



Full wwPDB X-ray Structure Validation Report ⓘ

May 21, 2020 – 05:47 am BST

PDB ID : 5ZTZ
Title : Proteobacterial origin of protein arginine methylation and regulation of Complex I assembly by MidA
Authors : Arold, S.T.; Swaminathan, K.; Hameed, U.F.S.
Deposited on : 2018-05-05
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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

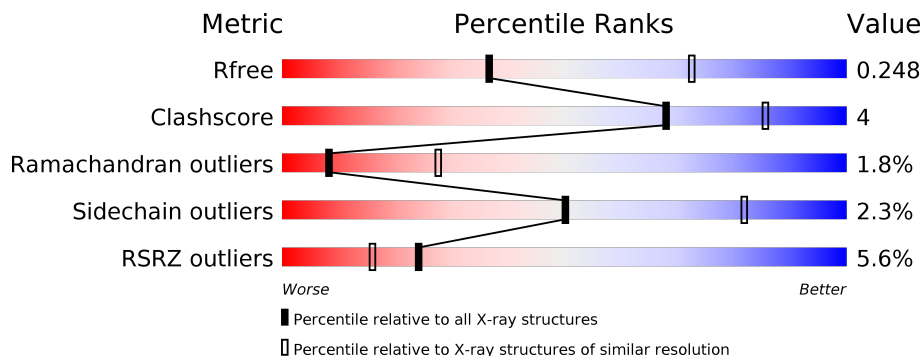
1 Overall quality at a glance

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))
R_{free}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (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 on 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	414	 4% 86% 9% . .
1	B	414	 5% 87% 9% .
1	C	414	 7% 86% 9% . .

2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 9622 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 Protein arginine methyltransferase NDUFAF7 homolog, mitochondrial.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	401	3201	2067	520	600	3	11	0	0	0
1	B	401	3201	2067	520	600	3	11	0	0	0
1	C	401	3201	2067	520	600	3	11	0	0	0

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	71	GLY	-	expression tag	UNP Q54S83
A	72	PRO	-	expression tag	UNP Q54S83
A	73	LEU	-	expression tag	UNP Q54S83
A	74	GLY	-	expression tag	UNP Q54S83
A	75	SER	-	expression tag	UNP Q54S83
B	71	GLY	-	expression tag	UNP Q54S83
B	72	PRO	-	expression tag	UNP Q54S83
B	73	LEU	-	expression tag	UNP Q54S83
B	74	GLY	-	expression tag	UNP Q54S83
B	75	SER	-	expression tag	UNP Q54S83
C	71	GLY	-	expression tag	UNP Q54S83
C	72	PRO	-	expression tag	UNP Q54S83
C	73	LEU	-	expression tag	UNP Q54S83
C	74	GLY	-	expression tag	UNP Q54S83
C	75	SER	-	expression tag	UNP Q54S83

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	4	Total	O	0	0
			4	4		

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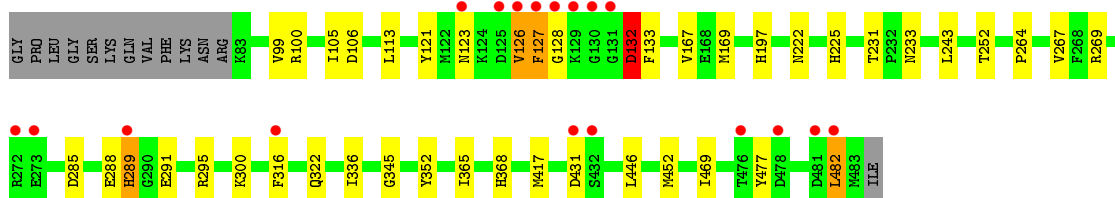
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	9	Total O 9 9	0	0
2	C	6	Total O 6 6	0	0

3 Residue-property plots [i](#)

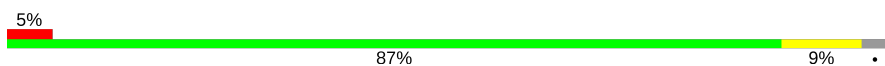
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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.

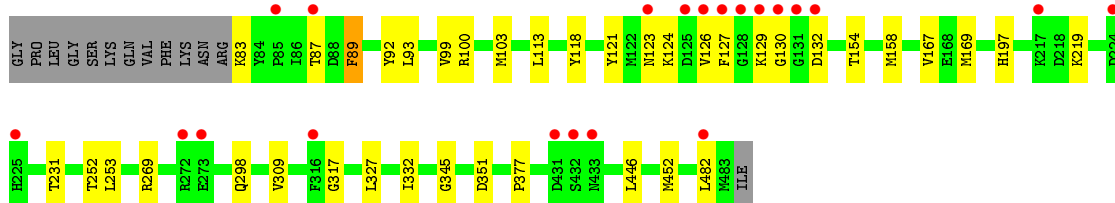
- Molecule 1: Protein arginine methyltransferase NDUFAF7 homolog, mitochondrial

Chain A: 




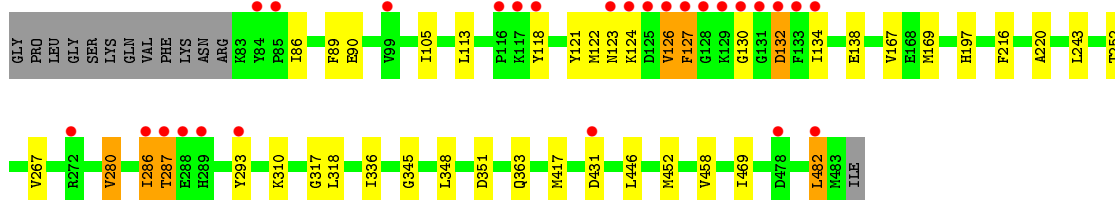
- Molecule 1: Protein arginine methyltransferase NDUFAF7 homolog, mitochondrial

Chain B: 



- Molecule 1: Protein arginine methyltransferase NDUFAF7 homolog, mitochondrial

Chain C: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	73.01Å 105.63Å 201.07Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	100.53 – 2.80 33.42 – 2.80	Depositor EDS
% Data completeness (in resolution range)	96.8 (100.53-2.80) 96.9 (33.42-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.17	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.85 (at 2.81Å)	Xtrriage
Refinement program	REFMAC 5.8.0216	Depositor
R, R_{free}	0.215 , 0.235 0.230 , 0.248	Depositor DCC
R_{free} test set	2000 reflections (5.29%)	wwPDB-VP
Wilson B-factor (Å ²)	39.7	Xtrriage
Anisotropy	0.264	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 41.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	9622	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.83% 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](#)

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	0.37	0/3259	0.58	0/4381
1	B	0.38	0/3259	0.59	0/4381
1	C	0.36	0/3259	0.60	0/4381
All	All	0.37	0/9777	0.59	0/13143

There are no bond length outliers.

There are no bond angle outliers.

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	3201	0	3234	23	0
1	B	3201	0	3234	27	0
1	C	3201	0	3234	27	0
2	A	4	0	0	0	0
2	B	9	0	0	0	0
2	C	6	0	0	0	0
All	All	9622	0	9702	74	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 4.

All (74) 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:154:THR:HG22	1:B:158:MSE:HE2	1.46	0.94
1:C:89:PHE:HB2	1:C:118:TYR:CD2	2.13	0.84
1:A:222:ASN:HD22	1:A:225:HIS:CE1	2.04	0.76
1:A:133:PHE:HZ	1:A:365:ILE:HG21	1.51	0.75
1:B:158:MSE:HE1	1:B:253:LEU:HD21	1.69	0.74
1:B:158:MSE:CE	1:B:253:LEU:HD21	2.19	0.72
1:C:446:LEU:HA	1:C:452:MSE:HE3	1.72	0.71
1:C:267:VAL:HB	1:C:280:VAL:HG13	1.76	0.68
1:B:158:MSE:HE1	1:B:253:LEU:CD2	2.30	0.62
1:B:87:THR:CG2	1:B:87:THR:O	2.47	0.62
1:B:89:PHE:HB3	1:B:118:TYR:CG	2.35	0.61
1:C:446:LEU:HD23	1:C:452:MSE:CE	2.33	0.59
1:B:89:PHE:HB3	1:B:118:TYR:CD1	2.39	0.57
1:C:86:ILE:HA	1:C:293:TYR:CE2	2.39	0.57
1:A:169:MSE:HE1	1:A:243:LEU:HD13	1.87	0.57
1:B:446:LEU:HA	1:B:452:MSE:HE3	1.85	0.57
1:A:113:LEU:HD13	1:A:121:TYR:CE2	2.40	0.57
1:C:286:ILE:O	1:C:287:THR:O	2.23	0.57
1:C:127:PHE:CE2	1:C:132:ASP:HB2	2.39	0.56
1:B:113:LEU:HD13	1:B:121:TYR:CE2	2.41	0.56
1:B:87:THR:O	1:B:87:THR:HG22	2.06	0.55
1:C:113:LEU:HD13	1:C:121:TYR:CE2	2.41	0.55
1:C:127:PHE:HD1	1:C:127:PHE:N	2.05	0.54
1:A:446:LEU:HA	1:A:452:MSE:HE3	1.89	0.54
1:B:154:THR:CG2	1:B:158:MSE:HE2	2.30	0.53
1:B:89:PHE:HB2	1:B:118:TYR:CD2	2.44	0.53
1:B:309:VAL:HG11	1:B:327:LEU:CD2	2.39	0.53
1:C:446:LEU:HD23	1:C:452:MSE:HE1	1.91	0.53
1:C:127:PHE:N	1:C:127:PHE:CD1	2.76	0.53
1:B:269:ARG:HD3	1:B:298:GLN:HE21	1.73	0.52
1:A:106:ASP:OD1	1:A:264:PRO:HB2	2.10	0.52
1:B:169:MSE:HE2	1:B:332:ILE:HG21	1.91	0.51
1:B:99:VAL:HG23	1:B:100:ARG:HG3	1.93	0.51
1:B:154:THR:HG22	1:B:158:MSE:CE	2.30	0.51
1:C:169:MSE:HE1	1:C:243:LEU:HD13	1.92	0.50
1:B:89:PHE:CB	1:B:118:TYR:CG	2.95	0.50
1:C:105:ILE:HD12	1:C:267:VAL:HB	1.94	0.49
1:A:128:GLY:HA3	1:A:132:ASP:OD1	2.13	0.49
1:B:309:VAL:HG11	1:B:327:LEU:HD21	1.96	0.48
1:B:89:PHE:HE1	1:B:377:PRO:O	1.96	0.48
1:C:127:PHE:HD1	1:C:127:PHE:H	1.59	0.48
1:C:90:GLU:OE1	1:C:293:TYR:HB2	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:169:MSE:HE3	1:A:336:ILE:HD11	1.96	0.47
1:A:99:VAL:HG23	1:A:100:ARG:HG3	1.97	0.47
1:A:288:GLU:HG3	1:A:289:HIS:CE1	2.51	0.46
1:C:169:MSE:HE3	1:C:336:ILE:HD11	1.99	0.45
1:A:368:HIS:HB3	1:C:216:PHE:O	2.17	0.45
1:C:134:ILE:HG23	1:C:138:GLU:HB2	1.98	0.45
1:A:316:PHE:O	1:A:316:PHE:CD2	2.70	0.44
1:C:252:THR:O	1:C:345:GLY:HA3	2.18	0.44
1:C:446:LEU:HD23	1:C:452:MSE:HE3	2.00	0.43
1:A:269:ARG:CZ	1:A:322:GLN:OE1	2.67	0.43
1:B:154:THR:O	1:B:158:MSE:HG3	2.18	0.43
1:B:89:PHE:CB	1:B:118:TYR:CD2	3.02	0.43
1:A:352:TYR:CG	1:C:220:ALA:HB2	2.54	0.42
1:A:352:TYR:CD1	1:C:220:ALA:HB2	2.55	0.42
1:C:267:VAL:HG12	1:C:280:VAL:CG1	2.50	0.42
1:A:126:VAL:O	1:A:127:PHE:HD1	2.03	0.41
1:A:417:MSE:SE	1:A:469:ILE:HG22	2.70	0.41
1:A:167:VAL:HA	1:A:197:HIS:O	2.21	0.41
1:A:285:ASP:HA	1:A:295:ARG:HD3	2.02	0.41
1:A:231:THR:HG22	1:A:233:ASN:H	1.86	0.41
1:C:417:MSE:SE	1:C:469:ILE:HG22	2.70	0.41
1:A:252:THR:O	1:A:345:GLY:HA3	2.19	0.41
1:B:167:VAL:HA	1:B:197:HIS:O	2.21	0.41
1:C:267:VAL:HB	1:C:280:VAL:CG1	2.48	0.41
1:A:446:LEU:HD23	1:A:452:MSE:CE	2.51	0.41
1:A:105:ILE:HD12	1:A:267:VAL:HB	2.02	0.41
1:B:89:PHE:HA	1:B:92:TYR:HB3	2.03	0.41
1:C:348:LEU:HD22	1:C:458:VAL:CG1	2.51	0.40
1:B:252:THR:O	1:B:345:GLY:HA3	2.20	0.40
1:B:446:LEU:HD23	1:B:452:MSE:CE	2.51	0.40
1:B:93:LEU:HB3	1:B:103:MSE:HE1	2.03	0.40
1:C:167:VAL:HA	1:C:197:HIS:O	2.21	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	399/414 (96%)	375 (94%)	18 (4%)	6 (2%)	10	33
1	B	399/414 (96%)	374 (94%)	18 (4%)	7 (2%)	8	28
1	C	399/414 (96%)	374 (94%)	17 (4%)	8 (2%)	7	24
All	All	1197/1242 (96%)	1123 (94%)	53 (4%)	21 (2%)	8	28

All (21) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	123	ASN
1	A	126	VAL
1	B	123	ASN
1	B	126	VAL
1	C	123	ASN
1	C	126	VAL
1	C	287	THR
1	A	291	GLU
1	A	482	LEU
1	B	130	GLY
1	B	317	GLY
1	C	286	ILE
1	C	317	GLY
1	A	132	ASP
1	B	129	LYS
1	B	132	ASP
1	B	482	LEU
1	C	132	ASP
1	C	482	LEU
1	A	477	TYR
1	C	130	GLY

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	352/352 (100%)	346 (98%)	6 (2%)	60	87
1	B	352/352 (100%)	345 (98%)	7 (2%)	55	84
1	C	352/352 (100%)	341 (97%)	11 (3%)	40	74
All	All	1056/1056 (100%)	1032 (98%)	24 (2%)	50	82

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	127	PHE
1	A	132	ASP
1	A	289	HIS
1	A	300	LYS
1	A	431	ASP
1	A	482	LEU
1	B	83	LYS
1	B	89	PHE
1	B	124	LYS
1	B	127	PHE
1	B	219	LYS
1	B	231	THR
1	B	351	ASP
1	C	122	MSE
1	C	124	LYS
1	C	126	VAL
1	C	127	PHE
1	C	280	VAL
1	C	310	LYS
1	C	318	LEU
1	C	351	ASP
1	C	363	GLN
1	C	431	ASP
1	C	482	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	141	GLN
1	A	222	ASN
1	A	257	GLN
1	B	257	GLN
1	B	298	GLN

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Mol	Chain	Res	Type
1	B	433	ASN
1	C	363	GLN
1	C	433	ASN

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 carbohydrates 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

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	390/414 (94%)	0.12	18 (4%) 32 22	26, 43, 81, 138	0
1	B	390/414 (94%)	0.18	21 (5%) 25 17	20, 38, 90, 154	0
1	C	390/414 (94%)	0.37	27 (6%) 16 10	27, 46, 102, 172	0
All	All	1170/1242 (94%)	0.22	66 (5%) 24 16	20, 43, 96, 172	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	130	GLY	14.2
1	C	128	GLY	13.6
1	B	127	PHE	11.1
1	B	128	GLY	9.2
1	C	126	VAL	9.1
1	C	131	GLY	8.4
1	B	482	LEU	8.2
1	B	130	GLY	8.1
1	C	129	LYS	7.8
1	C	127	PHE	7.8
1	A	127	PHE	7.6
1	B	131	GLY	7.2
1	B	431	ASP	6.6
1	B	129	LYS	6.2
1	A	482	LEU	6.0
1	B	132	ASP	5.7
1	C	125	ASP	5.7
1	B	126	VAL	5.7
1	A	126	VAL	5.5
1	C	286	ILE	5.3
1	C	123	ASN	5.2
1	B	125	ASP	5.0
1	A	125	ASP	5.0

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Mol	Chain	Res	Type	RSRZ
1	A	128	GLY	4.8
1	B	123	ASN	4.8
1	A	130	GLY	4.5
1	A	129	LYS	4.5
1	C	132	ASP	4.4
1	A	316	PHE	4.0
1	B	224	ASP	3.9
1	C	85	PRO	3.8
1	A	123	ASN	3.7
1	C	431	ASP	3.4
1	B	432	SER	3.3
1	C	99	VAL	3.3
1	C	124	LYS	3.1
1	A	481	ASP	3.1
1	C	289	HIS	3.1
1	A	478	ASP	3.1
1	A	476	THR	3.0
1	A	431	ASP	3.0
1	C	133	PHE	2.9
1	C	482	LEU	2.9
1	A	273	GLU	2.9
1	B	87	THR	2.8
1	A	131	GLY	2.8
1	A	272	ARG	2.7
1	B	85	PRO	2.7
1	C	117	LYS	2.6
1	A	289	HIS	2.6
1	C	84	TYR	2.6
1	C	118	TYR	2.6
1	C	116	PRO	2.5
1	C	288	GLU	2.5
1	C	272	ARG	2.5
1	C	478	ASP	2.5
1	B	225	HIS	2.4
1	A	432	SER	2.4
1	B	433	ASN	2.3
1	B	316	PHE	2.3
1	B	273	GLU	2.2
1	C	293	TYR	2.2
1	B	272	ARG	2.2
1	B	217	LYS	2.1
1	C	134	ILE	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	287	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 carbohydrates 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.