



Full wwPDB NMR Structure Validation Report ⓘ

May 29, 2020 – 09:41 am BST

PDB ID : 6CKV
Title : Solution NMR structure of human BOK
Authors : Grace, C.R.; Zheng, J.; Moldoveanu, T.
Deposited on : 2018-03-01

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 ⓘ symbol.

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

Cyrange : Kirchner and Güntert (2011)
NmrClust : Kelley et al. (1996)
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 : 2.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

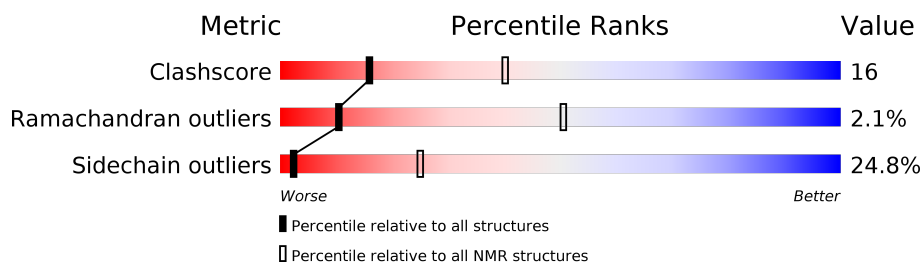
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 81%.

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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	158	

2 Ensemble composition and analysis

This entry contains 20 models. Model 7 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:24-A:46, A:61-A:173 (136)	0.25	7

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 4 clusters and 5 single-model clusters were found.

Cluster number	Models
1	4, 6, 7, 11, 16, 20
2	1, 9, 10, 15, 18
3	2, 8
4	3, 12
Single-model clusters	5; 13; 14; 17; 19

3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2435 atoms, of which 1240 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Bcl-2-related ovarian killer protein.

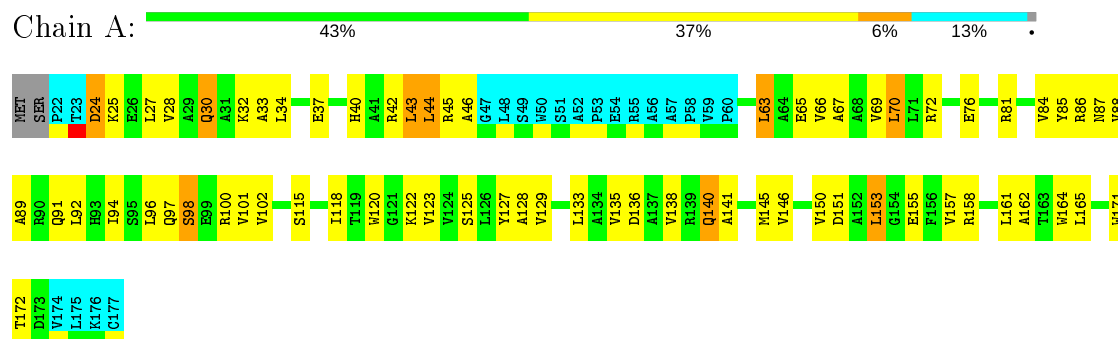
Mol	Chain	Residues	Atoms						Trace
1	A	156	Total	C	H	N	O	S	0
			2435	762	1240	224	206	3	

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	20	MET	-	initiating methionine	UNP Q9UMX3
A	67	ALA	CYS	engineered mutation	UNP Q9UMX3
A	100	ARG	PRO	engineered mutation	UNP Q9UMX3
A	137	ALA	CYS	engineered mutation	UNP Q9UMX3
A	152	ALA	CYS	engineered mutation	UNP Q9UMX3

