



# Full wwPDB NMR Structure Validation Report ⓘ

Feb 26, 2022 – 06:26 PM EST

PDB ID : 2ALJ  
Title : Structure of the cis conformer of the major extracytoplasmic domain of the bacterial cell division protein DivIB from *Geobacillus stearothermophilus*  
Authors : Robson, S.A.; King, G.F.  
Deposited on : 2005-08-05

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 : 2.27  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.27

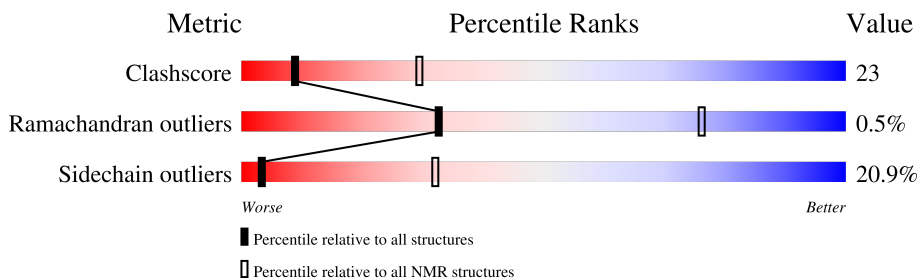
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment was not calculated.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



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

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	119	

## 2 Ensemble composition and analysis i

This entry contains 25 models. Model 19 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative.

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:117-A:188, A:194-A:220 (99)	0.10	19

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 5 clusters and 2 single-model clusters were found.

Cluster number	Models
1	1, 3, 8, 9, 10, 11, 12, 15, 19, 20
2	5, 6, 7, 13, 14, 22
3	18, 24, 25
4	2, 21
5	16, 17
Single-model clusters	4; 23

### 3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1869 atoms, of which 927 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called cell-division initiation protein.

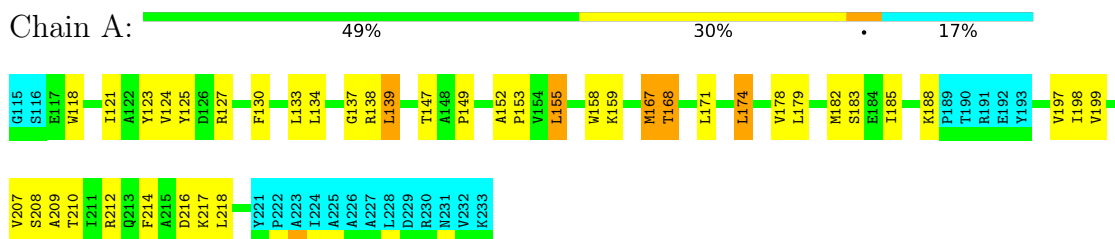
Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	119	1869	598	927	162	179	3	0

## 4 Residue-property plots [i](#)

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

These plots are provided for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

- Molecule 1: cell-division initiation protein

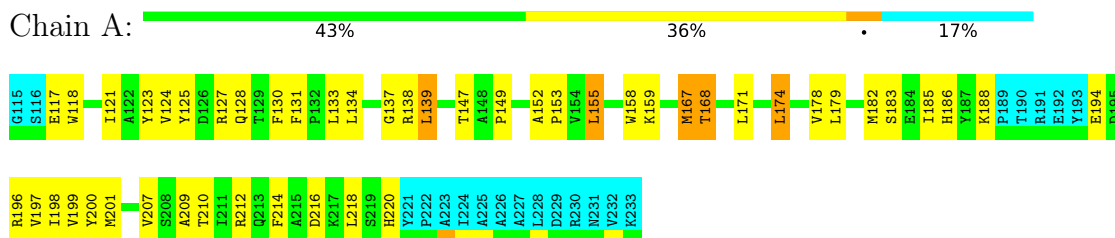


### 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

#### 4.2.1 Score per residue for model 1

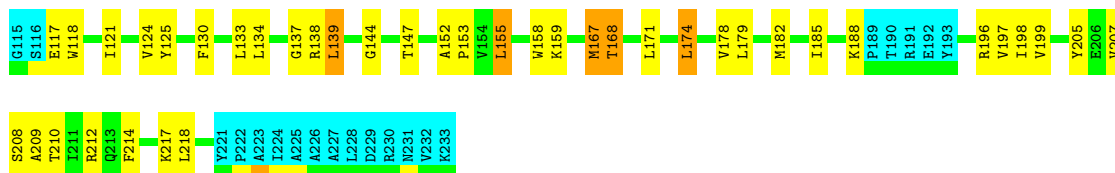
- Molecule 1: cell-division initiation protein



