W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Oct 19, 2023 – 08:24 AM EDT

PDB ID	:	2RI4
Title	:	Crystal Structure determination of Goat Methemoglobin at 2.7 Angstrom
Authors	:	Sathya Moorthy, P.; Neelagandan, K.; Balasubramanian, M.; Ponnuswamy, M.N.
Deposited on	:	2007-10-10
Resolution	:	2.70 Å(reported)

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

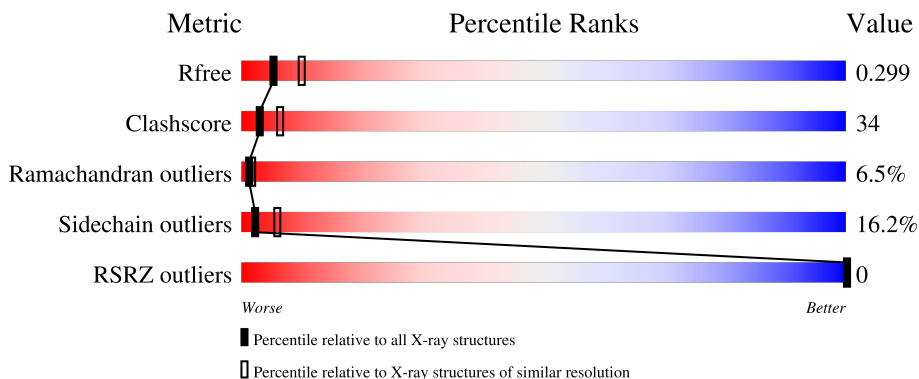|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 2.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.
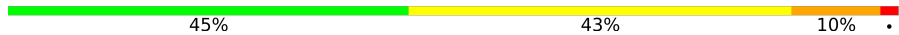
Metric	Percentile Ranks	Value
Rfree		0.299
Clashscore		34
Ramachandran outliers		6.5%
Sidechain outliers		16.2%
RSRZ outliers		0

Worse ← → *Better*

▌ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	141	44% 40% 13% ••
1	C	141	45% 40% 12% ••
1	I	141	49% 40% 6% • •
1	K	141	42% 43% 10% • •
2	B	145	42% 45% 10% ••

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Mol	Chain	Length	Quality of chain
2	D	145	39%　　46%　　13%
2	J	145	45%　　43%　　10%
2	L	145	41%　　45%　　14%

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 8995 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 subunit alpha-1/2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	139	Total	C	N	O	S	0	0	0
			1039	664	181	192	2			
1	C	138	Total	C	N	O	S	0	0	0
			1032	659	180	191	2			
1	I	137	Total	C	N	O	S	0	0	0
			1020	652	176	190	2			
1	K	138	Total	C	N	O	S	0	0	0
			1032	659	180	191	2			

- Molecule 2 is a protein called Hemoglobin subunit beta-A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	142	Total	C	N	O	S	0	0	0
			1101	706	194	198	3			
2	D	144	Total	C	N	O	S	0	0	0
			1121	720	196	201	4			
2	J	144	Total	C	N	O	S	0	0	0
			1124	721	198	202	3			
2	L	145	Total	C	N	O	S	0	0	0
			1131	726	199	202	4			

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

HEM

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	D	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	I	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	J	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	K	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	L	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 4 is water.

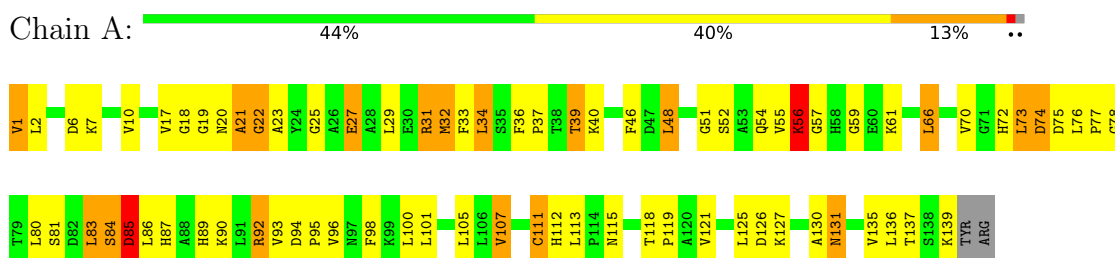| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	5	Total	O	0	0
			5	5		
4	B	6	Total	O	0	0
			6	6		
4	C	5	Total	O	0	0
			5	5		
4	D	8	Total	O	0	0
			8	8		

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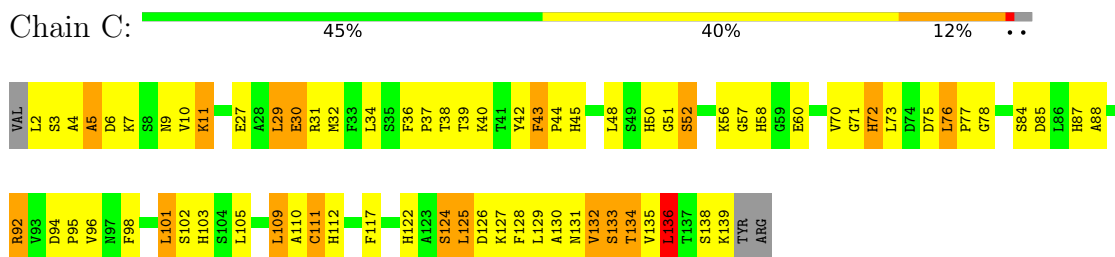| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	I	9	Total 9	O 9	0	0
4	J	6	Total 6	O 6	0	0
4	K	7	Total 7	O 7	0	0
4	L	5	Total 5	O 5	0	0

3 Residue-property plots ⓘ

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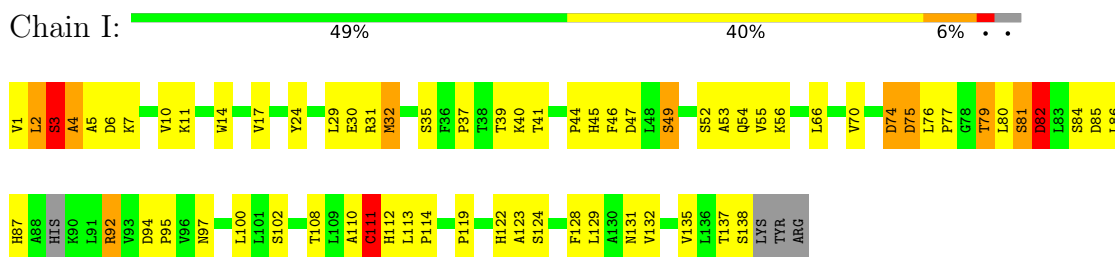
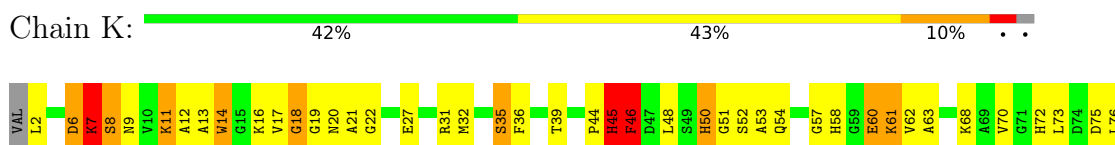- Molecule 1: Hemoglobin subunit alpha-1/2
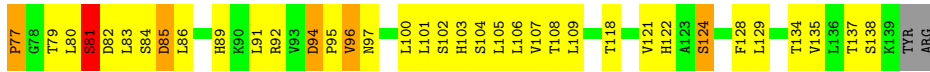
Chain A:

- Molecule 1: Hemoglobin subunit alpha-1/2
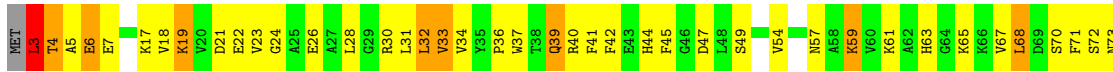
Chain C:

- Molecule 1: Hemoglobin subunit alpha-1/2
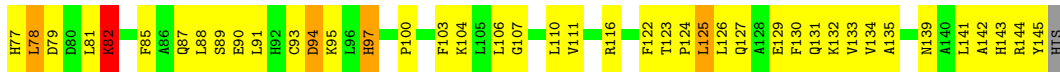
Chain I:

- Molecule 1: Hemoglobin subunit alpha-1/2

Chain K:

P77 G78 T79 L80 S81 D82 L83 S84 D85 L86 H89 K90 L91 R92 V93 D94 P95 V96 N97 L100 L101 S102 H103 S104 L105 L106 V107 T108 L109 T118 V121 H122 A123 S124 F128 L129 T134 V135 L136 T137 S138 K139 TYR ARG

• Molecule 2: Hemoglobin subunit beta-A

Chain B: 42% 45% 10%

MET L3 T4 A5 E6 E7 K17 V18 K19 V20 D21 E22 V23 G24 A25 E26 A27 L28 G29 R30 L31 L32 V33 V34 Y35 P36 W37 T38 Q39 R40 F41 F42 E43 H44 F45 G46 D47 L48 S49 V54 N57 A58 K59 V60 K61 A62 H63 G64 K65 K66 V67 L68 D69 S70 F71 S72 N73

G74 M75 K76 F85 A86 Q87 L88 S89 E90 L91 H92 C93 D94 K95 L96 H97 V98 D99 P100 E101 N102 F103 K104 L105 L106 G107 N108 V109 L110 V111 V112 L113 L114 A115 G119 F122 L125 L126 Q127 A128 E129 F130 Q131 V133 V134 V137 A138 N139 A140 L141 A142 H143 R144 TYR

HIS

• Molecule 2: Hemoglobin subunit beta-A

Chain D: 39% 46% 13%

M2 L3 T4 E7 K8 A9 A10 V11 T12 G13 F14 W15 V18 K19 V20 D21 E22 V23 G24 A25 E26 A27 L28 G29 R30 L31 L32 V33 V34 Y35 P36 W37 T38 Q39 R40 F41 F42 E43 H44 F45 L48 V54 G64 K65 K66 V67 L68 D69 S70 F71 S72 N73 G74 M75 K76

H77 L78 D79 D80 L81 K82 F85 A86 Q87 L88 S89 E90 L91 H92 C93 D94 K95 L96 H97 P100 F103 K104 L105 L106 G107 L110 V111 R116 F122 T123 P124 L125 L126 Q127 A128 E129 F130 Q131 K132 V133 V134 A135 N139 A140 L141 A142 H143 R144 Y145 HIS

• Molecule 2: Hemoglobin subunit beta-A

Chain J: 45% 43% 10%

MET L3 T4 A5 E6 E7 V11 T12 W15 K19 V20 D21 E22 V23 G24 A25 E26 A27 L28 L31 Y35 T38 Q39 R40 E43 H44 F45 G46 D47 S50 A51 D52 A53 V54 M55 N56 N57 A58 K59 V60 K61 A62 H63 G64 K65 K66 V67 L68 D69 S70 F71 S72

L78 D79 D80 L81 K82 G83 T84 F85 A86 Q87 L88 S89 E90 L91 H92 C93 D94 K95 L96 H97 V98 D99 P100 F103 K104 L105 L106 L110 R116 H117 L125 L126 Q127 A128 E129 F130 K132 V133 V134 A135 G136 L141 A142 H143 R144 Y145 H146

• Molecule 2: Hemoglobin subunit beta-A

Chain L: 41% 45% 14%

M2 L3 T4 A5 E6 E7 K8 V11 T12 G13 F14 W15 G16 K17 V18 K19 V20 G24 A25 E26 A27 L28 G29 R30 L31 L32 V33 V34 Y35 P36 W37 T38 Q39 R40 F41 F42 F45 S49 S50 A51 D52 A53 V54 M55 N56 N57 A58 K59 V60 H63 G64 K65 L68 D69

S70 F71 S72 N73 G74 M75 K76 H77 L78 D79 D80 L81 K82 F85 A86 Q87 L88 S89 D94 C93 K104 L105 N108 V109 L110 V111 V112 V113 L114 A115 R116 H117 H118 G119 S120 P124 L125 L126 Q127 A128 E129 F130 Q131 K132 V133 V134 A135 G136 V137 R144 Y145 H146

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	52.69Å 68.33Å 95.60Å 110.64° 91.90° 108.94°	Depositor
Resolution (Å)	22.50 – 2.70 22.49 – 2.70	Depositor EDS
% Data completeness (in resolution range)	90.5 (22.50-2.70) 90.4 (22.49-2.70)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.33 (at 2.71Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.225 , 0.308 0.221 , 0.299	Depositor DCC
R_{free} test set	2863 reflections (9.91%)	wwPDB-VP
Wilson B-factor (Å^2)	50.6	Xtriage
Anisotropy	0.161	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 25.4	EDS
L-test for twinning[2]	$< |L| > = 0.47$, $< L^2 > = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	8995	wwPDB-VP
Average B, all atoms (Å^2)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.47% of the height of the origin peak. No significant pseudotranslation is detected.*

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

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.68	1/1064 (0.1%)	0.79	1/1446 (0.1%)
1	C	0.77	0/1057	0.85	0/1436
1	I	0.76	1/1043 (0.1%)	0.86	0/1417
1	K	0.63	0/1057	0.79	0/1436
2	B	0.71	0/1125	0.80	1/1520 (0.1%)
2	D	0.75	0/1146	0.85	0/1548
2	J	0.66	0/1150	0.78	0/1553
2	L	0.70	0/1157	0.79	1/1563 (0.1%)
All	All	0.71	2/8799 (0.0%)	0.81	3/11919 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	I	111	CYS	CB-SG	-5.34	1.73	1.81
1	A	111	CYS	CB-SG	-5.29	1.73	1.81

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	L	3	LEU	CA-CB-CG	5.90	128.88	115.30
2	B	3	LEU	CA-CB-CG	5.17	127.18	115.30
1	A	34	LEU	CA-CB-CG	5.05	126.93	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1	VAL	Peptide

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	1039	0	1044	76	0
1	C	1032	0	1032	84	0
1	I	1020	0	1023	73	0
1	K	1032	0	1032	67	0
2	B	1101	0	1100	92	0
2	D	1121	0	1118	86	0
2	J	1124	0	1116	72	0
2	L	1131	0	1125	107	0
3	A	43	0	30	6	0
3	B	43	0	30	10	0
3	C	43	0	30	2	0
3	D	43	0	30	11	0
3	I	43	0	30	2	0
3	J	43	0	30	4	0
3	K	43	0	30	1	0
3	L	43	0	30	4	0
4	A	5	0	0	0	0
4	B	6	0	0	1	0
4	C	5	0	0	0	0
4	D	8	0	0	4	0
4	I	9	0	0	3	0
4	J	6	0	0	1	0
4	K	7	0	0	1	0
4	L	5	0	0	0	0
All	All	8995	0	8830	610	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 34.

The worst 5 of 610 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:B:39:GLN:HB3	1:C:92:ARG:NH1	1.53	1.22
2:B:59:LYS:HD2	2:B:59:LYS:N	1.54	1.19
3:D:147:HEM:HBD2	3:D:147:HEM:HHA	1.29	1.11
1:I:84:SER:HB3	1:I:138:SER:OG	1.55	1.04
2:L:71:PHE:HE2	2:L:137:VAL:HG21	1.17	1.01

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	137/141 (97%)	110 (80%)	18 (13%)	9 (7%)	1	2
1	C	136/141 (96%)	107 (79%)	20 (15%)	9 (7%)	1	2
1	I	133/141 (94%)	112 (84%)	14 (10%)	7 (5%)	2	3
1	K	136/141 (96%)	99 (73%)	26 (19%)	11 (8%)	1	1
2	B	140/145 (97%)	116 (83%)	17 (12%)	7 (5%)	2	4
2	D	142/145 (98%)	118 (83%)	14 (10%)	10 (7%)	1	1
2	J	142/145 (98%)	108 (76%)	25 (18%)	9 (6%)	1	2
2	L	143/145 (99%)	116 (81%)	17 (12%)	10 (7%)	1	1
All	All	1109/1144 (97%)	886 (80%)	151 (14%)	72 (6%)	1	2

5 of 72 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	56	LYS
1	A	85	ASP
2	B	5	ALA
2	B	129	GLU

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Mol	Chain	Res	Type
1	C	43	PHE

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	111/113 (98%)	91 (82%)	20 (18%)	1	4
1	C	110/113 (97%)	95 (86%)	15 (14%)	3	8
1	I	109/113 (96%)	96 (88%)	13 (12%)	5	12
1	K	110/113 (97%)	92 (84%)	18 (16%)	2	6
2	B	115/118 (98%)	90 (78%)	25 (22%)	1	2
2	D	117/118 (99%)	101 (86%)	16 (14%)	3	8
2	J	117/118 (99%)	96 (82%)	21 (18%)	2	4
2	L	118/118 (100%)	99 (84%)	19 (16%)	2	6
All	All	907/924 (98%)	760 (84%)	147 (16%)	2	6

5 of 147 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	K	16	LYS
2	L	120	SER
1	K	48	LEU
2	L	17	LYS
1	C	30	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	I	97	ASN
2	L	97	HIS
2	J	108	ASN
1	K	97	ASN

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Mol	Chain	Res	Type
2	J	87	GLN

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5   Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6   Ligand geometry ⓘ

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	B	147	2	41,50,50	2.03	7 (17%)	45,82,82	1.89	10 (22%)
3	HEM	I	142	1,4	41,50,50	2.05	7 (17%)	45,82,82	2.12	15 (33%)
3	HEM	A	142	1	41,50,50	2.06	6 (14%)	45,82,82	1.94	12 (26%)
3	HEM	C	142	1,4	41,50,50	2.09	8 (19%)	45,82,82	1.66	6 (13%)
3	HEM	D	147	2,4	41,50,50	2.06	7 (17%)	45,82,82	1.97	11 (24%)
3	HEM	J	147	2,4	41,50,50	2.09	7 (17%)	45,82,82	1.66	7 (15%)
3	HEM	L	147	2	41,50,50	2.27	8 (19%)	45,82,82	2.11	11 (24%)
3	HEM	K	142	1	41,50,50	2.03	8 (19%)	45,82,82	1.94	12 (26%)

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	B	147	2	-	9/12/54/54	-
3	HEM	I	142	1,4	-	7/12/54/54	-
3	HEM	A	142	1	-	3/12/54/54	-
3	HEM	C	142	1,4	-	4/12/54/54	-
3	HEM	D	147	2,4	-	11/12/54/54	-
3	HEM	J	147	2,4	-	6/12/54/54	-
3	HEM	L	147	2	-	8/12/54/54	-
3	HEM	K	142	1	-	6/12/54/54	-

The worst 5 of 58 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	147	HEM	C3D-C2D	8.83	1.55	1.36
3	J	147	HEM	C3D-C2D	8.71	1.55	1.36
3	C	142	HEM	C3D-C2D	8.51	1.54	1.36
3	A	142	HEM	C3D-C2D	8.07	1.53	1.36
3	K	142	HEM	C3D-C2D	7.99	1.53	1.36

The worst 5 of 84 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	L	147	HEM	CAD-C3D-C4D	6.58	136.16	124.66
3	B	147	HEM	C4D-ND-C1D	6.26	111.54	105.07
3	J	147	HEM	C4D-ND-C1D	5.99	111.26	105.07
3	A	142	HEM	C4D-ND-C1D	5.99	111.26	105.07
3	I	142	HEM	C4D-ND-C1D	5.90	111.17	105.07

There are no chirality outliers.

5 of 54 torsion outliers are listed below:

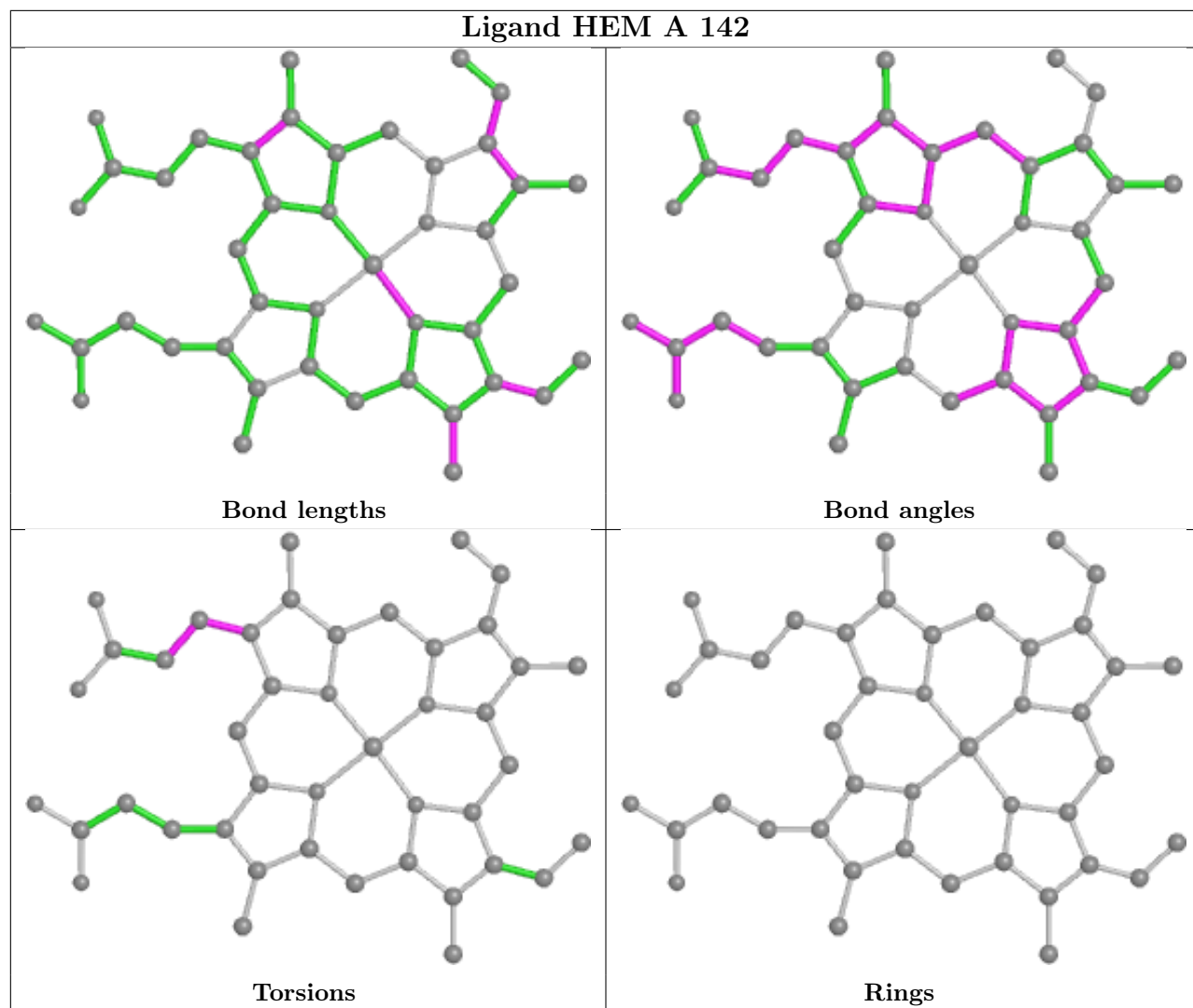| Mol	Chain	Res	Type	Atoms
3	A	142	HEM	C4D-C3D-CAD-CBD
3	B	147	HEM	C1A-C2A-CAA-CBA
3	B	147	HEM	C3A-C2A-CAA-CBA
3	B	147	HEM	C2B-C3B-CAB-CBB
3	B	147	HEM	C4B-C3B-CAB-CBB

There are no ring outliers.
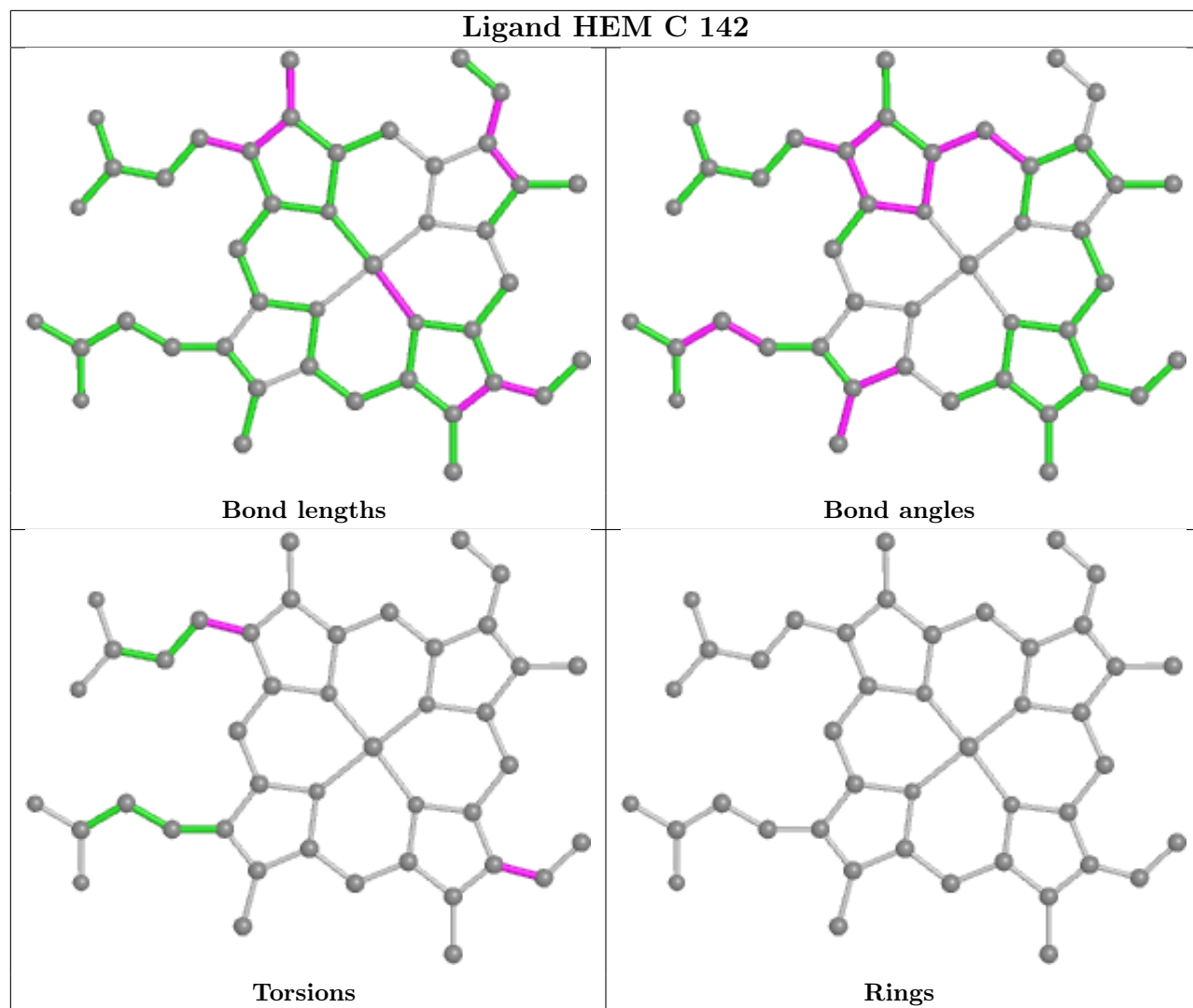
8 monomers are involved in 40 short contacts:

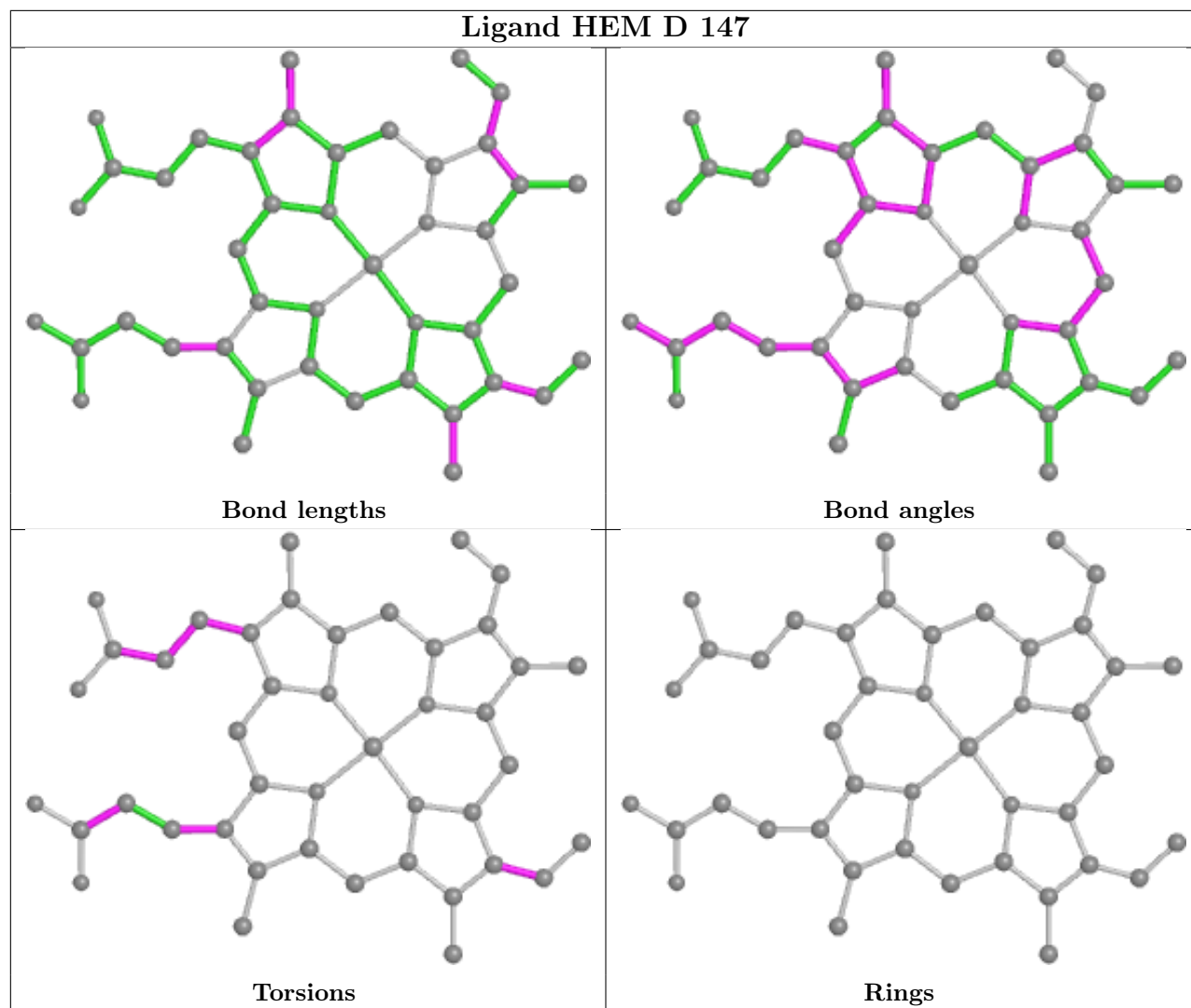| Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	147	HEM	10	0
3	I	142	HEM	2	0
3	A	142	HEM	6	0
3	C	142	HEM	2	0
3	D	147	HEM	11	0
3	J	147	HEM	4	0
3	L	147	HEM	4	0
3	K	142	HEM	1	0

