Full wwPDB X-ray Structure Validation Report (i)

Feb 1, 2016 – 02:01 PM GMT

PDB ID	:	3VU7
Title	:	Crystal structure of REV1-REV7-REV3 ternary complex
Authors	:	Kikuchi, S.; Hara, K.; Shimizu, T.; Sato, M.; Hashimoto, H.
Deposited on	:	2012-06-20
Resolution	:	2.80 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:

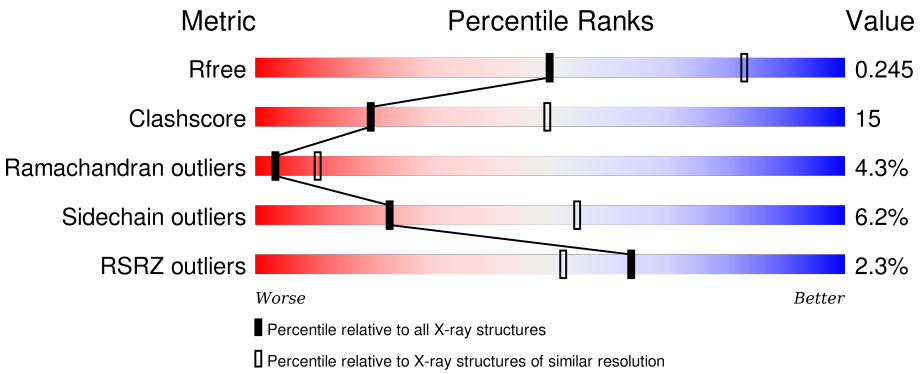
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	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 2.80 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	2393 (2.80-2.80)
Clashscore	102246	2827 (2.80-2.80)
Ramachandran outliers	100387	2782 (2.80-2.80)
Sidechain outliers	100360	2784 (2.80-2.80)
RSRZ outliers	91569	2404 (2.80-2.80)

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	H	124	2% 51% 17% 7% • 24%
2	C	227	% 57% 26% • 14%
3	Z	52	2% 21% 17% • 60%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 2516 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 DNA repair protein REV1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	H	94	766	493	119	149	5	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	1128	MET	-	EXPRESSION TAG	UNP Q9UBZ9
H	1129	ARG	-	EXPRESSION TAG	UNP Q9UBZ9
H	1130	GLY	-	EXPRESSION TAG	UNP Q9UBZ9
H	1131	SER	-	EXPRESSION TAG	UNP Q9UBZ9
H	1132	HIS	-	EXPRESSION TAG	UNP Q9UBZ9
H	1133	HIS	-	EXPRESSION TAG	UNP Q9UBZ9
H	1134	HIS	-	EXPRESSION TAG	UNP Q9UBZ9
H	1135	HIS	-	EXPRESSION TAG	UNP Q9UBZ9
H	1136	HIS	-	EXPRESSION TAG	UNP Q9UBZ9
H	1137	HIS	-	EXPRESSION TAG	UNP Q9UBZ9
H	1138	GLY	-	EXPRESSION TAG	UNP Q9UBZ9
H	1139	SER	-	EXPRESSION TAG	UNP Q9UBZ9

- Molecule 2 is a protein called Mitotic spindle assembly checkpoint protein MAD2B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	196	1588	1025	267	286	10	0	0	0

There are 17 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-15	MET	-	EXPRESSION TAG	UNP Q9UI95
C	-14	GLY	-	EXPRESSION TAG	UNP Q9UI95
C	-13	SER	-	EXPRESSION TAG	UNP Q9UI95
C	-12	SER	-	EXPRESSION TAG	UNP Q9UI95

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-11	HIS	-	EXPRESSION TAG	UNP Q9UI95
C	-10	HIS	-	EXPRESSION TAG	UNP Q9UI95
C	-9	HIS	-	EXPRESSION TAG	UNP Q9UI95
C	-8	HIS	-	EXPRESSION TAG	UNP Q9UI95
C	-7	HIS	-	EXPRESSION TAG	UNP Q9UI95
C	-6	HIS	-	EXPRESSION TAG	UNP Q9UI95
C	-5	SER	-	EXPRESSION TAG	UNP Q9UI95
C	-4	GLN	-	EXPRESSION TAG	UNP Q9UI95
C	-3	ASP	-	EXPRESSION TAG	UNP Q9UI95
C	-2	PRO	-	EXPRESSION TAG	UNP Q9UI95
C	-1	ASN	-	EXPRESSION TAG	UNP Q9UI95
C	0	SER	-	EXPRESSION TAG	UNP Q9UI95
C	124	ALA	ARG	ENGINEERED MUTATION	UNP Q9UI95

- Molecule 3 is a protein called DNA polymerase zeta catalytic subunit.

