



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 18, 2026 – 04:46 PM UTC

PDB ID : 4I15 / pdb_00004i15
Title : Crystal structure of TbrPDEB1
Authors : Wang, H.; Ke, H.
Deposited on : 2012-11-20
Resolution : 1.65 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:

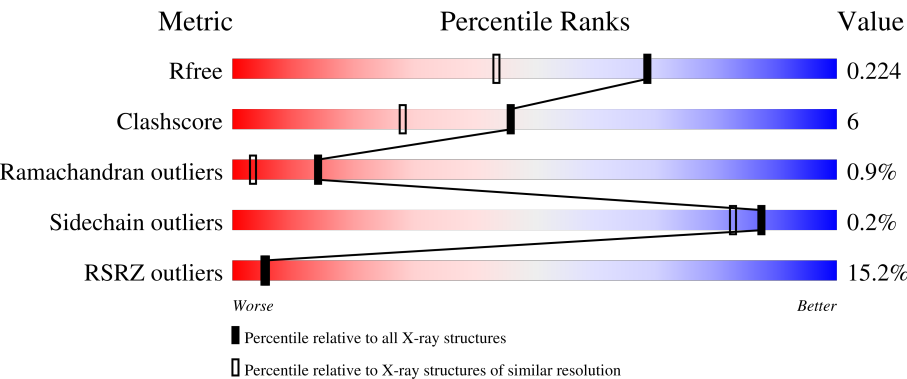
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.65 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	2563 (1.66-1.66)
Clashscore	190562	2662 (1.66-1.66)
Ramachandran outliers	187476	2621 (1.66-1.66)
Sidechain outliers	187428	2621 (1.66-1.66)
RSRZ outliers	180081	2564 (1.66-1.66)

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	343	11% 87% 10% .
1	B	343	18% 81% 16% ..

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5680 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 1 phosphodiesterase PDEB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	333	Total	C	N	O	S	0	0	0
			2636	1673	445	500	18			
1	B	333	Total	C	N	O	S	0	0	0
			2636	1673	445	500	18			

- 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		

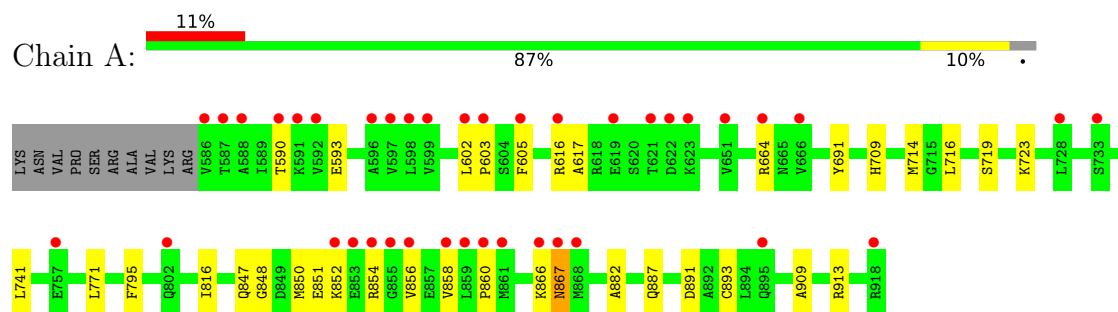
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	244	Total	O	0	0
			244	244		
4	B	160	Total	O	0	0
			160	160		

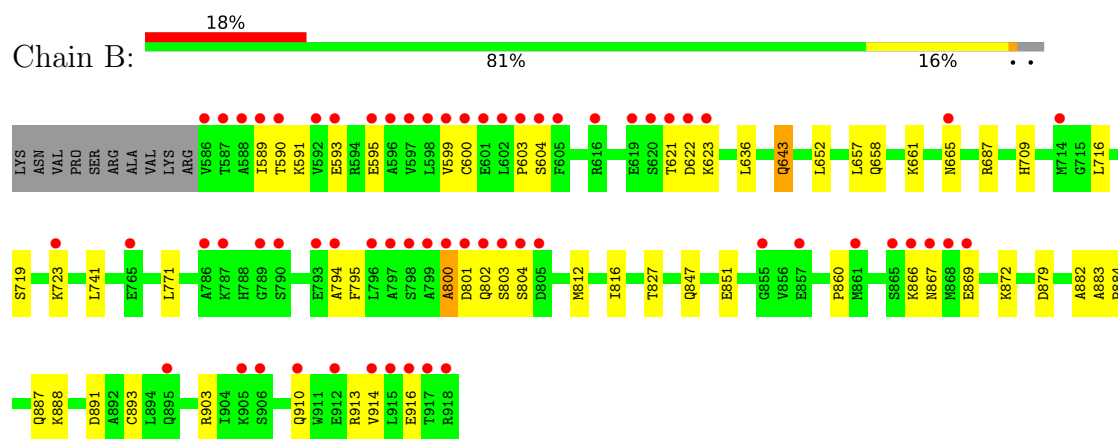
3 Residue-property plots [i](#)

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 1 phosphodiesterase PDEB1



- Molecule 1: Class 1 phosphodiesterase PDEB1



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	115.01Å 115.34Å 68.51Å 90.00° 108.13° 90.00°	Depositor
Resolution (Å)	30.00 – 1.65 30.00 – 1.65	Depositor EDS
% Data completeness (in resolution range)	86.4 (30.00-1.65) 86.5 (30.00-1.65)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.56 (at 1.65Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.204 , 0.223 0.204 , 0.224	Depositor DCC
R_{free} test set	9211 reflections (10.00%)	wwPDB-VP
Wilson B-factor (Å ²)	21.7	Xtriage
Anisotropy	0.751	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 33.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5680	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.88% 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: 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	0.36	0/2687	0.79	2/3634 (0.1%)
1	B	0.34	0/2687	0.79	5/3634 (0.1%)
All	All	0.35	0/5374	0.79	7/7268 (0.1%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	709	HIS	N-CA-C	7.29	121.27	112.38
1	B	709	HIS	N-CA-C	7.25	121.57	112.87
1	A	882	ALA	N-CA-C	6.75	118.29	111.07
1	B	882	ALA	N-CA-C	6.48	118.03	110.97
1	B	687	ARG	N-CA-C	-6.02	106.06	113.41
1	B	803	SER	N-CA-C	-5.55	106.83	113.21
1	B	879	ASP	N-CA-C	5.12	116.54	111.07

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	2636	0	2598	23	0
1	B	2636	0	2598	38	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	244	0	0	0	0
4	B	160	0	0	1	0
All	All	5680	0	5196	61	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 6.

All (61) 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:643:GLN:HE21	1:B:643:GLN:H	1.15	0.89
1:B:636:LEU:HD13	1:B:652:LEU:HD11	1.54	0.87
1:B:643:GLN:H	1:B:643:GLN:NE2	1.75	0.83
1:B:860:PRO:HG3	1:B:866:LYS:HZ2	1.54	0.73
1:A:590:THR:OG1	1:A:593:GLU:HG3	1.91	0.70
1:B:643:GLN:HE21	1:B:643:GLN:N	1.89	0.69
1:A:719:SER:OG	1:A:723:LYS:HE3	1.93	0.68
1:A:860:PRO:HG3	1:A:866:LYS:NZ	2.09	0.67
1:B:590:THR:OG1	1:B:593:GLU:HG3	1.96	0.65
1:B:883:ALA:HB3	1:B:884:PRO:HD3	1.77	0.65
1:B:795:PHE:CG	1:B:816:ILE:HG13	2.33	0.64
1:B:794:ALA:HB3	1:B:812:MET:HE2	1.82	0.61
1:A:860:PRO:HA	1:A:866:LYS:HD2	1.82	0.60
1:B:595:GLU:O	1:B:599:VAL:HG23	2.01	0.60
1:B:621:THR:HG22	1:B:622:ASP:N	2.18	0.58
1:A:771:LEU:C	1:A:771:LEU:HD23	2.29	0.58
1:A:605:PHE:HE2	1:A:616:ARG:HE	1.52	0.57
1:B:589:ILE:HD11	1:B:658:GLN:HG2	1.89	0.55
1:A:602:LEU:N	1:A:603:PRO:HD3	2.22	0.54
1:B:771:LEU:C	1:B:771:LEU:HD23	2.34	0.53
1:A:664:ARG:NH1	1:A:714:MET:HG2	2.24	0.52
1:A:795:PHE:CG	1:A:816:ILE:HG13	2.45	0.51
1:B:621:THR:HG22	1:B:623:LYS:H	1.76	0.50
1:A:860:PRO:HG3	1:A:866:LYS:HZ2	1.75	0.50
1:A:716:LEU:O	1:A:741:LEU:HD11	2.12	0.49
1:B:589:ILE:HD12	1:B:589:ILE:N	2.27	0.49
1:B:827:THR:O	1:B:903:ARG:HG2	2.12	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:860:PRO:HG3	1:A:866:LYS:HZ3	1.74	0.49
1:B:869:GLU:HB2	1:B:872:LYS:HG3	1.95	0.49
1:A:847:GLN:O	1:A:851:GLU:HG3	2.12	0.49
1:B:802:GLN:C	1:B:804:SER:H	2.21	0.48
1:B:716:LEU:O	1:B:741:LEU:HD11	2.15	0.47
1:A:851:GLU:HB3	1:A:856:VAL:HG23	1.96	0.47
1:B:910:GLN:O	1:B:914:VAL:HG23	2.15	0.46
1:B:910:GLN:HA	1:B:913:ARG:HE	1.80	0.46
1:A:851:GLU:HB2	1:A:858:VAL:HG22	1.97	0.46
1:A:854:ARG:HH11	1:A:854:ARG:HG2	1.80	0.46
1:A:848:GLY:O	1:A:852:LYS:HG3	2.16	0.46
1:B:887:GLN:HE21	1:B:891:ASP:CG	2.23	0.46
1:A:605:PHE:CZ	1:A:617:ALA:HA	2.51	0.45
1:B:603:PRO:O	1:B:604:SER:OG	2.29	0.44
1:B:657:LEU:O	1:B:661:LYS:HG3	2.17	0.44
1:B:636:LEU:CD1	1:B:652:LEU:HD11	2.39	0.44
1:A:909:ALA:O	1:A:913:ARG:HG3	2.18	0.44
1:B:589:ILE:HG23	1:B:593:GLU:HB2	2.00	0.44
1:B:719:SER:OG	1:B:723:LYS:HE3	2.17	0.44
1:A:850:MET:O	1:A:854:ARG:HG3	2.18	0.44
1:B:591:LYS:O	1:B:595:GLU:HG2	2.17	0.44
1:B:621:THR:CG2	1:B:622:ASP:N	2.82	0.43
1:A:887:GLN:HE21	1:A:891:ASP:CG	2.26	0.43
1:B:621:THR:HB	4:B:1144:HOH:O	2.18	0.43
1:B:910:GLN:HG3	1:B:913:ARG:NH2	2.33	0.43
1:B:884:PRO:O	1:B:888:LYS:HG3	2.19	0.42
1:B:794:ALA:CB	1:B:812:MET:HE2	2.49	0.42
1:B:800:ALA:O	1:B:801:ASP:C	2.62	0.42
1:B:827:THR:C	1:B:903:ARG:HG2	2.44	0.42
1:B:866:LYS:O	1:B:867:ASN:C	2.62	0.42
1:A:691:TYR:CD1	1:A:691:TYR:C	2.98	0.42
1:A:866:LYS:O	1:A:867:ASN:C	2.62	0.42
1:B:847:GLN:O	1:B:851:GLU:HG3	2.20	0.42
1:B:665:ASN:C	1:B:665:ASN:HD22	2.28	0.41

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	331/343 (96%)	322 (97%)	7 (2%)	2 (1%)	21	8
1	B	331/343 (96%)	317 (96%)	10 (3%)	4 (1%)	10	2
All	All	662/686 (96%)	639 (96%)	17 (3%)	6 (1%)	14	3

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	600	CYS
1	B	800	ALA
1	A	893	CYS
1	A	867	ASN
1	B	893	CYS
1	B	916	GLU

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	288/297 (97%)	288 (100%)	0	100	100
1	B	288/297 (97%)	287 (100%)	1 (0%)	86	80
All	All	576/594 (97%)	575 (100%)	1 (0%)	87	83

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	643	GLN

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	665	ASN
1	A	887	GLN
1	A	910	GLN
1	B	643	GLN
1	B	665	ASN
1	B	895	GLN
1	B	910	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 4 ligands modelled in this entry, 4 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

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	333/343 (97%)	0.62	39 (11%) 9 10	19, 27, 48, 58	0
1	B	333/343 (97%)	0.94	62 (18%) 3 4	20, 30, 59, 79	0
All	All	666/686 (97%)	0.78	101 (15%) 5 5	19, 29, 54, 79	0

All (101) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	586	VAL	9.1
1	B	602	LEU	7.7
1	A	586	VAL	6.8
1	B	603	PRO	6.5
1	B	917	THR	6.2
1	B	592	VAL	6.2
1	B	801	ASP	5.5
1	B	865	SER	5.4
1	A	858	VAL	5.1
1	B	868	MET	4.9
1	B	804	SER	4.9
1	B	588	ALA	4.8
1	B	587	THR	4.7
1	B	802	GLN	4.4
1	A	853	GLU	4.4
1	B	598	LEU	4.4
1	B	798	SER	4.3
1	A	616	ARG	4.3
1	B	867	ASN	4.2
1	A	591	LYS	4.2
1	B	789	GLY	4.1
1	B	621	THR	4.1
1	B	915	LEU	4.0
1	B	797	ALA	4.0

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Mol	Chain	Res	Type	RSRZ
1	A	587	THR	3.9
1	B	590	THR	3.8
1	B	589	ILE	3.8
1	B	805	ASP	3.8
1	A	592	VAL	3.7
1	B	599	VAL	3.7
1	B	619	GLU	3.6
1	B	916	GLU	3.6
1	B	620	SER	3.5
1	B	800	ALA	3.4
1	B	918	ARG	3.3
1	A	599	VAL	3.3
1	A	588	ALA	3.2
1	B	794	ALA	3.2
1	B	600	CYS	3.1
1	B	723	LYS	3.0
1	A	619	GLU	3.0
1	A	802	GLN	3.0
1	A	598	LEU	2.9
1	B	803	SER	2.9
1	B	605	PHE	2.8
1	A	856	VAL	2.8
1	B	597	VAL	2.8
1	A	895	GLN	2.8
1	B	604	SER	2.8
1	B	857	GLU	2.7
1	A	603	PRO	2.7
1	B	869	GLU	2.7
1	A	866	LYS	2.7
1	B	601	GLU	2.7
1	A	623	LYS	2.7
1	B	914	VAL	2.7
1	A	861	MET	2.7
1	A	605	PHE	2.6
1	A	596	ALA	2.6
1	B	855	GLY	2.6
1	B	786	ALA	2.6
1	A	621	THR	2.5
1	B	905	LYS	2.5
1	A	918	ARG	2.5
1	B	912	GLU	2.5
1	A	733	SER	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	622	ASP	2.4
1	B	866	LYS	2.4
1	B	799	ALA	2.4
1	A	597	VAL	2.4
1	A	855	GLY	2.4
1	B	623	LYS	2.4
1	A	868	MET	2.4
1	A	859	LEU	2.4
1	A	757	GLU	2.4
1	A	590	THR	2.3
1	A	602	LEU	2.3
1	B	861	MET	2.3
1	B	595	GLU	2.3
1	A	728	LEU	2.3
1	B	796	LEU	2.3
1	B	665	ASN	2.3
1	A	664	ARG	2.3
1	B	906	SER	2.2
1	B	910	GLN	2.2
1	B	616	ARG	2.2
1	A	651	VAL	2.2
1	B	790	SER	2.2
1	A	854	ARG	2.2
1	B	714	MET	2.1
1	B	765	GLU	2.1
1	B	596	ALA	2.1
1	B	593	GLU	2.1
1	B	622	ASP	2.1
1	B	787	LYS	2.1
1	A	867	ASN	2.0
1	B	793	GLU	2.0
1	B	895	GLN	2.0
1	A	860	PRO	2.0
1	A	666	VAL	2.0
1	A	852	LYS	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 [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, 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($\text{\AA}^2$)	Q<0.9
3	MG	A	1002	1/1	0.98	0.05	26,26,26,26	0
2	ZN	B	1001	1/1	0.99	0.03	26,26,26,26	0
2	ZN	A	1001	1/1	0.99	0.03	26,26,26,26	0
3	MG	B	1002	1/1	0.99	0.07	25,25,25,25	0

6.5 Other polymers [i](#)

There are no such residues in this entry.