



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 21, 2020 – 03:16 am BST

PDB ID : 4QQY  
Title : Crystal structure of T. fusca Cas3-ADP  
Authors : Ke, A.; Huo, Y.; Nam, K.H.  
Deposited on : 2014-06-30  
Resolution : 3.12 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.

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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 : 2.11  
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) : 2.11

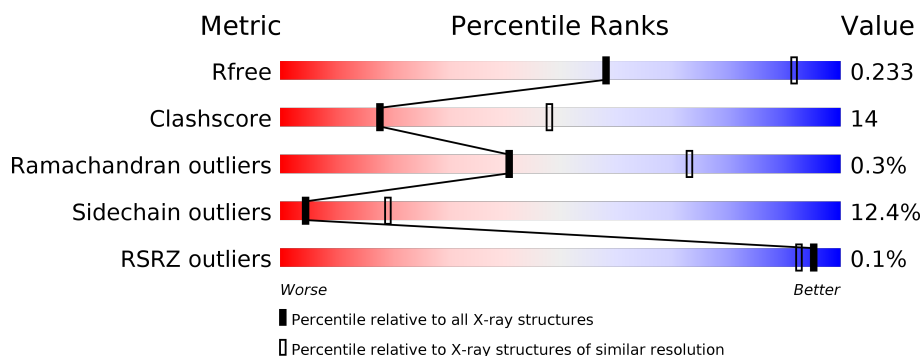
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.12 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	1292 (3.14-3.10)
Clashscore	141614	1389 (3.14-3.10)
Ramachandran outliers	138981	1337 (3.14-3.10)
Sidechain outliers	138945	1337 (3.14-3.10)
RSRZ outliers	127900	1260 (3.14-3.10)

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 on 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	964	
1	C	964	
1	E	964	
1	G	964	
2	B	12	
2	D	12	

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Mol	Chain	Length	Quality of chain
2	F	12	<div><div></div><div>8%</div><div>42%</div><div>33%</div><div>17%</div><div>8%</div></div>
2	H	12	<div><div></div><div>50%</div><div>25%</div><div>17%</div><div>8%</div></div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 28826 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 CRISPR-associated helicase, Cas3 family.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	896	Total	C	N	O	S	0	0	0
			6973	4430	1240	1276	27			
1	C	902	Total	C	N	O	S	0	0	0
			7001	4441	1243	1290	27			
1	E	902	Total	C	N	O	S	0	0	0
			7006	4444	1246	1289	27			
1	G	894	Total	C	N	O	S	0	0	0
			6942	4408	1235	1272	27			

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	INITIATING METHIONINE	UNP Q47PJ0
A	-18	GLY	-	EXPRESSION TAG	UNP Q47PJ0
A	-17	SER	-	EXPRESSION TAG	UNP Q47PJ0
A	-16	SER	-	EXPRESSION TAG	UNP Q47PJ0
A	-15	HIS	-	EXPRESSION TAG	UNP Q47PJ0
A	-14	HIS	-	EXPRESSION TAG	UNP Q47PJ0
A	-13	HIS	-	EXPRESSION TAG	UNP Q47PJ0
A	-12	HIS	-	EXPRESSION TAG	UNP Q47PJ0
A	-11	HIS	-	EXPRESSION TAG	UNP Q47PJ0
A	-10	HIS	-	EXPRESSION TAG	UNP Q47PJ0
A	-9	SER	-	EXPRESSION TAG	UNP Q47PJ0
A	-8	SER	-	EXPRESSION TAG	UNP Q47PJ0
A	-7	GLY	-	EXPRESSION TAG	UNP Q47PJ0
A	-6	LEU	-	EXPRESSION TAG	UNP Q47PJ0
A	-5	VAL	-	EXPRESSION TAG	UNP Q47PJ0
A	-4	PRO	-	EXPRESSION TAG	UNP Q47PJ0
A	-3	ARG	-	EXPRESSION TAG	UNP Q47PJ0
A	-2	GLY	-	EXPRESSION TAG	UNP Q47PJ0
A	-1	SER	-	EXPRESSION TAG	UNP Q47PJ0
A	0	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-19	MET	-	INITIATING METHIONINE	UNP Q47PJ0

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-18	GLY	-	EXPRESSION TAG	UNP Q47PJ0
C	-17	SER	-	EXPRESSION TAG	UNP Q47PJ0
C	-16	SER	-	EXPRESSION TAG	UNP Q47PJ0
C	-15	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-14	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-13	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-12	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-11	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-10	HIS	-	EXPRESSION TAG	UNP Q47PJ0
C	-9	SER	-	EXPRESSION TAG	UNP Q47PJ0
C	-8	SER	-	EXPRESSION TAG	UNP Q47PJ0
C	-7	GLY	-	EXPRESSION TAG	UNP Q47PJ0
C	-6	LEU	-	EXPRESSION TAG	UNP Q47PJ0
C	-5	VAL	-	EXPRESSION TAG	UNP Q47PJ0
C	-4	PRO	-	EXPRESSION TAG	UNP Q47PJ0
C	-3	ARG	-	EXPRESSION TAG	UNP Q47PJ0
C	-2	GLY	-	EXPRESSION TAG	UNP Q47PJ0
C	-1	SER	-	EXPRESSION TAG	UNP Q47PJ0
C	0	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-19	MET	-	INITIATING METHIONINE	UNP Q47PJ0
E	-18	GLY	-	EXPRESSION TAG	UNP Q47PJ0
E	-17	SER	-	EXPRESSION TAG	UNP Q47PJ0
E	-16	SER	-	EXPRESSION TAG	UNP Q47PJ0
E	-15	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-14	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-13	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-12	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-11	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-10	HIS	-	EXPRESSION TAG	UNP Q47PJ0
E	-9	SER	-	EXPRESSION TAG	UNP Q47PJ0
E	-8	SER	-	EXPRESSION TAG	UNP Q47PJ0
E	-7	GLY	-	EXPRESSION TAG	UNP Q47PJ0
E	-6	LEU	-	EXPRESSION TAG	UNP Q47PJ0
E	-5	VAL	-	EXPRESSION TAG	UNP Q47PJ0
E	-4	PRO	-	EXPRESSION TAG	UNP Q47PJ0
E	-3	ARG	-	EXPRESSION TAG	UNP Q47PJ0
E	-2	GLY	-	EXPRESSION TAG	UNP Q47PJ0
E	-1	SER	-	EXPRESSION TAG	UNP Q47PJ0
E	0	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-19	MET	-	INITIATING METHIONINE	UNP Q47PJ0
G	-18	GLY	-	EXPRESSION TAG	UNP Q47PJ0
G	-17	SER	-	EXPRESSION TAG	UNP Q47PJ0

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-16	SER	-	EXPRESSION TAG	UNP Q47PJ0
G	-15	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-14	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-13	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-12	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-11	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-10	HIS	-	EXPRESSION TAG	UNP Q47PJ0
G	-9	SER	-	EXPRESSION TAG	UNP Q47PJ0
G	-8	SER	-	EXPRESSION TAG	UNP Q47PJ0
G	-7	GLY	-	EXPRESSION TAG	UNP Q47PJ0
G	-6	LEU	-	EXPRESSION TAG	UNP Q47PJ0
G	-5	VAL	-	EXPRESSION TAG	UNP Q47PJ0
G	-4	PRO	-	EXPRESSION TAG	UNP Q47PJ0
G	-3	ARG	-	EXPRESSION TAG	UNP Q47PJ0
G	-2	GLY	-	EXPRESSION TAG	UNP Q47PJ0
G	-1	SER	-	EXPRESSION TAG	UNP Q47PJ0
G	0	HIS	-	EXPRESSION TAG	UNP Q47PJ0

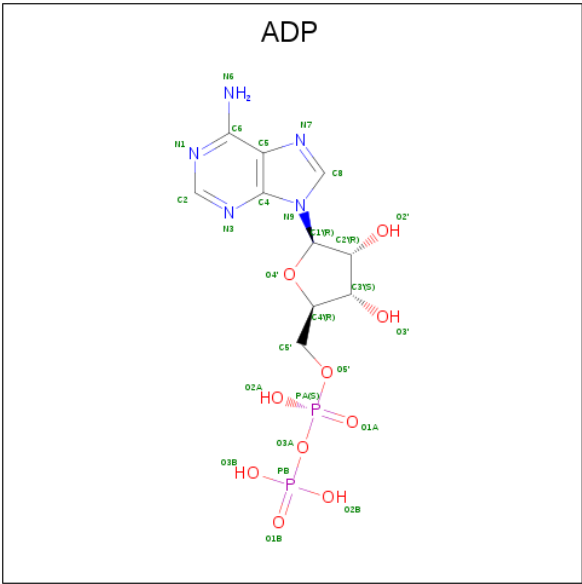
- Molecule 2 is a DNA chain called HD nuclease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	11	Total	C	N	O	P	0	0	0
			197	90	45	51	11			
2	D	11	Total	C	N	O	P	0	0	0
			197	90	45	51	11			
2	F	11	Total	C	N	O	P	0	0	0
			197	90	45	51	11			
2	H	11	Total	C	N	O	P	0	0	0
			197	90	45	51	11			

- Molecule 3 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	G	2	Total	Fe	0	0
			2	2		
3	A	2	Total	Fe	0	0
			2	2		
3	C	2	Total	Fe	0	0
			2	2		
3	E	2	Total	Fe	0	0
			2	2		

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>).

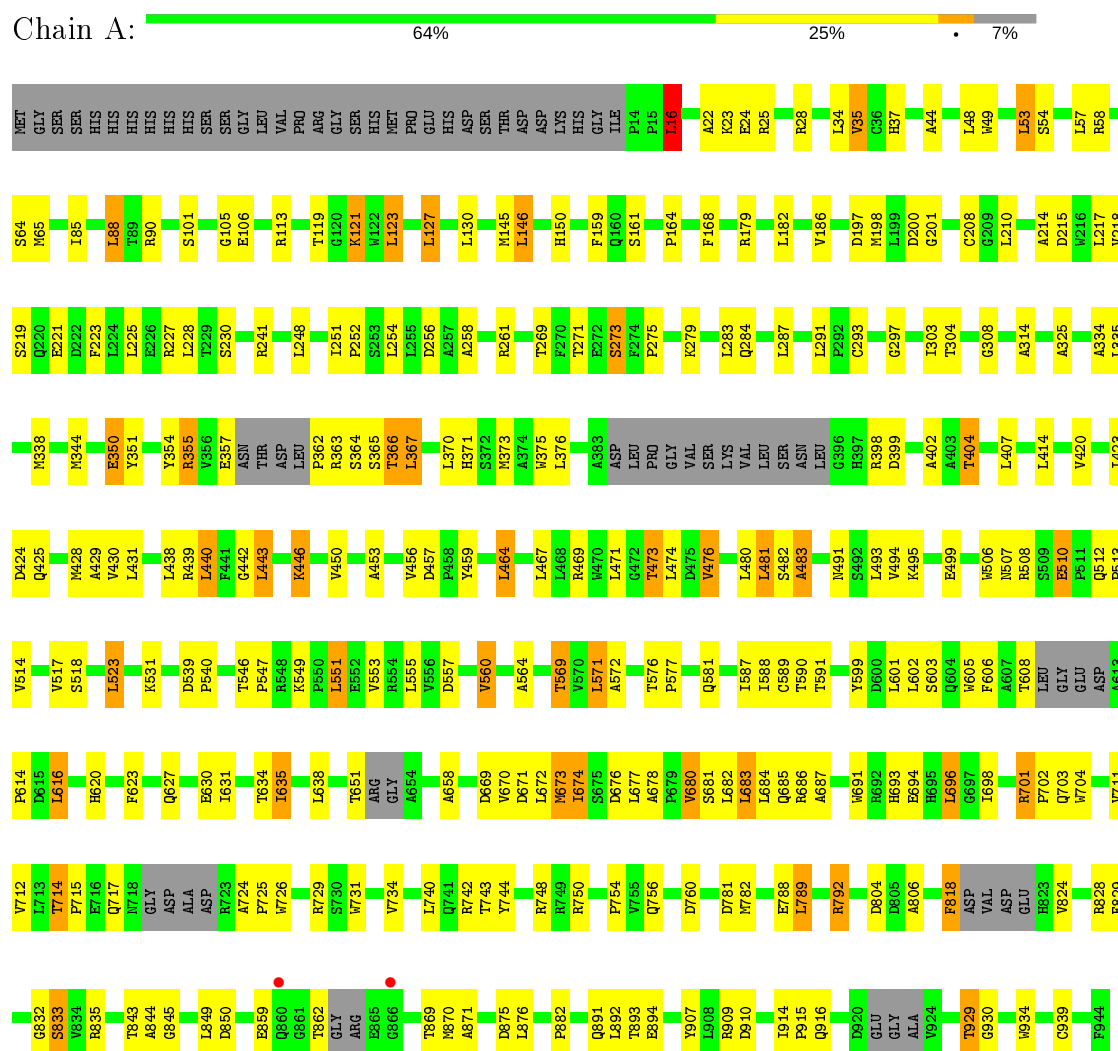


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	E	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	G	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

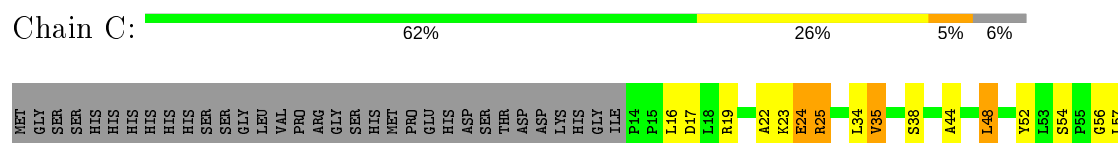
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: CRISPR-associated helicase, Cas3 family



- Molecule 1: CRISPR-associated helicase, Cas3 family









Chain B: 



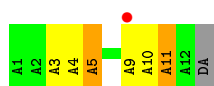
• Molecule 2: HD nuclease

Chain D: 



• Molecule 2: HD nuclease

Chain F: 



• Molecule 2: HD nuclease

Chain H: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	87.21Å 222.61Å 124.85Å 90.00° 104.07° 90.00°	Depositor
Resolution (Å)	47.84 – 3.12 47.84 – 2.91	Depositor EDS
% Data completeness (in resolution range)	98.2 (47.84-3.12) 90.9 (47.84-2.91)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.50 (at 2.91Å)	Xtriage
Refinement program	PHENIX 1.8.2_1309	Depositor
R, $R_{free}$	0.170 , 0.236 0.173 , 0.233	Depositor DCC
$R_{free}$ test set	2000 reflections (2.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	63.3	Xtriage
Anisotropy	0.268	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 58.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	28826	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	76.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.46% 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: FE, 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	0.51	0/7148	0.67	7/9746 (0.1%)
1	C	0.53	1/7176 (0.0%)	0.68	10/9790 (0.1%)
1	E	0.52	0/7181	0.66	3/9796 (0.0%)
1	G	0.47	0/7115	0.65	3/9702 (0.0%)
2	B	1.10	1/222 (0.5%)	2.09	11/339 (3.2%)
2	D	1.65	6/222 (2.7%)	2.56	25/339 (7.4%)
2	F	1.24	0/222	2.62	21/339 (6.2%)
2	H	0.90	0/222	1.90	10/339 (2.9%)
All	All	0.54	8/29508 (0.0%)	0.78	90/40390 (0.2%)

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 outliers	#Planarity outliers
1	A	0	1
1	E	0	1
All	All	0	2

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	10	DA	P-O5'	11.51	1.71	1.59
2	D	10	DA	P-OP1	7.39	1.61	1.49
2	D	9	DA	C3'-C2'	5.56	1.58	1.52
2	D	9	DA	C5'-C4'	-5.31	1.45	1.51
2	D	10	DA	C3'-O3'	5.21	1.50	1.44

The worst 5 of 90 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	10	DA	C1'-O4'-C4'	-13.80	96.30	110.10
2	D	9	DA	O4'-C1'-N9	13.19	117.23	108.00
2	F	11	DA	O4'-C4'-C3'	11.95	113.17	106.00
2	H	11	DA	C1'-O4'-C4'	-11.54	98.56	110.10
1	C	410	ARG	NE-CZ-NH1	-11.34	114.63	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	355	ARG	Sidechain
1	E	355	ARG	Sidechain

## 5.2 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 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	6973	0	6917	156	0
1	C	7001	0	6944	217	0
1	E	7006	0	6952	178	0
1	G	6942	0	6897	228	0
2	B	197	0	99	8	0
2	D	197	0	99	14	0
2	F	197	0	99	4	0
2	H	197	0	99	7	0
3	A	2	0	0	0	0
3	C	2	0	0	0	0
3	E	2	0	0	0	0
3	G	2	0	0	0	0
4	A	27	0	12	3	0
4	C	27	0	12	3	0
4	E	27	0	12	0	0
4	G	27	0	12	6	0
All	All	28826	0	28154	773	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 14.

The worst 5 of 773 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:G:575:LEU:O	1:G:579:VAL:HG13	1.41	1.18
1:G:576:THR:O	1:G:579:VAL:HG22	1.46	1.13
1:C:612:ASP:HA	1:C:613:ALA:HB3	1.25	1.12
1:C:610:GLY:O	1:C:613:ALA:HB2	1.57	1.04
1:G:576:THR:OG1	1:G:577:PRO:HD3	1.64	0.96

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	878/964 (91%)	819 (93%)	58 (7%)	1 (0%)	51	83
1	C	892/964 (92%)	834 (94%)	57 (6%)	1 (0%)	51	83
1	E	892/964 (92%)	831 (93%)	60 (7%)	1 (0%)	51	83
1	G	880/964 (91%)	823 (94%)	51 (6%)	6 (1%)	22	56
All	All	3542/3856 (92%)	3307 (93%)	226 (6%)	9 (0%)	41	73

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	660	GLN
1	A	698	ILE
1	E	752	GLY
1	G	409	GLY
1	G	642	GLU

### 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	740/796 (93%)	646 (87%)	94 (13%)	4	18
1	C	742/796 (93%)	651 (88%)	91 (12%)	4	19
1	E	742/796 (93%)	660 (89%)	82 (11%)	6	24
1	G	735/796 (92%)	635 (86%)	100 (14%)	3	16
All	All	2959/3184 (93%)	2592 (88%)	367 (12%)	4	19

5 of 367 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	692	ARG
1	E	250	ARG
1	G	716	GLU
1	C	734	VAL
1	E	23	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	220	GLN
1	C	345	HIS
1	G	160	GLN
1	G	290	HIS
1	G	693	HIS

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 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
4	ADP	C	1003	-	24,29,29	1.07	1 (4%)	29,45,45	1.54	5 (17%)
4	ADP	E	1003	-	24,29,29	1.08	1 (4%)	29,45,45	1.79	8 (27%)
4	ADP	G	1003	-	24,29,29	1.04	2 (8%)	29,45,45	1.49	6 (20%)
4	ADP	A	1003	-	24,29,29	1.21	1 (4%)	29,45,45	1.62	6 (20%)

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
4	ADP	C	1003	-	-	2/12/32/32	0/3/3/3
4	ADP	E	1003	-	-	6/12/32/32	0/3/3/3
4	ADP	G	1003	-	-	4/12/32/32	0/3/3/3
4	ADP	A	1003	-	-	4/12/32/32	0/3/3/3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	1003	ADP	C2'-C1'	-2.75	1.49	1.53
4	C	1003	ADP	C2'-C1'	-2.53	1.49	1.53
4	A	1003	ADP	C2'-C1'	-2.51	1.49	1.53
4	G	1003	ADP	C2'-C1'	-2.01	1.50	1.53
4	G	1003	ADP	C5-N7	-2.00	1.32	1.39

The worst 5 of 25 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	1003	ADP	PA-O3A-PB	-4.45	117.56	132.83
4	E	1003	ADP	N3-C2-N1	-3.61	123.04	128.68
4	A	1003	ADP	O3'-C3'-C2'	-3.56	100.31	111.82
4	G	1003	ADP	PA-O3A-PB	-3.49	120.86	132.83
4	C	1003	ADP	N3-C2-N1	-3.42	123.33	128.68

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1003	ADP	C5'-O5'-PA-O3A
4	G	1003	ADP	PA-O3A-PB-O2B
4	G	1003	ADP	O4'-C4'-C5'-O5'
4	G	1003	ADP	C3'-C4'-C5'-O5'
4	E	1003	ADP	C5'-O5'-PA-O1A

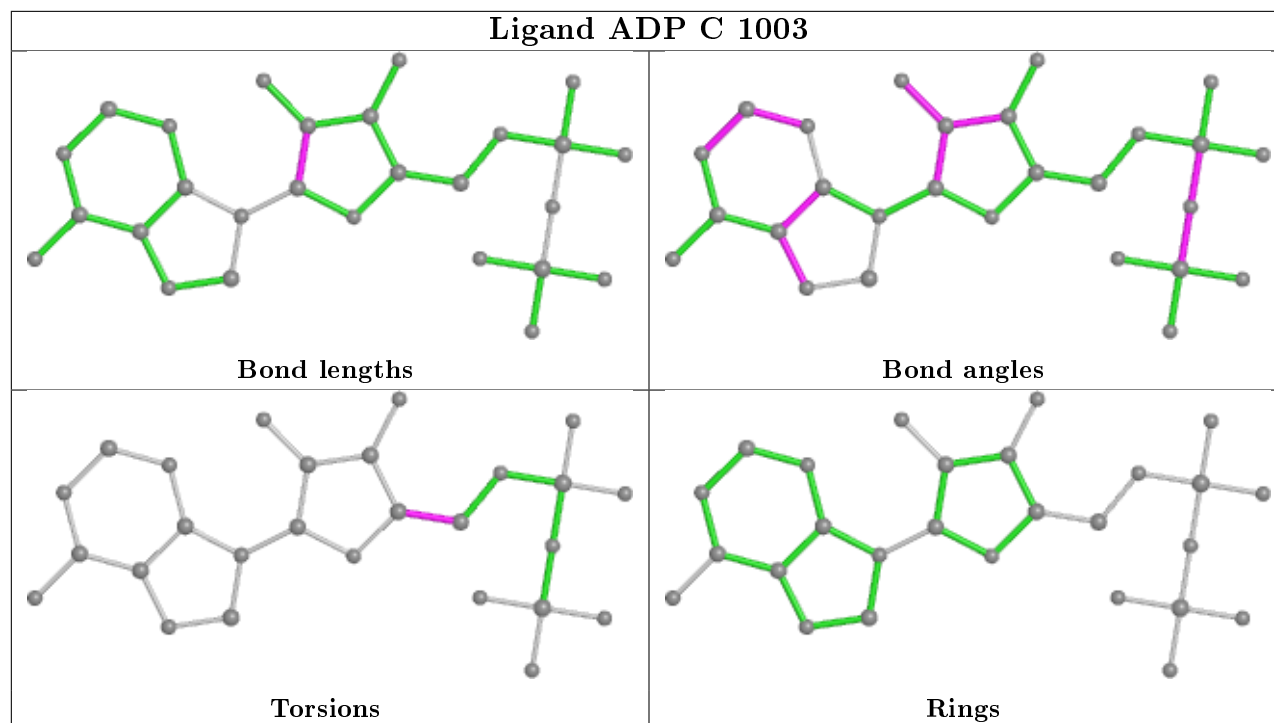
There are no ring outliers.

3 monomers are involved in 12 short contacts:

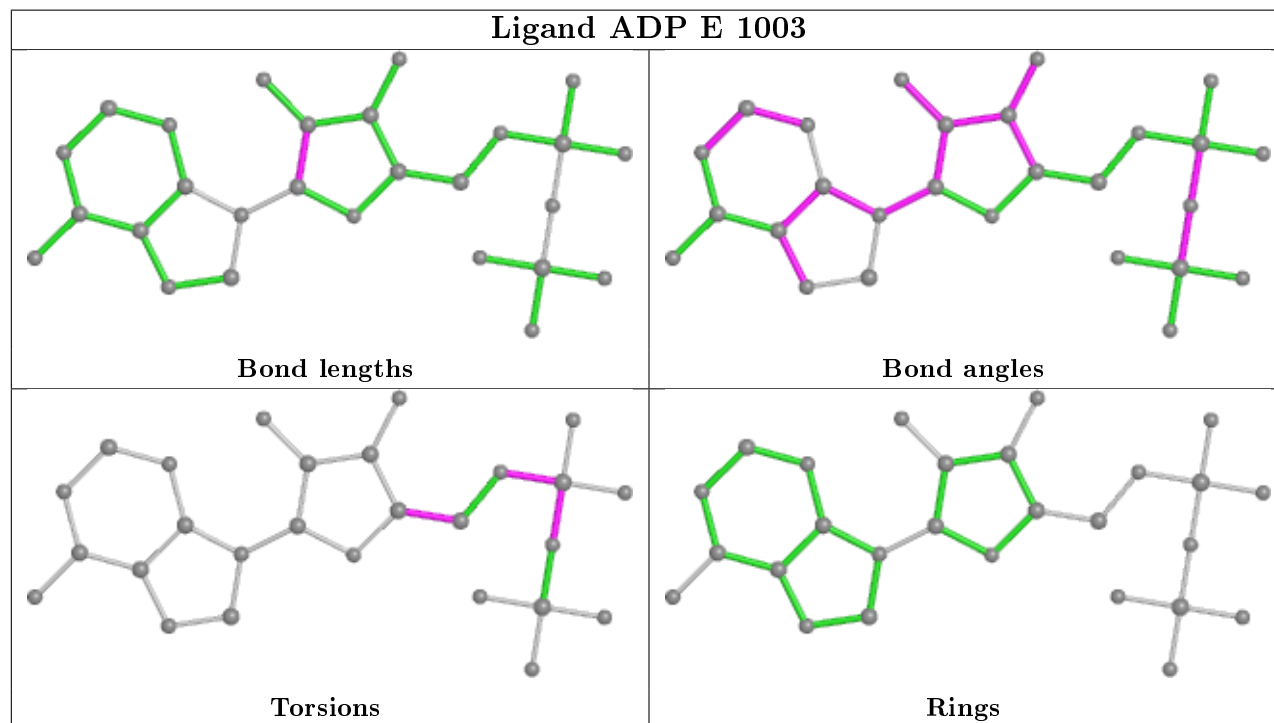
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	1003	ADP	3	0
4	G	1003	ADP	6	0
4	A	1003	ADP	3	0

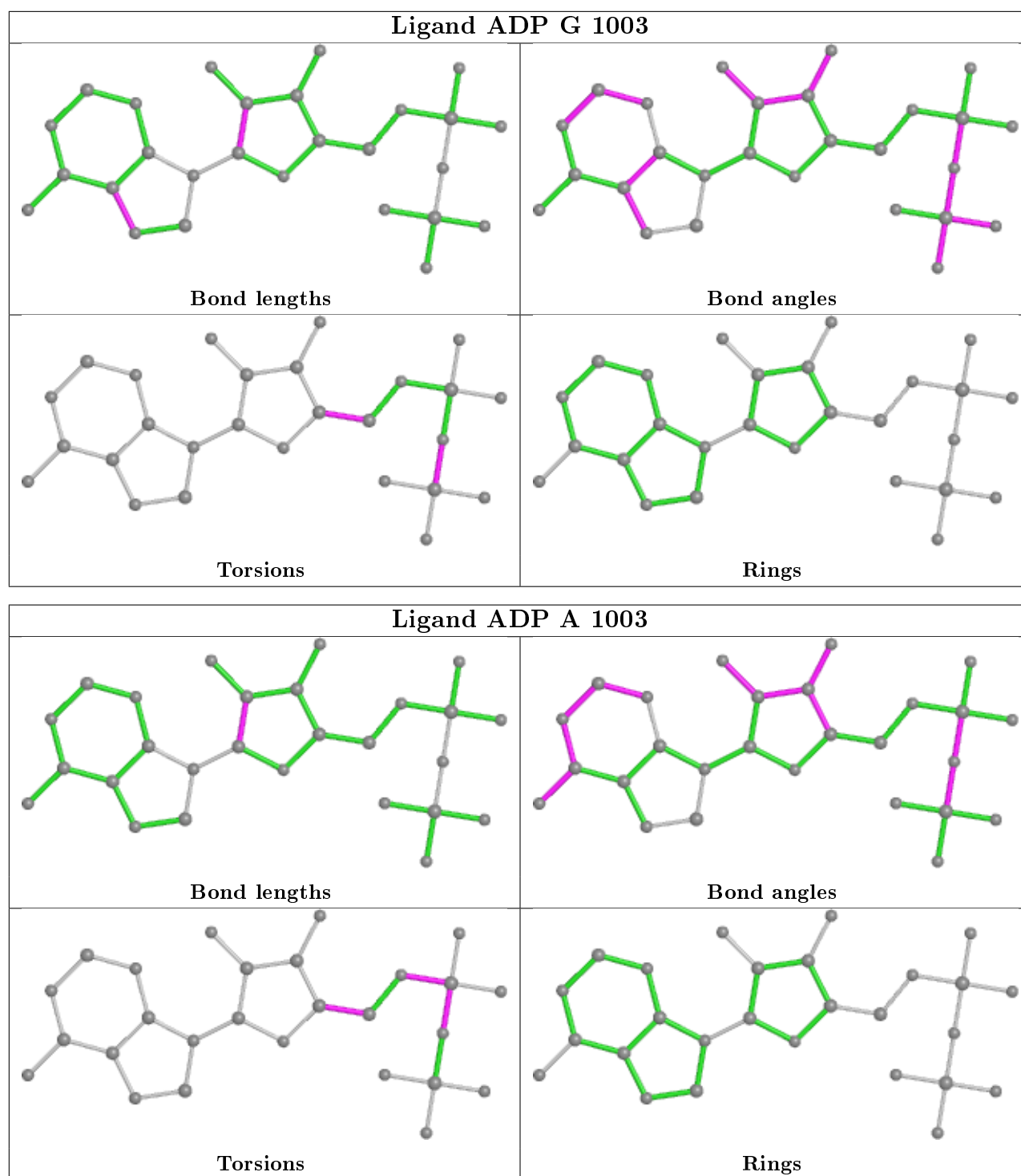
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

## Ligand ADP C 1003



## Ligand ADP E 1003





## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

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	896/964 (92%)	-0.49	2 (0%) 95 91	42, 69, 111, 131	0
1	C	902/964 (93%)	-0.52	0 100 100	47, 73, 103, 126	0
1	E	902/964 (93%)	-0.48	1 (0%) 95 92	40, 65, 102, 128	0
1	G	894/964 (92%)	-0.42	1 (0%) 95 92	46, 82, 122, 137	0
2	B	11/12 (91%)	0.11	0 100 100	64, 69, 115, 132	0
2	D	11/12 (91%)	0.08	0 100 100	63, 75, 121, 126	0
2	F	11/12 (91%)	0.41	1 (9%) 9 3	56, 66, 128, 128	0
2	H	11/12 (91%)	0.21	0 100 100	64, 89, 132, 149	0
All	All	3638/3904 (93%)	-0.47	5 (0%) 95 92	40, 72, 113, 149	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	860	GLN	3.0
2	F	9	DA	2.5
1	E	847	ARG	2.3
1	G	565	LEU	2.1
1	A	866	GLY	2.0

### 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 carbohydrates in this entry.

## 6.4 Ligands

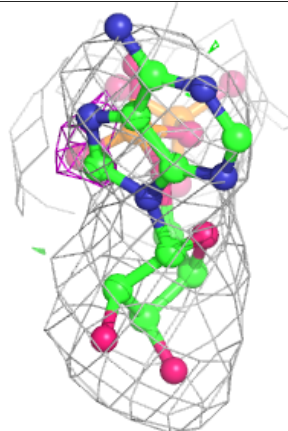
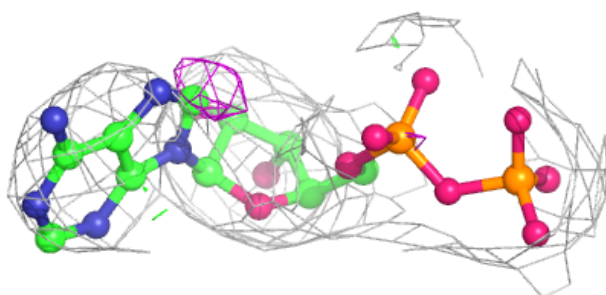
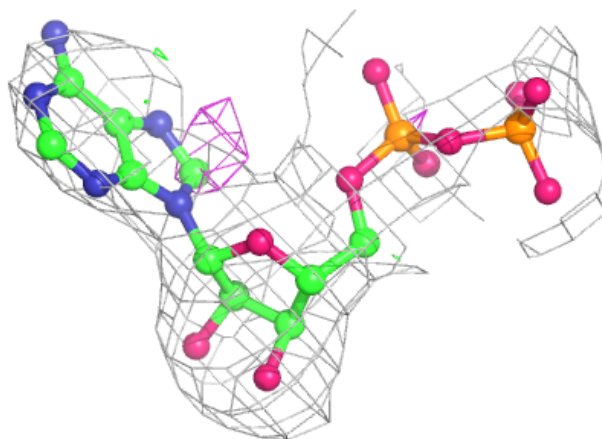
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	ADP	G	1003	27/27	0.81	0.20	95,108,134,138	0
4	ADP	E	1003	27/27	0.90	0.19	67,84,102,120	0
4	ADP	C	1003	27/27	0.92	0.12	87,98,115,123	0
4	ADP	A	1003	27/27	0.92	0.12	74,84,99,105	0
3	FE	A	1001	1/1	0.98	0.20	55,55,55,55	0
3	FE	E	1001	1/1	0.99	0.16	54,54,54,54	0
3	FE	A	1002	1/1	0.99	0.18	50,50,50,50	0
3	FE	C	1002	1/1	0.99	0.16	60,60,60,60	0
3	FE	G	1001	1/1	0.99	0.17	55,55,55,55	0
3	FE	G	1002	1/1	0.99	0.15	57,57,57,57	0
3	FE	C	1001	1/1	0.99	0.17	52,52,52,52	0
3	FE	E	1002	1/1	1.00	0.16	49,49,49,49	0

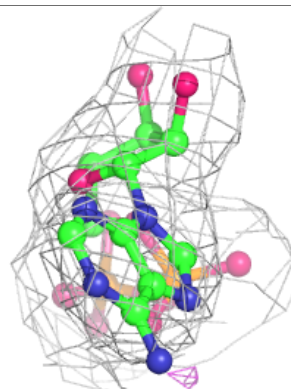
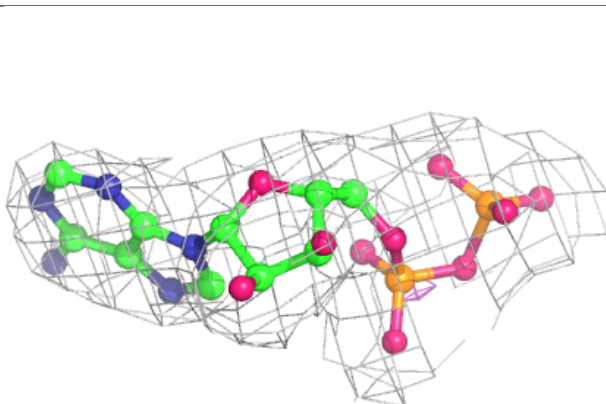
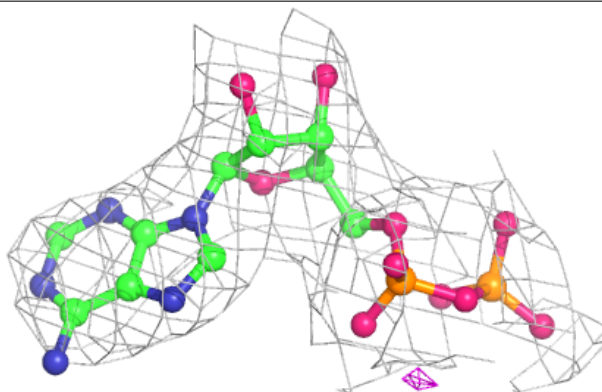
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around ADP G 1003:**

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

**Electron density around ADP E 1003:**

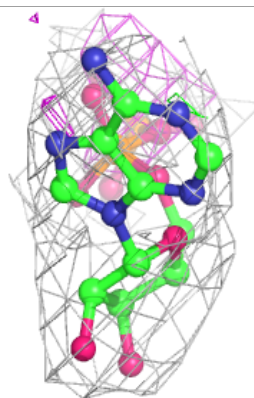
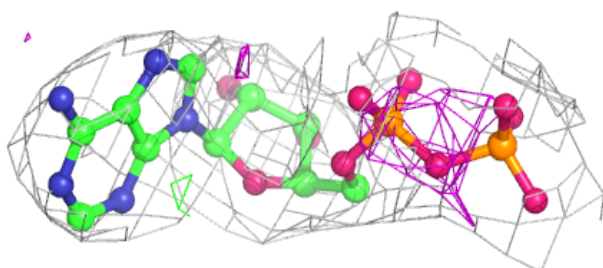
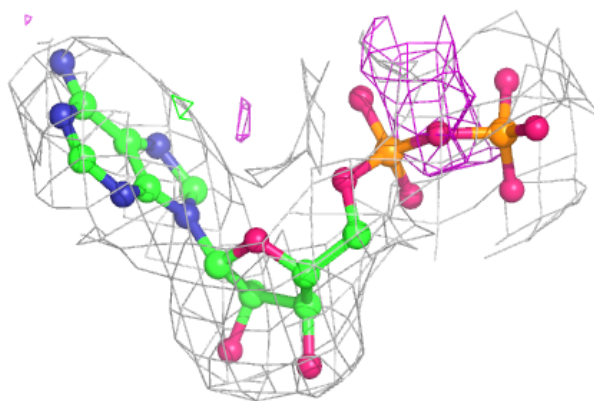
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



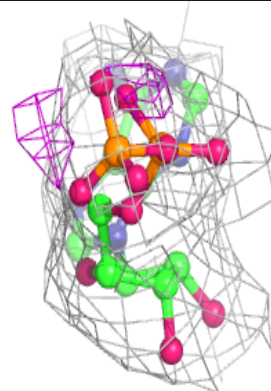
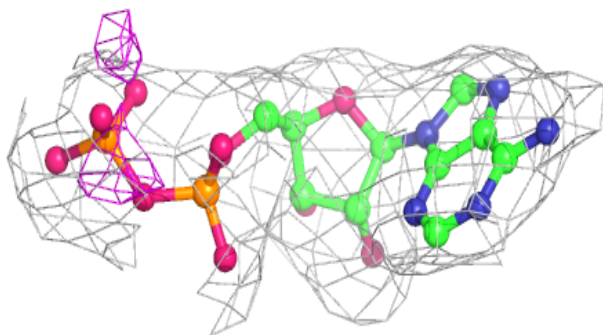
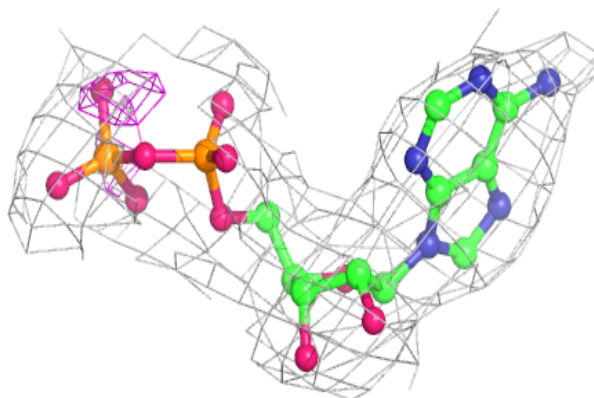


**Electron density around ADP C 1003:**

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

**Electron density around ADP A 1003:**

$2mF_o-DF_c$  (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.