



# Full wwPDB NMR Structure Validation Report ⓘ

May 28, 2020 – 08:10 pm BST

PDB ID : 1O0P  
Title : Solution Structure of the third RNA Recognition Motif (RRM) of U2AF65 in complex with an N-terminal SF1 peptide  
Authors : Selenko, P.; Gregorovic, G.; Sprangers, R.; Stier, G.; Rhani, Z.; Kramer, A.; Sattler, M.  
Deposited on : 2003-02-24

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:

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

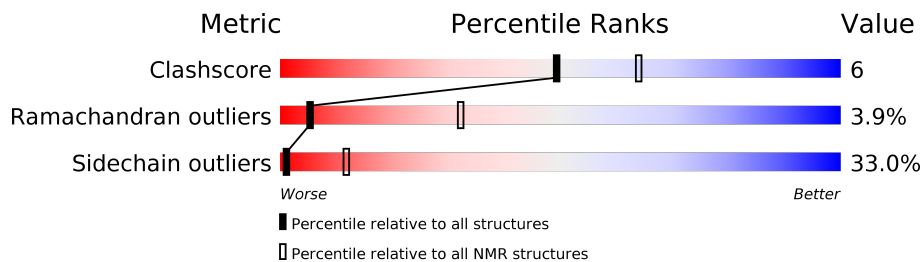
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment 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	104	
2	B	13	

## 2 Ensemble composition and analysis

This entry contains 10 models. Model 3 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:373-A:423, A:429-A:474 (97)	0.33	3

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 1 clusters. No single-model clusters were found.

Cluster number	Models
1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

### 3 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 1889 atoms, of which 933 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Splicing factor U2AF 65 kDa subunit.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	104	1647	529	810	137	163	8	0

- Molecule 2 is a protein called Splicing Factor SF1.

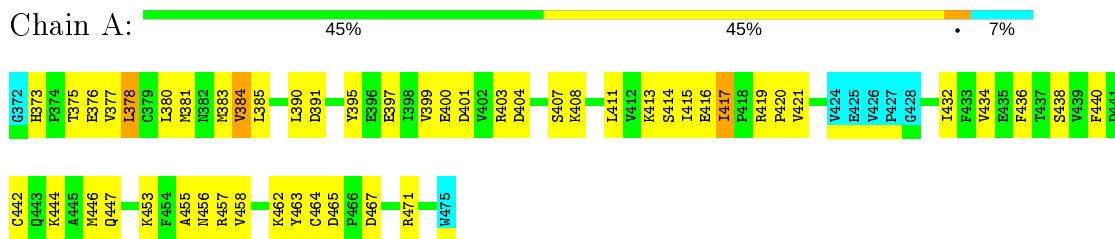
Mol	Chain	Residues	Atoms					Trace
			Total	C	H	N	O	
2	B	13	242	71	123	28	20	0

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

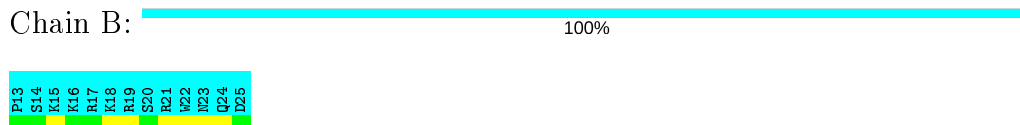
### 4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA and DNA 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: Splicing factor U2AF 65 kDa subunit



- Molecule 2: Splicing Factor SF1

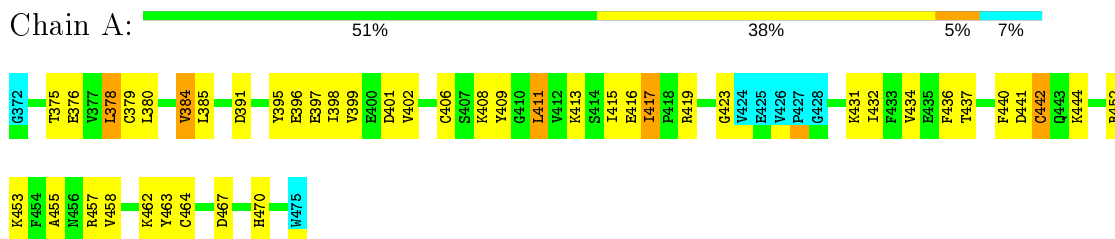


### 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

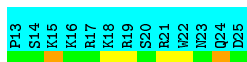
#### 4.2.1 Score per residue for model 1

