



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 14, 2020 – 10:56 AM JST

PDB ID : 7DD0
Title : Crystal structure of the N-terminal domain of TagH from *Bacillus subtilis*
Authors : Ko, T.P.; Yang, C.S.; Wang, Y.C.; Chen, Y.
Deposited on : 2020-10-27
Resolution : 2.70 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.15.1
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)	:	2.15.1

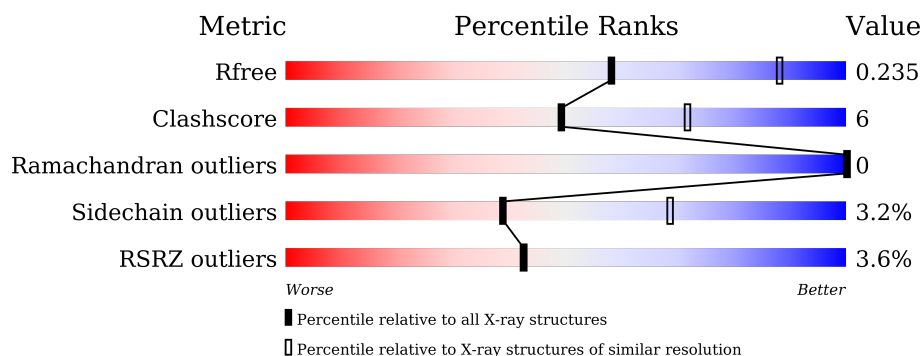
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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}	130704	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	280	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 1%, green 1%, green 74%, yellow 74%, yellow 88%, grey 88%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 74% 14% 13% </div> </div>
1	B	280	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 5%, green 5%, green 75%, yellow 75%, yellow 92%, grey 92%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 5% 75% 17% 7% </div> </div>
1	C	280	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 4%, green 4%, green 71%, yellow 71%, yellow 89%, grey 89%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 4% 71% 18% 10% </div> </div>
1	D	280	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 0%, red 3%, green 3%, green 70%, yellow 70%, yellow 86%, grey 86%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 3% 70% 16% 14% </div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8314 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 Teichoic acids export ATP-binding protein TagH.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	244	Total	C	N	O	S	0	0	0
			1954	1245	329	367	13			
1	B	260	Total	C	N	O	S	0	0	0
			2088	1335	351	390	12			
1	C	252	Total	C	N	O	S	0	0	0
			2022	1290	339	380	13			
1	D	241	Total	C	N	O	S	0	0	0
			1929	1233	321	362	13			

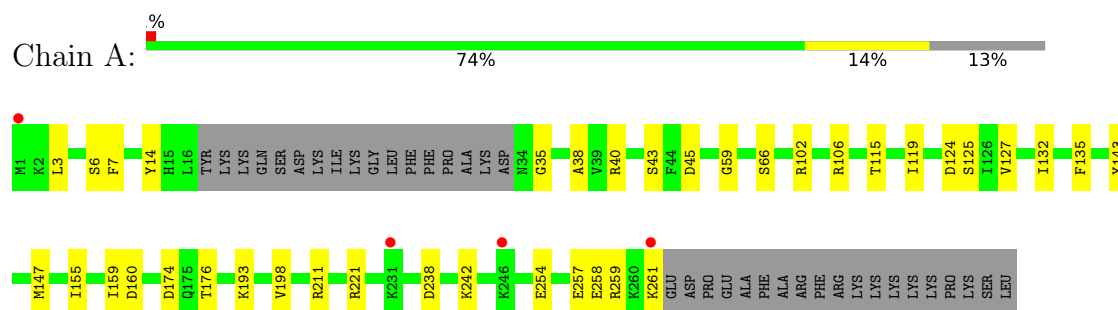
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	104	Total	O	0	0
			104	104		
2	B	69	Total	O	0	0
			69	69		
2	C	80	Total	O	0	0
			80	80		
2	D	68	Total	O	0	0
			68	68		

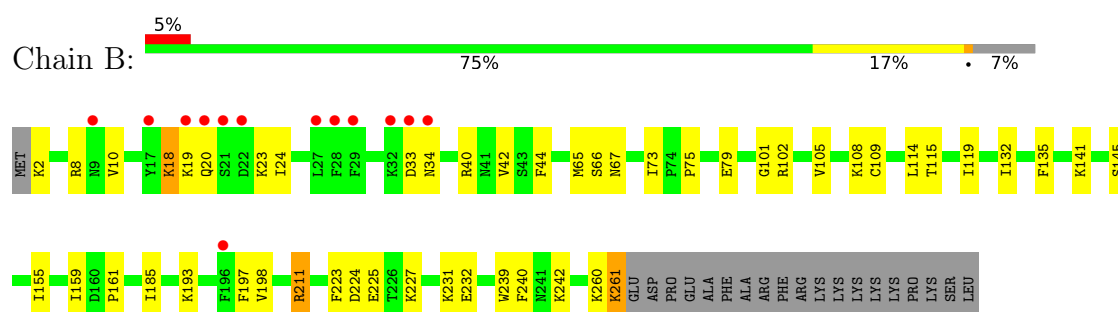
3 Residue-property plots [i](#)

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.

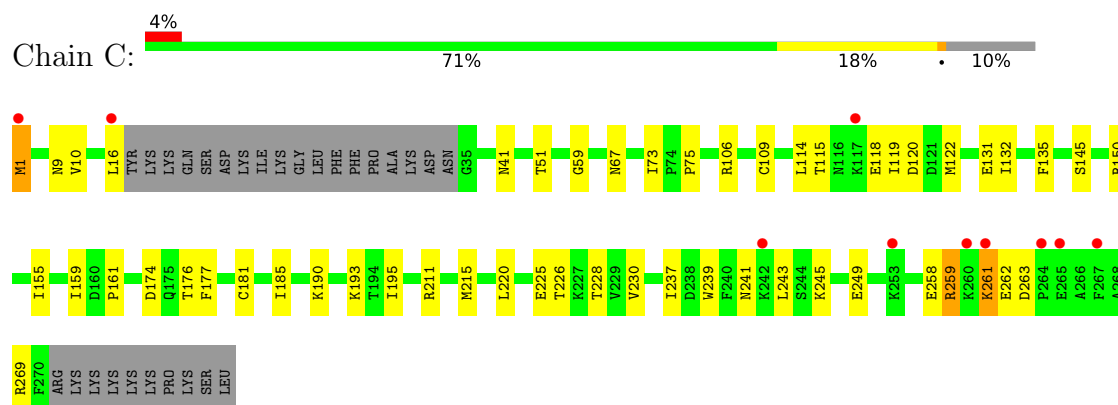
- Molecule 1: Teichoic acids export ATP-binding protein TagH



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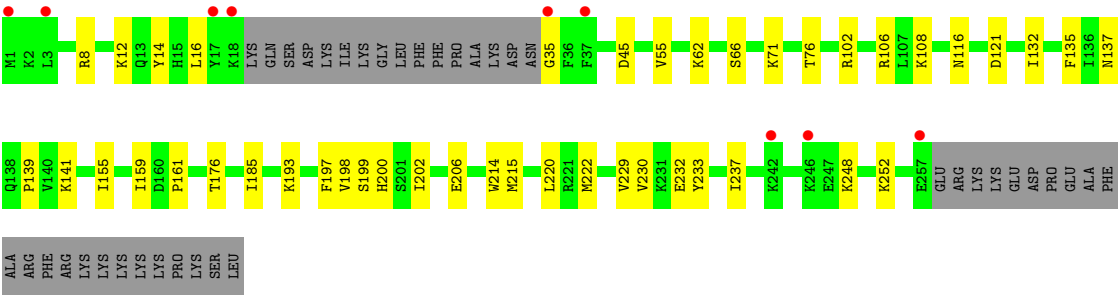


- Molecule 1: Teichoic acids export ATP-binding protein TagH



- Molecule 1: Teichoic acids export ATP-binding protein TagH





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	73.73Å 90.67Å 91.21Å 90.00° 91.77° 90.00°	Depositor
Resolution (Å)	19.73 – 2.70 19.73 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.6 (19.73-2.70) 98.7 (19.73-2.70)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.66 (at 2.71Å)	Xtriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.186 , 0.235 0.186 , 0.235	Depositor DCC
R_{free} test set	1986 reflections (6.10%)	wwPDB-VP
Wilson B-factor (Å ²)	58.0	Xtriage
Anisotropy	0.066	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 43.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.003 for -h,l,k 0.016 for -h,-l,-k 0.026 for h,-k,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8314	wwPDB-VP
Average B, all atoms (Å ²)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.25% 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 [i](#)

5.1 Standard geometry [i](#)

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	0.28	0/1988	0.49	0/2663
1	B	0.29	0/2127	0.51	0/2849
1	C	0.30	0/2059	0.50	0/2759
1	D	0.30	0/1964	0.50	1/2633 (0.0%)
All	All	0.29	0/8138	0.50	1/10904 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	71	LYS	CD-CE-NZ	-5.76	98.46	111.70

There are no chirality outliers.

