Full wwPDB X-ray Structure Validation Report ⓘ

Feb 9, 2026 – 12:37 am GMT

PDB ID	:	9GBG / pdb_00009gbg
Title	:	Putative Phage Recombinase UvsX
Authors	:	Freitag-Pohl, S.; Pohl, E.
Deposited on	:	2024-07-31
Resolution	:	2.60 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:

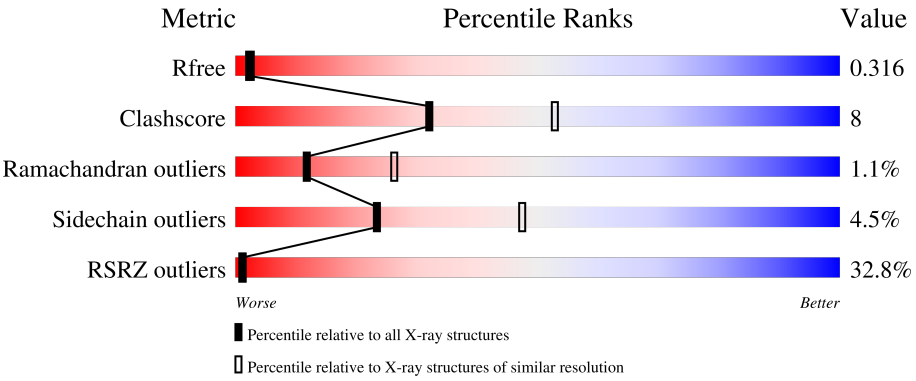
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.48

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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}	164625	3775 (2.60-2.60)
Clashscore	180529	4181 (2.60-2.60)
Ramachandran outliers	177936	4129 (2.60-2.60)
Sidechain outliers	177891	4129 (2.60-2.60)
RSRZ outliers	164620	3775 (2.60-2.60)

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% 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	334	28% 67% 18% · 14%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3510 atoms, of which 1654 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 Phage Recombinase UvsX.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	287	3499	1155	1654	316	367	7	245	0	0

- Molecule 2 is water.

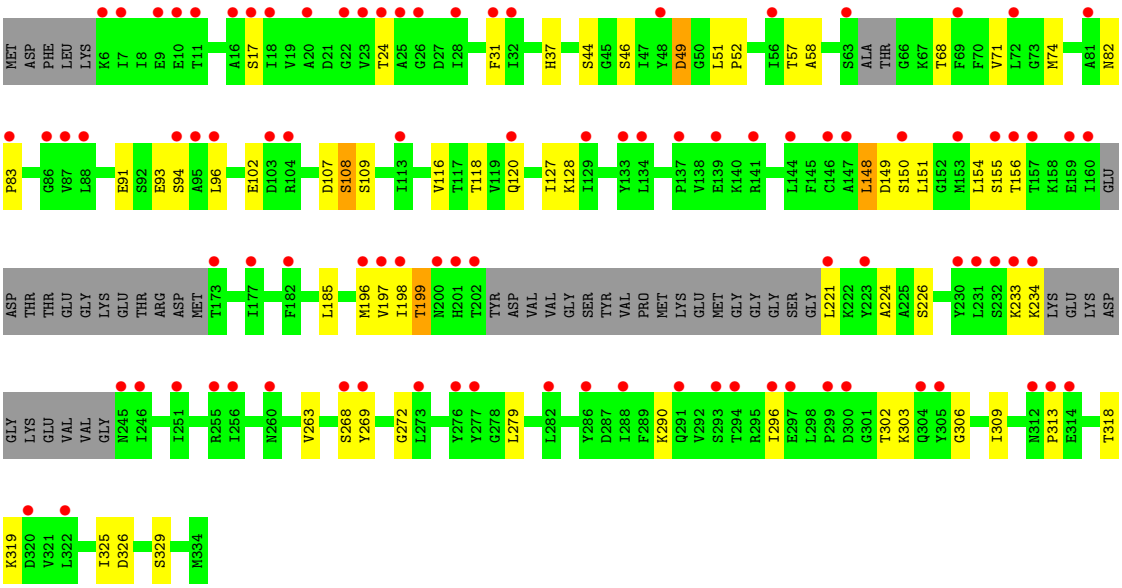
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	11	11	11	0	0

