



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 3, 2024 – 02:55 PM JST

PDB ID : 8KAL
Title : Crystal structure of SpyCas9 in complex with sgRNA and 17nt target DNA
Authors : Chen, Y.; Chen, J.; Liu, L.
Deposited on : 2023-08-03
Resolution : 3.16 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36.2
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) : 2.36.2

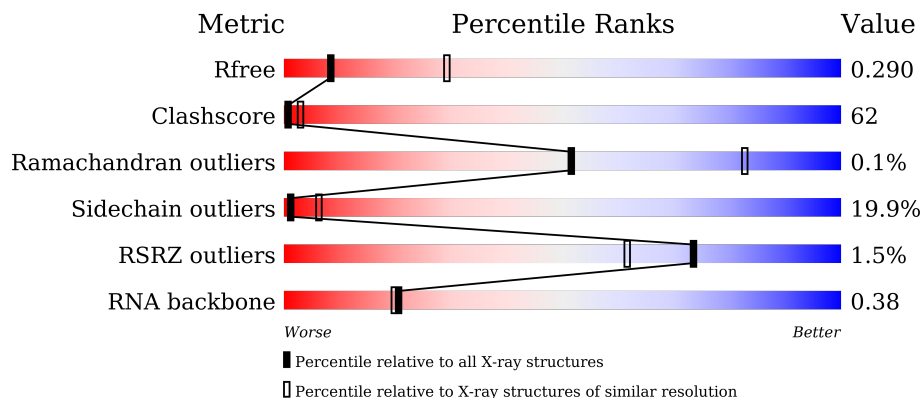
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.16 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.



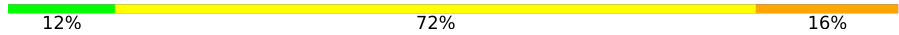


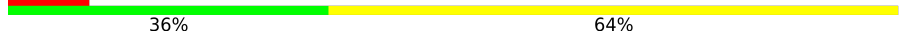
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1665 (3.20-3.12)
Clashscore	141614	1804 (3.20-3.12)
Ramachandran outliers	138981	1770 (3.20-3.12)
Sidechain outliers	138945	1769 (3.20-3.12)
RSRZ outliers	127900	1616 (3.20-3.12)
RNA backbone	3102	1073 (3.50-2.82)

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	98	 11% 48% 32% 5%
1	E	98	 16% 49% 28%
2	B	1368	 2% 30% 52% 14%
2	G	1368	 32% 52% 13%

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Mol	Chain	Length	Quality of chain
3	C	25	
3	H	25	
4	D	11	
4	J	11	

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 27214 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a RNA chain called RNA (98-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	A	94	Total 2009	C 899	N 362	O 654	P 94	0	0	0
1	E	95	Total 2029	C 908	N 365	O 661	P 95	0	0	0

- Molecule 2 is a protein called CRISPR-associated endonuclease Cas9/Csn1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	1326	Total 10821	C 6892	N 1877	O 2030	S 22	0	0	0
2	G	1326	Total 10822	C 6892	N 1879	O 2029	S 22	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	10	ALA	ASP	engineered mutation	UNP Q99ZW2
B	840	ALA	HIS	engineered mutation	UNP Q99ZW2
G	10	ALA	ASP	engineered mutation	UNP Q99ZW2
G	840	ALA	HIS	engineered mutation	UNP Q99ZW2

