Full wwPDB NMR Structure Validation Report (i)

Apr 26, 2016 – 02:55 PM BST

PDB ID	:	1J4M
Title	:	Minimized average structure of the 14-residue peptide RG-KWTY-NG-ITYE-GR (MBH12)
Authors	:	Pastor, M.T.; Lopez de la Paz, M.; Lacroix, E.; Serrano, L.; Perez-Paya, E.
Deposited on	:	2001-10-10

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
http://wwpdb.org/validation/2016/NMRValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

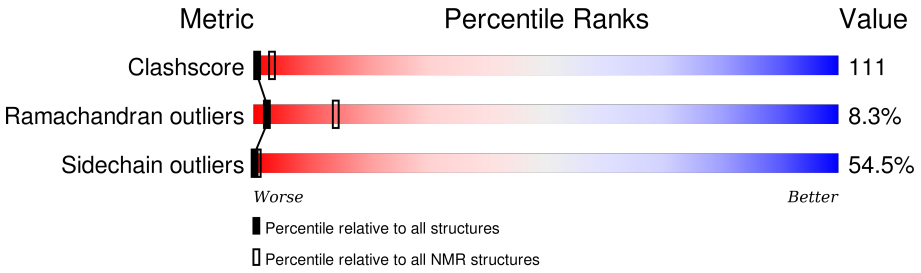
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20027457

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	114402	11133
Ramachandran outliers	111179	9975
Sidechain outliers	111093	9958

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	14	21% 14% 43% 21%

2 Ensemble composition and analysis

This entry contains 1 models. Identification of well-defined residues and clustering analysis are not possible.

3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 236 atoms, of which 115 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called MBH12.

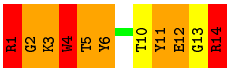
Mol	Chain	Residues	Atoms					Trace
1	A	14	Total	C	H	N	O	0
			236	76	115	23	22	

4 Residue-property plots (i)

These plots are provided for all protein, RNA and DNA 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: MBH12

Chain A:



5 Refinement protocol and experimental data overview

The models were refined using the following method: *simulated annealing combined with torsion angle dynamics (DYANA).*

Of the ? calculated structures, 1 were deposited, based on the following criterion: *?*.

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

Software name	Classification	Version
DYANA	structure solution	1.5
GROMOS	refinement	96

No chemical shift data was provided. No validations of the models with respect to experimental NMR restraints is performed at this time.

6 Model quality

6.1 Standard geometry

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 (average) 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	9.98	34/124 (27.4%)	11.21	48/164 (29.3%)
All	All	9.98	34/124 (27.4%)	11.21	48/164 (29.3%)

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	4
All	All	0	4

All bond outliers are listed below. They are sorted according to the Z-score.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	14	ARG	CZ-NH1	-47.64	0.71	1.33
1	A	1	ARG	CZ-NH1	-42.63	0.77	1.33
1	A	14	ARG	CZ-NH2	-39.46	0.81	1.33
1	A	1	ARG	CZ-NH2	-37.55	0.84	1.33
1	A	1	ARG	NE-CZ	-26.55	0.98	1.33
1	A	6	TYR	CE1-CZ	-23.54	1.07	1.38
1	A	6	TYR	CG-CD2	-19.42	1.14	1.39
1	A	12	GLU	CD-OE2	-18.38	1.05	1.25
1	A	14	ARG	NE-CZ	-17.95	1.09	1.33
1	A	6	TYR	CG-CD1	-17.44	1.16	1.39
1	A	6	TYR	CE2-CZ	-17.16	1.16	1.38
1	A	2	GLY	CA-C	-17.07	1.24	1.51
1	A	2	GLY	N-CA	-16.03	1.22	1.46
1	A	1	ARG	N-CA	-12.99	1.20	1.46
1	A	11	TYR	CG-CD2	-12.09	1.23	1.39
1	A	11	TYR	CE1-CZ	-11.80	1.23	1.38
1	A	11	TYR	CG-CD1	-10.82	1.25	1.39
1	A	11	TYR	CE2-CZ	-10.78	1.24	1.38

