



# Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2016 – 07:07 PM EDT

PDB ID : 5HB1  
Title : Crystal structure of Chaetomium thermophilum Nup170 SOL  
Authors : Lin, D.H.; Hoelz, A.  
Deposited on : 2015-12-31  
Resolution : 4.01 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](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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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  
Mogul : unknown  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20027257  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20027257

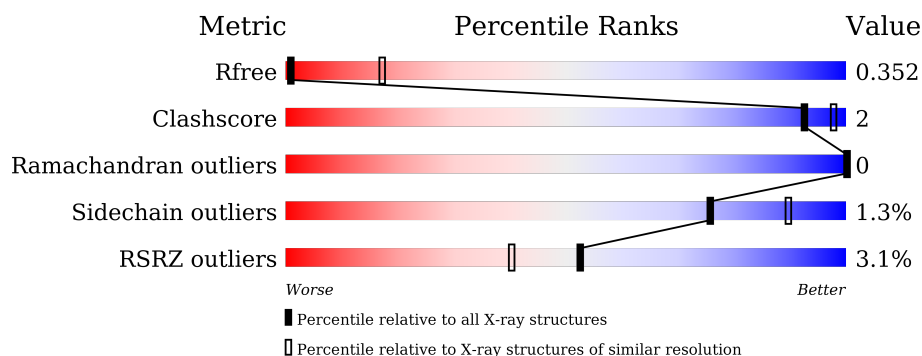
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 4.01 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))
$R_{free}$	91344	1010 (4.42-3.56)
Clashscore	102246	1052 (4.40-3.60)
Ramachandran outliers	100387	1005 (4.40-3.60)
Sidechain outliers	100360	1013 (4.42-3.58)
RSRZ outliers	91569	1013 (4.42-3.56)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	830	<div> <div>3%</div> <div>84%</div> <div>5%</div> <div>11%</div> </div>

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 11786 atoms, of which 5891 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 Nucleoporin NUP170.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	742	Total	C	H	N	O	S	0	0	0
			11786	3714	5891	1048	1117	16			

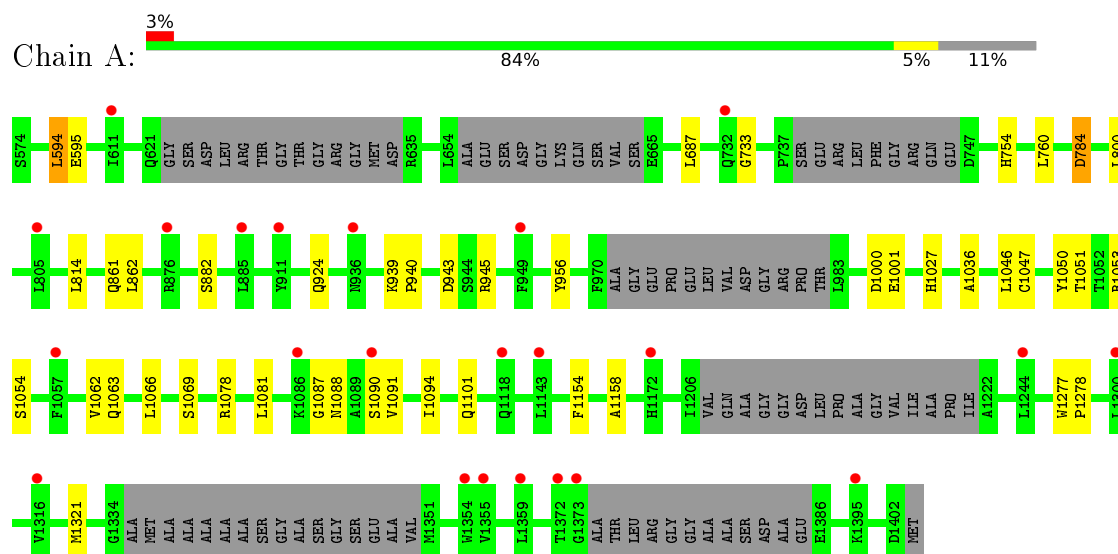
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	574	SER	-	expression tag	UNP G0S7B6

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

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Nucleoporin NUP170



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.07Å 138.62Å 89.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.00 – 4.01 42.49 – 4.01	Depositor EDS
% Data completeness (in resolution range)	75.0 (40.00-4.01) 75.0 (42.49-4.01)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.12 (at 4.00Å)	Xtriage
Refinement program	PHENIX (1.10.1 _2155: ???)	Depositor
R, $R_{free}$	0.303 , 0.352 0.300 , 0.352	Depositor DCC
$R_{free}$ test set	789 reflections (10.03%)	DCC
Wilson B-factor (Å <sup>2</sup> )	220.4	Xtriage
Anisotropy	0.103	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 168.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	11786	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	243.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.37% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.25	0/5992	0.38	0/8119

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	5895	5891	5885	23	0
All	All	5895	5891	5885	23	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 2.

All (23) 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:1069:SER:O	1:A:1078:ARG:NH1	2.33	0.62
1:A:594:LEU:HD23	1:A:595:GLU:N	2.25	0.52
1:A:1154:PHE:HA	1:A:1158:ALA:HB3	1.92	0.51
1:A:1063:GLN:OE1	1:A:1088:ASN:ND2	2.44	0.50
1:A:1050:TYR:O	1:A:1054:SER:N	2.45	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:784:ASP:OD1	1:A:784:ASP:N	2.46	0.48
1:A:1277:TRP:N	1:A:1278:PRO:CD	2.77	0.47
1:A:733:GLY:O	1:A:754:HIS:ND1	2.46	0.47
1:A:939:LYS:N	1:A:940:PRO:HD3	2.30	0.46
1:A:1090:SER:HA	1:A:1101:GLN:HE21	1.80	0.46
1:A:1046:LEU:HD11	1:A:1062:VAL:HG11	1.98	0.46
1:A:1066:LEU:HD23	1:A:1081:LEU:HD22	1.99	0.45
1:A:861:GLN:HB2	1:A:882:SER:HB3	1.99	0.44
1:A:1087:GLY:O	1:A:1091:VAL:HG13	2.18	0.44
1:A:1062:VAL:O	1:A:1066:LEU:N	2.49	0.43
1:A:1094:ILE:HD12	1:A:1094:ILE:N	2.34	0.43
1:A:1047:CYS:O	1:A:1051:THR:HG23	2.18	0.43
1:A:1046:LEU:HD12	1:A:1047:CYS:N	2.34	0.43
1:A:800:LEU:HD22	1:A:814:LEU:HD22	2.02	0.42
1:A:1036:ALA:CB	1:A:1046:LEU:HD23	2.49	0.42
1:A:956:TYR:OH	1:A:1000:ASP:OD1	2.28	0.41
1:A:1001:GLU:HB3	1:A:1027:HIS:NE2	2.36	0.41
1:A:943:ASP:OD2	1:A:945:ARG:NH2	2.54	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	726/830 (88%)	703 (97%)	23 (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	638/694 (92%)	630 (99%)	8 (1%)	76 90

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	594	LEU
1	A	687	LEU
1	A	760	LEU
1	A	784	ASP
1	A	862	LEU
1	A	924	GLN
1	A	1053	ARG
1	A	1321	MET

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

Mol	Chain	Res	Type
1	A	1101	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

There are no ligands in this entry.



## 5.7 Other polymers

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 ⓘ

### 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, 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	742/830 (89%)	0.22	23 (3%)	52 40	197, 218, 253, 265	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1244	LEU	4.1
1	A	1372	THR	4.1
1	A	1355	VAL	3.9
1	A	936	ASN	3.4
1	A	949	PHE	3.4
1	A	1395	LYS	3.1
1	A	1373	GLY	3.0
1	A	1086	LYS	2.6
1	A	611	ILE	2.6
1	A	885	LEU	2.5
1	A	1143	LEU	2.5
1	A	1359	LEU	2.5
1	A	911	TYR	2.5
1	A	1300	LEU	2.5
1	A	876	ARG	2.4
1	A	1354	TRP	2.4
1	A	1057	PHE	2.4
1	A	1316	VAL	2.3
1	A	1090	SER	2.2
1	A	732	GLN	2.2
1	A	1118	GLN	2.2
1	A	1172	HIS	2.1
1	A	805	LEU	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 carbohydrates 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.