#### 4.2.2 Score per residue for model 2

- Molecule 1: cell-division initiation protein

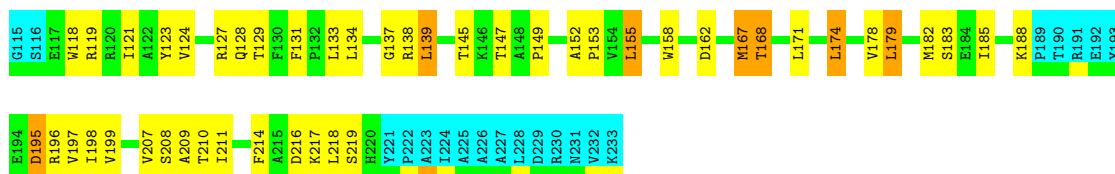




#### 4.2.3 Score per residue for model 3

- Molecule 1: cell-division initiation protein

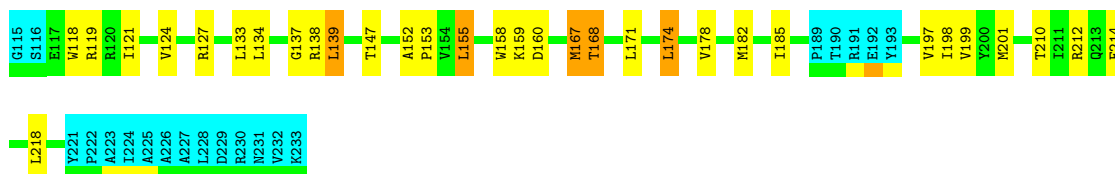
Chain A: 44% 34% 6% 17%



#### 4.2.4 Score per residue for model 4

- Molecule 1: cell-division initiation protein

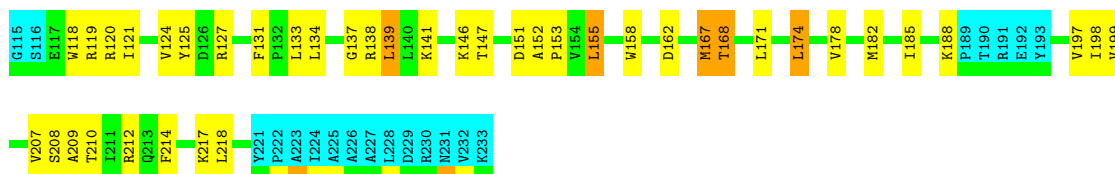
Chain A: 56% 23% 17%



#### 4.2.5 Score per residue for model 5

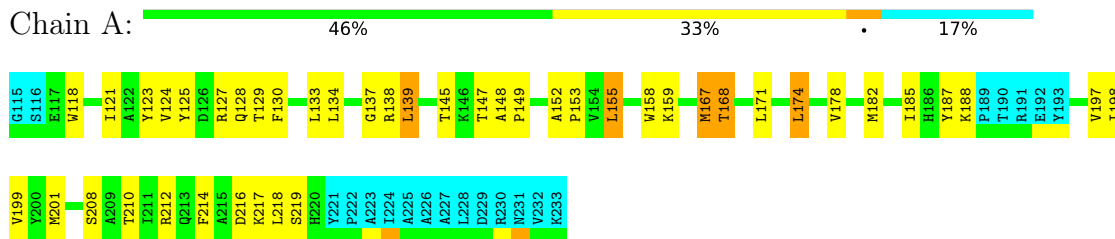
- Molecule 1: cell-division initiation protein

Chain A: 49% 30% 17%



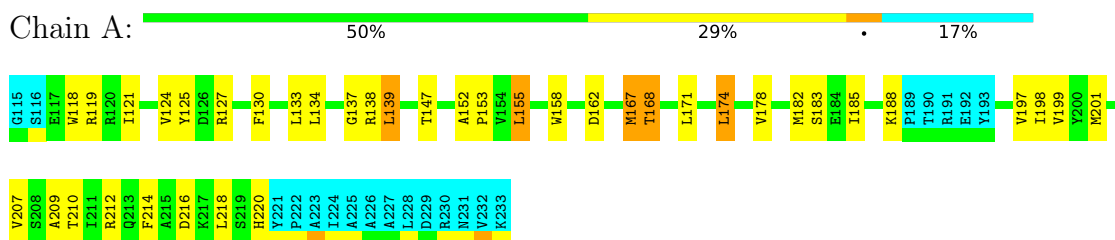
#### 4.2.6 Score per residue for model 6

- Molecule 1: cell-division initiation protein



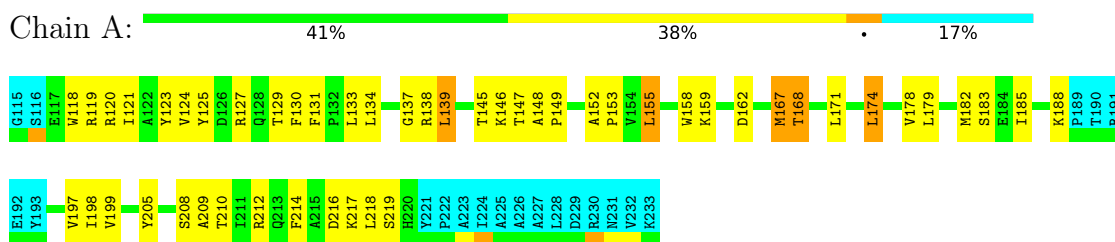
#### 4.2.7 Score per residue for model 7

- Molecule 1: cell-division initiation protein



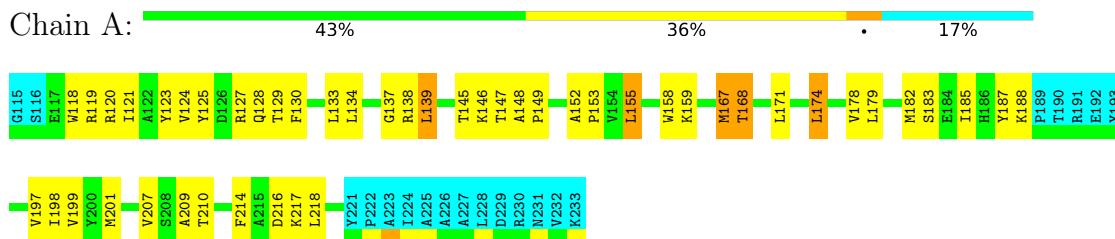
#### 4.2.8 Score per residue for model 8

- Molecule 1: cell-division initiation protein



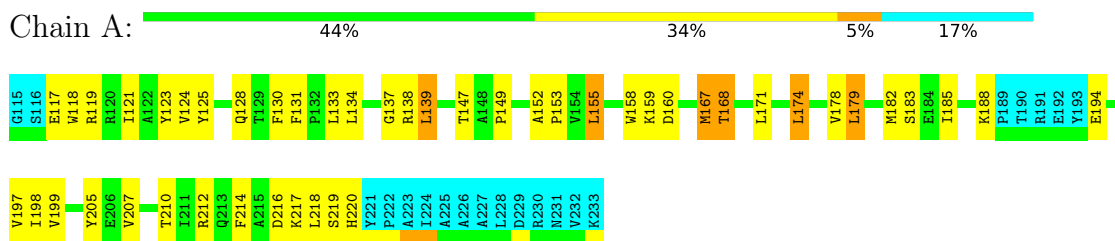
#### 4.2.9 Score per residue for model 9

- Molecule 1: cell-division initiation protein



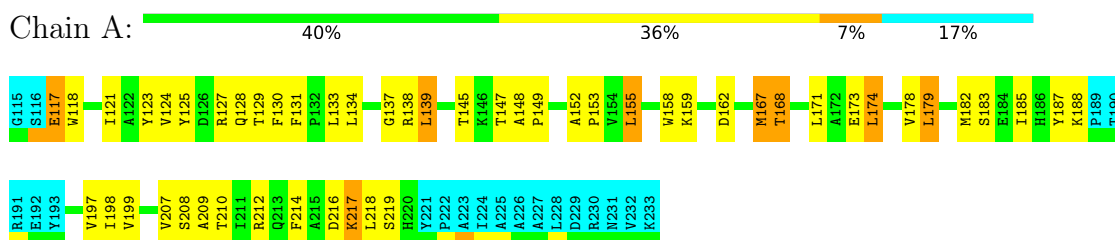
#### 4.2.10 Score per residue for model 10

- Molecule 1: cell-division initiation protein



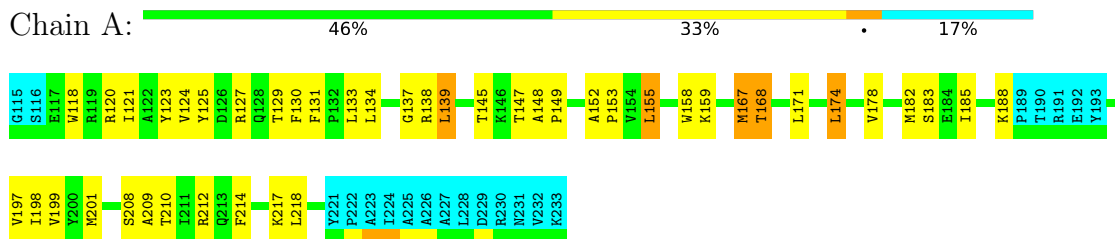
#### 4.2.11 Score per residue for model 11

