WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Jun 12, 2024 – 12:58 PM EDT

PDB ID	:	2PFK
Title	:	THE CRYSTAL STRUCTURE OF UNLIGANDED PHOSPHOFRUCTOKI- NASE FROM ESCHERICHIA COLI
Authors	:	Rypniewski, W.R.; Evans, P.R.
Deposited on	:	1988-01-25
Resolution	:	2.40 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

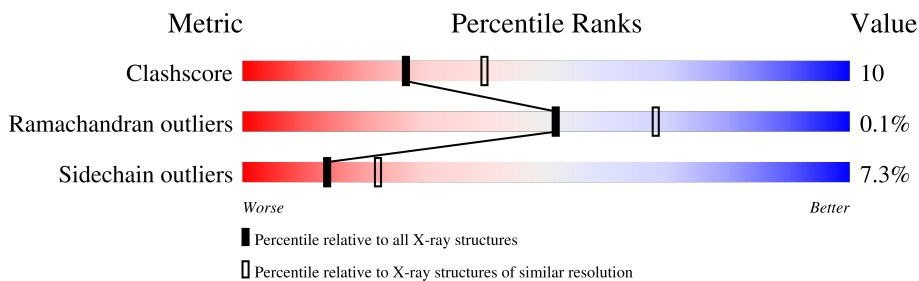|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 2.40 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	Percentile Ranks	Value
Clashscore		10
Ramachandran outliers		0.1%
Sidechain outliers		7.3%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)

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 of the lower bar indicate the fraction of residues that contain outliers for >=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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	320	58% 31% • • 6%
1	B	320	61% 27% 5% • 6%
1	C	320	66% 23% • • 6%
1	D	320	68% 21% 5% • 5%

2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 9371 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 6-PHOSPHOFRUCTOKINASE ISOZYME I.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	301	Total	C	N	O	S	0	0	0
			2255	1413	395	431	16			
1	B	301	Total	C	N	O	S	0	0	0
			2233	1401	390	426	16			
1	C	302	Total	C	N	O	S	0	0	1
			2251	1409	394	433	15			
1	D	305	Total	C	N	O	S	0	0	0
			2285	1432	396	441	16			

- Molecule 2 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	81	Total	O	0	0
			81	81		
2	B	76	Total	O	0	0
			76	76		
2	C	94	Total	O	0	0
			94	94		
2	D	96	Total	O	0	0
			96	96		

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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. 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. 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.
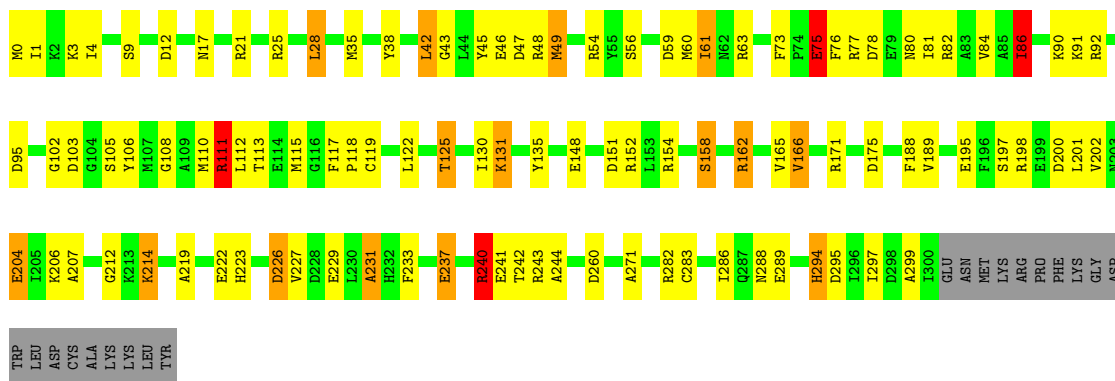
Note EDS was not executed.

