



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 10:53 AM UTC

PDB ID : 4ZOV / pdb_00004zov
Title : Crystal structure of the Saccharomyces cerevisiae Sqt1
Authors : Pausch, P.; Altegoer, F.; Bange, G.
Deposited on : 2015-05-07
Resolution : 2.00 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

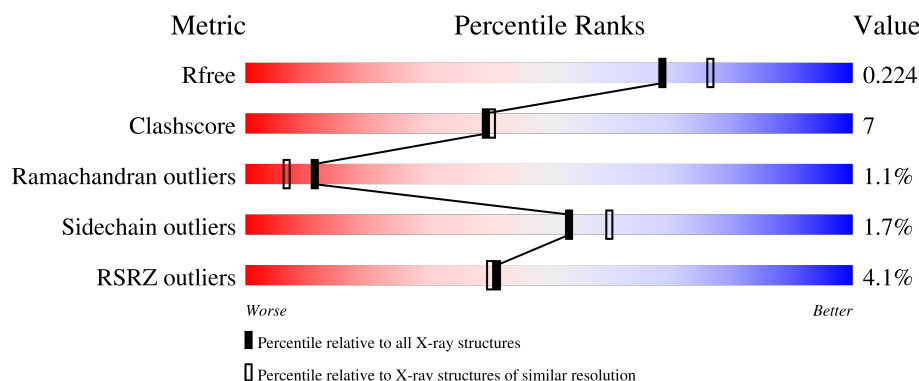
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (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 $\leq 5\%$. 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	387	3% 84% 11% ..
1	B	387	5% 82% 13% ..

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6367 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 Ribosome assembly protein SQT1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	379	Total	C	N	O	S	0	0	0
			2889	1826	481	562	20			
1	B	373	Total	C	N	O	S	0	0	0
			2838	1794	473	551	20			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	432	GLY	-	expression tag	UNP P35184
A	433	SER	-	expression tag	UNP P35184
A	434	HIS	-	expression tag	UNP P35184
A	435	HIS	-	expression tag	UNP P35184
A	436	HIS	-	expression tag	UNP P35184
A	437	HIS	-	expression tag	UNP P35184
A	438	HIS	-	expression tag	UNP P35184
A	439	HIS	-	expression tag	UNP P35184
B	432	GLY	-	expression tag	UNP P35184
B	433	SER	-	expression tag	UNP P35184
B	434	HIS	-	expression tag	UNP P35184
B	435	HIS	-	expression tag	UNP P35184
B	436	HIS	-	expression tag	UNP P35184
B	437	HIS	-	expression tag	UNP P35184
B	438	HIS	-	expression tag	UNP P35184
B	439	HIS	-	expression tag	UNP P35184

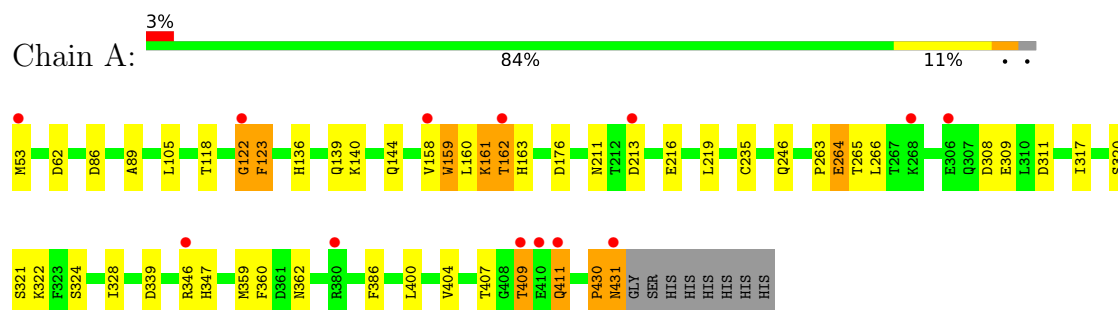
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	332	Total	O	0	0
			332	332		
2	B	308	Total	O	0	0
			308	308		

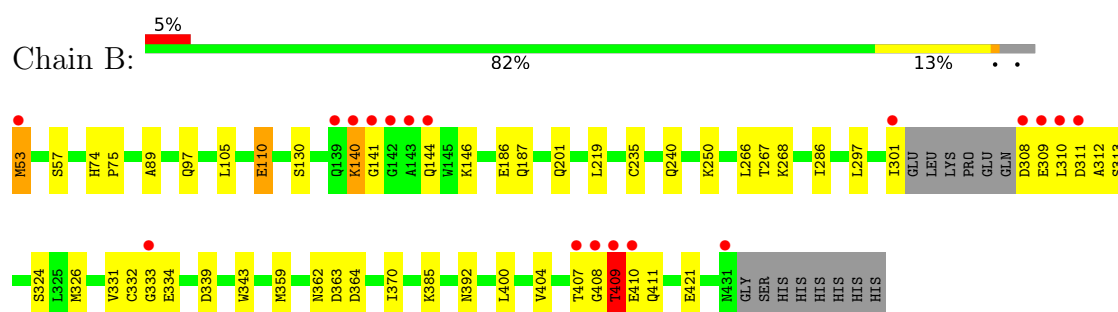
3 Residue-property plots

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: Ribosome assembly protein SQT1



• Molecule 1: Ribosome assembly protein SQT1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	53.79Å 75.17Å 101.25Å 90.00° 104.42° 90.00°	Depositor
Resolution (Å)	42.56 – 2.00 42.56 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.0 (42.56-2.00) 98.0 (42.56-2.00)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	10.02 (at 2.00Å)	Xtriage
Refinement program	PHENIX 1.9_1685	Depositor
R, R_{free}	0.187 , 0.223 0.189 , 0.224	Depositor DCC
R_{free} test set	2001 reflections (3.78%)	wwPDB-VP
Wilson B-factor (Å ²)	24.3	Xtriage
Anisotropy	0.393	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 36.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.021 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6367	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.64% 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	0.51	0/2950	0.84	6/4003 (0.1%)
1	B	0.48	0/2897	0.82	5/3930 (0.1%)
All	All	0.49	0/5847	0.83	11/7933 (0.1%)

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	162	THR	N-CA-C	8.06	121.68	112.57
1	A	122	GLY	N-CA-C	-7.92	101.29	112.37
1	B	333	GLY	N-CA-C	-6.73	100.51	112.22
1	B	409	THR	CA-C-N	6.08	132.65	121.70
1	B	409	THR	C-N-CA	6.08	132.65	121.70
1	A	162	THR	CB-CA-C	-5.95	101.83	111.06
1	B	409	THR	N-CA-C	-5.53	103.08	110.55
1	A	216	GLU	N-CA-C	-5.34	103.84	110.41
1	A	430	PRO	CA-C-N	5.29	131.21	121.70
1	A	430	PRO	C-N-CA	5.29	131.21	121.70
1	B	140	LYS	N-CA-C	5.07	119.62	113.38

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	2889	0	2810	36	0
1	B	2838	0	2758	44	0
2	A	332	0	0	11	2
2	B	308	0	0	10	2
All	All	6367	0	5568	76	3

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 7.

All (76) 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:240:GLN:NE2	2:B:504:HOH:O	2.10	0.83
1:A:86:ASP:OD1	2:A:501:HOH:O	1.97	0.82
1:A:118:THR:OG1	1:A:122:GLY:O	1.99	0.80
1:A:53:MET:SD	2:A:530:HOH:O	2.39	0.79
1:B:186:GLU:OE2	2:B:501:HOH:O	2.04	0.76
1:B:410:GLU:OE2	2:B:502:HOH:O	2.04	0.74
1:B:407:THR:O	1:B:409:THR:N	2.21	0.73
1:B:409:THR:HB	1:B:411:GLN:HG3	1.70	0.73
1:B:53:MET:N	2:B:507:HOH:O	2.20	0.73
1:B:250:LYS:HE3	1:B:297:LEU:HD23	1.70	0.72
1:A:176:ASP:OD2	2:A:502:HOH:O	2.08	0.70
1:B:311:ASP:OD1	1:B:312:ALA:N	2.26	0.69
1:A:266:LEU:HD11	1:A:324:SER:HA	1.73	0.69
1:A:431:ASN:N	1:A:431:ASN:OD1	2.26	0.68
1:A:347:HIS:ND1	2:A:510:HOH:O	2.27	0.67
1:B:187:GLN:NE2	2:B:508:HOH:O	2.25	0.66
1:A:359:MET:HE1	1:A:400:LEU:HB2	1.78	0.65
1:A:213:ASP:OD1	2:A:503:HOH:O	2.15	0.63
1:B:57:SER:OG	2:B:503:HOH:O	2.09	0.63
1:B:97:GLN:NE2	2:B:505:HOH:O	2.17	0.59
1:B:308:ASP:HB3	1:B:309:GLU:HA	1.84	0.59
1:B:311:ASP:OD1	1:B:313:SER:N	2.36	0.59
1:B:140:LYS:N	1:B:141:GLY:HA3	2.18	0.59
1:B:219:LEU:HG	1:B:235:CYS:HB2	1.85	0.58
1:B:359:MET:HE1	1:B:400:LEU:HB2	1.84	0.58
1:A:362:ASN:ND2	1:B:362:ASN:OD1	2.32	0.56
1:B:409:THR:HA	1:B:410:GLU:HB2	1.86	0.56
1:B:339:ASP:OD1	2:B:506:HOH:O	2.18	0.56
1:A:139:GLN:HB2	1:A:144:GLN:HG3	1.88	0.56
1:B:409:THR:HG22	1:B:410:GLU:C	2.32	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:409:THR:HG22	1:A:411:GLN:HG3	1.89	0.55
1:A:62:ASP:OD2	2:A:505:HOH:O	2.18	0.54
1:A:219:LEU:HG	1:A:235:CYS:HB2	1.87	0.54
1:B:310:LEU:HB3	1:B:332:CYS:HB2	1.89	0.54
1:B:266:LEU:HD11	1:B:324:SER:HA	1.89	0.53
1:A:404:VAL:HG22	1:B:404:VAL:HG22	1.91	0.53
1:B:110:GLU:HB2	1:B:130:SER:HB3	1.92	0.52
1:A:123:PHE:HA	1:A:136:HIS:O	2.10	0.52
1:A:308:ASP:O	1:A:311:ASP:HB2	2.09	0.52
1:B:326:MET:HE3	1:B:343:TRP:HZ3	1.75	0.52
1:A:246:GLN:HG3	2:A:664:HOH:O	2.10	0.51
1:A:89:ALA:HB3	1:A:105:LEU:HB2	1.93	0.50
2:A:594:HOH:O	1:B:404:VAL:HG23	2.11	0.49
1:A:160:LEU:HD23	1:A:161:LYS:N	2.27	0.48
1:A:322:LYS:HE2	1:B:363:ASP:OD2	2.14	0.47
1:B:407:THR:O	1:B:407:THR:OG1	2.30	0.47
1:B:409:THR:HG22	1:B:410:GLU:HB2	1.94	0.47
1:A:160:LEU:O	1:A:161:LYS:HB2	2.14	0.47
1:A:339:ASP:HB2	1:A:346:ARG:HD2	1.97	0.47
1:A:309:GLU:HB3	2:A:690:HOH:O	2.14	0.47
1:B:301:ILE:HG22	2:B:789:HOH:O	2.14	0.46
1:A:430:PRO:C	1:A:431:ASN:OD1	2.58	0.46
1:B:140:LYS:N	1:B:141:GLY:CA	2.78	0.46
1:A:264:GLU:HG2	1:A:265:THR:N	2.30	0.46
1:A:320:SER:HB2	1:A:360:PHE:CG	2.51	0.46
1:A:263:PRO:HB3	1:B:410:GLU:HG3	1.98	0.46
1:A:266:LEU:HD13	1:A:321:SER:HA	1.96	0.46
1:B:89:ALA:HB3	1:B:105:LEU:HB2	1.98	0.45
1:A:407:THR:OG1	1:A:409:THR:HB	2.17	0.45
1:B:313:SER:HB3	1:B:331:VAL:HG23	1.98	0.45
1:B:313:SER:HB3	1:B:331:VAL:CG2	2.48	0.44
1:B:364:ASP:OD1	1:B:385:LYS:NZ	2.51	0.44
1:B:74:HIS:CG	1:B:75:PRO:HD2	2.53	0.44
1:B:267:THR:O	1:B:268:LYS:HG2	2.18	0.43
1:B:359:MET:HB3	1:B:359:MET:HE2	1.71	0.42
1:A:211:ASN:C	1:A:213:ASP:H	2.24	0.42
1:A:404:VAL:HG23	2:A:675:HOH:O	2.19	0.42
1:B:310:LEU:HB3	1:B:332:CYS:CB	2.50	0.41
1:B:392:ASN:HB2	1:B:421:GLU:OE1	2.20	0.41
1:B:201:GLN:NE2	2:B:532:HOH:O	2.52	0.41
1:A:359:MET:HE2	1:A:359:MET:HB3	1.77	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:311:ASP:HB3	1:B:331:VAL:HG11	2.03	0.41
1:A:317:ILE:HG12	1:A:328:ILE:HG22	2.03	0.41
1:A:158:VAL:O	1:A:159:TRP:CD1	2.74	0.40
1:A:162:THR:O	2:A:506:HOH:O	2.22	0.40
1:B:308:ASP:CB	1:B:309:GLU:HA	2.48	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:504:HOH:O	2:A:658:HOH:O[2_656]	1.79	0.41
2:B:705:HOH:O	2:B:712:HOH:O[1_455]	2.13	0.07
2:A:665:HOH:O	2:B:646:HOH:O[2_747]	2.16	0.04

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	377/387 (97%)	357 (95%)	14 (4%)	6 (2%)	7	3
1	B	369/387 (95%)	353 (96%)	14 (4%)	2 (0%)	24	21
All	All	746/774 (96%)	710 (95%)	28 (4%)	8 (1%)	11	7

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	159	TRP
1	A	163	HIS
1	B	408	GLY
1	A	411	GLN
1	A	123	PHE
1	B	334	GLU

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Mol	Chain	Res	Type
1	A	161	LYS
1	A	386	PHE

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	320/327 (98%)	316 (99%)	4 (1%)	61	68
1	B	314/327 (96%)	307 (98%)	7 (2%)	45	50
All	All	634/654 (97%)	623 (98%)	11 (2%)	53	60

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	140	LYS
1	A	264	GLU
1	A	409	THR
1	A	431	ASN
1	B	53	MET
1	B	110	GLU
1	B	144	GLN
1	B	146	LYS
1	B	286	ILE
1	B	370	ILE
1	B	409	THR

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

Mol	Chain	Res	Type
1	A	76	ASN
1	A	144	GLN
1	A	193	GLN
1	A	411	GLN
1	B	144	GLN

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Mol	Chain	Res	Type
1	B	201	GLN
1	B	240	GLN
1	B	431	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	379/387 (97%)	-0.00	13 (3%) 48 47	14, 26, 41, 58	0
1	B	373/387 (96%)	0.01	18 (4%) 35 34	14, 26, 45, 60	0
All	All	752/774 (97%)	0.01	31 (4%) 41 40	14, 26, 43, 60	0

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	142	GLY	5.1
1	B	310	LEU	4.7
1	B	141	GLY	4.1
1	B	408	GLY	4.0
1	A	122	GLY	3.9
1	B	301	ILE	3.8
1	B	409	THR	3.7
1	A	410	GLU	3.7
1	B	333	GLY	3.4
1	B	309	GLU	3.4
1	B	308	ASP	3.3
1	A	409	THR	3.2
1	B	53	MET	3.0
1	A	431	ASN	3.0
1	B	407	THR	3.0
1	B	139	GLN	2.9
1	B	140	LYS	2.6
1	A	158	VAL	2.5
1	B	431	ASN	2.5
1	B	143	ALA	2.4
1	A	411	GLN	2.4
1	B	410	GLU	2.4
1	A	268	LYS	2.4
1	A	306	GLU	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	53	MET	2.3
1	A	213	ASP	2.2
1	A	380	ARG	2.2
1	B	311	ASP	2.1
1	A	346	ARG	2.1
1	B	144	GLN	2.0
1	A	162	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.