



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 6, 2023 – 01:47 AM EDT

PDB ID : 8FGG  
Title : Structure of human neuronal nitric oxide synthase R354A/G357D mutant heme domain in complex with 6-(5-(2-(dimethylamino)ethyl)-2,3-difluorophenethyl)-4-methylpyridin-2-amine  
Authors : Li, H.; Poulos, T.L.  
Deposited on : 2022-12-12  
Resolution : 1.86 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35.1  
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

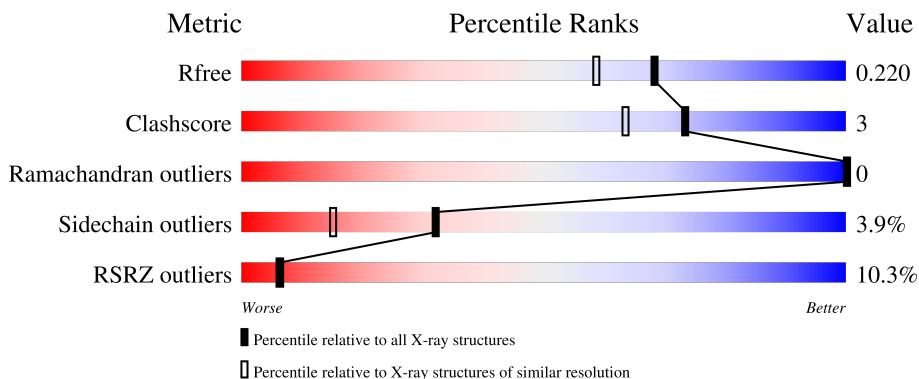
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.86 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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

Mol	Chain	Length	Quality of chain
1	A	421	
1	B	421	

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 7531 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	416	Total 3405	C 2180	N 580	O 622	S 23	0	4	0
1	B	411	Total 3365	C 2156	N 572	O 615	S 22	0	4	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	354	ALA	ARG	engineered mutation	UNP P29475
A	357	ASP	GLY	engineered mutation	UNP P29475
B	354	ALA	ARG	engineered mutation	UNP P29475
B	357	ASP	GLY	engineered mutation	UNP P29475

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



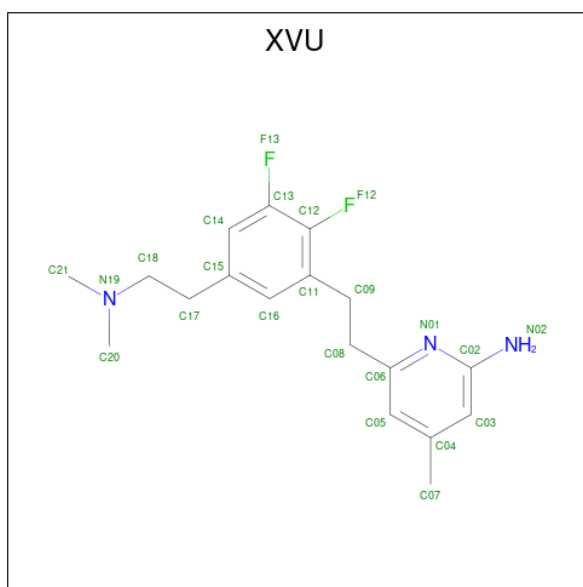
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- 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
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		

- Molecule 4 is 6-(2-{5-[2-(dimethylamino)ethyl]-2,3-difluorophenyl}ethyl)-4-methylpyridin-2-amine (three-letter code: XVU) (formula:  $C_{18}H_{23}F_2N_3$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
			Total	C	F			N
4	A	1	23	18	2	3	0	0
4	B	1	23	18	2	3	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



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

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

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

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

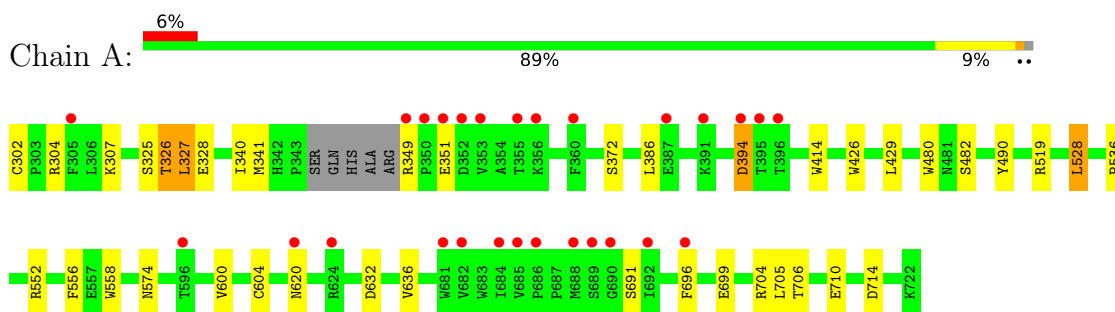
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	336	Total	O	0	0
			336	336		
7	B	240	Total	O	0	0
			240	240		

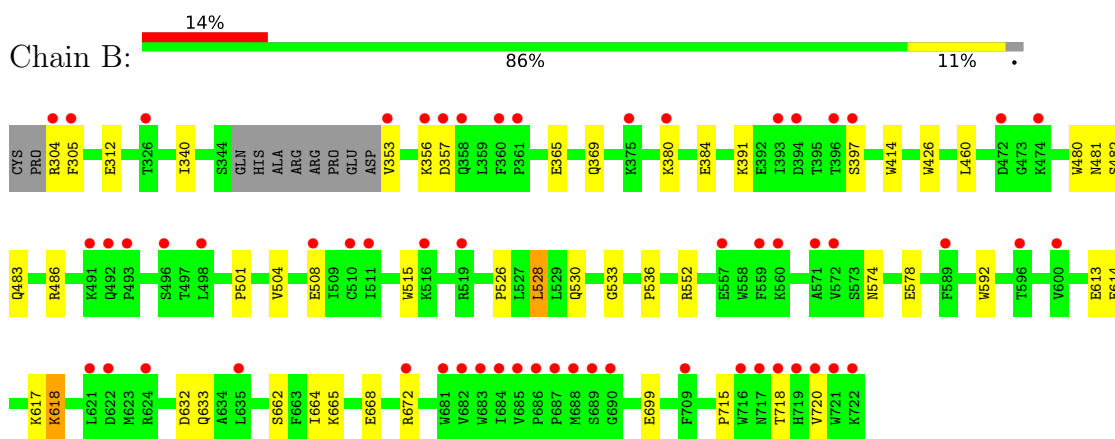
### 3 Residue-property plots [i](#)

