Full wwPDB NMR Structure Validation Report (i)

Feb 14, 2022 – 10:09 AM EST

PDB ID	:	1J3D
Title	:	Solution structure of the C-terminal domain of the HMGB2
Authors	:	Kurita, J.; Shimahara, H.; Yoshida, M.; Tate, S.
Deposited on	:	2003-01-23

This is a Full wwPDB NMR 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/NMRValidationReportHelp
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:

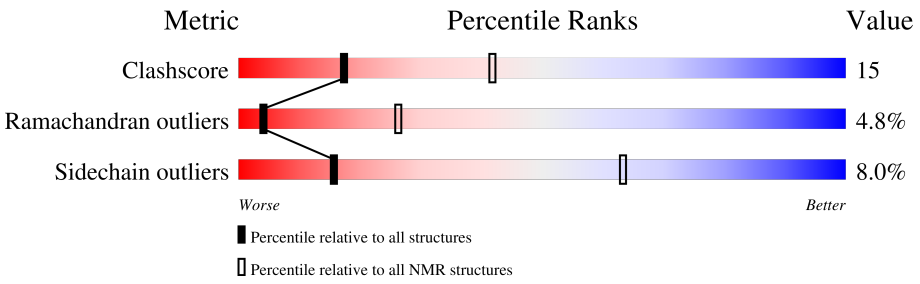
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.26
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.26

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
SOLUTION NMR

The overall completeness of chemical shifts assignment was not calculated.

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)	NMR archive (#Entries)
Clashscore	158937	12864
Ramachandran outliers	154571	11451
Sidechain outliers	154315	11428

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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%

Mol	Chain	Length	Quality of chain
1	A	78	44% 23% • 31%

2 Ensemble composition and analysis (i)

This entry contains 30 models. Model 9 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *lowest energy*.

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	**Residue range (total)**	**Backbone RMSD (Å)**	**Medoid model**
1	A:12-A:65 (54)	0.26	9

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 3 clusters. No single-model clusters were found.

Cluster number	Models
1	2, 3, 4, 7, 8, 9, 11, 12, 13, 14, 17, 19, 20, 21, 25, 28, 30
2	1, 6, 10, 15, 23, 24, 27, 29
3	5, 16, 18, 22, 26

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1271 atoms, of which 642 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called High mobility group protein 2.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	78	1271	400	642	111	115	3	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP P17741

4 Residue-property plots (i)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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 outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

• Molecule 1: High mobility group protein 2

Chain A: 44% 23% • 31%

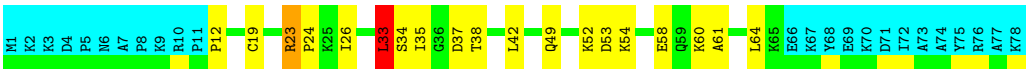
4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: High mobility group protein 2

Chain A: 45% 22% •• 31%



4.2.2 Score per residue for model 2

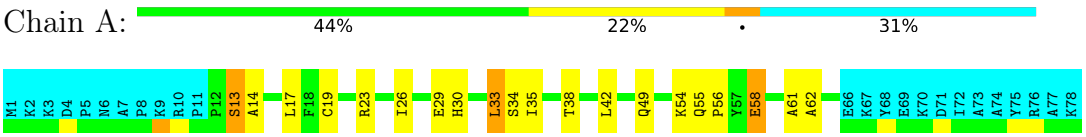
• Molecule 1: High mobility group protein 2

Chain A: 44% 21% 5% 31%

4.2.3 Score per residue for model 3

- Molecule 1: High mobility group protein 2

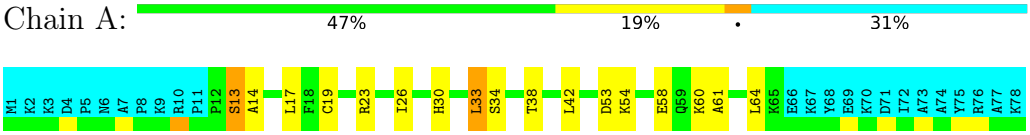
Chain A:



4.2.4 Score per residue for model 4

- Molecule 1: High mobility group protein 2

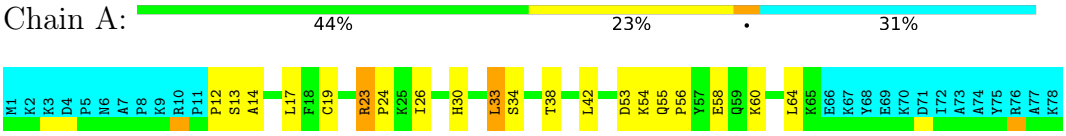
Chain A:



4.2.5 Score per residue for model 5

- Molecule 1: High mobility group protein 2

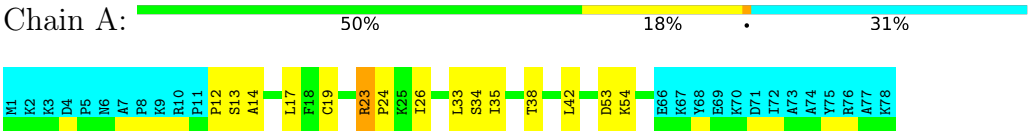
Chain A:



4.2.6 Score per residue for model 6

- Molecule 1: High mobility group protein 2

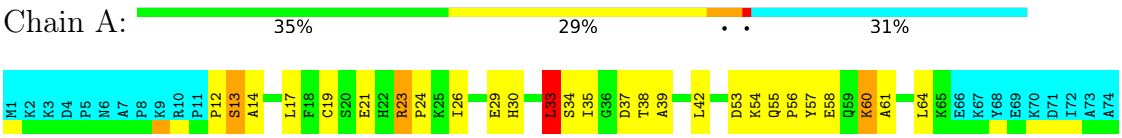
Chain A:



4.2.7 Score per residue for model 7

- Molecule 1: High mobility group protein 2

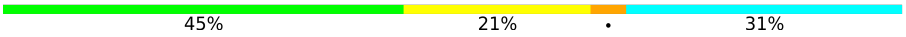
Chain A:

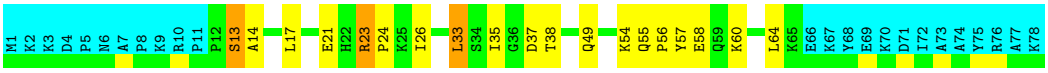


4.2.8 Score per residue for model 8

• Molecule 1: High mobility group protein 2

Chain A:

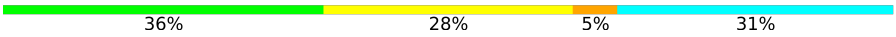




4.2.9 Score per residue for model 9 (medoid)

• Molecule 1: High mobility group protein 2

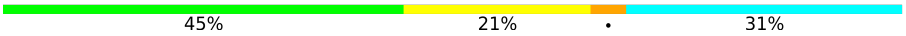
Chain A:

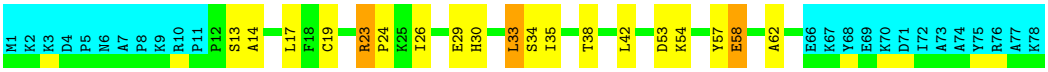


4.2.10 Score per residue for model 10

• Molecule 1: High mobility group protein 2

Chain A:

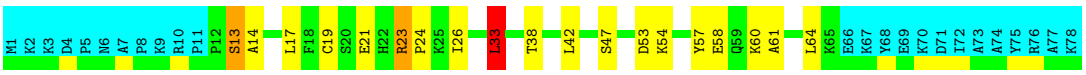




4.2.11 Score per residue for model 11

• Molecule 1: High mobility group protein 2

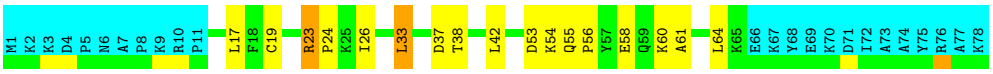
Chain A:



4.2.12 Score per residue for model 12

- Molecule 1: High mobility group protein 2

Chain A: 47% 19% • 31%



4.2.13 Score per residue for model 13

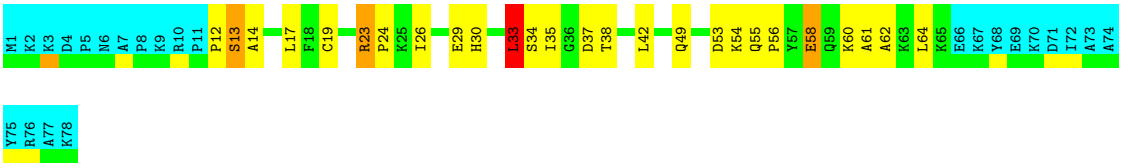
- Molecule 1: High mobility group protein 2

Chain A: 40% 23% 5% • 31%

4.2.14 Score per residue for model 14

- Molecule 1: High mobility group protein 2

Chain A: 36% 28% • • 31%



4.2.15 Score per residue for model 15

- Molecule 1: High mobility group protein 2

Chain A: 45% 22% • 31%

4.2.16 Score per residue for model 16

- Molecule 1: High mobility group protein 2

Chain A: 44% 19% 6% 31%

M1 K2 K3 D4 P5 N6 A7 P8 K9 R10 P11 F18 C19 S20 E21 H22 R23 P24 K25 I26 H30 L33 S34 I35 G36 D37 T38 L42 S47 E48 Q49 D53 K54 Y57 E58 Q59 K60 L64 K65 E66 K67 Y68 E69 K70 D71 I72 A73 A74 Y75 R76 A77 K78

4.2.17 Score per residue for model 17

- Molecule 1: High mobility group protein 2

Chain A: 42% 22% • • 31%

M1 K2 K3 D4 P5 N6 A7 P8 K9 R10 P11 P12 S13 A14 L17 F18 C19 R23 P24 K25 I26 E29 H30 L33 S34 I35 G36 D37 T38 L42 D53 K54 E58 Q59 K60 A61 A62 K63 L64 K65 E66 K67 Y68 E69 K70 D71 I72 A73 A74 Y75 R76 A77 K78

4.2.18 Score per residue for model 18

- Molecule 1: High mobility group protein 2

Chain A: 49% 17% • 31%

M1 K2 K3 D4 P5 N6 A7 P8 K9 R10 P11 P12 S13 A14 L17 F18 C19 R23 P24 K25 I26 H30 L33 T38 L42 D53 K54 E58 Q59 K60 L64 K65 E66 K67 Y68 E69 K70 D71 I72 A73 A74 Y75 R76 A77 K78

4.2.19 Score per residue for model 19

- Molecule 1: High mobility group protein 2

Chain A: 46% 18% • • 31%

M1 K2 K3 D4 P5 N6 A7 P8 K9 R10 P11 P12 S13 A14 L17 F18 C19 R23 P24 K25 I26 L33 S34 I35 G36 D37 T38 L42 K54 E58 Q59 K60 A61 L64 K65 E66 K67 Y68 E69 K70 D71 I72 A73 A74 Y75 R76 A77 K78

4.2.20 Score per residue for model 20

- Molecule 1: High mobility group protein 2

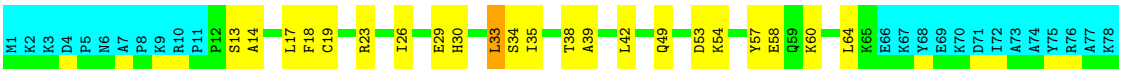
Chain A: 41% 24% • • 31%

M1 K2 K3 D4 P5 N6 A7 P8 K9 R10 P11 P12 S13 A14 F15 F16 L17 F18 C19 R23 P24 K25 I26 L33 S34 I35 G36 D37 T38 A39 L42 D53 K54 Q55 P56 Y57 E58 A61 A62 K63 E66 K67 Y68 E69 K70 D71 I72 A73 A74 Y75 R76 A77 K78

4.2.21 Score per residue for model 21

- Molecule 1: High mobility group protein 2

Chain A: 41% 27% • 31%



4.2.22 Score per residue for model 22

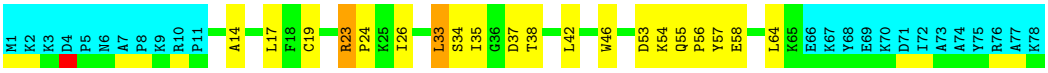
- Molecule 1: High mobility group protein 2

Chain A: 37% 29% • 31%

4.2.23 Score per residue for model 23

- Molecule 1: High mobility group protein 2

Chain A: 44% 23% • 31%



4.2.24 Score per residue for model 24

- Molecule 1: High mobility group protein 2

Chain A: 44% 24% • 31%

4.2.25 Score per residue for model 25

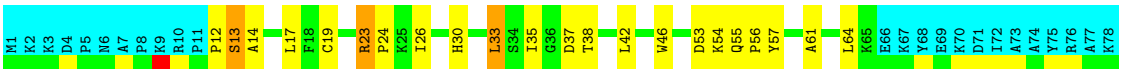
- Molecule 1: High mobility group protein 2

Chain A: 50% 17% • 31%

4.2.26 Score per residue for model 26

- Molecule 1: High mobility group protein 2

Chain A: 41% 24% • 31%



4.2.27 Score per residue for model 27

- Molecule 1: High mobility group protein 2

Chain A: 51% 15% •• 31%

4.2.28 Score per residue for model 28

- Molecule 1: High mobility group protein 2

Chain A: 36% 28% 5% 31%

4.2.29 Score per residue for model 29

- Molecule 1: High mobility group protein 2

Chain A: 44% 23% • 31%

4.2.30 Score per residue for model 30

- Molecule 1: High mobility group protein 2

Chain A: 35% 29% 5% 31%

5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *simulated annealing*.

Of the 100 calculated structures, 30 were deposited, based on the following criterion: *structures with the lowest energy*.

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
ARIA	structure solution	1.1
X-PLOR	refinement	3.851

No chemical shift data was provided.

6 Model quality (i)

6.1 Standard geometry (i)

There are no covalent bond-length or bond-angle outliers.

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	Planarity
1	A	0.0±0.0	1.0±0.0
All	All	0	30

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

All unique planar outliers are listed below.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	23	ARG	Sidechain	30

6.2 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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	429	431	431	13±3
All	All	12870	12930	12930	393

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 15.

All unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:26:ILE:HG21	1:A:38:THR:OG1	0.71	1.85	22	28
1:A:38:THR:O	1:A:42:LEU:HD13	0.69	1.87	3	21

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:33:LEU:HD12	1:A:38:THR:OG1	0.68	1.89	11	15
1:A:17:LEU:HD21	1:A:61:ALA:HB2	0.67	1.67	12	13
1:A:17:LEU:CD2	1:A:61:ALA:HB2	0.67	2.20	14	11
1:A:26:ILE:HG21	1:A:38:THR:CB	0.63	2.23	1	15
1:A:60:LYS:O	1:A:64:LEU:HD12	0.61	1.96	19	17
1:A:30:HIS:HB3	1:A:33:LEU:HD23	0.61	1.72	16	8
1:A:19:CYS:HA	1:A:42:LEU:HD23	0.61	1.72	12	28
1:A:13:SER:O	1:A:17:LEU:HD13	0.59	1.96	26	1
1:A:60:LYS:O	1:A:64:LEU:HD23	0.59	1.98	17	2
1:A:12:PRO:O	1:A:61:ALA:HB1	0.58	1.98	1	3
1:A:26:ILE:HG21	1:A:38:THR:HB	0.57	1.77	13	12
1:A:17:LEU:HD22	1:A:57:TYR:O	0.57	2.00	26	3
1:A:33:LEU:HD11	1:A:37:ASP:HB2	0.56	1.78	16	16
1:A:35:ILE:HD12	1:A:35:ILE:N	0.55	2.17	6	2
1:A:13:SER:O	1:A:14:ALA:HB3	0.54	2.02	4	23
1:A:35:ILE:O	1:A:35:ILE:HG22	0.53	2.03	15	20
1:A:12:PRO:HB2	1:A:17:LEU:HD11	0.53	1.79	15	5
1:A:58:GLU:O	1:A:62:ALA:HB2	0.52	2.04	13	9
1:A:17:LEU:HD12	1:A:17:LEU:N	0.51	2.20	21	10
1:A:33:LEU:HD13	1:A:34:SER:N	0.51	2.20	24	5
1:A:33:LEU:HD13	1:A:34:SER:O	0.50	2.07	24	1
1:A:17:LEU:HD22	1:A:17:LEU:N	0.48	2.22	25	8
1:A:17:LEU:HD23	1:A:61:ALA:HB2	0.48	1.86	14	1
1:A:60:LYS:HE2	1:A:64:LEU:HD11	0.47	1.86	7	1
1:A:35:ILE:O	1:A:39:ALA:HB2	0.47	2.10	21	7
1:A:35:ILE:O	1:A:39:ALA:HB3	0.46	2.11	30	1
1:A:23:ARG:N	1:A:24:PRO:CD	0.45	2.80	22	25
1:A:33:LEU:HD11	1:A:37:ASP:CB	0.45	2.42	30	4
1:A:33:LEU:C	1:A:33:LEU:HD13	0.44	2.32	6	1
1:A:23:ARG:N	1:A:24:PRO:HD2	0.44	2.28	24	23
1:A:23:ARG:NH1	1:A:35:ILE:HG23	0.43	2.29	24	1
1:A:17:LEU:CD2	1:A:17:LEU:N	0.43	2.82	20	2
1:A:55:GLN:N	1:A:56:PRO:HD2	0.42	2.29	30	10
1:A:18:PHE:CE1	1:A:49:GLN:OE1	0.42	2.73	16	2
1:A:29:GLU:C	1:A:30:HIS:CD2	0.41	2.94	22	7
1:A:17:LEU:HD23	1:A:57:TYR:HD1	0.41	1.75	26	1
1:A:21:GLU:OE2	1:A:57:TYR:CZ	0.41	2.74	2	9
1:A:55:GLN:N	1:A:56:PRO:CD	0.41	2.84	2	1
1:A:13:SER:O	1:A:14:ALA:CB	0.41	2.68	4	8
1:A:29:GLU:O	1:A:30:HIS:CG	0.41	2.74	3	2
1:A:17:LEU:HD22	1:A:57:TYR:HA	0.41	1.93	10	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:55:GLN:CB	1:A:56:PRO:CD	0.41	2.99	3	4
1:A:17:LEU:H	1:A:17:LEU:HD12	0.41	1.76	6	1
1:A:14:ALA:HB1	1:A:46:TRP:CZ2	0.40	2.51	26	2
1:A:17:LEU:N	1:A:17:LEU:CD1	0.40	2.84	21	1
1:A:17:LEU:HD11	1:A:61:ALA:HB2	0.40	1.93	19	1
1:A:15:PHE:CD1	1:A:15:PHE:O	0.40	2.75	20	1

6.3 Torsion angles (i)

6.3.1 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 PDB entries followed by that with respect to all NMR entries. 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	54/78 (69%)	41±2 (75±4%)	11±2 (20±4%)	3±1 (5±2%)	4 26
All	All	1620/2340 (69%)	1223 (75%)	320 (20%)	77 (5%)	4 26

All 6 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	54	LYS	30
1	A	13	SER	14
1	A	33	LEU	13
1	A	34	SER	13
1	A	12	PRO	5
1	A	17	LEU	2

6.3.2 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 PDB entries followed by that with respect to all NMR entries. 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	46/66 (70%)	42±1 (92±2%)	4±1 (8±2%)	16 63
All	All	1380/1980 (70%)	1270 (92%)	110 (8%)	16 63

All 15 unique residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	33	LEU	28
1	A	53	ASP	27
1	A	58	GLU	27
1	A	49	GLN	7
1	A	47	SER	5
1	A	64	LEU	4
1	A	37	ASP	3
1	A	54	LYS	2
1	A	52	LYS	1
1	A	60	LYS	1
1	A	63	LYS	1
1	A	28	SER	1
1	A	13	SER	1
1	A	25	LYS	1
1	A	21	GLU	1

6.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

6.5 Carbohydrates (i)

There are no monosaccharides in this entry.

6.6 Ligand geometry (i)

There are no ligands in this entry.

6.7 Other polymers (i)

There are no such molecules in this entry.

6.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

7 Chemical shift validation (i)

No chemical shift data were provided