



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2018 – 05:51 pm GMT

PDB ID : 3HQQ  
Title : Crystal structure of Leishmania mexicana pyruvate kinase (LmPYK) in complex with Fructose 2,6 biphosphate  
Authors : Morgan, H.P.; Walkinshaw, M.D.  
Deposited on : 2009-06-08  
Resolution : 5.07 Å(reported)

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

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

A user guide is available at

<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 : 1.7.3 (157068), CSD as539be (2018)  
Xtriage (Phenix) : 1.13  
EDS : trunk30967  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk30967

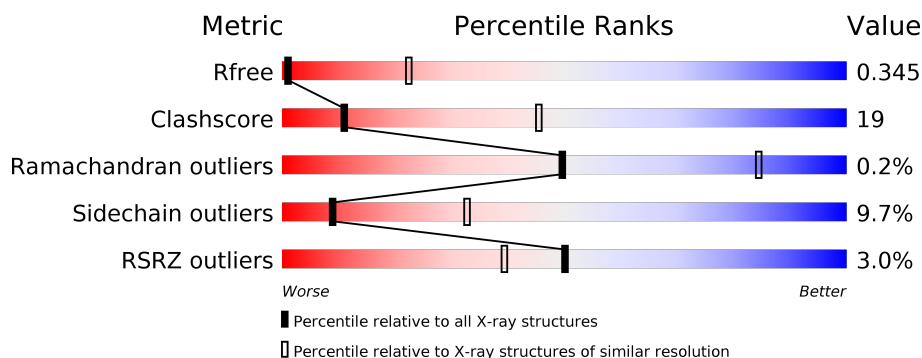
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 5.07 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.





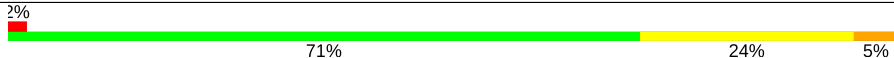
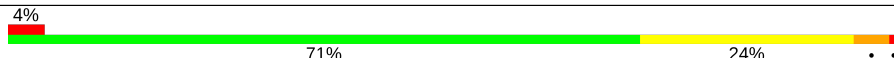
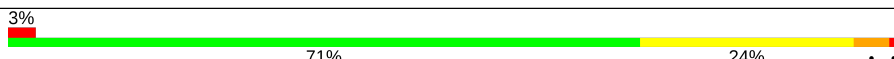
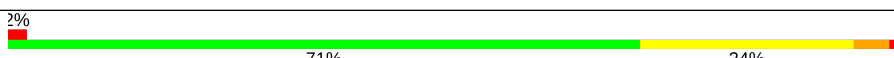
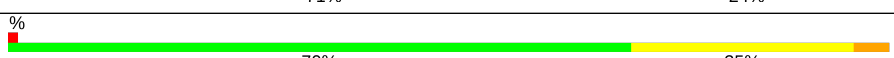
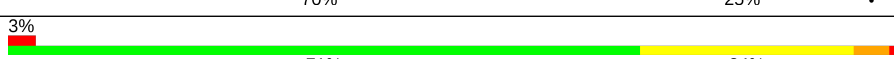
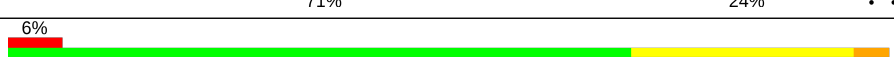
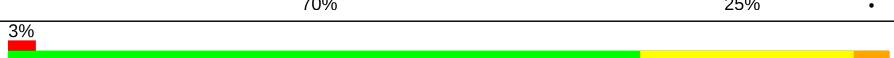








Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	111664	1003 (6.30-3.74)
Clashscore	122126	1024 (6.30-3.80)
Ramachandran outliers	120053	1003 (6.30-3.76)
Sidechain outliers	120020	1000 (6.30-3.72)
RSRZ outliers	108989	1020 (6.50-3.64)

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	499	<div> <div>6%</div> <div> <div></div> <div>72%</div> <div>23%</div> <div>.</div> </div> </div>
1	B	499	<div> <div>3%</div> <div> <div></div> <div>72%</div> <div>23%</div> <div>.</div> </div> </div>
1	C	499	<div> <div>2%</div> <div> <div></div> <div>70%</div> <div>24%</div> <div>5%</div> </div> </div>
1	D	499	<div> <div>4%</div> <div> <div></div> <div>72%</div> <div>23%</div> <div>.</div> </div> </div>
1	E	499	<div> <div>3%</div> <div> <div></div> <div>72%</div> <div>24%</div> <div>.</div> </div> </div>
1	F	499	<div> <div>3%</div> <div> <div></div> <div>72%</div> <div>23%</div> <div>.</div> </div> </div>

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Mol	Chain	Length	Quality of chain
1	G	499	
1	H	499	
1	I	499	
1	J	499	
1	K	499	
1	L	499	
1	M	499	
1	N	499	
1	O	499	
1	P	499	
1	Q	499	
1	R	499	
1	S	499	
1	T	499	
1	U	499	
1	V	499	
1	W	499	
1	X	499	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 91656 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 Pyruvate kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	B	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	C	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	D	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	E	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	F	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	G	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	H	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	I	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	J	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	K	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	L	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	M	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	N	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	O	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	P	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	Q	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	R	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	S	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	T	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	U	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	V	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	W	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			
1	X	498	Total	C	N	O	S	0	0	0
			3799	2368	670	735	26			

There are 96 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	382	SER	GLY	SEE REMARK 999	UNP Q27686
A	389	TYR	SER	SEE REMARK 999	UNP Q27686
A	404	ARG	ALA	SEE REMARK 999	UNP Q27686
A	405	SER	GLY	SEE REMARK 999	UNP Q27686
B	382	SER	GLY	SEE REMARK 999	UNP Q27686
B	389	TYR	SER	SEE REMARK 999	UNP Q27686
B	404	ARG	ALA	SEE REMARK 999	UNP Q27686
B	405	SER	GLY	SEE REMARK 999	UNP Q27686
C	382	SER	GLY	SEE REMARK 999	UNP Q27686
C	389	TYR	SER	SEE REMARK 999	UNP Q27686
C	404	ARG	ALA	SEE REMARK 999	UNP Q27686
C	405	SER	GLY	SEE REMARK 999	UNP Q27686
D	382	SER	GLY	SEE REMARK 999	UNP Q27686
D	389	TYR	SER	SEE REMARK 999	UNP Q27686
D	404	ARG	ALA	SEE REMARK 999	UNP Q27686
D	405	SER	GLY	SEE REMARK 999	UNP Q27686
E	382	SER	GLY	SEE REMARK 999	UNP Q27686
E	389	TYR	SER	SEE REMARK 999	UNP Q27686
E	404	ARG	ALA	SEE REMARK 999	UNP Q27686
E	405	SER	GLY	SEE REMARK 999	UNP Q27686
F	382	SER	GLY	SEE REMARK 999	UNP Q27686
F	389	TYR	SER	SEE REMARK 999	UNP Q27686
F	404	ARG	ALA	SEE REMARK 999	UNP Q27686

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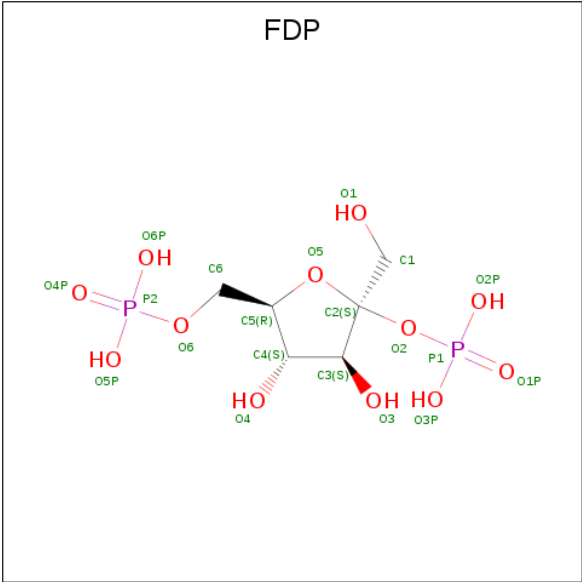
Chain	Residue	Modelled	Actual	Comment	Reference
F	405	SER	GLY	SEE REMARK 999	UNP Q27686
G	382	SER	GLY	SEE REMARK 999	UNP Q27686
G	389	TYR	SER	SEE REMARK 999	UNP Q27686
G	404	ARG	ALA	SEE REMARK 999	UNP Q27686
G	405	SER	GLY	SEE REMARK 999	UNP Q27686
H	382	SER	GLY	SEE REMARK 999	UNP Q27686
H	389	TYR	SER	SEE REMARK 999	UNP Q27686
H	404	ARG	ALA	SEE REMARK 999	UNP Q27686
H	405	SER	GLY	SEE REMARK 999	UNP Q27686
I	382	SER	GLY	SEE REMARK 999	UNP Q27686
I	389	TYR	SER	SEE REMARK 999	UNP Q27686
I	404	ARG	ALA	SEE REMARK 999	UNP Q27686
I	405	SER	GLY	SEE REMARK 999	UNP Q27686
J	382	SER	GLY	SEE REMARK 999	UNP Q27686
J	389	TYR	SER	SEE REMARK 999	UNP Q27686
J	404	ARG	ALA	SEE REMARK 999	UNP Q27686
J	405	SER	GLY	SEE REMARK 999	UNP Q27686
K	382	SER	GLY	SEE REMARK 999	UNP Q27686
K	389	TYR	SER	SEE REMARK 999	UNP Q27686
K	404	ARG	ALA	SEE REMARK 999	UNP Q27686
K	405	SER	GLY	SEE REMARK 999	UNP Q27686
L	382	SER	GLY	SEE REMARK 999	UNP Q27686
L	389	TYR	SER	SEE REMARK 999	UNP Q27686
L	404	ARG	ALA	SEE REMARK 999	UNP Q27686
L	405	SER	GLY	SEE REMARK 999	UNP Q27686
M	382	SER	GLY	SEE REMARK 999	UNP Q27686
M	389	TYR	SER	SEE REMARK 999	UNP Q27686
M	404	ARG	ALA	SEE REMARK 999	UNP Q27686
M	405	SER	GLY	SEE REMARK 999	UNP Q27686
N	382	SER	GLY	SEE REMARK 999	UNP Q27686
N	389	TYR	SER	SEE REMARK 999	UNP Q27686
N	404	ARG	ALA	SEE REMARK 999	UNP Q27686
N	405	SER	GLY	SEE REMARK 999	UNP Q27686
O	382	SER	GLY	SEE REMARK 999	UNP Q27686
O	389	TYR	SER	SEE REMARK 999	UNP Q27686
O	404	ARG	ALA	SEE REMARK 999	UNP Q27686
O	405	SER	GLY	SEE REMARK 999	UNP Q27686
P	382	SER	GLY	SEE REMARK 999	UNP Q27686
P	389	TYR	SER	SEE REMARK 999	UNP Q27686
P	404	ARG	ALA	SEE REMARK 999	UNP Q27686
P	405	SER	GLY	SEE REMARK 999	UNP Q27686
Q	382	SER	GLY	SEE REMARK 999	UNP Q27686

