



# wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 1, 2021 – 03:54 am BST

PDB ID : 7P46  
Title : Crystal Structure of Xanthomonas campestris Tryptophan 2,3-dioxygenase (TDO)  
Authors : Kwon, H.; Basran, J.; Booth, E.S.; Campbell, L.P.; Thackray, S.J.; Moody, P.C.E.; Mowat, C.G.; Raven, E.L.  
Deposited on : 2021-07-09  
Resolution : 1.70 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](mailto: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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.23.2  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0267  
CCP4 : 7.1.010 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.23.2

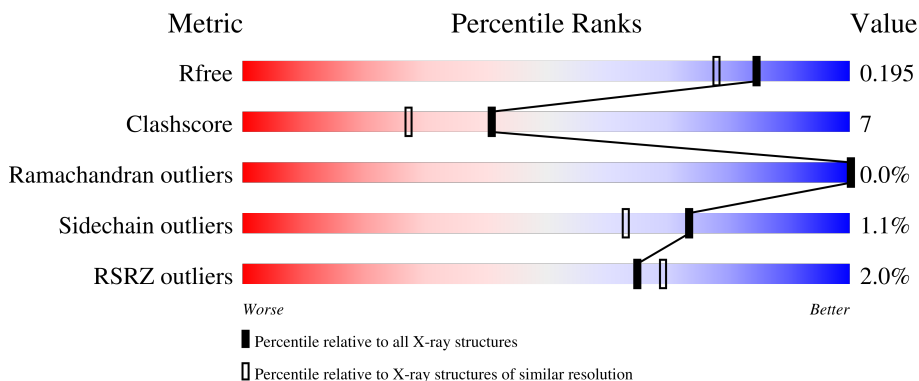
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	282	86% 13%
1	B	282	85% 14%
1	C	282	88% 11%
1	D	282	90% 9%
1	E	282	89% 10%

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Mol	Chain	Length	Quality of chain
1	F	282	<p>3% 89% 10%</p>
1	G	282	<p>5% 84% 13%</p>
1	H	282	<p>% 86% 13%</p>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	CYN	C	302	-	-	X	-
6	GOL	A	305	-	-	X	-
6	GOL	A	310	-	-	X	-
6	GOL	F	305	-	-	X	-

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 21574 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 Tryptophan 2,3-dioxygenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	281	Total 2445	C 1567	N 432	O 438	S 8	0	19	0
1	B	281	Total 2436	C 1561	N 424	O 443	S 8	0	19	0
1	C	279	Total 2353	C 1511	N 407	O 427	S 8	0	12	0
1	D	280	Total 2362	C 1519	N 408	O 427	S 8	0	12	0
1	E	278	Total 2375	C 1521	N 412	O 434	S 8	0	14	0
1	F	279	Total 2345	C 1495	N 414	O 428	S 8	0	7	0
1	G	277	Total 2304	C 1474	N 406	O 416	S 8	0	3	0
1	H	280	Total 2350	C 1505	N 412	O 425	S 8	0	8	0

There are 8 discrepancies between the modelled and reference sequences:

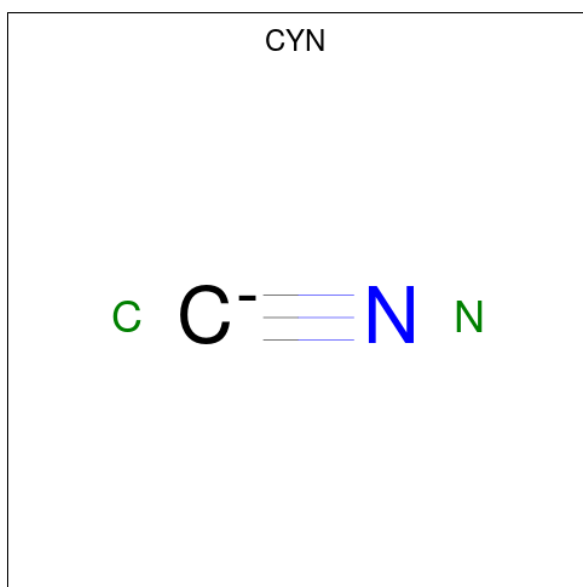
Chain	Residue	Modelled	Actual	Comment	Reference
A	55	SER	HIS	conflict	UNP Q8PDA8
B	55	SER	HIS	conflict	UNP Q8PDA8
C	55	SER	HIS	conflict	UNP Q8PDA8
D	55	SER	HIS	conflict	UNP Q8PDA8
E	55	SER	HIS	conflict	UNP Q8PDA8
F	55	SER	HIS	conflict	UNP Q8PDA8
G	55	SER	HIS	conflict	UNP Q8PDA8
H	55	SER	HIS	conflict	UNP Q8PDA8

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula:  $C_{34}H_{32}FeN_4O_4$ ) (labeled as "Ligand of Interest" by depositor).



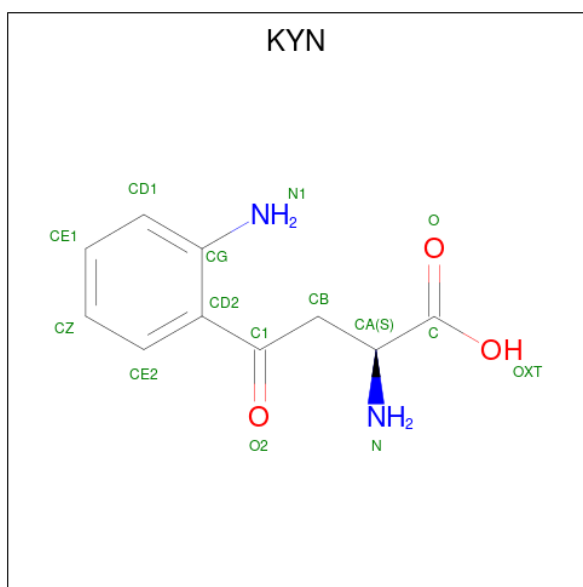
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	D	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	E	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	F	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	G	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	H	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is CYANIDE ION (three-letter code: CYN) (formula: CN).



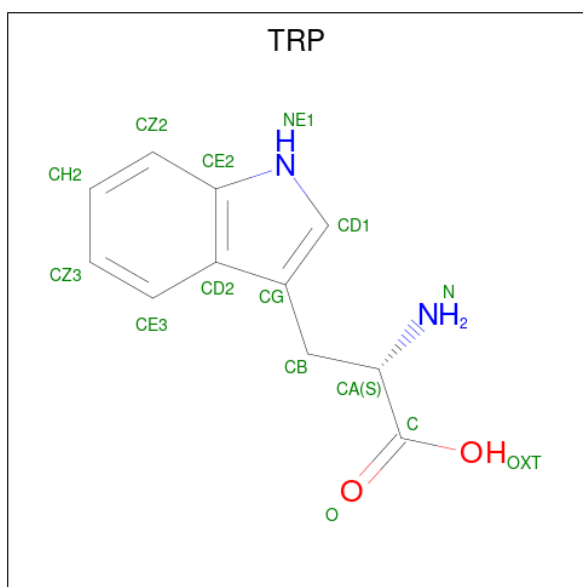
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	N		
3	A	1	2	1	1	0	0
3	B	1	2	1	1	0	0
3	C	1	2	1	1	0	0
3	D	1	2	1	1	0	0
3	F	1	2	1	1	0	0
3	H	1	2	1	1	0	0

- Molecule 4 is (2S)-2-amino-4-(2-aminophenyl)-4-oxobutanoic acid (three-letter code: KYN) (formula: C<sub>10</sub>H<sub>12</sub>N<sub>2</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	Total 15	C 10	N 2	O 3	0	0
4	B	1	Total 15	C 10	N 2	O 3	0	0
4	C	1	Total 15	C 10	N 2	O 3	0	0
4	D	1	Total 15	C 10	N 2	O 3	0	0
4	E	1	Total 15	C 10	N 2	O 3	0	0
4	F	1	Total 15	C 10	N 2	O 3	0	0
4	G	1	Total 15	C 10	N 2	O 3	0	0
4	H	1	Total 15	C 10	N 2	O 3	0	0

- Molecule 5 is TRYPTOPHAN (three-letter code: TRP) (formula: C<sub>11</sub>H<sub>12</sub>N<sub>2</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	A	1	Total	C	N	O	0	0
			15	11	2	2		
5	B	1	Total	C	N	O	0	0
			15	11	2	2		
5	C	1	Total	C	N	O	0	0
			15	11	2	2		
5	D	1	Total	C	N	O	0	0
			15	11	2	2		
5	E	1	Total	C	N	O	0	0
			15	11	2	2		
5	F	1	Total	C	N	O	0	0
			15	11	2	2		
5	G	1	Total	C	N	O	0	0
			15	11	2	2		
5	H	1	Total	C	N	O	0	0
			15	11	2	2		

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).





Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 6 3 3	0	0
6	A	1	Total C O 6 3 3	0	0
6	A	1	Total C O 6 3 3	0	0
6	A	1	Total C O 6 3 3	0	0
6	A	1	Total C O 6 3 3	0	0
6	A	1	Total C O 6 3 3	0	0
6	B	1	Total C O 6 3 3	0	0
6	B	1	Total C O 6 3 3	0	0
6	C	1	Total C O 6 3 3	0	0
6	C	1	Total C O 6 3 3	0	0
6	F	1	Total C O 6 3 3	0	0
6	H	1	Total C O 6 3 3	0	0
6	H	1	Total C O 6 3 3	0	0
6	H	1	Total C O 6 3 3	0	0

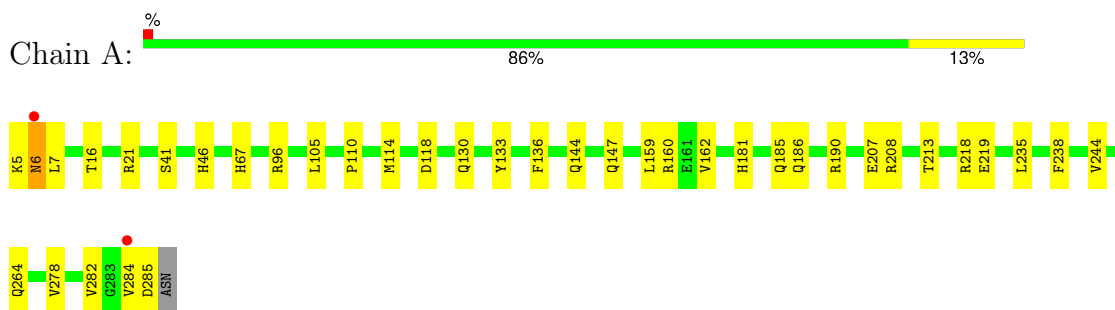
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	328	Total 328	O 328	0	0
7	B	320	Total 320	O 320	0	0
7	C	219	Total 219	O 219	0	0
7	D	267	Total 267	O 267	0	0
7	E	200	Total 200	O 200	0	0
7	F	199	Total 199	O 199	0	0
7	G	135	Total 135	O 135	0	0
7	H	256	Total 256	O 256	0	0

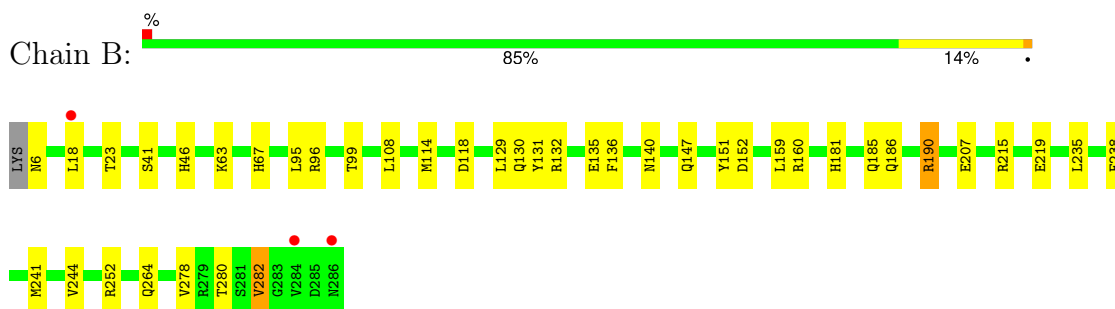
### 3 Residue-property plots [i](#)

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.

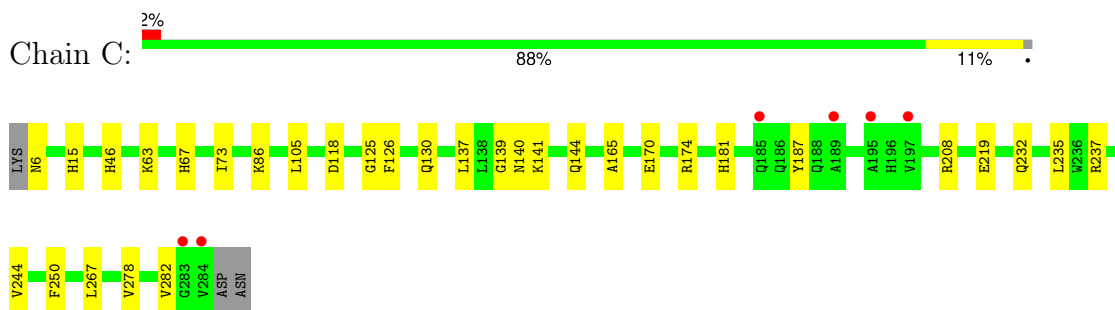
- Molecule 1: Tryptophan 2,3-dioxygenase



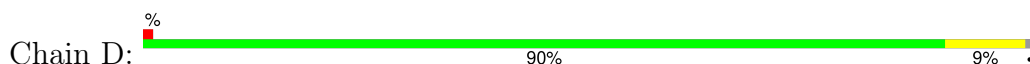
- Molecule 1: Tryptophan 2,3-dioxygenase



- Molecule 1: Tryptophan 2,3-dioxygenase

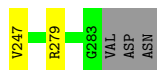
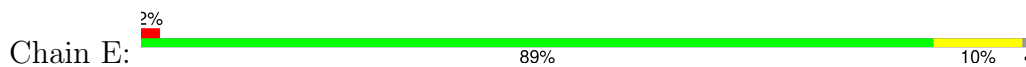


- Molecule 1: Tryptophan 2,3-dioxygenase

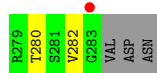
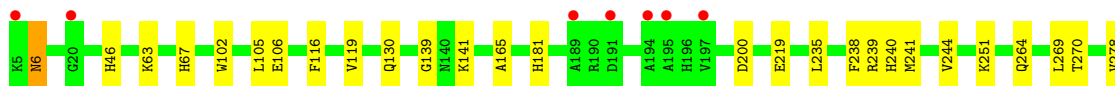
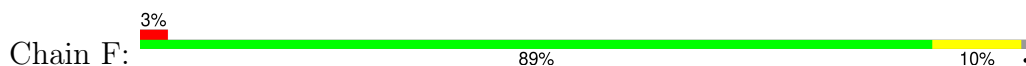




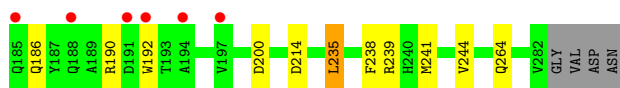
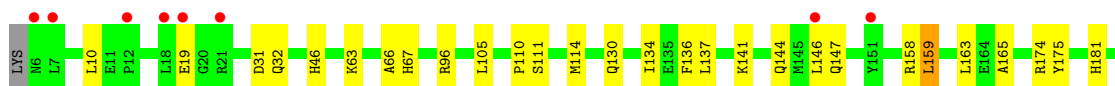
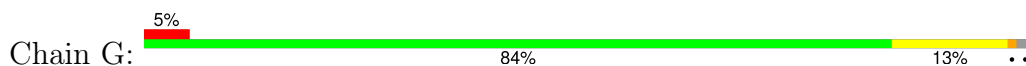
- Molecule 1: Tryptophan 2,3-dioxygenase



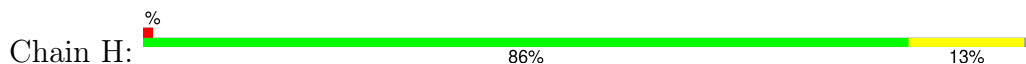
- Molecule 1: Tryptophan 2,3-dioxygenase



- Molecule 1: Tryptophan 2,3-dioxygenase



- Molecule 1: Tryptophan 2,3-dioxygenase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	78.09Å 117.75Å 138.82Å 90.00° 95.52° 90.00°	Depositor
Resolution (Å)	89.78 – 1.70 89.62 – 1.70	Depositor EDS
% Data completeness (in resolution range)	97.9 (89.78-1.70) 97.9 (89.62-1.70)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.74 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.8.0257	Depositor
R, $R_{free}$	0.149 , 0.185 0.162 , 0.195	Depositor DCC
$R_{free}$ test set	13541 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	19.8	Xtriage
Anisotropy	0.046	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	(Not available) , (Not available)	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	21574	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.86% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CYN, HEM, KYN, GOL

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	0.85	1/2526 (0.0%)	0.94	3/3422 (0.1%)
1	B	0.86	1/2523 (0.0%)	0.95	3/3421 (0.1%)
1	C	0.79	0/2437	0.85	0/3305
1	D	0.81	0/2455	0.85	0/3329
1	E	0.82	0/2453	0.85	1/3327 (0.0%)
1	F	0.83	0/2405	0.81	0/3259
1	G	0.76	0/2367	0.80	0/3207
1	H	0.80	0/2425	0.84	1/3286 (0.0%)
All	All	0.82	2/19591 (0.0%)	0.86	8/26556 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	41	SER	CB-OG	-5.08	1.35	1.42
1	A	5	LYS	C-N	5.06	1.45	1.34

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	6	ASN	CB-CA-C	11.48	133.35	110.40
1	A	96	ARG	CG-CD-NE	-5.85	99.52	111.80
1	B	160	ARG	NE-CZ-NH2	-5.78	117.41	120.30
1	B	131	TYR	CB-CG-CD1	5.72	124.43	121.00
1	E	279	ARG	NE-CZ-NH2	-5.54	117.53	120.30

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	2445	0	2423	39	1
1	B	2436	0	2413	53	0
1	C	2353	0	2321	33	0
1	D	2362	0	2345	28	0
1	E	2375	0	2333	25	1
1	F	2345	0	2282	36	0
1	G	2304	0	2260	32	0
1	H	2350	0	2317	39	0
2	A	43	0	30	2	0
2	B	43	0	30	2	0
2	C	43	0	30	3	0
2	D	43	0	30	2	0
2	E	43	0	30	6	0
2	F	43	0	30	3	0
2	G	43	0	30	3	0
2	H	43	0	30	3	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	2	0
3	D	2	0	0	1	0
3	F	2	0	0	0	0
3	H	2	0	0	1	0
4	A	15	0	11	0	0
4	B	15	0	11	0	0
4	C	15	0	11	1	0
4	D	15	0	11	1	0
4	E	15	0	11	0	0
4	F	15	0	11	0	0
4	G	15	0	11	0	0
4	H	15	0	11	1	0
5	A	15	0	9	0	0
5	B	15	0	9	1	0
5	C	15	0	9	0	0
5	D	15	0	9	0	0
5	E	15	0	9	0	0
5	F	15	0	9	0	0
5	G	15	0	9	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	H	15	0	9	1	0
6	A	36	0	48	10	1
6	B	12	0	16	5	0
6	C	12	0	16	1	0
6	F	6	0	8	8	0
6	H	18	0	24	3	0
7	A	328	0	0	17	2
7	B	320	0	0	31	3
7	C	219	0	0	10	0
7	D	267	0	0	8	1
7	E	200	0	0	4	3
7	F	199	0	0	16	0
7	G	135	0	0	7	0
7	H	256	0	0	12	0
All	All	21574	0	19206	277	7

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 7.

The worst 5 of 277 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:140[B]:ASN:ND2	7:D:401:HOH:O	1.67	1.28
1:B:114:MET:HE3	7:B:559:HOH:O	1.43	1.14
1:B:235[B]:LEU:CD1	7:B:653:HOH:O	1.98	1.10
1:B:18[B]:LEU:HD13	1:B:18[B]:LEU:H	1.08	1.09
6:A:310:GOL:H32	7:A:408:HOH:O	1.54	1.07

The worst 5 of 7 symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:16:THR:OG1	1:A:185[B]:GLN:NE2[2_655]	1.85	0.35
7:A:513:HOH:O	7:E:585:HOH:O[1_554]	1.99	0.21
7:A:402:HOH:O	7:A:634:HOH:O[2_645]	2.04	0.16
7:B:585:HOH:O	7:E:585:HOH:O[1_554]	2.13	0.07
7:B:647:HOH:O	7:D:635:HOH:O[1_455]	2.13	0.07



## 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	298/282 (106%)	294 (99%)	4 (1%)	0	100	100
1	B	298/282 (106%)	294 (99%)	4 (1%)	0	100	100
1	C	289/282 (102%)	287 (99%)	2 (1%)	0	100	100
1	D	290/282 (103%)	282 (97%)	7 (2%)	1 (0%)	41	24
1	E	290/282 (103%)	285 (98%)	5 (2%)	0	100	100
1	F	284/282 (101%)	279 (98%)	5 (2%)	0	100	100
1	G	278/282 (99%)	272 (98%)	6 (2%)	0	100	100
1	H	286/282 (101%)	282 (99%)	4 (1%)	0	100	100
All	All	2313/2256 (102%)	2275 (98%)	37 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	284	VAL

### 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	263/247 (106%)	263 (100%)	0	100	100
1	B	265/247 (107%)	259 (98%)	6 (2%)	50	33
1	C	253/247 (102%)	253 (100%)	0	100	100
1	D	256/247 (104%)	250 (98%)	6 (2%)	50	33

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	256/247 (104%)	253 (99%)	3 (1%)	71	59
1	F	249/247 (101%)	247 (99%)	2 (1%)	81	74
1	G	245/247 (99%)	240 (98%)	5 (2%)	55	38
1	H	252/247 (102%)	248 (98%)	4 (2%)	62	48
All	All	2039/1976 (103%)	2013 (99%)	26 (1%)	73	56

5 of 26 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	197	VAL
1	G	159	LEU
1	H	38	GLN
1	F	200	ASP
1	G	175	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 49 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	186	GLN
1	G	32	GLN
1	F	6	ASN
1	F	130	GLN
1	G	67	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](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

44 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
6	GOL	H	305	-	5,5,5	0.12	0	5,5,5	0.48	0
6	GOL	A	309	-	5,5,5	0.19	0	5,5,5	0.40	0
4	KYN	H	303	-	12,15,15	0.95	1 (8%)	14,20,20	1.26	1 (7%)
6	GOL	C	305	-	5,5,5	0.16	0	5,5,5	0.38	0
5	TRP	C	304	-	12,16,16	0.78	0	12,22,22	1.16	1 (8%)
4	KYN	C	303	-	12,15,15	1.08	1 (8%)	14,20,20	1.66	3 (21%)
5	TRP	E	303	-	12,16,16	0.90	1 (8%)	12,22,22	0.92	1 (8%)
6	GOL	H	306	-	5,5,5	0.08	0	5,5,5	0.27	0
6	GOL	A	310	-	5,5,5	0.49	0	5,5,5	1.31	1 (20%)
6	GOL	A	305	-	5,5,5	0.12	0	5,5,5	0.46	0
6	GOL	F	305	-	5,5,5	0.11	0	5,5,5	0.28	0
6	GOL	B	305	-	5,5,5	0.18	0	5,5,5	0.38	0
3	CYN	A	302	-	0,1,1	-	-	-	-	-
3	CYN	F	302	-	0,1,1	-	-	-	-	-
3	CYN	B	302	-	0,1,1	-	-	-	-	-
3	CYN	H	302	-	0,1,1	-	-	-	-	-
6	GOL	A	306	-	5,5,5	0.36	0	5,5,5	0.82	0
6	GOL	B	306	-	5,5,5	0.17	0	5,5,5	0.49	0
4	KYN	B	303	-	12,15,15	1.05	0	14,20,20	1.58	3 (21%)
3	CYN	D	302	-	0,1,1	-	-	-	-	-
4	KYN	A	303	-	12,15,15	1.23	1 (8%)	14,20,20	1.75	3 (21%)
4	KYN	F	303	-	12,15,15	0.86	1 (8%)	14,20,20	1.40	2 (14%)
5	TRP	B	304	-	12,16,16	0.89	1 (8%)	12,22,22	1.18	1 (8%)
2	HEM	G	301	1,7	27,50,50	0.93	2 (7%)	17,82,82	1.81	6 (35%)
4	KYN	E	302	-	12,15,15	1.04	1 (8%)	14,20,20	1.49	3 (21%)
6	GOL	C	306	-	5,5,5	0.08	0	5,5,5	0.23	0
2	HEM	H	301	-	27,50,50	1.15	1 (3%)	17,82,82	1.08	2 (11%)
4	KYN	D	303	-	12,15,15	1.03	1 (8%)	14,20,20	1.25	2 (14%)
3	CYN	C	302	-	0,1,1	-	-	-	-	-

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	HEM	F	301	1	27,50,50	1.25	3 (11%)	17,82,82	1.67	3 (17%)
5	TRP	G	303	-	12,16,16	1.04	1 (8%)	12,22,22	0.89	1 (8%)
6	GOL	A	308	-	5,5,5	0.27	0	5,5,5	0.44	0
6	GOL	H	307	-	5,5,5	0.19	0	5,5,5	0.43	0
5	TRP	H	304	-	12,16,16	0.84	1 (8%)	12,22,22	1.13	1 (8%)
2	HEM	A	301	1	27,50,50	1.13	3 (11%)	17,82,82	1.69	6 (35%)
2	HEM	E	301	1,7	27,50,50	1.34	3 (11%)	17,82,82	1.87	4 (23%)
5	TRP	A	304	-	12,16,16	1.03	1 (8%)	12,22,22	1.16	1 (8%)
5	TRP	F	304	-	12,16,16	0.90	1 (8%)	12,22,22	0.93	1 (8%)
2	HEM	D	301	1	27,50,50	1.00	2 (7%)	17,82,82	1.40	4 (23%)
4	KYN	G	302	-	12,15,15	1.12	1 (8%)	14,20,20	1.08	1 (7%)
5	TRP	D	304	-	12,16,16	0.79	0	12,22,22	1.13	1 (8%)
6	GOL	A	307	-	5,5,5	0.28	0	5,5,5	0.52	0
2	HEM	C	301	1	27,50,50	1.15	2 (7%)	17,82,82	1.75	5 (29%)
2	HEM	B	301	1	27,50,50	1.09	3 (11%)	17,82,82	1.25	2 (11%)

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	GOL	H	305	-	-	2/4/4/4	-
6	GOL	A	309	-	-	4/4/4/4	-
4	KYN	H	303	-	-	2/8/12/12	0/1/1/1
6	GOL	C	305	-	-	0/4/4/4	-
5	TRP	C	304	-	-	0/3/8/8	0/2/2/2
4	KYN	C	303	-	-	2/8/12/12	0/1/1/1
5	TRP	E	303	-	-	0/3/8/8	0/2/2/2
6	GOL	H	306	-	-	2/4/4/4	-
6	GOL	A	310	-	-	3/4/4/4	-
6	GOL	A	305	-	-	4/4/4/4	-
6	GOL	F	305	-	-	4/4/4/4	-
6	GOL	B	305	-	-	0/4/4/4	-
6	GOL	A	306	-	-	0/4/4/4	-
6	GOL	B	306	-	-	2/4/4/4	-
4	KYN	B	303	-	-	2/8/12/12	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	KYN	A	303	-	-	2/8/12/12	0/1/1/1
4	KYN	F	303	-	-	3/8/12/12	0/1/1/1
5	TRP	B	304	-	-	0/3/8/8	0/2/2/2
2	HEM	G	301	1,7	-	0/6/54/54	-
4	KYN	E	302	-	-	2/8/12/12	0/1/1/1
6	GOL	C	306	-	-	4/4/4/4	-
2	HEM	H	301	-	-	0/6/54/54	-
4	KYN	D	303	-	-	2/8/12/12	0/1/1/1
2	HEM	F	301	1	-	0/6/54/54	-
5	TRP	G	303	-	-	0/3/8/8	0/2/2/2
6	GOL	A	308	-	-	4/4/4/4	-
6	GOL	H	307	-	-	4/4/4/4	-
5	TRP	H	304	-	-	0/3/8/8	0/2/2/2
2	HEM	A	301	1	-	0/6/54/54	-
2	HEM	E	301	1,7	-	0/6/54/54	-
5	TRP	A	304	-	-	0/3/8/8	0/2/2/2
5	TRP	F	304	-	-	0/3/8/8	0/2/2/2
2	HEM	D	301	1	-	0/6/54/54	-
4	KYN	G	302	-	-	2/8/12/12	0/1/1/1
5	TRP	D	304	-	-	0/3/8/8	0/2/2/2
6	GOL	A	307	-	-	2/4/4/4	-
2	HEM	C	301	1	-	0/6/54/54	-
2	HEM	B	301	1	-	0/6/54/54	-

The worst 5 of 32 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	301	HEM	C4D-C3D	4.06	1.51	1.42
2	C	301	HEM	C3B-C2B	-3.94	1.34	1.40
2	H	301	HEM	C4D-C3D	3.91	1.51	1.42
2	F	301	HEM	C1A-NA	3.51	1.43	1.36
5	A	304	TRP	CA-N	3.06	1.53	1.47

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	301	HEM	CBD-CAD-C3D	-4.62	103.96	112.48
4	A	303	KYN	CB-CA-C	4.44	117.88	110.69
4	C	303	KYN	CB-CA-C	4.18	117.46	110.69
2	G	301	HEM	CBD-CAD-C3D	-3.58	105.88	112.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	301	HEM	CBA-CAA-C2A	-3.39	106.23	112.49

There are no chirality outliers.

5 of 52 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	303	KYN	C-CA-CB-C1
4	B	303	KYN	C-CA-CB-C1
4	C	303	KYN	C-CA-CB-C1
4	D	303	KYN	C-CA-CB-C1
4	E	302	KYN	C-CA-CB-C1

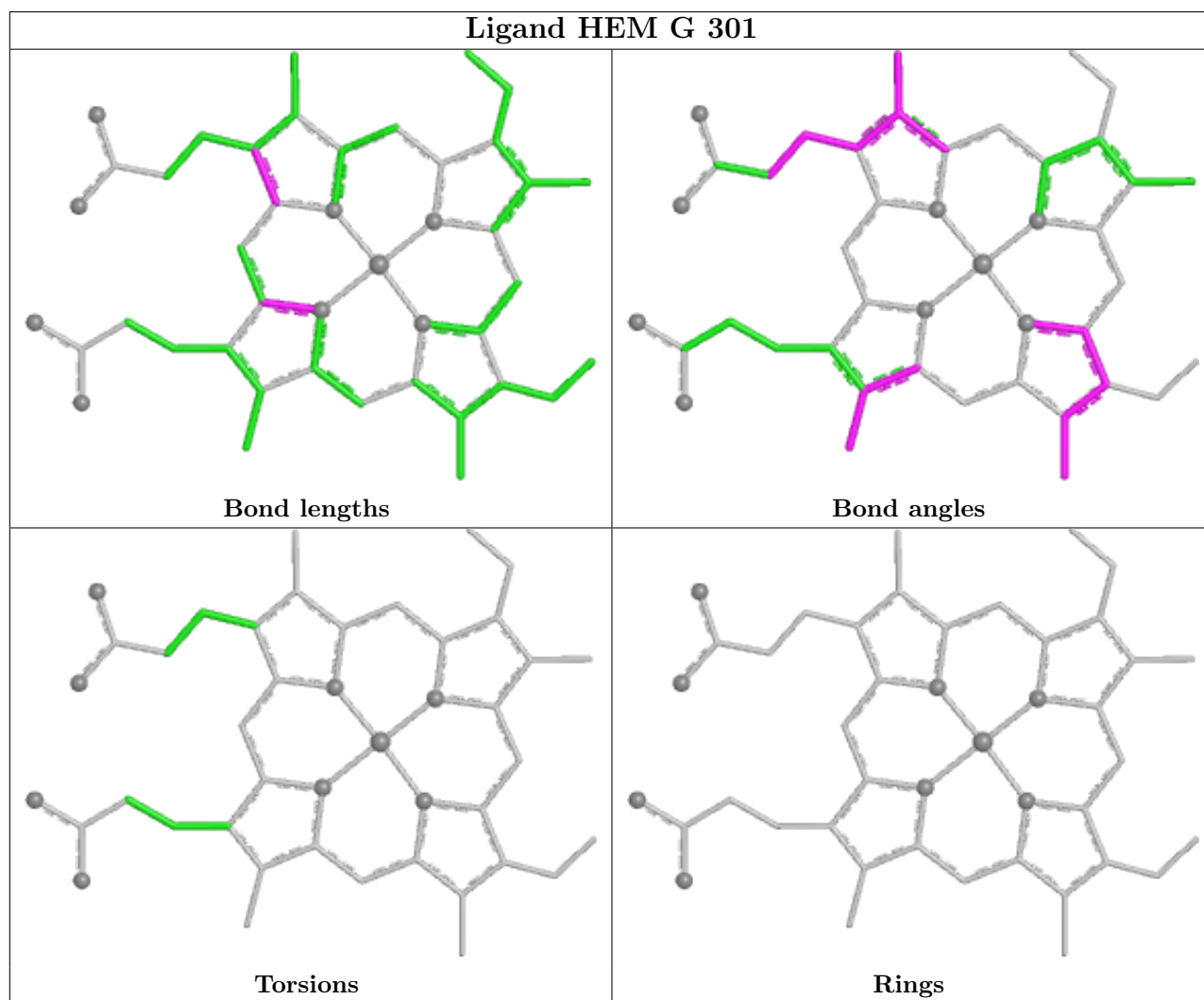
There are no ring outliers.

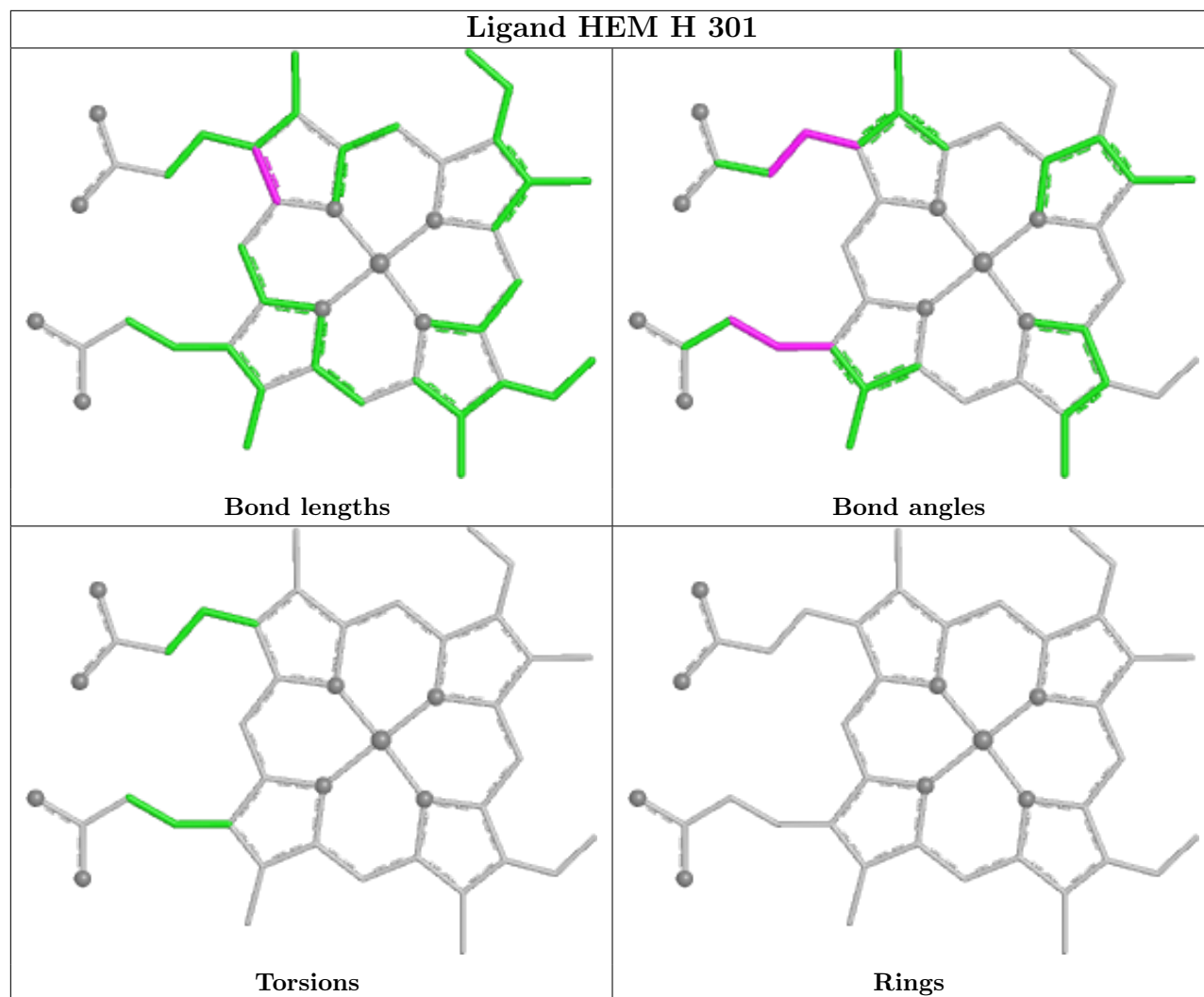
24 monomers are involved in 58 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	H	303	KYN	1	0
6	C	305	GOL	1	0
4	C	303	KYN	1	0
6	A	310	GOL	5	1
6	A	305	GOL	4	0
6	F	305	GOL	8	0
6	B	305	GOL	2	0
3	H	302	CYN	1	0
6	B	306	GOL	3	0
3	D	302	CYN	1	0
5	B	304	TRP	1	0
2	G	301	HEM	3	0
2	H	301	HEM	3	0
4	D	303	KYN	1	0
3	C	302	CYN	2	0
2	F	301	HEM	3	0
6	H	307	GOL	3	0
5	H	304	TRP	1	0
2	A	301	HEM	2	0
2	E	301	HEM	6	0
2	D	301	HEM	2	0
6	A	307	GOL	1	0
2	C	301	HEM	3	0
2	B	301	HEM	2	0

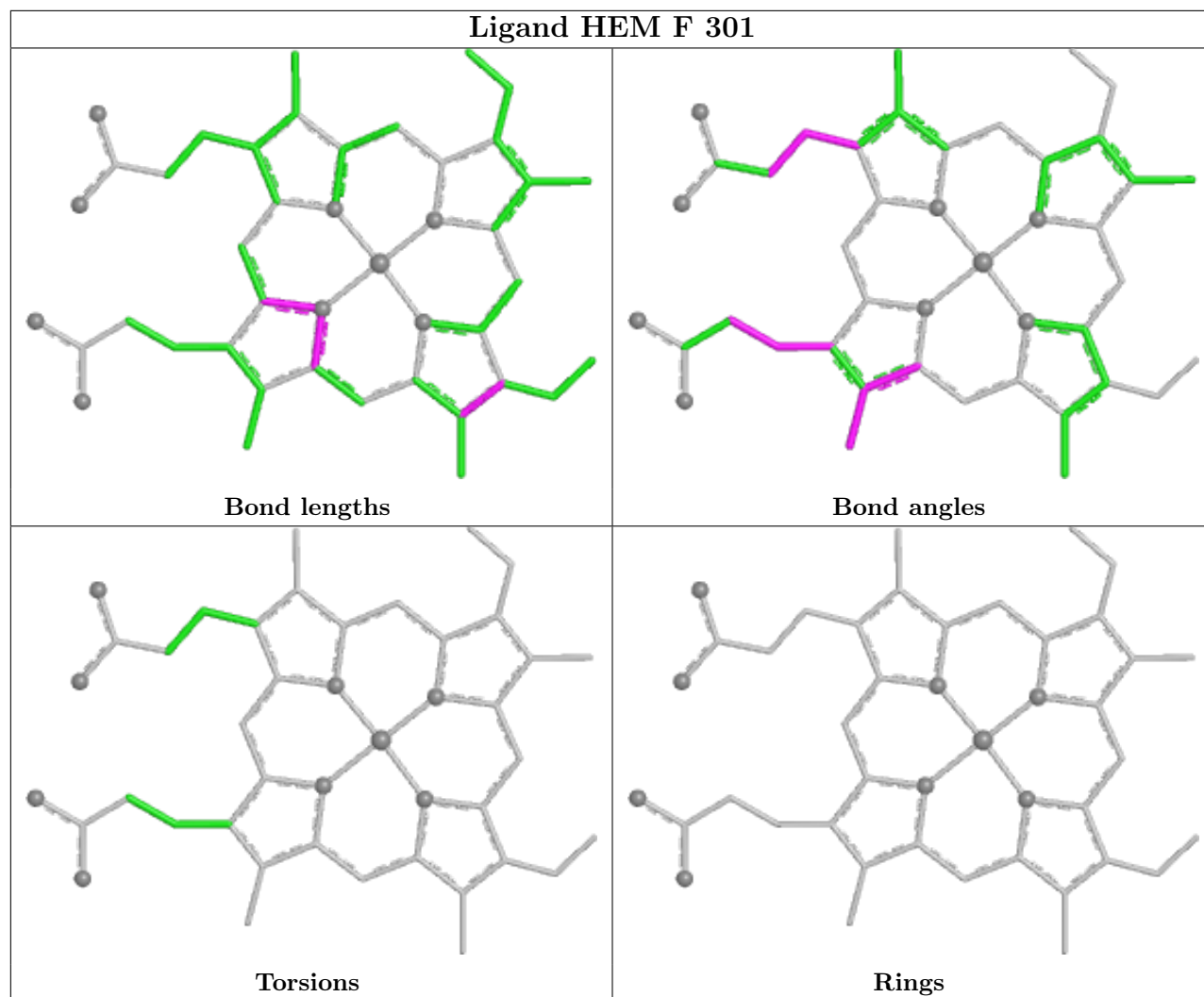
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

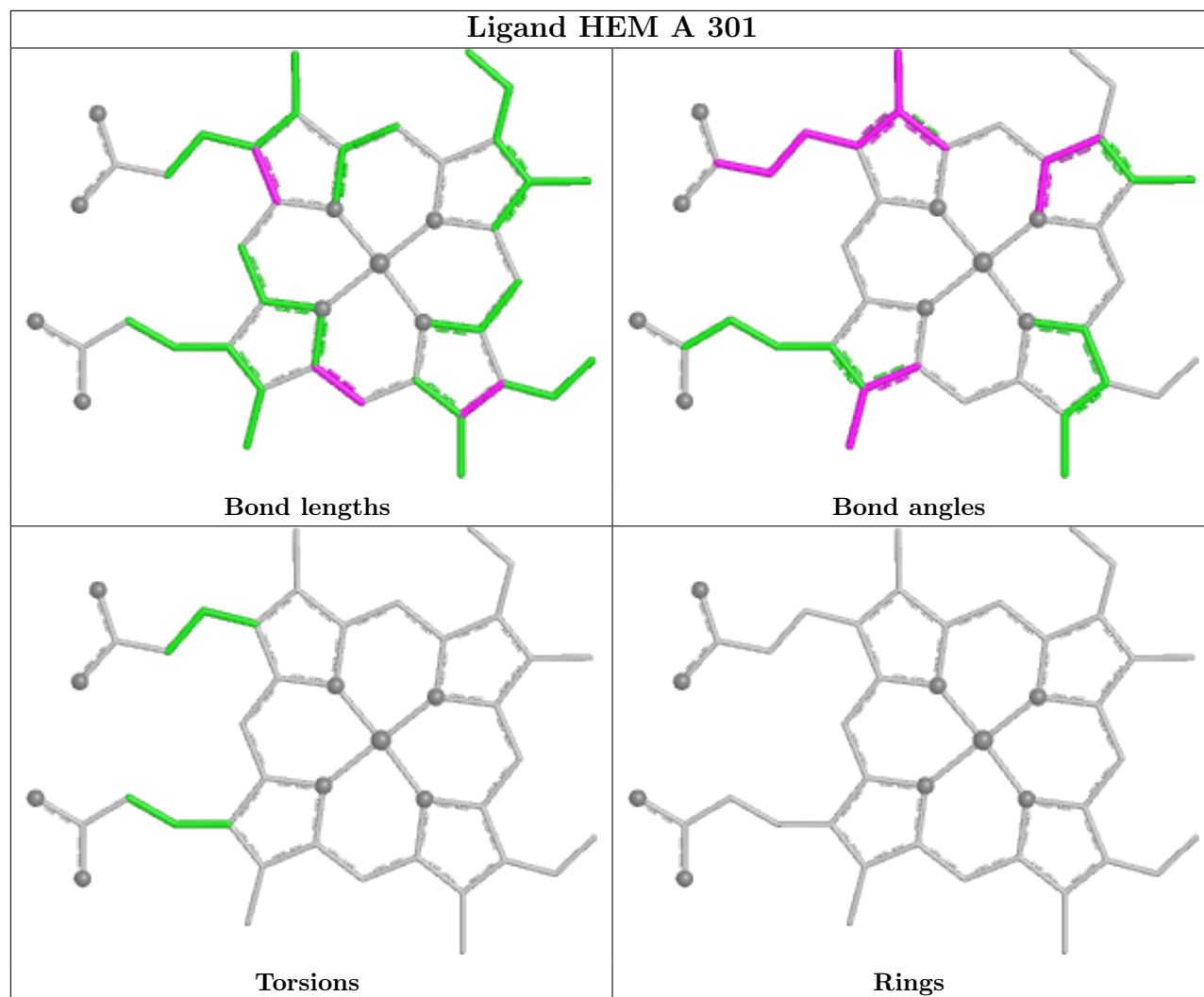
bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 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.

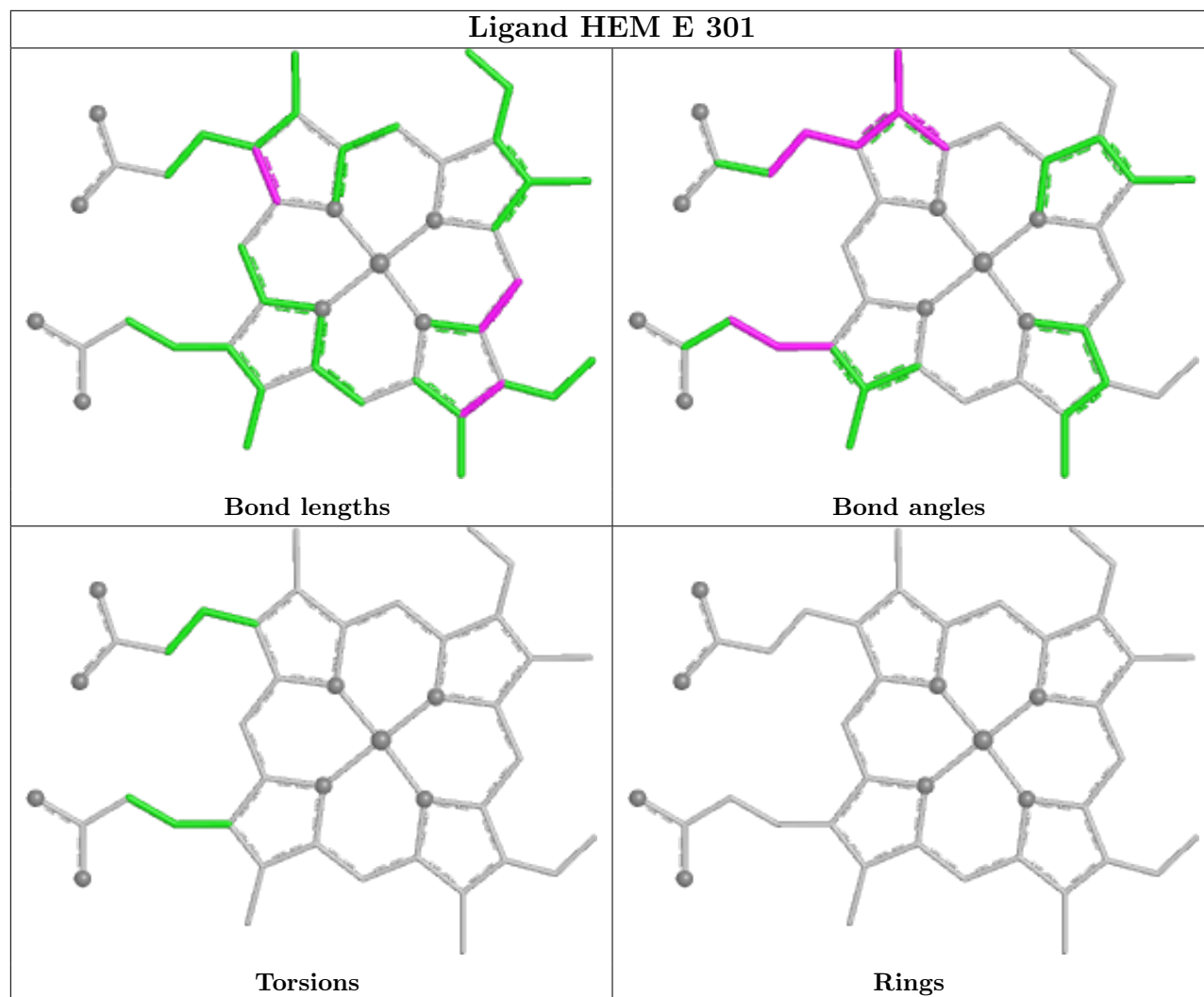


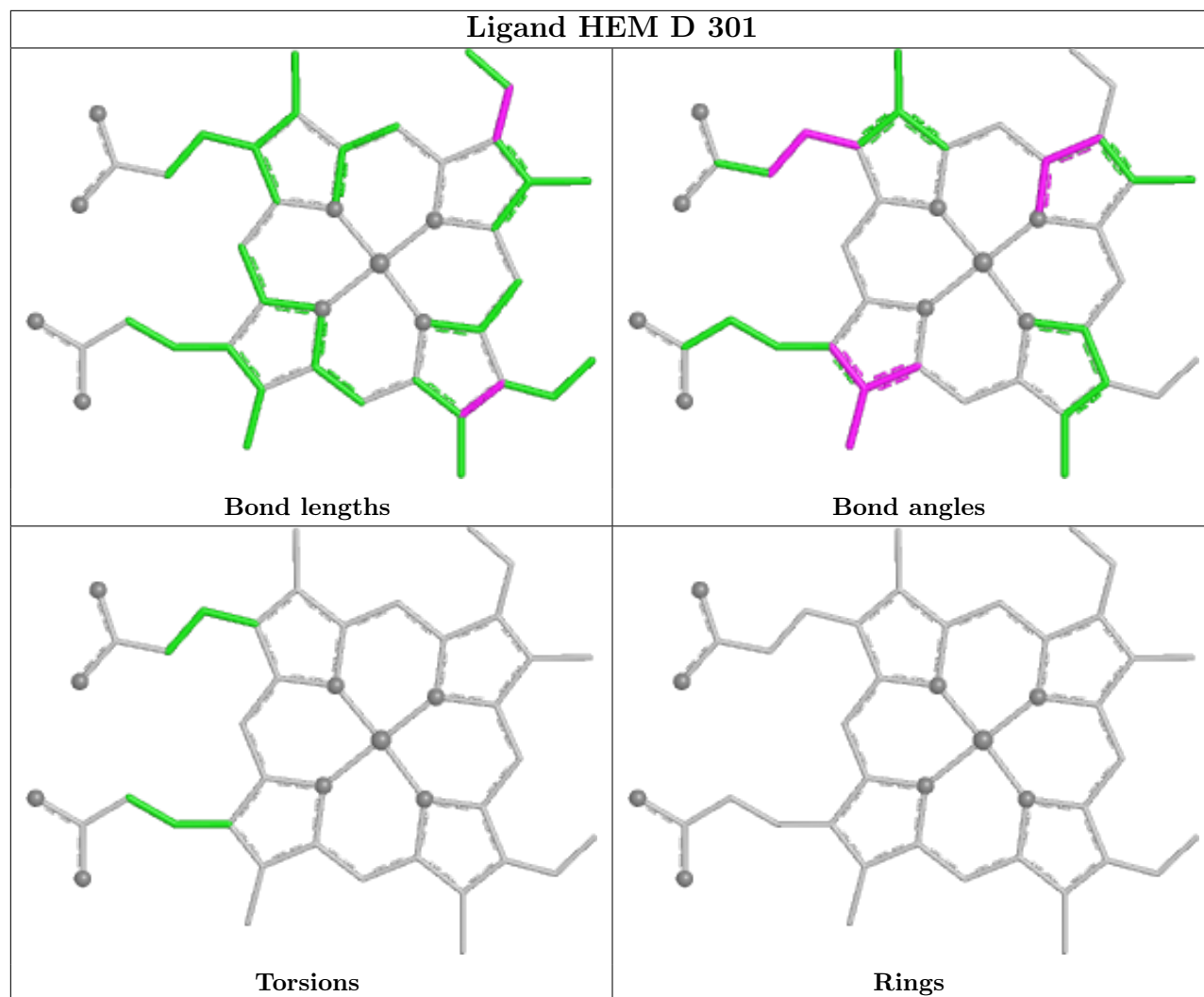


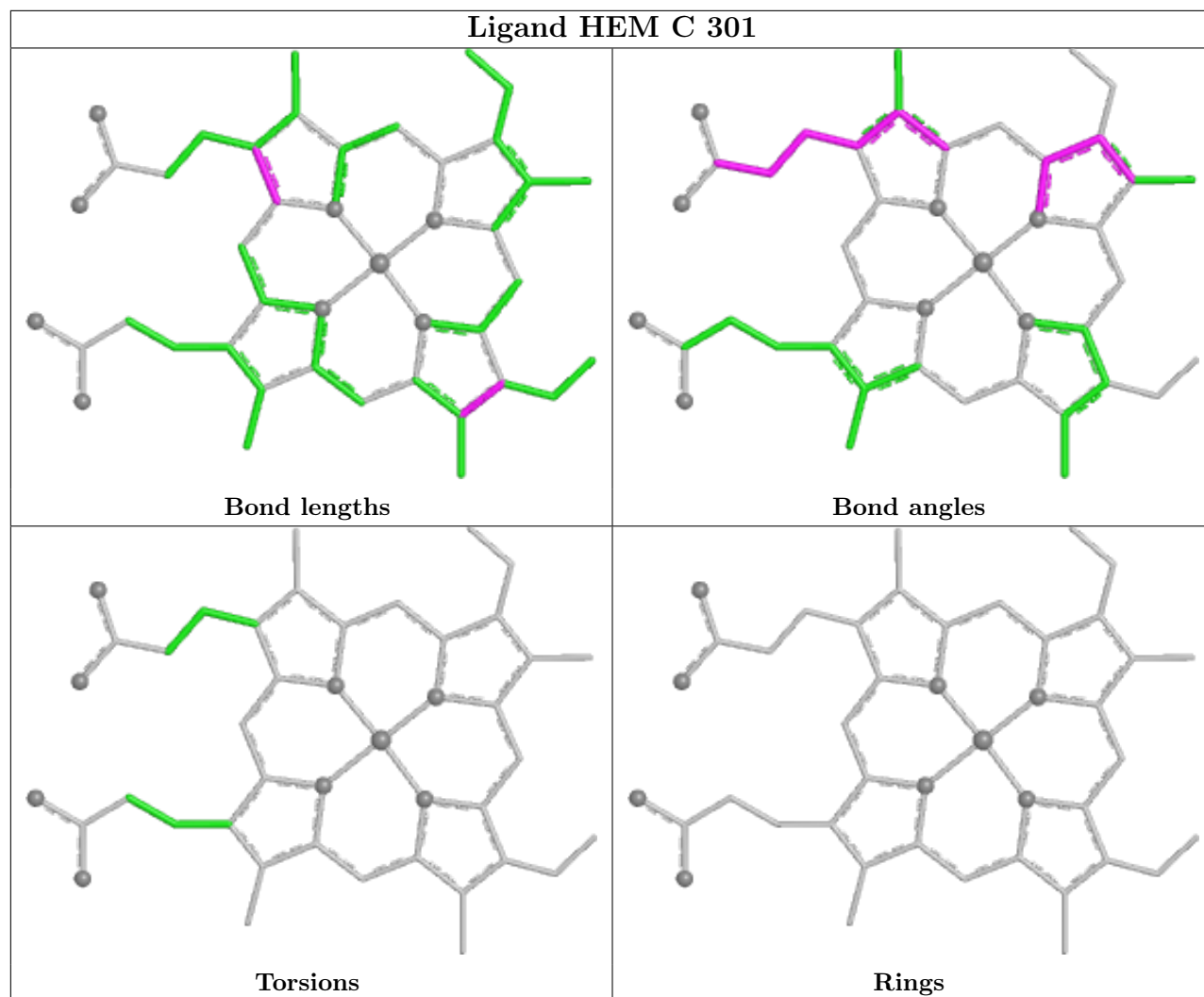


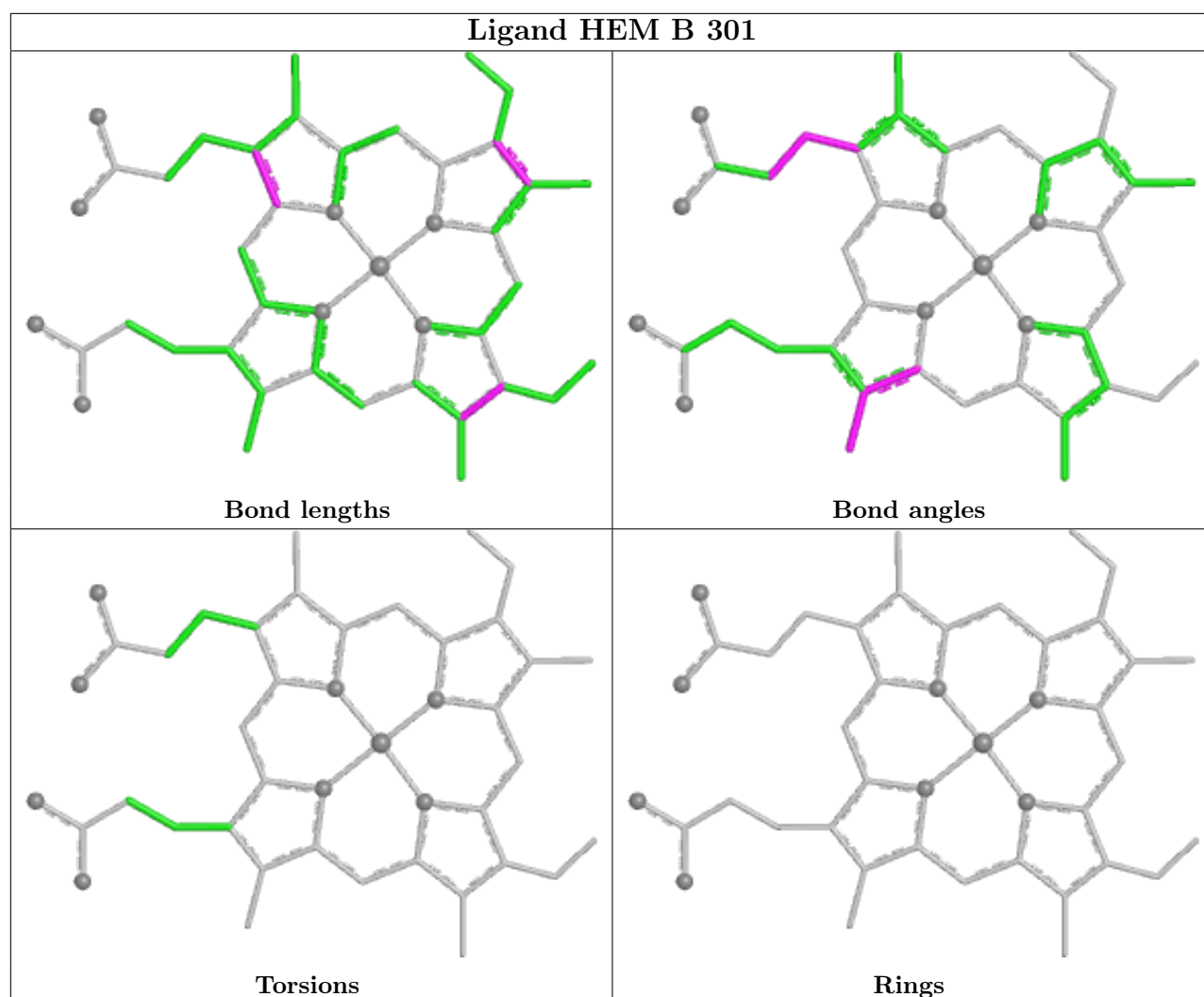












## 5.7 Other polymers [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	281/282 (99%)	-0.26	2 (0%) 87 90	9, 16, 29, 53	0
1	B	281/282 (99%)	-0.21	3 (1%) 80 83	9, 16, 33, 67	0
1	C	279/282 (98%)	-0.18	6 (2%) 62 66	13, 23, 50, 67	0
1	D	280/282 (99%)	-0.32	3 (1%) 80 83	12, 21, 39, 76	0
1	E	278/282 (98%)	-0.11	6 (2%) 62 66	13, 26, 48, 71	0
1	F	279/282 (98%)	-0.17	8 (2%) 51 56	15, 26, 51, 64	0
1	G	277/282 (98%)	0.19	14 (5%) 28 31	18, 34, 59, 76	0
1	H	280/282 (99%)	-0.31	3 (1%) 80 83	14, 22, 44, 66	0
All	All	2235/2256 (99%)	-0.17	45 (2%) 65 69	9, 23, 49, 76	0

The worst 5 of 45 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	284	VAL	6.7
1	F	197	VAL	5.8
1	C	284	VAL	5.5
1	A	284	VAL	3.9
1	G	197	VAL	3.8

### 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 monosaccharides 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
6	GOL	A	308	6/6	0.70	0.19	42,47,53,56	0
6	GOL	H	305	6/6	0.72	0.16	43,46,48,50	0
6	GOL	H	306	6/6	0.75	0.13	53,59,59,61	0
5	TRP	H	304	15/15	0.78	0.19	25,30,38,42	0
6	GOL	C	305	6/6	0.78	0.21	46,55,64,65	0
5	TRP	G	303	15/15	0.79	0.22	42,46,49,51	0
6	GOL	F	305	6/6	0.79	0.26	52,60,62,63	0
6	GOL	H	307	6/6	0.79	0.24	51,62,64,68	0
6	GOL	A	310	6/6	0.80	0.20	13,31,32,36	0
6	GOL	B	305	6/6	0.81	0.12	37,39,40,42	0
5	TRP	E	303	15/15	0.81	0.19	24,30,35,36	0
5	TRP	F	304	15/15	0.81	0.22	36,39,46,46	0
5	TRP	C	304	15/15	0.85	0.15	25,28,32,35	0
5	TRP	A	304	15/15	0.86	0.15	21,27,30,33	0
5	TRP	D	304	15/15	0.86	0.15	23,27,31,34	0
6	GOL	A	309	6/6	0.87	0.12	41,51,52,54	0
6	GOL	B	306	6/6	0.88	0.18	26,42,47,51	0
5	TRP	B	304	15/15	0.88	0.17	25,28,31,31	0
6	GOL	A	307	6/6	0.88	0.14	33,41,50,53	0
6	GOL	C	306	6/6	0.89	0.16	43,49,57,74	0
6	GOL	A	305	6/6	0.90	0.15	45,51,55,55	0
4	KYN	E	302	15/15	0.91	0.16	27,29,33,33	0
4	KYN	G	302	15/15	0.94	0.11	25,26,29,29	0
6	GOL	A	306	6/6	0.94	0.11	10,17,19,20	6
4	KYN	H	303	15/15	0.95	0.12	22,23,25,26	0
4	KYN	D	303	15/15	0.97	0.07	15,18,19,19	0
2	HEM	E	301	43/43	0.97	0.12	23,27,32,36	0
4	KYN	F	303	15/15	0.97	0.08	21,22,23,23	0
2	HEM	G	301	43/43	0.97	0.11	20,24,34,38	0
2	HEM	H	301	43/43	0.97	0.11	19,22,27,31	0
3	CYN	F	302	2/2	0.97	0.09	17,17,17,19	0
4	KYN	A	303	15/15	0.97	0.08	10,11,12,13	0
4	KYN	B	303	15/15	0.97	0.07	9,10,10,12	0
4	KYN	C	303	15/15	0.97	0.07	16,17,19,20	0
2	HEM	F	301	43/43	0.98	0.07	17,21,26,27	0
2	HEM	C	301	43/43	0.98	0.07	14,16,21,22	0
3	CYN	H	302	2/2	0.98	0.09	22,22,22,22	0

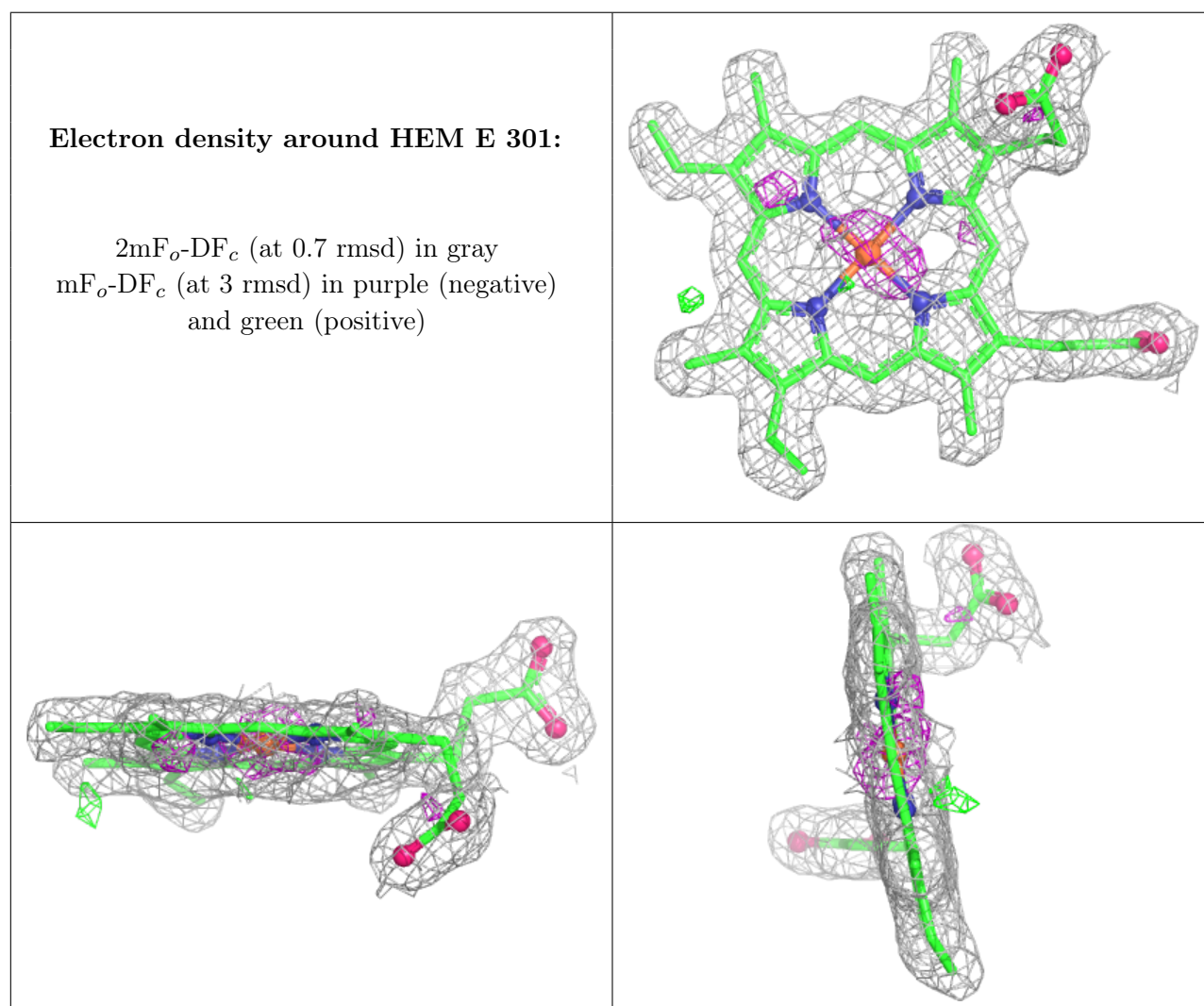
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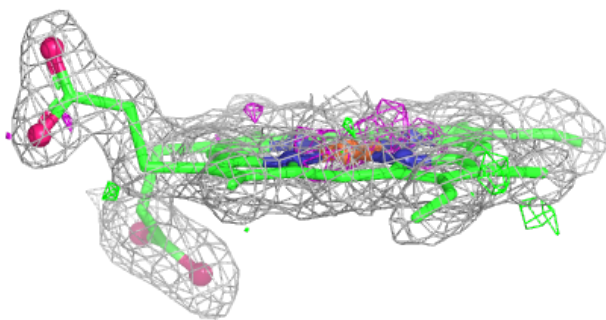
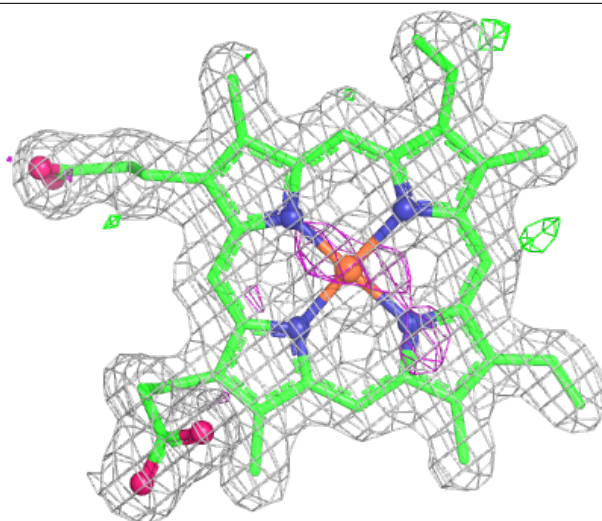
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	CYN	B	302	2/2	0.99	0.09	6,6,6,8	0
3	CYN	C	302	2/2	0.99	0.13	15,15,15,20	0
3	CYN	D	302	2/2	0.99	0.15	12,12,12,20	0
2	HEM	A	301	43/43	0.99	0.07	9,10,13,17	0
2	HEM	D	301	43/43	0.99	0.07	12,14,20,23	0
2	HEM	B	301	43/43	0.99	0.08	7,9,11,13	0
3	CYN	A	302	2/2	0.99	0.09	8,8,8,9	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.



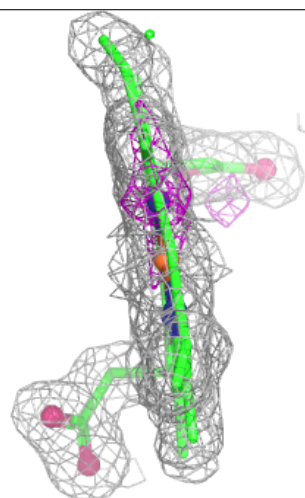
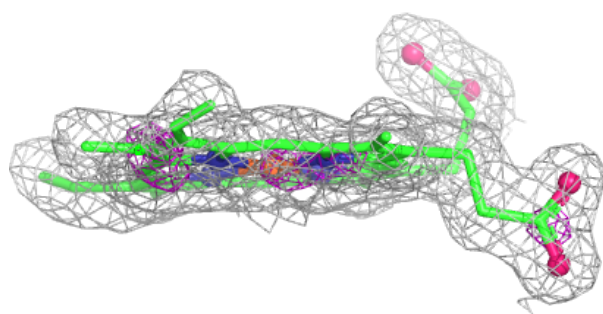
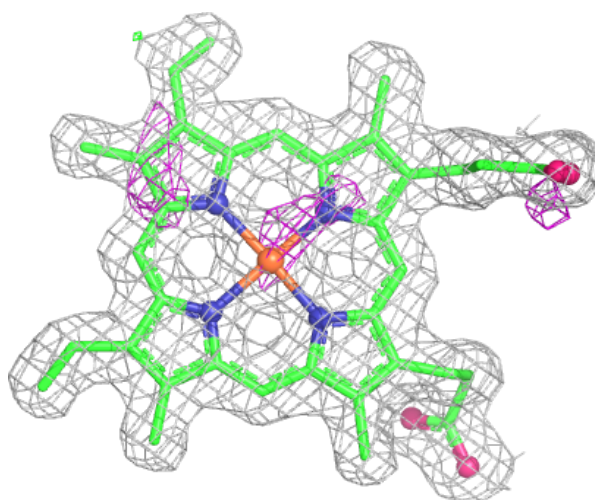
**Electron density around HEM G 301:**

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



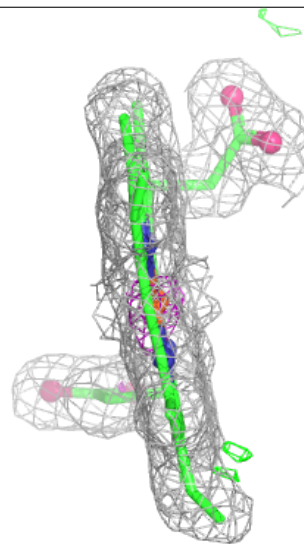
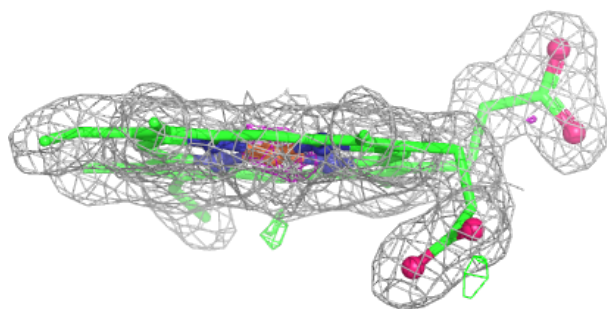
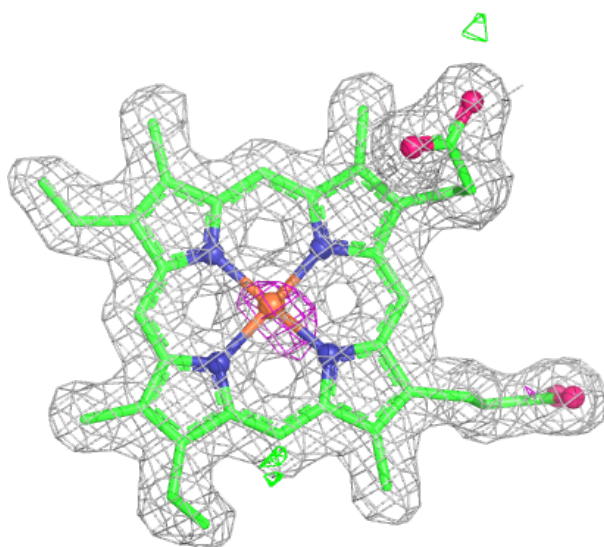
**Electron density around HEM H 301:**

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



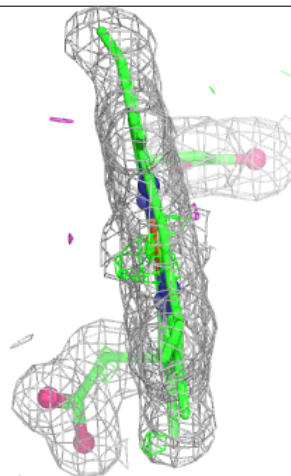
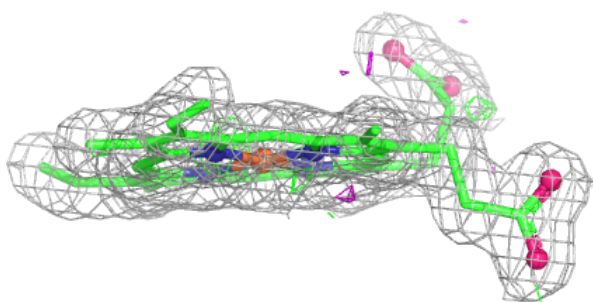
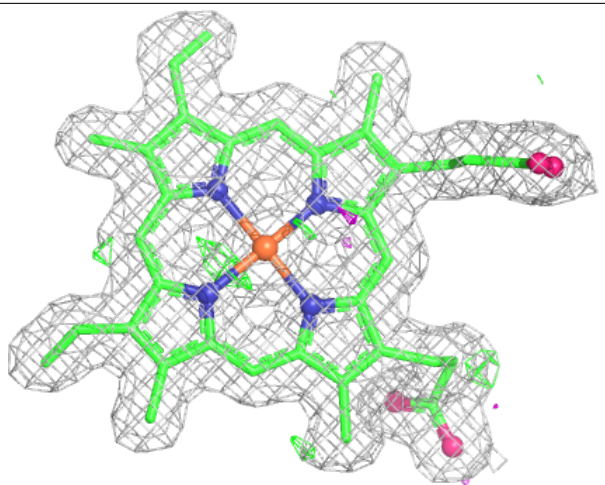
**Electron density around HEM F 301:**

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



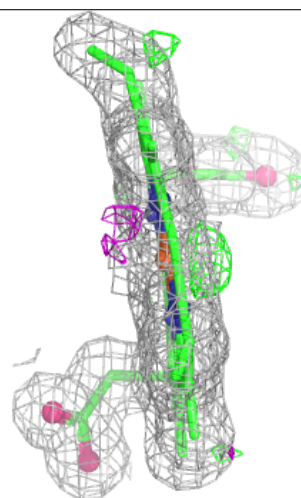
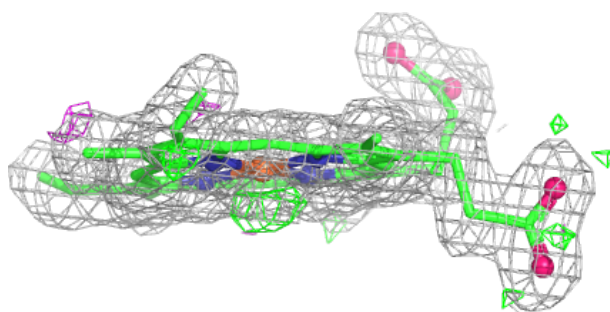
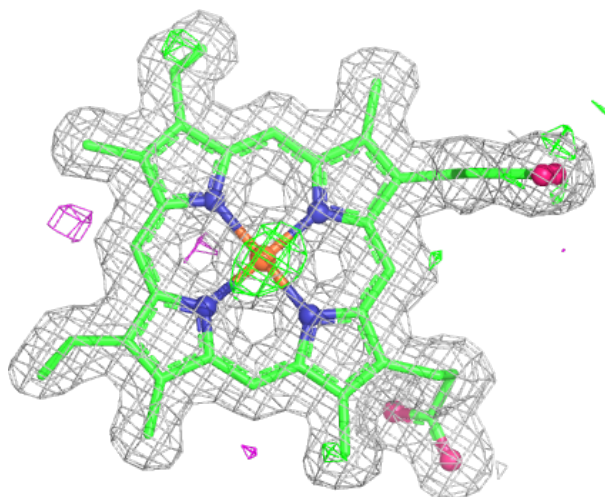
**Electron density around HEM C 301:**

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



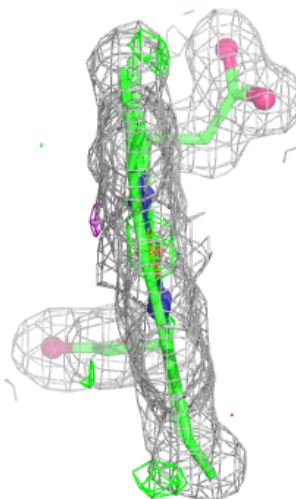
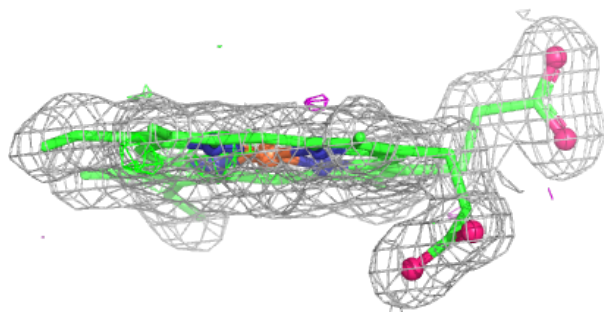
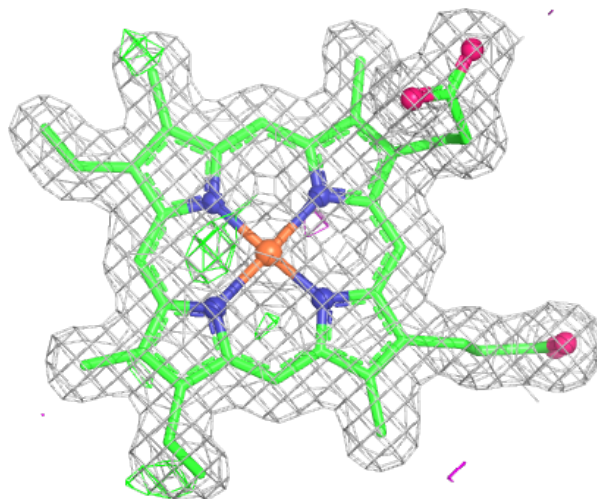
**Electron density around HEM A 301:**

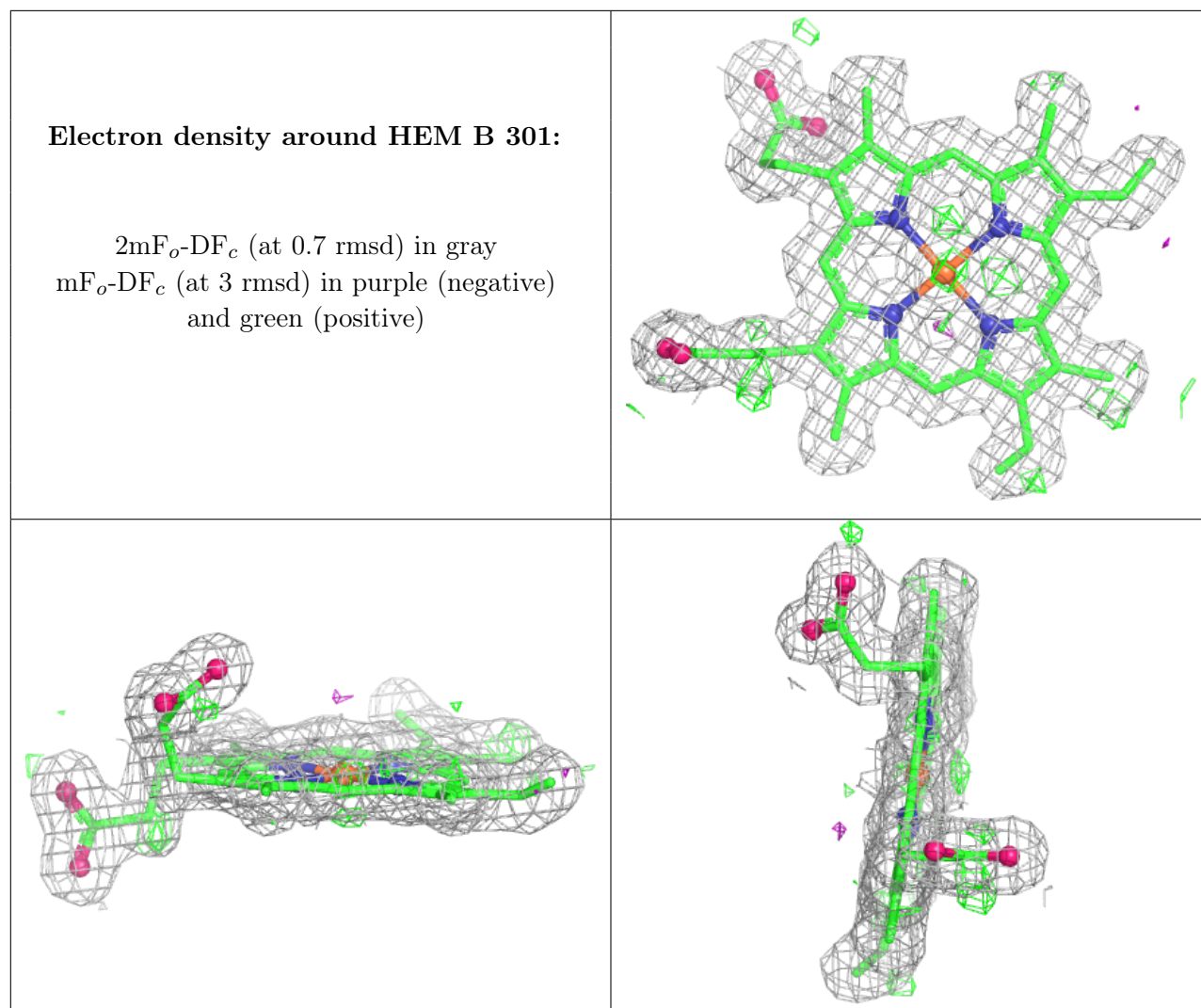
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around HEM D 301:**

$2mF_o-DF_c$  (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.