



Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2017 – 02:31 PM EDT

PDB ID : 5WRR
Title : Crystal structure of Fam20A
Authors : Zhu, Q.
Deposited on : 2016-12-03
Resolution : 2.51 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20029077
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20029077

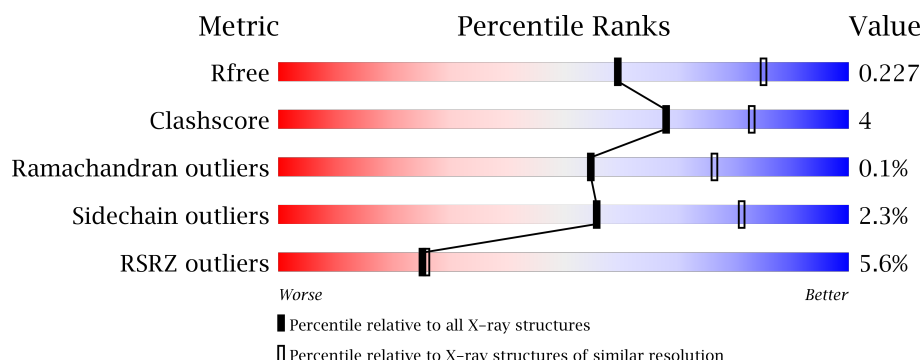
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.51 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}	100719	3846 (2.50-2.50)
Clashscore	112137	4554 (2.50-2.50)
Ramachandran outliers	110173	4463 (2.50-2.50)
Sidechain outliers	110143	4465 (2.50-2.50)
RSRZ outliers	101464	3876 (2.50-2.50)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	438	<div> <div>5%</div> <div>86%</div> <div>12%</div> <div>.</div> </div>
1	B	438	<div> <div>7%</div> <div>87%</div> <div>11%</div> <div>.</div> </div>

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 7137 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.

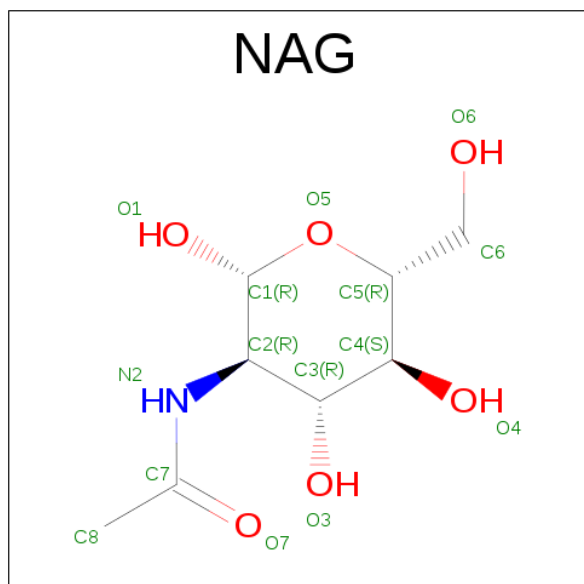
- Molecule 1 is a protein called Pseudokinase FAM20A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	431	Total	C	N	O	S	0	0	0
			3494	2234	615	624	21			
1	B	438	Total	C	N	O	S	0	0	0
			3545	2267	623	634	21			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	332	LYS	ASN	engineered mutation	UNP Q96MK3
B	332	LYS	ASN	engineered mutation	UNP Q96MK3

- Molecule 2 is N-ACETYL-D-GLUCOSAMINE (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			14	8	1	5		

Continued on next page...

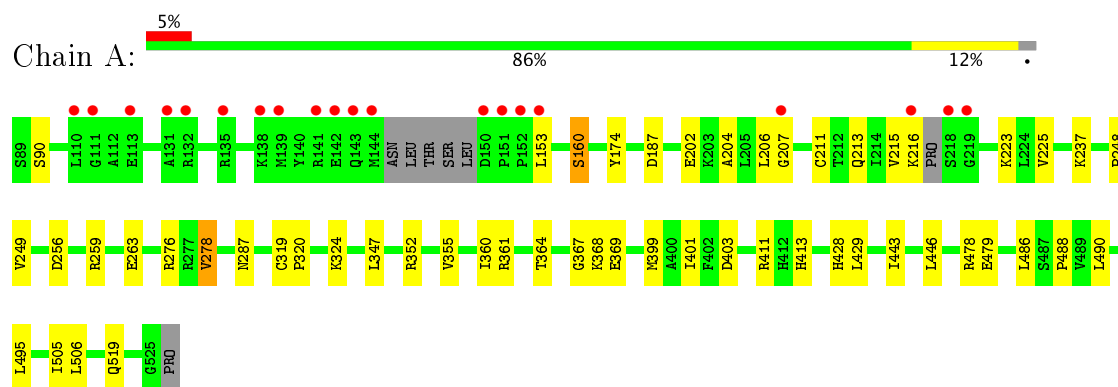
Continued from previous page...

