



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 03:34 PM GMT

PDB ID : 4CM9  
Title : Crystal structure of pteridine reductase 1 (PTR1) from Trypanosoma brucei  
in ternary complex with cofactor and inhibitor  
Authors : Barrack, K.L.; Hunter, W.N.  
Deposited on : 2014-01-15  
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 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

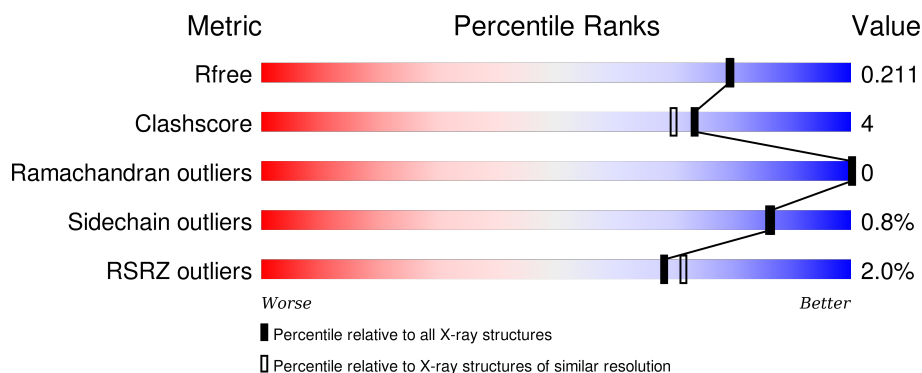
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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))
$R_{free}$	91344	4755 (1.90-1.90)
Clashscore	102246	5398 (1.90-1.90)
Ramachandran outliers	100387	5338 (1.90-1.90)
Sidechain outliers	100360	5339 (1.90-1.90)
RSRZ outliers	91569	4766 (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	288	<div> <div>2%</div> <div>78% 9% 14%</div> </div>
1	B	288	<div> <div>%</div> <div>79% 7% 14%</div> </div>
1	C	288	<div> <div>2%</div> <div>78% 8% 14%</div> </div>
2	D	288	<div> <div>2%</div> <div>77% 9% 14%</div> </div>

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
3	DTT	A	1168	-	-	-	X
3	DTT	B	1168	-	-	-	X
3	DTT	C	1168	-	-	-	X

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 8407 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 PTERIDINE REDUCTASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	249	Total	C	N	O	S	0	0	0
			1854	1165	327	351	11			
1	B	249	Total	C	N	O	S	0	3	0
			1873	1178	330	353	12			
1	C	249	Total	C	N	O	S	0	4	0
			1881	1182	335	353	11			

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	EXPRESSION TAG	UNP O76290
A	-18	GLY	-	EXPRESSION TAG	UNP O76290
A	-17	SER	-	EXPRESSION TAG	UNP O76290
A	-16	SER	-	EXPRESSION TAG	UNP O76290
A	-15	HIS	-	EXPRESSION TAG	UNP O76290
A	-14	HIS	-	EXPRESSION TAG	UNP O76290
A	-13	HIS	-	EXPRESSION TAG	UNP O76290
A	-12	HIS	-	EXPRESSION TAG	UNP O76290
A	-11	HIS	-	EXPRESSION TAG	UNP O76290
A	-10	HIS	-	EXPRESSION TAG	UNP O76290
A	-9	SER	-	EXPRESSION TAG	UNP O76290
A	-8	SER	-	EXPRESSION TAG	UNP O76290
A	-7	GLY	-	EXPRESSION TAG	UNP O76290
A	-6	LEU	-	EXPRESSION TAG	UNP O76290
A	-5	VAL	-	EXPRESSION TAG	UNP O76290
A	-4	PRO	-	EXPRESSION TAG	UNP O76290
A	-3	ARG	-	EXPRESSION TAG	UNP O76290
A	-2	GLY	-	EXPRESSION TAG	UNP O76290
A	-1	SER	-	EXPRESSION TAG	UNP O76290
A	0	HIS	-	EXPRESSION TAG	UNP O76290
B	-19	MET	-	EXPRESSION TAG	UNP O76290
B	-18	GLY	-	EXPRESSION TAG	UNP O76290
B	-17	SER	-	EXPRESSION TAG	UNP O76290

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	SER	-	EXPRESSION TAG	UNP O76290
B	-15	HIS	-	EXPRESSION TAG	UNP O76290
B	-14	HIS	-	EXPRESSION TAG	UNP O76290
B	-13	HIS	-	EXPRESSION TAG	UNP O76290
B	-12	HIS	-	EXPRESSION TAG	UNP O76290
B	-11	HIS	-	EXPRESSION TAG	UNP O76290
B	-10	HIS	-	EXPRESSION TAG	UNP O76290
B	-9	SER	-	EXPRESSION TAG	UNP O76290
B	-8	SER	-	EXPRESSION TAG	UNP O76290
B	-7	GLY	-	EXPRESSION TAG	UNP O76290
B	-6	LEU	-	EXPRESSION TAG	UNP O76290
B	-5	VAL	-	EXPRESSION TAG	UNP O76290
B	-4	PRO	-	EXPRESSION TAG	UNP O76290
B	-3	ARG	-	EXPRESSION TAG	UNP O76290
B	-2	GLY	-	EXPRESSION TAG	UNP O76290
B	-1	SER	-	EXPRESSION TAG	UNP O76290
B	0	HIS	-	EXPRESSION TAG	UNP O76290
C	-19	MET	-	EXPRESSION TAG	UNP O76290
C	-18	GLY	-	EXPRESSION TAG	UNP O76290
C	-17	SER	-	EXPRESSION TAG	UNP O76290
C	-16	SER	-	EXPRESSION TAG	UNP O76290
C	-15	HIS	-	EXPRESSION TAG	UNP O76290
C	-14	HIS	-	EXPRESSION TAG	UNP O76290
C	-13	HIS	-	EXPRESSION TAG	UNP O76290
C	-12	HIS	-	EXPRESSION TAG	UNP O76290
C	-11	HIS	-	EXPRESSION TAG	UNP O76290
C	-10	HIS	-	EXPRESSION TAG	UNP O76290
C	-9	SER	-	EXPRESSION TAG	UNP O76290
C	-8	SER	-	EXPRESSION TAG	UNP O76290
C	-7	GLY	-	EXPRESSION TAG	UNP O76290
C	-6	LEU	-	EXPRESSION TAG	UNP O76290
C	-5	VAL	-	EXPRESSION TAG	UNP O76290
C	-4	PRO	-	EXPRESSION TAG	UNP O76290
C	-3	ARG	-	EXPRESSION TAG	UNP O76290
C	-2	GLY	-	EXPRESSION TAG	UNP O76290
C	-1	SER	-	EXPRESSION TAG	UNP O76290
C	0	HIS	-	EXPRESSION TAG	UNP O76290

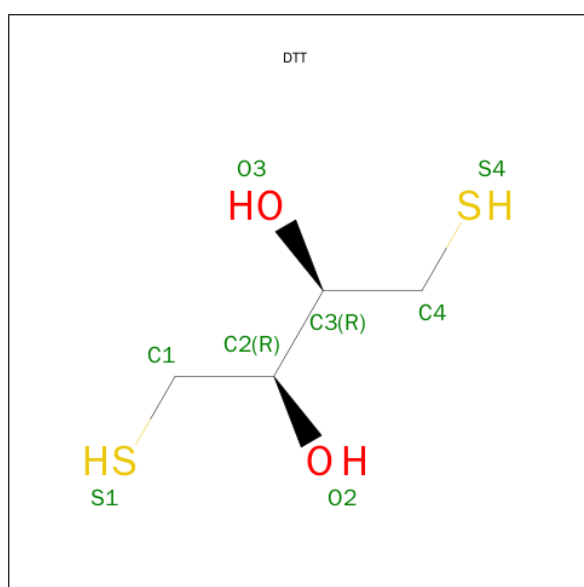
- Molecule 2 is a protein called PTERIDINE REDUCTASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	249	Total	C	N	O	S	0	2	0
			1864	1171	327	355	11			

There are 20 discrepancies between the modelled and reference sequences:

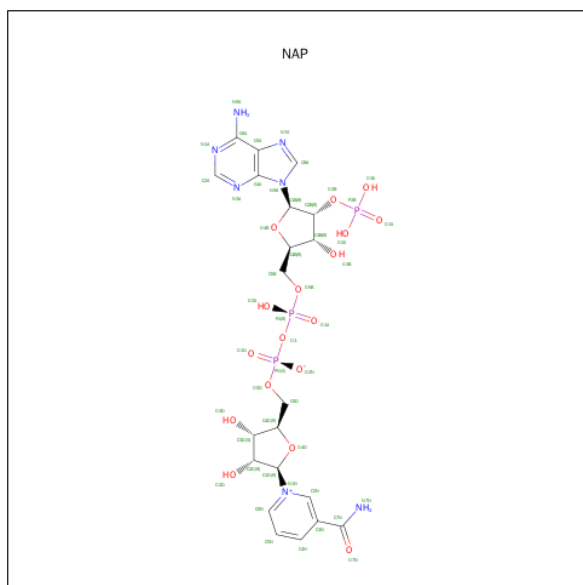
Chain	Residue	Modelled	Actual	Comment	Reference
D	-19	MET	-	EXPRESSION TAG	UNP O76290
D	-18	GLY	-	EXPRESSION TAG	UNP O76290
D	-17	SER	-	EXPRESSION TAG	UNP O76290
D	-16	SER	-	EXPRESSION TAG	UNP O76290
D	-15	HIS	-	EXPRESSION TAG	UNP O76290
D	-14	HIS	-	EXPRESSION TAG	UNP O76290
D	-13	HIS	-	EXPRESSION TAG	UNP O76290
D	-12	HIS	-	EXPRESSION TAG	UNP O76290
D	-11	HIS	-	EXPRESSION TAG	UNP O76290
D	-10	HIS	-	EXPRESSION TAG	UNP O76290
D	-9	SER	-	EXPRESSION TAG	UNP O76290
D	-8	SER	-	EXPRESSION TAG	UNP O76290
D	-7	GLY	-	EXPRESSION TAG	UNP O76290
D	-6	LEU	-	EXPRESSION TAG	UNP O76290
D	-5	VAL	-	EXPRESSION TAG	UNP O76290
D	-4	PRO	-	EXPRESSION TAG	UNP O76290
D	-3	ARG	-	EXPRESSION TAG	UNP O76290
D	-2	GLY	-	EXPRESSION TAG	UNP O76290
D	-1	SER	-	EXPRESSION TAG	UNP O76290
D	0	HIS	-	EXPRESSION TAG	UNP O76290

- Molecule 3 is 2,3-DIHYDROXY-1,4-DITHIOBUTANE (three-letter code: DTT) (formula:  $C_4H_{10}O_2S_2$ ).



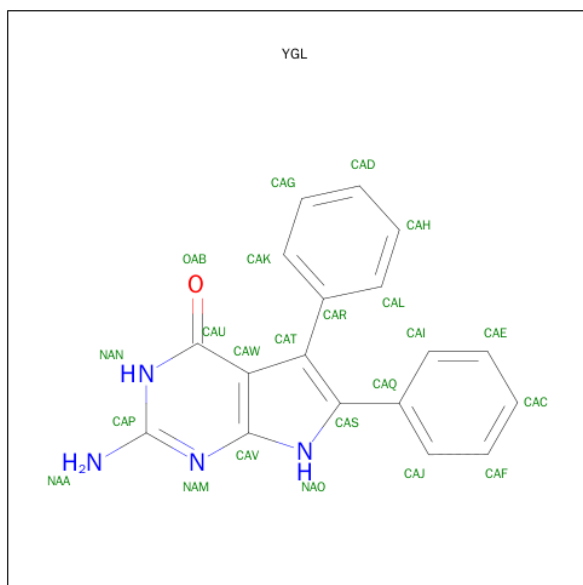
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	S	0	0
			8	4	2	2		
3	B	1	Total	C	O	S	0	0
			8	4	2	2		
3	C	1	Total	C	O	S	0	0
			8	4	2	2		

- Molecule 4 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula:  $C_{21}H_{28}N_7O_{17}P_3$ ).



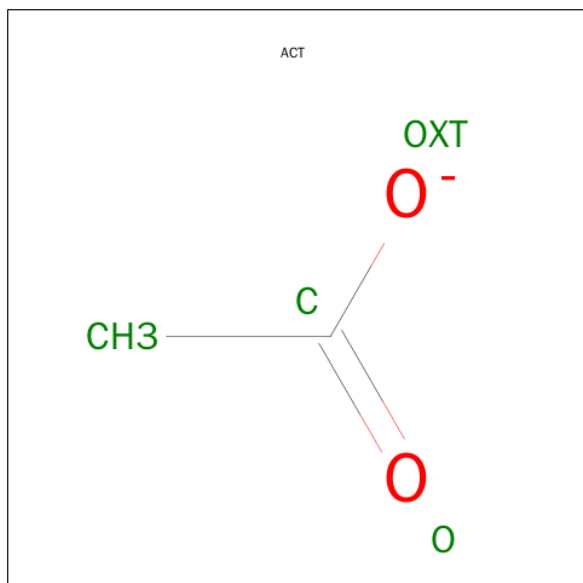
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
4	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
4	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
4	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 5 is 2-AMINO-5,6-DIPHENYL-3H-PYRROLO[2,3-D]PYRIMIDIN-4(7H)-ONE (three-letter code: YGL) (formula:  $C_{18}H_{14}N_4O$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			23	18	4	1		
5	B	1	Total	C	N	O	0	0
			23	18	4	1		
5	C	1	Total	C	N	O	0	0
			23	18	4	1		
5	D	1	Total	C	N	O	0	0
			23	18	4	1		

- Molecule 6 is ACETATE ION (three-letter code: ACT) (formula:  $C_2H_3O_2$ ).





Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	C	1	Total	C	O	0	0
			4	2	2		

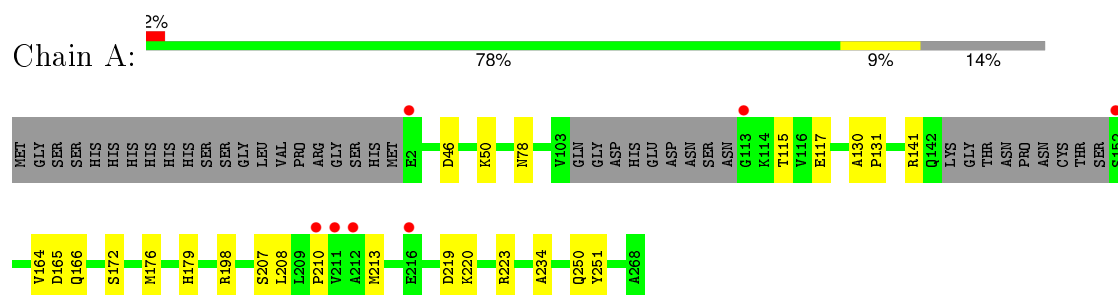
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	181	Total	O	0	0
			181	181		
7	B	169	Total	O	0	0
			169	169		
7	C	148	Total	O	0	0
			148	148		
7	D	125	Total	O	0	0
			125	125		

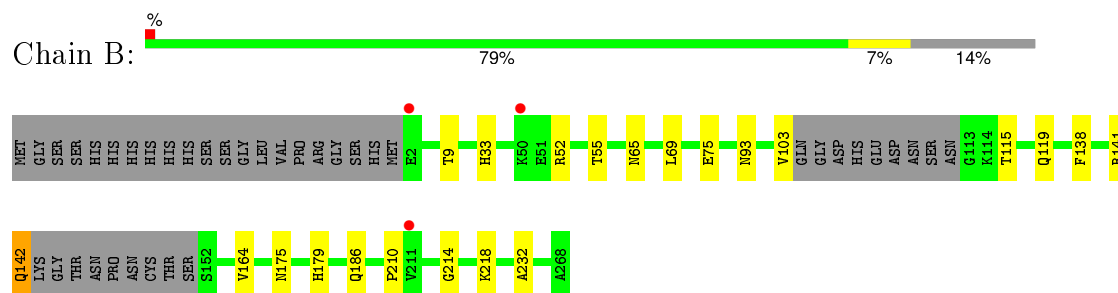
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

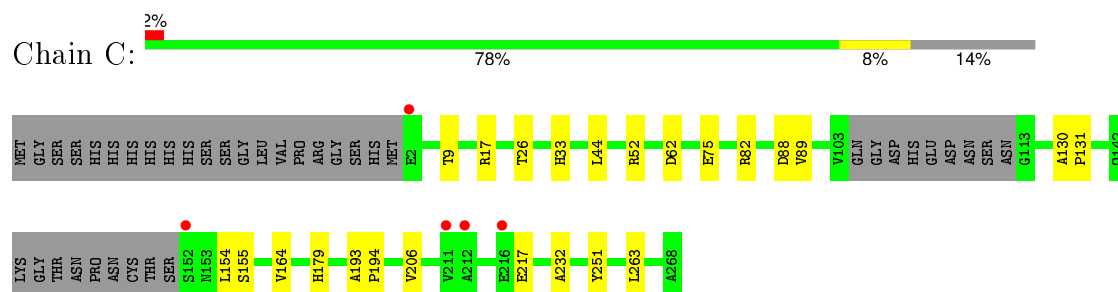
#### • Molecule 1: PTERIDINE REDUCTASE 1



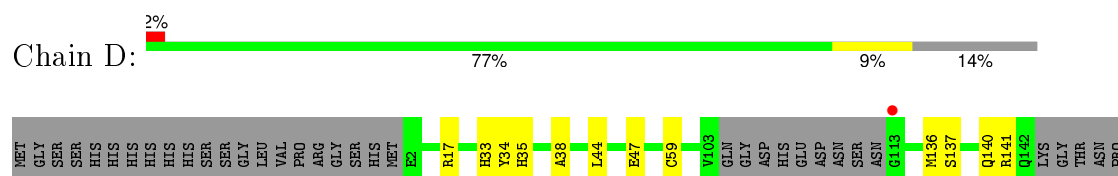
#### • Molecule 1: PTERIDINE REDUCTASE 1

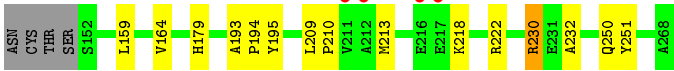


#### • Molecule 1: PTERIDINE REDUCTASE 1



#### • Molecule 2: PTERIDINE REDUCTASE 1





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	73.97Å 87.64Å 84.07Å 90.00° 115.75° 90.00°	Depositor
Resolution (Å)	43.82 – 1.90 43.82 – 1.90	Depositor EDS
% Data completeness (in resolution range)	94.7 (43.82-1.90) 94.7 (43.82-1.90)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.33 (at 1.89Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, $R_{free}$	0.151 , 0.202 0.164 , 0.211	Depositor DCC
$R_{free}$ test set	3672 reflections (5.36%)	DCC
Wilson B-factor (Å <sup>2</sup> )	19.5	Xtriage
Anisotropy	0.163	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 47.5	EDS
Estimated twinning fraction	0.017 for h,-k,-h-l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	1 of 72138 reflections (0.001%)	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	8407	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 30.61 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 1.2706e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

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

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NAP, YGL, DTT, CSX, ACT

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	0.72	0/1881	0.81	2/2552 (0.1%)
1	B	0.72	0/1909	0.79	0/2588
1	C	0.69	0/1914	0.83	2/2595 (0.1%)
2	D	0.70	0/1889	0.81	1/2561 (0.0%)
All	All	0.71	0/7593	0.81	5/10296 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	159	LEU	CA-CB-CG	-8.35	96.10	115.30
1	A	198	ARG	NE-CZ-NH1	6.40	123.50	120.30
1	A	165	ASP	CB-CG-OD1	5.19	122.97	118.30
1	C	52	ARG	NE-CZ-NH1	5.09	122.84	120.30
1	C	62	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 [i](#)

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	1854	0	1876	12	0
1	B	1873	0	1904	16	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	1881	0	1913	17	0
2	D	1864	0	1888	21	0
3	A	8	0	9	0	0
3	B	8	0	9	0	0
3	C	8	0	9	0	0
4	A	48	0	25	0	0
4	B	48	0	25	1	0
4	C	48	0	25	0	0
4	D	48	0	25	1	0
5	A	23	0	14	2	0
5	B	23	0	14	2	0
5	C	23	0	14	1	0
5	D	23	0	14	3	0
6	C	4	0	3	0	0
7	A	181	0	0	0	0
7	B	169	0	0	6	0
7	C	148	0	0	1	0
7	D	125	0	0	1	0
All	All	8407	0	7767	64	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (64) 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:186:GLN:OE1	7:B:2127:HOH:O	1.99	0.79
2:D:210:PRO:HD3	5:D:1270:YGL:CAH	2.19	0.72
2:D:213:MET:HE3	2:D:218:LYS:HG3	1.74	0.69
1:C:232:ALA:HB2	2:D:251:TYR:CE2	2.35	0.61
1:B:210:PRO:HD3	5:B:1270:YGL:CAH	2.35	0.57
1:A:250:GLN:HG2	7:B:2153:HOH:O	2.05	0.56
1:B:164:VAL:HG22	1:B:179:HIS:CD2	2.40	0.56
5:D:1270:YGL:CAJ	5:D:1270:YGL:CAK	2.85	0.54
2:D:136:MET:O	2:D:140:GLN:HG2	2.07	0.54
2:D:164:VAL:HG22	2:D:179:HIS:CD2	2.42	0.54
2:D:137:SER:O	2:D:141:ARG:HG2	2.08	0.53
1:B:75:GLU:OE2	7:B:2077:HOH:O	2.19	0.53
1:C:164:VAL:HG22	1:C:179:HIS:CD2	2.44	0.53
1:C:17[B]:ARG:CZ	1:C:44:LEU:HB2	2.39	0.52
1:B:115:THR:O	1:B:119:GLN:HG3	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:193:ALA:HB3	1:C:194:PRO:HD3	1.92	0.51
1:C:251:TYR:CE2	2:D:232:ALA:HB2	2.46	0.50
2:D:222:ARG:HG2	2:D:230:ARG:HA	1.94	0.49
2:D:213:MET:HE3	2:D:218:LYS:CG	2.43	0.49
4:B:1269:NAP:C7N	5:B:1270:YGL:HAL	2.43	0.49
1:C:206[A]:VAL:HG23	1:C:263:LEU:HD22	1.94	0.48
1:A:207:SER:O	1:A:208:LEU:C	2.51	0.48
1:A:115:THR:HB	1:A:117:GLU:OE1	2.13	0.48
1:B:138:PHE:O	1:B:142:GLN:HG2	2.13	0.48
1:B:9:THR:HA	1:B:33:HIS:HB3	1.95	0.48
1:A:210:PRO:HD3	5:A:1270:YGL:CAH	2.43	0.48
1:C:75:GLU:OE2	1:C:82[A]:ARG:NH2	2.47	0.47
2:D:193:ALA:HB3	2:D:194:PRO:HD3	1.96	0.47
1:B:9:THR:O	1:B:93:ASN:HB3	2.15	0.46
1:A:251:TYR:CE2	1:B:232:ALA:HB2	2.50	0.46
1:C:17[B]:ARG:NE	1:C:44:LEU:HD13	2.30	0.46
1:B:214:GLY:O	1:B:218:LYS:HG3	2.15	0.46
2:D:209:LEU:HA	5:D:1270:YGL:HAH	1.99	0.45
1:B:103:VAL:HG21	2:D:195:TYR:OH	2.16	0.45
1:A:46:ASP:O	1:A:50:LYS:HG2	2.17	0.44
1:A:172:SER:O	1:A:176:MET:HG3	2.18	0.44
1:B:65:ASN:HA	1:B:69:LEU:HD22	1.99	0.44
1:B:186:GLN:HB2	7:B:2127:HOH:O	2.18	0.43
1:C:130:ALA:HB3	1:C:131:PRO:HD3	2.01	0.43
1:C:26:THR:HG22	1:C:26:THR:O	2.19	0.43
1:C:206[A]:VAL:HG23	1:C:263:LEU:CD2	2.49	0.43
1:B:141:ARG:HG2	7:B:2101:HOH:O	2.20	0.42
1:C:232:ALA:HB2	2:D:251:TYR:CD2	2.54	0.42
1:C:251:TYR:CD2	2:D:232:ALA:HB2	2.55	0.42
1:A:164:VAL:HG22	1:A:179:HIS:CD2	2.54	0.42
1:A:130:ALA:HB3	1:A:131:PRO:HD3	2.01	0.42
1:B:52[B]:ARG:HB3	1:B:55:THR:HG21	2.02	0.42
2:D:213:MET:CE	2:D:218:LYS:CG	2.97	0.42
1:A:78:ASN:OD1	1:A:141:ARG:NH1	2.53	0.42
5:C:1270:YGL:CAK	5:C:1270:YGL:CAI	2.97	0.41
5:A:1270:YGL:CAK	5:A:1270:YGL:CAJ	2.98	0.41
2:D:47:GLU:HG3	7:D:2031:HOH:O	2.20	0.41
2:D:34:TYR:CE2	2:D:38:ALA:HA	2.54	0.41
2:D:17:ARG:HG3	2:D:44:LEU:HD22	2.02	0.41
1:A:208:LEU:HD11	1:A:234:ALA:HB2	2.02	0.41
1:C:217:GLU:OE2	7:C:2096:HOH:O	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:33:HIS:HA	2:D:59:CYS:O	2.21	0.41
1:C:89:VAL:HA	1:C:155:SER:O	2.21	0.41
1:B:175:ASN:ND2	7:B:2115:HOH:O	2.22	0.41
2:D:35:HIS:HB2	4:D:1269:NAP:C2A	2.51	0.40
1:C:88:ASP:O	1:C:154:LEU:HA	2.21	0.40
2:D:213:MET:CE	2:D:218:LYS:HG3	2.48	0.40
1:C:9:THR:HA	1:C:33:HIS:HB3	2.04	0.40
1:A:219:ASP:OD2	1:A:223:ARG:HD3	2.21	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	243/288 (84%)	233 (96%)	10 (4%)	0	100	100
1	B	246/288 (85%)	238 (97%)	8 (3%)	0	100	100
1	C	247/288 (86%)	239 (97%)	8 (3%)	0	100	100
2	D	244/288 (85%)	235 (96%)	9 (4%)	0	100	100
All	All	980/1152 (85%)	945 (96%)	35 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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



Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	197/231 (85%)	194 (98%)	3 (2%)	72	69
1	B	200/231 (87%)	199 (100%)	1 (0%)	92	92
1	C	200/231 (87%)	200 (100%)	0	100	100
2	D	198/230 (86%)	196 (99%)	2 (1%)	82	81
All	All	795/923 (86%)	789 (99%)	6 (1%)	86	86

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	166	GLN
1	A	213	MET
1	A	220	LYS
1	B	142	GLN
2	D	230	ARG
2	D	250	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	D	186	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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	CSX	D	168	2	3,6,7	0.89	0	3,6,8	0.94	0

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	CSX	D	168	2	-	0/1/5/7	0/0/0/0

There are no bond length outliers.

There are no bond angle outliers.

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](#)

12 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
3	DTT	A	1168	1	7,7,7	1.34	1 (14%)	4,8,8	2.49	2 (50%)
4	NAP	A	1269	-	42,52,52	0.87	2 (4%)	54,80,80	1.72	8 (14%)
5	YGL	A	1270	-	25,26,26	3.23	6 (24%)	23,37,37	2.44	7 (30%)
3	DTT	B	1168	1	7,7,7	0.91	0	4,8,8	3.84	2 (50%)
4	NAP	B	1269	-	42,52,52	0.88	1 (2%)	54,80,80	1.83	10 (18%)
5	YGL	B	1270	-	25,26,26	3.24	7 (28%)	23,37,37	2.45	8 (34%)
3	DTT	C	1168	1	7,7,7	1.02	0	4,8,8	3.08	2 (50%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	NAP	C	1269	-	42,52,52	0.94	2 (4%)	54,80,80	2.30	9 (16%)
5	YGL	C	1270	-	25,26,26	3.60	6 (24%)	23,37,37	2.58	7 (30%)
6	ACT	C	1271	-	1,3,3	0.67	0	0,3,3	0.00	-
4	NAP	D	1269	-	42,52,52	1.14	4 (9%)	54,80,80	2.09	12 (22%)
5	YGL	D	1270	-	25,26,26	3.17	5 (20%)	23,37,37	2.49	9 (39%)

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	DTT	A	1168	1	-	0/8/8/8	0/0/0/0
4	NAP	A	1269	-	-	0/27/67/67	0/5/5/5
5	YGL	A	1270	-	-	0/8/8/8	0/4/4/4
3	DTT	B	1168	1	-	0/8/8/8	0/0/0/0
4	NAP	B	1269	-	-	0/27/67/67	0/5/5/5
5	YGL	B	1270	-	-	0/8/8/8	0/4/4/4
3	DTT	C	1168	1	-	0/8/8/8	0/0/0/0
4	NAP	C	1269	-	-	0/27/67/67	0/5/5/5
5	YGL	C	1270	-	-	0/8/8/8	0/4/4/4
6	ACT	C	1271	-	-	0/0/0/0	0/0/0/0
4	NAP	D	1269	-	-	0/27/67/67	0/5/5/5
5	YGL	D	1270	-	-	0/8/8/8	0/4/4/4

All (34) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	1270	YGL	CAT-CAR	-11.25	1.36	1.49
5	A	1270	YGL	CAT-CAR	-10.86	1.37	1.49
5	D	1270	YGL	CAT-CAR	-10.67	1.37	1.49
5	B	1270	YGL	CAQ-CAS	-10.47	1.37	1.49
5	B	1270	YGL	CAT-CAR	-10.24	1.37	1.49
5	C	1270	YGL	CAQ-CAS	-9.95	1.38	1.49
5	A	1270	YGL	CAQ-CAS	-9.73	1.38	1.49
5	D	1270	YGL	CAQ-CAS	-8.61	1.39	1.49
5	C	1270	YGL	CAT-CAW	-4.98	1.35	1.42
5	C	1270	YGL	CAT-CAS	-4.47	1.36	1.41
5	A	1270	YGL	CAT-CAW	-3.48	1.37	1.42
5	D	1270	YGL	CAT-CAS	-2.99	1.38	1.41
5	B	1270	YGL	CAT-CAW	-2.59	1.39	1.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1270	YGL	CAT-CAS	-2.50	1.38	1.41
5	B	1270	YGL	CAU-CAW	-2.47	1.37	1.41
5	A	1270	YGL	CAT-CAS	-2.22	1.39	1.41
4	D	1269	NAP	C7N-N7N	2.05	1.37	1.33
4	A	1269	NAP	C5A-C4A	2.13	1.45	1.40
5	A	1270	YGL	CAP-NAN	2.14	1.39	1.35
4	A	1269	NAP	P2B-O2B	2.16	1.66	1.60
4	C	1269	NAP	C2A-N3A	2.20	1.36	1.32
4	D	1269	NAP	C4N-C3N	2.22	1.43	1.39
4	B	1269	NAP	C2A-N3A	2.25	1.36	1.32
5	B	1270	YGL	CAP-NAN	2.45	1.39	1.35
4	C	1269	NAP	C5A-C4A	2.47	1.46	1.40
4	D	1269	NAP	C5A-C4A	2.75	1.46	1.40
3	A	1168	DTT	C1-C2	2.76	1.58	1.51
4	D	1269	NAP	O4D-C1D	2.81	1.44	1.41
5	A	1270	YGL	CAU-NAN	3.25	1.39	1.33
5	C	1270	YGL	CAP-NAN	3.70	1.42	1.35
5	B	1270	YGL	CAU-NAN	3.79	1.40	1.33
5	D	1270	YGL	CAP-NAN	4.00	1.42	1.35
5	D	1270	YGL	CAU-NAN	4.42	1.41	1.33
5	C	1270	YGL	CAU-NAN	4.97	1.42	1.33

All (76) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	1269	NAP	N3A-C2A-N1A	-11.57	120.04	128.89
5	C	1270	YGL	CAW-CAU-NAN	-9.09	117.30	124.19
4	A	1269	NAP	N3A-C2A-N1A	-8.11	122.69	128.89
4	D	1269	NAP	N3A-C2A-N1A	-7.76	122.95	128.89
4	B	1269	NAP	N3A-C2A-N1A	-7.39	123.23	128.89
5	A	1270	YGL	CAW-CAU-NAN	-6.71	119.11	124.19
5	B	1270	YGL	NAM-CAP-NAN	-6.41	117.68	127.44
5	D	1270	YGL	NAM-CAP-NAN	-6.33	117.80	127.44
3	B	1168	DTT	C3-C4-S4	-6.08	103.83	113.91
5	A	1270	YGL	NAM-CAP-NAN	-5.77	118.66	127.44
5	D	1270	YGL	CAW-CAU-NAN	-5.40	120.10	124.19
5	B	1270	YGL	CAW-CAU-NAN	-5.14	120.30	124.19
3	C	1168	DTT	C3-C4-S4	-4.68	106.14	113.91
5	C	1270	YGL	NAM-CAP-NAN	-4.63	120.40	127.44
3	B	1168	DTT	C2-C1-S1	-4.62	106.25	113.91
4	C	1269	NAP	C1B-N9A-C4A	-4.58	120.03	126.94
4	D	1269	NAP	C4B-O4B-C1B	-4.33	104.97	109.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1269	NAP	C1B-N9A-C4A	-4.24	120.54	126.94
4	C	1269	NAP	C4B-O4B-C1B	-4.23	105.07	109.72
4	D	1269	NAP	C1B-N9A-C4A	-4.05	120.83	126.94
3	C	1168	DTT	C2-C1-S1	-3.85	107.53	113.91
5	D	1270	YGL	CAR-CAT-CAS	-3.71	119.51	126.88
4	D	1269	NAP	C4A-C5A-N7A	-3.62	106.15	109.48
4	B	1269	NAP	C4B-O4B-C1B	-3.55	105.82	109.72
3	A	1168	DTT	C2-C1-S1	-3.48	108.14	113.91
4	C	1269	NAP	O2B-P2B-O1X	-3.39	98.64	107.11
5	A	1270	YGL	CAR-CAT-CAS	-3.32	120.28	126.88
4	A	1269	NAP	C4B-O4B-C1B	-3.19	106.22	109.72
5	B	1270	YGL	CAR-CAT-CAS	-3.18	120.56	126.88
3	A	1168	DTT	C3-C4-S4	-3.17	108.66	113.91
5	B	1270	YGL	CAT-CAW-CAV	-3.03	105.12	107.54
5	A	1270	YGL	CAT-CAW-CAV	-2.93	105.20	107.54
4	B	1269	NAP	O7N-C7N-N7N	-2.92	118.49	122.59
4	B	1269	NAP	O3-PA-O5B	-2.82	95.44	102.94
4	B	1269	NAP	C4A-C5A-N7A	-2.62	107.07	109.48
4	A	1269	NAP	C4A-C5A-N7A	-2.60	107.09	109.48
4	D	1269	NAP	O7N-C7N-N7N	-2.52	119.05	122.59
5	C	1270	YGL	CAR-CAT-CAS	-2.41	122.09	126.88
4	C	1269	NAP	PN-O3-PA	-2.35	126.12	132.73
5	C	1270	YGL	CAT-CAW-CAV	-2.30	105.70	107.54
5	D	1270	YGL	CAT-CAW-CAV	-2.25	105.74	107.54
4	B	1269	NAP	C2N-C3N-C4N	-2.24	115.79	118.29
4	D	1269	NAP	PN-O3-PA	-2.15	126.70	132.73
4	D	1269	NAP	O3-PN-O5D	-2.01	97.61	102.94
5	B	1270	YGL	CAE-CAI-CAQ	2.00	123.20	120.56
5	A	1270	YGL	NAA-CAP-NAM	2.06	121.75	117.80
4	C	1269	NAP	C2A-N1A-C6A	2.06	122.45	118.77
4	A	1269	NAP	C2A-N1A-C6A	2.13	122.58	118.77
4	B	1269	NAP	O3B-C3B-C2B	2.14	117.33	111.16
4	A	1269	NAP	O3X-P2B-O1X	2.15	117.51	110.58
4	D	1269	NAP	O2N-PN-O1N	2.21	124.52	112.53
5	D	1270	YGL	CAL-CAR-CAT	2.29	124.35	120.76
5	D	1270	YGL	NAA-CAP-NAN	2.33	121.06	117.20
5	C	1270	YGL	CAG-CAK-CAR	2.47	123.83	120.56
5	C	1270	YGL	CAI-CAQ-CAS	2.57	124.61	120.60
5	A	1270	YGL	CAJ-CAQ-CAS	2.67	124.77	120.60
5	D	1270	YGL	CAE-CAI-CAQ	2.67	124.09	120.56
4	A	1269	NAP	O4B-C1B-N9A	2.83	114.01	108.10
4	D	1269	NAP	O3X-P2B-O2X	2.92	118.50	107.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1270	YGL	CAJ-CAQ-CAS	2.93	125.17	120.60
4	A	1269	NAP	O4D-C1D-N1N	3.03	111.46	108.13
5	D	1270	YGL	CAU-NAN-CAP	3.06	120.18	115.94
4	B	1269	NAP	C3N-C7N-N7N	3.10	121.21	117.82
5	B	1270	YGL	NAA-CAP-NAN	3.19	122.48	117.20
4	B	1269	NAP	O4D-C1D-N1N	3.21	111.66	108.13
5	B	1270	YGL	CAU-NAN-CAP	3.25	120.45	115.94
4	C	1269	NAP	C3N-C7N-N7N	3.28	121.41	117.82
4	C	1269	NAP	O4B-C1B-N9A	3.29	114.99	108.10
5	C	1270	YGL	CAU-NAN-CAP	3.30	120.52	115.94
5	A	1270	YGL	CAU-NAN-CAP	3.48	120.77	115.94
5	D	1270	YGL	CAJ-CAQ-CAS	3.55	126.14	120.60
4	B	1269	NAP	O4B-C1B-N9A	4.03	116.54	108.10
4	D	1269	NAP	O4B-C1B-N9A	4.06	116.60	108.10
4	C	1269	NAP	O4D-C1D-N1N	4.37	112.93	108.13
4	D	1269	NAP	O4D-C1D-N1N	4.67	113.26	108.13
4	D	1269	NAP	C3N-C7N-N7N	4.95	123.23	117.82

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1270	YGL	2	0
4	B	1269	NAP	1	0
5	B	1270	YGL	2	0
5	C	1270	YGL	1	0
4	D	1269	NAP	1	0
5	D	1270	YGL	3	0

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	249/288 (86%)	-0.25	7 (2%) 56 60	10, 18, 42, 71	0
1	B	249/288 (86%)	-0.28	3 (1%) 81 83	10, 18, 37, 59	0
1	C	249/288 (86%)	-0.14	5 (2%) 68 71	11, 20, 45, 62	0
2	D	248/288 (86%)	-0.18	5 (2%) 68 71	10, 20, 47, 71	0
All	All	995/1152 (86%)	-0.21	20 (2%) 68 71	10, 19, 43, 71	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	211	VAL	7.5
2	D	212	ALA	5.1
1	C	212	ALA	3.6
1	A	212	ALA	3.5
1	A	152	SER	3.4
1	C	2	GLU	3.3
1	A	216	GLU	3.1
1	C	211	VAL	3.0
1	B	211	VAL	2.8
2	D	211	VAL	2.7
2	D	113	GLY	2.6
1	B	2	GLU	2.5
2	D	216	GLU	2.5
1	A	113	GLY	2.5
1	C	216	GLU	2.4
1	A	210	PRO	2.3
2	D	217	GLU	2.2
1	C	152	SER	2.2
1	A	2	GLU	2.1
1	B	50	LYS	2.1

## 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, 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
2	CSX	D	168	7/8	0.98	0.07	-	18,19,34,36	0

## 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, 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	DTT	A	1168	8/8	0.81	0.29	10.04	61,70,75,77	0
3	DTT	B	1168	8/8	0.82	0.24	6.49	59,67,77,85	0
3	DTT	C	1168	8/8	0.75	0.20	2.99	59,63,65,74	0
6	ACT	C	1271	4/4	0.94	0.12	0.37	29,30,32,33	0
5	YGL	D	1270	23/23	0.94	0.09	-0.41	22,24,29,30	0
5	YGL	A	1270	23/23	0.94	0.09	-0.45	18,22,31,34	0
4	NAP	A	1269	48/48	0.98	0.07	-0.59	12,15,18,21	0
5	YGL	C	1270	23/23	0.94	0.08	-0.76	18,23,28,29	0
4	NAP	B	1269	48/48	0.98	0.06	-0.85	11,15,19,21	0
4	NAP	D	1269	48/48	0.97	0.07	-1.00	15,17,20,23	0
5	YGL	B	1270	23/23	0.96	0.07	-1.09	15,19,24,24	0
4	NAP	C	1269	48/48	0.98	0.06	-1.26	14,17,22,23	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.