3 Residue-property plots (i)

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 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: Phage Recombinase UvsX

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α, β, γ	116.75Å 116.75Å 60.91Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	101.11 – 2.60 101.11 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.7 (101.11-2.60) 99.7 (101.11-2.60)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.63 (at 2.58Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.258 , 0.306 0.270 , 0.316	Depositor DCC
R_{free} test set	727 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å^2)	80.7	Xtriage
Anisotropy	0.057	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 139.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.037 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	3510	wwPDB-VP
Average B, all atoms (Å^2)	102.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.70% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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

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	0.61	0/1865	1.32	9/2553 (0.4%)

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	A	0	1

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	313	PRO	N-CA-CB	-7.96	94.18	103.26
1	A	199	THR	CA-CB-OG1	-6.89	99.27	109.60
1	A	49	ASP	CB-CA-C	6.60	123.56	110.42
1	A	151	LEU	N-CA-CB	5.98	118.68	110.01
1	A	303	LYS	CB-CA-C	5.69	119.62	109.38
1	A	93	GLU	CB-CA-C	5.54	123.92	112.44
1	A	302	THR	CA-CB-OG1	-5.36	101.56	109.60
1	A	31	PHE	CA-CB-CG	-5.10	108.70	113.80
1	A	120	GLN	CB-CA-C	-5.05	102.92	110.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	156	THR	Peptide

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	1845	1654	1439	26	0
2	A	11	0	0	1	0
All	All	1856	1654	1439	26	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 8.

All (26) 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:71:VAL:HA	1:A:74:MET:HE3	1.83	0.60
1:A:185:LEU:HD13	1:A:196:MET:HE1	1.83	0.58
1:A:148:LEU:C	1:A:148:LEU:HD13	2.33	0.53
1:A:107:ASP:OD1	1:A:109:SER:CB	2.59	0.51
1:A:268:SER:N	1:A:272:GLY:O	2.44	0.50
1:A:46:SER:OG	1:A:326:ASP:OD1	2.21	0.50
1:A:325:ILE:O	1:A:329:SER:N	2.39	0.49
1:A:127:ILE:O	1:A:128:LYS:C	2.55	0.47
1:A:116:VAL:HG23	1:A:154:LEU:HD21	1.97	0.47
1:A:44:SER:OG	1:A:49:ASP:HB2	2.15	0.46
1:A:318:THR:O	1:A:319:LYS:C	2.58	0.45
1:A:233:LYS:O	1:A:234:LYS:C	2.59	0.45
1:A:57:THR:O	1:A:197:VAL:HA	2.17	0.44
1:A:51:LEU:O	1:A:52:PRO:C	2.61	0.43
1:A:68:THR:CG2	1:A:96:LEU:HD21	2.49	0.43
1:A:290:LYS:O	1:A:296:ILE:HA	2.18	0.43
1:A:102:GLU:OE2	1:A:108:SER:CB	2.66	0.43
1:A:17:SER:CB	2:A:404:HOH:O	2.66	0.43
1:A:118:THR:HA	1:A:155:SER:O	2.18	0.42
1:A:149:ASP:HA	1:A:199:THR:OG1	2.18	0.42
1:A:37:HIS:HB3	1:A:279:LEU:HD21	2.02	0.42
1:A:58:ALA:HA	1:A:198:ILE:O	2.20	0.42
1:A:221:LEU:HA	1:A:224:ALA:HB3	2.00	0.42
1:A:37:HIS:CB	1:A:279:LEU:HD21	2.50	0.41
1:A:306:GLY:HA2	1:A:309:ILE:HD12	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:82:ASN:O	1:A:83:PRO:C	2.62	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	277/334 (83%)	253 (91%)	21 (8%)	3 (1%)	12 26

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	269	TYR
1	A	108	SER
1	A	150	SER

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	132/290 (46%)	126 (96%)	6 (4%)	23 47

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	THR
1	A	91	GLU
1	A	94	SER
1	A	148	LEU
1	A	226	SER
1	A	263	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	125	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

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

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^{th} 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^2)	Q<0.9
1	A	287/334 (85%)	1.65	94 (32%) 1 1	66, 93, 115, 138	0

All (94) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	96	LEU	6.3
1	A	156	THR	6.2
1	A	20	ALA	5.6
1	A	269	TYR	5.5
1	A	69	PHE	4.9
1	A	9	GLU	4.4
1	A	95	ALA	4.4
1	A	202	THR	4.3
1	A	221	LEU	4.2
1	A	288	ILE	4.1
1	A	245	ASN	4.1
1	A	31	PHE	4.0
1	A	299	PRO	3.9
1	A	223	TYR	3.8
1	A	322	LEU	3.7
1	A	63	SER	3.6
1	A	147	ALA	3.6
1	A	234	LYS	3.6
1	A	159	GLU	3.6
1	A	7	ILE	3.6
1	A	10	GLU	3.5
1	A	133	TYR	3.5
1	A	305	TYR	3.4
1	A	201	HIS	3.4
1	A	182	PHE	3.3
1	A	103	ASP	3.3
1	A	173	THR	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	294	THR	3.1
1	A	273	LEU	3.1
1	A	246	ILE	3.1
1	A	157	THR	3.1
1	A	304	GLN	3.1
1	A	17	SER	3.0
1	A	129	ILE	3.0
1	A	113	ILE	3.0
1	A	16	ALA	3.0
1	A	56	ILE	2.9
1	A	296	ILE	2.9
1	A	160	ILE	2.9
1	A	28	ILE	2.8
1	A	251	ILE	2.8
1	A	83	PRO	2.8
1	A	150	SER	2.8
1	A	277	TYR	2.8
1	A	232	SER	2.8
1	A	276	TYR	2.8
1	A	6	LYS	2.7
1	A	94	SER	2.7
1	A	146	CYS	2.7
1	A	86	GLY	2.7
1	A	314	GLU	2.7
1	A	286	TYR	2.6
1	A	282	LEU	2.6
1	A	320	ASP	2.6
1	A	88	LEU	2.5
1	A	18	ILE	2.5
1	A	32	ILE	2.5
1	A	291	GLN	2.5
1	A	231	LEU	2.5
1	A	137	PRO	2.5
1	A	198	ILE	2.5
1	A	256	ILE	2.5
1	A	144	LEU	2.4
1	A	155	SER	2.4
1	A	22	GLY	2.4
1	A	48	TYR	2.4
1	A	197	VAL	2.4
1	A	11	THR	2.4
1	A	300	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	200	ASN	2.3
1	A	87	VAL	2.3
1	A	177	ILE	2.3
1	A	72	LEU	2.3
1	A	134	LEU	2.3
1	A	260	ASN	2.3
1	A	141	ARG	2.3
1	A	255	ARG	2.3
1	A	25	ALA	2.3
1	A	312	ASN	2.3
1	A	293	SER	2.2
1	A	139	GLU	2.2
1	A	233	LYS	2.2
1	A	120	GLN	2.2
1	A	230	TYR	2.1
1	A	297	GLU	2.1
1	A	81	ALA	2.1
1	A	24	THR	2.1
1	A	23	VAL	2.1
1	A	26	GLY	2.1
1	A	268	SER	2.1
1	A	104	ARG	2.0
1	A	313	PRO	2.0
1	A	153	MET	2.0
1	A	196	MET	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 oligosaccharides in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.