



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 11, 2024 – 01:33 AM EST

PDB ID : 3BG1  
Title : Architecture of a Coat for the Nuclear Pore Membrane  
Authors : Hoelz, A.  
Deposited on : 2007-11-23  
Resolution : 3.00 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](mailto: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>.

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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  
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

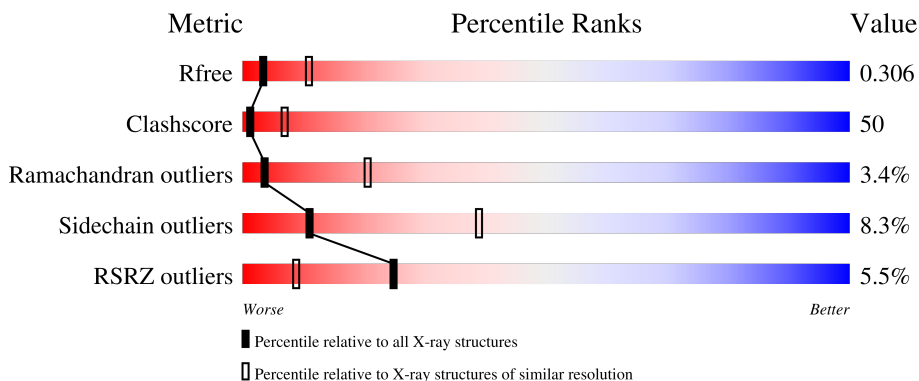
# 1 Overall quality at a glance

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.



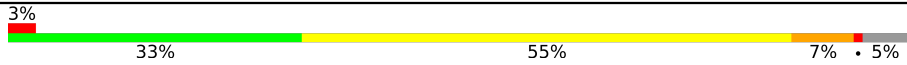


Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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  $\geq 3$ , 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	316	
1	D	316	
1	E	316	
1	H	316	
2	B	442	

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Mol	Chain	Length	Quality of chain
2	C	442	 <p>3% 33% 55% 7% 5%</p>
2	F	442	 <p>3% 33% 53% 8% 5%</p>
2	G	442	 <p>3% 36% 52% 7% 5%</p>

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 22614 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 SEC13 homolog.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	285	2233	1407	389	425	12	0	0	0
1	D	283	2218	1398	386	422	12	0	0	0
1	E	285	2233	1407	389	425	12	0	0	0
1	H	283	2218	1398	386	422	12	0	0	0

- Molecule 2 is a protein called Nucleoporin NUP145.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	423	3438	2201	570	656	11	0	0	0
2	C	420	3418	2188	566	653	11	0	0	0
2	F	423	3438	2201	570	656	11	0	0	0
2	G	420	3418	2188	566	653	11	0	0	0

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	111	MET	-	expression tag	UNP P49687
B	112	GLY	-	expression tag	UNP P49687
B	113	SER	-	expression tag	UNP P49687
B	114	SER	-	expression tag	UNP P49687
B	115	HIS	-	expression tag	UNP P49687
B	116	HIS	-	expression tag	UNP P49687
B	117	HIS	-	expression tag	UNP P49687
B	118	HIS	-	expression tag	UNP P49687

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Chain	Residue	Modelled	Actual	Comment	Reference
B	119	HIS	-	expression tag	UNP P49687
B	120	HIS	-	expression tag	UNP P49687
B	121	SER	-	expression tag	UNP P49687
B	122	GLY	-	expression tag	UNP P49687
B	123	ASP	-	expression tag	UNP P49687
B	124	PRO	-	expression tag	UNP P49687
C	111	MET	-	expression tag	UNP P49687
C	112	GLY	-	expression tag	UNP P49687
C	113	SER	-	expression tag	UNP P49687
C	114	SER	-	expression tag	UNP P49687
C	115	HIS	-	expression tag	UNP P49687
C	116	HIS	-	expression tag	UNP P49687
C	117	HIS	-	expression tag	UNP P49687
C	118	HIS	-	expression tag	UNP P49687
C	119	HIS	-	expression tag	UNP P49687
C	120	HIS	-	expression tag	UNP P49687
C	121	SER	-	expression tag	UNP P49687
C	122	GLY	-	expression tag	UNP P49687
C	123	ASP	-	expression tag	UNP P49687
C	124	PRO	-	expression tag	UNP P49687
F	111	MET	-	expression tag	UNP P49687
F	112	GLY	-	expression tag	UNP P49687
F	113	SER	-	expression tag	UNP P49687
F	114	SER	-	expression tag	UNP P49687
F	115	HIS	-	expression tag	UNP P49687
F	116	HIS	-	expression tag	UNP P49687
F	117	HIS	-	expression tag	UNP P49687
F	118	HIS	-	expression tag	UNP P49687
F	119	HIS	-	expression tag	UNP P49687
F	120	HIS	-	expression tag	UNP P49687
F	121	SER	-	expression tag	UNP P49687
F	122	GLY	-	expression tag	UNP P49687
F	123	ASP	-	expression tag	UNP P49687
F	124	PRO	-	expression tag	UNP P49687
G	111	MET	-	expression tag	UNP P49687
G	112	GLY	-	expression tag	UNP P49687
G	113	SER	-	expression tag	UNP P49687
G	114	SER	-	expression tag	UNP P49687
G	115	HIS	-	expression tag	UNP P49687
G	116	HIS	-	expression tag	UNP P49687
G	117	HIS	-	expression tag	UNP P49687
G	118	HIS	-	expression tag	UNP P49687

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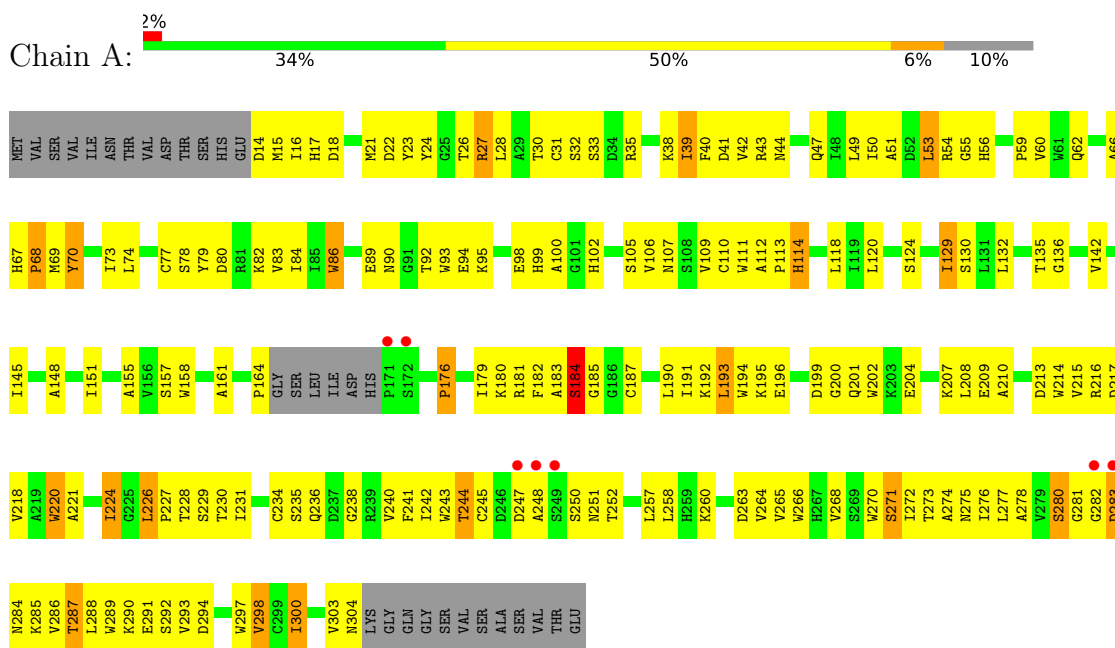
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Chain	Residue	Modelled	Actual	Comment	Reference
G	119	HIS	-	expression tag	UNP P49687
G	120	HIS	-	expression tag	UNP P49687
G	121	SER	-	expression tag	UNP P49687
G	122	GLY	-	expression tag	UNP P49687
G	123	ASP	-	expression tag	UNP P49687
G	124	PRO	-	expression tag	UNP P49687

