



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 16, 2023 – 03:26 PM EDT

PDB ID : 2A6E
Title : Crystal structure of the T. Thermophilus RNA polymerase holoenzyme
Authors : Artsimovitch, I.; Vassilyeva, M.N.; Svetlov, D.; Svetlov, V.; Perederina, A.; Igarashi, N.; Matsugaki, N.; Wakatsuki, S.; Tahirov, T.H.; Vassilyev, D.G.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)
Deposited on : 2005-07-02
Resolution : 2.80 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 ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.35
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) : 2.35

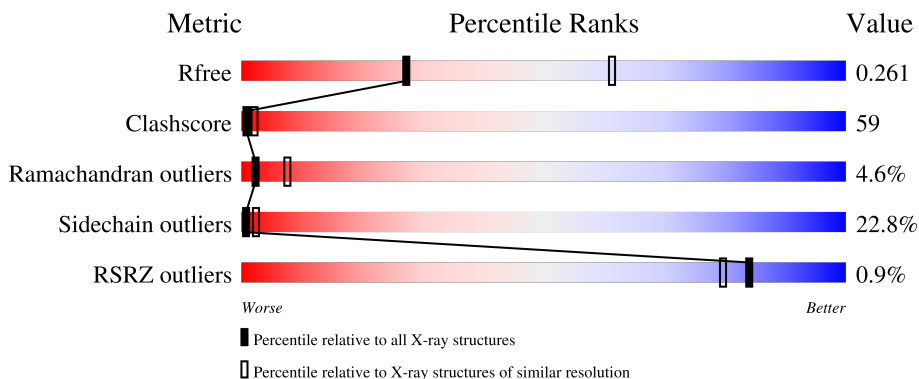
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	315	
1	B	315	
1	K	315	
1	L	315	
2	C	1119	

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Mol	Chain	Length	Quality of chain
2	M	1119	<p>%</p> <p>25% 57% 17%</p>
3	D	1524	<p>%</p> <p>23% 51% 17% 9%</p>
3	N	1524	<p>%</p> <p>24% 51% 15% 9%</p>
4	E	99	<p>%</p> <p>22% 52% 20%</p>
4	O	99	<p>%</p> <p>28% 48% 19%</p>
5	F	423	<p>%</p> <p>19% 47% 14% 18%</p>
5	P	423	<p>%</p> <p>22% 49% 10% 18%</p>

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 58679 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 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	229	Total 1806	C 1153	N 313	O 337	S 3	0	0	0
1	B	229	Total 1806	C 1153	N 313	O 337	S 3	0	0	0
1	K	229	Total 1806	C 1153	N 313	O 337	S 3	0	0	0
1	L	229	Total 1806	C 1153	N 313	O 337	S 3	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	1119	Total 8829	C 5581	N 1577	O 1647	S 24	0	0	0
2	M	1119	Total 8829	C 5581	N 1577	O 1647	S 24	0	0	0

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	D	1392	Total 10797	C 6819	N 1925	O 2020	S 33	0	0	0
3	N	1392	Total 10797	C 6819	N 1925	O 2020	S 33	0	0	0

- Molecule 4 is a protein called RNA polymerase omega chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	E	95	Total 769	C 488	N 133	O 144	S 4	0	0	0
4	O	95	Total 769	C 488	N 133	O 144	S 4	0	0	0

- Molecule 5 is a protein called RNA polymerase sigma factor rpoD.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	F	345	Total	C	N	O	S	0	0	0
			2771	1744	504	519	4			
5	P	345	Total	C	N	O	S	0	0	0
			2771	1744	504	519	4			

- Molecule 6 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	D	2	Total	Zn	0	0
			2	2		
6	N	2	Total	Zn	0	0
			2	2		

- Molecule 7 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	191	Total	O	0	0
			191	191		
8	B	181	Total	O	0	0
			181	181		
8	C	767	Total	O	0	0
			767	767		
8	D	1100	Total	O	0	0
			1100	1100		
8	E	93	Total	O	0	0
			93	93		
8	F	333	Total	O	0	0
			333	333		
8	K	151	Total	O	0	0
			151	151		
8	L	179	Total	O	0	0
			179	179		
8	M	739	Total	O	0	0
			739	739		

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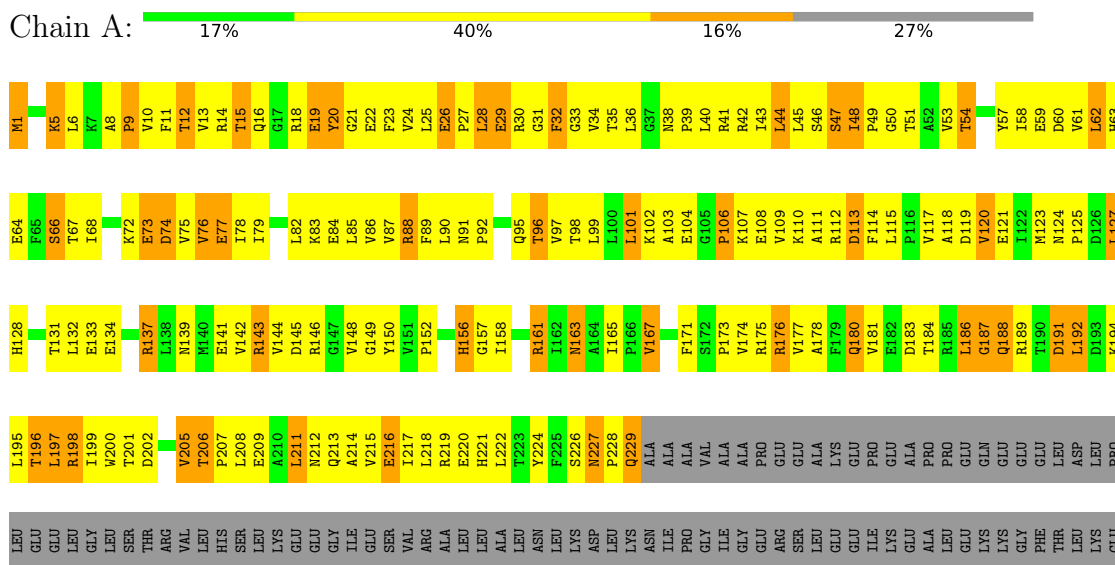
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	N	1038	Total 1038	O 1038	0	0
8	O	78	Total 78	O 78	0	0
8	P	267	Total 267	O 267	0	0

