Full wwPDB X-ray Structure Validation Report ⓘ

May 14, 2024 – 01:30 pm BST

PDB ID	:	4BVY
Title	:	Crystal structure of the AIMP3-MRS N-terminal domain complex
Authors	:	Cho, H.Y.; Seo, W.W.; Cho, H.J.; Kang, B.S.
Deposited on	:	2013-06-29
Resolution	:	1.99 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:

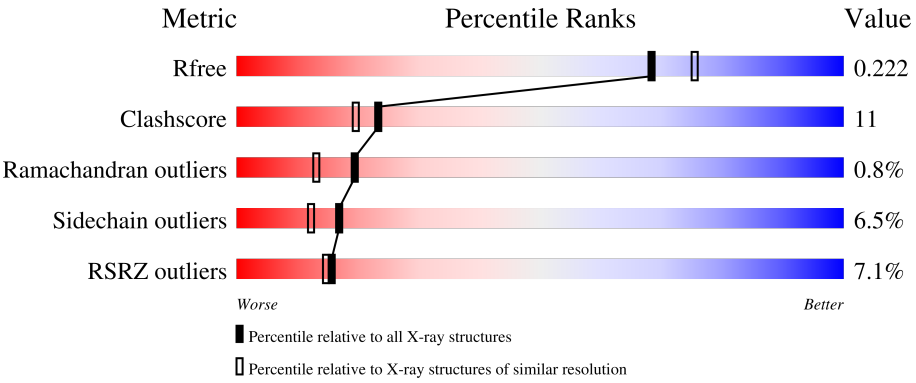
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 1.99 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}	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 <=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	232	7% 69% 18% · 9%
2	B	186	5% 75% 12% · · 10%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 3052 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 METHIONINE–TRNA LIGASE, CYTOPLASMIC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	211	Total	C	N	O	S	0	0	0
			1642	1054	279	303	6			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	226	GLU	-	expression tag	UNP P56192
A	227	HIS	-	expression tag	UNP P56192
A	228	HIS	-	expression tag	UNP P56192
A	229	HIS	-	expression tag	UNP P56192
A	230	HIS	-	expression tag	UNP P56192
A	231	HIS	-	expression tag	UNP P56192
A	232	HIS	-	expression tag	UNP P56192
A	36	GLN	GLU	conflict	UNP P56192
A	187	GLN	GLU	conflict	UNP P56192

- Molecule 2 is a protein called EUKARYOTIC TRANSLATION ELONGATION FACTOR 1 EPSILON-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	168	Total	C	N	O	S	0	0	0
			1336	854	227	254	1			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-11	MET	-	expression tag	UNP O43324
B	-10	ARG	-	expression tag	UNP O43324
B	-9	GLY	-	expression tag	UNP O43324
B	-8	SER	-	expression tag	UNP O43324
B	-7	HIS	-	expression tag	UNP O43324
B	-6	HIS	-	expression tag	UNP O43324

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-5	HIS	-	expression tag	UNP O43324
B	-4	HIS	-	expression tag	UNP O43324
B	-3	HIS	-	expression tag	UNP O43324
B	-2	HIS	-	expression tag	UNP O43324
B	-1	GLY	-	expression tag	UNP O43324
B	0	SER	-	expression tag	UNP O43324
B	37	ASP	ASN	conflict	UNP O43324
B	147	SER	CYS	engineered mutation	UNP O43324

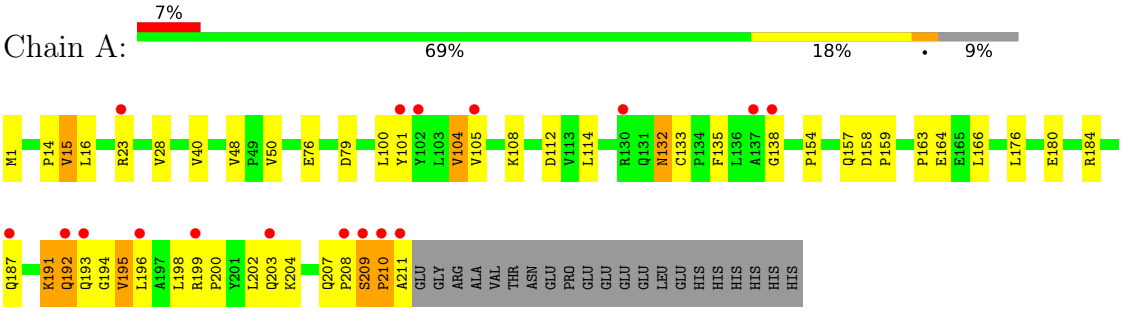
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	44	Total O 44 44	0	0
3	B	30	Total O 30 30	0	0

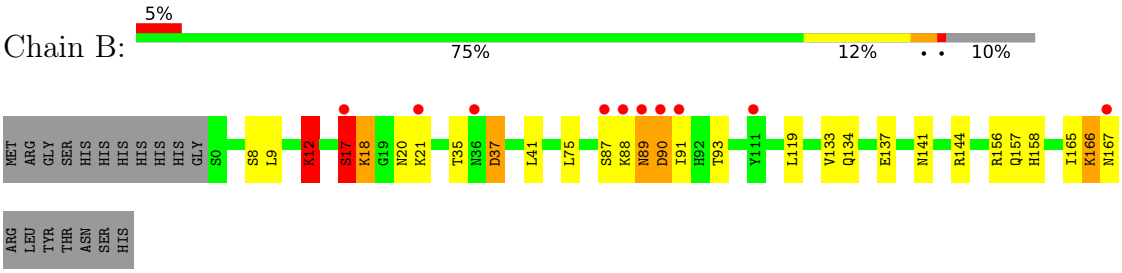
3 Residue-property plots (i)

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: METHIONINE–TRNA LIGASE, CYTOPLASMIC



• Molecule 2: EUKARYOTIC TRANSLATION ELONGATION FACTOR 1 EPSILON-1



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	43.17Å 71.25Å 64.34Å 90.00° 104.83° 90.00°	Depositor
Resolution (Å)	39.67 – 1.99 39.67 – 1.99	Depositor EDS
% Data completeness (in resolution range)	98.8 (39.67-1.99) 97.6 (39.67-1.99)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.66 (at 2.00Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.189 , 0.218 0.201 , 0.222	Depositor DCC
R_{free} test set	1292 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	26.3	Xtriage
Anisotropy	0.369	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 44.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	3052	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 9.19% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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	6/1684 (0.4%)	0.71	1/2303 (0.0%)
2	B	0.84	2/1363 (0.1%)	0.72	1/1849 (0.1%)
All	All	0.87	8/3047 (0.3%)	0.71	2/4152 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	B	0	1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	195	VAL	CB-CG2	-5.89	1.40	1.52
2	B	12	LYS	C-O	-5.74	1.12	1.23
2	B	18	LYS	N-CA	-5.33	1.35	1.46
1	A	15	VAL	C-O	-5.26	1.13	1.23
1	A	194	GLY	C-O	-5.23	1.15	1.23
1	A	176	LEU	CG-CD1	-5.22	1.32	1.51
1	A	14	PRO	C-N	-5.20	1.22	1.34
1	A	105	VAL	CB-CG2	-5.04	1.42	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	191	LYS	C-N-CA	-5.19	108.72	121.70
2	B	90	ASP	CB-CG-OD1	-5.17	113.65	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	17	SER	Peptide