There are no planarity outliers.

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	1954	0	1964	19	0
1	B	2088	0	2103	26	0
1	C	2022	0	2022	28	0
1	D	1929	0	1935	24	0
2	A	104	0	0	0	0
2	B	69	0	0	3	0
2	C	80	0	0	2	0
2	D	68	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	8314	0	8024	95	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 6.

All (95) 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:C:9:ASN:OD1	1:C:41:ASN:ND2	2.18	0.76
1:C:106:ARG:HG3	1:C:119:ILE:HG21	1.70	0.72
1:A:59:GLY:O	1:A:259:ARG:NH2	2.28	0.65
1:C:59:GLY:O	1:C:259:ARG:NH2	2.22	0.64
1:B:40:ARG:HH22	1:B:261:LYS:HG3	1.64	0.61
1:B:239:TRP:HA	1:B:242:LYS:HZ1	1.65	0.60
1:D:8:ARG:NH2	1:D:45:ASP:OD1	2.33	0.58
1:B:109:CYS:HB3	1:B:114:LEU:HD12	1.86	0.57
1:C:106:ARG:NH1	1:C:120:ASP:OD1	2.35	0.56
1:A:155:ILE:O	1:A:159:ILE:HG12	2.06	0.56
1:C:237:ILE:O	1:C:241:ASN:ND2	2.30	0.56
1:B:239:TRP:HA	1:B:242:LYS:NZ	2.21	0.55
1:A:124:ASP:HA	1:A:127:VAL:HG22	1.88	0.55
1:B:132:ILE:O	1:B:135:PHE:HB2	2.06	0.55
1:D:66:SER:HB2	1:D:198:VAL:HG21	1.89	0.55
1:C:258:GLU:O	1:C:261:LYS:HG3	2.06	0.55
1:C:225:GLU:OE1	1:C:228:THR:N	2.35	0.54
1:C:131:GLU:O	1:C:150:ARG:NH1	2.41	0.54
1:B:161:PRO:O	1:B:193:LYS:HD2	2.08	0.54
1:C:181:CYS:O	1:C:185:ILE:HG12	2.09	0.53
1:D:155:ILE:O	1:D:159:ILE:HG12	2.09	0.53
1:D:214:TRP:HZ3	1:D:232:GLU:HG3	1.74	0.53
1:A:45:ASP:O	1:A:211:ARG:NH1	2.39	0.53
1:B:10:VAL:HG13	1:B:75:PRO:HB3	1.91	0.52
1:C:263:ASP:HB3	1:C:269:ARG:HH12	1.74	0.52
1:D:233:TYR:O	1:D:237:ILE:HG12	2.11	0.51
1:D:161:PRO:O	1:D:193:LYS:HD2	2.11	0.50
1:A:254:GLU:O	1:A:258:GLU:HG2	2.12	0.50
1:A:66:SER:HB2	1:A:198:VAL:HG21	1.94	0.50
1:D:12:LYS:HD2	1:D:76:THR:HG23	1.93	0.50
1:A:40:ARG:NH1	1:A:261:LYS:HD3	2.28	0.49
1:A:3:LEU:HD21	1:A:6:SER:HB2	1.95	0.49
1:B:141:LYS:NZ	2:B:302:HOH:O	2.37	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:2:LYS:N	2:B:304:HOH:O	2.46	0.48
1:D:202:ILE:HG13	1:D:206:GLU:HG3	1.95	0.48
1:D:214:TRP:CZ3	1:D:232:GLU:HG3	2.49	0.48
1:A:238:ASP:OD1	1:A:242:LYS:NZ	2.44	0.48
1:A:40:ARG:HH12	1:A:261:LYS:HD3	1.79	0.48
1:A:174:ASP:OD1	1:A:176:THR:OG1	2.19	0.48
1:C:132:ILE:O	1:C:135:PHE:HB2	2.14	0.47
1:C:114:LEU:HB2	1:C:119:ILE:HD11	1.96	0.47
1:B:102:ARG:NE	2:B:305:HOH:O	2.48	0.47
1:B:42:VAL:HG21	1:B:65:MET:HE3	1.96	0.47
1:D:132:ILE:O	1:D:135:PHE:HB2	2.14	0.47
1:C:115:THR:O	1:C:119:ILE:HG12	2.15	0.46
1:C:150:ARG:NH2	2:C:306:HOH:O	2.48	0.46
1:B:42:VAL:HG21	1:B:65:MET:CE	2.44	0.46
1:B:155:ILE:O	1:B:159:ILE:HG12	2.16	0.46
1:C:1:MET:HA	2:C:331:HOH:O	2.16	0.46