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, $\alpha$ , $\beta$ , $\gamma$	52.26Å 121.78Å 164.57Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.98 – 1.86 38.98 – 1.86	Depositor EDS
% Data completeness (in resolution range)	93.1 (38.98-1.86) 93.5 (38.98-1.86)	Depositor EDS
$R_{merge}$	0.14	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.93 (at 1.85Å)	Xtrriage
Refinement program	PHENIX 1.11.1-2575_1496	Depositor
R, $R_{free}$	0.180 , 0.221 0.181 , 0.220	Depositor DCC
$R_{free}$ test set	4097 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.5	Xtrriage
Anisotropy	0.514	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 49.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	7531	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.20% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

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



## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: HEM, ZN, XVU, GOL, H4B

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	0.37	0/3514	0.55	1/4769 (0.0%)
1	B	0.35	0/3472	0.50	0/4709
All	All	0.36	0/6986	0.53	1/9478 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	327	LEU	CA-CB-CG	6.88	131.13	115.30

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	3405	0	3320	21	0
1	B	3365	0	3282	24	0
2	A	43	0	30	2	0
2	B	43	0	30	1	0
3	A	17	0	15	0	0
3	B	17	0	15	0	0
4	A	23	0	0	0	0
4	B	23	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	12	0	16	1	0
5	B	6	0	8	0	0
6	A	1	0	0	0	0
7	A	336	0	0	5	0
7	B	240	0	0	4	0
All	All	7531	0	6716	45	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 3.

All (45) 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:662[B]:SER:OG	7:B:901:HOH:O	2.06	0.73
1:B:504:VAL:O	1:B:508:GLU:HG2	1.94	0.68
1:A:394:ASP:OD2	7:A:901:HOH:O	2.12	0.67
1:A:528:LEU:HD22	1:A:536:PRO:HB2	1.76	0.67
1:B:528:LEU:HD22	1:B:536:PRO:HB2	1.77	0.66
1:B:578:GLU:OE1	7:B:902:HOH:O	2.14	0.66
1:A:349:ARG:HD3	1:A:351:GLU:HB3	1.80	0.63
1:A:429:LEU:O	5:A:805:GOL:H12	2.00	0.62
1:B:380:LYS:NZ	1:B:384:GLU:OE2	2.31	0.61
2:A:801:HEM:HMC2	2:A:801:HEM:HBC2	1.82	0.61
1:B:664:ILE:O	1:B:668[B]:GLU:HG2	2.00	0.61
1:B:618:LYS:NZ	7:B:907:HOH:O	2.37	0.58
1:A:326:THR:HG21	1:A:706[A]:THR:HG22	1.87	0.57
2:A:801:HEM:HBB2	2:A:801:HEM:HHC	1.89	0.55
1:A:714:ASP:OD1	7:A:902:HOH:O	2.18	0.54
1:A:620:ASN:ND2	7:A:903:HOH:O	2.26	0.54
1:B:515:TRP:CE2	1:B:526:PRO:HD3	2.43	0.54
1:A:480:TRP:HB2	1:A:528:LEU:HB3	1.92	0.52
1:A:519:ARG:NH1	7:A:904:HOH:O	2.27	0.51
1:B:482:SER:HA	1:B:574:ASN:HB3	1.93	0.51
2:B:801:HEM:HBB2	2:B:801:HEM:HHC	1.93	0.49
1:B:530:GLN:HE21	1:B:533:GLY:HA2	1.77	0.49
1:B:356:LYS:HG2	1:B:397:SER:HA	1.95	0.49
1:B:483:GLN:OE1	1:B:486:ARG:HD2	2.13	0.49
1:A:340:ILE:HD13	1:B:699:GLU:HB3	1.95	0.48
1:A:349:ARG:CD	1:A:351:GLU:HB3	2.44	0.47
1:B:483:GLN:HG2	4:B:803:XVU:C12	2.45	0.47
1:A:556:PHE:HB3	1:A:558:TRP:CE2	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:668[A]:GLU:OE2	1:B:672:ARG:NH2	2.44	0.45
7:A:1161:HOH:O	1:B:312:GLU:HG3	2.16	0.45
1:A:636:VAL:HG11	1:B:633:GLN:HG3	1.99	0.44
1:A:600:VAL:O	1:A:604:CYS:HB2	2.18	0.44
1:B:414:TRP:CE3	1:B:426:TRP:HA	2.53	0.44
1:A:482:SER:HA	1:A:574:ASN:HB3	2.01	0.43
1:A:414:TRP:CE3	1:A:426:TRP:HA	2.54	0.42
1:A:328:GLU:O	1:A:704:ARG:NH1	2.52	0.42
1:A:699:GLU:HB3	1:B:340:ILE:HD13	2.01	0.42
1:A:490:TYR:CE1	1:A:519:ARG:HA	2.55	0.41
1:B:613:GLU:HG3	7:B:970:HOH:O	2.19	0.41
1:A:691:SER:HA	1:A:696:PHE:CG	2.56	0.41
1:B:460:LEU:HD12	1:B:592:TRP:HB3	2.03	0.40
1:B:501:PRO:HA	1:B:504:VAL:HG23	2.02	0.40
1:B:614:GLU:O	1:B:618:LYS:HD2	2.21	0.40
1:A:325:SER:HA	1:A:705:LEU:HD23	2.03	0.40
1:B:480:TRP:CE2	1:B:715:PRO:HB2	2.56	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	416/421 (99%)	410 (99%)	6 (1%)	0	100	100
1	B	411/421 (98%)	401 (98%)	10 (2%)	0	100	100
All	All	827/842 (98%)	811 (98%)	16 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	376/376 (100%)	363 (96%)	13 (4%)	36	18
1	B	371/376 (99%)	355 (96%)	16 (4%)	29	12
All	All	747/752 (99%)	718 (96%)	29 (4%)	32	15

