



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2014 – 11:24 PM GMT

PDB ID : 4AD8
Title : Crystal structure of a deletion mutant of Deinococcus radiodurans RecN
Authors : Pellegrino, S.; Radzimanowski, J.; De Sanctis, D.; Mcsweeney, S.; Timmins, J.
Deposited on : 2011-12-22
Resolution : 4.00 Å(reported)

This is a full wwPDB 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/ValidationPDFNotes.html>

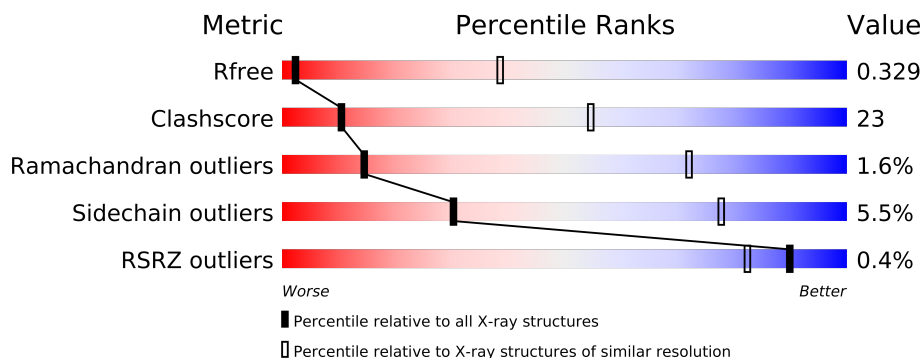
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 4.00 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}	66092	1035 (4.52-3.46)
Clashscore	79885	1235 (4.50-3.50)
Ramachandran outliers	78287	1170 (4.50-3.50)
Sidechain outliers	78261	1156 (4.50-3.50)
RSRZ outliers	66119	1035 (4.52-3.46)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	517	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 3416 atoms, of which 0 are hydrogen and 0 are deuterium.

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 REC�.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	452	Total	C	N	O	S	0	0	0
			3416	2111	630	670	5			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	GLY	-	EXPRESSION TAG	UNP Q9WXF2
A	-4	ILE	-	EXPRESSION TAG	UNP Q9WXF2
A	-3	ASP	-	EXPRESSION TAG	UNP Q9WXF2
A	-2	PRO	-	EXPRESSION TAG	UNP Q9WXF2
A	-1	PHE	-	EXPRESSION TAG	UNP Q9WXF2
A	0	THR	-	EXPRESSION TAG	UNP Q9WXF2
A	238	GLU	-	LINKER	UNP Q9WXF2
A	239	SER	-	LINKER	UNP Q9WXF2
A	240	SER	-	LINKER	UNP Q9WXF2
A	241	LYS	-	LINKER	UNP Q9WXF2
A	242	HIS	-	LINKER	UNP Q9WXF2
A	243	PRO	-	LINKER	UNP Q9WXF2
A	244	THR	-	LINKER	UNP Q9WXF2
A	245	SER	-	LINKER	UNP Q9WXF2
A	246	LEU	-	LINKER	UNP Q9WXF2
A	247	VAL	-	LINKER	UNP Q9WXF2
A	248	PRO	-	LINKER	UNP Q9WXF2
A	249	ARG	-	LINKER	UNP Q9WXF2
A	250	GLY	-	LINKER	UNP Q9WXF2
A	251	SER	-	LINKER	UNP Q9WXF2

4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	72.20Å 62.49Å 145.53Å 90.00° 98.39° 90.00°	Depositor
Resolution (Å)	47.03 – 4.00 47.03 – 4.00	Depositor EDS
% Data completeness (in resolution range)	96.9 (47.03-4.00) 97.2 (47.03-4.00)	Depositor EDS
R_{merge}	0.28	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.96 (at 4.00Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.325 , 0.347 0.322 , 0.329	Depositor DCC
R_{free} test set	245 reflections (4.53%)	DCC
Wilson B-factor (Å ²)	87.2	Xtriage
Anisotropy	0.384	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 6.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.36$, $\langle L^2 \rangle = 0.19$	Xtriage
Outliers	0 of 5430 reflections	Xtriage
F_o, F_c correlation	0.84	EDS
Total number of atoms	3416	wwPDB-VP
Average B, all atoms (Å ²)	70.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.59% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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	0.23	0/3458	0.42	0/4675

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3416	0	3403	158	0
All	All	3416	0	3403	158	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 23.