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		

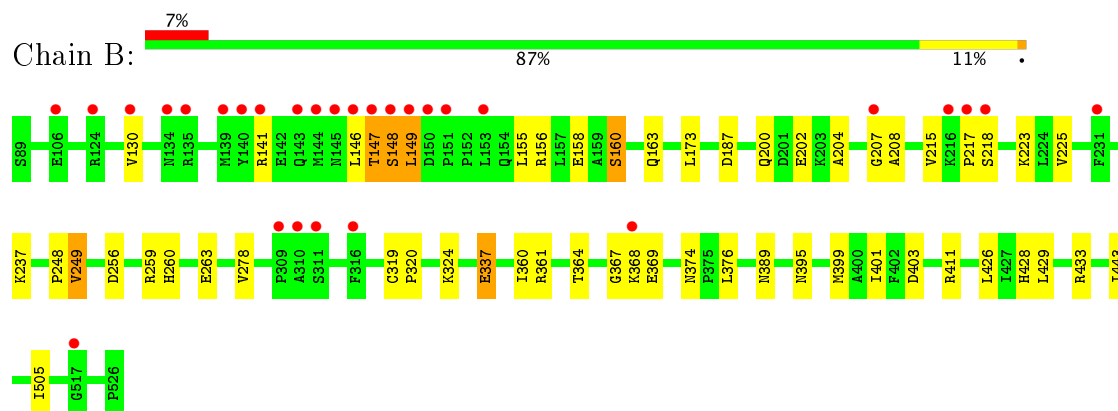
3 Residue-property plots [i](#)

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: Pseudokinase FAM20A



• Molecule 1: Pseudokinase FAM20A



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	156.85Å 156.85Å 143.66Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.14 – 2.51 39.14 – 2.51	Depositor EDS
% Data completeness (in resolution range)	99.8 (39.14-2.51) 92.8 (39.14-2.51)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.17 (at 2.51Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, R_{free}	0.215 , 0.231 0.205 , 0.227	Depositor DCC
R_{free} test set	1859 reflections (2.85%)	DCC
Wilson B-factor (Å ²)	52.3	Xtriage
Anisotropy	0.755	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 49.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.022 for -h,-k,l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7137	wwPDB-VP
Average B, all atoms (Å ²)	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.92% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAG

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	0.24	0/3578	0.43	0/4842
1	B	0.25	0/3633	0.43	0/4923
All	All	0.24	0/7211	0.43	0/9765

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	3494	0	3475	31	0
1	B	3545	0	3531	36	0
2	A	56	0	50	2	0
2	B	42	0	38	1	0
All	All	7137	0	7094	62	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 4.