- Molecule 1: Splicing factor U2AF 65 kDa subunit



- Molecule 2: Splicing Factor SF1

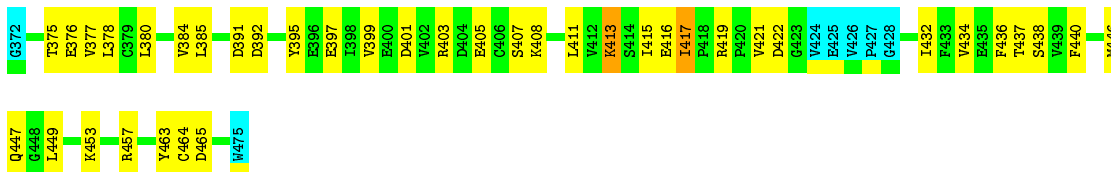
Chain B:  100%



#### 4.2.2 Score per residue for model 2

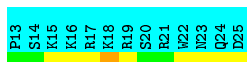
- Molecule 1: Splicing factor U2AF 65 kDa subunit

Chain A:  56% 36% 7%



- Molecule 2: Splicing Factor SF1

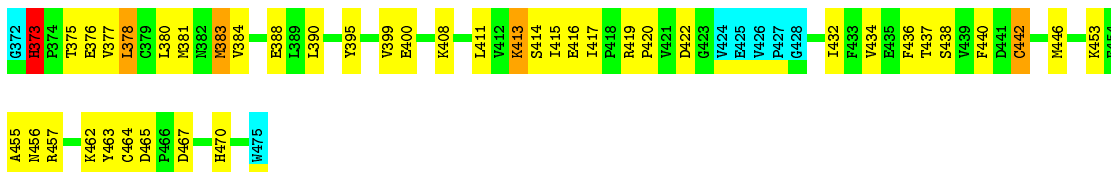
Chain B:  100%



#### 4.2.3 Score per residue for model 3 (medoid)

- Molecule 1: Splicing factor U2AF 65 kDa subunit

Chain A:  53% 36% 7%



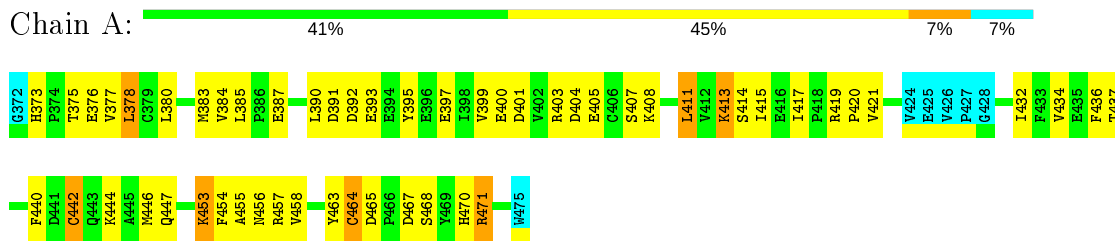
- Molecule 2: Splicing Factor SF1

Chain B:  100%

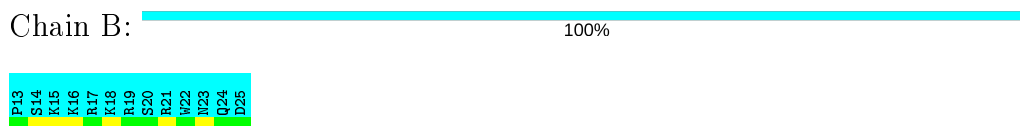


#### 4.2.4 Score per residue for model 4

- Molecule 1: Splicing factor U2AF 65 kDa subunit

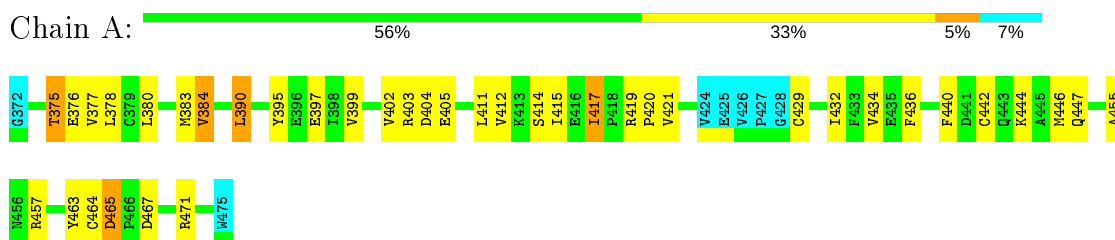