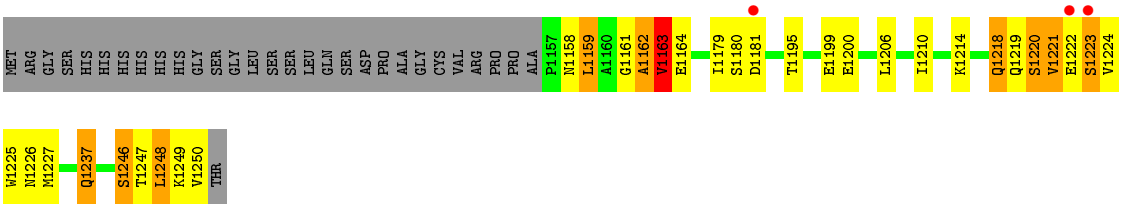
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	Z	21	162	101	29	30	2	0	0	0

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.

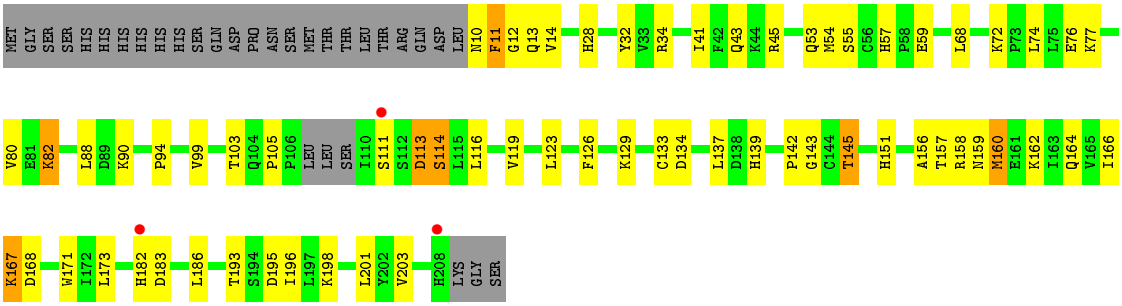
- Molecule 1: DNA repair protein REV1

Chain H:



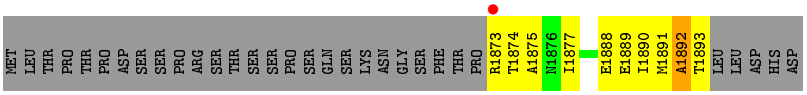
- Molecule 2: Mitotic spindle assembly checkpoint protein MAD2B

Chain C:



- Molecule 3: DNA polymerase zeta catalytic subunit

Chain Z:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	75.07Å 75.07Å 123.31Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	65.01 – 2.80 19.65 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.3 (65.01-2.80) 99.7 (19.65-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.88 (at 2.79Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.189 , 0.239 0.188 , 0.245	Depositor DCC
R_{free} test set	493 reflections (5.03%)	DCC
Wilson B-factor (Å^2)	90.5	Xtriage
Anisotropy	0.057	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 64.9	EDS
Estimated twinning fraction	0.030 for -h,-k,l	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Outliers	0 of 10288 reflections	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	2516	wwPDB-VP
Average B, all atoms (Å^2)	94.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.49% 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 (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	H	0.74	0/777	0.91	2/1052 (0.2%)
2	C	0.79	1/1623 (0.1%)	0.84	2/2206 (0.1%)
3	Z	0.56	0/164	0.84	0/221
All	All	0.76	1/2564 (0.0%)	0.86	4/3479 (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	H	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	171	TRP	CD2-CE2	6.69	1.49	1.41

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	H	1163	VAL	N-CA-C	6.15	127.59	111.00
1	H	1161	GLY	N-CA-C	-5.54	99.24	113.10
2	C	183	ASP	CB-CG-OD1	-5.13	113.68	118.30
2	C	68	LEU	CA-CB-CG	-5.07	103.64	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	H	1162	ALA	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	H	766	0	778	27	0
2	C	1588	0	1616	45	0
3	Z	162	0	173	8	0
All	All	2516	0	2567	76	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 15.

