



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 5, 2023 – 03:02 AM EDT

PDB ID : 3UFV
Title : Structure of rat nitric oxide synthase heme domain in complex with 4-methyl-6-(((3R,4R)-4-((5-(4-methylpyridin-2-yl)pentyl)oxy)pyrrolidin-3-yl)methyl)pyridin-2-amine
Authors : Li, H.; Poulos, T.L.
Deposited on : 2011-11-01
Resolution : 2.08 Å(reported)

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

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

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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.35

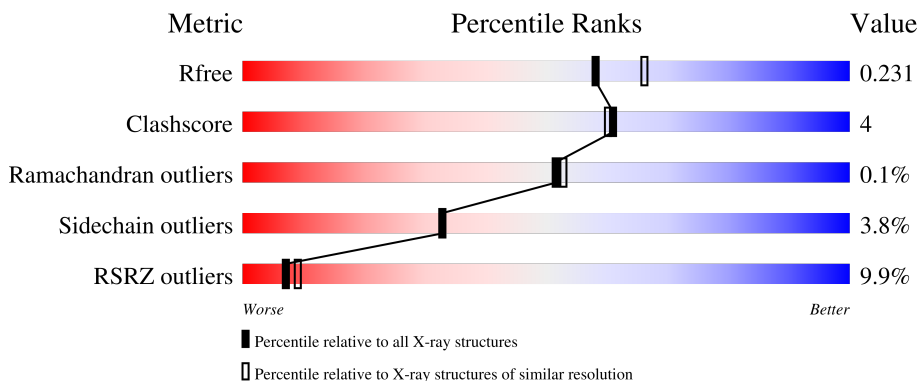
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.08 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	6189 (2.10-2.06)
Clashscore	141614	6738 (2.10-2.06)
Ramachandran outliers	138981	6663 (2.10-2.06)
Sidechain outliers	138945	6664 (2.10-2.06)
RSRZ outliers	127900	6057 (2.10-2.06)

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	422	
1	B	422	

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 7199 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, brain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	407	Total 3324	C 2128	N 567	O 607	S 22	0	3	0
1	B	411	Total 3367	C 2154	N 576	O 615	S 22	0	6	0

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



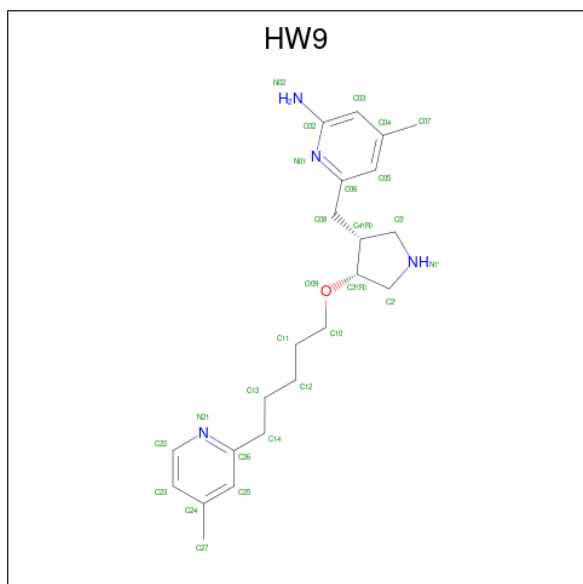
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	Fe	N			O
2	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

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



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

- Molecule 4 is 4-methyl-6-[[[(3R,4R)-4-[[5-(4-methylpyridin-2-yl)pentyl]oxy]pyrrolidin-3-yl]methyl]pyridin-2-amine (three-letter code: HW9) (formula: C₂₂H₃₂N₄O).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	27	22	4	1	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	B	1	27	22	4	1	0	0

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: C₂H₃O₂).



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

- Molecule 6 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
6	A	1	1	1	0	0

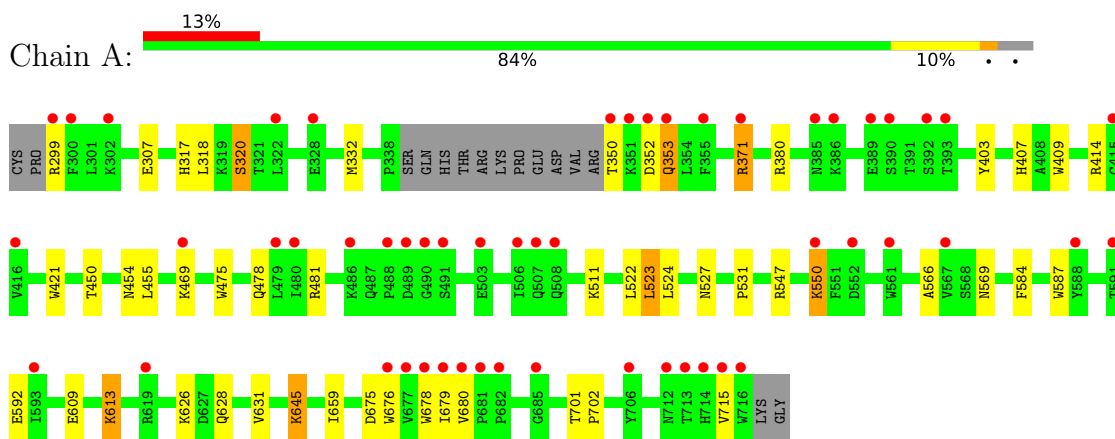
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
7	A	139	139	139	0	0
7	B	186	186	186	0	0

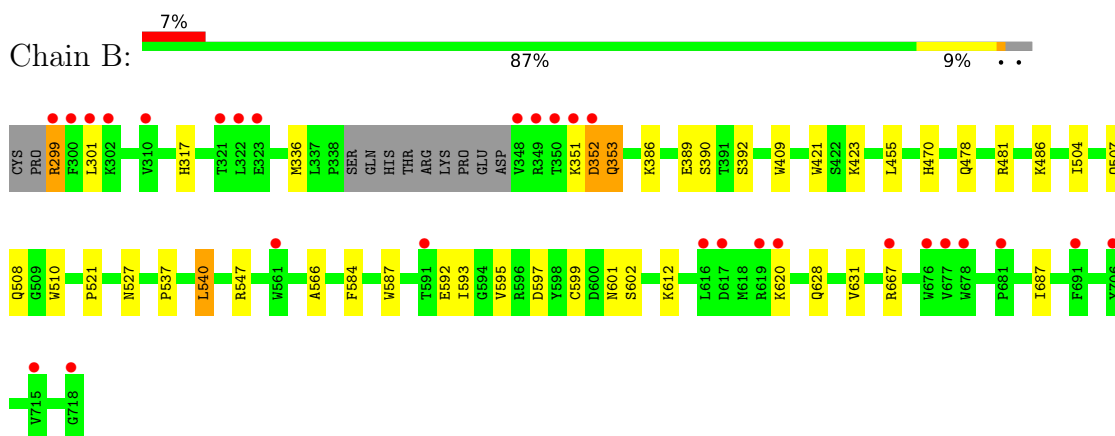
3 Residue-property plots [i](#)

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, brain



- Molecule 1: Nitric oxide synthase, brain



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	51.67Å 110.22Å 164.25Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.06 – 2.08 38.84 – 2.08	Depositor EDS
% Data completeness (in resolution range)	96.4 (41.06-2.08) 96.4 (38.84-2.08)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.48 (at 2.08Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.175 , 0.218 0.189 , 0.231	Depositor DCC
R_{free} test set	2745 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	35.9	Xtrriage
Anisotropy	0.156	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 48.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7199	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.38% 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: ACT, ZN, HW9, H4B, HEM

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	0.69	0/3426	0.69	0/4648
1	B	0.73	0/3478	0.71	0/4715
All	All	0.71	0/6904	0.70	0/9363

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	3324	0	3237	36	0
1	B	3367	0	3291	27	0
2	A	43	0	30	2	0
2	B	43	0	30	4	0
3	A	17	0	15	0	0
3	B	17	0	15	0	0
4	A	27	0	32	2	0
4	B	27	0	32	3	0
5	A	4	0	3	1	0
5	B	4	0	3	0	0
6	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	139	0	0	0	0
7	B	186	0	0	2	0
All	All	7199	0	6688	61	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 4.

All (61) 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:B:353:GLN:HE21	1:B:353:GLN:H	1.05	1.00
1:B:336:MET:HG2	4:B:800:HW9:H7	1.71	0.73
1:A:371:ARG:CG	1:A:371:ARG:HH21	2.06	0.69
1:A:317:HIS:O	1:A:320:SER:HB3	1.93	0.68
1:B:353:GLN:H	1:B:353:GLN:NE2	1.86	0.67
1:A:371:ARG:NH2	1:A:371:ARG:HG2	2.11	0.66
1:B:352:ASP:HB3	1:B:353:GLN:HE21	1.62	0.65
1:A:609:GLU:O	1:A:613:LYS:HG2	1.98	0.64
2:A:750:HEM:HMB3	5:A:860:ACT:H2	1.79	0.64
1:A:645:LYS:HB2	1:A:645:LYS:NZ	2.13	0.63
1:A:371:ARG:HH21	1:A:371:ARG:HG2	1.64	0.63
1:B:352:ASP:HB3	1:B:353:GLN:NE2	2.15	0.60
1:A:371:ARG:CG	1:A:371:ARG:NH2	2.68	0.55
1:A:645:LYS:HB2	1:A:645:LYS:HZ1	1.71	0.55
1:B:667:ARG:CZ	7:B:1160:HOH:O	2.57	0.52
1:A:592:GLU:OE1	4:A:800:HW9:H27	2.10	0.52
1:A:626:LYS:HB3	1:B:687:ILE:HD12	1.93	0.51
1:A:409:TRP:CE3	1:A:421:TRP:HA	2.46	0.50
1:B:595:VAL:O	1:B:599:CYS:HB2	2.11	0.50
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.94	0.49
1:A:523:LEU:HD22	1:A:531:PRO:HB2	1.94	0.49
1:A:628:GLN:HG3	1:B:631:VAL:HG11	1.95	0.49
1:A:403:TYR:CE1	1:A:407:HIS:CE1	3.01	0.48
2:B:750:HEM:C1C	4:B:800:HW9:H33	2.49	0.48
2:A:750:HEM:C4B	4:A:800:HW9:H29	2.49	0.48
1:A:350:THR:N	1:A:353:GLN:HE22	2.12	0.47
1:B:584:PHE:CD1	2:B:750:HEM:CAC	2.98	0.47
1:B:386:LYS:HA	1:B:389:GLU:HG2	1.97	0.47
1:B:537:PRO:HG2	1:B:540:LEU:HD22	1.97	0.47
1:A:332:MET:CE	1:B:301:LEU:HD22	2.46	0.46
1:A:475:TRP:HB2	1:A:523:LEU:HB3	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:507:GLN:NE2	7:B:1123:HOH:O	2.49	0.45
1:A:307:GLU:OE1	1:B:601[A]:ASN:OD1	2.34	0.45
1:A:350:THR:N	1:A:353:GLN:NE2	2.64	0.45
1:A:353:GLN:H	1:A:353:GLN:HG3	1.60	0.45
1:A:550:LYS:HB2	1:A:550:LYS:HE2	1.42	0.45
1:B:504:ILE:O	1:B:508:GLN:HG2	2.16	0.45
1:B:584:PHE:CD1	2:B:750:HEM:HAC	2.52	0.44
1:A:475:TRP:CE2	1:A:531:PRO:HG3	2.52	0.44
1:B:592:GLU:OE1	4:B:800:HW9:H27	2.18	0.44
1:B:478:GLN:HB2	1:B:481:ARG:HG3	2.00	0.44
1:B:299:ARG:HG2	1:B:317:HIS:NE2	2.32	0.44
1:B:587:TRP:H	2:B:750:HEM:HAB	1.83	0.43
1:A:566:ALA:HA	1:A:584:PHE:O	2.19	0.43
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.54	0.43
1:A:450:THR:HA	1:A:455:LEU:HD22	2.00	0.42
1:A:414:ARG:HD3	1:A:678:TRP:CD2	2.55	0.42
1:B:470:HIS:HB3	1:B:527[A]:ASN:ND2	2.34	0.42
1:A:676:TRP:CZ2	1:A:680:VAL:HG21	2.55	0.41
1:B:593:ILE:HA	1:B:597:ASP:HB2	2.01	0.41
1:A:522:LEU:HB3	1:A:524:LEU:HD21	2.02	0.41
1:A:631:VAL:HG11	1:B:628:GLN:HG2	2.03	0.41
1:A:524:LEU:O	1:A:531:PRO:HA	2.21	0.41
1:A:527:ASN:HD22	1:A:527:ASN:HA	1.70	0.41
1:A:701:THR:HA	1:A:702:PRO:C	2.41	0.41
1:A:455:LEU:HD12	1:A:587:TRP:HB3	2.03	0.41
1:A:675:ASP:O	1:A:679:ILE:HG12	2.21	0.40
1:B:566:ALA:HA	1:B:584:PHE:O	2.22	0.40
1:A:299:ARG:O	1:A:318:LEU:HD21	2.21	0.40
1:A:659:ILE:HD13	1:A:659:ILE:HA	1.98	0.40
1:B:510:TRP:CE2	1:B:521:PRO:HD3	2.57	0.40

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	406/422 (96%)	393 (97%)	13 (3%)	0	100	100
1	B	413/422 (98%)	404 (98%)	8 (2%)	1 (0%)	47	47
All	All	819/844 (97%)	797 (97%)	21 (3%)	1 (0%)	51	53

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	352	ASP

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	366/377 (97%)	351 (96%)	15 (4%)	30	30
1	B	372/377 (99%)	358 (96%)	14 (4%)	33	33
All	All	738/754 (98%)	709 (96%)	29 (4%)	33	32

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	320	SER
1	A	352	ASP
1	A	353	GLN
1	A	371	ARG
1	A	380	ARG
1	A	454	ASN
1	A	469	LYS
1	A	511	LYS
1	A	523	LEU
1	A	547	ARG
1	A	550	LYS
1	A	569	ASN