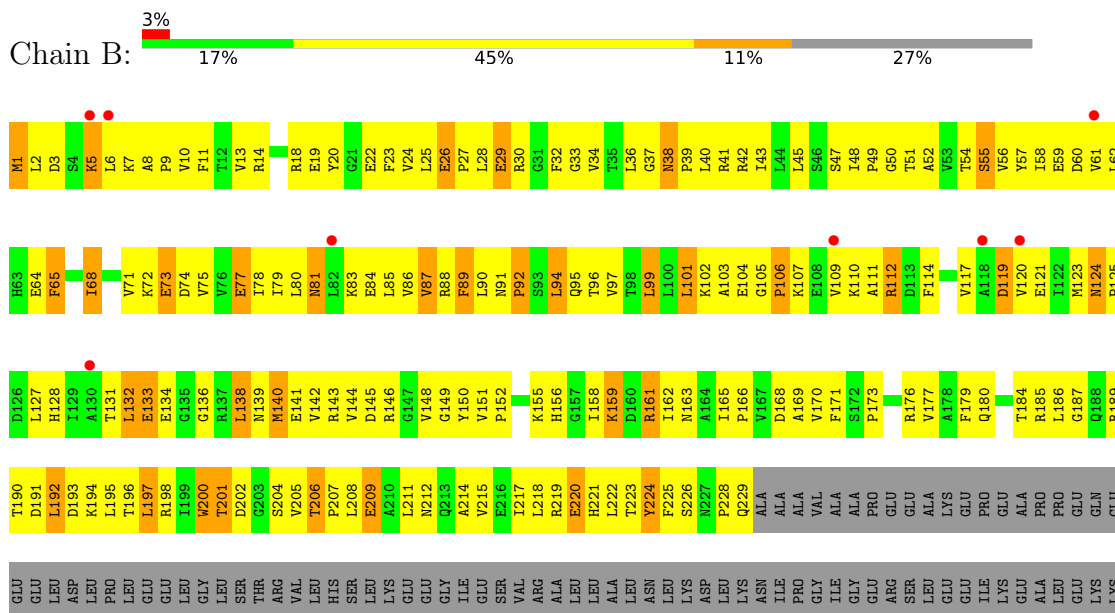
3 Residue-property plots

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 alpha chain



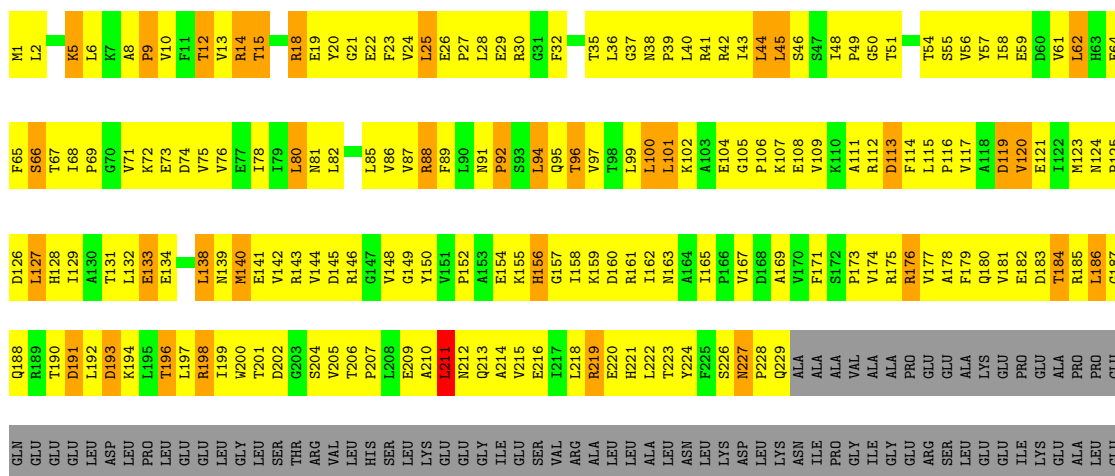
- Molecule 1: DNA-directed RNA polymerase alpha chain



GLY
PHE
THR
LEU
LYS
GLU

• Molecule 1: DNA-directed RNA polymerase alpha chain

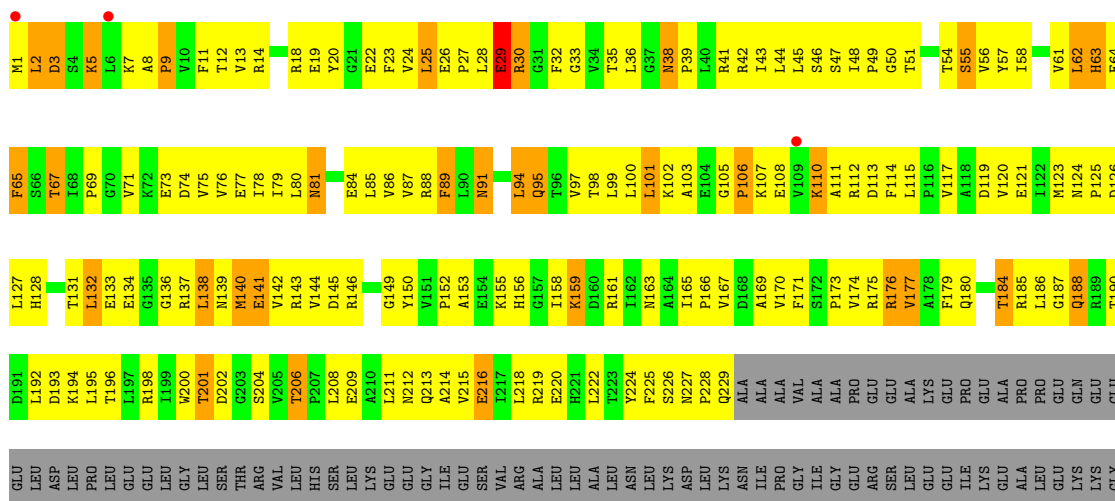
Chain K: 14% 47% 11% 27%



LYS
LYS
GLY
PHE
THR
LEU
LYS
GLU

• Molecule 1: DNA-directed RNA polymerase alpha chain

Chain L: 18% 44% 10% 27%

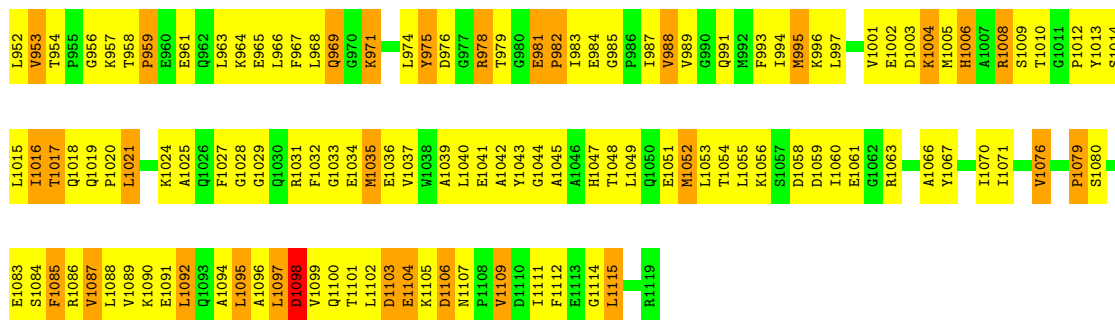


PHE
THR
LEU
LYS
GLU

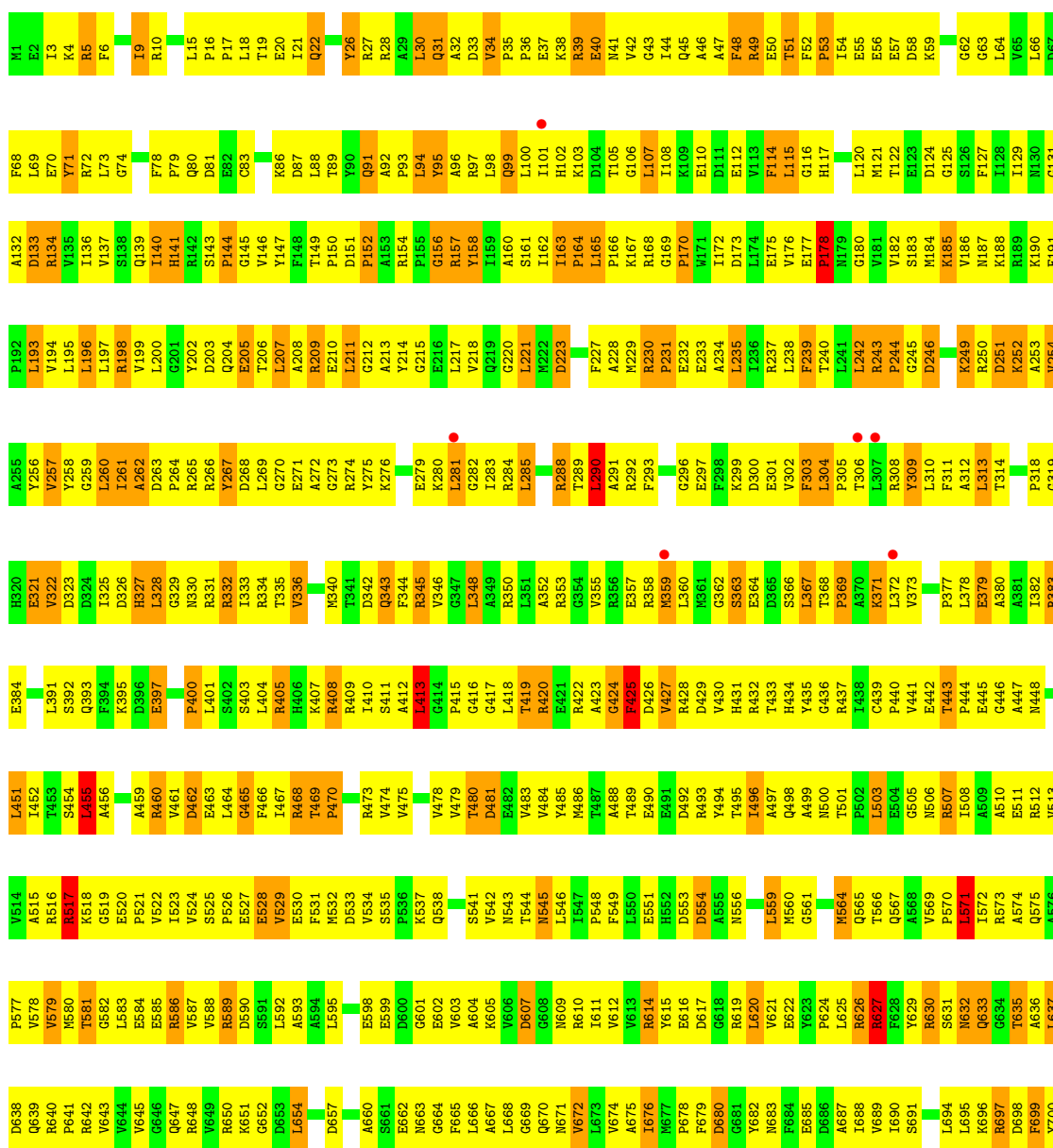
• Molecule 2: DNA-directed RNA polymerase beta chain

Chain C: 22% 60% 17%

M1	E2	I3	K4	R5	F6	G7	R8	I9	R10	E11	V12	I13	F14	L15	P16	L17	L18	T19	E20	I21	Q22	V23	E24	S25	Y26	R27	R28	P29	L30	L31	A32	D33	V34	P35	P36	E37	K38	R39	E40	N41	V42	G43	I44	Q45	A46	A47	F48	R49	F50	T51	F52	P53	I54	E55	E56	D58	K59																																																																																																																																																																																																																																																																																																																																																																																																																																																		
G63	L64	V65	L66	D67	F68	L69	E70	Y71	R72	L73	G74	E75	F76	L77	F78	F79	Q80	D81	E82	C83	R84	L88	Y90	Q91	A92	P93	L94	Y95	A96	R97	L98	Q99	L100	I101	H102	K103	D104	T105	G106	L107	I108	K109	E110	D111	D112	V113	E114	L115	G116	H117	I118	P119	E120	M121	F122	E123	L124																																																																																																																																																																																																																																																																																																																																																																																																																																																		
S126	S127	F128	I129	D133	R134	V135	L136	V137	S138	E139	I140	H141	R142	S143	P144	G145	V146	F148	T149	P150	D151	P152	Y154	R155	L156	R157	I158	I159	A160	S161	I162	I163	P164	L165	P166	R168	G169	P170	W171	I172	D173	L174	E175	V176	E177	P178	H179	G180	L241	L242	V182	S183	M184	E185	V186																																																																																																																																																																																																																																																																																																																																																																																																																																																				
M187	K188	R189	K190	L193	V194	L196	L197	R198	L199	E200	G201	Y202	D203	Y204	R205	E206	T206	A208	R209	E210	L211	G212	A213	Y214	E215	R216	E217	L218	L219	E220	D221	M222	D223	E224	S225	V226	F227	A228	N229	R230	P231	E232	E233	A234	L235	T236	L237	L238	F239	L240	R241	Y242	Y243	F244	L245	D246																																																																																																																																																																																																																																																																																																																																																																																																																																																			
R250	D251	K252	A253	V254	A255	Y256	Y257	Y258	G259	L260	L261	A262	D263	Y264	R265	R266	Y267	D268	L269	E271	A272	G273	R274	Y275	K276	E279	K280	L281	G282	L283	L284	R285	S286	G287	R288	L289	F227	A228	N229	R230	P231	E232	E233	A234	L235	T236	L237	L238	F239	L240	R241	Y242	Y243	F244	L245	D246																																																																																																																																																																																																																																																																																																																																																																																																																																																			
V317	P318	R319	H320	E321	I325	D326	H327	L328	G329	R332	I333	R334	T335	V336	G337	E338	L339	M340	T341	A272	G273	R274	Y275	K276	E279	K280	L281	G282	L283	L284	R285	S286	G287	R288	L289	F227	A228	N229	R230	P231	E232	E233	A234	L235	T236	L237	L238	F239	L240	R241	Y242	Y243	F244	L245	D246																																																																																																																																																																																																																																																																																																																																																																																																																																																				
A380	A381	R382	R383	E384	F385	F386	R387	R388	L391	S392	Q393	F394	K395	D396	E397	V398	N399	P400	L401	S402	F403	L404	R405	H406	K407	R408	R409	I410	R411	S411	A412	L413	G414	P415	G416	G417	L418	T419	R420	E421	R422	F423	R428	T429	D430	H431	R432	A370	H433	Y435	G436	R437	P440	V441	E442	L443																																																																																																																																																																																																																																																																																																																																																																																																																																																			
P444	E445	G446	A447	N448	I449	G450	L451	R452	T453	V454	A455	L456	A457	Y458	E459	R460	V461	D462	E463	S464	P465	E466	I467	R468	T469	P470	Y471	R472	R473	R474	V475	V478	T479	D480	D481	E482	V483	Y484	Y485	M486	T487	A488	T489	E490	D491	A492	H493	Y494	T495	I496	A497	Q498	G499	R500	F501	S502	Y503	N504	T505	P506	S507	E508																																																																																																																																																																																																																																																																																																																																																																																																																																													
G505	N506	R507	I508	A509	A510	E511	V512	V513	V514	A515	R516	R517	K518	G519	E520	P521	V522	E523	E524	S525	P526	E527	E528	V529	E530	F531	M532	D533	V534	S535	P536	Q538	V542	T543	D544	E545	F546	F547	L548	E549	D550	A551	H552	D553	A554	A555	N556	E557	A558	L559	M560	M561	F562	V563	V564	Y565	L566	L567	L568	L569	L570	L571	L572	L573	L574	L575	L576	L577	L578	L579	L580	L581	L582	L583	L584	L585	L586	L587	L588	L589	L590	L591	L592	L593	L594	L595	L596	L597	L598	L599	L600	L601	L602	L603	L604	L605	L606	L607	L608	L609	L610	L611	L612	L613	L614	L615	L616	L617	L618	L619	L620	L621	L622	L623	L624	L625	L626	L627	L628	L629	L630	L631	L632	L633	L634	L635	L636	L637	L638	L639	L640	L641	L642	L643	L644	L645	L646	L647	L648	L649	L650	L651	L652	L653	L654	L655	L656	L657	L658	L659	L660	L661	L662	L663	L664	L665	L666	L667	L668	L669	L670	L671	L672	L673	L674	L675	L676	L677	L678	L679	L680	L681	L682	L683	L684	L685	L686	L687	L688	L689	L690	L691	L692	L693	L694	L695	L696	L697	L698	L699	L700	L701	L702	L703	L704	L705	L706	L707	L708	L709	L710	L711	L712	L713	L714	L715	L716	L717	L718	L719	L720	L721	L722	L723	L724	L725	L726	L727	L728	L729	L730	L731	L732	L733	L734	L735	L736	L737	L738	L739	L740	L741	L742	L743	L744	L745	L746	L747	L748	L749	L750	L751	L752	L753	L754	L755	L756	L757	L758	L759	L760	L761	L762	L763	L764	L765	L766	L767	L768	L769	L770	L771	L772	L773	L774	L775	L776	L777	L778	L779	L780	L781	L782	L783	L784	L785	L786	L787	L788	L789	L790	L791	L792	L793	L794	L795	L796	L797	L798	L799	L800	L801	L802	L803	L804	L805	L806	L807	L808	L809	L810	L811	L812	L813	L814	L815	L816	L817	L818	L819	L820	L821	L822	L823	L824	L825	L826	L827	L828	L829	L830	L831	L832	L833	L834	L835	L836	L837	L838	L839	L840	L841	L842	L843	L844	L845	L846	L847	L848	L849	L850	L851	L852	L853	L854	L855	L856	L857	L858	L859	L860	L861	L862	L863	L864	L865	L866	L867	L868	L869	L870	L871	L872	L873	L874	L875	L876	L877	L878	L879	L880	L881	L882	L883	L884	L885	L886	L887	L888	L889	L890	L891	L892	L893	L894	L895	L896	L897	L898	L899	L900	L901	L902	L903	L904	L905	L906	L907	L908	L909	L910	L911	L912	L913	L914	L915	L916	L917	L918	L919	L920	L921	L922	L923	L924	L925	L926	L927	L928	L929	L930	L931	L932	L933	L934	L935	L936	L937	L938	L939	L940	L941	L942	L943	L944	L945	L946	L947	L948	L949	L950	L951	L952	L953	L954	L955	L956	L957	L958	L959	L960	L961	L962	L963	L964	L965	L966	L967	L968	L969	L970	L971	L972	L973	L974	L975	L976	L977	L978	L979	L980	L981	L982	L983	L984	L985	L986	L987	L988	L989	L990	L991	L992	L993	L994	L995	L996	L997	L998	L999	L1000



