Full wwPDB X-ray Structure Validation Report (i)

Jun 12, 2024 – 04:16 AM EDT

PDB ID	:	2DYU
Title	:	Helicobacter pylori formamidase AmiF contains a fine-tuned cysteine-glutamate-lysine catalytic triad
Authors	:	Wang, W.C.; Hung, C.L.
Deposited on	:	2006-09-18
Resolution	:	1.75 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:

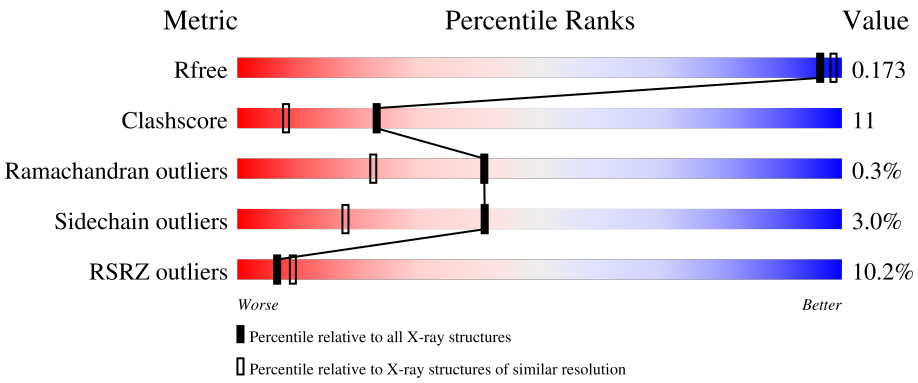
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

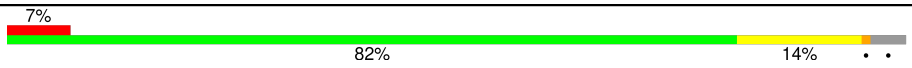
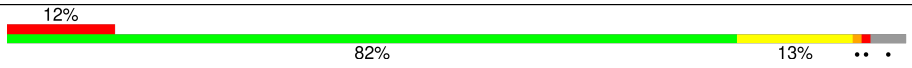
The reported resolution of this entry is 1.75 Å.

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	2340 (1.76-1.76)
Clashscore	141614	2466 (1.76-1.76)
Ramachandran outliers	138981	2437 (1.76-1.76)
Sidechain outliers	138945	2437 (1.76-1.76)
RSRZ outliers	127900	2298 (1.76-1.76)

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	334	
1	B	334	

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 5811 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 Formamidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	322	2549	1641	427	469	12	0	0	0
1	B	322	2549	1641	427	469	12	0	0	0

- Molecule 2 is water.

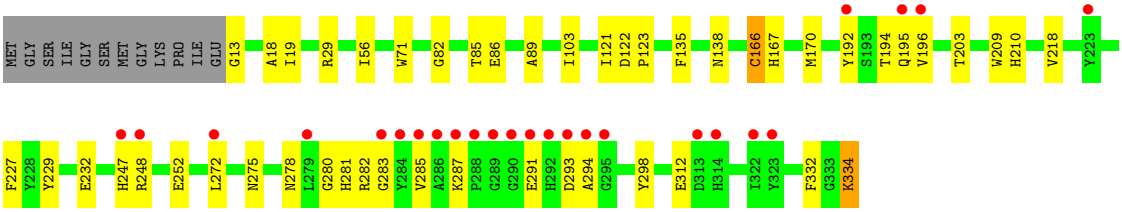
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	412	412	412	0	0
2	B	301	301	301	0	0

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.

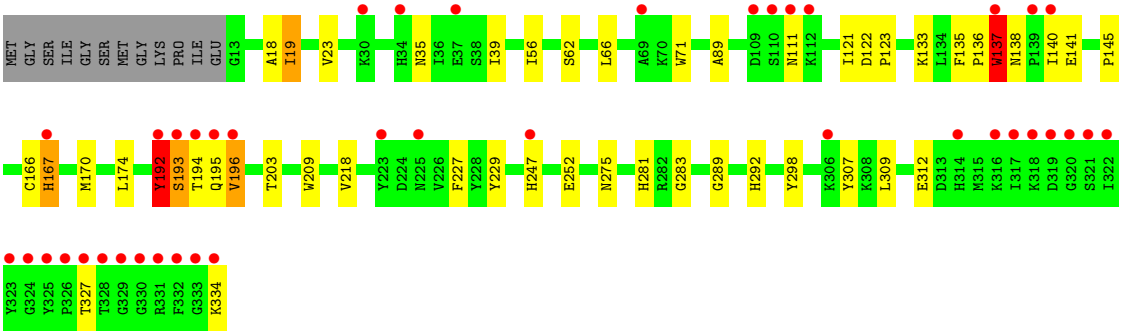
- Molecule 1: Formamidase

Chain A:



- Molecule 1: Formamidase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α, β, γ	147.22Å 147.22Å 72.27Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 1.75 25.27 – 1.75	Depositor EDS
% Data completeness (in resolution range)	99.0 (30.00-1.75) 98.8 (25.27-1.75)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.68 (at 1.75Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.174 , 0.215 0.175 , 0.173	Depositor DCC
R_{free} test set	2962 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	17.7	Xtriage
Anisotropy	0.025	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 65.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.015 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	5811	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.61% 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	0.36	0/2623	0.53	0/3567
1	B	0.32	0/2623	0.51	0/3567
All	All	0.34	0/5246	0.52	0/7134

There are no bond length outliers.

There are no bond angle outliers.

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	2549	0	2480	71	0
1	B	2549	0	2480	75	0
2	A	412	0	0	8	0
2	B	301	0	0	8	0
All	All	5811	0	4960	115	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 (115) 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:A:209:TRP:HE1	1:B:170:MET:CE	1.51	1.23

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:166:CYS:SG	1:A:167:HIS:N	2.11	1.19
1:A:170:MET:SD	2:A:733:HOH:O	1.96	1.19
1:B:137:TRP:CD1	1:B:167:HIS:HB2	1.77	1.18
1:A:170:MET:CE	1:B:209:TRP:HE1	1.60	1.13
1:A:170:MET:HE1	1:B:209:TRP:HE1	1.11	1.08
1:B:170:MET:HE3	1:B:203:THR:HG21	1.36	1.08
1:A:209:TRP:HE1	1:B:170:MET:HE1	1.19	1.06
1:B:170:MET:CE	1:B:203:THR:HG21	1.87	1.03
1:B:170:MET:SD	2:B:628:HOH:O	2.17	1.01
1:B:192:TYR:HA	2:B:619:HOH:O	1.59	1.00
1:A:170:MET:CE	1:A:203:THR:HG21	1.95	0.96
1:A:170:MET:HE3	1:A:203:THR:HG21	1.48	0.96
1:B:137:TRP:HD1	1:B:167:HIS:CB	1.79	0.96
1:B:170:MET:HE3	1:B:170:MET:HA	1.50	0.94
1:A:170:MET:HE1	1:B:209:TRP:NE1	1.82	0.93
1:A:19:ILE:HD11	1:A:56:ILE:HG23	1.49	0.92
1:A:170:MET:HE3	1:A:170:MET:HA	1.49	0.92
1:B:137:TRP:HD1	1:B:167:HIS:HB2	1.26	0.91
1:B:137:TRP:CD1	1:B:167:HIS:CB	2.53	0.90
1:A:209:TRP:NE1	1:B:170:MET:CE	2.35	0.90
1:A:209:TRP:HE1	1:B:170:MET:HE2	1.34	0.88
1:A:209:TRP:NE1	1:B:170:MET:HE1	1.88	0.87
1:A:13:GLY:N	2:A:721:HOH:O	2.10	0.84
1:A:170:MET:CE	1:B:209:TRP:NE1	2.41	0.78
1:A:334:LYS:HD2	1:A:334:LYS:H	1.48	0.78
1:A:19:ILE:HD11	1:A:56:ILE:CG2	2.14	0.76
1:A:167:HIS:CE1	1:B:275:ASN:ND2	2.53	0.76
1:B:170:MET:HE1	1:B:203:THR:HG21	1.70	0.72
1:B:23:VAL:CG2	1:B:35:ASN:HD21	2.02	0.71
1:A:167:HIS:HE1	1:B:275:ASN:ND2	1.87	0.71
1:A:170:MET:CE	1:A:170:MET:HA	2.22	0.70
1:A:170:MET:HE1	1:A:203:THR:HG21	1.74	0.70
1:A:209:TRP:NE1	1:B:170:MET:HE2	2.05	0.69
1:A:232:GLU:OE1	2:A:728:HOH:O	2.09	0.69
1:B:136:PRO:O	2:B:623:HOH:O	2.10	0.68
1:B:23:VAL:HG23	1:B:35:ASN:HD21	1.60	0.67
1:B:136:PRO:O	1:B:138:ASN:N	2.29	0.66
1:B:170:MET:CE	1:B:170:MET:HA	2.25	0.65
1:A:170:MET:HE2	1:B:209:TRP:HE1	1.59	0.64
1:A:229:TYR:HA	2:A:723:HOH:O	1.98	0.63
1:B:137:TRP:NE1	1:B:167:HIS:HB2	2.14	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:291:GLU:HG3	1:A:293:ASP:H	1.66	0.59
1:B:292:HIS:HD2	2:B:342:HOH:O	1.84	0.59
1:B:170:MET:HE1	1:B:203:THR:CG2	2.33	0.58
1:B:170:MET:HE3	1:B:170:MET:CA	2.30	0.57
1:B:229:TYR:HA	2:B:627:HOH:O	2.05	0.56
1:A:283:GLY:HA3	1:B:145:PRO:HG3	1.86	0.56
1:A:167:HIS:CE1	1:B:275:ASN:HD21	2.22	0.56
1:A:135:PHE:O	1:A:167:HIS:HD2	1.89	0.55
1:A:275:ASN:ND2	1:B:167:HIS:CE1	2.76	0.54
1:A:170:MET:HE3	1:A:170:MET:CA	2.31	0.53
1:A:170:MET:CE	1:A:170:MET:CA	2.85	0.52
1:A:282:ARG:HG2	1:B:135:PHE:CE1	2.45	0.52
1:B:281:HIS:HD2	1:B:289:GLY:O	1.93	0.52
1:B:170:MET:CE	1:B:170:MET:CA	2.87	0.51
1:A:196:VAL:O	1:A:196:VAL:CG1	2.58	0.50
1:B:167:HIS:CD2	1:B:167:HIS:C	2.84	0.50
1:A:285:VAL:HA	1:B:327:THR:HG22	1.93	0.50
1:A:334:LYS:HD2	1:A:334:LYS:N	2.23	0.50
1:A:167:HIS:CE1	1:B:275:ASN:HD22	2.26	0.49
1:A:194:THR:HG23	1:A:195:GLN:HG2	1.94	0.49
1:B:170:MET:CE	1:B:203:THR:CG2	2.74	0.48
1:A:278:ASN:HD22	1:B:167:HIS:HE1	1.62	0.48
1:A:312:GLU:OE2	1:B:281:HIS:HE1	1.96	0.48
1:B:122:ASP:HB2	1:B:123:PRO:CD	2.43	0.48
1:B:196:VAL:HG23	2:B:514:HOH:O	2.12	0.48
1:B:309:LEU:HB2	1:B:312:GLU:HG3	1.96	0.48
1:A:85:THR:HG22	1:A:103:ILE:CD1	2.43	0.47
1:A:122:ASP:HB2	1:A:123:PRO:CD	2.44	0.47
1:B:193:SER:O	1:B:193:SER:OG	2.32	0.47
1:A:332:PHE:HA	1:A:334:LYS:HE3	1.97	0.47
1:A:247:HIS:O	1:A:252:GLU:OE1	2.33	0.46
1:A:192:TYR:HA	2:A:405:HOH:O	2.14	0.46
1:A:170:MET:HE1	1:B:209:TRP:CD1	2.48	0.46
1:A:287:LYS:HD3	1:A:291:GLU:HB2	1.98	0.46
1:A:272:LEU:HD21	1:B:140:ILE:HG22	1.98	0.45
1:B:194:THR:HG23	1:B:195:GLN:HG2	1.98	0.45
1:B:167:HIS:CD2	1:B:167:HIS:O	2.69	0.45
1:B:133:LYS:HD3	1:B:136:PRO:HA	1.99	0.45
1:B:247:HIS:O	1:B:252:GLU:OE1	2.34	0.44
1:A:196:VAL:O	1:A:196:VAL:HG13	2.16	0.44
1:A:282:ARG:HD2	1:A:294:ALA:HB2	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:209:TRP:CD1	1:B:170:MET:HE1	2.51	0.44
1:A:19:ILE:CD1	1:A:56:ILE:CG2	2.92	0.44
1:B:227:PHE:CZ	1:B:229:TYR:HB2	2.53	0.44
1:A:29:ARG:HD2	2:A:377:HOH:O	2.18	0.43
1:B:39:ILE:HD11	1:B:62:SER:O	2.18	0.43
1:A:280:GLY:HA3	1:B:307:TYR:CD2	2.53	0.43
1:A:82:GLY:O	1:A:86:GLU:HG2	2.18	0.43
1:B:89:ALA:HA	1:B:121:ILE:HG21	2.00	0.43
1:B:194:THR:HG22	2:B:621:HOH:O	2.19	0.43
1:A:227:PHE:CZ	1:A:229:TYR:HB2	2.54	0.43
1:B:19:ILE:CD1	1:B:19:ILE:N	2.81	0.43
1:B:167:HIS:HB3	2:B:393:HOH:O	2.18	0.43
1:A:210:HIS:HD2	2:A:342:HOH:O	2.01	0.43
1:A:248:ARG:C	2:A:723:HOH:O	2.56	0.43
1:A:89:ALA:HA	1:A:121:ILE:HG21	2.01	0.43
1:A:334:LYS:H	1:A:334:LYS:CD	2.23	0.42
1:A:170:MET:HE1	1:A:203:THR:CG2	2.44	0.42
1:A:278:ASN:ND2	1:B:167:HIS:HE1	2.17	0.42
1:A:281:HIS:HE1	1:B:312:GLU:OE2	2.02	0.42
1:B:166:CYS:HG	1:B:192:TYR:HE2	1.63	0.42
1:B:141:GLU:OE2	1:B:192:TYR:OH	2.32	0.42
1:A:272:LEU:HD22	1:B:137:TRP:CD2	2.55	0.41
1:A:138:ASN:HD21	1:B:283:GLY:HA2	1.85	0.41
1:A:170:MET:HE2	1:B:209:TRP:NE1	2.25	0.41
1:B:137:TRP:HD1	1:B:167:HIS:HB3	1.77	0.41
1:A:166:CYS:SG	1:A:167:HIS:CB	3.09	0.41
1:B:18:ALA:HB1	1:B:218:VAL:HB	2.02	0.41
1:B:19:ILE:HD11	1:B:56:ILE:HG23	2.03	0.40
1:A:138:ASN:HD21	1:B:283:GLY:CA	2.34	0.40
1:A:18:ALA:HB1	1:A:218:VAL:HB	2.03	0.40
1:A:194:THR:C	1:A:196:VAL:H	2.24	0.40
1:B:170:MET:HE2	1:B:170:MET:HB3	1.80	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	320/334 (96%)	305 (95%)	15 (5%)	0	100	100
1	B	320/334 (96%)	301 (94%)	17 (5%)	2 (1%)	25	10
All	All	640/668 (96%)	606 (95%)	32 (5%)	2 (0%)	41	22

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	137	TRP
1	B	192	TYR

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	268/277 (97%)	264 (98%)	4 (2%)	65	49
1	B	268/277 (97%)	256 (96%)	12 (4%)	27	8
All	All	536/554 (97%)	520 (97%)	16 (3%)	41	18

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	71	TRP
1	A	166	CYS
1	A	298	TYR
1	A	334	LYS
1	B	19	ILE
1	B	66	LEU
1	B	71	TRP
1	B	111	ASN
1	B	137	TRP
1	B	167	HIS

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Mol	Chain	Res	Type
1	B	174	LEU
1	B	192	TYR
1	B	193	SER
1	B	196	VAL
1	B	298	TYR
1	B	334	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	138	ASN
1	A	167	HIS
1	A	210	HIS
1	A	275	ASN
1	A	278	ASN
1	A	292	HIS
1	B	35	ASN
1	B	111	ASN
1	B	167	HIS
1	B	210	HIS
1	B	275	ASN
1	B	278	ASN
1	B	281	HIS
1	B	292	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 (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	322/334 (96%)	0.27	25 (7%)	13	17	9, 16, 31, 58	0
1	B	322/334 (96%)	0.95	41 (12%)	3	5	10, 21, 62, 98	0
All	All	644/668 (96%)	0.61	66 (10%)	6	9	9, 18, 44, 98	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	323	TYR	15.4
1	B	332	PHE	14.8
1	B	137	TRP	14.5
1	B	326	PRO	13.0
1	B	320	GLY	12.5
1	B	196	VAL	12.4
1	A	285	VAL	12.3
1	B	322	ILE	12.3
1	B	325	TYR	12.1
1	B	328	THR	11.5
1	A	284	TYR	10.9
1	B	327	THR	10.8
1	B	333	GLY	10.0
1	A	286	ALA	9.8
1	B	324	GLY	9.8
1	B	192	TYR	8.7
1	A	290	GLY	8.7
1	A	288	PRO	8.6
1	B	330	GLY	7.8
1	B	195	GLN	7.7
1	A	292	HIS	7.6
1	B	140	ILE	7.5
1	B	334	LYS	7.4
1	B	331	ARG	7.4

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Mol	Chain	Res	Type	RSRZ
1	A	289	GLY	7.3
1	B	329	GLY	7.3
1	B	319	ASP	7.1
1	B	317	ILE	7.1
1	A	283	GLY	7.0
1	B	321	SER	7.0
1	A	291	GLU	6.5
1	B	111	ASN	5.6
1	B	139	PRO	5.2
1	A	195	GLN	5.1
1	B	69	ALA	4.8
1	B	318	LYS	4.8
1	A	287	LYS	4.7
1	B	34	HIS	4.5
1	B	314	HIS	4.3
1	A	323	TYR	4.2
1	A	294	ALA	4.1
1	B	110	SER	4.1
1	B	194	THR	4.1
1	B	193	SER	3.9
1	A	192	TYR	3.6
1	A	293	ASP	3.6
1	B	316	LYS	3.6
1	B	109	ASP	3.3
1	B	247	HIS	3.1
1	A	322	ILE	3.0
1	B	30	LYS	2.9
1	A	247	HIS	2.7
1	A	279	LEU	2.7
1	B	167	HIS	2.7
1	A	196	VAL	2.7
1	A	295	GLY	2.6
1	A	314	HIS	2.6
1	B	112	LYS	2.6
1	A	248	ARG	2.6
1	A	313	ASP	2.3
1	B	225	ASN	2.3
1	B	37	GLU	2.3
1	B	306	LYS	2.3
1	A	223	TYR	2.2
1	A	272	LEU	2.2
1	B	223	TYR	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.