



Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 11:54 AM GMT

PDB ID : 3HYH
Title : Crystal structure of the protein kinase domain of yeast AMP-activated protein kinase Snf1
Authors : Rudolph, M.J.; Amodeo, G.A.; Bai, Y.; Tong, L.
Deposited on : 2009-06-22
Resolution : 2.20 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>

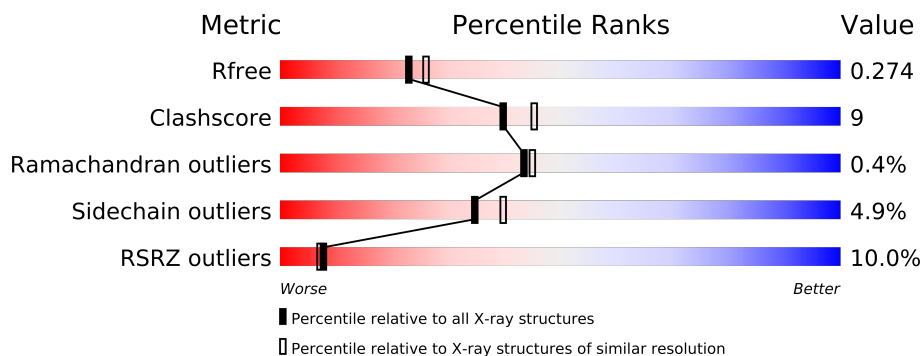
The following versions of software and data (see [references](#)) were used in the production of this report:

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 2.20 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	2938 (2.20-2.20)
Clashscore	79885	3751 (2.20-2.20)
Ramachandran outliers	78287	3681 (2.20-2.20)
Sidechain outliers	78261	3682 (2.20-2.20)
RSRZ outliers	66119	2939 (2.20-2.20)

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	275	
1	B	275	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3958 atoms, of which 0 are hydrogen 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 Carbon catabolite-derepressingprotein kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	238	Total	C	N	O	S	0	0	0
			1943	1260	332	342	9			
1	B	233	Total	C	N	O	S	0	0	0
			1908	1237	326	336	9			

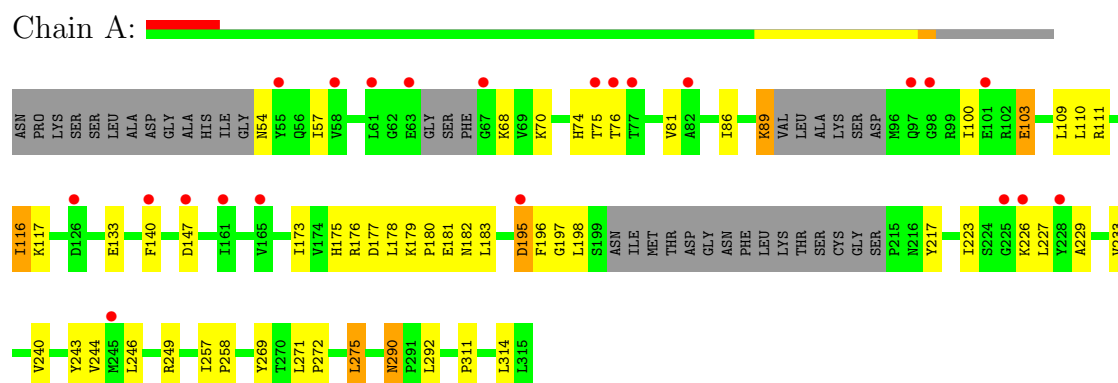
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	69	Total	O	0	0
			69	69		
2	B	38	Total	O	0	0
			38	38		

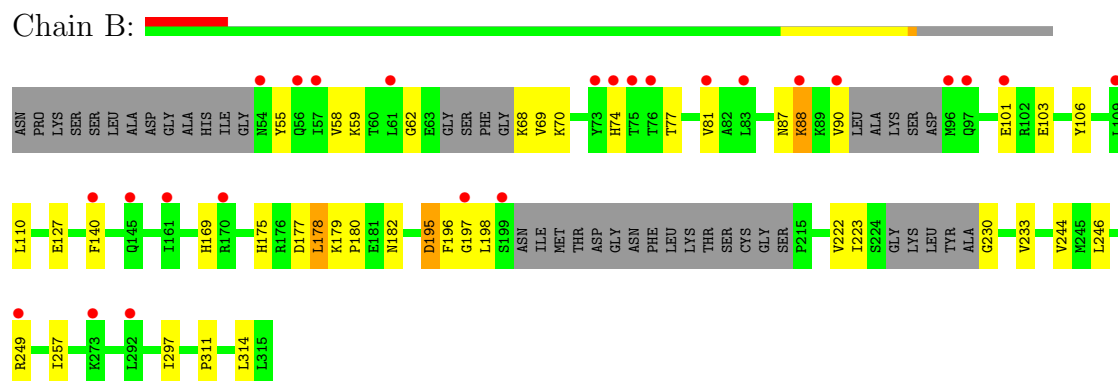
3 Residue-property plots

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: Carbon catabolite-derepressingprotein kinase



- Molecule 1: Carbon catabolite-derepressingprotein kinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	71.03Å 75.14Å 113.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.73 – 2.20 19.73 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.7 (19.73-2.20) 99.7 (19.73-2.20)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.77 (at 2.19Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.239 , 0.280 0.238 , 0.274	Depositor DCC
R_{free} test set	1570 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	39.6	Xtriage
Anisotropy	0.103	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 65.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 31425 reflections	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3958	wwPDB-VP
Average B, all atoms (Å ²)	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.34% 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	0.58	1/1982 (0.1%)	0.65	1/2672 (0.0%)
1	B	0.48	1/1945 (0.1%)	0.57	0/2622
All	All	0.53	2/3927 (0.1%)	0.61	1/5294 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	89	LYS	C-O	11.48	1.45	1.23
1	B	90	VAL	C-O	6.19	1.35	1.23

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	89	LYS	CA-C-O	-6.45	106.57	120.10

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	1943	0	2002	48	0
1	B	1908	0	1966	28	0
2	A	69	0	0	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	38	0	0	1	0
All	All	3958	0	3968	74	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 9.

All (74) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:178:LEU:HA	1:A:182:ASN:HD21	1.17	1.04
1:A:178:LEU:HA	1:A:182:ASN:ND2	1.80	0.96
1:A:179:LYS:O	1:A:182:ASN:OD1	1.89	0.91
1:A:195:ASP:OD1	1:A:196:PHE:N	2.04	0.91
1:B:103:GLU:OE1	1:B:195:ASP:O	1.91	0.89
1:A:179:LYS:H	1:A:182:ASN:ND2	1.73	0.86
1:A:178:LEU:CA	1:A:182:ASN:HD21	1.93	0.79
1:A:179:LYS:H	1:A:182:ASN:HD21	1.32	0.76
1:B:195:ASP:OD2	1:B:198:LEU:N	2.20	0.73
1:A:179:LYS:N	1:A:182:ASN:HD21	1.87	0.71
1:A:179:LYS:N	1:A:182:ASN:ND2	2.40	0.70
1:A:240:VAL:O	1:A:244:VAL:HG23	1.92	0.70
1:A:68:LYS:HE2	1:A:70:LYS:HE3	1.73	0.70
1:A:74:HIS:HD2	1:A:76:THR:H	1.41	0.68
1:A:103:GLU:CD	1:A:195:ASP:O	2.33	0.67
1:A:176:ARG:NH1	1:A:229:ALA:O	2.30	0.65
1:A:175:HIS:HD2	1:A:177:ASP:H	1.45	0.65
1:A:179:LYS:HB2	1:A:180:PRO:CD	2.29	0.63
1:A:195:ASP:CG	1:A:197:GLY:H	2.02	0.62
1:A:180:PRO:HB2	1:A:181:GLU:OE2	2.00	0.61
1:B:230:GLY:O	1:B:233:VAL:HG12	2.01	0.59
1:B:62:GLY:HA2	1:B:69:VAL:H	1.66	0.59
1:A:179:LYS:H	1:A:182:ASN:CG	2.05	0.59
1:A:57:ILE:HG21	1:A:70:LYS:HD3	1.84	0.58
1:B:175:HIS:HD2	1:B:177:ASP:H	1.50	0.58
1:B:182:ASN:ND2	1:B:195:ASP:OD1	2.37	0.58
1:B:195:ASP:CG	1:B:197:GLY:H	2.07	0.58
1:B:68:LYS:HE3	1:B:70:LYS:HE3	1.86	0.57
1:B:175:HIS:CE1	1:B:196:PHE:H	2.23	0.57
1:B:74:HIS:HD2	1:B:77:THR:H	1.51	0.57
1:B:179:LYS:HB2	1:B:180:PRO:HD2	1.86	0.56
1:A:179:LYS:HE3	1:B:257:ILE:HD11	1.86	0.56
1:B:195:ASP:OD2	1:B:197:GLY:C	2.45	0.55
1:B:179:LYS:HB2	1:B:180:PRO:CD	2.35	0.55

