



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 12, 2024 – 02:34 PM EST

PDB ID : 3IKO  
Title : Crystal structure of the heterotrimeric Sec13-Nup145C-Nup84 nucleoporin complex  
Authors : Nagy, V.; Hsia, K.-C.; Debler, E.W.; Davenport, A.; Blobel, G.; Hoelz, A.  
Deposited on : 2009-08-06  
Resolution : 3.20 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

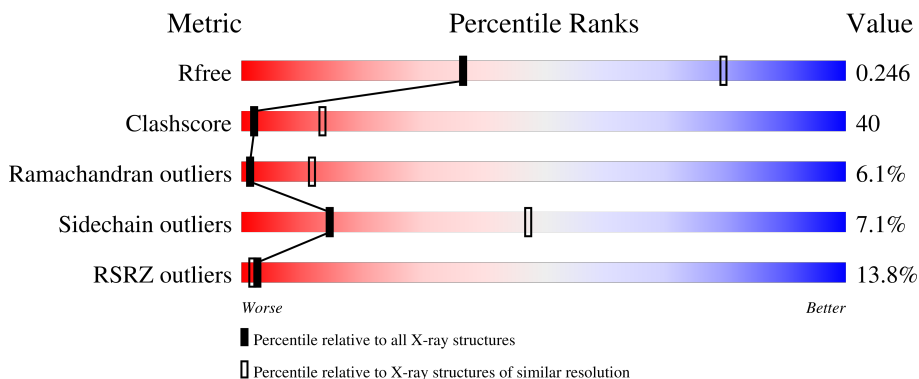
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.20 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.



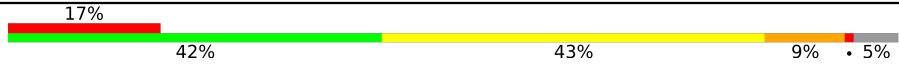

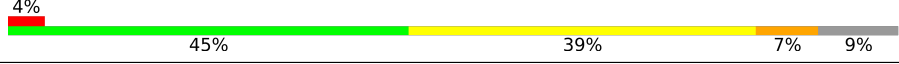
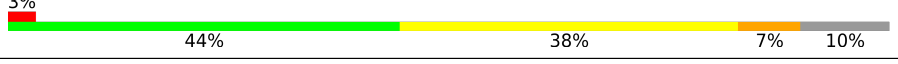
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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	297	
1	D	297	
1	G	297	
2	B	442	
2	E	442	

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Mol	Chain	Length	Quality of chain
2	H	442	
3	C	460	
3	F	460	
3	I	460	

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 27032 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 transport protein SEC13.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	274	2160	1379	369	409	3	0	0	0
1	D	274	2160	1379	369	409	3	0	0	0
1	G	274	2160	1379	369	409	3	0	0	0

- Molecule 2 is a protein called Nucleoporin NUP145C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	434	3528	2254	587	675	12	9	0	0
2	E	423	3438	2201	570	656	11	9	0	0
2	H	420	3409	2182	566	650	11	9	0	0

There are 42 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
B	119	HIS	-	expression tag	UNP P49687
B	120	HIS	-	expression tag	UNP P49687
B	121	SER	-	expression tag	UNP P49687
B	122	GLN	-	expression tag	UNP P49687

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

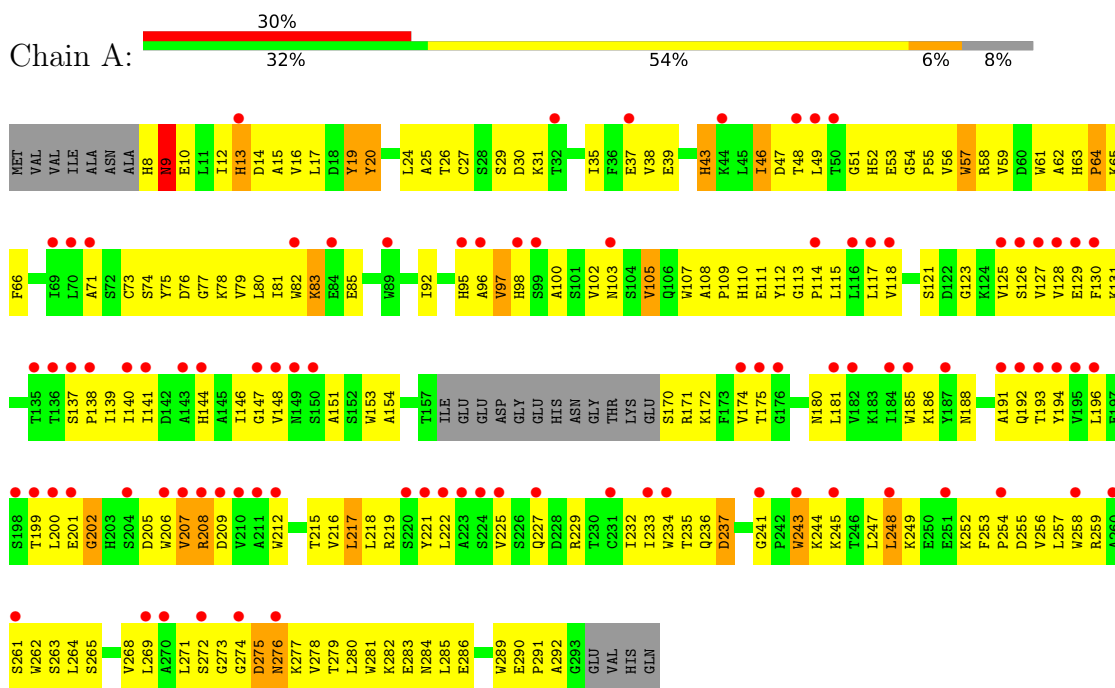
- Molecule 3 is a protein called Nucleoporin NUP84.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	419	Total	C	N	O	S	0	0	0
			3404	2178	557	657	12			
3	F	419	Total	C	N	O	S	0	0	0
			3404	2178	558	656	12			
3	I	414	Total	C	N	O	S	0	0	0
			3369	2155	554	649	11			

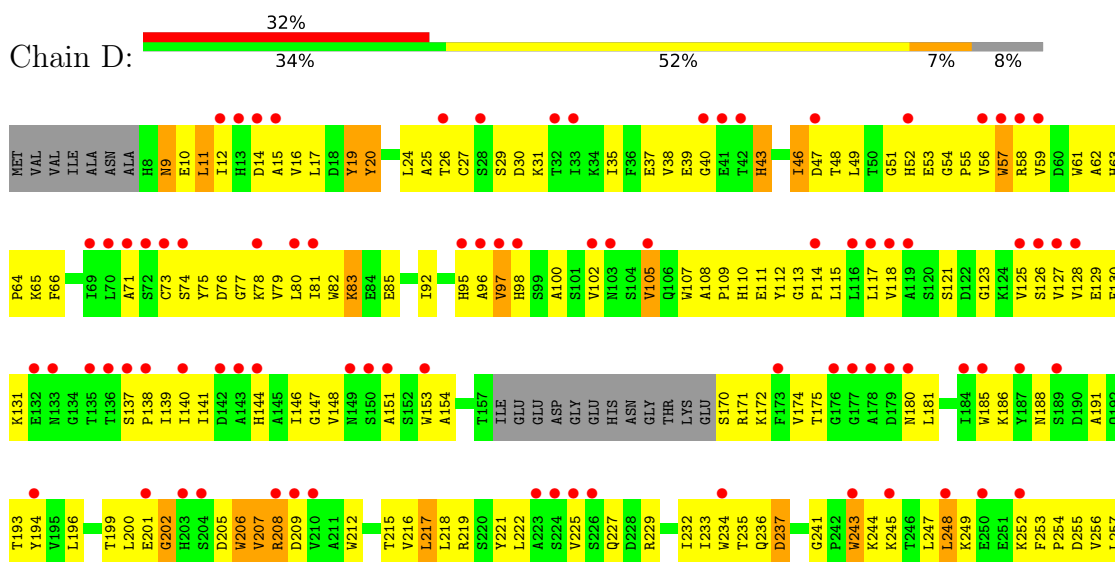
### 3 Residue-property plots [i](#)

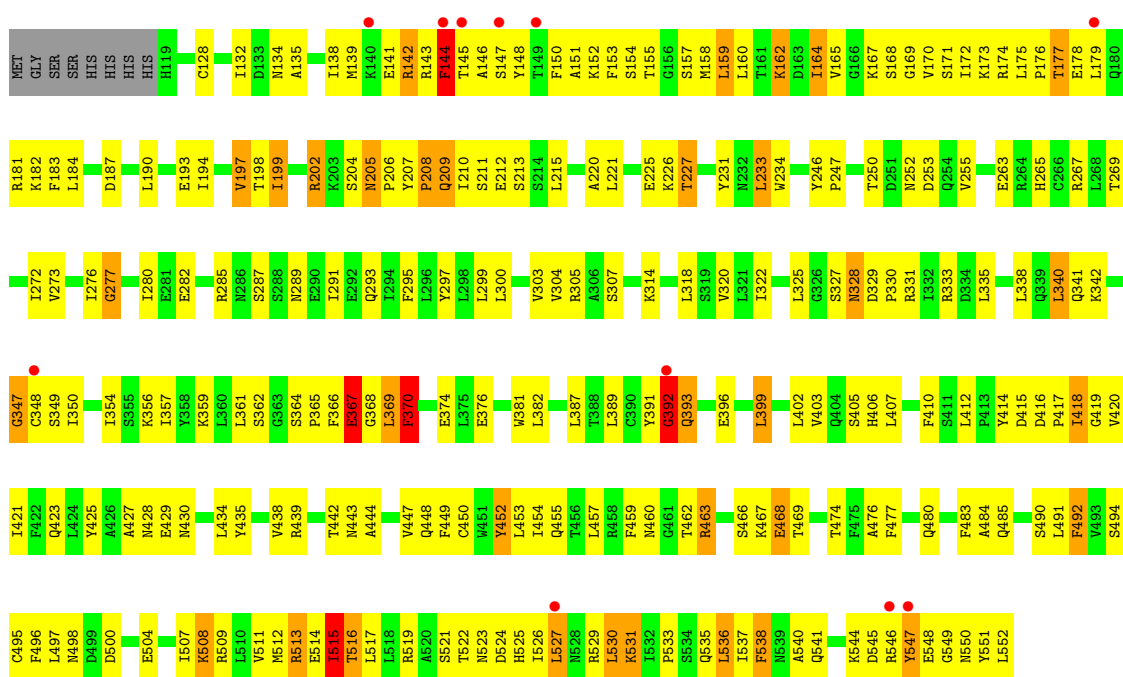
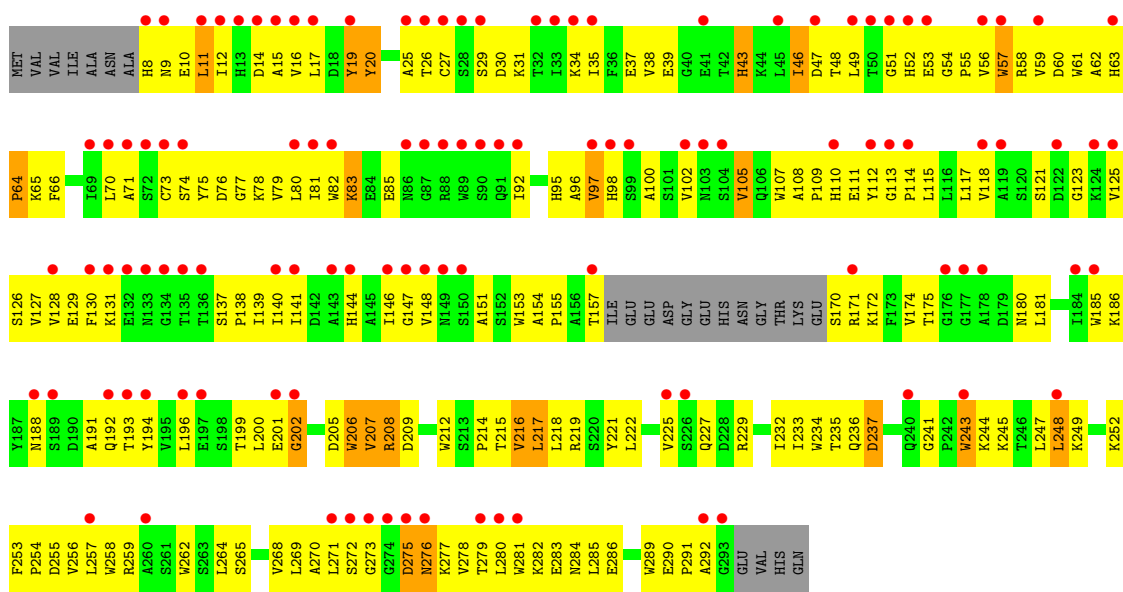
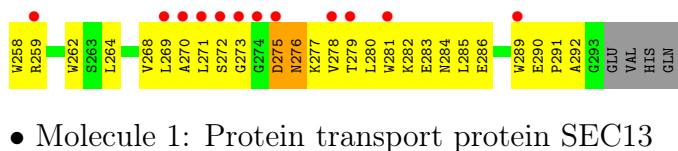
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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



- Molecule 1: Protein transport protein SEC13







MET	GLY	SER	SER	HIS	HIS	HIS	HIS	HIS	HIS	HIS	GLN	SER	ASP	PRO	PHE	SER	GLU	CYS	ASN	D130	E131	I132	D133	N134	A135	K136	L137	I138	L139	M139	K140	E141	R142	R143	F144	T145	S211	S147	Y148	T149	F150	A151	K152	F153	S154	T155	G156	M158	L159	L160	T161	K162	D163	I164	V165	G166	K167	S168	G169	V170
S171	I172	K173	R174	L175	P176	T177	E178	L179	Q180	R181	K182	F183	L184	D187	L190	E193	I194	V197	T198	I199	R202	K203	E204	N205	P206	Y207	P208	Q209	L210	S211	E212	S213	S214	L215	A220	L221	E225	K226	T227	Y231	N232	L233	W234	Y246	P247	Y248	K249	T250	D251	N252										
D253	Q254	V255	E263	R264	H265	C266	L272	V273	I276	G277	L280	E281	E282	R285	N286	S287	S288	N289	E290	S291	F295	L296	Y297	L298	L299	L300	V303	V304	R305	A306	S307	K314	L318	S319	V320	L321	L322	S323	Y324	L402	V403	S405	H406	L407	Q430	L412	F413	Y414	D416											
R333	D334	L335	A336	E337	L338	Q339	L340	K342	G347	C348	I350	I354	K356	Y358	K359	L360	S362	G363	E364	P365	F366	E367	G368	L369	F370	W381	L382	L387	Y391	G392	Q393	E396	L399	L402	V403	S405	H406	L407	Q430	A466	K467	E468	T469	T474	F475	A476	F477	A484	Q485	S490										
L491	F492	V493	S494	C495	F496	L497	N498	D499	D500	E504	I507	K508	R509	L510	V511	M512	R513	E514	T515	T516	K517	L518	R519	A520	S521	T522	N523	D524	H525	L526	L527	N528	R529	L530	K531	F532	P533	S534	Q535	L536	L537	F538	N539	A540	Q541	K544	D545	R546	Y547	E548	G549	N550	Y551	L552						

