



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 01:47 AM UTC

PDB ID : 1OEN / pdb_00001oen
Title : PHOSPHOENOLPYRUVATE CARBOXYKINASE
Authors : Matte, A.; Goldie, H.; Sweet, R.M.; Delbaere, L.T.J.
Deposited on : 1995-09-08
Resolution : 1.90 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

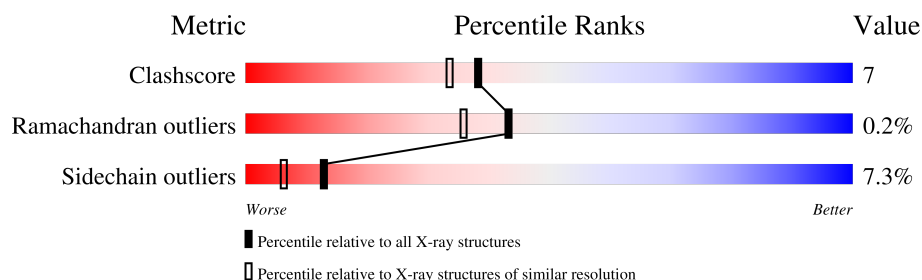
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	540	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4173 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.

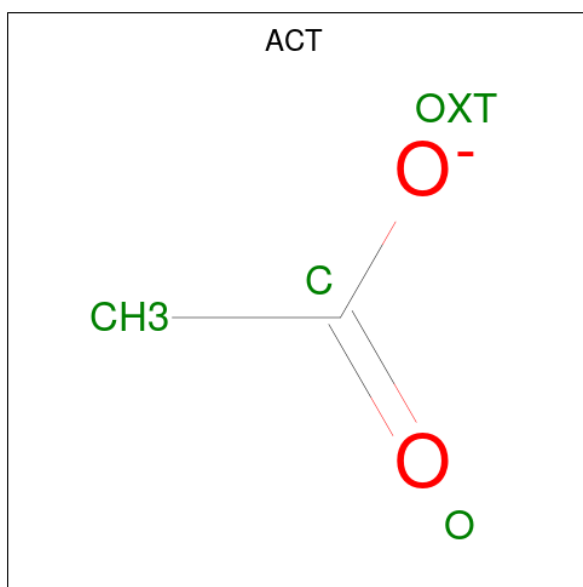
- Molecule 1 is a protein called PHOSPHOENOLPYRUVATE CARBOXYKINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	524	4034	2567	680	773	14	0	0	0

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	240	ALA	LYS	conflict	UNP P22259
A	252	SER	THR	conflict	UNP P22259
A	262	ALA	LYS	variant	UNP P22259
A	285	SER	CYS	variant	UNP P22259
A	302	ALA	ASN	variant	UNP P22259
A	317	ALA	GLU	conflict	UNP P22259
A	318	GLY	ASP	conflict	UNP P22259
A	390	ALA	LYS	conflict	UNP P22259
A	391	ALA	LEU	conflict	UNP P22259
A	452	ALA	ILE	conflict	UNP P22259
A	453	ALA	LYS	conflict	UNP P22259
A	492	GLY	LYS	variant	UNP P22259
A	501	ALA	GLU	variant	UNP P22259
A	502	GLY	GLN	variant	UNP P22259
A	539	ALA	LYS	variant	UNP P22259

- Molecule 2 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	135	Total	O	0	0
			135	135		

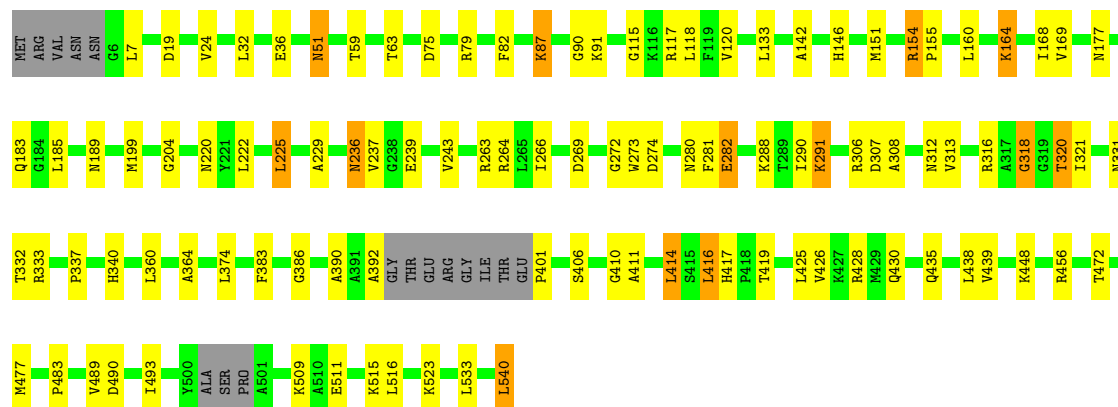
3 Residue-property plots

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: PHOSPHOENOLPYRUVATE CARBOXYKINASE

Chain A:  77% 17% ..



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	77.70Å 89.66Å 93.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	6.00 – 1.90	Depositor
% Data completeness (in resolution range)	(Not available) (6.00-1.90)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.202 , 0.244	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4173	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.43	0/4129	0.94	12/5609 (0.2%)

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	321	ILE	N-CA-C	9.14	121.71	109.37
1	A	151	MET	N-CA-C	7.32	121.47	112.54
1	A	266	ILE	N-CA-C	-7.28	104.68	111.45
1	A	222	LEU	N-CA-C	7.08	118.64	111.07
1	A	318	GLY	N-CA-C	-6.42	101.30	111.18
1	A	308	ALA	N-CA-C	-6.38	101.94	110.55
1	A	282	GLU	N-CA-C	6.21	120.04	110.42
1	A	117	ARG	N-CA-C	-5.81	99.81	109.46
1	A	320	THR	N-CA-C	5.68	122.91	110.80
1	A	142	ALA	N-CA-C	5.29	116.73	111.07
1	A	269	ASP	N-CA-C	5.03	121.51	110.80
1	A	383	PHE	N-CA-C	-5.03	105.88	111.36

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	4034	0	3932	55	0
2	A	4	0	3	0	0
3	A	135	0	0	3	0
All	All	4173	0	3935	55	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 7.

All (55) 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:364:ALA:HB1	1:A:392:ALA:HB3	1.60	0.82
1:A:331:ASN:HD21	1:A:333:ARG:HH11	1.33	0.74
1:A:189:ASN:HD22	1:A:204:GLY:HA3	1.60	0.67
1:A:59:THR:H	1:A:312:ASN:HD21	1.44	0.65
1:A:411:ALA:HA	1:A:414:LEU:HD22	1.81	0.62
1:A:264:ARG:HH11	1:A:264:ARG:HG3	1.65	0.60
1:A:316:ARG:HB2	1:A:318:GLY:O	2.02	0.60
1:A:417:HIS:HD2	1:A:419:THR:OG1	1.88	0.56
1:A:236:ASN:HD22	1:A:236:ASN:C	2.14	0.56
1:A:515:LYS:HG2	1:A:540:LEU:HD11	1.87	0.56
1:A:472:THR:HG22	1:A:483:PRO:HA	1.88	0.55
1:A:316:ARG:HG3	1:A:320:THR:O	2.06	0.55
1:A:91:LYS:HE3	1:A:523:LYS:HE2	1.91	0.53
1:A:489:VAL:HG13	1:A:493:ILE:HD11	1.91	0.53
1:A:164:LYS:HB2	1:A:164:LYS:NZ	2.24	0.53
1:A:236:ASN:ND2	1:A:263:ARG:HE	2.06	0.52
1:A:19:ASP:O	1:A:115:GLY:HA2	2.10	0.51
1:A:515:LYS:HG2	1:A:540:LEU:CD1	2.40	0.51
1:A:87:LYS:HA	1:A:87:LYS:HE3	1.93	0.50
1:A:280:ASN:HD22	1:A:281:PHE:N	2.10	0.50
1:A:426:VAL:O	1:A:430:GLN:HG3	2.10	0.50
1:A:274:ASP:HB2	3:A:627:HOH:O	2.11	0.50
1:A:318:GLY:C	1:A:320:THR:H	2.21	0.48
1:A:59:THR:H	1:A:312:ASN:ND2	2.10	0.47
1:A:91:LYS:O	1:A:91:LYS:HG3	2.15	0.46
1:A:280:ASN:ND2	1:A:282:GLU:H	2.13	0.46
1:A:225:LEU:HD13	1:A:416:LEU:HD21	1.98	0.46
1:A:337:PRO:HG2	1:A:340:HIS:CD2	2.50	0.46
1:A:386:GLY:HA3	1:A:406:SER:O	2.16	0.46
1:A:290:ILE:HG12	3:A:586:HOH:O	2.14	0.45
1:A:306:ARG:O	1:A:307:ASP:HB2	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:331:ASN:ND2	1:A:333:ARG:HD3	2.32	0.45
1:A:313:VAL:HG12	1:A:332:THR:HB	1.99	0.45
1:A:239:GLU:HG2	3:A:626:HOH:O	2.17	0.44
1:A:36:GLU:OE2	1:A:146:HIS:HD2	2.00	0.44
1:A:390:ALA:O	1:A:401:PRO:HA	2.17	0.44
1:A:189:ASN:ND2	1:A:204:GLY:HA3	2.29	0.44
1:A:51:ASN:ND2	1:A:320:THR:OG1	2.51	0.44
1:A:229:ALA:HB3	1:A:273:TRP:HB3	2.01	0.42
1:A:477:MET:HE1	1:A:511:GLU:HA	2.01	0.42
1:A:288:LYS:HB3	1:A:288:LYS:HE2	1.72	0.42
1:A:264:ARG:HG3	1:A:264:ARG:NH1	2.33	0.42
1:A:177:ASN:OD1	1:A:183:GLN:NE2	2.52	0.42
1:A:90:GLY:O	1:A:91:LYS:HB3	2.19	0.42
1:A:291:LYS:HB2	1:A:291:LYS:NZ	2.34	0.42
1:A:7:LEU:HD21	1:A:120:VAL:HG11	2.01	0.41
1:A:168:ILE:O	1:A:199:MET:HA	2.20	0.41
1:A:229:ALA:O	1:A:272:GLY:HA2	2.20	0.41
1:A:360:LEU:HD23	1:A:439:VAL:HB	2.01	0.41
1:A:490:ASP:O	1:A:493:ILE:HG12	2.19	0.41
1:A:280:ASN:HD22	1:A:281:PHE:H	1.66	0.41
1:A:220:ASN:HD22	1:A:220:ASN:HA	1.70	0.41
1:A:75:ASP:O	1:A:79:ARG:HB2	2.21	0.41
1:A:154:ARG:HA	1:A:155:PRO:HD3	1.90	0.41
1:A:91:LYS:HE3	1:A:523:LYS:CE	2.51	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	518/540 (96%)	498 (96%)	19 (4%)	1 (0%)	43 36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	410	GLY

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	422/435 (97%)	391 (93%)	31 (7%)	13 6

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	VAL
1	A	32	LEU
1	A	51	ASN
1	A	63	THR
1	A	82	PHE
1	A	87	LYS
1	A	118	LEU
1	A	133	LEU
1	A	154	ARG
1	A	160	LEU
1	A	164	LYS
1	A	169	VAL
1	A	185	LEU
1	A	225	LEU
1	A	236	ASN
1	A	237	VAL
1	A	243	VAL
1	A	291	LYS
1	A	374	LEU
1	A	414	LEU
1	A	416	LEU
1	A	425	LEU
1	A	428	ARG
1	A	435	GLN

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Mol	Chain	Res	Type
1	A	438	LEU
1	A	448	LYS
1	A	456	ARG
1	A	509	LYS
1	A	516	LEU
1	A	533	LEU
1	A	540	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	51	ASN
1	A	94	ASN
1	A	103	GLN
1	A	112	GLN
1	A	128	ASN
1	A	144	GLN
1	A	189	ASN
1	A	200	GLN
1	A	220	ASN
1	A	236	ASN
1	A	280	ASN
1	A	312	ASN
1	A	331	ASN
1	A	343	ASN
1	A	417	HIS
1	A	420	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 oligosaccharides in this entry.

5.6 Ligand geometry

1 ligand is modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	ACT	A	676	-	3,3,3	0.97	0	3,3,3	0.83	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

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.