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Chain	Residue	Modelled	Actual	Comment	Reference
Q	389	TYR	SER	SEE REMARK 999	UNP Q27686
Q	404	ARG	ALA	SEE REMARK 999	UNP Q27686
Q	405	SER	GLY	SEE REMARK 999	UNP Q27686
R	382	SER	GLY	SEE REMARK 999	UNP Q27686
R	389	TYR	SER	SEE REMARK 999	UNP Q27686
R	404	ARG	ALA	SEE REMARK 999	UNP Q27686
R	405	SER	GLY	SEE REMARK 999	UNP Q27686
S	382	SER	GLY	SEE REMARK 999	UNP Q27686
S	389	TYR	SER	SEE REMARK 999	UNP Q27686
S	404	ARG	ALA	SEE REMARK 999	UNP Q27686
S	405	SER	GLY	SEE REMARK 999	UNP Q27686
T	382	SER	GLY	SEE REMARK 999	UNP Q27686
T	389	TYR	SER	SEE REMARK 999	UNP Q27686
T	404	ARG	ALA	SEE REMARK 999	UNP Q27686
T	405	SER	GLY	SEE REMARK 999	UNP Q27686
U	382	SER	GLY	SEE REMARK 999	UNP Q27686
U	389	TYR	SER	SEE REMARK 999	UNP Q27686
U	404	ARG	ALA	SEE REMARK 999	UNP Q27686
U	405	SER	GLY	SEE REMARK 999	UNP Q27686
V	382	SER	GLY	SEE REMARK 999	UNP Q27686
V	389	TYR	SER	SEE REMARK 999	UNP Q27686
V	404	ARG	ALA	SEE REMARK 999	UNP Q27686
V	405	SER	GLY	SEE REMARK 999	UNP Q27686
W	382	SER	GLY	SEE REMARK 999	UNP Q27686
W	389	TYR	SER	SEE REMARK 999	UNP Q27686
W	404	ARG	ALA	SEE REMARK 999	UNP Q27686
W	405	SER	GLY	SEE REMARK 999	UNP Q27686
X	382	SER	GLY	SEE REMARK 999	UNP Q27686
X	389	TYR	SER	SEE REMARK 999	UNP Q27686
X	404	ARG	ALA	SEE REMARK 999	UNP Q27686
X	405	SER	GLY	SEE REMARK 999	UNP Q27686

- Molecule 2 is FRUCTOSE-2,6-DIPHOSPHATE (three-letter code: FDP) (formula:  $C_6H_{14}O_{12}P_2$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	O	P	0	0
			20	6	12	2		
2	B	1	Total	C	O	P	0	0
			20	6	12	2		
2	C	1	Total	C	O	P	0	0
			20	6	12	2		
2	D	1	Total	C	O	P	0	0
			20	6	12	2		
2	E	1	Total	C	O	P	0	0
			20	6	12	2		
2	F	1	Total	C	O	P	0	0
			20	6	12	2		
2	G	1	Total	C	O	P	0	0
			20	6	12	2		
2	H	1	Total	C	O	P	0	0
			20	6	12	2		
2	I	1	Total	C	O	P	0	0
			20	6	12	2		
2	J	1	Total	C	O	P	0	0
			20	6	12	2		
2	K	1	Total	C	O	P	0	0
			20	6	12	2		
2	L	1	Total	C	O	P	0	0
			20	6	12	2		
2	M	1	Total	C	O	P	0	0
			20	6	12	2		
2	N	1	Total	C	O	P	0	0
			20	6	12	2		

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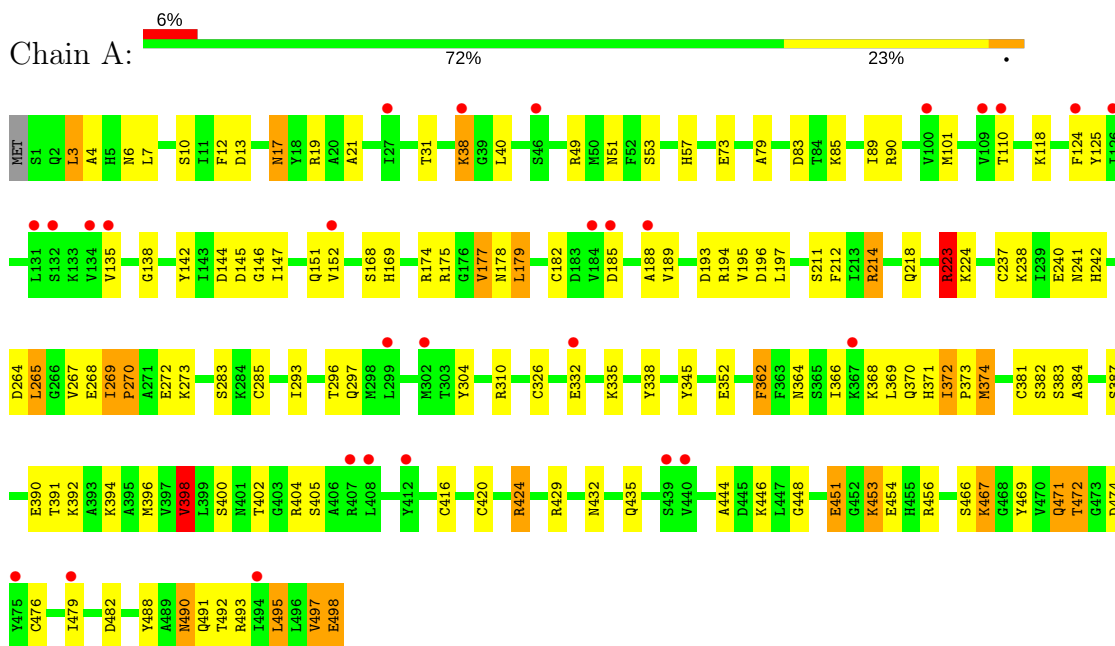
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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	O	1	Total 20	C 6	O 12	P 2	0	0
2	P	1	Total 20	C 6	O 12	P 2	0	0
2	Q	1	Total 20	C 6	O 12	P 2	0	0
2	R	1	Total 20	C 6	O 12	P 2	0	0
2	S	1	Total 20	C 6	O 12	P 2	0	0
2	T	1	Total 20	C 6	O 12	P 2	0	0
2	U	1	Total 20	C 6	O 12	P 2	0	0
2	V	1	Total 20	C 6	O 12	P 2	0	0
2	W	1	Total 20	C 6	O 12	P 2	0	0
2	X	1	Total 20	C 6	O 12	P 2	0	0

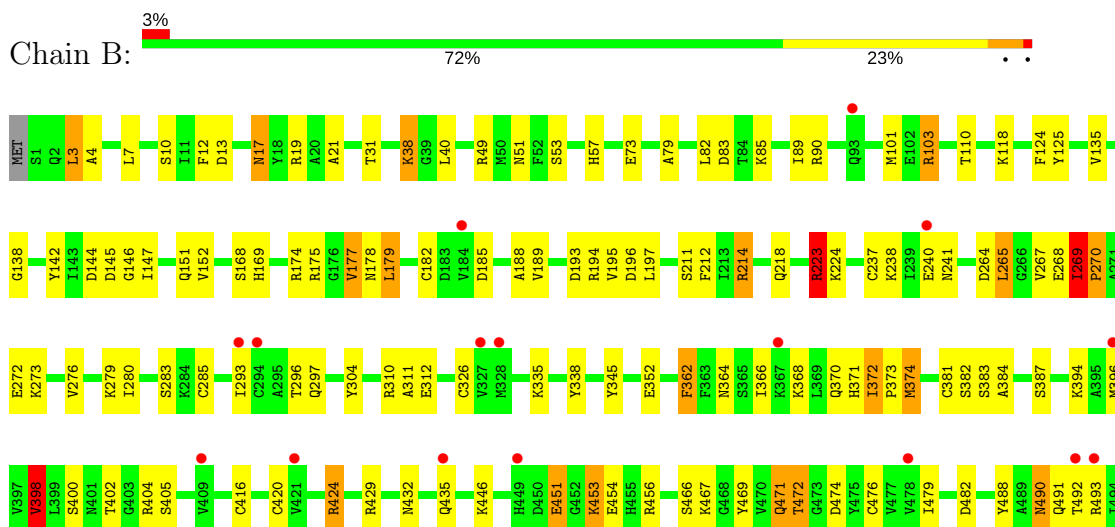
### 3 Residue-property plots [i](#)