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	6	TYR	CD1-CE1	-9.56	1.25	1.39
1	A	6	TYR	CD2-CE2	-9.35	1.25	1.39
1	A	1	ARG	CA-CB	-9.27	1.33	1.53
1	A	12	GLU	CD-OE1	-8.35	1.16	1.25
1	A	1	ARG	C-N	-8.09	1.18	1.33
1	A	6	TYR	CZ-OH	-8.00	1.24	1.37
1	A	6	TYR	CB-CG	-7.64	1.40	1.51
1	A	1	ARG	CG-CD	-7.45	1.33	1.51
1	A	12	GLU	CG-CD	-7.16	1.41	1.51
1	A	1	ARG	CA-C	-6.96	1.34	1.52
1	A	4	TRP	CD2-CE2	-6.58	1.33	1.41
1	A	4	TRP	CG-CD1	-5.83	1.28	1.36
1	A	4	TRP	NE1-CE2	-5.81	1.29	1.37
1	A	14	ARG	CA-CB	-5.40	1.42	1.53
1	A	12	GLU	CA-CB	-5.20	1.42	1.53
1	A	14	ARG	CG-CD	-5.14	1.39	1.51

All angle outliers are listed below. They are sorted according to the Z-score.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	6	TYR	CB-CG-CD1	49.19	150.51	121.00
1	A	1	ARG	NE-CZ-NH1	48.42	144.51	120.30
1	A	1	ARG	NE-CZ-NH2	48.41	144.51	120.30
1	A	1	ARG	NH1-CZ-NH2	-44.07	70.93	119.40
1	A	6	TYR	CD1-CG-CD2	-32.13	82.55	117.90
1	A	6	TYR	CG-CD1-CE1	31.87	146.80	121.30
1	A	14	ARG	NE-CZ-NH1	29.16	134.88	120.30
1	A	6	TYR	CZ-CE2-CD2	24.02	141.42	119.80
1	A	14	ARG	NH1-CZ-NH2	-23.56	93.48	119.40
1	A	11	TYR	CB-CG-CD1	23.30	134.98	121.00
1	A	11	TYR	CD1-CG-CD2	-22.29	93.38	117.90
1	A	14	ARG	NE-CZ-NH2	20.65	130.62	120.30
1	A	6	TYR	CE1-CZ-CE2	-20.36	87.22	119.80
1	A	1	ARG	CA-C-N	-20.30	75.60	116.20
1	A	14	ARG	CG-CD-NE	-17.91	74.18	111.80
1	A	11	TYR	CB-CG-CD2	17.70	131.62	121.00
1	A	11	TYR	CG-CD1-CE1	17.66	135.43	121.30
1	A	14	ARG	CA-CB-CG	-17.14	75.70	113.40
1	A	11	TYR	CZ-CE2-CD2	16.98	135.08	119.80
1	A	1	ARG	CB-CA-C	16.38	143.16	110.40
1	A	11	TYR	CE1-CZ-CE2	-16.15	93.96	119.80
1	A	2	GLY	CA-C-O	-14.82	93.91	120.60

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	1	ARG	CG-CD-NE	-13.51	83.44	111.80
1	A	12	GLU	OE1-CD-OE2	-13.32	107.32	123.30
1	A	6	TYR	CG-CD2-CE2	13.29	131.94	121.30
1	A	14	ARG	CB-CG-CD	-13.08	77.59	111.60
1	A	12	GLU	CG-CD-OE1	13.03	144.36	118.30
1	A	11	TYR	CG-CD2-CE2	12.51	131.31	121.30
1	A	11	TYR	CD1-CE1-CZ	12.26	130.84	119.80
1	A	6	TYR	CD1-CE1-CZ	11.42	130.08	119.80
1	A	2	GLY	O-C-N	10.38	139.31	122.70
1	A	1	ARG	CB-CG-CD	-10.18	85.14	111.60
1	A	1	ARG	O-C-N	9.67	139.64	123.20
1	A	12	GLU	CB-CG-CD	-9.59	88.32	114.20
1	A	6	TYR	CB-CG-CD2	9.22	126.53	121.00
1	A	6	TYR	OH-CZ-CE2	8.93	144.22	120.10
1	A	1	ARG	CA-CB-CG	-8.68	94.30	113.40
1	A	4	TRP	CZ3-CH2-CZ2	-8.43	111.49	121.60
1	A	4	TRP	CD1-NE1-CE2	7.44	115.69	109.00
1	A	6	TYR	N-CA-CB	-7.10	97.82	110.60
1	A	12	GLU	CG-CD-OE2	-6.23	105.83	118.30
1	A	14	ARG	CB-CA-C	-6.23	97.94	110.40
1	A	4	TRP	CH2-CZ2-CE2	6.18	123.58	117.40
1	A	4	TRP	CB-CG-CD1	-6.08	119.09	127.00
1	A	1	ARG	N-CA-CB	-6.00	99.80	110.60
1	A	4	TRP	NE1-CE2-CD2	-5.74	101.56	107.30
1	A	11	TYR	OH-CZ-CE2	5.71	135.50	120.10
1	A	4	TRP	CB-CG-CD2	5.04	133.15	126.60

There are no chirality outliers.

All planar outliers are listed below.

Mol	Chain	Res	Type	Group
1	A	2	GLY	Mainchain,Peptide
1	A	1	ARG	Sidechain,Mainchain

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	121	115	114	26
All	All	121	115	114	26

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 111.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:1:ARG:NH1	1:A:1:ARG:NE	1.37	1.67
1:A:14:ARG:NE	1:A:14:ARG:NH1	1.36	1.67
1:A:14:ARG:NE	1:A:14:ARG:NH2	1.35	1.74
1:A:1:ARG:NH2	1:A:1:ARG:NE	1.29	1.73
1:A:14:ARG:CD	1:A:14:ARG:NH1	0.79	2.46
1:A:1:ARG:CZ	1:A:1:ARG:HH21	0.76	1.47
1:A:1:ARG:CZ	1:A:1:ARG:HH22	0.75	1.47
1:A:14:ARG:CZ	1:A:14:ARG:HH21	0.74	1.45
1:A:14:ARG:CZ	1:A:14:ARG:HH22	0.74	1.45
1:A:1:ARG:CZ	1:A:1:ARG:HH12	0.70	1.41
1:A:1:ARG:CZ	1:A:1:ARG:HH11	0.69	1.41
1:A:1:ARG:CZ	1:A:1:ARG:NH2	0.68	0.84
1:A:1:ARG:CZ	1:A:1:ARG:NH1	0.67	0.77
1:A:14:ARG:CZ	1:A:14:ARG:NH2	0.66	0.81
1:A:14:ARG:HH12	1:A:14:ARG:CZ	0.66	1.36
1:A:3:LYS:HG3	1:A:12:GLU:CG	0.66	2.20
1:A:14:ARG:HH11	1:A:14:ARG:CZ	0.65	1.36
1:A:14:ARG:CZ	1:A:14:ARG:NH1	0.64	0.71
1:A:3:LYS:HG3	1:A:12:GLU:HG2	0.64	1.70
1:A:1:ARG:HG2	1:A:1:ARG:O	0.61	1.95
1:A:4:TRP:CE3	1:A:11:TYR:CB	0.55	2.90
1:A:4:TRP:N	1:A:4:TRP:CD1	0.52	2.77
1:A:14:ARG:HH11	1:A:14:ARG:CD	0.47	2.13
1:A:4:TRP:O	1:A:11:TYR:N	0.42	2.51
1:A:4:TRP:CE3	1:A:11:TYR:HB3	0.41	2.50
1:A:5:THR:CG2	1:A:10:THR:HA	0.40	2.47

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	12/14 (86%)	10 (83%)	1 (8%)	1 (8%)	2 14
All	All	12/14 (86%)	10 (83%)	1 (8%)	1 (8%)	2 14

All 1 Ramachandran outliers are listed below.

Mol	Chain	Res	Type
1	A	13	GLY

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	11/11 (100%)	5 (45%)	6 (55%)	0 1
All	All	11/11 (100%)	5 (45%)	6 (55%)	0 1

All 6 residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	3	LYS
1	A	5	THR
1	A	1	ARG
1	A	6	TYR
1	A	14	ARG
1	A	4	TRP

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

There are no carbohydrates in this entry.

6.6 Ligand geometry

There are no ligands in this entry.

6.7 Other polymers

There are no such molecules in this entry.

6.8 Polymer linkage issues

There are no chain breaks in this entry.

7 Chemical shift validation

No chemical shift data were provided