



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:55 PM UTC

PDB ID : 7XRH / pdb_00007xrh
Title : Feruloyl esterase from *Lactobacillus acidophilus*
Authors : Hwang, J.; Lee, C.W.; Lee, J.H.; Do, H.
Deposited on : 2022-05-10
Resolution : 2.30 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
Xtriage (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

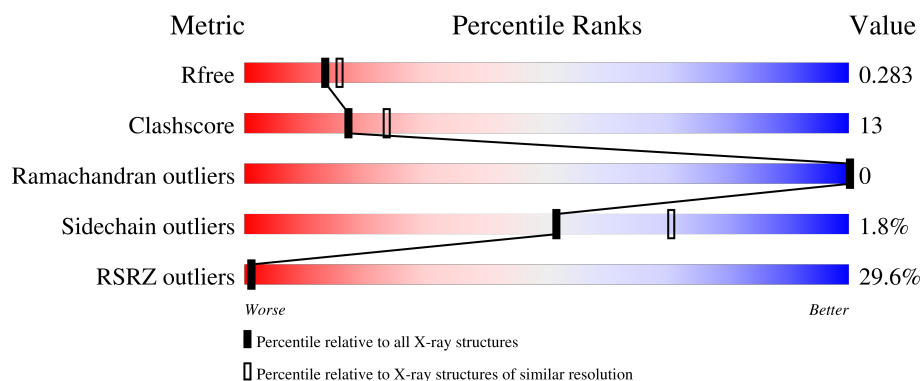
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	248	37% 71%25%..
1	B	248	19% 65%25%10%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3690 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 Cinnamoyl esterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	242	Total	C	N	O	S	0	0	0
			1883	1191	321	365	6			
1	B	224	Total	C	N	O	S	0	0	0
			1741	1098	296	340	7			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	expression tag	UNP A0A060IN49
B	0	SER	-	expression tag	UNP A0A060IN49

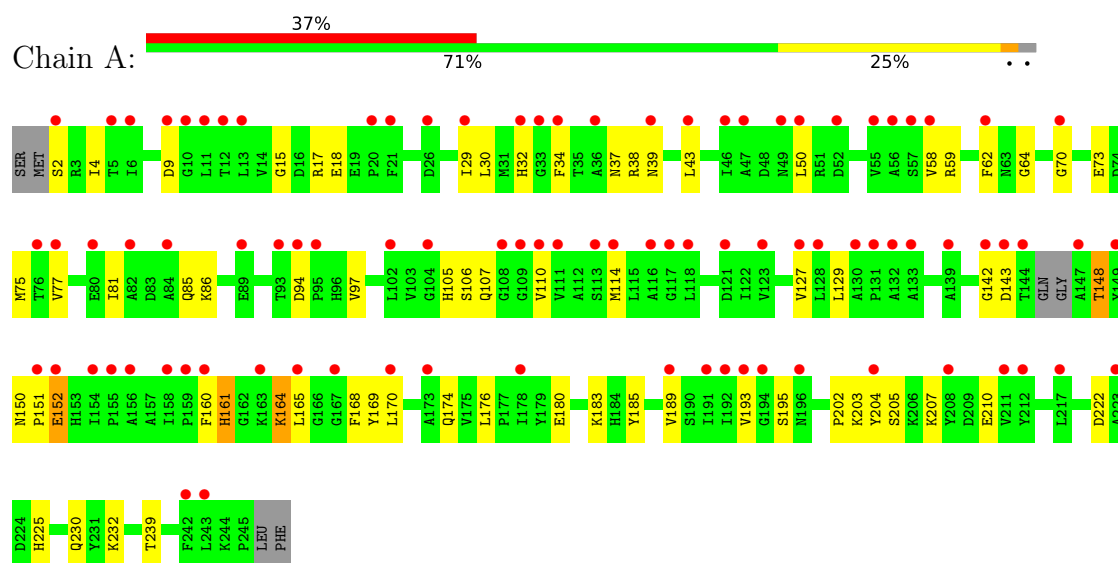
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	43	Total	O	0	0
			43	43		
2	B	23	Total	O	0	0
			23	23		

