Full wwPDB X-ray Structure Validation Report ⓘ

May 21, 2020 – 06:03 am BST

PDB ID	:	5MZU
Title	:	Crystal structure of the myosin chaperone UNC-45 from C. elegans (alternative conformation)
Authors	:	Hellerschmied, D.; Gazda, L.; Clausen, T.
Deposited on	:	2017-02-01
Resolution	:	3.80 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
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 ①) were used in the production of this report:

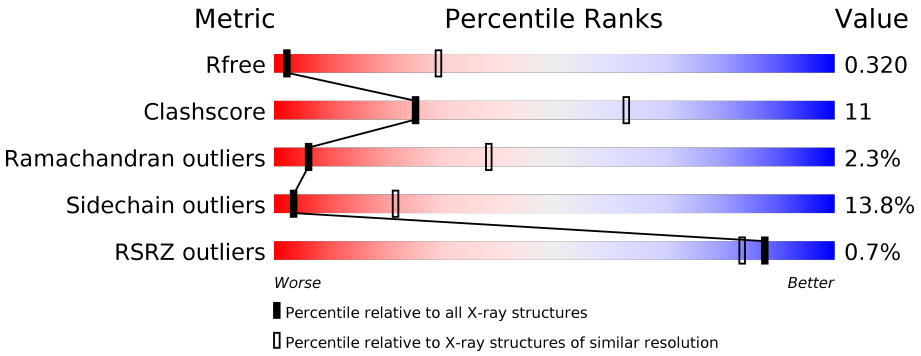
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 3.80 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}	130704	1212 (4.00-3.60)
Clashscore	141614	1288 (4.00-3.60)
Ramachandran outliers	138981	1243 (4.00-3.60)
Sidechain outliers	138945	1237 (4.00-3.60)
RSRZ outliers	127900	1121 (4.00-3.60)

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 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	961	% 65% 22% • 10%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 5991 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 UNC-45.

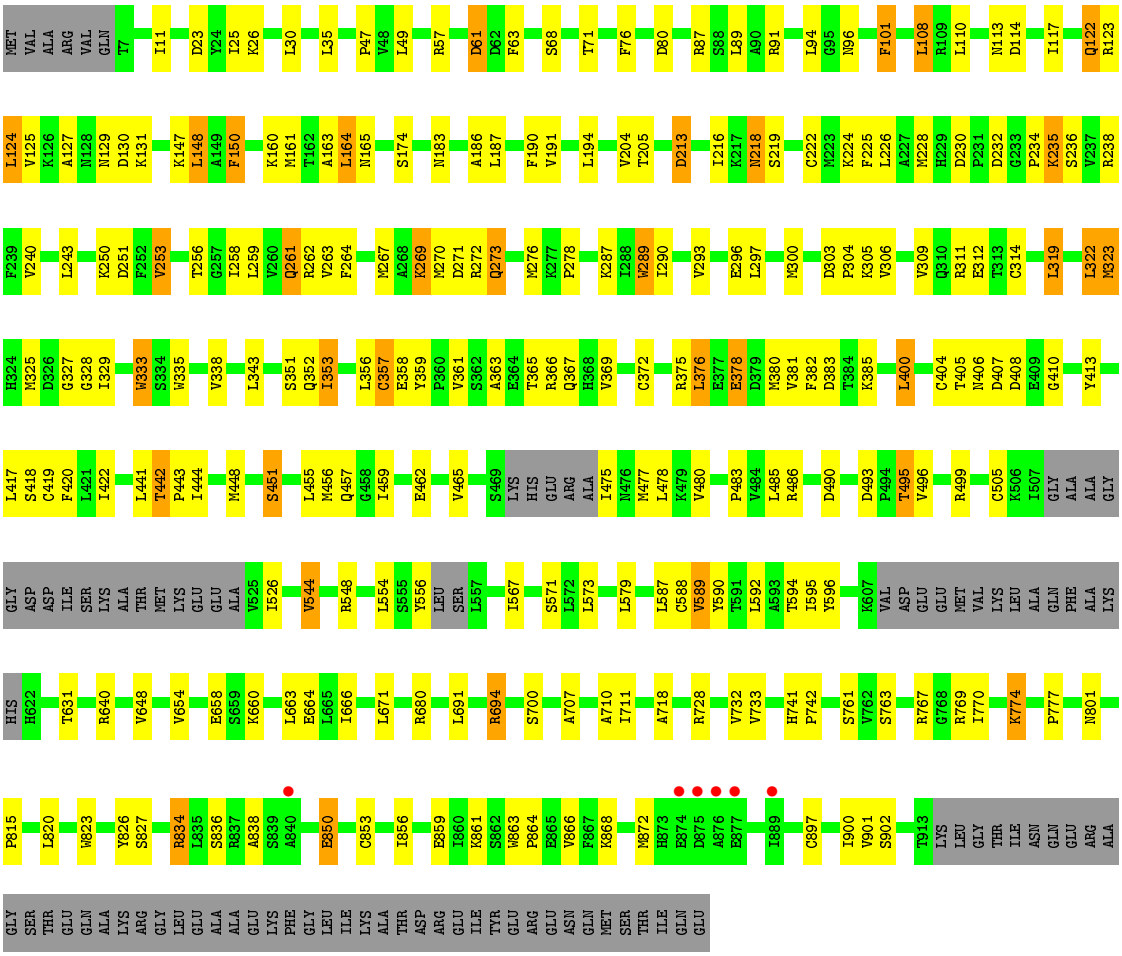
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	869	5991	3740	1058	1155	17	21	0	0	0

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 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: UNC-45

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α, β, γ	86.15Å 86.15Å 716.47Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.40 – 3.80 29.40 – 3.80	Depositor EDS
% Data completeness (in resolution range)	90.2 (29.40-3.80) 90.2 (29.40-3.80)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	4.44 (at 3.75Å)	Xtriage
Refinement program	PHENIX dev_2645	Depositor
R, R_{free}	0.298 , 0.319 0.298 , 0.320	Depositor DCC
R_{free} test set	732 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å^2)	160.7	Xtriage
Anisotropy	0.077	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.22 , 126.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.42$, $< L^2 > = 0.25$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	5991	wwPDB-VP
Average B, all atoms (Å^2)	183.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.41% 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

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	0.33	0/6049	0.51	0/8218

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

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	5991	0	5324	121	0
All	All	5991	0	5324	121	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 11.

All (121) 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:319:LEU:HB3	1:A:372:CYS:HB3	1.62	0.81
1:A:270:MSE:SE	1:A:328:GLY:HA2	2.37	0.74
1:A:475:ILE:HA	1:A:478:LEU:HD12	1.69	0.74
1:A:267:MSE:SE	1:A:289:TRP:HB3	2.40	0.72
1:A:127:ALA:O	1:A:131:LYS:HB2	1.91	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:660:LYS:HA	1:A:663:LEU:HD12	1.78	0.66
1:A:505:CYS:HB3	1:A:556:TYR:HB2	1.79	0.65
1:A:589:VAL:HG23	1:A:590:TYR:H	1.62	0.65
1:A:164:LEU:HD21	1:A:204:VAL:HG13	1.78	0.65
1:A:226:LEU:O	1:A:236:SER:OG	2.09	0.65
1:A:329:ILE:HG12	1:A:333:TRP:CD1	2.33	0.64
1:A:94:LEU:HD23	1:A:96:ASN:HB2	1.80	0.64
1:A:338:VAL:HA	1:A:343:LEU:HB2	1.80	0.63
1:A:827:SER:HA	1:A:836:SER:HA	1.79	0.63
1:A:269:LYS:O	1:A:278:PRO:HA	1.99	0.62
1:A:495:THR:O	1:A:499:ARG:HB2	2.01	0.61
1:A:289:TRP:O	1:A:293:VAL:HG13	2.00	0.61
1:A:108:LEU:HD23	1:A:117:ILE:HB	1.83	0.61
1:A:448:MSE:HB3	1:A:456:MSE:HB3	1.83	0.61
1:A:691:LEU:HA	1:A:694:ARG:HB3	1.83	0.60
1:A:271:ASP:HA	1:A:276:MSE:HG3	1.84	0.59
1:A:592:LEU:HD12	1:A:596:TYR:CE2	2.36	0.59
1:A:365:THR:O	1:A:369:VAL:HG22	2.03	0.59
1:A:567:ILE:HG23	1:A:573:LEU:HD13	1.84	0.58
1:A:451:SER:O	1:A:457:GLN:NE2	2.37	0.56
1:A:148:LEU:HD23	1:A:163:ALA:HB2	1.86	0.56
1:A:868:LYS:O	1:A:872:MSE:HG2	2.06	0.56
1:A:442:THR:HG23	1:A:443:PRO:HD3	1.87	0.56
1:A:87:ARG:HE	1:A:91:ARG:CZ	2.19	0.56
1:A:125:VAL:O	1:A:129:ASN:HB2	2.06	0.56
1:A:270:MSE:HG2	1:A:278:PRO:HG3	1.89	0.55
1:A:213:ASP:HB3	1:A:259:LEU:HD23	1.89	0.55
1:A:183:ASN:HB3	1:A:186:ALA:HB3	1.88	0.54
1:A:338:VAL:HG12	1:A:343:LEU:HD13	1.89	0.54
1:A:353:ILE:HD12	1:A:356:LEU:H	1.71	0.54
1:A:271:ASP:O	1:A:273:GLN:N	2.38	0.54
1:A:234:PRO:HD2	1:A:235:LYS:HE3	1.89	0.54
1:A:353:ILE:HG12	1:A:419:CYS:SG	2.48	0.54
1:A:707:ALA:O	1:A:711:ILE:HG13	2.08	0.54
1:A:448:MSE:HE2	1:A:456:MSE:HG2	1.89	0.53
1:A:269:LYS:HG2	1:A:276:MSE:HE1	1.89	0.53
1:A:287:LYS:HA	1:A:290:ILE:HD12	1.90	0.53
1:A:462:GLU:HA	1:A:465:VAL:HG22	1.91	0.53
1:A:23:ASP:OD2	1:A:25:ILE:HG23	2.09	0.52
1:A:335:TRP:HE1	1:A:385:LYS:CB	2.22	0.52
1:A:863:TRP:CD1	1:A:864:PRO:HD3	2.45	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:222:CYS:O	1:A:225:PHE:HB3	2.10	0.51
1:A:253:VAL:HA	1:A:256:THR:HG22	1.93	0.51
1:A:269:LYS:HZ2	1:A:276:MSE:HE1	1.76	0.50
1:A:589:VAL:HG12	1:A:654:VAL:O	2.11	0.50
1:A:352:GLN:HB3	1:A:357:CYS:HA	1.91	0.50
1:A:261:GLN:HA	1:A:264:PHE:HD2	1.75	0.50
1:A:323:MSE:HE2	1:A:376:LEU:HA	1.92	0.50
1:A:480:VAL:O	1:A:483:PRO:HD2	2.11	0.50
1:A:733:VAL:HG21	1:A:769:ARG:HG2	1.94	0.49
1:A:404:CYS:HA	1:A:413:TYR:HB3	1.94	0.49
1:A:262:ARG:HH11	1:A:262:ARG:HG2	1.78	0.49
1:A:728:ARG:O	1:A:732:VAL:HG23	2.13	0.49
1:A:101:PHE:HA	1:A:124:LEU:HD23	1.95	0.49
1:A:658:GLU:CD	1:A:658:GLU:H	2.16	0.49
1:A:767:ARG:HA	1:A:770:ILE:HD12	1.95	0.48
1:A:406:ASN:HD21	1:A:444:ILE:HD12	1.79	0.48
1:A:250:LYS:HG3	1:A:251:ASP:H	1.79	0.48
1:A:68:SER:HA	1:A:71:THR:HG22	1.95	0.48
1:A:834:ARG:CZ	1:A:838:ALA:HB2	2.44	0.48
1:A:322:LEU:HA	1:A:329:ILE:HG22	1.96	0.47
1:A:774:LYS:HE2	1:A:777:PRO:HD3	1.95	0.47
1:A:261:GLN:HA	1:A:264:PHE:CD2	2.50	0.47
1:A:303:ASP:HB3	1:A:306:VAL:HG23	1.95	0.47
1:A:380:MSE:HE3	1:A:385:LYS:O	2.14	0.47
1:A:900:ILE:O	1:A:902:SER:N	2.47	0.47
1:A:160:LYS:O	1:A:164:LEU:HG	2.15	0.47
1:A:441:LEU:HD12	1:A:477:MSE:HE2	1.97	0.47
1:A:418:SER:O	1:A:422:ILE:HG13	2.15	0.47
1:A:47:PRO:HB3	1:A:76:PHE:CD1	2.50	0.47
1:A:863:TRP:N	1:A:864:PRO:HD2	2.29	0.47
1:A:87:ARG:HH21	1:A:91:ARG:HH22	1.62	0.47
1:A:187:LEU:O	1:A:191:VAL:HG23	2.15	0.46
1:A:230:ASP:CG	1:A:235:LYS:HG3	2.35	0.46
1:A:406:ASN:N	1:A:406:ASN:OD1	2.47	0.46
1:A:404:CYS:HA	1:A:413:TYR:CB	2.45	0.46
1:A:240:VAL:HA	1:A:243:LEU:HD12	1.98	0.46
1:A:304:PRO:HA	1:A:359:TYR:HB3	1.98	0.46
1:A:26:LYS:O	1:A:30:LEU:HD23	2.16	0.46
1:A:25:ILE:HG13	1:A:26:LYS:HG3	1.98	0.46
1:A:400:LEU:HB3	1:A:417:LEU:HD13	1.98	0.46
1:A:122:GLN:HG3	1:A:123:ARG:N	2.31	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:269:LYS:NZ	1:A:276:MSE:HE1	2.31	0.45
1:A:278:PRO:HG2	1:A:328:GLY:O	2.16	0.45
1:A:359:TYR:O	1:A:361:VAL:HG23	2.16	0.45
1:A:405:THR:O	1:A:407:ASP:N	2.47	0.45
1:A:850:GLU:HG3	1:A:850:GLU:H	1.60	0.45
1:A:375:ARG:HA	1:A:378:GLU:HB2	1.97	0.45
1:A:224:LYS:HG2	1:A:228:MSE:HE3	2.00	0.44
1:A:853:CYS:O	1:A:856:ILE:HG12	2.17	0.44
1:A:664:GLU:HB2	1:A:700:SER:OG	2.17	0.44
1:A:297:LEU:HA	1:A:300:MSE:HG2	2.00	0.43
1:A:588:CYS:HB3	1:A:592:LEU:HD23	2.01	0.43
1:A:194:LEU:HA	1:A:194:LEU:HD23	1.73	0.43
1:A:418:SER:OG	1:A:459:ILE:HD13	2.19	0.43
1:A:150:PHE:HD2	1:A:190:PHE:HD1	1.66	0.42
1:A:382:PHE:HB3	1:A:383:ASP:H	1.68	0.42
1:A:309:VAL:O	1:A:312:GLU:HG2	2.19	0.42
1:A:216:ILE:HB	1:A:222:CYS:HB2	2.01	0.42
1:A:11:ILE:HD12	1:A:11:ILE:HA	1.86	0.42
1:A:218:ASN:OD1	1:A:219:SER:N	2.51	0.42
1:A:213:ASP:HA	1:A:216:ILE:HG12	2.02	0.42
1:A:311:ARG:O	1:A:314:CYS:HB3	2.20	0.42
1:A:671:LEU:HB3	1:A:710:ALA:HB2	2.01	0.42
1:A:408:ASP:C	1:A:410:GLY:H	2.24	0.42
1:A:363:ALA:O	1:A:587:LEU:HD11	2.21	0.41
1:A:863:TRP:HA	1:A:866:VAL:HG22	2.02	0.41
1:A:400:LEU:HD13	1:A:417:LEU:HB2	2.02	0.41
1:A:262:ARG:HA	1:A:262:ARG:HD3	1.90	0.41
1:A:226:LEU:HD21	1:A:263:VAL:HG11	2.02	0.41
1:A:23:ASP:HB3	1:A:25:ILE:HG12	2.03	0.41
1:A:232:ASP:O	1:A:235:LYS:HG2	2.21	0.40
1:A:663:LEU:HA	1:A:666:ILE:HG22	2.03	0.40
1:A:238:ARG:HG2	1:A:296:GLU:CD	2.42	0.40
1:A:592:LEU:HA	1:A:595:ILE:HB	2.03	0.40
1:A:161:MET:HA	1:A:164:LEU:HD11	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	861/961 (90%)	773 (90%)	68 (8%)	20 (2%)	6 38

