



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:14 AM UTC

PDB ID : 1SRU / pdb_00001sru
Title : Crystal structure of full length E. coli SSB protein
Authors : Savvides, S.N.; Raghunathan, S.; Fuetterer, K.; Kozlov, A.G.; Lohman, T.M.; Waksman, G.
Deposited on : 2004-03-23
Resolution : 3.30 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	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
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)	:	2.49

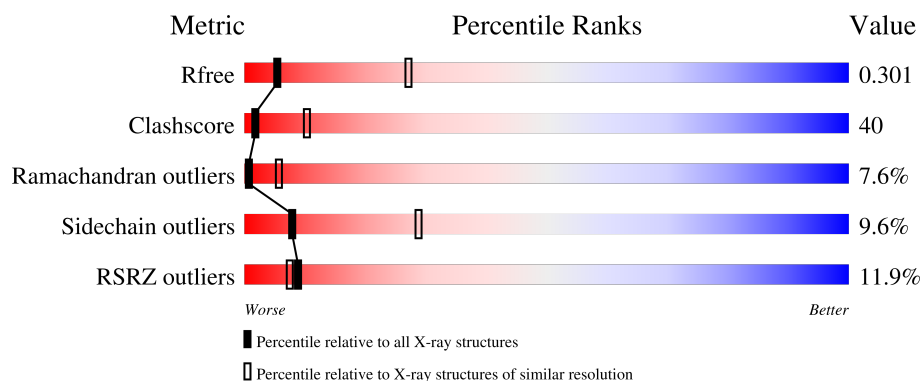
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.30 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}	180053	1169 (3.32-3.28)
Clashscore	190562	1209 (3.32-3.28)
Ramachandran outliers	187476	1188 (3.32-3.28)
Sidechain outliers	187428	1187 (3.32-3.28)
RSRZ outliers	180081	1169 (3.32-3.28)

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 $\leq 5\%$. 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	113	
1	B	113	
1	C	113	
1	D	113	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2808 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-strand binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	100	Total	C	N	O	S	0	0	0
			698	440	122	134	2			
1	B	97	Total	C	N	O	S	0	0	0
			688	432	121	134	1			
1	C	96	Total	C	N	O	S	0	0	0
			698	443	121	133	1			
1	D	101	Total	C	N	O	S	0	0	0
			724	453	125	144	2			

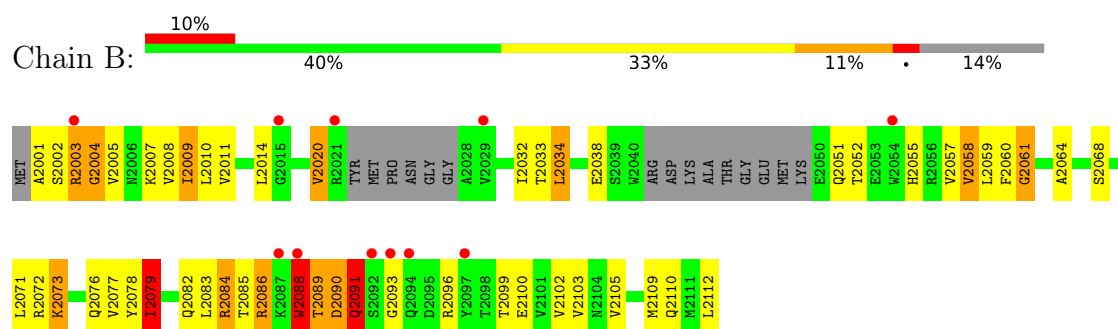
3 Residue-property plots [i](#)

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.

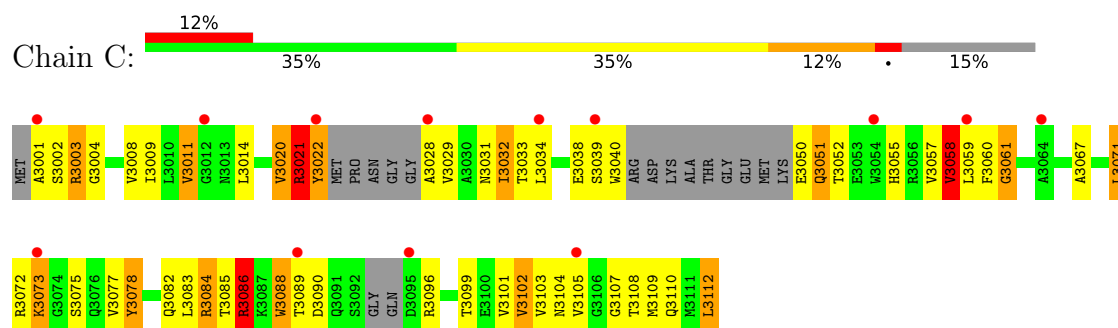
• Molecule 1: Single-strand binding protein



