



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 4, 2024 – 03:35 AM EST

PDB ID : 1P6I  
Title : Rat neuronal NOS heme domain with (4S)-N-(4-amino-5-[aminoethyl]aminopentyl)-N'-nitroguanidine bound  
Authors : Flinspach, M.L.; Li, H.; Jamal, J.; Yang, W.; Huang, H.; Hah, J.-M.; Gomez-Vidal, J.A.; Litzinger, E.A.; Silverman, R.B.; Poulos, T.L.  
Deposited on : 2003-04-29  
Resolution : 1.90 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 : 2.36  
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) : 2.36

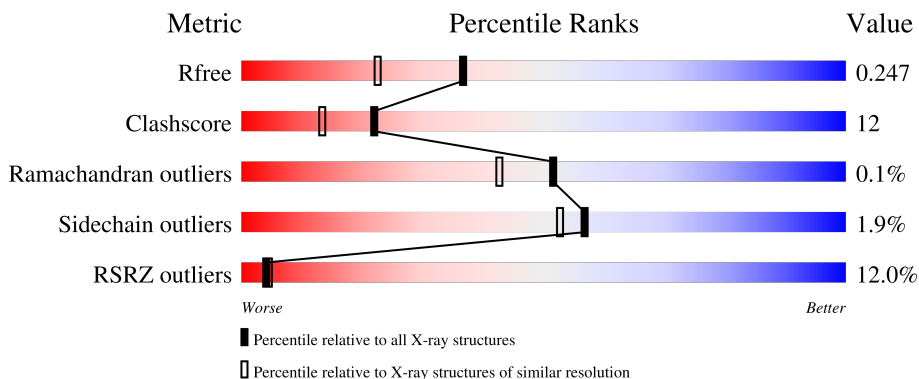
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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](#)

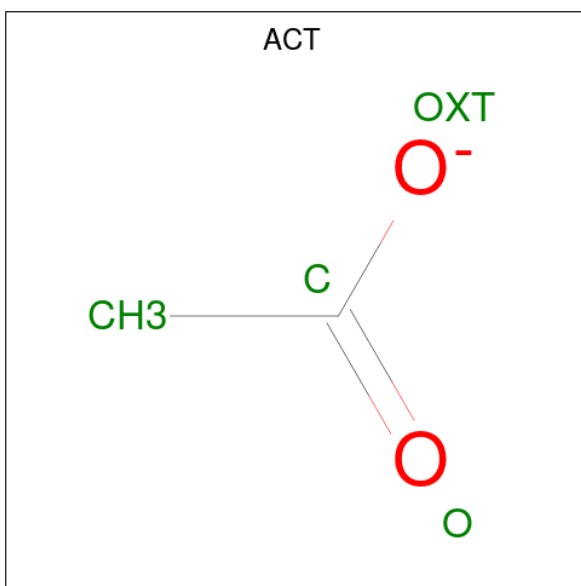
There are 7 unique types of molecules in this entry. The entry contains 7359 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 3313	C 2121	N 566	O 605	S 21	0	0	0
1	B	410	Total 3341	C 2138	N 573	O 609	S 21	0	0	0

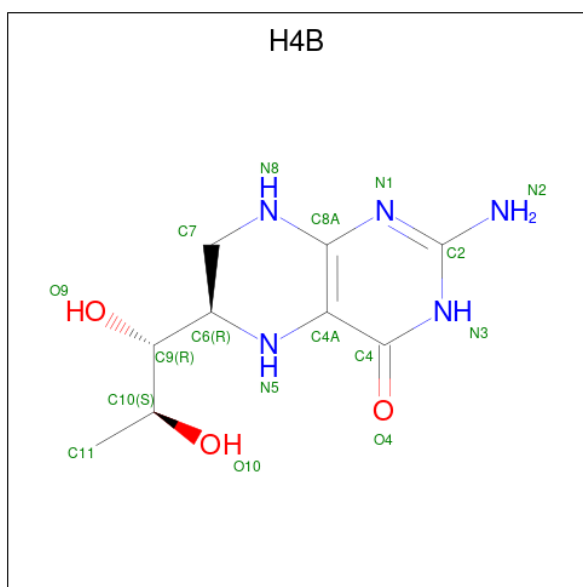
- Molecule 2 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



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

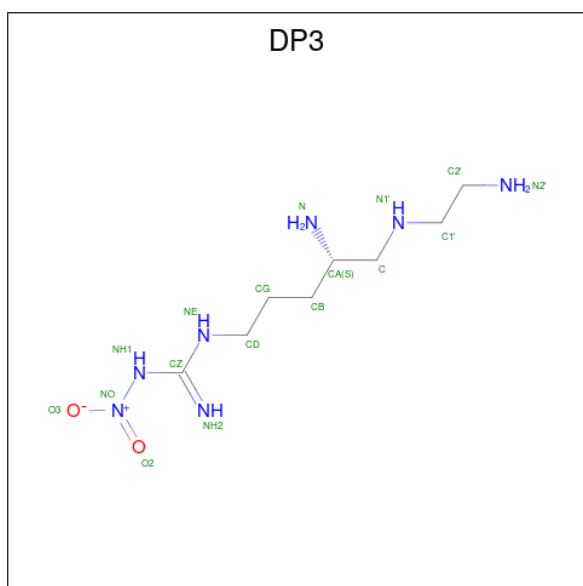
- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).





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

- Molecule 6 is N-{(4S)-4-AMINO-5-[(2-AMINOETHYL)AMINO]PENTYL}-N'-NITROGUANIDINE (three-letter code: DP3) (formula: C<sub>8</sub>H<sub>21</sub>N<sub>7</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			17	8	7	2		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	B	1	17	8	7	2	0	0

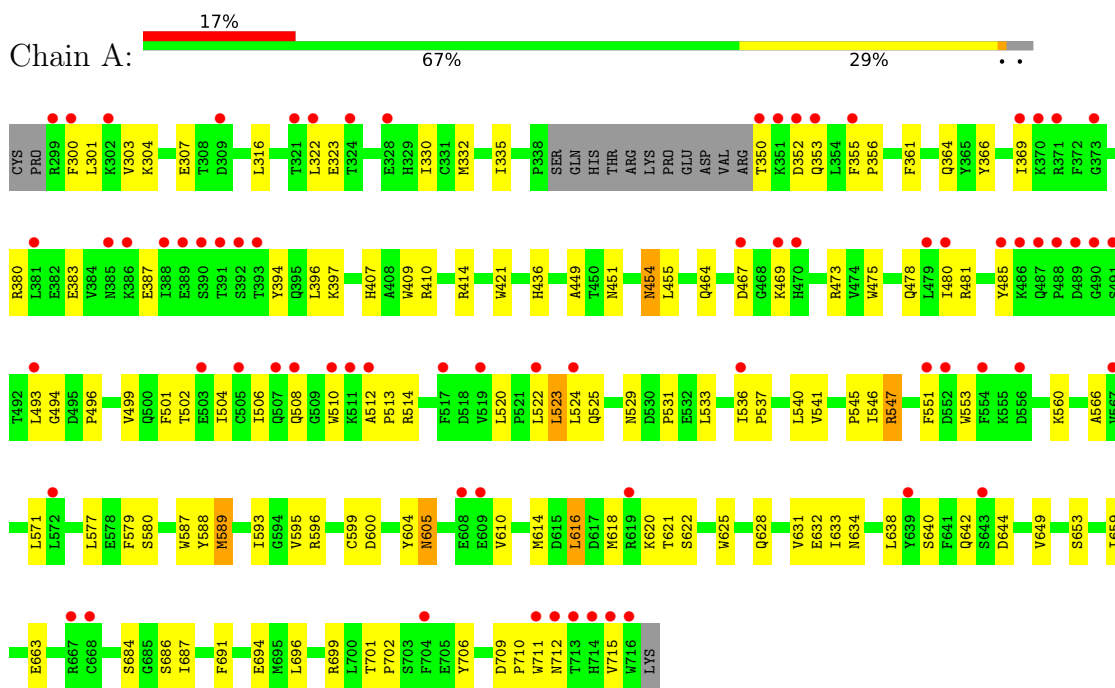
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	232	Total	O	0	0
			232	232		
7	B	310	Total	O	0	0
			310	310		

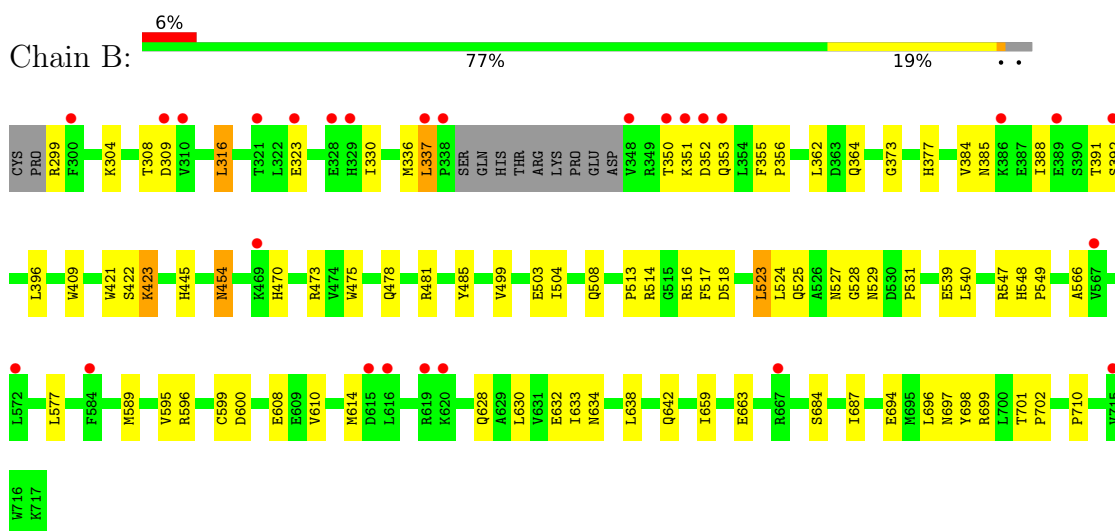
### 3 Residue-property plots [i](#)

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, $\alpha$ , $\beta$ , $\gamma$	51.11Å 110.69Å 164.36Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	32.03 – 1.90 32.02 – 1.87	Depositor EDS
% Data completeness (in resolution range)	97.1 (32.03-1.90) 93.8 (32.02-1.87)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.34 (at 1.87Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.228 , 0.256 0.222 , 0.247	Depositor DCC
$R_{free}$ test set	3695 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.4	Xtrriage
Anisotropy	0.544	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 42.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	7359	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.29% 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: H4B, HEM, DP3, ZN, 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	0.32	0/3406	0.58	1/4621 (0.0%)
1	B	0.33	0/3434	0.60	1/4656 (0.0%)
All	All	0.33	0/6840	0.59	2/9277 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	589	MET	N-CA-C	-5.73	95.52	111.00
1	B	589	MET	N-CA-C	-5.49	96.19	111.00

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	3313	0	3221	99	0
1	B	3341	0	3256	63	0
2	A	4	0	3	0	0
2	B	4	0	3	0	0
3	A	1	0	0	0	0
4	A	43	0	30	2	0
4	B	43	0	30	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	17	0	15	0	0
5	B	17	0	15	0	0
6	A	17	0	21	2	0
6	B	17	0	21	1	0
7	A	232	0	0	5	0
7	B	310	0	0	7	0
All	All	7359	0	6615	159	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 12.

All (159) 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:373:GLY:H	1:B:377:HIS:HD2	1.17	0.93
1:B:523:LEU:HD22	1:B:531:PRO:HB2	1.49	0.91
1:B:350:THR:HB	1:B:353:GLN:OE1	1.79	0.81
1:A:545:PRO:HG2	1:A:547:ARG:NH1	2.01	0.75
1:A:523:LEU:HD22	1:A:531:PRO:HB2	1.68	0.73
1:A:350:THR:HB	1:A:353:GLN:HG3	1.69	0.73
1:A:473:ARG:NH2	1:A:710:PRO:HD3	2.08	0.69
1:A:350:THR:HG22	1:A:352:ASP:H	1.58	0.69
1:A:616:LEU:HD13	1:A:625:TRP:HB2	1.75	0.68
1:B:478:GLN:HB2	1:B:481:ARG:HG3	1.74	0.68
1:A:684:SER:HB3	1:A:687:ILE:HD11	1.77	0.67
4:A:750:HEM:HMC2	4:A:750:HEM:HBC2	1.77	0.67
1:B:373:GLY:H	1:B:377:HIS:CD2	2.07	0.66
1:A:380:ARG:NH1	1:A:397:LYS:HE2	2.11	0.65
1:A:546:ILE:HA	1:A:640:SER:OG	1.97	0.65
1:A:628:GLN:NE2	1:B:632:GLU:OE2	2.31	0.63
1:B:659:ILE:O	1:B:663:GLU:HG3	1.98	0.63
1:B:513:PRO:HG2	1:B:518:ASP:CG	2.18	0.63
1:A:537:PRO:HB2	1:A:540:LEU:HG	1.81	0.62
1:A:307:GLU:HG3	7:B:935:HOH:O	1.97	0.62
1:A:620:LYS:HE3	1:A:622:SER:OG	1.99	0.62
1:A:361:PHE:O	1:A:364:GLN:HG2	1.98	0.62
1:A:304:LYS:O	1:A:694:GLU:HG3	1.99	0.61
1:B:684:SER:HB3	1:B:687:ILE:HD11	1.82	0.61
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.83	0.61
1:A:545:PRO:HG2	1:A:547:ARG:HH11	1.65	0.61
1:B:355:PHE:N	1:B:356:PRO:HD2	2.16	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:337:LEU:N	1:B:337:LEU:HD23	2.16	0.61
1:B:684:SER:HB3	1:B:687:ILE:CG1	2.31	0.60
1:A:684:SER:HB3	1:A:687:ILE:CG1	2.30	0.60
1:B:336:MET:HB3	1:B:337:LEU:HD23	1.83	0.60
1:A:595:VAL:HG23	1:A:634:ASN:HD21	1.67	0.59
1:B:323:GLU:O	1:B:699:ARG:HD3	2.03	0.59
1:B:350:THR:HG22	1:B:352:ASP:H	1.67	0.59
1:A:684:SER:HB3	1:A:687:ILE:CD1	2.33	0.59
1:B:391:THR:O	1:B:392:SER:HB2	2.03	0.58
1:A:475:TRP:HB2	1:A:523:LEU:HB3	1.86	0.58
1:A:350:THR:HB	1:A:353:GLN:CG	2.32	0.58
1:B:499:VAL:O	1:B:503:GLU:HG3	2.04	0.58
1:A:322:LEU:HD13	1:A:699:ARG:NH2	2.20	0.57
1:A:610:VAL:O	1:A:614:MET:HG3	2.04	0.57
1:B:422:SER:OG	1:B:423:LYS:HD2	2.05	0.56
1:A:524:LEU:O	1:A:531:PRO:HA	2.06	0.56
1:A:506:ILE:HD11	1:A:512:ALA:HB2	1.89	0.55
1:A:396:LEU:HG	1:A:577:LEU:HD12	1.88	0.55
1:A:502:THR:O	1:A:506:ILE:HG12	2.07	0.55
1:A:485:TYR:CE2	1:A:512:ALA:HB1	2.42	0.55
1:B:396:LEU:HG	1:B:577:LEU:HD12	1.89	0.55
1:A:355:PHE:N	1:A:356:PRO:HD2	2.23	0.54
1:A:366:TYR:HA	1:A:369:ILE:HG12	1.90	0.54
1:A:335:ILE:HD13	1:B:694:GLU:HB3	1.89	0.53
1:A:621:THR:HG23	7:A:1123:HOH:O	2.09	0.53
1:B:638:LEU:O	1:B:642:GLN:HG3	2.09	0.53
1:A:330:ILE:HD11	1:B:696:LEU:HB3	1.91	0.52
1:A:684:SER:HB3	1:A:687:ILE:HG12	1.89	0.52
1:A:659:ILE:O	1:A:663:GLU:HG3	2.09	0.52
1:A:596:ARG:O	1:A:600:ASP:HB2	2.10	0.52
1:B:304:LYS:O	1:B:694:GLU:HG3	2.10	0.51
1:B:475:TRP:HB2	1:B:523:LEU:HB3	1.91	0.51
1:A:322:LEU:HB3	1:A:699:ARG:NH1	2.25	0.51
1:B:684:SER:HB3	1:B:687:ILE:CD1	2.40	0.51
1:B:364:GLN:HG3	7:B:1135:HOH:O	2.10	0.51
1:A:621:THR:HG22	7:A:1058:HOH:O	2.11	0.51
1:B:504:ILE:O	1:B:508:GLN:HG2	2.11	0.51
1:B:595:VAL:HG23	1:B:634:ASN:HD21	1.75	0.50
1:A:350:THR:HG22	1:A:352:ASP:N	2.26	0.50
1:B:308:THR:O	1:B:309:ASP:HB2	2.11	0.50
1:B:316:LEU:HB3	1:B:698:TYR:OH	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:614:MET:CE	1:A:632:GLU:HG3	2.42	0.49
1:A:409:TRP:CE3	1:A:421:TRP:HA	2.47	0.49
1:A:504:ILE:O	1:A:508:GLN:HB2	2.13	0.49
1:B:485:TYR:CZ	1:B:514:ARG:HA	2.48	0.49
1:B:701:THR:HA	1:B:702:PRO:C	2.33	0.49
1:B:596:ARG:O	1:B:600:ASP:HB2	2.13	0.49
1:A:451:ASN:HB3	1:A:454:ASN:O	2.13	0.48
1:A:455:LEU:HD12	1:A:587:TRP:HB3	1.96	0.48
1:A:436:HIS:HB2	7:A:1040:HOH:O	2.13	0.48
1:A:696:LEU:HD22	1:B:330:ILE:HD11	1.96	0.48
1:B:362:LEU:HD11	1:B:384:VAL:HG21	1.95	0.48
1:A:407:HIS:CE1	1:A:410:ARG:HH11	2.32	0.48
1:A:475:TRP:CZ3	1:A:711:TRP:HB3	2.49	0.48
6:A:793:DP3:H2	7:A:1130:HOH:O	2.14	0.48
1:B:478:GLN:HB2	1:B:481:ARG:CG	2.40	0.48
1:B:608:GLU:HG3	7:B:1163:HOH:O	2.13	0.48
1:A:709:ASP:HB2	1:A:712:ASN:ND2	2.29	0.47
1:A:301:LEU:CD1	1:B:330:ILE:HD13	2.44	0.47
1:A:449:ALA:O	1:A:455:LEU:HA	2.15	0.47
1:A:715:VAL:O	1:A:715:VAL:HG23	2.15	0.47
1:B:355:PHE:CE1	1:B:385:ASN:HB2	2.50	0.47
6:B:794:DP3:H1'1	7:B:1008:HOH:O	2.15	0.47
1:B:351:LYS:HE2	1:B:392:SER:OG	2.15	0.47
1:A:545:PRO:HD2	1:A:644:ASP:OD2	2.15	0.46
1:A:614:MET:HE1	1:A:632:GLU:HG3	1.97	0.46
1:A:478:GLN:HB2	1:A:481:ARG:CG	2.44	0.46
1:A:467:ASP:OD1	1:A:469:LYS:HB2	2.15	0.46
1:A:610:VAL:HG21	1:A:633:ILE:HD11	1.96	0.46
1:A:496:PRO:O	1:A:499:VAL:HG23	2.16	0.46
1:A:473:ARG:HD3	1:A:580:SER:HB2	1.98	0.46
1:A:687:ILE:HD13	1:B:630:LEU:HD22	1.98	0.46
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.50	0.46
1:A:464:GLN:HB3	1:A:579:PHE:CE2	2.51	0.46
1:B:684:SER:HB3	1:B:687:ILE:HG12	1.97	0.45
1:A:323:GLU:O	1:A:699:ARG:HD3	2.15	0.45
1:A:701:THR:HA	1:A:702:PRO:C	2.37	0.45
1:A:387:GLU:OE2	1:A:394:TYR:HA	2.17	0.45
1:B:539:GLU:HG2	1:B:540:LEU:HD13	1.98	0.45
1:A:485:TYR:HB3	1:A:514:ARG:NH1	2.32	0.45
1:A:512:ALA:HA	1:A:513:PRO:HD3	1.85	0.45
1:B:388:ILE:O	1:B:392:SER:N	2.44	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:522:LEU:O	1:A:533:LEU:HA	2.17	0.44
1:A:551:PHE:HB3	1:A:553:TRP:CE2	2.52	0.44
1:A:604:TYR:O	1:A:605:ASN:C	2.56	0.44
1:A:709:ASP:HB2	1:A:712:ASN:HD22	1.82	0.44
1:A:494:GLY:O	1:A:496:PRO:HD3	2.18	0.44
1:A:551:PHE:HB3	1:A:553:TRP:NE1	2.33	0.44
1:B:299:ARG:HB3	1:B:299:ARG:HH11	1.83	0.44
1:B:525:GLN:HG3	1:B:529:ASN:O	2.17	0.44
1:B:614:MET:CE	1:B:632:GLU:HG3	2.48	0.44
1:B:473:ARG:NH2	1:B:710:PRO:HD3	2.33	0.44
1:A:525:GLN:HG3	1:A:529:ASN:O	2.18	0.44
1:B:470:HIS:HB3	1:B:527:ASN:ND2	2.32	0.43
1:A:536:ILE:O	1:A:537:PRO:C	2.56	0.43
1:A:631:VAL:HG11	1:B:628:GLN:HG2	1.99	0.43
1:B:470:HIS:HA	1:B:528:GLY:HA3	2.01	0.43
1:A:595:VAL:O	1:A:599:CYS:HB2	2.18	0.43
1:B:548:HIS:CG	1:B:549:PRO:HD2	2.52	0.43
1:A:506:ILE:C	1:A:508:GLN:H	2.21	0.43
1:A:571:LEU:C	1:A:571:LEU:HD23	2.39	0.43
1:B:699:ARG:HG2	7:B:974:HOH:O	2.18	0.43
1:B:516:ARG:HD3	1:B:517:PHE:CE1	2.54	0.42
1:A:501:PHE:HD2	1:A:520:LEU:HD13	1.83	0.42
1:A:303:VAL:CG1	1:A:696:LEU:HG	2.49	0.42
1:A:686:SER:HA	1:A:691:PHE:CG	2.54	0.42
1:B:445:HIS:CD2	1:B:445:HIS:C	2.93	0.42
1:B:485:TYR:CE1	1:B:514:ARG:HA	2.55	0.42
1:A:300:PHE:CD1	1:A:300:PHE:N	2.87	0.42
1:B:355:PHE:N	1:B:356:PRO:CD	2.82	0.42
1:B:524:LEU:O	1:B:531:PRO:HA	2.19	0.42
1:A:322:LEU:HB3	1:A:699:ARG:CZ	2.50	0.41
1:A:383:GLU:HG3	7:A:1094:HOH:O	2.20	0.41
1:A:414:ARG:NH1	1:A:706:TYR:OH	2.52	0.41
1:A:510:TRP:HB2	1:A:533:LEU:HD13	2.01	0.41
1:A:638:LEU:O	1:A:642:GLN:HG3	2.20	0.41
1:A:595:VAL:HG23	1:A:634:ASN:ND2	2.33	0.41
1:A:506:ILE:C	1:A:508:GLN:N	2.74	0.41
1:B:454:ASN:ND2	7:B:875:HOH:O	2.53	0.41
1:A:589:MET:HA	1:A:649:VAL:O	2.20	0.41
4:A:750:HEM:HBA2	6:A:793:DP3:HD1	2.02	0.41
1:B:478:GLN:HA	1:B:566:ALA:O	2.20	0.41
1:A:350:THR:HB	1:A:353:GLN:CD	2.41	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:588:TYR:CD1	1:A:593:ILE:HD11	2.56	0.40
1:A:653:SER:HB2	7:B:1016:HOH:O	2.20	0.40
1:A:478:GLN:HA	1:A:566:ALA:O	2.21	0.40
1:A:618:MET:HA	1:A:625:TRP:CD1	2.56	0.40
1:B:595:VAL:O	1:B:599:CYS:HB2	2.21	0.40
1:A:455:LEU:HD12	1:A:587:TRP:CB	2.50	0.40
1:A:480:ILE:HD13	1:A:541:VAL:HG13	2.03	0.40
1:A:546:ILE:HG12	1:A:560:LYS:HA	2.04	0.40
1:B:610:VAL:HG21	1:B:633:ILE:HD11	2.03	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	403/421 (96%)	378 (94%)	24 (6%)	1 (0%)	47	38
1	B	406/421 (96%)	393 (97%)	13 (3%)	0	100	100
All	All	809/842 (96%)	771 (95%)	37 (5%)	1 (0%)	51	42

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	605	ASN

### 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	363/377 (96%)	356 (98%)	7 (2%)	57	53
1	B	366/377 (97%)	359 (98%)	7 (2%)	57	53
All	All	729/754 (97%)	715 (98%)	14 (2%)	57	53

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	316	LEU
1	A	332	MET
1	A	454	ASN
1	A	493	LEU
1	A	523	LEU
1	A	547	ARG
1	A	616	LEU
1	B	316	LEU
1	B	337	LEU
1	B	423	LYS
1	B	454	ASN
1	B	523	LEU
1	B	547	ARG
1	B	697	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	407	HIS
1	A	425	GLN
1	A	451	ASN
1	A	454	ASN
1	A	500	GLN
1	A	634	ASN
1	A	697	ASN
1	A	712	ASN
1	B	364	GLN
1	B	377	HIS
1	B	407	HIS
1	B	425	GLN
1	B	451	ASN
1	B	454	ASN

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Mol	Chain	Res	Type
1	B	507	GLN
1	B	527	ASN
1	B	535	GLN
1	B	634	ASN
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	$\# Z  > 2$
4	HEM	B	750	1	41,50,50	1.39	5 (12%)	45,82,82	1.39	7 (15%)
2	ACT	A	860	-	3,3,3	0.89	0	3,3,3	0.79	0
6	DP3	B	794	-	11,16,16	1.36	2 (18%)	11,18,18	1.42	3 (27%)
6	DP3	A	793	-	11,16,16	1.49	3 (27%)	11,18,18	1.44	3 (27%)
4	HEM	A	750	1	41,50,50	1.20	3 (7%)	45,82,82	1.30	7 (15%)
5	H4B	B	761	-	16,18,18	2.31	3 (18%)	11,26,26	4.19	9 (81%)
2	ACT	B	861	-	3,3,3	0.91	0	3,3,3	0.80	0
5	H4B	A	760	-	16,18,18	2.22	4 (25%)	11,26,26	4.22	9 (81%)



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	HEM	B	750	1	-	2/12/54/54	-
6	DP3	B	794	-	-	4/13/16/16	-
6	DP3	A	793	-	-	4/13/16/16	-
5	H4B	B	761	-	-	0/8/17/17	0/2/2/2
4	HEM	A	750	1	-	1/12/54/54	-
5	H4B	A	760	-	-	0/8/17/17	0/2/2/2

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	761	H4B	C4-N3	5.65	1.42	1.33
5	A	760	H4B	C4-N3	5.19	1.42	1.33
5	B	761	H4B	C4A-N5	4.70	1.47	1.38
5	A	760	H4B	C4A-N5	4.65	1.47	1.38
5	B	761	H4B	C6-N5	4.54	1.54	1.45
5	A	760	H4B	C6-N5	4.23	1.54	1.45
4	B	750	HEM	C3C-C2C	-3.63	1.35	1.40
4	A	750	HEM	C3C-CAC	-3.36	1.40	1.47
4	B	750	HEM	C4A-NA	3.27	1.42	1.36
4	B	750	HEM	C3C-CAC	-2.88	1.41	1.47
6	A	793	DP3	CB-CA	2.88	1.57	1.53
4	B	750	HEM	CAB-C3B	-2.82	1.39	1.47
4	A	750	HEM	CAB-C3B	-2.62	1.40	1.47
6	B	794	DP3	CB-CA	2.61	1.57	1.53
6	A	793	DP3	CZ-NH2	2.53	1.36	1.29
6	B	794	DP3	CZ-NH2	2.34	1.36	1.29
4	B	750	HEM	CHB-C1B	2.18	1.40	1.35
6	A	793	DP3	CD-NE	2.18	1.51	1.46
5	A	760	H4B	C8A-N1	2.16	1.38	1.34
4	A	750	HEM	C4A-NA	2.04	1.40	1.36

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	760	H4B	C8A-C4A-C4	8.97	122.53	114.57
5	B	761	H4B	C8A-C4A-C4	8.95	122.52	114.57
5	A	760	H4B	C2-N3-C4	5.60	124.83	115.93
5	B	761	H4B	C2-N3-C4	5.57	124.77	115.93

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	760	H4B	N1-C2-N3	-4.82	117.86	125.42
5	B	761	H4B	N1-C2-N3	-4.68	118.08	125.42
4	B	750	HEM	C4A-C3A-C2A	-3.80	104.35	107.00
5	A	760	H4B	C2-N1-C8A	3.70	122.83	114.54
5	B	761	H4B	C4A-C4-N3	-3.66	113.61	124.01
5	B	761	H4B	C2-N1-C8A	3.59	122.59	114.54
5	A	760	H4B	C4A-C4-N3	-3.59	113.81	124.01
5	A	760	H4B	N2-C2-N1	3.32	122.41	117.25
6	A	793	DP3	CB-CA-C	3.26	114.20	109.52
6	B	794	DP3	CB-CA-C	3.24	114.17	109.52
5	B	761	H4B	C4A-N5-C6	-3.21	112.43	121.16
5	A	760	H4B	C4A-N5-C6	-3.17	112.54	121.16
5	B	761	H4B	N2-C2-N1	3.08	122.05	117.25
4	B	750	HEM	CBA-CAA-C2A	-3.02	107.47	112.62
5	B	761	H4B	C4-C4A-N5	-2.56	116.97	119.12
4	B	750	HEM	CMA-C3A-C2A	2.51	129.68	124.94
5	A	760	H4B	C4-C4A-N5	-2.46	117.06	119.12
4	A	750	HEM	C4B-CHC-C1C	2.46	125.81	122.56
4	A	750	HEM	C4A-C3A-C2A	-2.46	105.29	107.00
4	B	750	HEM	CBD-CAD-C3D	-2.44	105.85	112.63
4	A	750	HEM	CBA-CAA-C2A	-2.39	108.54	112.62
4	A	750	HEM	CBD-CAD-C3D	-2.34	106.14	112.63
5	A	760	H4B	O9-C9-C6	2.23	114.32	108.98
4	B	750	HEM	C4C-CHD-C1D	2.23	125.50	122.56
4	A	750	HEM	CMC-C2C-C3C	2.20	128.80	124.68
4	B	750	HEM	C4B-CHC-C1C	2.20	125.46	122.56
5	B	761	H4B	O9-C9-C6	2.17	114.16	108.98
4	B	750	HEM	C1D-C2D-C3D	-2.12	104.73	106.96
6	B	794	DP3	CD-NE-CZ	2.11	127.36	123.50
6	B	794	DP3	NE-CZ-NH2	-2.11	116.31	120.26
6	A	793	DP3	CD-NE-CZ	2.09	127.32	123.50
4	A	750	HEM	C4C-CHD-C1D	2.08	125.30	122.56
4	A	750	HEM	CAB-C3B-C2B	-2.07	121.77	128.60
6	A	793	DP3	NE-CZ-NH2	-2.07	116.37	120.26

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	793	DP3	N1'-C1'-C2'-N2'
6	A	793	DP3	N1'-C-CA-CB
6	B	794	DP3	N1'-C-CA-N

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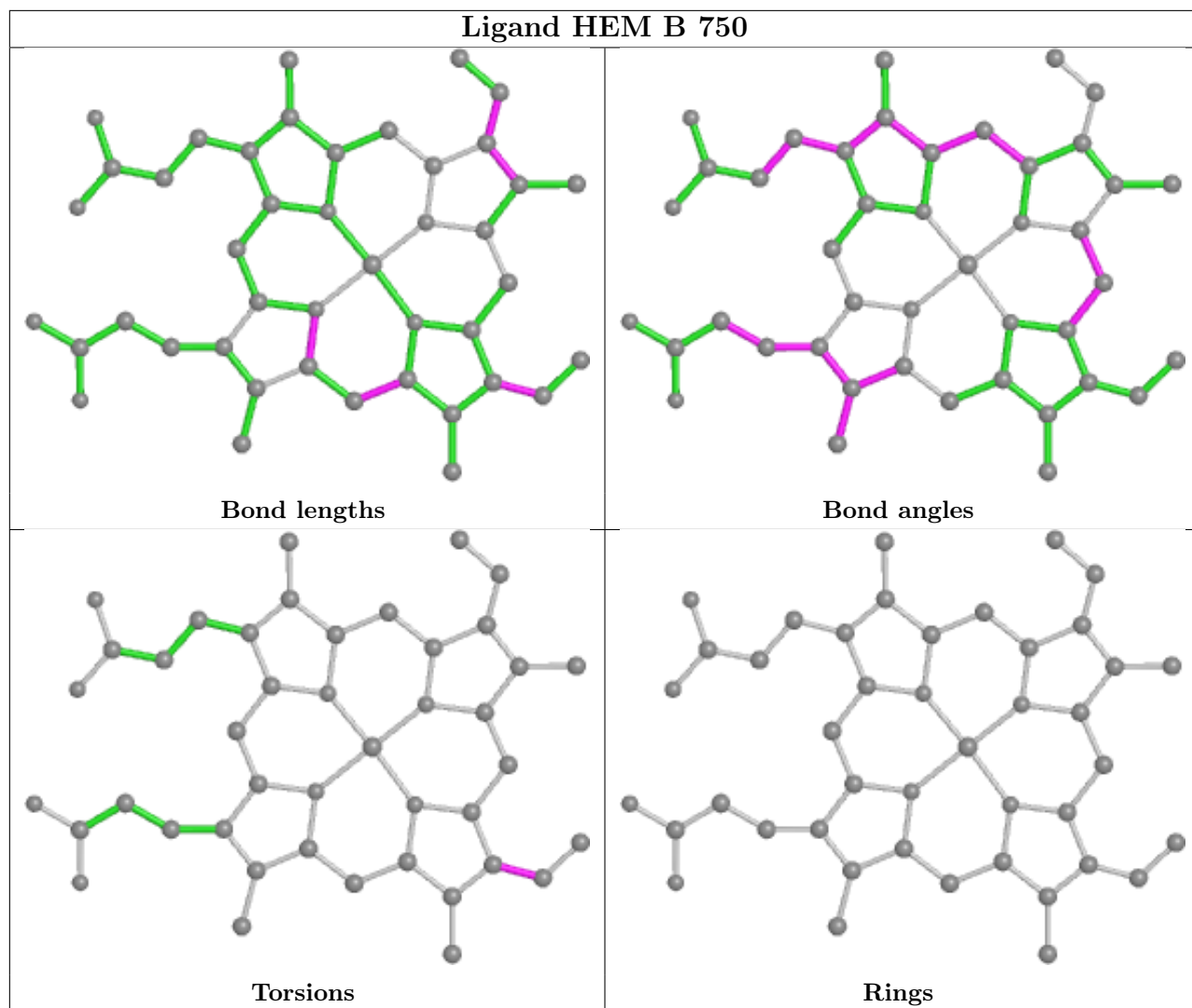
Mol	Chain	Res	Type	Atoms
6	B	794	DP3	N1'-C-CA-CB
6	A	793	DP3	N1'-C-CA-N
4	B	750	HEM	C2B-C3B-CAB-CBB
4	B	750	HEM	C4B-C3B-CAB-CBB
6	B	794	DP3	N-CA-CB-CG
4	A	750	HEM	C4B-C3B-CAB-CBB
6	B	794	DP3	C-CA-CB-CG
6	A	793	DP3	N-CA-CB-CG

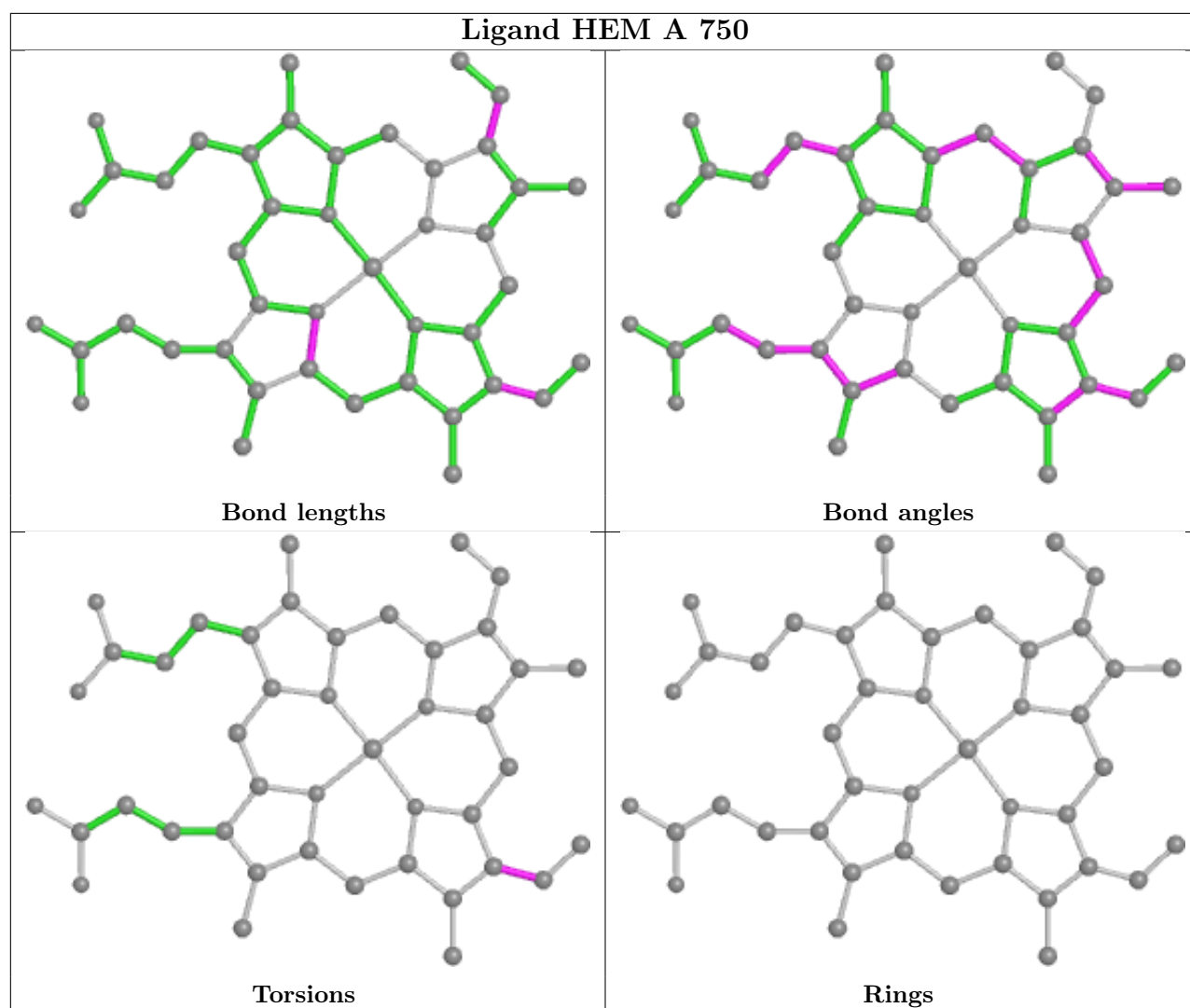
There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	794	DP3	1	0
6	A	793	DP3	2	0
4	A	750	HEM	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 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	407/421 (96%)	1.11	71 (17%) <b>1</b> <b>1</b>	16, 37, 60, 74	0
1	B	410/421 (97%)	0.47	27 (6%) <b>18</b> <b>20</b>	16, 27, 49, 62	0
All	All	817/842 (97%)	0.79	98 (11%) <b>4</b> <b>4</b>	16, 31, 57, 74	0

All (98) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	715	VAL	7.9
1	A	488	PRO	7.4
1	A	716	TRP	6.6
1	B	348	VAL	6.6
1	A	355	PHE	6.2
1	B	350	THR	6.0
1	B	300	PHE	5.3
1	A	299	ARG	5.3
1	A	486	LYS	4.9
1	A	300	PHE	4.6
1	A	352	ASP	4.6
1	A	713	THR	4.4
1	A	350	THR	4.3
1	A	490	GLY	4.2
1	A	351	LYS	4.1
1	B	619	ARG	4.0
1	A	507	GLN	4.0
1	A	388	ILE	4.0
1	A	390	SER	4.0
1	A	469	LYS	3.8
1	A	491	SER	3.8
1	A	470	HIS	3.8
1	A	489	ASP	3.7
1	A	373	GLY	3.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	370	LYS	3.7
1	A	392	SER	3.7
1	A	714	HIS	3.6
1	A	712	ASN	3.5
1	A	552	ASP	3.5
1	A	371	ARG	3.3
1	A	321	THR	3.3
1	A	511	LYS	3.2
1	A	619	ARG	3.2
1	A	328	GLU	3.2
1	A	487	GLN	3.1
1	A	386	LYS	3.1
1	B	321	THR	3.0
1	A	517	PHE	3.0
1	A	503	GLU	3.0
1	A	485	TYR	3.0
1	A	704	PHE	2.9
1	B	352	ASP	2.9
1	B	392	SER	2.9
1	A	554	PHE	2.9
1	B	328	GLU	2.8
1	A	519	VAL	2.8
1	A	551	PHE	2.8
1	A	510	TRP	2.8
1	A	667	ARG	2.8
1	A	391	THR	2.8
1	A	711	TRP	2.7
1	A	505	CYS	2.7
1	A	567	VAL	2.7
1	B	567	VAL	2.7
1	A	479	LEU	2.7
1	A	668	CYS	2.7
1	B	310	VAL	2.6
1	A	381	LEU	2.6
1	B	337	LEU	2.6
1	A	512	ALA	2.5
1	A	467	ASP	2.5
1	B	351	LYS	2.5
1	A	385	ASN	2.5
1	A	322	LEU	2.5
1	B	386	LYS	2.4
1	B	323	GLU	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	329	HIS	2.4
1	A	389	GLU	2.4
1	A	522	LEU	2.4
1	B	615	ASP	2.4
1	B	715	VAL	2.4
1	A	572	LEU	2.3
1	B	667	ARG	2.3
1	A	639	TYR	2.3
1	B	389	GLU	2.3
1	A	608	GLU	2.3
1	B	620	LYS	2.3
1	A	393	THR	2.3
1	A	302	LYS	2.3
1	A	480	ILE	2.3
1	B	338	PRO	2.3
1	A	493	LEU	2.3
1	B	572	LEU	2.3
1	B	616	LEU	2.3
1	A	609	GLU	2.3
1	A	508	GLN	2.3
1	A	556	ASP	2.2
1	A	309	ASP	2.2
1	A	353	GLN	2.2
1	B	309	ASP	2.2
1	B	353	GLN	2.2
1	A	369	ILE	2.1
1	B	469	LYS	2.1
1	A	324	THR	2.1
1	A	643	SER	2.1
1	A	536	ILE	2.1
1	A	524	LEU	2.1
1	B	584	PHE	2.1

## 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

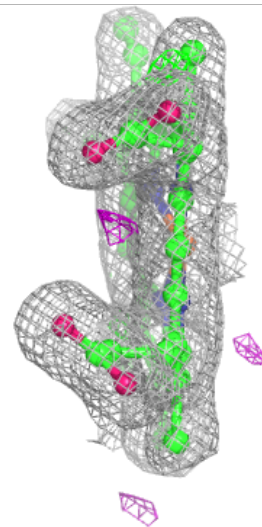
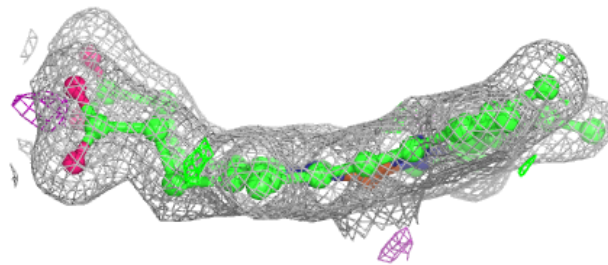
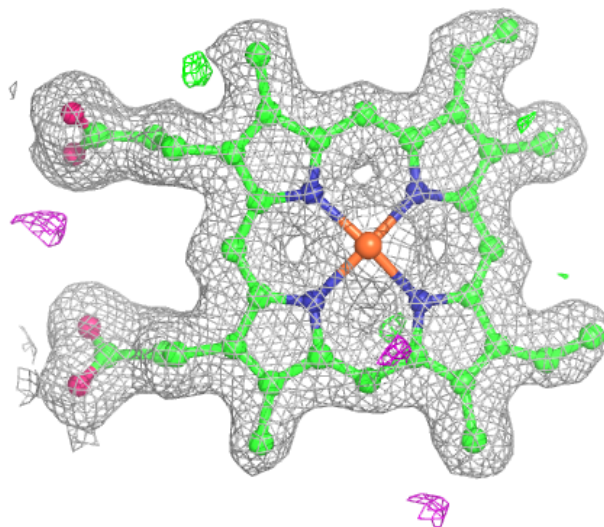
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

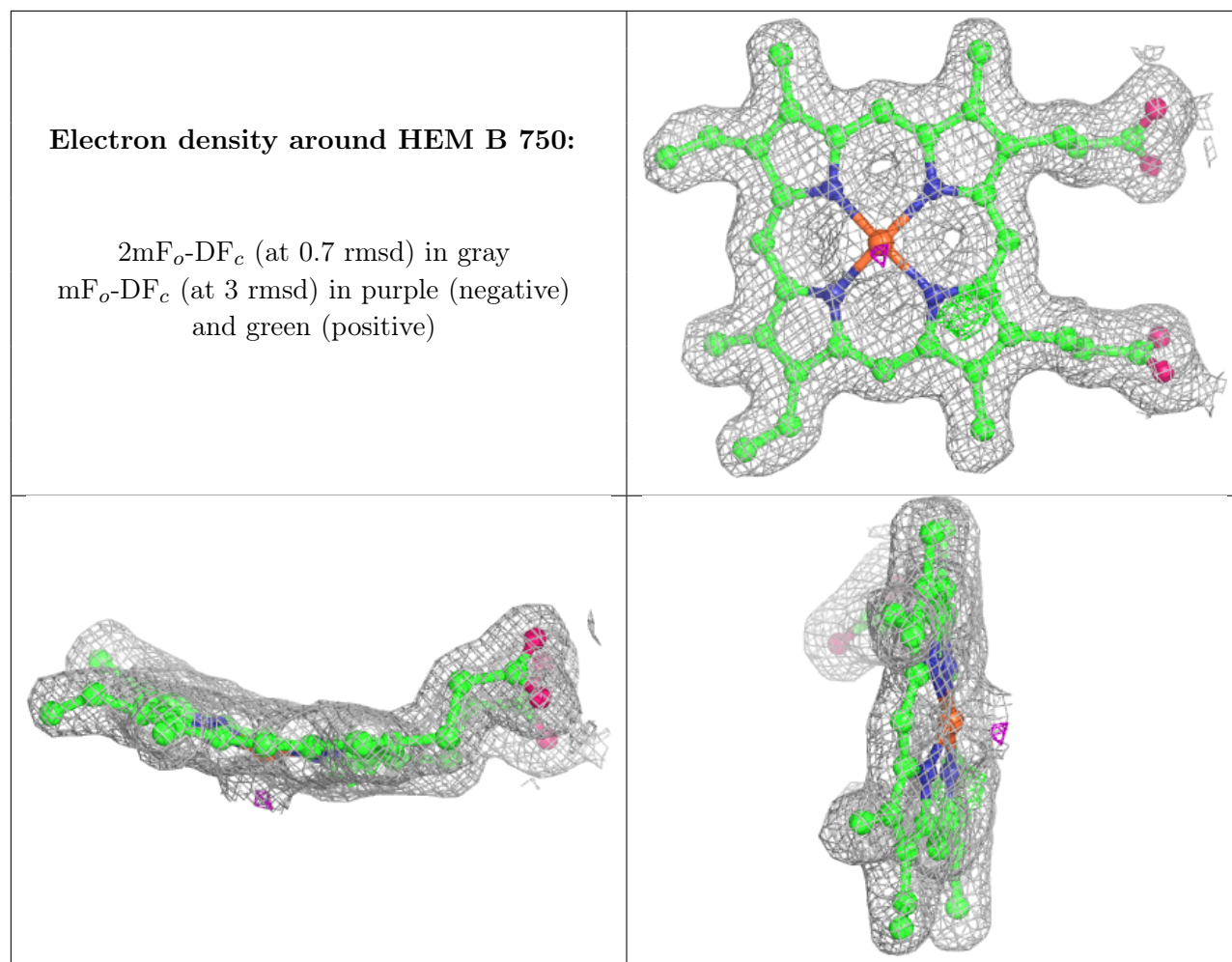
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	ACT	A	860	4/4	0.89	0.16	50,50,50,51	0
6	DP3	A	793	17/17	0.92	0.19	23,27,33,33	0
2	ACT	B	861	4/4	0.94	0.14	36,36,36,36	0
6	DP3	B	794	17/17	0.94	0.16	23,26,32,32	0
5	H4B	A	760	17/17	0.95	0.13	19,20,21,21	0
5	H4B	B	761	17/17	0.96	0.13	16,17,19,19	0
4	HEM	A	750	43/43	0.97	0.15	18,19,20,20	0
4	HEM	B	750	43/43	0.97	0.17	16,17,19,20	0
3	ZN	A	900	1/1	0.99	0.08	30,30,30,30	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 750:**

$2mF_o-DF_c$  (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.