Full wwPDB X-ray Structure Validation Report ⓘ

Apr 4, 2026 – 10:39 PM UTC

PDB ID	:	22UY / pdb_000022uy
Title	:	S-adenosyl-L-methionine hydrolase(MJ1651) mutant-R89A
Authors	:	XiuJuan, L.; Sheng, L.
Deposited on	:	2026-01-24
Resolution	:	2.75 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:

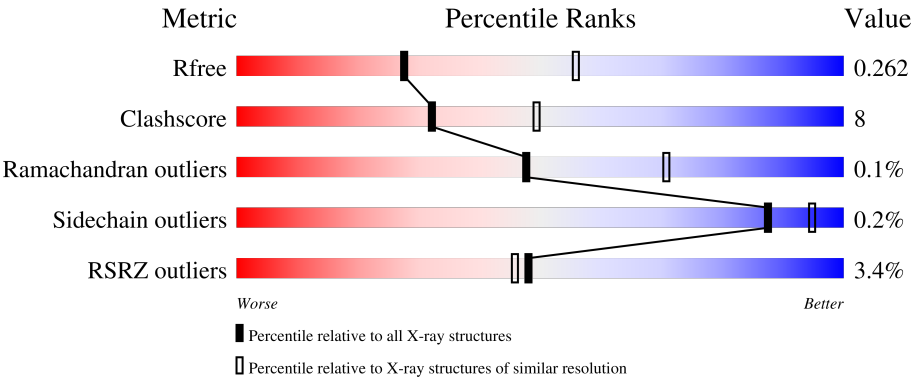
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

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 2.75 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}	180053	1009 (2.76-2.76)
Clashscore	190562	1044 (2.76-2.76)
Ramachandran outliers	187476	1024 (2.76-2.76)
Sidechain outliers	187428	1024 (2.76-2.76)
RSRZ outliers	180081	1009 (2.76-2.76)

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	271	2% 74% 15% 10%
1	B	271	2% 75% 15% 10%
1	C	271	5% 59% 24% 17%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 5773 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 (R)-S-adenosyl-L-methionine hydrolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	243	Total	C	N	O	S	0	0	0
			1957	1272	314	365	6			
1	B	245	Total	C	N	O	S	0	0	0
			1991	1297	318	370	6			
1	C	225	Total	C	N	O	S	0	0	0
			1810	1180	296	328	6			

There are 27 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	89	GLN	ARG	engineered mutation	UNP Q59045
A	264	LEU	-	expression tag	UNP Q59045
A	265	GLU	-	expression tag	UNP Q59045
A	266	HIS	-	expression tag	UNP Q59045
A	267	HIS	-	expression tag	UNP Q59045
A	268	HIS	-	expression tag	UNP Q59045
A	269	HIS	-	expression tag	UNP Q59045
A	270	HIS	-	expression tag	UNP Q59045
A	271	HIS	-	expression tag	UNP Q59045
B	89	GLN	ARG	engineered mutation	UNP Q59045
B	264	LEU	-	expression tag	UNP Q59045
B	265	GLU	-	expression tag	UNP Q59045
B	266	HIS	-	expression tag	UNP Q59045
B	267	HIS	-	expression tag	UNP Q59045
B	268	HIS	-	expression tag	UNP Q59045
B	269	HIS	-	expression tag	UNP Q59045
B	270	HIS	-	expression tag	UNP Q59045
B	271	HIS	-	expression tag	UNP Q59045
C	89	GLN	ARG	engineered mutation	UNP Q59045
C	264	LEU	-	expression tag	UNP Q59045
C	265	GLU	-	expression tag	UNP Q59045
C	266	HIS	-	expression tag	UNP Q59045
C	267	HIS	-	expression tag	UNP Q59045

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	268	HIS	-	expression tag	UNP Q59045
C	269	HIS	-	expression tag	UNP Q59045
C	270	HIS	-	expression tag	UNP Q59045
C	271	HIS	-	expression tag	UNP Q59045

- Molecule 2 is water.

