



# Full wwPDB NMR Structure Validation Report ⓘ

Feb 16, 2022 – 08:56 AM EST

PDB ID : 1MO8  
Title : ATPase  
Authors : Hilge, M.; Siegal, G.; Vuister, G.W.; Guentert, P.; Gloor, S.M.; Abrahams, J.P.  
Deposited on : 2002-09-08

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.

---

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
buster-report : 1.1.7 (2018)  
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 : 2.26  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.26

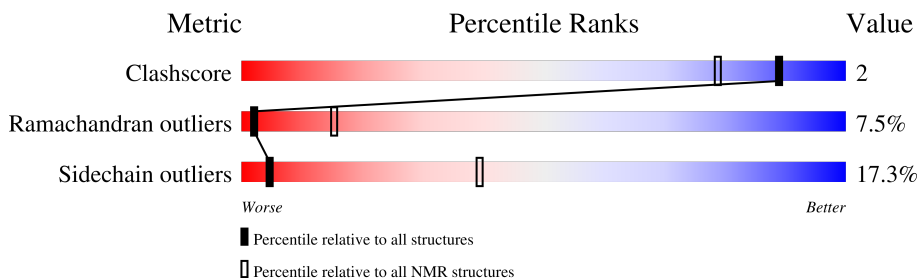
# 1 Overall quality at a glance

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	213	 65% 17% 17%

## 2 Ensemble composition and analysis

This entry contains 20 models. Model 11 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:386-A:398, A:416-A:434, A:441-A:449, A:453-A:546, A:552-A:592 (176)	0.58	11

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 4 single-model clusters were found.

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

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

There are 2 unique types of molecules in this entry. The entry contains 3346 atoms, of which 1644 are hydrogens and 0 are deuteriums.

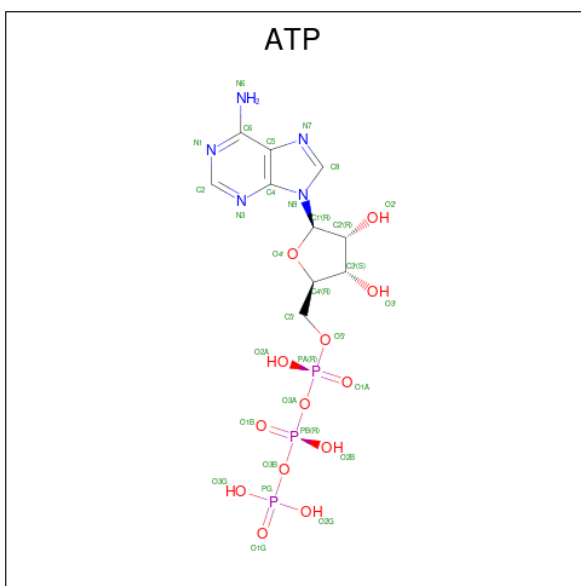
- Molecule 1 is a protein called Sodium/Potassium-Transporting ATPase alpha-1.

Mol	Chain	Residues	Atoms					Trace	
			Total	C	H	N	O		S
1	A	213	3303	1056	1632	282	320	13	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	385	PRO	ARG	cloning artifact	UNP P06685

- Molecule 2 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula:  $C_{10}H_{16}N_5O_{13}P_3$ ).



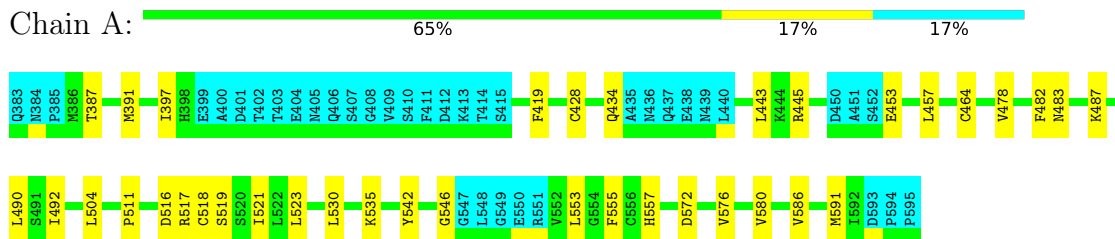
Mol	Chain	Residues	Atoms					
			Total	C	H	N	O	P
2	A	1	43	10	12	5	13	3

