



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:41 AM UTC

PDB ID : 4IY9 / pdb_00004iy9
Title : Bmlp3 - C2 crystal form
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Deposited on : 2013-01-28
Resolution : 2.10 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

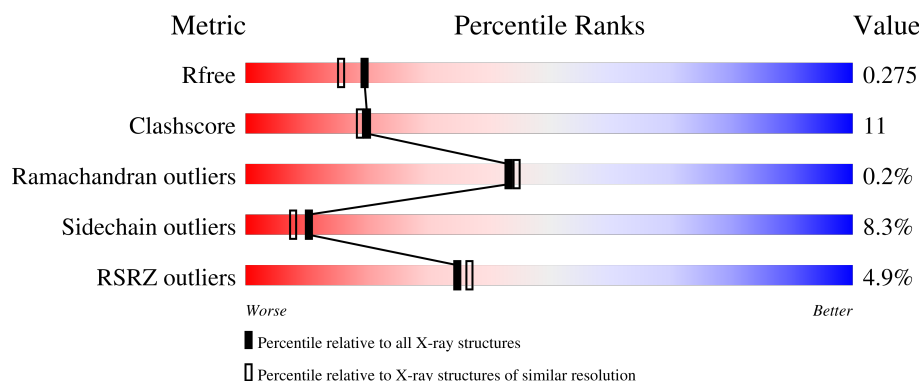
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	239	4% 73% 22% ••
1	B	239	5% 67% 27% 5% •

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4001 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 30K protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	235	Total	C	N	O	S	0	3	0
			1934	1238	330	358	8			
1	B	235	Total	C	N	O	S	0	4	0
			1942	1243	332	359	8			

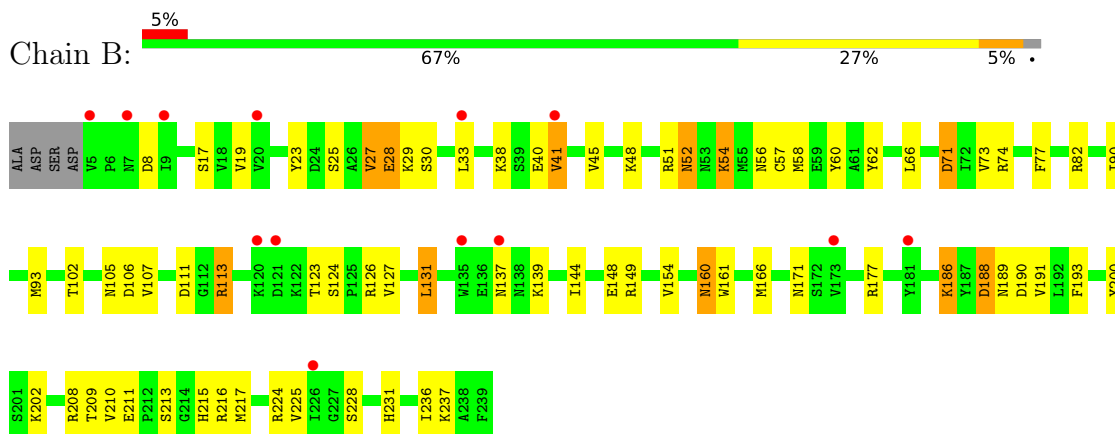
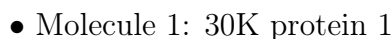
- Molecule 2 is IODIDE ION (CCD ID: IOD) (formula: I).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	I	0	0
			1	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	66	Total	O	0	0
			66	66		
3	B	58	Total	O	0	0
			58	58		

- Molecule 1: 30K protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	154.15Å 34.56Å 93.14Å 90.00° 97.99° 90.00°	Depositor
Resolution (Å)	38.10 – 2.10 38.10 – 2.10	Depositor EDS
% Data completeness (in resolution range)	91.1 (38.10-2.10) 91.1 (38.10-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.42 (at 2.10Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.1_1168)	Depositor
R, R_{free}	0.216 , 0.272 0.222 , 0.275	Depositor DCC
R_{free} test set	1325 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	34.9	Xtriage
Anisotropy	0.495	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 69.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4001	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 14.03% 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: IOD