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Mol	Chain	Res	Type
1	A	613	LYS
1	A	645	LYS
1	A	715	VAL
1	B	299	ARG
1	B	351	LYS
1	B	353	GLN
1	B	390	SER
1	B	392	SER
1	B	423	LYS
1	B	455	LEU
1	B	486	LYS
1	B	540	LEU
1	B	547	ARG
1	B	602[A]	SER
1	B	602[B]	SER
1	B	612	LYS
1	B	620	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	436	HIS
1	A	440	ASN
1	A	454	ASN
1	A	507	GLN
1	A	527	ASN
1	A	569	ASN
1	A	605	ASN
1	A	642	GLN
1	A	697	ASN
1	A	712	ASN
1	B	353	GLN
1	B	425	GLN
1	B	454	ASN
1	B	507	GLN
1	B	605	ASN
1	B	697	ASN

5.3.3 RNA ⓘ

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 9 ligands modelled in this entry, 1 is monoatomic - leaving 8 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
3	H4B	A	760	-	16,18,18	0.71	0	11,26,26	3.07	6 (54%)
2	HEM	B	750	1	41,50,50	1.94	8 (19%)	45,82,82	1.70	9 (20%)
5	ACT	B	860	-	3,3,3	0.87	0	3,3,3	0.51	0
2	HEM	A	750	1	41,50,50	1.89	9 (21%)	45,82,82	1.90	11 (24%)
4	HW9	A	800	-	28,29,29	0.65	0	32,38,38	2.03	8 (25%)
4	HW9	B	800	-	28,29,29	0.63	0	32,38,38	1.89	6 (18%)
5	ACT	A	860	-	3,3,3	0.78	0	3,3,3	0.73	0
3	H4B	B	760	-	16,18,18	1.11	1 (6%)	11,26,26	2.56	4 (36%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	H4B	A	760	-	-	0/8/17/17	0/2/2/2
2	HEM	B	750	1	-	2/12/54/54	-
2	HEM	A	750	1	-	0/12/54/54	-
4	HW9	A	800	-	-	7/13/23/23	0/3/3/3
4	HW9	B	800	-	-	6/13/23/23	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	H4B	B	760	-	-	0/8/17/17	0/2/2/2

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	750	HEM	C3D-C2D	7.57	1.52	1.36
2	B	750	HEM	C3D-C2D	7.26	1.52	1.36
2	B	750	HEM	C3C-C2C	-4.60	1.34	1.40
2	A	750	HEM	C3C-CAC	3.19	1.54	1.47
2	A	750	HEM	C3C-C2C	-3.00	1.36	1.40
2	B	750	HEM	FE-ND	3.00	2.11	1.96
2	B	750	HEM	C3C-CAC	2.99	1.53	1.47
2	B	750	HEM	CMB-C2B	2.91	1.57	1.50
2	A	750	HEM	CMD-C2D	2.79	1.56	1.50
3	B	760	H4B	C7-N8	2.76	1.49	1.44
2	A	750	HEM	CAB-C3B	2.64	1.54	1.47
2	B	750	HEM	CAB-C3B	2.47	1.54	1.47
2	A	750	HEM	CMC-C2C	2.29	1.57	1.51
2	A	750	HEM	CMB-C2B	2.29	1.55	1.50
2	B	750	HEM	CAA-C2A	2.24	1.55	1.52
2	A	750	HEM	C3B-C2B	-2.10	1.33	1.37
2	A	750	HEM	FE-ND	2.06	2.07	1.96
2	B	750	HEM	C4A-NA	2.03	1.40	1.36

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	800	HW9	C02-N01-C06	6.53	123.05	118.10
3	A	760	H4B	C4-C4A-N5	5.94	124.10	119.12
3	B	760	H4B	C8A-C4A-C4	5.84	119.76	114.57
2	A	750	HEM	C4D-ND-C1D	5.62	110.88	105.07
4	A	800	HW9	C02-N01-C06	5.34	122.14	118.10
2	B	750	HEM	C4D-ND-C1D	5.20	110.44	105.07
2	B	750	HEM	CBA-CAA-C2A	-5.14	103.84	112.62
2	A	750	HEM	CBA-CAA-C2A	-4.95	104.17	112.62
3	A	760	H4B	C8A-C4A-C4	4.36	118.44	114.57
4	A	800	HW9	C23-C22-N21	-4.13	118.83	123.96
4	A	800	HW9	C24-C25-C26	-3.79	117.83	120.32
3	A	760	H4B	N1-C2-N3	-3.63	119.72	125.42
4	B	800	HW9	C5'-N1'-C2'	3.57	113.84	105.42
3	A	760	H4B	C2-N3-C4	3.50	121.49	115.93
2	A	750	HEM	C4B-CHC-C1C	3.49	127.16	122.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	750	HEM	C2C-C3C-C4C	3.46	109.31	106.90
4	A	800	HW9	C5'-N1'-C2'	3.40	113.44	105.42
4	A	800	HW9	C22-N21-C26	3.37	122.04	117.42
3	B	760	H4B	C2-N3-C4	3.34	121.24	115.93
3	A	760	H4B	C2-N1-C8A	3.27	121.87	114.54
4	B	800	HW9	C22-N21-C26	3.02	121.56	117.42
2	A	750	HEM	CBD-CAD-C3D	-2.99	104.33	112.63
2	B	750	HEM	C4B-CHC-C1C	2.98	126.49	122.56
2	A	750	HEM	CHC-C4B-C3B	2.93	129.06	124.57
2	B	750	HEM	CBD-CAD-C3D	-2.93	104.48	112.63
4	A	800	HW9	C04-C05-C06	-2.87	118.44	120.32
4	B	800	HW9	C23-C22-N21	-2.86	120.40	123.96
2	A	750	HEM	CHA-C4D-ND	2.85	127.90	124.38
3	B	760	H4B	N1-C2-N3	-2.73	121.13	125.42
4	A	800	HW9	C12-C13-C14	-2.72	103.20	113.76
4	A	800	HW9	C07-C04-C05	-2.62	117.06	120.94
2	B	750	HEM	C1D-C2D-C3D	-2.55	104.28	106.96
2	A	750	HEM	O1A-CGA-CBA	-2.39	115.41	123.08
3	B	760	H4B	C2-N1-C8A	2.34	119.79	114.54
2	A	750	HEM	C1D-C2D-C3D	-2.28	104.56	106.96
4	B	800	HW9	C05-C06-N01	-2.25	120.51	122.90
2	B	750	HEM	C3C-C4C-NC	-2.22	106.74	110.94
2	A	750	HEM	CMA-C3A-C4A	-2.22	125.05	128.46
2	A	750	HEM	CMC-C2C-C3C	2.20	128.78	124.68
2	B	750	HEM	CHC-C4B-NB	2.16	126.77	124.43
4	B	800	HW9	C12-C13-C14	-2.15	105.41	113.76
2	A	750	HEM	C2C-C3C-C4C	2.13	108.39	106.90
3	A	760	H4B	N2-C2-N1	2.12	120.56	117.25
2	B	750	HEM	CMD-C2D-C1D	2.11	128.25	125.04

