



# Full wwPDB NMR Structure Validation Report ⓘ

Nov 17, 2021 – 10:10 AM JST

PDB ID : 6L8V  
Title : membrane-bound Bax helix2-helix5 domain  
Authors : OuYang, B.; Lv, F.  
Deposited on : 2019-11-07

This is a Full wwPDB NMR 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

<https://www.wwpdb.org/validation/2017/NMRValidationReportHelp>

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  
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 : 2.23.2  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.23.2

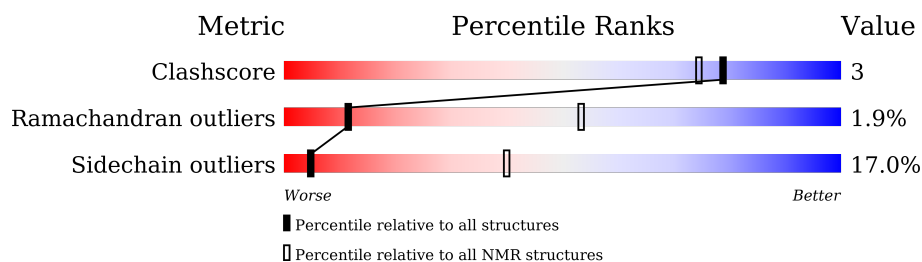
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 20%.

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  $\geq 3$ , 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	81	 79% 12% 9%
1	B	81	 77% 14% 10%

## 2 Ensemble composition and analysis

This entry contains 15 models. Model 15 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:55-A:128, B:56-B:128 (147)	0.70	15

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 2 clusters and 2 single-model clusters were found.

Cluster number	Models
1	2, 3, 4, 5, 6, 7, 8, 9, 11, 14, 15
2	1, 12
Single-model clusters	10; 13

### 3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2520 atoms, of which 1262 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Apoptosis regulator BAX.

Mol	Chain	Residues	Atoms						Trace
1	A	81	Total	C	H	N	O	S	0
			1260	398	631	107	120	4	
1	B	81	Total	C	H	N	O	S	0
			1260	398	631	107	120	4	

There are 14 discrepancies between the modelled and reference sequences:

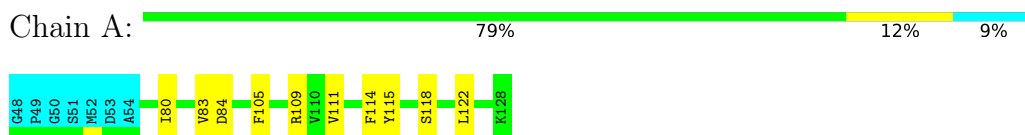
Chain	Residue	Modelled	Actual	Comment	Reference
A	48	GLY	-	expression tag	UNP Q07812
A	49	PRO	-	expression tag	UNP Q07812
A	50	GLY	-	expression tag	UNP Q07812
A	51	SER	-	expression tag	UNP Q07812
A	52	MET	-	expression tag	UNP Q07812
A	62	SER	CYS	engineered mutation	UNP Q07812
A	126	SER	CYS	engineered mutation	UNP Q07812
B	48	GLY	-	expression tag	UNP Q07812
B	49	PRO	-	expression tag	UNP Q07812
B	50	GLY	-	expression tag	UNP Q07812
B	51	SER	-	expression tag	UNP Q07812
B	52	MET	-	expression tag	UNP Q07812
B	62	SER	CYS	engineered mutation	UNP Q07812
B	126	SER	CYS	engineered mutation	UNP Q07812

## 4 Residue-property plots

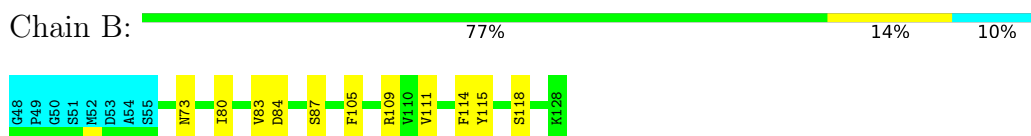
### 4.1 Average score per residue in the NMR ensemble