## 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: Sodium/Potassium-Transporting ATPase alpha-1

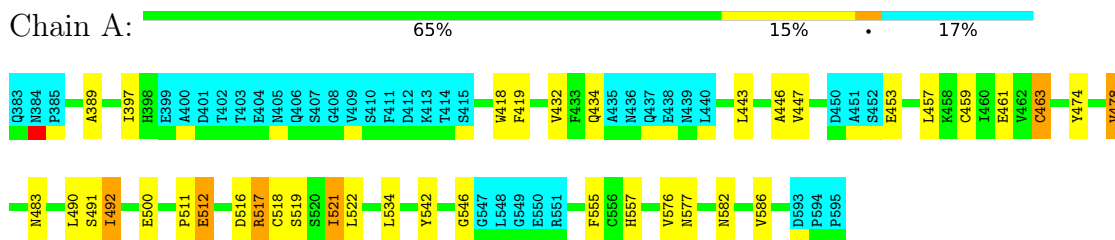


### 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

#### 4.2.1 Score per residue for model 1

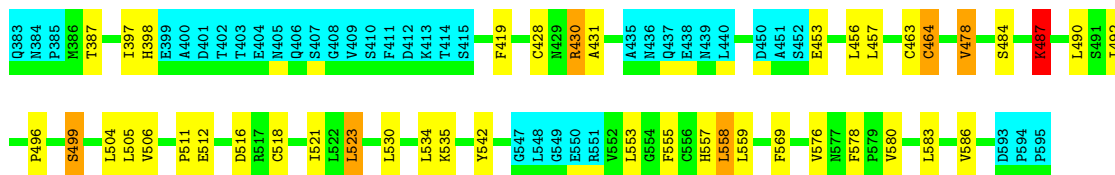
- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1



