WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Oct 31, 2023 – 12:52 PM EDT

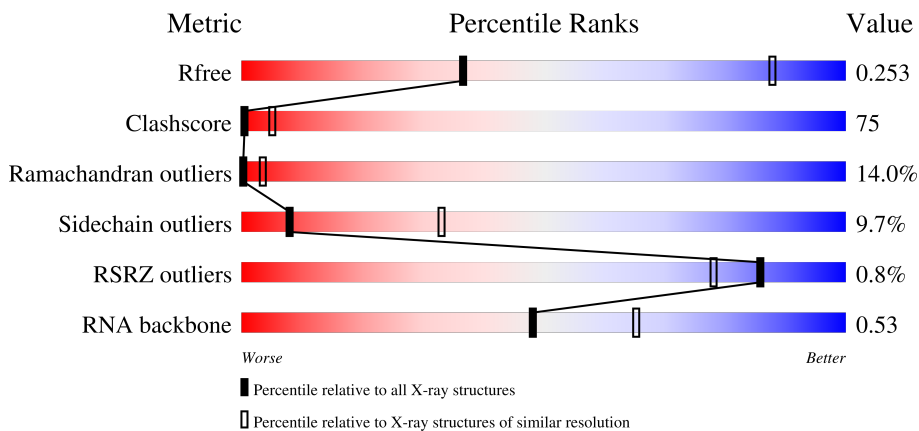|		
PDB ID	:	3I4M
Title	:	8-oxoguanine containing RNA polymerase II elongation complex D
Authors	:	Damsma, G.E.; Cramer, P.
Deposited on	:	2009-07-02
Resolution	:	3.70 Å(reported)

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 3.70 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.
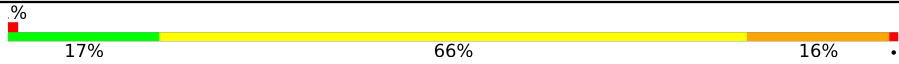
Metric	Percentile Ranks	Value
Rfree		0.253
Clashscore		75
Ramachandran outliers		14.0%
Sidechain outliers		9.7%
RSRZ outliers		0.8%
RNA backbone		0.53

Worse ... *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution
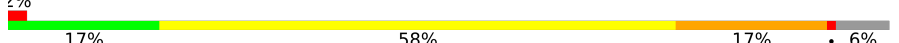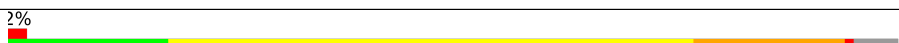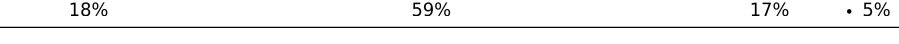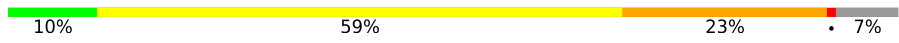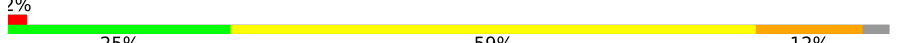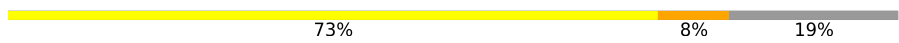
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	1049 (3.88-3.52)
Clashscore	141614	1027 (3.86-3.54)
Ramachandran outliers	138981	1069 (3.88-3.52)
Sidechain outliers	138945	1065 (3.88-3.52)
RSRZ outliers	127900	1578 (3.90-3.50)
RNA backbone	3102	1027 (4.40-3.00)

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	A	1733	16% · 53% · 13% · 18%
2	B	1224	% · 17% · 58% · 16% · 8%
3	C	324	18% · 50% · 15% · 17%
4	D	221	2% · 19% · 51% · 13% · 15%

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Mol	Chain	Length	Quality of chain
5	E	215	% 17% 66% 16%
6	F	155	9% 42% 5% 43%
7	G	171	28% 60% 11%
8	H	146	2% 17% 58% 17% 6%
9	I	122	2% 18% 59% 17% 5%
10	J	70	10% 59% 23% 7%
11	K	120	2% 25% 59% 12%
12	L	70	% 39% 24% 33%
13	T	26	73% 8% 19%
14	N	12	8% 25% 67% 8%
15	P	16	6% 19% 38% 6% 38%

2   Entry composition ⓘ

There are 17 unique types of molecules in this entry. The entry contains 32355 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	1429	Total	C	N	O	S	0	0	0
			11240	7079	1966	2133	62			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	1125	Total	C	N	O	S	0	0	0
			8942	5659	1571	1657	55			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	270	Total	C	N	O	S	0	0	0
			2125	1336	353	422	14			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-5	HIS	-	EXPRESSION TAG	UNP P16370
C	-4	HIS	-	EXPRESSION TAG	UNP P16370
C	-3	HIS	-	EXPRESSION TAG	UNP P16370
C	-2	HIS	-	EXPRESSION TAG	UNP P16370
C	-1	HIS	-	EXPRESSION TAG	UNP P16370
C	0	HIS	-	EXPRESSION TAG	UNP P16370

- Molecule 4 is a protein called DNA-directed RNA polymerase II subunit RPB4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	187	Total	C	N	O	S	0	0	0
			1504	930	269	301	4			

- Molecule 5 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC1.

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

- Molecule 6 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
6	F	88	712	455	120	134	3	0	0	0

- Molecule 7 is a protein called DNA-directed RNA polymerase II subunit RPB7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
7	G	171	1340	861	222	249	8	0	0	0

- Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
8	H	137	1101	693	185	218	5	0	0	0

- Molecule 9 is a protein called DNA-directed RNA polymerase II subunit RPB9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
9	I	116	944	581	172	181	10	0	0	0

- Molecule 10 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC5.

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

- Molecule 11 is a protein called DNA-directed RNA polymerase II subunit RPB11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
11	K	116	929	596	158	173	2	0	0	0

- Molecule 12 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	47	Total 370	C 228	N 73	O 65	S 4	0	0	0

- Molecule 13 is a DNA chain called DNA (5'-D(*AP*G*CP*TP*CP*AP*AP*GP*TP*AP*CP*TP*TP*AP*(8OG)P*GP*CP*CP*(BRU)P*GP*GP*TP*CP*AP*TP*T)-3').

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
13	T	21	Total 426	Br 1	C 203	N 75	O 127	P 20	0	0	0

- Molecule 14 is a DNA chain called DNA (5'-D(*AP*GP*TP*AP*CP*TP*TP*GP*AP*GP*CP*T)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
14	N	11	Total 224	C 108	N 42	O 64	P 10	0	0	0

- Molecule 15 is a RNA chain called RNA (5'-R(*UP*GP*CP*AP*UP*C*UP*UP*CP*CP*AP*GP*GP*CP*CP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
15	P	10	Total 205	C 93	N 33	O 70	P 9	0	0	0

- Molecule 16 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 17 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
17	A	2	Total 2	Zn 2	0	0
17	B	1	Total 1	Zn 1	0	0
17	C	1	Total 1	Zn 1	0	0
17	I	2	Total 2	Zn 2	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
17	J	1	Total 1	Zn 1	0	0
17	L	1	Total 1	Zn 1	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

PRO SER TYR SER PRO THR SER PRO ASN TYR SER PRO THR SER PRO SER TYR SER PRO THR SER PRO SER PRO ALA TYR SER PRO LYS GLN ASP GLU GLN LYS HIS ASN GLU ASN SER ARG

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

Chain B:

%

17%   58%   16%   •   8%

G867 M868 S869 I870 T871 E872 T873 F874 E875 K876 P877 Q878 R879 T880 N881 T882 L883 R884 Y890 D891 K892 L893 D894 D895 D896 G897 L898 I899 A900 P901 G902 V903 R904 V905 S906 G907 E908 D909 V910 I911 I912 G913 K914 T915 T916 P917 I918 S919 PRO ASP GLU GLU GLU LEU GLY GLN ARG THR ALA

TYR HIS S933 K934 R935 D936 A937 S938 L941 R942 S943 T944 E945 N946 V949 D950 Q951 V952 L953 V954 T955 N957 Q958 D959 G960 L961 K962 F963 V964 K965 V966 R967 V968 R969 T970 T971 K972 I973 P974 Q975 I976 G977 D978 K979 F980 A981 S982 R983 H984 G985 Q986 K987 I990 G991 I992 T993

Y994 R995 R996 E997 D998 M999 P1000 F1001 T1002 A1003 E1004 G1005 I1006 V1007 P1008 D1009 L1010 I1011 I1012 N1013 A1016 I1017 P1018 S1019 R1020 M1021 T1022 V1023 A1024 H1025 L1026 I1027 E1028 C1029 L1030 L1031 S1032 K1033 V1034 A1035 A1036 L1037 S1038 G1039 N1040 E1041 A1044 S1045 P1046 F1047 T1048 D1049 I1050 I1051 V1052 E1053 G1054 I1055

S1056 K1057 L1058 L1059 R1060 E1061 H1062 G1063 Y1064 Q1065 S1066 R1067 G1068 F1069 E1070 V1071 M1072 Y1073 N1074 G1075 H1076 T1077 K1080 L1081 M1082 A1083 Q1084 I1085 F1086 F1087 Y1091 Y1092 Q1093 R1094 L1095 R1096 H1097 M1098 V1099 D1100 D1101 K1102 H1104 A1105 R1106 A1107 R1108 G1109 P1110 M1111 Q1112 T1115 R1116 Q1117 P1118 V1119

E1120 G1121 R1122 D1125 G1126 G1127 L1128 R1129 F1130 G1131 E1132 M1133 E1134 R1135 D1136 C1137 M1138 I1139 A1140 H1141 G1142 A1143 A1144 S1145 F1146 L1147 K1148 E1149 R1150 L1151 M1152 E1153 A1154 S1155 D1156 A1157 F1158 R1159 I1162 C1163 G1164 I1165 C1166 G1167 L1168 M1169 T1170 V1171 K1174 L1175 N1176 H1177 N1178 Q1179 F1180 E1181 C1182

K1183 G1184 C1185 D1186 N1187 K1188 I1191 Y1192 Q1193 I1194 H1195 I1196 P1197 Y1198 A1199 A1200 K1201 L1202 L1203 F1204 Q1205 E1206 L1207 N1211 P1214 R1215 L1216 Y1217 T1218 D1219 R1220 S1221 R1222 D1223 F1224
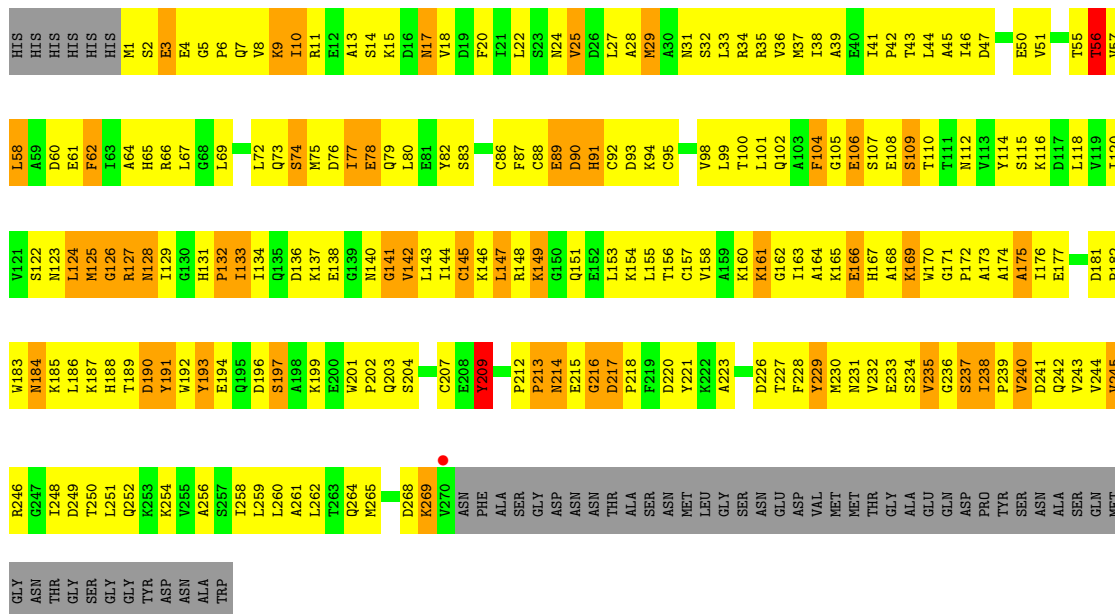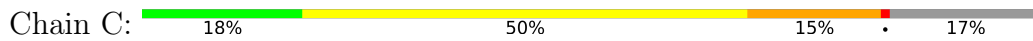
● Molecule 3: DNA-directed RNA polymerase II subunit RPB3

Chain C: 18%   50%   15%   •   17%

HIS HIS HIS HIS HIS HIS M1 S2 E3 E4 G5 P6 Q7 V8 K9 I10 R11 E12 A13 S14 K15 D16 N17 V18 D19 F20 I21 L22 S23 N24 V25 D26 L27 A28 M29 A30 N31 S32 L33 R34 R35 V36 M37 I38 A39 E40 I41 P42 T43 L44 A45 I46 D47 E50 V51 T55 T56 V57

L58 A59 D60 E61 F62 I63 A64 H65 R66 L67 G68 L69 L72 Q73 S74 M75 D76 I77 E78 Q79 L80 E81 Y82 S83 C86 F87 C88 E89 D90 H91 C92 D93 K94 C95 V98 L99 T100 L101 Q102 A103 F104 G105 E106 S107 E108 S109 T110 T111 N112 V113 Y114 S115 K116 D117 L118 V119 I120

V121 S122 N123 L124 M125 G126 R127 N128 I129 G130 H131 P132 I133 I134 Q135 D136 K137 E138 G139 N140 G141 V142 L143 L144 C145 K146 L147 R148 K149 G150 Q151 E152 L153 K154 L155 T156 C157 V158 A159 K160 K161 G162 I163 A164 K165 E166 H167 A168 K169 W170 G171 P172 A173 A174 A175 I176 E177 D181 P182

W183 N184 K185 L186 K187 H188 T189 D190 Y191 W192 Y193 E194 Q195 D196 S197 A198 K199 E200 W201 P202 Q203 S204 C207 E208 Y209 P212 P213 N214 E215 G216 D217 P218 F219 D220 Y221 K222 A223 D226 T227 F228 Y229 M230 N231 V232 E233 S234 V235 G236 S237 I238 P239 V240 D241 Q242 V243 V244 V245

R246 G247 I248 D249 T250 L251 Q252 K253 K254 V255 A256 S257 I258 L259 L260 A261 L262 T263 Q264 M265 D268 K269 V270 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

GLY ASN THR GLY SER GLY GLY TYR ASP ASN ALA TRP

● Molecule 4: DNA-directed RNA polymerase II subunit RPB4

Chain D: 2%   19%   51%   13%   •   15%

M1 N2 V3 S4 T7 F8 Q9 T10 R11 R12 R13 R14 L15 K16 K17 V18 E19 E20 E21 E22 N23 A24 A25 T26 L27 Q28 L29 G30 Q31 E32 F33 F34 Q37 I38 N39 H40 Q41 G42 E43 E46 L47 I48 A49 L50 N51 L52 S53 E54 A55 R56 L57 V58 I59 K60 E61 A62 I63

• Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC1
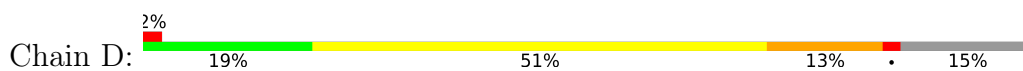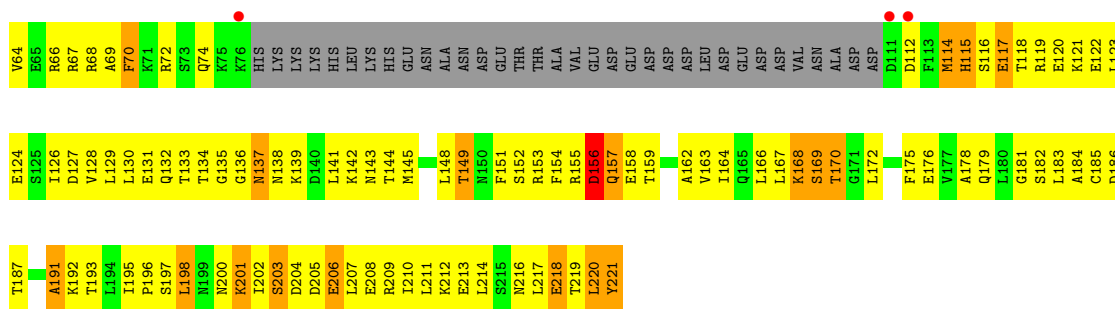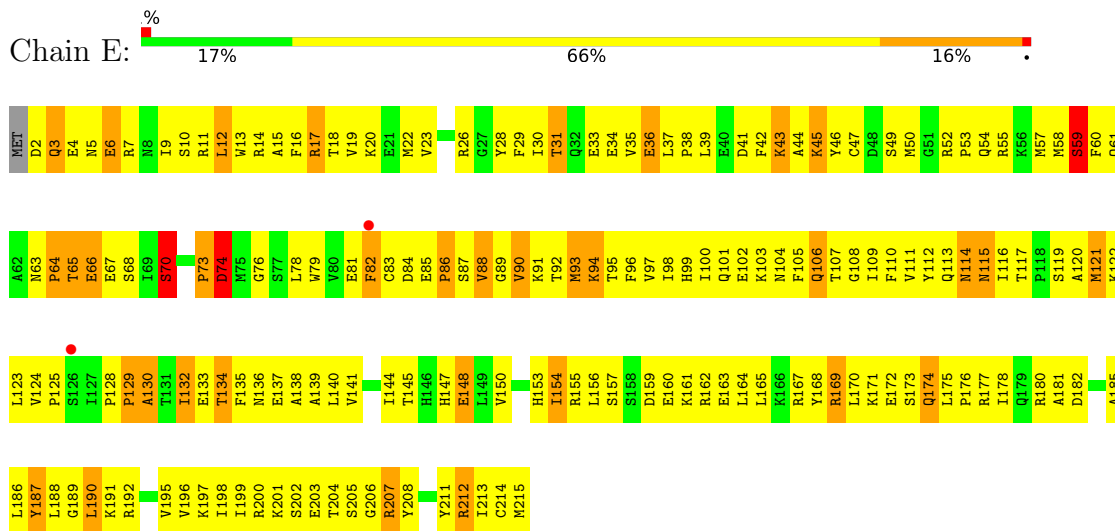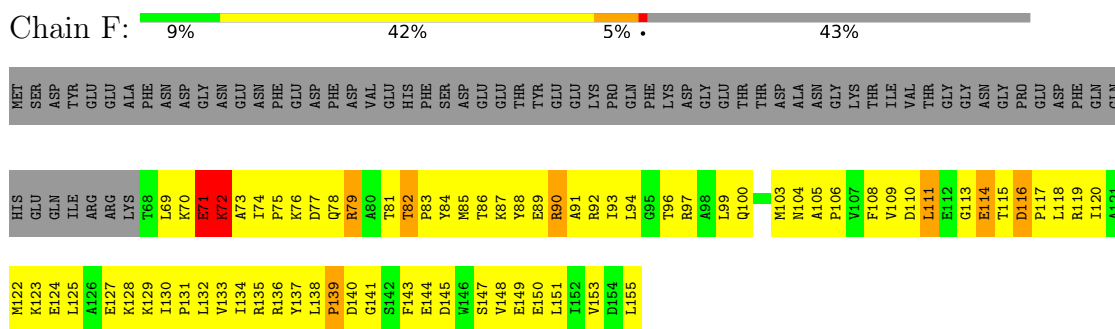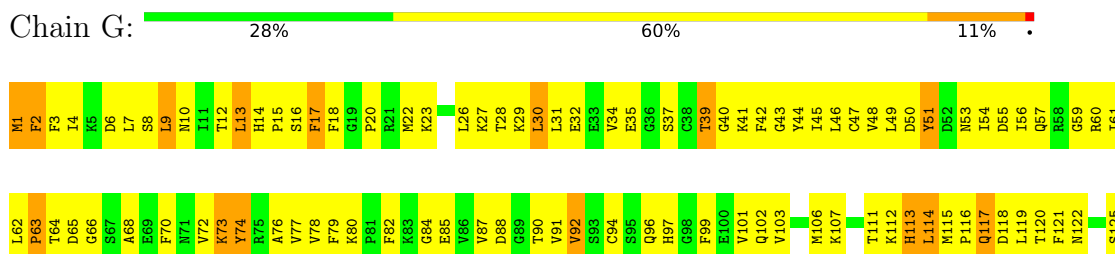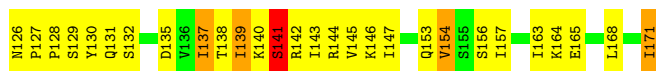

• Molecule 6: DNA-directed RNA polymerases I, II, and III subunit RPABC2
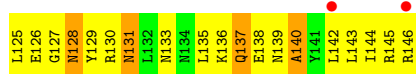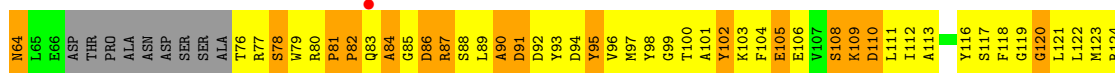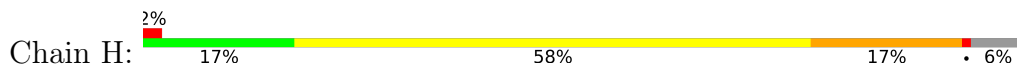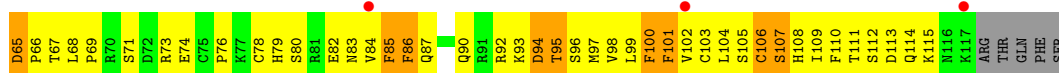

• Molecule 7: DNA-directed RNA polymerase II subunit RPB7

N126 P127 P128 S129 Y130 Q131 S132 D135 V136 I137 T138 I139 K140 S141 R142 I143 R144 V145 K146 I147 Q153 V154 S155 S156 I157 I163 K164 E165 L168 I171
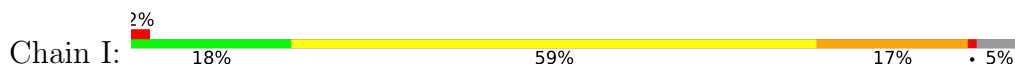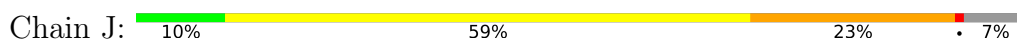
• Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC3

Chain H:

2%

17%　　　　　58%　　　　　17%　　　6%

M1 S2 N3 T4 L5 F6 D7 D8 I9 F10 Q11 V12 S13 E14 V15 D16 P17 G18 R19 Y20 C24 R25 I26 E27 A28 A29 S30 T31 T32 Q33 D34 Q35 C36 K37 L38 T39 L40 D41 I42 N43 V44 E45 L46 F47 P48 V49 Q52 D53 S54 L55 T56 V57 T58 I59 A60 S61 S62 L63

N64 L65 E66 ASP THR PRO ALA ASN ASP SER SER ALA T76 R77 S78 W79 R80 P81 P82 Q83 A84 G85 D86 R87 S88 L89 A90 D91 D92 Y93 D94 Y95 V96 M97 Y98 G99 T100 A101 Y102 K103 F104 E105 E106 V107 S108 K109 D110 L111 I112 A113 Y116 S117 F118 G119 G120 L121 L122 M123 R124

L125 E126 G127 N128 Y129 R130 N131 L132 N133 M134 L135 K136 Q137 E138 N139 A140 Y141 L142 L143 I144 R145 R146

• Molecule 9: DNA-directed RNA polymerase II subunit RPB9

Chain I:

2%

18%　　　　　59%　　　　　17%　　　5%

MET T2 T3 F4 R5 F6 C7 R8 D9 C10 N11 N12 M13 L14 Y15 P16 R17 N22 N23 R24 L25 L26 F27 E28 C29 R30 T31 C32 S33 Y34 V35 E36 E37 A38 G39 S40 P41 Y44 R45 H46 E47 L48 I49 T50 N51 I52 G53 E54 T55 A56 G57 V58 V59 Q60 D61 I62 G63 S64

D65 P66 T67 L68 P69 R70 S71 D72 R73 E74 C75 P76 K77 C78 H79 S80 R81 E82 N83 V84 F85 F86 Q87 Q90 R91 R92 K93 D94 T95 S96 M97 V98 L99 F100 F101 V102 C103 L104 S105 C106 S107 H108 I109 F110 T111 S112 D113 Q114 K115 N116 K117 ARG THR GLN PHE SER

• Molecule 10: DNA-directed RNA polymerases I, II, and III subunit RPABC5

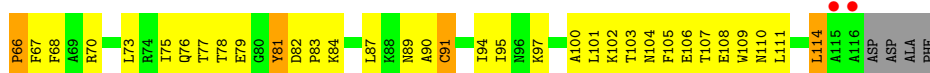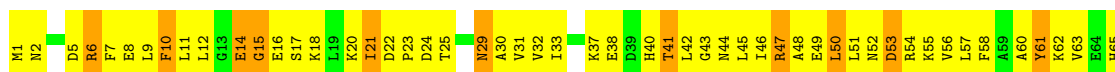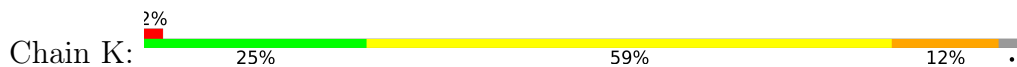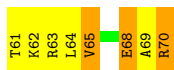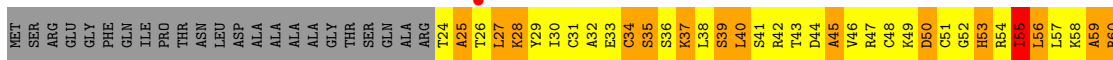Chain J:

10%　　　　　59%　　　　　23%　　　7%

M1 I2 V3 P4 V5 R6 C7 F8 S9 C10 G11 K12 V13 V14 G15 D16 K17 W18 E19 S20 Y21 L22 N23 L24 L25 Q26 E27 D28 E29 L30 D31 E32 G33 T34 A35 L36 S37 R38 L39 K42 R43 Y44 C45 C46 R47 R48 M49 I50 L51 T52 H53 V54 D55 L56 I57 E58 K59 F60 L61

R62 Y63 N64 P65 LEU GLU LYS ARG ASP

• Molecule 11: DNA-directed RNA polymerase II subunit RPB11

Chain K:

2%

25%　　　　　59%　　　　　12%

M1 N2 D5 R6 F7 E8 L9 F10 L11 L12 G13 E14 G15 E16 S17 K18 L19 K20 I21 D22 P23 D24 T25 N29 A30 V31 V32 I33 K37 E38 D39 H40 T41 L42 G43 N44 L45 I46 R47 A48 E49 L50 L51 N52 D53 R54 K55 V56 L57 F58 A59 A60 Y61 K62 V63 E64 H65

P66 F67 F68 A69 R70 L73 R74 I75 Q76 T77 T78 E79 G80 Y81 D82 P83 K84 L87 K88 N89 A90 C91 I94 I95 N96 K97 A100 L101 K102 T103 N104 F105 E106 T107 E108 W109 N110 L111 L114 A115 A116 ASP ASP ALA PHE

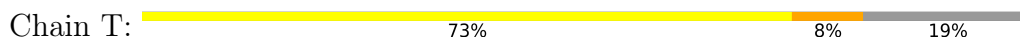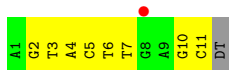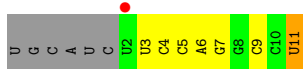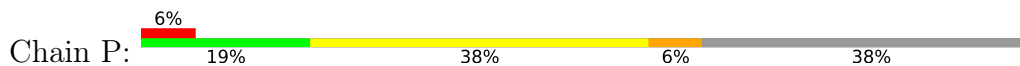• Molecule 12: DNA-directed RNA polymerases I, II, and III subunit RPABC4

Chain L:

• Molecule 13: DNA (5'-D(*AP*G*CP*TP*CP*AP*AP*GP*TP*AP*CP*TP*TP*AP*(8OG)P
*GP*CP*CP*(BRU)P*GP*GP*TP*CP*AP*TP*T)-3')

Chain T:
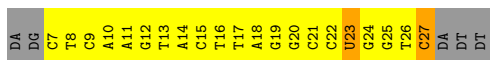
• Molecule 14: DNA (5'-D(*AP*GP*TP*AP*CP*TP*TP*GP*AP*GP*CP*T)-3')

Chain N:

• Molecule 15: RNA (5'-R(*UP*GP*CP*AP*UP*C*UP*UP*CP*CP*AP*GP*GP*CP*CP*U)-3
')

Chain P:

4   Data and refinement statistics ⓘ

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	220.65Å 392.00Å 281.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 3.70 49.00 – 3.70	Depositor EDS
% Data completeness (in resolution range)	99.6 (50.00-3.70) 100.0 (49.00-3.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$< I/\sigma(I) >$ [1]	1.93 (at 3.67Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.225 , 0.258 0.227 , 0.253	Depositor DCC
R_{free} test set	2439 reflections (1.88%)	wwPDB-VP
Wilson B-factor (Å^2)	114.2	Xtriage
Anisotropy	0.492	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 97.9	EDS
L-test for twinning[2]	$< |L| > = 0.45, < L^2 > = 0.27$	Xtriage
Estimated twinning fraction	0.029 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.034 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	32355	wwPDB-VP
Average B, all atoms (Å^2)	89.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.80% 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: ZN, MG, 8OG, BRU

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	0.44	0/11441	0.74	3/15473 (0.0%)
2	B	0.41	0/9116	0.70	0/12291
3	C	0.42	0/2163	0.69	0/2930
4	D	0.38	0/1516	0.63	0/2031
5	E	0.39	0/1788	0.64	0/2406
6	F	0.52	0/724	0.82	0/977
7	G	0.44	0/1368	0.72	0/1844
8	H	0.37	0/1119	0.68	0/1514
9	I	0.38	0/962	0.66	0/1295
10	J	0.44	0/541	0.74	0/727
11	K	0.46	0/947	0.68	0/1279
12	L	0.39	0/372	0.68	0/495
13	T	0.56	1/426 (0.2%)	0.87	0/650
14	N	0.41	0/251	0.81	0/386
15	P	0.42	0/227	0.80	0/351
All	All	0.43	1/32961 (0.0%)	0.71	3/44649 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
2	B	0	1
All	All	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
13	T	27	DC	C1'-N1	5.98	1.57	1.49

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	567	LYS	C-N-CD	5.82	140.63	128.40
1	A	3	GLY	N-CA-C	-5.75	98.73	113.10
1	A	509	LEU	CA-CB-CG	-5.00	103.79	115.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1035	TYR	Sidechain
2	B	797	TYR	Sidechain

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	11240	0	11311	1819	0
2	B	8942	0	8986	1481	0
3	C	2125	0	2090	340	0
4	D	1504	0	1518	205	0
5	E	1752	0	1776	286	0
6	F	712	0	738	138	0
7	G	1340	0	1357	217	0
8	H	1101	0	1075	206	0
9	I	944	0	901	162	0
10	J	532	0	542	129	0
11	K	929	0	939	135	0
12	L	370	0	394	90	0
13	T	426	0	236	37	0
14	N	224	0	126	11	0
15	P	205	0	109	8	0
16	A	1	0	0	0	0
17	A	2	0	0	0	0
17	B	1	0	0	0	0
17	C	1	0	0	0	0
17	I	2	0	0	0	0
17	J	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
17	L	1	0	0	0	0
All	All	32355	0	32098	4821	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 75.

The worst 5 of 4821 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)
2:B:69:LEU:HD13	2:B:429:PHE:CD1	1.39	1.55
2:B:69:LEU:HD13	2:B:429:PHE:CE1	1.66	1.30
2:B:577:ALA:HB1	2:B:589:VAL:HG11	1.24	1.17
2:B:806:THR:HG22	2:B:808:ALA:H	1.08	1.16
2:B:340:ALA:HB3	2:B:343:ILE:HG12	1.29	1.15

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	1421/1733 (82%)	909 (64%)	310 (22%)	202 (14%)	0	3
2	B	1111/1224 (91%)	694 (62%)	257 (23%)	160 (14%)	0	3
3	C	268/324 (83%)	164 (61%)	66 (25%)	38 (14%)	0	3
4	D	183/221 (83%)	108 (59%)	49 (27%)	26 (14%)	0	3
5	E	212/215 (99%)	134 (63%)	49 (23%)	29 (14%)	0	3
6	F	86/155 (56%)	60 (70%)	20 (23%)	6 (7%)	1	15
7	G	169/171 (99%)	127 (75%)	32 (19%)	10 (6%)	1	18
8	H	133/146 (91%)	72 (54%)	37 (28%)	24 (18%)	0	1

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
9	I	114/122 (93%)	73 (64%)	26 (23%)	15 (13%)	0	4
10	J	63/70 (90%)	34 (54%)	13 (21%)	16 (25%)	0	0
11	K	114/120 (95%)	79 (69%)	26 (23%)	9 (8%)	1	12
12	L	45/70 (64%)	19 (42%)	11 (24%)	15 (33%)	0	0
All	All	3919/4571 (86%)	2473 (63%)	896 (23%)	550 (14%)	0	3

5 of 550 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	4	GLN
1	A	41	MET
1	A	43	GLU
1	A	48	ALA
1	A	58	LEU

