Full wwPDB X-ray Structure Validation Report (i)

Nov 21, 2023 – 10:06 PM JST

PDB ID	:	7XBQ
Title	:	Crystal structure of potato 14-3-3 protein St14f
Authors	:	Harada, K.; Kojima, C.; Yamashita, E.; Nakagawa, A.
Deposited on	:	2022-03-21
Resolution	:	2.45 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 (i) 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 (1)) were used in the production of this report:

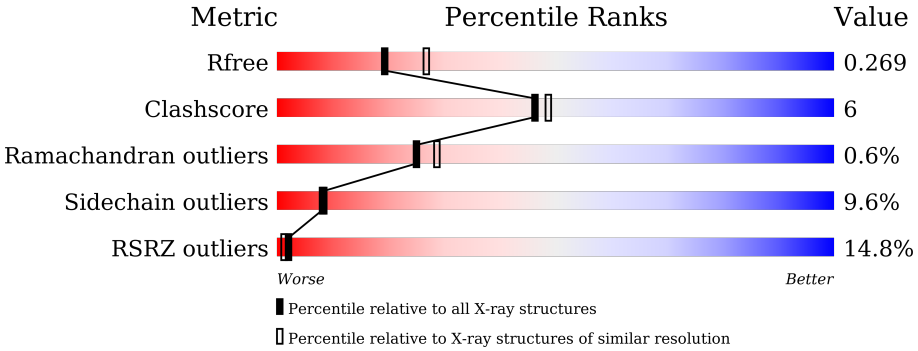
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 2.45 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	1544 (2.48-2.44)
Clashscore	141614	1613 (2.48-2.44)
Ramachandran outliers	138981	1598 (2.48-2.44)
Sidechain outliers	138945	1598 (2.48-2.44)
RSRZ outliers	127900	1523 (2.48-2.44)

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 <=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	258	11%, 67%, 21%, •, 10%
1	B	258	5%, 76%, 12%, •, 9%
1	C	258	24%, 76%, 13%, •, 10%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 5347 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 Putative 14-3-3 protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	233	1823	1142	307	365	9	0	0	0
1	B	235	1859	1164	316	370	9	0	0	0
1	C	233	1665	1030	291	336	8	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

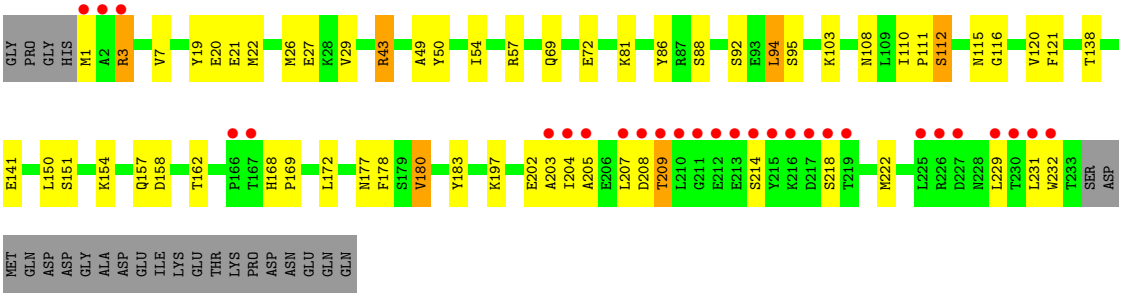
Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	GLY	-	expression tag	UNP P93785
A	-2	PRO	-	expression tag	UNP P93785
A	-1	GLY	-	expression tag	UNP P93785
A	0	HIS	-	expression tag	UNP P93785
B	-3	GLY	-	expression tag	UNP P93785
B	-2	PRO	-	expression tag	UNP P93785
B	-1	GLY	-	expression tag	UNP P93785
B	0	HIS	-	expression tag	UNP P93785
C	-3	GLY	-	expression tag	UNP P93785
C	-2	PRO	-	expression tag	UNP P93785
C	-1	GLY	-	expression tag	UNP P93785
C	0	HIS	-	expression tag	UNP P93785

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.

