



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 16, 2017 – 01:34 PM EDT

PDB ID : 5KQQ
Title : Crystal structure of the W153F variant of catalase-peroxidase from *B. pseudomallei* treated
Authors : Loewen, P.C.
Deposited on : unknown
Resolution : 1.87 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

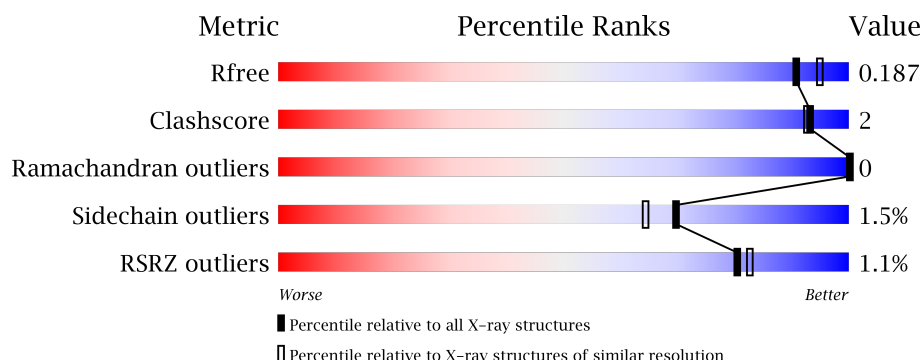
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.87 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	7505 (1.90-1.86)
Clashscore	112137	8369 (1.90-1.86)
Ramachandran outliers	110173	8279 (1.90-1.86)
Sidechain outliers	110143	8280 (1.90-1.86)
RSRZ outliers	101464	7571 (1.90-1.86)

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 $\leq 5\%$. 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	728	
1	B	728	

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
5	PO4	A	804	-	X	-	-
6	MPD	A	805	-	-	-	X
6	MPD	B	805	-	-	-	X

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 12673 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.

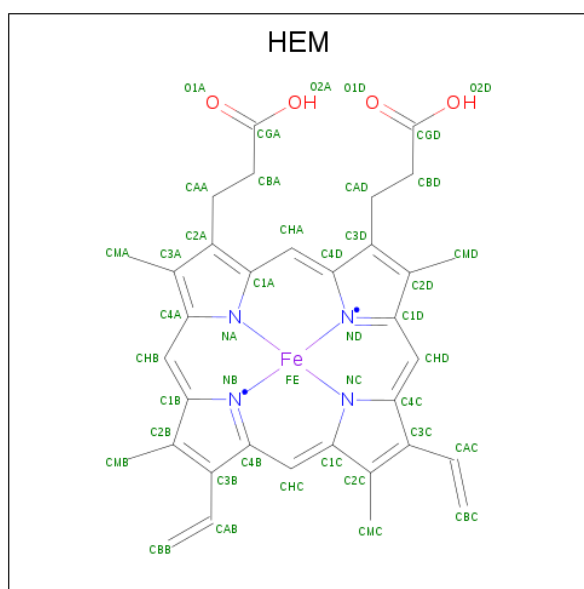
- Molecule 1 is a protein called Catalase-peroxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	713	Total	C	N	O	S	0	6	0
			5547	3500	989	1044	14			
1	B	713	Total	C	N	O	S	0	11	0
			5586	3523	993	1056	14			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	153	PHE	TRP	engineered mutation	UNP Q3JNW6
B	153	PHE	TRP	engineered mutation	UNP Q3JNW6

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



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

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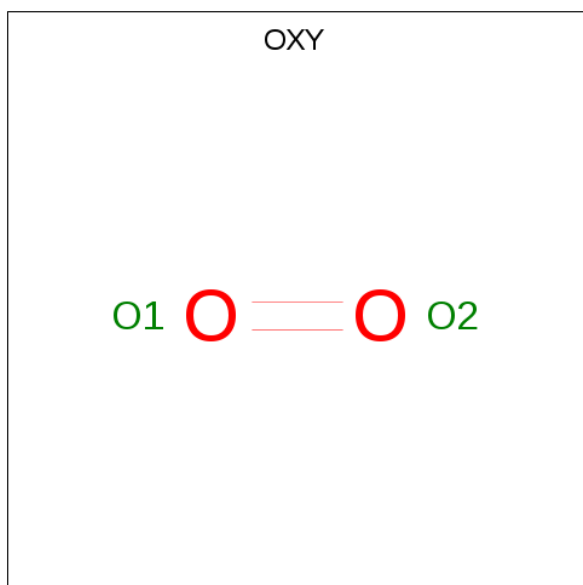
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Na	0	0
			1	1		
3	A	1	Total	Na	0	0
			1	1		

- Molecule 4 is OXYGEN MOLECULE (three-letter code: OXY) (formula: O₂).