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	1.12	2/1991 (0.1%)	1.19	11/2697 (0.4%)
1	B	1.09	1/2002 (0.0%)	1.23	7/2712 (0.3%)
All	All	1.11	3/3993 (0.1%)	1.21	18/5409 (0.3%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	175	SER	CA-C	5.99	1.60	1.52
1	B	154	VAL	CA-CB	5.55	1.63	1.54
1	A	100	ALA	CA-CB	-5.16	1.45	1.53

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	183	GLN	CA-C-N	7.07	127.03	120.03
1	A	183	GLN	C-N-CA	7.07	127.03	120.03
1	B	131	LEU	CA-C-N	-6.09	115.00	123.10
1	B	131	LEU	C-N-CA	-6.09	115.00	123.10
1	B	54	LYS	N-CA-C	-5.77	101.94	110.48
1	A	188	ASP	CB-CA-C	-5.71	109.97	116.54
1	A	5	VAL	CA-C-N	5.69	126.15	120.52
1	A	5	VAL	C-N-CA	5.69	126.15	120.52
1	B	113	ARG	CA-C-N	5.65	125.56	119.85
1	B	113	ARG	C-N-CA	5.65	125.56	119.85
1	A	171	ASN	N-CA-C	5.54	119.30	112.54
1	B	208	ARG	CA-C-N	-5.44	115.76	122.84
1	B	208	ARG	C-N-CA	-5.44	115.76	122.84
1	A	112	GLY	N-CA-C	5.42	120.22	111.38
1	A	172	SER	N-CA-C	5.29	115.52	108.38
1	A	190	ASP	N-CA-C	5.27	118.17	109.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	6	PRO	CA-C-O	-5.22	115.25	122.15
1	A	158	GLY	N-CA-C	5.19	119.18	112.54

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	1934	0	1888	40	0
1	B	1942	0	1897	48	0
2	A	1	0	0	0	0
3	A	66	0	0	2	0
3	B	58	0	0	7	0
All	All	4001	0	3785	87	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 11.

All (87) 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:54:LYS:HE2	1:B:56:ASN:OD1	1.83	0.78
1:B:52:ASN:HD21	1:B:54:LYS:HB2	1.48	0.77
1:B:74:ARG:HG2	1:B:82:ARG:HD3	1.65	0.77
1:A:224:ARG:HG3	3:A:458:HOH:O	1.89	0.73
1:A:10:LEU:HD11	1:A:33:LEU:HD11	1.69	0.72
1:A:105[A]:ASN:OD1	1:A:149:ARG:NH2	2.22	0.72
1:B:54:LYS:HB3	1:B:56:ASN:OD1	1.94	0.67
1:B:52:ASN:ND2	1:B:54:LYS:H	1.93	0.67
1:A:90:ILE:HD11	1:A:131:LEU:HD13	1.76	0.65
1:A:32:HIS:HD2	1:A:36:GLU:HG3	1.61	0.64
1:A:32:HIS:CD2	1:A:36:GLU:HG3	2.33	0.63
1:B:23:TYR:O	1:B:27:VAL:HG12	1.98	0.63
1:A:119:GLY:H	1:A:215:HIS:CE1	2.16	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:52:ASN:ND2	1:B:54:LYS:HB2	2.13	0.62
1:A:71:ASP:OD1	1:A:71:ASP:N	2.26	0.61
1:B:236:ILE:C	1:B:237:LYS:HD3	2.25	0.60
1:B:126:ARG:NH1	3:B:313:HOH:O	2.34	0.59
1:B:211:GLU:HB2	1:B:215:HIS:HB2	1.84	0.59
1:B:193:PHE:CD1	1:B:236:ILE:HD13	2.37	0.58
1:B:236:ILE:O	1:B:237:LYS:HD3	2.02	0.58
1:B:23:TYR:OH	1:B:56:ASN:ND2	2.29	0.58
1:A:34:TYR:OH	1:A:75:ASP:OD2	2.21	0.57
1:A:121:ASP:OD2	1:A:124:SER:OG	2.24	0.56
1:A:91:LYS:HE3	1:A:239:PHE:CD1	2.40	0.56
1:B:177:ARG:HD3	1:B:200:TYR:OH	2.05	0.56
1:A:74:ARG:HG2	1:A:82:ARG:HD3	1.88	0.55
1:B:71:ASP:OD1	1:B:71:ASP:N	2.21	0.55
1:A:6:PRO:HG2	1:A:9:ILE:HD13	1.89	0.54
1:B:33:LEU:HD13	1:B:41:VAL:HG22	1.89	0.54
1:A:211:GLU:HB2	1:A:215:HIS:HB2	1.88	0.54
1:B:19:VAL:O	1:B:54:LYS:NZ	2.21	0.54
1:B:137:ASN:O	1:B:139:LYS:HG3	2.08	0.54
1:B:111:ASP:OD1	1:B:171[A]:ASN:ND2	2.40	0.53
1:B:105:ASN:OD1	1:B:149:ARG:HD2	2.09	0.53
1:A:107:VAL:HG12	1:A:109:GLY:H	1.75	0.52
1:A:91:LYS:HE3	1:A:239:PHE:HD1	1.75	0.51
1:B:28:GLU:OE1	1:B:28:GLU:N	2.43	0.51
1:B:102:THR:HG22	1:B:127:VAL:HG12	1.90	0.51
1:B:216:ARG:HG2	3:B:318:HOH:O	2.11	0.51
1:B:73:VAL:HA	1:B:77:PHE:CD1	2.45	0.51
1:A:148:GLU:OE1	1:A:148:GLU:N	2.42	0.50
1:A:148:GLU:N	1:A:148:GLU:CD	2.69	0.50
1:B:62:TYR:CE2	1:B:66:LEU:HD11	2.47	0.50
1:A:33:LEU:HD13	1:A:41:VAL:CG2	2.41	0.50
1:A:10:LEU:HD11	1:A:33:LEU:CD1	2.40	0.50
1:A:6:PRO:HD2	1:A:9:ILE:HB	1.93	0.49
1:B:17:SER:HB3	3:B:355:HOH:O	2.12	0.49
1:A:91:LYS:NZ	1:A:239:PHE:HA	2.28	0.48
1:A:103:LEU:O	1:A:126:ARG:NH1	2.44	0.48
1:B:33:LEU:HD13	1:B:41:VAL:CG2	2.43	0.48
1:A:33:LEU:HD13	1:A:41:VAL:HG21	1.95	0.48
1:B:48:LYS:O	1:B:51:ARG:HB2	2.13	0.47
1:B:166:MET:HE2	3:B:306:HOH:O	2.14	0.47
1:A:93:MET:HE2	1:A:93:MET:HB3	1.59	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:209:THR:HA	3:B:353:HOH:O	2.14	0.46
1:A:230:GLU:OE1	1:A:230:GLU:N	2.41	0.46
1:A:224:ARG:HD2	3:A:448:HOH:O	2.16	0.45
1:B:27:VAL:HG13	1:B:28:GLU:OE1	2.15	0.45
1:A:59:GLU:CD	1:A:140:VAL:HG12	2.42	0.44
1:B:131:LEU:CD2	1:B:144:ILE:HG12	2.46	0.44
1:B:106:ASP:HB2	1:B:113:ARG:HG3	1.99	0.44
1:B:124:SER:O	1:B:127:VAL:HG22	2.17	0.44
1:B:186:LYS:HG2	1:B:190:ASP:O	2.18	0.44
1:A:5:VAL:HA	1:A:6:PRO:HD3	1.79	0.43
1:B:38:LYS:O	1:B:41:VAL:HG13	2.18	0.43
1:A:148:GLU:CD	1:A:148:GLU:H	2.25	0.43
1:B:160[A]:ASN:HA	3:B:351:HOH:O	2.18	0.43
1:B:54:LYS:O	1:B:56:ASN:N	2.50	0.43
1:B:25:SER:OG	1:B:29:LYS:HE2	2.18	0.43
1:A:10:LEU:HD12	1:A:10:LEU:O	2.19	0.43
1:A:217:MET:HE1	1:B:161:TRP:CE3	2.53	0.42
1:B:188:ASP:HB3	1:B:189:ASN:H	1.65	0.42
1:A:125:PRO:O	1:A:148:GLU:CD	2.63	0.42
1:B:224:ARG:HE	1:B:225:VAL:H	1.68	0.42
1:B:52:ASN:CG	1:B:54:LYS:H	2.27	0.42
1:A:152:TYR:O	1:A:169:GLY:HA2	2.20	0.42
1:B:30:SER:OG	1:B:60:TYR:OH	2.29	0.41
1:B:41:VAL:O	1:B:45:VAL:HG23	2.20	0.41
1:B:202:LYS:NZ	3:B:335:HOH:O	2.38	0.41
1:B:58:MET:CE	1:B:193:PHE:HE2	2.34	0.41
1:A:10:LEU:HD12	1:A:10:LEU:C	2.45	0.41
1:A:155:LEU:HD23	1:A:155:LEU:HA	1.79	0.41
1:B:211:GLU:HG3	1:B:217:MET:HE3	2.02	0.41
1:A:126:ARG:HG2	1:A:126:ARG:HH11	1.86	0.41
1:A:173:VAL:O	1:A:173:VAL:HG23	2.21	0.41
1:A:145:LEU:HD13	1:A:152:TYR:CZ	2.56	0.41
1:A:114:PRO:HA	1:A:168:PHE:HB3	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	236/239 (99%)	233 (99%)	3 (1%)	0	100	100
1	B	237/239 (99%)	230 (97%)	5 (2%)	2 (1%)	16	12
All	All	473/478 (99%)	463 (98%)	8 (2%)	2 (0%)	43	28

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	160[A]	ASN
1	B	160[B]	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	208/208 (100%)	192 (92%)	16 (8%)	12	9
1	B	209/208 (100%)	188 (90%)	21 (10%)	7	5
All	All	417/416 (100%)	380 (91%)	37 (9%)	10	6

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	VAL
1	A	10	LEU
1	A	58[A]	MET
1	A	58[B]	MET

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Mol	Chain	Res	Type
1	A	70	LYS
1	A	71	ASP
1	A	93	MET
1	A	111	ASP
1	A	134	LEU
1	A	154	VAL
1	A	170	VAL
1	A	172	SER
1	A	188	ASP
1	A	207[A]	SER
1	A	207[B]	SER
1	A	213	SER
1	B	8	ASP
1	B	27	VAL
1	B	28	GLU
1	B	40	GLU
1	B	41	VAL
1	B	52	ASN
1	B	57	CYS
1	B	71	ASP
1	B	90	ILE
1	B	93[A]	MET
1	B	93[B]	MET
1	B	107	VAL
1	B	123	THR
1	B	148	GLU
1	B	186	LYS
1	B	188	ASP
1	B	191	VAL
1	B	210	VAL
1	B	213	SER
1	B	228	SER
1	B	231	HIS

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	171	ASN
1	B	32	HIS
1	B	150	ASN
1	B	151	GLN
1	B	231	HIS

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 [i](#)

Of 1 ligands modelled in this entry, 1 is 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, 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	235/239 (98%)	0.56	10 (4%) 40 41	20, 45, 83, 103	3 (1%)
1	B	235/239 (98%)	0.63	13 (5%) 30 32	20, 47, 84, 100	4 (1%)
All	All	470/478 (98%)	0.59	23 (4%) 35 37	20, 46, 84, 103	7 (1%)

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	10	LEU	3.5
1	B	9	ILE	3.2
1	B	181	TYR	3.0
1	A	9	ILE	2.8
1	B	173	VAL	2.8
1	A	238	ALA	2.6
1	B	41	VAL	2.5
1	A	148	GLU	2.5
1	B	226	ILE	2.5
1	B	137	ASN	2.4
1	A	5	VAL	2.4
1	B	121	ASP	2.3
1	B	5	VAL	2.3
1	A	110	ASP	2.3
1	B	7	ASN	2.3
1	B	120	LYS	2.3
1	B	135	TRP	2.2
1	B	33	LEU	2.2
1	A	6	PRO	2.1
1	A	41	VAL	2.1
1	A	73	VAL	2.1
1	B	20	VAL	2.0
1	A	32	HIS	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, 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
2	IOD	A	301	1/1	0.99	0.04	32,32,32,32	0

6.5 Other polymers [i](#)

There are no such residues in this entry.