



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 07:31 PM UTC

PDB ID : 9MWT / pdb_00009mwt
Title : Structure of human endothelial nitric oxide synthase heme domain bound with N-(3-(2-((3-(furan-2-carboximidamido)benzyl)amino)ethyl)phenyl)furan-2-carboximidamide
Authors : Li, H.; Poulos, T.L.
Deposited on : 2025-01-17
Resolution : 1.90 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

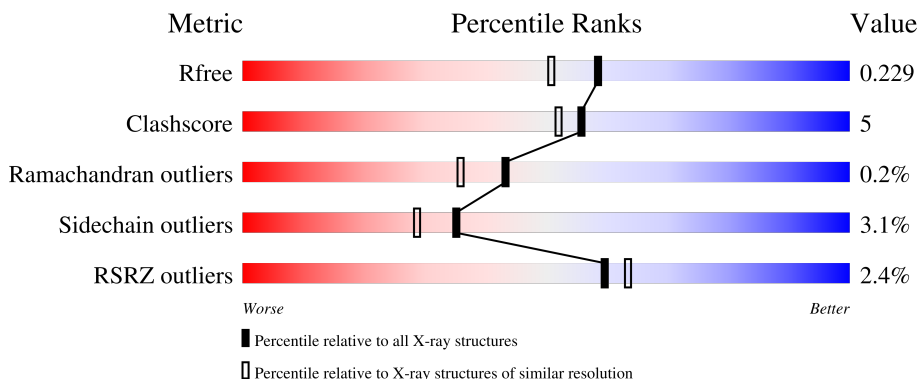
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	440	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 5%, orange 5%, yellow 5%, green 80%, grey 5%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 5% 83% 8% 9% </div> </div>
1	B	440	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 5%, orange 5%, yellow 5%, green 80%, grey 5%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 5% 80% 10% 8% </div> </div>
1	C	440	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 5%, orange 5%, yellow 5%, green 80%, grey 5%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 5% 82% 8% 9% </div> </div>
1	D	440	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 5%, orange 5%, yellow 5%, green 80%, grey 5%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 5% 82% 8% 9% </div> </div>

2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 14243 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	402	Total	C	N	O	S	0	3	0
			3223	2052	567	588	16			
1	B	403	Total	C	N	O	S	0	2	0
			3229	2056	569	588	16			
1	C	401	Total	C	N	O	S	0	3	0
			3212	2046	563	587	16			
1	D	402	Total	C	N	O	S	0	2	0
			3217	2048	567	586	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: $C_{34}H_{32}FeN_4O_4$).



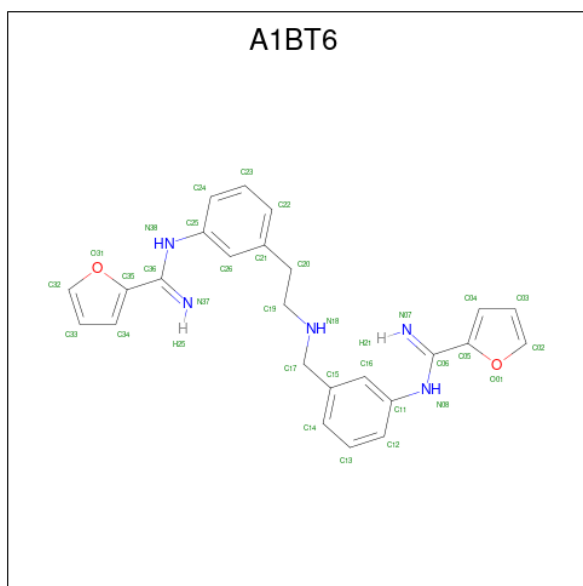
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	C	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	D	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 3 is 5,6,7,8-TETRAHYDROBIOPTERIN (CCD ID: H4B) (formula: C₉H₁₅N₅O₃).



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-(3-{[(Z)-(furan-2-yl)(imino)methyl]amino}phenyl)ethyl]amino}methyl)phenyl]furan-2-carboximidamide (CCD ID: A1BT6) (formula: C₂₅H₂₅N₅O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			32	25	5	2		
4	B	1	Total	C	N	O	0	0
			32	25	5	2		
4	C	1	Total	C	N	O	0	0
			32	25	5	2		
4	D	1	Total	C	N	O	0	0
			32	25	5	2		

- Molecule 5 is 2-[BIS-(2-HYDROXY-ETHYL)-AMINO]-2-HYDROXYMETHYL-PROPAN E-1,3-DIOL (CCD ID: BTB) (formula: C₈H₁₉NO₅).



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

- Molecule 6 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 4 2 2	0	0
6	B	1	Total C O 4 2 2	0	0
6	C	1	Total C O 4 2 2	0	0
6	D	1	Total C O 4 2 2	0	0

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

- Molecule 8 is GADOLINIUM ATOM (CCD ID: GD) (formula: Gd).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	2	Total Gd 2 2	0	0

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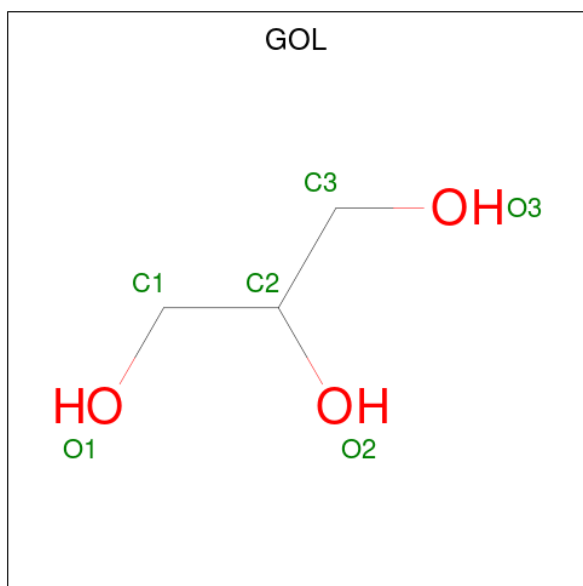
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	B	1	Total	Gd	0	0
			1	1		
8	C	1	Total	Gd	0	0
			1	1		
8	D	1	Total	Gd	0	0
			1	1		

- Molecule 9 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

- Molecule 10 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	A	1	Total	C	O	0	0
			6	3	3		
10	C	1	Total	C	O	0	0
			6	3	3		
10	D	1	Total	C	O	0	0
			6	3	3		
10	D	1	Total	C	O	0	0
			6	3	3		

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

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

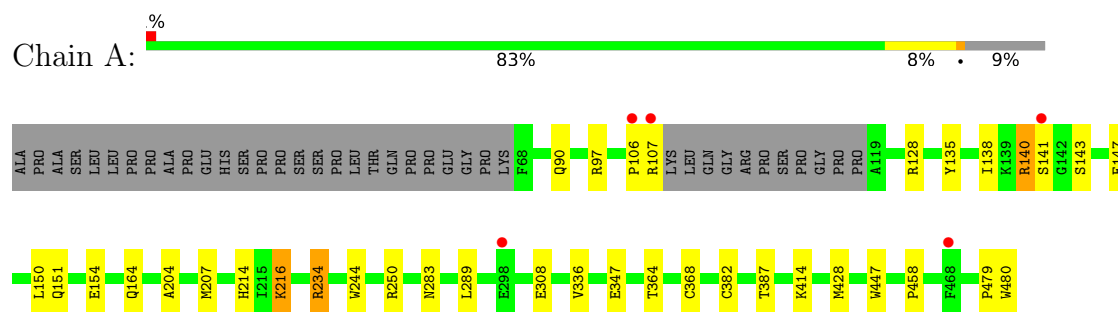
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	186	Total 186	O 186	0	0
12	B	266	Total 266	O 266	0	0
12	C	138	Total 138	O 138	0	0
12	D	240	Total 240	O 240	0	0

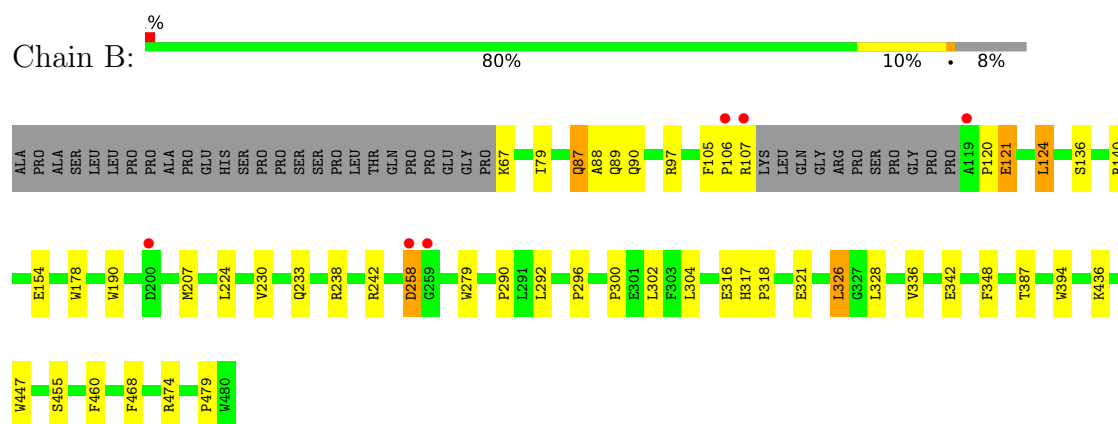
3 Residue-property plots [i](#)

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.

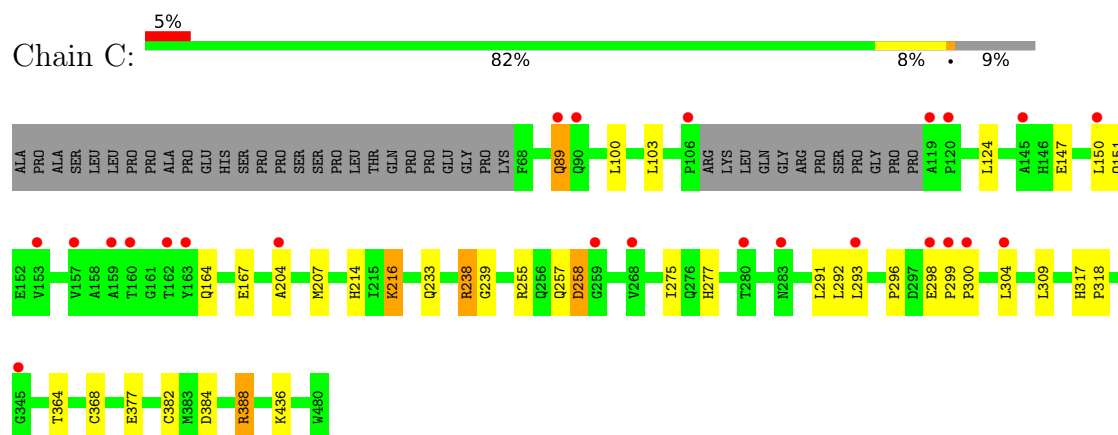
- Molecule 1: Nitric oxide synthase, endothelial



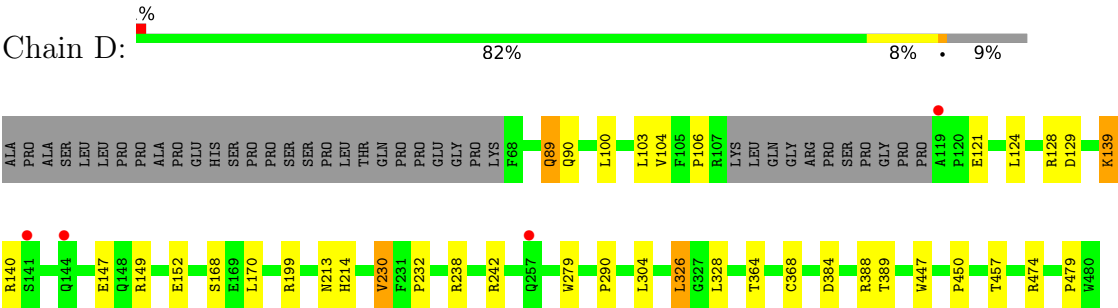
- Molecule 1: Nitric oxide synthase, endothelial



- 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, α , β , γ	59.66Å 152.97Å 109.04Å 90.00° 90.81° 90.00°	Depositor
Resolution (Å)	39.96 – 1.90 39.96 – 1.90	Depositor EDS
% Data completeness (in resolution range)	97.3 (39.96-1.90) 97.9 (39.96-1.90)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.36 (at 1.89Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, R_{free}	0.192 , 0.233 0.188 , 0.229	Depositor DCC
R_{free} test set	7534 reflections (3.89%)	wwPDB-VP
Wilson B-factor (Å ²)	32.2	Xtriage
Anisotropy	0.633	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 53.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.068 for h,-k,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	14243	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.05% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: A1BT6, BTB, CL, H4B, ACT, ZN, HEM, GD, GOL, CA

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	0.28	0/3324	0.47	0/4529
1	B	0.33	0/3327	0.50	0/4532
1	C	0.25	0/3313	0.44	0/4515
1	D	0.31	0/3315	0.48	0/4517
All	All	0.30	0/13279	0.48	0/18093

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	3223	0	3127	20	0
1	B	3229	0	3135	29	0
1	C	3212	0	3114	25	0
1	D	3217	0	3121	25	0
2	A	43	0	30	2	0
2	B	43	0	30	2	0
2	C	43	0	30	2	0
2	D	43	0	30	2	0
3	A	17	0	15	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	17	0	15	1	0
3	C	17	0	15	0	0
3	D	17	0	15	1	0
4	A	32	0	0	2	0
4	B	32	0	0	2	0
4	C	32	0	0	0	0
4	D	32	0	0	0	0
5	A	28	0	36	7	0
5	B	28	0	37	4	0
5	C	28	0	36	8	0
5	D	28	0	36	5	0
6	A	4	0	3	0	0
6	B	4	0	3	0	0
6	C	4	0	3	0	0
6	D	4	0	3	0	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
7	C	1	0	0	0	0
7	D	1	0	0	0	0
8	A	2	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	C	1	0	0	0	0
10	A	6	0	8	0	0
10	C	6	0	8	1	0
10	D	12	0	16	2	0
11	B	1	0	0	0	0
12	A	186	0	0	1	0
12	B	266	0	0	4	0
12	C	138	0	0	3	0
12	D	240	0	0	3	0
All	All	14243	0	12866	124	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 5.

The worst 5 of 124 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:C:382:CYS:HA	5:C:505:BTB:H11	1.61	0.82
1:C:207:MET:HE3	1:C:293:LEU:HB3	1.69	0.74
2:A:501:HEM:HBB2	2:A:501:HEM:HHC	1.72	0.72
1:A:283:ASN:ND2	12:A:602:HOH:O	2.24	0.71
1:B:321:GLU:OE2	5:B:505:BTB:O4	2.08	0.69

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	401/440 (91%)	390 (97%)	10 (2%)	1 (0%)	43	36
1	B	401/440 (91%)	389 (97%)	10 (2%)	2 (0%)	24	16
1	C	400/440 (91%)	387 (97%)	13 (3%)	0	100	100
1	D	400/440 (91%)	392 (98%)	8 (2%)	0	100	100
All	All	1602/1760 (91%)	1558 (97%)	41 (3%)	3 (0%)	43	36

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	106	PRO
1	B	106	PRO
1	B	120	PRO

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	344/373 (92%)	334 (97%)	10 (3%)	37	31
1	B	344/373 (92%)	331 (96%)	13 (4%)	29	21
1	C	343/373 (92%)	333 (97%)	10 (3%)	37	31
1	D	343/373 (92%)	332 (97%)	11 (3%)	34	27
All	All	1374/1492 (92%)	1330 (97%)	44 (3%)	35	27