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	800	HW9	C05-C06-C08-C4'
4	A	800	HW9	N01-C06-C08-C4'
4	B	800	HW9	C05-C06-C08-C4'
4	B	800	HW9	N01-C06-C08-C4'
4	B	800	HW9	C2'-C3'-O09-C10
4	A	800	HW9	C12-C13-C14-C26
4	B	800	HW9	C4'-C3'-O09-C10
4	A	800	HW9	C10-C11-C12-C13

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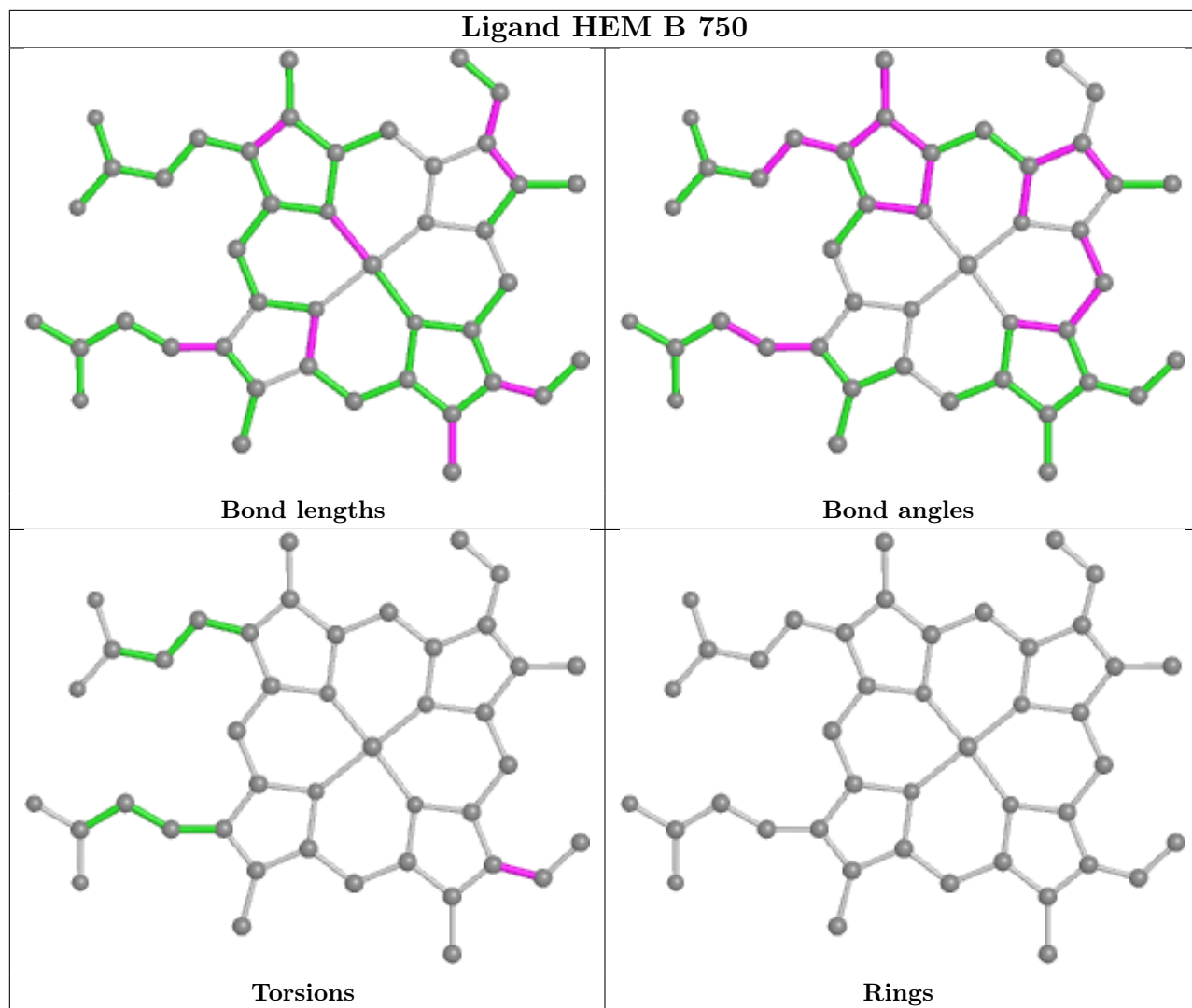
Mol	Chain	Res	Type	Atoms
2	B	750	HEM	C2B-C3B-CAB-CBB
2	B	750	HEM	C4B-C3B-CAB-CBB
4	B	800	HW9	O09-C10-C11-C12
4	A	800	HW9	C11-C10-O09-C3'
4	A	800	HW9	O09-C10-C11-C12
4	A	800	HW9	C13-C14-C26-N21
4	B	800	HW9	C13-C14-C26-N21

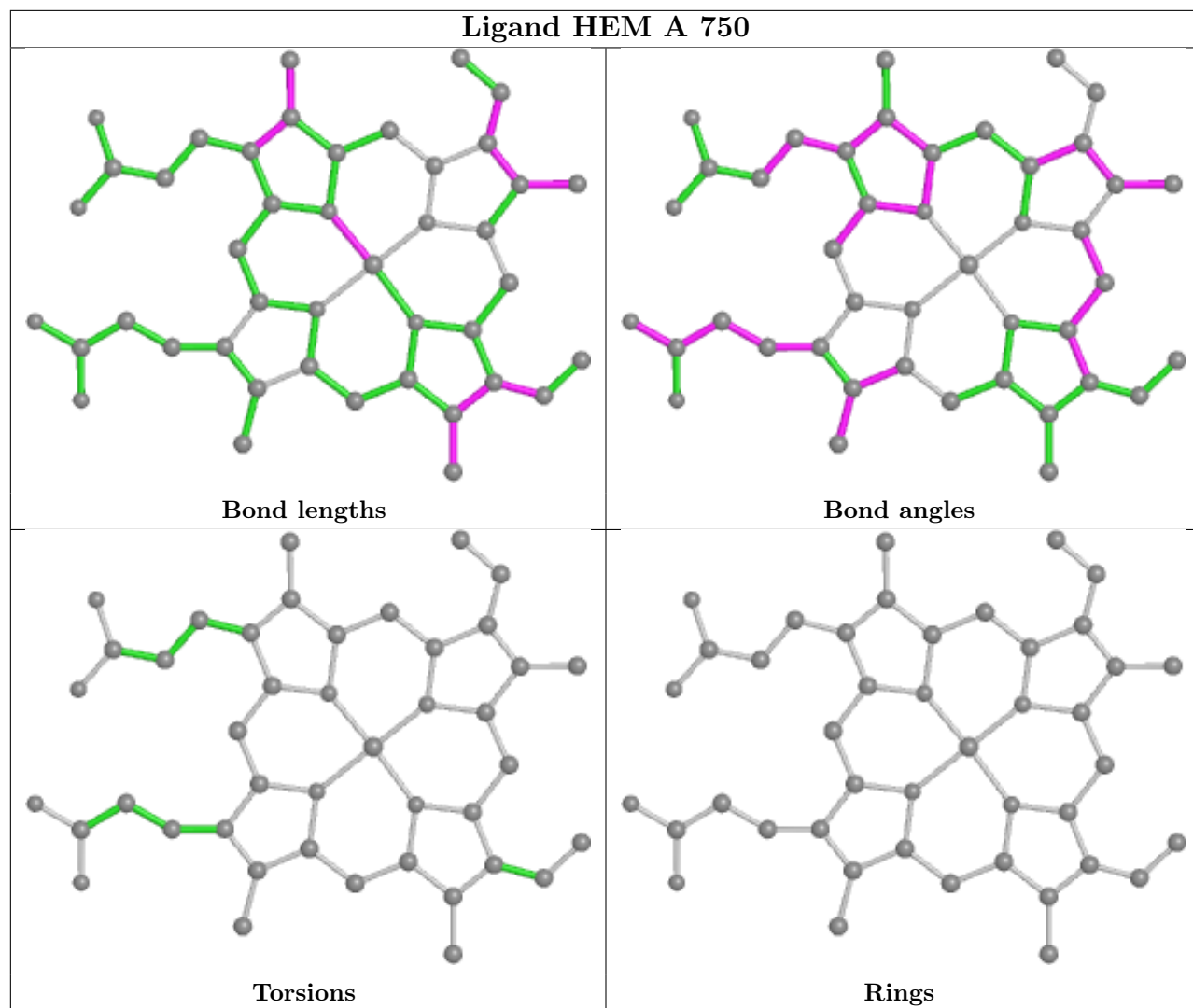
There are no ring outliers.