• Molecule 1: Single-strand binding protein

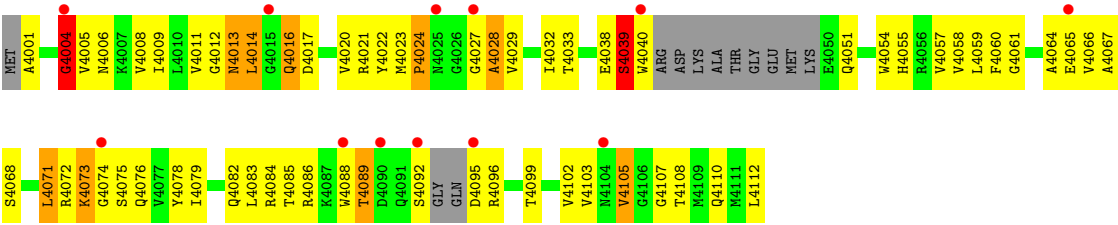


• Molecule 1: Single-strand binding protein



• Molecule 1: Single-strand binding protein





4 Data and refinement statistics

Property	Value	Source
Space group	P 31 1 2	Depositor
Cell constants a, b, c, α , β , γ	60.85Å 60.85Å 348.92Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.92 – 3.30 19.92 – 3.30	Depositor EDS
% Data completeness (in resolution range)	97.9 (19.92-3.30) 97.4 (19.92-3.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.26 (at 3.29Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.288 , 0.309 0.286 , 0.301	Depositor DCC
R_{free} test set	1196 reflections (10.34%)	wwPDB-VP
Wilson B-factor (Å ²)	106.9	Xtriage
Anisotropy	0.335	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 126.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.075 for -h,-k,l	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	2808	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 5.66% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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	1.01	1/707 (0.1%)	1.20	4/966 (0.4%)
1	B	1.51	12/696 (1.7%)	1.64	17/950 (1.8%)
1	C	1.58	13/707 (1.8%)	1.61	17/963 (1.8%)
1	D	1.06	1/733 (0.1%)	1.16	2/999 (0.2%)
All	All	1.31	27/2843 (0.9%)	1.41	40/3878 (1.0%)

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
1	C	0	1
All	All	0	2

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	2071	LEU	CG-CD1	-11.21	1.15	1.52
1	B	2089	THR	C-O	-10.44	1.11	1.23
1	C	3071	LEU	CG-CD1	-10.08	1.19	1.52
1	C	3052	THR	CB-CG2	-10.07	1.19	1.52
1	B	2052	THR	CB-CG2	-9.99	1.19	1.52
1	C	3089	THR	C-O	-9.98	1.12	1.23
1	B	2088	TRP	CG-CD1	-9.51	1.13	1.36
1	C	3071	LEU	CG-CD2	-9.28	1.22	1.52
1	C	3088	TRP	CG-CD1	-9.13	1.14	1.36
1	C	3058	VAL	CB-CG2	-8.87	1.23	1.52
1	B	2071	LEU	CG-CD2	-8.72	1.23	1.52
1	C	3020	VAL	CB-CG2	-8.40	1.24	1.52
1	B	2058	VAL	CB-CG2	-7.61	1.27	1.52
1	B	2058	VAL	CB-CG1	-7.32	1.28	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	4039	SER	CA-C	7.12	1.63	1.53
1	C	3088	TRP	NE1-CE2	-7.03	1.29	1.37
1	C	3058	VAL	CB-CG1	-6.61	1.30	1.52
1	C	3088	TRP	CD2-CE3	-6.09	1.30	1.40
1	A	1003	ARG	CA-CB	5.89	1.63	1.53
1	B	2020	VAL	CB-CG2	-5.87	1.33	1.52
1	B	2020	VAL	CB-CG1	-5.78	1.33	1.52
1	B	2058	VAL	CA-CB	-5.59	1.47	1.54
1	C	3020	VAL	CB-CG1	-5.37	1.34	1.52
1	B	2088	TRP	NE1-CE2	-5.20	1.31	1.37
1	C	3052	THR	CA-CB	-5.16	1.45	1.53
1	C	3032	ILE	CA-CB	-5.12	1.47	1.54
1	B	2088	TRP	CD2-CE3	-5.00	1.32	1.40