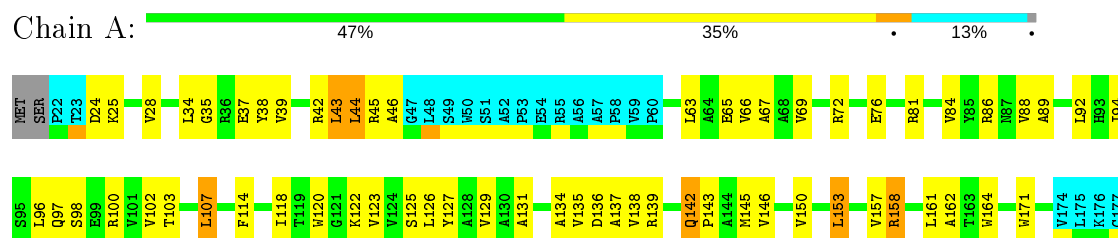
4.2.2 Score per residue for model 2

- Molecule 1: Bcl-2-related ovarian killer protein



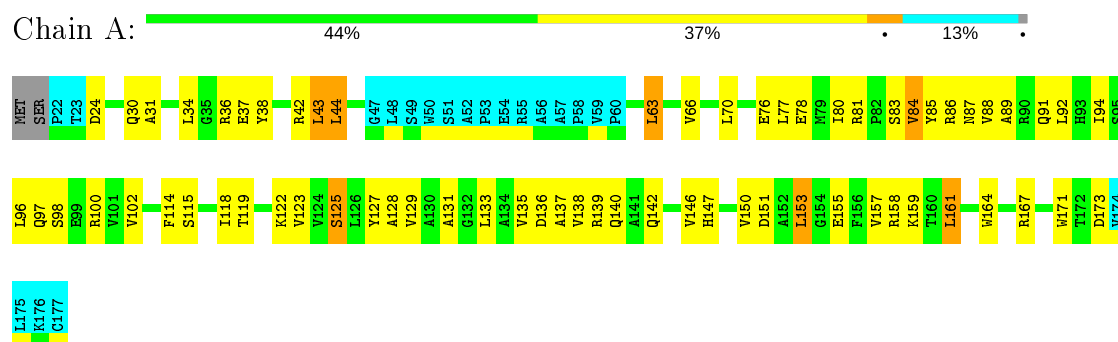
4.2.3 Score per residue for model 3

- Molecule 1: Bcl-2-related ovarian killer protein



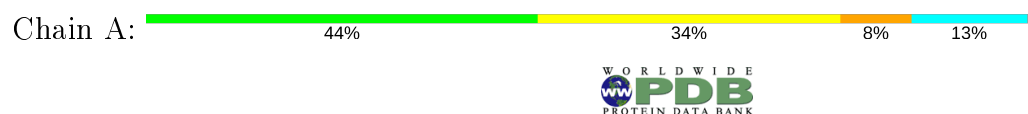
4.2.4 Score per residue for model 4

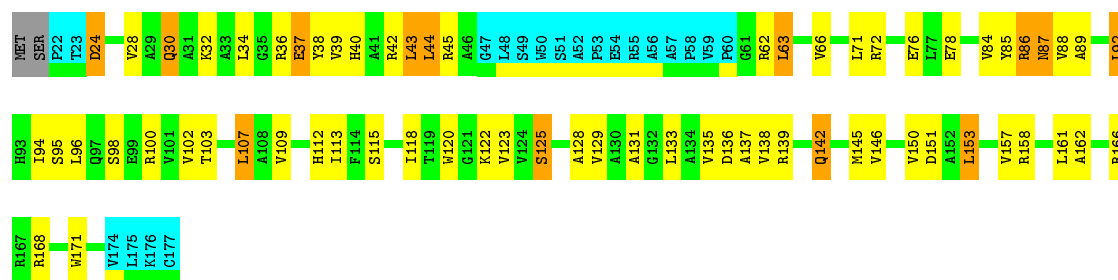
- Molecule 1: Bcl-2-related ovarian killer protein



4.2.5 Score per residue for model 5

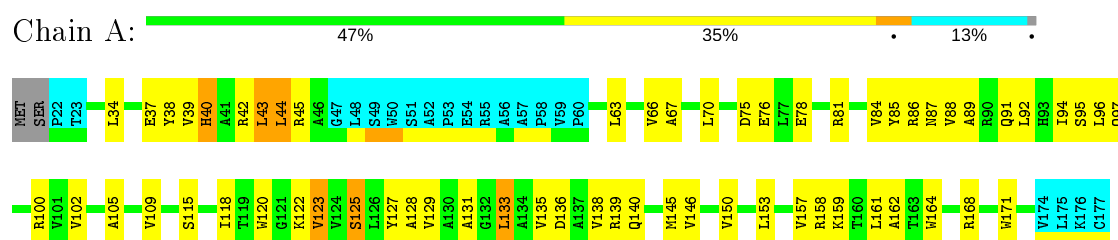
- Molecule 1: Bcl-2-related ovarian killer protein





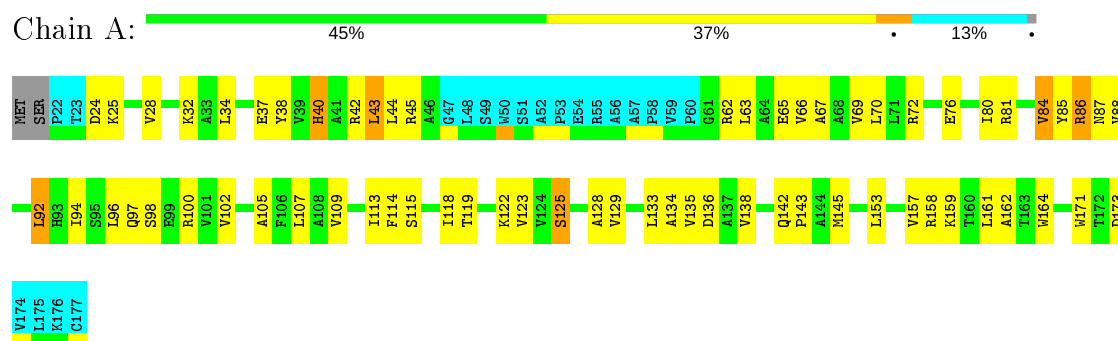
4.2.6 Score per residue for model 6

- Molecule 1: Bcl-2-related ovarian killer protein



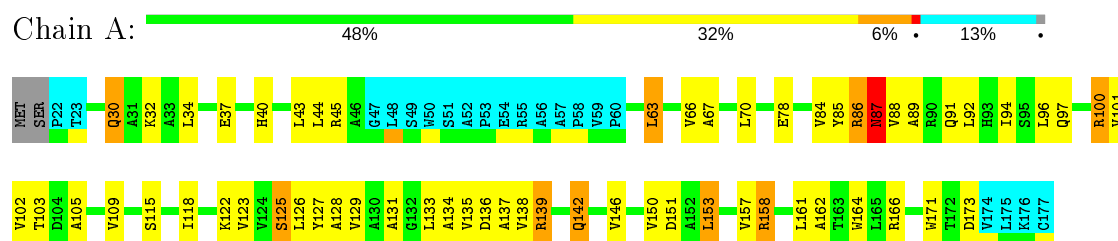
4.2.7 Score per residue for model 7 (medoid)

