118.30
1	A	440	TYR	CB-CG-CD1	6.15	124.69	121.00
1	C	183	ARG	NE-CZ-NH1	6.12	123.36	120.30
1	C	121	ARG	NE-CZ-NH2	-6.12	117.24	120.30
1	D	377	ARG	NH1-CZ-NH2	6.11	126.12	119.40
1	C	210	ASP	CB-CG-OD1	6.08	123.77	118.30
1	C	479	ARG	NE-CZ-NH1	6.08	123.34	120.30
1	A	369	ARG	NE-CZ-NH1	6.08	123.34	120.30
1	A	111	ARG	NE-CZ-NH2	6.05	123.33	120.30
1	B	609	ASP	CB-CG-OD2	6.05	123.75	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	100	ARG	NE-CZ-NH2	6.04	123.32	120.30
1	A	248	GLU	OE1-CD-OE2	-6.04	116.05	123.30
1	C	177	ASP	CB-CG-OD2	6.04	123.74	118.30
1	C	488	ARG	CD-NE-CZ	6.01	132.01	123.60
1	C	72	ARG	NE-CZ-NH2	-5.99	117.30	120.30
1	C	471	ARG	NE-CZ-NH1	5.99	123.29	120.30
1	A	37	ARG	NE-CZ-NH2	-5.98	117.31	120.30
1	A	612	ARG	CD-NE-CZ	5.96	131.95	123.60
1	C	422	ARG	CD-NE-CZ	5.95	131.94	123.60
1	D	536	ARG	NE-CZ-NH2	-5.95	117.32	120.30
1	C	440	TYR	CB-CG-CD1	5.93	124.56	121.00
1	D	111	ARG	NE-CZ-NH1	-5.91	117.35	120.30
1	A	497	ARG	NE-CZ-NH1	5.87	123.23	120.30
1	A	467	ASP	CB-CG-OD1	5.86	123.57	118.30
1	B	183	ARG	NE-CZ-NH1	5.86	123.23	120.30
1	D	121	ARG	NE-CZ-NH2	5.86	123.23	120.30
1	C	76	GLU	OE1-CD-OE2	5.85	130.32	123.30
1	B	401	ASP	CB-CG-OD2	5.83	123.55	118.30
1	A	260	ARG	NE-CZ-NH2	-5.83	117.39	120.30
1	B	121	ARG	NE-CZ-NH1	5.82	123.21	120.30
1	D	344	GLU	CB-CA-C	-5.81	98.78	110.40
1	A	722	ASP	CB-CG-OD1	5.81	123.53	118.30
1	B	615	ASP	CB-CG-OD1	-5.79	113.09	118.30
1	B	118	ASP	CB-CG-OD1	-5.77	113.11	118.30
1	A	278	ARG	NE-CZ-NH2	5.74	123.17	120.30
1	B	445	ARG	NE-CZ-NH2	5.69	123.15	120.30
1	C	488	ARG	NE-CZ-NH1	5.67	123.14	120.30
1	C	446	ASP	CB-CG-OD1	5.67	123.40	118.30
1	D	403	THR	N-CA-CB	5.62	120.99	110.30
1	B	350	ASP	CB-CA-C	5.60	121.61	110.40
1	A	422	ARG	NE-CZ-NH2	5.58	123.09	120.30
1	B	290	ARG	N-CA-CB	5.58	120.64	110.60
1	B	290	ARG	NE-CZ-NH1	-5.55	117.52	120.30
1	D	155	ASP	CB-CG-OD1	5.55	123.29	118.30
1	C	422	ARG	NE-CZ-NH2	5.53	123.07	120.30
1	C	612	ARG	CD-NE-CZ	5.53	131.34	123.60
1	D	130	ARG	NE-CZ-NH1	5.52	123.06	120.30
1	A	663	ASP	CB-CG-OD1	5.51	123.26	118.30
1	C	568	ASP	CB-CG-OD1	-5.46	113.38	118.30
1	A	350	ASP	CB-CG-OD1	-5.45	113.39	118.30
1	C	497	ARG	NE-CZ-NH2	-5.42	117.59	120.30
1	C	660	LEU	CA-CB-CG	5.41	127.74	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	61	ARG	NE-CZ-NH2	-5.39	117.60	120.30
1	D	215	PRO	N-CA-CB	5.39	109.77	103.30
1	C	610	GLU	CA-CB-CG	5.38	125.25	113.40
1	D	265	SER	N-CA-CB	-5.37	102.44	110.50
1	B	156	PRO	N-CA-CB	5.36	109.73	103.30
1	C	155	ASP	CB-CG-OD1	-5.36	113.48	118.30
1	D	643	ASP	CB-CG-OD2	-5.35	113.48	118.30
1	D	487	GLU	OE1-CD-OE2	-5.34	116.89	123.30
1	D	479	ARG	NE-CZ-NH1	5.33	122.97	120.30
1	A	320	ARG	NE-CZ-NH1	5.33	122.96	120.30
1	C	733	LEU	CA-CB-CG	5.30	127.50	115.30
1	C	509	ARG	NE-CZ-NH1	-5.29	117.65	120.30
1	C	170	GLN	CB-CG-CD	5.29	125.34	111.60
1	B	377	ARG	NE-CZ-NH1	-5.28	117.66	120.30
1	C	521	ARG	NE-CZ-NH1	5.28	122.94	120.30
1	D	471	ARG	NE-CZ-NH2	-5.28	117.66	120.30
1	C	405	ASP	CB-CG-OD2	5.27	123.04	118.30
1	A	96	ARG	NE-CZ-NH2	-5.25	117.67	120.30
1	C	612	ARG	NE-CZ-NH1	5.24	122.92	120.30
1	A	601	ARG	CD-NE-CZ	5.23	130.92	123.60
1	A	445	ARG	NE-CZ-NH2	-5.23	117.69	120.30
1	A	165	ARG	NE-CZ-NH2	-5.22	117.69	120.30
1	A	165	ARG	CD-NE-CZ	5.21	130.89	123.60
1	B	270	GLU	OE1-CD-OE2	-5.20	117.06	123.30
1	D	320	ARG	NE-CZ-NH1	5.18	122.89	120.30
1	B	601	ARG	CD-NE-CZ	5.18	130.85	123.60
1	C	90	ASP	CB-CG-OD2	5.17	122.95	118.30
1	C	263	PRO	N-CA-CB	5.17	109.50	103.30
1	B	130	ARG	NE-CZ-NH1	5.16	122.88	120.30
1	B	377	ARG	CD-NE-CZ	5.16	130.83	123.60
1	B	435	ARG	NE-CZ-NH1	5.16	122.88	120.30
1	B	536	ARG	NE-CZ-NH2	-5.16	117.72	120.30
1	C	740	ARG	NE-CZ-NH2	-5.16	117.72	120.30
1	C	727	SER	N-CA-CB	-5.16	102.77	110.50
1	C	159	ILE	CB-CA-C	5.15	121.91	111.60
1	C	69	GLU	OE1-CD-OE2	-5.14	117.13	123.30
1	B	70	ASP	CB-CG-OD2	5.14	122.92	118.30
1	D	411	ARG	NE-CZ-NH1	5.13	122.86	120.30
1	C	471	ARG	NE-CZ-NH2	-5.12	117.74	120.30
1	D	290	ARG	CD-NE-CZ	-5.11	116.45	123.60
1	B	165	ARG	NE-CZ-NH1	-5.09	117.75	120.30
1	C	324	GLU	OE1-CD-OE2	-5.09	117.19	123.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	595	ASP	CB-CG-OD1	5.08	122.87	118.30
1	D	37	ARG	N-CA-CB	-5.08	101.46	110.60
1	A	541	GLU	OE1-CD-OE2	5.06	129.37	123.30
1	D	517	PRO	N-CA-CB	5.04	109.35	103.30
1	A	435	ARG	NE-CZ-NH1	5.04	122.82	120.30
1	A	440	TYR	CB-CG-CD2	-5.04	117.98	121.00
1	C	339	GLN	N-CA-CB	5.03	119.65	110.60
1	D	540	ARG	NE-CZ-NH2	-5.03	117.79	120.30
1	D	270	GLU	OE1-CD-OE2	-5.01	117.29	123.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5747	0	5586	63	0
1	B	5747	0	5586	101	0
1	C	5747	0	5586	75	0
1	D	5747	0	5586	80	0
2	A	43	0	30	1	0
2	B	43	0	30	3	0
2	C	43	0	30	3	0
2	D	43	0	30	3	0
3	A	739	0	0	3	0
3	B	610	0	0	14	0
3	C	674	0	0	10	0
3	D	710	0	0	8	0
All	All	25893	0	22464	291	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 6.