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

Mol	Chain	Res	Type
1	A	302	CYS
1	A	304	ARG
1	A	307	LYS
1	A	326	THR
1	A	327	LEU
1	A	341	MET
1	A	372	SER
1	A	386	LEU
1	A	394	ASP
1	A	528	LEU
1	A	552	ARG
1	A	632	ASP
1	A	710	GLU
1	B	304	ARG
1	B	305	PHE
1	B	353	VAL
1	B	357	ASP
1	B	365	GLU
1	B	369	GLN
1	B	391	LYS
1	B	481	ASN
1	B	528	LEU
1	B	552	ARG
1	B	617	LYS
1	B	618	LYS
1	B	632	ASP
1	B	665	LYS

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Mol	Chain	Res	Type
1	B	718	THR
1	B	720	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 1 is monoatomic - leaving 9 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
4	XVU	B	803	-	24,24,24	0.47	0	32,33,33	1.86	7 (21%)
3	H4B	B	802	-	16,18,18	0.88	0	11,26,26	2.66	5 (45%)
4	XVU	A	803	-	24,24,24	0.47	0	32,33,33	1.80	8 (25%)
3	H4B	A	802	-	16,18,18	0.85	1 (6%)	11,26,26	2.42	4 (36%)
5	GOL	B	804	-	5,5,5	0.33	0	5,5,5	0.23	0
2	HEM	B	801	1	41,50,50	1.57	6 (14%)	45,82,82	1.85	9 (20%)
5	GOL	A	804	-	5,5,5	0.36	0	5,5,5	0.44	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	HEM	A	801	1	41,50,50	1.43	3 (7%)	45,82,82	1.45	5 (11%)
5	GOL	A	805	-	5,5,5	0.43	0	5,5,5	0.25	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
4	XVU	B	803	-	-	4/10/10/10	0/2/2/2
3	H4B	B	802	-	-	0/8/17/17	0/2/2/2
4	XVU	A	803	-	-	4/10/10/10	0/2/2/2
3	H4B	A	802	-	-	0/8/17/17	0/2/2/2
5	GOL	B	804	-	-	2/4/4/4	-
2	HEM	B	801	1	-	0/12/54/54	-
5	GOL	A	804	-	-	4/4/4/4	-
2	HEM	A	801	1	-	0/12/54/54	-
5	GOL	A	805	-	-	4/4/4/4	-

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	801	HEM	C3C-CAC	3.82	1.55	1.47
2	B	801	HEM	C3C-C2C	-3.81	1.35	1.40
2	A	801	HEM	C3C-C2C	-3.72	1.35	1.40
2	A	801	HEM	C3C-CAC	3.59	1.55	1.47
2	A	801	HEM	CAB-C3B	2.93	1.55	1.47
2	B	801	HEM	CAB-C3B	2.83	1.55	1.47
2	B	801	HEM	CMB-C2B	2.53	1.56	1.50
3	A	802	H4B	C4A-C4	-2.35	1.38	1.41
2	B	801	HEM	FE-NB	2.22	2.07	1.96
2	B	801	HEM	CMD-C2D	2.21	1.55	1.50

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	801	HEM	CBA-CAA-C2A	-6.22	102.00	112.62
4	B	803	XVU	C09-C08-C06	-5.76	100.08	112.99
3	B	802	H4B	C8A-C4A-C4	5.56	119.51	114.57
2	B	801	HEM	C4B-CHC-C1C	5.29	129.53	122.56
2	A	801	HEM	CBA-CAA-C2A	-4.99	104.11	112.62

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	802	H4B	C8A-C4A-C4	4.95	118.97	114.57
4	A	803	XVU	C09-C08-C06	-4.88	102.05	112.99
4	A	803	XVU	C09-C11-C12	-4.16	117.39	120.73
4	B	803	XVU	C02-N01-C06	4.00	121.13	118.10
4	A	803	XVU	C02-N01-C06	3.98	121.12	118.10
2	A	801	HEM	C4B-CHC-C1C	3.67	127.40	122.56
3	B	802	H4B	C2-N3-C4	3.50	121.50	115.93
3	A	802	H4B	C2-N3-C4	3.28	121.15	115.93
4	B	803	XVU	C08-C09-C11	3.21	118.01	112.81
2	A	801	HEM	CMC-C2C-C3C	3.17	130.61	124.68
3	B	802	H4B	N1-C2-N3	-3.12	120.52	125.42
4	B	803	XVU	C05-C06-N01	-3.10	119.61	122.90
3	A	802	H4B	N1-C2-N3	-3.04	120.66	125.42
4	A	803	XVU	F12-C12-C11	3.01	121.03	117.85
4	B	803	XVU	F12-C12-C11	2.95	120.96	117.85
4	A	803	XVU	C16-C11-C12	2.91	119.42	116.76
2	B	801	HEM	C3D-C4D-ND	-2.83	107.02	110.17
2	B	801	HEM	CBD-CAD-C3D	-2.82	104.78	112.63
4	B	803	XVU	C16-C11-C12	2.82	119.34	116.76
2	B	801	HEM	C4D-ND-C1D	2.80	107.97	105.07
4	A	803	XVU	C05-C06-N01	-2.72	120.02	122.90
2	A	801	HEM	C3B-C2B-C1B	2.55	108.38	106.49
2	A	801	HEM	CBD-CAD-C3D	-2.52	105.61	112.63
3	B	802	H4B	C4-C4A-N5	2.49	121.21	119.12
2	B	801	HEM	C1B-NB-C4B	2.47	107.62	105.07
4	B	803	XVU	C08-C06-N01	2.44	119.59	115.95
3	B	802	H4B	C2-N1-C8A	2.38	119.88	114.54
2	B	801	HEM	CMA-C3A-C4A	-2.36	124.84	128.46
3	A	802	H4B	C2-N1-C8A	2.34	119.79	114.54
2	B	801	HEM	CAD-C3D-C2D	-2.25	123.69	127.88
4	A	803	XVU	C08-C09-C11	2.18	116.34	112.81
4	A	803	XVU	C08-C06-N01	2.18	119.19	115.95
2	B	801	HEM	CHD-C1D-ND	2.15	126.77	124.43