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 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.
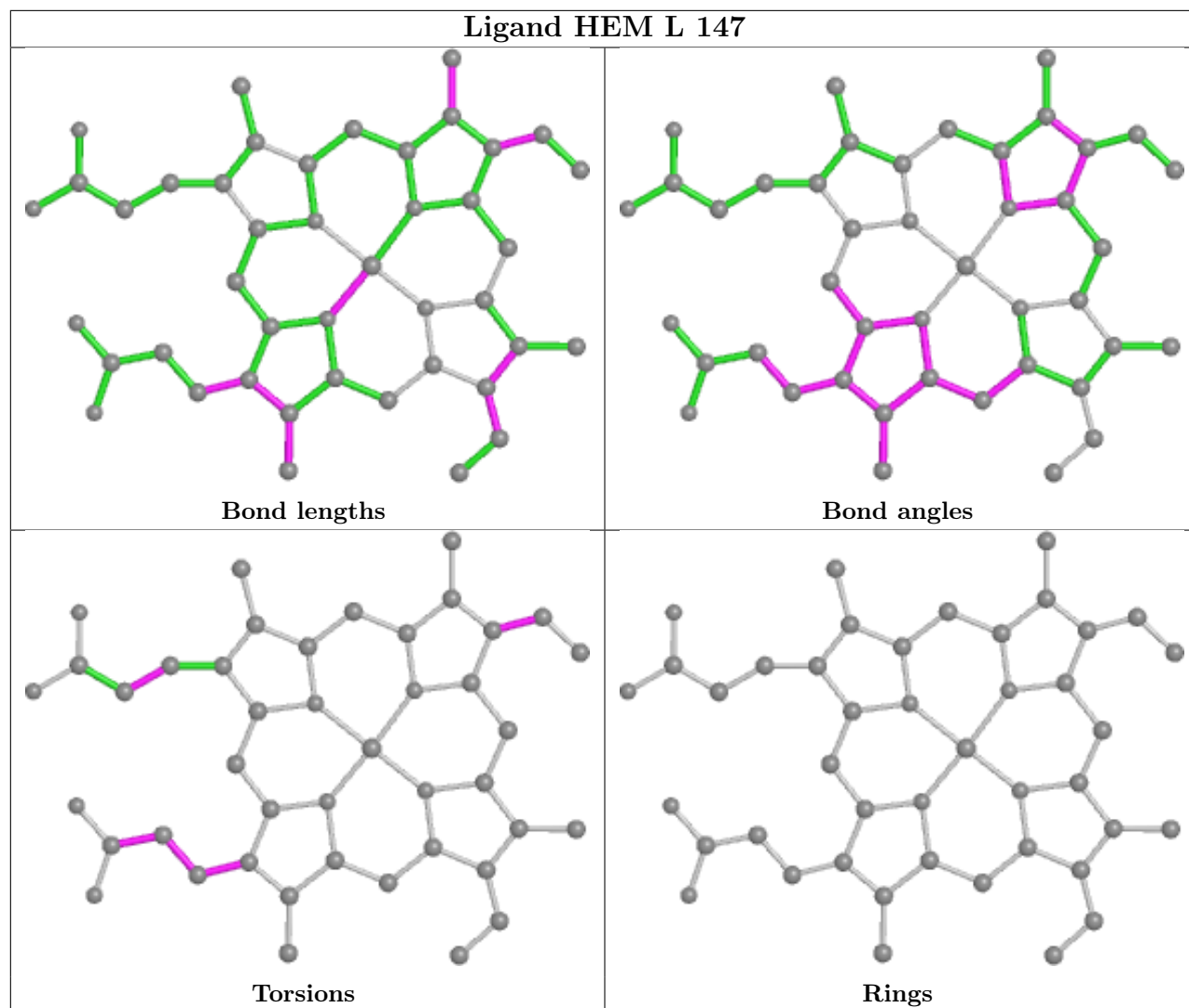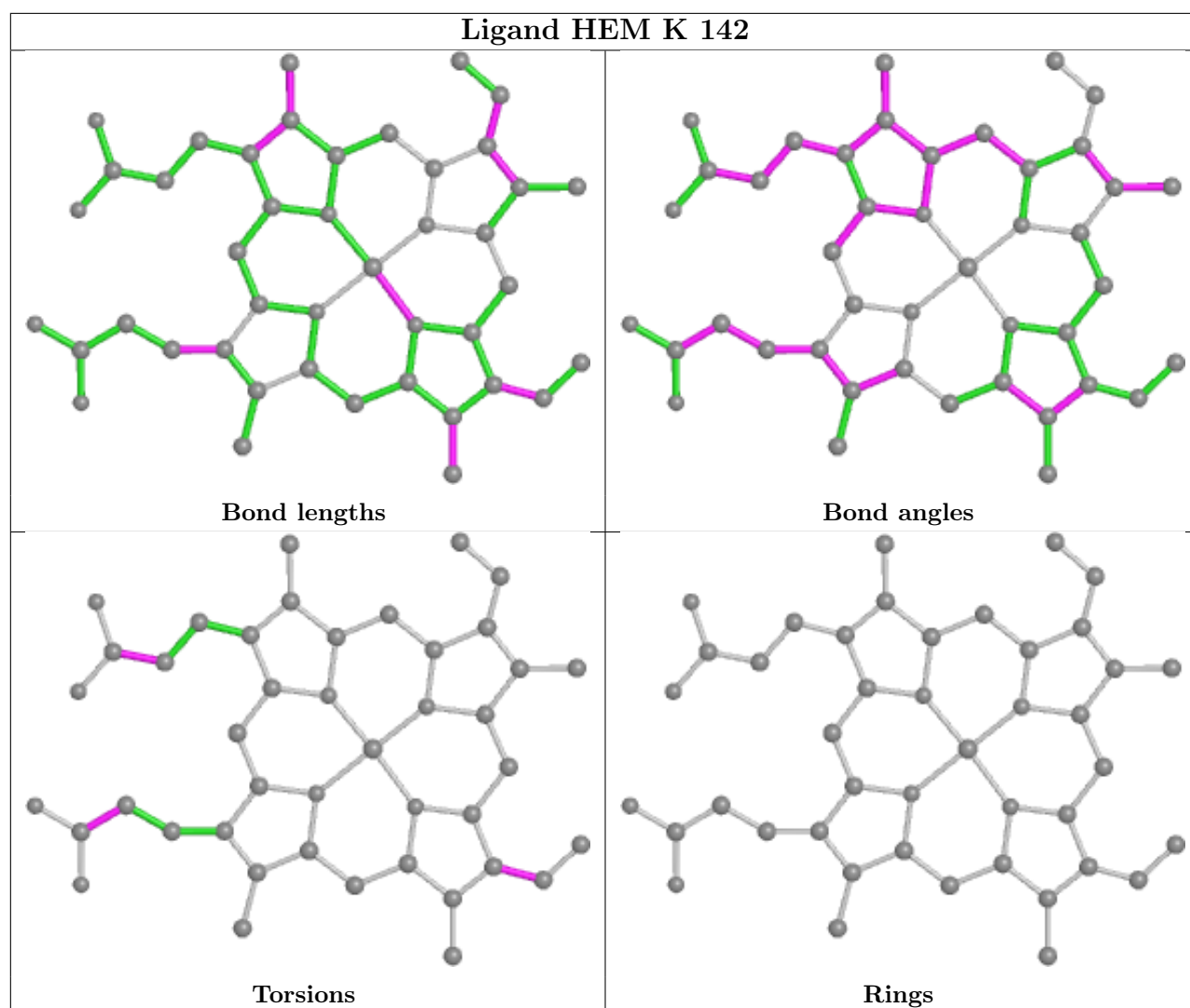
Ligand HEM B 147

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM I 142

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM A 142

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM C 142

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM D 147

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM J 147

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM L 147

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM K 142

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	139/141 (98%)	-0.70	0	100	100	29, 42, 55, 60	0
1	C	138/141 (97%)	-0.80	0	100	100	21, 31, 47, 55	0
1	I	137/141 (97%)	-0.84	0	100	100	22, 33, 48, 53	0
1	K	138/141 (97%)	-0.66	0	100	100	28, 47, 60, 67	0
2	B	142/145 (97%)	-0.60	0	100	100	26, 45, 69, 70	0
2	D	144/145 (99%)	-0.74	0	100	100	22, 38, 60, 67	0
2	J	144/145 (99%)	-0.67	0	100	100	24, 45, 63, 71	0
2	L	145/145 (100%)	-0.68	0	100	100	22, 43, 64, 76	0
All	All	1127/1144 (98%)	-0.71	0	100	100	21, 41, 62, 76	0

There are no RSRZ outliers to report.

