



Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2023 – 04:16 am BST

PDB ID : 8BB6
Title : Crystal structure of Arabidopsis thaliana sucrose transporter SUC1
Authors : Bavnhøj, L.; Pedersen, B.P.
Deposited on : 2022-10-12
Resolution : 2.68 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
Xtrriage (Phenix) : 1.13
EDS : 2.33
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) : 2.33

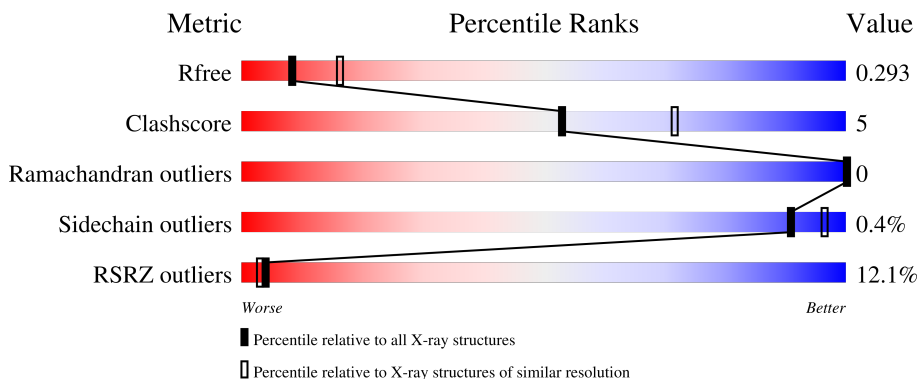
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.68 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	3863 (2.70-2.66)
Clashscore	141614	4210 (2.70-2.66)
Ramachandran outliers	138981	4141 (2.70-2.66)
Sidechain outliers	138945	4141 (2.70-2.66)
RSRZ outliers	127900	3780 (2.70-2.66)

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	519	
1	B	519	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 7220 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 Sucrose transport protein SUC1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	476	3593	2363	593	616	21	0	0	0
1	B	476	3593	2363	593	616	21	0	0	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP Q39232
A	1	GLY	-	expression tag	UNP Q39232
A	514	GLY	-	expression tag	UNP Q39232
A	515	LEU	-	expression tag	UNP Q39232
A	516	VAL	-	expression tag	UNP Q39232
A	517	PRO	-	expression tag	UNP Q39232
A	518	ARG	-	expression tag	UNP Q39232
B	0	MET	-	initiating methionine	UNP Q39232
B	1	GLY	-	expression tag	UNP Q39232
B	514	GLY	-	expression tag	UNP Q39232
B	515	LEU	-	expression tag	UNP Q39232
B	516	VAL	-	expression tag	UNP Q39232
B	517	PRO	-	expression tag	UNP Q39232
B	518	ARG	-	expression tag	UNP Q39232

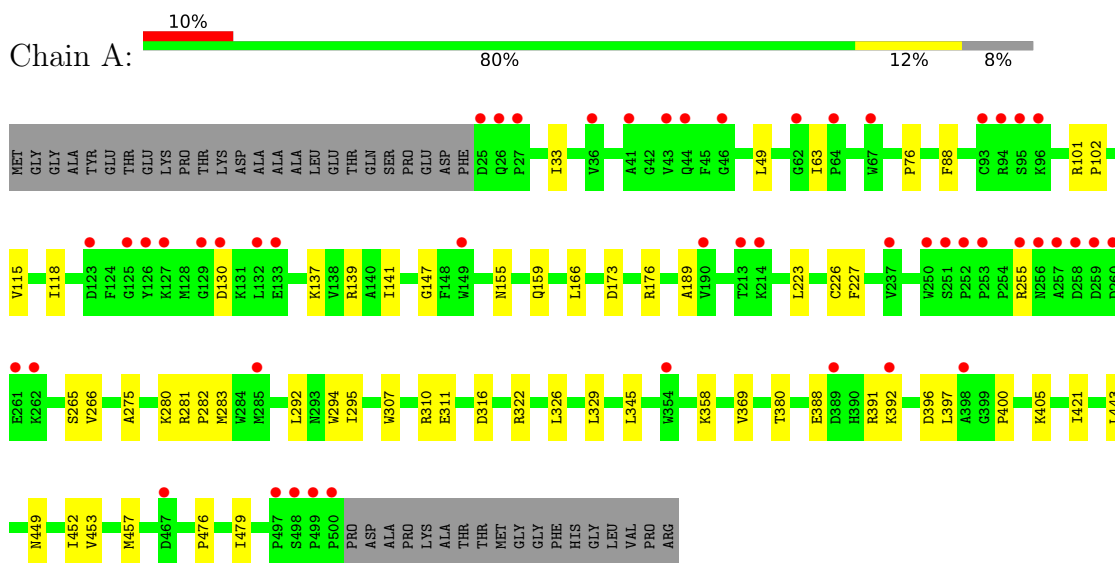
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	21	Total	O	0	0
			21	21		
2	B	13	Total	O	0	0
			13	13		

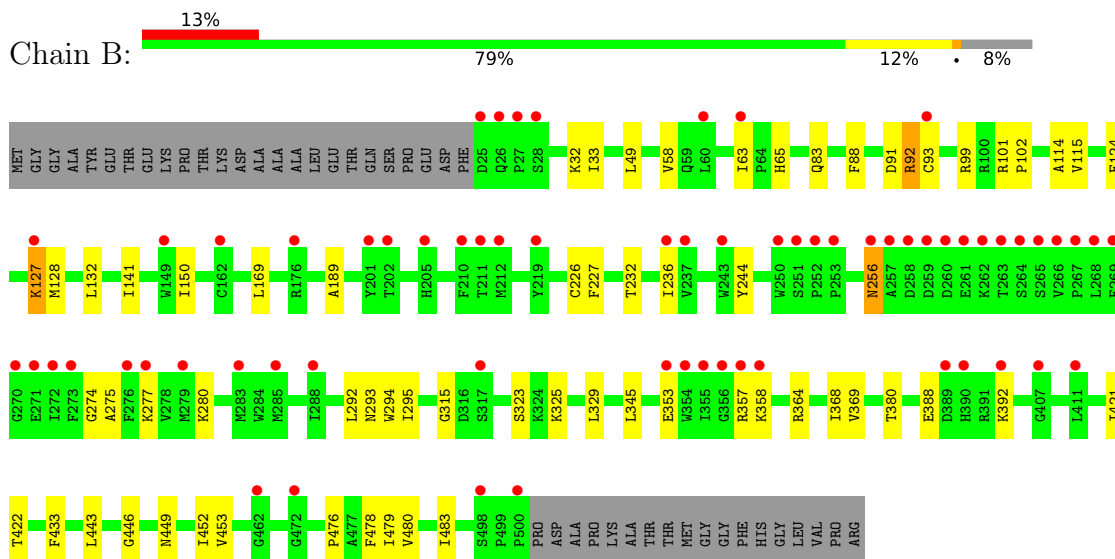
3 Residue-property plots [i](#)

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: Sucrose transport protein SUC1



- Molecule 1: Sucrose transport protein SUC1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	58.78Å 65.62Å 82.81Å 89.96° 101.74° 94.72°	Depositor
Resolution (Å)	34.74 – 2.68 34.73 – 2.68	Depositor EDS
% Data completeness (in resolution range)	98.2 (34.74-2.68) 98.2 (34.73-2.68)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.26 (at 2.68Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.270 , 0.293 0.270 , 0.293	Depositor DCC
R_{free} test set	2003 reflections (6.02%)	wwPDB-VP
Wilson B-factor (Å ²)	48.7	Xtrriage
Anisotropy	0.577	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 54.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	7220	wwPDB-VP
Average B, all atoms (Å ²)	48.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 17.59% 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	0.31	0/3687	0.50	0/5010
1	B	0.34	0/3687	0.61	3/5010 (0.1%)
All	All	0.32	0/7374	0.56	3/10020 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	92	ARG	NE-CZ-NH2	-15.45	112.57	120.30
1	B	92	ARG	NE-CZ-NH1	10.65	125.63	120.30
1	B	358	LYS	CD-CE-NZ	-7.45	94.56	111.70

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	3593	0	3680	34	0
1	B	3593	0	3680	45	0
2	A	21	0	0	0	0
2	B	13	0	0	0	0
All	All	7220	0	7360	79	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 5.

All (79) 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:130:ASP:OD1	1:A:139:ARG:NH1	2.20	0.73
1:A:391:ARG:HG2	1:A:396:ASP:HA	1.71	0.72
1:B:275:ALA:HB2	1:B:443:LEU:HD21	1.71	0.71
1:A:280:LYS:HG3	1:A:283:MET:H	1.56	0.70
1:A:275:ALA:HB2	1:A:443:LEU:HD21	1.73	0.69
1:B:115:VAL:HG13	1:B:227:PHE:HB3	1.76	0.67
1:A:307:TRP:HD1	1:A:311:GLU:HG3	1.59	0.67
1:B:63:ILE:HG12	1:B:141:ILE:HG12	1.78	0.64
1:B:115:VAL:CG1	1:B:227:PHE:HB3	2.29	0.62
1:B:353:GLU:OE2	1:B:357:ARG:NH2	2.29	0.62
1:B:92:ARG:N	1:B:92:ARG:HD2	2.15	0.62
1:A:310:ARG:NH1	1:A:316:ASP:OD1	2.25	0.62
1:A:115:VAL:HG13	1:A:227:PHE:HB3	1.82	0.61
1:A:265:SER:OG	1:A:266:VAL:N	2.34	0.61
1:B:91:ASP:C	1:B:92:ARG:HD2	2.22	0.59
1:B:364:ARG:O	1:B:368:ILE:HG12	2.03	0.59
1:B:132:LEU:H	1:B:132:LEU:HD12	1.67	0.58
1:A:189:ALA:HB2	1:A:345:LEU:HD22	1.84	0.58
1:B:189:ALA:HB2	1:B:345:LEU:HD22	1.86	0.57
1:B:476:PRO:HA	1:B:479:ILE:HG12	1.88	0.56
1:A:63:ILE:HG12	1:A:141:ILE:HG12	1.87	0.54
1:B:58:VAL:HG22	1:B:63:ILE:HD12	1.90	0.54
1:A:88:PHE:HB2	1:A:443:LEU:HD12	1.89	0.54
1:A:292:LEU:O	1:A:295:ILE:HG22	2.09	0.53
1:B:256:ASN:OD1	1:B:256:ASN:N	2.40	0.53
1:A:49:LEU:HG	1:A:226:CYS:HB3	1.92	0.52
1:B:65:HIS:CD2	1:B:65:HIS:H	2.26	0.52
1:B:294:TRP:CD1	1:B:452:ILE:HG12	2.44	0.52
1:A:115:VAL:CG1	1:A:227:PHE:HB3	2.39	0.51
1:B:369:VAL:HG21	1:B:421:ILE:HD13	1.93	0.51
1:A:76:PRO:HB2	1:A:457:MET:HE2	1.93	0.50
1:B:315:GLY:HA2	1:B:323:SER:HB2	1.94	0.50
1:B:124:PHE:O	1:B:128:MET:HG3	2.11	0.50
1:A:322:ARG:HB2	1:A:397:LEU:HD23	1.94	0.49
1:B:83:GLN:HG2	1:B:446:GLY:HA2	1.94	0.49
1:A:369:VAL:HG11	1:A:421:ILE:HD13	1.95	0.49
1:B:380:THR:HG21	1:B:478:PHE:CD2	2.48	0.49
1:A:388:GLU:O	1:A:392:LYS:HG3	2.13	0.49
1:B:88:PHE:CE1	1:B:92:ARG:NH2	2.80	0.49
1:B:274:GLY:HA2	1:B:277:LYS:HD2	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:223:LEU:HG	1:A:227:PHE:CE2	2.50	0.47
1:B:132:LEU:HD12	1:B:132:LEU:N	2.30	0.47
1:B:388:GLU:O	1:B:392:LYS:HG2	2.15	0.46
1:A:155:ASN:O	1:A:159:GLN:HG2	2.15	0.46
1:A:173:ASP:HB3	1:A:176:ARG:HB2	1.98	0.46
1:A:294:TRP:CD1	1:A:452:ILE:HG12	2.51	0.46
1:B:293:ASN:HD22	1:B:422:THR:HG23	1.80	0.45
1:B:88:PHE:HB2	1:B:443:LEU:HD12	1.98	0.45
1:A:358:LYS:HA	1:A:358:LYS:HD2	1.71	0.45
1:B:292:LEU:O	1:B:295:ILE:HG22	2.17	0.45
1:A:307:TRP:CZ2	1:A:380:THR:HG23	2.52	0.45
1:A:307:TRP:CD1	1:A:311:GLU:HG3	2.44	0.44
1:A:326:LEU:HA	1:A:329:LEU:HD12	2.00	0.44
1:B:232:THR:O	1:B:236:ILE:HG12	2.16	0.44
1:A:33:ILE:HG23	1:A:166:LEU:HD22	1.99	0.44
1:B:115:VAL:HG13	1:B:227:PHE:CG	2.53	0.44
1:B:33:ILE:HG12	1:B:169:LEU:HB3	2.00	0.43
1:A:476:PRO:HA	1:A:479:ILE:HG12	2.00	0.43
1:B:115:VAL:HG13	1:B:227:PHE:CB	2.46	0.43
1:B:32:LYS:HD3	1:B:244:TYR:CE2	2.54	0.43
1:B:114:ALA:HB2	1:B:150:ILE:HG22	2.01	0.43
1:A:281:ARG:HB3	1:A:282:PRO:HD3	2.00	0.43
1:A:130:ASP:OD2	1:A:137:LYS:HB3	2.19	0.42
1:B:49:LEU:HG	1:B:226:CYS:HB3	2.01	0.42
1:B:127:LYS:HE3	1:B:127:LYS:HB2	1.25	0.42
1:B:93:CYS:HB3	1:B:99:ARG:HA	2.00	0.42
1:A:449:ASN:O	1:A:453:VAL:HG22	2.20	0.42
1:A:400:PRO:HG2	1:A:405:LYS:HE3	2.02	0.41
1:B:325:LYS:O	1:B:329:LEU:HG	2.21	0.41
1:B:33:ILE:HA	1:B:169:LEU:HD13	2.02	0.41
1:A:101:ARG:N	1:A:102:PRO:HD2	2.35	0.41
1:A:118:ILE:HG13	1:A:147:GLY:HA3	2.03	0.41
1:B:92:ARG:HH21	1:B:92:ARG:HD3	1.53	0.41
1:B:479:ILE:O	1:B:483:ILE:HG12	2.20	0.41
1:B:479:ILE:HG13	1:B:480:VAL:N	2.36	0.41
1:B:280:LYS:HE2	1:B:433:PHE:HB3	2.02	0.41
1:B:293:ASN:ND2	1:B:422:THR:HG23	2.36	0.41
1:B:449:ASN:O	1:B:453:VAL:HG22	2.20	0.40
1:B:101:ARG:N	1:B:102:PRO:HD2	2.37	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	474/519 (91%)	465 (98%)	9 (2%)	0	100	100
1	B	474/519 (91%)	467 (98%)	7 (2%)	0	100	100
All	All	948/1038 (91%)	932 (98%)	16 (2%)	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	372/404 (92%)	371 (100%)	1 (0%)	92	97
1	B	372/404 (92%)	370 (100%)	2 (0%)	88	95
All	All	744/808 (92%)	741 (100%)	3 (0%)	91	96

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

Mol	Chain	Res	Type
1	A	255	ARG
1	B	127	LYS
1	B	256	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	65	HIS
1	B	293	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 monosaccharides 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	476/519 (91%)	0.89	50 (10%) 6 4	33, 43, 66, 92	0
1	B	476/519 (91%)	1.05	65 (13%) 3 2	32, 44, 83, 138	0
All	All	952/1038 (91%)	0.97	115 (12%) 4 3	32, 44, 73, 138	0

All (115) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	269	PHE	16.6
1	B	260	ASP	10.7
1	B	268	LEU	10.1
1	B	263	THR	8.2
1	B	267	PRO	7.5
1	B	264	SER	6.8
1	B	261	GLU	6.7
1	B	256	ASN	6.5
1	B	259	ASP	6.5
1	B	273	PHE	6.5
1	A	260	ASP	6.4
1	B	25	ASP	6.3
1	B	257	ALA	5.9
1	B	271	GLU	5.8
1	B	258	ASP	5.5
1	A	25	ASP	5.2
1	A	253	PRO	5.2
1	A	256	ASN	5.0
1	B	253	PRO	5.0
1	B	266	VAL	4.8
1	B	93	CYS	4.6
1	B	27	PRO	4.5
1	B	354	TRP	4.5
1	A	132	LEU	4.4

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Mol	Chain	Res	Type	RSRZ
1	A	125	GLY	4.3
1	A	126	TYR	4.3
1	B	211	THR	4.2
1	A	262	LYS	4.2
1	A	62	GLY	4.1
1	A	27	PRO	4.0
1	B	356	GLY	4.0
1	B	251	SER	4.0
1	A	93	CYS	3.9
1	B	262	LYS	3.9
1	B	127	LYS	3.8
1	B	272	ILE	3.8
1	B	212	MET	3.8
1	A	64	PRO	3.4
1	A	500	PRO	3.4
1	B	270	GLY	3.3
1	B	252	PRO	3.3
1	A	96	LYS	3.3
1	A	255	ARG	3.3
1	A	354	TRP	3.3
1	A	26	GLN	3.1
1	A	41	ALA	3.1
1	A	130	ASP	3.1
1	A	261	GLU	3.1
1	A	398	ALA	3.0
1	B	202	THR	3.0
1	A	258	ASP	3.0
1	A	252	PRO	3.0
1	B	149	TRP	3.0
1	B	277	LYS	2.9
1	A	497	PRO	2.9
1	A	214	LYS	2.9
1	B	357	ARG	2.9
1	B	288	ILE	2.9
1	B	392	LYS	2.9
1	A	94	ARG	2.8
1	A	149	TRP	2.7
1	B	390	HIS	2.7
1	A	95	SER	2.7
1	A	127	LYS	2.7
1	A	213	THR	2.7
1	B	358	LYS	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	317	SER	2.6
1	B	389	ASP	2.6
1	A	251	SER	2.6
1	A	392	LYS	2.6
1	A	129	GLY	2.6
1	B	407	GLY	2.5
1	B	26	GLN	2.5
1	B	176	ARG	2.5
1	B	219	TYR	2.5
1	B	28	SER	2.5
1	B	60	LEU	2.5
1	B	276	PHE	2.4
1	A	499	PRO	2.4
1	B	355	ILE	2.4
1	A	237	VAL	2.4
1	A	123	ASP	2.4
1	B	210	PHE	2.4
1	A	257	ALA	2.4
1	A	285	MET	2.3
1	B	205	HIS	2.3
1	B	472	GLY	2.3
1	B	236	ILE	2.3
1	B	243	TRP	2.3
1	B	353	GLU	2.3
1	B	63	ILE	2.2
1	B	201	TYR	2.2
1	A	259	ASP	2.2
1	A	190	VAL	2.2
1	B	279	MET	2.2
1	B	237	VAL	2.2
1	B	500	PRO	2.2
1	A	44	GLN	2.2
1	A	67	TRP	2.2
1	A	250	TRP	2.1
1	A	46	GLY	2.1
1	A	389	ASP	2.1
1	B	250	TRP	2.1
1	B	285	MET	2.1
1	B	265	SER	2.1
1	A	43	VAL	2.1
1	B	162	CYS	2.1
1	A	498	SER	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	411	LEU	2.1
1	A	133	GLU	2.1
1	A	467	ASP	2.1
1	B	498	SER	2.1
1	A	36	VAL	2.0
1	B	462	GLY	2.0
1	B	283	MET	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.