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: Pyruvate kinase

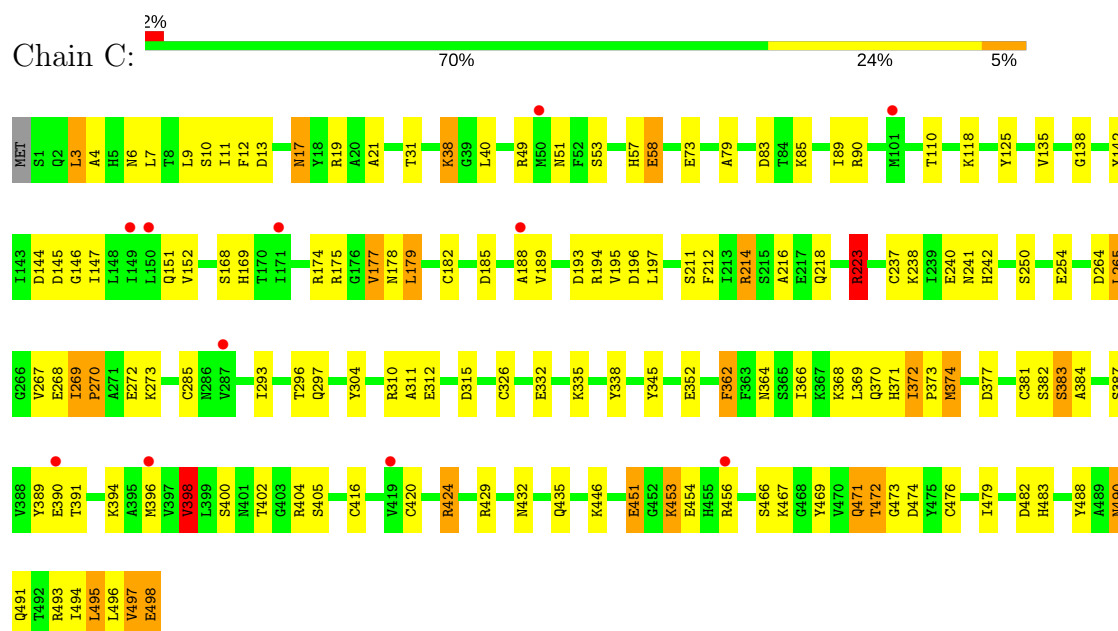


#### • Molecule 1: Pyruvate kinase

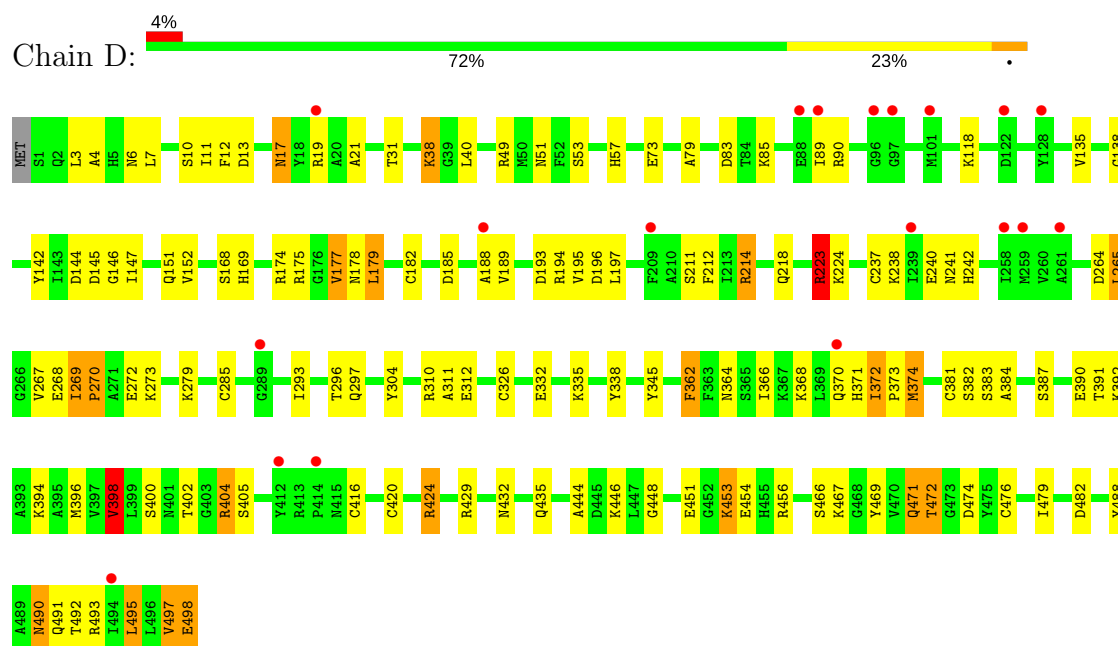


L495  
L496  
V497  
E498

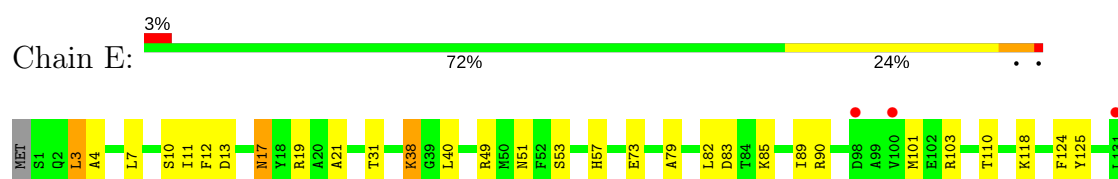
• Molecule 1: Pyruvate kinase

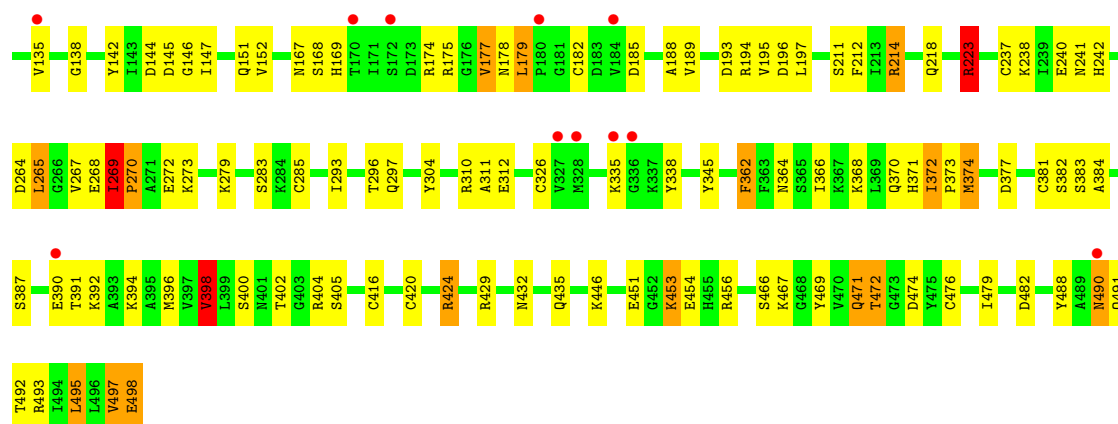


• Molecule 1: Pyruvate kinase

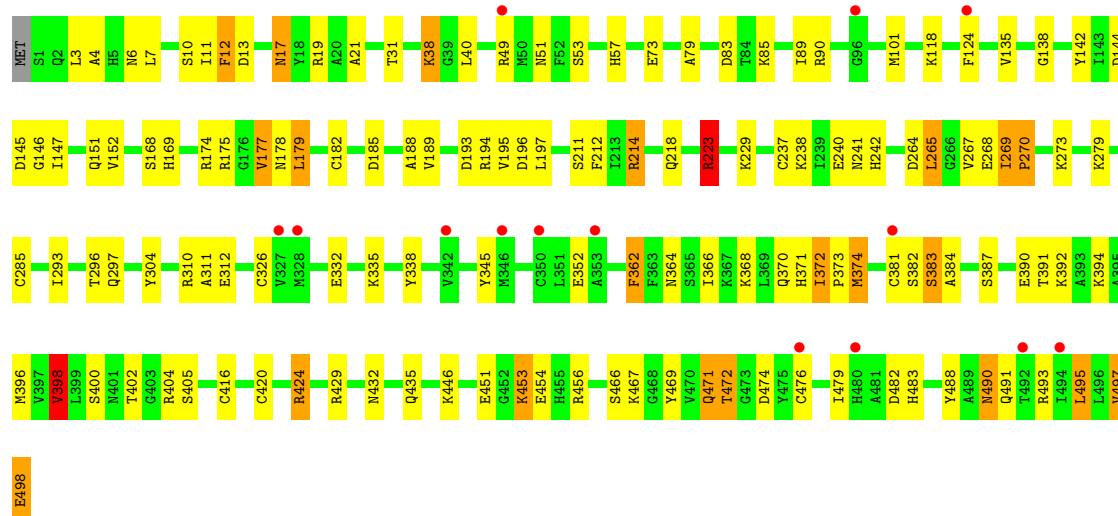


• Molecule 1: Pyruvate kinase

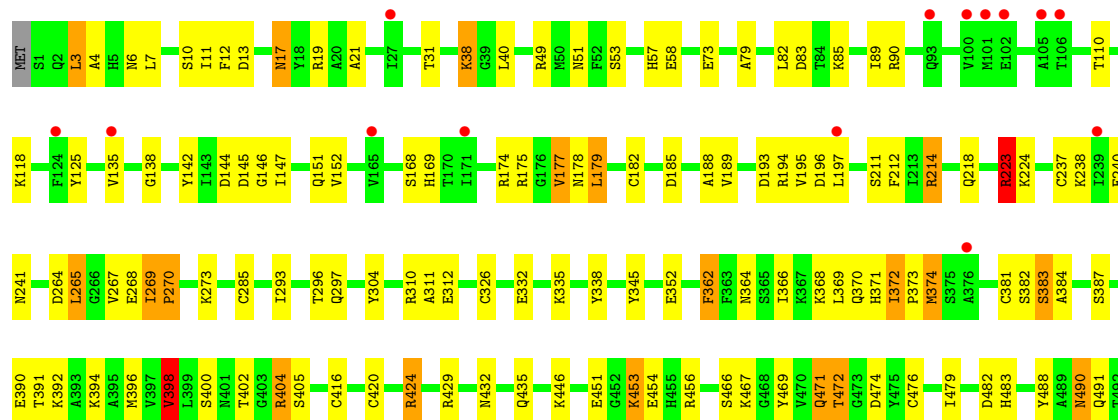
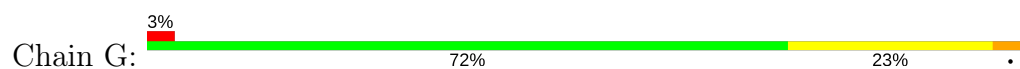


