



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 4, 2024 – 05:00 PM EST

PDB ID : 1RS7  
Title : Rat neuronal NOS heme domain with D-phenylalanine-D-nitroarginine amide bound  
Authors : Flinspach, M.; Li, H.; Jamal, J.; Yang, W.; Huang, H.; Silverman, R.B.; Poulos, T.L.  
Deposited on : 2003-12-09  
Resolution : 1.95 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

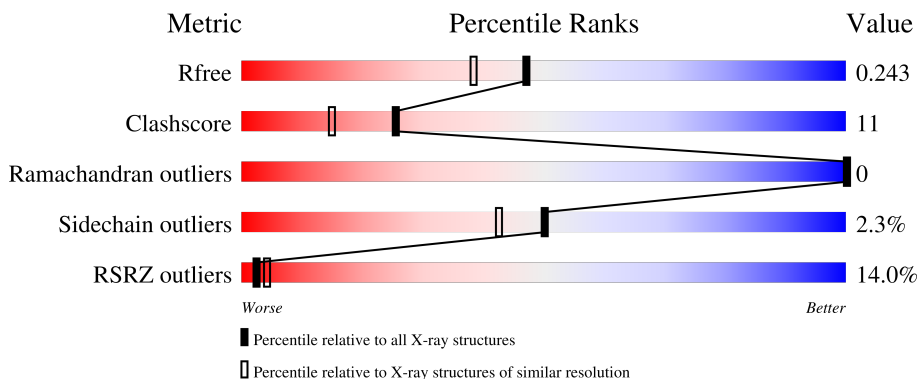
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	 21% (red), 69% (green), 26% (yellow), . . (grey)
1	B	421	 6% (red), 82% (green), 15% (yellow), . (grey)

## 2 Entry composition [i](#)

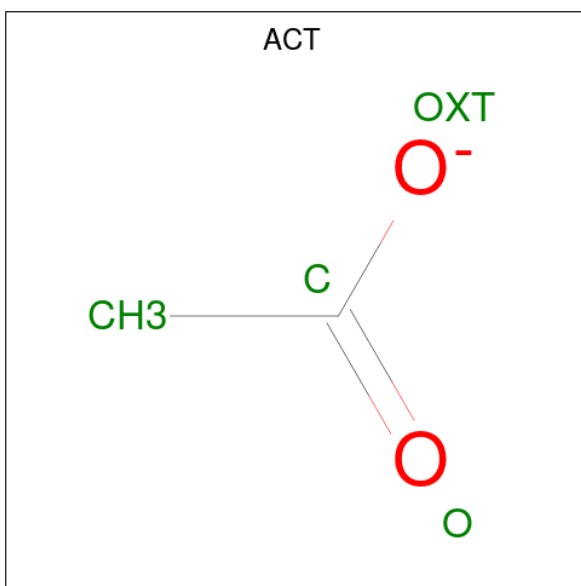
There are 8 unique types of molecules in this entry. The entry contains 7408 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

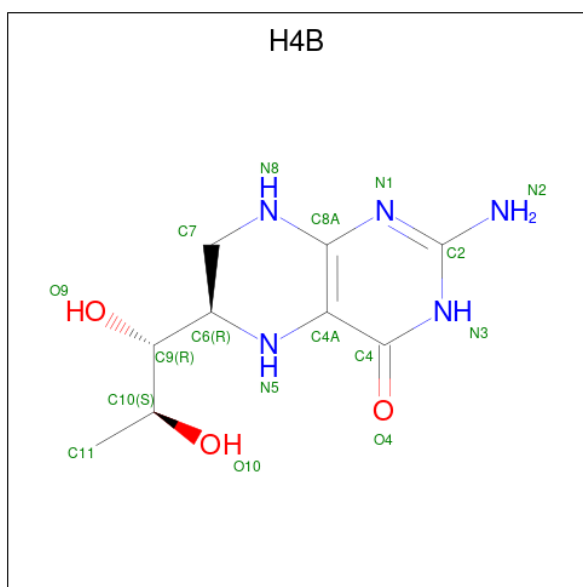
- Molecule 2 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



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

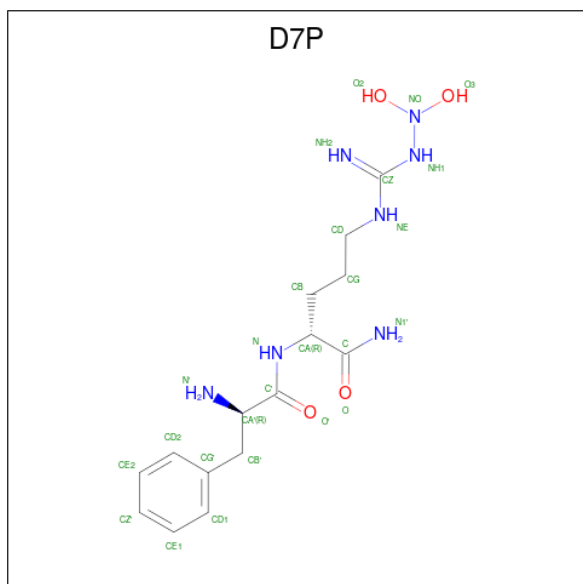
- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).





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

- Molecule 6 is D-PHENYLALANYL-N 5 -[(2,2-DIHYDROXYHYDRAZINO)(IMINO)MET HYL]-D-ORNITHINAMIDE (three-letter code: D7P) (formula: C<sub>15</sub>H<sub>25</sub>N<sub>7</sub>O<sub>4</sub>).



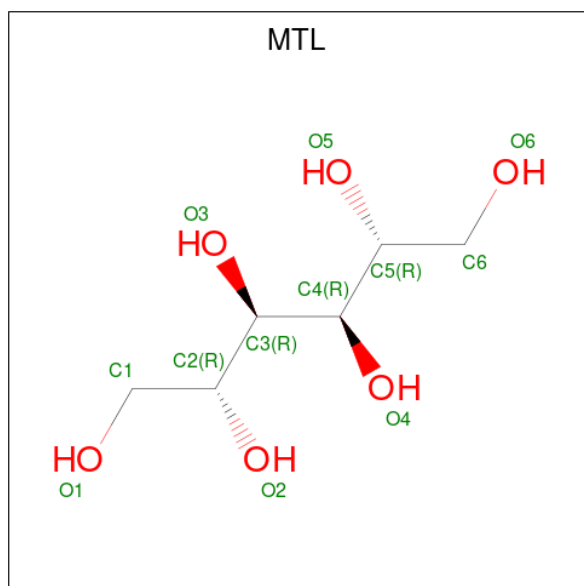
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	A	1	26	15	7	4	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	B	1	Total	C	N	O	0	0
			26	15	7	4		

- Molecule 7 is D-MANNITOL (three-letter code: MTL) (formula: C<sub>6</sub>H<sub>14</sub>O<sub>6</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	B	1	Total	C	O	0	0
			12	6	6		

