



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 4Q9T / pdb_00004q9t
Title : Crystal structure of Vanderwaltozyma polyspora Nup133 Beta-propeller domain
Authors : Sampathkumar, P.; Bonanno, J.B.; Almo, S.C.; Nucleocytoplasmic Transport: a Target for Cellular Control (NPCXstals); New York SGX Research Center for Structural Genomics (NYSGXRC); New York Structural Genomics Research Consortium (NYSGRC)
Deposited on : 2014-05-01
Resolution : 3.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

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A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)

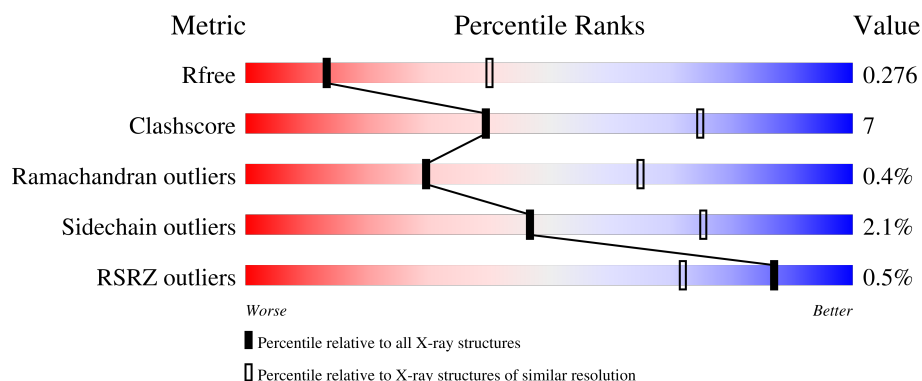
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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}	180053	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

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 $\leq 5\%$. 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	459	
1	B	459	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 6097 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 Nucleoporin NUP133.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	384	Total	C	N	O	S	Se	0	0	0
			3057	1974	495	580	5	3			
1	B	382	Total	C	N	O	S	Se	0	0	0
			3040	1961	492	579	5	3			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	52	MSE	-	expression tag	UNP A7TDS5
A	53	SER	-	expression tag	UNP A7TDS5
A	54	LEU	-	expression tag	UNP A7TDS5
A	503	GLU	-	expression tag	UNP A7TDS5
A	504	GLY	-	expression tag	UNP A7TDS5
A	505	HIS	-	expression tag	UNP A7TDS5
A	506	HIS	-	expression tag	UNP A7TDS5
A	507	HIS	-	expression tag	UNP A7TDS5
A	508	HIS	-	expression tag	UNP A7TDS5
A	509	HIS	-	expression tag	UNP A7TDS5
A	510	HIS	-	expression tag	UNP A7TDS5
B	52	MSE	-	expression tag	UNP A7TDS5
B	53	SER	-	expression tag	UNP A7TDS5
B	54	LEU	-	expression tag	UNP A7TDS5
B	503	GLU	-	expression tag	UNP A7TDS5
B	504	GLY	-	expression tag	UNP A7TDS5
B	505	HIS	-	expression tag	UNP A7TDS5
B	506	HIS	-	expression tag	UNP A7TDS5
B	507	HIS	-	expression tag	UNP A7TDS5
B	508	HIS	-	expression tag	UNP A7TDS5
B	509	HIS	-	expression tag	UNP A7TDS5
B	510	HIS	-	expression tag	UNP A7TDS5

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	109.17Å 133.84Å 136.78Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.00 – 3.00 40.00 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.4 (40.00-3.00) 99.4 (40.00-3.00)	Depositor EDS
R_{merge}	0.19	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.46 (at 2.99Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.215 , 0.268 0.225 , 0.276	Depositor DCC
R_{free} test set	1044 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å ²)	89.3	Xtriage
Anisotropy	0.374	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 70.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6097	wwPDB-VP
Average B, all atoms (Å ²)	102.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.43% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 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	0.60	0/3112	0.84	3/4209 (0.1%)
1	B	0.60	0/3095	0.86	7/4185 (0.2%)
All	All	0.60	0/6207	0.85	10/8394 (0.1%)

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	3
1	B	0	5
All	All	0	8

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	103	VAL	N-CA-C	7.64	120.28	108.44
1	A	102	LEU	N-CA-C	6.41	118.62	110.61
1	B	137	LEU	N-CA-C	6.29	117.93	111.14
1	B	256	THR	N-CA-C	-5.72	101.22	110.32
1	B	102	LEU	CA-C-N	-5.61	115.17	122.51
1	B	102	LEU	C-N-CA	-5.61	115.17	122.51
1	B	411	LEU	N-CA-C	-5.26	106.82	113.18
1	A	103	VAL	N-CA-C	5.10	115.25	108.11
1	B	452	SER	N-CA-C	5.08	118.21	111.30
1	A	273	SER	N-CA-C	-5.02	100.11	110.80

There are no chirality outliers.

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	101	GLY	Peptide
1	A	106	ALA	Peptide
1	A	412	ASN	Peptide
1	B	100	GLU	Peptide
1	B	102	LEU	Peptide
1	B	106	ALA	Peptide
1	B	129	ASP	Peptide
1	B	255	SER	Peptide

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	3057	0	3119	37	0
1	B	3040	0	3093	48	0
All	All	6097	0	6212	83	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 7.

All (83) 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:341:TYR:HH	1:B:341:TYR:HH	1.14	0.80
1:A:151:LEU:HD11	1:A:230:THR:HG22	1.66	0.77
1:A:272:ASN:O	1:A:273:SER:C	2.29	0.75
1:B:181:ASN:O	1:B:199:ILE:N	2.24	0.71
1:B:472:ILE:HD13	1:B:484:VAL:CG1	2.21	0.71
1:B:472:ILE:HD13	1:B:484:VAL:HG11	1.74	0.70
1:A:341:TYR:OH	1:B:341:TYR:OH	1.91	0.65
1:B:235:PRO:HG2	1:B:293:ILE:HD12	1.81	0.62
1:A:102:LEU:HG	1:A:474:GLY:HA2	1.86	0.58
1:A:356:ILE:HD11	1:A:363:ALA:CB	2.34	0.57
1:A:356:ILE:HD11	1:A:363:ALA:HB1	1.87	0.56
1:A:186:ILE:HD12	1:A:193:PHE:CE2	2.41	0.55
1:A:102:LEU:HA	1:A:473:ILE:O	2.06	0.55
1:B:305:THR:CG2	1:B:309:SER:HB3	2.36	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:149:ILE:CD1	1:B:188:LYS:HG2	2.37	0.54
1:B:186:ILE:HD12	1:B:193:PHE:CE2	2.43	0.54
1:B:108:GLN:HG2	1:B:124:ASN:ND2	2.24	0.53
1:B:193:PHE:HB3	1:B:217:LEU:HB3	1.89	0.53
1:B:275:PHE:CE2	1:B:276:PHE:CE1	2.97	0.53
1:A:193:PHE:HB3	1:A:217:LEU:HB3	1.90	0.52
1:A:272:ASN:O	1:A:274:PHE:N	2.43	0.52
1:B:114:ASP:CG	1:B:115:LEU:H	2.17	0.52
1:B:146:SER:OG	1:B:188:LYS:HE3	2.10	0.52
1:A:130:THR:N	1:A:131:PRO:HD3	2.25	0.51
1:A:108:GLN:HA	1:A:123:TYR:CZ	2.46	0.51
1:B:305:THR:HG22	1:B:309:SER:HB3	1.91	0.51
1:B:129:ASP:OD2	1:B:130:THR:OG1	2.19	0.51
1:B:107:LEU:C	1:B:107:LEU:HD12	2.36	0.51
1:A:458:ARG:NH2	1:A:461:GLU:OE1	2.45	0.50
1:B:458:ARG:NH2	1:B:461:GLU:OE1	2.45	0.50
1:A:108:GLN:HA	1:A:123:TYR:CE2	2.46	0.50
1:A:151:LEU:HD11	1:A:230:THR:CG2	2.39	0.50
1:B:65:ILE:HG21	1:B:68:GLU:HB2	1.94	0.49
1:A:65:ILE:HG21	1:A:68:GLU:HB2	1.94	0.49
1:B:273:SER:C	1:B:275:PHE:H	2.20	0.49
1:A:423:LEU:HB2	1:A:479:THR:HG22	1.95	0.49
1:A:217:LEU:HB2	1:A:261:LEU:HD13	1.95	0.48
1:A:146:SER:HB2	1:A:147:PRO:HD2	1.96	0.48
1:A:246:ARG:HD3	1:A:248:LEU:HD21	1.96	0.48
1:B:146:SER:HB2	1:B:147:PRO:HD2	1.96	0.48
1:B:423:LEU:HB2	1:B:479:THR:HG22	1.96	0.48
1:A:150:CYS:HA	1:A:184:CYS:O	2.14	0.47
1:A:185:ILE:HB	1:A:194:LEU:HB2	1.96	0.47
1:A:183:ILE:HG22	1:A:196:PHE:HB2	1.97	0.47
1:B:246:ARG:HD3	1:B:248:LEU:HD21	1.97	0.47
1:B:217:LEU:HB2	1:B:261:LEU:HD13	1.96	0.47
1:B:238:ILE:C	1:B:239:ILE:HD12	2.41	0.46
1:B:149:ILE:HD11	1:B:188:LYS:HG2	1.97	0.46
1:B:272:ASN:OD1	1:B:273:SER:O	2.33	0.46
1:B:105:THR:HG22	1:B:107:LEU:H	1.81	0.46
1:B:102:LEU:CD1	1:B:150:CYS:H	2.28	0.46
1:B:185:ILE:HB	1:B:194:LEU:HB2	1.98	0.46
1:A:483:TYR:HA	1:A:492:LEU:O	2.16	0.46
1:B:101:GLY:HA2	1:B:112:VAL:HA	1.98	0.46
1:B:116:ASP:OD1	1:B:116:ASP:N	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:105:THR:O	1:B:107:LEU:O	2.34	0.45
1:B:150:CYS:HA	1:B:184:CYS:O	2.17	0.44
1:B:183:ILE:HG22	1:B:196:PHE:HB2	2.00	0.44
1:B:483:TYR:HA	1:B:492:LEU:O	2.17	0.44
1:B:366:THR:O	1:B:380:MSE:HA	2.18	0.44
1:A:405:THR:HG22	1:A:406:LYS:N	2.33	0.44
1:B:254:ASP:C	1:B:256:THR:H	2.26	0.44
1:B:238:ILE:HD11	1:B:250:ILE:HB	2.00	0.44
1:A:130:THR:N	1:A:131:PRO:CD	2.81	0.43
1:A:366:THR:O	1:A:380:MSE:HA	2.18	0.42
1:B:405:THR:HG22	1:B:406:LYS:N	2.34	0.42
1:A:196:PHE:CE2	1:A:214:ALA:HB2	2.55	0.42
1:B:239:ILE:HD12	1:B:239:ILE:N	2.34	0.42
1:B:351:LEU:HD11	1:B:369:SER:HB3	2.03	0.41
1:B:108:GLN:N	1:B:108:GLN:OE1	2.53	0.41
1:A:198:ASP:HB3	1:A:201:THR:OG1	2.20	0.41
1:A:78:SER:OG	1:A:126:ILE:HA	2.21	0.41
1:B:190:ASN:O	1:B:191:SER:HB3	2.21	0.41
1:A:195:TYR:HB3	1:A:261:LEU:HD23	2.03	0.41
1:A:325:LEU:HD12	1:A:390:ASN:OD1	2.21	0.40
1:B:234:GLU:HB2	1:B:235:PRO:HD3	2.02	0.40
1:A:190:ASN:O	1:A:191:SER:HB3	2.21	0.40
1:A:235:PRO:O	1:A:317:ILE:HD11	2.21	0.40
1:B:254:ASP:OD1	1:B:254:ASP:N	2.53	0.40
1:A:225:GLU:HB3	1:A:244:LEU:HD22	2.03	0.40
1:B:195:TYR:HB3	1:B:261:LEU:HD23	2.04	0.40
1:A:376:ILE:HB	1:A:405:THR:HB	2.04	0.40
1:B:79:THR:OG1	1:B:125:SER:HB3	2.22	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	374/459 (82%)	336 (90%)	37 (10%)	1 (0%)	36	70
1	B	372/459 (81%)	341 (92%)	29 (8%)	2 (0%)	24	60
All	All	746/918 (81%)	677 (91%)	66 (9%)	3 (0%)	30	65

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	126	ILE
1	A	126	ILE
1	B	272	ASN

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	358/421 (85%)	351 (98%)	7 (2%)	48	76
1	B	356/421 (85%)	348 (98%)	8 (2%)	45	74
All	All	714/842 (85%)	699 (98%)	15 (2%)	47	75

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

Mol	Chain	Res	Type
1	A	69	THR
1	A	128	LYS
1	A	138	HIS
1	A	186	ILE
1	A	273	SER
1	A	274	PHE
1	A	458	ARG
1	B	69	THR
1	B	107	LEU
1	B	127	GLN
1	B	186	ILE
1	B	234	GLU
1	B	256	THR

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Mol	Chain	Res	Type
1	B	273	SER
1	B	458	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	124	ASN
1	A	192	GLN
1	A	226	ASN
1	A	272	ASN
1	A	497	HIS
1	B	127	GLN
1	B	181	ASN
1	B	266	GLN

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 oligosaccharides 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	381/459 (83%)	-0.23	2 (0%)	87 72	66, 103, 134, 154	0
1	B	379/459 (82%)	-0.20	2 (0%)	87 72	65, 98, 145, 171	0
All	All	760/918 (82%)	-0.21	4 (0%)	87 72	65, 101, 141, 171	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	106	ALA	2.2
1	B	134	LYS	2.2
1	A	308	GLY	2.1
1	B	271	GLN	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 oligosaccharides 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.