



Full wwPDB NMR Structure Validation Report ⓘ

Jun 23, 2024 – 04:47 AM EDT

PDB ID : 6HPJ
BMRB ID : 34317
Title : Structure of human SRSF1 RRM1 bound to AACAAA RNA
Authors : Allain, F.T.H.; Clery, A.
Deposited on : 2018-09-21

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The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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)
wwPDB-RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
wwPDB-ShiftChecker : v1.2
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

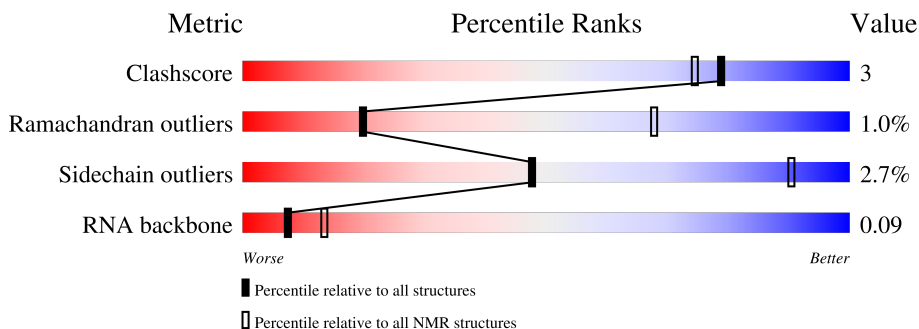
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 73%.

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
RNA backbone	4643	676

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	B	161	 37% 13% 48%
2	A	6	 17% 67% 17%

2 Ensemble composition and analysis i

This entry contains 20 models. Model 17 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	B:16-B:23, B:30-B:49, B:55-B:89 (63)	0.92	17

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 3 clusters and 5 single-model clusters were found.

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

3 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1506 atoms, of which 705 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	B	84	1311	422	637	121	130	1	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-63	MET	-	initiating methionine	UNP P19909
B	-62	GLN	-	expression tag	UNP P19909
B	-7	GLY	-	linker	UNP P19909
B	-6	SER	-	linker	UNP P19909
B	-5	HIS	-	linker	UNP P19909
B	-4	HIS	-	linker	UNP P19909
B	-3	HIS	-	linker	UNP P19909
B	-2	HIS	-	linker	UNP P19909
B	-1	HIS	-	linker	UNP P19909
B	0	HIS	-	linker	UNP P19909
B	37	SER	TYR	conflict	UNP Q07955
B	72	SER	TYR	conflict	UNP Q07955

- Molecule 2 is a RNA chain called RNA (5'-R(*AP*AP*CP*AP*AP*A)-3').

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	P	
2	A	6	195	59	68	28	35	5	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.

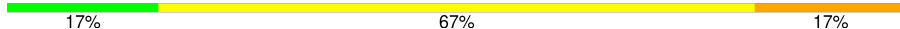
- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B: 

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LEU LYS GLY GLU THR THR THR GLU ALA VAL ASP ALA ALA THR ALA ALA GLU LYS VAL PHE LYS GLN TYR ALA ASN ASP ASN GLY VAL ASP GLU TRP THR TYR ASP ASP ALA THR LYS THR PHE THR VAL THR GLU SER HIS HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 G9 P10 A11 G12 M13 M14 D15 Y19 P24 P25 D26 I27 R28 T29 R50 R51 G52 G53 P54 F58 Y79 D80 P89 ARG SER GLY ARG GLY THR ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A: 

A90 A91 C92 A93 A94 A95

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

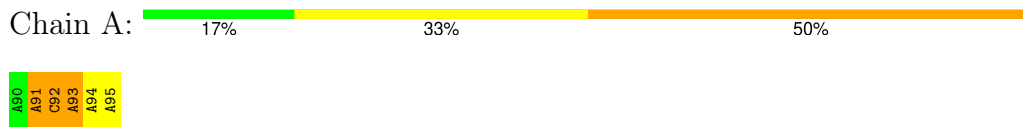
- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B: 

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LEU LYS GLY GLU THR THR THR GLU ALA VAL ASP ALA ALA THR ALA ALA GLU LYS VAL PHE LYS GLN TYR ALA ASN ASP ASN GLY VAL ASP GLU TRP THR TYR ASP ASP ALA THR LYS THR PHE THR VAL THR GLU SER HIS HIS

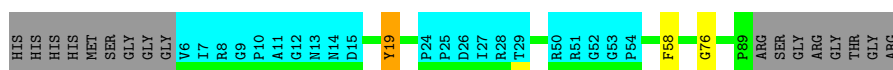
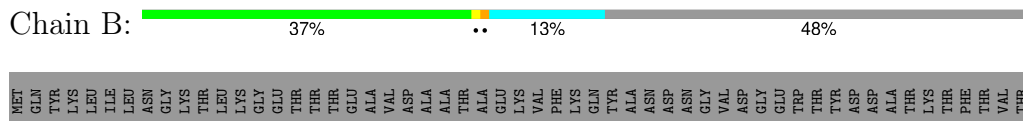
HIS HIS HIS MET SER GLY GLY V6 I7 R8 G9 P10 A11 G12 M13 M14 D15 Y19 P24 P25 D26 I27 R28 T29 G40 R50 R51 G52 G53 P54 F58 Y79 D80 P89 ARG SER GLY ARG GLY THR ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.2 Score per residue for model 2

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

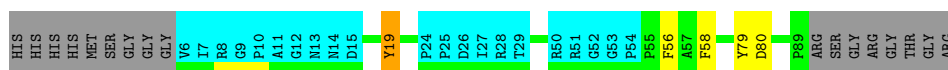
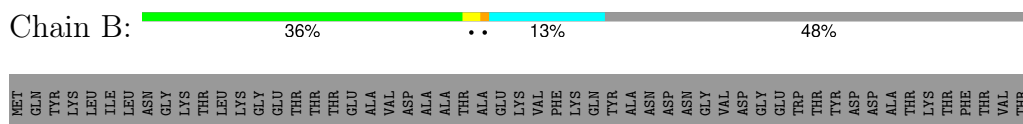


- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.3 Score per residue for model 3

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1



- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.4 Score per residue for model 4

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B:  37% .. 13% 48%

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR GLU ALA VAL ASP ALA THR ALA THR LYS VAL PHE GLN TYR ALA ASN ASP ASN GLY VAL ASP GLY TRP TYR ASP ASP THR LYS THR PHE THR VAL THR GLU SER HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 N13 N14 D15 Y19 P24 P25 D26 I27 R28 T29 R50 R51 G52 G53 P54 Y79 D80 P89 ARG SER GLY TRP TYR GLY ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A:  50% 33% 17%

A90 A91 C92 A93 A94 A95

4.2.5 Score per residue for model 5

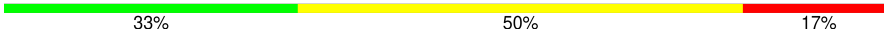
- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B:  36% .. 13% 48%

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR GLU ALA VAL ASP ALA THR ALA THR LYS VAL PHE GLN TYR ALA ASN ASP ASN GLY VAL ASP GLY TRP TYR ASP ASP THR LYS THR PHE THR VAL THR GLU SER HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 N13 N14 D15 Y19 P24 P25 D26 I27 R28 T29 R50 R51 G52 G53 P54 P55 P56 A57 F58 Y79 D80 P89 ARG SER GLY TRP TYR GLY ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A:  33% 50% 17%

A90 A91 C92 A93 A94 A95

4.2.6 Score per residue for model 6

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

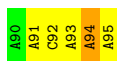
Chain B:  38% .. 13% 48%

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR GLU ALA VAL ASP ALA THR ALA THR LYS VAL PHE GLN TYR ALA ASN ASP ASN GLY VAL ASP GLY TRP TYR ASP ASP THR LYS THR PHE THR VAL THR GLU SER HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 N13 N14 D15 Y19 P24 P25 D26 I27 R28 T29 K30 R50 R51 G52 G53 P54 P89 ARG SER GLY TRP TYR GLY ARG