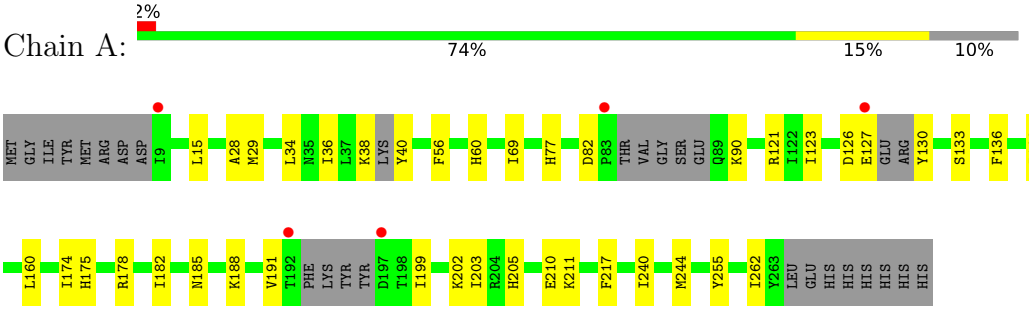
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	8	Total O 8 8	0	0
2	B	4	Total O 4 4	0	0
2	C	3	Total O 3 3	0	0

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.

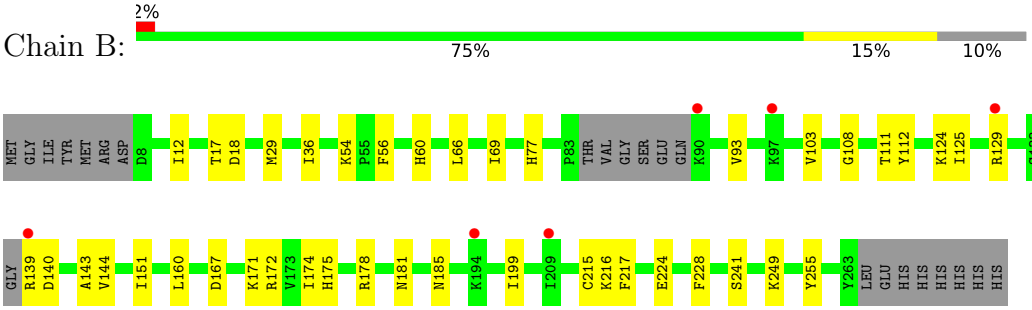
• Molecule 1: (R)-S-adenosyl-L-methionine hydrolase

Chain A:



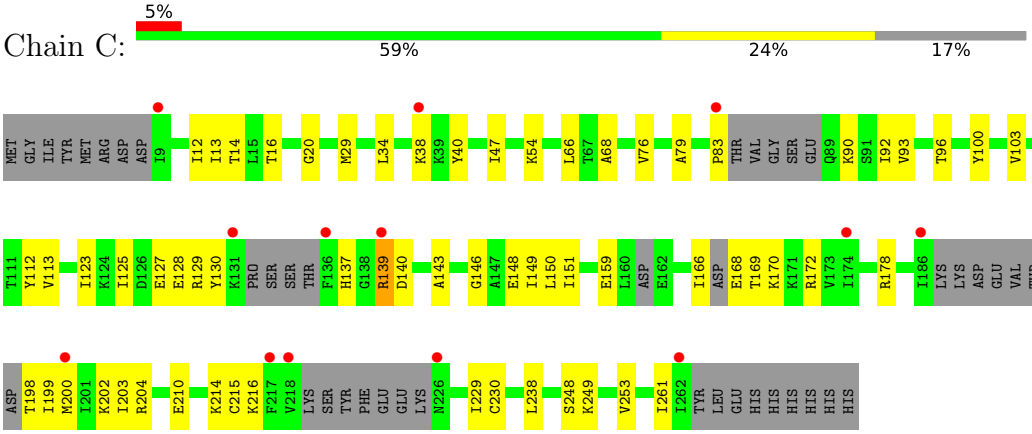
• Molecule 1: (R)-S-adenosyl-L-methionine hydrolase

Chain B:



• Molecule 1: (R)-S-adenosyl-L-methionine hydrolase

Chain C:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	122.55Å 160.77Å 124.02Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.59 – 2.75 39.59 – 2.75	Depositor EDS
% Data completeness (in resolution range)	99.7 (39.59-2.75) 99.6 (39.59-2.75)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.70 (at 2.77Å)	Xtriage
Refinement program	PHENIX 1.16_3549	Depositor
R, R_{free}	0.198 , 0.258 0.203 , 0.262	Depositor DCC
R_{free} test set	2000 reflections (6.21%)	wwPDB-VP
Wilson B-factor (Å^2)	78.3	Xtriage
Anisotropy	0.235	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 67.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	5773	wwPDB-VP
Average B, all atoms (Å^2)	81.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.47% 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	0.44	0/1990	0.64	0/2679
1	B	0.45	0/2027	0.67	2/2730 (0.1%)
1	C	0.43	0/1837	0.79	8/2468 (0.3%)
All	All	0.44	0/5854	0.70	10/7877 (0.1%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	249	LYS	CG-CD-CE	8.72	131.37	111.30
1	C	249	LYS	CA-CB-CG	7.56	129.23	114.10
1	C	54	LYS	CB-CG-CD	-7.46	94.14	111.30
1	C	229	ILE	CG1-CB-CG2	-6.79	90.33	110.70
1	C	54	LYS	CG-CD-CE	6.74	126.80	111.30
1	C	249	LYS	CB-CG-CD	6.60	126.48	111.30
1	B	249	LYS	CB-CG-CD	6.09	125.31	111.30
1	C	139	ARG	NE-CZ-NH1	-5.67	115.83	121.50
1	C	229	ILE	CA-CB-CG1	5.39	119.57	110.40
1	C	139	ARG	NE-CZ-NH2	5.28	123.95	119.20

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	1957	0	1999	31	0
1	B	1991	0	2038	28	0
1	C	1810	0	1871	40	0
2	A	8	0	0	0	0
2	B	4	0	0	1	0
2	C	3	0	0	0	0
All	All	5773	0	5908	93	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 8.

All (93) 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:C:93:VAL:HG23	1:C:125:ILE:HD11	1.56	0.86
1:C:168:GLU:HG2	1:C:169:THR:H	1.41	0.84
1:B:199:ILE:HD11	1:B:217:PHE:HB2	1.67	0.74
1:A:127:GLU:OE1	1:A:130:TYR:N	2.30	0.65
1:C:199:ILE:N	1:C:215:CYS:O	2.30	0.62
1:C:66:LEU:HD22	1:C:112:TYR:HB3	1.83	0.61
1:C:123:ILE:HG13	1:C:159:GLU:HG3	1.82	0.61
1:A:15:LEU:HD22	1:A:29:MET:HE3	1.83	0.61
1:C:83:PRO:HD3	1:C:107:ASN:HD22	1.66	0.60
1:B:174:ILE:HG21	1:B:185:ASN:HB3	1.85	0.59
1:C:230:CYS:HB3	1:C:238:LEU:HD11	1.86	0.57
1:A:121:ARG:NH2	1:A:155:TYR:O	2.37	0.57
1:A:199:ILE:CD1	1:A:217:PHE:HB2	2.34	0.56
1:B:17:THR:HG21	1:B:29:MET:HE1	1.87	0.56
1:C:198:THR:N	1:C:216:LYS:HZ2	2.03	0.56
1:B:29:MET:HG3	1:B:143:ALA:HB2	1.88	0.55
1:A:34:LEU:HD13	1:C:12:ILE:HD13	1.88	0.54
1:A:90:LYS:HD2	1:A:160:LEU:HD11	1.90	0.54
1:C:93:VAL:HG22	1:C:103:VAL:HG22	1.89	0.54
1:A:40:TYR:HB2	1:A:151:ILE:HD12	1.89	0.53
1:C:248:SER:HB2	1:C:253:VAL:HB	1.90	0.53
1:A:38:LYS:HD2	1:A:40:TYR:N	2.24	0.53
1:B:66:LEU:HD22	1:B:112:TYR:HB3	1.90	0.52
1:B:12:ILE:HD13	1:C:34:LEU:HD13	1.90	0.52
1:A:199:ILE:HD11	1:A:217:PHE:HB2	1.91	0.52
1:B:178:ARG:HH21	1:C:20:GLY:HA3	1.73	0.51
1:C:169:THR:HG23	1:C:170:LYS:H	1.75	0.50
1:B:69:ILE:HG23	1:B:77:HIS:CE1	2.47	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:202:LYS:HE3	1:C:204:ARG:HH12	1.77	0.49
1:B:167:ASP:O	1:B:172:ARG:NH2	2.37	0.49
1:B:108:GLY:O	1:B:111:THR:OG1	2.27	0.49
1:A:244:MET:HE1	1:B:56:PHE:CE2	2.48	0.49
1:C:137:HIS:HD2	1:C:140:ASP:HB3	1.78	0.49
1:C:110:PHE:HD1	1:C:113:VAL:HG21	1.78	0.48
1:C:198:THR:N	1:C:216:LYS:HD2	2.28	0.48
1:A:149:ILE:HG12	1:A:155:TYR:HB2	1.95	0.48
1:C:90:LYS:HB3	1:C:106:ASP:HB3	1.95	0.48
1:C:29:MET:HG3	1:C:143:ALA:HB2	1.95	0.48
1:A:40:TYR:CD2	1:A:151:ILE:HG21	2.49	0.48
1:A:56:PHE:HD1	1:A:82:ASP:O	1.97	0.47
1:B:181:ASN:OD1	1:B:241:SER:HB2	2.14	0.47
1:C:168:GLU:HG2	1:C:169:THR:N	2.21	0.47
1:A:28:ALA:HB2	1:C:68:ALA:HA	1.95	0.47
1:C:168:GLU:HG2	1:C:169:THR:HG22	1.96	0.47
1:C:139:ARG:H	1:C:139:ARG:HG2	1.39	0.47
1:B:199:ILE:CD1	1:B:217:PHE:HB2	2.42	0.46
1:B:93:VAL:HG22	1:B:103:VAL:HG22	1.97	0.46
1:A:38:LYS:CD	1:A:40:TYR:N	2.78	0.46
1:A:174:ILE:HG21	1:A:185:ASN:HB3	1.98	0.46
1:C:13:ILE:HB	1:C:150:LEU:HD11	1.96	0.46
1:C:40:TYR:HB2	1:C:151:ILE:HD12	1.97	0.46
1:C:178:ARG:HE	1:C:178:ARG:HB2	1.52	0.46
1:A:182:ILE:HB	1:A:240:ILE:HB	1.98	0.46
1:C:261:ILE:H	1:C:261:ILE:HD12	1.79	0.45
1:C:203:ILE:O	1:C:210:GLU:HA	2.16	0.45
1:B:129:ARG:HD3	2:B:303:HOH:O	2.16	0.45
1:B:54:LYS:HG3	1:B:60:HIS:ND1	2.32	0.44
1:C:16:THR:O	1:C:79:ALA:HA	2.17	0.44
1:B:216:LYS:HE2	1:B:224:GLU:HG3	1.99	0.44
1:A:38:LYS:HE2	1:A:40:TYR:N	2.33	0.44
1:A:175:HIS:HA	1:A:255:TYR:CE2	2.53	0.44
1:B:174:ILE:CG2	1:B:185:ASN:HB3	2.48	0.44
1:C:129:ARG:NH2	1:C:148:GLU:OE1	2.50	0.44
1:A:60:HIS:CD2	1:A:175:HIS:CE1	3.05	0.44
1:B:171:LYS:HD2	1:B:171:LYS:HA	1.76	0.43
1:B:171:LYS:HD2	1:B:185:ASN:OD1	2.17	0.43
1:C:13:ILE:HA	1:C:76:VAL:O	2.18	0.43
1:A:188:LYS:O	1:A:191:VAL:HG22	2.17	0.43
1:C:146:GLY:HA2	1:C:149:ILE:HD12	2.00	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:175:HIS:HA	1:B:255:TYR:CE2	2.54	0.43
1:C:14:THR:HA	1:C:47:ILE:O	2.18	0.43
1:A:205:HIS:NE2	1:A:211:LYS:HE2	2.33	0.43
1:A:126:ASP:OD1	1:A:127:GLU:N	2.37	0.42
1:B:36:ILE:HD11	1:B:144:VAL:HG22	2.01	0.42
1:A:127:GLU:CD	1:A:130:TYR:N	2.77	0.42
1:B:93:VAL:HG23	1:B:125:ILE:HD11	2.01	0.42
1:A:203:ILE:O	1:A:210:GLU:HA	2.18	0.42
1:C:166:ILE:C	1:C:168:GLU:OE1	2.62	0.42
1:B:36:ILE:HG22	1:B:151:ILE:HD11	2.01	0.42
1:C:96:THR:CG2	1:C:100:TYR:HB2	2.49	0.42
1:C:92:ILE:HG23	1:C:106:ASP:HB2	2.01	0.41
1:C:128:GLU:C	1:C:130:TYR:H	2.28	0.41
1:C:200:MET:HE3	1:C:214:LYS:HB2	2.02	0.41
1:B:215:CYS:HA	1:B:228:PHE:O	2.20	0.41
1:A:69:ILE:HG12	1:A:77:HIS:ND1	2.35	0.41
1:A:178:ARG:NH1	1:B:18:ASP:O	2.50	0.41
1:A:202:LYS:HB2	1:A:262:ILE:HD11	2.01	0.41
1:A:36:ILE:O	1:A:38:LYS:HG3	2.21	0.41
1:A:121:ARG:HD2	1:A:123:ILE:HD11	2.02	0.41
1:B:124:LYS:HB2	1:B:160:LEU:HD11	2.03	0.41
1:A:133:SER:HB3	1:A:136:PHE:HD2	1.85	0.41
1:B:139:ARG:HB3	1:B:140:ASP:H	1.58	0.41
1:C:38:LYS:HE3	1:C:38:LYS:HB3	1.90	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	233/271 (86%)	228 (98%)	5 (2%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	B	239/271 (88%)	234 (98%)	5 (2%)	0	100 100
1	C	211/271 (78%)	199 (94%)	11 (5%)	1 (0%)	24 43
All	All	683/813 (84%)	661 (97%)	21 (3%)	1 (0%)	48 71