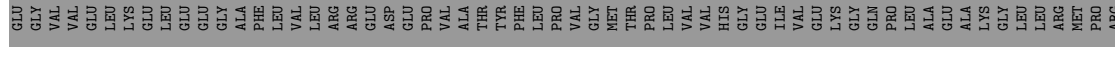
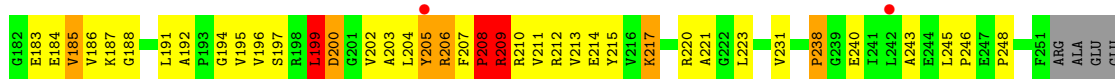
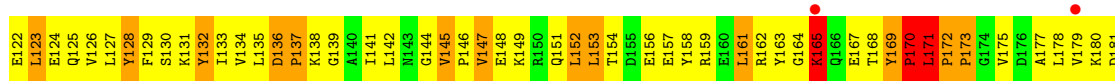
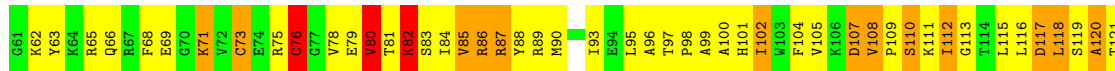
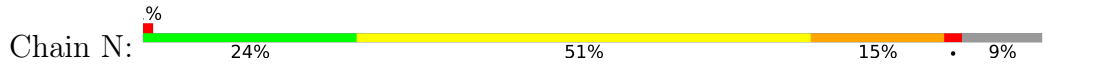
● Molecule 2: DNA-directed RNA polymerase beta chain



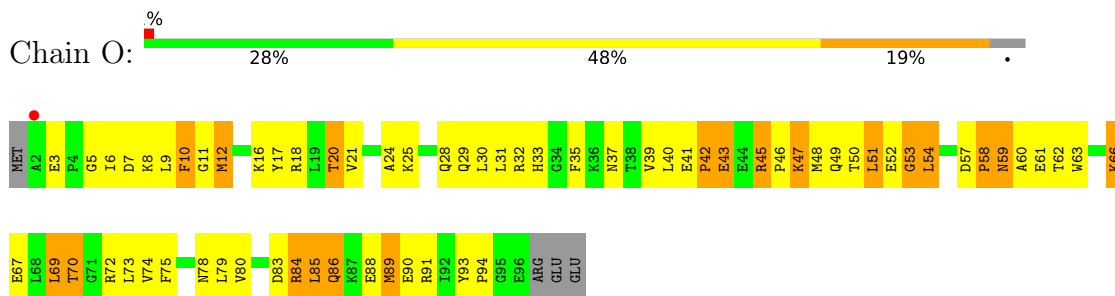
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L1352	L1290	L1291	G1157	T1095	Q1034	E965	Q901	R832	L769	R704	C642	A577	Y517	M456
K1353	L1158	R1096	R1158	K1097	I1035	E966	I902	E833	L770	A705	G643	A578	P518	E459
L1292	L1160	L1098	R1159	R1097	A967	E967	D903	T834	S771	P706	L644	L581	P519	A460
L1293	E1161	V1099	E1160	L1103	Q1037	D968	Y904	S835	A772	T707	P645	L582	L520	L461
E1295	E1162	D1100	G1040	D1100	C1039	R969	Q905	S836	S774	L708	K646	D583	P521	Q462
	G1163	V1101	G1041	V1101	G1042	K970	Q906	C837	G775	R710	R647	M584	P522	Q463
	R1164	T1102	L1041	T1102	L1042	L971	E907	R838	G776	R711	M648	G585	L524	L464
	Y1165	H1103	R1042	H1103	R1043	L972	R908	L839	E777	L711	A649	R586	R525	L465
	L1166	H1104	G1043	G1104	G1043	Q973	N909	R340	L778	G712	L650	R587	P526	K466
	S1167	L1105	L1044	L1105	E975	E975	L911	V842	A779	I713	E651	P527	E527	E467
	M1168	V1106	M1045	V1106	Q976	E976	L912	F843	K780	Q714	L652	E590	M527	E468
	D1169	V1107	Q1046	V1107	A977	A977	D913	A844		F716	K654	Q529	P528	D469
	D1170	R1108	K1047	R1108	Y978	Y978	L914		R783	Q717	P655	V591	V590	L471
	H1171	E1109	P1048	E1109	E979	E979	V915	D847	D784	F718	F656	T592	V591	E470
	L1174	A1110	S1049	A1110	M980	M980	Y916	E848	I785	W719	L657	P594	D531	A472
	I1175	D1111	G1050	D1111	Q917	Q917	Q917	A849	I786	L720	L658	C532	C532	L473
	K1176	C1112	E1051	C1112	A918	A918	A918	L850	L787	W721	K659	B597	G533	L474
	A1177	G1113	R986	G1113	R986	R986	F919	L851	S788	E722	K660	R598	R585	E474
		T1114	R988	T1114	R988	R988	L920	A852	S789	G723	M661	P599	A596	K475
		G1115	R988	G1115	R988	R988	L922	V853	Y791	Q724	E663	L600	T537	L477
		H1116	V1055	H1116	V1055	V1055	L922			S725		R601	S538	L478
		Y1117	P1056	Y1117	P1056	P1056	G923			I726		S602	D539	E479
		S1119	Q994	S1119	Q994	Q994	M924			Q727		L540	D539	E480
		L1120	M996	L1120	M996	M996	E925			L728		M541	D542	K481
		P1121	S1060	P1121	S1060	S1060	R926			H729		D605	D542	K482
		F1122	F1061	F1122	F1061	F1061	R927			L606		L543	L543	H483
		H1123	R1062	H1123	R1062	R1062	A928			L607		P484	P484	P484
		Q1124	E1063	Q1124	E1063	E1063	R929			W670		R545	R545	S485
		P1125	G1064	P1125	G1064	G1064	L930			E734		G609	G609	R486
			L1065		L1065	L1065	L931			A735		K610	L547	K487
			T1066		T1066	T1066	E1001			F736		Q611	L548	R488
			V1067		V1067	V1067	Y936			N737		R612	M549	R489
			Y1068		Y1068	Y1068	Q937			A738		G613	R613	A490
			E1069		E1069	E1069	F938			F614		N551	N551	K491
			Y1070		Y1070	Y1070	T940			F740		R615	N552	A492
			F1071		F1071	F1071	F941			D741		Q616	R553	R493
			S1072		S1072	S1072	T943			Q744		M617	L554	K494
			S1073		S1073	S1073	S942			W745		L618	L554	R495
			H1074		H1074	H1074	F1011			F745		L619	K556	L496
			G1075		G1075	G1075	T944			V749		R622	L557	E497
			R1076		R1076	R1076	S945			D684		V498	L557	V498
			G1077		G1077	G1077	R879			D685		V499	A559	V499
			R1078		R1078	R1078	L946			D686		R623	A559	V499
			K1079		K1079	K1079	Y947			S752		D624	Q560	R500
			L1079		L1079	L1079	T948			F753		Y625	Q560	A501
			L1080		L1080	L1080	Y949			F754		R628	G561	A501
			L1081		L1081	L1081	Y951			A755		P563	A562	F502
			L1082		L1082	L1082	D952			Q756		R629	E564	L503
			L1083		L1083	L1083	Y955			A757		V630	I565	D504
			L1084		L1084	L1084	V955			E758		W631	I566	S505
			A1085		A1085	A1085	E891			E759		L632	L566	G506
			L1086		L1086	L1086	D892			A822		W632	L567	N507
			L1087		L1087	L1087	D892			A822		V633	L567	R508
			L1088		L1088	L1088	E893			W634		W634	R568	R508
			L1089		L1089	L1089	E893			I761		Q634	N569	P509
			L1090		L1090	L1090	E894			Q762		P635	E570	E510
			D1090		D1090	D1090	E895			W635		Q636	E570	E510
			R1029		R1029	R1029	E896			W636		P636	K571	W511
			G1091		G1091	G1091	E897			L764		L637	A572	M512
			L1092		L1092	L1092	E897			S765		R638	M573	M512
			Y1093		Y1093	Y1093	E898			A766		L639	M573	M512
							E899			H767		H640	Q575	E515



