



# wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 18, 2025 – 10:17 AM EST

PDB ID : 9MWR / pdb\_00009mwr  
Title : Structure of human endothelial nitric oxide synthase heme domain bound with N-(4-(2-((3-(thiazole-2-carboximidamido)benzyl)amino)ethyl)phenyl)thiazole-2-carboximidamide  
Authors : Li, H.; Poulos, T.L.  
Deposited on : 2025-01-17  
Resolution : 1.97 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.

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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

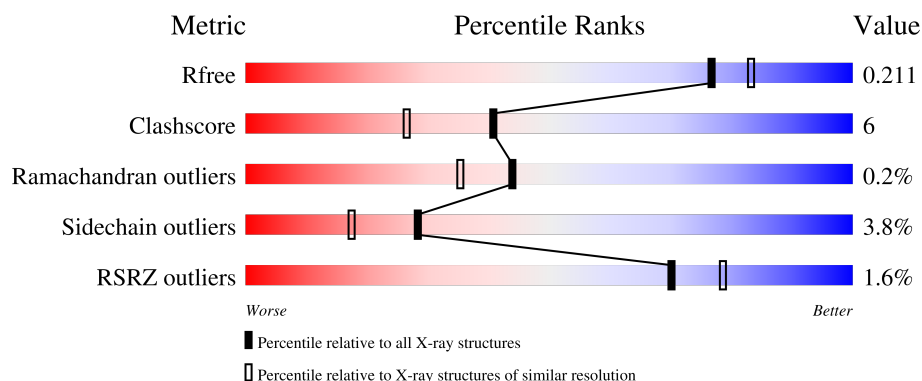
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.97 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))
$R_{free}$	164625	1356 (1.98-1.98)
Clashscore	180529	1437 (1.98-1.98)
Ramachandran outliers	177936	1426 (1.98-1.98)
Sidechain outliers	177891	1426 (1.98-1.98)
RSRZ outliers	164620	1356 (1.98-1.98)

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	440	
1	B	440	
1	C	440	
1	D	440	

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
5	ACT	A	504	-	-	X	-
5	ACT	C	504	-	-	X	-

## 2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 14386 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.

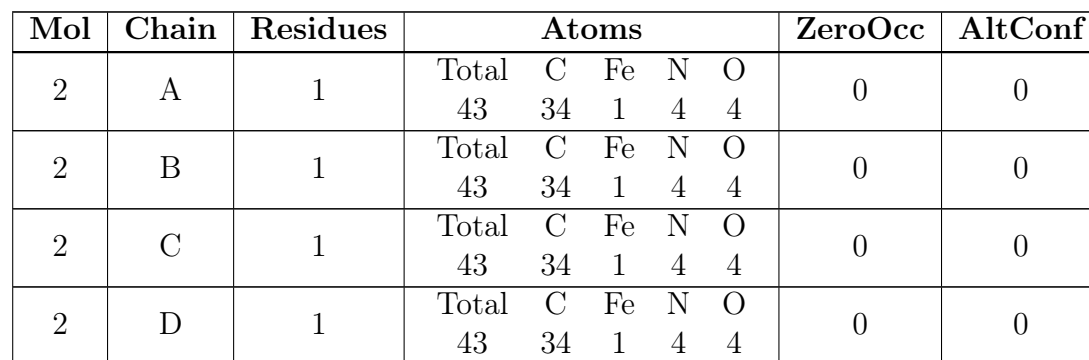
- Molecule 1 is a protein called Nitric oxide synthase, endothelial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	403	Total	C	N	O	S	0	1	0
			3223	2052	569	586	16			
1	B	403	Total	C	N	O	S	0	3	0
			3229	2056	569	588	16			
1	C	401	Total	C	N	O	S	0	1	0
			3207	2043	564	584	16			
1	D	404	Total	C	N	O	S	0	3	0
			3240	2063	572	589	16			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	298	GLU	ASP	variant	UNP P29474
B	298	GLU	ASP	variant	UNP P29474
C	298	GLU	ASP	variant	UNP P29474
D	298	GLU	ASP	variant	UNP P29474

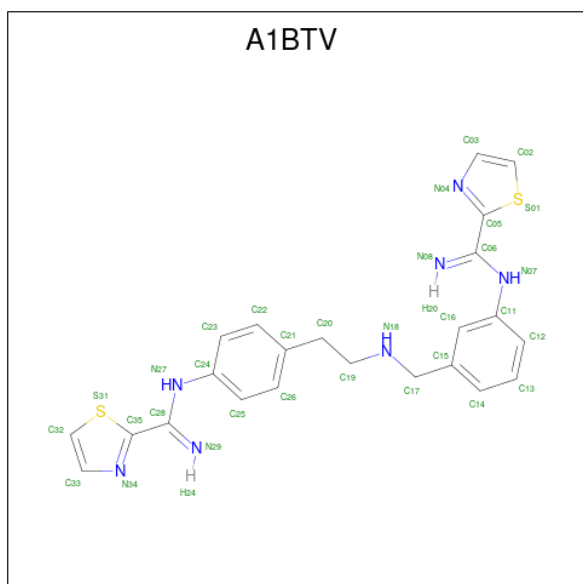
- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula:  $C_{34}H_{32}FeN_4O_4$ ).



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- Chemical structure of H4B (Hydroxybenzoylserine) is shown. The structure features a benzene ring with an amino group (NH<sub>2</sub>) at position 1 and a carboxylic acid group (COOH) at position 4. The benzene ring is connected to a serine side chain at position 2. The serine side chain consists of a chiral center (C6(R)) bonded to a hydroxyl group (OH) and a hydrogen atom (H). The chiral center is also bonded to a methylene group (C9(R)), which is further bonded to a carboxylic acid group (COOH). The carboxylic acid group is labeled with C10(S) and O11. The amino group is labeled with N1 and N2. The carboxylic acid group is labeled with C4 and O4. The hydroxyl group is labeled with O9. The methylene group is labeled with C7. The chiral center is labeled with C6(R). The methylene group is labeled with C9(R). The carboxylic acid group is labeled with C10(S) and O11. The structure is labeled H4B.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			17	9	5	3		
3	B	1	Total	C	N	O	0	0
			17	9	5	3		
3	C	1	Total	C	N	O	0	0
			17	9	5	3		
3	D	1	Total	C	N	O	0	0
			17	9	5	3		

- Molecule 4 is N-[3-({[2-(4-{[(Z)-imino(1,3-thiazol-2-yl)methyl]amino}phenyl)ethyl]amino}methyl)phenyl]-1,3-thiazole-2-carboximidamide (CCD ID: A1BTV) (formula: C<sub>23</sub>H<sub>23</sub>N<sub>7</sub>S<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



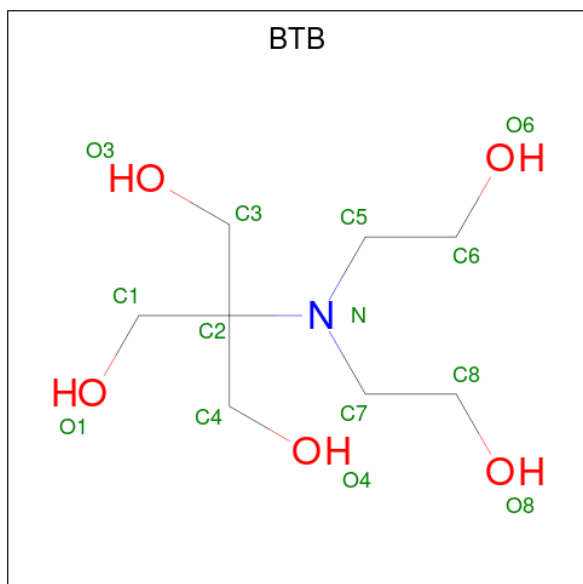
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	S	0	0
			32	23	7	2		
4	B	1	Total	C	N	S	0	0
			32	23	7	2		
4	C	1	Total	C	N	S	0	0
			32	23	7	2		
4	D	1	Total	C	N	S	0	0
			32	23	7	2		

- Molecule 5 is ACETATE ION (CCD ID: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		

- Molecule 6 is 2-[BIS-(2-HYDROXY-ETHYL)-AMINO]-2-HYDROXYMETHYL-PROPAN E-1,3-DIOL (CCD ID: BTB) (formula: C<sub>8</sub>H<sub>19</sub>NO<sub>5</sub>).



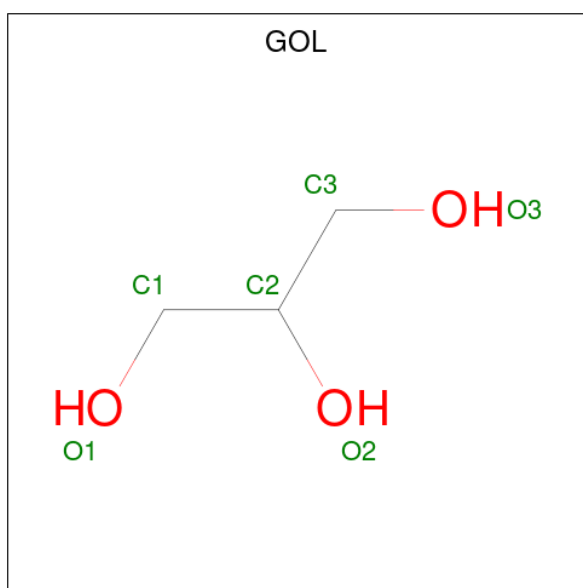
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			14	8	1	5		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	B	1	Total	C	N	O	0	0
			14	8	1	5		
6	B	1	Total	C	N	O	0	0
			14	8	1	5		
6	C	1	Total	C	N	O	0	0
			14	8	1	5		
6	C	1	Total	C	N	O	0	0
			14	8	1	5		
6	D	1	Total	C	N	O	0	0
			14	8	1	5		
6	D	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 7 is GLYCEROL (CCD ID: GOL) (formula:  $C_3H_8O_3$ ).



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

*Continued on next page...*



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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	B	1	Total	C	O	0	0
			6	3	3		
7	C	1	Total	C	O	0	0
			6	3	3		
7	C	1	Total	C	O	0	0
			6	3	3		
7	D	1	Total	C	O	0	0
			6	3	3		
7	D	1	Total	C	O	0	0
			6	3	3		

- Molecule 8 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	1	Total	Cl	0	0
			1	1		
8	B	1	Total	Cl	0	0
			1	1		
8	C	1	Total	Cl	0	0
			1	1		
8	D	1	Total	Cl	0	0
			1	1		

- Molecule 9 is GADOLINIUM ATOM (CCD ID: GD) (formula: Gd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	1	Total	Gd	0	0
			1	1		
9	B	1	Total	Gd	0	0
			1	1		
9	C	1	Total	Gd	0	0
			1	1		
9	D	1	Total	Gd	0	0
			1	1		

- Molecule 10 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	1	Total	Zn	0	0
			1	1		
10	C	1	Total	Zn	0	0
			1	1		

- Molecule 11 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	1	Total 1	Ca 1	0	0
11	B	1	Total 1	Ca 1	0	0

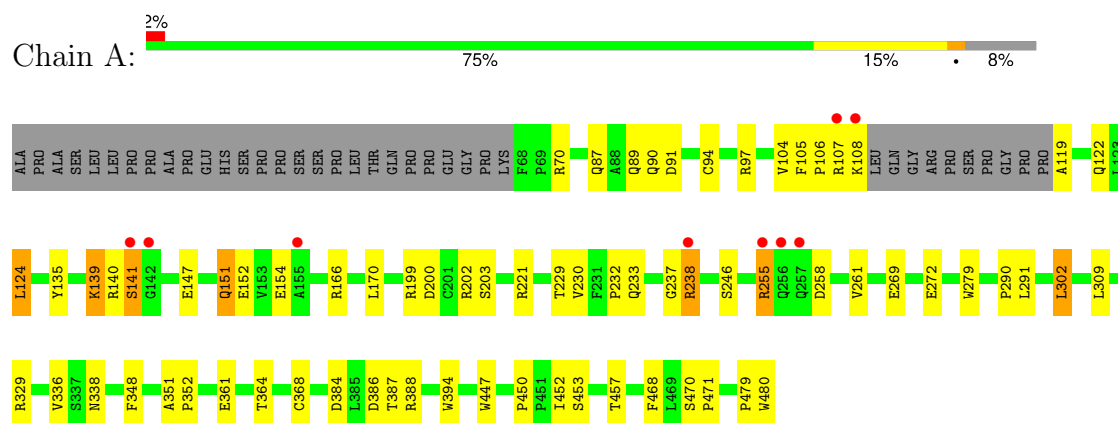
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	209	Total 209	O 209	0	0
12	B	272	Total 272	O 272	0	0
12	C	192	Total 192	O 192	0	0
12	D	260	Total 260	O 260	0	0

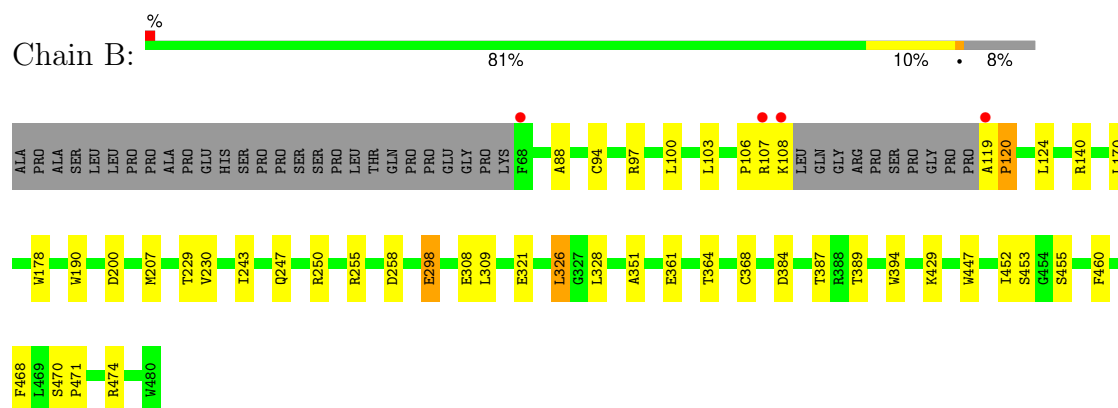
### 3 Residue-property plots [i](#)

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.

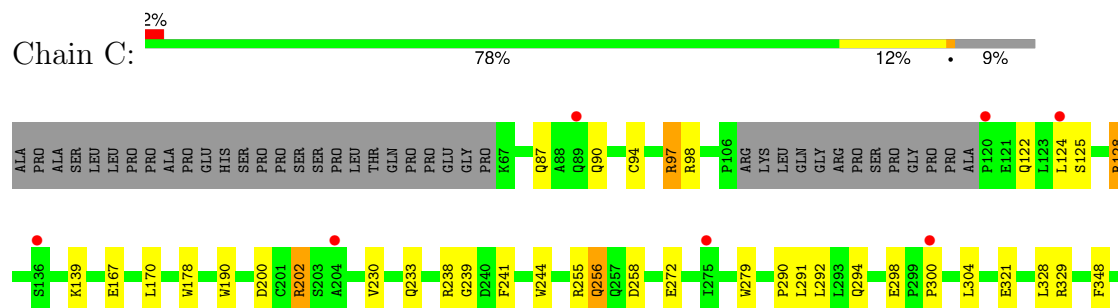
- Molecule 1: Nitric oxide synthase, endothelial



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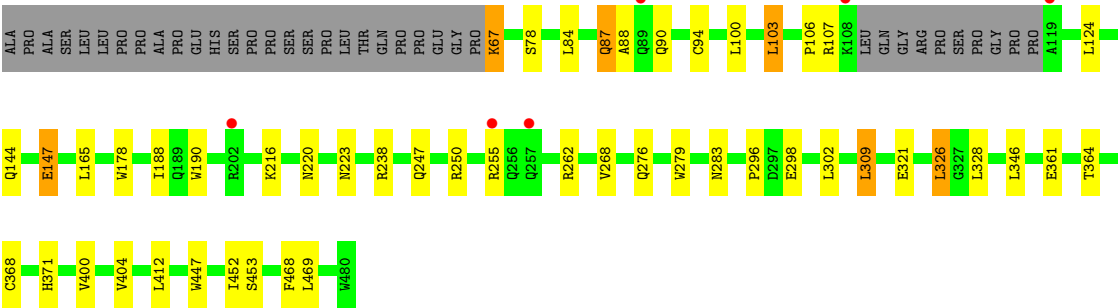
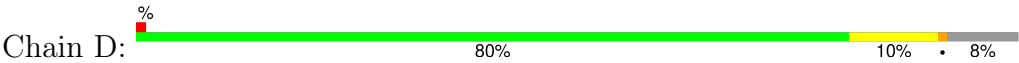


- Molecule 1: Nitric oxide synthase, endothelial





● Molecule 1: Nitric oxide synthase, endothelial



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.79Å 152.09Å 107.62Å 90.00° 90.75° 90.00°	Depositor
Resolution (Å)	49.10 – 1.97 49.10 – 1.97	Depositor EDS
% Data completeness (in resolution range)	96.2 (49.10-1.97) 96.1 (49.10-1.97)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.73 (at 1.97Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, $R_{free}$	0.172 , 0.211 0.171 , 0.211	Depositor DCC
$R_{free}$ test set	6453 reflections (3.40%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	28.1	Xtriage
Anisotropy	0.722	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 51.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.098 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	14386	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.20% 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: CA, HEM, GD, ACT, A1BTB, CL, BTB, ZN, H4B, 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	0.33	1/3318 (0.0%)	0.63	3/4520 (0.1%)
1	B	0.33	0/3330	0.52	0/4536
1	C	0.26	0/3302	0.48	0/4498
1	D	0.31	0/3341	0.51	0/4550
All	All	0.31	1/13291 (0.0%)	0.54	3/18104 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	105	PHE	C-N	10.13	1.57	1.33

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	105	PHE	O-C-N	16.37	140.14	121.32
1	A	105	PHE	CA-C-N	-14.37	101.88	119.84
1	A	105	PHE	C-N-CA	-14.37	101.88	119.84

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	3223	0	3129	44	0
1	B	3229	0	3139	28	0
1	C	3207	0	3112	36	0
1	D	3240	0	3153	39	0
2	A	43	0	30	3	0
2	B	43	0	30	2	0
2	C	43	0	30	3	0
2	D	43	0	30	3	0
3	A	17	0	15	1	0
3	B	17	0	15	1	0
3	C	17	0	15	1	0
3	D	17	0	15	1	0
4	A	32	0	0	3	0
4	B	32	0	0	2	0
4	C	32	0	0	3	0
4	D	32	0	0	3	0
5	A	4	0	3	8	0
5	C	4	0	3	8	0
6	A	28	0	37	4	0
6	B	28	0	35	4	0
6	C	28	0	38	6	0
6	D	28	0	34	5	0
7	A	18	0	24	1	0
7	B	12	0	16	0	0
7	C	12	0	16	1	0
7	D	12	0	16	0	0
8	A	1	0	0	0	0
8	B	1	0	0	0	0
8	C	1	0	0	0	0
8	D	1	0	0	0	0
9	A	1	0	0	0	0
9	B	1	0	0	0	0
9	C	1	0	0	0	0
9	D	1	0	0	0	0
10	A	1	0	0	0	0
10	C	1	0	0	0	0
11	A	1	0	0	0	0
11	B	1	0	0	0	0
12	A	209	0	0	5	0
12	B	272	0	0	0	0
12	C	192	0	0	1	0
12	D	260	0	0	3	0
All	All	14386	0	12935	168	0

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

The worst 5 of 168 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:119:ALA:HB3	1:A:122:GLN:NE2	1.34	1.40
1:A:119:ALA:CB	1:A:122:GLN:HE22	1.50	1.24
1:A:119:ALA:CB	1:A:122:GLN:NE2	2.09	1.10
1:A:119:ALA:HB3	1:A:122:GLN:HE21	1.28	0.95
1:A:119:ALA:HB1	1:A:122:GLN:HE22	1.31	0.92

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

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

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	400/440 (91%)	388 (97%)	11 (3%)	1 (0%)	37	27
1	B	402/440 (91%)	393 (98%)	7 (2%)	2 (0%)	25	15
1	C	398/440 (90%)	387 (97%)	11 (3%)	0	100	100
1	D	403/440 (92%)	396 (98%)	7 (2%)	0	100	100
All	All	1603/1760 (91%)	1564 (98%)	36 (2%)	3 (0%)	44	35

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	255	ARG
1	B	120	PRO
1	A	141	SER



### 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	343/373 (92%)	325 (95%)	18 (5%)	19	9
1	B	345/373 (92%)	334 (97%)	11 (3%)	34	24
1	C	342/373 (92%)	328 (96%)	14 (4%)	26	15
1	D	346/373 (93%)	337 (97%)	9 (3%)	41	32
All	All	1376/1492 (92%)	1324 (96%)	52 (4%)	28	17

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

Mol	Chain	Res	Type
1	B	474	ARG
1	C	139	LYS
1	D	309	LEU
1	C	87	GLN
1	C	122	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	205	GLN
1	C	220	ASN
1	C	277	HIS
1	C	144	GLN
1	A	122	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 43 ligands modelled in this entry, 12 are monoatomic - leaving 31 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	HEM	A	501	1	42,50,50	1.48	6 (14%)	46,82,82	1.73	10 (21%)
7	GOL	D	507	-	5,5,5	0.37	0	5,5,5	0.32	0
2	HEM	D	501	1	42,50,50	1.49	5 (11%)	46,82,82	1.71	11 (23%)
6	BTB	D	505	-	13,13,13	0.28	0	7,16,16	0.72	0
4	A1BTV	B	503	-	33,35,35	1.34	7 (21%)	27,46,46	1.61	5 (18%)
7	GOL	A	509	-	5,5,5	0.42	0	5,5,5	0.40	0
6	BTB	D	504	9	13,13,13	0.41	0	7,16,16	0.36	0
7	GOL	C	508	-	5,5,5	0.34	0	5,5,5	0.34	0
2	HEM	B	501	1	42,50,50	1.43	5 (11%)	46,82,82	1.59	5 (10%)
4	A1BTV	C	503	-	33,35,35	1.24	6 (18%)	27,46,46	1.52	5 (18%)
5	ACT	A	504	-	3,3,3	1.00	0	3,3,3	1.32	1 (33%)
5	ACT	C	504	-	3,3,3	0.92	0	3,3,3	0.95	0
3	H4B	B	502	-	16,18,18	0.88	0	14,26,26	2.64	7 (50%)
2	HEM	C	501	1	42,50,50	1.51	5 (11%)	46,82,82	1.68	9 (19%)
4	A1BTV	A	503	-	33,35,35	1.29	6 (18%)	27,46,46	1.60	5 (18%)
4	A1BTV	D	503	-	33,35,35	1.25	4 (12%)	27,46,46	1.64	5 (18%)
7	GOL	B	506	-	5,5,5	0.39	0	5,5,5	0.37	0
3	H4B	A	502	-	16,18,18	0.88	0	14,26,26	2.54	6 (42%)
3	H4B	D	502	-	16,18,18	0.90	0	14,26,26	2.48	5 (35%)
6	BTB	B	505	-	13,13,13	0.49	0	7,16,16	0.98	0
7	GOL	D	506	-	5,5,5	0.36	0	5,5,5	0.30	0
3	H4B	C	502	-	16,18,18	0.84	0	14,26,26	2.53	5 (35%)
7	GOL	C	507	-	5,5,5	0.39	0	5,5,5	0.36	0
7	GOL	A	508	-	5,5,5	0.37	0	5,5,5	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	BTB	B	504	9	13,13,13	0.42	0	7,16,16	0.79	0
6	BTB	A	506	-	13,13,13	0.63	0	7,16,16	1.03	0
6	BTB	A	505	9	13,13,13	0.47	0	7,16,16	0.83	0
7	GOL	A	507	-	5,5,5	0.39	0	5,5,5	0.36	0
6	BTB	C	506	-	13,13,13	0.40	0	7,16,16	0.64	0
7	GOL	B	507	-	5,5,5	0.35	0	5,5,5	0.87	0
6	BTB	C	505	9	13,13,13	0.53	0	7,16,16	0.93	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
2	HEM	A	501	1	-	1/12/54/54	-
7	GOL	D	507	-	-	1/4/4/4	-
2	HEM	D	501	1	-	0/12/54/54	-
6	BTB	D	505	-	-	11/21/21/21	-
4	A1BTB	B	503	-	-	7/15/23/23	0/4/4/4
7	GOL	A	509	-	-	4/4/4/4	-
6	BTB	D	504	9	-	2/21/21/21	-
7	GOL	C	508	-	-	4/4/4/4	-
2	HEM	B	501	1	-	1/12/54/54	-
4	A1BTB	C	503	-	-	5/15/23/23	0/4/4/4
3	H4B	B	502	-	-	0/8/17/17	0/2/2/2
2	HEM	C	501	1	-	2/12/54/54	-
4	A1BTB	A	503	-	-	6/15/23/23	0/4/4/4
4	A1BTB	D	503	-	-	6/15/23/23	0/4/4/4
7	GOL	B	506	-	-	1/4/4/4	-
3	H4B	A	502	-	-	0/8/17/17	0/2/2/2
3	H4B	D	502	-	-	0/8/17/17	0/2/2/2
6	BTB	B	505	-	-	11/21/21/21	-
7	GOL	D	506	-	-	4/4/4/4	-
3	H4B	C	502	-	-	0/8/17/17	0/2/2/2
7	GOL	C	507	-	-	4/4/4/4	-
7	GOL	A	508	-	-	4/4/4/4	-
6	BTB	B	504	9	-	4/21/21/21	-
6	BTB	A	506	-	-	7/21/21/21	-
6	BTB	A	505	9	-	4/21/21/21	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	GOL	A	507	-	-	3/4/4/4	-
6	BTB	C	506	-	-	10/21/21/21	-
7	GOL	B	507	-	-	2/4/4/4	-
6	BTB	C	505	9	-	7/21/21/21	-

The worst 5 of 44 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	HEM	C3C-CAC	3.77	1.56	1.47
2	D	501	HEM	C3C-C2C	-3.68	1.35	1.40
2	A	501	HEM	C3C-C2C	-3.68	1.35	1.40
2	B	501	HEM	C3C-CAC	3.66	1.55	1.47
2	C	501	HEM	C3C-C2C	-3.63	1.35	1.40

The worst 5 of 79 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	502	H4B	C8A-C4A-C4	6.67	120.57	114.50
3	A	502	H4B	C8A-C4A-C4	6.03	119.99	114.50
3	D	502	H4B	C8A-C4A-C4	5.96	119.92	114.50
3	C	502	H4B	C8A-C4A-C4	5.80	119.78	114.50
2	B	501	HEM	CBA-CAA-C2A	-5.25	103.72	112.54

There are no chirality outliers.

5 of 111 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	503	A1BTV	N18-C19-C20-C21
4	C	503	A1BTV	N18-C19-C20-C21
4	D	503	A1BTV	N18-C19-C20-C21
6	A	505	BTB	C1-C2-C4-O4
6	A	505	BTB	C3-C2-C4-O4

There are no ring outliers.

24 monomers are involved in 60 short contacts:

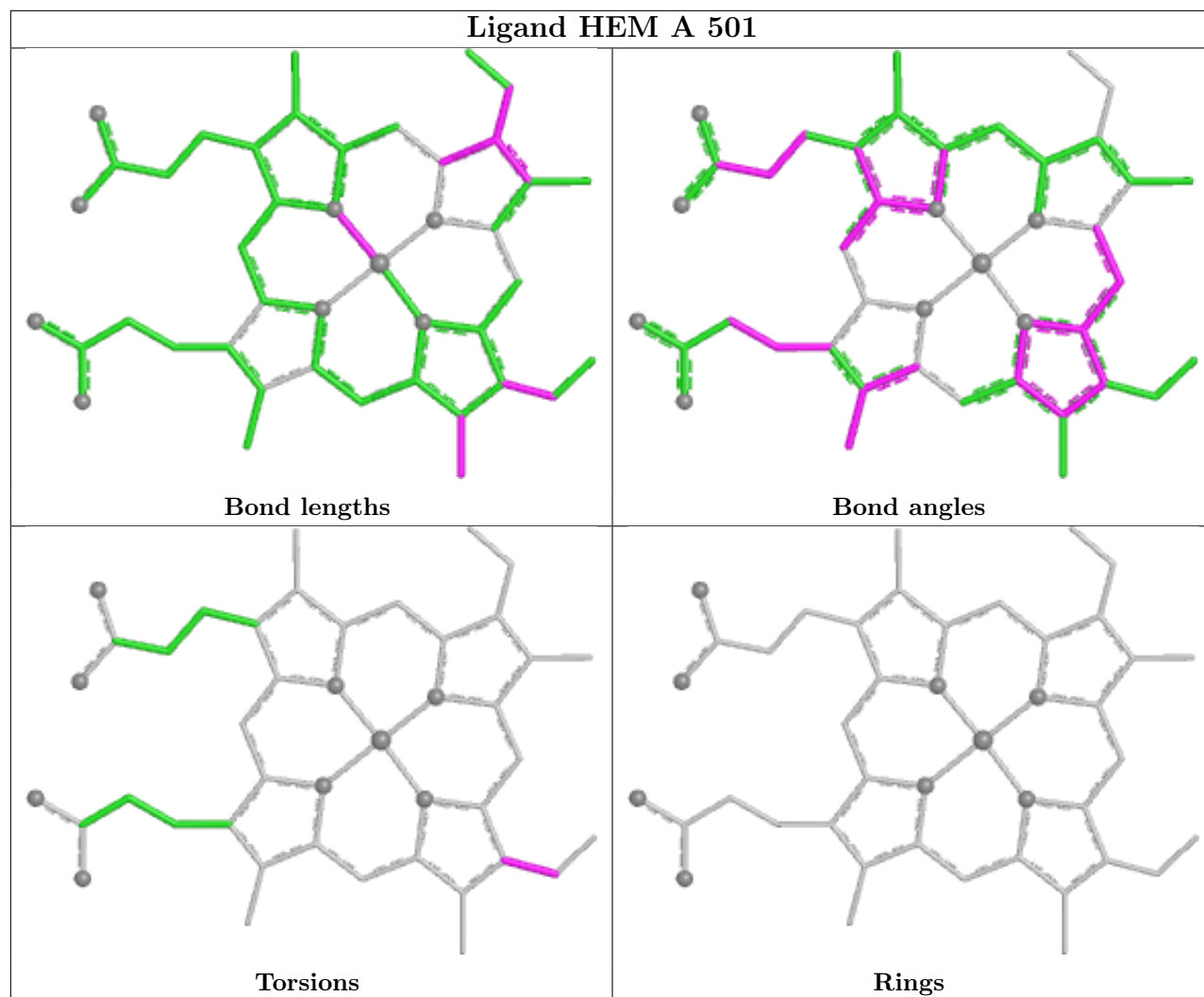
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	HEM	3	0
2	D	501	HEM	3	0
6	D	505	BTB	4	0

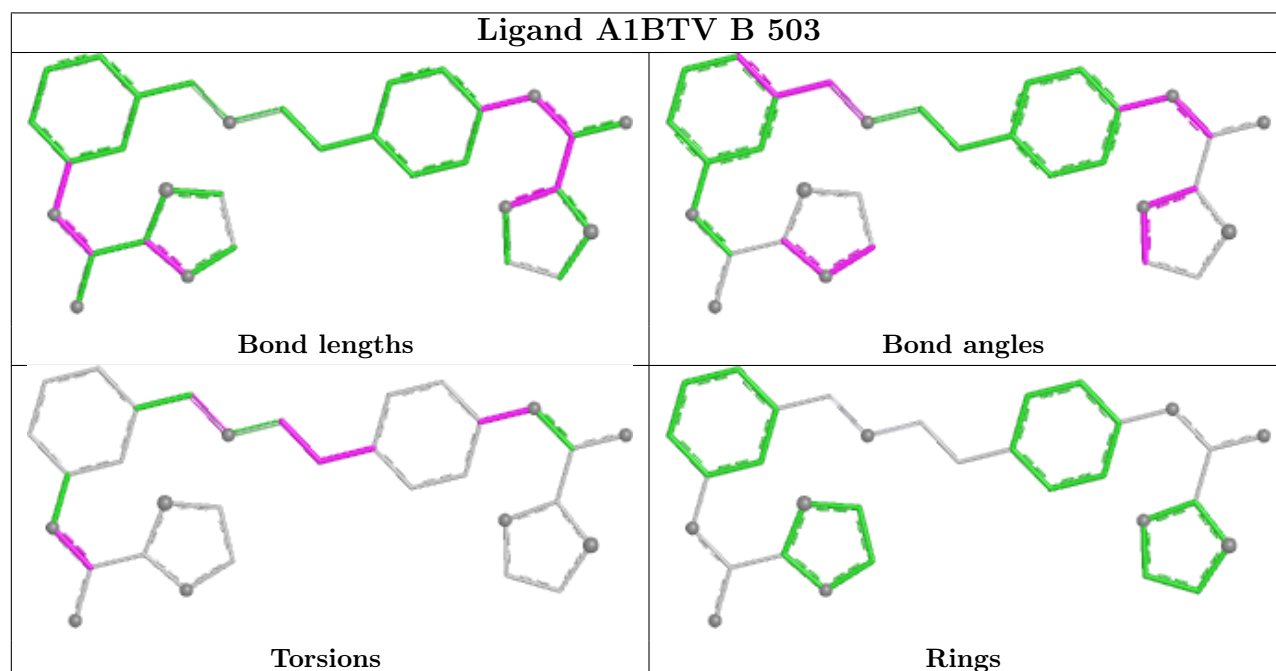
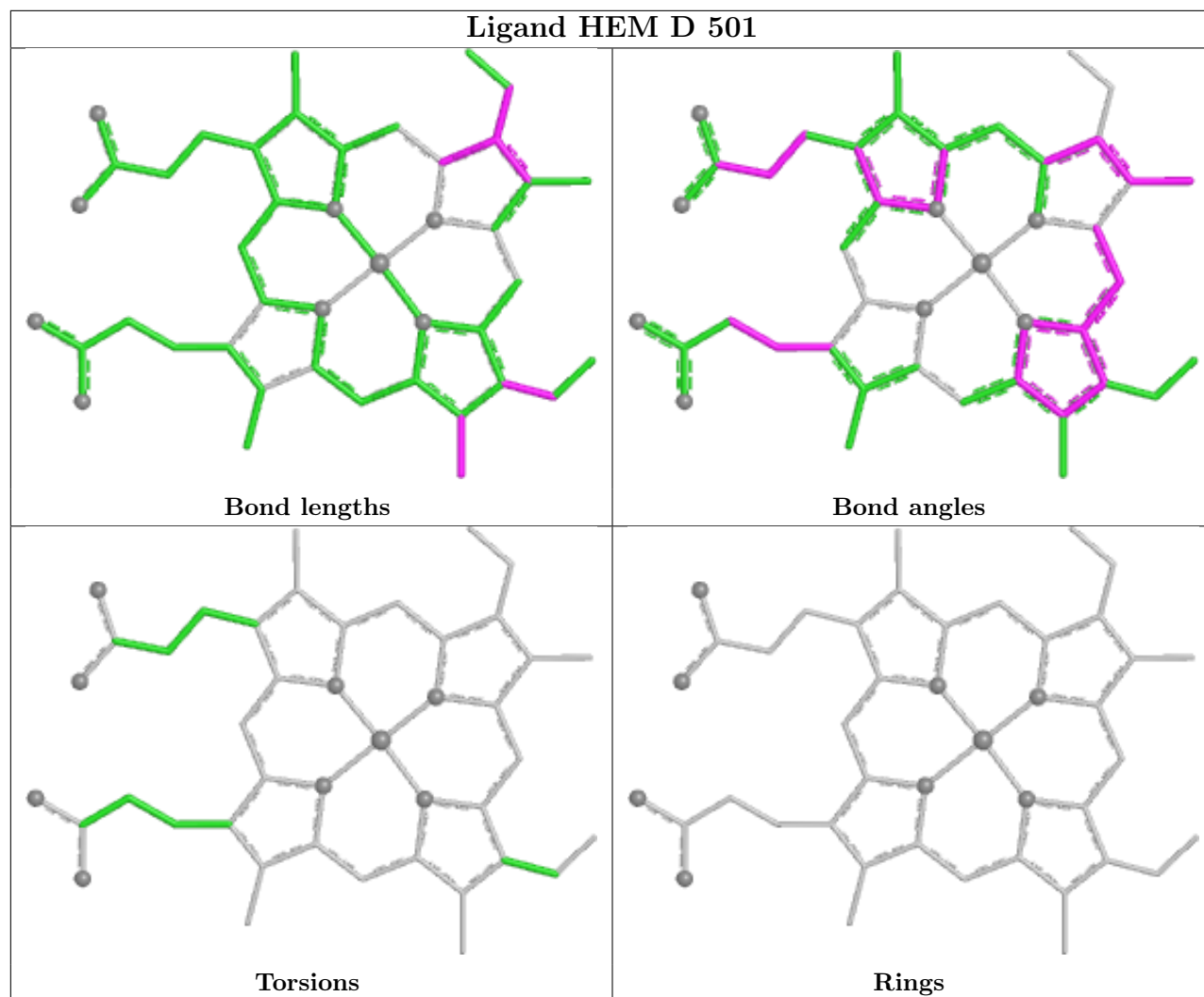
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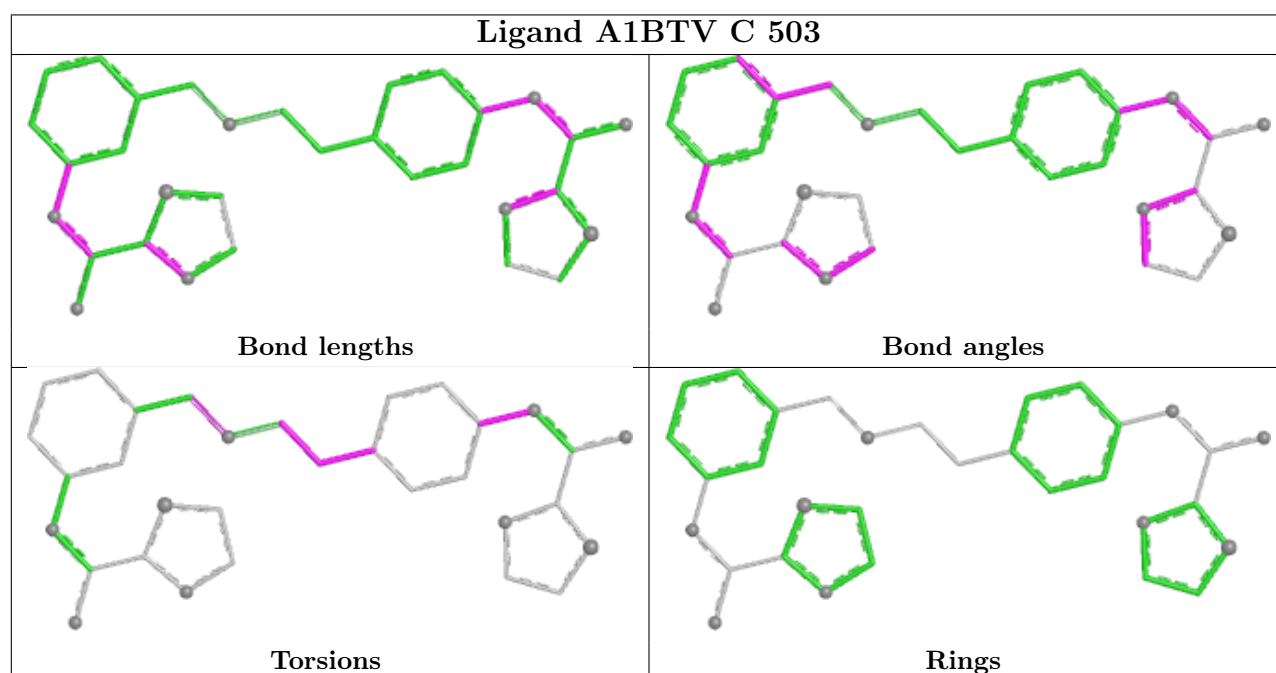
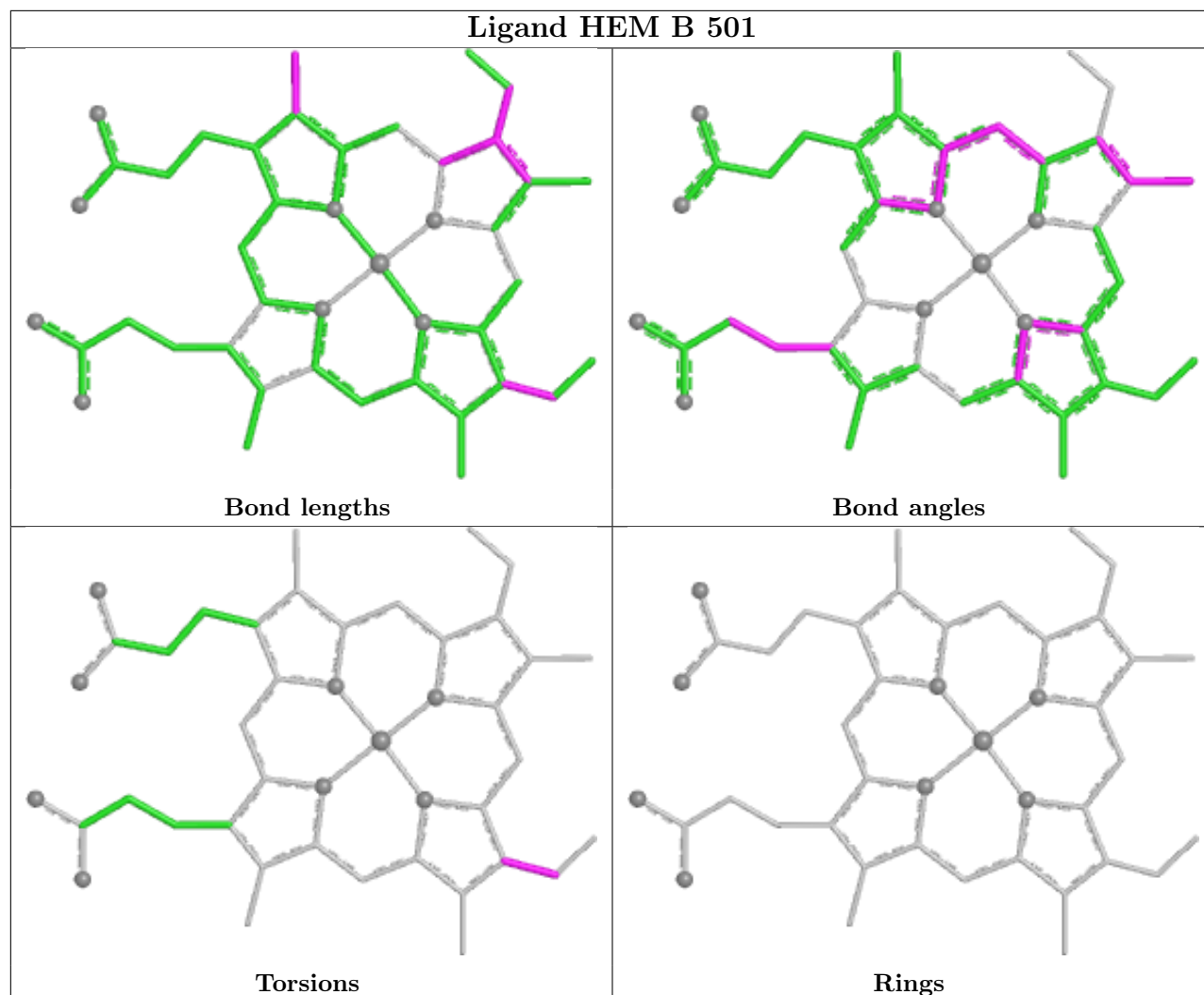
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	503	A1BTV	2	0
7	A	509	GOL	1	0
6	D	504	BTB	1	0
7	C	508	GOL	1	0
2	B	501	HEM	2	0
4	C	503	A1BTV	3	0
5	A	504	ACT	8	0
5	C	504	ACT	8	0
3	B	502	H4B	1	0
2	C	501	HEM	3	0
4	A	503	A1BTV	3	0
4	D	503	A1BTV	3	0
3	A	502	H4B	1	0
3	D	502	H4B	1	0
6	B	505	BTB	2	0
3	C	502	H4B	1	0
6	B	504	BTB	2	0
6	A	506	BTB	1	0
6	A	505	BTB	3	0
6	C	506	BTB	4	0
6	C	505	BTB	2	0

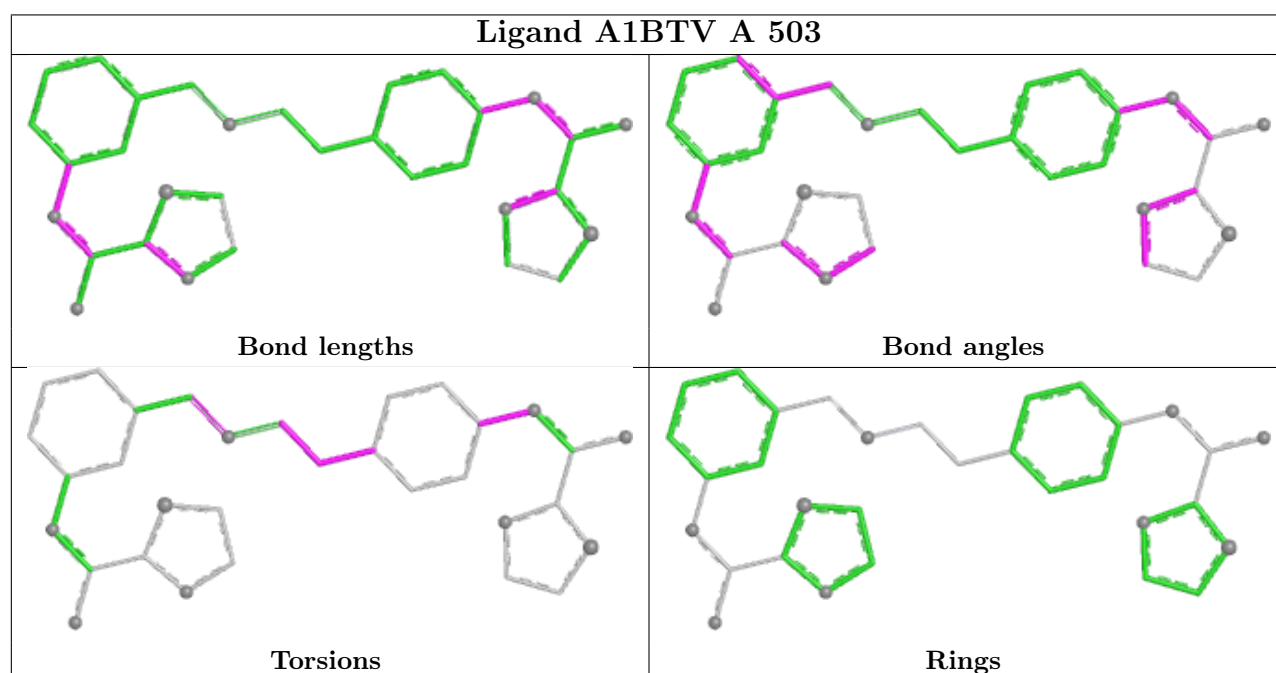
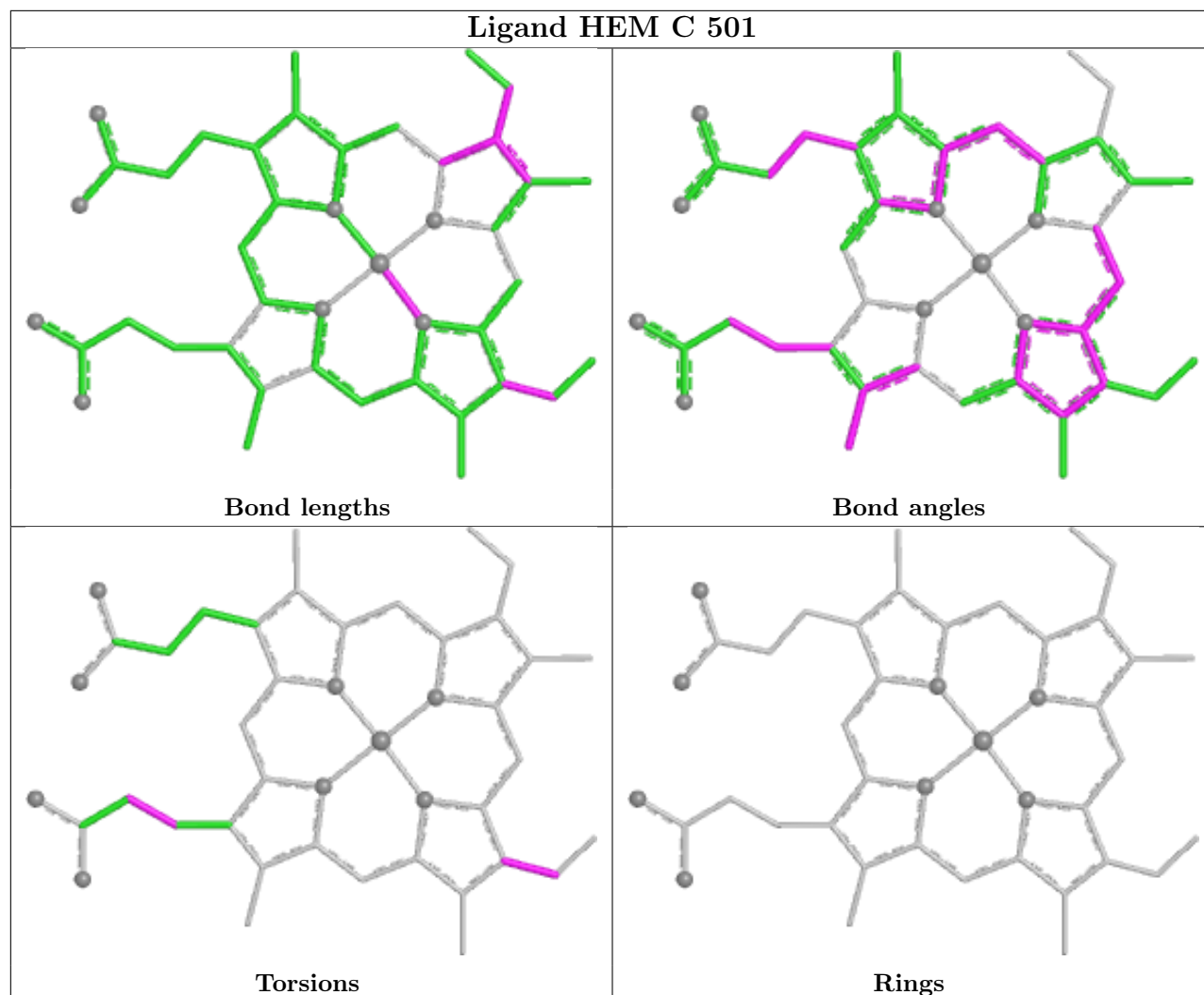
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

