



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 20, 2026 – 04:20 pm BST

PDB ID : 29RX / pdb_000029rx
Title : Crystal structure of JAK2 JH1 in complex with ADP
Authors : Miao, Y.; Haikarainen, T.
Deposited on : 2026-04-02
Resolution : 1.80 Å(reported)

This is a Full wwPDB X-ray 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/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>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.015 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

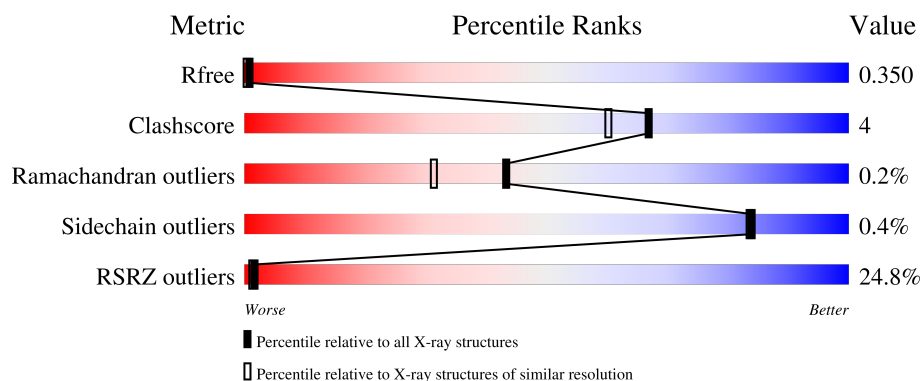
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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}	180053	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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 ≥ 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	316	28% 84%11%5%
1	B	316	21% 88%7%5%
1	C	316	22% 84%11%5%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 15318 atoms, of which 7294 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 Tyrosine-protein kinase JAK2.

Mol	Chain	Residues	Atoms								ZeroOcc	AltConf	Trace
1	A	300	Total	C	H	N	O	P	S		0	1	0
			4888	1568	2418	424	461	2	15				
1	B	300	Total	C	H	N	O	P	S		0	2	0
			4892	1571	2419	424	461	2	15				
1	C	300	Total	C	H	N	O	P	S		0	1	0
			4895	1570	2421	425	462	2	15				

There are 69 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	817	MET	-	initiating methionine	UNP O60674
A	818	HIS	-	expression tag	UNP O60674
A	819	HIS	-	expression tag	UNP O60674
A	820	HIS	-	expression tag	UNP O60674
A	821	HIS	-	expression tag	UNP O60674
A	822	HIS	-	expression tag	UNP O60674
A	823	HIS	-	expression tag	UNP O60674
A	824	SER	-	expression tag	UNP O60674
A	825	SER	-	expression tag	UNP O60674
A	826	GLY	-	expression tag	UNP O60674
A	827	VAL	-	expression tag	UNP O60674
A	828	ASP	-	expression tag	UNP O60674
A	829	LEU	-	expression tag	UNP O60674
A	830	GLY	-	expression tag	UNP O60674
A	831	THR	-	expression tag	UNP O60674
A	832	GLU	-	expression tag	UNP O60674
A	833	ASN	-	expression tag	UNP O60674
A	834	LEU	-	expression tag	UNP O60674
A	835	TYR	-	expression tag	UNP O60674
A	836	PHE	-	expression tag	UNP O60674
A	837	GLN	-	expression tag	UNP O60674
A	838	SER	-	expression tag	UNP O60674
A	839	MET	-	expression tag	UNP O60674

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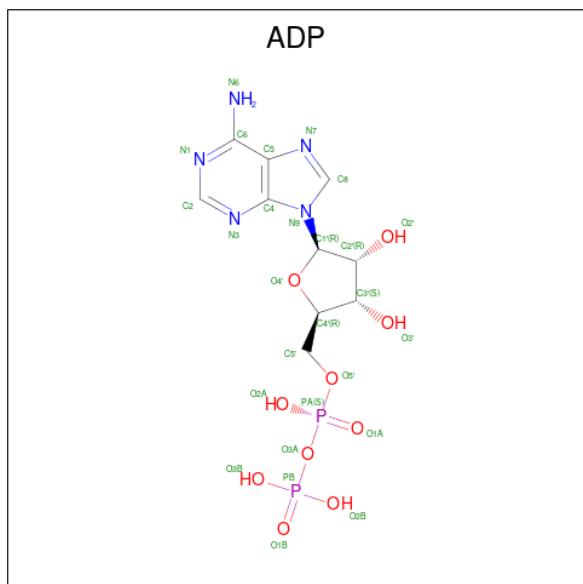
Chain	Residue	Modelled	Actual	Comment	Reference
B	817	MET	-	initiating methionine	UNP O60674
B	818	HIS	-	expression tag	UNP O60674
B	819	HIS	-	expression tag	UNP O60674
B	820	HIS	-	expression tag	UNP O60674
B	821	HIS	-	expression tag	UNP O60674
B	822	HIS	-	expression tag	UNP O60674
B	823	HIS	-	expression tag	UNP O60674
B	824	SER	-	expression tag	UNP O60674
B	825	SER	-	expression tag	UNP O60674
B	826	GLY	-	expression tag	UNP O60674
B	827	VAL	-	expression tag	UNP O60674
B	828	ASP	-	expression tag	UNP O60674
B	829	LEU	-	expression tag	UNP O60674
B	830	GLY	-	expression tag	UNP O60674
B	831	THR	-	expression tag	UNP O60674
B	832	GLU	-	expression tag	UNP O60674
B	833	ASN	-	expression tag	UNP O60674
B	834	LEU	-	expression tag	UNP O60674
B	835	TYR	-	expression tag	UNP O60674
B	836	PHE	-	expression tag	UNP O60674
B	837	GLN	-	expression tag	UNP O60674
B	838	SER	-	expression tag	UNP O60674
B	839	MET	-	expression tag	UNP O60674
C	817	MET	-	initiating methionine	UNP O60674
C	818	HIS	-	expression tag	UNP O60674
C	819	HIS	-	expression tag	UNP O60674
C	820	HIS	-	expression tag	UNP O60674
C	821	HIS	-	expression tag	UNP O60674
C	822	HIS	-	expression tag	UNP O60674
C	823	HIS	-	expression tag	UNP O60674
C	824	SER	-	expression tag	UNP O60674
C	825	SER	-	expression tag	UNP O60674
C	826	GLY	-	expression tag	UNP O60674
C	827	VAL	-	expression tag	UNP O60674
C	828	ASP	-	expression tag	UNP O60674
C	829	LEU	-	expression tag	UNP O60674
C	830	GLY	-	expression tag	UNP O60674
C	831	THR	-	expression tag	UNP O60674
C	832	GLU	-	expression tag	UNP O60674
C	833	ASN	-	expression tag	UNP O60674
C	834	LEU	-	expression tag	UNP O60674
C	835	TYR	-	expression tag	UNP O60674

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Chain	Residue	Modelled	Actual	Comment	Reference
C	836	PHE	-	expression tag	UNP O60674
C	837	GLN	-	expression tag	UNP O60674
C	838	SER	-	expression tag	UNP O60674
C	839	MET	-	expression tag	UNP O60674