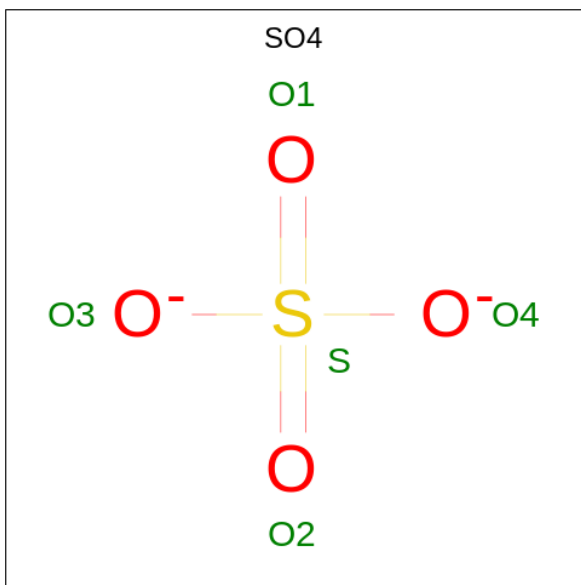
- Molecule 3 is a DNA chain called DNA (25-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	C	25	Total 505	C 243	N 93	O 145	P 24	0	0	0
3	H	25	Total 505	C 243	N 93	O 145	P 24	0	0	0

- Molecule 4 is a DNA chain called DNA (5'-D(*TP*TP*TP*AP*GP*GP*TP*AP*TP*TP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	11	Total	C	N	O	P	0	0	0
			225	110	37	68	10			
4	J	11	Total	C	N	O	P	0	0	0
			225	110	37	68	10			

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	O	S	0	0
			5	4	1		
5	G	1	Total	O	S	0	0
			5	4	1		

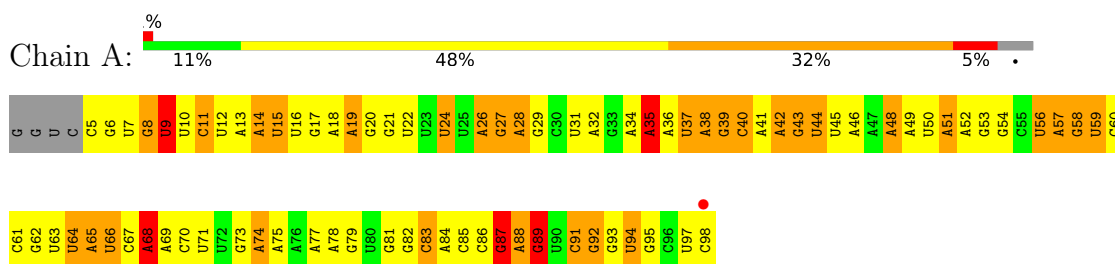
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	3	Total	O	0	0
			3	3		
6	B	26	Total	O	0	0
			26	26		
6	C	1	Total	O	0	0
			1	1		
6	E	3	Total	O	0	0
			3	3		
6	G	29	Total	O	0	0
			29	29		
6	H	1	Total	O	0	0
			1	1		

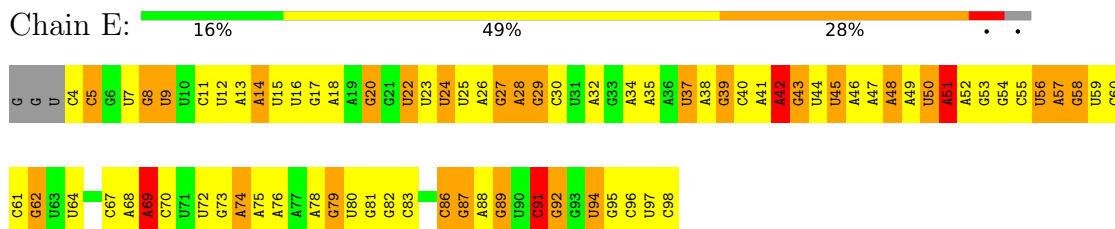
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

