Full wwPDB X-ray Structure Validation Report (i)

Feb 1, 2016 – 05:13 PM GMT

PDB ID	:	4HK0
Title	:	UCA Fab (unbound) from CH65-CH67 Lineage
Authors	:	Schmidt, A.G.; Harrison, S.C.
Deposited on	:	2012-10-14
Resolution	:	2.50 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
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

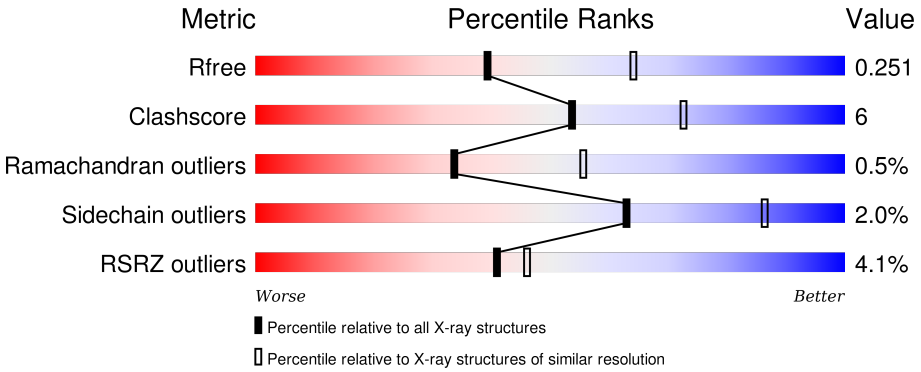
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 2.50 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}	91344	3553 (2.50-2.50)
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)
RSRZ outliers	91569	3562 (2.50-2.50)

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. 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	237	9%, 76%, 14%, 9%
1	C	237	4%, 79%, 14%, 6%
2	B	214	2%, 83%, 14%
2	D	214	82%, 15%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6548 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 UCA heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	215	Total	C	N	O	S	0	0	0
			1624	1029	273	313	9			
1	C	222	Total	C	N	O	S	0	0	0
			1684	1066	283	326	9			

- Molecule 2 is a protein called UCA light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	210	Total	C	N	O	S	0	0	0
			1567	976	267	320	4			
2	D	210	Total	C	N	O	S	0	0	0
			1567	976	267	320	4			

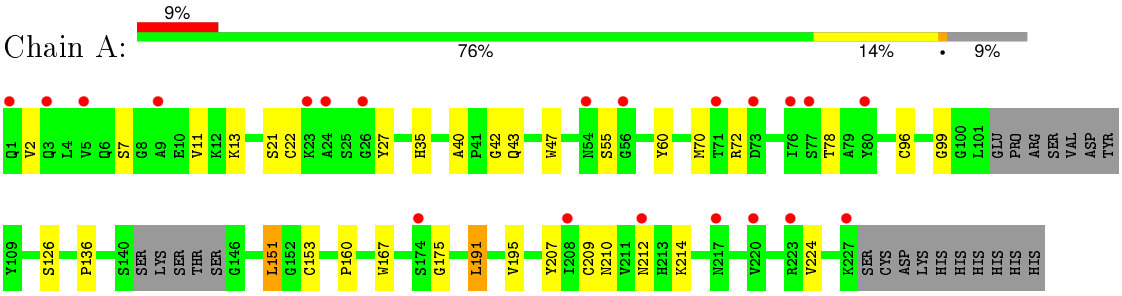
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	10	Total	O	0	0
			10	10		
3	B	27	Total	O	0	0
			27	27		
3	C	39	Total	O	0	0
			39	39		
3	D	30	Total	O	0	0
			30	30		

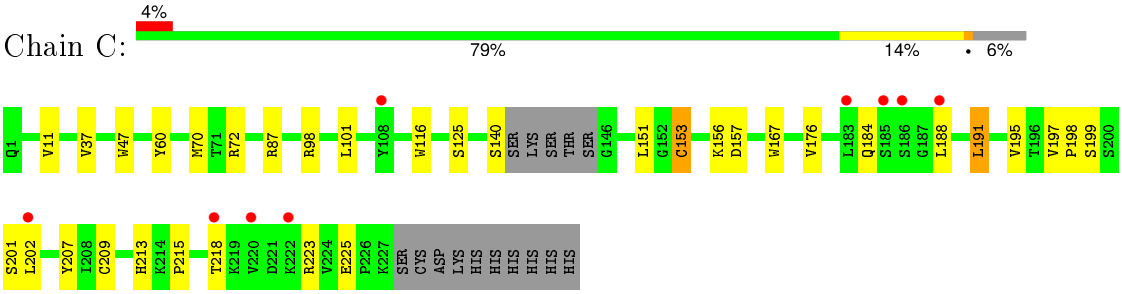
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