- Molecule 1: Bcl-2-related ovarian killer protein



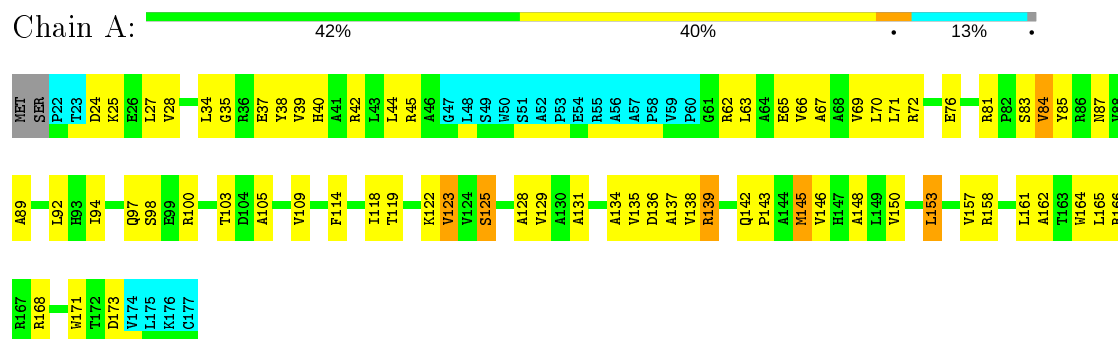
4.2.8 Score per residue for model 8

- Molecule 1: Bcl-2-related ovarian killer protein



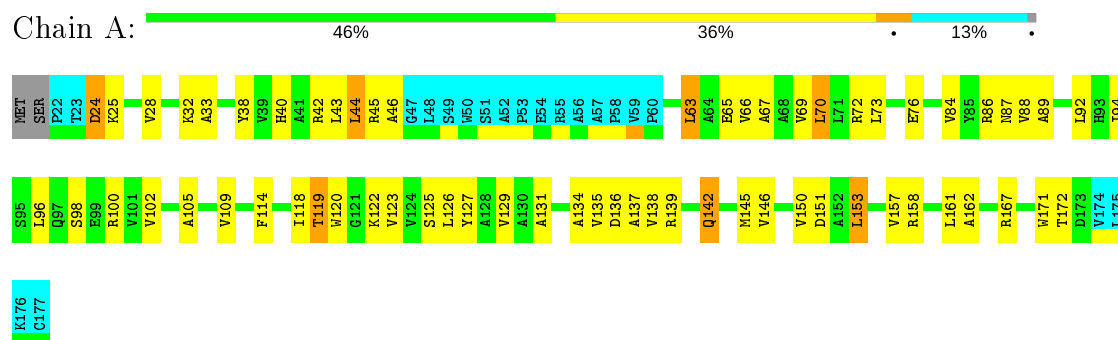
4.2.9 Score per residue for model 9

- Molecule 1: Bcl-2-related ovarian killer protein



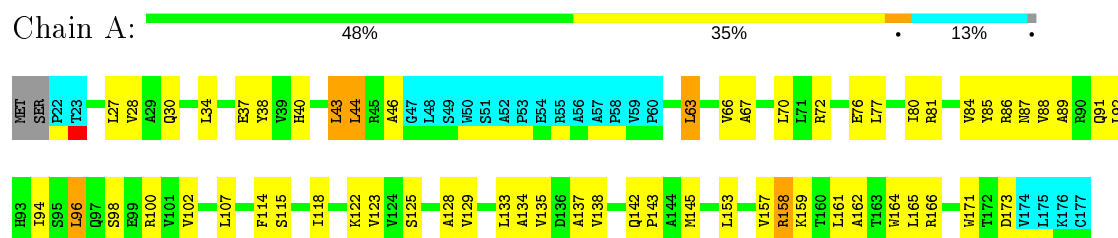
4.2.10 Score per residue for model 10

- Molecule 1: Bcl-2-related ovarian killer protein



4.2.11 Score per residue for model 11

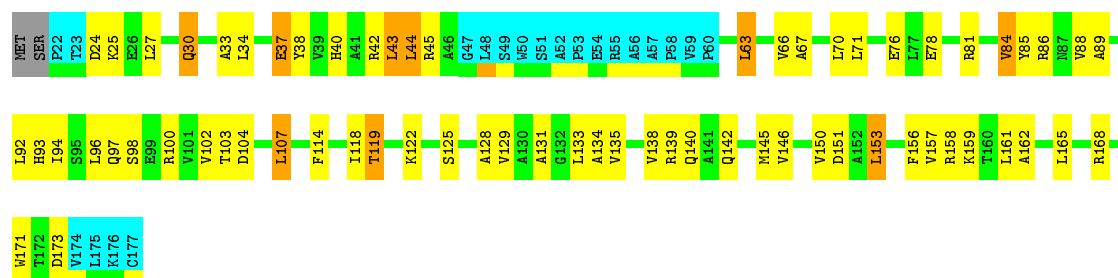
- Molecule 1: Bcl-2-related ovarian killer protein



4.2.12 Score per residue for model 12

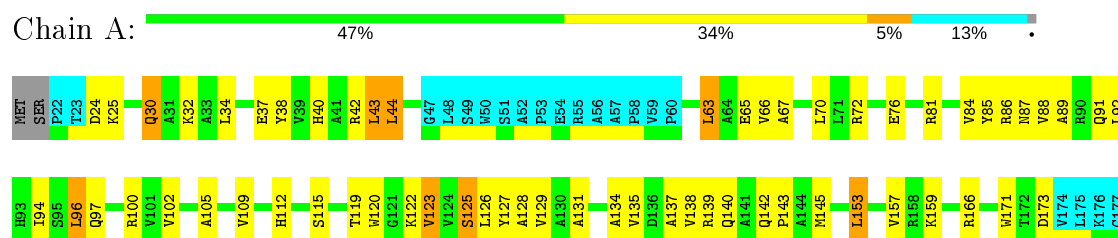
- Molecule 1: Bcl-2-related ovarian killer protein