All (62) 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:204:ALA:HB1	1:B:204:ALA:HB1	1.58	0.86
1:B:369:GLU:HG2	1:B:374:ASN:HD22	1.46	0.81
1:B:360:ILE:HG23	1:B:361:ARG:HG2	1.76	0.68
1:A:174:TYR:O	1:A:276:ARG:NH1	2.25	0.68
1:A:360:ILE:HG23	1:A:361:ARG:HG2	1.79	0.65
1:A:278:VAL:HG12	1:A:428:HIS:HB2	1.82	0.60
1:B:248:PRO:HG2	1:B:324:LYS:HB3	1.82	0.60
1:A:202:GLU:OE2	1:A:223:LYS:NZ	2.34	0.60
1:A:401:ILE:HG23	1:A:505:ILE:HD13	1.84	0.59
1:B:401:ILE:HG23	1:B:505:ILE:HD13	1.86	0.57
1:B:237:LYS:NZ	1:B:263:GLU:OE2	2.31	0.57
1:B:256:ASP:HB2	1:B:259:ARG:HB2	1.88	0.55
1:B:260:HIS:NE2	1:B:337:GLU:OE2	2.37	0.55
1:B:147:THR:O	1:B:149:LEU:N	2.38	0.54
1:B:141:ARG:HD3	1:B:148:SER:HA	1.91	0.53
1:B:278:VAL:HG12	1:B:428:HIS:HB2	1.90	0.52
1:B:141:ARG:HG2	1:B:146:LEU:O	2.09	0.52
1:A:213:GLN:HA	1:A:216:LYS:HE2	1.93	0.51
1:A:248:PRO:HD2	1:A:324:LYS:HB3	1.93	0.50
1:B:389:ASN:HB3	2:B:603:NAG:H82	1.93	0.50
1:B:160:SER:OG	1:B:187:ASP:OD2	2.30	0.50
1:A:367:GLY:HA3	1:A:368:LYS:HD2	1.94	0.49
1:B:367:GLY:HA3	1:B:368:LYS:HD2	1.95	0.48
1:B:202:GLU:OE1	1:B:223:LYS:NZ	2.37	0.47
1:A:90:SER:OG	1:A:479:GLU:OE2	2.19	0.47
1:A:443:ILE:HD11	1:B:364:THR:HG21	1.97	0.47
1:B:207:GLY:HA3	1:B:208:ALA:HB3	1.96	0.46
1:A:367:GLY:HA2	1:A:368:LYS:HA	1.57	0.46
1:B:411:ARG:NH2	1:B:429:LEU:O	2.49	0.46
1:B:141:ARG:CZ	1:B:146:LEU:HG	2.45	0.46
1:A:403:ASP:OD2	1:A:411:ARG:HD2	2.16	0.46
1:A:399:MET:SD	1:A:411:ARG:HD3	2.56	0.46
1:B:399:MET:SD	1:B:411:ARG:HD3	2.57	0.45
1:B:395:ASN:HB3	1:B:426:LEU:HG	1.99	0.45
1:B:319:CYS:HB3	1:B:320:PRO:HD3	1.99	0.45
1:A:478:ARG:HB2	1:A:495:LEU:HD13	1.99	0.44
1:A:413:HIS:NE2	1:B:215:VAL:O	2.50	0.44
1:A:488:PRO:O	1:A:490:LEU:N	2.45	0.44
1:A:256:ASP:HB2	1:A:259:ARG:HB2	1.99	0.44
1:A:446:LEU:HD11	1:A:505:ILE:HG12	1.99	0.44
1:B:367:GLY:HA2	1:B:368:LYS:HA	1.58	0.43
1:A:411:ARG:NH2	1:A:429:LEU:O	2.49	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:130:VAL:HG21	1:B:155:LEU:HB2	2.00	0.42
1:A:237:LYS:NZ	1:A:263:GLU:OE2	2.45	0.42
2:A:603:NAG:O3	2:A:604:NAG:H83	2.20	0.42
1:A:413:HIS:HE1	1:B:217:PRO:HD3	1.85	0.42
1:A:206:LEU:HA	1:A:207:GLY:HA3	1.81	0.41
1:A:211:CYS:O	1:A:215:VAL:HG23	2.20	0.41
1:B:141:ARG:HE	1:B:147:THR:C	2.23	0.41
1:B:374:ASN:OD1	1:B:376:LEU:HB2	2.19	0.41
1:A:364:THR:HG21	1:B:443:ILE:HD11	2.01	0.41
1:A:287:ASN:HD22	2:A:601:NAG:H83	1.86	0.41
1:A:319:CYS:HB3	1:A:320:PRO:HD3	2.02	0.40
1:A:347:LEU:HD21	1:A:352:ARG:HE	1.86	0.40
1:A:355:VAL:HG22	1:B:249:VAL:HG22	2.03	0.40
1:B:156:ARG:HB3	1:B:158:GLU:OE1	2.20	0.40
1:B:403:ASP:OD2	1:B:411:ARG:HD2	2.21	0.40
1:A:160:SER:OG	1:A:187:ASP:OD2	2.35	0.40
1:B:141:ARG:NE	1:B:148:SER:HA	2.36	0.40
1:B:256:ASP:OD2	1:B:259:ARG:HD3	2.22	0.40
1:A:446:LEU:HD23	1:A:446:LEU:HA	1.94	0.40
1:B:218:SER:HA	1:B:433:ARG:HD3	2.02	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	425/438 (97%)	413 (97%)	12 (3%)	0	100	100
1	B	436/438 (100%)	422 (97%)	13 (3%)	1 (0%)	51	73
All	All	861/876 (98%)	835 (97%)	25 (3%)	1 (0%)	55	76

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	148	SER

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	387/394 (98%)	378 (98%)	9 (2%)	56	81
1	B	394/394 (100%)	385 (98%)	9 (2%)	56	81
All	All	781/788 (99%)	763 (98%)	18 (2%)	56	81

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	153	LEU
1	A	160	SER
1	A	225	VAL
1	A	249	VAL
1	A	278	VAL
1	A	369	GLU
1	A	486	LEU
1	A	506	LEU
1	A	519	GLN
1	B	147	THR
1	B	149	LEU
1	B	160	SER
1	B	163	GLN
1	B	173	LEU
1	B	200	GLN
1	B	225	VAL
1	B	249	VAL
1	B	337	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 ⓘ

7 ligands are modelled in this entry.