All (158) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:450:LEU:HD23	1:A:451:SER:N	1.90	0.86
1:A:125:LEU:O	1:A:127:GLY:N	2.10	0.83
1:A:431:SER:HB2	1:A:436:GLU:HB3	1.61	0.82
1:A:471:ASP:OD1	1:A:472:GLU:HG2	1.78	0.81
1:A:185:ALA:HB1	1:A:365:VAL:HG22	1.60	0.81

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:423:LEU:HD23	1:A:423:LEU:H	1.46	0.80
1:A:469:VAL:HG22	1:A:499:LEU:HB2	1.63	0.80
1:A:449:GLU:CD	1:A:449:GLU:H	1.91	0.74
1:A:94:LEU:CD2	1:A:115:LEU:HB2	2.17	0.73
1:A:376:GLY:HA3	1:A:423:LEU:HD21	1.70	0.73
1:A:125:LEU:HD13	1:A:130:VAL:HB	1.69	0.73
1:A:543:ALA:O	1:A:546:LEU:O	2.06	0.73
1:A:190:GLU:OE1	1:A:191:ARG:N	2.22	0.72
1:A:460:VAL:HG13	1:A:461:LEU:HD13	1.74	0.69
1:A:327:LYS:HG3	1:A:332:PRO:O	1.93	0.69
1:A:160:GLN:O	1:A:163:LEU:HG	1.92	0.69
1:A:486:ALA:HB2	1:A:507:ILE:HG12	1.76	0.68
1:A:120:ARG:HG3	1:A:121:GLY:H	1.59	0.68
1:A:415:LEU:HD12	1:A:416:ALA:H	1.57	0.68
1:A:82:ALA:HB1	1:A:115:LEU:HD11	1.76	0.67
1:A:168:VAL:HG11	1:A:382:ALA:HB1	1.77	0.67
1:A:452:ARG:HG3	1:A:473:VAL:HG23	1.77	0.66
1:A:130:VAL:HG12	1:A:131:SER:H	1.61	0.64
1:A:175:TYR:OH	1:A:418:PRO:O	2.15	0.64
1:A:195:SER:O	1:A:199:ARG:HB2	1.97	0.64
1:A:452:ARG:NH1	1:A:473:VAL:O	2.31	0.64
1:A:335:GLU:N	1:A:335:GLU:OE1	2.31	0.63
1:A:437:GLU:O	1:A:438:LEU:HB2	1.98	0.63
1:A:415:LEU:HD12	1:A:416:ALA:N	2.12	0.63
1:A:459:THR:HG21	1:A:488:GLN:HG3	1.80	0.63
1:A:452:ARG:CG	1:A:473:VAL:HG23	2.31	0.61
1:A:413:SER:O	1:A:424:SER:HA	2.00	0.61
1:A:45:ILE:HG12	1:A:69:ILE:HD11	1.82	0.60
1:A:431:SER:HB3	1:A:438:LEU:HA	1.83	0.59
1:A:150:SER:OG	1:A:454:MET:SD	2.52	0.58
1:A:175:TYR:CZ	1:A:422:GLY:HA2	2.37	0.58
1:A:466:PRO:HA	1:A:496:ARG:HH11	1.68	0.58
1:A:92:LYS:HG3	1:A:93:GLU:HG2	1.85	0.57
1:A:395:LEU:HB3	1:A:399:ARG:HD2	1.86	0.57
1:A:151:ALA:O	1:A:156:SER:OG	2.20	0.57
1:A:449:GLU:N	1:A:449:GLU:OE2	2.37	0.57
1:A:38:GLU:HB3	1:A:97:THR:OG1	2.04	0.57
1:A:450:LEU:HD23	1:A:450:LEU:C	2.25	0.57
1:A:212:GLU:OE1	1:A:330:TYR:OH	2.23	0.57
1:A:147:TRP:H	1:A:150:SER:HB2	1.70	0.56
1:A:521:VAL:HG22	1:A:526:THR:HG23	1.88	0.56
1:A:69:ILE:HG22	1:A:70:ILE:HD12	1.88	0.56

