



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 09:02 AM UTC

PDB ID : 8BB6 / pdb_00008bb6
Title : Crystal structure of Arabidopsis thaliana sucrose transporter SUC1
Authors : Bavnhoj, 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 : 4-5-2 with Phenix2.0
Xtrriage (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

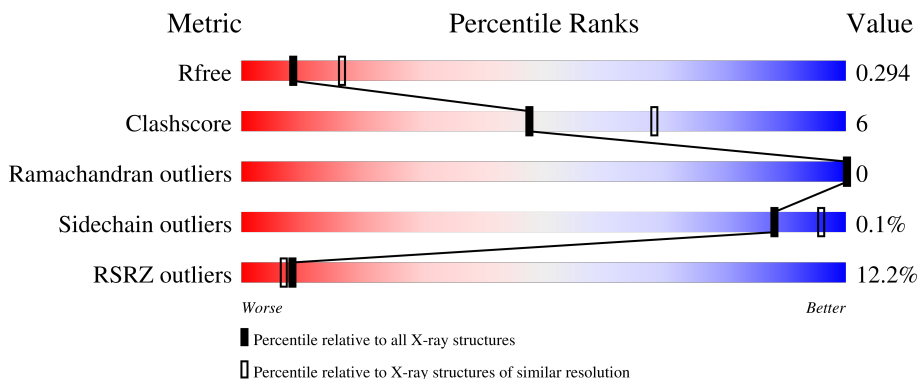
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.68 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}	180053	5070 (2.70-2.66)
Clashscore	190562	5409 (2.70-2.66)
Ramachandran outliers	187476	5324 (2.70-2.66)
Sidechain outliers	187428	5324 (2.70-2.66)
RSRZ outliers	180081	5070 (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

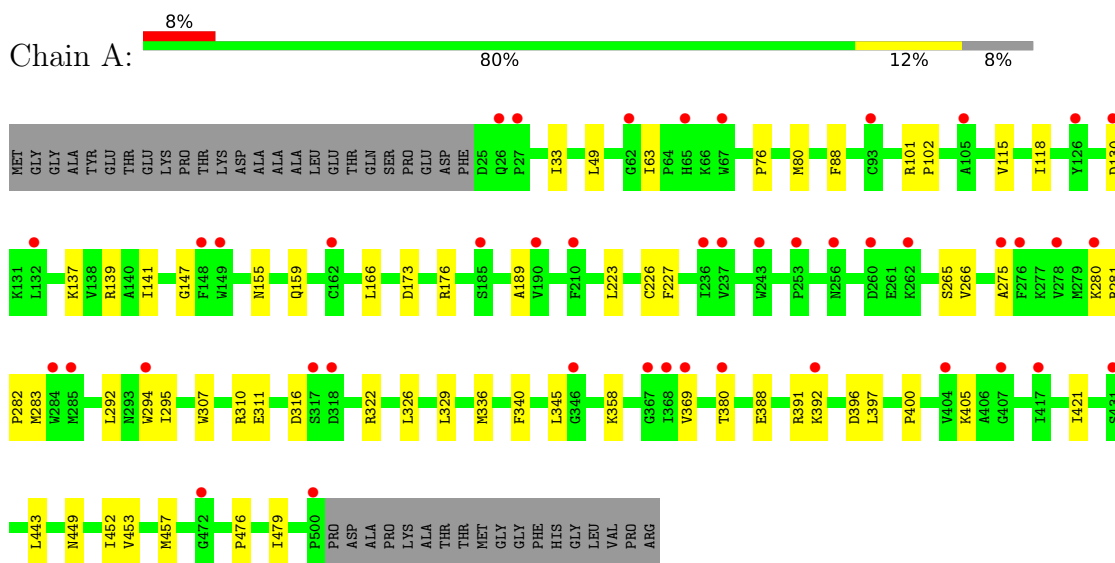
- Molecule 2 is water.

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

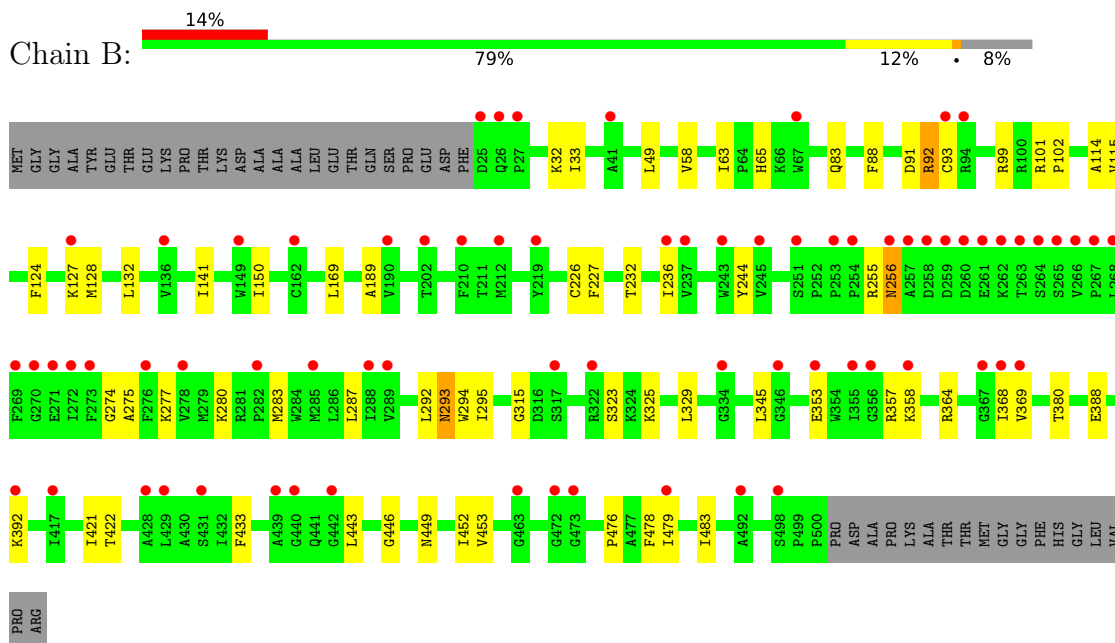
3 Residue-property plots [i](#)

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 34.74 – 2.68	Depositor EDS
% Data completeness (in resolution range)	98.2 (34.74-2.68) 98.2 (34.74-2.68)	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 0.272 , 0.294	Depositor DCC
R_{free} test set	2008 reflections (5.93%)	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 , 64.6	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	0.88	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	0.22	0/3687	0.46	0/5010
1	B	0.27	0/3687	0.54	6/5010 (0.1%)
All	All	0.24	0/7374	0.50	6/10020 (0.1%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	92	ARG	NE-CZ-NH2	-7.36	112.57	119.20
1	B	293	ASN	CB-CA-C	-5.86	101.69	110.88
1	B	255	ARG	CA-C-N	-5.56	110.92	121.54
1	B	255	ARG	C-N-CA	-5.56	110.92	121.54
1	B	358	LYS	CD-CE-NZ	-5.42	94.56	111.90
1	B	358	LYS	CG-CD-CE	5.33	123.56	111.30

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	36	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	81	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 6.

All (81) 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:76:PRO:HB2	1:A:457:MET:HE2	1.68	0.75
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:91:ASP:C	1:B:92:ARG:HD2	2.22	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:HD2	1:B:92:ARG:N	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: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:A:80:MET:SD	1:A:457:MET:HE1	2.43	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: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:336:MET:HE3	1:A:340:PHE:CZ	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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
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:B:283:MET:HE3	1:B:287:LEU:HD11	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:280:LYS:HE2	1:B:433:PHE:HB3	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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%)	372 (100%)	0	100	100
1	B	372/404 (92%)	371 (100%)	1 (0%)	86	94
All	All	744/808 (92%)	743 (100%)	1 (0%)	88	96

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	256	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	155	ASN
1	A	205	HIS
1	A	222	ASN
1	A	256	ASN
1	B	65	HIS
1	B	205	HIS
1	B	222	ASN
1	B	293	ASN
1	B	390	HIS

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	476/519 (91%)	0.97	44 (9%) 14 12	33, 43, 66, 92	0
1	B	476/519 (91%)	1.13	72 (15%) 5 4	32, 44, 83, 138	0
All	All	952/1038 (91%)	1.05	116 (12%) 8 7	32, 44, 73, 138	0

All (116) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	269	PHE	8.7
1	B	268	LEU	5.4
1	B	267	PRO	5.2
1	B	263	THR	4.1
1	A	260	ASP	4.0
1	B	260	ASP	4.0
1	B	253	PRO	3.8
1	B	272	ILE	3.8
1	B	367	GLY	3.7
1	B	273	PHE	3.7
1	B	236	ILE	3.6
1	B	259	ASP	3.6
1	B	257	ALA	3.4
1	B	262	LYS	3.4
1	B	473	GLY	3.4
1	B	270	GLY	3.3
1	B	127	LYS	3.3
1	A	472	GLY	3.3
1	A	236	ILE	3.2
1	A	149	TRP	3.1
1	B	266	VAL	3.1
1	B	392	LYS	3.1
1	B	498	SER	3.1
1	B	256	ASN	3.0

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Mol	Chain	Res	Type	RSRZ
1	B	369	VAL	3.0
1	B	439	ALA	3.0
1	B	271	GLU	2.9
1	A	317	SER	2.9
1	B	251	SER	2.9
1	A	256	ASN	2.9
1	B	149	TRP	2.9
1	B	27	PRO	2.8
1	B	243	TRP	2.8
1	B	93	CYS	2.8
1	B	442	GLY	2.8
1	A	285	MET	2.8
1	A	431	SER	2.8
1	A	210	PHE	2.8
1	B	25	ASP	2.7
1	B	264	SER	2.7
1	A	126	TYR	2.6
1	A	162	CYS	2.6
1	B	356	GLY	2.6
1	B	202	THR	2.6
1	B	276	PHE	2.6
1	A	190	VAL	2.6
1	A	67	TRP	2.6
1	A	318	ASP	2.6
1	B	317	SER	2.5
1	A	237	VAL	2.5
1	B	288	ILE	2.5
1	B	358	LYS	2.5
1	A	404	VAL	2.5
1	A	276	PHE	2.5
1	B	210	PHE	2.5
1	B	282	PRO	2.5
1	A	280	LYS	2.4
1	A	243	TRP	2.4
1	A	62	GLY	2.4
1	B	440	GLY	2.4
1	A	369	VAL	2.4
1	B	237	VAL	2.4
1	A	185	SER	2.4
1	B	254	PRO	2.4
1	A	26	GLN	2.4
1	B	219	TYR	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	500	PRO	2.4
1	B	463	GLY	2.3
1	B	428	ALA	2.3
1	B	261	GLU	2.3
1	A	130	ASP	2.3
1	A	294	TRP	2.3
1	B	162	CYS	2.3
1	B	322	ARG	2.3
1	B	417	ILE	2.3
1	A	93	CYS	2.2
1	A	253	PRO	2.2
1	A	284	TRP	2.2
1	B	136	VAL	2.2
1	A	65	HIS	2.2
1	B	353	GLU	2.2
1	B	265	SER	2.2
1	B	472	GLY	2.2
1	B	190	VAL	2.2
1	B	289	VAL	2.2
1	B	212	MET	2.2
1	A	346	GLY	2.2
1	B	67	TRP	2.2
1	A	105	ALA	2.2
1	B	94	ARG	2.2
1	A	27	PRO	2.2
1	B	431	SER	2.2
1	A	392	LYS	2.1
1	B	26	GLN	2.1
1	B	285	MET	2.1
1	A	367	GLY	2.1
1	B	346	GLY	2.1
1	A	278	VAL	2.1
1	B	258	ASP	2.1
1	B	278	VAL	2.1
1	B	355	ILE	2.1
1	B	492	ALA	2.1
1	A	132	LEU	2.1
1	A	417	ILE	2.1
1	B	368	ILE	2.1
1	A	275	ALA	2.1
1	B	41	ALA	2.1
1	A	262	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	380	THR	2.1
1	A	368	ILE	2.1
1	A	148	PHE	2.1
1	B	429	LEU	2.0
1	B	479	ILE	2.0
1	A	407	GLY	2.0
1	B	334	GLY	2.0
1	B	245	VAL	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.