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	1249/1520 (82%)	1135 (91%)	114 (9%)	9	36
2	B	974/1061 (92%)	879 (90%)	95 (10%)	8	33
3	C	238/280 (85%)	215 (90%)	23 (10%)	8	33
4	D	167/200 (84%)	145 (87%)	22 (13%)	4	22
5	E	196/197 (100%)	179 (91%)	17 (9%)	10	38
6	F	78/137 (57%)	69 (88%)	9 (12%)	5	27
7	G	152/152 (100%)	138 (91%)	14 (9%)	9	36
8	H	121/128 (94%)	112 (93%)	9 (7%)	13	44
9	I	110/116 (95%)	98 (89%)	12 (11%)	6	29
10	J	60/65 (92%)	55 (92%)	5 (8%)	11	40
11	K	99/102 (97%)	87 (88%)	12 (12%)	5	24
12	L	41/57 (72%)	35 (85%)	6 (15%)	3	18

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	3485/4015 (87%)	3147 (90%)	338 (10%)	8 33

5 of 338 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	245	VAL
7	G	73	LYS
4	D	43	GLU
5	E	74	ASP
8	H	91	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 130 such sidechains are listed below:

Mol	Chain	Res	Type
8	H	33	GLN
8	H	139	ASN
1	A	1354	ASN
1	A	1278	ASN
9	I	90	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
15	P	9/16 (56%)	1 (11%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
15	P	11	U

There are no RNA pucker outliers to report.

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

2 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	$\#\|Z\| > 2$
13	8OG	T	19	15,13	22,25,26	1.01	1 (4%)	30,37,40	1.55	4 (13%)
13	BRU	T	23	15,13	18,21,22	3.91	1 (5%)	26,30,33	0.97	2 (7%)

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
13	8OG	T	19	15,13	-	0/7/21/22	0/3/3/3
13	BRU	T	23	15,13	-	1/7/21/22	0/2/2/2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
13	T	23	BRU	BR-C5	-16.52	1.49	1.88
13	T	19	8OG	C8-N7	-3.70	1.31	1.38

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

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
13	T	19	8OG	N7-C8-N9	5.47	113.07	106.58
13	T	19	8OG	C5-N7-C8	-3.45	104.51	109.47
13	T	19	8OG	C2'-C1'-N9	2.75	119.27	116.01
13	T	23	BRU	C6-C5-C4	-2.59	118.04	120.67
13	T	19	8OG	C4-C5-N7	2.42	110.73	106.08

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
13	T	23	BRU	C2'-C1'-N1-C2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
13	T	23	BRU	1	0

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 9 ligands modelled in this entry, 9 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	1429/1733 (82%)	-0.31	1 (0%)	95	94	15, 72, 135, 195	0
2	B	1125/1224 (91%)	-0.15	14 (1%)	79	69	11, 88, 154, 194	0
3	C	270/324 (83%)	-0.29	1 (0%)	92	88	34, 73, 131, 174	0
4	D	187/221 (84%)	-0.15	4 (2%)	63	52	58, 98, 152, 197	0
5	E	214/215 (99%)	-0.26	2 (0%)	84	76	42, 112, 155, 161	0
6	F	88/155 (56%)	-0.47	0	100	100	24, 48, 91, 122	0
7	G	171/171 (100%)	-0.23	0	100	100	48, 74, 117, 128	0
8	H	137/146 (93%)	0.16	3 (2%)	62	50	91, 125, 152, 157	0
9	I	116/122 (95%)	-0.13	3 (2%)	56	43	65, 121, 152, 153	0
10	J	65/70 (92%)	-0.42	0	100	100	48, 67, 106, 121	0
11	K	116/120 (96%)	-0.32	2 (1%)	70	59	32, 79, 108, 160	0
12	L	47/70 (67%)	-0.05	1 (2%)	63	52	73, 124, 147, 159	0
13	T	19/26 (73%)	0.44	0	100	100	128, 194, 200, 200	0
14	N	11/12 (91%)	0.88	1 (9%)	9	7	186, 198, 200, 200	0
15	P	10/16 (62%)	0.33	1 (10%)	7	5	177, 193, 199, 200	0
All	All	4005/4625 (86%)	-0.22	33 (0%)	86	78	11, 83, 152, 200	0

The worst 5 of 33 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	471	LYS	6.2
2	B	883	LEU	3.8
11	K	116	ALA	3.4
2	B	504	ARG	3.3
2	B	722	ASP	3.2

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(Å^2)	Q<0.9
13	BRU	T	23	20/21	0.68	0.27	153,162,167,170	0
13	8OG	T	19	23/24	0.89	0.17	131,141,154,155	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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
17	ZN	I	1122	1/1	0.92	0.04	134,134,134,134	0
16	MG	A	2458	1/1	0.95	0.09	69,69,69,69	0
17	ZN	A	2456	1/1	0.96	0.07	96,96,96,96	0
17	ZN	L	1071	1/1	0.97	0.06	111,111,111,111	0
17	ZN	B	2225	1/1	0.99	0.21	43,43,43,43	0
17	ZN	J	1066	1/1	0.99	0.23	47,47,47,47	0
17	ZN	I	1121	1/1	0.99	0.12	70,70,70,70	0
17	ZN	A	2457	1/1	1.00	0.14	38,38,38,38	0
17	ZN	C	1269	1/1	1.00	0.12	39,39,39,39	0

6.5 Other polymers (i)

There are no such residues in this entry.