



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 20, 2024 – 10:14 pm BST

PDB ID : 4CPC
Title : Crystal structure of human synaptonemal complex protein SYCP3
Authors : Syrjanen, J.L.; Pellegrini, L.; Davies, O.R.
Deposited on : 2014-02-05
Resolution : 2.24 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.36.2
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) : 2.36.2

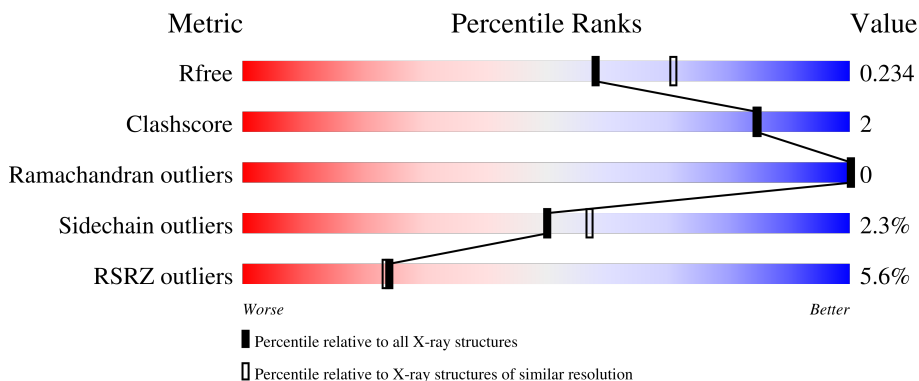
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.24 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.



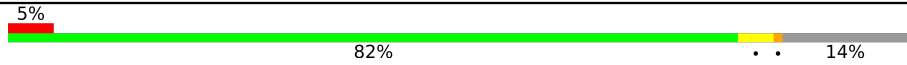


Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2391 (2.26-2.22)
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)
RSRZ outliers	127900	2353 (2.26-2.22)

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	167	 3% 79% 7% 14%
1	B	167	 5% 80% 5% 14%
1	C	167	 7% 81% 5% 14%
1	D	167	 5% 77% 7% 16%
1	E	167	 2% 80% 6% 14%

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Mol	Chain	Length	Quality of chain
1	F	167	 5% 82% 7% 14%
1	G	167	 7% 84% 7% 9%
1	H	167	 4% 75% 8% 16%

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 10412 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 SYNAPTONEMAL COMPLEX PROTEIN 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	143	1230	769	221	232	8	0	1	0
1	B	144	1247	782	223	233	9	0	2	0
1	C	144	1231	770	221	232	8	0	1	0
1	D	141	1204	755	216	225	8	0	0	0
1	E	143	1230	769	221	232	8	0	1	0
1	F	144	1238	776	221	232	9	0	1	0
1	G	152	1292	809	231	243	9	0	1	0
1	H	140	1213	759	218	227	9	0	2	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	64	GLY	-	expression tag	UNP Q8IZU3
A	65	SER	-	expression tag	UNP Q8IZU3
B	64	GLY	-	expression tag	UNP Q8IZU3
B	65	SER	-	expression tag	UNP Q8IZU3
C	64	GLY	-	expression tag	UNP Q8IZU3
C	65	SER	-	expression tag	UNP Q8IZU3
D	64	GLY	-	expression tag	UNP Q8IZU3
D	65	SER	-	expression tag	UNP Q8IZU3
E	64	GLY	-	expression tag	UNP Q8IZU3
E	65	SER	-	expression tag	UNP Q8IZU3
F	64	GLY	-	expression tag	UNP Q8IZU3
F	65	SER	-	expression tag	UNP Q8IZU3
G	64	GLY	-	expression tag	UNP Q8IZU3

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Chain	Residue	Modelled	Actual	Comment	Reference
G	65	SER	-	expression tag	UNP Q8IZU3
H	64	GLY	-	expression tag	UNP Q8IZU3
H	65	SER	-	expression tag	UNP Q8IZU3