#### 4.2.2 Score per residue for model 2

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

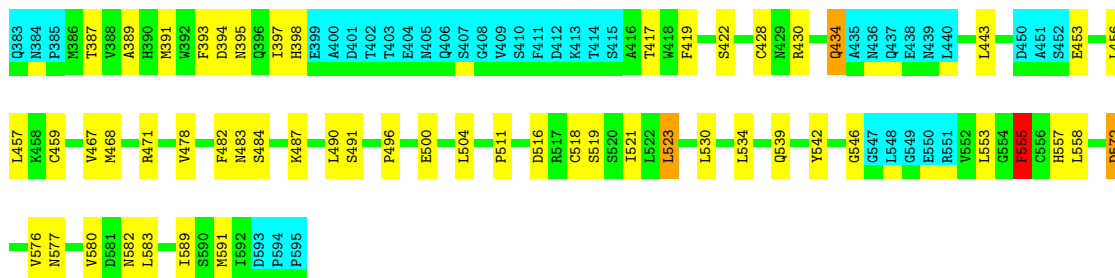




### 4.2.3 Score per residue for model 3

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

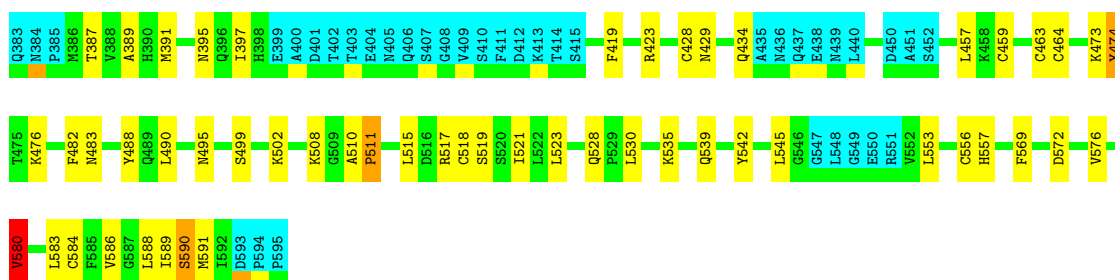
Chain A: 57% 24% 17%



### 4.2.4 Score per residue for model 4

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

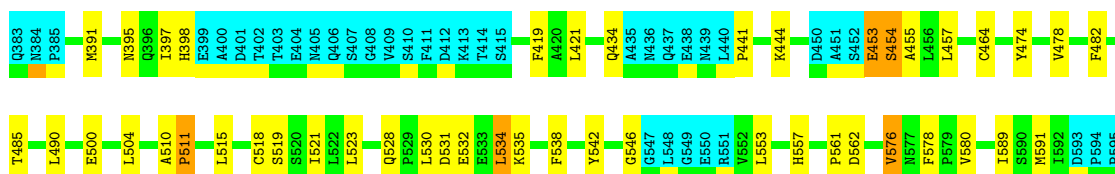
Chain A: 58% 23% 17%



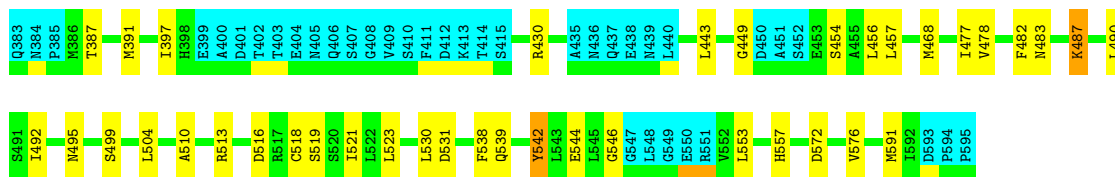
### 4.2.5 Score per residue for model 5

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

Chain A: 61% 19% 17%



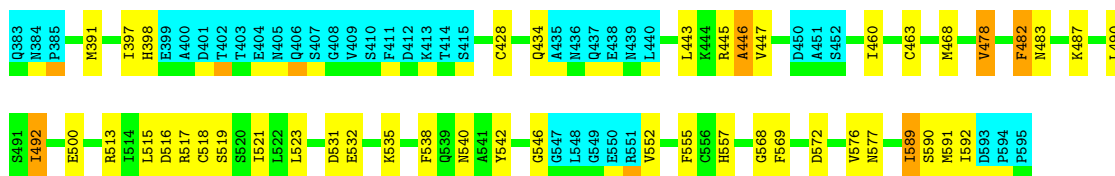




#### 4.2.10 Score per residue for model 10

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

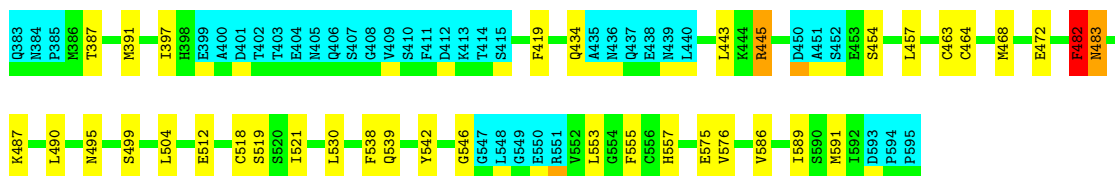
Chain A: 61% 19% 17%



#### 4.2.11 Score per residue for model 11 (medoid)

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

Chain A: 65% 16% 17%



#### 4.2.12 Score per residue for model 12

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

Chain A: 62% 17% 17%

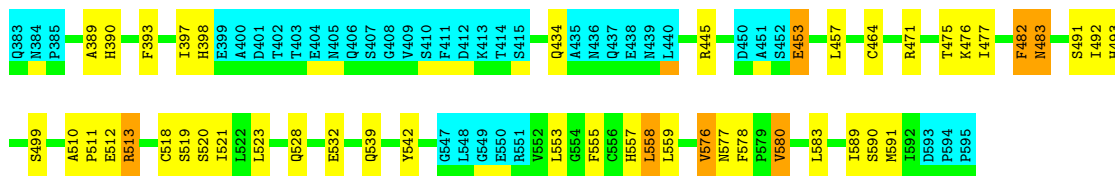


#### 4.2.13 Score per residue for model 13

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1



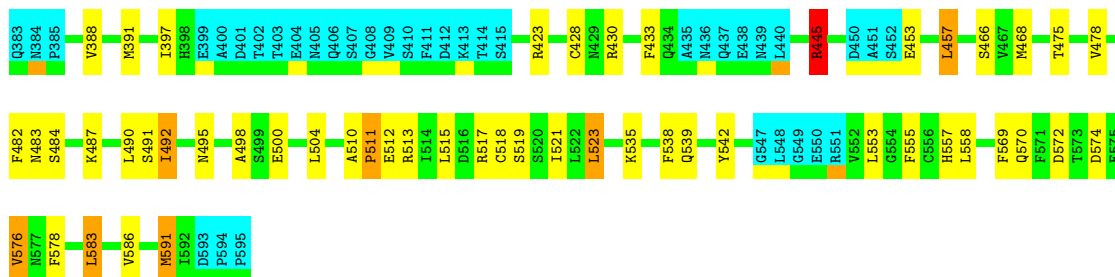
Chain A:  61% 18% 17%



#### 4.2.14 Score per residue for model 14

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

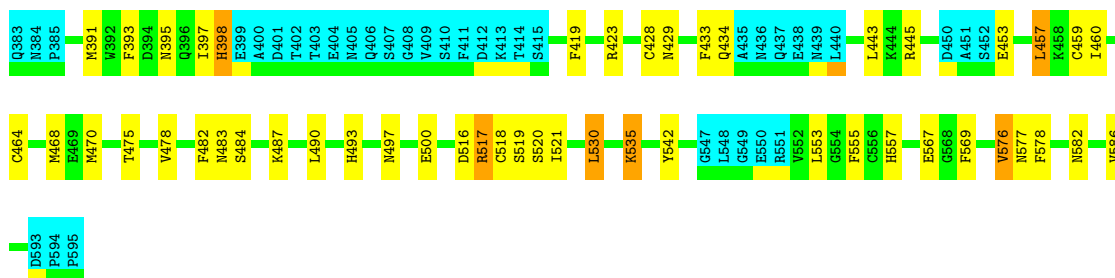
Chain A:  58% 21% 17%



#### 4.2.15 Score per residue for model 15

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

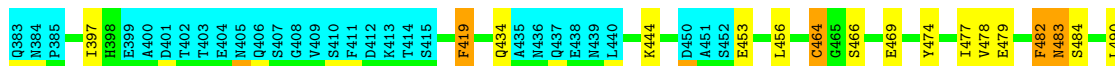
Chain A:  60% 20% 17%



#### 4.2.16 Score per residue for model 16

- Molecule 1: Sodium/Potassium-Transporting ATPase alpha-1

