Full wwPDB NMR Structure Validation Report (i)

Mar 13, 2021 – 09:01 am GMT

PDB ID	:	6TT8
Title	:	Haddock model of NDM-1/morin complex
Authors	:	Riviere, G.; Oueslati, S.; Gayral, M.; Crechet, J.B.; Nhiri, N.; Jacquet, E.; Cintrat, J.C.; Giraud, F.; van Heijenoort, C.; Lescop, E.; Pethe, S.; Iorga, B.I.; Naas, T.; Guittet, E.; Morellet, N.
Deposited on	:	2019-12-25

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 (1)) were used in the production of this report:

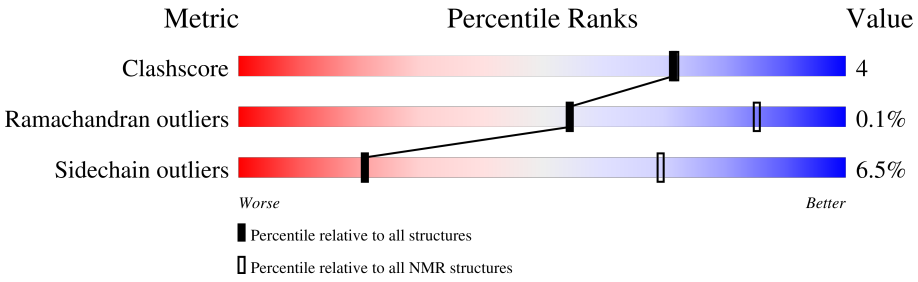
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.17.1
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.17.1

1 Overall quality at a glance

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

The overall completeness of chemical shifts assignment is 39%.

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	227	85% 8% 7%

2 Ensemble composition and analysis

This entry contains 56 models. Model 11 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *closest to the average*.

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:49-A:65, A:73-A:267 (212)	0.18	11

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 6 clusters and 3 single-model clusters were found.

Cluster number	Models
1	10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33
2	34, 35, 36, 37, 38, 39, 40, 41
3	2, 3, 4, 6, 7, 8, 9
4	1, 42, 43, 44, 45, 46, 48
5	49, 50, 51, 53, 56
6	52, 55
Single-model clusters	5; 47; 54

3 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3352 atoms, of which 1641 are hydrogens and 0 are deuteriums.

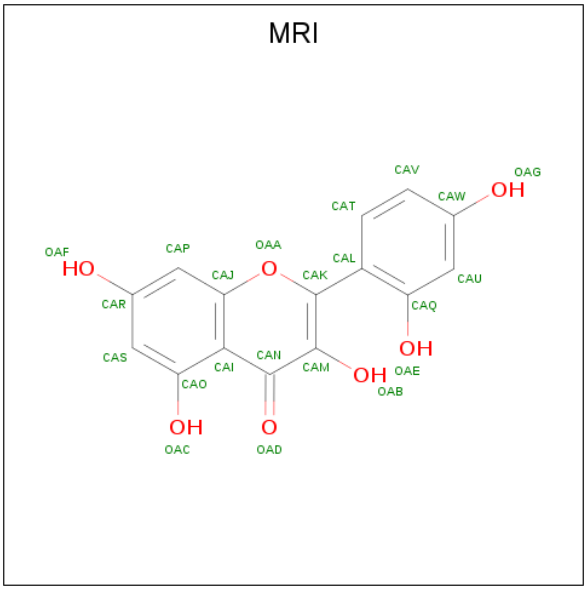
- Molecule 1 is a protein called Metallo beta lactamase NDM-1.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	227	3323	1061	1636	298	320	8	0

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	
			Total	Zn
2	A	2	2	2

- Molecule 3 is 2-[2,4-bis(oxidanyl)phenyl]-3,5,7-tris(oxidanyl)chromen-4-one (three-letter code: MRI) (formula: $C_{15}H_{10}O_7$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			
			Total	C	H	O
3	A	1	27	15	5	7

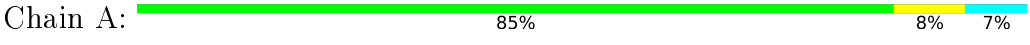
4 Residue-property plots

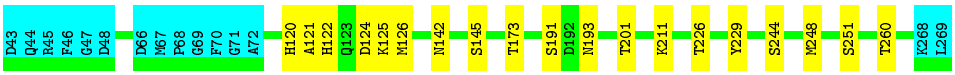
4.1 Average score per residue in the NMR ensemble

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: Metallo beta lactamase NDM-1

Chain A:





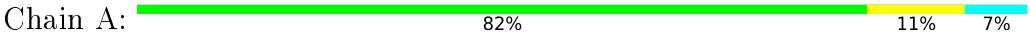
4.2 Scores per residue for each member of the ensemble

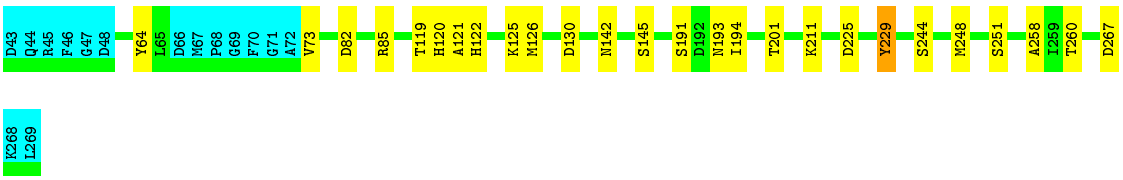
Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: Metallo beta lactamase NDM-1

Chain A:

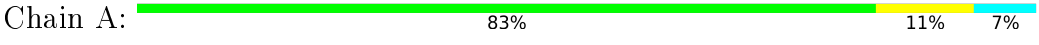


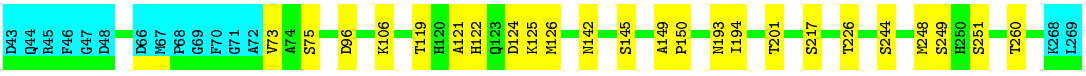


4.2.2 Score per residue for model 2

• Molecule 1: Metallo beta lactamase NDM-1

Chain A:

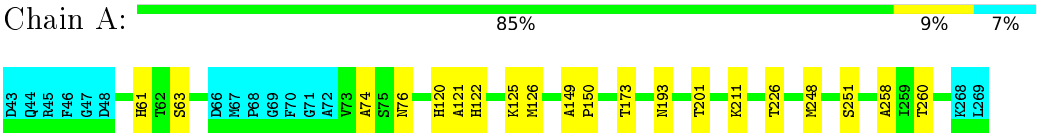




4.2.3 Score per residue for model 3

• Molecule 1: Metallo beta lactamase NDM-1

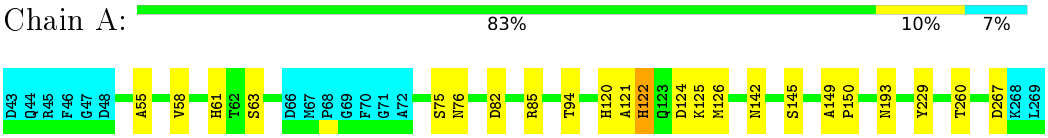
Chain A:



4.2.4 Score per residue for model 4

• Molecule 1: Metallo beta lactamase NDM-1

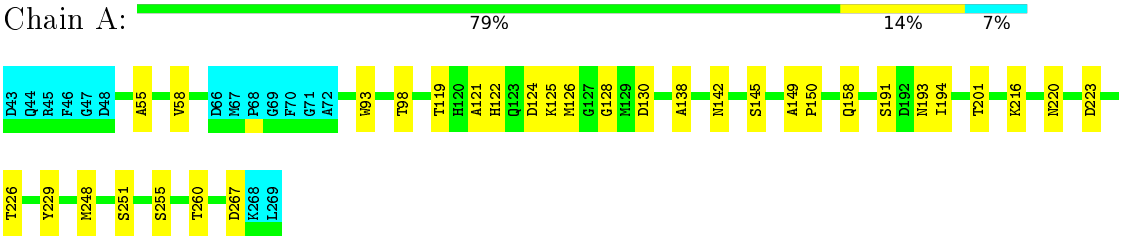
Chain A:



4.2.5 Score per residue for model 5

• Molecule 1: Metallo beta lactamase NDM-1

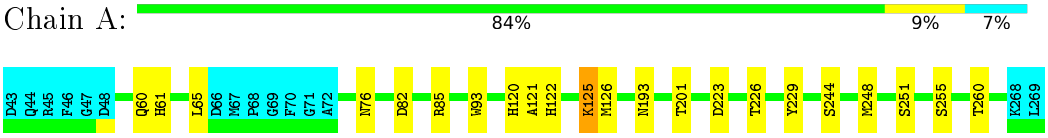
Chain A:



4.2.6 Score per residue for model 6

• Molecule 1: Metallo beta lactamase NDM-1

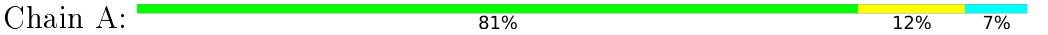
Chain A:

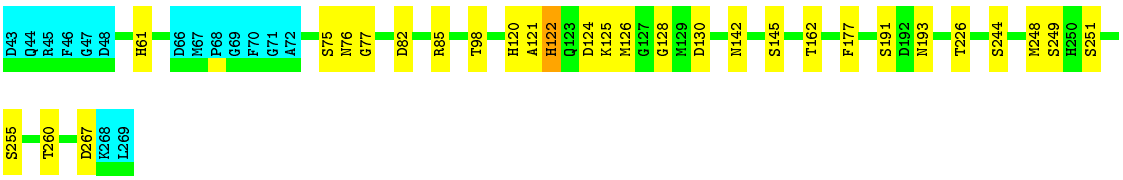


4.2.7 Score per residue for model 7

• Molecule 1: Metallo beta lactamase NDM-1

Chain A:

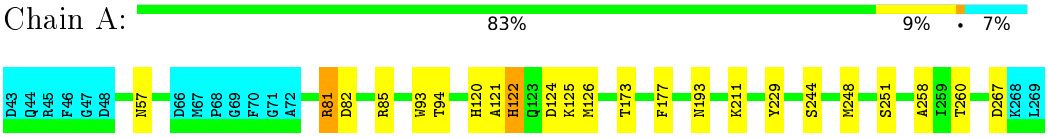




4.2.8 Score per residue for model 8

- Molecule 1: Metallo beta lactamase NDM-1

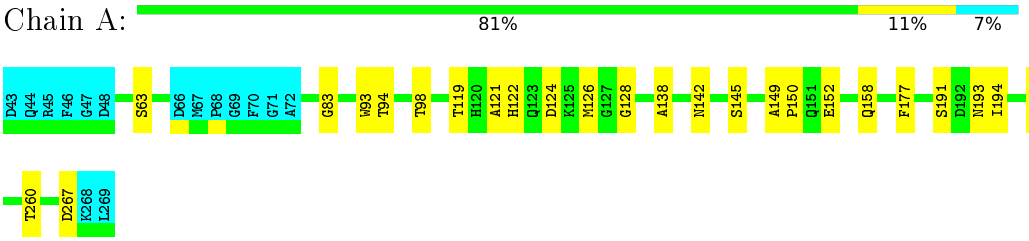
Chain A:



4.2.9 Score per residue for model 9

- Molecule 1: Metallo beta lactamase NDM-1

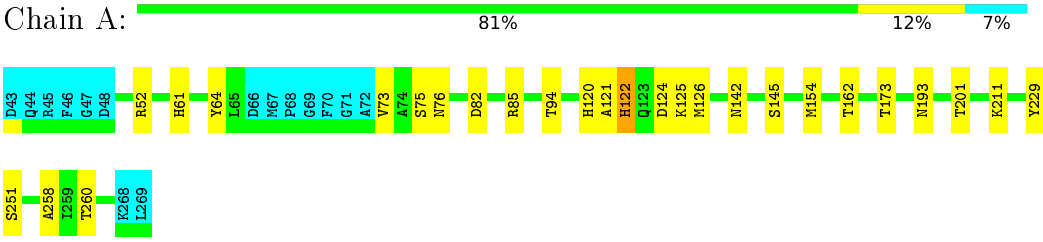
Chain A:



4.2.10 Score per residue for model 10

- Molecule 1: Metallo beta lactamase NDM-1

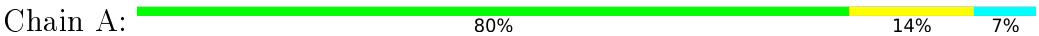
Chain A:

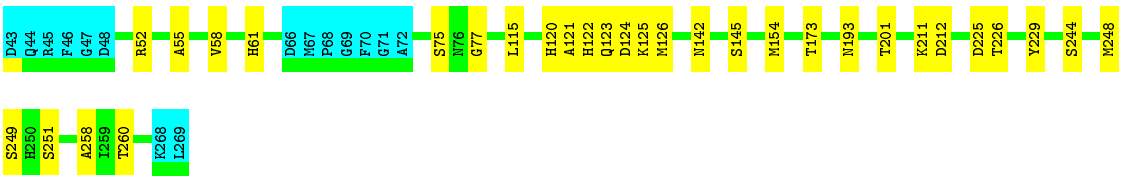


4.2.11 Score per residue for model 11 (medoid)

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

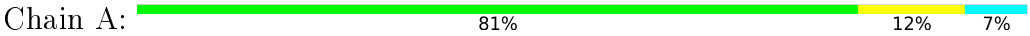


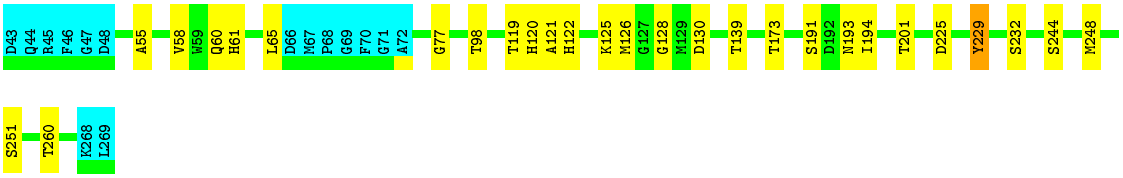


4.2.12 Score per residue for model 12

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

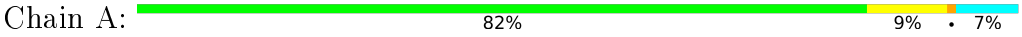


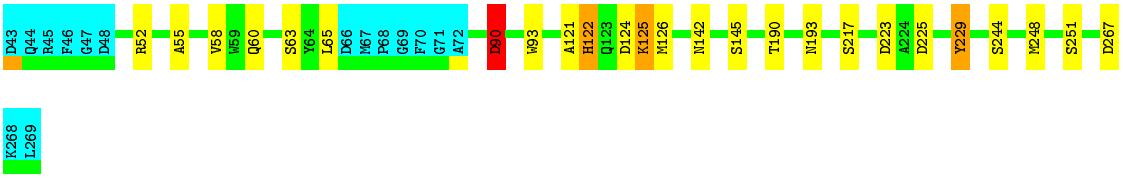


4.2.13 Score per residue for model 13

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

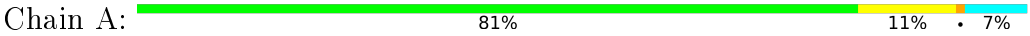


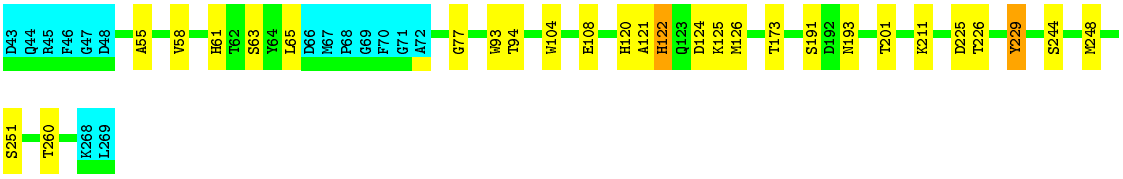


4.2.14 Score per residue for model 14

- Molecule 1: Metallo beta lactamase NDM-1

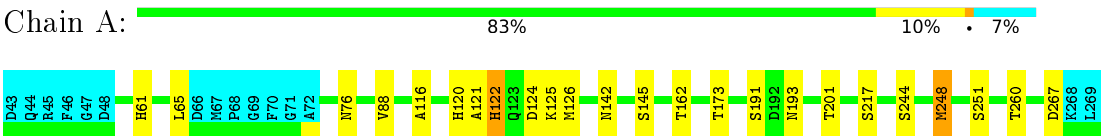
Chain A:





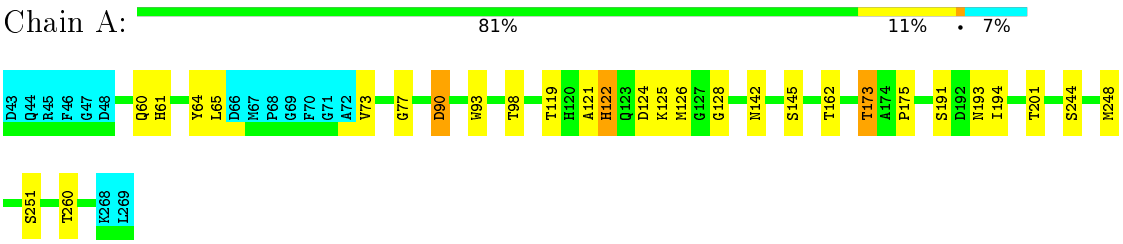
4.2.15 Score per residue for model 15

- Molecule 1: Metallo beta lactamase NDM-1



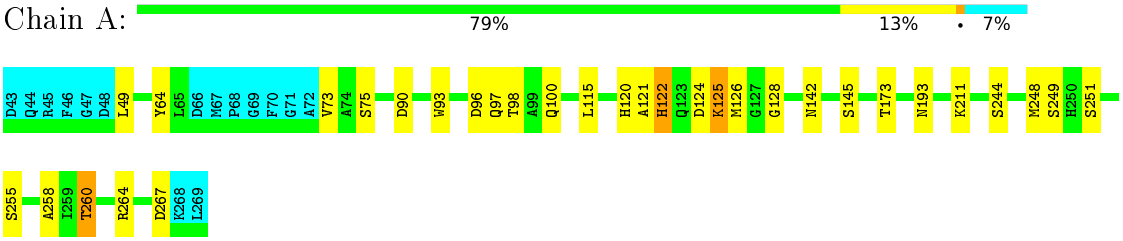
4.2.16 Score per residue for model 16

- Molecule 1: Metallo beta lactamase NDM-1



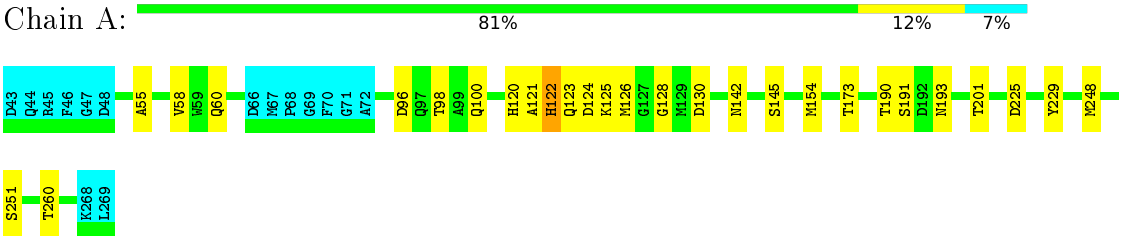
4.2.17 Score per residue for model 17

- Molecule 1: Metallo beta lactamase NDM-1



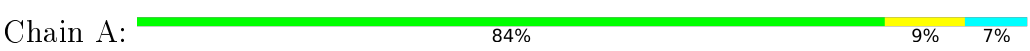
4.2.18 Score per residue for model 18

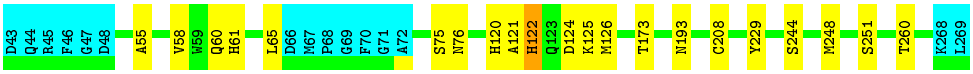
- Molecule 1: Metallo beta lactamase NDM-1



4.2.19 Score per residue for model 19

- Molecule 1: Metallo beta lactamase NDM-1

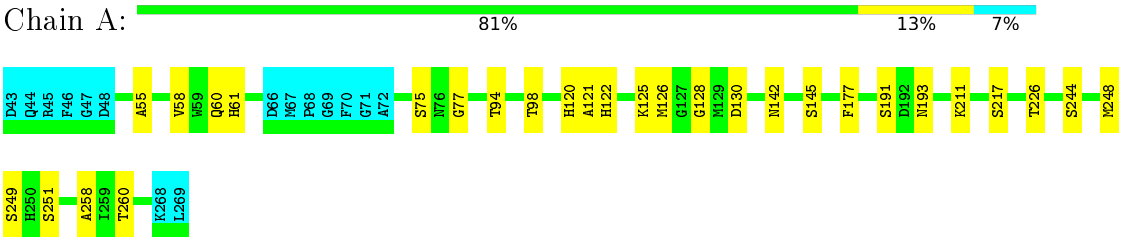




4.2.20 Score per residue for model 20

• Molecule 1: Metallo beta lactamase NDM-1

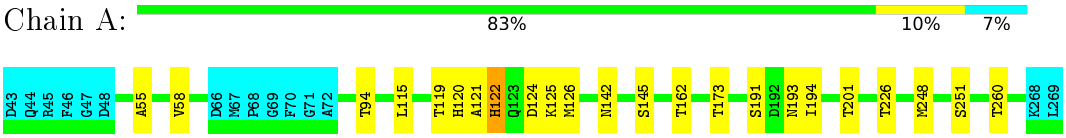
Chain A:



4.2.21 Score per residue for model 21

• Molecule 1: Metallo beta lactamase NDM-1

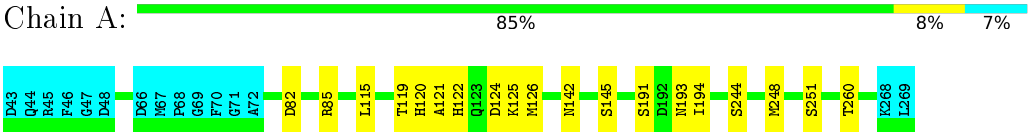
Chain A:



4.2.22 Score per residue for model 22

• Molecule 1: Metallo beta lactamase NDM-1

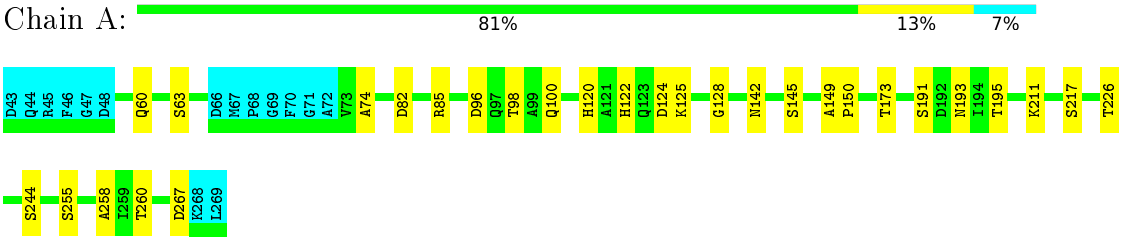
Chain A:



4.2.23 Score per residue for model 23

• Molecule 1: Metallo beta lactamase NDM-1

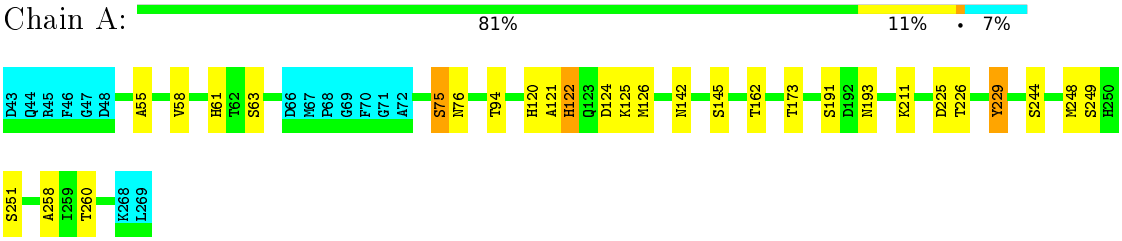
Chain A:



4.2.24 Score per residue for model 24

• Molecule 1: Metallo beta lactamase NDM-1

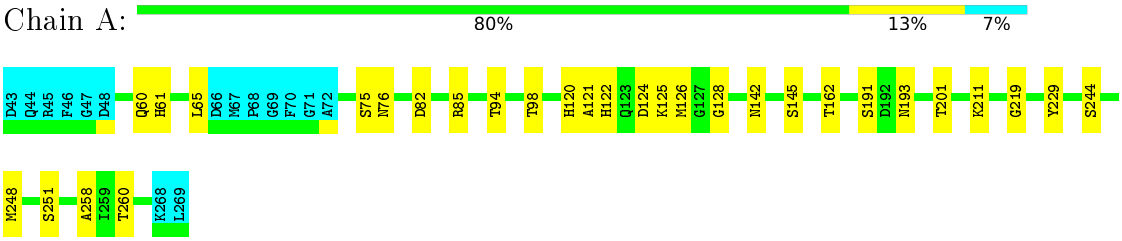
Chain A:



4.2.25 Score per residue for model 25

• Molecule 1: Metallo beta lactamase NDM-1

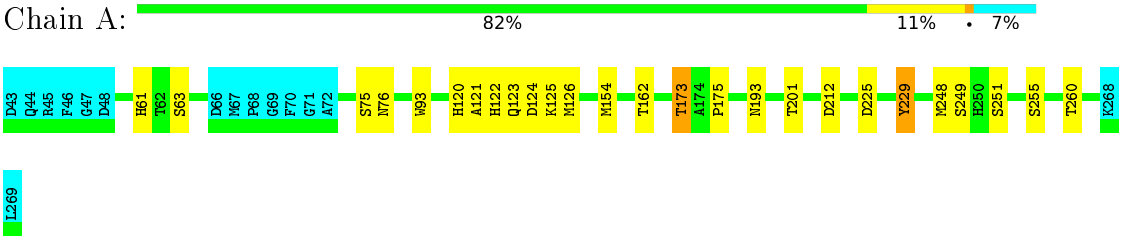
Chain A:



4.2.26 Score per residue for model 26

• Molecule 1: Metallo beta lactamase NDM-1

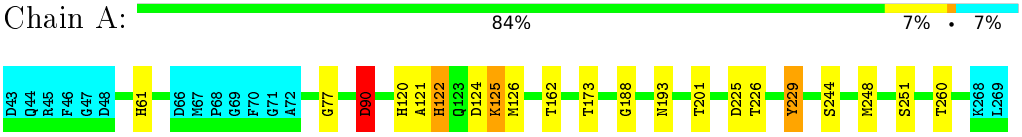
Chain A:



4.2.27 Score per residue for model 27

• Molecule 1: Metallo beta lactamase NDM-1

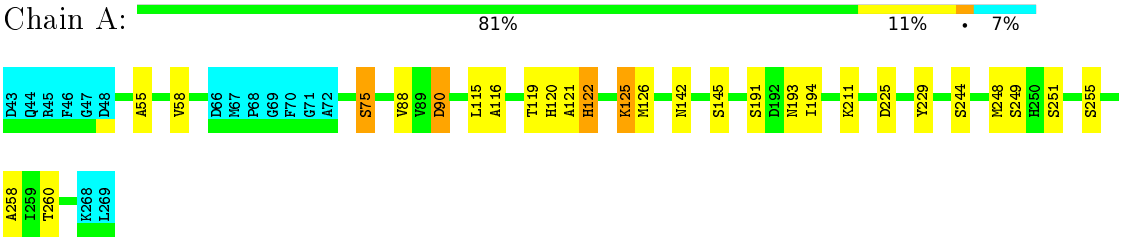
Chain A:



4.2.28 Score per residue for model 28

• Molecule 1: Metallo beta lactamase NDM-1

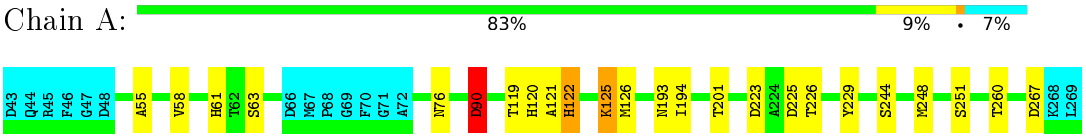
Chain A:



4.2.29 Score per residue for model 29

• Molecule 1: Metallo beta lactamase NDM-1

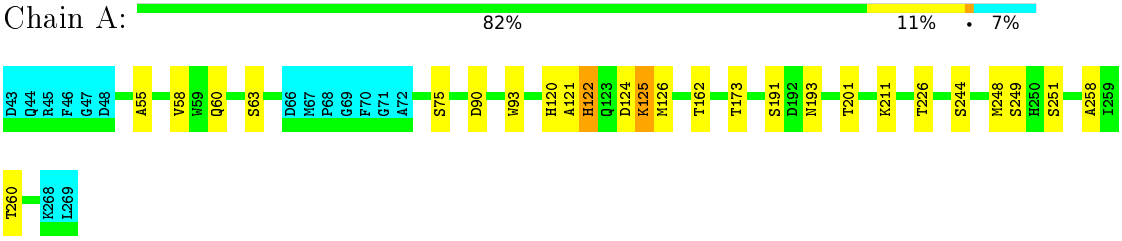
Chain A:



4.2.30 Score per residue for model 30

• Molecule 1: Metallo beta lactamase NDM-1

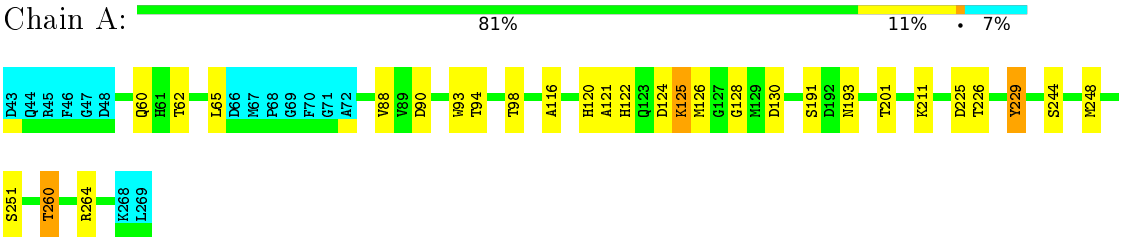
Chain A:



4.2.31 Score per residue for model 31

• Molecule 1: Metallo beta lactamase NDM-1

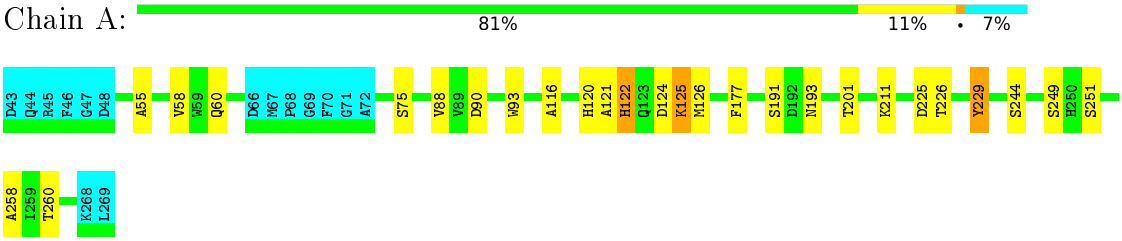
Chain A:



4.2.32 Score per residue for model 32

• Molecule 1: Metallo beta lactamase NDM-1

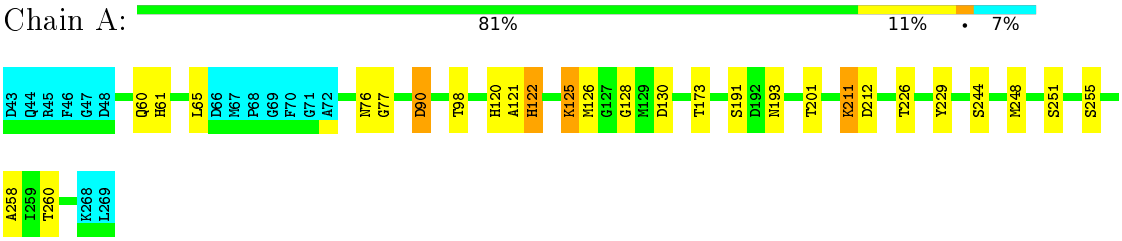
Chain A:



4.2.33 Score per residue for model 33

• Molecule 1: Metallo beta lactamase NDM-1

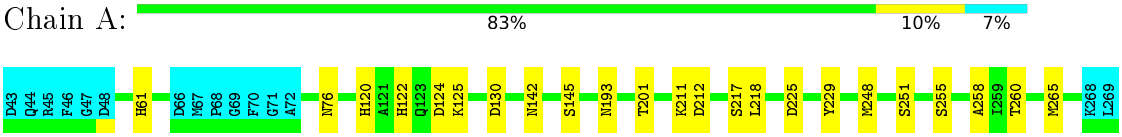
Chain A:



4.2.34 Score per residue for model 34

• Molecule 1: Metallo beta lactamase NDM-1

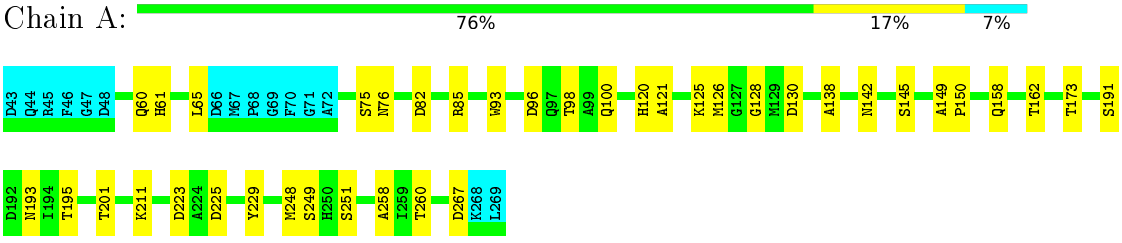
Chain A:



4.2.35 Score per residue for model 35

• Molecule 1: Metallo beta lactamase NDM-1

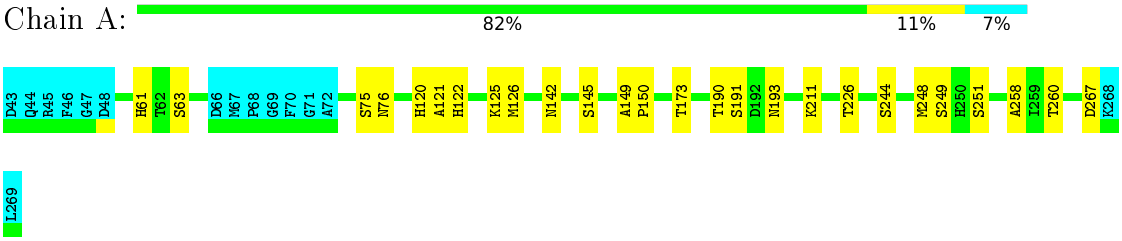
Chain A:



4.2.36 Score per residue for model 36

• Molecule 1: Metallo beta lactamase NDM-1

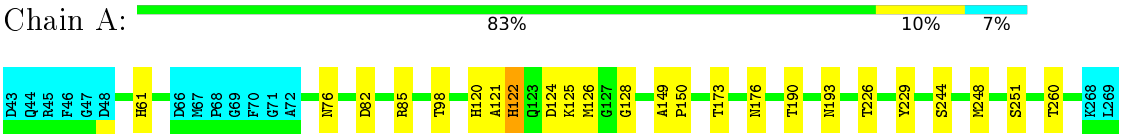
Chain A:



4.2.37 Score per residue for model 37

• Molecule 1: Metallo beta lactamase NDM-1

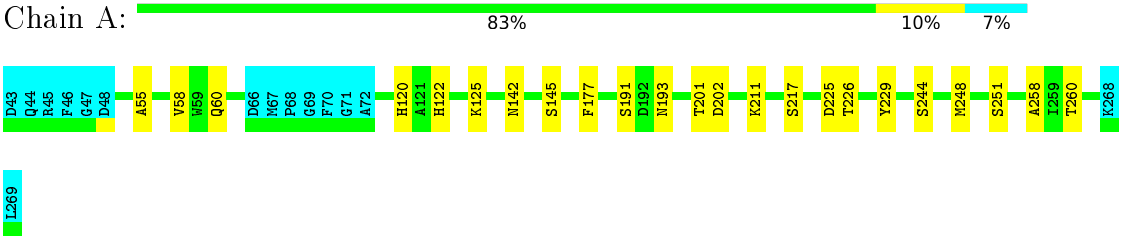
Chain A:



4.2.38 Score per residue for model 38

• Molecule 1: Metallo beta lactamase NDM-1

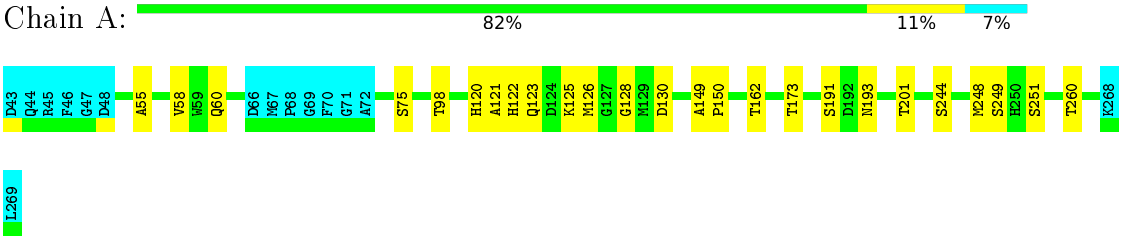
Chain A:



4.2.39 Score per residue for model 39

• Molecule 1: Metallo beta lactamase NDM-1

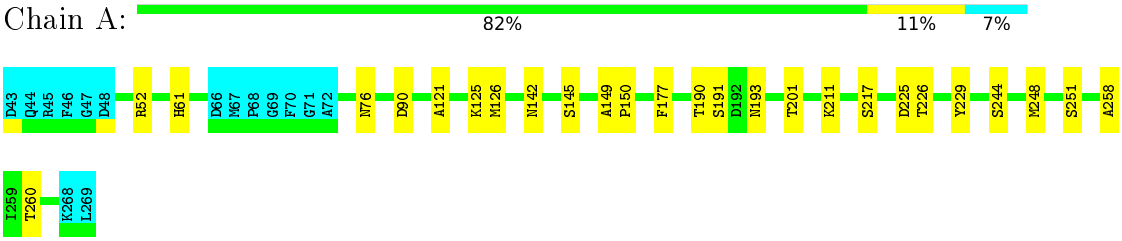
Chain A:



4.2.40 Score per residue for model 40

• Molecule 1: Metallo beta lactamase NDM-1

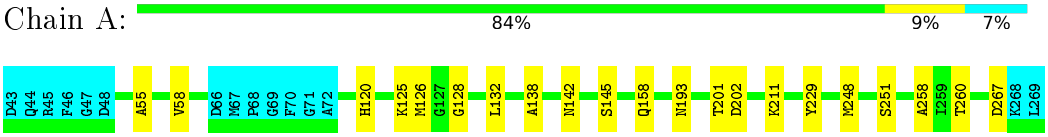
Chain A:



4.2.41 Score per residue for model 41

• Molecule 1: Metallo beta lactamase NDM-1

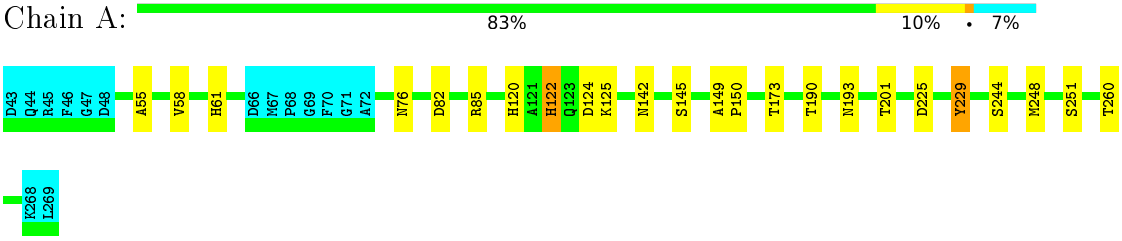
Chain A:



4.2.42 Score per residue for model 42

• Molecule 1: Metallo beta lactamase NDM-1

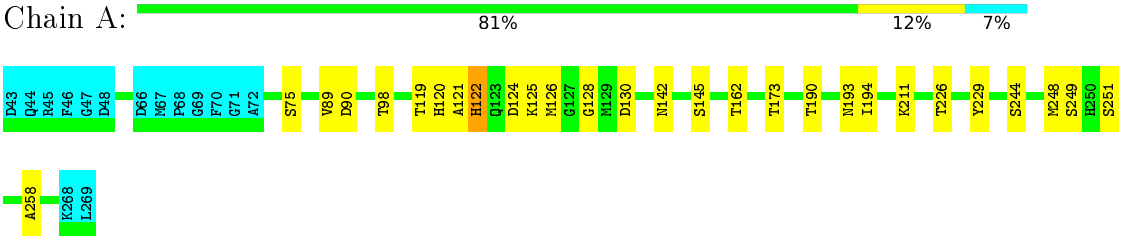
Chain A:



4.2.43 Score per residue for model 43

• Molecule 1: Metallo beta lactamase NDM-1

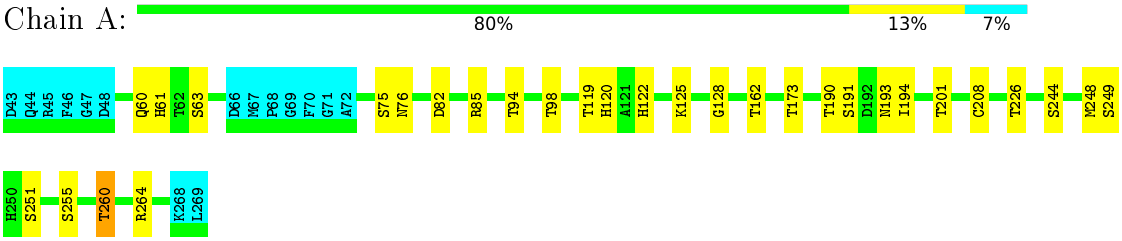
Chain A:



4.2.44 Score per residue for model 44

• Molecule 1: Metallo beta lactamase NDM-1

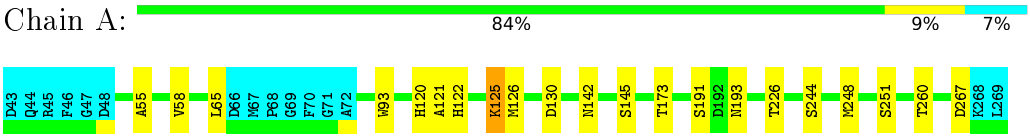
Chain A:



4.2.45 Score per residue for model 45

• Molecule 1: Metallo beta lactamase NDM-1

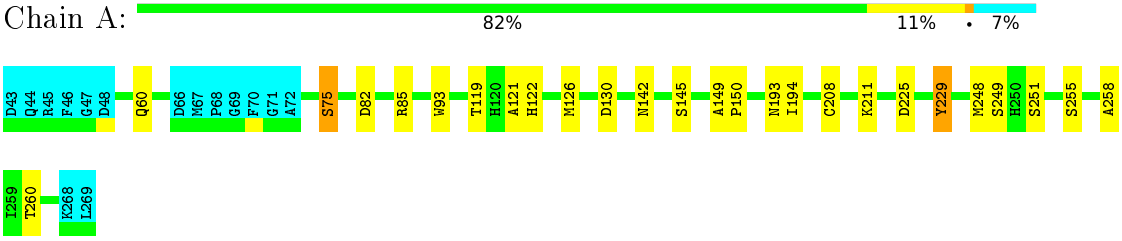
Chain A:



4.2.46 Score per residue for model 46

• Molecule 1: Metallo beta lactamase NDM-1

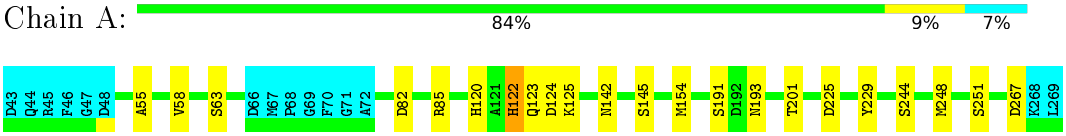
Chain A:



4.2.47 Score per residue for model 47

• Molecule 1: Metallo beta lactamase NDM-1

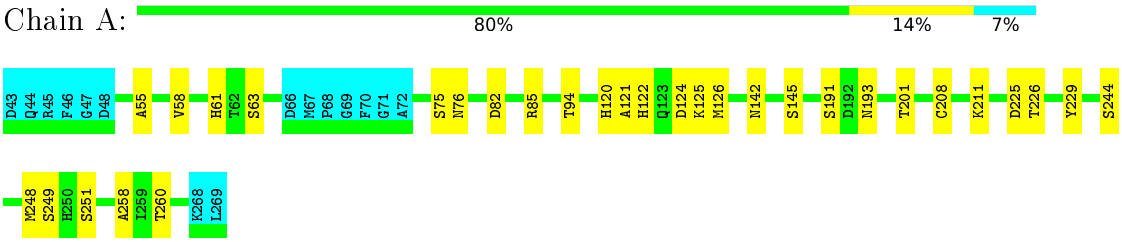
Chain A:



4.2.48 Score per residue for model 48

• Molecule 1: Metallo beta lactamase NDM-1

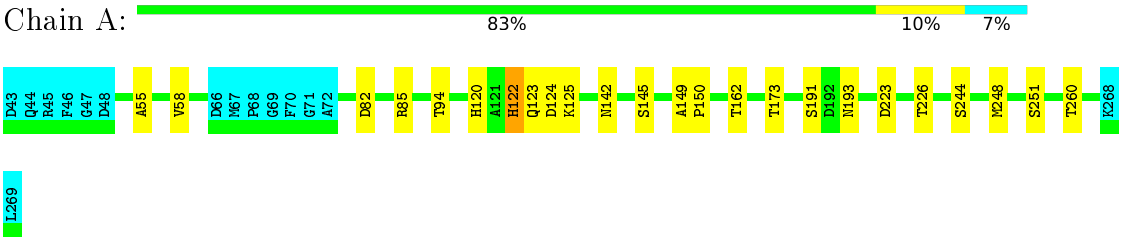
Chain A:



4.2.49 Score per residue for model 49

- Molecule 1: Metallo beta lactamase NDM-1

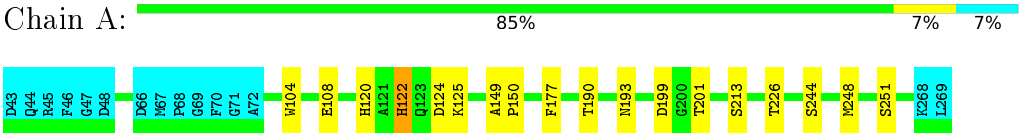
Chain A:



4.2.50 Score per residue for model 50

- Molecule 1: Metallo beta lactamase NDM-1

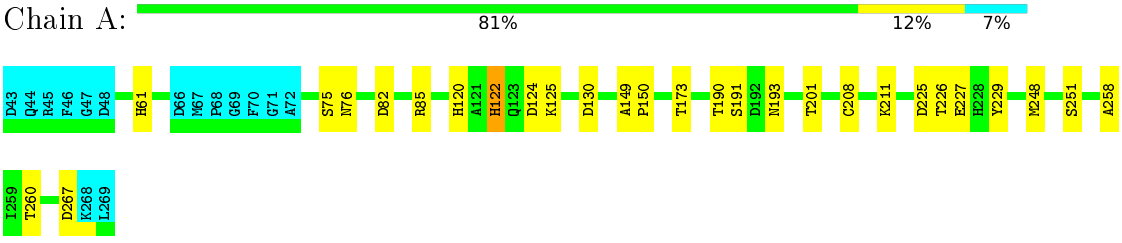
Chain A:



4.2.51 Score per residue for model 51

- Molecule 1: Metallo beta lactamase NDM-1

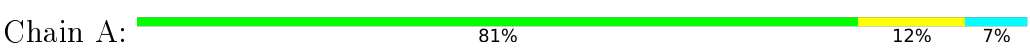
Chain A:

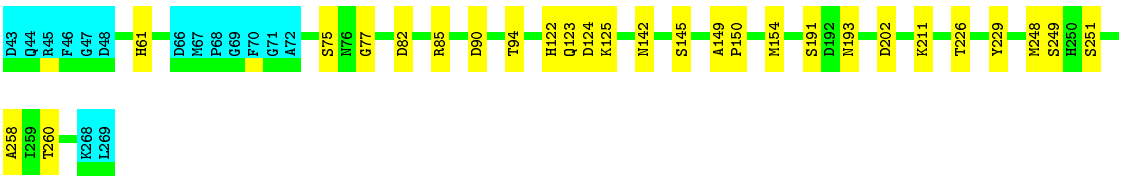


4.2.52 Score per residue for model 52

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

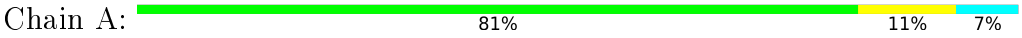


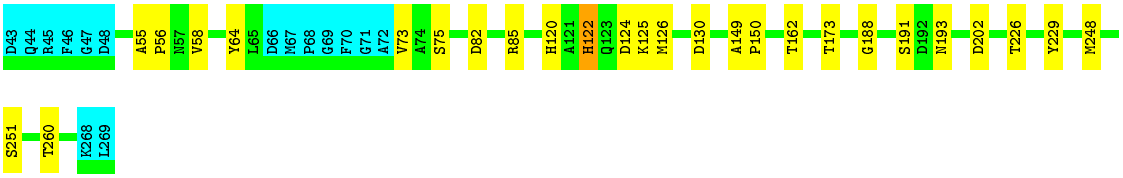


4.2.53 Score per residue for model 53

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

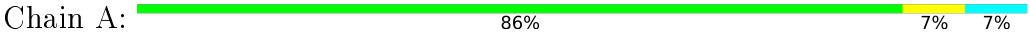


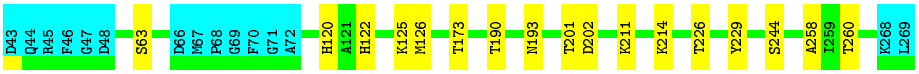


4.2.54 Score per residue for model 54

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

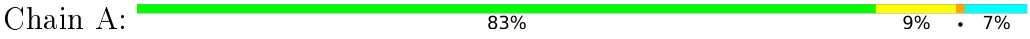


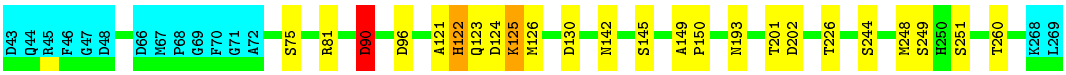


4.2.55 Score per residue for model 55

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:

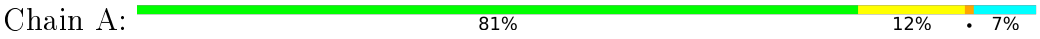


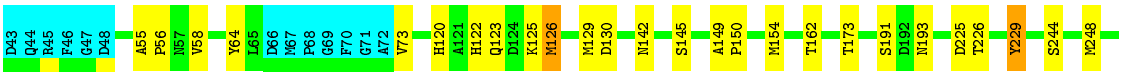


4.2.56 Score per residue for model 56

- Molecule 1: Metallo beta lactamase NDM-1

Chain A:






S251
S255
T260
K268
L269

5 Refinement protocol and experimental data overview

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

Of the 2800 calculated structures, 56 were deposited, based on the following criterion: *target function*.

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

Software name	Classification	Version
HADDOCK	structure calculation	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 7 of this report.

Chemical shift file(s)	working_cs.cif
Number of chemical shift lists	1
Total number of shifts	993
Number of shifts mapped to atoms	993
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	39%

6 Model quality

6.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MRI, ZN

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

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

There are no planarity outliers.

6.2 Too-close contacts

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	1571	1531	1530	9±2
2	A	2	0	0	0±0
3	A	22	5	5	3±1
All	All	89320	86016	85997	616

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 4.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:122:HIS:CG	3:A:303:MRI:H3	0.71	2.21	29	11
1:A:121:ALA:HA	1:A:126:MET:SD	0.70	2.25	35	42
1:A:220:ASN:H	3:A:303:MRI:H5	0.70	1.43	5	1
1:A:122:HIS:CE1	3:A:303:MRI:H3	0.66	2.25	30	3
2:A:302:ZN:ZN	3:A:303:MRI:OAD	0.66	1.45	5	8
2:A:301:ZN:ZN	3:A:303:MRI:OAD	0.64	1.47	15	6
1:A:248:MET:SD	1:A:251:SER:HB2	0.63	2.34	19	51
1:A:124:ASP:OD1	3:A:303:MRI:H9	0.63	1.94	23	3
1:A:122:HIS:HB3	1:A:124:ASP:OD1	0.62	1.93	4	23
1:A:120:HIS:CE1	1:A:125:LYS:HG3	0.62	2.30	19	47

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
3:A:303:MRI:OAB	3:A:303:MRI:OAE	0.62	2.17	36	56
1:A:55:ALA:HB3	1:A:58:VAL:HB	0.60	1.73	49	25
1:A:122:HIS:CD2	3:A:303:MRI:H3	0.56	2.36	28	2
1:A:149:ALA:HB3	1:A:150:PRO:HD3	0.55	1.77	35	16
1:A:75:SER:HA	1:A:249:SER:O	0.53	2.04	48	19
1:A:225:ASP:O	1:A:229:TYR:HB2	0.52	2.04	1	24
3:A:303:MRI:OAE	3:A:303:MRI:CAM	0.51	2.59	20	56
1:A:260:THR:O	1:A:264:ARG:HG3	0.50	2.07	31	3
1:A:82:ASP:O	1:A:85:ARG:HG2	0.50	2.06	4	20
1:A:61:HIS:O	1:A:76:ASN:HA	0.49	2.07	34	21
1:A:93:TRP:CH2	1:A:124:ASP:HB3	0.49	2.42	31	7
1:A:93:TRP:CZ3	1:A:124:ASP:HB3	0.49	2.42	8	4
1:A:65:LEU:HB2	1:A:93:TRP:CD2	0.49	2.42	31	2
1:A:211:LYS:O	1:A:258:ALA:HB1	0.49	2.08	41	26
1:A:124:ASP:O	1:A:125:LYS:HE2	0.49	2.07	5	2
1:A:119:THR:O	1:A:194:ILE:HG12	0.49	2.07	44	13
1:A:98:THR:OG1	1:A:128:GLY:HA3	0.49	2.08	35	17
1:A:123:GLN:HA	1:A:154:MET:SD	0.48	2.49	26	6
1:A:218:LEU:HG	1:A:265:MET:SD	0.48	2.49	34	1
1:A:142:ASN:HB3	1:A:145:SER:OG	0.47	2.08	28	36
1:A:138:ALA:HA	1:A:158:GLN:OE1	0.47	2.10	9	4
1:A:63:SER:O	1:A:74:ALA:HA	0.46	2.10	23	2
1:A:64:TYR:HA	1:A:73:VAL:O	0.46	2.10	10	6
1:A:208:CYS:HB3	3:A:303:MRI:H5	0.46	1.88	48	1
1:A:61:HIS:NE2	1:A:77:GLY:HA3	0.45	2.27	12	9
1:A:123:GLN:OE1	3:A:303:MRI:H9	0.45	2.11	39	1
1:A:120:HIS:CD2	1:A:122:HIS:HB2	0.45	2.47	47	4
1:A:173:THR:O	1:A:175:PRO:HD3	0.44	2.13	26	1
1:A:88:VAL:O	1:A:116:ALA:HA	0.44	2.13	28	4
1:A:49:LEU:HD11	1:A:97:GLN:HB3	0.44	1.90	17	1
1:A:75:SER:HB2	1:A:93:TRP:NE1	0.43	2.28	46	1
1:A:90:ASP:OD2	1:A:125:LYS:HD3	0.43	2.13	29	5
1:A:65:LEU:HD13	1:A:93:TRP:CE3	0.43	2.47	35	1
1:A:219:GLY:HA2	3:A:303:MRI:H6	0.43	1.91	25	1
1:A:208:CYS:SG	1:A:249:SER:HB2	0.43	2.54	46	1
1:A:122:HIS:CE1	3:A:303:MRI:H9	0.43	2.49	24	1
1:A:104:TRP:CE2	1:A:108:GLU:HG3	0.42	2.49	50	2
1:A:123:GLN:HB3	3:A:303:MRI:H9	0.42	1.91	39	2
1:A:96:ASP:O	1:A:100:GLN:HG3	0.42	2.15	35	4
1:A:125:LYS:HD2	1:A:208:CYS:SG	0.41	2.55	44	3
1:A:128:GLY:O	1:A:132:LEU:HG	0.41	2.16	41	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:65:LEU:HD22	1:A:93:TRP:CE3	0.41	2.51	6	1
1:A:57:ASN:OD1	1:A:81:ARG:HD2	0.41	2.16	8	1
1:A:173:THR:C	1:A:175:PRO:HD3	0.41	2.36	16	1
1:A:149:ALA:N	1:A:150:PRO:HD2	0.41	2.30	42	4
1:A:126:MET:HG2	1:A:129:MET:CG	0.41	2.46	56	1
1:A:121:ALA:O	1:A:152:GLU:HG3	0.40	2.16	9	1
1:A:89:VAL:O	1:A:90:ASP:HB2	0.40	2.16	43	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	212/227 (93%)	203±2 (96±1%)	9±2 (4±1%)	0±0 (0±0%)	54	85
All	All	11872/12712 (93%)	11381 (96%)	478 (4%)	13 (0%)	54	85

