WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 2, 2025 – 12:33 PM EDT

PDB ID	:	9Q51 / pdb_00009q51
Title	:	Structure of human endothelial nitric oxide synthase heme domain bound with 6-((5-(2-(diethylamino)ethyl)-2,3-difluorophenxy)methyl)-4-methylpyridin-2-amine
Authors	:	Li, H.; Poulos, T.L.
Deposited on	:	2025-08-20
Resolution	:	1.80 Å(reported)

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

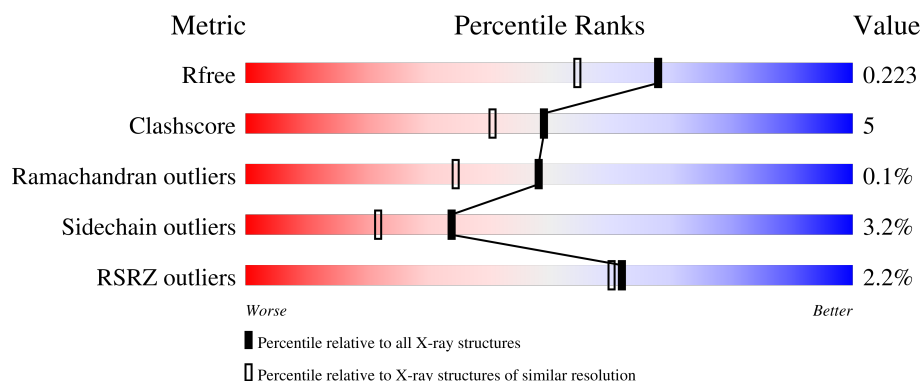|		
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.45.1

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 1.80 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	Percentile Ranks	Value
Rfree		0.223
Clashscore		5
Ramachandran outliers		0.1%
Sidechain outliers		3.2%
RSRZ outliers		2.2%

Worse ←→ *Better*

∎ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	7108 (1.80-1.80)
Clashscore	180529	8162 (1.80-1.80)
Ramachandran outliers	177936	8077 (1.80-1.80)
Sidechain outliers	177891	8076 (1.80-1.80)
RSRZ outliers	164620	7108 (1.80-1.80)

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 <=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	2% · 80% · 11% · 9%
1	B	440	% · 81% · 10% · 9%
1	C	440	3% · 79% · 11% · 9%
1	D	440	% · 83% · 8% · 9%

2 Entry composition ⓘ

There are 11 unique types of molecules in this entry. The entry contains 14519 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 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	402	Total	C	N	O	S	0	1	0
			3214	2046	567	585	16			
1	B	402	Total	C	N	O	S	0	1	0
			3212	2046	565	585	16			
1	C	401	Total	C	N	O	S	0	1	0
			3207	2043	564	584	16			
1	D	402	Total	C	N	O	S	0	3	0
			3220	2051	566	587	16			

There are 4 discrepancies between the modelled and reference sequences:

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

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

HEM

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

- Molecule 3 is 5,6,7,8-TETRAHYDROBIOPTERIN (CCD ID: H4B) (formula: $C_9H_{15}N_5O_3$).

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 6-({5-[2-(diethylamino)ethyl]-2,3-difluorophenoxy}methyl)-4-methylpyridin-2-amine (CCD ID: A1COA) (formula: $C_{19}H_{25}F_2N_3O$) (labeled as "Ligand of Interest" by depositor).

A1COA
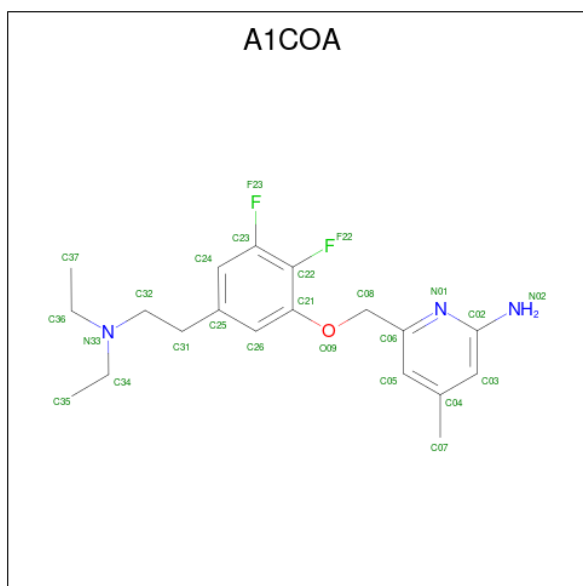
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	F	N	O	0	0
			25	19	2	3	1		
4	B	1	Total	C	F	N	O	0	0
			25	19	2	3	1		
4	C	1	Total	C	F	N	O	0	0
			25	19	2	3	1		
4	D	1	Total	C	F	N	O	0	0
			25	19	2	3	1		

- Molecule 5 is 2-[BIS-(2-HYDROXY-ETHYL)-AMINO]-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: BTB) (formula: $C_8H_{19}NO_5$).

BTB

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 GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).

GOL

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

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

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

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

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

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

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

- Molecule 10 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	1	Total 1	Ca 1	0	0

- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	259	Total 259	O 259	0	0
11	B	345	Total 345	O 345	0	0
11	C	218	Total 218	O 218	0	0
11	D	333	Total 333	O 333	0	0

3 Residue-property plots ⓘ

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 3

• Molecule 1: Nitric oxide synthase 3

• Molecule 1: Nitric oxide synthase 3

W356 Y357 I362 G363 T364 C368 E377 D378 C382 D386 T387 R388 I417 K436 W447 S453 L456 F468 Y475 W480

• Molecule 1: Nitric oxide synthase 3

Chain D:

83%   8%   9%

ALA PRO ALA SER LEU LEU PRO PRO ALA PRO GLU HIS SER PRO PRO SER SER PRO LEU THR GLN PRO PRO GLU GLY PRO K67 R70 I79 L84 Q87 A88 Q89 Q90 P106 ARG LYS LEU GLN GLY ARG PRO SER PRO GLY PRO A119 L124 R128 S136

Q144 R149 E152 E206 N213 R238 Q247 R250 Q257 D258 G259 P290 P296 L304 E312 E321 R329 M358 S359 T360 T387 W394 K397 W447 S453 L456 F468 L469 S470 P471 Y475 W480

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	59.99Å 153.18Å 108.59Å 90.00° 90.75° 90.00°	Depositor
Resolution (Å)	47.23 – 1.80 47.23 – 1.80	Depositor EDS
% Data completeness (in resolution range)	98.8 (47.23-1.80) 98.7 (47.23-1.80)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.41 (at 1.79Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, R_{free}	0.190 , 0.228 0.184 , 0.223	Depositor DCC
R_{free} test set	8981 reflections (4.22%)	wwPDB-VP
Wilson B-factor (Å^2)	26.4	Xtriage
Anisotropy	0.654	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 49.2	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.105 for h,-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	14519	wwPDB-VP
Average B, all atoms (Å^2)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.12% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5   Model quality ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, GOL, CL, BTB, HEM, A1COA, CA, H4B, GD

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	0.26	0/3309	0.47	0/4509
1	B	0.33	0/3307	0.52	0/4506
1	C	0.25	0/3302	0.46	0/4498
1	D	0.31	0/3321	0.48	0/4525
All	All	0.29	0/13239	0.48	0/18038

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 ⓘ

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	3214	0	3116	30	0
1	B	3212	0	3116	28	0
1	C	3207	0	3112	32	0
1	D	3220	0	3127	20	0
2	A	43	0	30	3	0
2	B	43	0	30	5	0
2	C	43	0	30	4	0
2	D	43	0	30	5	0
3	A	17	0	15	2	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	2	0
3	D	17	0	15	1	0
4	A	25	0	0	1	0
4	B	25	0	0	4	0
4	C	25	0	0	4	0
4	D	25	0	0	1	0
5	A	28	0	37	9	0
5	B	28	0	35	6	0
5	C	28	0	38	6	0
5	D	28	0	36	4	0
6	A	18	0	24	0	0
6	B	6	0	8	0	0
6	C	12	0	16	0	0
6	D	12	0	16	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	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	C	1	0	0	0	0
10	A	1	0	0	0	0
11	A	259	0	0	4	0
11	B	345	0	0	4	1
11	C	218	0	0	5	0
11	D	333	0	0	3	1
All	All	14519	0	12861	140	1

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 140 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)
4:B:503:A1COA:C31	4:B:503:A1COA:C35	2.12	1.21
1:A:119:ALA:HB3	1:A:120:PRO:HD3	1.32	1.09
5:A:504:BTB:O3	11:A:601:HOH:O	1.87	0.93

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:119:ALA:HB3	1:A:120:PRO:CD	2.10	0.81
1:B:138:ILE:HD12	1:B:140:ARG:HE	1.50	0.76

