



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:03 AM UTC

PDB ID : 2R8Q / pdb_00002r8q
Title : Structure of LmjPDEB1 in complex with IBMX
Authors : Wang, H.; Yan, Z.; Geng, J.; Kunz, S.; Seebeck, T.; Ke, H.
Deposited on : 2007-09-11
Resolution : 1.50 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

<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>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
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

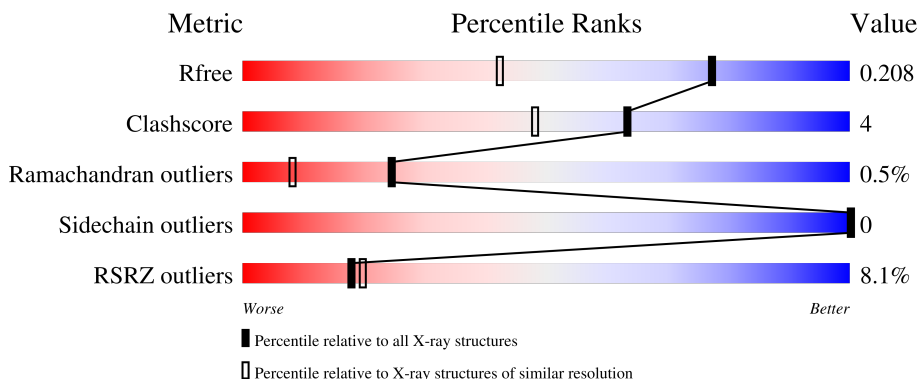
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.50 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	4037 (1.50-1.50)
Clashscore	190562	4235 (1.50-1.50)
Ramachandran outliers	187476	4153 (1.50-1.50)
Sidechain outliers	187428	4150 (1.50-1.50)
RSRZ outliers	180081	4039 (1.50-1.50)

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 ≥ 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	359	
1	B	359	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 5857 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 Class I phosphodiesterase PDEB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	335	Total	C	N	O	S	0	0	0
			2660	1686	453	504	17			
1	B	335	Total	C	N	O	S	0	0	0
			2660	1686	453	504	17			

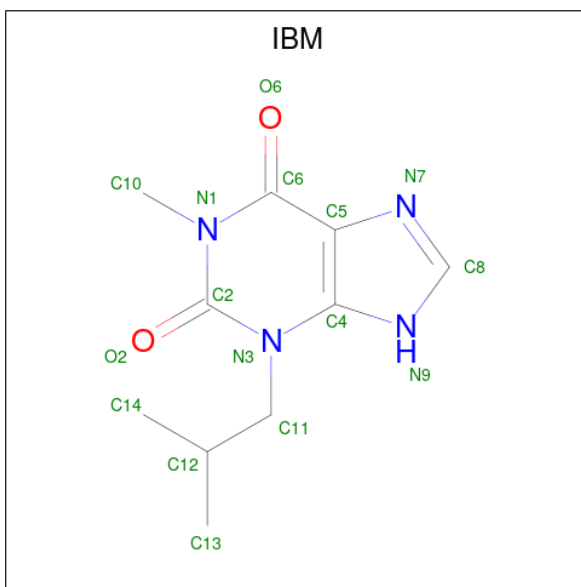
- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		
3	B	1	Total	Mg	0	0
			1	1		

- Molecule 4 is 3-ISOBUTYL-1-METHYLYXANTHINE (CCD ID: IBM) (formula: C₁₀H₁₄N₄O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			16	10	4	2		
4	B	1	Total	C	N	O	0	0
			16	10	4	2		

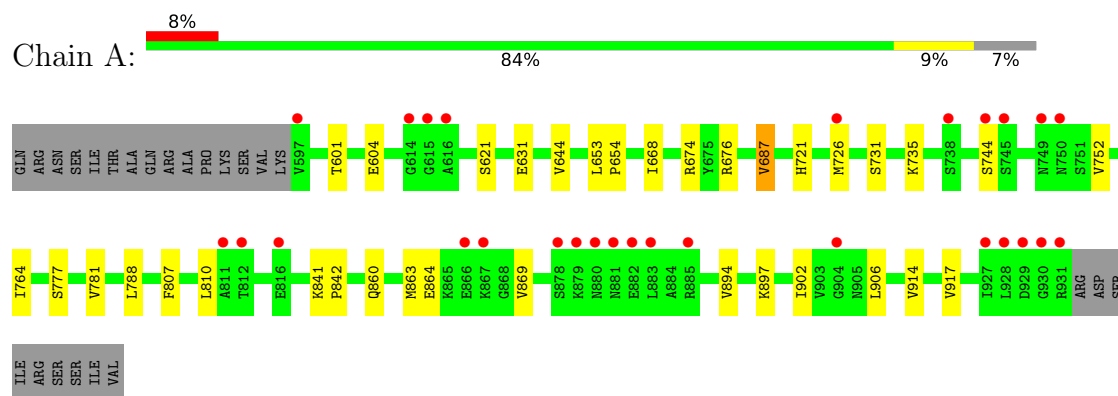
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	267	Total	O	0	0
			267	267		
5	B	234	Total	O	0	0
			234	234		

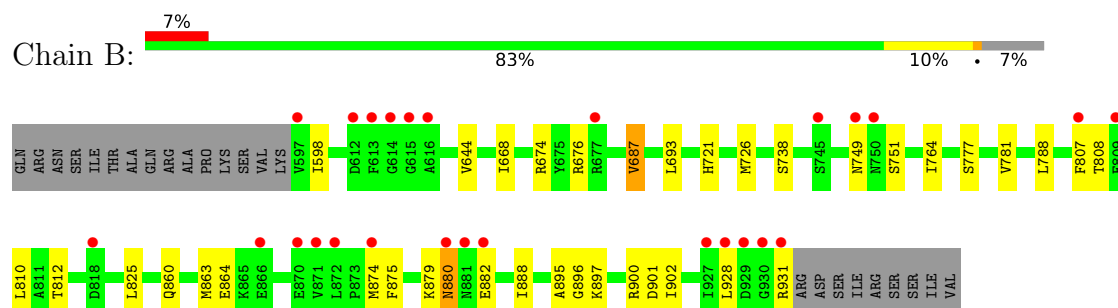
3 Residue-property plots [i](#)

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: Class I phosphodiesterase PDEB1



• Molecule 1: Class I phosphodiesterase PDEB1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	63.75Å 78.69Å 70.51Å 90.00° 92.46° 90.00°	Depositor
Resolution (Å)	30.00 – 1.50 30.00 – 1.50	Depositor EDS
% Data completeness (in resolution range)	(Not available) (30.00-1.50) 88.2 (30.00-1.50)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.27 (at 1.50Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.190 , 0.208 0.190 , 0.208	Depositor DCC
R_{free} test set	10050 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å ²)	17.8	Xtriage
Anisotropy	0.330	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 32.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.024 for h,-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5857	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.28% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: IBM, MG, ZN

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	0.32	0/2718	0.81	3/3681 (0.1%)
1	B	0.32	0/2718	0.78	3/3681 (0.1%)
All	All	0.32	0/5436	0.79	6/7362 (0.1%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	721	HIS	N-CA-C	7.09	121.03	112.38
1	A	721	HIS	N-CA-C	7.08	121.01	112.38
1	B	895	ALA	N-CA-C	6.55	118.08	111.07
1	A	687	VAL	N-CA-C	-5.46	105.21	110.72
1	A	621	SER	N-CA-C	5.44	116.92	110.07
1	B	687	VAL	N-CA-C	-5.06	105.61	110.72

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	2660	0	2577	20	0
1	B	2660	0	2577	22	0
2	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	16	0	14	0	0
4	B	16	0	14	0	0
5	A	267	0	0	2	0
5	B	234	0	0	1	0
All	All	5857	0	5182	42	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 (42) 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:B:674:ARG:HD2	1:B:764:ILE:HD11	1.62	0.82
1:A:676:ARG:NH1	1:A:726:MET:HG2	2.00	0.75
1:A:676:ARG:CZ	1:A:726:MET:HG2	2.25	0.65
1:A:731:SER:OG	1:A:735:LYS:HE3	1.96	0.65
1:B:749:ASN:HD21	1:B:751:SER:HB2	1.63	0.63
1:A:674:ARG:HD2	1:A:764:ILE:HD11	1.82	0.62
1:B:860:GLN:HA	1:B:863:MET:HE3	1.82	0.61
1:A:601:THR:OG1	1:A:604:GLU:HG3	2.02	0.59
1:B:598:ILE:HD12	1:B:598:ILE:N	2.19	0.57
1:B:807:PHE:CE2	1:B:902:ILE:HA	2.40	0.57
1:A:744:SER:OG	1:A:752:VAL:HG22	2.07	0.54
1:B:644:VAL:HG13	1:B:687:VAL:HG13	1.91	0.53
1:A:897:LYS:HD3	5:A:1161:HOH:O	2.09	0.52
1:A:644:VAL:HG23	1:A:668:ILE:HD13	1.92	0.51
1:A:631:GLU:HG3	5:A:1061:HOH:O	2.10	0.50
1:B:810:LEU:HD22	1:B:825:LEU:HD23	1.94	0.50
1:B:874:MET:HG3	1:B:875:PHE:CD1	2.47	0.49
1:B:882:GLU:OE2	1:B:931:ARG:HD3	2.12	0.49
1:B:896:GLY:O	1:B:900:ARG:HG3	2.13	0.49
1:B:860:GLN:O	1:B:864:GLU:HG3	2.14	0.47
1:B:897:LYS:HE2	1:B:901:ASP:OD2	2.16	0.46
1:B:777:SER:O	1:B:781:VAL:HG23	2.15	0.46
1:A:860:GLN:HA	1:A:863:MET:HE3	1.99	0.45
1:A:860:GLN:O	1:A:864:GLU:HG3	2.17	0.45
1:A:807:PHE:CE2	1:A:902:ILE:HA	2.52	0.44
1:A:644:VAL:HG13	1:A:687:VAL:HG13	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:788:LEU:C	1:B:788:LEU:HD23	2.43	0.44
1:A:788:LEU:C	1:A:788:LEU:HD23	2.43	0.44
1:B:644:VAL:HG23	1:B:668:ILE:HD13	2.01	0.43
1:B:888:ILE:HD12	1:B:928:LEU:HD11	2.00	0.43
1:B:676:ARG:NH1	1:B:726:MET:SD	2.92	0.43
1:B:879:LYS:O	1:B:880:ASN:C	2.63	0.42
1:A:777:SER:O	1:A:781:VAL:HG23	2.19	0.42
1:B:738:SER:HB3	5:B:1088:HOH:O	2.19	0.42
1:A:653:LEU:HB2	1:A:654:PRO:HD3	2.02	0.41
1:A:807:PHE:O	1:A:810:LEU:HB3	2.20	0.41
1:A:841:LYS:O	1:A:842:PRO:C	2.63	0.41
1:B:808:THR:O	1:B:812:THR:HG23	2.20	0.41
1:A:864:GLU:HB3	1:A:869:VAL:HG23	2.03	0.41
1:B:888:ILE:HD12	1:B:928:LEU:CD1	2.51	0.41
1:A:914:VAL:O	1:A:917:VAL:HG12	2.21	0.40
1:B:693:LEU:HD23	1:B:693:LEU:HA	1.94	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	333/359 (93%)	327 (98%)	4 (1%)	2 (1%)	21	6
1	B	333/359 (93%)	327 (98%)	5 (2%)	1 (0%)	36	17
All	All	666/718 (93%)	654 (98%)	9 (1%)	3 (0%)	24	8

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	880	ASN
1	A	906	LEU

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Mol	Chain	Res	Type
1	A	894	VAL

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	287/309 (93%)	287 (100%)	0	100	100
1	B	287/309 (93%)	287 (100%)	0	100	100
All	All	574/618 (93%)	574 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	650	ASN
1	A	908	HIS
1	B	646	ASN
1	B	650	ASN
1	B	749	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry

Of 6 ligands modelled in this entry, 4 are monoatomic - leaving 2 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
4	IBM	B	3	-	17,17,17	1.01	1 (5%)	19,25,25	1.83	6 (31%)
4	IBM	A	3	-	17,17,17	1.03	1 (5%)	19,25,25	1.84	6 (31%)

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
4	IBM	B	3	-	-	0/4/4/4	0/2/2/2
4	IBM	A	3	-	-	2/4/4/4	0/2/2/2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	3	IBM	C5-C6	-2.66	1.39	1.45
4	B	3	IBM	C5-C6	-2.61	1.39	1.45

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	3	IBM	N3-C2-N1	4.21	121.91	116.72
4	B	3	IBM	N3-C2-N1	4.20	121.90	116.72
4	A	3	IBM	C6-N1-C2	-3.20	120.46	125.66
4	B	3	IBM	C6-N1-C2	-3.18	120.50	125.66
4	A	3	IBM	C11-N3-C2	2.55	122.86	117.67
4	B	3	IBM	C11-N3-C2	2.55	122.85	117.67
4	A	3	IBM	C5-C6-N1	2.32	119.30	115.02
4	B	3	IBM	C5-C6-N1	2.31	119.28	115.02
4	B	3	IBM	C12-C11-N3	-2.19	109.20	112.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	3	IBM	C12-C11-N3	-2.18	109.22	112.38
4	A	3	IBM	O2-C2-N3	-2.18	119.05	121.98
4	B	3	IBM	O2-C2-N3	-2.14	119.10	121.98

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	3	IBM	N3-C11-C12-C13
4	A	3	IBM	N3-C11-C12-C14

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, 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	335/359 (93%)	0.43	28 (8%) 17 18	13, 21, 35, 59	0
1	B	335/359 (93%)	0.47	26 (7%) 19 21	14, 20, 37, 64	0
All	All	670/718 (93%)	0.45	54 (8%) 18 20	13, 21, 36, 64	0

All (54) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	885	ARG	5.2
1	A	930	GLY	4.8
1	A	750	ASN	4.2
1	A	880	ASN	4.2
1	A	881	ASN	4.0
1	A	812	THR	3.7
1	B	882	GLU	3.7
1	A	616	ALA	3.6
1	A	928	LEU	3.5
1	B	930	GLY	3.5
1	B	616	ALA	3.5
1	B	745	SER	3.2
1	A	882	GLU	3.2
1	A	745	SER	3.2
1	A	866	GLU	3.1
1	A	597	VAL	3.1
1	A	726	MET	3.1
1	B	931	ARG	3.1
1	A	929	ASP	3.0
1	B	929	ASP	3.0
1	B	818	ASP	3.0
1	B	880	ASN	3.0
1	A	811	ALA	2.9
1	A	614	GLY	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	931	ARG	2.9
1	B	866	GLU	2.8
1	B	928	LEU	2.7
1	B	614	GLY	2.7
1	B	874	MET	2.7
1	B	809	GLU	2.6
1	A	615	GLY	2.6
1	B	615	GLY	2.6
1	A	927	ILE	2.6
1	A	878	SER	2.6
1	B	881	ASN	2.5
1	A	883	LEU	2.5
1	B	677	ARG	2.4
1	B	613	PHE	2.4
1	B	750	ASN	2.4
1	A	749	ASN	2.3
1	A	744	SER	2.3
1	B	870	GLU	2.3
1	A	879	LYS	2.2
1	A	816	GLU	2.1
1	B	807	PHE	2.1
1	B	597	VAL	2.1
1	B	927	ILE	2.1
1	A	867	LYS	2.1
1	B	612	ASP	2.1
1	B	749	ASN	2.1
1	A	904	GLY	2.0
1	B	871	VAL	2.0
1	B	872	LEU	2.0
1	A	738	SER	2.0

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 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, 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	B-factors(Å ²)	Q<0.9
4	IBM	A	3	16/16	0.74	0.18	50,51,52,53	0
4	IBM	B	3	16/16	0.82	0.12	30,33,38,38	0
3	MG	A	2	1/1	0.99	0.02	15,15,15,15	0
3	MG	B	2	1/1	1.00	0.03	14,14,14,14	0
2	ZN	B	1	1/1	1.00	0.02	17,17,17,17	0
2	ZN	A	1	1/1	1.00	0.02	16,16,16,16	0

6.5 Other polymers [i](#)

There are no such residues in this entry.