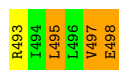


• Molecule 1: Pyruvate kinase

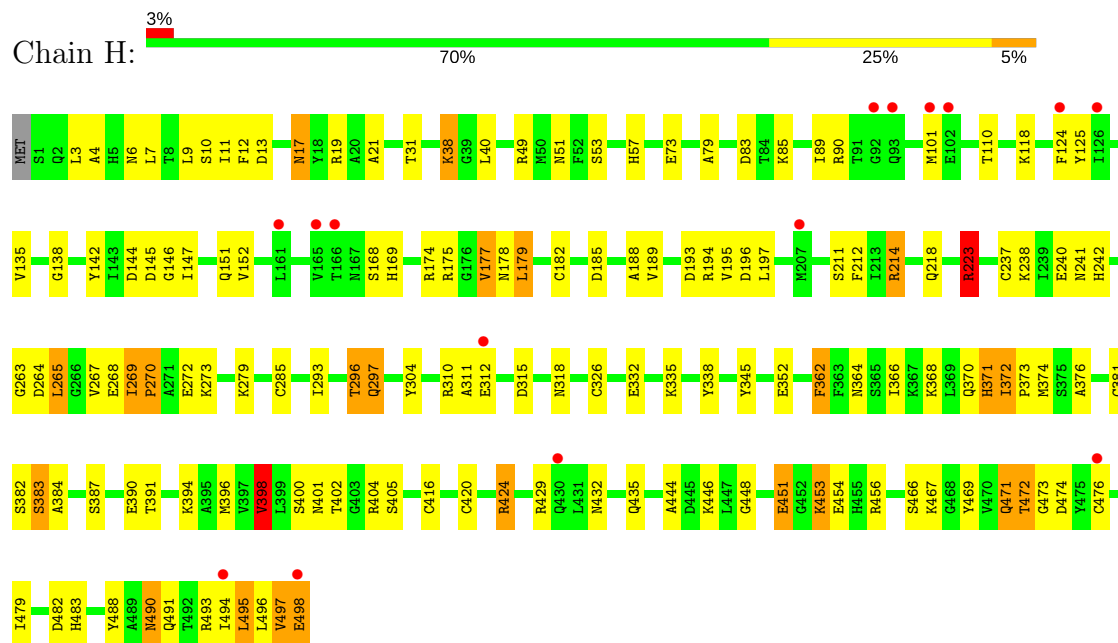


• Molecule 1: Pyruvate kinase

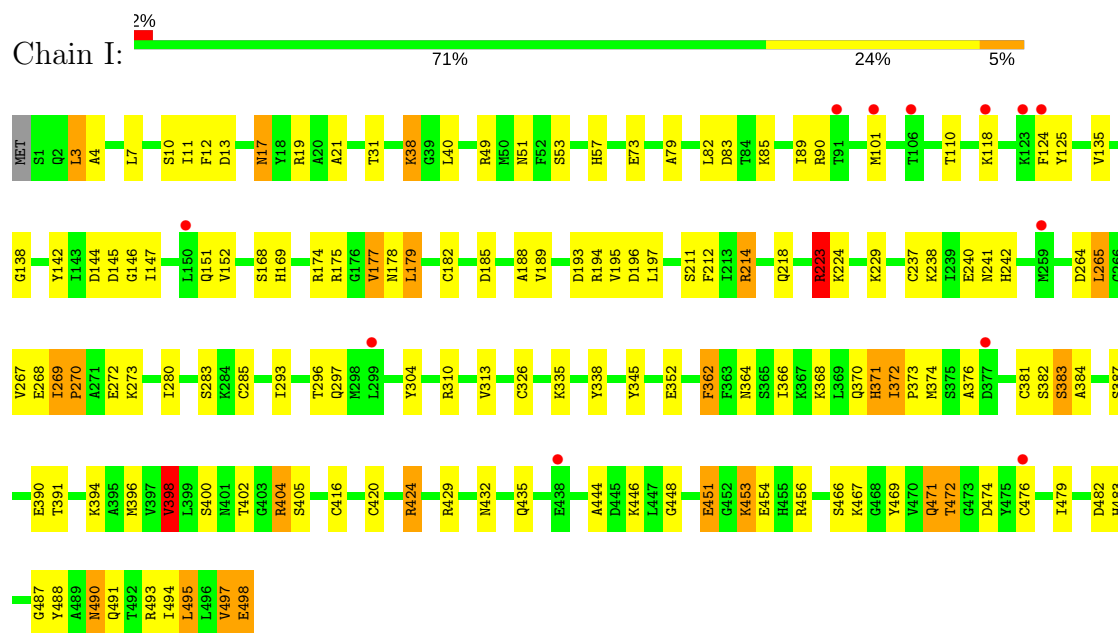




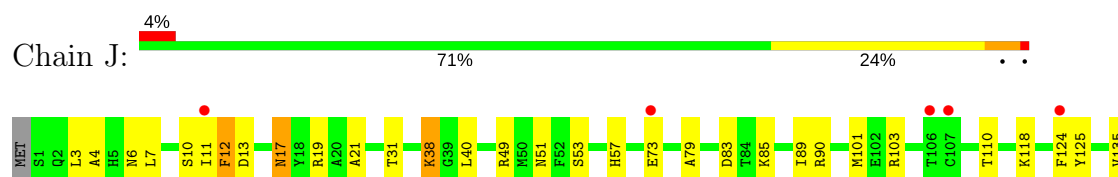
• Molecule 1: Pyruvate kinase

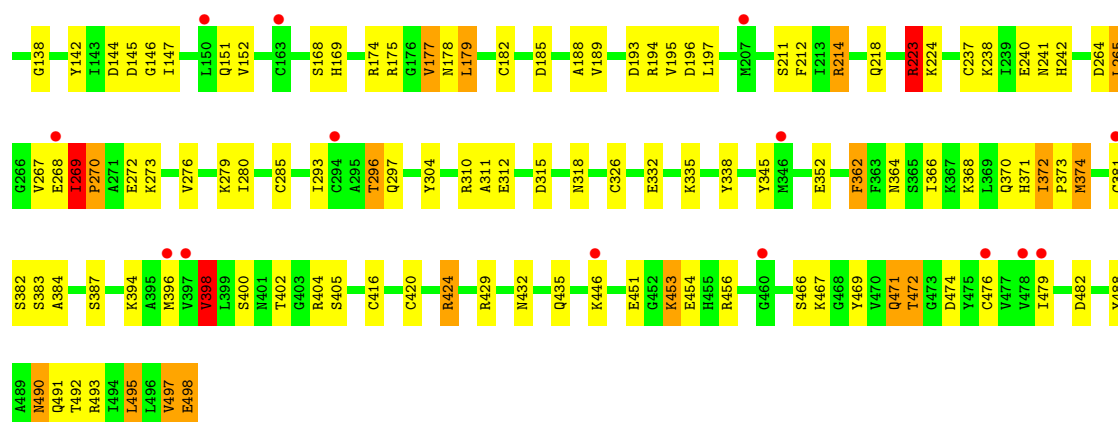


• Molecule 1: Pyruvate kinase

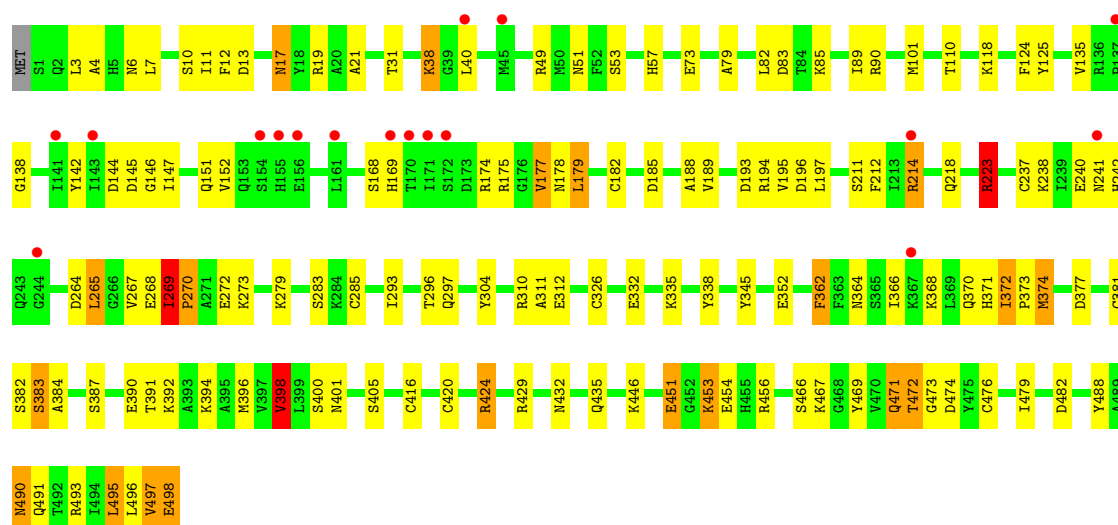


• Molecule 1: Pyruvate kinase

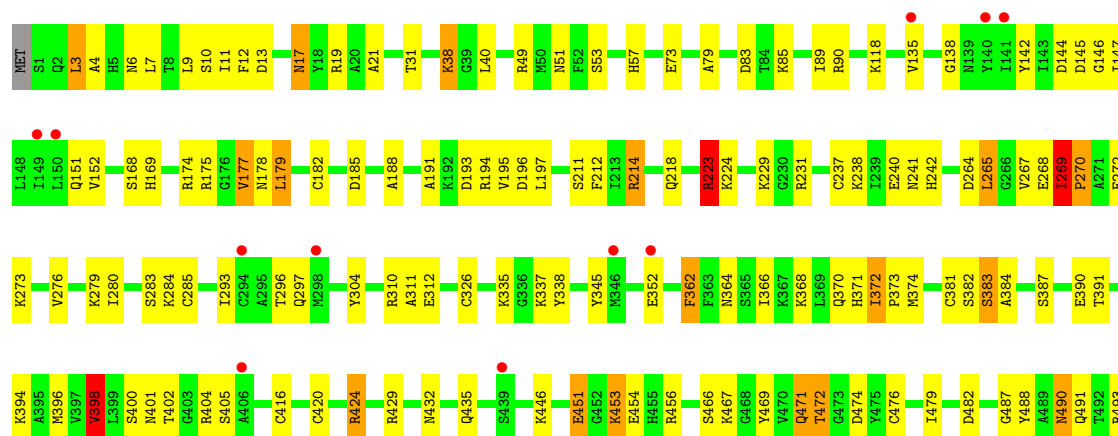




• Molecule 1: Pyruvate kinase

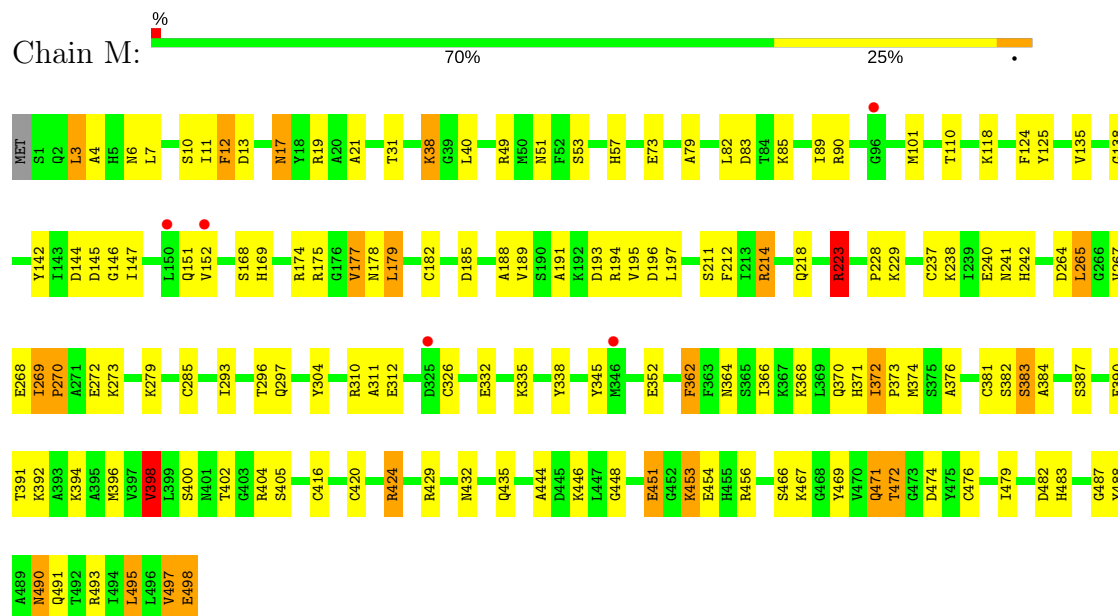


• Molecule 1: Pyruvate kinase

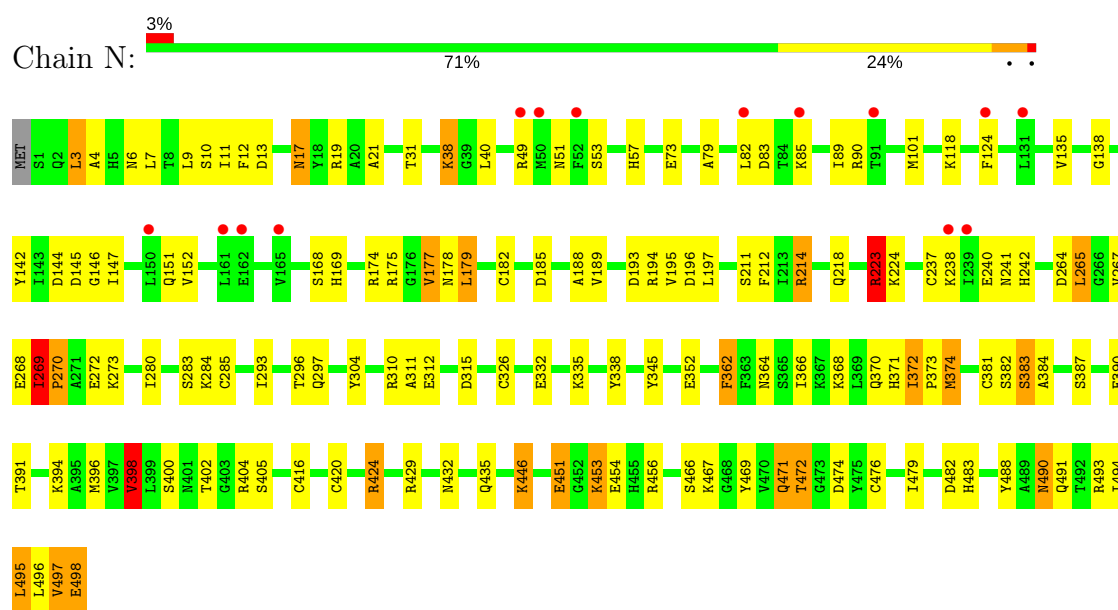




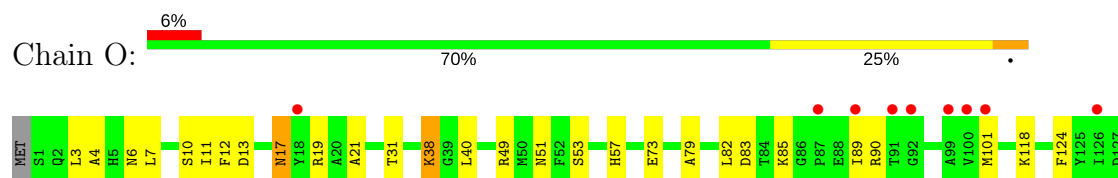
• Molecule 1: Pyruvate kinase

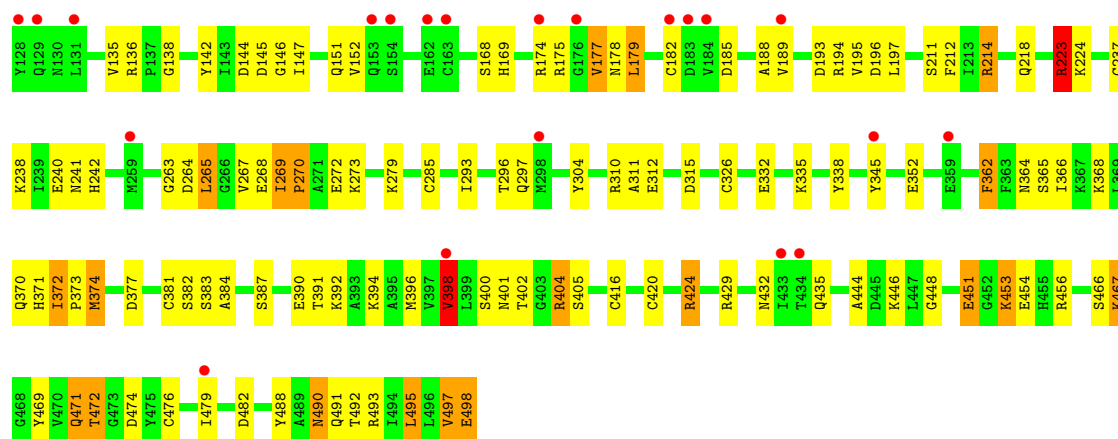


• Molecule 1: Pyruvate kinase



• Molecule 1: Pyruvate kinase

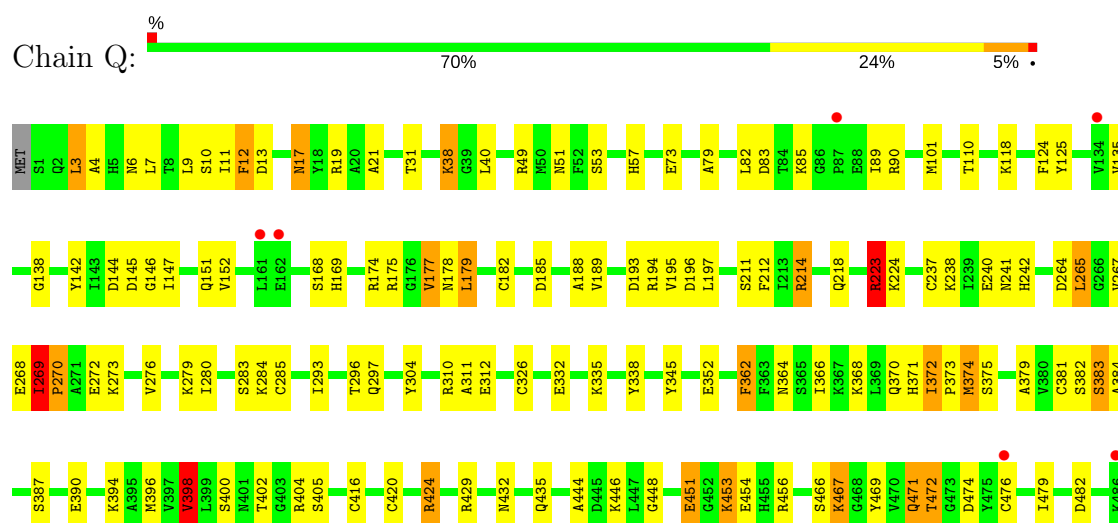




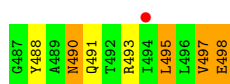
• Molecule 1: Pyruvate kinase



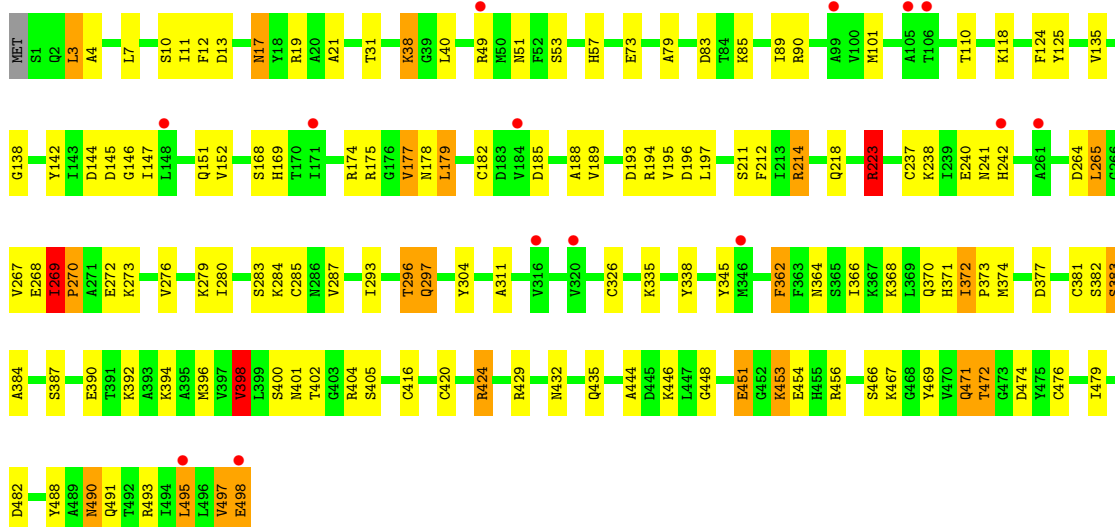
• Molecule 1: Pyruvate kinase



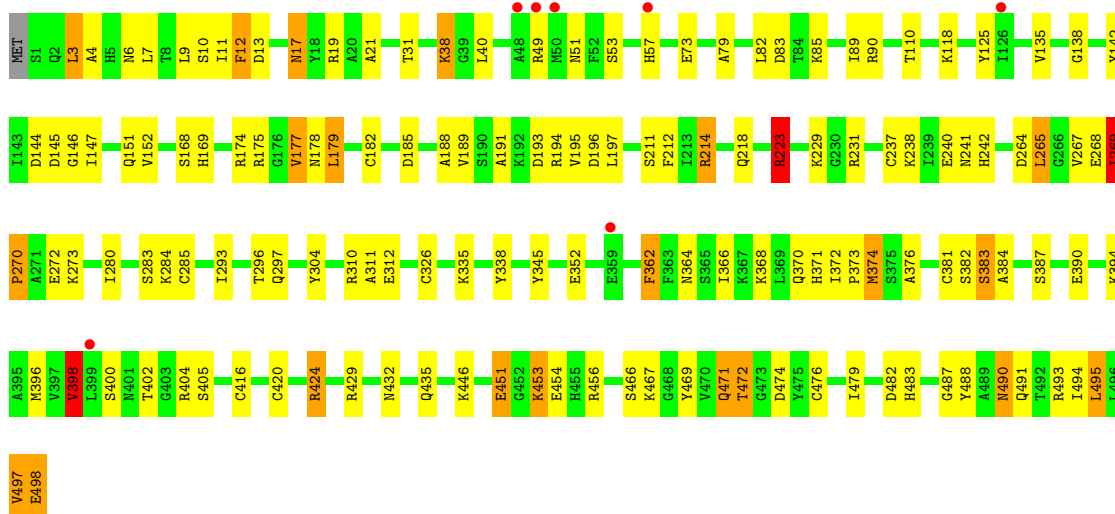




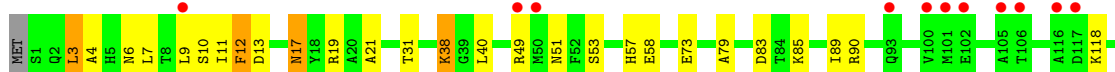
● Molecule 1: Pyruvate kinase

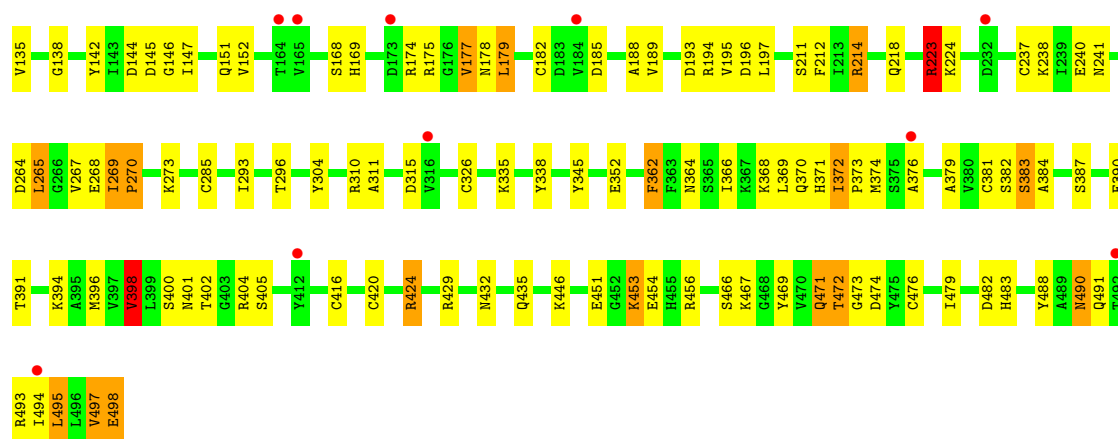


● Molecule 1: Pyruvate kinase

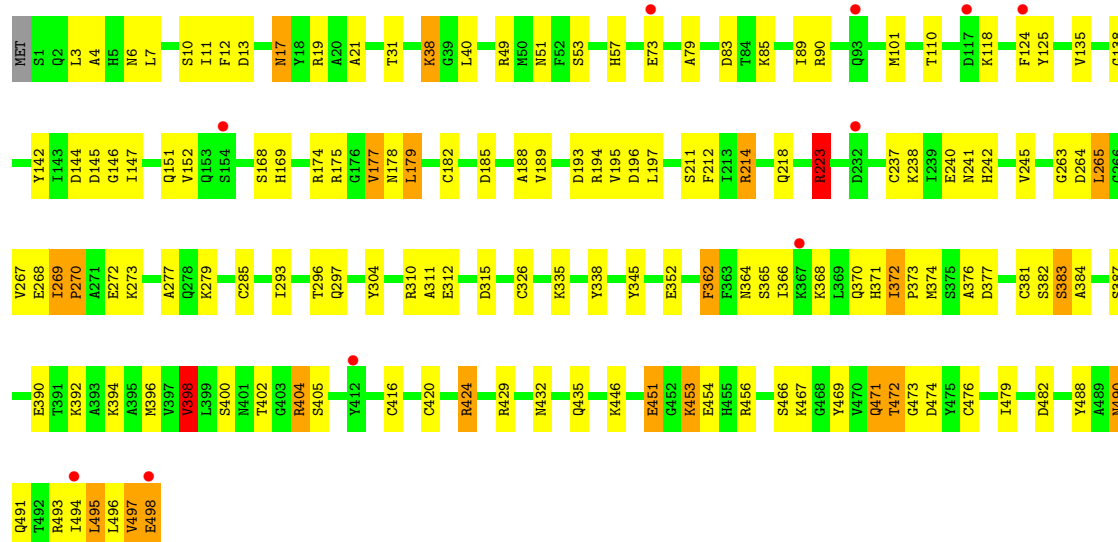


● Molecule 1: Pyruvate kinase

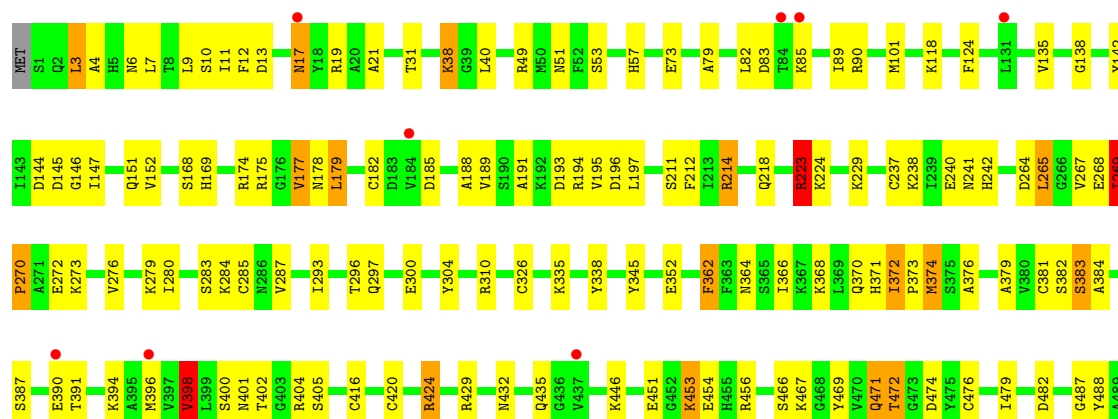




• Molecule 1: Pyruvate kinase

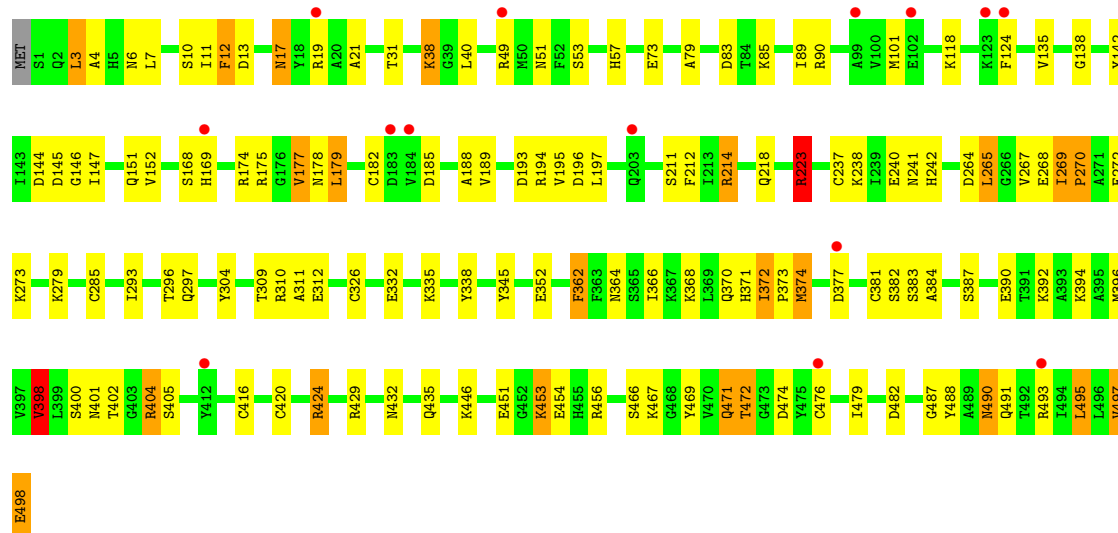
