



Full wwPDB X-ray Structure Validation Report

Feb 26, 2014 – 02:41 PM GMT

PDB ID : 2VC9
Title : FAMILY 89 GLYCOSIDE HYDROLASE FROM CLOSTRIDIUM PERFRINGENS IN COMPLEX WITH 2-ACETAMIDO-1,2-DIDEOXYNOJIRMYCIN
Authors : Ficko-Blean, E.; Stubbs, K.A.; Berg, O.; Vocadlo, D.J.; Boraston, A.B.
Deposited on : 2007-09-19
Resolution : 2.36 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>

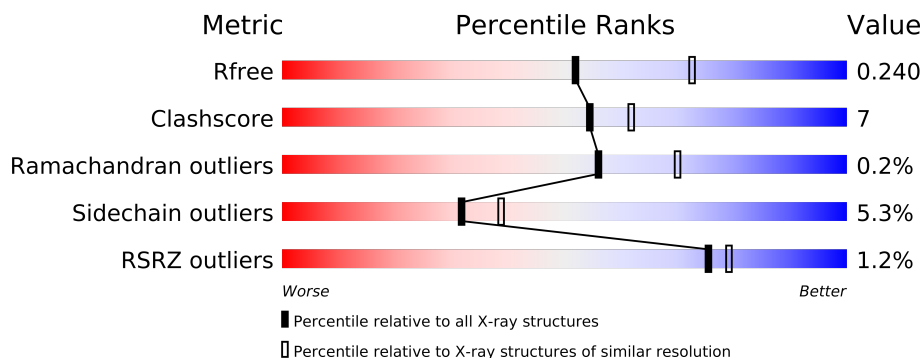
The following versions of software and data (see [references](#)) were used in the production of this report:

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 2.36 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	3327 (2.40-2.32)
Clashscore	79885	1064 (2.38-2.34)
Ramachandran outliers	78287	1048 (2.38-2.34)
Sidechain outliers	78261	1049 (2.38-2.34)
RSRZ outliers	66119	3330 (2.40-2.32)

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	891	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
3	GOL	A	1910	-	X
3	GOL	A	1911	-	X

2 Entry composition i

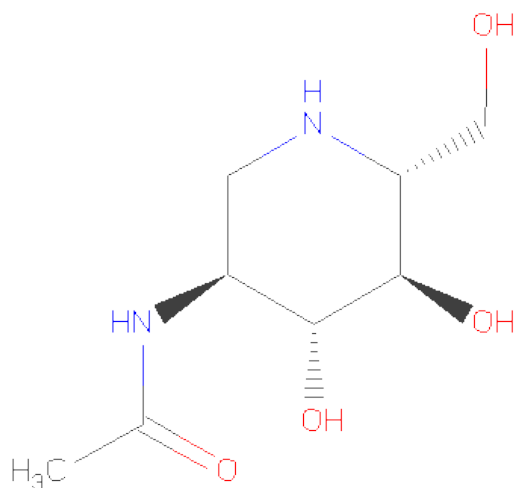
There are 5 unique types of molecules in this entry. The entry contains 7576 atoms, of which 0 are hydrogen and 0 are deuterium.

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 ALPHA-N-ACETYLGLUCOSAMINIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	884	7158	4536	1182	1411	29	57	1	1

- Molecule 2 is 2-ACETAMIDO-1,2-DIDEOXYNOJIRMYCIN (three-letter code: NOK) (formula: C₈H₁₆N₂O₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	14	8	2	4	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Ca	0	0
			1	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	381	Total	O	0	10
			391	391		

4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α , β , γ	90.96Å 90.96Å 252.40Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.70 – 2.36 19.69 – 2.36	Depositor EDS
% Data completeness (in resolution range)	90.7 (19.70-2.36) 90.7 (19.69-2.36)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.40 (at 2.35Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.203 , 0.246 0.200 , 0.240	Depositor DCC
R_{free} test set	2198 reflections (5.29%)	DCC
Wilson B-factor (Å ²)	38.8	Xtriage
Anisotropy	0.305	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 40.5	EDS
Estimated twinning fraction	0.056 for h,-h-k,-l	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	0 of 43771 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7576	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.30% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, CA, NOK

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	0.49	4/7331 (0.1%)	0.59	2/9925 (0.0%)

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	A	0	3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	790	LYS	CD-CE	-7.38	1.32	1.51
1	A	166	LYS	CB-CG	-6.06	1.36	1.52
1	A	277	GLU	CB-CG	5.80	1.63	1.52
1	A	165	LYS	CG-CD	5.17	1.70	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	608	LEU	CA-CB-CG	6.24	129.65	115.30
1	A	908	ASP	O-C-N	-5.84	113.36	122.70

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	846	ILE	Peptide

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Mol	Chain	Res	Type	Group
1	A	847	ASN	Peptide
1	A	908	ASP	Mainchain

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	7158	0	6748	94	0
2	A	14	0	16	1	0
3	A	12	0	16	0	0
4	A	1	0	0	0	0
5	A	391	0	0	4	0
All	All	7576	0	6780	94	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 7.

All (94) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:42:GLU:CG	1:A:43:GLY:HA2	1.60	1.29
1:A:42:GLU:HG3	1:A:43:GLY:HA2	1.06	1.05
1:A:605:THR:HG21	5:A:2253:HOH:O	1.60	1.01
1:A:857:ALA:HB1	1:A:858:LYS:C	1.82	1.00
1:A:605:THR:HG23	1:A:606:ASN:OD1	1.65	0.96
1:A:572:MET:H	1:A:727:GLN:HE21	1.18	0.92
1:A:847:ASN:N	1:A:848:GLY:HA3	1.85	0.90
1:A:42:GLU:CG	1:A:43:GLY:CA	2.50	0.86
1:A:659:ARG:HD2	1:A:663:TYR:CE2	2.10	0.86
1:A:42:GLU:HG3	1:A:43:GLY:CA	2.00	0.84
1:A:605:THR:CG2	1:A:606:ASN:OD1	2.27	0.83
1:A:295:ARG:HD2	1:A:326:GLY:O	1.81	0.80
1:A:674:ARG:HD2	1:A:868:GLU:OE1	1.81	0.80
1:A:336:GLN:HE22	1:A:465:GLN:HE21	1.31	0.77
1:A:572:MET:H	1:A:727:GLN:NE2	1.84	0.74
1:A:857:ALA:HB1	1:A:858:LYS:CA	2.18	0.73

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:85:LYS:H	1:A:146:ASN:ND2	1.88	0.72
1:A:42:GLU:HG2	1:A:43:GLY:HA2	1.68	0.70
1:A:355:LYS:HE3	1:A:379:LEU:O	1.91	0.70
1:A:659:ARG:HD3	1:A:661:ASP:OD2	1.92	0.69
1:A:408:GLN:H	1:A:465:GLN:HE22	1.40	0.69
1:A:262:ASN:HD21	1:A:634:GLU:HG2	1.57	0.69
1:A:857:ALA:HB1	1:A:859:ALA:N	2.09	0.68
1:A:85:LYS:H	1:A:146:ASN:HD21	1.43	0.64
1:A:564:HIS:HE1	1:A:605:THR:HG22	1.63	0.64
1:A:79:LYS:HB2	1:A:153:PHE:HB2	1.80	0.63
1:A:316:GLU:OE2	1:A:397:ARG:NH2	2.33	0.62
1:A:77:LEU:O	1:A:126:ASN:HA	2.00	0.62
1:A:767:GLU:HB3	1:A:835:GLU:OE1	1.99	0.61
1:A:565:ASN:HD21	1:A:568:GLY:H	1.49	0.61
1:A:407:LEU:HG	1:A:473:THR:HG21	1.86	0.57
1:A:42:GLU:HG2	1:A:43:GLY:CA	2.31	0.57
1:A:857:ALA:CB	1:A:858:LYS:CA	2.82	0.56
1:A:209:ARG:NH2	5:A:2071:HOH:O	2.38	0.56
1:A:214:LYS:CG	1:A:279:MET:HG3	2.36	0.56
1:A:139:ASN:O	1:A:866:LYS:NZ	2.32	0.55
1:A:383:TRP:CE2	1:A:387:ARG:HG3	2.42	0.55
1:A:596:ILE:HD11	1:A:617:ALA:HB2	1.88	0.54
1:A:220:ARG:HD3	1:A:221:ASP:O	2.06	0.54
1:A:847:ASN:N	1:A:848:GLY:CA	2.67	0.54
1:A:197:ASN:HB3	5:A:2067:HOH:O	2.08	0.53
1:A:40:ASN:HB2	1:A:44:ASN:O	2.11	0.51
1:A:847:ASN:H	1:A:848:GLY:HA3	1.73	0.50
1:A:214:LYS:HG2	1:A:279:MET:CG	2.42	0.49
1:A:665:GLY:O	1:A:687:HIS:HE1	1.96	0.49
1:A:42:GLU:HA	1:A:44:ASN:H	1.78	0.49
1:A:214:LYS:HG2	1:A:279:MET:HG3	1.93	0.49
1:A:565:ASN:HD22	1:A:565:ASN:C	2.17	0.48
1:A:319:LEU:HD11	1:A:394:MET:HG2	1.95	0.48
1:A:847:ASN:O	1:A:850:GLN:HB3	2.15	0.47
1:A:639:LYS:HG3	1:A:711:PHE:CE1	2.50	0.47
1:A:263:VAL:HG13	1:A:272:ASN:O	2.14	0.47
1:A:45[A]:THR:HG23	1:A:47:ASP:OD2	2.15	0.46
1:A:583:ILE:HB	1:A:584:PRO:HD3	1.98	0.46
1:A:744:TYR:HA	1:A:853:LEU:HD21	1.96	0.46
1:A:659:ARG:HD2	1:A:663:TYR:CD2	2.50	0.46
1:A:346:GLU:HG3	1:A:460:VAL:HG11	1.97	0.46
1:A:296:TYR:HA	1:A:329:LEU:O	2.14	0.46

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:598:ILE:HG23	1:A:613:LEU:HD22	1.98	0.46
1:A:407:LEU:HG	1:A:473:THR:CG2	2.46	0.46
1:A:766:GLN:O	1:A:770:LEU:HG	2.16	0.46
1:A:782:ILE:HG23	1:A:801:GLU:HG3	1.97	0.46
1:A:857:ALA:HB1	1:A:858:LYS:HA	1.96	0.45
1:A:857:ALA:CB	1:A:858:LYS:HA	2.46	0.45
1:A:214:LYS:HG3	1:A:279:MET:HG3	1.98	0.45
1:A:859:ALA:HA	1:A:860:PRO:HD3	1.89	0.44
1:A:496:TYR:HB3	1:A:529:LEU:HD13	2.00	0.44
1:A:200:LYS:HE2	1:A:212:LYS:O	2.17	0.44
1:A:668:GLU:OE1	1:A:686:GLY:HA3	2.17	0.44
1:A:466:LYS:HE3	1:A:466:LYS:HB3	1.89	0.44
1:A:268:ILE:HG22	1:A:269:MET:HG2	2.00	0.44
1:A:572:MET:HA	1:A:606:ASN:HD21	1.82	0.44
1:A:608:LEU:HG	1:A:656:TYR:HE2	1.83	0.43
1:A:565:ASN:HD21	1:A:568:GLY:N	2.13	0.43
1:A:601:GLU:OE2	2:A:1909:NOK:N5	2.51	0.43
1:A:696:GLU:HG2	5:A:2285:HOH:O	2.18	0.43
1:A:407:LEU:HB3	1:A:465:GLN:NE2	2.34	0.43
1:A:332:ASP:OD2	1:A:395:HIS:NE2	2.49	0.42
1:A:31:GLU:HG2	1:A:32:GLY:N	2.33	0.42
1:A:199:ILE:O	1:A:203:VAL:HG23	2.20	0.42
1:A:372:MET:CE	1:A:375:PHE:HB3	2.50	0.42
1:A:239:VAL:HG21	1:A:256:TYR:CZ	2.54	0.42
1:A:643:GLU:HA	1:A:646:GLU:HG2	2.02	0.41
1:A:371:ASN:HB3	1:A:433:TRP:CD2	2.54	0.41
1:A:672:ASN:HA	1:A:838:TYR:CD1	2.56	0.41
1:A:847:ASN:HD22	1:A:847:ASN:HA	1.69	0.41
1:A:297:ALA:O	1:A:298:LEU:HB2	2.20	0.41
1:A:575:ALA:O	1:A:579:LEU:HG	2.20	0.41
1:A:426:GLN:HB3	1:A:443:LYS:HD2	2.02	0.41
1:A:382:ASP:O	1:A:386:GLN:HG3	2.21	0.41
1:A:96:ALA:HB1	1:A:129:ALA:HB2	2.02	0.41
1:A:246:GLY:HA3	1:A:401:PHE:HA	2.03	0.40
1:A:565:ASN:ND2	1:A:568:GLY:H	2.16	0.40
1:A:96:ALA:HB2	1:A:106:ILE:HD13	2.03	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	883/891 (99%)	850 (96%)	31 (4%)	2 (0%)	56 70

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	298	LEU
1	A	908	ASP

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	761/767 (99%)	721 (95%)	40 (5%)	32 39

All (40) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	27	VAL
1	A	31	GLU
1	A	33	VAL
1	A	54	LEU
1	A	155	LYS
1	A	161	LEU
1	A	165	LYS
1	A	166	LYS
1	A	209	ARG
1	A	214	LYS
1	A	220	ARG
1	A	223	LEU

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Mol	Chain	Res	Type
1	A	247	VAL
1	A	295	ARG
1	A	341	ARG
1	A	379	LEU
1	A	394	MET
1	A	397	ARG
1	A	442	LEU
1	A	524	ASN
1	A	529	LEU
1	A	541	PHE
1	A	556	LEU
1	A	565	ASN
1	A	605	THR
1	A	608	LEU
1	A	613	LEU
1	A	615	ASP
1	A	645	LEU
1	A	691	VAL
1	A	709	ASP
1	A	721	PHE
1	A	764	LYS
1	A	792	SER
1	A	811	TRP
1	A	847	ASN
1	A	853	LEU
1	A	869	TYR
1	A	894	LEU
1	A	908	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	84	ASN
1	A	146	ASN
1	A	192	ASN
1	A	201	ASN
1	A	262	ASN
1	A	325	ASN
1	A	386	GLN
1	A	423	GLN
1	A	426	GLN
1	A	455	GLN

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Mol	Chain	Res	Type
1	A	465	GLN
1	A	474	ASN
1	A	506	HIS
1	A	518	GLN
1	A	523	ASN
1	A	549	ASN
1	A	565	ASN
1	A	622	GLN
1	A	687	HIS
1	A	727	GLN
1	A	745	ASN
1	A	746	ASN
1	A	847	ASN
1	A	873	ASN
1	A	888	ASN

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 ⓘ

Of 4 ligands modelled in this entry, 1 is monoatomic - leaving 3 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NOK	A	1909	-	14,14,14	0.86	0	19,19,19	1.00	1 (5%)
3	GOL	A	1910	-	5,5,5	0.35	0	5,5,5	0.26	0
3	GOL	A	1911	-	5,5,5	0.40	0	5,5,5	0.59	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NOK	A	1909	-	-	0/6/23/23	0/1/1/1
3	GOL	A	1910	-	-	0/4/4/4	0/0/0/0
3	GOL	A	1911	-	-	0/4/4/4	0/0/0/0

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1909	NOK	C1-N5-C5	2.61	115.26	110.79

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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	883/891 (99%)	-0.22	11 (1%) 75 79	20, 34, 47, 55	19 (2%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	857	ALA	4.4
1	A	855	GLY	3.1
1	A	858	LYS	3.0
1	A	908	ASP	2.9
1	A	278	THR	2.6
1	A	163	GLU	2.5
1	A	32	GLY	2.4
1	A	748	ASN	2.3
1	A	791	ASP	2.3
1	A	591	GLU	2.2
1	A	164	VAL	2.1

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 ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains.

The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(Å ²)	Q<0.9
3	GOL	A	1910	6/6	0.31	6.58	49,53,54,54	0
3	GOL	A	1911	6/6	0.28	3.76	44,48,49,51	0
2	NOK	A	1909	14/14	0.13	0.93	24,25,27,28	0
4	CA	A	1912	1/1	0.08	-1.46	34,34,34,34	0

6.5 Other polymers ⓘ

There are no such residues in this entry.