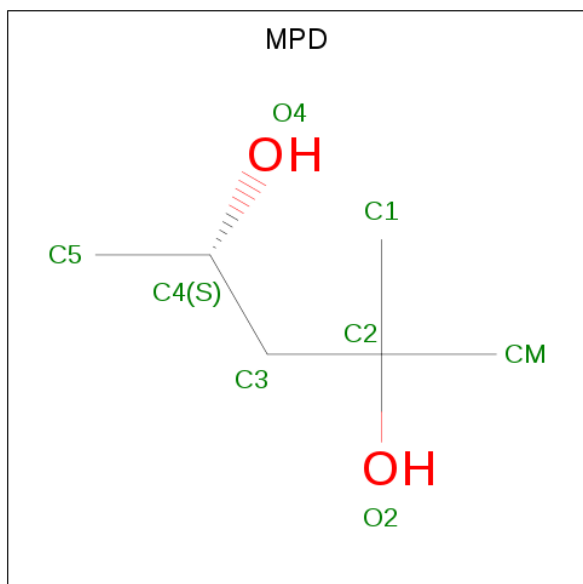
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	O	0	0
			2	2		
4	B	1	Total	O	0	0
			2	2		

- Molecule 5 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	P	0	0
			5	4	1		
5	B	1	Total	O	P	0	0
			5	4	1		

- Molecule 6 is (4S)-2-METHYL-2,4-PENTANEDIOL (three-letter code: MPD) (formula: $C_6H_{14}O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			8	6	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			8	6	2		
6	B	1	Total	C	O	0	0
			8	6	2		

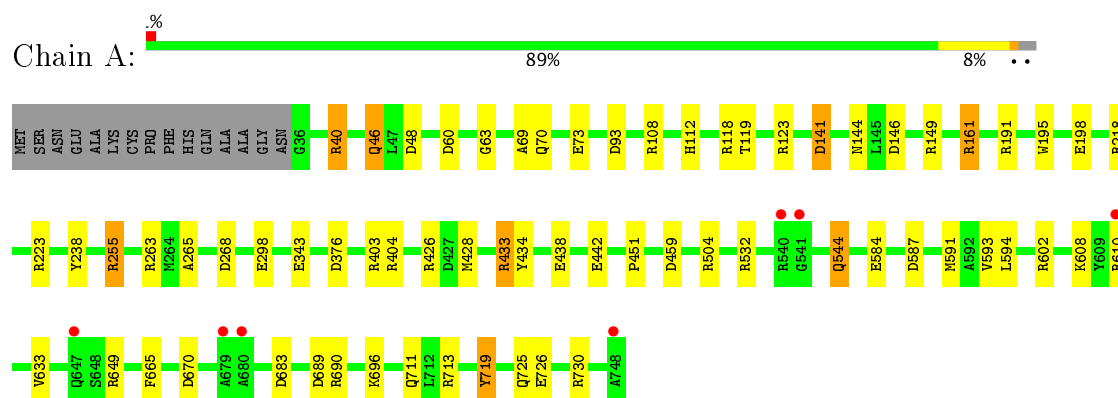
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	710	Total	O	0	1
			710	710		
7	B	704	Total	O	0	2
			704	704		

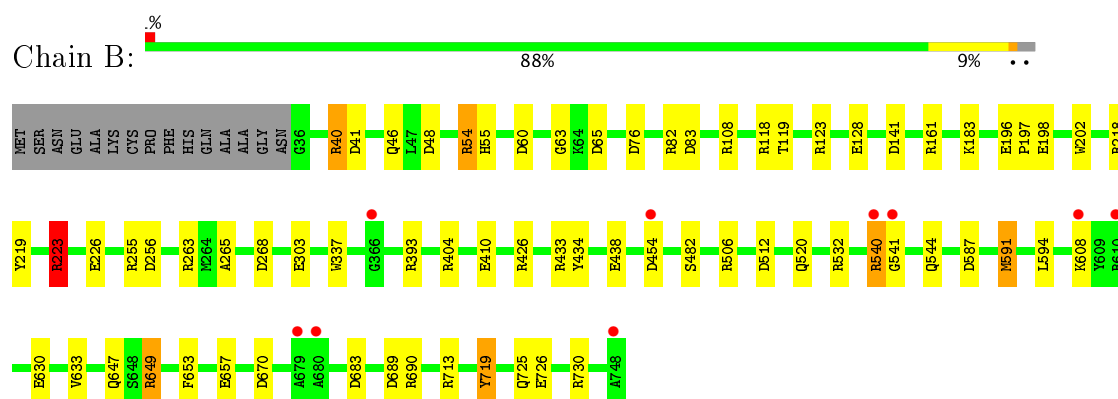
3 Residue-property plots [i](#)