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	3071	LEU	CD1-CG-CD2	-15.26	77.22	110.80
1	B	2071	LEU	CD1-CG-CD2	-15.03	77.74	110.80
1	B	2052	THR	OG1-CB-CG2	-11.20	86.89	109.30
1	C	3052	THR	OG1-CB-CG2	-9.90	89.51	109.30
1	C	3058	VAL	CG1-CB-CG2	-8.45	92.20	110.80
1	B	2086	ARG	NE-CZ-NH2	7.90	126.31	119.20
1	C	3020	VAL	CG1-CB-CG2	-7.80	93.63	110.80
1	B	2020	VAL	CG1-CB-CG2	-7.80	93.64	110.80
1	B	2058	VAL	CG1-CB-CG2	-7.66	93.95	110.80
1	B	2089	THR	CA-C-O	-7.07	111.48	120.31
1	A	1070	TYR	N-CA-C	6.97	122.14	112.45
1	A	1011	VAL	N-CA-C	-6.66	98.45	108.17
1	C	3089	THR	O-C-N	-6.56	115.56	123.10
1	C	3089	THR	CA-C-O	-6.15	114.03	121.28
1	B	2088	TRP	CB-CG-CD2	6.03	135.24	126.80
1	B	2084	ARG	NE-CZ-NH2	5.90	124.51	119.20
1	B	2052	THR	N-CA-CB	5.70	119.45	110.56
1	C	3088	TRP	CB-CG-CD2	5.62	134.67	126.80
1	B	2088	TRP	CB-CG-CD1	-5.56	118.55	126.90
1	A	1077	VAL	N-CA-C	5.52	115.55	108.82
1	C	3089	THR	CA-C-N	-5.51	111.89	123.20
1	C	3089	THR	C-N-CA	-5.51	111.89	123.20
1	B	2086	ARG	CB-CA-C	-5.50	100.68	109.75
1	B	2004	GLY	N-CA-C	5.48	119.78	112.65
1	C	3039	SER	N-CA-C	5.45	118.10	109.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	2079	ILE	CG1-CB-CG2	-5.38	94.56	110.70
1	D	4004	GLY	N-CA-C	5.38	125.92	113.18
1	C	3086	ARG	NE-CZ-NH2	5.36	124.02	119.20
1	C	3104	ASN	CB-CA-C	-5.35	109.37	117.07
1	D	4021	ARG	N-CA-C	-5.33	101.35	108.86
1	A	1101	VAL	N-CA-C	-5.28	100.28	107.99
1	B	2086	ARG	NE-CZ-NH1	-5.26	116.24	121.50
1	B	2091	GLN	N-CA-C	5.22	121.93	110.80
1	C	3084	ARG	NE-CZ-NH1	-5.22	116.28	121.50
1	C	3084	ARG	NE-CZ-NH2	5.20	123.88	119.20
1	C	3088	TRP	CB-CG-CD1	-5.14	119.19	126.90
1	B	2058	VAL	N-CA-CB	-5.13	104.84	111.82
1	B	2034	LEU	N-CA-C	5.13	117.76	109.40
1	C	3021	ARG	N-CA-C	-5.05	101.77	109.65
1	C	3011	VAL	N-CA-C	-5.04	100.81	108.17

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1078	TYR	Sidechain
1	C	3078	TYR	Sidechain

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	698	0	632	54	0
1	B	688	0	628	55	0
1	C	698	0	635	69	0
1	D	724	0	661	78	0
All	All	2808	0	2556	215	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 40.

All (215) 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:B:2089:THR:O	1:B:2090:ASP:HB3	1.53	1.09
1:D:4020:VAL:HG21	1:D:4068:SER:HB2	1.37	1.06
1:C:3014:LEU:HD23	1:C:3034:LEU:HD23	1.42	0.97
1:C:3077:VAL:HG23	1:C:3110:GLN:O	1.63	0.97
1:C:3011:VAL:O	1:D:4004:GLY:HA3	1.63	0.97
1:B:2088:TRP:CD1	1:B:2088:TRP:C	2.44	0.94
1:A:1020:VAL:HG21	1:A:1068:SER:HB2	1.49	0.93
1:D:4084:ARG:HH21	1:D:4086:ARG:HD2	1.34	0.92
1:A:1012:GLY:C	1:A:1013:ASN:HD22	1.78	0.90
1:C:3096:ARG:HH11	1:D:4096:ARG:NH1	1.70	0.88
1:C:3096:ARG:NH1	1:D:4096:ARG:HH11	1.71	0.87
1:C:3084:ARG:HH21	1:C:3086:ARG:HD3	1.38	0.87
1:A:1089:THR:HG22	1:A:1095:ASP:OD1	1.74	0.86
1:A:1023:MET:HB2	1:A:1024:PRO:HD2	1.57	0.84
1:C:3001:ALA:HA	1:D:4039:SER:H	1.41	0.84
1:B:2077:VAL:HG23	1:B:2110:GLN:O	1.79	0.83
1:D:4084:ARG:HH21	1:D:4086:ARG:CD	1.93	0.82
1:C:3096:ARG:HD3	1:D:4096:ARG:HH12	1.45	0.81
1:C:3088:TRP:HD1	1:C:3088:TRP:N	1.79	0.80
1:D:4020:VAL:HG21	1:D:4068:SER:CB	2.12	0.80
1:B:2088:TRP:C	1:B:2088:TRP:HD1	1.90	0.79
1:C:3086:ARG:HH11	1:C:3086:ARG:CG	1.94	0.79
1:C:3032:ILE:HG13	1:C:3057:VAL:HB	1.65	0.78
1:C:3086:ARG:HH11	1:C:3086:ARG:HG2	1.48	0.78
1:C:3096:ARG:HH11	1:D:4096:ARG:HH11	0.85	0.76
1:C:3099:THR:HB	1:D:4099:THR:HG21	1.68	0.76
1:D:4084:ARG:NH2	1:D:4086:ARG:HD2	2.00	0.75
1:A:1022:TYR:HB3	1:A:1027:GLY:HA3	1.68	0.75
1:C:3050:GLU:HG2	1:C:3051:GLN:H	1.52	0.74
1:A:1032:ILE:HG13	1:A:1057:VAL:HB	1.68	0.74
1:C:3096:ARG:HD3	1:D:4096:ARG:NH1	2.03	0.73
1:A:1001:ALA:HA	1:B:2038:GLU:HA	1.69	0.73
1:C:3088:TRP:N	1:C:3088:TRP:CD1	2.54	0.72
1:D:4066:VAL:HG13	1:D:4067:ALA:N	2.06	0.70
1:C:3014:LEU:HD23	1:C:3034:LEU:CD2	2.20	0.70
1:C:3096:ARG:CD	1:D:4096:ARG:NH1	2.55	0.70
1:B:2002:SER:HA	1:D:4110:GLN:NE2	2.06	0.69
1:B:2089:THR:O	1:B:2090:ASP:CB	2.26	0.69
1:B:2034:LEU:HD11	1:B:2079:ILE:HD13	1.74	0.68
1:C:3050:GLU:HG2	1:C:3051:GLN:N	2.06	0.68
1:D:4022:TYR:HB3	1:D:4027:GLY:HA3	1.76	0.68
1:C:3088:TRP:HD1	1:C:3088:TRP:H	1.44	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1013:ASN:HD22	1:A:1013:ASN:N	1.91	0.66
1:A:1039:SER:H	1:B:2001:ALA:HA	1.60	0.66
1:C:3011:VAL:HB	1:D:4005:VAL:H	1.61	0.66
1:B:2014:LEU:HB2	1:B:2073:LYS:O	1.95	0.66
1:A:1090:ASP:CG	1:A:1091:GLN:H	2.02	0.66
1:A:1014:LEU:HD11	1:A:1071:LEU:HD23	1.78	0.65
1:D:4057:VAL:HG11	1:D:4079:ILE:HD13	1.78	0.65
1:A:1039:SER:O	1:A:1040:TRP:HB3	1.97	0.64
1:D:4039:SER:O	1:D:4040:TRP:HB3	1.96	0.64
1:C:3088:TRP:CD1	1:C:3088:TRP:H	2.15	0.64
1:A:1096:ARG:HG2	1:B:2096:ARG:HH12	1.62	0.64
1:B:2088:TRP:HD1	1:B:2089:THR:N	1.95	0.64
1:A:1023:MET:O	1:A:1024:PRO:O	2.16	0.63
1:C:3096:ARG:CD	1:D:4096:ARG:HH12	2.09	0.63
1:C:3014:LEU:HB2	1:C:3073:LYS:O	1.98	0.63
1:C:3038:GLU:HA	1:D:4001:ALA:HA	1.78	0.63
1:C:3084:ARG:NH2	1:C:3086:ARG:HD3	2.12	0.63
1:B:2090:ASP:OD1	1:B:2090:ASP:C	2.42	0.62
1:A:1014:LEU:HD22	1:A:1032:ILE:HB	1.80	0.62
1:C:3090:ASP:OD1	1:C:3090:ASP:C	2.43	0.61
1:B:2076:GLN:HG2	1:B:2112:LEU:HD12	1.82	0.61
1:D:4072:ARG:O	1:D:4073:LYS:C	2.44	0.61
1:C:3099:THR:HB	1:D:4099:THR:CG2	2.30	0.61
1:D:4006:ASN:ND2	1:D:4082:GLN:HB3	2.16	0.61
1:A:1090:ASP:OD1	1:A:1091:GLN:N	2.25	0.60
1:A:1008:VAL:HA	1:B:2008:VAL:HA	1.84	0.59
1:D:4040:TRP:CD1	1:D:4040:TRP:O	2.55	0.59
1:A:1005:VAL:O	1:B:2010:LEU:HA	2.04	0.58
1:A:1020:VAL:HG21	1:A:1068:SER:CB	2.30	0.58
1:C:3001:ALA:CA	1:D:4039:SER:H	2.13	0.57
1:A:1108:THR:HG22	1:A:1109:MET:N	2.18	0.57
1:C:3050:GLU:CG	1:C:3051:GLN:H	2.16	0.57
1:C:3002:SER:O	1:C:3003:ARG:C	2.48	0.56
1:D:4085:THR:HA	1:D:4099:THR:HA	1.86	0.56
1:C:3001:ALA:HA	1:D:4038:GLU:HA	1.87	0.56
1:D:4006:ASN:HD21	1:D:4082:GLN:HB3	1.71	0.56
1:B:2032:ILE:HG13	1:B:2057:VAL:HB	1.87	0.56
1:C:3002:SER:O	1:C:3003:ARG:O	2.23	0.56
1:A:1072:ARG:O	1:A:1073:LYS:C	2.48	0.56
1:C:3031:ASN:OD1	1:C:3058:VAL:HG23	2.05	0.56
1:B:2002:SER:HA	1:D:4110:GLN:HE22	1.69	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1066:VAL:HG13	1:A:1067:ALA:N	2.22	0.55
1:B:2014:LEU:HD22	1:B:2032:ILE:HB	1.89	0.55
1:C:3008:VAL:HA	1:D:4008:VAL:HA	1.88	0.55
1:A:1065:GLU:O	1:A:1068:SER:HB3	2.06	0.55
1:B:2002:SER:O	1:B:2003:ARG:O	2.24	0.55
1:B:2084:ARG:NH2	1:B:2100:GLU:OE2	2.40	0.55
1:C:3022:TYR:N	1:C:3022:TYR:CD2	2.75	0.54
1:A:1014:LEU:HB2	1:A:1073:LYS:O	2.08	0.54
1:B:2059:LEU:HD23	1:B:2103:VAL:HB	1.88	0.54
1:C:3021:ARG:C	1:C:3022:TYR:CD2	2.86	0.54
1:A:1053:GLU:OE1	1:B:2084:ARG:HA	2.07	0.54
1:A:1063:LEU:HD12	1:A:1109:MET:HB3	1.89	0.54
1:B:2060:PHE:HE1	1:B:2102:VAL:HG23	1.73	0.54
1:B:2058:VAL:HG12	1:B:2060:PHE:CE1	2.43	0.53
1:A:1085:THR:HG23	1:A:1099:THR:OG1	2.07	0.53
1:B:2002:SER:O	1:B:2003:ARG:C	2.51	0.53
1:B:2020:VAL:HG21	1:B:2068:SER:HB2	1.89	0.53
1:A:1004:GLY:CA	1:B:2011:VAL:O	2.57	0.53
1:C:3021:ARG:NH2	1:C:3022:TYR:C	2.68	0.51
1:C:3033:THR:HA	1:C:3055:HIS:O	2.10	0.51
1:A:1002:SER:O	1:A:1003:ARG:O	2.29	0.51
1:D:4066:VAL:CG1	1:D:4067:ALA:N	2.72	0.51
1:D:4089:THR:HG23	1:D:4095:ASP:OD1	2.10	0.51
1:C:3096:ARG:HD2	1:D:4096:ARG:NH1	2.25	0.51
1:C:3085:THR:HA	1:C:3099:THR:HA	1.93	0.51
1:D:4020:VAL:CG2	1:D:4068:SER:HB2	2.27	0.51
1:A:1060:PHE:O	1:A:1061:GLY:C	2.52	0.51