- Molecule 1: cell-division initiation protein



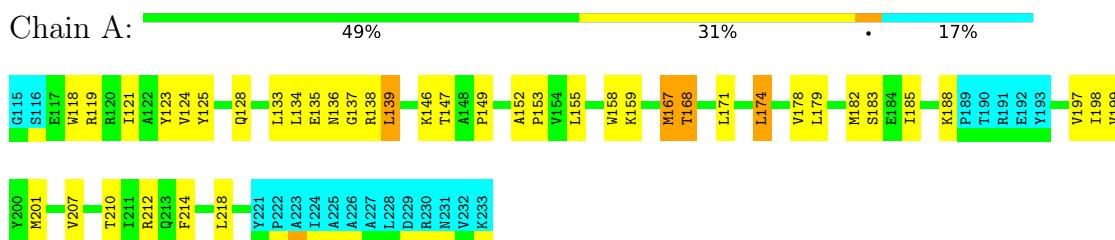
#### 4.2.12 Score per residue for model 12

- Molecule 1: cell-division initiation protein



#### 4.2.13 Score per residue for model 13

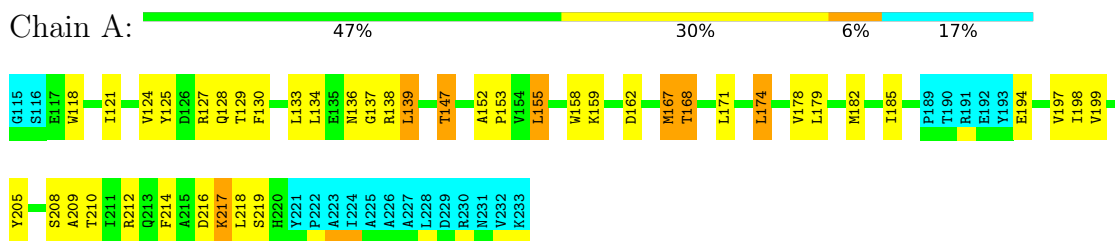
- Molecule 1: cell-division initiation protein





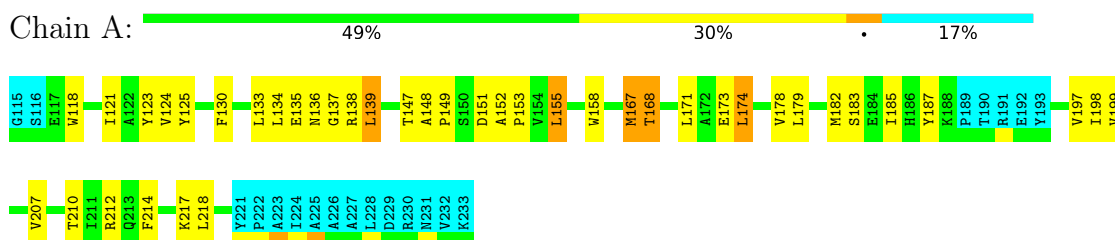
#### 4.2.14 Score per residue for model 14

- Molecule 1: cell-division initiation protein



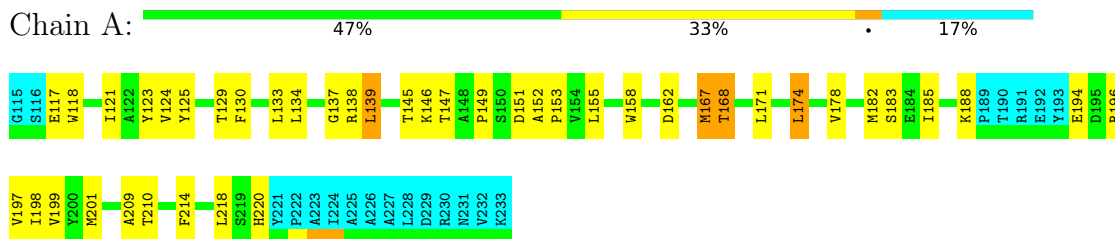
#### 4.2.15 Score per residue for model 15

- Molecule 1: cell-division initiation protein



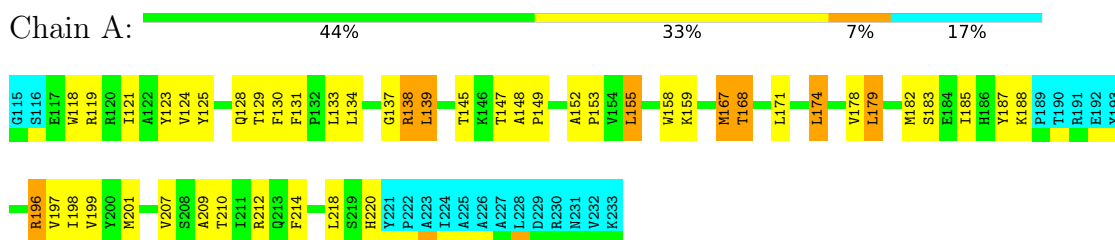
#### 4.2.16 Score per residue for model 16

- Molecule 1: cell-division initiation protein



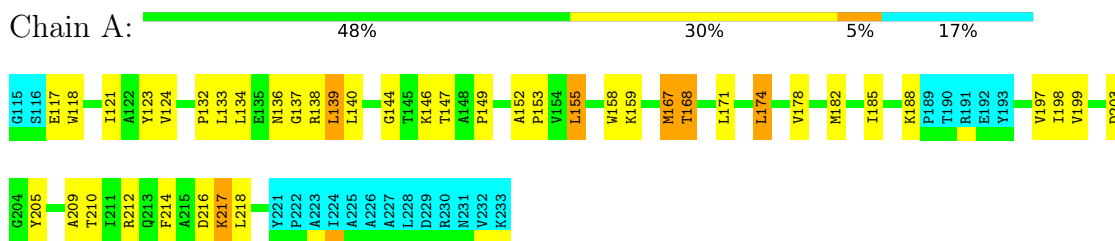
#### 4.2.17 Score per residue for model 17

- Molecule 1: cell-division initiation protein



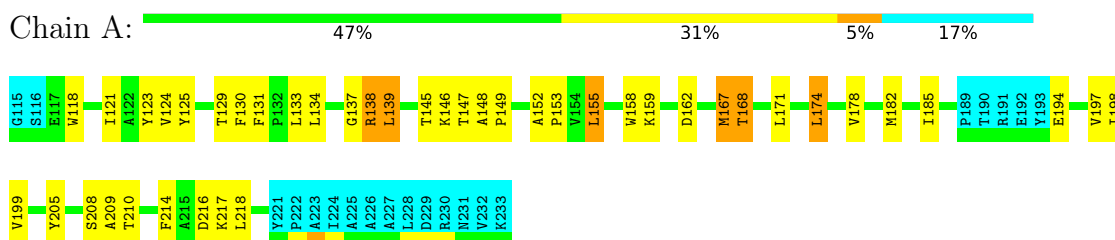
#### 4.2.18 Score per residue for model 18

- Molecule 1: cell-division initiation protein



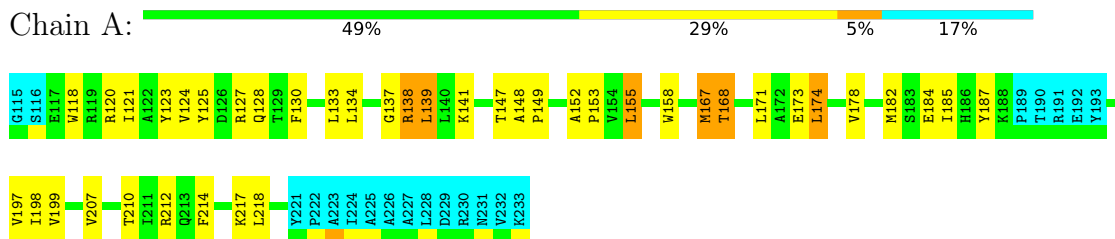
#### 4.2.19 Score per residue for model 19 (medoid)

- Molecule 1: cell-division initiation protein



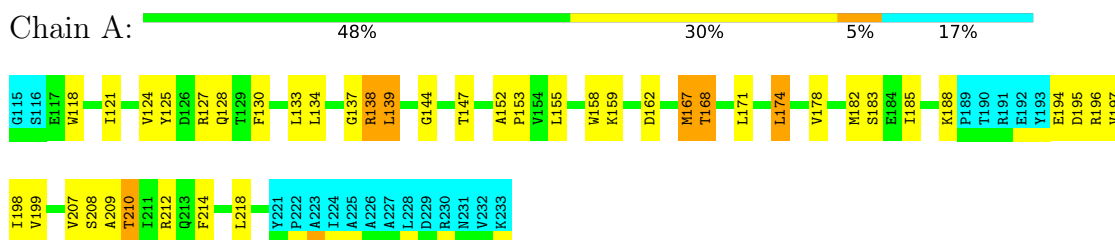
#### 4.2.20 Score per residue for model 20

- Molecule 1: cell-division initiation protein



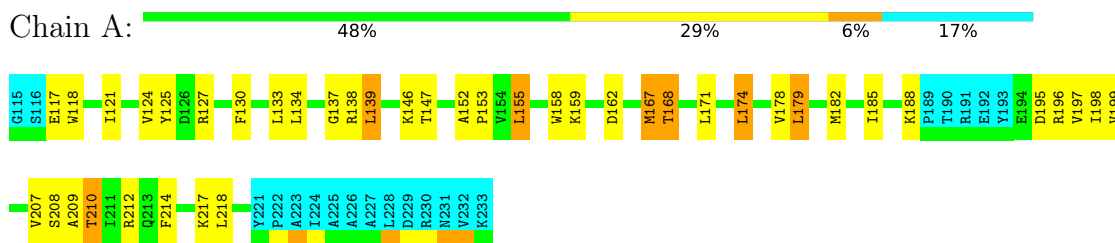
#### 4.2.21 Score per residue for model 21

- Molecule 1: cell-division initiation protein



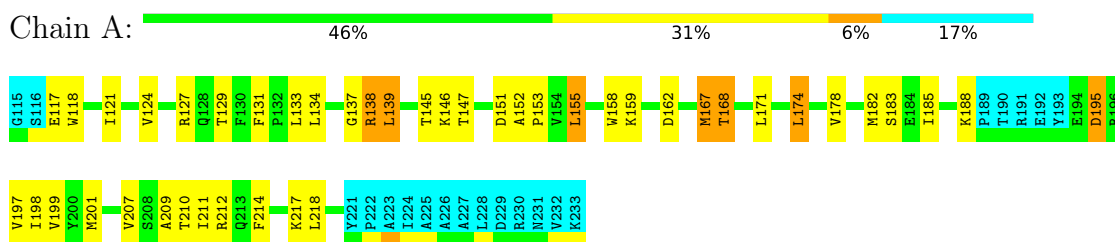
### 4.2.22 Score per residue for model 22

- Molecule 1: cell-division initiation protein



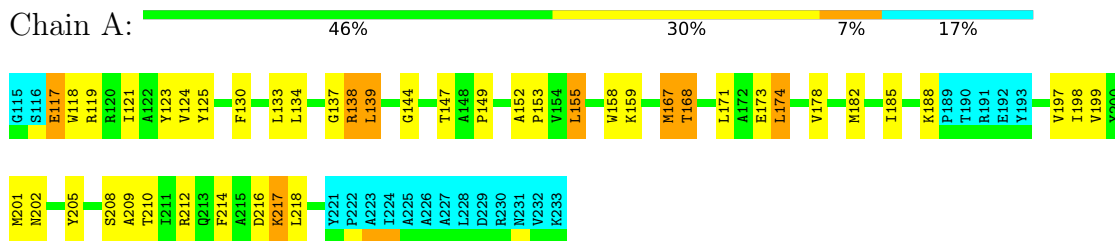
### 4.2.23 Score per residue for model 23

- Molecule 1: cell-division initiation protein



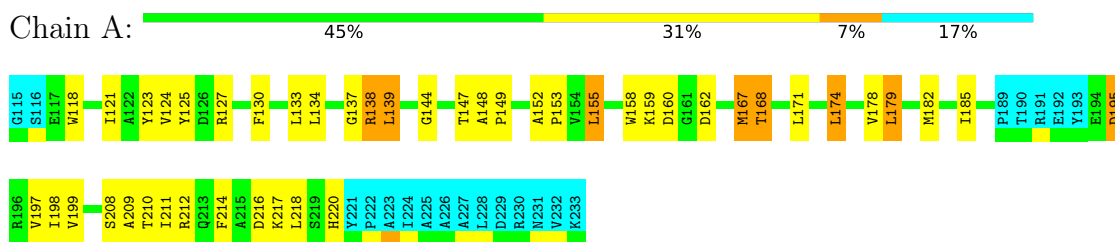
### 4.2.24 Score per residue for model 24

- Molecule 1: cell-division initiation protein



### 4.2.25 Score per residue for model 25

- Molecule 1: cell-division initiation protein



## 5 Refinement protocol and experimental data overview

The models were refined using the following method: *TORSION ANGLE DYNAMICS (CANDID/CYANA) FOLLOWED BY SIMULATED ANNEALING (XPLOR)*.

Of the 60 calculated structures, 25 were deposited, based on the following criterion: *STRUCTURES WITH LOWEST ENERGY AND NO RESTRAINT VIOLATIONS*.

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

Software name	Classification	Version
X-PLOR	refinement	3.1
NMRPipe	structure solution	2.2
XEASY	structure solution	1.3.13
C	structure solution	
ID/CYANA	structure solution	1.1

No chemical shift data was provided.