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	127	GLU

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	218/244 (89%)	218 (100%)	0	100 100
1	B	221/244 (91%)	221 (100%)	0	100 100
1	C	200/244 (82%)	199 (100%)	1 (0%)	81 89
All	All	639/732 (87%)	638 (100%)	1 (0%)	87 95

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	172	ARG

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

Mol	Chain	Res	Type
1	A	226	ASN
1	B	22	ASN
1	C	137	HIS
1	C	227	ASN

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 oligosaccharides 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	243/271 (89%)	-0.21	5 (2%)	63	61	48, 66, 103, 123	0
1	B	245/271 (90%)	-0.05	6 (2%)	59	57	54, 78, 116, 141	0
1	C	225/271 (83%)	0.18	13 (5%)	29	29	58, 88, 122, 164	0
All	All	713/813 (87%)	-0.03	24 (3%)	48	46	48, 77, 117, 164	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	9	ILE	4.1
1	C	217	PHE	3.3
1	B	129	ARG	3.2
1	C	218	VAL	3.0
1	C	136	PHE	3.0
1	A	9	ILE	2.8
1	C	186	ILE	2.7
1	B	139	ARG	2.6
1	B	97	LYS	2.6
1	C	83	PRO	2.6
1	B	194	LYS	2.6
1	C	131	LYS	2.6
1	C	139	ARG	2.5
1	A	192	THR	2.5
1	A	83	PRO	2.4
1	A	127	GLU	2.4
1	C	174	ILE	2.4
1	C	262	ILE	2.2
1	B	209	ILE	2.2
1	C	226	ASN	2.1
1	A	197	ASP	2.1
1	C	38	LYS	2.1
1	B	90	LYS	2.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	200	MET	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 oligosaccharides 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.