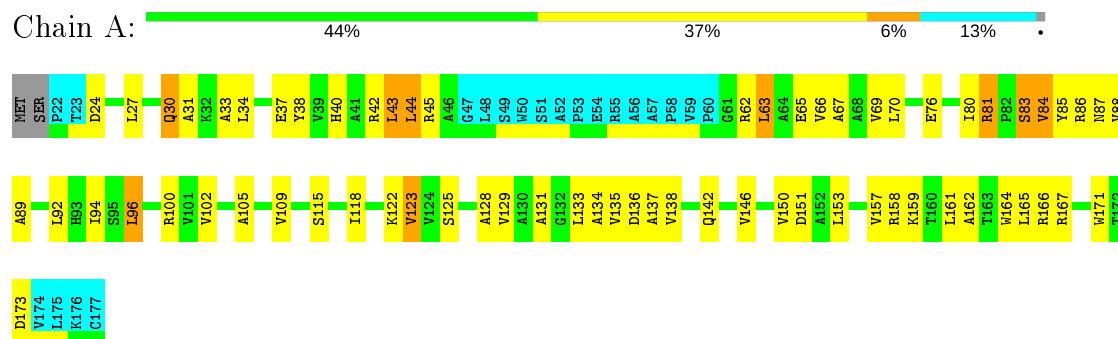
4.2.13 Score per residue for model 13

- Molecule 1: Bcl-2-related ovarian killer protein



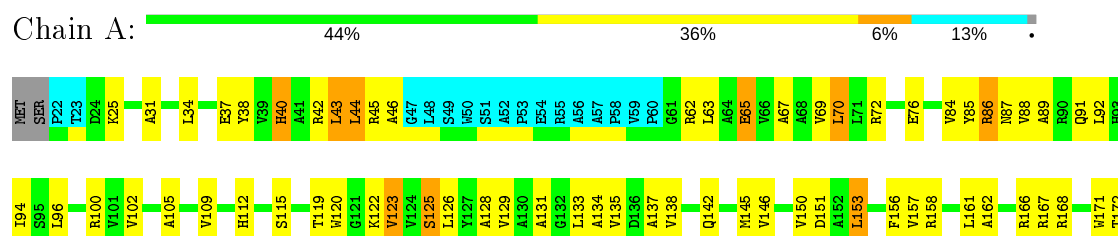
4.2.14 Score per residue for model 14

- Molecule 1: Bcl-2-related ovarian killer protein



4.2.15 Score per residue for model 15

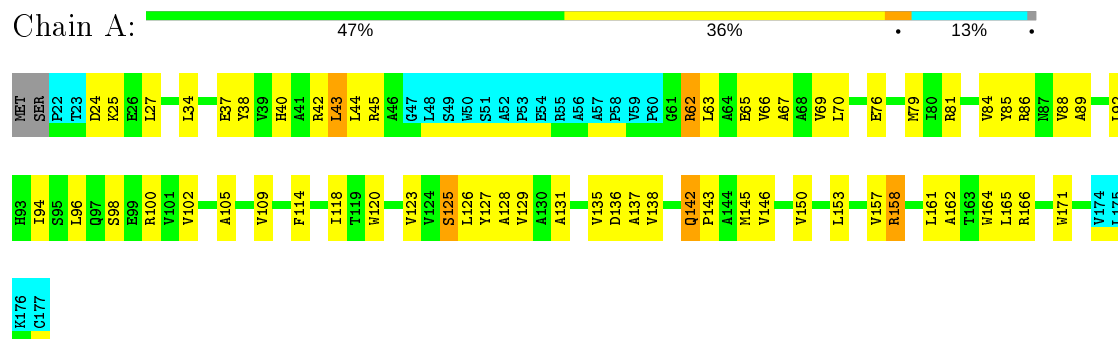
- Molecule 1: Bcl-2-related ovarian killer protein





