



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 07:58 AM UTC

PDB ID : 9H0M / pdb_00009h0m
Title : Structure of avian Pit54 SRCR 1-2 in complex with hemoglobin
Authors : Mikkelsen, J.H.; Andersen, C.B.F.
Deposited on : 2024-10-08
Resolution : 2.64 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

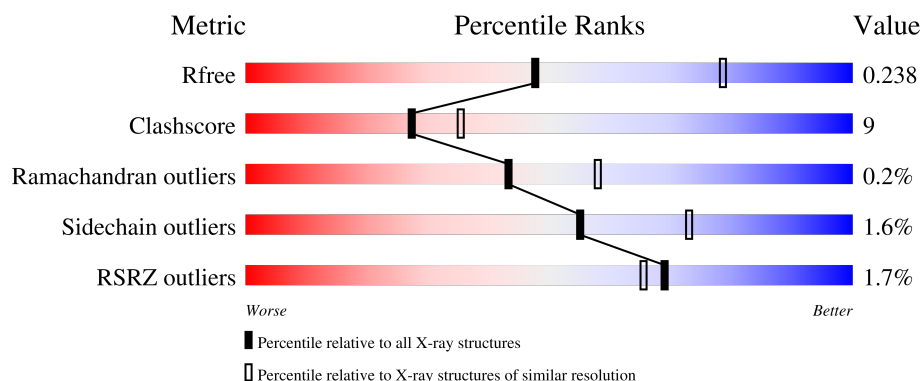
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.64 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.











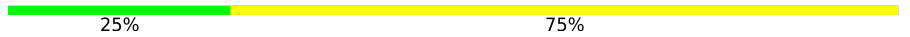
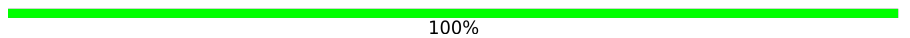
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2053 (2.66-2.62)
Clashscore	190562	2097 (2.66-2.62)
Ramachandran outliers	187476	2066 (2.66-2.62)
Sidechain outliers	187428	2066 (2.66-2.62)
RSRZ outliers	180081	2052 (2.66-2.62)

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	142	
1	C	142	
1	G	142	
1	I	142	
2	B	147	

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Mol	Chain	Length	Quality of chain
2	D	147	
2	H	147	
2	J	147	
3	E	508	
3	F	508	
3	K	508	
3	L	508	
4	M	4	
4	N	4	
5	O	2	

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 15794 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-A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	141	Total	C	N	O	S	0	0	0
			1081	696	188	194	3			
1	C	141	Total	C	N	O	S	0	0	0
			1081	696	188	194	3			
1	G	138	Total	C	N	O	S	0	0	0
			1048	675	181	189	3			
1	I	138	Total	C	N	O	S	0	0	0
			1048	675	181	189	3			

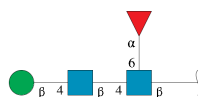
- Molecule 2 is a protein called Hemoglobin subunit beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	146	Total	C	N	O	S	0	0	0
			1155	746	204	201	4			
2	D	146	Total	C	N	O	S	0	0	0
			1155	746	204	201	4			
2	H	145	Total	C	N	O	S	0	0	0
			1144	740	201	199	4			
2	J	145	Total	C	N	O	S	0	0	0
			1144	740	201	199	4			

- Molecule 3 is a protein called PIT54 protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	215	Total	C	N	O	S	0	0	0
			1616	982	292	326	16			
3	F	215	Total	C	N	O	S	0	0	0
			1616	982	292	326	16			
3	K	215	Total	C	N	O	S	0	0	0
			1616	982	292	326	16			
3	L	215	Total	C	N	O	S	0	0	0
			1616	982	292	326	16			

- Molecule 4 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



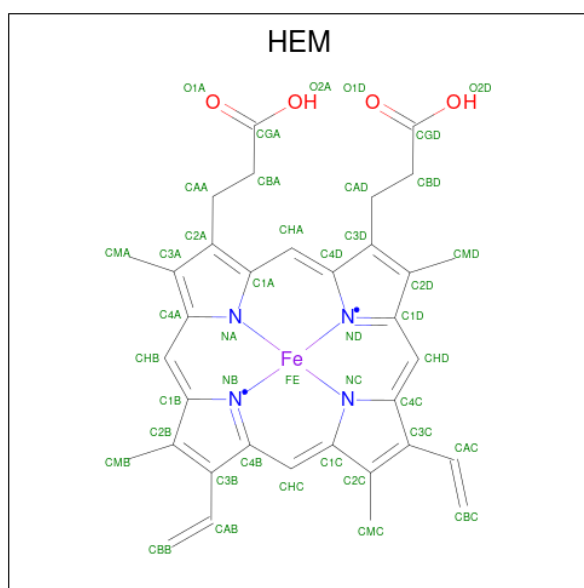
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	M	4	Total	C	N	O	0	0	0
			49	28	2	19			
4	N	4	Total	C	N	O	0	0	0
			49	28	2	19			

- Molecule 5 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	O	2	Total	C	N	O	0	0	0
			24	14	1	9			

- Molecule 6 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	C	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	D	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	G	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	H	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	I	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
6	J	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

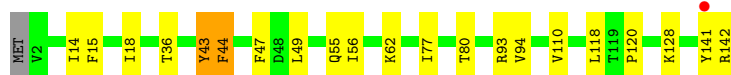
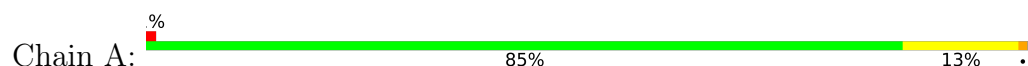
- Molecule 7 is CALCIUM ION (CCD ID: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	E	2	Total 2	Ca 2	0	0
7	F	2	Total 2	Ca 2	0	0
7	K	2	Total 2	Ca 2	0	0
7	L	2	Total 2	Ca 2	0	0

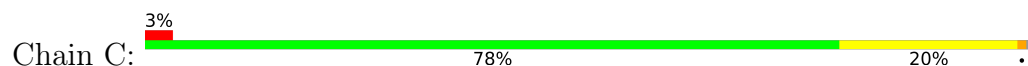
3 Residue-property plots

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.

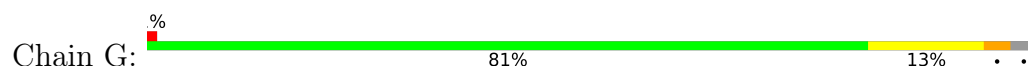
- Molecule 1: Hemoglobin subunit alpha-A



- Molecule 1: Hemoglobin subunit alpha-A



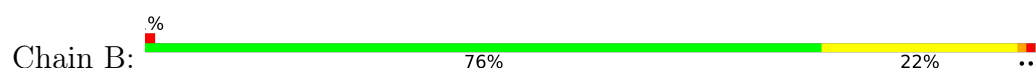
- Molecule 1: Hemoglobin subunit alpha-A

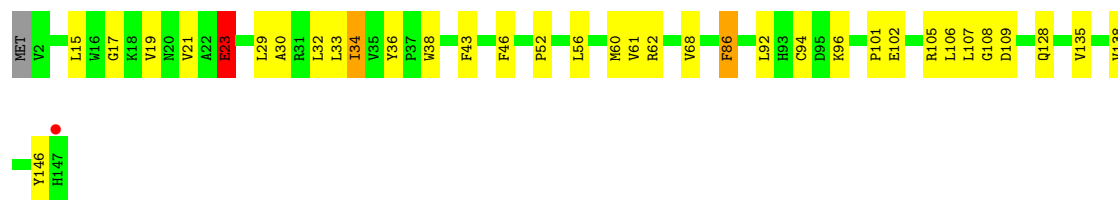


- Molecule 1: Hemoglobin subunit alpha-A

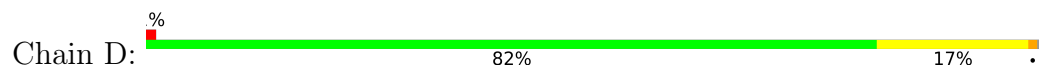


- Molecule 2: Hemoglobin subunit beta

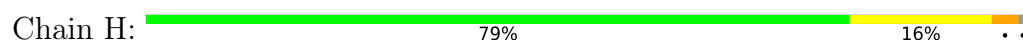




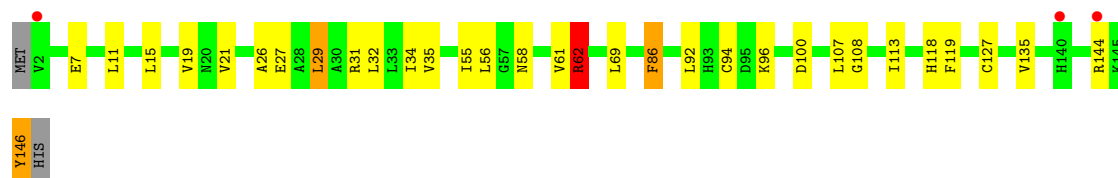
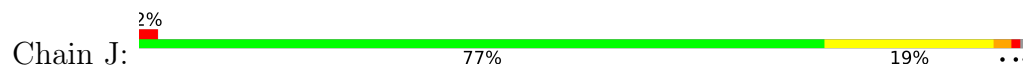
• Molecule 2: Hemoglobin subunit beta



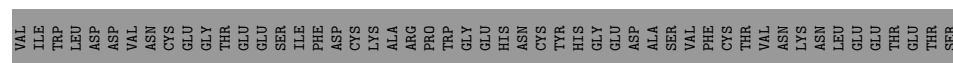
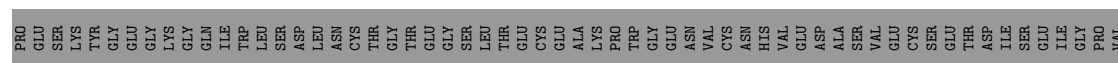
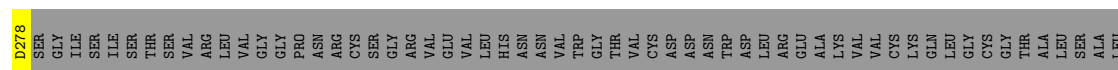
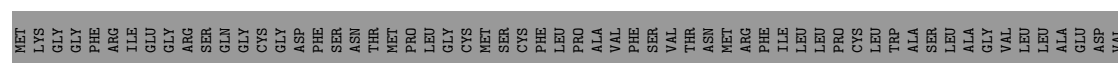
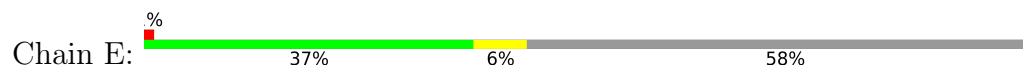
• Molecule 2: Hemoglobin subunit beta



• Molecule 2: Hemoglobin subunit beta

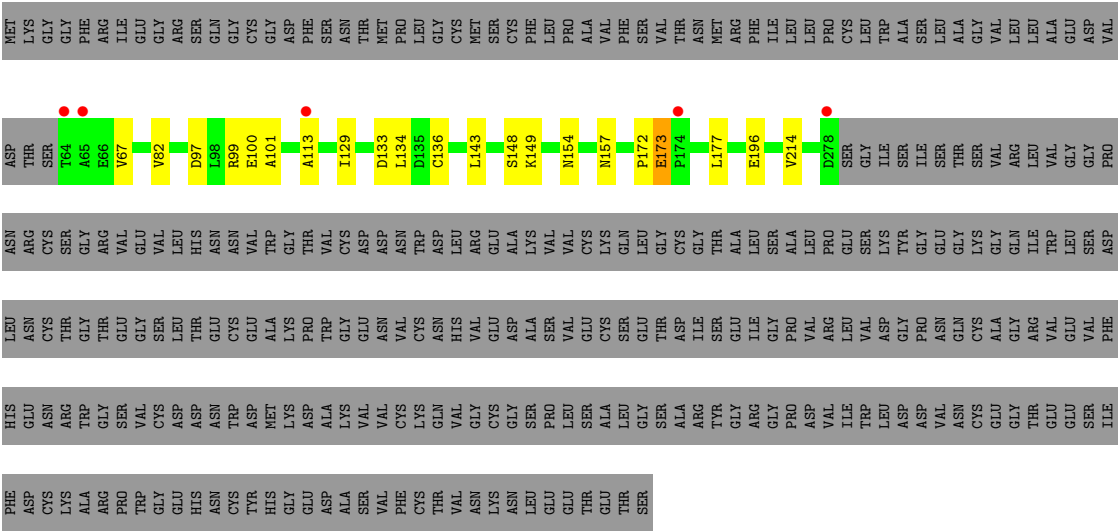


• Molecule 3: PIT54 protein



[illegible][illegible]

Chain L: 38% 2% 60%



● Molecule 4: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



● Molecule 4: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



● Molecule 5: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	101.53Å 157.59Å 175.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	58.68 – 2.64 58.68 – 2.64	Depositor EDS
% Data completeness (in resolution range)	67.1 (58.68-2.64) 67.1 (58.68-2.64)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.64 (at 2.65Å)	Xtriage
Refinement program	PHENIX 1.21.2_5419	Depositor
R, R_{free}	0.201 , 0.238 0.201 , 0.238	Depositor DCC
R_{free} test set	1831 reflections (2.20%)	wwPDB-VP
Wilson B-factor (Å ²)	66.4	Xtriage
Anisotropy	0.064	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 47.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	15794	wwPDB-VP
Average B, all atoms (Å ²)	69.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.47% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, BMA, HEM, FUC, CA

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	0.15	0/1107	0.46	0/1501
1	C	0.17	0/1107	0.44	0/1501
1	G	0.16	0/1073	0.46	0/1458
1	I	0.15	0/1073	0.40	0/1458
2	B	0.24	0/1184	0.48	1/1606 (0.1%)
2	D	0.17	0/1184	0.43	0/1606
2	H	0.18	0/1172	0.46	0/1591
2	J	0.25	0/1172	0.50	1/1591 (0.1%)
3	E	0.22	0/1649	0.50	0/2239
3	F	0.24	0/1649	0.62	3/2239 (0.1%)
3	K	0.19	0/1649	0.47	0/2239
3	L	0.16	0/1649	0.45	0/2239
All	All	0.19	0/15668	0.48	5/21268 (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
2	H	0	2
2	J	0	1
3	F	0	4
3	K	0	1
All	All	0	8

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	189	ARG	CG-CD-NE	-8.77	92.70	112.00
2	B	23	GLU	CA-CB-CG	6.10	126.30	114.10
3	F	236	THR	CA-C-N	-5.68	113.42	122.17
3	F	236	THR	C-N-CA	-5.68	113.42	122.17
2	J	62	ARG	CG-CD-NE	-5.42	100.08	112.00

There are no chirality outliers.

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	F	172	PRO	Peptide
3	F	173	GLU	Peptide
3	F	189	ARG	Sidechain
3	F	75	ARG	Sidechain
2	H	31	ARG	Sidechain
2	H	62	ARG	Sidechain
2	J	62	ARG	Sidechain
3	K	189	ARG	Sidechain

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	1081	0	1095	21	0
1	C	1081	0	1095	29	0
1	G	1048	0	1060	24	0
1	I	1048	0	1060	33	0
2	B	1155	0	1164	28	0
2	D	1155	0	1164	23	0
2	H	1144	0	1157	27	0
2	J	1144	0	1157	26	0
3	E	1616	0	1497	19	0
3	F	1616	0	1497	25	0
3	K	1616	0	1497	32	0
3	L	1616	0	1498	12	0
4	M	49	0	43	0	0
4	N	49	0	43	0	0
5	O	24	0	22	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	43	0	30	3	0
6	B	43	0	30	2	0
6	C	43	0	30	5	0
6	D	43	0	30	4	0
6	G	43	0	30	3	0
6	H	43	0	30	2	0
6	I	43	0	30	4	0
6	J	43	0	30	2	0
7	E	2	0	0	0	0
7	F	2	0	0	0	0
7	K	2	0	0	0	0
7	L	2	0	0	0	0
All	All	15794	0	15289	283	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 9.

All (283) 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:34:ILE:HD12	2:B:52:PRO:HB3	1.49	0.95
1:G:120:PRO:HB2	2:H:34:ILE:HD11	1.49	0.93
1:C:120:PRO:HB2	2:D:34:ILE:HD11	1.56	0.88
2:D:21:VAL:HB	3:F:159:VAL:HG21	1.59	0.85
2:B:21:VAL:HB	3:E:159:VAL:HG21	1.60	0.83
2:H:26:ALA:HB1	2:H:62:ARG:HG2	1.60	0.82
1:G:43:TYR:HE2	1:G:94:VAL:HA	1.45	0.81
3:F:189:ARG:NH1	3:F:235:GLY:HA2	1.96	0.80
2:H:21:VAL:HB	3:K:159:VAL:HG21	1.66	0.78
1:I:23:GLU:OE2	1:I:57:LYS:HD3	1.83	0.78
3:L:67:VAL:HG12	3:L:82:VAL:HG12	1.67	0.76
1:A:43:TYR:HE2	1:A:94:VAL:HA	1.50	0.75
3:K:189:ARG:HH12	3:K:235:GLY:HA2	1.49	0.75
1:C:43:TYR:CE2	1:C:94:VAL:HA	2.21	0.74
1:A:43:TYR:CE2	1:A:94:VAL:HA	2.24	0.73
1:G:97:VAL:HG21	2:J:100:ASP:OD2	1.89	0.72
6:C:201:HEM:HHC	6:C:201:HEM:HBB2	1.71	0.72
2:D:94:CYS:HB2	2:D:146:TYR:CD1	2.25	0.72
6:A:201:HEM:HHC	6:A:201:HEM:HBB2	1.71	0.71
2:H:100:ASP:OD2	1:I:97:VAL:HG21	1.91	0.70
6:G:201:HEM:HHC	6:G:201:HEM:HBB2	1.73	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:I:201:HEM:HHC	6:I:201:HEM:HBB2	1.73	0.70
2:H:94:CYS:HB2	2:H:146:TYR:CE1	2.27	0.69
3:E:203:HIS:CD2	3:E:270:GLU:HB3	2.27	0.69
1:I:43:TYR:HE2	1:I:94:VAL:HA	1.56	0.69
2:J:11:LEU:HD23	2:J:127:CYS:HA	1.73	0.69
2:J:94:CYS:HB2	2:J:146:TYR:CE1	2.28	0.69
3:K:189:ARG:NH1	3:K:235:GLY:HA2	2.08	0.69
3:K:184:ASN:ND2	3:K:278:ASP:OD2	2.27	0.67
1:C:43:TYR:HE2	1:C:94:VAL:HA	1.58	0.67
3:F:224:VAL:HG12	3:F:225:LEU:HD12	1.76	0.66
1:I:120:PRO:HB3	2:J:31:ARG:HG2	1.77	0.66
3:L:177:LEU:HD21	3:L:214:VAL:HG13	1.77	0.66
1:C:12:LYS:HE2	1:C:74:ILE:HD11	1.79	0.65
3:E:184:ASN:HD21	3:E:278:ASP:HB2	1.62	0.64
3:F:177:LEU:HD21	3:F:214:VAL:HG13	1.78	0.64
2:J:29:LEU:HD12	2:J:61:VAL:HG13	1.78	0.64
3:L:133:ASP:OD2	3:L:149:LYS:HE3	1.97	0.64
1:G:32:ARG:HD3	2:H:128:GLN:OE1	1.98	0.63
2:B:29:LEU:HD12	2:B:61:VAL:HG13	1.80	0.63
3:F:189:ARG:HA	3:F:273:SER:HA	1.81	0.63
1:C:15:PHE:HA	1:C:18:ILE:HG12	1.82	0.61
3:K:124:GLU:OE2	3:K:159:VAL:HG22	2.01	0.61
3:F:65:ALA:O	3:F:66:GLU:HB2	2.00	0.60
2:H:29:LEU:HD12	2:H:61:VAL:HG13	1.83	0.60
1:C:120:PRO:HB3	2:D:31:ARG:HG2	1.82	0.60
3:E:134:LEU:HD23	3:E:148:SER:HB3	1.82	0.60
2:J:26:ALA:HB1	2:J:62:ARG:HD2	1.81	0.60
1:I:99:PHE:HE2	1:I:138:THR:HG23	1.66	0.60
3:F:131:LEU:HB3	3:F:134:LEU:HD11	1.84	0.60
1:A:36:THR:HG21	2:B:128:GLN:HG2	1.83	0.59
2:D:94:CYS:HB2	2:D:146:TYR:CE1	2.38	0.59
2:B:32:LEU:HD22	2:B:107:LEU:HD13	1.85	0.59
3:E:100:GLU:HG3	3:E:136:CYS:SG	2.43	0.59
3:K:177:LEU:HD21	3:K:214:VAL:HG13	1.83	0.59
3:K:134:LEU:HD23	3:K:148:SER:HB3	1.84	0.58
1:G:97:VAL:HA	1:G:100:LYS:HE2	1.84	0.58
3:K:188:GLY:HA2	3:K:232:PHE:CD2	2.38	0.58
3:E:212:GLN:HE21	3:E:216:LYS:HD2	1.68	0.58
2:H:27:GLU:O	2:H:31:ARG:HG3	2.02	0.58
1:C:89:ALA:O	1:C:141:TYR:HE2	1.87	0.57
6:J:201:HEM:HMC2	6:J:201:HEM:HBC2	1.86	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:J:92:LEU:O	2:J:96:LYS:HB3	2.03	0.57
1:I:33:MET:HE2	1:I:40:THR:HG21	1.87	0.57
6:B:201:HEM:HMB1	6:B:201:HEM:HBB2	1.86	0.56
3:F:189:ARG:HH11	3:F:235:GLY:HA2	1.67	0.56
6:H:201:HEM:HMB1	6:H:201:HEM:HBB2	1.88	0.56
1:G:15:PHE:HA	1:G:18:ILE:HG12	1.88	0.55
2:H:144:ARG:NH1	2:J:144:ARG:HH22	2.04	0.55
3:F:100:GLU:HG3	3:F:136:CYS:SG	2.46	0.55
1:I:120:PRO:HB2	2:J:34:ILE:HD11	1.88	0.55
3:L:134:LEU:HD23	3:L:148:SER:HB3	1.88	0.55
2:B:94:CYS:HB2	2:B:146:TYR:CD1	2.42	0.54
1:C:44:PHE:N	1:C:44:PHE:CD1	2.76	0.54
6:I:201:HEM:HBC2	6:I:201:HEM:HMC1	1.87	0.54
2:H:11:LEU:HD23	2:H:127:CYS:HA	1.89	0.54
1:A:44:PHE:CD1	1:A:44:PHE:N	2.75	0.54
6:D:201:HEM:HBB2	6:D:201:HEM:HMB1	1.89	0.54
2:B:38:TRP:CG	1:C:93:ARG:HG2	2.42	0.54
1:I:15:PHE:HA	1:I:18:ILE:HG12	1.89	0.54
2:D:29:LEU:HD12	2:D:61:VAL:HG13	1.88	0.54
3:F:129:ILE:HB	3:F:154:ASN:HD21	1.73	0.54
6:G:201:HEM:HBC2	6:G:201:HEM:HMC1	1.90	0.54
6:A:201:HEM:HMC1	6:A:201:HEM:HBC2	1.91	0.53
6:C:201:HEM:HMC1	6:C:201:HEM:HBC2	1.90	0.53
2:D:11:LEU:HD23	2:D:127:CYS:HA	1.91	0.53
6:D:201:HEM:HBC2	6:D:201:HEM:HMC1	1.91	0.53
2:B:30:ALA:O	2:B:34:ILE:HG22	2.09	0.53
2:D:101:PRO:HG3	2:D:146:TYR:CE2	2.44	0.53
1:G:8:LYS:HD2	1:G:74:ILE:HD13	1.91	0.53
2:H:40:GLN:HB2	1:I:93:ARG:HE	1.74	0.53
3:F:179:LEU:HD13	3:F:218:LEU:HD11	1.91	0.52
3:F:243:ASP:HB2	3:F:259:ARG:HG3	1.90	0.52
3:F:133:ASP:HB2	3:F:149:LYS:HG3	1.91	0.52
1:I:8:LYS:HG2	1:I:74:ILE:HD12	1.92	0.52
3:K:186:CYS:HB3	3:K:276:CYS:HB2	1.92	0.52
1:G:44:PHE:N	1:G:44:PHE:CD1	2.76	0.52
1:A:120:PRO:HG3	2:B:56:LEU:HD21	1.92	0.52
3:L:172:PRO:O	3:L:173:GLU:HG3	2.10	0.52
1:A:15:PHE:HA	1:A:18:ILE:HG12	1.92	0.51
2:B:36:TYR:CZ	2:B:106:LEU:HD22	2.46	0.51
2:B:56:LEU:O	2:B:62:ARG:HD3	2.09	0.51
2:B:94:CYS:HB2	2:B:146:TYR:CE1	2.45	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:43:PHE:N	2:H:43:PHE:CD1	2.78	0.51
2:J:58:ASN:O	2:J:62:ARG:HB2	2.11	0.51
2:B:101:PRO:HG3	2:B:146:TYR:CE2	2.45	0.51
1:A:128:LYS:HG2	1:C:142:ARG:OXT	2.11	0.51
2:D:36:TYR:CZ	2:D:106:LEU:HD22	2.45	0.51
6:B:201:HEM:HBC2	6:B:201:HEM:HMC1	1.93	0.51
1:G:44:PHE:HD2	1:G:47:PHE:CD2	2.29	0.51
6:J:201:HEM:HMB1	6:J:201:HEM:HBB2	1.91	0.51
1:C:37:TYR:CZ	1:C:101:LEU:HD22	2.46	0.51
3:K:179:LEU:HD13	3:K:218:LEU:HD11	1.93	0.51
3:F:232:PHE:N	3:F:232:PHE:CD1	2.79	0.50
2:H:26:ALA:CB	2:H:62:ARG:HG2	2.37	0.50
1:A:93:ARG:HG2	2:D:38:TRP:CG	2.47	0.50
1:A:44:PHE:HB3	1:A:47:PHE:CD2	2.47	0.50
1:G:77:ILE:HA	1:G:80:THR:HG22	1.93	0.50
2:H:118:HIS:C	2:H:119:PHE:HD1	2.20	0.50
1:I:44:PHE:CD1	1:I:44:PHE:N	2.79	0.50
3:K:100:GLU:HG3	3:K:136:CYS:SG	2.52	0.50
1:C:15:PHE:CD1	1:C:18:ILE:HD11	2.47	0.50
3:K:133:ASP:OD2	3:K:149:LYS:HE3	2.12	0.50
3:F:188:GLY:HA2	3:F:232:PHE:CD2	2.47	0.49
1:G:62:LYS:HB3	6:G:201:HEM:HMA3	1.94	0.49
2:B:105:ARG:HD3	2:B:109:ASP:OD2	2.12	0.49
3:E:203:HIS:ND1	3:E:228:ILE:HB	2.27	0.49
2:H:41:ARG:HH22	1:I:42:THR:HG22	1.75	0.49
6:H:201:HEM:HMC1	6:H:201:HEM:HBC2	1.94	0.49
2:H:15:LEU:O	2:H:19:VAL:HG23	2.13	0.49
1:I:70:ALA:O	1:I:74:ILE:HG23	2.12	0.49
2:B:105:ARG:NH1	2:B:109:ASP:OD2	2.44	0.49
1:I:120:PRO:C	2:J:34:ILE:HD11	2.38	0.49
2:D:15:LEU:HD12	2:D:131:TRP:CD1	2.48	0.49
3:K:93:ASP:OD1	3:K:160:GLU:HB3	2.13	0.48
2:B:86:PHE:N	2:B:86:PHE:CD1	2.82	0.48
1:I:3:LEU:O	1:I:8:LYS:HE3	2.13	0.48
2:J:118:HIS:C	2:J:119:PHE:HD1	2.22	0.48
2:D:97:LEU:HD21	6:D:201:HEM:C3D	2.48	0.48
2:J:32:LEU:HD12	2:J:107:LEU:HD13	1.94	0.48
2:B:108:GLY:HA3	2:B:135:VAL:CG1	2.43	0.48
1:I:44:PHE:HD2	1:I:47:PHE:CE2	2.31	0.48
2:H:86:PHE:N	2:H:86:PHE:CD1	2.81	0.48
3:F:232:PHE:N	3:F:232:PHE:HD1	2.11	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:96:TRP:CE2	3:E:162:ALA:HB1	2.49	0.48
1:I:49:LEU:HA	1:I:56:ILE:HD11	1.96	0.47
2:J:108:GLY:HA3	2:J:135:VAL:HG13	1.96	0.47
1:C:62:LYS:HB3	6:C:201:HEM:HMA3	1.95	0.47
3:E:186:CYS:HB3	3:E:276:CYS:HB2	1.95	0.47
1:I:123:HIS:CD2	2:J:113:ILE:HG21	2.49	0.47
1:A:44:PHE:HB3	1:A:47:PHE:HD2	1.79	0.47
2:H:43:PHE:N	2:H:43:PHE:HD1	2.11	0.47
3:F:100:GLU:HG2	3:F:134:LEU:HD23	1.95	0.47
3:K:203:HIS:HB2	3:K:228:ILE:HG22	1.97	0.47
3:K:232:PHE:N	3:K:232:PHE:CD1	2.83	0.47
1:C:14:ILE:HD13	1:C:126:LEU:HD11	1.97	0.47
1:C:44:PHE:HD2	1:C:47:PHE:CD2	2.33	0.47
1:A:44:PHE:N	1:A:44:PHE:HD1	2.13	0.47
1:I:44:PHE:HD2	1:I:47:PHE:CD2	2.33	0.47
2:J:34:ILE:HG22	2:J:55:ILE:HD12	1.96	0.47
1:I:44:PHE:N	1:I:44:PHE:HD1	2.12	0.47
2:B:23:GLU:O	2:B:23:GLU:OE1	2.32	0.47
1:G:114:HIS:HB3	1:G:117:ALA:HB3	1.96	0.47
2:J:92:LEU:HD12	2:J:96:LYS:HG2	1.97	0.47
1:C:8:LYS:HG2	1:C:74:ILE:HD12	1.97	0.46
2:H:86:PHE:N	2:H:86:PHE:HD1	2.12	0.46
3:K:232:PHE:N	3:K:232:PHE:HD1	2.13	0.46
2:B:86:PHE:CE2	2:B:138:VAL:HG13	2.50	0.46
1:C:43:TYR:CD1	1:C:43:TYR:N	2.84	0.46
3:E:130:TRP:HB3	3:E:151:TRP:CE3	2.50	0.46
2:J:15:LEU:O	2:J:19:VAL:HG23	2.15	0.46
3:K:76:CYS:HB3	3:K:166:CYS:HB2	1.97	0.46
3:L:97:ASP:HB2	3:L:196:GLU:O	2.16	0.46
1:A:62:LYS:HB3	6:A:201:HEM:HMA3	1.98	0.46
2:B:15:LEU:O	2:B:19:VAL:HG23	2.16	0.46
1:C:17:LYS:HB3	1:C:114:HIS:CE1	2.51	0.46
2:D:4:TRP:CZ3	2:D:133:LYS:HD2	2.51	0.46
1:G:99:PHE:N	1:G:99:PHE:CD1	2.84	0.46
2:D:86:PHE:HD1	2:D:86:PHE:N	2.14	0.46
1:G:44:PHE:N	1:G:44:PHE:HD1	2.13	0.46
1:I:123:HIS:ND1	2:J:35:VAL:HG21	2.30	0.46
3:L:100:GLU:HG3	3:L:136:CYS:SG	2.56	0.46
1:A:141:TYR:HB3	1:A:142:ARG:H	1.66	0.46
1:C:3:LEU:O	1:C:8:LYS:HE3	2.16	0.46
1:A:47:PHE:CD1	1:A:55:GLN:HB3	2.51	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:88:HIS:HE1	6:C:201:HEM:NA	2.08	0.45
2:B:86:PHE:N	2:B:86:PHE:HD1	2.14	0.45
2:D:7:GLU:O	2:D:11:LEU:HD13	2.16	0.45
2:D:86:PHE:N	2:D:86:PHE:CD1	2.84	0.45
1:G:18:ILE:HG22	1:G:25:TYR:HE2	1.80	0.45
3:F:157:ASN:OD1	3:F:158:HIS:N	2.50	0.45
3:K:96:TRP:CE2	3:K:162:ALA:HB1	2.52	0.45
3:K:189:ARG:HA	3:K:273:SER:HA	1.97	0.45
3:E:133:ASP:OD2	3:E:149:LYS:HE3	2.17	0.45
2:J:21:VAL:HG13	2:J:69:LEU:HD12	1.99	0.45
1:C:77:ILE:HA	1:C:80:THR:HG22	1.98	0.45
2:D:15:LEU:HD12	2:D:131:TRP:NE1	2.31	0.45
2:D:96:LYS:HD2	3:F:270:GLU:OE2	2.17	0.45
3:K:172:PRO:O	3:K:173:GLU:HG2	2.17	0.45
1:G:120:PRO:HB3	2:H:31:ARG:HH11	1.82	0.45
1:C:44:PHE:N	1:C:44:PHE:HD1	2.14	0.45
1:A:49:LEU:HA	1:A:56:ILE:HD11	2.00	0.44
2:H:96:LYS:HD2	3:K:270:GLU:OE2	2.17	0.44
3:F:124:GLU:OE2	3:F:159:VAL:HG22	2.17	0.44
3:L:99:ARG:HH11	3:L:196:GLU:HG3	1.82	0.44
3:E:130:TRP:HB3	3:E:151:TRP:HE3	1.83	0.44
3:K:177:LEU:HD11	3:K:190:VAL:HG13	1.98	0.44
2:J:108:GLY:HA3	2:J:135:VAL:CG1	2.48	0.44
3:K:134:LEU:HD13	3:K:143:LEU:HD11	1.99	0.44
3:K:179:LEU:HD21	3:K:274:ALA:HB3	1.99	0.44
1:A:43:TYR:N	1:A:43:TYR:CD1	2.85	0.44
3:F:167:SER:HB2	3:F:170:GLU:O	2.18	0.44
3:F:174:PRO:HA	3:F:175:GLY:HA2	1.53	0.44
1:I:74:ILE:HA	1:I:77:ILE:HG13	2.00	0.44
1:I:90:HIS:HA	1:I:93:ARG:NH1	2.33	0.44
2:D:97:LEU:HD21	6:D:201:HEM:C2D	2.52	0.44
1:A:14:ILE:HG23	1:A:15:PHE:HD1	1.83	0.44
3:E:203:HIS:HB2	3:E:228:ILE:HG22	2.00	0.44
3:K:98:LEU:HA	3:K:101:ALA:HB3	2.00	0.44
1:A:43:TYR:N	1:A:43:TYR:HD1	2.16	0.44
2:D:46:PHE:HA	2:D:60:MET:HE3	2.00	0.44
1:G:99:PHE:N	1:G:99:PHE:HD1	2.16	0.44
3:L:129:ILE:HB	3:L:154:ASN:HD21	1.83	0.44
3:E:184:ASN:ND2	3:E:278:ASP:HB2	2.32	0.43
3:L:134:LEU:HA	3:L:148:SER:HB3	2.00	0.43
1:C:43:TYR:CD2	1:C:94:VAL:HG22	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:94:CYS:HB2	2:H:146:TYR:CD1	2.53	0.43
1:I:37:TYR:CZ	1:I:101:LEU:HD22	2.53	0.43
2:B:68:VAL:HG11	2:B:107:LEU:HD21	2.00	0.43
1:A:141:TYR:O	1:A:142:ARG:HB2	2.19	0.43
2:B:33:LEU:HD21	2:B:43:PHE:CD2	2.53	0.43
2:D:15:LEU:O	2:D:19:VAL:HG23	2.17	0.43
3:E:212:GLN:HE21	3:E:216:LYS:CD	2.31	0.43
1:G:74:ILE:H	1:G:74:ILE:HG13	1.54	0.43
3:L:134:LEU:HD13	3:L:143:LEU:HD11	2.00	0.43
1:I:120:PRO:HG3	2:J:56:LEU:HD21	2.00	0.43
3:K:171:ILE:C	3:K:173:GLU:H	2.26	0.42
1:A:77:ILE:HA	1:A:80:THR:HG22	2.01	0.42
3:F:129:ILE:HB	3:F:154:ASN:ND2	2.34	0.42
1:I:18:ILE:HG22	1:I:25:TYR:HE2	1.84	0.42
3:E:124:GLU:HB3	3:E:158:HIS:HB3	2.01	0.42
1:C:93:ARG:HD3	1:C:141:TYR:CE2	2.54	0.42
3:K:102:ARG:HA	3:K:113:ALA:HB2	2.01	0.42
2:B:17:GLY:HA2	3:E:157:ASN:HB3	2.01	0.42
2:B:92:LEU:HD12	2:B:96:LYS:HB2	2.01	0.42
1:C:36:THR:HG21	2:D:128:GLN:HG2	2.00	0.42
1:G:37:TYR:CZ	1:G:101:LEU:HD22	2.55	0.42
1:G:43:TYR:CE2	1:G:94:VAL:HA	2.37	0.42
2:H:108:GLY:HA3	2:H:135:VAL:HG13	2.00	0.42
3:E:98:LEU:HD21	3:E:115:SER:HA	2.01	0.42
3:K:194:HIS:CE1	3:K:195:GLU:HG3	2.55	0.42
1:I:110:VAL:HG23	1:I:118:LEU:HD22	2.02	0.42
2:B:108:GLY:HA3	2:B:135:VAL:HG13	2.02	0.42
3:F:245:ASN:HB3	3:F:257:GLN:O	2.20	0.42
2:J:7:GLU:O	2:J:11:LEU:HD13	2.19	0.42
3:L:101:ALA:HB1	3:L:113:ALA:HB1	2.02	0.42
2:B:46:PHE:CD1	2:B:60:MET:HE2	2.55	0.41
2:H:43:PHE:HD2	2:H:46:PHE:CE2	2.38	0.41
1:C:35:THR:HG22	2:D:129:ALA:HB2	2.01	0.41
1:C:99:PHE:HD1	6:C:201:HEM:HBB2	1.85	0.41
1:I:99:PHE:CE2	1:I:138:THR:HG23	2.51	0.41
2:J:27:GLU:HG3	2:J:31:ARG:HE	1.85	0.41
2:H:41:ARG:HB2	1:I:93:ARG:HB3	2.03	0.41
3:E:112:THR:HG21	3:E:171:ILE:O	2.20	0.41
1:I:114:HIS:HB3	1:I:117:ALA:HB3	2.02	0.41
3:K:177:LEU:HD13	3:K:192:VAL:HG12	2.02	0.41
3:F:177:LEU:HD11	3:F:190:VAL:HG13	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:110:VAL:HG23	1:A:118:LEU:HD22	2.02	0.41
1:G:15:PHE:HE1	1:G:126:LEU:HD21	1.86	0.41
1:G:43:TYR:N	1:G:43:TYR:CD1	2.89	0.41
3:K:97:ASP:HB2	3:K:196:GLU:O	2.20	0.41
3:K:101:ALA:HB1	3:K:164:VAL:HG23	2.02	0.41
1:G:43:TYR:N	1:G:43:TYR:HD1	2.19	0.41
2:J:86:PHE:N	2:J:86:PHE:HD1	2.19	0.41
2:H:140:HIS:O	2:H:144:ARG:HG2	2.21	0.40
1:C:12:LYS:O	1:C:16:THR:HG23	2.22	0.40
1:G:123:HIS:ND1	2:H:35:VAL:HG21	2.35	0.40
1:I:102:LEU:HD23	6:I:201:HEM:CBB	2.50	0.40
2:B:102:GLU:HG2	1:C:95:ASP:OD2	2.21	0.40
1:I:99:PHE:HD1	6:I:201:HEM:HMC2	1.86	0.40
2:J:86:PHE:N	2:J:86:PHE:CD1	2.89	0.40
3:K:189:ARG:HE	3:K:189:ARG:HB3	1.82	0.40
1:I:89:ALA:HB2	1:I:138:THR:HA	2.02	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	139/142 (98%)	132 (95%)	7 (5%)	0	100	100
1	C	139/142 (98%)	133 (96%)	6 (4%)	0	100	100
1	G	136/142 (96%)	130 (96%)	6 (4%)	0	100	100
1	I	136/142 (96%)	131 (96%)	5 (4%)	0	100	100
2	B	144/147 (98%)	137 (95%)	7 (5%)	0	100	100
2	D	144/147 (98%)	140 (97%)	4 (3%)	0	100	100
2	H	143/147 (97%)	139 (97%)	4 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	J	143/147 (97%)	140 (98%)	3 (2%)	0	100	100
3	E	213/508 (42%)	205 (96%)	7 (3%)	1 (0%)	24	36
3	F	213/508 (42%)	202 (95%)	10 (5%)	1 (0%)	24	36
3	K	213/508 (42%)	203 (95%)	9 (4%)	1 (0%)	24	36
3	L	213/508 (42%)	201 (94%)	11 (5%)	1 (0%)	24	36
All	All	1976/3188 (62%)	1893 (96%)	79 (4%)	4 (0%)	43	58

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	E	205	GLU
3	F	66	GLU
3	L	173	GLU
3	K	173	GLU

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	114/115 (99%)	112 (98%)	2 (2%)	51	71
1	C	114/115 (99%)	112 (98%)	2 (2%)	51	71
1	G	111/115 (96%)	107 (96%)	4 (4%)	31	50
1	I	111/115 (96%)	109 (98%)	2 (2%)	51	71
2	B	122/123 (99%)	119 (98%)	3 (2%)	42	63
2	D	122/123 (99%)	121 (99%)	1 (1%)	73	84
2	H	121/123 (98%)	118 (98%)	3 (2%)	42	63
2	J	121/123 (98%)	118 (98%)	3 (2%)	42	63
3	E	176/422 (42%)	174 (99%)	2 (1%)	65	79
3	F	176/422 (42%)	175 (99%)	1 (1%)	78	87
3	K	176/422 (42%)	174 (99%)	2 (1%)	65	79

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	L	176/422 (42%)	175 (99%)	1 (1%)	78	87
All	All	1640/2640 (62%)	1614 (98%)	26 (2%)	55	73

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	43	TYR
1	A	44	PHE
2	B	23	GLU
2	B	34	ILE
2	B	86	PHE
1	C	43	TYR
1	C	44	PHE
2	D	86	PHE
3	E	195	GLU
3	E	205	GLU
3	F	232	PHE
1	G	43	TYR
1	G	44	PHE
1	G	74	ILE
1	G	99	PHE
2	H	15	LEU
2	H	43	PHE
2	H	86	PHE
1	I	43	TYR
1	I	44	PHE
2	J	29	LEU
2	J	86	PHE
2	J	146	TYR
3	K	157	ASN
3	K	232	PHE
3	L	157	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	72	ASN
2	B	10	GLN
1	C	114	HIS
3	E	107	GLN
3	E	128	GLN

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Mol	Chain	Res	Type
3	E	212	GLN
3	F	128	GLN
3	F	194	HIS
1	G	51	HIS
1	G	114	HIS
2	J	88	GLN
3	K	84	HIS

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 ⓘ

10 monosaccharides 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	$\# Z > 2$
4	NAG	M	1	4,3	14,14,15	0.70	0	17,19,21	0.89	0
4	NAG	M	2	4	14,14,15	0.73	0	17,19,21	0.99	0
4	BMA	M	3	4	11,11,12	0.89	0	15,15,17	2.41	5 (33%)
4	FUC	M	4	4	10,10,11	0.86	0	14,14,16	0.99	0
4	NAG	N	1	4,3	14,14,15	0.85	1 (7%)	17,19,21	1.77	4 (23%)
4	NAG	N	2	4	14,14,15	0.67	0	17,19,21	1.05	1 (5%)
4	BMA	N	3	4	11,11,12	0.87	0	15,15,17	2.70	6 (40%)
4	FUC	N	4	4	10,10,11	0.78	0	14,14,16	0.97	0
5	NAG	O	1	5,3	14,14,15	0.67	0	17,19,21	0.83	0
5	FUC	O	2	5	10,10,11	0.79	0	14,14,16	0.93	0

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
4	NAG	M	1	4,3	-	0/6/23/26	0/1/1/1
4	NAG	M	2	4	-	2/6/23/26	0/1/1/1
4	BMA	M	3	4	-	0/2/19/22	0/1/1/1
4	FUC	M	4	4	-	-	0/1/1/1
4	NAG	N	1	4,3	-	0/6/23/26	0/1/1/1
4	NAG	N	2	4	-	0/6/23/26	0/1/1/1
4	BMA	N	3	4	-	0/2/19/22	0/1/1/1
4	FUC	N	4	4	-	-	0/1/1/1
5	NAG	O	1	5,3	-	0/6/23/26	0/1/1/1
5	FUC	O	2	5	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	N	1	NAG	C1-C2	2.42	1.55	1.52

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	N	3	BMA	C1-O5-C5	8.35	123.38	112.19
4	M	3	BMA	C1-O5-C5	6.87	121.40	112.19
4	N	1	NAG	O5-C1-C2	-4.13	104.91	111.29
4	N	1	NAG	C1-O5-C5	3.67	117.11	112.19
4	N	1	NAG	C1-C2-N2	3.64	116.17	110.43
4	M	3	BMA	C2-C3-C4	3.19	116.47	110.86
4	N	3	BMA	C3-C4-C5	3.18	115.99	110.23
4	N	3	BMA	C2-C3-C4	2.99	116.11	110.86
4	M	3	BMA	C3-C4-C5	2.97	115.62	110.23
4	M	3	BMA	O4-C4-C3	-2.35	104.83	110.38
4	N	3	BMA	O5-C5-C4	2.33	116.50	110.83
4	M	3	BMA	O3-C3-C2	-2.33	105.31	110.05
4	N	2	NAG	C1-O5-C5	2.30	115.27	112.19
4	N	3	BMA	O4-C4-C3	-2.30	104.95	110.38
4	N	3	BMA	O3-C3-C2	-2.07	105.83	110.05
4	N	1	NAG	O4-C4-C3	-2.01	105.64	110.38

There are no chirality outliers.

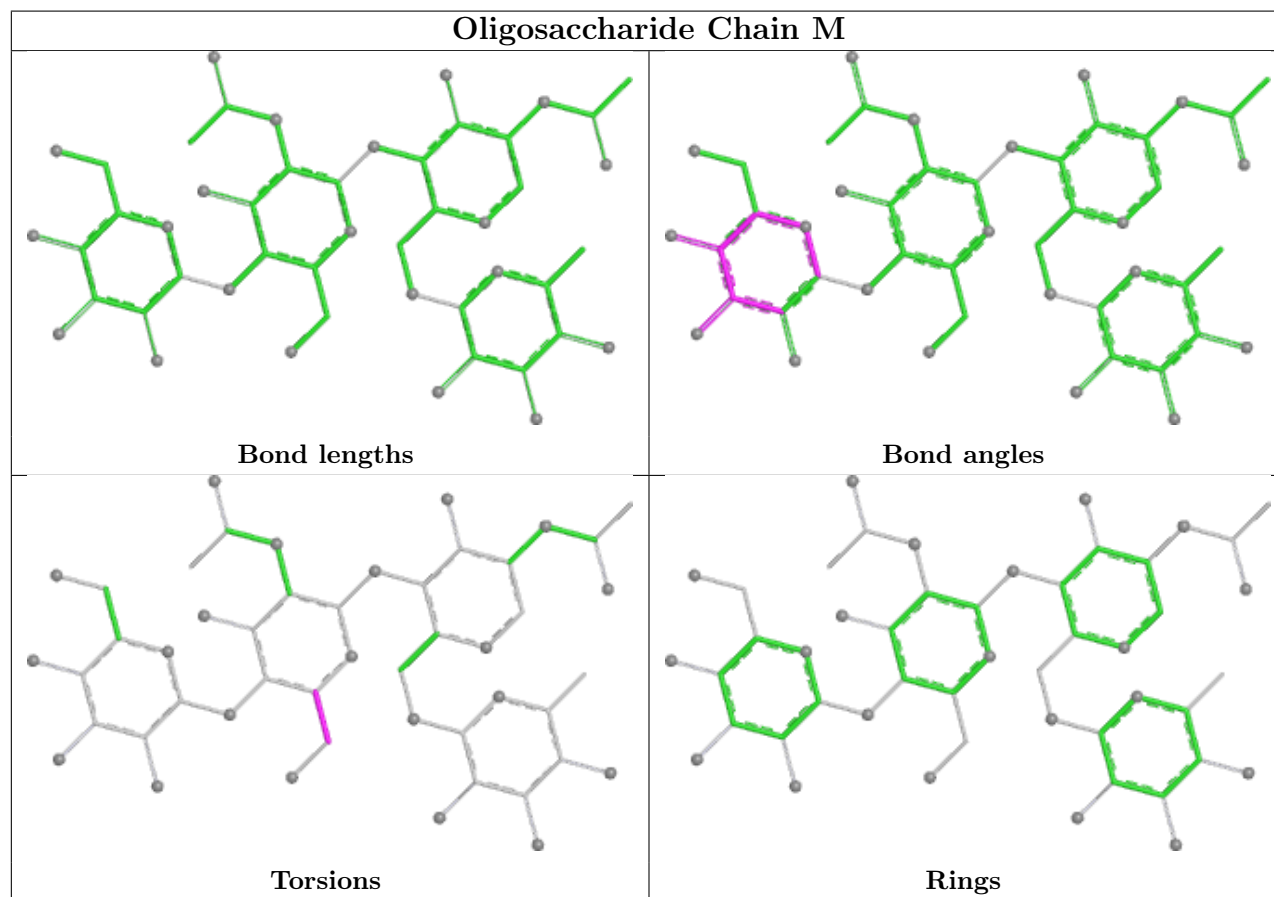
All (2) torsion outliers are listed below:

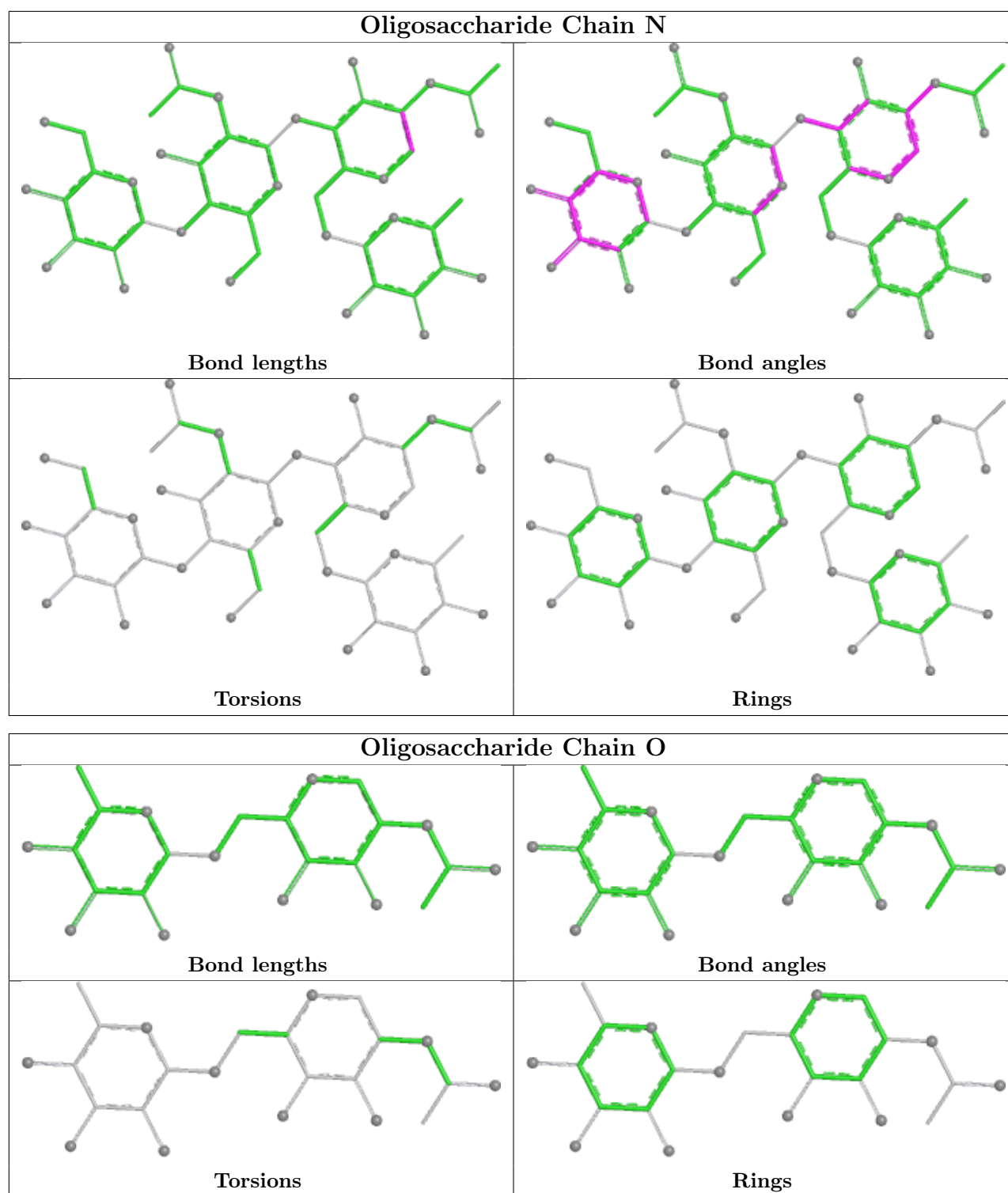
Mol	Chain	Res	Type	Atoms
4	M	2	NAG	C4-C5-C6-O6
4	M	2	NAG	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.





5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 8 are monoatomic - leaving 8 for Mogul analysis.

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
6	HEM	A	201	1	50,50,50	1.44	8 (16%)	67,82,82	1.19	4 (5%)
6	HEM	C	201	1	50,50,50	1.47	8 (16%)	67,82,82	1.18	7 (10%)
6	HEM	H	201	2	50,50,50	1.41	9 (18%)	67,82,82	1.07	3 (4%)
6	HEM	G	201	1	50,50,50	1.50	8 (16%)	67,82,82	1.19	4 (5%)
6	HEM	D	201	2	50,50,50	1.40	7 (14%)	67,82,82	1.11	5 (7%)
6	HEM	I	201	1	50,50,50	1.50	9 (18%)	67,82,82	1.16	5 (7%)
6	HEM	B	201	2	50,50,50	1.41	6 (12%)	67,82,82	1.11	4 (5%)
6	HEM	J	201	2	50,50,50	1.39	7 (14%)	67,82,82	1.08	3 (4%)

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
6	HEM	A	201	1	-	1/14/54/54	-
6	HEM	C	201	1	-	4/14/54/54	-
6	HEM	H	201	2	-	0/14/54/54	-
6	HEM	G	201	1	-	4/14/54/54	-
6	HEM	D	201	2	-	2/14/54/54	-
6	HEM	I	201	1	-	6/14/54/54	-
6	HEM	B	201	2	-	0/14/54/54	-
6	HEM	J	201	2	-	0/14/54/54	-

All (62) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	I	201	HEM	FE-NB	3.85	2.06	1.94
6	C	201	HEM	FE-NB	3.70	2.06	1.94
6	G	201	HEM	FE-NB	3.69	2.06	1.94
6	A	201	HEM	FE-ND	3.66	2.06	1.94
6	G	201	HEM	FE-ND	3.59	2.05	1.94
6	G	201	HEM	FE-NC	3.58	2.07	1.95
6	I	201	HEM	FE-ND	3.58	2.05	1.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	C	201	HEM	FE-NA	3.55	2.06	1.95
6	G	201	HEM	FE-NA	3.54	2.06	1.95
6	B	201	HEM	FE-ND	3.44	2.05	1.94
6	I	201	HEM	FE-NC	3.41	2.06	1.95
6	H	201	HEM	FE-ND	3.39	2.05	1.94
6	I	201	HEM	FE-NA	3.39	2.06	1.95
6	B	201	HEM	FE-NC	3.37	2.06	1.95
6	C	201	HEM	FE-ND	3.30	2.05	1.94
6	A	201	HEM	FE-NA	3.28	2.06	1.95
6	D	201	HEM	FE-ND	3.23	2.04	1.94
6	J	201	HEM	FE-ND	3.21	2.04	1.94
6	D	201	HEM	FE-NA	3.21	2.05	1.95
6	C	201	HEM	FE-NC	3.19	2.05	1.95
6	H	201	HEM	FE-NB	3.18	2.04	1.94
6	G	201	HEM	CAC-C3C	3.18	1.55	1.47
6	J	201	HEM	CAB-C3B	3.16	1.55	1.47
6	D	201	HEM	FE-NB	3.14	2.04	1.94
6	A	201	HEM	FE-NB	3.14	2.04	1.94
6	I	201	HEM	CAC-C3C	3.13	1.55	1.47
6	J	201	HEM	FE-NB	3.12	2.04	1.94
6	B	201	HEM	CAB-C3B	3.12	1.55	1.47
6	C	201	HEM	CAC-C3C	3.10	1.55	1.47
6	B	201	HEM	CAC-C3C	3.10	1.55	1.47
6	A	201	HEM	CAC-C3C	3.10	1.55	1.47
6	D	201	HEM	CAB-C3B	3.09	1.55	1.47
6	D	201	HEM	CAC-C3C	3.09	1.55	1.47
6	B	201	HEM	FE-NB	3.07	2.04	1.94
6	H	201	HEM	CAC-C3C	3.07	1.55	1.47
6	H	201	HEM	CAB-C3B	3.06	1.55	1.47
6	H	201	HEM	FE-NC	3.05	2.05	1.95
6	J	201	HEM	CAC-C3C	3.04	1.55	1.47
6	C	201	HEM	CAB-C3B	3.01	1.55	1.47
6	G	201	HEM	CAB-C3B	3.01	1.55	1.47
6	A	201	HEM	CAB-C3B	3.00	1.55	1.47
6	I	201	HEM	CAB-C3B	2.99	1.55	1.47
6	A	201	HEM	FE-NC	2.93	2.04	1.95
6	J	201	HEM	FE-NA	2.91	2.04	1.95
6	H	201	HEM	FE-NA	2.89	2.04	1.95
6	B	201	HEM	FE-NA	2.82	2.04	1.95
6	D	201	HEM	FE-NC	2.79	2.04	1.95
6	J	201	HEM	FE-NC	2.77	2.04	1.95
6	A	201	HEM	CMC-C2C	2.16	1.55	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	G	201	HEM	CMC-C2C	2.11	1.55	1.50
6	I	201	HEM	CMC-C2C	2.10	1.55	1.50
6	H	201	HEM	CMC-C2C	2.10	1.55	1.50
6	D	201	HEM	CMC-C2C	2.07	1.55	1.50
6	C	201	HEM	CMC-C2C	2.05	1.55	1.50
6	I	201	HEM	CMA-C3A	2.05	1.55	1.50
6	H	201	HEM	CMB-C2B	2.04	1.55	1.50
6	I	201	HEM	CMD-C2D	2.04	1.54	1.50
6	A	201	HEM	CMD-C2D	2.02	1.54	1.50
6	H	201	HEM	CMD-C2D	2.02	1.54	1.50
6	G	201	HEM	CMD-C2D	2.01	1.54	1.50
6	J	201	HEM	CMB-C2B	2.01	1.54	1.50
6	C	201	HEM	CMB-C2B	2.01	1.54	1.50

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	201	HEM	C3B-C2B-C1B	3.08	108.72	106.41
6	G	201	HEM	C3B-C2B-C1B	2.95	108.63	106.41
6	C	201	HEM	C3B-C2B-C1B	2.92	108.61	106.41
6	G	201	HEM	C3B-C4B-NB	-2.86	107.42	109.47
6	I	201	HEM	C3B-C2B-C1B	2.81	108.52	106.41
6	A	201	HEM	C1B-NB-C4B	2.76	108.48	105.21
6	G	201	HEM	C1B-NB-C4B	2.76	108.48	105.21
6	A	201	HEM	C3B-C4B-NB	-2.76	107.49	109.47
6	D	201	HEM	C4D-ND-C1D	2.74	108.45	105.21
6	I	201	HEM	C3B-C4B-NB	-2.65	107.56	109.47
6	C	201	HEM	C1B-NB-C4B	2.55	108.22	105.21
6	I	201	HEM	C1B-NB-C4B	2.54	108.21	105.21
6	G	201	HEM	C4D-ND-C1D	2.50	108.16	105.21
6	D	201	HEM	C3D-C4D-ND	-2.49	107.44	110.17
6	B	201	HEM	C4D-ND-C1D	2.49	108.15	105.21
6	J	201	HEM	C3B-C2B-C1B	2.48	108.28	106.41
6	I	201	HEM	C4D-ND-C1D	2.48	108.14	105.21
6	H	201	HEM	C4D-ND-C1D	2.45	108.11	105.21
6	C	201	HEM	C3B-C4B-NB	-2.44	107.72	109.47
6	B	201	HEM	C3B-C2B-C1B	2.39	108.20	106.41
6	B	201	HEM	C2A-C1A-NA	-2.34	107.56	110.15
6	C	201	HEM	CAD-CBD-CGD	-2.32	107.51	113.67
6	C	201	HEM	C4D-ND-C1D	2.29	107.92	105.21
6	B	201	HEM	C3D-C4D-ND	-2.24	107.71	110.17
6	D	201	HEM	C3B-C2B-C1B	2.23	108.09	106.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	201	HEM	C4D-ND-C1D	2.20	107.81	105.21
6	C	201	HEM	CAA-CBA-CGA	-2.19	107.86	113.67
6	H	201	HEM	C2A-C1A-NA	-2.13	107.78	110.15
6	D	201	HEM	C2A-C1A-NA	-2.10	107.82	110.15
6	D	201	HEM	C2D-C1D-ND	-2.09	107.49	109.90
6	H	201	HEM	C3D-C4D-ND	-2.08	107.89	110.17
6	I	201	HEM	C3D-C4D-ND	-2.07	107.90	110.17
6	J	201	HEM	C2A-C1A-NA	-2.06	107.86	110.15
6	J	201	HEM	C1B-NB-C4B	2.02	107.60	105.21
6	C	201	HEM	C3D-C4D-ND	-2.01	107.97	110.17

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	G	201	HEM	C3D-CAD-CBD-CGD
6	I	201	HEM	C2A-CAA-CBA-CGA
6	A	201	HEM	C4B-C3B-CAB-CBB
6	C	201	HEM	C4B-C3B-CAB-CBB
6	G	201	HEM	C4B-C3B-CAB-CBB
6	I	201	HEM	C4B-C3B-CAB-CBB
6	C	201	HEM	C3D-CAD-CBD-CGD
6	G	201	HEM	CAD-CBD-CGD-O1D
6	I	201	HEM	CAD-CBD-CGD-O1D
6	G	201	HEM	CAD-CBD-CGD-O2D
6	I	201	HEM	CAD-CBD-CGD-O2D
6	I	201	HEM	C3D-CAD-CBD-CGD
6	D	201	HEM	CAD-CBD-CGD-O2D
6	D	201	HEM	CAD-CBD-CGD-O1D
6	C	201	HEM	CAD-CBD-CGD-O1D
6	C	201	HEM	CAD-CBD-CGD-O2D
6	I	201	HEM	C2C-C3C-CAC-CBC

There are no ring outliers.

8 monomers are involved in 25 short contacts:

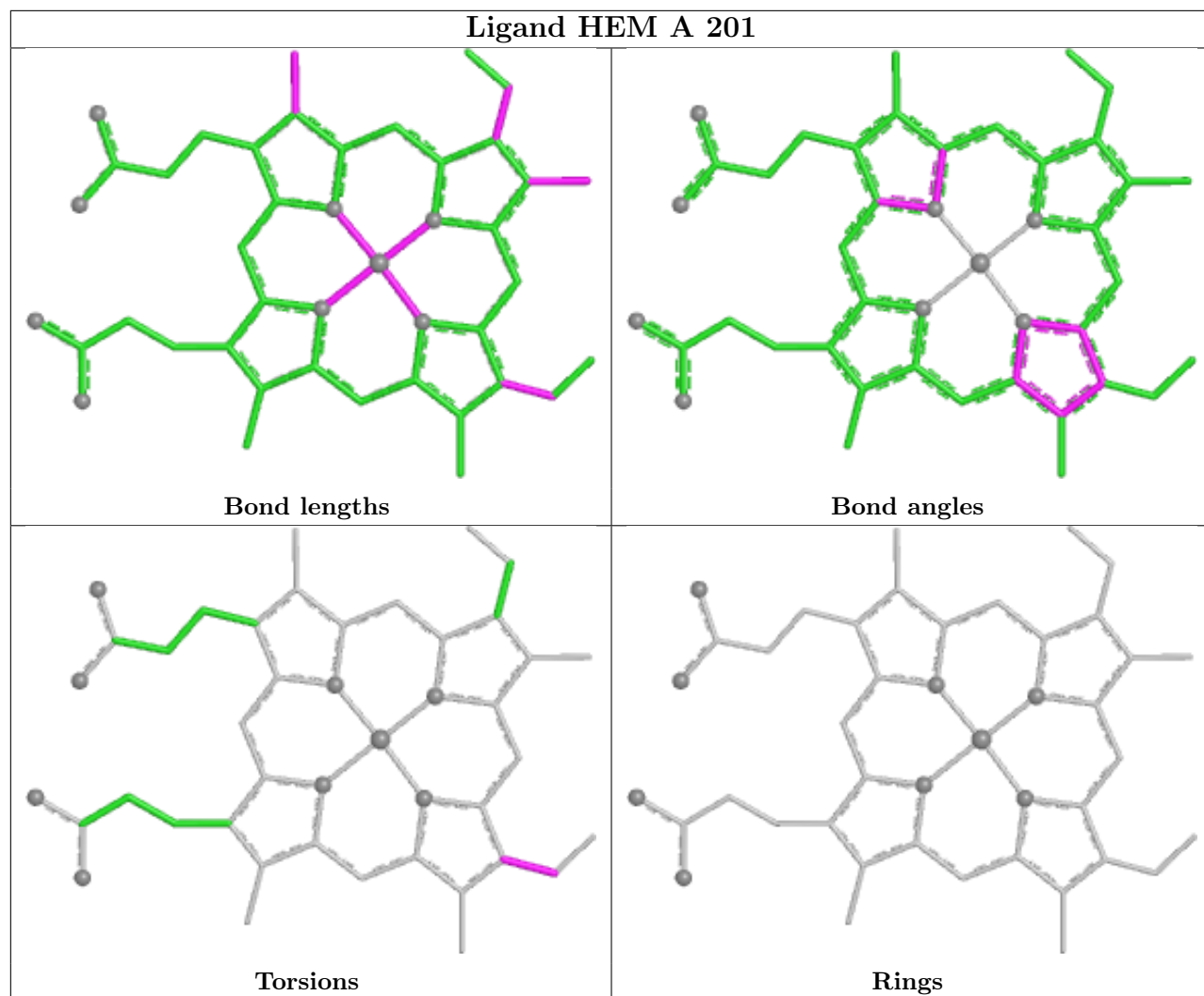
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	201	HEM	3	0
6	C	201	HEM	5	0
6	H	201	HEM	2	0
6	G	201	HEM	3	0

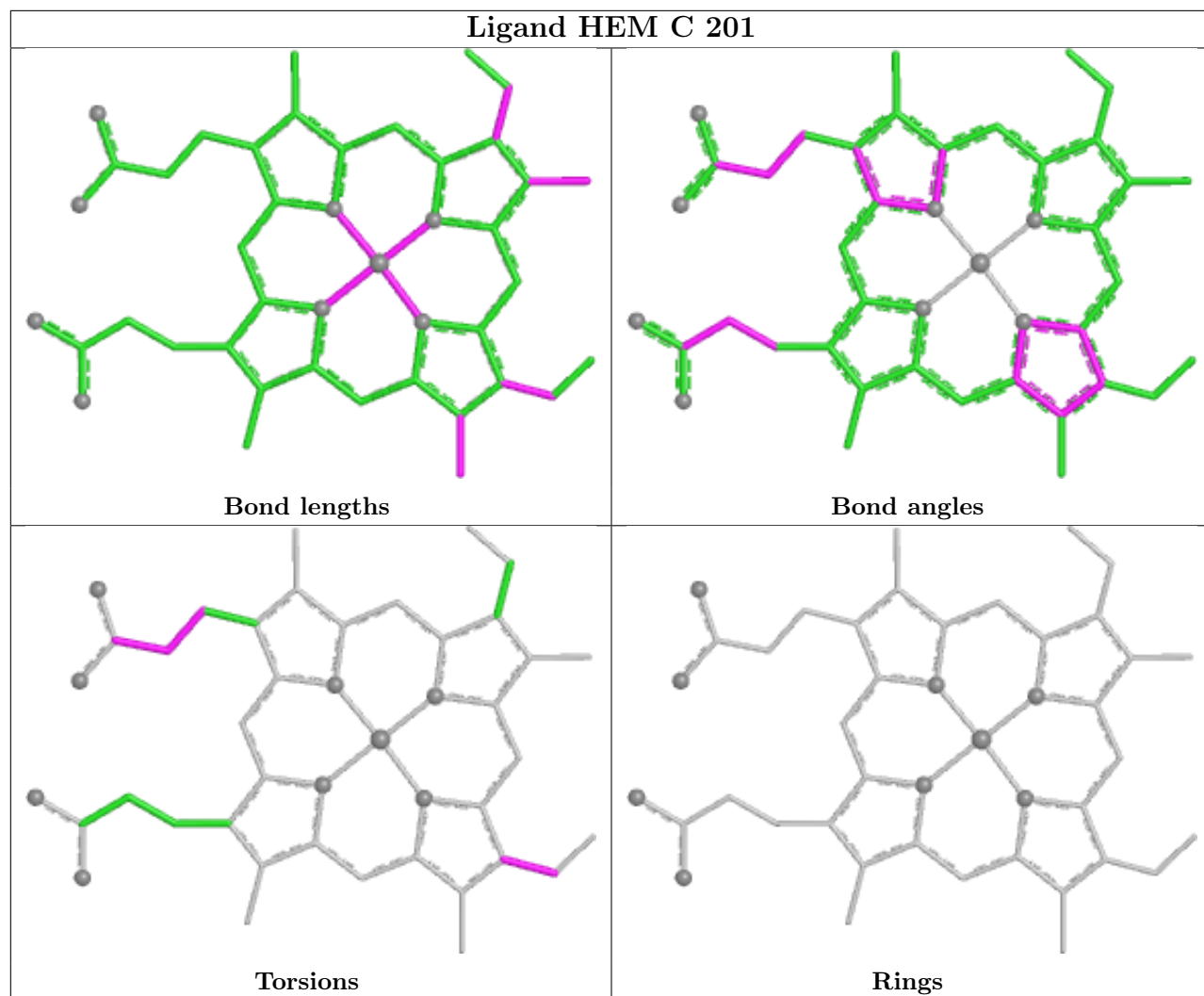
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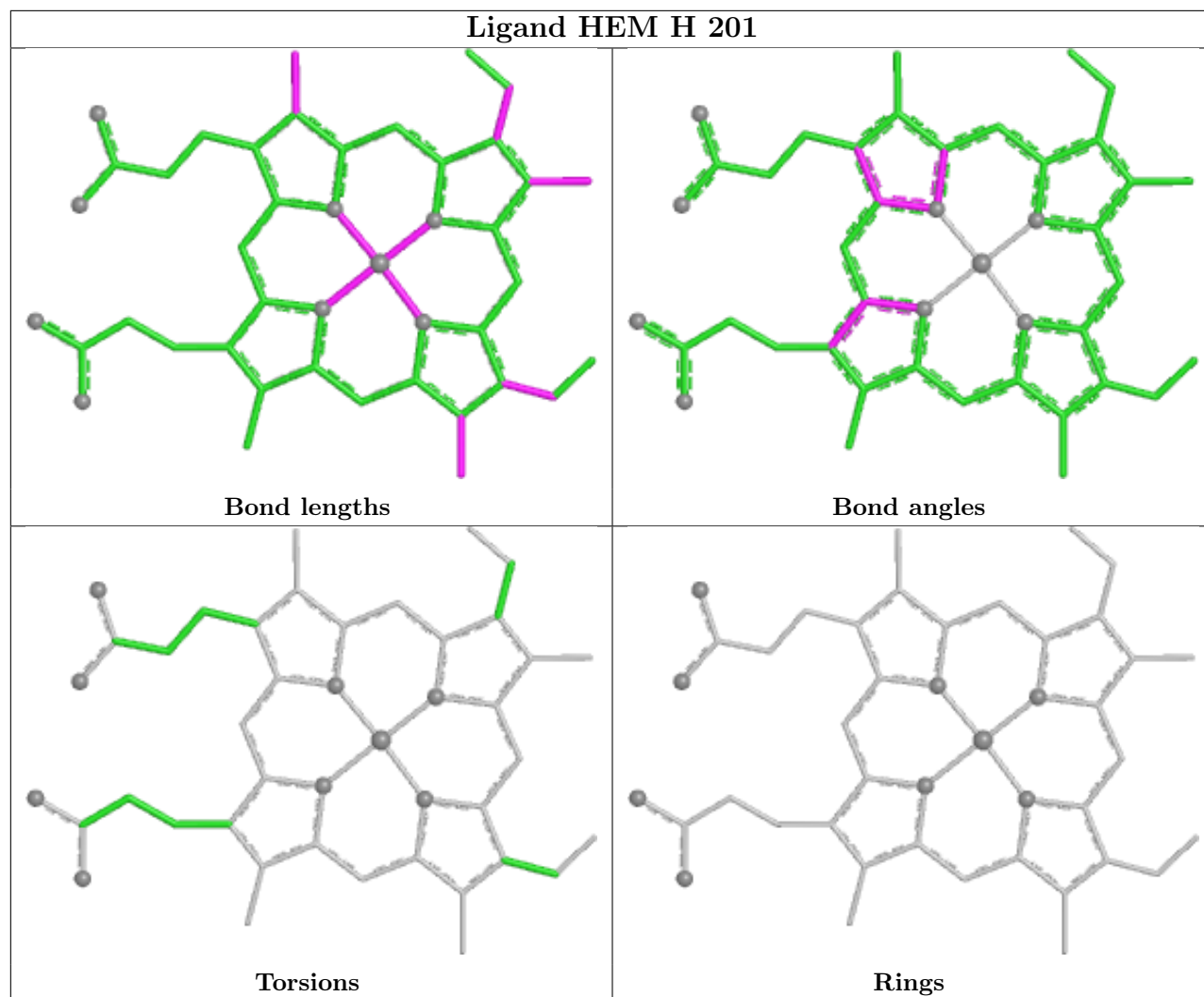
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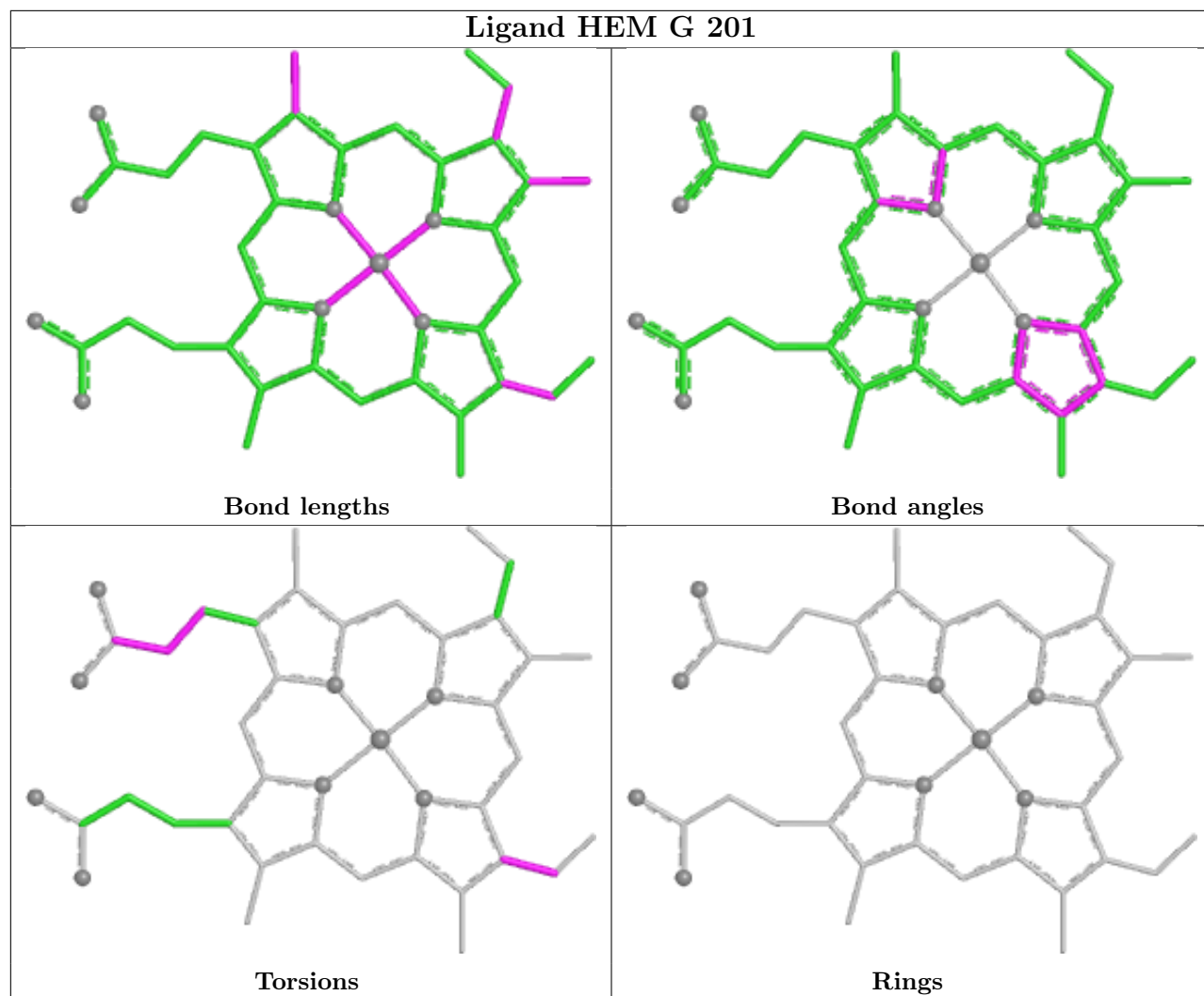
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	D	201	HEM	4	0
6	I	201	HEM	4	0
6	B	201	HEM	2	0
6	J	201	HEM	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

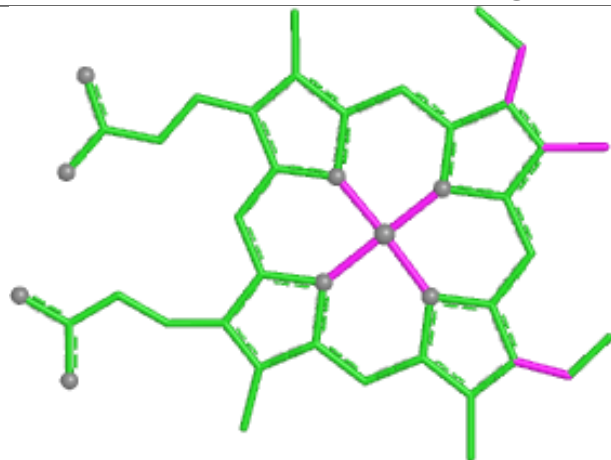




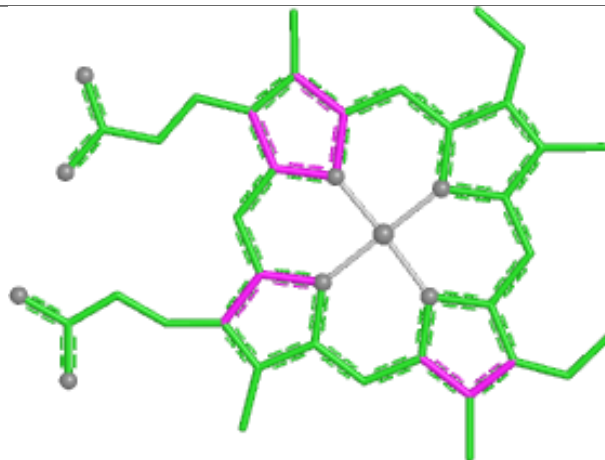




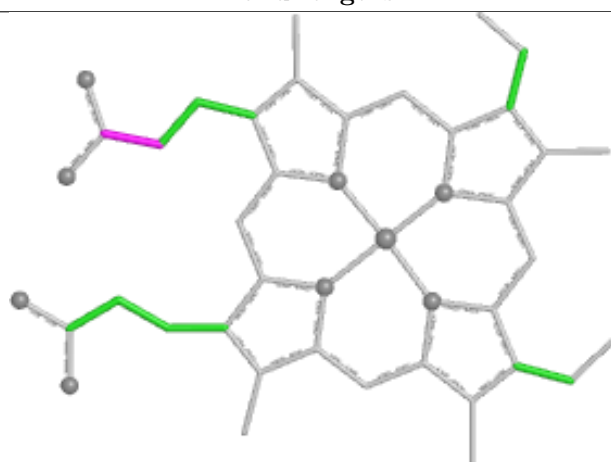
Ligand HEM D 201



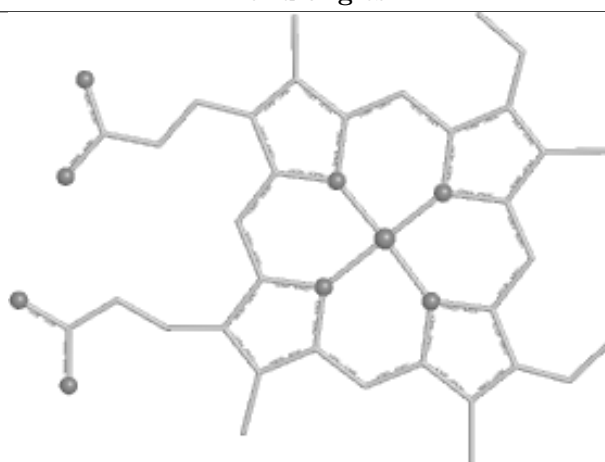
Bond lengths



Bond angles

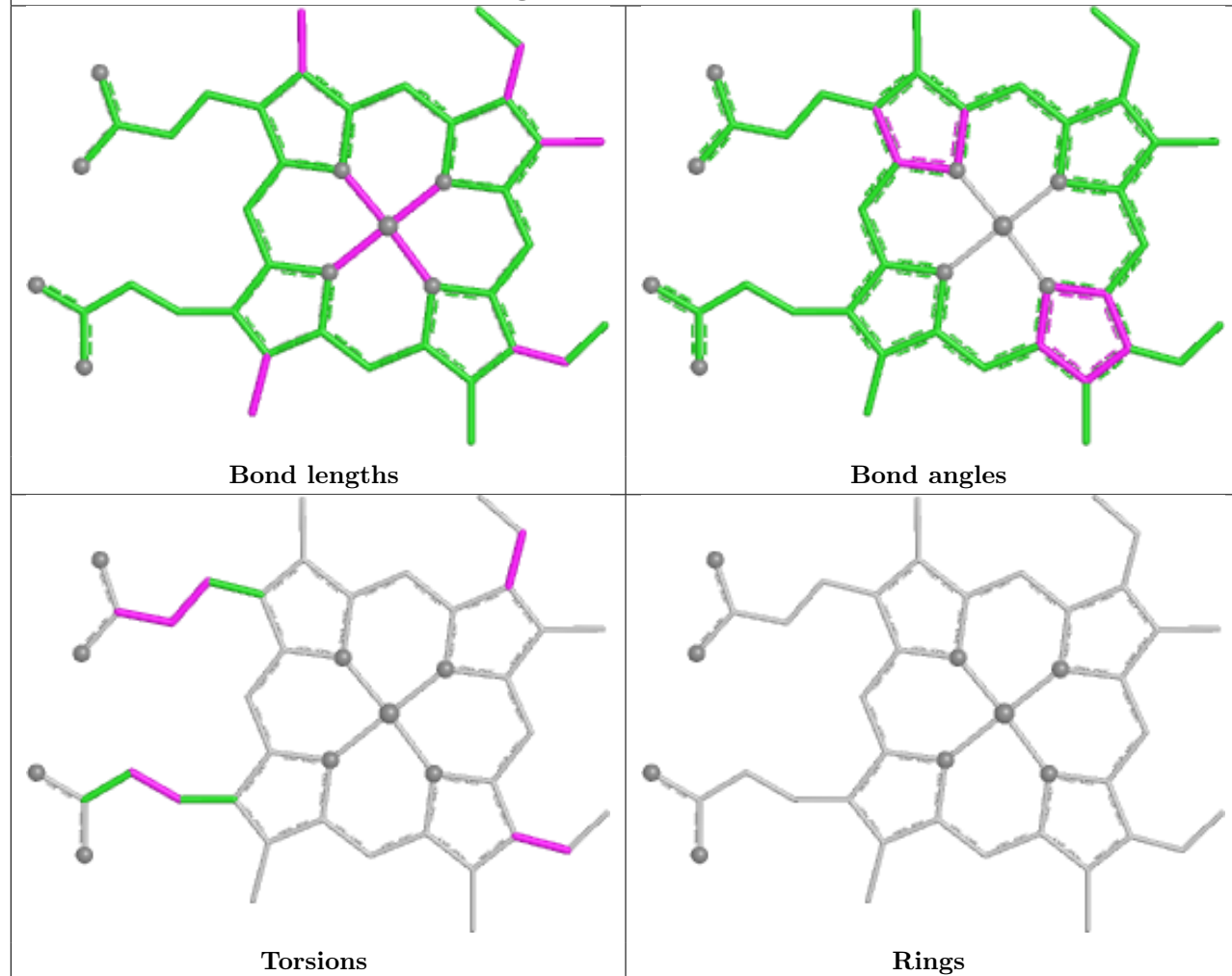


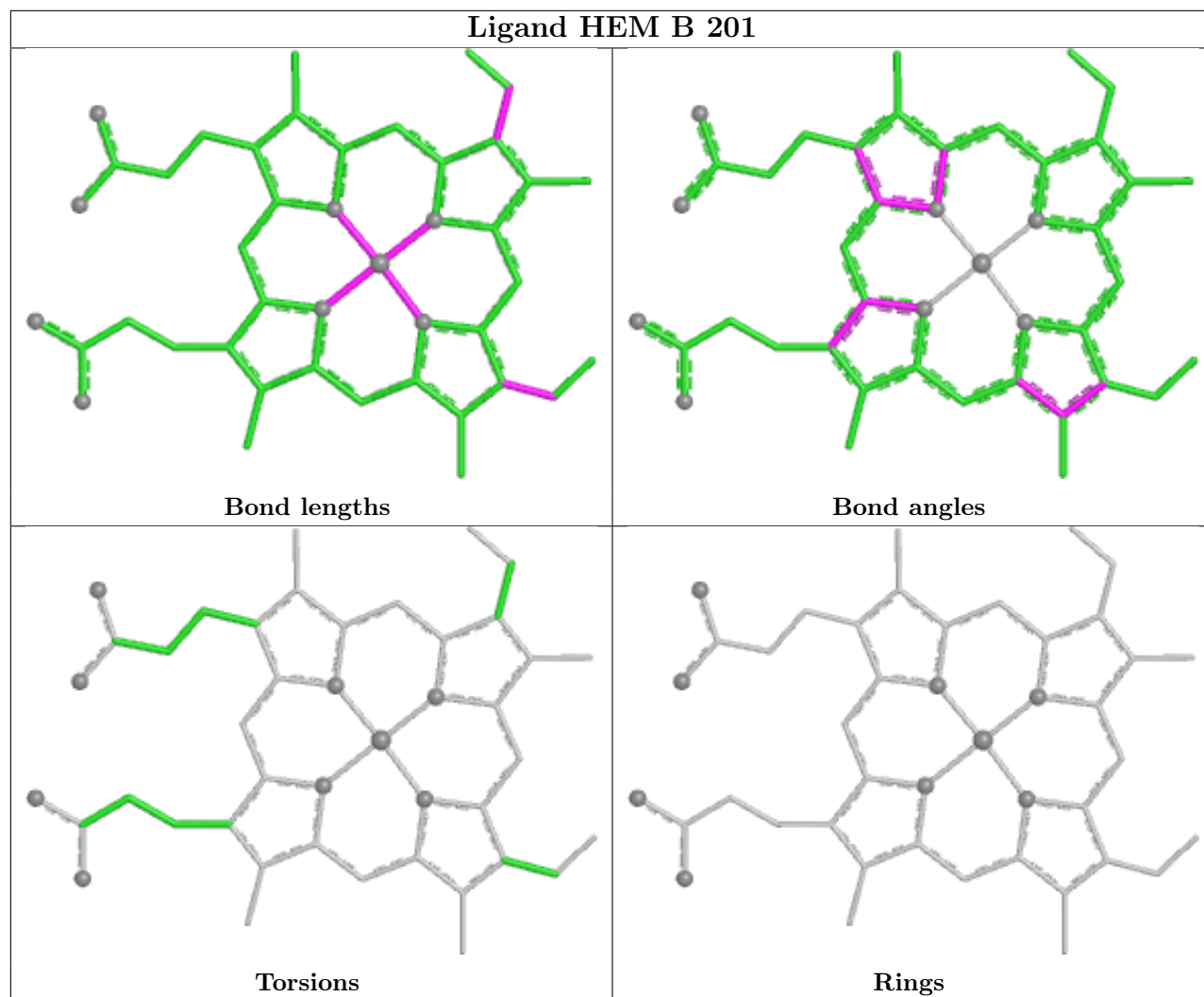
Torsions

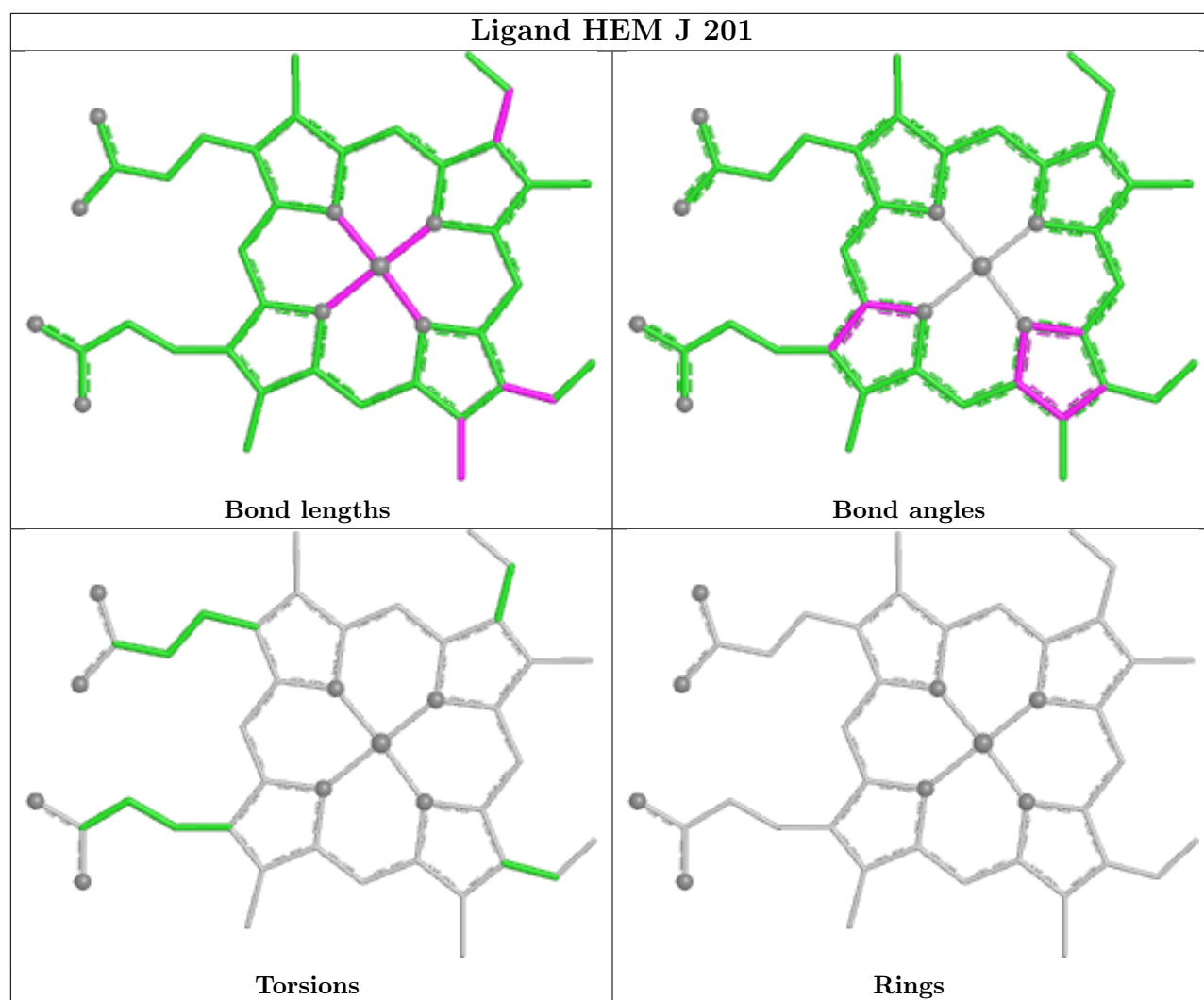


Rings

Ligand HEM I 201







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	141/142 (99%)	-0.11	1 (0%) 84 82	40, 65, 113, 153	0
1	C	141/142 (99%)	0.20	4 (2%) 55 50	45, 75, 110, 191	0
1	G	138/142 (97%)	0.08	1 (0%) 84 82	51, 72, 102, 137	0
1	I	138/142 (97%)	0.19	3 (2%) 62 58	58, 84, 116, 160	0
2	B	146/147 (99%)	-0.27	1 (0%) 84 82	39, 49, 71, 89	0
2	D	146/147 (99%)	-0.05	1 (0%) 84 82	44, 59, 81, 92	0
2	H	145/147 (98%)	0.03	0 100 100	49, 65, 88, 104	0
2	J	145/147 (98%)	-0.05	3 (2%) 63 59	43, 60, 87, 104	0
3	E	215/508 (42%)	-0.18	3 (1%) 73 70	35, 51, 76, 110	0
3	F	215/508 (42%)	0.10	5 (2%) 61 57	50, 73, 112, 144	0
3	K	215/508 (42%)	0.13	7 (3%) 49 43	48, 71, 109, 158	0
3	L	215/508 (42%)	0.04	5 (2%) 61 57	46, 69, 99, 148	0
All	All	2000/3188 (62%)	0.01	34 (1%) 69 65	35, 65, 105, 191	0

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	L	113	ALA	4.7
3	E	174	PRO	4.3
3	F	172	PRO	4.1
1	I	2	VAL	4.0
1	C	2	VAL	3.8
3	K	171	ILE	3.5
3	K	172	PRO	3.5
3	K	278	ASP	3.4
3	F	171	ILE	3.3
3	L	278	ASP	3.0
2	J	144	ARG	3.0

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Mol	Chain	Res	Type	RSRZ
3	L	174	PRO	2.9
3	K	174	PRO	2.8
1	I	139	ALA	2.8
3	K	170	GLU	2.8
2	J	140	HIS	2.6
1	C	138	THR	2.5
3	F	75	ARG	2.5
1	G	46	HIS	2.5
3	K	65	ALA	2.5
3	E	65	ALA	2.5
3	E	64	THR	2.4
1	A	141	TYR	2.4
2	J	2	VAL	2.4
3	F	174	PRO	2.3
1	I	90	HIS	2.3
3	F	173	GLU	2.3
1	C	142	ARG	2.3
3	K	64	THR	2.3
2	D	34	ILE	2.2
2	B	147	HIS	2.1
3	L	64	THR	2.1
1	C	83	LYS	2.0
3	L	65	ALA	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](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	BMA	N	3	11/12	0.18	0.14	134,147,155,161	0
4	BMA	M	3	11/12	0.38	0.14	110,131,142,144	0
4	FUC	N	4	10/11	0.45	0.18	101,109,115,117	10
4	NAG	N	2	14/15	0.51	0.14	115,137,148,152	0
5	NAG	O	1	14/15	0.52	0.12	95,113,119,121	0

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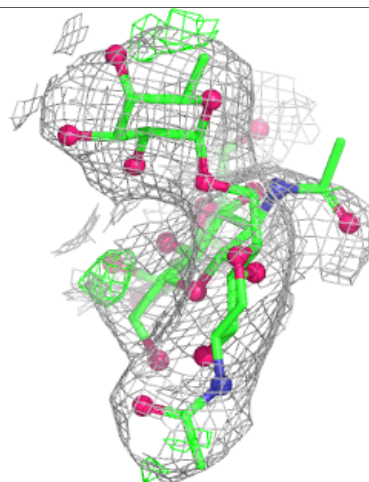
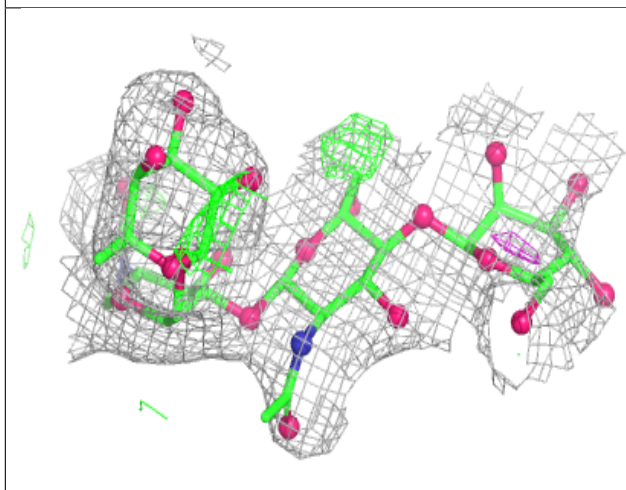
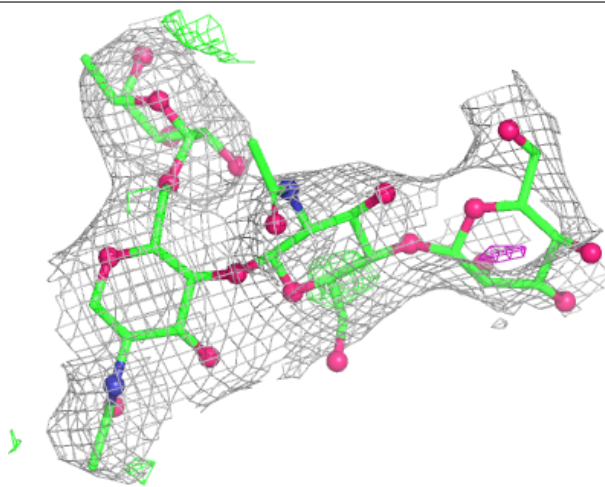
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	FUC	O	2	10/11	0.62	0.14	91,108,114,116	10
4	NAG	N	1	14/15	0.71	0.13	93,117,122,135	14
4	NAG	M	2	14/15	0.76	0.13	79,93,109,121	0
4	NAG	M	1	14/15	0.89	0.08	59,67,76,86	0
4	FUC	M	4	10/11	0.90	0.10	65,74,77,79	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

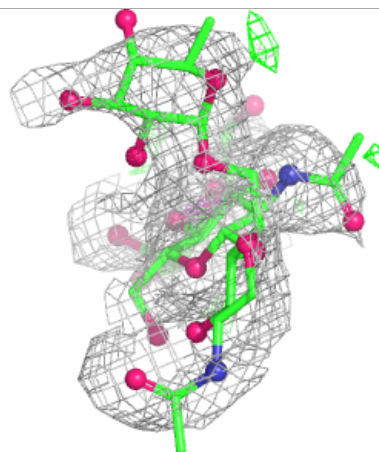
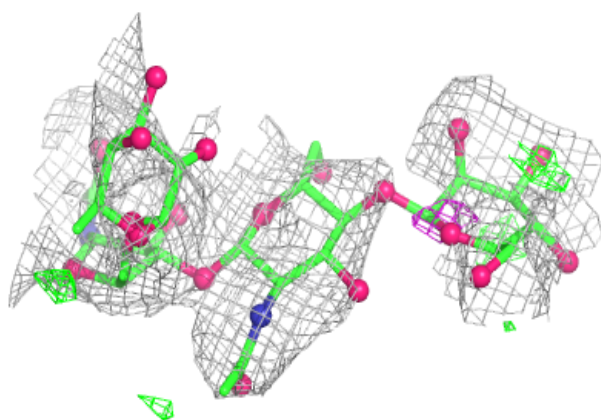
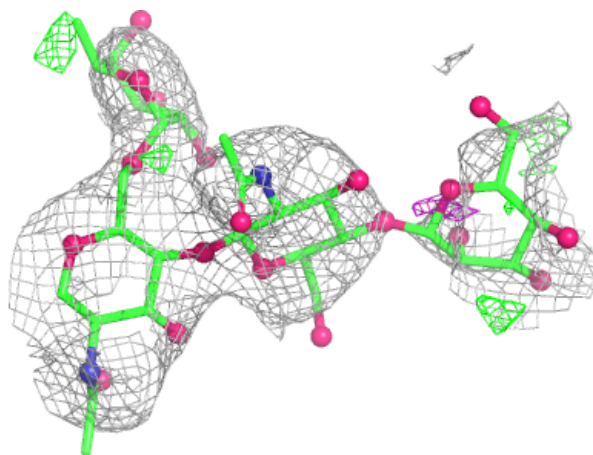
Electron density around Chain M:

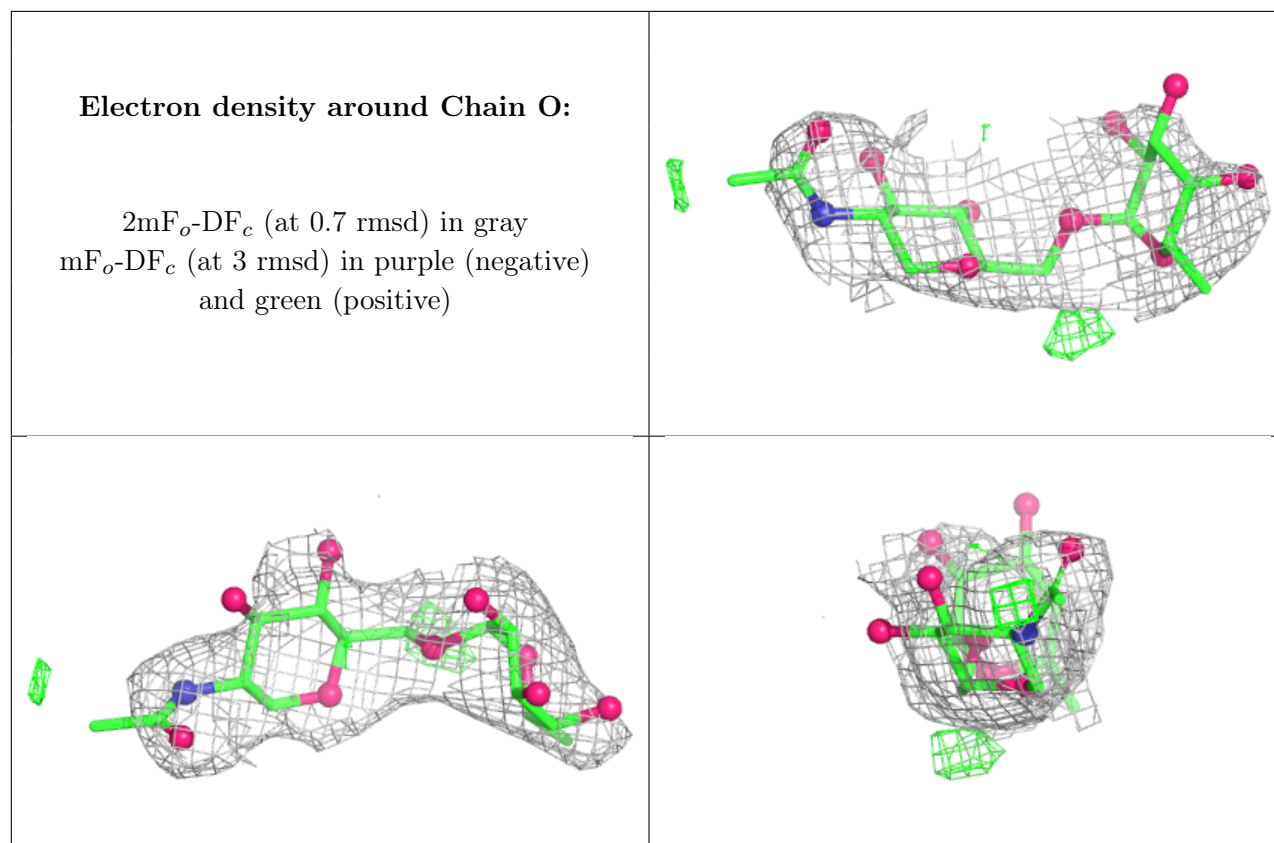
2mF_o-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain N:

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





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(Å ²)	Q<0.9
6	HEM	C	201	43/43	0.95	0.10	52,73,86,99	0
7	CA	E	601	1/1	0.95	0.06	66,66,66,66	0
7	CA	F	602	1/1	0.95	0.05	73,73,73,73	0
6	HEM	I	201	43/43	0.96	0.10	63,81,101,110	0
6	HEM	A	201	43/43	0.97	0.08	45,65,80,88	0
6	HEM	J	201	43/43	0.97	0.09	33,43,51,61	0
6	HEM	G	201	43/43	0.97	0.08	47,62,80,84	0
7	CA	E	602	1/1	0.97	0.06	51,51,51,51	0
6	HEM	H	201	43/43	0.97	0.09	40,49,62,69	0
7	CA	K	601	1/1	0.97	0.10	66,66,66,66	0
7	CA	L	601	1/1	0.97	0.06	76,76,76,76	0
6	HEM	D	201	43/43	0.98	0.09	43,51,61,67	0
6	HEM	B	201	43/43	0.98	0.06	33,43,50,58	0
7	CA	L	602	1/1	0.98	0.03	71,71,71,71	0

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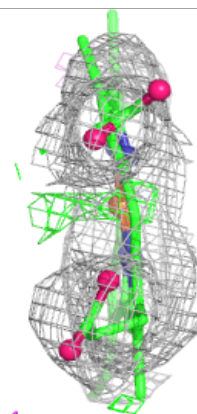
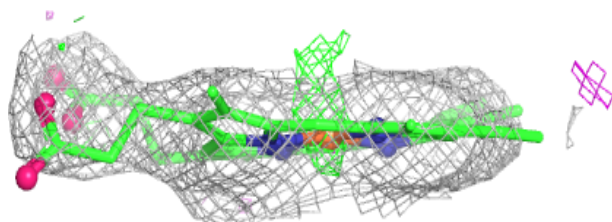
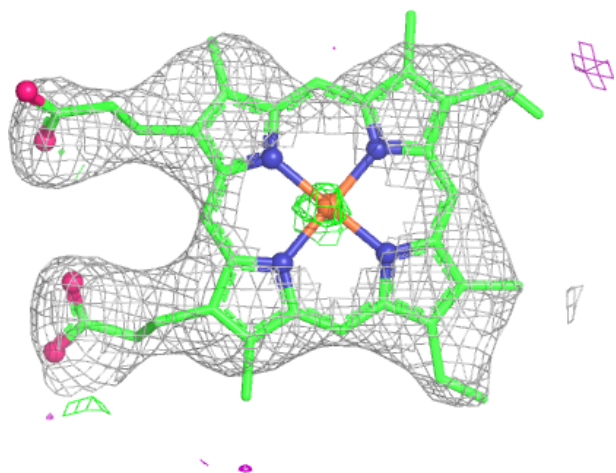
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
7	CA	F	601	1/1	0.99	0.05	74,74,74,74	0
7	CA	K	602	1/1	0.99	0.03	77,77,77,77	0

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.

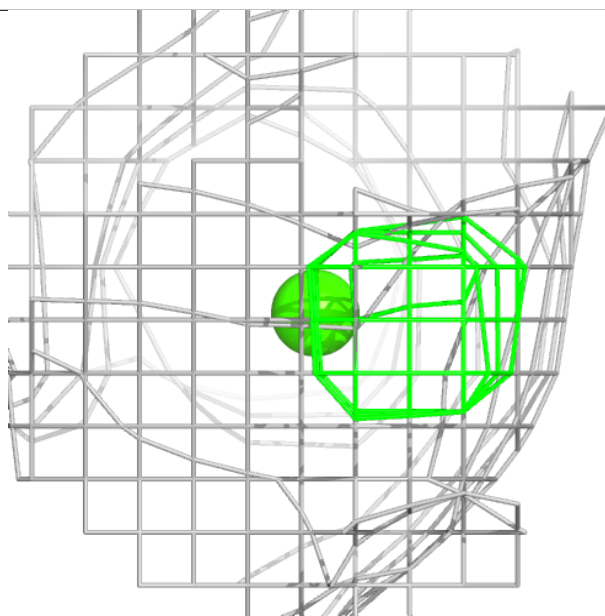
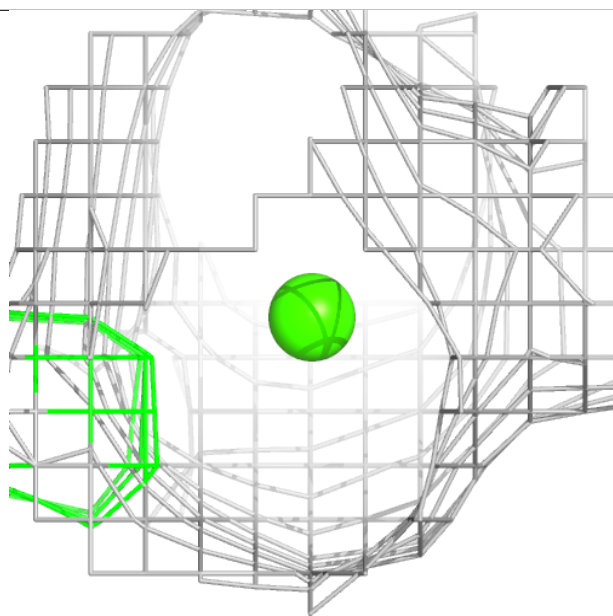
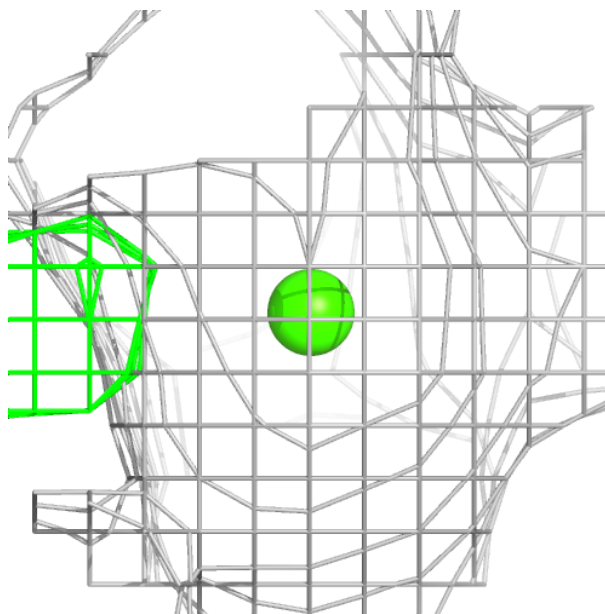
Electron density around HEM C 201:

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



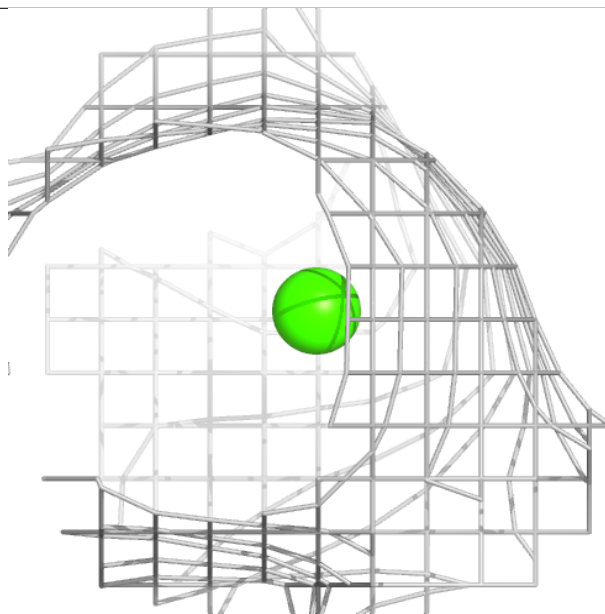
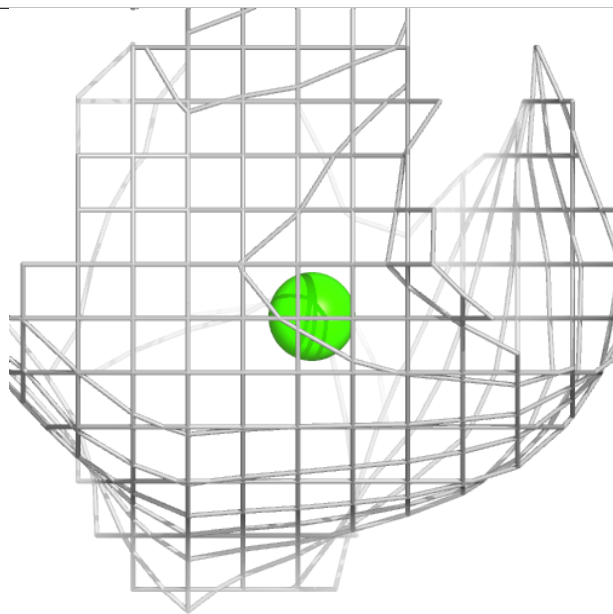
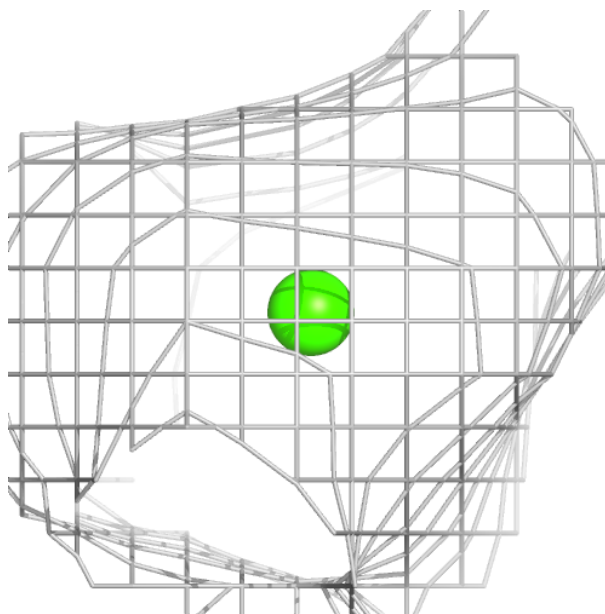
Electron density around CA E 601:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



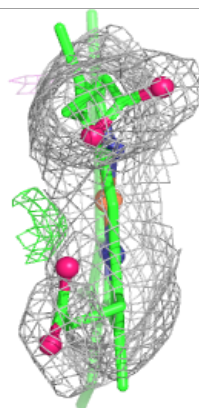
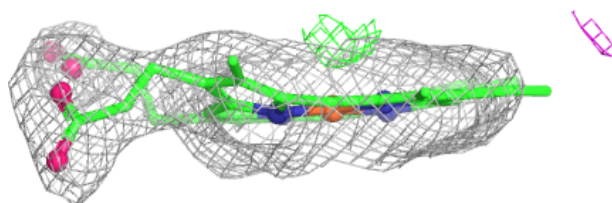
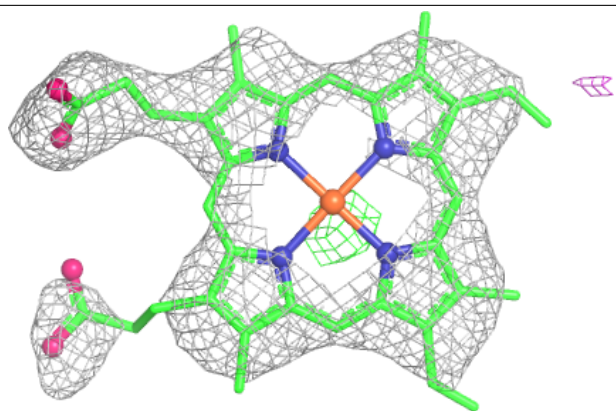
Electron density around CA F 602:

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and green (positive)

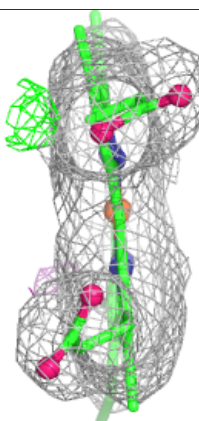
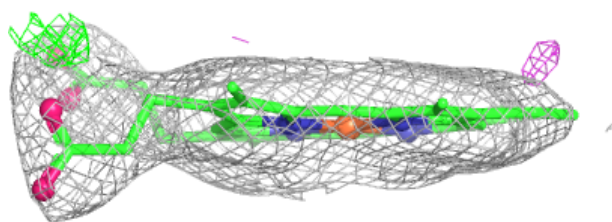
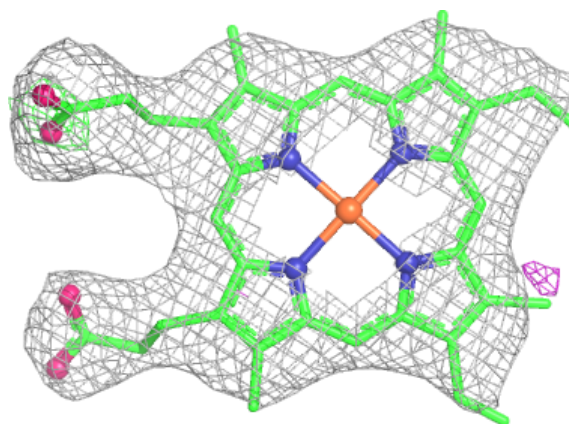


Electron density around HEM I 201:

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and green (positive)

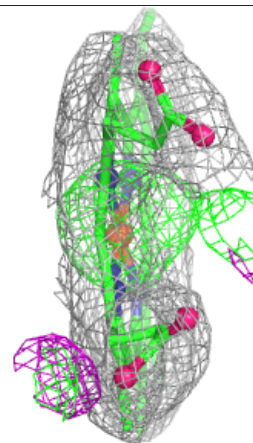
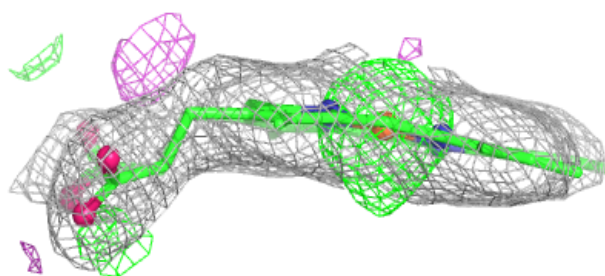
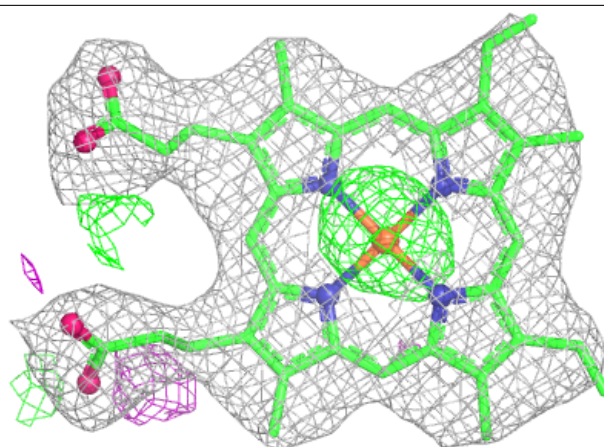
**Electron density around HEM A 201:**

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and green (positive)



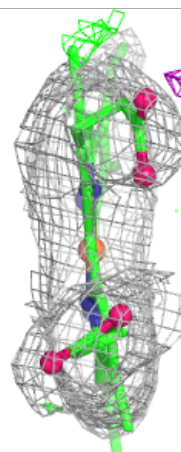
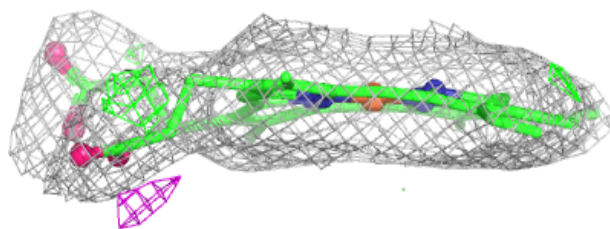
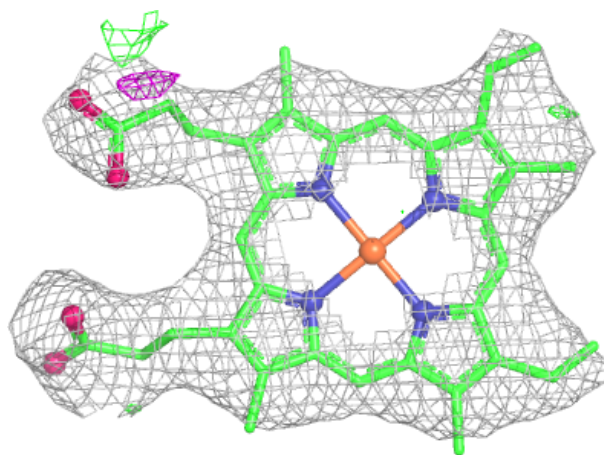
Electron density around HEM J 201:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



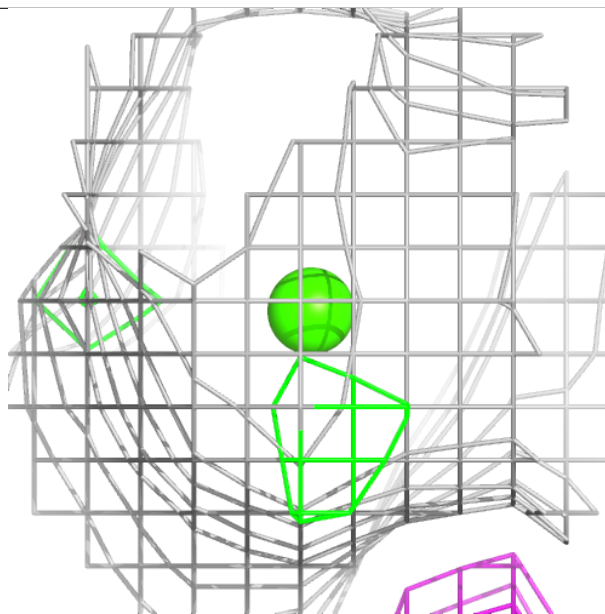
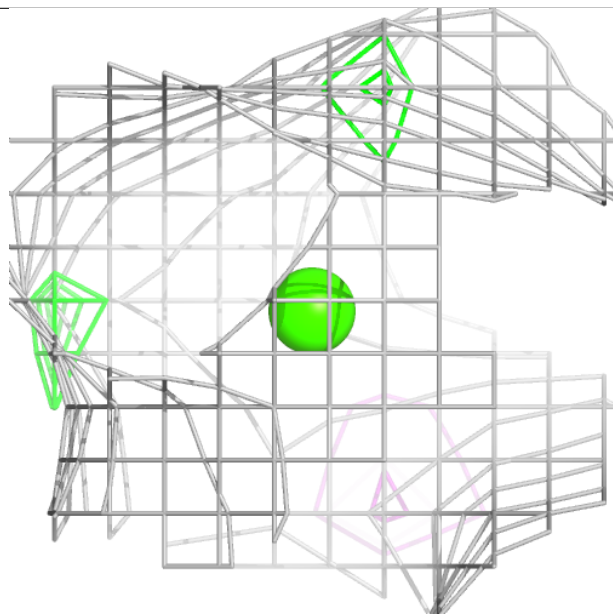
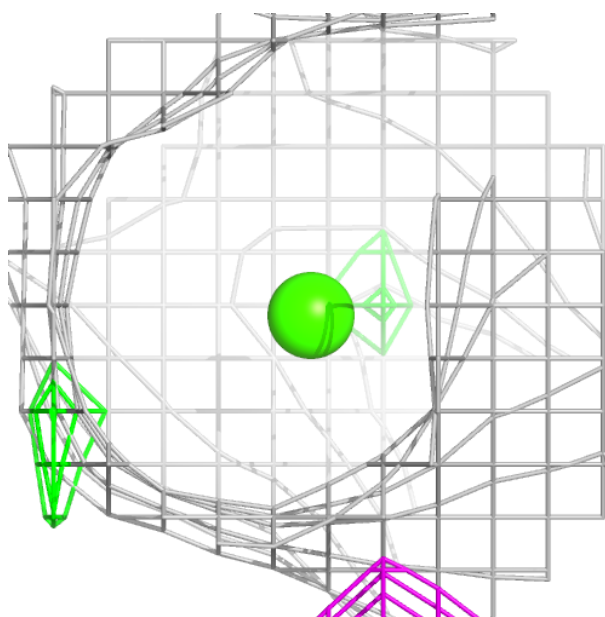
Electron density around HEM G 201:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



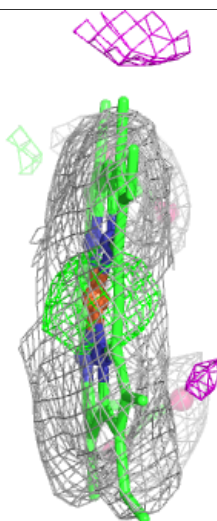
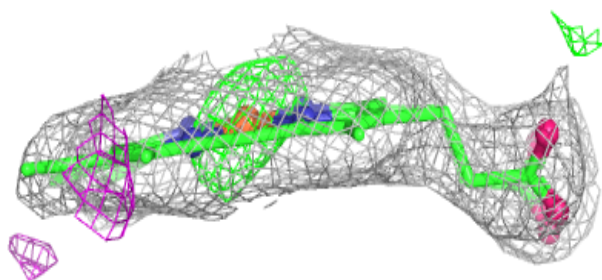
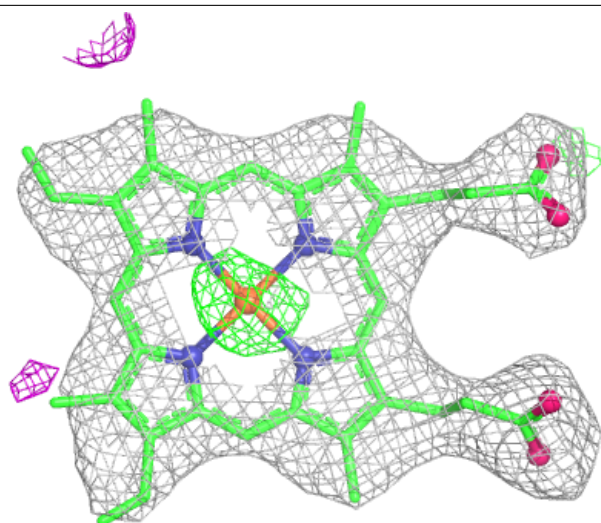
Electron density around CA E 602:

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and green (positive)



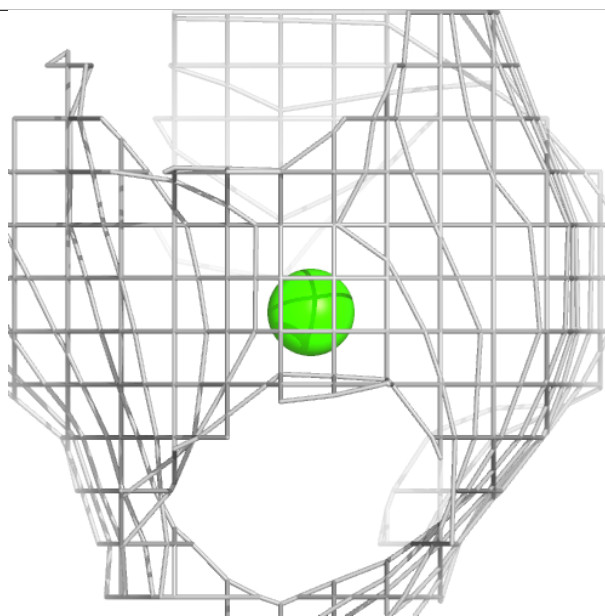
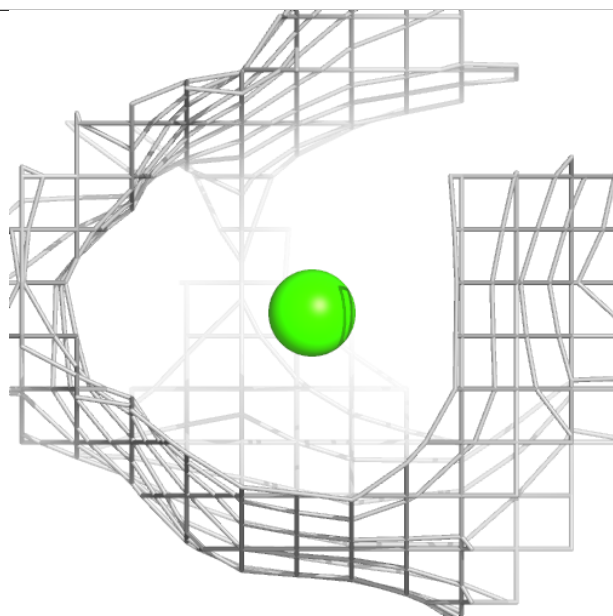
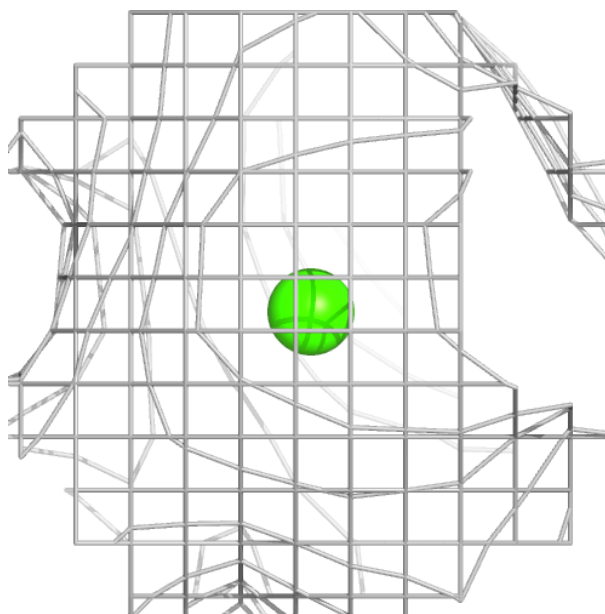
Electron density around HEM H 201:

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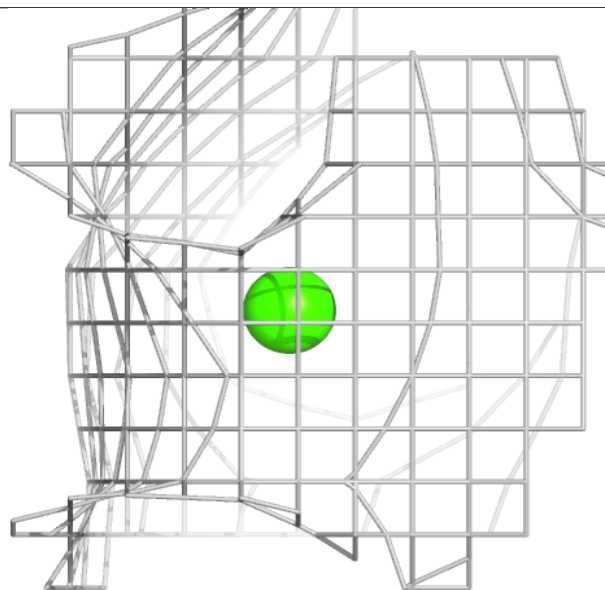
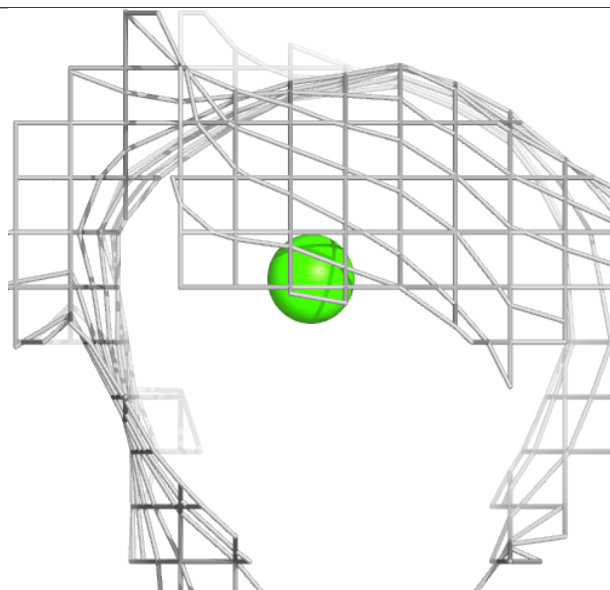
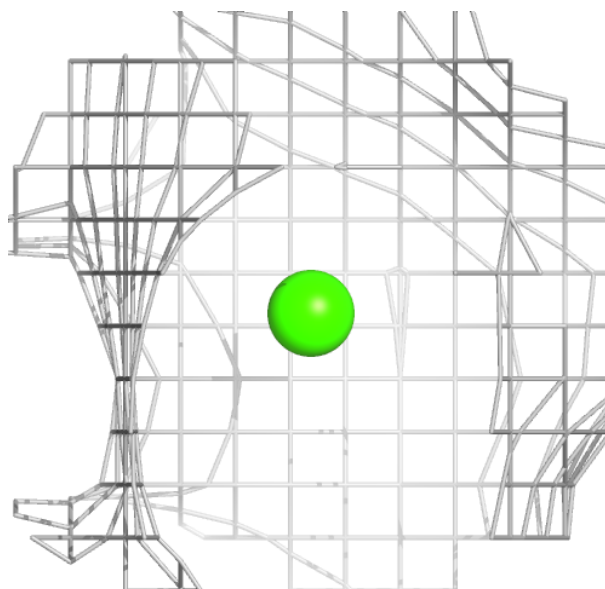
Electron density around CA K 601:

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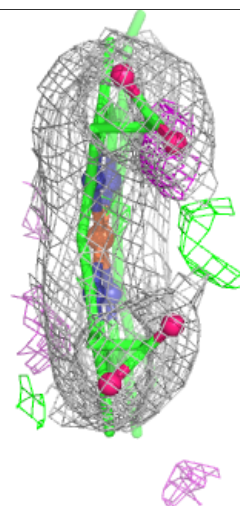
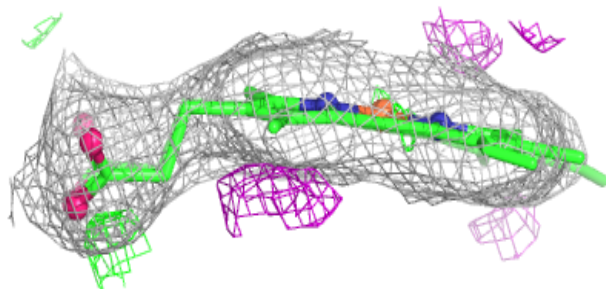
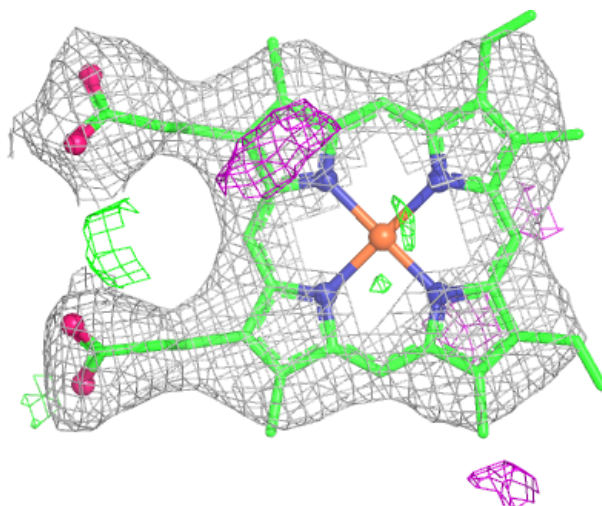
Electron density around CA L 601:

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and green (positive)



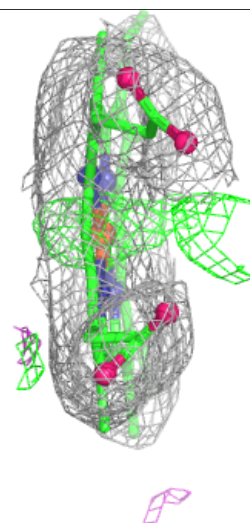
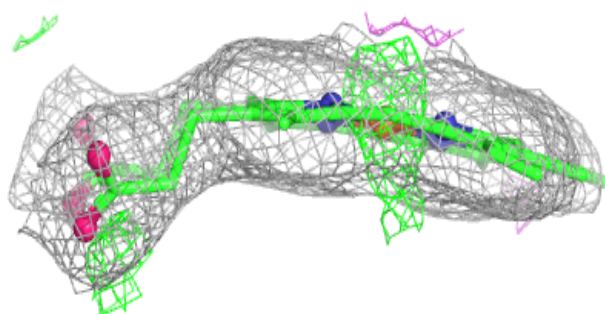
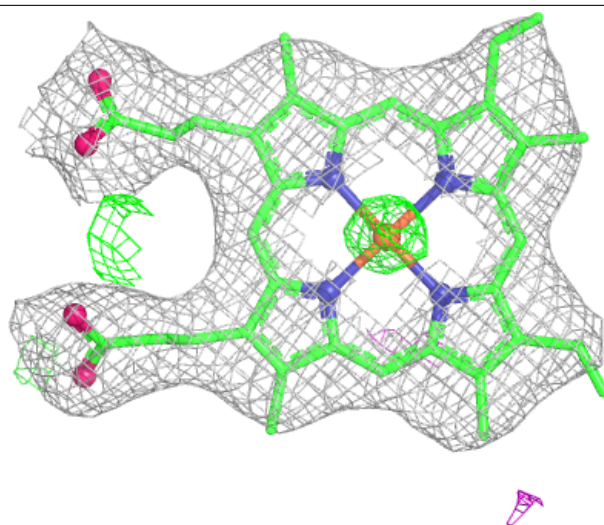
Electron density around HEM D 201:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



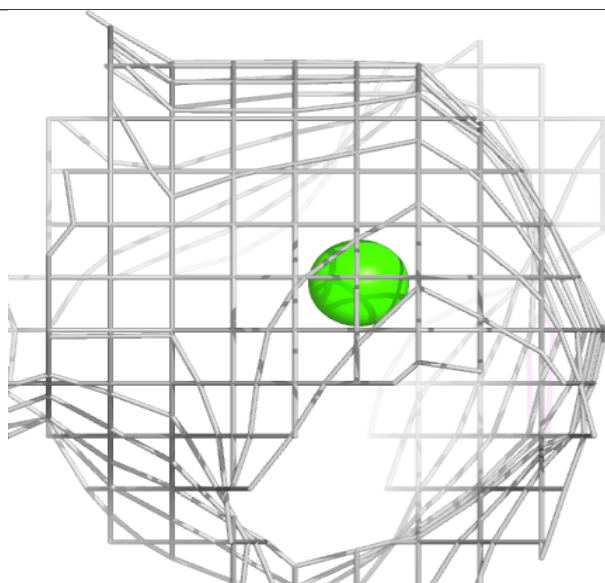
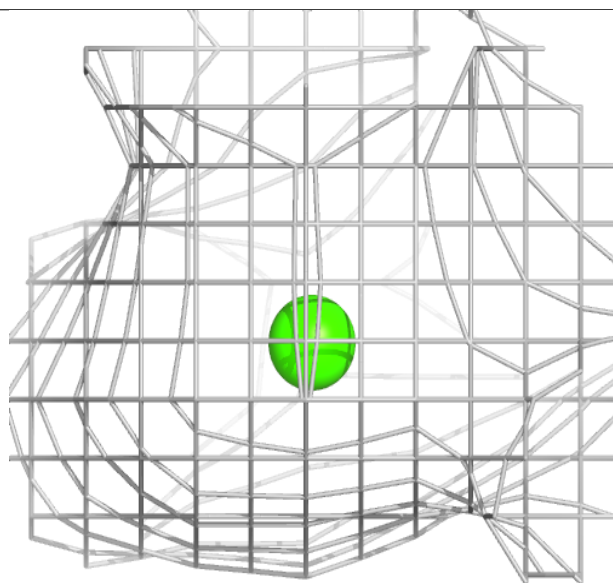
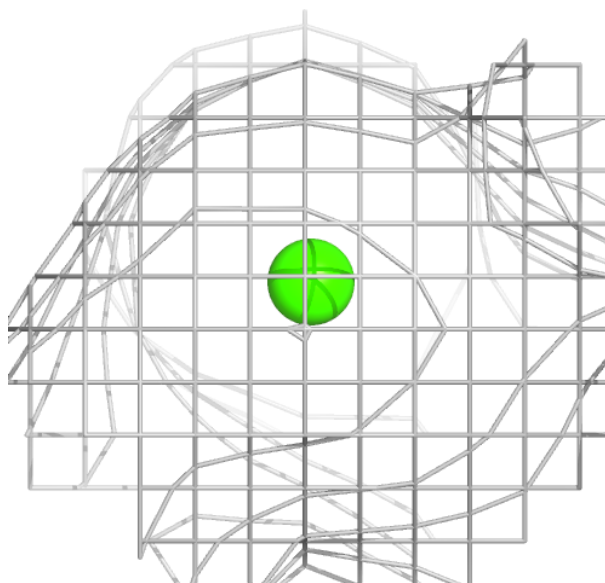
Electron density around HEM B 201:

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



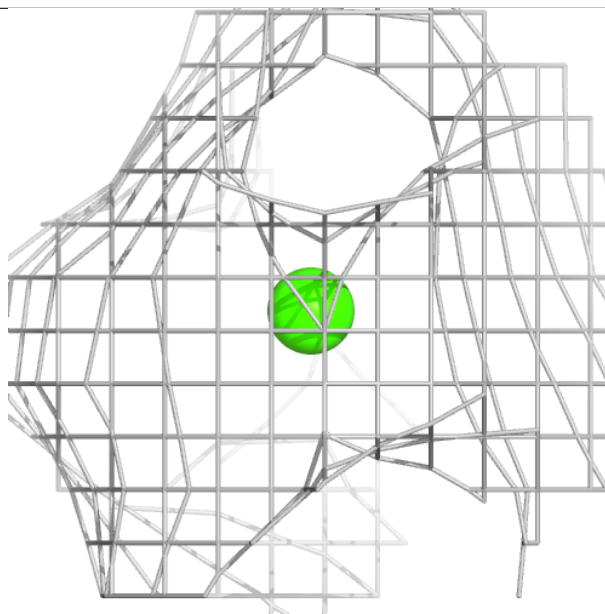
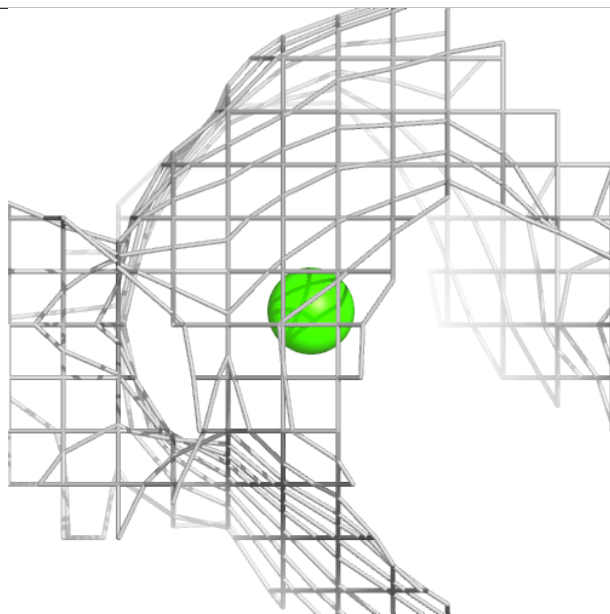
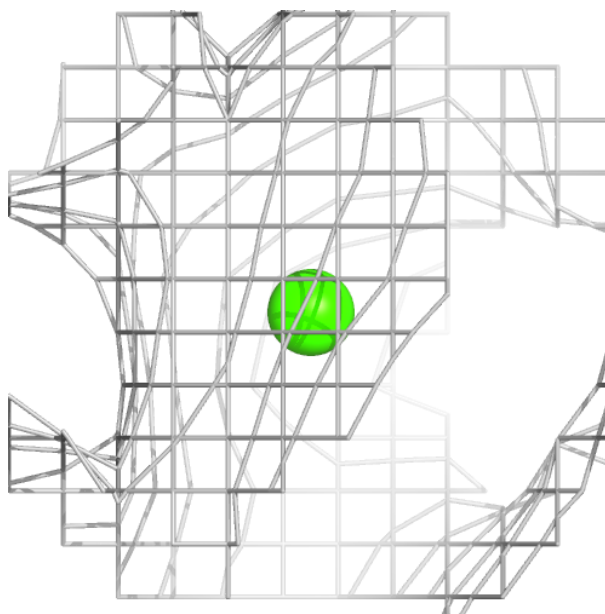
Electron density around CA L 602:

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



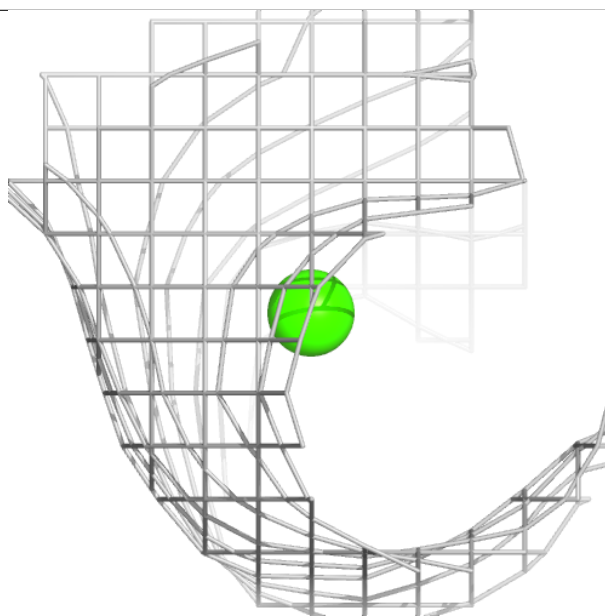
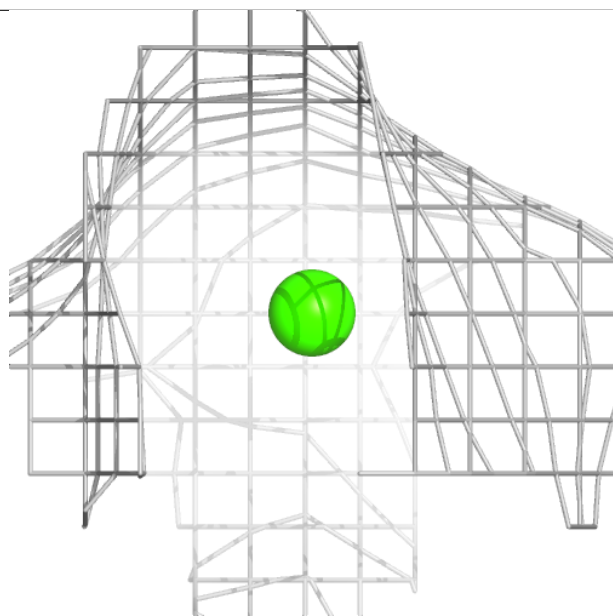
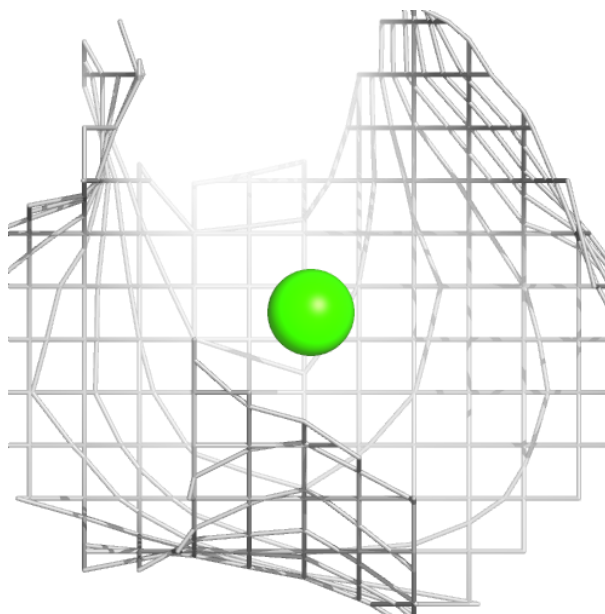
Electron density around CA F 601:

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



Electron density around CA K 602:

$2mF_o-DF_c$ (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.