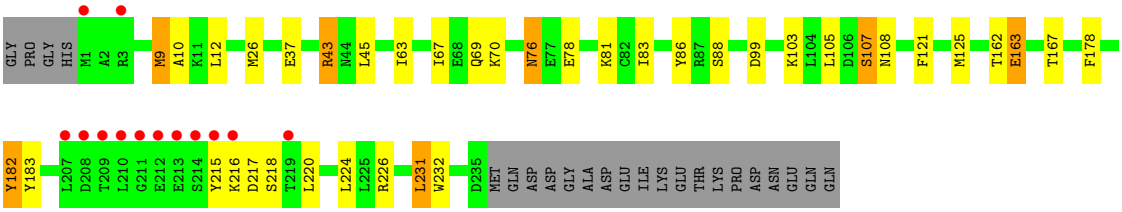
• Molecule 1: Putative 14-3-3 protein

Chain A:



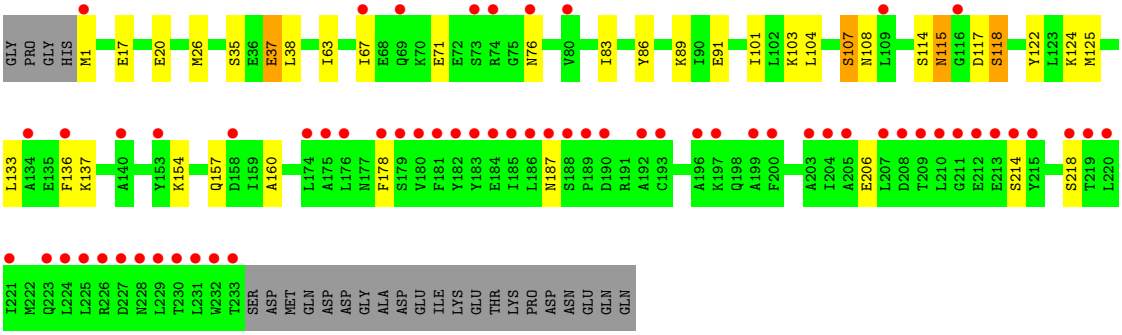
• Molecule 1: Putative 14-3-3 protein

Chain B:



• Molecule 1: Putative 14-3-3 protein

Chain C:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	230.20Å 105.28Å 60.99Å 90.00° 104.84° 90.00°	Depositor
Resolution (Å)	47.58 – 2.45 47.53 – 2.45	Depositor EDS
% Data completeness (in resolution range)	99.3 (47.58-2.45) 99.4 (47.53-2.45)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.72 (at 2.45Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.209 , 0.277 0.202 , 0.269	Depositor DCC
R_{free} test set	2573 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	44.6	Xtriage
Anisotropy	1.097	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 51.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.016 for -h-2*l,-k,l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	5347	wwPDB-VP
Average B, all atoms (Å^2)	83.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.35% of the height of the origin peak. No significant pseudotranslation is detected.*

[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 (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	0.98	5/1850 (0.3%)	1.08	3/2496 (0.1%)
1	B	0.91	1/1886 (0.1%)	0.98	2/2540 (0.1%)
1	C	0.92	2/1686 (0.1%)	0.93	0/2286
All	All	0.94	8/5422 (0.1%)	1.00	5/7322 (0.1%)

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	B	0	1
All	All	0	2

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	37	GLU	CD-OE1	6.72	1.33	1.25
1	A	20	GLU	CD-OE1	6.69	1.33	1.25
1	A	158	ASP	CG-OD1	6.01	1.39	1.25
1	C	17	GLU	CD-OE2	-5.59	1.19	1.25
1	A	72	GLU	CD-OE1	5.13	1.31	1.25
1	C	20	GLU	CD-OE1	5.13	1.31	1.25
1	A	21	GLU	CD-OE1	5.12	1.31	1.25
1	A	141	GLU	CD-OE1	-5.03	1.20	1.25

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	43	ARG	NE-CZ-NH2	-8.68	115.96	120.30
1	A	3	ARG	CB-CA-C	6.96	124.31	110.40
1	A	108	ASN	N-CA-CB	6.20	121.76	110.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	108	ASN	CB-CA-C	5.92	122.24	110.40
1	B	43	ARG	NE-CZ-NH2	-5.28	117.66	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	3	ARG	Peptide
1	B	76	ASN	Peptide

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	1823	0	1773	30	0
1	B	1859	0	1828	19	0
1	C	1665	0	1479	18	0
All	All	5347	0	5080	66	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 (66) 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:22:MET:HE3	1:A:49:ALA:HA	1.52	0.90
1:C:26:MET:HA	1:C:26:MET:HE2	1.55	0.88
1:C:26:MET:HA	1:C:26:MET:CE	2.09	0.83
1:A:19:TYR:HD1	1:A:22:MET:HE2	1.51	0.73
1:A:203:ALA:HB3	1:A:222:MET:HE3	1.70	0.73
1:B:67:ILE:HG22	1:B:83:ILE:HD13	1.71	0.71
1:B:105:LEU:HD21	1:B:125:MET:CE	2.21	0.71
1:A:19:TYR:HD1	1:A:22:MET:CE	2.03	0.70
1:A:22:MET:HE3	1:A:49:ALA:CA	2.22	0.69
1:B:105:LEU:HD21	1:B:125:MET:HE3	1.75	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:112:SER:HG	1:B:182:TYR:HH	1.41	0.68
1:A:27:GLU:OE1	1:A:50:TYR:OH	2.12	0.65
1:A:7:VAL:HA	1:A:26:MET:HE1	1.82	0.60
1:A:57:ARG:HB3	1:A:94:LEU:HD13	1.83	0.59
1:A:197:LYS:N	1:A:229:LEU:HD11	2.19	0.58
1:A:26:MET:HE2	1:A:26:MET:HA	1.85	0.58
1:A:19:TYR:CD1	1:A:22:MET:CE	2.85	0.57
1:C:117:ASP:OD1	1:C:118:SER:N	2.41	0.54
1:A:183:TYR:CE2	1:A:232:TRP:CD1	2.95	0.54
1:C:26:MET:CE	1:C:26:MET:CA	2.84	0.54
1:A:19:TYR:CD1	1:A:22:MET:HE1	2.43	0.53
1:B:167:THR:O	1:B:218:SER:OG	2.21	0.53
1:C:133:LEU:O	1:C:137:LYS:HG2	2.09	0.53
1:B:67:ILE:HG22	1:B:83:ILE:CD1	2.39	0.52
1:C:157:GLN:HA	1:C:160:ALA:HB3	1.92	0.52
1:B:9:MET:CE	1:B:12:LEU:HD12	2.41	0.51
1:C:133:LEU:O	1:C:137:LYS:CG	2.60	0.49
1:A:116:GLY:O	1:A:120:VAL:HG23	2.12	0.49
1:A:150:LEU:HD11	1:A:154:LYS:HE3	1.95	0.48
1:A:22:MET:CE	1:A:49:ALA:HA	2.34	0.47
1:A:43:ARG:HD3	1:A:121:PHE:CE2	2.48	0.47
1:A:177:ASN:O	1:A:180:VAL:HG12	2.14	0.47
1:A:57:ARG:CB	1:A:94:LEU:HD13	2.44	0.47
1:A:197:LYS:CA	1:A:229:LEU:HD11	2.45	0.47
1:C:37:GLU:OE2	1:C:38:LEU:N	2.49	0.46
1:A:26:MET:HA	1:A:26:MET:CE	2.45	0.46
1:C:71:GLU:HG3	1:C:76:ASN:HB2	1.99	0.45
1:A:172:LEU:HD12	1:A:218:SER:HB2	1.99	0.45
1:B:43:ARG:HD3	1:B:121:PHE:CD2	2.51	0.45
1:A:22:MET:HG2	1:A:49:ALA:HB2	2.00	0.44
1:C:154:LYS:O	1:C:157:GLN:N	2.50	0.44
1:A:202:GLU:O	1:A:205:ALA:HB3	2.17	0.44
1:C:214:SER:O	1:C:218:SER:OG	2.22	0.44
1:A:168:HIS:ND1	1:A:169:PRO:HD2	2.33	0.43
1:A:110:ILE:HB	1:A:111:PRO:HD3	2.01	0.43
1:C:67:ILE:HG22	1:C:83:ILE:HD13	2.01	0.43
1:B:231:LEU:O	1:B:231:LEU:HD23	2.19	0.43
1:B:26:MET:HE3	1:B:45:LEU:CD1	2.49	0.42
1:B:99:ASP:O	1:B:103:LYS:HB2	2.20	0.42
1:C:38:LEU:HB2	1:C:122:TYR:OH	2.19	0.42
1:A:26:MET:HE2	1:A:29:VAL:CG2	2.49	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:10:ALA:HB3	1:B:26:MET:HE1	2.02	0.42
1:B:103:LYS:O	1:B:107:SER:HB3	2.20	0.42
1:B:105:LEU:HD11	1:B:125:MET:HE3	2.01	0.42
1:A:203:ALA:CB	1:A:222:MET:HE3	2.45	0.42
1:B:26:MET:HE2	1:B:45:LEU:HB3	2.01	0.42
1:C:104:LEU:O	1:C:108:ASN:HB3	2.20	0.42
1:B:162:THR:HG22	1:B:163:GLU:OE2	2.20	0.42
1:B:10:ALA:CB	1:B:26:MET:HE1	2.50	0.41
1:C:101:ILE:HG12	1:C:125:MET:HE2	2.02	0.41
1:C:103:LYS:O	1:C:107:SER:HB3	2.20	0.41
1:A:204:ILE:HG12	1:A:222:MET:CE	2.51	0.41
1:C:115:ASN:OD1	1:C:115:ASN:N	2.53	0.41
1:B:76:ASN:O	1:B:78:GLU:N	2.49	0.41
1:B:183:TYR:CE2	1:B:232:TRP:CD1	3.10	0.40
1:C:91:GLU:HG2	1:C:136:PHE:CD1	2.57	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	231/258 (90%)	211 (91%)	18 (8%)	2 (1%)	17	19
1	B	233/258 (90%)	215 (92%)	17 (7%)	1 (0%)	34	41
1	C	231/258 (90%)	210 (91%)	20 (9%)	1 (0%)	34	41
All	All	695/774 (90%)	636 (92%)	55 (8%)	4 (1%)	25	29

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	187	ASN
1	A	115	ASN

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Mol	Chain	Res	Type
1	A	209	THR
1	B	215	TYR

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	192/222 (86%)	170 (88%)	22 (12%)	5 5
1	B	198/222 (89%)	181 (91%)	17 (9%)	10 11
1	C	149/222 (67%)	136 (91%)	13 (9%)	10 11
All	All	539/666 (81%)	487 (90%)	52 (10%)	8 8

All (52) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	54	ILE
1	A	69	GLN
1	A	81	LYS
1	A	86	TYR
1	A	88	SER
1	A	92	SER
1	A	94	LEU
1	A	95	SER
1	A	103	LYS
1	A	112	SER
1	A	138	THR
1	A	151	SER
1	A	157	GLN
1	A	162	THR
1	A	178	PHE
1	A	180	VAL
1	A	207	LEU
1	A	208	ASP
1	A	209	THR

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Mol	Chain	Res	Type
1	A	214	SER
1	A	231	LEU
1	B	9	MET
1	B	63	ILE
1	B	69	GLN
1	B	70	LYS
1	B	81	LYS
1	B	86	TYR
1	B	88	SER
1	B	107	SER
1	B	163	GLU
1	B	178	PHE
1	B	182	TYR
1	B	216	LYS
1	B	217	ASP
1	B	220	LEU
1	B	224	LEU
1	B	226	ARG
1	B	231	LEU
1	C	1	MET
1	C	35	SER
1	C	37	GLU
1	C	63	ILE
1	C	86	TYR
1	C	89	LYS
1	C	107	SER
1	C	114	SER
1	C	115	ASN
1	C	118	SER
1	C	124	LYS
1	C	178	PHE
1	C	206	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	96	ASN
1	A	228	ASN
1	B	76	ASN
1	B	228	ASN
1	C	76	ASN
1	C	108	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 (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)

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	233/258 (90%)	0.82	28 (12%)	4	2	39, 60, 132, 173	0
1	B	235/258 (91%)	0.44	13 (5%)	25	22	44, 65, 117, 168	0
1	C	233/258 (90%)	1.56	63 (27%)	0	0	56, 103, 187, 226	0
All	All	701/774 (90%)	0.94	104 (14%)	2	1	39, 74, 169, 226	0

All (104) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	196	ALA	18.3
1	C	210	LEU	10.8
1	C	193	CYS	10.5
1	C	192	ALA	9.8
1	C	204	ILE	8.8
1	C	231	LEU	8.7
1	A	211	GLY	8.6
1	A	207	LEU	8.0
1	C	178	PHE	7.8
1	C	224	LEU	7.7
1	A	215	TYR	7.7
1	C	197	LYS	7.4
1	C	189	PRO	7.4
1	A	210	LEU	7.0
1	C	186	LEU	6.9
1	C	203	ALA	6.9
1	A	214	SER	6.8
1	A	209	THR	6.6
1	C	209	THR	6.4
1	C	230	THR	6.2
1	C	223	GLN	6.1
1	C	185	ILE	6.0
1	C	208	ASP	5.9

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Mol	Chain	Res	Type	RSRZ
1	C	232	TRP	5.9
1	A	208	ASP	5.9
1	C	182	TYR	5.9
1	A	218	SER	5.8
1	B	1	MET	5.6
1	B	212	GLU	5.6
1	C	226	ARG	5.6
1	C	187	ASN	5.4
1	A	212	GLU	5.3
1	B	211	GLY	5.3
1	C	207	LEU	5.2
1	C	214	SER	4.9
1	C	212	GLU	4.9
1	C	225	LEU	4.8
1	B	210	LEU	4.8
1	C	211	GLY	4.7
1	C	184	GLU	4.6
1	A	213	GLU	4.6
1	C	140	ALA	4.4
1	B	209	THR	4.4
1	B	213	GLU	4.2
1	C	188	SER	4.1
1	C	199	ALA	4.1
1	C	181	PHE	4.1
1	C	221	ILE	3.8
1	B	215	TYR	3.7
1	C	174	LEU	3.6
1	C	74	ARG	3.6
1	A	225	LEU	3.6
1	C	76	ASN	3.5
1	A	205	ALA	3.5
1	C	153	TYR	3.5
1	C	219	THR	3.5
1	C	215	TYR	3.4
1	C	213	GLU	3.3
1	A	230	THR	3.3
1	C	190	ASP	3.2
1	C	134	ALA	3.2
1	C	205	ALA	3.2
1	C	228	ASN	3.2
1	A	217	ASP	3.1
1	C	200	PHE	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	1	MET	3.1
1	C	180	VAL	3.0
1	C	227	ASP	3.0
1	C	73	SER	3.0
1	A	231	LEU	3.0
1	C	116	GLY	2.9
1	C	69	GLN	2.8
1	C	233	THR	2.7
1	A	166	PRO	2.7
1	A	203	ALA	2.7
1	C	183	TYR	2.7
1	C	175	ALA	2.7
1	A	232	TRP	2.7
1	B	3	ARG	2.6
1	C	229	LEU	2.6
1	A	227	ASP	2.5
1	C	176	LEU	2.5
1	A	229	LEU	2.5
1	C	136	PHE	2.4
1	C	158	ASP	2.4
1	C	179	SER	2.4
1	C	218	SER	2.4
1	C	67	ILE	2.4
1	A	167	THR	2.4
1	C	109	LEU	2.3
1	B	216	LYS	2.3
1	A	1	MET	2.2
1	B	219	THR	2.2
1	B	207	LEU	2.2
1	C	220	LEU	2.2
1	B	214	SER	2.2
1	A	204	ILE	2.1
1	B	208	ASP	2.1
1	A	3	ARG	2.1
1	C	80	VAL	2.1
1	A	226	ARG	2.1
1	A	219	THR	2.1
1	A	2	ALA	2.1
1	A	216	LYS	2.1

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 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.