- Molecule 2: Splicing Factor SF1

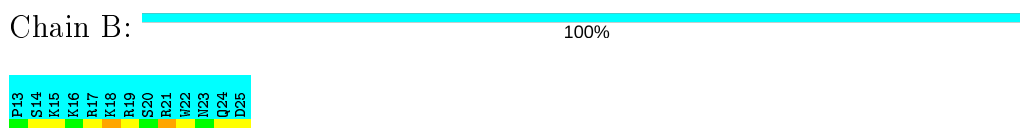


#### 4.2.5 Score per residue for model 5

- Molecule 1: Splicing factor U2AF 65 kDa subunit

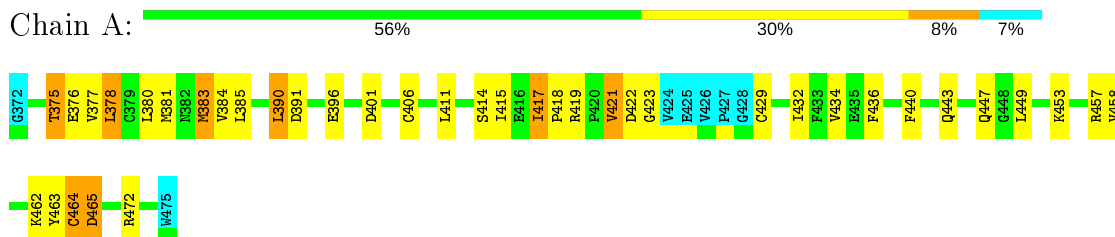


- Molecule 2: Splicing Factor SF1



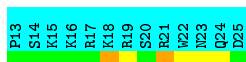
#### 4.2.6 Score per residue for model 6

- Molecule 1: Splicing factor U2AF 65 kDa subunit



- Molecule 2: Splicing Factor SF1

Chain B:  100%



#### 4.2.7 Score per residue for model 7

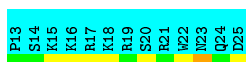
- Molecule 1: Splicing factor U2AF 65 kDa subunit

Chain A:  53% 38% 7%



- Molecule 2: Splicing Factor SF1

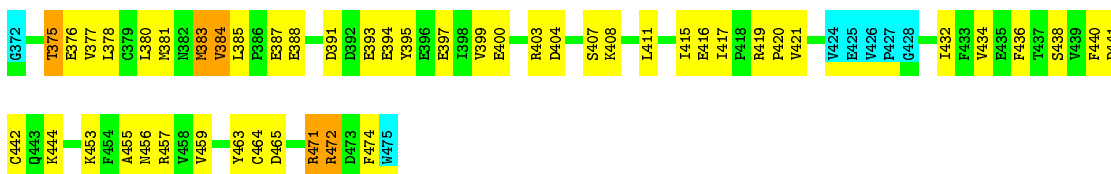
Chain B:  100%



#### 4.2.8 Score per residue for model 8

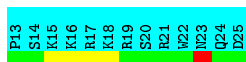
- Molecule 1: Splicing factor U2AF 65 kDa subunit

Chain A:  47% 41% 5% 7%



- Molecule 2: Splicing Factor SF1

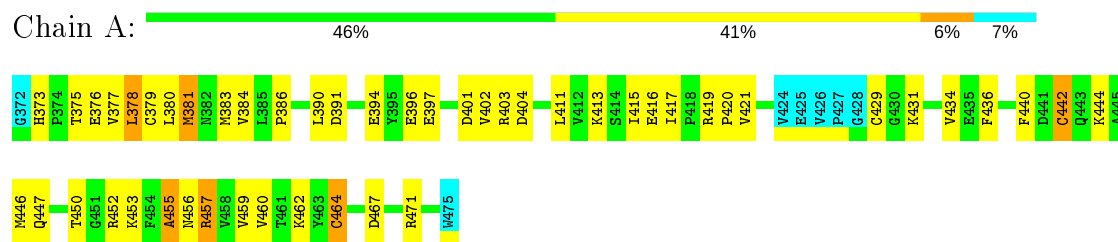
Chain B:  100%



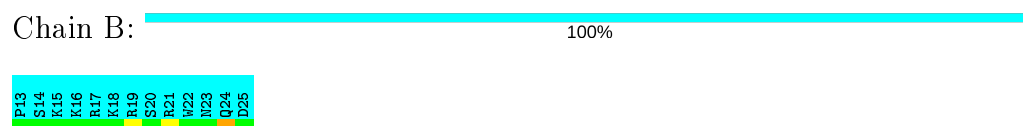
#### 4.2.9 Score per residue for model 9

- Molecule 1: Splicing factor U2AF 65 kDa subunit



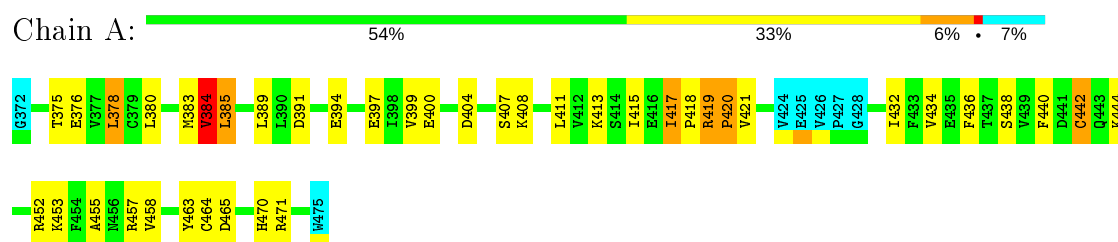


- Molecule 2: Splicing Factor SF1

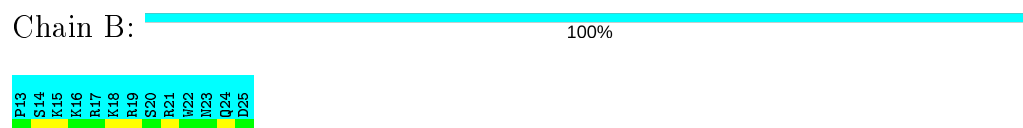


#### 4.2.10 Score per residue for model 10

- Molecule 1: Splicing factor U2AF 65 kDa subunit



- Molecule 2: Splicing Factor SF1



## 5 Refinement protocol and experimental data overview

The models were refined using the following method: *Restrained molecular dynamics using CNS and ARIA for ambiguous distance restraints.*

Of the 100 calculated structures, 10 were deposited, based on the following criterion: *structures with the least restraint violations, structures with the lowest energy.*

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

Software name	Classification	Version
ARIA	structure solution	1.2
CNS	structure solution	1.1
CNS	refinement	1.1

No chemical shift data was provided. No validations of the models with respect to experimental NMR restraints is performed at this time.

## 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	784	763	761	10±2
2	B	0	0	0	0±0
All	All	7840	7630	7610	95

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 6.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:415:ILE:HG12	1:A:434:VAL:HG22	0.68	1.66	1	1
1:A:390:LEU:HD21	1:A:420:PRO:HB2	0.67	1.65	9	1
1:A:384:VAL:HG21	1:A:432:ILE:HG23	0.62	1.70	7	1
1:A:384:VAL:HG13	1:A:432:ILE:HD11	0.62	1.71	10	1
1:A:411:LEU:HD23	1:A:437:THR:HG21	0.62	1.72	1	2
1:A:399:VAL:HG22	1:A:417:ILE:HD12	0.61	1.70	7	5
1:A:417:ILE:HG12	1:A:432:ILE:HG23	0.58	1.74	5	6
1:A:417:ILE:HG23	1:A:432:ILE:HG21	0.58	1.74	7	1
1:A:417:ILE:HG23	1:A:432:ILE:CG2	0.58	2.28	7	1
1:A:413:LYS:HG3	1:A:437:THR:HG22	0.57	1.75	1	4
1:A:415:ILE:HG23	1:A:434:VAL:HG12	0.56	1.78	3	8
1:A:375:THR:C	1:A:439:VAL:HG12	0.54	2.23	7	1
1:A:384:VAL:HG11	1:A:432:ILE:HD11	0.54	1.79	1	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:375:THR:O	1:A:439:VAL:HG12	0.52	2.05	7	1
1:A:441:ASP:HA	1:A:444:LYS:HG2	0.51	1.83	1	2
1:A:377:VAL:HG22	1:A:464:CYS:O	0.51	2.05	8	5
1:A:395:TYR:O	1:A:399:VAL:HG23	0.50	2.06	8	6
1:A:402:VAL:HG12	1:A:415:ILE:HD13	0.50	1.81	9	3
1:A:384:VAL:CG1	1:A:389:LEU:HD21	0.50	2.36	10	1
1:A:378:LEU:HD11	1:A:446:MET:HB3	0.50	1.82	4	1
1:A:373:HIS:CG	1:A:373:HIS:O	0.50	2.64	3	2
1:A:377:VAL:HG23	1:A:464:CYS:HB3	0.50	1.83	2	3
1:A:390:LEU:HD11	1:A:420:PRO:HB2	0.49	1.85	5	1
1:A:386:PRO:O	1:A:390:LEU:HD23	0.48	2.08	9	1
1:A:455:ALA:HB3	1:A:457:ARG:NH1	0.48	2.24	9	1
1:A:383:MET:HB3	1:A:459:VAL:HG13	0.48	1.84	8	1
1:A:378:LEU:HD12	1:A:442:CYS:SG	0.47	2.48	9	5
1:A:417:ILE:HG22	1:A:418:PRO:HD2	0.47	1.85	10	2
1:A:471:ARG:O	1:A:472:ARG:HB2	0.46	2.10	8	1
1:A:411:LEU:CD2	1:A:437:THR:HG21	0.45	2.40	1	1
1:A:378:LEU:HD21	1:A:446:MET:HB3	0.45	1.86	9	1
1:A:381:MET:HG2	1:A:460:VAL:HG13	0.45	1.88	9	1
1:A:417:ILE:HG23	1:A:432:ILE:HG12	0.45	1.88	10	2
1:A:375:THR:OG1	1:A:465:ASP:HA	0.45	2.12	6	3
1:A:417:ILE:HG12	1:A:432:ILE:HG13	0.44	1.88	7	1
1:A:384:VAL:HG12	1:A:398:ILE:HD13	0.44	1.89	1	1
1:A:415:ILE:HG22	1:A:417:ILE:HG13	0.44	1.87	7	1
1:A:384:VAL:HG12	1:A:389:LEU:HD21	0.44	1.88	10	1
1:A:378:LEU:HD22	1:A:380:LEU:HD21	0.44	1.88	6	1
1:A:390:LEU:HD21	1:A:420:PRO:CB	0.44	2.40	9	1
1:A:390:LEU:HD21	1:A:423:GLY:N	0.44	2.28	6	1
1:A:441:ASP:HA	1:A:444:LYS:CG	0.43	2.44	8	1
1:A:454:PHE:O	1:A:455:ALA:HB3	0.43	2.14	4	1
1:A:468:SER:HA	1:A:471:ARG:HB2	0.41	1.92	4	1
1:A:384:VAL:CG1	1:A:432:ILE:HD11	0.41	2.45	5	1
1:A:419:ARG:O	1:A:420:PRO:C	0.41	2.59	10	1
1:A:472:ARG:O	1:A:474:PHE:CD2	0.40	2.74	8	1
1:A:399:VAL:HG22	1:A:417:ILE:CD1	0.40	2.46	10	1
1:A:412:VAL:O	1:A:412:VAL:HG13	0.40	2.16	5	1
1:A:406:CYS:SG	1:A:434:VAL:HG21	0.40	2.56	1	1
1:A:417:ILE:HG23	1:A:432:ILE:HG23	0.40	1.93	6	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	97/104 (93%)	83±2 (86±2%)	10±2 (10±2%)	4±1 (4±1%)	5	32
2	B	0	-	-	-	-	-
All	All	970/1170 (83%)	831 (86%)	101 (10%)	38 (4%)	5	32

All 15 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	376	GLU	9
1	A	455	ALA	6
1	A	456	ASN	4
1	A	467	ASP	3
1	A	452	ARG	3
1	A	383	MET	3
1	A	453	LYS	2
1	A	385	LEU	1
1	A	421	VAL	1
1	A	374	PRO	1
1	A	429	CYS	1
1	A	373	HIS	1
1	A	458	VAL	1
1	A	384	VAL	1
1	A	420	PRO	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	90/95 (95%)	60±4 (67±4%)	30±4 (33±4%)	1	12

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
2	B	0	-	-	-
All	All	900/1080 (83%)	603 (67%)	297 (33%)	<b>1</b> <b>12</b>

All 61 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	436	PHE	10
1	A	419	ARG	10
1	A	384	VAL	10
1	A	440	PHE	10
1	A	411	LEU	10
1	A	378	LEU	10
1	A	457	ARG	10
1	A	375	THR	9
1	A	380	LEU	9
1	A	397	GLU	8
1	A	463	TYR	8
1	A	442	CYS	7
1	A	391	ASP	7
1	A	465	ASP	7
1	A	453	LYS	7
1	A	385	LEU	6
1	A	401	ASP	6
1	A	417	ILE	6
1	A	383	MET	6
1	A	416	GLU	6
1	A	408	LYS	6
1	A	413	LYS	6
1	A	464	CYS	6
1	A	403	ARG	5
1	A	414	SER	5
1	A	400	GLU	5
1	A	381	MET	5
1	A	471	ARG	5
1	A	390	LEU	5
1	A	462	LYS	5
1	A	447	GLN	5
1	A	407	SER	5
1	A	404	ASP	5
1	A	438	SER	5
1	A	458	VAL	4

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Mol	Chain	Res	Type	Models (Total)
1	A	446	MET	4
1	A	470	HIS	4
1	A	396	GLU	4
1	A	444	LYS	4
1	A	422	ASP	3
1	A	394	GLU	3
1	A	467	ASP	3
1	A	431	LYS	3
1	A	392	ASP	3
1	A	429	CYS	3
1	A	373	HIS	3
1	A	379	CYS	2
1	A	393	GLU	2
1	A	387	GLU	2
1	A	472	ARG	2
1	A	388	GLU	2
1	A	406	CYS	2
1	A	456	ASN	1
1	A	452	ARG	1
1	A	443	GLN	1
1	A	432	ILE	1
1	A	376	GLU	1
1	A	409	TYR	1
1	A	450	THR	1
1	A	459	VAL	1
1	A	405	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

No chemical shift data were provided