



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 02:55 PM GMT

PDB ID : 4AX3  
Title : Structure of three-domain heme-Cu nitrite reductase from *Ralstonia pickettii* at 1.6 Å resolution  
Authors : Antonyuk, S.V.; Cong, H.; Eady, R.R.; Hasnain, S.S.  
Deposited on : 2012-06-07  
Resolution : 1.60 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) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

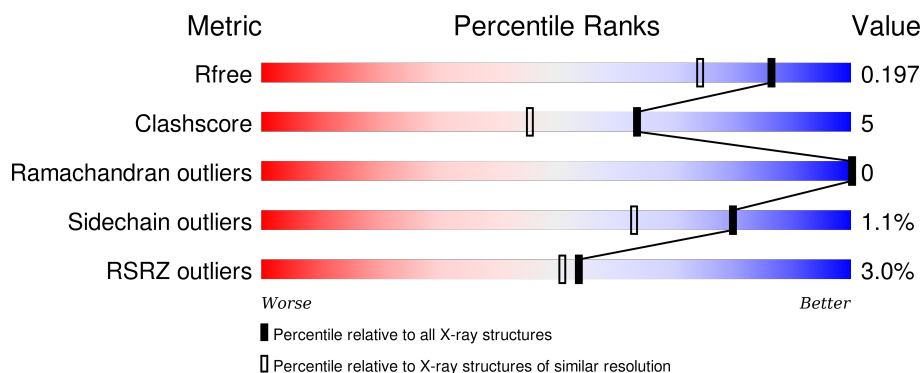
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.60 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))
$R_{free}$	91344	2475 (1.60-1.60)
Clashscore	102246	2732 (1.60-1.60)
Ramachandran outliers	100387	2654 (1.60-1.60)
Sidechain outliers	100360	2653 (1.60-1.60)
RSRZ outliers	91569	2479 (1.60-1.60)

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.

Mol	Chain	Length	Quality of chain
1	A	468	<div> <div>3%</div> <div>89%</div> <div>8%</div> <div>.</div> </div>
1	B	468	<div> <div>%</div> <div>89%</div> <div>8%</div> <div>.</div> </div>
1	C	468	<div> <div>%</div> <div>88%</div> <div>9%</div> <div>.</div> </div>
1	D	468	<div> <div>7%</div> <div>89%</div> <div>9%</div> <div>.</div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 16795 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 COPPER-CONTAINING NITRITE REDUCTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	456	Total	C	N	O	S	0	21	0
			3551	2270	610	655	16			
1	B	455	Total	C	N	O	S	0	21	0
			3543	2260	607	661	15			
1	C	455	Total	C	N	O	S	0	22	0
			3547	2264	603	664	16			
1	D	457	Total	C	N	O	S	0	9	0
			3495	2225	603	652	15			

- Molecule 2 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	2	Total	Cu	0	0
			2	2		
2	A	2	Total	Cu	0	0
			2	2		
2	D	2	Total	Cu	0	0
			2	2		
2	C	2	Total	Cu	0	0
			2	2		

- Molecule 3 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: C<sub>34</sub>H<sub>32</sub>FeN<sub>4</sub>O<sub>4</sub>).



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

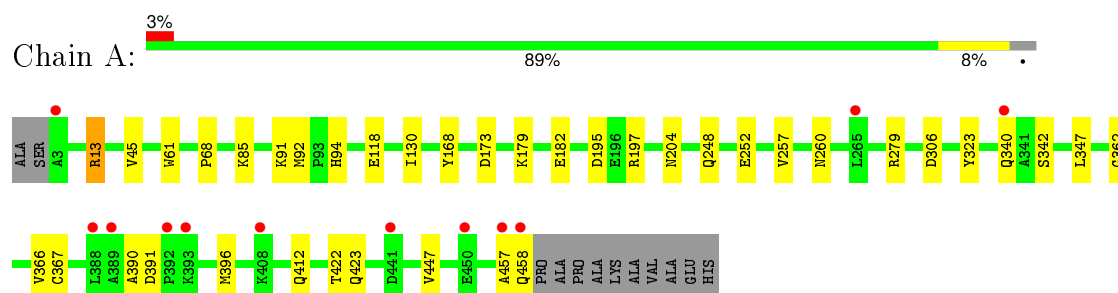
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	629	Total O 636 636	0	7
4	B	633	Total O 635 635	0	2
4	C	697	Total O 697 697	0	0
4	D	511	Total O 511 511	0	0