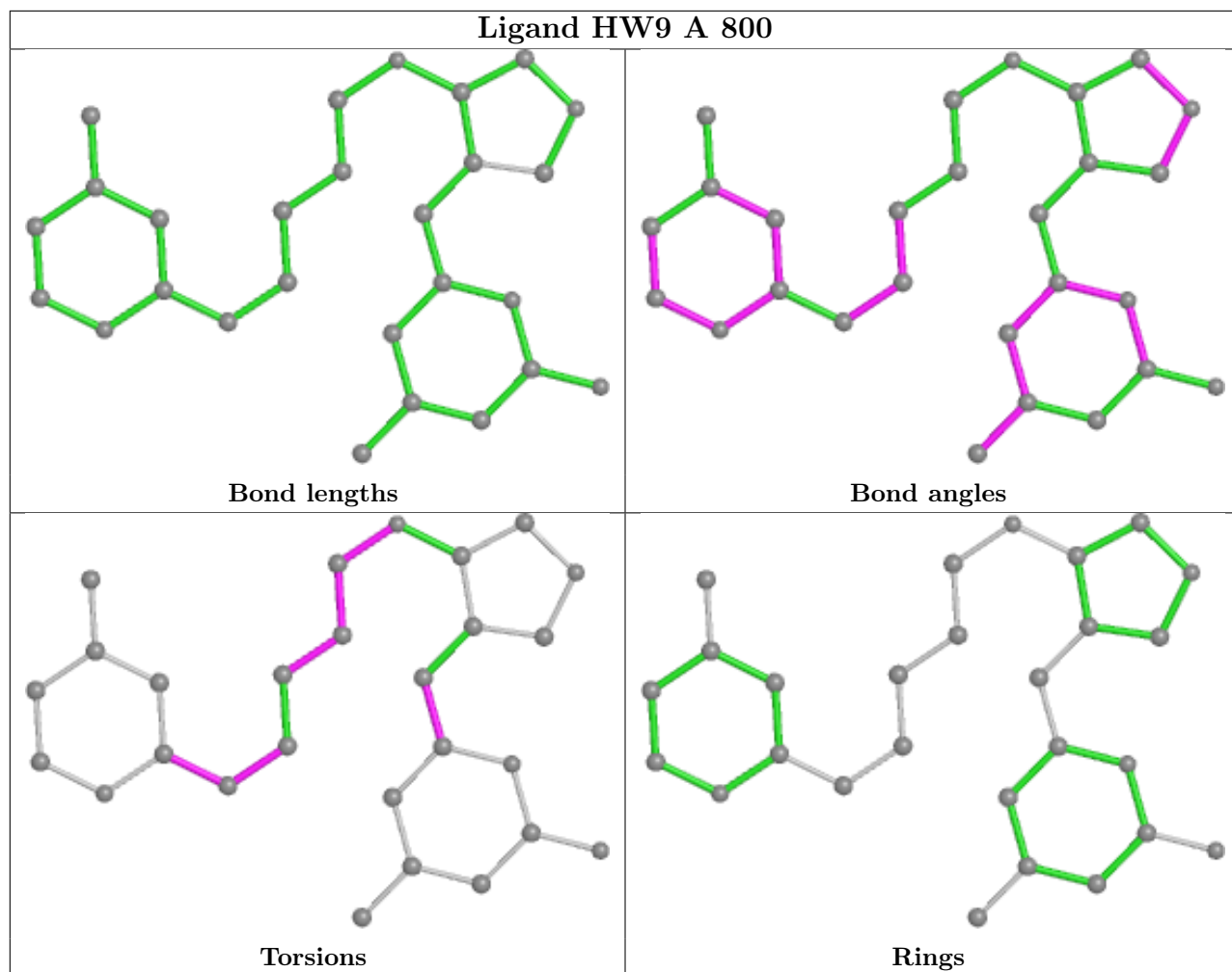
5 monomers are involved in 9 short contacts:

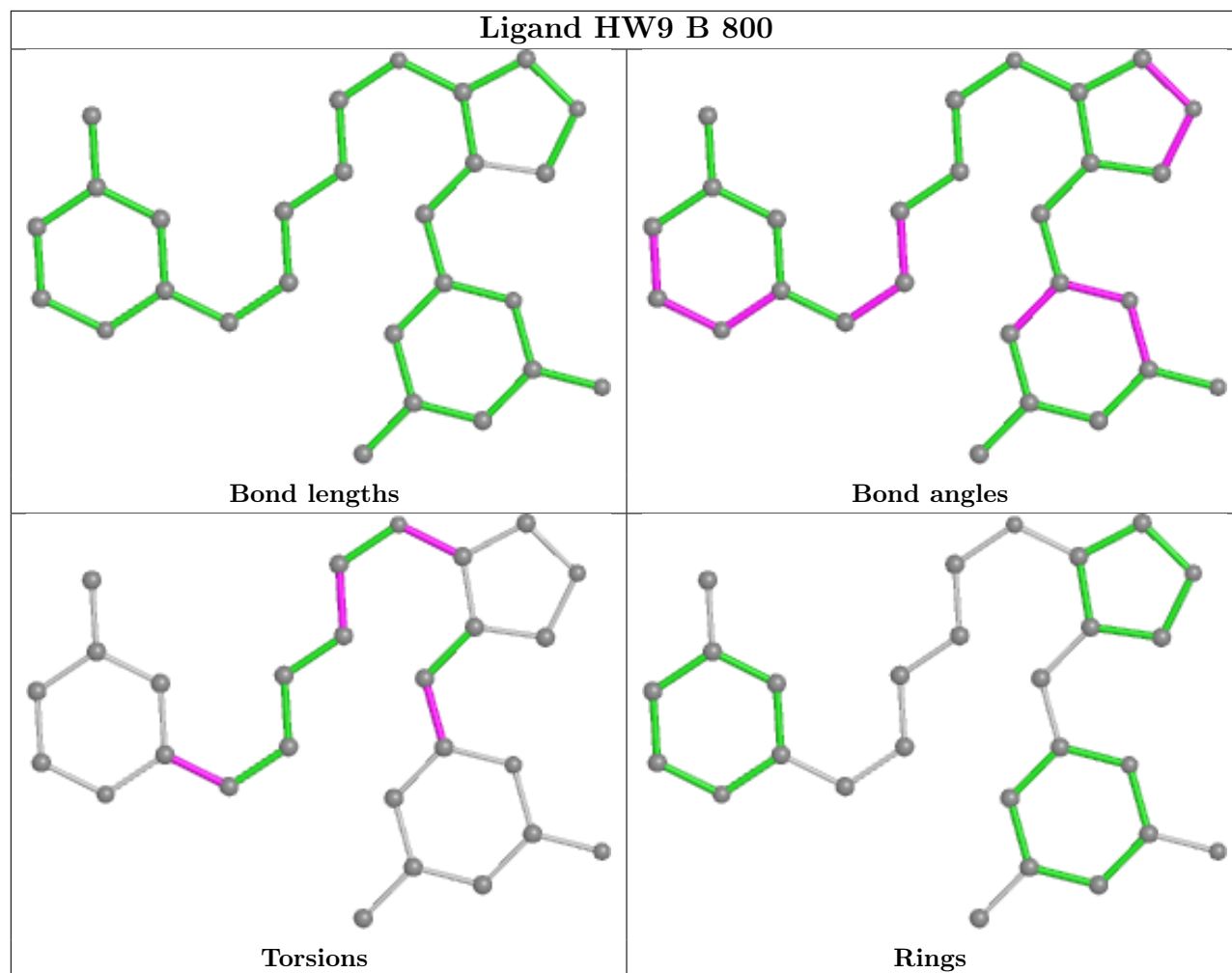
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	750	HEM	4	0
2	A	750	HEM	2	0
4	A	800	HW9	2	0
4	B	800	HW9	3	0
5	A	860	ACT	1	0

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

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	407/422 (96%)	0.70	53 (13%) 3 4	26, 44, 75, 95	0
1	B	411/422 (97%)	0.31	28 (6%) 17 21	24, 38, 62, 89	0
All	All	818/844 (96%)	0.50	81 (9%) 7 9	24, 41, 70, 95	0

All (81) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	350	THR	8.4
1	A	716	TRP	8.0
1	A	352	ASP	7.2
1	B	300	PHE	7.1
1	A	488	PRO	6.7
1	A	715	VAL	6.1
1	A	351	LYS	6.0
1	A	350	THR	5.9
1	A	300	PHE	5.3
1	A	713	THR	4.9
1	B	718	GLY	4.7
1	B	348	VAL	4.5
1	B	351	LYS	4.5
1	A	355	PHE	4.4
1	B	715	VAL	4.2
1	A	714	HIS	4.0
1	B	619	ARG	3.7
1	A	322	LEU	3.7
1	B	321	THR	3.6
1	B	352	ASP	3.5
1	A	486	LYS	3.5
1	A	389	GLU	3.4
1	A	678	TRP	3.4
1	A	507	GLN	3.4

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Mol	Chain	Res	Type	RSRZ
1	A	353	GLN	3.3
1	A	706	TYR	3.3
1	A	677	VAL	3.2
1	A	503	GLU	3.2
1	A	390	SER	3.2
1	A	299	ARG	3.1
1	A	480	ILE	3.0
1	A	567	VAL	3.0
1	A	508	GLN	2.9
1	A	712	ASN	2.9
1	A	392	SER	2.8
1	A	619	ARG	2.8
1	B	349	ARG	2.8
1	A	593	ILE	2.8
1	A	680	VAL	2.7
1	A	676	TRP	2.7
1	B	322	LEU	2.7
1	B	620	LYS	2.6
1	A	491	SER	2.5
1	A	588	TYR	2.5
1	A	393	THR	2.5
1	A	489	ASP	2.5
1	B	677	VAL	2.5
1	A	328	GLU	2.5
1	B	691	PHE	2.5
1	A	371	ARG	2.5
1	B	616	LEU	2.4
1	A	679	ILE	2.4
1	A	591	THR	2.4
1	B	667	ARG	2.4
1	B	310	VAL	2.4
1	B	706	TYR	2.4
1	A	386	LYS	2.3
1	A	561	TRP	2.3
1	B	617	ASP	2.3
1	B	681	PRO	2.2
1	B	678	TRP	2.2
1	B	591	THR	2.2
1	B	323	GLU	2.2
1	B	302	LYS	2.2
1	A	506	ILE	2.1
1	A	479	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	685	GLY	2.1
1	A	302	LYS	2.1
1	A	490	GLY	2.1
1	B	301	LEU	2.1
1	A	550	LYS	2.1
1	A	385	ASN	2.1
1	B	299	ARG	2.1
1	A	681	PRO	2.1
1	B	676	TRP	2.1
1	A	415	CYS	2.1
1	A	416	VAL	2.0
1	A	552	ASP	2.0
1	A	682	PRO	2.0
1	B	561	TRP	2.0
1	A	469	LYS	2.0

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 monosaccharides 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.

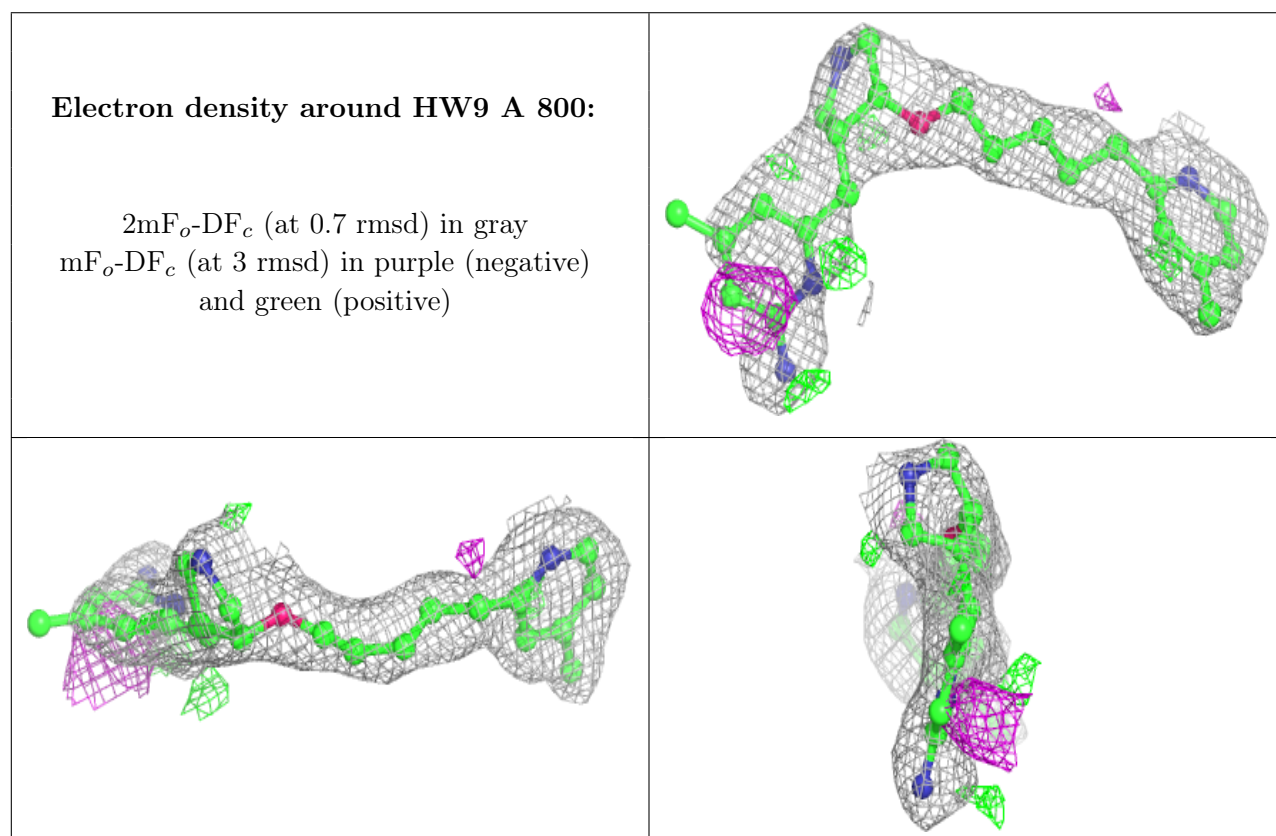
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	HW9	A	800	27/27	0.84	0.33	34,59,64,66	0
4	HW9	B	800	27/27	0.87	0.29	32,48,58,61	0
5	ACT	A	860	4/4	0.93	0.23	56,56,57,59	0
3	H4B	A	760	17/17	0.97	0.20	27,31,35,36	0
2	HEM	A	750	43/43	0.97	0.22	26,32,39,41	0
5	ACT	B	860	4/4	0.97	0.14	47,50,50,52	0
2	HEM	B	750	43/43	0.98	0.20	22,26,36,43	0
3	H4B	B	760	17/17	0.98	0.20	25,30,38,39	0