1:A:38:ALA:HA	1:A:259:ARG:HH11	1.79	0.46
1:B:240:PHE:CE2	1:D:176:THR:HG21	2.51	0.46
1:A:160:ASP:OD1	1:A:193:LYS:NZ	2.38	0.46
1:C:161:PRO:O	1:C:193:LYS:HD2	2.16	0.46
1:D:206:GLU:OE2	1:D:230:VAL:HG11	2.16	0.45
1:C:226:THR:O	1:C:230:VAL:HG23	2.17	0.45
1:A:102:ARG:NH2	1:A:106:ARG:HD2	2.32	0.45
1:B:211:ARG:HG3	1:B:224:ASP:O	2.16	0.45
1:A:132:ILE:O	1:A:135:PHE:HB2	2.17	0.45
1:D:215:MET:HE1	1:D:220:LEU:HB2	1.98	0.45
1:A:7:PHE:O	1:A:43:SER:HA	2.18	0.44
1:A:115:THR:O	1:A:119:ILE:HG13	2.17	0.44
1:C:174:ASP:OD1	1:C:176:THR:HB	2.17	0.44
1:D:222:MET:HG2	1:D:229:VAL:HG22	1.99	0.44
1:A:143:TYR:HB3	1:A:147:MET:HB2	2.00	0.43
1:D:14:TYR:O	1:D:35:GLY:HA2	2.18	0.43
1:C:109:CYS:HB3	1:C:114:LEU:HD12	2.00	0.43
1:C:215:MET:HE1	1:C:220:LEU:HB2	2.01	0.43
1:D:106:ARG:NH2	1:D:116:ASN:OD1	2.51	0.43
1:D:185:ILE:HD13	1:D:197:PHE:HZ	1.84	0.43
1:B:18:LYS:O	1:B:18:LYS:HG2	2.19	0.43
1:C:150:ARG:HG2	1:C:177:PHE:CE2	2.54	0.43
1:B:185:ILE:HD13	1:B:197:PHE:CZ	2.54	0.43
1:D:139:PRO:HB2	1:D:141:LYS:HG2	2.01	0.43
1:C:155:ILE:O	1:C:159:ILE:HG12	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:55:VAL:HA	1:D:199:SER:O	2.19	0.42
1:D:62:LYS:HE3	1:D:200:HIS:HB3	2.01	0.42
1:B:66:SER:HB2	1:B:198:VAL:HG21	2.02	0.42
1:C:118:GLU:O	1:C:122:MET:HG2	2.20	0.42
1:B:115:THR:O	1:B:119:ILE:HG13	2.20	0.42
1:C:239:TRP:CH2	1:C:243:LEU:HD11	2.55	0.42
1:B:242:LYS:HZ3	1:B:242:LYS:HB2	1.84	0.42
1:D:248:LYS:HE3	1:D:248:LYS:HB2	1.89	0.42
1:A:14:TYR:O	1:A:35:GLY:HA3	2.20	0.41
1:C:51:THR:HG23	1:C:195:ILE:HB	2.02	0.41
1:B:240:PHE:CD2	1:D:176:THR:HG21	2.55	0.41
1:B:44:PHE:HB2	1:B:223:PHE:CE2	2.55	0.41
1:D:102:ARG:HH21	1:D:137:ASN:ND2	2.19	0.41
1:C:67:ASN:HB3	1:C:73:ILE:HG12	2.02	0.41
1:B:225:GLU:OE2	1:B:227:LYS:HG2	2.20	0.41
1:D:248:LYS:HG2	1:D:252:LYS:HE3	2.03	0.41
1:B:8:ARG:HB2	1:B:79:GLU:HG2	2.02	0.41
1:B:101:GLY:O	1:B:105:VAL:HG23	2.21	0.40
1:C:10:VAL:HG13	1:C:75:PRO:HB3	2.04	0.40
1:B:67:ASN:HB3	1:B:73:ILE:HG12	2.02	0.40
1:C:245:LYS:O	1:C:249:GLU:HG2	2.22	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	240/280 (86%)	235 (98%)	5 (2%)	0	100	100
1	B	258/280 (92%)	250 (97%)	8 (3%)	0	100	100
1	C	248/280 (89%)	243 (98%)	5 (2%)	0	100	100
1	D	237/280 (85%)	231 (98%)	6 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	983/1120 (88%)	959 (98%)	24 (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	216/248 (87%)	213 (99%)	3 (1%)	67	86
1	B	230/248 (93%)	216 (94%)	14 (6%)	18	41
1	C	222/248 (90%)	214 (96%)	8 (4%)	35	64
1	D	213/248 (86%)	210 (99%)	3 (1%)	67	86
All	All	881/992 (89%)	853 (97%)	28 (3%)	39	68

