



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 09:44 PM GMT

PDB ID : 1QDB  
Title : CYTOCHROME C NITRITE REDUCTASE  
Authors : Einsle, O.; Messerschmidt, A.; Stach, P.; Huber, R.; Kroneck, P.M.H.  
Deposited on : 1999-05-19  
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  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

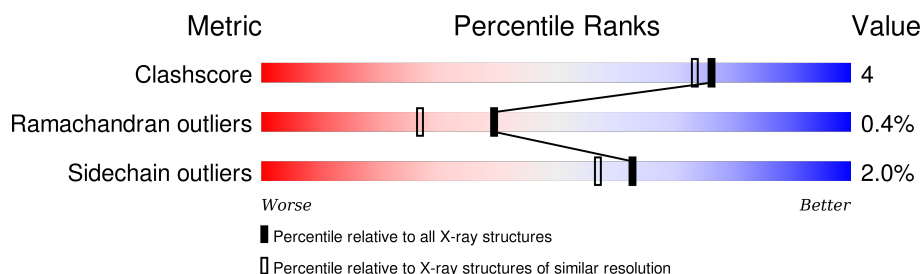
# 1 Overall quality at a glance

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))
Clashscore	102246	5398 (1.90-1.90)
Ramachandran outliers	100387	5338 (1.90-1.90)
Sidechain outliers	100360	5339 (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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	473	 88% 11% •
1	B	473	 91% 8% •
1	C	473	 90% 9% •

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 13431 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 CYTOCHROME C NITRITE REDUCTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	473	Total	C	N	O	S	93	0	0
			3751	2367	654	710	20			
1	B	473	Total	C	N	O	S	14	0	0
			3751	2367	654	710	20			
1	C	473	Total	C	N	O	S	17	0	0
			3751	2367	654	710	20			

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

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

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

- Molecule 4 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula:  $C_{34}H_{32}FeN_4O_4$ ).



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

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

- Molecule 5 is water.

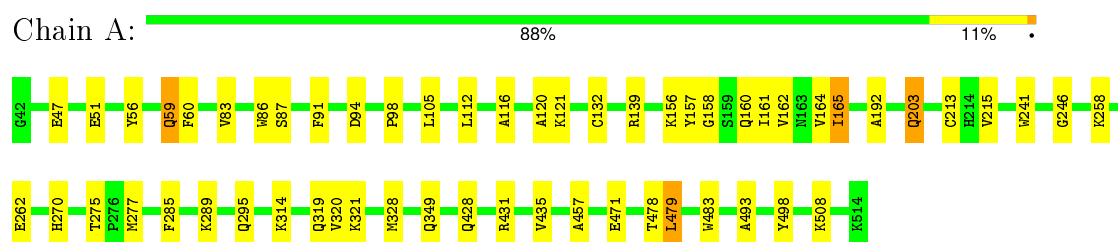
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	371	Total	O	0	0
			371	371		
5	B	505	Total	O	0	0
			505	505		
5	C	609	Total	O	0	0
			609	609		

### 3 Residue-property plots

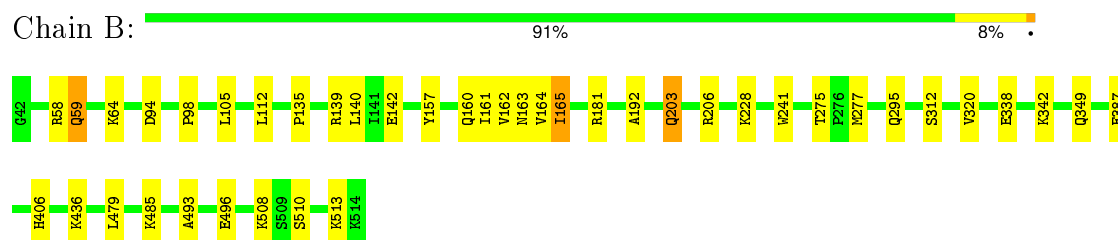
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according 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.

Note EDS was not executed.

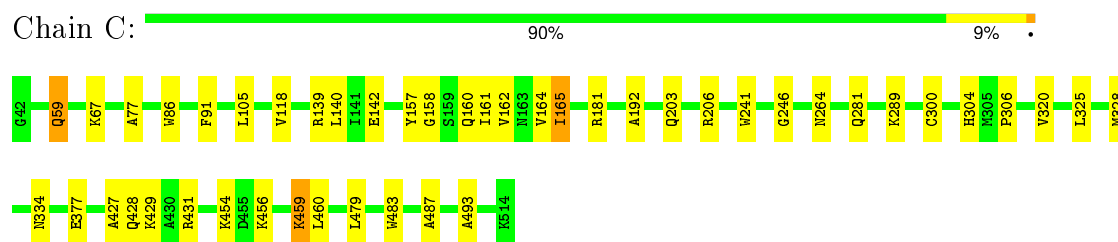
#### • Molecule 1: CYTOCHROME C NITRITE REDUCTASE



#### • Molecule 1: CYTOCHROME C NITRITE REDUCTASE



#### • Molecule 1: CYTOCHROME C NITRITE REDUCTASE



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	107.48Å 185.34Å 92.19Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 1.90	Depositor
% Data completeness (in resolution range)	100.0 (25.00-1.90)	Depositor
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS	Depositor
R, $R_{free}$	0.184 , 0.220	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	13431	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP



## 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, CA, SO4

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	0.39	0/3840	0.60	0/5173
1	B	0.42	0/3840	0.63	0/5173
1	C	0.47	0/3840	0.66	0/5173
All	All	0.42	0/11520	0.63	0/15519

There are no bond length outliers.

There are no bond angle outliers.

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	3751	0	3658	38	0
1	B	3751	0	3658	25	0
1	C	3751	0	3658	30	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
3	A	15	0	0	0	0
3	B	15	0	0	0	0
3	C	15	0	0	1	0
4	A	215	0	150	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	215	0	150	0	0
4	C	215	0	150	1	0
5	A	371	0	0	3	0
5	B	505	0	0	1	0
5	C	609	0	0	3	0
All	All	13431	0	11424	87	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 (87) 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:349:GLN:HE22	1:B:295:GLN:HE22	1.29	0.78
1:A:319:GLN:O	1:A:321:LYS:HD2	1.86	0.75
1:C:456:LYS:O	1:C:459:LYS:HD3	1.87	0.74
1:A:295:GLN:HE22	1:B:349:GLN:HE22	1.34	0.73
1:B:140:LEU:HD12	1:B:161:ILE:HD11	1.71	0.73
1:A:139:ARG:HH22	1:A:160:GLN:HE21	1.43	0.67
1:C:140:LEU:HD12	1:C:161:ILE:HD11	1.77	0.66
1:A:56:TYR:HB3	1:A:59:GLN:NE2	2.12	0.64
1:C:142:GLU:OE2	1:C:181:ARG:HD2	1.98	0.63
1:B:203:GLN:HA	1:B:203:GLN:HE21	1.64	0.62
1:A:428:GLN:HE21	1:A:428:GLN:HA	1.63	0.61
1:C:59:GLN:H	1:C:59:GLN:HE21	1.47	0.60
1:C:139:ARG:HH22	1:C:160:GLN:HE21	1.49	0.59
1:B:59:GLN:NE2	1:B:59:GLN:H	2.02	0.58
1:C:59:GLN:NE2	1:C:59:GLN:H	2.02	0.57
1:A:56:TYR:HB3	1:A:59:GLN:HE21	1.70	0.56
1:B:142:GLU:OE2	1:B:181:ARG:HD2	2.05	0.56
1:A:349:GLN:HE22	1:B:295:GLN:NE2	2.03	0.56
1:B:58:ARG:HH12	1:C:203:GLN:NE2	2.04	0.54
1:C:428:GLN:HA	1:C:428:GLN:HE21	1.74	0.53
1:C:157:TYR:HB3	1:C:161:ILE:HG12	1.90	0.53
1:A:431:ARG:O	1:A:435:VAL:HG23	2.09	0.53
1:C:203:GLN:HE21	1:C:203:GLN:HA	1.74	0.53
1:B:59:GLN:HE21	1:B:59:GLN:H	1.56	0.52
5:A:1669:HOH:O	1:B:436:LYS:HG2	2.10	0.51
1:A:203:GLN:HE21	1:A:203:GLN:HA	1.77	0.50
1:A:116:ALA:HB3	1:A:471:GLU:HG2	1.94	0.50
1:B:139:ARG:HH22	1:B:160:GLN:HE21	1.59	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:338:GLU:CD	1:B:342:LYS:HD3	2.33	0.49
1:C:86:TRP:CE3	1:C:91:PHE:HB3	2.49	0.48
1:A:428:GLN:NE2	1:A:428:GLN:HA	2.30	0.47
1:C:246:GLY:HA3	1:C:289:LYS:HB3	1.96	0.47
1:C:427:ALA:O	1:C:431:ARG:HG3	2.15	0.47
1:A:295:GLN:NE2	1:B:349:GLN:HE22	2.08	0.47
1:B:192:ALA:HB2	1:B:241:TRP:HB3	1.97	0.47
1:A:158:GLY:HA3	1:A:483:TRP:CE2	2.50	0.46
1:A:246:GLY:HA3	1:A:289:LYS:HB3	1.97	0.46
1:C:377:GLU:HG3	5:C:2056:HOH:O	2.16	0.46
1:A:258:LYS:O	1:A:262:GLU:HG3	2.15	0.46
1:C:459:LYS:NZ	5:C:2008:HOH:O	2.39	0.45
1:B:510:SER:O	1:B:513:LYS:HE3	2.16	0.45
1:B:312:SER:HB3	1:C:334:ASN:HD22	1.81	0.45
1:B:162:VAL:HG23	1:B:493:ALA:HB2	1.97	0.45
1:A:94:ASP:HB2	1:A:112:LEU:HB2	1.98	0.45
1:B:64:LYS:HE3	5:B:1812:HOH:O	2.15	0.45
1:B:164:VAL:O	1:B:165:ILE:C	2.55	0.45
1:A:478:THR:HG22	1:A:479:LEU:N	2.31	0.45
1:B:157:TYR:HB3	1:B:161:ILE:HG12	2.00	0.45
1:A:192:ALA:HB2	1:A:241:TRP:HB3	2.00	0.44
1:A:60:PHE:HA	4:A:516:HEM:HBB2	2.00	0.44
1:A:164:VAL:O	1:A:165:ILE:C	2.56	0.44
1:C:281:GLN:HG2	3:C:1503:SO4:O2	2.18	0.44
1:A:121:LYS:HD2	1:A:121:LYS:HA	1.77	0.44
1:A:428:GLN:HE22	1:A:431:ARG:HH11	1.66	0.44
1:A:508:LYS:HE2	5:A:1734:HOH:O	2.17	0.44
1:C:164:VAL:HG22	1:C:165:ILE:N	2.33	0.44
1:C:162:VAL:HG23	1:C:493:ALA:HB2	2.00	0.43
1:C:192:ALA:HB2	1:C:241:TRP:HB3	2.00	0.43
1:A:120:ALA:HB1	1:A:156:LYS:HA	1.99	0.43
1:A:87:SER:HB3	1:A:270:HIS:CE1	2.53	0.43
1:B:135:PRO:HD2	1:B:163:ASN:O	2.19	0.43
1:C:429:LYS:HD3	5:C:1751:HOH:O	2.18	0.43
1:A:86:TRP:CE3	1:A:91:PHE:HB3	2.53	0.43
1:C:158:GLY:HA3	1:C:483:TRP:CE2	2.53	0.43
1:A:83:VAL:HB	1:A:457:ALA:HB1	2.00	0.43
1:C:203:GLN:HE22	1:C:206:ARG:HE	1.65	0.43
1:C:300:CYS:HA	4:C:518:HEM:CHC	2.50	0.42
1:B:203:GLN:HE22	1:B:206:ARG:HE	1.68	0.42
1:B:94:ASP:HB2	1:B:112:LEU:HB2	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:77:ALA:HA	1:C:454:LYS:HB2	2.01	0.42
1:A:157:TYR:HB3	1:A:161:ILE:HG13	2.01	0.42
1:C:428:GLN:HE22	1:C:431:ARG:HH11	1.67	0.42
1:C:325:LEU:O	1:C:328:MET:HG3	2.20	0.42
1:A:215:VAL:HG12	1:A:285:PHE:HB3	2.02	0.41
1:C:162:VAL:HG11	1:C:487:ALA:HB2	2.03	0.41
1:A:162:VAL:HG23	1:A:493:ALA:HB2	2.02	0.41
1:C:304:HIS:C	1:C:306:PRO:HD3	2.41	0.41
1:A:132:CYS:HB3	1:A:213:CYS:SG	2.61	0.41
1:B:275:THR:O	1:B:277:MET:HG2	2.21	0.41
1:A:498:TYR:HB2	5:A:1718:HOH:O	2.21	0.41
1:A:59:GLN:HG2	4:A:516:HEM:C4A	2.56	0.41
1:A:47:GLU:CD	1:A:47:GLU:H	2.25	0.41
1:C:459:LYS:HE2	1:C:460:LEU:HG	2.03	0.40
1:B:98:PRO:HD3	1:B:406:HIS:CD2	2.56	0.40
1:A:275:THR:O	1:A:277:MET:HG2	2.22	0.40
1:A:428:GLN:NE2	1:A:431:ARG:HD3	2.36	0.40
1:A:98:PRO:HG3	4:A:515:HEM:CGD	2.52	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	471/473 (100%)	454 (96%)	15 (3%)	2 (0%)	39	27
1	B	471/473 (100%)	465 (99%)	4 (1%)	2 (0%)	39	27
1	C	471/473 (100%)	462 (98%)	7 (2%)	2 (0%)	39	27
All	All	1413/1419 (100%)	1381 (98%)	26 (2%)	6 (0%)	39	27

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	165	ILE
1	B	165	ILE
1	C	165	ILE
1	A	320	VAL
1	C	320	VAL
1	B	320	VAL

### 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	392/392 (100%)	385 (98%)	7 (2%)	66	61
1	B	392/392 (100%)	383 (98%)	9 (2%)	58	51
1	C	392/392 (100%)	385 (98%)	7 (2%)	66	61
All	All	1176/1176 (100%)	1153 (98%)	23 (2%)	63	57

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	GLU
1	A	59	GLN
1	A	105	LEU
1	A	203	GLN
1	A	314	LYS
1	A	328	MET
1	A	479	LEU
1	B	59	GLN
1	B	105	LEU
1	B	203	GLN
1	B	228	LYS
1	B	387	GLU
1	B	479	LEU
1	B	485	LYS
1	B	496	GLU
1	B	508	LYS
1	C	59	GLN

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Mol	Chain	Res	Type
1	C	67	LYS
1	C	105	LEU
1	C	118	VAL
1	C	264	ASN
1	C	459	LYS
1	C	479	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	59	GLN
1	A	160	GLN
1	A	203	GLN
1	A	295	GLN
1	A	428	GLN
1	A	458	GLN
1	A	494	ASN
1	B	59	GLN
1	B	160	GLN
1	B	203	GLN
1	B	295	GLN
1	B	309	GLN
1	B	330	GLN
1	B	458	GLN
1	B	477	GLN
1	B	512	ASN
1	C	59	GLN
1	C	160	GLN
1	C	203	GLN
1	C	309	GLN
1	C	428	GLN
1	C	458	GLN
1	C	477	GLN
1	C	512	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 ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 27 ligands modelled in this entry, 3 are monoatomic - leaving 24 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
3	SO4	A	1501	4	4,4,4	0.96	0	6,6,6	0.69	0
3	SO4	A	1504	-	4,4,4	1.13	0	6,6,6	0.34	0
3	SO4	A	1506	-	4,4,4	0.84	0	6,6,6	0.17	0
4	HEM	A	515	1,3	30,50,50	2.70	10 (33%)	24,82,82	2.11	8 (33%)
4	HEM	A	516	1	30,50,50	2.51	7 (23%)	24,82,82	2.21	7 (29%)
4	HEM	A	517	1	30,50,50	2.71	10 (33%)	24,82,82	2.47	10 (41%)
4	HEM	A	518	1	30,50,50	2.98	12 (40%)	24,82,82	2.41	10 (41%)
4	HEM	A	519	1	30,50,50	2.40	9 (30%)	24,82,82	2.44	9 (37%)
3	SO4	B	1502	4	4,4,4	0.69	0	6,6,6	0.48	0
3	SO4	B	1505	-	4,4,4	1.00	0	6,6,6	0.24	0
3	SO4	B	1507	-	4,4,4	1.05	0	6,6,6	0.26	0
4	HEM	B	515	1,3	30,50,50	2.51	11 (36%)	24,82,82	2.45	6 (25%)
4	HEM	B	516	1	30,50,50	3.47	10 (33%)	24,82,82	2.33	7 (29%)
4	HEM	B	517	1	30,50,50	2.57	10 (33%)	24,82,82	2.18	8 (33%)
4	HEM	B	518	1	30,50,50	2.62	10 (33%)	24,82,82	2.78	9 (37%)
4	HEM	B	519	1	30,50,50	2.75	11 (36%)	24,82,82	2.38	8 (33%)
3	SO4	C	1503	4	4,4,4	1.38	0	6,6,6	1.01	1 (16%)
3	SO4	C	1508	-	4,4,4	0.56	0	6,6,6	0.30	0
3	SO4	C	1509	-	4,4,4	0.89	0	6,6,6	0.31	0
4	HEM	C	515	1,3	30,50,50	2.39	9 (30%)	24,82,82	2.26	8 (33%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	HEM	C	516	1	30,50,50	2.70	10 (33%)	24,82,82	2.25	7 (29%)
4	HEM	C	517	1	30,50,50	2.60	11 (36%)	24,82,82	2.39	8 (33%)
4	HEM	C	518	1	30,50,50	2.67	10 (33%)	24,82,82	2.57	8 (33%)
4	HEM	C	519	1	30,50,50	3.24	10 (33%)	24,82,82	2.40	8 (33%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	SO4	A	1501	4	-	0/0/0/0	0/0/0/0
3	SO4	A	1504	-	-	0/0/0/0	0/0/0/0
3	SO4	A	1506	-	-	0/0/0/0	0/0/0/0
4	HEM	A	515	1,3	-	0/10/54/54	0/0/8/8
4	HEM	A	516	1	-	0/10/54/54	0/0/8/8
4	HEM	A	517	1	-	0/10/54/54	0/0/8/8
4	HEM	A	518	1	-	0/10/54/54	0/0/8/8
4	HEM	A	519	1	-	0/10/54/54	0/0/8/8
3	SO4	B	1502	4	-	0/0/0/0	0/0/0/0
3	SO4	B	1505	-	-	0/0/0/0	0/0/0/0
3	SO4	B	1507	-	-	0/0/0/0	0/0/0/0
4	HEM	B	515	1,3	-	0/10/54/54	0/0/8/8
4	HEM	B	516	1	-	0/10/54/54	0/0/8/8
4	HEM	B	517	1	-	0/10/54/54	0/0/8/8
4	HEM	B	518	1	-	0/10/54/54	0/0/8/8
4	HEM	B	519	1	-	0/10/54/54	0/0/8/8
3	SO4	C	1503	4	-	0/0/0/0	0/0/0/0
3	SO4	C	1508	-	-	0/0/0/0	0/0/0/0
3	SO4	C	1509	-	-	0/0/0/0	0/0/0/0
4	HEM	C	515	1,3	-	0/10/54/54	0/0/8/8
4	HEM	C	516	1	-	0/10/54/54	0/0/8/8
4	HEM	C	517	1	-	0/10/54/54	0/0/8/8
4	HEM	C	518	1	-	0/10/54/54	0/0/8/8
4	HEM	C	519	1	-	0/10/54/54	0/0/8/8

All (150) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	519	HEM	C3B-C4B	-12.40	1.40	1.51
4	B	516	HEM	C3B-C4B	-12.33	1.40	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	518	HEM	C3B-C4B	-9.24	1.43	1.51
4	C	516	HEM	C3B-C4B	-7.90	1.44	1.51
4	B	516	HEM	C3D-C4D	-7.11	1.42	1.51
4	A	517	HEM	C2D-C3D	-6.66	1.34	1.54
4	C	515	HEM	C2D-C3D	-6.54	1.34	1.54
4	B	516	HEM	C2D-C3D	-6.54	1.34	1.54
4	C	517	HEM	C2D-C3D	-6.52	1.35	1.54
4	A	515	HEM	C3B-CAB	-6.50	1.39	1.51
4	B	517	HEM	C3B-C4B	-6.46	1.46	1.51
4	C	519	HEM	C2D-C3D	-6.45	1.35	1.54
4	A	516	HEM	C3C-CAC	-6.44	1.39	1.51
4	A	519	HEM	C2D-C3D	-6.36	1.35	1.54
4	C	518	HEM	C2D-C3D	-6.35	1.35	1.54
4	A	518	HEM	C3C-CAC	-6.28	1.39	1.51
4	A	515	HEM	C2D-C3D	-6.28	1.35	1.54
4	B	519	HEM	C2D-C3D	-6.25	1.35	1.54
4	A	515	HEM	C3B-C4B	-6.14	1.46	1.51
4	B	518	HEM	C2D-C3D	-6.13	1.36	1.54
4	A	517	HEM	C3C-CAC	-6.10	1.39	1.51
4	C	516	HEM	C2D-C3D	-6.10	1.36	1.54
4	A	516	HEM	C3B-CAB	-6.06	1.40	1.51
4	B	518	HEM	C3B-C4B	-6.04	1.46	1.51
4	A	518	HEM	C2D-C3D	-5.97	1.36	1.54
4	B	519	HEM	C3B-C4B	-5.93	1.46	1.51
4	A	516	HEM	C2D-C3D	-5.88	1.36	1.54
4	B	515	HEM	C3B-CAB	-5.88	1.40	1.51
4	A	517	HEM	C2C-C1C	-5.87	1.41	1.52
4	B	517	HEM	C2D-C3D	-5.86	1.36	1.54
4	C	518	HEM	C3B-C4B	-5.86	1.46	1.51
4	B	519	HEM	C3B-CAB	-5.74	1.40	1.51
4	B	515	HEM	C2D-C3D	-5.69	1.37	1.54
4	A	515	HEM	C3D-C4D	-5.68	1.44	1.51
4	C	518	HEM	C3B-CAB	-5.64	1.40	1.51
4	B	515	HEM	C3C-CAC	-5.51	1.41	1.51
4	C	517	HEM	C3B-C4B	-5.51	1.46	1.51
4	C	518	HEM	C3C-CAC	-5.30	1.41	1.51
4	A	519	HEM	C3B-CAB	-5.25	1.41	1.51
4	B	516	HEM	C3B-CAB	-5.23	1.41	1.51
4	C	519	HEM	C3B-CAB	-5.20	1.41	1.51
4	C	516	HEM	C3B-CAB	-5.17	1.41	1.51
4	C	516	HEM	C3D-C4D	-5.15	1.45	1.51
4	B	519	HEM	C3C-CAC	-5.14	1.41	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	519	HEM	C3D-C4D	-5.10	1.45	1.51
4	B	516	HEM	C3C-CAC	-5.04	1.41	1.51
4	C	518	HEM	C3D-C4D	-5.02	1.45	1.51
4	A	517	HEM	C3B-CAB	-4.97	1.42	1.51
4	A	519	HEM	C3C-CAC	-4.93	1.42	1.51
4	B	518	HEM	C3B-CAB	-4.85	1.42	1.51
4	A	518	HEM	C3B-CAB	-4.81	1.42	1.51
4	B	518	HEM	C3C-CAC	-4.81	1.42	1.51
4	B	517	HEM	C3D-C4D	-4.78	1.45	1.51
4	B	517	HEM	C3B-CAB	-4.77	1.42	1.51
4	C	515	HEM	C3B-C4B	-4.71	1.47	1.51
4	B	515	HEM	C2C-C1C	-4.68	1.43	1.52
4	C	519	HEM	C3C-CAC	-4.68	1.42	1.51
4	C	516	HEM	C3C-CAC	-4.68	1.42	1.51
4	A	518	HEM	C2C-C1C	-4.65	1.43	1.52
4	A	518	HEM	C3D-C4D	-4.60	1.45	1.51
4	A	517	HEM	C3B-C4B	-4.51	1.47	1.51
4	A	516	HEM	C2C-C1C	-4.47	1.44	1.52
4	A	516	HEM	C3B-C4B	-4.45	1.47	1.51
4	C	519	HEM	C3D-C4D	-4.44	1.45	1.51
4	C	517	HEM	C3C-CAC	-4.43	1.43	1.51
4	A	519	HEM	C3B-C4B	-4.34	1.48	1.51
4	B	517	HEM	C3C-CAC	-4.33	1.43	1.51
4	B	518	HEM	C2C-C1C	-4.29	1.44	1.52
4	A	519	HEM	C3D-C4D	-4.26	1.46	1.51
4	B	516	HEM	C2C-C1C	-4.23	1.44	1.52
4	C	517	HEM	C2C-C1C	-4.19	1.44	1.52
4	A	515	HEM	C3C-CAC	-4.17	1.43	1.51
4	C	518	HEM	C2C-C1C	-4.13	1.44	1.52
4	C	517	HEM	C3B-CAB	-4.12	1.43	1.51
4	C	515	HEM	C3D-C4D	-4.08	1.46	1.51
4	B	518	HEM	C3D-C4D	-3.98	1.46	1.51
4	C	517	HEM	C3D-C4D	-3.93	1.46	1.51
4	B	517	HEM	C2C-C1C	-3.87	1.45	1.52
4	B	515	HEM	C3D-C4D	-3.86	1.46	1.51
4	C	515	HEM	C3C-CAC	-3.73	1.44	1.51
4	C	515	HEM	C3B-CAB	-3.55	1.44	1.51
4	A	516	HEM	C3D-C4D	-3.44	1.47	1.51
4	B	519	HEM	C2C-C1C	-3.32	1.46	1.52
4	C	515	HEM	C2C-C1C	-3.30	1.46	1.52
4	B	516	HEM	C2B-C1B	-3.27	1.41	1.51
4	A	517	HEM	C3D-C4D	-3.19	1.47	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	517	HEM	C2B-C1B	-3.15	1.41	1.51
4	C	519	HEM	C2B-C1B	-3.13	1.41	1.51
4	A	519	HEM	C2C-C1C	-3.03	1.46	1.52
4	A	515	HEM	C2C-C1C	-3.00	1.46	1.52
4	C	519	HEM	C2C-C1C	-2.90	1.47	1.52
4	B	515	HEM	C3B-C4B	-2.80	1.49	1.51
4	C	519	HEM	C2D-C1D	-2.76	1.42	1.51
4	A	518	HEM	C2B-C1B	-2.60	1.43	1.51
4	C	516	HEM	C2C-C1C	-2.57	1.47	1.52
4	B	519	HEM	C2B-C1B	-2.47	1.43	1.51
4	A	515	HEM	C2D-C1D	-2.45	1.43	1.51
4	C	516	HEM	C2B-C1B	-2.37	1.44	1.51
4	B	515	HEM	C2D-C1D	-2.21	1.44	1.51
4	A	518	HEM	C2D-C1D	-2.20	1.44	1.51
4	A	519	HEM	C2D-C1D	-2.13	1.44	1.51
4	B	517	HEM	C2D-C1D	-2.09	1.45	1.51
4	C	516	HEM	C2D-C1D	-2.08	1.45	1.51
4	C	517	HEM	C2D-C1D	-2.05	1.45	1.51
4	B	516	HEM	CBC-CAC	2.05	1.41	1.29
4	C	518	HEM	CHC-C1C	2.09	1.41	1.36
4	C	519	HEM	CBC-CAC	2.17	1.41	1.29
4	A	517	HEM	CBB-CAB	2.19	1.42	1.29
4	B	519	HEM	CBC-CAC	2.22	1.42	1.29
4	B	518	HEM	CBC-CAC	2.22	1.42	1.29
4	A	518	HEM	CHD-C4C	2.23	1.41	1.36
4	A	518	HEM	CBB-CAB	2.23	1.42	1.29
4	A	518	HEM	CAA-C2A	2.27	1.55	1.52
4	A	518	HEM	CBC-CAC	2.29	1.42	1.29
4	A	519	HEM	C4C-NC	2.31	1.38	1.36
4	B	515	HEM	CHC-C1C	2.33	1.41	1.36
4	B	519	HEM	C1C-NC	2.36	1.38	1.36
4	A	519	HEM	CBB-CAB	2.36	1.43	1.29
4	A	515	HEM	CBB-CAB	2.39	1.43	1.29
4	C	518	HEM	C4C-NC	2.43	1.39	1.36
4	B	519	HEM	CBB-CAB	2.45	1.43	1.29
4	C	518	HEM	CBC-CAC	2.45	1.43	1.29
4	C	518	HEM	CBB-CAB	2.46	1.43	1.29
4	C	519	HEM	CBB-CAB	2.46	1.43	1.29
4	A	515	HEM	CBC-CAC	2.49	1.43	1.29
4	B	518	HEM	CAA-C2A	2.53	1.56	1.52
4	B	517	HEM	C4C-NC	2.54	1.39	1.36
4	A	517	HEM	CBC-CAC	2.55	1.44	1.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	516	HEM	CBC-CAC	2.58	1.44	1.29
4	B	515	HEM	CBB-CAB	2.58	1.44	1.29
4	C	515	HEM	CBB-CAB	2.61	1.44	1.29
4	B	517	HEM	CBC-CAC	2.61	1.44	1.29
4	C	515	HEM	CBC-CAC	2.61	1.44	1.29
4	C	517	HEM	CBC-CAC	2.66	1.44	1.29
4	B	516	HEM	CBB-CAB	2.68	1.44	1.29
4	C	516	HEM	CBB-CAB	2.75	1.45	1.29
4	B	515	HEM	CBC-CAC	2.81	1.45	1.29
4	C	516	HEM	CBC-CAC	2.86	1.45	1.29
4	B	516	HEM	C1C-NC	2.94	1.39	1.36
4	C	517	HEM	CBB-CAB	3.03	1.46	1.29
4	B	518	HEM	CBB-CAB	3.08	1.47	1.29
4	A	517	HEM	C4C-NC	3.17	1.39	1.36
4	A	515	HEM	C4C-NC	3.22	1.40	1.36
4	B	517	HEM	CBB-CAB	3.26	1.48	1.29
4	B	515	HEM	C1C-NC	3.29	1.40	1.36
4	A	517	HEM	C1C-NC	3.72	1.40	1.36
4	B	518	HEM	C4C-NC	4.10	1.41	1.36
4	C	517	HEM	C4C-NC	4.45	1.41	1.36
4	C	515	HEM	C1C-NC	4.67	1.41	1.36
4	B	519	HEM	C4C-NC	4.94	1.42	1.36

All (122) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	518	HEM	C3B-CAB-CBB	-5.13	116.59	124.46
4	B	515	HEM	C3B-CAB-CBB	-4.72	117.21	124.46
4	C	518	HEM	C3C-CAC-CBC	-4.44	117.65	124.46
4	B	518	HEM	CBA-CAA-C2A	-4.28	104.86	112.53
4	C	519	HEM	CAA-C2A-C1A	-3.81	122.88	127.01
4	B	516	HEM	C3B-CAB-CBB	-3.44	119.18	124.46
4	C	517	HEM	C3B-CAB-CBB	-3.32	119.36	124.46
4	A	518	HEM	C1D-CHD-C4C	-3.29	120.32	125.82
4	A	519	HEM	CAA-C2A-C1A	-3.14	123.59	127.01
4	C	515	HEM	C3B-CAB-CBB	-3.00	119.86	124.46
4	A	517	HEM	C3B-CAB-CBB	-2.97	119.91	124.46
4	B	517	HEM	C3B-CAB-CBB	-2.95	119.94	124.46
4	B	519	HEM	C3C-CAC-CBC	-2.92	119.98	124.46
4	A	518	HEM	C3B-CAB-CBB	-2.88	120.04	124.46
4	C	515	HEM	C3C-CAC-CBC	-2.86	120.07	124.46
4	C	516	HEM	C3B-CAB-CBB	-2.84	120.10	124.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	518	HEM	CBA-CAA-C2A	-2.52	108.01	112.53
4	C	517	HEM	C3C-CAC-CBC	-2.49	120.63	124.46
4	A	518	HEM	C3C-CAC-CBC	-2.49	120.64	124.46
4	B	518	HEM	C3C-CAC-CBC	-2.44	120.72	124.46
4	A	516	HEM	C3C-CAC-CBC	-2.33	120.89	124.46
4	A	515	HEM	C4B-CHC-C1C	-2.25	122.06	125.82
4	C	519	HEM	C3B-CAB-CBB	-2.24	121.02	124.46
4	A	518	HEM	CMA-C3A-C4A	-2.22	124.70	128.36
4	B	517	HEM	CMA-C3A-C4A	-2.20	124.72	128.36
3	C	1503	SO4	O2-S-O1	-2.20	102.53	109.50
4	A	519	HEM	CMA-C3A-C4A	-2.15	124.81	128.36
4	B	519	HEM	CAA-C2A-C1A	-2.08	124.75	127.01
4	A	517	HEM	C1D-CHD-C4C	-2.03	122.44	125.82
4	A	515	HEM	C3B-CAB-CBB	-2.02	121.35	124.46
4	A	517	HEM	CMA-C3A-C4A	-2.01	125.04	128.36
4	A	518	HEM	C2D-C3D-C4D	2.07	105.01	101.50
4	A	519	HEM	CMA-C3A-C2A	2.08	129.58	125.24
4	A	515	HEM	C2D-C3D-C4D	2.25	105.31	101.50
4	A	517	HEM	CAA-C2A-C1A	2.31	129.52	127.01
4	C	519	HEM	C2D-C3D-C4D	2.42	105.61	101.50
4	B	516	HEM	CMD-C2D-C3D	2.44	125.14	114.35
4	B	517	HEM	CMD-C2D-C3D	2.52	125.49	114.35
4	C	518	HEM	C2D-C3D-C4D	2.54	105.80	101.50
4	C	518	HEM	CMD-C2D-C3D	2.59	125.82	114.35
4	B	519	HEM	CAD-C3D-C4D	2.68	121.91	112.47
4	C	519	HEM	CMD-C2D-C3D	2.73	126.44	114.35
4	A	518	HEM	CMD-C2D-C3D	2.73	126.44	114.35
4	C	515	HEM	C2D-C3D-C4D	2.84	106.31	101.50
4	B	518	HEM	C2D-C3D-C4D	2.84	106.31	101.50
4	A	515	HEM	CMD-C2D-C3D	2.88	127.09	114.35
4	B	517	HEM	C2D-C3D-C4D	2.90	106.41	101.50
4	C	515	HEM	CMD-C2D-C3D	2.91	127.21	114.35
4	A	516	HEM	C2D-C3D-C4D	2.93	106.47	101.50
