W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

May 13, 2020 – 12:03 am BST

PDB ID	:	1QVC
Title	:	CRYSTAL STRUCTURE ANALYSIS OF SINGLE STRANDED DNA BINDING PROTEIN (SSB) FROM E.COLI
Authors	:	Matsumoto, T.; Morimoto, Y.; Shibata, N.; Shimamoto, N.; Tsukihara, T.; Yasuoka, N.
Deposited on	:	1999-07-07
Resolution	:	2.20 Å(reported)

The following versions of software and data (see references (1)) were used in the production of this report:

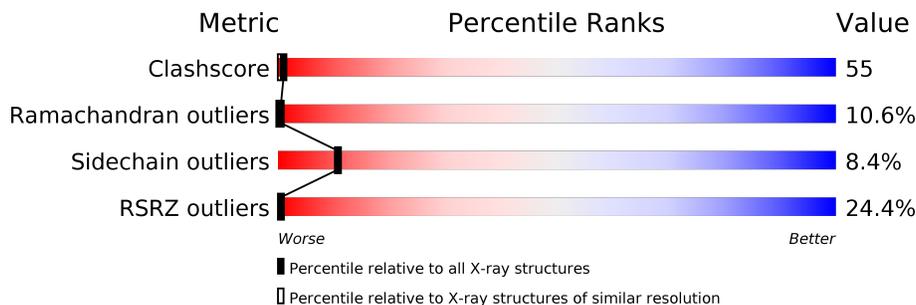|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 2.20 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		55
Ramachandran outliers		10.6%
Sidechain outliers		8.4%
RSRZ outliers		24.4%

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	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 on 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	145	33% / 38% 47% 13% •
1	B	145	21% / 34% 54% 10% •
1	C	145	21% / 36% 52% 11% ••
1	D	145	22% / 32% 57% 7% •

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 4748 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 MONOMER.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	145	Total	C	N	O	S	0	0	0
			1083	665	204	210	4			
1	B	144	Total	C	N	O	S	0	0	0
			1078	662	203	209	4			
1	C	144	Total	C	N	O	S	0	0	0
			1078	662	203	209	4			
1	D	140	Total	C	N	O	S	0	0	0
			1054	648	198	204	4			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	119	Total	O	0	0
			119	119		
2	B	118	Total	O	0	0
			118	118		
2	C	111	Total	O	0	0
			111	111		
2	D	107	Total	O	0	0
			107	107		