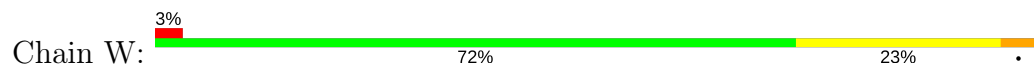


• Molecule 1: Pyruvate kinase

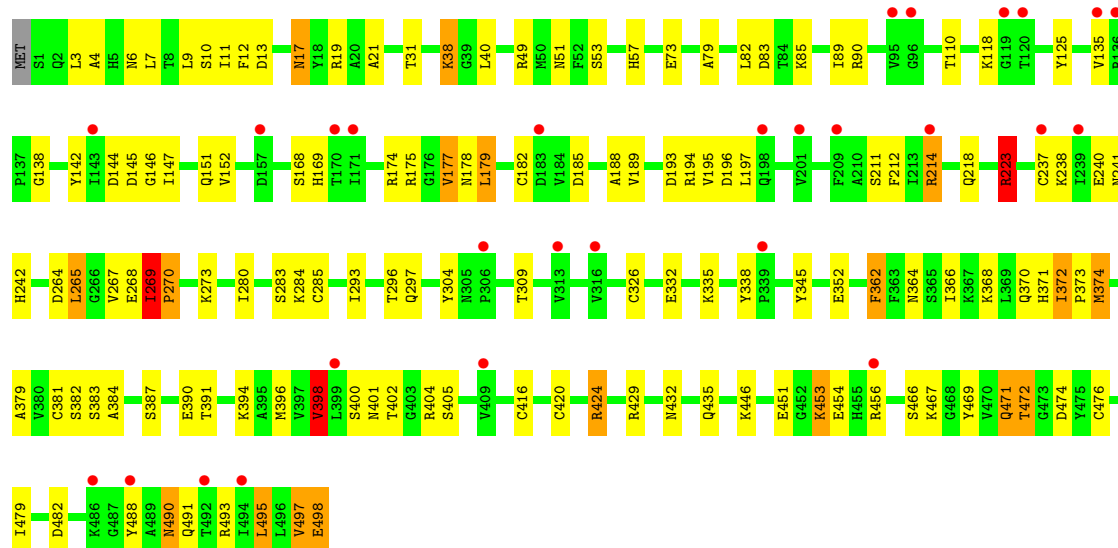




• Molecule 1: Pyruvate kinase



• Molecule 1: Pyruvate kinase



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	243.84Å 254.69Å 892.49Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.81 – 5.07 39.81 – 5.07	Depositor EDS
% Data completeness (in resolution range)	100.0 (39.81-5.07) 86.3 (39.81-5.07)	Depositor EDS
$R_{merge}$	0.19	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.42 (at 5.09Å)	Xtriage
Refinement program	REFMAC 5.5.0066	Depositor
R, $R_{free}$	0.353 , 0.357 0.343 , 0.345	Depositor DCC
$R_{free}$ test set	5652 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	131.8	Xtriage
Anisotropy	0.034	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 28.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.36$ , $\langle L^2 \rangle = 0.18$	Xtriage
Estimated twinning fraction	0.118 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.76	EDS
Total number of atoms	91656	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.00% 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: FDP

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	1.44	12/3856 (0.3%)	0.85	7/5220 (0.1%)
1	B	1.44	10/3856 (0.3%)	0.85	8/5220 (0.2%)
1	C	1.44	11/3856 (0.3%)	0.85	7/5220 (0.1%)