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	238	ARG
1	D	121	GLU
1	C	255	ARG
1	C	388	ARG
1	D	168[A]	SER

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	B	403	ASN
1	C	126	GLN
1	D	126	GLN
1	A	151	GLN
1	A	144	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 40 ligands modelled in this entry, 12 are monoatomic - leaving 28 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$
10	GOL	A	510	-	5,5,5	0.30	0	5,5,5	0.59	0
5	BTB	D	506	-	13,13,13	0.60	0	7,16,16	0.99	1 (14%)
10	GOL	C	507	-	5,5,5	0.35	0	5,5,5	0.38	0
5	BTB	A	504	8	13,13,13	0.39	0	7,16,16	1.35	1 (14%)
2	HEM	D	501	1	50,50,50	1.94	6 (12%)	67,82,82	1.48	12 (17%)
6	ACT	A	505	-	3,3,3	0.73	0	3,3,3	0.95	0
5	BTB	A	506	8	13,13,13	0.42	0	7,16,16	0.46	0
10	GOL	D	508	-	5,5,5	0.42	0	5,5,5	0.35	0
4	A1BT6	D	503	-	33,35,35	1.10	4 (12%)	41,46,46	1.14	3 (7%)
5	BTB	C	505	8	13,13,13	0.40	0	7,16,16	0.58	0
6	ACT	B	504	-	3,3,3	0.79	0	3,3,3	0.76	0
3	H4B	B	502	-	17,18,18	0.83	0	14,26,26	1.94	5 (35%)
3	H4B	D	502	-	17,18,18	0.91	1 (5%)	14,26,26	2.03	5 (35%)
4	A1BT6	C	503	-	33,35,35	1.12	4 (12%)	41,46,46	1.10	4 (9%)
2	HEM	C	501	1	50,50,50	1.74	7 (14%)	67,82,82	1.28	9 (13%)
2	HEM	B	501	1	50,50,50	1.81	9 (18%)	67,82,82	1.32	10 (14%)
6	ACT	C	504	-	3,3,3	0.79	0	3,3,3	0.72	0
5	BTB	C	506	-	13,13,13	0.57	0	7,16,16	1.09	0
5	BTB	B	506	-	13,13,13	0.47	0	7,16,16	0.87	0
4	A1BT6	A	503	-	33,35,35	1.14	4 (12%)	41,46,46	1.23	4 (9%)
6	ACT	D	504	-	3,3,3	0.80	0	3,3,3	0.77	0
5	BTB	D	505	8	13,13,13	0.60	0	7,16,16	0.53	0
3	H4B	C	502	-	17,18,18	0.86	0	14,26,26	1.82	4 (28%)
3	H4B	A	502	-	17,18,18	0.83	0	14,26,26	1.92	4 (28%)
2	HEM	A	501	1	50,50,50	1.77	9 (18%)	67,82,82	1.35	8 (11%)
10	GOL	D	507	-	5,5,5	0.44	0	5,5,5	0.53	0
4	A1BT6	B	503	-	33,35,35	1.10	4 (12%)	41,46,46	0.98	1 (2%)
5	BTB	B	505	8	13,13,13	0.43	0	7,16,16	0.75	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
10	GOL	A	510	-	-	2/4/4/4	-
5	BTB	D	506	-	-	11/21/21/21	-
10	GOL	C	507	-	-	4/4/4/4	-
5	BTB	A	504	8	-	4/21/21/21	-
2	HEM	D	501	1	-	1/14/54/54	-
5	BTB	A	506	8	-	4/21/21/21	-
10	GOL	D	508	-	-	0/4/4/4	-
4	A1BT6	D	503	-	-	5/15/23/23	0/4/4/4
5	BTB	C	505	8	-	8/21/21/21	-
3	H4B	B	502	-	-	0/8/17/17	0/2/2/2
3	H4B	D	502	-	-	0/8/17/17	0/2/2/2
4	A1BT6	C	503	-	-	6/15/23/23	0/4/4/4
2	HEM	C	501	1	-	2/14/54/54	-
2	HEM	B	501	1	-	0/14/54/54	-
5	BTB	C	506	-	-	10/21/21/21	-
5	BTB	B	506	-	-	10/21/21/21	-
4	A1BT6	A	503	-	-	5/15/23/23	0/4/4/4
5	BTB	D	505	8	-	1/21/21/21	-
3	H4B	C	502	-	-	0/8/17/17	0/2/2/2
3	H4B	A	502	-	-	0/8/17/17	0/2/2/2
2	HEM	A	501	1	-	1/14/54/54	-
10	GOL	D	507	-	-	0/4/4/4	-
4	A1BT6	B	503	-	-	3/15/23/23	0/4/4/4
5	BTB	B	505	8	-	3/21/21/21	-

The worst 5 of 48 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	501	HEM	FE-NC	6.40	2.16	1.95
2	D	501	HEM	FE-NB	6.06	2.13	1.94
2	B	501	HEM	FE-NC	5.80	2.14	1.95
2	B	501	HEM	FE-NB	5.22	2.11	1.94
2	A	501	HEM	FE-NC	5.18	2.12	1.95

The worst 5 of 71 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	502	H4B	C2-N1-C8A	4.66	121.58	113.36
3	B	502	H4B	C2-N1-C8A	4.27	120.89	113.36
3	C	502	H4B	C2-N1-C8A	4.16	120.69	113.36
3	A	502	H4B	C2-N1-C8A	4.15	120.68	113.36
4	A	503	A1BT6	C35-C36-N38	4.05	121.28	114.93

There are no chirality outliers.

5 of 80 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	503	A1BT6	N18-C19-C20-C21
4	A	503	A1BT6	N37-C36-N38-C25
4	B	503	A1BT6	N18-C19-C20-C21
4	C	503	A1BT6	N18-C19-C20-C21
4	C	503	A1BT6	N37-C36-N38-C25

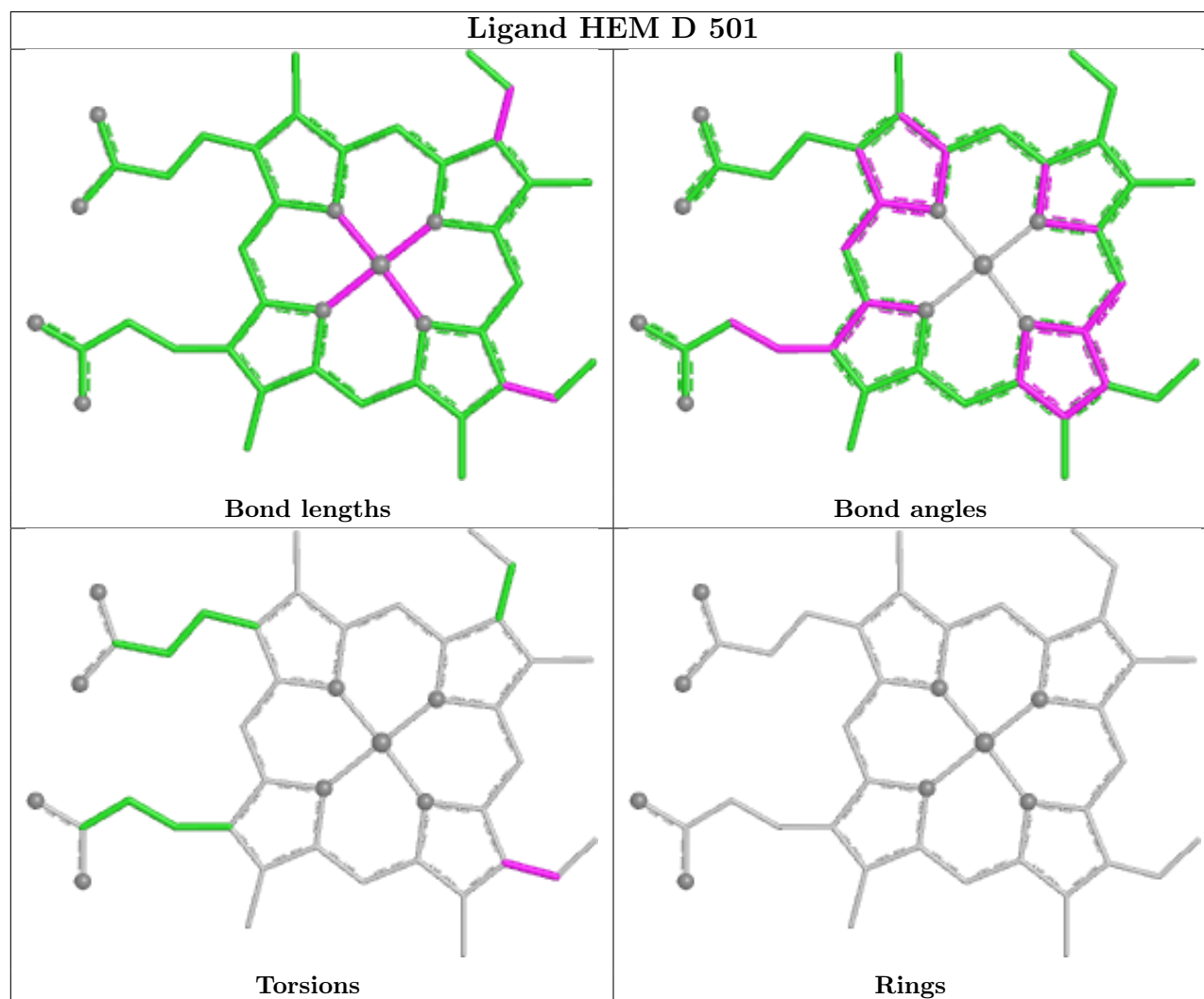
There are no ring outliers.

19 monomers are involved in 40 short contacts:

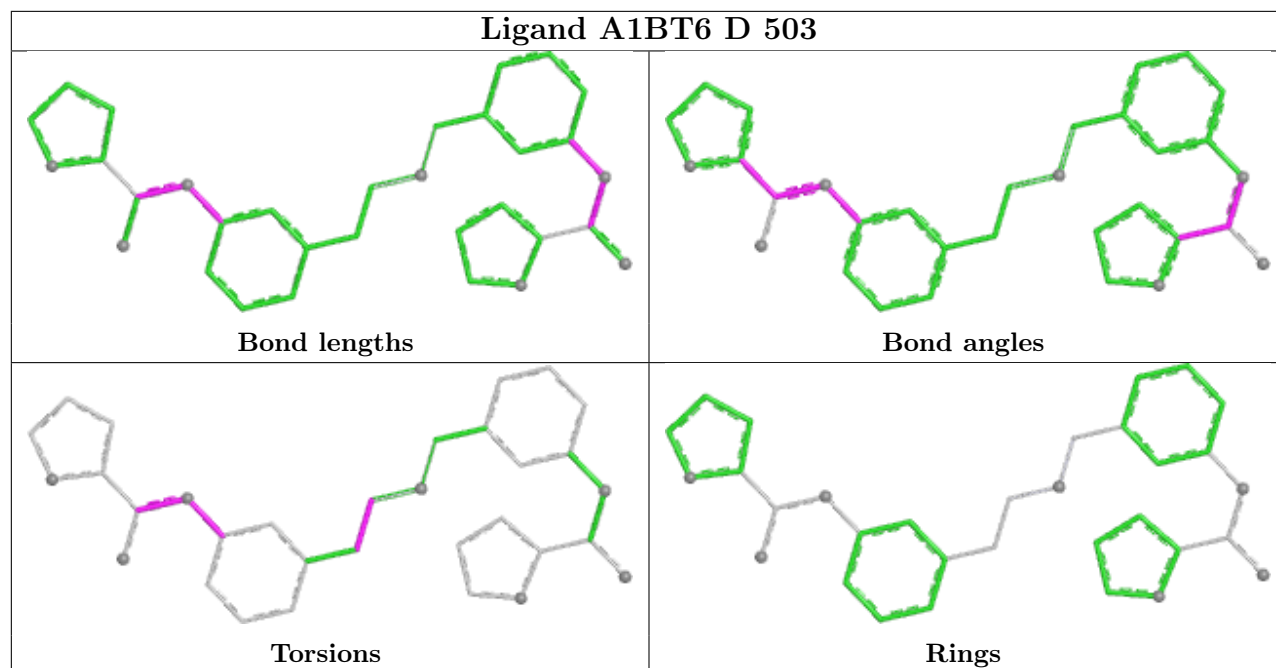
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	506	BTB	3	0
10	C	507	GOL	1	0
5	A	504	BTB	3	0
2	D	501	HEM	2	0
5	A	506	BTB	4	0
5	C	505	BTB	3	0
3	B	502	H4B	1	0
3	D	502	H4B	1	0
2	C	501	HEM	2	0
2	B	501	HEM	2	0
5	C	506	BTB	5	0
5	B	506	BTB	2	0
4	A	503	A1BT6	2	0
5	D	505	BTB	2	0
3	A	502	H4B	1	0
2	A	501	HEM	2	0
10	D	507	GOL	2	0
4	B	503	A1BT6	2	0
5	B	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

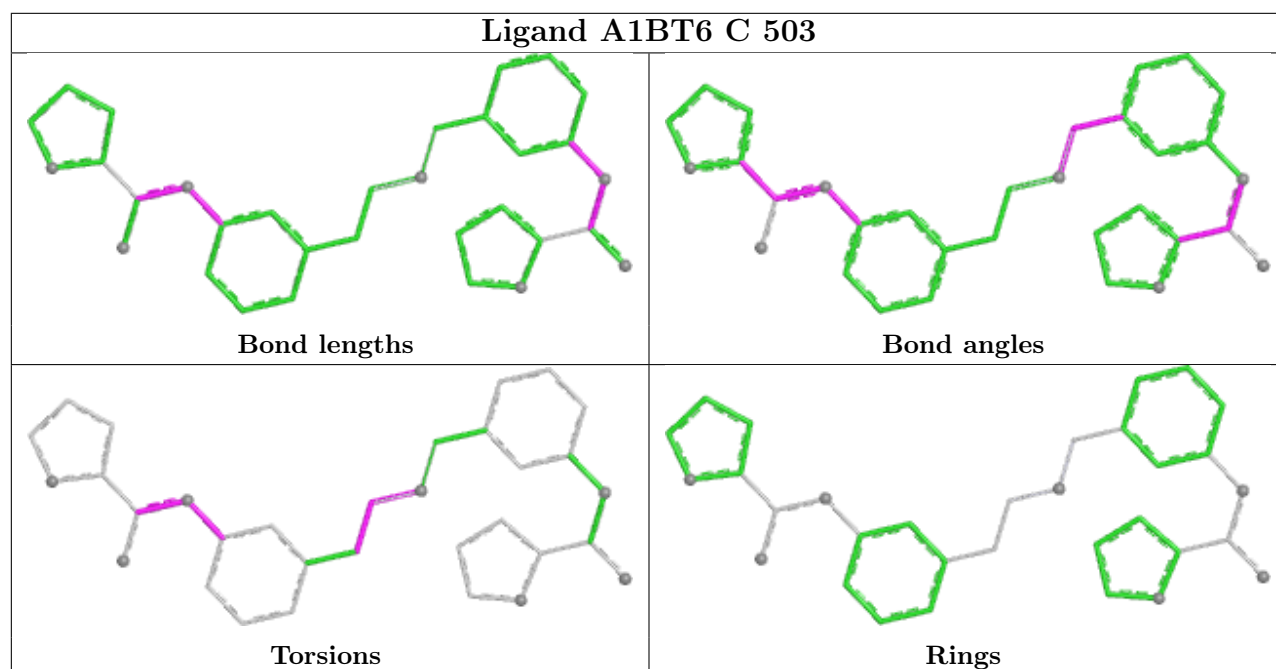
also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted 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.

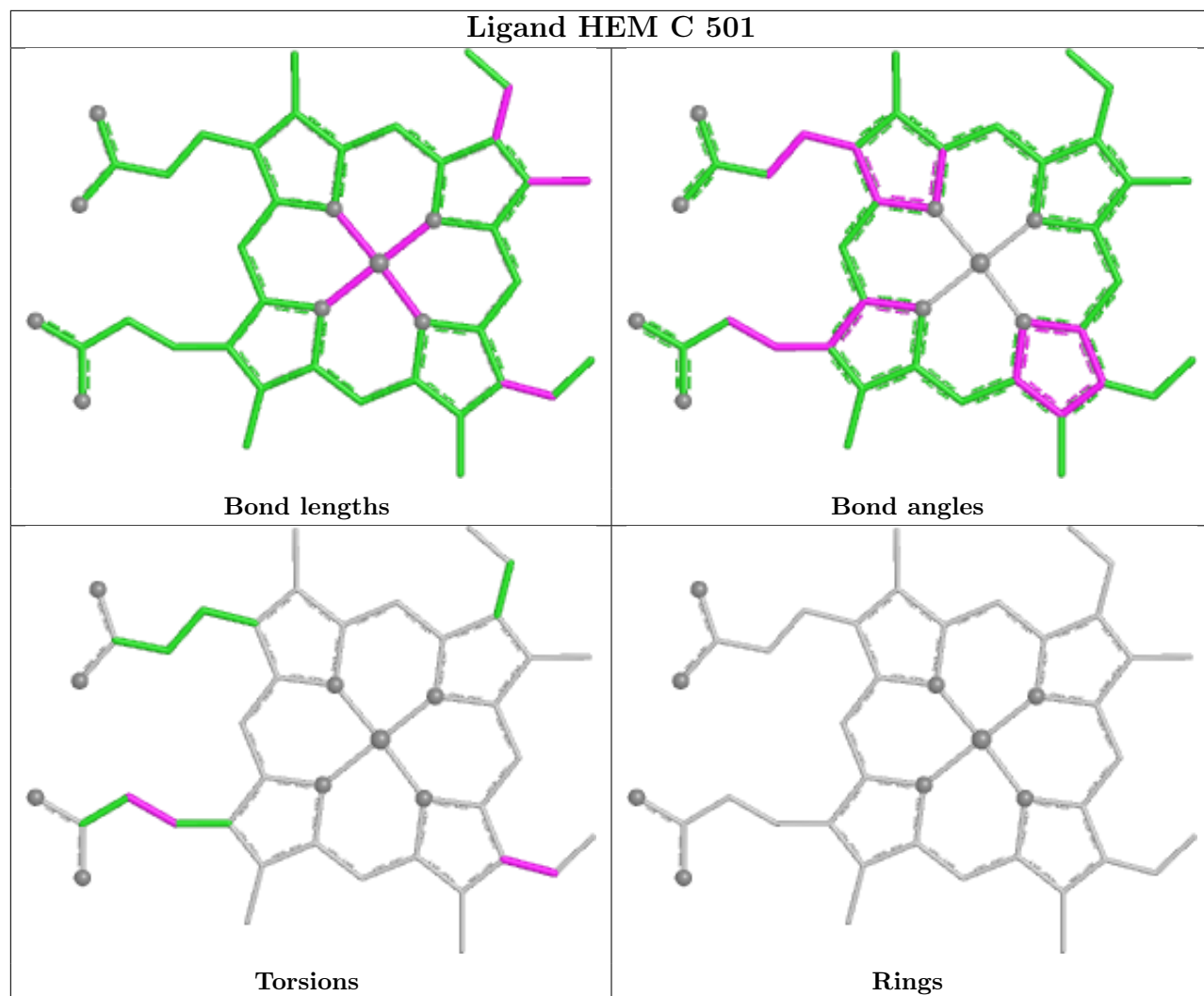


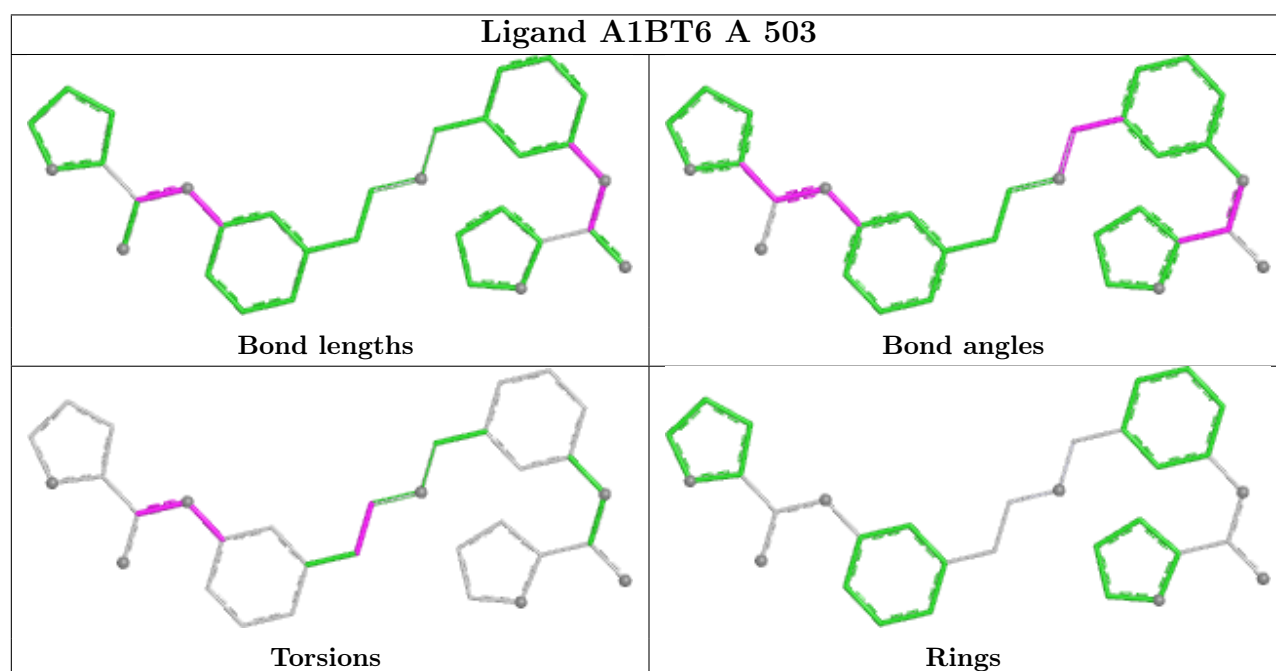
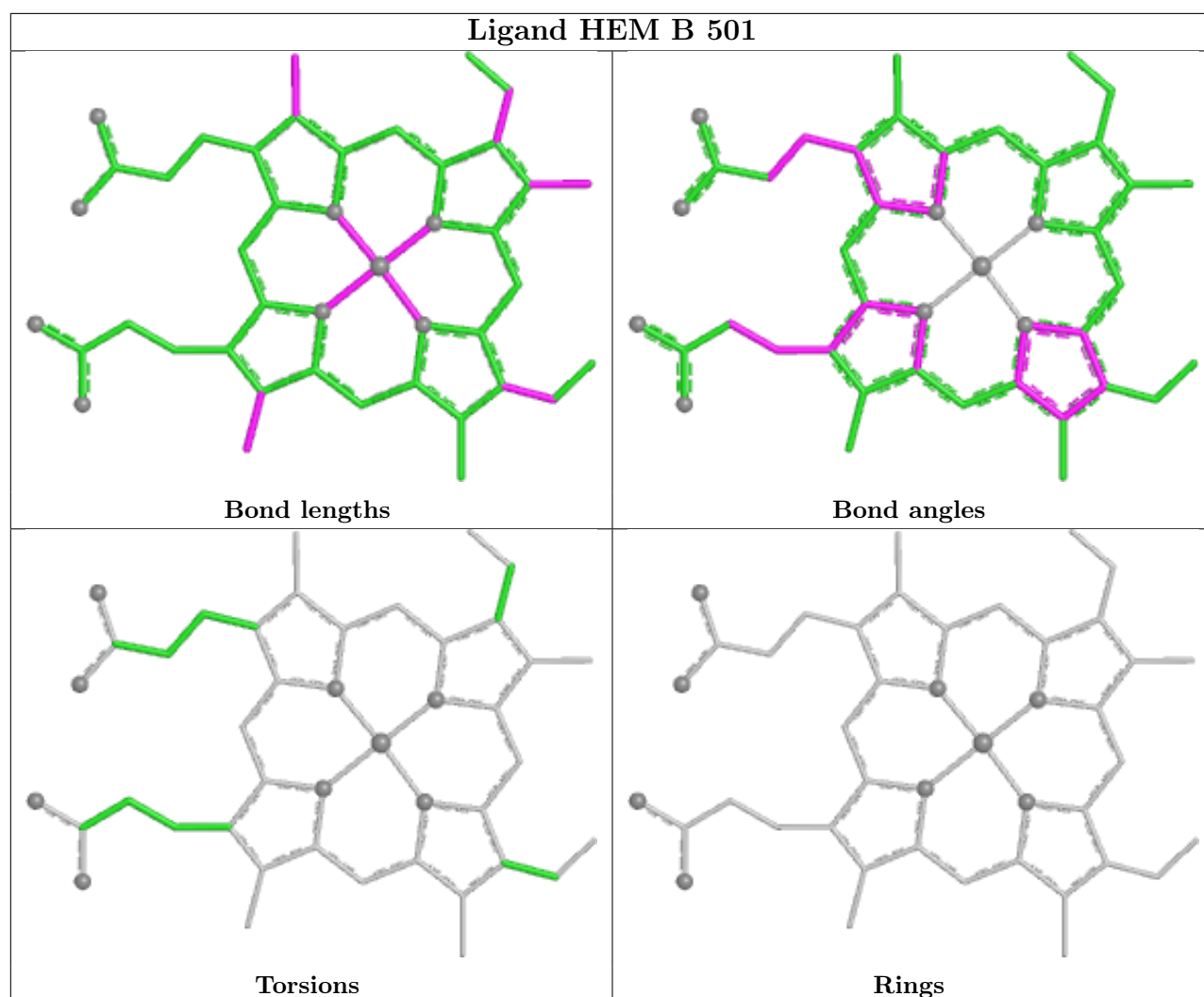
Ligand A1BT6 D 503

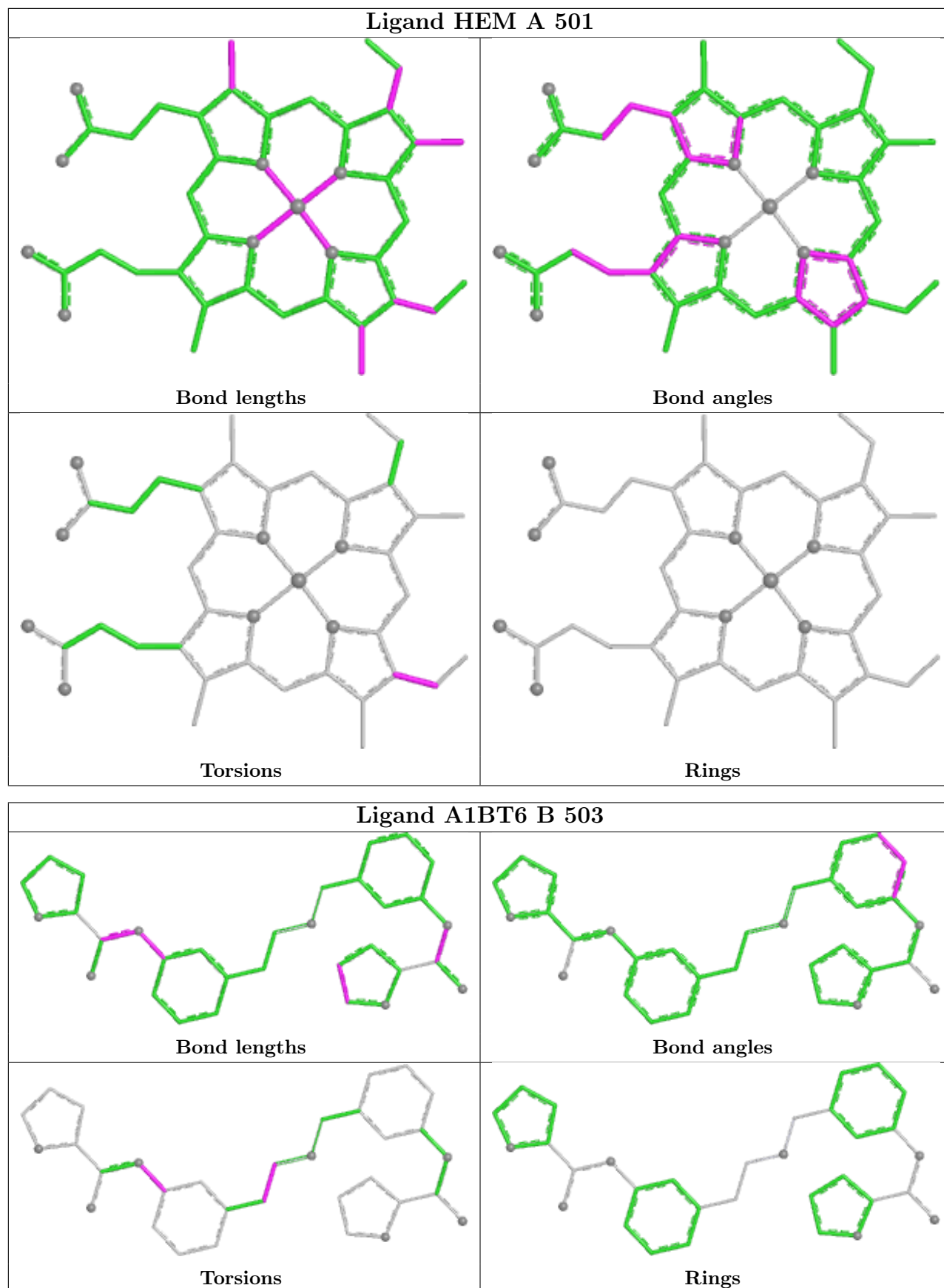


Ligand A1BT6 C 503









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

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

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

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	402/440 (91%)	0.15	5 (1%) 76 79	24, 51, 87, 116	3 (0%)
1	B	403/440 (91%)	-0.12	6 (1%) 72 75	20, 40, 70, 122	2 (0%)
1	C	401/440 (91%)	0.51	24 (5%) 27 29	23, 59, 109, 135	3 (0%)
1	D	402/440 (91%)	-0.06	4 (0%) 79 82	25, 40, 76, 114	2 (0%)
All	All	1608/1760 (91%)	0.12	39 (2%) 59 63	20, 47, 92, 135	10 (0%)

The worst 5 of 39 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	106	PRO	4.3
1	B	119	ALA	4.1
1	B	107	ARG	3.3
1	A	298	GLU	3.0
1	C	204	ALA	3.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

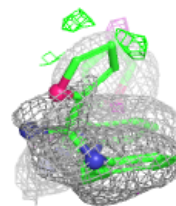
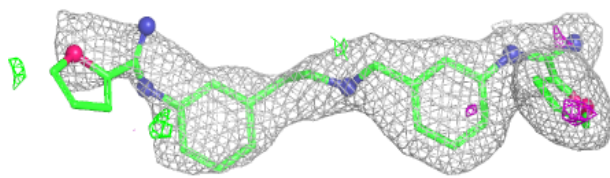
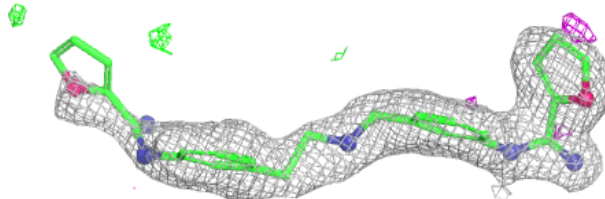
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	BTB	C	506	14/14	0.62	0.21	65,85,90,93	0
10	GOL	D	508	6/6	0.68	0.12	77,78,81,83	0
5	BTB	B	506	14/14	0.71	0.21	61,79,96,106	0
10	GOL	D	507	6/6	0.72	0.14	53,68,75,76	0
5	BTB	D	506	14/14	0.74	0.19	53,75,95,106	0
5	BTB	A	506	14/14	0.77	0.15	62,86,96,100	0
5	BTB	D	505	14/14	0.84	0.14	29,49,69,80	0
10	GOL	C	507	6/6	0.85	0.11	56,75,91,91	0
5	BTB	B	505	14/14	0.86	0.16	39,70,80,86	0
4	A1BT6	C	503	32/32	0.88	0.15	33,70,115,116	0
5	BTB	C	505	14/14	0.89	0.12	41,81,97,101	0
6	ACT	C	504	4/4	0.90	0.10	48,53,57,58	0
6	ACT	A	505	4/4	0.90	0.14	48,53,54,56	0
10	GOL	A	510	6/6	0.92	0.08	48,52,60,63	0
6	ACT	B	504	4/4	0.92	0.12	41,43,49,50	0
4	A1BT6	A	503	32/32	0.92	0.12	26,57,101,104	0
8	GD	C	509	1/1	0.92	0.08	126,126,126,126	0
3	H4B	D	502	17/17	0.94	0.08	27,37,46,48	0
3	H4B	A	502	17/17	0.94	0.09	29,40,51,54	0
4	A1BT6	B	503	32/32	0.94	0.11	18,43,111,113	0
3	H4B	C	502	17/17	0.94	0.07	37,49,56,58	0
4	A1BT6	D	503	32/32	0.94	0.12	20,55,114,117	0
7	CL	C	508	1/1	0.95	0.09	55,55,55,55	0
5	BTB	A	504	14/14	0.95	0.10	18,70,77,83	0
8	GD	A	508	1/1	0.96	0.09	90,90,90,90	0
7	CL	A	507	1/1	0.96	0.09	51,51,51,51	0
3	H4B	B	502	17/17	0.96	0.07	26,36,46,48	0
2	HEM	A	501	43/43	0.97	0.07	29,40,47,65	0
6	ACT	D	504	4/4	0.97	0.10	36,41,43,44	0
8	GD	B	508	1/1	0.97	0.05	47,47,47,47	0
2	HEM	C	501	43/43	0.97	0.09	34,49,57,62	0
8	GD	D	510	1/1	0.98	0.04	42,42,42,42	0
9	ZN	C	510	1/1	0.98	0.03	40,40,40,40	0
2	HEM	B	501	43/43	0.98	0.06	20,28,36,45	0
8	GD	A	511	1/1	0.98	0.08	104,104,104,104	0
2	HEM	D	501	43/43	0.98	0.06	19,29,37,48	0
7	CL	D	509	1/1	0.98	0.07	40,40,40,40	0
11	CA	B	509	1/1	0.98	0.04	37,37,37,37	0
7	CL	B	507	1/1	0.99	0.05	46,46,46,46	0
9	ZN	A	509	1/1	1.00	0.03	33,33,33,33	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.

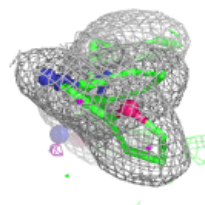
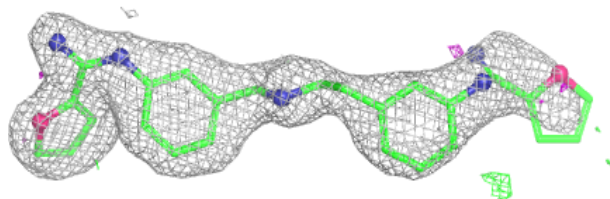
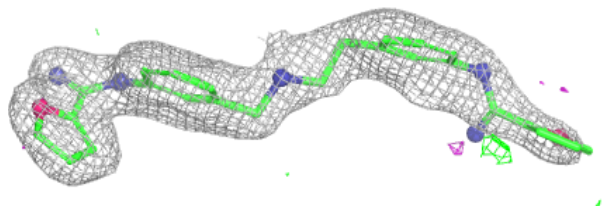
Electron density around A1BT6 C 503:

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



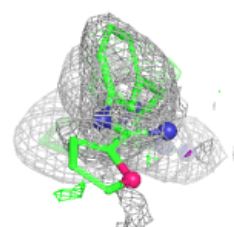
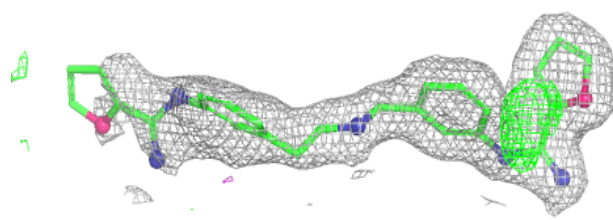
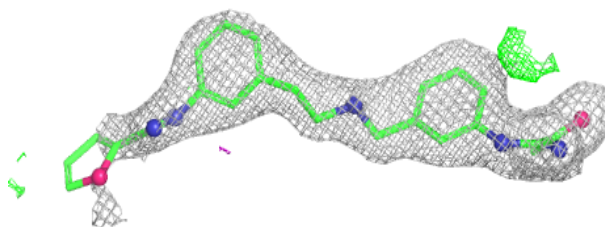
Electron density around A1BT6 A 503:

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and green (positive)

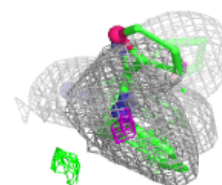
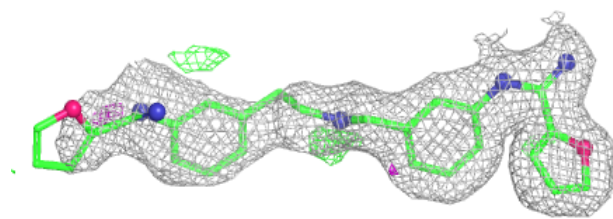
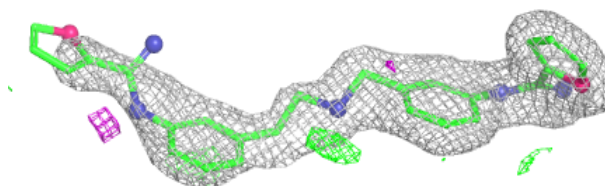


Electron density around A1BT6 B 503:

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

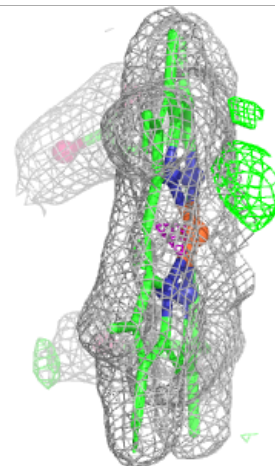
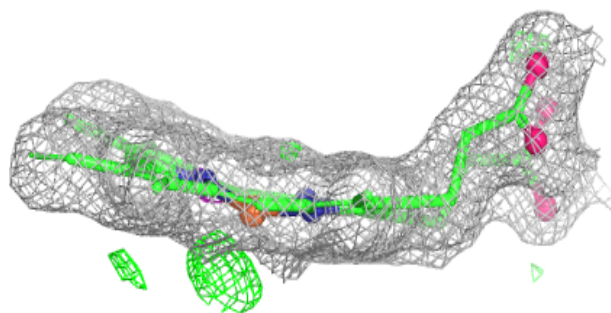
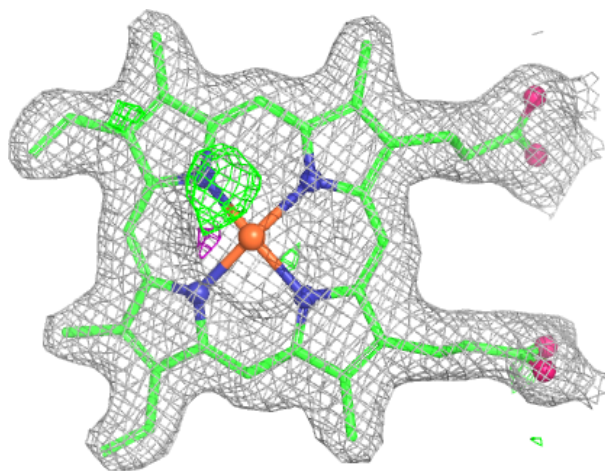
**Electron density around A1BT6 D 503:**

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



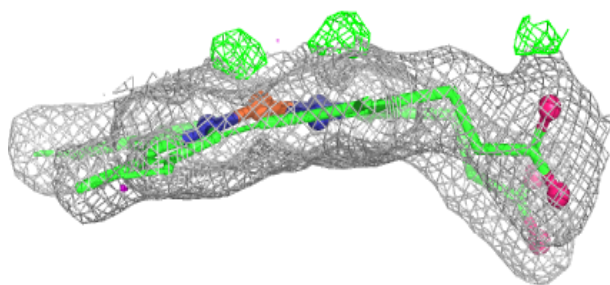
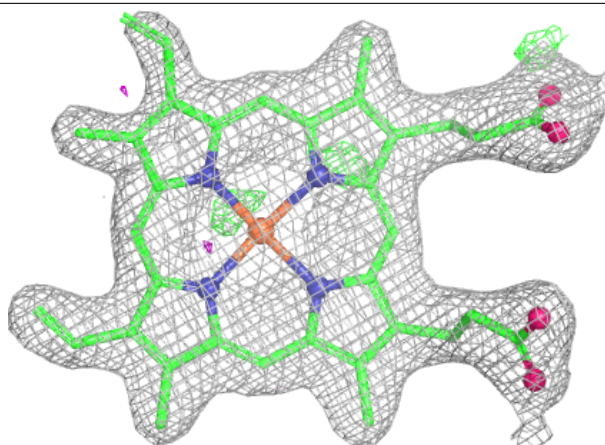
Electron density around HEM A 501:

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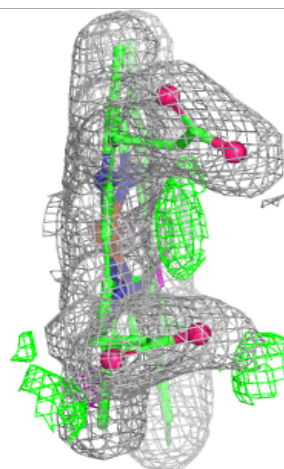
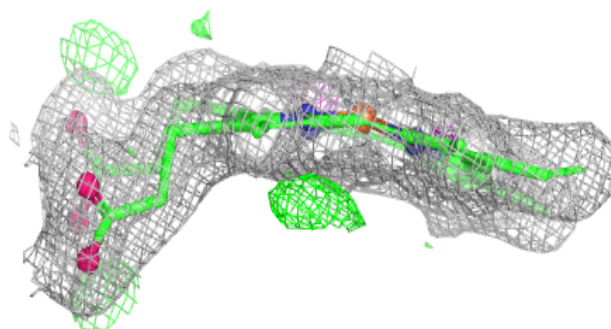
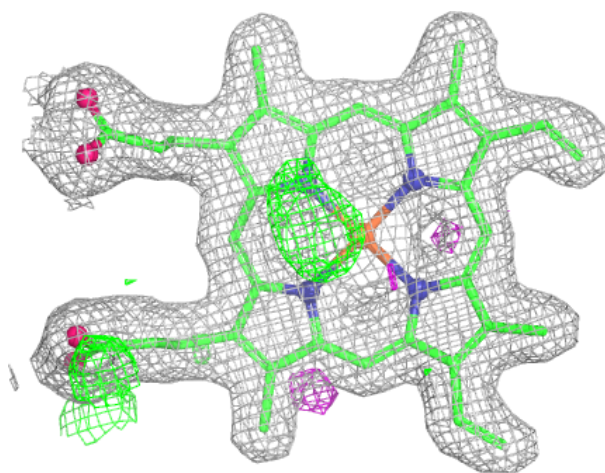
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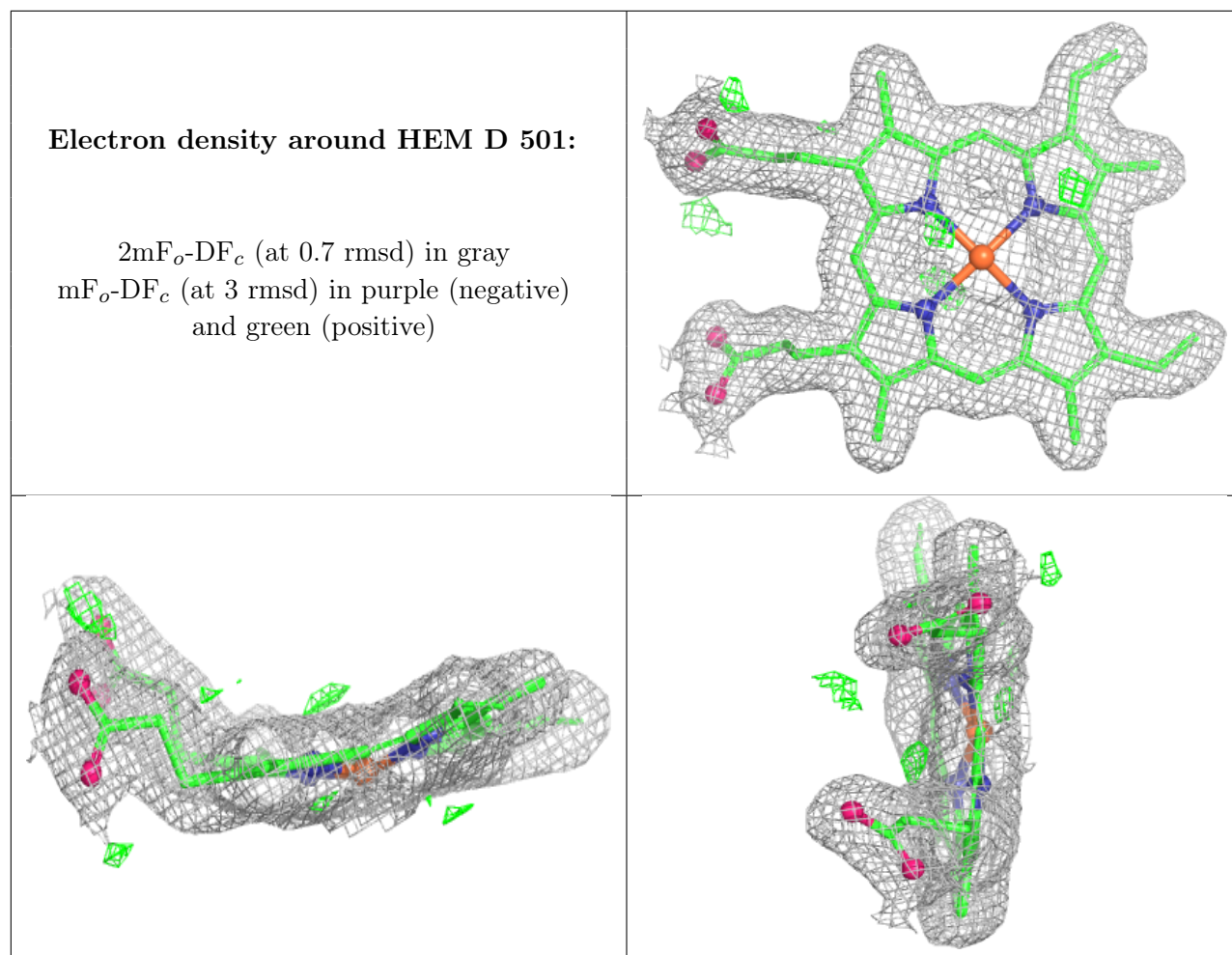
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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



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 [i](#)

There are no such residues in this entry.