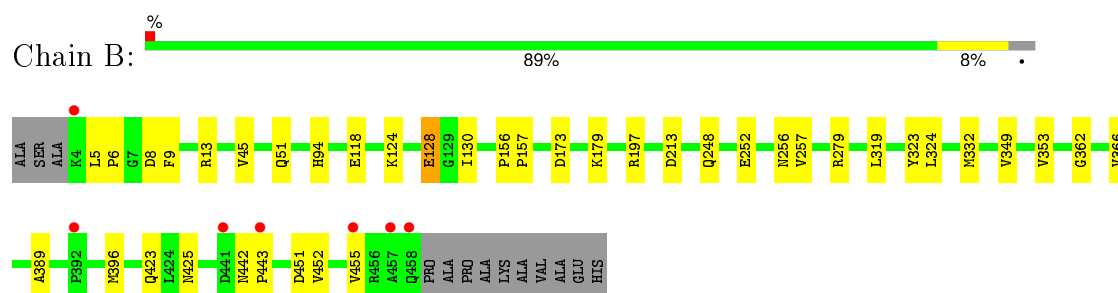
### 3 Residue-property plots [i](#)

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.

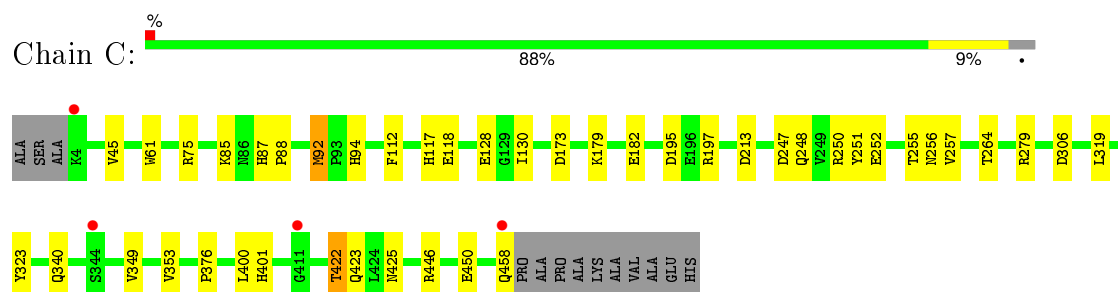
#### • Molecule 1: COPPER-CONTAINING NITRITE REDUCTASE



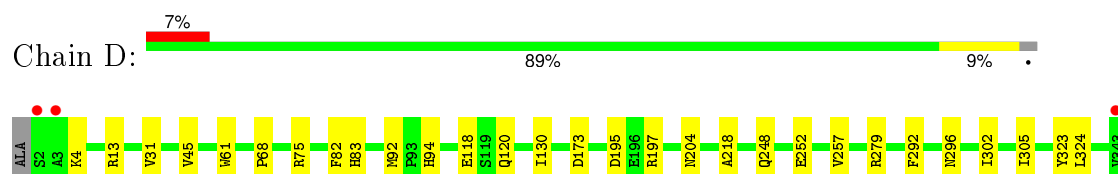
#### • Molecule 1: COPPER-CONTAINING NITRITE REDUCTASE

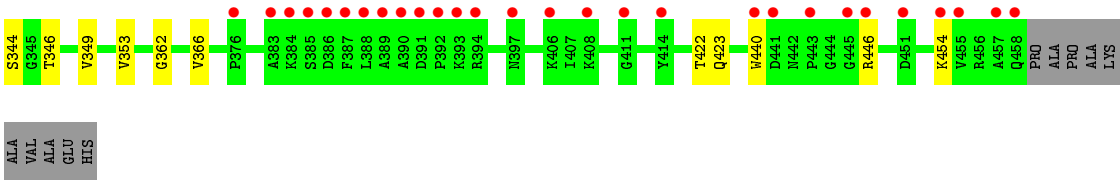


#### • Molecule 1: COPPER-CONTAINING NITRITE REDUCTASE



#### • Molecule 1: COPPER-CONTAINING NITRITE REDUCTASE





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	185.81Å 185.81Å 185.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 1.60 49.66 – 1.60	Depositor EDS
% Data completeness (in resolution range)	99.8 (25.00-1.60) 99.8 (49.66-1.60)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.02 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.163 , 0.194 0.168 , 0.197	Depositor DCC
$R_{free}$ test set	14059 reflections (5.32%)	DCC
Wilson B-factor (Å <sup>2</sup> )	19.8	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 47.5	EDS
Estimated twinning fraction	0.022 for l,-k,h	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 278659 reflections	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	16795	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 46.17 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 1.1891e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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, 0.375 respectively for untwinned datasets, and 0.333, 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, CU

