WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 20, 2023 – 01:29 PM EST

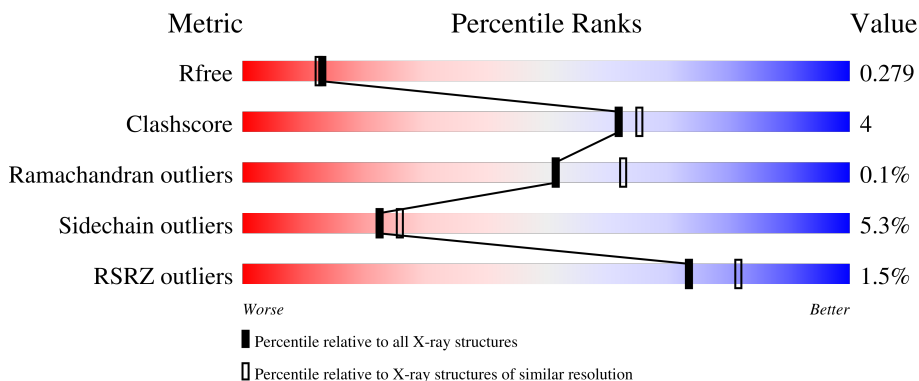|		
PDB ID	:	3T3Z
Title	:	Human Cytochrome P450 2E1 in complex with pilocarpine
Authors	:	Meneely, K.M.; DeVore, N.M.; Scott, E.E.
Deposited on	:	2011-07-25
Resolution	:	2.35 Å(reported)

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 2.35 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.
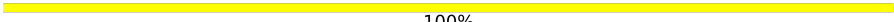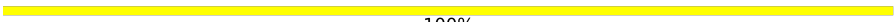
Metric	Percentile Ranks	Value
Rfree		0.279
Clashscore		4
Ramachandran outliers		0.1%
Sidechain outliers		5.3%
RSRZ outliers		1.5%

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	1164 (2.36-2.36)
Clashscore	141614	1232 (2.36-2.36)
Ramachandran outliers	138981	1211 (2.36-2.36)
Sidechain outliers	138945	1212 (2.36-2.36)
RSRZ outliers	127900	1150 (2.36-2.36)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	476	2% / 86% 11% · ·
1	B	476	84% 12% · ·
1	C	476	2% / 84% 12% · ·
1	D	476	2% / 86% 11% · ·
2	E	2	100%

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Mol	Chain	Length	Quality of chain
2	F	2	100%
2	G	2	100%
2	H	2	100%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 16204 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Cytochrome P450 2E1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	464	Total 3799	C 2458	N 651	O 672	S 18	0	2	0
1	B	464	Total 3793	C 2454	N 651	O 670	S 18	0	1	0
1	C	464	Total 3787	C 2450	N 651	O 668	S 18	0	0	0
1	D	464	Total 3787	C 2450	N 651	O 668	S 18	0	0	0

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	22	MET	-	expression tag	UNP P05181
A	23	ALA	-	expression tag	UNP P05181
A	24	LYS	-	expression tag	UNP P05181
A	25	LYS	-	expression tag	UNP P05181
A	26	THR	-	expression tag	UNP P05181
A	27	SER	-	expression tag	UNP P05181
A	28	SER	-	expression tag	UNP P05181
A	29	LYS	-	expression tag	UNP P05181
A	30	GLY	-	expression tag	UNP P05181
A	31	LYS	-	expression tag	UNP P05181
A	494	HIS	-	expression tag	UNP P05181
A	495	HIS	-	expression tag	UNP P05181
A	496	HIS	-	expression tag	UNP P05181
A	497	HIS	-	expression tag	UNP P05181
B	22	MET	-	expression tag	UNP P05181
B	23	ALA	-	expression tag	UNP P05181
B	24	LYS	-	expression tag	UNP P05181
B	25	LYS	-	expression tag	UNP P05181
B	26	THR	-	expression tag	UNP P05181
B	27	SER	-	expression tag	UNP P05181
B	28	SER	-	expression tag	UNP P05181

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Chain	Residue	Modelled	Actual	Comment	Reference
B	29	LYS	-	expression tag	UNP P05181
B	30	GLY	-	expression tag	UNP P05181
B	31	LYS	-	expression tag	UNP P05181
B	494	HIS	-	expression tag	UNP P05181
B	495	HIS	-	expression tag	UNP P05181
B	496	HIS	-	expression tag	UNP P05181
B	497	HIS	-	expression tag	UNP P05181
C	22	MET	-	expression tag	UNP P05181
C	23	ALA	-	expression tag	UNP P05181
C	24	LYS	-	expression tag	UNP P05181
C	25	LYS	-	expression tag	UNP P05181
C	26	THR	-	expression tag	UNP P05181
C	27	SER	-	expression tag	UNP P05181
C	28	SER	-	expression tag	UNP P05181
C	29	LYS	-	expression tag	UNP P05181
C	30	GLY	-	expression tag	UNP P05181
C	31	LYS	-	expression tag	UNP P05181
C	494	HIS	-	expression tag	UNP P05181
C	495	HIS	-	expression tag	UNP P05181
C	496	HIS	-	expression tag	UNP P05181
C	497	HIS	-	expression tag	UNP P05181
D	22	MET	-	expression tag	UNP P05181
D	23	ALA	-	expression tag	UNP P05181
D	24	LYS	-	expression tag	UNP P05181
D	25	LYS	-	expression tag	UNP P05181
D	26	THR	-	expression tag	UNP P05181
D	27	SER	-	expression tag	UNP P05181
D	28	SER	-	expression tag	UNP P05181
D	29	LYS	-	expression tag	UNP P05181
D	30	GLY	-	expression tag	UNP P05181
D	31	LYS	-	expression tag	UNP P05181
D	494	HIS	-	expression tag	UNP P05181
D	495	HIS	-	expression tag	UNP P05181
D	496	HIS	-	expression tag	UNP P05181
D	497	HIS	-	expression tag	UNP P05181

- Molecule 2 is an oligosaccharide called beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose.
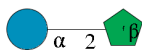
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	E	2	Total 23	C 12	O 11	0	0	0
2	F	2	Total 23	C 12	O 11	0	0	0
2	G	2	Total 23	C 12	O 11	0	0	0
2	H	2	Total 23	C 12	O 11	0	0	0

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

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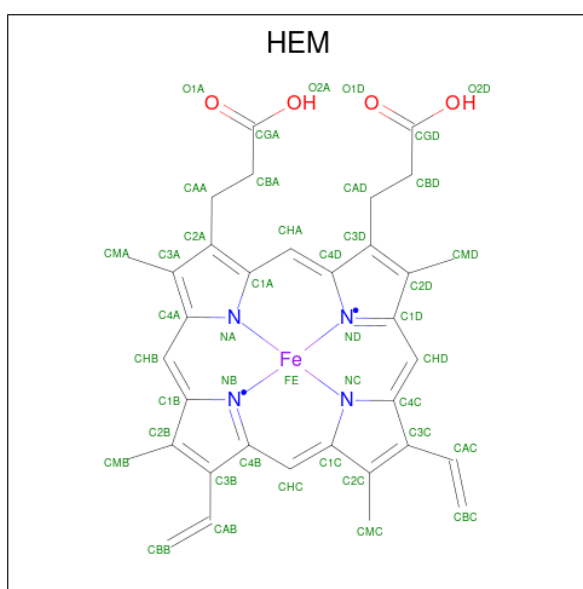
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	C	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	D	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 4 is (3S,4R)-3-ethyl-4-[(1-methyl-1H-imidazol-5-yl)methyl]dihydrofuran-2(3H)-one (three-letter code: 9PL) (formula: $C_{11}H_{16}N_2O_2$).

9PL
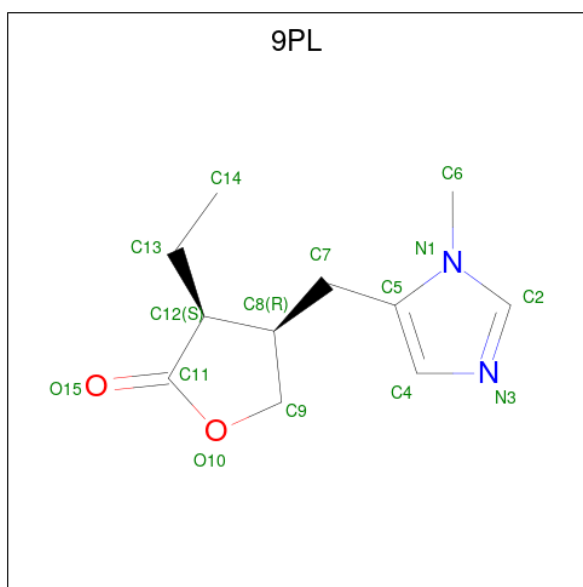
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			15	11	2	2		
4	B	1	Total	C	N	O	0	0
			15	11	2	2		
4	C	1	Total	C	N	O	0	0
			15	11	2	2		
4	D	1	Total	C	N	O	0	0
			15	11	2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	202	Total	O	0	0
			202	202		
5	B	202	Total	O	0	0
			202	202		
5	C	151	Total	O	0	0
			151	151		
5	D	159	Total	O	0	0
			159	159		