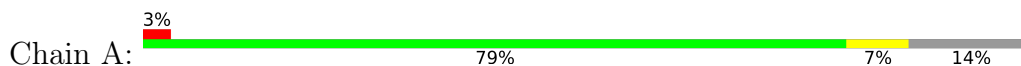
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	90	Total O 90 90	0	0
2	B	65	Total O 65 65	0	0
2	C	68	Total O 68 68	0	0
2	D	43	Total O 43 43	0	0
2	E	62	Total O 62 62	0	0
2	F	70	Total O 70 70	0	0
2	G	71	Total O 71 71	0	0
2	H	58	Total O 58 58	0	0

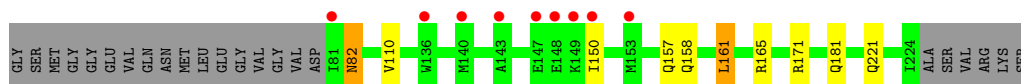
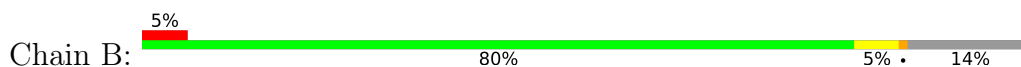
3 Residue-property plots [i](#)

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.

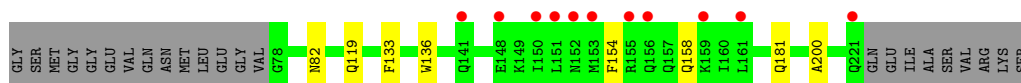
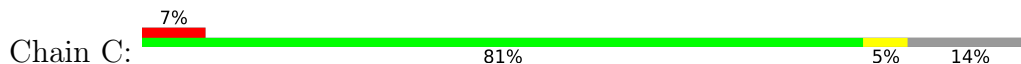
- Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3



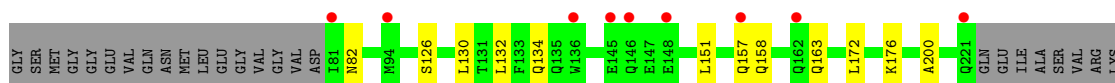
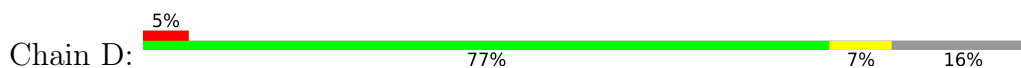
- Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3



- Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3

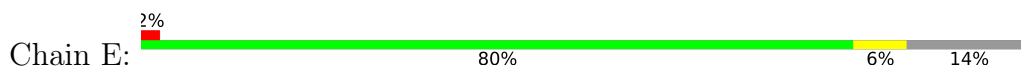


- Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3

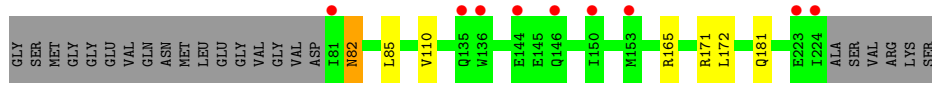
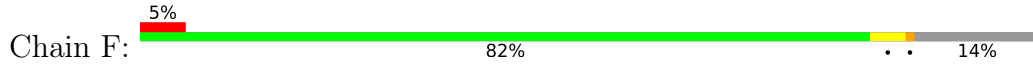


SER

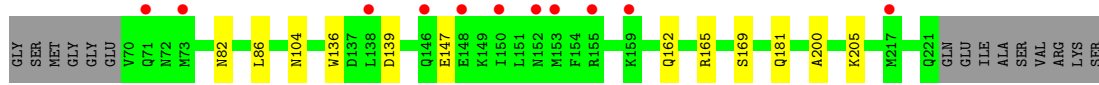
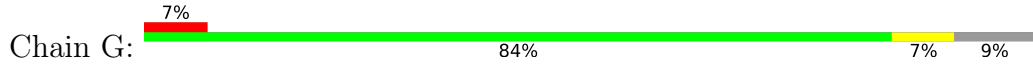
- Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3