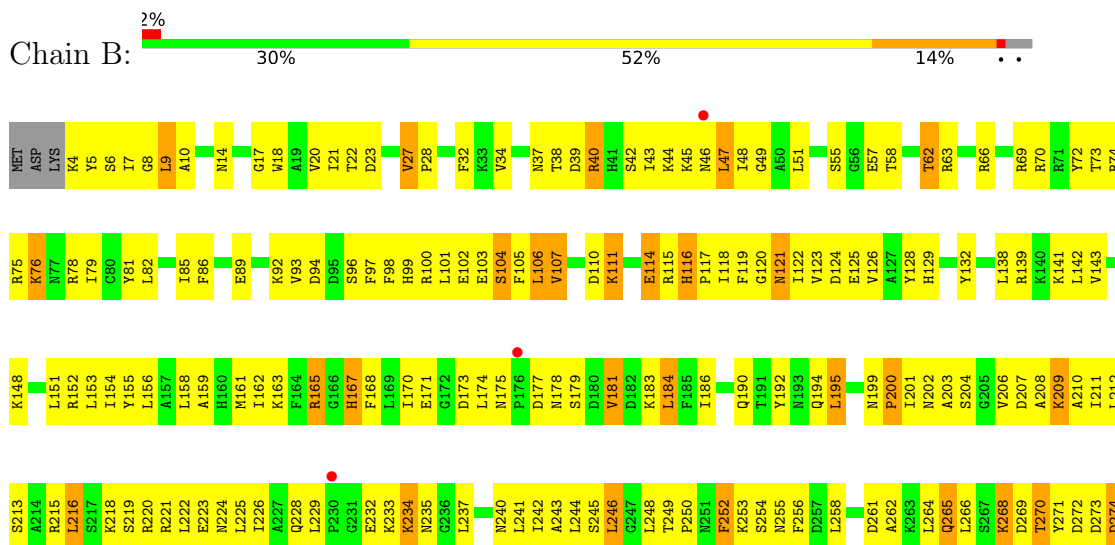
- Molecule 1: RNA (98-MER)



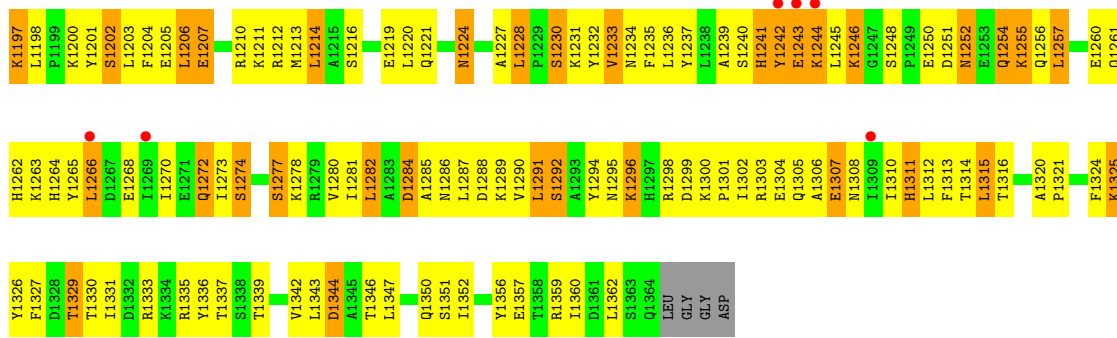
- Molecule 1: RNA (98-MER)



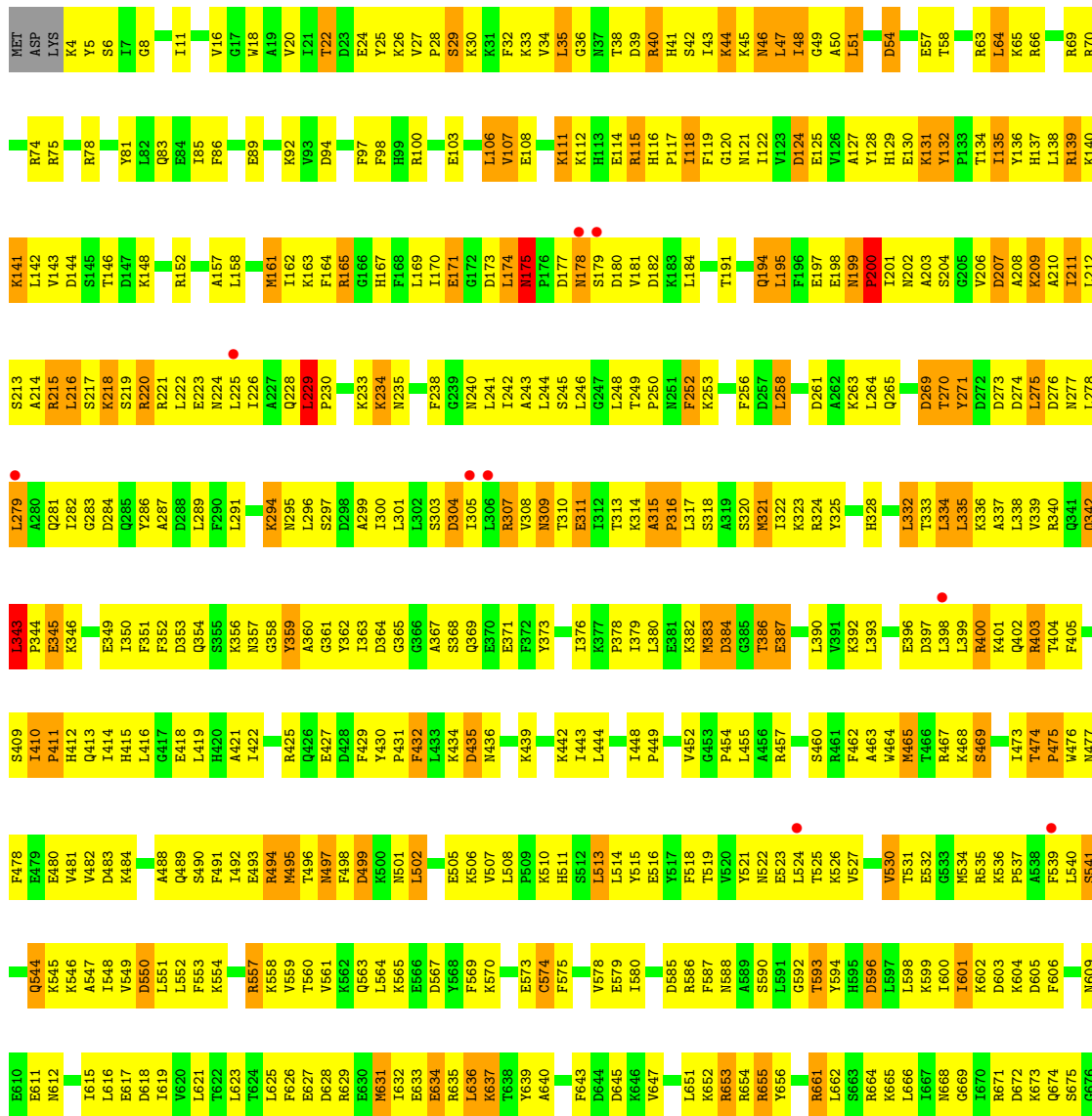
- Molecule 2: CRISPR-associated endonuclease Cas9/Csn1

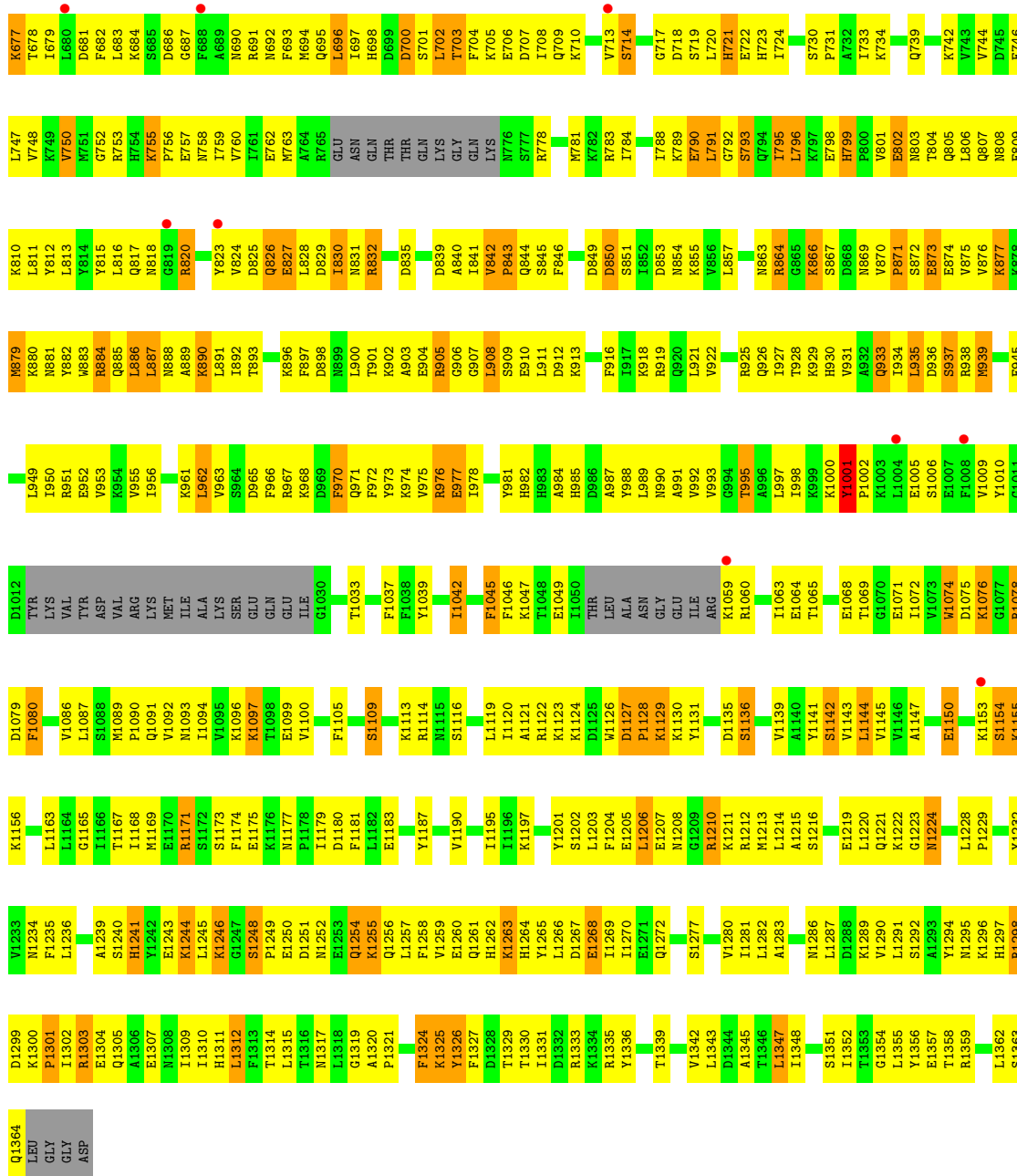


L275	L276	L277	L278	L279	A280	Q281	L282	G283	D284	Q285	A286	Y287	D288	L289	F290	L291	A292	D298	A299	I300	L301	L302	S303	D304	I305	L306	V308	N309	E311	I312	T313	K314	A315	P316	L317	S320	K323	R324	H328	L332	T333	L334	L335	K336	A337	L338	V339	R340																																																																																																																																																																																																																																																																																																																																																																																																													
Q341	Q342	P343	E345	K346	Y347	K348	E349	F350	F351	F352	K356	N357	G358	Y359	A360	G361	Y362	I363	D364	S368	A369	F429	Y430	P431	F432	L433	K434	F435	T443	L444	T445	F446	R447	P448	P449	G385	T386	E387	F388	L389	L390	V391	L392	L393	N394	R395	E396	D397	A463	L398	L399	W464	L400	K401	Q402	K468	S469	E470	R403	F405																																																																																																																																																																																																																																																																																																																																																																																																	
P406	M407	I410	H411	H412	Q413	L414	H415	L416	Q417	E418	L419	H420	A421	I422	L423	R424	R425	F429	Y430	P431	F432	L433	K434	F372	Y373	K374	F375	K377	P378	L443	L444	T445	F446	R447	P448	P449	G385	T386	E387	F388	L389	L390	V391	L392	L393	N394	R395	E396	D397	A463	L398	L399	W464	L400	K401	Q402	K468	S469	E470	R403	F405																																																																																																																																																																																																																																																																																																																																																																																																
T472	I473	T474	W475	W476	W477	E478	E479	E480	W481	W482	D483	A486	S487	A488	Q489	S490	F491	I492	M495	K496	V497	L498	F372	Y373	K374	F375	K377	P378	L443	L444	T445	F446	R447	P448	P449	G385	T386	E387	F388	L389	L390	V391	L392	L393	N394	R395	E396	D397	A463	L398	L399	W464	L400	K401	Q402	K468	S469	E470	R403	F405																																																																																																																																																																																																																																																																																																																																																																																																	
P537	A538	F539	L540	S541	G542	E543	Q544	K545	K546	A547	I548	V549	D550	L551	L552	F553	T555	M556	R557	K558	V559	L560	K562	Q563	E566	Y568	F569	K570	K571	L572	E573	C574	F575	S577	V578	E579	I580	S581	G582	V583	A584	D585	R586	F587	N588	A589	S590	L591	G592	L593	Y594	H595	D596	L597																																																																																																																																																																																																																																																																																																																																																																																																							
L598	K599	I600	I601	K602	D603	F606	L607	D608	W609	E610	E611	N612	E613	D614	I615	L616	E617	D618	I619	V620	L621	T622	L623	T624	L625	E626	E627	R628	R629	M631	E634	R635	L636	K637	F638	Y639	A640	H641	L642	F643	D644	V647	M648	K649	Q650	L651	R652	R653	L654	R655	L656	T657	G658	W659	G660																																																																																																																																																																																																																																																																																																																																																																																																						
S663	R664	K665	L666	I667	N668	G669	I670	R671	D672	K673	E674	N675	G676	D677	T678	I679	L680	D681	P682	L683	K684	S685	D686	G687	P688	A689	M690	R691	M692	F693	M694	Q695	L696	I697	H698	D699	D700	S701	L702	T703	F704	K705	E706	D707	I708	Q709	K710	A711	Q712	D718	R719	S719	L720	R721	Y722	H723	I724	K789																																																																																																																																																																																																																																																																																																																																																																																																			
L727	S750	A751	A752	K753	K754	K755	K756	L757	L758	Q759	T760	V763	D764	D765	E766	E767	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	L1001	L1002	L1003	L1004	L1005	L1006	L1007	L1008	L1009	L1010	L1011	L1012	L1013	L1014	L1015	L1016	L1017	L1018	L1019	L1020	L1021	L1022	L1023	L1024	L1025	L1026	L1027	L1028	L1029	L1030	L1031	L1032	L1033	L1034	L1035	L1036	L1037	L1038	L1039	L1040	L1041	L1042	L1043	L1044	L1045	L1046	L1047	L1048	L1049	L1050	L1051	L1052	L1053	L1054	L1055	L1056	L1057	L1058	L1059	L1060	L1061	L1062	L1063	L1064	L1065	L1066	L1067	L1068	L1069	L1070	L1071	L1072	L1073	L1074	L1075	L1076	L1077	L1078	L1079	L1080	L1081	L1082	L1083	L1084	L1085	L1086	L1087	L1088	L1089	L1090	L1091	L1092	L1093	L1094	L1095	L1096	L1097	L1098	L1099	L1100	L1101	L1102	L1103	L1104	L1105	L1106	L1107	L1108	L1109	L1110	L1111	L1112	L1113	L1114	L1115	L1116	L1117	L1118	L1119	L1120	L1121	L1122	L1123	L1124	L1125	L1126	L1127	L1128	L1129	L1130	L1131	L1132	L1133	L1134	L1135	L1136	L1137	L1138	L1139	L1140	L1141	L1142	L1143	L1144	L1145	L1146	L1147	L1148	L1149	L1150	L1151	L1152	L1153	L1154	L1155	L1156	L1157	L1158	L1159	L1160	L1161	L1162	L1163	L1164	L1165	L1166	L1167	L1168	L1169	L1170	L1171	L1172	L1173	L1174	L1175	L1176	L1177	L1178	L1179	L1180	L1181	L1182	L1183	L1184	L1185	L1186	L1187	L1188	L1189	L1190	L1191	L1192	L1193	L1194	L1195	L1196

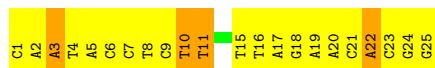


• Molecule 2: CRISPR-associated endonuclease Cas9/Csn1

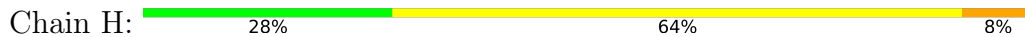




• Molecule 3: DNA (25-MER)

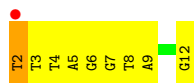
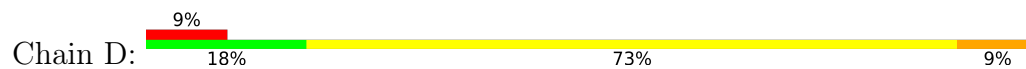


• Molecule 3: DNA (25-MER)

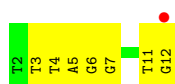




- Molecule 4: DNA (5'-D(*TP*TP*TP*AP*GP*GP*TP*AP*TP*TP*G)-3')



- Molecule 4: DNA (5'-D(*TP*TP*TP*AP*GP*GP*TP*AP*TP*TP*G)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	362.05Å 70.96Å 200.10Å 90.00° 101.52° 90.00°	Depositor
Resolution (Å)	50.17 – 3.16 50.17 – 3.16	Depositor EDS
% Data completeness (in resolution range)	65.6 (50.17-3.16) 65.6 (50.17-3.16)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.79 (at 3.19Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.251 , 0.288 0.251 , 0.290	Depositor DCC
R_{free} test set	2797 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	58.3	Xtrriage
Anisotropy	0.329	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.23 , 35.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.39$, $\langle L^2 \rangle = 0.22$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.85	EDS
Total number of atoms	27214	wwPDB-VP
Average B, all atoms (Å ²)	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 43.87 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.6562e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: SO4

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	0.87	1/2249 (0.0%)	1.58	39/3503 (1.1%)
1	E	0.84	0/2271	1.55	31/3537 (0.9%)
2	B	0.62	11/11013 (0.1%)	0.73	29/14802 (0.2%)
2	G	0.60	9/11013 (0.1%)	0.71	22/14799 (0.1%)
3	C	1.25	2/566 (0.4%)	1.24	6/870 (0.7%)
3	H	1.38	2/566 (0.4%)	1.21	1/870 (0.1%)
4	D	1.40	2/251 (0.8%)	1.27	0/387
4	J	1.29	2/251 (0.8%)	1.20	0/387
All	All	0.71	29/28180 (0.1%)	0.97	128/39155 (0.3%)

The worst 5 of 29 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	10	DT	C3'-O3'	-7.60	1.34	1.44
4	J	3	DT	C1'-N1	6.21	1.57	1.49
4	D	3	DT	N1-C2	5.78	1.42	1.38
4	J	4	DT	C3'-O3'	-5.67	1.36	1.44
3	H	14	DA	N9-C4	-5.66	1.34	1.37

