



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 05:43 AM GMT

PDB ID : 2RGZ  
Title : Ensemble refinement of the protein crystal structure of human heme oxygenase-2 C127A (HO-2) with bound heme  
Authors : Bianchetti, C.M.; Bingman, C.A.; Bitto, E.; Wesenberg, G.E.; Phillips Jr., G.N.; Center for Eukaryotic Structural Genomics (CESG)  
Deposited on : 2007-10-05  
Resolution : 2.61 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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

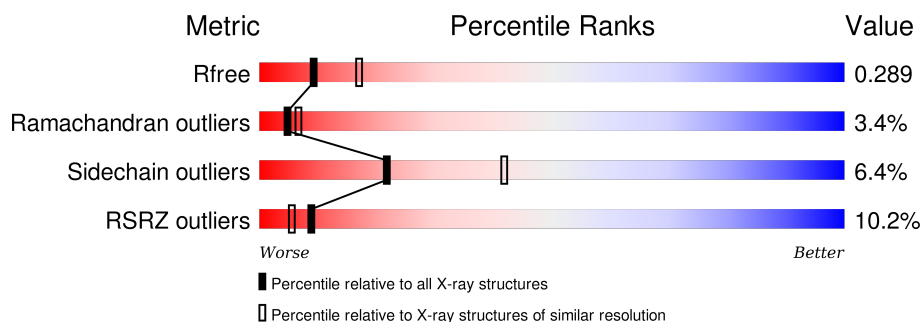
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.61 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	2700 (2.64-2.60)
Ramachandran outliers	100387	3015 (2.64-2.60)
Sidechain outliers	100360	3015 (2.64-2.60)
RSRZ outliers	91569	2706 (2.64-2.60)

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	1-A	264	<div> <div>3%</div> <div>77%</div> <div>5%</div> <div>19%</div> </div>
1	1-B	264	<div> <div>15%</div> <div>76%</div> <div>7%</div> <div>17%</div> </div>
1	10-A	264	<div> <div>3%</div> <div>77%</div> <div>•</div> <div>19%</div> </div>
1	10-B	264	<div> <div>15%</div> <div>77%</div> <div>6%</div> <div>•</div> <div>17%</div> </div>
1	11-A	264	<div> <div>3%</div> <div>75%</div> <div>6%</div> <div>19%</div> </div>
1	11-B	264	<div> <div>15%</div> <div>77%</div> <div>6%</div> <div>17%</div> </div>
1	12-A	264	<div> <div>3%</div> <div>78%</div> <div>•</div> <div>19%</div> </div>

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Mol	Chain	Length	Quality of chain
1	12-B	264	
1	13-A	264	
1	13-B	264	
1	14-A	264	
1	14-B	264	
1	15-A	264	
1	15-B	264	
1	16-A	264	
1	16-B	264	
1	2-A	264	
1	2-B	264	
1	3-A	264	
1	3-B	264	
1	4-A	264	
1	4-B	264	
1	5-A	264	
1	5-B	264	
1	6-A	264	
1	6-B	264	
1	7-A	264	
1	7-B	264	
1	8-A	264	
1	8-B	264	
1	9-A	264	
1	9-B	264	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 58291 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 Heme oxygenase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	1-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	2-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	3-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	4-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	5-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	6-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	7-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	8-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	9-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	10-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	11-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	12-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	13-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	14-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	15-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			
1	16-A	214	Total	C	N	O	S	0	0	0
			1758	1118	299	333	8			

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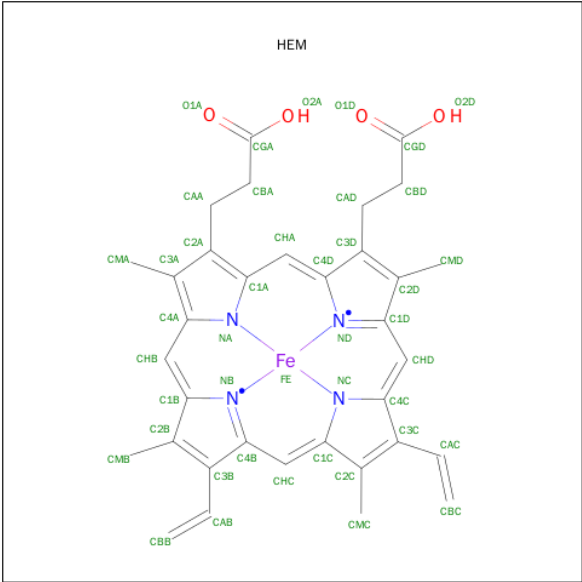
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	1-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	2-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	3-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	4-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	5-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	6-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	7-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	8-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	9-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	10-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	11-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	12-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	13-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	14-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	15-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			
1	16-B	219	Total	C	N	O	S	0	0	0
			1794	1140	304	342	8			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	127	ALA	CYS	ENGINEERED	UNP P30519
B	127	ALA	CYS	ENGINEERED	UNP P30519

- Molecule 2 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
2	1-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	2-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	3-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	4-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	5-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	6-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	7-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	8-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	9-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	10-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	11-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	12-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	13-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	14-A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	15-A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	16-A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	1-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	2-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	3-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	4-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	5-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	6-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	7-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	8-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	9-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	10-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	11-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	12-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	13-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	14-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	15-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	16-B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	1-A	49	Total	O	0	0
			49	49		

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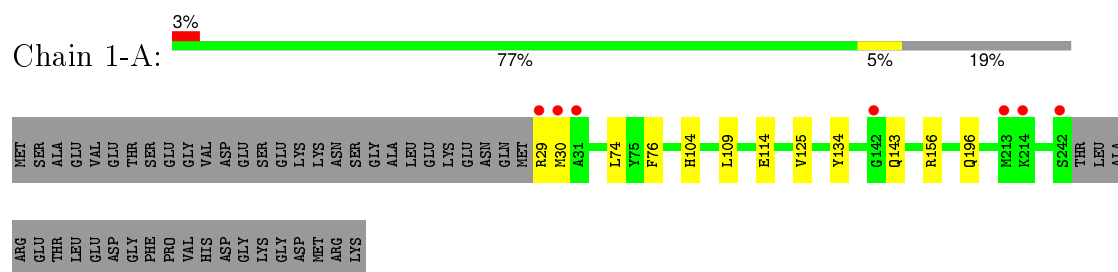
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	1-B	34	Total	O	0	0
			34	34		



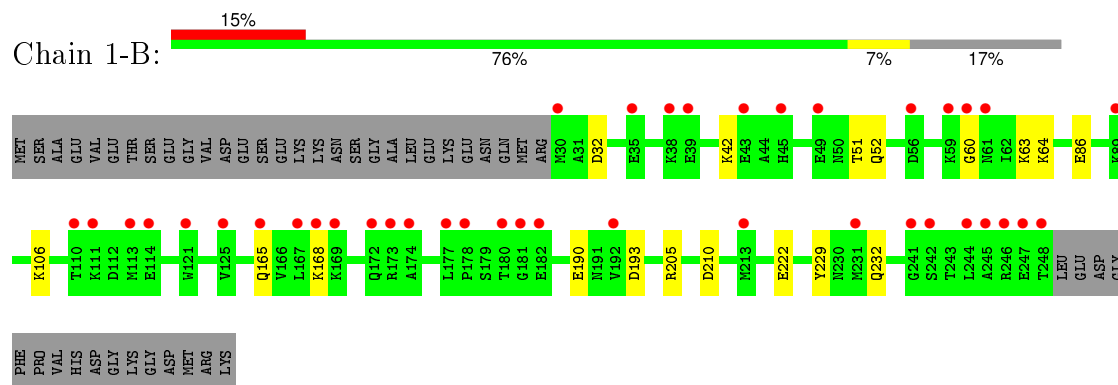
### 3 Residue-property plots

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 ( $\text{RSRZ} > 2$ ). 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.

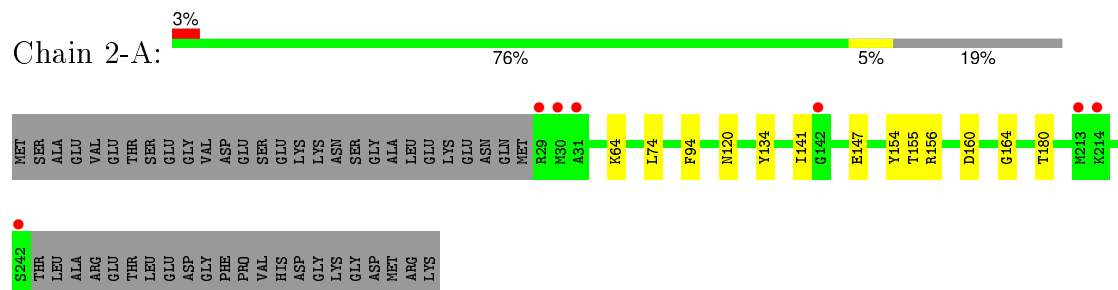
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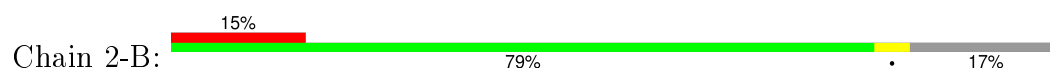
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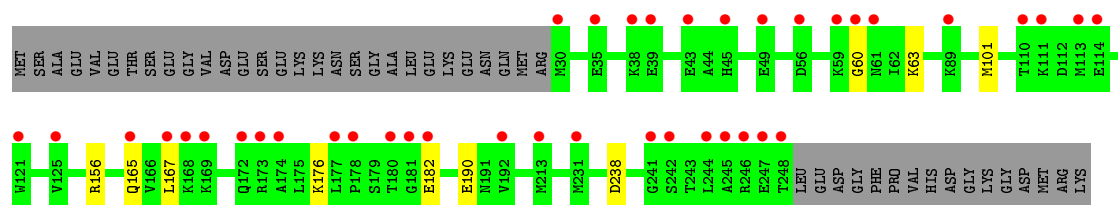


- Molecule 1: Heme oxygenase 2

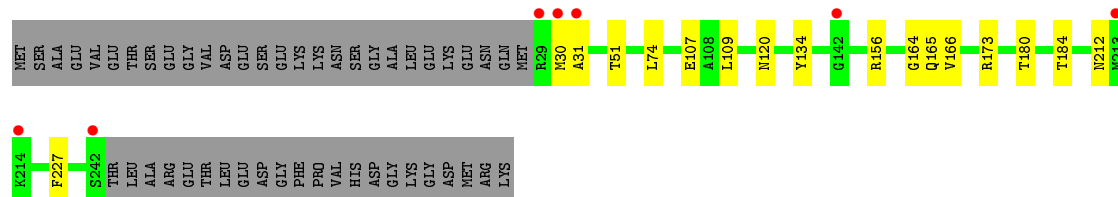
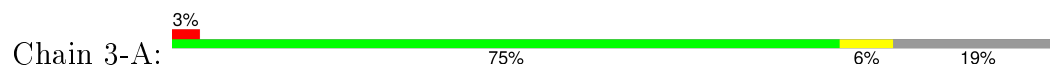


- Molecule 1: Heme oxygenase 2

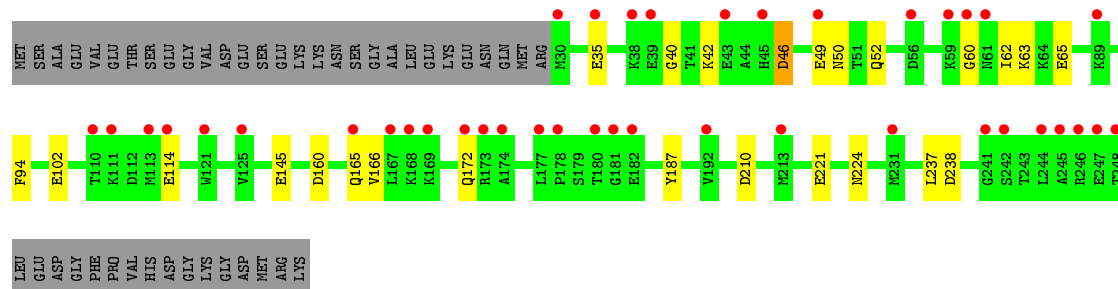
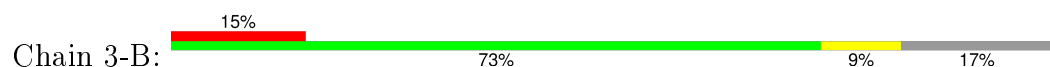




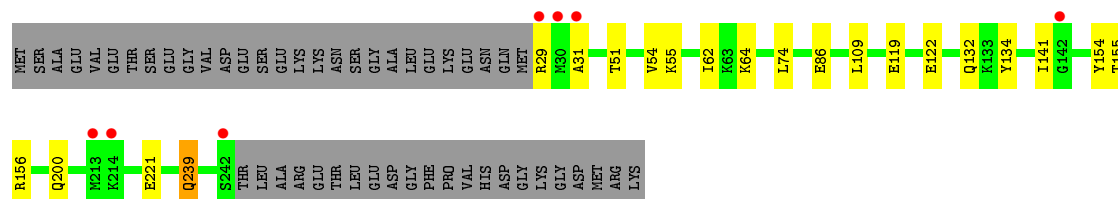
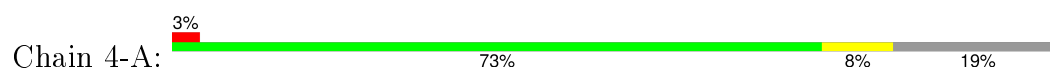
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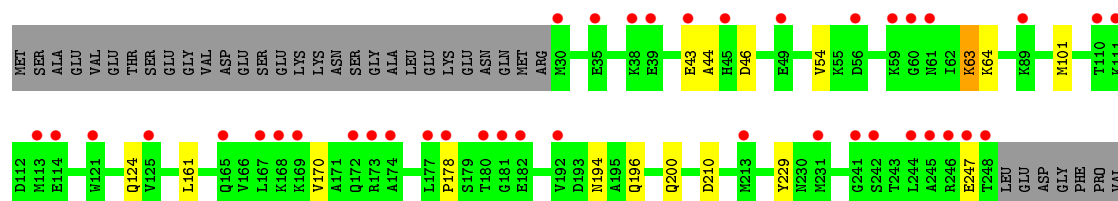
- Molecule 1: Heme oxygenase 2



- Molecule 1: Heme oxygenase 2




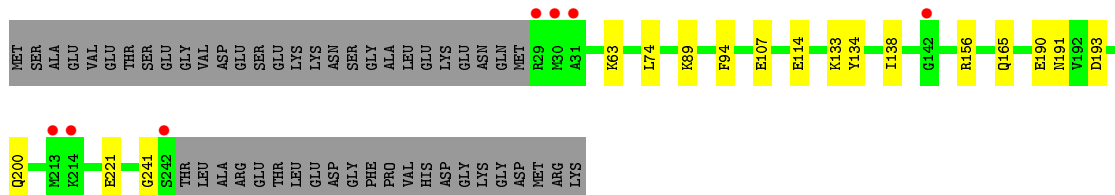
- Molecule 1: Heme oxygenase 2




HIS  
ASP  
GLY  
LYS  
GLY  
ASP  
MET  
ARG  
LYS

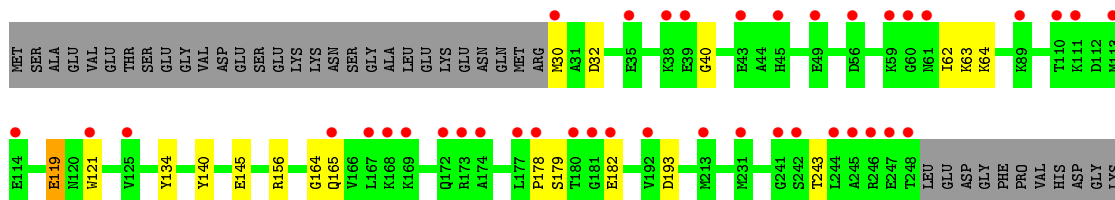
- Molecule 1: Heme oxygenase 2

Chain 5-A: 




- Molecule 1: Heme oxygenase 2

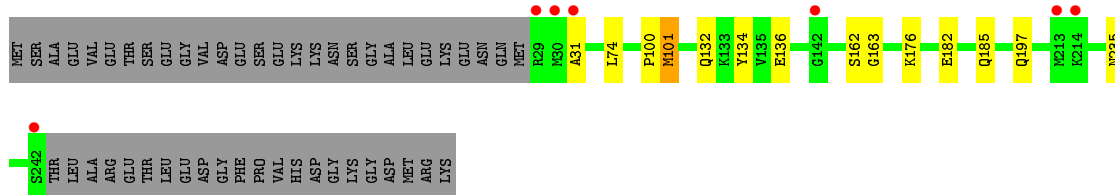
Chain 5-B: 




GLY  
ASP  
MET  
ARG  
LYS

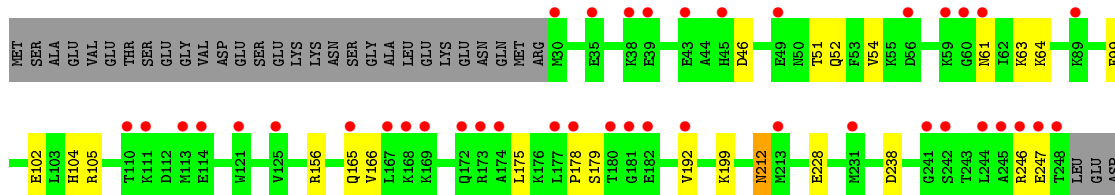
- Molecule 1: Heme oxygenase 2

Chain 6-A: 

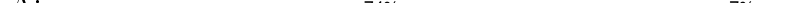


- Molecule 1: Heme oxygenase 2

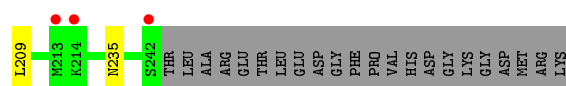
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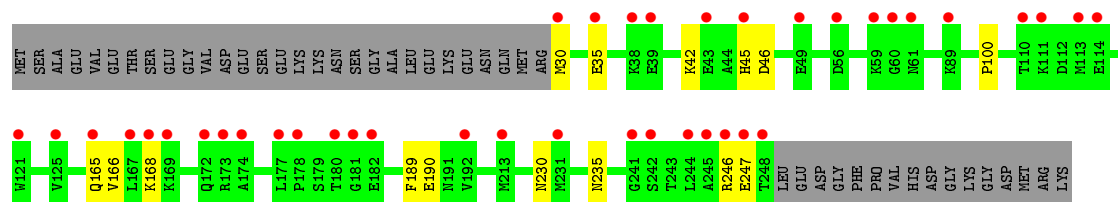
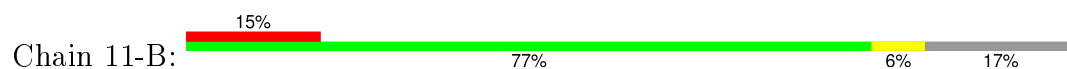
GLY  
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PRO  
VAL  
HIS  
ASP  
GLY  
LYS  
GLY  
MET  
ASP  
ARG  
LYS

- Chain 9-A: 

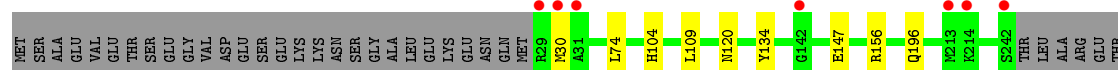
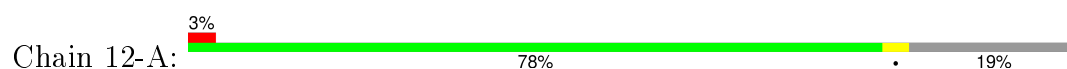




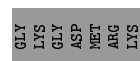
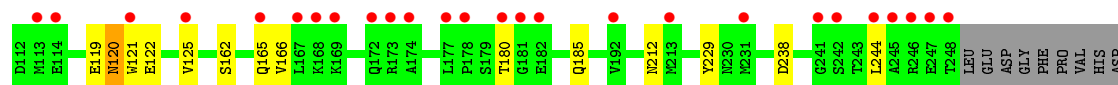
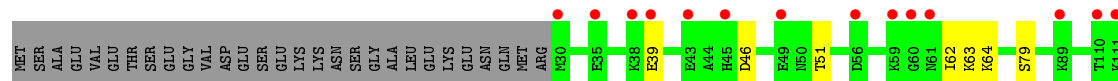
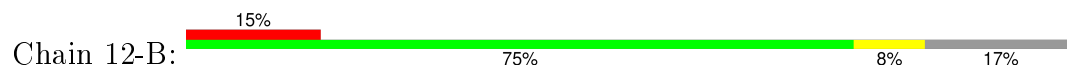
- Molecule 1: Heme oxygenase 2



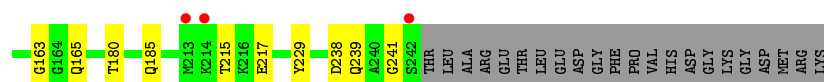
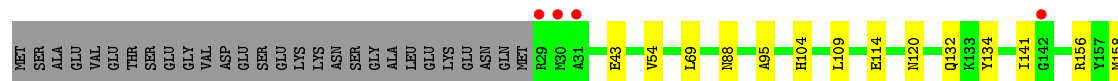
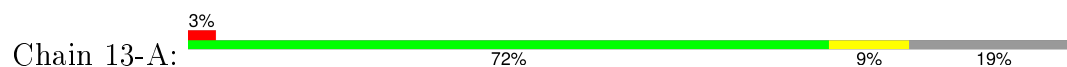
- Molecule 1: Heme oxygenase 2



- Molecule 1: Heme oxygenase 2

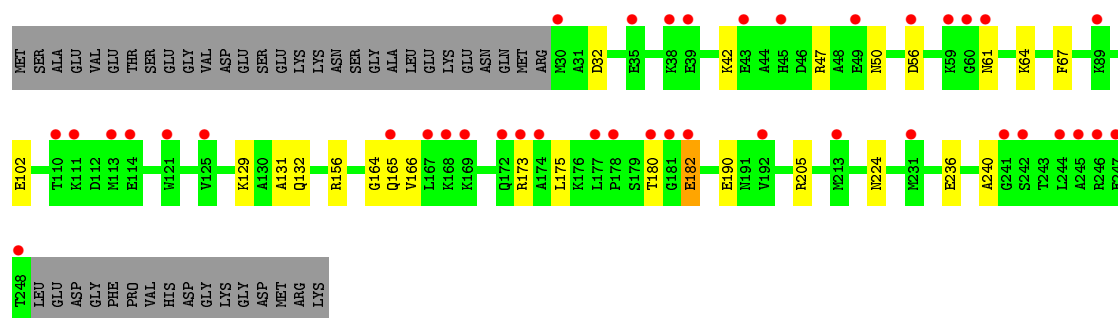


- Molecule 1: Heme oxygenase 2

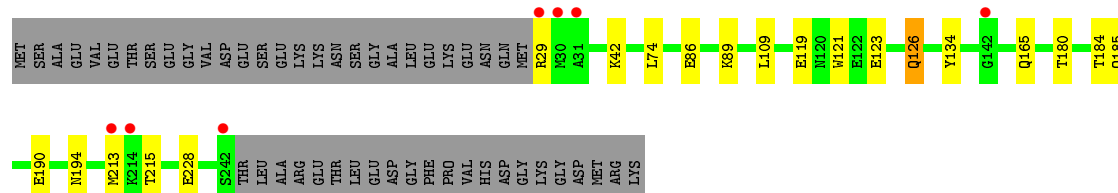
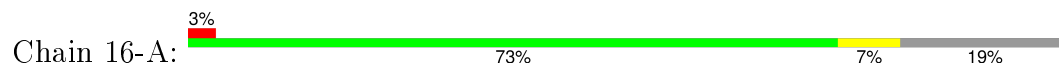


- Molecule 1: Heme oxygenase 2

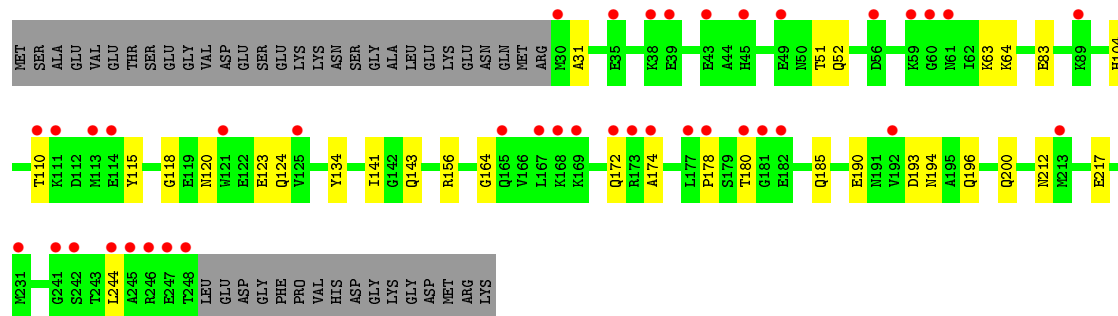
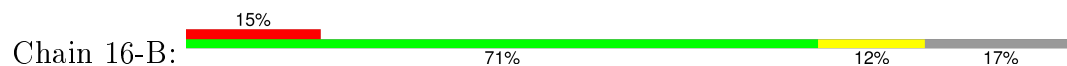




- Molecule 1: Heme oxygenase 2



- Molecule 1: Heme oxygenase 2





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.98Å 85.09Å 97.85Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.02 – 2.61 39.02 – 2.61	Depositor EDS
% Data completeness (in resolution range)	99.3 (39.02-2.61) 99.4 (39.02-2.61)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.30 (at 2.61Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.161 , 0.249 0.211 , 0.289	Depositor DCC
$R_{free}$ test set	1005 reflections (5.43%)	DCC
Wilson B-factor (Å <sup>2</sup> )	66.1	Xtriage
Anisotropy	0.048	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.23 , 158.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 19515 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	58291	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.90% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	1-A	0.43	0/1794	0.57	0/2410
1	1-B	0.39	0/1830	0.54	0/2460
1	2-A	0.43	0/1794	0.56	0/2410
1	2-B	0.40	0/1830	0.54	0/2460
1	3-A	0.43	0/1794	0.57	0/2410
1	3-B	0.39	0/1830	0.56	0/2460
1	4-A	0.44	0/1794	0.58	0/2410
1	4-B	0.39	0/1830	0.56	0/2460
1	5-A	0.43	0/1794	0.58	1/2410 (0.0%)
1	5-B	0.39	0/1830	0.54	0/2460
1	6-A	0.42	0/1794	0.56	0/2410
1	6-B	0.40	0/1830	0.55	0/2460
1	7-A	0.42	0/1794	0.57	0/2410
1	7-B	0.39	0/1830	0.54	0/2460
1	8-A	0.44	0/1794	0.57	0/2410
1	8-B	0.39	0/1830	0.55	0/2460
1	9-A	0.43	0/1794	0.57	0/2410
1	9-B	0.39	0/1830	0.54	0/2460
1	10-A	0.43	0/1794	0.57	0/2410
1	10-B	0.40	0/1830	0.55	0/2460
1	11-A	0.43	0/1794	0.56	0/2410
1	11-B	0.40	0/1830	0.55	0/2460
1	12-A	0.43	0/1794	0.55	0/2410
1	12-B	0.40	0/1830	0.55	0/2460
1	13-A	0.47	0/1794	0.63	0/2410
1	13-B	0.43	0/1830	0.55	0/2460
1	14-A	0.48	0/1794	0.61	0/2410
1	14-B	0.44	0/1830	0.58	0/2460
1	15-A	0.50	0/1794	0.64	0/2410
1	15-B	0.43	0/1830	0.60	0/2460
1	16-A	0.49	0/1794	0.64	0/2410
1	16-B	0.42	0/1830	0.57	0/2460

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
All	All	0.42	0/57984	0.57	1/77920 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	5-A	156	ARG	NE-CZ-NH2	-5.48	117.56	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	1-A	1758	0	1717	0	0
1	1-B	1794	0	1753	0	0
1	2-A	1758	0	1717	0	0
1	2-B	1794	0	1753	0	0
1	3-A	1758	0	1717	0	0
1	3-B	1794	0	1753	0	0
1	4-A	1758	0	1717	0	0
1	4-B	1794	0	1753	0	0
1	5-A	1758	0	1717	0	0
1	5-B	1794	0	1753	0	0
1	6-A	1758	0	1717	0	0
1	6-B	1794	0	1753	0	0
1	7-A	1758	0	1717	0	0
1	7-B	1794	0	1753	0	0
1	8-A	1758	0	1717	0	0
1	8-B	1794	0	1753	0	0
1	9-A	1758	0	1717	0	0
1	9-B	1794	0	1753	0	0
1	10-A	1758	0	1717	0	0
1	10-B	1794	0	1753	0	0
1	11-A	1758	0	1717	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	11-B	1794	0	1753	0	0
1	12-A	1758	0	1717	0	0
1	12-B	1794	0	1753	0	0
1	13-A	1758	0	1717	0	0
1	13-B	1794	0	1753	0	0
1	14-A	1758	0	1717	0	0
1	14-B	1794	0	1753	0	0
1	15-A	1758	0	1717	0	0
1	15-B	1794	0	1753	0	0
1	16-A	1758	0	1717	0	0
1	16-B	1794	0	1753	0	0
2	1-A	43	0	30	0	0
2	1-B	43	0	30	0	0
2	2-A	43	0	30	0	0
2	2-B	43	0	30	0	0
2	3-A	43	0	30	0	0
2	3-B	43	0	30	0	0
2	4-A	43	0	30	0	0
2	4-B	43	0	30	0	0
2	5-A	43	0	30	0	0
2	5-B	43	0	30	0	0
2	6-A	43	0	30	0	0
2	6-B	43	0	30	0	0
2	7-A	43	0	30	0	0
2	7-B	43	0	30	0	0
2	8-A	43	0	30	0	0
2	8-B	43	0	30	0	0
2	9-A	43	0	30	0	0
2	9-B	43	0	30	0	0
2	10-A	43	0	30	0	0
2	10-B	43	0	30	0	0
2	11-A	43	0	30	0	0
2	11-B	43	0	30	0	0
2	12-A	43	0	30	0	0
2	12-B	43	0	30	0	0
2	13-A	43	0	30	0	0
2	13-B	43	0	30	0	0
2	14-A	43	0	30	0	0
2	14-B	43	0	30	0	0
2	15-A	43	0	30	0	0
2	15-B	43	0	30	0	0
2	16-A	43	0	30	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	16-B	43	0	30	0	0
3	1-A	49	0	0	0	0
3	1-B	34	0	0	0	0
All	All	58291	0	56480	0	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). Clashscore could not be calculated for this entry.

There are no clashes within the asymmetric unit.

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	1-A	212/264 (80%)	185 (87%)	23 (11%)	4 (2%)	10	18
1	1-B	217/264 (82%)	190 (88%)	19 (9%)	8 (4%)	4	5
1	2-A	212/264 (80%)	184 (87%)	23 (11%)	5 (2%)	7	12
1	2-B	217/264 (82%)	183 (84%)	30 (14%)	4 (2%)	11	20
1	3-A	212/264 (80%)	192 (91%)	17 (8%)	3 (1%)	14	26
1	3-B	217/264 (82%)	174 (80%)	33 (15%)	10 (5%)	3	3
1	4-A	212/264 (80%)	188 (89%)	17 (8%)	7 (3%)	5	7
1	4-B	217/264 (82%)	175 (81%)	35 (16%)	7 (3%)	5	7
1	5-A	212/264 (80%)	189 (89%)	18 (8%)	5 (2%)	7	12
1	5-B	217/264 (82%)	186 (86%)	22 (10%)	9 (4%)	3	4
1	6-A	212/264 (80%)	181 (85%)	25 (12%)	6 (3%)	6	9
1	6-B	217/264 (82%)	167 (77%)	38 (18%)	12 (6%)	2	2
1	7-A	212/264 (80%)	182 (86%)	26 (12%)	4 (2%)	10	18
1	7-B	217/264 (82%)	183 (84%)	28 (13%)	6 (3%)	6	9

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	8-A	212/264 (80%)	187 (88%)	21 (10%)	4 (2%)	10	18
1	8-B	217/264 (82%)	183 (84%)	21 (10%)	13 (6%)	2	2
1	9-A	212/264 (80%)	179 (84%)	24 (11%)	9 (4%)	3	4
1	9-B	217/264 (82%)	184 (85%)	23 (11%)	10 (5%)	3	3
1	10-A	212/264 (80%)	189 (89%)	20 (9%)	3 (1%)	14	26
1	10-B	217/264 (82%)	185 (85%)	23 (11%)	9 (4%)	3	4
1	11-A	212/264 (80%)	185 (87%)	24 (11%)	3 (1%)	14	26
1	11-B	217/264 (82%)	184 (85%)	28 (13%)	5 (2%)	8	13
1	12-A	212/264 (80%)	198 (93%)	12 (6%)	2 (1%)	21	41
1	12-B	217/264 (82%)	174 (80%)	33 (15%)	10 (5%)	3	3
1	13-A	212/264 (80%)	186 (88%)	21 (10%)	5 (2%)	7	12
1	13-B	217/264 (82%)	182 (84%)	26 (12%)	9 (4%)	3	4
1	14-A	212/264 (80%)	176 (83%)	30 (14%)	6 (3%)	6	9
1	14-B	217/264 (82%)	165 (76%)	35 (16%)	17 (8%)	1	1
1	15-A	212/264 (80%)	176 (83%)	26 (12%)	10 (5%)	3	3
1	15-B	217/264 (82%)	171 (79%)	36 (17%)	10 (5%)	3	3
1	16-A	212/264 (80%)	177 (84%)	32 (15%)	3 (1%)	14	26
1	16-B	217/264 (82%)	172 (79%)	28 (13%)	17 (8%)	1	1
All	All	6864/8448 (81%)	5812 (85%)	817 (12%)	235 (3%)	5	7

5 of 235 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1-B	64	LYS
1	2-A	64	LYS
1	3-B	46	ASP
1	3-B	52	GLN
1	3-B	65	GLU

### 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	1-A	182/224 (81%)	174 (96%)	8 (4%)	35	62
1	1-B	186/224 (83%)	176 (95%)	10 (5%)	27	51
1	2-A	182/224 (81%)	174 (96%)	8 (4%)	35	62
1	2-B	186/224 (83%)	180 (97%)	6 (3%)	46	74
1	3-A	182/224 (81%)	168 (92%)	14 (8%)	16	30
1	3-B	186/224 (83%)	170 (91%)	16 (9%)	13	24
1	4-A	182/224 (81%)	167 (92%)	15 (8%)	14	27
1	4-B	186/224 (83%)	175 (94%)	11 (6%)	24	46
1	5-A	182/224 (81%)	171 (94%)	11 (6%)	24	45
1	5-B	186/224 (83%)	175 (94%)	11 (6%)	24	46
1	6-A	182/224 (81%)	173 (95%)	9 (5%)	31	56
1	6-B	186/224 (83%)	173 (93%)	13 (7%)	19	36
1	7-A	182/224 (81%)	170 (93%)	12 (7%)	21	39
1	7-B	186/224 (83%)	177 (95%)	9 (5%)	31	57
1	8-A	182/224 (81%)	174 (96%)	8 (4%)	35	62
1	8-B	186/224 (83%)	173 (93%)	13 (7%)	19	36
1	9-A	182/224 (81%)	173 (95%)	9 (5%)	31	56
1	9-B	186/224 (83%)	180 (97%)	6 (3%)	46	74
1	10-A	182/224 (81%)	172 (94%)	10 (6%)	27	50
1	10-B	186/224 (83%)	176 (95%)	10 (5%)	27	51
1	11-A	182/224 (81%)	168 (92%)	14 (8%)	16	30
1	11-B	186/224 (83%)	176 (95%)	10 (5%)	27	51
1	12-A	182/224 (81%)	175 (96%)	7 (4%)	40	68
1	12-B	186/224 (83%)	174 (94%)	12 (6%)	21	41
1	13-A	182/224 (81%)	163 (90%)	19 (10%)	9	15
1	13-B	186/224 (83%)	176 (95%)	10 (5%)	27	51
1	14-A	182/224 (81%)	164 (90%)	18 (10%)	10	17
1	14-B	186/224 (83%)	175 (94%)	11 (6%)	24	46
1	15-A	182/224 (81%)	166 (91%)	16 (9%)	12	23
1	15-B	186/224 (83%)	170 (91%)	16 (9%)	13	24
1	16-A	182/224 (81%)	164 (90%)	18 (10%)	10	17

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	16-B	186/224 (83%)	172 (92%)	14 (8%)	17	32
All	All	5888/7168 (82%)	5514 (94%)	374 (6%)	22	42

5 of 374 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	8-B	205	ARG
1	11-A	29	ARG
1	16-A	86	GLU
1	9-A	39	GLU
1	10-A	29	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 175 such sidechains are listed below:

Mol	Chain	Res	Type
1	7-B	185	GLN
1	9-A	143	GLN
1	15-B	232	GLN
1	7-B	232	GLN
1	8-B	124	GLN

### 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](#)

32 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	$\# Z  > 2$
2	HEM	1-A	300	1	30,50,50	2.92	11 (36%)	24,82,82	2.06	6 (25%)
2	HEM	1-B	265	1	30,50,50	2.78	10 (33%)	24,82,82	1.99	7 (29%)
2	HEM	10-A	300	1	30,50,50	2.90	11 (36%)	24,82,82	2.06	6 (25%)
2	HEM	10-B	265	1	30,50,50	2.76	10 (33%)	24,82,82	2.00	7 (29%)
2	HEM	11-A	300	1	30,50,50	2.99	11 (36%)	24,82,82	2.04	6 (25%)
2	HEM	11-B	265	1	30,50,50	2.75	10 (33%)	24,82,82	1.96	7 (29%)
2	HEM	12-A	300	1	30,50,50	2.96	10 (33%)	24,82,82	2.03	6 (25%)
2	HEM	12-B	265	1	30,50,50	2.76	10 (33%)	24,82,82	2.00	6 (25%)
2	HEM	13-A	300	1	30,50,50	2.94	10 (33%)	24,82,82	2.03	6 (25%)
2	HEM	13-B	265	1	30,50,50	2.72	10 (33%)	24,82,82	2.00	7 (29%)
2	HEM	14-A	300	1	30,50,50	2.96	10 (33%)	24,82,82	2.07	6 (25%)
2	HEM	14-B	265	1	30,50,50	2.59	9 (30%)	24,82,82	1.97	6 (25%)
2	HEM	15-A	300	1	30,50,50	2.94	11 (36%)	24,82,82	2.07	6 (25%)
2	HEM	15-B	265	1	30,50,50	2.73	11 (36%)	24,82,82	2.02	7 (29%)
2	HEM	16-A	300	1	30,50,50	2.92	11 (36%)	24,82,82	2.06	6 (25%)
2	HEM	16-B	265	1	30,50,50	2.82	10 (33%)	24,82,82	2.06	6 (25%)
2	HEM	2-A	300	1	30,50,50	2.87	10 (33%)	24,82,82	2.05	6 (25%)
2	HEM	2-B	265	1	30,50,50	2.77	10 (33%)	24,82,82	2.01	7 (29%)
2	HEM	3-A	300	1	30,50,50	2.93	10 (33%)	24,82,82	1.97	6 (25%)
2	HEM	3-B	265	1	30,50,50	2.73	11 (36%)	24,82,82	2.05	6 (25%)
2	HEM	4-A	300	1	30,50,50	2.91	11 (36%)	24,82,82	1.97	6 (25%)
2	HEM	4-B	265	1	30,50,50	2.77	10 (33%)	24,82,82	2.10	6 (25%)
2	HEM	5-A	300	1	30,50,50	2.90	11 (36%)	24,82,82	2.07	6 (25%)
2	HEM	5-B	265	1	30,50,50	2.72	11 (36%)	24,82,82	2.01	6 (25%)
2	HEM	6-A	300	1	30,50,50	2.97	11 (36%)	24,82,82	2.04	6 (25%)
2	HEM	6-B	265	1	30,50,50	2.73	11 (36%)	24,82,82	2.03	6 (25%)
2	HEM	7-A	300	1	30,50,50	2.93	11 (36%)	24,82,82	2.05	6 (25%)
2	HEM	7-B	265	1	30,50,50	2.73	11 (36%)	24,82,82	2.02	6 (25%)
2	HEM	8-A	300	1	30,50,50	2.91	11 (36%)	24,82,82	2.07	6 (25%)
2	HEM	8-B	265	1	30,50,50	2.82	10 (33%)	24,82,82	2.03	7 (29%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	HEM	9-A	300	1	30,50,50	3.02	9 (30%)	24,82,82	2.01	6 (25%)
2	HEM	9-B	265	1	30,50,50	2.78	10 (33%)	24,82,82	2.02	7 (29%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	1-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	1-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	10-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	10-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	11-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	11-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	12-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	12-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	13-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	13-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	14-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	14-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	15-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	15-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	16-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	16-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	2-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	2-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	3-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	3-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	4-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	4-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	5-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	5-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	6-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	6-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	7-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	7-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	8-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	8-B	265	1	-	0/10/54/54	0/0/8/8
2	HEM	9-A	300	1	-	0/10/54/54	0/0/8/8
2	HEM	9-B	265	1	-	0/10/54/54	0/0/8/8

The worst 5 of 333 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	14-A	300	HEM	C3B-C4B	-8.42	1.44	1.51
2	13-A	300	HEM	C3B-C4B	-8.09	1.44	1.51
2	9-A	300	HEM	C3B-C4B	-8.02	1.44	1.51
2	16-A	300	HEM	C3B-C4B	-7.65	1.45	1.51
2	16-B	265	HEM	C3B-C4B	-7.53	1.45	1.51

The worst 5 of 200 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	15-B	265	HEM	C3B-CAB-CBB	-2.21	121.06	124.46
2	9-B	265	HEM	C3B-CAB-CBB	-2.15	121.16	124.46
2	1-B	265	HEM	C3B-CAB-CBB	-2.09	121.25	124.46
2	2-B	265	HEM	C3B-CAB-CBB	-2.08	121.26	124.46
2	11-B	265	HEM	C3B-CAB-CBB	-2.06	121.30	124.46

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 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	1-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	1-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	2-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	2-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	3-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	3-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	4-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	4-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	5-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	5-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	6-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	6-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	7-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	7-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	8-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	8-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	9-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	9-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	10-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	10-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	11-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	11-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	12-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	12-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	13-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	13-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	14-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	14-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	15-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	15-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
1	16-A	214/264 (81%)	0.12	7 (3%) 50 43	29, 50, 62, 67	214 (100%)
1	16-B	219/264 (82%)	0.72	40 (18%) 2 1	34, 59, 81, 91	219 (100%)
All	All	6928/8448 (82%)	0.42	752 (10%) 9 4	29, 53, 78, 91	6928 (100%)

The worst 5 of 752 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	1-A	29	ARG	10.8
1	2-A	29	ARG	10.8
1	3-A	29	ARG	10.8
1	4-A	29	ARG	10.8
1	5-A	29	ARG	10.8

## 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( $\text{\AA}^2$ )	Q<0.9
2	HEM	16-B	265	43/43	0.89	0.21	0.34	54,61,63,64	43
2	HEM	5-B	265	43/43	0.89	0.21	0.15	56,64,66,67	43
2	HEM	10-B	265	43/43	0.89	0.21	0.15	59,64,66,67	43
2	HEM	6-B	265	43/43	0.89	0.21	0.13	57,64,66,68	43
2	HEM	15-B	265	43/43	0.89	0.21	0.12	54,63,65,66	43
2	HEM	14-B	265	43/43	0.89	0.21	0.10	50,60,64,66	43
2	HEM	2-B	265	43/43	0.89	0.21	0.10	57,62,64,64	43
2	HEM	1-B	265	43/43	0.89	0.21	0.06	57,64,65,65	43
2	HEM	11-B	265	43/43	0.89	0.21	0.06	57,62,64,65	43
2	HEM	8-B	265	43/43	0.89	0.21	0.05	55,64,65,66	43
2	HEM	4-B	265	43/43	0.89	0.21	0.03	59,63,65,66	43
2	HEM	13-B	265	43/43	0.89	0.21	0.01	56,63,65,67	43
2	HEM	7-B	265	43/43	0.89	0.21	-0.02	58,64,65,66	43
2	HEM	9-B	265	43/43	0.89	0.21	-0.02	54,63,65,65	43
2	HEM	3-B	265	43/43	0.89	0.21	-0.02	44,62,64,65	43
2	HEM	12-B	265	43/43	0.89	0.21	-0.10	56,62,65,65	43
2	HEM	14-A	300	43/43	0.94	0.16	-0.52	44,50,53,56	43
2	HEM	15-A	300	43/43	0.94	0.16	-0.54	41,51,59,62	43
2	HEM	13-A	300	43/43	0.94	0.16	-0.59	44,49,53,55	43
2	HEM	9-A	300	43/43	0.94	0.16	-0.60	45,50,52,53	43
2	HEM	4-A	300	43/43	0.94	0.16	-0.60	43,49,53,57	43
2	HEM	6-A	300	43/43	0.94	0.16	-0.61	47,53,59,60	43
2	HEM	10-A	300	43/43	0.94	0.16	-0.61	47,53,59,60	43
2	HEM	5-A	300	43/43	0.94	0.16	-0.61	47,53,60,61	43
2	HEM	3-A	300	43/43	0.94	0.16	-0.65	42,51,53,54	43
2	HEM	2-A	300	43/43	0.94	0.16	-0.66	47,52,56,56	43
2	HEM	1-A	300	43/43	0.94	0.16	-0.66	47,53,59,60	43
2	HEM	16-A	300	43/43	0.94	0.16	-0.66	44,51,55,56	43
2	HEM	8-A	300	43/43	0.94	0.16	-0.66	47,52,55,56	43
2	HEM	11-A	300	43/43	0.94	0.16	-0.66	47,53,58,60	43
2	HEM	12-A	300	43/43	0.94	0.16	-0.66	47,53,59,60	43
2	HEM	7-A	300	43/43	0.94	0.16	-0.66	48,53,59,60	43

## 6.5 Other polymers

There are no such residues in this entry.