



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 10, 2023 – 01:04 AM EDT

PDB ID : 5J98
Title : Crystal structure of Slow Bee Paralysis Virus at 2.6A resolution
Authors : Kalynych, S.; Levdansky, Y.; Palkova, L.; Plevka, P.
Deposited on : 2016-04-08
Resolution : 2.60 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
Xtriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

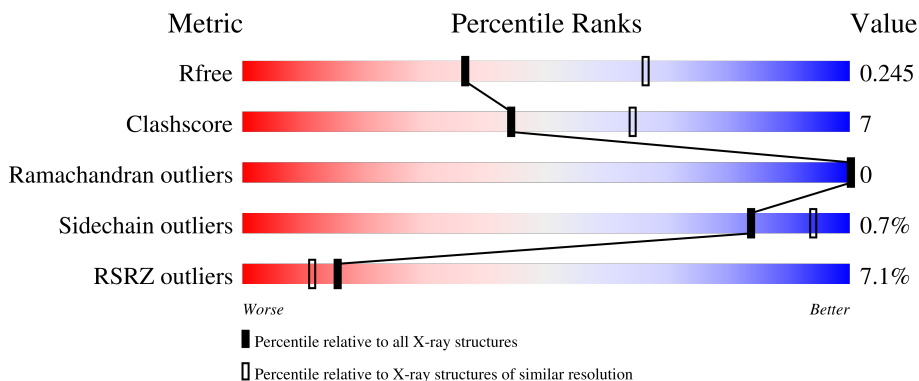
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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	266	 15% 79% 15% 5%
2	B	261	 82% 17%
3	C	430	 15% 82% 15%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7438 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 VP1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	252	2023	1293	353	368	9	0	0	0

- Molecule 2 is a protein called VP2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	260	2086	1341	347	384	14	0	0	0

- Molecule 3 is a protein called VP3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	417	3260	2113	538	601	8	0	0	0

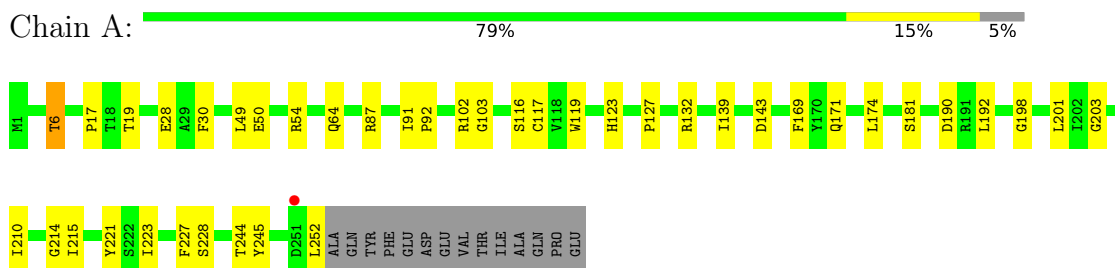
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	20	Total O 20 20	0	0
4	B	19	Total O 19 19	0	0
4	C	30	Total O 30 30	0	0

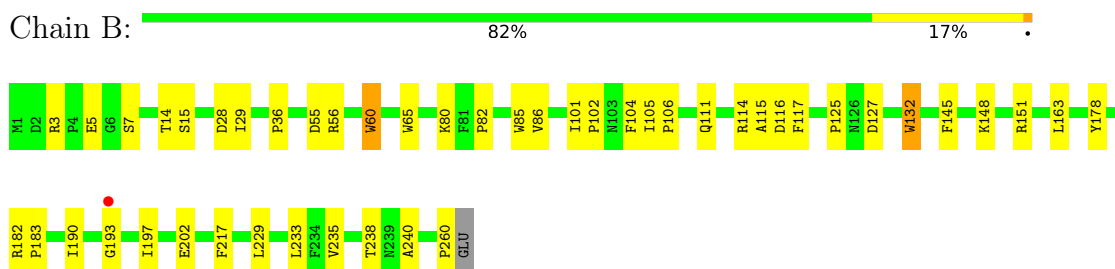
3 Residue-property plots

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.

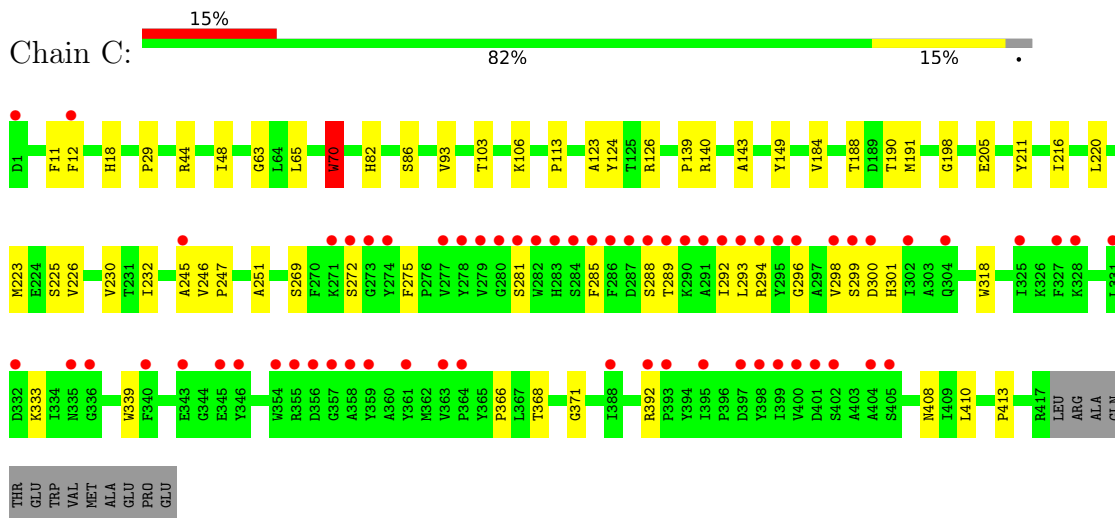
- Molecule 1: VP1



- Molecule 2: VP2



- Molecule 3: VP3



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	340.04Å 396.85Å 431.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.50 – 2.60 49.65 – 2.60	Depositor EDS
% Data completeness (in resolution range)	88.3 (49.50-2.60) 88.6 (49.65-2.60)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.42 (at 2.61Å)	Xtrriage
Refinement program	CNS 1.3, PHENIX	Depositor
R, R_{free}	0.279 , (Not available) 0.245 , 0.245	Depositor DCC
R_{free} test set	38971 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	34.4	Xtrriage
Anisotropy	0.509	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	1.25 , 17.8	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	0.89	EDS
Total number of atoms	7438	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.56% 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	0.24	0/2079	0.46	0/2832
2	B	0.26	0/2139	0.47	0/2907
3	C	0.24	0/3360	0.47	1/4600 (0.0%)
All	All	0.25	0/7578	0.47	1/10339 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	C	70	TRP	CA-CB-CG	6.00	125.11	113.70

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	2023	0	1972	29	0
2	B	2086	0	2072	32	0
3	C	3260	0	3208	45	0
4	A	20	0	0	0	0
4	B	19	0	0	0	0
4	C	30	0	0	0	0
All	All	7438	0	7252	97	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 7.

All (97) 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)
3:C:124:TYR:HB2	3:C:245:ALA:HB3	1.61	0.81
3:C:82:HIS:HB3	3:C:216:ILE:HD12	1.63	0.81
2:B:127:ASP:OD2	3:C:140:ARG:NH2	2.15	0.80
1:A:17:PRO:O	3:C:126:ARG:NH2	2.15	0.79
3:C:188:THR:HG22	3:C:190:THR:H	1.47	0.77
3:C:11:PHE:O	3:C:12:PHE:HD1	1.73	0.71
3:C:140:ARG:HG3	3:C:226:VAL:HG21	1.72	0.71
1:A:102:ARG:HD2	3:C:48:ILE:HD13	1.73	0.70
2:B:132:TRP:HE1	2:B:163:LEU:HB3	1.57	0.69
1:A:103:GLY:HA3	1:A:227:PHE:HA	1.77	0.67
1:A:190:ASP:OD1	2:B:182:ARG:NH2	2.29	0.64
1:A:127:PRO:HG2	1:A:192:LEU:O	1.99	0.63
3:C:294:ARG:NH1	3:C:296:GLY:O	2.31	0.63
1:A:6:THR:OG1	1:A:6:THR:O	2.16	0.61
3:C:285:PHE:CG	3:C:292:ILE:HD11	2.37	0.60
2:B:114:ARG:HG3	2:B:178:TYR:CD2	2.37	0.59
1:A:223:ILE:HG23	1:A:227:PHE:HB3	1.86	0.58
3:C:294:ARG:HH22	3:C:299:SER:HA	1.70	0.57
3:C:63:GLY:HA3	3:C:113:PRO:HB3	1.86	0.57
2:B:125:PRO:HB3	2:B:229:LEU:HD21	1.87	0.56
2:B:148:LYS:HA	2:B:151:ARG:HD2	1.87	0.56
2:B:115:ALA:O	2:B:178:TYR:HB2	2.05	0.56
3:C:123:ALA:N	3:C:246:VAL:O	2.36	0.56
3:C:65:LEU:HD21	3:C:93:VAL:HG21	1.87	0.56
3:C:70:TRP:HB3	3:C:230:VAL:O	2.05	0.56
2:B:105:ILE:HG22	2:B:106:PRO:HD3	1.89	0.55
1:A:244:THR:OG1	1:A:245:TYR:N	2.39	0.54
3:C:103:THR:HB	3:C:106:LYS:HB2	1.91	0.53
3:C:366:PRO:HB2	3:C:368:THR:HG22	1.91	0.52
3:C:368:THR:HG23	3:C:371:GLY:H	1.74	0.52
2:B:114:ARG:HG3	2:B:178:TYR:CE2	2.45	0.52
1:A:50:GLU:HG2	1:A:210:ILE:HB	1.90	0.52
3:C:285:PHE:CD2	3:C:292:ILE:HD11	2.45	0.51
2:B:151:ARG:HH22	2:B:260:PRO:C	2.14	0.51
2:B:116:ASP:HB2	2:B:238:THR:HB	1.93	0.51
2:B:15:SER:HB3	2:B:56:ARG:HG3	1.94	0.50
2:B:114:ARG:HD3	2:B:183:PRO:O	2.11	0.50
3:C:139:PRO:HB2	3:C:140:ARG:NH1	2.26	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:115:ALA:HB2	2:B:240:ALA:HA	1.93	0.49
3:C:272:SER:HA	3:C:275:PHE:HE1	1.77	0.49
3:C:281:SER:HB2	3:C:288:SER:HB2	1.94	0.49
3:C:269:SER:HB3	3:C:410:LEU:HD23	1.95	0.48
2:B:82:PRO:HG3	2:B:117:PHE:CZ	2.49	0.48
1:A:28:GLU:HG3	1:A:30:PHE:CZ	2.48	0.48
1:A:228:SER:OG	3:C:44:ARG:NH2	2.46	0.48
2:B:65:TRP:CH2	2:B:217:PHE:HB2	2.49	0.48
3:C:298:VAL:O	3:C:301:HIS:HB2	2.14	0.48
1:A:127:PRO:HB3	1:A:198:GLY:HA2	1.95	0.47
3:C:318:TRP:CZ3	3:C:413:PRO:HG3	2.50	0.47
1:A:49:LEU:HD23	1:A:214:GLY:HA3	1.96	0.46
3:C:269:SER:HB2	3:C:408:ASN:ND2	2.30	0.46
1:A:210:ILE:HG23	1:A:215:ILE:HG23	1.98	0.46
1:A:169:PHE:CZ	1:A:171:GLN:HB2	2.51	0.45
2:B:36:PRO:HG3	2:B:114:ARG:HH22	1.82	0.45
3:C:143:ALA:HB2	3:C:220:LEU:HA	1.99	0.45
3:C:246:VAL:HA	3:C:247:PRO:HD3	1.86	0.45
1:A:119:TRP:CE2	1:A:203:GLY:HA3	2.52	0.45
2:B:3:ARG:HD2	2:B:7:SER:HA	1.98	0.45
3:C:198:GLY:O	3:C:251:ALA:HA	2.16	0.45
1:A:143:ASP:O	1:A:201:LEU:HD22	2.17	0.45
3:C:18:HIS:CE1	3:C:29:PRO:HB2	2.52	0.44
1:A:54:ARG:NH2	1:A:139:ILE:O	2.50	0.44
3:C:272:SER:HA	3:C:275:PHE:CE1	2.52	0.44
1:A:123:HIS:CE1	1:A:201:LEU:HD13	2.52	0.44
1:A:87:ARG:HH12	1:A:244:THR:HG22	1.82	0.44
1:A:181:SER:HB2	2:B:145:PHE:HA	1.99	0.44
2:B:36:PRO:HG3	2:B:114:ARG:HH12	1.82	0.44
3:C:289:THR:HG21	3:C:392:ARG:NH2	2.32	0.44
2:B:28:ASP:OD1	2:B:29:ILE:N	2.49	0.44
1:A:181:SER:HA	2:B:145:PHE:HB3	1.99	0.43
2:B:3:ARG:HB2	2:B:5:GLU:O	2.17	0.43
2:B:80:LYS:NZ	2:B:202:GLU:OE2	2.41	0.43
1:A:102:ARG:CD	3:C:48:ILE:HD13	2.45	0.43
2:B:36:PRO:CG	2:B:114:ARG:HH22	2.32	0.43
2:B:85:TRP:CE2	2:B:235:VAL:HB	2.53	0.43
3:C:191:MET:H	3:C:191:MET:HG3	1.61	0.43
3:C:198:GLY:N	3:C:205:GLU:HG2	2.34	0.43
1:A:116:SER:OG	1:A:117:CYS:N	2.50	0.43
3:C:149:TYR:CD1	3:C:184:VAL:HB	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:14:THR:OG1	2:B:55:ASP:O	2.29	0.42
2:B:101:ILE:HA	2:B:102:PRO:HD2	1.86	0.42
1:A:19:THR:HG23	3:C:126:ARG:NH2	2.35	0.42
2:B:86:VAL:HA	2:B:104:PHE:CZ	2.54	0.42
3:C:223:MET:HE2	3:C:225:SER:H	1.84	0.42
1:A:102:ARG:NH1	1:A:174:LEU:O	2.51	0.42
3:C:333:LYS:HA	3:C:339:TRP:O	2.20	0.42
1:A:64:GLN:HG3	1:A:201:LEU:HD21	2.02	0.41
1:A:132:ARG:HD2	1:A:132:ARG:HA	1.88	0.41
1:A:91:ILE:HB	1:A:92:PRO:HD3	2.02	0.41
3:C:70:TRP:CD1	3:C:232:ILE:HD11	2.55	0.41
3:C:292:ILE:HG22	3:C:293:LEU:N	2.36	0.41
2:B:111:GLN:HG3	2:B:190:ILE:HD13	2.03	0.41
2:B:193:GLY:HA3	2:B:197:ILE:O	2.20	0.41
2:B:60:TRP:HB3	2:B:233:LEU:HB2	2.03	0.41
3:C:198:GLY:H	3:C:205:GLU:HG2	1.86	0.40
3:C:86:SER:HB2	3:C:211:TYR:CE2	2.56	0.40
3:C:300:ASP:N	3:C:300:ASP:OD2	2.55	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	250/266 (94%)	239 (96%)	11 (4%)	0	100	100
2	B	258/261 (99%)	245 (95%)	13 (5%)	0	100	100
3	C	415/430 (96%)	404 (97%)	11 (3%)	0	100	100
All	All	923/957 (96%)	888 (96%)	35 (4%)	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	218/230 (95%)	215 (99%)	3 (1%)	67	85
2	B	233/234 (100%)	231 (99%)	2 (1%)	78	91
3	C	355/366 (97%)	354 (100%)	1 (0%)	92	98
All	All	806/830 (97%)	800 (99%)	6 (1%)	84	94

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	THR
1	A	221	TYR
1	A	252	LEU
2	B	60	TRP
2	B	132	TRP
3	C	70	TRP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	110	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 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	252/266 (94%)	-0.30	1 (0%) 92 91	9, 14, 29, 56	0
2	B	260/261 (99%)	-0.33	1 (0%) 92 91	8, 15, 30, 36	0
3	C	417/430 (96%)	0.38	64 (15%) 2 1	9, 18, 56, 66	0
All	All	929/957 (97%)	-0.00	66 (7%) 16 11	8, 15, 52, 66	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	280	GLY	5.6
3	C	302	ILE	5.3
3	C	285	PHE	5.2
3	C	398	TYR	5.2
3	C	286	PHE	4.9
3	C	290	LYS	4.7
3	C	282	TRP	4.6
3	C	300	ASP	4.6
3	C	292	ILE	4.5
3	C	283	HIS	4.4
3	C	328	LYS	4.3
3	C	284	SER	4.3
3	C	343	GLU	4.1
3	C	388	ILE	4.1
3	C	295	TYR	4.1
3	C	287	ASP	3.9
3	C	358	ALA	3.6
3	C	397	ASP	3.6
3	C	395	ILE	3.6
3	C	288	SER	3.6
3	C	12	PHE	3.4
3	C	332	ASP	3.2
3	C	392	ARG	3.2

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Mol	Chain	Res	Type	RSRZ
3	C	273	GLY	3.2
3	C	361	TYR	3.2
3	C	335	ASN	3.1
3	C	404	ALA	3.1
3	C	357	GLY	3.0
3	C	272	SER	2.9
3	C	327	PHE	2.9
3	C	279	VAL	2.9
3	C	346	TYR	2.9
3	C	354	TRP	2.9
3	C	294	ARG	2.9
3	C	274	TYR	2.9
3	C	289	THR	2.8
3	C	399	ILE	2.8
3	C	402	SER	2.8
3	C	281	SER	2.7
3	C	1	ASP	2.7
3	C	293	LEU	2.7
3	C	325	ILE	2.7
3	C	356	ASP	2.7
3	C	277	VAL	2.6
3	C	278	TYR	2.6
3	C	291	ALA	2.6
3	C	364	PRO	2.6
3	C	245	ALA	2.6
3	C	304	GLN	2.5
3	C	400	VAL	2.5
3	C	271	LYS	2.5
3	C	393	PRO	2.5
3	C	298	VAL	2.5
3	C	401	ASP	2.5
3	C	296	GLY	2.4
3	C	299	SER	2.4
3	C	405	SER	2.4
2	B	193	GLY	2.4
3	C	359	TYR	2.4
3	C	345	GLU	2.3
3	C	363	VAL	2.3
3	C	355	ARG	2.2
3	C	336	GLY	2.2
3	C	331	LEU	2.1
3	C	340	PHE	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	251	ASP	2.1

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.