



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 26, 2021 – 10:03 pm BST

PDB ID : 6Z90  
Title : Crystal structure of MINDY1 mutant-P138A  
Authors : Abdul Rehman, S.A.; Kulathu, Y.  
Deposited on : 2020-06-03  
Resolution : 3.59 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](mailto: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.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.23.2  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0267  
CCP4 : 7.1.010 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.23.2

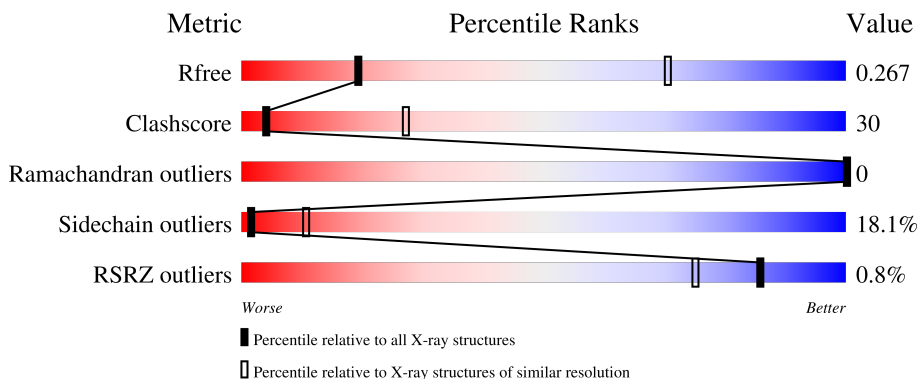
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.59 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	1257 (3.70-3.50)
Clashscore	141614	1353 (3.70-3.50)
Ramachandran outliers	138981	1307 (3.70-3.50)
Sidechain outliers	138945	1307 (3.70-3.50)
RSRZ outliers	127900	1161 (3.70-3.50)

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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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  $\leq 5\%$ . 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	289	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1946 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 Ubiquitin carboxyl-terminal hydrolase MINDY-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	256	1946	1240	315	379	12	0	0	0

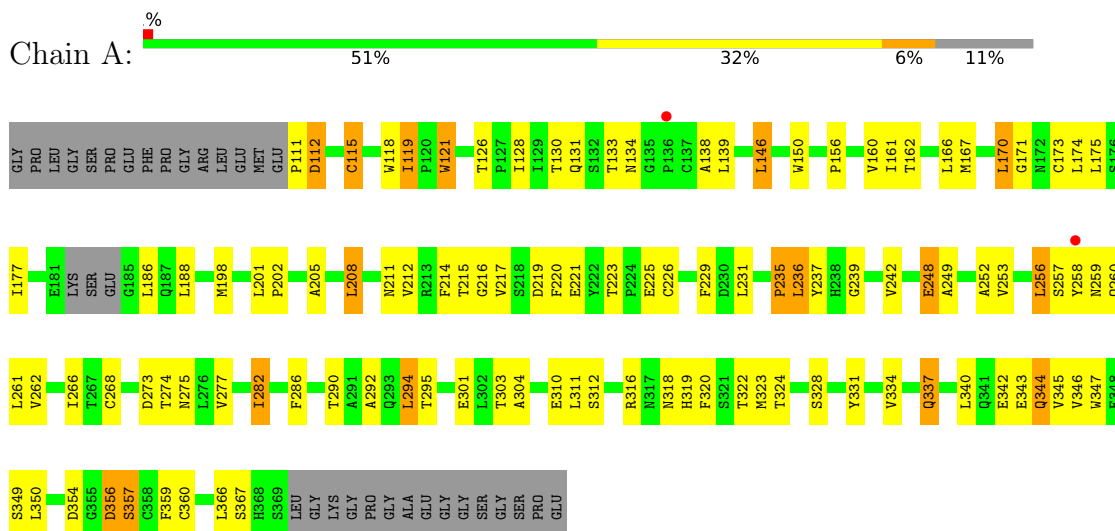
There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	96	GLY	-	expression tag	UNP Q8N5J2
A	97	PRO	-	expression tag	UNP Q8N5J2
A	98	LEU	-	expression tag	UNP Q8N5J2
A	99	GLY	-	expression tag	UNP Q8N5J2
A	100	SER	-	expression tag	UNP Q8N5J2
A	101	PRO	-	expression tag	UNP Q8N5J2
A	102	GLU	-	expression tag	UNP Q8N5J2
A	103	PHE	-	expression tag	UNP Q8N5J2
A	104	PRO	-	expression tag	UNP Q8N5J2
A	105	GLY	-	expression tag	UNP Q8N5J2
A	106	ARG	-	expression tag	UNP Q8N5J2
A	107	LEU	-	expression tag	UNP Q8N5J2
A	108	GLU	-	expression tag	UNP Q8N5J2
A	109	MET	-	expression tag	UNP Q8N5J2
A	138	ALA	PRO	engineered mutation	UNP Q8N5J2

### 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: Ubiquitin carboxyl-terminal hydrolase MINDY-1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	98.65Å 98.65Å 166.07Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.00 – 3.59 48.28 – 3.59	Depositor EDS
% Data completeness (in resolution range)	99.8 (48.00-3.59) 99.9 (48.28-3.59)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.08 (at 3.57Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.212 , 0.258 0.230 , 0.267	Depositor DCC
$R_{free}$ test set	525 reflections (5.19%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	149.3	Xtriage
Anisotropy	0.676	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	(Not available) , (Not available)	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	1946	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	191.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.00% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  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	0.72	0/1993	0.90	0/2731

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 [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	1946	0	1798	112	0
All	All	1946	0	1798	112	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 30.

All (112) 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:177:ILE:HD12	1:A:231:LEU:CD2	1.55	1.37
1:A:256:LEU:HD11	1:A:260:GLN:C	1.69	1.13
1:A:256:LEU:HD21	1:A:260:GLN:HB3	1.32	1.06
1:A:177:ILE:CD1	1:A:231:LEU:HD23	1.87	1.05
1:A:177:ILE:CD1	1:A:231:LEU:CD2	2.36	1.03

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:256:LEU:HD11	1:A:260:GLN:O	1.63	0.96
1:A:177:ILE:HD12	1:A:231:LEU:HD23	1.42	0.95
1:A:256:LEU:CD1	1:A:261:LEU:N	2.33	0.91
1:A:256:LEU:HD12	1:A:261:LEU:HA	1.53	0.91
1:A:177:ILE:HD12	1:A:231:LEU:HD21	1.51	0.90
1:A:256:LEU:CD2	1:A:260:GLN:HB3	2.04	0.86
1:A:170:LEU:HD12	1:A:170:LEU:O	1.76	0.86
1:A:256:LEU:CD1	1:A:261:LEU:CA	2.54	0.85
1:A:256:LEU:CD1	1:A:260:GLN:C	2.43	0.85
1:A:231:LEU:HD23	1:A:231:LEU:O	1.80	0.82
1:A:256:LEU:CD1	1:A:261:LEU:HA	2.13	0.78
1:A:256:LEU:HD12	1:A:261:LEU:CA	2.16	0.75
1:A:208:LEU:CD1	1:A:225:GLU:OE1	2.34	0.75
1:A:131:GLN:OE1	1:A:319:HIS:HE1	1.71	0.72
1:A:177:ILE:HD13	1:A:231:LEU:HD23	1.70	0.72
1:A:177:ILE:HD12	1:A:231:LEU:HD22	1.66	0.71
1:A:242:VAL:CG2	1:A:249:ALA:HB1	2.20	0.70
1:A:256:LEU:HD13	1:A:261:LEU:N	2.05	0.69
1:A:290:THR:HG22	1:A:290:THR:O	1.93	0.69
1:A:346:VAL:HG12	1:A:347:TRP:CD1	2.29	0.67
1:A:211:ASN:ND2	1:A:259:ASN:HB2	2.10	0.67
1:A:256:LEU:CD2	1:A:260:GLN:CB	2.72	0.67
1:A:344:GLN:HG3	1:A:367:SER:HB2	1.77	0.66
1:A:208:LEU:HD11	1:A:225:GLU:OE1	1.98	0.64
1:A:337:GLN:HG3	1:A:340:LEU:HD22	1.81	0.61
1:A:356:ASP:N	1:A:356:ASP:OD1	2.34	0.60
1:A:256:LEU:HD22	1:A:257:SER:H	1.66	0.60
1:A:146:LEU:HD23	1:A:146:LEU:N	2.17	0.59
1:A:170:LEU:HD12	1:A:170:LEU:C	2.21	0.59
1:A:344:GLN:O	1:A:360:CYS:O	2.21	0.59
1:A:208:LEU:HD13	1:A:225:GLU:CG	2.33	0.58
1:A:334:VAL:O	1:A:334:VAL:HG12	2.04	0.58
1:A:131:GLN:OE1	1:A:319:HIS:CE1	2.54	0.58
1:A:217:VAL:O	1:A:237:TYR:HA	2.04	0.57
1:A:331:TYR:CD1	1:A:349:SER:HA	2.39	0.57
1:A:349:SER:OG	1:A:357:SER:CB	2.53	0.57
1:A:256:LEU:HD11	1:A:261:LEU:N	2.05	0.57
1:A:342:GLU:HA	1:A:342:GLU:OE1	2.05	0.56
1:A:290:THR:HG21	1:A:295:THR:HG23	1.87	0.55
1:A:256:LEU:HD21	1:A:260:GLN:CB	2.19	0.55
1:A:292:ALA:O	1:A:294:LEU:N	2.31	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:273:ASP:OD2	1:A:275:ASN:HB3	2.07	0.54
1:A:223:THR:HB	1:A:225:GLU:OE1	2.07	0.54
1:A:256:LEU:HD12	1:A:261:LEU:HD12	1.90	0.54
1:A:290:THR:HG21	1:A:295:THR:CG2	2.39	0.53
1:A:331:TYR:HD1	1:A:349:SER:HA	1.74	0.53
1:A:118:TRP:CZ2	1:A:156:PRO:HA	2.43	0.53
1:A:139:LEU:HD21	1:A:166:LEU:HB3	1.91	0.52
1:A:301:GLU:O	1:A:304:ALA:HB3	2.09	0.52
1:A:343:GLU:O	1:A:346:VAL:CG2	2.58	0.52
1:A:177:ILE:HD13	1:A:231:LEU:O	2.09	0.52
1:A:242:VAL:HG23	1:A:249:ALA:HB1	1.92	0.51
1:A:115:CYS:O	1:A:130:THR:OG1	2.29	0.50
1:A:344:GLN:HG3	1:A:367:SER:CB	2.41	0.50
1:A:211:ASN:HD21	1:A:259:ASN:HB2	1.74	0.50
1:A:346:VAL:HG12	1:A:347:TRP:NE1	2.27	0.50
1:A:171:GLY:O	1:A:175:LEU:HG	2.12	0.49
1:A:258:TYR:CG	1:A:258:TYR:O	2.65	0.49
1:A:262:VAL:O	1:A:266:ILE:HG12	2.13	0.49
1:A:208:LEU:HD13	1:A:225:GLU:CD	2.33	0.48
1:A:167:MET:CE	1:A:205:ALA:HB2	2.43	0.48
1:A:220:PHE:CZ	1:A:236:LEU:HD23	2.49	0.48
1:A:345:VAL:HG13	1:A:359:PHE:CD2	2.49	0.48
1:A:242:VAL:CG2	1:A:249:ALA:CB	2.91	0.47
1:A:214:PHE:HZ	1:A:258:TYR:HB2	1.79	0.47
1:A:211:ASN:CG	1:A:259:ASN:HB2	2.34	0.47
1:A:323:MET:HG2	1:A:324:THR:N	2.29	0.47
1:A:214:PHE:CZ	1:A:258:TYR:HB2	2.50	0.47
1:A:282:ILE:HG23	1:A:282:ILE:O	2.15	0.47
1:A:345:VAL:HG13	1:A:359:PHE:HD2	1.80	0.46
1:A:239:GLY:HA3	1:A:294:LEU:HD12	1.95	0.46
1:A:256:LEU:HD22	1:A:260:GLN:CB	2.46	0.46
1:A:256:LEU:HD22	1:A:260:GLN:HB2	1.99	0.45
1:A:138:ALA:HB2	1:A:320:PHE:CD2	2.52	0.45
1:A:208:LEU:O	1:A:208:LEU:HG	2.16	0.45
1:A:249:ALA:O	1:A:253:VAL:HB	2.16	0.45
1:A:292:ALA:HB1	1:A:316:ARG:HH22	1.82	0.44
1:A:248:GLU:O	1:A:252:ALA:N	2.44	0.44
1:A:121:TRP:O	1:A:121:TRP:CD1	2.70	0.44
1:A:138:ALA:HB2	1:A:320:PHE:CG	2.52	0.44
1:A:235:PRO:HD2	1:A:312:SER:HA	2.00	0.44
1:A:257:SER:O	1:A:261:LEU:N	2.50	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:170:LEU:CD1	1:A:174:LEU:CD1	2.96	0.43
1:A:119:ILE:HD11	1:A:121:TRP:HB2	2.00	0.43
1:A:170:LEU:HD11	1:A:174:LEU:CD1	2.47	0.43
1:A:208:LEU:CD1	1:A:225:GLU:CD	2.87	0.43
1:A:337:GLN:O	1:A:340:LEU:HB2	2.18	0.43
1:A:167:MET:HE2	1:A:205:ALA:HB2	2.01	0.42
1:A:349:SER:OG	1:A:357:SER:HB3	2.18	0.42
1:A:290:THR:O	1:A:290:THR:CG2	2.63	0.42
1:A:111:PRO:HG3	1:A:133:THR:HG21	2.00	0.42
1:A:112:ASP:OD1	1:A:112:ASP:N	2.53	0.42
1:A:170:LEU:HD11	1:A:174:LEU:HD11	2.01	0.42
1:A:211:ASN:HB3	1:A:221:GLU:HB2	2.01	0.42
1:A:248:GLU:H	1:A:248:GLU:HG2	1.41	0.42
1:A:146:LEU:N	1:A:146:LEU:CD2	2.81	0.42
1:A:268:CYS:O	1:A:277:VAL:HG22	2.19	0.42
1:A:286:PHE:O	1:A:286:PHE:CG	2.73	0.42
1:A:131:GLN:NE2	1:A:134:ASN:HA	2.34	0.41
1:A:231:LEU:HD23	1:A:231:LEU:C	2.40	0.41
1:A:121:TRP:CD1	1:A:121:TRP:C	2.90	0.41
1:A:229:PHE:O	1:A:231:LEU:N	2.53	0.41
1:A:128:ILE:HD12	1:A:128:ILE:HA	1.94	0.41
1:A:215:THR:OG1	1:A:216:GLY:N	2.53	0.41
1:A:201:LEU:N	1:A:202:PRO:CD	2.84	0.40
1:A:350:LEU:HD12	1:A:350:LEU:HA	1.86	0.40
1:A:343:GLU:O	1:A:346:VAL:HG23	2.22	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	252/289 (87%)	209 (83%)	43 (17%)	0	<a href="#">100</a> <a href="#">100</a>