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	1642	0	1635	43	0
2	B	1336	0	1329	25	0
3	A	44	0	0	1	0
3	B	30	0	0	1	0
All	All	3052	0	2964	67	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 (67) 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:209:SER:HB2	1:A:210:PRO:CD	1.73	1.17
2:B:166:LYS:HA	2:B:167:ASN:HB2	1.24	1.07
1:A:209:SER:CB	1:A:210:PRO:HD3	1.89	1.01
1:A:209:SER:HB2	1:A:210:PRO:HD3	1.02	1.00
1:A:203:GLN:HE21	1:A:204:LYS:HE3	1.24	0.99
2:B:165:ILE:O	2:B:166:LYS:HG3	1.69	0.93
1:A:209:SER:CB	1:A:210:PRO:CD	2.46	0.88
1:A:203:GLN:CG	1:A:204:LYS:N	2.36	0.87
1:A:203:GLN:NE2	1:A:204:LYS:HE3	1.94	0.83
1:A:203:GLN:HG3	1:A:204:LYS:N	1.94	0.81
2:B:165:ILE:O	2:B:166:LYS:CG	2.30	0.80
2:B:165:ILE:O	2:B:166:LYS:CB	2.30	0.79
2:B:166:LYS:CA	2:B:167:ASN:HB2	2.11	0.79
2:B:17:SER:HB2	2:B:18:LYS:HA	1.66	0.76
2:B:166:LYS:HA	2:B:167:ASN:CB	1.93	0.75
1:A:199:ARG:HB3	1:A:200:PRO:HD3	1.69	0.74
1:A:101:TYR:OH	1:A:207:GLN:NE2	2.22	0.73
1:A:135:PHE:HB2	1:A:138:GLY:O	1.93	0.69
2:B:165:ILE:O	2:B:166:LYS:HB2	1.91	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:88:LYS:C	2:B:89:ASN:OD1	2.33	0.68
2:B:89:ASN:OD1	2:B:89:ASN:N	2.28	0.66
2:B:87:SER:OG	2:B:88:LYS:N	2.30	0.65
1:A:207:GLN:N	1:A:207:GLN:OE1	2.29	0.64
1:A:203:GLN:HG2	1:A:204:LYS:H	1.63	0.63
2:B:8:SER:O	2:B:12:LYS:HD3	2.00	0.62
1:A:203:GLN:HE21	1:A:204:LYS:CE	2.05	0.62
1:A:192:GLN:HE21	1:A:193:GLN:HG2	1.66	0.60
1:A:200:PRO:O	1:A:203:GLN:HG2	2.05	0.57
1:A:203:GLN:CG	1:A:204:LYS:HG3	2.35	0.57
1:A:100:LEU:O	1:A:104:VAL:HG12	2.06	0.56
1:A:104:VAL:HG11	1:A:202:LEU:CD1	2.35	0.56
2:B:17:SER:CB	2:B:18:LYS:HA	2.35	0.56
1:A:100:LEU:O	1:A:104:VAL:CG1	2.55	0.54
2:B:89:ASN:HB2	2:B:90:ASP:OD1	2.08	0.52
1:A:203:GLN:HG2	1:A:204:LYS:HG3	1.91	0.52
1:A:104:VAL:HG11	1:A:202:LEU:HD13	1.90	0.52
1:A:1:MET:CE	1:A:28:VAL:HG22	2.41	0.51
2:B:133:VAL:O	2:B:137:GLU:HG3	2.11	0.50
2:B:141:ASN:OD1	2:B:144:ARG:NH2	2.41	0.50
1:A:108:LYS:HD3	1:A:112:ASP:HB3	1.94	0.49
1:A:192:GLN:O	1:A:192:GLN:CG	2.56	0.49
2:B:20:ASN:ND2	3:B:2006:HOH:O	2.45	0.48
1:A:187:GLN:O	1:A:191:LYS:HA	2.13	0.48
1:A:203:GLN:HG2	1:A:204:LYS:N	2.17	0.48
1:A:101:TYR:CE2	1:A:207:GLN:HG3	2.49	0.48
2:B:17:SER:HB2	2:B:18:LYS:CA	2.40	0.47
1:A:79:ASP:HB3	2:B:41:LEU:HD21	1.96	0.47
1:A:104:VAL:CG1	1:A:202:LEU:HD13	2.45	0.47
2:B:88:LYS:HA	2:B:91:ILE:CG2	2.46	0.46
2:B:134:GLN:H	2:B:134:GLN:CD	2.19	0.45
2:B:35:THR:O	2:B:37:ASP:HA	2.17	0.45
1:A:154:PRO:HB3	1:A:198:LEU:CD2	2.47	0.45
1:A:40:VAL:HG22	1:A:50:VAL:HG11	1.99	0.44
2:B:17:SER:CB	2:B:18:LYS:CA	2.95	0.44
1:A:192:GLN:NE2	1:A:193:GLN:HG2	2.33	0.43
1:A:192:GLN:NE2	1:A:193:GLN:CG	2.82	0.43
1:A:154:PRO:HB3	1:A:198:LEU:HD21	2.00	0.43
2:B:75:LEU:HD22	2:B:119:LEU:HD12	2.01	0.43
2:B:157:GLN:HB2	2:B:158:HIS:H	1.54	0.43
1:A:101:TYR:CZ	1:A:207:GLN:HG3	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:210:PRO:O	1:A:211:ALA:C	2.57	0.42
1:A:163:PRO:HG2	1:A:166:LEU:HD12	2.02	0.41
1:A:23:ARG:HD3	1:A:23:ARG:HA	1.90	0.41
1:A:15:VAL:HG23	1:A:16:LEU:N	2.36	0.41
1:A:207:GLN:CB	1:A:208:PRO:HD2	2.50	0.41
1:A:132:ASN:HB2	3:A:2041:HOH:O	2.20	0.41
1:A:158:ASP:HA	1:A:159:PRO:HD3	1.92	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	209/232 (90%)	204 (98%)	3 (1%)	2 (1%)	15 9
2	B	166/186 (89%)	155 (93%)	10 (6%)	1 (1%)	25 19
All	All	375/418 (90%)	359 (96%)	13 (4%)	3 (1%)	19 13

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	209	SER
1	A	210	PRO
2	B	166	LYS

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	177/197 (90%)	164 (93%)	13 (7%)	14 9
2	B	145/163 (89%)	137 (94%)	8 (6%)	21 17
All	All	322/360 (89%)	301 (94%)	21 (6%)	17 12

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	VAL
1	A	76	GLU
1	A	104	VAL
1	A	114	LEU
1	A	132	ASN
1	A	133	CYS
1	A	157	GLN
1	A	164	GLU
1	A	180	GLU
1	A	184	ARG
1	A	192	GLN
1	A	195	VAL
1	A	196	LEU
2	B	9	LEU
2	B	12	LYS
2	B	17	SER
2	B	21	LYS
2	B	37	ASP
2	B	89	ASN
2	B	93	THR
2	B	156	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	192	GLN
1	A	203	GLN
2	B	157	GLN
2	B	167	ASN

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 monosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

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, 95^{th} 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	211/232 (90%)	0.53	17 (8%)	12	11	7, 23, 44, 56	0
2	B	168/186 (90%)	0.33	10 (5%)	21	20	7, 20, 49, 61	0
All	All	379/418 (90%)	0.45	27 (7%)	16	15	7, 21, 45, 61	0

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	211	ALA	10.7
1	A	210	PRO	7.0
1	A	209	SER	6.4
2	B	36	ASN	5.5
1	A	137	ALA	5.0
2	B	17	SER	5.0
2	B	89	ASN	4.4
1	A	138	GLY	4.3
2	B	167	ASN	4.1
1	A	208	PRO	3.9
1	A	192	GLN	3.9
2	B	21	LYS	3.5
1	A	196	LEU	3.0
2	B	88	LYS	2.8
2	B	111	TYR	2.8
1	A	101	TYR	2.7
1	A	203	GLN	2.7
1	A	23	ARG	2.6
2	B	87	SER	2.5
2	B	91	ILE	2.5
1	A	193	GLN	2.4
1	A	105	VAL	2.4
2	B	90	ASP	2.2
1	A	102	TYR	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	187	GLN	2.1
1	A	130	ARG	2.0
1	A	199	ARG	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 monosaccharides 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.