



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 21, 2023 – 06:33 PM JST

PDB ID : 7F60
Title : Crystal structure of auxiliary protein in complex with human nuclear protein
Authors : Gao, X.; Cui, S.
Deposited on : 2021-06-23
Resolution : 2.85 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
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

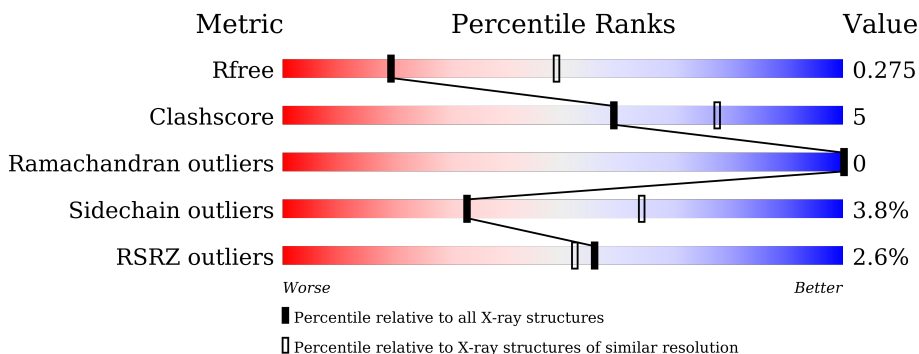
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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	368	 2% 78% 11% 10%
1	B	368	 % 77% 12% 10%
2	C	1817	 • 97%
2	D	1817	 •• 97%
3	E	61	 3% 10% •• 85%
3	F	61	 2% 7% •• 89%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6151 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 mRNA export factor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	331	Total	C	N	O	S	0	0	0
			2616	1655	456	488	17			
1	B	330	Total	C	N	O	S	0	0	0
			2608	1651	454	486	17			

- Molecule 2 is a protein called Nuclear pore complex protein Nup98-Nup96.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	48	Total	C	N	O	S	0	0	0
			383	235	66	80	2			
2	D	52	Total	C	N	O	S	0	0	0
			411	252	70	86	3			

- Molecule 3 is a protein called ORF6 protein.

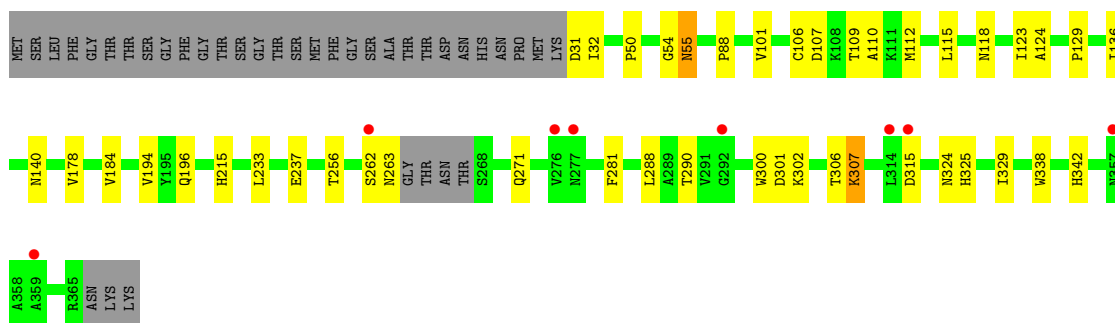
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	E	9	Total	C	N	O	S	0	0	0
			75	44	10	20	1			
3	F	7	Total	C	N	O	S	0	0	0
			58	35	8	14	1			

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.

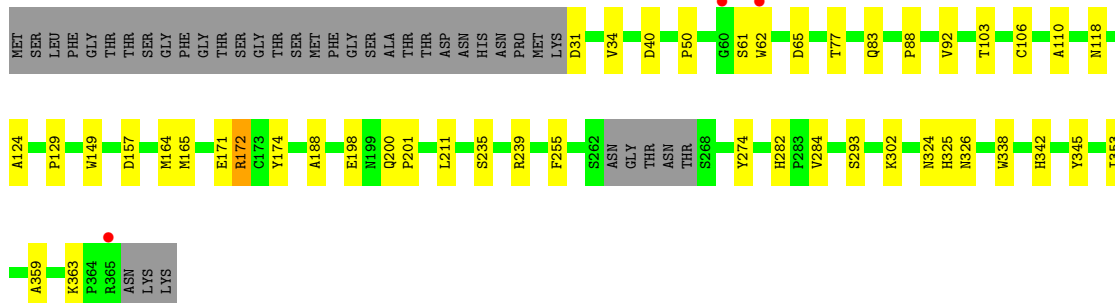
- Molecule 1: mRNA export factor

Chain A: 2% 78% 11% 10%



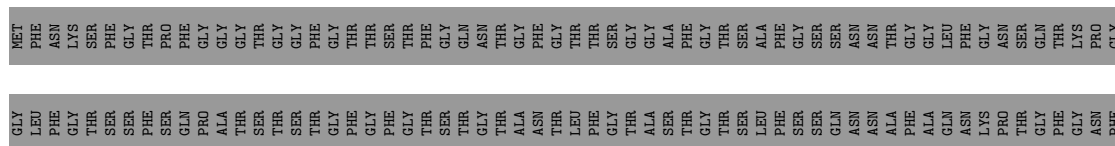
- Molecule 1: mRNA export factor

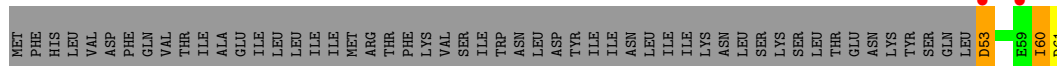
Chain B: 1% 77% 12% 10%



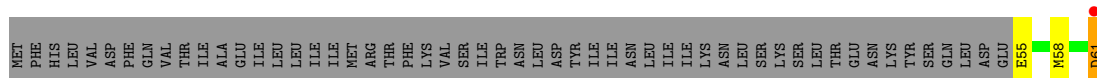
- Molecule 2: Nuclear pore complex protein Nup98-Nup96

Chain C: 97%





- Molecule 3: ORF6 protein



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	193.34Å 87.53Å 48.23Å 90.00° 93.68° 90.00°	Depositor
Resolution (Å)	48.24 – 2.85 48.24 – 2.85	Depositor EDS
% Data completeness (in resolution range)	98.8 (48.24-2.85) 98.9 (48.24-2.85)	Depositor EDS
R_{merge}	0.37	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.46 (at 2.86Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.236 , 0.276 0.235 , 0.275	Depositor DCC
R_{free} test set	906 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	42.0	Xtrriage
Anisotropy	0.695	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 30.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	6151	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.39% 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	0.24	0/2691	0.44	0/3658
1	B	0.24	0/2683	0.43	0/3647
2	C	0.23	0/387	0.44	0/519
2	D	0.23	0/415	0.43	0/557
3	E	0.27	0/75	0.53	0/100
3	F	0.23	0/58	0.42	0/77
All	All	0.24	0/6309	0.44	0/8558

There are no bond length outliers.

There are no bond angle outliers.

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	2616	0	2514	19	0
1	B	2608	0	2508	29	0
2	C	383	0	376	6	0
2	D	411	0	406	3	0
3	E	75	0	60	2	0
3	F	58	0	50	4	0
All	All	6151	0	5914	57	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 5.

All (57) 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:B:239:ARG:NH1	3:F:61:ASP:OD2	2.10	0.84
1:A:110:ALA:HB3	1:A:124:ALA:HB3	1.67	0.75
1:B:171:GLU:HG3	1:B:172:ARG:HD2	1.77	0.66
3:E:53:ASP:OD1	3:E:53:ASP:N	2.28	0.65
1:B:110:ALA:HB3	1:B:124:ALA:HB3	1.80	0.63
1:B:50:PRO:HG3	1:B:325:HIS:HB2	1.80	0.63
2:D:194:GLU:N	2:D:194:GLU:OE1	2.35	0.60
1:A:263:ASN:HB2	1:A:271:GLN:HG3	1.84	0.60
1:A:107:ASP:OD1	1:A:109:THR:OG1	2.20	0.59
1:A:101:VAL:HG23	1:A:115:LEU:HD11	1.85	0.58
1:B:88:PRO:HD2	1:B:106:CYS:HB2	1.85	0.58
2:C:198:LYS:NZ	2:C:206:GLU:OE2	2.34	0.57
1:A:262:SER:O	1:A:263:ASN:ND2	2.38	0.56
1:B:172:ARG:HD2	1:B:172:ARG:H	1.71	0.56
3:F:61:ASP:OD1	3:F:61:ASP:N	2.38	0.56
1:B:282:HIS:HE1	1:B:359:ALA:HA	1.70	0.56
1:A:50:PRO:HG3	1:A:325:HIS:HB2	1.87	0.56
1:A:290:THR:HG1	1:A:300:TRP:HE1	1.53	0.55
1:B:149:TRP:HA	1:B:172:ARG:HB2	1.89	0.55
1:A:88:PRO:HD2	1:A:106:CYS:HB2	1.90	0.53
2:D:171:ASP:OD1	2:D:172:THR:N	2.43	0.52
1:B:83:GLN:NE2	1:B:118:ASN:OD1	2.41	0.52
1:B:61:SER:OG	1:B:65:ASP:OD1	2.27	0.51
2:D:167:PRO:HG2	2:D:186:HIS:HB3	1.92	0.51
1:A:136:ILE:HG12	1:A:178:VAL:HG11	1.91	0.51
1:B:274:TYR:HB3	1:B:293:SER:HB2	1.93	0.51
1:B:239:ARG:HD3	3:F:61:ASP:OD2	2.11	0.51
3:E:60:ILE:HG12	3:E:61:ASP:N	2.26	0.51
1:A:184:VAL:HG22	1:A:194:VAL:HG22	1.93	0.51
1:A:301:ASP:HB3	1:A:306:THR:HG22	1.93	0.50
1:B:174:TYR:CZ	1:B:188:ALA:HB2	2.46	0.50
1:B:282:HIS:CD2	1:B:284:VAL:HG12	2.47	0.49
1:B:211:LEU:HD13	1:B:235:SER:HB3	1.95	0.49
1:A:324:ASN:OD1	1:A:329:ILE:N	2.44	0.49
1:A:106:CYS:HA	1:A:129:PRO:HB3	1.95	0.49
1:B:62:TRP:HA	1:B:88:PRO:HB3	1.96	0.47
1:A:112:MET:HB2	1:A:123:ILE:HD13	1.96	0.47
1:A:54:GLY:C	1:A:55:ASN:HD22	2.18	0.47
2:C:200:LEU:HD12	2:C:200:LEU:H	1.80	0.47
1:B:174:TYR:CZ	2:C:199:SER:HB3	2.51	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:255:PHE:HE2	3:F:58:MET:HE1	1.82	0.45
1:B:324:ASN:ND2	1:B:326:ASN:OD1	2.39	0.44
1:B:92:VAL:HG12	1:B:103:THR:HA	1.98	0.44
1:B:40:ASP:OD1	1:B:345:TYR:OH	2.34	0.44
2:C:168:THR:HG22	2:C:185:LYS:HD3	2.00	0.44
1:A:315:ASP:N	1:A:315:ASP:OD1	2.51	0.44
1:B:165:MET:HE2	1:B:201:PRO:HG2	2.00	0.44
1:B:338:TRP:HZ3	2:C:207:ASP:OD2	2.02	0.43
1:A:281:PHE:CE1	1:A:288:LEU:HB3	2.54	0.43
1:B:198:GLU:O	1:B:200:GLN:N	2.51	0.43
1:B:342:HIS:ND1	2:C:160:THR:OG1	2.44	0.43
1:B:157:ASP:HB3	1:B:164:MET:SD	2.60	0.42
1:B:34:VAL:HG22	1:B:77:THR:HG21	2.02	0.41
1:B:34:VAL:HB	1:B:353:ILE:HB	2.02	0.41
1:B:106:CYS:HA	1:B:129:PRO:HB3	2.01	0.41
1:A:307:LYS:HE3	1:A:307:LYS:HB3	1.88	0.41
1:A:215:HIS:NE2	1:A:233:LEU:HD21	2.36	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	327/368 (89%)	319 (98%)	8 (2%)	0	100	100
1	B	326/368 (89%)	319 (98%)	7 (2%)	0	100	100
2	C	44/1817 (2%)	42 (96%)	2 (4%)	0	100	100
2	D	48/1817 (3%)	45 (94%)	3 (6%)	0	100	100
3	E	7/61 (12%)	7 (100%)	0	0	100	100
3	F	5/61 (8%)	5 (100%)	0	0	100	100
All	All	757/4492 (17%)	737 (97%)	20 (3%)	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	287/317 (90%)	275 (96%)	12 (4%)	30	60
1	B	286/317 (90%)	282 (99%)	4 (1%)	67	86
2	C	44/1543 (3%)	43 (98%)	1 (2%)	50	78
2	D	48/1543 (3%)	43 (90%)	5 (10%)	7	19
3	E	9/60 (15%)	7 (78%)	2 (22%)	1	2
3	F	7/60 (12%)	5 (71%)	2 (29%)	0	1
All	All	681/3840 (18%)	655 (96%)	26 (4%)	33	64

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	ASP
1	A	32	ILE
1	A	55	ASN
1	A	118	ASN
1	A	140	ASN
1	A	196	GLN
1	A	237	GLU
1	A	256	THR
1	A	302	LYS
1	A	307	LYS
1	A	338	TRP
1	A	342	HIS
1	B	31	ASP
1	B	172	ARG
1	B	302	LYS
1	B	363	LYS
2	C	170	THR
2	D	158	THR
2	D	161	THR

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	D	163	LYS
2	D	173	MET
2	D	203	LEU
3	E	53	ASP
3	E	60	ILE
3	F	55	GLU
3	F	61	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	64	ASN
1	B	282	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 [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	331/368 (89%)	0.33	8 (2%) 59 56	24, 35, 61, 89	0
1	B	330/368 (89%)	0.31	3 (0%) 84 84	24, 36, 56, 92	0
2	C	48/1817 (2%)	0.51	2 (4%) 36 31	32, 47, 69, 86	0
2	D	52/1817 (2%)	0.58	4 (7%) 13 10	29, 53, 88, 113	0
3	E	9/61 (14%)	1.09	2 (22%) 0 0	51, 57, 78, 80	0
3	F	7/61 (11%)	0.78	1 (14%) 2 2	46, 57, 61, 79	0
All	All	777/4492 (17%)	0.36	20 (2%) 56 52	24, 38, 67, 113	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	357	ASN	3.6
1	A	262	SER	3.2
2	D	174	VAL	3.2
1	B	60	GLY	3.0
3	E	59	GLU	2.9
1	B	365	ARG	2.7
3	F	61	ASP	2.6
1	A	292	GLY	2.4
2	D	211	ASN	2.4
2	D	173	MET	2.3
2	C	207	ASP	2.2
2	C	193	LYS	2.1
1	A	276	VAL	2.1
1	B	62	TRP	2.1
1	A	277	ASN	2.1
1	A	359	ALA	2.0
1	A	314	LEU	2.0
1	A	315	ASP	2.0
2	D	212	ARG	2.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
3	E	53	ASP	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.