Full wwPDB X-ray Structure Validation Report (i)

Jun 22, 2024 – 04:12 PM EDT

PDB ID	:	6IMP
Title	:	Crystal structure of alpha-beta hydrolase (ABH) from Vibrio vulnificus
Authors	:	Kim, M.H.; Hwang, J.
Deposited on	:	2018-10-23
Resolution	:	2.62 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 (i) 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 (1)) were used in the production of this report:

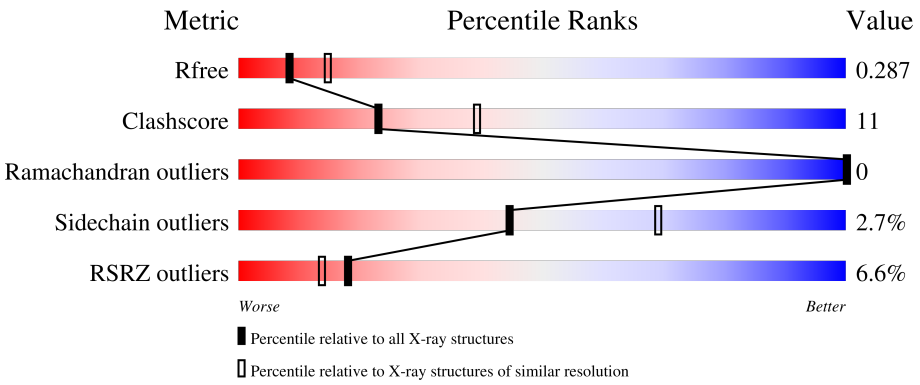
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 2.62 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	3797 (2.64-2.60)
Clashscore	141614	4168 (2.64-2.60)
Ramachandran outliers	138981	4093 (2.64-2.60)
Sidechain outliers	138945	4093 (2.64-2.60)
RSRZ outliers	127900	3731 (2.64-2.60)

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 <=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	323	8% 71% 15% • 12%
1	B	323	4% 68% 16% • • 13%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 4298 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 RTX toxin RtxA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	284	2157	1343	381	427	6	0	0	0
1	B	280	2120	1319	375	420	6	0	0	0

- Molecule 2 is water.

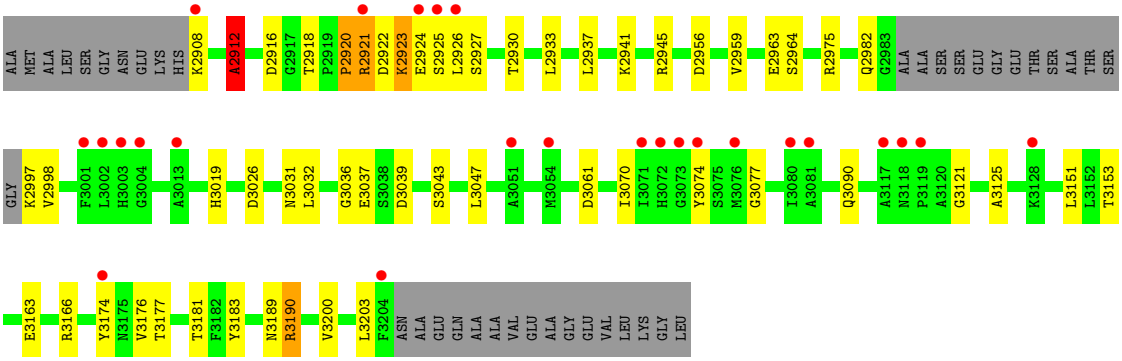
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	12	12	12	0	0
2	B	9	9	9	0	0

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.

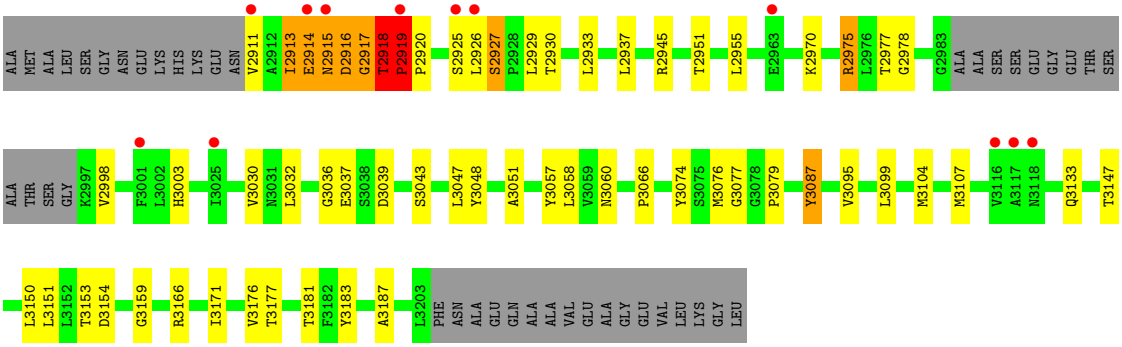
- Molecule 1: RTX toxin RtxA

Chain A:



- Molecule 1: RTX toxin RtxA

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	44.11Å 99.68Å 164.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.84 – 2.62 32.57 – 2.62	Depositor EDS
% Data completeness (in resolution range)	97.7 (49.84-2.62) 97.7 (32.57-2.62)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	0.08	Depositor
$< I/\sigma(I) >$ [1]	2.34 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.8.0103	Depositor
R, R_{free}	0.237 , 0.287 0.237 , 0.287	Depositor DCC
R_{free} test set	1071 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å^2)	77.6	Xtriage
Anisotropy	0.181	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 59.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.45$, $< L^2 > = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	4298	wwPDB-VP
Average B, all atoms (Å^2)	92.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.74% 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 (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	0.48	0/2191	0.63	2/2954 (0.1%)
1	B	0.48	0/2153	0.75	8/2904 (0.3%)
All	All	0.48	0/4344	0.69	10/5858 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	4
1	B	0	7
All	All	0	11

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	2914	GLU	CB-CA-C	-13.41	83.57	110.40
1	B	2914	GLU	N-CA-C	9.89	137.71	111.00
1	B	2913	ILE	CB-CA-C	-7.75	96.11	111.60
1	B	2914	GLU	N-CA-CB	-6.07	99.68	110.60
1	A	2912	ALA	CB-CA-C	-5.89	101.27	110.10
1	B	2918	THR	C-N-CD	5.75	140.49	128.40
1	B	2925	SER	CB-CA-C	-5.67	99.32	110.10
1	B	2919	PRO	C-N-CD	5.65	140.26	128.40
1	B	2918	THR	N-CA-C	5.64	126.22	111.00
1	A	2920	PRO	CA-N-CD	-5.02	104.48	111.50

There are no chirality outliers.

All (11) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	2912	ALA	Peptide
1	A	2918	THR	Peptide
1	A	2925	SER	Peptide
1	A	3190	ARG	Sidechain
1	B	2915	ASN	Peptide
1	B	2916	ASP	Peptide
1	B	2917	GLY	Peptide
1	B	2918	THR	Peptide
1	B	2919	PRO	Peptide
1	B	2926	LEU	Peptide
1	B	2927	SER	Peptide

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	2157	0	2126	43	0
1	B	2120	0	2092	55	0
2	A	12	0	0	1	0
2	B	9	0	0	0	0
All	All	4298	0	4218	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 11.

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)
1:B:2913:ILE:HG22	1:B:2913:ILE:O	1.45	1.06
1:B:2919:PRO:HD2	1:B:2920:PRO:HD3	1.36	1.01
1:B:2913:ILE:HG23	1:B:2970:LYS:HB2	1.45	0.99
1:A:2926:LEU:HD22	1:A:2930:THR:OG1	1.70	0.91
1:A:3070:ILE:HG23	1:A:3203:LEU:HD13	1.56	0.87
1:B:2911:VAL:HG23	1:B:3060:ASN:ND2	1.93	0.84
1:B:2913:ILE:O	1:B:2913:ILE:CG2	2.22	0.83
1:B:2913:ILE:CG2	1:B:2970:LYS:HB2	2.14	0.77
1:A:2921:ARG:HD3	1:A:2921:ARG:H	1.50	0.77

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:2913:ILE:HG22	1:B:2970:LYS:H	1.51	0.75
1:A:3181:THR:HG22	1:A:3183:TYR:H	1.53	0.74
1:B:3076:MET:HA	1:B:3104:MET:HE3	1.71	0.72
1:B:2951:THR:HG22	1:B:2955:LEU:HD13	1.73	0.68
1:A:2975:ARG:HG2	1:A:3039:ASP:OD2	1.93	0.68
1:A:2926:LEU:CD2	1:A:2930:THR:OG1	2.43	0.66
1:B:3181:THR:HG22	1:B:3183:TYR:H	1.61	0.65
1:B:2919:PRO:HD2	1:B:2920:PRO:CD	2.21	0.62
1:A:2924:GLU:N	1:A:2924:GLU:OE1	2.32	0.61
1:B:2913:ILE:CG2	1:B:2970:LYS:H	2.13	0.61
1:B:2919:PRO:CD	1:B:2920:PRO:HD3	2.21	0.61
1:A:2908:LYS:O	1:A:2908:LYS:HD3	2.01	0.60
1:B:3066:PRO:O	1:B:3095:VAL:HA	2.01	0.59
1:A:2926:LEU:HD23	1:A:2927:SER:N	2.17	0.59
1:A:3200:VAL:HG12	1:A:3200:VAL:O	2.02	0.59
1:B:2977:THR:HG21	1:B:3037:GLU:H	1.67	0.59
1:B:2913:ILE:HG23	1:B:2970:LYS:CB	2.27	0.58
1:A:2956:ASP:O	1:A:2959:VAL:HG22	2.05	0.57
1:B:3154:ASP:O	1:B:3159:GLY:HA3	2.05	0.56
1:A:2912:ALA:HB1	1:A:3061:ASP:OD1	2.05	0.56
1:B:3150:LEU:HD13	1:B:3177:THR:HG23	1.88	0.56
1:B:3151:LEU:O	1:B:3166:ARG:NH1	2.38	0.56
1:A:3019:HIS:NE2	1:A:3189:ASN:OD1	2.34	0.55
1:A:3070:ILE:CG2	1:A:3203:LEU:HD13	2.33	0.55
1:A:3090:GLN:HG3	1:B:3171:ILE:HD11	1.89	0.55
1:A:2921:ARG:HD3	1:A:2921:ARG:N	2.21	0.55
1:A:2921:ARG:O	1:A:2921:ARG:HG2	2.04	0.55
1:A:3153:THR:O	1:A:3181:THR:HB	2.06	0.55
1:A:2921:ARG:HH11	1:A:3037:GLU:HG2	1.72	0.54
1:B:3003:HIS:CE1	1:B:3032:LEU:HD12	2.42	0.54
1:B:3032:LEU:HB3	1:B:3047:LEU:HD22	1.91	0.53
1:A:2975:ARG:NH2	1:A:3039:ASP:OD2	2.42	0.53
1:B:2929:LEU:C	1:B:2929:LEU:HD23	2.29	0.52
1:B:3043:SER:O	1:B:3047:LEU:HG	2.09	0.52
1:A:2921:ARG:H	1:A:2921:ARG:CD	2.20	0.52
1:B:3099:LEU:HD12	1:B:3150:LEU:O	2.08	0.52
1:A:3183:TYR:HE1	1:A:3190:ARG:HH11	1.57	0.52
1:B:3176:VAL:HG13	1:B:3176:VAL:O	2.10	0.52
1:A:3032:LEU:HB3	1:A:3047:LEU:HD22	1.91	0.51
1:A:2959:VAL:HA	1:A:2964:SER:O	2.10	0.50
1:B:2917:GLY:O	1:B:2918:THR:HB	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:2945:ARG:HD3	1:B:3036:GLY:O	2.11	0.49
1:B:2913:ILE:CG2	1:B:2970:LYS:CB	2.90	0.49
1:B:2998:VAL:HG11	1:B:3058:LEU:HD13	1.94	0.49
1:B:2914:GLU:O	1:B:2915:ASN:HB3	2.14	0.48
1:B:2933:LEU:HD21	1:B:2937:LEU:HD22	1.96	0.48
1:A:3174:TYR:O	1:A:3176:VAL:HG23	2.14	0.48
1:A:2998:VAL:HG22	1:A:3026:ASP:HB2	1.97	0.47
1:B:3087:TYR:CD1	1:B:3087:TYR:C	2.87	0.47
1:A:3151:LEU:O	1:A:3166:ARG:NH1	2.39	0.47
1:A:3181:THR:HG22	1:A:3183:TYR:N	2.27	0.47
1:A:3181:THR:HG23	1:A:3183:TYR:CD2	2.50	0.47
1:B:2951:THR:O	1:B:2955:LEU:HD13	2.14	0.47
1:B:2977:THR:HG21	1:B:3037:GLU:HG2	1.97	0.47
1:B:2975:ARG:NH2	1:B:3039:ASP:OD1	2.48	0.46
1:B:2951:THR:HG22	1:B:2955:LEU:CD1	2.45	0.46
1:A:3074:TYR:O	1:A:3077:GLY:N	2.48	0.46
1:B:3151:LEU:HD23	1:B:3166:ARG:HB2	1.99	0.45
1:A:2933:LEU:HG	1:A:2937:LEU:HD13	1.99	0.45
1:B:3048:TYR:O	1:B:3051:ALA:HB3	2.16	0.45
1:A:2923:LYS:HG2	1:A:2945:ARG:HH21	1.81	0.45
1:B:2914:GLU:CG	1:B:3057:TYR:HE1	2.30	0.44
1:B:2977:THR:HG21	1:B:3037:GLU:CG	2.48	0.44
1:B:3181:THR:CG2	1:B:3183:TYR:HD2	2.31	0.44
1:B:2914:GLU:HG2	1:B:3057:TYR:HE1	1.83	0.44
1:A:2963:GLU:O	1:A:2982:GLN:HG2	2.18	0.43
1:A:3163:GLU:OE2	1:A:3166:ARG:NH2	2.52	0.43
1:B:2951:THR:O	1:B:2955:LEU:CD1	2.66	0.43
1:B:3074:TYR:O	1:B:3077:GLY:N	2.52	0.43
1:B:3076:MET:CA	1:B:3104:MET:HE3	2.45	0.43
1:B:3150:LEU:CD1	1:B:3177:THR:HG23	2.49	0.43
1:B:3104:MET:SD	1:B:3107:MET:HA	2.59	0.42
1:B:2927:SER:O	1:B:2930:THR:N	2.52	0.42
1:A:3031:ASN:ND2	1:A:3036:GLY:HA3	2.35	0.42
1:A:2923:LYS:CD	1:A:2941:LYS:HD2	2.49	0.42
1:A:3181:THR:CG2	1:A:3183:TYR:CD2	3.02	0.42
1:B:3153:THR:O	1:B:3181:THR:HB	2.19	0.42
1:A:3181:THR:CG2	1:A:3183:TYR:HD2	2.33	0.42
1:B:3181:THR:CG2	1:B:3183:TYR:CD2	3.03	0.42
1:A:2922:ASP:C	1:A:2923:LYS:HG3	2.39	0.41
1:B:2978:GLY:HA3	1:B:3030:VAL:HA	2.00	0.41
1:B:3076:MET:CB	1:B:3104:MET:CE	2.98	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3074:TYR:O	1:A:3077:GLY:CA	2.69	0.41
1:B:2919:PRO:CD	1:B:2920:PRO:CD	2.91	0.41
1:A:3190:ARG:NH1	2:A:3303:HOH:O	2.54	0.41
1:A:3043:SER:O	1:A:3047:LEU:HG	2.21	0.41
1:A:3121:GLY:O	1:A:3125:ALA:N	2.50	0.41
1:B:3183:TYR:HB3	1:B:3187:ALA:HB3	2.02	0.41

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	280/323 (87%)	261 (93%)	19 (7%)	0	100	100
1	B	276/323 (85%)	262 (95%)	14 (5%)	0	100	100
All	All	556/646 (86%)	523 (94%)	33 (6%)	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	224/249 (90%)	218 (97%)	6 (3%)	44	69
1	B	220/249 (88%)	214 (97%)	6 (3%)	44	69

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	444/498 (89%)	432 (97%)	12 (3%)	44 69

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2916	ASP
1	A	2920	PRO
1	A	2921	ARG
1	A	2923	LYS
1	A	2997	LYS
1	A	3177	THR
1	B	2916	ASP
1	B	2975	ARG
1	B	3079	PRO
1	B	3087	TYR
1	B	3133	GLN
1	B	3147	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	3021	GLN
1	B	3060	ASN

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 (i)

6.1 Protein, DNA and RNA chains (i)

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	284/323 (87%)	0.22	25 (8%)	10	7	56, 85, 122, 150	0
1	B	280/323 (86%)	0.10	12 (4%)	35	29	64, 93, 132, 160	0
All	All	564/646 (87%)	0.16	37 (6%)	18	14	56, 90, 129, 160	0

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	3204	PHE	4.6
1	B	2911	VAL	4.4
1	B	2963	GLU	3.8
1	B	2926	LEU	3.7
1	A	2921	ARG	3.5
1	B	2919	PRO	3.3
1	A	2908	LYS	2.9
1	A	2925	SER	2.8
1	A	3174	TYR	2.8
1	A	3072	HIS	2.7
1	B	3117	ALA	2.7
1	A	3117	ALA	2.6
1	A	3001	PHE	2.6
1	A	3071	ILE	2.6
1	B	2914	GLU	2.6
1	A	3119	PRO	2.6
1	A	3002	LEU	2.6
1	A	3003	HIS	2.6
1	B	3001	PHE	2.4
1	B	3118	ASN	2.4
1	A	3080	ILE	2.4
1	A	3073	GLY	2.3
1	A	3013	ALA	2.3
1	A	3128	LYS	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	3081	ALA	2.3
1	A	2926	LEU	2.2
1	B	3116	VAL	2.2
1	A	3054	MET	2.2
1	A	3076	MET	2.2
1	A	3118	ASN	2.1
1	A	2924	GLU	2.1
1	B	2925	SER	2.1
1	B	3025	ILE	2.1
1	A	3004	GLY	2.1
1	B	2915	ASN	2.1
1	A	3051	ALA	2.1
1	A	3074	TYR	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 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.