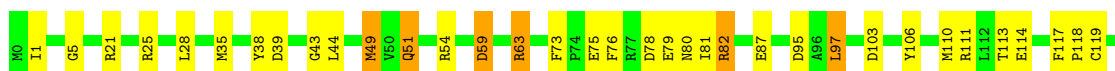• Molecule 1: 6-PHOSPHOFRUCTOKINASE ISOZYME I

Chain A:
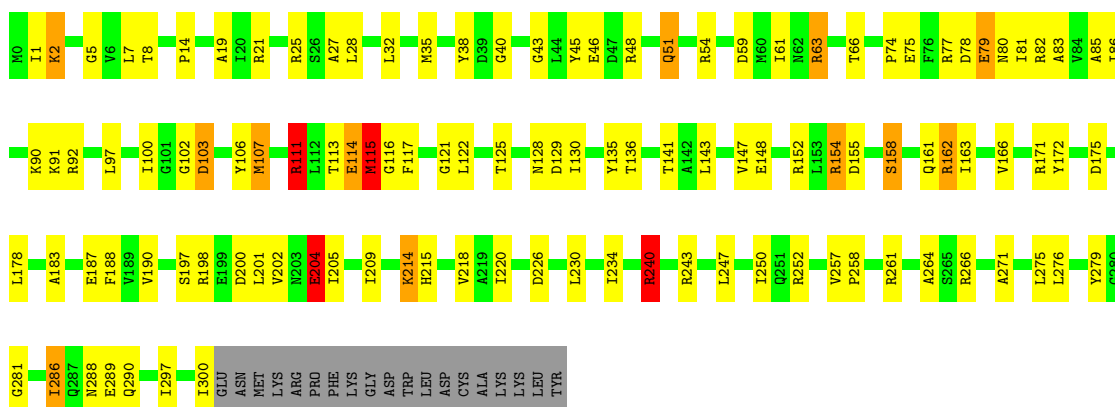
• Molecule 1: 6-PHOSPHOFRUCTOKINASE ISOZYME I

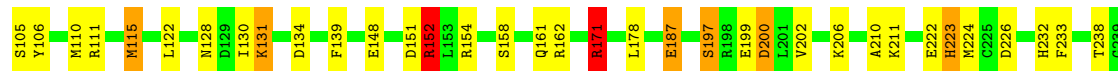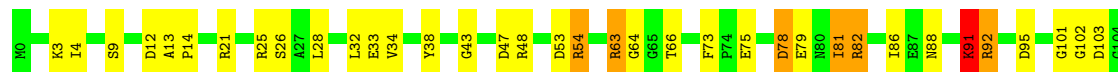Chain B:

• Molecule 1: 6-PHOSPHOFRUCTOKINASE ISOZYME I

Chain C:

L122 I130 D134 E148 D151 R152 L153 R154 S158 R162 I163 S164 V165 V166 R171 E187 V190 E195 F196 S197 R198 E199 D200 L201 V202 N203 E204 I205 G208 K211 G212 K213 K214 H215 I220 T221 E222 H223 M224 C225 D226 L230 F233 I234 E235

K236 R240 E241 T242 R243 A244 R252 V257 D260 R261 R266 M267 G268 A269 Y270 Y279 R282 Q287 Q290 I300 E301 ASN MET LYS ARG PRO PHE LYS GLY ASP TRP LEU ASP CYS ALA LYS LYS LEU TYR

• Molecule 1: 6-PHOSPHOFRUCTOKINASE ISOZYME I

Chain D:

68%   21%   5% • 5%

M0 K3 I4 S9 D12 A13 P14 R21 R25 S26 A27 L28 L32 E33 V34 Y38 G43 D47 R48 D53 R54 R63 G64 G65 T66 F73 P74 E75 D78 E79 N80 I81 R82 I86 E87 N88 K91 R92 D95 G101 G102 D103 G104

S105 Y106 M110 R111 M115 L122 N128 D129 I130 K131 D134 F139 E148 D151 R152 L153 R154 S158 Q161 R162 R171 L178 E187 S197 R198 E199 D200 L201 V202 K206 A210 K211 E222 H223 M224 C225 D226 H232 F233 T238 G239