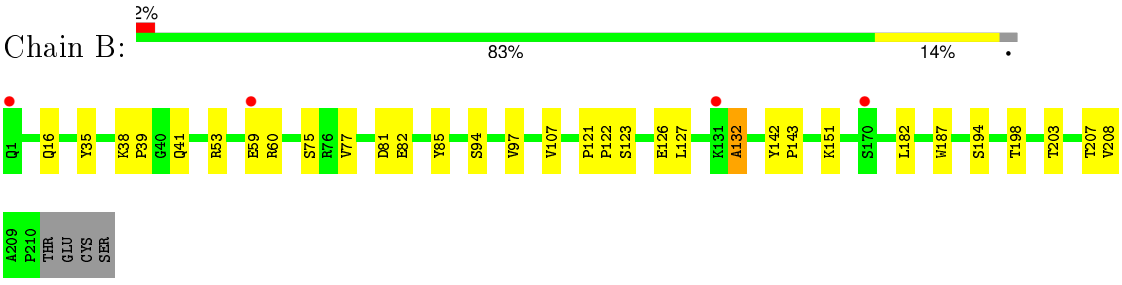
- Molecule 1: UCA heavy chain



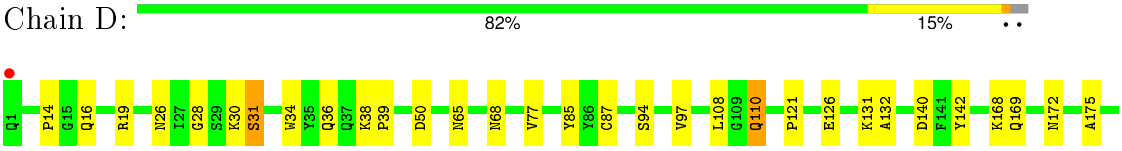
- Molecule 1: UCA heavy chain

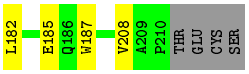


- Molecule 2: UCA light chain



- Molecule 2: UCA light chain




L182
E185
Q186
W187
V208
A209
P210
THR
GLU
CYS
SER

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 62	Depositor
Cell constants a, b, c, α, β, γ	102.00Å 102.00Å 163.09Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	37.20 – 2.50 48.68 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.5 (37.20-2.50) 97.4 (48.68-2.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.48 (at 2.51Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.3_928)	Depositor
R, R_{free}	0.206 , 0.258 0.201 , 0.251	Depositor DCC
R_{free} test set	1635 reflections (5.04%)	DCC
Wilson B-factor (Å^2)	35.0	Xtriage
Anisotropy	0.489	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 33.9	EDS
Estimated twinning fraction	0.049 for h,-h-k,-l	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Outliers	0 of 33168 reflections	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	6548	wwPDB-VP
Average B, all atoms (Å^2)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.19% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.57	1/1666 (0.1%)	0.72	1/2269 (0.0%)
1	C	0.68	0/1729	0.77	2/2357 (0.1%)
2	B	0.66	0/1606	0.77	0/2197
2	D	0.70	1/1606 (0.1%)	0.81	1/2197 (0.0%)
All	All	0.65	2/6607 (0.0%)	0.77	4/9020 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	185	GLU	CG-CD	5.68	1.60	1.51
1	A	96	CYS	CB-SG	-5.23	1.73	1.81

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	19	ARG	NE-CZ-NH2	-5.78	117.41	120.30
1	C	191	LEU	CA-CB-CG	5.71	128.44	115.30
1	A	191	LEU	CA-CB-CG	5.58	128.12	115.30
1	C	151	LEU	CA-CB-CG	5.50	127.96	115.30

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	1624	0	1577	19	1
1	C	1684	0	1633	21	0
2	B	1567	0	1511	23	0
2	D	1567	0	1511	21	0
3	A	10	0	0	0	0
3	B	27	0	0	0	0
3	C	39	0	0	2	0
3	D	30	0	0	0	1
All	All	6548	0	6232	81	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 6.

All (81) 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)
2:D:169:GLN:HE21	2:D:175:ALA:HB2	1.34	0.93
1:A:35:HIS:HD2	1:A:47:TRP:HE1	1.26	0.82
1:C:153:CYS:SG	1:C:209:CYS:CB	2.68	0.80
2:B:121:PRO:HB3	2:B:208:VAL:HG11	1.64	0.79
2:D:121:PRO:HB3	2:D:208:VAL:HG11	1.65	0.78
1:C:184:GLN:NE2	3:C:319:HOH:O	2.17	0.77
1:C:223:ARG:NH1	1:C:225:GLU:OE2	2.20	0.75
1:C:176:VAL:HG22	1:C:195:VAL:HG12	1.67	0.74
1:C:201:SER:HG	1:C:207:TYR:HH	1.28	0.74
2:B:53:ARG:CZ	2:B:59:GLU:HG2	2.24	0.68
1:A:35:HIS:CD2	1:A:47:TRP:HE1	2.12	0.67
2:D:187:TRP:HH2	2:D:208:VAL:HG12	1.60	0.67
2:D:140:ASP:H	2:D:169:GLN:HE22	1.42	0.65
2:D:168:LYS:NZ	2:D:172:ASN:OD1	2.17	0.65
2:D:16:GLN:O	2:D:77:VAL:HG23	1.96	0.65
2:D:110:GLN:HB2	2:D:142:TYR:CE1	2.32	0.64
2:B:121:PRO:HB3	2:B:208:VAL:CG1	2.29	0.62
1:A:7:SER:HB3	1:A:21:SER:OG	2.00	0.61
1:C:153:CYS:CB	1:C:209:CYS:SG	2.82	0.61
1:A:35:HIS:HE1	1:A:99:GLY:O	1.86	0.59
2:B:182:LEU:HD13	2:B:187:TRP:HB2	1.85	0.58
2:D:132:ALA:HB3	2:D:182:LEU:O	2.03	0.58
2:D:121:PRO:HB3	2:D:208:VAL:CG1	2.34	0.56
1:C:60:TYR:CE1	1:C:70:MET:HE2	2.40	0.56
1:A:11:VAL:HG11	1:A:160:PRO:HG3	1.88	0.55
1:A:136:PRO:HB3	1:A:224:VAL:HG22	1.90	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:110:GLN:HB2	2:D:142:TYR:CZ	2.42	0.54
2:D:26:ASN:H	2:D:68:ASN:ND2	2.06	0.54
1:C:156:LYS:NZ	3:C:319:HOH:O	2.40	0.54
2:B:123:SER:OG	2:B:126:GLU:HG3	2.06	0.54
1:C:47:TRP:CD1	2:D:97:VAL:HB	2.44	0.53
2:B:16:GLN:O	2:B:77:VAL:HG23	2.09	0.53
2:D:30:LYS:O	2:D:31:SER:HB3	2.09	0.53
1:A:212:ASN:HD21	1:A:214:LYS:HG3	1.74	0.53
2:D:140:ASP:H	2:D:169:GLN:NE2	2.06	0.52
1:C:176:VAL:HG22	1:C:195:VAL:CG1	2.39	0.52
2:B:53:ARG:NH2	2:B:59:GLU:HG2	2.24	0.52
1:A:167:TRP:CH2	1:A:209:CYS:HB3	2.47	0.50
1:A:40:ALA:HB3	1:A:43:GLN:HG3	1.92	0.50
2:B:182:LEU:CD1	2:B:187:TRP:HB2	2.42	0.50
1:C:37:VAL:O	1:C:37:VAL:HG23	2.11	0.49
2:D:14:PRO:HD3	2:D:108:LEU:O	2.13	0.49
2:D:34:TRP:CZ3	2:D:87:CYS:HB3	2.47	0.49
2:B:38:LYS:HB3	2:B:39:PRO:HD2	1.95	0.49
1:C:37:VAL:HG21	1:C:116:TRP:CZ3	2.48	0.48
1:A:60:TYR:CE1	1:A:70:MET:HE2	2.49	0.48
2:D:38:LYS:HB3	2:D:39:PRO:HD2	1.95	0.47
2:B:207:THR:HG22	2:B:208:VAL:N	2.30	0.46
1:C:198:PRO:O	1:C:201:SER:HB3	2.16	0.46
2:D:31:SER:HA	2:D:50:ASP:OD1	2.15	0.46
1:A:175:GLY:O	1:A:195:VAL:HA	2.16	0.46
2:B:127:LEU:HD23	2:B:132:ALA:HB2	1.99	0.45
1:A:22:CYS:O	1:A:78:THR:HA	2.17	0.45
1:A:47:TRP:CG	2:B:97:VAL:HB	2.52	0.44
2:B:151:LYS:HB2	2:B:194:SER:HB2	1.99	0.44
2:D:126:GLU:HG2	2:D:131:LYS:HB2	1.99	0.44
1:C:11:VAL:CG2	1:C:215:PRO:HB3	2.46	0.44
2:B:38:LYS:O	2:B:41:GLN:HG2	2.18	0.43
1:A:151:LEU:C	1:A:151:LEU:HD12	2.39	0.43
2:B:142:TYR:CG	2:B:143:PRO:HA	2.54	0.43
1:A:47:TRP:CD1	2:B:97:VAL:HB	2.53	0.43
1:A:13:LYS:NZ	1:A:126:SER:O	2.51	0.43
1:C:197:VAL:HG11	1:C:207:TYR:CE1	2.54	0.43
1:C:199:SER:O	1:C:202:LEU:HG	2.19	0.43
1:C:213:HIS:HB3	1:C:218:THR:OG1	2.19	0.42
1:C:167:TRP:CH2	1:C:209:CYS:HB3	2.53	0.42
2:B:122:PRO:HB3	2:B:132:ALA:HA	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:151:LEU:HD21	1:A:207:TYR:CG	2.55	0.42
2:D:28:GLY:HA2	2:D:65:ASN:OD1	2.20	0.41
2:D:36:GLN:HG3	2:D:85:TYR:CE2	2.54	0.41
2:B:198:THR:HG22	2:B:203:THR:HG23	2.01	0.41
2:B:60:ARG:HB3	2:B:75:SER:O	2.20	0.41
2:B:35:TYR:O	2:B:85:TYR:HA	2.19	0.41
1:C:11:VAL:HG23	1:C:215:PRO:HB3	2.02	0.41
2:B:60:ARG:NH1	2:B:81:ASP:OD2	2.42	0.41
2:B:121:PRO:CB	2:B:208:VAL:HG11	2.42	0.41
1:A:212:ASN:HD21	1:A:214:LYS:CG	2.34	0.40
1:A:2:VAL:HG13	1:A:27:TYR:CD1	2.57	0.40
1:C:87:ARG:HD3	1:C:87:ARG:HH11	1.75	0.40
2:B:82:GLU:HG3	2:B:107:VAL:HG23	2.04	0.40
1:C:157:ASP:HB3	1:C:188:LEU:HD13	2.04	0.40

