



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 14, 2017 – 06:12 pm GMT

PDB ID : 4CM6  
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 : 1.70 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : 1.9-1692  
EDS : trunk28620  
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) : recalc28949

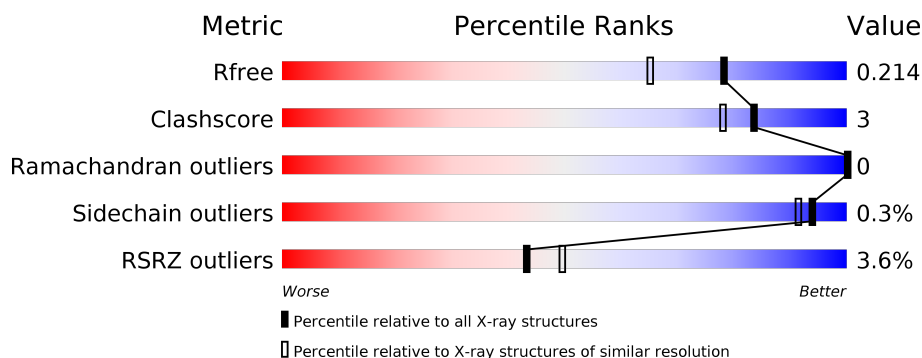
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 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	3453 (1.70-1.70)
Clashscore	112137	3876 (1.70-1.70)
Ramachandran outliers	110173	3815 (1.70-1.70)
Sidechain outliers	110143	3815 (1.70-1.70)
RSRZ outliers	101464	3491 (1.70-1.70)

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>3%</div> <div> <div></div> <div>82%</div> <div>5%</div> <div>13%</div> </div> </div>
1	B	288	<div> <div>3%</div> <div> <div></div> <div>82%</div> <div>5%</div> <div>13%</div> </div> </div>
1	C	288	<div> <div>4%</div> <div> <div></div> <div>81%</div> <div>6%</div> <div>13%</div> </div> </div>
1	D	288	<div> <div>2%</div> <div> <div></div> <div>81%</div> <div>6%</div> <div>14%</div> </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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	AOB	D	1270	-	-	-	X

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8525 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	250	Total	C	N	O	S	0	3	0
			1877	1178	332	355	12			
1	B	251	Total	C	N	O	S	0	0	0
			1867	1172	329	355	11			
1	C	251	Total	C	N	O	S	0	1	0
			1872	1175	330	356	11			
1	D	249	Total	C	N	O	S	0	1	0
			1860	1169	328	352	11			

There are 80 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

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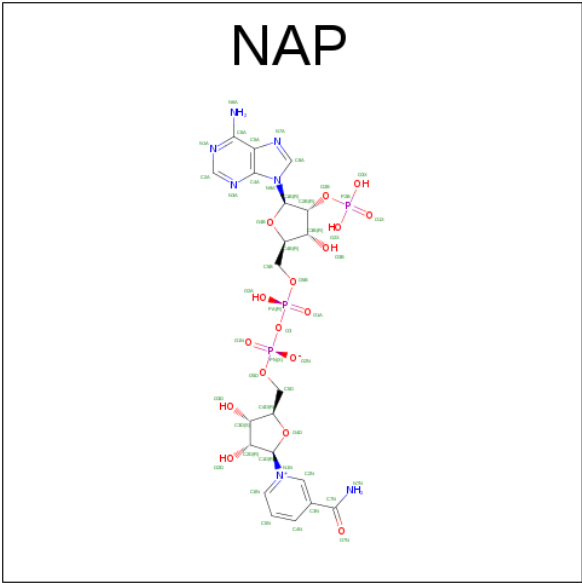
Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	GLY	-	EXPRESSION TAG	UNP O76290
B	-17	SER	-	EXPRESSION TAG	UNP O76290
B	-16	SER	-	EXPRESSION TAG	UNP O76290
B	-15	HIS	-	EXPRESSION TAG	UNP O76290
B	-14	HIS	-	EXPRESSION TAG	UNP O76290
B	-13	HIS	-	EXPRESSION TAG	UNP O76290
B	-12	HIS	-	EXPRESSION TAG	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
D	-19	MET	-	EXPRESSION TAG	UNP O76290
D	-18	GLY	-	EXPRESSION TAG	UNP O76290
D	-17	SER	-	EXPRESSION TAG	UNP O76290

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Chain	Residue	Modelled	Actual	Comment	Reference
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 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: C<sub>21</sub>H<sub>28</sub>N<sub>7</sub>O<sub>17</sub>P<sub>3</sub>).



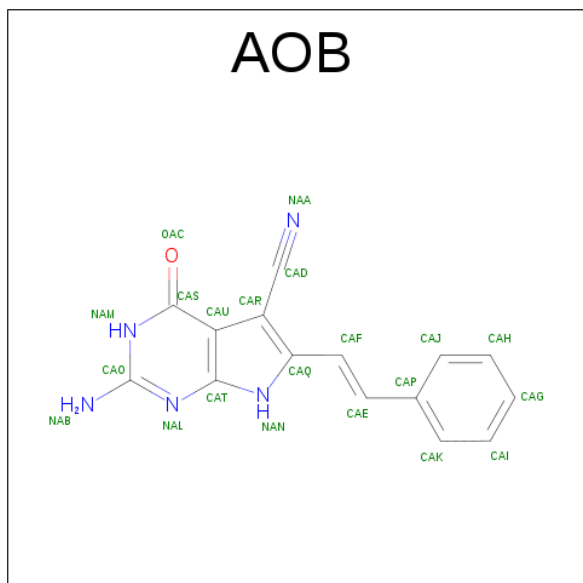
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 48	C 21	N 7	O 17	P 3	0	0
2	B	1	Total 48	C 21	N 7	O 17	P 3	0	0

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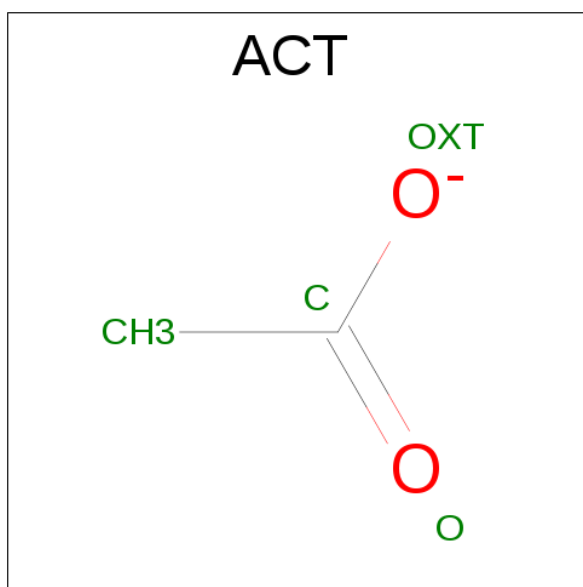
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is (E)-2-AMINO-4-OXO-6-STYRYL-4,7-DIHYDRO-3H-PYRROLO[2,3-D]PYRIMIDINE-5-CARBONITRILE (three-letter code: AOB) (formula: C<sub>15</sub>H<sub>11</sub>N<sub>5</sub>O).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O		0	0
			21	15	5	1			
3	B	1	Total	C	N	O		0	0
			21	15	5	1			
3	C	1	Total	C	N	O		0	0
			21	15	5	1			
3	D	1	Total	C	N	O		0	0
			21	15	5	1			

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



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

- Molecule 5 is water.

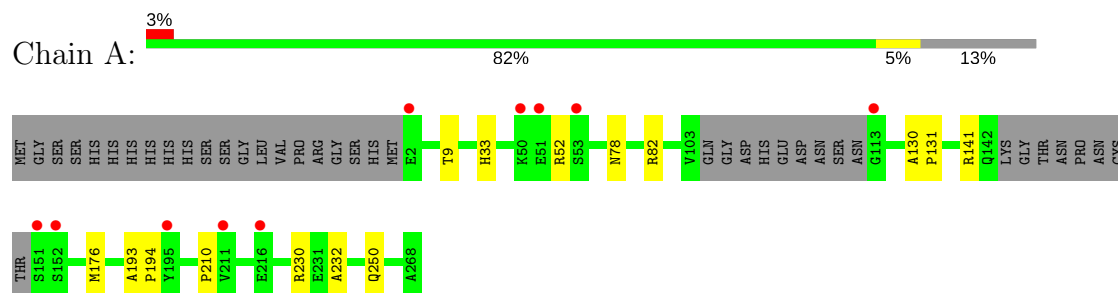
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	225	Total	O	0	0
			225	225		
5	B	191	Total	O	0	0
			191	191		
5	C	177	Total	O	0	0
			177	177		
5	D	176	Total	O	0	0
			176	176		



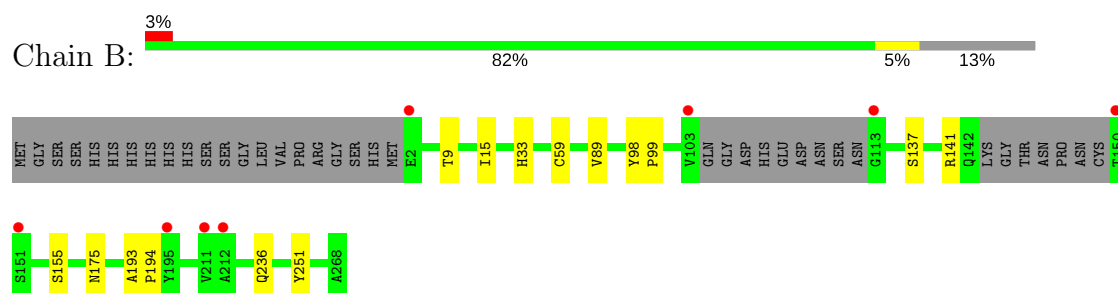
### 3 Residue-property plots [i](#)

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.

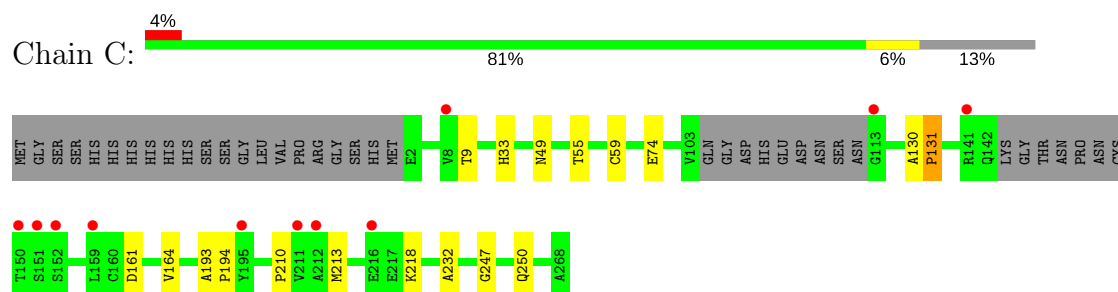
#### • Molecule 1: PTERIDINE REDUCTASE 1



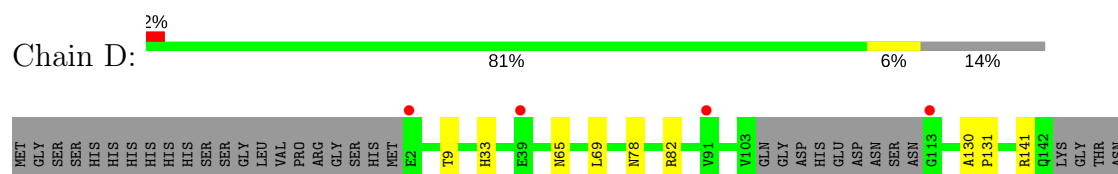
#### • Molecule 1: PTERIDINE REDUCTASE 1

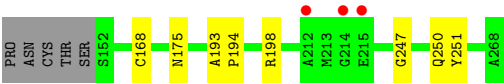


#### • Molecule 1: PTERIDINE REDUCTASE 1



#### • Molecule 1: PTERIDINE REDUCTASE 1





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.22Å 89.42Å 84.17Å 90.00° 115.26° 90.00°	Depositor
Resolution (Å)	29.00 – 1.70 28.98 – 1.70	Depositor EDS
% Data completeness (in resolution range)	95.7 (29.00-1.70) 95.8 (28.98-1.70)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.93 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, $R_{free}$	0.173 , 0.207 0.182 , 0.214	Depositor DCC
$R_{free}$ test set	5278 reflections (5.31%)	DCC
Wilson B-factor (Å <sup>2</sup> )	18.0	Xtriage
Anisotropy	0.123	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 44.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.022 for h,-k,-h-l	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	8525	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 16.21% of the height of the origin peak. No significant pseudotranslation is detected.*

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

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

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAP, AOB, 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	0.62	0/1910	0.75	1/2590 (0.0%)
1	B	0.65	0/1894	0.77	0/2570
1	C	0.64	0/1902	0.76	0/2581
1	D	0.65	0/1890	0.74	2/2564 (0.1%)
All	All	0.64	0/7596	0.75	3/10305 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	198	ARG	NE-CZ-NH1	5.54	123.07	120.30
1	D	82	ARG	NE-CZ-NH2	-5.20	117.70	120.30
1	A	82	ARG	NE-CZ-NH1	5.03	122.81	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	1877	0	1904	16	0
1	B	1867	0	1889	11	0
1	C	1872	0	1895	11	0
1	D	1860	0	1885	11	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	48	0	25	0	0
2	B	48	0	25	1	0
2	C	48	0	25	0	0
2	D	48	0	25	0	0
3	A	21	0	11	1	0
3	B	21	0	11	0	0
3	C	21	0	11	1	0
3	D	21	0	11	1	0
4	A	4	0	3	0	0
5	A	225	0	0	6	1
5	B	191	0	0	2	0
5	C	177	0	0	0	0
5	D	176	0	0	1	1
All	All	8525	0	7720	44	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 3.

All (44) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52[B]:ARG:NH1	5:A:2021:HOH:O	1.90	1.04
1:D:78:ASN:OD1	1:D:141:ARG:NH1	2.00	0.94
5:B:2145:HOH:O	1:D:175:ASN:ND2	1.97	0.76
1:A:230:ARG:NH1	5:A:2183:HOH:O	2.22	0.72
1:B:175:ASN:OD1	5:B:2129:HOH:O	2.14	0.66
1:A:78:ASN:ND2	5:A:2089:HOH:O	2.27	0.65
1:A:250:GLN:NE2	5:A:2204:HOH:O	2.17	0.65
1:D:9:THR:HA	1:D:33:HIS:HB3	1.90	0.53
1:D:78:ASN:ND2	5:D:2087:HOH:O	2.36	0.53
1:C:232:ALA:HB2	1:D:251:TYR:CD2	2.45	0.52
1:A:78:ASN:OD1	1:A:141:ARG:NH1	2.42	0.51
1:C:49:ASN:ND2	1:C:55:THR:H	2.10	0.50
1:C:232:ALA:HB2	1:D:251:TYR:CE2	2.47	0.50
1:C:210:PRO:HD3	3:C:1270:AOB:NAA	2.27	0.49
1:C:193:ALA:N	1:C:194:PRO:CD	2.76	0.48
1:D:247:GLY:O	1:D:250:GLN:HG2	2.13	0.48
1:A:193:ALA:N	1:A:194:PRO:CD	2.77	0.47
1:C:161:ASP:HB3	1:C:164:VAL:HG13	1.97	0.47
1:A:210:PRO:HD3	3:A:1270:AOB:NAA	2.30	0.46
1:C:9:THR:HA	1:C:33:HIS:HB3	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:193:ALA:N	1:B:194:PRO:CD	2.80	0.45
1:B:9:THR:HA	1:B:33:HIS:HB3	1.99	0.45
1:A:250:GLN:HG2	5:A:2198:HOH:O	2.16	0.45
1:A:232:ALA:HB2	1:B:251:TYR:CE2	2.52	0.44
1:B:33:HIS:HA	1:B:59:CYS:O	2.17	0.44
1:D:168:CYS:SG	3:D:1270:AOB:CAH	3.05	0.44
1:B:15:ILE:HB	2:B:1269:NAP:H51N	2.00	0.43
1:A:250:GLN:HG3	1:B:236:GLN:NE2	2.33	0.43
1:A:250:GLN:HG3	1:B:236:GLN:HE21	1.82	0.43
1:B:89:VAL:HA	1:B:155:SER:O	2.19	0.43
1:D:193:ALA:N	1:D:194:PRO:CD	2.82	0.42
1:A:9:THR:HA	1:A:33:HIS:HB3	2.01	0.42
1:D:130:ALA:HB3	1:D:131:PRO:HD3	2.01	0.42
1:A:141:ARG:HG2	5:A:2126:HOH:O	2.20	0.42
1:C:130:ALA:HB3	1:C:131:PRO:HD3	2.00	0.42
1:C:247:GLY:O	1:C:250:GLN:HG2	2.20	0.41
1:C:33:HIS:HA	1:C:59:CYS:O	2.19	0.41
1:A:52[A]:ARG:HD3	1:A:52[A]:ARG:HH11	1.70	0.41
1:B:137:SER:O	1:B:141:ARG:HG2	2.21	0.41
1:B:98:TYR:HB2	1:B:99:PRO:HD2	2.02	0.41
1:A:130:ALA:HB3	1:A:131:PRO:HD3	2.01	0.41
1:C:213:MET:O	1:C:218:LYS:HE3	2.21	0.41
1:D:65:ASN:HA	1:D:69:LEU:HD22	2.03	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:A:2018:HOH:O	5:D:2027:HOH:O[1_455]	2.18	0.02

## 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	247/288 (86%)	238 (96%)	9 (4%)	0	100	100
1	B	245/288 (85%)	238 (97%)	7 (3%)	0	100	100
1	C	246/288 (85%)	238 (97%)	8 (3%)	0	100	100
1	D	244/288 (85%)	238 (98%)	6 (2%)	0	100	100
All	All	982/1152 (85%)	952 (97%)	30 (3%)	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	201/231 (87%)	201 (100%)	0	100	100
1	B	199/231 (86%)	199 (100%)	0	100	100
1	C	200/231 (87%)	198 (99%)	2 (1%)	80	71
1	D	198/231 (86%)	198 (100%)	0	100	100
All	All	798/924 (86%)	796 (100%)	2 (0%)	94	91

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	74	GLU
1	C	131	PRO

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

Mol	Chain	Res	Type
1	B	236	GLN
1	C	49	ASN
1	C	54	ASN
1	C	92	ASN
1	C	142	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

9 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	NAP	A	1269	-	44,52,52	0.95	2 (4%)	51,80,80	1.53	6 (11%)
3	AOB	A	1270	-	21,23,23	2.12	6 (28%)	21,32,32	2.69	6 (28%)
4	ACT	A	1271	-	1,3,3	1.37	0	0,3,3	0.00	-
2	NAP	B	1269	-	44,52,52	1.17	3 (6%)	51,80,80	1.83	8 (15%)
3	AOB	B	1270	-	21,23,23	2.07	5 (23%)	21,32,32	2.82	6 (28%)
2	NAP	C	1269	-	44,52,52	0.92	1 (2%)	51,80,80	1.80	8 (15%)
3	AOB	C	1270	-	21,23,23	2.09	6 (28%)	21,32,32	2.72	8 (38%)
2	NAP	D	1269	-	44,52,52	0.98	1 (2%)	51,80,80	1.13	3 (5%)
3	AOB	D	1270	-	21,23,23	1.97	5 (23%)	21,32,32	2.69	6 (28%)

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	NAP	A	1269	-	-	0/27/67/67	0/5/5/5
3	AOB	A	1270	-	-	0/3/7/7	0/3/3/3
4	ACT	A	1271	-	-	0/0/0/0	0/0/0/0
2	NAP	B	1269	-	-	0/27/67/67	0/5/5/5
3	AOB	B	1270	-	-	0/3/7/7	0/3/3/3
2	NAP	C	1269	-	-	0/27/67/67	0/5/5/5
3	AOB	C	1270	-	-	0/3/7/7	0/3/3/3
2	NAP	D	1269	-	-	0/27/67/67	0/5/5/5
3	AOB	D	1270	-	-	0/3/7/7	0/3/3/3

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1270	AOB	CAR-CAU	-6.55	1.33	1.42
3	C	1270	AOB	CAR-CAU	-5.42	1.35	1.42
3	B	1270	AOB	CAR-CAU	-5.00	1.35	1.42
3	D	1270	AOB	CAR-CAU	-4.96	1.35	1.42
3	C	1270	AOB	CAR-CAQ	-2.94	1.36	1.41
3	A	1270	AOB	CAR-CAQ	-2.87	1.36	1.41
3	B	1270	AOB	CAR-CAQ	-2.42	1.37	1.41
3	D	1270	AOB	CAR-CAQ	-2.23	1.37	1.41
3	C	1270	AOB	CAT-NAL	-2.16	1.32	1.36
3	A	1270	AOB	CAT-NAN	2.03	1.38	1.34
3	D	1270	AOB	CAT-NAN	2.19	1.38	1.34
2	A	1269	NAP	C5A-C4A	2.26	1.45	1.40
3	B	1270	AOB	CAT-NAN	2.33	1.39	1.34
3	A	1270	AOB	CAQ-CAF	2.38	1.49	1.46
2	C	1269	NAP	C5A-C4A	2.44	1.46	1.40
3	A	1270	AOB	CAO-NAB	2.46	1.39	1.34
3	D	1270	AOB	CAO-NAB	2.52	1.39	1.34
3	C	1270	AOB	CAQ-CAF	2.66	1.49	1.46
2	A	1269	NAP	P2B-O2B	2.78	1.64	1.59
2	B	1269	NAP	C2A-N3A	2.86	1.36	1.32
3	C	1270	AOB	CAO-NAB	3.03	1.40	1.34
2	B	1269	NAP	C5A-C4A	3.18	1.47	1.40
2	B	1269	NAP	P2B-O2B	3.36	1.65	1.59
2	D	1269	NAP	P2B-O2B	3.58	1.65	1.59
3	B	1270	AOB	CAO-NAB	3.94	1.42	1.34
3	C	1270	AOB	CAR-CAD	3.94	1.48	1.44
3	A	1270	AOB	CAR-CAD	4.19	1.49	1.44
3	B	1270	AOB	CAR-CAD	4.38	1.49	1.44
3	D	1270	AOB	CAR-CAD	5.11	1.50	1.44

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1269	NAP	N3A-C2A-N1A	-7.64	122.20	128.86
2	B	1269	NAP	N3A-C2A-N1A	-7.23	122.56	128.86
3	A	1270	AOB	CAU-CAS-NAM	-7.23	117.18	124.12
3	B	1270	AOB	CAU-CAS-NAM	-7.00	117.40	124.12
3	D	1270	AOB	CAQ-CAR-CAD	-6.49	118.01	127.33
3	D	1270	AOB	CAU-CAS-NAM	-5.90	118.46	124.12
2	A	1269	NAP	N3A-C2A-N1A	-5.38	124.17	128.86
3	C	1270	AOB	NAL-CAO-NAM	-4.95	120.23	127.46
3	C	1270	AOB	CAU-CAS-NAM	-4.86	119.46	124.12
3	C	1270	AOB	CAQ-CAF-CAE	-4.71	118.45	123.80
2	A	1269	NAP	C4B-O4B-C1B	-4.63	104.84	109.77
2	C	1269	NAP	C4B-O4B-C1B	-4.51	104.97	109.77
3	D	1270	AOB	NAL-CAO-NAM	-4.48	120.91	127.46
3	A	1270	AOB	NAL-CAO-NAM	-4.17	121.36	127.46
3	B	1270	AOB	CAQ-CAR-CAD	-4.06	121.49	127.33
3	D	1270	AOB	CAQ-CAF-CAE	-3.99	119.26	123.80
2	B	1269	NAP	O7N-C7N-C3N	-3.97	114.99	119.62
3	B	1270	AOB	NAL-CAO-NAM	-3.83	121.86	127.46
3	A	1270	AOB	CAQ-CAF-CAE	-3.78	119.50	123.80
2	B	1269	NAP	C4B-O4B-C1B	-3.48	106.06	109.77
3	C	1270	AOB	CAQ-CAR-CAD	-3.20	122.73	127.33
2	B	1269	NAP	C4A-C5A-N7A	-3.14	106.38	109.41
2	D	1269	NAP	C4A-C5A-N7A	-3.03	106.48	109.41
2	D	1269	NAP	N3A-C2A-N1A	-3.02	126.22	128.86
2	C	1269	NAP	C1B-N9A-C4A	-2.87	121.68	126.64
2	A	1269	NAP	C1B-N9A-C4A	-2.84	121.72	126.64
2	B	1269	NAP	C1B-N9A-C4A	-2.56	122.21	126.64
3	A	1270	AOB	CAQ-CAR-CAD	-2.54	123.68	127.33
2	C	1269	NAP	O7N-C7N-C3N	-2.46	116.75	119.62
2	A	1269	NAP	O7N-C7N-C3N	-2.37	116.85	119.62
2	D	1269	NAP	C1B-N9A-C4A	-2.31	122.65	126.64
2	A	1269	NAP	C4A-C5A-N7A	-2.23	107.25	109.41
2	C	1269	NAP	C3N-C2N-N1N	-2.18	118.23	120.43
3	B	1270	AOB	CAQ-CAF-CAE	-2.09	121.43	123.80
3	C	1270	AOB	NAB-CAO-NAM	2.04	120.50	117.24
2	C	1269	NAP	O2A-PA-O1A	2.06	122.93	112.28
2	B	1269	NAP	C2A-N1A-C6A	2.55	123.24	118.77
3	C	1270	AOB	CAS-NAM-CAO	2.63	119.85	116.06
2	B	1269	NAP	C4D-O4D-C1D	2.69	112.63	109.77
2	C	1269	NAP	C2A-N1A-C6A	2.75	123.58	118.77
3	D	1270	AOB	CAS-CAU-CAT	3.07	116.75	115.02
3	B	1270	AOB	CAS-NAM-CAO	3.73	121.42	116.06

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1269	NAP	C3N-C7N-N7N	3.73	122.04	117.77
3	C	1270	AOB	CAO-NAL-CAT	3.78	119.57	115.16
3	D	1270	AOB	CAS-NAM-CAO	4.27	122.20	116.06
2	C	1269	NAP	C4D-O4D-C1D	4.30	114.34	109.77
3	A	1270	AOB	CAS-NAM-CAO	4.62	122.70	116.06
2	B	1269	NAP	C3N-C7N-N7N	5.11	123.60	117.77
3	A	1270	AOB	CAS-CAU-CAT	5.41	118.06	115.02
3	C	1270	AOB	CAS-CAU-CAT	6.30	118.56	115.02
3	B	1270	AOB	CAS-CAU-CAT	7.49	119.23	115.02

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 4 short contacts:

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

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	250/288 (86%)	0.18	10 (4%) 39 44	11, 17, 32, 56	0
1	B	251/288 (87%)	0.08	8 (3%) 48 54	11, 16, 32, 66	0
1	C	251/288 (87%)	0.16	11 (4%) 35 40	9, 16, 32, 61	0
1	D	249/288 (86%)	0.11	7 (2%) 53 59	10, 16, 33, 51	0
All	All	1001/1152 (86%)	0.13	36 (3%) 43 49	9, 16, 32, 66	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	211	VAL	6.9
1	B	113	GLY	6.5
1	C	150	THR	5.7
1	A	113	GLY	5.6
1	C	113	GLY	5.6
1	B	212	ALA	5.4
1	D	113	GLY	5.3
1	B	151	SER	4.3
1	B	150	THR	3.9
1	C	151	SER	3.8
1	A	152	SER	3.3
1	A	151	SER	3.3
1	A	195	TYR	3.3
1	C	195	TYR	3.3
1	D	214	GLY	3.3
1	A	2	GLU	3.2
1	C	216	GLU	3.0
1	B	2	GLU	2.8
1	C	152	SER	2.8
1	C	212	ALA	2.7
1	A	50	LYS	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	103	VAL	2.6
1	A	51	GLU	2.6
1	D	2	GLU	2.6
1	C	8	VAL	2.5
1	C	211	VAL	2.5
1	C	141	ARG	2.4
1	D	91	VAL	2.3
1	A	216	GLU	2.2
1	D	39	GLU	2.2
1	D	215	GLU	2.2
1	B	195	TYR	2.1
1	A	211	VAL	2.1
1	A	53	SER	2.1
1	C	159	LEU	2.1
1	D	212	ALA	2.1

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

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

## 6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. 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	AOB	D	1270	21/21	0.89	0.13	2.37	17,22,29,29	0
3	AOB	B	1270	21/21	0.91	0.13	1.76	17,22,34,34	0
3	AOB	C	1270	21/21	0.91	0.11	1.56	15,19,33,34	0
3	AOB	A	1270	21/21	0.90	0.10	0.77	18,21,27,28	0
4	ACT	A	1271	4/4	0.92	0.14	-0.22	22,23,24,24	0
2	NAP	C	1269	48/48	0.97	0.07	-1.08	11,14,15,18	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	NAP	B	1269	48/48	0.96	0.07	-1.14	11,15,18,21	0
2	NAP	D	1269	48/48	0.97	0.07	-1.22	11,14,16,19	0
2	NAP	A	1269	48/48	0.97	0.06	-1.25	12,15,17,18	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.