Full wwPDB X-ray Structure Validation Report (i)

Oct 17, 2021 – 08:54 AM EDT

PDB ID	:	1K5J
Title	:	The Crystal Structure of Nucleoplasmin-Core
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Deposited on	:	2001-10-10
Resolution	:	2.30 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 (i) symbol.

The following versions of software and data (see references (i)) were used in the production of this report:

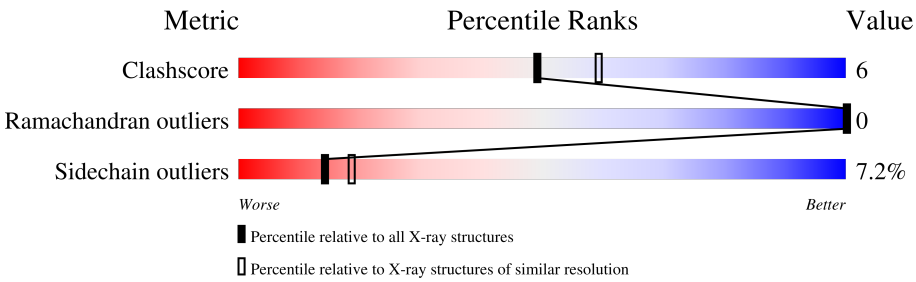
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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))
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)

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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	124	66% 10% 24%
1	B	124	59% 19% 23%
1	C	124	60% 11% • 28%
1	D	124	59% 13% • 27%
1	E	124	59% 15% • 25%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3627 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 Nucleoplasmin Core.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	94	713	462	118	129	4	0	0	0
1	B	96	720	464	119	133	4	0	0	0
1	C	89	671	435	110	122	4	0	0	0
1	D	90	677	438	111	124	4	0	0	0
1	E	93	699	453	115	127	4	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	27	ASN	ASP	engineered mutation	UNP P05221
A	61	HIS	ASN	engineered mutation	UNP P05221
B	27	ASN	ASP	engineered mutation	UNP P05221
B	61	HIS	ASN	engineered mutation	UNP P05221
C	27	ASN	ASP	engineered mutation	UNP P05221
C	61	HIS	ASN	engineered mutation	UNP P05221
D	27	ASN	ASP	engineered mutation	UNP P05221
D	61	HIS	ASN	engineered mutation	UNP P05221
E	27	ASN	ASP	engineered mutation	UNP P05221
E	61	HIS	ASN	engineered mutation	UNP P05221

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	32	32	32	0	0
2	B	32	32	32	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	C	29	29	29	0	0
			Total	O		
2	D	26	26	26	0	0
			Total	O		
2	E	28	28	28	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. 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. 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.

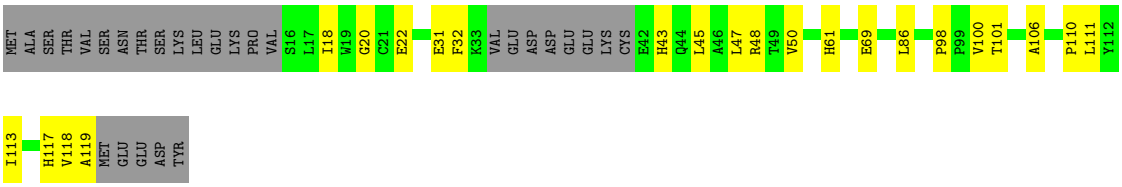
Note EDS was not executed.

• Molecule 1: Nucleoplasmin Core

Chain A: 66% 10% 24%

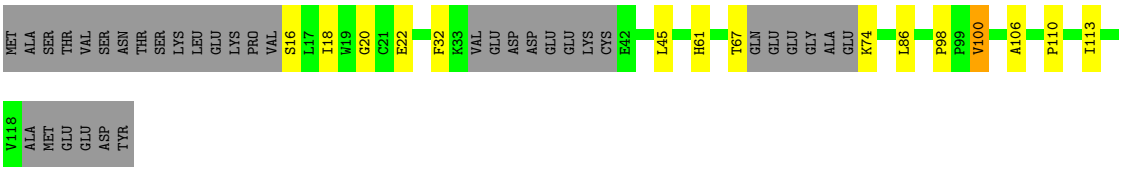
• Molecule 1: Nucleoplasmin Core

Chain B: 59% 19% 23%



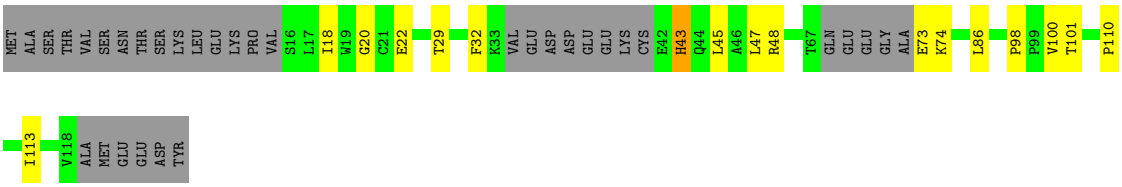
• Molecule 1: Nucleoplasmin Core

Chain C: 60% 11% • 28%



• Molecule 1: Nucleoplasmin Core

Chain D: 59% 13% • 27%



• Molecule 1: Nucleoplasmin Core

Chain E:

59%
15%
•
25%

MET ALA SER THR VAL SER ASN THR SER LYS LEU GLU LYS PRO V15 I18 W19 G20 C21 E22 E31 F32 K33 VAL GLU ASP ASP GLU GLU LYS CYS E42 H43 Q44 L45 R48 T67 Q68 GLU GLU GLY ALA E73 K74 L86 P98 P99 V100 P110 I113 V118

A119 MET GLU GLU ASP TYR

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	116.70Å 67.10Å 101.70Å 90.00° 123.30° 90.00°	Depositor
Resolution (Å)	50.00 – 2.30	Depositor
% Data completeness (in resolution range)	(Not available) (50.00-2.30)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 0.9	Depositor
R, R_{free}	0.219 , 0.252	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3627	wwPDB-VP
Average B, all atoms (Å^2)	39.0	wwPDB-VP

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	0.46	0/726	0.67	0/983
1	B	0.46	0/734	0.67	0/996
1	C	0.43	0/683	0.67	0/925
1	D	0.43	0/690	0.66	0/936
1	E	0.44	0/712	0.68	0/967
All	All	0.44	0/3545	0.67	0/4807

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	713	0	727	5	0
1	B	720	0	722	11	0
1	C	671	0	680	6	0
1	D	677	0	674	7	0
1	E	699	0	700	13	0
2	A	32	0	0	0	0
2	B	32	0	0	0	0
2	C	29	0	0	0	0
2	D	26	0	0	0	0
2	E	28	0	0	0	0
All	All	3627	0	3503	41	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 6.

All (41) 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:15:VAL:HB	1:E:119:ALA:O	1.95	0.67
1:D:43:HIS:ND1	1:D:43:HIS:N	2.46	0.64
1:E:32:PHE:CE2	1:E:98:PRO:HB3	2.33	0.63
1:E:67:THR:O	1:E:74:LYS:N	2.33	0.62
1:C:67:THR:O	1:C:74:LYS:N	2.33	0.60
1:A:31:GLU:CD	1:A:33:LYS:HE2	2.22	0.59
1:E:32:PHE:HD2	1:E:100:VAL:HG23	1.67	0.59
1:A:31:GLU:OE2	1:A:33:LYS:HE2	2.09	0.53
1:E:32:PHE:HE2	1:E:98:PRO:HD3	1.75	0.51
1:B:43:HIS:HD2	1:B:117:HIS:CE1	2.29	0.50
1:B:31:GLU:HG2	1:B:101:THR:HG23	1.94	0.49
1:C:22:GLU:OE1	1:C:110:PRO:HB3	2.13	0.48
1:D:22:GLU:OE1	1:D:110:PRO:HB3	2.14	0.47
1:A:22:GLU:OE1	1:A:110:PRO:HB3	2.14	0.47
1:E:32:PHE:O	1:E:99:PRO:HA	2.15	0.47
1:C:32:PHE:CE2	1:C:98:PRO:HB3	2.49	0.47
1:E:22:GLU:OE1	1:E:110:PRO:HB3	2.16	0.46
1:B:22:GLU:OE1	1:B:110:PRO:HB3	2.15	0.46
1:E:32:PHE:CD2	1:E:98:PRO:HB3	2.50	0.46
1:D:73:GLU:HG2	1:D:74:LYS:N	2.30	0.46
1:C:32:PHE:HD2	1:C:100:VAL:HG23	1.81	0.45
1:B:43:HIS:CD2	1:B:117:HIS:CE1	3.05	0.45
1:B:32:PHE:CE2	1:B:98:PRO:HB3	2.52	0.45
1:E:43:HIS:CD2	1:E:119:ALA:HB2	2.54	0.43
1:B:43:HIS:CD2	1:B:117:HIS:HE1	2.37	0.43
1:B:47:LEU:O	1:B:48:ARG:HD3	2.18	0.43
1:E:31:GLU:HG3	1:E:32:PHE:N	2.34	0.43
1:E:32:PHE:HD2	1:E:100:VAL:CG2	2.32	0.43
1:B:43:HIS:CD2	1:B:119:ALA:HB2	2.54	0.43
1:D:32:PHE:CE2	1:D:98:PRO:HB3	2.55	0.42
1:D:20:GLY:HA2	1:D:113:ILE:O	2.21	0.41
1:D:29:THR:HG23	1:D:101:THR:CG2	2.51	0.41
1:A:94:ILE:HG12	1:E:48:ARG:HG3	2.02	0.41
1:C:20:GLY:HA2	1:C:113:ILE:O	2.21	0.41
1:C:61:HIS:HA	1:C:106:ALA:O	2.21	0.41
1:B:50:VAL:HG13	1:B:111:LEU:HD21	2.03	0.41
1:E:20:GLY:HA2	1:E:113:ILE:O	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:61:HIS:HA	1:A:106:ALA:O	2.21	0.40
1:D:47:LEU:O	1:D:48:ARG:HD3	2.21	0.40
1:B:20:GLY:HA2	1:B:113:ILE:O	2.22	0.40
1:B:61:HIS:HA	1:B:106:ALA:O	2.21	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	88/124 (71%)	86 (98%)	2 (2%)	0	100	100
1	B	92/124 (74%)	89 (97%)	3 (3%)	0	100	100
1	C	83/124 (67%)	80 (96%)	3 (4%)	0	100	100
1	D	84/124 (68%)	81 (96%)	3 (4%)	0	100	100
1	E	87/124 (70%)	83 (95%)	4 (5%)	0	100	100
All	All	434/620 (70%)	419 (96%)	15 (4%)	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	78/109 (72%)	73 (94%)	5 (6%)	17	23

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	77/109 (71%)	71 (92%)	6 (8%)	12	16
1	C	73/109 (67%)	68 (93%)	5 (7%)	16	21
1	D	73/109 (67%)	68 (93%)	5 (7%)	16	21
1	E	75/109 (69%)	69 (92%)	6 (8%)	12	15
All	All	376/545 (69%)	349 (93%)	27 (7%)	14	18

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	SER
1	A	18	ILE
1	A	45	LEU
1	A	86	LEU
1	A	100	VAL
1	B	18	ILE
1	B	45	LEU
1	B	69	GLU
1	B	86	LEU
1	B	100	VAL
1	B	118	VAL
1	C	16	SER
1	C	18	ILE
1	C	45	LEU
1	C	86	LEU
1	C	100	VAL
1	D	18	ILE
1	D	43	HIS
1	D	45	LEU
1	D	86	LEU
1	D	100	VAL
1	E	18	ILE
1	E	44	GLN
1	E	45	LEU
1	E	86	LEU
1	E	100	VAL
1	E	118	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	43	HIS
1	A	117	HIS
1	B	43	HIS
1	B	44	GLN
1	B	117	HIS
1	D	117	HIS
1	E	43	HIS
1	E	44	GLN
1	E	117	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)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains (i)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.