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA and DNA 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 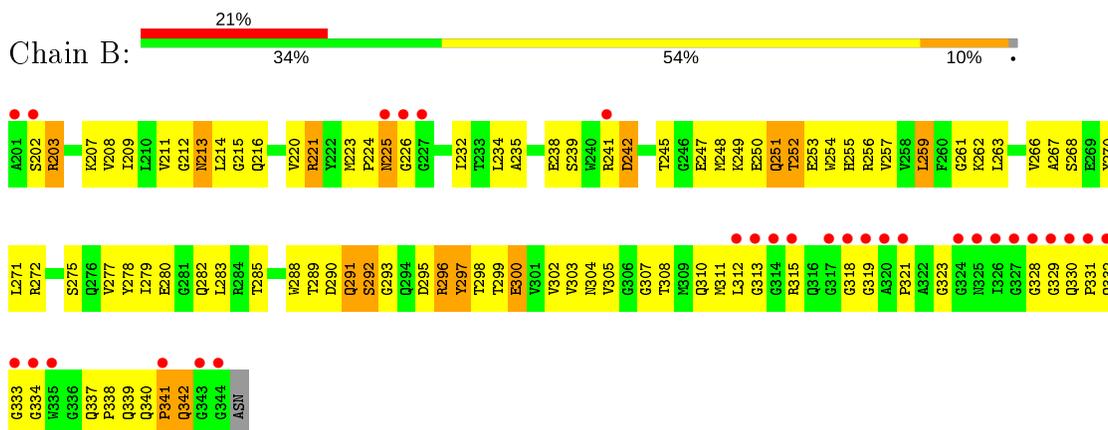> 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.
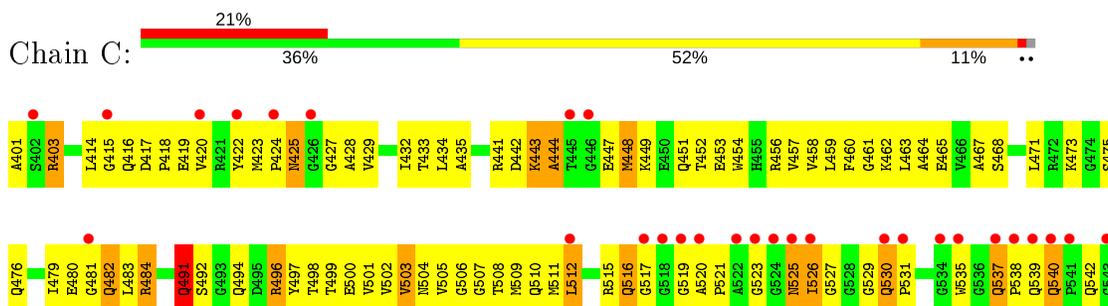
- Molecule 1: SINGLE STRANDED DNA BINDING PROTEIN MONOMER
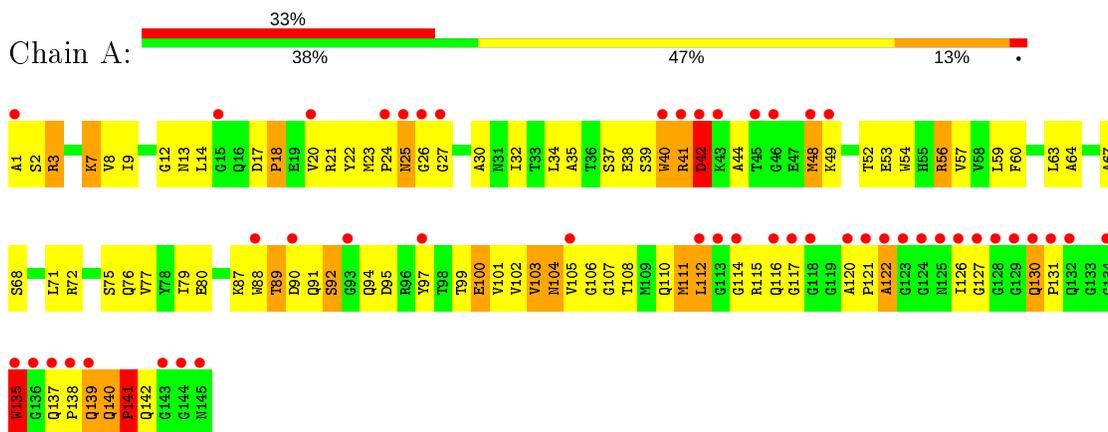
- Molecule 1: SINGLE STRANDED DNA BINDING PROTEIN MONOMER
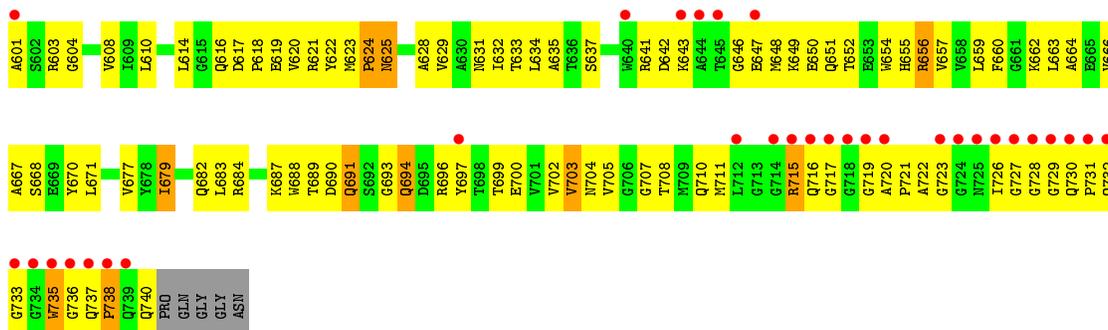

- Molecule 1: SINGLE STRANDED DNA BINDING PROTEIN MONOMER

G544
ASN

● Molecule 1: SINGLE STRANDED DNA BINDING PROTEIN MONOMER

Chain D:

22%

32%

57%

7%

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	105.37Å 62.92Å 97.79Å 90.00° 112.57° 90.00°	Depositor
Resolution (Å)	15.00 – 2.20 51.96 – 2.20	Depositor EDS
% Data completeness (in resolution range)	83.2 (15.00-2.20) 82.7 (51.96-2.20)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	3.11 (at 2.20Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.247 , 0.317 0.264 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	43.2	Xtriage
Anisotropy	0.607	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 101.1	EDS
L-test for twinning[2]	$<|L|> = 0.48, <L^2> = 0.31$	Xtriage
Estimated twinning fraction	0.024 for 1/2*h+3/2*k,1/2*h-1/2*k,-1/2*h-1/2*k-l 0.020 for 1/2*h-3/2*k,-1/2*h-1/2*k,-1/2*h+1/2*k-l	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	4748	wwPDB-VP
Average B, all atoms (Å^2)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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	0.32	0/1102	0.58	0/1487
1	B	0.35	0/1097	0.58	0/1480
1	C	0.37	0/1097	0.62	0/1480
1	D	0.34	0/1072	0.61	0/1446
All	All	0.34	0/4368	0.60	0/5893

There are no bond length outliers.

There are no bond angle outliers.

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	1083	0	1055	121	0
1	B	1078	0	1050	137	0
1	C	1078	0	1050	130	0
1	D	1054	0	1029	99	0
2	A	119	0	0	35	0
2	B	118	0	0	54	0
2	C	111	0	0	44	1
2	D	107	0	0	39	0
All	All	4748	0	4184	467	1

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 55.

The worst 5 of 467 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:20:VAL:HG21	1:A:68:SER:HB2	1.37	1.05
1:B:339:GLN:HG2	1:B:341:PRO:HD3	1.39	1.01
1:C:462:LYS:HD3	1:C:523:GLY:HA2	1.41	1.01
1:C:501:VAL:HA	2:C:1222:HOH:O	1.61	1.00
1:C:458:VAL:HB	2:C:1222:HOH:O	1.61	0.99

All (1) 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:C:826:HOH:O	2:C:826:HOH:O[2_655]	1.42	0.78

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	143/145 (99%)	104 (73%)	18 (13%)	21 (15%)	0	0
1	B	142/145 (98%)	113 (80%)	16 (11%)	13 (9%)	1	0
1	C	142/145 (98%)	112 (79%)	19 (13%)	11 (8%)	1	0
1	D	138/145 (95%)	103 (75%)	20 (14%)	15 (11%)	0	0
All	All	565/580 (97%)	432 (76%)	73 (13%)	60 (11%)	0	0

5 of 60 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3	ARG
1	A	104	ASN
1	B	291	GLN
1	B	292	SER

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Mol	Chain	Res	Type
1	B	338	PRO

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	108/109 (99%)	98 (91%)	10 (9%)	9	8
1	B	108/109 (99%)	101 (94%)	7 (6%)	17	19
1	C	108/109 (99%)	97 (90%)	11 (10%)	7	6
1	D	106/109 (97%)	98 (92%)	8 (8%)	13	14
All	All	430/436 (99%)	394 (92%)	36 (8%)	11	11

5 of 36 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	300	GLU
1	C	491	GLN
1	D	697	TYR
1	C	482	GLN
1	C	496	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 33 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	291	GLN
1	B	332	GLN
1	D	682	GLN
1	B	310	GLN
1	B	316	GLN

5.3.3 RNA (i)

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 carbohydrates 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 (i)

6.1 Protein, DNA and RNA chains (i)

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, 95th 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	145/145 (100%)	1.64	48 (33%)	0	0	29, 67, 100, 100	0
1	B	144/145 (99%)	1.14	30 (20%)	1	1	28, 57, 100, 100	0
1	C	144/145 (99%)	1.18	30 (20%)	1	1	25, 58, 100, 100	0
1	D	140/145 (96%)	1.54	32 (22%)	0	0	30, 67, 100, 100	0
All	All	573/580 (98%)	1.37	140 (24%)	0	0	25, 61, 100, 100	0

The worst 5 of 140 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	335	TRP	9.7
1	D	601	ALA	9.2
1	D	723	GLY	8.9
1	D	720	ALA	8.3
1	D	724	GLY	8.1

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 carbohydrates 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.