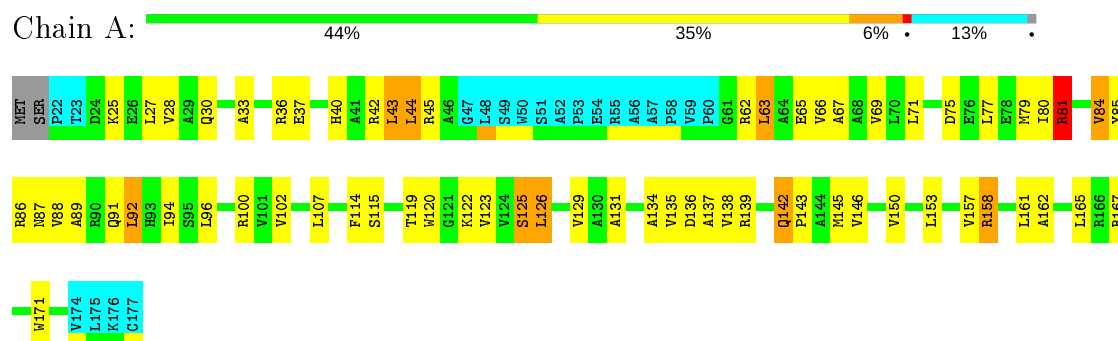
4.2.16 Score per residue for model 16

- Molecule 1: Bcl-2-related ovarian killer protein



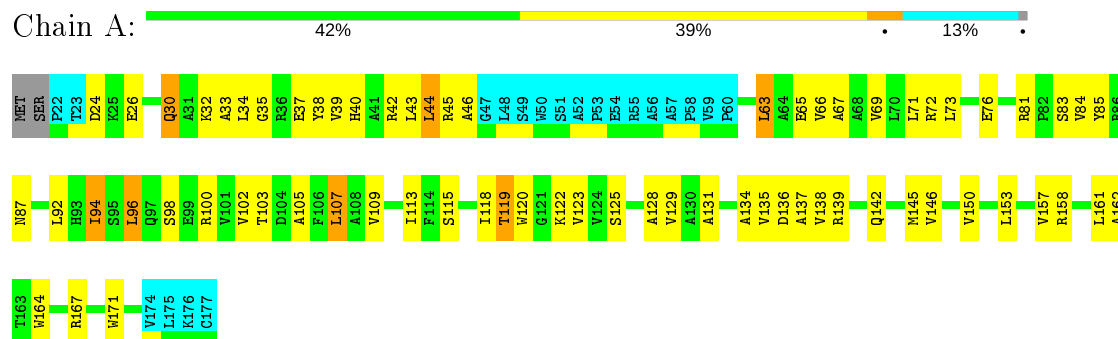
4.2.17 Score per residue for model 17

- Molecule 1: Bcl-2-related ovarian killer protein



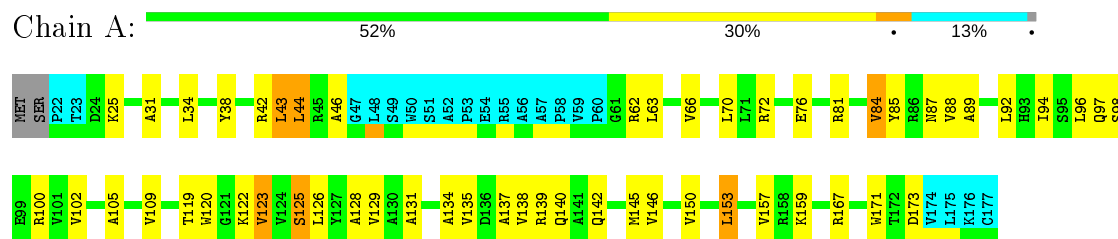
4.2.18 Score per residue for model 18

- Molecule 1: Bcl-2-related ovarian killer protein



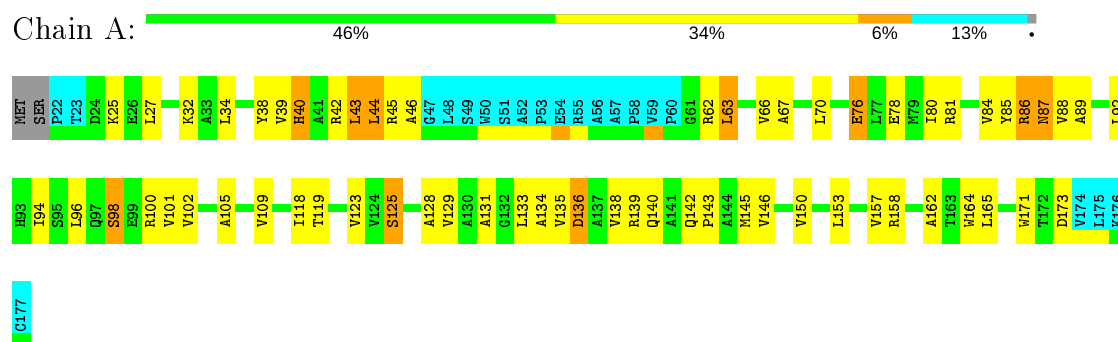
4.2.19 Score per residue for model 19

- Molecule 1: Bcl-2-related ovarian killer protein



4.2.20 Score per residue for model 20

- Molecule 1: Bcl-2-related ovarian killer protein



5 Refinement protocol and experimental data overview

The models were refined using the following method: *torsion angle dynamics*.

Of the 100 calculated structures, 20 were deposited, based on the following criterion: *structures with the least restraint violations*.

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

Software name	Classification	Version
CYANA	refinement	2.1
CYANA	structure calculation	2.1

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)	input_cs.cif
Number of chemical shift lists	1
Total number of shifts	1842
Number of shifts mapped to atoms	1842
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	81%

No validations of the models with respect to experimental NMR restraints is performed at this time.

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	1050	1090	1090	35±5
All	All	21000	21800	21800	691

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 16.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:94:ILE:HD11	1:A:102:VAL:HG23	0.99	1.34	16	18
1:A:157:VAL:HG22	1:A:161:LEU:HD12	0.91	1.40	18	12
1:A:88:VAL:HG11	1:A:129:VAL:HG13	0.85	1.45	14	17
1:A:34:LEU:HD12	1:A:70:LEU:HD22	0.84	1.50	19	1
1:A:27:LEU:HD22	1:A:165:LEU:HD23	0.73	1.57	9	1
1:A:134:ALA:HB1	1:A:146:VAL:HG22	0.72	1.58	14	5
1:A:43:LEU:HD11	1:A:138:VAL:HG11	0.69	1.64	10	6
1:A:118:ILE:HD13	1:A:164:TRP:CD1	0.68	2.24	16	11
1:A:43:LEU:HD13	1:A:138:VAL:HG11	0.68	1.66	18	2
1:A:27:LEU:HD11	1:A:165:LEU:HB3	0.66	1.66	11	4
1:A:158:ARG:C	1:A:162:ALA:HB2	0.66	2.11	1	17
1:A:88:VAL:HG11	1:A:129:VAL:CG1	0.66	2.21	19	17
1:A:131:ALA:O	1:A:135:VAL:HG23	0.66	1.91	14	16
1:A:24:ASP:O	1:A:28:VAL:HG23	0.65	1.92	9	6