There are no Ramachandran outliers to report.

### 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	210/252 (83%)	172 (82%)	38 (18%)	<b>1</b> <b>11</b>

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	ASP
1	A	115	CYS
1	A	119	ILE
1	A	121	TRP
1	A	126	THR
1	A	146	LEU
1	A	150	TRP
1	A	160	VAL
1	A	161	ILE
1	A	162	THR
1	A	170	LEU
1	A	173	CYS
1	A	186	LEU
1	A	188	LEU
1	A	198	MET
1	A	208	LEU
1	A	212	VAL
1	A	219	ASP
1	A	226	CYS
1	A	235	PRO
1	A	236	LEU
1	A	248	GLU
1	A	256	LEU
1	A	274	THR
1	A	282	ILE
1	A	294	LEU
1	A	303	THR

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Mol	Chain	Res	Type
1	A	310	GLU
1	A	311	LEU
1	A	318	ASN
1	A	322	THR
1	A	328	SER
1	A	337	GLN
1	A	344	GLN
1	A	354	ASP
1	A	356	ASP
1	A	357	SER
1	A	366	LEU

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	189	ASN
1	A	259	ASN
1	A	318	ASN
1	A	319	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 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	256/289 (88%)	-0.13	2 (0%) 86 75	132, 189, 246, 293	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	258	TYR	2.5
1	A	136	PRO	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.