



# wwPDB X-ray Structure Validation Summary Report

Oct 22, 2023 – 02:24 PM EDT

PDB ID : 3AOI  
Title : RNA polymerase-Gfh1 complex (Crystal type 2)  
Authors : Tagami, S.; Sekine, S.; Kumarevel, T.; Yamamoto, M.; Yokoyama, S.; RIKEN  
Structural Genomics/Proteomics Initiative (RSGI)  
Deposited on : 2010-09-30  
Resolution : 4.30 Å (reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the  symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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

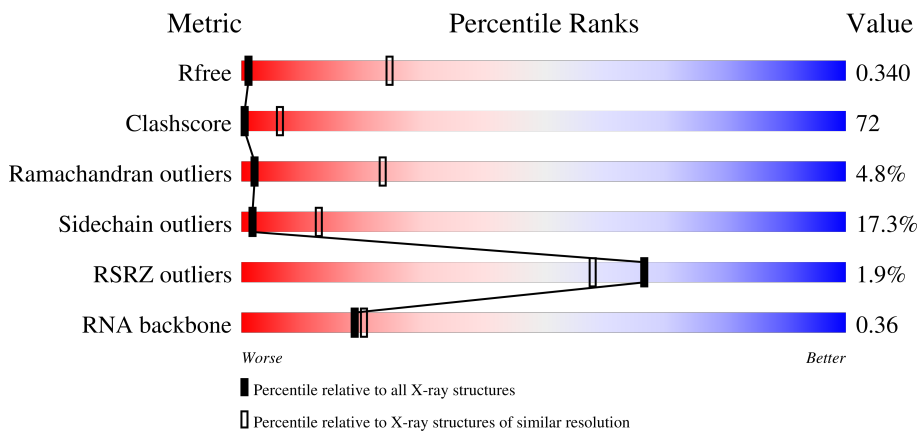
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 4.30 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	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1014 (4.80-3.80)
Clashscore	141614	1077 (4.80-3.80)
Ramachandran outliers	138981	1029 (4.80-3.80)
Sidechain outliers	138945	1012 (4.80-3.80)
RSRZ outliers	127900	1075 (4.90-3.70)
RNA backbone	3102	1058 (5.60-3.00)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	315	
1	B	315	
1	F	315	
1	G	315	

*Continued on next page...*

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Mol	Chain	Length	Quality of chain
1	K	315	% 20% 44% 7% 29%
1	L	315	% 22% 39% 9% 29%
2	C	1119	% 25% 55% 16% ..
2	H	1119	% 22% 58% 16% ..
2	M	1119	% 22% 59% 15% ..
3	D	1524	% 22% 52% 12% • 14%
3	I	1524	% 20% 49% 13% • 17%
3	N	1524	% 21% 53% 13% • 13%
4	E	99	% 32% 49% 11% • 6%
4	J	99	% 25% 57% 11% • 6%
4	O	99	% 25% 52% 16% • 6%
5	P	27	% • 19% • 74%
5	R	27	% • 19% 78%
5	T	27	% 7% 11% 81%
6	Q	32	% 6% 12% • 78%
6	S	32	% 12% 6% 12% 6% 75%
6	U	32	% • 9% 9% 78%
7	X	156	% 38% 51% 8% ..
7	Y	156	% 4% 35% 51% 11% •
7	Z	156	% 4% 40% 46% 10% ..

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 73646 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 subunit alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	223	Total	C	N	O	S	0	0	0
			1759	1123	306	328	2			
1	B	223	Total	C	N	O	S	0	0	0
			1759	1123	306	328	2			
1	F	223	Total	C	N	O	S	0	0	0
			1759	1123	306	328	2			
1	G	224	Total	C	N	O	S	0	0	0
			1764	1126	307	329	2			
1	K	225	Total	C	N	O	S	0	0	0
			1769	1129	308	330	2			
1	L	223	Total	C	N	O	S	0	0	0
			1759	1123	306	328	2			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	1083	Total	C	N	O	S	0	0	0
			8550	5413	1525	1588	24			
2	H	1080	Total	C	N	O	S	0	0	0
			8524	5395	1521	1584	24			
2	M	1084	Total	C	N	O	S	0	0	0
			8555	5413	1528	1590	24			

- Molecule 3 is a protein called DNA-directed RNA polymerase subunit beta'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	D	1316	Total	C	N	O	S	0	0	0
			10384	6574	1840	1941	29			
3	I	1262	Total	C	N	O	S	0	0	0
			9965	6314	1765	1858	28			
3	N	1327	Total	C	N	O	S	0	0	0
			10475	6634	1852	1961	28			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	E	93	Total	C	N	O	S	0	0	0
			754	481	131	138	4			
4	J	93	Total	C	N	O	S	0	0	0
			754	481	131	138	4			
4	O	93	Total	C	N	O	S	0	0	0
			754	481	131	138	4			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	P	7	Total	C	N	O	P	0	0	0
			136	65	25	40	6			
5	R	6	Total	C	N	O	P	0	0	0
			119	57	24	33	5			
5	T	5	Total	C	N	O	P	0	0	0
			98	47	19	28	4			

- Molecule 6 is a RNA chain called RNA (5'-R(\*CP\*CP\*CP\*GP\*GP\*AP\*AP\*GP\*AP\*UP\*CP\*AP\*UP\*CP\*UP\*UP\*CP\*CP\*GP\*GP\*GP\*GP\*GP\*AP\*U\*GP\*CP\*GP\*GP\*CP\*GP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	Q	7	Total	C	N	O	P	0	0	0
			152	68	31	47	6			
6	S	8	Total	C	N	O	P	0	0	0
			172	77	33	55	7			
6	U	7	Total	C	N	O	P	0	0	0
			152	68	31	47	6			

- Molecule 7 is a protein called Anti-cleavage anti-GreA transcription factor Gfh1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	X	154	Total	C	N	O	S	0	0	0
			1189	730	212	243	4			
7	Y	152	Total	C	N	O	S	0	0	0
			1169	719	207	239	4			
7	Z	152	Total	C	N	O	S	0	0	0
			1169	719	207	239	4			

- Molecule 8 is ZINC ION (three-letter code: ZN) (formula: Zn).