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total 39	C 10	H 12	N 5	O 10	P 2	0	0
2	B	1	Total 39	C 10	H 12	N 5	O 10	P 2	0	0
2	C	1	Total 39	C 10	H 12	N 5	O 10	P 2	0	0

- Molecule 3 is MAGNESIUM ION (CCD ID: 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		
3	C	1	Total	Mg	0	0
			1	1		

- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	1	Total 1	Na 1	0	0

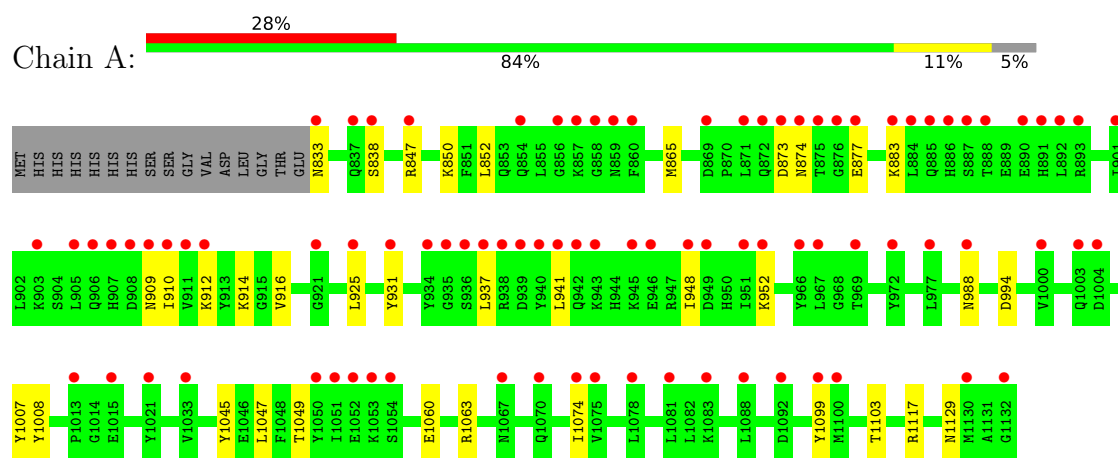
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	181	Total 181	O 181	0	0
5	B	173	Total 177	O 177	0	4
5	C	163	Total 164	O 164	0	1

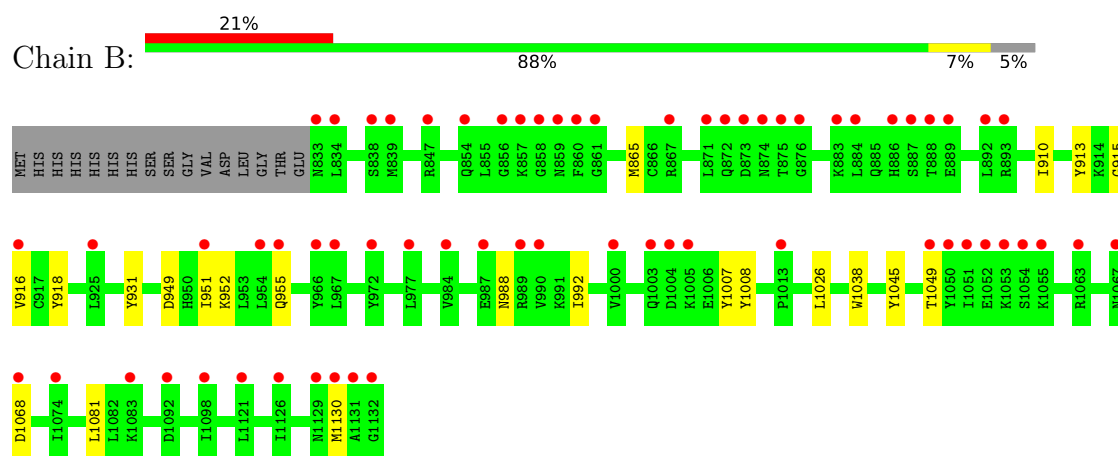
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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.

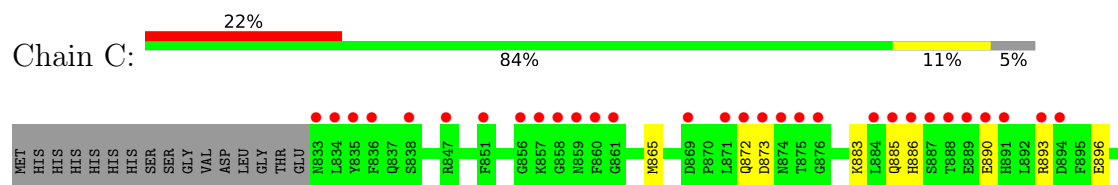
• Molecule 1: Tyrosine-protein kinase JAK2

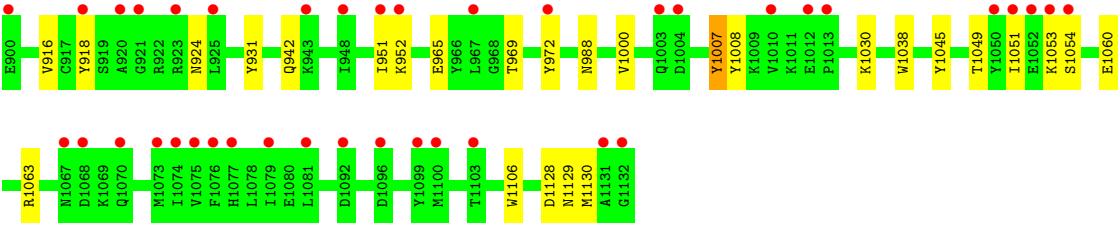


• Molecule 1: Tyrosine-protein kinase JAK2



• Molecule 1: Tyrosine-protein kinase JAK2





4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	50.26Å 69.19Å 320.49Å 90.00° 90.21° 90.00°	Depositor
Resolution (Å)	80.12 – 1.80 80.12 – 1.80	Depositor EDS
% Data completeness (in resolution range)	99.2 (80.12-1.80) 99.8 (80.12-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.44 (at 1.80Å)	Xtriage
Refinement program	PHENIX 1.21.1_5286	Depositor
R, R_{free}	0.307 , 0.350 0.310 , 0.350	Depositor DCC
R_{free} test set	4936 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	17.3	Xtriage
Anisotropy	0.093	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.45 , 51.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.41$, $\langle L^2 \rangle = 0.25$	Xtriage
Estimated twinning fraction	0.000 for h,-k,-l	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	15318	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 75.41 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.2699e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.78	0/2493	0.71	0/3358
1	B	0.75	1/2499 (0.0%)	0.70	0/3366
1	C	0.73	0/2494	0.68	0/3359
All	All	0.75	1/7486 (0.0%)	0.70	0/10083

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1026	LEU	CG-CD2	-5.78	1.33	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	2470	2418	2420	20	1
1	B	2473	2419	2424	14	0
1	C	2474	2421	2421	20	2
2	A	27	12	12	0	0
2	B	27	12	12	0	0
2	C	27	12	12	0	0
3	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
4	C	1	0	0	0	0
5	A	181	0	0	6	0
5	B	177	0	0	2	0
5	C	164	0	0	0	0
All	All	8024	7294	7301	54	3

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 4.

All (54) 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:1074:ILE:HG22	5:A:1402:HOH:O	1.75	0.86
1:A:952:LYS:NZ	1:A:988:ASN:OD1	2.13	0.80
1:B:952:LYS:NZ	1:B:988:ASN:OD1	2.15	0.80
1:C:952:LYS:NZ	1:C:988:ASN:OD1	2.19	0.75
1:A:847:ARG:O	1:A:850:LYS:NZ	2.23	0.65
1:A:1045:TYR:O	1:A:1049:THR:HG23	1.98	0.64
1:C:1045:TYR:O	1:C:1049:THR:HG23	1.99	0.62
1:C:893:ARG:NH1	1:C:896:GLU:OE1	2.33	0.61
1:A:852:LEU:HD13	5:A:1481:HOH:O	2.02	0.60
1:A:1099:TYR:O	1:A:1103:THR:HG23	2.02	0.59
1:B:951:ILE:HD12	5:B:1453:HOH:O	2.02	0.58
1:B:952:LYS:NZ	1:B:955:GLN:OE1	2.32	0.58
1:C:1053:LYS:O	1:C:1054:SER:OG	2.15	0.57
1:A:865:MET:HE2	1:A:931:TYR:CZ	2.41	0.55
1:C:972:TYR:CD1	1:C:1000:VAL:HG22	2.42	0.54
1:A:865:MET:SD	5:A:1481:HOH:O	2.59	0.53
1:C:1060:GLU:OE2	1:C:1063:ARG:NH2	2.25	0.52
1:B:951:ILE:HD11	1:B:1130:MET:SD	2.50	0.51
1:C:972:TYR:CE1	1:C:1000:VAL:HG22	2.45	0.51
1:C:942:GLN:OE1	1:C:1051:ILE:HG21	2.11	0.51
1:C:1045:TYR:CE1	1:C:1049:THR:HG21	2.47	0.50
1:A:877:GLU:OE1	1:A:914:LYS:NZ	2.38	0.50
1:A:916[B]:VAL:HG11	1:A:925:LEU:CD1	2.42	0.49
1:C:885:GLN:O	1:C:886:HIS:HB2	2.13	0.49
1:B:1045:TYR:CE2	1:B:1049:THR:HG21	2.47	0.49
1:C:865:MET:HE2	1:C:931:TYR:CZ	2.48	0.49
1:A:833:ASN:N	5:A:1311:HOH:O	2.47	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1060:GLU:OE2	1:A:1063:ARG:NH2	2.27	0.47
1:C:942:GLN:HG3	1:C:1051:ILE:HB	1.96	0.47
1:B:865:MET:HE2	1:B:931:TYR:CZ	2.51	0.46
1:A:873:ASP:O	1:A:874:ASN:CB	2.64	0.45
1:B:951:ILE:HG23	5:B:1311:HOH:O	2.17	0.45
1:A:941:LEU:HD23	1:A:948:ILE:HD13	1.98	0.44
1:C:1045:TYR:CZ	1:C:1049:THR:HG21	2.52	0.44
1:B:1081:LEU:C	1:B:1081:LEU:HD23	2.42	0.44
1:C:885:GLN:O	1:C:886:HIS:CB	2.66	0.43
1:C:951:ILE:CD1	1:C:1130:MET:SD	3.07	0.43
1:C:1007:PTR:O2P	1:C:1030:LYS:NZ	2.49	0.43
1:B:916:VAL:HG23	1:B:918:TYR:CE1	2.53	0.43
1:A:937:LEU:HD21	1:A:1047:LEU:HD21	2.00	0.43
1:C:916:VAL:HG21	1:C:918:TYR:OH	2.19	0.43
1:B:913:TYR:CZ	1:B:915:GLY:HA2	2.55	0.42
1:C:965:GLU:O	1:C:969:THR:HG23	2.19	0.42
1:A:909:ASN:O	1:A:910:ILE:HD13	2.19	0.42
1:A:916[B]:VAL:HG11	1:A:925:LEU:HD11	2.02	0.42
1:A:873:ASP:O	1:A:874:ASN:HB3	2.20	0.41
1:B:949:ASP:OD1	1:B:952:LYS:HG2	2.20	0.41
1:A:1117:ARG:NE	5:A:1315:HOH:O	2.51	0.41
1:A:912:LYS:NZ	5:A:1312:HOH:O	2.48	0.41
1:B:1045:TYR:O	1:B:1049:THR:HG23	2.21	0.41
1:C:1038:TRP:CE3	1:C:1106:TRP:HA	2.55	0.41
1:B:1038:TRP:CD1	1:B:1038:TRP:C	2.99	0.40
1:B:910[A]:ILE:HD13	1:B:992:ILE:HB	2.03	0.40
1:C:873:ASP:N	1:C:873:ASP:OD1	2.55	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:883:LYS:HZ1	1:C:1129:ASN:O[1_655]	1.57	0.03
1:C:924:ASN:HD22	1:C:1128:ASP:OD2[1_655]	1.58	0.02
1:A:883:LYS:HZ2	1:A:1129:ASN:O[1_455]	1.59	0.01

5.3 Torsion angles

5.3.1 Protein backbone

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	297/316 (94%)	285 (96%)	11 (4%)	1 (0%)	36	25
1	B	298/316 (94%)	286 (96%)	12 (4%)	0	100	100
1	C	297/316 (94%)	285 (96%)	11 (4%)	1 (0%)	36	25
All	All	892/948 (94%)	856 (96%)	34 (4%)	2 (0%)	43	31

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	872	GLN
1	A	994	ASP

5.3.2 Protein sidechains

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	268/286 (94%)	267 (100%)	1 (0%)	84	83
1	B	268/286 (94%)	267 (100%)	1 (0%)	84	83
1	C	268/286 (94%)	267 (100%)	1 (0%)	84	83
All	All	804/858 (94%)	801 (100%)	3 (0%)	84	83

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	838	SER

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Mol	Chain	Res	Type
1	B	1068	ASP
1	C	890	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	886	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

6 non-standard protein/DNA/RNA residues are modelled in this entry.