Chain A:  62% 16% 17%







## 5 Refinement protocol and experimental data overview

The models were refined using the following method: *Automated NOESY cross peak assignment*.

Of the 200 calculated structures, 20 were deposited, based on the following criterion: *structures with the lowest energy, target function*.

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

Software name	Classification	Version
CYANA	structure solution	1.0.5
OPALp	refinement	1.0

No chemical shift data was provided.

## 6 Model quality i

### 6.1 Standard geometry i

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

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	A	0.59±0.01	0±0/1430 ( 0.0± 0.0%)	1.10±0.02	1±1/1935 ( 0.0± 0.0%)
All	All	0.59	0/28600 ( 0.0%)	1.10	18/38700 ( 0.0%)

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
1	A	0.0±0.0	2.0±1.0
All	All	0	40

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
1	A	555	PHE	CB-CG-CD2	-7.27	115.71	120.80	3	3
1	A	542	TYR	CB-CG-CD2	-6.29	117.22	121.00	7	2
1	A	517	ARG	NE-CZ-NH2	-6.12	117.24	120.30	15	2
1	A	513	ARG	NE-CZ-NH2	-5.90	117.35	120.30	16	1
1	A	487	LYS	CB-CA-C	5.58	121.55	110.40	10	1
1	A	445	ARG	CB-CA-C	5.46	121.32	110.40	19	1
1	A	517	ARG	NE-CZ-NH1	5.45	123.03	120.30	20	1
1	A	591	MET	CA-CB-CG	-5.35	104.21	113.30	6	1
1	A	430	ARG	NE-CZ-NH2	-5.33	117.64	120.30	2	1
1	A	419	PHE	CB-CG-CD2	-5.30	117.09	120.80	16	1
1	A	482	PHE	CB-CA-C	5.25	120.90	110.40	11	1
1	A	423	ARG	NE-CZ-NH1	5.21	122.90	120.30	4	1

*Continued on next page...*

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	475	THR	CA-CB-CG2	5.18	119.66	112.40	14	1
1	A	445	ARG	NE-CZ-NH2	-5.10	117.75	120.30	10	1

There are no chirality outliers.