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	125	SER
1	A	221	ARG
1	A	257	GLU
1	B	18	LYS
1	B	19	LYS
1	B	20	GLN
1	B	23	LYS
1	B	24	ILE
1	B	33	ASP
1	B	34	ASN
1	B	108	LYS
1	B	145	SER
1	B	211	ARG
1	B	231	LYS
1	B	232	GLU
1	B	260	LYS
1	B	261	LYS

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Mol	Chain	Res	Type
1	C	1	MET
1	C	16	LEU
1	C	145	SER
1	C	190	LYS
1	C	211	ARG
1	C	259	ARG
1	C	261	LYS
1	C	262	GLU
1	D	16	LEU
1	D	108	LYS
1	D	121	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	204	GLN
1	A	216	HIS
1	A	255	GLN
1	B	15	HIS
1	B	97	ASN
1	B	241	ASN
1	B	255	GLN
1	C	204	GLN
1	D	9	ASN
1	D	137	ASN
1	D	241	ASN

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 monosaccharides 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, 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	244/280 (87%)	-0.39	4 (1%) 72 74	39, 54, 82, 109	0
1	B	260/280 (92%)	-0.01	13 (5%) 28 27	46, 67, 128, 154	0
1	C	252/280 (90%)	-0.06	10 (3%) 38 37	40, 63, 106, 127	0
1	D	241/280 (86%)	-0.14	9 (3%) 41 41	43, 63, 115, 141	0
All	All	997/1120 (89%)	-0.15	36 (3%) 42 42	39, 62, 106, 154	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	28	PHE	10.3
1	C	1	MET	5.2
1	D	1	MET	5.2
1	B	33	ASP	4.5
1	B	21	SER	4.1
1	D	257	GLU	3.7
1	D	17	TYR	3.7
1	B	34	ASN	3.5
1	C	267	PHE	3.5
1	B	20	GLN	3.5
1	A	1	MET	3.2
1	B	22	ASP	3.2
1	B	27	LEU	3.1
1	B	17	TYR	3.0
1	C	16	LEU	3.0
1	A	261	LYS	2.9
1	D	246	LYS	2.9
1	A	231	LYS	2.8
1	B	29	PHE	2.7
1	B	32	LYS	2.7
1	C	260	LYS	2.6

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Mol	Chain	Res	Type	RSRZ
1	D	35	GLY	2.5
1	C	265	GLU	2.5
1	D	18	LYS	2.4
1	D	3	LEU	2.4
1	B	19	LYS	2.3
1	A	246	LYS	2.3
1	D	242	LYS	2.3
1	D	37	PHE	2.2
1	C	117	LYS	2.2
1	C	264	PRO	2.2
1	B	9	ASN	2.1
1	C	261	LYS	2.1
1	B	196	PHE	2.0
1	C	242	LYS	2.0
1	C	253	LYS	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 monosaccharides 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.