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
11:B:632:HOH:O	11:D:681:HOH:O[1_456]	2.15	0.05

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	399/440 (91%)	388 (97%)	11 (3%)	0	100	100
1	B	399/440 (91%)	390 (98%)	8 (2%)	1 (0%)	37	25
1	C	398/440 (90%)	389 (98%)	8 (2%)	1 (0%)	37	25
1	D	401/440 (91%)	391 (98%)	10 (2%)	0	100	100
All	All	1597/1760 (91%)	1558 (98%)	37 (2%)	2 (0%)	48	34

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	120	PRO
1	C	89	GLN

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	342/373 (92%)	327 (96%)	15 (4%)	24	12
1	B	342/373 (92%)	338 (99%)	4 (1%)	67	62
1	C	342/373 (92%)	325 (95%)	17 (5%)	20	9
1	D	344/373 (92%)	336 (98%)	8 (2%)	45	34
All	All	1370/1492 (92%)	1326 (97%)	44 (3%)	34	22

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

Mol	Chain	Res	Type
1	C	202	ARG
1	C	417	ILE
1	C	216	LYS
1	C	304	LEU
1	D	79	ILE

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	126	GLN
1	C	276	GLN
1	D	176	GLN
1	A	233	GLN
1	A	133	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 39 ligands modelled in this entry, 11 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
5	BTB	D	505	-	13,13,13	0.56	0	7,16,16	1.45	1 (14%)
5	BTB	B	505	-	13,13,13	0.58	0	7,16,16	1.55	1 (14%)
3	H4B	C	502	-	16,18,18	0.91	0	14,26,26	2.52	5 (35%)
4	A1COA	C	503	-	26,26,26	0.31	0	33,35,35	1.34	2 (6%)
2	HEM	D	501	1	42,50,50	1.54	6 (14%)	46,82,82	1.73	10 (21%)
5	BTB	D	504	8	13,13,13	0.51	0	7,16,16	0.37	0
5	BTB	B	504	8	13,13,13	0.44	0	7,16,16	0.67	0
6	GOL	A	507	-	5,5,5	0.35	0	5,5,5	0.35	0
3	H4B	B	502	-	16,18,18	0.78	0	14,26,26	2.43	5 (35%)
4	A1COA	B	503	-	26,26,26	0.37	0	33,35,35	1.43	4 (12%)
6	GOL	A	508	-	5,5,5	0.43	0	5,5,5	0.14	0
6	GOL	C	507	-	5,5,5	0.36	0	5,5,5	0.42	0
2	HEM	C	501	1	42,50,50	1.54	5 (11%)	46,82,82	1.65	10 (21%)
3	H4B	D	502	-	16,18,18	0.90	0	14,26,26	2.47	6 (42%)
5	BTB	A	504	8	13,13,13	0.53	0	7,16,16	1.07	1 (14%)
5	BTB	A	505	-	13,13,13	1.34	1 (7%)	7,16,16	1.15	1 (14%)
6	GOL	D	506	-	5,5,5	0.34	0	5,5,5	0.42	0
2	HEM	B	501	1	42,50,50	1.58	9 (21%)	46,82,82	1.57	6 (13%)
6	GOL	B	506	-	5,5,5	0.39	0	5,5,5	0.37	0
2	HEM	A	501	1	42,50,50	1.49	5 (11%)	46,82,82	1.73	9 (19%)
6	GOL	C	506	-	5,5,5	0.32	0	5,5,5	0.67	0
5	BTB	C	505	-	13,13,13	0.58	0	7,16,16	1.12	1 (14%)
6	GOL	D	507	-	5,5,5	0.29	0	5,5,5	0.37	0
6	GOL	A	506	-	5,5,5	0.40	0	5,5,5	0.78	0
3	H4B	A	502	-	16,18,18	0.88	0	14,26,26	2.74	8 (57%)
4	A1COA	A	503	-	26,26,26	0.31	0	33,35,35	1.33	3 (9%)
4	A1COA	D	503	-	26,26,26	0.39	0	33,35,35	1.34	2 (6%)
5	BTB	C	504	8	13,13,13	0.41	0	7,16,16	0.59	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
5	BTB	D	505	-	-	10/21/21/21	-
5	BTB	B	505	-	-	13/21/21/21	-
3	H4B	C	502	-	-	0/8/17/17	0/2/2/2
4	A1COA	C	503	-	-	5/14/14/14	0/2/2/2
2	HEM	D	501	1	-	1/12/54/54	-
5	BTB	D	504	8	-	3/21/21/21	-
5	BTB	B	504	8	-	6/21/21/21	-
6	GOL	A	507	-	-	4/4/4/4	-
3	H4B	B	502	-	-	0/8/17/17	0/2/2/2
4	A1COA	B	503	-	-	6/14/14/14	0/2/2/2
6	GOL	A	508	-	-	0/4/4/4	-
6	GOL	C	507	-	-	2/4/4/4	-
2	HEM	C	501	1	-	4/12/54/54	-
3	H4B	D	502	-	-	0/8/17/17	0/2/2/2
5	BTB	A	504	8	-	6/21/21/21	-
5	BTB	A	505	-	-	7/21/21/21	-
6	GOL	D	506	-	-	3/4/4/4	-
2	HEM	B	501	1	-	3/12/54/54	-
6	GOL	B	506	-	-	2/4/4/4	-
2	HEM	A	501	1	-	5/12/54/54	-
6	GOL	C	506	-	-	3/4/4/4	-
5	BTB	C	505	-	-	11/21/21/21	-
6	GOL	D	507	-	-	2/4/4/4	-
6	GOL	A	506	-	-	2/4/4/4	-
3	H4B	A	502	-	-	0/8/17/17	0/2/2/2
4	A1COA	A	503	-	-	4/14/14/14	0/2/2/2
4	A1COA	D	503	-	-	8/14/14/14	0/2/2/2
5	BTB	C	504	8	-	8/21/21/21	-

The worst 5 of 26 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	505	BTB	C2-N	-4.16	1.40	1.48
2	D	501	HEM	C3C-C2C	-3.88	1.35	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	HEM	C3C-C2C	-3.86	1.35	1.40
2	B	501	HEM	C3C-C2C	-3.60	1.35	1.40
2	A	501	HEM	C3C-C2C	-3.52	1.35	1.40

The worst 5 of 75 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	501	HEM	CBA-CAA-C2A	-6.86	101.00	112.54
3	A	502	H4B	C8A-C4A-C4	6.00	119.96	114.50
3	D	502	H4B	C8A-C4A-C4	5.86	119.84	114.50
3	B	502	H4B	C8A-C4A-C4	5.77	119.75	114.50
2	B	501	HEM	CBA-CAA-C2A	-5.75	102.87	112.54

There are no chirality outliers.

5 of 118 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	504	BTB	O1-C1-C2-N
5	A	504	BTB	C1-C2-C4-O4
5	A	504	BTB	C3-C2-C4-O4
5	A	504	BTB	N-C2-C4-O4
5	A	505	BTB	C1-C2-C3-O3

There are no ring outliers.

19 monomers are involved in 54 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	505	BTB	4	0
3	C	502	H4B	2	0
4	C	503	A1COA	4	0
2	D	501	HEM	5	0
5	D	504	BTB	4	0
5	B	504	BTB	2	0
3	B	502	H4B	1	0
4	B	503	A1COA	4	0
2	C	501	HEM	4	0
3	D	502	H4B	1	0
5	A	504	BTB	5	0
5	A	505	BTB	4	0
2	B	501	HEM	5	0
2	A	501	HEM	3	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	505	BTB	3	0
3	A	502	H4B	2	0
4	A	503	A1COA	1	0
4	D	503	A1COA	1	0
5	C	504	BTB	3	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 then 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 A1COA C 503

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM D 501
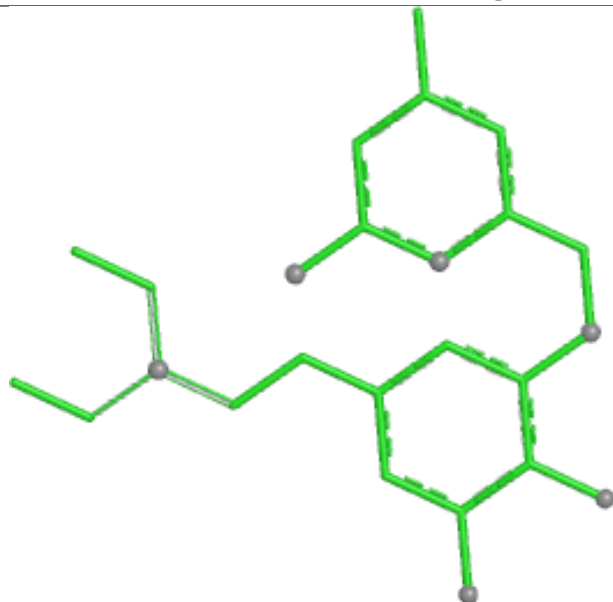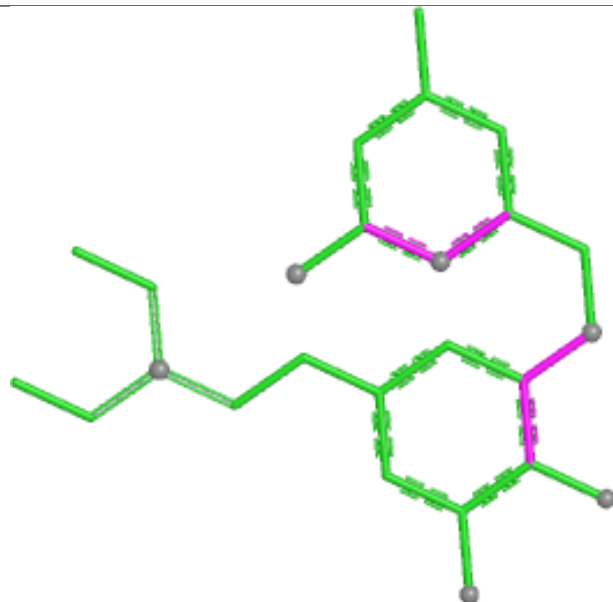
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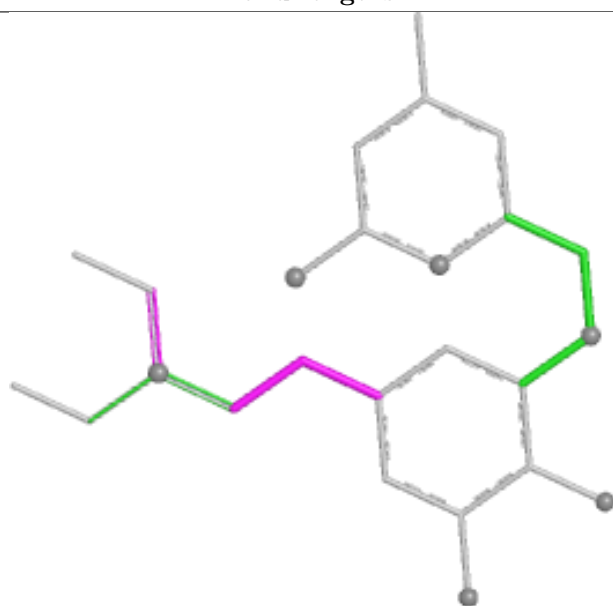
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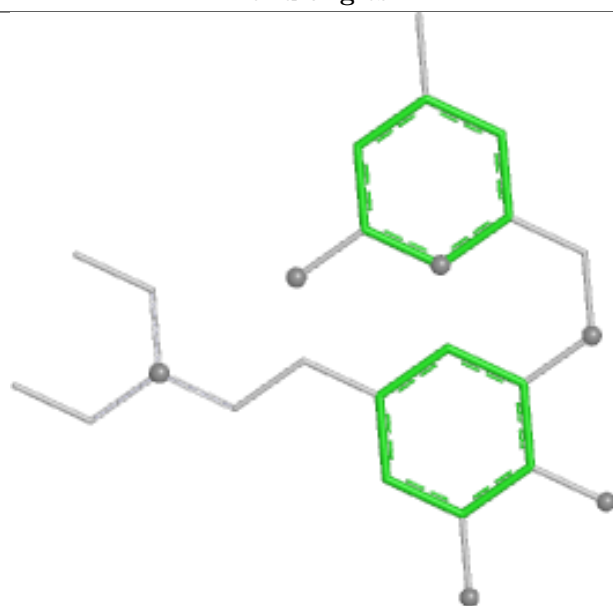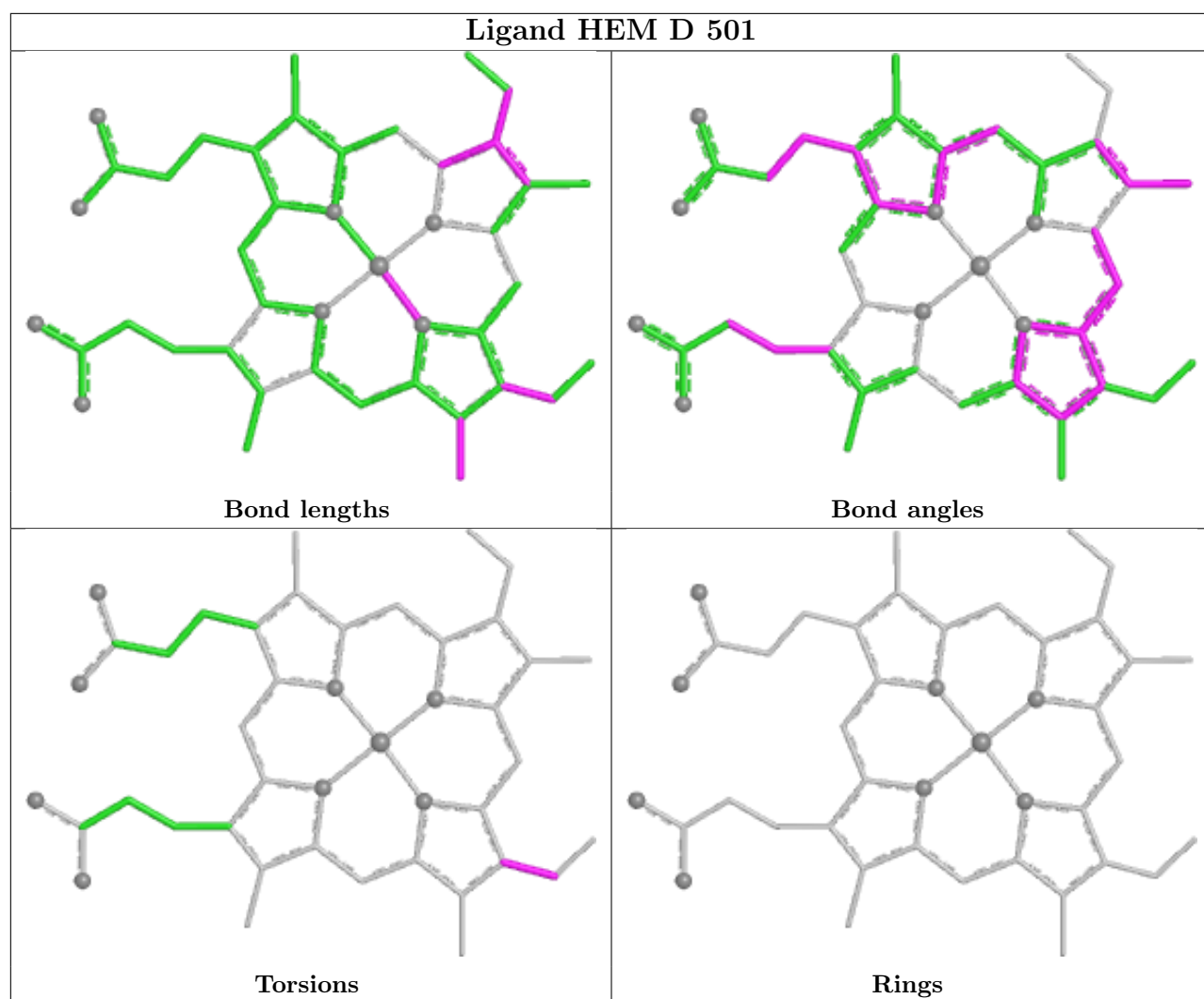
Torsions