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:86:ILE:HD13	1:A:100:ILE:HD12	1.87	0.55
1:A:140:PHE:CD1	1:A:180:PRO:HA	2.42	0.54
1:A:257:ILE:HB	1:A:258:PRO:HD3	1.89	0.53
1:A:117:LYS:H	1:A:133:GLU:HG2	1.74	0.53
1:A:182:ASN:OD1	1:A:183:LEU:HG	2.08	0.53
1:A:272:PRO:HD2	1:A:275:LEU:HD22	1.91	0.53
1:A:116:ILE:HG13	1:A:133:GLU:CG	2.40	0.52
1:A:140:PHE:CE2	1:A:217:TYR:OH	2.62	0.51
1:A:179:LYS:HB2	1:A:180:PRO:HD2	1.92	0.51
1:A:103:GLU:OE2	1:A:195:ASP:O	2.29	0.51
1:B:87:ASN:HB3	1:B:127:GLU:HB3	1.92	0.50
1:A:195:ASP:OD1	1:A:197:GLY:N	2.45	0.49
1:A:195:ASP:O	1:A:196:PHE:HB2	2.12	0.49
1:A:269:TYR:HE1	1:A:271:LEU:HD13	1.77	0.49
1:A:311:PRO:HD2	1:A:314:LEU:HD12	1.94	0.49
1:B:233:VAL:CG2	2:B:39:HOH:O	2.62	0.48
1:A:223:ILE:HG23	1:B:223:ILE:HG23	1.96	0.47
1:B:58:VAL:HG12	1:B:59:LYS:HG3	1.96	0.47
1:B:169:HIS:CE1	1:B:297:ILE:CD1	2.97	0.47
1:A:290:ASN:HD22	1:A:292:LEU:H	1.63	0.47
1:B:311:PRO:HD2	1:B:314:LEU:HD12	1.97	0.47
1:A:100:ILE:HD13	1:A:198:LEU:HD13	1.96	0.47
1:A:290:ASN:HD22	1:A:290:ASN:C	2.18	0.47
1:B:222:VAL:HG21	1:B:233:VAL:CG2	2.45	0.47
1:A:177:ASP:O	1:A:182:ASN:ND2	2.48	0.46
1:A:249:ARG:NH2	2:A:20:HOH:O	2.45	0.46
1:A:176:ARG:HG2	1:A:233:VAL:HG21	1.98	0.46
1:B:175:HIS:CD2	1:B:177:ASP:H	2.33	0.46
1:B:222:VAL:HG21	1:B:233:VAL:HG23	1.98	0.45
1:B:169:HIS:ND1	1:B:297:ILE:CD1	2.80	0.44
1:A:243:TYR:OH	1:A:249:ARG:NH1	2.50	0.44
1:B:175:HIS:CD2	1:B:178:LEU:HD13	2.54	0.43
1:A:109:LEU:HD23	1:A:173:ILE:HD11	2.00	0.43
1:A:140:PHE:HE2	1:A:217:TYR:OH	2.01	0.42
1:B:106:TYR:O	1:B:110:LEU:HG	2.20	0.42
1:A:175:HIS:HD2	1:A:177:ASP:N	2.15	0.41
1:A:116:ILE:HG13	1:A:133:GLU:HG2	2.02	0.41
1:B:222:VAL:CG2	1:B:233:VAL:HG23	2.51	0.40
1:B:140:PHE:CE2	1:B:244:VAL:HG11	2.56	0.40
1:A:110:LEU:HD21	1:A:173:ILE:HD12	2.03	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	230/275 (84%)	217 (94%)	12 (5%)	1 (0%)	43	45
1	B	223/275 (81%)	213 (96%)	9 (4%)	1 (0%)	43	45
All	All	453/550 (82%)	430 (95%)	21 (5%)	2 (0%)	43	45