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: Apoptosis regulator BAX



- Molecule 1: Apoptosis regulator BAX

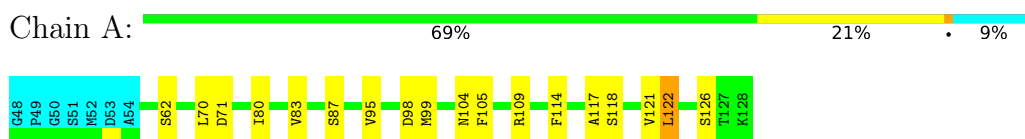


### 4.2 Scores per residue for each member of the ensemble

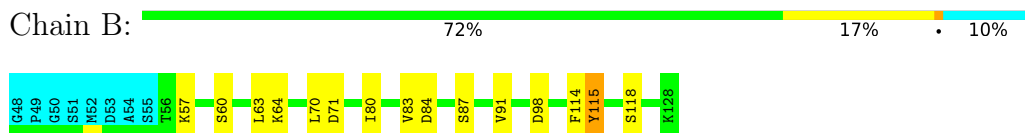
Colouring as in section 4.1 above.

#### 4.2.1 Score per residue for model 1

- Molecule 1: Apoptosis regulator BAX

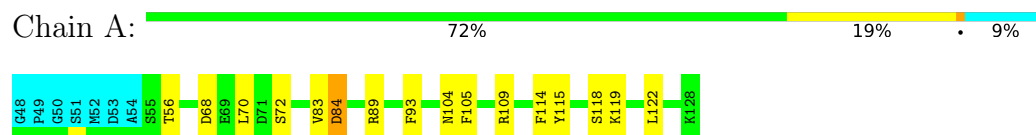


- Molecule 1: Apoptosis regulator BAX

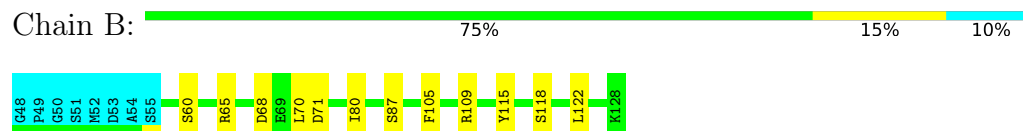


### 4.2.2 Score per residue for model 2

- Molecule 1: Apoptosis regulator BAX

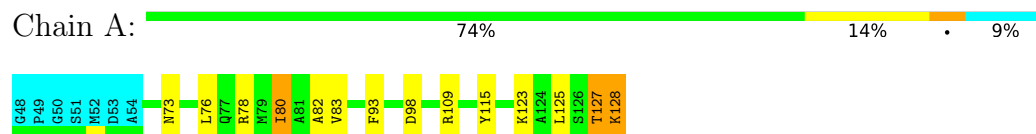


- Molecule 1: Apoptosis regulator BAX

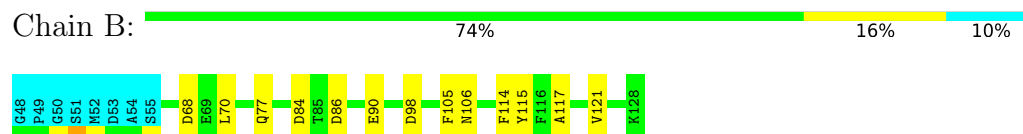


### 4.2.3 Score per residue for model 3

- Molecule 1: Apoptosis regulator BAX

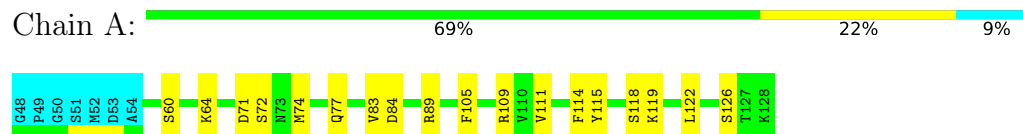


- Molecule 1: Apoptosis regulator BAX

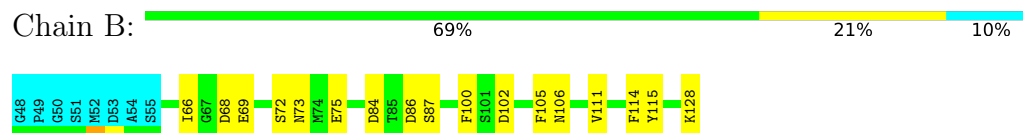


### 4.2.4 Score per residue for model 4

- Molecule 1: Apoptosis regulator BAX

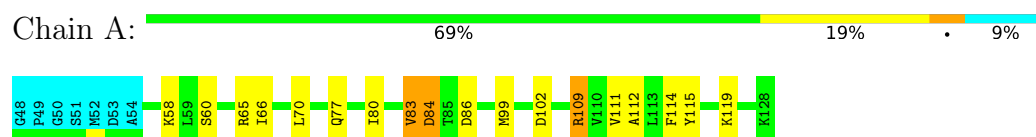


- Molecule 1: Apoptosis regulator BAX

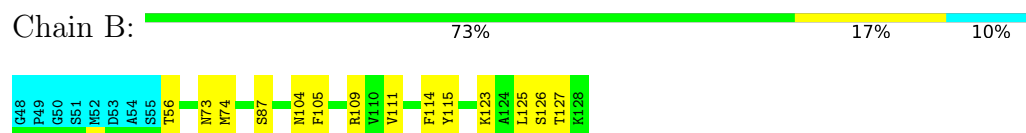


### 4.2.5 Score per residue for model 5

- Molecule 1: Apoptosis regulator BAX

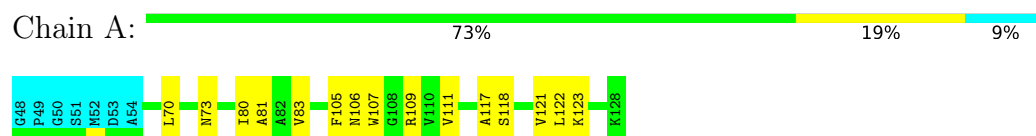


- Molecule 1: Apoptosis regulator BAX

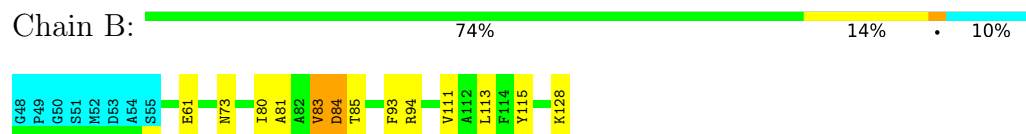


### 4.2.6 Score per residue for model 6

- Molecule 1: Apoptosis regulator BAX

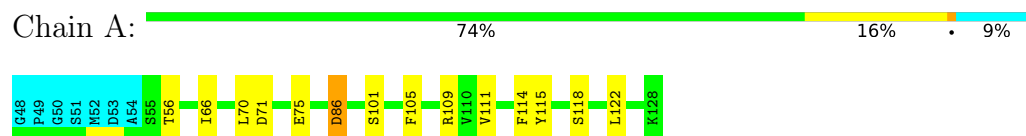


- Molecule 1: Apoptosis regulator BAX

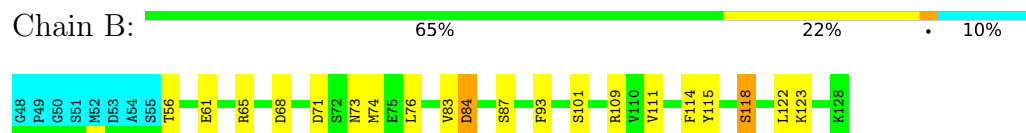


### 4.2.7 Score per residue for model 7

- Molecule 1: Apoptosis regulator BAX

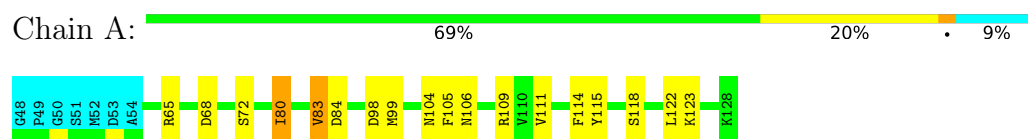


- Molecule 1: Apoptosis regulator BAX

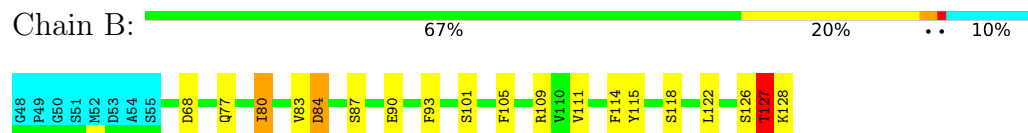


### 4.2.8 Score per residue for model 8

- Molecule 1: Apoptosis regulator BAX

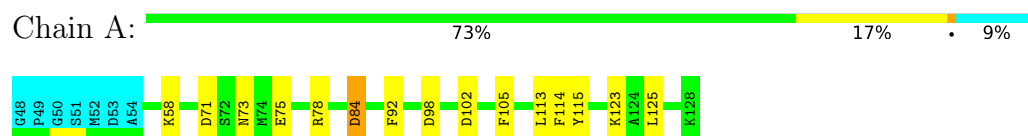


- Molecule 1: Apoptosis regulator BAX

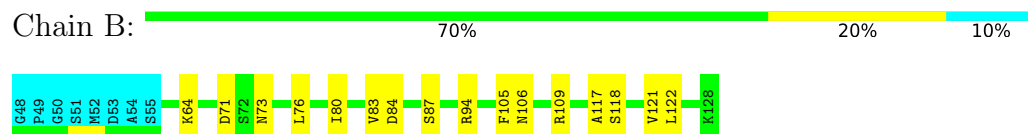


### 4.2.9 Score per residue for model 9

- Molecule 1: Apoptosis regulator BAX

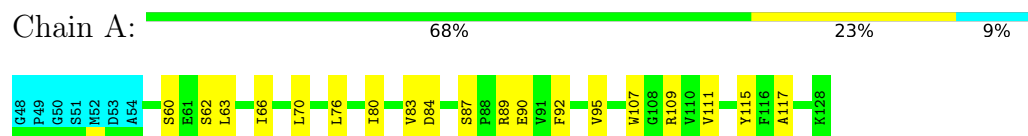


- Molecule 1: Apoptosis regulator BAX

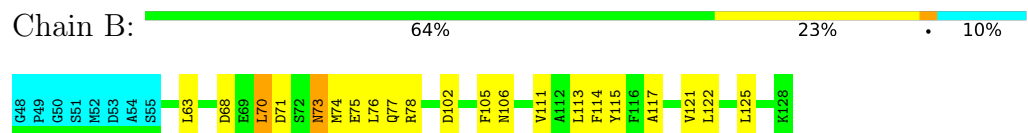


### 4.2.10 Score per residue for model 10

- Molecule 1: Apoptosis regulator BAX




- Molecule 1: Apoptosis regulator BAX

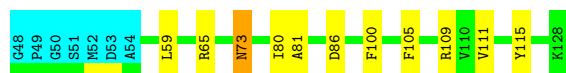





### 4.2.11 Score per residue for model 11

- Molecule 1: Apoptosis regulator BAX

Chain A: 




- Molecule 1: Apoptosis regulator BAX

Chain B: 



### 4.2.12 Score per residue for model 12

- Molecule 1: Apoptosis regulator BAX

Chain A: 



- Molecule 1: Apoptosis regulator BAX

Chain B: 



### 4.2.13 Score per residue for model 13

- Molecule 1: Apoptosis regulator BAX

Chain A: 



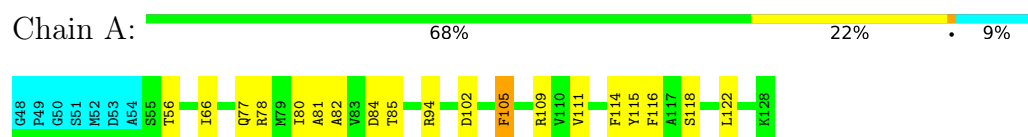
- Molecule 1: Apoptosis regulator BAX

Chain B: 

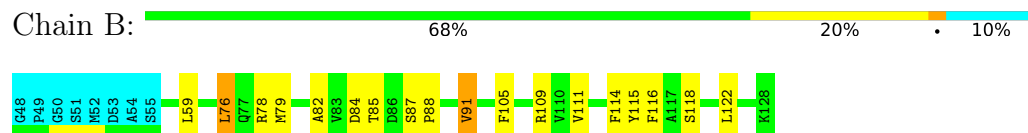


#### 4.2.14 Score per residue for model 14

- Molecule 1: Apoptosis regulator BAX

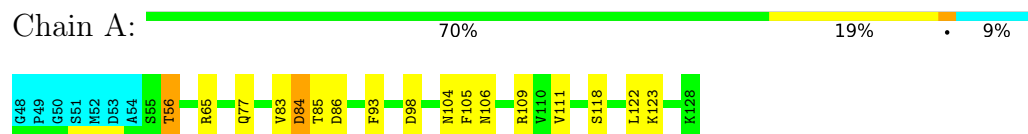


- Molecule 1: Apoptosis regulator BAX

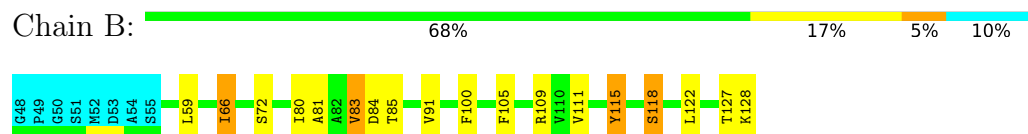


#### 4.2.15 Score per residue for model 15 (medoid)

- Molecule 1: Apoptosis regulator BAX



- Molecule 1: Apoptosis regulator BAX



## 5 Refinement protocol and experimental data overview

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

Of the 200 calculated structures, 15 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
X-PLOR NIH	structure calculation	
X-PLOR NIH	refinement	

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	387
Number of shifts mapped to atoms	387
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	20%

## 6 Model quality

### 6.1 Standard geometry

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	587	593	593	4±2
1	B	581	588	588	4±2
All	All	17520	17715	17715	98

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 3.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:111:VAL:HG12	1:B:111:VAL:HG13	0.72	1.61	10	2
1:A:111:VAL:CG1	1:B:111:VAL:HG13	0.67	2.20	10	2
1:A:80:ILE:O	1:A:83:VAL:HG13	0.63	1.93	13	3
1:A:125:LEU:O	1:A:125:LEU:HD13	0.60	1.94	3	1
1:A:111:VAL:HG13	1:B:111:VAL:CG1	0.56	2.30	6	3
1:A:111:VAL:HG13	1:B:111:VAL:HG12	0.56	1.75	15	6
1:A:117:ALA:O	1:A:121:VAL:HG12	0.56	2.00	6	1
1:A:111:VAL:HG22	1:B:111:VAL:HG12	0.55	1.78	5	4
1:B:117:ALA:O	1:B:121:VAL:HG12	0.55	2.02	10	3
1:B:126:SER:O	1:B:127:THR:HG23	0.55	2.02	8	1
1:A:80:ILE:HD12	1:A:81:ALA:N	0.54	2.18	11	3
1:B:88:PRO:O	1:B:91:VAL:HG13	0.54	2.02	14	1
1:B:80:ILE:O	1:B:83:VAL:HG22	0.54	2.02	13	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:B:80:ILE:O	1:B:83:VAL:HG13	0.53	2.03	9	4
1:B:59:LEU:O	1:B:63:LEU:HD12	0.53	2.04	13	2
1:A:115:TYR:HB2	1:B:111:VAL:HG21	0.52	1.80	10	1
1:A:76:LEU:CD2	1:A:80:ILE:HD11	0.50	2.37	10	1
1:B:80:ILE:HD12	1:B:81:ALA:N	0.50	2.21	6	2
1:B:80:ILE:O	1:B:83:VAL:HG23	0.49	2.08	12	1
1:A:62:SER:O	1:A:66:ILE:HD13	0.49	2.08	10	1
1:B:83:VAL:HG12	1:B:91:VAL:HG21	0.49	1.85	15	1
1:A:78:ARG:O	1:A:82:ALA:HB2	0.48	2.07	14	2
1:B:70:LEU:O	1:B:70:LEU:HD13	0.47	2.09	10	1
1:B:118:SER:O	1:B:122:LEU:HD13	0.47	2.10	9	6
1:A:76:LEU:O	1:A:80:ILE:HD13	0.47	2.09	3	1
1:B:76:LEU:C	1:B:76:LEU:HD13	0.47	2.30	7	2
1:A:111:VAL:CG1	1:B:111:VAL:HG12	0.47	2.39	13	1
1:B:88:PRO:HA	1:B:91:VAL:HG13	0.47	1.86	14	1
1:A:118:SER:O	1:A:122:LEU:HD13	0.47	2.10	15	7
1:A:111:VAL:HG21	1:B:115:TYR:HB2	0.46	1.87	15	1
1:A:70:LEU:HD23	1:A:70:LEU:O	0.46	2.10	6	5
1:A:80:ILE:O	1:A:83:VAL:HG23	0.45	2.12	10	2
1:A:92:PHE:CZ	1:A:117:ALA:HB2	0.45	2.47	13	3
1:B:83:VAL:O	1:B:83:VAL:HG23	0.45	2.12	13	1
1:B:127:THR:HG23	1:B:127:THR:O	0.44	2.13	5	1
1:B:83:VAL:CG1	1:B:91:VAL:HG21	0.44	2.42	15	1
1:A:127:THR:O	1:A:127:THR:HG22	0.44	2.13	3	1
1:B:115:TYR:CD2	1:B:115:TYR:C	0.43	2.91	1	1
1:B:76:LEU:HD23	1:B:79:MET:CE	0.43	2.43	14	1
1:B:70:LEU:HD23	1:B:70:LEU:O	0.43	2.14	3	1
1:B:121:VAL:HG13	1:B:122:LEU:HD12	0.43	1.91	9	1
1:A:127:THR:O	1:A:128:LYS:C	0.43	2.57	3	1
1:A:118:SER:O	1:A:122:LEU:HD22	0.42	2.15	1	1
1:A:83:VAL:HG23	1:A:83:VAL:O	0.41	2.15	13	1
1:B:78:ARG:O	1:B:82:ALA:HB2	0.41	2.15	14	1
1:A:83:VAL:O	1:A:83:VAL:HG23	0.41	2.15	3	2
1:B:73:ASN:ND2	1:B:76:LEU:HD12	0.41	2.31	10	1
1:A:117:ALA:O	1:A:121:VAL:HG22	0.41	2.16	1	1
1:A:77:GLN:O	1:A:81:ALA:HB3	0.41	2.15	14	1
1:A:80:ILE:HD13	1:A:116:PHE:CE2	0.41	2.51	14	1
1:B:66:ILE:O	1:B:66:ILE:HD13	0.41	2.16	15	1
1:B:76:LEU:HD13	1:B:76:LEU:O	0.40	2.16	9	1
1:A:109:ARG:NH1	1:A:112:ALA:HB3	0.40	2.32	5	1
1:B:117:ALA:O	1:B:121:VAL:HG22	0.40	2.15	13	1