1	D	1.44	12/3856 (0.3%)	0.85	7/5220 (0.1%)
1	E	1.44	10/3856 (0.3%)	0.85	8/5220 (0.2%)
1	F	1.44	11/3856 (0.3%)	0.85	7/5220 (0.1%)
1	G	1.44	13/3856 (0.3%)	0.85	8/5220 (0.2%)
1	H	1.44	12/3856 (0.3%)	0.85	7/5220 (0.1%)
1	I	1.44	10/3856 (0.3%)	0.85	8/5220 (0.2%)
1	J	1.44	11/3856 (0.3%)	0.85	7/5220 (0.1%)
1	K	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	L	1.44	10/3856 (0.3%)	0.85	7/5220 (0.1%)
1	M	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	N	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	O	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	P	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	Q	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	R	1.44	10/3856 (0.3%)	0.85	7/5220 (0.1%)
1	S	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	T	1.44	11/3856 (0.3%)	0.85	7/5220 (0.1%)
1	U	1.44	10/3856 (0.3%)	0.85	7/5220 (0.1%)
1	V	1.44	11/3856 (0.3%)	0.85	8/5220 (0.2%)
1	W	1.44	12/3856 (0.3%)	0.85	7/5220 (0.1%)
1	X	1.44	13/3856 (0.3%)	0.85	8/5220 (0.2%)
All	All	1.44	266/92544 (0.3%)	0.85	181/125280 (0.1%)

The worst 5 of 266 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	L	476	CYS	CB-SG	-7.67	1.69	1.82
1	R	476	CYS	CB-SG	-7.64	1.69	1.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	J	476	CYS	CB-SG	-7.64	1.69	1.82
1	D	476	CYS	CB-SG	-7.63	1.69	1.82
1	E	476	CYS	CB-SG	-7.62	1.69	1.82