Rings

Ligand A1COA B 503

Bond lengths
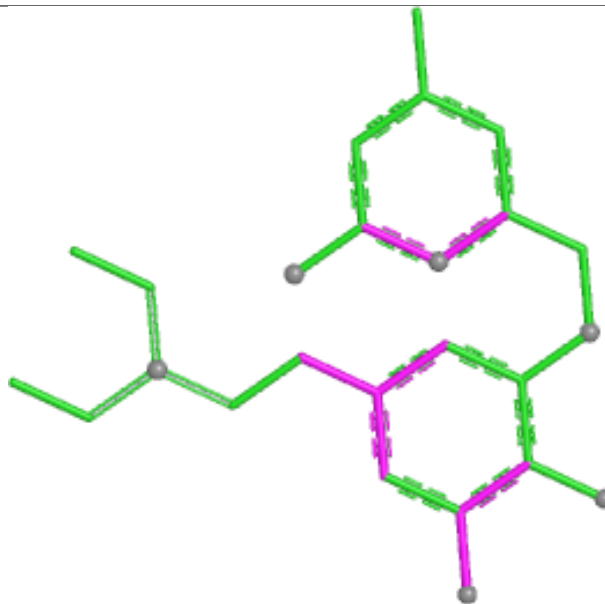
Bond angles
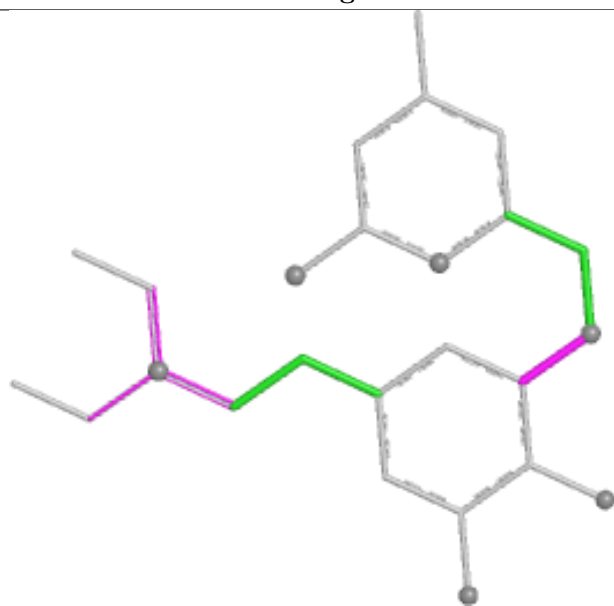
Torsions

Rings

Ligand HEM C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM A 501

Bond lengths

Bond angles

Torsions

Rings

Ligand A1COA A 503

Bond lengths

Bond angles

Torsions

Rings

Ligand A1COA D 503

Bond lengths

Bond angles

Torsions
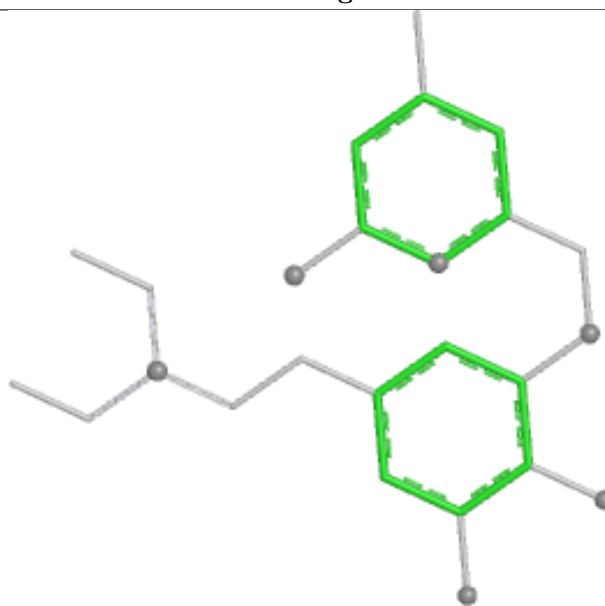
Rings
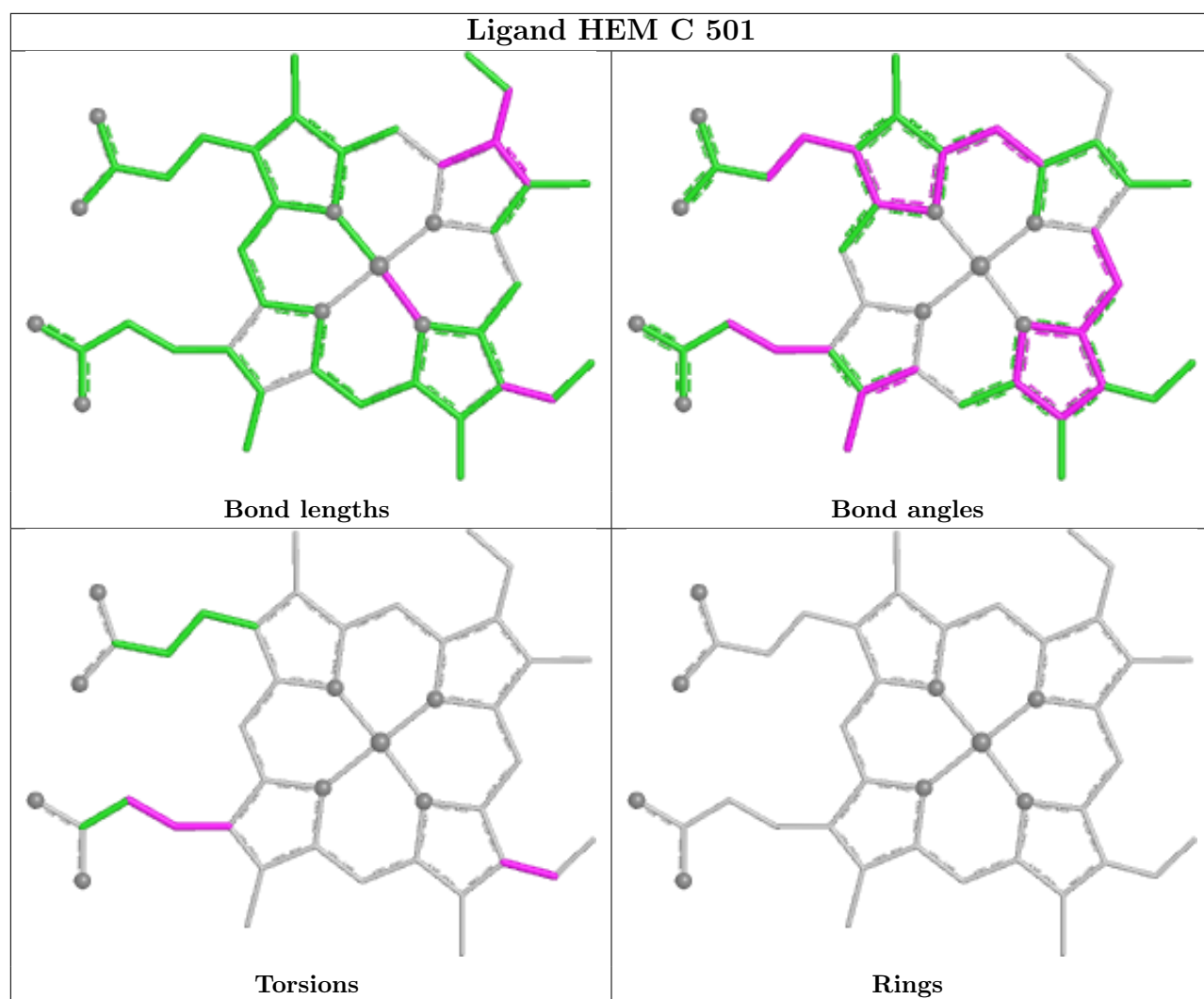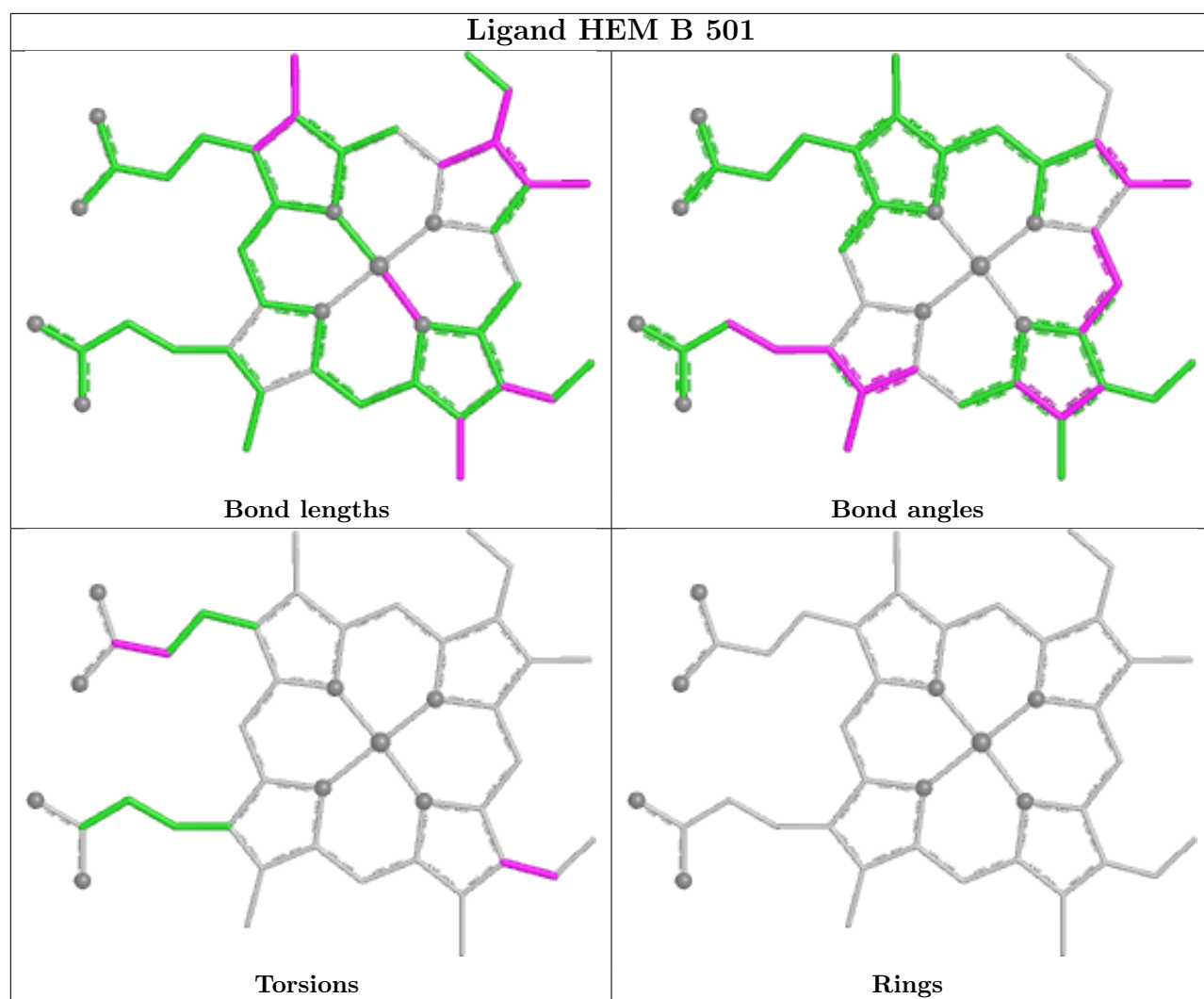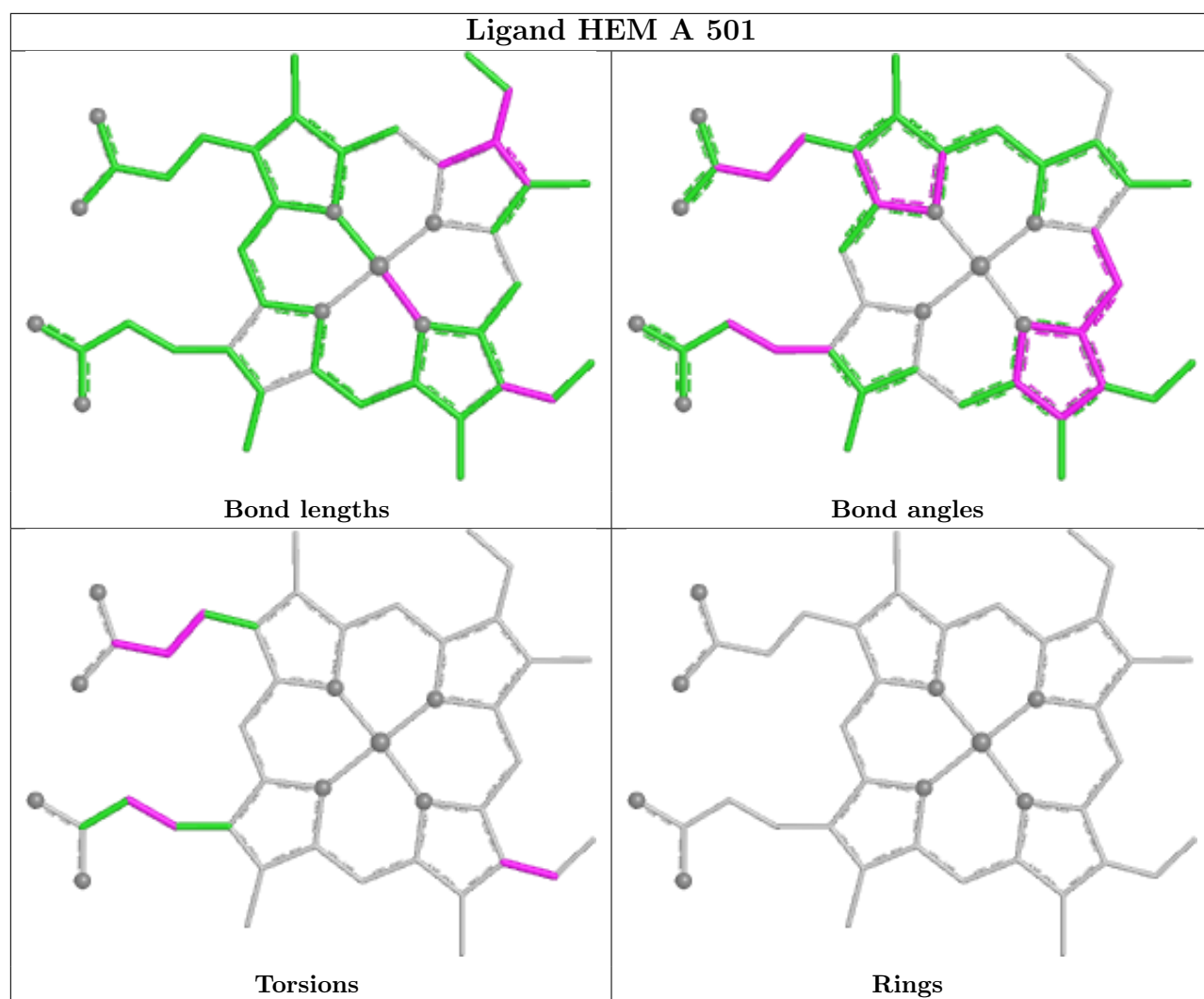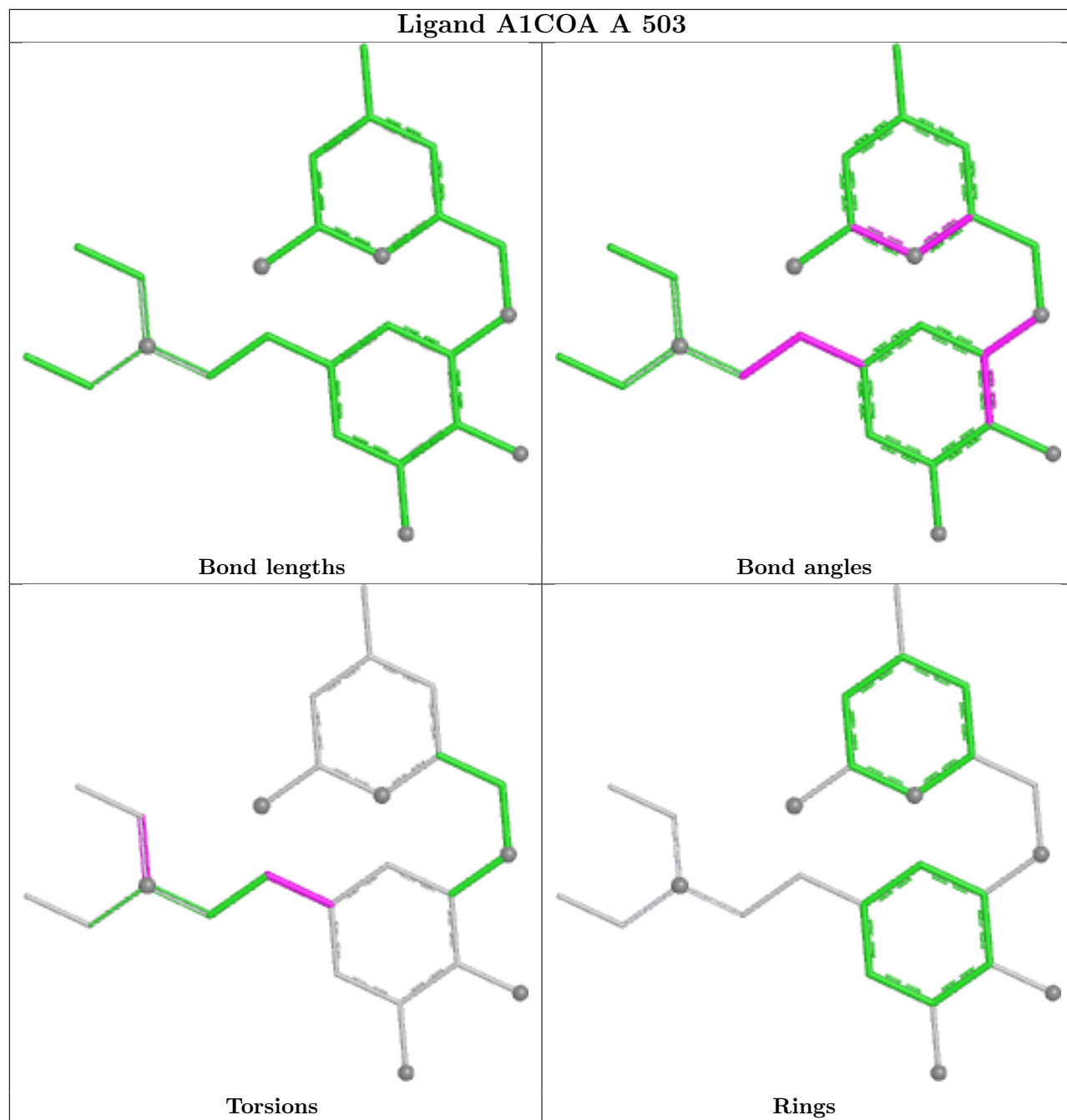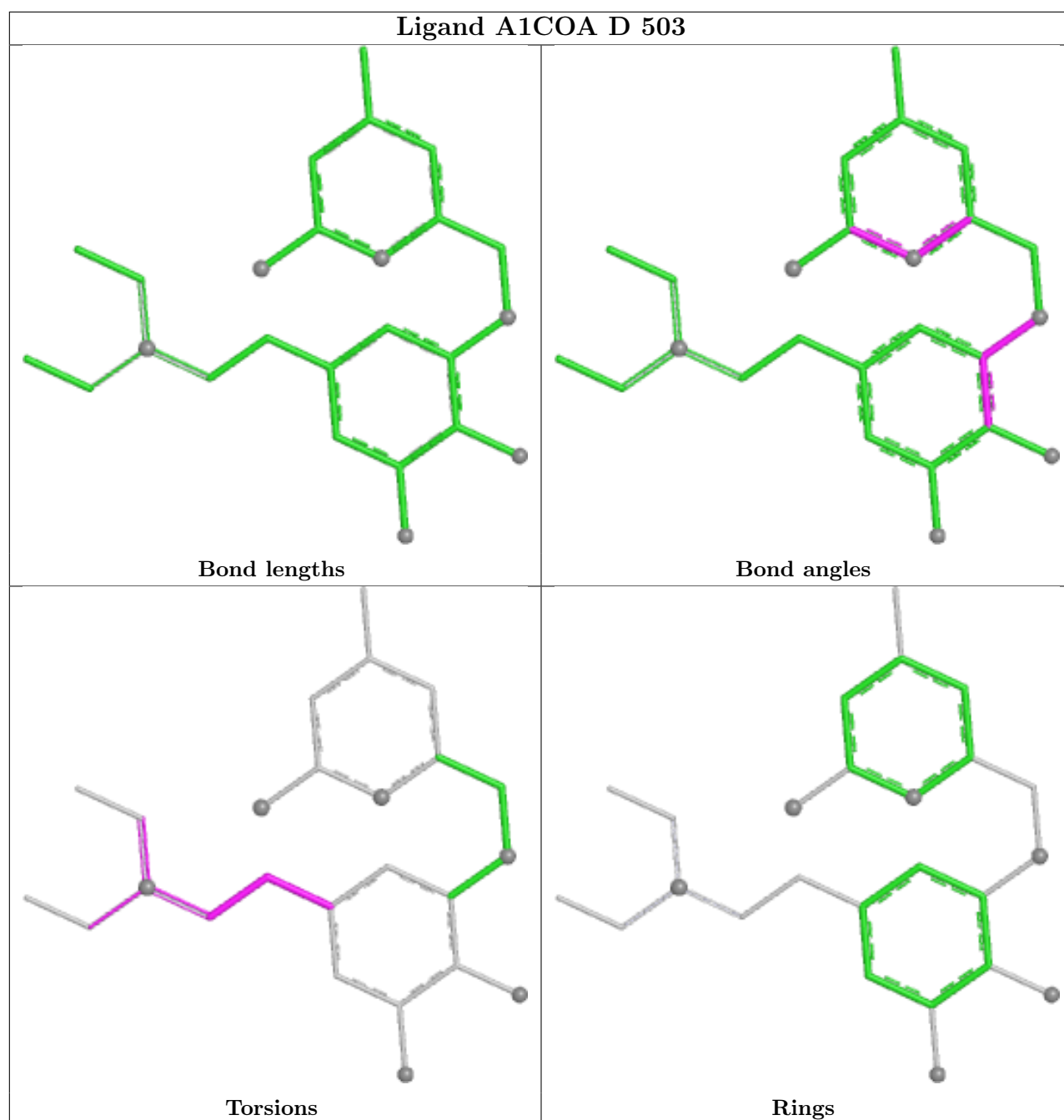
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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, 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%)	0.20	11 (2%)	56	54	20, 43, 81, 110	1 (0%)
1	B	402/440 (91%)	-0.27	6 (1%)	71	71	19, 29, 52, 107	1 (0%)
1	C	401/440 (91%)	0.35	14 (3%)	47	45	18, 44, 81, 106	1 (0%)
1	D	402/440 (91%)	-0.17	5 (1%)	76	76	17, 32, 65, 108	3 (0%)
All	All	1607/1760 (91%)	0.03	36 (2%)	62	60	17, 36, 77, 110	6 (0%)

The worst 5 of 36 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	106	PRO	6.0
1	A	106	PRO	4.5
1	D	106	PRO	3.8
1	C	120	PRO	3.8
1	B	106	PRO	3.7

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

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

6.3   Carbohydrates ⓘ

There are no oligosaccharides 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, 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(Å^2)	Q<0.9
5	BTB	B	505	14/14	0.60	0.22	63,68,79,84	0
6	GOL	A	507	6/6	0.60	0.17	83,85,87,89	0
6	GOL	D	506	6/6	0.62	0.18	65,72,72,73	0
6	GOL	B	506	6/6	0.67	0.16	64,69,72,72	0
5	BTB	D	505	14/14	0.72	0.17	39,64,71,71	0
4	A1COA	A	503	25/25	0.74	0.23	37,83,93,98	0
5	BTB	C	504	14/14	0.78	0.18	60,91,98,100	0
5	BTB	C	505	14/14	0.82	0.19	32,58,70,74	0
6	GOL	C	507	6/6	0.82	0.10	78,80,85,85	0
6	GOL	A	508	6/6	0.82	0.18	52,62,67,70	0
4	A1COA	C	503	25/25	0.83	0.21	41,83,99,107	0
4	A1COA	D	503	25/25	0.83	0.21	22,82,97,98	0
5	BTB	B	504	14/14	0.83	0.15	46,52,71,73	0
4	A1COA	B	503	25/25	0.85	0.20	24,80,92,95	0
5	BTB	D	504	14/14	0.87	0.14	37,47,57,58	0
5	BTB	A	505	14/14	0.89	0.17	10,49,64,65	0
6	GOL	C	506	6/6	0.89	0.14	39,60,72,73	0
6	GOL	D	507	6/6	0.89	0.15	53,59,60,63	0
5	BTB	A	504	14/14	0.90	0.15	17,65,74,78	0
3	H4B	A	502	17/17	0.91	0.10	29,39,45,49	0
6	GOL	A	506	6/6	0.92	0.10	36,40,55,57	0
3	H4B	C	502	17/17	0.92	0.09	35,44,50,50	0
8	GD	C	509	1/1	0.92	0.12	121,121,121,121	0
3	H4B	D	502	17/17	0.93	0.07	25,32,38,41	0
3	H4B	B	502	17/17	0.95	0.07	26,32,37,37	0
2	HEM	C	501	43/43	0.96	0.10	29,39,74,82	0
7	CL	C	508	1/1	0.97	0.09	48,48,48,48	0
8	GD	A	510	1/1	0.97	0.16	72,72,72,72	0
8	GD	B	508	1/1	0.97	0.04	37,37,37,37	0
2	HEM	A	501	43/43	0.97	0.08	25,34,63,72	0
7	CL	D	508	1/1	0.98	0.08	33,33,33,33	0
2	HEM	D	501	43/43	0.98	0.07	18,24,59,85	0
7	CL	B	507	1/1	0.98	0.06	37,37,37,37	0
2	HEM	B	501	43/43	0.98	0.07	15,22,49,71	0
9	ZN	C	510	1/1	0.98	0.03	30,30,30,30	0
8	GD	D	509	1/1	0.99	0.04	35,35,35,35	0
7	CL	A	509	1/1	0.99	0.09	43,43,43,43	0
10	CA	A	512	1/1	0.99	0.04	31,31,31,31	0
9	ZN	A	511	1/1	1.00	0.02	27,27,27,27	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 A1COA A 503:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
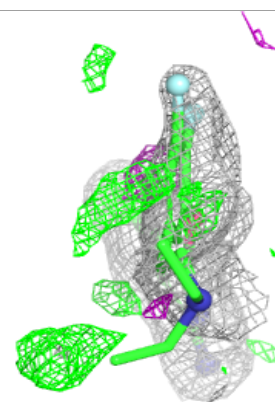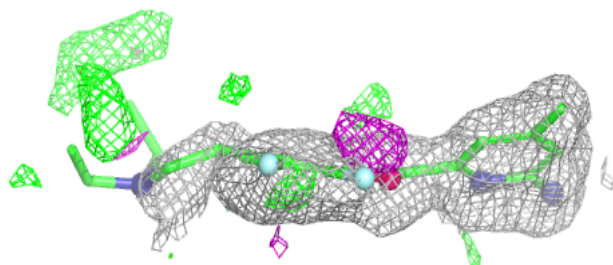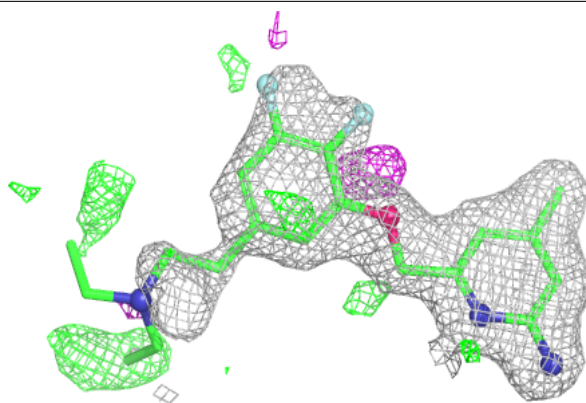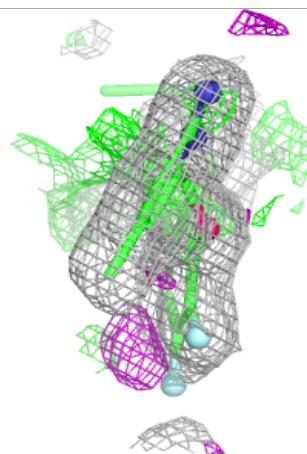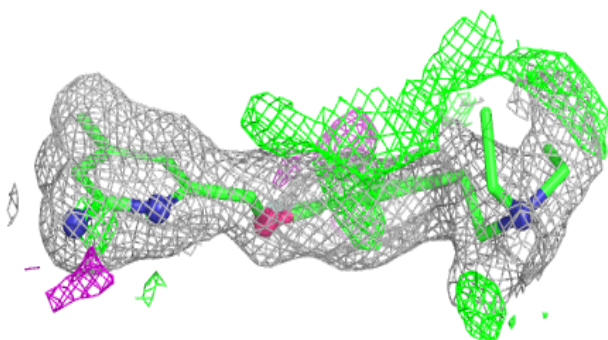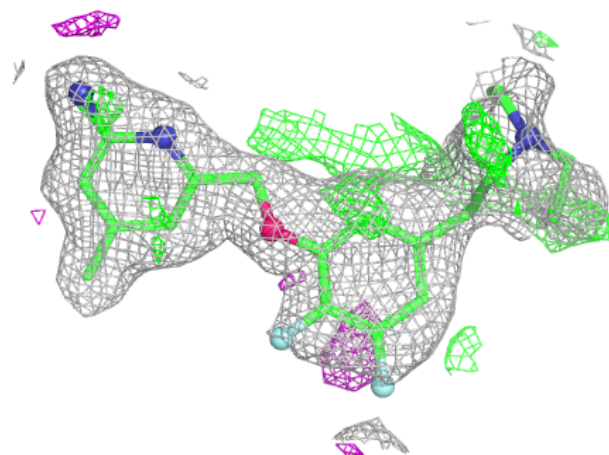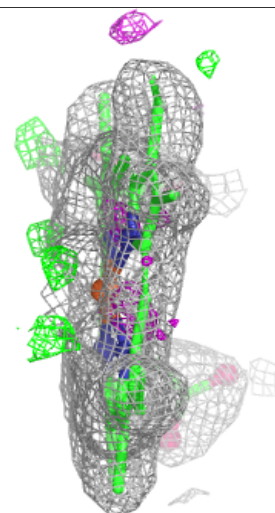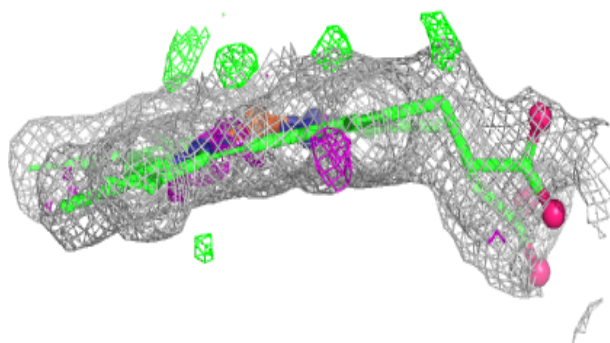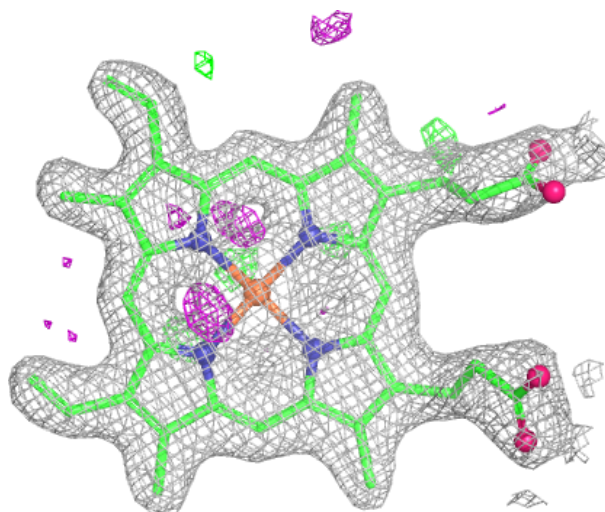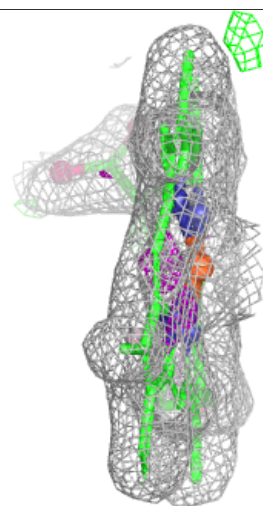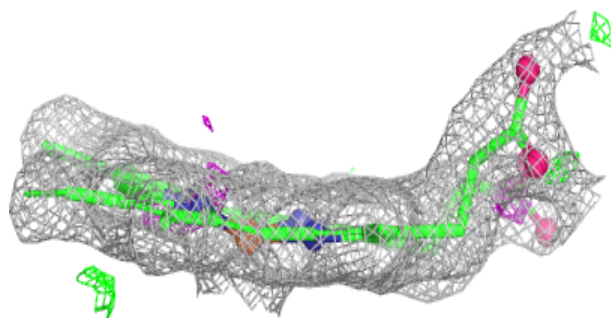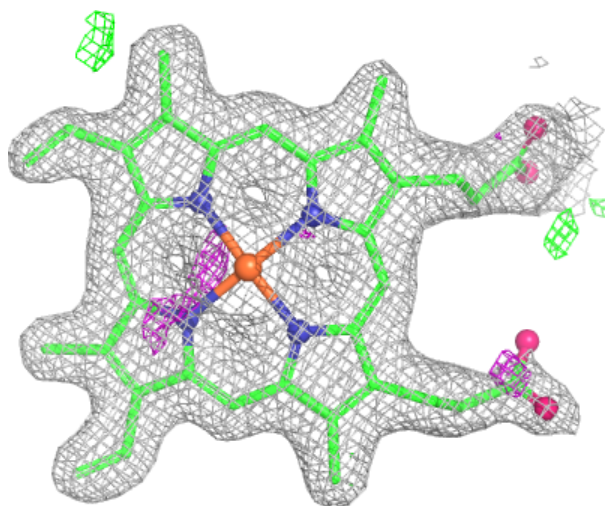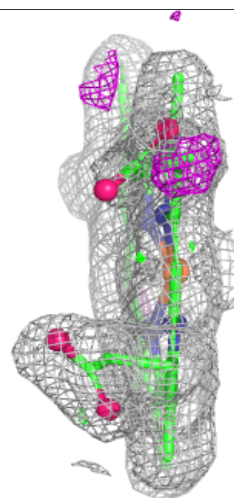and green (positive)
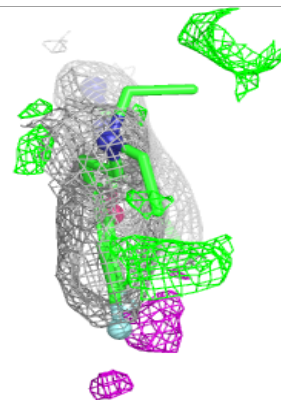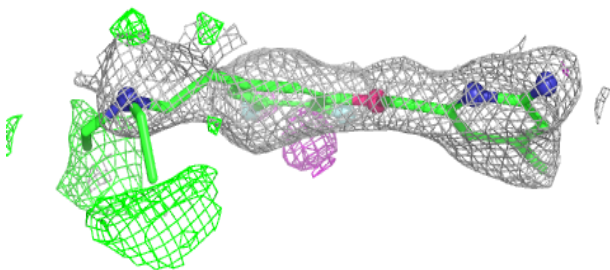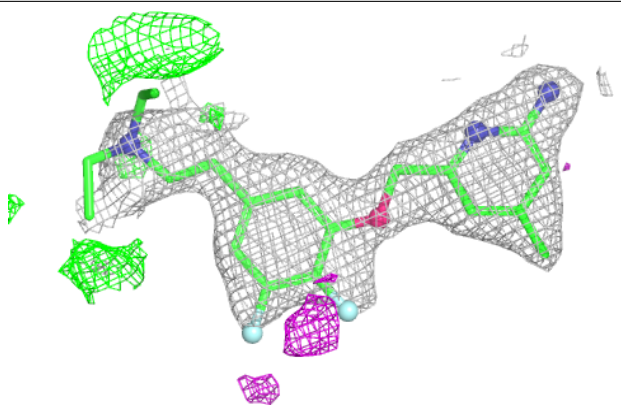
Electron density around A1COA C 503:

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mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
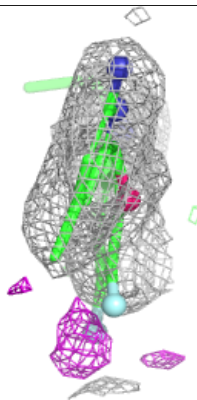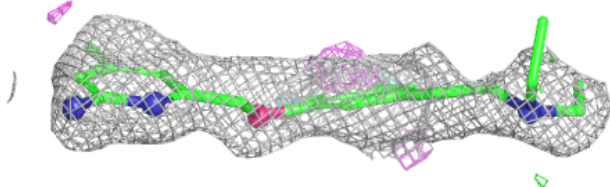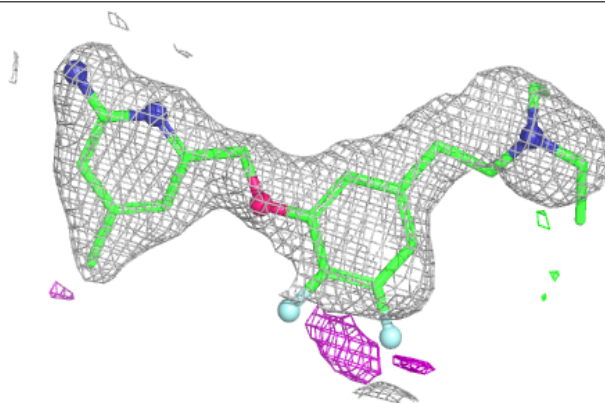
Electron density around A1COA D 503:

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and green (positive)

Electron density around A1COA B 503:

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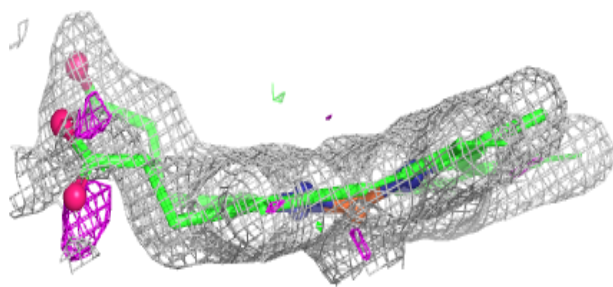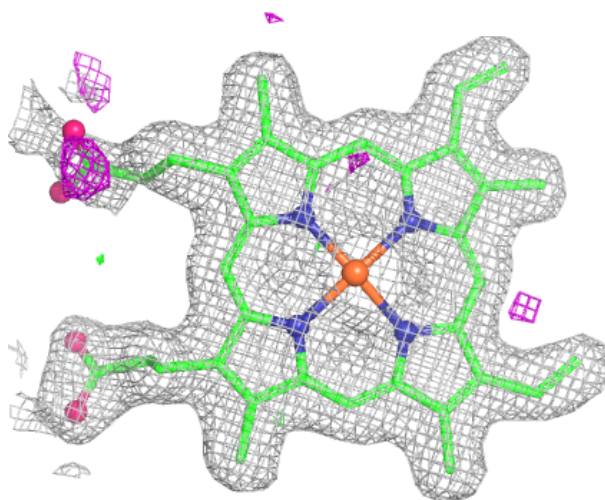and green (positive)

Electron density around HEM C 501:

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and green (positive)

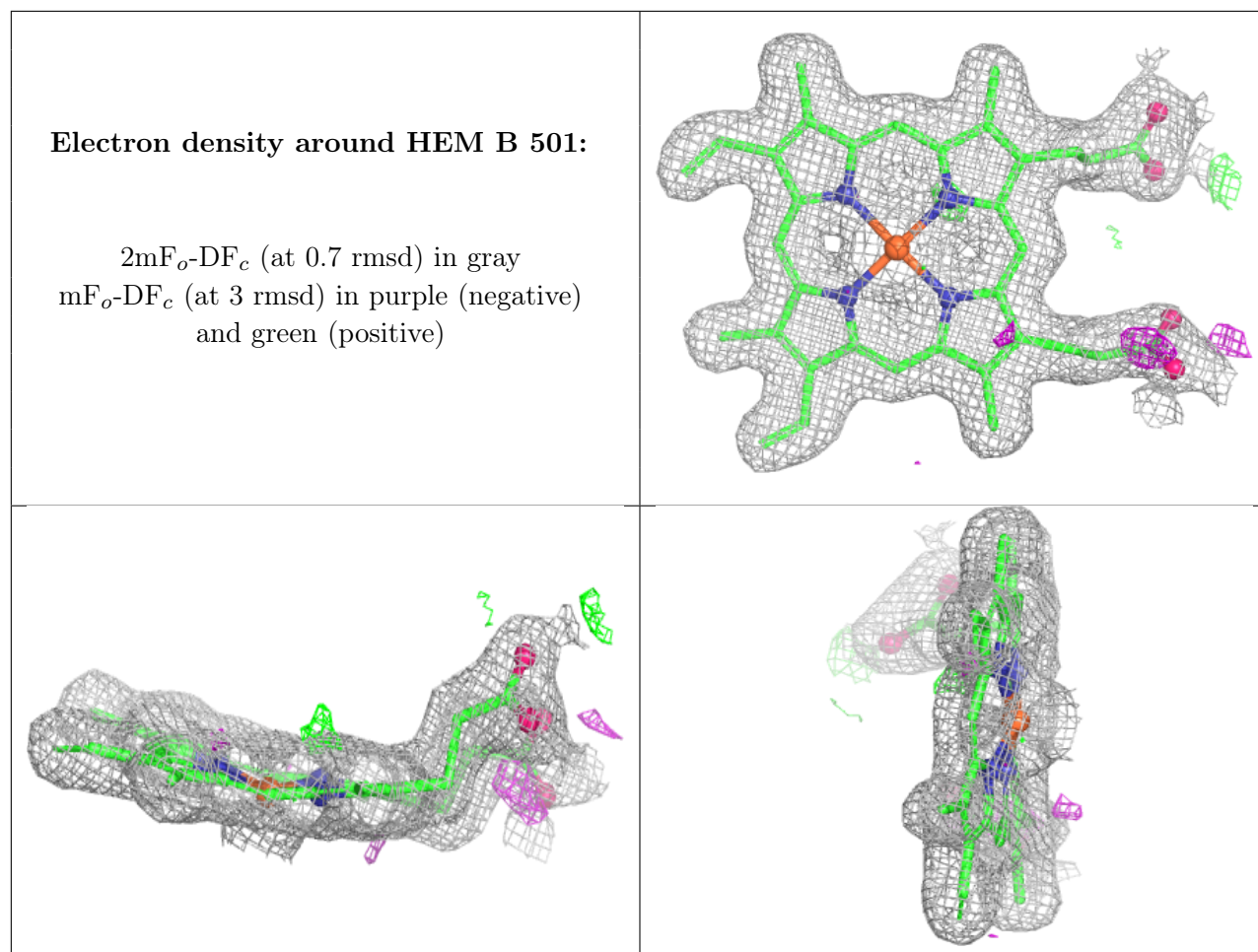**Electron density around HEM A 501:**

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$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around HEM D 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.