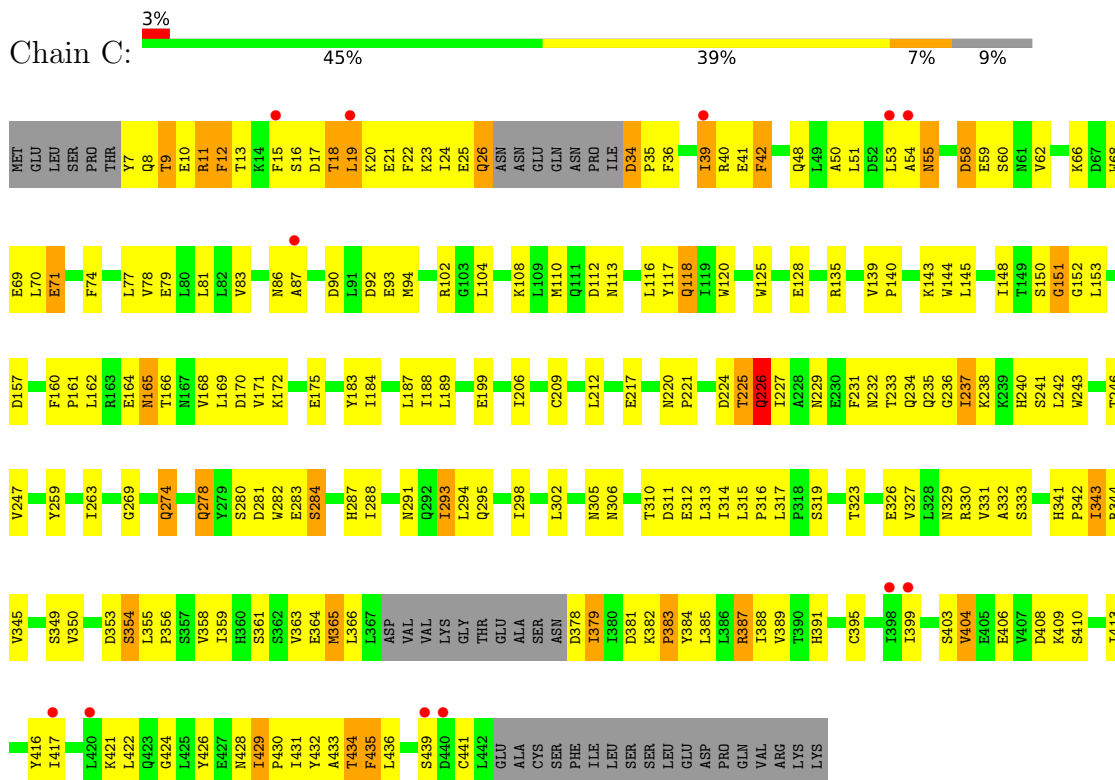
• Molecule 2: Nucleoporin NUP145C



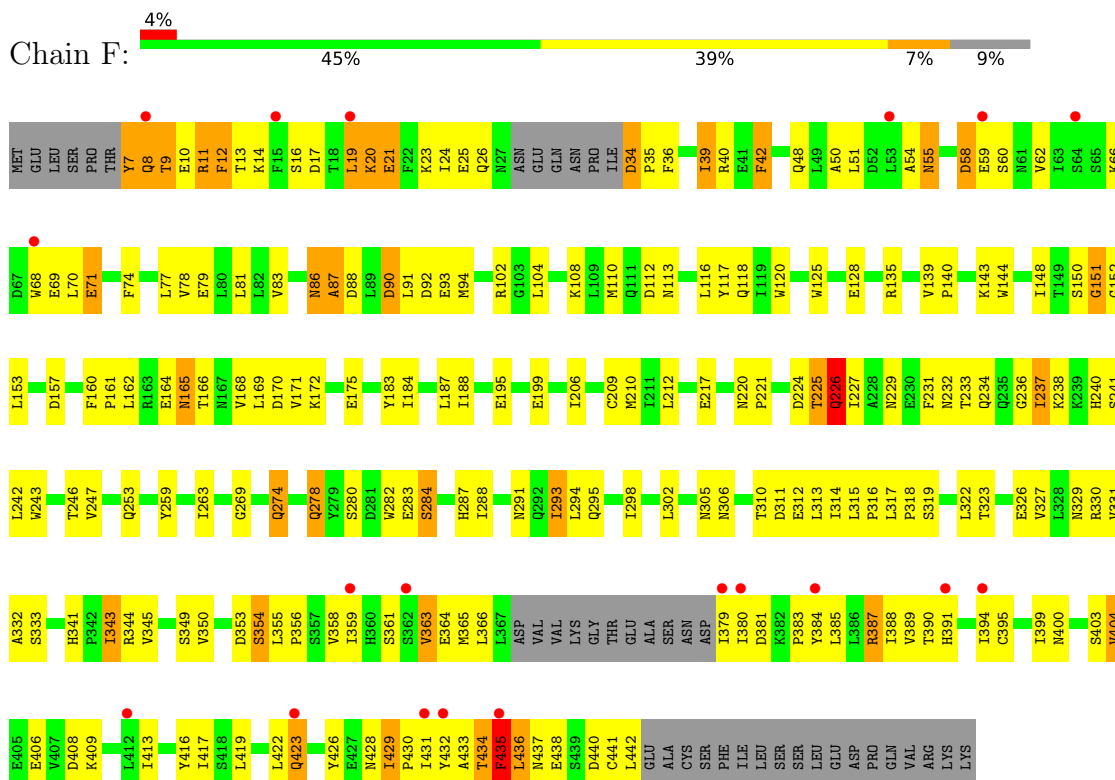
MET	GLY	SER	SER	HIS	HIS	HIS	HIS	HIS	HIS	HIS	GLN	SER	ASP	PRO	PHE	SER	GLU	CYS	ASN	D130	E131	I132	D133	N134	A135	K136	L137	I138	L139	M139	K140	E141	R142	R143	F144	T145	S211	S147	Y148	T149	F150	A151	K152	F153	S154	T155	G156	M158	L159	L160	T161	K162	D163	I164	V165	G166	K167	S168	G169	V170																																																	
S171	I172	K173	R174	L175	P176	T177	E178	L179	Q180	R181	K182	F183	L184	D187	L188	L190	E193	I194	V197	T198	I199	E200	K201	R202	K203	S204	N205	P206	Y207	P208	Q209	L210	S211	E212	S213	S214	L215	A220	L221	E225	K226	T227	Y231	N232	L233	W234	Y246	P247	Y248	K249	T250	D251																																																									
N252	D253	Q254	V255	L259	E263	R264	H265	C266	R267	L269	I272	V273	I276	G277	I280	E281	E282	R285	N286	S287	K289	L360	N443	S362	G363	S364	P365	F366	E367	G368	L369	F370	W381	L382	L387	Y391	G392	Q393	E396	L399	L402	V403	S405	H406	L407	Q430	L412	F413	Y414	D416																																																											
N328	D329	P330	R333	D334	L335	A336	E337	L338	Q339	L340	K341	K342	W343	S344	A426	A427	N428	E429	M430	L434	Y435	V438	R439	T442	L443	E514	V447	Q448	F449	C450	Y452	L453	L454	T456	R458	M460	G461	T462	R463	S466	K467	E468	T469	T474	F475	A476	F477	Q480	L484	L485	L486	L487	L488	L489	L490	L491	L492	L493	L494	L495	L496	L497	L498	L499	L500	L501	L502	L503	L504	L505	L506	L507	L508	L509	L510	L511	L512	L513	L514	L515	L516	L517	L518	L519	L520	L521	L522	L523	L524	L525	L526	L527	L528	L529	L530	L531	L532	L533	L534	L535	L536	L537	L538	L539	L540	L541	L542	L543	L544



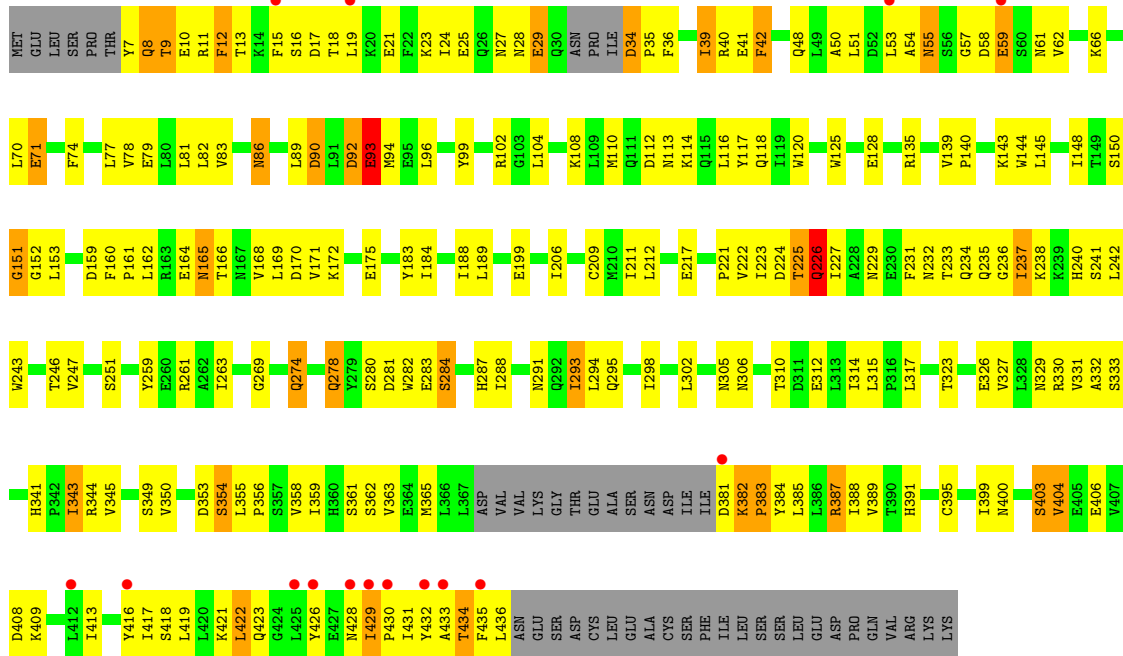
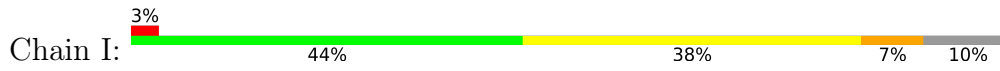
- Molecule 3: Nucleoporin NUP84



- Molecule 3: Nucleoporin NUP84



- Molecule 3: Nucleoporin NUP84



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	101.40Å 194.05Å 327.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 3.20 48.79 – 3.18	Depositor EDS
% Data completeness (in resolution range)	91.1 (50.00-3.20) 96.2 (48.79-3.18)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.12	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.12 (at 3.19Å)	Xtrriage
Refinement program	CNS 1.2	Depositor
R, $R_{free}$	0.234 , 0.273 0.243 , 0.246	Depositor DCC
$R_{free}$ test set	5253 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	86.0	Xtrriage
Anisotropy	0.620	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 110.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	27032	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	126.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.01% of the height of the origin peak. No significant pseudotranslation is detected.*

<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	0/2220	0.68	1/3028 (0.0%)
1	D	0.47	0/2220	0.67	0/3028
1	G	0.47	0/2220	0.67	0/3028
2	B	0.55	0/3598	0.74	1/4856 (0.0%)
2	E	0.57	0/3504	0.75	1/4728 (0.0%)
2	H	0.56	0/3474	0.74	1/4688 (0.0%)
3	C	0.63	0/3472	0.76	0/4714
3	F	0.63	0/3472	0.77	3/4714 (0.1%)
3	I	0.62	0/3437	0.76	0/4666
All	All	0.57	0/27617	0.74	7/37450 (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
3	C	0	1
3	F	0	1
All	All	0	2

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(°)
2	E	392	GLY	N-CA-C	5.99	128.08	113.10
2	H	392	GLY	N-CA-C	5.98	128.05	113.10
2	B	392	GLY	N-CA-C	5.96	128.01	113.10
3	F	435	PHE	N-CA-C	5.71	126.41	111.00
3	F	436	LEU	N-CA-C	5.29	125.28	111.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	C	435	PHE	Mainchain
3	F	435	PHE	Mainchain

## 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	2160	0	2096	239	0
1	D	2160	0	2096	228	0
1	G	2160	0	2096	226	0
2	B	3528	0	3521	301	0
2	E	3438	0	3452	293	0
2	H	3409	0	3426	313	0
3	C	3404	0	3378	249	0
3	F	3404	0	3380	246	0
3	I	3369	0	3341	243	0
All	All	27032	0	26786	2165	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 40.

The worst 5 of 2165 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)
2:E:369:LEU:HG	2:E:369:LEU:O	1.36	1.13
2:E:208:PRO:HB3	2:E:531:LYS:HB2	1.32	1.10
1:A:131:LYS:HE3	1:A:137:SER:HB2	1.38	1.06
2:H:208:PRO:HB3	2:H:531:LYS:HB2	1.32	1.06
2:B:208:PRO:HB3	2:B:531:LYS:HB2	1.32	1.05

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	270/297 (91%)	199 (74%)	51 (19%)	20 (7%)	1	7
1	D	270/297 (91%)	200 (74%)	51 (19%)	19 (7%)	1	8
1	G	270/297 (91%)	200 (74%)	50 (18%)	20 (7%)	1	7
2	B	432/442 (98%)	346 (80%)	55 (13%)	31 (7%)	1	7
2	E	421/442 (95%)	343 (82%)	48 (11%)	30 (7%)	1	8
2	H	418/442 (95%)	339 (81%)	49 (12%)	30 (7%)	1	7
3	C	413/460 (90%)	341 (83%)	55 (13%)	17 (4%)	3	21
3	F	413/460 (90%)	343 (83%)	53 (13%)	17 (4%)	3	21
3	I	408/460 (89%)	334 (82%)	56 (14%)	18 (4%)	2	19
All	All	3315/3597 (92%)	2645 (80%)	468 (14%)	202 (6%)	1	12

5 of 202 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	9	ASN
1	A	254	PRO
2	B	209	GLN
2	B	348	CYS
2	B	367	GLU

### 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	233/252 (92%)	221 (95%)	12 (5%)	23	59
1	D	233/252 (92%)	222 (95%)	11 (5%)	26	62
1	G	233/252 (92%)	223 (96%)	10 (4%)	29	64
2	B	397/404 (98%)	362 (91%)	35 (9%)	10	36
2	E	386/404 (96%)	352 (91%)	34 (9%)	10	36
2	H	383/404 (95%)	350 (91%)	33 (9%)	10	38
3	C	387/425 (91%)	361 (93%)	26 (7%)	16	50
3	F	387/425 (91%)	359 (93%)	28 (7%)	14	47
3	I	382/425 (90%)	358 (94%)	24 (6%)	18	52
All	All	3021/3243 (93%)	2808 (93%)	213 (7%)	14	47

5 of 213 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	515	ILE
3	F	404	VAL
3	I	225	THR
3	F	12	PHE
3	F	232	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
3	F	300	ASN
1	G	9	ASN
2	H	328	ASN
3	C	235	GLN
1	D	9	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](#)

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, 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	274/297 (92%)	1.65	90 (32%)	0 0	103, 167, 201, 202	0
1	D	274/297 (92%)	1.78	95 (34%)	0 0	101, 185, 202, 202	0
1	G	274/297 (92%)	1.90	113 (41%)	0 0	127, 193, 202, 202	0
2	B	434/442 (98%)	0.18	11 (2%)	57 43	44, 102, 181, 202	2 (0%)
2	E	423/442 (95%)	0.40	32 (7%)	13 7	49, 94, 192, 202	2 (0%)
2	H	420/442 (95%)	0.83	76 (18%)	1 1	46, 122, 200, 202	2 (0%)
3	C	419/460 (91%)	0.12	12 (2%)	51 36	9, 95, 175, 202	19 (4%)
3	F	419/460 (91%)	0.19	19 (4%)	33 21	11, 96, 178, 201	19 (4%)
3	I	414/460 (90%)	0.11	15 (3%)	42 27	48, 95, 181, 202	0
All	All	3351/3597 (93%)	0.67	463 (13%)	2 2	9, 124, 201, 202	44 (1%)

The worst 5 of 463 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	148	VAL	10.6
1	D	73	CYS	10.5
1	D	41	GLU	10.2
1	D	136	THR	9.6
2	E	138	ILE	9.3

### 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.