1:A:1066:VAL:O	1:A:1067:ALA:C	2.54	0.51
1:D:4033:THR:HG22	1:D:4054:TRP:HE3	1.76	0.51
1:D:4058:VAL:CG2	1:D:4102:VAL:HG12	2.41	0.50
1:D:4013:ASN:HA	1:D:4075:SER:O	2.10	0.50
1:A:1013:ASN:N	1:A:1013:ASN:ND2	2.59	0.50
1:A:1072:ARG:O	1:A:1073:LYS:O	2.29	0.50
1:B:2085:THR:HA	1:B:2099:THR:HA	1.94	0.50
1:D:4032:ILE:HG13	1:D:4057:VAL:HB	1.92	0.50
1:C:3028:ALA:O	1:C:3029:VAL:CG2	2.59	0.50
1:D:4032:ILE:HD11	1:D:4079:ILE:HD11	1.94	0.50
1:B:2072:ARG:O	1:B:2073:LYS:C	2.55	0.50
1:D:4064:ALA:O	1:D:4067:ALA:HB3	2.10	0.50
1:C:3077:VAL:CG2	1:C:3110:GLN:O	2.48	0.50
1:C:3004:GLY:HA2	1:D:4011:VAL:O	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:3077:VAL:HG23	1:C:3110:GLN:C	2.34	0.50
1:D:4023:MET:HB2	1:D:4024:PRO:HD2	1.93	0.50
1:D:4033:THR:HA	1:D:4055:HIS:O	2.11	0.49
1:A:1083:LEU:HD11	1:B:2083:LEU:HD21	1.93	0.49
1:A:1112:LEU:HD13	1:D:4112:LEU:HD13	1.93	0.49
1:D:4032:ILE:CG1	1:D:4057:VAL:HB	2.42	0.49
1:D:4028:ALA:C	1:D:4029:VAL:HG23	2.37	0.49
1:A:1032:ILE:CG1	1:A:1057:VAL:HB	2.39	0.49
1:A:1067:ALA:HA	1:A:1071:LEU:HD13	1.95	0.48
1:D:4060:PHE:O	1:D:4061:GLY:C	2.56	0.48
1:A:1010:LEU:HA	1:B:2005:VAL:O	2.13	0.48
1:B:2077:VAL:HG21	1:B:2109:MET:HG2	1.94	0.48
1:C:3103:VAL:HG12	1:C:3103:VAL:O	2.12	0.48
1:C:3086:ARG:CG	1:C:3086:ARG:NH1	2.63	0.48
1:D:4107:GLY:C	1:D:4108:THR:HG23	2.39	0.48
1:D:4105:VAL:C	1:D:4107:GLY:H	2.22	0.48
1:B:2033:THR:HA	1:B:2055:HIS:O	2.14	0.48
1:B:2034:LEU:CD1	1:B:2079:ILE:HD13	2.43	0.47
1:C:3102:VAL:O	1:C:3102:VAL:CG2	2.61	0.47
1:D:4065:GLU:O	1:D:4068:SER:HB3	2.14	0.47
1:A:1008:VAL:CG1	1:A:1101:VAL:HG13	2.43	0.47
1:C:3001:ALA:HA	1:D:4039:SER:N	2.19	0.47
1:D:4022:TYR:HB3	1:D:4027:GLY:CA	2.44	0.47
1:A:1061:GLY:O	1:A:1064:ALA:HB3	2.14	0.47
1:C:3077:VAL:HG22	1:C:3078:TYR:N	2.30	0.47
1:D:4073:LYS:O	1:D:4075:SER:N	2.47	0.47
1:B:2077:VAL:HG22	1:B:2078:TYR:N	2.29	0.47
1:C:3077:VAL:HG21	1:C:3109:MET:HG2	1.95	0.47
1:A:1083:LEU:HD21	1:B:2083:LEU:HD11	1.97	0.47
1:C:3059:LEU:HD23	1:C:3103:VAL:HB	1.97	0.47
1:A:1006:ASN:C	1:A:1006:ASN:OD1	2.57	0.47
1:D:4089:THR:CG2	1:D:4095:ASP:OD1	2.64	0.46
1:A:1090:ASP:CG	1:A:1091:GLN:N	2.73	0.46
1:D:4107:GLY:O	1:D:4108:THR:CG2	2.64	0.46
1:C:3083:LEU:HD11	1:D:4083:LEU:HD11	1.98	0.46
1:D:4023:MET:HB2	1:D:4024:PRO:CD	2.45	0.46
1:D:4066:VAL:HG13	1:D:4067:ALA:H	1.81	0.46
1:D:4085:THR:OG1	1:D:4099:THR:HB	2.15	0.46
1:A:1108:THR:CG2	1:A:1109:MET:N	2.78	0.46
1:D:4009:ILE:HG23	1:D:4078:TYR:CE1	2.51	0.46
1:B:2091:GLN:C	1:B:2093:GLY:H	2.24	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:3107:GLY:O	1:C:3108:THR:HB	2.16	0.45