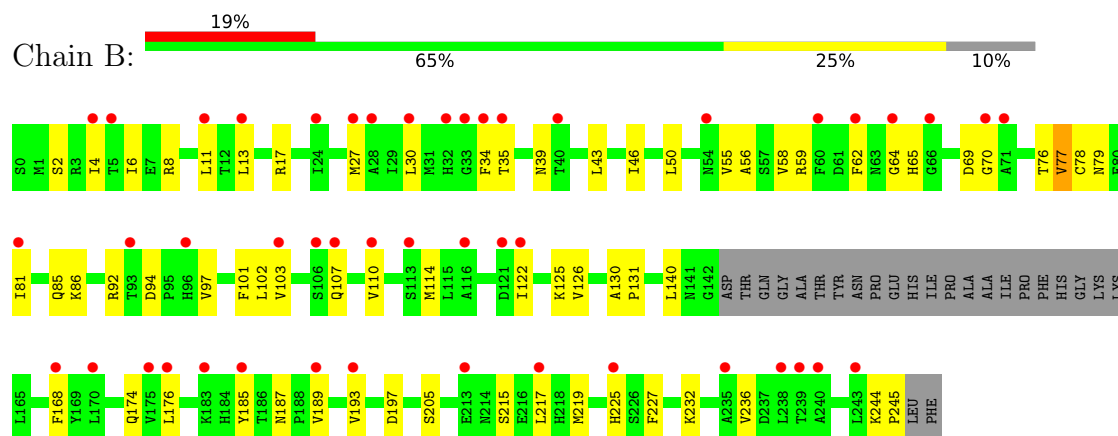
3 Residue-property plots [i](#)

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: Cinnamoyl esterase



• Molecule 1: Cinnamoyl esterase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	49.19Å 74.59Å 123.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.06 – 2.30 41.06 – 2.30	Depositor EDS
% Data completeness (in resolution range)	96.1 (41.06-2.30) 96.4 (41.06-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.91 (at 2.29Å)	Xtriage
Refinement program	REFMAC 1.14_3260, PHENIX 1.14_3260	Depositor
R, R_{free}	0.227 , 0.280 0.228 , 0.283	Depositor DCC
R_{free} test set	2000 reflections (9.56%)	wwPDB-VP
Wilson B-factor (Å ²)	37.4	Xtriage
Anisotropy	0.652	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 33.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	3690	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.48% 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	0.73	3/1923 (0.2%)	0.94	4/2612 (0.2%)
1	B	0.76	2/1774 (0.1%)	0.85	0/2406
All	All	0.74	5/3697 (0.1%)	0.90	4/5018 (0.1%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	131	PRO	C-O	-6.28	1.16	1.23
1	A	225	HIS	C-O	-5.69	1.17	1.24
1	B	77	VAL	C-O	-5.37	1.17	1.24
1	A	202	PRO	C-O	-5.16	1.17	1.24
1	A	230	GLN	C-O	-5.14	1.17	1.24

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	34	PHE	CA-CB-CG	6.32	120.12	113.80
1	A	152	GLU	CB-CG-CD	5.73	122.34	112.60
1	A	204	TYR	CB-CA-C	5.21	119.05	110.88
1	A	161	HIS	CA-CB-CG	5.11	118.91	113.80

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	1883	0	1833	44	0
1	B	1741	0	1701	51	0
2	A	43	0	0	0	0
2	B	23	0	0	0	0
All	All	3690	0	3534	90	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 13.

All (90) 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:B:27:MET:HG3	1:B:56:ALA:HB3	1.37	1.05
1:A:81:ILE:HD11	1:A:114:MET:HE3	1.59	0.84
1:A:30:LEU:HB3	1:A:43:LEU:HD22	1.65	0.78
1:B:140:LEU:HD21	1:B:174:GLN:HB3	1.70	0.73
1:A:64:GLY:HA2	1:A:70:GLY:O	1.90	0.72
1:B:27:MET:HG3	1:B:56:ALA:CB	2.19	0.71
1:A:2:SER:N	1:A:17:ARG:O	2.24	0.70
1:A:29:ILE:HA	1:A:58:VAL:HG23	1.74	0.70
1:B:110:VAL:HG12	1:B:114:MET:HE2	1.74	0.70
1:B:46:ILE:HG13	1:B:236:VAL:HG12	1.74	0.69
1:A:15:GLY:HA2	1:A:38:ARG:CD	2.25	0.67
1:A:15:GLY:HA2	1:A:38:ARG:HD2	1.76	0.67
1:B:27:MET:CE	1:B:58:VAL:HG22	2.26	0.66
1:B:189:VAL:HG13	1:B:215:SER:HB3	1.78	0.65
1:B:140:LEU:CD2	1:B:174:GLN:HB3	2.29	0.63
1:B:34:PHE:CD2	1:B:107:GLN:HG2	2.35	0.62
1:A:143:ASP:O	1:A:143:ASP:OD1	2.18	0.61
1:A:142:GLY:O	1:A:148:THR:HA	2.01	0.59
1:B:6:ILE:CG2	1:B:13:LEU:HB2	2.32	0.59
1:A:85:GLN:HG3	1:B:168:PHE:CD1	2.38	0.59
1:B:94:ASP:HB3	1:B:97:VAL:HG23	1.84	0.59
1:B:102:LEU:HB2	1:B:126:VAL:HG22	1.88	0.56
1:A:15:GLY:HA2	1:A:38:ARG:NE	2.20	0.55
1:B:130:ALA:HA	1:B:193:VAL:HG12	1.88	0.55
1:A:30:LEU:HB2	1:A:59:ARG:HB3	1.87	0.55
1:B:77:VAL:HG11	1:B:176:LEU:HD21	1.89	0.54
1:B:101:PHE:CD1	1:B:125:LYS:HB2	2.44	0.52
1:B:34:PHE:CE2	1:B:107:GLN:HG2	2.45	0.52
1:B:11:LEU:HD22	1:B:69:ASP:HB3	1.90	0.52
1:A:32:HIS:CE1	1:A:62:PHE:HD2	2.27	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:6:ILE:HG23	1:B:13:LEU:HB2	1.92	0.51
1:A:165:LEU:HD11	1:A:169:TYR:CD2	2.47	0.50
1:A:168:PHE:CE1	1:B:85:GLN:HG3	2.47	0.50
1:A:110:VAL:O	1:A:114:MET:HG3	2.12	0.50
1:A:195:SER:HB3	1:A:222:ASP:H	1.77	0.50
1:B:39:ASN:OD1	1:B:59:ARG:NH2	2.32	0.49
1:B:78:CYS:HA	1:B:81:ILE:HD12	1.95	0.49
1:A:170:LEU:O	1:A:174:GLN:HG3	2.14	0.48
1:A:180:GLU:O	1:A:183:LYS:HG2	2.12	0.48
1:B:27:MET:HG2	1:B:56:ALA:C	2.38	0.48
1:B:193:VAL:HG23	1:B:219:MET:HG2	1.96	0.47
1:B:27:MET:HE3	1:B:58:VAL:HG22	1.95	0.47
1:B:197:ASP:OD1	1:B:225:HIS:HB2	2.13	0.47
1:A:4:ILE:HD13	1:A:17:ARG:HB2	1.96	0.47
1:B:30:LEU:HB3	1:B:43:LEU:HD22	1.97	0.47
1:B:2:SER:HB3	1:B:17:ARG:HB3	1.96	0.46
1:B:189:VAL:HG13	1:B:215:SER:CB	2.43	0.46
1:A:168:PHE:CD1	1:B:85:GLN:HG3	2.51	0.46