The worst 5 of 181 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	V	270	PRO	O-C-N	7.21	134.24	122.70
1	K	270	PRO	O-C-N	7.19	134.21	122.70
1	P	270	PRO	O-C-N	7.17	134.18	122.70
1	I	270	PRO	O-C-N	7.17	134.17	122.70
1	C	270	PRO	O-C-N	7.16	134.16	122.70

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	3799	0	3802	142	0
1	B	3799	0	3802	165	0
1	C	3799	0	3802	208	0
1	D	3799	0	3802	134	0
1	E	3799	0	3802	154	0
1	F	3799	0	3802	144	3
1	G	3799	0	3802	154	0
1	H	3799	0	3802	238	0
1	I	3799	0	3802	178	0
1	J	3799	0	3802	197	1
1	K	3799	0	3802	172	0
1	L	3799	0	3802	229	0
1	M	3799	0	3802	194	0
1	N	3799	0	3802	235	0
1	O	3799	0	3802	167	0
1	P	3799	0	3802	197	0
1	Q	3799	0	3802	191	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	R	3799	0	3802	200	0
1	S	3799	0	3802	230	0
1	T	3799	0	3802	213	1
1	U	3799	0	3802	218	0
1	V	3799	0	3802	257	0
1	W	3799	0	3802	188	3
1	X	3799	0	3802	186	0
2	A	20	0	10	4	0
2	B	20	0	10	4	0
2	C	20	0	10	4	0
2	D	20	0	10	4	0
2	E	20	0	10	4	0
2	F	20	0	10	4	0
2	G	20	0	10	4	0
2	H	20	0	10	5	0
2	I	20	0	10	4	0
2	J	20	0	10	4	0
2	K	20	0	10	5	0
2	L	20	0	10	5	0
2	M	20	0	10	4	0
2	N	20	0	10	4	0
2	O	20	0	10	5	0
2	P	20	0	10	5	0
2	Q	20	0	10	4	0
2	R	20	0	10	5	0
2	S	20	0	10	4	0
2	T	20	0	10	5	0
2	U	20	0	10	4	0
2	V	20	0	10	5	0
2	W	20	0	10	5	0
2	X	20	0	10	5	0
All	All	91656	0	91488	3536	4

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 19.