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:333:THR:HG22	1:A:335:GLU:H	1.70	0.55
1:A:163:LEU:HD12	1:A:164:LEU:N	2.21	0.55
1:A:449:GLU:N	1:A:449:GLU:CD	2.60	0.54
1:A:450:LEU:HD23	1:A:451:SER:CA	2.37	0.54
1:A:32:PRO:O	1:A:466:PRO:HB3	2.07	0.54
1:A:151:ALA:HA	1:A:155:LEU:CB	2.37	0.54
1:A:151:ALA:HA	1:A:155:LEU:HB2	1.89	0.54
1:A:156:SER:HB3	1:A:157:PRO:CD	2.38	0.54
1:A:70:ILE:O	1:A:74:LEU:HB2	2.08	0.53
1:A:448:GLY:N	1:A:449:GLU:OE2	2.42	0.52
1:A:400:GLU:O	1:A:402:GLY:N	2.43	0.52
1:A:120:ARG:HG3	1:A:121:GLY:N	2.24	0.52
1:A:70:ILE:HA	1:A:74:LEU:HD13	1.91	0.52
1:A:62:GLU:HG3	1:A:519:LYS:HE3	1.91	0.52
1:A:541:GLU:O	1:A:545:MET:HG3	2.10	0.52
1:A:518:GLU:HG2	1:A:519:LYS:H	1.72	0.52
1:A:42:LEU:HG	1:A:94:LEU:HD12	1.92	0.52
1:A:459:THR:HG22	1:A:492:LEU:HB2	1.92	0.52
1:A:52:LEU:O	1:A:52:LEU:HD12	2.09	0.52
1:A:361:LEU:O	1:A:365:VAL:HG23	2.10	0.51
1:A:546:LEU:HD12	1:A:547:SER:N	2.26	0.51
1:A:394:LEU:O	1:A:397:VAL:HG12	2.11	0.51
1:A:395:LEU:HD21	1:A:408:MET:HB3	1.92	0.51
1:A:546:LEU:O	1:A:547:SER:OG	2.25	0.51
1:A:146:HIS:HA	1:A:150:SER:HB2	1.91	0.51
1:A:492:LEU:O	1:A:492:LEU:HD23	2.11	0.50
1:A:199:ARG:NH1	1:A:202:GLN:OE1	2.44	0.50
1:A:539:LEU:O	1:A:542:ILE:HG12	2.11	0.50
1:A:517:VAL:HG22	1:A:530:VAL:HG22	1.93	0.50
1:A:41:ASN:ND2	1:A:91:GLU:HG3	2.27	0.50
1:A:88:ARG:HB3	1:A:91:GLU:HB2	1.92	0.50
1:A:130:VAL:HG12	1:A:131:SER:N	2.26	0.49
1:A:156:SER:HB3	1:A:157:PRO:HD2	1.93	0.49
1:A:132:VAL:O	1:A:136:GLN:HG3	2.12	0.49
1:A:456:ALA:O	1:A:460:VAL:HG12	2.12	0.49
1:A:161:ARG:NE	1:A:165:ASP:OD2	2.46	0.49
1:A:144:THR:HB	1:A:468:VAL:HG12	1.94	0.49
1:A:125:LEU:HB2	1:A:130:VAL:HG21	1.95	0.48
1:A:94:LEU:HD21	1:A:115:LEU:HB2	1.94	0.48
1:A:36:ARG:HB3	1:A:99:PHE:HB2	1.95	0.48
1:A:546:LEU:HD12	1:A:547:SER:H	1.79	0.48
1:A:125:LEU:HD13	1:A:130:VAL:CB	2.40	0.48

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:442:SER:C	1:A:444:VAL:H	2.16	0.48
1:A:527:VAL:HG12	1:A:528:SER:N	2.29	0.47
1:A:70:ILE:HG23	1:A:469:VAL:HG11	1.96	0.47
1:A:366:ASP:O	1:A:369:HIS:HB3	2.14	0.47
1:A:219:ASP:O	1:A:222:GLU:HB2	2.14	0.47
1:A:125:LEU:CD1	1:A:130:VAL:HB	2.43	0.46
1:A:511:ALA:O	1:A:538:ARG:NH2	2.46	0.46
1:A:458:SER:O	1:A:462:GLY:N	2.46	0.46
1:A:506:GLN:H	1:A:506:GLN:CD	2.15	0.46
1:A:523:ASP:HA	1:A:524:GLY:HA2	1.51	0.46
1:A:423:LEU:H	1:A:423:LEU:CD2	2.23	0.46
1:A:471:ASP:OD1	1:A:472:GLU:N	2.49	0.46
1:A:56:PHE:C	1:A:56:PHE:CD1	2.88	0.46
1:A:388:GLU:N	1:A:389:PRO:HD2	2.31	0.46
1:A:485:VAL:O	1:A:489:LEU:HG	2.16	0.46
1:A:34:LEU:HG	1:A:52:LEU:HD11	1.98	0.46
1:A:72:ASP:O	1:A:76:LEU:HD23	2.16	0.45
1:A:537:GLU:O	1:A:541:GLU:HG2	2.16	0.45
1:A:539:LEU:HD11	1:A:559:ARG:CG	2.47	0.45
1:A:110:SER:O	1:A:110:SER:OG	2.30	0.45
1:A:188:ARG:O	1:A:191:ARG:HG2	2.18	0.44
1:A:144:THR:O	1:A:469:VAL:N	2.46	0.44
1:A:436:GLU:O	1:A:437:GLU:HB3	2.17	0.44
1:A:394:LEU:O	1:A:398:ILE:HG13	2.18	0.44
1:A:370:ALA:O	1:A:373:LEU:HB3	2.17	0.44
1:A:81:ARG:NH1	1:A:81:ARG:HB2	2.33	0.44
1:A:171:GLU:OE1	1:A:171:GLU:N	2.43	0.44
1:A:146:HIS:ND1	1:A:454:MET:SD	2.91	0.43
1:A:455:LEU:HD21	1:A:488:GLN:HB3	2.00	0.43
1:A:394:LEU:CD2	1:A:460:VAL:HG11	2.48	0.43
1:A:466:PRO:O	1:A:496:ARG:HB3	2.19	0.43
1:A:36:ARG:HG2	1:A:37:LEU:N	2.33	0.43
1:A:169:THR:O	1:A:173:GLN:HG3	2.19	0.43
1:A:324:SER:HA	1:A:327:LYS:HE2	2.01	0.43
1:A:401:LEU:HD23	1:A:485:VAL:HG22	2.01	0.43
1:A:45:ILE:N	1:A:45:ILE:HD12	2.33	0.43
1:A:56:PHE:HE1	1:A:500:VAL:HG12	1.83	0.43
1:A:544:ARG:HA	1:A:549:ASN:O	2.17	0.43
1:A:40:ARG:NE	1:A:41:ASN:OD1	2.52	0.43
1:A:486:ALA:HA	1:A:489:LEU:HD12	2.00	0.43
1:A:431:SER:HB3	1:A:438:LEU:CA	2.49	0.43
1:A:327:LYS:O	1:A:331:GLY:HA3	2.19	0.43

