



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:26 AM UTC

PDB ID : 4CTW / pdb_00004ctw
Title : Structure of rat neuronal nitric oxide synthase heme domain in complex with (R)-6-(3-amino-2-(5-(2-(6-amino-4-methylpyridin-2-yl) ethyl)pyridin-3-yl)propyl)-4-methylpyridin-2-amine
Authors : Li, H.; Poulos, T.L.
Deposited on : 2014-03-15
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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

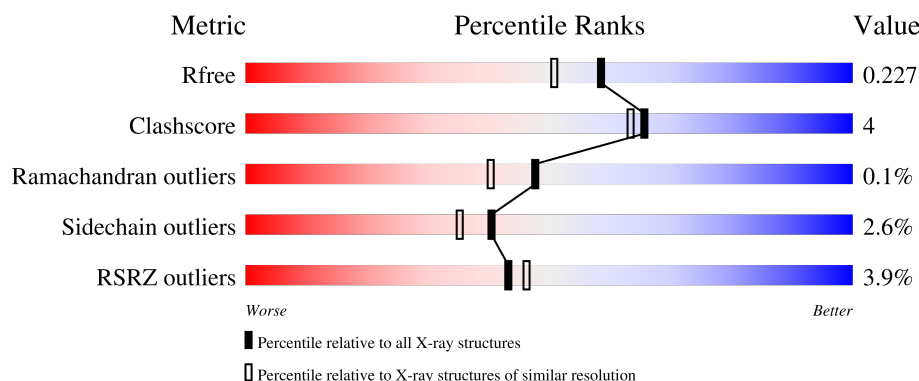
1 Overall quality at a glance

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}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (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 ≥ 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	5% 86% 10% ..
1	B	422	3% 87% 10% .

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 7308 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.

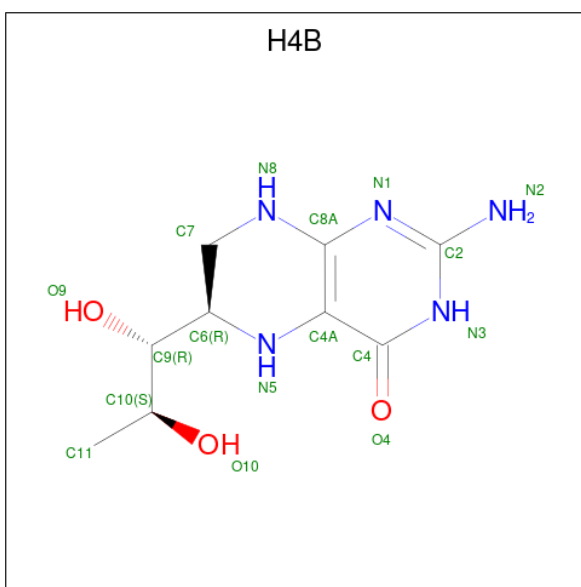
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	408	Total	C	N	O	S	0	3	1
			3326	2129	567	608	22			
1	B	411	Total	C	N	O	S	0	2	0
			3356	2150	574	610	22			

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



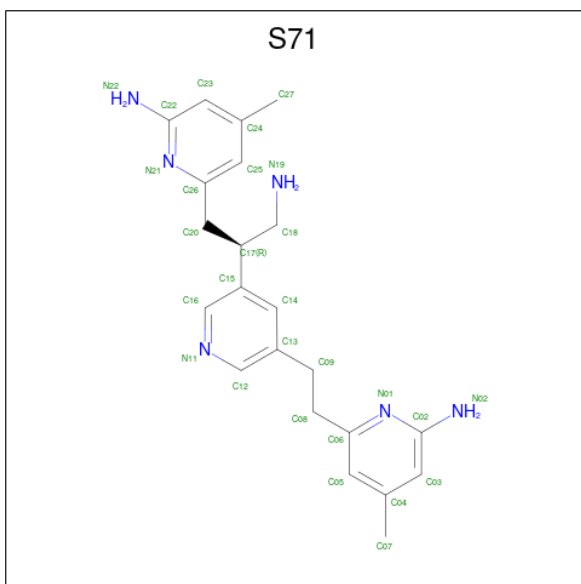
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

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



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

- Molecule 4 is (R)-6-(3-amino-2-(5-(2-(6-amino-4-methylpyridin-2-yl)ethyl)pyridin-3-yl)propyl)-4-methylpyridin-2-amine (CCD ID: S71) (formula: C₂₂H₂₈N₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	N	0	0
			28	22	6		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	N	0	0
			28	22	6		

- Molecule 5 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



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

- Molecule 6 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

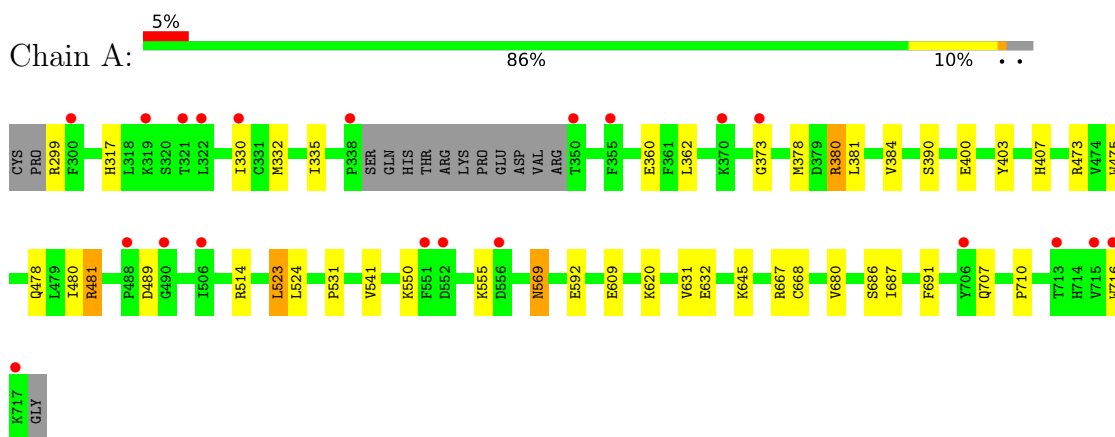
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	189	Total	O	0	0
			189	189		
7	B	252	Total	O	0	0
			252	252		

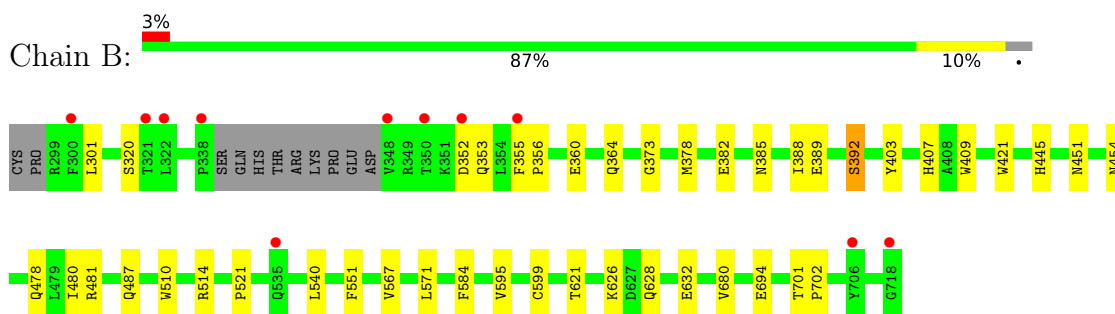
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: NITRIC OXIDE SYNTHASE, BRAIN



• Molecule 1: NITRIC OXIDE SYNTHASE, BRAIN



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	52.23Å 110.78Å 164.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.10 – 1.90 49.10 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.8 (49.10-1.90) 98.8 (49.10-1.90)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.72 (at 1.91Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.189 , 0.228 0.189 , 0.227	Depositor DCC
R_{free} test set	3711 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	25.4	Xtriage
Anisotropy	0.596	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 40.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7308	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.78% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: S71, ZN, HEM, ACT, H4B

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.65	1/3428 (0.0%)	0.88	2/4651 (0.0%)
1	B	0.74	0/3456	0.89	2/4686 (0.0%)
All	All	0.69	1/6884 (0.0%)	0.88	4/9337 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	716	TRP	C-N	-6.57	1.24	1.33

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	680	VAL	CA-C-N	6.47	124.38	119.66
1	B	680	VAL	C-N-CA	6.47	124.38	119.66
1	A	680	VAL	CA-C-N	6.20	124.19	119.66
1	A	680	VAL	C-N-CA	6.20	124.19	119.66

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	3326	0	3237	23	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3356	0	3273	27	0
2	A	43	0	30	4	0
2	B	43	0	30	4	0
3	A	17	0	15	0	0
3	B	17	0	15	0	0
4	A	28	0	28	1	0
4	B	28	0	28	1	0
5	A	4	0	3	0	0
5	B	4	0	3	0	0
6	A	1	0	0	0	0
7	A	189	0	0	2	0
7	B	252	0	0	2	0
All	All	7308	0	6662	52	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (52) 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:480:ILE:HD13	1:A:541:VAL:HG13	1.72	0.71
1:B:382:GLU:HG3	7:B:2035:HOH:O	1.89	0.71
2:B:1719:HEM:HBB2	2:B:1719:HEM:HHC	1.72	0.71
1:A:332:MET:HE1	1:B:301:LEU:HD22	1.73	0.70
2:A:1717:HEM:HHC	2:A:1717:HEM:HBB2	1.79	0.65
1:A:523:LEU:HD22	1:A:531:PRO:HB2	1.80	0.63
1:A:609:GLU:HG3	7:A:2146:HOH:O	2.00	0.62
1:A:373:GLY:HA2	1:A:378:MET:HE3	1.85	0.59
2:A:1717:HEM:CMC	2:A:1717:HEM:HBC2	2.33	0.58
2:A:1717:HEM:HBC2	2:A:1717:HEM:HMC1	1.84	0.58
1:A:478:GLN:HB2	1:A:481:ARG:HG3	1.85	0.58
1:A:335:ILE:HD13	1:B:694:GLU:HB3	1.90	0.54
1:A:475:TRP:HB2	1:A:523:LEU:HB3	1.88	0.54
1:B:701:THR:HA	1:B:702:PRO:C	2.32	0.54
1:B:551:PHE:HE2	1:B:632:GLU:HG3	1.74	0.53
1:B:364:GLN:NE2	7:B:2022:HOH:O	2.41	0.52
1:B:403:TYR:CE2	1:B:407:HIS:CE1	2.97	0.52
1:B:478:GLN:HB2	1:B:481:ARG:HG3	1.91	0.52
1:A:632:GLU:OE2	1:B:628:GLN:NE2	2.43	0.52
1:B:355[B]:PHE:HB2	1:B:356:PRO:HD3	1.94	0.50
1:A:362:LEU:HD11	1:A:384:VAL:HG21	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:1719:HEM:HHC	2:B:1719:HEM:CBB	2.40	0.49
1:B:355[B]:PHE:HB2	1:B:356:PRO:CD	2.43	0.48
7:A:2111:HOH:O	1:B:621:THR:HG22	2.13	0.48
1:B:445:HIS:C	1:B:445:HIS:CD2	2.92	0.48
1:B:356:PRO:O	1:B:360:GLU:HG3	2.14	0.48
1:A:330:ILE:O	1:A:330:ILE:HG23	2.15	0.46
1:A:380:ARG:HD3	1:A:400:GLU:OE2	2.16	0.46
1:A:473:ARG:NH2	1:A:710:PRO:HD3	2.31	0.46
1:B:510:TRP:CE2	1:B:521:PRO:HD3	2.50	0.46
1:B:373:GLY:HA2	1:B:378:MET:HE3	1.99	0.45
1:B:451:ASN:HB3	1:B:454:ASN:O	2.17	0.44
1:B:409:TRP:CE3	1:B:421:TRP:HA	2.52	0.44
1:B:388:ILE:O	1:B:392:SER:N	2.51	0.44
1:A:687:ILE:HD12	1:B:626:LYS:HB3	2.00	0.44
1:A:403:TYR:CE2	1:A:407:HIS:CE1	3.06	0.43
1:A:569:ASN:HD22	1:A:569:ASN:H	1.65	0.43
1:A:631:VAL:HG11	1:B:628:GLN:HG2	2.01	0.43
1:A:524:LEU:O	1:A:531:PRO:HA	2.19	0.43
1:A:299:ARG:O	1:A:317:HIS:CE1	2.72	0.43
1:A:667:ARG:NH1	1:A:668[A]:CYS:SG	2.92	0.42
1:B:584:PHE:CD1	2:B:1719:HEM:CAC	3.03	0.42
2:A:1717:HEM:HMC1	2:A:1717:HEM:CBC	2.49	0.42
2:B:1719:HEM:HBC2	2:B:1719:HEM:CMC	2.50	0.42
1:A:686:SER:HA	1:A:691:PHE:CG	2.55	0.42
1:B:567:VAL:HG23	4:B:1721:S71:H05	2.02	0.41
1:B:595:VAL:O	1:B:599:CYS:HB2	2.20	0.41
1:B:487:GLN:OE1	1:B:514:ARG:NH2	2.53	0.41
1:B:355[A]:PHE:CE1	1:B:385:ASN:HB2	2.55	0.41
1:B:571:LEU:C	1:B:571:LEU:HD23	2.45	0.41
1:A:592:GLU:OE1	4:A:1719:S71:N01	2.54	0.41
1:A:569:ASN:O	1:A:707:GLN:HG2	2.21	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	407/422 (96%)	393 (97%)	13 (3%)	1 (0%)	43	36
1	B	409/422 (97%)	403 (98%)	6 (2%)	0	100	100
All	All	816/844 (97%)	796 (98%)	19 (2%)	1 (0%)	48	40

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	489	ASP

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	366/377 (97%)	354 (97%)	12 (3%)	33	26
1	B	368/377 (98%)	361 (98%)	7 (2%)	50	47
All	All	734/754 (97%)	715 (97%)	19 (3%)	40	35

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	360	GLU
1	A	380	ARG
1	A	381	LEU
1	A	390	SER
1	A	481	ARG
1	A	514	ARG
1	A	523	LEU
1	A	550	LYS
1	A	555	LYS
1	A	569	ASN
1	A	620	LYS
1	A	645	LYS

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Mol	Chain	Res	Type
1	B	320	SER
1	B	352	ASP
1	B	353	GLN
1	B	389	GLU
1	B	392	SER
1	B	480	ILE
1	B	540	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	353	GLN
1	A	454	ASN
1	A	464	GLN
1	A	487	GLN
1	A	527	ASN
1	A	569	ASN
1	A	601	ASN
1	A	605	ASN
1	A	628	GLN
1	A	642	GLN
1	A	697	ASN
1	B	364	GLN
1	B	395	GLN
1	B	454	ASN
1	B	478	GLN
1	B	507	GLN
1	B	527	ASN
1	B	601	ASN
1	B	605	ASN
1	B	628	GLN
1	B	697	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides 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
2	HEM	A	1717	1	50,50,50	1.56	7 (14%)	67,82,82	1.60	13 (19%)
3	H4B	B	1720	-	17,18,18	1.12	0	14,26,26	1.75	3 (21%)
4	S71	B	1721	-	29,30,30	0.85	1 (3%)	34,41,41	2.30	12 (35%)
4	S71	A	1719	-	29,30,30	0.76	0	34,41,41	1.99	7 (20%)
5	ACT	B	1722	-	3,3,3	0.72	0	3,3,3	1.07	0
3	H4B	A	1718	-	17,18,18	1.08	2 (11%)	14,26,26	2.33	6 (42%)
2	HEM	B	1719	1	50,50,50	1.53	7 (14%)	67,82,82	1.75	15 (22%)
5	ACT	A	1720	-	3,3,3	0.91	0	3,3,3	0.76	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
2	HEM	A	1717	1	-	1/14/54/54	-
3	H4B	B	1720	-	-	0/8/17/17	0/2/2/2
4	S71	B	1721	-	-	2/15/15/15	0/3/3/3
4	S71	A	1719	-	-	2/15/15/15	0/3/3/3
3	H4B	A	1718	-	-	0/8/17/17	0/2/2/2
2	HEM	B	1719	1	-	0/14/54/54	-

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1717	HEM	FE-NB	5.46	2.11	1.94
2	B	1719	HEM	FE-NB	4.43	2.08	1.94
2	A	1717	HEM	FE-NC	4.00	2.08	1.95
2	B	1719	HEM	FE-NC	3.84	2.07	1.95
2	B	1719	HEM	C3B-C4B	3.21	1.51	1.44
2	A	1717	HEM	C3B-C4B	3.00	1.50	1.44
2	A	1717	HEM	C1B-NB	-2.74	1.35	1.40
2	B	1719	HEM	C1C-C2C	-2.73	1.39	1.45
2	B	1719	HEM	C1B-NB	-2.62	1.35	1.40
2	A	1717	HEM	CHC-C1C	2.55	1.43	1.38
2	B	1719	HEM	O2A-CGA	-2.43	1.22	1.30
3	A	1718	H4B	C2-N2	2.42	1.39	1.34
2	A	1717	HEM	C4B-NB	-2.41	1.34	1.38
2	B	1719	HEM	C1D-ND	-2.25	1.34	1.38
2	A	1717	HEM	C1D-C2D	2.21	1.49	1.44
3	A	1718	H4B	C7-N8	2.09	1.48	1.46
4	B	1721	S71	C05-C04	2.01	1.42	1.39

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1721	S71	C02-N01-C06	7.38	123.59	118.07
4	A	1719	S71	C02-N01-C06	5.84	122.44	118.07
3	A	1718	H4B	C2-N1-C8A	5.68	123.38	113.36
2	B	1719	HEM	CHC-C4B-NB	4.54	129.31	124.42
4	A	1719	S71	C22-N21-C26	4.44	121.39	118.07
4	B	1721	S71	C22-N21-C26	4.37	121.34	118.07
4	B	1721	S71	C20-C26-N21	4.06	121.55	116.57
2	B	1719	HEM	C3B-C4B-NB	-3.91	106.66	109.47
3	B	1720	H4B	C2-N1-C8A	3.85	120.16	113.36
2	B	1719	HEM	CHD-C1D-ND	3.84	128.55	124.42
2	B	1719	HEM	C1B-NB-C4B	3.78	109.68	105.21
4	A	1719	S71	C20-C26-N21	3.75	121.16	116.57
2	B	1719	HEM	C4C-CHD-C1D	-3.72	118.12	126.02
2	A	1717	HEM	C1B-NB-C4B	3.65	109.52	105.21
4	B	1721	S71	C05-C06-N01	-3.64	118.58	122.73
2	A	1717	HEM	CHC-C4B-NB	3.48	128.17	124.42
2	A	1717	HEM	CHA-C4D-ND	3.48	128.67	124.37
2	A	1717	HEM	C3B-C4B-NB	-3.45	106.99	109.47
2	B	1719	HEM	CHD-C1D-C2D	-3.35	119.73	125.03
2	A	1717	HEM	CHA-C4D-C3D	-3.33	119.09	125.23
2	A	1717	HEM	C4C-CHD-C1D	-3.30	119.01	126.02
3	A	1718	H4B	C4A-C4-N3	3.23	121.00	112.13

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1721	S71	C12-N11-C16	3.23	121.90	117.51
4	A	1719	S71	C12-N11-C16	3.20	121.86	117.51
4	A	1719	S71	C15-C16-N11	-3.20	119.06	124.05
4	B	1721	S71	C15-C16-N11	-3.05	119.30	124.05
2	A	1717	HEM	C1A-CHA-C4D	-2.94	119.33	126.25
2	B	1719	HEM	CHA-C4D-C3D	-2.90	119.88	125.23
4	B	1721	S71	C08-C06-C05	2.85	125.78	121.65
2	B	1719	HEM	CHA-C4D-ND	2.84	127.88	124.37
2	B	1719	HEM	C4A-CHB-C1B	-2.78	119.72	126.25
2	B	1719	HEM	CAD-C3D-C4D	2.75	129.49	124.70
4	B	1721	S71	N22-C22-N21	2.72	120.96	116.59
3	A	1718	H4B	C4-C4A-N5	2.69	123.61	116.27
3	A	1718	H4B	O4-C4-C4A	-2.61	120.97	127.26
2	A	1717	HEM	C4A-CHB-C1B	-2.60	120.12	126.25
4	A	1719	S71	C05-C06-N01	-2.60	119.76	122.73
3	B	1720	H4B	O4-C4-C4A	-2.57	121.07	127.26
3	A	1718	H4B	N3-C2-N1	-2.56	118.63	123.32
3	A	1718	H4B	C2-N3-C4	-2.54	120.50	125.11
2	B	1719	HEM	C1A-CHA-C4D	-2.49	120.40	126.25
2	A	1717	HEM	CBD-CAD-C3D	-2.42	105.85	112.53
2	A	1717	HEM	CHA-C1A-NA	2.41	128.23	123.86
3	B	1720	H4B	C4A-C4-N3	2.40	118.73	112.13
2	A	1717	HEM	C4C-NC-C1C	2.38	109.70	105.82
2	B	1719	HEM	O2A-CGA-O1A	-2.31	117.39	123.33
4	B	1721	S71	C18-C17-C15	2.28	115.56	110.97
2	B	1719	HEM	CBA-CAA-C2A	-2.28	106.23	112.53
2	A	1717	HEM	CBA-CAA-C2A	-2.24	106.33	112.53
4	A	1719	S71	N22-C22-N21	2.21	120.14	116.59
4	B	1721	S71	C14-C13-C12	2.20	118.94	116.90
2	B	1719	HEM	O2D-CGD-CBD	2.20	120.94	114.00
2	B	1719	HEM	CBD-CAD-C3D	-2.13	106.63	112.53
4	B	1721	S71	C15-C14-C13	-2.07	118.92	121.16
2	A	1717	HEM	O2D-CGD-CBD	2.03	120.41	114.00
4	B	1721	S71	C25-C26-N21	-2.03	120.42	122.73

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	1721	S71	C15-C17-C18-N19
4	B	1721	S71	C20-C17-C18-N19
2	A	1717	HEM	C4B-C3B-CAB-CBB

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Mol	Chain	Res	Type	Atoms
4	A	1719	S71	N01-C06-C08-C09
4	A	1719	S71	C05-C06-C08-C09

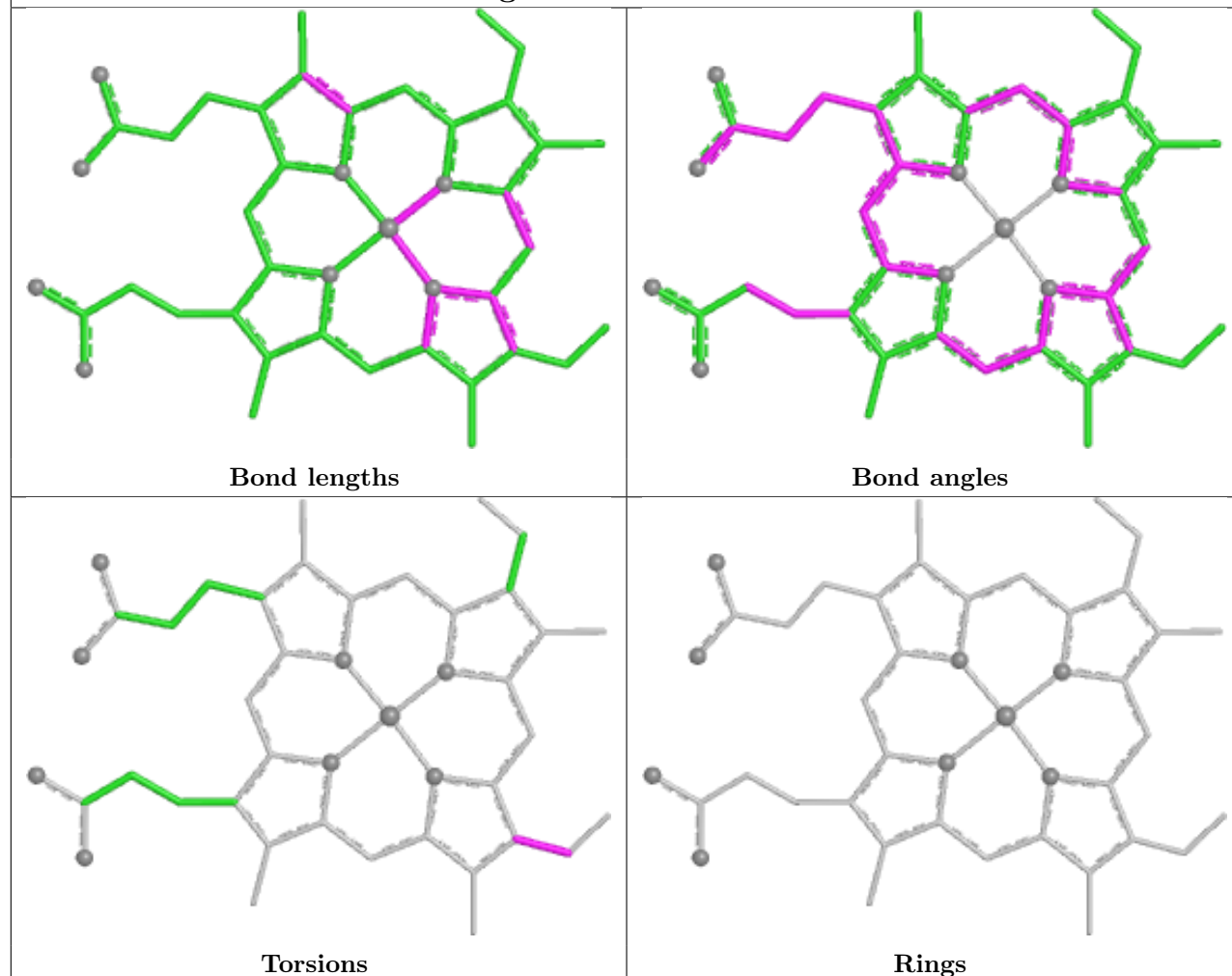
There are no ring outliers.

4 monomers are involved in 10 short contacts:

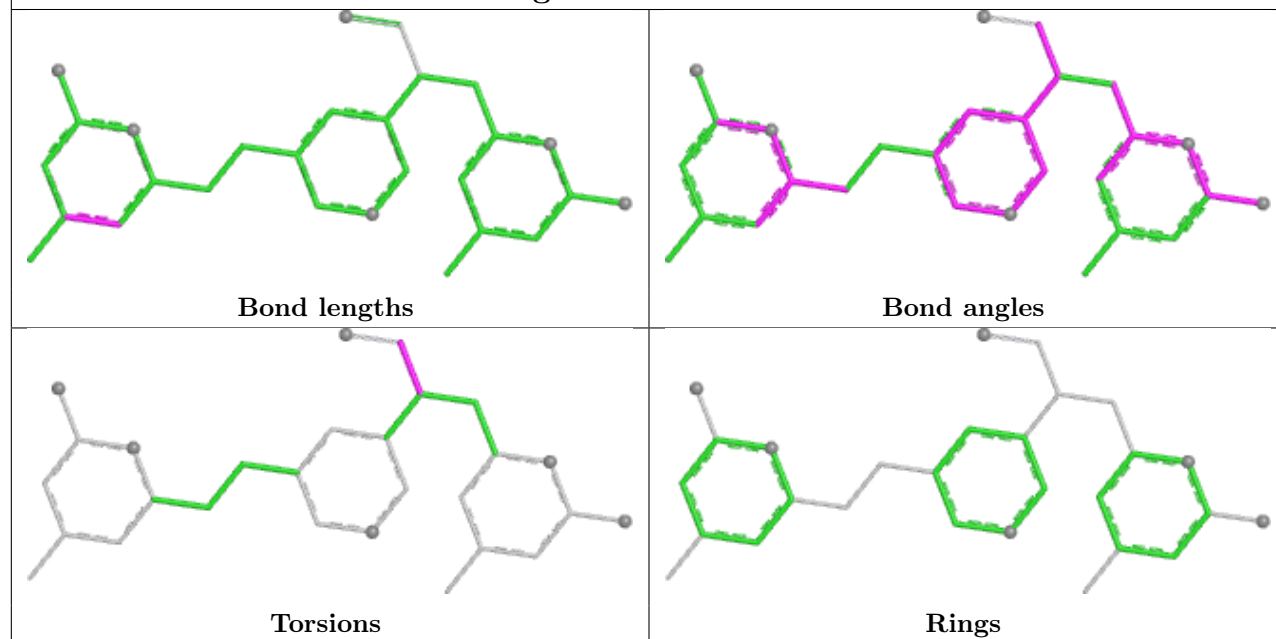
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1717	HEM	4	0
4	B	1721	S71	1	0
4	A	1719	S71	1	0
2	B	1719	HEM	4	0

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.

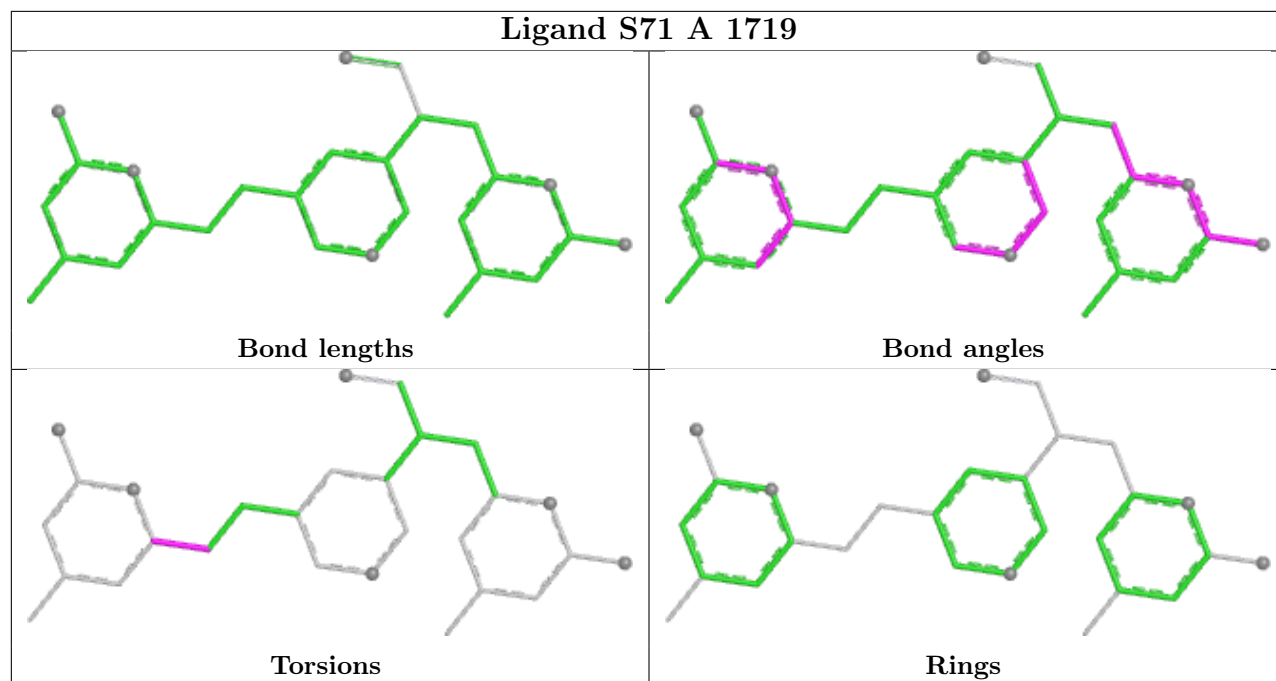
Ligand HEM A 1717



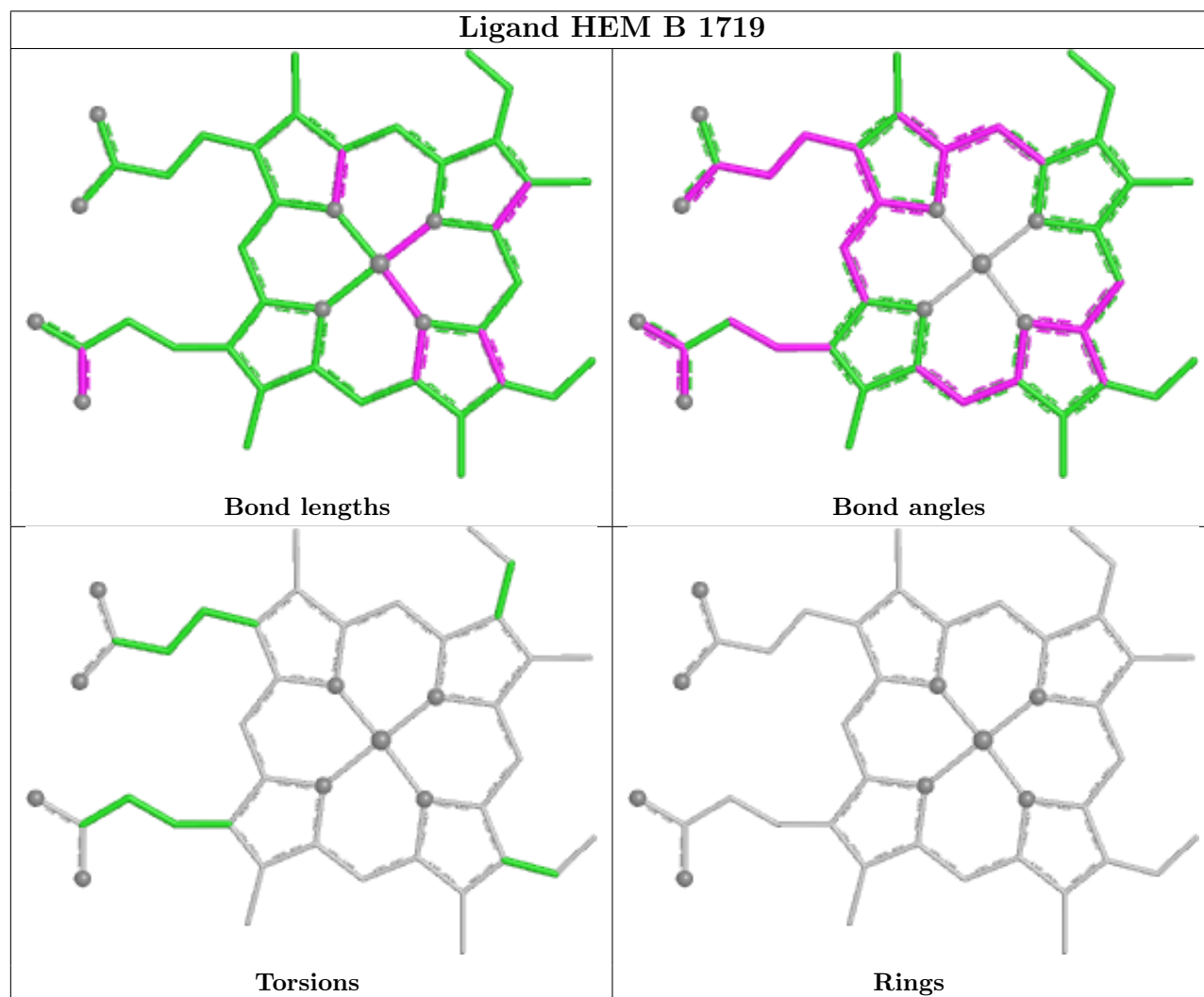
Ligand S71 B 1721



Ligand S71 A 1719



Ligand HEM B 1719



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	408/422 (96%)	0.40	21 (5%) 33 36	16, 37, 70, 90	3 (0%)
1	B	411/422 (97%)	-0.07	11 (2%) 56 60	16, 28, 51, 70	2 (0%)
All	All	819/844 (97%)	0.16	32 (3%) 43 46	16, 32, 65, 90	5 (0%)

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	348	VAL	5.0
1	A	300	PHE	4.8
1	B	321	THR	4.0
1	A	706	TYR	4.0
1	A	355	PHE	3.9
1	B	322	LEU	3.8
1	A	321	THR	3.6
1	B	355[A]	PHE	3.6
1	A	322	LEU	3.6
1	A	713	THR	3.0
1	A	715	VAL	3.0
1	A	490	GLY	2.8
1	A	551	PHE	2.6
1	B	300	PHE	2.5
1	A	506	ILE	2.5
1	A	350	THR	2.5
1	B	706	TYR	2.5
1	A	488	PRO	2.5
1	B	350	THR	2.5
1	B	718	GLY	2.4
1	A	330	ILE	2.4
1	A	556	ASP	2.3
1	A	716	TRP	2.3
1	B	535	GLN	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	338	PRO	2.1
1	A	552	ASP	2.1
1	B	352	ASP	2.1
1	A	319	LYS	2.0
1	A	338	PRO	2.0
1	A	370	LYS	2.0
1	A	717	LYS	2.0
1	A	373	GLY	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 ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

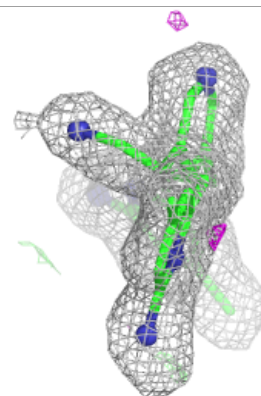
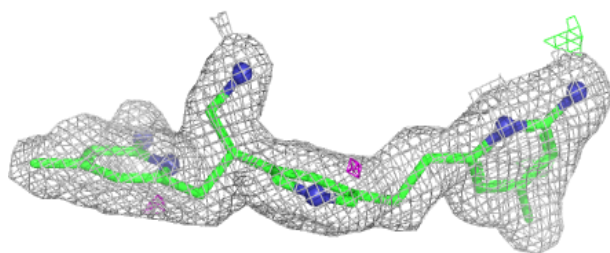
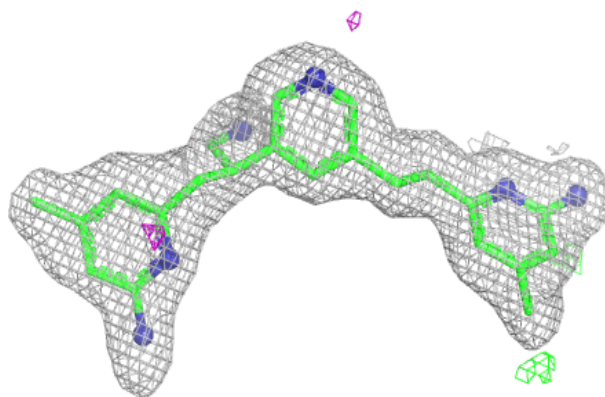
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	ACT	A	1720	4/4	0.85	0.20	54,56,58,61	0
5	ACT	B	1722	4/4	0.87	0.18	49,49,50,52	0
4	S71	A	1719	28/28	0.95	0.07	20,30,34,36	0
4	S71	B	1721	28/28	0.95	0.06	20,27,29,31	0
2	HEM	A	1717	43/43	0.97	0.07	20,22,26,29	0
2	HEM	B	1719	43/43	0.97	0.07	17,19,24,28	0
3	H4B	A	1718	17/17	0.97	0.05	18,20,24,25	0
3	H4B	B	1720	17/17	0.97	0.05	18,20,24,24	0
6	ZN	A	1721	1/1	0.99	0.02	26,26,26,26	0

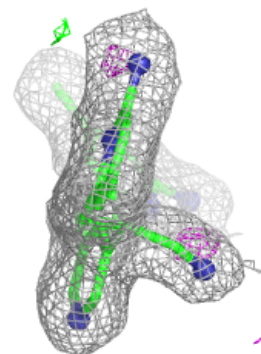
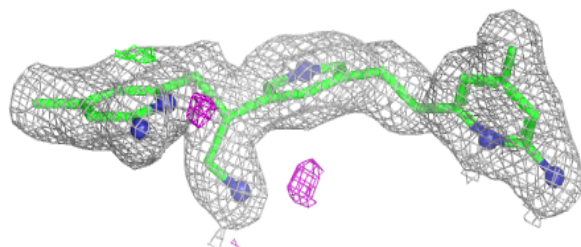
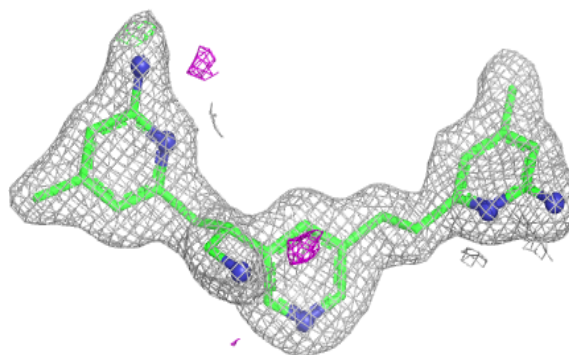
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around S71 A 1719:

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

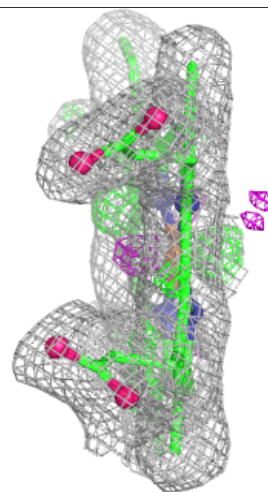
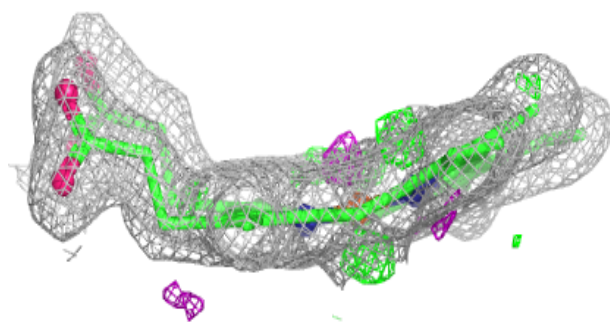
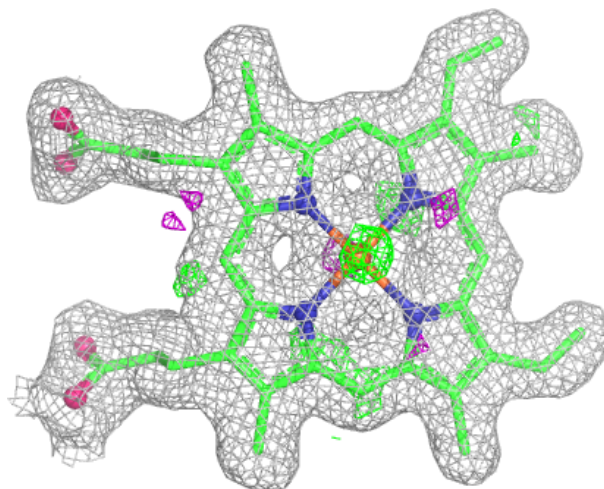
**Electron density around S71 B 1721:**

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



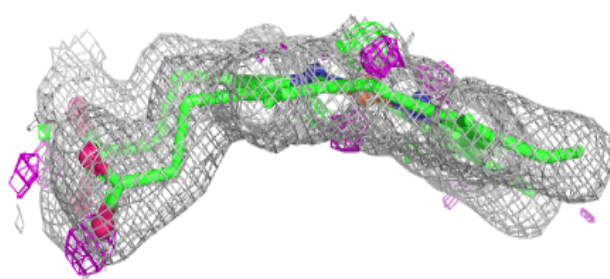
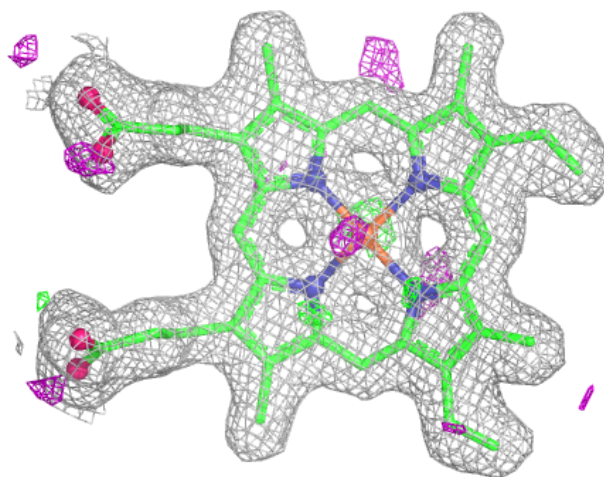
Electron density around HEM A 1717:

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



Electron density around HEM B 1719:

$2mF_o-DF_c$ (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.