Full wwPDB NMR Structure Validation Report (i)

Feb 26, 2022 – 04:08 PM EST

PDB ID	:	2CPF
Title	:	Solution structure of the penultimate RNA recognition motif of hypothetical RNA-binding protein RBM19
Authors	:	Nagata, T.; Muto, Y.; Inoue, M.; Kigawa, T.; Terada, T.; Shirouzu, M.; Yokoyama, S.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)
Deposited on	:	2005-05-19

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 (i) symbol.

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

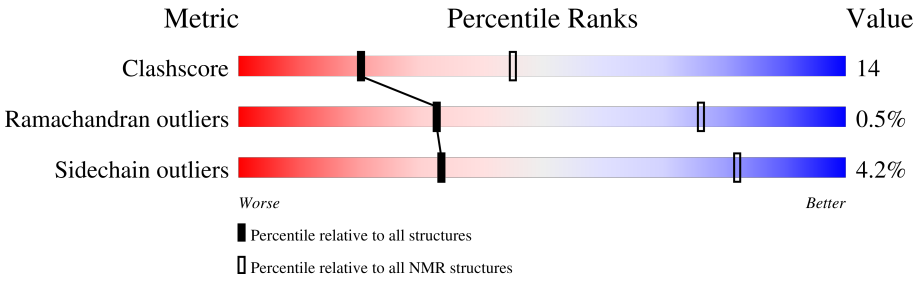
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.27
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.27

1 Overall quality at a glance (i)

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 >=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 <=5%

Mol	Chain	Length	Quality of chain
1	A	98	66% 16% 17%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 14 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:359-A:439 (81)	0.25	14

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 2 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1488 atoms, of which 760 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called RNA binding motif protein 19.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	98	1488	458	760	129	139	2	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	355	GLY	-	cloning artifact	UNP Q8R3C6
A	356	SER	-	cloning artifact	UNP Q8R3C6
A	357	SER	-	cloning artifact	UNP Q8R3C6
A	358	GLY	-	cloning artifact	UNP Q8R3C6
A	359	SER	-	cloning artifact	UNP Q8R3C6
A	360	SER	-	cloning artifact	UNP Q8R3C6
A	361	GLY	-	cloning artifact	UNP Q8R3C6
A	447	SER	-	cloning artifact	UNP Q8R3C6
A	448	GLY	-	cloning artifact	UNP Q8R3C6
A	449	PRO	-	cloning artifact	UNP Q8R3C6
A	450	SER	-	cloning artifact	UNP Q8R3C6
A	451	SER	-	cloning artifact	UNP Q8R3C6
A	452	GLY	-	cloning artifact	UNP Q8R3C6

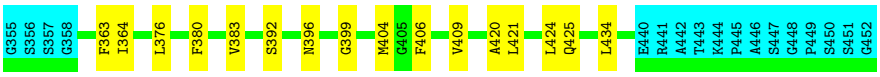
4 Residue-property plots (i)

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: RNA binding motif protein 19

Chain A: 66% 16% 17%



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: RNA binding motif protein 19

Chain A: 60% 21% • 17%

4.2.2 Score per residue for model 2

• Molecule 1: RNA binding motif protein 19

Chain A: 64% 18% 17%

4.2.3 Score per residue for model 3

- Molecule 1: RNA binding motif protein 19

Chain A: 59% 22% • 17%

G355 S356 S357 G358 G361 L362 F363 I364 K365 N366 L367 E373 E374 K377 S381 K382 V383 K387 I391 N396 G399 V400 S403 F406 G407 F408 V409 E410 A420 L421 L424 K433 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451 G452

4.2.4 Score per residue for model 4

- Molecule 1: RNA binding motif protein 19

Chain A: 55% 26% • 17%

G355 S356 S357 G358 F363 N366 L367 N368 T371 L376 K377 F380 S381 I386 I391 S392 K395 N396 K397 A398 G399 M404 G405 F406 K412 K413 P414 E415 Q423 L424 K433 L434 E435 V436 R437 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451

G452

4.2.5 Score per residue for model 5

- Molecule 1: RNA binding motif protein 19

Chain A: 60% 21% • 17%

G355 S356 S357 G358 F363 I364 N368 T371 T372 E373 E374 T375 L376 F380 I386 N396 K397 A398 G399 V400 V409 E410 K413 A420 L421 L424 Q425 V429 L434 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451 G452

4.2.6 Score per residue for model 6

- Molecule 1: RNA binding motif protein 19

Chain A: 54% 28% • 17%

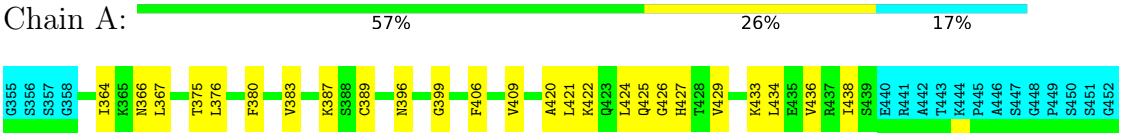
G355 S356 S357 G358 G361 L362 F363 I364 N368 F369 S370 T371 T372 E373 E374 T375 L376 K377 F380 S381 K382 V383 K387 S388 C389 K394 K395 N396 K397 A398 G399 M404 G405 F406 G407 F408 A420 L424 Q425 V429 L434 E440 R441 A442 T443 K444 P445 A446 S447

G448 P449 S450 S451 G452

4.2.7 Score per residue for model 7

- Molecule 1: RNA binding motif protein 19

Chain A:



4.2.8 Score per residue for model 8

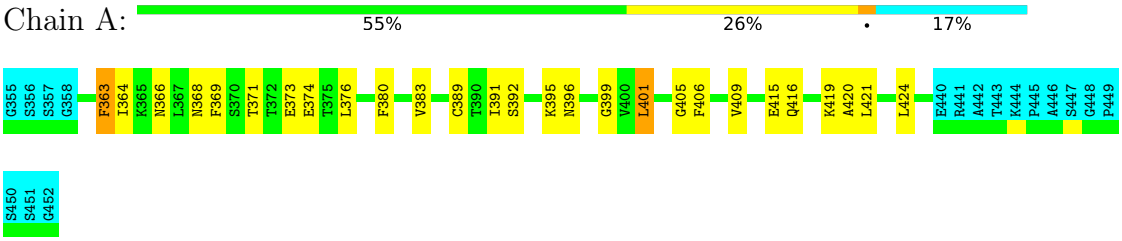
- Molecule 1: RNA binding motif protein 19

Chain A:

4.2.9 Score per residue for model 9

- Molecule 1: RNA binding motif protein 19

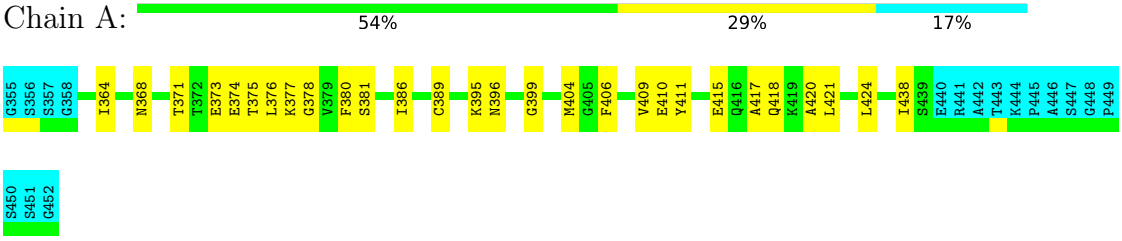
Chain A:



4.2.10 Score per residue for model 10

- Molecule 1: RNA binding motif protein 19

Chain A:



4.2.11 Score per residue for model 11

- Molecule 1: RNA binding motif protein 19

Chain A: 66% 15% • 17%

G355 S356 S357 G358 S359 S360 G361 L362 F363 L376 F380 S392 N396 G399 M404 G405 F406 A420 L421 K422 Q423 L424 Q425 L434 E435 V436 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451 G452

4.2.12 Score per residue for model 12

- Molecule 1: RNA binding motif protein 19

Chain A: 60% 20% • 17%

G355 S356 S357 G358 L367 N368 T371 L376 K377 F380 V383 K387 S388 C389 S392 N396 K397 F406 V409 Q416 A420 L421 K422 Q423 L424 Q425 L434 I438 S439 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451 G452

4.2.13 Score per residue for model 13

- Molecule 1: RNA binding motif protein 19

Chain A: 55% 27% • 17%

G355 S356 S357 G358 I364 L367 N368 F369 S370 T371 T372 E373 E374 T375 L376 V379 F380 V383 C389 S392 K395 N396 G399 V400 L401 F406 V409 A420 L421 L424 Q425 L434 I438 S439 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451

G452

4.2.14 Score per residue for model 14 (medoid)

- Molecule 1: RNA binding motif protein 19

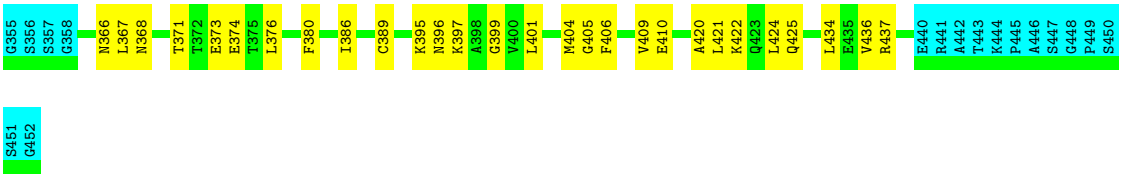
Chain A: 59% 21% • 17%

G355 S356 S357 G358 F363 I364 L367 T375 L376 K377 G378 V379 F380 V383 I391 S392 N396 K397 A398 G399 F406 P414 E415 Q416 A417 Q418 K419 A420 L421 K422 Q423 L424 I438 S439 E440 R441 A442 T443 K444 P445 A446 S447 G448 P449 S450 S451 G452

4.2.15 Score per residue for model 15

- Molecule 1: RNA binding motif protein 19

Chain A: 54% 29% 17%



4.2.16 Score per residue for model 16

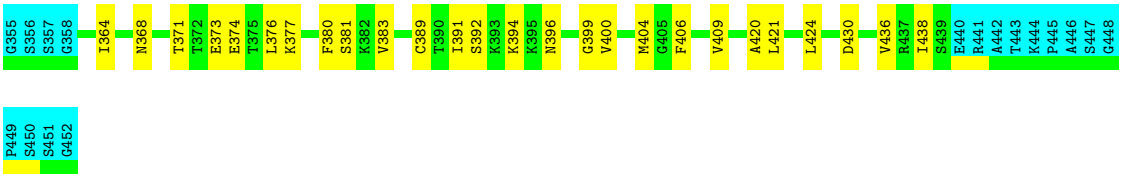
• Molecule 1: RNA binding motif protein 19

Chain A: 61% 21% 17%

4.2.17 Score per residue for model 17

• Molecule 1: RNA binding motif protein 19

Chain A: 56% 27% 17%



4.2.18 Score per residue for model 18

• Molecule 1: RNA binding motif protein 19

Chain A: 68% 12% • 17%

4.2.19 Score per residue for model 19

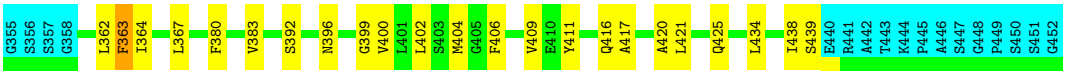
• Molecule 1: RNA binding motif protein 19

Chain A: 55% 26% • 17%

4.2.20 Score per residue for model 20

- Molecule 1: RNA binding motif protein 19

Chain A:



5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *torsion angle dyanamics, simulated annealing.*

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

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

Software name	Classification	Version
CYANA	structure solution	2.0.17
CYANA	refinement	2.0.17

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	622	660	660	18±5
All	All	12440	13200	13200	352

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 14.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:380:PHE:CD2	1:A:409:VAL:HG11	0.88	2.04	18	5
1:A:375:THR:O	1:A:379:VAL:HG23	0.85	1.71	13	1
1:A:383:VAL:HG21	1:A:420:ALA:HB2	0.79	1.52	20	12
1:A:389:CYS:SG	1:A:409:VAL:HG22	0.77	2.19	12	7
1:A:420:ALA:HB1	1:A:424:LEU:HD12	0.74	1.58	14	11
1:A:364:ILE:HD12	1:A:436:VAL:HG22	0.71	1.61	7	2
1:A:392:SER:CB	1:A:406:PHE:CE2	0.69	2.75	14	1
1:A:421:LEU:HD22	1:A:438:ILE:HD11	0.68	1.66	7	10
1:A:383:VAL:HG21	1:A:420:ALA:CB	0.66	2.20	20	9
1:A:429:VAL:HG21	1:A:434:LEU:HD11	0.64	1.69	19	4
1:A:396:ASN:ND2	1:A:402:LEU:HD12	0.64	2.08	20	2
1:A:420:ALA:HB1	1:A:424:LEU:CD1	0.63	2.24	10	6
1:A:392:SER:CB	1:A:406:PHE:CZ	0.61	2.83	12	1
1:A:364:ILE:HD13	1:A:364:ILE:N	0.60	2.11	2	3

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:367:LEU:HD23	1:A:434:LEU:HD22	0.59	1.75	7	2
1:A:362:LEU:HD22	1:A:436:VAL:CG1	0.59	2.28	11	1
1:A:404:MET:O	1:A:406:PHE:CE1	0.59	2.56	19	7
1:A:376:LEU:HD12	1:A:380:PHE:CD1	0.59	2.33	9	10
1:A:404:MET:O	1:A:406:PHE:CE2	0.59	2.56	10	4
1:A:380:PHE:CD2	1:A:424:LEU:CD1	0.57	2.87	10	3
1:A:367:LEU:HD12	1:A:406:PHE:C	0.57	2.20	13	7
1:A:376:LEU:CD1	1:A:380:PHE:CD1	0.56	2.89	13	10
1:A:376:LEU:CD1	1:A:380:PHE:CE1	0.56	2.88	14	13
1:A:367:LEU:HD12	1:A:406:PHE:CA	0.56	2.30	12	3
1:A:380:PHE:HA	1:A:424:LEU:HD11	0.56	1.77	4	6
1:A:392:SER:OG	1:A:406:PHE:CD2	0.55	2.60	14	1
1:A:396:ASN:OD1	1:A:398:ALA:HB3	0.55	2.00	5	1
1:A:363:PHE:O	1:A:363:PHE:CD1	0.54	2.61	8	1
1:A:396:ASN:ND2	1:A:402:LEU:CD1	0.54	2.71	18	1
1:A:383:VAL:HG12	1:A:416:GLN:NE2	0.54	2.18	14	1
1:A:392:SER:HB3	1:A:406:PHE:CE2	0.53	2.37	14	2
1:A:404:MET:O	1:A:406:PHE:CD2	0.52	2.62	10	2
1:A:391:ILE:HG21	1:A:403:SER:OG	0.52	2.04	16	2
1:A:429:VAL:HG21	1:A:434:LEU:CD1	0.52	2.35	6	2
1:A:404:MET:HB3	1:A:406:PHE:CZ	0.52	2.39	6	3
1:A:395:LYS:O	1:A:395:LYS:CG	0.51	2.59	8	1
1:A:392:SER:HB3	1:A:406:PHE:CE1	0.51	2.40	13	1
1:A:429:VAL:HG12	1:A:430:ASP:OD1	0.51	2.05	8	1
1:A:395:LYS:CG	1:A:395:LYS:O	0.51	2.59	6	2
1:A:425:GLN:NE2	1:A:434:LEU:O	0.50	2.45	5	12
1:A:383:VAL:O	1:A:416:GLN:NE2	0.50	2.45	20	1
1:A:364:ILE:O	1:A:406:PHE:CB	0.50	2.60	19	11
1:A:376:LEU:HD11	1:A:380:PHE:CE1	0.50	2.41	13	9
1:A:362:LEU:N	1:A:409:VAL:O	0.50	2.45	16	2
1:A:379:VAL:O	1:A:382:LYS:CG	0.50	2.59	18	1
1:A:396:ASN:O	1:A:399:GLY:N	0.49	2.45	3	18
1:A:408:PHE:CZ	1:A:410:GLU:HG3	0.49	2.42	3	1
1:A:377:LYS:O	1:A:381:SER:CB	0.49	2.60	6	6
1:A:366:ASN:N	1:A:405:GLY:O	0.49	2.45	16	4
1:A:366:ASN:ND2	1:A:433:LYS:O	0.49	2.45	7	3
1:A:386:ILE:HG23	1:A:410:GLU:O	0.49	2.08	15	4
1:A:411:TYR:CD2	1:A:417:ALA:HA	0.49	2.43	1	3
1:A:363:PHE:C	1:A:363:PHE:CD1	0.49	2.85	4	3
1:A:415:GLU:O	1:A:418:GLN:N	0.49	2.46	10	4
1:A:436:VAL:O	1:A:437:ARG:CZ	0.48	2.60	15	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:368:ASN:O	1:A:371:THR:N	0.48	2.47	15	10
1:A:422:LYS:O	1:A:425:GLN:N	0.48	2.47	2	2
1:A:361:GLY:CA	1:A:408:PHE:CE1	0.48	2.97	6	2
1:A:396:ASN:ND2	1:A:400:VAL:O	0.48	2.46	5	3
1:A:380:PHE:CD1	1:A:424:LEU:HD13	0.47	2.44	7	3
1:A:392:SER:HB3	1:A:406:PHE:CZ	0.47	2.45	12	1
1:A:367:LEU:HD12	1:A:406:PHE:HA	0.47	1.85	12	1
1:A:363:PHE:CD1	1:A:363:PHE:C	0.47	2.86	1	5
1:A:385:ALA:HB1	1:A:412:LYS:HE3	0.47	1.86	19	1
1:A:380:PHE:CG	1:A:424:LEU:CD1	0.47	2.98	12	2
1:A:435:GLU:OE1	1:A:437:ARG:CG	0.46	2.63	4	1
1:A:363:PHE:C	1:A:364:ILE:HD13	0.46	2.30	2	4
1:A:375:THR:O	1:A:378:GLY:N	0.46	2.48	19	3
1:A:368:ASN:O	1:A:369:PHE:C	0.45	2.55	13	3
1:A:367:LEU:HD23	1:A:434:LEU:CD2	0.45	2.41	7	1
1:A:429:VAL:CG2	1:A:434:LEU:HD11	0.45	2.41	19	1
1:A:373:GLU:O	1:A:374:GLU:C	0.45	2.55	6	9
1:A:373:GLU:OE2	1:A:389:CYS:C	0.45	2.56	6	1
1:A:363:PHE:CD1	1:A:363:PHE:O	0.45	2.70	6	1
1:A:404:MET:O	1:A:406:PHE:CD1	0.45	2.69	19	2
1:A:401:LEU:N	1:A:401:LEU:CD2	0.44	2.80	13	2
1:A:420:ALA:O	1:A:424:LEU:HD12	0.44	2.12	11	1
1:A:420:ALA:O	1:A:421:LEU:C	0.44	2.55	20	8
1:A:386:ILE:O	1:A:412:LYS:NZ	0.44	2.51	4	1
1:A:423:GLN:O	1:A:423:GLN:CD	0.44	2.55	12	3
1:A:415:GLU:O	1:A:416:GLN:C	0.44	2.55	14	3
1:A:364:ILE:CD1	1:A:436:VAL:HG13	0.44	2.42	17	1
1:A:422:LYS:HD3	1:A:423:GLN:N	0.44	2.28	19	1
1:A:423:GLN:CD	1:A:423:GLN:C	0.43	2.77	12	2
1:A:375:THR:O	1:A:376:LEU:C	0.43	2.57	19	4
1:A:396:ASN:ND2	1:A:400:VAL:H	0.43	2.12	17	1
1:A:427:HIS:CD2	1:A:429:VAL:CG2	0.43	3.02	7	1
1:A:422:LYS:CD	1:A:423:GLN:N	0.43	2.81	19	1
1:A:426:GLY:O	1:A:433:LYS:NZ	0.43	2.51	7	1
1:A:396:ASN:OD1	1:A:402:LEU:HD12	0.43	2.14	8	1
1:A:380:PHE:CG	1:A:424:LEU:HD13	0.42	2.49	10	2
1:A:391:ILE:HG23	1:A:406:PHE:O	0.42	2.15	14	1
1:A:377:LYS:O	1:A:381:SER:N	0.42	2.52	1	1
1:A:392:SER:OG	1:A:406:PHE:CE1	0.42	2.70	12	1
1:A:423:GLN:O	1:A:423:GLN:NE2	0.41	2.52	12	1
1:A:414:PRO:O	1:A:415:GLU:C	0.41	2.59	19	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:394:LYS:HG3	1:A:395:LYS:N	0.41	2.30	2	1
1:A:391:ILE:HG22	1:A:392:SER:N	0.41	2.30	9	3
1:A:372:THR:HG23	1:A:374:GLU:H	0.41	1.76	13	1
1:A:414:PRO:O	1:A:418:GLN:NE2	0.41	2.54	14	1
1:A:391:ILE:CG2	1:A:392:SER:N	0.40	2.84	4	1
1:A:392:SER:CB	1:A:406:PHE:CE1	0.40	3.04	13	1
1:A:376:LEU:HD12	1:A:376:LEU:O	0.40	2.16	19	1
1:A:404:MET:CB	1:A:406:PHE:CZ	0.40	3.04	6	1
1:A:362:LEU:HD22	1:A:436:VAL:HG12	0.40	1.94	11	1
1:A:396:ASN:OD1	1:A:400:VAL:O	0.40	2.40	19	1
1:A:422:LYS:O	1:A:423:GLN:C	0.40	2.60	19	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	81/98 (83%)	72±3 (89±4%)	8±3 (10±4%)	0±1 (0±1%)	32	76
All	All	1620/1960 (83%)	1442 (89%)	170 (10%)	8 (0%)	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	392	SER	6
1	A	439	SER	2

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	69/80 (86%)	66±2 (96±2%)	3±2 (4±2%)	33 82
All	All	1380/1600 (86%)	1322 (96%)	58 (4%)	33 82

All 19 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	363	PHE	11
1	A	397	LYS	7
1	A	387	LYS	6
1	A	395	LYS	5
1	A	422	LYS	5
1	A	394	LYS	4
1	A	396	ASN	3
1	A	401	LEU	3
1	A	423	GLN	2
1	A	416	GLN	2
1	A	360	SER	2
1	A	413	LYS	1
1	A	389	CYS	1
1	A	365	LYS	1
1	A	403	SER	1
1	A	419	LYS	1
1	A	377	LYS	1
1	A	430	ASP	1
1	A	382	LYS	1

6.3.3 RNA (i)

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

6.5 Carbohydrates (i)

There are no monosaccharides in this entry.

6.6 Ligand geometry (i)

There are no ligands in this entry.

6.7 Other polymers (i)

There are no such molecules in this entry.

6.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

7 Chemical shift validation (i)

No chemical shift data were provided