1:C:3008:VAL:HG11	1:C:3101:VAL:HG13	1.98	0.45
1:D:4016:GLN:HG2	1:D:4017:ASP:O	2.16	0.45
1:B:2086:ARG:HH11	1:B:2086:ARG:HD2	1.56	0.45
1:A:1066:VAL:HG13	1:A:1067:ALA:H	1.81	0.44
1:B:2060:PHE:O	1:B:2061:GLY:C	2.61	0.44
1:D:4014:LEU:HB2	1:D:4073:LYS:O	2.17	0.44
1:C:3040:TRP:N	1:C:3040:TRP:CD1	2.85	0.44
1:A:1008:VAL:HG11	1:A:1101:VAL:HG13	1.99	0.44
1:B:2059:LEU:HD21	1:B:2103:VAL:HG21	2.00	0.44
1:D:4032:ILE:HD11	1:D:4079:ILE:CD1	2.47	0.44
1:A:1085:THR:HA	1:A:1099:THR:HA	1.99	0.43
1:B:2059:LEU:CD2	1:B:2103:VAL:HG21	2.48	0.43
1:B:2102:VAL:HG13	1:B:2102:VAL:O	2.19	0.43
1:C:3102:VAL:O	1:C:3102:VAL:HG23	2.19	0.43
1:D:4059:LEU:HD23	1:D:4103:VAL:CG2	2.49	0.43
1:D:4014:LEU:HD12	1:D:4014:LEU:N	2.33	0.43
1:D:4065:GLU:OE2	1:D:4065:GLU:HA	2.18	0.43
1:D:4027:GLY:O	1:D:4028:ALA:HB2	2.19	0.43
1:B:2032:ILE:CG1	1:B:2057:VAL:HB	2.47	0.43
1:C:3072:ARG:O	1:C:3073:LYS:C	2.61	0.43
1:A:1011:VAL:O	1:B:2004:GLY:CA	2.67	0.43
1:D:4028:ALA:O	1:D:4029:VAL:CG2	2.66	0.43
1:A:1014:LEU:CD2	1:A:1032:ILE:HB	2.47	0.42
1:B:2088:TRP:HE1	1:B:2090:ASP:HB2	1.84	0.42
1:B:2009:ILE:HD13	1:C:3009:ILE:HD13	2.01	0.42
1:B:2103:VAL:O	1:B:2103:VAL:HG12	2.19	0.42
1:A:1016:GLN:O	1:A:1017:ASP:C	2.62	0.42
1:C:3011:VAL:C	1:D:4004:GLY:HA3	2.38	0.42
1:B:2008:VAL:O	1:B:2008:VAL:HG13	2.19	0.42
1:C:3067:ALA:O	1:C:3071:LEU:HB2	2.20	0.42
1:D:4012:GLY:O	1:D:4076:GLN:HA	2.19	0.42
1:D:4058:VAL:HG23	1:D:4058:VAL:O	2.18	0.42
1:D:4023:MET:O	1:D:4024:PRO:O	2.38	0.42
1:C:3112:LEU:N	1:C:3112:LEU:CD1	2.82	0.41
1:C:3099:THR:CB	1:D:4099:THR:HG21	2.45	0.41
1:D:4059:LEU:CD2	1:D:4103:VAL:HG21	2.50	0.41
1:A:1004:GLY:HA2	1:B:2011:VAL:O	2.20	0.41
1:C:3028:ALA:C	1:C:3029:VAL:HG23	2.45	0.41
1:B:2091:GLN:H	1:B:2091:GLN:HG3	1.53	0.41
1:A:1011:VAL:HB	1:B:2005:VAL:H	1.85	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1022:TYR:CD2	1:A:1027:GLY:O	2.74	0.41
1:B:2077:VAL:CG2	1:B:2109:MET:HG2	2.50	0.41
1:C:3032:ILE:CG1	1:C:3057:VAL:HB	2.44	0.41
1:D:4067:ALA:O	1:D:4071:LEU:HB2	2.20	0.41
1:B:2061:GLY:O	1:B:2064:ALA:HB3	2.21	0.41
1:C:3055:HIS:HD2	1:D:4083:LEU:HD23	1.86	0.41
1:A:1011:VAL:O	1:B:2004:GLY:HA2	2.21	0.40
1:C:3060:PHE:O	1:C:3061:GLY:C	2.64	0.40
1:C:3014:LEU:HD22	1:C:3032:ILE:HB	2.03	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	94/113 (83%)	77 (82%)	9 (10%)	8 (8%)	0	4
1	B	91/113 (80%)	78 (86%)	6 (7%)	7 (8%)	1	5
1	C	88/113 (78%)	74 (84%)	8 (9%)	6 (7%)	1	7
1	D	95/113 (84%)	78 (82%)	10 (10%)	7 (7%)	1	6
All	All	368/452 (81%)	307 (83%)	33 (9%)	28 (8%)	1	6

All (28) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1003	ARG
1	A	1024	PRO
1	A	1073	LYS
1	A	1105	VAL
1	B	2051	GLN
1	B	2105	VAL

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Mol	Chain	Res	Type
1	C	3105	VAL
1	D	4024	PRO
1	D	4073	LYS
1	D	4105	VAL
1	A	1004	GLY
1	B	2003	ARG
1	B	2061	GLY
1	B	2091	GLN
1	C	3003	ARG
1	C	3051	GLN
1	C	3061	GLY
1	D	4004	GLY
1	D	4074	GLY
1	A	1061	GLY
1	B	2073	LYS
1	D	4028	ALA
1	A	1074	GLY
1	B	2090	ASP
1	C	3073	LYS
1	D	4016	GLN
1	A	1017	ASP
1	C	3075	SER

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	63/94 (67%)	59 (94%)	4 (6%)	16	44
1	B	64/94 (68%)	59 (92%)	5 (8%)	11	36
1	C	64/94 (68%)	56 (88%)	8 (12%)	4	19
1	D	69/94 (73%)	61 (88%)	8 (12%)	5	21
All	All	260/376 (69%)	235 (90%)	25 (10%)	8	29

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1007	LYS
1	A	1013	ASN
1	A	1031	ASN
1	A	1059	LEU
1	B	2007	LYS
1	B	2009	ILE
1	B	2079	ILE
1	B	2082	GLN
1	B	2088	TRP
1	C	3020	VAL
1	C	3021	ARG
1	C	3022	TYR
1	C	3058	VAL
1	C	3082	GLN
1	C	3086	ARG
1	C	3102	VAL
1	C	3112	LEU
1	D	4013	ASN
1	D	4014	LEU
1	D	4039	SER
1	D	4051	GLN
1	D	4071	LEU
1	D	4088	TRP
1	D	4089	THR
1	D	4092	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1013	ASN
1	A	1055	HIS
1	B	2031	ASN
1	B	2051	GLN
1	B	2055	HIS
1	B	2110	GLN
1	C	3055	HIS
1	C	3076	GLN
1	C	3110	GLN
1	D	4016	GLN
1	D	4031	ASN
1	D	4051	GLN
1	D	4076	GLN
1	D	4110	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

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, 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	100/113 (88%)	0.68	11 (11%) 10 9	49, 97, 168, 200	0
1	B	97/113 (85%)	0.71	11 (11%) 10 8	51, 99, 164, 192	0
1	C	96/113 (84%)	0.83	13 (13%) 7 6	50, 106, 173, 200	0
1	D	101/113 (89%)	0.80	12 (11%) 9 7	38, 92, 169, 200	0
All	All	394/452 (87%)	0.75	47 (11%) 9 7	38, 98, 169, 200	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	4074	GLY	5.5
1	D	4015	GLY	4.6
1	D	4090	ASP	4.4
1	B	2015	GLY	4.3
1	D	4092	SER	3.8
1	C	3028	ALA	3.7
1	D	4027	GLY	3.7
1	A	1027	GLY	3.7
1	C	3022	TYR	3.6
1	B	2054	TRP	3.6
1	A	1095	ASP	3.4
1	A	1038	GLU	3.3
1	B	2094	GLN	3.3
1	C	3073	LYS	3.2
1	B	2092	SER	3.2
1	A	1104	ASN	3.1
1	D	4104	ASN	3.0
1	A	1004	GLY	3.0
1	C	3039	SER	2.9
1	D	4095	ASP	2.8
1	C	3095	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	1091	GLN	2.7
1	D	4004	GLY	2.7
1	D	4040	TRP	2.7
1	C	3064	ALA	2.6
1	C	3059	LEU	2.6
1	D	4088	TRP	2.5
1	D	4025	ASN	2.5
1	C	3034	LEU	2.5
1	C	3001	ALA	2.5
1	A	1013	ASN	2.5
1	B	2087	LYS	2.4
1	A	1025	ASN	2.4
1	C	3054	TRP	2.4
1	A	1051	GLN	2.3
1	C	3105	VAL	2.3
1	C	3089	THR	2.3
1	D	4065	GLU	2.3
1	A	1090	ASP	2.3
1	B	2029	VAL	2.3
1	B	2088	TRP	2.2
1	B	2021	ARG	2.1
1	C	3012	GLY	2.1
1	B	2097	TYR	2.1
1	B	2003	ARG	2.1
1	B	2093	GLY	2.1
1	A	1015	GLY	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.