The worst 5 of 3536 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:C:216:ALA:CB	1:N:446:LYS:HD3	1.49	1.42
1:C:250:SER:CB	1:N:446:LYS:HG2	1.49	1.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:U:242:HIS:HE1	1:W:12:PHE:CZ	1.42	1.38
1:H:12:PHE:CZ	1:J:242:HIS:HE1	1.41	1.37
1:P:487:GLY:HA2	1:V:229:LYS:CE	1.56	1.33

All (4) 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)
1:J:103:ARG:CD	1:T:58:GLU:OE1[5_545]	1.91	0.29
1:F:229:LYS:CE	1:W:487:GLY:CA[5_545]	2.08	0.12
1:F:229:LYS:CD	1:W:487:GLY:CA[5_545]	2.15	0.05
1:F:229:LYS:CG	1:W:487:GLY:CA[5_545]	2.16	0.04

## 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	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	B	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	C	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	D	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	E	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	F	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	G	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	H	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	I	496/499 (99%)	485 (98%)	10 (2%)	1 (0%)	49	84
1	J	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	K	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	L	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	M	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	N	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	O	496/499 (99%)	485 (98%)	10 (2%)	1 (0%)	49	84
1	P	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	Q	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	R	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	S	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	T	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	U	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	V	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	W	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
1	X	496/499 (99%)	486 (98%)	9 (2%)	1 (0%)	49	84
All	All	11904/11976 (99%)	11662 (98%)	218 (2%)	24 (0%)	49	84

5 of 24 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	296	THR
1	B	296	THR
1	C	296	THR
1	D	296	THR
1	E	296	THR

### 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	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	B	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	C	416/417 (100%)	374 (90%)	42 (10%)	8	31

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	E	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	F	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	G	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	H	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	I	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	J	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	K	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	L	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	M	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	N	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	O	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	P	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	Q	416/417 (100%)	375 (90%)	41 (10%)	8	32
1	R	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	S	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	T	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	U	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	V	416/417 (100%)	376 (90%)	40 (10%)	9	33
1	W	416/417 (100%)	374 (90%)	42 (10%)	8	31
1	X	416/417 (100%)	377 (91%)	39 (9%)	9	34
All	All	9984/10008 (100%)	9012 (90%)	972 (10%)	9	33

5 of 972 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	K	453	LYS
1	N	304	TYR
1	W	175	ARG
1	L	38	LYS
1	M	38	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 267 such sidechains are listed below:

Mol	Chain	Res	Type
1	L	139	ASN
1	N	305	ASN
1	W	151	GLN
1	L	242	HIS
1	M	242	HIS

### 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](#)

24 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	FDP	A	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	B	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	C	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	D	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	E	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	F	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	G	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	H	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	FDP	I	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	J	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	K	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	L	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	M	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	N	700	-	19,20,20	1.05	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	O	700	-	19,20,20	1.03	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	P	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	Q	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	R	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	S	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	T	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.34	4 (13%)
2	FDP	U	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	V	700	-	19,20,20	1.05	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	W	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)
2	FDP	X	700	-	19,20,20	1.04	2 (10%)	30,32,32	1.33	4 (13%)

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	FDP	A	700	-	-	0/12/34/34	0/1/1/1
2	FDP	B	700	-	-	0/12/34/34	0/1/1/1
2	FDP	C	700	-	-	0/12/34/34	0/1/1/1
2	FDP	D	700	-	-	0/12/34/34	0/1/1/1
2	FDP	E	700	-	-	0/12/34/34	0/1/1/1
2	FDP	F	700	-	-	0/12/34/34	0/1/1/1
2	FDP	G	700	-	-	0/12/34/34	0/1/1/1
2	FDP	H	700	-	-	0/12/34/34	0/1/1/1
2	FDP	I	700	-	-	0/12/34/34	0/1/1/1
2	FDP	J	700	-	-	0/12/34/34	0/1/1/1
2	FDP	K	700	-	-	0/12/34/34	0/1/1/1
2	FDP	L	700	-	-	0/12/34/34	0/1/1/1
2	FDP	M	700	-	-	0/12/34/34	0/1/1/1
2	FDP	N	700	-	-	0/12/34/34	0/1/1/1
2	FDP	O	700	-	-	0/12/34/34	0/1/1/1
2	FDP	P	700	-	-	0/12/34/34	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	FDP	Q	700	-	-	0/12/34/34	0/1/1/1
2	FDP	R	700	-	-	0/12/34/34	0/1/1/1
2	FDP	S	700	-	-	0/12/34/34	0/1/1/1
2	FDP	T	700	-	-	0/12/34/34	0/1/1/1
2	FDP	U	700	-	-	0/12/34/34	0/1/1/1
2	FDP	V	700	-	-	0/12/34/34	0/1/1/1
2	FDP	W	700	-	-	0/12/34/34	0/1/1/1
2	FDP	X	700	-	-	0/12/34/34	0/1/1/1

The worst 5 of 48 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	K	700	FDP	O4-C4	-2.37	1.37	1.43
2	X	700	FDP	O4-C4	-2.37	1.37	1.43
2	A	700	FDP	O4-C4	-2.37	1.37	1.43
2	W	700	FDP	O4-C4	-2.36	1.37	1.43
2	E	700	FDP	O4-C4	-2.36	1.37	1.43

The worst 5 of 96 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	700	FDP	C6-C5-C4	-2.66	105.28	115.29
2	X	700	FDP	C6-C5-C4	-2.66	105.29	115.29
2	W	700	FDP	C6-C5-C4	-2.65	105.30	115.29
2	O	700	FDP	C6-C5-C4	-2.65	105.30	115.29
2	Q	700	FDP	C6-C5-C4	-2.65	105.31	115.29

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

24 monomers are involved in 106 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	700	FDP	4	0
2	B	700	FDP	4	0
2	C	700	FDP	4	0
2	D	700	FDP	4	0
2	E	700	FDP	4	0
2	F	700	FDP	4	0
2	G	700	FDP	4	0
2	H	700	FDP	5	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	I	700	FDP	4	0
2	J	700	FDP	4	0
2	K	700	FDP	5	0
2	L	700	FDP	5	0
2	M	700	FDP	4	0
2	N	700	FDP	4	0
2	O	700	FDP	5	0
2	P	700	FDP	5	0
2	Q	700	FDP	4	0
2	R	700	FDP	5	0
2	S	700	FDP	4	0
2	T	700	FDP	5	0
2	U	700	FDP	4	0
2	V	700	FDP	5	0
2	W	700	FDP	5	0
2	X	700	FDP	5	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	498/499 (99%)	0.52	28 (5%) 24 21	13, 23, 36, 46	0
1	B	498/499 (99%)	0.35	16 (3%) 47 37	13, 23, 36, 46	0
1	C	498/499 (99%)	0.38	11 (2%) 62 53	13, 23, 36, 46	0
1	D	498/499 (99%)	0.42	19 (3%) 40 32	13, 23, 36, 46	0
1	E	498/499 (99%)	0.39	14 (2%) 53 43	13, 23, 36, 46	0
1	F	498/499 (99%)	0.40	14 (2%) 53 43	13, 23, 36, 46	0
1	G	498/499 (99%)	0.37	14 (2%) 53 43	13, 23, 36, 46	0
1	H	498/499 (99%)	0.34	15 (3%) 50 39	13, 23, 36, 46	0
1	I	498/499 (99%)	0.36	12 (2%) 59 49	13, 23, 36, 46	0
1	J	498/499 (99%)	0.42	19 (3%) 40 32	13, 23, 36, 46	0
1	K	498/499 (99%)	0.38	17 (3%) 45 36	13, 23, 36, 46	0
1	L	498/499 (99%)	0.41	11 (2%) 62 53	13, 23, 36, 46	0
1	M	498/499 (99%)	0.32	5 (1%) 82 74	13, 23, 36, 46	0
1	N	498/499 (99%)	0.40	14 (2%) 53 43	13, 23, 36, 46	0
1	O	498/499 (99%)	0.47	30 (6%) 22 18	13, 23, 36, 46	0
1	P	498/499 (99%)	0.37	16 (3%) 47 37	13, 23, 36, 46	0
1	Q	498/499 (99%)	0.34	7 (1%) 75 66	13, 23, 36, 46	0
1	R	498/499 (99%)	0.38	14 (2%) 53 43	13, 23, 36, 46	0
1	S	498/499 (99%)	0.33	7 (1%) 75 66	13, 23, 36, 46	0
1	T	498/499 (99%)	0.43	21 (4%) 36 29	13, 23, 36, 46	0
1	U	498/499 (99%)	0.37	10 (2%) 65 56	13, 23, 36, 46	0
1	V	498/499 (99%)	0.41	8 (1%) 72 63	13, 23, 36, 46	0
1	W	498/499 (99%)	0.41	14 (2%) 53 43	13, 23, 36, 46	0
1	X	498/499 (99%)	0.50	28 (5%) 24 21	13, 23, 36, 46	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å <sup>2</sup> )	Q<0.9
All	All	11952/11976 (99%)	0.40	364 (3%)	50	39	13, 23, 36, 46	0

The worst 5 of 364 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	135	VAL	6.1
1	O	163	CYS	5.7
1	A	132	SER	5.4
1	A	131	LEU	5.2
1	T	116	ALA	5.1

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

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

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. 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	FDP	X	700	20/20	0.63	0.34	25,32,34,35	0
2	FDP	L	700	20/20	0.64	0.30	25,32,34,35	0
2	FDP	J	700	20/20	0.64	0.37	25,32,34,35	0
2	FDP	C	700	20/20	0.64	0.32	25,32,34,35	0
2	FDP	P	700	20/20	0.66	0.29	25,32,34,35	0
2	FDP	T	700	20/20	0.67	0.25	25,32,34,35	0
2	FDP	S	700	20/20	0.70	0.33	25,32,34,35	0
2	FDP	H	700	20/20	0.71	0.31	25,32,34,35	0
2	FDP	K	700	20/20	0.73	0.27	25,32,34,35	0
2	FDP	U	700	20/20	0.73	0.32	25,32,34,35	0
2	FDP	E	700	20/20	0.74	0.24	25,32,34,35	0
2	FDP	Q	700	20/20	0.74	0.30	25,32,34,35	0
2	FDP	R	700	20/20	0.75	0.23	25,32,34,35	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	FDP	G	700	20/20	0.76	0.31	25,32,34,35	0
2	FDP	F	700	20/20	0.78	0.31	25,32,34,35	0
2	FDP	B	700	20/20	0.78	0.19	25,32,34,35	0
2	FDP	V	700	20/20	0.79	0.30	25,32,34,35	0
2	FDP	W	700	20/20	0.80	0.32	25,32,34,35	0
2	FDP	N	700	20/20	0.80	0.26	25,32,34,35	0
2	FDP	A	700	20/20	0.81	0.19	25,32,34,35	0
2	FDP	I	700	20/20	0.81	0.25	25,32,34,35	0
2	FDP	O	700	20/20	0.82	0.26	25,32,34,35	0
2	FDP	M	700	20/20	0.82	0.22	25,32,34,35	0
2	FDP	D	700	20/20	0.87	0.23	25,32,34,35	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.