Full wwPDB X-ray Structure Validation Report ⓘ

May 24, 2020 – 06:01 pm BST

PDB ID	:	6BRP
Title	:	F-box protein form 2
Authors	:	Shabek, N.; Zheng, N.; Mao, H.; Hinds, T.R.; Ticchiarelli, F.; Leyser, O.
Deposited on	:	2017-11-30
Resolution	:	2.39 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 following versions of software and data (see references ①) were used in the production of this report:

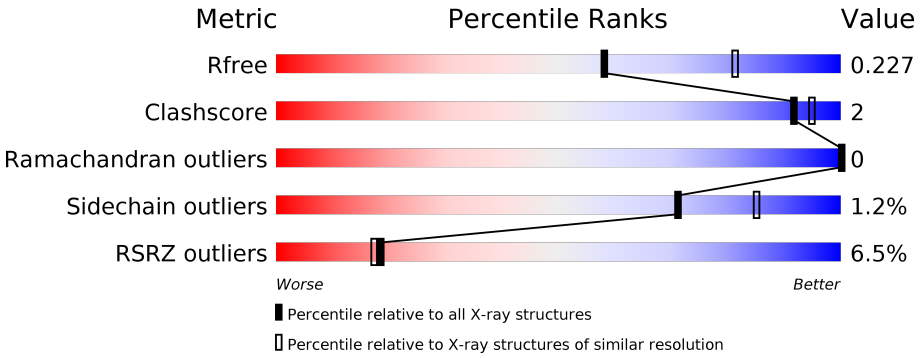
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 2.39 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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 on 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 <=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	B	688	3% 86% · 10%
1	D	688	3% 86% · 11%
2	A	160	28% 71% 8% 21%
2	C	160	6% 78% 8% 14%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 12231 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 F-box/LRR-repeat MAX2 homolog.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	620	Total	C	N	O	S	0	0	0
			4828	3075	849	874	30			
1	D	615	Total	C	N	O	S	0	0	0
			4790	3054	841	865	30			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	509	GLU	-	linker	UNP Q5VMP0
B	510	ASN	-	linker	UNP Q5VMP0
B	511	LEU	-	linker	UNP Q5VMP0
B	512	TYR	-	linker	UNP Q5VMP0
B	513	PHE	-	linker	UNP Q5VMP0
B	514	GLN	-	linker	UNP Q5VMP0
B	515	SER	-	linker	UNP Q5VMP0
D	509	GLU	-	linker	UNP Q5VMP0
D	510	ASN	-	linker	UNP Q5VMP0
D	511	LEU	-	linker	UNP Q5VMP0
D	512	TYR	-	linker	UNP Q5VMP0
D	513	PHE	-	linker	UNP Q5VMP0
D	514	GLN	-	linker	UNP Q5VMP0
D	515	SER	-	linker	UNP Q5VMP0

- Molecule 2 is a protein called SKP1-like protein 1A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	127	Total	C	N	O	S	0	0	0
			1021	649	166	201	5			
2	C	137	Total	C	N	O	S	0	0	0
			1098	695	179	219	5			

- Molecule 3 is water.

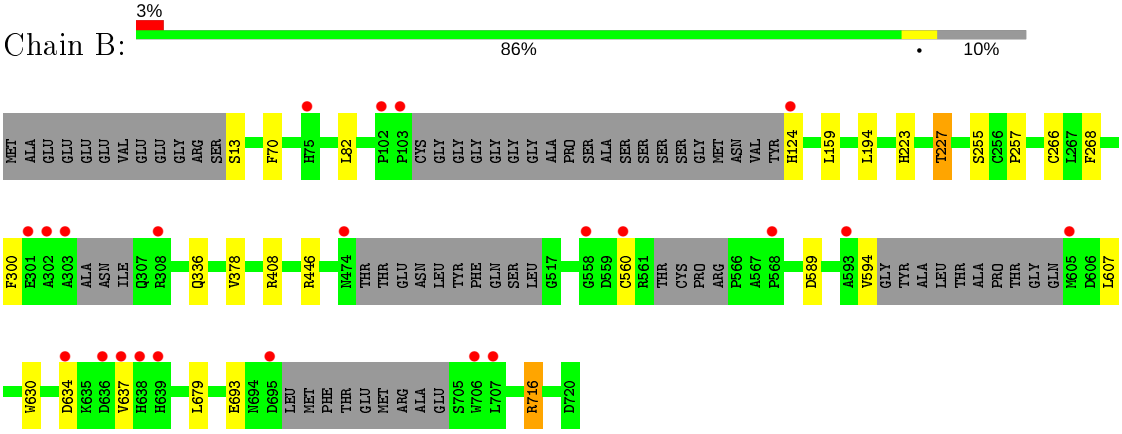
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	239	Total O 239 239	0	0
3	A	15	Total O 15 15	0	0
3	D	209	Total O 209 209	0	0
3	C	31	Total O 31 31	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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.

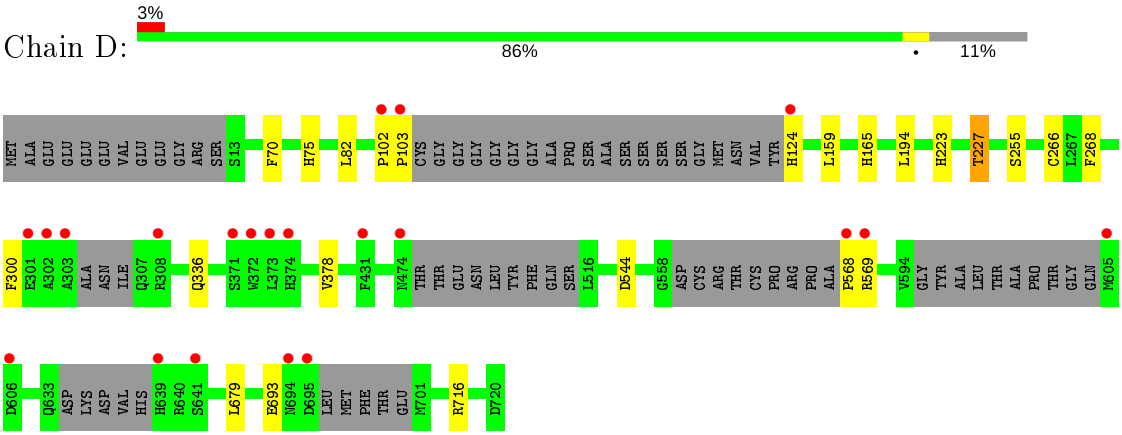
- Molecule 1: F-box/LRR-repeat MAX2 homolog

Chain B:



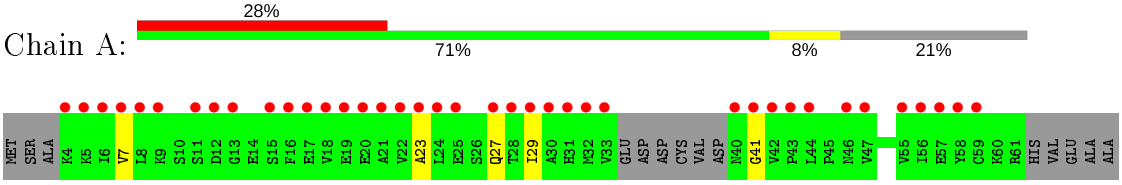
- Molecule 1: F-box/LRR-repeat MAX2 homolog

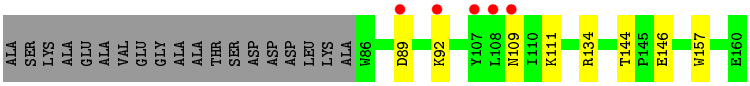
Chain D:



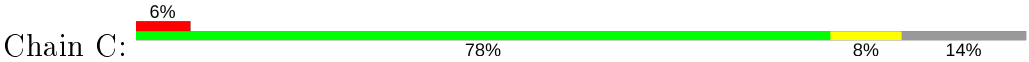
- Molecule 2: SKP1-like protein 1A

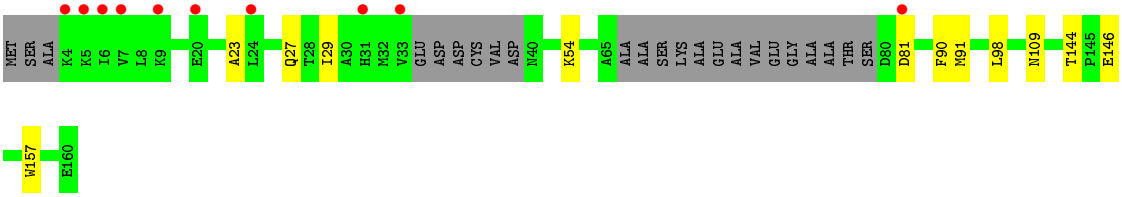
Chain A:





- Molecule 2: SKP1-like protein 1A





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	79.45Å 130.47Å 94.32Å 90.00° 99.38° 90.00°	Depositor
Resolution (Å)	93.06 – 2.39 46.53 – 2.39	Depositor EDS
% Data completeness (in resolution range)	(Not available) (93.06-2.39) 98.3 (46.53-2.39)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.18	Depositor
$< I/\sigma(I) >$ [1]	2.87 (at 2.39Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.192 , 0.218 0.198 , 0.227	Depositor DCC
R_{free} test set	3784 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å^2)	27.6	Xtriage
Anisotropy	0.301	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 39.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	12231	wwPDB-VP
Average B, all atoms (Å^2)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.83% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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	B	0.52	0/4940	0.72	2/6715 (0.0%)
1	D	0.51	0/4899	0.72	1/6656 (0.0%)
2	A	0.50	0/1035	0.65	0/1396
2	C	0.52	0/1113	0.67	0/1502
All	All	0.51	0/11987	0.71	3/16269 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	544	ASP	CB-CG-OD1	6.77	124.39	118.30
1	B	716	ARG	NE-CZ-NH2	-5.65	117.47	120.30
1	B	716	ARG	NE-CZ-NH1	5.08	122.84	120.30

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	B	4828	0	4834	15	0
1	D	4790	0	4806	11	0
2	A	1021	0	1019	6	0
2	C	1098	0	1087	8	0
3	A	15	0	0	0	0
3	B	239	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	31	0	0	0	0
3	D	209	0	0	1	0
All	All	12231	0	11746	37	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 2.

All (37) 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)
2:A:27:GLN:HB2	2:A:109:ASN:HB3	1.70	0.74
2:C:27:GLN:HB2	2:C:109:ASN:HB3	1.68	0.74
1:B:560:CYS:HB2	1:B:594:VAL:HG22	1.74	0.69
2:C:91:MET:CE	2:C:98:LEU:HD13	2.23	0.68
1:B:227:THR:HG23	1:B:255:SER:O	1.95	0.65
1:D:227:THR:HG23	1:D:255:SER:O	1.96	0.65
1:D:159:LEU:HD13	1:D:194:LEU:HG	1.82	0.61
1:D:300:PHE:HB3	1:D:336:GLN:HG3	1.82	0.61
1:B:300:PHE:HB3	1:B:336:GLN:HG3	1.83	0.61
1:B:408:ARG:HG2	3:B:952:HOH:O	2.03	0.59
1:B:266:CYS:HB2	1:B:268:PHE:CE2	2.38	0.58
1:B:159:LEU:HD13	1:B:194:LEU:HG	1.86	0.57
1:B:257:PRO:HB2	1:D:75:HIS:HB2	1.86	0.56
1:D:266:CYS:HB2	1:D:268:PHE:CE2	2.40	0.56
1:D:165:HIS:HE1	3:D:829:HOH:O	1.92	0.53
2:A:144:THR:HG22	2:A:146:GLU:H	1.73	0.52
2:C:144:THR:HG22	2:C:146:GLU:H	1.74	0.52
2:C:91:MET:HE2	2:C:98:LEU:HD13	1.91	0.50
2:C:91:MET:HE1	2:C:98:LEU:HD13	1.93	0.49
1:B:634:ASP:HB3	1:B:637:VAL:HG12	1.93	0.48
1:D:679:LEU:O	1:D:716:ARG:NH2	2.39	0.48
1:B:594:VAL:HG21	1:B:607:LEU:HD21	1.96	0.48
1:B:594:VAL:HG21	1:B:607:LEU:CD2	2.44	0.47
2:C:54:LYS:HE3	2:C:90:PHE:CE1	2.49	0.47
2:A:89:ASP:HA	2:A:92:LYS:HD3	1.98	0.46
1:B:679:LEU:O	1:B:716:ARG:NH2	2.39	0.46
1:D:102:PRO:HA	1:D:103:PRO:HD3	1.91	0.45
2:A:23:ALA:HB1	2:A:29:ILE:HG21	2.00	0.43
1:B:227:THR:HG21	3:B:808:HOH:O	2.17	0.43
1:D:70:PHE:HB2	2:C:157:TRP:CH2	2.54	0.43
1:D:223:HIS:O	1:D:227:THR:HB	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:223:HIS:O	1:B:227:THR:HB	2.19	0.42
2:C:23:ALA:HB1	2:C:29:ILE:HG21	2.00	0.42
1:D:568:PRO:HB2	1:D:569:ARG:H	1.74	0.41
1:B:589:ASP:HA	1:B:630:TRP:HB2	2.03	0.41
1:B:70:PHE:HB2	2:A:157:TRP:CH2	2.56	0.41
2:A:7:VAL:HG23	2:A:41:GLY:HA3	2.04	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	B	606/688 (88%)	597 (98%)	9 (2%)	0	100	100
1	D	599/688 (87%)	592 (99%)	7 (1%)	0	100	100
2	A	121/160 (76%)	118 (98%)	3 (2%)	0	100	100
2	C	131/160 (82%)	128 (98%)	3 (2%)	0	100	100
All	All	1457/1696 (86%)	1435 (98%)	22 (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	B	524/575 (91%)	517 (99%)	7 (1%)	69 84
1	D	519/575 (90%)	514 (99%)	5 (1%)	76 88
2	A	114/137 (83%)	112 (98%)	2 (2%)	59 76
2	C	122/137 (89%)	121 (99%)	1 (1%)	81 91
All	All	1279/1424 (90%)	1264 (99%)	15 (1%)	71 85

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	13	SER
1	B	82	LEU
1	B	124	HIS
1	B	227	THR
1	B	378	VAL
1	B	446	ARG
1	B	693	GLU
2	A	111	LYS
2	A	134	ARG
1	D	82	LEU
1	D	124	HIS
1	D	227	THR
1	D	378	VAL
1	D	693	GLU
2	C	81	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	27	HIS
1	D	165	HIS
1	D	694	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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, 95^{th} 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	B	620/688 (90%)	0.07	22 (3%)	44	43	16, 25, 55, 86	0
1	D	615/688 (89%)	0.17	21 (3%)	45	44	15, 31, 58, 100	0
2	A	127/160 (79%)	1.47	44 (34%)	0	0	18, 62, 112, 122	0
2	C	137/160 (85%)	0.39	10 (7%)	15	13	18, 38, 80, 95	0
All	All	1499/1696 (88%)	0.26	97 (6%)	18	17	15, 29, 78, 122	0

All (97) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	373	LEU	8.6
2	A	8	LEU	7.6
1	D	639	HIS	7.0
2	A	42	VAL	6.7
2	A	7	VAL	6.3
1	B	707	LEU	6.0
2	A	59	CYS	5.9
2	A	6	ILE	5.9
1	D	605	MET	5.8
1	D	374	HIS	5.8
1	D	103	PRO	5.8
1	D	372	TRP	5.6
2	A	21	ALA	5.3
2	A	41	GLY	5.3
2	A	22	VAL	5.2
1	B	303	ALA	5.0
1	B	605	MET	5.0
1	B	638	HIS	4.9
1	D	124	HIS	4.9
2	A	47	VAL	4.9
1	D	474	ASN	4.6

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Mol	Chain	Res	Type	RSRZ
2	A	18	VAL	4.5
2	A	24	LEU	4.3
2	A	16	PHE	4.3
1	D	371	SER	4.3
1	D	303	ALA	4.2
1	D	569	ARG	4.1
2	A	4	LYS	4.0
1	B	695	ASP	3.9
2	A	43	PRO	3.9
1	B	706	TRP	3.9
2	A	56	ILE	3.9
2	A	20	GLU	3.9
2	A	31	HIS	3.9
2	C	6	ILE	3.9
1	D	302	ALA	3.9
1	B	302	ALA	3.8
2	A	19	GLU	3.7
2	A	12	ASP	3.6
2	C	4	LYS	3.6
2	A	11	SER	3.5
2	A	89	ASP	3.5
1	D	606	ASP	3.4
2	A	25	GLU	3.3
1	B	558	GLY	3.3
1	D	568	PRO	3.2
1	B	308	ARG	3.2
1	B	103	PRO	3.2
1	D	641	SER	3.2
2	A	13	GLY	3.1
1	D	301	GLU	3.1
1	B	639	HIS	3.1
2	A	23	ALA	3.1
1	D	102	PRO	3.0
1	D	431	PHE	3.0
2	C	7	VAL	2.9
1	D	694	ASN	2.9
1	B	560	CYS	2.8
1	D	695	ASP	2.8
2	A	17	GLU	2.8
1	B	637	VAL	2.8
2	C	9	LYS	2.8
2	C	33	VAL	2.7

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Mol	Chain	Res	Type	RSRZ
2	A	44	LEU	2.7
2	A	107	TYR	2.7
2	A	33	VAL	2.6
2	A	108	LEU	2.6
1	B	593	ALA	2.6
2	C	31	HIS	2.6
1	B	634	ASP	2.6
1	D	308	ARG	2.6
2	A	57	GLU	2.6
2	C	24	LEU	2.6
2	A	55	VAL	2.6
2	A	9	LYS	2.6
1	B	474	ASN	2.5
2	A	46	ASN	2.5
2	A	5	LYS	2.4
1	B	301	GLU	2.4
2	A	92	LYS	2.4
2	A	40	ASN	2.4
1	B	102	PRO	2.4
1	B	636	ASP	2.4
2	A	28	THR	2.4
2	A	27	GLN	2.4
1	B	568	PRO	2.3
2	A	32	MET	2.3
2	C	20	GLU	2.3
2	A	15	SER	2.3
2	C	5	LYS	2.2
2	C	81	ASP	2.2
2	A	30	ALA	2.2
2	A	29	ILE	2.1
2	A	109	ASN	2.1
2	A	58	TYR	2.1
1	B	124	HIS	2.1
1	B	75	HIS	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

There are no carbohydrates in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.