All (291) 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:D:750:LYS:HD3	1:D:751:ILE:H	1.49	0.78
1:B:583:LYS:NZ	1:B:583:LYS:H	1.84	0.75
1:D:267:ARG:HG2	1:D:332:PRO:HB3	1.69	0.74
1:C:267:ARG:HG3	3:C:3862:HOH:O	1.89	0.72
1:B:710:ILE:HD13	1:B:718:ILE:HG13	1.70	0.72
1:C:490:GLU:HG3	1:D:490:GLU:HG3	1.71	0.71
1:B:468:ASN:HD22	1:D:27:ASP:N	1.88	0.71
1:D:144:LEU:HD11	1:D:370:VAL:HG13	1.73	0.70
1:B:37:ARG:HD2	3:B:3832:HOH:O	1.91	0.69
1:A:690:LYS:HG3	1:A:751:ILE:HD11	1.74	0.69
1:D:748:ILE:O	1:D:751:ILE:HG22	1.95	0.66
1:A:214:PHE:HB3	1:A:215:PRO:HD3	1.78	0.66
1:C:748:ILE:O	1:C:751:ILE:HG22	1.96	0.66
1:B:310:LEU:HD13	1:B:660:LEU:HB3	1.77	0.65
1:B:686:MET:HB3	1:B:751:ILE:HD11	1.79	0.65
1:B:267:ARG:HG3	3:B:2872:HOH:O	1.96	0.64
1:B:604:ALA:HB2	1:B:662:VAL:HG11	1.78	0.64
1:D:546:GLN:HG3	3:D:3688:HOH:O	1.97	0.64
1:C:578:ASP:HB2	1:C:582:LEU:O	1.97	0.63
1:B:705:LYS:HE3	1:B:710:ILE:HG22	1.81	0.62
1:B:748:ILE:O	1:B:751:ILE:HG22	2.00	0.61
1:B:583:LYS:O	1:B:584:LYS:HB3	2.02	0.60
3:A:1161:HOH:O	1:D:126[B]:ILE:HD11	2.01	0.60
1:C:610:GLU:OE1	1:C:643:ASP:HA	2.02	0.60
1:A:709:LYS:HE3	1:A:709:LYS:HA	1.84	0.59
1:A:459:ASN:ND2	1:B:219:HIS:HB3	2.17	0.59
1:A:121:ARG:HG2	1:D:126[B]:ILE:HD13	1.85	0.59
1:B:27:ASP:HB3	3:B:3519:HOH:O	2.02	0.59
1:D:330:ASP:OD1	1:D:629:HIS:HE1	1.86	0.58
1:B:281:ASN:OD1	1:B:283:GLU:HG2	2.03	0.58
1:B:267:ARG:HD2	3:B:1632:HOH:O	2.03	0.58
1:B:583:LYS:H	1:B:583:LYS:HZ3	1.50	0.57
1:C:222:LYS:HB3	1:C:223:PRO:CD	2.35	0.57
1:B:521:ARG:HH21	1:B:745:ILE:HG21	1.70	0.57
1:B:552:LEU:HD21	1:B:571:LEU:HD12	1.86	0.57
1:A:126[B]:ILE:HD11	3:D:4171:HOH:O	2.05	0.57
1:C:137:TYR:HB2	1:C:159:ILE:CD1	2.35	0.56
1:D:750:LYS:CD	1:D:751:ILE:H	2.15	0.56
1:B:36:HIS:HD1	1:B:36:HIS:H	1.54	0.56
1:D:594:PRO:HA	3:D:3812:HOH:O	2.03	0.56
1:C:704:PHE:O	1:C:707:THR:HG22	2.05	0.56
1:D:629:HIS:HD2	3:D:2510:HOH:O	1.88	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:634:TYR:O	1:B:653:THR:HA	2.06	0.56
1:C:516:THR:HB	1:C:517:PRO:HD2	1.88	0.56
1:A:748:ILE:O	1:A:751:ILE:HG13	2.05	0.56
1:D:507:HIS:N	1:D:508:PRO:HD2	2.21	0.56
1:B:51:ALA:HB1	1:B:52:PRO:HD2	1.89	0.55
1:C:214:PHE:HB3	1:C:215:PRO:HD3	1.88	0.55
3:B:3419:HOH:O	1:C:126[B]:ILE:HD11	2.07	0.55
1:D:274:ILE:HD12	2:D:760:HEM:HMB1	1.87	0.55
1:D:708:ILE:HG13	1:D:710:ILE:HG12	1.89	0.55
1:A:583:LYS:O	1:A:584:LYS:HB3	2.07	0.55
1:D:315:PRO:HB2	3:D:2309:HOH:O	2.06	0.55
1:D:535:VAL:O	1:D:537:PRO:HD3	2.06	0.55
1:D:392:HIS:ND1	1:D:415:TYR:HB2	2.22	0.54
1:D:634:TYR:O	1:D:653:THR:HA	2.08	0.54
1:C:535:VAL:O	1:C:537:PRO:HD3	2.07	0.54
1:B:369:ARG:HG3	3:B:1254:HOH:O	2.07	0.54
1:D:51:ALA:HB1	1:D:52:PRO:HD2	1.90	0.54
1:A:92:GLN:HA	1:D:213:LYS:HD3	1.89	0.53
1:C:612:ARG:HB2	1:C:612:ARG:CZ	2.38	0.53
1:A:751:ILE:HD12	1:A:751:ILE:O	2.07	0.53
1:C:392:HIS:ND1	1:C:415:TYR:HB2	2.24	0.53
1:D:267:ARG:HG3	3:D:2871:HOH:O	2.09	0.53
1:D:48:GLN:HB3	1:D:49:PRO:HD2	1.91	0.53
1:C:592:ALA:O	1:C:594:PRO:HD3	2.09	0.53
1:A:28:SER:CB	1:D:245:LEU:HD22	2.40	0.52
1:A:490:GLU:HG2	1:B:490:GLU:HG2	1.90	0.52
1:D:359:LEU:H	1:D:507:HIS:HD2	1.58	0.52
1:A:471:ARG:CZ	1:C:27:ASP:HA	2.40	0.52
1:A:596:GLY:HA3	1:A:737:ALA:O	2.09	0.52
1:B:521:ARG:HH21	1:B:745:ILE:HD13	1.75	0.52
1:B:552:LEU:HD22	1:B:556:GLN:HG3	1.91	0.51
1:B:27:ASP:OD2	1:D:468:ASN:ND2	2.31	0.51
1:B:533:LYS:NZ	3:B:4179:HOH:O	2.43	0.51
1:B:330:ASP:OD1	1:B:629:HIS:HE1	1.93	0.51
1:C:51:ALA:HB1	1:C:52:PRO:HD2	1.93	0.51
1:D:65:LEU:HD21	1:D:135:HIS:CG	2.46	0.51
1:C:516:THR:HB	1:C:517:PRO:CD	2.41	0.51
1:B:516:THR:HB	1:B:517:PRO:CD	2.41	0.51
1:A:27:ASP:O	1:A:28:SER:C	2.50	0.51
1:A:478:LYS:HE2	3:A:3725:HOH:O	2.10	0.51
1:B:274:ILE:HD12	2:B:760:HEM:HMB1	1.91	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:596:GLY:HA3	3:B:3145:HOH:O	2.10	0.51
1:C:708:ILE:HG13	1:C:710:ILE:HG12	1.94	0.50
1:B:364:LEU:HD11	1:B:580:ASN:HB2	1.94	0.50
1:D:689:TYR:HA	1:D:744:ARG:NH1	2.27	0.50
1:B:583:LYS:HE2	1:B:584:LYS:HG2	1.94	0.50
1:D:392:HIS:CE1	1:D:415:TYR:HB2	2.47	0.49
1:B:126[B]:ILE:HD11	1:C:118:ASP:O	2.12	0.49
1:B:315:PRO:HB2	3:B:1492:HOH:O	2.12	0.49
1:B:211:ALA:CB	1:B:410:GLY:HA3	2.41	0.49
1:D:443:PHE:CZ	1:D:470:PRO:HD2	2.47	0.49
1:A:708:ILE:O	1:A:710:ILE:HG22	2.12	0.49
1:B:669:CYS:SG	1:B:670:GLY:N	2.81	0.49
1:D:27:ASP:O	1:D:28:SER:HB2	2.12	0.49
1:D:38:PRO:HA	1:D:48:GLN:HE21	1.77	0.49
1:C:435:ARG:HD3	3:C:2150:HOH:O	2.13	0.49
1:B:521:ARG:NH2	1:B:745:ILE:HG21	2.28	0.49
1:C:552:LEU:HD22	1:C:556:GLN:HG3	1.93	0.49
1:B:310:LEU:HD13	1:B:660:LEU:CB	2.42	0.49
1:B:471:ARG:NH1	1:D:28:SER:HA	2.28	0.49
1:A:725:ASP:H	1:A:728:PHE:HB3	1.78	0.48
1:D:624:LYS:HD3	1:D:624:LYS:C	2.33	0.48
1:D:631:LYS:HG3	1:D:633:LEU:HD13	1.95	0.48
1:A:51:ALA:HB1	1:A:52:PRO:HD2	1.95	0.48
1:A:28:SER:HB2	1:D:245:LEU:HD13	1.94	0.48
1:A:509:ARG:HD2	1:A:576:PRO:HD2	1.95	0.48
1:B:170:GLN:HB2	3:B:4166:HOH:O	2.14	0.48
1:C:330:ASP:OD1	1:C:629:HIS:HE1	1.97	0.48
1:B:604:ALA:HB1	1:B:633:LEU:HD22	1.95	0.48
1:A:52:PRO:HG3	3:C:1996:HOH:O	2.14	0.48
1:A:299:LYS:HE2	3:A:2744:HOH:O	2.13	0.48
1:C:552:LEU:HD21	1:C:571:LEU:HD12	1.95	0.48
2:C:760:HEM:CMC	2:C:760:HEM:HBC2	2.44	0.48
1:D:359:LEU:H	1:D:507:HIS:CD2	2.32	0.48
1:A:207:PHE:O	1:A:249:THR:HA	2.13	0.48
1:A:682:ASN:HB3	1:A:707:THR:HG21	1.96	0.47
1:C:459:ASN:ND2	1:D:219:HIS:HB3	2.29	0.47
1:B:459:ASN:HD22	1:B:459:ASN:H	1.62	0.47
1:A:438:CYS:HB2	1:A:439:PRO:CD	2.45	0.47
1:C:251:HIS:CE1	1:C:507:HIS:HB3	2.50	0.47
1:A:126[A]:ILE:HD12	1:D:121:ARG:CZ	2.45	0.47
1:B:556:GLN:HA	1:B:566:LEU:HD21	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:626:LYS:NZ	3:B:3404:HOH:O	2.47	0.47
1:C:459:ASN:H	1:C:459:ASN:HD22	1.62	0.47
1:D:37:ARG:HA	1:D:38:PRO:HD2	1.79	0.47
1:B:612:ARG:HD3	1:B:670:GLY:HA2	1.96	0.47
1:B:678:ASN:OD1	1:B:680:ASP:HB2	2.15	0.47
1:C:507:HIS:N	1:C:508:PRO:HD2	2.29	0.47
1:D:87:ARG:NE	3:D:2163:HOH:O	2.48	0.47
1:A:119:HIS:CE1	1:C:420:ILE:HG21	2.50	0.47
1:C:203:THR:HB	1:C:204:PRO:HD2	1.97	0.47
1:D:744:ARG:HA	1:D:747:LYS:HD3	1.96	0.47
1:C:222:LYS:HB3	1:C:223:PRO:HD2	1.97	0.46
1:D:669:CYS:SG	1:D:670:GLY:N	2.88	0.46
1:A:392:HIS:ND1	1:A:415:TYR:HB2	2.29	0.46
1:B:359:LEU:HD12	1:B:359:LEU:C	2.36	0.46
1:C:709:LYS:HD3	1:C:709:LYS:N	2.30	0.46
1:A:37:ARG:HA	1:A:38:PRO:HD3	1.84	0.46
1:A:461:GLU:HB2	1:A:462:PRO:HA	1.96	0.46
1:B:745:ILE:O	1:B:748:ILE:HG12	2.15	0.46
1:A:28:SER:HB2	1:D:245:LEU:HD22	1.98	0.46
1:D:407:LEU:HD11	2:D:760:HEM:HMC2	1.97	0.46
1:A:417:ASP:OD2	1:D:118:ASP:OD1	2.33	0.46
1:D:507:HIS:N	1:D:508:PRO:CD	2.78	0.46
1:A:37:ARG:HG3	1:A:38:PRO:HD2	1.97	0.46
1:A:443:PHE:CZ	1:A:470:PRO:HD2	2.50	0.46
1:B:222:LYS:HB3	1:B:223:PRO:HD2	1.98	0.46
