



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 01:02 AM UTC

PDB ID : 1HV4 / pdb_00001hv4
Title : CRYSTAL STRUCTURE ANALYSIS OF BAR-HEAD GOOSE
HEMOGLOBIN (DEOXY FORM)
Authors : Liang, Y.; Hua, Z.; Liang, X.; Xu, Q.; Lu, G.
Deposited on : 2001-01-07
Resolution : 2.80 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 Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

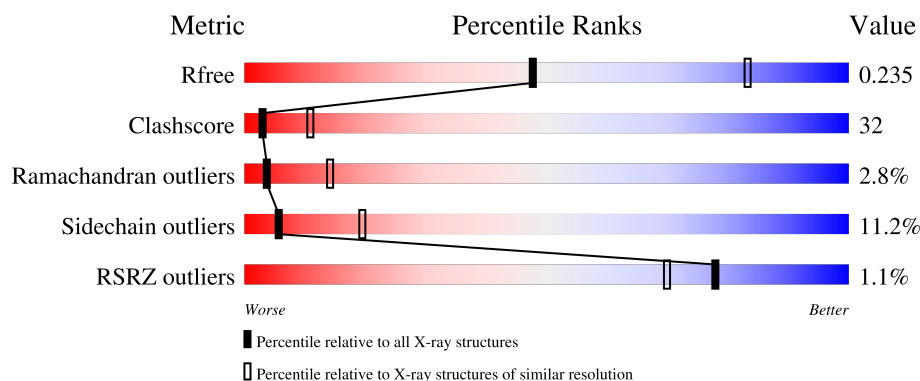
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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}	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	141	60% 31% 9%
1	C	141	3% 56% 35% 9%
1	E	141	59% 33% 9%
1	G	141	3% 58% 33% 9%
2	B	146	51% 38% 9%

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Mol	Chain	Length	Quality of chain
2	D	146	53%37%9%
2	F	146	% 50%40%9%
2	H	146	% 52%37%10%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9288 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.

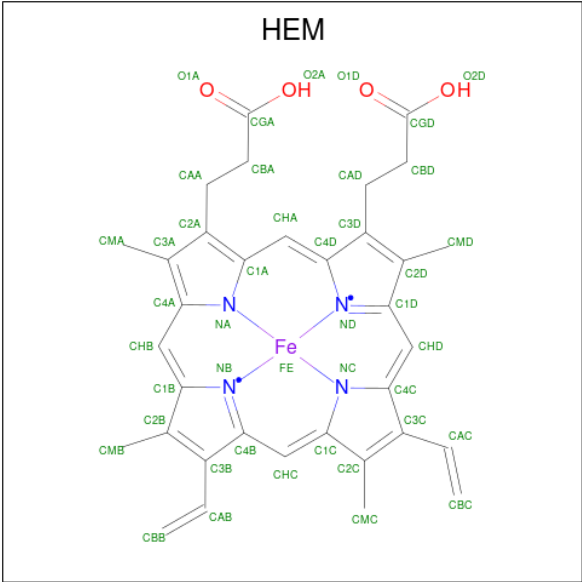
- Molecule 1 is a protein called HEMOGLOBIN ALPHA-A CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	141	Total	C	N	O	S	0	0	0
			1084	697	189	195	3			
1	C	141	Total	C	N	O	S	0	0	0
			1084	697	189	195	3			
1	E	141	Total	C	N	O	S	0	0	0
			1084	697	189	195	3			
1	G	141	Total	C	N	O	S	0	0	0
			1084	697	189	195	3			

- Molecule 2 is a protein called HEMOGLOBIN BETA CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	146	Total	C	N	O	S	0	0	0
			1152	744	204	200	4			
2	D	146	Total	C	N	O	S	0	0	0
			1152	744	204	200	4			
2	F	146	Total	C	N	O	S	0	0	0
			1152	744	204	200	4			
2	H	146	Total	C	N	O	S	0	0	0
			1152	744	204	200	4			

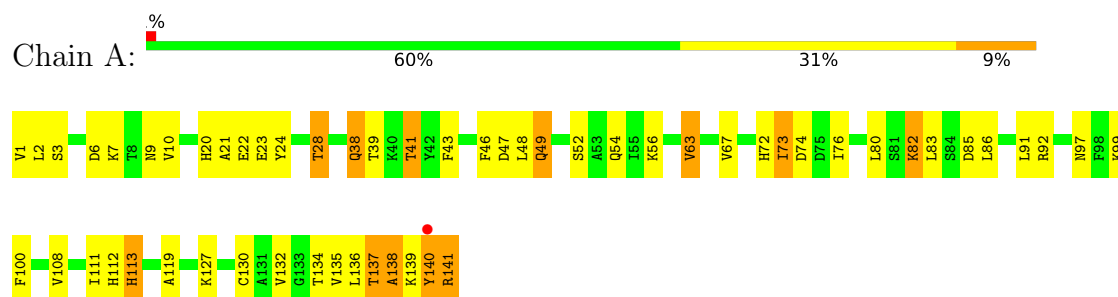
- Molecule 3 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



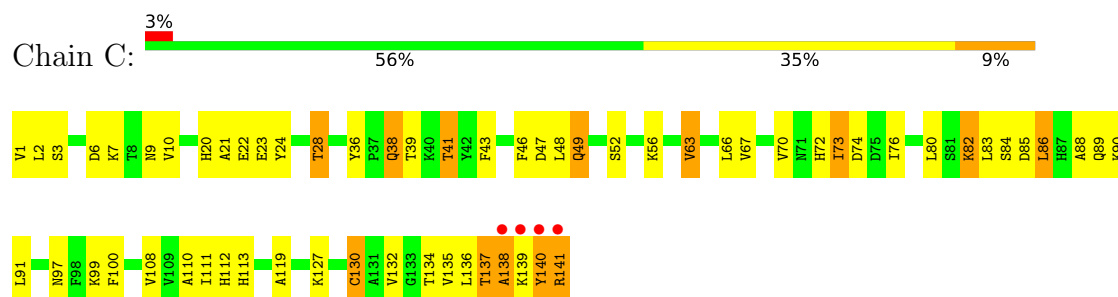
3 Residue-property plots [i](#)

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.

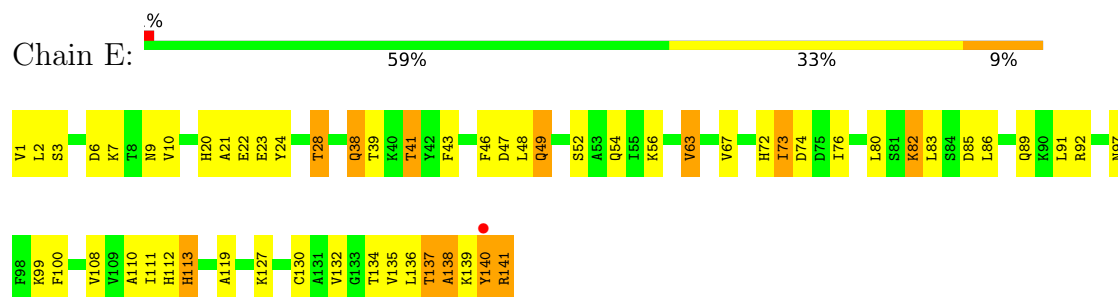
• Molecule 1: HEMOGLOBIN ALPHA-A CHAIN



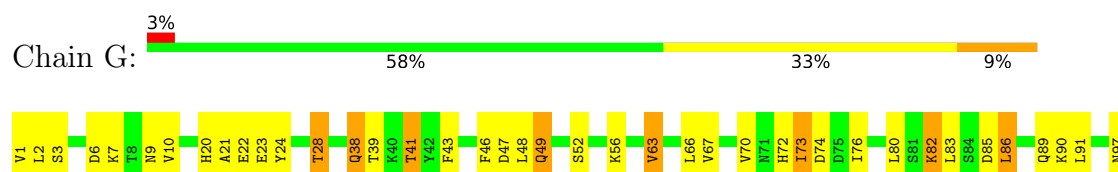
• Molecule 1: HEMOGLOBIN ALPHA-A CHAIN



• Molecule 1: HEMOGLOBIN ALPHA-A CHAIN

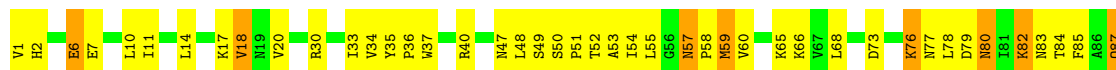


• Molecule 1: HEMOGLOBIN ALPHA-A CHAIN

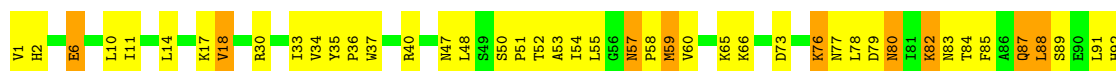




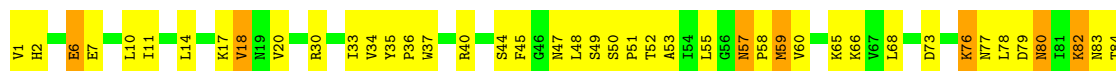
• Molecule 2: HEMOGLOBIN BETA CHAIN



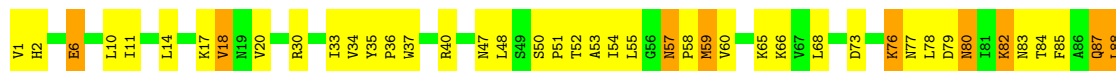
• Molecule 2: HEMOGLOBIN BETA CHAIN



• Molecule 2: HEMOGLOBIN BETA CHAIN



• Molecule 2: HEMOGLOBIN BETA CHAIN



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	70.66Å 94.10Å 59.23Å 71.55° 65.10° 83.10°	Depositor
Resolution (Å)	36.89 – 2.80 36.89 – 2.80	Depositor EDS
% Data completeness (in resolution range)	84.0 (36.89-2.80) 84.0 (36.89-2.80)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.05 (at 2.54Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.197 , 0.243 0.188 , 0.235	Depositor DCC
R_{free} test set	2752 reflections (8.98%)	wwPDB-VP
Wilson B-factor (Å ²)	27.3	Xtriage
Anisotropy	0.244	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 52.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.457 for -h+1,-k+1,l 0.000 for h-l,-k,-l 0.000 for -h,k-l,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9288	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 48.29 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 8.7905e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

5.1 Standard geometry

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	0/1109	1.00	5/1501 (0.3%)
1	C	0.60	0/1109	1.02	6/1501 (0.4%)
1	E	0.56	0/1109	1.02	5/1501 (0.3%)
1	G	0.60	0/1109	1.00	5/1501 (0.3%)
2	B	0.55	0/1181	1.09	10/1602 (0.6%)
2	D	0.53	0/1181	1.09	10/1602 (0.6%)
2	F	0.57	0/1181	1.08	10/1602 (0.6%)
2	H	0.53	0/1181	1.09	10/1602 (0.6%)
All	All	0.56	0/9160	1.05	61/12412 (0.5%)

There are no bond length outliers.

All (61) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	137	THR	N-CA-C	-8.96	103.17	114.56
1	A	137	THR	N-CA-C	-8.93	103.23	114.56
1	E	137	THR	N-CA-C	-8.88	103.29	114.56
2	B	48	LEU	N-CA-C	-8.74	100.57	112.03
2	F	48	LEU	N-CA-C	-8.70	100.64	112.03
2	D	57	ASN	CA-C-N	8.67	128.31	119.56
2	D	57	ASN	C-N-CA	8.67	128.31	119.56
2	F	57	ASN	CA-C-N	8.62	128.26	119.56
2	F	57	ASN	C-N-CA	8.62	128.26	119.56
2	H	57	ASN	CA-C-N	8.53	128.17	119.56
2	H	57	ASN	C-N-CA	8.53	128.17	119.56
2	D	48	LEU	N-CA-C	-8.50	100.90	112.03
2	B	57	ASN	CA-C-N	8.40	128.04	119.56
2	B	57	ASN	C-N-CA	8.40	128.04	119.56
2	H	48	LEU	N-CA-C	-8.31	101.15	112.03
2	H	18	VAL	N-CA-C	8.02	119.80	109.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	18	VAL	N-CA-C	8.01	119.79	109.30
2	D	18	VAL	N-CA-C	7.70	119.38	109.30
2	F	33	ILE	N-CA-C	6.71	117.50	110.72
2	D	33	ILE	N-CA-C	6.53	117.32	110.72
2	F	35	TYR	CA-C-N	6.19	127.58	119.84
2	F	35	TYR	C-N-CA	6.19	127.58	119.84
2	H	33	ILE	N-CA-C	6.17	116.95	110.72
2	H	35	TYR	CA-C-N	6.16	127.54	119.84
2	H	35	TYR	C-N-CA	6.16	127.54	119.84
2	B	33	ILE	N-CA-C	6.13	116.91	110.72
2	D	35	TYR	CA-C-N	5.99	127.33	119.84
2	D	35	TYR	C-N-CA	5.99	127.33	119.84
1	C	85	ASP	N-CA-C	-5.95	104.42	111.03
2	D	11	ILE	N-CA-C	5.95	116.12	110.53
1	C	23	GLU	N-CA-C	5.94	117.43	111.07
2	H	11	ILE	N-CA-C	5.90	116.07	110.53
2	B	35	TYR	CA-C-N	5.88	127.19	119.84
2	B	35	TYR	C-N-CA	5.88	127.19	119.84
2	B	60	VAL	N-CA-C	-5.82	105.06	110.53
1	A	23	GLU	N-CA-C	5.69	117.16	111.07
1	A	85	ASP	N-CA-C	-5.67	104.78	110.97
1	C	36	TYR	CA-C-N	5.59	125.69	119.32
1	C	36	TYR	C-N-CA	5.59	125.69	119.32
2	B	103	PHE	N-CA-C	-5.54	105.24	111.28
1	G	130	CYS	N-CA-C	-5.51	105.36	111.36
1	G	85	ASP	N-CA-C	-5.49	104.94	111.03
2	F	60	VAL	N-CA-C	-5.46	105.39	110.53
1	C	130	CYS	N-CA-C	-5.45	105.42	111.36
1	E	85	ASP	N-CA-C	-5.41	105.02	111.03
1	G	23	GLU	N-CA-C	5.35	116.80	111.07
2	F	11	ILE	N-CA-C	5.33	115.54	110.53
2	B	11	ILE	N-CA-C	5.24	115.35	110.42
2	F	103	PHE	N-CA-C	-5.23	105.47	111.07
1	E	23	GLU	N-CA-C	5.22	116.66	111.07
2	H	60	VAL	N-CA-C	-5.13	105.32	110.30
2	D	60	VAL	N-CA-C	-5.13	105.32	110.30
2	H	103	PHE	N-CA-C	-5.11	105.60	111.07
1	G	113	HIS	CA-C-N	5.07	125.36	119.47
1	G	113	HIS	C-N-CA	5.07	125.36	119.47
1	E	113	HIS	CA-C-N	5.05	126.15	119.84
1	E	113	HIS	C-N-CA	5.05	126.15	119.84
1	A	113	HIS	CA-C-N	5.03	126.13	119.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	113	HIS	C-N-CA	5.03	126.13	119.84
2	F	18	VAL	N-CA-C	5.02	119.79	109.34
2	D	103	PHE	N-CA-C	-5.00	105.72	111.07

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1084	0	1095	74	0
1	C	1084	0	1095	78	0
1	E	1084	0	1095	77	0
1	G	1084	0	1095	76	0
2	B	1152	0	1163	78	0
2	D	1152	0	1163	80	0
2	F	1152	0	1163	81	0
2	H	1152	0	1163	81	0
3	A	43	0	30	0	0
3	B	43	0	30	2	0
3	C	43	0	30	0	0
3	D	43	0	30	1	0
3	E	43	0	30	0	0
3	F	43	0	30	3	0
3	G	43	0	30	0	0
3	H	43	0	30	1	0
All	All	9288	0	9272	592	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 32.

