Full wwPDB X-ray Structure Validation Report (i)

Feb 5, 2024 – 09:26 PM EST

PDB ID	:	1YFQ
Title	:	High resolution S. cerevisiae Bub3 mitotic checkpoint protein
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Deposited on	:	2005-01-03
Resolution	:	1.10 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 (i)) were used in the production of this report:

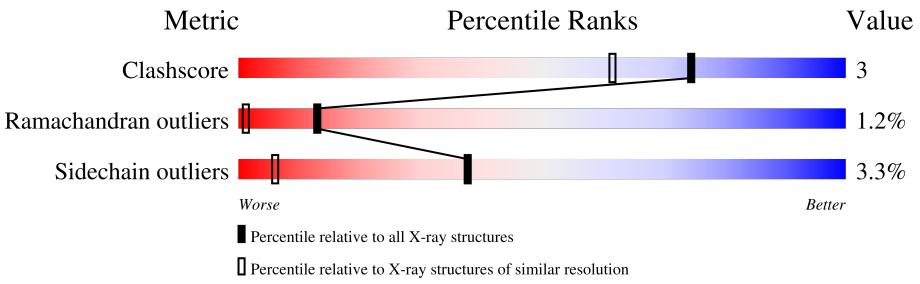
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.10 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))
Clashscore	141614	1671 (1.14-1.06)
Ramachandran outliers	138981	1615 (1.14-1.06)
Sidechain outliers	138945	1613 (1.14-1.06)

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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	342	84% 13% • •

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 3278 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 Cell cycle arrest protein BUB3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	342	2709	1714	454	528	13	0	0	0

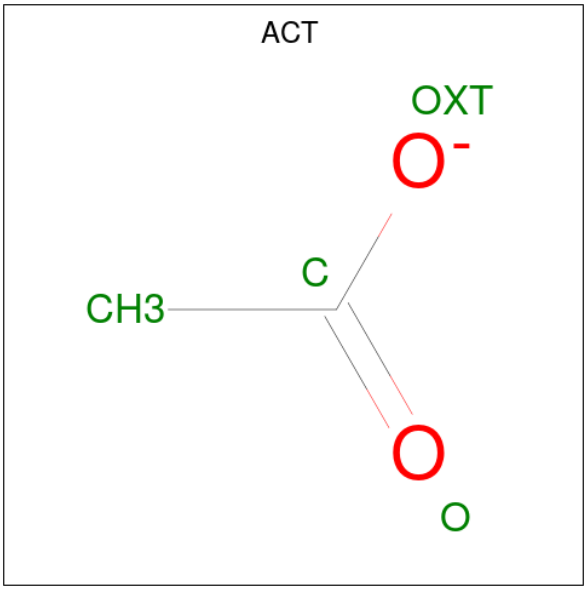
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	342	PRO	-	cloning artifact	UNP P26449

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
2	A	4	4	4	0	0

- Molecule 3 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	4	2	2	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	561	561	561	0	0

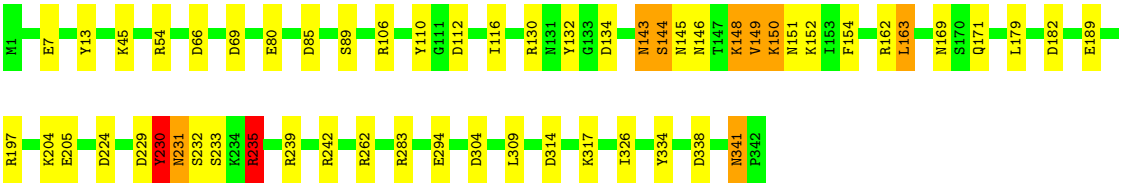
3 Residue-property plots (i)

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. 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. 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.

Note EDS was not executed.

• Molecule 1: Cell cycle arrest protein BUB3

Chain A:



4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	52.27Å 74.09Å 94.09Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.10	Depositor
% Data completeness (in resolution range)	(Not available) (30.00-1.10)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.152 , 0.186	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3278	wwPDB-VP
Average B, all atoms (Å^2)	17.0	wwPDB-VP

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: ACT, CA

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	0.77	0/2757	1.47	52/3734 (1.4%)

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	1

There are no bond length outliers.

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	162	ARG	NE-CZ-NH1	13.61	127.10	120.30
1	A	197	ARG	NE-CZ-NH1	12.54	126.57	120.30
1	A	66	ASP	CB-CG-OD2	11.76	128.88	118.30
1	A	162	ARG	NE-CZ-NH2	-11.31	114.65	120.30
1	A	106	ARG	NE-CZ-NH2	-9.73	115.43	120.30
1	A	106	ARG	CG-CD-NE	9.62	132.01	111.80
1	A	13	TYR	CB-CG-CD2	8.72	126.23	121.00
1	A	235	ARG	CD-NE-CZ	8.59	135.62	123.60
1	A	235	ARG	NE-CZ-NH2	-8.32	116.14	120.30
1	A	163	LEU	CB-CG-CD2	8.12	124.81	111.00
1	A	239	ARG	NE-CZ-NH1	8.07	124.33	120.30
1	A	154	PHE	CB-CG-CD1	8.04	126.43	120.80
1	A	54	ARG	NE-CZ-NH1	7.97	124.29	120.30
1	A	294	GLU	OE1-CD-OE2	-7.95	113.76	123.30
1	A	242	ARG	NE-CZ-NH2	7.54	124.07	120.30
1	A	231	ASN	C-N-CA	-7.45	103.08	121.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	235	ARG	NE-CZ-NH1	7.38	123.99	120.30
1	A	197	ARG	CG-CD-NE	7.36	127.25	111.80
1	A	148	LYS	C-N-CA	7.19	139.67	121.70
1	A	230	TYR	CB-CG-CD1	7.17	125.30	121.00
1	A	130	ARG	NE-CZ-NH2	-7.16	116.72	120.30
1	A	143	ASN	CA-C-N	7.12	132.86	117.20
1	A	239	ARG	NE-CZ-NH2	-7.01	116.79	120.30
1	A	106	ARG	CD-NE-CZ	6.96	133.34	123.60
1	A	334	TYR	CG-CD2-CE2	6.82	126.75	121.30
1	A	143	ASN	C-N-CA	6.75	138.57	121.70
1	A	66	ASP	CA-CB-CG	6.63	128.00	113.40
1	A	182	ASP	CB-CG-OD1	6.48	124.13	118.30
1	A	334	TYR	CG-CD1-CE1	-6.43	116.16	121.30
1	A	314	ASP	CB-CG-OD1	-6.36	112.58	118.30
1	A	112	ASP	CB-CG-OD2	6.10	123.79	118.30
1	A	314	ASP	CB-CG-OD2	5.98	123.68	118.30
1	A	197	ARG	CD-NE-CZ	5.93	131.90	123.60
1	A	130	ARG	CD-NE-CZ	5.87	131.81	123.60
1	A	334	TYR	CZ-CE2-CD2	-5.79	114.59	119.80
1	A	132	TYR	CB-CG-CD2	-5.73	117.56	121.00
1	A	80	GLU	CG-CD-OE2	-5.67	106.95	118.30
1	A	231	ASN	O-C-N	-5.66	113.64	122.70
1	A	239	ARG	CA-CB-CG	5.55	125.62	113.40
1	A	189	GLU	OE1-CD-OE2	-5.45	116.76	123.30
1	A	334	TYR	CB-CG-CD1	5.43	124.26	121.00
1	A	262	ARG	NE-CZ-NH1	-5.40	117.60	120.30
1	A	230	TYR	C-N-CA	5.30	134.95	121.70
1	A	66	ASP	CB-CG-OD1	-5.23	113.59	118.30
1	A	110	TYR	CB-CG-CD1	5.22	124.13	121.00
1	A	304	ASP	CB-CG-OD1	-5.18	113.64	118.30
1	A	85	ASP	CB-CG-OD1	-5.16	113.65	118.30
1	A	334	TYR	CB-CG-CD2	-5.15	117.91	121.00
1	A	13	TYR	CB-CG-CD1	-5.14	117.91	121.00
1	A	197	ARG	NH1-CZ-NH2	-5.11	113.78	119.40
1	A	283	ARG	NE-CZ-NH2	-5.09	117.75	120.30
1	A	317	LYS	CD-CE-NZ	5.00	123.20	111.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	144	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	2709	0	2685	17	0
2	A	4	0	0	0	0
3	A	4	0	3	0	0
4	A	561	0	0	4	0
All	All	3278	0	2688	17	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 3.

All (17) 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:229:ASP:O	1:A:231:ASN:N	2.04	0.91
1:A:341:ASN:HB3	4:A:2497:HOH:O	1.84	0.76
1:A:224:ASP:HB2	4:A:2197:HOH:O	1.99	0.62
1:A:232:SER:O	1:A:235:ARG:HG2	2.06	0.56
1:A:150:LYS:CE	1:A:152:LYS:HB2	2.37	0.54
1:A:45:LYS:HE3	1:A:338:ASP:OD2	2.11	0.50
1:A:144:SER:O	1:A:146:ASN:OD1	2.29	0.50
1:A:134:ASP:HB2	4:A:2257:HOH:O	2.11	0.49
1:A:134:ASP:HB2	4:A:2189:HOH:O	2.12	0.48
1:A:150:LYS:HG2	1:A:151:ASN:N	2.28	0.48
1:A:149:VAL:O	1:A:149:VAL:HG12	2.15	0.46
1:A:143:ASN:O	1:A:146:ASN:ND2	2.49	0.45
1:A:69:ASP:OD1	1:A:69:ASP:N	2.49	0.43
1:A:116:ILE:HD13	1:A:163:LEU:HD12	2.00	0.42
1:A:229:ASP:O	1:A:230:TYR:C	2.57	0.42
1:A:229:ASP:OD1	1:A:233:SER:HB2	2.19	0.42
1:A:169:ASN:O	1:A:171:GLN:HG3	2.19	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	340/342 (99%)	322 (95%)	14 (4%)	4 (1%)	13 1

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	148	LYS
1	A	149	VAL
1	A	230	TYR
1	A	145	ASN

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	306/306 (100%)	296 (97%)	10 (3%)	38 6

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	GLU
1	A	89	SER
1	A	150	LYS
1	A	179	LEU
1	A	204	LYS
1	A	205	GLU
1	A	235	ARG

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Mol	Chain	Res	Type
1	A	309	LEU
1	A	326	ILE
1	A	341	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	67	ASN
1	A	151	ASN
1	A	173	GLN
1	A	206	GLN
1	A	341	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)

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	ACT	A	900	-	3,3,3	0.63	0	3,3,3	0.81	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains (i)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.