



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 8, 2024 – 10:14 PM JST

PDB ID : 8K1X  
Title : Biochemical and structural characterization of a multifunctional cytochrome P450 SpcN in staurosporine biosynthesis  
Authors : Xiao, F.; Dong, S.; Feng, Y.; Li, W.  
Deposited on : 2023-07-11  
Resolution : 2.27 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : **FAILED**  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.003 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39



## 2 Entry composition i

There are 4 unique types of molecules in this entry. The entry contains 9344 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.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	390	2969	1893	529	532	15	0	0	0
1	B	387	2921	1865	520	521	15	0	0	0
1	C	381	2896	1849	520	512	15	0	0	0

There are 150 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	HIS	-	expression tag	UNP W5R4Y8
A	-14	HIS	-	expression tag	UNP W5R4Y8
A	-13	HIS	-	expression tag	UNP W5R4Y8
A	-12	HIS	-	expression tag	UNP W5R4Y8
A	-11	HIS	-	expression tag	UNP W5R4Y8
A	-10	HIS	-	expression tag	UNP W5R4Y8
A	-9	SER	-	expression tag	UNP W5R4Y8
A	-8	SER	-	expression tag	UNP W5R4Y8
A	-7	GLY	-	expression tag	UNP W5R4Y8
A	-6	LEU	-	expression tag	UNP W5R4Y8
A	-5	VAL	-	expression tag	UNP W5R4Y8
A	-4	PRO	-	expression tag	UNP W5R4Y8
A	-3	ARG	-	expression tag	UNP W5R4Y8
A	-2	GLY	-	expression tag	UNP W5R4Y8
A	-1	SER	-	expression tag	UNP W5R4Y8
A	0	HIS	-	expression tag	UNP W5R4Y8
A	1	MET	-	expression tag	UNP W5R4Y8
A	2	ASN	-	expression tag	UNP W5R4Y8
A	3	VAL	-	expression tag	UNP W5R4Y8
A	4	THR	-	expression tag	UNP W5R4Y8
A	5	THR	-	expression tag	UNP W5R4Y8
A	6	LYS	-	expression tag	UNP W5R4Y8
A	7	THR	-	expression tag	UNP W5R4Y8

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Chain	Residue	Modelled	Actual	Comment	Reference
A	8	GLY	-	expression tag	UNP W5R4Y8
A	9	LEU	-	expression tag	UNP W5R4Y8
A	10	ALA	-	expression tag	UNP W5R4Y8
A	11	GLU	-	expression tag	UNP W5R4Y8
A	12	ALA	-	expression tag	UNP W5R4Y8
A	13	PRO	-	expression tag	UNP W5R4Y8
A	14	GLU	-	expression tag	UNP W5R4Y8
A	15	ALA	-	expression tag	UNP W5R4Y8
A	16	HIS	-	expression tag	UNP W5R4Y8
A	17	MET	-	expression tag	UNP W5R4Y8
A	18	PRO	-	expression tag	UNP W5R4Y8
A	19	THR	-	expression tag	UNP W5R4Y8
A	20	ASP	-	expression tag	UNP W5R4Y8
A	21	PRO	-	expression tag	UNP W5R4Y8
A	22	GLY	-	expression tag	UNP W5R4Y8
A	23	PRO	-	expression tag	UNP W5R4Y8
A	24	PHE	-	expression tag	UNP W5R4Y8
A	25	ASP	-	expression tag	UNP W5R4Y8
A	26	CYS	-	expression tag	UNP W5R4Y8
A	417	LEU	-	expression tag	UNP W5R4Y8
A	418	GLU	-	expression tag	UNP W5R4Y8
A	419	HIS	-	expression tag	UNP W5R4Y8
A	420	HIS	-	expression tag	UNP W5R4Y8
A	421	HIS	-	expression tag	UNP W5R4Y8
A	422	HIS	-	expression tag	UNP W5R4Y8
A	423	HIS	-	expression tag	UNP W5R4Y8
A	424	HIS	-	expression tag	UNP W5R4Y8
B	-15	HIS	-	expression tag	UNP W5R4Y8
B	-14	HIS	-	expression tag	UNP W5R4Y8
B	-13	HIS	-	expression tag	UNP W5R4Y8
B	-12	HIS	-	expression tag	UNP W5R4Y8
B	-11	HIS	-	expression tag	UNP W5R4Y8
B	-10	HIS	-	expression tag	UNP W5R4Y8
B	-9	SER	-	expression tag	UNP W5R4Y8
B	-8	SER	-	expression tag	UNP W5R4Y8
B	-7	GLY	-	expression tag	UNP W5R4Y8
B	-6	LEU	-	expression tag	UNP W5R4Y8
B	-5	VAL	-	expression tag	UNP W5R4Y8
B	-4	PRO	-	expression tag	UNP W5R4Y8
B	-3	ARG	-	expression tag	UNP W5R4Y8
B	-2	GLY	-	expression tag	UNP W5R4Y8
B	-1	SER	-	expression tag	UNP W5R4Y8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	HIS	-	expression tag	UNP W5R4Y8
B	1	MET	-	expression tag	UNP W5R4Y8
B	2	ASN	-	expression tag	UNP W5R4Y8
B	3	VAL	-	expression tag	UNP W5R4Y8
B	4	THR	-	expression tag	UNP W5R4Y8
B	5	THR	-	expression tag	UNP W5R4Y8
B	6	LYS	-	expression tag	UNP W5R4Y8
B	7	THR	-	expression tag	UNP W5R4Y8
B	8	GLY	-	expression tag	UNP W5R4Y8
B	9	LEU	-	expression tag	UNP W5R4Y8
B	10	ALA	-	expression tag	UNP W5R4Y8
B	11	GLU	-	expression tag	UNP W5R4Y8
B	12	ALA	-	expression tag	UNP W5R4Y8
B	13	PRO	-	expression tag	UNP W5R4Y8
B	14	GLU	-	expression tag	UNP W5R4Y8
B	15	ALA	-	expression tag	UNP W5R4Y8
B	16	HIS	-	expression tag	UNP W5R4Y8
B	17	MET	-	expression tag	UNP W5R4Y8
B	18	PRO	-	expression tag	UNP W5R4Y8
B	19	THR	-	expression tag	UNP W5R4Y8
B	20	ASP	-	expression tag	UNP W5R4Y8
B	21	PRO	-	expression tag	UNP W5R4Y8
B	22	GLY	-	expression tag	UNP W5R4Y8
B	23	PRO	-	expression tag	UNP W5R4Y8
B	24	PHE	-	expression tag	UNP W5R4Y8
B	25	ASP	-	expression tag	UNP W5R4Y8
B	26	CYS	-	expression tag	UNP W5R4Y8
B	417	LEU	-	expression tag	UNP W5R4Y8
B	418	GLU	-	expression tag	UNP W5R4Y8
B	419	HIS	-	expression tag	UNP W5R4Y8
B	420	HIS	-	expression tag	UNP W5R4Y8
B	421	HIS	-	expression tag	UNP W5R4Y8
B	422	HIS	-	expression tag	UNP W5R4Y8
B	423	HIS	-	expression tag	UNP W5R4Y8
B	424	HIS	-	expression tag	UNP W5R4Y8
C	-15	HIS	-	expression tag	UNP W5R4Y8
C	-14	HIS	-	expression tag	UNP W5R4Y8
C	-13	HIS	-	expression tag	UNP W5R4Y8
C	-12	HIS	-	expression tag	UNP W5R4Y8
C	-11	HIS	-	expression tag	UNP W5R4Y8
C	-10	HIS	-	expression tag	UNP W5R4Y8
C	-9	SER	-	expression tag	UNP W5R4Y8

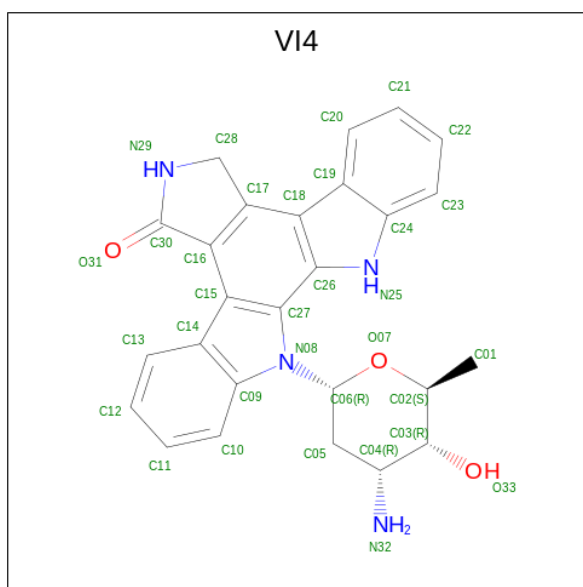
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Chain	Residue	Modelled	Actual	Comment	Reference
C	-8	SER	-	expression tag	UNP W5R4Y8
C	-7	GLY	-	expression tag	UNP W5R4Y8
C	-6	LEU	-	expression tag	UNP W5R4Y8
C	-5	VAL	-	expression tag	UNP W5R4Y8
C	-4	PRO	-	expression tag	UNP W5R4Y8
C	-3	ARG	-	expression tag	UNP W5R4Y8
C	-2	GLY	-	expression tag	UNP W5R4Y8
C	-1	SER	-	expression tag	UNP W5R4Y8
C	0	HIS	-	expression tag	UNP W5R4Y8
C	1	MET	-	expression tag	UNP W5R4Y8
C	2	ASN	-	expression tag	UNP W5R4Y8
C	3	VAL	-	expression tag	UNP W5R4Y8
C	4	THR	-	expression tag	UNP W5R4Y8
C	5	THR	-	expression tag	UNP W5R4Y8
C	6	LYS	-	expression tag	UNP W5R4Y8
C	7	THR	-	expression tag	UNP W5R4Y8
C	8	GLY	-	expression tag	UNP W5R4Y8
C	9	LEU	-	expression tag	UNP W5R4Y8
C	10	ALA	-	expression tag	UNP W5R4Y8
C	11	GLU	-	expression tag	UNP W5R4Y8
C	12	ALA	-	expression tag	UNP W5R4Y8
C	13	PRO	-	expression tag	UNP W5R4Y8
C	14	GLU	-	expression tag	UNP W5R4Y8
C	15	ALA	-	expression tag	UNP W5R4Y8
C	16	HIS	-	expression tag	UNP W5R4Y8
C	17	MET	-	expression tag	UNP W5R4Y8
C	18	PRO	-	expression tag	UNP W5R4Y8
C	19	THR	-	expression tag	UNP W5R4Y8
C	20	ASP	-	expression tag	UNP W5R4Y8
C	21	PRO	-	expression tag	UNP W5R4Y8
C	22	GLY	-	expression tag	UNP W5R4Y8
C	23	PRO	-	expression tag	UNP W5R4Y8
C	24	PHE	-	expression tag	UNP W5R4Y8
C	25	ASP	-	expression tag	UNP W5R4Y8
C	26	CYS	-	expression tag	UNP W5R4Y8
C	417	LEU	-	expression tag	UNP W5R4Y8
C	418	GLU	-	expression tag	UNP W5R4Y8
C	419	HIS	-	expression tag	UNP W5R4Y8
C	420	HIS	-	expression tag	UNP W5R4Y8
C	421	HIS	-	expression tag	UNP W5R4Y8
C	422	HIS	-	expression tag	UNP W5R4Y8
C	423	HIS	-	expression tag	UNP W5R4Y8

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
3	A	1	Total	C	N	O	0	0
			33	26	4	3		
3	A	1	Total	C	N	O	0	0
			33	26	4	3		
3	B	1	Total	C	N	O	0	0
			33	26	4	3		
3	B	1	Total	C	N	O	0	0
			33	26	4	3		
3	B	1	Total	C	N	O	0	0
			33	26	4	3		
3	C	1	Total	C	N	O	0	0
			33	26	4	3		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	85	Total	O	0	0
			85	85		
4	B	74	Total	O	0	0
			74	74		
4	C	72	Total	O	0	0
			72	72		

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### 3 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	206.96Å 121.79Å 64.21Å 90.00° 91.45° 90.00°	Depositor
Resolution (Å)	55.17 – 2.27 55.17 – 2.27	Depositor EDS
% Data completeness (in resolution range)	96.5 (55.17-2.27) 96.5 (55.17-2.27)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.28 (at 2.27Å)	Xtrriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, $R_{free}$	0.211 , 0.234 0.223 , 0.245	Depositor DCC
$R_{free}$ test set	3657 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	53.1	Xtrriage
Anisotropy	0.567	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 76.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.015 for -1/2*h+3/2*k,1/2*h+1/2*k,-l 0.011 for -1/2*h-3/2*k,-1/2*h+1/2*k,-l 0.176 for 1/2*h+3/2*k,1/2*h-1/2*k,-l 0.089 for 1/2*h-3/2*k,-1/2*h-1/2*k,-l 0.028 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	9344	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	79.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.59% 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.

## 4 Model quality [i](#)

### 4.1 Standard geometry [i](#)

MolProbity failed to run properly - this section is therefore empty.

### 4.2 Too-close contacts [i](#)

MolProbity failed to run properly - this section is therefore empty.

### 4.3 Torsion angles [i](#)

#### 4.3.1 Protein backbone [i](#)

MolProbity failed to run properly - this section is therefore empty.

#### 4.3.2 Protein sidechains [i](#)

MolProbity failed to run properly - this section is therefore empty.

#### 4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

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

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

### 4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

### 4.6 Ligand geometry [i](#)

9 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
2	HEM	A	501	1	41,50,50	2.21	15 (36%)	45,82,82	1.96	14 (31%)
3	VI4	B	502	-	32,39,39	3.09	9 (28%)	37,61,61	1.97	4 (10%)
3	VI4	A	503	-	32,39,39	3.15	7 (21%)	37,61,61	2.18	6 (16%)
3	VI4	A	502	-	32,39,39	3.11	8 (25%)	37,61,61	2.18	7 (18%)
2	HEM	C	501	-	41,50,50	2.40	17 (41%)	45,82,82	2.27	16 (35%)
3	VI4	B	503	-	32,39,39	3.18	9 (28%)	37,61,61	2.12	7 (18%)
2	HEM	B	501	-	41,50,50	2.49	18 (43%)	45,82,82	2.21	18 (40%)
3	VI4	B	504	-	32,39,39	3.29	9 (28%)	37,61,61	2.39	10 (27%)
3	VI4	C	502	-	32,39,39	3.08	9 (28%)	37,61,61	2.16	6 (16%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	A	501	1	-	2/12/54/54	-
3	VI4	B	502	-	-	0/0/29/29	0/7/7/7
3	VI4	A	503	-	-	0/0/29/29	0/7/7/7
3	VI4	A	502	-	-	0/0/29/29	0/7/7/7
2	HEM	C	501	-	-	0/12/54/54	-
3	VI4	B	503	-	-	0/0/29/29	0/7/7/7
2	HEM	B	501	-	-	0/12/54/54	-
3	VI4	B	504	-	-	0/0/29/29	0/7/7/7
3	VI4	C	502	-	-	0/0/29/29	0/7/7/7

All (101) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	504	VI4	C30-N29	13.38	1.46	1.35
3	C	502	VI4	C30-N29	13.26	1.45	1.35
3	B	503	VI4	C30-N29	13.22	1.45	1.35
3	A	503	VI4	C30-N29	13.20	1.45	1.35
3	A	502	VI4	C30-N29	13.10	1.45	1.35
3	B	502	VI4	C30-N29	13.10	1.45	1.35
3	B	504	VI4	O07-C06	7.87	1.52	1.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	503	VI4	O07-C06	6.98	1.50	1.42
3	A	503	VI4	O07-C06	6.60	1.50	1.42
2	B	501	HEM	C1B-NB	-6.48	1.29	1.40
3	A	502	VI4	O07-C06	6.34	1.50	1.42
3	B	502	VI4	O07-C06	6.26	1.50	1.42
2	C	501	HEM	C1B-NB	-6.25	1.29	1.40
2	B	501	HEM	C4D-ND	-6.09	1.29	1.40
3	C	502	VI4	O07-C06	5.84	1.49	1.42
2	A	501	HEM	C4D-ND	-5.38	1.31	1.40
2	C	501	HEM	C4B-NB	-5.30	1.27	1.38
2	A	501	HEM	C1B-NB	-5.21	1.31	1.40
3	A	502	VI4	C28-C17	5.13	1.54	1.50
3	A	503	VI4	C28-C17	5.00	1.54	1.50
3	B	504	VI4	C28-C17	4.95	1.54	1.50
3	C	502	VI4	C28-C17	4.87	1.54	1.50
3	B	502	VI4	C28-C17	4.82	1.54	1.50
3	B	503	VI4	C28-C17	4.75	1.54	1.50
2	C	501	HEM	C4D-ND	-4.69	1.32	1.40
2	B	501	HEM	C3C-C2C	-4.51	1.34	1.40
2	C	501	HEM	C3C-C2C	-4.33	1.34	1.40
2	B	501	HEM	C1D-ND	-4.21	1.30	1.38
2	A	501	HEM	C4B-NB	-4.08	1.30	1.38
2	B	501	HEM	C4B-NB	-4.04	1.30	1.38
2	C	501	HEM	FE-ND	-3.97	1.77	1.96
2	C	501	HEM	C1D-ND	-3.89	1.30	1.38
3	A	503	VI4	C16-C30	3.87	1.55	1.49
3	B	504	VI4	C16-C30	3.84	1.55	1.49
2	A	501	HEM	C3C-C2C	-3.82	1.35	1.40
3	B	503	VI4	C16-C30	3.74	1.55	1.49
3	A	502	VI4	C16-C30	3.57	1.54	1.49
2	C	501	HEM	C1B-C2B	-3.56	1.37	1.44
3	C	502	VI4	C16-C30	3.49	1.54	1.49
2	A	501	HEM	C3D-C2D	-3.42	1.29	1.36
2	C	501	HEM	C2C-C1C	-3.41	1.34	1.42
3	B	504	VI4	C05-C04	-3.39	1.46	1.53
3	B	502	VI4	C16-C30	3.38	1.54	1.49
2	A	501	HEM	C1B-C2B	-3.29	1.38	1.44
2	A	501	HEM	C1D-ND	-3.26	1.32	1.38
3	B	503	VI4	C05-C04	-3.23	1.46	1.53
2	A	501	HEM	O2D-CGD	-3.22	1.19	1.30
2	B	501	HEM	O2A-CGA	-3.17	1.20	1.30
2	B	501	HEM	O2D-CGD	-3.09	1.20	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	HEM	C1A-CHA	-3.08	1.32	1.41
2	B	501	HEM	C1B-C2B	-2.99	1.38	1.44
3	A	502	VI4	C05-C04	-2.94	1.47	1.53
2	B	501	HEM	C3D-C2D	-2.93	1.30	1.36
2	B	501	HEM	FE-ND	-2.92	1.82	1.96
3	B	502	VI4	C05-C04	-2.90	1.47	1.53
2	A	501	HEM	C2C-C1C	-2.89	1.36	1.42
3	B	502	VI4	C15-C27	-2.86	1.39	1.42
2	B	501	HEM	C2C-C1C	-2.81	1.36	1.42
2	C	501	HEM	C3B-C2B	-2.79	1.31	1.37
2	C	501	HEM	C3D-C2D	-2.78	1.30	1.36
2	B	501	HEM	C4A-NA	-2.77	1.30	1.36
3	C	502	VI4	C05-C04	-2.76	1.47	1.53
2	A	501	HEM	FE-ND	-2.72	1.83	1.96
3	A	503	VI4	C05-C04	-2.71	1.47	1.53
2	A	501	HEM	O2A-CGA	-2.69	1.21	1.30
2	B	501	HEM	C3B-C2B	-2.61	1.32	1.37
2	C	501	HEM	C2A-C3A	-2.61	1.29	1.37
2	A	501	HEM	C1A-CHA	-2.61	1.33	1.41
3	B	504	VI4	C03-C04	-2.60	1.48	1.53
3	B	503	VI4	C15-C27	-2.59	1.39	1.42
3	C	502	VI4	C15-C27	-2.59	1.39	1.42
2	C	501	HEM	C1A-CHA	-2.59	1.33	1.41
3	A	502	VI4	C15-C27	-2.57	1.39	1.42
3	B	504	VI4	C15-C27	-2.53	1.39	1.42
3	B	503	VI4	C27-C26	2.45	1.49	1.42
2	C	501	HEM	O2A-CGA	-2.45	1.22	1.30
2	A	501	HEM	C3B-C2B	-2.44	1.32	1.37
2	C	501	HEM	C4A-CHB	-2.42	1.34	1.41
2	C	501	HEM	CHC-C4B	-2.39	1.34	1.41
3	A	503	VI4	C27-C26	2.35	1.48	1.42
2	C	501	HEM	O2D-CGD	-2.35	1.22	1.30
3	A	503	VI4	C15-C27	-2.33	1.39	1.42
2	B	501	HEM	C2A-C3A	-2.31	1.30	1.37
2	A	501	HEM	C2A-C3A	-2.30	1.30	1.37
3	B	503	VI4	C03-C04	-2.28	1.48	1.53
2	B	501	HEM	CHD-C1D	-2.23	1.34	1.41
2	A	501	HEM	C4A-CHB	-2.18	1.34	1.41
3	B	504	VI4	C27-C26	2.15	1.48	1.42
3	A	502	VI4	O31-C30	-2.15	1.18	1.23
3	C	502	VI4	O31-C30	-2.12	1.19	1.23
3	C	502	VI4	C27-C26	2.12	1.48	1.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	502	VI4	C27-C26	2.12	1.48	1.42
3	B	502	VI4	C06-N08	-2.10	1.43	1.49
3	A	502	VI4	C06-N08	-2.07	1.43	1.49
2	C	501	HEM	CAA-C2A	-2.07	1.49	1.52
2	B	501	HEM	C3C-CAC	-2.07	1.43	1.47
3	C	502	VI4	C06-N08	-2.06	1.43	1.49
3	B	504	VI4	O31-C30	-2.05	1.19	1.23
2	B	501	HEM	CHC-C4B	-2.05	1.35	1.41
3	B	502	VI4	O31-C30	-2.04	1.19	1.23
3	B	503	VI4	O31-C30	-2.00	1.19	1.23

All (88) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	504	VI4	O07-C06-N08	7.56	114.16	105.84
3	A	503	VI4	O07-C06-N08	7.42	114.00	105.84
3	A	502	VI4	O07-C06-N08	6.71	113.22	105.84
2	C	501	HEM	CHC-C4B-NB	6.59	131.59	124.43
3	A	502	VI4	C28-N29-C30	-6.57	107.53	113.85
3	C	502	VI4	C28-N29-C30	-6.44	107.66	113.85
3	B	504	VI4	C28-N29-C30	-6.35	107.75	113.85
3	C	502	VI4	O07-C06-N08	6.27	112.74	105.84
3	A	502	VI4	C17-C28-N29	6.18	108.05	101.76
3	A	503	VI4	C28-N29-C30	-6.12	107.97	113.85
3	A	503	VI4	C17-C28-N29	6.11	107.98	101.76
3	B	502	VI4	C17-C28-N29	6.10	107.96	101.76
3	C	502	VI4	C17-C28-N29	6.08	107.94	101.76
3	B	502	VI4	C28-N29-C30	-6.07	108.01	113.85
3	B	503	VI4	C28-N29-C30	-6.06	108.02	113.85
3	B	503	VI4	C17-C28-N29	6.00	107.86	101.76
3	B	504	VI4	C17-C28-N29	5.97	107.84	101.76
2	B	501	HEM	CHC-C4B-NB	5.94	130.88	124.43
2	C	501	HEM	CHD-C1D-ND	5.85	130.79	124.43
2	B	501	HEM	C1B-NB-C4B	5.42	110.67	105.07
3	B	502	VI4	O07-C06-N08	5.34	111.72	105.84
2	A	501	HEM	CHC-C4B-NB	5.22	130.10	124.43
2	A	501	HEM	C1B-NB-C4B	5.15	110.39	105.07
3	B	503	VI4	O07-C06-N08	4.98	111.32	105.84
3	B	503	VI4	O07-C02-C03	4.60	117.77	109.52
2	C	501	HEM	C1B-NB-C4B	4.29	109.50	105.07
2	B	501	HEM	CHD-C1D-C2D	-3.83	118.99	124.98
3	B	504	VI4	O07-C02-C03	3.82	116.38	109.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	501	HEM	CHA-C4D-ND	3.82	129.10	124.38
3	B	503	VI4	C02-O07-C06	3.69	120.48	113.47
2	A	501	HEM	CHB-C1B-NB	3.67	128.92	124.38
3	B	504	VI4	C02-O07-C06	3.55	120.21	113.47
2	C	501	HEM	CHD-C1D-C2D	-3.35	119.74	124.98
2	C	501	HEM	CHB-C1B-NB	3.33	128.49	124.38
2	A	501	HEM	CHD-C1D-ND	3.32	128.03	124.43
2	B	501	HEM	O2A-CGA-O1A	-3.21	115.31	123.30
3	B	504	VI4	C01-C02-C03	-3.19	107.17	113.07
2	C	501	HEM	O2A-CGA-CBA	3.14	124.12	114.03
2	C	501	HEM	O2D-CGD-O1D	-3.12	115.53	123.30
2	B	501	HEM	O2D-CGD-O1D	-3.07	115.65	123.30
2	B	501	HEM	O2A-CGA-CBA	3.06	123.86	114.03
2	B	501	HEM	CHD-C1D-ND	3.05	127.74	124.43
3	A	502	VI4	O31-C30-C16	-3.02	125.74	129.32
2	A	501	HEM	CHA-C4D-ND	3.01	128.10	124.38
3	A	503	VI4	O07-C02-C03	2.99	114.89	109.52
2	C	501	HEM	C4C-CHD-C1D	-2.97	118.64	122.56
2	B	501	HEM	CHB-C1B-NB	2.96	128.04	124.38
2	B	501	HEM	C4A-C3A-C2A	2.92	109.03	107.00
3	C	502	VI4	O31-C30-C16	-2.88	125.90	129.32
3	B	502	VI4	O31-C30-C16	-2.85	125.94	129.32
2	C	501	HEM	CHC-C4B-C3B	-2.83	120.24	124.57
2	B	501	HEM	C2D-C1D-ND	2.82	113.26	109.88
2	A	501	HEM	C4A-C3A-C2A	2.78	108.93	107.00
3	C	502	VI4	C05-C04-C03	2.77	114.22	110.04
2	A	501	HEM	O2A-CGA-O1A	-2.75	116.44	123.30
2	C	501	HEM	CHA-C4D-C3D	-2.72	120.22	125.33
2	A	501	HEM	O2A-CGA-CBA	2.69	122.67	114.03
2	A	501	HEM	C4C-CHD-C1D	-2.59	119.14	122.56
2	C	501	HEM	O2A-CGA-O1A	-2.59	116.85	123.30
2	B	501	HEM	C3B-C2B-C1B	2.58	108.40	106.49
2	B	501	HEM	O2D-CGD-CBD	2.58	122.33	114.03
2	A	501	HEM	O2D-CGD-O1D	-2.57	116.90	123.30
3	B	504	VI4	O31-C30-C16	-2.56	126.29	129.32
2	A	501	HEM	CMD-C2D-C1D	2.54	128.91	125.04
3	B	503	VI4	O31-C30-C16	-2.52	126.33	129.32
2	C	501	HEM	O2D-CGD-CBD	2.50	122.06	114.03
2	A	501	HEM	CHD-C1D-C2D	-2.48	121.10	124.98
3	A	503	VI4	O31-C30-C16	-2.46	126.41	129.32
2	B	501	HEM	CAD-C3D-C4D	2.46	128.95	124.66
3	B	503	VI4	C01-C02-C03	-2.37	108.69	113.07

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502	VI4	C16-C17-C18	-2.36	119.24	122.42
3	B	504	VI4	C10-C09-C14	-2.36	117.33	120.73
2	C	501	HEM	CAD-C3D-C4D	2.31	128.69	124.66
3	B	504	VI4	C16-C17-C18	-2.28	119.35	122.42
3	A	503	VI4	C05-C04-C03	2.26	113.45	110.04
3	C	502	VI4	C16-C17-C18	-2.19	119.47	122.42
3	A	502	VI4	C16-C30-N29	2.18	108.57	106.37
2	A	501	HEM	CAD-C3D-C4D	2.15	128.41	124.66
2	C	501	HEM	CMB-C2B-C1B	2.14	128.29	125.04
2	B	501	HEM	C4C-CHD-C1D	-2.13	119.75	122.56
2	B	501	HEM	C4B-C3B-C2B	-2.12	105.43	107.11
3	A	502	VI4	C01-C02-C03	-2.10	109.19	113.07
2	B	501	HEM	CHC-C4B-C3B	-2.10	121.35	124.57
2	A	501	HEM	CHA-C4D-C3D	-2.10	121.39	125.33
2	B	501	HEM	C2C-C3C-C4C	2.07	108.35	106.90
3	B	504	VI4	C16-C30-N29	2.07	108.46	106.37
2	B	501	HEM	C1D-C2D-C3D	-2.01	104.85	106.96
2	C	501	HEM	C4D-ND-C1D	2.00	107.14	105.07

There are no chirality outliers.

All (2) torsion outliers are listed below:

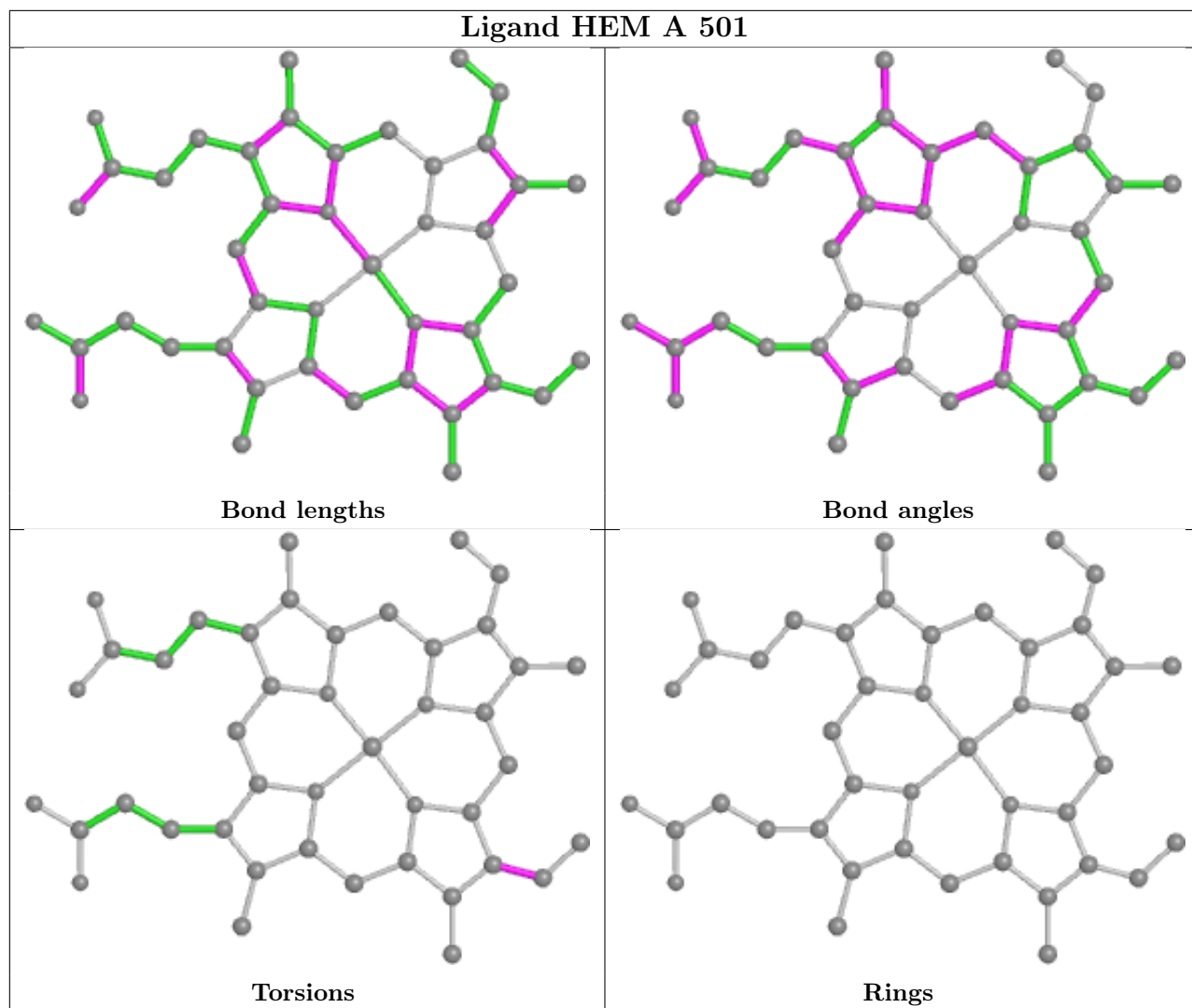
Mol	Chain	Res	Type	Atoms
2	A	501	HEM	C2B-C3B-CAB-CBB
2	A	501	HEM	C4B-C3B-CAB-CBB

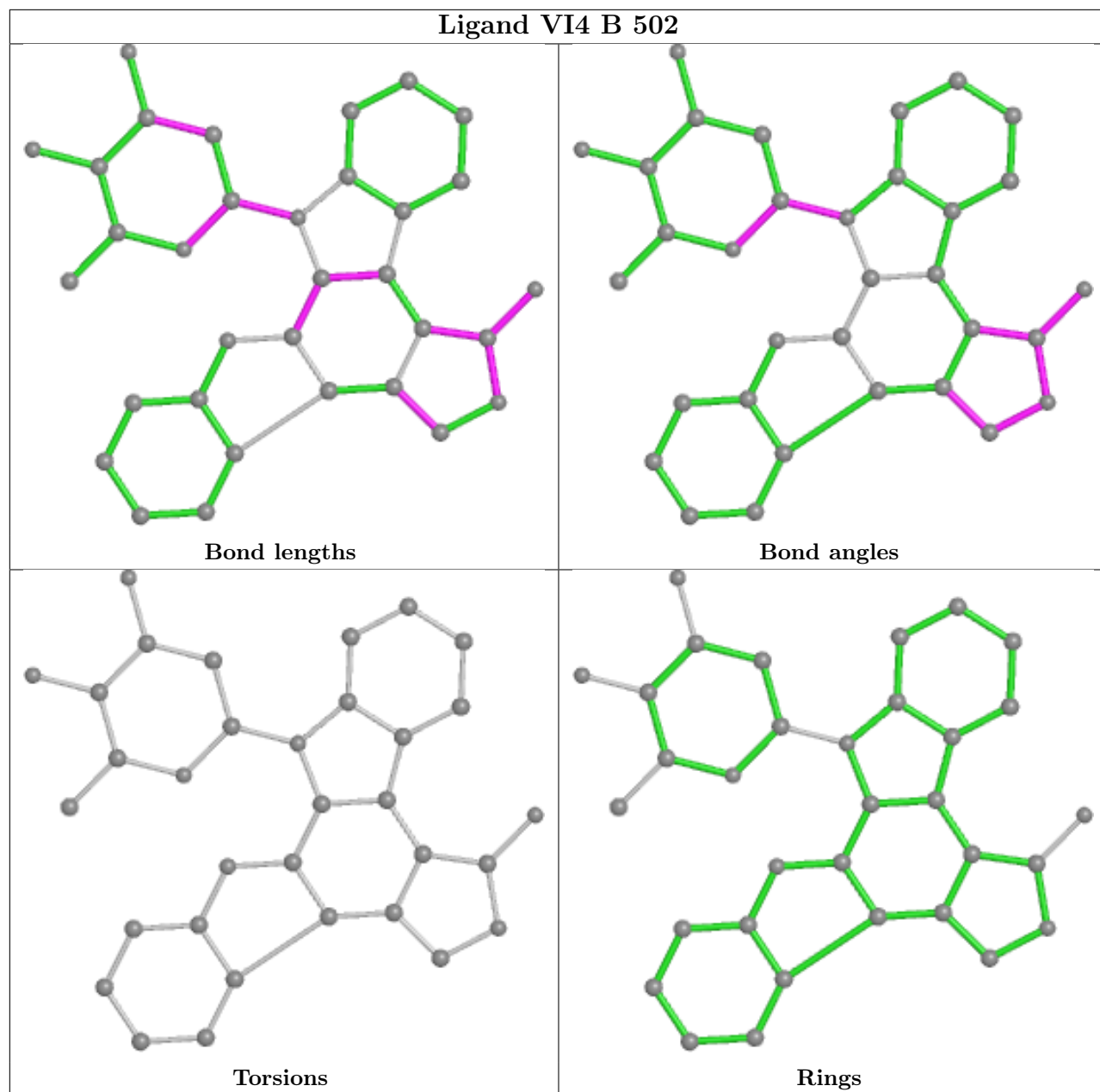
There are no ring outliers.

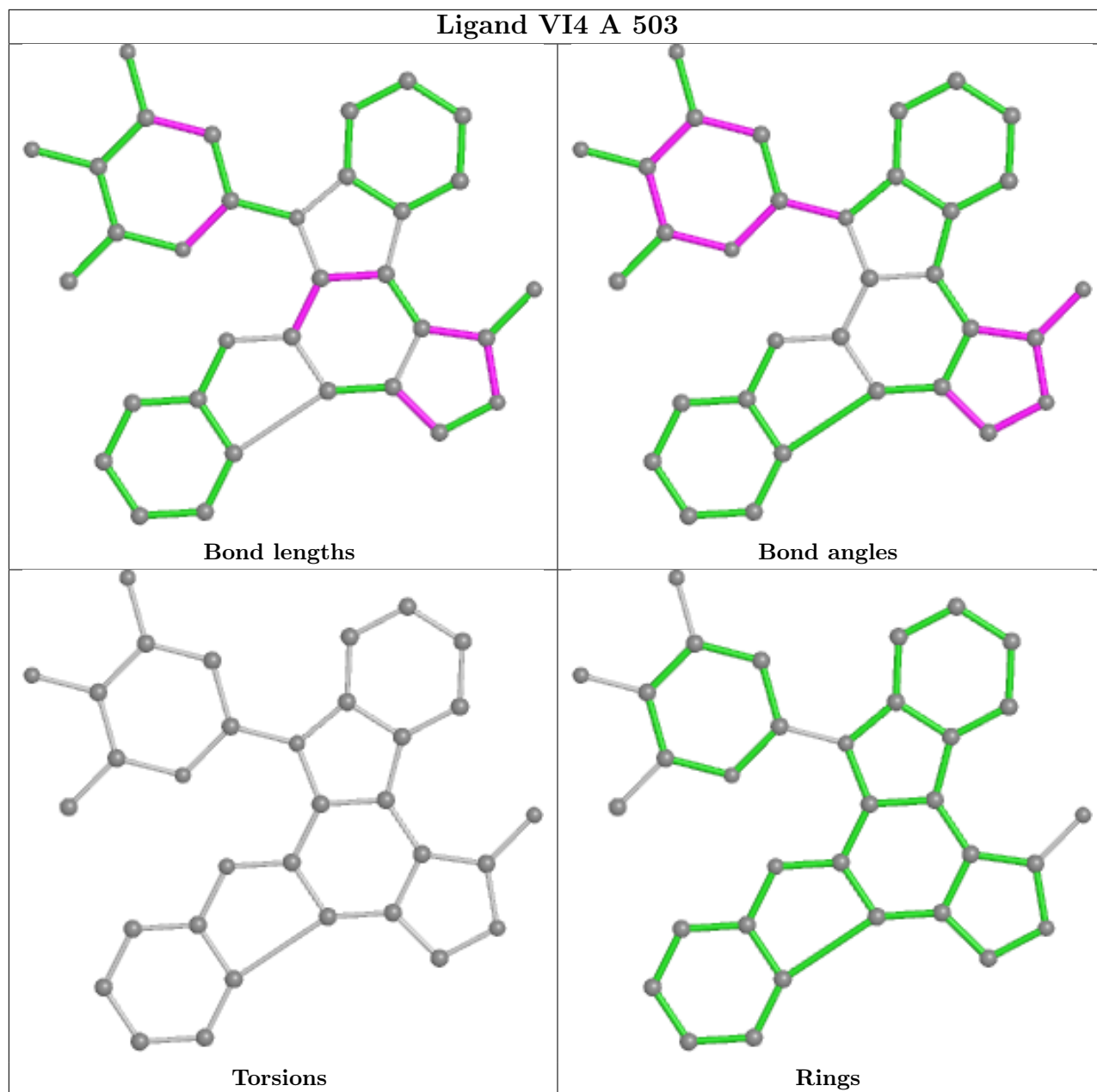
No monomer is involved in short contacts.

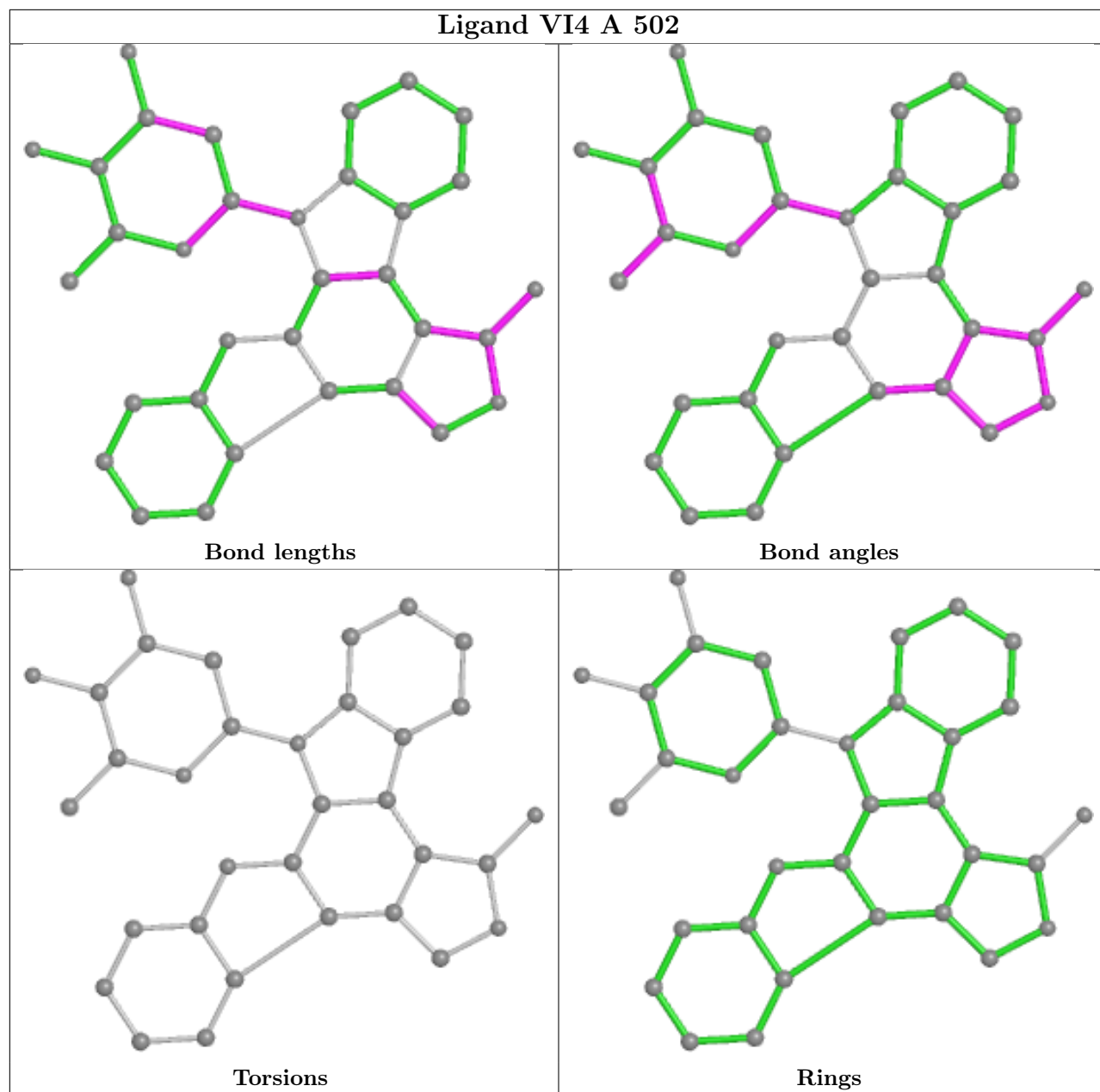
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

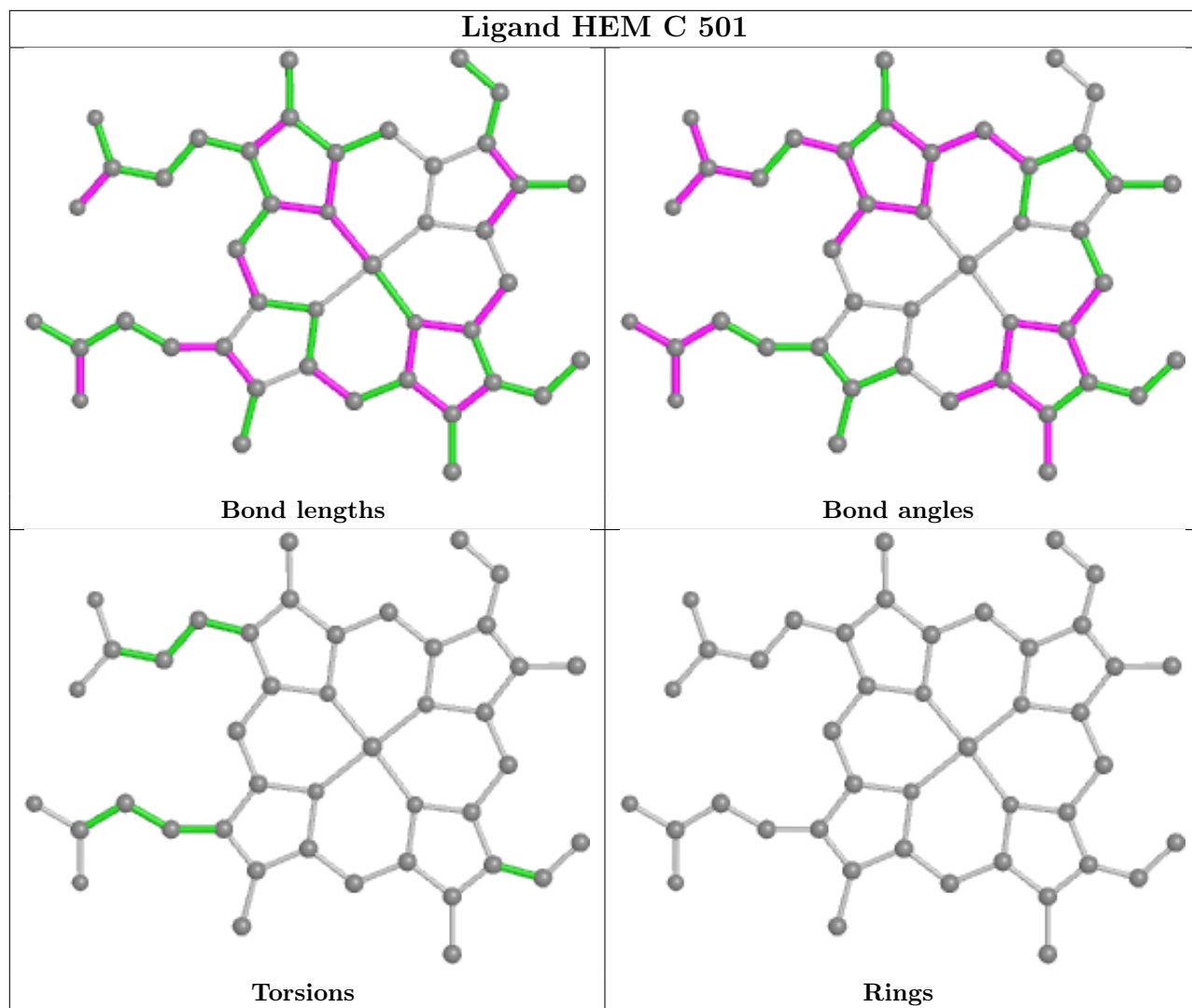


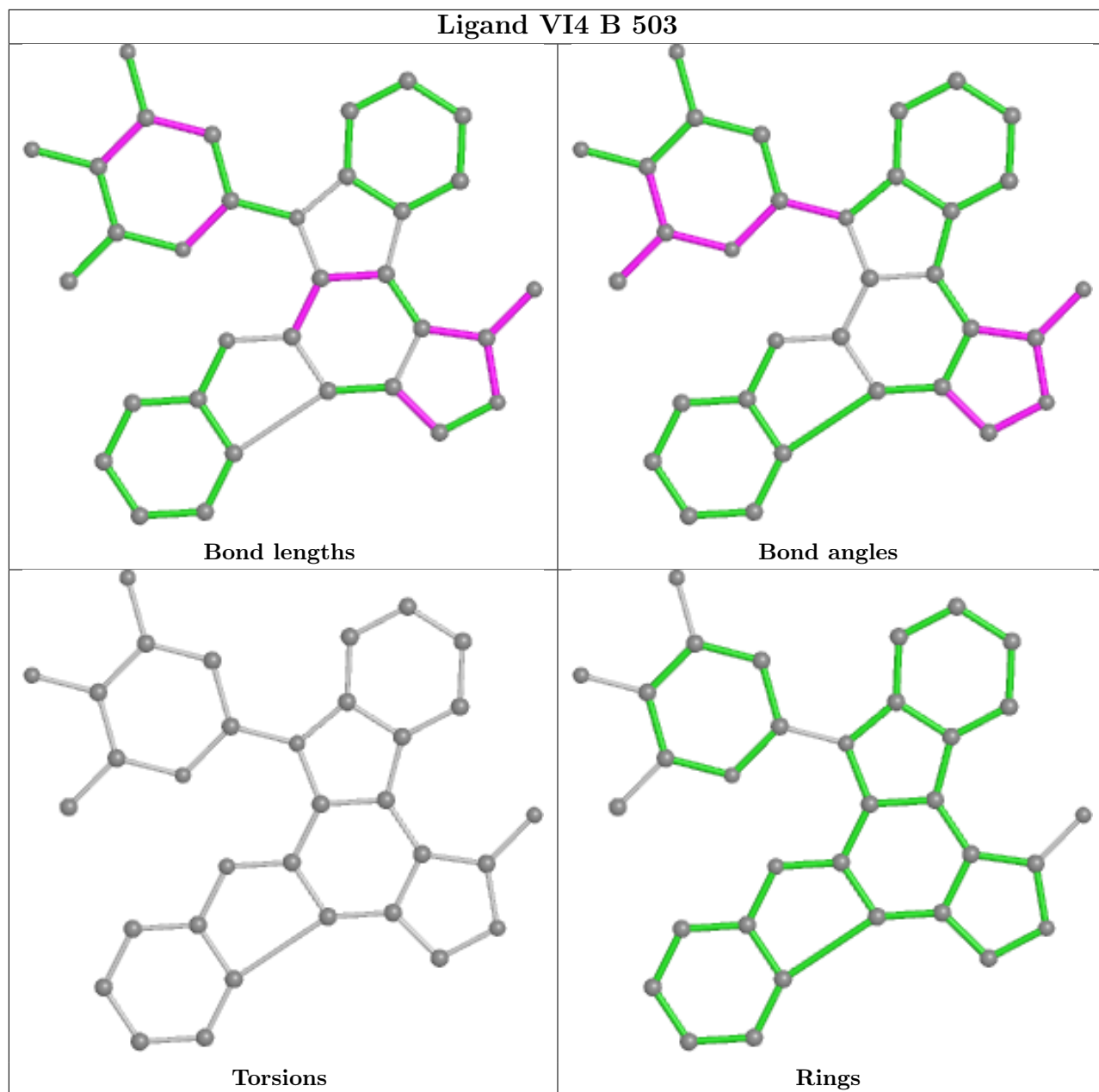


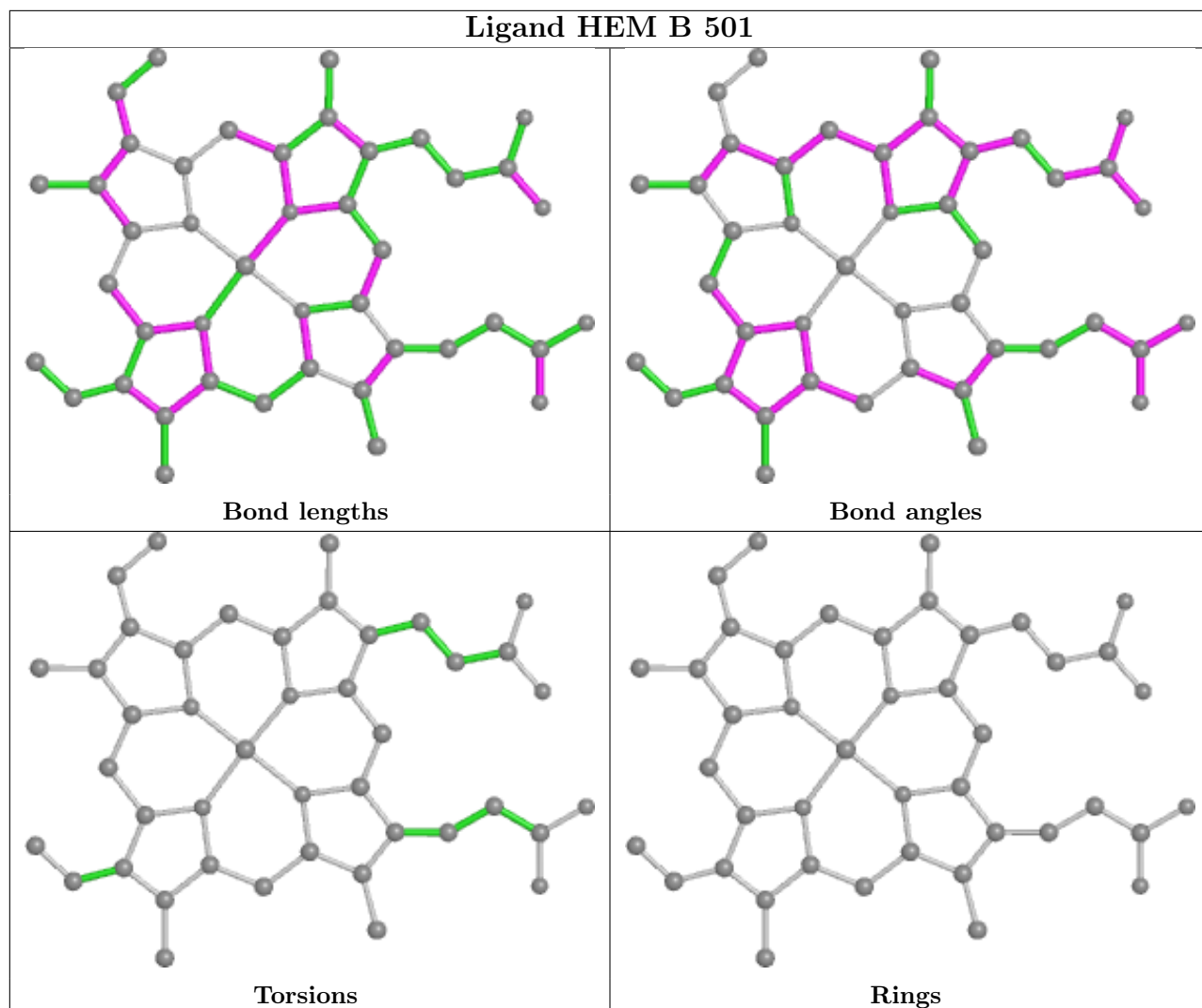


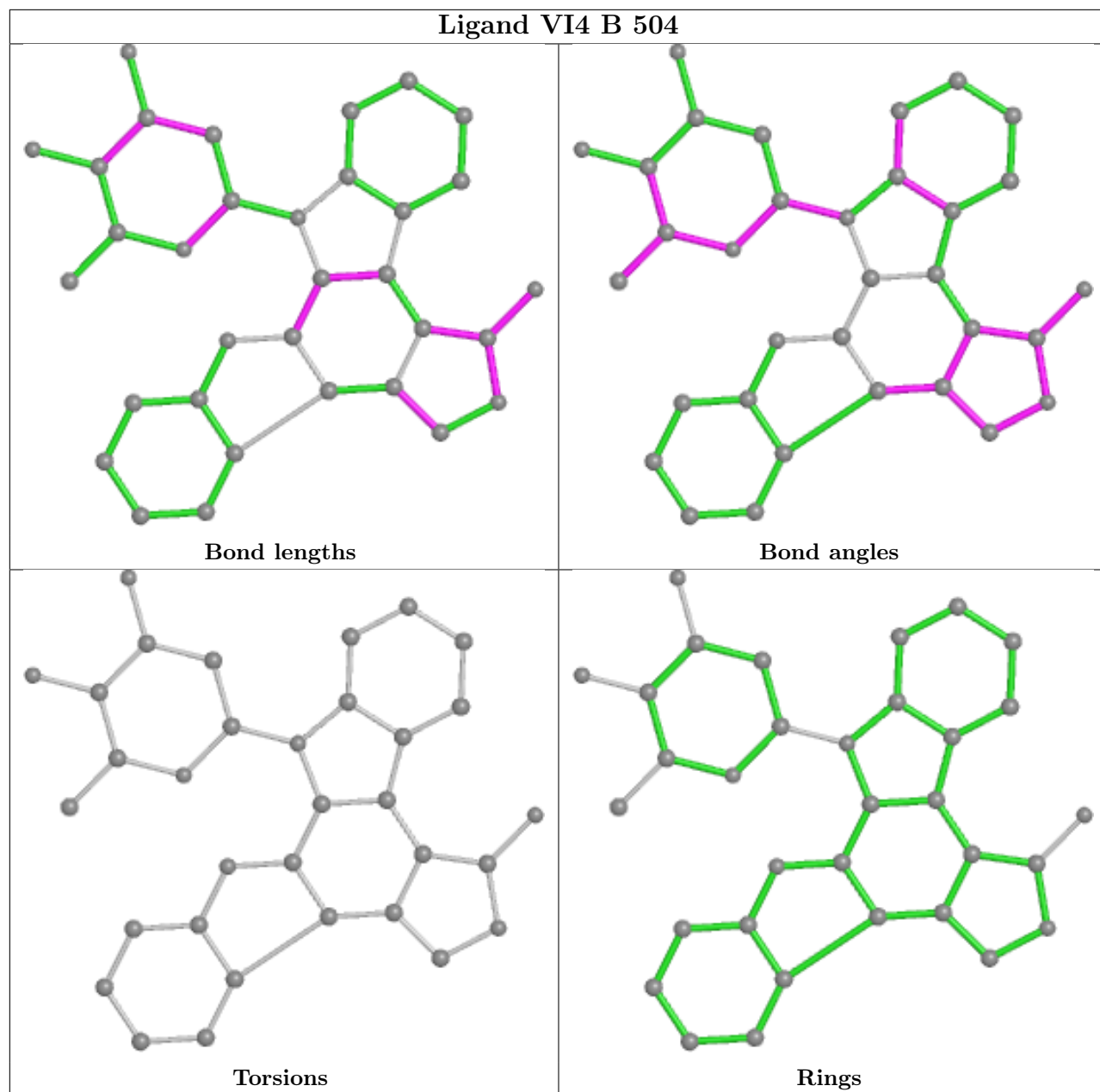




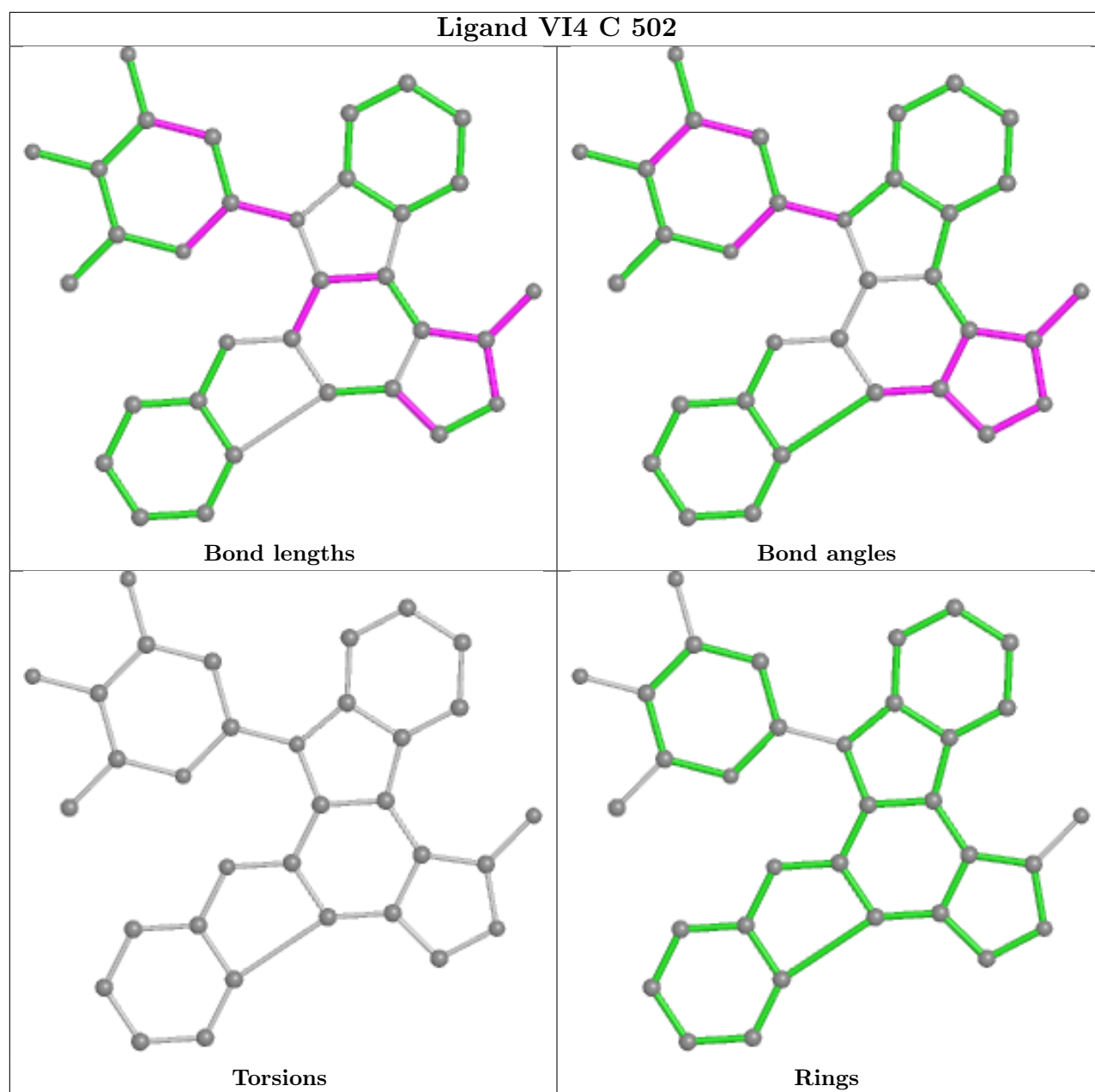












#### 4.7 Other polymers [i](#)

There are no such residues in this entry.

#### 4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 5 Fit of model and data [i](#)

### 5.1 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	390/440 (88%)	-0.73	0 <a href="#">100</a> <a href="#">100</a>	46, 73, 118, 156	0
1	B	387/440 (87%)	-0.64	0 <a href="#">100</a> <a href="#">100</a>	49, 74, 113, 174	0
1	C	381/440 (86%)	-0.64	1 (0%) <a href="#">90</a> <a href="#">91</a>	46, 87, 125, 167	0
All	All	1158/1320 (87%)	-0.67	1 (0%) <a href="#">92</a> <a href="#">93</a>	46, 78, 120, 174	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	233	ASP	2.5

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

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

### 5.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.4 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.

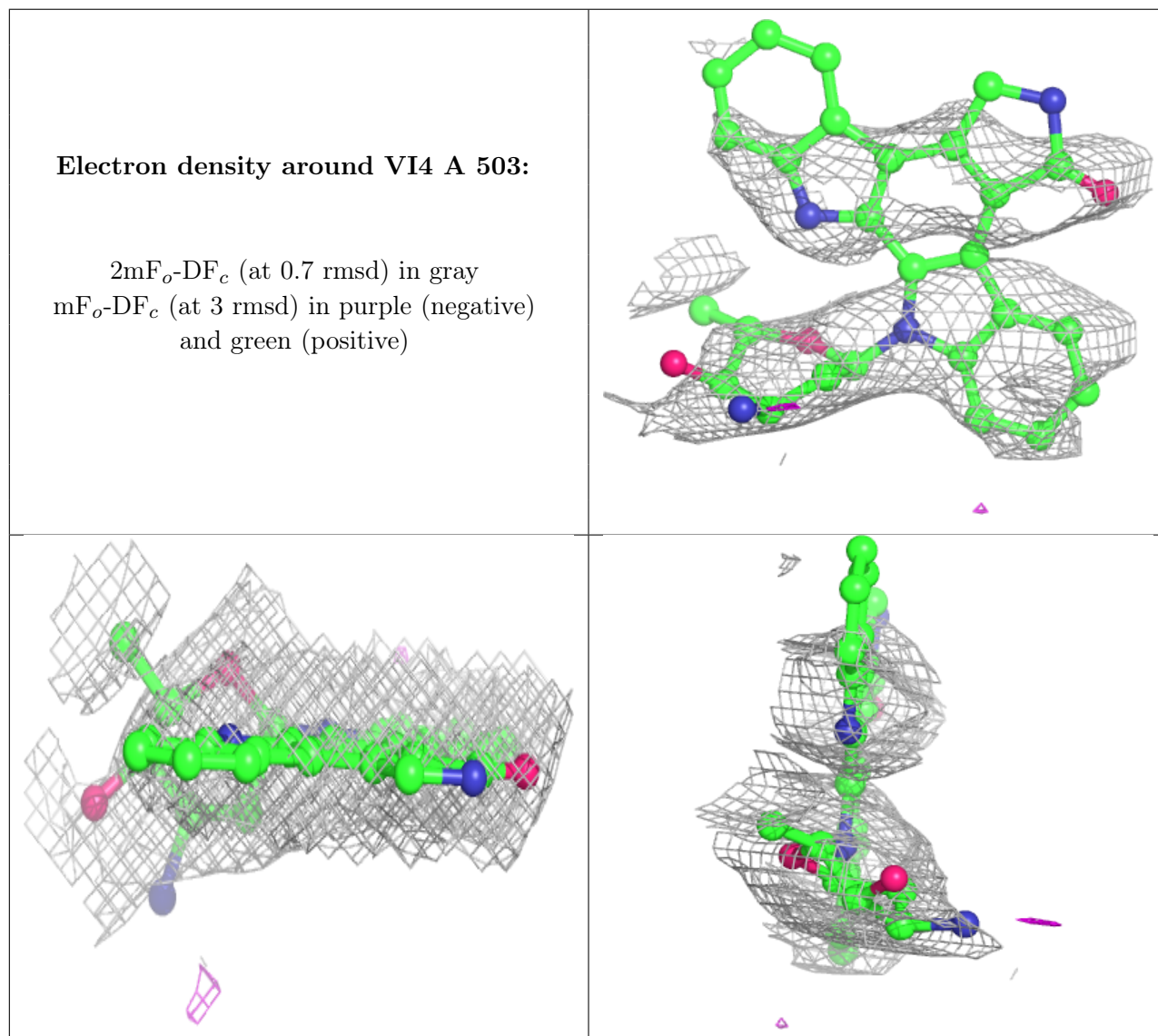
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	VI4	A	503	33/33	0.98	0.07	85,112,126,126	0
3	VI4	B	503	33/33	0.98	0.09	91,117,136,138	0

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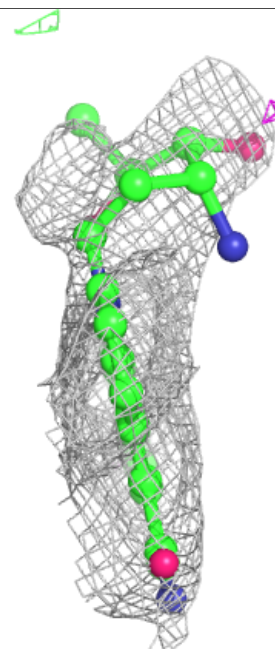
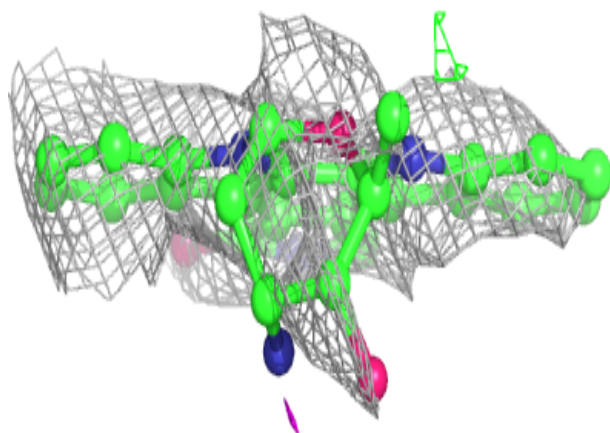
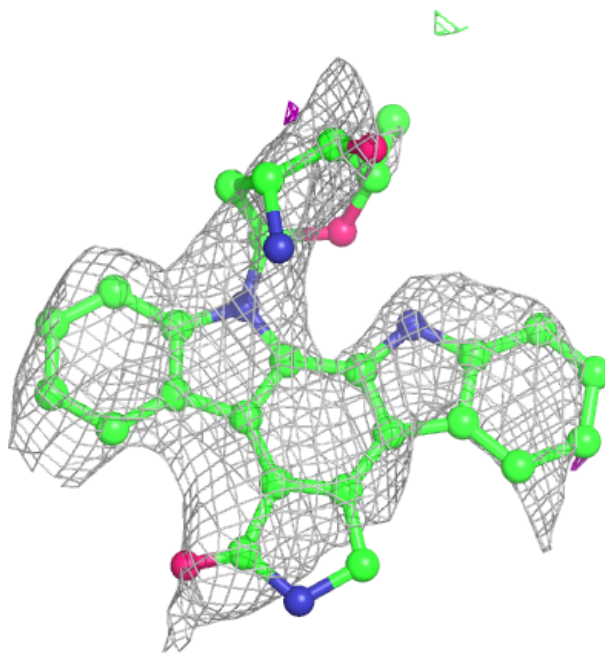
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	VI4	B	504	33/33	0.98	0.07	84,108,115,130	0
3	VI4	B	502	33/33	0.99	0.06	52,63,71,72	0
3	VI4	A	502	33/33	0.99	0.05	39,49,57,61	0
2	HEM	A	501	43/43	0.99	0.05	36,47,57,62	0
3	VI4	C	502	33/33	0.99	0.06	48,54,67,67	0
2	HEM	B	501	43/43	1.00	0.04	42,51,59,63	0
2	HEM	C	501	43/43	1.00	0.04	40,50,66,70	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.



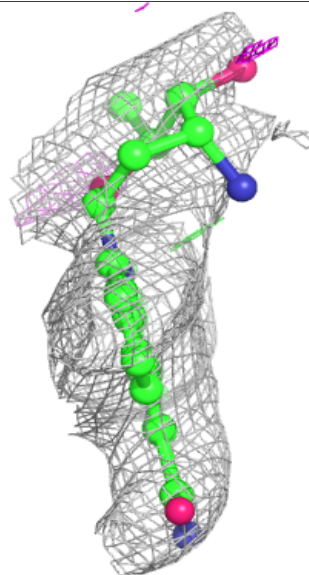
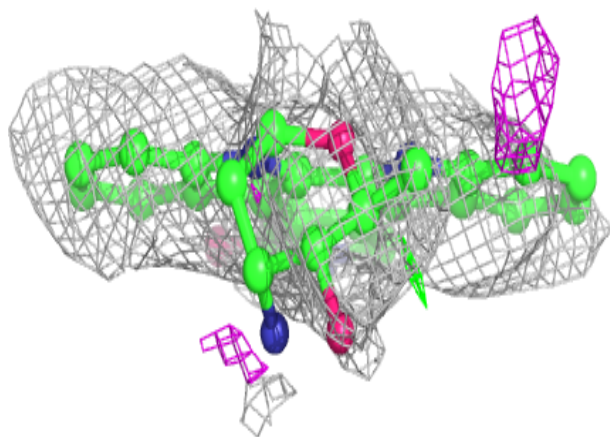
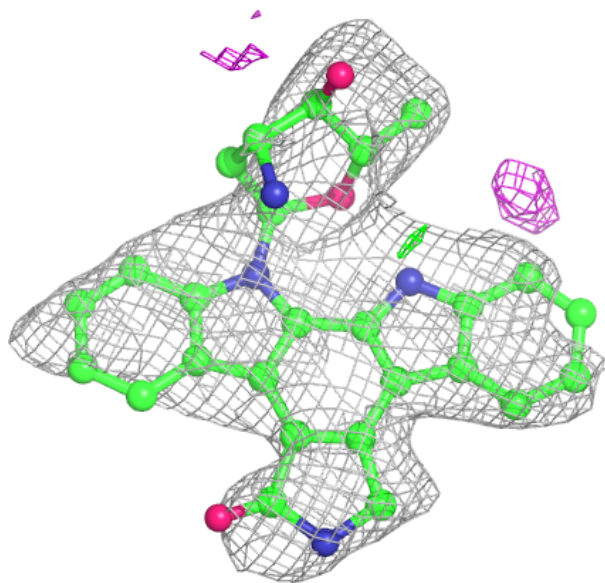
**Electron density around VI4 B 503:**

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



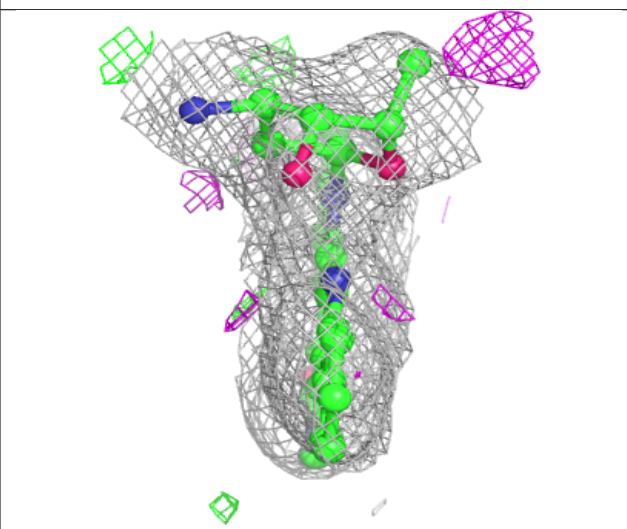
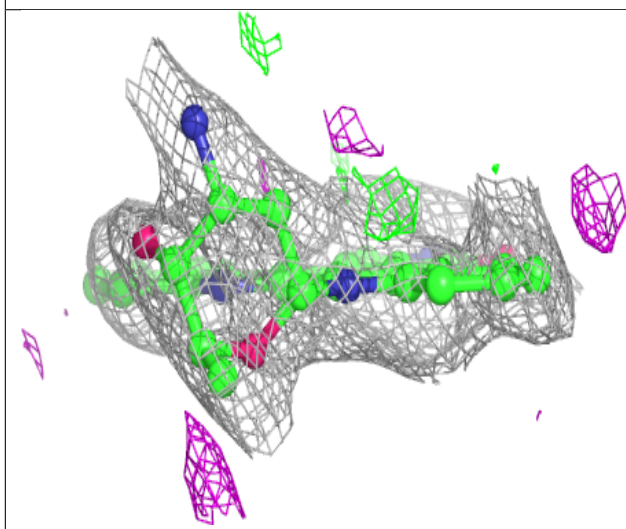
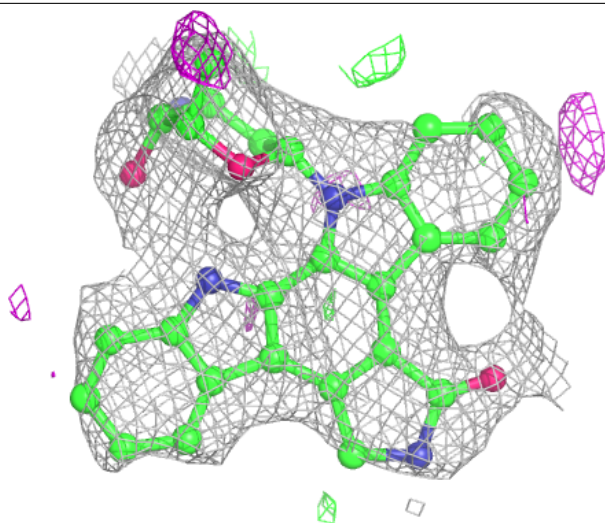
**Electron density around VI4 B 504:**

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



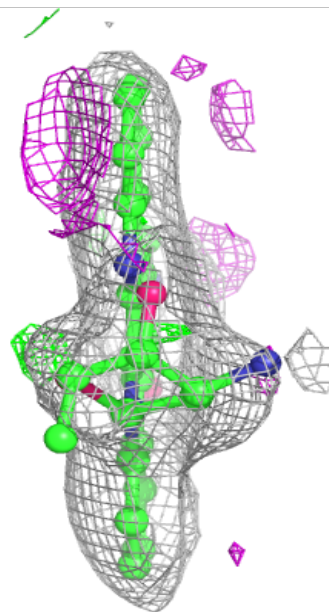
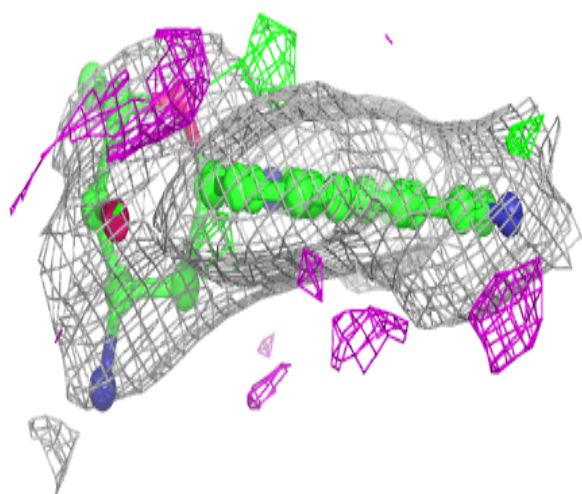
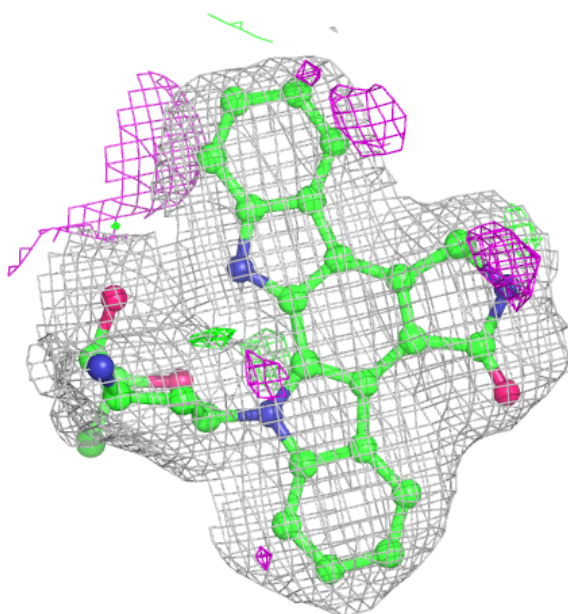
**Electron density around VI4 B 502:**

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



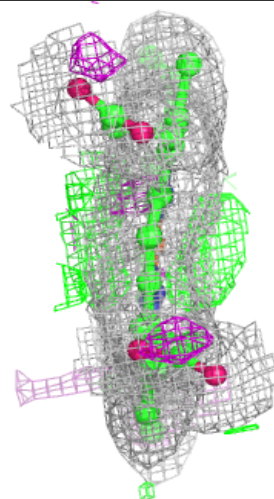
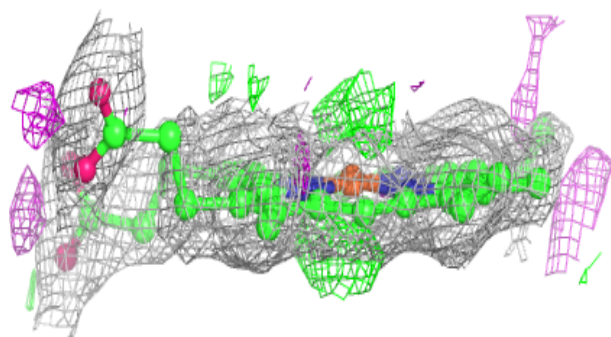
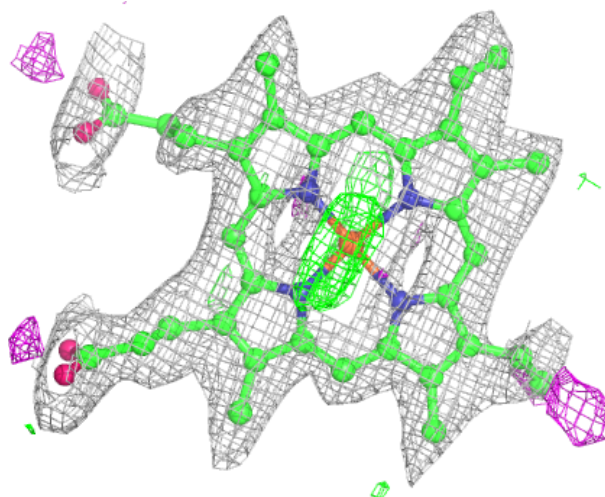
**Electron density around VI4 A 502:**

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



**Electron density around HEM A 501:**

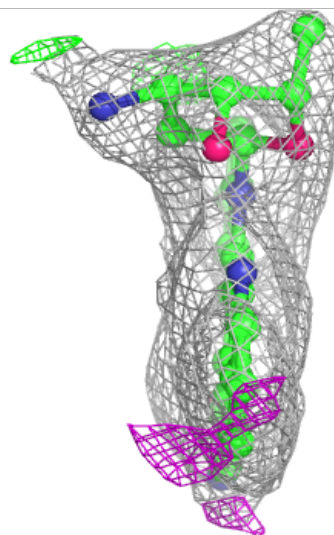
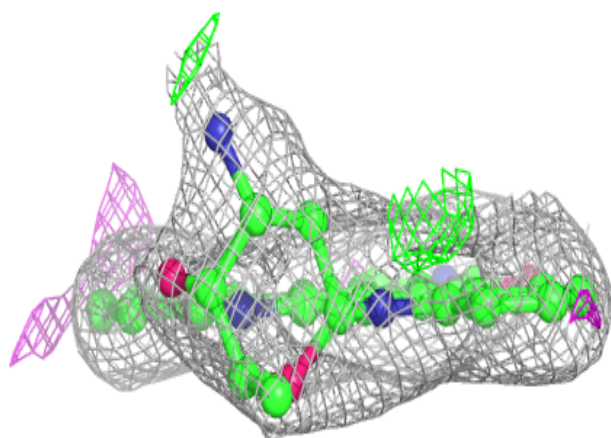
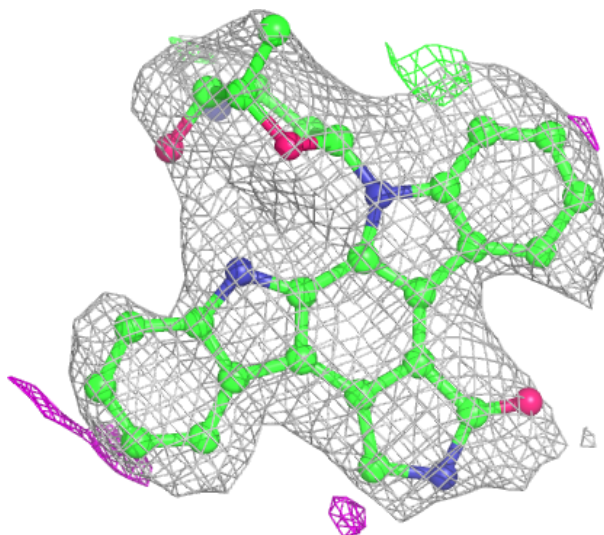
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





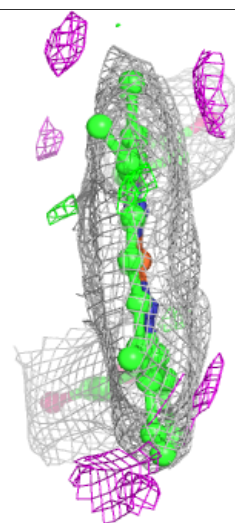
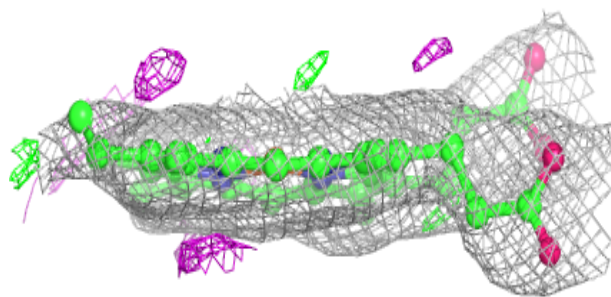
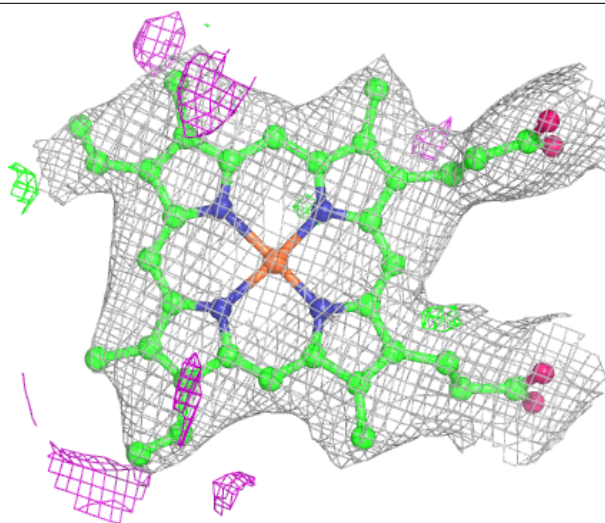
**Electron density around VI4 C 502:**

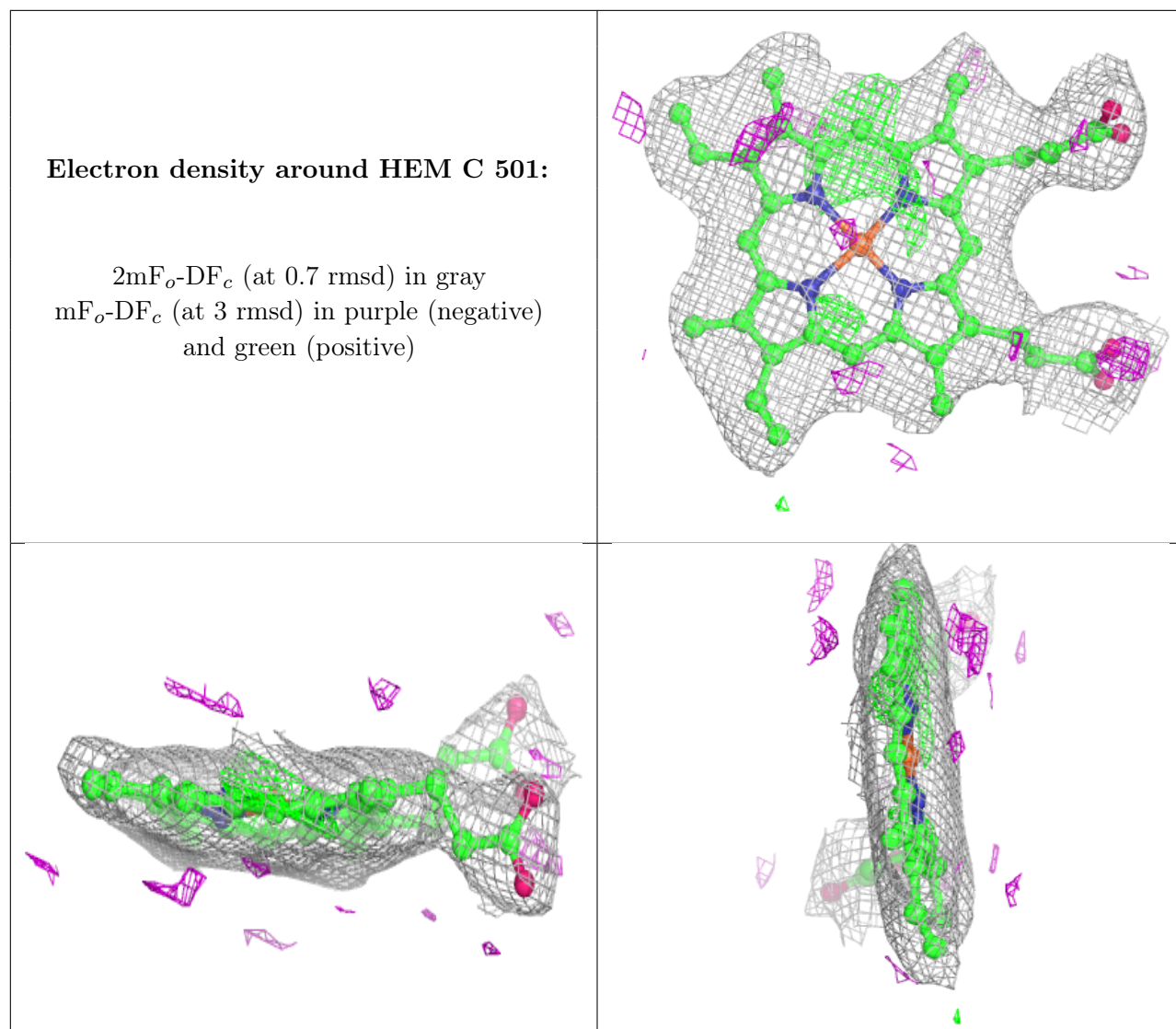
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around HEM B 501:**

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





## 5.5 Other polymers ⓘ

There are no such residues in this entry.