Full wwPDB X-ray Structure Validation Report (i)

Mar 14, 2018 – 04:40 am GMT

PDB ID	:	2ZLW
Title	:	Horse methemoglobin high salt, pH 7.0 (75% relative humidity)
Authors	:	Kaushal, P.S.; Sankaranarayanan, R.; Vijayan, M.
Deposited on	:	2008-04-10
Resolution	:	2.90 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 (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

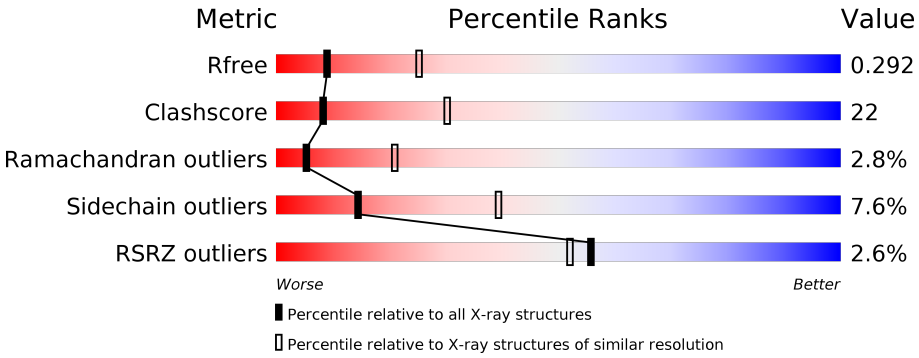
MolProbity	:	4.02b-467
Mogul	:	1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix)	:	1.13
EDS	:	trunk31020
Percentile statistics	:	20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac	:	5.8.0158
CCP4	:	7.0 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk31020

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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}	111664	1716 (2.90-2.90)
Clashscore	122126	1924 (2.90-2.90)
Ramachandran outliers	120053	1884 (2.90-2.90)
Sidechain outliers	120020	1886 (2.90-2.90)
RSRZ outliers	108989	1669 (2.90-2.90)

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 >=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 <=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	141	2% 65% 31%
1	C	141	2% 58% 35% 6%
2	B	146	4% 58% 40%
2	D	146	2% 53% 42%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 4562 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 Hemoglobin subunit alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	141	Total	C	N	O	S	0	0	0
			1065	681	186	196	2			
1	C	141	Total	C	N	O	S	0	0	0
			1069	684	187	196	2			

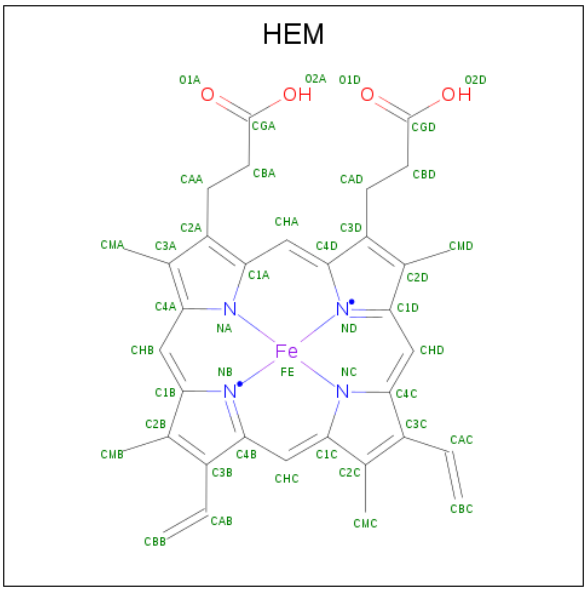
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	82	ASP	ASN	CONFLICT	UNP P01958
A	85	ASN	ASP	CONFLICT	UNP P01958
C	82	ASP	ASN	CONFLICT	UNP P01958
C	85	ASN	ASP	CONFLICT	UNP P01958

- Molecule 2 is a protein called Hemoglobin subunit beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	146	Total	C	N	O	S	0	0	0
			1126	722	198	204	2			
2	D	146	Total	C	N	O	S	0	0	0
			1130	725	199	204	2			

