W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Feb 17, 2024 – 12:21 PM EST

PDB ID	:	3S1Q
Title	:	RNA Polymerase II Initiation Complex with a 5-nt 3'-deoxy RNA soaked with ATP
Authors	:	Liu, X.; Bushnell, D.A.; Silva, D.A.; Huang, X.; Kornberg, R.D.
Deposited on	:	2011-05-16
Resolution	:	3.30 Å(reported)

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

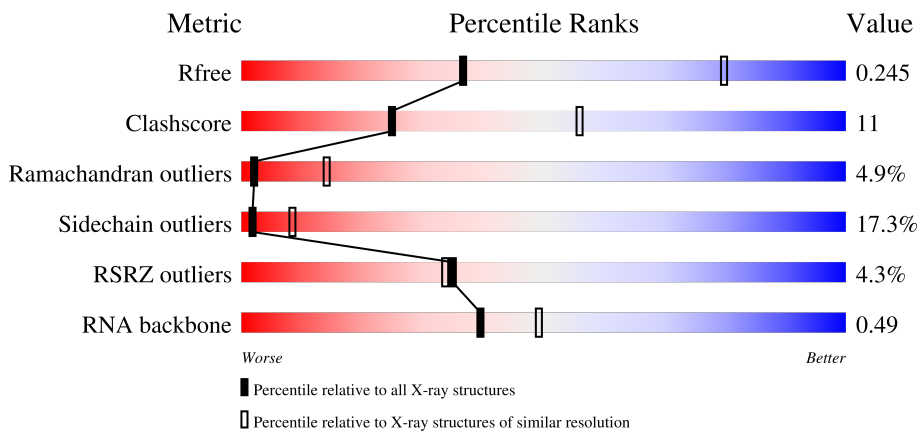|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 3.30 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	Percentile Ranks	Value
Rfree		0.245
Clashscore		11
Ramachandran outliers		4.9%
Sidechain outliers		17.3%
RSRZ outliers		4.3%
RNA backbone		0.49

Worse — Better

■ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution
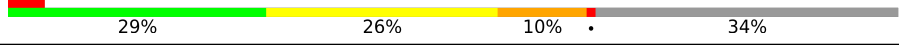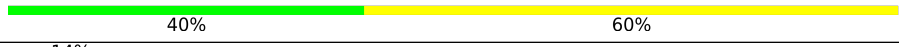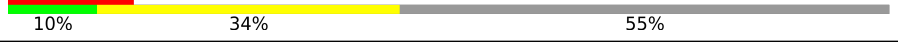
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1149 (3.34-3.26)
Clashscore	141614	1205 (3.34-3.26)
Ramachandran outliers	138981	1183 (3.34-3.26)
Sidechain outliers	138945	1182 (3.34-3.26)
RSRZ outliers	127900	1115 (3.34-3.26)
RNA backbone	3102	1117 (3.70-2.90)

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 <=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	1733	5% — 50% 25% 5% · 19%
2	B	1224	4% — 57% 28% 5% · 9%
3	C	318	52% 25% 6% · 16%
4	E	215	2% — 69% 28% ·

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	F	155	36% 17% · 45%
6	H	146	8% 54% 31% 6% 9%
7	I	122	% 67% 27% · · ·
8	J	70	43% 41% 9% 7%
9	K	120	56% 34% 5% 5%
10	L	70	4% 29% 26% 10% · 34%
11	R	5	40% 60%
12	T	29	14% 10% 34% 55%

2 Entry composition ⓘ

There are 15 unique types of molecules in this entry. The entry contains 28703 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 DNA-directed RNA polymerase II subunit RPB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1405	Total 11043	C 6965	N 1936	O 2081	S 61	0	0	0

- Molecule 2 is a protein called DNA-directed RNA polymerase II subunit RPB2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	1114	Total 8861	C 5610	N 1549	O 1647	S 55	0	0	0

- Molecule 3 is a protein called DNA-directed RNA polymerase II subunit RPB3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	266	Total 2095	C 1317	N 348	O 417	S 13	0	0	0

- Molecule 4 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	E	214	Total 1752	C 1111	N 309	O 321	S 11	0	0	0

- Molecule 5 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	F	85	Total 688	C 439	N 116	O 130	S 3	0	0	0

- Molecule 6 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	H	133	Total 1068	C 673	N 180	O 211	S 4	0	0	0

- Molecule 7 is a protein called DNA-directed RNA polymerase II subunit RPB9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	I	119	Total 971	C 596	N 179	O 186	S 10	0	0	0

- Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	J	65	Total 532	C 339	N 93	O 94	S 6	0	0	0

- Molecule 9 is a protein called DNA-directed RNA polymerase II subunit RPB11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
9	K	114	Total 919	C 590	N 156	O 171	S 2	0	0	0

- Molecule 10 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	L	46	Total 363	C 224	N 72	O 63	S 4	0	0	0

- Molecule 11 is a RNA chain called RNA (5'-R(*AP*GP*AP*GP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
11	R	5	Total 109	C 50	N 25	O 30	P 4	0	0	0

- Molecule 12 is a DNA chain called DNA (5'-D(*CP*TP*AP*CP*CP*GP*AP*TP*AP*AP *GP*CP*AP*GP*AP*CP*GP*AP*TP*CP*CP*TP*CP*TP*CP*GP*AP*TP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	T	13	Total 261	C 125	N 43	O 80	P 13	0	0	0

- Molecule 13 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	2	Total 2	Mg 2	0	0

• Molecule 14 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
14	A	2	Total 2	Zn 2	0	0
14	B	1	Total 1	Zn 1	0	0
14	C	1	Total 1	Zn 1	0	0
14	I	2	Total 2	Zn 2	0	0
14	J	1	Total 1	Zn 1	0	0
14	L	1	Total 1	Zn 1	0	0

• Molecule 15 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).
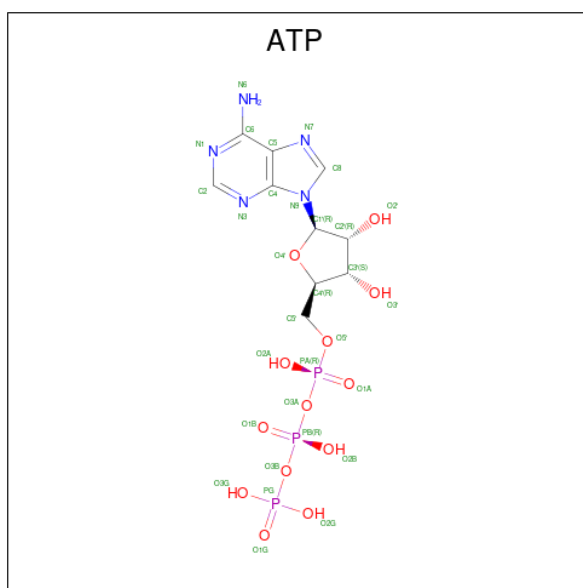
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
15	A	1	31	10	5	13	3	0	0

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: DNA-directed RNA polymerase II subunit RPB1

• Molecule 2: DNA-directed RNA polymerase II subunit RPB2

• Molecule 3: DNA-directed RNA polymerase II subunit RPB3

Chain C:

H188 T189 D190 Y191 Q195 W201 P202 Q203 S204 K205 N206 C207 P212 P213 N214 E215 G216 D217 Y221 D226 E233 V240 D241 Q242 V243 V244 R246 L251 K254 V255 I258 L259 T263 Q264 M265 D268 LYS VAL ASN PHE ALA SER GLY ASP ASN ASN THR

ALA SER ASN MET LEU GLY SER ASN GLU ASP VAL MET MET THR GLY ALA GLU GLN ASP PRO TYR SER ASN ALA SER GLN MET ASN THR GLY SER GLY TYR ASP ASN ALA TRP
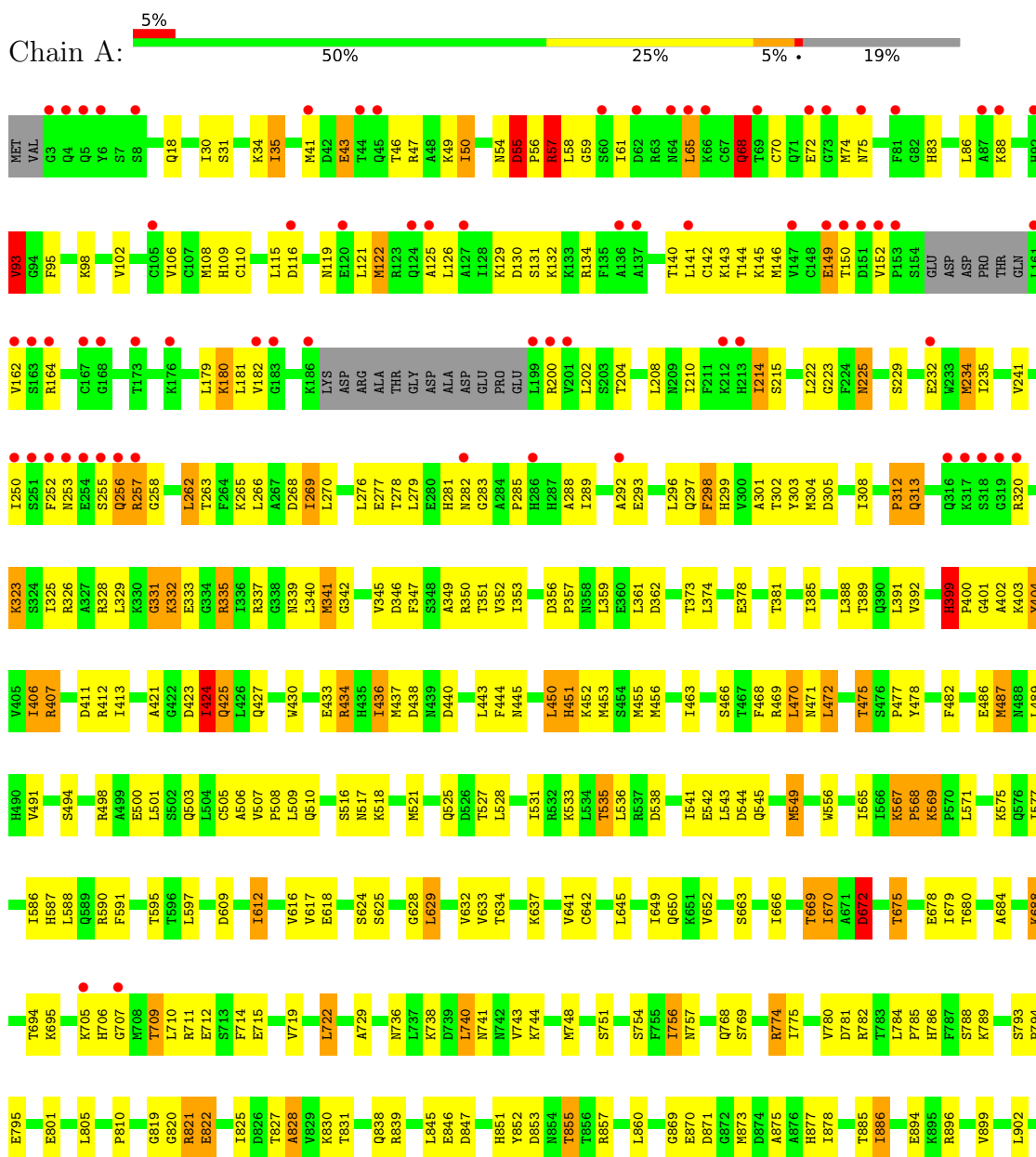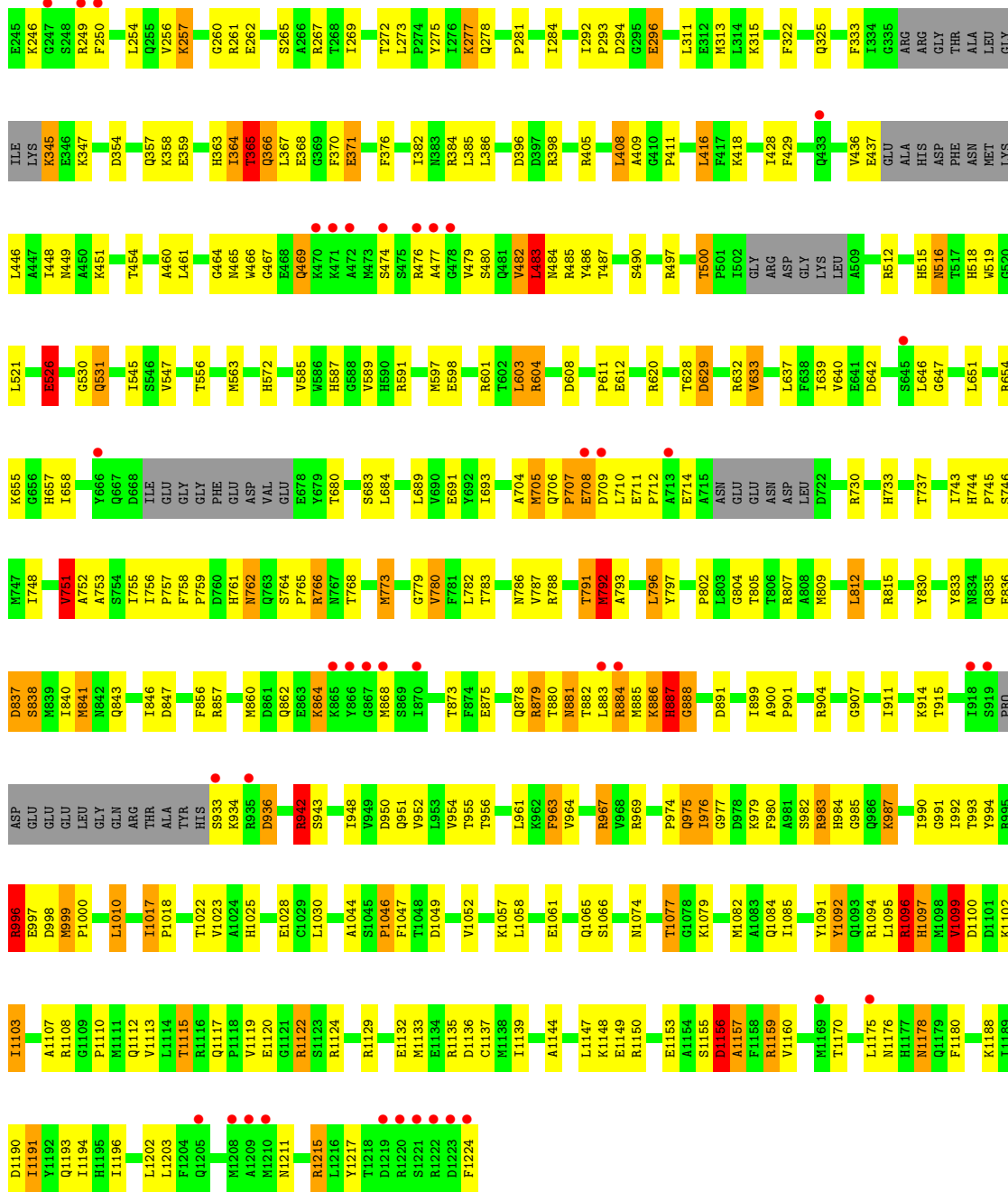
• Molecule 4: DNA-directed RNA polymerases I, II, and III subunit RPABC1

Chain E:

2%
69%					28%			•

MET D2 Q3 N8 I9 S10 R14 V19 K20 V23 K24 I30 V35 E36 Y46 C47 G51 R52 P53 Q54 M57 Q61 T65 E66 I69 M75 G76 S77 L78 W79 V80 D84 E85 V88 G89 V90 K91 T92 M93 K94 V97 I98 Q101

E102 F105 Q106 T107 N115 I116 T117 P118 S119 A120 M121 V124 I132 F135 N136 E137 L140 V141 V142 H146 H147 E148 L149 V150 L156 D159 E163 L164 L165 R169 P176 A185 L190 I198 I199 R200 K201 T204 S205 Y208 R212

M215

• Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC2

Chain F:

36%				17%		•				45%

MET SER ASP TYR GLU GLU ALA PHE ASN ASP GLY ASN GLU ASN PHE GLU ASP PHE ASP VAL GLU HIS PHE SER ASP GLU GLU THR TYR GLU GLU LYS PRO GLN PHE LYS ASP GLY GLU THR THR ASP ALA ASN GLY LYS THR ILE VAL THR GLY GLY ASN GLY PRO GLU ASP PHE GLN GLN

HIS GLU GLN ILE ARG ARG LYS THR LEU LYS E71 K72 A73 K76 D77 Q78 R79 A80 T81 T82 P83 E89 R90 A91 R92 L99 M103 N104 D110 L111 E112 D116 P117 L118 R119 M122 E127 K128 V133 L138 S142 W146 E149 D154 L155

• Molecule 6: DNA-directed RNA polymerases I, II, and III subunit RPABC3

Chain H:

8%
54%						31%				6%	9%

MET S2 N3 D16 P17 G18 R19 I26 E27 Q33 D34 Q35 C36 L40 D41 I42 N43 V44 E45 L46 L55 T56 V57 T58 S61 S62 L63 ASN LEU GLU ASP THR PRO ALA ASN ASP SER SER ALA T76 R77 S78 W79 P82 Q83 A84 G85 D86 R87 A90 D91 D92

Y93 D94 Y95 V96 M97 F104 E105 E106 V107 S108 L111 V114 S117 F118 G119 G120 M123 R124 L125 E126 G127 N128 Y129 R130 N131 L132 N133 N134 L135 K136 Q137 E138 N139 A140 Y141 L142 L143 I144 R145 R146

• Molecule 7: DNA-directed RNA polymerase II subunit RPB9

Chain I:

.%
67%					27%			• • •

MET T2 T3 N12 R17 E18 D19 K20 E21 R24 E28 C32 S33 Y34 V35 E36 E37 L42 T50 N51 I52 T55 D61 I62 D65 L68 R69 R70 R73 K77 V84 Q87 S88 Q89 Q90 D94 T95 S96 M97 V98 L104 S112

K117 R118 T119 Q120 PHE SER

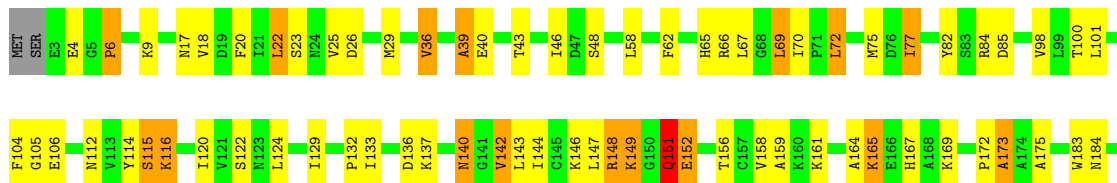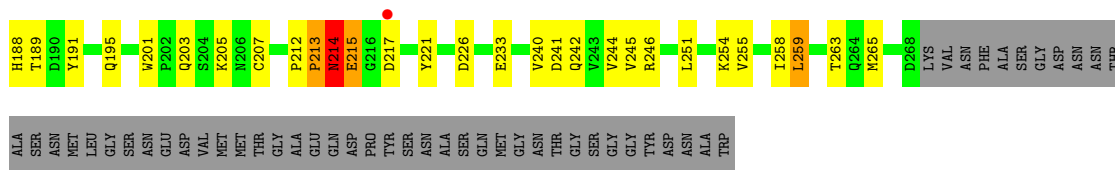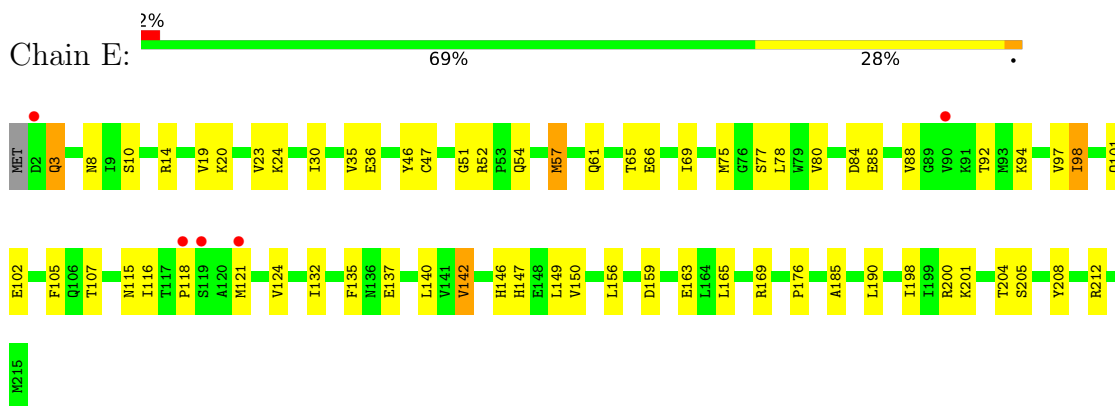• Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC5

Chain J:

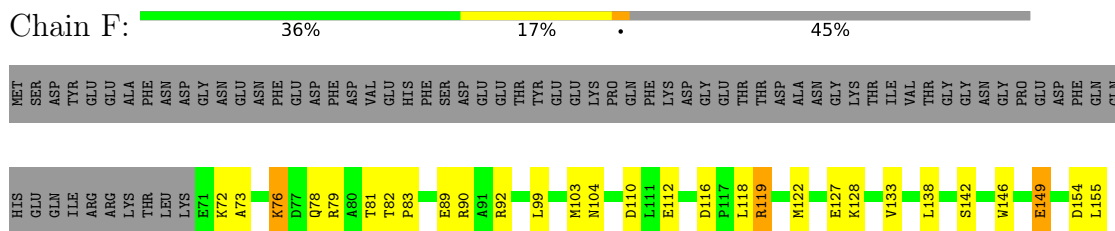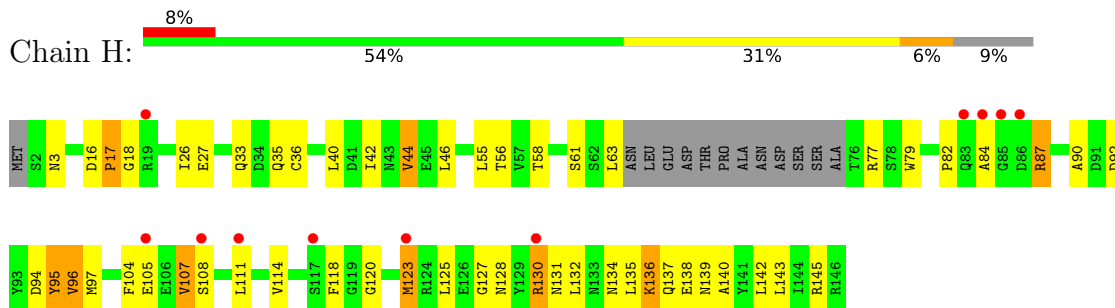• Molecule 9: DNA-directed RNA polymerase II subunit RPB11

Chain K:

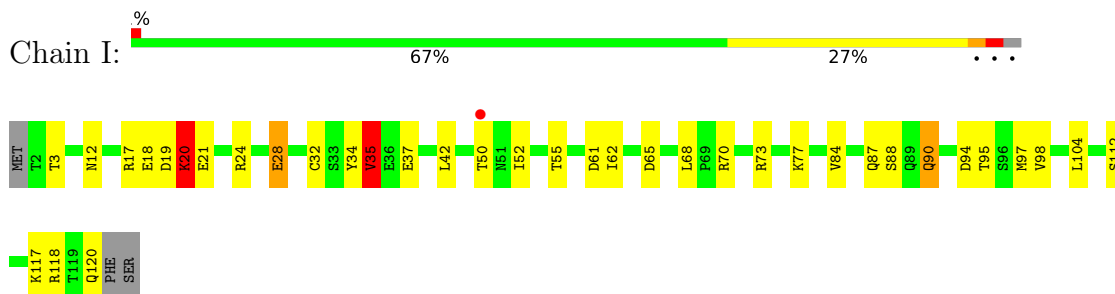• Molecule 10: DNA-directed RNA polymerases I, II, and III subunit RPABC4

Chain L:
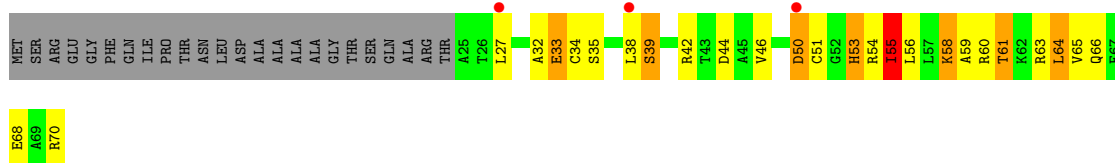
• Molecule 11: RNA (5'-R(*AP*GP*AP*GP*G)-3')

Chain R:

• Molecule 12: DNA (5'-D(*CP*TP*AP*CP*CP*GP*AP*TP*AP*AP*GP*CP*AP*GP*AP*C
P*GP*AP*TP*CP*CP*TP*CP*TP*CP*GP*AP*TP*G)-3')

Chain T:
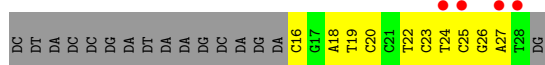
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	161.94Å 220.53Å 193.72Å 90.00° 98.48° 90.00°	Depositor
Resolution (Å)	29.67 – 3.30 29.67 – 3.30	Depositor EDS
% Data completeness (in resolution range)	(Not available) (29.67-3.30) 99.3 (29.67-3.30)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.63 (at 3.31Å)	Xtriage
Refinement program	BUSTER-TNT BUSTER 2.8.0, BUSTER 2.8.0	Depositor
R, R_{free}	0.176 , 0.229 0.194 , 0.245	Depositor DCC
R_{free} test set	4995 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	97.3	Xtriage
Anisotropy	0.589	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 111.4	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	28703	wwPDB-VP
Average B, all atoms (Å^2)	136.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.80% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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, ATP, ZN

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	0/11241	0.83	6/15199 (0.0%)
2	B	0.54	0/9033	0.83	3/12181 (0.0%)
3	C	0.49	0/2133	0.84	1/2891 (0.0%)
4	E	0.46	0/1788	0.72	0/2406
5	F	0.49	0/700	0.74	0/945
6	H	0.49	0/1086	0.82	0/1470
7	I	0.50	0/989	0.81	0/1331
8	J	0.59	0/541	0.93	0/727
9	K	0.46	0/937	0.74	0/1265
10	L	0.58	0/365	1.05	0/485
11	R	0.93	0/123	1.42	0/191
12	T	1.14	0/290	2.13	17/444 (3.8%)
All	All	0.53	0/29226	0.85	27/39535 (0.1%)

There are no bond length outliers.

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
12	T	16	DC	P-O3'-C3'	10.52	132.32	119.70
12	T	25	DC	O4'-C1'-N1	9.54	114.68	108.00
12	T	23	DC	O4'-C1'-N1	8.20	113.74	108.00
12	T	22	DT	C4'-C3'-C2'	-8.13	95.78	103.10
12	T	24	DT	O4'-C1'-N1	8.12	113.69	108.00

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	11043	0	11133	280	0
2	B	8861	0	8884	215	0
3	C	2095	0	2051	56	0
4	E	1752	0	1776	36	0
5	F	688	0	707	9	0
6	H	1068	0	1040	20	0
7	I	971	0	927	11	0
8	J	532	0	542	23	0
9	K	919	0	929	27	0
10	L	363	0	386	14	0
11	R	109	0	55	2	0
12	T	261	0	148	0	0
13	A	2	0	0	0	0
14	A	2	0	0	0	0
14	B	1	0	0	0	0
14	C	1	0	0	0	0
14	I	2	0	0	0	0
14	J	1	0	0	0	0
14	L	1	0	0	0	0
15	A	31	0	12	5	0
All	All	28703	0	28590	619	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 11.

The worst 5 of 619 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)
15:A:1736:ATP:H5'1	15:A:1736:ATP:H8	1.25	1.01
1:A:1123:GLY:HA3	1:A:1124:HIS:HB2	1.45	0.99
1:A:855:THR:HG21	1:A:857:ARG:HE	1.37	0.88
1:A:830:LYS:HG3	1:A:1098:VAL:HG11	1.55	0.87
1:A:525:GLN:HB2	2:B:835:GLN:HE21	1.43	0.84

There are no symmetry-related clashes.

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	1395/1733 (80%)	1177 (84%)	149 (11%)	69 (5%)	2	14
2	B	1096/1224 (90%)	927 (85%)	110 (10%)	59 (5%)	2	12
3	C	264/318 (83%)	235 (89%)	19 (7%)	10 (4%)	3	19
4	E	212/215 (99%)	199 (94%)	11 (5%)	2 (1%)	17	48
5	F	83/155 (54%)	73 (88%)	7 (8%)	3 (4%)	3	20
6	H	129/146 (88%)	93 (72%)	24 (19%)	12 (9%)	0	4
7	I	117/122 (96%)	103 (88%)	10 (8%)	4 (3%)	3	22
8	J	63/70 (90%)	55 (87%)	6 (10%)	2 (3%)	4	22
9	K	112/120 (93%)	101 (90%)	8 (7%)	3 (3%)	5	26
10	L	44/70 (63%)	28 (64%)	7 (16%)	9 (20%)	0	0
All	All	3515/4173 (84%)	2991 (85%)	351 (10%)	173 (5%)	2	14

5 of 173 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	68	GLN
1	A	215	SER
1	A	250	ILE
1	A	312	PRO
1	A	556	TRP

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	1225/1520 (81%)	1008 (82%)	217 (18%)		2	8
2	B	967/1061 (91%)	811 (84%)	156 (16%)		2	10
3	C	234/274 (85%)	191 (82%)	43 (18%)		1	7
4	E	196/197 (100%)	173 (88%)	23 (12%)		5	21
5	F	75/137 (55%)	60 (80%)	15 (20%)		1	5
6	H	117/128 (91%)	96 (82%)	21 (18%)		2	8
7	I	113/116 (97%)	91 (80%)	22 (20%)		1	5
8	J	60/65 (92%)	46 (77%)	14 (23%)		1	3
9	K	99/102 (97%)	83 (84%)	16 (16%)		2	10
10	L	40/57 (70%)	26 (65%)	14 (35%)		0	1
All	All	3126/3657 (86%)	2585 (83%)	541 (17%)		2	8

5 of 541 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
6	H	94	ASP
7	I	20	LYS
6	H	92	ASP
9	K	78	THR
1	A	1308	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 72 such sidechains are listed below:

Mol	Chain	Res	Type
3	C	112	ASN
9	K	89	ASN
3	C	167	HIS
6	H	134	ASN
1	A	965	GLN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
11	R	3/5 (60%)	0	0

There are no RNA backbone outliers to report.

There are no RNA pucker outliers to report.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 11 ligands modelled in this entry, 10 are monoatomic - leaving 1 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	$\#|Z| > 2$
15	ATP	A	1736	13	26,33,33	1.25	3 (11%)	31,52,52	1.50	6 (19%)

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
15	ATP	A	1736	13	-	7/18/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	A	1736	ATP	C2-N3	3.49	1.37	1.32
15	A	1736	ATP	C2-N1	2.33	1.38	1.33
15	A	1736	ATP	PB-O1B	2.30	1.59	1.50

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	A	1736	ATP	O3'-C3'-C2'	3.28	122.43	111.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
15	A	1736	ATP	O4'-C1'-C2'	-3.25	102.18	106.93
15	A	1736	ATP	O3'-C3'-C4'	2.47	118.19	111.05
15	A	1736	ATP	O3G-PG-O3B	2.43	112.78	104.64
15	A	1736	ATP	C4-C5-N7	2.38	111.88	109.40

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
15	A	1736	ATP	PB-O3B-PG-O3G
15	A	1736	ATP	PB-O3B-PG-O2G
15	A	1736	ATP	C5'-O5'-PA-O3A
15	A	1736	ATP	C4'-C5'-O5'-PA
15	A	1736	ATP	C5'-O5'-PA-O1A

There are no ring outliers.

1 monomer is involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	A	1736	ATP	5	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 then 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 ATP A 1736

Bond lengths

Bond angles

Torsions

Rings
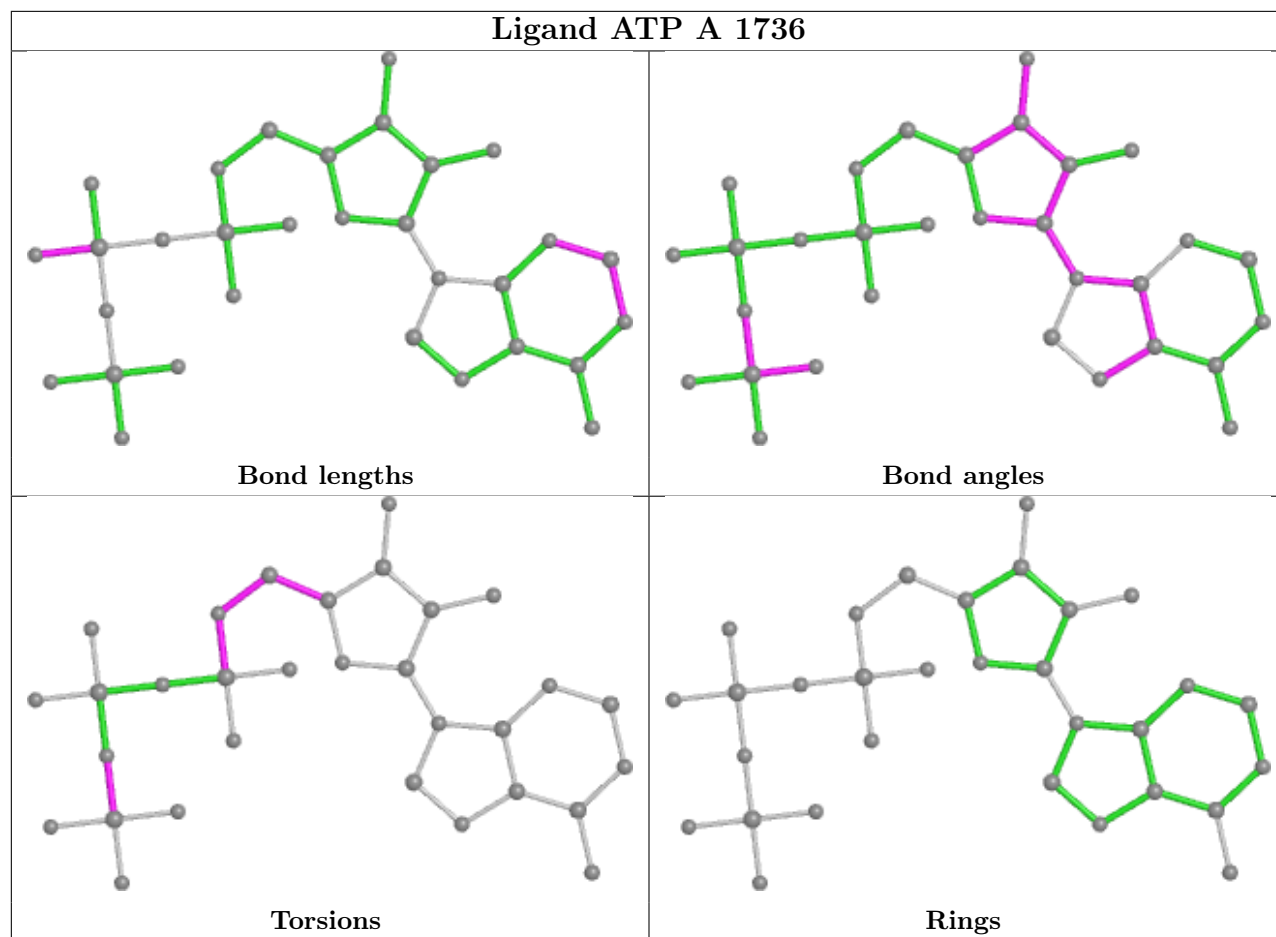
5.7   Other polymers ⓘ

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 ⓘ

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(Å²)	Q<0.9
1	A	1405/1733 (81%)	0.06	82 (5%)	23	22	78, 133, 223, 254	0
2	B	1114/1224 (91%)	-0.05	48 (4%)	35	34	71, 115, 183, 241	0
3	C	266/318 (83%)	-0.23	1 (0%)	92	93	87, 113, 153, 215	0
4	E	214/215 (99%)	-0.06	5 (2%)	60	59	102, 159, 206, 216	0
5	F	85/155 (54%)	-0.15	0	100	100	109, 139, 178, 196	0
6	H	133/146 (91%)	0.35	11 (8%)	11	11	131, 172, 202, 222	0
7	I	119/122 (97%)	-0.16	1 (0%)	86	86	93, 138, 185, 200	0
8	J	65/70 (92%)	-0.18	0	100	100	81, 104, 136, 151	0
9	K	114/120 (95%)	-0.23	0	100	100	87, 123, 150, 175	0
10	L	46/70 (65%)	0.25	3 (6%)	18	18	99, 155, 188, 214	0
11	R	5/5 (100%)	0.27	0	100	100	148, 153, 180, 183	0
12	T	13/29 (44%)	1.33	4 (30%)	0	0	150, 170, 237, 245	0
All	All	3579/4207 (85%)	-0.01	155 (4%)	35	34	71, 128, 208, 254	0

The worst 5 of 155 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	69	THR	8.7
2	B	1222	ARG	7.0
2	B	1224	PHE	6.8
1	A	1176	LEU	6.5
1	A	66	LYS	6.3

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

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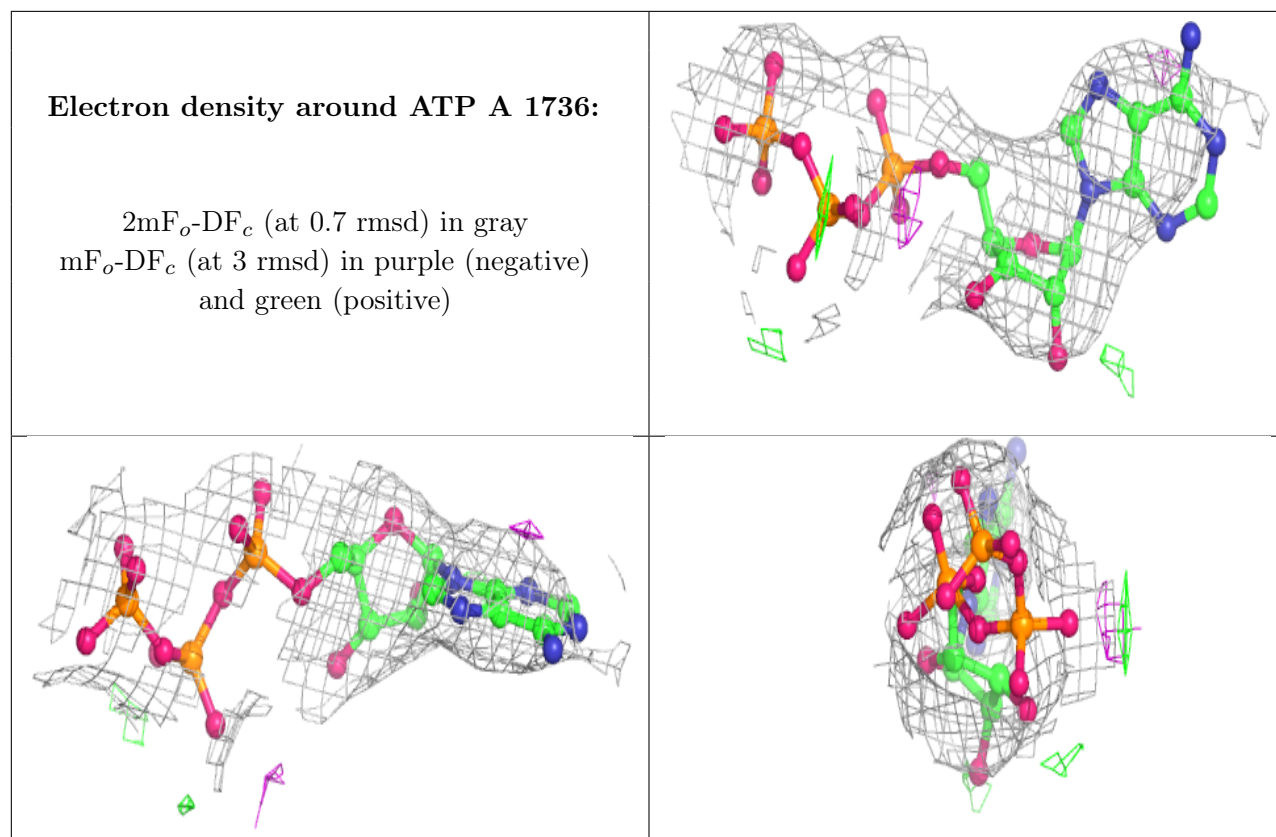
6.3 Carbohydrates ⓘ

There are no monosaccharides 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, 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(Å^2)	Q<0.9
14	ZN	A	1734	1/1	0.24	0.15	300,300,300,300	0
14	ZN	B	1307	1/1	0.82	0.10	221,221,221,221	0
15	ATP	A	1736	31/31	0.88	0.23	162,165,195,197	0
13	MG	A	2002	1/1	0.91	0.14	131,131,131,131	0
13	MG	A	2001	1/1	0.92	0.04	102,102,102,102	0
14	ZN	A	1735	1/1	0.94	0.15	198,198,198,198	0
14	ZN	L	105	1/1	0.97	0.03	142,142,142,142	0
14	ZN	I	203	1/1	0.98	0.08	134,134,134,134	0
14	ZN	J	101	1/1	0.98	0.20	102,102,102,102	0
14	ZN	I	204	1/1	0.99	0.07	112,112,112,112	0
14	ZN	C	319	1/1	0.99	0.09	113,113,113,113	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 ATP A 1736:

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 ⓘ

There are no such residues in this entry.