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:450:LEU:O	1:A:454:MET:CG	2.67	0.42
1:A:146:HIS:O	1:A:147:TRP:HB2	2.18	0.42
1:A:416:ALA:O	1:A:417:GLU:HB2	2.19	0.42
1:A:183:ARG:HA	1:A:183:ARG:HD3	1.84	0.42
1:A:412:LEU:HA	1:A:425:ASP:O	2.19	0.42
1:A:418:PRO:O	1:A:419:ALA:HB3	2.18	0.42
1:A:142:ARG:HA	1:A:466:PRO:HD2	2.01	0.42
1:A:166:ARG:HH21	1:A:461:LEU:HG	1.84	0.42
1:A:163:LEU:HD13	1:A:390:LEU:HD21	2.02	0.42
1:A:148:GLN:OE1	1:A:148:GLN:HA	2.20	0.42
1:A:161:ARG:CD	1:A:421:TYR:HB2	2.50	0.42
1:A:474:ASP:OD2	1:A:502:THR:HG22	2.20	0.42
1:A:416:ALA:O	1:A:417:GLU:CB	2.68	0.42
1:A:152:VAL:O	1:A:152:VAL:HG12	2.20	0.42
1:A:226:LEU:HD11	1:A:316:VAL:HG13	2.02	0.42
1:A:161:ARG:HG2	1:A:165:ASP:OD2	2.20	0.41
1:A:182:TRP:O	1:A:186:VAL:HG23	2.20	0.41
1:A:385:ARG:NH1	1:A:386:GLU:OE2	2.54	0.41
1:A:39:ILE:O	1:A:47:GLN:HA	2.20	0.41
1:A:161:ARG:HG3	1:A:426:VAL:HG21	2.02	0.41
1:A:449:GLU:O	1:A:453:VAL:HG23	2.21	0.41
1:A:147:TRP:CE3	1:A:147:TRP:HA	2.56	0.41
1:A:38:GLU:HA	1:A:48:LEU:O	2.20	0.40
1:A:514:HIS:CG	1:A:533:LEU:HD12	2.56	0.40
1:A:443:ASP:N	1:A:443:ASP:OD1	2.54	0.40
1:A:56:PHE:HD1	1:A:57:CYS:N	2.19	0.40
1:A:562:LEU:C	1:A:562:LEU:HD12	2.42	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	446/517 (86%)	403 (90%)	36 (8%)	7 (2%)	14 72

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	126	SER
1	A	147	TRP
1	A	47	GLN
1	A	401	LEU
1	A	417	GLU
1	A	535	GLY
1	A	332	PRO

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	348/399 (87%)	329 (94%)	19 (6%)	30	78

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	56	PHE
1	A	85	ASP
1	A	94	LEU
1	A	120	ARG
1	A	126	SER
1	A	147	TRP
1	A	155	LEU
1	A	190	GLU
1	A	227	ASN
1	A	330	TYR
1	A	421	TYR
1	A	443	ASP
1	A	449	GLU
1	A	450	LEU
1	A	454	MET
1	A	473	VAL
1	A	534	THR
1	A	546	LEU
1	A	552	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	179	HIS
1	A	211	GLN
1	A	227	ASN
1	A	488	GLN
1	A	497	GLN
1	A	557	HIS

5.3.3 RNA ⓘ

There are no RNA chains 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, 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	A	452/517 (87%)	0.25	2 (0%) 90 82	70, 70, 70, 70	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	119	GLY	2.8
1	A	92	LYS	2.4

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.