



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 02:52 PM UTC

PDB ID : 3EJD / pdb_00003ejd
Title : Crystal Structure of P450BioI in complex with hexadec-9Z-enoic acid ligated
Acyl Carrier Protein
Authors : Cryle, M.J.; Schlichting, I.
Deposited on : 2008-09-18
Resolution : 2.10 Å (reported)

This is a wwPDB X-ray Structure Validation Summary 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)
Xtrriage (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

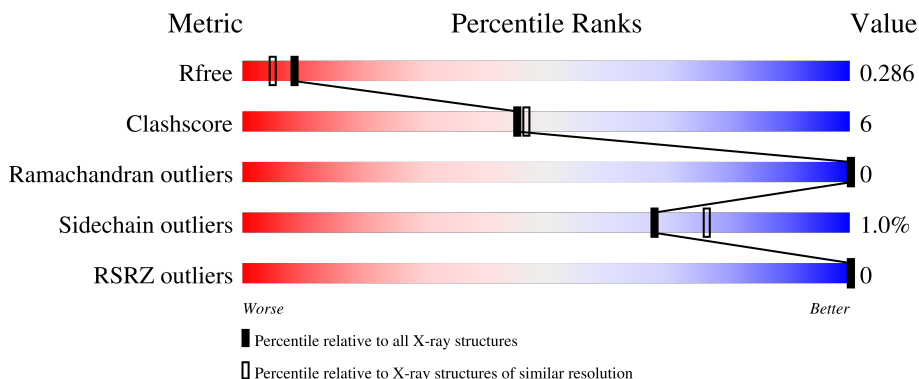
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	97	
1	C	97	
1	E	97	
1	G	97	
2	B	404	

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Mol	Chain	Length	Quality of chain
2	D	404	 80% 14% 5%
2	F	404	 81% 14% 6%
2	H	404	 81% 13% 5%

2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 16057 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 Acyl carrier protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	78	Total 606	C 374	N 95	O 135	S 2	0	0	0
1	C	77	Total 596	C 368	N 92	O 134	S 2	0	0	0
1	E	78	Total 606	C 374	N 95	O 135	S 2	0	0	0
1	G	77	Total 596	C 368	N 92	O 134	S 2	0	0	0

There are 76 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	GLY	-	expression tag	UNP P0A6A8
A	2	SER	-	expression tag	UNP P0A6A8
A	3	SER	-	expression tag	UNP P0A6A8
A	4	HIS	-	expression tag	UNP P0A6A8
A	5	HIS	-	expression tag	UNP P0A6A8
A	6	HIS	-	expression tag	UNP P0A6A8
A	7	HIS	-	expression tag	UNP P0A6A8
A	8	HIS	-	expression tag	UNP P0A6A8
A	9	HIS	-	expression tag	UNP P0A6A8
A	10	SER	-	expression tag	UNP P0A6A8
A	11	SER	-	expression tag	UNP P0A6A8
A	12	GLY	-	expression tag	UNP P0A6A8
A	13	LEU	-	expression tag	UNP P0A6A8
A	14	VAL	-	expression tag	UNP P0A6A8
A	15	PRO	-	expression tag	UNP P0A6A8
A	16	ARG	-	expression tag	UNP P0A6A8
A	17	GLY	-	expression tag	UNP P0A6A8
A	18	SER	-	expression tag	UNP P0A6A8
A	19	HIS	-	expression tag	UNP P0A6A8
C	1	GLY	-	expression tag	UNP P0A6A8
C	2	SER	-	expression tag	UNP P0A6A8

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Chain	Residue	Modelled	Actual	Comment	Reference
C	3	SER	-	expression tag	UNP P0A6A8
C	4	HIS	-	expression tag	UNP P0A6A8
C	5	HIS	-	expression tag	UNP P0A6A8
C	6	HIS	-	expression tag	UNP P0A6A8
C	7	HIS	-	expression tag	UNP P0A6A8
C	8	HIS	-	expression tag	UNP P0A6A8
C	9	HIS	-	expression tag	UNP P0A6A8
C	10	SER	-	expression tag	UNP P0A6A8
C	11	SER	-	expression tag	UNP P0A6A8
C	12	GLY	-	expression tag	UNP P0A6A8
C	13	LEU	-	expression tag	UNP P0A6A8
C	14	VAL	-	expression tag	UNP P0A6A8
C	15	PRO	-	expression tag	UNP P0A6A8
C	16	ARG	-	expression tag	UNP P0A6A8
C	17	GLY	-	expression tag	UNP P0A6A8
C	18	SER	-	expression tag	UNP P0A6A8
C	19	HIS	-	expression tag	UNP P0A6A8
E	1	GLY	-	expression tag	UNP P0A6A8
E	2	SER	-	expression tag	UNP P0A6A8
E	3	SER	-	expression tag	UNP P0A6A8
E	4	HIS	-	expression tag	UNP P0A6A8
E	5	HIS	-	expression tag	UNP P0A6A8
E	6	HIS	-	expression tag	UNP P0A6A8
E	7	HIS	-	expression tag	UNP P0A6A8
E	8	HIS	-	expression tag	UNP P0A6A8
E	9	HIS	-	expression tag	UNP P0A6A8
E	10	SER	-	expression tag	UNP P0A6A8
E	11	SER	-	expression tag	UNP P0A6A8
E	12	GLY	-	expression tag	UNP P0A6A8
E	13	LEU	-	expression tag	UNP P0A6A8
E	14	VAL	-	expression tag	UNP P0A6A8
E	15	PRO	-	expression tag	UNP P0A6A8
E	16	ARG	-	expression tag	UNP P0A6A8
E	17	GLY	-	expression tag	UNP P0A6A8
E	18	SER	-	expression tag	UNP P0A6A8
E	19	HIS	-	expression tag	UNP P0A6A8
G	1	GLY	-	expression tag	UNP P0A6A8
G	2	SER	-	expression tag	UNP P0A6A8
G	3	SER	-	expression tag	UNP P0A6A8
G	4	HIS	-	expression tag	UNP P0A6A8
G	5	HIS	-	expression tag	UNP P0A6A8
G	6	HIS	-	expression tag	UNP P0A6A8

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Chain	Residue	Modelled	Actual	Comment	Reference
G	7	HIS	-	expression tag	UNP P0A6A8
G	8	HIS	-	expression tag	UNP P0A6A8
G	9	HIS	-	expression tag	UNP P0A6A8
G	10	SER	-	expression tag	UNP P0A6A8
G	11	SER	-	expression tag	UNP P0A6A8
G	12	GLY	-	expression tag	UNP P0A6A8
G	13	LEU	-	expression tag	UNP P0A6A8
G	14	VAL	-	expression tag	UNP P0A6A8
G	15	PRO	-	expression tag	UNP P0A6A8
G	16	ARG	-	expression tag	UNP P0A6A8
G	17	GLY	-	expression tag	UNP P0A6A8
G	18	SER	-	expression tag	UNP P0A6A8
G	19	HIS	-	expression tag	UNP P0A6A8

- Molecule 2 is a protein called Biotin biosynthesis cytochrome P450-like enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	382	Total 3056	C 1945	N 529	O 568	S 14	0	0	0
2	D	385	Total 3080	C 1958	N 535	O 573	S 14	0	0	0
2	F	381	Total 3053	C 1943	N 531	O 565	S 14	0	0	0
2	H	382	Total 3052	C 1942	N 529	O 567	S 14	0	0	0

There are 40 discrepancies between the modelled and reference sequences:

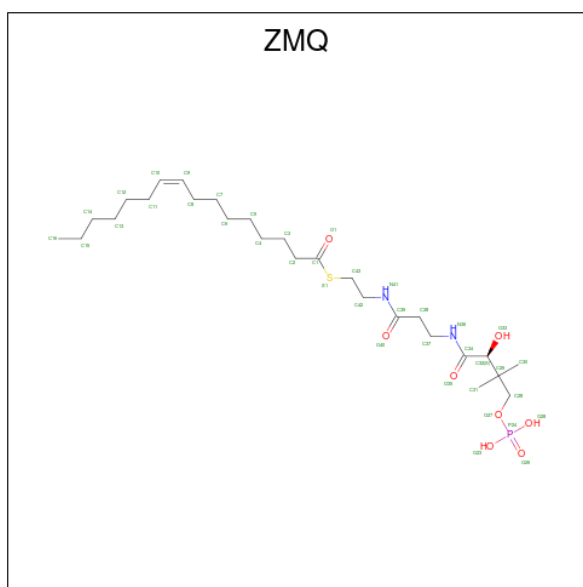
Chain	Residue	Modelled	Actual	Comment	Reference
B	395	ALA	-	expression tag	UNP P53554
B	396	SER	-	expression tag	UNP P53554
B	397	TRP	-	expression tag	UNP P53554
B	398	SER	-	expression tag	UNP P53554
B	399	HIS	-	expression tag	UNP P53554
B	400	PRO	-	expression tag	UNP P53554
B	401	GLN	-	expression tag	UNP P53554
B	402	PHE	-	expression tag	UNP P53554
B	403	GLU	-	expression tag	UNP P53554
B	404	LYS	-	expression tag	UNP P53554
D	395	ALA	-	expression tag	UNP P53554
D	396	SER	-	expression tag	UNP P53554
D	397	TRP	-	expression tag	UNP P53554