1:A:232:LYS:HB3	1:A:232:LYS:HE3	1.81	0.46
1:A:127:VAL:HG21	1:A:239:THR:HG23	1.96	0.45
1:A:77:VAL:HG11	1:A:176:LEU:HD21	1.97	0.45
1:A:85:GLN:HG3	1:B:168:PHE:CG	2.51	0.45
1:B:27:MET:HE1	1:B:58:VAL:HG22	1.98	0.45
1:A:86:LYS:HD3	1:A:86:LYS:HA	1.69	0.45
1:A:38:ARG:HD2	1:A:59:ARG:O	2.16	0.44
1:B:76:THR:HG23	1:B:79:ASN:ND2	2.32	0.44
1:A:193:VAL:HG11	1:A:205:SER:HB3	2.00	0.44
1:A:9:ASP:O	1:B:11:LEU:HG	2.17	0.44
1:B:193:VAL:CG1	1:B:205:SER:OG	2.66	0.44
1:A:29:ILE:HA	1:A:58:VAL:CG2	2.44	0.44
1:B:185:TYR:CZ	1:B:187:ASN:HB2	2.52	0.44
1:A:94:ASP:HB3	1:A:97:VAL:HG23	2.00	0.43
1:A:207:LYS:HA	1:A:210:GLU:CD	2.43	0.43
1:A:73:GLU:HB3	1:A:164:LYS:O	2.19	0.43
1:A:193:VAL:HG11	1:A:205:SER:CB	2.47	0.43
1:B:64:GLY:HA2	1:B:70:GLY:O	2.18	0.43
1:B:193:VAL:HG13	1:B:205:SER:OG	2.19	0.43
1:B:227:PHE:O	1:B:232:LYS:HB2	2.19	0.43
1:A:152:GLU:O	1:A:152:GLU:HG2	2.18	0.43
1:B:92:ARG:HD3	1:B:122:ILE:HG21	2.01	0.42
1:B:232:LYS:HE2	1:B:232:LYS:HB3	1.85	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:50:LEU:HD23	1:A:50:LEU:HA	1.80	0.41
1:A:185:TYR:HE2	1:A:189:VAL:HG22	1.86	0.41
1:B:4:ILE:HD13	1:B:17:ARG:HB2	2.02	0.41
1:A:37:ASN:OD1	1:A:39:ASN:N	2.47	0.41
1:B:232:LYS:O	1:B:236:VAL:HG13	2.20	0.41
1:A:105:HIS:HA	1:A:129:LEU:O	2.21	0.41
1:B:2:SER:N	1:B:17:ARG:O	2.51	0.41
1:B:217:LEU:HD11	1:B:219:MET:HG3	2.03	0.40
1:B:8:ARG:HG2	1:B:86:LYS:CG	2.52	0.40
1:A:106:SER:OG	1:A:107:GLN:N	2.54	0.40
1:A:150:ASN:HA	1:A:151:PRO:HD3	1.94	0.40
1:A:207:LYS:HG3	1:A:210:GLU:OE1	2.21	0.40
1:B:50:LEU:HB3	1:B:55:VAL:HB	2.03	0.40
1:B:62:PHE:O	1:B:65:HIS:HB2	2.21	0.40
1:A:15:GLY:C	1:A:38:ARG:HE	2.30	0.40
1:A:75:MET:SD	1:A:75:MET:C	3.05	0.40
1:B:8:ARG:HG2	1:B:86:LYS:HG3	2.03	0.40
1:B:30:LEU:HD23	1:B:103:VAL:HB	2.04	0.40
1:B:244:LYS:HA	1:B:245:PRO:HD3	1.76	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	238/248 (96%)	228 (96%)	10 (4%)	0	100	100
1	B	220/248 (89%)	211 (96%)	9 (4%)	0	100	100
All	All	458/496 (92%)	439 (96%)	19 (4%)	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	202/208 (97%)	196 (97%)	6 (3%)	36	53
1	B	188/208 (90%)	187 (100%)	1 (0%)	81	90
All	All	390/416 (94%)	383 (98%)	7 (2%)	51	70

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	GLU
1	A	148	THR
1	A	160	PHE
1	A	161	HIS
1	A	164	LYS
1	A	203	LYS
1	B	35	THR

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

Mol	Chain	Res	Type
1	B	141	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 oligosaccharides 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	242/248 (97%)	1.80	91 (37%) 1 0	26, 35, 60, 75	0
1	B	224/248 (90%)	1.53	47 (20%) 2 3	30, 41, 56, 70	0
All	All	466/496 (93%)	1.67	138 (29%) 1 1	26, 38, 57, 75	0

All (138) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	21	PHE	4.7
1	A	56	ALA	4.7
1	B	33	GLY	4.0
1	B	4	ILE	4.0
1	A	132	ALA	3.7
1	A	173	ALA	3.7
1	A	143	ASP	3.6
1	B	27	MET	3.6
1	A	144	THR	3.5
1	A	34	PHE	3.4
1	A	47	ALA	3.3
1	A	6	ILE	3.3
1	B	34	PHE	3.3
1	A	108	GLY	3.2
1	A	160	PHE	3.2
1	A	117	GLY	3.1
1	B	11	LEU	3.1
1	A	110	VAL	3.1
1	A	116	ALA	3.1
1	A	159	PRO	3.0
1	A	212	TYR	3.0
1	B	239	THR	2.9
1	A	109	GLY	2.9
1	A	133	ALA	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	28	ALA	2.9
1	B	122	ILE	2.9
1	B	62	PHE	2.8
1	A	93	THR	2.8
1	B	30	LEU	2.8
1	A	84	ALA	2.8
1	A	29	ILE	2.8
1	A	178	ILE	2.8
1	A	39	ASN	2.8
1	B	238	LEU	2.8
1	B	243	LEU	2.8
1	A	192	ILE	2.8
1	A	165	LEU	2.8
1	A	62	PHE	2.8
1	B	168	PHE	2.8
1	A	123	VAL	2.8
1	A	104	GLY	2.7
1	A	43	LEU	2.7
1	A	95	PRO	2.7
1	A	208	TYR	2.7
1	A	32	HIS	2.7
1	A	82	ALA	2.6
1	A	152	GLU	2.6
1	A	139	ALA	2.5
1	B	93	THR	2.5
1	A	113	SER	2.5
1	A	36	ALA	2.5
1	B	5	THR	2.5
1	B	35	THR	2.5
1	A	114	MET	2.5
1	B	235	ALA	2.5
1	B	189	VAL	2.5
1	A	13	LEU	2.5
1	A	50	LEU	2.5
1	A	170	LEU	2.5
1	B	217	LEU	2.5
1	A	26	ASP	2.5
1	A	12	THR	2.4
1	A	80	GLU	2.4
1	A	189	VAL	2.4
1	B	13	LEU	2.4
1	A	155	PRO	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	163	LYS	2.4
1	B	183	LYS	2.4
1	A	102	LEU	2.4
1	B	96	HIS	2.4
1	B	107	GLN	2.4
1	A	33	GLY	2.4
1	A	223	ALA	2.4
1	A	111	VAL	2.4
1	A	158	ILE	2.4
1	A	11	LEU	2.4
1	A	20	PRO	2.4
1	A	10	GLY	2.3
1	B	64	GLY	2.3
1	A	156	ALA	2.3
1	B	110	VAL	2.3
1	B	32	HIS	2.3
1	A	49	ASN	2.3
1	B	54	ASN	2.3
1	A	194	GLY	2.3
1	B	70	GLY	2.3
1	A	130	ALA	2.3
1	A	76	THR	2.3
1	A	57	SER	2.3
1	A	243	LEU	2.3
1	B	170	LEU	2.3
1	A	2	SER	2.3
1	A	191	ILE	2.3
1	A	204	TYR	2.3
1	A	151	PRO	2.2
1	B	66	GLY	2.2
1	A	149	TYR	2.2
1	B	71	ALA	2.2
1	B	240	ALA	2.2
1	A	154	ILE	2.2
1	B	24	ILE	2.2
1	B	60	PHE	2.2
1	A	52	ASP	2.2
1	A	147	ALA	2.2
1	A	55	VAL	2.2
1	A	131	PRO	2.2
1	B	213	GLU	2.2
1	B	113	SER	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	185	TYR	2.2
1	B	81	ILE	2.2
1	B	176	LEU	2.2
1	A	9	ASP	2.2
1	A	94	ASP	2.2
1	A	127	VAL	2.2
1	A	167	GLY	2.2
1	B	116	ALA	2.2
1	A	193	VAL	2.1
1	B	106	SER	2.1
1	A	128	LEU	2.1
1	A	196	ASN	2.1
1	A	242	PHE	2.1
1	A	46	ILE	2.1
1	A	118	LEU	2.1
1	A	217	LEU	2.1
1	A	121	ASP	2.1
1	B	121	ASP	2.1
1	A	58	VAL	2.1
1	A	77	VAL	2.1
1	B	193	VAL	2.1
1	A	70	GLY	2.1
1	A	89	GLU	2.1
1	A	211	VAL	2.1
1	B	175	VAL	2.1
1	A	142	GLY	2.1
1	B	225	HIS	2.0
1	B	103	VAL	2.0
1	A	5	THR	2.0
1	B	40	THR	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 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.