## 6 Model quality i

### 6.1 Standard geometry i

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

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 i

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in each chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	787	772	772	37±4
All	All	19675	19300	19300	913

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 23.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:155:LEU:HD23	1:A:158:TRP:CE2	0.80	2.12	23	25
1:A:197:VAL:O	1:A:198:ILE:HD13	0.77	1.80	17	25
1:A:121:ILE:HD11	1:A:168:THR:HG22	0.77	1.57	13	25
1:A:178:VAL:HG12	1:A:182:MET:CE	0.76	2.10	12	25
1:A:130:PHE:CE2	1:A:148:ALA:HB2	0.75	2.17	11	10
1:A:155:LEU:HD21	1:A:167:MET:SD	0.73	2.24	23	25
1:A:178:VAL:HG11	1:A:218:LEU:HB3	0.72	1.62	7	25
1:A:185:ILE:HG12	1:A:199:VAL:HG12	0.71	1.63	2	25
1:A:178:VAL:CG1	1:A:218:LEU:HD12	0.68	2.19	2	23
1:A:178:VAL:HG12	1:A:182:MET:HE3	0.67	1.65	24	25
1:A:178:VAL:HG11	1:A:218:LEU:HD12	0.65	1.69	2	22
1:A:198:ILE:HD12	1:A:208:SER:OG	0.62	1.94	25	7
1:A:167:MET:HE3	1:A:168:THR:HA	0.62	1.71	23	2
1:A:197:VAL:HG22	1:A:209:ALA:O	0.61	1.96	12	19

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:133:LEU:HD21	1:A:168:THR:OG1	0.60	1.96	8	25
1:A:118:TRP:HB2	1:A:134:LEU:HD13	0.59	1.74	4	25
1:A:124:VAL:HG21	1:A:139:LEU:HD11	0.59	1.74	12	25
1:A:134:LEU:HD12	1:A:138:ARG:CB	0.58	2.28	20	3
1:A:174:LEU:CD2	1:A:179:LEU:HD13	0.57	2.29	9	4
1:A:121:ILE:O	1:A:179:LEU:HD21	0.57	2.00	11	5
1:A:152:ALA:HB1	1:A:153:PRO:HD2	0.56	1.78	4	25
1:A:171:LEU:HD11	1:A:214:PHE:CE1	0.56	2.35	8	13
1:A:121:ILE:HD11	1:A:168:THR:CG2	0.56	2.29	22	25
1:A:124:VAL:HG21	1:A:139:LEU:CD1	0.55	2.31	11	23
1:A:130:PHE:CZ	1:A:148:ALA:HB2	0.55	2.36	15	10
1:A:178:VAL:HG21	1:A:218:LEU:O	0.55	2.02	11	17
1:A:153:PRO:HD3	1:A:179:LEU:HD23	0.55	1.78	10	2
1:A:134:LEU:HD12	1:A:138:ARG:HB3	0.54	1.78	9	24
1:A:174:LEU:HD21	1:A:179:LEU:HB2	0.54	1.80	15	1
1:A:155:LEU:HD23	1:A:158:TRP:NE1	0.54	2.18	4	25
1:A:199:VAL:HG11	1:A:214:PHE:CZ	0.54	2.37	6	24
1:A:178:VAL:HG12	1:A:182:MET:HE2	0.54	1.78	2	3
1:A:174:LEU:HD21	1:A:179:LEU:HD13	0.53	1.80	13	4
1:A:195:ASP:OD1	1:A:210:THR:HG22	0.52	2.04	21	2
1:A:133:LEU:HD11	1:A:137:GLY:HA2	0.52	1.81	12	25
1:A:171:LEU:O	1:A:174:LEU:HD22	0.51	2.04	13	23
1:A:137:GLY:HA2	1:A:168:THR:HG21	0.51	1.82	16	25
1:A:125:TYR:CE1	1:A:130:PHE:CZ	0.50	3.00	1	2
1:A:171:LEU:HA	1:A:174:LEU:HD22	0.50	1.83	4	24
1:A:125:TYR:CD1	1:A:130:PHE:CE1	0.50	3.00	7	7
1:A:125:TYR:CE1	1:A:130:PHE:CE1	0.50	3.00	6	14
1:A:133:LEU:HD11	1:A:137:GLY:C	0.49	2.28	12	25
1:A:155:LEU:HD21	1:A:167:MET:CG	0.49	2.37	16	3
1:A:155:LEU:HD21	1:A:167:MET:HG2	0.49	1.84	16	1
1:A:129:THR:HG23	1:A:145:THR:O	0.49	2.08	19	7
1:A:123:TYR:CD1	1:A:149:PRO:CG	0.48	2.97	11	17
1:A:134:LEU:O	1:A:168:THR:HG21	0.47	2.09	13	23
1:A:125:TYR:CD1	1:A:130:PHE:CE2	0.47	3.02	1	2
1:A:133:LEU:HD11	1:A:137:GLY:CA	0.47	2.39	12	24
1:A:199:VAL:HG21	1:A:218:LEU:HD11	0.47	1.86	20	5
1:A:118:TRP:CD1	1:A:136:ASN:ND2	0.46	2.83	14	4
1:A:132:PRO:HB2	1:A:140:LEU:HD12	0.46	1.86	18	1
1:A:167:MET:CE	1:A:171:LEU:HD22	0.46	2.41	9	2
1:A:155:LEU:HD11	1:A:167:MET:CE	0.46	2.40	24	2
1:A:130:PHE:CE2	1:A:148:ALA:CB	0.46	2.99	9	9