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
1	PTR	A	1007	1	15,16,17	3.16	2 (13%)	19,22,24	1.09	1 (5%)
1	PTR	A	1008	1	15,16,17	2.41	1 (6%)	19,22,24	1.32	2 (10%)
1	PTR	B	1007	1	15,16,17	3.06	2 (13%)	19,22,24	1.15	1 (5%)
1	PTR	B	1008	1	15,16,17	2.93	1 (6%)	19,22,24	1.29	1 (5%)
1	PTR	C	1007	1	15,16,17	3.05	2 (13%)	19,22,24	1.23	2 (10%)
1	PTR	C	1008	1	15,16,17	2.86	2 (13%)	19,22,24	1.41	3 (15%)

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
1	PTR	A	1007	1	-	0/10/11/13	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	PTR	A	1008	1	-	0/10/11/13	0/1/1/1
1	PTR	B	1007	1	-	0/10/11/13	0/1/1/1
1	PTR	B	1008	1	-	0/10/11/13	0/1/1/1
1	PTR	C	1007	1	-	0/10/11/13	0/1/1/1
1	PTR	C	1008	1	-	0/10/11/13	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1007	PTR	P-OH	11.80	1.77	1.59
1	B	1007	PTR	P-OH	11.39	1.77	1.59
1	C	1007	PTR	P-OH	11.32	1.77	1.59
1	B	1008	PTR	P-OH	10.78	1.76	1.59
1	C	1008	PTR	P-OH	10.38	1.75	1.59
1	A	1008	PTR	P-OH	8.83	1.73	1.59
1	C	1008	PTR	OH-CZ	-2.52	1.34	1.40
1	C	1007	PTR	OH-CZ	-2.30	1.35	1.40
1	B	1007	PTR	OH-CZ	-2.16	1.35	1.40
1	A	1007	PTR	OH-CZ	-2.04	1.36	1.40

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1008	PTR	O3P-P-O2P	2.48	117.11	107.64
1	C	1008	PTR	O3P-P-O2P	2.39	116.78	107.64
1	B	1008	PTR	O3P-P-O2P	2.37	116.69	107.64
1	C	1008	PTR	CE2-CZ-CE1	-2.31	116.61	120.18
1	B	1007	PTR	O3P-P-O2P	2.30	116.42	107.64
1	C	1007	PTR	O2P-P-OH	-2.29	98.08	105.24
1	A	1007	PTR	O3P-P-O2P	2.21	116.07	107.64
1	C	1008	PTR	O2P-P-OH	-2.20	98.38	105.24
1	A	1008	PTR	O2P-P-OH	-2.15	98.53	105.24
1	C	1007	PTR	O3P-P-O2P	2.07	115.56	107.64

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	1007	PTR	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 7 ligands modelled in this entry, 4 are monoatomic - leaving 3 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	A	1201	3	27,29,29	1.30	2 (7%)	42,45,45	2.00	10 (23%)
2	ADP	B	1201	3	27,29,29	1.48	4 (14%)	42,45,45	2.05	11 (26%)
2	ADP	C	1201	3	27,29,29	1.69	6 (22%)	42,45,45	1.95	12 (28%)

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	A	1201	3	-	3/16/32/32	0/3/3/3
2	ADP	B	1201	3	-	3/16/32/32	0/3/3/3
2	ADP	C	1201	3	-	3/16/32/32	0/3/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1201	ADP	C5-C4	5.34	1.49	1.39
2	A	1201	ADP	C5-C4	4.15	1.46	1.39
2	B	1201	ADP	C5-C4	4.07	1.46	1.39
2	B	1201	ADP	C8-N9	-3.38	1.31	1.37
2	A	1201	ADP	C4-N9	-2.96	1.31	1.37
2	C	1201	ADP	C4-N3	2.69	1.39	1.34
2	C	1201	ADP	PA-O1A	2.68	1.60	1.50
2	C	1201	ADP	C5-N7	-2.61	1.34	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1201	ADP	C6-N6	2.43	1.40	1.34
2	C	1201	ADP	C4-N9	-2.37	1.32	1.37
2	B	1201	ADP	C4-N9	-2.32	1.32	1.37
2	B	1201	ADP	C4-N3	2.24	1.38	1.34

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1201	ADP	C5-C4-N3	-5.79	119.19	126.75
2	B	1201	ADP	N3-C4-N9	5.49	136.13	127.08
2	B	1201	ADP	C5-C4-N3	-5.39	119.72	126.75
2	B	1201	ADP	C4-N9-C8	5.34	111.51	105.73
2	A	1201	ADP	N3-C4-N9	5.03	135.38	127.08
2	C	1201	ADP	N3-C4-N9	4.97	135.27	127.08
2	A	1201	ADP	C4-N9-C8	4.73	110.85	105.73
2	C	1201	ADP	C2-N1-C6	4.40	126.31	118.77
2	C	1201	ADP	C4-N9-C8	4.31	110.40	105.73
2	C	1201	ADP	C5-C4-N3	-4.19	121.28	126.75
2	C	1201	ADP	N6-C6-N1	3.98	127.08	118.35
2	A	1201	ADP	C2-N3-C4	3.64	120.34	111.75
2	A	1201	ADP	N3-C2-N1	-3.31	123.42	128.60
2	B	1201	ADP	C2-N3-C4	3.19	119.29	111.75
2	B	1201	ADP	PA-O3A-PB	-3.18	121.90	132.83
2	A	1201	ADP	C4-C5-N7	-2.96	107.01	110.62
2	A	1201	ADP	PA-O3A-PB	-2.86	123.00	132.83
2	B	1201	ADP	C4-C5-N7	-2.84	107.16	110.62
2	B	1201	ADP	C5-C6-N6	-2.68	117.60	123.43
2	C	1201	ADP	C5-N7-C8	2.52	107.08	103.51
2	C	1201	ADP	N3-C2-N1	-2.48	124.73	128.60
2	C	1201	ADP	O4'-C4'-C5'	2.46	117.46	109.37
2	C	1201	ADP	C5-C6-N6	-2.38	118.25	123.43
2	B	1201	ADP	N3-C2-N1	-2.32	124.97	128.60
2	C	1201	ADP	N9-C8-N7	-2.28	110.79	113.91
2	A	1201	ADP	O3'-C3'-C4'	-2.25	104.53	111.05
2	B	1201	ADP	N6-C6-N1	2.12	122.99	118.35
2	B	1201	ADP	C2'-C3'-C4'	2.09	106.71	102.64
2	A	1201	ADP	C6-C5-N7	2.04	135.83	132.02
2	A	1201	ADP	C2'-C3'-C4'	2.04	106.60	102.64
2	C	1201	ADP	C5-C4-N9	-2.02	103.43	105.78
2	C	1201	ADP	C4-C5-N7	-2.01	108.17	110.62
2	B	1201	ADP	N9-C8-N7	-2.00	111.17	113.91

There are no chirality outliers.

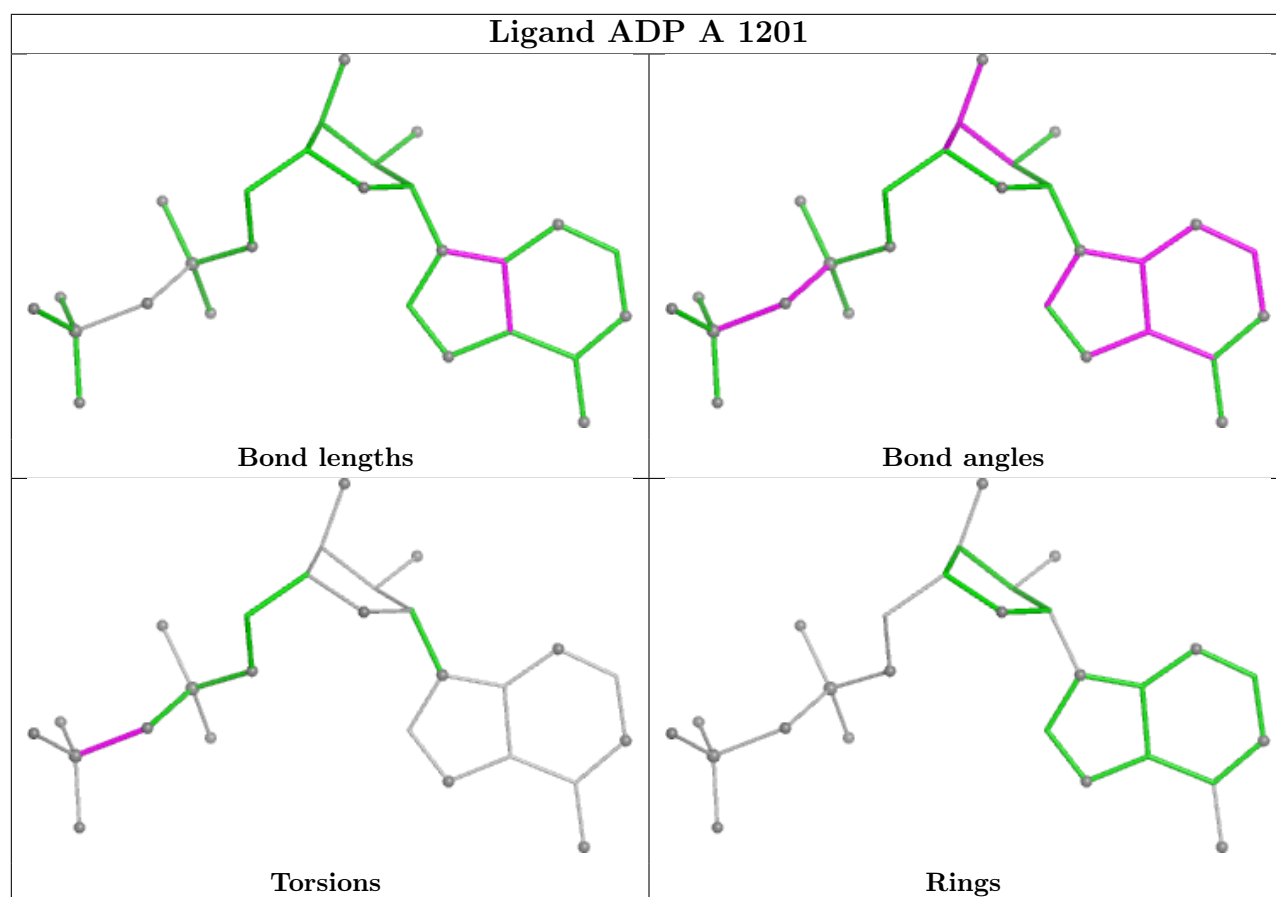
All (9) torsion outliers are listed below:

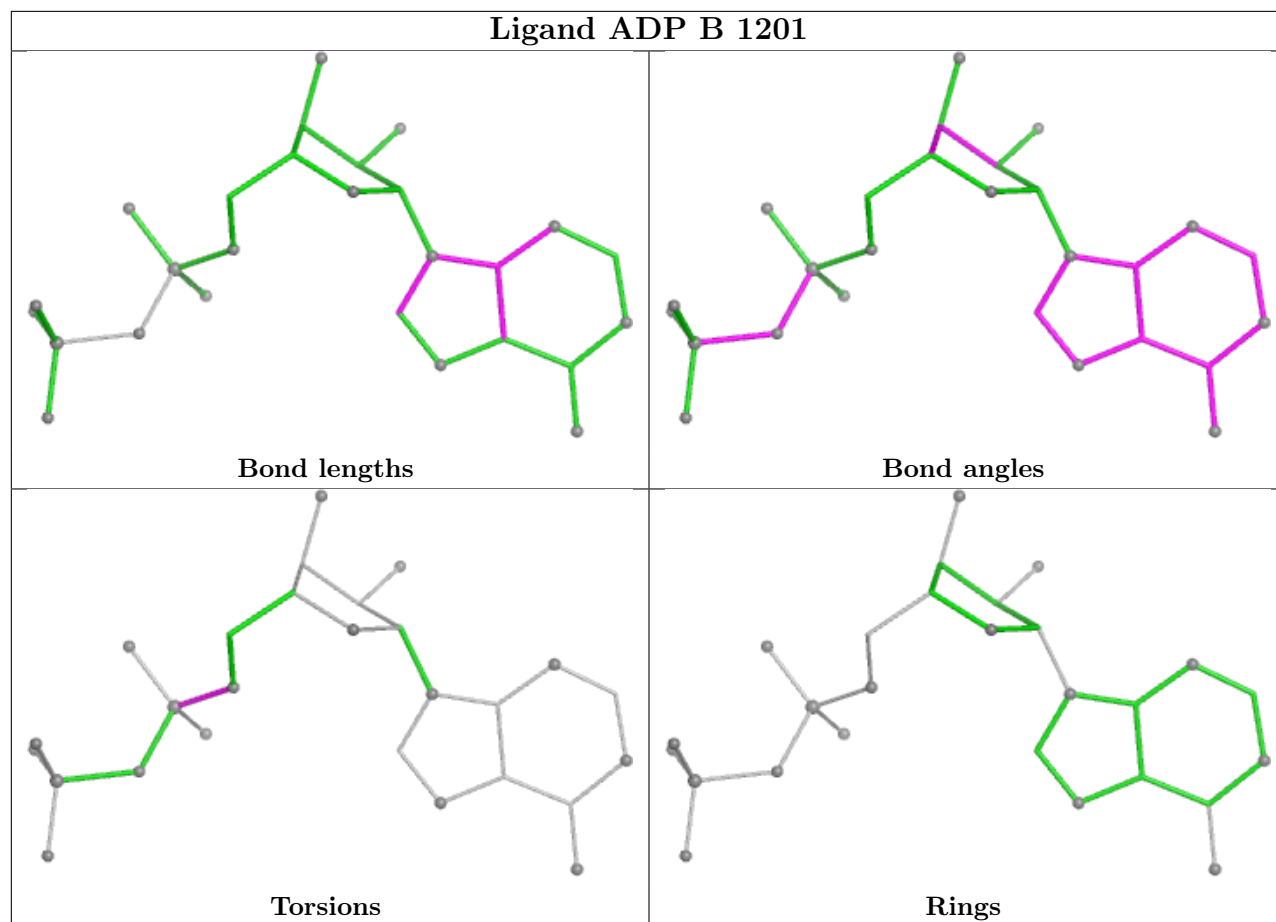
Mol	Chain	Res	Type	Atoms
2	A	1201	ADP	PA-O3A-PB-O2B
2	A	1201	ADP	PA-O3A-PB-O3B
2	B	1201	ADP	C5'-O5'-PA-O2A
2	C	1201	ADP	O4'-C4'-C5'-O5'
2	C	1201	ADP	C3'-C4'-C5'-O5'
2	B	1201	ADP	C5'-O5'-PA-O3A
2	A	1201	ADP	PA-O3A-PB-O1B
2	C	1201	ADP	PB-O3A-PA-O1A
2	B	1201	ADP	C5'-O5'-PA-O1A

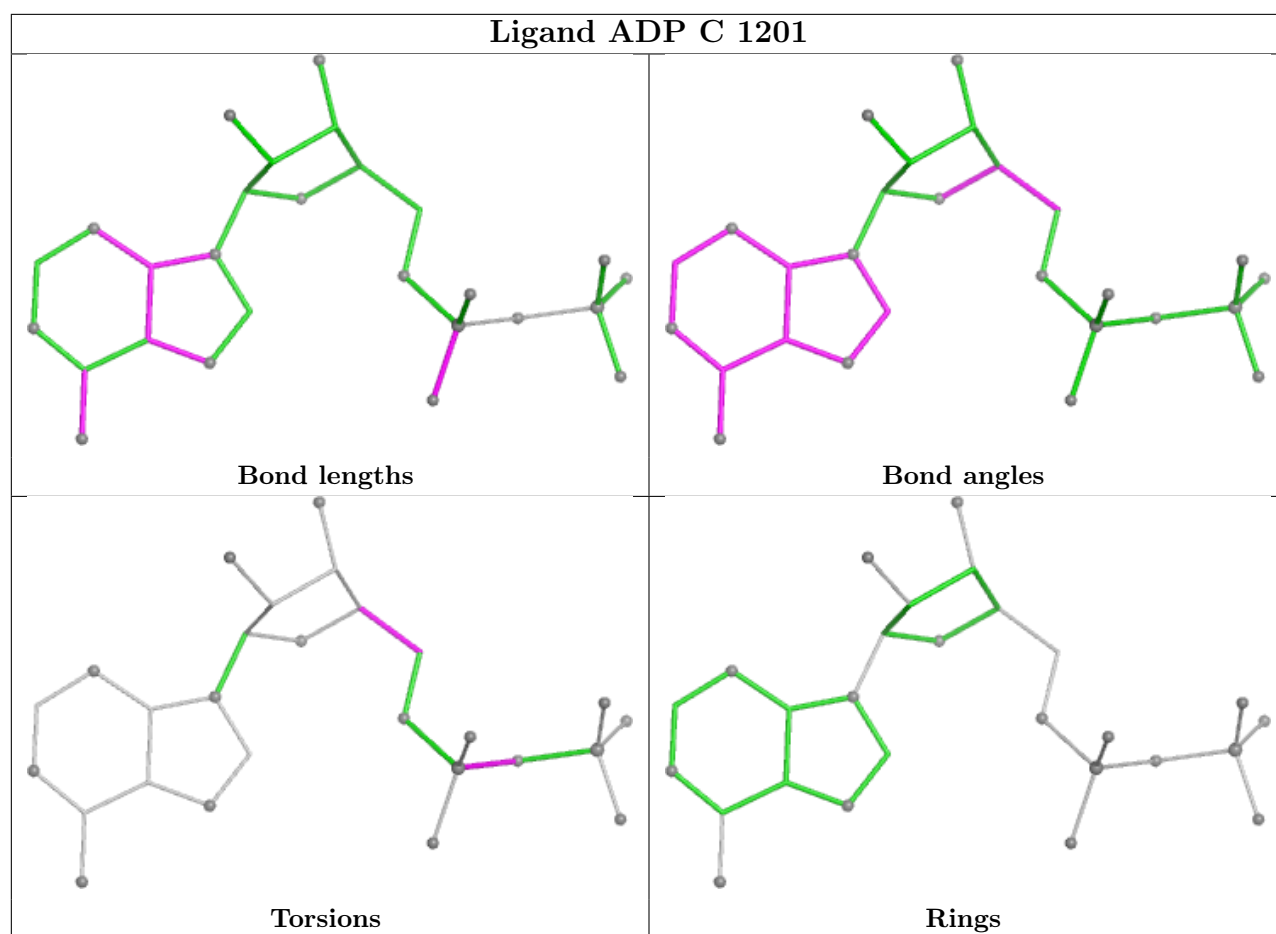
There are no ring outliers.

No monomer is involved in short contacts.

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

6.1 Protein, DNA and RNA chains

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, 95th 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 ²)	Q<0.9
1	A	298/316 (94%)	1.52	88 (29%) 1 1	11, 24, 46, 61	1 (0%)
1	B	298/316 (94%)	1.25	65 (21%) 2 2	10, 24, 46, 60	2 (0%)
1	C	298/316 (94%)	1.38	69 (23%) 2 1	10, 25, 47, 60	1 (0%)
All	All	894/948 (94%)	1.38	222 (24%) 2 1	10, 24, 47, 61	4 (0%)

All (222) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	860	PHE	9.2
1	A	859	ASN	7.6
1	C	1051	ILE	6.9
1	A	1050	TYR	6.7
1	C	943	LYS	6.7
1	B	1050	TYR	6.5
1	A	876	GLY	6.5
1	C	1050	TYR	6.2
1	C	886	HIS	6.0
1	B	1051	ILE	5.8
1	A	872	GLN	5.6
1	A	1051	ILE	5.6
1	C	833	ASN	5.6
1	C	887	SER	5.5
1	B	875	THR	5.4
1	A	948	ILE	5.2
1	A	874	ASN	5.2
1	B	874	ASN	5.2
1	A	875	THR	5.0
1	B	857	LYS	5.0
1	A	1054	SER	4.9
1	A	1004	ASP	4.8
1	A	1075	VAL	4.7

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Mol	Chain	Res	Type	RSRZ
1	A	949	ASP	4.7
1	C	857	LYS	4.7
1	B	871	LEU	4.7
1	B	977	LEU	4.7
1	B	872	GLN	4.6
1	C	875	THR	4.6
1	B	1132	GLY	4.6
1	C	885	GLN	4.6
1	C	871	LEU	4.6
1	B	1054	SER	4.5
1	C	847	ARG	4.5
1	C	860	PHE	4.4
1	C	858	GLY	4.4
1	C	1053	LYS	4.4
1	B	1004	ASP	4.4
1	B	886	HIS	4.3
1	C	835	TYR	4.3
1	C	1052	GLU	4.3
1	A	909	ASN	4.3
1	C	1054	SER	4.2
1	C	872	GLN	4.2
1	A	892	LEU	4.2
1	A	871	LEU	4.1
1	B	1131	ALA	4.0
1	C	884	LEU	4.0
1	B	859	ASN	4.0
1	A	893	ARG	3.9
1	A	1003	GLN	3.9
1	B	858	GLY	3.9
1	B	887	SER	3.9
1	A	940	TYR	3.8
1	B	876	GLY	3.8
1	C	1070	GLN	3.8
1	A	937	LEU	3.8
1	C	876	GLY	3.8
1	B	1003	GLN	3.7
1	C	1100	MET	3.7
1	A	884	LEU	3.7
1	C	888	THR	3.6
1	B	987	GLU	3.6
1	C	1013	PRO	3.6
1	A	907	HIS	3.6

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Mol	Chain	Res	Type	RSRZ
1	C	893	ARG	3.5
1	B	860	PHE	3.5
1	C	838	SER	3.5
1	C	920	ALA	3.4
1	A	941	LEU	3.4
1	C	1132	GLY	3.3
1	C	1076	PHE	3.3
1	B	833	ASN	3.2
1	C	1079	ILE	3.2
1	A	1033	VAL	3.2
1	A	938	ARG	3.2
1	A	856	GLY	3.2
1	B	893	ARG	3.2
1	B	1068	ASP	3.2
1	B	888	THR	3.1
1	C	873	ASP	3.1
1	C	836	PHE	3.1
1	A	942	GLN	3.1
1	C	1099	TYR	3.1
1	A	1052	GLU	3.1
1	B	1126	ILE	3.0
1	C	834	LEU	3.0
1	C	1081	LEU	3.0
1	C	859	ASN	3.0
1	A	1100	MET	3.0
1	C	891	HIS	3.0
1	B	951	ILE	3.0
1	A	906	GLN	2.9
1	A	1083	LYS	2.9
1	B	847	ARG	2.9
1	C	874	ASN	2.9
1	C	1003	GLN	2.9
1	A	1053	LYS	2.9
1	A	1099	TYR	2.9
1	B	889	GLU	2.9
1	C	1012	GLU	2.9
1	A	873	ASP	2.9
1	A	908	ASP	2.9
1	A	910	ILE	2.9
1	C	1073	MET	2.8
1	B	861	GLY	2.8
1	C	1096	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	884	LEU	2.8
1	B	984	VAL	2.8
1	C	1004	ASP	2.8
1	B	838	SER	2.8
1	A	1132	GLY	2.8
1	C	921	GLY	2.8
1	B	954	LEU	2.8
1	B	1074	ILE	2.8
1	C	1068	ASP	2.8
1	A	887	SER	2.7
1	C	851	PHE	2.7
1	C	889	GLU	2.7
1	A	969	THR	2.7
1	C	948	ILE	2.7
1	A	1070	GLN	2.7
1	B	916	VAL	2.7
1	C	1131	ALA	2.7
1	A	951	ILE	2.7
1	C	856	GLY	2.6
1	A	934	TYR	2.6
1	A	939	ASP	2.6
1	C	918	TYR	2.6
1	A	886	HIS	2.6
1	C	869	ASP	2.6
1	A	1015	GLU	2.6
1	A	833	ASN	2.6
1	C	925	LEU	2.6
1	A	869	ASP	2.6
1	C	894	ASP	2.6
1	B	972	TYR	2.6
1	A	925	LEU	2.6
1	B	1121	LEU	2.6
1	C	967	LEU	2.6
1	B	955	GLN	2.6
1	A	877	GLU	2.6
1	A	1074	ILE	2.6
1	B	1052	GLU	2.6
1	A	888	THR	2.6
1	A	966	TYR	2.5
1	A	837	GLN	2.5
1	A	858	GLY	2.5
1	C	1074	ILE	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	931	TYR	2.5
1	B	967	LEU	2.5
1	A	1000	VAL	2.5
1	B	854	GLN	2.5
1	B	1092	ASP	2.5
1	A	891	HIS	2.4
1	A	936	SER	2.4
1	A	972	TYR	2.4
1	A	901	ILE	2.4
1	C	1092	ASP	2.4
1	A	885	GLN	2.4
1	A	988	ASN	2.4
1	B	856	GLY	2.4
1	B	873	ASP	2.3
1	A	967	LEU	2.3
1	C	972	TYR	2.3
1	C	900	GLU	2.3
1	C	1077	HIS	2.3
1	A	838	SER	2.3
1	B	1000	VAL	2.3
1	C	1075	VAL	2.3
1	B	1063	ARG	2.3
1	A	857	LYS	2.3
1	A	943	LYS	2.3
1	A	952	LYS	2.3
1	C	861	GLY	2.3
1	A	1130	MET	2.3
1	B	1130	MET	2.3
1	A	912	LYS	2.3
1	B	1053	LYS	2.3
1	B	1083	LYS	2.3
1	B	867	ARG	2.3
1	A	1088	LEU	2.3
1	B	834	LEU	2.3
1	B	1049	THR	2.3
1	A	921	GLY	2.2
1	B	1098	ILE	2.2
1	B	1067	ASN	2.2
1	B	1055	LYS	2.2
1	A	890	GLU	2.2
1	B	925	LEU	2.2
1	B	1129	ASN	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	847	ARG	2.2
1	A	1078	LEU	2.2
1	A	1092	ASP	2.2
1	B	1005	LYS	2.2
1	A	911	VAL	2.2
1	C	1103	THR	2.2
1	A	935	GLY	2.2
1	B	892	LEU	2.2
1	B	989	ARG	2.2
1	C	923	ARG	2.2
1	A	946	GLU	2.1
1	A	1021	TYR	2.1
1	B	966	TYR	2.1
1	C	1010	VAL	2.1
1	A	905	LEU	2.1
1	A	1013	PRO	2.1
1	A	1081	LEU	2.1
1	C	890	GLU	2.1
1	A	1067	ASN	2.1
1	A	945	LYS	2.1
1	C	952	LYS	2.1
1	A	854	GLN	2.1
1	A	903	LYS	2.1
1	B	883	LYS	2.1
1	A	883	LYS	2.0
1	C	951	ILE	2.0
1	B	839	MET	2.0
1	B	990	VAL	2.0
1	A	977	LEU	2.0
1	C	1067	ASN	2.0
1	B	1013	PRO	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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, 95th 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
1	PTR	C	1008	16/17	0.87	0.15	23,28,47,51	0
1	PTR	A	1008	16/17	0.88	0.14	17,28,40,44	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
1	PTR	B	1007	16/17	0.90	0.12	18,30,48,50	0
1	PTR	B	1008	16/17	0.90	0.12	18,28,41,46	0
1	PTR	C	1007	16/17	0.90	0.12	23,33,51,58	0
1	PTR	A	1007	16/17	0.90	0.12	19,28,52,62	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

