



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 03:27 PM EDT

PDB ID : 5CKN / pdb_00005ckn
Title : The CUB1-EGF-CUB2 domains of rat MBL-associated serine protease-2 (MASP-2) bound to Ca²⁺
Authors : Nan, R.; Furze, C.M.; Wright, D.W.; Gor, J.; Wallis, R.; Perkins, S.J.
Deposited on : 2015-07-15
Resolution : 2.60 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

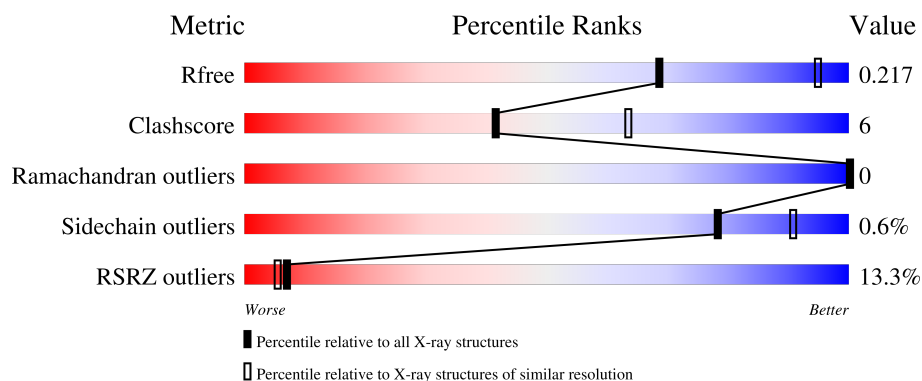
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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	278	12% 85% 15%
1	D	278	15% 83% 17%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4510 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 Mannan-binding lectin serine peptidase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	278	Total	C	N	O	S	0	0	0
			2217	1407	366	431	13			
1	D	278	Total	C	N	O	S	0	1	0
			2216	1407	364	432	13			

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Ca	0	0
			3	3		
2	D	3	Total	Ca	0	0
			3	3		

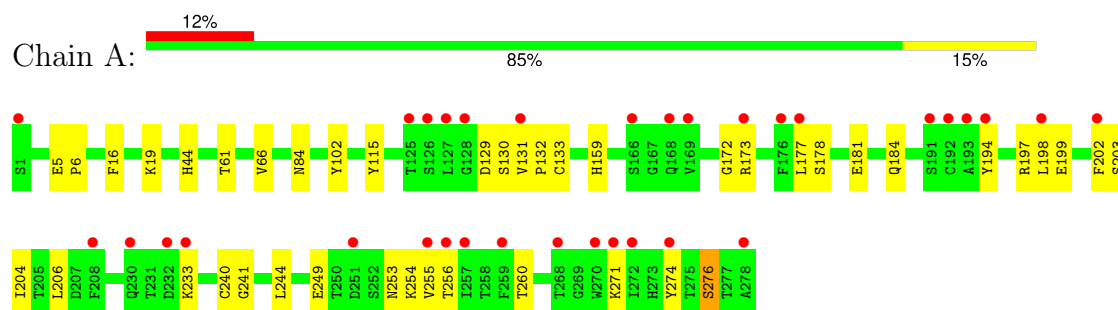
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	38	Total	O	0	0
			38	38		
3	D	33	Total	O	0	0
			33	33		

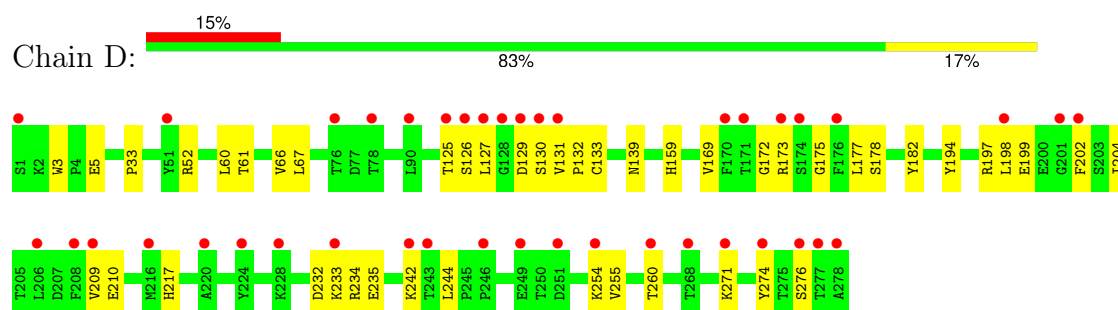
3 Residue-property plots

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: Mannan-binding lectin serine peptidase 2



- Molecule 1: Mannan-binding lectin serine peptidase 2



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	83.64Å 91.34Å 127.09Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	63.55 – 2.60 63.55 – 2.60	Depositor EDS
% Data completeness (in resolution range)	97.5 (63.55-2.60) 97.6 (63.55-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.34 (at 2.61Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.207 , 0.252 0.221 , 0.217	Depositor DCC
R_{free} test set	1447 reflections (4.72%)	wwPDB-VP
Wilson B-factor (Å ²)	55.5	Xtriage
Anisotropy	0.673	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 52.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4510	wwPDB-VP
Average B, all atoms (Å ²)	92.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.65% 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: CA

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	0.34	0/2287	0.79	4/3110 (0.1%)
1	D	0.33	0/2289	0.79	6/3114 (0.2%)
All	All	0.33	0/4576	0.79	10/6224 (0.2%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	126	SER	N-CA-C	-7.16	103.81	112.54
1	D	175	GLY	N-CA-C	6.46	120.26	110.18
1	A	276	SER	N-CA-C	5.68	117.73	108.76
1	D	5	GLU	CA-C-N	5.41	125.39	120.03
1	D	5	GLU	C-N-CA	5.41	125.39	120.03
1	A	129	ASP	N-CA-C	-5.26	106.86	113.28
1	A	244	LEU	CA-C-N	5.12	123.35	119.66
1	A	244	LEU	C-N-CA	5.12	123.35	119.66
1	D	244	LEU	CA-C-N	5.02	123.28	119.66
1	D	244	LEU	C-N-CA	5.02	123.28	119.66

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	2217	0	2059	30	0
1	D	2216	0	2054	29	0
2	A	3	0	0	0	0
2	D	3	0	0	0	0
3	A	38	0	0	3	0
3	D	33	0	0	2	0
All	All	4510	0	4113	55	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 (55) 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:84:ASN:ND2	3:A:403:HOH:O	2.19	0.74
1:A:197:ARG:HH11	1:A:254:LYS:HB3	1.59	0.66
1:A:131:VAL:HG12	1:A:133:CYS:H	1.61	0.66
1:A:102:TYR:OH	3:A:401:HOH:O	2.13	0.64
1:A:249:GLU:OE1	1:D:217:HIS:NE2	2.28	0.63
1:A:198:LEU:HG	1:A:199:GLU:H	1.64	0.63
1:D:209:VAL:HG23	1:D:210:GLU:HG3	1.81	0.62
1:A:19:LYS:HD2	1:A:19:LYS:H	1.66	0.61
1:D:173:ARG:HG3	1:D:198:LEU:HD21	1.84	0.59
1:A:173:ARG:CZ	1:A:202:PHE:HB3	2.33	0.57
1:A:173:ARG:CZ	1:A:276:SER:HB2	2.36	0.56
1:A:115:TYR:OH	3:A:402:HOH:O	2.17	0.56
1:D:125:THR:HG21	1:D:129:ASP:HB3	1.88	0.55
1:A:172:GLY:O	1:A:274:TYR:OH	2.18	0.55
1:A:173:ARG:NH2	1:A:202:PHE:HB3	2.22	0.54
1:A:130:SER:HB2	1:D:52:ARG:HH22	1.73	0.53
1:D:172:GLY:O	1:D:274:TYR:OH	2.20	0.52
1:A:197:ARG:NH2	1:A:256:THR:OG1	2.43	0.52
1:A:233:LYS:HE3	1:D:242:LYS:HD3	1.92	0.51
1:A:130:SER:HB2	1:D:52:ARG:HH12	1.76	0.50
1:A:173:ARG:HD2	1:A:198:LEU:HD23	1.94	0.50
1:D:178:SER:N	3:D:406:HOH:O	2.38	0.50
1:A:178:SER:HB2	1:A:271:LYS:HD2	1.93	0.49
1:A:204:ILE:HD12	1:A:255:VAL:HG23	1.93	0.49
1:D:232:ASP:OD1	1:D:233:LYS:HG3	2.13	0.48
1:D:177:LEU:HD11	1:D:194:TYR:HB3	1.95	0.47
1:A:16:PHE:HE1	1:A:44:HIS:CD2	2.32	0.47
1:D:3:TRP:CD2	1:D:33:PRO:HG3	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:204:ILE:HD11	1:A:253:ASN:O	2.16	0.46
1:D:178:SER:HB2	1:D:271:LYS:HD2	1.98	0.45
1:D:139[B]:ASN:OD1	3:D:402:HOH:O	2.21	0.45
1:D:197:ARG:NH1	1:D:254:LYS:HB3	2.31	0.45
1:D:129:ASP:OD1	1:D:130:SER:N	2.41	0.45
1:D:234:ARG:HG2	1:D:235:GLU:N	2.31	0.45
1:D:125:THR:C	1:D:127:LEU:N	2.75	0.45
1:D:173:ARG:HG2	1:D:276:SER:OG	2.18	0.44
1:A:181:GLU:HB3	1:A:184:GLN:HB2	2.00	0.44
1:D:132:PRO:O	1:D:159:HIS:HD2	2.01	0.43
1:D:182:TYR:CE1	1:D:271:LYS:HG2	2.52	0.43
1:A:197:ARG:NH1	1:A:254:LYS:HB3	2.30	0.43
1:A:240:CYS:HB3	1:A:241:GLY:H	1.69	0.43
1:D:61:THR:HG22	1:D:66:VAL:HA	2.00	0.43
1:A:61:THR:HG22	1:A:66:VAL:HG22	2.01	0.42
1:D:199:GLU:HB2	1:D:202:PHE:CD2	2.53	0.42
1:A:206:LEU:HD11	1:A:255:VAL:HG11	2.02	0.42
1:D:131:VAL:HG12	1:D:133:CYS:H	1.83	0.42
1:D:204:ILE:HD12	1:D:255:VAL:HG23	2.02	0.42
1:D:177:LEU:HD21	1:D:194:TYR:CG	2.56	0.41
1:A:132:PRO:O	1:A:159:HIS:HD2	2.04	0.41
1:D:61:THR:HG22	1:D:66:VAL:HG22	2.02	0.41
1:A:177:LEU:HD11	1:A:194:TYR:HB3	2.02	0.41
1:A:173:ARG:HH22	1:A:203:SER:N	2.19	0.41
1:D:60:LEU:O	1:D:67:LEU:N	2.53	0.41
1:A:5:GLU:HG3	1:A:6:PRO:HD2	2.04	0.40
1:D:127:LEU:HD12	1:D:127:LEU:HA	1.85	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	276/278 (99%)	258 (94%)	18 (6%)	0	100	100
1	D	277/278 (100%)	258 (93%)	19 (7%)	0	100	100
All	All	553/556 (100%)	516 (93%)	37 (7%)	0	100	100

There are no Ramachandran outliers to report.

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	247/247 (100%)	246 (100%)	1 (0%)	84	93
1	D	247/247 (100%)	245 (99%)	2 (1%)	73	88
All	All	494/494 (100%)	491 (99%)	3 (1%)	78	91

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	260	THR
1	D	169	VAL
1	D	260	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	22	ASN
1	A	24	GLN
1	A	73	GLN
1	D	24	GLN
1	D	46	ASN
1	D	73	GLN

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 6 ligands modelled in this entry, 6 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, 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	278/278 (100%)	0.57	33 (11%) 9 7	41, 76, 168, 212	0
1	D	278/278 (100%)	0.73	41 (14%) 6 4	33, 84, 164, 190	1 (0%)
All	All	556/556 (100%)	0.65	74 (13%) 7 5	33, 81, 168, 212	1 (0%)

All (74) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	278	ALA	7.4
1	A	278	ALA	6.3
1	A	131	VAL	5.8
1	A	125	THR	4.5
1	A	176	PHE	4.1
1	D	131	VAL	4.1
1	D	209	VAL	4.0
1	D	128	GLY	4.0
1	A	233	LYS	3.9
1	A	128	GLY	3.8
1	A	193	ALA	3.7
1	A	191	SER	3.7
1	D	242	LYS	3.6
1	D	78	THR	3.6
1	D	127	LEU	3.6
1	D	202	PHE	3.6
1	A	192	CYS	3.5
1	D	251	ASP	3.5
1	D	271	LYS	3.5
1	A	126	SER	3.4
1	A	168	GLN	3.4
1	A	255	VAL	3.3
1	D	129	ASP	3.3
1	D	224	TYR	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	230	GLN	3.1
1	D	216	MET	3.1
1	A	270	TRP	3.0
1	A	198	LEU	3.0
1	A	1	SER	3.0
1	D	176	PHE	3.0
1	D	249	GLU	2.9
1	D	243	THR	2.9
1	A	173	ARG	2.9
1	D	201	GLY	2.9
1	A	208	PHE	2.9
1	A	194	TYR	2.8
1	D	233	LYS	2.8
1	D	274	TYR	2.7
1	D	125	THR	2.7
1	A	271	LYS	2.7
1	A	257	ILE	2.6
1	D	208	PHE	2.6
1	A	251	ASP	2.5
1	D	198	LEU	2.5
1	D	170	PHE	2.5
1	D	277	THR	2.5
1	D	260	THR	2.4
1	A	232	ASP	2.4
1	A	127	LEU	2.4
1	D	126	SER	2.4
1	D	228	LYS	2.4
1	A	202	PHE	2.4
1	D	220	ALA	2.3
1	A	272	ILE	2.3
1	D	76	THR	2.3
1	A	274	TYR	2.3
1	A	166	SER	2.3
1	D	51	TYR	2.2
1	D	130	SER	2.2
1	A	256	THR	2.2
1	D	90	LEU	2.2
1	D	246	PRO	2.1
1	D	206	LEU	2.1
1	A	169	VAL	2.1
1	A	259	PHE	2.1
1	D	173	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	268	THR	2.1
1	A	177	LEU	2.1
1	D	1	SER	2.0
1	D	174	SER	2.0
1	D	276	SER	2.0
1	D	268	THR	2.0
1	D	254	LYS	2.0
1	D	171	THR	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(Å ²)	Q<0.9
2	CA	D	302	1/1	0.89	0.10	100,100,100,100	0
2	CA	A	302	1/1	0.99	0.04	73,73,73,73	0
2	CA	D	300	1/1	0.99	0.04	56,56,56,56	0
2	CA	D	301	1/1	0.99	0.07	55,55,55,55	0
2	CA	A	300	1/1	0.99	0.05	59,59,59,59	0
2	CA	A	301	1/1	1.00	0.02	45,45,45,45	0

6.5 Other polymers [i](#)

There are no such residues in this entry.