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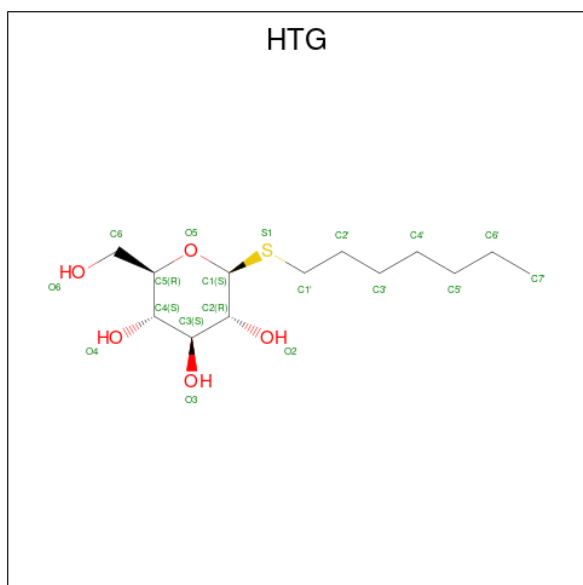
Chain	Residue	Modelled	Actual	Comment	Reference
D	398	SER	-	expression tag	UNP P53554
D	399	HIS	-	expression tag	UNP P53554
D	400	PRO	-	expression tag	UNP P53554
D	401	GLN	-	expression tag	UNP P53554
D	402	PHE	-	expression tag	UNP P53554
D	403	GLU	-	expression tag	UNP P53554
D	404	LYS	-	expression tag	UNP P53554
F	395	ALA	-	expression tag	UNP P53554
F	396	SER	-	expression tag	UNP P53554
F	397	TRP	-	expression tag	UNP P53554
F	398	SER	-	expression tag	UNP P53554
F	399	HIS	-	expression tag	UNP P53554
F	400	PRO	-	expression tag	UNP P53554
F	401	GLN	-	expression tag	UNP P53554
F	402	PHE	-	expression tag	UNP P53554
F	403	GLU	-	expression tag	UNP P53554
F	404	LYS	-	expression tag	UNP P53554
H	395	ALA	-	expression tag	UNP P53554
H	396	SER	-	expression tag	UNP P53554
H	397	TRP	-	expression tag	UNP P53554
H	398	SER	-	expression tag	UNP P53554
H	399	HIS	-	expression tag	UNP P53554
H	400	PRO	-	expression tag	UNP P53554
H	401	GLN	-	expression tag	UNP P53554
H	402	PHE	-	expression tag	UNP P53554
H	403	GLU	-	expression tag	UNP P53554
H	404	LYS	-	expression tag	UNP P53554

- Molecule 3 is S-[2-({N-[(2S)-2-hydroxy-3,3-dimethyl-4-(phosphonoxy)butanoyl]-beta-alanyl}amino)ethyl] (9Z)-hexadec-9-enethioate (CCD ID: ZMQ) (formula: C₂₇H₅₁N₂O₈PS).



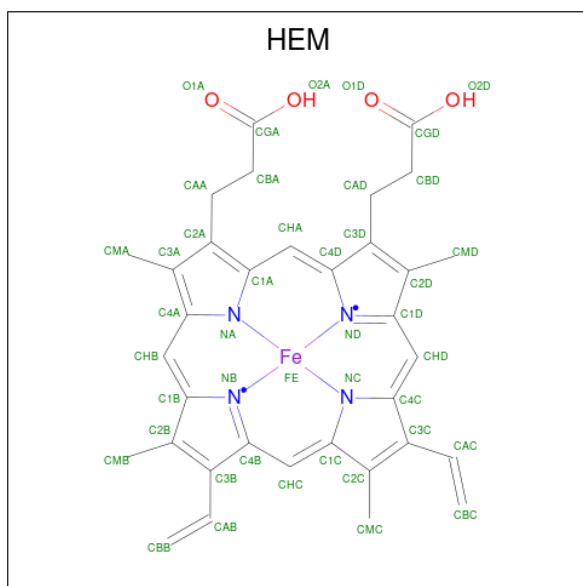
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf		
			Total	C	N	O	P			S	
3	A	1	Total	38	27	2	7	1	1	0	0
3	C	1	Total	38	27	2	7	1	1	0	0
3	E	1	Total	38	27	2	7	1	1	0	0
3	G	1	Total	38	27	2	7	1	1	0	0

- Molecule 4 is heptyl 1-thio-beta-D-glucopyranoside (CCD ID: HTG) (formula: $C_{13}H_{26}O_5S$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O S 15 9 5 1	0	0
4	A	1	Total C 7 7	0	0
4	C	1	Total C O S 12 6 5 1	0	0
4	D	1	Total C 5 5	0	0
4	E	1	Total C O S 12 6 5 1	0	0
4	F	1	Total C 6 6	0	0
4	G	1	Total C O S 12 6 5 1	0	0
4	H	1	Total C S 7 6 1	0	0

- Molecule 5 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C Fe N O 43 34 1 4 4	0	0
5	D	1	Total C Fe N O 43 34 1 4 4	0	0
5	F	1	Total C Fe N O 43 34 1 4 4	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
5	H	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 6 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	1	Total	Cl	0	0
			1	1		
6	F	1	Total	Cl	0	0
			1	1		

- Molecule 7 is water.

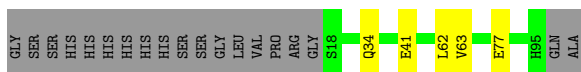
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	53	Total	O	0	0
			53	53		
7	B	219	Total	O	0	0
			219	219		
7	C	45	Total	O	0	0
			45	45		
7	D	189	Total	O	0	0
			189	189		
7	E	71	Total	O	0	0
			71	71		
7	F	223	Total	O	0	0
			223	223		
7	G	51	Total	O	0	0
			51	51		
7	H	159	Total	O	0	0
			159	159		

3 Residue-property plots [i](#)


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

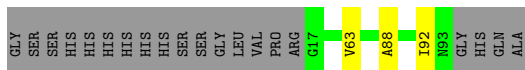
- Molecule 1: Acyl carrier protein

Chain A:  75% 5% 20%




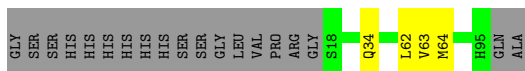
- Molecule 1: Acyl carrier protein

Chain C:  76% 0% 21%




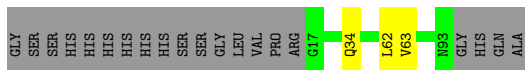
- Molecule 1: Acyl carrier protein

Chain E:  76% 0% 20%




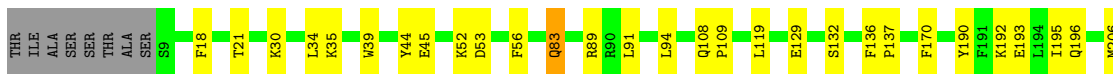
- Molecule 1: Acyl carrier protein

Chain G:  76% 0% 21%

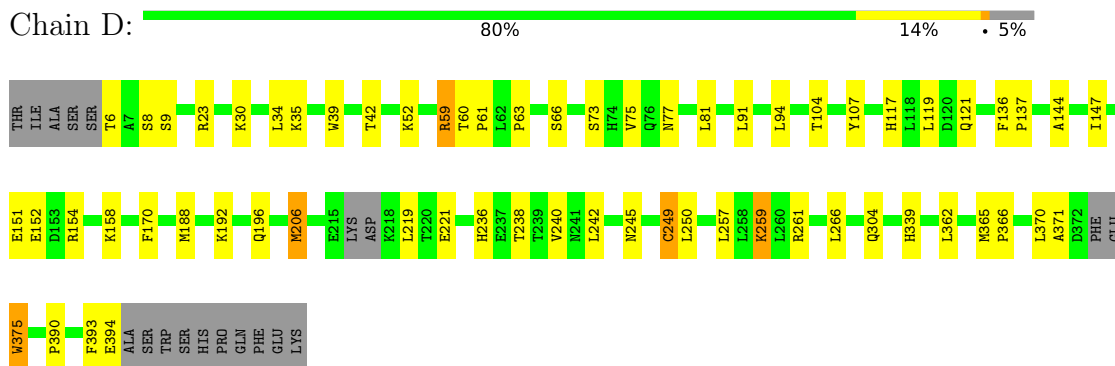


- Molecule 2: Biotin biosynthesis cytochrome P450-like enzyme

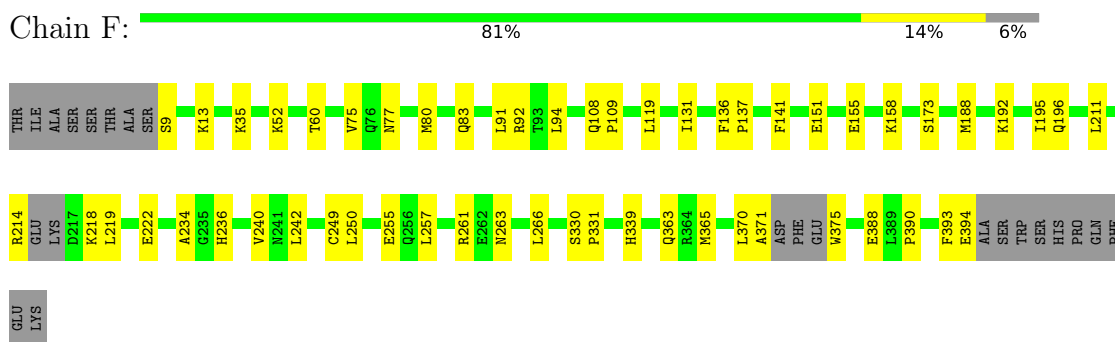
Chain B:  83% 11% 5%



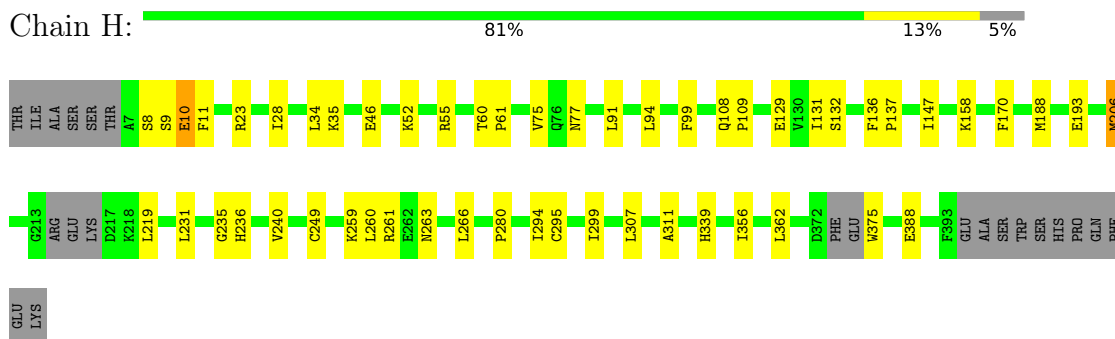
- Molecule 2: Biotin biosynthesis cytochrome P450-like enzyme



- Molecule 2: Biotin biosynthesis cytochrome P450-like enzyme



- Molecule 2: Biotin biosynthesis cytochrome P450-like enzyme



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	61.30Å 92.10Å 107.70Å 109.00° 89.20° 90.10°	Depositor
Resolution (Å)	20.00 – 2.10 20.00 – 2.10	Depositor EDS
% Data completeness (in resolution range)	96.8 (20.00-2.10) 92.9 (20.00-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.21 (at 2.09Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.241 , 0.285 0.242 , 0.286	Depositor DCC
R_{free} test set	6319 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	30.2	Xtrriage
Anisotropy	0.043	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 27.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.267 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	16057	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.79% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ZMQ, HTG, CL, HEM

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.30	0/611	0.69	0/826
1	C	0.31	0/600	0.70	0/811
1	E	0.31	0/611	0.70	0/826
1	G	0.31	0/600	0.70	0/811
2	B	0.34	1/3122 (0.0%)	0.70	0/4231
2	D	0.31	0/3146	0.70	0/4263
2	F	0.32	0/3119	0.70	0/4226
2	H	0.31	0/3118	0.73	1/4226 (0.0%)
All	All	0.32	1/14927 (0.0%)	0.71	1/20220 (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	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	83	GLN	CD-OE1	5.03	1.33	1.23

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	260	LEU	N-CA-C	-13.20	96.92	113.55

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	H	259	LYS	Peptide

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	606	0	578	4	0
1	C	596	0	571	2	0
1	E	606	0	578	3	0
1	G	596	0	571	2	0
2	B	3056	0	3049	33	0
2	D	3080	0	3077	46	0
2	F	3053	0	3054	44	0
2	H	3052	0	3049	41	0
3	A	38	0	47	3	0
3	C	38	0	47	5	0
3	E	38	0	48	4	0
3	G	38	0	47	2	0
4	A	22	0	28	2	0
4	C	12	0	11	0	0
4	D	5	0	9	1	0
4	E	12	0	11	0	0
4	F	6	0	11	0	0
4	G	12	0	11	0	0
4	H	7	0	10	1	0
5	B	43	0	30	2	0
5	D	43	0	30	1	0
5	F	43	0	30	4	0
5	H	43	0	30	2	0
6	B	1	0	0	1	0
6	F	1	0	0	1	0
7	A	53	0	0	1	0
7	B	219	0	0	1	0
7	C	45	0	0	0	0
7	D	189	0	0	2	0
7	E	71	0	0	0	0
7	F	223	0	0	4	0
7	G	51	0	0	0	0
7	H	159	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	16057	0	14927	177	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

The worst 5 of 177 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:H:8:SER:HA	2:H:10:GLU:H	1.27	0.99
2:D:60:THR:HG21	2:D:77:ASN:OD1	1.66	0.95
2:D:94:LEU:HD13	2:D:219:LEU:HD13	1.49	0.94
2:F:9:SER:O	2:F:13:LYS:HG2	1.76	0.85
2:F:393:PHE:HD1	2:F:394:GLU:HG2	1.44	0.83

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	76/97 (78%)	76 (100%)	0	0	100	100
1	C	75/97 (77%)	75 (100%)	0	0	100	100
1	E	76/97 (78%)	76 (100%)	0	0	100	100
1	G	75/97 (77%)	75 (100%)	0	0	100	100
2	B	376/404 (93%)	368 (98%)	8 (2%)	0	100	100
2	D	379/404 (94%)	370 (98%)	9 (2%)	0	100	100
2	F	375/404 (93%)	367 (98%)	8 (2%)	0	100	100
2	H	376/404 (93%)	363 (96%)	13 (4%)	0	100	100
All	All	1808/2004 (90%)	1770 (98%)	38 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	68/83 (82%)	68 (100%)	0	100	100
1	C	67/83 (81%)	67 (100%)	0	100	100
1	E	68/83 (82%)	68 (100%)	0	100	100
1	G	67/83 (81%)	67 (100%)	0	100	100
2	B	335/355 (94%)	332 (99%)	3 (1%)	70	78
2	D	338/355 (95%)	332 (98%)	6 (2%)	51	60
2	F	335/355 (94%)	334 (100%)	1 (0%)	86	91
2	H	335/355 (94%)	329 (98%)	6 (2%)	51	60
All	All	1613/1752 (92%)	1597 (99%)	16 (1%)	68	76

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	307	LEU
2	H	249	CYS
2	D	375	TRP
2	H	206	MET
2	D	259	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	85	GLN
2	H	156	GLN
2	D	203	GLN
2	H	332	ASN
2	F	363	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 2 are monoatomic - leaving 16 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
5	HEM	B	405	2	50,50,50	1.93	8 (16%)	67,82,82	1.33	5 (7%)
5	HEM	D	405	2	50,50,50	1.97	10 (20%)	67,82,82	1.31	5 (7%)
4	HTG	H	417	-	6,6,19	1.52	1 (16%)	5,5,24	1.20	1 (20%)
4	HTG	E	100	-	11,12,19	0.32	0	15,17,24	0.74	0
3	ZMQ	A	99	1	32,37,38	2.10	6 (18%)	36,44,47	1.84	10 (27%)
4	HTG	D	417	-	4,4,19	0.56	0	3,3,24	0.59	0
3	ZMQ	E	99	1	32,37,38	2.10	6 (18%)	36,44,47	1.65	5 (13%)
4	HTG	F	417	-	5,5,19	0.63	0	4,4,24	0.61	0
5	HEM	H	405	2	50,50,50	1.96	10 (20%)	67,82,82	1.31	4 (5%)
4	HTG	A	100	-	15,15,19	3.37	2 (13%)	19,20,24	1.11	1 (5%)
3	ZMQ	G	99	1	32,37,38	2.13	6 (18%)	36,44,47	1.87	9 (25%)
4	HTG	C	100	-	11,12,19	0.31	0	15,17,24	0.75	0
3	ZMQ	C	99	1	32,37,38	2.11	6 (18%)	36,44,47	1.76	8 (22%)
5	HEM	F	405	2	50,50,50	1.95	11 (22%)	67,82,82	1.31	5 (7%)
4	HTG	G	100	-	11,12,19	0.30	0	15,17,24	0.88	0
4	HTG	A	101	-	6,6,19	0.65	0	5,5,24	0.67	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
5	HEM	B	405	2	-	5/14/54/54	-
5	HEM	D	405	2	-	3/14/54/54	-
4	HTG	H	417	-	-	2/4/4/30	-
4	HTG	E	100	-	-	0/2/22/30	0/1/1/1
3	ZMQ	A	99	1	-	18/42/44/45	-
4	HTG	D	417	-	-	0/2/2/30	-
3	ZMQ	E	99	1	-	16/42/44/45	-
4	HTG	F	417	-	-	3/3/3/30	-
5	HEM	H	405	2	-	4/14/54/54	-
4	HTG	A	100	-	-	1/6/26/30	0/1/1/1
3	ZMQ	G	99	1	-	24/42/44/45	-
4	HTG	C	100	-	-	0/2/22/30	0/1/1/1
3	ZMQ	C	99	1	-	17/42/44/45	-
5	HEM	F	405	2	-	6/14/54/54	-
4	HTG	G	100	-	-	0/2/22/30	0/1/1/1
4	HTG	A	101	-	-	3/4/4/30	-

The worst 5 of 66 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	100	HTG	C1'-S1	-10.35	1.66	1.81
3	C	99	ZMQ	O1-C1	7.95	1.33	1.21
3	E	99	ZMQ	O1-C1	7.94	1.33	1.21
3	A	99	ZMQ	O1-C1	7.91	1.33	1.21
3	G	99	ZMQ	O1-C1	7.90	1.33	1.21

The worst 5 of 53 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	99	ZMQ	C2-C1-S1	5.52	119.98	113.40
5	B	405	HEM	C4D-ND-C1D	5.42	111.62	105.21
5	F	405	HEM	C4D-ND-C1D	5.39	111.59	105.21
3	A	99	ZMQ	C2-C1-S1	5.36	119.78	113.40
5	H	405	HEM	C4D-ND-C1D	5.31	111.50	105.21

There are no chirality outliers.

5 of 102 torsion outliers are listed below:

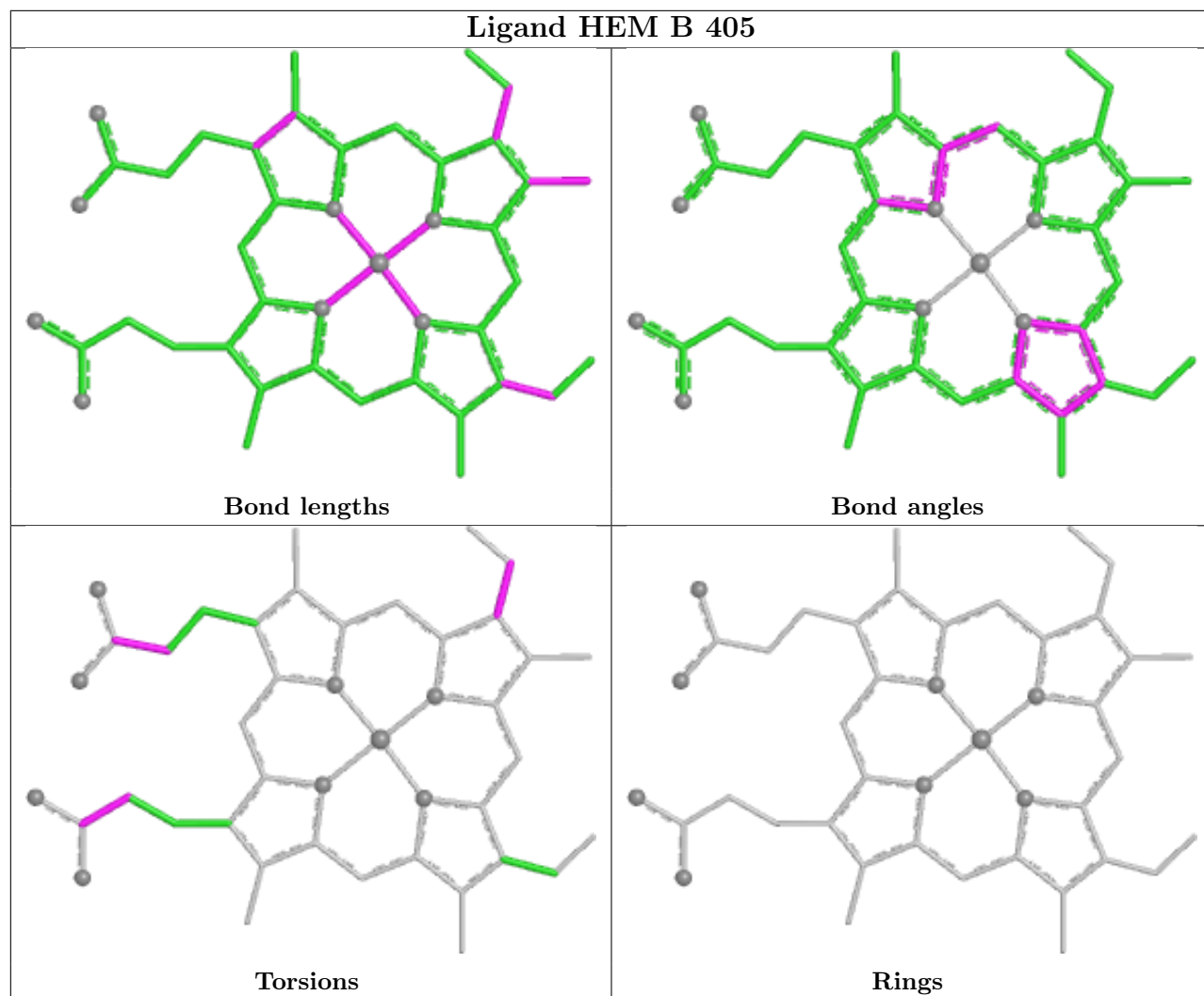
Mol	Chain	Res	Type	Atoms
3	A	99	ZMQ	C28-C29-C32-O33
3	A	99	ZMQ	C32-C34-N36-C37
3	A	99	ZMQ	O1-C1-C2-C3
3	A	99	ZMQ	C1-C2-C3-C4
3	C	99	ZMQ	C28-C29-C32-O33

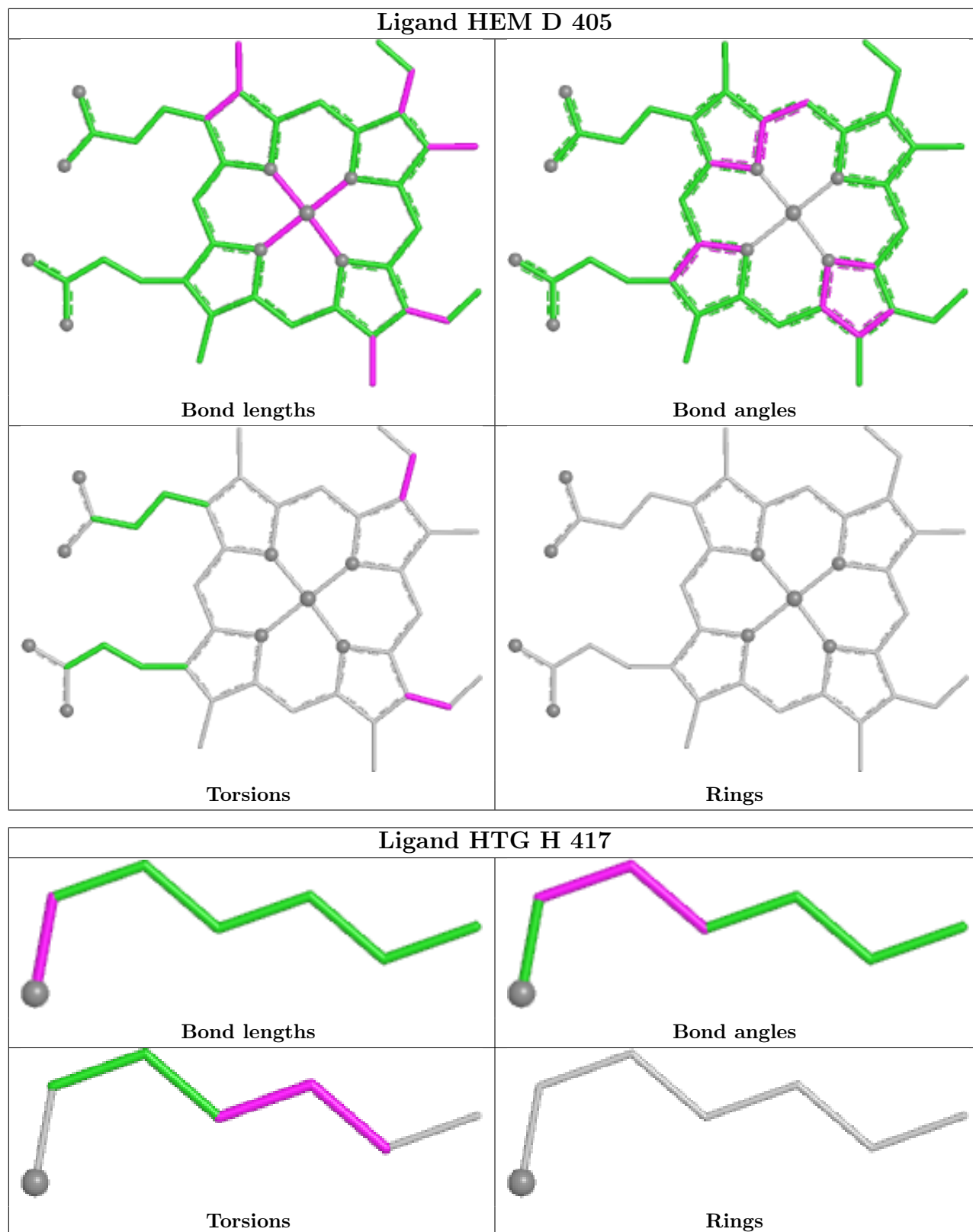
There are no ring outliers.

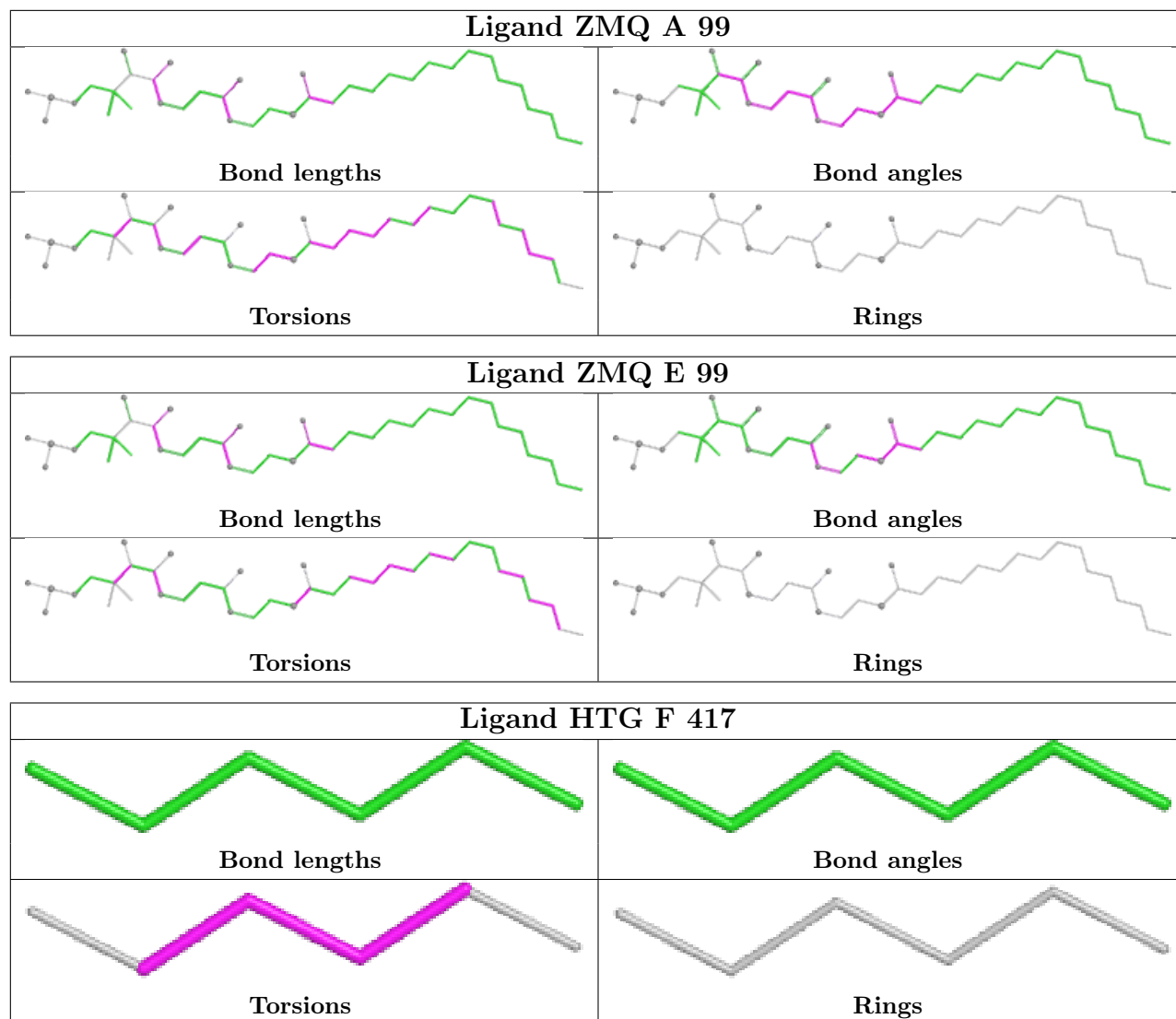
12 monomers are involved in 27 short contacts:

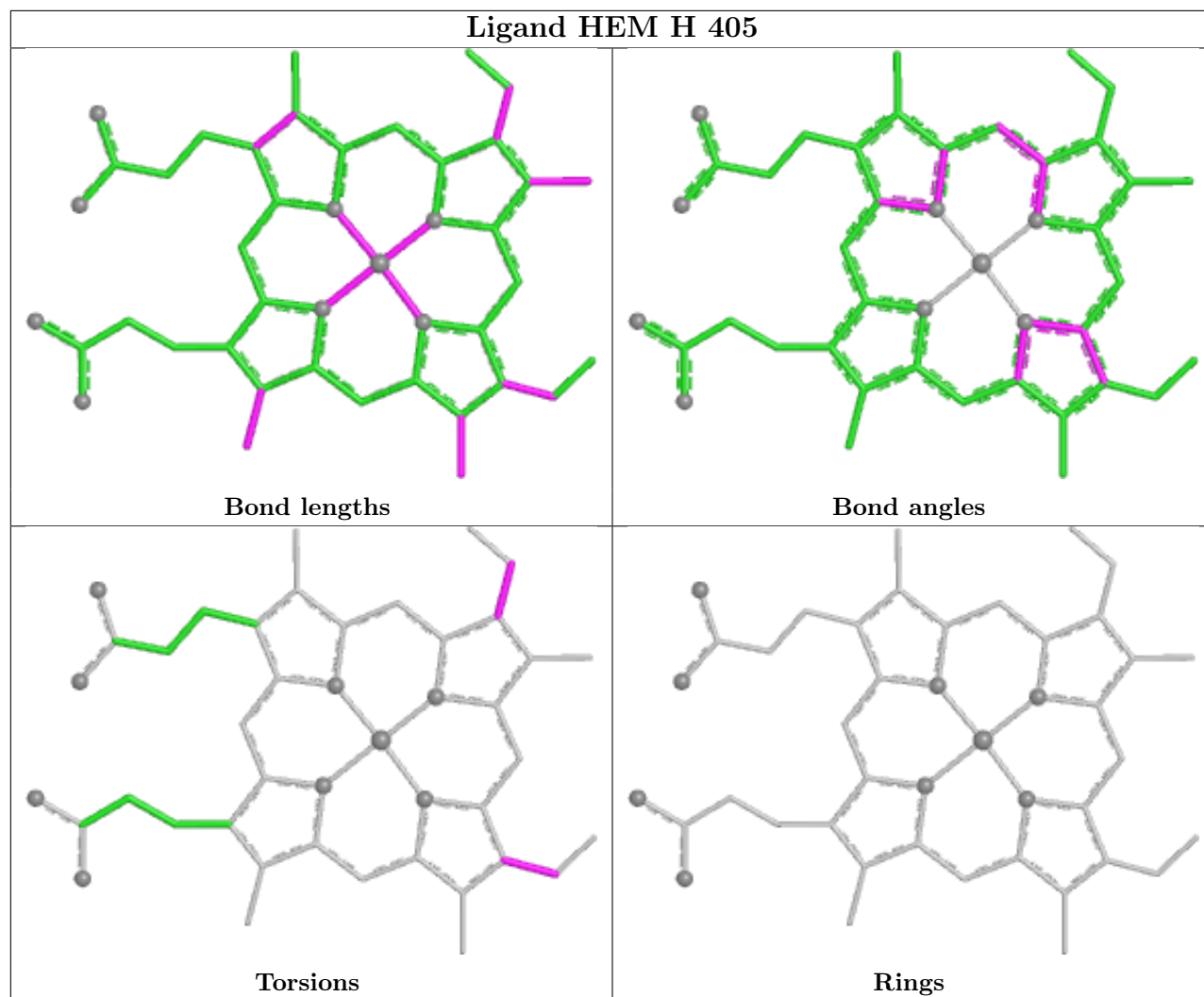
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	405	HEM	2	0
5	D	405	HEM	1	0
4	H	417	HTG	1	0
3	A	99	ZMQ	3	0
4	D	417	HTG	1	0
3	E	99	ZMQ	4	0
5	H	405	HEM	2	0
4	A	100	HTG	1	0
3	G	99	ZMQ	2	0
3	C	99	ZMQ	5	0
5	F	405	HEM	4	0
4	A	101	HTG	1	0

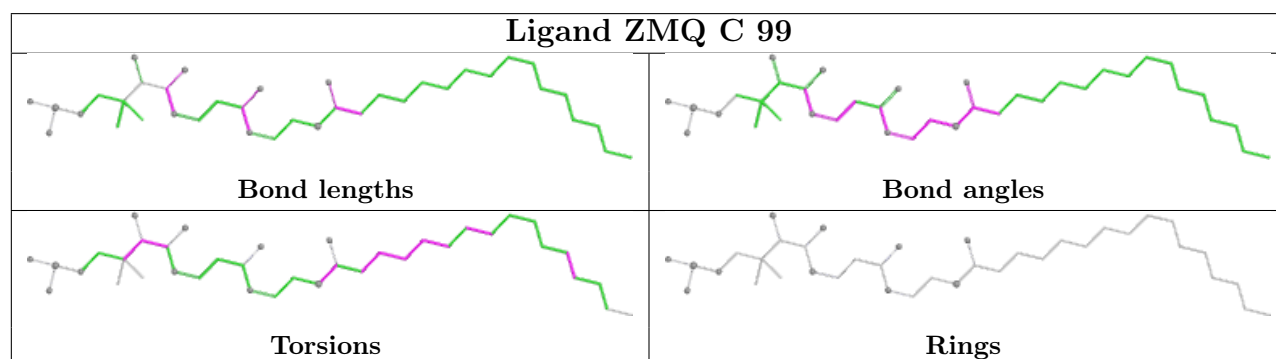
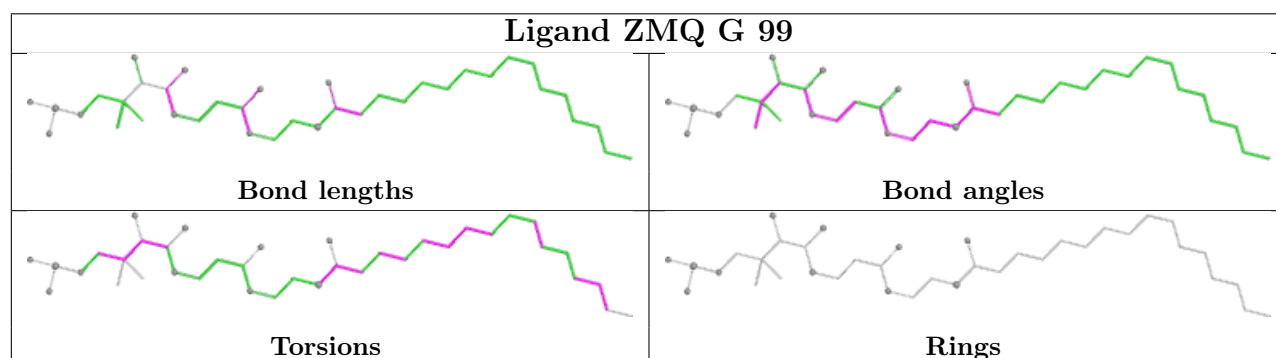
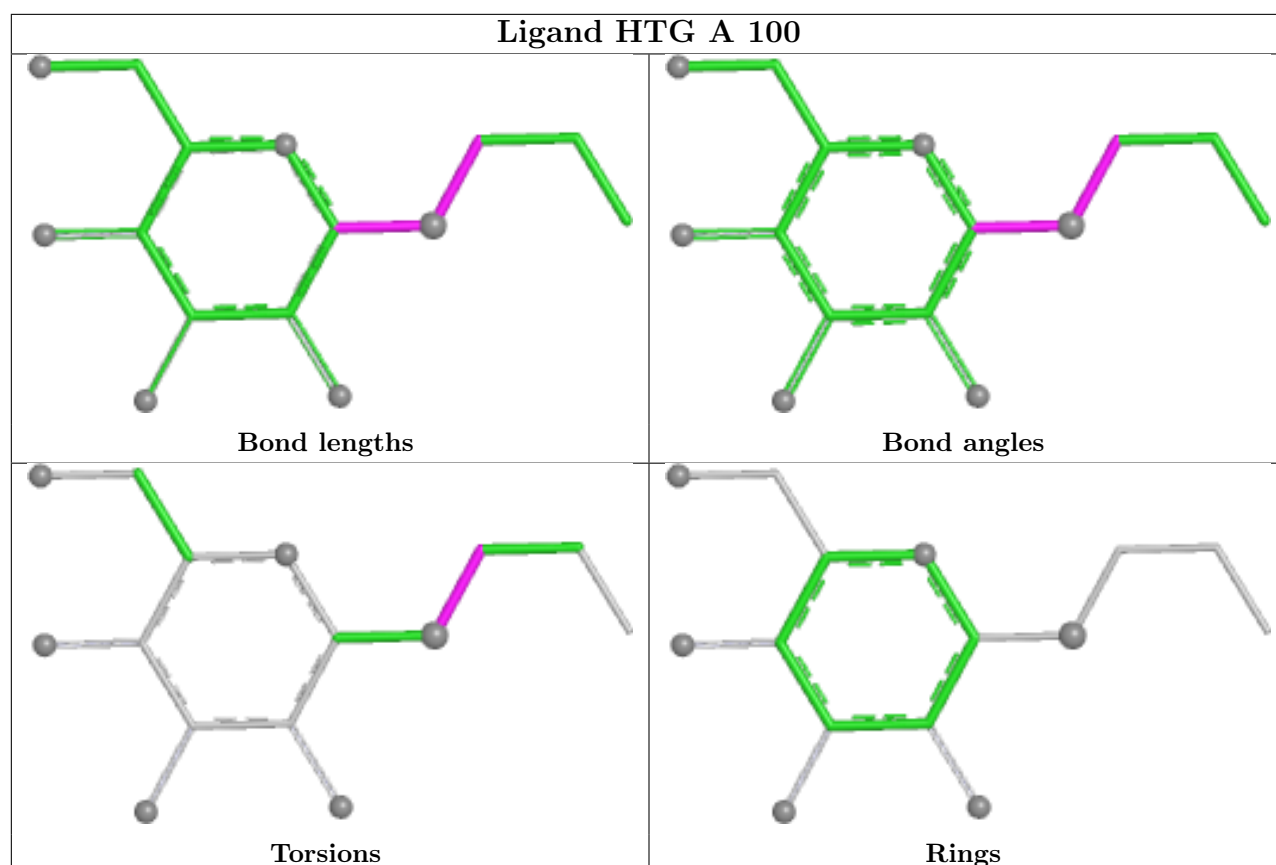
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

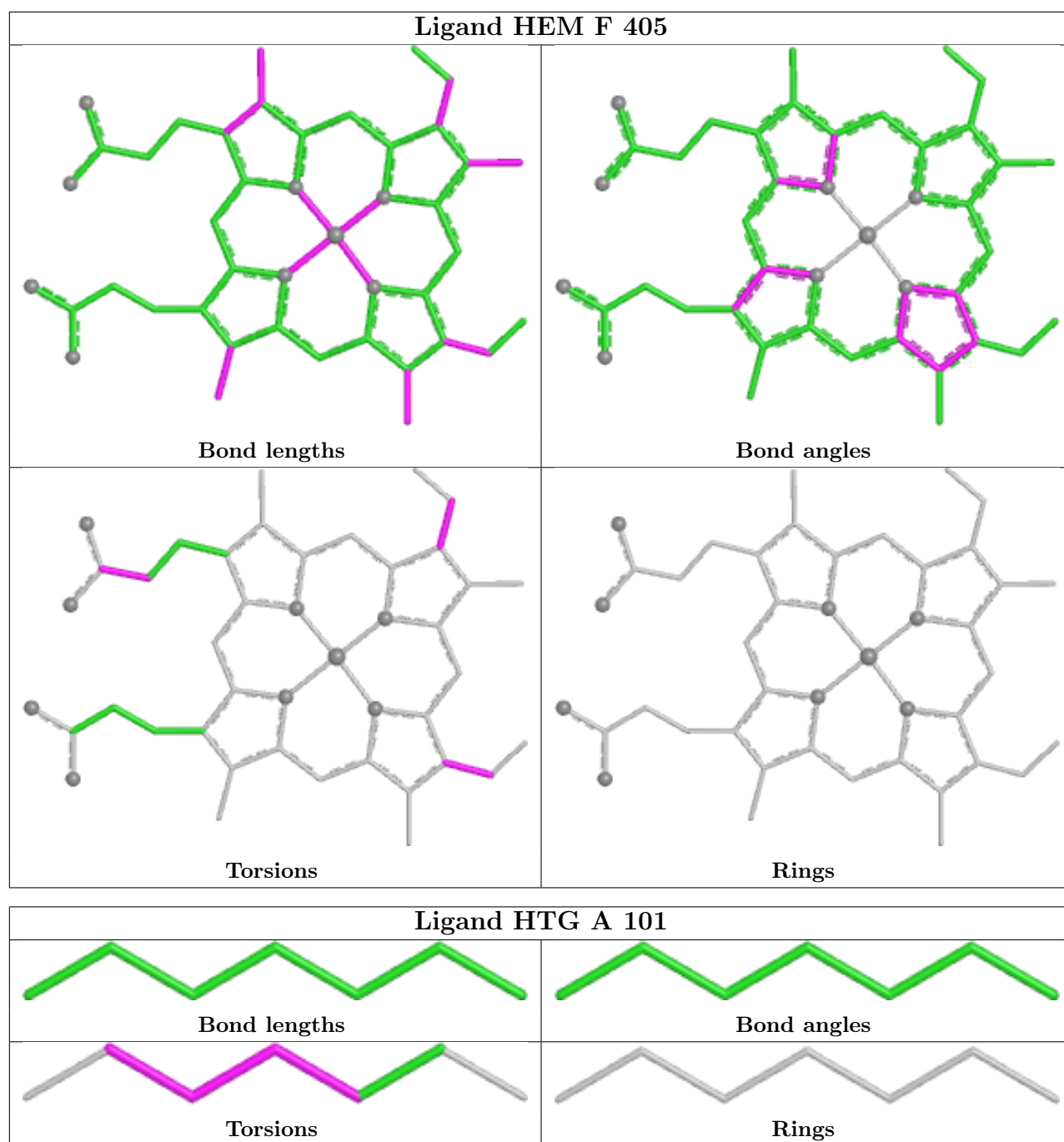












5.7 Other polymers [\(i\)](#)

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	78/97 (80%)	-1.36	0 100 100	26, 39, 56, 60	0
1	C	77/97 (79%)	-1.35	0 100 100	26, 39, 56, 60	0
1	E	78/97 (80%)	-1.40	0 100 100	26, 39, 56, 60	0
1	G	77/97 (79%)	-1.40	0 100 100	26, 38, 56, 60	0
2	B	382/404 (94%)	-1.46	0 100 100	19, 32, 48, 56	0
2	D	385/404 (95%)	-1.42	0 100 100	19, 32, 48, 58	0
2	F	381/404 (94%)	-1.43	0 100 100	19, 32, 48, 58	0
2	H	382/404 (94%)	-1.39	0 100 100	19, 32, 48, 56	0
All	All	1840/2004 (91%)	-1.42	0 100 100	19, 33, 49, 60	0

There are no RSRZ outliers to report.

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

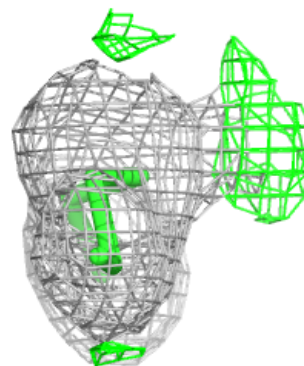
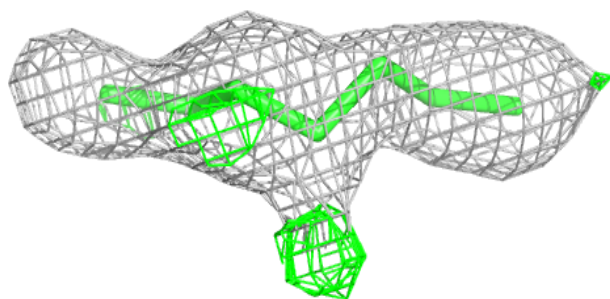
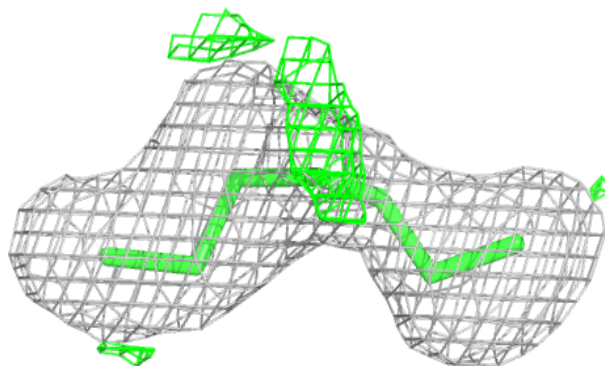
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	HTG	A	101	7/19	0.97	0.06	36,37,37,38	0
4	HTG	C	100	12/19	0.98	0.04	49,50,51,51	0
4	HTG	D	417	5/19	0.98	0.07	33,33,34,34	0
4	HTG	F	417	6/19	0.98	0.06	48,49,49,49	0
6	CL	F	418	1/1	0.98	0.04	45,45,45,45	0
3	ZMQ	A	99	38/39	0.99	0.04	26,32,39,39	0
3	ZMQ	C	99	38/39	0.99	0.03	30,34,40,41	0
3	ZMQ	E	99	38/39	0.99	0.03	26,31,37,39	0
4	HTG	E	100	12/19	0.99	0.03	34,36,37,37	0
3	ZMQ	G	99	38/39	0.99	0.04	32,35,40,40	0
4	HTG	G	100	12/19	0.99	0.03	37,40,40,41	0
4	HTG	H	417	7/19	0.99	0.04	51,51,51,51	0
6	CL	B	416	1/1	0.99	0.06	60,60,60,60	0
4	HTG	A	100	15/19	0.99	0.03	35,39,40,40	0
5	HEM	F	405	43/43	1.00	0.02	16,20,22,25	0
5	HEM	H	405	43/43	1.00	0.03	16,17,20,22	0
5	HEM	B	405	43/43	1.00	0.02	13,15,16,19	0
5	HEM	D	405	43/43	1.00	0.02	15,16,19,20	0

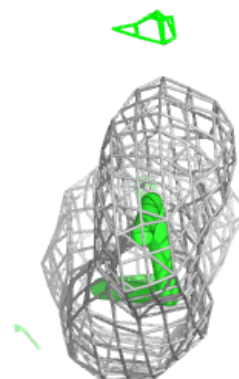
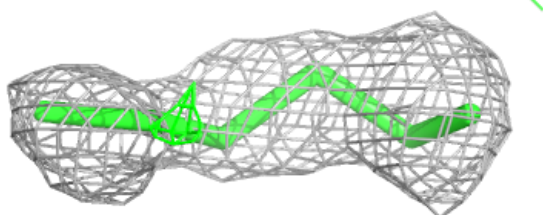
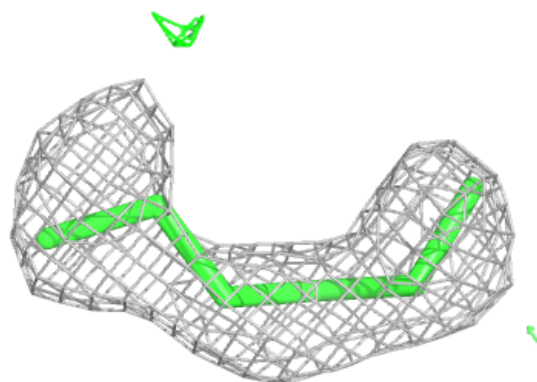
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around HTG A 101:

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

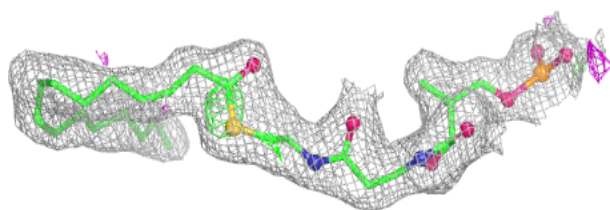
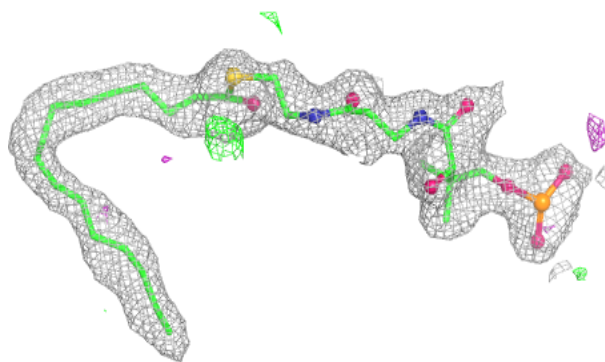
**Electron density around HTG F 417:**

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

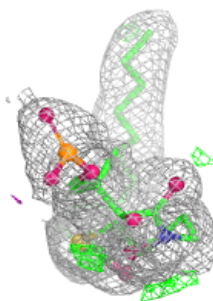
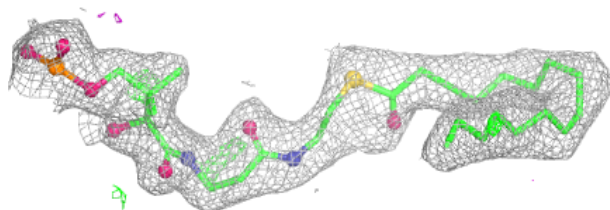
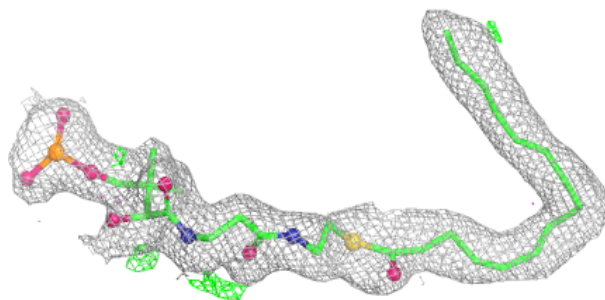


Electron density around ZMQ A 99:

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

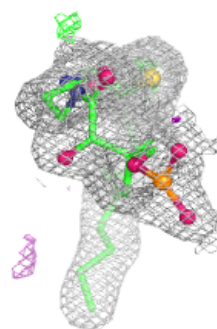
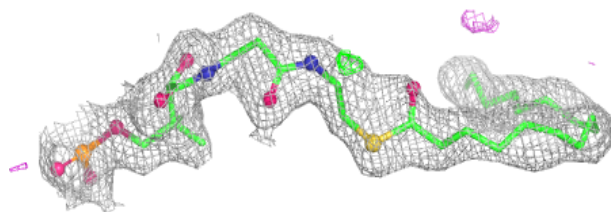
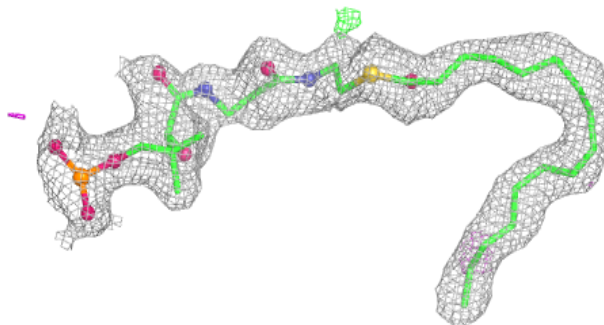
**Electron density around ZMQ C 99:**

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

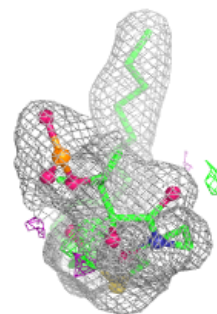
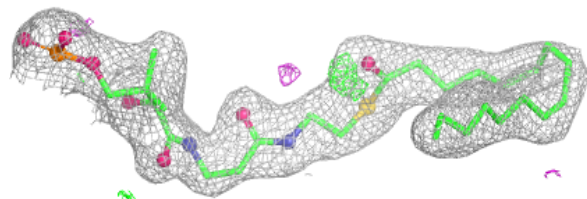
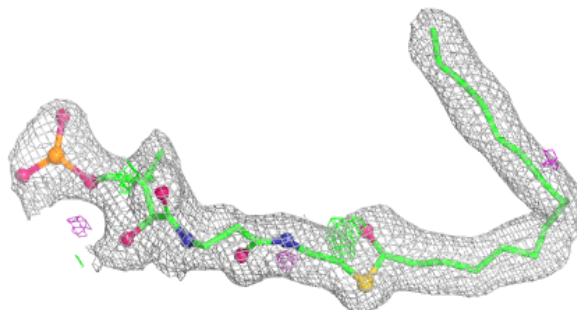


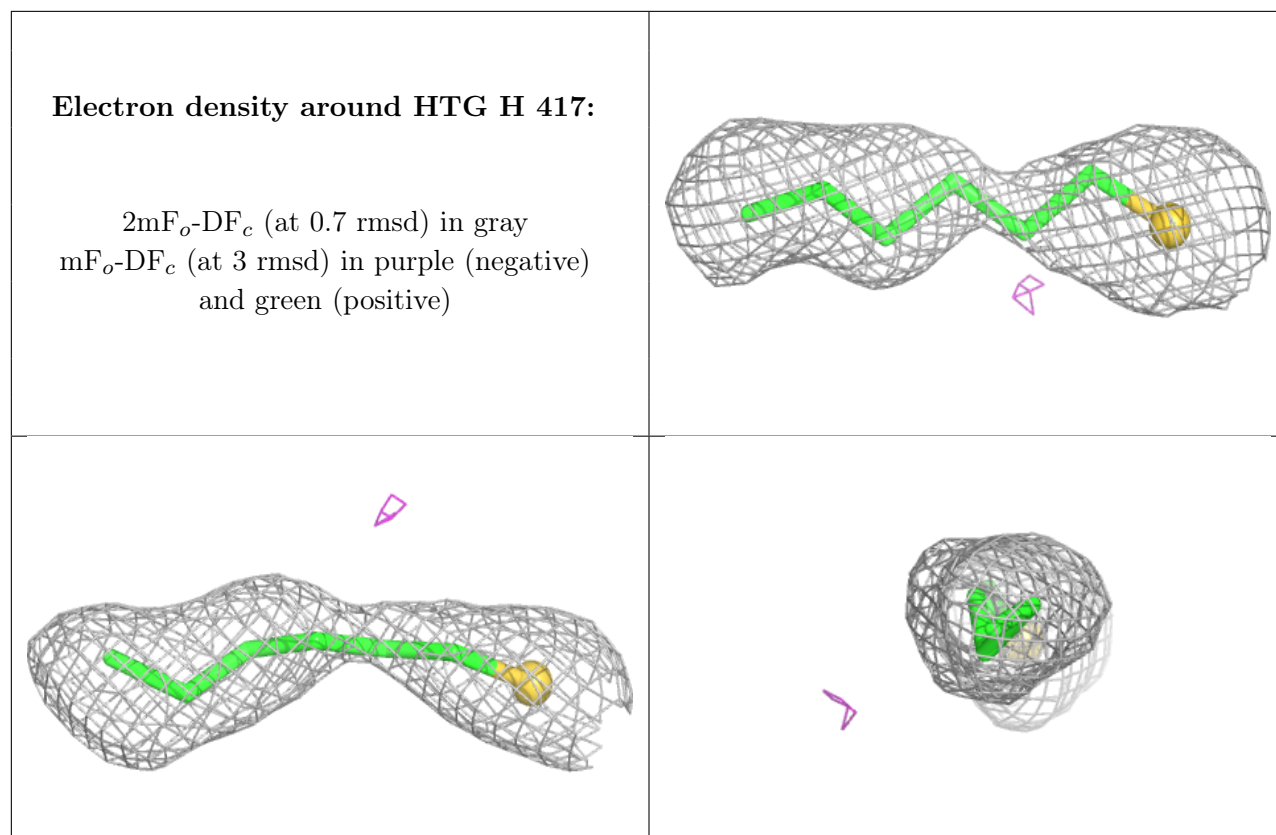
Electron density around ZMQ E 99:

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

**Electron density around ZMQ G 99:**

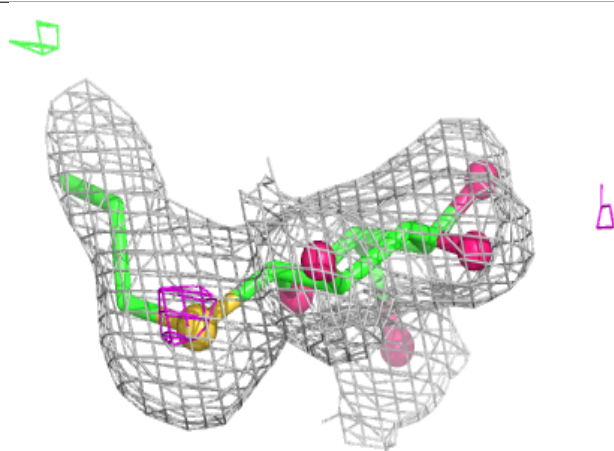
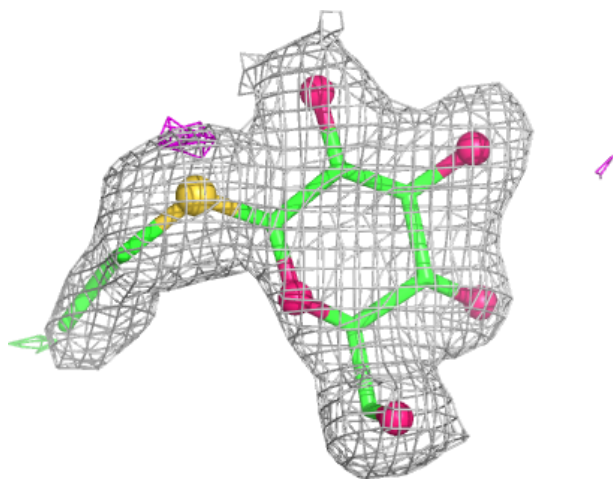
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





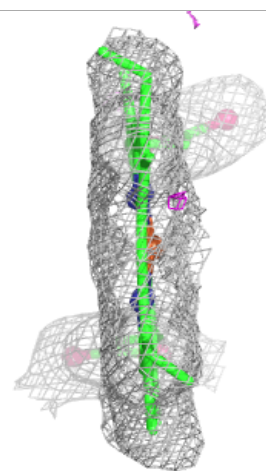
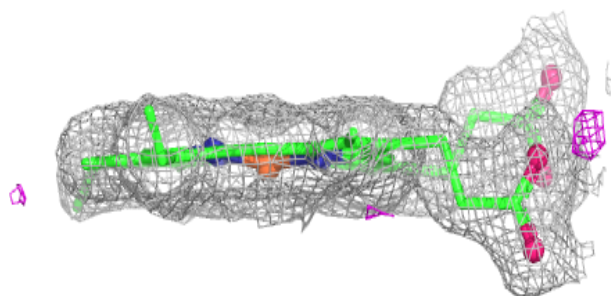
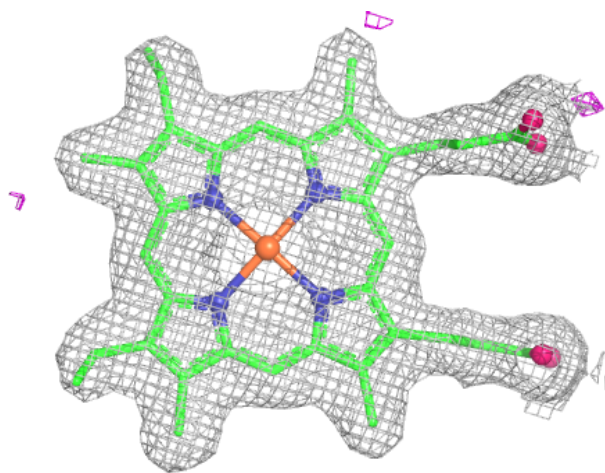
Electron density around HTG A 100:

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



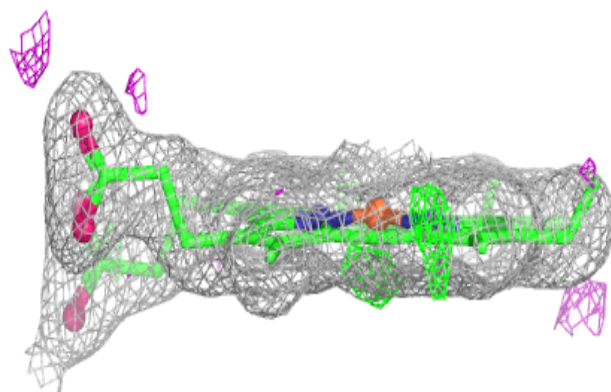
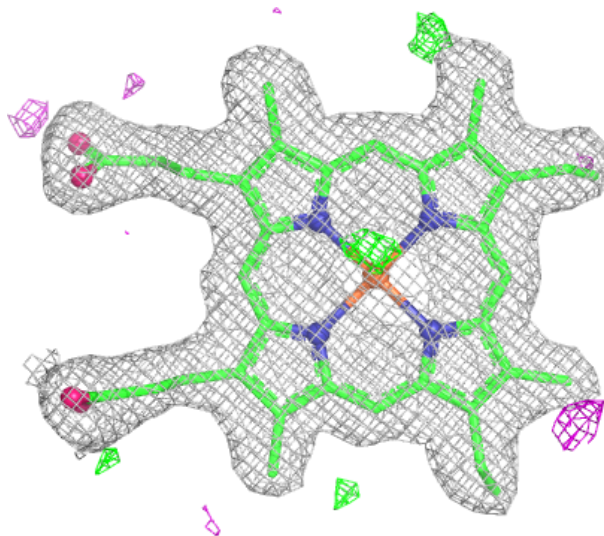
Electron density around HEM F 405:

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



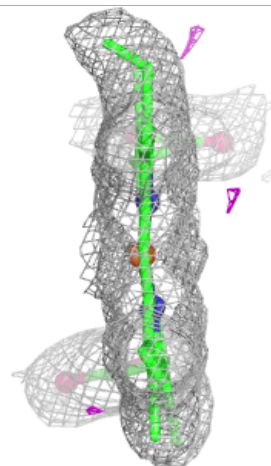
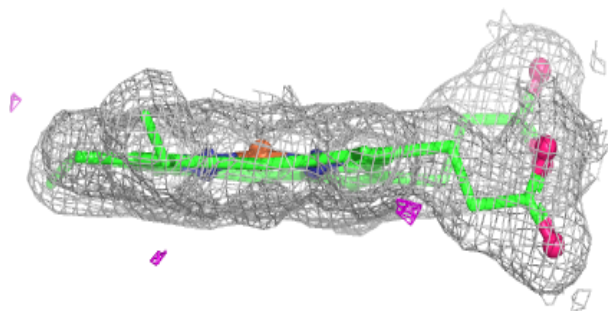
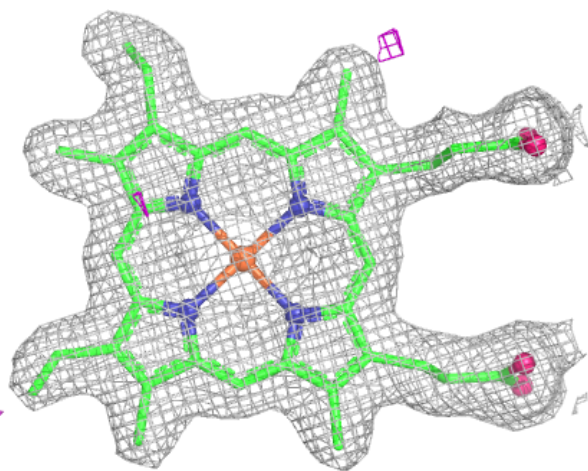
Electron density around HEM H 405:

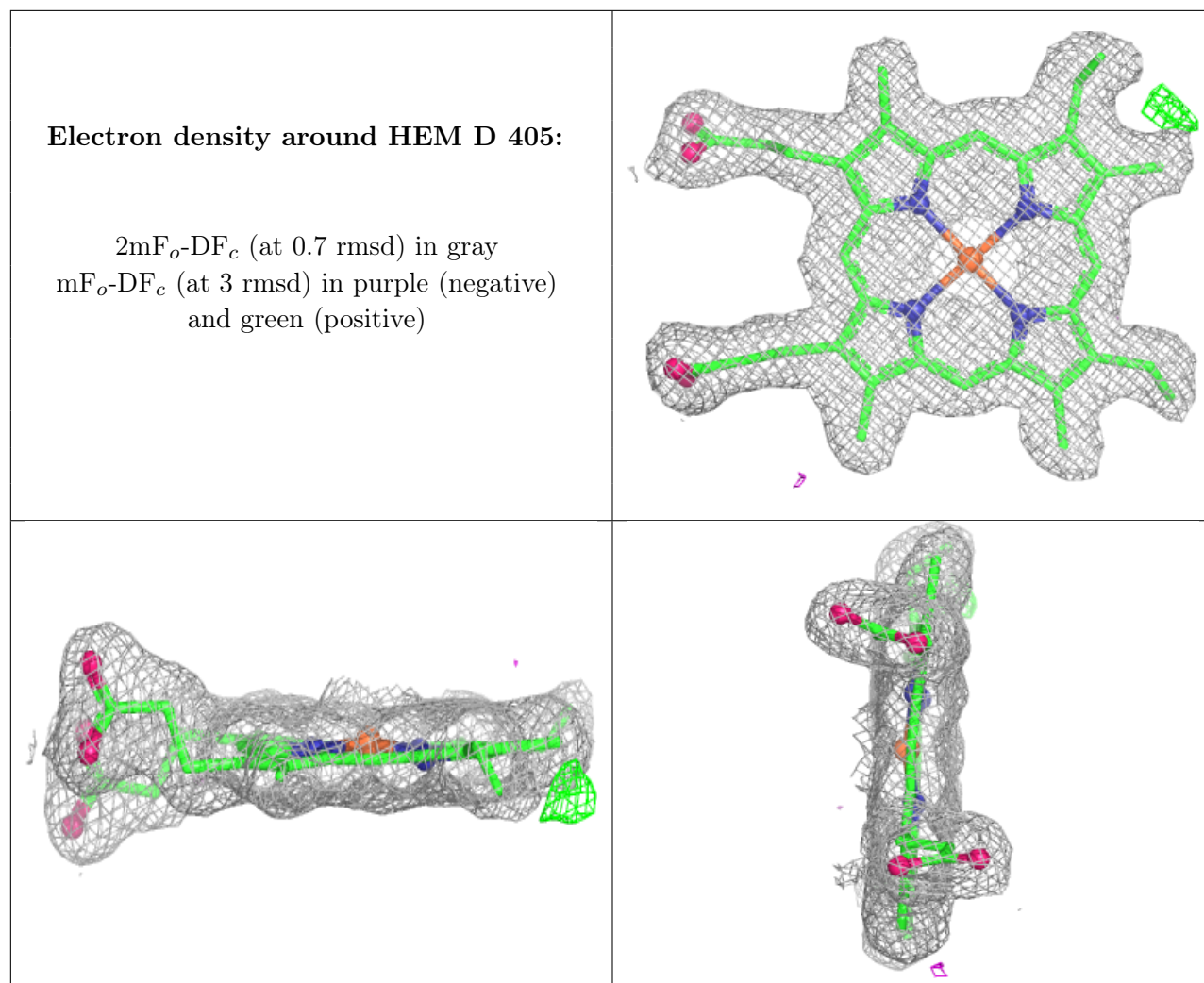
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEM B 405:

$2mF_o-DF_c$ (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.