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	NAG	A	601	1,2	14,14,15	0.34	0	15,19,21	0.53	0
2	NAG	A	602	2	14,14,15	0.34	0	15,19,21	0.63	0
2	NAG	A	603	1,2	14,14,15	0.20	0	15,19,21	0.58	0
2	NAG	A	604	2	14,14,15	0.40	0	15,19,21	0.49	0
2	NAG	B	601	1,2	14,14,15	0.29	0	15,19,21	0.79	0
2	NAG	B	602	2	14,14,15	1.10	1 (7%)	15,19,21	1.49	1 (6%)
2	NAG	B	603	1	14,14,15	0.26	0	15,19,21	0.90	1 (6%)

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	NAG	A	601	1,2	-	0/6/23/26	0/1/1/1
2	NAG	A	602	2	-	0/6/23/26	0/1/1/1
2	NAG	A	603	1,2	-	0/6/23/26	0/1/1/1

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	A	604	2	-	0/6/23/26	0/1/1/1
2	NAG	B	601	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	602	2	-	0/6/23/26	0/1/1/1
2	NAG	B	603	1	-	0/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	602	NAG	O5-C1	4.01	1.50	1.43

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	603	NAG	C1-O5-C5	3.12	116.47	112.17
2	B	602	NAG	C1-O5-C5	5.46	119.69	112.17

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	NAG	1	0
2	A	603	NAG	1	0
2	A	604	NAG	1	0
2	B	603	NAG	1	0

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 ⓘ

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	431/438 (98%)	0.19	20 (4%)	33 35	45, 67, 121, 178	0
1	B	438/438 (100%)	0.39	29 (6%)	19 19	51, 71, 123, 185	0
All	All	869/876 (99%)	0.29	49 (5%)	25 26	45, 69, 122, 185	0

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	144	MET	11.1
1	B	149	LEU	10.9
1	B	217	PRO	8.1
1	B	146	LEU	7.7
1	B	148	SER	6.3
1	A	139	MET	5.0
1	A	151	PRO	4.9
1	A	150	ASP	4.7
1	B	147	THR	4.7
1	B	143	GLN	4.4
1	A	218	SER	4.4
1	A	216	LYS	4.2
1	B	218	SER	4.1
1	A	138	LYS	4.1
1	B	216	LYS	4.1
1	B	145	ASN	3.9
1	B	141	ARG	3.7
1	B	207	GLY	3.6
1	B	140	TYR	3.4
1	A	142	GLU	3.4
1	A	144	MET	3.4
1	B	231	PHE	3.4
1	B	368	LYS	3.3
1	B	310	ALA	3.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	309	PRO	3.3
1	A	153	LEU	3.0
1	A	143	GLN	3.0
1	B	517	GLY	3.0
1	A	111	GLY	2.7
1	B	124	ARG	2.7
1	A	135	ARG	2.7
1	B	150	ASP	2.7
1	A	219	GLY	2.7
1	B	134	ASN	2.6
1	A	110	LEU	2.6
1	B	106	GLU	2.6
1	B	151	PRO	2.6
1	B	153	LEU	2.5
1	A	141	ARG	2.4
1	B	311	SER	2.3
1	A	131	ALA	2.3
1	A	207	GLY	2.3
1	B	135	ARG	2.3
1	B	139	MET	2.2
1	A	132	ARG	2.2
1	A	152	PRO	2.2
1	A	113	GLU	2.1
1	B	130	VAL	2.1
1	B	316	PHE	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	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	NAG	B	601	14/15	0.91	0.15	-0.12	91,97,107,116	0
2	NAG	A	601	14/15	0.94	0.12	-1.05	71,81,95,98	0
2	NAG	B	602	14/15	0.80	0.26	-	116,131,139,141	0
2	NAG	A	604	14/15	0.66	0.51	-	127,148,154,155	0
2	NAG	A	603	14/15	0.66	0.27	-	101,116,132,139	0
2	NAG	A	602	14/15	0.88	0.25	-	79,101,117,124	0
2	NAG	B	603	14/15	0.60	0.29	-	119,130,141,144	0

6.5 Other polymers [i](#)

There are no such residues in this entry.