wwPDB X-ray Structure Validation Summary Report (i)

Aug 4, 2025 – 10:10 AM EDT

PDB ID	:	9N5C / pdb_00009n5c
Title	:	RNA polymerase II elongation complex with 8-oxoG at +1 site, CMPCPP-bound
Authors	:	Oh, J.; Wang, D.
Deposited on	:	2025-02-04
Resolution	:	3.60 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) 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 (i)) were used in the production of this report:

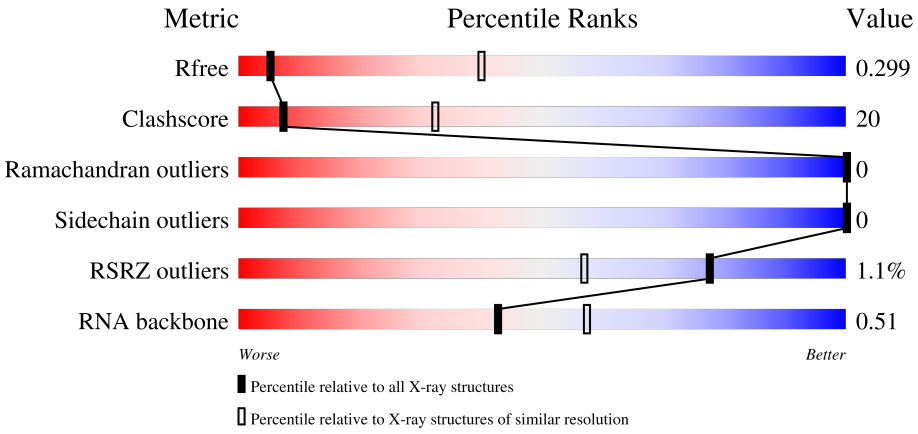
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.45.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.60 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}	164625	1563 (3.70-3.50)
Clashscore	180529	1665 (3.70-3.50)
Ramachandran outliers	177936	1641 (3.70-3.50)
Sidechain outliers	177891	1640 (3.70-3.50)
RSRZ outliers	164620	1562 (3.70-3.50)
RNA backbone	3690	1108 (4.20-3.00)

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	R	9	33% 56% 11%
2	T	29	31% 59% 10%
3	N	18	28% 56% 17%
4	A	1733	% 45% 35% 20%

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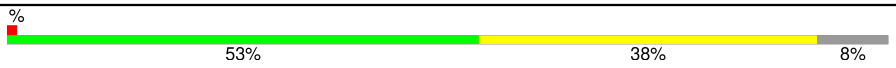
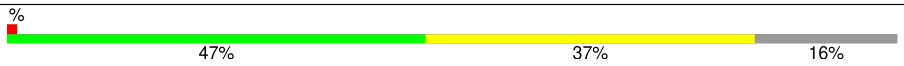
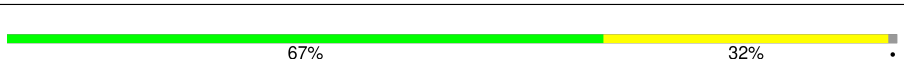
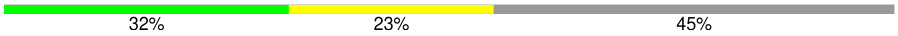
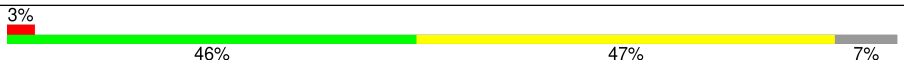
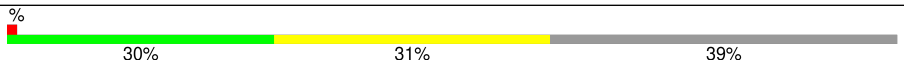
Mol	Chain	Length	Quality of chain
5	B	1224	
6	C	318	
7	E	215	
8	F	155	
9	H	146	
10	I	122	
11	J	70	
12	K	120	
13	L	70	

2 Entry composition (i)

There are 16 unique types of molecules in this entry. The entry contains 29046 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 RNA chain called RNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	R	9	Total	C	N	O	P	0	0	0
			199	88	40	62	9			

- Molecule 2 is a DNA chain called Template strand DNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	T	26	Total	C	N	O	P	0	0	0
			521	250	80	165	26			

- Molecule 3 is a DNA chain called Non-template strand DNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	N	15	Total	C	N	O	P	0	0	0
			317	148	71	83	15			

- Molecule 4 is a protein called DNA-directed RNA polymerase II subunit RPB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	A	1385	Total	C	N	O	S	0	0	0
			10817	6824	1890	2043	60			

- Molecule 5 is a protein called DNA-directed RNA polymerase II subunit RPB2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	B	1121	Total	C	N	O	S	0	0	0
			8843	5598	1547	1645	53			

- Molecule 6 is a protein called DNA-directed RNA polymerase II subunit RPB3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	C	267	Total	C	N	O	S	0	0	0
			2101	1320	349	419	13			

- Molecule 7 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	E	213	Total	C	N	O	S	0	0	0
			1740	1105	307	317	11			

- Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	F	86	Total	C	N	O	S	0	0	0
			684	437	115	129	3			

- Molecule 9 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
9	H	133	Total	C	N	O	S	0	0	0
			1052	664	173	211	4			

- Molecule 10 is a protein called DNA-directed RNA polymerase II subunit RPB9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	I	118	Total	C	N	O	S	0	0	0
			952	585	173	184	10			

- Molecule 11 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC5.

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

- Molecule 12 is a protein called DNA-directed RNA polymerase II subunit RPB11.

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

- Molecule 13 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
13	L	43	Total	C	N	O	S	0	0	0
			331	205	63	59	4			

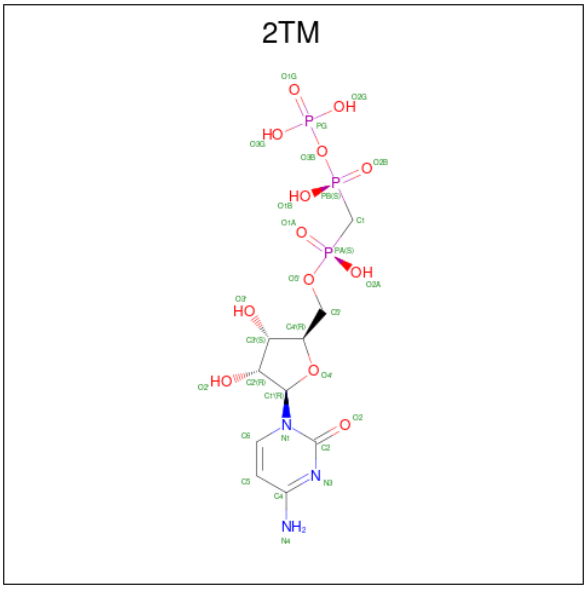
- Molecule 14 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

- Molecule 15 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
15	A	1	Total Mg 1 1	0	0

- Molecule 16 is 5'-O-[(S)-hydroxy{[(S)-hydroxy(phosphonooxy)phosphoryl]methyl}phosphoryl]cytidine (CCD ID: 2TM) (formula: $C_{10}H_{18}N_3O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
16	B	1	Total C N O P 29 10 3 13 3	0	0

3 Residue-property plots (i)

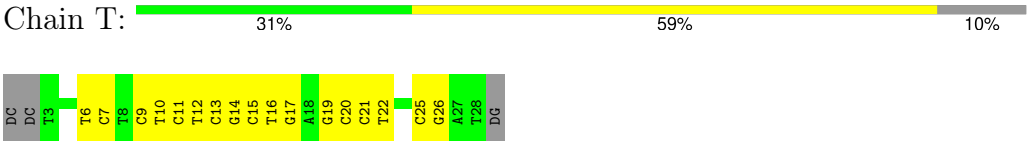
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: RNA

Chain R:

- Molecule 2: Template strand DNA

Chain T:

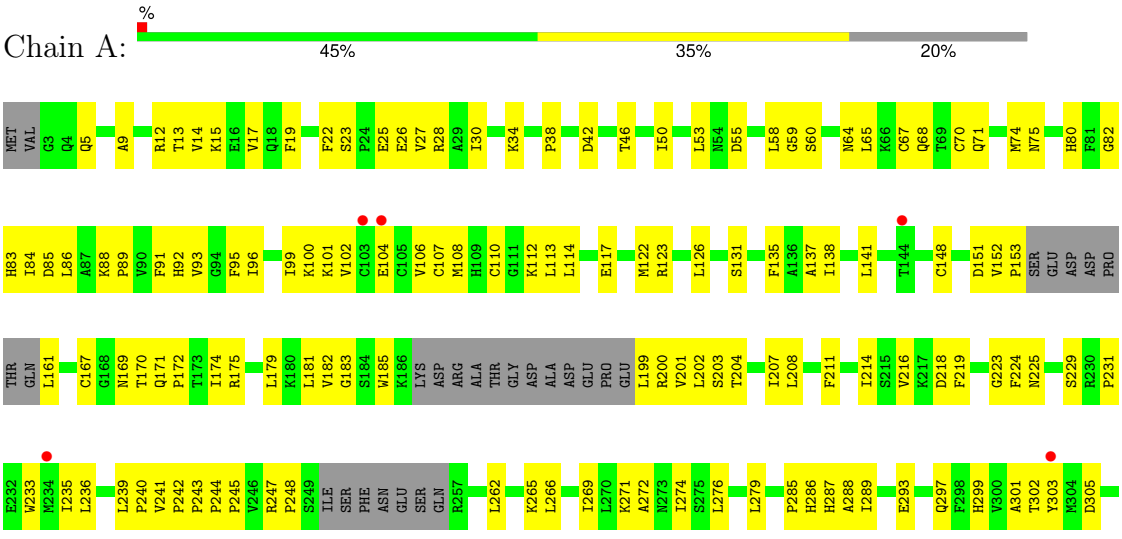


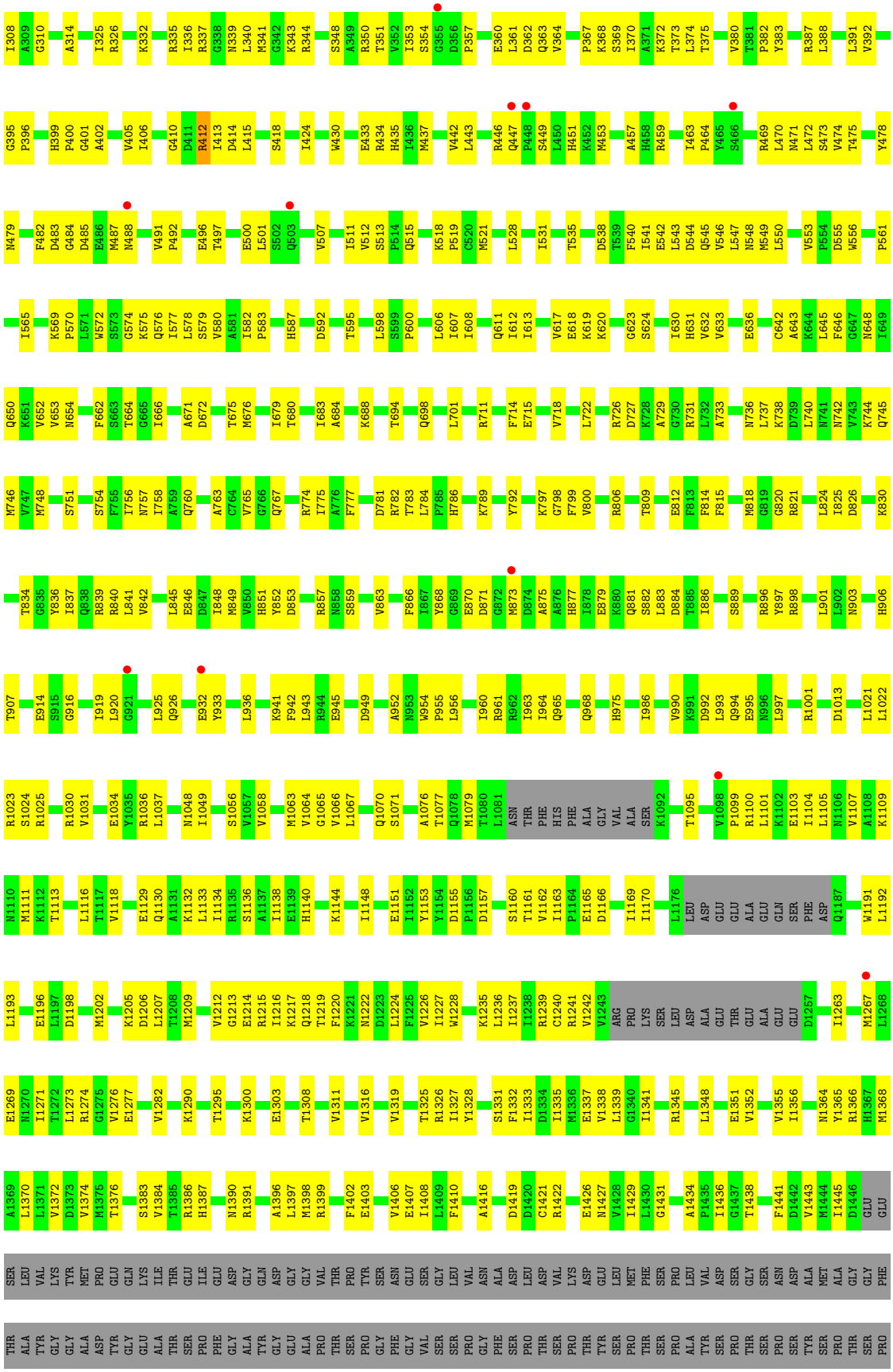
- Molecule 3: Non-template strand DNA

Chain N:

- Molecule 4: DNA-directed RNA polymerase II subunit RPB1

Chain A:

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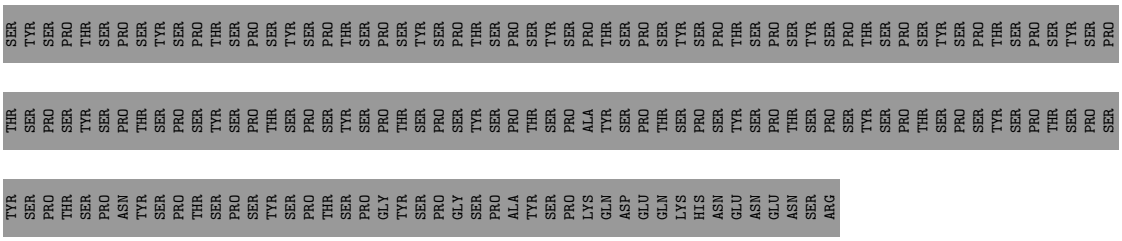
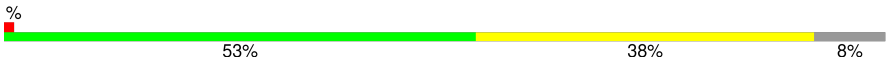
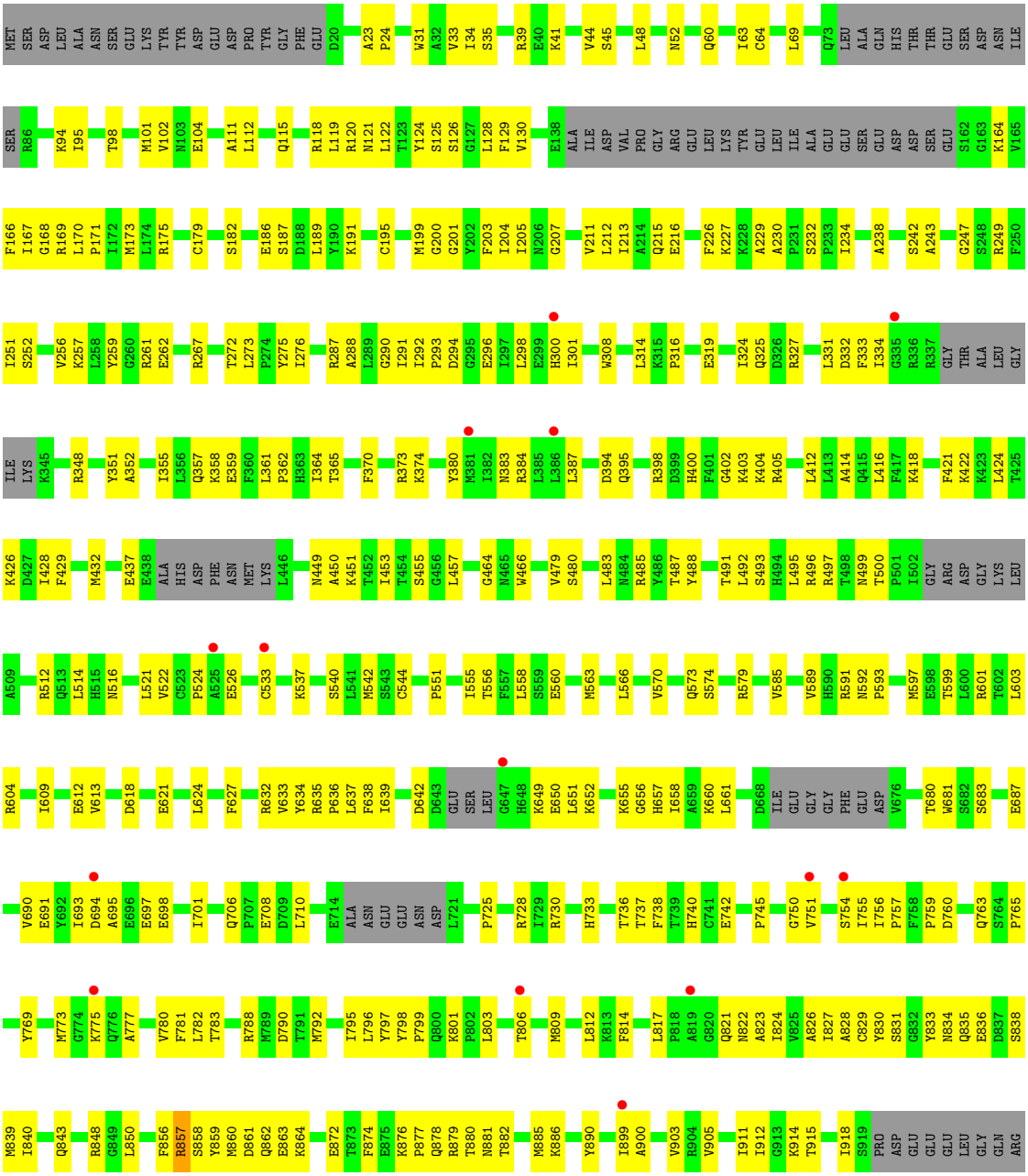
G395 P396 H399 P400 G401 A402 V405 I406 G410 D411 R412 I413 D414 L415 S418 I424 W430 E433 R434 H435 I436 M437 V442 L443 R446 Q447 P448 S449 L450 H451 K452 M453 A457 H458 R459 I463 P464 Y465 S466 R469 L470 N471 L472 S473 V474 T475 Y478
N479 F482 D483 G484 D485 E486 M487 N488 V491 P492 E496 T497 E500 L501 S502 Q503 V507 I511 V512 S513 P514 Q515 K518 P519 Q520 M521 L528 I531 T535 D538 T539 F540 I541 E542 L543 D544 Q545 V546 L547 N548 M549 L550 V553 P554 D555 W556 P561
I565 K569 P570 L571 W572 S573 G574 K575 Q576 I577 L578 S579 V580 A581 I582 P583 H587 D592 T595 L598 S599 P600 L606 I607 I608 Q611 I612 I613 V617 E618 K619 K620 G623 S624 I630 H631 V632 V633 E636 C642 A643 K644 L645 F646 G647 N648 I649
Q650 K651 V652 V653 N654 F662 S663 T664 G665 I666 A671 D672 T675 M676 I679 T680 I683 A684 K688 T694 Q698 L701 R711 F714 E715 V718 L722 R726 D727 K728 A729 G730 R731 L732 A733 N736 L737 K738 D739 L740 N741 N742 V743 K744 Q745
M746 V747 M748 S751 S754 F755 I756 N757 I758 A759 Q760 A763 C764 V765 G766 Q767 R774 I775 A776 F777 D781 R782 T783 L784 P785 H786 K789 Y792 K797 G798 F799 V800 R806 T809 E812 F813 F814 F815 M818 G819 G820 R821 L824 I825 D826 K830
T834 G835 Y836 I837 Q838 R839 R840 L841 V842 L845 E846 D847 I848 M849 V850 H851 Y852 D853 R857 N858 S859 V863 F866 I867 Y868 G869 E870 D871 G872 M873 D874 A875 A876 H877 I878 E879 K880 Q881 S882 L883 D884 T885 I886 S889 R896 Y897 R898 L901 L902 N903 H906
T907 E914 S915 G916 I919 L920 G921 L925 Q926 E932 Y933 L936 K941 F942 L943 R944 E945 D949 A952 N953 W954 P955 L956 I960 R961 R962 I963 I964 Q965 Q968 H975 I986 V990 K991 D992 L993 Q994 E995 N996 L997 R1001 D1013 L1021 L1022
R1023 S1024 R1025 R1030 V1031 E1034 Y1035 R1036 L1037 N1048 I1049 S1056 V1057 V1058 M1063 V1064 G1065 V1066 L1067 Q1070 S1071 A1076 T1077 Q1078 M1079 T1080 L1081 ASN THR PHE HIS PHE ALA GLY VAL ALA SER K1092 T1095 V1098 P1099 R1100 L1101 K1102 E1103 I1104 L1105 N1106 V1107 A1108 K1109
N1110 M1111 K1112 T1113 L1116 T1117 V1118 E1129 Q1130 A1131 K1132 L1133 I1134 R1135 S1136 A1137 I1138 E1139 H1140 K1144 I1148 E1151 I1152 Y1153 Y1154 D1155 P1156 D1157 S1160 T1161 V1162 I1163 P1164 E1165 D1166 I1169 I1170 L1176 LEU ASP GLU GLU ALA GLU GLN SER PHE ASP Q1187 W1191 L1192
L1193 E1196 L1197 D1198 M1202 K1205 D1206 L1207 T1208 M1209 V1212 G1213 E1214 R1215 I1216 K1217 Q1218 T1219 F1220 K1221 N1222 D1223 L1224 F1225 V1226 I1227 W1228 K1235 L1236 I1237 I1238 R1239 C1240 R1241 V1242 V1243 ARG PRO LYS SER LEU ASP ALA GLU THR GLU GLU D1267 I1263 M1267 L1268
E1269 N1270 I1271 T1272 L1273 R1274 G1275 V1276 E1277 V1282 K1290 T1295 K1300 E1303 T1308 V1311 V1316 V1319 T1325 R1326 I1327 Y1328 S1331 F1332 I1333 D1334 I1335 M1336 E1337 V1338 L1339 G1340 I1341 R1345 L1348 E1351 V1352 V1355 I1356 N1364 Y1365 R1366 H1367 M1368
A1369 L1370 L1371 V1372 D1373 V1374 M1375 T1376 S1383 V1384 T1385 R1386 H1387 N1390 R1391 A1396 L1397 M1398 R1399 F1402 E1403 V1406 E1407 I1408 L1409 F1410 A1416 D1419 D1420 C1421 R1422 E1426 N1427 V1428 I1429 L1430 G1431 A1434 P1435 I1436 G1437 T1438 F1441 D1442 V1443 M1444 I1445 D1446 GLU GLU
SER LEU VAL LYS TYR MET PRO GLU GLN LYS ILE THR GLU ILE GLU ASP GLY GLN ASP GLY GLY VAL THR PRO TYR SER PRO GLY PHE GLY VAL SER SER PRO GLY PHE SER PRO LEU VAL ASP SER PRO THR SER PRO THR TYR SER PRO THR SER PRO ALA TYR SER PRO THR SER PRO PRO SER TYR MET ALA GLY SER PRO THR SER PRO GLY PHE
THR ALA TYR GLY GLY ALA ASP TYR GLY GLU ALA THR SER PRO PHE GLY ALA TYR GLY GLU ALA PRO THR SER PRO GLY PHE GLY VAL SER SER PRO GLY PHE SER PRO THR TYR SER PRO THR SER PRO ALA TYR SER PRO THR SER PRO PRO SER TYR SER PRO THR SER PRO PRO SER TYR SER PRO THR SER PRO

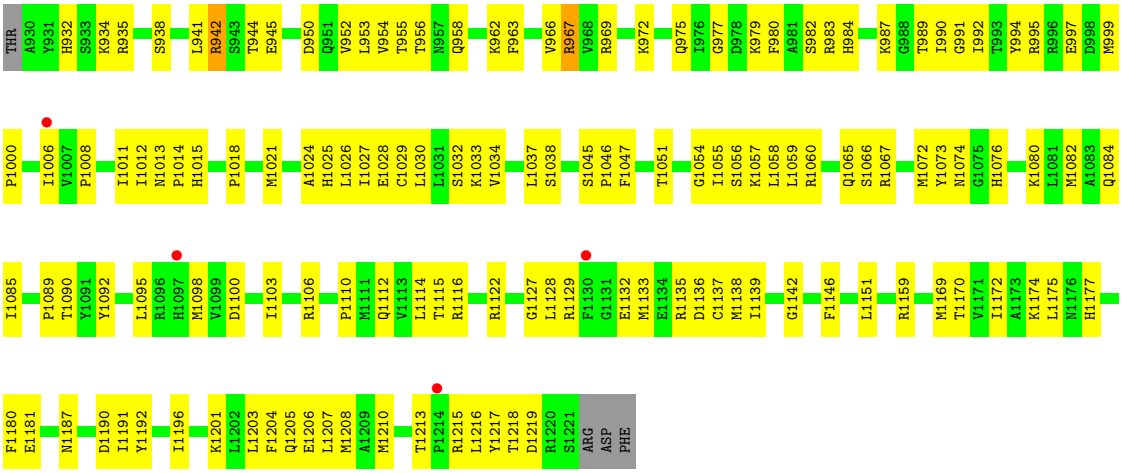


• Molecule 5: DNA-directed RNA polymerase II subunit RPB2

Chain B:

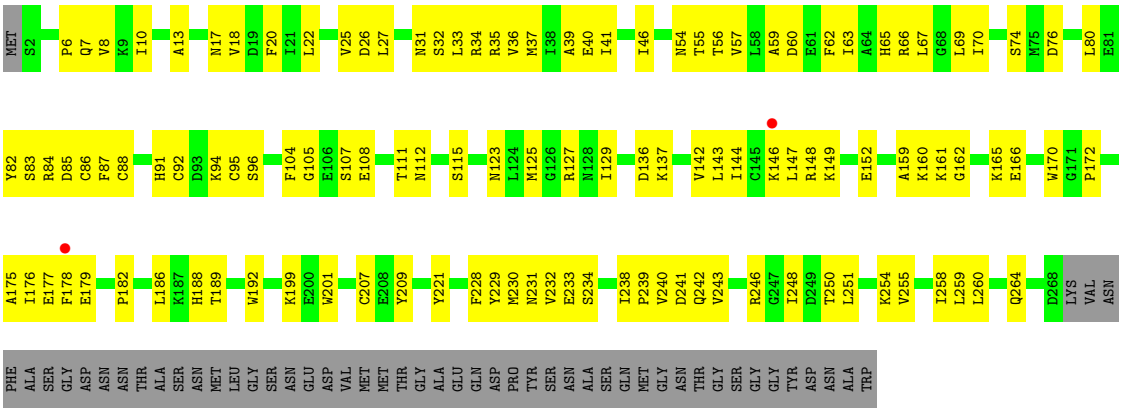






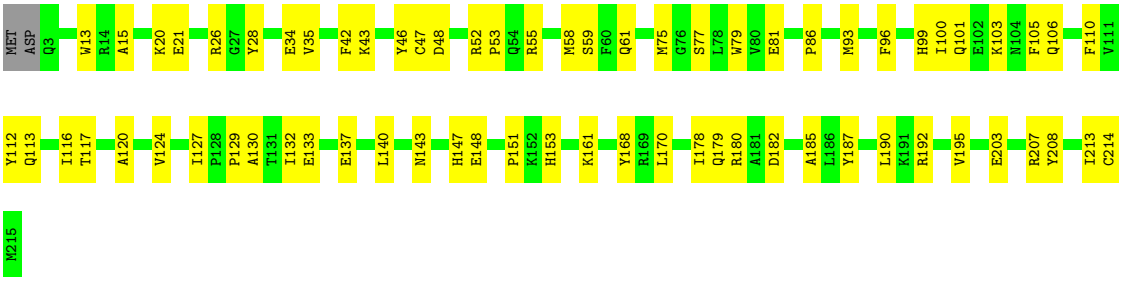
• Molecule 6: DNA-directed RNA polymerase II subunit RPB3

Chain C:



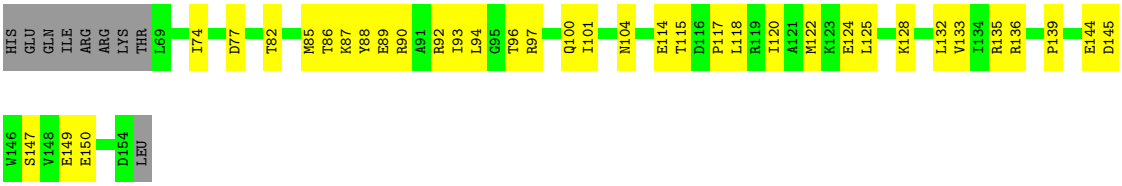
• Molecule 7: DNA-directed RNA polymerases I, II, and III subunit RPABC1

Chain E:



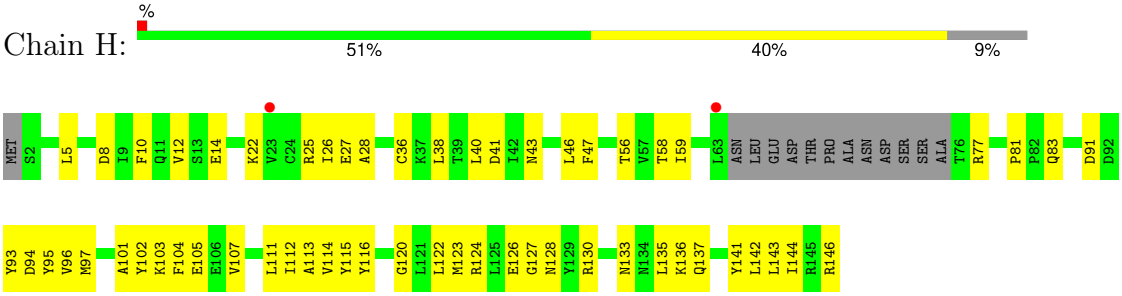
• Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC2

Chain F:



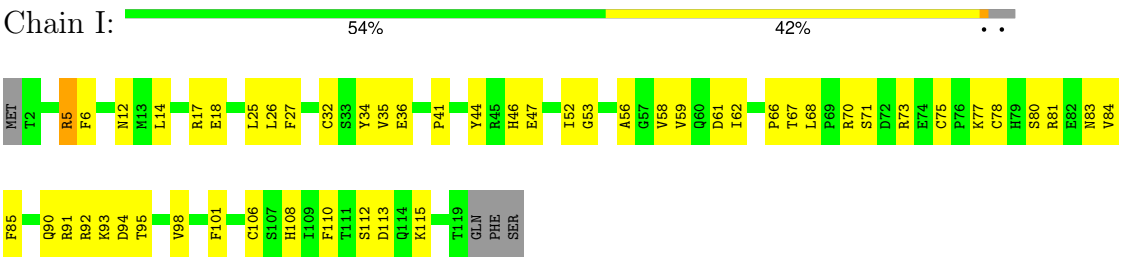
• Molecule 9: DNA-directed RNA polymerases I, II, and III subunit RPABC3

Chain H:



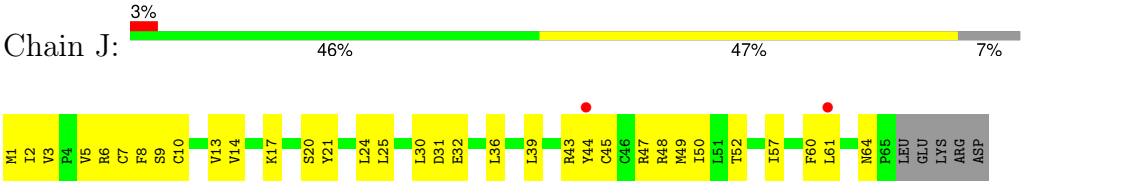
• Molecule 10: DNA-directed RNA polymerase II subunit RPB9

Chain I:



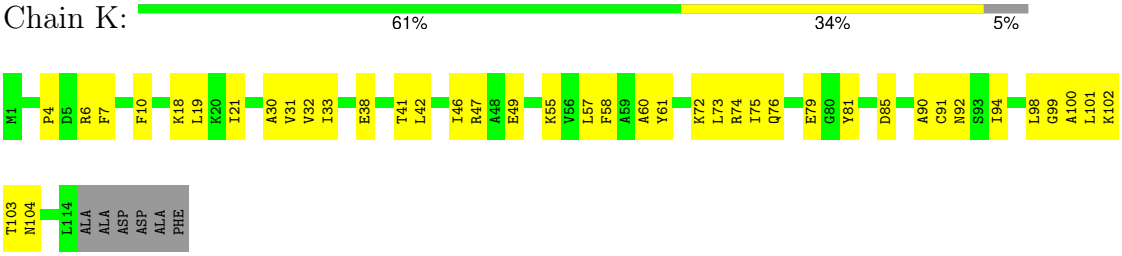
• Molecule 11: DNA-directed RNA polymerases I, II, and III subunit RPABC5

Chain J:



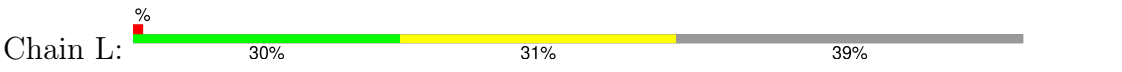
• Molecule 12: DNA-directed RNA polymerase II subunit RPB11

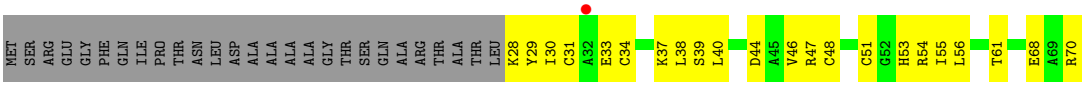
Chain K:



• Molecule 13: DNA-directed RNA polymerases I, II, and III subunit RPABC4

Chain L:




MET
SER
ARG
GLU
GLY
PHE
GLN
ILE
PRO
THR
ASN
LEU
ASP
ALA
ALA
ALA
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THR
SER
GLN
ALA
ARG
THR
ALA
THR
LEU
K28
Y29
I30
C31
A32
E33
C34
K37
L38
S39
L40
D44
A45
V46
R47
C48
C51
G52
H53
R54
I55
L56
T61
E68
A69
R70

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	162.64Å 222.99Å 192.26Å 90.00° 98.55° 90.00°	Depositor
Resolution (Å)	48.77 – 3.60 48.77 – 3.60	Depositor EDS
% Data completeness (in resolution range)	99.5 (48.77-3.60) 99.4 (48.77-3.60)	Depositor EDS
R_{merge}	0.51	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.19 (at 3.57Å)	Xtriage
Refinement program	PHENIX (1.19.2_4158: ???)	Depositor
R, R_{free}	0.252 , 0.297 0.253 , 0.299	Depositor DCC
R_{free} test set	2000 reflections (2.41%)	wwPDB-VP
Wilson B-factor (Å^2)	103.1	Xtriage
Anisotropy	0.582	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 117.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.39$, $< L^2 > = 0.22$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	29046	wwPDB-VP
Average B, all atoms (Å^2)	124.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.68% of the height of the origin peak. No significant pseudotranslation is detected.*

[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: ZN, 8OG, 2TM, MG

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	R	0.18	0/223	0.39	0/345
2	T	0.22	0/551	0.48	0/843
3	N	0.22	0/359	0.42	0/553
4	A	0.17	0/11009	0.41	0/14897
5	B	0.15	0/9014	0.37	0/12165
6	C	0.16	0/2139	0.39	0/2899
7	E	0.14	0/1776	0.36	0/2390
8	F	0.12	0/696	0.35	0/943
9	H	0.16	0/1070	0.45	0/1452
10	I	0.17	0/970	0.45	0/1308
11	J	0.19	0/541	0.48	0/727
12	K	0.17	0/937	0.42	0/1265
13	L	0.13	0/333	0.46	0/443
All	All	0.16	0/29618	0.40	0/40230

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
4	A	0	2
5	B	0	3
9	H	0	1
10	I	0	1
All	All	0	7

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
4	A	412	ARG	Sidechain
4	A	726	ARG	Sidechain
5	B	857	ARG	Sidechain
5	B	942	ARG	Sidechain
5	B	967	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	R	199	0	98	8	0
2	T	521	0	297	14	0
3	N	317	0	166	12	0
4	A	10817	0	10839	521	0
5	B	8843	0	8799	363	0
6	C	2101	0	2058	102	0
7	E	1740	0	1766	48	0
8	F	684	0	692	29	0
9	H	1052	0	1007	56	0
10	I	952	0	904	48	1
11	J	532	0	543	38	0
12	K	919	0	929	41	0
13	L	331	0	343	16	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	1	0	0	0	0
16	B	29	0	14	1	0
All	All	29046	0	28455	1157	1

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 20.

The worst 5 of 1157 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)
5:B:863:GLU:HG3	5:B:962:LYS:HB2	1.46	0.97
9:H:36:CYS:HA	9:H:126:GLU:O	1.67	0.94
11:J:21:TYR:HB2	11:J:39:LEU:HD11	1.50	0.92
4:A:1364:ASN:OD1	4:A:1366:ARG:NH1	2.03	0.91
5:B:101:MET:HG2	5:B:111:ALA:HA	1.57	0.87

All (1) 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)
10:I:81:ARG:O	10:I:81:ARG:NH2[2_556]	2.14	0.06

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	
4	A	1371/1733 (79%)	1326 (97%)	45 (3%)	0	100	100
5	B	1101/1224 (90%)	1081 (98%)	20 (2%)	0	100	100
6	C	265/318 (83%)	259 (98%)	6 (2%)	0	100	100
7	E	211/215 (98%)	198 (94%)	13 (6%)	0	100	100
8	F	84/155 (54%)	83 (99%)	1 (1%)	0	100	100
9	H	129/146 (88%)	123 (95%)	6 (5%)	0	100	100
10	I	116/122 (95%)	113 (97%)	3 (3%)	0	100	100
11	J	63/70 (90%)	63 (100%)	0	0	100	100
12	K	112/120 (93%)	111 (99%)	1 (1%)	0	100	100
13	L	41/70 (59%)	40 (98%)	1 (2%)	0	100	100
All	All	3493/4173 (84%)	3397 (97%)	96 (3%)	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	
4	A	1191/1520 (78%)	1191 (100%)	0	100	100
5	B	954/1061 (90%)	954 (100%)	0	100	100
6	C	235/274 (86%)	235 (100%)	0	100	100
7	E	194/197 (98%)	194 (100%)	0	100	100
8	F	73/137 (53%)	73 (100%)	0	100	100
9	H	114/128 (89%)	114 (100%)	0	100	100
10	I	110/116 (95%)	110 (100%)	0	100	100
11	J	60/65 (92%)	60 (100%)	0	100	100
12	K	99/102 (97%)	99 (100%)	0	100	100
13	L	36/57 (63%)	36 (100%)	0	100	100
All	All	3066/3657 (84%)	3066 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 32 such sidechains are listed below:

Mol	Chain	Res	Type
9	H	33	GLN
9	H	134	ASN
4	A	1222	ASN
4	A	1187	GLN
10	I	46	HIS

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	R	8/9 (88%)	1 (12%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	R	9	G

There are no RNA pucker outliers to report.

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

1 non-standard protein/DNA/RNA residue is 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	$\#\|Z\| > 2$
2	8OG	T	19	2	22,25,26	3.97	18 (81%)	26,37,40	1.50	5 (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
2	8OG	T	19	2	-	4/7/21/22	0/3/3/3

The worst 5 of 18 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	T	19	8OG	C8-N7	7.26	1.51	1.38
2	T	19	8OG	C8-N9	6.14	1.51	1.40
2	T	19	8OG	C2-N3	5.78	1.47	1.33
2	T	19	8OG	C4-N3	5.61	1.47	1.34
2	T	19	8OG	C2-N2	4.74	1.45	1.34

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	T	19	8OG	C2-N3-C4	3.63	118.55	112.30
2	T	19	8OG	C5-N7-C8	-2.77	105.65	109.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	T	19	8OG	O6-C6-C5	-2.57	121.06	127.26
2	T	19	8OG	C4-C5-N7	2.46	110.57	106.06
2	T	19	8OG	C5-C6-N1	2.24	118.29	112.13

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	T	19	8OG	O4'-C4'-C5'-O5'
2	T	19	8OG	C3'-C4'-C5'-O5'
2	T	19	8OG	C4'-C5'-O5'-P
2	T	19	8OG	C2'-C1'-N9-C8

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 10 ligands modelled in this entry, 9 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	$\#\|Z\| > 2$
16	2TM	B	2101	-	26,30,30	3.98	15 (57%)	39,47,47	0.96	2 (5%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
16	2TM	B	2101	-	-	4/19/38/38	0/2/2/2

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
16	B	2101	2TM	PB-O3B	7.73	1.67	1.58
16	B	2101	2TM	C2'-C3'	-7.14	1.34	1.53
16	B	2101	2TM	C2-N3	6.50	1.49	1.36
16	B	2101	2TM	O4'-C4'	6.38	1.59	1.45
16	B	2101	2TM	C6-C5	6.10	1.49	1.35

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
16	B	2101	2TM	C3'-C2'-C1'	2.53	106.25	101.46
16	B	2101	2TM	PB-O3B-PG	-2.35	124.02	132.45

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
16	B	2101	2TM	C3'-C4'-C5'-O5'
16	B	2101	2TM	O4'-C4'-C5'-O5'
16	B	2101	2TM	C5'-O5'-PA-O1A
16	B	2101	2TM	C4'-C5'-O5'-PA

There are no ring outliers.

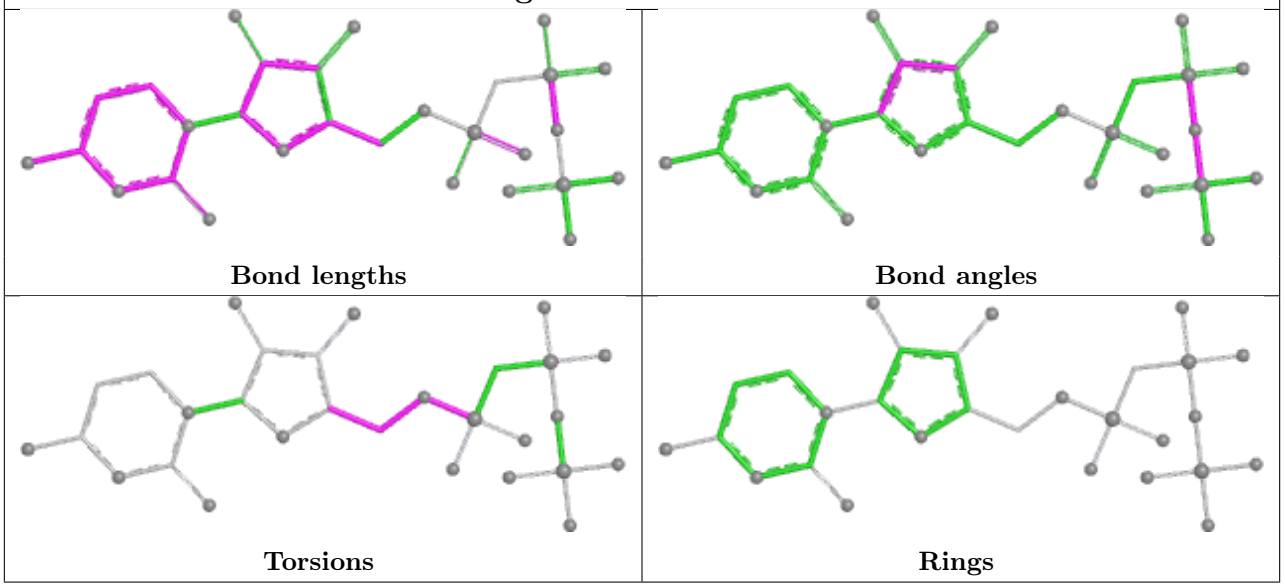
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
16	B	2101	2TM	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 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 2TM B 2101



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, 95^{th} 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	R	9/9 (100%)	0.00	0 100 100	76, 86, 172, 223	0
2	T	25/29 (86%)	0.15	0 100 100	90, 188, 241, 268	0
3	N	15/18 (83%)	0.19	0 100 100	143, 205, 241, 253	0
4	A	1385/1733 (79%)	-0.07	16 (1%) 76 55	74, 121, 184, 241	0
5	B	1121/1224 (91%)	0.02	18 (1%) 70 49	52, 106, 170, 250	0
6	C	267/318 (83%)	-0.17	2 (0%) 84 67	73, 111, 158, 195	0
7	E	213/215 (99%)	-0.33	0 100 100	83, 144, 211, 252	0
8	F	86/155 (55%)	-0.25	0 100 100	76, 110, 158, 178	0
9	H	133/146 (91%)	-0.03	2 (1%) 71 51	106, 146, 202, 220	0
10	I	118/122 (96%)	-0.06	0 100 100	88, 137, 194, 229	0
11	J	65/70 (92%)	0.14	2 (3%) 51 33	65, 99, 134, 165	0
12	K	114/120 (95%)	-0.23	0 100 100	63, 103, 147, 185	0
13	L	43/70 (61%)	0.08	1 (2%) 61 41	93, 195, 256, 274	0
All	All	3594/4229 (84%)	-0.06	41 (1%) 77 57	52, 118, 188, 274	0

The worst 5 of 41 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
5	B	775	LYS	4.7
4	A	103	CYS	3.6
5	B	899	ILE	3.6
13	L	32	ALA	3.5
5	B	819	ALA	3.5

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, 95^{th} 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
2	8OG	T	19	23/24	0.88	0.11	88,96,112,144	0

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

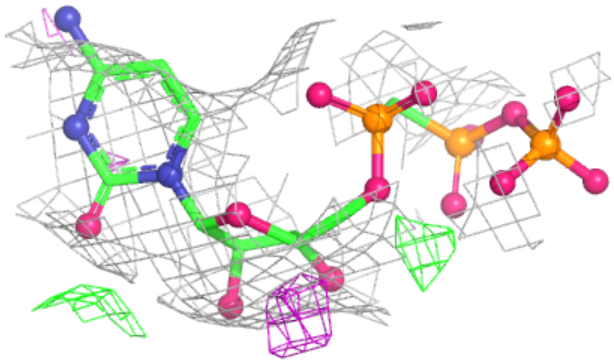
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

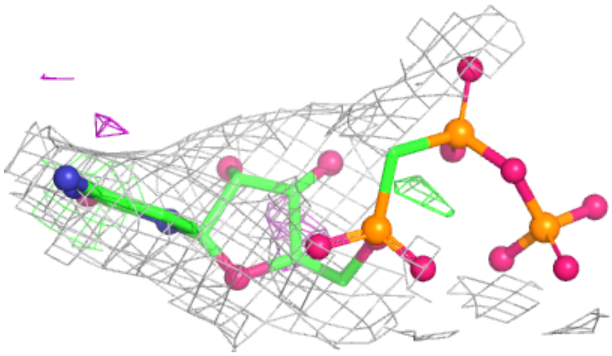
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
14	ZN	I	202	1/1	0.65	0.19	209,209,209,209	0
14	ZN	L	101	1/1	0.78	0.11	309,309,309,309	0
16	2TM	B	2101	29/29	0.87	0.09	38,77,133,172	0
14	ZN	A	1801	1/1	0.92	0.07	240,240,240,240	0
14	ZN	J	101	1/1	0.92	0.09	145,145,145,145	0
14	ZN	C	401	1/1	0.93	0.10	148,148,148,148	0
14	ZN	B	2102	1/1	0.98	0.04	163,163,163,163	0
15	MG	A	1803	1/1	0.98	0.05	62,62,62,62	0
14	ZN	A	1802	1/1	0.98	0.03	121,121,121,121	0
14	ZN	I	201	1/1	0.99	0.03	110,110,110,110	0

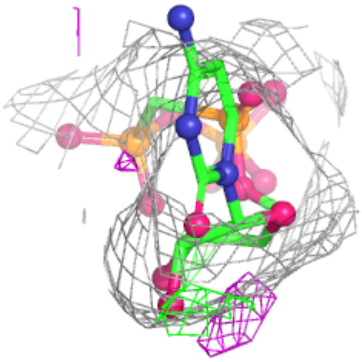
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around 2TM B 2101:

$2mF_o$-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.