



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 2BW3 / pdb_00002bw3
Title : Three-dimensional structure of the Hermes DNA transposase
Authors : Hickman, A.B.; Perez, Z.N.; Zhou, L.; Musingarimi, P.; Ghirlando, R.; Hinshaw, J.E.; Craig, N.L.; Dyda, F.
Deposited on : 2005-07-11
Resolution : 2.00 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

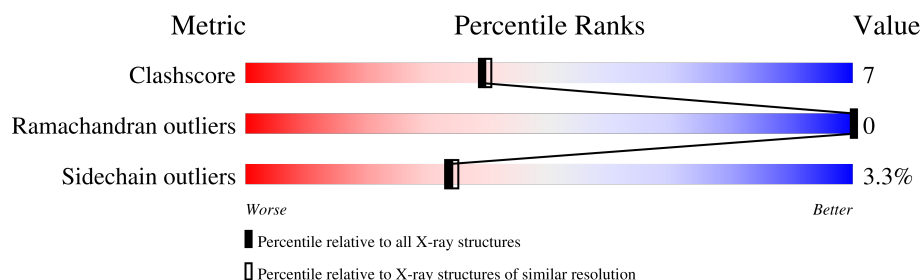
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)

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	534	 78% 17% . .
2	B	84	 86% 14%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5233 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 TRANSPOSASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	518	Total	C	N	O	S	Se	0	0	0
			4164	2657	706	780	12	9			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	163	GLY	SER	engineered mutation	UNP Q25442
A	233	SER	LEU	engineered mutation	UNP Q25442
A	286	MSE	VAL	engineered mutation	UNP Q25442

- Molecule 2 is a protein called TRANSPOSASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	84	Total	C	N	O	S	Se	0	0	0
			653	411	113	124	3	2			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	368	Total	O	0	0
			368	368		
3	B	48	Total	O	0	0
			48	48		

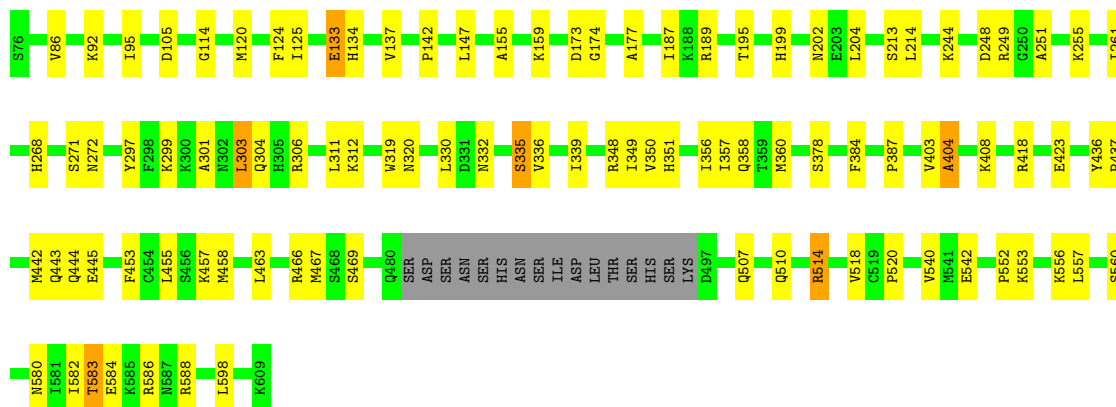
3 Residue-property plots

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: TRANSPOSASE

Chain A:  78% 17% ..



