



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 03:00 PM UTC

PDB ID : 1KAW / pdb_00001kaw
Title : STRUCTURE OF SINGLE STRANDED DNA BINDING PROTEIN (SSB)
Authors : Raghunathan, S.; Waksman, G.
Deposited on : 1996-12-06
Resolution : 2.90 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 ⓘ 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) : **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

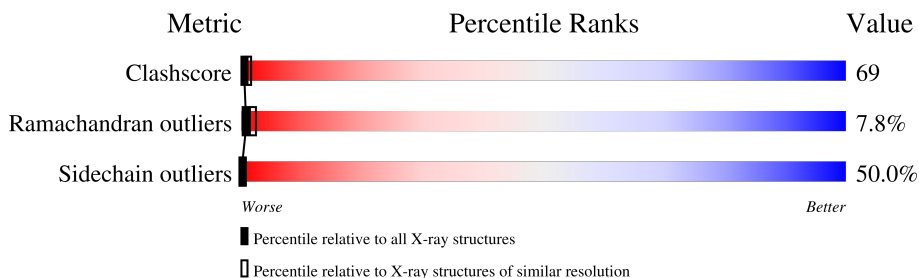
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)

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	135	
1	B	135	
1	C	135	
1	D	135	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3067 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.

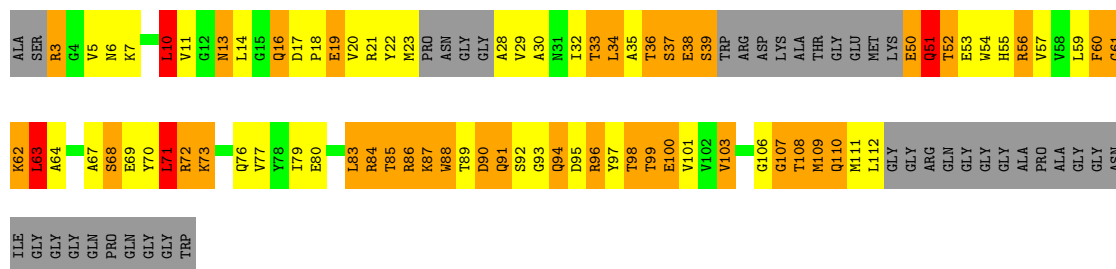
- Molecule 1 is a protein called SINGLE-STRANDED DNA BINDING PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	96	Total	C	N	O	S	0	0	0
			758	473	136	146	3			
1	B	96	Total	C	N	O	S	0	0	0
			758	473	136	146	3			
1	C	96	Total	C	N	O	S	0	0	0
			758	473	136	146	3			
1	D	96	Total	C	N	O	S	0	0	0
			758	473	136	146	3			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	7	Total	O	0	0
			7	7		
2	B	7	Total	O	0	0
			7	7		
2	C	15	Total	O	0	0
			15	15		
2	D	6	Total	O	0	0
			6	6		

Chain D:



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	58.08 Å 105.85 Å 90.24 Å 90.00° 99.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.90	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-2.90)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.85	Depositor
R, R_{free}	0.221 , 0.289	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3067	wwPDB-VP
Average B, all atoms (Å ²)	22.0	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	0.92	0/766	1.23	6/1032 (0.6%)
1	B	0.92	0/766	1.23	5/1032 (0.5%)
1	C	0.92	0/766	1.23	6/1032 (0.6%)
1	D	0.92	0/766	1.23	5/1032 (0.5%)
All	All	0.92	0/3064	1.23	22/4128 (0.5%)

There are no bond length outliers.

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	38	GLU	N-CA-C	-7.19	98.82	108.74
1	A	38	GLU	N-CA-C	-7.18	98.83	108.74
1	B	38	GLU	N-CA-C	-7.17	98.84	108.74
1	D	38	GLU	N-CA-C	-7.16	98.87	108.74
1	D	37	SER	N-CA-C	6.94	119.93	110.35

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	758	0	755	122	0
1	B	758	0	755	109	3
1	C	758	0	755	125	0
1	D	758	0	755	111	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	7	0	0	1	0
2	B	7	0	0	0	0
2	C	15	0	0	5	0
2	D	6	0	0	1	0
All	All	3067	0	3020	416	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 69.

The worst 5 of 416 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:94:GLN:HE22	1:B:94:GLN:NE2	1.39	1.20
1:C:94:GLN:HE22	1:D:94:GLN:NE2	1.39	1.17
1:C:50:GLU:OE2	2:C:142:HOH:O	1.60	1.16
1:B:10:LEU:HD23	1:B:34:LEU:HD12	1.27	1.15
1:D:10:LEU:HD23	1:D:34:LEU:HD12	1.28	1.15

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)
1:B:7:LYS:CE	1:B:80:GLU:OE2[2_556]	1.78	0.42
1:B:5:VAL:CG2	1:B:110:GLN:OE1[2_556]	1.95	0.25
1:B:65:GLU:OE1	1:D:87:LYS:O[3_445]	2.05	0.15

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	90/135 (67%)	74 (82%)	9 (10%)	7 (8%)	1 2

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	90/135 (67%)	74 (82%)	9 (10%)	7 (8%)	1	2
1	C	90/135 (67%)	74 (82%)	9 (10%)	7 (8%)	1	2
1	D	90/135 (67%)	74 (82%)	9 (10%)	7 (8%)	1	2
All	All	360/540 (67%)	296 (82%)	36 (10%)	28 (8%)	1	2

5 of 28 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	51	GLN
1	A	60	PHE
1	A	61	GLY
1	A	73	LYS
1	B	51	GLN

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	82/102 (80%)	41 (50%)	41 (50%)	0	0
1	B	82/102 (80%)	41 (50%)	41 (50%)	0	0
1	C	82/102 (80%)	41 (50%)	41 (50%)	0	0
1	D	82/102 (80%)	41 (50%)	41 (50%)	0	0
All	All	328/408 (80%)	164 (50%)	164 (50%)	0	0

5 of 164 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	97	TYR
1	D	70	TYR
1	C	103	VAL
1	D	34	LEU
1	D	86	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	13	ASN
1	C	51	GLN
1	D	94	GLN
1	D	51	GLN
1	D	76	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.