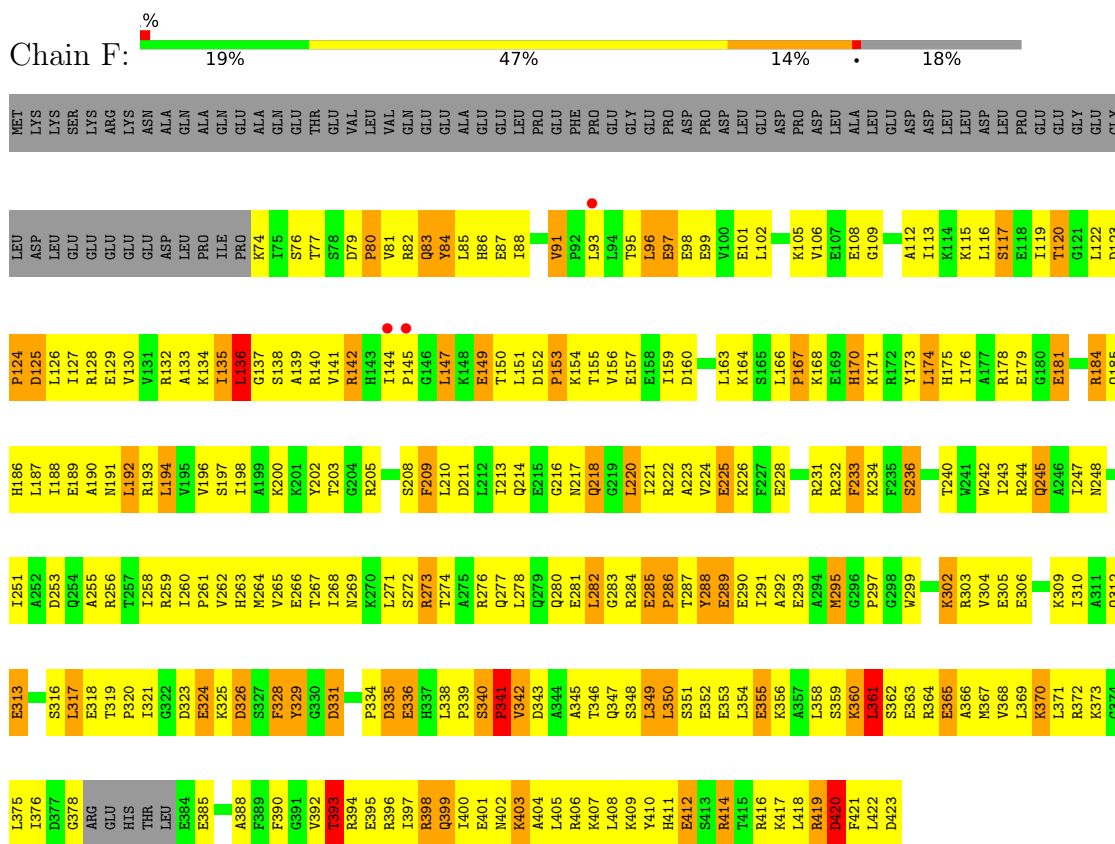
• Molecule 3: DNA-directed RNA polymerase beta' chain



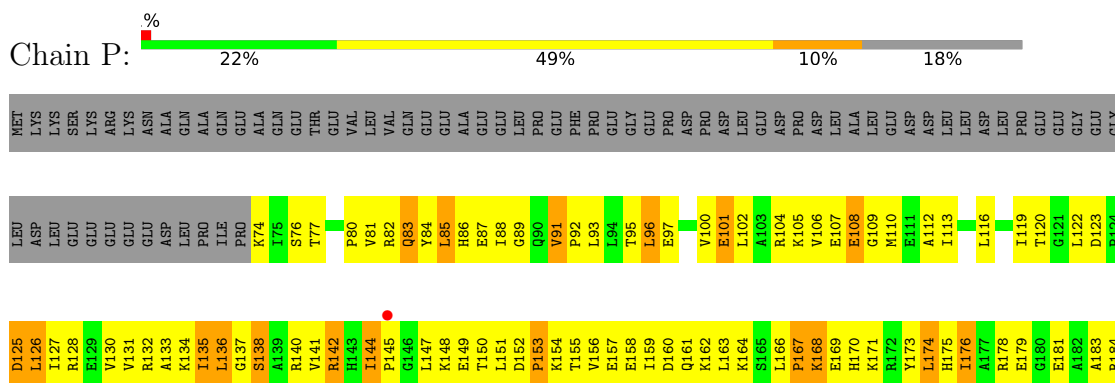
- Molecule 4: RNA polymerase omega chain



- Molecule 5: RNA polymerase sigma factor rpoD



- Molecule 5: RNA polymerase sigma factor rpoD



Q185	D253	T319	ARG
H186	R256	P320	GLU
L187	T257	I321	HIS
I188	I258	G322	THR
E189	R259	D323	LEU
A190	I260	E324	E384
M191	P261	K325	E385
L192	D326	D327	F390
R193	V262	F328	G391
L194	H263	Y329	V392
V195	M264	G330	T393
V196	V265	D331	R394
S197	E266	F332	E395
K200	T267	I333	R396
K201	I268	P334	I397
Y202	N269	D335	R398
T203	K270	E336	Q399
G204	L271	H337	I400
R205	S272	L338	E401
G206	R273	P339	H402
L207	T274	S340	K403
S208	A275	P341	A404
F209	R276	V342	L405
L210	Q277	D343	R406
D211	L278	A344	K407
L212	Q279	A345	L408
I213	Q280	T346	K409
Q214	G283	Q347	Y410
E215	G283	S348	H411
G216	P286	L349	E412
N217	T287	L350	R416
Q218	Y288	S351	K417
G219	E289	E352	L418
L220	E290	E353	L419
I221	I291	L354	R420
R222	A292	E355	F421
A223	M295	K356	L422
V224	G296	A357	D423
K226	P297	L358	
R232	G298	S359	
F233	W299	L361	
K234	K302	S362	
Y238	R303	E363	
W241	V304	R364	
W242	T307	E365	
I243	L308	A366	
R244	I310	M367	
Q245	K309	Y368	
A246	I311	L369	
I247	A311	K370	
N248	Q312	L371	
R249	E313	R372	
A250	P314	K373	
I251	V315	G374	
A252	S316	L375	
	L317	I376	
	E318	D377	
		G378	

4 Data and refinement statistics i

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	239.50Å 239.50Å 253.10Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	25.00 – 2.80 24.96 – 2.80	Depositor EDS
% Data completeness (in resolution range)	(Not available) (25.00-2.80) 92.0 (24.96-2.80)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.16 (at 2.80Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.231 , 0.268 0.227 , 0.261	Depositor DCC
R_{free} test set	21166 reflections (5.78%)	wwPDB-VP
Wilson B-factor (Å ²)	58.9	Xtriage
Anisotropy	0.079	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 79.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.42$, $\langle L^2 \rangle = 0.24$	Xtriage
Estimated twinning fraction	0.499 for -h,-k,l 0.068 for h,-h-k,-l 0.068 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	58679	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.92% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.80	1/1838 (0.1%)	0.88	1/2498 (0.0%)
1	B	0.75	0/1838	0.82	2/2498 (0.1%)
1	K	0.75	0/1838	0.86	2/2498 (0.1%)
1	L	0.72	0/1838	0.78	1/2498 (0.0%)
2	C	0.84	0/8997	0.90	8/12164 (0.1%)
2	M	0.82	0/8997	0.89	7/12164 (0.1%)
3	D	0.84	0/10975	0.94	20/14836 (0.1%)
3	N	0.83	0/10975	0.93	18/14836 (0.1%)
4	E	0.84	0/783	0.97	0/1054
4	O	0.88	0/783	1.00	1/1054 (0.1%)
5	F	0.75	0/2812	0.82	3/3781 (0.1%)
5	P	0.75	0/2812	0.80	1/3781 (0.0%)
All	All	0.82	1/54486 (0.0%)	0.90	64/73662 (0.1%)

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
3	N	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	48	ILE	C-N	5.57	1.44	1.34

The worst 5 of 64 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	199	LEU	CA-CB-CG	-8.69	95.30	115.30
1	B	138	LEU	CA-CB-CG	8.01	133.72	115.30
3	N	1389	LEU	CA-CB-CG	7.77	133.18	115.30
5	P	136	LEU	CA-CB-CG	7.49	132.51	115.30
3	N	76	CYS	CA-CB-SG	6.73	126.11	114.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	N	132	TYR	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	A	1806	0	1861	216	0
1	B	1806	0	1861	199	0
1	K	1806	0	1861	208	0
1	L	1806	0	1861	206	0
2	C	8829	0	8933	1184	0
2	M	8829	0	8933	1106	0
3	D	10797	0	10873	1450	0
3	N	10797	0	10873	1345	0
4	E	769	0	775	97	0
4	O	769	0	775	108	0
5	F	2771	0	2844	336	0
5	P	2771	0	2844	342	0
6	D	2	0	0	0	0
6	N	2	0	0	0	0
7	D	1	0	0	0	0
7	N	1	0	0	0	0
8	A	191	0	0	37	0
8	B	181	0	0	34	0
8	C	767	0	0	174	0
8	D	1100	0	0	234	0
8	E	93	0	0	14	0
8	F	333	0	0	58	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	K	151	0	0	30	0
8	L	179	0	0	49	0
8	M	739	0	0	195	0
8	N	1038	0	0	225	0
8	O	78	0	0	24	0
8	P	267	0	0	61	0
All	All	58679	0	54294	6401	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 59.