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	0.70	0/3700	0.75	1/5026 (0.0%)
1	B	0.74	4/3687 (0.1%)	0.77	2/5009 (0.0%)
1	C	0.78	0/3698	0.82	5/5022 (0.1%)
1	D	0.68	0/3607	0.71	0/4898
All	All	0.73	4/14692 (0.0%)	0.76	8/19955 (0.0%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	128[A]	GLU	CB-CG	-7.04	1.38	1.52
1	B	128[B]	GLU	CB-CG	-7.04	1.38	1.52
1	B	128[A]	GLU	CD-OE2	-5.71	1.19	1.25
1	B	128[B]	GLU	CD-OE2	-5.71	1.19	1.25

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	332	MET	CG-SD-CE	-6.38	90.00	100.20
1	C	446	ARG	NE-CZ-NH2	-5.76	117.42	120.30
1	C	75	ARG	NE-CZ-NH1	5.44	123.02	120.30
1	C	247	ASP	CB-CG-OD2	-5.32	113.52	118.30
1	C	279	ARG	NE-CZ-NH1	5.25	122.93	120.30
1	A	168	TYR	CB-CG-CD1	5.25	124.15	121.00
1	C	319	LEU	CA-CB-CG	5.24	127.35	115.30
1	B	279	ARG	NE-CZ-NH1	5.15	122.88	120.30

There are no chirality outliers.

There are no planarity outliers.



## 5.2 Too-close contacts ⓘ

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	3551	0	3578	46	0
1	B	3543	0	3544	37	0
1	C	3547	0	3556	39	0
1	D	3495	0	3477	27	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
2	C	2	0	0	0	0
2	D	2	0	0	0	0
3	A	43	0	30	3	0
3	B	43	0	30	0	0
3	C	43	0	30	0	0
3	D	43	0	30	0	0
4	A	636	0	0	25	0
4	B	635	0	0	12	0
4	C	697	0	0	19	1
4	D	511	0	0	8	0
All	All	16795	0	14275	147	1

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 5.

All (147) 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:367:CYS:SG	3:A:600:HEM:HAC	1.66	1.35
1:A:13[A]:ARG:NH2	4:A:2036:HOH:O	1.57	1.35
1:B:51[B]:GLN:NE2	4:B:2130:HOH:O	1.60	1.25
1:A:412[A]:GLN:NE2	4:A:2599:HOH:O	1.64	1.24
1:A:260[B]:ASN:ND2	4:A:2462:HOH:O	1.71	1.23
1:B:118:GLU:OE2	4:B:2206:HOH:O	1.52	1.21
1:D:423[B]:GLN:OE1	4:D:2488:HOH:O	1.63	1.16
1:B:423[B]:GLN:OE1	4:B:2596:HOH:O	1.61	1.14
1:C:306[A]:ASP:OD1	4:C:2506:HOH:O	1.67	1.12
1:B:396:MET:HE2	1:B:455:VAL:HG21	1.29	1.12
1:A:179[B]:LYS:HE2	4:A:2351:HOH:O	0.94	1.11