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: Catalase-peroxidase



• Molecule 1: Catalase-peroxidase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	100.92Å 116.13Å 175.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	96.90 – 1.87 48.45 – 1.87	Depositor EDS
% Data completeness (in resolution range)	90.2 (96.90-1.87) 90.2 (48.45-1.87)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.35 (at 1.87Å)	Xtriage
Refinement program	REFMAC 5.8.0151	Depositor
R, R_{free}	0.143 , 0.175 0.157 , 0.187	Depositor DCC
R_{free} test set	7599 reflections (5.20%)	DCC
Wilson B-factor (Å ²)	22.8	Xtriage
Anisotropy	0.326	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 47.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	12673	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.61% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: TOX, OXY, NA, PO4, MPD, 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	1.29	20/5671 (0.4%)	1.29	51/7705 (0.7%)
1	B	1.29	26/5716 (0.5%)	1.19	49/7765 (0.6%)
All	All	1.29	46/11387 (0.4%)	1.24	100/15470 (0.6%)

All (46) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	198	GLU	CG-CD	8.72	1.65	1.51
1	B	198	GLU	CG-CD	8.22	1.64	1.51
1	A	544	GLN	CD-OE1	8.06	1.41	1.24
1	A	725	GLN	CD-NE2	7.96	1.52	1.32
1	A	434	TYR	CE2-CZ	-7.76	1.28	1.38
1	B	730	ARG	CZ-NH1	7.72	1.43	1.33
1	A	434	TYR	CG-CD1	-7.58	1.29	1.39
1	A	442	GLU	CD-OE2	-7.39	1.17	1.25
1	B	512	ASP	CG-OD2	6.86	1.41	1.25
1	B	725	GLN	CD-NE2	6.80	1.49	1.32
1	B	63	GLY	N-CA	6.66	1.56	1.46
1	B	438	GLU	CD-OE1	-6.62	1.18	1.25
1	B	410	GLU	CG-CD	6.61	1.61	1.51
1	B	337	TRP	CE3-CZ3	6.50	1.49	1.38
1	B	434	TYR	CG-CD1	-6.45	1.30	1.39
1	A	725	GLN	CG-CD	6.34	1.65	1.51
1	A	161	ARG	CZ-NH1	6.23	1.41	1.33
1	A	343	GLU	CD-OE1	6.19	1.32	1.25
1	B	128	GLU	CD-OE1	-5.91	1.19	1.25
1	A	195	TRP	CG-CD1	5.88	1.45	1.36
1	B	730	ARG	CZ-NH2	5.80	1.40	1.33
1	A	63	GLY	N-CA	5.78	1.54	1.46
1	B	82	ARG	CZ-NH2	-5.68	1.25	1.33
1	A	161	ARG	CD-NE	-5.67	1.36	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	438	GLU	CD-OE2	5.60	1.31	1.25
1	B	226	GLU	CG-CD	5.56	1.60	1.51
1	B	202	TRP	CZ3-CH2	5.52	1.48	1.40
1	B	196	GLU	CG-CD	5.51	1.60	1.51
1	B	303	GLU	CD-OE2	-5.51	1.19	1.25
1	A	298	GLU	CD-OE2	5.46	1.31	1.25
1	B	219	TYR	CE1-CZ	5.42	1.45	1.38
1	A	255[A]	ARG	CZ-NH2	-5.37	1.26	1.33
1	A	255[B]	ARG	CZ-NH2	-5.37	1.26	1.33
1	B	482	SER	CA-CB	5.31	1.60	1.52
1	B	197	PRO	N-CA	-5.29	1.38	1.47
1	B	630	GLU	CD-OE2	5.21	1.31	1.25
1	B	544	GLN	CD-NE2	5.20	1.45	1.32
1	B	719	TYR	CD2-CE2	5.15	1.47	1.39
1	B	719	TYR	CE2-CZ	5.14	1.45	1.38
1	A	725	GLN	CD-OE1	5.13	1.35	1.24
1	B	196	GLU	CB-CG	-5.11	1.42	1.52
1	A	719	TYR	CD2-CE2	5.10	1.47	1.39
1	B	719	TYR	CZ-OH	5.06	1.46	1.37
1	B	410	GLU	CD-OE2	5.06	1.31	1.25
1	A	584	GLU	CG-CD	5.03	1.59	1.51
1	A	504	ARG	CZ-NH1	-5.00	1.26	1.33

