



# Full wwPDB X-ray Structure Validation Report ⓘ

May 22, 2020 – 04:57 pm BST

PDB ID : 6FXL  
Title : Structure of Trypanosoma cruzi type B ribose 5-phosphate isomerase (TcRpiB)  
Authors : Ronin, C.; Ciesielski, F.; Ciapetti, P.  
Deposited on : 2018-03-09  
Resolution : 1.96 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

<https://www.wwpdb.org/validation/2017/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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

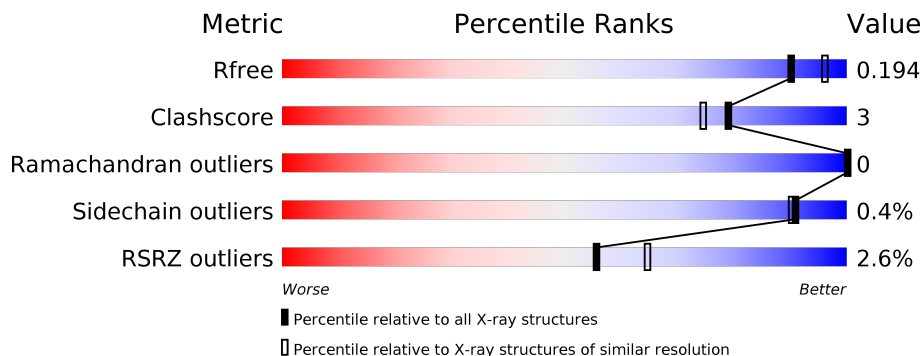
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.96 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))
$R_{free}$	130704	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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 respectively. 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	179	 3% 78% 8% • 13%
1	B	179	 % 76% 9% 15%
1	C	179	 2% 75% 10% • 14%
1	D	179	 3% 76% 10% • 13%

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:

<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
2	PO4	A	201	-	X	-	-
2	PO4	B	201	-	X	-	-
2	PO4	C	201	-	X	-	-

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 5219 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 Ribose 5-phosphate isomerase, putative.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	155	1199	755	215	222	7	0	2	0
1	B	153	1178	741	211	219	7	0	1	0
1	C	154	1210	762	218	223	7	0	4	0
1	D	155	1196	753	215	221	7	0	1	0

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP Q4DBP9
A	-18	GLY	-	expression tag	UNP Q4DBP9
A	-17	SER	-	expression tag	UNP Q4DBP9
A	-16	SER	-	expression tag	UNP Q4DBP9
A	-15	HIS	-	expression tag	UNP Q4DBP9
A	-14	HIS	-	expression tag	UNP Q4DBP9
A	-13	HIS	-	expression tag	UNP Q4DBP9
A	-12	HIS	-	expression tag	UNP Q4DBP9
A	-11	HIS	-	expression tag	UNP Q4DBP9
A	-10	HIS	-	expression tag	UNP Q4DBP9
A	-9	SER	-	expression tag	UNP Q4DBP9
A	-8	SER	-	expression tag	UNP Q4DBP9
A	-7	GLY	-	expression tag	UNP Q4DBP9
A	-6	LEU	-	expression tag	UNP Q4DBP9
A	-5	VAL	-	expression tag	UNP Q4DBP9
A	-4	PRO	-	expression tag	UNP Q4DBP9
A	-3	ARG	-	expression tag	UNP Q4DBP9
A	-2	GLY	-	expression tag	UNP Q4DBP9
A	-1	SER	-	expression tag	UNP Q4DBP9
A	0	HIS	-	expression tag	UNP Q4DBP9
B	-19	MET	-	initiating methionine	UNP Q4DBP9

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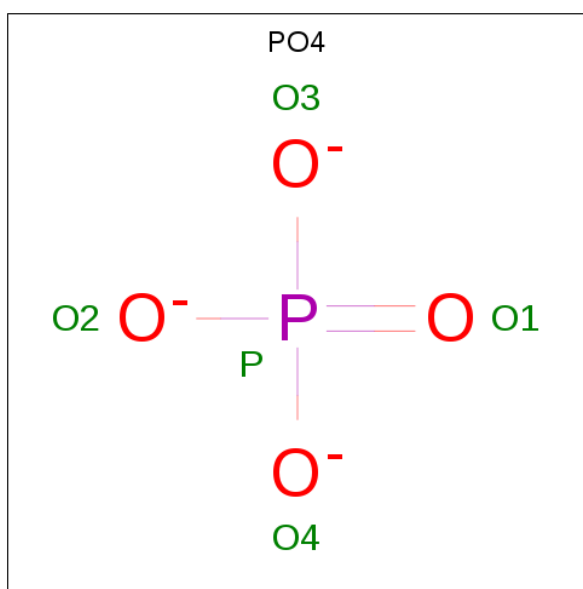
Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	GLY	-	expression tag	UNP Q4DBP9
B	-17	SER	-	expression tag	UNP Q4DBP9
B	-16	SER	-	expression tag	UNP Q4DBP9
B	-15	HIS	-	expression tag	UNP Q4DBP9
B	-14	HIS	-	expression tag	UNP Q4DBP9
B	-13	HIS	-	expression tag	UNP Q4DBP9
B	-12	HIS	-	expression tag	UNP Q4DBP9
B	-11	HIS	-	expression tag	UNP Q4DBP9
B	-10	HIS	-	expression tag	UNP Q4DBP9
B	-9	SER	-	expression tag	UNP Q4DBP9
B	-8	SER	-	expression tag	UNP Q4DBP9
B	-7	GLY	-	expression tag	UNP Q4DBP9
B	-6	LEU	-	expression tag	UNP Q4DBP9
B	-5	VAL	-	expression tag	UNP Q4DBP9
B	-4	PRO	-	expression tag	UNP Q4DBP9
B	-3	ARG	-	expression tag	UNP Q4DBP9
B	-2	GLY	-	expression tag	UNP Q4DBP9
B	-1	SER	-	expression tag	UNP Q4DBP9
B	0	HIS	-	expression tag	UNP Q4DBP9
C	-19	MET	-	initiating methionine	UNP Q4DBP9
C	-18	GLY	-	expression tag	UNP Q4DBP9
C	-17	SER	-	expression tag	UNP Q4DBP9
C	-16	SER	-	expression tag	UNP Q4DBP9
C	-15	HIS	-	expression tag	UNP Q4DBP9
C	-14	HIS	-	expression tag	UNP Q4DBP9
C	-13	HIS	-	expression tag	UNP Q4DBP9
C	-12	HIS	-	expression tag	UNP Q4DBP9
C	-11	HIS	-	expression tag	UNP Q4DBP9
C	-10	HIS	-	expression tag	UNP Q4DBP9
C	-9	SER	-	expression tag	UNP Q4DBP9
C	-8	SER	-	expression tag	UNP Q4DBP9
C	-7	GLY	-	expression tag	UNP Q4DBP9
C	-6	LEU	-	expression tag	UNP Q4DBP9
C	-5	VAL	-	expression tag	UNP Q4DBP9
C	-4	PRO	-	expression tag	UNP Q4DBP9
C	-3	ARG	-	expression tag	UNP Q4DBP9
C	-2	GLY	-	expression tag	UNP Q4DBP9
C	-1	SER	-	expression tag	UNP Q4DBP9
C	0	HIS	-	expression tag	UNP Q4DBP9
D	-19	MET	-	initiating methionine	UNP Q4DBP9
D	-18	GLY	-	expression tag	UNP Q4DBP9
D	-17	SER	-	expression tag	UNP Q4DBP9

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-16	SER	-	expression tag	UNP Q4DBP9
D	-15	HIS	-	expression tag	UNP Q4DBP9
D	-14	HIS	-	expression tag	UNP Q4DBP9
D	-13	HIS	-	expression tag	UNP Q4DBP9
D	-12	HIS	-	expression tag	UNP Q4DBP9
D	-11	HIS	-	expression tag	UNP Q4DBP9
D	-10	HIS	-	expression tag	UNP Q4DBP9
D	-9	SER	-	expression tag	UNP Q4DBP9
D	-8	SER	-	expression tag	UNP Q4DBP9
D	-7	GLY	-	expression tag	UNP Q4DBP9
D	-6	LEU	-	expression tag	UNP Q4DBP9
D	-5	VAL	-	expression tag	UNP Q4DBP9
D	-4	PRO	-	expression tag	UNP Q4DBP9
D	-3	ARG	-	expression tag	UNP Q4DBP9
D	-2	GLY	-	expression tag	UNP Q4DBP9
D	-1	SER	-	expression tag	UNP Q4DBP9
D	0	HIS	-	expression tag	UNP Q4DBP9

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



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

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		

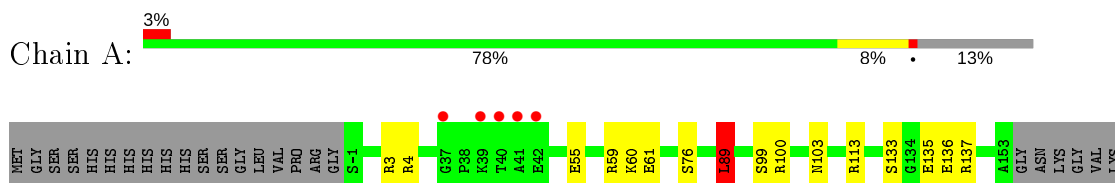
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	104	Total	O	0	0
			104	104		
3	B	100	Total	O	0	0
			100	100		
3	C	85	Total	O	0	0
			85	85		
3	D	82	Total	O	0	0
			82	82		

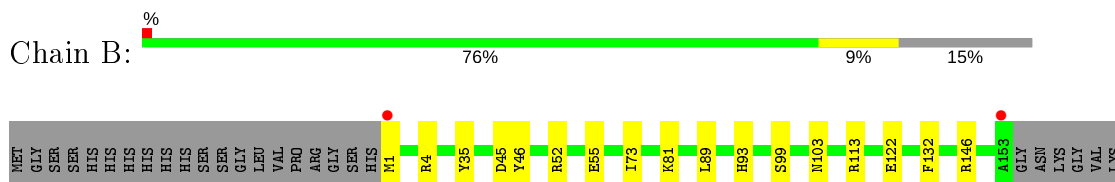
### 3 Residue-property plots [i](#)

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.

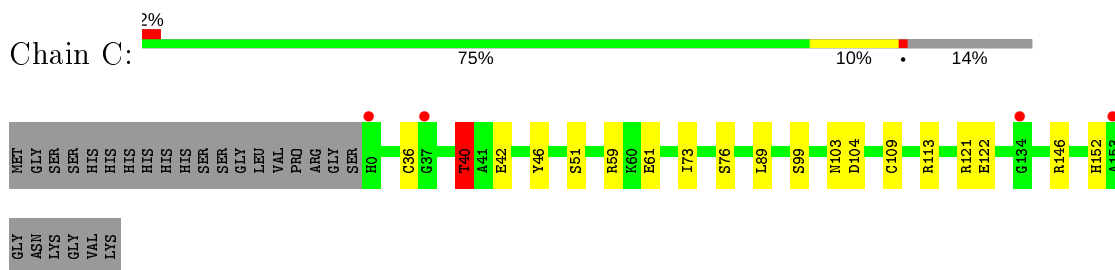
- Molecule 1: Ribose 5-phosphate isomerase, putative



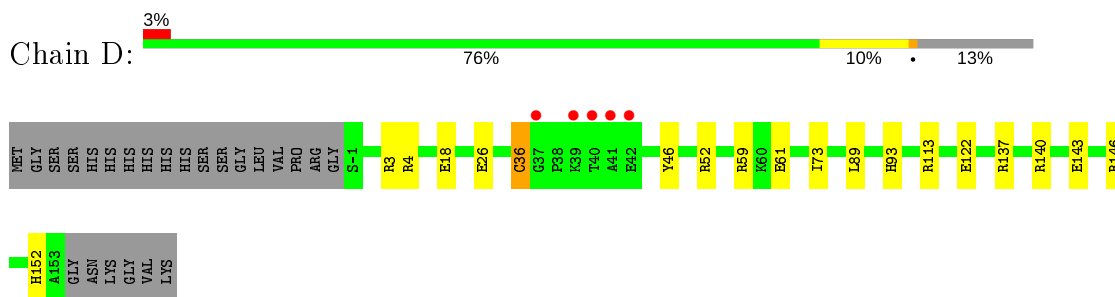
- Molecule 1: Ribose 5-phosphate isomerase, putative



- Molecule 1: Ribose 5-phosphate isomerase, putative



- Molecule 1: Ribose 5-phosphate isomerase, putative





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	171.16Å 175.35Å 93.27Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.58 – 1.96 47.58 – 1.96	Depositor EDS
% Data completeness (in resolution range)	98.8 (47.58-1.96) 98.8 (47.58-1.96)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.05	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.14 (at 1.97Å)	Xtrriage
Refinement program	REFMAC 5.8.0189	Depositor
R, $R_{free}$	0.161 , 0.184 0.175 , 0.194	Depositor DCC
$R_{free}$ test set	4971 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	21.7	Xtrriage
Anisotropy	0.029	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.40 , 48.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.025 for -k,-h,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5219	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.51% 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 [i](#)

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

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

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	5/1228 (0.4%)	1.20	11/1663 (0.7%)
1	B	1.36	3/1203 (0.2%)	1.19	10/1629 (0.6%)
1	C	1.43	6/1242 (0.5%)	1.28	9/1681 (0.5%)
1	D	1.28	4/1222 (0.3%)	1.29	12/1655 (0.7%)
All	All	1.34	18/4895 (0.4%)	1.24	42/6628 (0.6%)

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	143	GLU	CD-OE2	8.37	1.34	1.25
1	C	122	GLU	CD-OE2	-8.18	1.16	1.25
1	A	136	GLU	CG-CD	7.84	1.63	1.51
1	D	122	GLU	CD-OE2	-7.76	1.17	1.25
1	B	122	GLU	CD-OE2	-7.40	1.17	1.25
1	C	51	SER	CB-OG	-6.93	1.33	1.42
1	A	136	GLU	CD-OE1	6.71	1.33	1.25
1	A	135	GLU	CG-CD	-6.67	1.42	1.51
1	C	36	CYS	CB-SG	-6.48	1.71	1.82
1	D	18	GLU	CG-CD	6.41	1.61	1.51
1	D	146	ARG	CZ-NH1	6.09	1.41	1.33
1	A	133	SER	CB-OG	6.02	1.50	1.42
1	C	76	SER	CB-OG	-5.99	1.34	1.42
1	A	76	SER	CB-OG	-5.50	1.35	1.42
1	B	132	PHE	CG-CD2	5.42	1.46	1.38
1	B	35	TYR	CG-CD1	5.30	1.46	1.39
1	C	109	CYS	CB-SG	5.27	1.91	1.82
1	C	122	GLU	CG-CD	5.19	1.59	1.51

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	146	ARG	NE-CZ-NH1	18.55	129.58	120.30
1	C	146	ARG	NE-CZ-NH1	17.66	129.13	120.30
1	D	146	ARG	NE-CZ-NH2	-12.84	113.88	120.30
1	C	146	ARG	NE-CZ-NH2	-12.59	114.01	120.30
1	C	113	ARG	NE-CZ-NH2	-10.13	115.23	120.30
1	A	113	ARG	NE-CZ-NH2	-9.43	115.59	120.30
1	D	113	ARG	NE-CZ-NH2	-9.41	115.59	120.30
1	B	146	ARG	NE-CZ-NH2	8.81	124.71	120.30
1	D	4	ARG	NE-CZ-NH1	8.44	124.52	120.30
1	D	113	ARG	NE-CZ-NH1	8.26	124.43	120.30
1	A	4	ARG	NE-CZ-NH1	8.25	124.42	120.30
1	C	113	ARG	NE-CZ-NH1	8.16	124.38	120.30
1	A	3	ARG	NE-CZ-NH1	7.92	124.26	120.30
1	D	140	ARG	NE-CZ-NH1	7.86	124.23	120.30
1	A	113	ARG	NE-CZ-NH1	7.76	124.18	120.30
1	B	146	ARG	NE-CZ-NH1	-7.58	116.51	120.30
1	D	146	ARG	CD-NE-CZ	7.57	134.20	123.60
1	B	113	ARG	NE-CZ-NH2	-7.06	116.77	120.30
1	D	4	ARG	NE-CZ-NH2	-7.04	116.78	120.30
1	C	36	CYS	CB-CA-C	-6.81	96.78	110.40
1	B	52	ARG	NE-CZ-NH1	6.74	123.67	120.30
1	B	113	ARG	NE-CZ-NH1	6.45	123.52	120.30
1	C	146	ARG	CD-NE-CZ	6.34	132.48	123.60
1	A	3	ARG	NE-CZ-NH2	-6.33	117.14	120.30
1	A	89[A]	LEU	CB-CG-CD1	-6.25	100.37	111.00
1	A	89[B]	LEU	CB-CG-CD1	-6.25	100.37	111.00
1	A	100	ARG	NE-CZ-NH2	-6.00	117.30	120.30
1	B	45	ASP	CB-CG-OD1	5.91	123.62	118.30
1	B	1	MET	CG-SD-CE	5.80	109.47	100.20
1	B	4	ARG	NE-CZ-NH1	5.71	123.16	120.30
1	B	146	ARG	CD-NE-CZ	5.69	131.56	123.60
1	D	3	ARG	NE-CZ-NH2	-5.57	117.51	120.30
1	D	36	CYS	CB-CA-C	-5.49	99.42	110.40
1	C	104	ASP	CB-CG-OD1	5.36	123.13	118.30
1	C	121	ARG	NE-CZ-NH1	5.29	122.94	120.30
1	A	89[A]	LEU	CA-CB-CG	-5.26	103.20	115.30
1	A	89[B]	LEU	CA-CB-CG	-5.26	103.20	115.30
1	C	40	THR	N-CA-CB	-5.25	100.33	110.30
1	D	26	GLU	OE1-CD-OE2	-5.24	117.02	123.30
1	A	137	ARG	NE-CZ-NH2	-5.15	117.73	120.30
1	D	137	ARG	NE-CZ-NH2	-5.13	117.74	120.30
1	B	81	LYS	CD-CE-NZ	-5.06	100.06	111.70

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	1199	0	1200	7	0
1	B	1178	0	1177	7	0
1	C	1210	0	1213	13	0
1	D	1196	0	1195	7	0
2	A	15	0	0	1	0
2	B	25	0	0	1	0
2	C	10	0	0	1	0
2	D	15	0	0	1	0
3	A	104	0	0	2	0
3	B	100	0	0	0	0
3	C	85	0	0	0	0
3	D	82	0	0	0	0
All	All	5219	0	4785	27	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 3.

All (27) 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:D:59:ARG:NH2	1:D:61:GLU:OE1	2.25	0.65
1:A:99[B]:SER:OG	1:D:73:ILE:HD13	1.99	0.63
1:B:89:LEU:HD12	1:C:89[B]:LEU:HD12	1.82	0.62
1:C:40:THR:CG2	1:C:42:GLU:H	2.15	0.59
1:A:59:ARG:NH1	1:A:61:GLU:OE1	2.36	0.58
2:B:201:PO4:O4	2:B:202:PO4:O3	2.23	0.56
1:B:103:ASN:ND2	1:C:46:TYR:OH	2.39	0.55
1:B:73:ILE:HD13	1:C:99[B]:SER:OG	2.07	0.55
1:D:36:CYS:HB3	1:D:52:ARG:HD2	1.92	0.52
1:C:73:ILE:HG13	1:C:89[A]:LEU:CD2	2.41	0.51
2:C:201:PO4:O1	2:C:202:PO4:O2	2.29	0.50
1:A:59:ARG:HG3	3:A:314:HOH:O	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:40:THR:HG22	1:C:42:GLU:H	1.75	0.50
1:B:46:TYR:OH	1:C:103:ASN:ND2	2.45	0.50
1:B:99[B]:SER:OG	1:C:73:ILE:HD13	2.12	0.50
2:D:202:PO4:O2	2:D:203:PO4:O4	2.30	0.49
1:C:73:ILE:HG13	1:C:89[A]:LEU:HD21	1.93	0.49
1:C:59[B]:ARG:NE	1:C:61:GLU:OE2	2.41	0.47
1:A:55:GLU:OE2	1:D:152:HIS:NE2	2.48	0.46
1:A:89[A]:LEU:HB3	1:D:89[A]:LEU:HD23	1.99	0.45
1:C:73:ILE:CG1	1:C:89[A]:LEU:CD2	2.94	0.44
1:C:40:THR:HG23	1:C:42:GLU:H	1.82	0.44
1:B:55:GLU:OE2	1:C:152:HIS:NE2	2.52	0.43
1:B:93:HIS:HB3	1:D:93:HIS:HB3	2.01	0.42
2:A:201:PO4:O2	2:A:202:PO4:O1	2.37	0.42
1:A:60:LYS:NZ	3:A:309:HOH:O	2.53	0.41
1:A:103:ASN:ND2	1:D:46:TYR:OH	2.53	0.41

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	155/179 (87%)	151 (97%)	4 (3%)	0	100	100
1	B	152/179 (85%)	150 (99%)	2 (1%)	0	100	100
1	C	156/179 (87%)	154 (99%)	2 (1%)	0	100	100
1	D	154/179 (86%)	150 (97%)	4 (3%)	0	100	100
All	All	617/716 (86%)	605 (98%)	12 (2%)	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	126/143 (88%)	124 (98%)	2 (2%)	62	58
1	B	123/143 (86%)	123 (100%)	0	100	100
1	C	127/143 (89%)	126 (99%)	1 (1%)	81	80
1	D	125/143 (87%)	125 (100%)	0	100	100
All	All	501/572 (88%)	498 (99%)	3 (1%)	91	85

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

Mol	Chain	Res	Type
1	A	89[A]	LEU
1	A	89[B]	LEU
1	C	40	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	103	ASN
1	B	103	ASN
1	C	103	ASN
1	D	103	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates i

There are no carbohydrates in this entry.

## 5.6 Ligand geometry i

13 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	PO4	D	201	-	4,4,4	1.60	1 (25%)	6,6,6	1.69	1 (16%)
2	PO4	A	201	-	4,4,4	3.01	2 (50%)	6,6,6	3.43	3 (50%)
2	PO4	B	201	-	4,4,4	2.06	1 (25%)	6,6,6	2.60	4 (66%)
2	PO4	A	203	-	4,4,4	0.74	0	6,6,6	1.92	2 (33%)
2	PO4	B	202	-	4,4,4	2.00	2 (50%)	6,6,6	0.64	0
2	PO4	D	202	-	4,4,4	1.92	1 (25%)	6,6,6	1.17	0
2	PO4	D	203	-	4,4,4	1.58	2 (50%)	6,6,6	0.74	0
2	PO4	B	203	-	4,4,4	0.50	0	6,6,6	1.53	1 (16%)
2	PO4	C	201	-	4,4,4	3.06	3 (75%)	6,6,6	1.96	2 (33%)
2	PO4	A	202	-	4,4,4	1.94	1 (25%)	6,6,6	1.11	1 (16%)
2	PO4	B	204	-	4,4,4	1.12	0	6,6,6	1.61	1 (16%)
2	PO4	C	202	-	4,4,4	2.75	2 (50%)	6,6,6	1.13	0
2	PO4	B	205	-	4,4,4	0.77	0	6,6,6	1.17	0

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	202	PO4	P-O1	4.59	1.61	1.50
2	A	201	PO4	P-O4	-4.36	1.41	1.54
2	C	201	PO4	P-O3	-3.96	1.42	1.54
2	C	201	PO4	P-O4	-3.85	1.43	1.54
2	A	201	PO4	P-O1	-3.70	1.42	1.50
2	B	201	PO4	P-O3	-3.63	1.43	1.54
2	D	202	PO4	P-O4	-3.32	1.44	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	202	PO4	P-O1	3.16	1.58	1.50
2	D	201	PO4	P-O1	3.07	1.58	1.50
2	B	202	PO4	P-O1	2.85	1.57	1.50
2	C	202	PO4	P-O3	-2.82	1.46	1.54
2	C	201	PO4	P-O1	2.62	1.57	1.50
2	D	203	PO4	P-O4	2.09	1.60	1.54
2	B	202	PO4	P-O3	2.08	1.60	1.54
2	D	203	PO4	P-O1	-2.05	1.46	1.50