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	804	GOL	O1-C1-C2-C3
5	A	805	GOL	O1-C1-C2-O2
5	A	805	GOL	O1-C1-C2-C3
5	B	804	GOL	O1-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
4	A	803	XVU	C17-C18-N19-C20
4	A	803	XVU	C17-C18-N19-C21
4	B	803	XVU	C17-C18-N19-C21
4	B	803	XVU	C15-C17-C18-N19
4	B	803	XVU	C17-C18-N19-C20
5	A	804	GOL	O1-C1-C2-O2
5	B	804	GOL	O1-C1-C2-O2
4	A	803	XVU	C15-C17-C18-N19
5	A	805	GOL	C1-C2-C3-O3
5	A	804	GOL	O2-C2-C3-O3
5	A	805	GOL	O2-C2-C3-O3
4	A	803	XVU	C08-C09-C11-C12
4	B	803	XVU	C08-C09-C11-C12
5	A	804	GOL	C1-C2-C3-O3

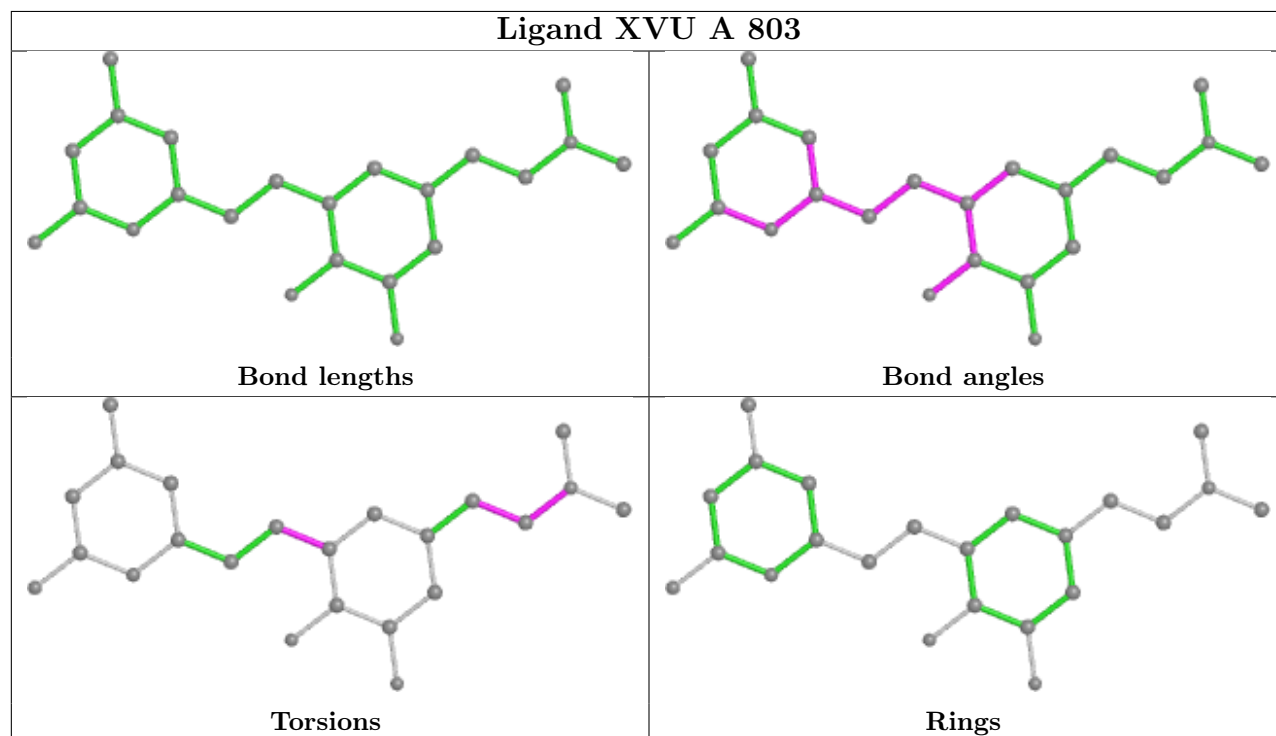
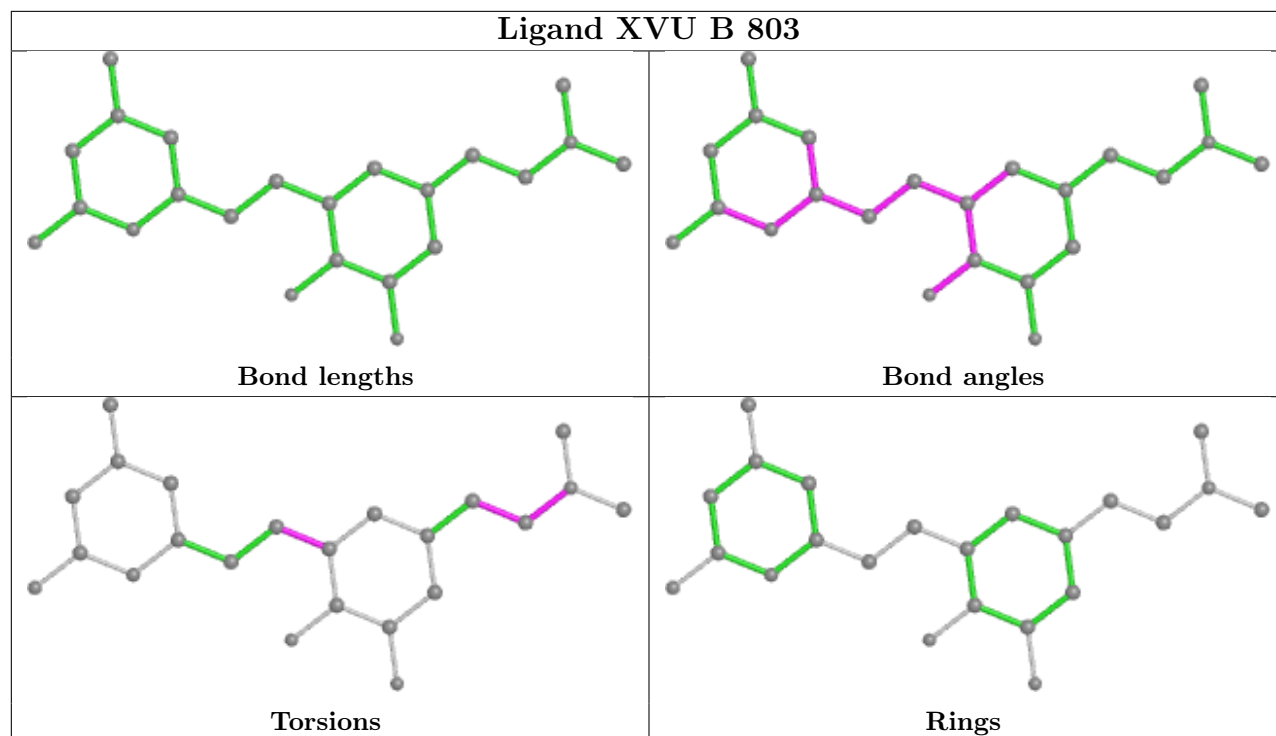
There are no ring outliers.

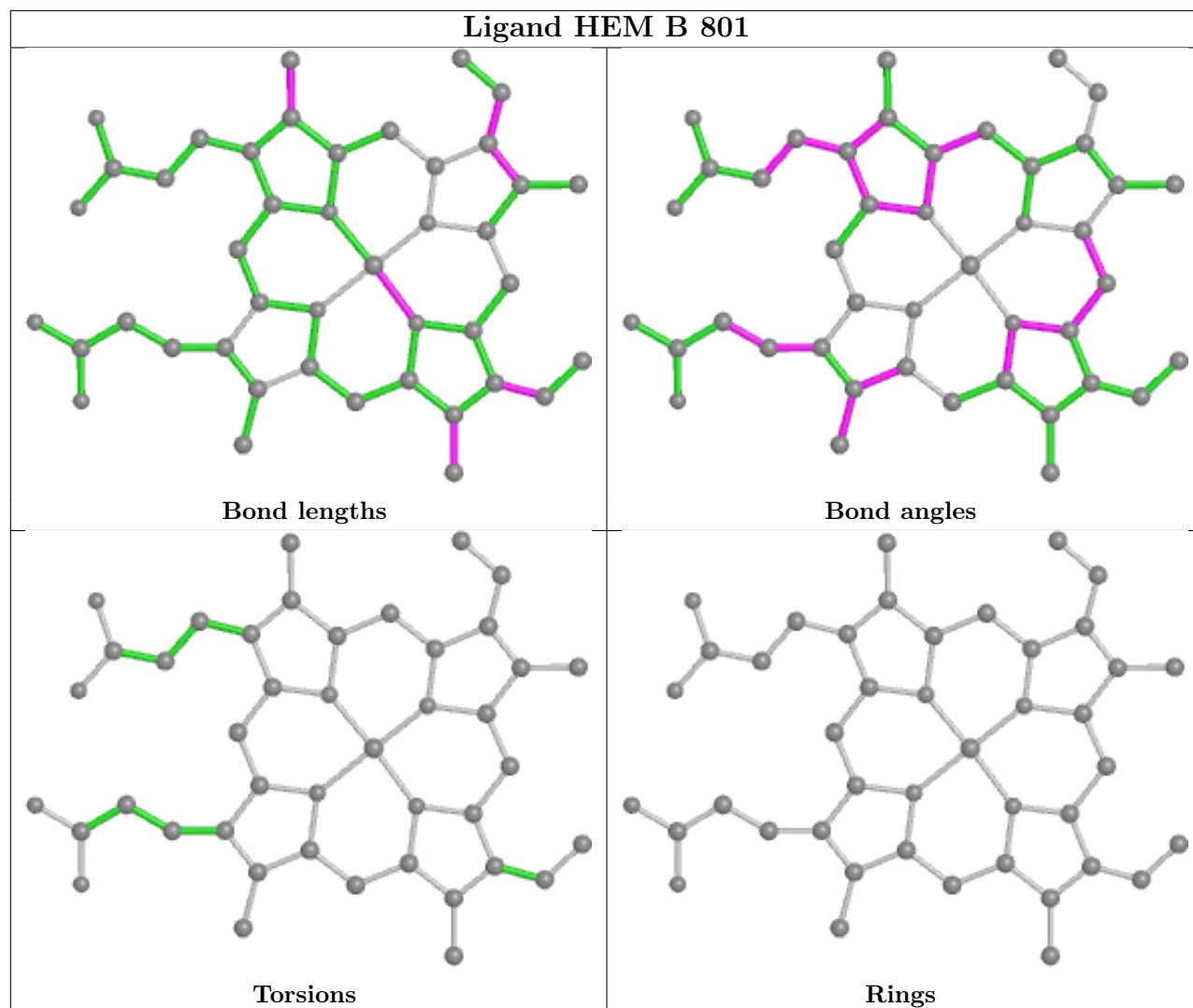
4 monomers are involved in 5 short contacts:

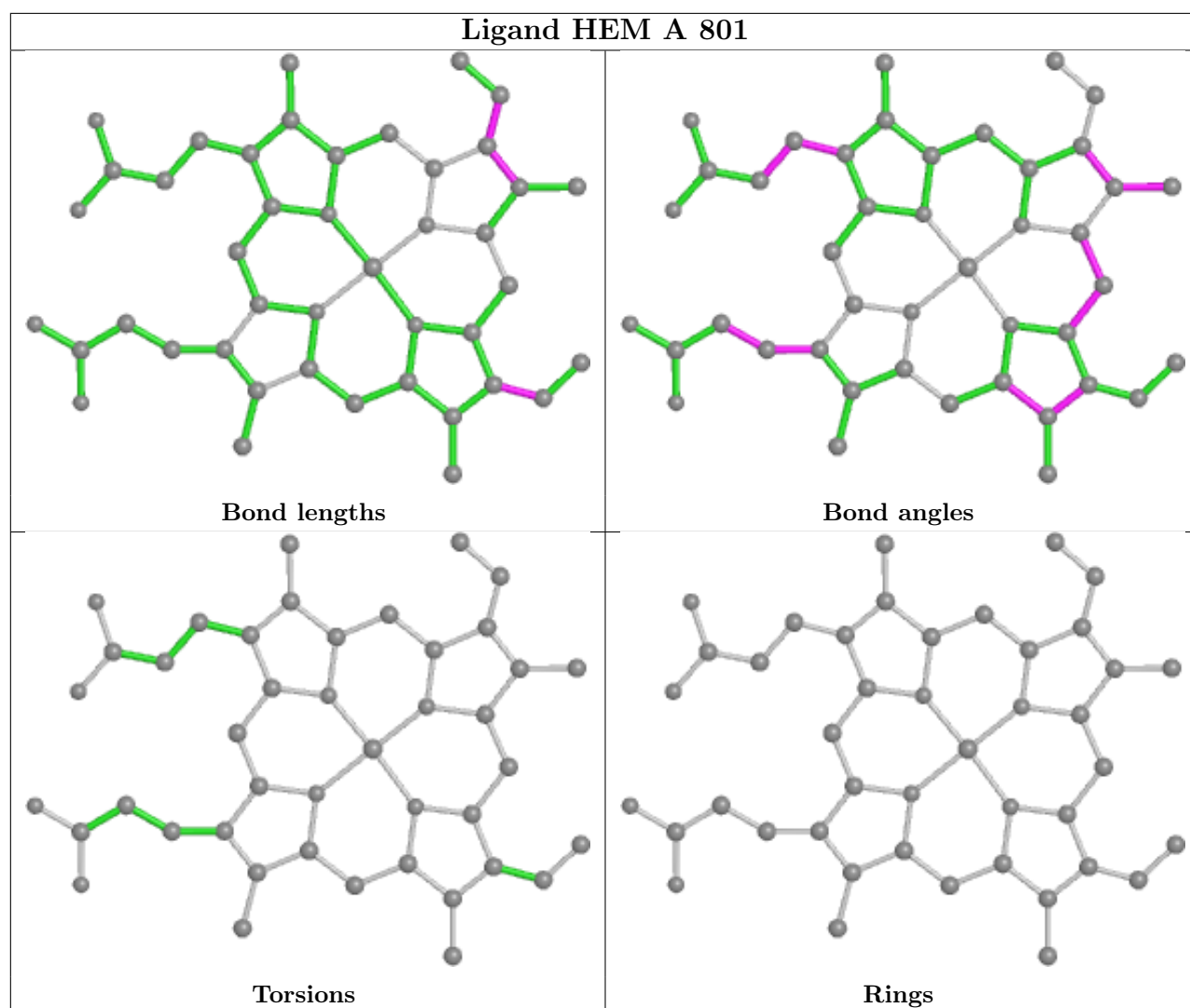
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	803	XVU	1	0
2	B	801	HEM	1	0
2	A	801	HEM	2	0
5	A	805	GOL	1	0

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, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	416/421 (98%)	0.30	27 (6%) 18 18	28, 45, 77, 146	0
1	B	411/421 (97%)	0.69	58 (14%) 2 3	30, 54, 100, 131	0
All	All	827/842 (98%)	0.49	85 (10%) 6 6	28, 49, 92, 146	0

All (85) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	721	TRP	8.2
1	A	350	PRO	8.1
1	A	351	GLU	6.8
1	B	720	VAL	6.2
1	B	357	ASP	5.6
1	B	353	VAL	5.1
1	B	493	PRO	4.9
1	B	360	PHE	4.6
1	B	356	LYS	4.4
1	B	716	TRP	4.3
1	B	396	THR	4.3
1	B	511	ILE	3.9
1	A	352	ASP	3.9
1	A	305	PHE	3.9
1	B	624	ARG	3.8
1	B	397	SER	3.8
1	A	624	ARG	3.8
1	B	683	TRP	3.7
1	B	304	ARG	3.7
1	A	349	ARG	3.6
1	B	719	HIS	3.6
1	B	686	PRO	3.6
1	A	685	VAL	3.5
1	A	353	VAL	3.5

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	326	THR	3.5
1	B	557	GLU	3.5
1	B	682	VAL	3.4
1	A	684	ILE	3.4
1	B	722	LYS	3.3
1	A	355	THR	3.3
1	B	589	PHE	3.2
1	B	560	LYS	3.2
1	A	696	PHE	3.2
1	B	685	VAL	3.2
1	B	498	LEU	3.2
1	A	395	THR	3.1
1	B	688	MET	3.1
1	A	690	GLY	3.1
1	B	394	ASP	3.0
1	B	510	CYS	3.0
1	B	496	SER	3.0
1	B	718	THR	3.0
1	B	690	GLY	3.0
1	B	508	GLU	3.0
1	A	681	TRP	2.9
1	B	474	LYS	2.9
1	B	687	PRO	2.8
1	A	689	SER	2.8
1	B	572	VAL	2.8
1	B	571	ALA	2.8
1	B	358	GLN	2.8
1	B	717	ASN	2.7
1	A	682	VAL	2.6
1	A	686	PRO	2.6
1	A	360	PHE	2.5
1	B	689	SER	2.5
1	B	305	PHE	2.5
1	B	635	LEU	2.5
1	B	375	LYS	2.5
1	B	516	LYS	2.5
1	A	356	LYS	2.4
1	A	692	ILE	2.4
1	B	684	ILE	2.4
1	B	621	LEU	2.3
1	B	361	PRO	2.3
1	B	596	THR	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	492	GLN	2.3
1	A	620	ASN	2.3
1	B	472	ASP	2.3
1	A	596	THR	2.2
1	B	380	LYS	2.2
1	B	393	ILE	2.2
1	A	391	LYS	2.2
1	B	622	ASP	2.2
1	A	387	GLU	2.2
1	A	394	ASP	2.2
1	B	600	VAL	2.2
1	B	519	ARG	2.1
1	A	688	MET	2.1
1	B	491	LYS	2.1
1	B	559	PHE	2.1
1	A	396	THR	2.1
1	B	672	ARG	2.1
1	B	709	PHE	2.0
1	B	681	TRP	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, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

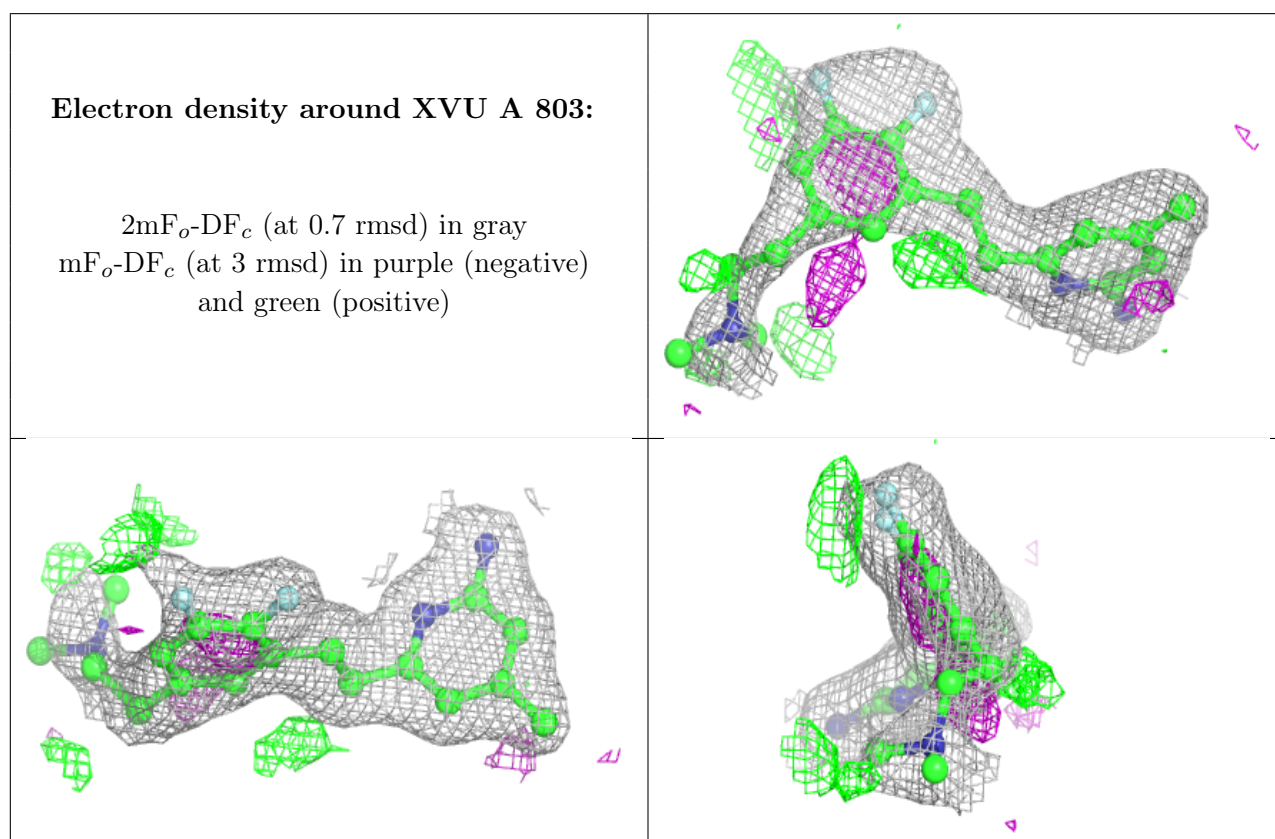
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	GOL	A	804	6/6	0.81	0.14	60,67,71,71	0
5	GOL	B	804	6/6	0.85	0.13	72,78,80,85	0
5	GOL	A	805	6/6	0.88	0.15	59,73,78,87	0
4	XVU	A	803	23/23	0.92	0.20	29,58,85,89	0

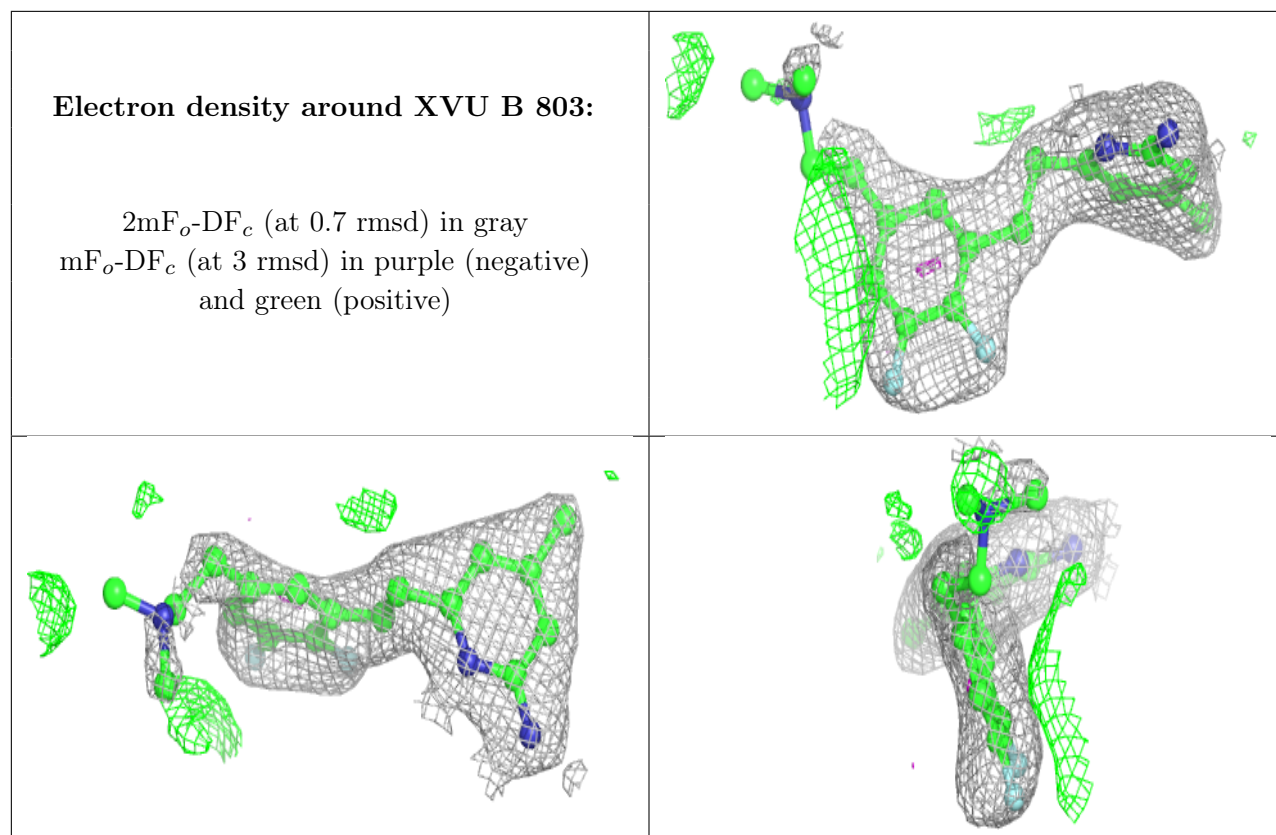
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	XVU	B	803	23/23	0.93	0.27	30,70,98,100	0
3	H4B	B	802	17/17	0.97	0.18	33,38,47,48	0
2	HEM	A	801	43/43	0.98	0.17	27,33,41,46	0
2	HEM	B	801	43/43	0.98	0.20	27,37,47,50	0
3	H4B	A	802	17/17	0.98	0.14	30,34,40,41	0
6	ZN	A	806	1/1	0.99	0.10	36,36,36,36	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.

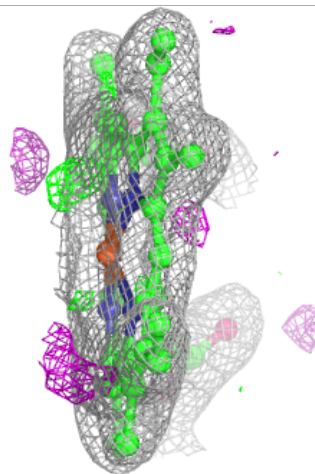
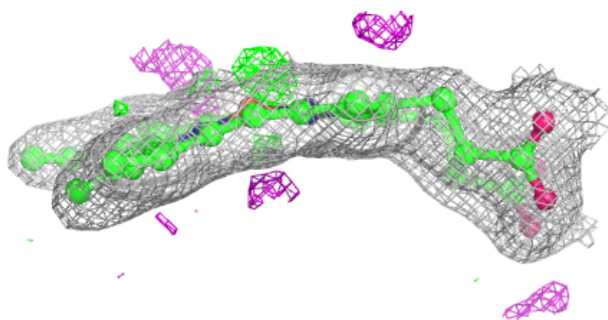
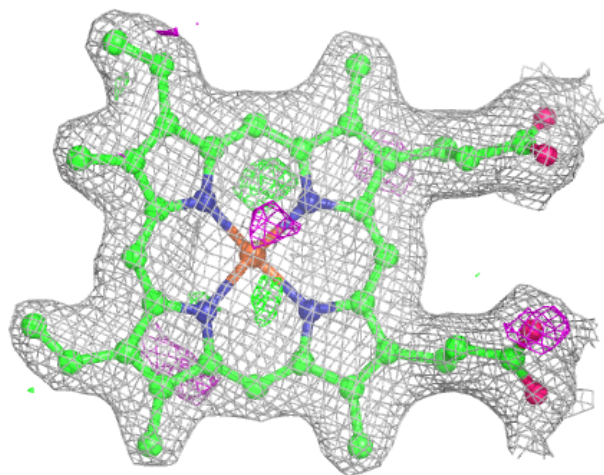


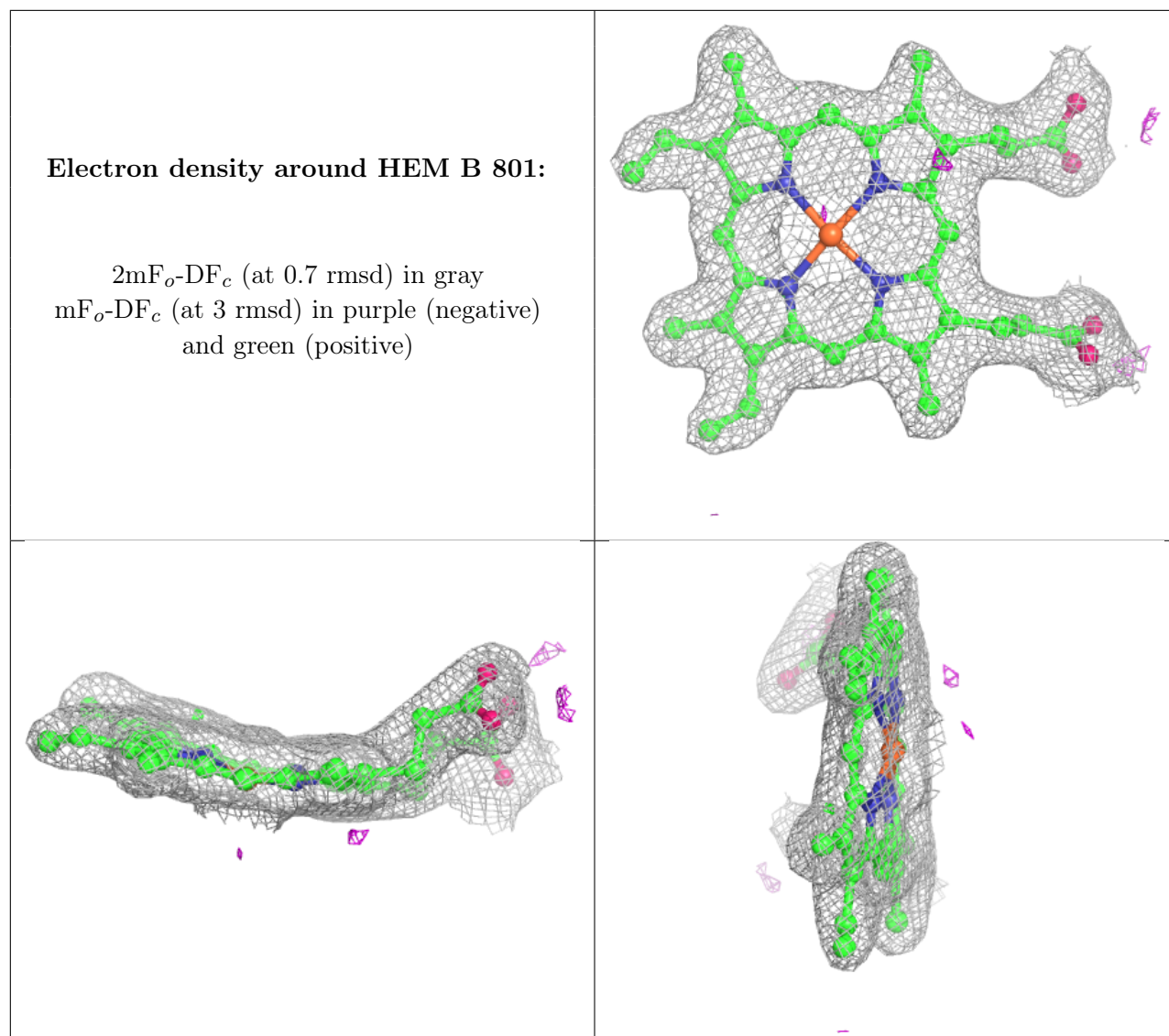




**Electron density around HEM A 801:**

$2mF_o-DF_c$  (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.