



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 11, 2023 – 04:23 AM EDT

PDB ID : 4JSH  
Title : Structure of rat neuronal nitric oxide synthase heme domain in complex with 4-methyl-6-((3-(piperidin-4-ylmethoxy)phenoxy)methyl)pyridin-2-amine  
Authors : Li, H.; Poulos, T.L.  
Deposited on : 2013-03-22  
Resolution : 2.35 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

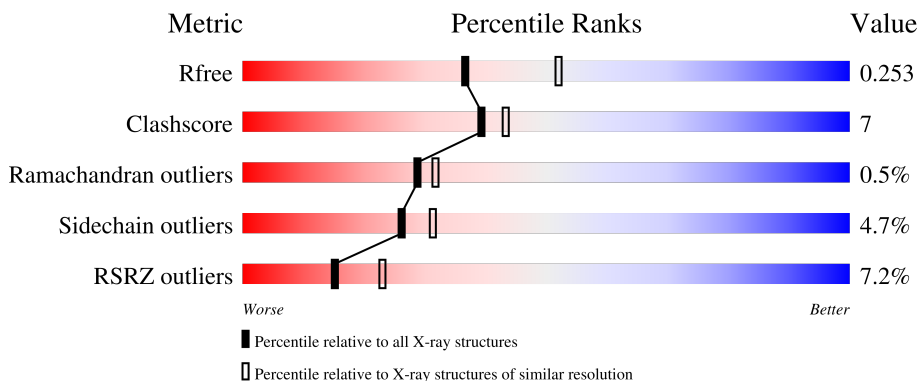
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*


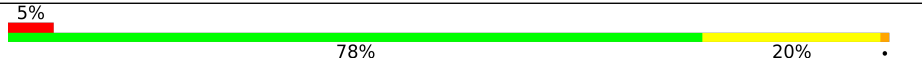
The reported resolution of this entry is 2.35 Å.

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	1164 (2.36-2.36)
Clashscore	141614	1232 (2.36-2.36)
Ramachandran outliers	138981	1211 (2.36-2.36)
Sidechain outliers	138945	1212 (2.36-2.36)
RSRZ outliers	127900	1150 (2.36-2.36)

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	422	 9% 79% 19% ..
1	B	422	 5% 78% 20% .

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 7082 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	418	Total	C	N	O	S	0	0	0
			3407	2176	587	623	21			
1	B	420	Total	C	N	O	S	0	1	0
			3424	2186	590	626	22			

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



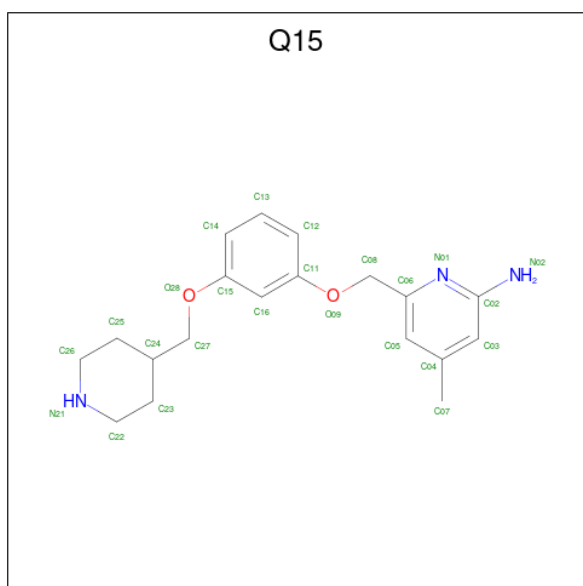
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	Fe	N			O
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- 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
			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-{[3-(piperidin-4-ylmethoxy)phenoxy]methyl}pyridin-2-amine (three-letter code: Q15) (formula: C<sub>19</sub>H<sub>25</sub>N<sub>3</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	24	19	3	2	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	B	1	24	19	3	2	0	0

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



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

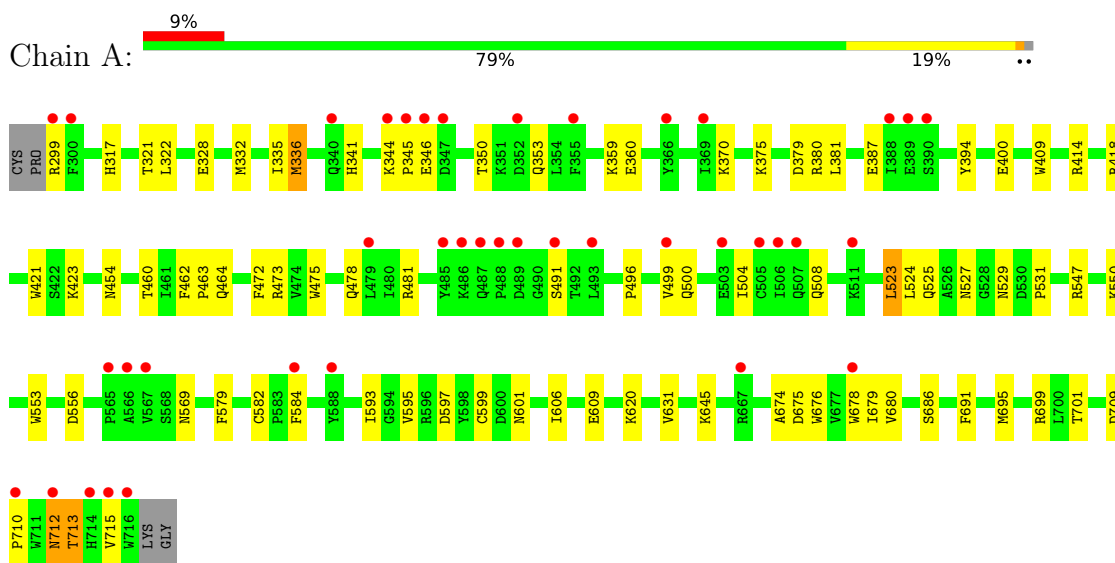
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
7	A	30	30	30	0	0
7	B	44	44	44	0	0

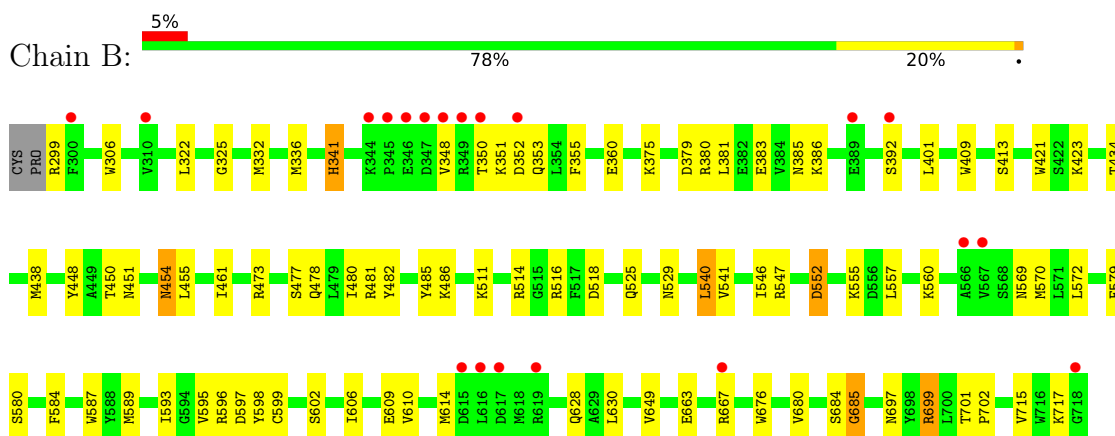
### 3 Residue-property plots [i](#)

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, $\alpha$ , $\beta$ , $\gamma$	51.73Å 111.56Å 164.33Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.78 – 2.35 40.75 – 2.33	Depositor EDS
% Data completeness (in resolution range)	99.1 (40.78-2.35) 98.1 (40.75-2.33)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.98 (at 2.34Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.193 , 0.253 0.193 , 0.253	Depositor DCC
$R_{free}$ test set	2010 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	45.5	Xtrriage
Anisotropy	0.939	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 43.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7082	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	66.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.27% 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, Q15, H4B, ACT

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	0.55	0/3503	0.70	1/4753 (0.0%)
1	B	0.63	0/3523	0.74	0/4777
All	All	0.59	0/7026	0.72	1/9530 (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	418	ARG	NE-CZ-NH1	-5.15	117.72	120.30

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	3407	0	3314	40	0
1	B	3424	0	3335	53	0
2	A	43	0	30	8	0
2	B	43	0	30	6	0
3	A	17	0	15	0	0
3	B	17	0	15	1	0
4	A	24	0	25	3	0
4	B	24	0	25	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	4	0	3	0	0
5	B	4	0	3	0	0
6	A	1	0	0	0	0
7	A	30	0	0	0	0
7	B	44	0	0	2	0
All	All	7082	0	6795	102	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 7.

All (102) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:523:LEU:HD22	1:A:531:PRO:HB2	1.51	0.90
1:B:350:THR:H	1:B:353:GLN:HE21	1.18	0.86
1:B:699:ARG:HG2	1:B:699:ARG:HH11	1.41	0.85
1:A:341:HIS:HA	1:A:699:ARG:NH1	2.06	0.70
1:B:593:ILE:HA	1:B:597:ASP:HB2	1.75	0.69
1:A:341:HIS:HA	1:A:699:ARG:HH12	1.59	0.67
1:B:595:VAL:O	1:B:599:CYS:HB2	1.95	0.66
1:A:321:THR:HG21	1:A:701:THR:HG22	1.79	0.64
2:A:801:HEM:HBD2	2:A:801:HEM:HMD2	1.81	0.61
1:A:595:VAL:O	1:A:599:CYS:HB2	2.02	0.60
2:B:801:HEM:HBA1	4:B:804:Q15:H8	1.85	0.59
1:B:587:TRP:H	2:B:801:HEM:HAB	1.68	0.58
1:A:345:PRO:HG3	1:A:713:THR:HG21	1.85	0.58
1:B:557:LEU:HD22	1:B:609:GLU:OE1	2.02	0.58
1:B:351:LYS:HE3	1:B:392:SER:OG	2.04	0.58
1:B:477:SER:HB2	1:B:569:ASN:ND2	2.19	0.57
1:A:332:MET:HE3	1:A:335:ILE:HG13	1.86	0.57
2:A:801:HEM:HBD1	4:A:803:Q15:C13	2.35	0.57
1:B:380:ARG:NH1	1:B:383:GLU:OE2	2.37	0.56
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.43	0.54
2:A:801:HEM:HBD2	2:A:801:HEM:CMD	2.36	0.54
1:B:663:GLU:HB3	1:B:667:ARG:NH1	2.23	0.54
1:A:332:MET:CE	1:A:335:ILE:HG13	2.37	0.54
1:B:336:MET:CE	4:B:804:Q15:H17	2.39	0.53
1:B:485:TYR:CZ	1:B:514:ARG:HA	2.44	0.53
1:A:322:LEU:HB3	1:A:699:ARG:HH21	1.74	0.53
1:B:525:GLN:HG3	1:B:529:ASN:O	2.09	0.53
1:A:524:LEU:O	1:A:531:PRO:HA	2.10	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:801:HEM:HBB2	2:A:801:HEM:HHC	1.90	0.52
2:A:801:HEM:CMC	2:A:801:HEM:HBC2	2.40	0.52
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.92	0.52
1:B:584:PHE:CD1	2:B:801:HEM:CAC	2.93	0.52
1:A:464:GLN:HB3	1:A:579:PHE:CE2	2.44	0.51
1:B:336:MET:HE1	4:B:804:Q15:H17	1.93	0.51
1:B:699:ARG:HH11	1:B:699:ARG:CG	2.16	0.51
1:A:593:ILE:O	1:A:597:ASP:HB2	2.11	0.51
1:B:701:THR:HA	1:B:702:PRO:C	2.30	0.51
1:A:500:GLN:O	1:A:504:ILE:HG13	2.11	0.50
1:B:478:GLN:HB2	1:B:481:ARG:HG3	1.92	0.50
2:B:801:HEM:HBC2	2:B:801:HEM:CMC	2.41	0.50
1:A:525:GLN:HG3	1:A:529:ASN:O	2.11	0.50
1:A:712:ASN:N	1:A:712:ASN:OD1	2.43	0.50
3:B:802:H4B:O4	4:B:804:Q15:H20	2.12	0.50
1:B:699:ARG:HG2	1:B:699:ARG:NH1	2.19	0.50
1:B:413:SER:OG	1:B:697:ASN:ND2	2.45	0.49
1:B:480:ILE:HA	7:B:933:HOH:O	2.11	0.49
1:A:675:ASP:O	1:A:679:ILE:HG12	2.12	0.49
1:B:434:THR:O	1:B:438:MET:HG3	2.13	0.49
1:A:380:ARG:HD3	1:A:400:GLU:OE1	2.12	0.49
1:A:460:THR:O	1:A:582:CYS:HA	2.13	0.49
1:A:299:ARG:O	1:A:317:HIS:CE1	2.66	0.48
2:A:801:HEM:HBD1	4:A:803:Q15:H12	1.95	0.48
1:A:631:VAL:HG11	1:B:628:GLN:HG3	1.96	0.48
1:A:674:ALA:HB3	1:A:695:MET:HB3	1.96	0.48
1:A:496:PRO:HA	1:A:499:VAL:HG23	1.95	0.48
1:A:387:GLU:OE1	1:A:394:TYR:HA	2.15	0.47
1:B:572:LEU:HB3	1:B:579:PHE:HB2	1.96	0.47
1:A:686:SER:HA	1:A:691:PHE:CG	2.50	0.47
1:B:341:HIS:NE2	2:B:801:HEM:O2D	2.42	0.47
2:B:801:HEM:HBD1	4:B:804:Q15:C13	2.44	0.47
2:A:801:HEM:C1C	4:A:803:Q15:H6	2.50	0.46
1:B:570:MET:SD	4:B:804:Q15:H12	2.56	0.46
1:A:606:ILE:HA	1:A:609:GLU:OE1	2.17	0.45
1:B:480:ILE:HD13	1:B:541:VAL:HG13	1.98	0.45
1:A:414:ARG:HD3	1:A:678:TRP:CD2	2.52	0.45
1:A:676:TRP:CZ2	1:A:680:VAL:HG21	2.52	0.45
1:B:325:GLY:O	1:B:332:MET:HG3	2.16	0.45
1:B:598:TYR:HB3	1:B:606:ILE:HG12	1.98	0.45
1:A:350:THR:OG1	1:A:353:GLN:HG3	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:359:LYS:HE2	1:A:381:LEU:HD21	1.99	0.44
1:B:595:VAL:HG13	1:B:630:LEU:HD11	1.99	0.44
1:B:448:TYR:CD2	1:B:448:TYR:C	2.91	0.44
1:A:409:TRP:CE3	1:A:421:TRP:HA	2.53	0.44
1:B:557:LEU:CD2	1:B:609:GLU:OE1	2.65	0.44
1:B:684:SER:O	1:B:685:GLY:C	2.56	0.43
1:B:401:LEU:HD11	1:B:461:ILE:HG21	2.00	0.43
1:A:336:MET:HG3	1:B:306:TRP:NE1	2.35	0.42
1:B:473:ARG:HD3	1:B:580:SER:HB2	2.02	0.42
1:B:299:ARG:HB3	1:B:299:ARG:CZ	2.50	0.42
1:A:475:TRP:HB2	1:A:523:LEU:HB3	2.01	0.42
1:A:553:TRP:O	1:A:556:ASP:HB2	2.20	0.42
1:A:462:PHE:HB3	1:A:463:PRO:CD	2.49	0.42
1:B:546:ILE:HG12	1:B:560:LYS:HA	2.01	0.42
1:B:353:GLN:H	1:B:353:GLN:HG2	1.66	0.41
1:B:451:ASN:HB3	1:B:454:ASN:O	2.20	0.41
1:B:482:TYR:HA	1:B:518:ASP:O	2.20	0.41
1:A:375:LYS:HG2	1:A:379:ASP:OD1	2.20	0.41
1:B:552:ASP:OD1	1:B:555:LYS:NZ	2.53	0.41
1:B:540:LEU:HD12	1:B:540:LEU:HA	1.89	0.41
1:B:589:MET:HA	1:B:649:VAL:O	2.21	0.41
1:B:381:LEU:HD23	1:B:381:LEU:HA	1.92	0.41
1:B:375:LYS:HE2	1:B:379:ASP:OD2	2.21	0.41
1:B:610:VAL:O	1:B:614:MET:HG3	2.21	0.41
1:A:321:THR:HG21	1:A:701:THR:CG2	2.47	0.41
1:B:676:TRP:CZ2	1:B:680:VAL:HG21	2.56	0.41
1:A:472:PHE:HA	1:A:525:GLN:O	2.21	0.40
1:A:709:ASP:HA	1:A:710:PRO:HD2	1.83	0.40
1:B:355:PHE:CE1	1:B:385:ASN:HB2	2.57	0.40
1:B:450:THR:O	1:B:455:LEU:HD12	2.21	0.40
1:B:596:ARG:HD3	7:B:926:HOH:O	2.22	0.40
1:B:715:VAL:O	1:B:717:LYS:HE3	2.21	0.40
1:A:584:PHE:CD1	2:A:801:HEM:CAC	3.05	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	416/422 (99%)	394 (95%)	21 (5%)	1 (0%)	47	56
1	B	419/422 (99%)	400 (96%)	16 (4%)	3 (1%)	22	23
All	All	835/844 (99%)	794 (95%)	37 (4%)	4 (0%)	29	32

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	352	ASP
1	B	685	GLY
1	B	322	LEU
1	A	491	SER

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	374/377 (99%)	353 (94%)	21 (6%)	21	23
1	B	376/377 (100%)	362 (96%)	14 (4%)	34	42
All	All	750/754 (100%)	715 (95%)	35 (5%)	26	31

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	328	GLU
1	A	336	MET

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	344	LYS
1	A	346	GLU
1	A	360	GLU
1	A	370	LYS
1	A	423	LYS
1	A	454	ASN
1	A	473	ARG
1	A	508	GLN
1	A	523	LEU
1	A	527	ASN
1	A	547	ARG
1	A	550	LYS
1	A	569	ASN
1	A	601	ASN
1	A	620	LYS
1	A	645	LYS
1	A	712	ASN
1	A	713	THR
1	A	715	VAL
1	B	341	HIS
1	B	348	VAL
1	B	360	GLU
1	B	386	LYS
1	B	423	LYS
1	B	454	ASN
1	B	486	LYS
1	B	511	LYS
1	B	516	ARG
1	B	540	LEU
1	B	547	ARG
1	B	552	ASP
1	B	602	SER
1	B	699	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	454	ASN
1	A	507	GLN
1	A	508	GLN
1	A	527	ASN
1	A	535	GLN

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Mol	Chain	Res	Type
1	A	569	ASN
1	A	605	ASN
1	A	642	GLN
1	A	697	ASN
1	B	353	GLN
1	B	364	GLN
1	B	385	ASN
1	B	425	GLN
1	B	454	ASN
1	B	601	ASN
1	B	642	GLN
1	B	697	ASN

### 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 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	802	-	16,18,18	0.97	0	11,26,26	2.55	5 (45%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	H4B	B	802	-	16,18,18	1.00	0	11,26,26	2.60	6 (54%)
4	Q15	A	803	-	26,26,26	0.51	0	34,34,34	1.62	6 (17%)
2	HEM	A	801	1	41,50,50	1.37	8 (19%)	45,82,82	1.90	13 (28%)
4	Q15	B	804	-	26,26,26	0.64	0	34,34,34	1.54	5 (14%)
2	HEM	B	801	1	41,50,50	1.34	5 (12%)	45,82,82	2.08	14 (31%)
5	ACT	B	803	-	3,3,3	0.86	0	3,3,3	1.00	0
5	ACT	A	804	-	3,3,3	0.80	0	3,3,3	0.80	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
3	H4B	A	802	-	-	0/8/17/17	0/2/2/2
3	H4B	B	802	-	-	0/8/17/17	0/2/2/2
4	Q15	A	803	-	-	5/10/18/18	1/3/3/3
2	HEM	A	801	1	-	6/12/54/54	-
4	Q15	B	804	-	-	2/10/18/18	0/3/3/3
2	HEM	B	801	1	-	8/12/54/54	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	HEM	C1B-NB	-3.99	1.33	1.40
2	B	801	HEM	C1B-NB	-3.51	1.34	1.40
2	B	801	HEM	C3B-C4B	2.77	1.50	1.44
2	A	801	HEM	C4D-ND	-2.70	1.35	1.40
2	A	801	HEM	FE-NB	2.63	2.09	1.96
2	A	801	HEM	C3B-C4B	2.46	1.49	1.44
2	B	801	HEM	C4D-ND	-2.45	1.36	1.40
2	A	801	HEM	C4B-NB	-2.43	1.33	1.38
2	B	801	HEM	C1D-C2D	2.32	1.49	1.44
2	B	801	HEM	C1D-ND	-2.31	1.34	1.38
2	A	801	HEM	C1D-C2D	2.08	1.48	1.44
2	A	801	HEM	C4D-C3D	2.03	1.48	1.45
2	A	801	HEM	O1A-CGA	2.00	1.28	1.22

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	802	H4B	C8A-C4A-C4	5.40	119.37	114.57
2	A	801	HEM	C1B-NB-C4B	4.82	110.06	105.07
4	B	804	Q15	C02-N01-C06	4.63	121.61	118.10
2	B	801	HEM	CBD-CAD-C3D	4.39	124.81	112.63
2	A	801	HEM	CHA-C4D-ND	4.37	129.78	124.38
2	B	801	HEM	C1B-NB-C4B	4.35	109.56	105.07
2	B	801	HEM	CHC-C4B-NB	4.24	129.03	124.43
4	A	803	Q15	C27-O28-C15	4.13	126.69	117.93
3	B	802	H4B	C8A-C4A-C4	4.11	118.22	114.57
2	B	801	HEM	CHA-C4D-C3D	-4.08	117.67	125.33
2	A	801	HEM	CHA-C4D-C3D	-4.06	117.72	125.33
3	B	802	H4B	C4-C4A-N5	4.01	122.49	119.12
4	A	803	Q15	C02-N01-C06	3.84	121.01	118.10
2	B	801	HEM	C3D-C4D-ND	3.67	114.25	110.17
2	B	801	HEM	CHD-C1D-C2D	-3.58	119.39	124.98
3	B	802	H4B	N1-C2-N3	-3.52	119.90	125.42
4	A	803	Q15	C26-N21-C22	3.42	120.16	110.34
4	A	803	Q15	C04-C05-C06	-3.31	118.15	120.32
3	A	802	H4B	C2-N3-C4	3.23	121.06	115.93
2	B	801	HEM	O2D-CGD-CBD	3.19	124.29	114.03
3	B	802	H4B	N2-C2-N1	3.16	122.16	117.25
3	B	802	H4B	C2-N3-C4	3.07	120.80	115.93
2	B	801	HEM	O2D-CGD-O1D	-3.04	115.73	123.30
2	A	801	HEM	CHC-C4B-NB	3.02	127.71	124.43
3	A	802	H4B	N1-C2-N3	-3.01	120.69	125.42
4	B	804	Q15	C26-N21-C22	2.88	118.60	110.34
2	B	801	HEM	CHA-C4D-ND	2.87	127.93	124.38
2	B	801	HEM	CHD-C1D-ND	2.84	127.52	124.43
2	A	801	HEM	CMD-C2D-C1D	2.77	129.26	125.04
4	B	804	Q15	O28-C27-C24	2.74	115.35	108.21
3	B	802	H4B	C2-N1-C8A	2.71	120.61	114.54
4	B	804	Q15	C05-C06-N01	-2.62	120.12	122.90
2	B	801	HEM	CBA-CAA-C2A	-2.59	108.20	112.62
2	B	801	HEM	C2D-C1D-ND	2.58	112.97	109.88
3	A	802	H4B	C4-C4A-N5	2.53	121.24	119.12
4	A	803	Q15	C26-C25-C24	2.52	116.03	112.14
3	A	802	H4B	C2-N1-C8A	2.46	120.06	114.54
2	B	801	HEM	C4D-C3D-C2D	-2.46	103.31	106.90
2	A	801	HEM	CHD-C1D-C2D	-2.46	121.14	124.98
2	A	801	HEM	C4B-CHC-C1C	2.43	125.77	122.56
2	A	801	HEM	CHB-C1B-NB	2.43	127.38	124.38
2	A	801	HEM	O2D-CGD-CBD	2.39	121.70	114.03
2	A	801	HEM	CBD-CAD-C3D	2.35	119.16	112.63

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	HEM	C4B-C3B-C2B	-2.30	105.29	107.11
4	B	804	Q15	C08-O09-C11	2.12	122.89	117.65
2	A	801	HEM	CHD-C1D-ND	2.11	126.72	124.43
4	A	803	Q15	C15-C16-C11	2.07	121.60	118.48
2	A	801	HEM	C3C-C4C-NC	-2.07	107.04	110.94
2	B	801	HEM	CHB-C1B-NB	2.02	126.88	124.38

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	801	HEM	C2A-CAA-CBA-CGA
2	A	801	HEM	C2D-C3D-CAD-CBD
4	B	804	Q15	C23-C24-C27-O28
2	A	801	HEM	C4D-C3D-CAD-CBD
2	B	801	HEM	C4D-C3D-CAD-CBD
4	A	803	Q15	C14-C15-O28-C27
2	B	801	HEM	C2A-CAA-CBA-CGA
4	A	803	Q15	C16-C15-O28-C27
4	B	804	Q15	C25-C24-C27-O28
2	B	801	HEM	C2B-C3B-CAB-CBB
2	B	801	HEM	C4B-C3B-CAB-CBB
4	A	803	Q15	C12-C11-O09-C08
4	A	803	Q15	C16-C11-O09-C08
2	B	801	HEM	C2D-C3D-CAD-CBD
2	B	801	HEM	CAD-CBD-CGD-O1D
2	B	801	HEM	CAD-CBD-CGD-O2D
4	A	803	Q15	C06-C08-O09-C11
2	A	801	HEM	C3D-CAD-CBD-CGD
2	A	801	HEM	CAD-CBD-CGD-O1D
2	A	801	HEM	CAD-CBD-CGD-O2D
2	B	801	HEM	C3D-CAD-CBD-CGD

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	803	Q15	C22-C23-C24-C25-C26-N21

5 monomers are involved in 18 short contacts:

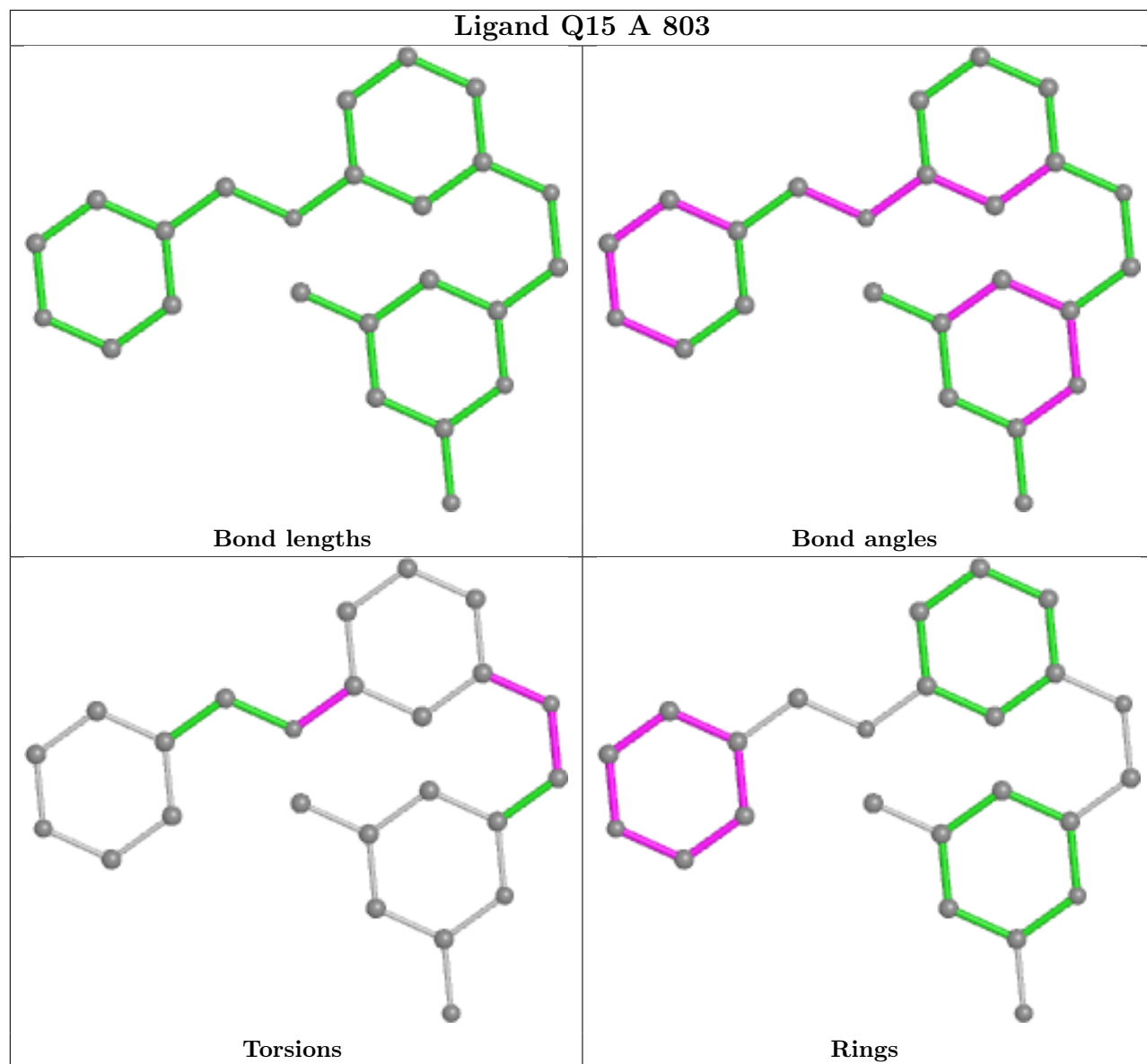
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	802	H4B	1	0

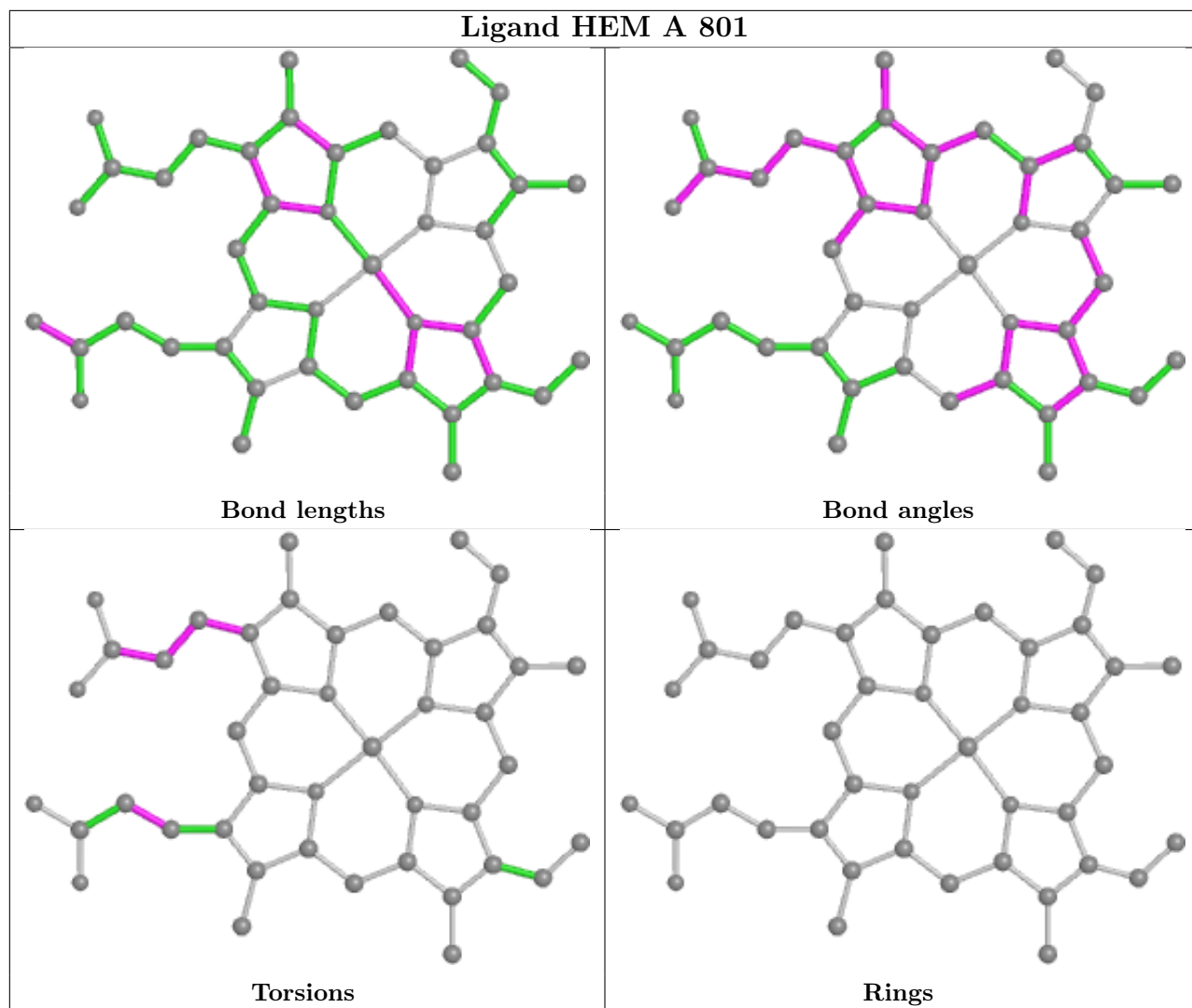
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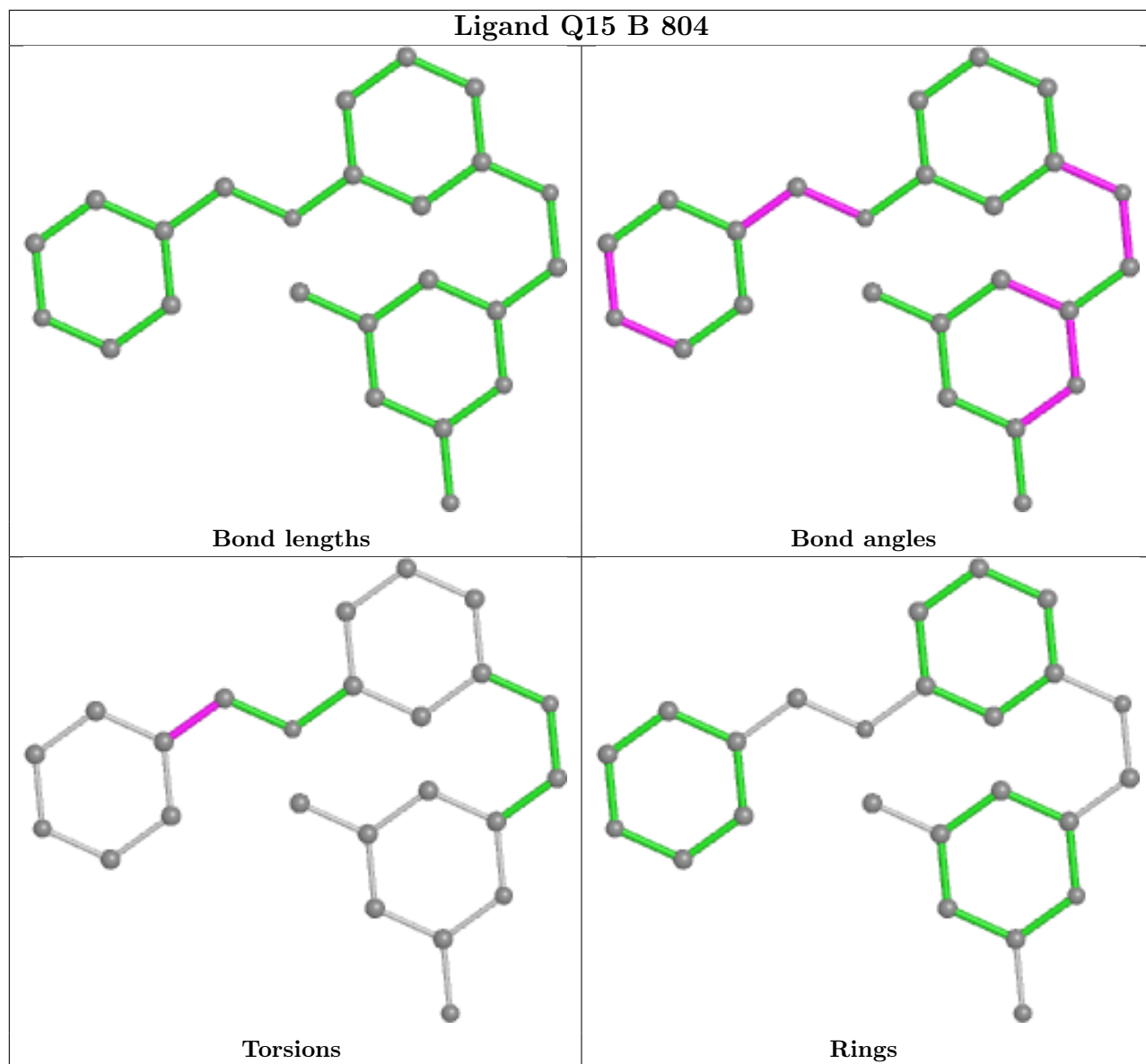
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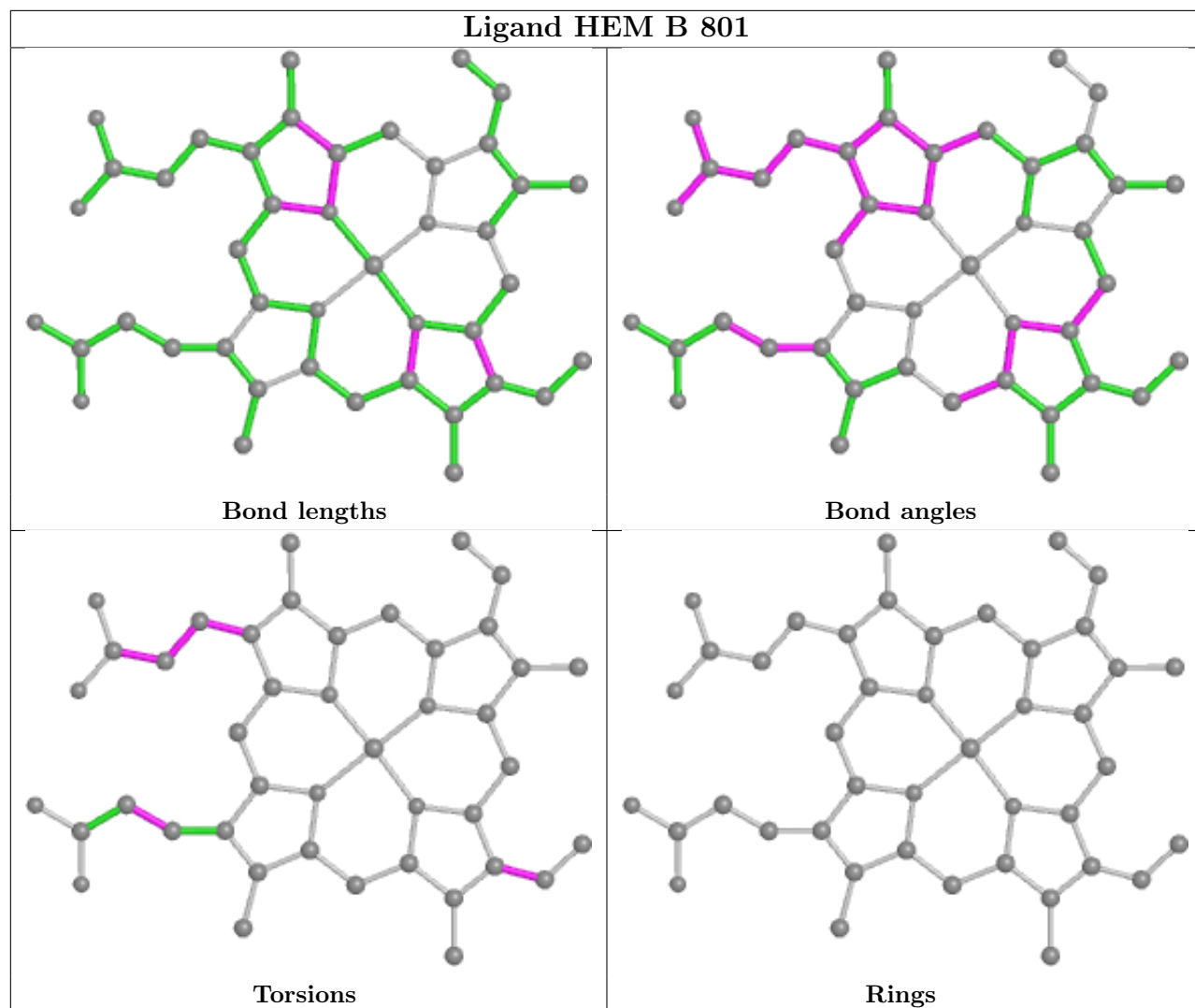
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	803	Q15	3	0
2	A	801	HEM	8	0
4	B	804	Q15	6	0
2	B	801	HEM	6	0

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	418/422 (99%)	0.59	40 (9%) <b>8</b> <b>12</b>	39, 69, 121, 155	0
1	B	420/422 (99%)	0.20	20 (4%) <b>30</b> <b>43</b>	34, 57, 90, 131	0
All	All	838/844 (99%)	0.39	60 (7%) <b>15</b> <b>23</b>	34, 61, 111, 155	0

All (60) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	345	PRO	6.3
1	A	716	TRP	5.6
1	A	715	VAL	5.4
1	B	300	PHE	4.8
1	A	486	LYS	4.5
1	A	488	PRO	4.4
1	B	718	GLY	4.4
1	B	345	PRO	4.2
1	A	344	LYS	4.2
1	A	347	ASP	4.1
1	B	619	ARG	3.9
1	A	507	GLN	3.8
1	A	355	PHE	3.7
1	A	567	VAL	3.7
1	A	390	SER	3.7
1	B	347	ASP	3.4
1	A	493	LEU	3.4
1	B	346	GLU	3.3
1	A	487	GLN	3.3
1	A	389	GLU	3.3
1	A	506	ILE	3.1
1	A	503	GLU	3.1
1	A	584	PHE	3.0
1	A	714	HIS	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	566	ALA	2.8
1	A	352	ASP	2.8
1	B	348	VAL	2.8
1	B	352	ASP	2.8
1	B	567	VAL	2.6
1	A	489	ASP	2.6
1	B	667	ARG	2.6
1	A	340	GLN	2.6
1	A	366	TYR	2.5
1	A	588	TYR	2.5
1	A	565	PRO	2.5
1	A	678	TRP	2.5
1	A	388	ILE	2.5
1	A	712	ASN	2.5
1	A	299	ARG	2.4
1	A	346	GLU	2.4
1	A	491	SER	2.4
1	A	479	LEU	2.4
1	B	615	ASP	2.3
1	A	485	TYR	2.3
1	A	710	PRO	2.2
1	B	350	THR	2.2
1	A	505	CYS	2.2
1	A	300	PHE	2.2
1	B	344	LYS	2.2
1	B	392	SER	2.2
1	B	310	VAL	2.2
1	B	389	GLU	2.1
1	B	616	LEU	2.1
1	A	499	VAL	2.1
1	A	369	ILE	2.1
1	A	511	LYS	2.1
1	A	667	ARG	2.1
1	B	566	ALA	2.1
1	B	349	ARG	2.1
1	B	617	ASP	2.0

## 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 [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

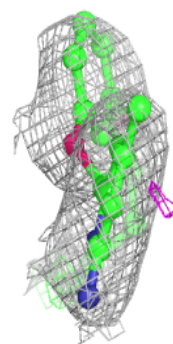
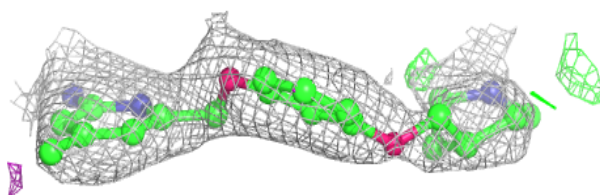
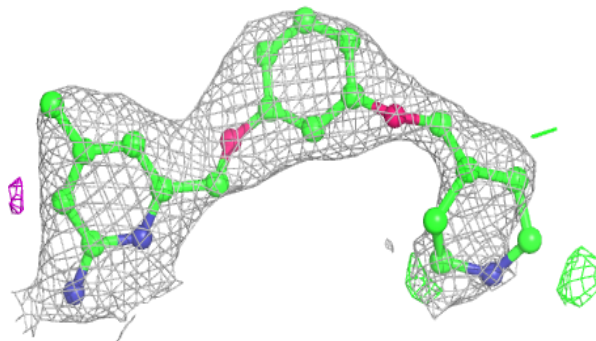
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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	ACT	B	803	4/4	0.74	0.35	64,71,72,74	0
4	Q15	A	803	24/24	0.93	0.38	49,60,105,111	0
5	ACT	A	804	4/4	0.94	0.14	56,61,64,65	0
3	H4B	B	802	17/17	0.94	0.23	52,57,63,64	0
4	Q15	B	804	24/24	0.96	0.17	30,51,82,82	0
3	H4B	A	802	17/17	0.97	0.20	48,55,62,64	0
2	HEM	A	801	43/43	0.97	0.23	37,44,58,68	0
2	HEM	B	801	43/43	0.98	0.17	37,45,64,72	0
6	ZN	A	805	1/1	0.99	0.12	55,55,55,55	0

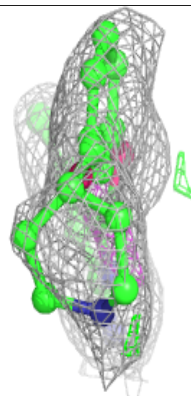
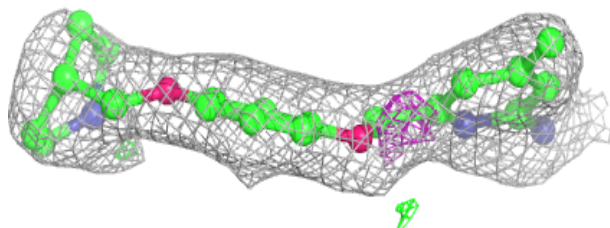
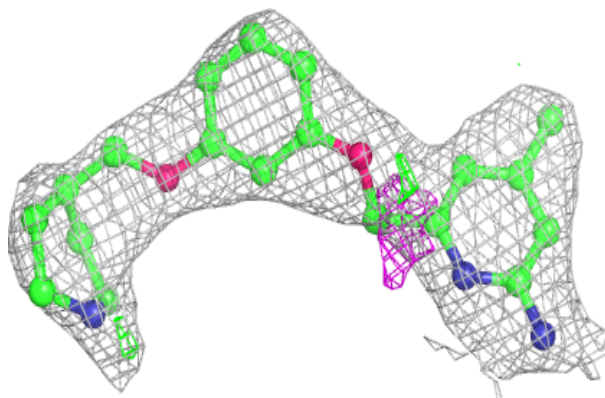
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around Q15 A 803:**

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

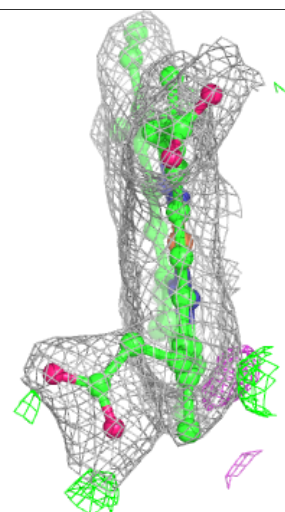
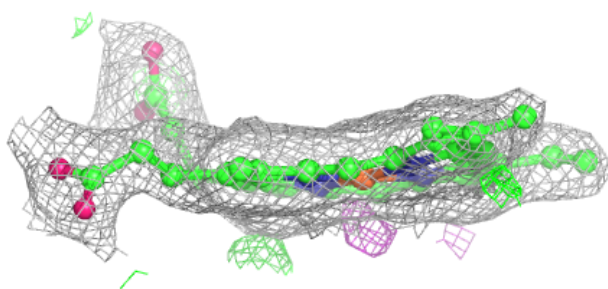
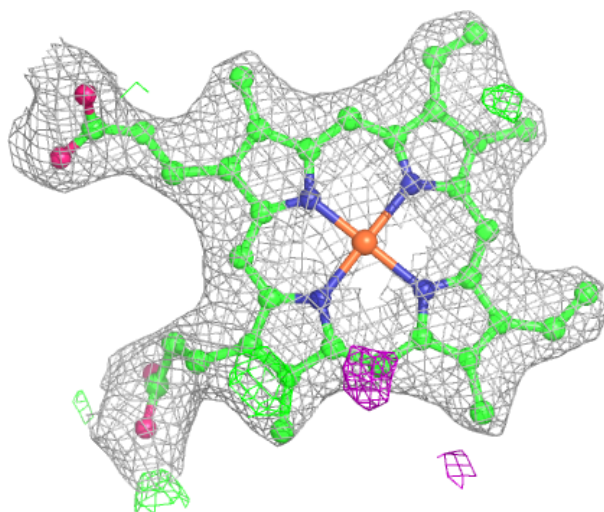
**Electron density around Q15 B 804:**

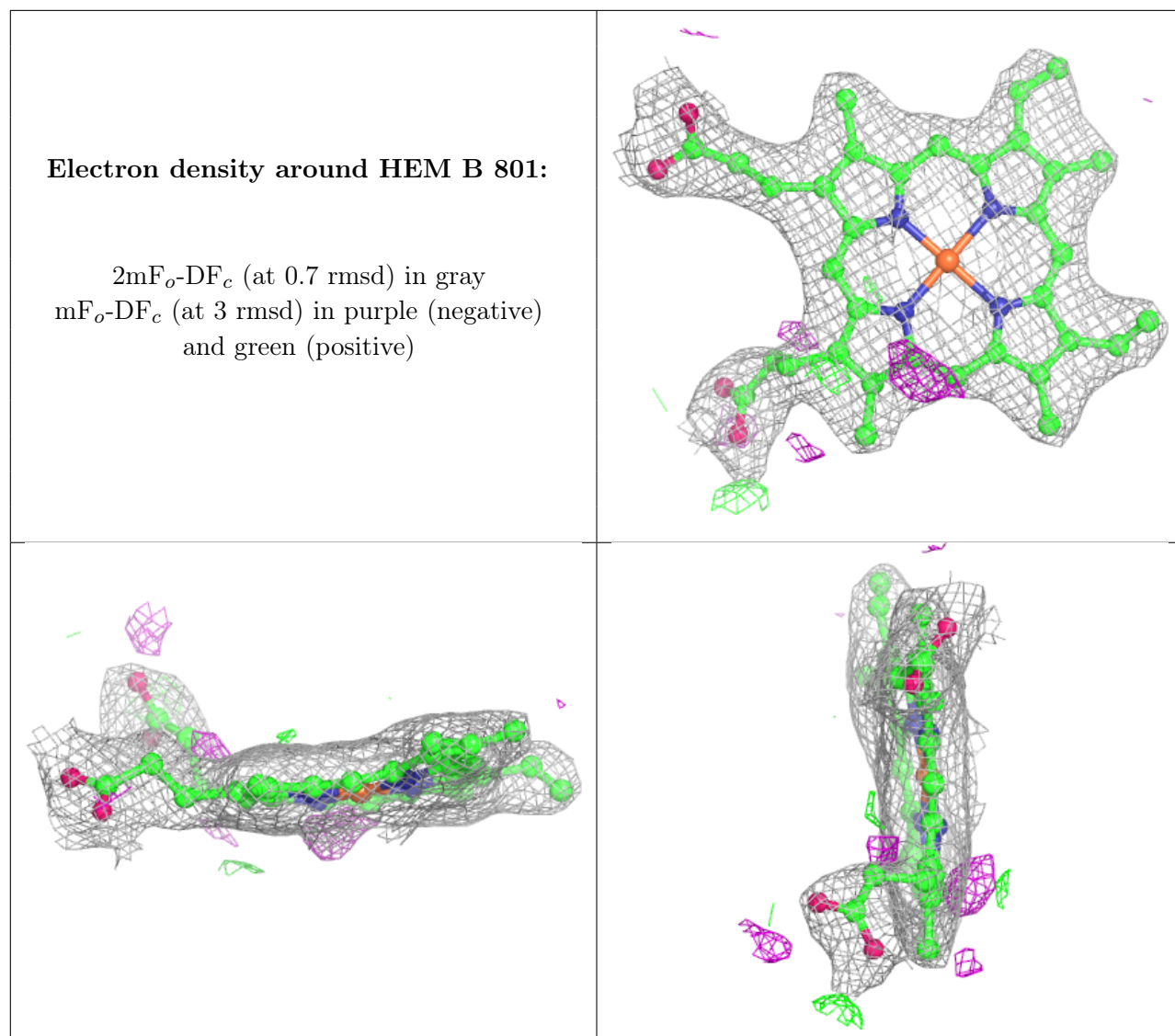
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around HEM 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.