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

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

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\mathrm{\AA}^2$)	Q<0.9
3	HEM	B	147	43/43	0.96	0.12	48,53,56,57	0
3	HEM	J	147	43/43	0.96	0.16	50,55,58,59	0
3	HEM	L	147	43/43	0.96	0.13	34,40,48,53	0
3	HEM	A	142	43/43	0.97	0.13	25,32,42,45	0
3	HEM	K	142	43/43	0.97	0.12	41,44,46,50	0
3	HEM	D	147	43/43	0.97	0.11	28,37,39,39	0
3	HEM	I	142	43/43	0.98	0.11	23,29,37,41	0
3	HEM	C	142	43/43	0.98	0.12	25,33,41,46	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.
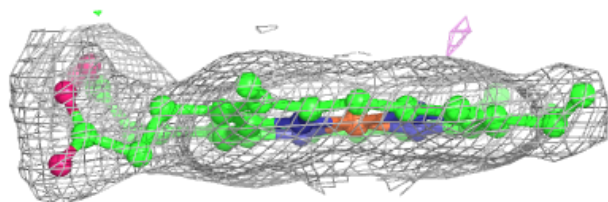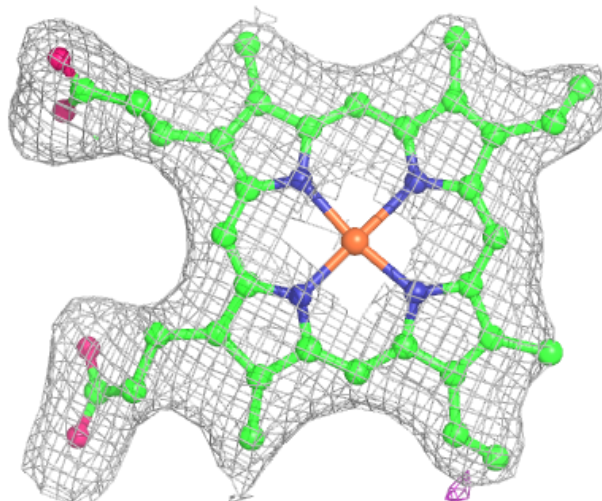