All (592) 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)
2:F:76:LYS:HZ2	2:F:76:LYS:HA	0.98	1.15

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:76:LYS:NZ	2:H:76:LYS:HA	1.60	1.15
2:B:76:LYS:HA	2:B:76:LYS:NZ	1.62	1.14
2:D:76:LYS:HA	2:D:76:LYS:NZ	1.60	1.14
2:F:76:LYS:HA	2:F:76:LYS:NZ	1.61	1.14
2:D:76:LYS:HA	2:D:76:LYS:HZ2	0.97	1.11
2:H:76:LYS:HA	2:H:76:LYS:HZ2	1.02	1.11
2:B:76:LYS:HA	2:B:76:LYS:HZ2	1.11	1.02
2:D:142:ALA:O	2:D:144:LYS:N	2.06	0.89
1:C:140:TYR:C	1:C:141:ARG:HH11	1.81	0.88
2:H:142:ALA:O	2:H:144:LYS:N	2.07	0.88
2:F:142:ALA:O	2:F:144:LYS:N	2.06	0.88
2:B:142:ALA:O	2:B:144:LYS:N	2.08	0.87
1:G:140:TYR:C	1:G:141:ARG:HH11	1.82	0.86
1:A:140:TYR:C	1:A:141:ARG:HH11	1.84	0.85
1:E:140:TYR:C	1:E:141:ARG:HH11	1.85	0.85
1:G:141:ARG:HB2	1:G:141:ARG:NH1	1.93	0.84
2:D:82:LYS:HD3	2:D:83:ASN:N	1.95	0.82
1:A:141:ARG:NH1	1:A:141:ARG:HB2	1.95	0.81
2:H:82:LYS:HD3	2:H:83:ASN:N	1.94	0.81
1:C:141:ARG:NH1	1:C:141:ARG:HB2	1.95	0.81
2:F:82:LYS:HD3	2:F:83:ASN:N	1.96	0.81
2:B:82:LYS:HD3	2:B:83:ASN:N	1.96	0.81
1:E:141:ARG:NH1	1:E:141:ARG:HB2	1.96	0.81
2:F:76:LYS:NZ	2:F:76:LYS:CA	2.46	0.78
1:G:39:THR:HG22	1:G:97:ASN:ND2	1.97	0.78
1:G:141:ARG:HH11	1:G:141:ARG:N	1.82	0.78
1:C:141:ARG:HH11	1:C:141:ARG:N	1.80	0.77
1:A:39:THR:HG22	1:A:97:ASN:ND2	1.99	0.77
1:A:141:ARG:HH11	1:A:141:ARG:N	1.82	0.77
2:B:52:THR:HA	2:B:55:LEU:HD23	1.67	0.77
1:E:39:THR:HG22	1:E:97:ASN:ND2	1.99	0.77
2:F:52:THR:HA	2:F:55:LEU:HD23	1.67	0.76
2:H:57:ASN:ND2	2:H:59:MET:H	1.83	0.76
1:G:38:GLN:H	1:G:38:GLN:HE21	1.32	0.76
1:E:1:VAL:HG22	1:G:141:ARG:OXT	1.86	0.76
1:C:38:GLN:H	1:C:38:GLN:HE21	1.34	0.75
2:D:57:ASN:ND2	2:D:59:MET:H	1.83	0.75
2:D:133:LEU:O	2:D:137:VAL:HG23	1.86	0.75
2:D:52:THR:HA	2:D:55:LEU:HD23	1.67	0.75
1:C:39:THR:HG22	1:C:97:ASN:ND2	2.02	0.75
1:G:99:LYS:HD3	2:H:104:ARG:HH22	1.50	0.75

