



Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 12:34 PM GMT

PDB ID : 3O2O
Title : Structure of E. coli ClpS ring complex
Authors : Roman-Hernandez, G.; Grant, R.A.; Sauer, R.T.; Baker, T.A.; de Regt, A.
Deposited on : 2010-07-22
Resolution : 2.90 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

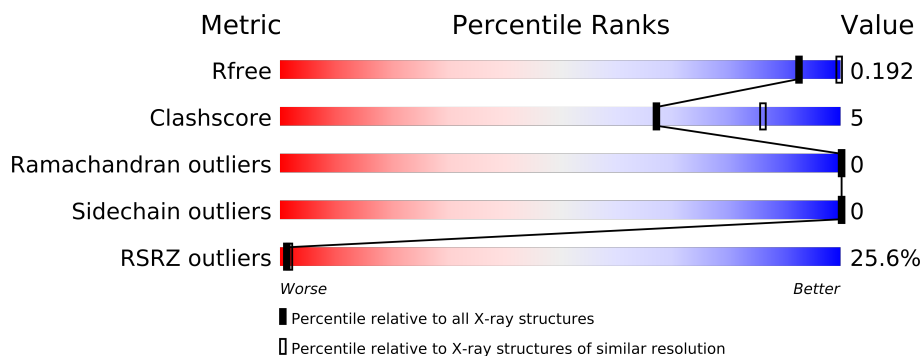
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.90 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}	66092	1053 (2.90-2.90)
Clashscore	79885	1326 (2.90-2.90)
Ramachandran outliers	78287	1290 (2.90-2.90)
Sidechain outliers	78261	1292 (2.90-2.90)
RSRZ outliers	66119	1054 (2.90-2.90)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	85	
1	B	85	
1	C	85	
1	D	85	
1	E	85	
1	F	85	
1	G	85	
1	H	85	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 10764 atoms, of which 5378 are hydrogens and 0 are deuterium.

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 ATP-dependent Clp protease adaptor protein ClpS.

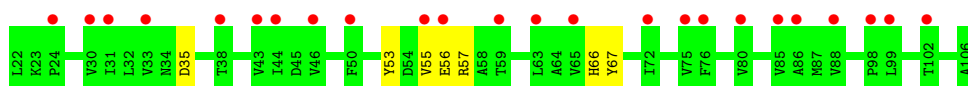
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	85	Total	C	H	N	O	S	0	0	0
			1345	436	672	107	124	6			
1	B	85	Total	C	H	N	O	S	0	0	0
			1368	441	687	108	126	6			
1	C	85	Total	C	H	N	O	S	0	0	0
			1360	439	683	108	124	6			
1	D	85	Total	C	H	N	O	S	0	0	0
			1315	430	650	105	124	6			
1	E	85	Total	C	H	N	O	S	0	0	0
			1344	435	675	108	120	6			
1	F	85	Total	C	H	N	O	S	0	0	0
			1353	438	676	107	126	6			
1	G	85	Total	C	H	N	O	S	0	1	0
			1372	443	689	109	125	6			
1	H	85	Total	C	H	N	O	S	0	0	0
			1307	428	646	105	122	6			

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

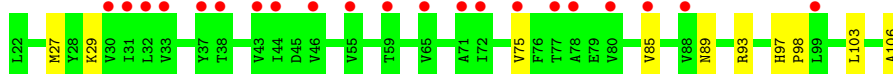
- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS

Chain A: 



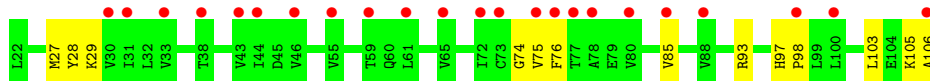
- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS

Chain B: 



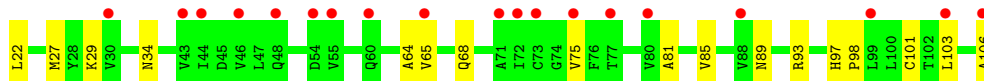
- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS

Chain C: 



- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS

Chain D: 



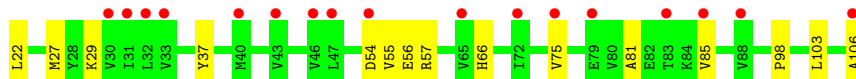
- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS

Chain E: 

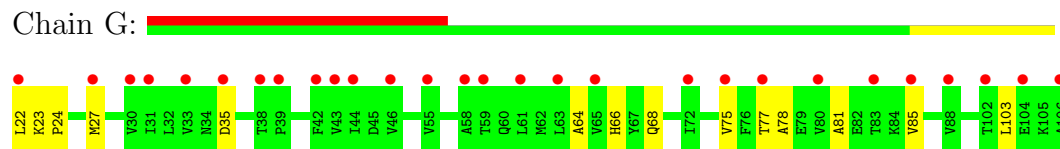


- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS

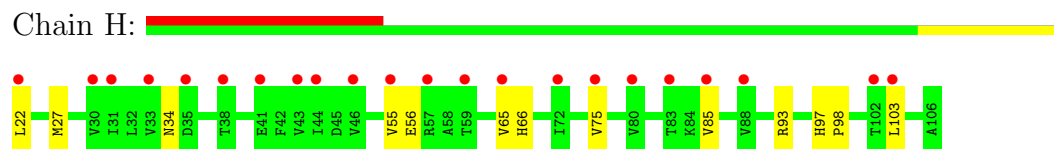
Chain F: 



- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS



- Molecule 1: ATP-dependent Clp protease adaptor protein ClpS



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	171.91Å 155.87Å 71.23Å 90.00° 114.64° 90.00°	Depositor
Resolution (Å)	24.97 – 2.90 24.97 – 2.90	Depositor EDS
% Data completeness (in resolution range)	99.9 (24.97-2.90) 98.9 (24.97-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.59 (at 2.89Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.2_432)	Depositor
R, R_{free}	0.173 , 0.201 0.166 , 0.192	Depositor DCC
R_{free} test set	1881 reflections (5.00%)	DCC
Wilson B-factor (Å ²)	62.6	Xtriage
Anisotropy	0.229	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 15.3	EDS
Estimated twinning fraction	0.411 for k+l,h+l,-l 0.370 for -k+l,-h-l,-l 0.360 for k+l,h+l,-l 0.449 for -h-2*l,-k,l	Xtriage
Reported twinning fraction	0.411 for k+l,h+l,-l	Depositor
L-test for twinning	$\langle L \rangle = 0.39$, $\langle L^2 \rangle = 0.22$	Xtriage
Outliers	0 of 37634 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	10764	wwPDB-VP
Average B, all atoms (Å ²)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.42% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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	0.33	0/687	0.47	0/931
1	B	0.29	0/695	0.44	0/940
1	C	0.31	0/691	0.47	0/935
1	D	0.29	0/679	0.45	0/923
1	E	0.34	0/683	0.49	0/925
1	F	0.32	0/691	0.47	0/936
1	G	0.31	0/700	0.46	0/947
1	H	0.29	0/675	0.43	0/918
All	All	0.31	0/5501	0.46	0/7455

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	673	672	0	5	0
1	B	681	687	0	5	0
1	C	677	683	0	7	0
1	D	665	650	0	10	0
1	E	669	675	0	6	0
1	F	677	676	0	10	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	G	683	689	0	9	0
1	H	661	646	0	8	0
All	All	5386	5378	0	54	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 5.

All (54) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:F:22:LEU:N	1:G:66:HIS:HD1	1.96	0.62
1:G:22:LEU:N	1:H:66:HIS:HD1	2.02	0.57
1:B:27:MET:HE3	1:B:75:VAL:HG12	1.93	0.51
1:B:85:VAL:HG21	1:B:103:LEU:HG	1.93	0.51
1:D:85:VAL:HG21	1:D:103:LEU:HG	1.93	0.49
1:G:85:VAL:HG21	1:G:103:LEU:HG	1.96	0.48
1:C:27:MET:HE3	1:C:75:VAL:HG12	1.96	0.48
1:H:27:MET:HE3	1:H:75:VAL:HG12	1.94	0.48
1:D:27:MET:HE3	1:D:75:VAL:HG12	1.95	0.47
1:H:85:VAL:HG21	1:H:103:LEU:HG	1.96	0.47
1:D:81:ALA:HB1	1:D:103:LEU:HD22	1.96	0.47
1:C:85:VAL:HG21	1:C:103:LEU:HG	1.96	0.47
1:E:27:MET:HE3	1:E:75:VAL:HG12	1.97	0.46
1:F:81:ALA:HB1	1:F:103:LEU:HD22	1.97	0.46
1:G:27:MET:HE3	1:G:75:VAL:HG12	1.98	0.45
1:F:29:LYS:HE3	1:F:106:ALA:HA	1.98	0.45
1:G:81:ALA:HB1	1:G:103:LEU:HD22	1.99	0.45
1:E:88:VAL:HG11	1:E:101:CYS:HB2	1.99	0.45
1:E:29:LYS:HE3	1:E:106:ALA:HA	1.98	0.45
1:H:34:ASN:HB2	1:H:65:VAL:O	2.17	0.45
1:D:29:LYS:HE3	1:D:106:ALA:HA	1.99	0.44
1:B:29:LYS:HE3	1:B:106:ALA:HA	1.99	0.44
1:A:55:VAL:HG13	1:A:56:GLU:N	2.33	0.44
1:D:89:ASN:O	1:D:93:ARG:HG2	2.18	0.44
1:F:54:ASP:OD1	1:F:57:ARG:HB2	2.18	0.43
1:D:22:LEU:N	1:E:66:HIS:HD1	2.17	0.43
1:A:35:ASP:O	1:H:22:LEU:HA	2.19	0.43
1:D:64:ALA:O	1:D:68:GLN:HB2	2.19	0.43
1:C:97:HIS:HA	1:C:98:PRO:HD3	1.78	0.43
1:H:93:ARG:HD3	1:H:93:ARG:HA	1.83	0.43
1:A:53:TYR:CE1	1:A:57:ARG:HD3	2.53	0.42
1:D:85:VAL:HG22	1:D:101:CYS:SG	2.59	0.42
1:B:89:ASN:O	1:B:93:ARG:HG2	2.19	0.42

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:66:HIS:HD2	1:A:67:TYR:CE1	2.37	0.42
1:F:37:TYR:HB2	1:F:98:PRO:HG2	2.02	0.42
1:D:97:HIS:HA	1:D:98:PRO:HD3	1.84	0.41
1:G:64:ALA:O	1:G:68[B]:GLN:HB2	2.20	0.41
1:F:22:LEU:HA	1:G:35:ASP:O	2.20	0.41
1:A:53:TYR:CD1	1:A:57:ARG:HD3	2.55	0.41
1:G:23:LYS:HA	1:G:24:PRO:HD2	1.88	0.41
1:F:27:MET:HE3	1:F:75:VAL:HG12	2.02	0.41
1:C:74:GLY:HA3	1:C:76:PHE:CE1	2.56	0.41
1:F:55:VAL:HG13	1:F:56:GLU:N	2.35	0.41
1:E:84:LYS:O	1:E:88:VAL:HG23	2.21	0.41
1:G:77:THR:HG22	1:G:78:ALA:N	2.36	0.41
1:B:97:HIS:HA	1:B:98:PRO:HD3	1.85	0.41
1:H:55:VAL:HG13	1:H:56:GLU:N	2.35	0.41
1:C:93:ARG:HA	1:C:93:ARG:HD3	1.82	0.41
1:H:97:HIS:HA	1:H:98:PRO:HD3	1.83	0.41
1:C:29:LYS:HE3	1:C:106:ALA:HA	2.03	0.40
1:D:34:ASN:HB2	1:D:65:VAL:O	2.21	0.40
1:F:85:VAL:HG21	1:F:103:LEU:HG	2.04	0.40
1:E:22:LEU:N	1:F:66:HIS:HD1	2.18	0.40
1:C:28:TYR:CD2	1:C:105:LYS:HA	2.56	0.40

There are no symmetry-related clashes.

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	83/85 (98%)	83 (100%)	0	0	100	100
1	B	83/85 (98%)	82 (99%)	1 (1%)	0	100	100
1	C	83/85 (98%)	83 (100%)	0	0	100	100
1	D	83/85 (98%)	82 (99%)	1 (1%)	0	100	100
1	E	83/85 (98%)	82 (99%)	1 (1%)	0	100	100
1	F	83/85 (98%)	82 (99%)	1 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	G	84/85 (99%)	84 (100%)	0	0	100	100
1	H	83/85 (98%)	81 (98%)	2 (2%)	0	100	100
All	All	665/680 (98%)	659 (99%)	6 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	73/75 (97%)	73 (100%)	0	100	100
1	B	75/75 (100%)	75 (100%)	0	100	100
1	C	74/75 (99%)	74 (100%)	0	100	100
1	D	71/75 (95%)	71 (100%)	0	100	100
1	E	72/75 (96%)	72 (100%)	0	100	100
1	F	74/75 (99%)	74 (100%)	0	100	100
1	G	75/75 (100%)	75 (100%)	0	100	100
1	H	70/75 (93%)	70 (100%)	0	100	100
All	All	584/600 (97%)	584 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	34	ASN
1	A	66	HIS
1	B	34	ASN
1	C	34	ASN
1	D	34	ASN
1	E	34	ASN
1	H	34	ASN

5.3.3 RNA ⓘ

There are no RNA chains 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, 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	85/85 (100%)	1.47	24 (28%)	1 1	56, 68, 86, 97	0
1	B	85/85 (100%)	1.37	21 (24%)	1 2	60, 76, 89, 97	0
1	C	85/85 (100%)	1.59	23 (27%)	1 1	52, 70, 89, 104	0
1	D	85/85 (100%)	1.44	19 (22%)	1 2	59, 79, 90, 101	0
1	E	85/85 (100%)	1.57	20 (23%)	1 2	55, 69, 86, 98	0
1	F	85/85 (100%)	1.39	17 (20%)	2 2	56, 75, 89, 96	0
1	G	85/85 (100%)	1.62	28 (32%)	1 1	55, 71, 88, 102	0
1	H	85/85 (100%)	1.46	22 (25%)	1 1	58, 78, 90, 97	0
All	All	680/680 (100%)	1.49	174 (25%)	1 2	52, 74, 90, 104	0

All (174) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	55	VAL	7.1
1	A	30	VAL	6.1
1	B	65	VAL	6.0
1	H	30	VAL	5.9
1	G	75	VAL	5.9
1	D	73	CYS	5.7
1	H	75	VAL	5.5
1	D	72	ILE	5.5
1	D	30	VAL	5.3
1	B	30	VAL	5.2
1	G	72	ILE	5.2
1	E	43	VAL	5.0
1	H	46	VAL	4.9
1	F	31	ILE	4.9
1	H	33	VAL	4.9
1	G	55	VAL	4.8

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Mol	Chain	Res	Type	RSRZ
1	A	65	VAL	4.7
1	B	72	ILE	4.7
1	G	88	VAL	4.7
1	C	65	VAL	4.6
1	G	43	VAL	4.6
1	C	43	VAL	4.6
1	F	43	VAL	4.5
1	C	44	ILE	4.4
1	H	31	ILE	4.4
1	D	88	VAL	4.4
1	H	72	ILE	4.4
1	G	30	VAL	4.3
1	B	75	VAL	4.3
1	D	106	ALA	4.3
1	C	80	VAL	4.2
1	B	43	VAL	4.2
1	E	30	VAL	4.2
1	B	88	VAL	4.2
1	E	33	VAL	4.1
1	G	85	VAL	4.1
1	H	85	VAL	4.0
1	F	46	VAL	4.0
1	G	46	VAL	3.9
1	G	33	VAL	3.9
1	C	33	VAL	3.9
1	F	30	VAL	3.9
1	E	75	VAL	3.9
1	E	46	VAL	3.8
1	D	43	VAL	3.8
1	E	80	VAL	3.8
1	C	72	ILE	3.8
1	D	55	VAL	3.8
1	H	55	VAL	3.8
1	F	33	VAL	3.8
1	H	44	ILE	3.8
1	C	75	VAL	3.7
1	B	46	VAL	3.7
1	D	65	VAL	3.7
1	C	38	THR	3.7
1	B	55	VAL	3.7
1	G	31	ILE	3.7
1	C	55	VAL	3.7

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Mol	Chain	Res	Type	RSRZ
1	H	65	VAL	3.6
1	E	83	THR	3.6
1	C	88	VAL	3.6
1	F	85	VAL	3.5
1	A	80	VAL	3.5
1	F	88	VAL	3.5
1	C	85	VAL	3.5
1	C	59	THR	3.4
1	E	88	VAL	3.4
1	F	75	VAL	3.4
1	B	85	VAL	3.4
1	C	30	VAL	3.4
1	C	46	VAL	3.4
1	H	43	VAL	3.4
1	D	103	LEU	3.3
1	A	43	VAL	3.3
1	A	46	VAL	3.3
1	A	55	VAL	3.3
1	B	31	ILE	3.3
1	A	44	ILE	3.3
1	F	65	VAL	3.3
1	F	106	ALA	3.2
1	F	72	ILE	3.2
1	B	59	THR	3.2
1	E	44	ILE	3.2
1	G	44	ILE	3.2
1	E	72	ILE	3.2
1	B	78	ALA	3.1
1	D	75	VAL	3.1
1	A	75	VAL	3.1
1	D	44	ILE	3.1
1	D	99	LEU	3.1
1	A	59	THR	3.0
1	G	102	THR	3.0
1	G	106	ALA	3.0
1	G	59	THR	3.0
1	D	46	VAL	3.0
1	C	106	ALA	2.9
1	F	47	LEU	2.9
1	E	65	VAL	2.9
1	C	31	ILE	2.9
1	A	85	VAL	2.9

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Mol	Chain	Res	Type	RSRZ
1	G	65	VAL	2.9
1	A	72	ILE	2.9
1	G	22	LEU	2.9
1	H	88	VAL	2.8
1	B	44	ILE	2.8
1	A	31	ILE	2.8
1	H	59	THR	2.8
1	B	80	VAL	2.8
1	H	38	THR	2.8
1	B	33	VAL	2.7
1	D	80	VAL	2.7
1	H	57	ARG	2.6
1	B	77	THR	2.6
1	E	31	ILE	2.6
1	A	24	PRO	2.6
1	E	85	VAL	2.6
1	C	73	CYS	2.5
1	H	83	THR	2.5
1	G	38	THR	2.5
1	C	78	ALA	2.5
1	D	54	ASP	2.4
1	A	76	PHE	2.4
1	D	77	THR	2.4
1	A	33	VAL	2.4
1	E	26	SER	2.4
1	B	99	LEU	2.4
1	F	83	THR	2.3
1	B	32	LEU	2.3
1	D	48	GLN	2.3
1	A	102	THR	2.3
1	C	77	THR	2.3
1	A	63	LEU	2.3
1	A	88	VAL	2.3
1	E	59	THR	2.3
1	G	77	THR	2.3
1	H	103	LEU	2.3
1	F	40	MET	2.3
1	C	61	LEU	2.3
1	A	98	PRO	2.3
1	B	38	THR	2.3
1	G	58	ALA	2.3
1	G	39	PRO	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	60	GLN	2.2
1	C	76	PHE	2.2
1	G	83	THR	2.2
1	B	71	ALA	2.2
1	D	71	ALA	2.2
1	E	92	ALA	2.2
1	E	77	THR	2.2
1	F	54	ASP	2.2
1	G	104	GLU	2.2
1	A	50	PHE	2.2
1	A	86	ALA	2.2
1	H	22	LEU	2.2
1	E	73	CYS	2.2
1	G	27	MET	2.2
1	F	79	GLU	2.1
1	F	32	LEU	2.1
1	H	35	ASP	2.1
1	H	102	THR	2.1
1	G	80	VAL	2.1
1	H	41	GLU	2.1
1	G	63	LEU	2.1
1	A	38	THR	2.1
1	A	56	GLU	2.1
1	G	61	LEU	2.1
1	G	35	ASP	2.1
1	G	42	PHE	2.1
1	C	98	PRO	2.0
1	B	37	TYR	2.0
1	E	47	LEU	2.0
1	H	80	VAL	2.0
1	A	99	LEU	2.0
1	C	100	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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.