All 3 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	90	ASP	10
1	A	188	GLY	2
1	A	83	GLY	1

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	159/170 (94%)	149±2 (93±1%)	10±2 (7±1%)	21	69
All	All	8904/9520 (94%)	8323 (93%)	581 (7%)	21	69

All 47 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	193	ASN	56
1	A	260	THR	52
1	A	122	HIS	50
1	A	244	SER	41
1	A	201	THR	35
1	A	191	SER	34
1	A	226	THR	33
1	A	173	THR	31
1	A	229	TYR	27
1	A	130	ASP	18
1	A	60	GLN	18
1	A	267	ASP	17
1	A	162	THR	17
1	A	125	LYS	15
1	A	94	THR	14
1	A	63	SER	13
1	A	255	SER	12
1	A	190	THR	11
1	A	217	SER	9
1	A	90	ASP	9
1	A	75	SER	8
1	A	177	PHE	8
1	A	223	ASP	6
1	A	202	ASP	6
1	A	115	LEU	5
1	A	212	ASP	4
1	A	126	MET	4
1	A	211	LYS	3
1	A	124	ASP	3
1	A	96	ASP	2
1	A	81	ARG	2
1	A	195	THR	2
1	A	56	PRO	2
1	A	106	LYS	1
1	A	216	LYS	1
1	A	154	MET	1
1	A	139	THR	1
1	A	232	SER	1
1	A	248	MET	1
1	A	62	THR	1
1	A	251	SER	1

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Mol	Chain	Res	Type	Models (Total)
1	A	176	ASN	1
1	A	123	GLN	1
1	A	199	ASP	1
1	A	213	SER	1
1	A	227	GLU	1
1	A	214	LYS	1

6.3.3 RNA

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains

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

6.5 Carbohydrates

There are no monosaccharides in this entry.

6.6 Ligand geometry

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
3	MRI	A	303	2	20,24,24	0.66±0.00	0±0 (0±0%)

In the following table, the Counts columns list the number of angles for which Mogul statistics could be retrieved, the number of angles that are observed in the model and the number of angles that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond angle is the number of standard deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of

the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
3	MRI	A	303	2	28,36,36	1.17±0.00	4±0 (14±0%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	MRI	A	303	2	-	0±0,3,4,4	0±0,3,3,3

There are no bond-length outliers.

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})	Models	
								Worst	Total
3	A	303	MRI	CAP-CAJ-CAI	3.23	119.48	123.05	1	56
3	A	303	MRI	OAA-CAJ-CAP	2.67	119.23	116.11	1	56
3	A	303	MRI	CAM-CAN-CAI	2.60	117.74	121.38	1	56
3	A	303	MRI	CAO-CAI-CAJ	2.16	120.32	117.82	1	56

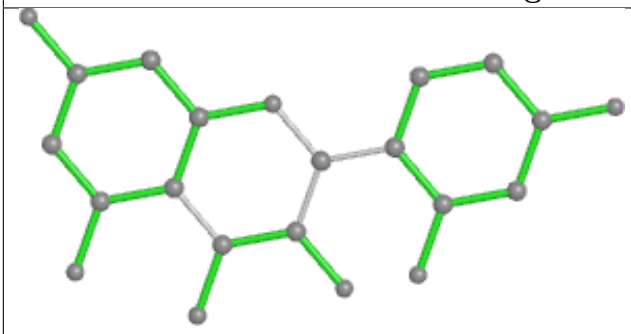
There are no chirality outliers.

There are no torsion outliers.

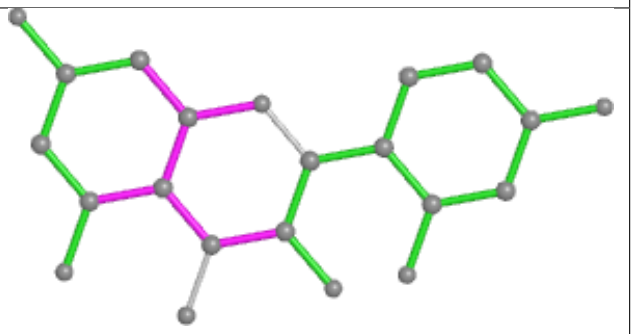
There are no ring outliers.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

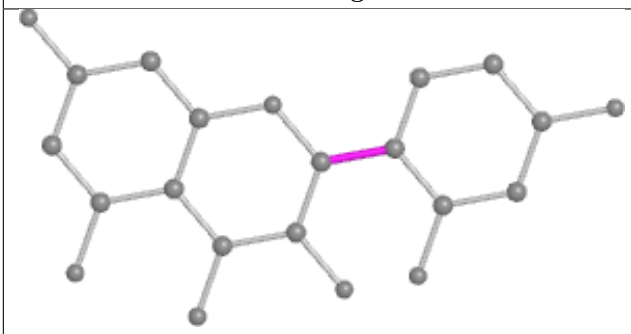
Ligand MRI A 303



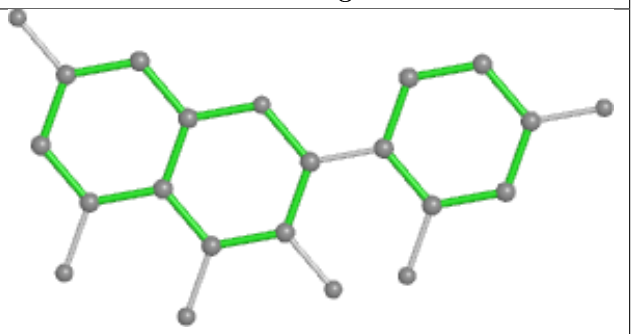
Bond lengths



Bond angles



Torsions



Rings

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

The completeness of assignment taking into account all chemical shift lists is 39% for the well-defined parts and 39% for the entire structure.

7.1 Chemical shift list 1

File name: working_cs.cif

Chemical shift list name: *starch_ output*

7.1.1 Bookkeeping

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	993
Number of shifts mapped to atoms	993
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	0

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	220	0.12 ± 0.08	None needed (< 0.5 ppm)
$^{13}C_{\beta}$	160	0.21 ± 0.16	None needed (< 0.5 ppm)
$^{13}C'$	201	-0.06 ± 0.08	None needed (< 0.5 ppm)
^{15}N	206	0.65 ± 0.35	None needed (imprecise)

7.1.3 Completeness of resonance assignments

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 39%, i.e. 926 atoms were assigned a chemical shift out of a possible 2397. 0 out of 31 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	778/1040 (75%)	193/414 (47%)	392/424 (92%)	193/202 (96%)
Sidechain	148/1151 (13%)	0/667 (0%)	148/440 (34%)	0/44 (0%)

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	Total	^{1}H	^{13}C	^{15}N
Aromatic	0/206 (0%)	0/111 (0%)	0/82 (0%)	0/13 (0%)
Overall	926/2397 (39%)	193/1192 (16%)	540/946 (57%)	193/259 (75%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 39%, i.e. 993 atoms were assigned a chemical shift out of a possible 2575. 0 out of 32 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	833/1113 (75%)	206/443 (47%)	421/454 (93%)	206/216 (95%)
Sidechain	160/1238 (13%)	0/719 (0%)	160/470 (34%)	0/49 (0%)
Aromatic	0/224 (0%)	0/121 (0%)	0/90 (0%)	0/13 (0%)
Overall	993/2575 (39%)	206/1283 (16%)	581/1014 (57%)	206/278 (74%)

7.1.4 Statistically unusual chemical shifts (i)

There are no statistically unusual chemical shifts.

7.1.5 Random Coil Index (RCI) plots (i)

The image below reports *random coil index* values for the protein chains in the structure. The height of each bar gives a probability of a given residue to be disordered, as predicted from the available chemical shifts and the amino acid sequence. A value above 0.2 is an indication of significant predicted disorder. The colour of the bar shows whether the residue is in the well-defined core (black) or in the ill-defined residue ranges (cyan), as described in section 2 on ensemble composition.

Random coil index (RCI) for chain A: