



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 17, 2017 – 04:34 AM EDT

PDB ID : 5D8O  
Title : 1.90Å resolution structure of BfrB (wild-type, C2221 form) from *Pseudomonas aeruginosa*  
Authors : Lovell, S.; Battaile, K.P.; Wang, Y.; Yao, H.; Rivera, M.  
Deposited on : unknown  
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 : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20029824  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
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) : rb-20029824

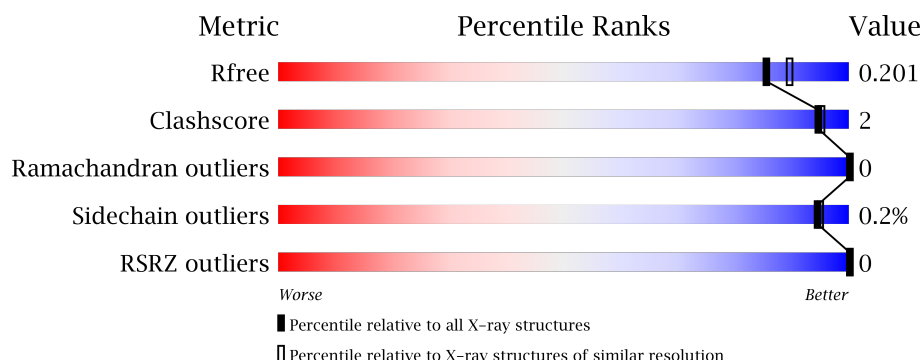
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

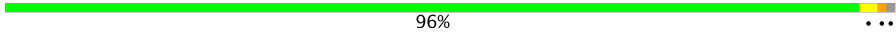
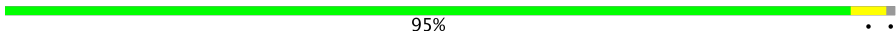
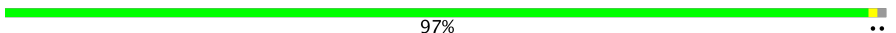
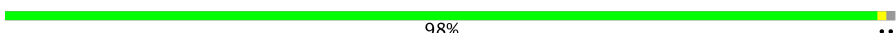
The reported resolution of this entry is 1.90 Å.

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))
$R_{free}$	100719	5047 (1.90-1.90)
Clashscore	112137	5731 (1.90-1.90)
Ramachandran outliers	110173	5669 (1.90-1.90)
Sidechain outliers	110143	5670 (1.90-1.90)
RSRZ outliers	101464	5100 (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.

Mol	Chain	Length	Quality of chain
1	A	158	 96%
1	B	158	 95%
1	C	158	 97%
1	D	158	 98%
1	E	158	 96%

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Mol	Chain	Length	Quality of chain
1	F	158	 94%
1	G	158	 95%
1	H	158	 98%
1	I	158	 96%
1	J	158	 96%
1	K	158	 96%
1	L	158	 95%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	K	A	201	-	-	-	X
2	K	B	201	-	-	-	X
2	K	D	201	-	-	-	X
3	PG4	A	202	-	-	-	X
3	PG4	A	203	-	-	-	X
3	PG4	A	204	-	-	-	X
3	PG4	B	202	-	-	-	X
3	PG4	C	201	-	-	-	X
3	PG4	C	202	-	-	-	X
3	PG4	D	202	-	-	-	X
3	PG4	E	201	-	-	-	X
3	PG4	F	201	-	-	-	X
3	PG4	G	201	-	-	-	X
3	PG4	G	202	-	-	-	X
3	PG4	G	203	-	-	-	X
3	PG4	H	201	-	-	-	X
3	PG4	H	202	-	-	-	X
3	PG4	H	203	-	-	-	X
3	PG4	I	201	-	-	-	X
3	PG4	J	202	-	-	-	X
3	PG4	K	201	-	-	-	X
3	PG4	K	202	-	-	-	X
3	PG4	L	201	-	-	-	X
3	PG4	L	202	-	-	-	X
4	HEM	F	203	-	-	-	X

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	HEM	I	202	-	-	-	X

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 17843 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 Ferroxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	156	Total	C	N	O	S	0	2	0
			1275	809	218	241	7			
1	B	156	Total	C	N	O	S	0	2	0
			1274	807	217	243	7			
1	C	156	Total	C	N	O	S	0	2	0
			1273	805	217	244	7			
1	D	156	Total	C	N	O	S	0	2	0
			1279	808	218	246	7			
1	E	156	Total	C	N	O	S	0	3	0
			1286	814	219	246	7			
1	F	156	Total	C	N	O	S	0	2	0
			1269	805	217	240	7			
1	G	156	Total	C	N	O	S	0	2	0
			1274	807	217	243	7			
1	H	156	Total	C	N	O	S	0	3	0
			1274	808	217	242	7			
1	I	156	Total	C	N	O	S	0	2	0
			1272	806	216	243	7			
1	J	156	Total	C	N	O	S	0	2	0
			1276	808	219	242	7			
1	K	156	Total	C	N	O	S	0	2	0
			1274	807	217	243	7			
1	L	156	Total	C	N	O	S	0	3	0
			1277	810	218	242	7			

- Molecule 2 is POTASSIUM ION (three-letter code: K) (formula: K).

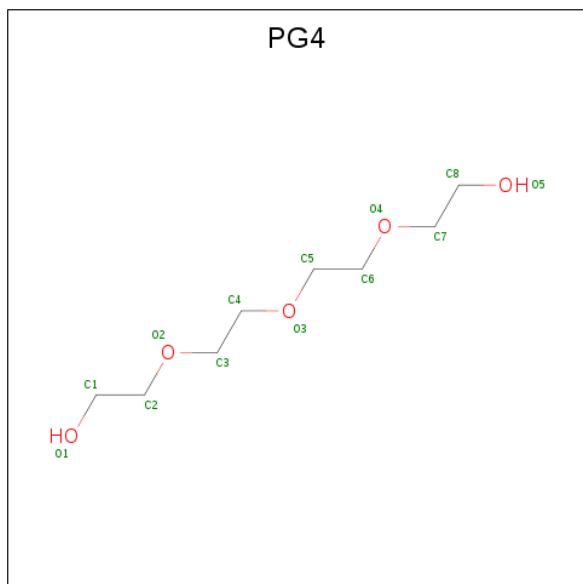
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	K	0	0
			1	1		
2	A	1	Total	K	0	0
			1	1		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	D	1	Total K 1 1	0	0

- Molecule 3 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: C<sub>8</sub>H<sub>18</sub>O<sub>5</sub>).



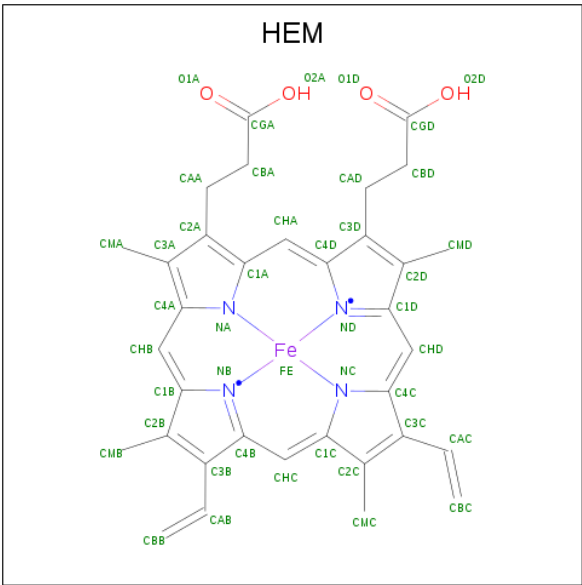
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 13 8 5	0	0
3	A	1	Total C O 13 8 5	0	0
3	A	1	Total C O 9 6 3	0	0
3	B	1	Total C O 10 6 4	0	0
3	C	1	Total C O 13 8 5	0	0
3	C	1	Total C O 10 6 4	0	0
3	D	1	Total C O 10 6 4	0	0
3	E	1	Total C O 13 8 5	0	0
3	E	1	Total C O 11 7 4	0	0
3	F	1	Total C O 13 8 5	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	F	1	Total	C	O	0	0
			11	7	4		
3	G	1	Total	C	O	0	0
			13	8	5		
3	G	1	Total	C	O	0	0
			13	8	5		
3	G	1	Total	C	O	0	0
			10	6	4		
3	H	1	Total	C	O	0	0
			13	8	5		
3	H	1	Total	C	O	0	0
			13	8	5		
3	H	1	Total	C	O	0	0
			8	5	3		
3	I	1	Total	C	O	0	0
			10	6	4		
3	J	1	Total	C	O	0	0
			13	8	5		
3	J	1	Total	C	O	0	0
			10	6	4		
3	J	1	Total	C	O	0	0
			13	8	5		
3	K	1	Total	C	O	0	0
			13	8	5		
3	K	1	Total	C	O	0	0
			10	6	4		
3	L	1	Total	C	O	0	0
			13	8	5		
3	L	1	Total	C	O	0	0
			11	7	4		

- 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 43	C 34	Fe 1	N 4	O 4	0	0
4	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
4	D	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
4	F	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
4	I	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
4	J	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
4	L	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	157	Total	O	0	0
			157	157		
5	B	178	Total	O	0	0
			178	178		
5	C	173	Total	O	0	0
			173	173		
5	D	143	Total	O	0	0
			143	143		
5	E	199	Total	O	0	0
			199	199		

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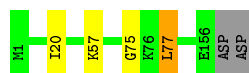
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	F	171	Total 171	O 171	0	0
5	G	149	Total 149	O 149	0	0
5	H	138	Total 138	O 138	0	0
5	I	150	Total 150	O 150	0	0
5	J	172	Total 172	O 172	0	0
5	K	172	Total 172	O 172	0	0
5	L	145	Total 145	O 145	0	0

### 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 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: Ferroxidase

Chain A:  96% ..



- Molecule 1: Ferroxidase

Chain B:  95% ..



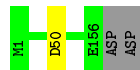
- Molecule 1: Ferroxidase

Chain C:  97% ..



- Molecule 1: Ferroxidase

Chain D:  98% ..



- Molecule 1: Ferroxidase

Chain E:  96% ..



- Molecule 1: Ferroxidase

Chain F:  94% ..



- Molecule 1: Ferroxidase

Chain G: 95% ..



- Molecule 1: Ferroxidase

Chain H: 98% ..



- Molecule 1: Ferroxidase

Chain I: 96% ..



- Molecule 1: Ferroxidase

Chain J: 96% ..



- Molecule 1: Ferroxidase

Chain K: 96% ..



- Molecule 1: Ferroxidase

Chain L: 95% ..



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	130.02Å 195.28Å 203.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.09 – 1.90 47.77 – 1.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (45.09-1.90) 100.0 (47.77-1.90)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.20 (at 1.90Å)	Xtriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	0.153 , 0.192 0.164 , 0.201	Depositor DCC
$R_{free}$ test set	10058 reflections (4.98%)	DCC
Wilson B-factor (Å <sup>2</sup> )	18.9	Xtriage
Anisotropy	0.769	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 57.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	17843	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.89% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

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

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: HEM, K, PG4

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	0.42	0/1302	0.55	0/1753
1	B	0.44	0/1301	0.53	0/1753
1	C	0.46	0/1300	0.56	0/1753
1	D	0.43	0/1306	0.55	0/1760
1	E	0.49	0/1316	0.56	0/1772
1	F	0.43	0/1296	0.53	0/1747
1	G	0.45	0/1301	0.54	0/1753
1	H	0.43	0/1304	0.52	0/1758
1	I	0.46	0/1299	0.55	0/1751
1	J	0.48	0/1303	0.54	0/1755
1	K	0.45	0/1301	0.56	1/1753 (0.1%)
1	L	0.43	0/1307	0.51	0/1761
All	All	0.45	0/15636	0.54	1/21069 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	K	90	ASP	CB-CG-OD1	5.01	122.81	118.30

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	1275	0	1259	3	0
1	B	1274	0	1250	5	0
1	C	1273	0	1243	2	0
1	D	1279	0	1254	0	0
1	E	1286	0	1269	3	0
1	F	1269	0	1243	5	0
1	G	1274	0	1250	4	0
1	H	1274	0	1247	1	0
1	I	1272	0	1243	3	0
1	J	1276	0	1259	3	0
1	K	1274	0	1250	5	0
1	L	1277	0	1256	5	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	D	1	0	0	0	0
3	A	35	0	47	1	0
3	B	10	0	13	0	0
3	C	23	0	31	0	0
3	D	10	0	13	0	0
3	E	24	0	31	0	0
3	F	24	0	31	1	0
3	G	36	0	49	4	0
3	H	34	0	45	0	0
3	I	10	0	13	1	0
3	J	36	0	49	0	0
3	K	23	0	31	1	0
3	L	24	0	31	1	0
4	A	43	0	30	1	0
4	B	43	0	30	1	0
4	D	43	0	30	0	0
4	F	43	0	30	3	0
4	I	43	0	30	0	0
4	J	43	0	30	1	0
4	L	43	0	30	1	0
5	A	157	0	0	2	0
5	B	178	0	0	2	0
5	C	173	0	0	1	0
5	D	143	0	0	0	0
5	E	199	0	0	1	1
5	F	171	0	0	3	0
5	G	149	0	0	6	0
5	H	138	0	0	1	0
5	I	150	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	J	172	0	0	1	1
5	K	172	0	0	3	0
5	L	145	0	0	4	0
All	All	17843	0	15617	48	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 2.

All (48) 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:K:50:ASP:OD1	5:K:301:HOH:O	2.04	0.75
1:H:156:GLU:OE1	5:H:301:HOH:O	2.04	0.74
1:G:130:HIS:NE2	5:G:302:HOH:O	2.23	0.70
1:B:50:ASP:OD1	5:B:301:HOH:O	2.11	0.69
3:A:202:PG4:H71	5:A:301:HOH:O	1.92	0.68
1:F:110:GLN:OE1	5:F:301:HOH:O	2.10	0.68
1:G:132:ASP:OD1	5:G:301:HOH:O	2.11	0.67
1:F:34:ASP:OD1	5:F:302:HOH:O	2.15	0.65
1:L:132:ASP:OD1	5:L:302:HOH:O	2.16	0.61
3:G:202:PG4:H71	5:G:311:HOH:O	2.04	0.58
1:J:82:ASN:OD1	1:J:84:GLN:HG2	2.05	0.57
1:I:38:LYS:NZ	3:I:201:PG4:O3	2.42	0.53
1:A:57:LYS:NZ	5:A:306:HOH:O	2.44	0.51
1:F:52:MET:HB3	4:F:203:HEM:CHD	2.42	0.49
1:A:20:ILE:HD11	1:A:75:GLY:HA3	1.95	0.49
1:L:130:HIS:NE2	5:L:301:HOH:O	2.15	0.48
1:C:119:LEU:HB2	3:F:201:PG4:H12	1.96	0.48
3:G:201:PG4:H72	5:G:309:HOH:O	2.14	0.48
3:G:202:PG4:H42	5:G:311:HOH:O	2.15	0.46
1:C:57:LYS:NZ	5:C:306:HOH:O	2.49	0.46
1:J:57:LYS:NZ	5:J:312:HOH:O	2.49	0.45
1:L:1:MET:O	1:L:65:LEU:HA	2.16	0.45
1:K:84:GLN:HB3	5:K:369:HOH:O	2.17	0.45
4:F:203:HEM:HBC2	4:F:203:HEM:HMC1	1.99	0.45
1:I:1:MET:O	1:I:65:LEU:HA	2.17	0.44
4:L:203:HEM:O1D	5:L:303:HOH:O	2.21	0.44
4:F:203:HEM:CHB	1:K:52:MET:HB3	2.47	0.44
1:A:20:ILE:HG23	1:A:77:LEU:HD12	2.00	0.43
1:K:84:GLN:NE2	5:K:302:HOH:O	2.19	0.43
1:B:136:THR:OG1	5:B:302:HOH:O	2.21	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:44:GLU:OE1	1:E:90:ASP:OD2	2.36	0.42
1:L:38:LYS:NZ	3:L:202:PG4:O4	2.52	0.42
3:G:202:PG4:C4	5:G:311:HOH:O	2.67	0.42
1:L:134:LEU:HD21	5:L:301:HOH:O	2.19	0.42
1:B:39:ARG:NH1	1:B:155:HIS:O	2.52	0.42
1:E:134:LEU:HD21	5:E:312:HOH:O	2.19	0.42
4:A:205:HEM:HMC2	4:A:205:HEM:HBC2	2.02	0.41
1:F:134:LEU:HD21	5:F:306:HOH:O	2.20	0.41
1:G:44:GLU:OE1	1:G:90:ASP:OD2	2.38	0.41
1:G:20:ILE:HG23	1:G:77:LEU:HD12	2.03	0.41
1:K:119:LEU:HB2	3:K:201:PG4:H12	2.03	0.41
4:J:204:HEM:HMC2	4:J:204:HEM:HBC2	2.02	0.41
1:B:39:ARG:HD3	1:B:153:HIS:CD2	2.56	0.40
1:F:44:GLU:OE1	1:F:90:ASP:OD2	2.39	0.40
1:E:147[A]:GLU:CD	1:E:147[A]:GLU:H	2.25	0.40
1:J:20:ILE:HG23	1:J:77:LEU:HD12	2.03	0.40
1:B:52:MET:HB3	4:B:203:HEM:CHD	2.50	0.40
1:I:10:HIS:O	1:I:14:ILE:HG12	2.22	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)
5:E:436:HOH:O	5:J:458:HOH:O[8_445]	2.10	0.10

## 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	156/158 (99%)	155 (99%)	1 (1%)	0	100	100
1	B	156/158 (99%)	156 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	156/158 (99%)	155 (99%)	1 (1%)	0	100	100
1	D	156/158 (99%)	155 (99%)	1 (1%)	0	100	100
1	E	157/158 (99%)	157 (100%)	0	0	100	100
1	F	156/158 (99%)	156 (100%)	0	0	100	100
1	G	156/158 (99%)	156 (100%)	0	0	100	100
1	H	157/158 (99%)	157 (100%)	0	0	100	100
1	I	156/158 (99%)	154 (99%)	2 (1%)	0	100	100
1	J	156/158 (99%)	155 (99%)	1 (1%)	0	100	100
1	K	156/158 (99%)	156 (100%)	0	0	100	100
1	L	157/158 (99%)	155 (99%)	2 (1%)	0	100	100
All	All	1875/1896 (99%)	1867 (100%)	8 (0%)	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	138/144 (96%)	137 (99%)	1 (1%)	87	87
1	B	138/144 (96%)	138 (100%)	0	100	100
1	C	138/144 (96%)	138 (100%)	0	100	100
1	D	140/144 (97%)	139 (99%)	1 (1%)	87	87
1	E	141/144 (98%)	141 (100%)	0	100	100
1	F	136/144 (94%)	135 (99%)	1 (1%)	87	87
1	G	138/144 (96%)	138 (100%)	0	100	100
1	H	137/144 (95%)	137 (100%)	0	100	100
1	I	137/144 (95%)	137 (100%)	0	100	100
1	J	139/144 (96%)	139 (100%)	0	100	100
1	K	138/144 (96%)	138 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	L	138/144 (96%)	138 (100%)	0	100	100
All	All	1658/1728 (96%)	1655 (100%)	3 (0%)	94	95

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	LEU
1	D	50	ASP
1	F	121	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	130	HIS
1	G	112	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 35 ligands modelled in this entry, 3 are monoatomic - leaving 32 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	PG4	A	202	-	12,12,12	0.83	0	11,11,11	0.72	0
3	PG4	A	203	-	12,12,12	0.46	0	11,11,11	0.49	0
3	PG4	A	204	-	8,8,12	0.65	0	7,7,11	0.26	0
4	HEM	A	205	1	28,50,50	1.71	5 (17%)	17,82,82	2.64	9 (52%)
3	PG4	B	202	-	9,9,12	0.59	0	8,8,11	0.35	0
4	HEM	B	203	1	28,50,50	1.67	6 (21%)	17,82,82	2.15	8 (47%)
3	PG4	C	201	-	12,12,12	0.53	0	11,11,11	0.64	0
3	PG4	C	202	-	9,9,12	0.56	0	8,8,11	0.36	0
3	PG4	D	202	-	9,9,12	0.59	0	8,8,11	0.26	0
4	HEM	D	203	1	28,50,50	1.87	4 (14%)	17,82,82	1.73	4 (23%)
3	PG4	E	201	-	12,12,12	0.54	0	11,11,11	0.43	0
3	PG4	E	202	-	10,10,12	0.60	0	9,9,11	0.18	0
3	PG4	F	201	-	12,12,12	0.56	0	11,11,11	0.39	0
3	PG4	F	202	-	10,10,12	0.57	0	9,9,11	0.33	0
4	HEM	F	203	1	28,50,50	1.77	5 (17%)	17,82,82	2.12	7 (41%)
3	PG4	G	201	-	12,12,12	0.53	0	11,11,11	0.77	0
3	PG4	G	202	-	12,12,12	0.40	0	11,11,11	1.03	1 (9%)
3	PG4	G	203	-	9,9,12	0.61	0	8,8,11	0.36	0
3	PG4	H	201	-	12,12,12	0.47	0	11,11,11	0.52	0
3	PG4	H	202	-	12,12,12	0.55	0	11,11,11	0.47	0
3	PG4	H	203	-	7,7,12	0.65	0	6,6,11	0.24	0
3	PG4	I	201	-	9,9,12	0.61	0	8,8,11	0.17	0
4	HEM	I	202	1	28,50,50	1.61	5 (17%)	17,82,82	2.22	7 (41%)
3	PG4	J	201	-	12,12,12	0.52	0	11,11,11	0.43	0
3	PG4	J	202	-	9,9,12	0.56	0	8,8,11	0.33	0
3	PG4	J	203	-	12,12,12	0.43	0	11,11,11	0.44	0
4	HEM	J	204	1	28,50,50	1.72	4 (14%)	17,82,82	2.14	7 (41%)
3	PG4	K	201	-	12,12,12	0.54	0	11,11,11	0.27	0
3	PG4	K	202	-	9,9,12	0.53	0	8,8,11	0.37	0
3	PG4	L	201	-	12,12,12	0.47	0	11,11,11	0.53	0
3	PG4	L	202	-	10,10,12	0.59	0	9,9,11	0.28	0
4	HEM	L	203	1	28,50,50	1.82	4 (14%)	17,82,82	1.87	7 (41%)

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	PG4	A	202	-	-	0/10/10/10	0/0/0/0
3	PG4	A	203	-	-	0/10/10/10	0/0/0/0

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PG4	A	204	-	-	0/6/6/10	0/0/0/0
4	HEM	A	205	1	-	0/6/54/54	0/0/8/8
3	PG4	B	202	-	-	0/7/7/10	0/0/0/0
4	HEM	B	203	1	-	0/6/54/54	0/0/8/8
3	PG4	C	201	-	-	0/10/10/10	0/0/0/0
3	PG4	C	202	-	-	0/7/7/10	0/0/0/0
3	PG4	D	202	-	-	0/7/7/10	0/0/0/0
4	HEM	D	203	1	-	0/6/54/54	0/0/8/8
3	PG4	E	201	-	-	0/10/10/10	0/0/0/0
3	PG4	E	202	-	-	0/8/8/10	0/0/0/0
3	PG4	F	201	-	-	0/10/10/10	0/0/0/0
3	PG4	F	202	-	-	0/8/8/10	0/0/0/0
4	HEM	F	203	1	-	0/6/54/54	0/0/8/8
3	PG4	G	201	-	-	0/10/10/10	0/0/0/0
3	PG4	G	202	-	-	0/10/10/10	0/0/0/0
3	PG4	G	203	-	-	0/7/7/10	0/0/0/0
3	PG4	H	201	-	-	0/10/10/10	0/0/0/0
3	PG4	H	202	-	-	0/10/10/10	0/0/0/0
3	PG4	H	203	-	-	0/5/5/10	0/0/0/0
3	PG4	I	201	-	-	0/7/7/10	0/0/0/0
4	HEM	I	202	1	-	0/6/54/54	0/0/8/8
3	PG4	J	201	-	-	0/10/10/10	0/0/0/0
3	PG4	J	202	-	-	0/7/7/10	0/0/0/0
3	PG4	J	203	-	-	0/10/10/10	0/0/0/0
4	HEM	J	204	1	-	0/6/54/54	0/0/8/8
3	PG4	K	201	-	-	0/10/10/10	0/0/0/0
3	PG4	K	202	-	-	0/7/7/10	0/0/0/0
3	PG4	L	201	-	-	0/10/10/10	0/0/0/0
3	PG4	L	202	-	-	0/8/8/10	0/0/0/0
4	HEM	L	203	1	-	0/6/54/54	0/0/8/8

All (33) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	203	HEM	C3B-C2B	-4.63	1.34	1.40
4	F	203	HEM	C3C-C2C	-4.16	1.34	1.40
4	B	203	HEM	C3B-C2B	-4.15	1.34	1.40
4	L	203	HEM	C3B-C2B	-4.14	1.34	1.40
4	J	204	HEM	C3C-C2C	-3.86	1.35	1.40
4	J	204	HEM	C3B-C2B	-3.82	1.35	1.40
4	F	203	HEM	C3B-C2B	-3.77	1.35	1.40
4	D	203	HEM	C3C-C2C	-3.61	1.35	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	205	HEM	C3C-C2C	-3.61	1.35	1.40
4	A	205	HEM	C3B-C2B	-3.39	1.35	1.40
4	B	203	HEM	C3C-C2C	-3.36	1.35	1.40
4	I	202	HEM	C3B-C2B	-3.28	1.36	1.40
4	L	203	HEM	C3C-C2C	-3.20	1.36	1.40
4	I	202	HEM	C3C-C2C	-2.87	1.36	1.40
4	I	202	HEM	CMC-C2C	2.05	1.56	1.51
4	B	203	HEM	CMB-C2B	2.07	1.56	1.51
4	F	203	HEM	C1C-NC	2.11	1.39	1.36
4	B	203	HEM	C4A-NA	2.24	1.40	1.36
4	B	203	HEM	C3B-CAB	2.47	1.52	1.47
4	F	203	HEM	C3B-CAB	2.65	1.53	1.47
4	A	205	HEM	C1C-NC	2.68	1.39	1.36
4	B	203	HEM	C3C-CAC	2.89	1.53	1.47
4	A	205	HEM	C3B-CAB	3.05	1.53	1.47
4	J	204	HEM	C3B-CAB	3.21	1.54	1.47
4	D	203	HEM	C3B-CAB	3.27	1.54	1.47
4	I	202	HEM	C3B-CAB	3.40	1.54	1.47
4	A	205	HEM	C3C-CAC	3.42	1.54	1.47
4	I	202	HEM	C3C-CAC	3.60	1.54	1.47
4	L	203	HEM	C3B-CAB	3.63	1.55	1.47
4	J	204	HEM	C3C-CAC	3.84	1.55	1.47
4	F	203	HEM	C3C-CAC	3.85	1.55	1.47
4	D	203	HEM	C3C-CAC	3.87	1.55	1.47
4	L	203	HEM	C3C-CAC	4.02	1.55	1.47

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	205	HEM	CMD-C2D-C1D	-4.50	121.54	128.46
4	F	203	HEM	CMA-C3A-C4A	-3.75	122.70	128.46
4	A	205	HEM	CMA-C3A-C4A	-3.56	122.99	128.46
4	B	203	HEM	CBD-CAD-C3D	-3.47	105.86	112.47
4	A	205	HEM	CBD-CAD-C3D	-3.28	106.22	112.47
4	A	205	HEM	CBA-CAA-C2A	-3.23	106.31	112.48
4	D	203	HEM	CAD-CBD-CGD	-3.13	107.32	112.66
4	J	204	HEM	CMA-C3A-C4A	-3.09	123.72	128.46
4	F	203	HEM	CBA-CAA-C2A	-2.99	106.77	112.48
4	J	204	HEM	CBA-CAA-C2A	-2.97	106.80	112.48
4	F	203	HEM	CBD-CAD-C3D	-2.84	107.05	112.47
4	I	202	HEM	CBD-CAD-C3D	-2.80	107.14	112.47
4	B	203	HEM	CMA-C3A-C4A	-2.74	124.25	128.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	203	HEM	CBD-CAD-C3D	-2.69	107.33	112.47
4	I	202	HEM	CMA-C3A-C4A	-2.65	124.40	128.46
4	I	202	HEM	CMD-C2D-C1D	-2.61	124.45	128.46
4	D	203	HEM	CBA-CAA-C2A	-2.59	107.53	112.48
4	B	203	HEM	CBA-CAA-C2A	-2.52	107.66	112.48
4	L	203	HEM	CMA-C3A-C4A	-2.40	124.78	128.46
4	J	204	HEM	CBD-CAD-C3D	-2.38	107.92	112.47
4	J	204	HEM	CAD-CBD-CGD	-2.21	108.88	112.66
4	B	203	HEM	CAD-CBD-CGD	-2.20	108.90	112.66
4	I	202	HEM	CBA-CAA-C2A	-2.18	108.31	112.48
4	F	203	HEM	CAA-CBA-CGA	-2.17	108.96	112.66
4	I	202	HEM	CAD-CBD-CGD	-2.13	109.03	112.66
4	L	203	HEM	CAA-CBA-CGA	-2.06	109.13	112.66
4	L	203	HEM	CMD-C2D-C1D	-2.06	125.30	128.46
3	G	202	PG4	C7-O4-C6	-2.04	104.46	113.30
4	L	203	HEM	CBA-CAA-C2A	-2.02	108.62	112.48
4	D	203	HEM	C1D-C2D-C3D	2.14	108.49	107.00
4	B	203	HEM	C4A-C3A-C2A	2.18	108.51	107.00
4	F	203	HEM	CMA-C3A-C2A	2.27	129.23	124.94
4	A	205	HEM	CMA-C3A-C2A	2.28	129.24	124.94
4	F	203	HEM	CMB-C2B-C3B	2.32	129.20	124.89
4	A	205	HEM	C1D-C2D-C3D	2.36	108.64	107.00
4	B	203	HEM	CMB-C2B-C3B	2.58	129.68	124.89
4	A	205	HEM	CMD-C2D-C3D	2.59	129.82	124.94
4	L	203	HEM	CMB-C2B-C3B	2.76	130.01	124.89
4	J	204	HEM	CMB-C2B-C3B	2.83	130.14	124.89
4	J	204	HEM	C1D-C2D-C3D	3.25	109.26	107.00
4	B	203	HEM	C4C-C3C-C2C	3.34	109.23	106.90
4	J	204	HEM	CMC-C2C-C3C	3.46	131.30	124.89
4	D	203	HEM	CMC-C2C-C3C	3.51	131.40	124.89
4	B	203	HEM	CMC-C2C-C3C	3.55	131.48	124.89
4	F	203	HEM	CMC-C2C-C3C	3.73	131.81	124.89
4	L	203	HEM	CMC-C2C-C3C	3.73	131.82	124.89
4	A	205	HEM	CMC-C2C-C3C	3.86	132.06	124.89
4	I	202	HEM	CMB-C2B-C3B	4.02	132.34	124.89
4	I	202	HEM	CMC-C2C-C3C	4.24	132.76	124.89
4	A	205	HEM	CMB-C2B-C3B	4.26	132.80	124.89

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

12 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	202	PG4	1	0
4	A	205	HEM	1	0
4	B	203	HEM	1	0
3	F	201	PG4	1	0
4	F	203	HEM	3	0
3	G	201	PG4	1	0
3	G	202	PG4	3	0
3	I	201	PG4	1	0
4	J	204	HEM	1	0
3	K	201	PG4	1	0
3	L	202	PG4	1	0
4	L	203	HEM	1	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	156/158 (98%)	-0.59	0 100 100	13, 19, 29, 44	0
1	B	156/158 (98%)	-0.65	0 100 100	12, 19, 28, 44	0
1	C	156/158 (98%)	-0.61	0 100 100	13, 18, 28, 50	0
1	D	156/158 (98%)	-0.53	0 100 100	17, 22, 32, 47	0
1	E	156/158 (98%)	-0.66	0 100 100	12, 16, 26, 42	0
1	F	156/158 (98%)	-0.64	0 100 100	12, 19, 28, 47	0
1	G	156/158 (98%)	-0.60	0 100 100	15, 19, 30, 47	0
1	H	156/158 (98%)	-0.49	0 100 100	15, 21, 31, 47	0
1	I	156/158 (98%)	-0.57	0 100 100	14, 20, 30, 46	0
1	J	156/158 (98%)	-0.55	0 100 100	13, 19, 29, 43	0
1	K	156/158 (98%)	-0.60	0 100 100	14, 19, 29, 47	0
1	L	156/158 (98%)	-0.47	0 100 100	15, 21, 31, 49	0
All	All	1872/1896 (98%)	-0.58	0 100 100	12, 20, 30, 50	0

There are no RSRZ outliers to report.

### 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 ⓘ

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	PG4	A	202	13/13	0.67	0.25	17.99	22,35,55,56	0
2	K	A	201	1/1	1.00	0.16	13.61	4,4,4,4	0
2	K	B	201	1/1	0.99	0.15	10.44	7,7,7,7	0
2	K	D	201	1/1	0.99	0.14	9.12	7,7,7,7	0
3	PG4	H	203	8/13	0.87	0.14	8.60	31,39,49,50	0
3	PG4	C	202	10/13	0.88	0.14	8.42	29,36,45,46	0
3	PG4	H	202	13/13	0.89	0.15	6.65	23,34,43,45	0
3	PG4	D	202	10/13	0.89	0.16	5.86	33,43,47,50	0
3	PG4	B	202	10/13	0.81	0.20	5.66	32,41,47,48	0
3	PG4	F	201	13/13	0.88	0.15	5.55	25,35,49,60	0
3	PG4	G	201	13/13	0.90	0.13	4.95	28,36,43,43	0
3	PG4	I	201	10/13	0.80	0.16	4.70	32,41,47,47	0
3	PG4	G	203	10/13	0.85	0.16	4.68	27,42,48,53	0
3	PG4	H	201	13/13	0.91	0.14	4.38	27,36,46,47	0
3	PG4	A	203	13/13	0.92	0.14	4.21	21,33,39,43	0
3	PG4	J	202	10/13	0.85	0.16	4.16	34,41,48,51	0
3	PG4	E	201	13/13	0.92	0.12	3.74	25,31,37,38	0
3	PG4	A	204	9/13	0.81	0.20	3.63	32,38,47,49	0
3	PG4	G	202	13/13	0.92	0.12	3.20	21,33,42,53	0
3	PG4	C	201	13/13	0.90	0.14	3.20	20,30,40,41	0
3	PG4	L	202	11/13	0.87	0.17	3.10	38,46,55,63	0
3	PG4	K	202	10/13	0.93	0.15	3.01	28,38,41,47	0
3	PG4	K	201	13/13	0.87	0.13	2.78	27,35,46,49	0
4	HEM	I	202	43/43	0.97	0.09	2.73	13,19,32,34	0
3	PG4	L	201	13/13	0.90	0.12	2.57	23,33,45,45	0
4	HEM	F	203	43/43	0.97	0.09	2.39	13,19,34,40	0
3	PG4	F	202	11/13	0.88	0.14	1.92	34,39,53,56	0
3	PG4	E	202	11/13	0.89	0.15	1.70	29,35,45,50	0
4	HEM	J	204	43/43	0.97	0.09	1.42	14,20,35,40	0
4	HEM	L	203	43/43	0.97	0.10	1.17	15,19,30,30	43
4	HEM	B	203	43/43	0.98	0.09	1.17	11,16,33,35	0
4	HEM	D	203	43/43	0.98	0.10	0.84	16,19,30,32	43
3	PG4	J	201	13/13	0.93	0.09	0.67	22,31,44,45	0
4	HEM	A	205	43/43	0.98	0.08	0.53	14,19,32,40	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	PG4	J	203	13/13	0.96	0.09	-0.05	27,29,39,39	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.