1:D:623:LEU:HD22	1:D:628:VAL:HG11	1.97	0.46
1:B:207:PHE:O	1:B:249:THR:HA	2.16	0.46
1:B:344:GLU:CD	1:B:344:GLU:H	2.19	0.46
1:B:359:LEU:H	1:B:507:HIS:HD2	1.64	0.46
1:C:137:TYR:HB2	1:C:159:ILE:HD12	1.98	0.46
1:C:274:ILE:HD12	2:C:760:HEM:HMB1	1.97	0.46
1:C:364:LEU:HD11	1:C:580:ASN:HB2	1.98	0.46
1:A:65:LEU:HD21	1:A:135:HIS:CG	2.51	0.45
1:A:76:GLU:O	1:A:77:ASN:HB2	2.16	0.45
1:B:594:PRO:HA	3:B:2927:HOH:O	2.16	0.45
1:C:583:LYS:O	1:C:584:LYS:HB3	2.17	0.45
1:D:640:VAL:HG13	1:D:650:ILE:HD11	1.98	0.45
1:B:369:ARG:HG2	3:B:2593:HOH:O	2.16	0.45
1:C:686:MET:CB	1:C:751:ILE:HD11	2.46	0.45
1:B:44:PRO:HB3	1:B:629:HIS:CD2	2.52	0.45
1:B:578:ASP:HB3	1:B:582:LEU:O	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:118:ASP:O	1:C:126[B]:ILE:HD11	2.16	0.45
1:D:251:HIS:CE1	1:D:507:HIS:HB3	2.52	0.45
1:A:745:ILE:N	1:A:746:PRO:HD2	2.32	0.45
1:D:603:VAL:HG11	1:D:666:ILE:HG13	1.97	0.45
1:D:604:ALA:HB2	1:D:662:VAL:HG11	1.99	0.45
1:A:260:ARG:HD3	1:A:590:LEU:HD21	1.99	0.45
1:B:461:GLU:OE1	1:D:91:ASP:OD1	2.35	0.45
1:C:28:SER:HA	3:C:3596:HOH:O	2.16	0.45
1:C:335:GLU:OE2	1:C:369:ARG:NH2	2.50	0.45
1:B:413:PHE:HB2	1:D:105:LEU:HD11	1.99	0.44
1:C:359:LEU:H	1:C:507:HIS:HD2	1.66	0.44
1:D:574:THR:HG22	3:D:2568:HOH:O	2.16	0.44
1:B:708:ILE:HG13	1:B:710:ILE:HD12	1.98	0.44
1:C:751:ILE:HB	3:C:3317:HOH:O	2.16	0.44
1:D:605:ILE:HD12	1:D:630:ALA:HB1	1.99	0.44
1:D:61:ARG:HH11	1:D:66:ASN:HA	1.82	0.44
1:D:364:LEU:HD11	1:D:580:ASN:HB2	2.00	0.44
1:B:362:GLU:HG2	1:B:367:VAL:HG23	2.00	0.44
1:D:598:VAL:HG13	1:D:628:VAL:CG2	2.47	0.44
1:D:748:ILE:O	1:D:749:ASP:C	2.56	0.44
1:A:331:PHE:O	1:A:333:GLU:HG3	2.17	0.44
1:B:128:HIS:HA	1:B:168:THR:O	2.18	0.44
1:B:516:THR:HB	1:B:517:PRO:HD2	1.98	0.44
1:C:720:GLU:O	1:C:721:ALA:HB2	2.17	0.44
1:D:97:ALA:O	1:D:101:GLY:HA3	2.18	0.44
1:D:574:THR:HA	1:D:575:PRO:HD3	1.83	0.44
1:C:411:ARG:HG2	2:C:760:HEM:C2C	2.53	0.44
1:D:122:ILE:HB	1:D:123:PRO:HD2	2.00	0.44
1:B:509:ARG:HD2	1:B:576:PRO:HD2	1.99	0.43
1:C:238:THR:HB	1:D:460:TYR:CE2	2.53	0.43
1:C:392:HIS:CG	1:C:415:TYR:HB2	2.53	0.43
1:C:604:ALA:HB1	1:C:633:LEU:HD22	1.99	0.43
1:A:696:ALA:HB1	1:A:728:PHE:CZ	2.53	0.43
2:B:760:HEM:HBC2	2:B:760:HEM:CMC	2.47	0.43
1:C:607:LEU:HD22	1:C:611:VAL:HG21	2.00	0.43
1:A:127:VAL:O	1:A:128:HIS:HB2	2.18	0.43
1:A:511:PHE:O	1:A:515:GLN:HG2	2.18	0.43
1:C:443:PHE:CZ	1:C:470:PRO:HD2	2.54	0.43
1:C:490:GLU:HG3	1:D:490:GLU:CG	2.46	0.43
1:A:36:HIS:CD2	1:A:36:HIS:H	2.36	0.43
1:A:274:ILE:HD12	2:A:760:HEM:HMB1	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:195:ILE:HD11	1:B:436:PRO:HA	2.00	0.43
1:B:556:GLN:HG2	1:B:566:LEU:HD23	2.01	0.43
1:B:562:LEU:HA	1:C:637:MET:HB2	2.01	0.43
1:C:170:GLN:HB2	3:C:4198:HOH:O	2.18	0.43
1:C:724:ALA:O	1:C:725:ASP:HB2	2.18	0.43
1:D:260:ARG:HD3	1:D:590:LEU:HD21	2.01	0.43
1:B:222:LYS:HB3	1:B:223:PRO:CD	2.49	0.43
1:A:634:TYR:O	1:A:653:THR:HA	2.18	0.43
1:B:507:HIS:N	1:B:508:PRO:HD2	2.33	0.43
1:C:207:PHE:O	1:C:249:THR:HA	2.18	0.43
1:C:392:HIS:HA	1:C:393:PRO:HD2	1.87	0.43
1:A:29:LEU:HB2	3:C:3355:HOH:O	2.18	0.43
1:A:603:VAL:HG11	1:A:666:ILE:HD12	2.01	0.43
1:B:119:HIS:CE1	1:D:420:ILE:HG21	2.54	0.43
1:B:443:PHE:CZ	1:B:470:PRO:HD2	2.53	0.43
1:B:725:ASP:OD2	1:B:727:SER:N	2.51	0.43
1:C:126[B]:ILE:HG12	3:C:1937:HOH:O	2.18	0.43
1:C:490:GLU:HA	1:D:489:VAL:O	2.19	0.42
1:C:727:SER:HA	3:C:3660:HOH:O	2.18	0.42
1:D:693:LYS:HA	1:D:694:PRO:HD3	1.88	0.42
1:B:612:ARG:CD	1:B:670:GLY:HA2	2.49	0.42
1:D:234:SER:HB2	1:D:239:PHE:CD2	2.55	0.42
1:B:252:ASN:HD22	1:B:252:ASN:HA	1.75	0.42
1:D:603:VAL:CG1	1:D:666:ILE:HG13	2.49	0.42
1:B:91:ASP:OD1	1:D:461:GLU:OE1	2.37	0.42
1:B:229:ILE:HG23	1:B:230:PRO:HA	2.00	0.42
1:B:251:HIS:CE1	1:B:507:HIS:HB3	2.54	0.42
1:A:392:HIS:CE1	1:A:415:TYR:HB2	2.54	0.42
1:A:607:LEU:HD11	1:A:632:LEU:HB3	2.01	0.42
1:C:219:HIS:HB3	1:D:459:ASN:ND2	2.34	0.42
1:C:686:MET:HB3	1:C:751:ILE:HD11	2.02	0.42
1:B:50:THR:HG21	1:C:227:TRP:CZ3	2.55	0.42
1:B:392:HIS:CE1	1:B:415:TYR:HB2	2.55	0.42
1:A:117:PHE:CZ	1:D:126[A]:ILE:HG12	2.55	0.42
1:C:310:LEU:HD13	1:C:660:LEU:HB3	2.01	0.42
1:A:211:ALA:CB	1:A:410:GLY:HA3	2.50	0.42
1:A:536:ARG:HA	1:A:537:PRO:HD3	1.84	0.42
1:C:477:PRO:HB2	1:C:478:LYS:HD3	2.02	0.42
1:D:258:SER:HA	1:D:523:ILE:HG12	2.02	0.42
1:A:604:ALA:HB2	1:A:662:VAL:HG11	2.02	0.42
1:A:703:LYS:HA	1:A:703:LYS:HD3	1.89	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:267:ARG:HH11	1:C:267:ARG:HD2	1.65	0.42
1:C:507:HIS:N	1:C:508:PRO:CD	2.82	0.42
1:C:488:ARG:HE	1:C:488:ARG:HB2	1.56	0.42
1:B:306:GLU:O	1:B:310:LEU:HB2	2.20	0.41
2:B:760:HEM:CMB	2:B:760:HEM:HBB2	2.50	0.41
1:C:65:LEU:HD21	1:C:135:HIS:CG	2.55	0.41
1:C:359:LEU:H	1:C:507:HIS:CD2	2.38	0.41
1:B:162:VAL:HG21	1:B:373:MET:SD	2.60	0.41
1:B:213:LYS:HD3	1:C:92:GLN:HA	2.03	0.41
1:B:507:HIS:N	1:B:508:PRO:CD	2.83	0.41
1:B:710:ILE:CD1	1:B:718:ILE:HG13	2.46	0.41
1:D:323:TRP:CH2	1:D:378:ASN:HB3	2.55	0.41
1:A:184:GLY:HA2	1:A:201:ASN:OD1	2.20	0.41
1:A:516:THR:HB	1:A:517:PRO:HD2	2.01	0.41
1:B:749:ASP:HB3	1:B:750:LYS:HG2	2.02	0.41
1:B:207:PHE:CD2	1:B:252:ASN:HB3	2.55	0.41
1:B:349:PHE:CD1	1:B:349:PHE:N	2.88	0.41
1:B:438:CYS:HB2	1:B:439:PRO:HD2	2.01	0.41
1:B:211:ALA:HB3	1:B:410:GLY:HA3	2.02	0.41
1:C:431:ILE:HA	1:C:432:PRO:HD3	1.91	0.41
1:A:341:ILE:HD11	1:A:365:VAL:HG21	2.02	0.41
1:B:148:THR:HB	1:B:279:LEU:HB3	2.03	0.41
1:B:227:TRP:CZ3	1:C:50:THR:HG21	2.56	0.41
1:B:278:ARG:HH22	1:B:487:GLU:CD	2.24	0.41
1:B:345:ASP:HA	1:B:348:LYS:HD2	2.02	0.41
1:B:392:HIS:ND1	1:B:415:TYR:HB2	2.35	0.41
1:B:477:PRO:HD2	3:B:1263:HOH:O	2.20	0.41
1:B:536:ARG:HA	1:B:537:PRO:HD3	1.89	0.41
1:B:631:LYS:HG3	1:B:633:LEU:HD13	2.02	0.41
1:C:97:ALA:O	1:C:101:GLY:HA3	2.21	0.41
1:D:126[A]:ILE:CG2	2:D:760:HEM:HMD1	2.50	0.41
1:D:461:GLU:HA	1:D:462:PRO:C	2.40	0.41
1:A:461:GLU:HA	1:A:462:PRO:C	2.41	0.41
1:B:498:SER:HA	1:B:499:PRO:HD3	1.79	0.41
1:B:626:LYS:HG3	1:B:733:LEU:HD13	2.03	0.41
1:C:142:LYS:HE2	3:C:3019:HOH:O	2.20	0.41
1:C:660:LEU:HD13	1:C:687:GLU:CD	2.41	0.41
1:A:507:HIS:N	1:A:508:PRO:CD	2.84	0.40
1:C:552:LEU:HD13	1:C:556:GLN:HE21	1.86	0.40
1:D:578:ASP:HB3	1:D:582:LEU:O	2.21	0.40
1:A:97:ALA:O	1:A:101:GLY:HA3	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:672:ILE:HG22	1:B:676:ALA:HB2	2.03	0.40
1:A:708:ILE:O	1:A:710:ILE:N	2.53	0.40
1:A:438:CYS:HB2	1:A:439:PRO:HD2	2.03	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	726/753 (96%)	699 (96%)	21 (3%)	6 (1%)	19	18
1	B	726/753 (96%)	703 (97%)	18 (2%)	5 (1%)	22	21
1	C	726/753 (96%)	705 (97%)	19 (3%)	2 (0%)	41	45
1	D	726/753 (96%)	698 (96%)	24 (3%)	4 (1%)	25	25
All	All	2904/3012 (96%)	2805 (97%)	82 (3%)	17 (1%)	25	25