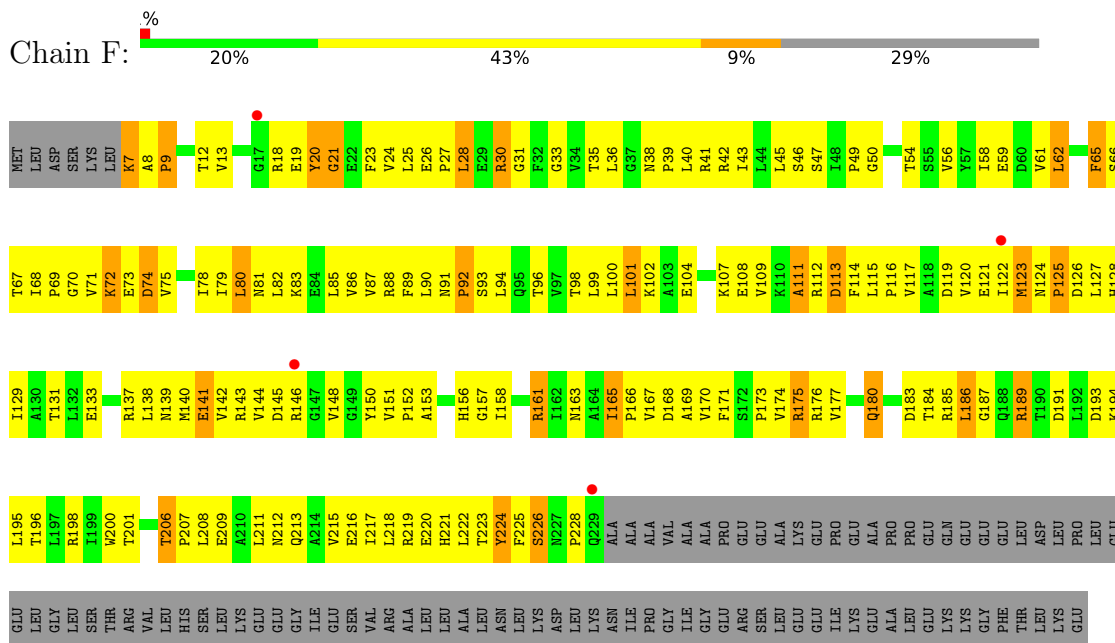
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	D	1	Total Zn 1 1	0	0
8	I	1	Total Zn 1 1	0	0
8	N	1	Total Zn 1 1	0	0

- Molecule 9 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

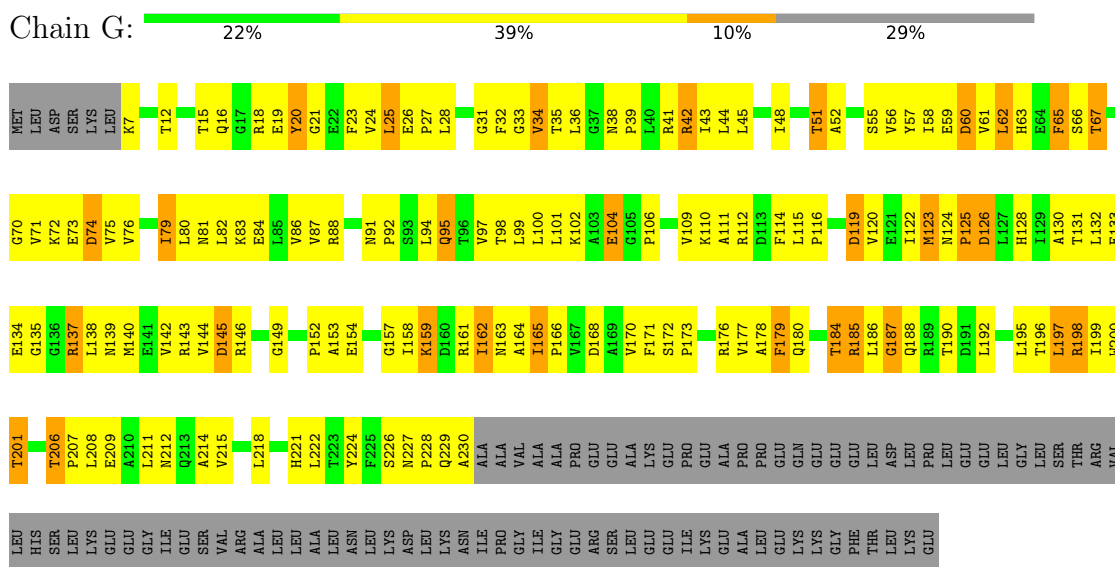
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	D	1	Total Mg 1 1	0	0
9	N	1	Total Mg 1 1	0	0
9	S	1	Total Mg 1 1	0	0



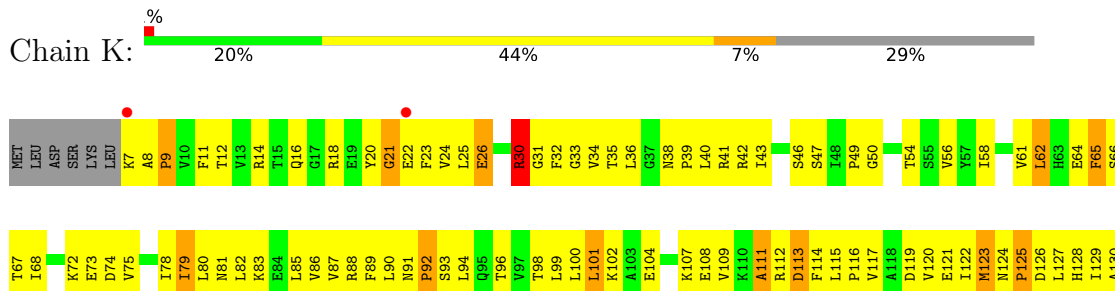
- Molecule 1: DNA-directed RNA polymerase subunit alpha



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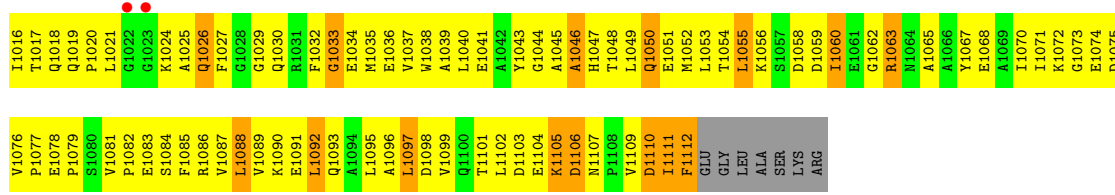




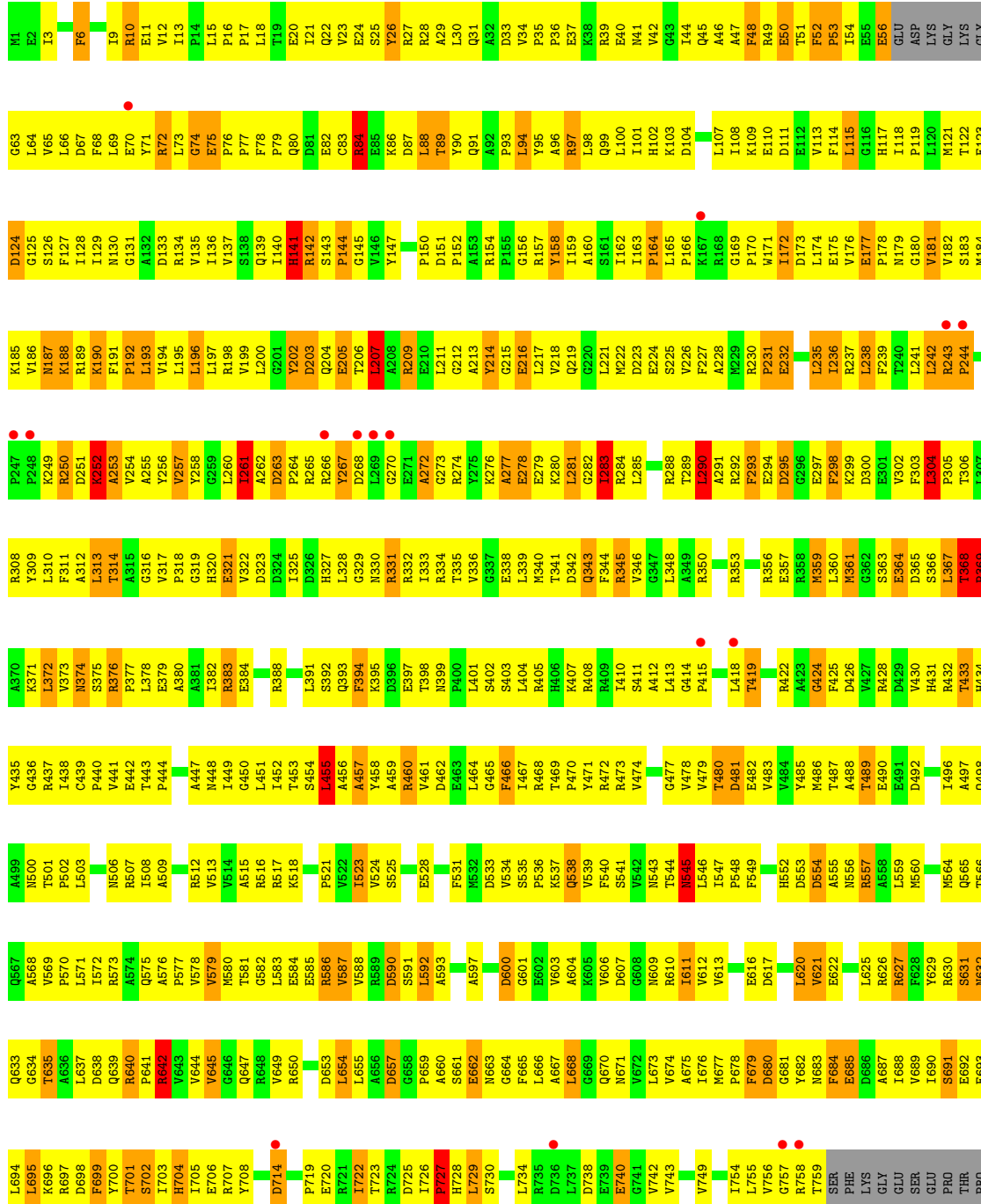


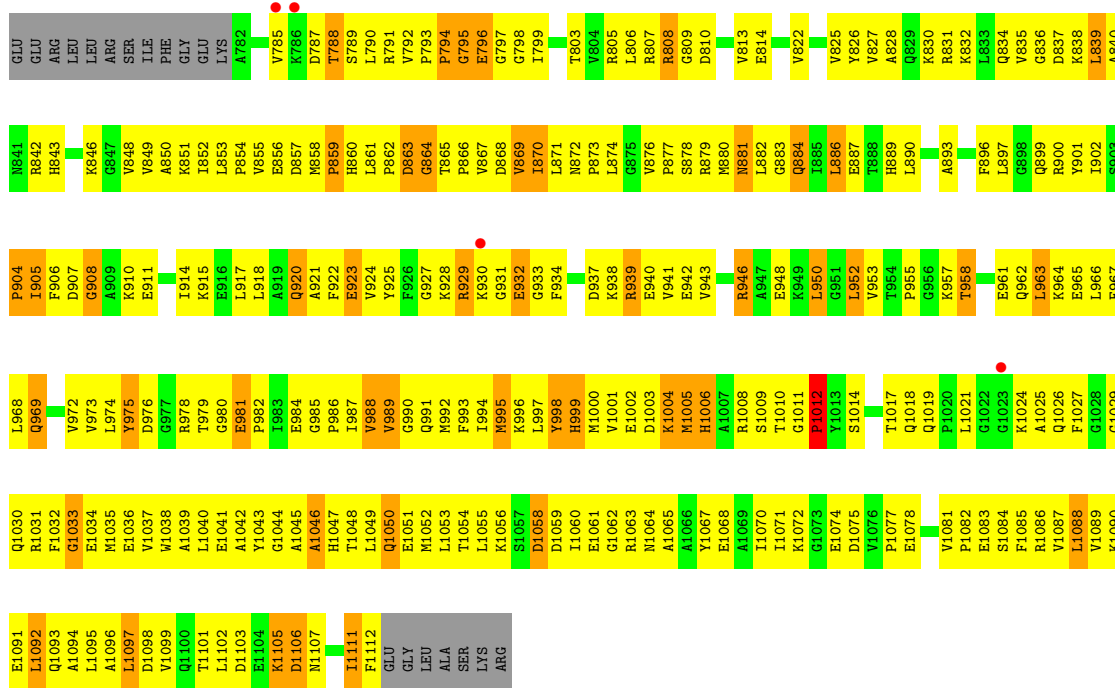


V65	S126	N187	R250	L310	K371	R432	T495	L559	L625	A687	PHE	Y826	E887	T984	V65
L66	F127	K188	D251	F311	L372	T483	I496	M560	R626	L688	LYS	V827	L890	P985	L66
D67	I128	R189	A253	A312	N373	H434	A497	M564	F628	V689	GLY	A828	L890	G956	D67
F68	I129	K190	A253	L313	N374	Y435	Q498	Q564	F629	T690	GLU	Q829	L890	K957	F68
L69	F130	F191	V254	T314	A376	G436	A509	Q565	R630	S691	SER	K830	A893	T988	L69
E70	G131	P192	A255	A315	R375	R437	M500	T566	R631	E692	GLU	R831	A893	T988	E70
Y71	A132	L193	Y256	G316	P377	I438	T501	Q567	S631	E693	PRO	K832	R896	E861	Y71
R72	D133	V194	Y257	V317	L378	C439	P502	A568	M632	L694	THR	K833	L897	Q962	R72
L73	R134	L195	Y258	V318	E379	A440	L503	V569	M633	L695	PRO	K834	L897	Q962	L73
G74	L135	L196	G259	G319	A380	V441	N506	P570	G634	K696	GLU	K835	R899	K964	G74
E75	L136	L197	G259	G319	A381	E442	N506	L571	T635	R697	GLU	K836	R900	E985	E75
F76	V137	R198	T261	E321	I382	T443	R507	I572	A636	D698	ARG	K837	Y901	F967	F76
P77	S138	V199	T262	V322	R383	P444	I508	E573	L637	F699	LEU	K838	Y902	F967	P77
F78	Q139	L200	D263	V322	E384	E445	A509	A574	D638	Y700	LEU	L839	S903	L968	F78
P79	I140	L201	R265	I325	F385	G446	G639	Q575	R640	T701	ARG	A840	P904	Q969	P79
Q80	H141	Y202	R265	R326	R386	A447	R512	A576	R640	S702	SER	H841	I905	I905	Q80
D81	R142	D203	R266	H327	S387	N448	A515	P577	P641	I703	ILE	R842	F906	F906	D81
E82	S143	Q204	Y267	L328	R388	I449	A515	V578	R642	H704	PHE	H843	D907	D907	E82
C83	P144	E205	D268	G329	S389	G450	R516	V579	V643	I705	GLY	K844	G908	G908	C83
R84	G145	T206	L269	R330	Q390	L451	R517	M580	V644	E786	GLU	K846	A909	Y975	R84
E85	V146	L207	G270	R331	L391	L452	K518	M581	V645	R707	LYS	G847	A910	A910	E85
K86	Y147	A208	E271	R332	S392	T453	P521	G582	V646	R713	ALA	V848	Y914	G977	K86
D87	F148	R209	A272	R333	Q393	S454	P521	L583	Q647	R714	ARG	V849	K915	R978	D87
L88	F148	E210	G273	R334	F394	L455	V522	E584	R648	D715	ASP	A850	K915	R978	L88
T89	D151	E211	R274	T335	K395	A456	I523	E585	V649	T715	VAL	K851	G916	G916	T89
Y90	P152	G212	Y275	V336	D396	A457	V524	R586	R650	K716	VAL	L852	L917	E981	Y90
Q91	A153	A213	R276	G337	E397	Y458	S525	V587	D653	P719	LYS	L853	L918	P982	Q91
A92	R154	A208	A277	E338	T398	A459	S526	V588	D653	R719	ALA	R854	L918	P982	A92
P93	G155	G215	E278	L339	N399	Y459	P526	R589	L654	E720	ARG	R855	A920	E984	P93
L94	G156	E216	E279	N340	P400	E463	E528	R590	L655	R721	ARG	R856	A920	E984	L94
Y95	R157	L217	L281	T341	L401	L464	V529	S591	A656	I722	GLY	R857	F922	P986	Y95
A96	Y158	L281	L281	D342	S402	G465	E530	L592	D657	T723	GLY	R858	E923	I987	A96
R97	I159	V218	G282	Q343	S403	F466	F531	A593	G658	R724	LYS	R859	V924	I987	R97
L98	A160	L221	T283	R344	L404	L467	M532	A594	P659	D725	PHE	H860	Y925	V989	L98
Q99	S161	M222	R284	R345	R405	R468	D533	L595	A660	I726	ARG	R861	F926	G990	Q99
L100	I162	D223	L285	V346	H406	T469	V534	Y596	S661	H727	ARG	R862	G927	E991	L100
I101	I163	E224	S286	G347	K407	P470	S535	A597	E662	H728	ARG	D863	K928	M992	I101
H102	P164	S225	G287	L348	R408	Y471	P536	E598	M663	L729	ARG	G864	R929	F993	H102
K103	L165	V226	R288	A349	R409	R472	K537	E599	G664	S730	LYS	T865	K930	I994	K103
D104	P166	F227	T289	R350	T410	R473	Q538	D600	F665	A733	LYS	R866	G931	M995	D104
G106	R167	A228	L290	A352	S411	V474	V539	G601	L666	L734	LYS	R867	E932	K996	G106
L107	G169	M229	R292	R353	L413	G477	F540	E602	L667	L734	LYS	D868	G933	L997	L107
K108	P170	R230	F293	G354	G414	V478	S541	M603	L668	L737	LYS	R869	F934	Y998	K108
E110	W171	P231	E294	V355	P415	V479	N543	A604	Q670	L738	LYS	L870	M000	H999	E110
D111	I172	P231	E294	V355	G416	T480	T544	V606	L673	D738	LYS	L871	M1000	M1000	D111
V113	D173	L236	G296	E357	G417	D481	N545	D607	L673	E739	LYS	R872	M1001	I1001	V113
E112	L174	I236	E297	R358	L418	E482	L546	G608	V674	E740	GLU	R873	E1002	E1002	E112
F114	E175	R237	F298	N359	L418	V483	I547	M609	A675	V742	GLU	L874	E1003	D1003	F114
L115	V176	L238	G299	L360	T419	V484	P548	R610	I676	V743	LYS	R875	E1004	K1004	L115
I118	P178	F239	E301	K361	R422	Y485	F549	I611	M677	G752	LYS	P877	E1005	M1005	I118
P119	M179	T240	V302	G362	A423	M486	L590	V612	F678	G753	LYS	S878	E1006	H1006	P119
L120	G190	L241	F303	S363	G424	T487	E551	V613	F679	D753	LYS	R879	R946	A1007	L120
M121	V181	L242	F303	E364	F425	A488	H552	R614	D680	T754	LYS	K880	S1009	S1009	M121
L122	V182	L242	F304	D365	R243	L304	D365	Y615	G681	V755	LYS	R881	E948	E948	L122
T122	V182	L242	F304	D365	R243	L304	D365	Y615	G681	V755	LYS	R882	K949	K949	T122
E123	S183	G245	T306	L367	R428	E491	A555	E556	M683	G757	LYS	G883	L950	L950	E123
D124	M184	D246	L307	T368	D429	D492	R556	M556	F684	R758	LYS	K884	G951	G951	D124
G125	V196	K249	Y309	A370	H431	Y494	A558	V621	D686	SER	LYS	L886	L952	L952	G125

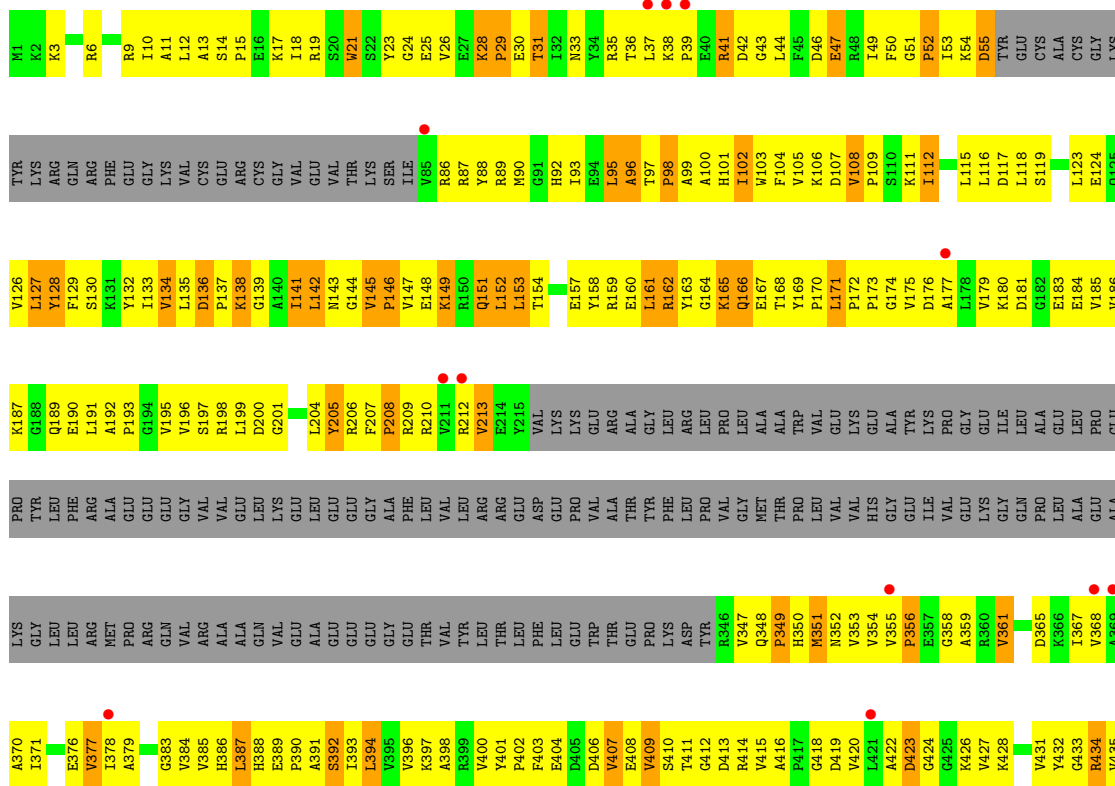


● Molecule 2: DNA-directed RNA polymerase subunit beta

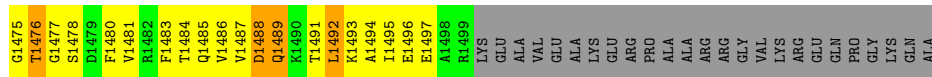




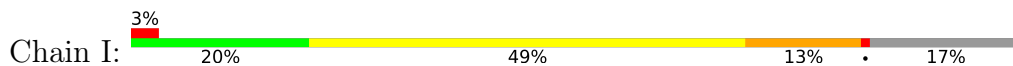
● Molecule 3: DNA-directed RNA polymerase subunit beta'

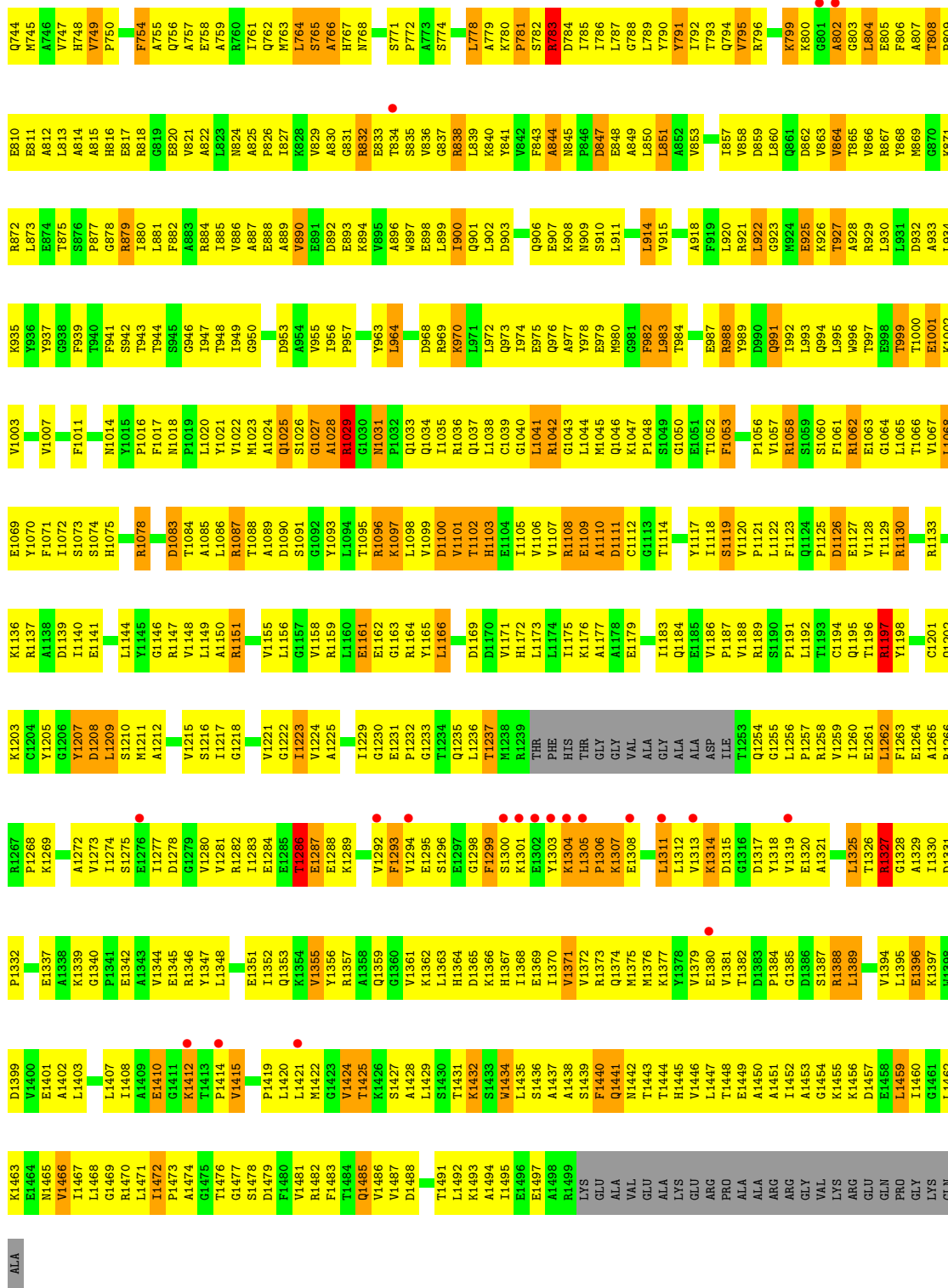


L1348	R1282	A1220	L1160	T1095	P1032	L984	V895	G831	H767	A705	L639	P563	V499	E436
L1283	L1283	V1221	E1161	R1096	Q1033	D968	A896	R832	L770	P706	H640	E564	F502	V437
E1352	E1284	G1223	E1162	K1097	I1034	D969	W897	E833	L707	T707	Q641	E570	F503	D438
Q1353	L1285	I1223	L1098	R969	I1035	R968	E998	T834	S771	L708	G642	E571	L502	R441
K1354	T1286	V1224	R1163	P1099	R1036	R969	R999	S835	R772	H709	G643	R572	D504	K442
V1355	A1226	A1226	Y1165	D1100	Q1037	L971	I900	I836	A773	R710	L644	R573	S505	S443
Y1356	E1288	A1226	Y1101	V1102	L1038	L972	Q901	G837	S774	L711	P645	M573	G506	V443
K1289	K1289	T1229	L1166	T1102	C1039	Q973	L902	R858	L778	G712	K646	L574	N507	V444
L1290	M1167	H1103	S1167	H1103	G1040	1974	D903	L839	L713	L713	R647	Q575	R508	R445
S1291	M1168	I1104	M1168	E1104	L1041	E975	Q906	K940	A779	Q714	R648	A577	P509	V446
Q1359	D1169	I1105	D1169	I1105	R1042	Q976	E941	R941	K780	A715	R648	A577	P509	V447
F1293	D1170	V1106	H1170	V1106	G1043	A977	E907	R943	P781	F716	L650	A577	E510	V447
V1361	H1171	V1107	D1171	V1107	L1044	Y978	K908	F843	S782	Q717	D651	D579	N511	E448
E1295	H1172	R1108	H1172	R1108	M1045	E979	N909	A844	R783	P718	L652	A580	N512	S449
S1296	L1173	E1109	L1173	E1109	Q1046	N980	S910	N945	D784	V719	L581	L514	L513	Y450
L1297	L1174	A1110	L1174	A1110	K1047	G981	L911	R845	I785	L720	L582	L515	L514	D451
L1298	I1175	G1111	I1175	G1111	F982	F982	L983	N945	I786	L721	L582	E515	L515	L452
F1299	K1176	C1112	K1176	C1112	S1049	L984	L914	E848	L787	E722	P655	D583	A516	D453
S1300	A1177	G1113	A1177	G1113	G1050	T984	V915	E849	G788	Q723	L657	N584	V617	A454
K1301	A1178	T1114	A1178	T1114	E1051	L985	L850	A849	G789	Q724	L658	N585	P518	R455
E1302	E1179	E1179	E1179	E1179	T1052	E987	A918	L851	L790	S725	L659	N586	P519	M456
Y1303	A1180	I1118	A1180	I1118	R1058	R988	F919	L851	R799	Q733	R660	R587	L520	G457
Y1304	G1181	S1119	G1181	S1119	E1054	Y989	F919	L860	K800	E734	R661	R588	P521	A458
L1305	E1182	V1120	E1182	V1120	V1055	D990	R921	V853	I792	Q727	A589	A589	P522	A459
P1306	I1183	G1121	I1183	G1121	P1056	Q991	R922	V853	T793	L728	P590	P590	D523	A460
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M1375	E1185	F1123	E1185	F1123	R1058	1994	M924	D859	R796	L731	P594	P594	R525	Q462
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V1314	T1196	L1134	T1196	L1134	E1069	F1007	L937	R872	T803	D743	R681	R613	THR	K475
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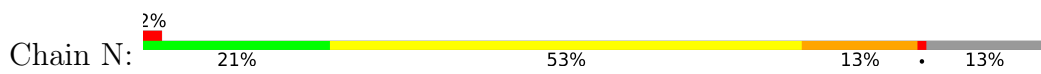


• Molecule 3: DNA-directed RNA polymerase subunit beta'



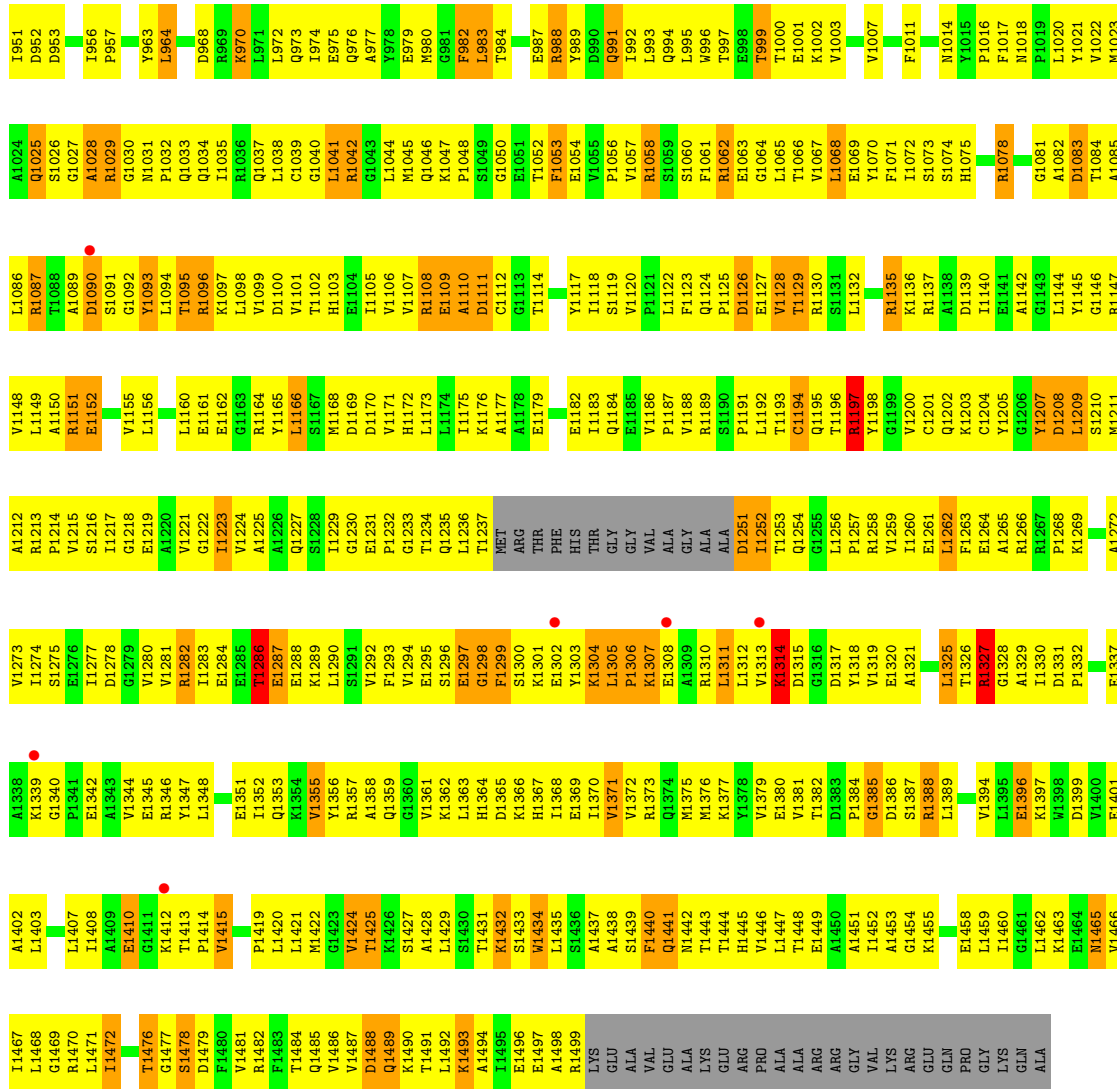


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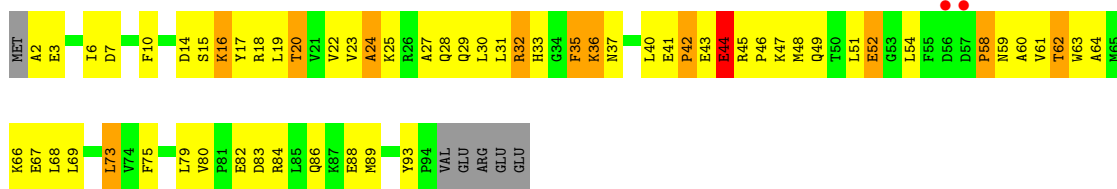




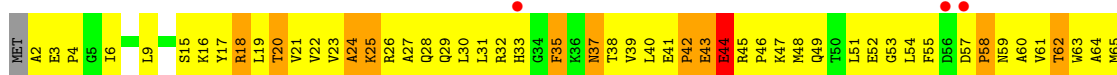
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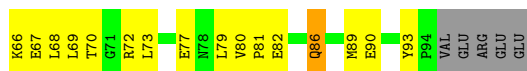


• Molecule 4: DNA-directed RNA polymerase subunit omega

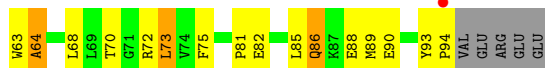


• Molecule 4: DNA-directed RNA polymerase subunit omega

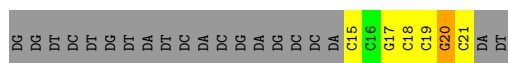




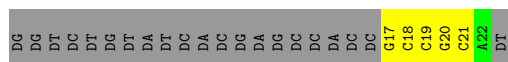
- Molecule 4: DNA-directed RNA polymerase subunit omega



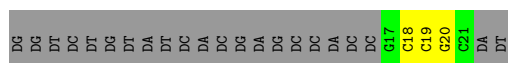
- Molecule 5: DNA (5'-D(\*GP\*GP\*TP\*CP\*TP\*GP\*TP\*AP\*TP\*CP\*AP\*CP\*GP\*AP\*GP\*CP\*CP\*A\*CP\*CP\*GP\*CP\*CP\*GP\*CP\*AP\*T)-3')



- Molecule 5: DNA (5'-D(\*GP\*GP\*TP\*CP\*TP\*GP\*TP\*AP\*TP\*CP\*AP\*CP\*GP\*AP\*GP\*CP\*CP\*A\*CP\*CP\*GP\*CP\*CP\*GP\*CP\*AP\*T)-3')



- Molecule 5: DNA (5'-D(\*GP\*GP\*TP\*CP\*TP\*GP\*TP\*AP\*TP\*CP\*AP\*CP\*GP\*AP\*GP\*CP\*CP\*A\*CP\*CP\*GP\*CP\*CP\*GP\*CP\*AP\*T)-3')



- Molecule 6: RNA (5'-R(\*CP\*CP\*CP\*GP\*GP\*AP\*AP\*GP\*AP\*UP\*CP\*AP\*UP\*CP\*UP\*UP\*CP\*CP\*GP\*GP\*GP\*GP\*AP\*U\*GP\*CP\*GP\*GP\*CP\*GP\*G)-3')



- Molecule 6: RNA (5'-R(\*CP\*CP\*CP\*GP\*GP\*AP\*AP\*GP\*AP\*UP\*CP\*AP\*UP\*CP\*UP\*UP\*CP\*CP\*GP\*GP\*GP\*GP\*AP\*U\*GP\*CP\*GP\*GP\*CP\*GP\*G)-3')





F149
R150
V151
V152
A153
I154
H155
G156

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	189.23Å 264.51Å 193.93Å 90.00° 116.68° 90.00°	Depositor
Resolution (Å)	47.57 – 4.30 47.57 – 4.30	Depositor EDS
% Data completeness (in resolution range)	97.6 (47.57-4.30) 97.7 (47.57-4.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.68 (at 4.29Å)	Xtrriage
Refinement program	CNS 1.2	Depositor
R, $R_{free}$	0.317 , 0.338 0.320 , 0.340	Depositor DCC
$R_{free}$ test set	3392 reflections (3.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	128.7	Xtrriage
Anisotropy	0.299	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.26 , 107.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.42$ , $\langle L^2 \rangle = 0.24$	Xtrriage
Estimated twinning fraction	0.054 for l,-k,h	Xtrriage
$F_o, F_c$ correlation	0.81	EDS
Total number of atoms	73646	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	160.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.76% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, 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	A	0.48	0/1791	0.76	0/2436
1	B	0.47	0/1791	0.71	1/2436 (0.0%)
1	F	0.48	0/1791	0.75	0/2436
1	G	0.47	0/1796	0.70	1/2443 (0.0%)
1	K	0.50	0/1801	0.76	0/2450
1	L	0.48	0/1791	0.70	1/2436 (0.0%)
2	C	0.49	0/8713	0.78	5/11785 (0.0%)
2	H	0.51	0/8686	0.78	3/11750 (0.0%)
2	M	0.51	0/8717	0.81	6/11792 (0.1%)
3	D	0.50	0/10559	0.77	5/14272 (0.0%)
3	I	0.50	0/10131	0.79	6/13685 (0.0%)
3	N	0.49	0/10653	0.79	8/14403 (0.1%)
4	E	0.47	0/768	0.72	1/1035 (0.1%)
4	J	0.47	0/768	0.73	1/1035 (0.1%)
4	O	0.49	0/768	0.77	1/1035 (0.1%)
5	P	0.89	0/151	1.70	3/230 (1.3%)
5	R	0.81	0/133	1.04	0/203
5	T	0.84	0/109	0.89	0/166
6	Q	1.05	0/170	1.04	0/265
6	S	1.02	0/192	0.92	0/299
6	U	0.94	0/170	0.97	2/265 (0.8%)
7	X	0.56	1/1198 (0.1%)	0.70	1/1608 (0.1%)
7	Y	0.64	1/1178 (0.1%)	0.66	0/1582
7	Z	0.65	1/1178 (0.1%)	0.68	1/1582 (0.1%)
All	All	0.51	3/75003 (0.0%)	0.78	46/101629 (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
2	C	0	5
2	H	0	1
2	M	0	3
3	D	0	2
3	I	0	4
3	N	0	5
6	Q	0	1
6	S	0	1
All	All	0	22

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	Z	156	GLY	C-OXT	16.27	1.54	1.23
7	Y	156	GLY	C-OXT	16.19	1.54	1.23
7	X	156	GLY	C-OXT	11.06	1.44	1.23

The worst 5 of 46 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	P	20	DG	N9-C1'-C2'	9.98	131.56	112.60
5	P	20	DG	O4'-C1'-C2'	8.43	112.64	105.90
3	I	1209	LEU	N-CA-C	-8.04	89.28	111.00
3	N	1209	LEU	N-CA-C	-7.97	89.49	111.00
3	N	142	LEU	CA-CB-CG	7.29	132.07	115.30

There are no chirality outliers.

5 of 22 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	C	267	TYR	Sidechain
2	C	589	ARG	Sidechain
2	C	642	ARG	Sidechain
2	C	71	TYR	Sidechain
2	C	735	ARG	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	1759	0	1805	209	3
1	B	1759	0	1805	263	2
1	F	1759	0	1805	195	3
1	G	1764	0	1810	253	3
1	K	1769	0	1815	202	0
1	L	1759	0	1805	220	0
2	C	8550	0	8654	1412	1
2	H	8524	0	8626	1521	0
2	M	8555	0	8658	1519	1
3	D	10384	0	10615	1752	3
3	I	9965	0	10206	1707	1
3	N	10475	0	10699	1791	3
4	E	754	0	769	94	0
4	J	754	0	769	116	0
4	O	754	0	769	111	0
5	P	136	0	79	3	0
5	R	119	0	68	12	0
5	T	98	0	57	8	0
6	Q	152	0	78	10	0
6	S	172	0	88	12	0
6	U	152	0	79	12	0
7	X	1189	0	1205	141	0
7	Y	1169	0	1186	151	0
7	Z	1169	0	1186	146	0
8	D	1	0	0	0	0
8	I	1	0	0	0	0
8	N	1	0	0	0	0
9	D	1	0	0	0	0
9	N	1	0	0	0	0
9	S	1	0	0	0	0
All	All	73646	0	74636	10729	10

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 72.

The worst 5 of 10729 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)
3:N:50:PHE:CD2	3:N:522:PRO:HD3	1.20	1.62
2:H:182:VAL:HG11	2:H:193:LEU:CD2	1.09	1.56
2:H:1090:LYS:HE3	3:I:90:MET:SD	1.45	1.55
2:H:182:VAL:CG1	2:H:193:LEU:HD21	1.13	1.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:I:783:ARG:NH1	7:Y:41:ASP:CB	1.67	1.53

The worst 5 of 10 symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:100:LEU:CD1	1:F:59:GLU:OE1[2_455]	1.51	0.69
3:D:1182:GLU:OE2	1:G:112:ARG:NE[1_655]	1.61	0.59
1:B:162:ILE:CG1	3:N:976:GLN:NE2[1_655]	1.90	0.30
1:A:100:LEU:CD1	1:F:59:GLU:CD[2_455]	1.97	0.23
2:C:223:ASP:O	3:N:562:ALA:O[2_444]	2.02	0.18

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	221/315 (70%)	191 (86%)	22 (10%)	8 (4%)	3	28
1	B	221/315 (70%)	191 (86%)	27 (12%)	3 (1%)	11	47
1	F	221/315 (70%)	191 (86%)	20 (9%)	10 (4%)	2	24
1	G	222/315 (70%)	193 (87%)	26 (12%)	3 (1%)	11	47
1	K	223/315 (71%)	193 (86%)	21 (9%)	9 (4%)	3	26
1	L	221/315 (70%)	188 (85%)	28 (13%)	5 (2%)	6	37
2	C	1077/1119 (96%)	864 (80%)	150 (14%)	63 (6%)	1	20
2	H	1074/1119 (96%)	867 (81%)	145 (14%)	62 (6%)	1	20
2	M	1078/1119 (96%)	871 (81%)	149 (14%)	58 (5%)	2	22
3	D	1306/1524 (86%)	1062 (81%)	186 (14%)	58 (4%)	2	25
3	I	1252/1524 (82%)	1012 (81%)	177 (14%)	63 (5%)	2	23
3	N	1317/1524 (86%)	1052 (80%)	196 (15%)	69 (5%)	2	22

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
4	E	91/99 (92%)	67 (74%)	17 (19%)	7 (8%)	1	15
4	J	91/99 (92%)	70 (77%)	14 (15%)	7 (8%)	1	15
4	O	91/99 (92%)	68 (75%)	16 (18%)	7 (8%)	1	15
7	X	152/156 (97%)	132 (87%)	16 (10%)	4 (3%)	5	35
7	Y	150/156 (96%)	135 (90%)	12 (8%)	3 (2%)	7	40
7	Z	150/156 (96%)	131 (87%)	16 (11%)	3 (2%)	7	40
All	All	9158/10584 (86%)	7478 (82%)	1238 (14%)	442 (5%)	2	23

5 of 442 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	187	GLY
2	C	23	VAL
2	C	40	GLU
2	C	44	ILE
2	C	152	PRO

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	196/273 (72%)	164 (84%)	32 (16%)	2	14
1	B	196/273 (72%)	166 (85%)	30 (15%)	2	16
1	F	196/273 (72%)	167 (85%)	29 (15%)	3	17
1	G	196/273 (72%)	164 (84%)	32 (16%)	2	14
1	K	196/273 (72%)	164 (84%)	32 (16%)	2	14
1	L	196/273 (72%)	164 (84%)	32 (16%)	2	14
2	C	912/941 (97%)	737 (81%)	175 (19%)	1	9
2	H	909/941 (97%)	736 (81%)	173 (19%)	1	9
2	M	912/941 (97%)	746 (82%)	166 (18%)	1	11
3	D	1113/1279 (87%)	928 (83%)	185 (17%)	2	14

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	I	1068/1279 (84%)	878 (82%)	190 (18%)	2	12
3	N	1124/1279 (88%)	937 (83%)	187 (17%)	2	14
4	E	82/88 (93%)	72 (88%)	10 (12%)	5	23
4	J	82/88 (93%)	72 (88%)	10 (12%)	5	23
4	O	82/88 (93%)	67 (82%)	15 (18%)	1	11
7	X	130/131 (99%)	115 (88%)	15 (12%)	5	24
7	Y	128/131 (98%)	104 (81%)	24 (19%)	1	10
7	Z	128/131 (98%)	110 (86%)	18 (14%)	3	19
All	All	7846/8955 (88%)	6491 (83%)	1355 (17%)	2	13

5 of 1355 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	197	LEU
3	N	434	ARG
2	M	190	LYS
1	L	186	LEU
2	M	691	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 252 such sidechains are listed below:

Mol	Chain	Res	Type
2	H	872	ASN
3	N	1034	GLN
3	I	991	GLN
3	N	994	GLN
4	O	59	ASN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
6	Q	6/32 (18%)	1 (16%)	0
6	S	7/32 (21%)	2 (28%)	0
6	U	6/32 (18%)	2 (33%)	0
All	All	19/96 (19%)	5 (26%)	0

All (5) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
6	Q	11	C
6	S	13	G
6	S	16	G
6	U	11	C
6	U	12	G

There are no RNA pucker outliers to report.

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

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

#### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

#### 5.6 Ligand geometry [i](#)

Of 6 ligands modelled in this entry, 6 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 [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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q < 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ > 2	OWAB(Å <sup>2</sup> )	Q < 0.9
1	A	223/315 (70%)	-0.18	1 (0%) 92 87	82, 143, 203, 231	0
1	B	223/315 (70%)	-0.25	1 (0%) 92 87	86, 150, 211, 231	0
1	F	223/315 (70%)	-0.04	4 (1%) 68 60	88, 145, 202, 231	0
1	G	224/315 (71%)	-0.22	0 100 100	74, 150, 204, 231	0
1	K	225/315 (71%)	0.03	4 (1%) 68 60	77, 152, 205, 231	0
1	L	223/315 (70%)	-0.24	1 (0%) 92 87	71, 146, 208, 231	0
2	C	1083/1119 (96%)	-0.17	11 (1%) 82 74	46, 150, 225, 231	0
2	H	1080/1119 (96%)	-0.18	15 (1%) 75 66	32, 148, 226, 231	0
2	M	1084/1119 (96%)	-0.07	20 (1%) 68 60	51, 150, 227, 231	0
3	D	1316/1524 (86%)	-0.08	25 (1%) 66 58	91, 161, 249, 285	0
3	I	1262/1524 (82%)	0.04	45 (3%) 42 34	91, 160, 246, 285	0
3	N	1327/1524 (87%)	-0.01	24 (1%) 68 60	91, 162, 250, 284	0
4	E	93/99 (93%)	0.06	2 (2%) 62 52	91, 182, 231, 231	0
4	J	93/99 (93%)	-0.01	3 (3%) 47 37	98, 176, 231, 231	0
4	O	93/99 (93%)	-0.06	3 (3%) 47 37	90, 172, 231, 231	0
5	P	7/27 (25%)	0.31	0 100 100	199, 200, 200, 200	0
5	R	6/27 (22%)	0.80	0 100 100	200, 200, 200, 200	0
5	T	5/27 (18%)	0.57	0 100 100	199, 200, 200, 200	0
6	Q	7/32 (21%)	0.94	0 100 100	195, 200, 200, 200	0
6	S	8/32 (25%)	2.18	4 (50%) 0 0	200, 200, 200, 200	0
6	U	7/32 (21%)	1.24	1 (14%) 2 3	194, 200, 200, 200	0
7	X	154/156 (98%)	0.11	4 (2%) 56 46	97, 175, 229, 231	0
7	Y	152/156 (97%)	0.11	6 (3%) 39 31	88, 174, 228, 231	0
7	Z	152/156 (97%)	0.18	6 (3%) 39 31	95, 172, 228, 231	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
All	All	9270/10761 (86%)	-0.07	180 (1%) 66 58	32, 156, 231, 285	0

The worst 5 of 180 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	E	56	ASP	6.1
3	I	1301	LYS	5.9
3	I	191	LEU	5.5
3	I	1292	VAL	5.3
2	C	270	GLY	4.9

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

## 6.3 Carbohydrates [i](#)

There are no 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, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
8	ZN	N	2001	1/1	0.91	0.07	115,115,115,115	0
8	ZN	D	2002	1/1	0.96	0.03	115,115,115,115	0
9	MG	N	2006	1/1	0.96	0.45	115,115,115,115	0
9	MG	S	2005	1/1	0.97	0.86	115,115,115,115	0
8	ZN	I	2003	1/1	0.99	0.09	115,115,115,115	0
9	MG	D	2004	1/1	0.99	0.11	115,115,115,115	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.