R240 E241 T242 R243 R252 R261 R266 A271 I272 R282 I286 E289 H294 I297 D298 A299 I300 K304 ARG PRO PHE LYS GLY ASP TRP LEU ASP CYS ALA LYS LYS LEU TYR

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	177.00Å 66.40Å 154.00Å 90.00° 118.80° 90.00°	Depositor
Resolution (Å)	100.00 – 2.40	Depositor
% Data completeness (in resolution range)	(Not available) (100.00-2.40)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.166 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	9371	wwPDB-VP
Average B, all atoms (Å^2)	39.0	wwPDB-VP

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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	0.84	0/2286	1.95	48/3085 (1.6%)
1	B	0.83	0/2264	1.92	49/3057 (1.6%)
1	C	0.86	0/2282	1.89	55/3081 (1.8%)
1	D	0.84	0/2317	1.92	69/3128 (2.2%)
All	All	0.84	0/9149	1.92	221/12351 (1.8%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1
1	D	0	1
All	All	0	2

There are no bond length outliers.

The worst 5 of 221 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	266	ARG	CD-NE-CZ	22.66	155.32	123.60
1	D	243	ARG	NE-CZ-NH1	20.52	130.56	120.30
1	B	152	ARG	CD-NE-CZ	20.30	152.02	123.60
1	A	152	ARG	NE-CZ-NH2	-19.54	110.53	120.30
1	B	152	ARG	NE-CZ-NH2	-18.16	111.22	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	300	ILE	Mainchain
1	D	152	ARG	Sidechain

5.2 Too-close contacts (i)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2255	0	2250	57	1
1	B	2233	0	2212	66	0
1	C	2251	0	2239	35	2
1	D	2285	0	2262	32	1
2	A	81	0	0	1	0
2	B	76	0	0	4	0
2	C	94	0	0	4	0
2	D	96	0	0	2	1
All	All	9371	0	8963	183	3

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 10.

The worst 5 of 183 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:131:LYS:H	1:B:131:LYS:HD2	1.09	1.09
1:A:240:ARG:HG2	1:A:240:ARG:HH11	1.17	1.08
1:C:240:ARG:HH11	1:C:240:ARG:HG2	1.28	0.95
1:B:75:GLU:HB3	1:B:81:ILE:HD13	1.58	0.84
1:B:131:LYS:HD2	1:B:131:LYS:N	1.93	0.81

All (3) 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)
2:D:389:HOH:O	2:D:389:HOH:O[4_556]	1.95	0.25
1:C:236:LYS:NZ	1:D:232:HIS:CD2[4_546]	2.07	0.13
1:A:279:TYR:OH	1:C:87:GLU:OE2[4_556]	2.10	0.10

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	299/320 (93%)	288 (96%)	10 (3%)	1 (0%)	41	55
1	B	299/320 (93%)	293 (98%)	6 (2%)	0	100	100
1	C	300/320 (94%)	292 (97%)	8 (3%)	0	100	100
1	D	303/320 (95%)	290 (96%)	13 (4%)	0	100	100
All	All	1201/1280 (94%)	1163 (97%)	37 (3%)	1 (0%)	51	68

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	115	MET

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	233/255 (91%)	214 (92%)	19 (8%)	11	17
1	B	227/255 (89%)	210 (92%)	17 (8%)	13	21
1	C	233/255 (91%)	216 (93%)	17 (7%)	14	22
1	D	236/255 (92%)	221 (94%)	15 (6%)	17	28
All	All	929/1020 (91%)	861 (93%)	68 (7%)	14	22

5 of 68 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	91	LYS
1	D	131	LYS
1	D	286	ILE
1	B	56	SER
1	B	49	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	223	HIS
1	C	288	ASN
1	D	302	ASN
1	D	161	GLN
1	B	223	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

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6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.