



wwPDB X-ray Structure Validation Summary Report ⓘ

May 8, 2024 – 12:03 PM EDT

PDB ID : 8V11
Title : Structure of a *Saccharomyces cerevisiae* Ipl1 peptide Bound to dwarf Ndc80 complex
Authors : Zahm, J.A.; Harrison, S.C.
Deposited on : 2023-11-19
Resolution : 3.95 Å (reported)

This is a wwPDB X-ray Structure Validation Summary 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

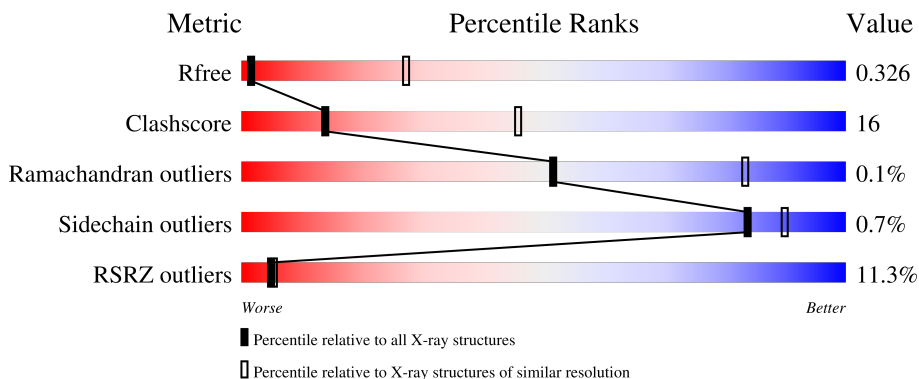
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.95 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	1025 (4.22-3.70)
Clashscore	141614	1085 (4.22-3.70)
Ramachandran outliers	138981	1047 (4.22-3.70)
Sidechain outliers	138945	1039 (4.22-3.70)
RSRZ outliers	127900	1013 (4.28-3.64)

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	272	 15% 70% 29% .
1	E	272	 20% 69% 29% ..
2	B	227	 4% 66% 25% . 8%
2	F	227	 12% 67% 25% . 8%
3	C	99	 4% 67% 28% 5%

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Mol	Chain	Length	Quality of chain
3	G	99	 55% 38% 5%
4	D	114	 11% 66% 32% ..
4	H	114	 6% 68% 30% ..

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 11265 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 Kinetochore protein NDC80.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	270	Total	C	N	O	S	0	2	0
			2286	1469	384	427	6			
1	E	270	Total	C	N	O	S	0	2	0
			2286	1469	384	427	6			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	111	SER	-	expression tag	UNP P40460
A	112	ASN	-	expression tag	UNP P40460
A	113	ALA	-	expression tag	UNP P40460
E	111	SER	-	expression tag	UNP P40460
E	112	ASN	-	expression tag	UNP P40460
E	113	ALA	-	expression tag	UNP P40460

- Molecule 2 is a protein called Ipl1/Nuf2 chimera protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	209	Total	C	N	O	S	0	0	0
			1681	1065	274	330	12			
2	F	209	Total	C	N	O	S	0	0	0
			1681	1065	274	330	12			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1430	ALA	ILE	conflict	UNP P33895
B	1431	ALA	GLU	conflict	UNP P33895
F	1430	ALA	ILE	conflict	UNP P33895
F	1431	ALA	GLU	conflict	UNP P33895

- Molecule 3 is a protein called Kinetochore protein SPC24.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	94	Total 785	495	136	153	1	0	0	0
3	G	94	Total 785	495	136	153	1	0	0	0

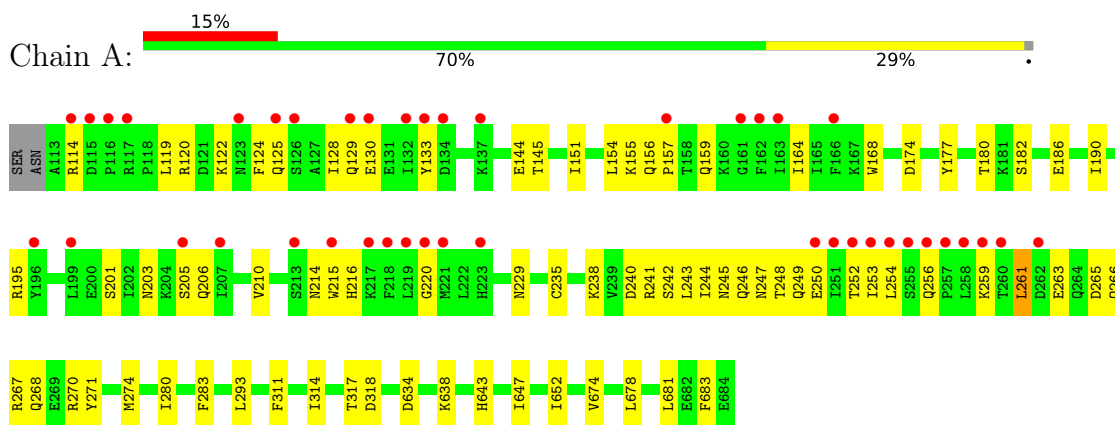
- Molecule 4 is a protein called Kinetochore protein SPC25.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	D	113	Total 883	553	163	163	4	0	0	0
4	H	112	Total 878	550	162	162	4	0	0	0

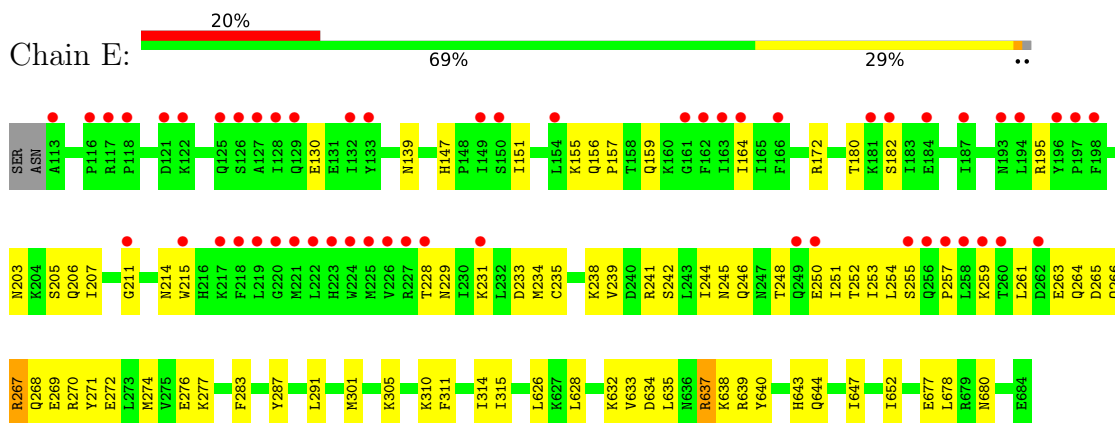
3 Residue-property plots [i](#)

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.

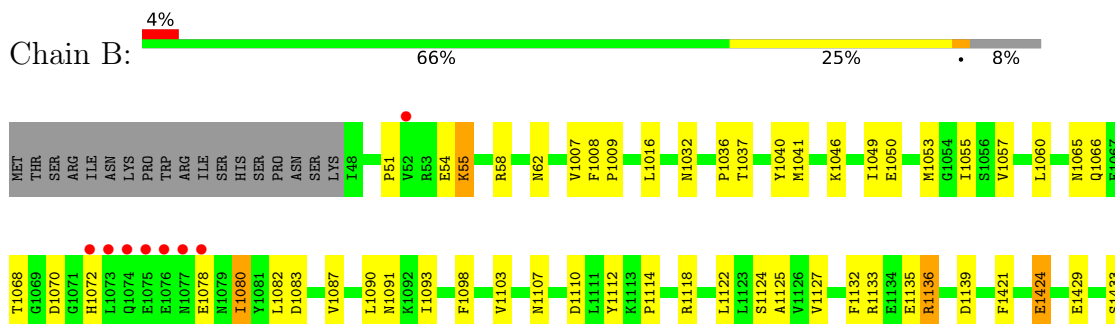
- Molecule 1: Kinetochores protein NDC80



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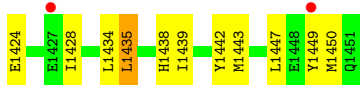
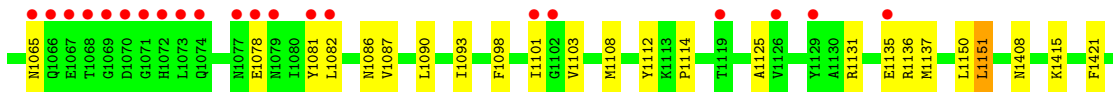


- Molecule 2: Ipl1/Nuf2 chimera protein





- Molecule 2: Ipl1/Nuf2 chimera protein



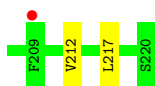
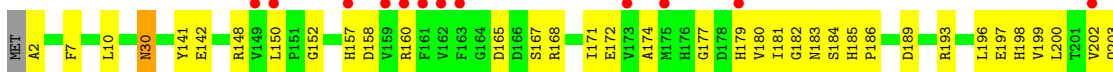
- Molecule 3: Kinetochores protein SPC24



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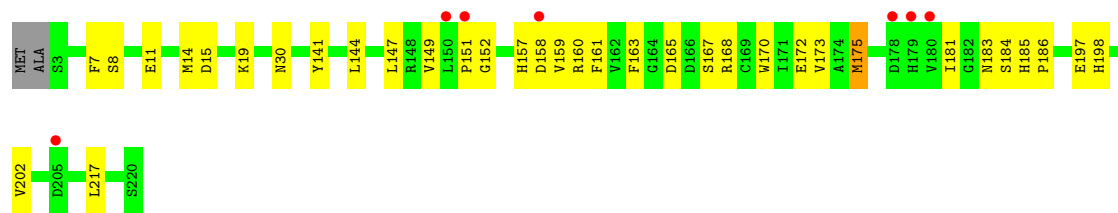


- Molecule 4: Kinetochores protein SPC25



- Molecule 4: Kinetochores protein SPC25





4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	114.76Å 114.76Å 423.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.53 – 3.95 48.53 – 3.95	Depositor EDS
% Data completeness (in resolution range)	42.5 (48.53-3.95) 42.6 (48.53-3.95)	Depositor EDS
R_{merge}	0.56	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.80 (at 4.00Å)	Xtrriage
Refinement program	PHENIX 1.21_5207	Depositor
R, R_{free}	0.267 , 0.327 0.273 , 0.326	Depositor DCC
R_{free} test set	561 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å ²)	103.0	Xtrriage
Anisotropy	0.477	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 156.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.39$, $\langle L^2 \rangle = 0.21$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	11265	wwPDB-VP
Average B, all atoms (Å ²)	162.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.13% 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	0.32	0/2337	0.63	2/3146 (0.1%)
1	E	0.30	0/2337	0.59	1/3146 (0.0%)
2	B	0.33	0/1706	0.60	1/2302 (0.0%)
2	F	0.32	0/1706	0.65	2/2302 (0.1%)
3	C	0.31	0/795	0.61	0/1071
3	G	0.41	0/795	0.70	0/1071
4	D	0.33	0/899	0.66	0/1218
4	H	0.34	0/894	0.73	1/1211 (0.1%)
All	All	0.33	0/11469	0.64	7/15467 (0.0%)

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
2	B	0	1

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	175	MET	CA-CB-CG	7.38	125.84	113.30
1	E	637	ARG	CA-CB-CG	-6.13	99.92	113.40
1	A	261	LEU	CB-CG-CD1	-5.75	101.23	111.00
2	F	1435	LEU	CA-CB-CG	5.69	128.39	115.30
2	F	1151	LEU	CA-CB-CG	-5.64	102.33	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	55	LYS	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	2286	0	2310	94	0
1	E	2286	0	2310	73	0
2	B	1681	0	1637	59	0
2	F	1681	0	1637	63	0
3	C	785	0	785	26	0
3	G	785	0	785	42	0
4	D	883	0	869	32	0
4	H	878	0	864	29	0
All	All	11265	0	11197	355	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 16.

The worst 5 of 355 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)
3:G:198:LEU:HD23	3:G:200:ASP:H	1.14	1.07
3:G:199:SER:HB3	3:G:203:LYS:HZ3	1.14	1.05
3:G:199:SER:HB3	3:G:203:LYS:NZ	1.72	1.04
2:F:1435:LEU:HD12	2:F:1438:HIS:CE1	2.01	0.96
1:A:206:GLN:HG3	1:A:214:ASN:HD22	1.34	0.93

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	270/272 (99%)	266 (98%)	4 (2%)	0	100	100
1	E	270/272 (99%)	264 (98%)	6 (2%)	0	100	100
2	B	207/227 (91%)	199 (96%)	8 (4%)	0	100	100
2	F	207/227 (91%)	198 (96%)	8 (4%)	1 (0%)	29	66
3	C	92/99 (93%)	86 (94%)	5 (5%)	1 (1%)	14	50
3	G	92/99 (93%)	87 (95%)	5 (5%)	0	100	100
4	D	111/114 (97%)	105 (95%)	6 (5%)	0	100	100
4	H	110/114 (96%)	106 (96%)	4 (4%)	0	100	100
All	All	1359/1424 (95%)	1311 (96%)	46 (3%)	2 (0%)	51	83

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	23	ASP
2	F	1010	ILE

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	261/261 (100%)	260 (100%)	1 (0%)	91	94
1	E	261/261 (100%)	257 (98%)	4 (2%)	65	79
2	B	188/214 (88%)	186 (99%)	2 (1%)	73	84
2	F	188/214 (88%)	188 (100%)	0	100	100
3	C	89/94 (95%)	89 (100%)	0	100	100
3	G	89/94 (95%)	87 (98%)	2 (2%)	52	71
4	D	94/95 (99%)	93 (99%)	1 (1%)	73	84
4	H	94/95 (99%)	94 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1264/1328 (95%)	1254 (99%)	10 (1%)	84 88

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	276[B]	GLU
3	G	14	PHE
3	G	203	LYS
4	D	30	ASN
1	E	229	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	246	GLN
1	E	268	GLN
3	G	197	ASN
1	A	214	ASN
1	A	125	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 [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	270/272 (99%)	0.77	42 (15%) 2 2	71, 180, 268, 343	0
1	E	270/272 (99%)	0.82	54 (20%) 1 1	51, 197, 281, 341	0
2	B	209/227 (92%)	0.17	8 (3%) 40 32	61, 140, 233, 298	0
2	F	209/227 (92%)	0.58	27 (12%) 3 4	80, 148, 248, 302	0
3	C	94/99 (94%)	0.20	4 (4%) 35 29	91, 158, 209, 237	0
3	G	94/99 (94%)	0.11	0 100 100	73, 131, 205, 239	0
4	D	113/114 (99%)	0.58	13 (11%) 4 5	85, 154, 202, 241	0
4	H	112/114 (98%)	0.41	7 (6%) 20 16	58, 132, 203, 253	0
All	All	1371/1424 (96%)	0.53	155 (11%) 5 5	51, 153, 264, 343	0

The worst 5 of 155 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	130	GLU	11.6
1	E	222	LEU	10.7
1	E	221	MET	10.0
1	A	134	ASP	9.2
1	E	223	HIS	8.8

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

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.