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:76:LYS:NZ	2:D:76:LYS:CA	2.47	0.75
1:G:38:GLN:H	1:G:38:GLN:NE2	1.84	0.75
1:C:134:THR:O	1:C:138:ALA:HB2	1.87	0.74
2:F:144:LYS:HE2	2:F:144:LYS:HA	1.69	0.74
2:B:144:LYS:HA	2:B:144:LYS:HE2	1.69	0.74
1:E:141:ARG:HH11	1:E:141:ARG:N	1.83	0.74
2:H:52:THR:HA	2:H:55:LEU:HD23	1.67	0.74
2:B:76:LYS:NZ	2:B:76:LYS:CA	2.47	0.74
2:H:144:LYS:HE2	2:H:144:LYS:HA	1.69	0.74
1:A:99:LYS:HD3	2:B:104:ARG:HH22	1.52	0.73
1:C:38:GLN:H	1:C:38:GLN:NE2	1.86	0.73
2:B:57:ASN:ND2	2:B:59:MET:H	1.86	0.73
1:E:38:GLN:H	1:E:38:GLN:HE21	1.36	0.73
2:H:133:LEU:O	2:H:137:VAL:HG23	1.88	0.73
2:D:91:LEU:HD12	2:D:92:HIS:N	2.03	0.73
2:D:144:LYS:HA	2:D:144:LYS:HE2	1.69	0.73
1:C:99:LYS:HD3	2:D:104:ARG:HH22	1.52	0.73
1:E:99:LYS:HD3	2:F:104:ARG:HH22	1.53	0.73
2:H:87:GLN:H	2:H:87:GLN:CD	1.94	0.72
2:H:91:LEU:HD12	2:H:92:HIS:N	2.03	0.72
1:C:140:TYR:C	1:C:141:ARG:NH1	2.46	0.72
2:B:91:LEU:HD12	2:B:92:HIS:N	2.05	0.72
2:D:87:GLN:CD	2:D:87:GLN:H	1.98	0.72
1:E:38:GLN:H	1:E:38:GLN:NE2	1.87	0.72
1:E:111:ILE:HG22	1:E:112:HIS:HD2	1.53	0.72
2:H:57:ASN:C	2:H:57:ASN:HD22	1.98	0.72
2:F:133:LEU:O	2:F:137:VAL:HG23	1.89	0.72
1:A:138:ALA:HA	1:A:141:ARG:NH1	2.05	0.72
1:G:140:TYR:C	1:G:141:ARG:NH1	2.47	0.72
1:A:138:ALA:O	1:A:141:ARG:N	2.22	0.71
1:C:138:ALA:HA	1:C:141:ARG:HH12	1.55	0.71
1:E:138:ALA:HA	1:E:141:ARG:HH12	1.55	0.71
2:D:57:ASN:C	2:D:57:ASN:HD22	1.96	0.71
2:H:76:LYS:NZ	2:H:76:LYS:CA	2.47	0.71
1:C:138:ALA:HA	1:C:141:ARG:NH1	2.05	0.71
1:A:138:ALA:HA	1:A:141:ARG:HH12	1.55	0.71
1:E:138:ALA:HA	1:E:141:ARG:NH1	2.04	0.71
1:A:1:VAL:HG22	1:C:141:ARG:OXT	1.91	0.71
2:F:91:LEU:HD12	2:F:92:HIS:N	2.06	0.71
1:A:140:TYR:C	1:A:141:ARG:NH1	2.49	0.70
2:B:87:GLN:CD	2:B:87:GLN:H	1.98	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:138:ALA:HA	1:G:141:ARG:NH1	2.06	0.70
2:F:87:GLN:H	2:F:87:GLN:CD	1.97	0.70
1:G:134:THR:O	1:G:138:ALA:HB2	1.92	0.70
2:F:57:ASN:ND2	2:F:59:MET:H	1.88	0.70
2:B:133:LEU:O	2:B:137:VAL:HG23	1.92	0.70
1:C:111:ILE:HG22	1:C:112:HIS:HD2	1.57	0.70
1:C:138:ALA:O	1:C:141:ARG:N	2.24	0.70
1:A:38:GLN:H	1:A:38:GLN:HE21	1.38	0.70
1:A:38:GLN:H	1:A:38:GLN:NE2	1.88	0.69
2:F:57:ASN:HD22	2:F:57:ASN:C	2.00	0.69
1:G:111:ILE:HG22	1:G:112:HIS:HD2	1.55	0.69
1:A:111:ILE:HG22	1:A:112:HIS:HD2	1.56	0.69
1:E:138:ALA:O	1:E:141:ARG:N	2.25	0.69
1:E:140:TYR:C	1:E:141:ARG:NH1	2.51	0.69
1:A:134:THR:O	1:A:138:ALA:HB2	1.92	0.69
1:G:138:ALA:HA	1:G:141:ARG:HH12	1.57	0.69
2:B:57:ASN:C	2:B:57:ASN:HD22	1.99	0.68
2:F:59:MET:HA	2:F:59:MET:HE2	1.75	0.68
1:G:138:ALA:O	1:G:141:ARG:N	2.26	0.68
1:E:134:THR:O	1:E:138:ALA:HB2	1.93	0.67
1:A:39:THR:HG22	1:A:97:ASN:HD22	1.58	0.67
2:H:59:MET:HE2	2:H:59:MET:HA	1.77	0.67
1:G:39:THR:HG22	1:G:97:ASN:HD22	1.60	0.66
1:A:134:THR:O	1:A:138:ALA:N	2.30	0.65
1:E:39:THR:HG22	1:E:97:ASN:HD22	1.59	0.65
2:B:59:MET:HE2	2:B:59:MET:HA	1.77	0.65
2:H:82:LYS:HZ1	2:H:143:ARG:HH22	1.45	0.65
2:B:82:LYS:HG2	2:B:143:ARG:HH12	1.62	0.65
2:H:104:ARG:HD3	2:H:104:ARG:C	2.22	0.65
2:B:104:ARG:C	2:B:104:ARG:HD3	2.22	0.65
1:C:39:THR:HG22	1:C:97:ASN:HD22	1.62	0.65
2:B:143:ARG:HG3	2:B:144:LYS:N	2.12	0.64
2:D:104:ARG:HD3	2:D:104:ARG:C	2.22	0.64
2:F:59:MET:HA	2:F:59:MET:CE	2.27	0.64
2:D:143:ARG:HG3	2:D:144:LYS:N	2.11	0.64
1:E:134:THR:O	1:E:138:ALA:N	2.29	0.64
2:B:59:MET:HA	2:B:59:MET:CE	2.28	0.64
1:C:3:SER:O	1:C:7:LYS:HG3	1.97	0.64
1:C:24:TYR:O	1:C:28:THR:HG23	1.96	0.64
2:F:104:ARG:HD3	2:F:104:ARG:C	2.22	0.64
2:B:76:LYS:HA	2:B:76:LYS:HZ3	1.57	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:134:THR:O	1:G:138:ALA:N	2.31	0.64
2:D:59:MET:HA	2:D:59:MET:HE2	1.78	0.64
1:A:138:ALA:O	1:A:139:LYS:C	2.41	0.64
1:C:134:THR:O	1:C:138:ALA:N	2.31	0.64
1:E:3:SER:O	1:E:7:LYS:HG3	1.98	0.64
2:H:143:ARG:HG3	2:H:144:LYS:N	2.12	0.63
1:A:141:ARG:OXT	1:C:1:VAL:HG22	1.97	0.63
2:F:6:GLU:H	2:F:6:GLU:CD	2.07	0.63
2:D:82:LYS:HZ1	2:D:143:ARG:HH22	1.47	0.63
2:F:82:LYS:HG2	2:F:143:ARG:HH12	1.62	0.63
1:G:138:ALA:HA	1:G:141:ARG:NH2	2.14	0.63
2:D:82:LYS:HG2	2:D:143:ARG:HH12	1.64	0.62
2:D:1:VAL:HG12	2:D:2:HIS:N	2.15	0.62
1:G:24:TYR:O	1:G:28:THR:HG23	1.99	0.62
2:D:80:ASN:O	2:D:84:THR:HG23	2.00	0.62
2:H:57:ASN:HD22	2:H:58:PRO:N	1.98	0.62
1:A:3:SER:O	1:A:7:LYS:HG3	2.00	0.62
1:A:138:ALA:C	1:A:140:TYR:N	2.56	0.62
2:B:89:SER:HB2	2:B:141:LEU:O	1.99	0.62
1:C:138:ALA:HA	1:C:141:ARG:NH2	2.15	0.62
2:F:89:SER:HB2	2:F:141:LEU:O	2.00	0.62
1:G:3:SER:O	1:G:7:LYS:HG3	1.99	0.62
2:B:6:GLU:CD	2:B:6:GLU:H	2.07	0.62
2:H:34:VAL:O	2:H:36:PRO:HD3	2.00	0.61
1:E:141:ARG:OXT	1:G:1:VAL:HG22	2.00	0.61
2:H:82:LYS:HG2	2:H:143:ARG:HH12	1.64	0.61
2:F:87:GLN:CD	2:F:87:GLN:N	2.58	0.61
2:F:143:ARG:HG3	2:F:144:LYS:N	2.15	0.61
2:B:87:GLN:CD	2:B:87:GLN:N	2.59	0.61
1:E:138:ALA:O	1:E:139:LYS:C	2.42	0.61
1:G:135:VAL:HA	1:G:138:ALA:HB3	1.83	0.61
1:G:138:ALA:O	1:G:139:LYS:C	2.44	0.61
2:F:80:ASN:O	2:F:84:THR:HG23	2.01	0.61
1:A:135:VAL:HA	1:A:138:ALA:HB3	1.83	0.60
1:C:135:VAL:HA	1:C:138:ALA:HB3	1.82	0.60
1:C:138:ALA:O	1:C:139:LYS:C	2.42	0.60
2:D:57:ASN:HD21	2:D:59:MET:HB2	1.66	0.60
2:H:59:MET:HA	2:H:59:MET:CE	2.31	0.60
2:D:34:VAL:O	2:D:36:PRO:HD3	2.01	0.60
1:E:24:TYR:O	1:E:28:THR:HG23	2.02	0.60
2:F:57:ASN:HD22	2:F:58:PRO:N	2.00	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:80:ASN:O	2:H:84:THR:HG23	2.01	0.60
2:B:57:ASN:HD21	2:B:59:MET:HB2	1.66	0.60
1:C:47:ASP:OD1	1:C:49:GLN:HG2	2.01	0.60
2:H:87:GLN:CD	2:H:87:GLN:N	2.56	0.60
1:A:24:TYR:O	1:A:28:THR:HG23	2.02	0.60
2:D:59:MET:HA	2:D:59:MET:CE	2.31	0.60
1:E:138:ALA:HA	1:E:141:ARG:NH2	2.17	0.60
2:B:1:VAL:HG12	2:B:2:HIS:N	2.17	0.60
2:D:57:ASN:HD22	2:D:58:PRO:N	1.99	0.59
1:A:138:ALA:HA	1:A:141:ARG:NH2	2.17	0.59
2:B:80:ASN:O	2:B:84:THR:HG23	2.02	0.59
2:B:37:TRP:HE1	2:B:102:ASN:HD21	1.50	0.59
1:C:138:ALA:C	1:C:140:TYR:N	2.56	0.59
1:G:47:ASP:OD1	1:G:49:GLN:HG2	2.03	0.59
2:H:57:ASN:HD21	2:H:59:MET:HB2	1.67	0.59
2:B:34:VAL:O	2:B:36:PRO:HD3	2.01	0.59
1:C:141:ARG:NH1	1:C:141:ARG:N	2.50	0.59
1:E:135:VAL:HA	1:E:138:ALA:HB3	1.82	0.59
2:F:37:TRP:HE1	2:F:102:ASN:HD21	1.50	0.59
2:B:82:LYS:HZ1	2:B:143:ARG:HH22	1.50	0.59
2:D:87:GLN:CD	2:D:87:GLN:N	2.58	0.59
2:H:76:LYS:HA	2:H:76:LYS:HZ3	1.64	0.59
2:B:57:ASN:HD22	2:B:58:PRO:N	1.99	0.59
2:H:1:VAL:HG12	2:H:2:HIS:N	2.16	0.59
1:E:91:LEU:O	2:H:40:ARG:HD2	2.03	0.59
1:A:141:ARG:NH1	1:A:141:ARG:N	2.51	0.59
1:C:138:ALA:HA	1:C:141:ARG:HH22	1.68	0.59
1:A:91:LEU:O	2:D:40:ARG:HD2	2.03	0.58
2:F:1:VAL:HG12	2:F:2:HIS:N	2.18	0.58
2:F:34:VAL:O	2:F:36:PRO:HD3	2.03	0.58
2:H:6:GLU:CD	2:H:6:GLU:H	2.11	0.58
2:H:37:TRP:HE1	2:H:102:ASN:HD21	1.49	0.58
1:G:138:ALA:HA	1:G:141:ARG:HH22	1.68	0.58
2:D:37:TRP:HE1	2:D:102:ASN:HD21	1.50	0.58
1:E:47:ASP:OD1	1:E:52:SER:HB2	2.04	0.58
1:C:132:VAL:O	1:C:136:LEU:HD23	2.03	0.58
2:F:57:ASN:HD21	2:F:59:MET:HB2	1.68	0.58
1:G:132:VAL:O	1:G:136:LEU:HD23	2.04	0.58
2:D:14:LEU:O	2:D:18:VAL:HG23	2.05	0.57
2:F:6:GLU:CD	2:F:6:GLU:N	2.63	0.57
1:A:132:VAL:O	1:A:136:LEU:HD23	2.04	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:76:LYS:CA	2:B:76:LYS:HZ3	2.15	0.57
2:D:93:CYS:SG	2:D:145:TYR:CG	2.93	0.57
1:A:47:ASP:OD1	1:A:52:SER:HB2	2.05	0.57
1:E:111:ILE:HG22	1:E:112:HIS:CD2	2.39	0.57
2:H:91:LEU:O	2:H:95:LYS:HB3	2.05	0.57
1:E:47:ASP:OD1	1:E:49:GLN:HG2	2.04	0.56
1:A:138:ALA:HA	1:A:141:ARG:HH22	1.71	0.56
2:B:6:GLU:CD	2:B:6:GLU:N	2.63	0.56
2:B:84:THR:C	2:B:87:GLN:HE22	2.13	0.56
1:G:141:ARG:NH1	1:G:141:ARG:N	2.51	0.56
2:F:93:CYS:SG	2:F:145:TYR:CG	2.95	0.56
2:D:6:GLU:CD	2:D:6:GLU:H	2.13	0.56
2:H:87:GLN:H	2:H:87:GLN:NE2	2.04	0.56
1:G:138:ALA:HA	1:G:141:ARG:CZ	2.35	0.56
2:H:14:LEU:O	2:H:18:VAL:HG23	2.06	0.56
1:A:24:TYR:CE2	1:A:112:HIS:ND1	2.72	0.56
1:C:82:LYS:O	1:C:82:LYS:HD3	2.06	0.56
1:E:138:ALA:C	1:E:140:TYR:N	2.57	0.56
1:G:9:ASN:N	1:G:9:ASN:HD22	2.03	0.56
2:D:89:SER:HB2	2:D:141:LEU:O	2.06	0.56
1:E:138:ALA:HA	1:E:141:ARG:CZ	2.36	0.56
2:H:93:CYS:SG	2:H:145:TYR:CG	2.95	0.56
1:C:134:THR:C	1:C:138:ALA:HB2	2.30	0.56
1:G:47:ASP:OD1	1:G:52:SER:HB2	2.05	0.56
1:A:134:THR:C	1:A:138:ALA:HB2	2.31	0.55
1:E:135:VAL:HA	1:E:138:ALA:CB	2.36	0.55
1:A:138:ALA:O	1:A:140:TYR:N	2.39	0.55
2:F:82:LYS:HZ1	2:F:143:ARG:HH22	1.55	0.55
1:G:141:ARG:HB2	1:G:141:ARG:CZ	2.35	0.55
1:E:138:ALA:HA	1:E:141:ARG:HH22	1.71	0.55
1:A:47:ASP:OD1	1:A:49:GLN:HG2	2.05	0.55
1:A:141:ARG:HH11	1:A:141:ARG:HB2	1.71	0.55
1:E:134:THR:C	1:E:138:ALA:HB2	2.31	0.55
1:G:49:GLN:CD	1:G:49:GLN:H	2.14	0.55
1:G:138:ALA:C	1:G:140:TYR:N	2.57	0.55
1:A:138:ALA:HA	1:A:141:ARG:CZ	2.36	0.55
1:C:138:ALA:O	1:C:140:TYR:N	2.40	0.55
1:G:134:THR:C	1:G:138:ALA:HB2	2.31	0.55
2:D:91:LEU:O	2:D:95:LYS:HB3	2.07	0.55
1:C:140:TYR:O	1:C:141:ARG:HD3	2.07	0.55
1:E:28:THR:HG22	1:E:108:VAL:HG21	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:135:VAL:HA	1:C:138:ALA:CB	2.36	0.55
2:H:6:GLU:O	2:H:10:LEU:HD23	2.07	0.55
1:C:134:THR:O	1:C:138:ALA:CB	2.54	0.54
1:C:9:ASN:N	1:C:9:ASN:HD22	2.04	0.54
1:C:49:GLN:CD	1:C:49:GLN:H	2.15	0.54
2:D:6:GLU:O	2:D:10:LEU:HD23	2.06	0.54
1:E:141:ARG:HH11	1:E:141:ARG:HB2	1.71	0.54
1:C:138:ALA:HA	1:C:141:ARG:CZ	2.36	0.54
2:H:89:SER:HB2	2:H:141:LEU:O	2.07	0.54
1:E:140:TYR:O	1:G:127:LYS:HD3	2.07	0.54
1:E:141:ARG:NH1	1:E:141:ARG:N	2.53	0.54
1:A:24:TYR:OH	1:A:113:HIS:HE1	1.89	0.54
1:A:135:VAL:HA	1:A:138:ALA:CB	2.37	0.54
1:G:135:VAL:HA	1:G:138:ALA:CB	2.37	0.54
1:A:6:ASP:O	1:A:10:VAL:HG23	2.06	0.54
2:B:14:LEU:O	2:B:18:VAL:HG23	2.07	0.54
1:C:111:ILE:HG22	1:C:112:HIS:CD2	2.42	0.54
1:G:137:THR:HB	1:G:140:TYR:CE1	2.43	0.54
1:A:28:THR:HG22	1:A:108:VAL:HG21	1.89	0.54
1:A:141:ARG:HB2	1:A:141:ARG:CZ	2.37	0.54
1:C:137:THR:HB	1:C:140:TYR:CE1	2.43	0.54
1:E:132:VAL:O	1:E:136:LEU:HD23	2.07	0.54
1:E:141:ARG:HB2	1:E:141:ARG:CZ	2.38	0.54
2:H:6:GLU:CD	2:H:6:GLU:N	2.65	0.54
2:H:34:VAL:C	2:H:36:PRO:HD3	2.33	0.54
1:A:111:ILE:HG22	1:A:112:HIS:CD2	2.42	0.54
1:E:49:GLN:CD	1:E:49:GLN:H	2.16	0.54
2:F:14:LEU:O	2:F:18:VAL:HG23	2.07	0.54
1:G:141:ARG:HH11	1:G:141:ARG:HB2	1.68	0.54
1:E:138:ALA:O	1:E:140:TYR:N	2.41	0.54
2:F:84:THR:C	2:F:87:GLN:HE22	2.15	0.54
1:G:76:ILE:O	1:G:80:LEU:HD12	2.08	0.54
2:H:47:ASN:ND2	2:H:53:ALA:HB1	2.23	0.54
2:H:57:ASN:ND2	2:H:57:ASN:C	2.66	0.54
1:E:82:LYS:O	1:E:82:LYS:HD3	2.08	0.54
1:G:7:LYS:HD3	1:G:73:ILE:HG23	1.90	0.53
1:C:47:ASP:OD1	1:C:52:SER:HB2	2.08	0.53
2:B:93:CYS:SG	2:B:145:TYR:CG	2.95	0.53
1:C:24:TYR:CE2	1:C:112:HIS:ND1	2.76	0.53
2:D:6:GLU:CD	2:D:6:GLU:N	2.67	0.53
2:D:84:THR:C	2:D:87:GLN:HE22	2.16	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:111:ILE:HG22	1:G:112:HIS:CD2	2.40	0.53
1:G:138:ALA:O	1:G:140:TYR:N	2.42	0.53
1:C:76:ILE:O	1:C:80:LEU:HD12	2.08	0.53
1:C:80:LEU:HD23	1:C:83:LEU:HD12	1.91	0.53
1:C:141:ARG:HB2	1:C:141:ARG:CZ	2.38	0.53
1:E:9:ASN:HD22	1:E:9:ASN:N	2.05	0.53
1:G:1:VAL:HG23	1:G:2:LEU:N	2.23	0.53
1:G:82:LYS:O	1:G:82:LYS:HD3	2.08	0.53
1:G:140:TYR:O	1:G:141:ARG:HD3	2.09	0.53
1:A:49:GLN:H	1:A:49:GLN:CD	2.17	0.53
2:D:47:ASN:ND2	2:D:53:ALA:HB1	2.24	0.53
2:F:91:LEU:O	2:F:95:LYS:HB3	2.09	0.53
1:G:111:ILE:HG12	2:H:115:ALA:O	2.08	0.53
1:A:82:LYS:O	1:A:82:LYS:HD3	2.09	0.53
2:B:47:ASN:ND2	2:B:53:ALA:HB1	2.24	0.53
2:D:57:ASN:HD22	2:D:59:MET:H	1.57	0.53
1:E:24:TYR:CE2	1:E:112:HIS:ND1	2.75	0.53
1:A:137:THR:HB	1:A:140:TYR:CE1	2.44	0.52
2:B:34:VAL:C	2:B:36:PRO:HD3	2.34	0.52
1:C:111:ILE:HG12	2:D:115:ALA:O	2.09	0.52
2:D:34:VAL:C	2:D:36:PRO:HD3	2.34	0.52
1:E:137:THR:HB	1:E:140:TYR:CE1	2.44	0.52
2:H:84:THR:C	2:H:87:GLN:HE22	2.16	0.52
2:D:133:LEU:O	2:D:136:VAL:HG12	2.09	0.52
1:E:1:VAL:HG23	1:E:2:LEU:N	2.24	0.52
1:G:134:THR:O	1:G:138:ALA:CB	2.58	0.52
2:F:34:VAL:C	2:F:36:PRO:HD3	2.34	0.52
2:B:133:LEU:O	2:B:136:VAL:HG12	2.10	0.52
2:F:87:GLN:H	2:F:87:GLN:NE2	2.07	0.52
1:A:140:TYR:O	1:C:127:LYS:HD3	2.09	0.52
1:C:141:ARG:HH11	1:C:141:ARG:HB2	1.71	0.52
1:C:1:VAL:HG23	1:C:2:LEU:N	2.24	0.52
1:E:6:ASP:O	1:E:10:VAL:HG23	2.09	0.52
1:G:1:VAL:CG2	1:G:2:LEU:N	2.73	0.52
1:A:1:VAL:HG23	1:A:2:LEU:N	2.25	0.52
1:A:134:THR:O	1:A:138:ALA:CB	2.57	0.52
2:D:87:GLN:H	2:D:87:GLN:NE2	2.07	0.52
1:E:134:THR:O	1:E:138:ALA:CB	2.57	0.52
2:F:47:ASN:ND2	2:F:53:ALA:HB1	2.25	0.52
2:D:93:CYS:SG	2:D:145:TYR:CD2	3.02	0.51
1:E:7:LYS:HD3	1:E:73:ILE:HG23	1.91	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:24:TYR:CE2	1:G:112:HIS:ND1	2.77	0.51
1:G:141:ARG:HH11	1:G:141:ARG:CB	2.23	0.51
2:B:91:LEU:O	2:B:95:LYS:HB3	2.10	0.51
2:D:1:VAL:HG12	2:D:2:HIS:H	1.73	0.51
1:A:9:ASN:N	1:A:9:ASN:HD22	2.08	0.51
1:A:80:LEU:HD23	1:A:83:LEU:HD12	1.93	0.51
2:B:141:LEU:CD1	3:B:152:HEM:HBB2	2.41	0.51
1:A:138:ALA:CA	1:A:141:ARG:HH12	2.23	0.51
1:C:1:VAL:CG2	1:C:2:LEU:N	2.73	0.51
1:E:1:VAL:CG2	1:E:2:LEU:N	2.73	0.51
1:E:24:TYR:OH	1:E:113:HIS:HE1	1.93	0.51
1:A:7:LYS:HD3	1:A:73:ILE:HG23	1.93	0.51
1:A:72:HIS:C	1:A:74:ASP:H	2.19	0.51
1:C:138:ALA:CA	1:C:141:ARG:HH12	2.23	0.51
1:E:63:VAL:O	1:E:67:VAL:HG23	2.11	0.51
2:H:1:VAL:HG12	2:H:2:HIS:H	1.75	0.51
1:C:138:ALA:C	1:C:141:ARG:HH12	2.18	0.51
1:C:7:LYS:HD3	1:C:73:ILE:HG23	1.92	0.51
2:D:76:LYS:HA	2:D:76:LYS:HZ3	1.68	0.51
1:G:138:ALA:CA	1:G:141:ARG:HH12	2.24	0.51
2:B:57:ASN:HD22	2:B:59:MET:H	1.57	0.50
1:E:76:ILE:O	1:E:80:LEU:HD12	2.11	0.50
1:C:72:HIS:C	1:C:74:ASP:H	2.20	0.50
2:F:142:ALA:HA	2:F:145:TYR:CE2	2.46	0.50
1:G:80:LEU:HD23	1:G:83:LEU:HD12	1.94	0.50
1:A:63:VAL:O	1:A:67:VAL:HG23	2.12	0.50
2:F:135:ARG:NH2	2:H:146:HIS:NE2	2.59	0.50
1:C:141:ARG:HH11	1:C:141:ARG:CB	2.25	0.50
1:G:22:GLU:OE2	1:G:56:LYS:HB3	2.12	0.50
1:A:1:VAL:CG2	1:A:2:LEU:N	2.74	0.50
1:E:72:HIS:C	1:E:74:ASP:H	2.20	0.50
1:A:141:ARG:HH11	1:A:141:ARG:CB	2.25	0.50
1:C:22:GLU:OE2	1:C:56:LYS:HB3	2.12	0.50
1:E:138:ALA:CA	1:E:141:ARG:HH12	2.23	0.50
2:B:1:VAL:HG12	2:B:2:HIS:H	1.77	0.49
2:B:87:GLN:H	2:B:87:GLN:NE2	2.09	0.49
1:G:24:TYR:OH	1:G:113:HIS:HE1	1.95	0.49
1:A:22:GLU:OE2	1:A:56:LYS:HB3	2.12	0.49
1:A:76:ILE:O	1:A:80:LEU:HD12	2.12	0.49
1:C:6:ASP:O	1:C:10:VAL:HG23	2.12	0.49
2:F:141:LEU:CD1	3:F:156:HEM:HBB2	2.42	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:72:HIS:C	1:G:74:ASP:H	2.19	0.49
1:A:43:PHE:HB3	1:A:46:PHE:HB2	1.93	0.49
1:G:138:ALA:C	1:G:141:ARG:HH12	2.20	0.49
2:H:133:LEU:O	2:H:136:VAL:HG12	2.12	0.49
1:E:80:LEU:HD23	1:E:83:LEU:HD12	1.94	0.49
1:A:138:ALA:C	1:A:141:ARG:HH12	2.20	0.49
1:C:7:LYS:HD3	1:C:73:ILE:CG2	2.43	0.49
2:B:6:GLU:O	2:B:10:LEU:HD23	2.13	0.49
2:B:93:CYS:SG	2:B:145:TYR:CD2	3.05	0.49
1:C:24:TYR:OH	1:C:113:HIS:HE1	1.96	0.49
1:E:22:GLU:OE2	1:E:56:LYS:HB3	2.13	0.49
2:F:133:LEU:O	2:F:136:VAL:HG12	2.13	0.49
2:H:142:ALA:HA	2:H:145:TYR:CE2	2.47	0.48
2:B:77:ASN:C	2:B:79:ASP:H	2.21	0.48
1:C:28:THR:HG22	1:C:108:VAL:HG21	1.94	0.48
2:F:77:ASN:C	2:F:79:ASP:H	2.21	0.48
1:E:111:ILE:HG12	2:F:115:ALA:O	2.13	0.48
1:G:28:THR:HG22	1:G:108:VAL:HG21	1.95	0.48
1:C:141:ARG:NH1	1:C:141:ARG:CB	2.74	0.48
1:E:43:PHE:HB3	1:E:46:PHE:HB2	1.95	0.48
2:D:82:LYS:HD3	2:D:83:ASN:CG	2.38	0.48
1:A:111:ILE:HG12	2:B:115:ALA:O	2.13	0.48
2:F:57:ASN:HD22	2:F:58:PRO:CD	2.27	0.48
1:G:6:ASP:O	1:G:10:VAL:HG23	2.12	0.48
2:B:142:ALA:HA	2:B:145:TYR:CE2	2.48	0.48
1:E:141:ARG:HH11	1:E:141:ARG:CB	2.26	0.48
1:G:7:LYS:HD3	1:G:73:ILE:CG2	2.43	0.48
2:B:135:ARG:NH2	2:D:146:HIS:NE2	2.61	0.48
1:E:20:HIS:O	1:E:21:ALA:C	2.57	0.48
2:F:77:ASN:O	2:F:79:ASP:N	2.47	0.48
1:E:138:ALA:C	1:E:141:ARG:HH12	2.21	0.48
2:F:96:LEU:H	2:F:96:LEU:HD22	1.79	0.48
2:B:131:GLN:CA	2:B:131:GLN:HE21	2.27	0.47
2:B:146:HIS:NE2	2:D:135:ARG:NH2	2.62	0.47
2:F:1:VAL:HG12	2:F:2:HIS:H	1.79	0.47
2:F:6:GLU:O	2:F:10:LEU:HD23	2.14	0.47
2:H:76:LYS:CA	2:H:76:LYS:HZ3	2.25	0.47
1:A:20:HIS:O	1:A:21:ALA:C	2.57	0.47
2:H:50:SER:O	2:H:54:ILE:HG13	2.14	0.47
2:H:82:LYS:HD3	2:H:83:ASN:CG	2.39	0.47
2:B:85:PHE:N	2:B:87:GLN:HE22	2.13	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:93:CYS:SG	2:H:145:TYR:CD2	3.06	0.47
2:F:93:CYS:SG	2:F:145:TYR:CD2	3.08	0.47
2:B:93:CYS:SG	2:B:145:TYR:CD1	3.03	0.47
2:F:57:ASN:HD22	2:F:59:MET:H	1.59	0.47
2:B:104:ARG:C	2:B:104:ARG:CD	2.88	0.46
2:D:131:GLN:CA	2:D:131:GLN:HE21	2.28	0.46
2:F:85:PHE:N	2:F:87:GLN:HE22	2.14	0.46
2:F:146:HIS:NE2	2:H:135:ARG:NH2	2.63	0.46
1:A:140:TYR:O	1:A:141:ARG:HD3	2.15	0.46
2:H:57:ASN:HD22	2:H:59:MET:H	1.57	0.46
2:D:50:SER:O	2:D:54:ILE:HG13	2.15	0.46
2:B:77:ASN:O	2:B:79:ASP:N	2.48	0.46
1:G:43:PHE:HB3	1:G:46:PHE:HB2	1.98	0.46
1:G:110:ALA:HB1	2:H:116:ALA:HB2	1.98	0.46
2:D:93:CYS:SG	2:D:145:TYR:CD1	3.03	0.46
2:D:142:ALA:HA	2:D:145:TYR:CE2	2.51	0.46
1:E:7:LYS:HD3	1:E:73:ILE:CG2	2.46	0.46
2:H:131:GLN:CA	2:H:131:GLN:HE21	2.27	0.46
1:E:127:LYS:HD3	1:G:140:TYR:O	2.15	0.46
2:F:88:LEU:HD13	2:F:88:LEU:HA	1.85	0.46
2:H:57:ASN:HD22	2:H:58:PRO:CD	2.27	0.46
2:H:77:ASN:C	2:H:79:ASP:H	2.24	0.46
2:H:96:LEU:HD22	2:H:96:LEU:H	1.81	0.46
1:C:137:THR:HB	1:C:140:TYR:HE1	1.81	0.45
2:D:77:ASN:C	2:D:79:ASP:H	2.24	0.45
1:E:140:TYR:O	1:E:141:ARG:HD3	2.16	0.45
1:G:20:HIS:O	1:G:21:ALA:C	2.58	0.45
1:G:63:VAL:O	1:G:67:VAL:HG23	2.16	0.45
2:D:57:ASN:HD22	2:D:58:PRO:CD	2.29	0.45
1:E:82:LYS:HD3	1:E:82:LYS:C	2.41	0.45
2:B:57:ASN:HD22	2:B:58:PRO:CD	2.30	0.45
1:E:141:ARG:NH1	1:E:141:ARG:CB	2.75	0.45
2:F:59:MET:HE2	2:F:59:MET:CA	2.45	0.45
1:A:47:ASP:N	1:A:54:GLN:OE1	2.48	0.45
1:A:119:ALA:HA	2:B:30:ARG:NH1	2.31	0.45
1:C:43:PHE:HB3	1:C:46:PHE:HB2	1.97	0.45
2:D:104:ARG:C	2:D:104:ARG:CD	2.89	0.45
1:G:82:LYS:HD3	1:G:82:LYS:C	2.42	0.45
1:A:137:THR:HB	1:A:140:TYR:HE1	1.81	0.45
2:B:82:LYS:HD3	2:B:83:ASN:CG	2.40	0.45
2:D:85:PHE:N	2:D:87:GLN:HE22	2.15	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:82:LYS:HD3	2:F:83:ASN:CG	2.42	0.45
2:H:93:CYS:SG	2:H:145:TYR:CD1	3.03	0.45
2:F:93:CYS:SG	2:F:145:TYR:CD1	3.01	0.45
2:F:131:GLN:HE21	2:F:131:GLN:CA	2.28	0.45
2:H:85:PHE:N	2:H:87:GLN:HE22	2.15	0.45
1:C:20:HIS:O	1:C:21:ALA:C	2.60	0.45
2:F:6:GLU:O	2:F:7:GLU:C	2.59	0.45
1:A:52:SER:O	1:A:56:LYS:HG3	2.17	0.45
1:C:82:LYS:HD3	1:C:82:LYS:C	2.41	0.45
1:C:110:ALA:HB1	2:D:116:ALA:HB2	1.98	0.45
2:H:52:THR:HA	2:H:55:LEU:CD2	2.43	0.45
1:A:24:TYR:HE2	1:A:112:HIS:HD1	1.56	0.45
1:A:92:ARG:O	2:D:40:ARG:HD3	2.16	0.45
2:D:57:ASN:ND2	2:D:57:ASN:C	2.65	0.45
2:D:96:LEU:H	2:D:96:LEU:HD22	1.80	0.45
2:F:57:ASN:ND2	2:F:57:ASN:C	2.69	0.44
1:G:137:THR:O	1:G:139:LYS:N	2.50	0.44
1:A:7:LYS:HD3	1:A:73:ILE:CG2	2.47	0.44
2:B:73:ASP:HA	2:B:76:LYS:HB2	2.00	0.44
1:C:63:VAL:O	1:C:67:VAL:HG23	2.17	0.44
1:E:24:TYR:HE2	1:E:112:HIS:HD1	1.60	0.44
2:F:65:LYS:HG3	2:F:66:LYS:N	2.31	0.44
2:D:145:TYR:CD2	2:D:145:TYR:N	2.85	0.44
1:C:137:THR:O	1:C:139:LYS:N	2.51	0.44
2:D:1:VAL:CG1	2:D:2:HIS:N	2.80	0.44
2:F:77:ASN:C	2:F:79:ASP:N	2.76	0.44
1:G:119:ALA:HA	2:H:30:ARG:NH1	2.33	0.44
1:A:82:LYS:HD3	1:A:82:LYS:C	2.43	0.44
2:D:88:LEU:HD13	2:D:88:LEU:HA	1.83	0.44
2:F:73:ASP:HA	2:F:76:LYS:HB2	1.99	0.44
1:G:97:ASN:HA	1:G:100:PHE:CD1	2.53	0.44
2:D:77:ASN:O	2:D:79:ASP:N	2.51	0.44
2:F:104:ARG:C	2:F:104:ARG:CD	2.89	0.44
1:A:127:LYS:HD3	1:C:140:TYR:O	2.18	0.44
1:E:52:SER:O	1:E:56:LYS:HG3	2.17	0.44
1:E:97:ASN:HA	1:E:100:PHE:CD1	2.53	0.44
1:E:119:ALA:HA	2:F:30:ARG:NH1	2.33	0.44
2:F:52:THR:HA	2:F:55:LEU:CD2	2.43	0.43
1:G:137:THR:HB	1:G:140:TYR:HE1	1.81	0.43
2:H:73:ASP:HA	2:H:76:LYS:HB2	1.99	0.43
2:H:59:MET:HE2	2:H:59:MET:CA	2.47	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:20:VAL:HA	2:B:68:LEU:HD23	1.99	0.43
2:F:131:GLN:HA	2:F:131:GLN:NE2	2.33	0.43
2:H:145:TYR:CD2	2:H:145:TYR:N	2.86	0.43
2:B:95:LYS:HE2	2:B:95:LYS:O	2.18	0.43
1:G:141:ARG:NH1	1:G:141:ARG:CB	2.72	0.43
2:H:65:LYS:HG3	2:H:66:LYS:N	2.32	0.43
2:H:131:GLN:HA	2:H:131:GLN:NE2	2.34	0.43
2:H:14:LEU:HD11	2:H:118:PHE:CD2	2.53	0.43
2:D:73:ASP:HA	2:D:76:LYS:HB2	1.99	0.43
1:E:137:THR:HB	1:E:140:TYR:HE1	1.82	0.43
2:H:1:VAL:CG1	2:H:2:HIS:N	2.82	0.43
2:B:131:GLN:HA	2:B:131:GLN:NE2	2.33	0.43
2:B:51:PRO:O	2:B:55:LEU:HD22	2.18	0.43
2:B:96:LEU:H	2:B:96:LEU:HD22	1.82	0.43
1:G:38:GLN:HE21	1:G:38:GLN:N	2.08	0.43
1:G:66:LEU:O	1:G:70:VAL:HG23	2.19	0.43
2:B:141:LEU:HD12	3:B:152:HEM:HBB2	2.01	0.43
2:H:141:LEU:CD1	3:H:158:HEM:HBB2	2.49	0.43
2:B:77:ASN:C	2:B:79:ASP:N	2.76	0.42
2:B:85:PHE:CA	2:B:87:GLN:HE22	2.32	0.42
2:F:141:LEU:O	2:F:142:ALA:O	2.37	0.42
1:G:52:SER:O	1:G:56:LYS:HG3	2.18	0.42
2:H:95:LYS:HE2	2:H:95:LYS:O	2.19	0.42
1:A:137:THR:O	1:A:139:LYS:N	2.53	0.42
2:D:52:THR:HA	2:D:55:LEU:CD2	2.44	0.42
2:D:131:GLN:NE2	2:D:131:GLN:HA	2.34	0.42
2:B:6:GLU:O	2:B:7:GLU:C	2.61	0.42
2:B:145:TYR:CD2	2:B:145:TYR:N	2.87	0.42
1:C:119:ALA:HA	2:D:30:ARG:NH1	2.33	0.42
2:H:85:PHE:CA	2:H:87:GLN:HE22	2.33	0.42
2:D:51:PRO:O	2:D:55:LEU:HD22	2.20	0.42
2:D:94:ASP:OD2	2:D:94:ASP:N	2.53	0.42
1:E:137:THR:O	1:E:139:LYS:N	2.52	0.42
2:F:50:SER:O	2:F:51:PRO:C	2.61	0.42
2:F:95:LYS:O	2:F:95:LYS:HE2	2.19	0.42
1:A:138:ALA:C	1:A:140:TYR:H	2.27	0.42
2:B:65:LYS:HG3	2:B:66:LYS:N	2.33	0.42
2:F:85:PHE:CA	2:F:87:GLN:HE22	2.31	0.42
2:B:57:ASN:ND2	2:B:57:ASN:C	2.68	0.42
1:C:97:ASN:HA	1:C:100:PHE:CD1	2.54	0.42
2:H:51:PRO:O	2:H:55:LEU:HD22	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:72:HIS:C	1:A:74:ASP:N	2.77	0.42
2:B:50:SER:O	2:B:54:ILE:HG13	2.20	0.42
2:B:141:LEU:O	2:B:142:ALA:O	2.38	0.42
2:D:65:LYS:HG3	2:D:66:LYS:N	2.35	0.42
1:C:72:HIS:C	1:C:74:ASP:N	2.78	0.42
1:G:72:HIS:C	1:G:74:ASP:N	2.77	0.42
2:H:77:ASN:O	2:H:79:ASP:N	2.52	0.42
1:A:97:ASN:HA	1:A:100:PHE:CD1	2.55	0.42
1:C:52:SER:O	1:C:56:LYS:HG3	2.20	0.42
1:C:86:LEU:O	1:C:90:LYS:HB3	2.20	0.42
2:F:1:VAL:CG1	2:F:2:HIS:N	2.83	0.42
2:B:14:LEU:HD11	2:B:118:PHE:CD2	2.54	0.42
2:D:76:LYS:CA	2:D:76:LYS:HZ3	2.30	0.42
1:C:66:LEU:O	1:C:70:VAL:HG23	2.20	0.41
2:D:14:LEU:HD11	2:D:118:PHE:CD2	2.55	0.41
2:F:40:ARG:HD2	1:G:91:LEU:O	2.20	0.41
2:H:104:ARG:C	2:H:104:ARG:CD	2.89	0.41
2:B:50:SER:OG	2:B:53:ALA:HB2	2.20	0.41
1:C:138:ALA:C	1:C:140:TYR:H	2.28	0.41
2:F:14:LEU:HD11	2:F:118:PHE:CD2	2.55	0.41
2:H:87:GLN:OE1	2:H:88:LEU:N	2.53	0.41
2:D:85:PHE:CA	2:D:87:GLN:HE22	2.34	0.41
1:E:72:HIS:C	1:E:74:ASP:N	2.78	0.41
1:E:92:ARG:O	2:H:40:ARG:HD3	2.20	0.41
2:F:141:LEU:HD12	3:F:156:HEM:HBB2	2.02	0.41
1:C:89:GLN:OE1	1:C:139:LYS:HG2	2.21	0.41
2:H:144:LYS:HE2	2:H:144:LYS:CA	2.47	0.41
2:D:77:ASN:C	2:D:79:ASP:N	2.79	0.41
2:B:87:GLN:OE1	2:B:88:LEU:N	2.54	0.41
2:D:95:LYS:HE2	2:D:95:LYS:O	2.20	0.41
1:E:1:VAL:O	1:E:2:LEU:HB2	2.21	0.41
1:E:110:ALA:HB1	2:F:116:ALA:HB2	2.01	0.41
2:F:20:VAL:HA	2:F:68:LEU:HD23	2.02	0.41
2:B:47:ASN:OD1	2:B:49:SER:HB2	2.20	0.41
2:B:50:SER:H	2:B:53:ALA:HB3	1.86	0.41
1:C:84:SER:O	1:C:88:ALA:HB3	2.21	0.41
2:D:141:LEU:CD1	3:D:154:HEM:HBB2	2.49	0.41
2:F:44:SER:C	2:F:45:PHE:HD2	2.29	0.41
2:F:145:TYR:CD2	2:F:145:TYR:N	2.88	0.41
1:G:89:GLN:OE1	1:G:139:LYS:HG2	2.20	0.41
2:D:57:ASN:HA	2:D:58:PRO:HD2	1.84	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:118:PHE:O	2:D:119:ALA:C	2.62	0.41
2:F:50:SER:OG	2:F:53:ALA:HB2	2.20	0.41
2:H:50:SER:O	2:H:51:PRO:C	2.64	0.41
1:C:63:VAL:HA	1:C:66:LEU:HD12	2.03	0.40
1:E:47:ASP:N	1:E:54:GLN:OE1	2.50	0.40
1:E:89:GLN:OE1	1:E:139:LYS:HG2	2.21	0.40
2:F:47:ASN:OD1	2:F:49:SER:HB2	2.21	0.40
2:F:87:GLN:OE1	2:F:88:LEU:N	2.54	0.40
1:G:86:LEU:O	1:G:90:LYS:HB3	2.21	0.40
2:D:87:GLN:OE1	2:D:88:LEU:N	2.54	0.40
2:D:141:LEU:O	2:D:142:ALA:O	2.39	0.40
2:H:20:VAL:HA	2:H:68:LEU:HD23	2.02	0.40
2:H:101:GLU:O	2:H:105:LEU:HG	2.21	0.40
2:F:106:LEU:HD23	3:F:156:HEM:HAB	2.03	0.40
2:B:40:ARG:HD2	1:C:91:LEU:O	2.21	0.40
2:H:91:LEU:HD12	2:H:91:LEU:C	2.47	0.40
2:H:141:LEU:O	2:H:142:ALA:O	2.39	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	139/141 (99%)	123 (88%)	13 (9%)	3 (2%)	5	19
1	C	139/141 (99%)	123 (88%)	13 (9%)	3 (2%)	5	19
1	E	139/141 (99%)	123 (88%)	13 (9%)	3 (2%)	5	19
1	G	139/141 (99%)	124 (89%)	12 (9%)	3 (2%)	5	19
2	B	144/146 (99%)	132 (92%)	7 (5%)	5 (4%)	3	10
2	D	144/146 (99%)	132 (92%)	7 (5%)	5 (4%)	3	10
2	F	144/146 (99%)	132 (92%)	7 (5%)	5 (4%)	3	10

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	H	144/146 (99%)	131 (91%)	8 (6%)	5 (4%)	3	10
All	All	1132/1148 (99%)	1020 (90%)	80 (7%)	32 (3%)	4	14

All (32) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	142	ALA
2	B	143	ARG
2	D	142	ALA
2	D	143	ARG
2	F	142	ALA
2	F	143	ARG
1	G	138	ALA
2	H	142	ALA
2	H	143	ARG
1	A	41	THR
1	A	138	ALA
1	C	41	THR
1	C	138	ALA
2	D	78	LEU
1	E	41	THR
1	E	138	ALA
2	F	78	LEU
1	G	41	THR
2	H	78	LEU
2	B	78	LEU
2	B	144	LYS
2	D	144	LYS
2	F	144	LYS
2	B	80	ASN
2	D	80	ASN
2	H	80	ASN
2	H	144	LYS
1	A	73	ILE
2	F	80	ASN
1	C	73	ILE
1	E	73	ILE
1	G	73	ILE

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	114/114 (100%)	103 (90%)	11 (10%)	8	26
1	C	114/114 (100%)	103 (90%)	11 (10%)	8	26
1	E	114/114 (100%)	103 (90%)	11 (10%)	8	26
1	G	114/114 (100%)	103 (90%)	11 (10%)	8	26
2	B	121/121 (100%)	105 (87%)	16 (13%)	4	14
2	D	121/121 (100%)	106 (88%)	15 (12%)	4	16
2	F	121/121 (100%)	106 (88%)	15 (12%)	4	16
2	H	121/121 (100%)	106 (88%)	15 (12%)	4	16
All	All	940/940 (100%)	835 (89%)	105 (11%)	6	19

All (105) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	THR
1	A	38	GLN
1	A	41	THR
1	A	48	LEU
1	A	49	GLN
1	A	63	VAL
1	A	82	LYS
1	A	86	LEU
1	A	130	CYS
1	A	140	TYR
1	A	141	ARG
2	B	6	GLU
2	B	17	LYS
2	B	59	MET
2	B	76	LYS
2	B	82	LYS
2	B	87	GLN
2	B	88	LEU
2	B	95	LYS

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Mol	Chain	Res	Type
2	B	100	PRO
2	B	101	GLU
2	B	124	PRO
2	B	131	GLN
2	B	134	VAL
2	B	136	VAL
2	B	143	ARG
2	B	144	LYS
1	C	28	THR
1	C	38	GLN
1	C	41	THR
1	C	48	LEU
1	C	49	GLN
1	C	63	VAL
1	C	82	LYS
1	C	86	LEU
1	C	130	CYS
1	C	140	TYR
1	C	141	ARG
2	D	6	GLU
2	D	17	LYS
2	D	59	MET
2	D	76	LYS
2	D	82	LYS
2	D	87	GLN
2	D	88	LEU
2	D	94	ASP
2	D	95	LYS
2	D	100	PRO
2	D	101	GLU
2	D	131	GLN
2	D	134	VAL
2	D	143	ARG
2	D	144	LYS
1	E	28	THR
1	E	38	GLN
1	E	41	THR
1	E	48	LEU
1	E	49	GLN
1	E	63	VAL
1	E	82	LYS
1	E	86	LEU

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Mol	Chain	Res	Type
1	E	130	CYS
1	E	140	TYR
1	E	141	ARG
2	F	6	GLU
2	F	17	LYS
2	F	59	MET
2	F	76	LYS
2	F	82	LYS
2	F	87	GLN
2	F	88	LEU
2	F	95	LYS
2	F	100	PRO
2	F	101	GLU
2	F	131	GLN
2	F	134	VAL
2	F	136	VAL
2	F	143	ARG
2	F	144	LYS
1	G	28	THR
1	G	38	GLN
1	G	41	THR
1	G	48	LEU
1	G	49	GLN
1	G	63	VAL
1	G	82	LYS
1	G	86	LEU
1	G	130	CYS
1	G	140	TYR
1	G	141	ARG
2	H	6	GLU
2	H	17	LYS
2	H	59	MET
2	H	76	LYS
2	H	82	LYS
2	H	87	GLN
2	H	88	LEU
2	H	94	ASP
2	H	95	LYS
2	H	101	GLU
2	H	131	GLN
2	H	134	VAL
2	H	136	VAL

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Mol	Chain	Res	Type
2	H	143	ARG
2	H	144	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (35) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	ASN
1	A	38	GLN
1	A	97	ASN
1	A	113	HIS
2	B	9	GLN
2	B	57	ASN
2	B	87	GLN
2	B	102	ASN
2	B	131	GLN
1	C	9	ASN
1	C	38	GLN
1	C	97	ASN
1	C	113	HIS
2	D	9	GLN
2	D	57	ASN
2	D	102	ASN
1	E	9	ASN
1	E	38	GLN
1	E	97	ASN
1	E	113	HIS
2	F	9	GLN
2	F	57	ASN
2	F	87	GLN
2	F	102	ASN
2	F	131	GLN
1	G	9	ASN
1	G	38	GLN
1	G	97	ASN
1	G	113	HIS
2	H	9	GLN
2	H	57	ASN
2	H	63	HIS
2	H	87	GLN
2	H	102	ASN
2	H	131	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](#)

8 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	HEM	H	158	2	50,50,50	1.60	7 (14%)	67,82,82	1.44	7 (10%)
3	HEM	A	151	1	50,50,50	1.55	8 (16%)	67,82,82	1.61	9 (13%)
3	HEM	G	157	1	50,50,50	1.35	8 (16%)	67,82,82	1.58	9 (13%)
3	HEM	C	153	1	50,50,50	1.43	7 (14%)	67,82,82	1.61	11 (16%)
3	HEM	B	152	2	50,50,50	1.48	8 (16%)	67,82,82	1.52	10 (14%)
3	HEM	F	156	2	50,50,50	1.46	8 (16%)	67,82,82	1.53	10 (14%)
3	HEM	D	154	2	50,50,50	1.54	8 (16%)	67,82,82	1.45	7 (10%)
3	HEM	E	155	1	50,50,50	1.44	8 (16%)	67,82,82	1.69	11 (16%)

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
3	HEM	H	158	2	-	10/14/54/54	-
3	HEM	A	151	1	-	7/14/54/54	-
3	HEM	G	157	1	-	7/14/54/54	-
3	HEM	C	153	1	-	7/14/54/54	-
3	HEM	B	152	2	-	10/14/54/54	-
3	HEM	F	156	2	-	10/14/54/54	-
3	HEM	D	154	2	-	10/14/54/54	-
3	HEM	E	155	1	-	7/14/54/54	-

All (62) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	158	HEM	FE-NC	6.76	2.17	1.95
3	D	154	HEM	FE-NC	6.00	2.15	1.95
3	A	151	HEM	FE-NB	5.03	2.10	1.94
3	F	156	HEM	FE-NC	4.43	2.09	1.95
3	B	152	HEM	FE-NA	4.32	2.09	1.95
3	C	153	HEM	FE-NB	4.27	2.08	1.94
3	E	155	HEM	FE-NB	3.88	2.06	1.94
3	B	152	HEM	FE-NC	3.88	2.08	1.95
3	G	157	HEM	FE-NB	3.74	2.06	1.94
3	F	156	HEM	FE-NA	3.69	2.07	1.95
3	C	153	HEM	CAB-C3B	-3.56	1.37	1.47
3	A	151	HEM	CAB-C3B	-3.55	1.37	1.47
3	E	155	HEM	CAB-C3B	-3.41	1.38	1.47
3	B	152	HEM	CAB-C3B	-3.40	1.38	1.47
3	F	156	HEM	CAB-C3B	-3.40	1.38	1.47
3	E	155	HEM	CBB-CAB	3.29	1.46	1.30
3	C	153	HEM	CBB-CAB	3.26	1.46	1.30
3	E	155	HEM	CBC-CAC	3.24	1.46	1.30
3	H	158	HEM	CBC-CAC	3.24	1.45	1.30
3	F	156	HEM	CBC-CAC	3.20	1.45	1.30
3	G	157	HEM	CBB-CAB	3.20	1.45	1.30
3	A	151	HEM	CBB-CAB	3.18	1.45	1.30
3	G	157	HEM	CAB-C3B	-3.17	1.38	1.47
3	B	152	HEM	CBC-CAC	3.17	1.45	1.30
3	A	151	HEM	CBC-CAC	3.13	1.45	1.30
3	D	154	HEM	CBC-CAC	3.12	1.45	1.30
3	D	154	HEM	C1A-C2A	3.07	1.50	1.44
3	D	154	HEM	CAC-C3C	-3.05	1.39	1.47
3	C	153	HEM	CBC-CAC	3.03	1.44	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	158	HEM	C1A-C2A	2.93	1.50	1.44
3	H	158	HEM	CHA-C4D	2.92	1.44	1.38
3	A	151	HEM	FE-NC	-2.88	1.85	1.95
3	B	152	HEM	CAC-C3C	-2.86	1.39	1.47
3	E	155	HEM	CMC-C2C	2.85	1.56	1.50
3	G	157	HEM	C1B-C2B	-2.85	1.38	1.44
3	A	151	HEM	C1B-C2B	-2.80	1.38	1.44
3	D	154	HEM	CAB-C3B	-2.79	1.40	1.47
3	C	153	HEM	C1B-C2B	-2.78	1.38	1.44
3	H	158	HEM	CAB-C3B	-2.78	1.40	1.47
3	H	158	HEM	CAC-C3C	-2.77	1.40	1.47
3	B	152	HEM	C1A-C2A	2.64	1.49	1.44
3	D	154	HEM	CBB-CAB	2.60	1.42	1.30
3	F	156	HEM	CAC-C3C	-2.58	1.40	1.47
3	D	154	HEM	CHA-C4D	2.52	1.43	1.38
3	H	158	HEM	CBB-CAB	2.49	1.42	1.30
3	F	156	HEM	C1A-C2A	2.48	1.49	1.44
3	A	151	HEM	CMC-C2C	2.47	1.55	1.50
3	E	155	HEM	C1B-C2B	-2.44	1.39	1.44
3	F	156	HEM	CHA-C4D	2.43	1.43	1.38
3	E	155	HEM	FE-NC	-2.40	1.87	1.95
3	G	157	HEM	CBC-CAC	2.37	1.41	1.30
3	G	157	HEM	C1B-NB	-2.34	1.36	1.40
3	C	153	HEM	CMB-C2B	2.29	1.55	1.50
3	B	152	HEM	CHA-C4D	2.29	1.43	1.38
3	B	152	HEM	CBB-CAB	2.28	1.41	1.30
3	G	157	HEM	CAC-C3C	-2.23	1.41	1.47
3	F	156	HEM	CBB-CAB	2.23	1.41	1.30
3	E	155	HEM	CAC-C3C	-2.22	1.41	1.47
3	G	157	HEM	CMC-C2C	2.16	1.55	1.50
3	D	154	HEM	FE-NA	2.10	2.02	1.95
3	A	151	HEM	CAC-C3C	-2.07	1.41	1.47
3	C	153	HEM	CAC-C3C	-2.06	1.41	1.47

All (74) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	152	HEM	CAA-C2A-C1A	5.25	135.19	124.94
3	F	156	HEM	CAA-C2A-C1A	5.12	134.94	124.94
3	D	154	HEM	CAA-C2A-C1A	5.00	134.71	124.94
3	F	156	HEM	CBA-CAA-C2A	4.91	126.11	112.53
3	H	158	HEM	CAA-C2A-C1A	4.91	134.53	124.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	H	158	HEM	CBA-CAA-C2A	4.87	125.99	112.53
3	C	153	HEM	CAD-C3D-C4D	4.86	133.17	124.70
3	D	154	HEM	CBA-CAA-C2A	4.85	125.95	112.53
3	B	152	HEM	CBA-CAA-C2A	4.81	125.84	112.53
3	E	155	HEM	CBD-CAD-C3D	4.74	125.65	112.53
3	A	151	HEM	CAD-C3D-C4D	4.73	132.95	124.70
3	E	155	HEM	CAD-C3D-C4D	4.65	132.80	124.70
3	A	151	HEM	CBD-CAD-C3D	4.54	125.09	112.53
3	G	157	HEM	CAD-C3D-C4D	4.53	132.60	124.70
3	G	157	HEM	CBD-CAD-C3D	4.37	124.61	112.53
3	C	153	HEM	CBD-CAD-C3D	4.22	124.21	112.53
3	A	151	HEM	CAD-C3D-C2D	-4.11	120.17	127.87
3	C	153	HEM	CAD-C3D-C2D	-4.09	120.20	127.87
3	E	155	HEM	CAD-C3D-C2D	-4.09	120.21	127.87
3	E	155	HEM	CAA-C2A-C3A	-3.79	118.57	127.07
3	G	157	HEM	CAD-C3D-C2D	-3.72	120.90	127.87
3	G	157	HEM	CAA-C2A-C3A	-3.65	118.88	127.07
3	E	155	HEM	CAA-C2A-C1A	3.52	131.82	124.94
3	A	151	HEM	CAA-C2A-C3A	-3.46	119.31	127.07
3	A	151	HEM	CBA-CAA-C2A	3.46	122.10	112.53
3	C	153	HEM	CAA-C2A-C3A	-3.37	119.52	127.07
3	F	156	HEM	C4A-C3A-C2A	3.35	110.65	106.82
3	A	151	HEM	CAA-C2A-C1A	3.33	131.43	124.94
3	C	153	HEM	CAA-C2A-C1A	3.31	131.41	124.94
3	E	155	HEM	CBA-CAA-C2A	3.27	121.58	112.53
3	C	153	HEM	CBA-CAA-C2A	3.26	121.54	112.53
3	G	157	HEM	CAA-C2A-C1A	3.21	131.21	124.94
3	B	152	HEM	C4A-C3A-C2A	3.18	110.45	106.82
3	G	157	HEM	CBA-CAA-C2A	3.16	121.28	112.53
3	G	157	HEM	C2B-C1B-NB	3.15	113.47	109.84
3	B	152	HEM	CAA-C2A-C3A	-3.11	120.09	127.07
3	F	156	HEM	CAA-C2A-C3A	-3.07	120.18	127.07
3	H	158	HEM	C4A-C3A-C2A	3.02	110.27	106.82
3	D	154	HEM	CAA-C2A-C3A	-2.92	120.52	127.07
3	H	158	HEM	CAA-C2A-C3A	-2.92	120.53	127.07
3	A	151	HEM	C2B-C1B-NB	2.91	113.19	109.84
3	D	154	HEM	C4A-C3A-C2A	2.86	110.09	106.82
3	F	156	HEM	CAD-C3D-C2D	-2.72	122.77	127.87
3	B	152	HEM	CAD-C3D-C2D	-2.67	122.86	127.87
3	E	155	HEM	CHB-C4A-C3A	-2.63	119.78	127.43
3	H	158	HEM	CAD-C3D-C2D	-2.62	122.95	127.87
3	D	154	HEM	CAD-C3D-C2D	-2.59	123.01	127.87

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	157	HEM	CHB-C4A-C3A	-2.53	120.09	127.43
3	C	153	HEM	CHB-C4A-C3A	-2.48	120.23	127.43
3	E	155	HEM	C2B-C1B-NB	2.45	112.66	109.84
3	B	152	HEM	CHD-C1D-C2D	-2.45	121.17	125.03
3	F	156	HEM	CHD-C1D-C2D	-2.42	121.21	125.03
3	F	156	HEM	CHA-C1A-NA	-2.34	119.61	123.86
3	A	151	HEM	CHB-C4A-C3A	-2.34	120.64	127.43
3	F	156	HEM	CHD-C1D-ND	2.33	126.94	124.42
3	G	157	HEM	C1D-C2D-C3D	2.33	109.43	106.98
3	C	153	HEM	C2B-C1B-NB	2.32	112.50	109.84
3	B	152	HEM	C1A-C2A-C3A	-2.31	103.29	106.87
3	E	155	HEM	CHC-C4B-NB	-2.25	122.00	124.42
3	F	156	HEM	CAD-C3D-C4D	2.23	128.59	124.70
3	E	155	HEM	CHD-C4C-C3C	-2.20	121.50	125.21
3	F	156	HEM	C1A-C2A-C3A	-2.19	103.48	106.87
3	B	152	HEM	CAD-C3D-C4D	2.18	128.49	124.70
3	D	154	HEM	C1A-C2A-C3A	-2.17	103.51	106.87
3	C	153	HEM	CHC-C4B-NB	-2.16	122.10	124.42
3	H	158	HEM	C1A-C2A-C3A	-2.16	103.53	106.87
3	C	153	HEM	CHD-C4C-C3C	-2.12	121.64	125.21
3	A	151	HEM	CHD-C4C-C3C	-2.10	121.67	125.21
3	B	152	HEM	CHA-C1A-NA	-2.09	120.08	123.86
3	E	155	HEM	CHB-C4A-NA	2.04	127.57	123.86
3	H	158	HEM	CHD-C1D-ND	2.04	126.61	124.42
3	B	152	HEM	CHD-C1D-ND	2.03	126.61	124.42
3	D	154	HEM	CHD-C1D-ND	2.02	126.60	124.42
3	C	153	HEM	CHD-C4C-NC	2.00	126.63	124.45

There are no chirality outliers.