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

Mol	Chain	Res	Type	Group	Models (Total)
1	A	474	TYR	Sidechain	4
1	A	517	ARG	Sidechain	3
1	A	471	ARG	Sidechain	3
1	A	567	GLU	Peptide	3
1	A	487	LYS	Peptide	2
1	A	542	TYR	Sidechain	2
1	A	490	LEU	Peptide	2
1	A	571	PHE	Peptide	2
1	A	447	VAL	Peptide	1
1	A	499	SER	Peptide	1
1	A	434	GLN	Peptide	1
1	A	546	GLY	Peptide	1
1	A	561	PRO	Peptide	1
1	A	580	VAL	Peptide	1
1	A	465	GLY	Peptide	1
1	A	482	PHE	Sidechain,Peptide	1
1	A	445	ARG	Sidechain	1
1	A	488	TYR	Sidechain	1
1	A	464	CYS	Peptide	1
1	A	497	ASN	Peptide	1
1	A	513	ARG	Sidechain	1
1	A	418	TRP	Peptide	1
1	A	519	SER	Peptide	1
1	A	493	HIS	Peptide	1
1	A	575	GLU	Peptide	1
1	A	449	GLY	Peptide	1

## 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	1397	1392	1392	5±2
All	All	28560	28080	28080	100

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 2.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:387:THR:HG23	1:A:389:ALA:H	0.68	1.47	7	2
1:A:560:LEU:HD13	1:A:565:PHE:CE2	0.64	2.27	7	1
1:A:473:LYS:HE3	1:A:474:TYR:CE2	0.63	2.29	17	1
1:A:521:ILE:HD13	1:A:522:LEU:H	0.59	1.58	1	2
1:A:515:LEU:HD11	1:A:535:LYS:HE3	0.58	1.75	4	1
1:A:558:LEU:HD22	1:A:583:LEU:HD22	0.58	1.76	16	1
1:A:478:VAL:HG11	1:A:572:ASP:HA	0.56	1.78	10	1
1:A:580:VAL:HA	1:A:583:LEU:HD11	0.55	1.78	4	3
1:A:515:LEU:HD11	1:A:535:LYS:HG3	0.54	1.78	20	1
1:A:515:LEU:HD21	1:A:535:LYS:HG3	0.54	1.80	17	3
1:A:576:VAL:HG13	1:A:578:PHE:CE1	0.54	2.38	13	3
1:A:504:LEU:HD12	1:A:505:LEU:N	0.53	2.19	2	1
1:A:455:ALA:HB3	1:A:591:MET:SD	0.52	2.45	6	2
1:A:388:VAL:HG22	1:A:591:MET:HG2	0.52	1.80	14	1
1:A:387:THR:HG23	1:A:389:ALA:N	0.52	2.20	7	1
1:A:530:LEU:HD23	1:A:535:LYS:HD2	0.52	1.80	15	1
1:A:478:VAL:CG2	1:A:492:ILE:HD12	0.51	2.35	1	5
1:A:511:PRO:HG2	1:A:542:TYR:CE1	0.51	2.40	7	3
1:A:504:LEU:CD1	1:A:506:VAL:HG13	0.51	2.35	2	1
1:A:453:GLU:OE1	1:A:456:LEU:HD11	0.50	2.06	3	1
1:A:473:LYS:HE3	1:A:474:TYR:CZ	0.50	2.42	17	1
1:A:395:ASN:HD21	1:A:534:LEU:HD22	0.49	1.67	5	1
1:A:555:PHE:CE2	1:A:589:ILE:HD13	0.49	2.43	13	2
1:A:427:LEU:HD21	1:A:474:TYR:CD1	0.48	2.43	7	1
1:A:518:CYS:SG	1:A:530:LEU:HD22	0.48	2.49	20	1
1:A:431:ALA:HB3	1:A:453:GLU:O	0.48	2.07	2	1
1:A:433:PHE:CD2	1:A:457:LEU:HD11	0.47	2.43	15	3
1:A:560:LEU:HD22	1:A:565:PHE:CE2	0.47	2.45	12	1
1:A:434:GLN:HE21	1:A:448:ALA:HB2	0.47	1.70	19	1
1:A:576:VAL:HG13	1:A:578:PHE:CZ	0.47	2.45	15	3
1:A:473:LYS:HE3	1:A:474:TYR:CE1	0.46	2.45	4	1
1:A:510:ALA:HB1	1:A:511:PRO:HD2	0.46	1.86	5	4
1:A:427:LEU:HD21	1:A:470:MET:HB3	0.46	1.86	12	1
1:A:515:LEU:HD22	1:A:538:PHE:CE1	0.46	2.45	10	3