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:125:SER:O	1:A:129:VAL:HG23	0.64	1.92	6	20
1:A:89:ALA:HB2	1:A:133:LEU:CD1	0.64	2.22	15	2
1:A:94:ILE:CD1	1:A:102:VAL:HG23	0.64	2.21	20	14
1:A:100:ARG:HD2	1:A:101:VAL:HG23	0.64	1.68	8	1
1:A:114:PHE:CE2	1:A:126:LEU:HD13	0.64	2.28	17	1
1:A:129:VAL:O	1:A:133:LEU:HD12	0.64	1.93	7	2
1:A:28:VAL:HG12	1:A:32:LYS:HE3	0.62	1.68	7	1
1:A:134:ALA:O	1:A:138:VAL:HG23	0.62	1.93	9	11
1:A:96:LEU:HD11	1:A:140:GLN:CD	0.62	2.14	13	1
1:A:27:LEU:HD21	1:A:165:LEU:HB2	0.62	1.71	16	2
1:A:34:LEU:CD1	1:A:70:LEU:HD22	0.62	2.24	19	1
1:A:127:TYR:CZ	1:A:153:LEU:HD21	0.62	2.29	1	1
1:A:65:GLU:O	1:A:69:VAL:HG23	0.62	1.95	2	11
1:A:89:ALA:HB1	1:A:94:ILE:CG2	0.61	2.24	20	18
1:A:89:ALA:HB1	1:A:94:ILE:HG21	0.61	1.71	14	8
1:A:153:LEU:O	1:A:157:VAL:HG23	0.61	1.96	20	20
1:A:80:ILE:HG22	1:A:81:ARG:HG2	0.61	1.73	20	3
1:A:158:ARG:O	1:A:162:ALA:HB2	0.60	1.96	17	15
1:A:88:VAL:HG13	1:A:133:LEU:HD11	0.60	1.74	2	2
1:A:43:LEU:CD1	1:A:138:VAL:HG11	0.60	2.26	12	5
1:A:42:ARG:HG3	1:A:135:VAL:HG21	0.59	1.72	13	8
1:A:40:HIS:NE2	1:A:44:LEU:HD12	0.59	2.13	11	9
1:A:77:LEU:HA	1:A:80:ILE:HD12	0.59	1.75	4	2
1:A:129:VAL:O	1:A:133:LEU:HD22	0.59	1.97	6	1
1:A:67:ALA:HA	1:A:70:LEU:HD12	0.59	1.73	13	12
1:A:89:ALA:HB1	1:A:94:ILE:HG22	0.59	1.75	19	12
1:A:105:ALA:O	1:A:109:VAL:HG23	0.58	1.99	14	12
1:A:118:ILE:O	1:A:119:THR:HG22	0.57	1.97	12	2
1:A:31:ALA:HA	1:A:34:LEU:HD12	0.57	1.77	14	1
1:A:43:LEU:HD12	1:A:138:VAL:HG11	0.57	1.77	16	7
1:A:34:LEU:HD22	1:A:70:LEU:CD1	0.56	2.30	4	7
1:A:94:ILE:HD11	1:A:102:VAL:CG2	0.56	2.22	8	1
1:A:156:PHE:CE1	1:A:161:LEU:HD11	0.56	2.35	12	2
1:A:114:PHE:CD2	1:A:118:ILE:HG23	0.56	2.35	10	5
1:A:66:VAL:HG21	1:A:171:TRP:HB2	0.56	1.77	7	3
1:A:109:VAL:HG12	1:A:113:ILE:HD11	0.56	1.76	18	1
1:A:27:LEU:HD22	1:A:165:LEU:HB3	0.56	1.77	2	3
1:A:85:TYR:CE1	1:A:128:ALA:HB1	0.56	2.35	11	4
1:A:66:VAL:HG11	1:A:171:TRP:HB3	0.56	1.78	13	2
1:A:85:TYR:CE2	1:A:128:ALA:HB1	0.55	2.37	12	13
1:A:28:VAL:HG12	1:A:32:LYS:CE	0.55	2.31	7	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:34:LEU:HD22	1:A:67:ALA:HA	0.55	1.78	16	3
1:A:37:GLU:OE2	1:A:71:LEU:HD11	0.55	2.01	12	1
1:A:157:VAL:HG22	1:A:161:LEU:CD1	0.55	2.23	18	1
1:A:137:ALA:HB1	1:A:142:GLN:O	0.54	2.02	15	13
1:A:62:ARG:O	1:A:66:VAL:HG23	0.54	2.01	5	3
1:A:127:TYR:CE2	1:A:153:LEU:HD21	0.54	2.38	13	3
1:A:40:HIS:NE2	1:A:44:LEU:HD13	0.54	2.17	14	5
1:A:89:ALA:HB2	1:A:133:LEU:HG	0.54	1.80	2	6
1:A:165:LEU:HD21	1:A:171:TRP:NE1	0.54	2.17	9	1
1:A:30:GLN:NE2	1:A:34:LEU:HD11	0.54	2.18	5	4
1:A:84:VAL:HG23	1:A:87:ASN:HB3	0.54	1.79	7	1
1:A:27:LEU:HD13	1:A:165:LEU:HB2	0.54	1.79	12	3
1:A:66:VAL:HG12	1:A:70:LEU:HD11	0.54	1.80	11	7
1:A:98:SER:HB3	1:A:101:VAL:HG12	0.53	1.81	2	2
1:A:42:ARG:CG	1:A:135:VAL:HG21	0.53	2.33	13	9
1:A:37:GLU:OE2	1:A:67:ALA:HB1	0.53	2.03	16	2
1:A:43:LEU:HD23	1:A:44:LEU:N	0.53	2.19	14	13
1:A:89:ALA:HB2	1:A:133:LEU:HD12	0.53	1.81	15	2
1:A:33:ALA:HB3	1:A:63:LEU:CD2	0.53	2.34	14	5
1:A:76:GLU:OE1	1:A:80:ILE:HD11	0.53	2.04	20	1
1:A:96:LEU:HD11	1:A:140:GLN:OE1	0.53	2.04	13	1
1:A:30:GLN:HA	1:A:63:LEU:HD21	0.53	1.80	2	6
1:A:28:VAL:HG22	1:A:158:ARG:HD2	0.53	1.80	3	1
1:A:88:VAL:O	1:A:92:LEU:HD23	0.53	2.03	7	1
1:A:34:LEU:HD13	1:A:70:LEU:CD1	0.52	2.34	16	1
1:A:40:HIS:CD2	1:A:44:LEU:HD12	0.52	2.38	20	1
1:A:66:VAL:HG21	1:A:171:TRP:CB	0.52	2.34	2	6
1:A:109:VAL:HG12	1:A:113:ILE:CD1	0.52	2.34	18	2
1:A:138:VAL:HG22	1:A:143:PRO:HA	0.52	1.79	9	6
1:A:123:VAL:HG11	1:A:171:TRP:CZ3	0.52	2.40	8	10
1:A:118:ILE:HG21	1:A:164:TRP:CE3	0.52	2.40	18	6
1:A:43:LEU:HA	1:A:135:VAL:HG22	0.52	1.82	14	2
1:A:146:VAL:O	1:A:150:VAL:HG23	0.52	2.05	9	17
1:A:96:LEU:HD13	1:A:137:ALA:CB	0.52	2.35	11	1
1:A:39:VAL:HG22	1:A:131:ALA:HA	0.52	1.82	20	3
1:A:103:THR:O	1:A:107:LEU:HD12	0.51	2.05	18	4
1:A:37:GLU:OE1	1:A:67:ALA:HB1	0.51	2.04	16	1
1:A:40:HIS:CE1	1:A:44:LEU:HD13	0.51	2.40	17	3
1:A:31:ALA:HB2	1:A:157:VAL:HG11	0.51	1.83	15	3
1:A:103:THR:CG2	1:A:148:ALA:HB1	0.51	2.36	9	1
1:A:98:SER:HB2	1:A:101:VAL:HG12	0.51	1.81	1	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:34:LEU:HD23	1:A:67:ALA:HB2	0.51	1.81	14	6
1:A:123:VAL:HG21	1:A:171:TRP:CZ3	0.51	2.41	15	5