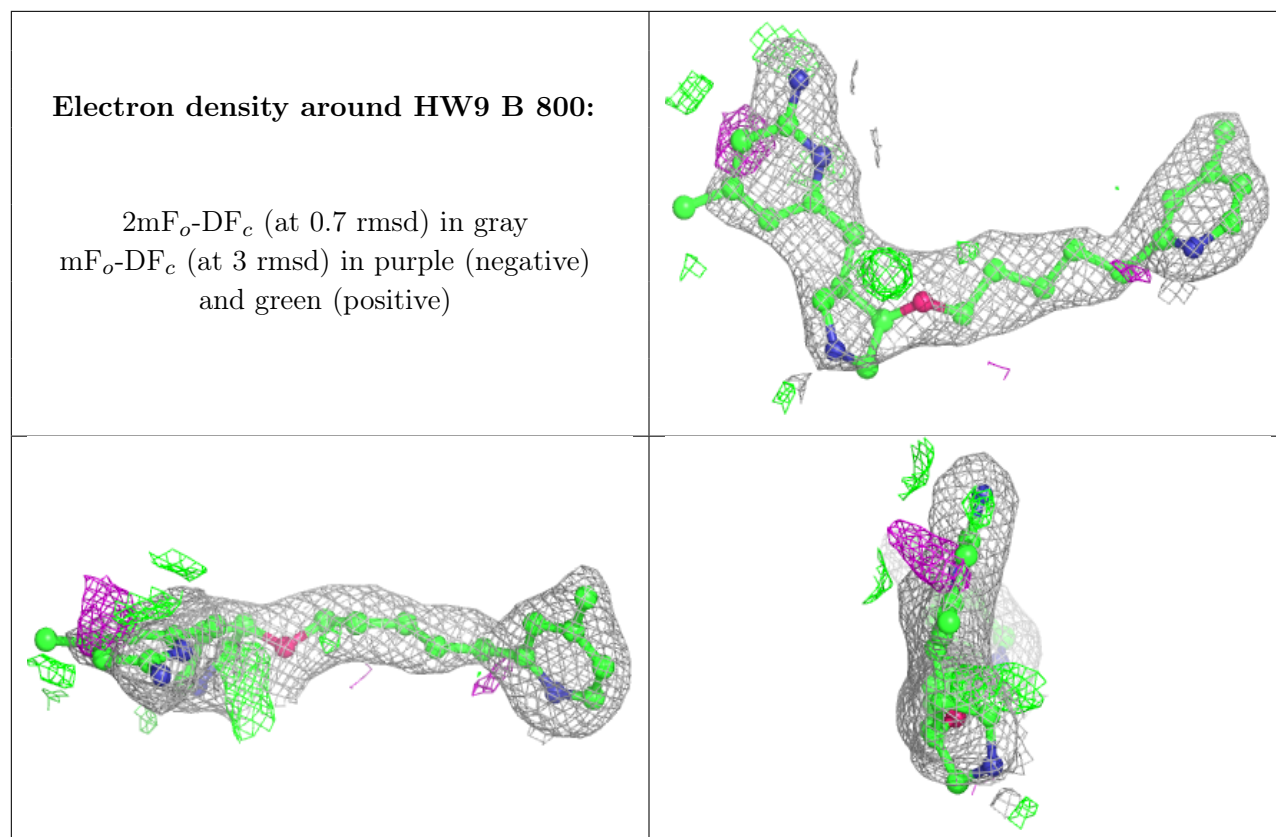
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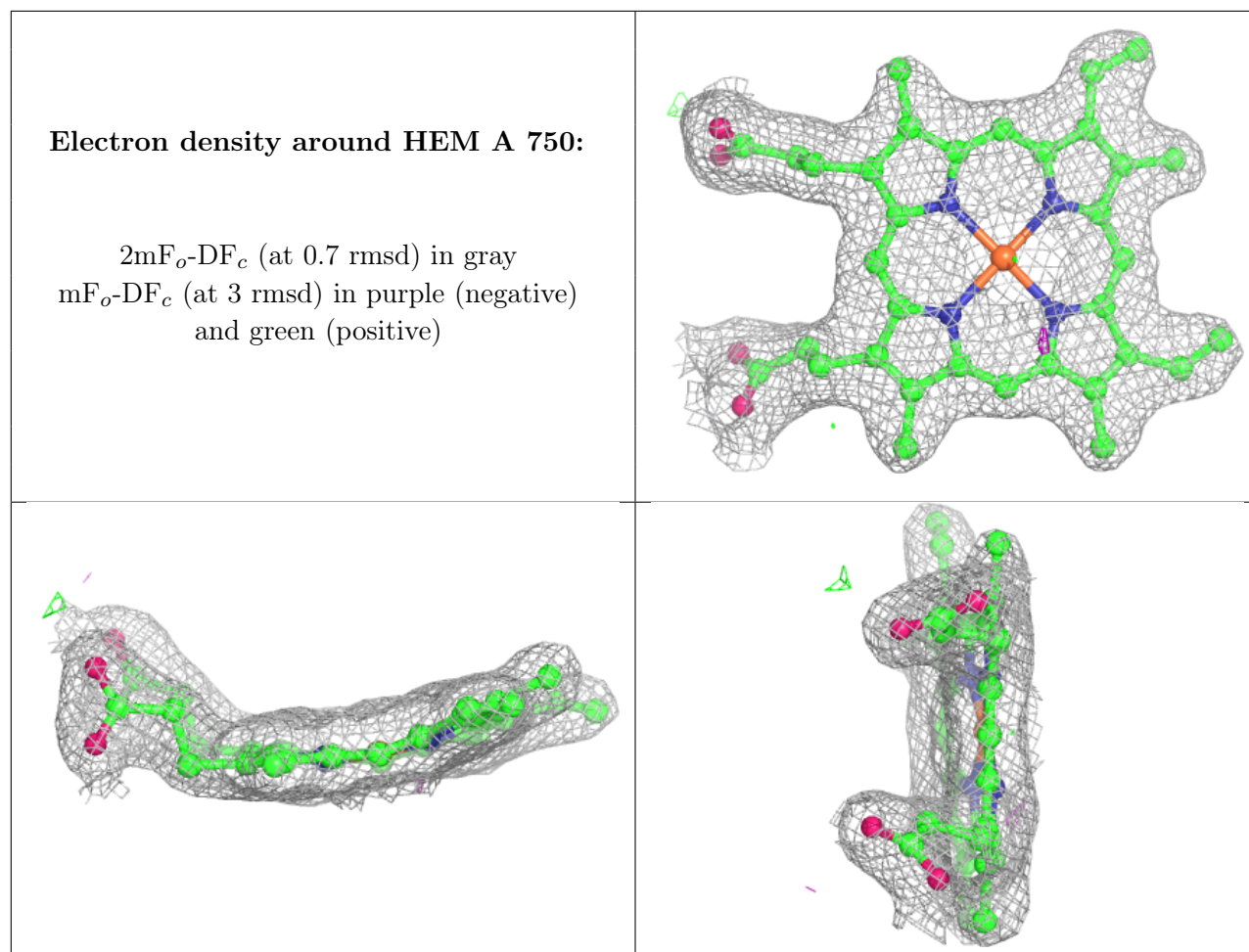
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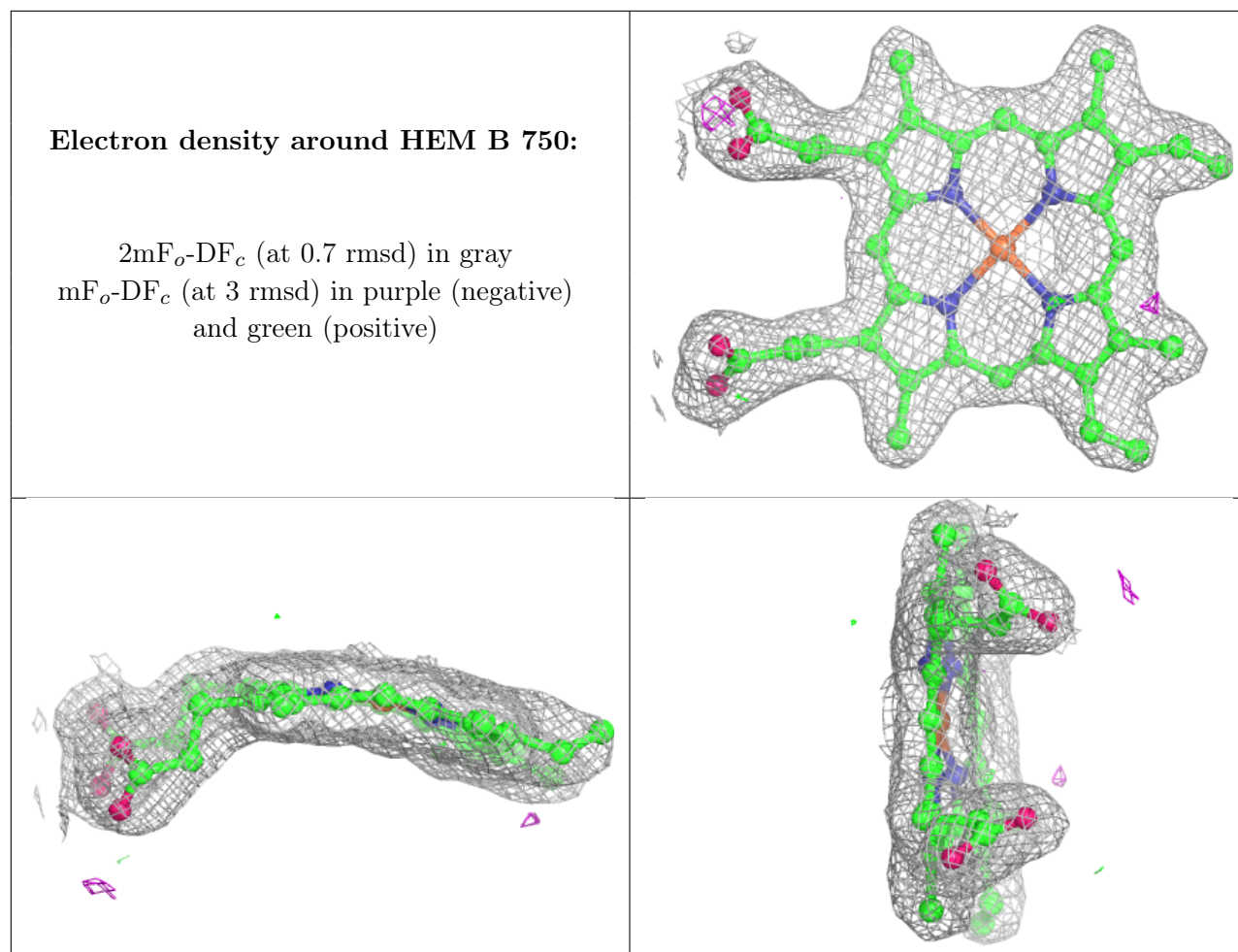
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
6	ZN	A	900	1/1	0.99	0.10	38,38,38,38	0

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.









6.5 Other polymers [i](#)

There are no such residues in this entry.