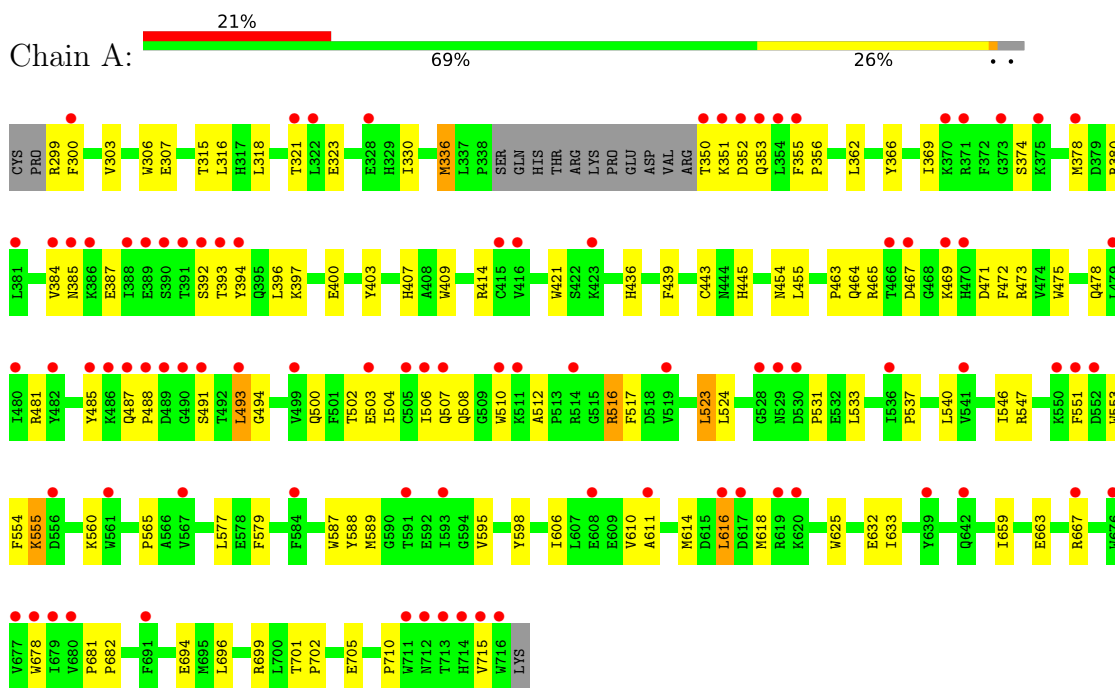
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	257	Total	O	0	0
			257	257		
8	B	304	Total	O	0	0
			304	304		

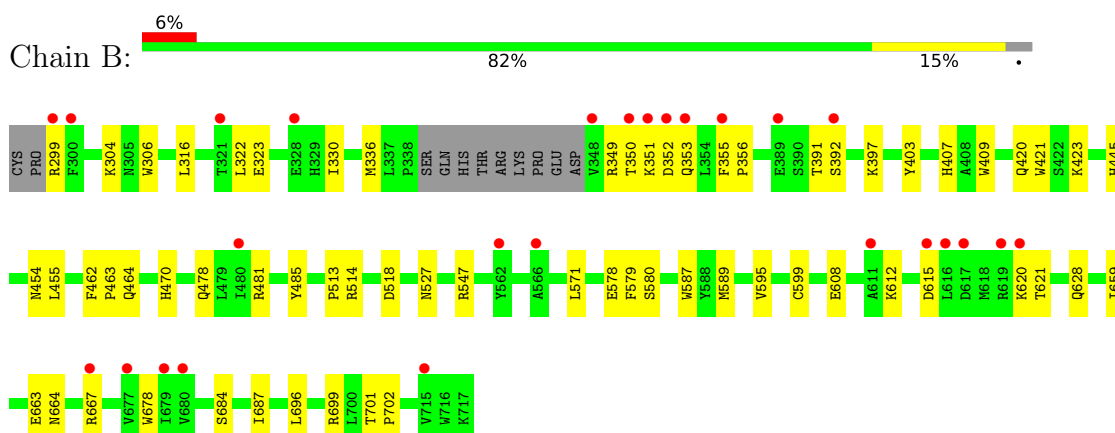
### 3 Residue-property plots i

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, $\alpha$ , $\beta$ , $\gamma$	52.09Å 110.91Å 165.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.06 – 1.95 39.05 – 1.95	Depositor EDS
% Data completeness (in resolution range)	91.2 (39.06-1.95) 91.3 (39.05-1.95)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.50 (at 1.95Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.216 , 0.251 0.208 , 0.243	Depositor DCC
$R_{free}$ test set	3221 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.7	Xtrriage
Anisotropy	0.670	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 52.0	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	7408	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.94% 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, ACT, D7P, H4B, ZN, MTL

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	0.48	0/3406	0.66	1/4621 (0.0%)
1	B	0.52	0/3434	0.68	1/4656 (0.0%)
All	All	0.50	0/6840	0.67	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	B	589	MET	N-CA-C	-5.37	96.50	111.00
1	A	589	MET	N-CA-C	-5.13	97.14	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	50	0
2	A	4	0	3	1	0
2	B	4	0	3	1	0
3	A	1	0	0	0	0
4	A	43	0	30	1	0
4	B	43	0	30	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	17	0	15	1	0
5	B	17	0	15	1	0
6	A	26	0	24	0	0
6	B	26	0	24	0	0
7	B	12	0	14	0	0
8	A	257	0	0	10	0
8	B	304	0	0	8	0
All	All	7408	0	6635	143	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 11.

All (143) 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	1.50	0.94
1:B:699:ARG:HG2	8:B:1175:HOH:O	1.73	0.88
1:A:396:LEU:CD2	1:A:577:LEU:HD12	2.10	0.81
1:A:611:ALA:HB1	1:A:616:LEU:HD11	1.65	0.77
1:A:595:VAL:HG11	1:A:682:PRO:HB2	1.67	0.76
1:A:667:ARG:HD3	8:A:1155:HOH:O	1.87	0.74
1:A:350:THR:HG22	1:A:352:ASP:H	1.52	0.74
1:B:350:THR:HG22	1:B:352:ASP:H	1.53	0.73
1:A:321:THR:HG21	8:A:1014:HOH:O	1.89	0.73
1:B:351:LYS:HE2	1:B:392:SER:OG	1.89	0.72
1:A:336:MET:HG3	1:B:306:TRP:NE1	2.05	0.71
1:A:502:THR:O	1:A:506:ILE:HG12	1.93	0.69
1:A:504:ILE:HA	1:A:507:GLN:HG2	1.76	0.67
1:A:350:THR:HB	1:A:353:GLN:HG3	1.77	0.67
1:A:306:TRP:NE1	1:B:336:MET:HG3	2.13	0.64
1:B:391:THR:O	1:B:392:SER:HB2	1.98	0.63
1:A:659:ILE:O	1:A:663:GLU:HG3	1.99	0.62
1:A:396:LEU:HD23	1:A:577:LEU:HD12	1.81	0.61
1:B:455:LEU:HD12	1:B:587:TRP:HB3	1.83	0.61
1:B:336:MET:HE3	8:B:878:HOH:O	2.00	0.61
1:B:664:ASN:O	1:B:667:ARG:HG2	2.00	0.61
1:B:323:GLU:O	1:B:699:ARG:HD3	2.01	0.60
1:A:396:LEU:HD21	1:A:577:LEU:HD12	1.84	0.59
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.85	0.58
1:A:350:THR:HB	1:A:353:GLN:CG	2.34	0.57
1:A:551:PHE:HB3	1:A:553:TRP:NE1	2.19	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:513:PRO:HG2	1:B:518:ASP:CG	2.23	0.57
1:A:350:THR:HG22	1:A:352:ASP:N	2.19	0.57
1:A:500:GLN:NE2	8:A:1116:HOH:O	2.38	0.56
1:B:659:ILE:O	1:B:663:GLU:HG3	2.05	0.56
1:A:374:SER:O	1:A:378:MET:HG2	2.06	0.56
1:A:467:ASP:OD1	1:A:469:LYS:HB2	2.06	0.55
1:A:473:ARG:NH2	1:A:710:PRO:HD3	2.21	0.55
1:A:611:ALA:CB	1:A:616:LEU:HD11	2.36	0.55
1:B:478:GLN:HB2	1:B:481:ARG:HG3	1.88	0.55
1:A:616:LEU:HD13	1:A:625:TRP:HB2	1.88	0.55
1:A:611:ALA:HB1	1:A:616:LEU:CD1	2.36	0.55
1:A:504:ILE:HA	1:A:507:GLN:CG	2.36	0.54
1:A:715:VAL:HG22	8:A:1142:HOH:O	2.08	0.53
1:A:299:ARG:HG3	1:A:318:LEU:HD21	1.90	0.53
1:A:351:LYS:HE2	1:A:392:SER:HA	1.90	0.53
1:A:436:HIS:HB2	8:A:994:HOH:O	2.08	0.53
1:A:560:LYS:NZ	8:A:1129:HOH:O	2.41	0.53
1:B:455:LEU:HD12	1:B:587:TRP:CB	2.39	0.53
2:A:860:ACT:H1	4:A:750:HEM:HMB2	1.90	0.52
1:B:608:GLU:HG3	8:B:1052:HOH:O	2.09	0.52
1:B:684:SER:HB3	1:B:687:ILE:HD11	1.91	0.52
1:A:551:PHE:HB3	1:A:553:TRP:CE2	2.45	0.52
1:A:396:LEU:HD12	1:A:400:GLU:HB3	1.92	0.52
1:A:614:MET:CE	1:A:632:GLU:HG3	2.41	0.51
1:A:614:MET:HE3	1:A:632:GLU:HG3	1.91	0.51
1:B:684:SER:HB3	1:B:687:ILE:CG1	2.41	0.51
1:A:351:LYS:HE2	1:A:392:SER:CB	2.41	0.50
1:A:464:GLN:HB3	1:A:579:PHE:CE2	2.47	0.50
1:A:565:PRO:HB3	1:A:588:TYR:CZ	2.47	0.50
1:A:504:ILE:O	1:A:508:GLN:HB2	2.11	0.50
1:A:475:TRP:HB2	1:A:523:LEU:HB3	1.93	0.50
1:A:715:VAL:O	1:A:715:VAL:HG23	2.12	0.49
1:A:516:ARG:HG2	1:A:517:PHE:CE1	2.48	0.49
1:B:571:LEU:HD11	1:B:578:GLU:HB3	1.95	0.49
1:A:439:PHE:CZ	1:A:443:CYS:SG	3.06	0.49
1:A:300:PHE:CD2	1:A:315:THR:HG22	2.48	0.49
1:A:696:LEU:HB3	1:B:330:ILE:HD11	1.93	0.49
1:A:504:ILE:CA	1:A:507:GLN:HG2	2.42	0.49
1:A:362:LEU:HD11	1:A:384:VAL:HG21	1.95	0.48
1:A:351:LYS:HE2	1:A:392:SER:CA	2.44	0.48
1:A:546:ILE:HG12	1:A:560:LYS:HA	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:355:PHE:N	1:B:356:PRO:HD2	2.27	0.48
1:A:523:LEU:HG	1:A:533:LEU:HD23	1.94	0.48
1:B:621:THR:HG22	8:B:1035:HOH:O	2.13	0.48
1:B:403:TYR:CE1	1:B:407:HIS:CE1	3.01	0.48
1:A:524:LEU:O	1:A:531:PRO:HA	2.14	0.48
1:B:350:THR:O	1:B:353:GLN:HG2	2.14	0.48
1:A:307:GLU:HG3	8:B:965:HOH:O	2.14	0.47
1:A:560:LYS:NZ	8:A:1128:HOH:O	2.47	0.47
1:A:503:GLU:O	1:A:507:GLN:HG2	2.14	0.47
1:A:506:ILE:HD11	1:A:512:ALA:HB2	1.96	0.47
1:A:491:SER:HB2	8:A:1045:HOH:O	2.14	0.47
1:B:595:VAL:O	1:B:599:CYS:HB2	2.14	0.47
1:A:465:ARG:NE	1:A:471:ASP:OD2	2.47	0.47
1:A:355:PHE:N	1:A:356:PRO:HD2	2.30	0.47
1:A:300:PHE:HD2	1:A:315:THR:HG22	1.80	0.47
1:A:336:MET:HG3	1:B:306:TRP:CD1	2.50	0.47
1:A:523:LEU:HG	1:A:533:LEU:CD2	2.45	0.47
1:B:612:LYS:O	1:B:615:ASP:N	2.42	0.46
1:B:684:SER:HB3	1:B:687:ILE:HG12	1.97	0.46
1:A:387:GLU:OE2	1:A:394:TYR:HA	2.15	0.46
1:B:304:LYS:NZ	8:B:1072:HOH:O	2.46	0.46
1:B:391:THR:O	1:B:392:SER:CB	2.63	0.46
1:A:555:LYS:HB3	1:A:555:LYS:HZ1	1.81	0.46
1:A:403:TYR:CE1	1:A:407:HIS:CE1	3.04	0.45
1:B:336:MET:HE1	1:B:678:TRP:CZ2	2.51	0.45
1:B:620:LYS:NZ	8:B:1163:HOH:O	2.48	0.45
1:A:523:LEU:CD2	1:A:531:PRO:HB2	2.33	0.45
1:A:350:THR:HB	1:A:353:GLN:OE1	2.16	0.45
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.51	0.45
1:A:306:TRP:CD1	1:B:336:MET:HG3	2.52	0.45
1:A:366:TYR:HA	1:A:369:ILE:HG12	1.99	0.44
1:A:350:THR:HG23	8:A:1078:HOH:O	2.17	0.44
1:A:681:PRO:HA	1:A:682:PRO:HD3	1.77	0.44
1:A:330:ILE:HD11	1:B:696:LEU:HB3	1.98	0.44
1:A:396:LEU:HD12	1:A:400:GLU:CB	2.47	0.44
1:A:598:TYR:O	1:A:606:ILE:HG12	2.18	0.44
1:B:445:HIS:C	1:B:445:HIS:CD2	2.91	0.43
1:B:684:SER:HB3	1:B:687:ILE:CD1	2.48	0.43
1:B:420:GLN:HG2	2:B:861:ACT:H2	2.01	0.43
1:B:678:TRP:HA	5:B:761:H4B:N1	2.33	0.43
1:A:699:ARG:HH21	1:A:705:GLU:CD	2.22	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:299:ARG:HG3	1:A:318:LEU:CD2	2.48	0.43
1:A:455:LEU:HD12	1:A:587:TRP:HB3	2.00	0.43
1:A:493:LEU:HD23	1:A:494:GLY:N	2.33	0.43
1:A:618:MET:HA	1:A:625:TRP:CD1	2.54	0.43
1:B:464:GLN:HB3	1:B:579:PHE:CE2	2.54	0.43
1:B:485:TYR:CE1	1:B:514:ARG:HA	2.53	0.43
1:B:608:GLU:O	1:B:612:LYS:HG3	2.19	0.43
1:A:487:GLN:HB3	1:A:488:PRO:CD	2.49	0.43
1:A:487:GLN:HB3	1:A:488:PRO:HD2	2.01	0.42
1:A:610:VAL:HG21	1:A:633:ILE:HD11	2.02	0.42
1:B:701:THR:HA	1:B:702:PRO:C	2.40	0.42
1:A:409:TRP:CE3	1:A:421:TRP:HA	2.54	0.42
1:A:414:ARG:HD3	1:A:678:TRP:CD2	2.55	0.42
1:A:463:PRO:HB2	1:A:472:PHE:CE1	2.55	0.42
1:A:546:ILE:HG22	1:A:554:PHE:HE2	1.85	0.41
1:A:682:PRO:HG3	8:A:902:HOH:O	2.19	0.41
1:B:462:PHE:HB3	1:B:463:PRO:CD	2.50	0.41
1:B:322:LEU:HD13	1:B:699:ARG:NH2	2.36	0.41
1:B:571:LEU:HD13	1:B:580:SER:HA	2.03	0.41
1:A:393:THR:OG1	1:A:394:TYR:N	2.52	0.41
1:B:397:LYS:HD3	8:B:1043:HOH:O	2.19	0.41
1:A:537:PRO:HB2	1:A:540:LEU:HG	2.03	0.41
4:B:750:HEM:CMC	4:B:750:HEM:HBC2	2.50	0.41
1:A:323:GLU:O	1:A:699:ARG:HD3	2.21	0.41
1:A:510:TRP:HB2	1:A:533:LEU:HD13	2.02	0.41
1:A:678:TRP:HA	5:A:760:H4B:N1	2.35	0.41
1:B:351:LYS:HE2	1:B:392:SER:HG	1.84	0.41
1:A:523:LEU:HD22	1:A:531:PRO:CB	2.36	0.40
1:A:306:TRP:CE2	1:B:336:MET:HG3	2.55	0.40
1:A:380:ARG:NH1	1:A:397:LYS:HE2	2.37	0.40
1:A:701:THR:HA	1:A:702:PRO:C	2.42	0.40
1:A:445:HIS:CD2	1:A:445:HIS:C	2.95	0.40
1:B:470:HIS:HB3	1:B:527:ASN:ND2	2.37	0.40
1:A:303:VAL:CG1	1:A:694:GLU:O	2.70	0.40
1:A:632:GLU:OE2	1:B:628:GLN:NE2	2.53	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%)	383 (95%)	20 (5%)	0	100	100
1	B	406/421 (96%)	394 (97%)	12 (3%)	0	100	100
All	All	809/842 (96%)	777 (96%)	32 (4%)	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	363/377 (96%)	352 (97%)	11 (3%)	41	30
1	B	366/377 (97%)	360 (98%)	6 (2%)	62	58
All	All	729/754 (97%)	712 (98%)	17 (2%)	50	42

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	316	LEU
1	A	336	MET
1	A	385	ASN
1	A	454	ASN
1	A	485	TYR
1	A	493	LEU
1	A	516	ARG
1	A	523	LEU

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Mol	Chain	Res	Type
1	A	547	ARG
1	A	555	LYS
1	A	616	LEU
1	B	299	ARG
1	B	316	LEU
1	B	349	ARG
1	B	423	LYS
1	B	454	ASN
1	B	547	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	385	ASN
1	A	454	ASN
1	A	500	GLN
1	A	697	ASN
1	A	712	ASN
1	B	364	GLN
1	B	454	ASN
1	B	527	ASN
1	B	535	GLN
1	B	664	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

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
6	D7P	B	798	-	21,26,26	1.24	3 (14%)	28,33,33	1.34	5 (17%)
6	D7P	A	797	-	21,26,26	1.21	1 (4%)	28,33,33	1.24	3 (10%)
7	MTL	B	871	-	11,11,11	1.08	0	14,14,14	0.91	0
4	HEM	B	750	1	41,50,50	1.61	6 (14%)	45,82,82	1.44	7 (15%)
4	HEM	A	750	1	41,50,50	1.41	7 (17%)	45,82,82	1.43	8 (17%)
2	ACT	B	861	-	3,3,3	0.87	0	3,3,3	0.75	0
5	H4B	B	761	-	16,18,18	2.76	7 (43%)	11,26,26	4.39	9 (81%)
2	ACT	A	860	-	3,3,3	0.84	0	3,3,3	0.85	0
5	H4B	A	760	-	16,18,18	2.47	3 (18%)	11,26,26	4.25	10 (90%)

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
6	D7P	B	798	-	-	4/23/27/27	0/1/1/1
6	D7P	A	797	-	-	5/23/27/27	0/1/1/1
7	MTL	B	871	-	-	0/16/16/16	-
4	HEM	B	750	1	-	1/12/54/54	-
4	HEM	A	750	1	-	0/12/54/54	-
5	H4B	B	761	-	-	0/8/17/17	0/2/2/2
5	H4B	A	760	-	-	0/8/17/17	0/2/2/2

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	761	H4B	C4-N3	6.17	1.43	1.33
5	A	760	H4B	C4-N3	6.00	1.43	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	761	H4B	C6-N5	5.51	1.56	1.45
5	A	760	H4B	C4A-N5	5.49	1.49	1.38
5	B	761	H4B	C4A-N5	5.33	1.48	1.38
5	A	760	H4B	C6-N5	4.10	1.54	1.45
4	B	750	HEM	CHB-C1B	4.02	1.45	1.35
4	B	750	HEM	CMD-C2D	3.75	1.58	1.50
4	B	750	HEM	CAA-C2A	3.72	1.57	1.52
4	B	750	HEM	C3C-C2C	-3.52	1.35	1.40
5	B	761	H4B	C7-N8	2.79	1.49	1.44
4	B	750	HEM	CAB-C3B	-2.71	1.40	1.47
6	A	797	D7P	CA-N	2.64	1.51	1.45
4	A	750	HEM	C4A-NA	2.53	1.41	1.36
5	B	761	H4B	C8A-N1	2.53	1.39	1.34
4	A	750	HEM	CAB-C3B	-2.52	1.40	1.47
4	A	750	HEM	CMA-C3A	2.46	1.56	1.51
4	B	750	HEM	C3C-CAC	-2.37	1.42	1.47
4	A	750	HEM	C3C-CAC	-2.37	1.43	1.47
4	A	750	HEM	CHA-C4D	2.35	1.41	1.35
6	B	798	D7P	CD2-CG'	2.27	1.43	1.38
4	A	750	HEM	C1A-NA	2.24	1.40	1.36
6	B	798	D7P	CA-N	2.23	1.50	1.45
4	A	750	HEM	CMB-C2B	2.17	1.55	1.50
5	B	761	H4B	C2-N3	2.06	1.39	1.35
6	B	798	D7P	CZ'-CE1	2.03	1.43	1.38
5	B	761	H4B	C7-C6	2.01	1.54	1.52

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	761	H4B	C8A-C4A-C4	8.74	122.34	114.57
5	A	760	H4B	C8A-C4A-C4	8.74	122.33	114.57
5	B	761	H4B	C2-N3-C4	5.86	125.25	115.93
5	A	760	H4B	C2-N3-C4	5.41	124.52	115.93
5	B	761	H4B	N1-C2-N3	-5.18	117.30	125.42
5	A	760	H4B	N1-C2-N3	-5.17	117.32	125.42
5	B	761	H4B	C4A-N5-C6	-3.88	110.61	121.16
5	A	760	H4B	C2-N1-C8A	3.84	123.14	114.54
4	A	750	HEM	CBA-CAA-C2A	-3.82	106.10	112.62
5	A	760	H4B	C4A-N5-C6	-3.64	111.25	121.16
5	B	761	H4B	C4A-C4-N3	-3.62	113.72	124.01
5	A	760	H4B	C4A-C4-N3	-3.61	113.76	124.01
5	B	761	H4B	C4-C4A-N5	-3.54	116.15	119.12

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	761	H4B	N2-C2-N1	3.49	122.68	117.25
6	B	798	D7P	CD-NE-CZ	3.48	129.84	123.50
5	B	761	H4B	C2-N1-C8A	3.39	122.15	114.54
4	B	750	HEM	C4B-CHC-C1C	3.36	127.00	122.56
4	B	750	HEM	CMB-C2B-C1B	3.31	130.07	125.04
6	A	797	D7P	CD-NE-CZ	3.05	129.06	123.50
6	B	798	D7P	O-C-N1'	-3.01	117.76	123.00
4	A	750	HEM	C4B-CHC-C1C	2.98	126.49	122.56
5	A	760	H4B	N2-C2-N1	2.92	121.80	117.25
4	A	750	HEM	CMB-C2B-C1B	2.90	129.46	125.04
4	A	750	HEM	CBD-CAD-C3D	-2.86	104.67	112.63
6	A	797	D7P	O-C-N1'	-2.85	118.05	123.00
6	B	798	D7P	CB-CA-N	-2.77	105.28	110.88
4	B	750	HEM	CBA-CAA-C2A	-2.76	107.90	112.62
5	A	760	H4B	C4-C4A-N5	-2.75	116.81	119.12
4	A	750	HEM	CAB-C3B-C2B	-2.73	119.60	128.60
4	B	750	HEM	CMA-C3A-C4A	-2.72	124.29	128.46
5	B	761	H4B	O9-C9-C6	2.59	115.16	108.98
4	A	750	HEM	C4B-C3B-C2B	2.52	109.11	107.11
4	B	750	HEM	C2C-C3C-C4C	-2.50	105.15	106.90
6	A	797	D7P	CB-CA-N	-2.39	106.03	110.88
5	A	760	H4B	N2-C2-N3	2.34	120.89	117.25
4	A	750	HEM	C2B-C1B-NB	2.26	112.52	109.84
6	B	798	D7P	CA-C-N1'	2.26	120.56	116.69
4	B	750	HEM	CAB-C3B-C2B	-2.25	121.19	128.60
4	A	750	HEM	CHC-C4B-C3B	2.20	127.94	124.57
4	B	750	HEM	CMA-C3A-C2A	2.17	129.03	124.94
5	A	760	H4B	O9-C9-C6	2.03	113.84	108.98
6	B	798	D7P	CB-CA-C	2.03	114.92	110.21

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	797	D7P	N-CA-CB-CG
6	A	797	D7P	C-CA-CB-CG
6	B	798	D7P	N-CA-CB-CG
6	A	797	D7P	N1'-C-CA-N
6	A	797	D7P	O-C-CA-N
6	B	798	D7P	N1'-C-CA-N
6	B	798	D7P	O-C-CA-N
6	A	797	D7P	CG-CD-NE-CZ

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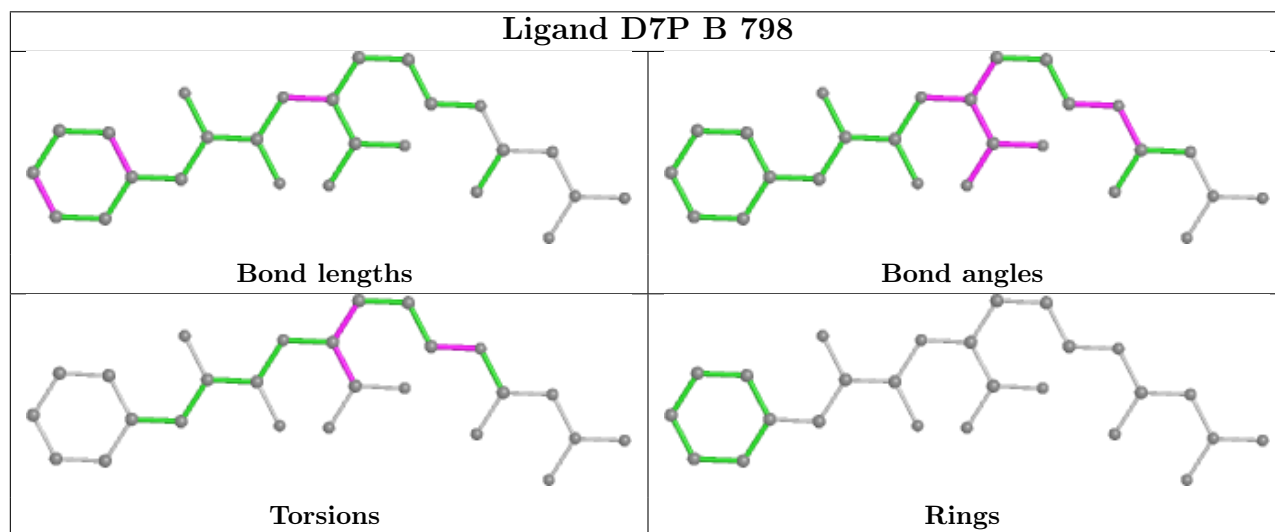
Mol	Chain	Res	Type	Atoms
4	B	750	HEM	C4B-C3B-CAB-CBB
6	B	798	D7P	CG-CD-NE-CZ

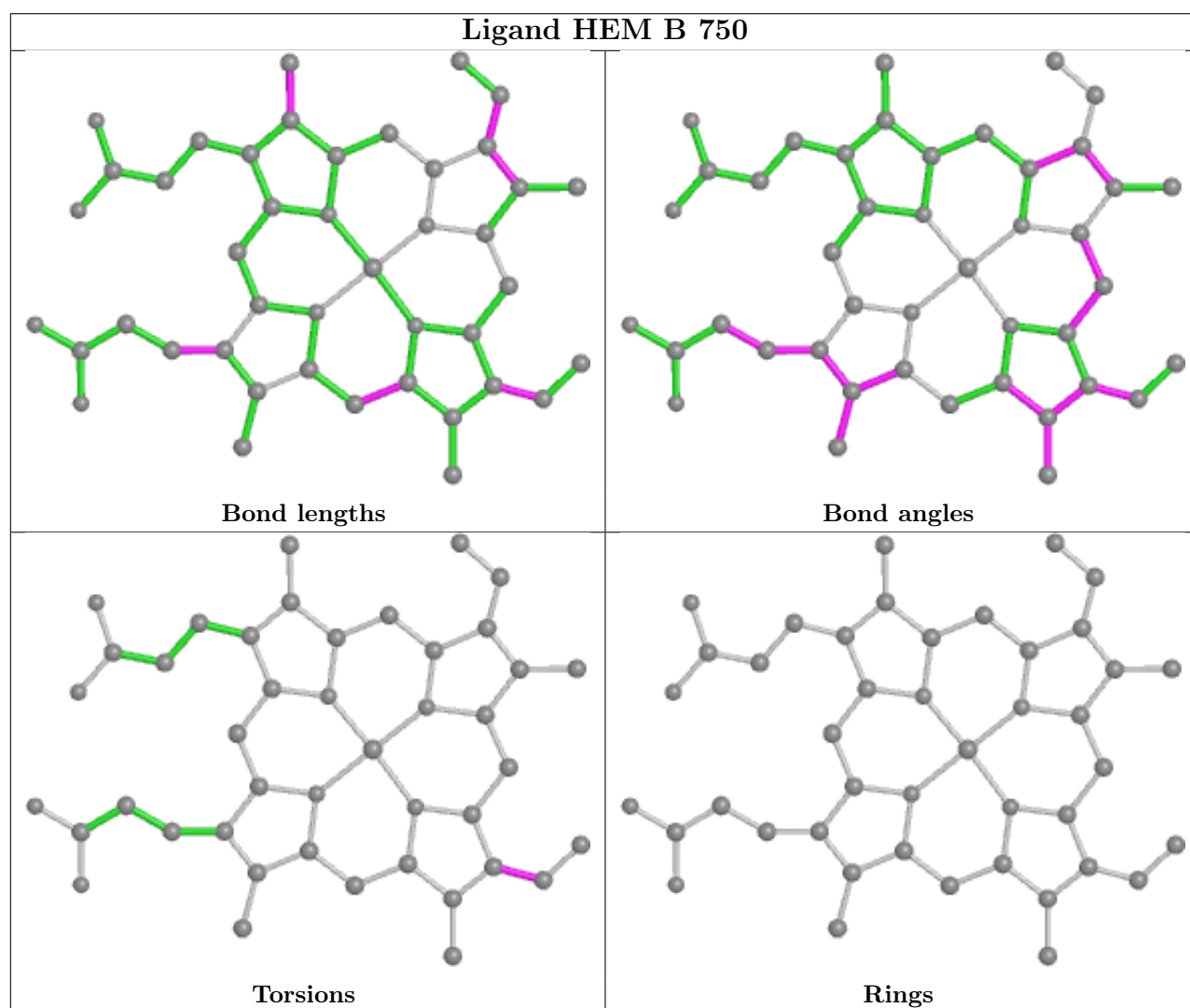
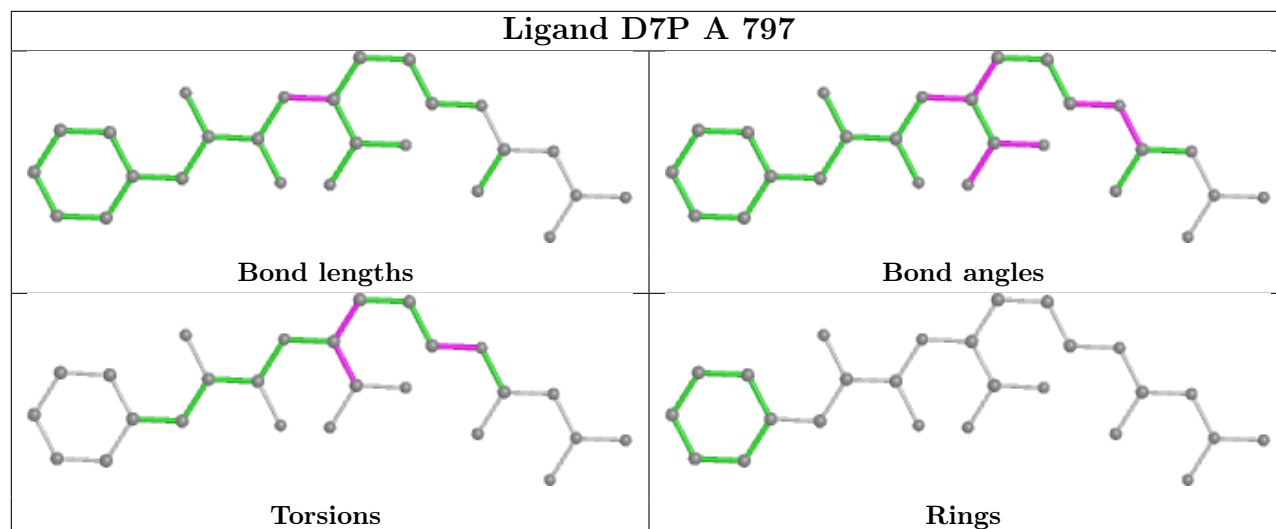
There are no ring outliers.

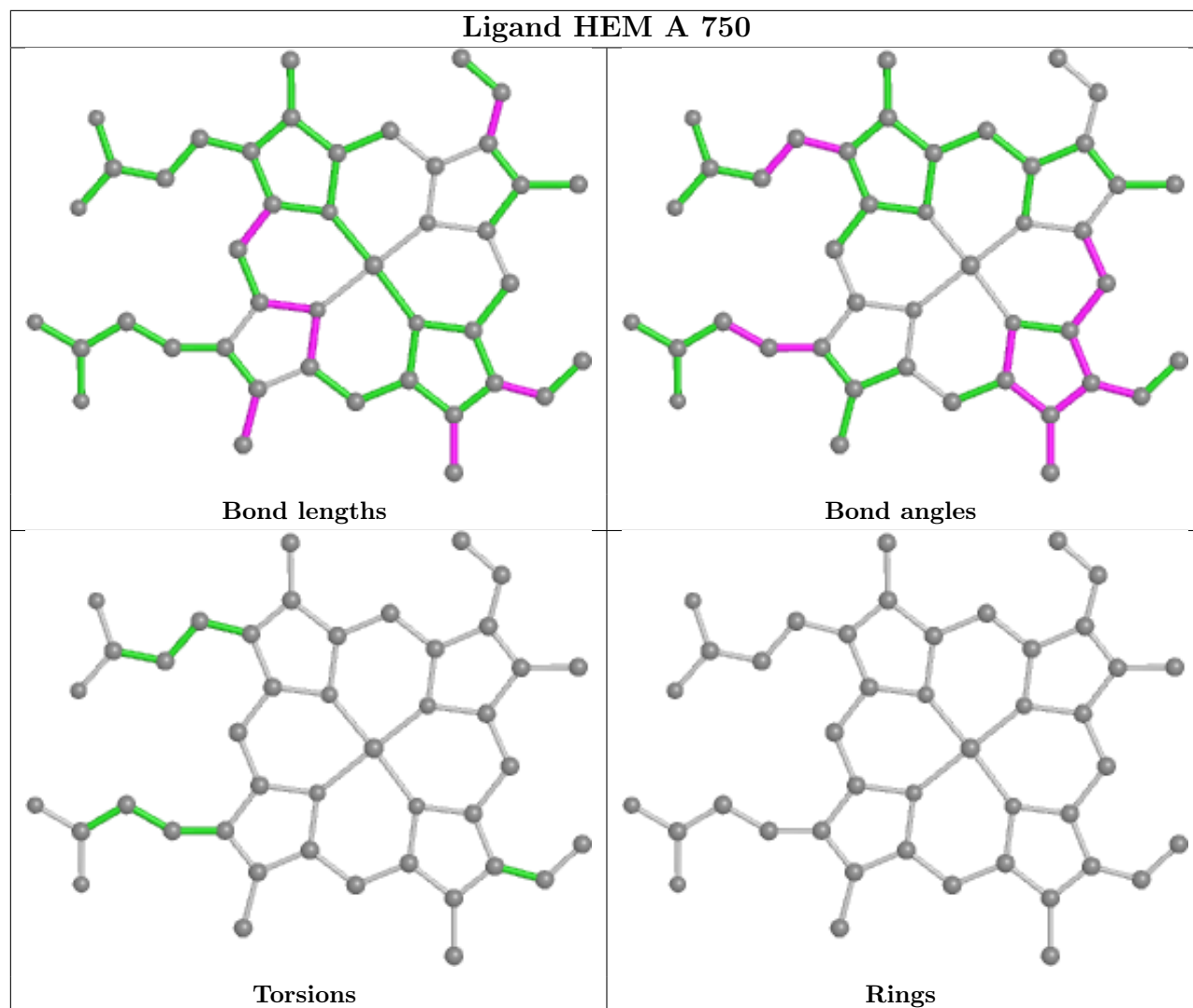
6 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	750	HEM	1	0
4	A	750	HEM	1	0
2	B	861	ACT	1	0
5	B	761	H4B	1	0
2	A	860	ACT	1	0
5	A	760	H4B	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	407/421 (96%)	1.25	88 (21%) <b>0</b> <b>1</b>	18, 38, 61, 75	0
1	B	410/421 (97%)	0.56	26 (6%) <b>20</b> <b>28</b>	18, 29, 51, 65	0
All	All	817/842 (97%)	0.90	114 (13%) <b>2</b> <b>4</b>	18, 32, 58, 75	0

All (114) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	355	PHE	8.8
1	B	300	PHE	7.2
1	A	715	VAL	7.0
1	A	490	GLY	6.5
1	A	491	SER	6.0
1	A	716	TRP	6.0
1	A	488	PRO	6.0
1	A	489	ASP	5.9
1	A	351	LYS	5.3
1	A	390	SER	5.3
1	A	470	HIS	5.2
1	A	392	SER	5.0
1	A	388	ILE	5.0
1	B	348	VAL	5.0
1	B	350	THR	4.9
1	B	619	ARG	4.8
1	A	391	THR	4.7
1	A	389	GLU	4.4
1	A	352	ASP	4.4
1	A	713	THR	4.4
1	B	611	ALA	4.3
1	A	381	LEU	4.3
1	A	506	ILE	4.2
1	B	299	ARG	4.2

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	351	LYS	4.2
1	A	551	PHE	4.2
1	A	714	HIS	4.0
1	A	486	LYS	4.0
1	A	385	ASN	4.0
1	A	393	THR	3.9
1	A	386	LYS	3.8
1	A	350	THR	3.8
1	A	619	ARG	3.8
1	A	373	GLY	3.7
1	B	355	PHE	3.7
1	B	667	ARG	3.7
1	A	328	GLU	3.6
1	A	616	LEU	3.6
1	A	552	ASP	3.6
1	A	479	LEU	3.4
1	B	321	THR	3.4
1	A	354	LEU	3.4
1	A	507	GLN	3.3
1	A	639	TYR	3.3
1	B	392	SER	3.3
1	A	480	ILE	3.2
1	A	541	VAL	3.2
1	A	487	GLN	3.2
1	A	469	LYS	3.2
1	B	616	LEU	3.2
1	A	503	GLU	3.2
1	A	499	VAL	3.1
1	A	617	ASP	3.1
1	B	677	VAL	3.1
1	A	676	TRP	3.0
1	B	620	LYS	3.0
1	A	519	VAL	3.0
1	A	678	TRP	3.0
1	A	300	PHE	3.0
1	A	467	ASP	3.0
1	B	353	GLN	3.0
1	A	611	ALA	2.9
1	A	466	THR	2.9
1	A	528	GLY	2.9
1	B	679	ILE	2.9
1	A	321	THR	2.8

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	561	TRP	2.8
1	A	679	ILE	2.8
1	A	567	VAL	2.8
1	A	712	ASN	2.8
1	A	511	LYS	2.8
1	A	677	VAL	2.8
1	B	352	ASP	2.7
1	A	514	ARG	2.7
1	B	615	ASP	2.6
1	A	584	PHE	2.6
1	A	416	VAL	2.6
1	A	378	MET	2.6
1	A	536	ILE	2.6
1	A	593	ILE	2.6
1	A	667	ARG	2.5
1	B	480	ILE	2.5
1	A	680	VAL	2.5
1	B	617	ASP	2.5
1	B	328	GLU	2.4
1	A	485	TYR	2.4
1	A	556	ASP	2.4
1	A	620	LYS	2.4
1	A	510	TRP	2.3
1	A	530	ASP	2.3
1	B	715	VAL	2.3
1	A	550	LYS	2.3
1	A	384	VAL	2.3
1	A	529	ASN	2.3
1	A	608	GLU	2.3
1	B	680	VAL	2.2
1	A	370	LYS	2.2
1	A	375	LYS	2.2
1	B	389	GLU	2.2
1	B	566	ALA	2.2
1	A	482	TYR	2.1
1	A	691	PHE	2.1
1	A	371	ARG	2.1
1	A	493	LEU	2.1
1	A	353	GLN	2.1
1	A	642	GLN	2.1
1	B	562	TYR	2.1
1	A	711	TRP	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	591	THR	2.1
1	A	505	CYS	2.1
1	A	394	TYR	2.1
1	A	415	CYS	2.1
1	A	423	LYS	2.1
1	A	322	LEU	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](#)

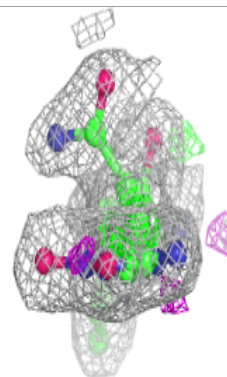
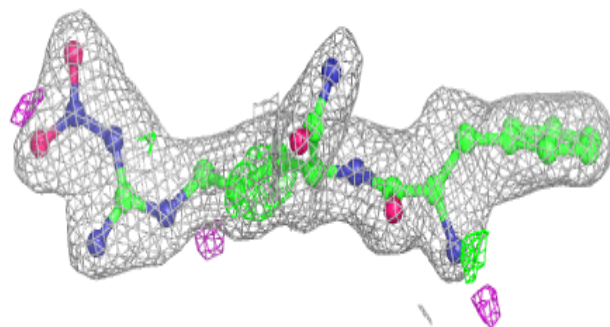
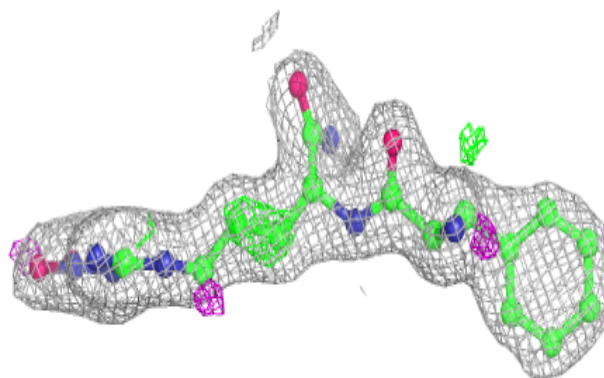
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
6	D7P	A	797	26/26	0.88	0.25	31,35,39,40	0
2	ACT	A	860	4/4	0.89	0.15	54,54,54,54	0
7	MTL	B	871	12/12	0.90	0.14	29,32,34,34	0
6	D7P	B	798	26/26	0.92	0.22	30,32,35,35	0
2	ACT	B	861	4/4	0.95	0.10	40,40,40,40	0
5	H4B	A	760	17/17	0.96	0.18	19,21,24,24	0
5	H4B	B	761	17/17	0.97	0.18	16,18,21,21	0
4	HEM	A	750	43/43	0.97	0.17	19,20,21,22	0
4	HEM	B	750	43/43	0.98	0.15	17,18,21,21	0
3	ZN	A	900	1/1	1.00	0.07	31,31,31,31	0

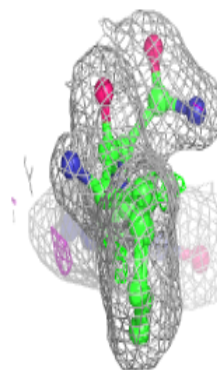
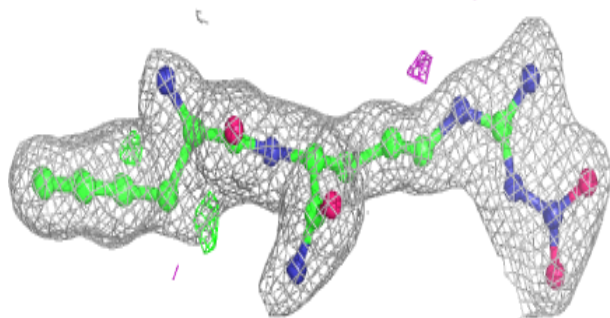
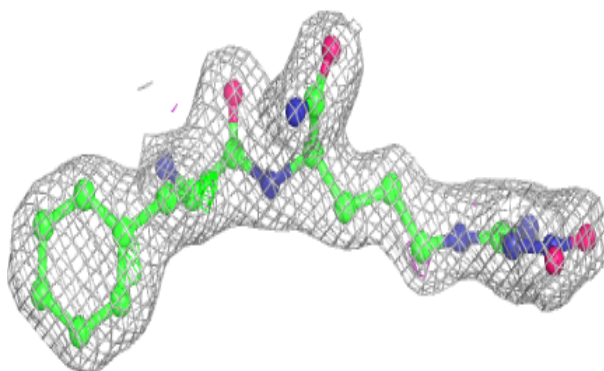
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

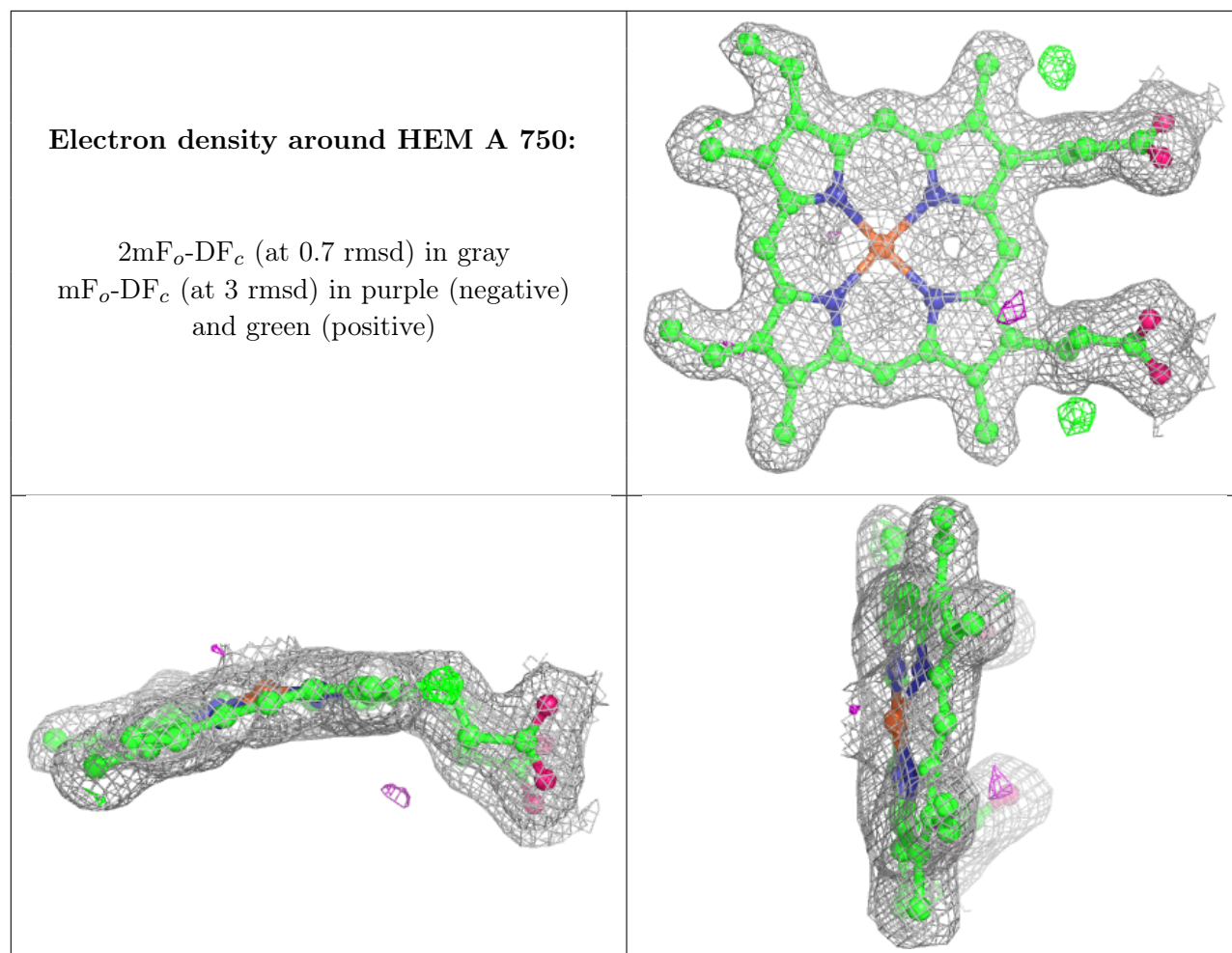
**Electron density around D7P A 797:**

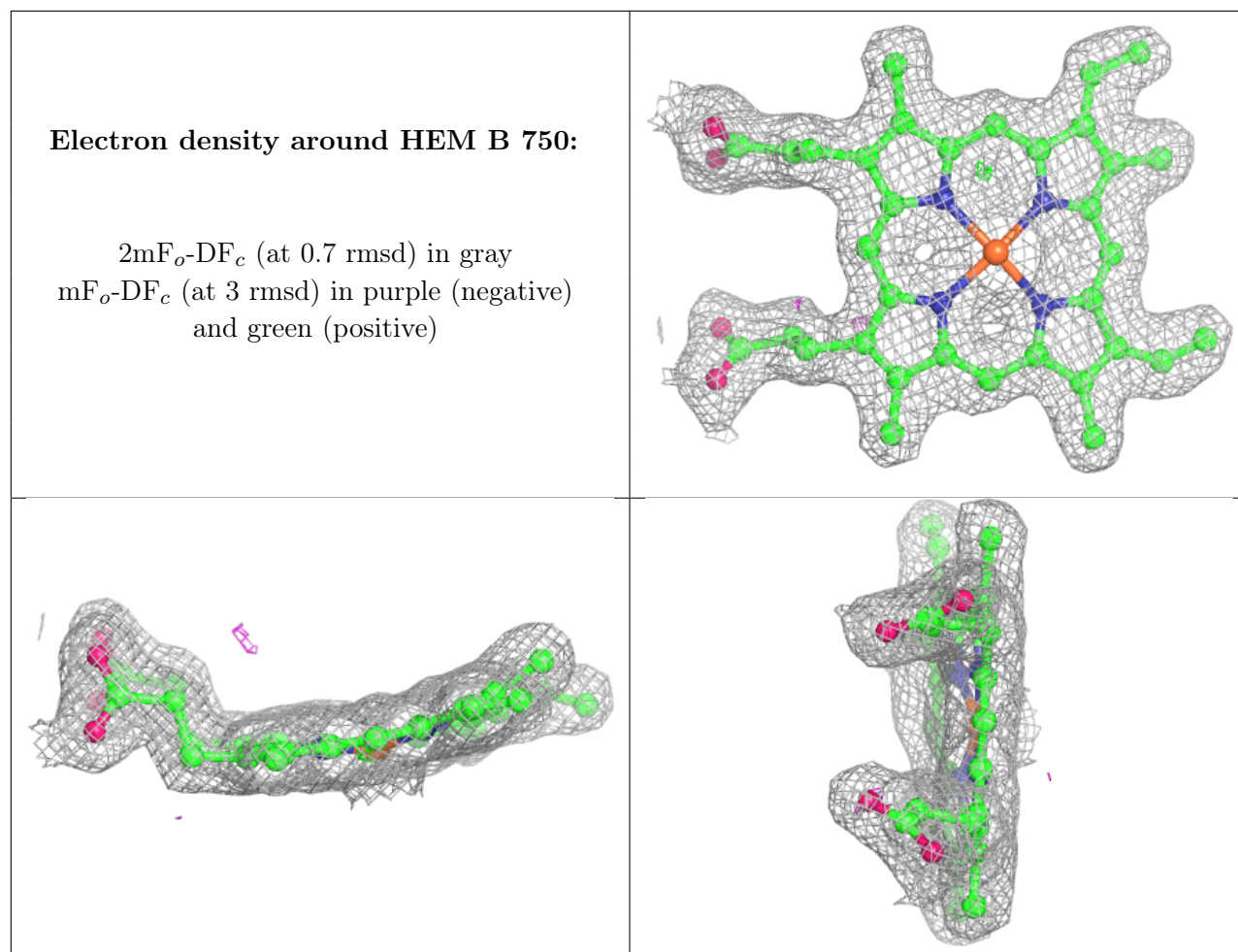
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around D7P B 798:**

$2mF_o-DF_c$  (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.