



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:54 PM UTC

PDB ID : 8BRE / pdb\_00008bre  
Title : 1,6-anhydro-n-actetylmuramic acid kinase (AnmK)  
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Deposited on : 2022-11-23  
Resolution : 2.00 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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

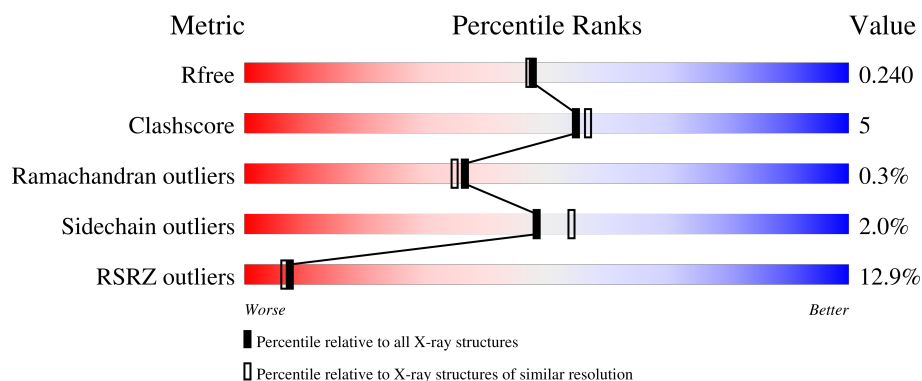
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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))
$R_{free}$	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	368	<div> <div>17%</div> <div>88%</div> <div>10% ..</div> </div>
1	B	368	<div> <div>8%</div> <div>85%</div> <div>10% • 5%</div> </div>

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 5588 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 Anhydro-N-acetylmuramic acid kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	363	Total	C	N	O	S	0	0	0
			2751	1731	497	507	16			
1	B	351	Total	C	N	O	S	0	0	0
			2662	1680	475	491	16			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	GLY	-	expression tag	UNP Q9I5Q5
A	-3	ALA	-	expression tag	UNP Q9I5Q5
A	-2	GLY	-	expression tag	UNP Q9I5Q5
A	-1	ALA	-	expression tag	UNP Q9I5Q5
A	0	GLY	-	expression tag	UNP Q9I5Q5
B	-4	GLY	-	expression tag	UNP Q9I5Q5
B	-3	ALA	-	expression tag	UNP Q9I5Q5
B	-2	GLY	-	expression tag	UNP Q9I5Q5
B	-1	ALA	-	expression tag	UNP Q9I5Q5
B	0	GLY	-	expression tag	UNP Q9I5Q5

- Molecule 2 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Cl	0	0
			1	1		
2	B	1	Total	Cl	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	93	Total	O	0	0
			93	93		

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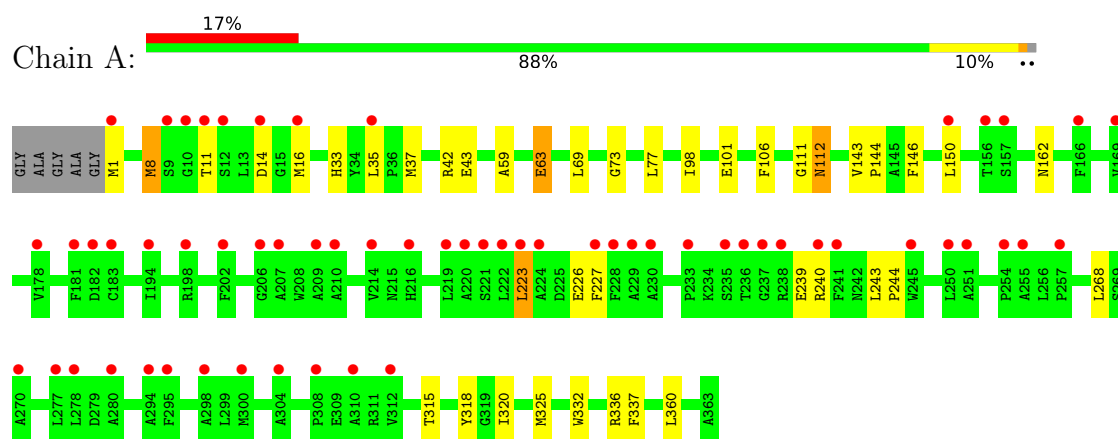
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	80	Total	O	0	0
			80	80		

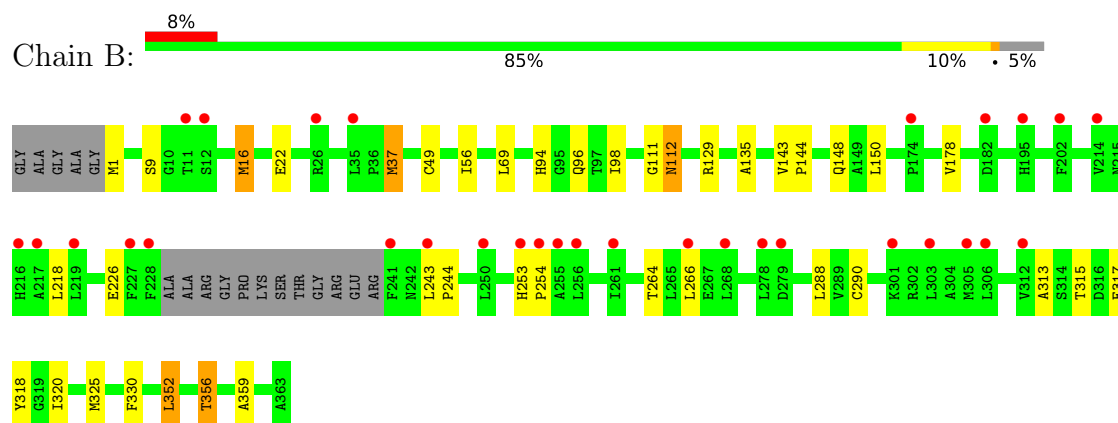
### 3 Residue-property plots [i](#)

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: Anhydro-N-acetylmuramic acid kinase



- Molecule 1: Anhydro-N-acetylmuramic acid kinase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	90.09Å 90.09Å 178.38Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.29 – 2.00 47.29 – 2.00	Depositor EDS
% Data completeness (in resolution range)	100.0 (47.29-2.00) 99.9 (47.29-2.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.65 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.8.0352	Depositor
R, $R_{free}$	0.178 , 0.212 0.201 , 0.240	Depositor DCC
$R_{free}$ test set	2667 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	41.9	Xtriage
Anisotropy	0.112	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 30.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.53$ , $\langle L^2 \rangle = 0.37$	Xtriage
Estimated twinning fraction	0.117 for h,-h-k,-l	Xtriage
Reported twinning fraction	0.575 for H, K, L 0.425 for -K, -H, -L	Depositor
Outliers	1 of 55167 reflections (0.002%)	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	5588	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.21% 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](#)

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

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	0.50	0/2816	0.88	0/3830
1	B	0.49	0/2725	0.86	1/3708 (0.0%)
All	All	0.50	0/5541	0.87	1/7538 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	356	THR	CB-CA-C	5.71	119.15	109.84

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	2751	0	2707	27	0
1	B	2662	0	2613	28	0
2	A	1	0	0	0	0
2	B	1	0	0	1	0
3	A	93	0	0	4	0
3	B	80	0	0	1	0
All	All	5588	0	5320	52	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 5.