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)
1:A:42:GLY:O	3:D:302:HOH:O[3_455]	2.13	0.07

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	209/237 (88%)	203 (97%)	6 (3%)	0	100	100
1	C	218/237 (92%)	211 (97%)	7 (3%)	0	100	100
2	B	208/214 (97%)	198 (95%)	8 (4%)	2 (1%)	19	34
2	D	208/214 (97%)	199 (96%)	7 (3%)	2 (1%)	19	34
All	All	843/902 (94%)	811 (96%)	28 (3%)	4 (0%)	34	55

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	132	ALA
2	D	31	SER
2	B	94	SER
2	D	94	SER

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	178/200 (89%)	172 (97%)	6 (3%)	44	72
1	C	185/200 (92%)	178 (96%)	7 (4%)	40	67
2	B	177/181 (98%)	177 (100%)	0	100	100
2	D	177/181 (98%)	176 (99%)	1 (1%)	90	97
All	All	717/762 (94%)	703 (98%)	14 (2%)	63	86

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	55	SER
1	A	72	ARG
1	A	151	LEU
1	A	153	CYS
1	A	191	LEU
1	A	210	ASN
1	C	72	ARG
1	C	98	ARG
1	C	101	LEU
1	C	125	SER
1	C	140	SER
1	C	153	CYS
1	C	191	LEU
2	D	110	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	35	HIS
1	A	177	HIS
1	A	212	ASN
2	B	16	GLN
2	B	169	GLN
1	C	177	HIS
1	C	184	GLN
2	D	68	ASN
2	D	169	GLN

5.3.3 RNA

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

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, 95^{th} 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	215/237 (90%)	0.60	21 (9%) 10 10	22, 52, 81, 123	0
1	C	222/237 (93%)	0.10	9 (4%) 41 46	16, 32, 64, 125	0
2	B	210/214 (98%)	0.07	4 (1%) 70 73	21, 40, 70, 134	0
2	D	210/214 (98%)	-0.04	1 (0%) 91 92	17, 32, 57, 91	0
All	All	857/902 (95%)	0.18	35 (4%) 41 46	16, 39, 73, 134	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	185	SER	4.2
1	A	73	ASP	4.0
1	A	227	LYS	3.8
1	A	24	ALA	3.6
1	C	218	THR	3.5
1	A	76	ILE	3.4
1	A	5	VAL	3.3
1	A	220	VAL	3.3
1	A	1	GLN	3.2
1	A	174	SER	3.0
2	D	1	GLN	2.9
1	A	217	ASN	2.8
1	C	220	VAL	2.7
1	A	56	GLY	2.6
1	C	108	TYR	2.6
1	A	3	GLN	2.6
1	A	54	ASN	2.5
2	B	1	GLN	2.5
1	A	9	ALA	2.4
1	A	77	SER	2.4
1	C	222	LYS	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	223	ARG	2.3
1	A	26	GLY	2.3
1	A	71	THR	2.3
2	B	170	SER	2.2
1	A	208	ILE	2.2
1	A	80	TYR	2.2
1	A	212	ASN	2.1
2	B	59	GLU	2.1
1	A	23	LYS	2.1
1	C	186	SER	2.1
1	C	188	LEU	2.0
1	C	202	LEU	2.0
1	C	183	LEU	2.0
2	B	131	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 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.