All (76) 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:H:1248:LEU:HD23	1:H:1249:LYS:H	1.10	1.08
1:H:1248:LEU:HD23	1:H:1249:LYS:N	1.78	0.99
2:C:90:LYS:CE	2:C:143:GLY:HA3	1.94	0.97
2:C:90:LYS:HE3	2:C:143:GLY:HA3	1.51	0.92
1:H:1248:LEU:CD2	1:H:1249:LYS:H	1.83	0.89
1:H:1163:VAL:HG13	1:H:1164:GLU:H	1.40	0.86
2:C:173:LEU:HD22	3:Z:1875:ALA:HB1	1.58	0.84
2:C:28:HIS:HD2	2:C:55:SER:H	1.22	0.84
1:H:1179:ILE:HG22	1:H:1181:ASP:H	1.43	0.81
2:C:166:ILE:HG22	2:C:167:LYS:O	1.84	0.78
2:C:90:LYS:HE2	2:C:143:GLY:HA3	1.67	0.76
2:C:28:HIS:CD2	2:C:55:SER:H	2.06	0.73
3:Z:1891:MET:C	3:Z:1893:THR:H	1.92	0.72
1:H:1237:GLN:CG	1:H:1247:THR:HG23	2.20	0.72
2:C:45:ARG:HG3	2:C:54:MET:HG3	1.72	0.72
2:C:167:LYS:H	2:C:167:LYS:HE2	1.53	0.71
1:H:1159:LEU:HA	1:H:1163:VAL:H	1.55	0.69
1:H:1219:GLN:O	1:H:1220:SER:HB2	1.92	0.69
1:H:1223:SER:HA	1:H:1226:ASN:HD22	1.58	0.68
1:H:1249:LYS:HG3	1:H:1250:VAL:H	1.59	0.67
1:H:1219:GLN:O	1:H:1220:SER:CB	2.42	0.67
2:C:90:LYS:HE3	2:C:143:GLY:CA	2.28	0.61
1:H:1237:GLN:HG3	1:H:1247:THR:HG23	1.84	0.60
2:C:119:VAL:HG21	2:C:196:ILE:HD11	1.81	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:41:ILE:HG21	3:Z:1890:ILE:CG2	2.31	0.60
2:C:77:LYS:HG3	2:C:162:LYS:HE3	1.83	0.59
2:C:167:LYS:O	2:C:168:ASP:HB2	2.02	0.59
1:H:1163:VAL:HG13	1:H:1164:GLU:N	2.15	0.59
2:C:113:ASP:OD1	2:C:114:SER:N	2.35	0.59
1:H:1249:LYS:O	1:H:1250:VAL:HG22	2.03	0.58
2:C:41:ILE:HG21	3:Z:1890:ILE:HG23	1.85	0.58
1:H:1159:LEU:HB2	1:H:1162:ALA:HA	1.87	0.56
2:C:88:LEU:HB2	2:C:145:THR:HG23	1.89	0.54
2:C:103:THR:HB	2:C:198:LYS:HB2	1.91	0.53
1:H:1221:VAL:HB	1:H:1225:TRP:HD1	1.72	0.53
3:Z:1891:MET:C	3:Z:1893:THR:N	2.62	0.52
1:H:1246:SER:HB2	2:C:186:LEU:HD12	1.91	0.52
2:C:88:LEU:HD23	2:C:94:PRO:HA	1.93	0.51
2:C:105:PRO:HG2	2:C:195:ASP:O	2.11	0.50
1:H:1249:LYS:HG3	1:H:1250:VAL:N	2.25	0.50
2:C:90:LYS:HG2	2:C:143:GLY:O	2.12	0.49
1:H:1158:ASN:HD21	1:H:1200:GLU:HG3	1.77	0.49
2:C:167:LYS:HE2	2:C:167:LYS:N	2.26	0.49
3:Z:1889:GLU:O	3:Z:1892:ALA:HB3	2.13	0.49
1:H:1221:VAL:HB	1:H:1225:TRP:CD1	2.49	0.47
2:C:156:ALA:O	2:C:159:ASN:HB2	2.15	0.47
2:C:123:LEU:O	2:C:126:PHE:HB2	2.16	0.46
1:H:1214:LYS:HG2	1:H:1218:GLN:HG3	1.96	0.46
2:C:32:TYR:CE2	2:C:53:GLN:HG3	2.51	0.46
2:C:116:LEU:HD23	2:C:116:LEU:HA	1.81	0.45
2:C:82:LYS:HG3	2:C:151:HIS:HB2	1.98	0.45
2:C:90:LYS:HE3	2:C:142:PRO:O	2.17	0.44
1:H:1180:SER:HA	1:H:1225:TRP:HE1	1.81	0.44
2:C:99:VAL:O	2:C:201:LEU:HA	2.18	0.44
1:H:1159:LEU:CB	1:H:1162:ALA:HA	2.47	0.44
2:C:166:ILE:CG2	2:C:167:LYS:O	2.62	0.44
2:C:160:MET:O	2:C:164:GLN:HG2	2.18	0.43
1:H:1195:THR:O	1:H:1199:GLU:HG3	2.19	0.43
2:C:34:ARG:HD2	2:C:34:ARG:HA	1.72	0.43
1:H:1206:LEU:O	1:H:1210:ILE:HG12	2.18	0.43
1:H:1220:SER:O	1:H:1221:VAL:HG23	2.19	0.43
2:C:74:LEU:HB3	2:C:80:VAL:HG23	1.99	0.43
2:C:158:ARG:H	2:C:158:ARG:HG2	1.69	0.43
2:C:137:LEU:HD21	2:C:203:VAL:HG11	2.00	0.42
1:H:1224:VAL:HA	1:H:1227:MET:CE	2.49	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:10:ASN:O	2:C:12:GLY:N	2.53	0.42
3:Z:1891:MET:O	3:Z:1893:THR:N	2.50	0.42
2:C:57:HIS:CE1	2:C:59:GLU:HB2	2.55	0.42
2:C:28:HIS:CD2	2:C:55:SER:N	2.82	0.41
2:C:167:LYS:O	2:C:168:ASP:CB	2.65	0.41
2:C:57:HIS:HE1	2:C:59:GLU:HB2	1.85	0.41
2:C:32:TYR:CD2	2:C:53:GLN:HG3	2.56	0.41
3:Z:1888:GLU:N	3:Z:1888:GLU:CD	2.74	0.41
2:C:72:LYS:HE3	2:C:76:GLU:OE1	2.21	0.41
2:C:10:ASN:C	2:C:12:GLY:H	2.25	0.40
2:C:129:LYS:O	2:C:133:CYS:HB3	2.21	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	H	92/124 (74%)	75 (82%)	10 (11%)	7 (8%)	1 2
2	C	192/227 (85%)	180 (94%)	8 (4%)	4 (2%)	9 29
3	Z	19/52 (36%)	16 (84%)	1 (5%)	2 (10%)	1 1
All	All	303/403 (75%)	271 (89%)	19 (6%)	13 (4%)	3 10

All (13) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	H	1159	LEU
1	H	1220	SER
2	C	11	PHE
2	C	113	ASP
1	H	1163	VAL
1	H	1223	SER

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Mol	Chain	Res	Type
1	H	1248	LEU
2	C	111	SER
2	C	114	SER
3	Z	1892	ALA
1	H	1222	GLU
3	Z	1874	THR
1	H	1221	VAL

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	H	89/113 (79%)	86 (97%)	3 (3%)	44	78
2	C	184/213 (86%)	171 (93%)	13 (7%)	18	46
3	Z	19/49 (39%)	17 (90%)	2 (10%)	8	24
All	All	292/375 (78%)	274 (94%)	18 (6%)	23	54

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	1218	GLN
1	H	1237	GLN
1	H	1246	SER
2	C	11	PHE
2	C	13	GLN
2	C	14	VAL
2	C	43	GLN
2	C	82	LYS
2	C	134	ASP
2	C	139	HIS
2	C	145	THR
2	C	157	THR
2	C	160	MET
2	C	167	LYS
2	C	182	HIS

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Mol	Chain	Res	Type
2	C	193	THR
3	Z	1873	ARG
3	Z	1877	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	1158	ASN
1	H	1226	ASN
2	C	28	HIS
2	C	139	HIS

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 carbohydrates 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	H	94/124 (75%)	-0.24	3 (3%)	51	39	64, 96, 146, 168	0
2	C	196/227 (86%)	-0.35	3 (1%)	76	68	60, 83, 120, 144	0
3	Z	21/52 (40%)	0.16	1 (4%)	34	23	85, 118, 190, 202	0
All	All	311/403 (77%)	-0.28	7 (2%)	64	52	60, 88, 140, 202	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	208	HIS	2.8
2	C	111	SER	2.7
1	H	1181	ASP	2.6
3	Z	1873	ARG	2.5
1	H	1222	GLU	2.1
2	C	182	HIS	2.1
1	H	1223	SER	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 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.