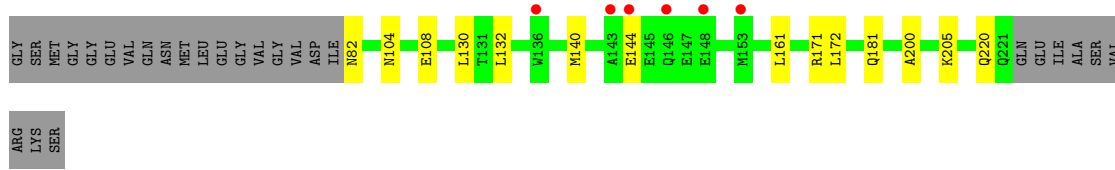
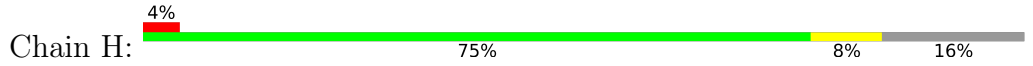
● Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3



● Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3



● Molecule 1: SYNAPTONEMAL COMPLEX PROTEIN 3



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	49.14Å 92.38Å 103.37Å 66.53° 82.32° 76.53°	Depositor
Resolution (Å)	47.36 – 2.24 47.36 – 2.24	Depositor EDS
% Data completeness (in resolution range)	85.3 (47.36-2.24) 85.3 (47.36-2.24)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.96 (at 2.24Å)	Xtrriage
Refinement program	BUSTER 2.10.0	Depositor
R, R_{free}	0.195 , 0.226 0.204 , 0.234	Depositor DCC
R_{free} test set	3301 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	28.7	Xtrriage
Anisotropy	1.597	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 54.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10412	wwPDB-VP
Average B, all atoms (Å ²)	61.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.70% 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	0.51	0/1243	0.58	0/1653
1	B	0.47	0/1260	0.58	0/1674
1	C	0.47	0/1244	0.58	0/1655
1	D	0.48	0/1217	0.61	0/1618
1	E	0.48	0/1243	0.57	0/1653
1	F	0.49	0/1251	0.60	0/1663
1	G	0.50	0/1305	0.61	0/1736
1	H	0.50	0/1226	0.58	0/1629
All	All	0.49	0/9989	0.59	0/13281

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 [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	1230	0	1257	8	0
1	B	1247	0	1283	10	0
1	C	1231	0	1259	11	0
1	D	1204	0	1238	10	0
1	E	1230	0	1257	11	0
1	F	1238	0	1271	7	0
1	G	1292	0	1327	13	0
1	H	1213	0	1242	14	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	90	0	0	1	0
2	B	65	0	0	0	0
2	C	68	0	0	1	0
2	D	43	0	0	0	0
2	E	62	0	0	1	0
2	F	70	0	0	1	0
2	G	71	0	0	1	0
2	H	58	0	0	1	0
All	All	10412	0	10134	46	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 2.