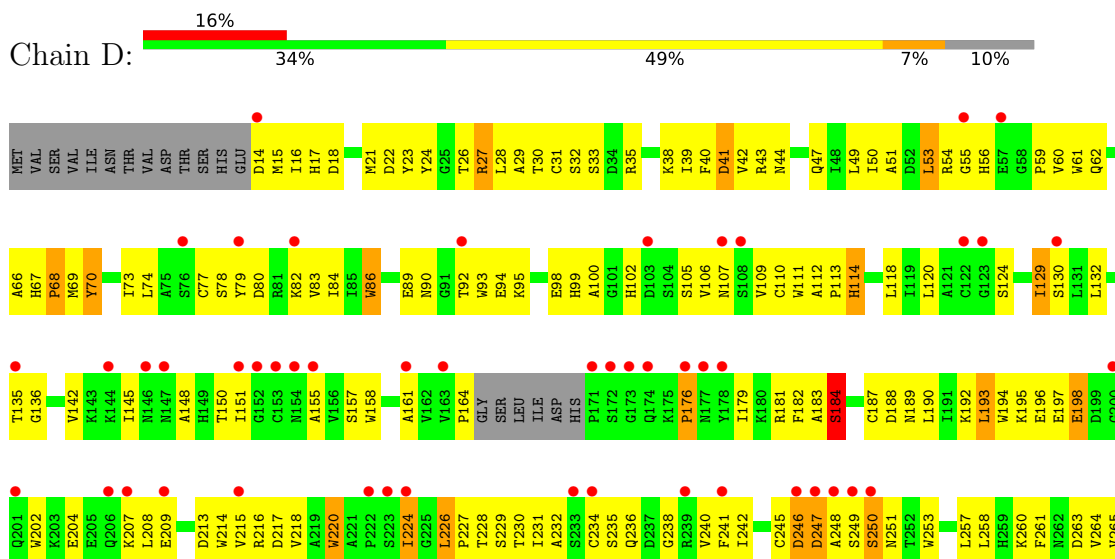
### 3 Residue-property plots [i](#)

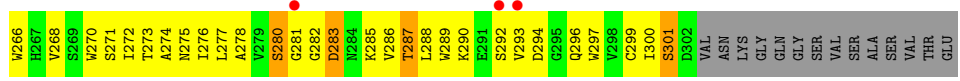
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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 SEC13 homolog

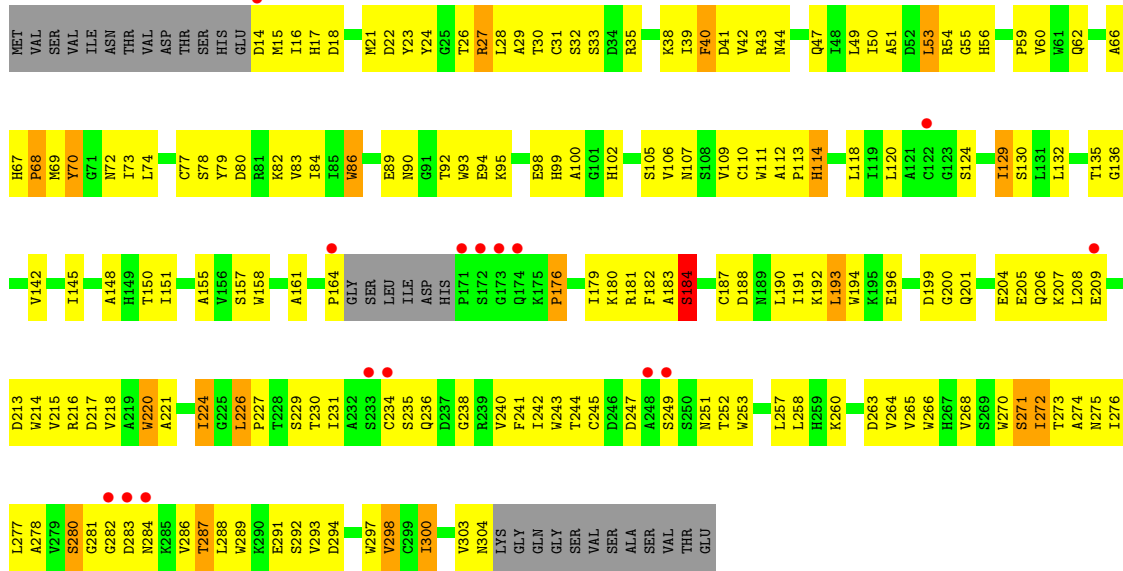


- Molecule 1: Protein SEC13 homolog

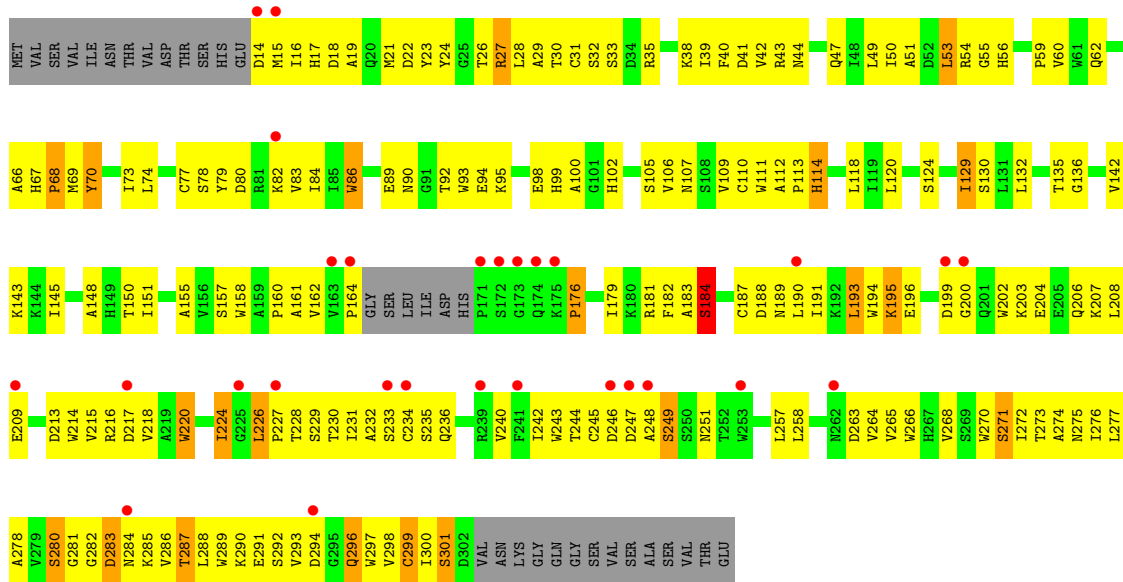




• Molecule 1: Protein SEC13 homolog



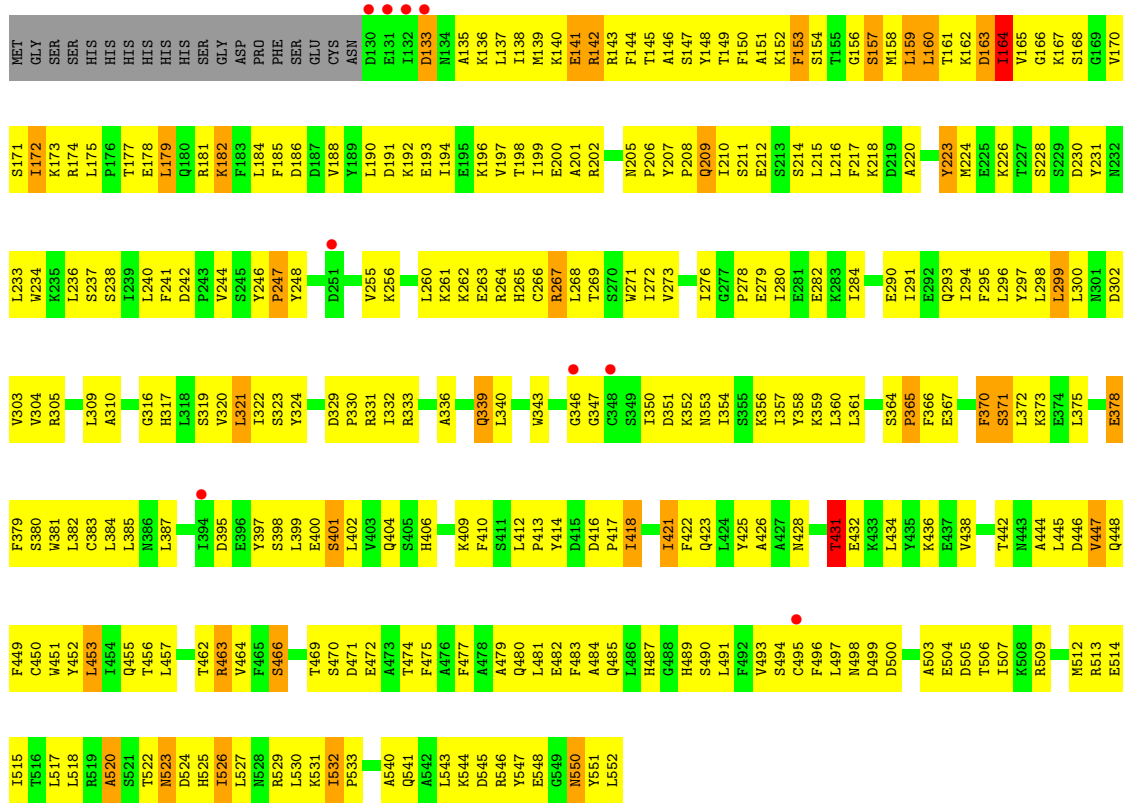
• Molecule 1: Protein SEC13 homolog



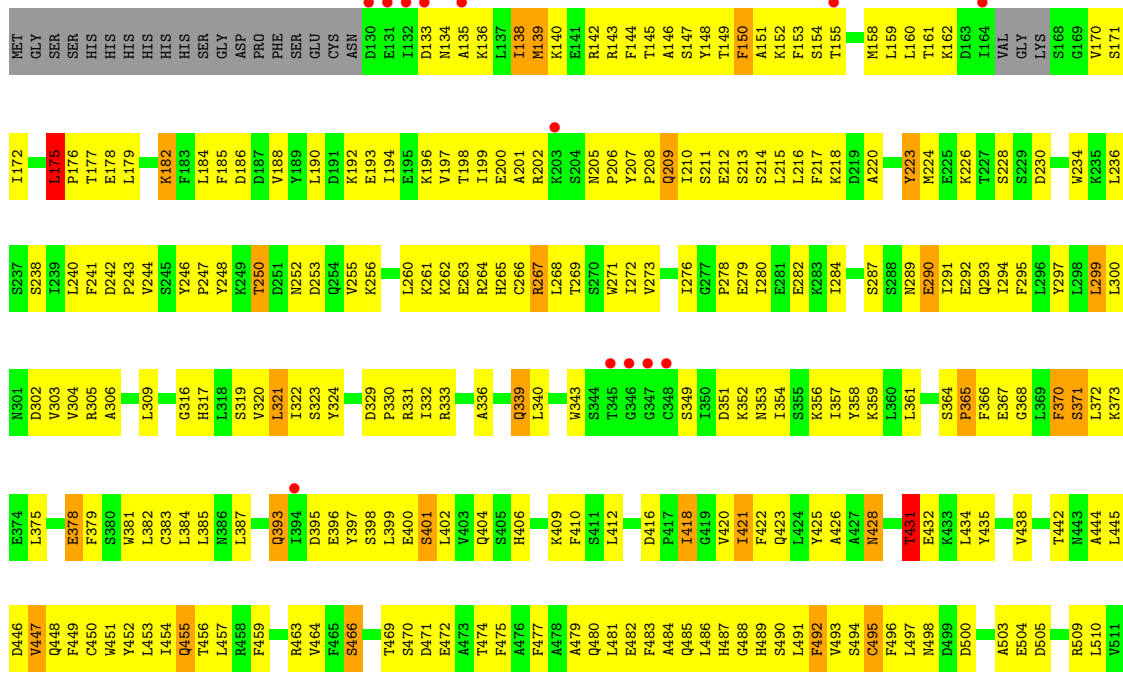
• Molecule 2: Nucleoporin NUP145

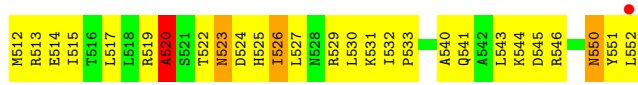




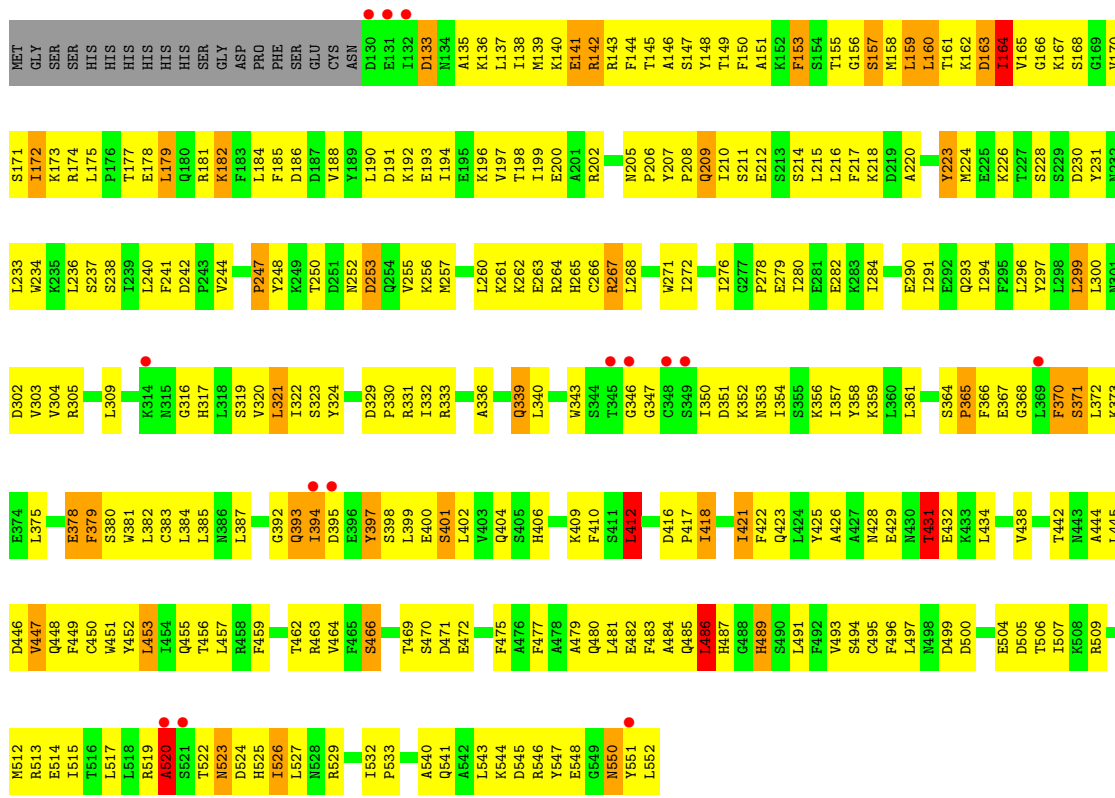


● Molecule 2: Nucleoporin NUP145

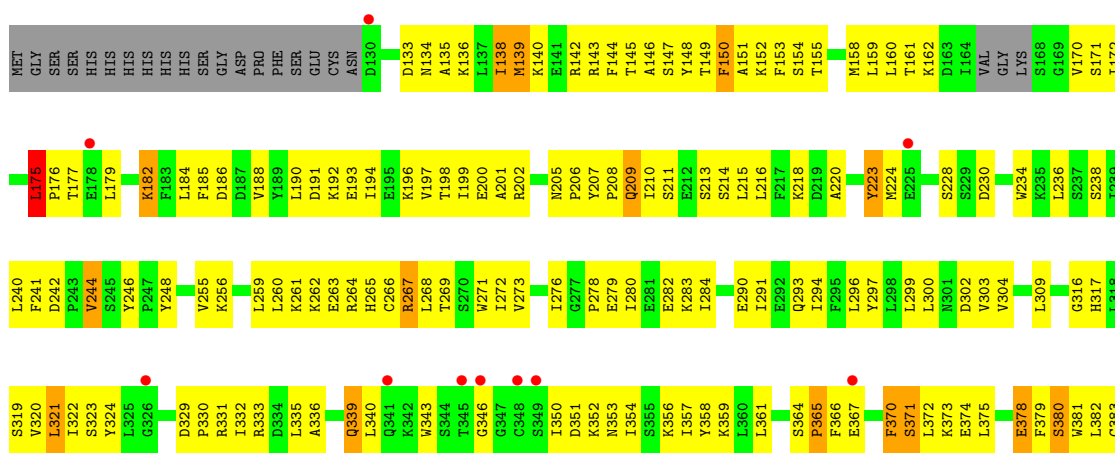


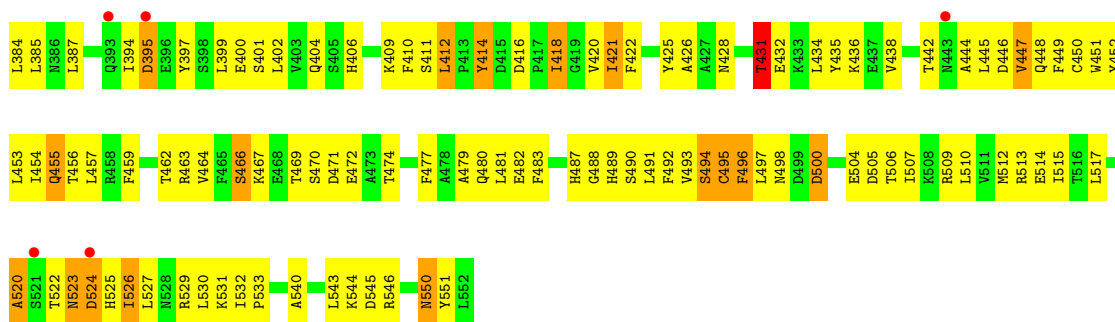


● Molecule 2: Nucleoporin NUP145



● Molecule 2: Nucleoporin NUP145





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	181.37Å 216.79Å 192.58Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00 20.00 – 3.00	Depositor EDS
% Data completeness (in resolution range)	97.3 (20.00-3.00) 84.6 (20.00-3.00)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.38 (at 2.98Å)	Xtrriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.249 , 0.294 0.262 , 0.306	Depositor DCC
$R_{free}$ test set	5815 reflections (8.15%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	87.9	Xtrriage
Anisotropy	0.769	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.26 , 78.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.45$ , $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	22614	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	149.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 24.84 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.5507e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.48	0/2297	0.74	1/3131 (0.0%)
1	D	0.45	0/2282	0.76	1/3110 (0.0%)
1	E	0.47	0/2297	0.74	2/3131 (0.1%)
1	H	0.43	0/2282	0.72	1/3110 (0.0%)
2	B	0.52	1/3504 (0.0%)	0.76	1/4728 (0.0%)
2	C	0.49	0/3483	0.76	3/4699 (0.1%)
2	F	0.52	1/3504 (0.0%)	0.77	2/4728 (0.0%)
2	G	0.48	0/3483	0.75	2/4699 (0.0%)
All	All	0.49	2/23132 (0.0%)	0.75	13/31336 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	153	PHE	CE2-CZ	5.19	1.47	1.37
2	B	153	PHE	CE2-CZ	5.05	1.47	1.37

The worst 5 of 13 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	175	LEU	CA-CB-CG	5.86	128.77	115.30
2	G	175	LEU	CA-CB-CG	5.85	128.75	115.30
2	C	397	TYR	N-CA-C	5.74	126.49	111.00
1	H	272	ILE	N-CA-C	5.58	126.06	111.00
1	D	272	ILE	N-CA-C	5.51	125.89	111.00

There are no chirality outliers.

There are no planarity outliers.

### 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	2233	0	2109	240	0
1	D	2218	0	2094	244	0
1	E	2233	0	2109	255	0
1	H	2218	0	2094	238	0
2	B	3438	0	3452	370	0
2	C	3418	0	3426	341	0
2	F	3438	0	3452	375	0
2	G	3418	0	3426	334	0
All	All	22614	0	22162	2245	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 50.

The worst 5 of 2245 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:E:278:ALA:HB2	2:F:153:PHE:CE1	1.79	1.18
2:G:481:LEU:HD13	2:G:489:HIS:HB3	1.23	1.17
2:C:479:ALA:CB	1:D:273:THR:HG21	1.76	1.14
1:E:107:ASN:HD21	2:F:142:ARG:NH2	1.47	1.12
1:E:278:ALA:HB2	2:F:153:PHE:HE1	0.98	1.10

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	281/316 (89%)	231 (82%)	42 (15%)	8 (3%)	<b>5</b> <b>25</b>
1	D	279/316 (88%)	226 (81%)	43 (15%)	10 (4%)	<b>3</b> <b>19</b>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	281/316 (89%)	231 (82%)	43 (15%)	7 (2%)	5	28
1	H	279/316 (88%)	228 (82%)	43 (15%)	8 (3%)	4	24
2	B	421/442 (95%)	336 (80%)	68 (16%)	17 (4%)	3	17
2	C	416/442 (94%)	330 (79%)	73 (18%)	13 (3%)	4	23
2	F	421/442 (95%)	337 (80%)	65 (15%)	19 (4%)	2	14
2	G	416/442 (94%)	330 (79%)	73 (18%)	13 (3%)	4	23
All	All	2794/3032 (92%)	2249 (80%)	450 (16%)	95 (3%)	3	20

5 of 95 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	251	ASN
2	B	164	ILE
2	B	371	SER
2	B	428	ASN
2	B	520	ALA

### 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	240/267 (90%)	222 (92%)	18 (8%)	13	43
1	D	238/267 (89%)	218 (92%)	20 (8%)	11	38
1	E	240/267 (90%)	222 (92%)	18 (8%)	13	43
1	H	238/267 (89%)	219 (92%)	19 (8%)	12	40
2	B	386/403 (96%)	352 (91%)	34 (9%)	10	36
2	C	384/403 (95%)	356 (93%)	28 (7%)	14	44
2	F	386/403 (96%)	349 (90%)	37 (10%)	8	32
2	G	384/403 (95%)	352 (92%)	32 (8%)	11	39
All	All	2496/2680 (93%)	2290 (92%)	206 (8%)	11	39

5 of 206 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	287	THR
2	F	412	LEU
1	H	271	SER
2	F	141	GLU
2	F	253	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 40 such sidechains are listed below:

Mol	Chain	Res	Type
2	F	455	GLN
2	G	498	ASN
2	G	232	ASN
2	G	353	ASN
1	H	114	HIS

### 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

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	285/316 (90%)	-0.03	7 (2%) 57 29	79, 129, 189, 200	0
1	D	283/316 (89%)	0.86	52 (18%) 1 0	119, 185, 200, 200	0
1	E	285/316 (90%)	0.02	15 (5%) 26 10	70, 128, 189, 200	0
1	H	283/316 (89%)	0.48	28 (9%) 7 2	108, 174, 200, 200	0
2	B	423/442 (95%)	-0.22	9 (2%) 63 34	70, 134, 189, 200	0
2	C	420/442 (95%)	-0.18	14 (3%) 46 20	99, 150, 195, 200	0
2	F	423/442 (95%)	-0.21	14 (3%) 46 20	70, 142, 193, 200	0
2	G	420/442 (95%)	-0.22	15 (3%) 42 17	92, 151, 197, 200	0
All	All	2822/3032 (93%)	0.01	154 (5%) 25 9	70, 149, 200, 200	0

The worst 5 of 154 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	248	ALA	10.8
1	H	247	ASP	8.4
1	E	282	GLY	6.0
1	D	155	ALA	5.9
1	D	122	CYS	5.8

### 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.