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:510:ALA:HB3	1:A:513:ARG:HB2	0.46	1.88	9	3
1:A:482:PHE:CG	1:A:483:ASN:N	0.46	2.83	13	4
1:A:558:LEU:HD13	1:A:583:LEU:HD22	0.45	1.88	3	2
1:A:512:GLU:H	1:A:512:GLU:CD	0.45	2.15	1	1
1:A:456:LEU:HD23	1:A:591:MET:SD	0.45	2.52	20	1
1:A:521:ILE:HD13	1:A:522:LEU:N	0.44	2.28	1	1
1:A:558:LEU:C	1:A:558:LEU:HD12	0.44	2.33	13	1
1:A:482:PHE:CD1	1:A:483:ASN:N	0.44	2.86	20	1
1:A:511:PRO:CG	1:A:542:TYR:CE1	0.44	3.01	14	2
1:A:510:ALA:HB1	1:A:511:PRO:CD	0.44	2.42	4	1
1:A:453:GLU:HG3	1:A:455:ALA:H	0.43	1.73	8	1
1:A:393:PHE:CD2	1:A:417:THR:HG21	0.43	2.48	3	1
1:A:421:LEU:HD11	1:A:589:ILE:HD11	0.43	1.91	5	1
1:A:395:ASN:OD1	1:A:521:ILE:HD12	0.43	2.14	8	1
1:A:560:LEU:HD22	1:A:565:PHE:CZ	0.42	2.49	12	1
1:A:477:ILE:HD12	1:A:492:ILE:HG22	0.42	1.90	9	2
1:A:555:PHE:CD2	1:A:589:ILE:HD12	0.42	2.49	11	1
1:A:456:LEU:HD22	1:A:555:PHE:CE1	0.42	2.50	17	1
1:A:432:VAL:CG2	1:A:448:ALA:HB3	0.42	2.45	19	1
1:A:453:GLU:CD	1:A:454:SER:H	0.42	2.18	5	1
1:A:492:ILE:HD11	1:A:578:PHE:CE2	0.42	2.49	20	2
1:A:446:ALA:O	1:A:447:VAL:HG23	0.42	2.15	10	1
1:A:447:VAL:HG12	1:A:449:GLY:H	0.41	1.75	6	1
1:A:545:LEU:HD13	1:A:590:SER:HB3	0.41	1.92	4	1
1:A:386:MET:CE	1:A:455:ALA:HB2	0.41	2.45	18	1
1:A:487:LYS:HE2	1:A:513:ARG:CZ	0.41	2.46	8	1
1:A:505:LEU:HD23	1:A:506:VAL:N	0.41	2.31	7	1
1:A:492:ILE:HD11	1:A:578:PHE:CD2	0.41	2.51	14	1
1:A:565:PHE:CE2	1:A:571:PHE:CE1	0.41	3.09	17	1
1:A:417:THR:HG23	1:A:586:VAL:HG13	0.40	1.92	12	1
1:A:558:LEU:C	1:A:558:LEU:HD13	0.40	2.36	2	1
1:A:441:PRO:CG	1:A:444:LYS:HE2	0.40	2.47	20	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	176/213 (83%)	131±5 (75±3%)	31±4 (18±2%)	13±3 (7±2%)	2	15
All	All	3520/4260 (83%)	2628 (75%)	629 (18%)	263 (7%)	2	15

All 48 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	576	VAL	20
1	A	397	ILE	17
1	A	586	VAL	14
1	A	483	ASN	13
1	A	464	CYS	13
1	A	434	GLN	12
1	A	546	GLY	10
1	A	555	PHE	9
1	A	511	PRO	9
1	A	389	ALA	8
1	A	580	VAL	8
1	A	484	SER	7
1	A	487	LYS	7
1	A	499	SER	7
1	A	572	ASP	7
1	A	398	HIS	6
1	A	523	LEU	6
1	A	569	PHE	6
1	A	498	ALA	6
1	A	463	CYS	5
1	A	577	ASN	5
1	A	552	VAL	5
1	A	570	GLN	5
1	A	446	ALA	4
1	A	492	ILE	4
1	A	559	LEU	4
1	A	500	GLU	4
1	A	395	ASN	4
1	A	589	ILE	4
1	A	496	PRO	3
1	A	582	ASN	3
1	A	590	SER	3
1	A	583	LEU	2
1	A	428	CYS	2
1	A	416	ALA	2
1	A	460	ILE	2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Models (Total)
1	A	568	GLY	2
1	A	477	ILE	2
1	A	493	HIS	2
1	A	445	ARG	2
1	A	393	PHE	2
1	A	441	PRO	1
1	A	449	GLY	1
1	A	453	GLU	1
1	A	475	THR	1
1	A	567	GLU	1
1	A	388	VAL	1
1	A	494	LYS	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	155/186 (83%)	128±3 (83±2%)	27±3 (17±2%)	<b>5</b> 39
All	All	3100/3720 (83%)	2564 (83%)	536 (17%)	<b>5</b> 39

All 100 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	521	ILE	20
1	A	557	HIS	20
1	A	490	LEU	19
1	A	457	LEU	18
1	A	519	SER	18
1	A	518	CYS	17
1	A	482	PHE	17
1	A	523	LEU	16
1	A	553	LEU	15
1	A	478	VAL	14
1	A	542	TYR	14
1	A	419	PHE	13
1	A	516	ASP	13

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Models (Total)
1	A	391	MET	13
1	A	591	MET	13
1	A	530	LEU	12
1	A	443	LEU	11
1	A	387	THR	11
1	A	428	CYS	11
1	A	504	LEU	11
1	A	535	LYS	9
1	A	453	GLU	8
1	A	468	MET	8
1	A	539	GLN	8
1	A	512	GLU	7
1	A	491	SER	6
1	A	517	ARG	6
1	A	534	LEU	6
1	A	430	ARG	6
1	A	500	GLU	5
1	A	464	CYS	5
1	A	577	ASN	5
1	A	528	GLN	5
1	A	538	PHE	5
1	A	459	CYS	4
1	A	456	LEU	4
1	A	487	LYS	4
1	A	558	LEU	4
1	A	495	ASN	4
1	A	531	ASP	4
1	A	532	GLU	4
1	A	417	THR	4
1	A	445	ARG	4
1	A	520	SER	4
1	A	398	HIS	4
1	A	423	ARG	4
1	A	395	ASN	3
1	A	572	ASP	3
1	A	429	ASN	3
1	A	476	LYS	3
1	A	588	LEU	3
1	A	444	LYS	3
1	A	454	SER	3
1	A	485	THR	3
1	A	570	GLN	3

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Models (Total)
1	A	590	SER	3
1	A	565	PHE	3
1	A	513	ARG	3
1	A	472	GLU	3
1	A	460	ILE	3
1	A	390	HIS	3
1	A	567	GLU	3
1	A	418	TRP	2
1	A	432	VAL	2
1	A	569	PHE	2
1	A	394	ASP	2
1	A	422	SER	2
1	A	467	VAL	2
1	A	502	LYS	2
1	A	508	LYS	2
1	A	556	CYS	2
1	A	562	ASP	2
1	A	484	SER	2
1	A	544	GLU	2
1	A	592	ILE	2
1	A	473	LYS	2
1	A	540	ASN	2
1	A	575	GLU	2
1	A	466	SER	2
1	A	461	GLU	1
1	A	463	CYS	1
1	A	582	ASN	1
1	A	471	ARG	1
1	A	488	TYR	1
1	A	580	VAL	1
1	A	584	CYS	1
1	A	421	LEU	1
1	A	589	ILE	1
1	A	483	ASN	1
1	A	393	PHE	1
1	A	475	THR	1
1	A	574	ASP	1
1	A	470	MET	1
1	A	497	ASN	1
1	A	469	GLU	1
1	A	479	GLU	1
1	A	489	GLN	1

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Models (Total)
1	A	505	LEU	1
1	A	536	ASP	1
1	A	494	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](#)

1 ligand 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	ATP	A	900	-	26,33,33	0.99±0.04	0±1 (1±2%)

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	ATP	A	900	-	31,52,52	1.13±0.16	2±2 (6±5%)

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	ATP	A	900	-	-	0±0,18,38,38	0±0,3,3,3

All unique bond 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(Å)	Ideal(Å)	Models	
								Worst	Total
2	A	900	ATP	O4'-C1'	2.31	1.44	1.41	18	1
2	A	900	ATP	C8-N7	2.30	1.30	1.34	18	5
2	A	900	ATP	O4'-C4'	2.20	1.40	1.45	9	1

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	900	ATP	O4'-C1'-C2'	4.36	100.56	106.93	9	7
2	A	900	ATP	C1'-N9-C4	4.16	119.33	126.64	1	5
2	A	900	ATP	C3'-C2'-C1'	3.88	95.14	100.98	1	1
2	A	900	ATP	C5-C6-N6	2.98	124.89	120.35	15	10
2	A	900	ATP	PA-O3A-PB	2.62	123.85	132.83	17	7
2	A	900	ATP	O3'-C3'-C4'	2.48	118.21	111.05	4	1
2	A	900	ATP	C2'-C3'-C4'	2.47	107.45	102.64	15	1
2	A	900	ATP	O3'-C3'-C2'	2.37	104.14	111.82	1	2
2	A	900	ATP	O4'-C4'-C5'	2.36	117.14	109.37	1	2
2	A	900	ATP	O5'-C5'-C4'	2.34	117.05	108.99	9	2
2	A	900	ATP	C4-C5-N7	2.18	111.67	109.40	6	2
2	A	900	ATP	O3G-PG-O2G	2.08	115.57	107.64	13	1