Electron density around HEM B 147:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative) and green (positive)
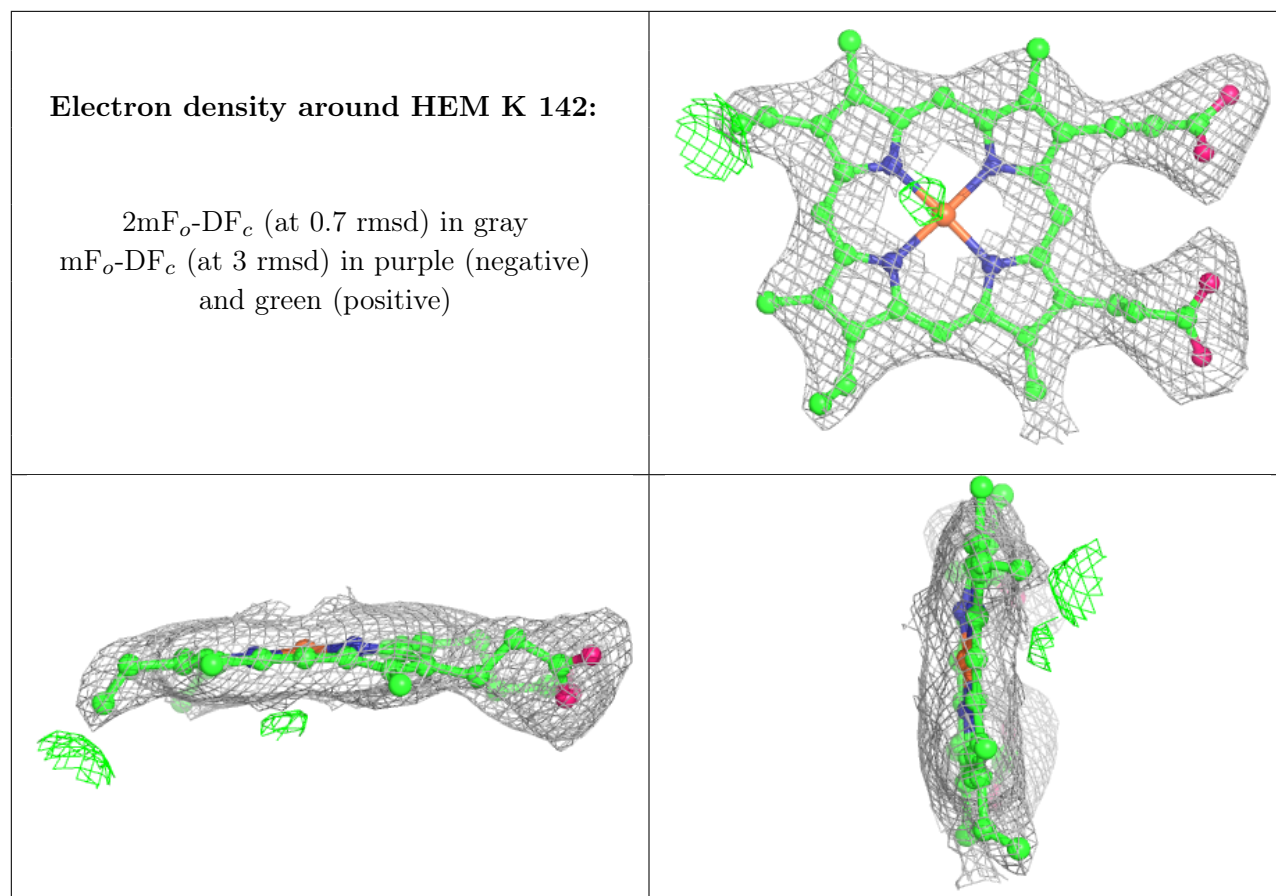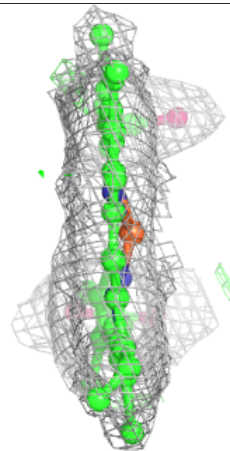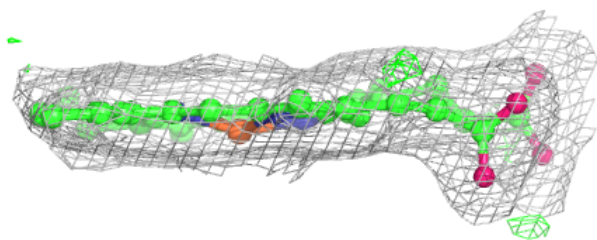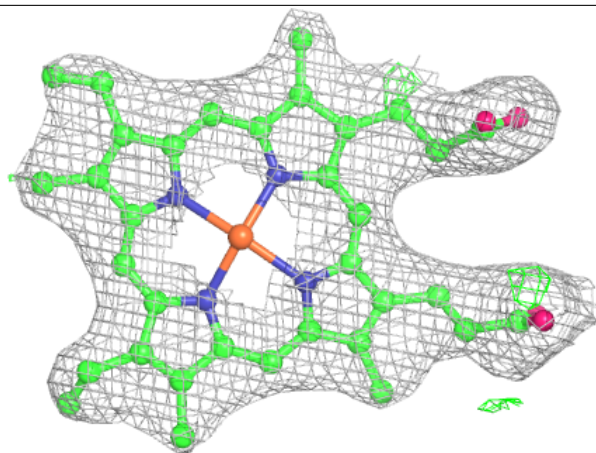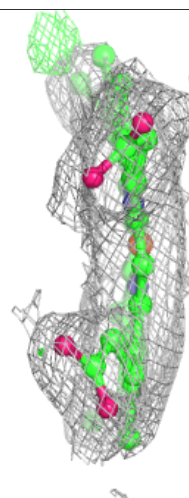
Electron density around HEM J 147:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
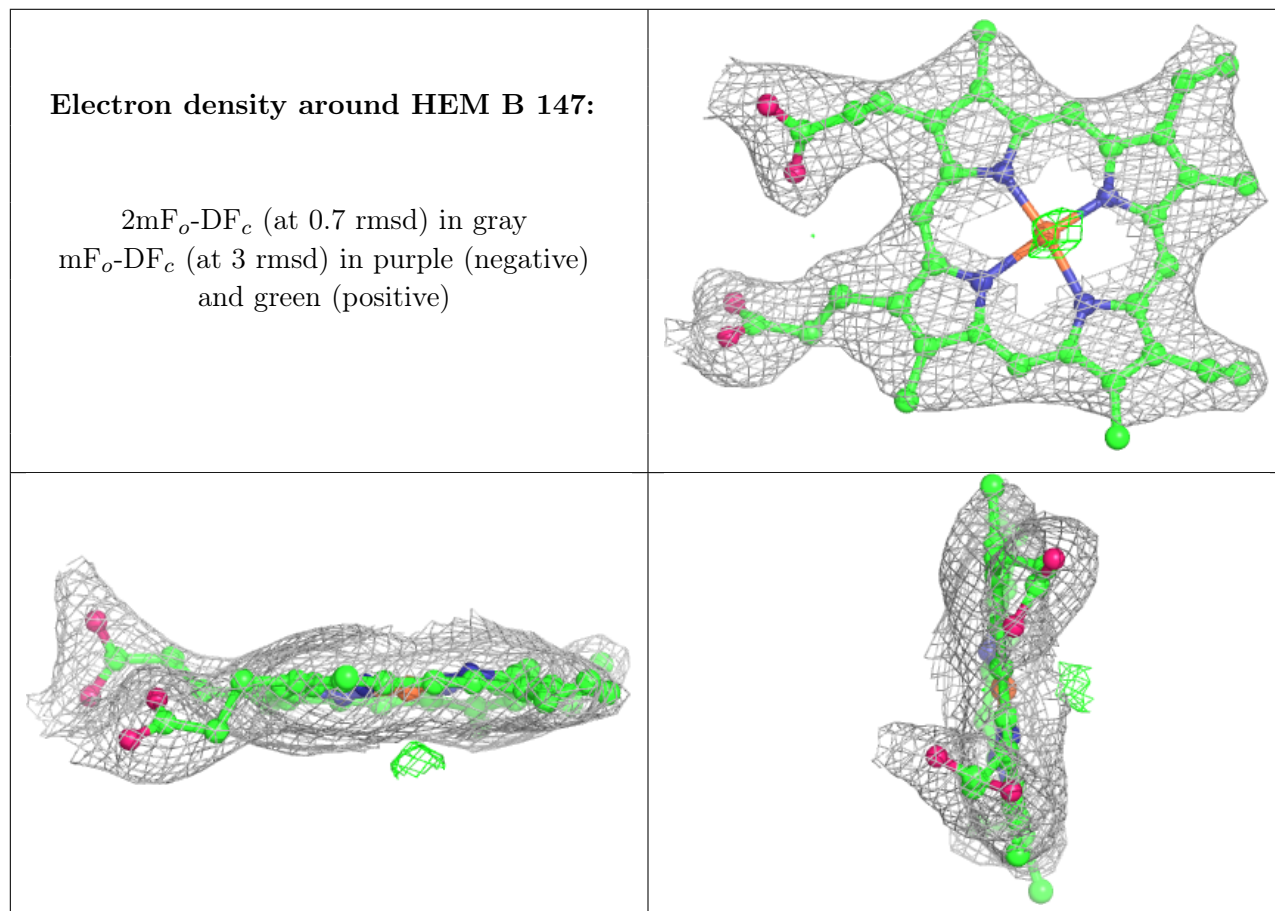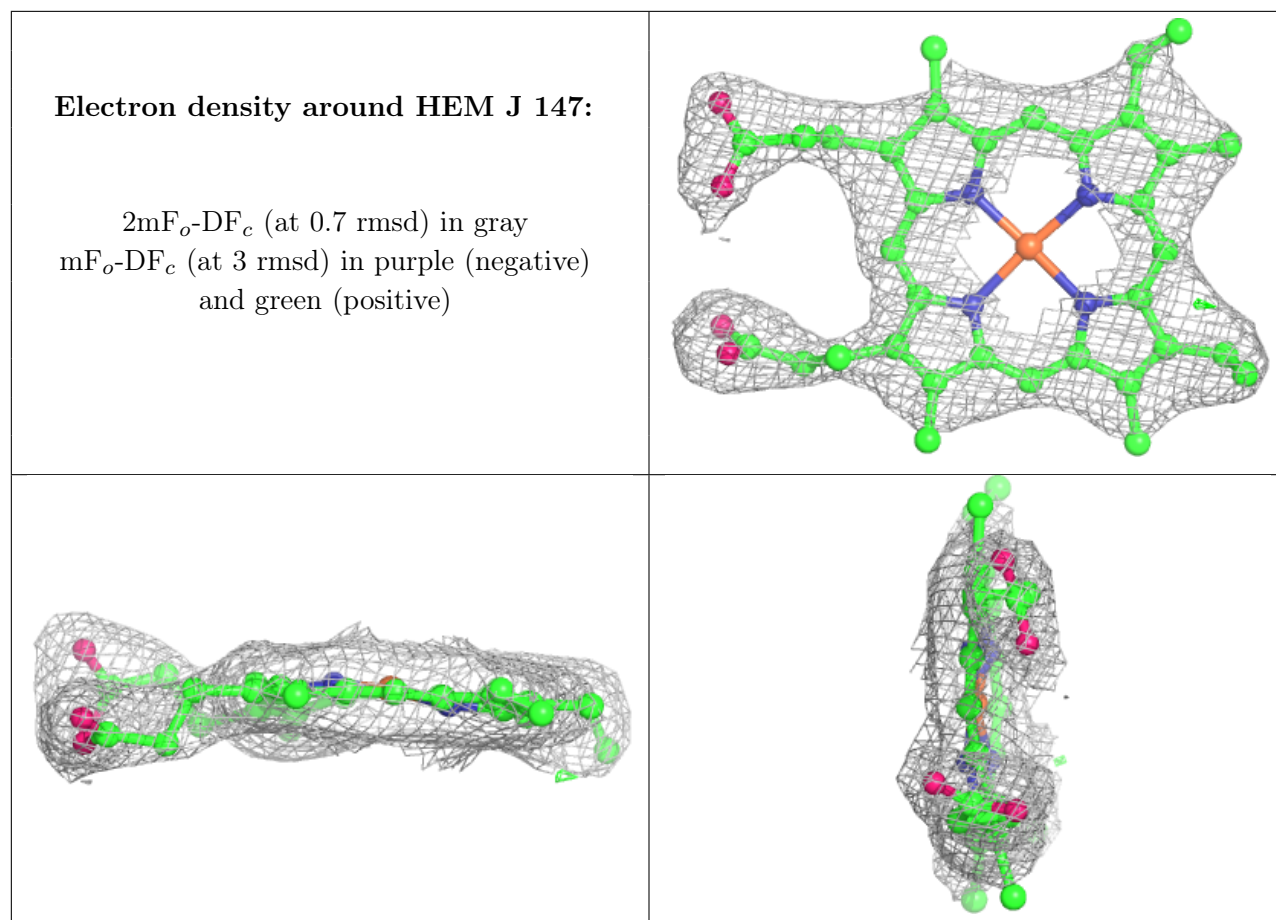
Electron density around HEM L 147:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
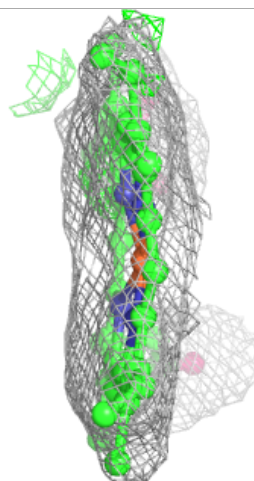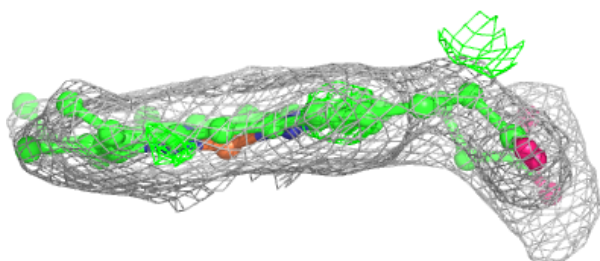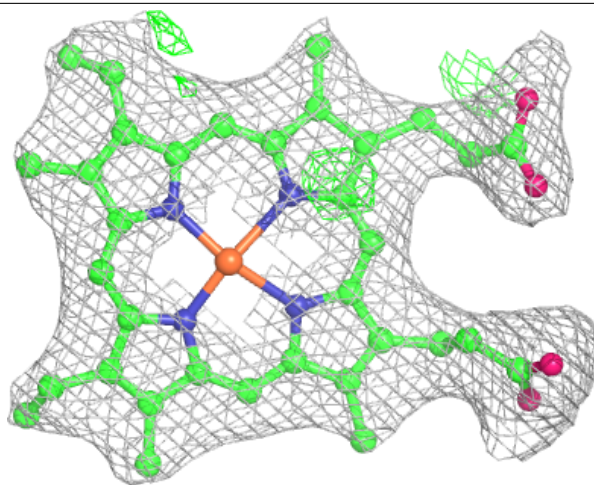
Electron density around HEM A 142:

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

Electron density around HEM K 142:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
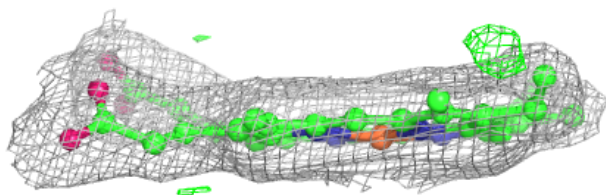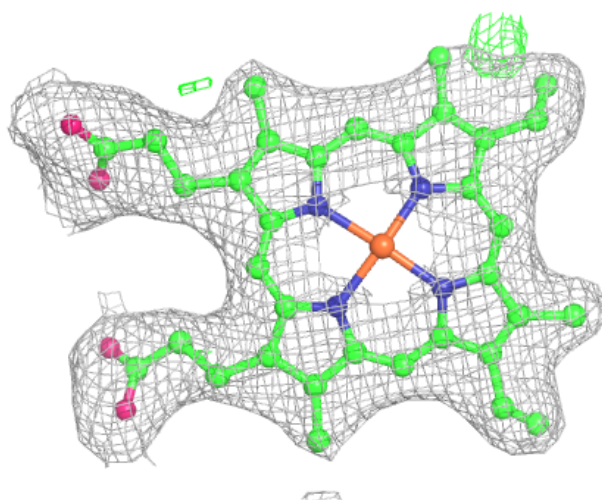and green (positive)
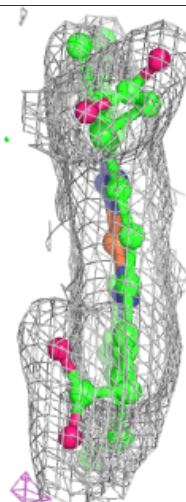
Electron density around HEM D 147:

$2mF_o$-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 I 142:
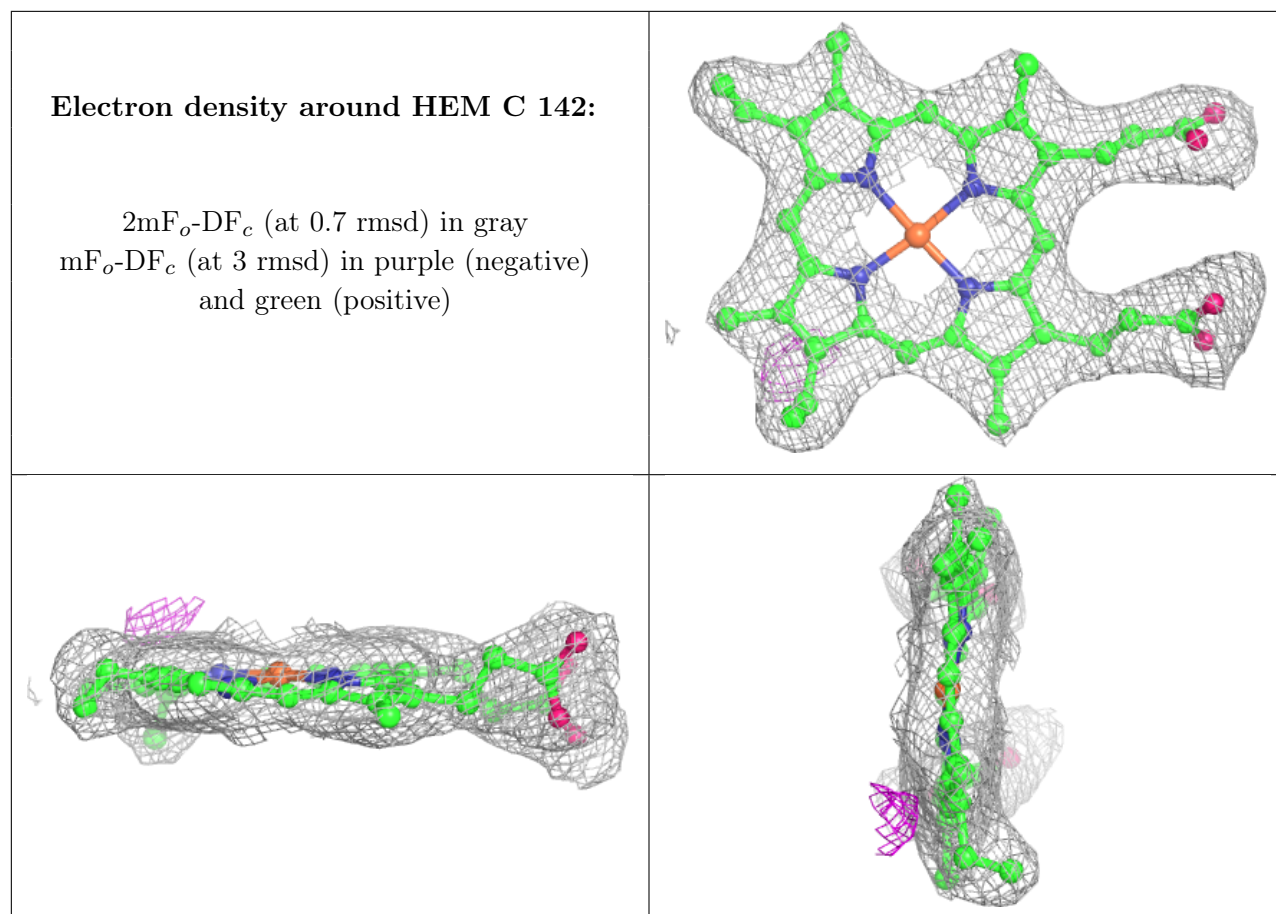
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around HEM C 142:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.