3 Residue-property plots ⓘ
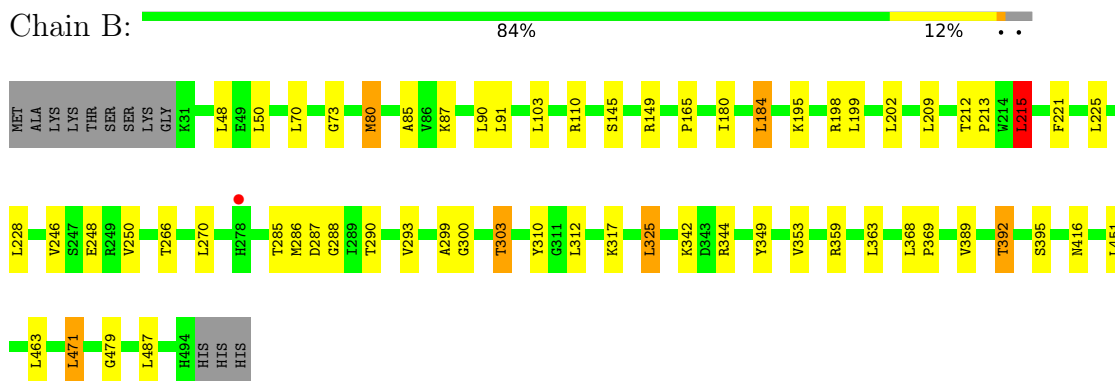
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.
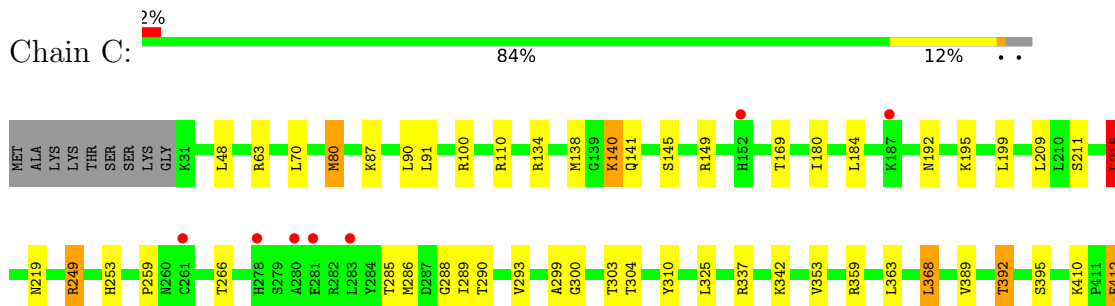
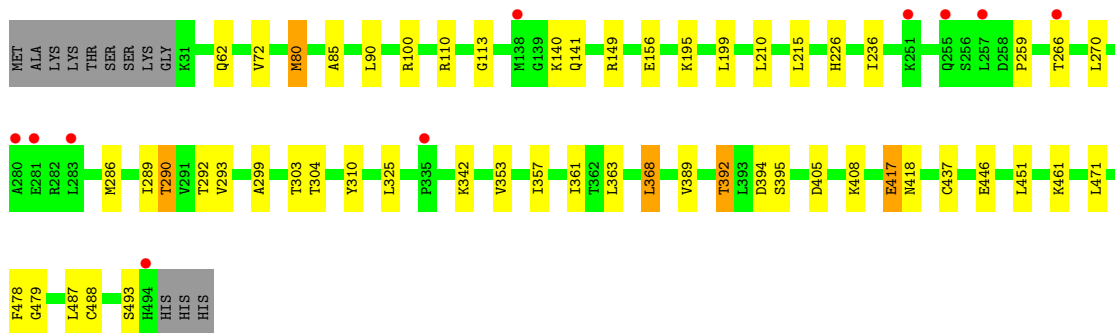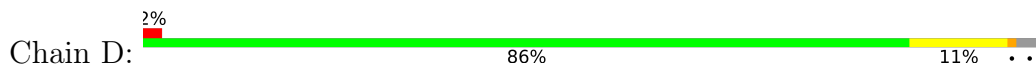• Molecule 1: Cytochrome P450 2E1
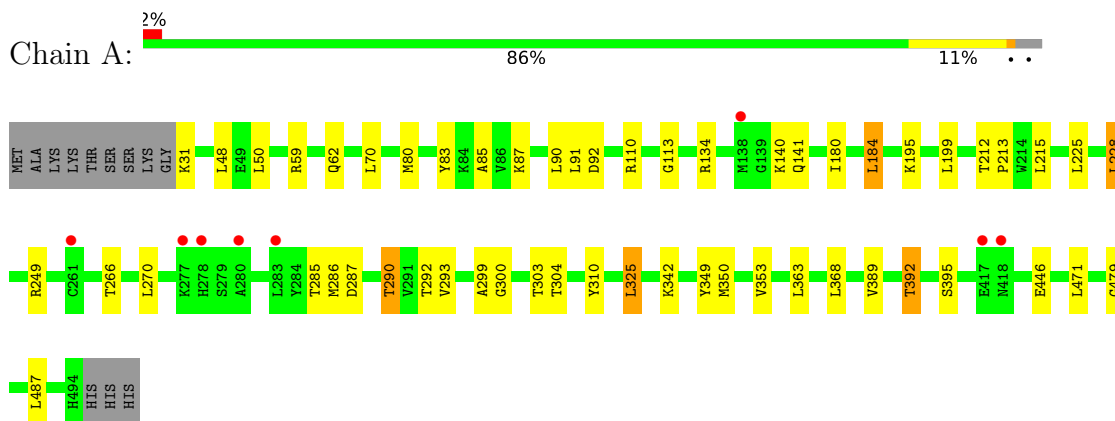
Chain A:

• Molecule 1: Cytochrome P450 2E1

Chain B:

• Molecule 1: Cytochrome P450 2E1

Chain C:

N416 E417 R435 E446 K461 L471 G477 F478 G479 L487 C488 V489 I490 P491 H494 HIS HIS HIS

• Molecule 1: Cytochrome P450 2E1

Chain D:

2%

86%   11%

MET ALA LYS LYS THR SER SER LYS GLY K31 Q62 V72 M80 A85 L90 R100 R110 G113 M138 G139 K140 Q141 R149 E156 K195 L199 L210 L215 H226 I236 K251 Q255 S256 L257 D258 P259 T266 L270

A280 E281 R282 L283 M286 I289 T290 V291 T292 V293 A299 T303 T304 Y310 L325 P335 K342 V353 I357 I361 T362 L363 L368 V389 T392 L393 D394 S395 D405 K408 E417 N418 C437 E446 L451 K461 L471

F478 G479 L487 C488 S493 H494 HIS HIS HIS

• Molecule 2: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose

Chain E: 100%

GLC1 FRU2

• Molecule 2: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose

Chain F: 100%

GLC1 FRU2

• Molecule 2: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose

Chain G: 100%

GLC1 FRU2

• Molecule 2: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose

Chain H: 100%

GLC1 FRU2
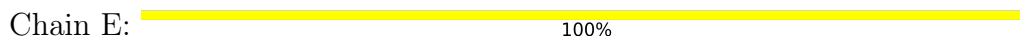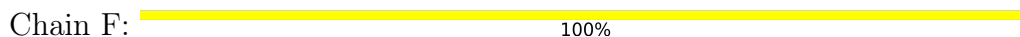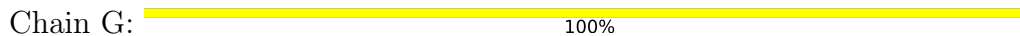
4   Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, α, β, γ	100.64Å 100.64Å 259.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.98 – 2.35 36.98 – 2.35	Depositor EDS
% Data completeness (in resolution range)	95.9 (36.98-2.35) 95.9 (36.98-2.35)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.21 (at 2.34Å)	Xtriage
Refinement program	REFMAC 6.1.13	Depositor
R, R_{free}	0.217 , 0.281 0.222 , 0.279	Depositor DCC
R_{free} test set	5096 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å^2)	33.4	Xtriage
Anisotropy	0.057	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 19.0	EDS
L-test for twinning[2]	$< |L| > = 0.52, < L^2 > = 0.35$	Xtriage
Estimated twinning fraction	0.448 for h,-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	16204	wwPDB-VP
Average B, all atoms (Å^2)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 72.68 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.1083e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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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, FRU, 9PL, GLC

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	0.48	0/3911	0.59	0/5296
1	B	0.48	0/3902	0.60	1/5284 (0.0%)
1	C	0.47	0/3893	0.58	2/5272 (0.0%)
1	D	0.46	0/3893	0.57	0/5272
All	All	0.47	0/15599	0.59	3/21124 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	215	LEU	CA-CB-CG	-5.74	102.09	115.30
1	C	215	LEU	CA-CB-CG	-5.38	102.92	115.30
1	C	487	LEU	CA-CB-CG	5.07	126.95	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3799	0	3800	29	0
1	B	3793	0	3794	39	0
1	C	3787	0	3788	33	0
1	D	3787	0	3788	25	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	23	0	21	0	0
2	F	23	0	21	0	0
2	G	23	0	21	0	0
2	H	23	0	21	1	0
3	A	43	0	30	2	0
3	B	43	0	30	2	0
3	C	43	0	30	7	0
3	D	43	0	30	4	0
4	A	15	0	16	2	0
4	B	15	0	16	3	0
4	C	15	0	16	2	0
4	D	15	0	16	2	0
5	A	202	0	0	1	0
5	B	202	0	0	3	0
5	C	151	0	0	4	0
5	D	159	0	0	0	0
All	All	16204	0	15438	136	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 4.

The worst 5 of 136 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:392:THR:HG22	1:D:395:SER:OG	1.86	0.76
1:D:303:THR:HG23	4:D:501:9PL:H6B	1.71	0.72
1:B:287:ASP:HA	1:B:290:THR:HG22	1.72	0.72
1:A:80:MET:HE1	1:A:389:VAL:HG13	1.73	0.70
1:A:392:THR:HG22	1:A:395:SER:OG	1.92	0.70

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	464/476 (98%)	447 (96%)	17 (4%)	0	100	100
1	B	463/476 (97%)	443 (96%)	20 (4%)	0	100	100
1	C	462/476 (97%)	445 (96%)	16 (4%)	1 (0%)	47	56
1	D	462/476 (97%)	447 (97%)	14 (3%)	1 (0%)	47	56
All	All	1851/1904 (97%)	1782 (96%)	67 (4%)	2 (0%)	51	63

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	259	PRO
1	D	259	PRO

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	420/428 (98%)	397 (94%)	23 (6%)	21	24
1	B	419/428 (98%)	397 (95%)	22 (5%)	22	26
1	C	418/428 (98%)	395 (94%)	23 (6%)	21	24
1	D	418/428 (98%)	397 (95%)	21 (5%)	24	28
All	All	1675/1712 (98%)	1586 (95%)	89 (5%)	22	26

5 of 89 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	249	ARG
1	D	110	ARG
1	C	337	ARG
1	C	417	GLU
1	D	156	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	141	GLN
1	B	326	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

8 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	#$|Z| > 2$
2	GLC	E	1	2	11,11,12	0.91	0	15,15,17	2.04	5 (33%)
2	FRU	E	2	2	11,12,12	1.37	2 (18%)	10,18,18	1.87	2 (20%)
2	GLC	F	1	2	11,11,12	1.59	4 (36%)	15,15,17	2.23	6 (40%)
2	FRU	F	2	2	11,12,12	1.37	1 (9%)	10,18,18	1.47	1 (10%)
2	GLC	G	1	2	11,11,12	1.32	2 (18%)	15,15,17	1.88	3 (20%)
2	FRU	G	2	2	11,12,12	1.29	2 (18%)	10,18,18	1.67	2 (20%)
2	GLC	H	1	2	11,11,12	1.02	0	15,15,17	1.64	3 (20%)
2	FRU	H	2	2	11,12,12	1.43	2 (18%)	10,18,18	1.32	2 (20%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GLC	E	1	2	-	2/2/19/22	0/1/1/1
2	FRU	E	2	2	-	0/5/24/24	0/1/1/1
2	GLC	F	1	2	-	2/2/19/22	0/1/1/1
2	FRU	F	2	2	-	3/5/24/24	0/1/1/1
2	GLC	G	1	2	-	0/2/19/22	0/1/1/1
2	FRU	G	2	2	-	2/5/24/24	0/1/1/1
2	GLC	H	1	2	-	0/2/19/22	0/1/1/1
2	FRU	H	2	2	-	1/5/24/24	0/1/1/1

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	2	FRU	O2-C2	3.47	1.46	1.40
2	F	2	FRU	O2-C2	3.13	1.46	1.40
2	G	2	FRU	O2-C2	2.99	1.45	1.40
2	E	2	FRU	O2-C2	2.99	1.45	1.40
2	E	2	FRU	O5-C2	2.66	1.47	1.43

The worst 5 of 24 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	G	1	GLC	C1-C2-C3	4.56	115.28	109.67
2	G	2	FRU	O1-C1-C2	-4.50	102.29	111.86
2	E	2	FRU	O1-C1-C2	-4.16	103.02	111.86
2	F	1	GLC	C1-C2-C3	4.08	114.68	109.67
2	H	1	GLC	O2-C2-C3	-4.08	101.97	110.14

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	F	2	FRU	O1-C1-C2-C3
2	F	2	FRU	O1-C1-C2-O2
2	G	2	FRU	O1-C1-C2-O2
2	F	2	FRU	O1-C1-C2-O5
2	F	1	GLC	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	2	FRU	1	0
2	H	1	GLC	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 oligosaccharide.

Oligosaccharide Chain E

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain F

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain G

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain H

Bond lengths

Bond angles

Torsions

Rings
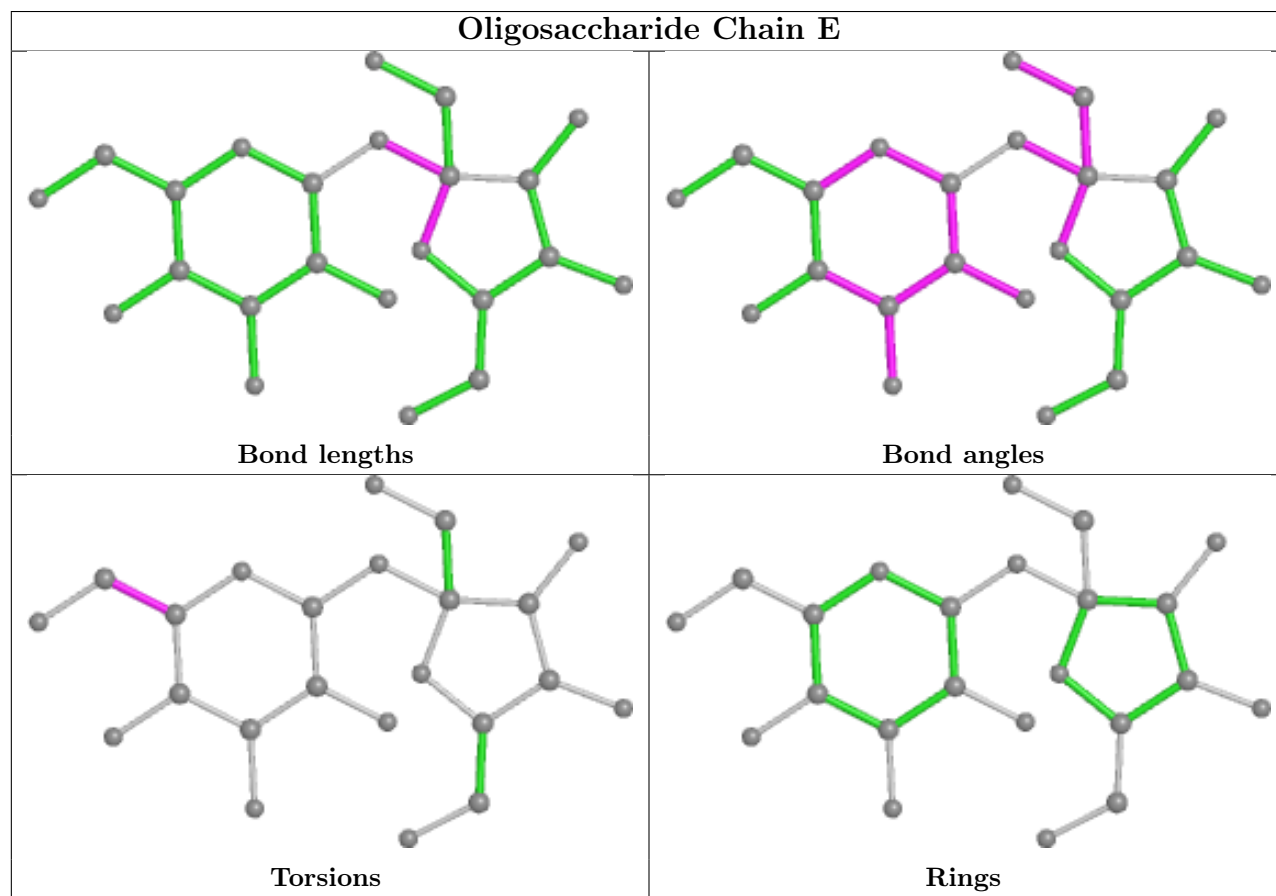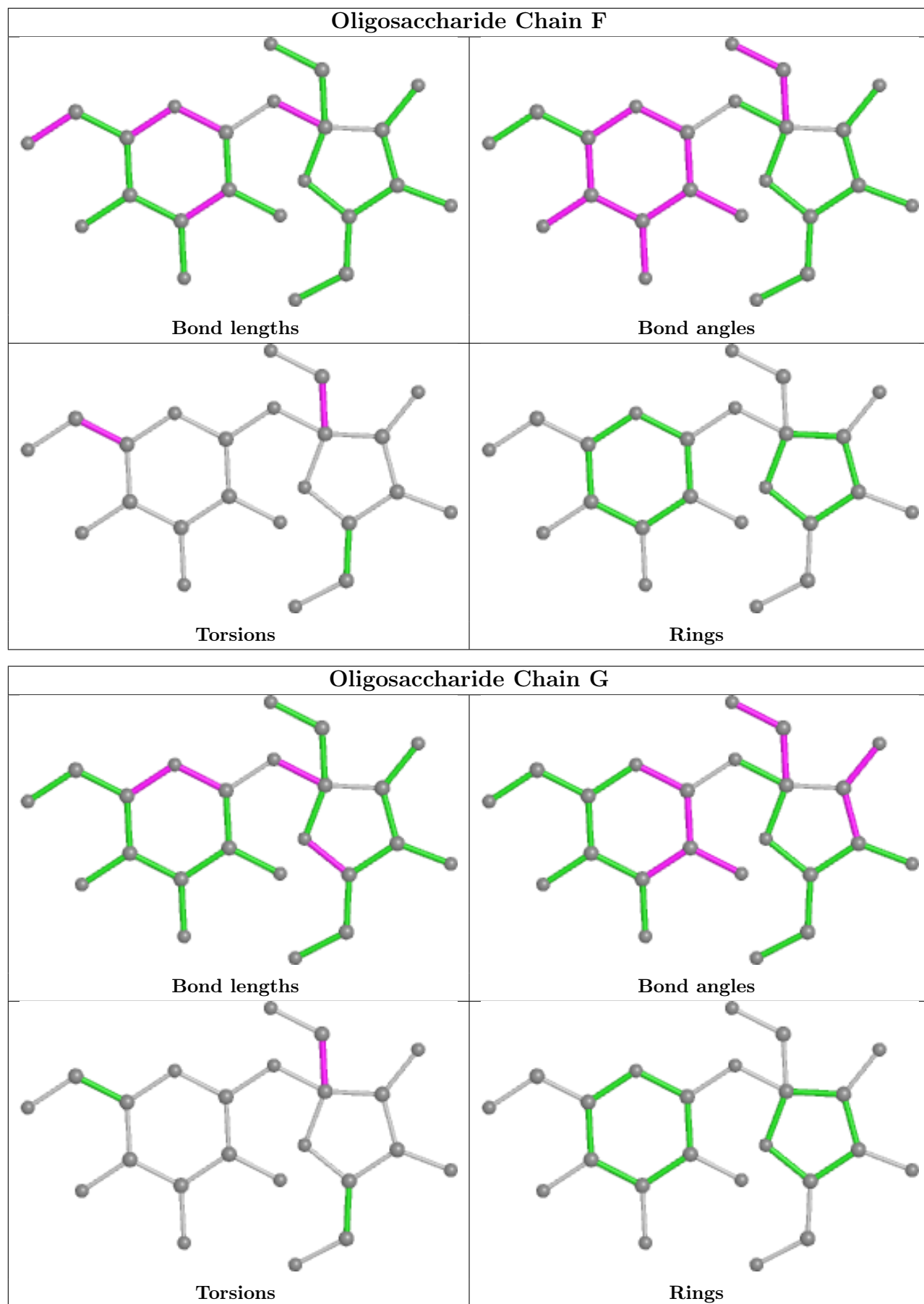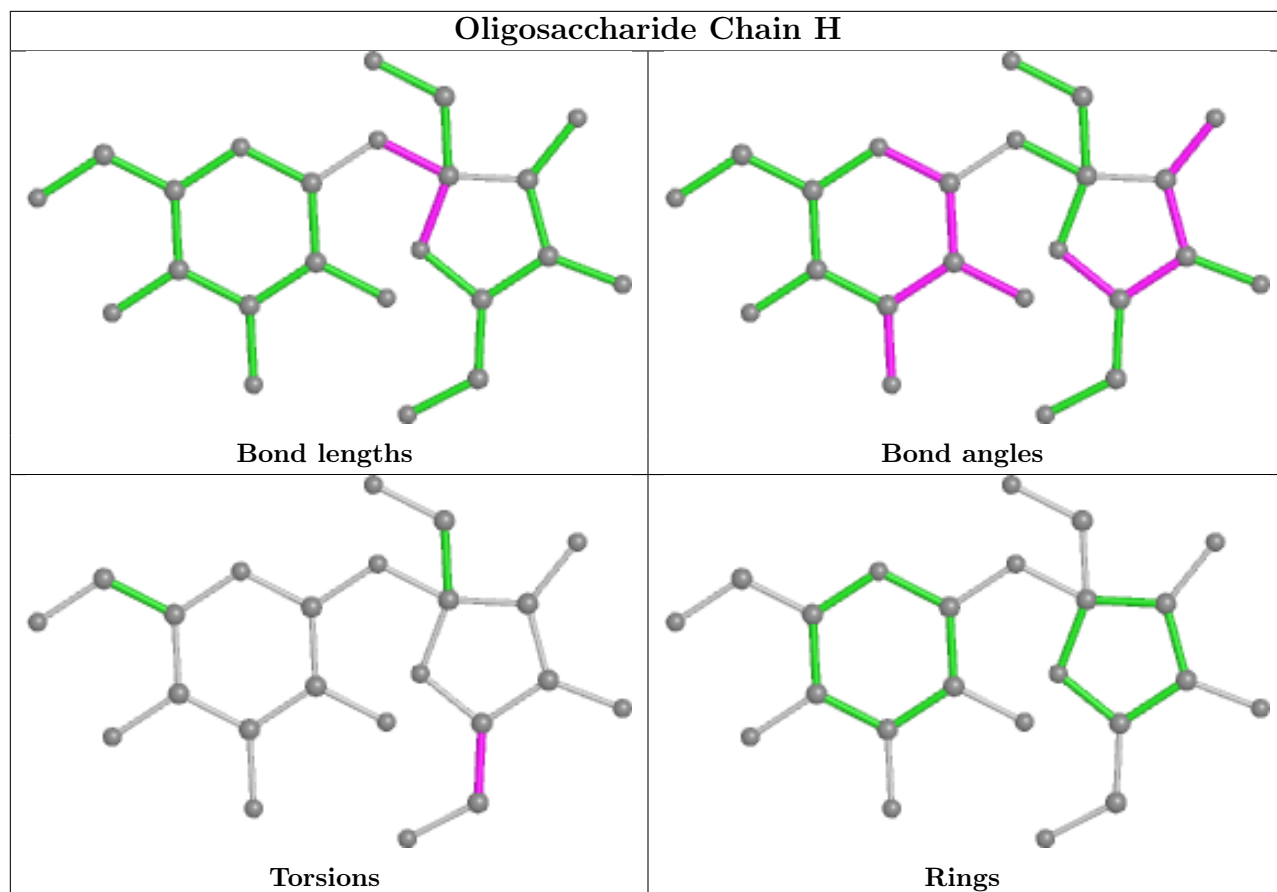
5.6 Ligand geometry ⓘ

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	#$|Z| > 2$
4	9PL	D	501	3	13,16,16	1.43	2 (15%)	16,22,22	2.08	7 (43%)
3	HEM	D	500	4,1	41,50,50	1.99	8 (19%)	45,82,82	1.72	10 (22%)
4	9PL	C	501	3	13,16,16	1.43	1 (7%)	16,22,22	1.68	3 (18%)
3	HEM	C	500	4,1	41,50,50	1.93	8 (19%)	45,82,82	1.76	10 (22%)
4	9PL	A	501	3	13,16,16	1.30	1 (7%)	16,22,22	1.82	5 (31%)
3	HEM	A	500	4,1	41,50,50	2.02	8 (19%)	45,82,82	1.67	11 (24%)
4	9PL	B	501	3	13,16,16	1.52	1 (7%)	16,22,22	2.00	5 (31%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$\|Z\|$ > 2	Counts	RMSZ	#$\|Z\|$ > 2
3	HEM	B	500	4,1	41,50,50	1.93	7 (17%)	45,82,82	1.44	8 (17%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	9PL	D	501	3	-	3/6/19/19	0/2/2/2
3	HEM	D	500	4,1	-	2/12/54/54	-
4	9PL	C	501	3	-	4/6/19/19	0/2/2/2
3	HEM	C	500	4,1	-	2/12/54/54	-
4	9PL	A	501	3	-	0/6/19/19	0/2/2/2
3	HEM	A	500	4,1	-	1/12/54/54	-
4	9PL	B	501	3	-	0/6/19/19	0/2/2/2
3	HEM	B	500	4,1	-	2/12/54/54	-

The worst 5 of 36 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	500	HEM	C3D-C2D	7.87	1.53	1.36
3	D	500	HEM	C3D-C2D	7.08	1.51	1.36
3	B	500	HEM	C3D-C2D	6.70	1.51	1.36
3	C	500	HEM	C3D-C2D	6.36	1.50	1.36
3	B	500	HEM	C3C-C2C	-4.71	1.33	1.40

The worst 5 of 59 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	500	HEM	C4C-CHD-C1D	5.77	130.17	122.56
3	A	500	HEM	C4D-ND-C1D	4.78	110.01	105.07
3	D	500	HEM	C4D-ND-C1D	4.68	109.91	105.07
3	D	500	HEM	C4C-CHD-C1D	4.61	128.64	122.56
4	D	501	9PL	O10-C11-O15	4.06	125.63	121.42

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	501	9PL	C5-C7-C8-C9

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Mol	Chain	Res	Type	Atoms
4	D	501	9PL	C8-C12-C13-C14
4	D	501	9PL	C11-C12-C13-C14
4	C	501	9PL	C11-C12-C13-C14
4	C	501	9PL	C8-C12-C13-C14

There are no ring outliers.
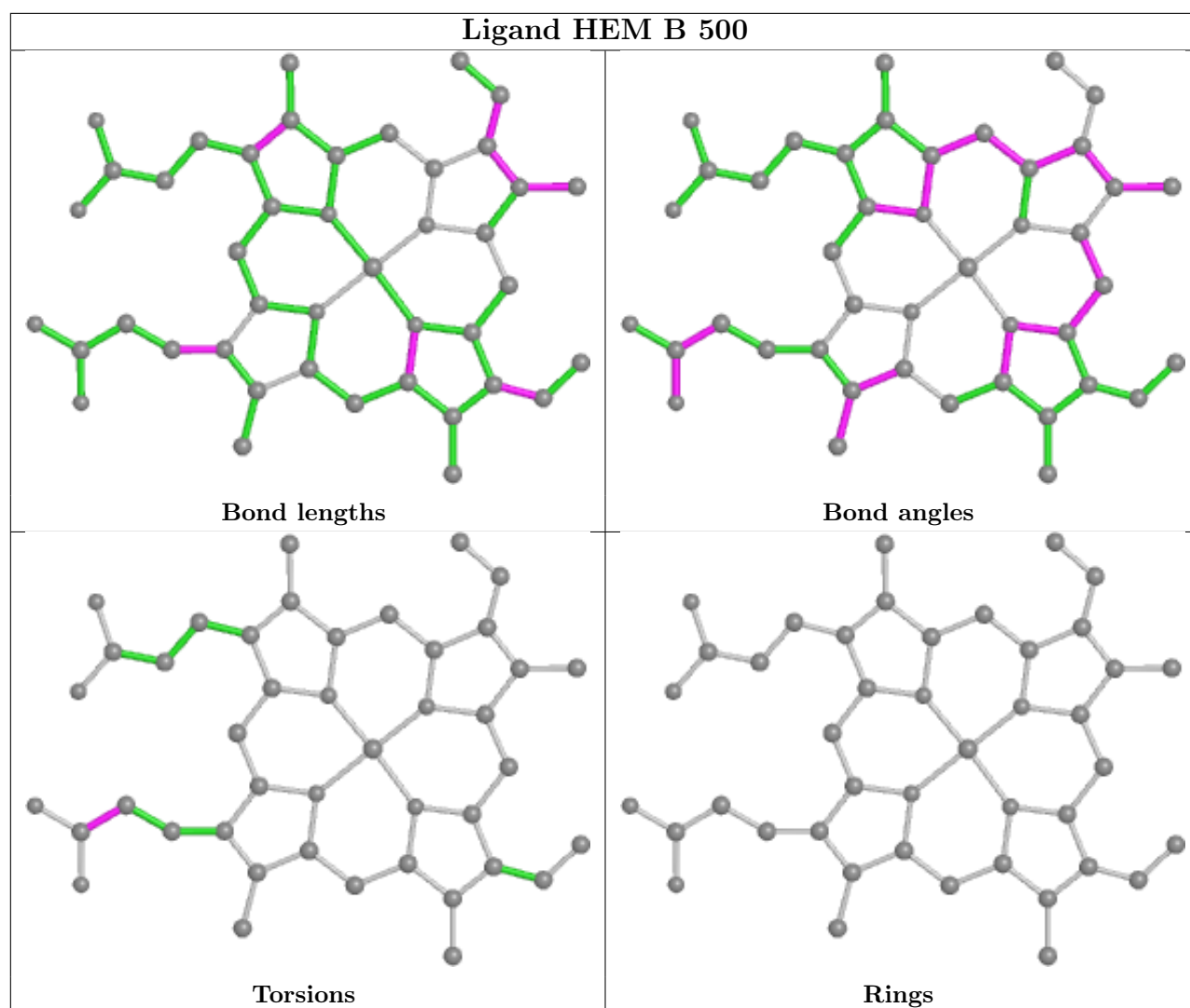
8 monomers are involved in 24 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	501	9PL	2	0
3	D	500	HEM	4	0
4	C	501	9PL	2	0
3	C	500	HEM	7	0
4	A	501	9PL	2	0
3	A	500	HEM	2	0
4	B	501	9PL	3	0
3	B	500	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 then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand HEM D 500

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM C 500

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM A 500

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM B 500

Bond lengths

Bond angles

Torsions

Rings
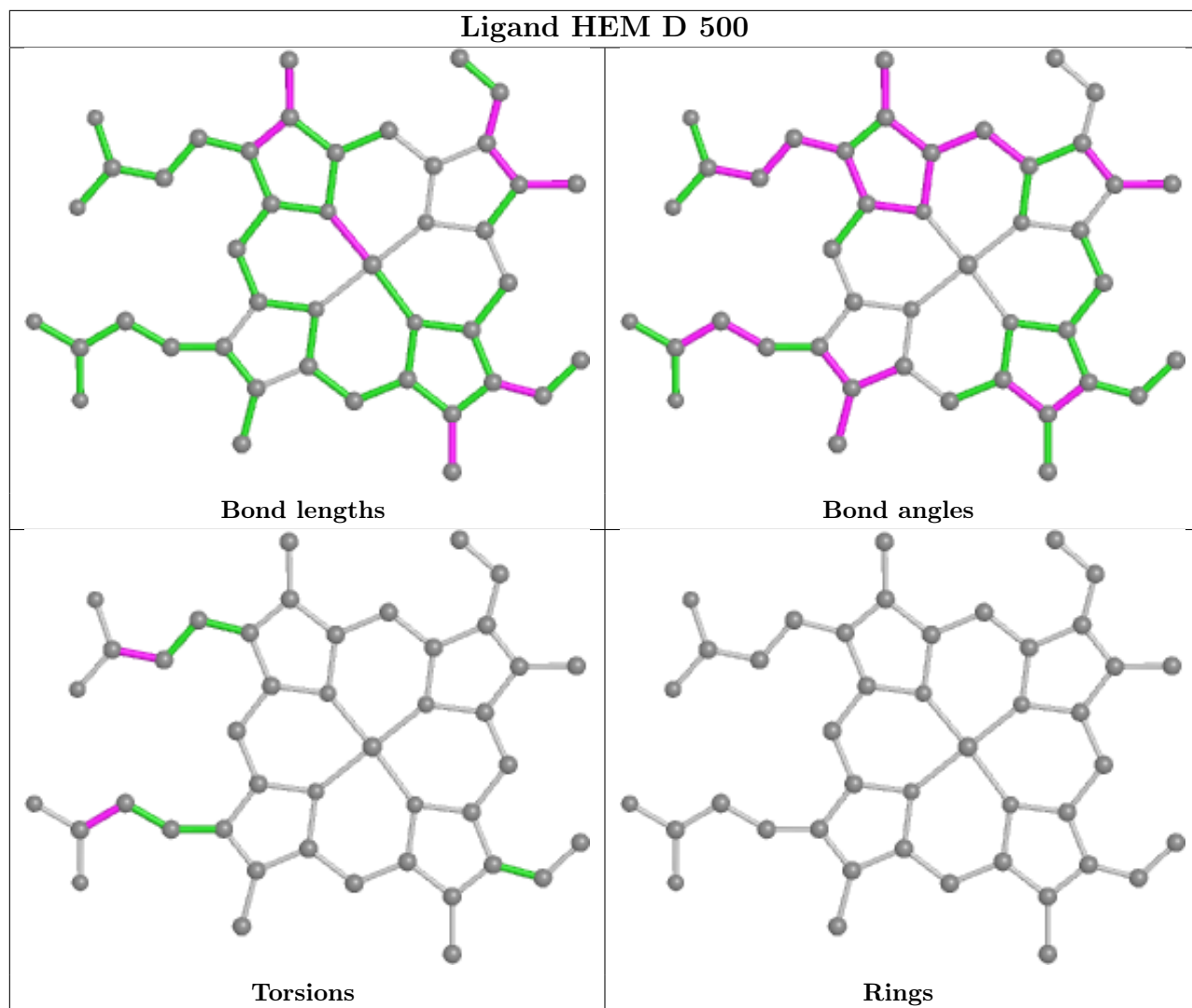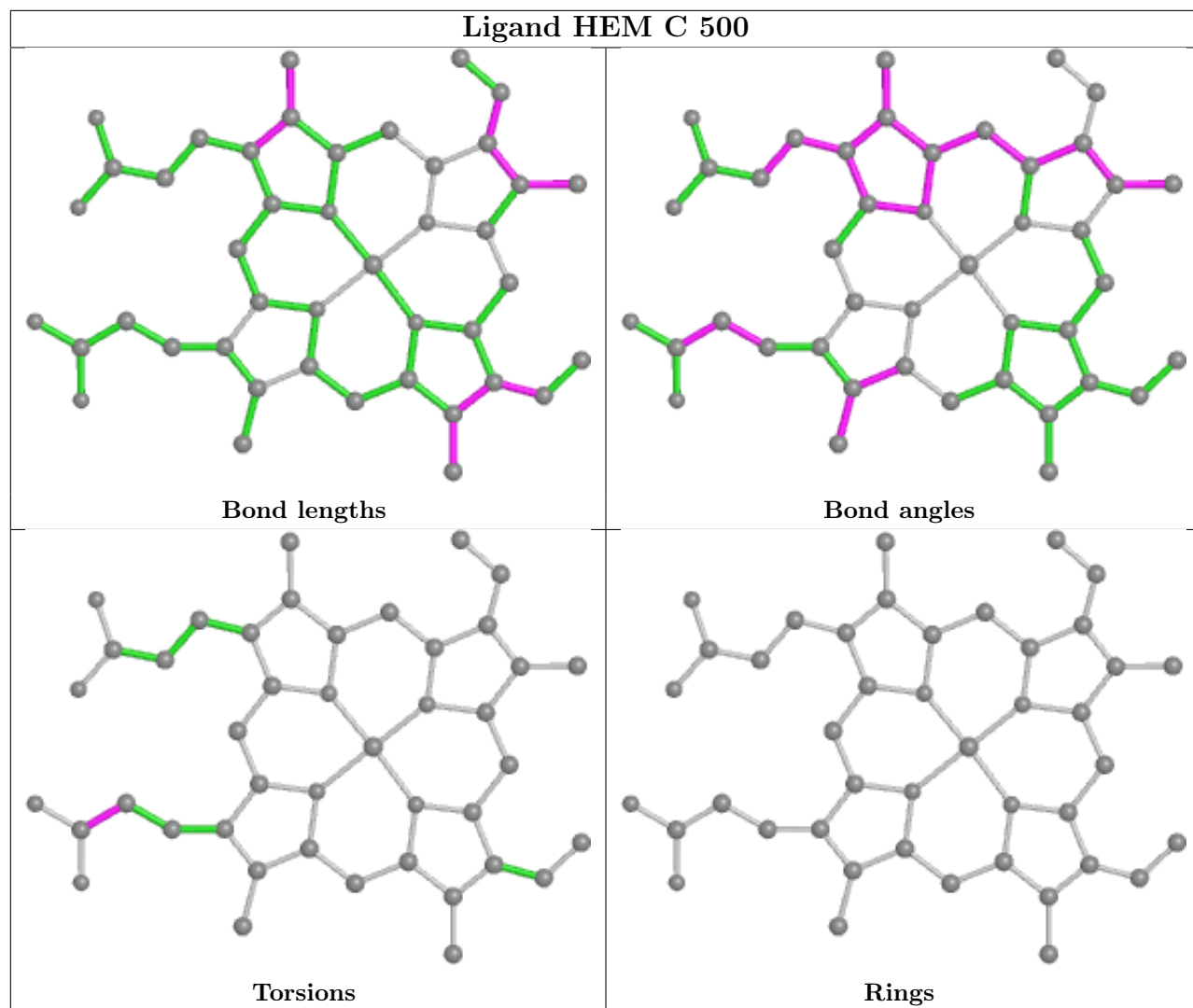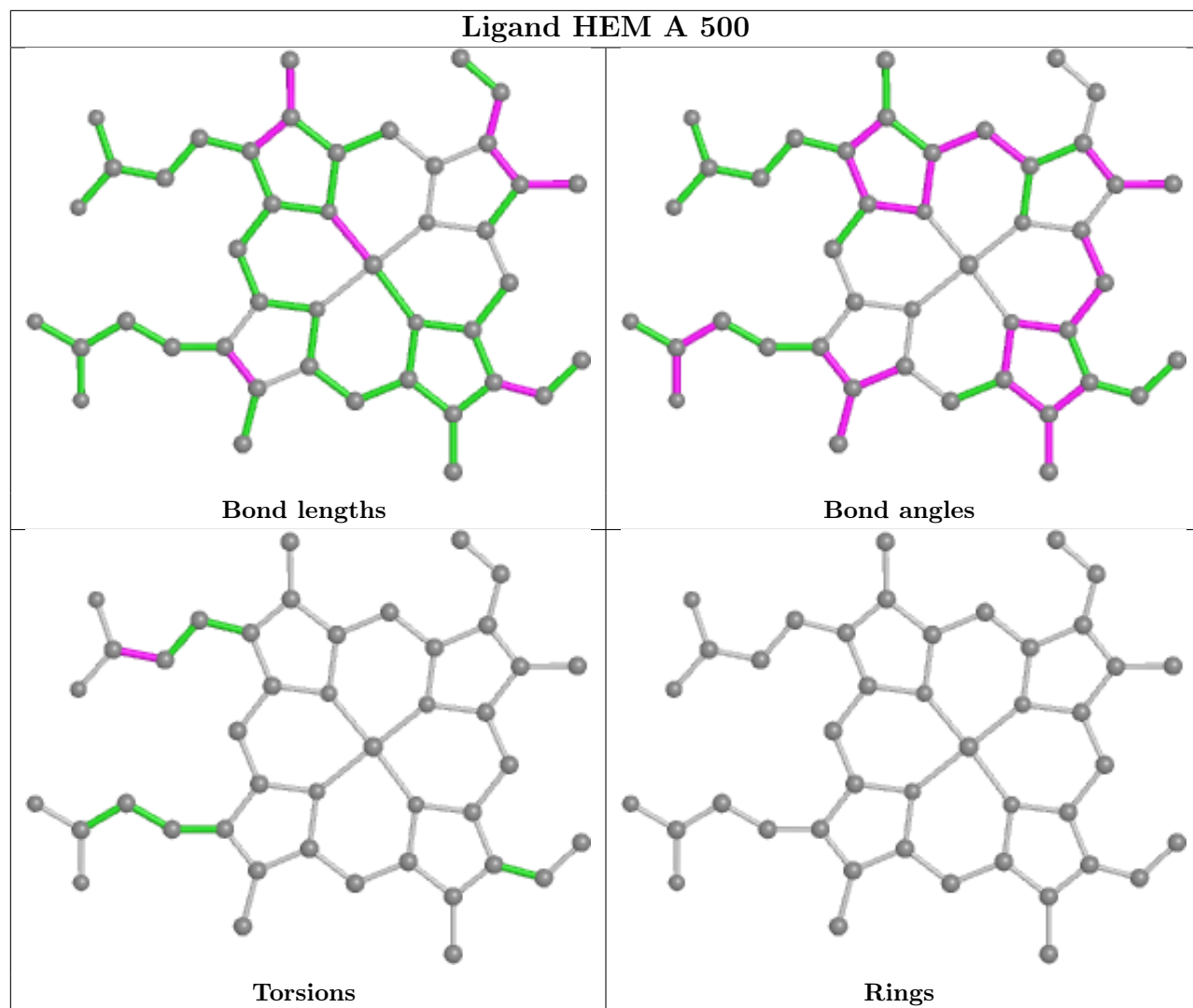
5.7 Other polymers ⓘ

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	464/476 (97%)	-0.10	8 (1%)	70	78	17, 28, 50, 71	0
1	B	464/476 (97%)	-0.11	1 (0%)	95	97	17, 28, 51, 69	0
1	C	464/476 (97%)	0.11	8 (1%)	70	78	17, 33, 62, 75	0
1	D	464/476 (97%)	0.09	10 (2%)	62	72	17, 32, 61, 76	0
All	All	1856/1904 (97%)	0.00	27 (1%)	73	81	17, 30, 57, 76	0

The worst 5 of 27 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	280	ALA	5.1
1	D	280	ALA	5.1
1	C	281	GLU	4.0
1	D	257	LEU	3.8
1	C	494	HIS	3.4

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 ⓘ

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.
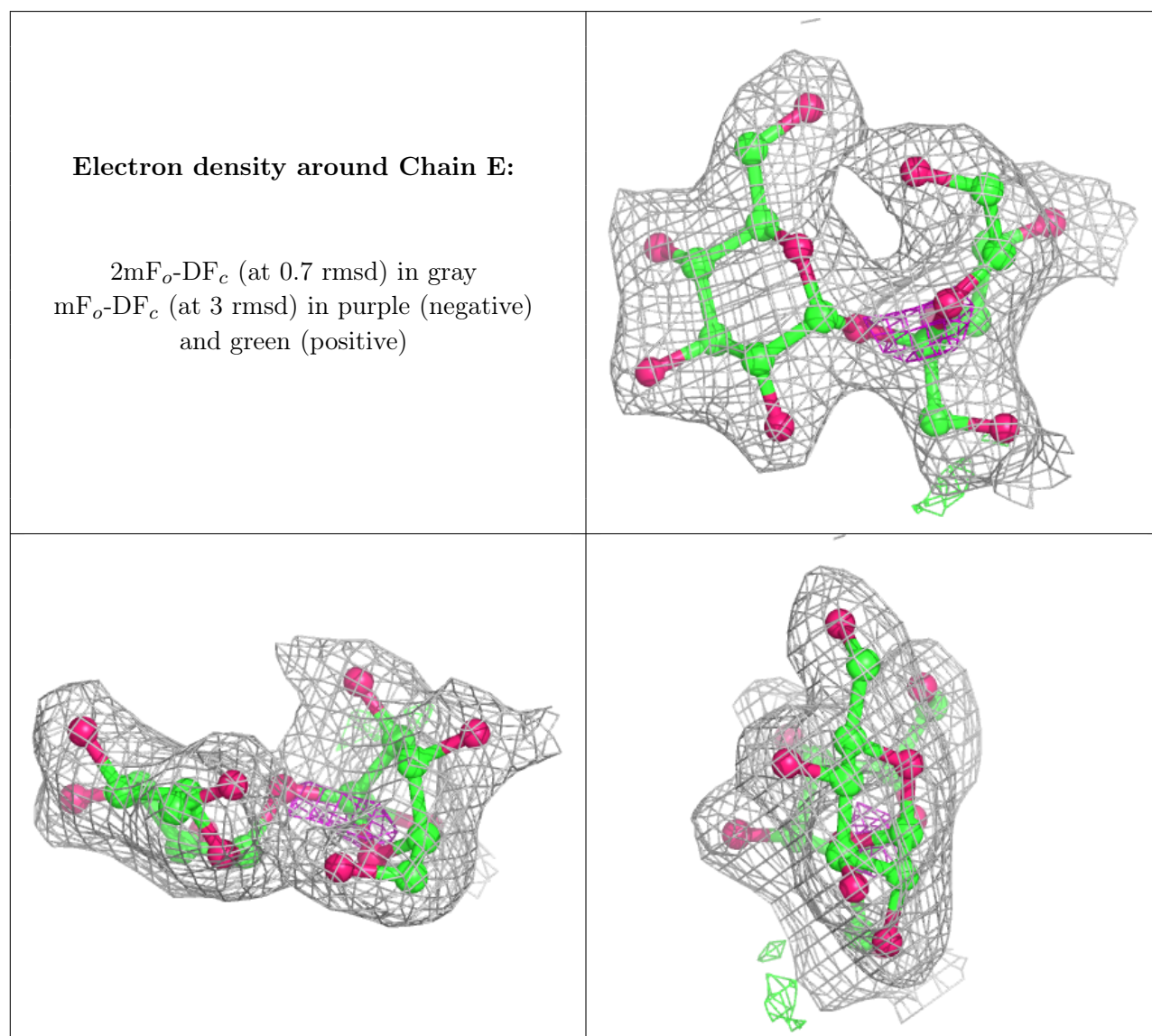
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	FRU	H	2	12/12	0.91	0.15	27,28,32,35	0
2	GLC	G	1	11/12	0.92	0.16	26,29,32,32	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	GLC	F	1	11/12	0.92	0.16	25,27,32,38	0
2	FRU	G	2	12/12	0.94	0.19	26,29,32,33	0
2	FRU	E	2	12/12	0.94	0.15	24,29,30,31	0
2	GLC	H	1	11/12	0.95	0.13	25,28,29,30	0
2	FRU	F	2	12/12	0.95	0.24	26,29,31,34	0
2	GLC	E	1	11/12	0.97	0.12	24,26,28,29	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 E:

$2mF_o$-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 F:

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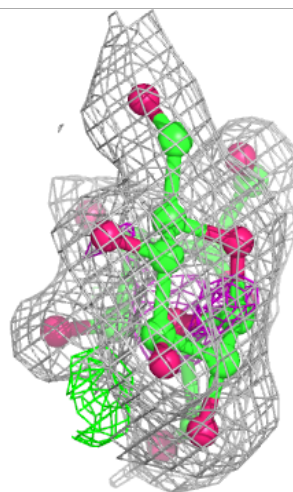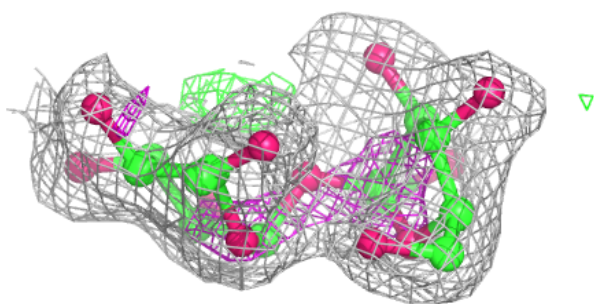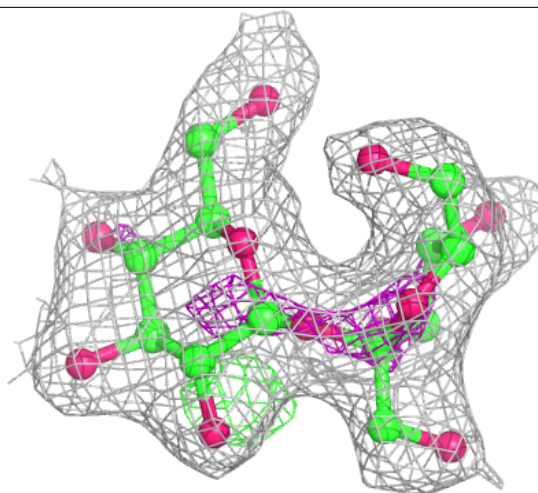
Electron density around Chain G:

$2mF_o$-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 H:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
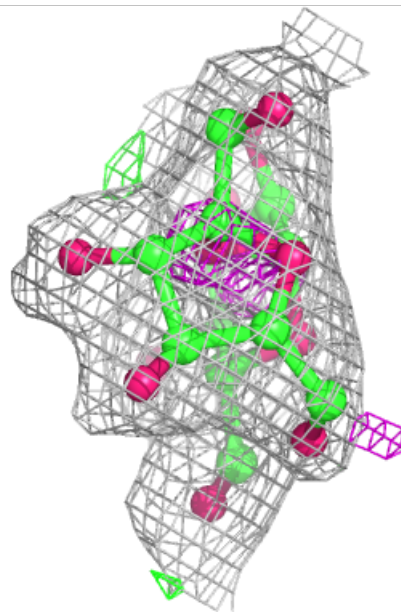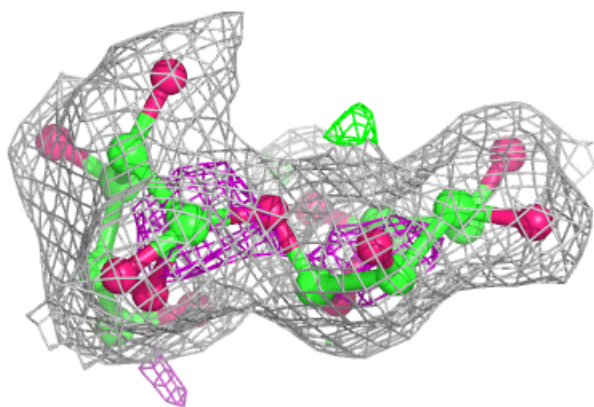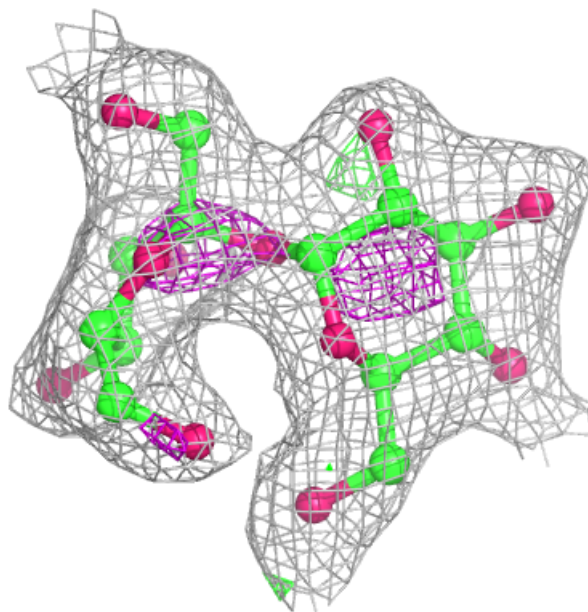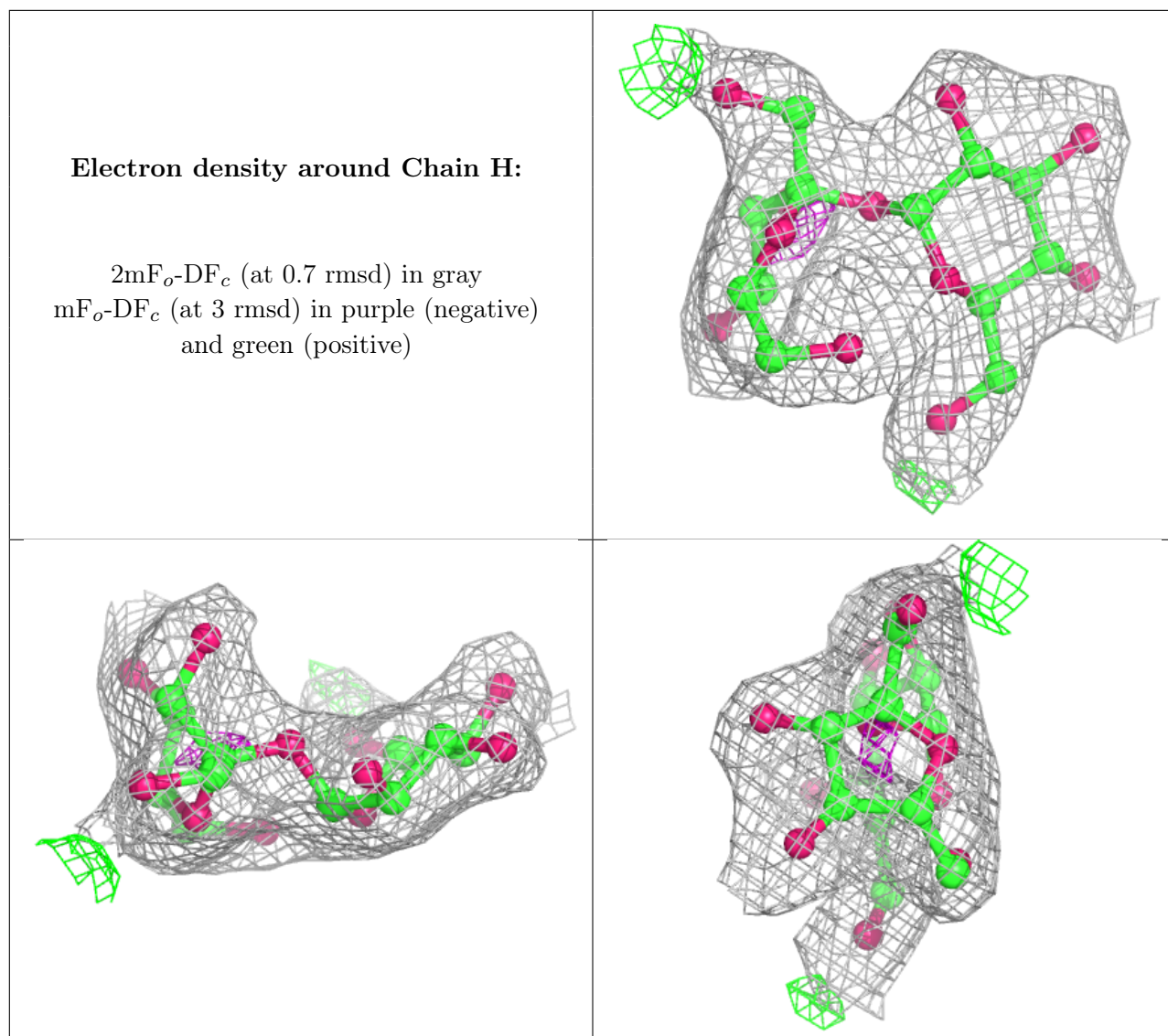
6.4 Ligands (i)

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.
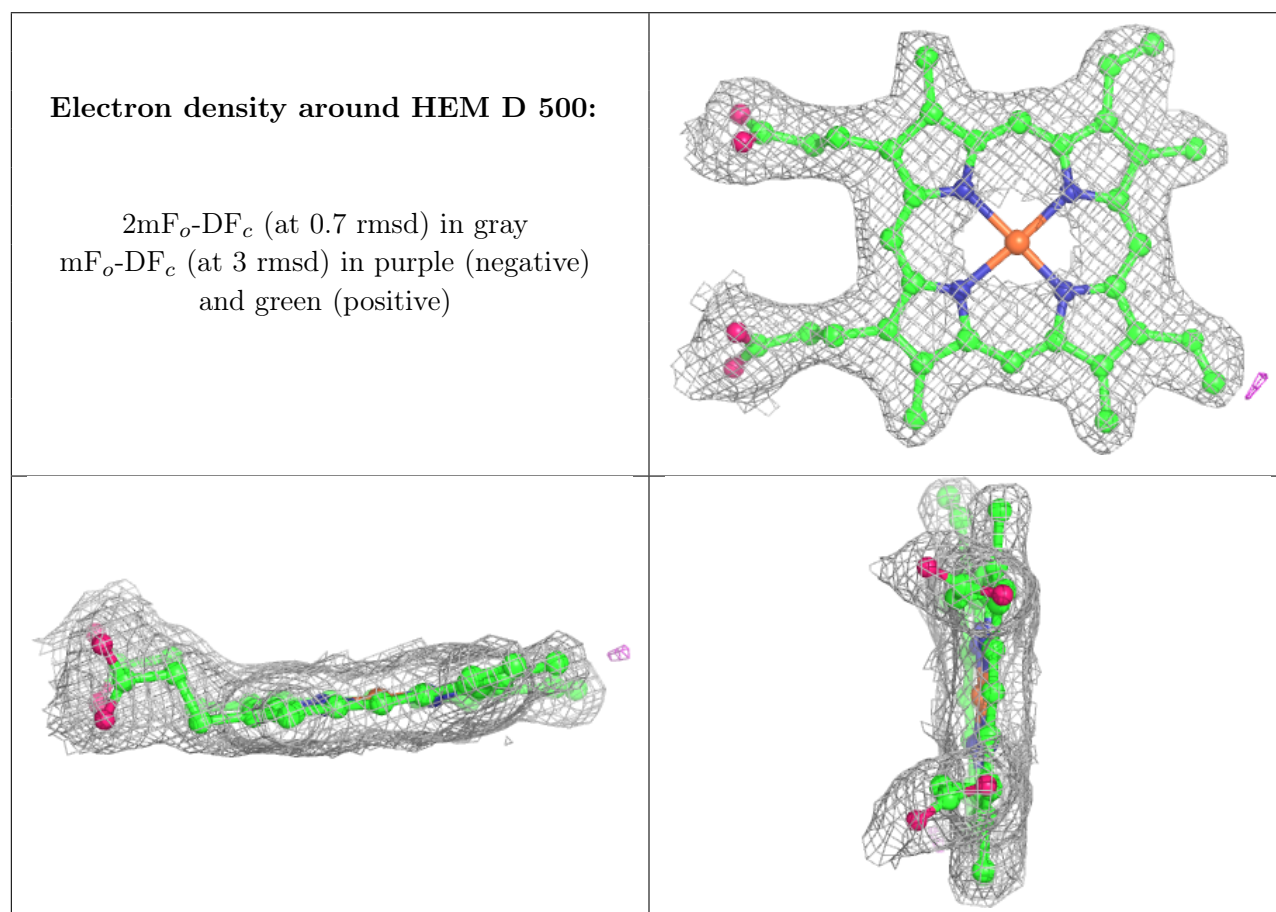
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	9PL	B	501	15/15	0.94	0.16	20,24,26,27	0
4	9PL	A	501	15/15	0.96	0.12	18,25,31,32	0
4	9PL	C	501	15/15	0.96	0.13	24,28,34,35	0
3	HEM	D	500	43/43	0.98	0.13	17,23,27,31	0
3	HEM	A	500	43/43	0.98	0.12	14,22,26,26	0
3	HEM	B	500	43/43	0.98	0.12	14,21,24,27	0
3	HEM	C	500	43/43	0.98	0.13	13,21,24,29	0

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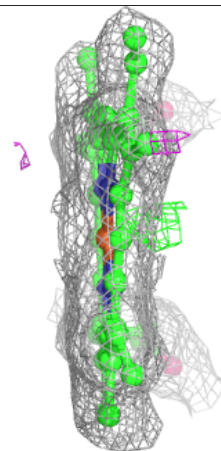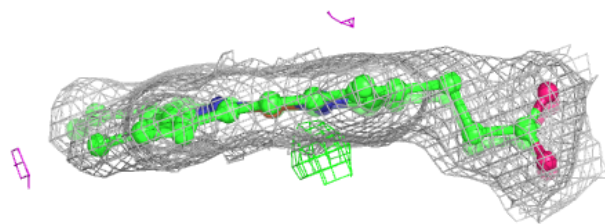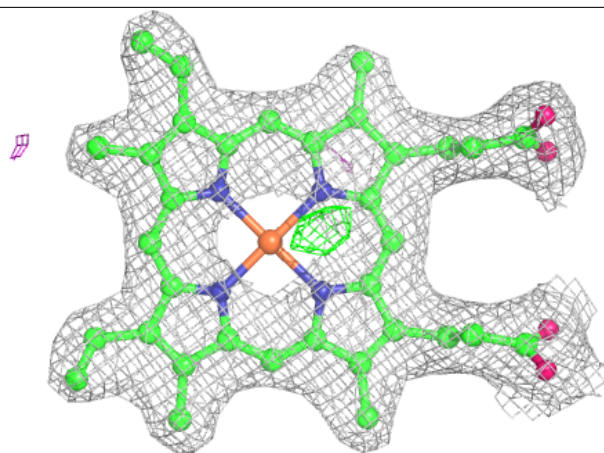| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	9PL	D	501	15/15	0.98	0.12	19,25,34,36	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.
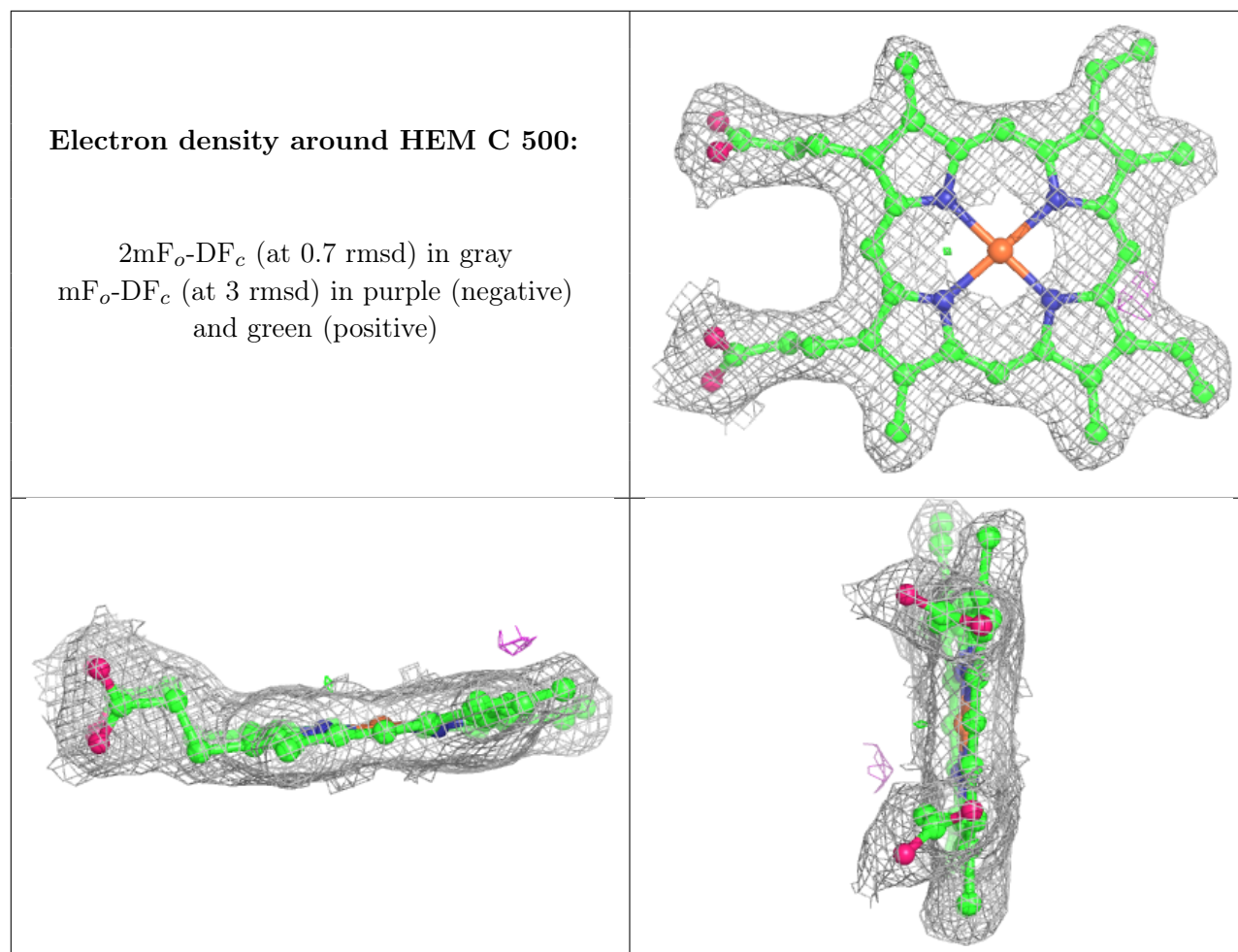
Electron density around HEM D 500:

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

Electron density around HEM A 500:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
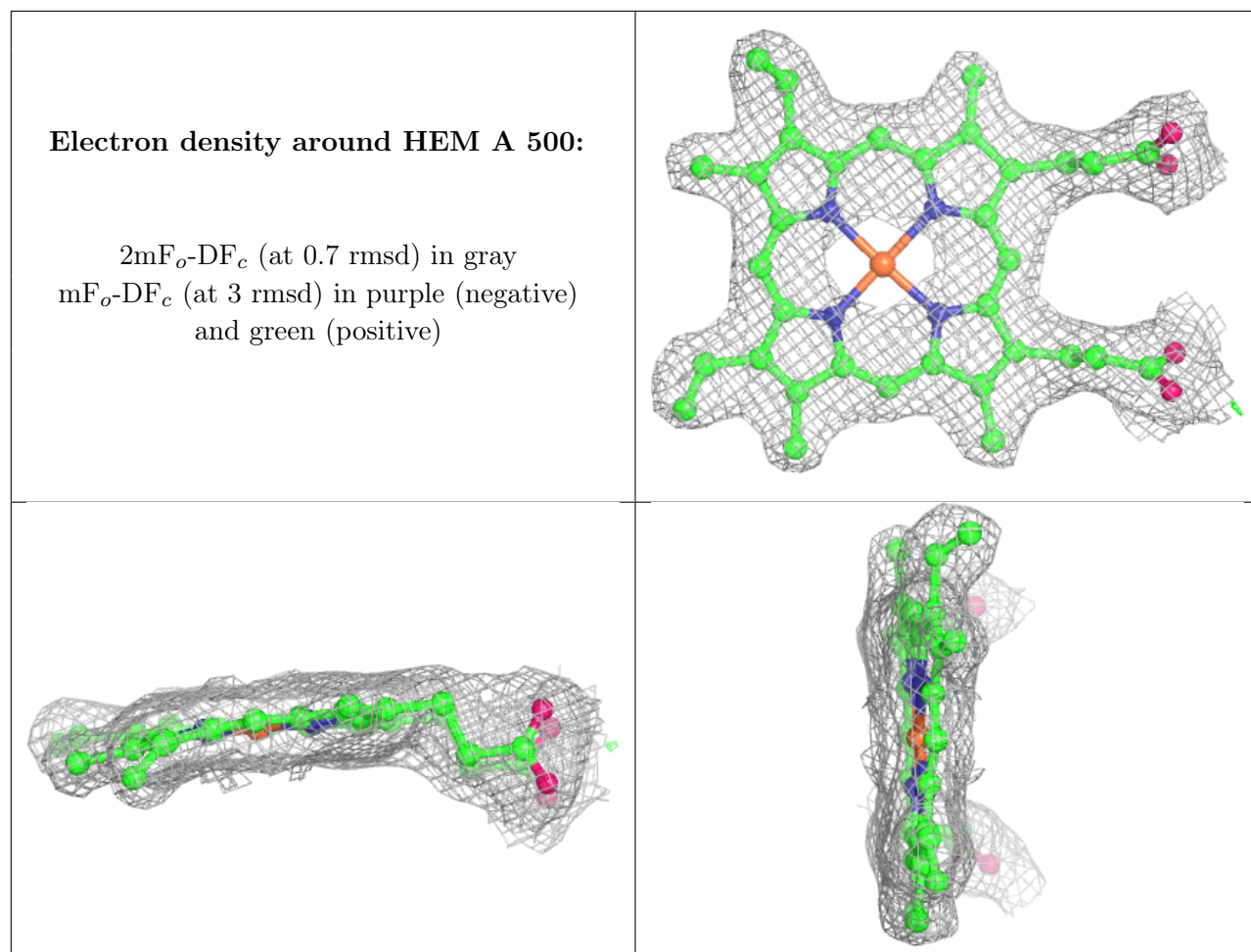
Electron density around HEM B 500:

$2mF_o$-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 500:

$2mF_o$-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 ⓘ

There are no such residues in this entry.