All (68) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	151	HEM	C2D-C3D-CAD-CBD
3	A	151	HEM	C4D-C3D-CAD-CBD
3	B	152	HEM	C2B-C3B-CAB-CBB
3	B	152	HEM	C2C-C3C-CAC-CBC
3	B	152	HEM	C4C-C3C-CAC-CBC
3	C	153	HEM	C2D-C3D-CAD-CBD
3	C	153	HEM	C4D-C3D-CAD-CBD
3	D	154	HEM	C2B-C3B-CAB-CBB
3	D	154	HEM	C2C-C3C-CAC-CBC
3	D	154	HEM	C4C-C3C-CAC-CBC

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Mol	Chain	Res	Type	Atoms
3	E	155	HEM	C2D-C3D-CAD-CBD
3	E	155	HEM	C4D-C3D-CAD-CBD
3	F	156	HEM	C2B-C3B-CAB-CBB
3	F	156	HEM	C2C-C3C-CAC-CBC
3	F	156	HEM	C4C-C3C-CAC-CBC
3	G	157	HEM	C2D-C3D-CAD-CBD
3	G	157	HEM	C4D-C3D-CAD-CBD
3	H	158	HEM	C2B-C3B-CAB-CBB
3	H	158	HEM	C2C-C3C-CAC-CBC
3	H	158	HEM	C4C-C3C-CAC-CBC
3	B	152	HEM	C1A-C2A-CAA-CBA
3	D	154	HEM	C1A-C2A-CAA-CBA
3	F	156	HEM	C1A-C2A-CAA-CBA
3	H	158	HEM	C1A-C2A-CAA-CBA
3	B	152	HEM	C3A-C2A-CAA-CBA
3	D	154	HEM	C3A-C2A-CAA-CBA
3	F	156	HEM	C3A-C2A-CAA-CBA
3	H	158	HEM	C3A-C2A-CAA-CBA
3	B	152	HEM	C4B-C3B-CAB-CBB
3	D	154	HEM	C4B-C3B-CAB-CBB
3	F	156	HEM	C4B-C3B-CAB-CBB
3	H	158	HEM	C4B-C3B-CAB-CBB
3	A	151	HEM	C2B-C3B-CAB-CBB
3	C	153	HEM	C2B-C3B-CAB-CBB
3	E	155	HEM	C2B-C3B-CAB-CBB
3	G	157	HEM	C2B-C3B-CAB-CBB
3	F	156	HEM	CAA-CBA-CGA-O2A
3	B	152	HEM	CAA-CBA-CGA-O2A
3	H	158	HEM	CAA-CBA-CGA-O2A
3	G	157	HEM	CAD-CBD-CGD-O2D
3	C	153	HEM	CAD-CBD-CGD-O2D
3	D	154	HEM	CAA-CBA-CGA-O2A
3	A	151	HEM	CAD-CBD-CGD-O2D
3	E	155	HEM	CAD-CBD-CGD-O2D
3	D	154	HEM	CAD-CBD-CGD-O2D
3	F	156	HEM	CAA-CBA-CGA-O1A
3	H	158	HEM	CAD-CBD-CGD-O2D
3	F	156	HEM	CAD-CBD-CGD-O2D
3	C	153	HEM	CAD-CBD-CGD-O1D
3	B	152	HEM	CAA-CBA-CGA-O1A
3	B	152	HEM	CAD-CBD-CGD-O2D
3	H	158	HEM	CAA-CBA-CGA-O1A

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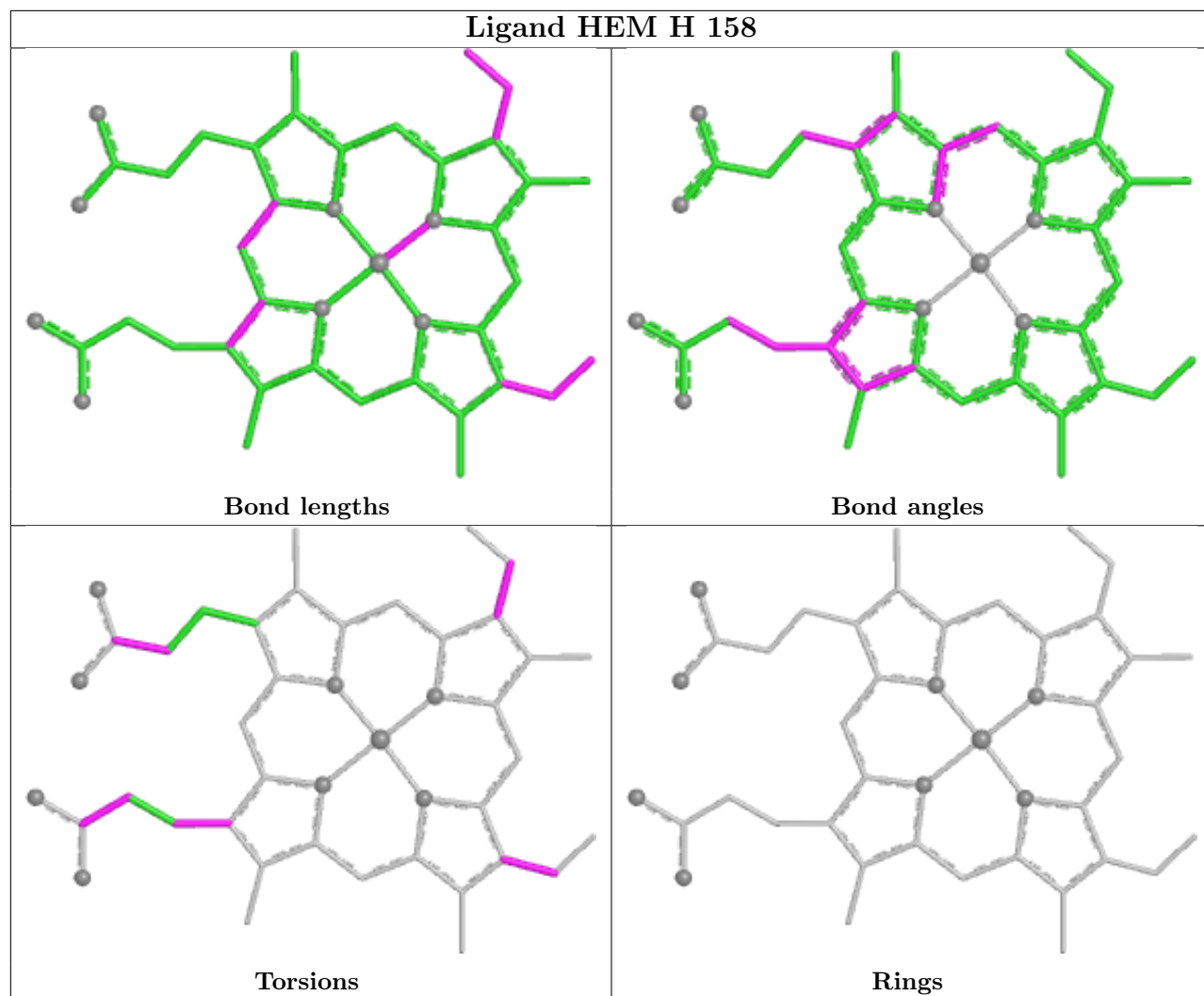
Mol	Chain	Res	Type	Atoms
3	D	154	HEM	CAA-CBA-CGA-O1A
3	A	151	HEM	CAD-CBD-CGD-O1D
3	E	155	HEM	CAD-CBD-CGD-O1D
3	D	154	HEM	CAD-CBD-CGD-O1D
3	G	157	HEM	CAD-CBD-CGD-O1D
3	H	158	HEM	CAD-CBD-CGD-O1D
3	B	152	HEM	CAD-CBD-CGD-O1D
3	A	151	HEM	CAA-CBA-CGA-O2A
3	C	153	HEM	CAA-CBA-CGA-O2A
3	E	155	HEM	CAA-CBA-CGA-O2A
3	F	156	HEM	CAD-CBD-CGD-O1D
3	G	157	HEM	CAA-CBA-CGA-O2A
3	C	153	HEM	CAA-CBA-CGA-O1A
3	A	151	HEM	CAA-CBA-CGA-O1A
3	G	157	HEM	CAA-CBA-CGA-O1A
3	E	155	HEM	CAA-CBA-CGA-O1A

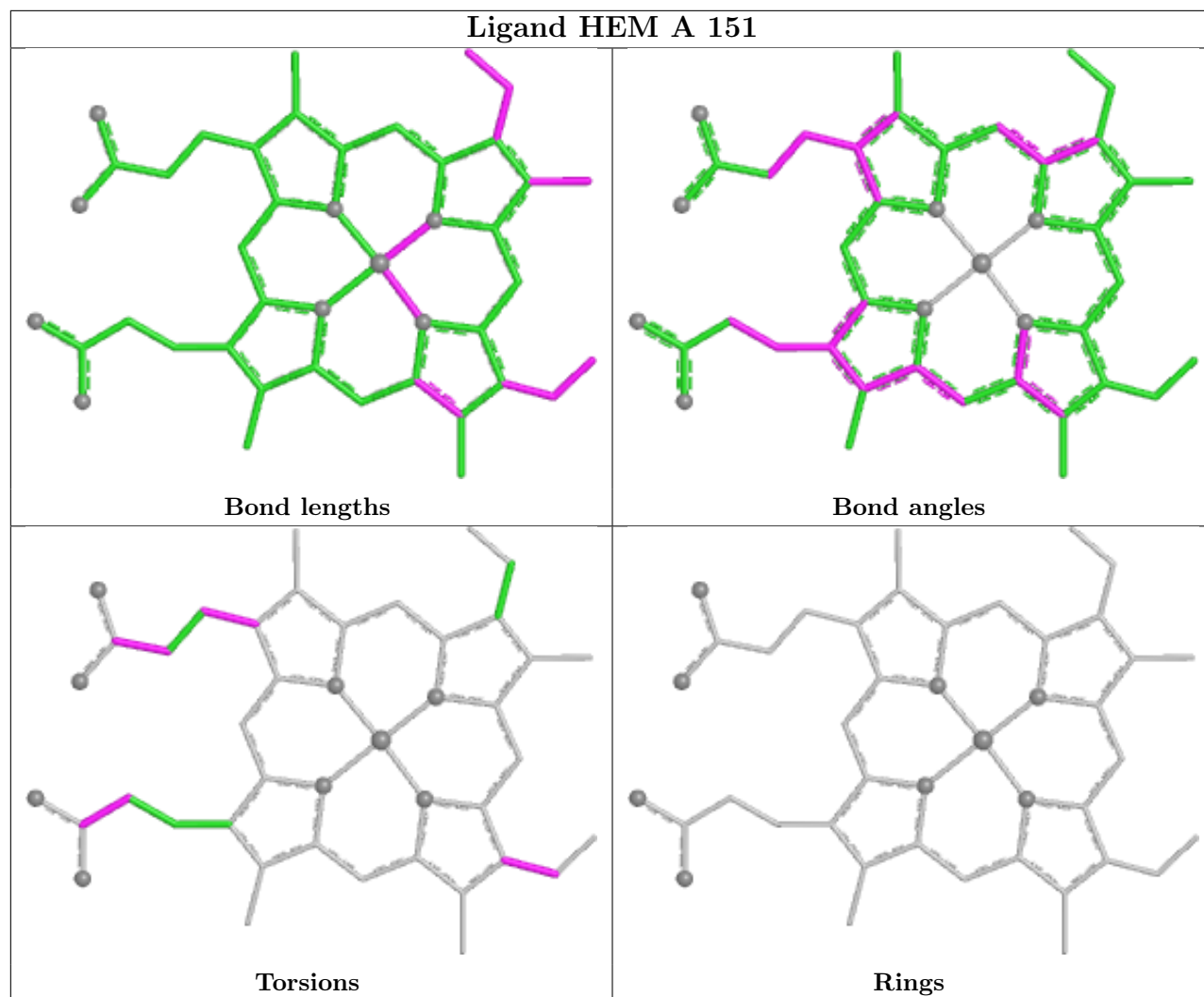
There are no ring outliers.

4 monomers are involved in 7 short contacts:

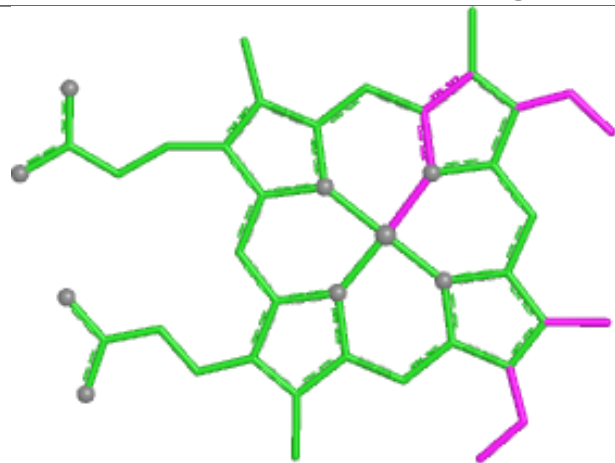
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	H	158	HEM	1	0
3	B	152	HEM	2	0
3	F	156	HEM	3	0
3	D	154	HEM	1	0

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

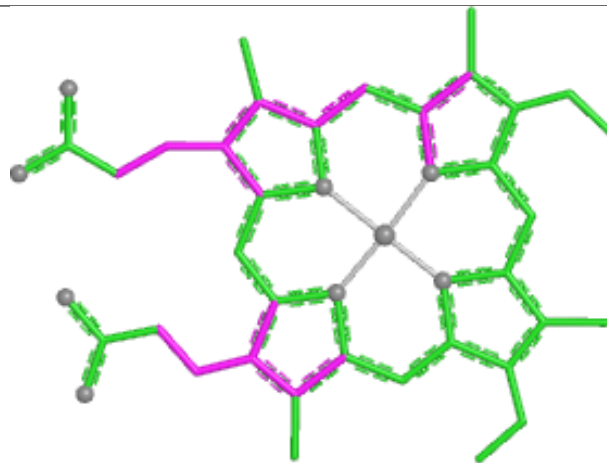




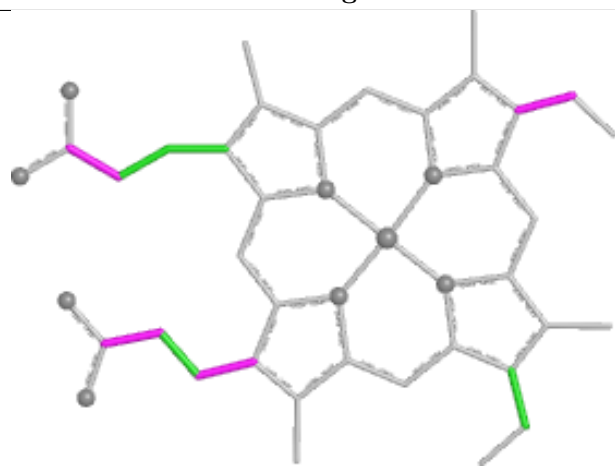
Ligand HEM G 157



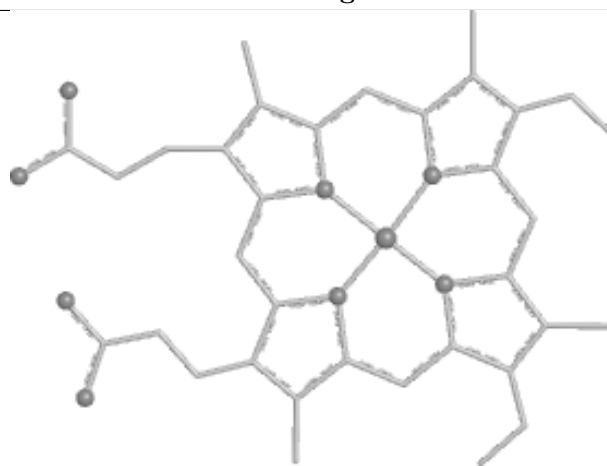
Bond lengths



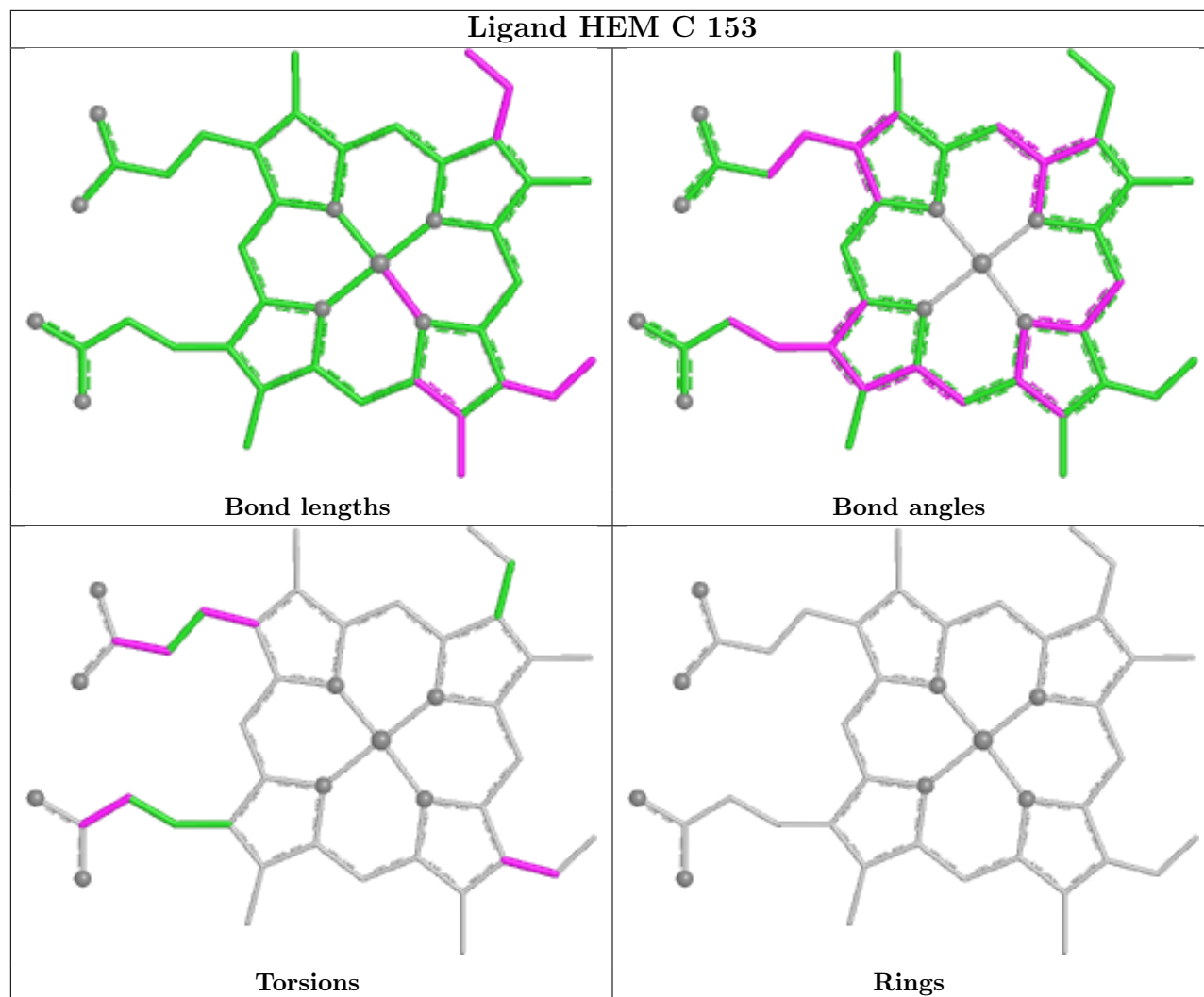
Bond angles

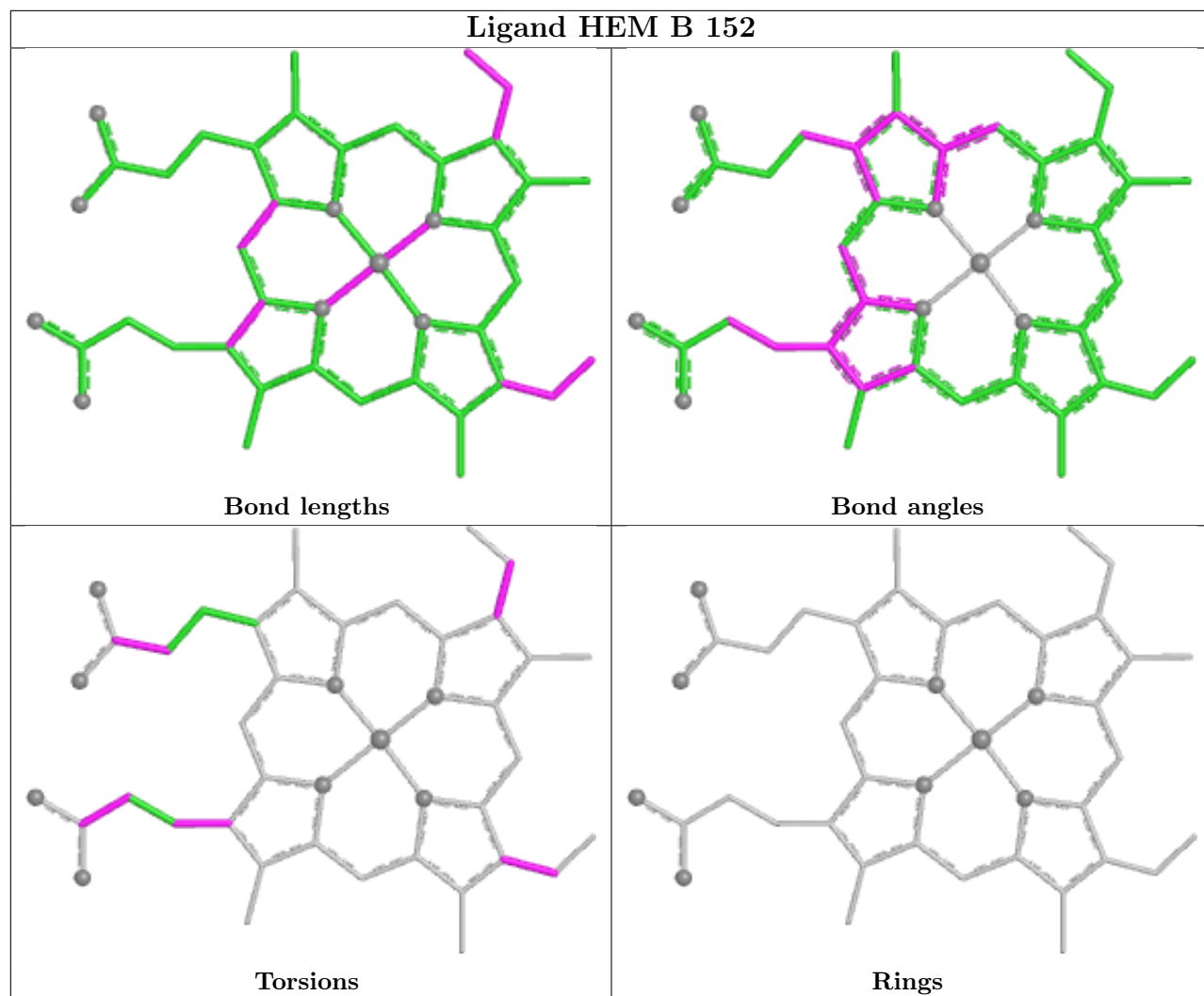


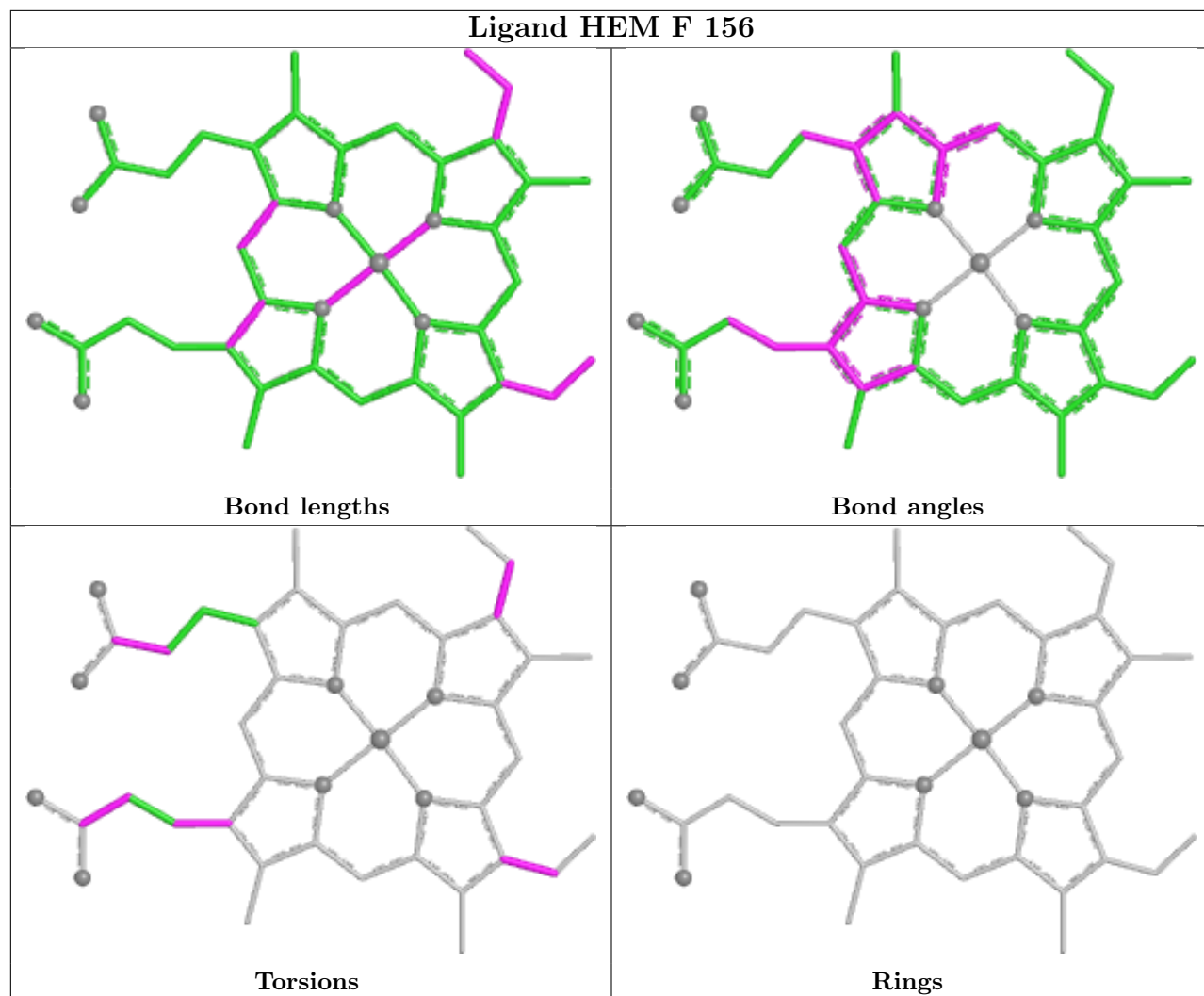
Torsions

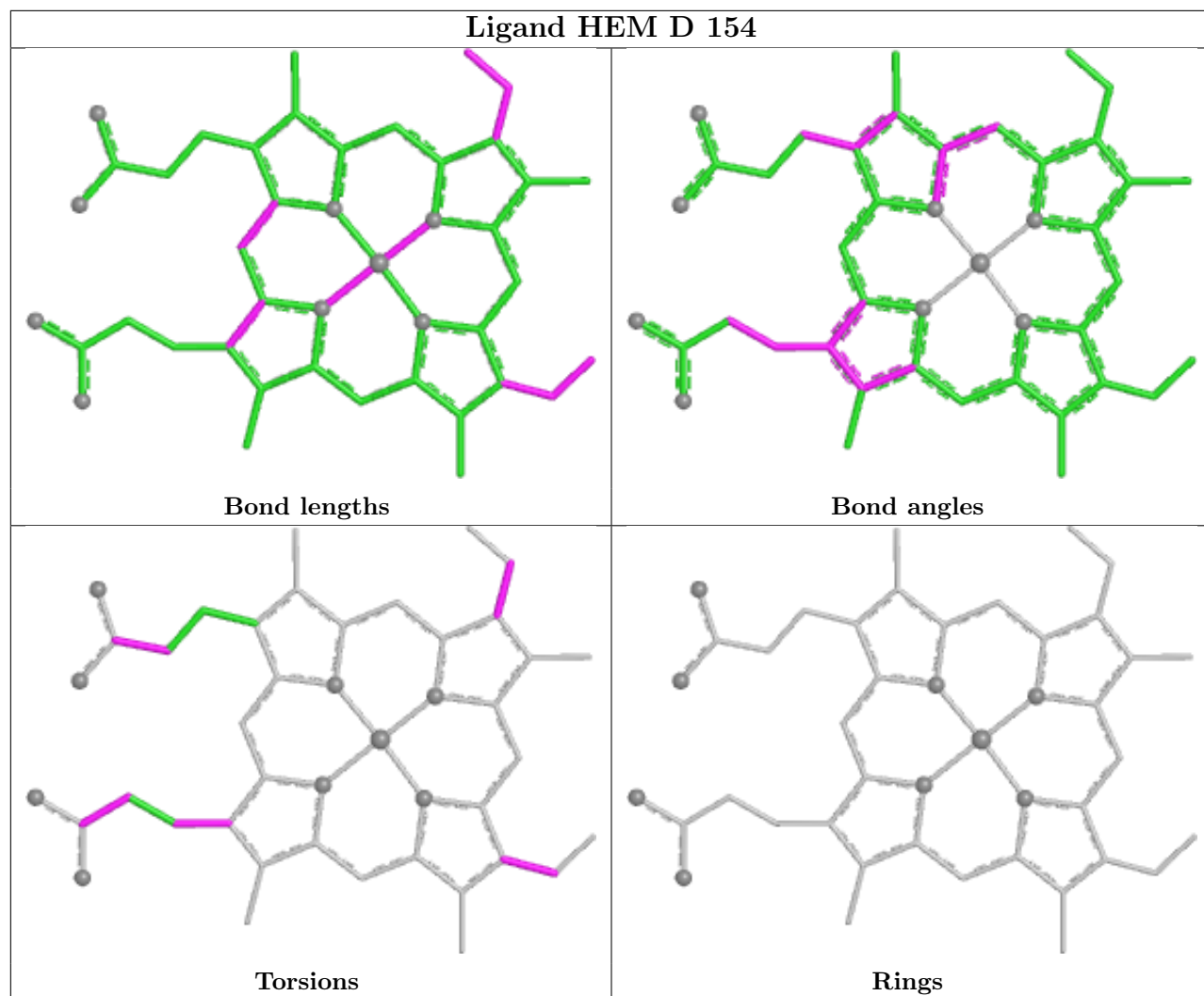


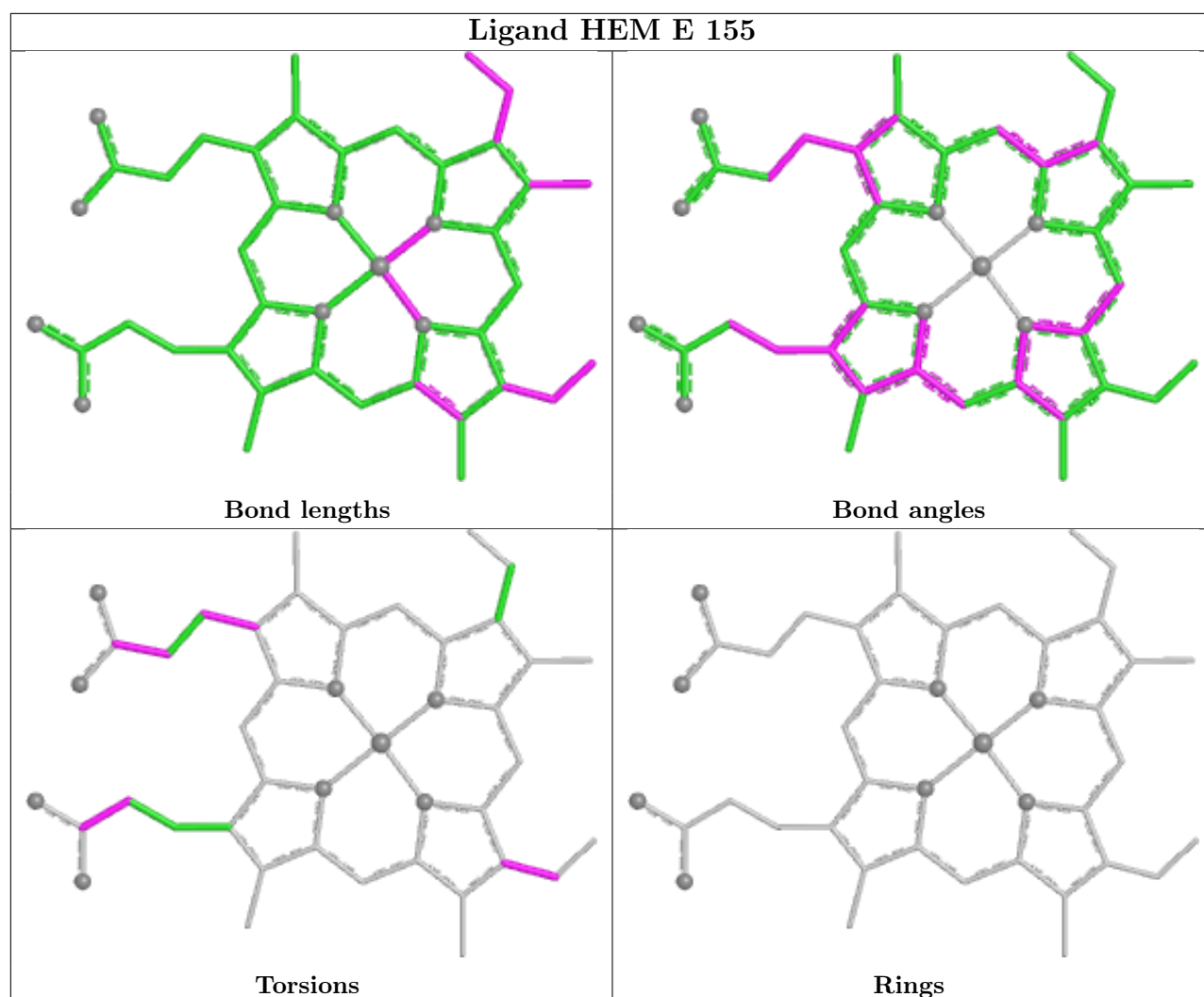
Rings











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	141/141 (100%)	-0.49	1 (0%) 84 77	7, 25, 50, 65	0
1	C	141/141 (100%)	-0.53	4 (2%) 55 45	5, 21, 43, 66	0
1	E	141/141 (100%)	-0.44	1 (0%) 84 77	8, 25, 49, 66	0
1	G	141/141 (100%)	-0.55	4 (2%) 55 45	4, 21, 46, 67	0
2	B	146/146 (100%)	-0.38	1 (0%) 84 77	6, 27, 53, 63	0
2	D	146/146 (100%)	-0.40	0 100 100	5, 29, 52, 68	0
2	F	146/146 (100%)	-0.43	1 (0%) 84 77	4, 26, 53, 62	0
2	H	146/146 (100%)	-0.39	1 (0%) 84 77	6, 27, 50, 66	0
All	All	1148/1148 (100%)	-0.45	13 (1%) 78 70	4, 25, 52, 68	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	140	TYR	7.3
1	E	140	TYR	5.6
1	G	140	TYR	5.6
1	A	140	TYR	4.3
1	C	138	ALA	3.3
1	C	139	LYS	3.1
1	G	139	LYS	2.8
2	B	144	LYS	2.8
1	G	138	ALA	2.4
2	F	144	LYS	2.1
2	H	144	LYS	2.1
1	G	141	ARG	2.0
1	C	141	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