All (46) 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:E:124:GLU:HG3	2:E:2035:HOH:O	1.76	0.84
1:E:140:MET:HE3	1:F:165:ARG:HG3	1.67	0.77
1:E:186:MET:HE2	2:F:2032:HOH:O	1.87	0.74
1:A:175:ILE:HG13	1:D:132:LEU:HD13	1.74	0.70
1:A:110:VAL:HG21	1:D:200:ALA:HB2	1.77	0.66
1:E:175:ILE:HG13	1:H:132:LEU:HD13	1.80	0.64
1:B:110:VAL:HG21	1:C:200:ALA:HB2	1.83	0.59
1:A:140:MET:HE3	1:B:165:ARG:HG3	1.86	0.57
1:C:119:GLN:HG2	2:C:2033:HOH:O	2.04	0.57
1:F:110:VAL:HG21	1:G:200:ALA:HB2	1.85	0.57
1:G:165:ARG:HD2	1:H:144:GLU:HG3	1.89	0.55
1:A:110:VAL:HG21	1:D:200:ALA:CB	2.38	0.52
1:E:110:VAL:HG21	1:H:200:ALA:HB2	1.91	0.52
1:G:104:ASN:HD22	1:H:205:LYS:HE2	1.75	0.52
1:B:110:VAL:HG21	1:C:200:ALA:CB	2.39	0.51
1:G:136:TRP:CE3	1:H:172:LEU:HD13	2.45	0.51
1:G:162:GLN:HG2	1:G:165:ARG:HH21	1.76	0.51
1:B:150:ILE:HD11	1:C:154:PHE:CE1	2.46	0.51
1:A:150:ILE:HG21	1:D:157:GLN:OE1	2.11	0.50
1:E:223:GLU:HB3	1:F:82:ASN:HD21	1.76	0.49
1:H:130:LEU:HD12	2:H:2037:HOH:O	2.13	0.49
1:G:205[A]:LYS:HE3	1:H:104:ASN:HD22	1.77	0.49
1:G:104:ASN:ND2	1:H:205:LYS:HE2	2.28	0.48
1:G:169:SER:HA	1:H:140:MET:HE1	1.94	0.48
1:A:201:GLN:NE2	2:A:2079:HOH:O	2.45	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:171:ARG:HD3	1:C:136:TRP:CD2	2.50	0.47
1:B:150:ILE:HD11	1:C:154:PHE:HE1	1.80	0.46
1:B:171:ARG:HD3	1:C:136:TRP:CG	2.51	0.46
1:B:157:GLN:NE2	1:D:158:GLN:HG2	2.31	0.45
1:C:133:PHE:CD2	1:D:176:LYS:HG3	2.53	0.43
1:E:136:TRP:CE3	1:F:172:LEU:HD13	2.53	0.43
1:F:171:ARG:HD3	1:G:136:TRP:CG	2.53	0.43
1:F:110:VAL:HG21	1:G:200:ALA:CB	2.48	0.42
1:E:107:ILE:HD13	1:H:200:ALA:HB1	2.02	0.42
1:G:147:GLU:HG3	1:H:161:LEU:HD23	2.01	0.41
1:E:175:ILE:HD11	1:H:132:LEU:HB3	2.02	0.41
2:G:2058:HOH:O	1:H:108:GLU:HG3	2.20	0.41
1:C:136:TRP:CE3	1:D:172:LEU:HD13	2.54	0.41
1:D:126:SER:O	1:D:130:LEU:HG	2.20	0.41
1:B:161:LEU:HD22	1:D:157:GLN:HE22	1.86	0.41
1:E:136:TRP:CH2	1:G:136:TRP:CH2	3.10	0.41
1:E:136:TRP:CD2	1:H:171:ARG:HD3	2.56	0.40
1:F:171:ARG:NH2	1:G:139:ASP:OD2	2.54	0.40
1:A:223:GLU:HB3	1:B:82:ASN:HD21	1.86	0.40
1:C:158:GLN:HG3	1:D:151:LEU:HD22	2.03	0.40
1:A:136:TRP:CH2	1:C:136:TRP:CH2	3.10	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	142/167 (85%)	142 (100%)	0	0	100	100
1	B	144/167 (86%)	144 (100%)	0	0	100	100
1	C	143/167 (86%)	143 (100%)	0	0	100	100
1	D	139/167 (83%)	139 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	142/167 (85%)	142 (100%)	0	0	100	100
1	F	143/167 (86%)	143 (100%)	0	0	100	100
1	G	151/167 (90%)	151 (100%)	0	0	100	100
1	H	140/167 (84%)	140 (100%)	0	0	100	100
All	All	1144/1336 (86%)	1144 (100%)	0	0	100	100

There are no Ramachandran outliers to report.

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	137/154 (89%)	133 (97%)	4 (3%)	42	48
1	B	139/154 (90%)	134 (96%)	5 (4%)	35	39
1	C	137/154 (89%)	135 (98%)	2 (2%)	65	72
1	D	134/154 (87%)	131 (98%)	3 (2%)	52	59
1	E	137/154 (89%)	135 (98%)	2 (2%)	65	72
1	F	138/154 (90%)	135 (98%)	3 (2%)	52	59
1	G	144/154 (94%)	141 (98%)	3 (2%)	53	60
1	H	135/154 (88%)	132 (98%)	3 (2%)	52	59
All	All	1101/1232 (89%)	1076 (98%)	25 (2%)	50	57

