



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 1, 2022 – 02:06 PM JST

PDB ID : 7WRG  
Title : Crystal structure of full-length kinesin-3 KLP-6  
Authors : Wang, W.J.; Ren, J.Q.; Song, W.Y.; Feng, W.  
Deposited on : 2022-01-26  
Resolution : 3.16 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at <http://www.wwpdb.org/validation/2017/FAQs#types>.

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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)  
Xtriage (Phenix) : 1.13  
EDS : 2.29  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.29

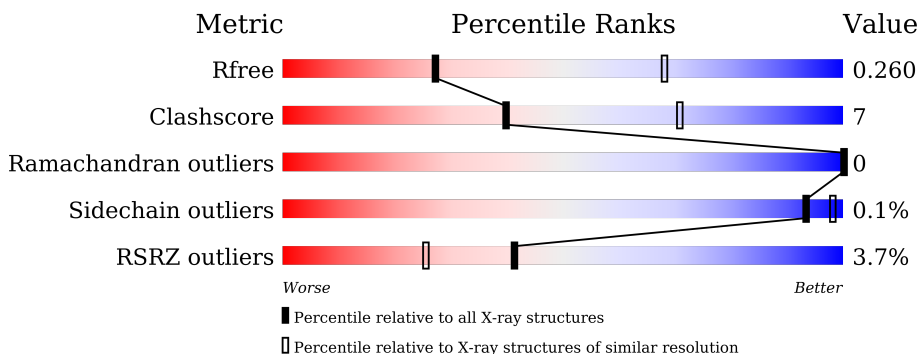
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 3.16 Å.

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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1665 (3.20-3.12)
Clashscore	141614	1804 (3.20-3.12)
Ramachandran outliers	138981	1770 (3.20-3.12)
Sidechain outliers	138945	1769 (3.20-3.12)
RSRZ outliers	127900	1616 (3.20-3.12)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. 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  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	960	<div> <div></div> <div>70%14%15%</div> </div>
1	B	960	<div> <div>6%</div> <div>64%18%18%</div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 12589 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Kinesin-like protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	812	Total	C	N	O	S	0	0	0
			6376	4010	1101	1236	29			
1	B	783	Total	C	N	O	S	0	0	0
			6154	3872	1064	1190	28			

There are 64 discrepancies between the modelled and reference sequences:

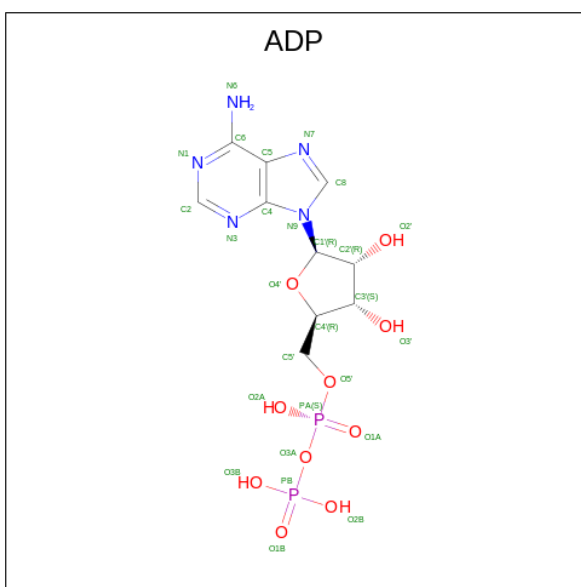
Chain	Residue	Modelled	Actual	Comment	Reference
A	929	GLY	-	expression tag	UNP G5EFQ4
A	930	THR	-	expression tag	UNP G5EFQ4
A	931	LYS	-	expression tag	UNP G5EFQ4
A	932	LEU	-	expression tag	UNP G5EFQ4
A	933	LEU	-	expression tag	UNP G5EFQ4
A	934	GLU	-	expression tag	UNP G5EFQ4
A	935	VAL	-	expression tag	UNP G5EFQ4
A	936	LEU	-	expression tag	UNP G5EFQ4
A	937	PHE	-	expression tag	UNP G5EFQ4
A	938	GLN	-	expression tag	UNP G5EFQ4
A	939	GLY	-	expression tag	UNP G5EFQ4
A	940	PRO	-	expression tag	UNP G5EFQ4
A	941	HIS	-	expression tag	UNP G5EFQ4
A	942	HIS	-	expression tag	UNP G5EFQ4
A	943	HIS	-	expression tag	UNP G5EFQ4
A	944	HIS	-	expression tag	UNP G5EFQ4
A	945	HIS	-	expression tag	UNP G5EFQ4
A	946	HIS	-	expression tag	UNP G5EFQ4
A	947	GLY	-	expression tag	UNP G5EFQ4
A	948	SER	-	expression tag	UNP G5EFQ4
A	949	GLY	-	expression tag	UNP G5EFQ4
A	950	SER	-	expression tag	UNP G5EFQ4
A	951	GLY	-	expression tag	UNP G5EFQ4
A	952	SER	-	expression tag	UNP G5EFQ4
A	953	TRP	-	expression tag	UNP G5EFQ4

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Chain	Residue	Modelled	Actual	Comment	Reference
A	954	SER	-	expression tag	UNP G5EFQ4
A	955	HIS	-	expression tag	UNP G5EFQ4
A	956	PRO	-	expression tag	UNP G5EFQ4
A	957	GLN	-	expression tag	UNP G5EFQ4
A	958	PHE	-	expression tag	UNP G5EFQ4
A	959	GLU	-	expression tag	UNP G5EFQ4
A	960	LYS	-	expression tag	UNP G5EFQ4
B	929	GLY	-	expression tag	UNP G5EFQ4
B	930	THR	-	expression tag	UNP G5EFQ4
B	931	LYS	-	expression tag	UNP G5EFQ4
B	932	LEU	-	expression tag	UNP G5EFQ4
B	933	LEU	-	expression tag	UNP G5EFQ4
B	934	GLU	-	expression tag	UNP G5EFQ4
B	935	VAL	-	expression tag	UNP G5EFQ4
B	936	LEU	-	expression tag	UNP G5EFQ4
B	937	PHE	-	expression tag	UNP G5EFQ4
B	938	GLN	-	expression tag	UNP G5EFQ4
B	939	GLY	-	expression tag	UNP G5EFQ4
B	940	PRO	-	expression tag	UNP G5EFQ4
B	941	HIS	-	expression tag	UNP G5EFQ4
B	942	HIS	-	expression tag	UNP G5EFQ4
B	943	HIS	-	expression tag	UNP G5EFQ4
B	944	HIS	-	expression tag	UNP G5EFQ4
B	945	HIS	-	expression tag	UNP G5EFQ4
B	946	HIS	-	expression tag	UNP G5EFQ4
B	947	GLY	-	expression tag	UNP G5EFQ4
B	948	SER	-	expression tag	UNP G5EFQ4
B	949	GLY	-	expression tag	UNP G5EFQ4
B	950	SER	-	expression tag	UNP G5EFQ4
B	951	GLY	-	expression tag	UNP G5EFQ4
B	952	SER	-	expression tag	UNP G5EFQ4
B	953	TRP	-	expression tag	UNP G5EFQ4
B	954	SER	-	expression tag	UNP G5EFQ4
B	955	HIS	-	expression tag	UNP G5EFQ4
B	956	PRO	-	expression tag	UNP G5EFQ4
B	957	GLN	-	expression tag	UNP G5EFQ4
B	958	PHE	-	expression tag	UNP G5EFQ4
B	959	GLU	-	expression tag	UNP G5EFQ4
B	960	LYS	-	expression tag	UNP G5EFQ4

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula:  $C_{10}H_{15}N_5O_{10}P_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

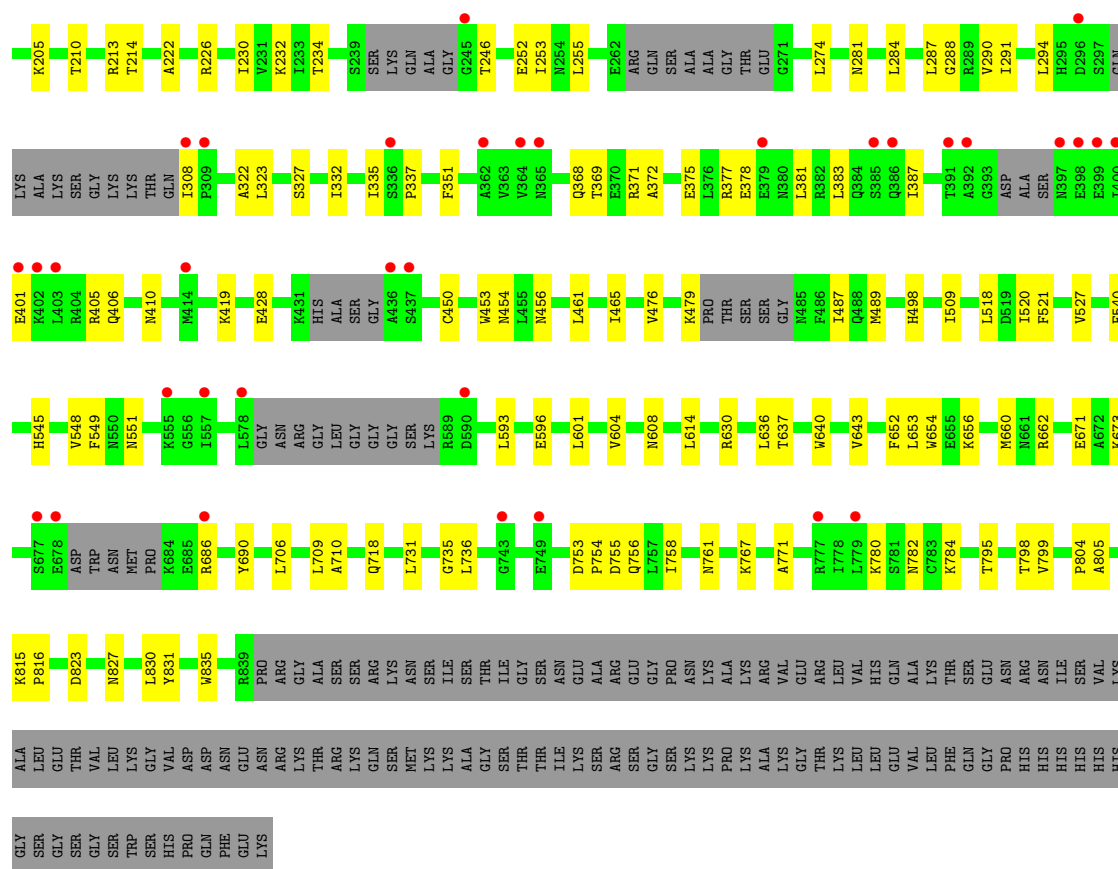
- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		
3	B	1	Total	Mg	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	3	Total	O	0	0
			3	3		





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	56.14Å 68.82Å 253.22Å 90.00° 92.75° 90.00°	Depositor
Resolution (Å)	33.20 – 3.16 33.20 – 3.16	Depositor EDS
% Data completeness (in resolution range)	97.7 (33.20-3.16) 97.7 (33.20-3.16)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.51 (at 3.18Å)	Xtriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, $R_{free}$	0.213 , 0.263 0.214 , 0.260	Depositor DCC
$R_{free}$ test set	1622 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	54.7	Xtriage
Anisotropy	0.364	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.26 , 49.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.025 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	12589	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	71.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.48% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.



## 5 Model quality

### 5.1 Standard geometry

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

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 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	0.25	0/6492	0.45	0/8767
1	B	0.24	0/6259	0.43	0/8443
All	All	0.25	0/12751	0.44	0/17210

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 the 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 within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	6376	0	6296	83	0
1	B	6154	0	6069	101	0
2	A	27	0	12	1	0
2	B	27	0	12	1	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	3	0	0	0	0
All	All	12589	0	12389	183	0

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 7.

The worst 5 of 183 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:718:GLN:HG2	1:A:733:THR:HG22	1.65	0.78
1:B:195:PRO:HD2	1:B:428:GLU:HG3	1.70	0.73
1:B:710:ALA:HB1	1:B:754:PRO:HB3	1.70	0.73
1:A:454:ASN:HB2	1:A:465:ILE:HG12	1.71	0.72
1:A:57:TRP:HE1	1:A:60:ASP:HB2	1.55	0.72

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 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 X-ray entries followed by that with respect to entries of similar resolution.

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	802/960 (84%)	754 (94%)	48 (6%)	0	100	100
1	B	763/960 (80%)	719 (94%)	44 (6%)	0	100	100
All	All	1565/1920 (82%)	1473 (94%)	92 (6%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 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 X-ray entries followed by that with respect to entries of similar resolution.

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	698/827 (84%)	697 (100%)	1 (0%)	93	98

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	672/827 (81%)	672 (100%)	0	100	100
All	All	1370/1654 (83%)	1369 (100%)	1 (0%)	93	98

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	367	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	367	ASN
1	A	485	ASN
1	B	756	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or 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 length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	ADP	B	1001	3	24,29,29	0.97	1 (4%)	29,45,45	1.45	4 (13%)
2	ADP	A	1001	3	24,29,29	0.96	1 (4%)	29,45,45	1.48	4 (13%)

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	ADP	B	1001	3	-	4/12/32/32	0/3/3/3
2	ADP	A	1001	3	-	3/12/32/32	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001	ADP	C5-C4	2.52	1.47	1.40
2	B	1001	ADP	C5-C4	2.49	1.47	1.40

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	ADP	PA-O3A-PB	-3.49	120.84	132.83
2	B	1001	ADP	PA-O3A-PB	-3.37	121.26	132.83
2	A	1001	ADP	C3'-C2'-C1'	3.37	106.05	100.98
2	B	1001	ADP	C3'-C2'-C1'	3.35	106.02	100.98
2	B	1001	ADP	N3-C2-N1	-3.20	123.67	128.68

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

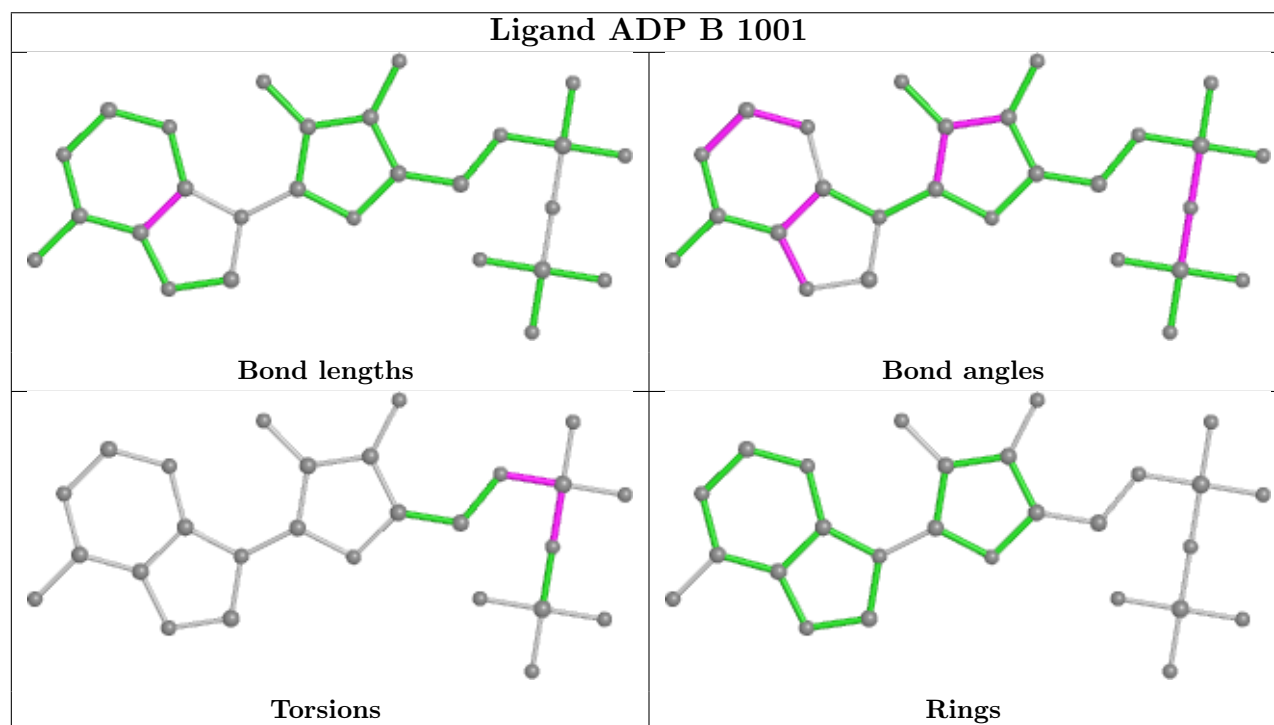
Mol	Chain	Res	Type	Atoms
2	A	1001	ADP	C5'-O5'-PA-O1A
2	A	1001	ADP	C5'-O5'-PA-O2A
2	B	1001	ADP	C5'-O5'-PA-O1A
2	B	1001	ADP	C5'-O5'-PA-O2A
2	A	1001	ADP	C5'-O5'-PA-O3A

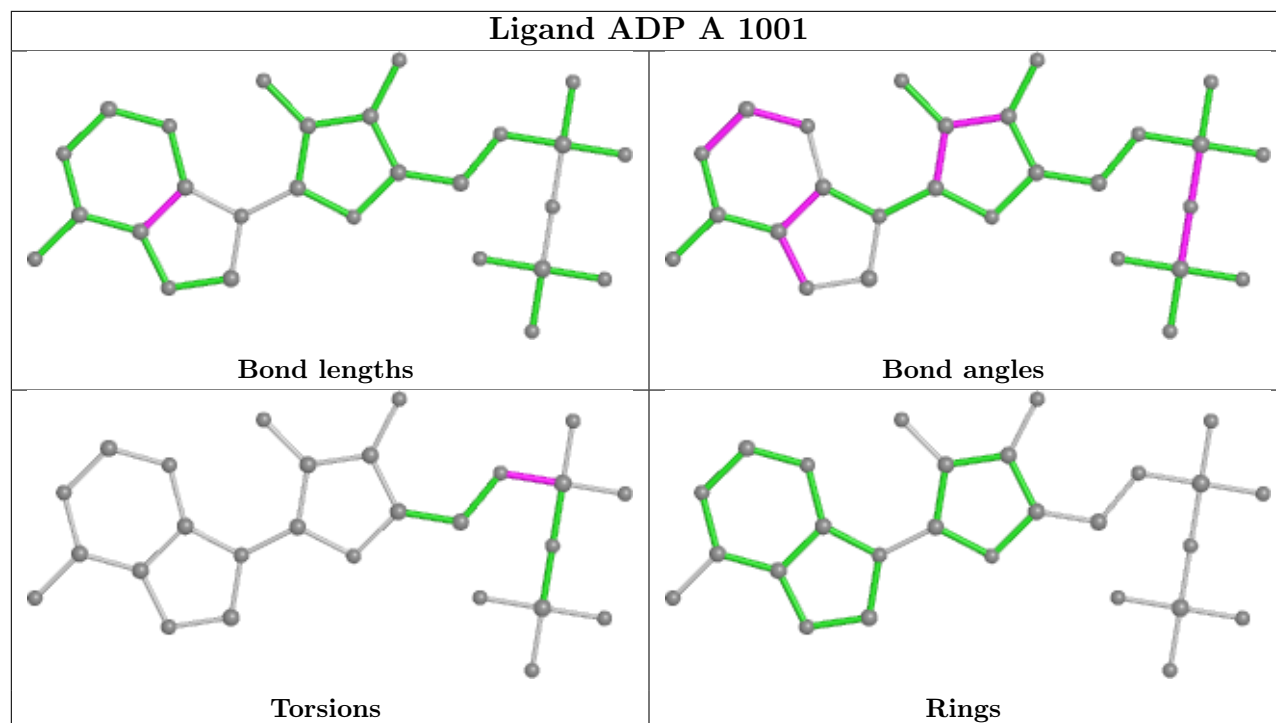
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1001	ADP	1	0
2	A	1001	ADP	1	0

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.





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	812/960 (84%)	-0.50	6 (0%) 87 81	9, 36, 87, 147	0
1	B	783/960 (81%)	0.29	53 (6%) 17 9	44, 96, 157, 198	0
All	All	1595/1920 (83%)	-0.11	59 (3%) 41 25	9, 65, 147, 198	0

The worst 5 of 59 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	70	LEU	4.9
1	B	397	ASN	4.5
1	B	39	ILE	4.2
1	B	32	PRO	4.0
1	B	245	GLY	3.9

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

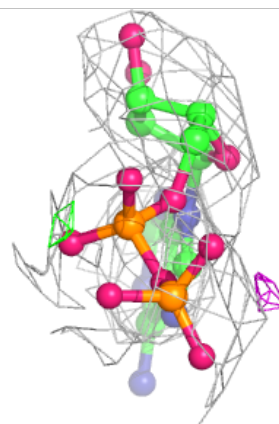
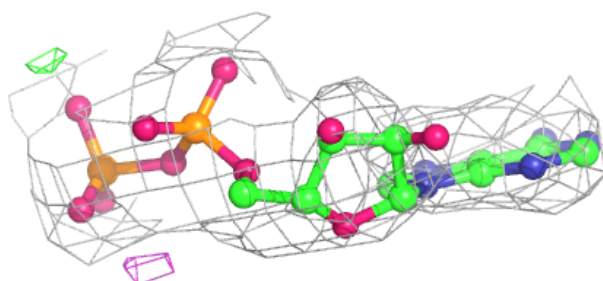
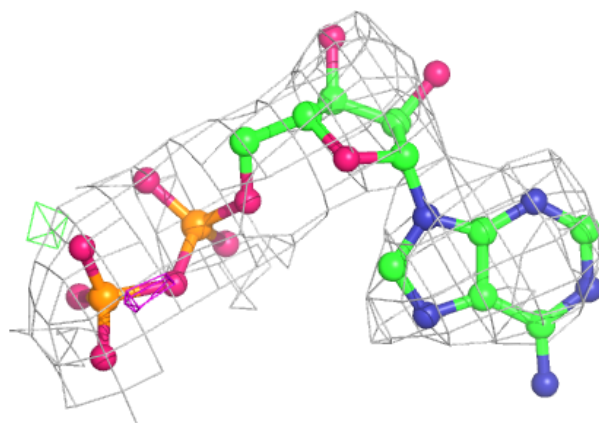
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	MG	B	1002	1/1	0.86	0.64	80,80,80,80	0
2	ADP	B	1001	27/27	0.87	0.23	66,108,122,127	0
3	MG	A	1002	1/1	0.92	0.40	28,28,28,28	0
2	ADP	A	1001	27/27	0.97	0.19	11,32,43,53	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around ADP B 1001:**

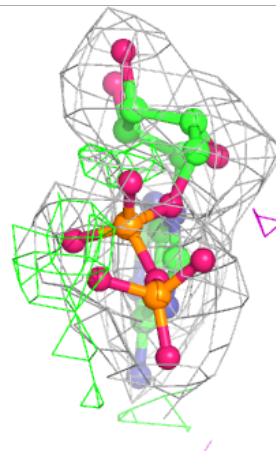
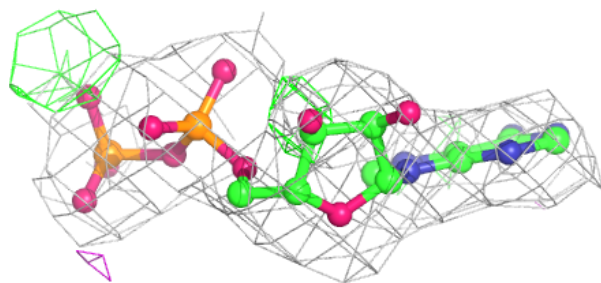
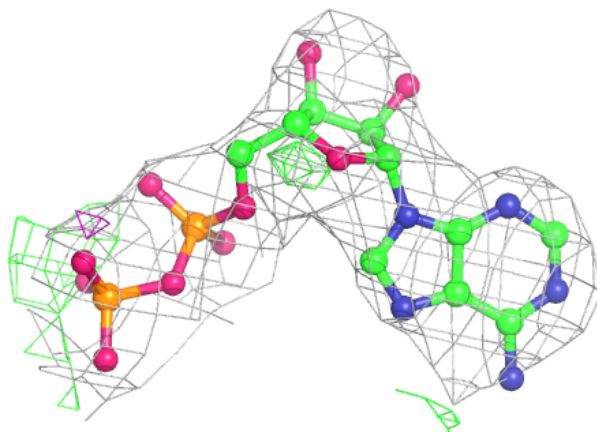
2mF<sub>o</sub>-DF<sub>c</sub> (at 0.7 rmsd) in gray  
mF<sub>o</sub>-DF<sub>c</sub> (at 3 rmsd) in purple (negative)  
and green (positive)





**Electron density around ADP A 1001:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.