All (20) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	544	VAL
1	A	61	ASP
1	A	218	ASN
1	A	718	ALA
1	A	742	PRO
1	A	901	VAL
1	A	114	ASP
1	A	269	LYS
1	A	358	GLU
1	A	763	SER
1	A	801	ASN
1	A	273	GLN
1	A	631	THR
1	A	774	LYS
1	A	366	ARG
1	A	589	VAL
1	A	815	PRO
1	A	526	ILE
1	A	381	VAL
1	A	327	GLY

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	513/791 (65%)	442 (86%)	71 (14%)	3 22

All (71) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	35	LEU
1	A	49	LEU
1	A	57	ARG
1	A	61	ASP
1	A	63	PHE
1	A	80	ASP
1	A	89	LEU
1	A	101	PHE
1	A	108	LEU
1	A	110	LEU
1	A	113	ASN
1	A	122	GLN
1	A	124	LEU
1	A	130	ASP
1	A	147	LYS
1	A	148	LEU
1	A	150	PHE
1	A	164	LEU
1	A	165	ASN
1	A	174	SER
1	A	205	THR
1	A	213	ASP
1	A	235	LYS
1	A	253	VAL
1	A	258	ILE
1	A	261	GLN
1	A	272	ARG
1	A	289	TRP
1	A	305	LYS
1	A	319	LEU
1	A	322	LEU
1	A	323	MSE
1	A	325	MSE
1	A	333	TRP
1	A	351	SER
1	A	353	ILE

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Mol	Chain	Res	Type
1	A	357	CYS
1	A	367	GLN
1	A	376	LEU
1	A	378	GLU
1	A	400	LEU
1	A	420	PHE
1	A	442	THR
1	A	451	SER
1	A	455	LEU
1	A	485	LEU
1	A	486	ARG
1	A	490	ASP
1	A	493	ASP
1	A	495	THR
1	A	496	VAL
1	A	544	VAL
1	A	548	ARG
1	A	554	LEU
1	A	571	SER
1	A	579	LEU
1	A	594	THR
1	A	640	ARG
1	A	648	VAL
1	A	680	ARG
1	A	694	ARG
1	A	741	HIS
1	A	761	SER
1	A	820	LEU
1	A	823	TRP
1	A	826	TYR
1	A	834	ARG
1	A	850	GLU
1	A	859	GLU
1	A	861	LYS
1	A	897	CYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	368	HIS

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	848/961 (88%)	-0.66	6 (0%) 87 83	112, 175, 268, 333	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	875	ASP	7.3
1	A	876	ALA	6.2
1	A	874	GLU	3.9
1	A	877	GLU	3.5
1	A	840	ALA	2.5
1	A	889	ILE	2.2

6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

There are no carbohydrates in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.