All (52) 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:325:MET:HG3	3:A:568:HOH:O	1.92	0.69
1:B:135:ALA:O	1:B:352:LEU:HD13	1.99	0.62
1:B:9:SER:OG	1:B:96:GLN:NE2	2.33	0.61
1:A:240:ARG:NH1	3:A:502:HOH:O	2.34	0.61
1:B:129:ARG:NH2	2:B:401:CL:CL	2.68	0.61
1:B:288:LEU:HD22	1:B:318:TYR:CE1	2.36	0.60
1:A:33:HIS:HB2	1:A:77:LEU:HD13	1.81	0.60
1:B:148:GLN:HB2	1:B:178:VAL:HG21	1.86	0.57
1:B:111:GLY:O	1:B:112:ASN:C	2.47	0.57
1:B:143:VAL:N	1:B:144:PRO:CD	2.68	0.57
1:A:315:THR:HG21	1:A:325:MET:HE3	1.88	0.54
1:A:143:VAL:N	1:A:144:PRO:CD	2.71	0.54
1:A:59:ALA:O	1:A:63:GLU:HB3	2.08	0.54
1:A:162:ASN:ND2	3:A:503:HOH:O	2.40	0.53
1:B:150:LEU:CD1	1:B:325:MET:HE1	2.38	0.53
1:A:42:ARG:NH2	1:A:43:GLU:OE2	2.42	0.53
1:A:101:GLU:HG3	1:A:106:PHE:CZ	2.45	0.52
1:A:337:PHE:CD1	1:A:337:PHE:C	2.87	0.52
1:B:313:ALA:HB1	1:B:317:GLU:HG3	1.92	0.51
1:A:98:ILE:HD12	1:B:56:ILE:HD13	1.95	0.48
1:B:9:SER:HB2	3:B:550:HOH:O	2.14	0.48
1:B:16:MET:HE3	1:B:16:MET:HB2	1.82	0.48
1:A:16:MET:HE3	1:A:69:LEU:HD23	1.96	0.48
1:A:37:MET:HE3	1:A:37:MET:HB2	1.79	0.46
1:A:243:LEU:HB3	1:A:244:PRO:HD3	1.98	0.46
1:A:35:LEU:HD11	1:A:73:GLY:HA3	1.98	0.45
1:A:106:PHE:HA	3:A:578:HOH:O	2.16	0.45
1:A:111:GLY:O	1:A:112:ASN:C	2.60	0.45
1:A:223:LEU:HD12	1:A:268:LEU:HD12	1.99	0.44
1:B:49:CYS:HA	1:B:98:ILE:O	2.18	0.43
1:B:143:VAL:N	1:B:144:PRO:HD2	2.32	0.43
1:B:1:MET:HE3	1:B:22:GLU:OE2	2.18	0.43
1:B:37:MET:HE2	1:B:37:MET:HB2	1.81	0.43
1:A:8:MET:HE2	1:A:8:MET:HB2	1.79	0.43
1:B:94:HIS:HD2	1:B:330:PHE:CE1	2.36	0.43
1:A:98:ILE:HD12	1:B:56:ILE:CD1	2.49	0.42
1:B:16:MET:HE3	1:B:69:LEU:HD23	2.00	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:146:PHE:CE2	1:A:150:LEU:HD11	2.55	0.42
1:A:360:LEU:O	1:B:359:ALA:HA	2.19	0.42
1:B:266:LEU:O	1:B:266:LEU:HD23	2.19	0.42
1:A:239:GLU:O	1:A:240:ARG:C	2.62	0.42
1:B:290:CYS:CB	1:B:325:MET:HG3	2.50	0.42
1:B:288:LEU:HB3	1:B:315:THR:HG22	2.02	0.42
1:B:320:ILE:HG21	1:B:325:MET:CE	2.49	0.42
1:B:253:HIS:HB3	1:B:254:PRO:HD2	2.02	0.42
1:B:288:LEU:HD23	1:B:288:LEU:N	2.35	0.41
1:A:226:GLU:O	1:A:227:PHE:C	2.64	0.41
1:B:243:LEU:HB3	1:B:244:PRO:HD3	2.02	0.41
1:A:332:TRP:CZ2	1:A:336:ARG:HD3	2.55	0.41
1:B:218:LEU:HD23	1:B:264:THR:HG21	2.02	0.41
1:A:318:TYR:CD1	1:A:318:TYR:N	2.89	0.41
1:A:150:LEU:HD13	1:A:320:ILE:CD1	2.52	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	361/368 (98%)	348 (96%)	12 (3%)	1 (0%)	36	35
1	B	347/368 (94%)	339 (98%)	7 (2%)	1 (0%)	36	35
All	All	708/736 (96%)	687 (97%)	19 (3%)	2 (0%)	36	35

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	112	ASN
1	B	112	ASN

### 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	280/280 (100%)	274 (98%)	6 (2%)	47	52
1	B	272/280 (97%)	267 (98%)	5 (2%)	51	58
All	All	552/560 (99%)	541 (98%)	11 (2%)	48	54