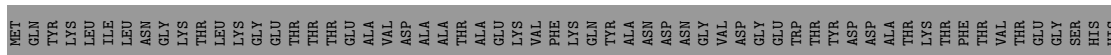
- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A:  17% 67% 17%



4.2.7 Score per residue for model 7

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

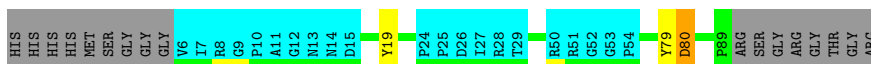
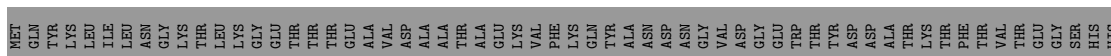


- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.8 Score per residue for model 8

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1



- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.9 Score per residue for model 9

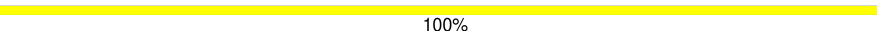
- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1



MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR M13 M14 M15 ALA VAL ASP ALA ALA THR ALA ALA GLU LYS VAL PHE LYS GLN TYR ALA ASN ASP ASN GLY VAL ASP GLY TRP TYR ASP ASP ALA THR LYS THR PHE THR VAL THR GLU GLY SER HIS HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 M13 M14 D15 Y19 P24 P25 D26 I27 R28 T29 I42 R50 R51 G52 G53 P54 P55 F56 A57 F58 F61 Y79 D80 P89 ARG SER GLY ARG GLY THR VAL THR GLU GLY SER HIS HIS

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A:  100%

A90
A91
C92
A93
A94
A95

4.2.10 Score per residue for model 10

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B:  35% . . 13% 48%

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR THR M13 M14 M15 ALA VAL ASP ALA ALA THR ALA ALA GLU LYS VAL PHE LYS GLN TYR ALA ASN ASP ASN GLY VAL ASP GLY TRP TYR ASP ASP ALA THR LYS THR PHE THR VAL THR GLU GLY SER HIS HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 M13 M14 D15 Y19 P24 P25 D26 I27 R28 K30 I42 R50 R51 G52 G53 P54 F56 F61 Y79 D80 P89 ARG SER GLY ARG GLY THR VAL THR GLU GLY SER HIS HIS

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A:  33% 33% 17% 17%

A90
A91
C92
A93
A94
A95

4.2.11 Score per residue for model 11

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B:  35% . 13% 48%

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR THR M13 M14 M15 ALA VAL ASP ALA ALA THR ALA ALA GLU LYS VAL PHE LYS GLN TYR ALA ASN ASP ASN GLY VAL ASP GLY TRP TYR ASP ASP ALA THR LYS THR PHE THR VAL THR GLU GLY SER HIS HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 M13 M14 D15 Y19 P24 P25 D26 I27 R28 K48 M49 R50 R51 G52 G53 P54 P55 F56 G76 Y79 D80 P89 ARG SER GLY ARG GLY THR VAL THR GLU GLY SER HIS HIS

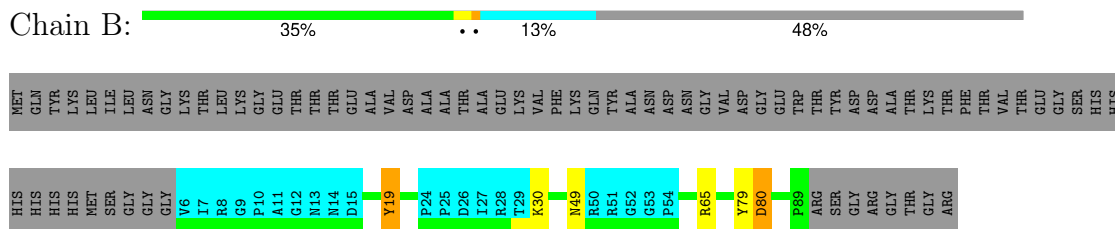
- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A:  17% 83%

A90
A91
C92
A93
A94
A95

4.2.12 Score per residue for model 12

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

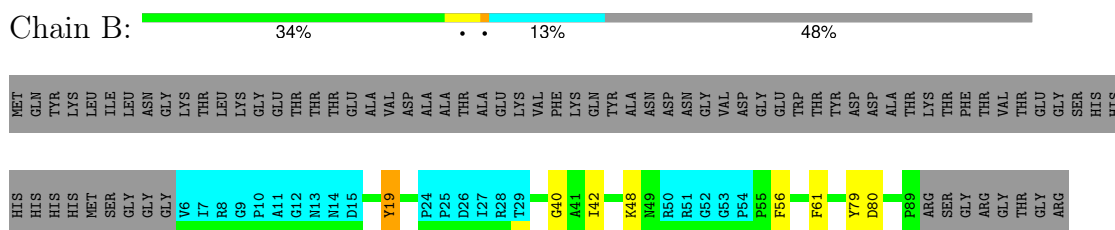


- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.13 Score per residue for model 13

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

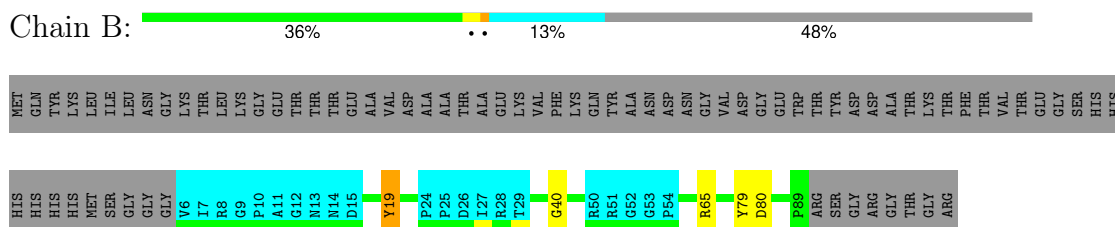


- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')



4.2.14 Score per residue for model 14

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1




Chain B: 

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR GLU ALA VAL ASP ALA THR ALA THR LYS PHE GLN TYR ALA ASN ASP ASN GLY VAL ASP GLU TRP THR TYR ASP ASP ALA THR LYS PHE THR VAL THR GLU SER HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 N13 N14 D15 Y19 P24 P25 D26 I27 R28 T29 I42 R50 R51 G52 G53 P54 F58 F61 Y79 D80 P89 ARG SER GLY ARG GLY THR GLY ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A: 

A90 A91 C92 A93 A94 A95

4.2.18 Score per residue for model 18

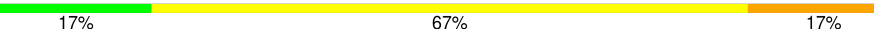
- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B: 

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR GLU ALA VAL ASP ALA THR ALA THR LYS PHE GLN TYR ALA ASN ASP ASN GLY VAL ASP GLU TRP THR TYR ASP ASP ALA THR LYS PHE THR VAL THR GLU SER HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 N13 N14 D15 Y19 P24 P25 D26 I27 R28 T29 I42 R50 R51 G52 G53 P54 F55 A57 F58 Y77 R83 L84 P89 ARG SER GLY ARG GLY THR GLY ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A: 

A90 A91 C92 A93 A94 A95

4.2.19 Score per residue for model 19

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B: 

MET GLN TYR LYS LEU ILE LEU ASN GLY LYS THR LEU LYS GLY GLU THR THR GLU ALA VAL ASP ALA THR ALA THR LYS PHE GLN TYR ALA ASN ASP ASN GLY VAL ASP GLU TRP THR TYR ASP ASP ALA THR LYS PHE THR VAL THR GLU SER HIS

HIS HIS HIS MET SER GLY GLY V6 I7 R8 C9 P10 A11 G12 N13 N14 D15 Y19 P24 P25 D26 I27 R28 T29 R50 R51 G52 G53 P54 F58 Y79 D80 P89 ARG SER GLY ARG GLY THR GLY ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A: 

A90
A91
C92
A93
A94
A95

4.2.20 Score per residue for model 20

- Molecule 1: Immunoglobulin G-binding protein G,Serine/arginine-rich splicing factor 1

Chain B: 37% .. 13% 48%

MET
GLN
TYR
LYS
LEU
ILE
LEU
ASN
GLY
LYS
THR
LEU
R8
LYS
GLY
GLU
THR
THR
THR
GLU
ALA
VAL
ASP
ALA
ALA
THR
ALA
GLU
LYS
VAL
PHE
LYS
GLN
TYR
ALA
ASN
ASP
ASN
GLY
VAL
ASP
GLY
GLU
TRP
THR
TYR
ASP
ASP
ALA
THR
LYS
THR
PHE
THR
VAL
THR
GLU
SER
HIS
HIS

HIS
HIS
HIS
MET
SER
GLY
GLY
V6
I7
R8
G9
F10
A11
G12
M13
M14
D15
Y19
P24
P25
D26
I27
R28
T29
G40
R50
R51
G52
G53
P54
F58
R65
F89
ARG
SER
GLY
ARG
GLY
THR
GLY
ARG

- Molecule 2: RNA (5'-R(*AP*AP*CP*AP*AP*A)-3')

Chain A: 50% 17% 33%

A90
A91
C92
A93
A94
A95

5 Refinement protocol and experimental data overview

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

Of the 50 calculated structures, 20 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
Amber	refinement	
CYANA	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	844
Number of shifts mapped to atoms	844
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	73%

6 Model quality i

6.1 Standard geometry i

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the (average) root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#Z>5	RMSZ	#Z>5
1	B	0.59±0.00	0±0/531 (0.0± 0.0%)	0.72±0.01	0±0/716 (0.0± 0.0%)
2	A	1.05±0.02	0±0/143 (0.0± 0.0%)	1.34±0.05	1±1/221 (0.4± 0.3%)
All	All	0.72	0/13480 (0.0%)	0.91	16/18740 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	Chirality	Planarity
2	A	0.0±0.0	0.1±0.3
All	All	0	2

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(°)	Ideal(°)	Models	
								Worst	Total
2	A	91	A	O4'-C1'-N9	6.27	113.22	108.20	1	3
2	A	90	A	O4'-C1'-N9	5.96	112.97	108.20	8	4
2	A	94	A	O4'-C1'-N9	5.70	112.76	108.20	2	5
2	A	93	A	O4'-C1'-N9	5.62	112.70	108.20	5	3
2	A	95	A	O4'-C1'-N9	5.01	112.21	108.20	7	1

There are no chirality outliers.

All unique planar outliers are listed below.

Mol	Chain	Res	Type	Group	Models (Total)
2	A	93	A	Sidechain	2

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	B	519	482	482	3±2
2	A	127	68	68	2±1
All	All	12920	11000	11000	66

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:B:42:ILE:HD11	1:B:61:PHE:CE2	0.56	2.36	15	3
1:B:84:LEU:HD22	1:B:84:LEU:N	0.54	2.17	18	1
1:B:58:PHE:CE1	2:A:93:A:C4	0.53	2.95	5	4
1:B:58:PHE:CE2	2:A:93:A:C4	0.53	2.97	16	5
1:B:79:TYR:CG	1:B:80:ASP:N	0.52	2.78	17	14
1:B:19:TYR:CE1	2:A:92:C:C6	0.48	3.02	9	10
1:B:42:ILE:HD11	1:B:61:PHE:CZ	0.46	2.46	17	2
1:B:58:PHE:CE2	2:A:93:A:C6	0.46	3.03	17	1
1:B:84:LEU:N	1:B:84:LEU:CD2	0.45	2.79	18	1
1:B:79:TYR:CD2	1:B:80:ASP:N	0.45	2.84	14	2
1:B:56:PHE:CE2	2:A:92:C:H4'	0.45	2.47	5	3
1:B:42:ILE:N	1:B:42:ILE:HD12	0.44	2.27	17	2
1:B:19:TYR:CE2	2:A:92:C:C6	0.44	3.05	2	6
1:B:48:LYS:HE2	1:B:56:PHE:CZ	0.43	2.48	11	2
1:B:58:PHE:CD2	2:A:93:A:C2	0.43	3.07	19	3
1:B:58:PHE:CZ	2:A:93:A:C5	0.42	3.06	5	1
1:B:79:TYR:CD1	1:B:80:ASP:N	0.42	2.88	3	3
2:A:93:A:C8	2:A:93:A:H5''	0.40	2.51	7	1
1:B:47:LEU:HD13	1:B:47:LEU:C	0.40	2.37	15	1
1:B:56:PHE:CE1	2:A:92:C:H4'	0.40	2.51	3	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	B	62/161 (39%)	54±2 (87±3%)	7±2 (12±4%)	1±1 (1±1%)	20	68
All	All	1240/3220 (39%)	1078 (87%)	149 (12%)	13 (1%)	20	68

All 5 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	B	40	GLY	5
1	B	80	ASP	4
1	B	76	GLY	2
1	B	49	ASN	1
1	B	77	TYR	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	B	54/130 (42%)	53±1 (97±1%)	1±1 (3±1%)	48	90
All	All	1080/2600 (42%)	1051 (97%)	29 (3%)	48	90

All 6 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	B	19	TYR	20
1	B	30	LYS	3
1	B	65	ARG	3
1	B	56	PHE	1
1	B	38	LYS	1

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Mol	Chain	Res	Type	Models (Total)
1	B	83	ARG	1

6.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers	Suiteness
2	A	5/6 (83%)	3±1 (63±18%)	1±1 (20±15%)	0.09±0.07
All	All	104/120 (87%)	63 (61%)	20 (19%)	0.09

The overall RNA backbone suiteness is 0.09.

All unique RNA backbone outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
2	A	94	A	16
2	A	93	A	14
2	A	95	A	14
2	A	91	A	11
2	A	92	C	8

All unique RNA pucker outliers are listed below:

Mol	Chain	Res	Type	Models (Total)
2	A	94	A	8
2	A	91	A	6
2	A	90	A	4
2	A	93	A	2

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 73% for the well-defined parts and 67% 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 [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	844
Number of shifts mapped to atoms	844
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	1

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
$^{13}\text{C}_\alpha$	56	-0.34 ± 0.36	None needed (< 0.5 ppm)
$^{13}\text{C}_\beta$	64	0.13 ± 0.20	None needed (< 0.5 ppm)
$^{13}\text{C}'$	0	—	None (insufficient data)
^{15}N	70	0.35 ± 0.35	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 73%, i.e. 718 atoms were assigned a chemical shift out of a possible 982. 0 out of 8 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	236/314 (75%)	126/128 (98%)	50/126 (40%)	60/60 (100%)
Sidechain	376/459 (82%)	260/292 (89%)	114/144 (79%)	2/23 (9%)

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	Total	¹H	¹³C	¹⁵N
Aromatic	62/95 (65%)	41/45 (91%)	21/50 (42%)	0/0 (—%)
Sugar	32/66 (48%)	32/36 (89%)	0/30 (0%)	0/0 (—%)
Base	12/48 (25%)	12/30 (40%)	0/12 (0%)	0/6 (0%)
Overall	718/982 (73%)	471/531 (89%)	185/362 (51%)	62/89 (70%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 67%, i.e. 844 atoms were assigned a chemical shift out of a possible 1259. 0 out of 9 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹H	¹³C	¹⁵N
Backbone	275/415 (66%)	149/170 (88%)	56/168 (33%)	70/77 (91%)
Sidechain	463/635 (73%)	323/404 (80%)	136/194 (70%)	4/37 (11%)
Aromatic	62/95 (65%)	41/45 (91%)	21/50 (42%)	0/0 (—%)
Sugar	32/66 (48%)	32/36 (89%)	0/30 (0%)	0/0 (—%)
Base	12/48 (25%)	12/30 (40%)	0/12 (0%)	0/6 (0%)
Overall	844/1259 (67%)	557/685 (81%)	213/454 (47%)	74/120 (62%)

7.1.4 Statistically unusual chemical shifts [i](#)

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.

List Id	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	B	48	LYS	HB2	0.55	0.58 – 2.97	-5.2

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. If well-defined core and ill-defined regions are not identified then it is shown as gray bars.

Random coil index (RCI) for chain B:

