



Full wwPDB X-ray Structure Validation Report ⓘ

May 13, 2024 – 04:48 pm BST

PDB ID : 9F63
Title : Crystal structure of *Saccharomyces cerevisiae* pH nine-sensitive protein 1 (PNS1)
Authors : Driller, J.H.; Pedersen, B.P.
Deposited on : 2024-04-30
Resolution : 2.73 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 ⓘ 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 : 4.02b-467
Xtriage (Phenix) : 1.13
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

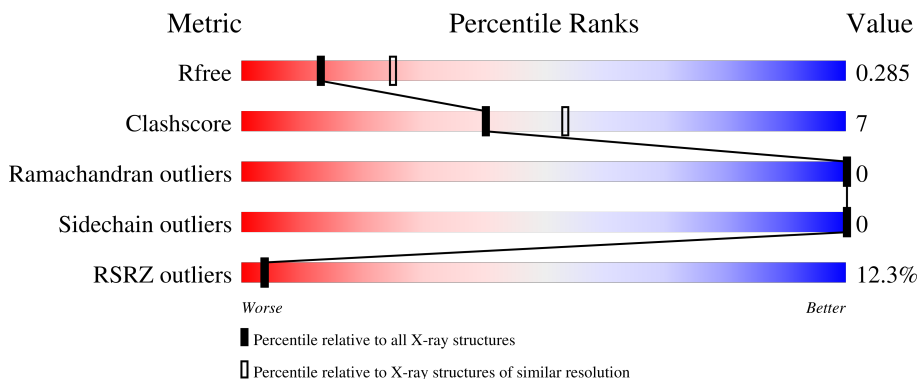
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.73 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	1271 (2.76-2.72)
Clashscore	141614	1322 (2.76-2.72)
Ramachandran outliers	138981	1297 (2.76-2.72)
Sidechain outliers	138945	1298 (2.76-2.72)
RSRZ outliers	127900	1243 (2.76-2.72)

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	572	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3381 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 Protein PNS1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	422	3369	2255	537	551	26	0	0	0

There are 33 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	MET	-	initiating methionine	UNP Q12412
A	-1	GLY	-	expression tag	UNP Q12412
A	0	PRO	-	expression tag	UNP Q12412
A	540	SER	-	expression tag	UNP Q12412
A	541	GLY	-	expression tag	UNP Q12412
A	542	LEU	-	expression tag	UNP Q12412
A	543	VAL	-	expression tag	UNP Q12412
A	544	PRO	-	expression tag	UNP Q12412
A	545	ARG	-	expression tag	UNP Q12412
A	546	GLY	-	expression tag	UNP Q12412
A	547	SER	-	expression tag	UNP Q12412
A	548	GLY	-	expression tag	UNP Q12412
A	549	GLY	-	expression tag	UNP Q12412
A	550	GLY	-	expression tag	UNP Q12412
A	551	GLY	-	expression tag	UNP Q12412
A	552	SER	-	expression tag	UNP Q12412
A	553	GLY	-	expression tag	UNP Q12412
A	554	GLY	-	expression tag	UNP Q12412
A	555	GLY	-	expression tag	UNP Q12412
A	556	GLY	-	expression tag	UNP Q12412
A	557	SER	-	expression tag	UNP Q12412
A	558	GLY	-	expression tag	UNP Q12412
A	559	GLY	-	expression tag	UNP Q12412
A	560	HIS	-	expression tag	UNP Q12412
A	561	HIS	-	expression tag	UNP Q12412
A	562	HIS	-	expression tag	UNP Q12412
A	563	HIS	-	expression tag	UNP Q12412

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Chain	Residue	Modelled	Actual	Comment	Reference
A	564	HIS	-	expression tag	UNP Q12412
A	565	HIS	-	expression tag	UNP Q12412
A	566	HIS	-	expression tag	UNP Q12412
A	567	HIS	-	expression tag	UNP Q12412
A	568	HIS	-	expression tag	UNP Q12412
A	569	HIS	-	expression tag	UNP Q12412

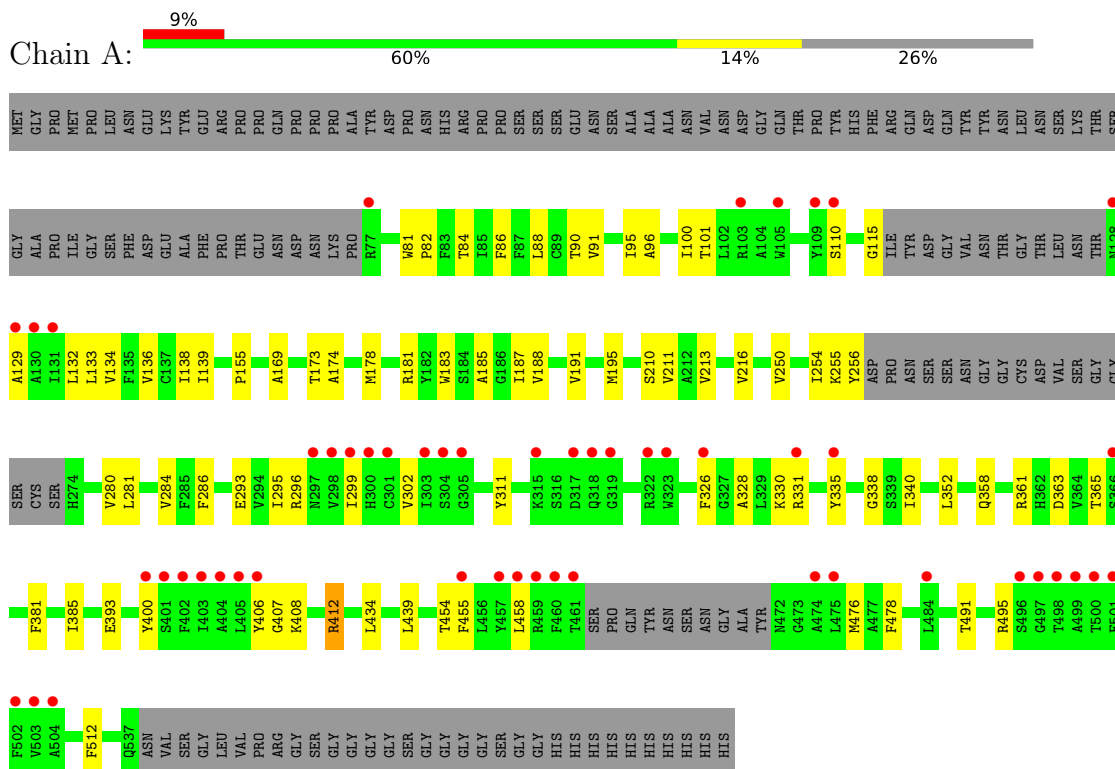
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	12	Total O 12 12	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: Protein PNS1



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.45Å 91.26Å 108.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.29 – 2.73 29.29 – 2.73	Depositor EDS
% Data completeness (in resolution range)	99.9 (29.29-2.73) 99.9 (29.29-2.73)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.11 (at 2.72Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, R_{free}	0.232 , 0.285 0.232 , 0.285	Depositor DCC
R_{free} test set	918 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	81.1	Xtrriage
Anisotropy	0.207	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 76.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3381	wwPDB-VP
Average B, all atoms (Å ²)	88.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.62% 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 [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	0.40	0/3467	0.57	4/4703 (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	1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	412	ARG	NE-CZ-NH1	-11.28	114.66	120.30
1	A	412	ARG	NE-CZ-NH2	8.88	124.74	120.30
1	A	412	ARG	CD-NE-CZ	7.38	133.93	123.60
1	A	363	ASP	CB-CG-OD2	5.04	122.84	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	412	ARG	Sidechain

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	3369	0	3402	49	0
2	A	12	0	0	0	0
All	All	3381	0	3402	49	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 (49) 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:136:VAL:HA	1:A:139:ILE:HD12	1.77	0.66
1:A:155:PRO:HG2	1:A:211:VAL:HG13	1.78	0.65
1:A:331:ARG:HH21	1:A:407:GLY:HA3	1.64	0.62
1:A:88:LEU:HA	1:A:91:VAL:HG12	1.84	0.59
1:A:134:VAL:O	1:A:138:ILE:HG12	2.04	0.57
1:A:296:ARG:HH12	1:A:393:GLU:HG2	1.70	0.57
1:A:280:VAL:O	1:A:284:VAL:HG23	2.05	0.56
1:A:455:PHE:HB2	1:A:476:MET:SD	2.46	0.56
1:A:381:PHE:O	1:A:385:ILE:HG12	2.07	0.54
1:A:331:ARG:HD2	1:A:335:TYR:HD2	1.73	0.53
1:A:326:PHE:O	1:A:330:LYS:HG3	2.08	0.52
1:A:302:VAL:HA	1:A:328:ALA:HB1	1.94	0.50
1:A:133:LEU:HA	1:A:136:VAL:HG12	1.94	0.49
1:A:439:LEU:HD13	1:A:491:THR:HG23	1.95	0.49
1:A:129:ALA:HB1	1:A:132:LEU:HD13	1.94	0.49
1:A:133:LEU:HD22	1:A:478:PHE:CE2	2.49	0.48
1:A:331:ARG:HD2	1:A:335:TYR:CD2	2.48	0.48
1:A:81:TRP:N	1:A:82:PRO:HD2	2.29	0.48
1:A:311:TYR:OH	1:A:512:PHE:HB2	2.14	0.47
1:A:86:PHE:O	1:A:90:THR:HG23	2.15	0.47
1:A:407:GLY:C	1:A:408:LYS:HE2	2.34	0.47
1:A:100:ILE:HG13	1:A:101:THR:N	2.31	0.46
1:A:255:LYS:HD3	1:A:256:TYR:CE2	2.50	0.46
1:A:295:ILE:O	1:A:299:ILE:HG12	2.15	0.46
1:A:331:ARG:NH2	1:A:407:GLY:HA3	2.30	0.46
1:A:84:THR:HG23	1:A:338:GLY:HA2	1.97	0.46
1:A:406:TYR:O	1:A:408:LYS:HE3	2.15	0.45
1:A:185:ALA:HA	1:A:188:VAL:HG22	1.98	0.45
1:A:286:PHE:HB2	1:A:352:LEU:HD22	1.98	0.45
1:A:293:GLU:OE2	1:A:296:ARG:NH1	2.50	0.45
1:A:281:LEU:HA	1:A:281:LEU:HD23	1.73	0.44
1:A:174:ALA:O	1:A:178:MET:HE2	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:88:LEU:HA	1:A:88:LEU:HD23	1.81	0.44
1:A:361:ARG:O	1:A:365:THR:HG23	2.18	0.44
1:A:191:VAL:O	1:A:195:MET:HG3	2.18	0.43
1:A:358:GLN:HE22	1:A:361:ARG:HH11	1.66	0.43
1:A:491:THR:HG22	1:A:495:ARG:NH2	2.33	0.43
1:A:181:ARG:HB3	1:A:183:TRP:CZ3	2.53	0.43
1:A:250:VAL:O	1:A:254:ILE:HG12	2.20	0.42
1:A:110:SER:OG	1:A:115:GLY:HA2	2.20	0.42
1:A:340:ILE:HA	1:A:400:TYR:CE1	2.55	0.42
1:A:213:VAL:HA	1:A:216:VAL:HG12	2.02	0.42
1:A:169:ALA:O	1:A:173:THR:HG23	2.20	0.41
1:A:183:TRP:O	1:A:187:ILE:HG12	2.20	0.41
1:A:95:ILE:HG13	1:A:96:ALA:N	2.35	0.41
1:A:210:SER:OG	1:A:434:LEU:HB2	2.21	0.41
1:A:81:TRP:CD2	1:A:82:PRO:HD3	2.56	0.41
1:A:255:LYS:HE2	1:A:256:TYR:CZ	2.56	0.40
1:A:454:THR:O	1:A:458:LEU:HG	2.21	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	414/572 (72%)	408 (99%)	6 (1%)	0	100 100

There are no Ramachandran outliers to report.

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	353/473 (75%)	353 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	358	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 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

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	422/572 (73%)	0.62	52 (12%) 4 4	60, 84, 125, 152	0

All (52) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	460	PHE	7.9
1	A	129	ALA	4.6
1	A	458	LEU	4.5
1	A	402	PHE	4.2
1	A	500	THR	4.1
1	A	317	ASP	4.0
1	A	318	GLN	4.0
1	A	301	CYS	3.9
1	A	304	SER	3.8
1	A	496	SER	3.7
1	A	331	ARG	3.6
1	A	131	ILE	3.6
1	A	459	ARG	3.5
1	A	401	SER	3.5
1	A	109	TYR	3.3
1	A	335	TYR	3.3
1	A	498	THR	3.2
1	A	499	ALA	3.2
1	A	503	VAL	3.2
1	A	461	THR	3.1
1	A	128	ASN	3.1
1	A	366	SER	3.1
1	A	475	LEU	3.1
1	A	502	PHE	3.0
1	A	322	ARG	3.0
1	A	455	PHE	3.0
1	A	130	ALA	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	400	TYR	3.0
1	A	497	GLY	2.9
1	A	404	ALA	2.9
1	A	504	ALA	2.8
1	A	501	PHE	2.8
1	A	405	LEU	2.8
1	A	403	ILE	2.8
1	A	77	ARG	2.8
1	A	105	TRP	2.7
1	A	323	TRP	2.7
1	A	326	PHE	2.6
1	A	299	ILE	2.6
1	A	484	LEU	2.5
1	A	103	ARG	2.5
1	A	300	HIS	2.4
1	A	303	ILE	2.4
1	A	457	TYR	2.4
1	A	305	GLY	2.4
1	A	315	LYS	2.3
1	A	110	SER	2.3
1	A	406	TYR	2.3
1	A	319	GLY	2.2
1	A	298	VAL	2.2
1	A	474	ALA	2.2
1	A	297	ASN	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 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.