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	227	LEU
1	B	88	LYS

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	215/244 (88%)	202 (94%)	13 (6%)	27	29
1	B	213/244 (87%)	205 (96%)	8 (4%)	44	53
All	All	428/488 (88%)	407 (95%)	21 (5%)	35	40

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	ASN
1	A	75	THR
1	A	81	VAL
1	A	89	LYS
1	A	103	GLU
1	A	111	ARG
1	A	116	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	147	ASP
1	A	195	ASP
1	A	226	LYS
1	A	246	LEU
1	A	275	LEU
1	A	290	ASN
1	B	55	TYR
1	B	81	VAL
1	B	88	LYS
1	B	101	GLU
1	B	178	LEU
1	B	195	ASP
1	B	246	LEU
1	B	249	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	54	ASN
1	A	74	HIS
1	A	175	HIS
1	A	266	ASN
1	A	290	ASN
1	B	54	ASN
1	B	74	HIS
1	B	175	HIS
1	B	293	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	238/275 (86%)	0.48	22 (9%) 9 8	26, 39, 63, 79	0
1	B	233/275 (84%)	0.53	25 (10%) 6 6	32, 46, 74, 83	0
All	All	471/550 (85%)	0.51	47 (9%) 8 7	26, 44, 70, 83	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	226	LYS	5.3
1	B	56	GLN	5.0
1	A	97	GLN	4.9
1	A	76	THR	4.3
1	B	75	THR	4.1
1	B	97	GLN	4.1
1	A	63	GLU	4.0
1	B	273	LYS	3.7
1	A	77	THR	3.6
1	B	76	THR	3.4
1	B	140	PHE	3.4
1	A	58	VAL	3.3
1	B	145	GLN	3.3
1	A	101	GLU	3.2
1	B	90	VAL	3.2
1	A	55	TYR	3.1
1	A	67	GLY	3.1
1	A	75	THR	3.0
1	B	74	HIS	3.0
1	A	140	PHE	2.9
1	B	73	TYR	2.8
1	B	109	LEU	2.8
1	B	81	VAL	2.7
1	A	61	LEU	2.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	197	GLY	2.6
1	B	161	ILE	2.5
1	A	195	ASP	2.5
1	B	57	ILE	2.5
1	B	96	MET	2.5
1	A	225	GLY	2.5
1	B	61	LEU	2.5
1	B	199	SER	2.4
1	A	228	TYR	2.4
1	A	82	ALA	2.4
1	B	54	ASN	2.4
1	B	88	LYS	2.3
1	B	170	ARG	2.2
1	A	98	GLY	2.2
1	B	292	LEU	2.2
1	A	165	VAL	2.2
1	A	161	ILE	2.1
1	A	147	ASP	2.1
1	B	83	LEU	2.1
1	A	126	ASP	2.1
1	B	101	GLU	2.0
1	B	249	ARG	2.0
1	A	245	MET	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.