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	8	MET
1	A	11	THR
1	A	14	ASP
1	A	63	GLU
1	A	223	LEU
1	B	16	MET
1	B	37	MET
1	B	226	GLU
1	B	352	LEU
1	B	356	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	23	GLN
1	A	96	GLN
1	A	162	ASN
1	A	195	HIS
1	B	72	GLN
1	B	96	GLN
1	B	168	ASN

### 5.3.3 RNA ⓘ

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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 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, 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	363/368 (98%)	0.96	61 (16%) <b>4</b> <b>4</b>	29, 52, 88, 111	0
1	B	351/368 (95%)	0.77	31 (8%) <b>15</b> <b>14</b>	30, 52, 82, 113	0
All	All	714/736 (97%)	0.87	92 (12%) <b>7</b> <b>6</b>	29, 52, 87, 113	0

All (92) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	236	THR	4.7
1	A	11	THR	4.7
1	A	10	GLY	4.2
1	A	228	PHE	4.1
1	A	181	PHE	3.9
1	B	11	THR	3.8
1	A	202	PHE	3.7
1	A	14	ASP	3.6
1	B	214	VAL	3.6
1	A	245	TRP	3.5
1	A	237	GLY	3.5
1	A	166	PHE	3.4
1	A	241	PHE	3.4
1	A	278	LEU	3.4
1	A	224	ALA	3.3
1	B	256	LEU	3.3
1	B	228	PHE	3.3
1	A	254	PRO	3.3
1	A	9	SER	3.2
1	B	305	MET	3.2
1	A	182	ASP	3.2
1	A	223	LEU	3.2
1	B	12	SER	3.2
1	A	183	CYS	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	229	ALA	3.1
1	A	220	ALA	3.0
1	A	298	ALA	3.0
1	A	240	ARG	2.9
1	B	303	LEU	2.9
1	A	308	PRO	2.9
1	A	255	ALA	2.9
1	A	210	ALA	2.8
1	A	35	LEU	2.8
1	B	255	ALA	2.7
1	B	312	VAL	2.7
1	B	266	LEU	2.7
1	A	295	PHE	2.6
1	B	227	PHE	2.6
1	B	241	PHE	2.6
1	A	194	ILE	2.5
1	B	253	HIS	2.5
1	A	12	SER	2.5
1	B	202	PHE	2.5
1	B	216	HIS	2.5
1	A	233	PRO	2.5
1	A	294	ALA	2.5
1	B	254	PRO	2.5
1	A	157	SER	2.5
1	A	277	LEU	2.5
1	A	16	MET	2.5
1	A	227	PHE	2.5
1	A	209	ALA	2.4
1	A	304	ALA	2.4
1	A	312	VAL	2.4
1	B	35	LEU	2.4
1	A	235	SER	2.4
1	B	278	LEU	2.3
1	A	206	GLY	2.3
1	A	1	MET	2.3
1	A	221	SER	2.3
1	A	310	ALA	2.3
1	A	178	VAL	2.3
1	A	238	ARG	2.3
1	B	26	ARG	2.3
1	A	216	HIS	2.2
1	B	174	PRO	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	306	LEU	2.2
1	B	219	LEU	2.2
1	A	214	VAL	2.2
1	B	217	ALA	2.2
1	A	150	LEU	2.2
1	A	207	ALA	2.1
1	A	219	LEU	2.1
1	A	300	MET	2.1
1	A	257	PRO	2.1
1	A	169	VAL	2.1
1	A	230	ALA	2.1
1	A	222	LEU	2.1
1	B	279	ASP	2.1
1	A	198	ARG	2.1
1	B	261	ILE	2.1
1	B	182	ASP	2.1
1	A	156	THR	2.1
1	B	195	HIS	2.1
1	B	301	LYS	2.1
1	A	251	ALA	2.1
1	A	270	ALA	2.1
1	A	280	ALA	2.1
1	A	250	LEU	2.0
1	B	268	LEU	2.0
1	B	243	LEU	2.0
1	B	250	LEU	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](#)

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. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	B-factors( $\text{\AA}^2$ )	Q<0.9
2	CL	A	401	1/1	0.90	0.21	69,69,69,69	0
2	CL	B	401	1/1	0.96	0.17	68,68,68,68	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.