All (100) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	255[A]	ARG	NE-CZ-NH2	-23.01	108.79	120.30
1	A	255[B]	ARG	NE-CZ-NH2	-23.01	108.79	120.30
1	A	161	ARG	NE-CZ-NH2	-18.68	110.96	120.30
1	A	255[A]	ARG	NE-CZ-NH1	16.64	128.62	120.30
1	A	255[B]	ARG	NE-CZ-NH1	16.64	128.62	120.30
1	A	161	ARG	NE-CZ-NH1	14.30	127.45	120.30
1	B	512	ASP	CB-CG-OD1	-11.76	107.72	118.30
1	B	161	ARG	NE-CZ-NH1	11.32	125.96	120.30
1	B	404	ARG	NE-CZ-NH1	10.94	125.77	120.30
1	A	404	ARG	NE-CZ-NH1	10.55	125.58	120.30
1	B	649	ARG	NE-CZ-NH2	-10.50	115.05	120.30
1	A	649	ARG	NE-CZ-NH2	-10.15	115.22	120.30
1	B	713	ARG	NE-CZ-NH1	9.65	125.12	120.30
1	A	263	ARG	NE-CZ-NH2	-9.29	115.65	120.30
1	B	198	GLU	OE1-CD-OE2	-9.15	112.32	123.30
1	A	404	ARG	NE-CZ-NH2	-8.94	115.83	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	40	ARG	NE-CZ-NH1	8.90	124.75	120.30
1	A	198	GLU	OE1-CD-OE2	-8.82	112.71	123.30
1	B	40	ARG	NE-CZ-NH1	8.40	124.50	120.30
1	A	60	ASP	CB-CG-OD2	-8.34	110.79	118.30
1	B	108	ARG	NE-CZ-NH2	-8.33	116.14	120.30
1	B	393	ARG	NE-CZ-NH2	-8.07	116.26	120.30
1	B	40	ARG	NE-CZ-NH2	-7.76	116.42	120.30
1	B	226	GLU	OE1-CD-OE2	-7.60	114.18	123.30
1	B	404	ARG	NE-CZ-NH2	-7.44	116.58	120.30
1	A	649	ARG	NE-CZ-NH1	7.44	124.02	120.30
1	A	713	ARG	NE-CZ-NH1	7.43	124.01	120.30
1	B	123	ARG	NE-CZ-NH1	7.39	124.00	120.30
1	A	433	ARG	NE-CZ-NH1	7.29	123.95	120.30
1	A	670	ASP	CB-CG-OD2	-7.28	111.75	118.30
1	B	268	ASP	CB-CG-OD1	7.25	124.83	118.30
1	A	108	ARG	NE-CZ-NH1	7.24	123.92	120.30
1	A	60	ASP	CB-CG-OD1	7.21	124.78	118.30
1	B	83	ASP	CB-CG-OD2	7.19	124.77	118.30
1	B	48	ASP	CB-CG-OD1	7.12	124.71	118.30
1	B	512	ASP	CB-CG-OD2	7.12	124.71	118.30
1	A	713	ARG	NE-CZ-NH2	-7.10	116.75	120.30
1	A	263	ARG	NE-CZ-NH1	7.09	123.84	120.30
1	B	719	TYR	CB-CG-CD1	-7.00	116.80	121.00
1	A	123	ARG	NE-CZ-NH1	6.97	123.79	120.30
1	B	65	ASP	CB-CG-OD2	-6.88	112.10	118.30
1	A	198	GLU	CG-CD-OE1	6.84	131.99	118.30
1	A	434	TYR	CB-CG-CD1	6.82	125.09	121.00
1	B	268	ASP	CB-CG-OD2	-6.82	112.17	118.30
1	A	433	ARG	NE-CZ-NH2	-6.75	116.92	120.30
1	A	191	ARG	NE-CZ-NH1	6.61	123.61	120.30
1	A	683	ASP	CB-CG-OD2	-6.61	112.35	118.30
1	A	40	ARG	NE-CZ-NH2	-6.49	117.05	120.30
1	A	532	ARG	NE-CZ-NH2	-6.47	117.06	120.30
1	A	376	ASP	CB-CG-OD2	-6.47	112.48	118.30
1	A	690	ARG	NE-CZ-NH1	-6.43	117.09	120.30
1	A	149	ARG	NE-CZ-NH1	6.40	123.50	120.30
1	A	255[A]	ARG	CG-CD-NE	-6.38	98.40	111.80
1	A	255[B]	ARG	CG-CD-NE	-6.38	98.40	111.80
1	B	60	ASP	CB-CG-OD2	-6.33	112.60	118.30
1	A	48	ASP	CB-CG-OD1	6.26	123.93	118.30
1	B	82	ARG	NE-CZ-NH1	6.26	123.43	120.30
1	B	198	GLU	CG-CD-OE1	6.18	130.66	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	689	ASP	CB-CG-OD1	6.13	123.82	118.30
1	A	719	TYR	CB-CG-CD1	-6.12	117.33	121.00
1	B	263	ARG	NE-CZ-NH2	-5.99	117.30	120.30
1	B	587	ASP	CB-CG-OD1	5.94	123.65	118.30
1	B	161	ARG	NE-CZ-NH2	-5.93	117.33	120.30
1	B	506	ARG	NE-CZ-NH1	5.86	123.23	120.30
1	A	587	ASP	CB-CG-OD2	-5.86	113.03	118.30
1	B	433	ARG	NE-CZ-NH1	5.73	123.17	120.30
1	B	218	ARG	NE-CZ-NH2	-5.71	117.44	120.30
1	A	602	ARG	NE-CZ-NH2	-5.66	117.47	120.30
1	B	60	ASP	CB-CG-OD1	5.65	123.38	118.30
1	A	689	ASP	CB-CG-OD1	5.63	123.37	118.30
1	B	690	ARG	NE-CZ-NH2	5.57	123.08	120.30
1	A	218	ARG	NE-CZ-NH2	-5.55	117.52	120.30
1	B	719	TYR	CB-CG-CD2	5.53	124.32	121.00