The worst 5 of 6401 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:M:1054:THR:HG21	2:M:1079:PRO:HB3	1.28	1.11
1:A:95:GLN:HA	1:A:146:ARG:HH12	1.12	1.08
2:C:135:VAL:HG11	2:C:407:LYS:HA	1.36	1.04
1:A:42:ARG:HH12	2:C:857:ASP:HB3	1.14	1.04
3:N:1036:ARG:HH21	3:N:1042:ARG:HA	1.20	1.04

There are no symmetry-related clashes.

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	227/315 (72%)	202 (89%)	21 (9%)	4 (2%)	8	28
1	B	227/315 (72%)	202 (89%)	21 (9%)	4 (2%)	8	28
1	K	227/315 (72%)	200 (88%)	23 (10%)	4 (2%)	8	28
1	L	227/315 (72%)	204 (90%)	19 (8%)	4 (2%)	8	28
2	C	1117/1119 (100%)	917 (82%)	150 (13%)	50 (4%)	2	8

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	M	1117/1119 (100%)	907 (81%)	159 (14%)	51 (5%)	2	7
3	D	1388/1524 (91%)	1123 (81%)	191 (14%)	74 (5%)	2	6
3	N	1388/1524 (91%)	1110 (80%)	195 (14%)	83 (6%)	1	4
4	E	93/99 (94%)	74 (80%)	16 (17%)	3 (3%)	4	13
4	O	93/99 (94%)	75 (81%)	15 (16%)	3 (3%)	4	13
5	F	341/423 (81%)	283 (83%)	42 (12%)	16 (5%)	2	7
5	P	341/423 (81%)	285 (84%)	40 (12%)	16 (5%)	2	7
All	All	6786/7590 (89%)	5582 (82%)	892 (13%)	312 (5%)	2	7

5 of 312 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	29	GLU
1	B	29	GLU
1	B	48	ILE
2	C	152	PRO
2	C	178	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	202/273 (74%)	147 (73%)	55 (27%)	0	1
1	B	202/273 (74%)	163 (81%)	39 (19%)	1	4
1	K	202/273 (74%)	152 (75%)	50 (25%)	0	2
1	L	202/273 (74%)	158 (78%)	44 (22%)	1	3
2	C	941/941 (100%)	734 (78%)	207 (22%)	1	2
2	M	941/941 (100%)	730 (78%)	211 (22%)	1	2
3	D	1123/1279 (88%)	846 (75%)	277 (25%)	0	2
3	N	1123/1279 (88%)	866 (77%)	257 (23%)	1	2
4	E	83/87 (95%)	58 (70%)	25 (30%)	0	1

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	O	83/87 (95%)	64 (77%)	19 (23%)	1	2
5	F	295/370 (80%)	228 (77%)	67 (23%)	1	2
5	P	295/370 (80%)	249 (84%)	46 (16%)	2	8
All	All	5692/6446 (88%)	4395 (77%)	1297 (23%)	1	2

5 of 1297 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	M	839	LEU
3	N	1059	SER
2	M	1003	ASP
2	M	834	GLN
3	N	470	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 179 such sidechains are listed below:

Mol	Chain	Res	Type
2	M	563	ASN
3	N	560	GLN
2	M	663	ASN
2	M	969	GLN
3	N	909	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	229/315 (72%)	-0.38	0 100 100	38, 65, 92, 117	0
1	B	229/315 (72%)	-0.27	8 (3%) 44 34	53, 95, 115, 121	0
1	K	229/315 (72%)	-0.37	0 100 100	41, 66, 93, 122	0
1	L	229/315 (72%)	-0.39	3 (1%) 77 72	52, 94, 114, 127	0
2	C	1119/1119 (100%)	-0.35	8 (0%) 87 84	23, 81, 110, 119	0
2	M	1119/1119 (100%)	-0.39	6 (0%) 91 88	27, 79, 109, 122	0
3	D	1392/1524 (91%)	-0.33	12 (0%) 84 80	17, 68, 113, 130	0
3	N	1392/1524 (91%)	-0.35	16 (1%) 80 75	27, 69, 110, 138	0
4	E	95/99 (95%)	-0.35	0 100 100	47, 85, 115, 133	0
4	O	95/99 (95%)	-0.49	1 (1%) 80 75	40, 76, 97, 111	0
5	F	345/423 (81%)	-0.40	3 (0%) 84 80	46, 84, 112, 131	0
5	P	345/423 (81%)	-0.39	5 (1%) 75 70	54, 87, 112, 125	0
All	All	6818/7590 (89%)	-0.36	62 (0%) 84 80	17, 77, 111, 138	0

The worst 5 of 62 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	130	ALA	5.1
3	D	1240	THR	4.7
3	N	1243	THR	4.7
3	D	1243	THR	4.5
5	F	145	PRO	4.4

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, 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(\AA^2)	Q<0.9
7	MG	N	9002	1/1	0.94	0.13	64,64,64,64	0
7	MG	D	9001	1/1	0.97	0.15	67,67,67,67	0
6	ZN	D	7058	1/1	0.98	0.07	109,109,109,109	0
6	ZN	N	7113	1/1	0.98	0.10	87,87,87,87	0
6	ZN	N	7059	1/1	0.99	0.11	100,100,100,100	0
6	ZN	D	7112	1/1	0.99	0.14	75,75,75,75	0

6.5 Other polymers [i](#)

There are no such residues in this entry.