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:186:HIS:CE1	1:A:200:TYR:CE1	0.45	3.04	1	1
1:A:171:LEU:CD1	1:A:214:PHE:CE1	0.45	3.00	9	4
1:A:174:LEU:C	1:A:174:LEU:HD23	0.44	2.32	20	16
1:A:155:LEU:HD11	1:A:167:MET:HE1	0.44	1.87	16	3
1:A:131:PHE:HB2	1:A:139:LEU:HD21	0.43	1.90	1	8
1:A:158:TRP:CZ2	1:A:197:VAL:CG1	0.43	3.01	25	1
1:A:153:PRO:CD	1:A:179:LEU:HD23	0.43	2.43	10	1
1:A:123:TYR:CD1	1:A:149:PRO:HG3	0.43	2.49	6	17
1:A:198:ILE:HD12	1:A:208:SER:HB2	0.43	1.90	22	3
1:A:158:TRP:CH2	1:A:197:VAL:HG11	0.42	2.48	25	1
1:A:195:ASP:HB3	1:A:211:ILE:HD12	0.42	1.89	3	3
1:A:158:TRP:CZ2	1:A:197:VAL:HG11	0.42	2.49	25	2
1:A:174:LEU:HD21	1:A:179:LEU:HG	0.42	1.91	25	1
1:A:124:VAL:CG2	1:A:139:LEU:HD11	0.41	2.44	11	1
1:A:137:GLY:CA	1:A:168:THR:HG21	0.41	2.45	24	3
1:A:123:TYR:CG	1:A:149:PRO:HG3	0.41	2.50	8	9
1:A:131:PHE:CB	1:A:139:LEU:CD2	0.41	2.98	11	9
1:A:174:LEU:HD23	1:A:174:LEU:O	0.41	2.15	16	9
1:A:131:PHE:CE1	1:A:141:LYS:O	0.41	2.74	5	1
1:A:130:PHE:CG	1:A:147:THR:O	0.41	2.74	14	1
1:A:198:ILE:HD12	1:A:208:SER:HB3	0.40	1.94	19	1
1:A:171:LEU:HD11	1:A:214:PHE:CZ	0.40	2.50	8	1
1:A:129:THR:CG2	1:A:145:THR:N	0.40	2.85	3	3
1:A:129:THR:HG22	1:A:130:PHE:N	0.40	2.32	14	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	99/119 (83%)	91±1 (92±1%)	8±1 (8±1%)	1±1 (1±1%)	32	76
All	All	2475/2975 (83%)	2268 (92%)	194 (8%)	13 (1%)	32	76

All 2 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	117	GLU	8
1	A	144	GLY	5

### 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	81/96 (84%)	64±2 (79±3%)	17±2 (21±3%)	<b>3</b> 32
All	All	2025/2400 (84%)	1602 (79%)	423 (21%)	<b>3</b> 32

All 40 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	139	LEU	25
1	A	147	THR	25
1	A	167	MET	25
1	A	168	THR	25
1	A	174	LEU	25
1	A	210	THR	25
1	A	155	LEU	22
1	A	212	ARG	21
1	A	159	LYS	19
1	A	188	LYS	19
1	A	127	ARG	16
1	A	217	LYS	15
1	A	183	SER	14
1	A	216	ASP	13
1	A	162	ASP	12
1	A	128	GLN	11
1	A	201	MET	11
1	A	119	ARG	10
1	A	146	LYS	9
1	A	179	LEU	8
1	A	196	ARG	7
1	A	205	TYR	7
1	A	138	ARG	7
1	A	194	GLU	6

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Mol	Chain	Res	Type	Models (Total)
1	A	219	SER	6
1	A	187	TYR	6
1	A	120	ARG	5
1	A	151	ASP	4
1	A	173	GLU	4
1	A	195	ASP	3
1	A	160	ASP	3
1	A	125	TYR	3
1	A	117	GLU	3
1	A	208	SER	2
1	A	135	GLU	2
1	A	203	ASP	1
1	A	141	LYS	1
1	A	184	GLU	1
1	A	202	ASN	1
1	A	220	HIS	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

There are no chain breaks in this entry.

## 7 Chemical shift validation

No chemical shift data were provided