1	A	268	ASP	CB-CG-OD2	-5.50	113.35	118.30
1	A	683	ASP	CB-CG-OD1	5.48	123.23	118.30
1	A	665	PHE	CB-CG-CD1	-5.47	116.97	120.80
1	B	532	ARG	NE-CZ-NH2	-5.45	117.58	120.30
1	B	541	GLY	N-CA-C	-5.44	99.49	113.10
1	A	93	ASP	CB-CG-OD2	5.43	123.19	118.30
1	B	434	TYR	CB-CG-CD1	5.39	124.23	121.00
1	B	670	ASP	CB-CG-OD2	-5.35	113.48	118.30
1	A	690	ARG	NE-CZ-NH2	5.34	122.97	120.30
1	B	649	ARG	NE-CZ-NH1	5.30	122.95	120.30
1	B	108	ARG	NE-CZ-NH1	5.23	122.92	120.30
1	A	403	ARG	CG-CD-NE	-5.23	100.82	111.80
1	B	41	ASP	CB-CG-OD1	5.21	122.98	118.30
1	A	426[A]	ARG	NE-CZ-NH1	-5.18	117.71	120.30
1	A	426[B]	ARG	NE-CZ-NH1	-5.18	117.71	120.30
1	A	587	ASP	CB-CG-OD1	5.17	122.95	118.30
1	A	459	ASP	CB-CG-OD1	5.15	122.94	118.30
1	B	454	ASP	CB-CG-OD1	5.15	122.94	118.30
1	B	256	ASP	CB-CG-OD1	5.10	122.89	118.30
1	B	725	GLN	CB-CG-CD	5.08	124.82	111.60
1	B	689	ASP	CB-CG-OD2	-5.08	113.73	118.30
1	B	591	MET	CG-SD-CE	-5.07	92.09	100.20
1	B	683	ASP	CB-CG-OD2	-5.05	113.75	118.30
1	B	540	ARG	NE-CZ-NH1	5.05	122.82	120.30
1	B	653	PHE	CB-CG-CD1	5.02	124.31	120.80
1	A	46	GLN	CA-CB-CG	5.00	124.41	113.40
1	B	223	ARG	NE-CZ-NH1	-5.00	117.80	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5547	0	5352	16	0
1	B	5586	0	5381	17	0
2	A	43	0	30	0	0
2	B	43	0	30	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	2	0	0	0	0
4	B	2	0	0	1	0
5	A	5	0	0	0	0
5	B	5	0	0	0	0
6	A	16	0	28	3	0
6	B	8	0	14	1	0
7	A	710	0	0	6	1
7	B	704	0	0	9	1
All	All	12673	0	10835	38	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 (38) 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:B:119[B]:THR:HG21	7:B:1169:HOH:O	1.63	0.96
1:A:119[B]:THR:HG21	7:A:1149:HOH:O	1.64	0.96
1:B:255[B]:ARG:HG2	7:B:1531:HOH:O	1.73	0.88
1:B:520:GLN:HG3	7:B:916:HOH:O	1.78	0.83
1:B:726[B]:GLU:CD	7:B:911:HOH:O	2.16	0.82
1:B:46:GLN:NE2	7:B:901:HOH:O	2.03	0.67
1:A:711:GLN:OE1	7:A:902:HOH:O	2.15	0.64
6:A:805:MPD:CM	6:A:805:MPD:O4	2.46	0.63
1:B:647:GLN:HG2	7:B:918:HOH:O	1.97	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:A:805:MPD:HM1	6:A:805:MPD:O4	2.00	0.61
1:B:76:ASP:OD1	7:B:902:HOH:O	2.16	0.60
1:A:255[A]:ARG:NH2	7:A:903:HOH:O	2.20	0.56
1:A:593:VAL:HG13	7:A:918:HOH:O	2.06	0.55
1:B:54:ARG:HB3	1:B:55:HIS:CD2	2.43	0.54
1:A:633[A]:VAL:CG2	1:A:719:TYR:CZ	2.92	0.53
1:B:540:ARG:CZ	1:B:540:ARG:HA	2.42	0.50
1:A:161:ARG:NH2	7:A:908:HOH:O	2.39	0.50
1:B:633[A]:VAL:CG2	1:B:719:TYR:CZ	2.94	0.50
1:B:647:GLN:NE2	7:B:918:HOH:O	2.45	0.49
4:B:803:OXY:O2	7:B:904:HOH:O	2.20	0.48
1:A:69:ALA:O	1:A:73:GLU:HG3	2.13	0.47
1:A:726[B]:GLU:HG2	1:A:730:ARG:HH12	1.80	0.46
1:B:591:MET:SD	1:B:594:LEU:HD12	2.55	0.46
1:A:696:LYS:HE2	7:A:1080:HOH:O	2.15	0.46
1:A:591:MET:SD	1:A:594:LEU:HD12	2.56	0.46
1:A:144:ASN:HA	1:A:146:ASP:OD1	2.17	0.45
6:A:806:MPD:C5	6:A:806:MPD:H11	2.46	0.45
1:A:70:GLN:HE21	1:A:70:GLN:HB2	1.59	0.44
1:B:540:ARG:NH1	1:B:540:ARG:HA	2.32	0.44
1:A:119[A]:THR:CG2	1:A:265:ALA:HB2	2.48	0.44
1:B:119[A]:THR:CG2	1:B:265:ALA:HB2	2.47	0.44
1:B:649:ARG:HH22	1:B:657[B]:GLU:CD	2.21	0.43
1:B:223:ARG:HD2	1:B:223:ARG:HH11	1.67	0.43
6:B:805:MPD:O4	6:B:805:MPD:H12	2.19	0.43
1:B:426[B]:ARG:HD2	1:B:426[B]:ARG:HA	1.82	0.42
1:A:112:HIS:CE1	1:A:141:ASP:O	2.73	0.41
1:A:428:MET:O	1:A:433:ARG:HD3	2.21	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)
7:A:1151:HOH:O	7:B:1290:HOH:O[2_444]	1.99	0.21

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	715/728 (98%)	705 (99%)	10 (1%)	0	100	100
1	B	720/728 (99%)	711 (99%)	9 (1%)	0	100	100
All	All	1435/1456 (99%)	1416 (99%)	19 (1%)	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	554/560 (99%)	545 (98%)	9 (2%)	68	62
1	B	559/560 (100%)	552 (99%)	7 (1%)	73	70
All	All	1113/1120 (99%)	1097 (99%)	16 (1%)	70	67

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	40	ARG
1	A	46	GLN
1	A	118	ARG
1	A	141	ASP
1	A	223	ARG
1	A	451	PRO
1	A	544	GLN
1	A	608	LYS

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Mol	Chain	Res	Type
1	A	610	ARG
1	B	40	ARG
1	B	54	ARG
1	B	118	ARG
1	B	141	ASP
1	B	183	LYS
1	B	223	ARG
1	B	608	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	70	GLN
1	A	247	ASN
1	B	227	ASN
1	B	406	HIS
1	B	647	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

4 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
1	TOX	A	111[A]	2	12,17,18	2.05	6 (50%)	11,23,25	2.19	5 (45%)
1	TOX	A	111[B]	-	12,17,18	2.05	6 (50%)	11,23,25	2.19	5 (45%)
1	TOX	B	111[A]	2	12,17,18	2.32	5 (41%)	11,23,25	1.40	2 (18%)
1	TOX	B	111[B]	-	12,17,18	2.32	5 (41%)	11,23,25	1.40	2 (18%)

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
1	TOX	A	111[A]	2	-	0/3/8/10	0/2/2/2
1	TOX	A	111[B]	-	-	0/3/8/10	0/2/2/2
1	TOX	B	111[A]	2	-	0/3/8/10	0/2/2/2
1	TOX	B	111[B]	-	-	0/3/8/10	0/2/2/2