4	B	516	HEM	C2D-C3D-C4D	2.94	106.49	101.50
4	B	519	HEM	CMD-C2D-C3D	2.99	127.56	114.35
4	B	519	HEM	C2D-C3D-C4D	3.01	106.60	101.50
4	A	516	HEM	CAD-C3D-C4D	3.01	123.09	112.47
4	A	519	HEM	CMD-C2D-C3D	3.02	127.70	114.35
4	B	518	HEM	CAD-C3D-C4D	3.04	123.21	112.47
4	C	516	HEM	CMD-C2D-C3D	3.07	127.91	114.35
4	A	517	HEM	C2D-C3D-C4D	3.07	106.70	101.50
4	A	516	HEM	CMD-C2D-C3D	3.09	128.03	114.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	516	HEM	C2D-C3D-C4D	3.09	106.74	101.50
4	A	519	HEM	C2D-C3D-C4D	3.10	106.76	101.50
4	A	517	HEM	CMD-C2D-C3D	3.11	128.09	114.35
4	B	518	HEM	CMD-C2D-C3D	3.13	128.20	114.35
4	C	517	HEM	C2D-C3D-C4D	3.17	106.87	101.50
4	C	518	HEM	CAD-C3D-C4D	3.19	123.70	112.47
4	B	515	HEM	CMD-C2D-C3D	3.31	129.00	114.35
4	C	517	HEM	CMD-C2D-C3D	3.36	129.19	114.35
4	B	516	HEM	CAD-C3D-C4D	3.38	124.38	112.47
4	A	515	HEM	CMB-C2B-C3B	3.46	125.16	116.53
4	A	519	HEM	CAD-C3D-C4D	3.47	124.70	112.47
4	C	516	HEM	CAD-C3D-C4D	3.68	125.43	112.47
4	C	517	HEM	CAD-C3D-C4D	3.89	126.19	112.47
4	C	516	HEM	CMB-C2B-C3B	4.00	126.52	116.53
4	B	517	HEM	CMC-C2C-C3C	4.01	126.55	116.53
4	B	516	HEM	CMB-C2B-C3B	4.08	126.71	116.53
4	C	515	HEM	CMB-C2B-C3B	4.09	126.74	116.53
4	B	517	HEM	CAD-C3D-C2D	4.09	124.98	113.22
4	C	519	HEM	CAD-C3D-C4D	4.10	126.94	112.47
4	B	515	HEM	CMC-C2C-C3C	4.15	126.90	116.53
4	A	517	HEM	CAD-C3D-C4D	4.17	127.18	112.47
4	A	517	HEM	CMC-C2C-C3C	4.25	127.15	116.53
4	A	516	HEM	CMB-C2B-C3B	4.26	127.17	116.53
4	A	515	HEM	CAD-C3D-C4D	4.27	127.53	112.47
4	A	516	HEM	CMC-C2C-C3C	4.28	127.22	116.53
4	C	515	HEM	CAD-C3D-C4D	4.30	127.63	112.47
4	B	515	HEM	CAD-C3D-C2D	4.32	125.63	113.22
4	A	518	HEM	CAD-C3D-C2D	4.37	125.79	113.22
4	C	517	HEM	CMC-C2C-C3C	4.41	127.54	116.53
4	C	515	HEM	CAD-C3D-C2D	4.46	126.05	113.22
4	A	517	HEM	CAD-C3D-C2D	4.47	126.06	113.22
4	B	517	HEM	CMB-C2B-C3B	4.48	127.72	116.53
4	B	517	HEM	CAD-C3D-C4D	4.50	128.34	112.47
4	A	518	HEM	CMB-C2B-C3B	4.54	127.86	116.53
4	A	518	HEM	CMC-C2C-C3C	4.62	128.06	116.53
4	A	515	HEM	CMC-C2C-C3C	4.68	128.21	116.53
4	A	518	HEM	CAD-C3D-C4D	4.74	129.19	112.47
4	A	519	HEM	CMB-C2B-C3B	4.77	128.43	116.53
4	C	517	HEM	CAD-C3D-C2D	4.77	126.93	113.22
4	C	519	HEM	CAD-C3D-C2D	4.80	127.01	113.22
4	A	515	HEM	CAD-C3D-C2D	4.85	127.16	113.22
4	B	519	HEM	CMB-C2B-C3B	4.85	128.64	116.53

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Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
4	B	515	HEM	CAD-C3D-C4D	5.00	130.11	112.47
4	B	519	HEM	CMC-C2C-C3C	5.03	129.08	116.53
4	C	515	HEM	CMC-C2C-C3C	5.06	129.16	116.53
4	C	516	HEM	CAD-C3D-C2D	5.08	127.82	113.22
4	B	518	HEM	CMC-C2C-C3C	5.10	129.26	116.53
4	C	519	HEM	CMB-C2B-C3B	5.11	129.29	116.53
4	C	518	HEM	CMB-C2B-C3B	5.21	129.53	116.53
4	B	516	HEM	CMC-C2C-C3C	5.23	129.60	116.53
4	C	516	HEM	CMC-C2C-C3C	5.30	129.75	116.53
4	A	519	HEM	CAD-C3D-C2D	5.31	128.49	113.22
4	B	516	HEM	CAD-C3D-C2D	5.51	129.06	113.22
4	B	518	HEM	CMB-C2B-C3B	5.65	130.63	116.53
4	C	519	HEM	CMC-C2C-C3C	5.67	130.68	116.53
4	C	517	HEM	CMB-C2B-C3B	5.69	130.73	116.53
4	C	518	HEM	CMC-C2C-C3C	5.75	130.88	116.53
4	A	519	HEM	CMC-C2C-C3C	5.82	131.07	116.53
4	C	518	HEM	CAD-C3D-C2D	5.87	130.11	113.22
4	A	516	HEM	CAD-C3D-C2D	5.95	130.32	113.22
4	B	518	HEM	CAD-C3D-C2D	5.95	130.32	113.22
4	B	515	HEM	CMB-C2B-C3B	6.01	131.53	116.53
4	A	517	HEM	CMB-C2B-C3B	6.05	131.63	116.53
4	B	519	HEM	CAD-C3D-C2D	6.34	131.45	113.22

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	515	HEM	1	0
4	A	516	HEM	2	0
3	C	1503	SO4	1	0
4	C	518	HEM	1	0

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.



## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section will therefore be empty.