## 6.3 Torsion angles

### 6.3.1 Protein backbone

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	73/81 (90%)	67±2 (92±2%)	4±2 (5±3%)	2±1 (2±1%)	9	48
1	B	72/81 (89%)	66±1 (92±2%)	4±1 (6±1%)	1±1 (1±1%)	14	59
All	All	2175/2430 (90%)	2007 (92%)	127 (6%)	41 (2%)	11	53

All 13 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	84	ASP	9
1	A	83	VAL	6
1	B	84	ASP	6
1	B	73	ASN	4
1	A	87	SER	3
1	B	86	ASP	2
1	B	83	VAL	2
1	A	86	ASP	2
1	A	105	PHE	2
1	A	73	ASN	2
1	A	127	THR	1
1	B	127	THR	1
1	B	87	SER	1

### 6.3.2 Protein sidechains

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	64/68 (94%)	54±3 (84±4%)	10±3 (16±4%)	5	41
1	B	63/68 (93%)	52±3 (82±4%)	11±3 (18±4%)	4	38

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1905/2040 (93%)	1582 (83%)	323 (17%)	5 40

All 99 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	109	ARG	13
1	B	115	TYR	12
1	B	105	PHE	12
1	A	105	PHE	11
1	A	115	TYR	10
1	B	87	SER	9
1	B	114	PHE	9
1	A	114	PHE	8
1	B	109	ARG	8
1	B	68	ASP	7
1	B	71	ASP	6
1	B	84	ASP	6
1	A	65	ARG	6
1	A	98	ASP	5
1	A	84	ASP	5
1	A	123	LYS	5
1	B	93	PHE	5
1	A	71	ASP	4
1	A	95	VAL	4
1	A	104	ASN	4
1	B	63	LEU	4
1	B	70	LEU	4
1	A	56	THR	4
1	A	89	ARG	4
1	A	93	PHE	4
1	A	73	ASN	4
1	B	77	GLN	4
1	B	106	ASN	4
1	B	128	LYS	4
1	B	74	MET	4
1	A	106	ASN	4
1	A	99	MET	3
1	A	122	LEU	3
1	B	64	LYS	3
1	B	118	SER	3
1	A	68	ASP	3

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Mol	Chain	Res	Type	Models (Total)
1	A	72	SER	3
1	A	119	LYS	3
1	B	65	ARG	3
1	A	60	SER	3
1	A	77	GLN	3
1	B	73	ASN	3
1	B	100	PHE	3
1	B	102	ASP	3
1	A	58	LYS	3
1	A	66	ILE	3
1	A	86	ASP	3
1	A	102	ASP	3
1	B	85	THR	3
1	A	126	SER	2
1	B	57	LYS	2
1	B	60	SER	2
1	B	91	VAL	2
1	B	98	ASP	2
1	B	80	ILE	2
1	A	80	ILE	2
1	B	90	GLU	2
1	A	64	LYS	2
1	B	66	ILE	2
1	B	69	GLU	2
1	B	72	SER	2
1	B	75	GLU	2
1	B	56	THR	2
1	B	123	LYS	2
1	B	125	LEU	2
1	A	107	TRP	2
1	B	61	GLU	2
1	B	94	ARG	2
1	B	113	LEU	2
1	A	75	GLU	2
1	B	101	SER	2
1	B	127	THR	2
1	A	94	ARG	2
1	A	85	THR	2
1	B	59	LEU	2
1	A	62	SER	1
1	A	70	LEU	1
1	A	128	LYS	1

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Mol	Chain	Res	Type	Models (Total)
1	A	74	MET	1
1	B	104	ASN	1
1	B	126	SER	1
1	A	101	SER	1
1	A	78	ARG	1
1	A	92	PHE	1
1	A	113	LEU	1
1	A	125	LEU	1
1	A	63	LEU	1
1	A	87	SER	1
1	A	90	GLU	1
1	B	78	ARG	1
1	B	122	LEU	1
1	A	59	LEU	1
1	A	100	PHE	1
1	B	119	LYS	1
1	B	58	LYS	1
1	B	110	VAL	1
1	B	76	LEU	1
1	B	116	PHE	1
1	B	83	VAL	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](#)

The completeness of assignment taking into account all chemical shift lists is 20% for the well-defined parts and 20% for the entire structure.

### 7.1 Chemical shift list 1

File name: working\_cs.cif

Chemical shift list name: *bax2-5CS\_V3.str*

#### 7.1.1 Bookkeeping [i](#)

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	387
Number of shifts mapped to atoms	387
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 [i](#)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	80	$0.14 \pm 0.16$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}_\beta$	73	$1.35 \pm 0.16$	Should be applied
$^{13}\text{C}'$	80	$0.05 \pm 0.22$	None needed ( $< 0.5$ ppm)
$^{15}\text{N}$	77	$-0.09 \pm 0.25$	None needed ( $< 0.5$ ppm)

#### 7.1.3 Completeness of resonance assignments [i](#)

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 20%, i.e. 360 atoms were assigned a chemical shift out of a possible 1844. 0 out of 28 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	$^1\text{H}$	$^{13}\text{C}$	$^{15}\text{N}$
Backbone	292/731 (40%)	72/292 (25%)	148/294 (50%)	72/145 (50%)
Sidechain	68/965 (7%)	0/564 (0%)	68/351 (19%)	0/50 (0%)

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	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Aromatic	0/148 (0%)	0/80 (0%)	0/66 (0%)	0/2 (0%)
Overall	360/1844 (20%)	72/936 (8%)	216/711 (30%)	72/197 (37%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 20%, i.e. 387 atoms were assigned a chemical shift out of a possible 1970. 0 out of 28 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Backbone	314/802 (39%)	77/320 (24%)	160/324 (49%)	77/158 (49%)
Sidechain	73/1020 (7%)	0/598 (0%)	73/372 (20%)	0/50 (0%)
Aromatic	0/148 (0%)	0/80 (0%)	0/66 (0%)	0/2 (0%)
Overall	387/1970 (20%)	77/998 (8%)	233/762 (31%)	77/210 (37%)

#### 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:

