



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 05:39 AM UTC

PDB ID : 3U86 / pdb_00003u86
Title : Crystal structure of human menin in complex with JunD
Authors : Huang, J.; Wan, B.; Lei, M.
Deposited on : 2011-10-15
Resolution : 2.84 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

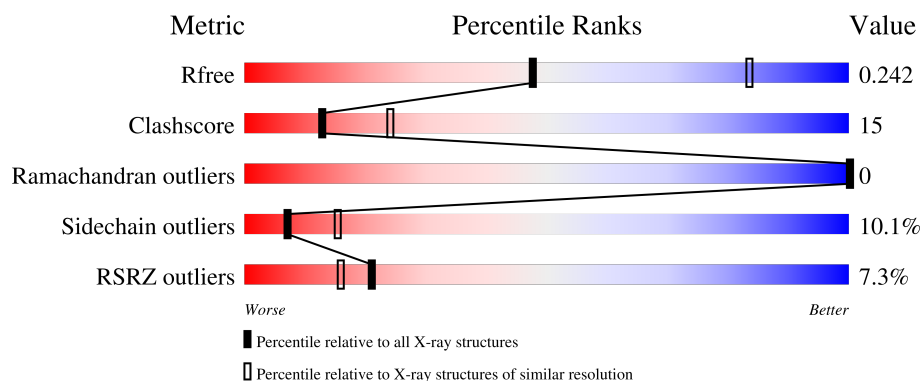
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.84 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	1520 (2.86-2.82)
Clashscore	190562	1559 (2.86-2.82)
Ramachandran outliers	187476	1517 (2.86-2.82)
Sidechain outliers	187428	1518 (2.86-2.82)
RSRZ outliers	180081	1521 (2.86-2.82)

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	550	
2	B	15	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3902 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 Menin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	484	Total	C	N	O	S	0	0	0
			3812	2442	653	703	14			

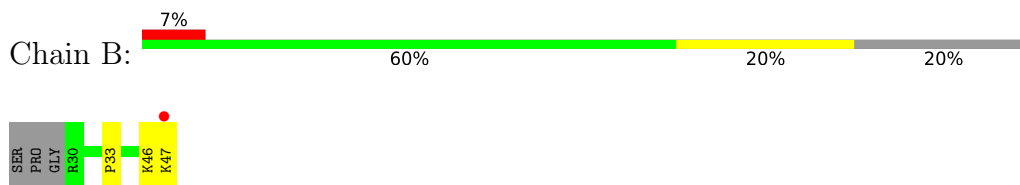
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP O00255

- Molecule 2 is a protein called Transcription factor jun-D.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	12	Total	C	N	O	0	0	0
			90	60	17	13			

- Molecule 1: Menin



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	140.65Å 140.65Å 93.11Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.98 – 2.84 33.98 – 2.84	Depositor EDS
% Data completeness (in resolution range)	94.9 (33.98-2.84) 94.8 (33.98-2.84)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.83 (at 2.86Å)	Xtriage
Refinement program	PHENIX 1.7_650	Depositor
R, R_{free}	0.217 , 0.245 0.215 , 0.242	Depositor DCC
R_{free} test set	2151 reflections (10.07%)	wwPDB-VP
Wilson B-factor (Å ²)	62.9	Xtriage
Anisotropy	1.143	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 65.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3902	wwPDB-VP
Average B, all atoms (Å ²)	95.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.98% 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	0.46	0/3900	0.91	14/5297 (0.3%)
2	B	0.41	0/93	0.88	0/125
All	All	0.46	0/3993	0.91	14/5422 (0.3%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	370	ASP	N-CA-C	9.12	125.04	113.55
1	A	137	ARG	N-CA-C	8.10	121.62	109.95
1	A	135	LYS	CB-CA-C	-6.11	99.06	110.36
1	A	53	VAL	CA-C-N	-6.02	118.25	122.59
1	A	53	VAL	C-N-CA	-6.02	118.25	122.59
1	A	129	LEU	N-CA-C	5.90	119.08	109.59
1	A	54	ILE	N-CA-C	5.82	113.64	107.76
1	A	54	ILE	CA-C-N	5.60	125.54	119.78
1	A	54	ILE	C-N-CA	5.60	125.54	119.78
1	A	133	TYR	N-CA-C	5.35	117.21	108.76
1	A	295	ARG	CA-C-N	5.34	126.09	120.11
1	A	295	ARG	C-N-CA	5.34	126.09	120.11
1	A	569	LYS	N-CA-C	-5.24	100.70	109.24
1	A	334	VAL	N-CA-C	5.22	115.84	110.36

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	3812	0	3793	115	0
2	B	90	0	99	4	0
All	All	3902	0	3892	118	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 15.

All (118) 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:137:ARG:HG2	1:A:138:ALA:H	1.31	0.92
1:A:130:SER:H	1:A:150:THR:HG22	1.35	0.89
1:A:29:ARG:HH11	1:A:29:ARG:HG2	1.39	0.87
1:A:29:ARG:HG2	1:A:29:ARG:NH1	1.92	0.85
1:A:448:GLU:HB3	1:A:451:VAL:HG23	1.64	0.78
1:A:108:ARG:HH12	1:A:111:GLY:HA2	1.50	0.76
1:A:31:GLU:OE2	1:A:232:ARG:NH1	2.19	0.75
1:A:349:GLN:HB2	1:A:422:LYS:HB3	1.68	0.75
1:A:355:ARG:O	1:A:358:GLU:HG3	1.90	0.71
1:A:176:ALA:HB2	1:A:185:VAL:HG13	1.73	0.70
1:A:37:LEU:HB3	1:A:239:MET:HE1	1.72	0.70
1:A:137:ARG:HG2	1:A:138:ALA:N	2.05	0.69
1:A:10:LEU:HD13	1:A:22:LEU:HA	1.75	0.68
1:A:335:ARG:HG2	1:A:409:CYS:SG	2.33	0.67
1:A:122:SER:OG	1:A:207:ARG:NH2	2.28	0.67
1:A:186:PHE:O	1:A:192:GLN:HB2	1.95	0.65
1:A:185:VAL:HG12	1:A:193:THR:HG22	1.79	0.65
1:A:558:MET:HA	1:A:558:MET:HE2	1.80	0.64
1:A:29:ARG:HH11	1:A:29:ARG:CG	2.09	0.64
1:A:150:THR:HG22	1:A:150:THR:O	1.99	0.63
1:A:68:ALA:HB2	1:A:74:GLY:O	1.99	0.62
1:A:238:PHE:CZ	2:B:33:PRO:HG2	2.34	0.62
1:A:41:LEU:HD22	1:A:239:MET:HE3	1.83	0.61
1:A:366:GLU:O	1:A:371:VAL:HG23	1.99	0.61
1:A:130:SER:N	1:A:150:THR:HG22	2.13	0.61
1:A:376:LEU:HB3	1:A:446:ARG:HG2	1.82	0.61
1:A:126:TRP:O	1:A:129:LEU:HD23	2.01	0.60
1:A:195:GLU:HB2	1:A:207:ARG:HA	1.83	0.59
1:A:299:LEU:HD13	1:A:303:HIS:CD2	2.36	0.59
1:A:199:HIS:CE1	1:A:221:LEU:HD11	2.38	0.59
1:A:573:SER:O	1:A:577:LEU:HG	2.03	0.58
1:A:452:ARG:O	1:A:566:VAL:HG23	2.03	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:70:ASP:HB2	1:A:72:PRO:HD2	1.86	0.58
1:A:129:LEU:HA	1:A:150:THR:CG2	2.33	0.58
1:A:62:THR:HG22	1:A:63:PHE:H	1.69	0.57
1:A:452:ARG:NH1	1:A:570:ILE:HD11	2.19	0.57
2:B:46:LYS:HE3	2:B:47:LYS:HE3	1.86	0.57
1:A:318:ILE:HG23	1:A:344:THR:HG23	1.87	0.57
1:A:62:THR:HG22	1:A:63:PHE:N	2.21	0.56
2:B:46:LYS:HG2	2:B:47:LYS:H	1.70	0.56
1:A:328:HIS:CD2	1:A:336:GLU:HB3	2.40	0.55
1:A:114:SER:O	1:A:118:VAL:HG23	2.07	0.54
1:A:70:ASP:HB3	1:A:71:PRO:HD2	1.90	0.52
1:A:413:LEU:HD11	1:A:417:TYR:HE1	1.73	0.52
1:A:31:GLU:HG3	1:A:166:GLN:HE21	1.74	0.52
1:A:54:ILE:HG12	1:A:63:PHE:CZ	2.45	0.52
1:A:371:VAL:O	1:A:375:LEU:HB2	2.10	0.52
1:A:455:VAL:HG22	1:A:549:PRO:HG2	1.92	0.51
1:A:458:VAL:HG22	1:A:520:GLY:H	1.74	0.51
1:A:254:LEU:HD22	1:A:254:LEU:O	2.11	0.50
1:A:458:VAL:O	1:A:552:THR:HB	2.12	0.50
1:A:287:GLU:OE1	1:A:291:PRO:HA	2.11	0.50
1:A:267:LEU:HB3	1:A:273:LEU:HD13	1.94	0.50
1:A:149:GLY:O	1:A:150:THR:HB	2.10	0.50
1:A:410:PHE:CE2	1:A:414:LEU:HD11	2.47	0.50
1:A:133:TYR:O	1:A:135:LYS:HE2	2.12	0.50
1:A:108:ARG:NH1	1:A:111:GLY:HA2	2.24	0.49
1:A:424:GLU:HG3	1:A:431:VAL:H	1.76	0.49
1:A:383:LEU:C	1:A:383:LEU:HD12	2.38	0.49
1:A:42:GLY:HA3	1:A:144:PHE:HB3	1.94	0.48
1:A:223:LEU:HD13	1:A:317:HIS:CD2	2.48	0.48
1:A:282:ASN:C	1:A:282:ASN:HD22	2.21	0.48
1:A:421:CYS:SG	1:A:558:MET:HE3	2.53	0.48
1:A:71:PRO:HB2	1:A:72:PRO:HD3	1.95	0.48
1:A:3:LEU:HB2	1:A:8:LYS:HE3	1.96	0.47
1:A:558:MET:HE2	1:A:558:MET:CA	2.44	0.47
1:A:302:TYR:O	1:A:306:ILE:HG13	2.14	0.47
1:A:108:ARG:HE	1:A:170:LEU:HD22	1.79	0.47
1:A:236:VAL:O	1:A:240:VAL:HG23	2.14	0.47
1:A:316:GLU:HG3	1:A:351:TYR:OH	2.15	0.46
1:A:32:PRO:O	1:A:166:GLN:NE2	2.36	0.46
1:A:70:ASP:CB	1:A:71:PRO:CD	2.94	0.46
1:A:253:SER:HB3	1:A:256:LEU:HB2	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:16:ILE:HG23	1:A:259:LEU:HD13	1.98	0.45
1:A:26:GLU:OE2	1:A:29:ARG:HD2	2.17	0.45
1:A:414:LEU:HD22	1:A:565:LEU:HD13	1.97	0.45
1:A:214:GLY:HA3	1:A:222:TYR:CD1	2.52	0.45
1:A:214:GLY:HA2	1:A:217:GLU:HG2	1.99	0.45
1:A:380:ALA:HB2	1:A:446:ARG:HD2	1.98	0.44
1:A:70:ASP:CB	1:A:71:PRO:HD2	2.46	0.44
1:A:265:TRP:CE3	1:A:265:TRP:HA	2.52	0.44
1:A:557:LYS:O	1:A:561:MET:HG2	2.18	0.44
1:A:54:ILE:HA	1:A:55:PRO:HD3	1.72	0.44
1:A:223:LEU:HD13	1:A:317:HIS:NE2	2.33	0.44
1:A:70:ASP:HB3	1:A:71:PRO:CD	2.49	0.43
1:A:68:ALA:HA	1:A:69:PRO:HD3	1.82	0.43
1:A:58:VAL:HG12	1:A:60:GLU:H	1.83	0.43
1:A:221:LEU:HD23	1:A:221:LEU:HA	1.72	0.43
1:A:119:LYS:O	1:A:122:SER:HB3	2.18	0.42
1:A:319:TYR:N	1:A:320:PRO:CD	2.82	0.42
1:A:452:ARG:NH1	1:A:567:ALA:O	2.52	0.42
1:A:249:LEU:HD23	1:A:249:LEU:HA	1.79	0.42
1:A:180:ASP:HB2	1:A:220:TRP:CH2	2.54	0.42
1:A:302:TYR:CD2	1:A:323:TYR:HB3	2.55	0.42
1:A:177:LEU:HD21	1:A:238:PHE:HD2	1.85	0.42
1:A:457:ILE:HD12	1:A:457:ILE:N	2.35	0.42
1:A:205:ASP:OD1	1:A:205:ASP:N	2.53	0.41
1:A:273:LEU:HB3	1:A:280:LEU:HD13	2.02	0.41
1:A:372:ILE:HB	1:A:373:PRO:HD3	2.01	0.41
1:A:23:PHE:CE1	1:A:37:LEU:HD22	2.55	0.41
1:A:129:LEU:HA	1:A:150:THR:HG22	2.01	0.41
1:A:404:LEU:HD12	1:A:404:LEU:HA	1.89	0.41
1:A:128:SER:O	1:A:150:THR:HG23	2.20	0.41
1:A:322:MET:HE2	1:A:322:MET:HB3	1.84	0.41
1:A:27:LEU:HD12	1:A:27:LEU:HA	1.71	0.41
1:A:414:LEU:HB2	1:A:551:LEU:HD11	2.03	0.41
1:A:424:GLU:OE1	1:A:432:LEU:HD23	2.20	0.41
1:A:41:LEU:HD12	1:A:41:LEU:HA	1.80	0.41
1:A:566:VAL:HG22	1:A:566:VAL:O	2.21	0.41
2:B:46:LYS:HG2	2:B:47:LYS:HG3	2.03	0.41
1:A:211:VAL:HG22	1:A:222:TYR:CE2	2.56	0.41
1:A:338:LEU:HD13	1:A:409:CYS:HB3	2.03	0.41
1:A:561:MET:C	1:A:563:GLU:H	2.29	0.41
1:A:413:LEU:O	1:A:416:PHE:HB3	2.20	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:38:SER:HB3	1:A:143:LEU:HD23	2.03	0.40
1:A:54:ILE:HG12	1:A:63:PHE:CE1	2.57	0.40
1:A:292:THR:HA	1:A:293:PRO:HD3	1.83	0.40
1:A:527:ARG:HA	1:A:527:ARG:HD2	1.89	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	478/550 (87%)	439 (92%)	39 (8%)	0	100	100
2	B	10/15 (67%)	9 (90%)	1 (10%)	0	100	100
All	All	488/565 (86%)	448 (92%)	40 (8%)	0	100	100

There are no Ramachandran outliers to report.

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	406/461 (88%)	364 (90%)	42 (10%)	7	14
2	B	9/11 (82%)	9 (100%)	0	100	100
All	All	415/472 (88%)	373 (90%)	42 (10%)	7	15

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	LEU
1	A	27	LEU
1	A	29	ARG
1	A	41	LEU
1	A	66	SER
1	A	70	ASP
1	A	103	LEU
1	A	129	LEU
1	A	131	ARG
1	A	143	LEU
1	A	147	ILE
1	A	148	THR
1	A	152	LEU
1	A	201	LYS
1	A	206	ARG
1	A	207	ARG
1	A	211	VAL
1	A	221	LEU
1	A	224	LYS
1	A	229	ARG
1	A	249	LEU
1	A	254	LEU
1	A	255	GLU
1	A	263	LEU
1	A	273	LEU
1	A	280	LEU
1	A	292	THR
1	A	299	LEU
1	A	318	ILE
1	A	322	MET
1	A	375	LEU
1	A	377	LYS
1	A	404	LEU
1	A	422	LYS
1	A	429	THR
1	A	438	THR
1	A	456	ARG
1	A	521	THR
1	A	525	THR
1	A	551	LEU
1	A	552	THR
1	A	558	MET

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	46	HIS
1	A	64	GLN
1	A	127	ASN
1	A	282	ASN
1	A	328	HIS
1	A	333	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 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

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	484/550 (88%)	0.50	35 (7%) 21 16	71, 92, 130, 174	0
2	B	12/15 (80%)	0.28	1 (8%) 17 13	77, 86, 108, 125	0
All	All	496/565 (87%)	0.50	36 (7%) 21 16	71, 91, 130, 174	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	385	ALA	4.9
1	A	581	ALA	4.4
1	A	59	PRO	4.3
1	A	200	GLY	3.5
1	A	58	VAL	3.5
1	A	203	ASN	3.3
1	A	137	ARG	3.1
1	A	57	ASN	3.0
1	A	366	GLU	3.0
1	A	71	PRO	2.9
1	A	576	LYS	2.9
1	A	520	GLY	2.8
1	A	69	PRO	2.8
1	A	136	ASP	2.6
1	A	116	GLU	2.6
1	A	131	ARG	2.5
1	A	88	ALA	2.4
1	A	384	GLU	2.4
1	A	548	GLY	2.3
1	A	248	ASP	2.3
1	A	108	ARG	2.3
2	B	47	LYS	2.2
1	A	123	ASP	2.2
1	A	201	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	577	LEU	2.2
1	A	60	GLU	2.1
1	A	51	ASN	2.1
1	A	522	VAL	2.1
1	A	205	ASP	2.1
1	A	103	LEU	2.1
1	A	327	TYR	2.1
1	A	210	THR	2.0
1	A	521	THR	2.0
1	A	459	SER	2.0
1	A	197	THR	2.0
1	A	370	ASP	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.