



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 17, 2020 – 12:17 am BST

PDB ID : 2OZ1  
Title : The SoxAX Complex of Rhodovulum Sulfidophilum  
Authors : Kihlken, M.A.; Berks, B.C.; Hemmings, A.M.  
Deposited on : 2007-02-23  
Resolution : 2.35 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 : 2.11  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

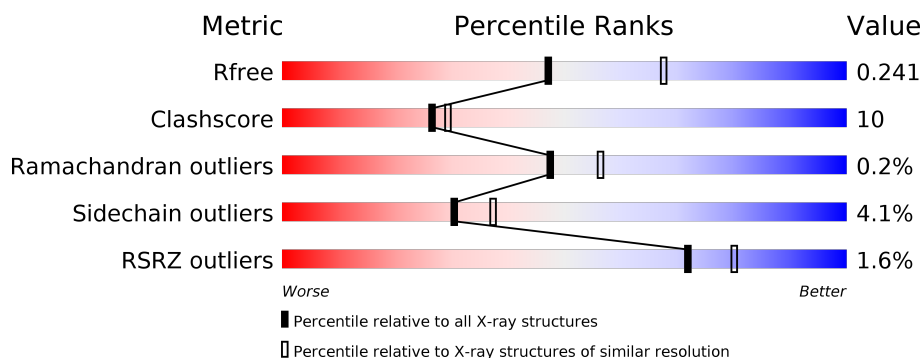
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.35 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1164 (2.36-2.36)
Clashscore	141614	1232 (2.36-2.36)
Ramachandran outliers	138981	1211 (2.36-2.36)
Sidechain outliers	138945	1212 (2.36-2.36)
RSRZ outliers	127900	1150 (2.36-2.36)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on 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	261	<div> <div>87%</div> <div>11%</div> <div>.</div> </div>
1	C	261	<div> <div>87%</div> <div>11%</div> <div>.</div> </div>
1	E	261	<div> <div>87%</div> <div>11%</div> <div>.</div> </div>
1	G	261	<div> <div>%</div> <div>89%</div> <div>10%</div> <div>.</div> </div>
2	B	138	<div> <div>3%</div> <div>80%</div> <div>16%</div> <div>..</div> </div>
2	D	138	<div> <div>2%</div> <div>81%</div> <div>17%</div> <div>..</div> </div>

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Mol	Chain	Length	Quality of chain
2	F	138	<div><div></div><div>3%</div><div>77%</div><div>22%</div><div></div></div>
2	H	138	<div><div></div><div>7%</div><div>82%</div><div>15%</div><div></div></div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 13668 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 Diheme cytochrome c.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	261	Total	C	N	O	S	0	0	0
			2031	1261	363	392	15			
1	C	261	Total	C	N	O	S	0	0	0
			2031	1261	363	392	15			
1	E	261	Total	C	N	O	S	0	0	0
			2031	1261	363	392	15			
1	G	261	Total	C	N	O	S	0	0	0
			2031	1261	363	392	15			

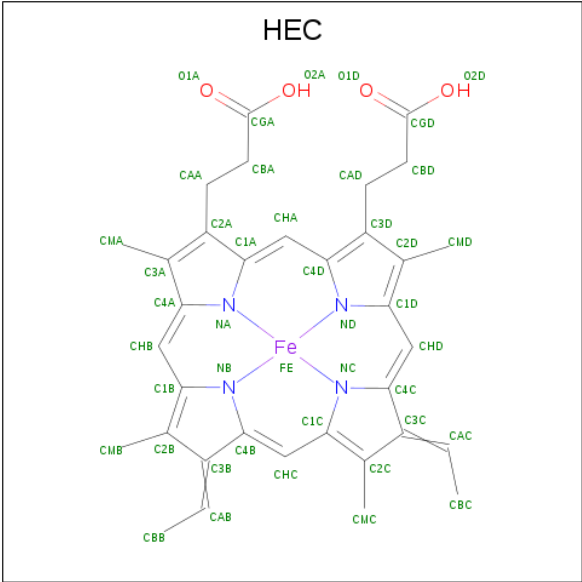
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	222	CSS	CYS	MODIFIED RESIDUE	UNP Q939U1
C	222	CSS	CYS	MODIFIED RESIDUE	UNP Q939U1
E	222	CSS	CYS	MODIFIED RESIDUE	UNP Q939U1
G	222	CSS	CYS	MODIFIED RESIDUE	UNP Q939U1

- Molecule 2 is a protein called Cytochrome c.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	135	Total	C	N	O	S	0	0	0
			1005	631	175	191	8			
2	D	137	Total	C	N	O	S	0	0	0
			1022	640	177	197	8			
2	F	138	Total	C	N	O	S	0	0	0
			1031	645	179	199	8			
2	H	138	Total	C	N	O	S	0	0	0
			1031	645	179	199	8			

- Molecule 3 is HEME C (three-letter code: HEC) (formula:  $C_{34}H_{34}FeN_4O_4$ ).



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

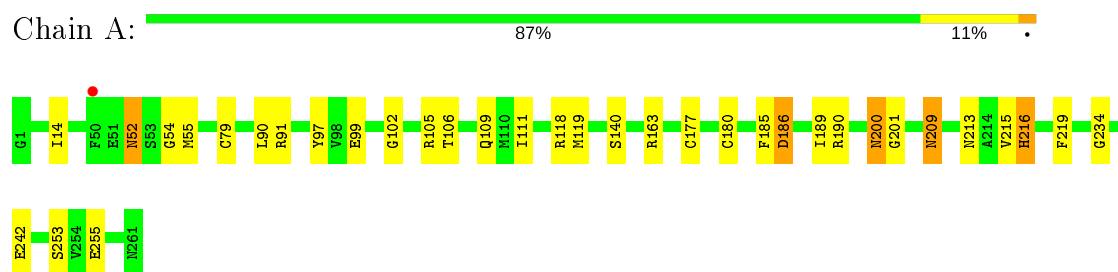
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	162	Total 162	O 162	0	0
4	B	71	Total 71	O 71	0	0
4	C	179	Total 179	O 179	0	0
4	D	67	Total 67	O 67	0	0
4	E	190	Total 190	O 190	0	0
4	F	66	Total 66	O 66	0	0
4	G	142	Total 142	O 142	0	0
4	H	62	Total 62	O 62	0	0

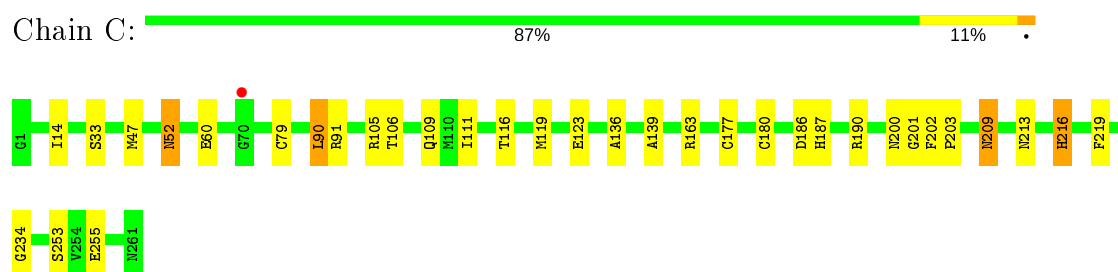
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

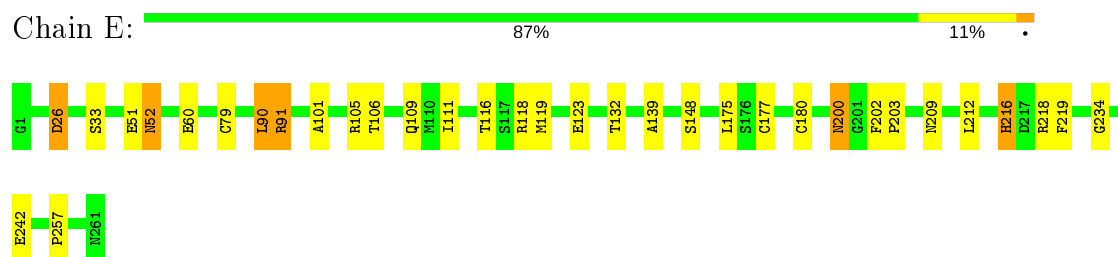
#### • Molecule 1: Diheme cytochrome c



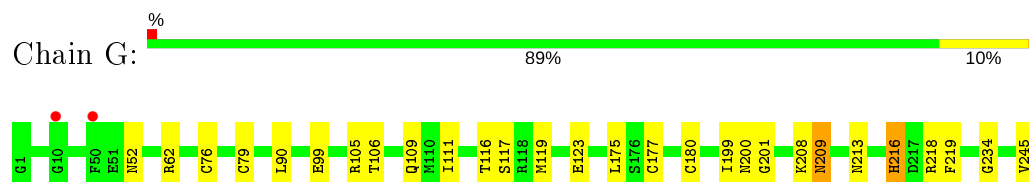
#### • Molecule 1: Diheme cytochrome c



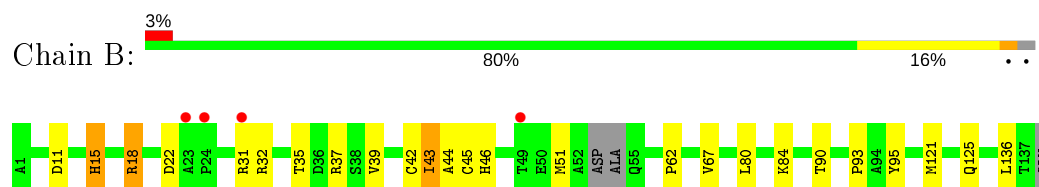
#### • Molecule 1: Diheme cytochrome c



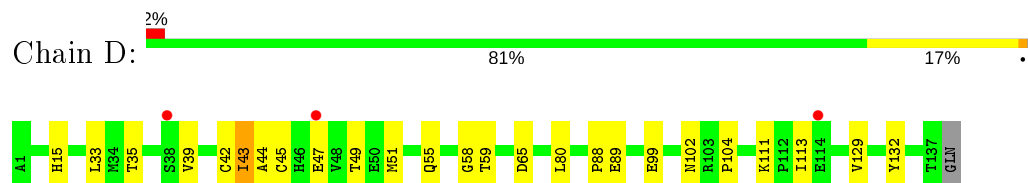
#### • Molecule 1: Diheme cytochrome c



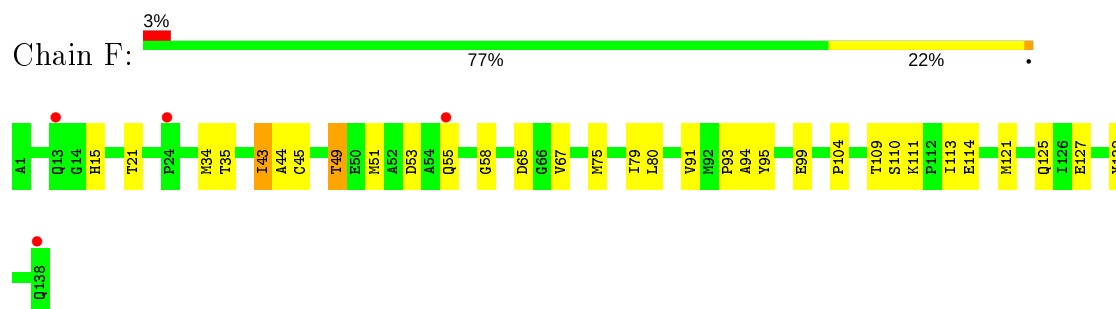
- Molecule 2: Cytochrome c



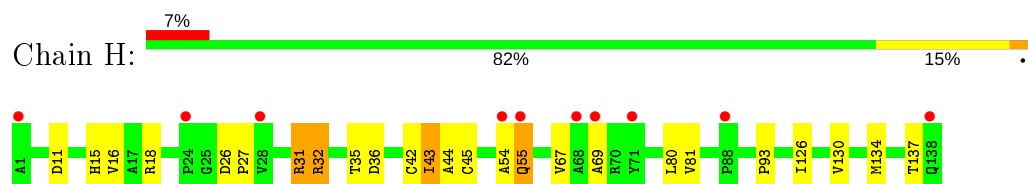
- Molecule 2: Cytochrome c



- Molecule 2: Cytochrome c



- Molecule 2: Cytochrome c





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	80.97Å 102.95Å 115.71Å 90.00° 110.22° 90.00°	Depositor
Resolution (Å)	50.00 – 2.35 42.62 – 2.35	Depositor EDS
% Data completeness (in resolution range)	96.0 (50.00-2.35) 96.0 (42.62-2.35)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.27 (at 2.34Å)	Xtriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.187 , 0.242 0.187 , 0.241	Depositor DCC
$R_{free}$ test set	3633 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	15.9	Xtriage
Anisotropy	0.142	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 36.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.035 for h,-k,-h-l	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	13668	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	14.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 23.23 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.8580e-03.*

<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: CSS, HEC

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	0.53	0/2070	0.63	0/2805
1	C	0.51	0/2070	0.62	0/2805
1	E	0.52	0/2070	0.65	0/2805
1	G	0.49	0/2070	0.63	0/2805
2	B	0.49	0/1025	0.60	0/1395
2	D	0.48	0/1043	0.60	0/1421
2	F	0.49	0/1052	0.60	0/1433
2	H	0.51	0/1052	0.65	0/1433
All	All	0.50	0/12452	0.63	0/16902

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 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	2031	0	1929	37	0
1	C	2031	0	1929	39	0
1	E	2031	0	1929	41	0
1	G	2031	0	1929	31	0
2	B	1005	0	996	28	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	1022	0	1009	16	0
2	F	1031	0	1017	25	0
2	H	1031	0	1018	33	0
3	A	86	0	63	18	0
3	B	43	0	32	12	0
3	C	86	0	63	16	0
3	D	43	0	31	7	0
3	E	86	0	63	20	0
3	F	43	0	31	9	0
3	G	86	0	63	21	0
3	H	43	0	32	12	0
4	A	162	0	0	7	0
4	B	71	0	0	5	0
4	C	179	0	0	4	0
4	D	67	0	0	1	0
4	E	190	0	0	12	0
4	F	66	0	0	2	0
4	G	142	0	0	1	0
4	H	62	0	0	7	0
All	All	13668	0	12134	257	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 10.

The worst 5 of 257 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:A:177:CYS:SG	3:A:953:HEC:HAB	1.45	1.56
1:C:177:CYS:SG	3:C:953:HEC:HAB	1.48	1.52
2:B:42:CYS:SG	3:B:951:HEC:HAB	1.54	1.46
1:G:76:CYS:SG	3:G:952:HEC:CAB	2.04	1.45
2:D:42:CYS:SG	3:D:951:HEC:CAB	2.05	1.41

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	258/261 (99%)	250 (97%)	8 (3%)	0	100	100
1	C	258/261 (99%)	251 (97%)	7 (3%)	0	100	100
1	E	258/261 (99%)	249 (96%)	8 (3%)	1 (0%)	34	38
1	G	258/261 (99%)	252 (98%)	6 (2%)	0	100	100
2	B	131/138 (95%)	126 (96%)	4 (3%)	1 (1%)	19	20
2	D	135/138 (98%)	130 (96%)	5 (4%)	0	100	100
2	F	136/138 (99%)	131 (96%)	5 (4%)	0	100	100
2	H	136/138 (99%)	130 (96%)	5 (4%)	1 (1%)	22	23
All	All	1570/1596 (98%)	1519 (97%)	48 (3%)	3 (0%)	47	56

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	55	GLN
1	E	26	ASP
2	B	39	VAL

### 5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	211/211 (100%)	204 (97%)	7 (3%)	38	46
1	C	211/211 (100%)	204 (97%)	7 (3%)	38	46

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	211/211 (100%)	203 (96%)	8 (4%)	33	41
1	G	211/211 (100%)	202 (96%)	9 (4%)	29	35
2	B	106/109 (97%)	102 (96%)	4 (4%)	33	41
2	D	108/109 (99%)	102 (94%)	6 (6%)	21	23
2	F	109/109 (100%)	103 (94%)	6 (6%)	21	24
2	H	109/109 (100%)	104 (95%)	5 (5%)	27	32
All	All	1276/1280 (100%)	1224 (96%)	52 (4%)	30	37

5 of 52 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	102	ASN
1	E	200	ASN
2	H	15	HIS
1	E	26	ASP
1	E	90	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	216	HIS
1	E	109	GLN
1	G	216	HIS
1	E	52	ASN
1	E	187	HIS

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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	$\# Z  > 2$
1	CSS	G	222	1,3	4,6,7	0.82	0	1,6,8	1.07	0
1	CSS	A	222	1,3	4,6,7	0.83	0	1,6,8	0.73	0
1	CSS	C	222	1,3	4,6,7	0.82	0	1,6,8	1.23	0
1	CSS	E	222	1,3	4,6,7	0.80	0	1,6,8	0.98	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
1	CSS	G	222	1,3	-	0/1/5/7	-
1	CSS	A	222	1,3	-	0/1/5/7	-
1	CSS	C	222	1,3	-	0/1/5/7	-
1	CSS	E	222	1,3	-	0/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

12 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	$\# Z  > 2$
3	HEC	H	951	2	26,50,50	2.21	4 (15%)	18,82,82	1.95	6 (33%)
3	HEC	C	952	1	26,50,50	2.07	4 (15%)	18,82,82	2.21	9 (50%)
3	HEC	A	952	1	26,50,50	2.06	4 (15%)	18,82,82	2.77	8 (44%)
3	HEC	G	952	1	26,50,50	2.27	4 (15%)	18,82,82	2.36	8 (44%)
3	HEC	E	952	1	26,50,50	2.17	6 (23%)	18,82,82	2.08	7 (38%)
3	HEC	A	953	1	26,50,50	2.24	6 (23%)	18,82,82	1.61	4 (22%)
3	HEC	B	951	2	26,50,50	2.09	5 (19%)	18,82,82	2.45	8 (44%)
3	HEC	G	953	1	26,50,50	2.23	4 (15%)	18,82,82	1.68	4 (22%)
3	HEC	D	951	2	26,50,50	2.15	5 (19%)	18,82,82	2.35	6 (33%)
3	HEC	E	953	1	26,50,50	2.19	4 (15%)	18,82,82	1.94	6 (33%)
3	HEC	F	951	2	26,50,50	2.15	4 (15%)	18,82,82	2.11	7 (38%)
3	HEC	C	953	1	26,50,50	2.13	4 (15%)	18,82,82	1.83	4 (22%)

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
3	HEC	H	951	2	-	1/6/54/54	-
3	HEC	C	952	1	-	0/6/54/54	-
3	HEC	A	952	1	-	0/6/54/54	-
3	HEC	G	952	1	-	0/6/54/54	-
3	HEC	E	952	1	-	0/6/54/54	-
3	HEC	A	953	1	-	0/6/54/54	-
3	HEC	B	951	2	-	1/6/54/54	-
3	HEC	G	953	1	-	0/6/54/54	-
3	HEC	D	951	2	-	1/6/54/54	-
3	HEC	E	953	1	-	0/6/54/54	-
3	HEC	F	951	2	-	1/6/54/54	-
3	HEC	C	953	1	-	0/6/54/54	-

The worst 5 of 54 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	953	HEC	C3B-C2B	-6.47	1.34	1.40
3	G	952	HEC	C3B-C2B	-6.25	1.34	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	953	HEC	C3B-C2B	-6.25	1.34	1.40
3	A	953	HEC	C3B-C2B	-6.14	1.34	1.40
3	D	951	HEC	C3D-C2D	5.98	1.55	1.37

The worst 5 of 77 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	952	HEC	CBA-CAA-C2A	-6.83	99.90	112.48
3	B	951	HEC	CBA-CAA-C2A	-5.99	101.44	112.48
3	A	952	HEC	CBD-CAD-C3D	-5.64	102.08	112.49
3	G	952	HEC	CBA-CAA-C2A	-5.48	102.39	112.48
3	G	952	HEC	CBD-CAD-C3D	-4.70	103.83	112.49

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	H	951	HEC	C3D-CAD-CBD-CGD
3	B	951	HEC	C3D-CAD-CBD-CGD
3	F	951	HEC	C3D-CAD-CBD-CGD
3	D	951	HEC	C3D-CAD-CBD-CGD

There are no ring outliers.

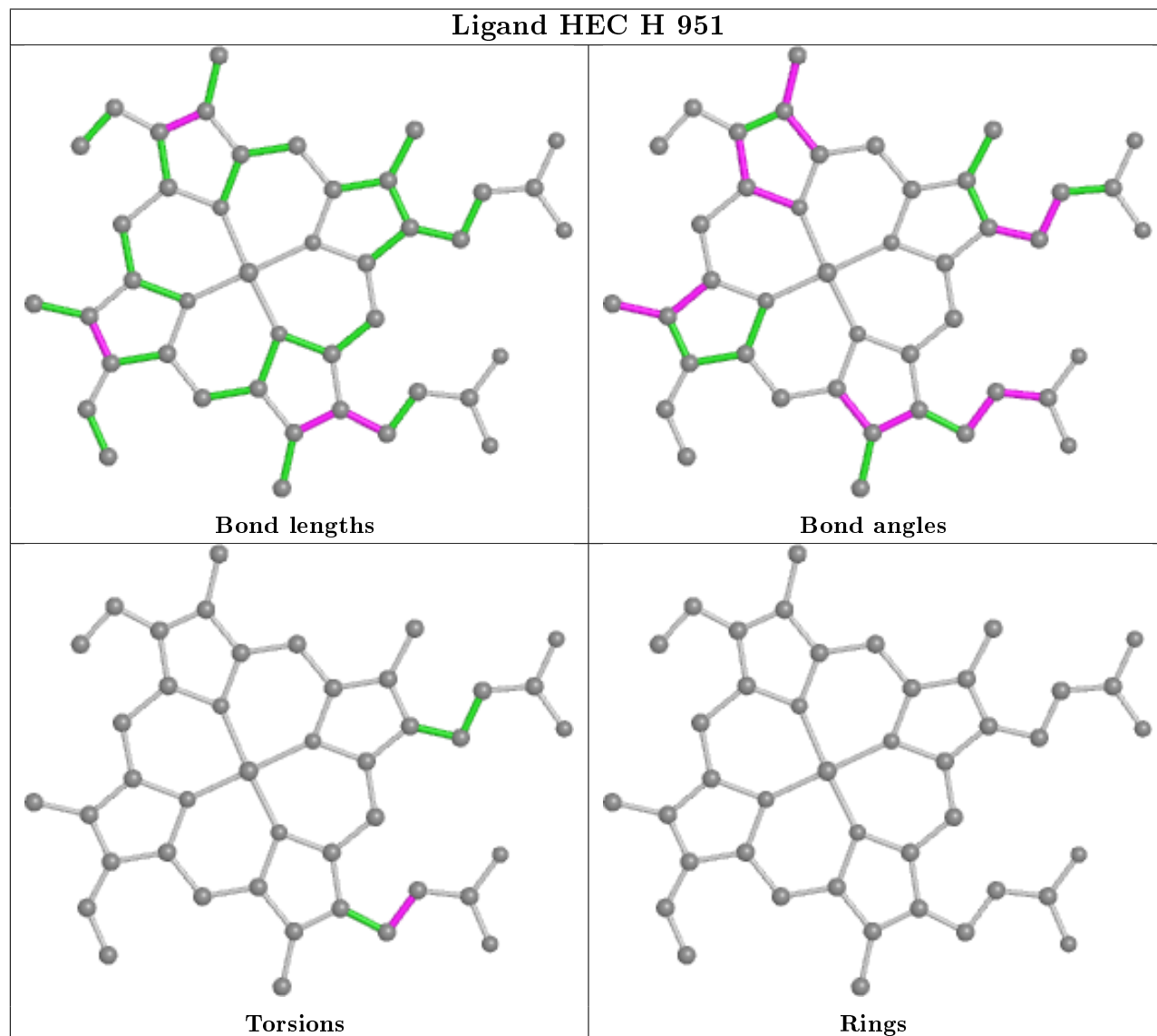
12 monomers are involved in 115 short contacts:

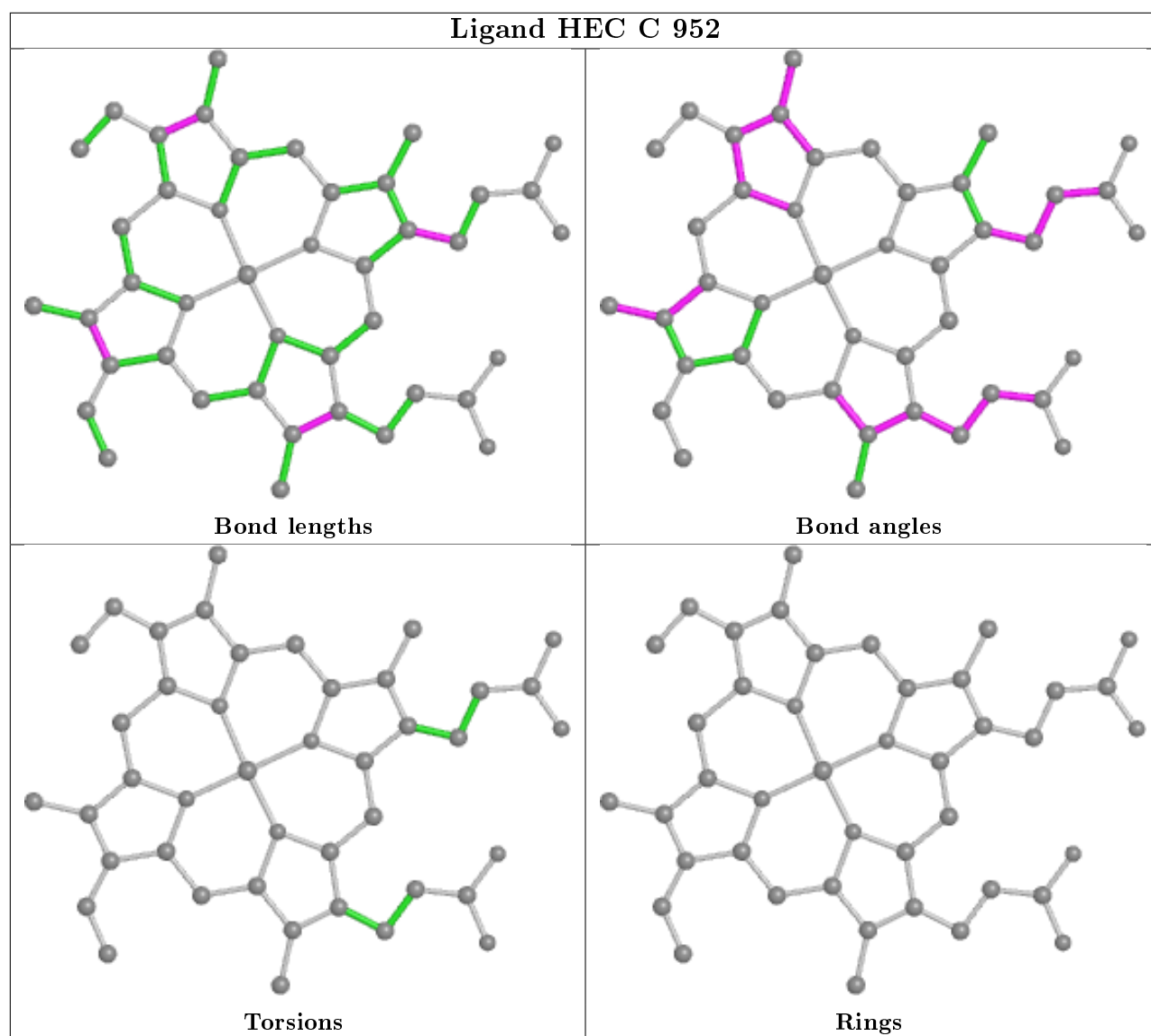
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	H	951	HEC	12	0
3	C	952	HEC	10	0
3	A	952	HEC	10	0
3	G	952	HEC	13	0
3	E	952	HEC	9	0
3	A	953	HEC	8	0
3	B	951	HEC	12	0
3	G	953	HEC	8	0
3	D	951	HEC	7	0
3	E	953	HEC	11	0
3	F	951	HEC	9	0
3	C	953	HEC	6	0

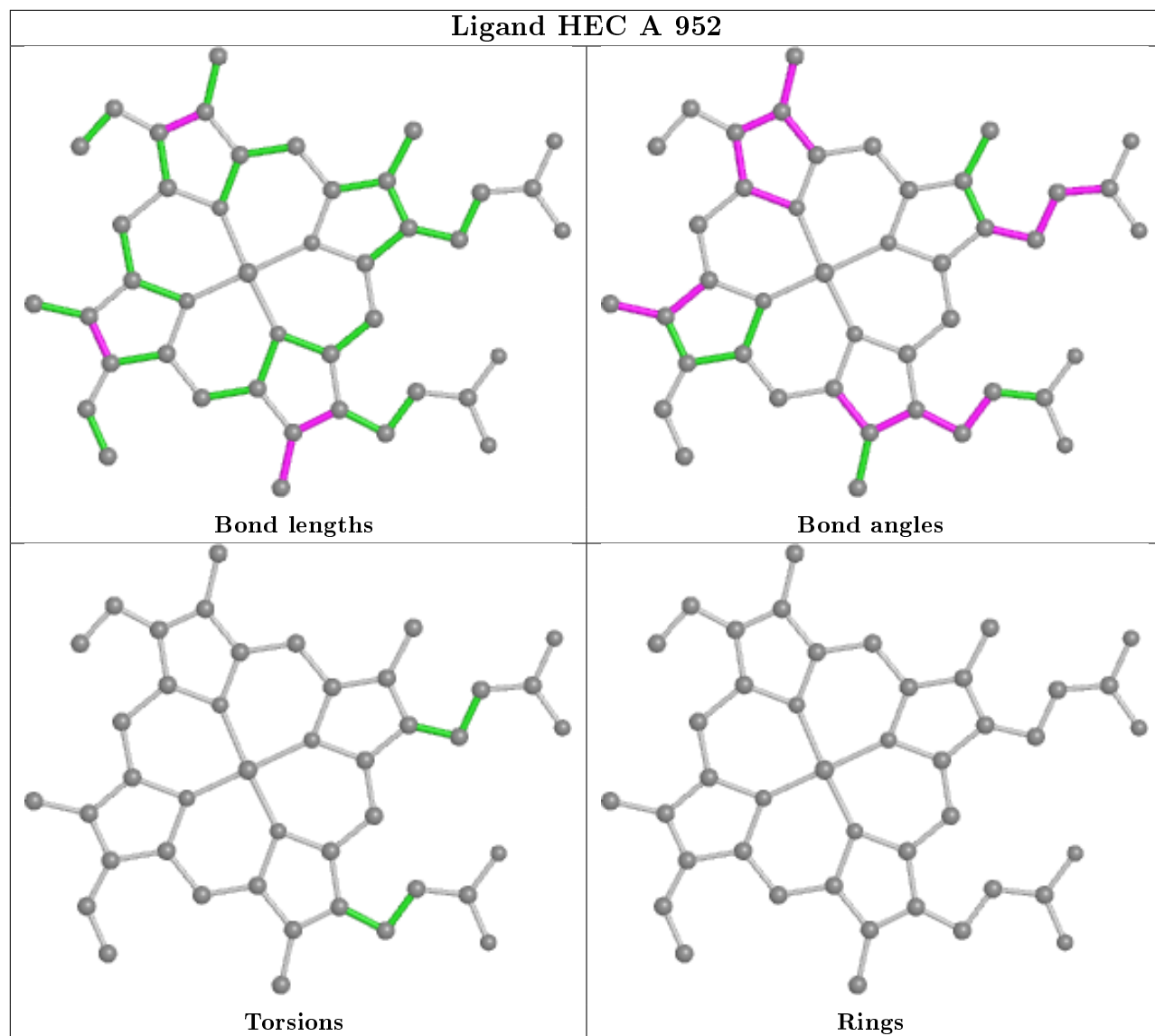
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

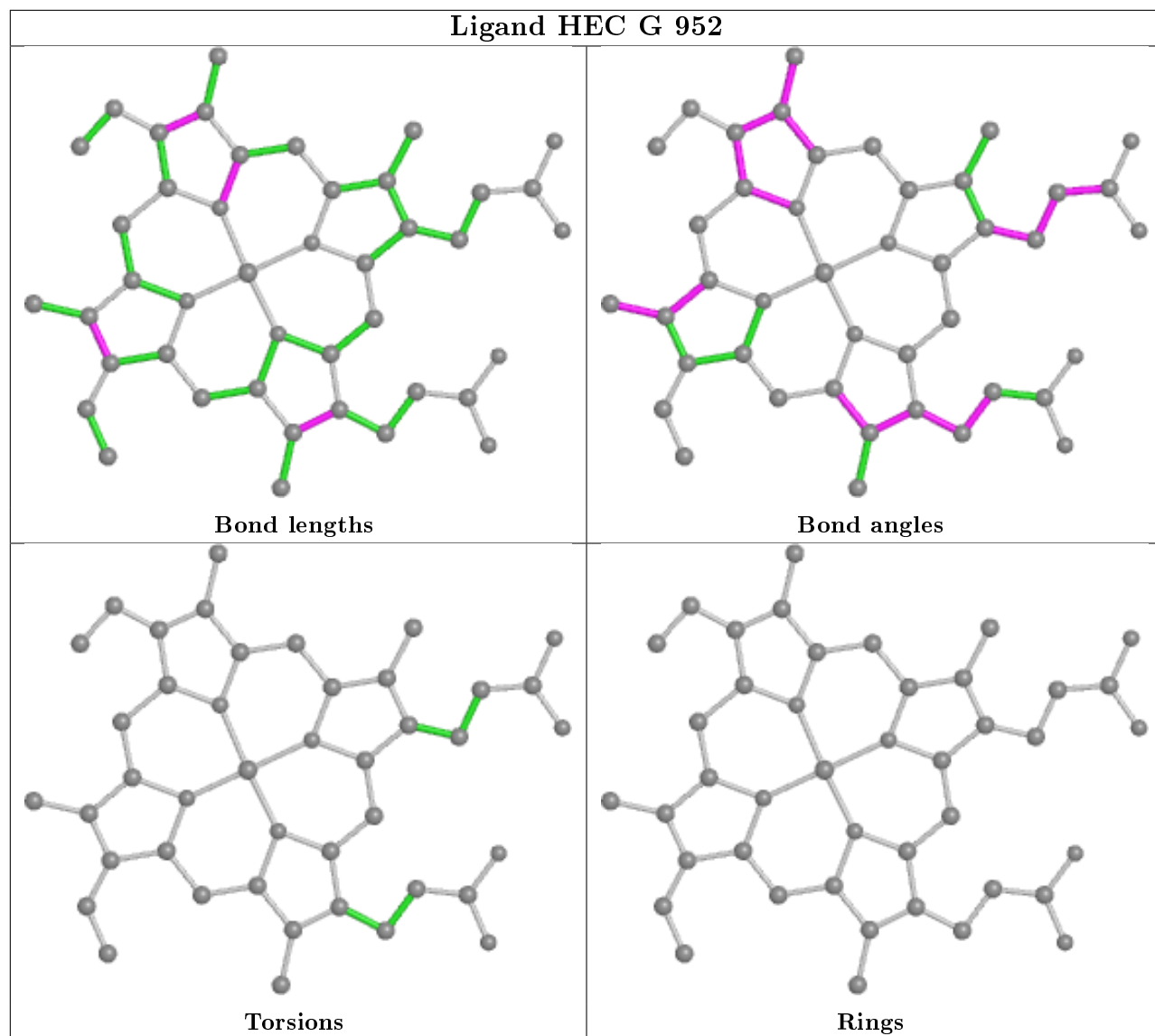


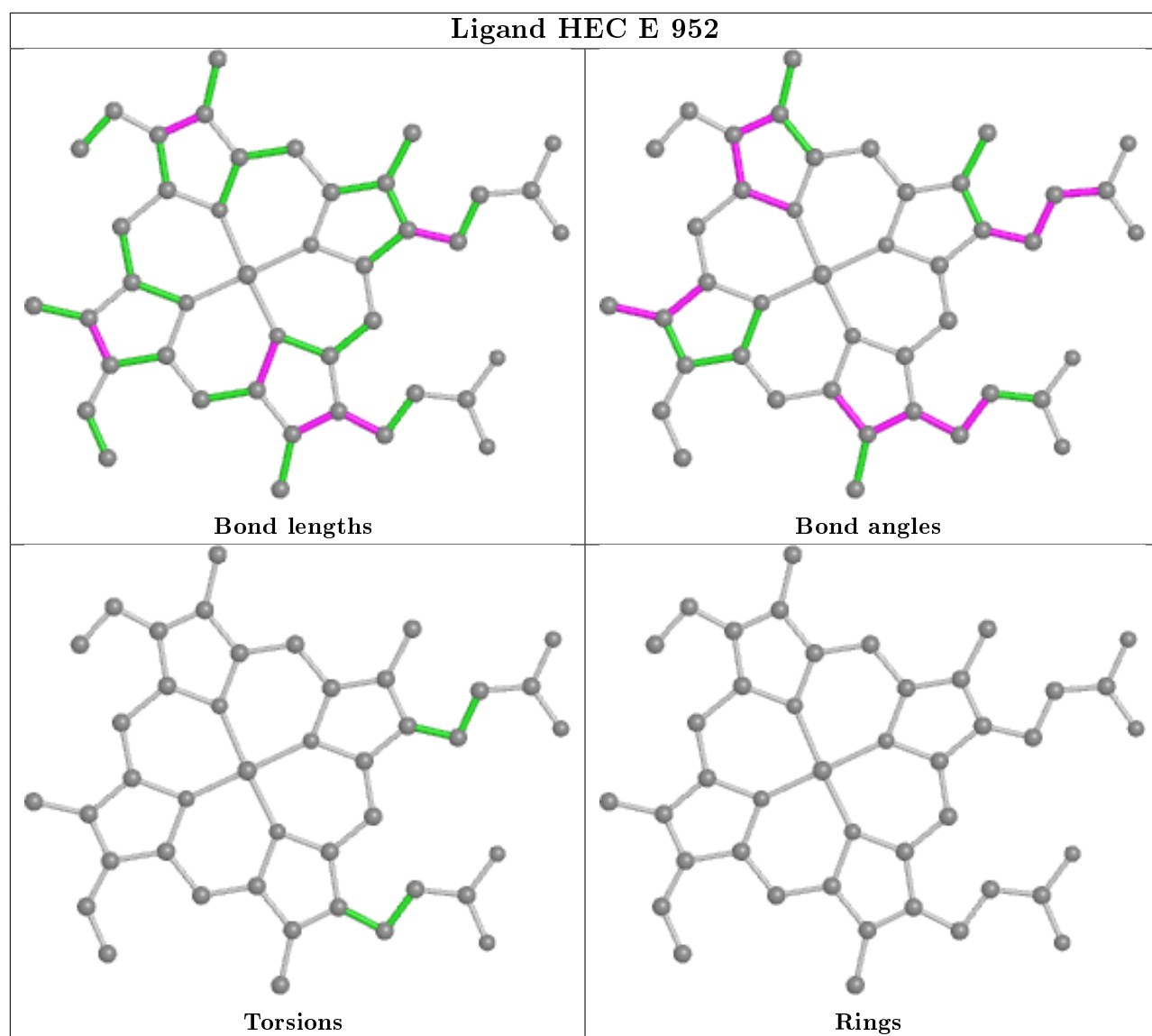
addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier.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

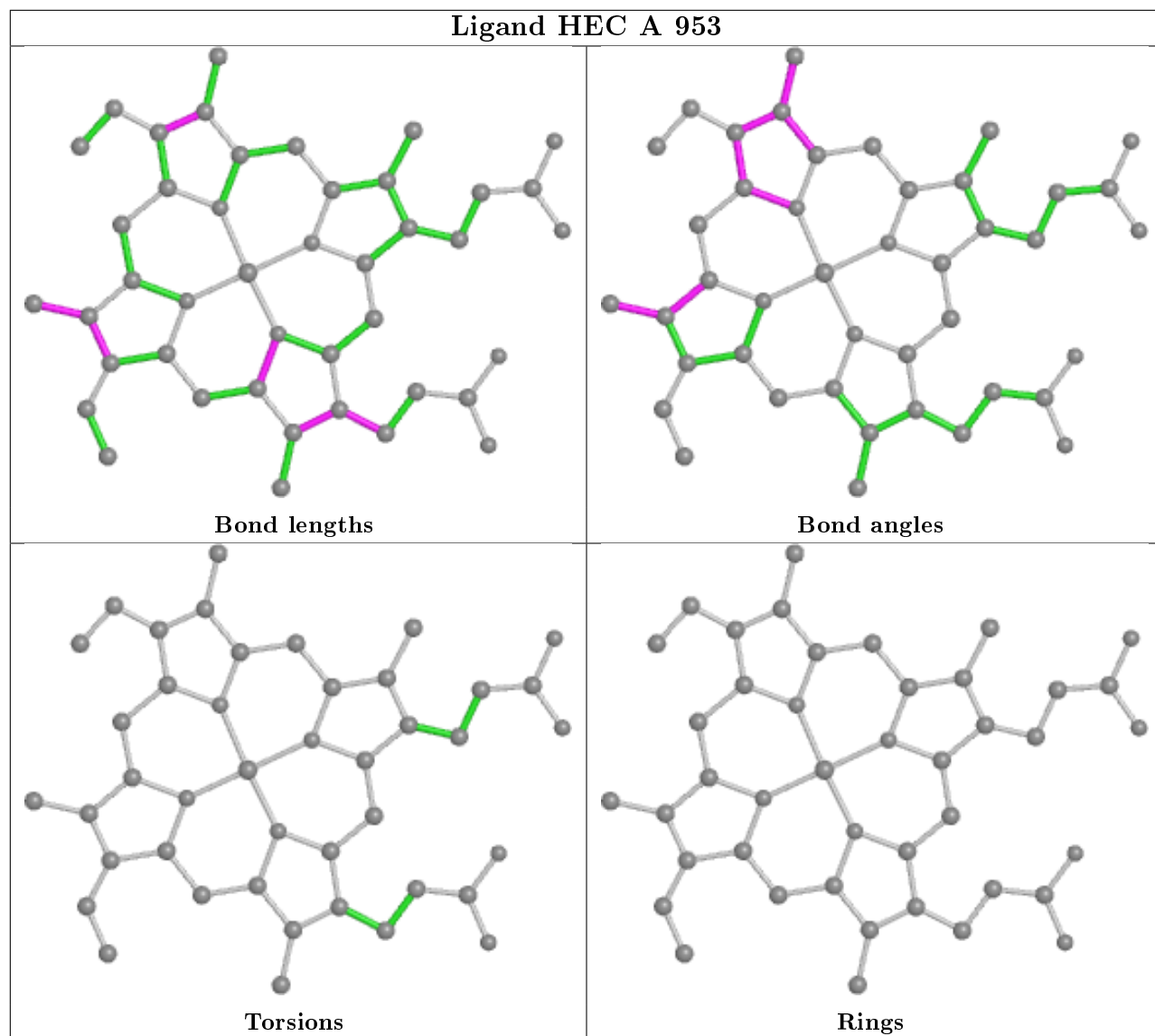


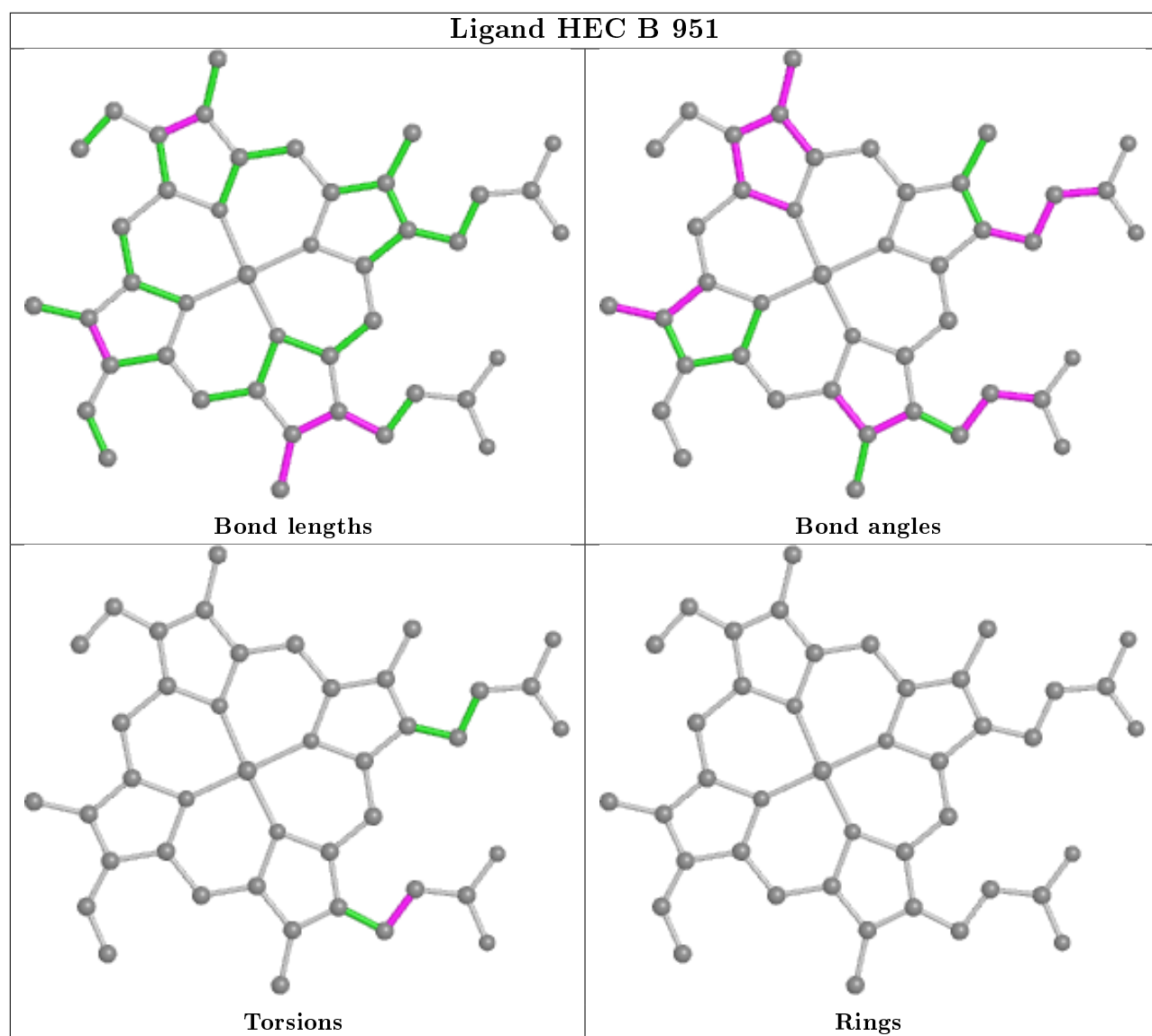


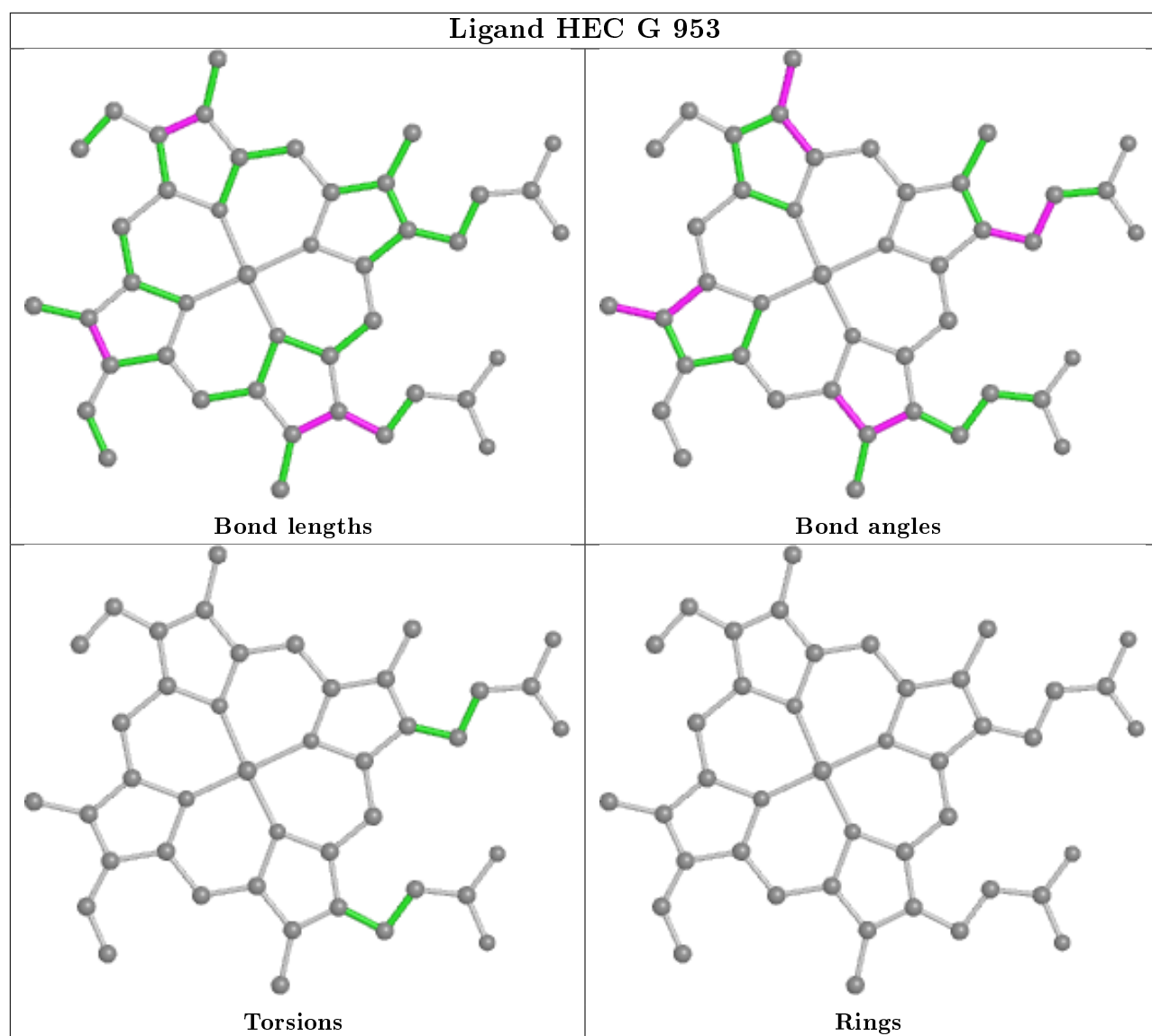




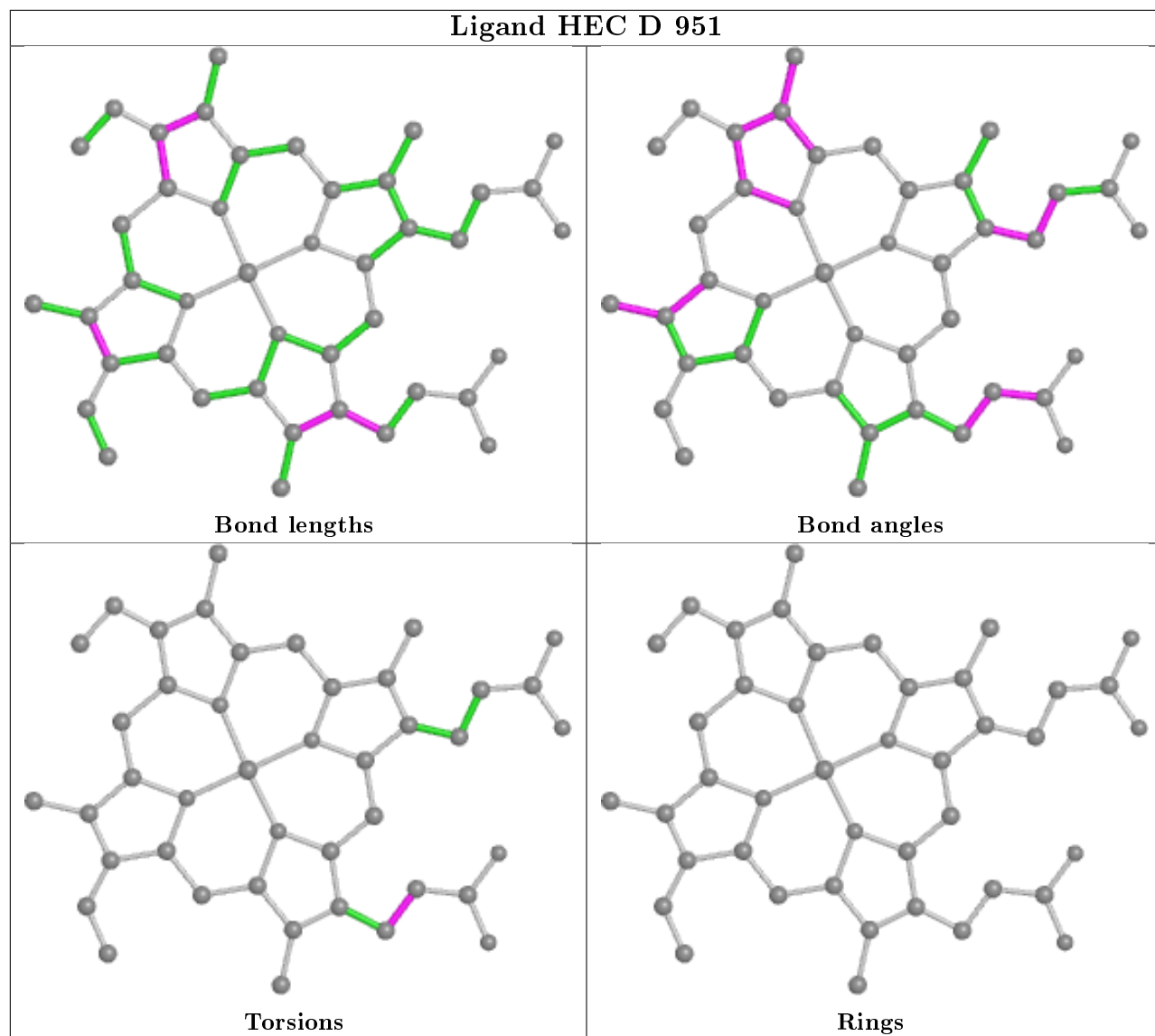




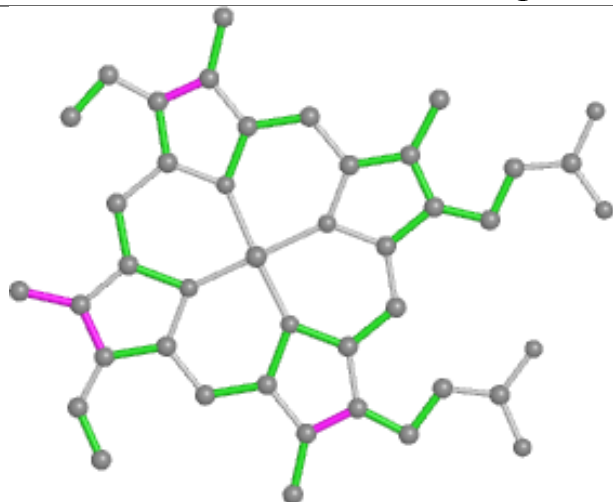




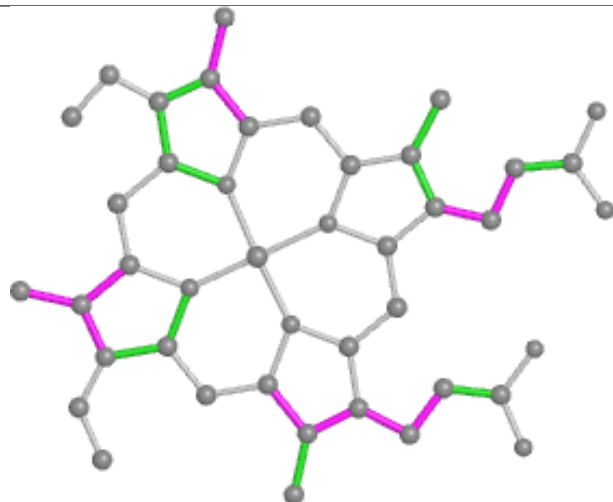




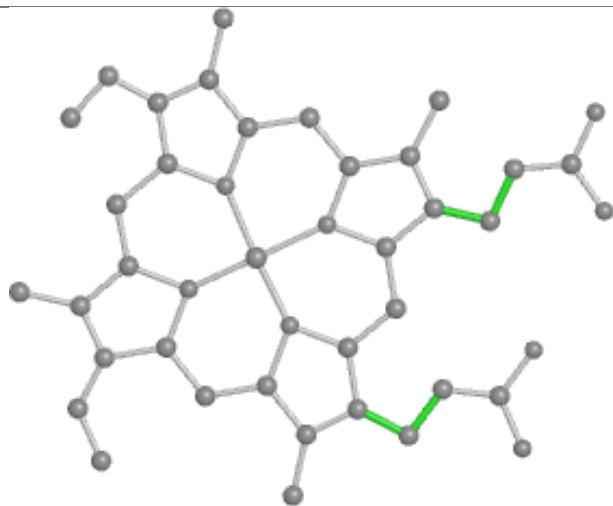
## Ligand HEC E 953



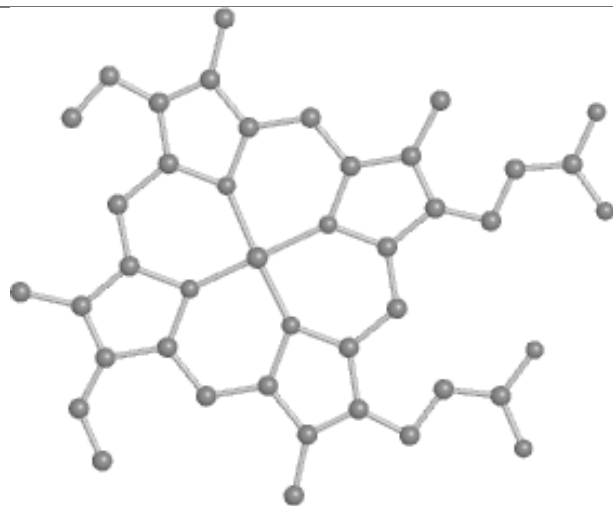
Bond lengths



Bond angles

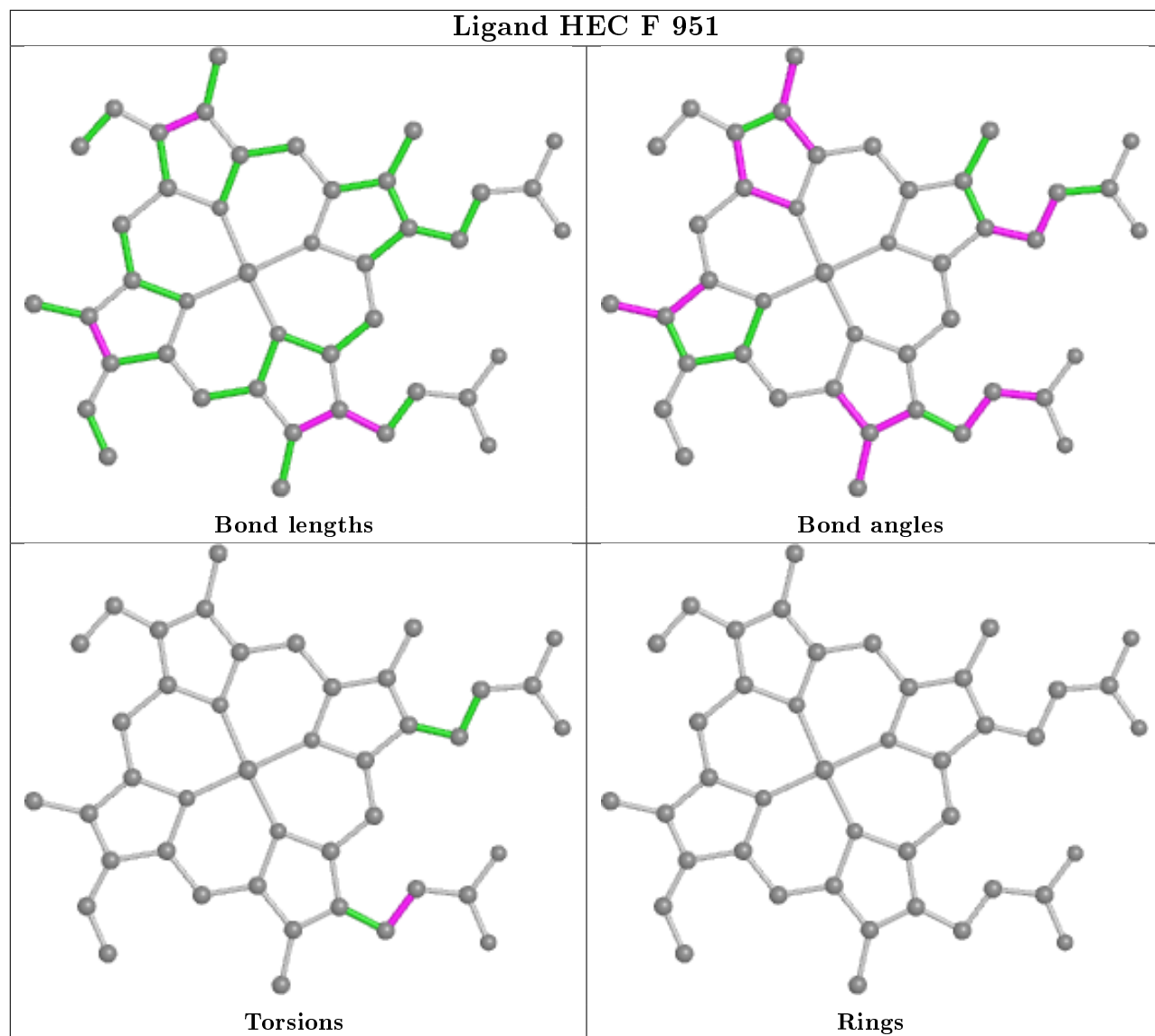


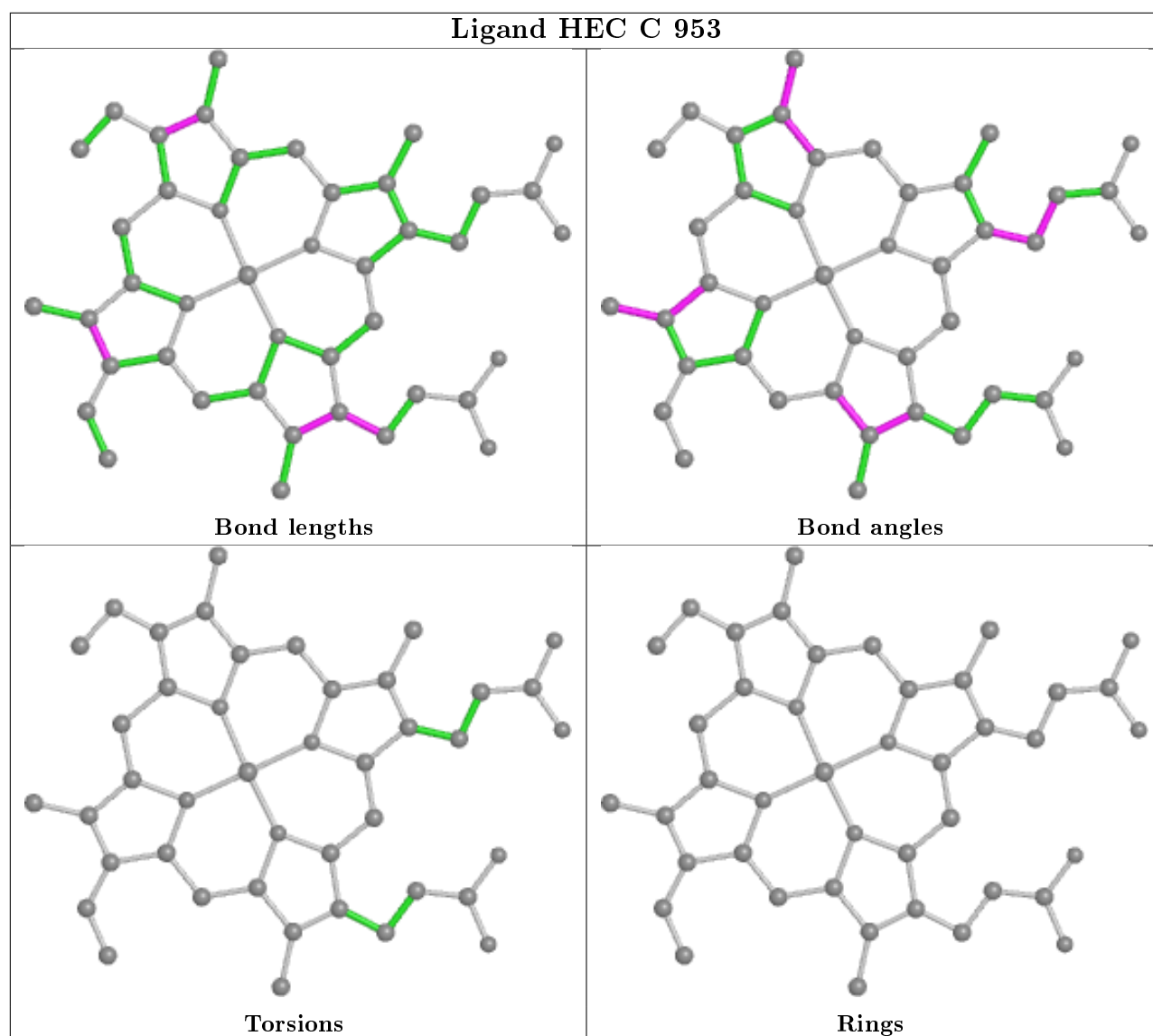
Torsions



Rings

## Ligand HEC F 951





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	260/261 (99%)	0.01	1 (0%) 92 96	4, 12, 22, 27	0
1	C	260/261 (99%)	0.09	1 (0%) 92 96	5, 11, 19, 27	0
1	E	260/261 (99%)	0.05	0 100 100	5, 11, 21, 25	0
1	G	260/261 (99%)	0.13	2 (0%) 86 91	5, 14, 24, 29	0
2	B	135/138 (97%)	0.35	4 (2%) 50 61	8, 18, 32, 35	0
2	D	137/138 (99%)	0.14	3 (2%) 62 72	10, 17, 27, 33	0
2	F	138/138 (100%)	0.11	4 (2%) 51 62	8, 15, 27, 29	0
2	H	138/138 (100%)	0.59	10 (7%) 15 23	8, 20, 34, 38	0
All	All	1588/1596 (99%)	0.15	25 (1%) 72 80	4, 14, 26, 38	0

The worst 5 of 25 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	54	ALA	4.4
1	A	50	PHE	3.4
2	F	24	PRO	3.2
2	B	23	ALA	3.0
2	B	24	PRO	3.0

### 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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
1	CSS	C	222	7/8	0.97	0.11	8,10,12,15	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
1	CSS	A	222	7/8	0.98	0.13	5,7,7,9	0
1	CSS	G	222	7/8	0.98	0.12	7,8,8,10	0
1	CSS	E	222	7/8	0.98	0.11	6,6,8,8	0

### 6.3 Carbohydrates

There are no carbohydrates in this entry.

### 6.4 Ligands

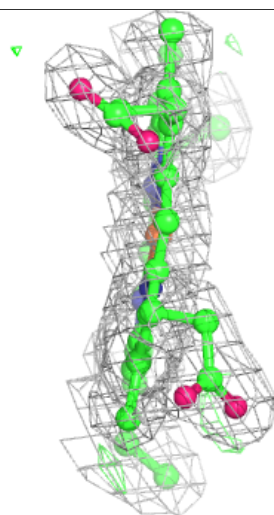
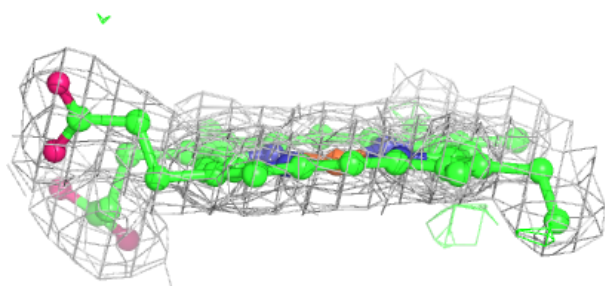
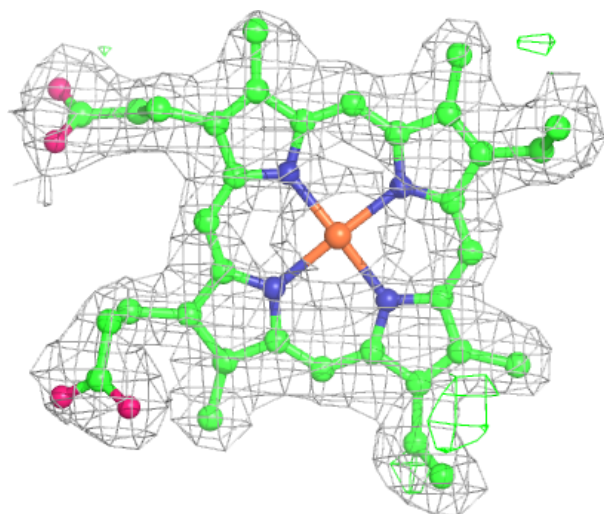
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	HEC	D	951	43/43	0.93	0.15	8,11,16,17	0
3	HEC	C	952	43/43	0.94	0.17	11,14,17,18	0
3	HEC	E	952	43/43	0.94	0.17	11,14,17,20	0
3	HEC	H	951	43/43	0.94	0.18	10,13,18,19	0
3	HEC	F	951	43/43	0.95	0.14	7,9,12,15	0
3	HEC	G	953	43/43	0.96	0.14	6,9,11,14	0
3	HEC	A	953	43/43	0.96	0.15	3,6,8,11	0
3	HEC	E	953	43/43	0.96	0.15	2,5,7,7	0
3	HEC	B	951	43/43	0.96	0.15	9,10,12,15	0
3	HEC	C	953	43/43	0.96	0.16	4,6,9,12	0
3	HEC	A	952	43/43	0.97	0.14	4,8,12,13	0
3	HEC	G	952	43/43	0.97	0.14	6,11,18,19	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.

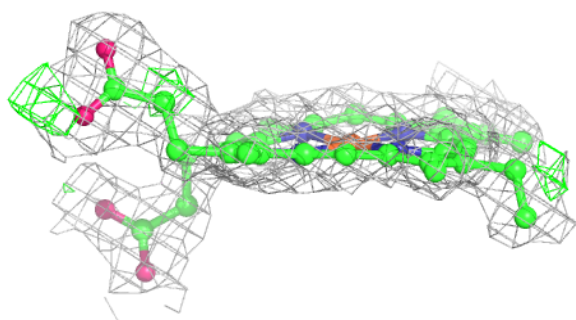
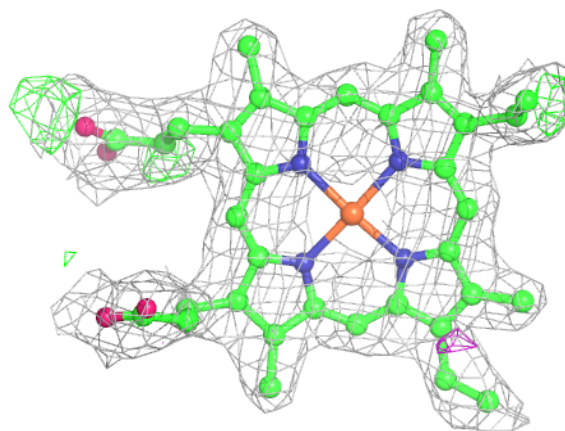
**Electron density around HEC D 951:**

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

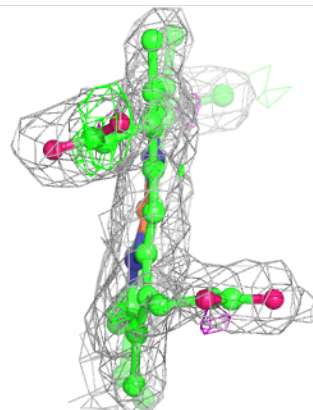
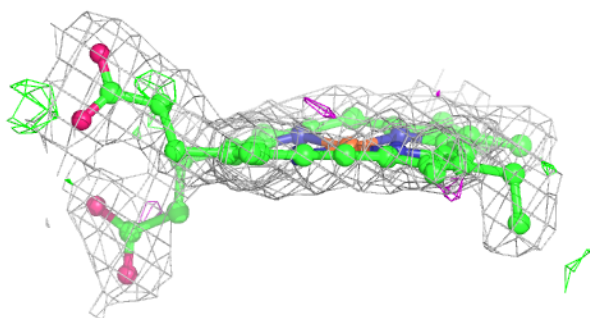
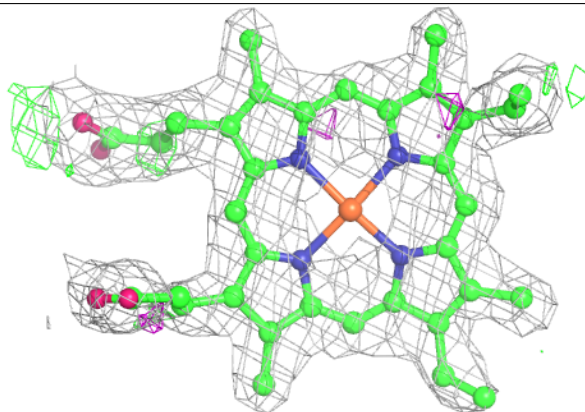


**Electron density around HEC C 952:**

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

**Electron density around HEC E 952:**

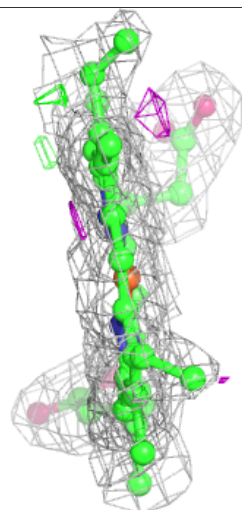
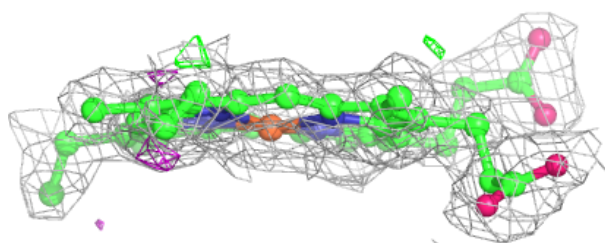
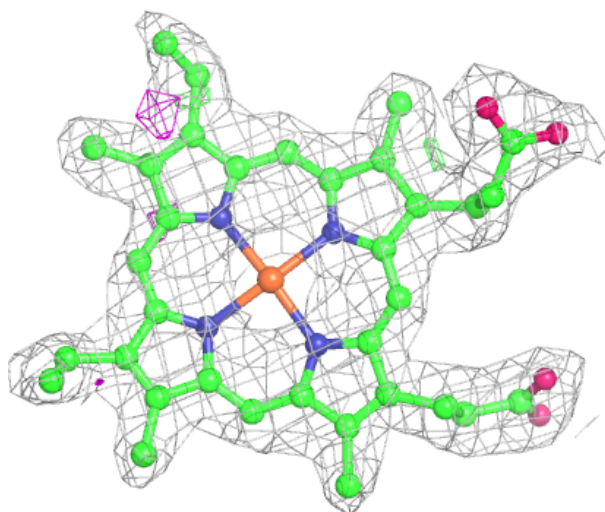
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





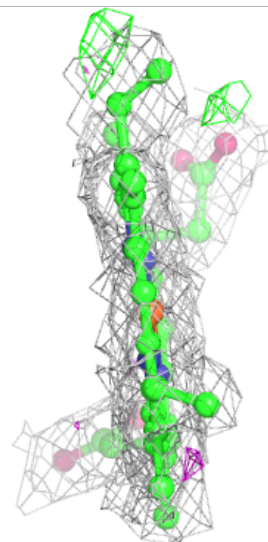
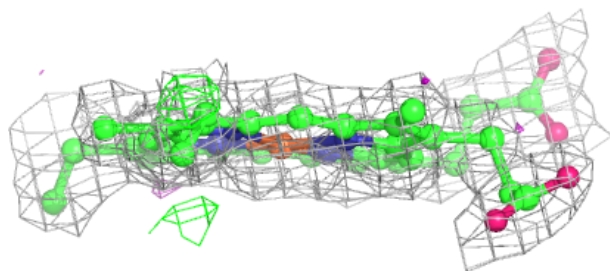
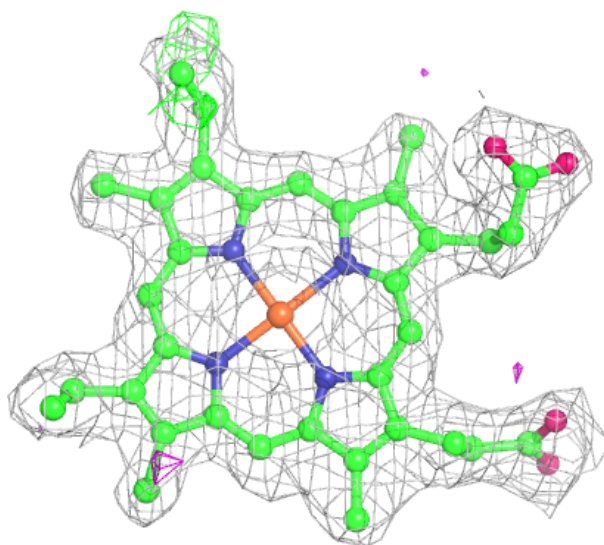
**Electron density around HEC H 951:**

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



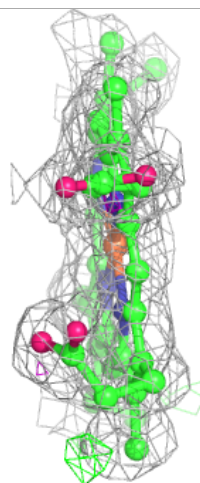
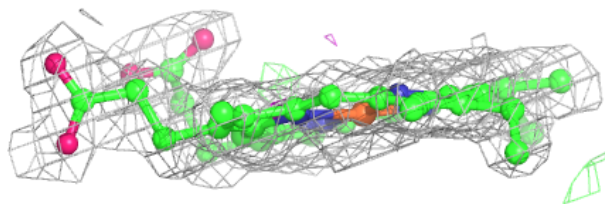
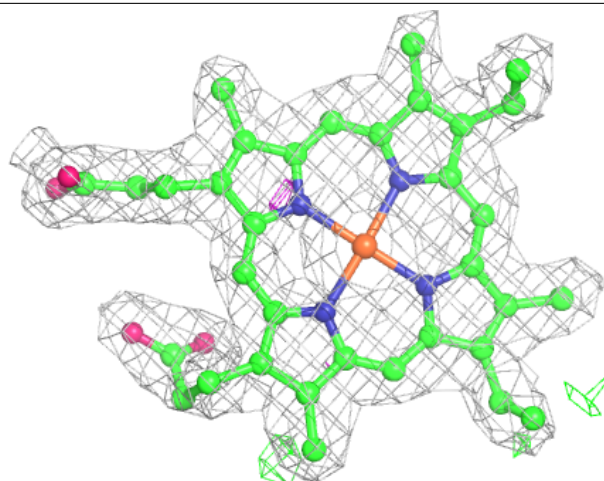
**Electron density around HEC F 951:**

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and green (positive)



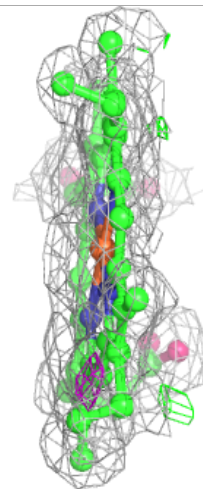
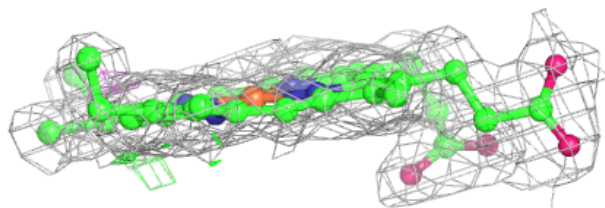
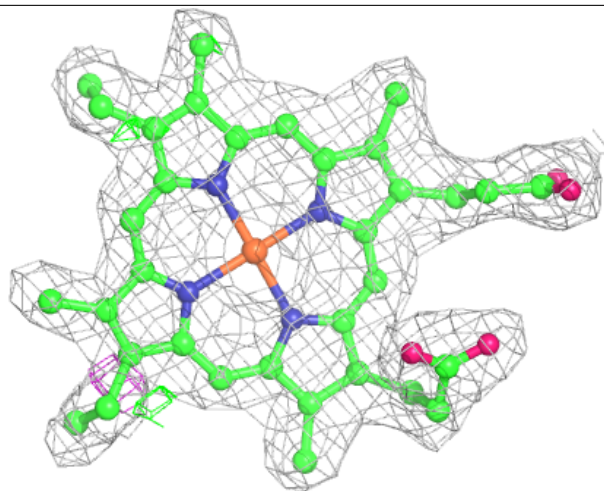
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and green (positive)



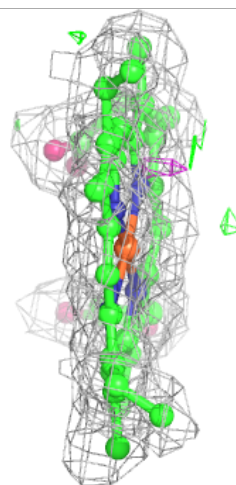
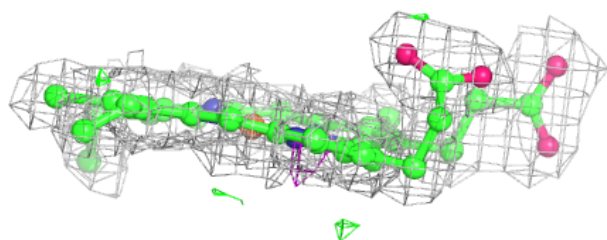
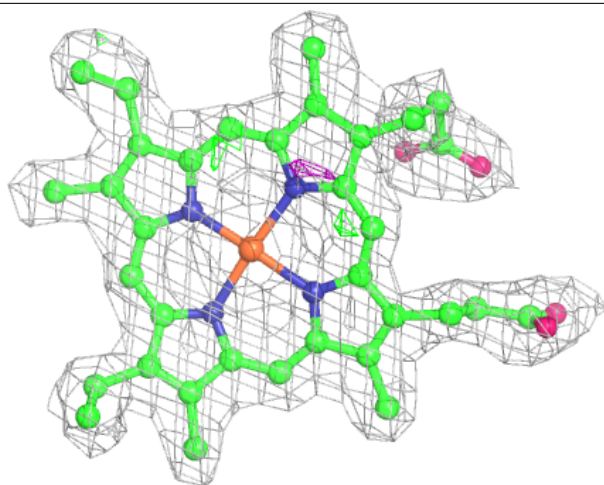
**Electron density around HEC A 953:**

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and green (positive)



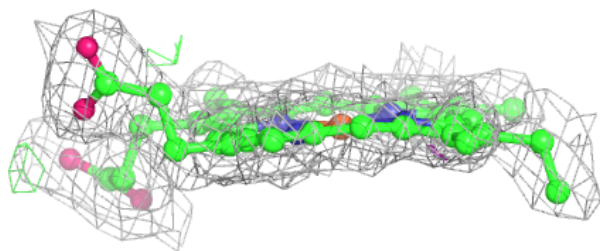
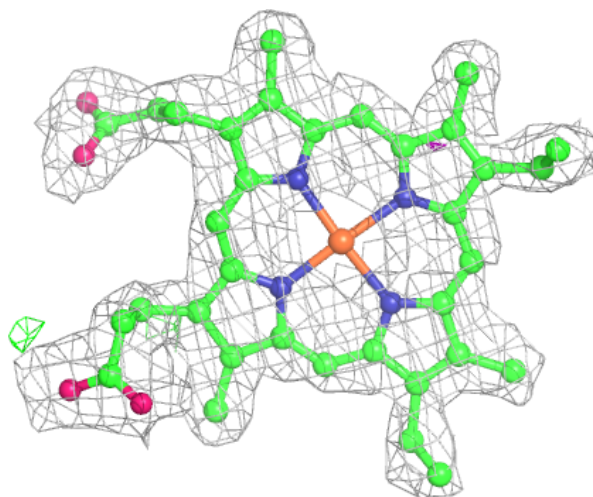
**Electron density around HEC E 953:**

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and green (positive)



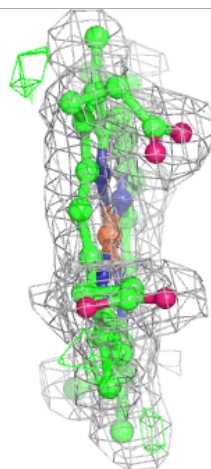
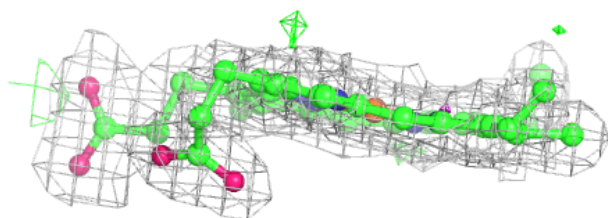
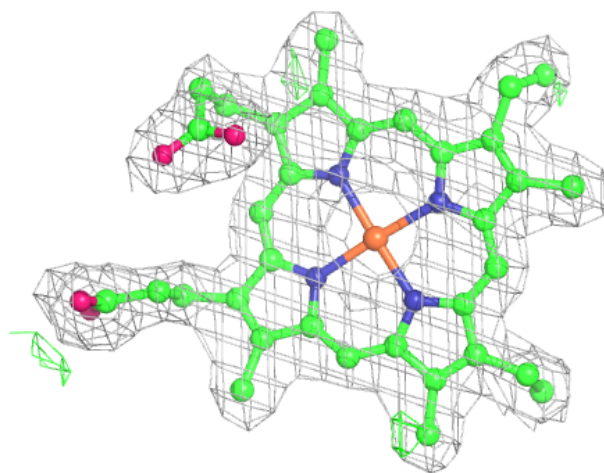
**Electron density around HEC B 951:**

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and green (positive)



**Electron density around HEC C 953:**

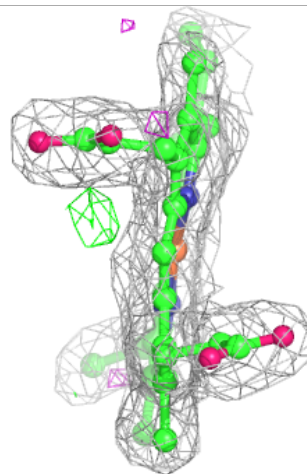
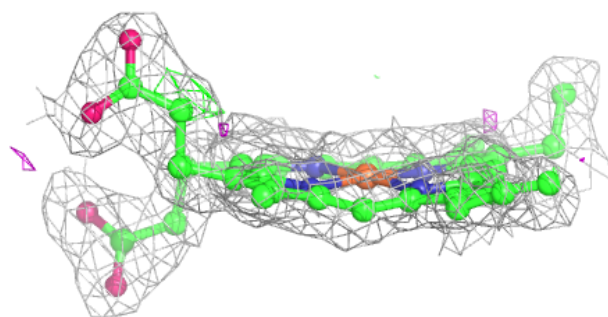
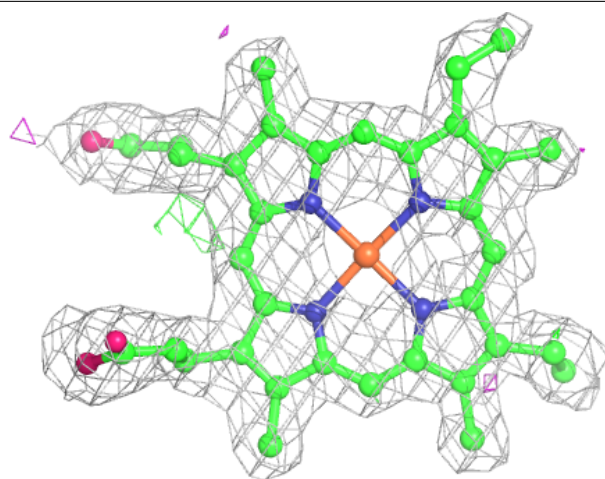
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and green (positive)





**Electron density around HEC A 952:**

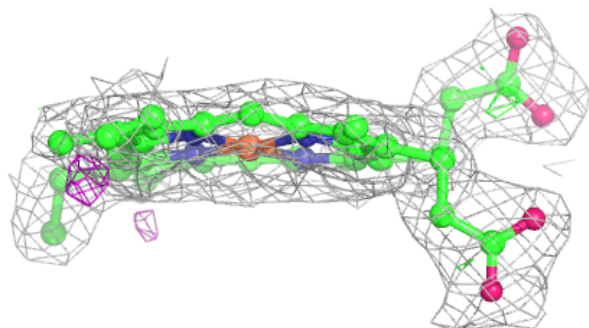
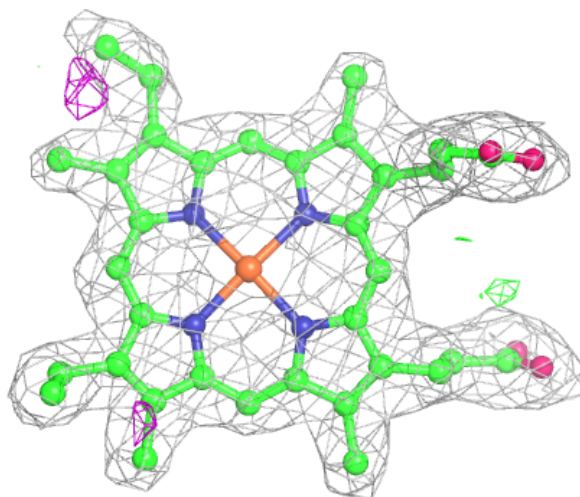
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





**Electron density around HEC G 952:**

$2mF_o-DF_c$  (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.