• Molecule 2: TRANSPOSASE

Chain B:  86% 14%



4 Data and refinement statistics

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	116.35Å 84.97Å 73.86Å 90.00° 93.71° 90.00°	Depositor
Resolution (Å)	29.03 – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) (29.03-2.00)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNX 2002	Depositor
R, R_{free}	0.185 , 0.211	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5233	wwPDB-VP
Average B, all atoms (Å ²)	29.0	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	0.70	0/4235	0.98	10/5701 (0.2%)
2	B	0.65	0/662	0.96	2/885 (0.2%)
All	All	0.70	0/4897	0.98	12/6586 (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	437	PRO	N-CA-C	7.97	120.42	110.70
2	B	134	HIS	N-CA-C	7.08	121.67	110.70
1	A	403	VAL	N-CA-C	-5.94	101.90	109.80
1	A	404	ALA	N-CA-C	5.67	118.19	111.33
2	B	84	LYS	N-CA-C	5.63	118.62	110.28
1	A	133	GLU	N-CA-C	5.57	119.25	112.23
1	A	583	THR	N-CA-C	5.45	120.30	113.43
1	A	125	ILE	N-CA-C	-5.38	105.28	110.72
1	A	540	VAL	N-CA-C	5.35	116.72	110.62
1	A	378	SER	N-CA-C	-5.24	106.91	113.72
1	A	436	TYR	N-CA-C	-5.19	98.42	108.59
1	A	311	LEU	N-CA-C	5.15	116.57	109.15

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	4164	0	4207	65	0
2	B	653	0	659	10	0
3	A	368	0	0	4	0
3	B	48	0	0	0	0
All	All	5233	0	4866	66	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 (66) 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:458:MSE:HE3	1:A:553:LYS:HB2	1.40	1.02
1:A:120:MSE:HE1	2:B:117:PHE:HZ	1.26	0.98
1:A:458:MSE:HE3	1:A:553:LYS:CB	2.02	0.89
1:A:458:MSE:HE1	1:A:520:PRO:HA	1.65	0.78
1:A:582:ILE:HG13	1:A:583:THR:HG23	1.66	0.78
1:A:120:MSE:CE	2:B:117:PHE:HZ	1.97	0.77
1:A:120:MSE:HE1	2:B:117:PHE:CZ	2.17	0.77
2:B:158:LYS:N	2:B:158:LYS:HD2	2.04	0.71
1:A:202:ASN:OD1	1:A:542:GLU:HA	1.91	0.71
1:A:418:ARG:NH1	1:A:423:GLU:HG2	2.06	0.71
1:A:120:MSE:CE	1:A:124:PHE:HE1	2.08	0.66
1:A:92:LYS:O	1:A:95:ILE:HG22	1.97	0.65
1:A:189:ARG:HG2	1:A:213:SER:OG	1.95	0.65
1:A:457:LYS:HE3	3:A:2280:HOH:O	1.97	0.64
1:A:418:ARG:HH12	1:A:423:GLU:HG2	1.61	0.63
1:A:120:MSE:HE3	2:B:98:CYS:SG	2.38	0.63
1:A:199:HIS:HD2	3:A:2093:HOH:O	1.82	0.62
1:A:453:PHE:CE1	1:A:457:LYS:HE2	2.34	0.61
1:A:458:MSE:CE	1:A:553:LYS:HB2	2.25	0.59
1:A:458:MSE:CE	1:A:520:PRO:HA	2.32	0.58
1:A:463:LEU:HG	1:A:467:MSE:HE2	1.85	0.57
1:A:249:ARG:HH21	1:A:272:ASN:HD22	1.54	0.56
1:A:271:SER:OG	1:A:319:TRP:HB3	2.06	0.55
1:A:356:ILE:HG22	1:A:360:MSE:HE2	1.88	0.55
1:A:335:SER:O	1:A:339:ILE:HG12	2.07	0.54
1:A:120:MSE:HE3	1:A:124:PHE:HE1	1.72	0.54
1:A:301:ALA:O	1:A:303:LEU:HD13	2.08	0.54
1:A:357:ILE:HA	1:A:360:MSE:HE3	1.89	0.53
1:A:187:ILE:HG22	1:A:189:ARG:HB2	1.88	0.53
1:A:442:MSE:O	1:A:444:GLN:HG3	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:357:ILE:HD13	1:A:360:MSE:CE	2.40	0.52
1:A:86:VAL:HG21	2:B:140:LEU:HD13	1.92	0.52
1:A:174:GLY:HA2	1:A:560:SER:HB2	1.92	0.51
1:A:251:ALA:O	1:A:255:LYS:HG3	2.11	0.51
1:A:297:TYR:HB2	1:A:348:ARG:NH1	2.27	0.50
1:A:248:ASP:HB2	1:A:268:HIS:ND1	2.26	0.50
1:A:552:PRO:O	1:A:556:LYS:HG3	2.12	0.49
1:A:458:MSE:HE2	1:A:520:PRO:HG3	1.94	0.49
1:A:584:GLU:O	1:A:588:ARG:HB2	2.12	0.49
1:A:147:LEU:HD11	2:B:112:VAL:HG11	1.95	0.49
1:A:332:ASN:O	1:A:336:VAL:HG23	2.12	0.49
1:A:510:GLN:HB2	1:A:514:ARG:HH21	1.79	0.48
1:A:357:ILE:HD13	1:A:360:MSE:HE3	1.96	0.47
1:A:120:MSE:HE2	1:A:124:PHE:HE1	1.79	0.46
1:A:249:ARG:HH21	1:A:272:ASN:ND2	2.14	0.46
1:A:404:ALA:O	1:A:408:LYS:HG3	2.16	0.46
1:A:155:ALA:O	1:A:159:LYS:HG3	2.16	0.45
1:A:350:VAL:O	1:A:351:HIS:HB2	2.16	0.45
1:A:114:GLY:HA3	2:B:105:ASP:OD2	2.16	0.45
1:A:384:PHE:C	1:A:387:PRO:HD2	2.42	0.45
1:A:458:MSE:HE3	1:A:553:LYS:HD2	1.99	0.45
1:A:142:PRO:HB3	2:B:95:ILE:HG12	1.98	0.45
1:A:244:LYS:HG3	1:A:261:ILE:HG21	1.99	0.44
1:A:580:ASN:HB2	3:A:2355:HOH:O	2.17	0.44
1:A:299:LYS:HG3	1:A:304:GLN:HE21	1.83	0.44
1:A:457:LYS:HA	1:A:457:LYS:HD3	1.90	0.44
1:A:137:VAL:HG21	2:B:122:LYS:HG2	2.00	0.43
1:A:458:MSE:CE	1:A:553:LYS:HD2	2.49	0.43
1:A:133:GLU:HG3	1:A:134:HIS:CE1	2.54	0.43
1:A:466:ARG:NH2	3:A:2293:HOH:O	2.45	0.42
1:A:120:MSE:HE3	1:A:124:PHE:CE1	2.52	0.42
1:A:330:LEU:HD21	1:A:358:GLN:NE2	2.34	0.42
1:A:349:ILE:O	1:A:349:ILE:HG12	2.19	0.42
1:A:177:ALA:HA	1:A:195:THR:O	2.21	0.41
1:A:306:ARG:HH21	1:A:339:ILE:HD11	1.85	0.41
1:A:105:ASP:O	1:A:586:ARG:NH2	2.52	0.40

There are no symmetry-related clashes.

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	514/534 (96%)	505 (98%)	9 (2%)	0	100	100
2	B	82/84 (98%)	81 (99%)	1 (1%)	0	100	100
All	All	596/618 (96%)	586 (98%)	10 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	475/484 (98%)	459 (97%)	16 (3%)	32	33
2	B	73/71 (103%)	71 (97%)	2 (3%)	39	42
All	All	548/555 (99%)	530 (97%)	18 (3%)	33	34

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	173	ASP
1	A	204	LEU
1	A	214	LEU
1	A	303	LEU
1	A	312	LYS
1	A	320	ASN
1	A	335	SER
1	A	443	GLN

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Mol	Chain	Res	Type
1	A	445	GLU
1	A	455	LEU
1	A	469	SER
1	A	507	GLN
1	A	514	ARG
1	A	518	VAL
1	A	557	LEU
1	A	598	LEU
2	B	91	LYS
2	B	139	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	134	HIS
1	A	199	HIS
1	A	272	ASN
1	A	285	ASN
1	A	293	ASN
1	A	351	HIS
1	A	358	GLN
1	A	362	ASN
1	A	412	ASN
1	A	416	ASN

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

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.

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.