All (17) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	28	SER
1	A	709	LYS
1	B	28	SER
1	D	28	SER
1	D	750	LYS
1	D	751	ILE
1	A	711	ALA
1	C	725	ASP
1	A	75	SER
1	B	725	ASP
1	C	75	SER
1	B	75	SER

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Mol	Chain	Res	Type
1	B	584	LYS
1	A	584	LYS
1	D	595	ASP
1	A	708	ILE
1	B	594	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	613/636 (96%)	597 (97%)	16 (3%)	46	57
1	B	613/636 (96%)	589 (96%)	24 (4%)	32	40
1	C	613/636 (96%)	577 (94%)	36 (6%)	19	22
1	D	613/636 (96%)	581 (95%)	32 (5%)	23	27
All	All	2452/2544 (96%)	2344 (96%)	108 (4%)	28	34

All (108) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	LEU
1	A	185	PHE
1	A	191	THR
1	A	198	LEU
1	A	205	ILE
1	A	227	TRP
1	A	237	ASP
1	A	252	ASN
1	A	375	LEU
1	A	392	HIS
1	A	440	TYR
1	A	459	ASN
1	A	552	LEU
1	A	594	PRO
1	A	709	LYS
1	A	712	ASP

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Mol	Chain	Res	Type
1	B	37	ARG
1	B	185	PHE
1	B	191	THR
1	B	205	ILE
1	B	227	TRP
1	B	237	ASP
1	B	252	ASN
1	B	370	VAL
1	B	375	LEU
1	B	392	HIS
1	B	440	TYR
1	B	459	ASN
1	B	562	LEU
1	B	565	GLU
1	B	568	ASP
1	B	571	LEU
1	B	583	LYS
1	B	612	ARG
1	B	616	LEU
1	B	633	LEU
1	B	703	LYS
1	B	727	SER
1	B	749	ASP
1	B	751	ILE
1	C	27	ASP
1	C	37	ARG
1	C	61	ARG
1	C	159	ILE
1	C	185	PHE
1	C	205	ILE
1	C	227	TRP
1	C	237	ASP
1	C	252	ASN
1	C	265	SER
1	C	375	LEU
1	C	377	ARG
1	C	379	PRO
1	C	440	TYR
1	C	459	ASN
1	C	478	LYS
1	C	488	ARG
1	C	521	ARG

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Mol	Chain	Res	Type
1	C	531	LEU
1	C	568	ASP
1	C	571	LEU
1	C	574	THR
1	C	584	LYS
1	C	606	LEU
1	C	612	ARG
1	C	616	LEU
1	C	617	LEU
1	C	633	LEU
1	C	636	ARG
1	C	648	LEU
1	C	660	LEU
1	C	685	LEU
1	C	709	LYS
1	C	725	ASP
1	C	733	LEU
1	C	750	LYS
1	D	41	GLU
1	D	48	GLN
1	D	73	LYS
1	D	185	PHE
1	D	191	THR
1	D	205	ILE
1	D	227	TRP
1	D	237	ASP
1	D	252	ASN
1	D	265	SER
1	D	340	LEU
1	D	375	LEU
1	D	392	HIS
1	D	440	TYR
1	D	459	ASN
1	D	490	GLU
1	D	552	LEU
1	D	554	LEU
1	D	582	LEU
1	D	584	LYS
1	D	598	VAL
1	D	610	GLU
1	D	612	ARG
1	D	616	LEU

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Mol	Chain	Res	Type
1	D	621	LYS
1	D	648	LEU
1	D	709	LYS
1	D	713	GLN
1	D	747	LYS
1	D	749	ASP
1	D	750	LYS
1	D	751	ILE

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	36	HIS
1	A	252	ASN
1	A	459	ASN
1	A	515	GLN
1	B	252	ASN
1	B	459	ASN
1	B	507	HIS
1	B	629	HIS
1	C	252	ASN
1	C	368	GLN
1	C	459	ASN
1	C	507	HIS
1	C	556	GLN
1	C	629	HIS
1	C	671	ASN
1	D	48	GLN
1	D	252	ASN
1	D	449	HIS
1	D	459	ASN
1	D	507	HIS
1	D	546	GLN
1	D	629	HIS
1	D	671	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	D	760	1	41,50,50	1.67	7 (17%)	45,82,82	1.18	5 (11%)
2	HEM	A	760	1	41,50,50	1.50	5 (12%)	45,82,82	1.10	5 (11%)
2	HEM	B	760	1	41,50,50	1.73	7 (17%)	45,82,82	1.36	7 (15%)
2	HEM	C	760	1	41,50,50	1.50	5 (12%)	45,82,82	1.27	7 (15%)

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	D	760	1	-	2/12/54/54	-
2	HEM	A	760	1	-	2/12/54/54	-
2	HEM	B	760	1	-	3/12/54/54	-
2	HEM	C	760	1	-	3/12/54/54	-

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	760	HEM	C3C-C2C	-5.49	1.32	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	760	HEM	C3C-C2C	-5.08	1.33	1.40
2	A	760	HEM	C3C-C2C	-4.53	1.34	1.40
2	C	760	HEM	C3C-C2C	-4.38	1.34	1.40
2	B	760	HEM	C3C-CAC	3.91	1.55	1.47
2	D	760	HEM	C3C-CAC	3.72	1.55	1.47
2	A	760	HEM	C3C-CAC	3.68	1.55	1.47
2	C	760	HEM	C3C-CAC	3.51	1.55	1.47
2	D	760	HEM	CAB-C3B	2.90	1.55	1.47
2	D	760	HEM	CMD-C2D	2.86	1.56	1.50
2	B	760	HEM	C3B-C2B	-2.72	1.31	1.37
2	B	760	HEM	CAB-C3B	2.71	1.54	1.47
2	B	760	HEM	CAA-C2A	2.70	1.56	1.52
2	C	760	HEM	CAB-C3B	2.64	1.54	1.47
2	C	760	HEM	CMB-C2B	2.59	1.56	1.50
2	C	760	HEM	C3B-C2B	-2.50	1.32	1.37
2	B	760	HEM	CMB-C2B	2.44	1.56	1.50
2	D	760	HEM	C3B-C2B	-2.33	1.32	1.37
2	D	760	HEM	CAD-C3D	2.29	1.57	1.51
2	A	760	HEM	CMD-C2D	2.28	1.55	1.50
2	A	760	HEM	CMB-C2B	2.28	1.55	1.50
2	A	760	HEM	CAB-C3B	2.18	1.53	1.47
2	D	760	HEM	C1A-NA	2.09	1.40	1.36
2	B	760	HEM	CMA-C3A	2.07	1.56	1.51

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	760	HEM	CMA-C3A-C4A	-3.30	123.39	128.46
2	B	760	HEM	CMA-C3A-C4A	-3.27	123.44	128.46
2	C	760	HEM	CMA-C3A-C4A	-3.22	123.51	128.46
2	D	760	HEM	CAD-CBD-CGD	3.07	120.22	113.60
2	A	760	HEM	CMA-C3A-C4A	-3.00	123.86	128.46
2	C	760	HEM	O1A-CGA-CBA	-2.98	113.51	123.08
2	C	760	HEM	O2A-CGA-O1A	2.76	130.17	123.30
2	B	760	HEM	O2A-CGA-O1A	2.71	130.06	123.30
2	C	760	HEM	CMA-C3A-C2A	2.66	129.96	124.94
2	D	760	HEM	O1A-CGA-CBA	-2.60	114.73	123.08
2	C	760	HEM	O1D-CGD-CBD	-2.58	114.78	123.08
2	A	760	HEM	O1A-CGA-CBA	-2.55	114.88	123.08
2	B	760	HEM	CMC-C2C-C3C	2.52	129.39	124.68
2	A	760	HEM	O2A-CGA-O1A	2.39	129.25	123.30
2	A	760	HEM	CBA-CAA-C2A	2.23	116.42	112.62

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	760	HEM	CMA-C3A-C2A	2.14	128.98	124.94
2	B	760	HEM	O1A-CGA-CBA	-2.10	116.33	123.08
2	B	760	HEM	CHD-C1D-ND	2.08	126.69	124.43
2	D	760	HEM	CHC-C4B-NB	2.08	126.69	124.43
2	B	760	HEM	CBA-CAA-C2A	2.07	116.15	112.62
2	B	760	HEM	CHA-C4D-ND	2.05	126.91	124.38
2	D	760	HEM	CMA-C3A-C2A	2.02	128.75	124.94
2	C	760	HEM	C4C-CHD-C1D	2.00	125.20	122.56
2	C	760	HEM	CMC-C2C-C3C	2.00	128.42	124.68

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	760	HEM	CAA-CBA-CGA-O2A
2	D	760	HEM	CAA-CBA-CGA-O1A
2	B	760	HEM	CAA-CBA-CGA-O1A
2	D	760	HEM	CAA-CBA-CGA-O2A
2	A	760	HEM	CAA-CBA-CGA-O1A
2	B	760	HEM	CAA-CBA-CGA-O2A
2	C	760	HEM	CAA-CBA-CGA-O1A
2	C	760	HEM	CAA-CBA-CGA-O2A
2	C	760	HEM	CAD-CBD-CGD-O2D
2	B	760	HEM	CAD-CBD-CGD-O1D

There are no ring outliers.

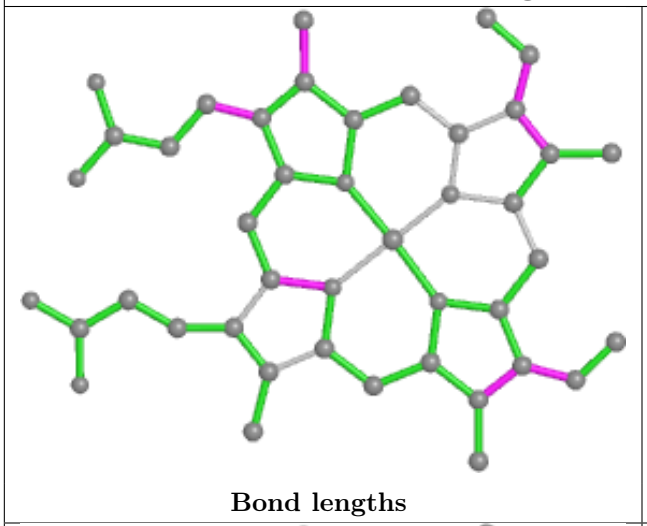
4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	760	HEM	3	0
2	A	760	HEM	1	0
2	B	760	HEM	3	0
2	C	760	HEM	3	0

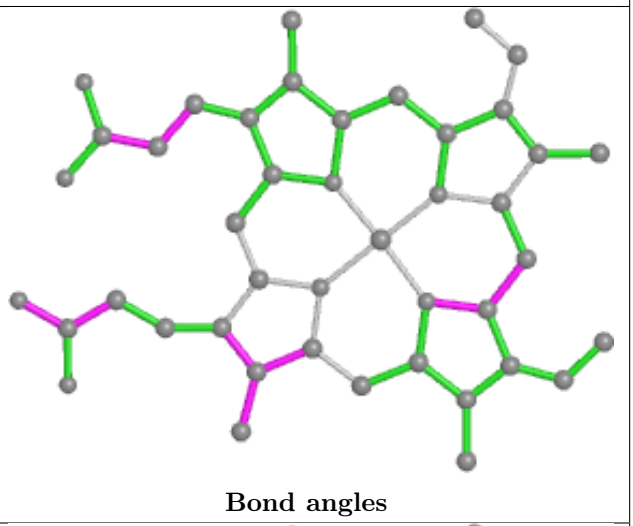
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

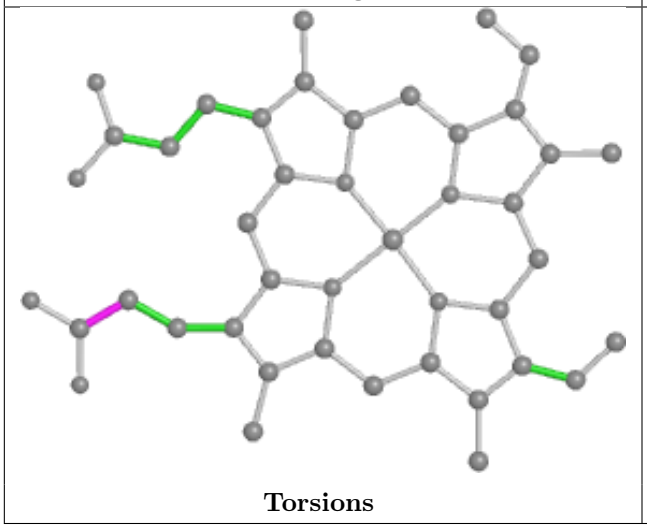
Ligand HEM D 760



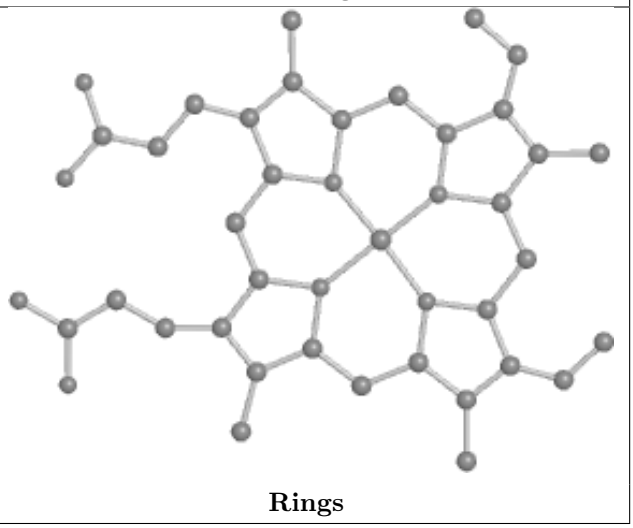
Bond lengths



Bond angles

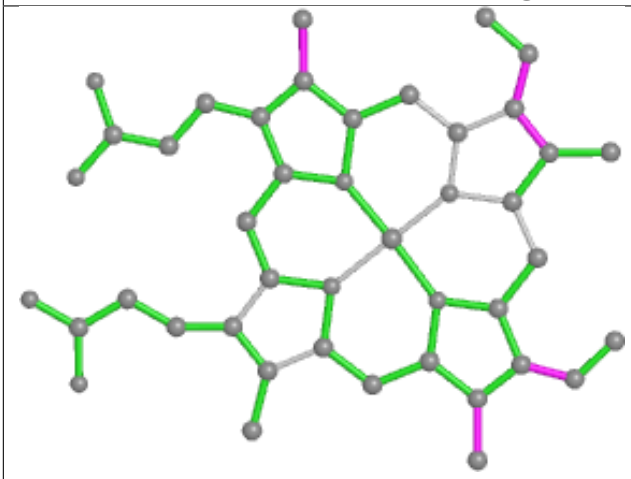


Torsions

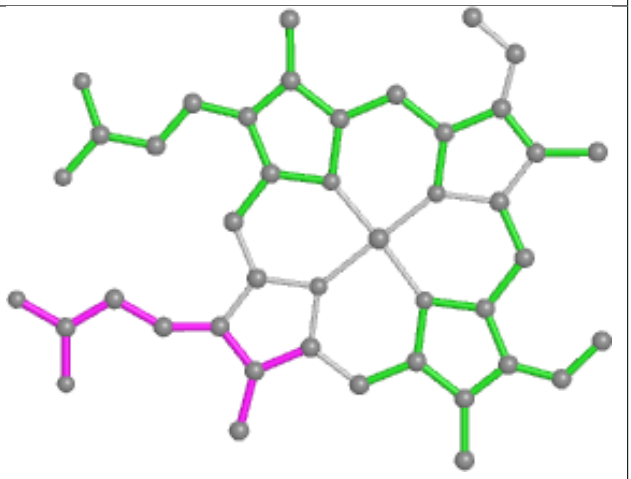


Rings

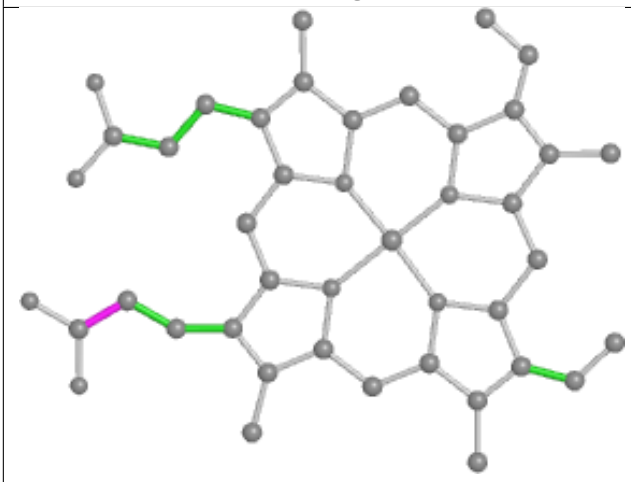
Ligand HEM A 760



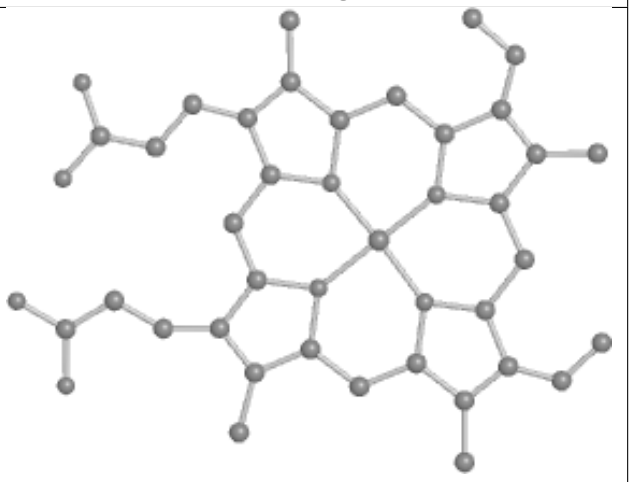
Bond lengths



Bond angles

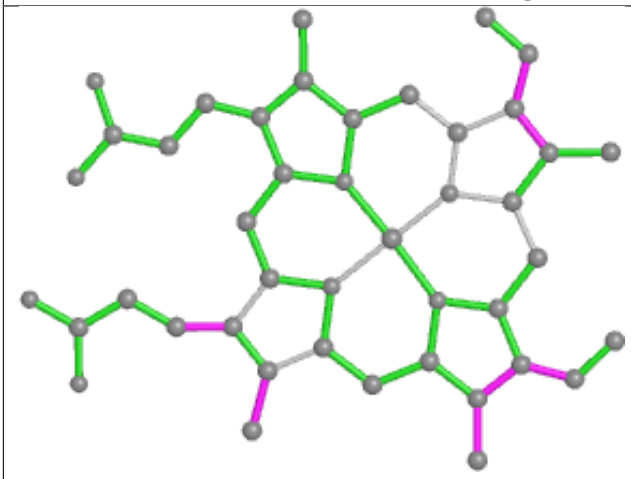


Torsions

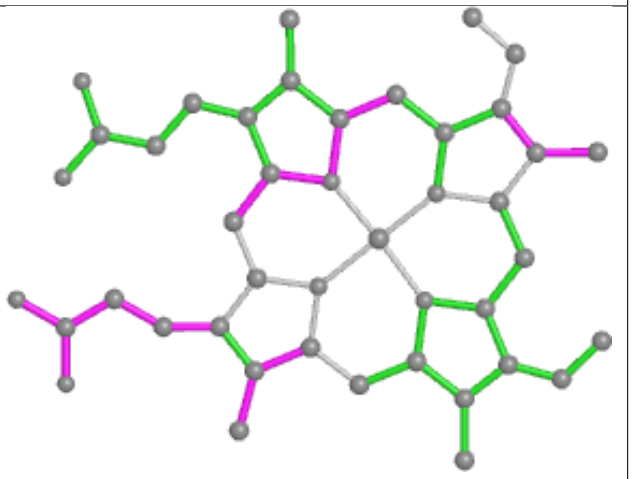


Rings

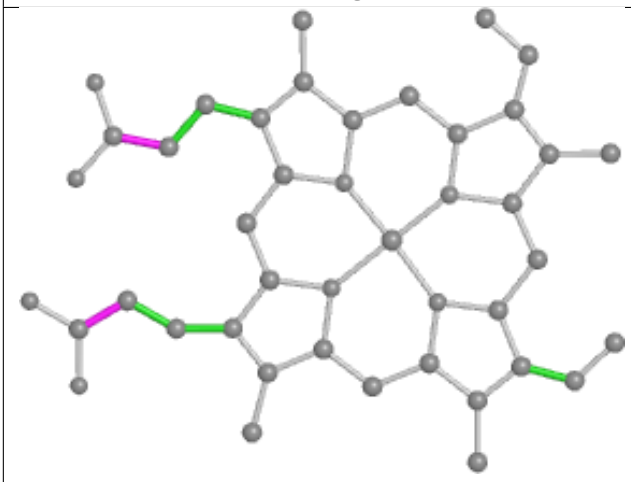
Ligand HEM B 760



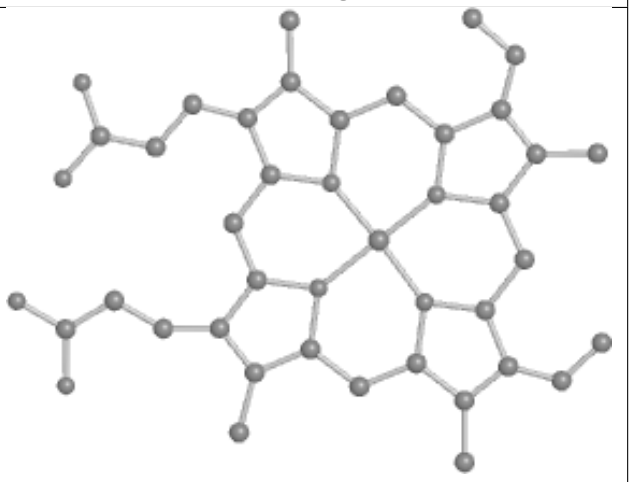
Bond lengths



Bond angles

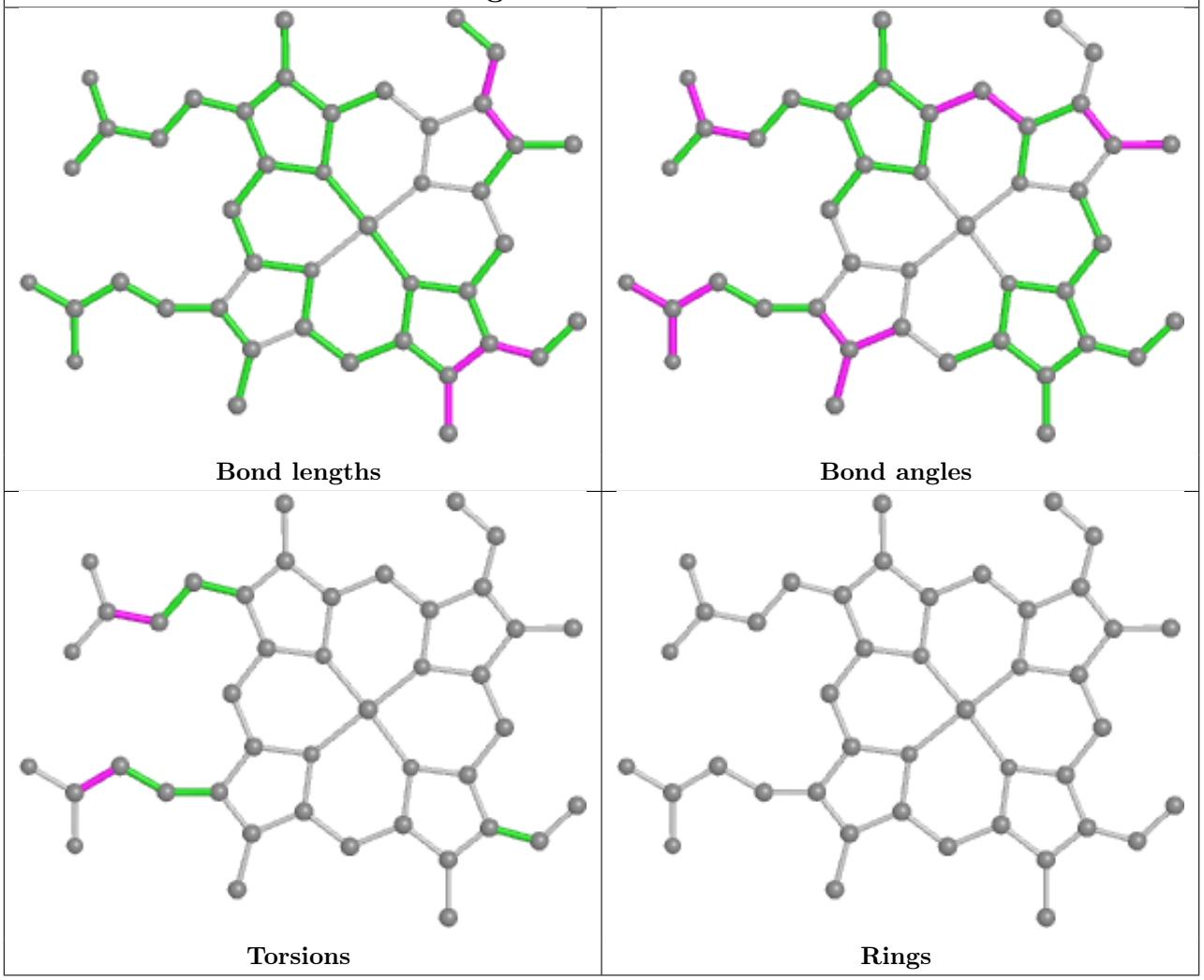


Torsions



Rings

Ligand HEM C 760



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	727/753 (96%)	-0.60	18 (2%)	57	55	10, 19, 41, 73	1 (0%)
1	B	727/753 (96%)	-0.48	18 (2%)	57	55	11, 20, 47, 65	1 (0%)
1	C	727/753 (96%)	-0.53	18 (2%)	57	55	11, 20, 44, 64	1 (0%)
1	D	727/753 (96%)	-0.54	14 (1%)	66	65	10, 19, 42, 65	1 (0%)
All	All	2908/3012 (96%)	-0.54	68 (2%)	60	58	10, 19, 44, 73	4 (0%)

All (68) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	27	ASP	7.2
1	C	27	ASP	6.2
1	A	28	SER	5.3
1	A	712	ASP	5.0
1	C	28	SER	4.6
1	A	32	GLU	4.6
1	D	749	ASP	4.6
1	A	749	ASP	4.5
1	A	594	PRO	4.5
1	A	711	ALA	4.3
1	C	749	ASP	4.2
1	B	27	ASP	4.1
1	D	27	ASP	4.1
1	B	594	PRO	4.0
1	D	28	SER	3.9
1	D	594	PRO	3.9
1	D	750	LYS	3.7
1	B	750	LYS	3.6
1	C	750	LYS	3.6
1	D	32	GLU	3.6
1	C	726	GLY	3.5

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Mol	Chain	Res	Type	RSRZ
1	B	726	GLY	3.4
1	B	32	GLU	3.3
1	C	595	ASP	3.3
1	B	568	ASP	3.2
1	A	750	LYS	3.1
1	C	703	LYS	3.0
1	D	30	ALA	3.0
1	D	33	ASP	3.0
1	A	713	GLN	2.9
1	B	677	ASP	2.9
1	D	35	SER	2.8
1	C	751	ILE	2.8
1	C	594	PRO	2.8
1	B	709	LYS	2.8
1	A	596	GLY	2.7
1	D	34	GLY	2.7
1	B	572	ASN	2.7
1	B	712	ASP	2.6
1	C	677	ASP	2.5
1	B	722	ASP	2.5
1	A	677	ASP	2.5
1	B	612	ARG	2.4
1	B	713	GLN	2.4
1	A	716	GLU	2.3
1	A	35	SER	2.3
1	B	711	ALA	2.3
1	D	612	ARG	2.3
1	C	713	GLN	2.3
1	C	711	ALA	2.3
1	D	711	ALA	2.3
1	B	574	THR	2.2
1	D	712	ASP	2.2
1	D	725	ASP	2.2
1	C	568	ASP	2.2
1	B	28	SER	2.2
1	A	751	ILE	2.2
1	C	32	GLU	2.1
1	A	595	ASP	2.1
1	C	569	ASP	2.1
1	A	710	ILE	2.1
1	A	726	GLY	2.1
1	C	670	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	748	ILE	2.1
1	C	725	ASP	2.1
1	B	33	ASP	2.1
1	B	595	ASP	2.0
1	C	612	ARG	2.0

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

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

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

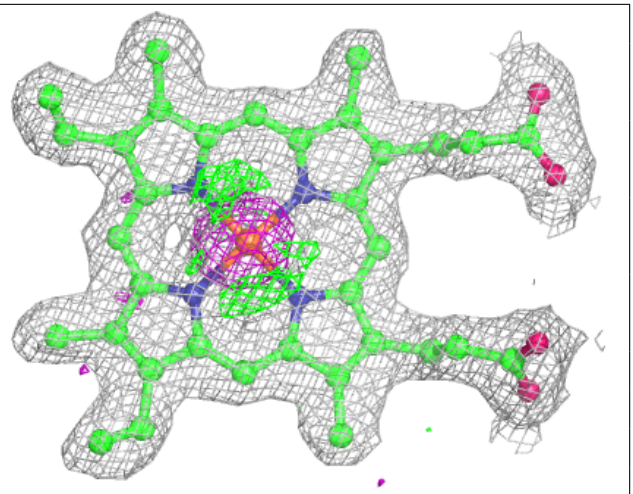
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

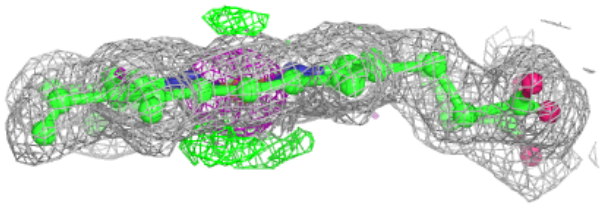
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	HEM	B	760	43/43	0.97	0.10	2,12,14,15	0
2	HEM	A	760	43/43	0.98	0.08	9,13,15,17	0
2	HEM	C	760	43/43	0.98	0.08	11,14,17,19	0
2	HEM	D	760	43/43	0.98	0.09	2,12,15,17	0

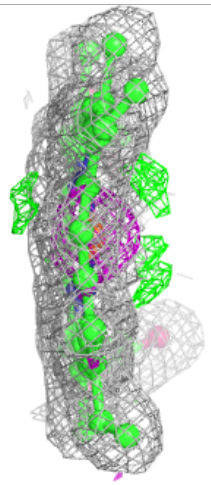
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around HEM B 760:

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

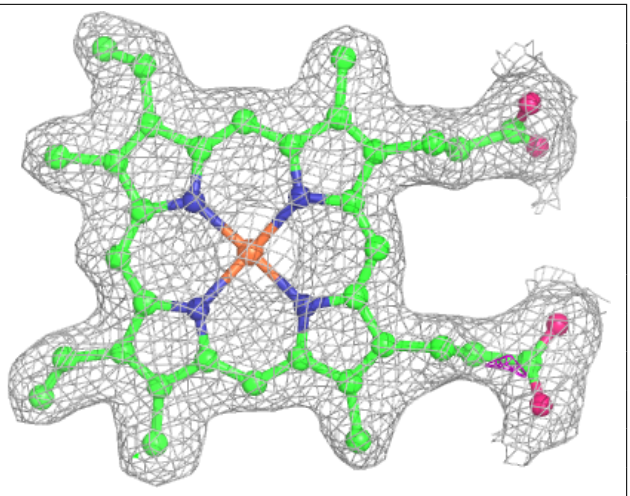


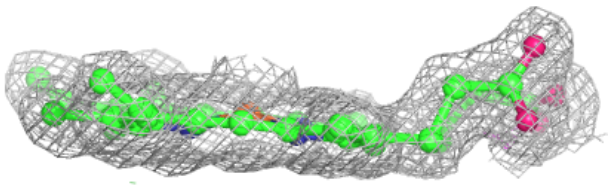


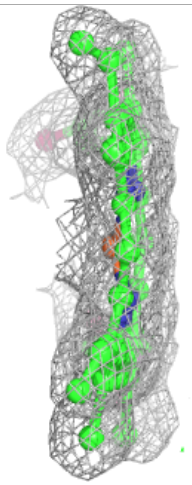


Electron density around HEM A 760:

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

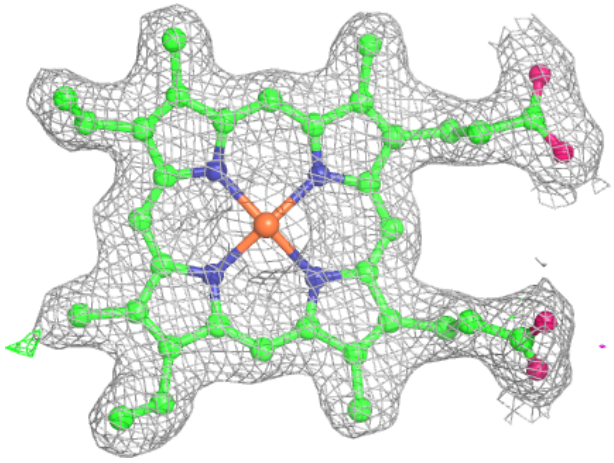


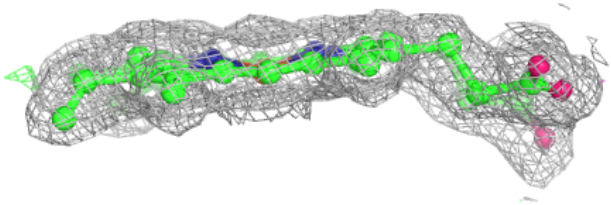


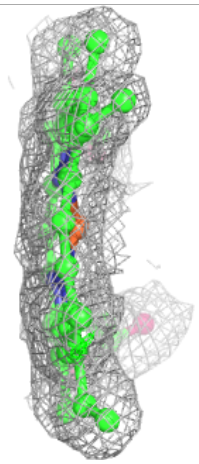


Electron density around HEM C 760:

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

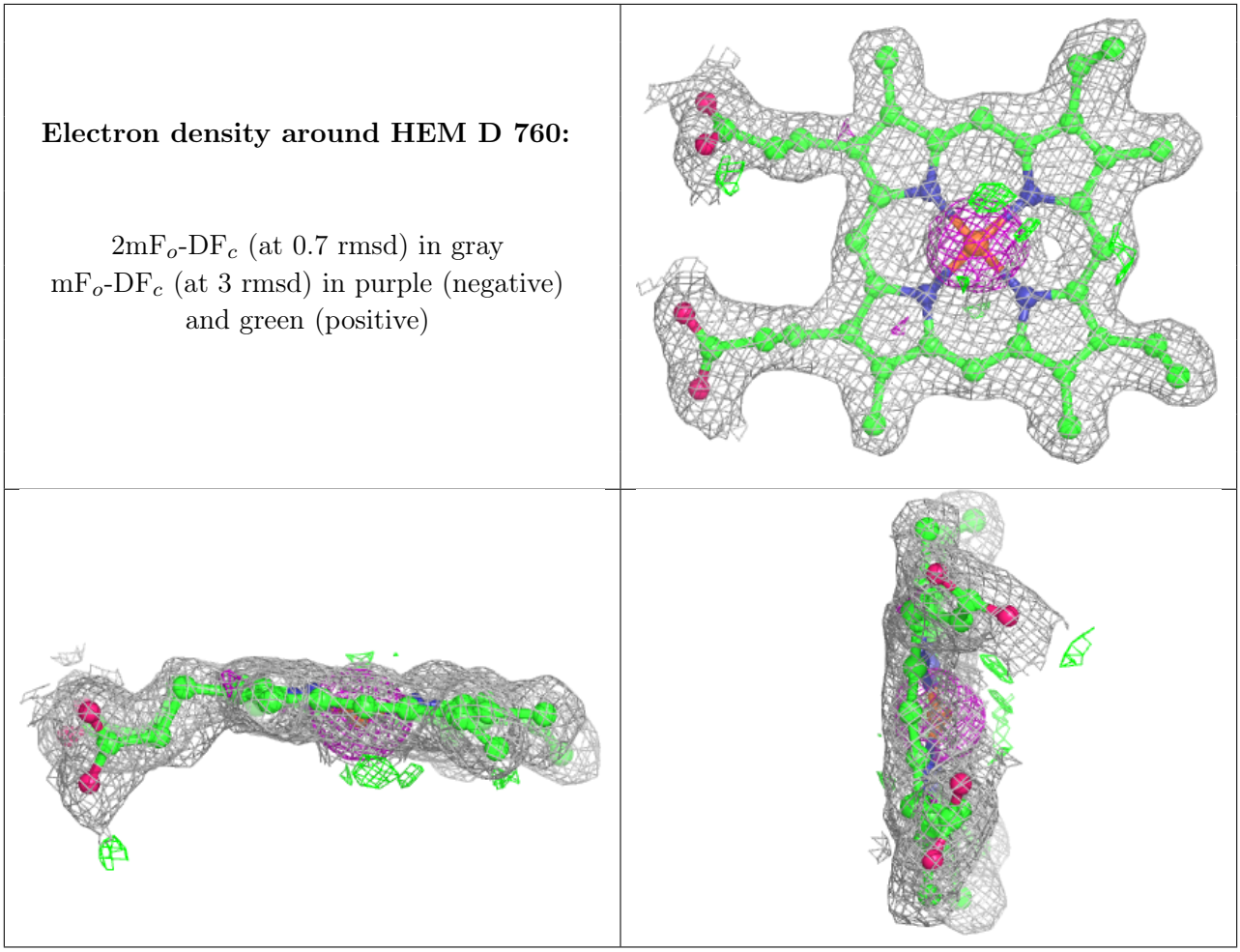






Electron density around HEM D 760:

$2mF_o$-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.