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:306[A]:ASP:OD1	4:A:2492:HOH:O	1.67	1.10
1:C:423[B]:GLN:OE1	4:C:2652:HOH:O	1.67	1.10
1:A:260[B]:ASN:OD1	4:A:2431:HOH:O	1.69	1.08
1:B:197[B]:ARG:HD2	4:B:2371:HOH:O	1.58	1.02
1:A:306[B]:ASP:OD2	4:A:2496:HOH:O	1.80	1.00
1:A:306[A]:ASP:CG	4:A:2492:HOH:O	2.00	0.96
1:B:213[B]:ASP:OD1	4:B:2387:HOH:O	1.82	0.96
1:B:213[B]:ASP:OD2	4:B:2390:HOH:O	1.84	0.95
1:B:396:MET:HE2	1:B:455:VAL:CG2	1.97	0.95
1:C:182[A]:GLU:OE1	4:C:2703:HOH:O	1.87	0.93
1:A:91[A]:LYS:HE3	4:A:2240:HOH:O	1.69	0.90
1:C:213[B]:ASP:OD1	4:C:2421:HOH:O	1.90	0.88
1:B:362:GLY:O	1:B:366[B]:VAL:HG13	1.74	0.88
1:A:306[A]:ASP:OD2	4:A:2492:HOH:O	1.91	0.88
1:C:264[B]:THR:HG23	1:C:264[B]:THR:O	1.73	0.88
1:D:279[A]:ARG:CZ	4:D:2362:HOH:O	2.23	0.86
1:C:85[B]:LYS:HE2	1:C:118[B]:GLU:OE2	1.75	0.86
1:A:279[B]:ARG:HD3	4:A:2645:HOH:O	1.76	0.85
1:C:195[B]:ASP:OD2	1:C:197[B]:ARG:HD2	1.76	0.84
1:A:248[A]:GLN:NE2	4:A:2436:HOH:O	2.12	0.81
1:B:396:MET:HE3	1:B:452:VAL:HA	1.61	0.80
1:B:396:MET:CE	1:B:455:VAL:CG2	2.60	0.79
1:A:423[A]:GLN:NE2	4:A:2611:HOH:O	2.12	0.76
1:C:306[A]:ASP:CG	4:C:2506:HOH:O	2.16	0.75
1:C:400:LEU:O	1:C:422[B]:THR:HG22	1.85	0.74
1:C:197[A]:ARG:HD3	4:C:2392:HOH:O	1.85	0.74
1:B:396:MET:CE	1:B:455:VAL:HG21	2.15	0.73
1:B:396:MET:HE1	1:B:451:ASP:O	1.88	0.72
1:A:91[A]:LYS:CE	4:A:2240:HOH:O	2.27	0.71
1:A:367:CYS:SG	3:A:600:HEM:C3C	2.84	0.69
1:C:248[A]:GLN:NE2	4:C:2453:HOH:O	2.02	0.69
1:D:83:HIS:ND1	4:D:2157:HOH:O	2.25	0.68
1:A:85[B]:LYS:HG3	4:A:2073:HOH:O	1.90	0.68
1:A:13[B]:ARG:NH1	4:A:2035:HOH:O	2.26	0.68
1:A:367:CYS:SG	3:A:600:HEM:CBC	2.79	0.68
1:A:248[B]:GLN:HG3	1:A:257:VAL:CG1	2.23	0.67
1:A:279[B]:ARG:CZ	4:A:2477:HOH:O	2.43	0.67
1:B:248:GLN:HG3	1:B:257:VAL:CG1	2.24	0.67
1:A:91[A]:LYS:NZ	4:A:2240:HOH:O	2.27	0.66
1:C:306[A]:ASP:OD2	4:C:2506:HOH:O	2.13	0.66
1:C:340[B]:GLN:OE1	4:C:2559:HOH:O	2.15	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:179[B]:LYS:CE	4:A:2351:HOH:O	1.77	0.64
1:D:248[B]:GLN:CG	1:D:257:VAL:CG1	2.76	0.64
1:C:85[B]:LYS:HE2	1:C:118[B]:GLU:CD	2.18	0.63
1:A:340[A]:GLN:HG3	4:A:2544:HOH:O	2.00	0.62
1:B:396:MET:CE	1:B:452:VAL:HA	2.28	0.62
1:A:85[B]:LYS:HE2	1:A:118:GLU:OE2	2.01	0.61
1:D:4:LYS:NZ	4:D:2003:HOH:O	0.76	0.60
1:C:179:LYS:HE2	1:C:425:ASN:ND2	2.16	0.60
1:C:255:THR:HG21	4:C:2468:HOH:O	2.01	0.60
1:C:85[B]:LYS:CE	1:C:118[B]:GLU:OE2	2.49	0.60
1:D:248[B]:GLN:HG3	1:D:257:VAL:CG1	2.33	0.59
1:A:182[A]:GLU:OE1	4:A:2347:HOH:O	2.16	0.59
1:B:118:GLU:HG2	4:B:2206:HOH:O	2.03	0.58
1:D:195[B]:ASP:OD2	1:D:197:ARG:HD2	2.03	0.58
1:A:279[B]:ARG:NH1	4:A:2477:HOH:O	2.36	0.58
1:B:197[A]:ARG:HD3	4:B:2371:HOH:O	2.03	0.58
1:C:45:VAL:HG11	1:C:94:HIS:CD2	2.39	0.57
1:D:349:VAL:HG23	1:D:446:ARG:HH21	1.69	0.57
1:B:9:PHE:CE2	1:B:157[B]:PRO:HG3	2.41	0.56
1:A:396:MET:HE1	1:A:447:VAL:HG13	1.86	0.56
1:A:396:MET:CE	1:A:447:VAL:HG13	2.37	0.54
1:A:457:ALA:O	1:A:458:GLN:HB2	2.07	0.54
1:B:118:GLU:CG	4:B:2206:HOH:O	2.56	0.54
1:C:340[B]:GLN:NE2	4:C:2565:HOH:O	2.41	0.53
1:D:349:VAL:O	1:D:353:VAL:HG23	2.09	0.53
1:C:130:ILE:O	1:C:252:GLU:HA	2.09	0.52
1:B:256:ASN:ND2	4:B:2434:HOH:O	2.37	0.52
1:D:45:VAL:HG11	1:D:94:HIS:CD2	2.45	0.52
1:C:450[B]:GLU:HG3	4:C:2351:HOH:O	2.09	0.52
1:C:197[A]:ARG:CG	4:C:2392:HOH:O	2.58	0.52
1:A:85[B]:LYS:CG	4:A:2073:HOH:O	2.56	0.51
1:D:366:VAL:HG11	4:D:2447:HOH:O	2.10	0.51
1:D:197:ARG:HD3	4:D:2284:HOH:O	2.10	0.51
1:A:362:GLY:O	1:A:366[B]:VAL:HG23	2.11	0.50
1:D:446:ARG:HD2	4:D:2504:HOH:O	2.11	0.50
1:B:442:ASN:HB3	1:B:443:PRO:HD2	1.92	0.50
1:C:195[B]:ASP:HB3	1:C:197[B]:ARG:HG3	1.92	0.50
1:C:256:ASN:ND2	4:C:2469:HOH:O	2.43	0.49
1:B:389:ALA:HB3	1:C:376:PRO:HG2	1.95	0.49
1:B:179[B]:LYS:HE2	1:B:425:ASN:OD1	2.12	0.49
1:B:362:GLY:O	1:B:366[A]:VAL:HG12	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:61:TRP:CH2	1:C:92[B]:MET:HG3	2.49	0.47
1:A:130:ILE:O	1:A:252:GLU:HA	2.15	0.47
1:A:13[A]:ARG:CZ	4:A:2036:HOH:O	2.27	0.47
1:A:248[B]:GLN:HG3	1:A:257:VAL:HG13	1.97	0.47
1:B:130:ILE:O	1:B:252:GLU:HA	2.15	0.46
1:D:130:ILE:O	1:D:252:GLU:HA	2.15	0.46
1:B:128[A]:GLU:HG3	1:B:156:PRO:HA	1.97	0.46
1:C:128[A]:GLU:OE2	1:C:250:ARG:NH1	2.42	0.46
1:C:248[B]:GLN:HG3	1:C:257:VAL:CG1	2.46	0.46
1:C:401:HIS:HE1	4:C:2629:HOH:O	2.00	0.45
1:B:8[B]:ASP:CG	1:B:124[B]:LYS:HZ3	2.20	0.45
1:A:68:PRO:HD3	1:A:204:ASN:HA	1.99	0.44
1:B:128[A]:GLU:HG3	1:B:156:PRO:CA	2.48	0.44
1:C:112:PHE:HB2	4:C:2239:HOH:O	2.18	0.44
1:A:13[A]:ARG:CD	4:A:2037:HOH:O	2.62	0.44
1:C:195[B]:ASP:OD2	1:C:197[B]:ARG:CD	2.59	0.43
1:A:248[B]:GLN:CG	1:A:257:VAL:CG1	2.95	0.43
1:A:390:ALA:O	1:D:440:TRP:HA	2.18	0.43
1:D:248[B]:GLN:CD	1:D:257:VAL:HG11	2.38	0.43
1:B:396:MET:HE1	1:B:455:VAL:HG23	1.98	0.43
1:A:45:VAL:HG11	1:A:94:HIS:CD2	2.53	0.43
1:B:349:VAL:O	1:B:353:VAL:HG23	2.19	0.43
1:D:118:GLU:HG2	4:D:2157:HOH:O	2.17	0.43
1:D:344:SER:HB2	1:D:346:THR:HG22	2.01	0.43
1:D:82:PHE:O	1:D:120:GLN:HA	2.19	0.43
1:A:61:TRP:CH2	1:A:92[A]:MET:HG3	2.54	0.42
1:C:85[B]:LYS:HG2	1:C:118[B]:GLU:CG	2.48	0.42
1:D:61:TRP:CH2	1:D:92:MET:HG3	2.53	0.42
1:A:248[B]:GLN:CG	1:A:257:VAL:HG13	2.48	0.42
1:D:292:PHE:O	1:D:296:ASN:HB2	2.18	0.42
1:D:68:PRO:HD3	1:D:204:ASN:HA	2.01	0.42
1:B:319:LEU:HD21	1:B:324:LEU:HD13	2.02	0.42
1:D:362:GLY:O	1:D:366:VAL:HG12	2.19	0.42
1:B:5:LEU:O	1:B:8[A]:ASP:HB2	2.20	0.41
1:D:302:ILE:HD11	1:D:324:LEU:HD21	2.01	0.41
1:C:85[B]:LYS:HG3	4:C:2126:HOH:O	2.19	0.41
1:C:422[B]:THR:HG21	4:C:2654:HOH:O	2.20	0.41
1:C:349:VAL:O	1:C:353:VAL:HG23	2.20	0.41
1:A:195[A]:ASP:HB3	1:A:197[A]:ARG:HG3	2.02	0.41
1:A:390:ALA:O	1:A:391:ASP:HB2	2.21	0.41
1:B:197[B]:ARG:NH2	4:B:2370:HOH:O	2.45	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:342:SER:OG	1:A:347:LEU:HD22	2.21	0.41
1:D:31:VAL:HG21	1:D:75:ARG:HB2	2.03	0.41
1:B:45:VAL:HG11	1:B:94:HIS:CD2	2.56	0.41
1:B:197[B]:ARG:HD2	4:B:2192:HOH:O	2.20	0.40
1:A:457:ALA:O	1:A:458:GLN:CB	2.69	0.40
1:C:87:HIS:CG	1:C:88:PRO:HD2	2.57	0.40
1:D:248[B]:GLN:CG	1:D:257:VAL:HG11	2.52	0.40
1:B:5:LEU:HB3	1:B:6:PRO:HD2	2.04	0.40
1:C:458:GLN:C	4:C:2695:HOH:O	2.60	0.40
1:D:218:ALA:HB3	1:D:305:ILE:CD1	2.51	0.40
1:B:13[B]:ARG:HB2	1:B:13[B]:ARG:HE	1.72	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:C:2392:HOH:O	4:C:2392:HOH:O[6_456]	1.81	0.39

## 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	475/468 (102%)	465 (98%)	10 (2%)	0	100	100
1	B	474/468 (101%)	466 (98%)	8 (2%)	0	100	100
1	C	475/468 (102%)	468 (98%)	7 (2%)	0	100	100
1	D	464/468 (99%)	458 (99%)	6 (1%)	0	100	100
All	All	1888/1872 (101%)	1857 (98%)	31 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	384/371 (104%)	379 (99%)	5 (1%)	76	56
1	B	383/371 (103%)	381 (100%)	2 (0%)	92	85
1	C	385/371 (104%)	378 (98%)	7 (2%)	66	41
1	D	373/371 (100%)	367 (98%)	6 (2%)	70	47
All	All	1525/1484 (103%)	1505 (99%)	20 (1%)	80	56

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13[A]	ARG
1	A	13[B]	ARG
1	A	173	ASP
1	A	323	TYR
1	A	422	THR
1	B	173	ASP
1	B	323	TYR
1	C	92[A]	MET
1	C	92[B]	MET
1	C	117	HIS
1	C	173	ASP
1	C	323	TYR
1	C	422[A]	THR
1	C	422[B]	THR
1	D	13[A]	ARG
1	D	13[B]	ARG
1	D	173	ASP
1	D	323	TYR
1	D	422	THR
1	D	454	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	127	ASN
1	A	397	ASN
1	C	260	ASN
1	C	425	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 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 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	HEM	A	600	1	30,50,50	2.28	8 (26%)	24,82,82	2.88	12 (50%)
3	HEM	B	600	1	30,50,50	2.25	7 (23%)	24,82,82	2.84	14 (58%)
3	HEM	C	600	1	30,50,50	2.35	6 (20%)	24,82,82	3.01	14 (58%)
3	HEM	D	600	1	30,50,50	2.37	6 (20%)	24,82,82	3.06	14 (58%)

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	HEM	A	600	1	-	0/10/54/54	0/0/8/8
3	HEM	B	600	1	-	0/10/54/54	0/0/8/8
3	HEM	C	600	1	-	0/10/54/54	0/0/8/8
3	HEM	D	600	1	-	0/10/54/54	0/0/8/8

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	600	HEM	C3B-C4B	-8.77	1.44	1.51
3	C	600	HEM	C3B-C4B	-8.27	1.44	1.51
3	B	600	HEM	C3B-C4B	-8.03	1.44	1.51
3	A	600	HEM	C3B-C4B	-7.53	1.45	1.51
3	C	600	HEM	C3D-C4D	-5.98	1.43	1.51
3	A	600	HEM	C3D-C4D	-5.89	1.44	1.51
3	D	600	HEM	C3D-C4D	-5.57	1.44	1.51
3	B	600	HEM	C3D-C4D	-5.32	1.44	1.51
3	A	600	HEM	C2C-C1C	-4.16	1.44	1.52
3	C	600	HEM	C2C-C1C	-4.13	1.44	1.52
3	D	600	HEM	C2C-C1C	-4.09	1.44	1.52
3	B	600	HEM	C2C-C1C	-3.96	1.45	1.52
3	A	600	HEM	C2B-C1B	-2.32	1.44	1.51
3	B	600	HEM	C2D-C1D	-2.28	1.44	1.51
3	D	600	HEM	C2D-C1D	-2.26	1.44	1.51
3	D	600	HEM	C2B-C1B	-2.25	1.44	1.51
3	B	600	HEM	C2B-C1B	-2.25	1.44	1.51
3	A	600	HEM	C2D-C1D	-2.19	1.44	1.51
3	C	600	HEM	C2B-C1B	-2.16	1.44	1.51
3	C	600	HEM	FE-NC	2.12	2.04	1.95
3	B	600	HEM	CAA-C2A	2.15	1.55	1.52
3	D	600	HEM	CAA-C2A	2.23	1.55	1.52
3	C	600	HEM	CAA-C2A	2.24	1.55	1.52
3	A	600	HEM	FE-NC	2.45	2.05	1.95
3	A	600	HEM	C3C-CAC	2.46	1.55	1.51
3	A	600	HEM	C3B-CAB	2.59	1.56	1.51
3	B	600	HEM	FE-NC	2.70	2.06	1.95

All (54) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	600	HEM	C3B-CAB-CBB	-7.40	113.11	124.46
3	A	600	HEM	C3B-CAB-CBB	-7.18	113.45	124.46
3	D	600	HEM	C3B-CAB-CBB	-7.15	113.49	124.46
3	B	600	HEM	C3C-CAC-CBC	-5.36	116.23	124.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	600	HEM	C3C-CAC-CBC	-4.83	117.05	124.46
3	D	600	HEM	C3C-CAC-CBC	-4.50	117.56	124.46
3	B	600	HEM	C3B-CAB-CBB	-4.41	117.69	124.46
3	B	600	HEM	CMA-C3A-C4A	-4.22	121.39	128.36
3	C	600	HEM	CAA-C2A-C1A	-3.77	122.91	127.01
3	A	600	HEM	CMA-C3A-C4A	-3.46	122.65	128.36
3	D	600	HEM	CAA-C2A-C1A	-3.31	123.42	127.01
3	C	600	HEM	C2C-C1C-NC	-3.02	105.11	110.21
3	D	600	HEM	CMA-C3A-C4A	-2.94	123.49	128.36
3	B	600	HEM	CAA-C2A-C1A	-2.86	123.91	127.01
3	A	600	HEM	C3C-CAC-CBC	-2.71	120.30	124.46
3	D	600	HEM	C3B-C4B-NB	-2.66	106.53	111.63
3	A	600	HEM	C2C-C1C-NC	-2.39	106.19	110.21
3	B	600	HEM	C2C-C1C-NC	-2.31	106.31	110.21
3	C	600	HEM	CMA-C3A-C4A	-2.23	124.68	128.36
3	D	600	HEM	C2C-C1C-NC	-2.19	106.51	110.21
3	A	600	HEM	CBD-CAD-C3D	-2.19	107.18	113.55
3	B	600	HEM	CBD-CAD-C3D	-2.11	107.41	113.55
3	C	600	HEM	C3B-C4B-CHC	2.05	126.06	123.16
3	B	600	HEM	CMA-C3A-C2A	2.21	129.85	125.24
3	B	600	HEM	CMD-C2D-C3D	2.21	124.13	114.35
3	C	600	HEM	CAA-CBA-CGA	2.31	116.98	112.75
3	D	600	HEM	CMD-C2D-C3D	2.33	124.65	114.35
3	A	600	HEM	C2C-C1C-CHC	2.37	127.29	123.68
3	A	600	HEM	CMD-C2D-C3D	2.50	125.43	114.35
3	C	600	HEM	C2C-C1C-CHC	2.51	127.50	123.68
3	B	600	HEM	C2D-C3D-C4D	2.54	105.80	101.50
3	D	600	HEM	C2D-C3D-C4D	2.64	105.98	101.50
3	C	600	HEM	CMD-C2D-C3D	2.66	126.09	114.35
3	D	600	HEM	C2C-C1C-CHC	2.66	127.73	123.68
3	A	600	HEM	C2D-C3D-C4D	2.84	106.31	101.50
3	C	600	HEM	C2D-C3D-C4D	3.13	106.80	101.50
3	D	600	HEM	C3B-C4B-CHC	3.14	127.59	123.16
3	C	600	HEM	CMC-C2C-C3C	3.30	124.77	116.53
3	B	600	HEM	CAD-C3D-C2D	3.38	122.94	113.22
3	B	600	HEM	C2C-C1C-CHC	3.47	128.96	123.68
3	A	600	HEM	CAD-C3D-C2D	3.62	123.61	113.22
3	D	600	HEM	CAD-C3D-C2D	3.76	124.03	113.22
3	C	600	HEM	CAD-C3D-C2D	3.78	124.08	113.22
3	B	600	HEM	CMB-C2B-C3B	3.86	126.16	116.53
3	A	600	HEM	CMB-C2B-C3B	4.16	126.93	116.53
3	D	600	HEM	CMC-C2C-C3C	4.33	127.35	116.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	600	HEM	CMC-C2C-C3C	4.61	128.03	116.53
3	C	600	HEM	CAD-C3D-C4D	4.72	129.12	112.47
3	C	600	HEM	CMB-C2B-C3B	4.77	128.43	116.53
3	D	600	HEM	CAD-C3D-C4D	4.96	129.95	112.47
3	A	600	HEM	CAD-C3D-C4D	4.99	130.07	112.47
3	D	600	HEM	CMB-C2B-C3B	5.01	129.03	116.53
3	A	600	HEM	CMC-C2C-C3C	5.18	129.47	116.53
3	B	600	HEM	CAD-C3D-C4D	5.33	131.26	112.47

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	600	HEM	3	0

## 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	456/468 (97%)	-0.02	12 (2%) 59 57	12, 20, 45, 58	11 (2%)
1	B	455/468 (97%)	-0.11	7 (1%) 76 75	12, 19, 38, 50	8 (1%)
1	C	455/468 (97%)	-0.25	4 (0%) 85 85	10, 18, 33, 44	5 (1%)
1	D	457/468 (97%)	0.04	31 (6%) 20 19	15, 24, 42, 49	13 (2%)
All	All	1823/1872 (97%)	-0.08	54 (2%) 54 51	10, 20, 41, 58	37 (2%)

All (54) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	389	ALA	6.1
1	A	389	ALA	5.0
1	A	3	ALA	4.8
1	D	387	PHE	4.5
1	B	457	ALA	4.4
1	B	4	LYS	4.4
1	D	392	PRO	4.2
1	A	457	ALA	4.2
1	D	390	ALA	4.1
1	D	411	GLY	3.8
1	D	2	SER	3.6
1	A	458	GLN	3.5
1	B	458	GLN	3.4
1	D	457	ALA	3.3
1	D	384	LYS	3.3
1	C	411	GLY	3.3
1	D	443	PRO	3.2
1	D	406	LYS	3.1
1	D	397	ASN	3.1
1	C	4	LYS	3.0
1	D	391	ASP	2.9

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Mol	Chain	Res	Type	RSRZ
1	D	445	GLY	2.8
1	D	454	LYS	2.8
1	D	386	ASP	2.8
1	D	458	GLN	2.8
1	D	414	TYR	2.7
1	D	3	ALA	2.6
1	D	393	LYS	2.6
1	C	458	GLN	2.6
1	D	388	LEU	2.6
1	D	343	VAL	2.4
1	A	265[A]	LEU	2.4
1	B	441	ASP	2.4
1	A	392	PRO	2.4
1	D	408	LYS	2.3
1	D	451	ASP	2.3
1	B	455	VAL	2.3
1	D	385	SER	2.3
1	B	443	PRO	2.3
1	A	441	ASP	2.3
1	D	376	PRO	2.2
1	D	440	TRP	2.2
1	A	340[A]	GLN	2.2
1	A	388	LEU	2.2
1	D	441	ASP	2.2
1	B	392	PRO	2.1
1	D	394	ARG	2.1
1	D	455	VAL	2.1
1	C	344	SER	2.1
1	D	383	ALA	2.1
1	A	393	LYS	2.1
1	A	408	LYS	2.0
1	A	450	GLU	2.0
1	D	446	ARG	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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
3	HEM	A	600	43/43	0.95	0.13	0.63	23,29,33,38	0
3	HEM	B	600	43/43	0.96	0.12	0.44	20,24,27,29	0
2	CU	A	501	1/1	0.99	0.07	-0.07	18,18,18,18	0
2	CU	B	501	1/1	0.99	0.06	-0.34	17,17,17,17	0
3	HEM	C	600	43/43	0.97	0.07	-0.40	14,17,22,24	0
3	HEM	D	600	43/43	0.96	0.10	-0.45	22,26,28,29	0
2	CU	D	502	1/1	0.99	0.06	-0.51	19,19,19,19	0
2	CU	B	502	1/1	1.00	0.07	-0.55	16,16,16,16	0
2	CU	C	502	1/1	0.99	0.06	-0.83	14,14,14,14	0
2	CU	D	501	1/1	0.98	0.06	-1.03	19,19,19,19	0
2	CU	C	501	1/1	0.99	0.06	-1.13	14,14,14,14	0
2	CU	A	502	1/1	0.99	0.07	-2.17	15,15,15,15	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.