Full wwPDB NMR Structure Validation Report (i)

Jun 4, 2023 – 06:19 AM EDT

PDB ID	:	2LNW
BMRB ID	:	18182
Title	:	Identification and structural basis for a novel interaction between Vav2 and Arap3
Authors	:	Wu, B.; Zhang, J.; Wu, J.; Shi, Y.
Deposited on	:	2012-01-05

This is a Full wwPDB NMR Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/NMRValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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 (i)) were used in the production of this report:

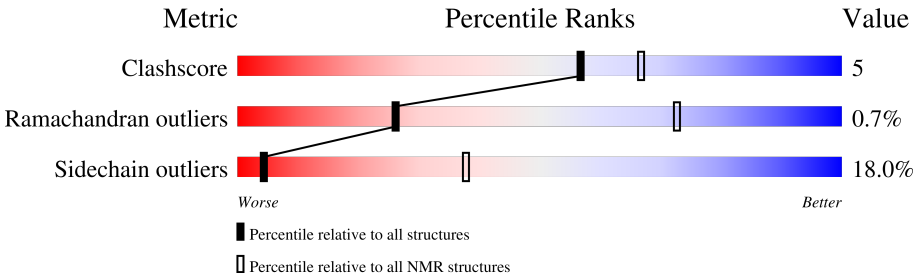
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
BMRB Restraints Analysis	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

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 is 86%.

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	122	69% 14% 10% 7%
2	B	9	44% 56%

2 Ensemble composition and analysis

This entry contains 20 models. Model 8 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:668-A:768, B:1409-B:1412 (105)	0.69	8

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 2 clusters and 2 single-model clusters were found.

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

3 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2027 atoms, of which 997 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Guanine nucleotide exchange factor VAV2.

Mol	Chain	Residues	Atoms						Trace
1	A	113	Total	C	H	N	O	S	0
			1887	607	935	163	180	2	

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	650	MET	-	expression tag	UNP P52735
A	651	GLY	-	expression tag	UNP P52735
A	652	HIS	-	expression tag	UNP P52735
A	653	HIS	-	expression tag	UNP P52735
A	654	HIS	-	expression tag	UNP P52735
A	655	HIS	-	expression tag	UNP P52735
A	656	HIS	-	expression tag	UNP P52735
A	657	HIS	-	expression tag	UNP P52735
A	658	MET	-	expression tag	UNP P52735

- Molecule 2 is a protein called Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3.

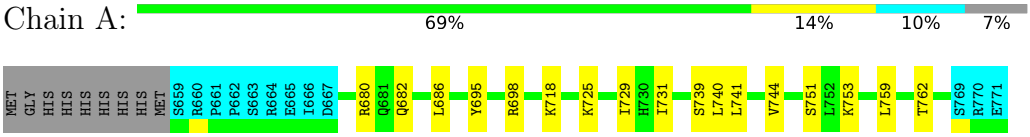
Mol	Chain	Residues	Atoms						Trace
2	B	9	Total	C	H	N	O	P	0
			140	46	62	9	22	1	

4 Residue-property plots

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: Guanine nucleotide exchange factor VAV2



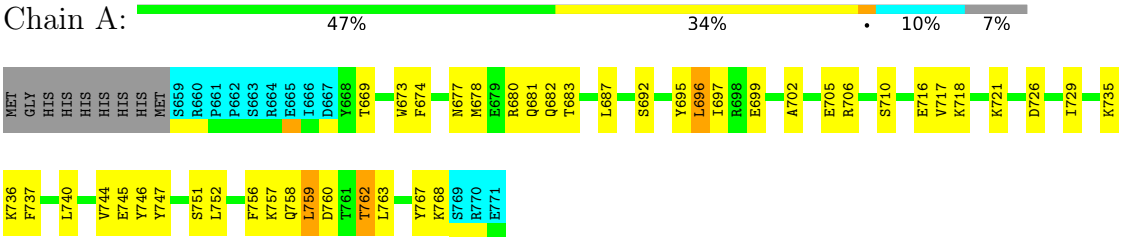
• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

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: Guanine nucleotide exchange factor VAV2



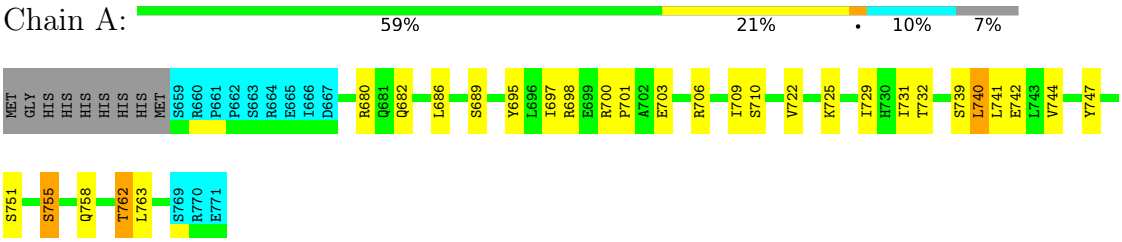
• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

Chain B:

4.2.2 Score per residue for model 2

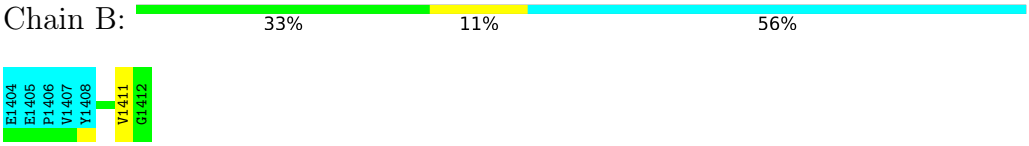
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

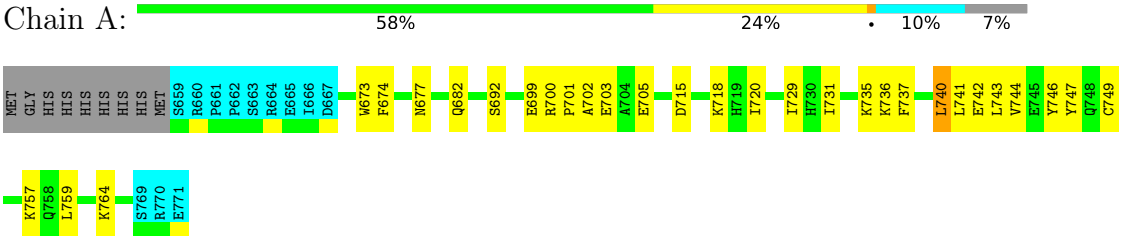
Chain B:



4.2.3 Score per residue for model 3

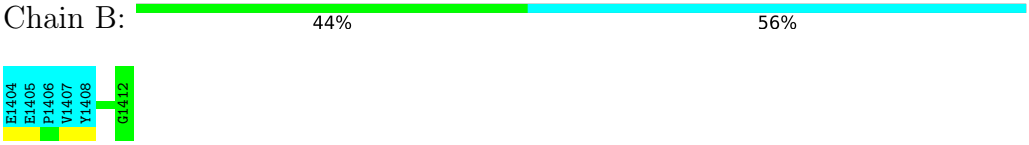
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

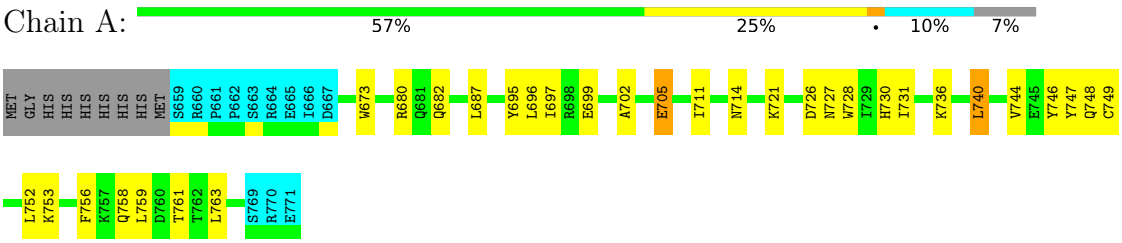
Chain B:



4.2.4 Score per residue for model 4

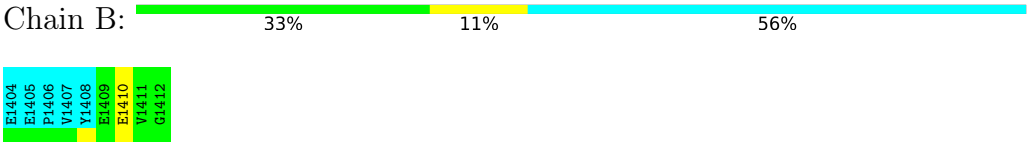
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

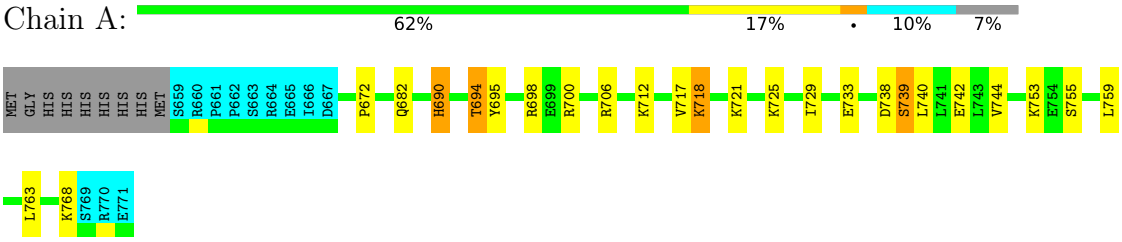
Chain B:



4.2.5 Score per residue for model 5

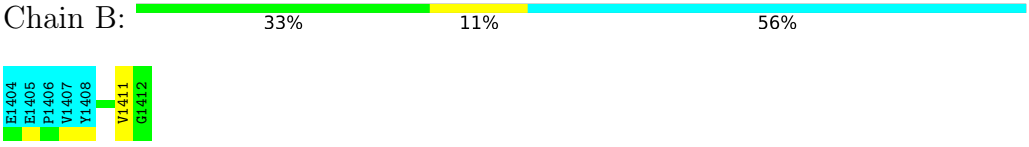
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

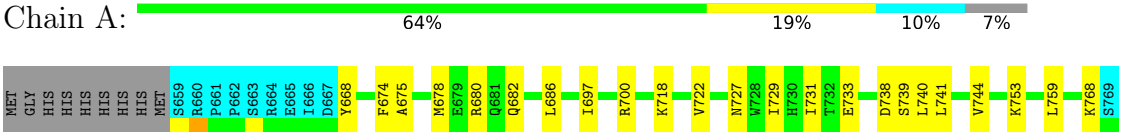
Chain B:



4.2.6 Score per residue for model 6

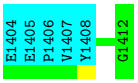
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

Chain B:



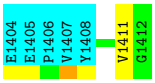
4.2.7 Score per residue for model 7

• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:

• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

Chain B:



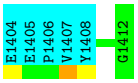
4.2.8 Score per residue for model 8 (medoid)

• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:

• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

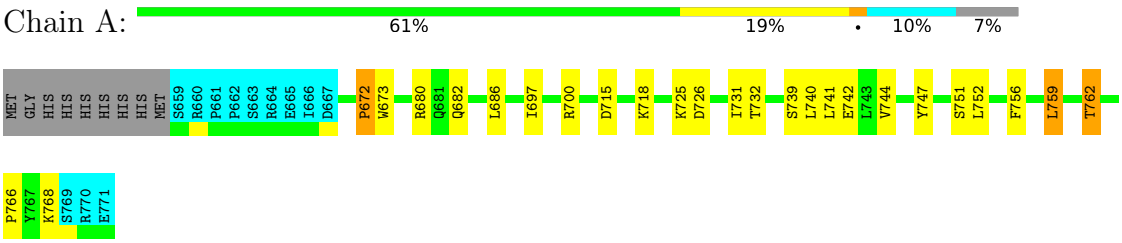
Chain B:



4.2.9 Score per residue for model 9

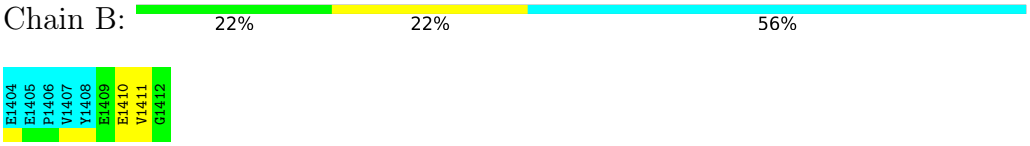
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

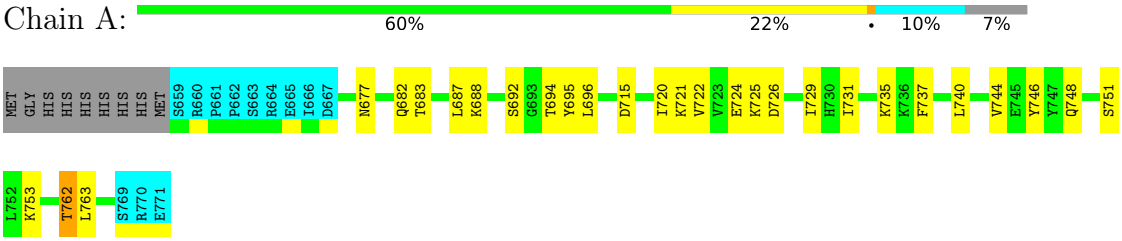
Chain B:



4.2.10 Score per residue for model 10

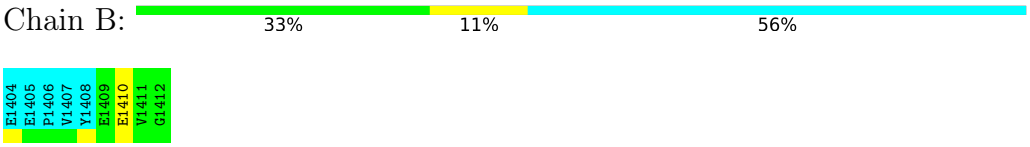
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

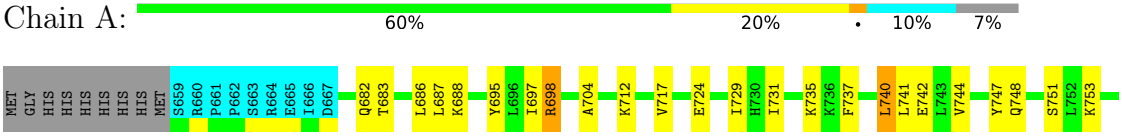
Chain B:

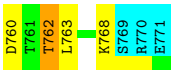


4.2.11 Score per residue for model 11

• Molecule 1: Guanine nucleotide exchange factor VAV2

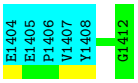
Chain A:





• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

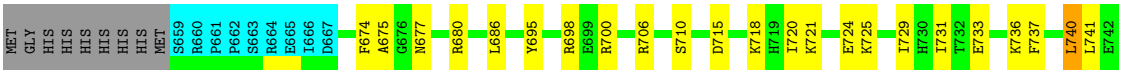
Chain B:

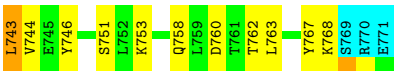


4.2.12 Score per residue for model 12

• Molecule 1: Guanine nucleotide exchange factor VAV2

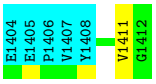
Chain A:





• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

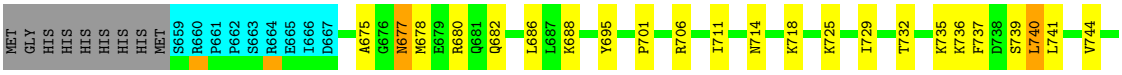
Chain B:

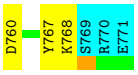


4.2.13 Score per residue for model 13

• Molecule 1: Guanine nucleotide exchange factor VAV2

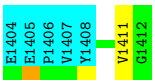
Chain A:





• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

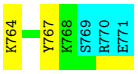
Chain B:



4.2.14 Score per residue for model 14

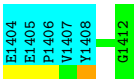
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

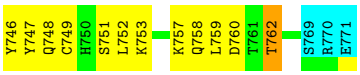
Chain B:



4.2.15 Score per residue for model 15

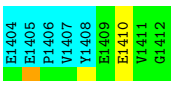
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

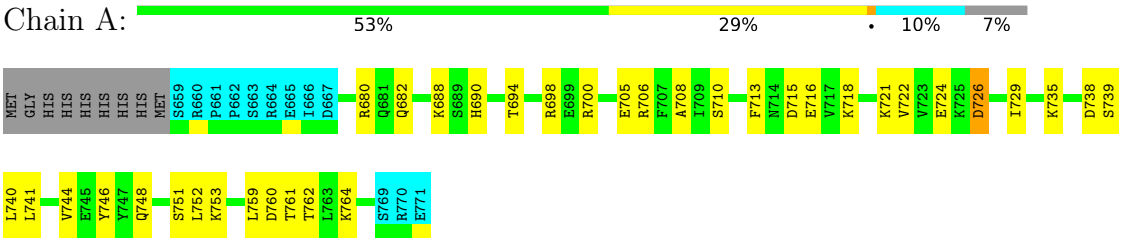
Chain B:



4.2.16 Score per residue for model 16

• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



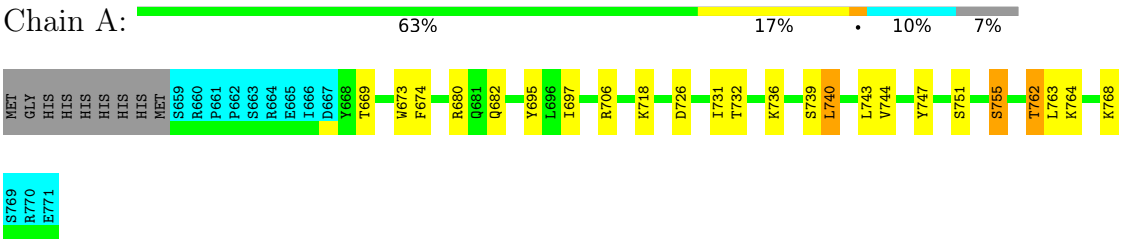
• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

Chain B:

4.2.17 Score per residue for model 17

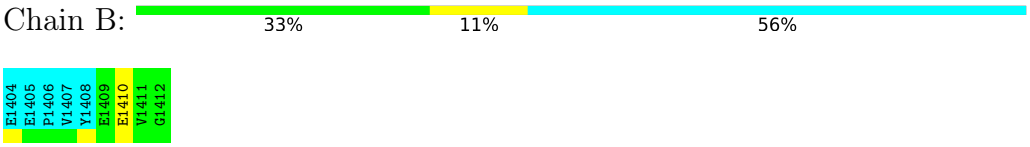
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

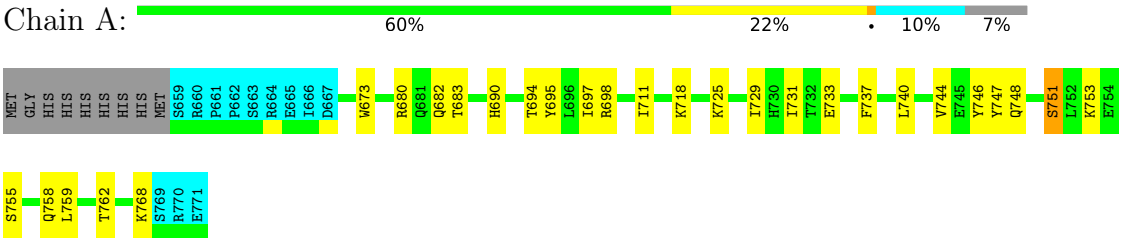
Chain B:



4.2.18 Score per residue for model 18

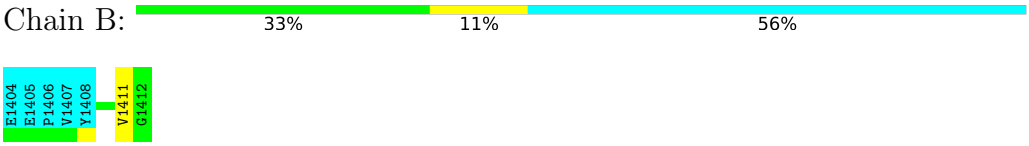
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

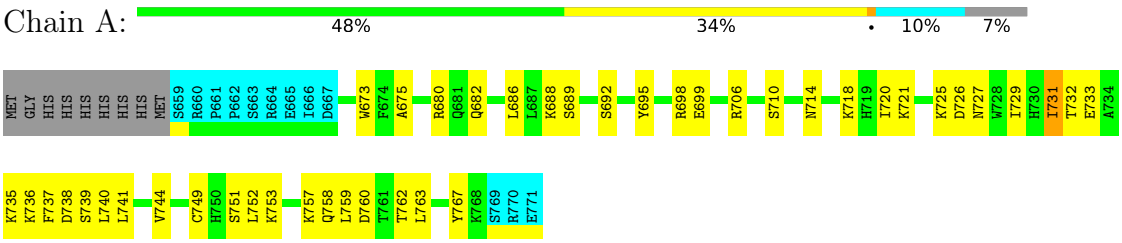
Chain B:



4.2.19 Score per residue for model 19

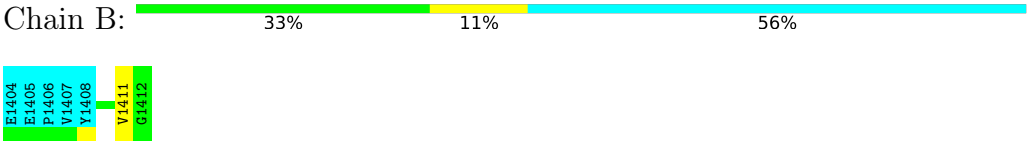
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

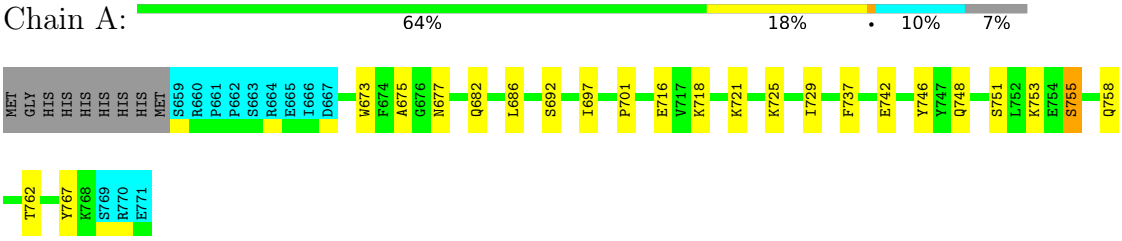
Chain B:



4.2.20 Score per residue for model 20

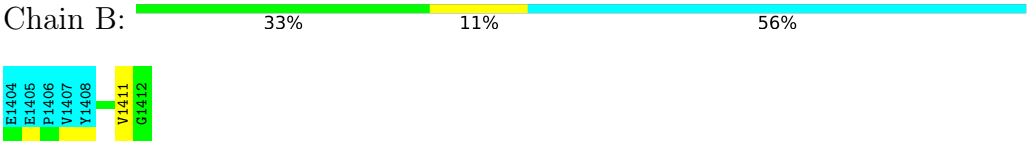
• Molecule 1: Guanine nucleotide exchange factor VAV2

Chain A:



• Molecule 2: Arf-GAP with Rho-GAP domain, ANK repeat and PH domain-containing protein 3

Chain B:



5 Refinement protocol and experimental data overview

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

Of the 200 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
CNS	refinement	

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	1450
Number of shifts mapped to atoms	1450
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	86%

6 Model quality

6.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PTR

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	852	840	836	9±3
2	B	30	24	24	0±1
All	All	17640	17280	17200	179

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 5.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:752:LEU:HD13	1:A:759:LEU:HD23	0.81	1.51	4	1
1:A:673:TRP:CH2	1:A:744:VAL:HG21	0.74	2.17	3	2
1:A:673:TRP:CE3	1:A:697:ILE:HD12	0.69	2.23	15	3
1:A:737:PHE:CE2	1:A:743:LEU:HD23	0.68	2.23	12	2
1:A:756:PHE:CE2	2:B:1411:VAL:HG22	0.68	2.24	7	1
1:A:751:SER:HA	1:A:762:THR:HG22	0.68	1.66	20	6
1:A:722:VAL:HG11	1:A:729:ILE:HD11	0.66	1.64	6	4
1:A:751:SER:HA	1:A:762:THR:HG23	0.66	1.66	17	7
1:A:690:HIS:HB3	1:A:694:THR:HG21	0.65	1.68	5	1
1:A:697:ILE:HD13	1:A:740:LEU:HD21	0.65	1.69	9	2
1:A:673:TRP:CZ3	1:A:697:ILE:HD12	0.65	2.27	4	6

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:740:LEU:O	1:A:744:VAL:HG23	0.64	1.93	16	19
1:A:673:TRP:CZ3	1:A:744:VAL:HG21	0.62	2.29	19	2
1:A:720:ILE:HG21	1:A:731:ILE:HD13	0.62	1.70	10	4
1:A:700:ARG:HG3	1:A:708:ALA:HB2	0.62	1.70	16	1
1:A:669:THR:HG22	1:A:674:PHE:CE1	0.61	2.30	1	2
1:A:752:LEU:HD13	1:A:759:LEU:HD13	0.61	1.73	16	1
1:A:695:TYR:HB3	1:A:711:ILE:HD12	0.59	1.74	18	3
1:A:697:ILE:HG21	1:A:740:LEU:HD21	0.59	1.74	6	1
1:A:675:ALA:HB2	1:A:767:TYR:CZ	0.59	2.33	14	4
1:A:747:TYR:O	1:A:762:THR:HG22	0.58	1.98	15	3
1:A:732:THR:OG1	2:B:1411:VAL:HG11	0.56	2.00	13	1
1:A:702:ALA:HB3	1:A:705:GLU:O	0.56	2.00	4	5
1:A:729:ILE:HG23	1:A:737:PHE:HB2	0.56	1.76	20	10
1:A:683:THR:HG23	1:A:696:LEU:HD21	0.54	1.77	10	2
1:A:731:ILE:HD11	1:A:747:TYR:CZ	0.54	2.37	17	2
1:A:751:SER:CA	1:A:762:THR:HG22	0.54	2.33	18	2
1:A:740:LEU:HD23	1:A:744:VAL:CG2	0.54	2.32	11	2
1:A:687:LEU:HD21	1:A:696:LEU:HD23	0.53	1.79	8	3
1:A:695:TYR:CD1	1:A:763:LEU:HD22	0.53	2.39	17	1
1:A:752:LEU:HD12	1:A:761:THR:O	0.52	2.04	4	1
1:A:712:LYS:HD3	1:A:717:VAL:HG22	0.52	1.81	5	1
1:A:687:LEU:HD12	1:A:717:VAL:HG13	0.52	1.80	11	2
1:A:731:ILE:HD11	1:A:747:TYR:CE2	0.52	2.40	2	2
1:A:732:THR:HB	2:B:1411:VAL:HG21	0.52	1.82	19	1
1:A:722:VAL:CG1	1:A:729:ILE:HD11	0.51	2.36	2	2
1:A:731:ILE:HG13	1:A:732:THR:HG23	0.50	1.82	9	1
1:A:695:TYR:CD2	1:A:763:LEU:HD22	0.50	2.42	11	4
1:A:675:ALA:HB2	1:A:767:TYR:CE1	0.49	2.43	20	1
1:A:718:LYS:HG3	1:A:759:LEU:HD11	0.49	1.85	1	2
1:A:722:VAL:HA	1:A:731:ILE:HG22	0.49	1.84	6	1
1:A:743:LEU:C	1:A:743:LEU:HD13	0.49	2.27	12	1
1:A:683:THR:HG22	1:A:687:LEU:HD12	0.48	1.85	1	1
1:A:718:LYS:HG3	1:A:759:LEU:HD21	0.48	1.84	6	2
1:A:747:TYR:CE1	1:A:752:LEU:HD23	0.48	2.43	7	2
1:A:756:PHE:CE1	2:B:1411:VAL:HG22	0.48	2.44	9	1
1:A:695:TYR:CG	1:A:763:LEU:HD22	0.47	2.44	4	2
1:A:731:ILE:HD11	1:A:747:TYR:OH	0.47	2.10	3	3
1:A:755:SER:O	2:B:1411:VAL:HG13	0.47	2.10	18	3
2:B:1411:VAL:O	2:B:1411:VAL:HG13	0.47	2.09	5	1
1:A:695:TYR:CB	1:A:763:LEU:HD22	0.46	2.40	1	3
1:A:752:LEU:HD13	1:A:759:LEU:CD2	0.46	2.33	4	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:713:PHE:HB2	1:A:761:THR:HG21	0.46	1.87	16	1
1:A:720:ILE:HG21	1:A:731:ILE:CD1	0.46	2.40	12	1
1:A:690:HIS:CB	1:A:694:THR:HG21	0.46	2.38	5	1
1:A:718:LYS:HG2	1:A:759:LEU:HD21	0.46	1.88	3	2
1:A:729:ILE:CD1	1:A:740:LEU:HD12	0.45	2.41	15	1
1:A:729:ILE:HD11	1:A:740:LEU:HD12	0.45	1.89	15	1
1:A:731:ILE:HG23	1:A:743:LEU:HD11	0.45	1.89	17	1
1:A:729:ILE:HG22	1:A:737:PHE:O	0.45	2.12	19	1
1:A:690:HIS:ND1	1:A:694:THR:HG21	0.45	2.27	18	1
1:A:728:TRP:CE3	1:A:730:HIS:CD2	0.45	3.04	4	1
1:A:731:ILE:HD12	1:A:756:PHE:CZ	0.45	2.47	4	1
1:A:728:TRP:CE3	1:A:736:LYS:HB3	0.44	2.47	4	1
1:A:697:ILE:CD1	1:A:740:LEU:HD21	0.43	2.44	11	1
1:A:700:ARG:CG	1:A:708:ALA:HB2	0.43	2.42	16	1
1:A:683:THR:HG21	1:A:698:ARG:HE	0.43	1.73	11	1
1:A:687:LEU:HD13	1:A:717:VAL:HG13	0.43	1.88	1	1
2:B:1411:VAL:HG23	2:B:1411:VAL:O	0.43	2.14	12	1
1:A:675:ALA:HB1	1:A:678:MET:SD	0.42	2.54	6	2
1:A:675:ALA:HB2	1:A:767:TYR:OH	0.42	2.14	13	1
1:A:729:ILE:HG21	1:A:739:SER:C	0.42	2.35	5	2
1:A:696:LEU:HD11	1:A:698:ARG:HD2	0.42	1.91	8	1
1:A:690:HIS:CG	1:A:694:THR:HG21	0.42	2.50	16	1
1:A:732:THR:HG22	2:B:1411:VAL:HG21	0.42	1.91	9	1
1:A:744:VAL:HG13	1:A:763:LEU:CD1	0.42	2.45	4	1
1:A:672:PRO:O	1:A:673:TRP:CG	0.41	2.73	9	1
1:A:752:LEU:HD22	1:A:756:PHE:CD2	0.41	2.50	1	1
1:A:748:GLN:HG3	1:A:763:LEU:HD12	0.41	1.92	8	1
1:A:732:THR:HG21	1:A:755:SER:HB3	0.41	1.92	17	1
1:A:697:ILE:HG13	1:A:709:ILE:HG23	0.41	1.92	2	1
1:A:687:LEU:HD11	1:A:696:LEU:HD21	0.41	1.92	1	1
1:A:696:LEU:HD22	1:A:767:TYR:HB3	0.41	1.92	1	1
1:A:767:TYR:CE2	1:A:768:LYS:CG	0.41	3.04	13	1
1:A:668:TYR:HB3	1:A:674:PHE:CE2	0.41	2.50	6	1
1:A:732:THR:HG21	1:A:755:SER:CB	0.40	2.46	2	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	101/122 (83%)	93±3 (92±3%)	7±2 (7±2%)	1±1 (1±1%)	26 73
2	B	3/9 (33%)	3±0 (87±16%)	0±0 (13±16%)	0±0 (0±0%)	100 100
All	All	2080/2620 (79%)	1909 (92%)	156 (8%)	15 (1%)	26 73

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	701	PRO	5
1	A	726	ASP	3
1	A	677	ASN	2
1	A	672	PRO	2
1	A	703	GLU	1
1	A	766	PRO	1
1	A	704	ALA	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	92/112 (82%)	75±5 (82±5%)	17±5 (18±5%)	4 37
2	B	3/7 (43%)	3±0 (92±14%)	0±0 (8±14%)	15 62
All	All	1900/2380 (80%)	1558 (82%)	342 (18%)	4 38

All 58 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	682	GLN	18
1	A	680	ARG	13
1	A	753	LYS	13
1	A	686	LEU	11
1	A	725	LYS	11
1	A	741	LEU	11

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Mol	Chain	Res	Type	Models (Total)
1	A	706	ARG	10
1	A	721	LYS	10
1	A	746	TYR	10
1	A	758	GLN	10
1	A	698	ARG	10
1	A	768	LYS	9
1	A	739	SER	9
1	A	718	LYS	9
1	A	735	LYS	8
1	A	736	LYS	8
1	A	760	ASP	8
1	A	700	ARG	8
1	A	742	GLU	8
1	A	748	GLN	8
1	A	726	ASP	7
1	A	762	THR	7
1	A	740	LEU	7
1	A	733	GLU	7
1	A	688	LYS	7
1	A	677	ASN	6
1	A	692	SER	6
1	A	710	SER	6
1	A	715	ASP	6
1	A	757	LYS	5
1	A	755	SER	5
2	B	1410	GLU	5
1	A	738	ASP	5
1	A	724	GLU	5
1	A	699	GLU	4
1	A	716	GLU	4
1	A	759	LEU	4
1	A	749	CYS	4
1	A	764	LYS	4
1	A	727	ASN	4
1	A	678	MET	3
1	A	681	GLN	3
1	A	689	SER	3
1	A	705	GLU	3
1	A	714	ASN	3
1	A	674	PHE	2
1	A	694	THR	2
1	A	669	THR	2