1:A:126:LEU:C	1:A:126:LEU:HD13	0.51	2.26	1	1
1:A:80:ILE:HG22	1:A:81:ARG:CG	0.50	2.36	17	3
1:A:119:THR:O	1:A:123:VAL:HG23	0.50	2.05	18	5
1:A:134:ALA:HB2	1:A:149:LEU:HD12	0.50	1.82	1	1
1:A:37:GLU:CD	1:A:67:ALA:HB1	0.50	2.27	16	2
1:A:37:GLU:OE1	1:A:71:LEU:HD11	0.50	2.06	18	2
1:A:30:GLN:CA	1:A:63:LEU:HD21	0.50	2.36	8	1
1:A:114:PHE:CE2	1:A:161:LEU:HD21	0.50	2.42	4	1
1:A:114:PHE:CE1	1:A:161:LEU:HD21	0.50	2.41	9	1
1:A:42:ARG:HG3	1:A:135:VAL:HG11	0.49	1.83	2	2
1:A:102:VAL:HG21	1:A:145:MET:SD	0.49	2.46	18	16
1:A:43:LEU:HA	1:A:135:VAL:HG12	0.49	1.85	2	2
1:A:88:VAL:HG11	1:A:133:LEU:HD11	0.49	1.85	7	1
1:A:67:ALA:O	1:A:71:LEU:HD13	0.48	2.07	9	2
1:A:118:ILE:HD13	1:A:164:TRP:HB2	0.48	1.84	9	1
1:A:92:LEU:HD12	1:A:92:LEU:O	0.48	2.09	17	1
1:A:87:ASN:HD21	1:A:91:GLN:NE2	0.48	2.07	15	8
1:A:134:ALA:HB1	1:A:146:VAL:CG2	0.48	2.37	17	1
1:A:109:VAL:HG22	1:A:113:ILE:HD11	0.47	1.86	5	1
1:A:123:VAL:HG21	1:A:171:TRP:CH2	0.47	2.44	6	4
1:A:84:VAL:HG23	1:A:88:VAL:HB	0.47	1.85	14	1
1:A:89:ALA:HB2	1:A:133:LEU:HD22	0.47	1.84	14	1
1:A:96:LEU:HD13	1:A:137:ALA:HA	0.47	1.87	18	1
1:A:35:GLY:O	1:A:39:VAL:HG23	0.47	2.10	9	3
1:A:84:VAL:HG13	1:A:84:VAL:O	0.47	2.10	19	1
1:A:118:ILE:O	1:A:119:THR:CG2	0.46	2.63	12	2
1:A:127:TYR:CE1	1:A:153:LEU:HD21	0.46	2.46	6	1
1:A:133:LEU:HD23	1:A:133:LEU:N	0.46	2.26	14	1
1:A:43:LEU:CA	1:A:135:VAL:HG12	0.46	2.40	2	3
1:A:88:VAL:CG1	1:A:133:LEU:HD11	0.46	2.41	11	1
1:A:123:VAL:HG12	1:A:127:TYR:CE1	0.46	2.46	4	3
1:A:94:ILE:HD11	1:A:102:VAL:HG13	0.46	1.85	18	1
1:A:126:LEU:CD2	1:A:153:LEU:HD21	0.46	2.41	8	1
1:A:123:VAL:HG12	1:A:127:TYR:CE2	0.46	2.45	8	1
1:A:28:VAL:HG21	1:A:158:ARG:CZ	0.46	2.40	1	1
1:A:34:LEU:HD22	1:A:70:LEU:HD12	0.46	1.88	4	1
1:A:114:PHE:CE1	1:A:118:ILE:HG23	0.46	2.46	16	1
1:A:120:TRP:O	1:A:123:VAL:HG22	0.45	2.11	19	1
1:A:42:ARG:O	1:A:46:ALA:HB2	0.45	2.12	20	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:126:LEU:HD23	1:A:153:LEU:HD21	0.45	1.86	8	1
1:A:96:LEU:HD12	1:A:142:GLN:HG3	0.45	1.88	14	1
1:A:70:LEU:HD22	1:A:127:TYR:CD1	0.45	2.46	2	1
1:A:118:ILE:HD13	1:A:164:TRP:CB	0.45	2.42	9	1
1:A:83:SER:O	1:A:84:VAL:HG13	0.45	2.11	14	2
1:A:37:GLU:CD	1:A:71:LEU:HD11	0.45	2.32	18	1
1:A:28:VAL:HG22	1:A:158:ARG:CD	0.45	2.42	11	1
1:A:62:ARG:HG3	1:A:172:THR:HG23	0.45	1.89	1	1
1:A:138:VAL:HG23	1:A:143:PRO:HB3	0.44	1.90	16	2
1:A:69:VAL:HG12	1:A:73:LEU:HD12	0.44	1.89	10	1
1:A:94:ILE:CD1	1:A:102:VAL:HG22	0.44	2.43	18	1
1:A:137:ALA:HB1	1:A:145:MET:SD	0.44	2.53	9	1
1:A:120:TRP:CZ2	1:A:173:ASP:HB3	0.44	2.48	13	2
1:A:27:LEU:HD11	1:A:165:LEU:CB	0.44	2.42	11	1
1:A:28:VAL:HG22	1:A:158:ARG:CB	0.43	2.43	17	2
1:A:43:LEU:HD11	1:A:138:VAL:CG1	0.43	2.40	10	1
1:A:118:ILE:HG21	1:A:164:TRP:CD2	0.43	2.48	4	1
1:A:109:VAL:HG22	1:A:113:ILE:CD1	0.43	2.43	5	1
1:A:118:ILE:HD13	1:A:164:TRP:CG	0.43	2.48	9	1
1:A:88:VAL:HG13	1:A:133:LEU:HD21	0.43	1.90	14	1
1:A:114:PHE:CD1	1:A:118:ILE:HG23	0.43	2.49	16	1
1:A:43:LEU:O	1:A:43:LEU:HD12	0.43	2.13	18	1
1:A:43:LEU:CA	1:A:135:VAL:HG22	0.43	2.44	14	1
1:A:66:VAL:HG21	1:A:171:TRP:HB3	0.43	1.90	10	1
1:A:89:ALA:HB2	1:A:133:LEU:HD11	0.43	1.90	15	1
1:A:34:LEU:HD22	1:A:66:VAL:HG12	0.42	1.90	2	1
1:A:127:TYR:CD1	1:A:153:LEU:HD21	0.42	2.48	6	1
1:A:94:ILE:HD13	1:A:102:VAL:HG22	0.42	1.90	18	1
1:A:101:VAL:HG13	1:A:102:VAL:N	0.42	2.30	20	2
1:A:118:ILE:O	1:A:119:THR:O	0.42	2.37	12	2
1:A:33:ALA:HB3	1:A:63:LEU:HD21	0.42	1.92	18	3
1:A:84:VAL:HG23	1:A:85:TYR:N	0.41	2.30	4	3
1:A:123:VAL:HG11	1:A:171:TRP:CH2	0.41	2.49	20	4
1:A:88:VAL:CG1	1:A:133:LEU:HD21	0.41	2.45	14	1
1:A:129:VAL:HG12	1:A:133:LEU:CD2	0.41	2.45	15	1
1:A:118:ILE:HG22	1:A:118:ILE:O	0.41	2.15	5	1
1:A:92:LEU:HD11	1:A:94:ILE:HB	0.41	1.92	5	2
1:A:131:ALA:O	1:A:135:VAL:HG22	0.41	2.15	20	1
1:A:85:TYR:CZ	1:A:128:ALA:HB1	0.41	2.51	2	1
1:A:140:GLN:O	1:A:141:ALA:HB3	0.40	2.17	2	1
1:A:135:VAL:HG23	1:A:136:ASP:N	0.40	2.30	20	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:30:GLN:HE22	1:A:34:LEU:HD11	0.40	1.77	5	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	136/158 (86%)	119±2 (87±1%)	14±2 (10±1%)	3±1 (2±1%)	10	50
All	All	2720/3160 (86%)	2377 (87%)	285 (10%)	58 (2%)	10	50