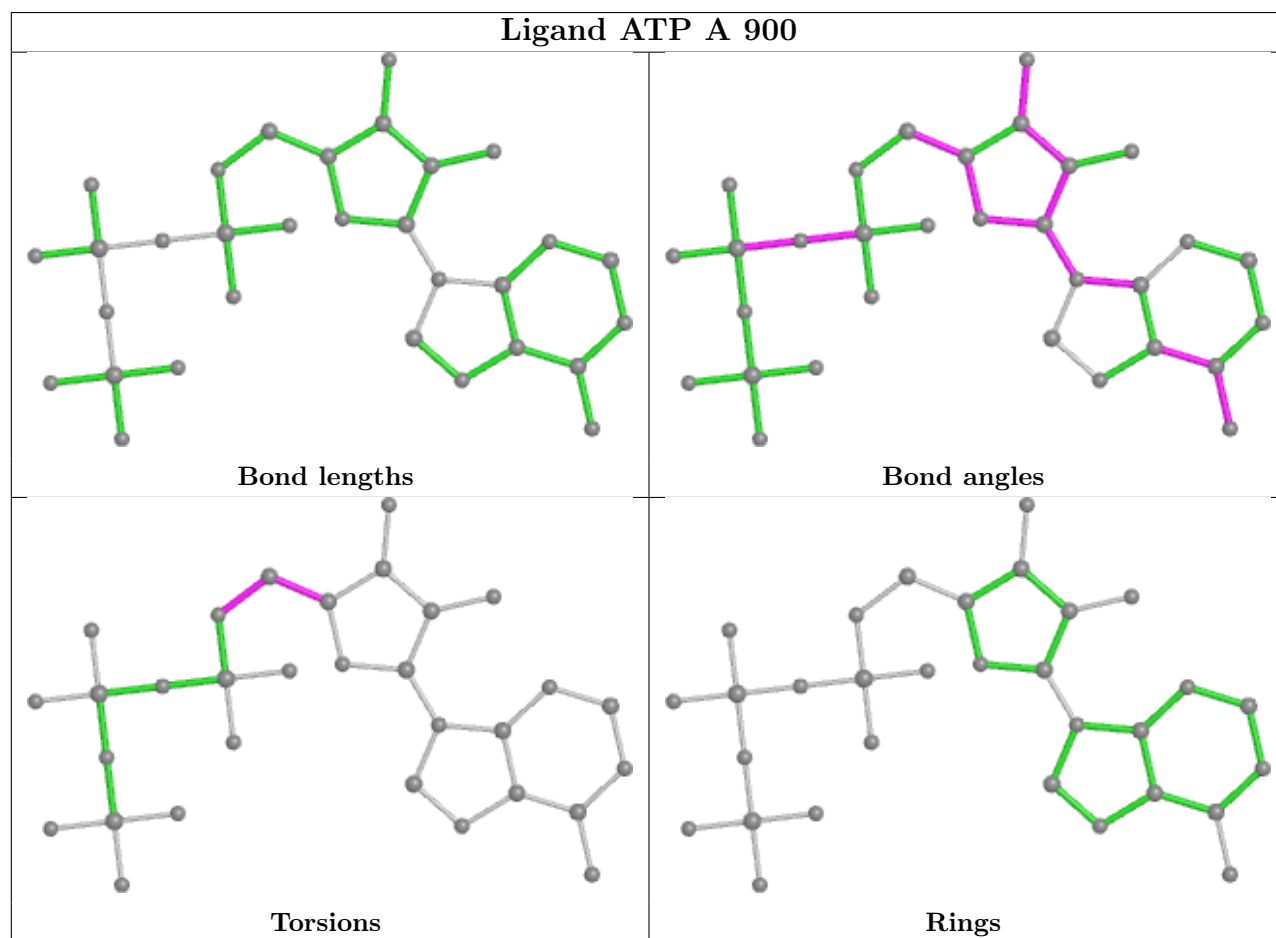
There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



## 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