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	201	PO4	O4-P-O1	5.52	131.09	110.89
2	A	201	PO4	O4-P-O2	-5.00	91.91	107.97
2	D	201	PO4	O4-P-O2	3.79	120.12	107.97
2	C	201	PO4	O4-P-O3	3.67	119.74	107.97
2	A	203	PO4	O3-P-O2	3.66	119.72	107.97
2	B	201	PO4	O4-P-O1	-3.47	98.21	110.89
2	B	204	PO4	O3-P-O2	3.34	118.69	107.97
2	B	201	PO4	O4-P-O3	3.18	118.17	107.97
2	A	201	PO4	O2-P-O1	-3.09	99.57	110.89
2	B	201	PO4	O3-P-O1	2.95	121.71	110.89
2	A	203	PO4	O2-P-O1	-2.78	100.74	110.89
2	C	201	PO4	O2-P-O1	-2.52	101.69	110.89
2	B	201	PO4	O2-P-O1	-2.35	102.30	110.89
2	B	203	PO4	O3-P-O1	-2.21	102.81	110.89
2	A	202	PO4	O4-P-O3	2.09	114.68	107.97

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

8 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	201	PO4	1	0
2	B	201	PO4	1	0
2	B	202	PO4	1	0
2	D	202	PO4	1	0
2	D	203	PO4	1	0
2	C	201	PO4	1	0
2	A	202	PO4	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	202	PO4	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, 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	155/179 (86%)	-0.13	5 (3%) 47 57	14, 19, 36, 51	0
1	B	153/179 (85%)	-0.10	2 (1%) 77 83	15, 22, 41, 58	0
1	C	154/179 (86%)	-0.08	4 (2%) 56 65	14, 22, 41, 80	0
1	D	155/179 (86%)	-0.06	5 (3%) 47 57	15, 20, 38, 57	0
All	All	617/716 (86%)	-0.09	16 (2%) 56 65	14, 21, 41, 80	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	153	ALA	3.5
1	C	0	HIS	3.4
1	C	153	ALA	3.3
1	D	40	THR	3.3
1	D	37	GLY	3.2
1	D	41	ALA	3.2
1	D	39	LYS	3.1
1	A	41	ALA	3.1
1	A	40	THR	3.0
1	A	39	LYS	2.6
1	A	37	GLY	2.5
1	A	42	GLU	2.4
1	B	1	MET	2.4
1	D	42	GLU	2.3
1	C	134	GLY	2.3
1	C	37	GLY	2.0

### 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. 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	B-factors(Å <sup>2</sup> )	Q<0.9
2	PO4	D	201	5/5	0.94	0.16	33,39,47,51	0
2	PO4	B	204	5/5	0.96	0.19	32,42,47,49	0
2	PO4	B	203	5/5	0.97	0.18	32,43,48,50	0
2	PO4	A	203	5/5	0.97	0.19	33,33,46,50	0
2	PO4	B	202	5/5	0.98	0.08	22,24,28,28	0
2	PO4	B	205	5/5	0.98	0.11	34,43,44,46	0
2	PO4	D	203	5/5	0.99	0.08	24,25,26,27	0
2	PO4	A	201	5/5	0.99	0.09	25,27,31,31	0
2	PO4	C	201	5/5	0.99	0.07	24,26,28,28	0
2	PO4	A	202	5/5	0.99	0.06	26,26,27,28	0
2	PO4	B	201	5/5	0.99	0.07	24,25,28,29	0
2	PO4	C	202	5/5	0.99	0.07	25,26,28,28	0
2	PO4	D	202	5/5	0.99	0.08	24,24,26,27	0

### 6.5 Other polymers [i](#)

There are no such residues in this entry.