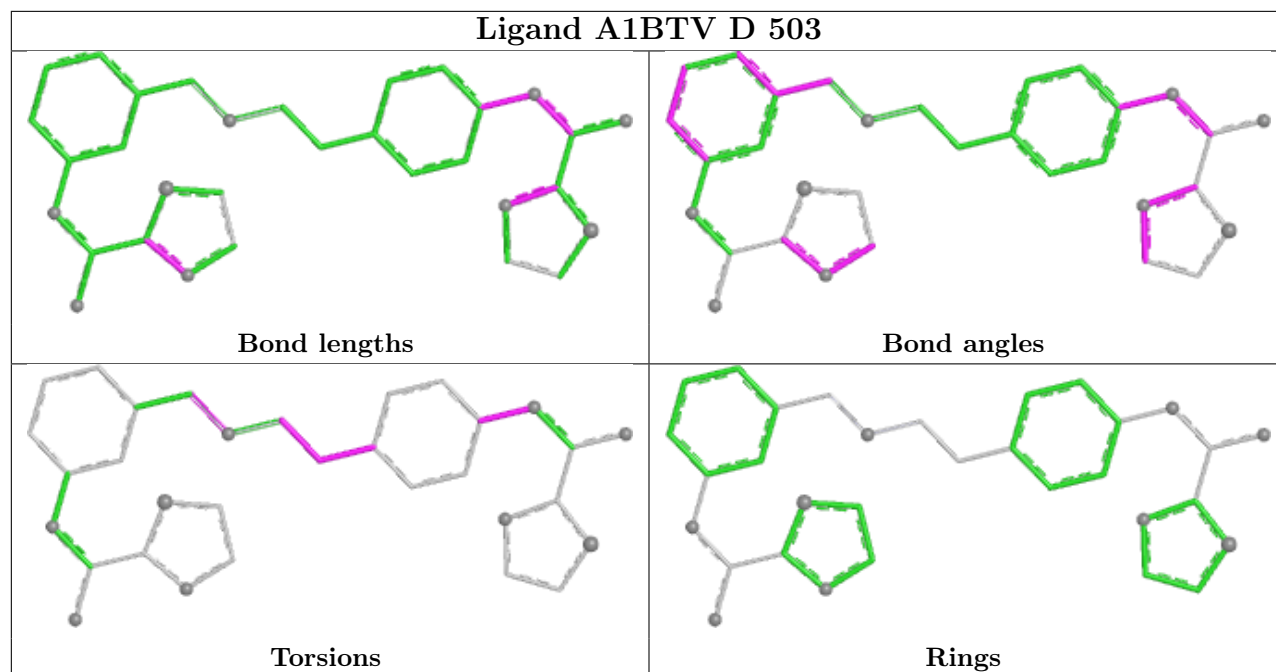












## 5.7 Other polymers [i](#)

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	403/440 (91%)	0.17	9 (2%) 62 72	17, 40, 76, 109	1 (0%)
1	B	403/440 (91%)	-0.19	4 (0%) 79 85	18, 30, 56, 101	3 (0%)
1	C	401/440 (91%)	0.19	7 (1%) 69 77	18, 42, 78, 109	1 (0%)
1	D	404/440 (91%)	-0.11	6 (1%) 71 80	16, 31, 65, 108	3 (0%)
All	All	1611/1760 (91%)	0.02	26 (1%) 70 78	16, 35, 73, 109	8 (0%)

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	119	ALA	4.7
1	A	107	ARG	4.1
1	C	120	PRO	3.7
1	A	108	LYS	3.5
1	B	107	ARG	3.5

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

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

### 6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

### 6.4 Ligands [i](#)

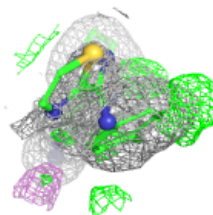
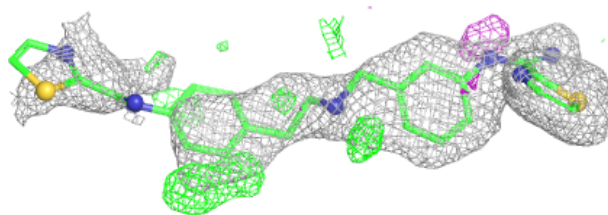
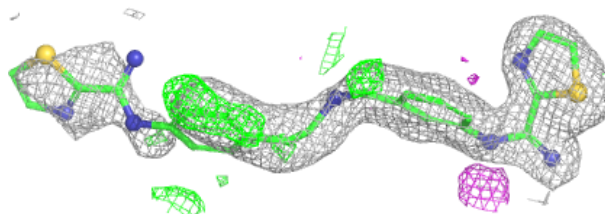
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 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
7	GOL	C	507	6/6	0.57	0.16	73,78,81,86	0
7	GOL	C	508	6/6	0.58	0.18	75,77,80,81	0
7	GOL	A	509	6/6	0.62	0.13	62,71,72,72	0
7	GOL	A	508	6/6	0.68	0.13	73,73,77,77	0
7	GOL	D	506	6/6	0.73	0.16	72,75,77,79	0
6	BTB	D	505	14/14	0.75	0.17	46,65,70,71	0
6	BTB	B	505	14/14	0.75	0.18	65,71,74,75	0
7	GOL	B	506	6/6	0.76	0.13	57,61,62,64	0
6	BTB	C	506	14/14	0.77	0.16	63,85,92,92	0
6	BTB	C	505	14/14	0.77	0.18	77,90,99,100	0
7	GOL	A	507	6/6	0.77	0.13	58,63,68,69	0
6	BTB	A	506	14/14	0.81	0.18	45,69,80,86	0
6	BTB	B	504	14/14	0.83	0.16	30,59,69,73	0
7	GOL	B	507	6/6	0.84	0.20	63,66,69,70	0
5	ACT	C	504	4/4	0.86	0.24	46,49,53,56	0
6	BTB	D	504	14/14	0.87	0.16	33,48,66,74	0
7	GOL	D	507	6/6	0.87	0.18	51,55,61,62	0
4	A1BTV	C	503	32/32	0.90	0.16	26,60,118,123	0
4	A1BTV	A	503	32/32	0.91	0.14	25,57,100,107	0
6	BTB	A	505	14/14	0.91	0.14	22,73,84,88	0
9	GD	A	511	1/1	0.91	0.16	107,107,107,107	0
9	GD	C	510	1/1	0.92	0.14	131,131,131,131	0
5	ACT	A	504	4/4	0.93	0.12	28,29,42,45	0
4	A1BTV	B	503	32/32	0.94	0.13	15,50,114,120	0
3	H4B	C	502	17/17	0.94	0.08	30,37,50,50	0
4	A1BTV	D	503	32/32	0.94	0.14	19,57,121,126	0
3	H4B	A	502	17/17	0.95	0.07	24,31,41,43	0
3	H4B	D	502	17/17	0.96	0.06	23,29,38,39	0
3	H4B	B	502	17/17	0.96	0.07	25,31,35,45	0
2	HEM	C	501	43/43	0.97	0.07	20,30,44,49	0
8	CL	B	508	1/1	0.97	0.10	34,34,34,34	0
2	HEM	D	501	43/43	0.98	0.06	15,22,34,36	0
8	CL	C	509	1/1	0.98	0.06	40,40,40,40	0
2	HEM	A	501	43/43	0.98	0.07	20,28,43,50	0
9	GD	B	509	1/1	0.98	0.04	38,38,38,38	0
8	CL	A	510	1/1	0.98	0.09	44,44,44,44	0
11	CA	B	510	1/1	0.98	0.04	39,39,39,39	0
2	HEM	B	501	43/43	0.99	0.05	16,20,33,37	0
9	GD	D	509	1/1	0.99	0.03	36,36,36,36	0
10	ZN	C	511	1/1	0.99	0.02	30,30,30,30	0
11	CA	A	513	1/1	0.99	0.03	27,27,27,27	0
8	CL	D	508	1/1	0.99	0.07	33,33,33,33	0
10	ZN	A	512	1/1	1.00	0.02	26,26,26,26	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.

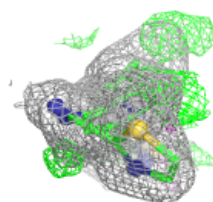
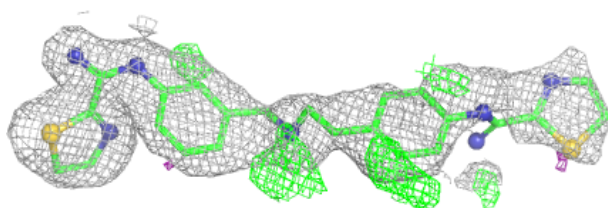
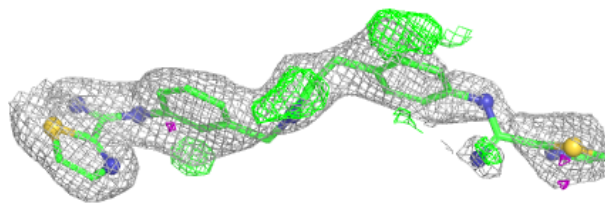
**Electron density around A1BTV C 503:**

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

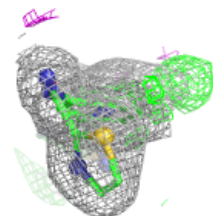
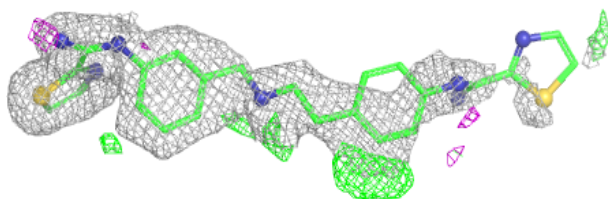
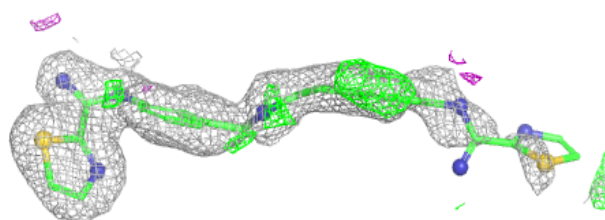


**Electron density around A1BTV A 503:**

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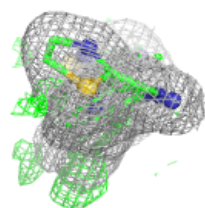
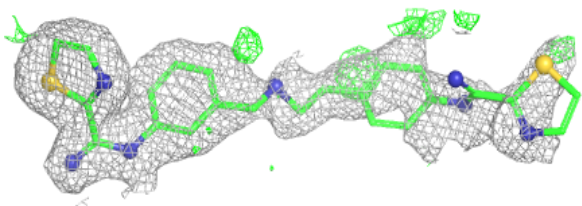
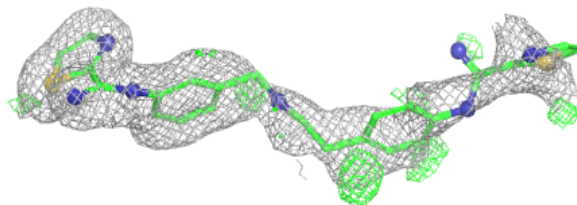
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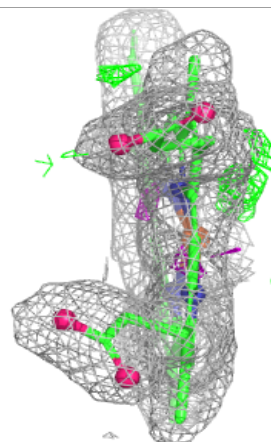
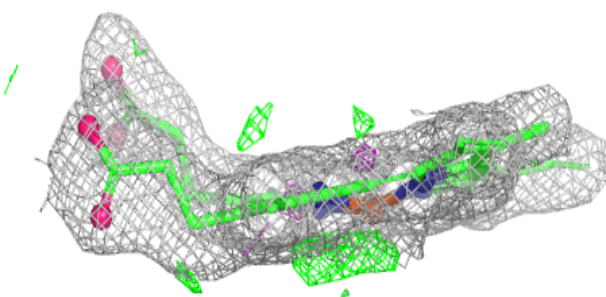
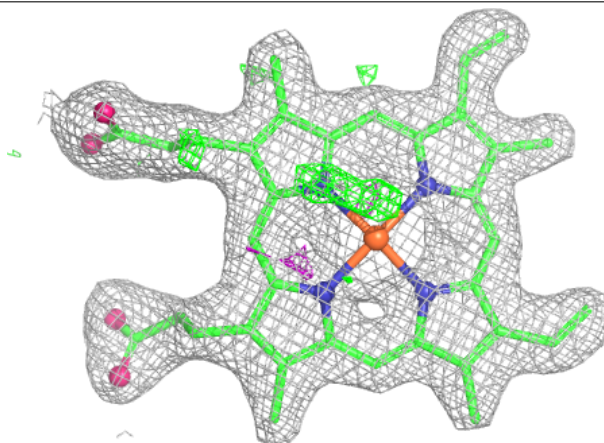


**Electron density around A1BTV D 503:**

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**Electron density around HEM C 501:**

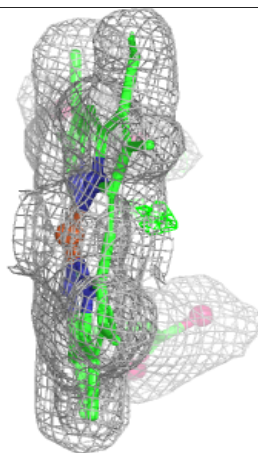
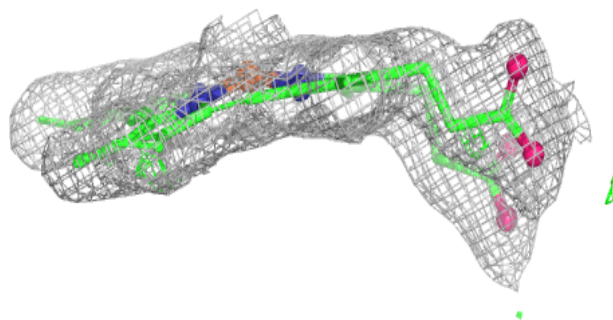
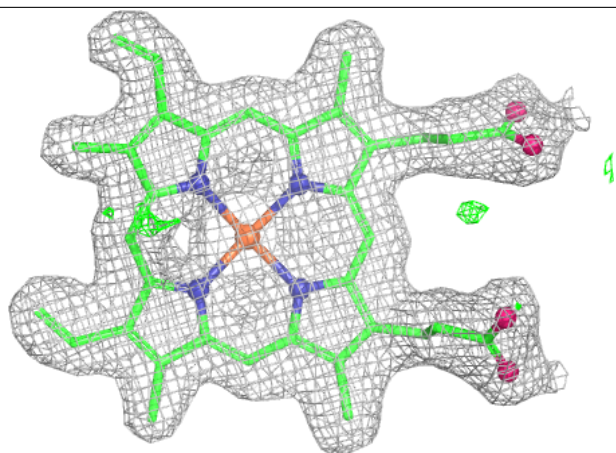
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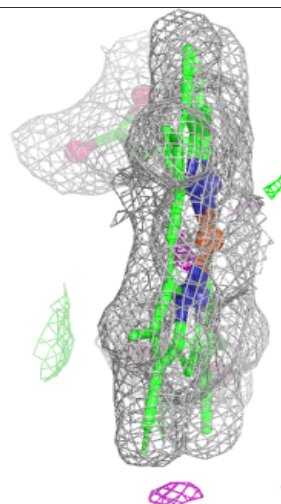
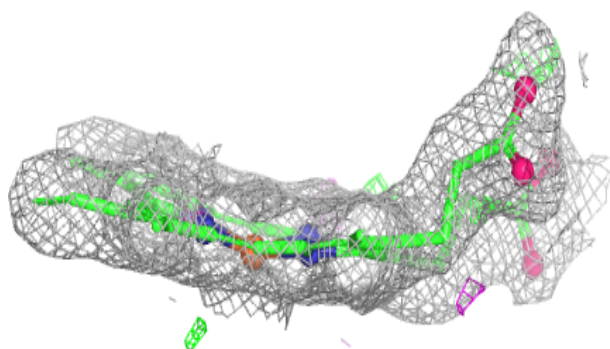
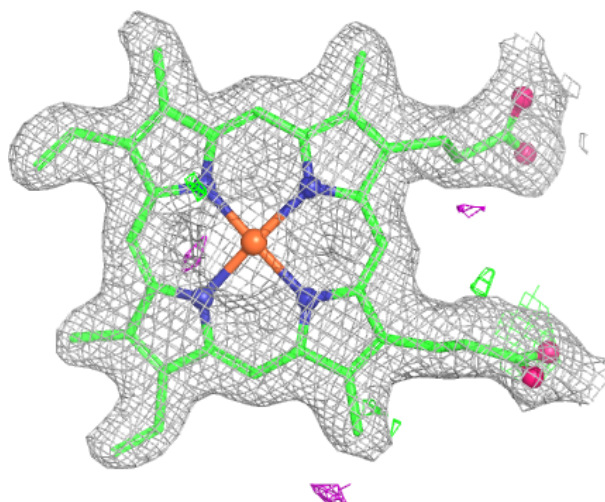
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and green (positive)





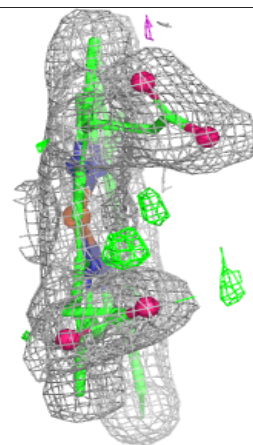
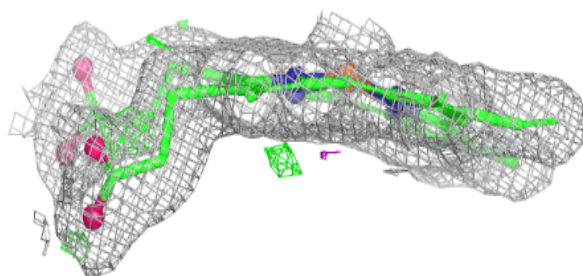
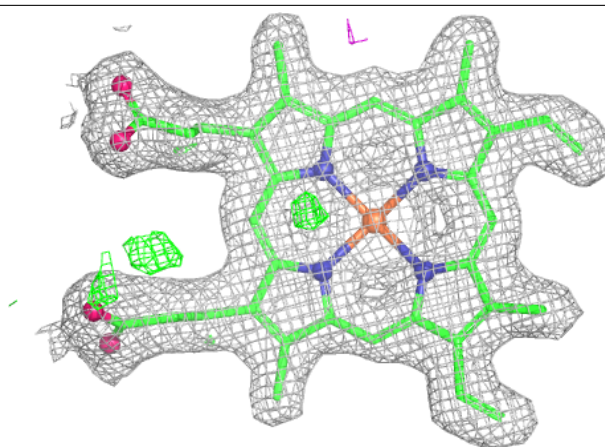
**Electron density around HEM A 501:**

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



**Electron density around 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)

**6.5 Other polymers** ⓘ

There are no such residues in this entry.