- Molecule 3 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



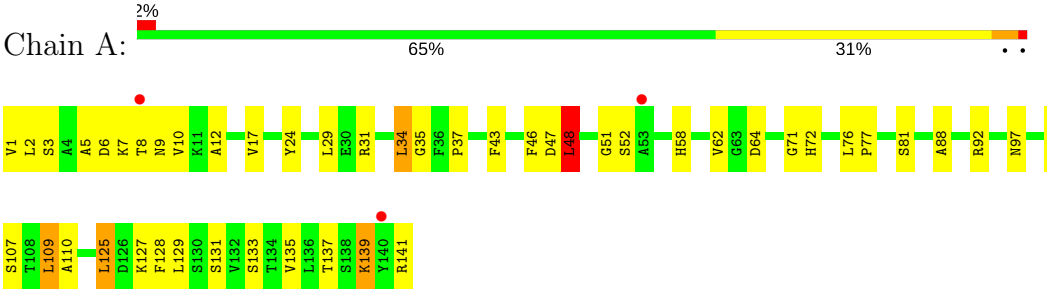
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	C	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
3	D	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

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 the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometryand 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.

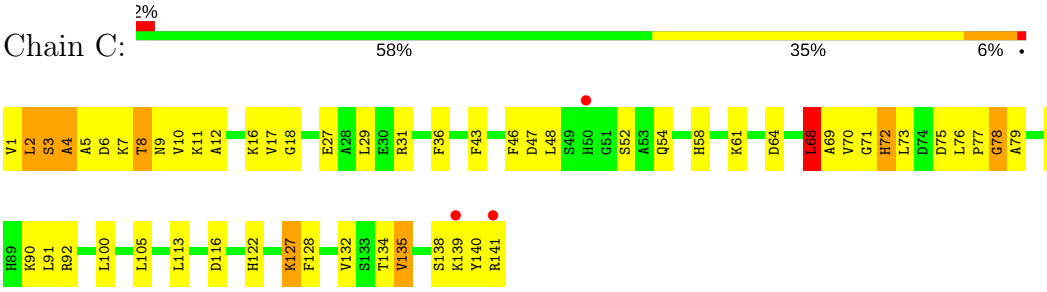
• Molecule 1: Hemoglobin subunit alpha

Chain A:



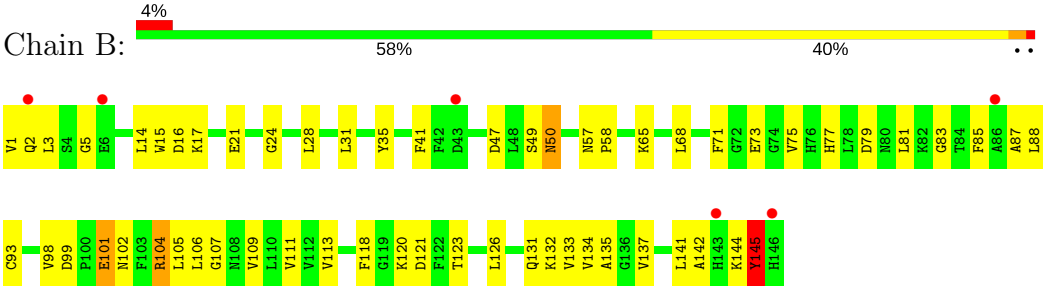
• Molecule 1: Hemoglobin subunit alpha

Chain C:



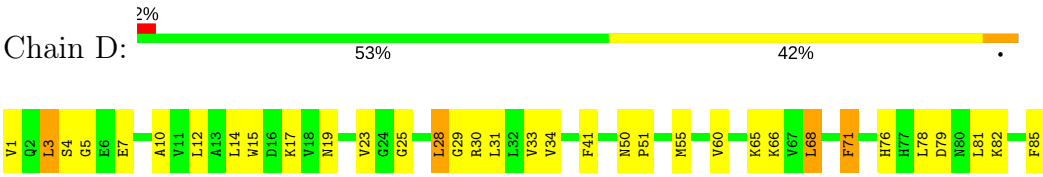
• Molecule 2: Hemoglobin subunit beta

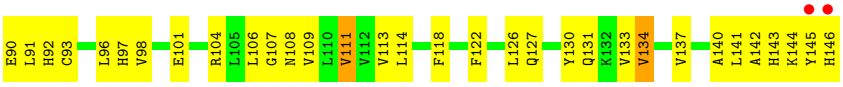
Chain B:



• Molecule 2: Hemoglobin subunit beta

Chain D:




E90
L91
H92
C93
L96
H97
V98
E101
R104
L105
L106
G107
N108
V109
L110
V111
V112
V113
L114
F118
F122
L126
Q127
Y130
Q131
K132
V133
V134
V137
A140
L141
A142
H143
K144
Y145
H146

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	108.27Å 63.27Å 108.15Å 90.00° 111.28° 90.00°	Depositor
Resolution (Å)	19.92 – 2.90 19.92 – 2.90	Depositor EDS
% Data completeness (in resolution range)	92.8 (19.92-2.90) 92.8 (19.92-2.90)	Depositor EDS
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.01 (at 2.88Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.274 , 0.294 0.272 , 0.292	Depositor DCC
R_{free} test set	695 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å^2)	34.8	Xtriage
Anisotropy	0.056	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 51.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.000 for 1/2*h+3/2*k,1/2*h-1/2*k,-1/2*h-1/2*k-l 0.000 for 1/2*h-3/2*k,-1/2*h-1/2*k,-1/2*h+1/2*k-l	Xtriage
F_o,F_c correlation	0.90	EDS
Total number of atoms	4562	wwPDB-VP
Average B, all atoms (Å^2)	22.0	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 76.21 % 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 1.0869e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: HEM

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	0.56	0/1092	0.65	0/1483
1	C	0.55	0/1096	0.72	1/1487 (0.1%)
2	B	0.57	0/1154	0.65	0/1564
2	D	0.63	0/1158	0.67	0/1568
All	All	0.58	0/4500	0.67	1/6102 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	68	LEU	CA-CB-CG	6.78	130.90	115.30

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	1065	0	1062	51	0
1	C	1069	0	1073	61	0
2	B	1126	0	1102	47	0
2	D	1130	0	1113	54	0
3	A	43	0	30	2	0
3	B	43	0	30	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	43	0	30	2	0
3	D	43	0	30	6	0
All	All	4562	0	4470	202	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 22.

All (202) 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:127:LYS:HD3	1:C:141:ARG:HA	1.26	1.15
1:A:1:VAL:HG11	1:A:128:PHE:HB2	1.47	0.95
2:D:106:LEU:HD23	3:D:147:HEM:HBB2	1.49	0.94
2:D:1:VAL:HG23	2:D:81:LEU:HD22	1.52	0.90
2:B:133:VAL:O	2:B:137:VAL:HG23	1.75	0.86
2:B:31:LEU:HD22	2:B:106:LEU:HD13	1.60	0.81
1:A:127:LYS:CD	1:C:141:ARG:HA	2.11	0.79
1:A:1:VAL:HG11	1:A:128:PHE:CB	2.13	0.78
2:B:142:ALA:HA	2:B:145:TYR:CD2	2.17	0.78
1:C:1:VAL:HG11	1:C:73:LEU:HD22	1.66	0.77
2:D:82:LYS:HA	2:D:140:ALA:HB1	1.67	0.77
2:B:24:GLY:HA2	2:B:68:LEU:HD23	1.69	0.75
2:B:142:ALA:HA	2:B:145:TYR:HD2	1.52	0.75
1:C:68:LEU:HD13	1:C:68:LEU:O	1.88	0.74
1:A:2:LEU:O	1:A:2:LEU:HD23	1.88	0.73
1:A:127:LYS:HD3	1:C:141:ARG:CA	2.13	0.73
1:A:48:LEU:HD22	1:A:48:LEU:H	1.54	0.72
1:C:2:LEU:O	1:C:3:SER:HB3	1.90	0.72
1:A:6:ASP:O	1:A:9:ASN:N	2.23	0.71
1:A:127:LYS:HZ2	1:C:141:ARG:C	1.92	0.71
1:A:1:VAL:HG12	1:A:10:VAL:HG21	1.72	0.71
1:C:128:PHE:O	1:C:132:VAL:HG23	1.93	0.67
1:C:7:LYS:O	1:C:11:LYS:HG3	1.93	0.67
2:B:101:GLU:HG2	2:B:104:ARG:HD2	1.77	0.66
1:A:1:VAL:HG11	1:A:128:PHE:CA	2.27	0.65
2:D:108:ASN:O	2:D:111:VAL:HG23	1.97	0.65
1:A:1:VAL:CG1	1:A:128:PHE:HB2	2.23	0.64
2:D:1:VAL:CG2	2:D:81:LEU:HD22	2.27	0.64
2:B:109:VAL:O	2:B:113:VAL:HG23	1.96	0.64
2:D:30:ARG:O	2:D:34:VAL:HG23	1.96	0.64
1:A:88:ALA:CB	1:A:139:LYS:HB3	2.28	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1:VAL:O	1:C:2:LEU:HB2	1.98	0.63
2:B:88:LEU:O	2:B:92:HIS:ND1	2.24	0.63
2:D:142:ALA:HA	2:D:145:TYR:CD2	2.33	0.63
2:D:41:PHE:CD1	3:D:147:HEM:HBC1	2.34	0.61
1:C:27:GLU:O	1:C:31:ARG:HG3	2.01	0.60
1:C:11:LYS:HG2	1:C:70:VAL:CG1	2.31	0.60
1:C:3:SER:OG	1:C:6:ASP:HB2	2.02	0.60
1:C:61:LYS:HD2	3:C:142:HEM:HBA2	1.83	0.60
1:A:6:ASP:O	1:A:7:LYS:C	2.39	0.60
1:C:86:LEU:O	1:C:91:LEU:HG	2.02	0.60
1:A:58:HIS:O	1:A:62:VAL:HG23	2.02	0.59
1:C:1:VAL:CG1	1:C:73:LEU:HD22	2.31	0.59
2:D:142:ALA:HA	2:D:145:TYR:CE2	2.37	0.59
1:C:76:LEU:N	1:C:77:PRO:CD	2.66	0.58
1:A:97:ASN:HB3	3:A:142:HEM:HBC2	1.85	0.58
2:D:93:CYS:HB2	2:D:145:TYR:CZ	2.39	0.58
1:C:122:HIS:O	1:C:122:HIS:HD2	1.87	0.57
2:D:3:LEU:HD21	2:D:133:VAL:CG2	2.34	0.57
1:A:141:ARG:HA	1:C:127:LYS:CD	2.35	0.57
2:D:106:LEU:CD2	3:D:147:HEM:HBB2	2.30	0.56
2:D:33:VAL:HG21	2:D:55:MET:HE2	1.89	0.55
1:C:71:GLY:C	1:C:72:HIS:ND1	2.60	0.55
1:C:88:ALA:CB	1:C:139:LYS:HB3	2.37	0.55
2:D:106:LEU:HD23	3:D:147:HEM:CBB	2.31	0.55
1:A:133:SER:O	1:A:137:THR:HG23	2.06	0.54
1:A:29:LEU:HD21	1:A:58:HIS:HD2	1.73	0.54
2:B:93:CYS:HB2	2:B:145:TYR:CE2	2.42	0.54
1:A:88:ALA:HB1	1:A:139:LYS:HB3	1.90	0.54
1:C:1:VAL:H2	1:C:127:LYS:HB3	1.73	0.53
2:B:90:GLU:HG3	2:B:91:LEU:N	2.23	0.53
1:A:97:ASN:CB	3:A:142:HEM:HBC2	2.39	0.53
1:C:47:ASP:O	1:C:52:SER:HB2	2.08	0.53
1:C:12:ALA:O	1:C:16:LYS:HG3	2.10	0.52
2:D:19:ASN:O	2:D:23:VAL:HG23	2.10	0.52
2:B:99:ASP:HB3	2:B:102:ASN:ND2	2.24	0.52
2:B:50:ASN:N	2:B:50:ASN:ND2	2.56	0.52
2:B:14:LEU:HD11	2:B:118:PHE:CD2	2.45	0.52
2:D:137:VAL:O	2:D:141:LEU:HB2	2.09	0.52
1:A:1:VAL:HG21	1:A:131:SER:HB3	1.92	0.52
1:A:141:ARG:HD2	1:C:127:LYS:HG3	1.92	0.52
1:A:1:VAL:HG11	1:A:128:PHE:HA	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:127:LYS:HB3	1:C:141:ARG:HD2	1.91	0.52
2:D:50:ASN:HB2	2:D:51:PRO:HD2	1.91	0.52
2:D:12:LEU:HD22	2:D:76:HIS:CD2	2.44	0.52
2:B:31:LEU:HD12	2:B:35:TYR:HD2	1.75	0.52
1:A:76:LEU:HB2	1:A:77:PRO:HD3	1.92	0.51
2:D:109:VAL:O	2:D:113:VAL:HG23	2.10	0.51
1:A:8:THR:O	1:A:12:ALA:HB2	2.11	0.51
1:C:1:VAL:CG1	1:C:10:VAL:HG11	2.40	0.51
1:C:43:PHE:HB3	1:C:46:PHE:HB2	1.93	0.50
1:A:8:THR:O	1:A:12:ALA:CB	2.60	0.50
1:C:4:ALA:O	1:C:5:ALA:C	2.49	0.50
1:A:131:SER:O	1:A:135:VAL:HG23	2.12	0.50
1:C:46:PHE:HA	1:C:54:GLN:NE2	2.26	0.50
2:D:90:GLU:HG3	2:D:91:LEU:N	2.27	0.50
2:D:3:LEU:HB3	2:D:7:GLU:HB2	1.92	0.50
2:B:89:SER:OG	2:B:144:LYS:HG2	2.12	0.49
1:C:17:VAL:HG22	1:C:113:LEU:HD11	1.94	0.49
2:D:25:GLY:O	2:D:29:GLY:N	2.40	0.49
1:C:29:LEU:HD21	1:C:58:HIS:HD2	1.78	0.48
2:B:14:LEU:O	2:B:15:TRP:C	2.52	0.48
1:A:1:VAL:HG12	1:A:10:VAL:CG2	2.43	0.48
1:C:86:LEU:HD12	1:C:90:LYS:HD3	1.95	0.48
1:C:122:HIS:O	1:C:122:HIS:CD2	2.67	0.48
1:C:2:LEU:O	1:C:3:SER:CB	2.61	0.48
2:D:14:LEU:HD22	2:D:126:LEU:HD21	1.94	0.48
2:B:71:PHE:O	2:B:75:VAL:HG23	2.14	0.48
2:D:71:PHE:CE1	2:D:137:VAL:HG11	2.50	0.47
2:D:31:LEU:HD22	2:D:106:LEU:HD13	1.96	0.47
2:B:98:VAL:O	2:B:145:TYR:CE1	2.67	0.47
1:C:3:SER:O	1:C:7:LYS:HG3	2.14	0.47
3:B:147:HEM:HMB2	3:B:147:HEM:HBB2	1.96	0.47
1:A:141:ARG:HA	1:C:127:LYS:CG	2.43	0.47
2:D:107:GLY:O	2:D:111:VAL:HG22	2.14	0.47
2:B:121:ASP:O	2:B:123:THR:HG23	2.14	0.47
1:C:47:ASP:O	1:C:52:SER:CB	2.63	0.47
1:A:103:HIS:NE2	2:B:131:GLN:OE1	2.43	0.47
2:B:132:LYS:O	2:B:135:ALA:HB3	2.15	0.47
1:A:141:ARG:HA	1:C:127:LYS:HD2	1.96	0.47
2:D:98:VAL:HG22	3:D:147:HEM:HBC2	1.97	0.47
2:B:41:PHE:HB3	3:B:147:HEM:HMD1	1.97	0.47
2:D:82:LYS:HA	2:D:140:ALA:CB	2.42	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:33:VAL:HG21	2:D:55:MET:CE	2.45	0.47
2:D:108:ASN:HA	2:D:111:VAL:CG2	2.45	0.47
2:D:130:TYR:O	2:D:134:VAL:HB	2.14	0.47
2:D:92:HIS:O	2:D:97:HIS:N	2.48	0.46
3:B:147:HEM:CMB	3:B:147:HEM:HBB2	2.46	0.46
2:B:90:GLU:HG3	2:B:91:LEU:H	1.80	0.46
1:A:127:LYS:NZ	1:C:141:ARG:OXT	2.49	0.46
2:D:131:GLN:HE21	2:D:131:GLN:HA	1.81	0.46
2:D:4:SER:OG	2:D:5:GLY:N	2.49	0.46
1:A:5:ALA:O	1:A:9:ASN:N	2.46	0.45
2:D:4:SER:HB3	2:D:7:GLU:HG3	1.98	0.45
2:D:85:PHE:O	2:D:88:LEU:N	2.41	0.45
1:C:88:ALA:HB3	1:C:139:LYS:HB3	1.98	0.45
1:A:31:ARG:HH21	1:A:31:ARG:HG2	1.81	0.45
2:B:14:LEU:HD22	2:B:126:LEU:HD21	1.99	0.45
1:C:36:PHE:CD2	1:C:100:LEU:HD22	2.52	0.45
2:D:93:CYS:HB2	2:D:145:TYR:CE1	2.52	0.45
2:B:107:GLY:O	2:B:111:VAL:HG23	2.16	0.45
1:A:43:PHE:HB3	1:A:46:PHE:HB2	1.99	0.45
2:B:50:ASN:ND2	2:B:50:ASN:H	2.14	0.45
1:A:51:GLY:O	1:A:52:SER:C	2.54	0.45
2:D:98:VAL:HG13	3:D:147:HEM:HBC2	1.97	0.45
2:D:93:CYS:HB2	2:D:145:TYR:CE2	2.52	0.45
2:B:104:ARG:HG2	2:B:104:ARG:H	1.66	0.44
1:A:127:LYS:HB3	1:C:141:ARG:CD	2.48	0.44
2:B:47:ASP:OD2	2:B:49:SER:OG	2.30	0.44
1:A:1:VAL:CG2	1:A:131:SER:HB3	2.48	0.44
2:B:57:ASN:HA	2:B:58:PRO:HD3	1.85	0.44
2:B:49:SER:CB	2:B:50:ASN:HD22	2.31	0.44
1:A:109:LEU:HD23	1:A:125:LEU:CD2	2.48	0.43
1:C:1:VAL:HG11	1:C:73:LEU:CD2	2.41	0.43
1:A:47:ASP:O	1:A:52:SER:HB2	2.19	0.43
1:C:1:VAL:HG12	1:C:10:VAL:HG11	1.99	0.43
1:C:10:VAL:O	1:C:10:VAL:HG22	2.19	0.43
2:D:96:LEU:O	2:D:97:HIS:HB2	2.18	0.43
2:D:86:ALA:HB1	2:D:144:LYS:NZ	2.33	0.43
2:B:88:LEU:HD23	2:B:88:LEU:HA	1.92	0.43
2:B:105:LEU:O	2:B:109:VAL:HG23	2.19	0.43
2:B:87:ALA:HA	2:B:90:GLU:HG2	1.99	0.43
1:C:1:VAL:N	1:C:127:LYS:HB3	2.32	0.43
1:C:75:ASP:OD1	1:C:77:PRO:HD2	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:71:PHE:CZ	2:D:137:VAL:HG11	2.54	0.43
2:D:3:LEU:HB3	2:D:4:SER:H	1.59	0.43
1:C:138:SER:C	1:C:140:TYR:N	2.72	0.43
2:B:93:CYS:HB2	2:B:145:TYR:CZ	2.54	0.43
1:C:61:LYS:HD2	3:C:142:HEM:CBA	2.48	0.43
1:C:47:ASP:N	1:C:54:GLN:OE1	2.49	0.42
2:D:33:VAL:CG2	2:D:55:MET:HE2	2.49	0.42
2:B:1:VAL:HG23	2:B:2:GLN:N	2.34	0.42
2:D:114:LEU:O	2:D:118:PHE:HD1	2.02	0.42
2:D:140:ALA:HA	2:D:143:HIS:HB2	2.02	0.42
2:B:73:GLU:O	2:B:77:HIS:HD2	2.02	0.42
2:D:122:PHE:HE2	2:D:127:GLN:HG3	1.83	0.42
1:C:7:LYS:HA	1:C:10:VAL:HG12	2.01	0.42
1:A:105:LEU:HD23	1:A:129:LEU:HD11	2.02	0.42
2:B:41:PHE:CD1	3:B:147:HEM:HBC1	2.55	0.42
2:B:15:TRP:O	2:B:17:LYS:N	2.53	0.42
2:B:91:LEU:CD2	3:B:147:HEM:HBA2	2.50	0.42
1:C:16:LYS:HD3	1:C:116:ASP:OD2	2.19	0.42
2:D:14:LEU:HD23	2:D:130:TYR:CE2	2.54	0.42
1:A:107:SER:O	1:A:110:ALA:HB3	2.19	0.42
1:A:141:ARG:OXT	1:C:1:VAL:O	2.38	0.42
1:A:71:GLY:C	1:A:72:HIS:ND1	2.73	0.42
1:C:78:GLY:O	1:C:79:ALA:C	2.58	0.42
1:C:88:ALA:O	1:C:92:ARG:HG2	2.20	0.42
2:D:1:VAL:HG22	2:D:78:LEU:O	2.20	0.42
2:B:21:GLU:HA	2:B:65:LYS:HG3	2.00	0.42
2:B:134:VAL:O	2:B:135:ALA:C	2.59	0.42
2:B:50:ASN:HD22	2:B:50:ASN:N	2.17	0.42
2:B:141:LEU:HD11	3:B:147:HEM:CBB	2.50	0.41
3:B:147:HEM:HMB2	3:B:147:HEM:CBB	2.50	0.41
2:D:7:GLU:O	2:D:10:ALA:HB3	2.20	0.41
1:A:17:VAL:HG13	1:A:24:TYR:CE1	2.55	0.41
1:A:6:ASP:O	1:A:8:THR:N	2.54	0.41
2:B:83:GLY:O	2:B:85:PHE:N	2.54	0.41
2:B:91:LEU:HD21	3:B:147:HEM:HBA2	2.01	0.41
2:D:15:TRP:CH2	2:D:68:LEU:CD1	3.04	0.41
1:C:134:THR:O	1:C:135:VAL:HG23	2.20	0.41
2:B:98:VAL:HG13	3:B:147:HEM:HBC2	2.03	0.41
1:A:141:ARG:HD3	1:C:127:LYS:HD2	2.03	0.41
1:C:1:VAL:HG21	1:C:73:LEU:HD22	2.03	0.41
1:C:36:PHE:CE2	1:C:100:LEU:HD22	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:8:THR:O	1:C:10:VAL:N	2.53	0.41
2:D:14:LEU:HD11	2:D:118:PHE:CD2	2.56	0.41
2:D:131:GLN:HA	2:D:131:GLN:NE2	2.36	0.41
2:D:28:LEU:HD12	2:D:60:VAL:O	2.21	0.41
2:B:101:GLU:O	2:B:104:ARG:HG2	2.22	0.40
1:A:34:LEU:HD12	1:A:34:LEU:HA	1.73	0.40
1:A:35:GLY:C	1:A:37:PRO:HD3	2.42	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	139/141 (99%)	113 (81%)	24 (17%)	2 (1%)	12 39
1	C	139/141 (99%)	110 (79%)	20 (14%)	9 (6%)	1 4
2	B	144/146 (99%)	123 (85%)	17 (12%)	4 (3%)	5 21
2	D	144/146 (99%)	131 (91%)	12 (8%)	1 (1%)	24 58
All	All	566/574 (99%)	477 (84%)	73 (13%)	16 (3%)	5 21

All (16) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	3	SER
1	C	9	ASN
2	D	3	LEU
1	A	81	SER
2	B	16	ASP
1	C	18	GLY
2	B	3	LEU
1	C	69	ALA

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Mol	Chain	Res	Type
1	C	135	VAL
1	A	48	LEU
2	B	145	TYR
1	C	2	LEU
1	C	8	THR
2	B	5	GLY
1	C	4	ALA
1	C	78	GLY

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	114/115 (99%)	106 (93%)	8 (7%)	16 44
1	C	115/115 (100%)	108 (94%)	7 (6%)	20 51
2	B	116/118 (98%)	108 (93%)	8 (7%)	17 44
2	D	117/118 (99%)	105 (90%)	12 (10%)	8 24
All	All	462/466 (99%)	427 (92%)	35 (8%)	14 39

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	SER
1	A	34	LEU
1	A	48	LEU
1	A	64	ASP
1	A	92	ARG
1	A	109	LEU
1	A	125	LEU
1	A	139	LYS
2	B	28	LEU
2	B	50	ASN
2	B	79	ASP
2	B	81	LEU
2	B	101	GLU

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Mol	Chain	Res	Type
2	B	104	ARG
2	B	120	LYS
2	B	145	TYR
1	C	48	LEU
1	C	64	ASP
1	C	68	LEU
1	C	72	HIS
1	C	85	ASN
1	C	105	LEU
1	C	127	LYS
2	D	17	LYS
2	D	28	LEU
2	D	65	LYS
2	D	66	LYS
2	D	68	LEU
2	D	71	PHE
2	D	79	ASP
2	D	101	GLU
2	D	104	ARG
2	D	111	VAL
2	D	134	VAL
2	D	146	HIS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	ASN
1	A	50	HIS
1	A	58	HIS
1	A	97	ASN
2	B	39	GLN
2	B	50	ASN
2	B	77	HIS
2	B	80	ASN
2	B	102	ASN
2	B	117	HIS
1	C	58	HIS
1	C	122	HIS
2	D	39	GLN
2	D	63	HIS
2	D	76	HIS
2	D	77	HIS

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

4 ligands are modelled in this entry.

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	142	-	27,50,50	1.49	4 (14%)	17,82,82	1.86	8 (47%)
3	HEM	B	147	-	27,50,50	1.46	5 (18%)	17,82,82	1.08	0
3	HEM	C	142	-	27,50,50	1.47	7 (25%)	17,82,82	1.73	6 (35%)
3	HEM	D	147	-	27,50,50	1.72	4 (14%)	17,82,82	1.25	2 (11%)

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	142	-	-	0/6/54/54	0/0/8/8
3	HEM	B	147	-	-	0/6/54/54	0/0/8/8
3	HEM	C	142	-	-	0/6/54/54	0/0/8/8
3	HEM	D	147	-	-	0/6/54/54	0/0/8/8

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	147	HEM	C3C-C2C	-5.01	1.33	1.40
3	D	147	HEM	C3B-C2B	-4.39	1.34	1.40
3	A	142	HEM	C3B-C2B	-4.05	1.34	1.40
3	C	142	HEM	C3B-C2B	-3.66	1.35	1.40
3	B	147	HEM	C3B-C2B	-3.56	1.35	1.40
3	A	142	HEM	C3C-C2C	-2.86	1.36	1.40
3	B	147	HEM	C3C-C2C	-2.48	1.36	1.40
3	C	142	HEM	C3C-C2C	-2.40	1.37	1.40
3	B	147	HEM	C4B-NB	2.00	1.40	1.36
3	C	142	HEM	C4B-NB	2.05	1.40	1.36
3	C	142	HEM	C4A-NA	2.07	1.40	1.36
3	C	142	HEM	C1A-NA	2.11	1.40	1.36
3	A	142	HEM	C3D-C2D	2.18	1.44	1.37
3	D	147	HEM	C3D-C2D	2.20	1.44	1.37
3	C	142	HEM	C1D-ND	2.29	1.40	1.36
3	B	147	HEM	C3D-C2D	2.36	1.44	1.37
3	C	142	HEM	C3D-C2D	2.39	1.44	1.37
3	B	147	HEM	C4A-NA	2.39	1.41	1.36
3	A	142	HEM	C4B-NB	2.43	1.41	1.36
3	D	147	HEM	C4A-NA	2.48	1.41	1.36

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	142	HEM	CBD-CAD-C3D	-3.40	105.99	112.47
3	D	147	HEM	CAD-CBD-CGD	-3.11	107.34	112.66
3	C	142	HEM	CAA-CBA-CGA	-2.92	107.67	112.66
3	A	142	HEM	CBA-CAA-C2A	-2.68	107.36	112.48
3	A	142	HEM	C4A-C3A-C2A	-2.67	105.14	107.00
3	A	142	HEM	CAA-CBA-CGA	-2.50	108.39	112.66
3	D	147	HEM	CBD-CAD-C3D	-2.48	107.73	112.47
3	C	142	HEM	CBD-CAD-C3D	-2.42	107.85	112.47
3	C	142	HEM	C4A-C3A-C2A	-2.36	105.35	107.00
3	A	142	HEM	C1D-C2D-C3D	-2.32	105.38	107.00
3	C	142	HEM	CMA-C3A-C4A	-2.30	124.93	128.46
3	A	142	HEM	CAD-CBD-CGD	-2.11	109.05	112.66
3	C	142	HEM	C1D-C2D-C3D	-2.07	105.56	107.00
3	A	142	HEM	CMC-C2C-C3C	2.33	129.13	124.88
3	A	142	HEM	CMA-C3A-C2A	2.38	129.42	124.94
3	C	142	HEM	CMA-C3A-C2A	2.51	129.67	124.94

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	142	HEM	2	0
3	B	147	HEM	9	0
3	C	142	HEM	2	0
3	D	147	HEM	6	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^{th} 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	141/141 (100%)	-0.11	3 (2%)	63	61	4, 21, 37, 52	0
1	C	141/141 (100%)	-0.12	3 (2%)	63	61	3, 20, 39, 52	0
2	B	146/146 (100%)	-0.06	6 (4%)	37	32	3, 20, 42, 62	0
2	D	146/146 (100%)	-0.09	3 (2%)	63	61	6, 21, 44, 64	0
All	All	574/574 (100%)	-0.09	15 (2%)	56	52	3, 21, 42, 64	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	146	HIS	3.4
1	C	50	HIS	3.2
2	B	2	GLN	3.2
2	D	145	TYR	3.1
1	A	140	TYR	2.8
1	C	141	ARG	2.4
2	D	146	HIS	2.4
2	B	6	GLU	2.4
2	B	43	ASP	2.3
1	A	53	ALA	2.3
2	B	86	ALA	2.3
1	C	139	LYS	2.1
2	B	143	HIS	2.1
1	A	8	THR	2.0
2	D	86	ALA	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 (i)

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. The B-factors column lists the minimum, median, 95^{th} 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
3	HEM	D	147	43/43	0.90	0.21	22,24,29,31	0
3	HEM	B	147	43/43	0.91	0.18	21,23,28,28	0
3	HEM	C	142	43/43	0.92	0.19	21,24,25,26	0
3	HEM	A	142	43/43	0.94	0.17	19,24,27,28	0

6.5 Other polymers (i)

There are no such residues in this entry.