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Mol	Chain	Res	Type	Models (Total)
1	A	731	ILE	2
1	A	696	LEU	1
1	A	745	GLU	1
1	A	703	GLU	1
1	A	690	HIS	1
1	A	712	LYS	1
1	A	743	LEU	1
1	A	683	THR	1
1	A	751	SER	1
1	A	752	LEU	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)

1 non-standard protein/DNA/RNA residue is modelled in this entry.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
2	PTR	B	1408	2	15,16,17	1.27±0.01	1±0 (6±0%)

In the following table, the Counts columns list the number of angles for which Mogul statistics could be retrieved, the number of angles that are observed in the model and the number of angles that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond angle is the number of standard deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
2	PTR	B	1408	2	19,22,24	0.52±0.02	0±0 (0±0%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PTR	B	1408	2	-	0±0,10,11,13	0±0,1,1,1

All unique bond outliers are listed below.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
2	B	1408	PTR	P-O1P	3.48	1.61	1.50	12	20

There are no bond-angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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

The completeness of assignment taking into account all chemical shift lists is 86% for the well-defined parts and 84% for the entire structure.

7.1 Chemical shift list 1

File name: working_cs.cif

Chemical shift list name: *assigned_chem_shift_list_1*

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	1450
Number of shifts mapped to atoms	1450
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	4

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	111	-0.37 ± 0.14	None needed (< 0.5 ppm)
$^{13}C_{\beta}$	108	0.08 ± 0.17	None needed (< 0.5 ppm)
$^{13}C'$	110	0.40 ± 0.13	None needed (< 0.5 ppm)
^{15}N	107	0.36 ± 0.37	None needed (< 0.5 ppm)

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 86%, i.e. 1290 atoms were assigned a chemical shift out of a possible 1499. 0 out of 14 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	500/522 (96%)	204/210 (97%)	199/210 (95%)	97/102 (95%)
Sidechain	719/808 (89%)	502/520 (97%)	213/257 (83%)	4/31 (13%)

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	Total	^{1}H	^{13}C	^{15}N
Aromatic	71/169 (42%)	71/81 (88%)	0/78 (0%)	0/10 (0%)
Overall	1290/1499 (86%)	777/811 (96%)	412/545 (76%)	101/143 (71%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 84%, i.e. 1442 atoms were assigned a chemical shift out of a possible 1718. 0 out of 15 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	557/596 (93%)	229/239 (96%)	221/242 (91%)	107/115 (93%)
Sidechain	814/953 (85%)	576/611 (94%)	234/302 (77%)	4/40 (10%)
Aromatic	71/169 (42%)	71/81 (88%)	0/78 (0%)	0/10 (0%)
Overall	1442/1718 (84%)	876/931 (94%)	455/622 (73%)	111/165 (67%)

7.1.4 Statistically unusual chemical shifts (i)

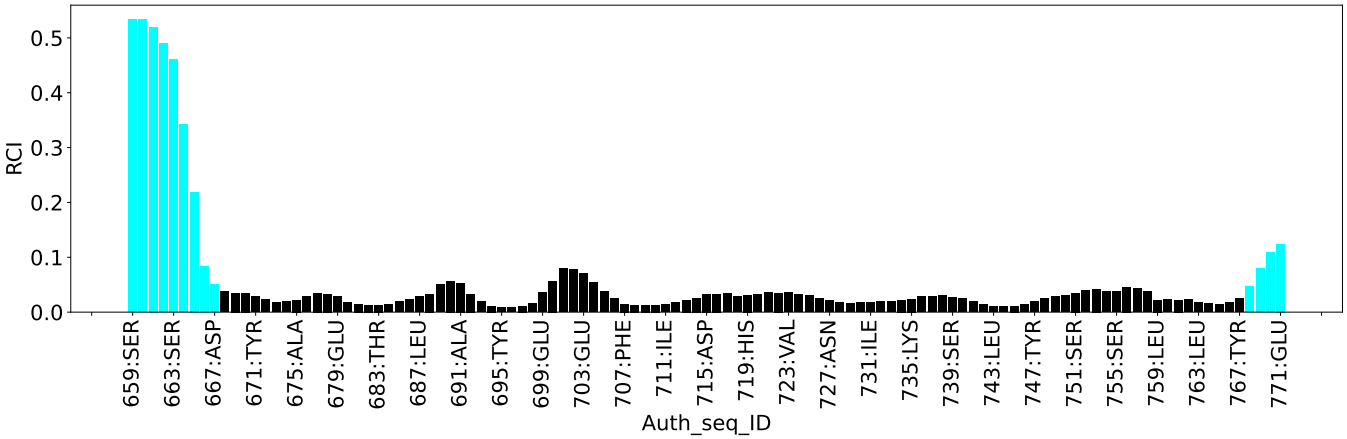
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, *ppm*	Expected range, *ppm*	Z-score
1	A	761	THR	HG1	6.28	0.08 – 2.19	24.4
1	B	1410	GLU	HG2	3.56	1.24 – 3.30	6.3
1	B	1410	GLU	HG3	3.56	1.20 – 3.30	6.3
1	A	743	LEU	HA	2.03	2.04 – 6.55	-5.0

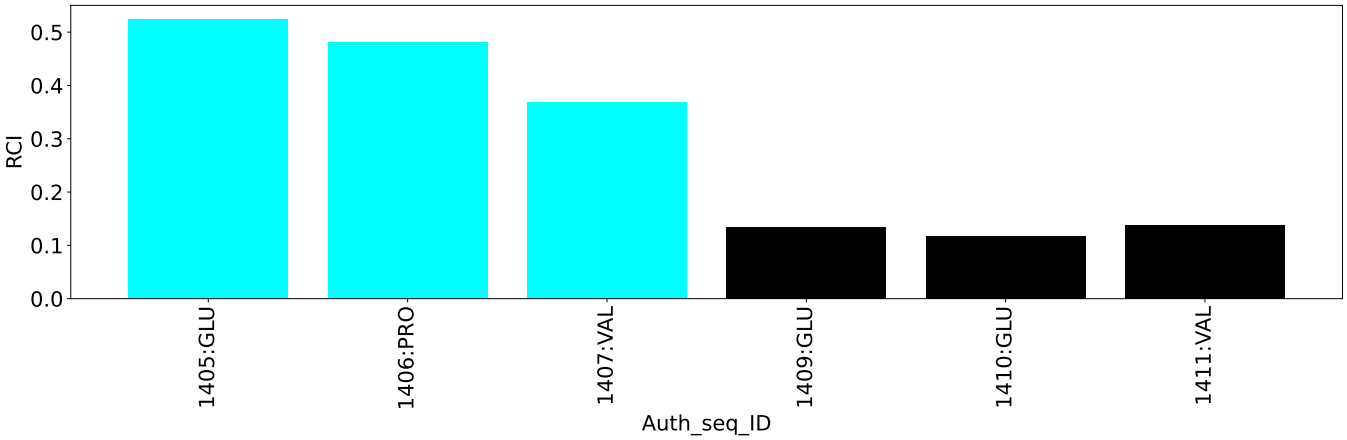
7.1.5 Random Coil Index (RCI) plots (i)

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 A:



Random coil index (RCI) for chain B:



8 NMR restraints analysis

8.1 Conformationally restricting restraints

The following table provides the summary of experimentally observed NMR restraints in different categories. Restraints are classified into different categories based on the sequence separation of the atoms involved.

Description	Value
Total distance restraints	1794
Intra-residue (|i-j|=0)	559
Sequential (|i-j|=1)	428
Medium range (|i-j|>1 and |i-j|<5)	243
Long range (|i-j|≥5)	447
Inter-chain	71
Hydrogen bond restraints	46
Disulfide bond restraints	0
Total dihedral-angle restraints	119
Number of unmapped restraints	0
Number of restraints per residue	14.6
Number of long range restraints per residue[1]	3.7

[1]Long range hydrogen bonds and disulfide bonds are counted as long range restraints while calculating the number of long range restraints per residue

8.2 Residual restraint violations

This section provides the overview of the restraint violations analysis. The violations are binned as small, medium and large violations based on its absolute value. Average number of violations per model is calculated by dividing the total number of violations in each bin by the size of the ensemble.

8.2.1 Average number of distance violations per model

Distance violations less than 0.1 Å are not included in the calculation.

Bins (Å)	Average number of violations per model	Max (Å)
0.1-0.2 (Small)	0.2	0.19
0.2-0.5 (Medium)	None	None
>0.5 (Large)	None	None

8.2.2 Average number of dihedral-angle violations per model (i)

Dihedral-angle violations less than 1° are not included in the calculation.There are no dihedral-angle violations

9 Distance violation analysis (i)

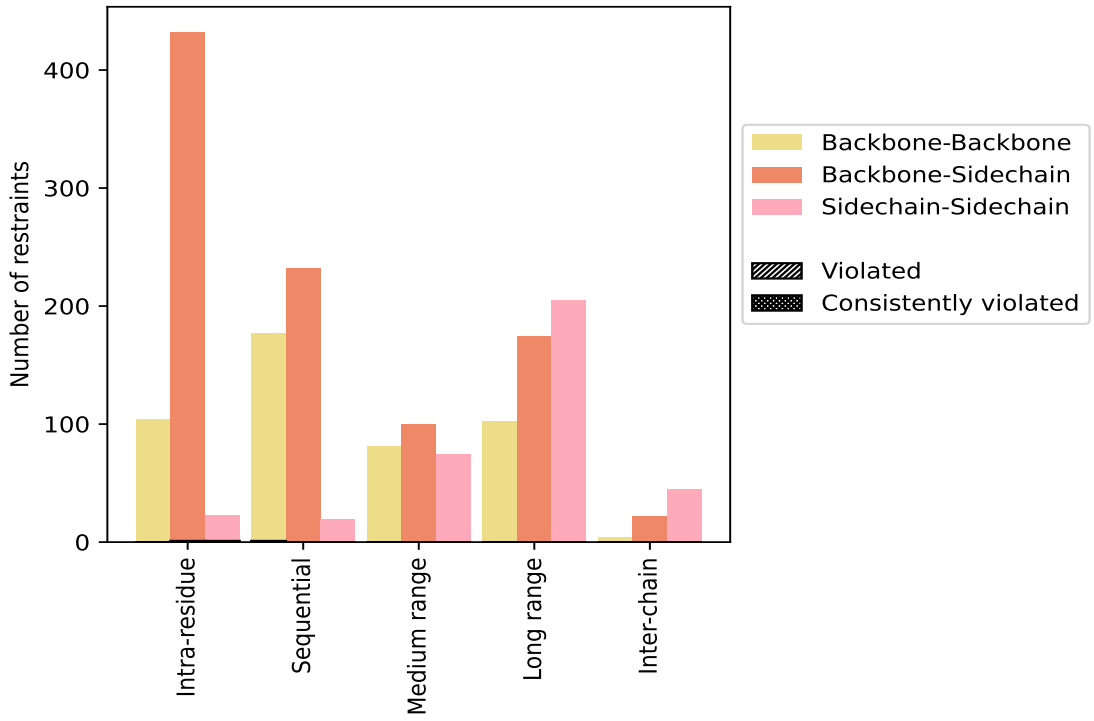
9.1 Summary of distance violations (i)

The following table shows the summary of distance violations in different restraint categories based on the sequence separation of the atoms involved. Each category is further sub-divided into three sub-categories based on the atoms involved. Violations less than 0.1 Å are not included in the statistics.

Restraints type	Count	%[1]	Violated[3]			Consistently Violated[4]		
			Count	%[2]	%[1]	Count	%[2]	%[1]
Intra-residue (|i-j|=0)	559	31.2	2	0.4	0.1	0	0.0	0.0
Backbone-Backbone	104	5.8	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	432	24.1	1	0.2	0.1	0	0.0	0.0
Sidechain-Sidechain	23	1.3	1	4.3	0.1	0	0.0	0.0
Sequential (|i-j|=1)	428	23.9	1	0.2	0.1	0	0.0	0.0
Backbone-Backbone	177	9.9	1	0.6	0.1	0	0.0	0.0
Backbone-Sidechain	232	12.9	0	0.0	0.0	0	0.0	0.0
Sidechain-Sidechain	19	1.1	0	0.0	0.0	0	0.0	0.0
Medium range (|i-j|>1 & |i-j|<5)	243	13.5	0	0.0	0.0	0	0.0	0.0
Backbone-Backbone	69	3.8	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	100	5.6	0	0.0	0.0	0	0.0	0.0
Sidechain-Sidechain	74	4.1	0	0.0	0.0	0	0.0	0.0
Long range (|i-j|≥5)	447	24.9	0	0.0	0.0	0	0.0	0.0
Backbone-Backbone	68	3.8	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	174	9.7	0	0.0	0.0	0	0.0	0.0
Sidechain-Sidechain	205	11.4	0	0.0	0.0	0	0.0	0.0
Inter-chain	71	4.0	0	0.0	0.0	0	0.0	0.0
Backbone-Backbone	4	0.2	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	22	1.2	0	0.0	0.0	0	0.0	0.0
Sidechain-Sidechain	45	2.5	0	0.0	0.0	0	0.0	0.0
Hydrogen bond	46	2.6	0	0.0	0.0	0	0.0	0.0
Disulfide bond	0	0.0	0	0.0	0.0	0	0.0	0.0
Total	1794	100.0	3	0.2	0.2	0	0.0	0.0
Backbone-Backbone	468	26.1	1	0.2	0.1	0	0.0	0.0
Backbone-Sidechain	960	53.5	1	0.1	0.1	0	0.0	0.0
Sidechain-Sidechain	366	20.4	1	0.3	0.1	0	0.0	0.0

[1] percentage calculated with respect to the total number of distance restraints, [2] percentage calculated with respect to the number of restraints in a particular restraint category, [3] violated in at least one model, [4] violated in all the models

9.1.1 Bar chart : Distribution of distance restraints and violations



Violated and consistently violated restraints are shown using different hatch patterns in their respective categories. The hydrogen bonds and disulfied bonds are counted in their appropriate category on the x-axis

9.2 Distance violation statistics for each model

The following table provides the distance violation statistics for each model in the ensemble. Violations less than 0.1 Å are not included in the statistics.

Model ID	Number of violations						Mean (Å)	Max (Å)	SD[6] (Å)	Median (Å)
	IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total				
1	0	0	0	0	0	0	0.0	0.0	0.0	0.0
2	0	0	0	0	0	0	0.0	0.0	0.0	0.0
3	1	0	0	0	0	1	0.19	0.19	0.0	0.19
4	0	0	0	0	0	0	0.0	0.0	0.0	0.0
5	0	1	0	0	0	1	0.11	0.11	0.0	0.11
6	0	0	0	0	0	0	0.0	0.0	0.0	0.0
7	0	0	0	0	0	0	0.0	0.0	0.0	0.0
8	0	0	0	0	0	0	0.0	0.0	0.0	0.0
9	0	0	0	0	0	0	0.0	0.0	0.0	0.0
10	1	0	0	0	0	1	0.16	0.16	0.0	0.16
11	0	0	0	0	0	0	0.0	0.0	0.0	0.0

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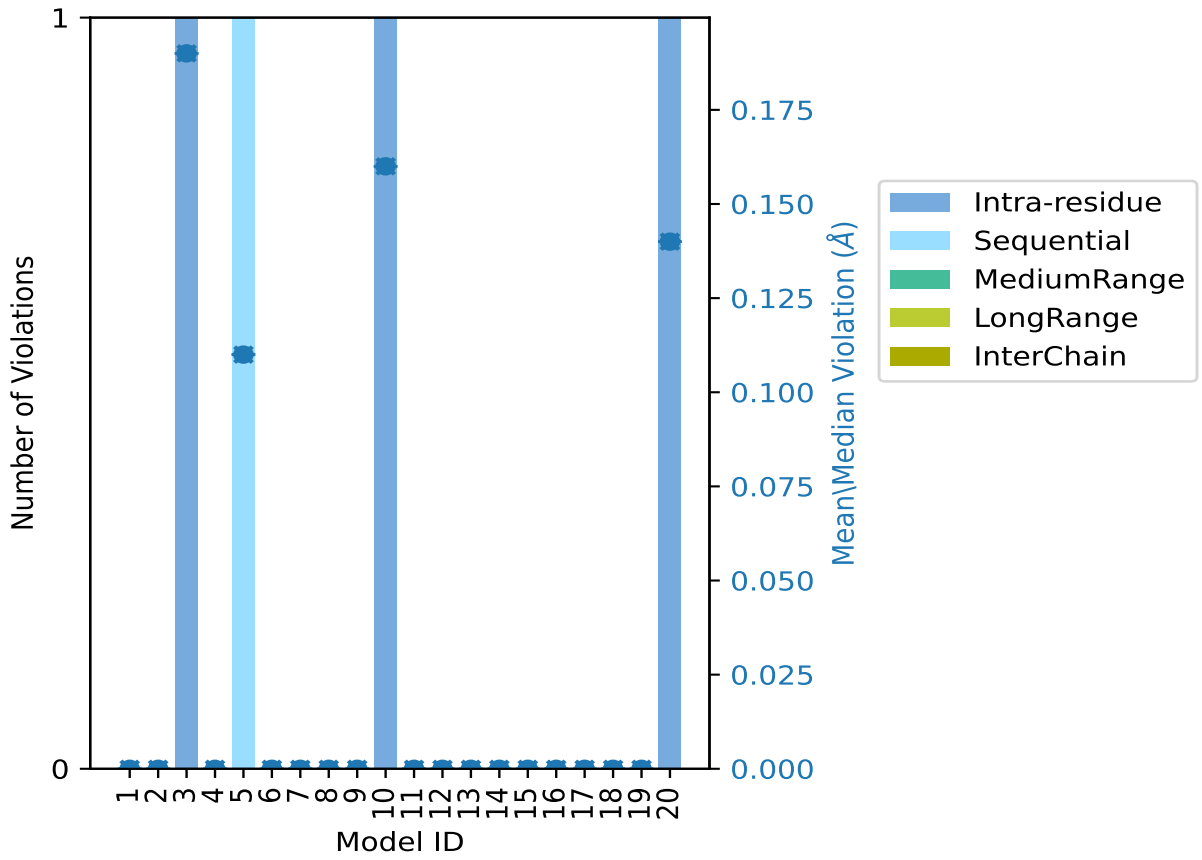
Model ID	Number of violations						Mean (Å)	Max (Å)	SD[6] (Å)	Median (Å)
	IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total				
12	0	0	0	0	0	0	0.0	0.0	0.0	0.0
13	0	0	0	0	0	0	0.0	0.0	0.0	0.0
14	0	0	0	0	0	0	0.0	0.0	0.0	0.0
15	0	0	0	0	0	0	0.0	0.0	0.0	0.0
16	0	0	0	0	0	0	0.0	0.0	0.0	0.0
17	0	0	0	0	0	0	0.0	0.0	0.0	0.0
18	0	0	0	0	0	0	0.0	0.0	0.0	0.0
19	0	0	0	0	0	0	0.0	0.0	0.0	0.0
20	1	0	0	0	0	1	0.14	0.14	0.0	0.14

[1]Intra-residue restraints, [2]Sequential restraints, [3]Medium range restraints, [4]Long range restraints, [5]Inter-chain restraints, [6]Standard deviation

9.2.1 Bar graph : Distance Violation statistics for each model



The mean(dot),median(x) and the standard deviation are shown in blue with respect to the y axis on the right

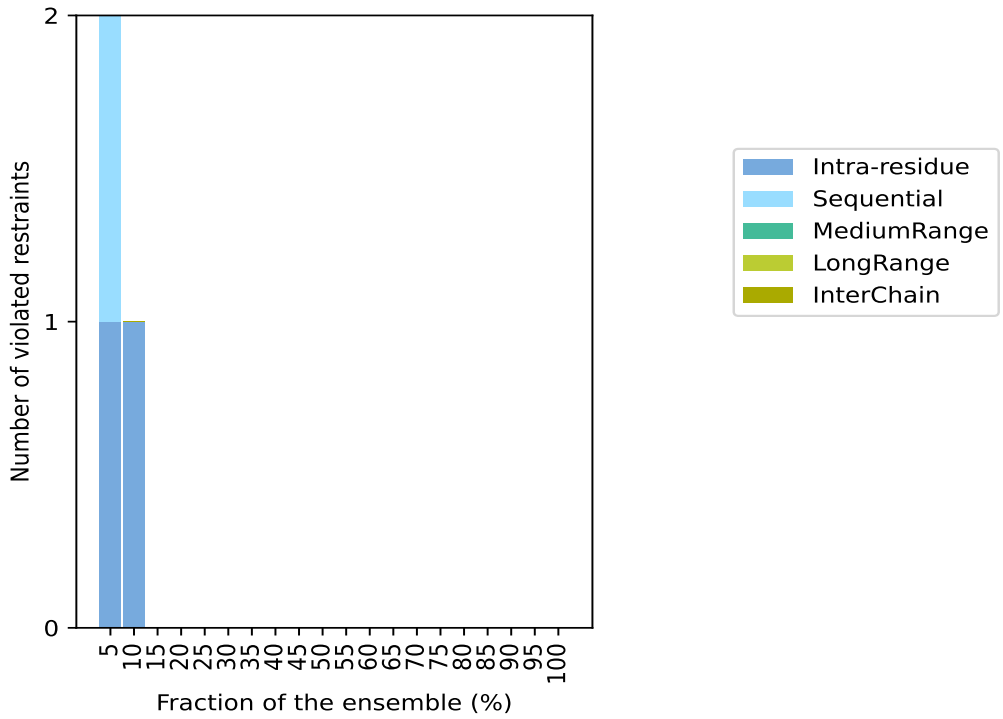
9.3 Distance violation statistics for the ensemble (i)

Violation analysis may find that some restraints are violated in few models and some are violated in most of models. The following table provides this information as number of violated restraints for a given fraction of the ensemble. In total, 1745(IR:557, SQ:427, MR:243, LR:447, IC:71) restraints are not violated in the ensemble.

Number of violated restraints						Fraction of the ensemble	
IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total	Count[6]	%
1	1	0	0	0	2	1	5.0
1	0	0	0	0	1	2	10.0
0	0	0	0	0	0	3	15.0
0	0	0	0	0	0	4	20.0
0	0	0	0	0	0	5	25.0
0	0	0	0	0	0	6	30.0
0	0	0	0	0	0	7	35.0
0	0	0	0	0	0	8	40.0
0	0	0	0	0	0	9	45.0
0	0	0	0	0	0	10	50.0
0	0	0	0	0	0	11	55.0
0	0	0	0	0	0	12	60.0
0	0	0	0	0	0	13	65.0
0	0	0	0	0	0	14	70.0
0	0	0	0	0	0	15	75.0
0	0	0	0	0	0	16	80.0
0	0	0	0	0	0	17	85.0
0	0	0	0	0	0	18	90.0
0	0	0	0	0	0	19	95.0
0	0	0	0	0	0	20	100.0

[1]Intra-residue restraints, [2]Sequential restraints, [3]Medium range restraints, [4]Long range restraints, [5]Inter-chain restraints, [6] Number of models with violations

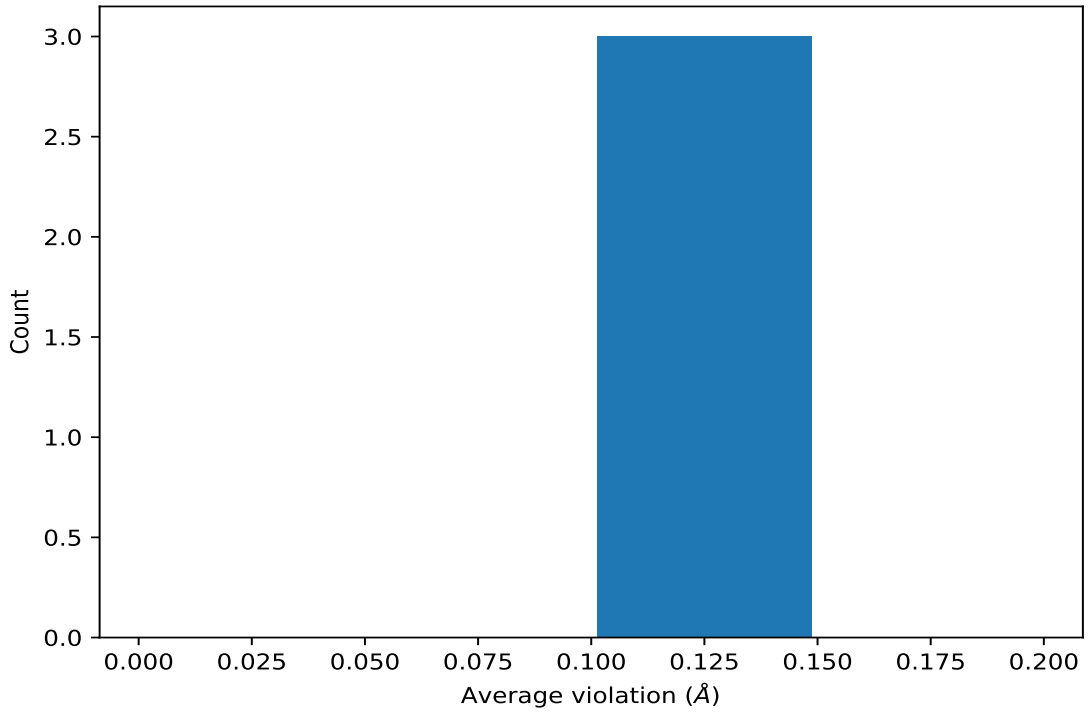
9.3.1 Bar graph : Distance violation statistics for the ensemble



9.4 Most violated distance restraints in the ensemble

9.4.1 Histogram : Distribution of mean distance violations

The following histogram shows the distribution of the average value of the violation. The average is calculated for each restraint that is violated in more than one model over all the violated models in the ensemble



9.4.2 Table: Most violated distance restraints (i)

The following table provides the mean and the standard deviation of the violation for each restraint sorted by number of violated models and the mean value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint. Rows with same key represent combinatorial or ambiguous restraints and are counted as a single restraint.

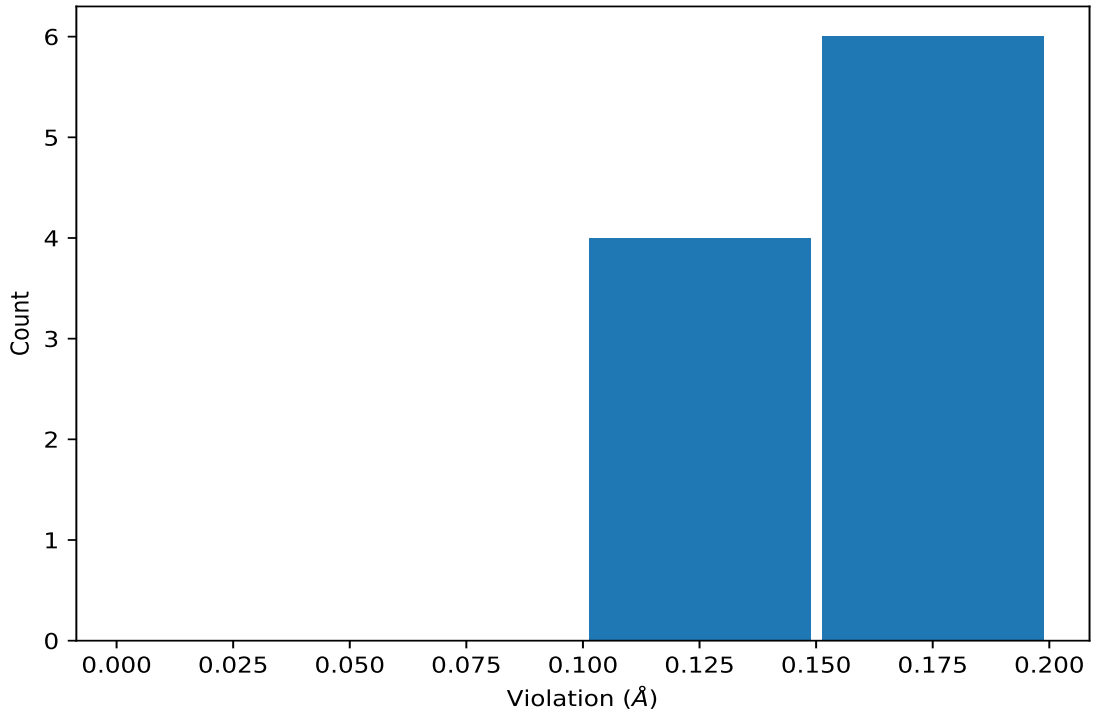
Key	Atom-1	Atom-2	Models[1]	Mean (Å)	SD[1] (Å)	Median (Å)
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG21	2	0.15	0.01	0.15
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG22	2	0.15	0.01	0.15
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG23	2	0.15	0.01	0.15

[1]Number of violated models, [2]Standard deviation

9.5 All violated distance restraints (i)

9.5.1 Histogram : Distribution of distance violations (i)

The following histogram shows the distribution of the absolute value of the violation for all violated restraints in the ensemble.



9.5.2 Table : All distance violations (i)

The following table lists the absolute value of the violation for each restraint in the ensemble sorted by its value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint. Rows with same key represent combinatorial or ambiguous restraints and are counted as a single restraint.

Key	Atom-1	Atom-2	Model ID	Violation (Å)
(1,659)	1:A:709:ILE:HD11	1:A:709:ILE:HB	3	0.19
(1,659)	1:A:709:ILE:HD12	1:A:709:ILE:HB	3	0.19
(1,659)	1:A:709:ILE:HD13	1:A:709:ILE:HB	3	0.19
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG21	10	0.16
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG22	10	0.16
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG23	10	0.16
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG21	20	0.14
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG22	20	0.14
(1,1664)	2:B:1407:VAL:HA	2:B:1407:VAL:HG23	20	0.14
(1,399)	1:A:691:ALA:H	1:A:690:HIS:HA	5	0.11

10 Dihedral-angle violation analysis

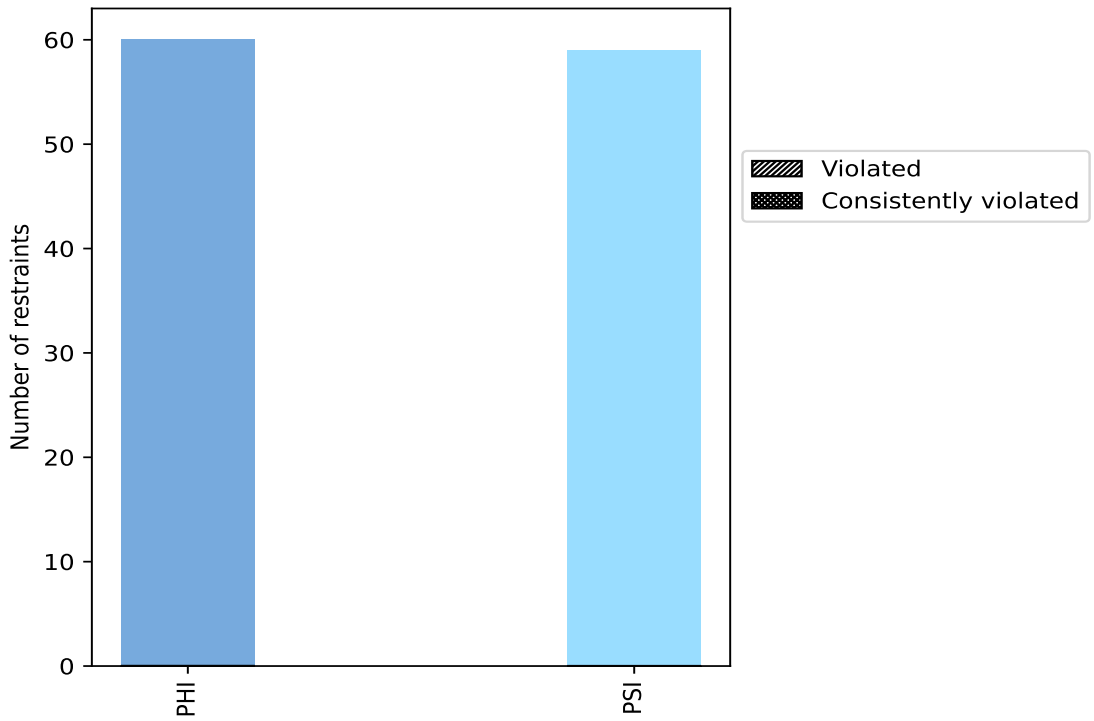
10.1 Summary of dihedral-angle violations

The following table provides the summary of dihedral-angle violations in different dihedral-angle types. Violations less than 1° are not included in the calculation.

Angle type	Count	%[1]	Violated[3]			Consistently Violated[4]		
			Count	%[2]	%[1]	Count	%[2]	%[1]
PHI	60	50.4	0	0.0	0.0	0	0.0	0.0
PSI	59	49.6	0	0.0	0.0	0	0.0	0.0
Total	119	100.0	0	0.0	0.0	0	0.0	0.0

[1] percentage calculated with respect to total number of dihedral-angle restraints, [2] percentage calculated with respect to number of restraints in a particular dihedral-angle type, [3] violated in at least one model, [4] violated in all the models

10.1.1 Bar chart : Distribution of dihedral-angles and violations



Violated and consistently violated restraints are shown using different hatch patterns in their respective categories

10.2 Dihedral-angle violation statistics for each model

No violations found

10.3 Dihedral-angle violation statistics for the ensemble

No violations found

10.4 Most violated dihedral-angle restraints in the ensemble

No violations found

10.5 All violated dihedral-angle restraints

No violations found