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	111[A]	TOX	CD1-NE1	-3.62	1.35	1.39
1	A	111[B]	TOX	CD1-NE1	-3.62	1.35	1.39
1	B	111[A]	TOX	CD1-NE1	-3.29	1.36	1.39
1	B	111[B]	TOX	CD1-NE1	-3.29	1.36	1.39
1	B	111[A]	TOX	CZ2-CE2	-3.11	1.34	1.41
1	B	111[B]	TOX	CZ2-CE2	-3.11	1.34	1.41
1	B	111[A]	TOX	CA-N	-2.50	1.39	1.47
1	B	111[B]	TOX	CA-N	-2.50	1.39	1.47
1	A	111[A]	TOX	CZ2-CE2	-2.16	1.36	1.41
1	A	111[B]	TOX	CZ2-CE2	-2.16	1.36	1.41
1	A	111[A]	TOX	CE3-CD2	-2.13	1.37	1.42
1	A	111[B]	TOX	CE3-CD2	-2.13	1.37	1.42
1	A	111[A]	TOX	O1-NE1	2.08	1.42	1.38
1	A	111[B]	TOX	O1-NE1	2.08	1.42	1.38
1	A	111[A]	TOX	CZ3-CE3	2.19	1.41	1.36
1	A	111[B]	TOX	CZ3-CE3	2.19	1.41	1.36
1	B	111[A]	TOX	CZ3-CH2	3.19	1.45	1.38
1	B	111[B]	TOX	CZ3-CH2	3.19	1.45	1.38
1	A	111[A]	TOX	O-C	3.66	1.35	1.19
1	A	111[B]	TOX	O-C	3.66	1.35	1.19
1	B	111[A]	TOX	O-C	4.30	1.38	1.19
1	B	111[B]	TOX	O-C	4.30	1.38	1.19

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	111[A]	TOX	CZ2-CE2-CD2	-4.01	115.49	120.94
1	A	111[B]	TOX	CZ2-CE2-CD2	-4.01	115.49	120.94
1	A	111[A]	TOX	O-C-CA	-2.82	117.24	125.02
1	A	111[B]	TOX	O-C-CA	-2.82	117.24	125.02

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	111[A]	TOX	CZ3-CE3-CD2	-2.38	117.47	120.88
1	A	111[B]	TOX	CZ3-CE3-CD2	-2.38	117.47	120.88
1	B	111[A]	TOX	O-C-CA	-2.17	119.02	125.02
1	B	111[B]	TOX	O-C-CA	-2.17	119.02	125.02
1	B	111[A]	TOX	CZ2-CE2-CD2	-2.10	118.08	120.94
1	B	111[B]	TOX	CZ2-CE2-CD2	-2.10	118.08	120.94
1	A	111[A]	TOX	CB-CG-CD1	2.53	131.09	127.97
1	A	111[B]	TOX	CB-CG-CD1	2.53	131.09	127.97
1	A	111[A]	TOX	CH2-CZ2-CE2	2.62	124.60	119.33
1	A	111[B]	TOX	CH2-CZ2-CE2	2.62	124.60	119.33

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 2 are monoatomic - leaving 9 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$
2	HEM	A	801	1	28,50,50	1.62	6 (21%)	17,82,82	2.35	5 (29%)
4	OXY	A	803	-	1,1,1	0.21	0	0,0,0	0.00	-
5	PO4	A	804	-	4,4,4	1.33	1 (25%)	6,6,6	2.34	3 (50%)
6	MPD	A	805	-	7,7,7	0.54	0	9,10,10	0.83	0
6	MPD	A	806	-	7,7,7	0.61	0	9,10,10	1.66	2 (22%)
2	HEM	B	801	1	28,50,50	1.76	7 (25%)	17,82,82	2.50	5 (29%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	OXY	B	803	-	1,1,1	0.76	0	0,0,0	0.00	-
5	PO4	B	804	-	4,4,4	0.69	0	6,6,6	1.88	2 (33%)
6	MPD	B	805	-	7,7,7	0.71	0	9,10,10	1.33	2 (22%)

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	A	801	1	-	0/6/54/54	0/0/8/8
4	OXY	A	803	-	-	0/0/0/0	0/0/0/0
5	PO4	A	804	-	-	0/0/0/0	0/0/0/0
6	MPD	A	805	-	-	0/5/5/5	0/0/0/0
6	MPD	A	806	-	-	0/5/5/5	0/0/0/0
2	HEM	B	801	1	-	0/6/54/54	0/0/8/8
4	OXY	B	803	-	-	0/0/0/0	0/0/0/0
5	PO4	B	804	-	-	0/0/0/0	0/0/0/0
6	MPD	B	805	-	-	0/5/5/5	0/0/0/0

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	801	HEM	C1B-NB	-3.68	1.32	1.36
2	A	801	HEM	C3B-C2B	-3.54	1.35	1.40
2	A	801	HEM	CMD-C2D	-3.00	1.45	1.51
2	A	801	HEM	CAD-C3D	-2.37	1.48	1.52
2	A	801	HEM	C1B-NB	-2.28	1.34	1.36
2	B	801	HEM	C3B-C2B	-2.12	1.37	1.40
2	B	801	HEM	C3B-CAB	2.25	1.52	1.47
5	A	804	PO4	P-O1	2.29	1.55	1.50
2	B	801	HEM	C4D-ND	2.38	1.39	1.36
2	A	801	HEM	CAA-C2A	2.46	1.56	1.52
2	A	801	HEM	C4C-NC	2.79	1.40	1.36
2	B	801	HEM	C1A-NA	3.41	1.43	1.36
2	B	801	HEM	C1C-NC	3.70	1.41	1.36
2	B	801	HEM	C4C-NC	3.71	1.41	1.36

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	801	HEM	CAA-CBA-CGA	-6.77	101.08	112.66

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	HEM	CMA-C3A-C4A	-4.61	121.38	128.46
5	A	804	PO4	O3-P-O1	-4.32	92.56	110.97
2	A	801	HEM	CAA-CBA-CGA	-3.44	106.78	112.66
5	B	804	PO4	O2-P-O1	-2.91	98.58	110.97
6	A	806	MPD	CM-C2-C1	-2.55	104.74	110.42
2	B	801	HEM	C1D-C2D-C3D	-2.44	105.30	107.00
6	B	805	MPD	O2-C2-C1	-2.26	100.16	108.00
2	A	801	HEM	CBA-CAA-C2A	2.36	117.00	112.48
5	A	804	PO4	O4-P-O3	2.49	117.06	107.90
5	A	804	PO4	O4-P-O1	2.56	121.86	110.97
6	B	805	MPD	C1-C2-C3	2.61	123.08	110.08
2	B	801	HEM	CMB-C2B-C3B	3.02	130.50	124.89
2	B	801	HEM	CBD-CAD-C3D	3.04	118.26	112.47
2	A	801	HEM	CBD-CAD-C3D	3.33	118.81	112.47
6	A	806	MPD	C5-C4-C3	3.37	128.86	112.11
5	B	804	PO4	O3-P-O2	3.38	120.31	107.90
2	B	801	HEM	CAD-CBD-CGD	4.27	119.96	112.66
2	A	801	HEM	C4A-C3A-C2A	4.45	110.09	107.00

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	805	MPD	2	0
6	A	806	MPD	1	0
4	B	803	OXY	1	0
6	B	805	MPD	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 [i](#)

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

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, 95th 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	712/728 (97%)	-0.51	7 (0%) 82 84	15, 23, 40, 87	0
1	B	712/728 (97%)	-0.46	9 (1%) 77 79	15, 22, 40, 84	0
All	All	1424/1456 (97%)	-0.49	16 (1%) 80 82	15, 22, 40, 87	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	540	ARG	4.5
1	B	608	LYS	4.3
1	B	748	ALA	4.1
1	A	748	ALA	3.6
1	B	679	ALA	3.4
1	B	610	ARG	3.3
1	B	540	ARG	3.2
1	B	680	ALA	2.9
1	B	366	GLY	2.7
1	A	679	ALA	2.5
1	A	541	GLY	2.5
1	A	610	ARG	2.5
1	B	541	GLY	2.4
1	A	680	ALA	2.3
1	A	647	GLN	2.1
1	B	454	ASP	2.0

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th 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(\AA^2)	Q<0.9
1	TOX	A	111[A]	16/17	0.97	0.11	-	15,17,22,22	2
1	TOX	A	111[B]	16/17	0.97	0.11	-	15,17,18,22	2
1	TOX	B	111[A]	16/17	0.98	0.12	-	15,16,23,23	1
1	TOX	B	111[B]	16/17	0.98	0.12	-	15,16,19,23	1

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. 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, 95th 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(\AA^2)	Q<0.9
6	MPD	A	805	8/8	0.90	0.17	8.11	57,67,71,73	0
6	MPD	B	805	8/8	0.92	0.14	2.73	54,59,62,63	0
2	HEM	B	801	43/43	0.99	0.11	0.55	15,17,19,21	0
2	HEM	A	801	43/43	0.99	0.09	0.14	15,17,20,21	0
3	NA	A	802	1/1	1.00	0.08	-0.59	18,18,18,18	0
3	NA	B	802	1/1	1.00	0.06	-1.45	20,20,20,20	0
6	MPD	A	806	8/8	0.94	0.15	-	43,45,52,57	0
5	PO4	B	804	5/5	0.95	0.22	-	46,55,64,67	0
5	PO4	A	804	5/5	0.96	0.12	-	45,58,63,68	0
4	OXY	A	803	2/2	0.93	0.18	-	34,34,34,39	0
4	OXY	B	803	2/2	0.94	0.15	-	32,32,32,35	0

6.5 Other polymers [i](#)

There are no such residues in this entry.