Full wwPDB X-ray Structure Validation Report (i)

Feb 1, 2016 – 09:52 AM GMT

PDB ID	:	3K1D
Title	:	Crystal structure of glycogen branching enzyme synonym: 1,4-alpha-D-glucan:1,4-alpha-D-GLUCAN 6-glucosyl-transferase from mycobacterium tuberculosis H37RV
Authors	:	Pal, K.; Kumar, S.; Swaminathan, K.
Deposited on	:	2009-09-27
Resolution	:	2.33 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
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

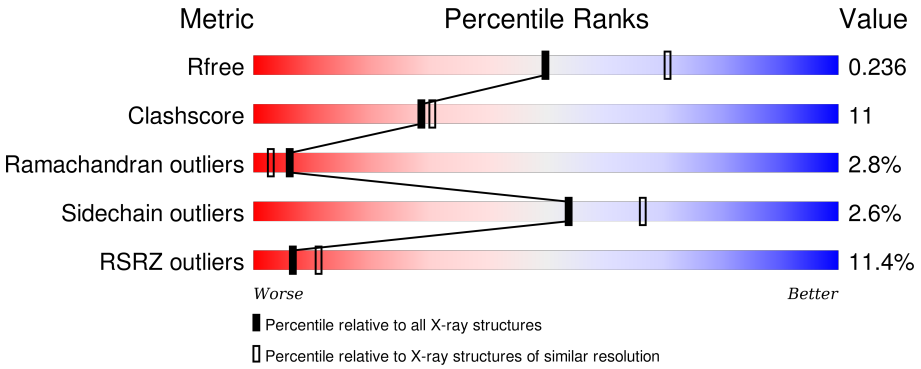
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 2.33 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}	91344	1406 (2.36-2.32)
Clashscore	102246	1509 (2.36-2.32)
Ramachandran outliers	100387	1490 (2.36-2.32)
Sidechain outliers	100360	1491 (2.36-2.32)
RSRZ outliers	91569	1412 (2.36-2.32)

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. 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	722	11% 77% 20%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6047 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 1,4-alpha-glucan-branching enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	722	Total	C	N	O	S	0	0	0
			5724	3656	1003	1047	18			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	323	Total	O	0	0
			323	323		

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 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: 1,4-alpha-glucan-branching enzyme

Chain A:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	109.37Å 156.86Å 48.02Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.97 – 2.33 48.02 – 2.33	Depositor EDS
% Data completeness (in resolution range)	99.9 (19.97-2.33) 99.8 (48.02-2.33)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.17	Depositor
$< I/\sigma(I) >$ [1]	1.93 (at 2.32Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.193 , 0.236 0.192 , 0.236	Depositor DCC
R_{free} test set	1800 reflections (4.98%)	DCC
Wilson B-factor (Å^2)	30.5	Xtriage
Anisotropy	0.378	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 55.0	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Outliers	0 of 36272 reflections	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	6047	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 3.60% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	A	0.35	0/5917	0.59	0/8083

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

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	5724	0	5369	127	0
2	A	323	0	0	7	0
All	All	6047	0	5369	127	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 (127) 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:38:GLU:HG2	1:A:43:THR:HG22	1.42	1.00
1:A:285:GLN:HE22	1:A:609:ARG:HH11	1.16	0.87
1:A:581:ARG:H	1:A:594:GLN:HE22	1.20	0.87
1:A:308:VAL:O	1:A:348:PRO:HG3	1.81	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:342:TRP:HE1	1:A:395:ASN:HD22	1.30	0.80
1:A:374:LEU:HD13	1:A:421:TYR:HE2	1.53	0.72
1:A:22:LEU:HD21	1:A:34:LEU:HD11	1.72	0.72
1:A:475:PRO:HD2	1:A:478:ILE:HD11	1.72	0.71
1:A:21:ARG:HH22	1:A:28:HIS:HD2	1.38	0.71
1:A:48:PHE:O	1:A:49:ARG:HG3	1.92	0.68
1:A:57:ALA:HB3	1:A:65:SER:OG	1.94	0.67
1:A:57:ALA:H	1:A:65:SER:CB	2.08	0.66
1:A:285:GLN:HE22	1:A:609:ARG:NH1	1.93	0.63
1:A:123:HIS:H	1:A:390:ASN:HD21	1.47	0.62
1:A:502:ASP:OD2	1:A:504:VAL:HG22	1.98	0.62
1:A:297:GLU:HB3	1:A:310:SER:HB2	1.81	0.61
1:A:285:GLN:NE2	1:A:609:ARG:HH11	1.94	0.61
1:A:87:ARG:HD2	1:A:99:THR:HB	1.81	0.61
1:A:332:HIS:HE1	1:A:406:ASP:OD2	1.84	0.61
1:A:238:ASP:OD2	1:A:332:HIS:HD2	1.84	0.60
1:A:19:MET:HE1	1:A:73:LEU:HD22	1.82	0.60
1:A:307:GLN:OE1	1:A:349:LYS:HE2	2.01	0.60
1:A:633:TRP:CD2	1:A:636:ALA:HB2	2.37	0.59
1:A:666:GLU:HB3	1:A:722:PRO:HD3	1.85	0.58
1:A:346:HIS:HE1	1:A:411:ASP:OD2	1.86	0.58
1:A:56:VAL:HG22	1:A:66:LEU:HA	1.84	0.58
1:A:522:SER:O	1:A:523:GLU:HG2	2.04	0.57
1:A:344:PRO:HB2	1:A:416:MET:HE1	1.87	0.57
1:A:49:ARG:HD3	1:A:90:VAL:HG21	1.88	0.56
1:A:67:GLN:HB2	1:A:74:PHE:HB3	1.88	0.56
1:A:41:ASP:O	1:A:81:VAL:HG12	2.06	0.56
1:A:64:PHE:CE1	1:A:78:LEU:HD13	2.41	0.55
1:A:526:VAL:O	1:A:528:PRO:HD3	2.05	0.55
1:A:13:ALA:HB2	1:A:69:LEU:HD11	1.89	0.55
1:A:57:ALA:H	1:A:65:SER:HB3	1.70	0.55
1:A:62:ASP:C	1:A:64:PHE:H	2.09	0.55
1:A:64:PHE:CZ	1:A:78:LEU:HD13	2.42	0.54
1:A:570:GLN:NE2	2:A:1001:HOH:O	2.37	0.54
1:A:372:GLU:HG3	1:A:373:GLN:N	2.23	0.54
1:A:173:ALA:N	1:A:174:PRO:HD3	2.23	0.53
1:A:492:MET:HE1	1:A:493:HIS:HA	1.89	0.53
1:A:19:MET:HE1	1:A:73:LEU:CD2	2.38	0.53
1:A:581:ARG:N	1:A:594:GLN:HE22	2.01	0.53
1:A:682:GLU:HA	1:A:728:LEU:HD23	1.90	0.53
1:A:367:ASP:HB2	1:A:368:PRO:HD2	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:21:ARG:HH22	1:A:28:HIS:CD2	2.25	0.52
1:A:492:MET:CE	1:A:496:LEU:HD12	2.40	0.52
1:A:702:VAL:HG11	1:A:718:LEU:HB3	1.93	0.51
1:A:691:TYR:O	1:A:692:HIS:HB2	2.10	0.51
1:A:607:LEU:HG	1:A:607:LEU:O	2.09	0.51
1:A:30:PRO:HD2	1:A:176:ARG:HB3	1.92	0.51
1:A:89:GLN:HE21	1:A:99:THR:CG2	2.24	0.50
1:A:67:GLN:O	1:A:68:HIS:HB3	2.11	0.50
1:A:68:HIS:HA	1:A:74:PHE:CD2	2.46	0.50
1:A:150:ALA:HA	1:A:184:TRP:O	2.12	0.50
1:A:655:VAL:HG22	1:A:656:LEU:N	2.27	0.49
1:A:713:PRO:HG3	2:A:1284:HOH:O	2.12	0.49
1:A:65:SER:O	1:A:66:LEU:HB2	2.11	0.49
1:A:67:GLN:CB	1:A:74:PHE:HB3	2.41	0.49
1:A:155:ASN:O	1:A:204:ALA:HB2	2.12	0.49
1:A:123:HIS:H	1:A:390:ASN:ND2	2.11	0.49
1:A:56:VAL:HG22	1:A:66:LEU:HG	1.94	0.48
1:A:105:ARG:HG2	1:A:105:ARG:O	2.12	0.48
1:A:67:GLN:CG	1:A:76:VAL:HG22	2.43	0.48
1:A:66:LEU:C	1:A:67:GLN:HG3	2.35	0.48
1:A:372:GLU:CG	1:A:373:GLN:H	2.26	0.47
1:A:130:LEU:O	1:A:133:HIS:HE1	1.97	0.47
1:A:64:PHE:HE2	1:A:80:PHE:HE2	1.61	0.47
1:A:647:MET:HE3	1:A:655:VAL:HG22	1.97	0.47
1:A:421:TYR:O	1:A:422:SER:O	2.33	0.46
1:A:383:PHE:CZ	1:A:416:MET:HE2	2.49	0.46
1:A:282:ILE:HG23	1:A:287:PHE:HB2	1.97	0.46
1:A:522:SER:C	1:A:523:GLU:HG2	2.36	0.46
1:A:138:THR:O	1:A:138:THR:HG23	2.16	0.46
1:A:34:LEU:O	1:A:37:HIS:HE1	1.99	0.46
1:A:48:PHE:O	1:A:172:GLU:HB3	2.16	0.46
1:A:250:PRO:HG2	1:A:460:VAL:HG13	1.98	0.46
1:A:166:ASN:HB3	1:A:170:GLY:H	1.80	0.45
1:A:64:PHE:CZ	1:A:78:LEU:HB3	2.49	0.45
1:A:347:PHE:CD2	1:A:379:TYR:HB3	2.52	0.45
1:A:497:ASP:OD2	1:A:501:ARG:NH1	2.39	0.45
1:A:121:GLY:HA2	1:A:390:ASN:HB2	1.99	0.45
1:A:62:ASP:HB3	1:A:64:PHE:HB3	1.99	0.45
1:A:356:ARG:HA	1:A:360:THR:O	2.17	0.45
1:A:103:ALA:HB2	1:A:189:PRO:HD2	1.99	0.45
1:A:374:LEU:HD13	1:A:421:TYR:CE2	2.43	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:367:ASP:HB2	1:A:368:PRO:CD	2.47	0.44
1:A:372:GLU:HG3	1:A:373:GLN:H	1.82	0.44
1:A:474:ARG:HB3	1:A:480:GLY:HA3	1.99	0.44
1:A:282:ILE:HD13	1:A:290:VAL:HB	2.00	0.44
1:A:574:MET:HB2	1:A:590:LEU:HD11	1.99	0.44
1:A:49:ARG:HA	1:A:172:GLU:HB3	2.00	0.44
1:A:389:ARG:HD3	2:A:1142:HOH:O	2.18	0.43
1:A:202:HIS:HB3	2:A:1288:HOH:O	2.19	0.43
1:A:56:VAL:HA	1:A:66:LEU:H	1.83	0.43
1:A:372:GLU:CG	1:A:373:GLN:N	2.81	0.43
1:A:120:GLU:HB2	1:A:122:ARG:HG2	1.99	0.43
1:A:348:PRO:HB2	2:A:1227:HOH:O	2.18	0.43
1:A:63:ARG:O	1:A:65:SER:N	2.51	0.43
1:A:442:VAL:O	1:A:446:GLN:HG3	2.18	0.43
1:A:344:PRO:HB2	1:A:416:MET:CE	2.47	0.43
1:A:361:PRO:HB2	1:A:366:SER:OG	2.19	0.43
1:A:492:MET:HE2	1:A:496:LEU:HD12	2.01	0.43
1:A:355:GLY:O	1:A:356:ARG:C	2.57	0.43
1:A:313:ALA:HA	1:A:314:PRO:HD3	1.87	0.42
1:A:62:ASP:C	1:A:64:PHE:N	2.71	0.42
1:A:151:VAL:HG22	1:A:199:PHE:CZ	2.54	0.42
1:A:35:GLY:HA2	1:A:102:ASP:OD2	2.20	0.42
1:A:220:GLU:CD	1:A:224:GLN:HB3	2.40	0.42
1:A:30:PRO:CG	1:A:174:PRO:HB2	2.49	0.42
1:A:492:MET:HE2	1:A:492:MET:O	2.19	0.42
1:A:19:MET:CE	1:A:73:LEU:HD22	2.49	0.42
1:A:69:LEU:O	1:A:73:LEU:O	2.38	0.42
1:A:634:ILE:HD11	1:A:647:MET:SD	2.59	0.42
1:A:103:ALA:HB2	1:A:189:PRO:CD	2.50	0.42
1:A:78:LEU:HA	1:A:79:PRO:HD3	1.79	0.42
1:A:556:LEU:O	1:A:556:LEU:HD12	2.20	0.42
1:A:172:GLU:C	1:A:174:PRO:HD3	2.41	0.42
1:A:545:MET:HE1	1:A:559:LEU:HD22	2.02	0.42
1:A:656:LEU:HD12	1:A:729:THR:HG23	2.02	0.41
1:A:531:HIS:HB3	1:A:573:PHE:CE1	2.55	0.41
1:A:492:MET:HE3	1:A:496:LEU:HD12	2.02	0.41
1:A:43:THR:HG23	1:A:81:VAL:HA	2.01	0.41
1:A:692:HIS:CE1	2:A:1027:HOH:O	2.74	0.41
1:A:418:TYR:CE2	1:A:467:THR:HG21	2.56	0.41
1:A:353:ALA:HB3	2:A:1227:HOH:O	2.20	0.40
1:A:80:PHE:C	1:A:80:PHE:CD1	2.94	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	720/722 (100%)	652 (91%)	48 (7%)	20 (3%)	6 3

All (20) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	64	PHE
1	A	79	PRO
1	A	80	PHE
1	A	372	GLU
1	A	420	ASP
1	A	422	SER
1	A	56	VAL
1	A	65	SER
1	A	68	HIS
1	A	432	VAL
1	A	85	ASP
1	A	378	THR
1	A	433	HIS
1	A	70	ASP
1	A	78	LEU
1	A	421	TYR
1	A	528	PRO
1	A	84	ILE
1	A	369	LYS
1	A	294	PRO

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	588/588 (100%)	573 (97%)	15 (3%)	54 66

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

Mol	Chain	Res	Type
1	A	80	PHE
1	A	151	VAL
1	A	164	GLU
1	A	172	GLU
1	A	276	ARG
1	A	367	ASP
1	A	374	LEU
1	A	375	ASP
1	A	419	LEU
1	A	421	TYR
1	A	423	ARG
1	A	492	MET
1	A	528	PRO
1	A	598	ASN
1	A	718	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	HIS
1	A	67	GLN
1	A	166	ASN
1	A	252	ASN
1	A	285	GLN
1	A	332	HIS
1	A	346	HIS
1	A	390	ASN
1	A	395	ASN
1	A	449	ASN
1	A	594	GLN
1	A	598	ASN
1	A	602	ASN
1	A	642	ASN

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Mol	Chain	Res	Type
1	A	667	HIS

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	A	722/722 (100%)	0.50	82 (11%) 7 11	16, 29, 76, 87	0

All (82) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	424	PRO	14.9
1	A	428	TRP	14.4
1	A	374	LEU	14.2
1	A	432	VAL	13.5
1	A	429	THR	13.1
1	A	426	GLY	12.4
1	A	376	TRP	11.7
1	A	371	GLY	11.6
1	A	425	GLU	11.4
1	A	421	TYR	11.3
1	A	427	GLY	11.2
1	A	64	PHE	11.1
1	A	422	SER	10.9
1	A	430	PRO	10.6
1	A	78	LEU	10.2
1	A	431	ASN	9.8
1	A	370	ARG	9.6
1	A	423	ARG	8.9
1	A	369	LYS	8.8
1	A	368	PRO	8.8
1	A	433	HIS	8.5
1	A	373	GLN	8.4
1	A	83	LEU	7.1
1	A	367	ASP	6.8
1	A	372	GLU	6.8
1	A	375	ASP	6.4
1	A	94	GLY	6.4

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Mol	Chain	Res	Type	RSRZ
1	A	79	PRO	6.3
1	A	434	GLY	6.0
1	A	68	HIS	5.6
1	A	56	VAL	5.2
1	A	76	VAL	5.2
1	A	66	LEU	5.0
1	A	42	HIS	4.9
1	A	142	GLY	4.5
1	A	98	HIS	4.4
1	A	84	ILE	4.4
1	A	378	THR	4.3
1	A	96	GLU	4.2
1	A	97	PRO	4.2
1	A	60	GLY	4.1
1	A	99	THR	4.1
1	A	377	GLY	4.0
1	A	39	TYR	4.0
1	A	65	SER	3.8
1	A	420	ASP	3.5
1	A	87	ARG	3.5
1	A	61	LYS	3.4
1	A	41	ASP	3.3
1	A	90	VAL	3.3
1	A	379	TYR	3.3
1	A	59	VAL	3.3
1	A	80	PHE	3.2
1	A	436	ARG	3.2
1	A	11	HIS	3.2
1	A	91	THR	3.1
1	A	468	PRO	3.0
1	A	93	GLU	3.0
1	A	81	VAL	2.9
1	A	63	ARG	2.8
1	A	40	ASP	2.8
1	A	70	ASP	2.8
1	A	55	VAL	2.8
1	A	88	LEU	2.7
1	A	67	GLN	2.7
1	A	95	CYS	2.7
1	A	598	ASN	2.6
1	A	85	ASP	2.6
1	A	10	GLU	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	138	THR	2.5
1	A	54	GLU	2.4
1	A	69	LEU	2.3
1	A	276	ARG	2.3
1	A	71	SER	2.3
1	A	140	ALA	2.3
1	A	74	PHE	2.2
1	A	139	THR	2.2
1	A	141	ASP	2.2
1	A	36	ALA	2.2
1	A	75	ALA	2.1
1	A	82	ASP	2.0
1	A	58	LEU	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 carbohydrates 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.