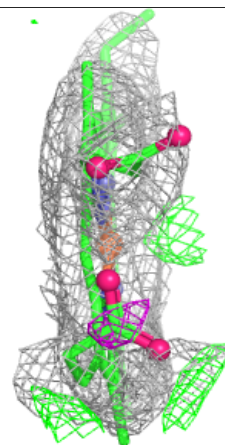
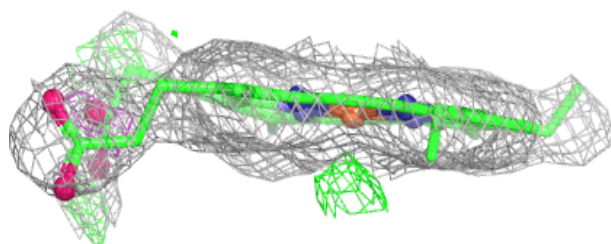
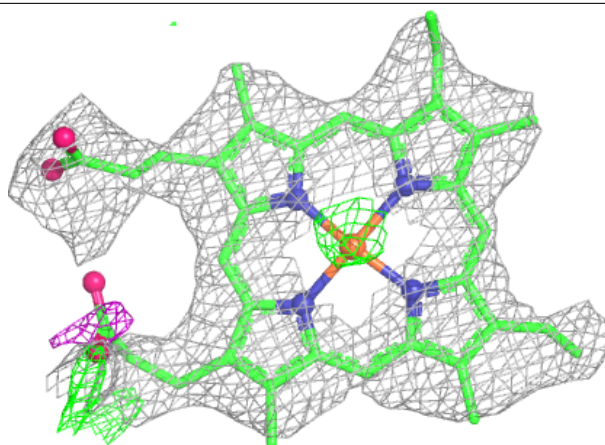
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	HEM	D	154	43/43	0.92	0.11	23,40,54,64	0
3	HEM	H	158	43/43	0.93	0.10	19,40,55,63	0
3	HEM	B	152	43/43	0.96	0.08	19,29,52,64	0
3	HEM	F	156	43/43	0.97	0.09	15,29,54,64	0
3	HEM	E	155	43/43	0.97	0.07	3,24,44,50	0
3	HEM	A	151	43/43	0.98	0.07	10,23,42,52	0
3	HEM	G	157	43/43	0.98	0.06	3,16,33,42	0
3	HEM	C	153	43/43	0.98	0.06	3,17,32,36	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.

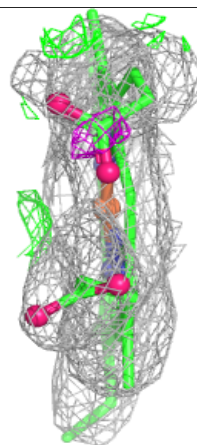
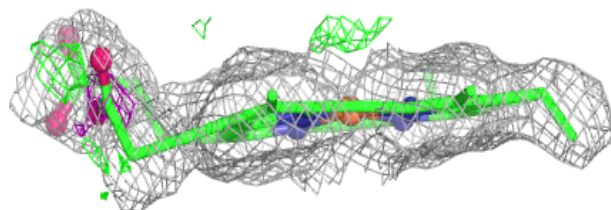
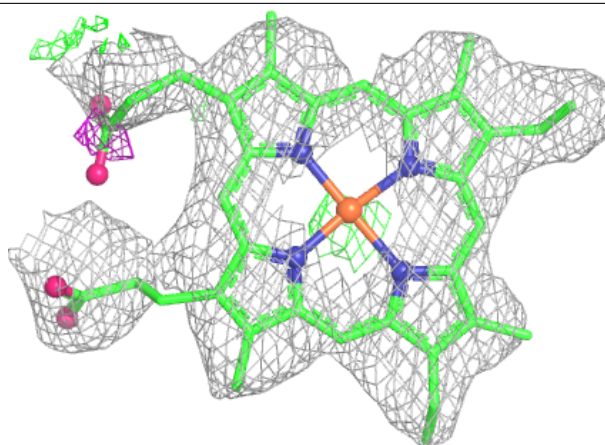
Electron density around HEM D 154:

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



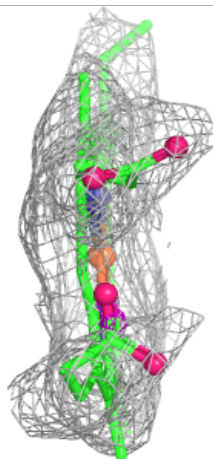
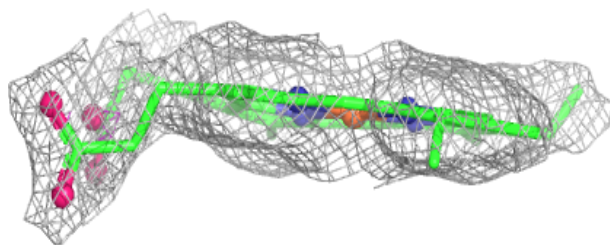
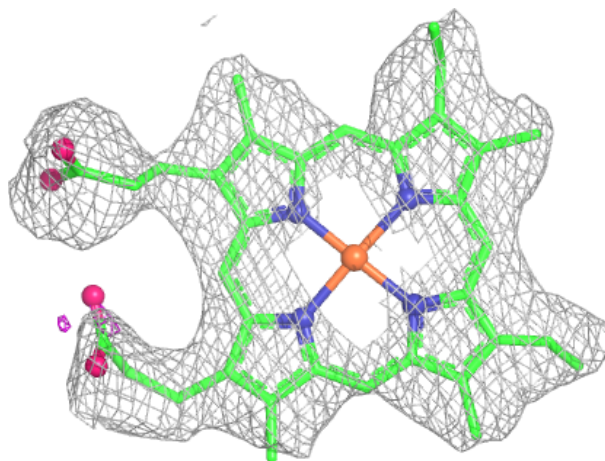
Electron density around HEM H 158:

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



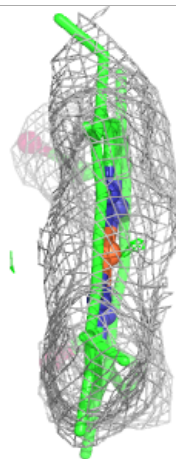
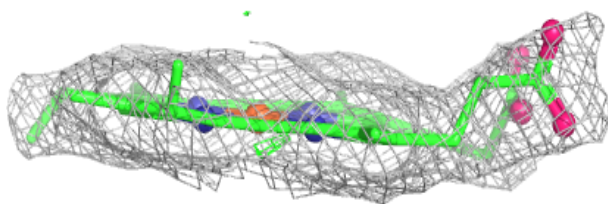
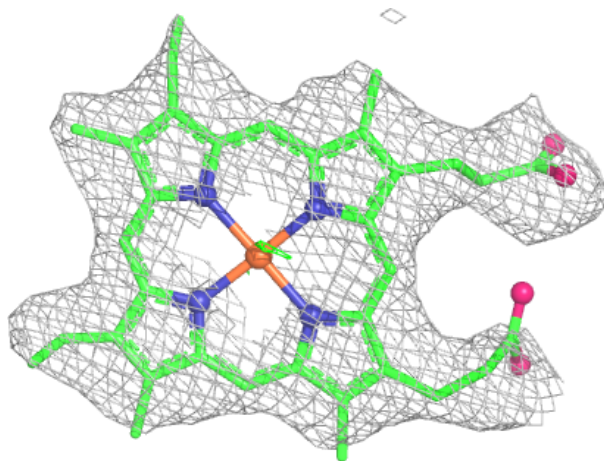
Electron density around HEM B 152:

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



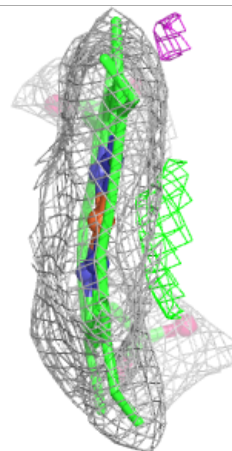
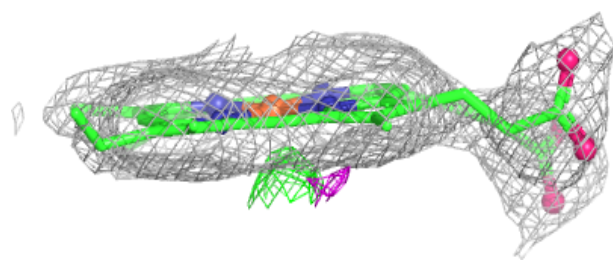
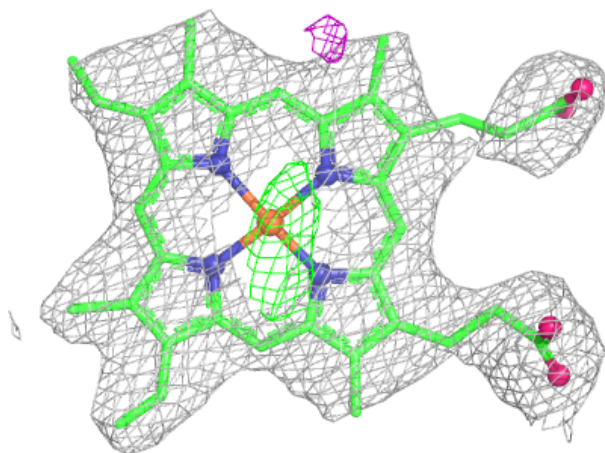
Electron density around HEM F 156:

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



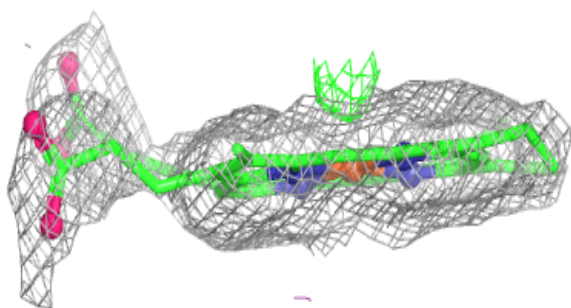
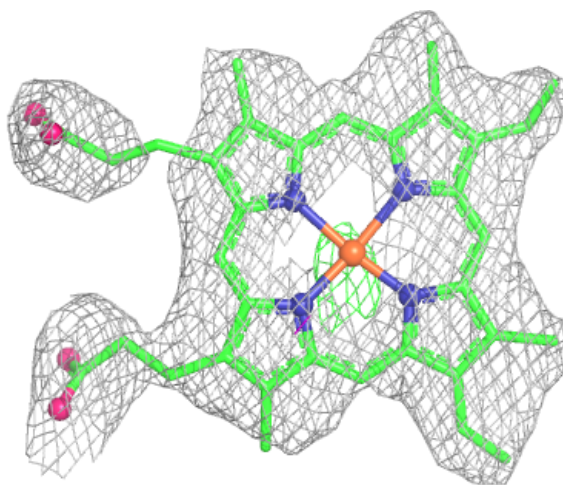
Electron density around HEM E 155:

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



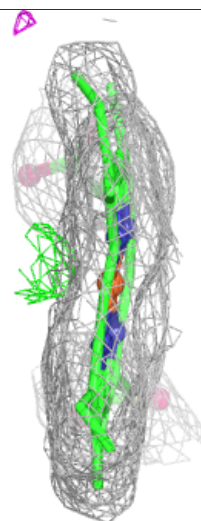
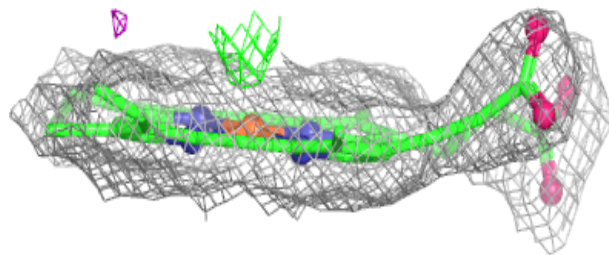
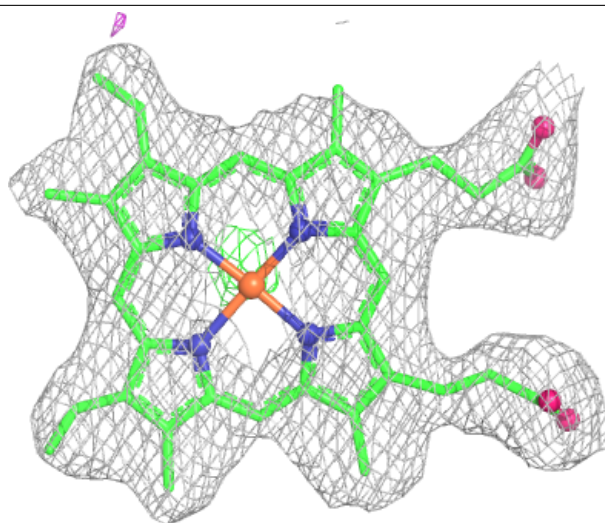
Electron density around HEM A 151:

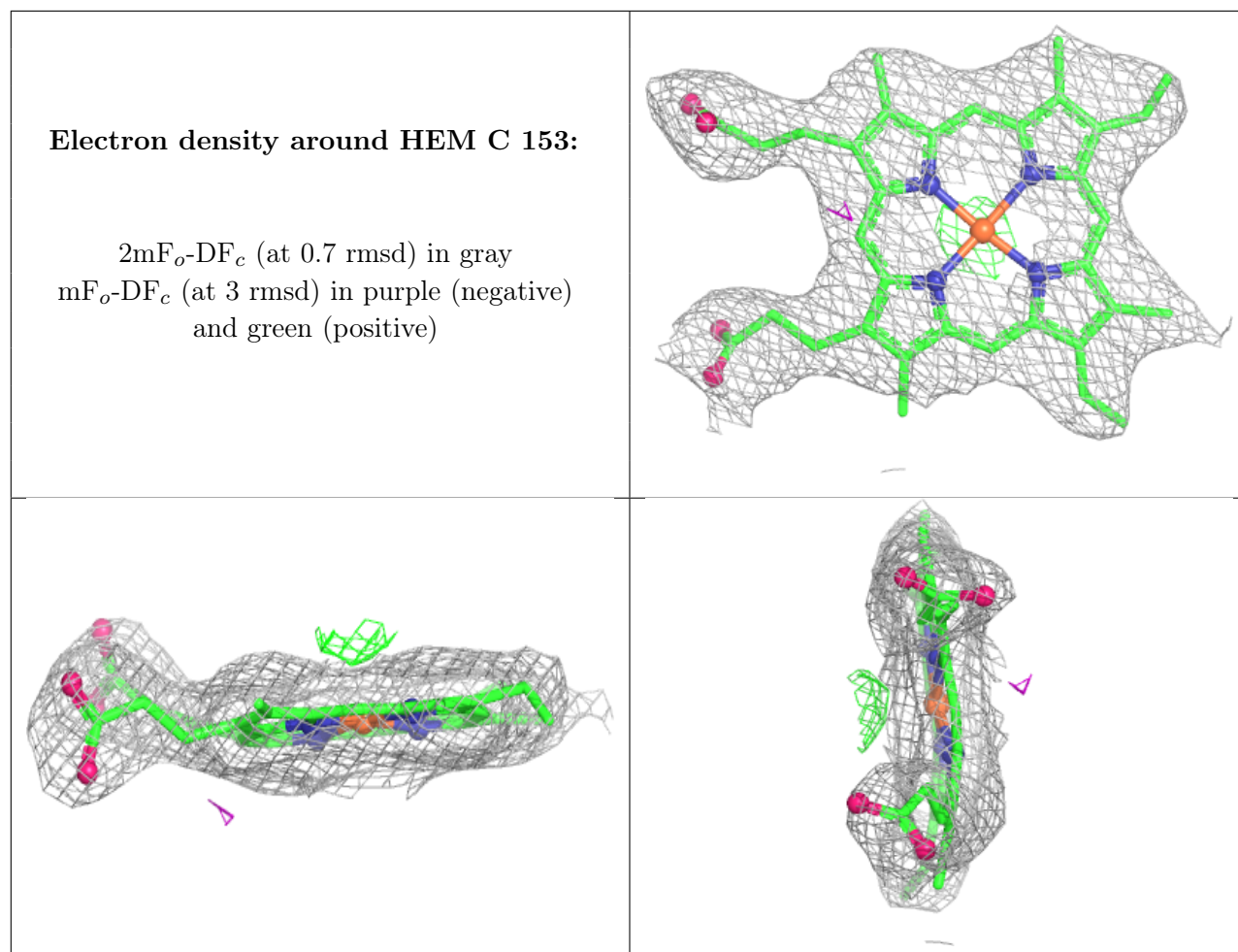
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEM G 157:

$2mF_o-DF_c$ (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.