All 7 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	VAL	20
1	A	86	ARG	15
1	A	87	ASN	8
1	A	119	THR	8
1	A	46	ALA	5
1	A	95	SER	1
1	A	81	ARG	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	103/121 (85%)	78±3 (75±3%)	26±3 (25±3%)	2	25
All	All	2060/2420 (85%)	1550 (75%)	510 (25%)	2	25

All 64 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	92	LEU	20
1	A	100	ARG	20
1	A	63	LEU	20
1	A	96	LEU	19
1	A	122	LYS	18
1	A	44	LEU	18
1	A	76	GLU	17
1	A	38	TYR	17
1	A	136	ASP	15
1	A	45	ARG	15
1	A	43	LEU	15
1	A	98	SER	14
1	A	37	GLU	14
1	A	25	LYS	13
1	A	81	ARG	13
1	A	142	GLN	12
1	A	153	LEU	12
1	A	139	ARG	12
1	A	115	SER	12
1	A	72	ARG	12
1	A	125	SER	12
1	A	97	GLN	10
1	A	151	ASP	9
1	A	173	ASP	9
1	A	166	ARG	9
1	A	24	ASP	9
1	A	107	LEU	8
1	A	159	LYS	8
1	A	30	GLN	8
1	A	126	LEU	7
1	A	78	GLU	7
1	A	140	GLN	7
1	A	32	LYS	7
1	A	62	ARG	7
1	A	86	ARG	7
1	A	167	ARG	7
1	A	158	ARG	6
1	A	42	ARG	6
1	A	123	VAL	6
1	A	40	HIS	6
1	A	168	ARG	6
1	A	87	ASN	5

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Mol	Chain	Res	Type	Models (Total)
1	A	70	LEU	4
1	A	83	SER	3
1	A	112	HIS	3
1	A	36	ARG	3
1	A	172	THR	2
1	A	161	LEU	2
1	A	75	ASP	2
1	A	155	GLU	2
1	A	79	MET	2
1	A	119	THR	1
1	A	103	THR	1
1	A	93	HIS	1
1	A	104	ASP	1
1	A	77	LEU	1
1	A	145	MET	1
1	A	26	GLU	1
1	A	73	LEU	1
1	A	147	HIS	1
1	A	94	ILE	1
1	A	95	SER	1
1	A	133	LEU	1
1	A	65	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 carbohydrates 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

The completeness of assignment taking into account all chemical shift lists is 81% for the well-defined parts and 82% for the entire structure.

7.1 Chemical shift list 1

File name: input_cs.cif

Chemical shift list name: *dN20_hBOK_FP100RC4A_303K_nmrstar31.str*

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	1842
Number of shifts mapped to atoms	1842
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	9

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction \pm precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	158	-0.81 ± 0.13	Should be applied
$^{13}\text{C}_\beta$	147	-0.01 ± 0.05	None needed (< 0.5 ppm)
$^{13}\text{C}'$	0	—	None (insufficient data)
^{15}N	152	0.69 ± 0.21	Should be applied

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 81%, i.e. 1364 atoms were assigned a chemical shift out of a possible 1679. 34 out of 35 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	540/676 (80%)	270/270 (100%)	136/272 (50%)	134/134 (100%)
Sidechain	737/888 (83%)	447/512 (87%)	284/324 (88%)	6/52 (12%)

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	Total	¹H	¹³C	¹⁵N
Aromatic	87/115 (76%)	51/61 (84%)	33/47 (70%)	3/7 (43%)
Overall	1364/1679 (81%)	768/843 (91%)	453/643 (70%)	143/193 (74%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 82%, i.e. 1562 atoms were assigned a chemical shift out of a possible 1909. 38 out of 39 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹H	¹³C	¹⁵N
Backbone	612/768 (80%)	306/306 (100%)	156/312 (50%)	150/150 (100%)
Sidechain	851/1014 (84%)	518/588 (88%)	327/370 (88%)	6/56 (11%)
Aromatic	99/127 (78%)	57/67 (85%)	38/52 (73%)	4/8 (50%)
Overall	1562/1909 (82%)	881/961 (92%)	521/734 (71%)	160/214 (75%)

7.1.4 Statistically unusual chemical shifts ⓘ

The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

Mol	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	118	ILE	HG23	-1.03	2.13 – -0.57	-6.7
1	A	118	ILE	HG22	-1.03	2.13 – -0.57	-6.7
1	A	118	ILE	HG21	-1.03	2.13 – -0.57	-6.7
1	A	174	VAL	HB	-0.06	3.59 – 0.39	-6.4
1	A	164	TRP	HH2	4.78	8.94 – 5.04	-5.7
1	A	110	ALA	HB3	0.00	2.61 – 0.11	-5.4
1	A	110	ALA	HB1	0.00	2.61 – 0.11	-5.4
1	A	110	ALA	HB2	0.00	2.61 – 0.11	-5.4
1	A	118	ILE	HB	0.33	3.24 – 0.34	-5.0

7.1.5 Random Coil Index (RCI) plots ⓘ

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:

