



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 23, 2026 – 09:26 PM UTC

PDB ID : 1DWU / pdb_00001dwu
Title : Ribosomal protein L1
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Deposited on : 1999-12-13
Resolution : 2.80 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

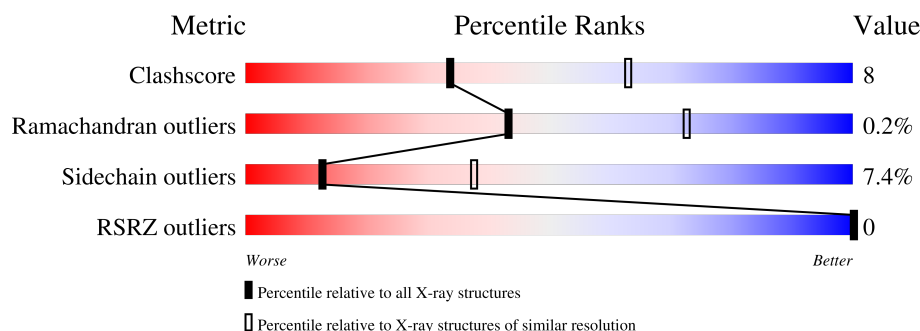
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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))
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	213	
1	B	213	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 3336 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 RIBOSOMAL PROTEIN L1.

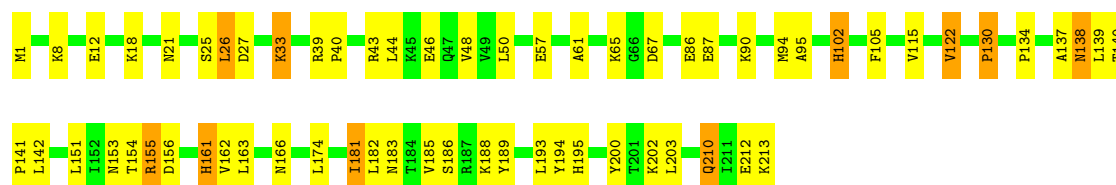
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	213	Total	C	N	O	S	0	0	0
			1668	1054	296	310	8			
1	B	213	Total	C	N	O	S	0	0	0
			1668	1054	296	310	8			

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.

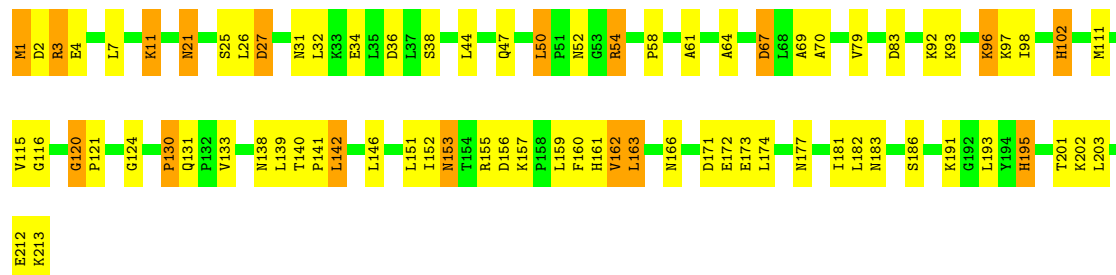
• Molecule 1: RIBOSOMAL PROTEIN L1

Chain A: 



• Molecule 1: RIBOSOMAL PROTEIN L1

Chain B: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.36Å 69.98Å 106.17Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.80 8.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	91.0 (8.00-2.80) 91.4 (8.00-2.80)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.18 (at 2.71Å)	Xtriage
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.207 , 0.305 0.209 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	60.5	Xtriage
Anisotropy	0.262	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.22 , 62.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.069 for k,h,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3336	wwPDB-VP
Average B, all atoms (Å ²)	37.0	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

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	0.89	4/1691 (0.2%)	1.68	28/2274 (1.2%)
1	B	0.88	5/1691 (0.3%)	1.65	33/2274 (1.5%)
All	All	0.89	9/3382 (0.3%)	1.67	61/4548 (1.3%)

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	102	HIS	CD2-NE2	-6.94	1.30	1.37
1	B	195	HIS	CD2-NE2	-6.65	1.30	1.37
1	A	195	HIS	CD2-NE2	-6.65	1.30	1.37
1	A	161	HIS	CD2-NE2	-6.54	1.30	1.37
1	B	102	HIS	CD2-NE2	-6.39	1.30	1.37
1	B	161	HIS	CD2-NE2	-5.74	1.31	1.37
1	B	102	HIS	CG-ND1	-5.53	1.32	1.38
1	A	102	HIS	CG-ND1	-5.50	1.32	1.38
1	B	195	HIS	CG-ND1	-5.06	1.32	1.38

All (61) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	156	ASP	N-CA-C	10.02	124.61	110.68
1	A	156	ASP	N-CA-CB	-8.90	99.24	110.45
1	A	21	ASN	CA-CB-CG	8.19	120.79	112.60
1	B	21	ASN	CA-CB-CG	7.95	120.55	112.60
1	B	156	ASP	CA-CB-CG	7.81	120.41	112.60
1	B	183	ASN	CA-CB-CG	7.76	120.36	112.60
1	B	64	ALA	N-CA-C	7.42	117.67	107.73
1	A	185	VAL	N-CA-C	-7.33	103.38	110.42
1	B	177	ASN	CA-CB-CG	7.16	119.75	112.60
1	B	156	ASP	N-CA-C	7.03	125.78	110.80
1	A	67	ASP	CA-CB-CG	7.00	119.60	112.60
1	B	161	HIS	CA-CB-CG	6.60	120.40	113.80
1	B	36	ASP	CA-CB-CG	6.42	119.02	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	27	ASP	CA-CB-CG	6.40	119.00	112.60
1	B	50	LEU	CA-C-N	6.39	125.61	118.97
1	B	50	LEU	C-N-CA	6.39	125.61	118.97
1	B	98	ILE	N-CA-C	-6.32	104.69	110.82
1	B	27	ASP	CA-CB-CG	6.30	118.90	112.60
1	A	161	HIS	CB-CG-CD2	-6.23	123.10	131.20
1	B	34	GLU	N-CA-C	6.17	120.13	112.47
1	B	96	LYS	CA-C-O	-6.16	113.89	120.42
1	A	140	THR	CA-C-N	6.13	125.34	118.97
1	A	140	THR	C-N-CA	6.13	125.34	118.97
1	B	121	PRO	N-CA-C	6.06	121.52	113.40
1	B	166	ASN	CA-CB-CG	6.05	118.65	112.60
1	B	54	ARG	N-CA-C	5.88	120.58	113.17
1	A	153	ASN	OD1-CG-ND2	-5.88	116.72	122.60
1	A	18	LYS	CA-C-N	5.81	125.75	119.76
1	A	18	LYS	C-N-CA	5.81	125.75	119.76
1	B	3	ARG	N-CA-C	5.78	123.12	110.80
1	B	120	GLY	CA-C-N	5.72	125.08	118.85
1	B	120	GLY	C-N-CA	5.72	125.08	118.85
1	A	155	ARG	N-CA-C	-5.71	98.81	109.32
1	A	155	ARG	CB-CA-C	-5.66	109.05	115.79
1	A	212	GLU	O-C-N	5.60	130.10	122.48
1	A	138	ASN	OD1-CG-ND2	-5.57	117.03	122.60
1	A	102	HIS	CA-CB-CG	-5.50	108.30	113.80
1	B	138	ASN	N-CA-C	-5.50	100.28	109.24
1	A	195	HIS	CB-CG-CD2	-5.46	124.10	131.20
1	A	86	GLU	CB-CG-CD	5.43	121.84	112.60
1	B	195	HIS	CB-CG-CD2	-5.39	124.19	131.20
1	A	26	LEU	N-CA-C	5.36	116.98	108.67
1	A	50	LEU	CA-C-N	5.31	124.49	118.97
1	A	50	LEU	C-N-CA	5.31	124.49	118.97
1	B	130	PRO	N-CA-C	5.30	119.36	111.41
1	A	181	ILE	N-CA-C	-5.25	105.96	110.74
1	B	212	GLU	O-C-N	5.21	128.89	122.84
1	A	102	HIS	CB-CG-CD2	-5.20	124.44	131.20
1	B	156	ASP	N-CA-CB	-5.20	101.71	110.49
1	A	210	GLN	N-CA-C	5.17	117.93	110.28
1	B	124	GLY	CA-C-N	5.17	124.96	119.28
1	B	124	GLY	C-N-CA	5.17	124.96	119.28
1	B	153	ASN	CB-CG-ND2	5.14	124.12	116.40
1	B	155	ARG	N-CA-C	-5.14	100.38	109.02
1	A	39	ARG	CA-C-N	5.13	124.79	119.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	39	ARG	C-N-CA	5.13	124.79	119.56
1	B	4	GLU	N-CA-C	-5.11	105.79	111.36
1	A	130	PRO	N-CA-C	5.08	119.06	111.14
1	B	155	ARG	CA-C-N	-5.01	111.97	121.54
1	B	155	ARG	C-N-CA	-5.01	111.97	121.54
1	B	212	GLU	N-CA-C	5.00	117.86	110.46

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	1668	0	1764	22	0
1	B	1668	0	1764	32	0
All	All	3336	0	3528	53	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 8.

All (53) 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:44:LEU:HD13	1:A:188:LYS:HD2	1.74	0.69
1:A:134:PRO:HG2	1:A:137:ALA:HB2	1.79	0.64
1:B:47:GLN:HG2	1:B:151:LEU:HD22	1.81	0.61
1:B:133:VAL:HG11	1:B:142:LEU:HD11	1.82	0.60
1:B:27:ASP:HB2	1:B:162:VAL:O	2.03	0.58
1:B:7:LEU:O	1:B:11:LYS:HD3	2.04	0.56
1:B:31:ASN:OD1	1:B:159:LEU:HG	2.06	0.55
1:B:61:ALA:HB2	1:B:102:HIS:CD2	2.41	0.55
1:B:131:GLN:HE22	1:B:146:LEU:HD21	1.72	0.55
1:A:138:ASN:O	1:A:141:PRO:HD2	2.08	0.54
1:A:25:SER:HA	1:A:166:ASN:HA	1.91	0.53
1:A:94:MET:HE3	1:B:191:LYS:HD2	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:40:PRO:HA	1:A:43:ARG:HD2	1.92	0.51
1:A:202:LYS:HG2	1:A:203:LEU:O	2.11	0.51
1:B:26:LEU:HD11	1:B:201:THR:HG22	1.93	0.51
1:A:188:LYS:HD3	1:A:189:TYR:CE1	2.46	0.50
1:B:186:SER:HB3	1:B:193:LEU:HG	1.93	0.50
1:B:111:MET:O	1:B:115:VAL:HG23	2.12	0.49
1:B:44:LEU:O	1:B:153:ASN:HA	2.10	0.49
1:A:186:SER:HB2	1:A:193:LEU:HG	1.92	0.49
1:A:95:ALA:HB1	1:A:122:VAL:HG21	1.94	0.49
1:B:32:LEU:HA	1:B:195:HIS:O	2.12	0.49
1:B:25:SER:HB2	1:B:163:LEU:HD11	1.93	0.49
1:B:1:MET:HG2	1:B:182:LEU:HD13	1.94	0.48
1:A:26:LEU:HD22	1:A:174:LEU:HD13	1.95	0.48
1:A:33:LYS:HE3	1:A:194:TYR:O	2.13	0.48
1:B:202:LYS:HG2	1:B:203:LEU:O	2.15	0.46
1:A:87:GLU:HA	1:A:90:LYS:HE3	1.96	0.46
1:B:140:THR:HB	1:B:141:PRO:HD3	1.98	0.46
1:B:52:ASN:ND2	1:B:173:GLU:HA	2.32	0.45
1:B:116:GLY:O	1:B:120:GLY:HA3	2.16	0.45
1:B:131:GLN:NE2	1:B:146:LEU:HD21	2.32	0.45
1:B:152:ILE:HG23	1:B:160:PHE:CD2	2.52	0.44
1:A:115:VAL:HG11	1:A:130:PRO:HG3	2.00	0.44
1:B:26:LEU:HD22	1:B:174:LEU:HD13	1.99	0.44
1:A:8:LYS:O	1:A:12:GLU:HG3	2.17	0.44
1:A:1:MET:HB3	1:A:182:LEU:HD13	2.00	0.44
1:B:213:LYS:HA	1:B:213:LYS:HD3	1.74	0.44
1:A:200:TYR:CE2	1:A:210:GLN:HB3	2.53	0.44
1:B:92:LYS:O	1:B:96:LYS:HD3	2.18	0.43
1:B:203:LEU:HD23	1:B:203:LEU:HA	1.90	0.43
1:B:69:ALA:HB1	1:B:79:VAL:HG11	2.01	0.43
1:A:105:PHE:HB3	1:A:130:PRO:HB3	2.00	0.43
1:B:11:LYS:HD2	1:B:171:ASP:CG	2.44	0.43
1:A:200:TYR:HA	1:A:210:GLN:HA	2.01	0.42
1:B:115:VAL:HG11	1:B:130:PRO:HG3	2.01	0.42
1:A:61:ALA:HB2	1:A:102:HIS:CD2	2.54	0.41
1:B:54:ARG:HD3	1:B:58:PRO:HD3	2.02	0.41
1:B:157:LYS:HE2	1:B:157:LYS:HB3	1.97	0.41
1:A:154:THR:C	1:A:155:ARG:O	2.60	0.41
1:A:48:VAL:HG11	1:A:181:ILE:HD13	2.03	0.41
1:B:67:ASP:O	1:B:70:ALA:HB3	2.21	0.41
1:B:50:LEU:HD21	1:B:181:ILE:HD11	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	211/213 (99%)	204 (97%)	7 (3%)	0	100	100
1	B	211/213 (99%)	197 (93%)	13 (6%)	1 (0%)	24	55
All	All	422/426 (99%)	401 (95%)	20 (5%)	1 (0%)	43	72

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	3	ARG

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	183/183 (100%)	170 (93%)	13 (7%)	13	39
1	B	183/183 (100%)	169 (92%)	14 (8%)	12	36
All	All	366/366 (100%)	339 (93%)	27 (7%)	13	37

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	33	LYS
1	A	46	GLU

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Mol	Chain	Res	Type
1	A	57	GLU
1	A	65	LYS
1	A	122	VAL
1	A	139	LEU
1	A	142	LEU
1	A	151	LEU
1	A	161	HIS
1	A	162	VAL
1	A	163	LEU
1	A	183	ASN
1	A	213	LYS
1	B	1	MET
1	B	2	ASP
1	B	11	LYS
1	B	21	ASN
1	B	38	SER
1	B	67	ASP
1	B	83	ASP
1	B	93	LYS
1	B	97	LYS
1	B	139	LEU
1	B	142	LEU
1	B	162	VAL
1	B	163	LEU
1	B	172	GLU

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	31	ASN
1	A	71	GLN
1	A	136	ASN
1	A	138	ASN
1	B	21	ASN
1	B	131	GLN
1	B	195	HIS

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](#)

There are no ligands in this entry.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	213/213 (100%)	-0.73	0 100 100	15, 37, 55, 70	0
1	B	213/213 (100%)	-0.79	0 100 100	14, 35, 51, 62	0
All	All	426/426 (100%)	-0.76	0 100 100	14, 37, 53, 70	0

There are no RSRZ outliers to report.

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.