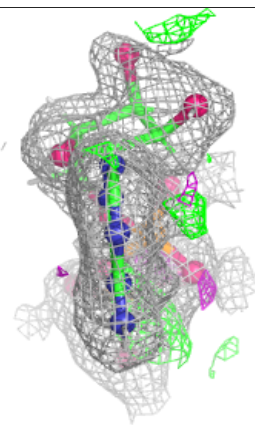
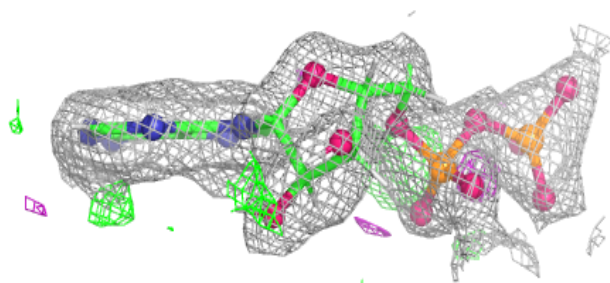
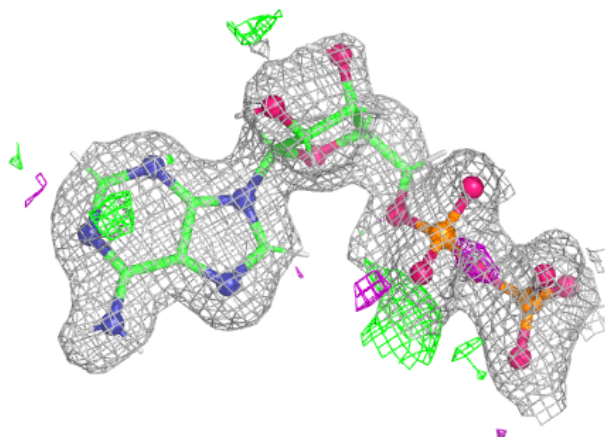
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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
2	ADP	A	1201	27/27	0.87	0.12	14,30,42,45	0
2	ADP	B	1201	27/27	0.87	0.14	13,26,42,46	0
2	ADP	C	1201	27/27	0.87	0.15	10,24,49,60	0
4	NA	C	1203	1/1	0.87	0.27	36,36,36,36	0
3	MG	A	1202	1/1	0.92	0.10	22,22,22,22	0
3	MG	B	1202	1/1	0.96	0.06	27,27,27,27	0
3	MG	C	1202	1/1	0.97	0.30	28,28,28,28	0

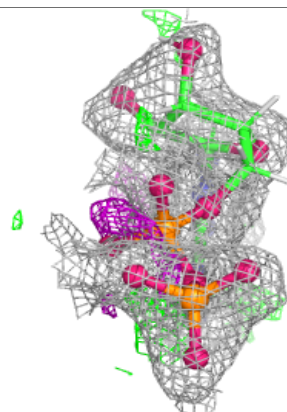
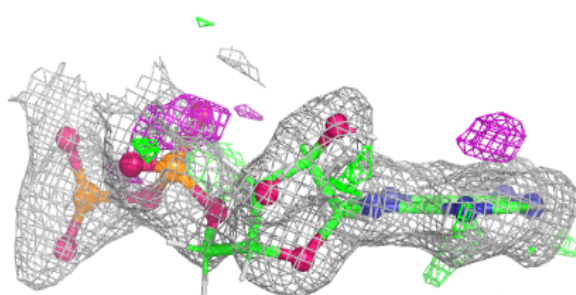
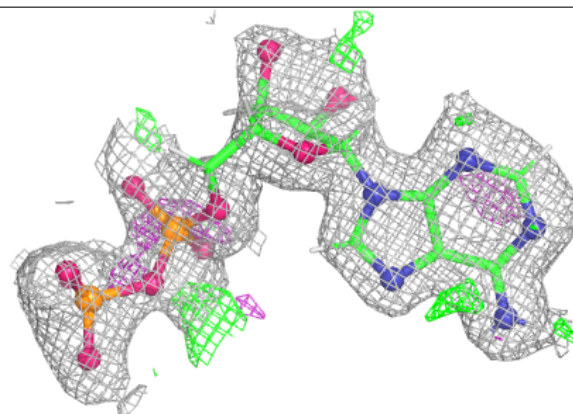
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

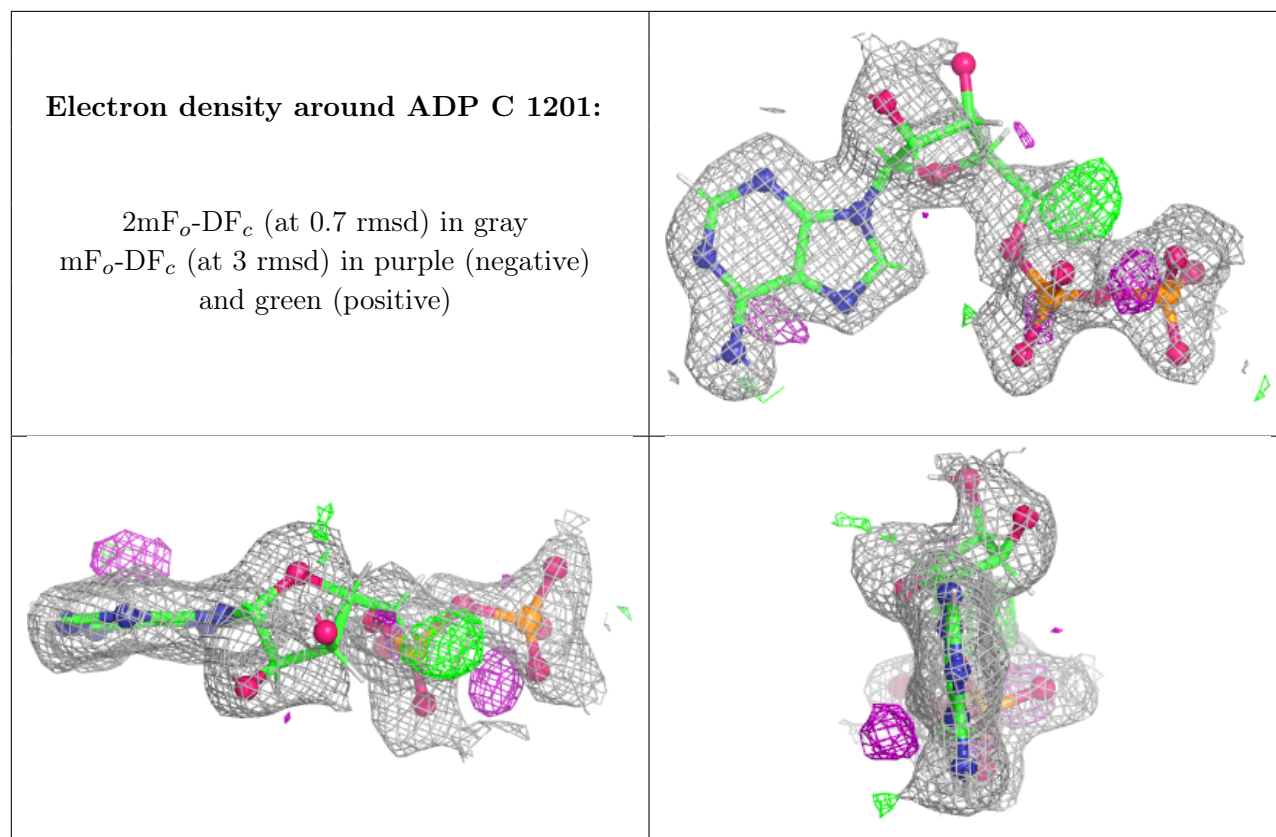
Electron density around ADP A 1201:

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

**Electron density around ADP B 1201:**

$2mF_o-DF_c$ (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.