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

Mol	Chain	Res	Type
1	A	82	ASN
1	A	163	GLN
1	A	170	GLN
1	A	181	GLN
1	B	82	ASN
1	B	158	GLN

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Mol	Chain	Res	Type
1	B	161	LEU
1	B	181	GLN
1	B	221	GLN
1	C	82	ASN
1	C	181	GLN
1	D	82	ASN
1	D	134	GLN
1	D	163	GLN
1	E	163	GLN
1	E	181	GLN
1	F	82	ASN
1	F	85	LEU
1	F	181	GLN
1	G	82	ASN
1	G	86	LEU
1	G	181	GLN
1	H	82	ASN
1	H	181	GLN
1	H	220	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	158	GLN
1	B	82	ASN
1	B	181	GLN
1	C	104	ASN
1	D	158	GLN
1	E	158	GLN
1	G	104	ASN
1	G	157	GLN
1	H	104	ASN
1	H	212	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 monosaccharides 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	143/167 (85%)	0.23	5 (3%) 44 43	31, 54, 104, 110	0
1	B	144/167 (86%)	0.31	9 (6%) 20 19	30, 56, 111, 124	0
1	C	144/167 (86%)	0.38	11 (7%) 13 13	30, 56, 114, 124	0
1	D	141/167 (84%)	0.25	9 (6%) 19 19	31, 56, 103, 130	0
1	E	143/167 (85%)	0.22	4 (2%) 53 53	32, 57, 92, 104	0
1	F	144/167 (86%)	0.32	9 (6%) 20 19	30, 57, 101, 109	0
1	G	152/167 (91%)	0.36	11 (7%) 15 14	32, 56, 105, 118	0
1	H	140/167 (83%)	0.20	6 (4%) 35 34	30, 53, 102, 125	0
All	All	1151/1336 (86%)	0.28	64 (5%) 24 23	30, 56, 106, 130	0

All (64) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	81	ILE	5.4
1	F	150	ILE	5.4
1	F	153	MET	5.4
1	F	136	TRP	5.2
1	C	153	MET	4.2
1	D	81	ILE	4.0
1	F	81	ILE	3.9
1	G	73	MET	3.8
1	B	150	ILE	3.8
1	C	152	ASN	3.7
1	H	153	MET	3.6
1	G	155	ARG	3.6
1	F	224	ILE	3.5
1	G	153	MET	3.5
1	A	153	MET	3.5
1	B	153	MET	3.3

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Mol	Chain	Res	Type	RSRZ
1	B	136	TRP	3.3
1	G	138	LEU	3.2
1	C	155	ARG	3.2
1	A	146	GLN	3.1
1	B	147	GLU	3.0
1	F	223	GLU	2.9
1	F	146	GLN	2.9
1	E	159	LYS	2.8
1	D	136	TRP	2.8
1	H	136	TRP	2.8
1	C	159	LYS	2.8
1	E	221	GLN	2.8
1	G	150	ILE	2.8
1	G	148	GLU	2.7
1	B	81	ILE	2.7
1	D	157	GLN	2.7
1	H	144	GLU	2.7
1	D	145	GLU	2.6
1	G	159	LYS	2.6
1	G	146	GLN	2.6
1	B	140	MET	2.6
1	D	148	GLU	2.5
1	C	150	ILE	2.5
1	D	146	GLN	2.5
1	C	151	LEU	2.4
1	G	71	GLN	2.4
1	C	221	GLN	2.4
1	C	148	GLU	2.4
1	C	141	GLN	2.3
1	C	156	GLN	2.3
1	E	146	GLN	2.3
1	B	148	GLU	2.3
1	D	221	GLN	2.2
1	A	166	ILE	2.2
1	G	217	MET	2.2
1	B	143	ALA	2.1
1	E	224	ILE	2.1
1	A	151	LEU	2.1
1	B	149	LYS	2.1
1	F	135	GLN	2.1
1	F	144	GLU	2.1
1	D	94	MET	2.0

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Mol	Chain	Res	Type	RSRZ
1	G	152	ASN	2.0
1	H	143	ALA	2.0
1	D	162	GLN	2.0
1	H	146	GLN	2.0
1	C	161	LEU	2.0
1	H	148	GLU	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.