The worst 5 of 128 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	14	A	O5'-P-OP2	-9.27	97.36	105.70
2	B	684	LYS	N-CA-C	-9.20	86.15	111.00
1	E	51	A	C8-N9-C4	-9.21	102.12	105.80
2	G	506	LYS	N-CA-C	-9.19	86.20	111.00
2	G	507	VAL	N-CA-CB	-9.01	91.67	111.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2009	0	1009	110	0
1	E	2029	0	1020	127	0
2	B	10821	0	10948	1507	0
2	G	10822	0	10967	1594	0
3	C	505	0	283	31	0
3	H	505	0	283	23	0
4	D	225	0	129	18	0
4	J	225	0	129	6	0
5	B	5	0	0	0	0
5	G	5	0	0	1	0
6	A	3	0	0	0	0
6	B	26	0	0	7	0
6	C	1	0	0	0	0
6	E	3	0	0	1	0
6	G	29	0	0	10	0
6	H	1	0	0	0	0
All	All	27214	0	24768	3234	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 62.

The worst 5 of 3234 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:G:530:VAL:CG1	2:G:537:PRO:HB3	1.21	1.65
2:B:181:VAL:HG11	2:B:300:ILE:CD1	1.14	1.59
2:G:279:LEU:CD1	2:G:287:ALA:HB2	1.28	1.59
2:G:279:LEU:HD11	2:G:287:ALA:CB	1.21	1.59
2:G:870:VAL:CG2	2:G:908:LEU:CD2	1.77	1.59

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	
2	B	1318/1368 (96%)	1279 (97%)	38 (3%)	1 (0%)	51	83
2	G	1318/1368 (96%)	1273 (97%)	43 (3%)	2 (0%)	47	78
All	All	2636/2736 (96%)	2552 (97%)	81 (3%)	3 (0%)	51	83

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	200	PRO
2	G	200	PRO
2	G	230	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	
2	B	1185/1225 (97%)	943 (80%)	242 (20%)	1	5
2	G	1186/1225 (97%)	957 (81%)	229 (19%)	1	7
All	All	2371/2450 (97%)	1900 (80%)	471 (20%)	1	6

5 of 471 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	1291	LEU
2	G	1205	GLU
2	G	220	ARG

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Mol	Chain	Res	Type
2	G	1155	LYS
2	G	886	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 48 such sidechains are listed below:

Mol	Chain	Res	Type
2	G	235	ASN
2	G	497	ASN
2	G	281	GLN
2	G	342	GLN
2	G	690	ASN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	93/98 (94%)	31 (33%)	4 (4%)
1	E	94/98 (95%)	24 (25%)	3 (3%)
All	All	187/196 (95%)	55 (29%)	7 (3%)

5 of 55 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	9	U
1	A	11	C
1	A	20	G
1	A	24	U
1	A	27	G

5 of 7 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	68	A
1	E	8	G
1	E	42	A
1	E	27	G
1	A	42	A

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](#)

2 ligands 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
5	SO4	G	1401	-	4,4,4	0.98	0	6,6,6	1.66	1 (16%)
5	SO4	B	1401	-	4,4,4	0.98	0	6,6,6	1.66	1 (16%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
5	B	1401	SO4	O4-S-O3	3.83	125.39	109.06
5	G	1401	SO4	O4-S-O3	3.83	125.39	109.06

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	G	1401	SO4	1	0

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	94/98 (95%)	-0.27	1 (1%) 80 70	27, 56, 107, 151	0
1	E	95/98 (96%)	-0.29	0 100 100	31, 56, 109, 125	0
2	B	1326/1368 (96%)	-0.21	23 (1%) 70 57	24, 57, 90, 137	0
2	G	1326/1368 (96%)	-0.21	18 (1%) 75 63	25, 57, 89, 123	0
3	C	25/25 (100%)	-0.32	0 100 100	32, 47, 96, 107	0
3	H	25/25 (100%)	-0.31	0 100 100	34, 47, 99, 112	0
4	D	11/11 (100%)	0.23	1 (9%) 9 5	48, 65, 121, 133	0
4	J	11/11 (100%)	0.13	1 (9%) 9 5	35, 60, 114, 132	0
All	All	2913/3004 (96%)	-0.21	44 (1%) 73 61	24, 57, 93, 151	0

The worst 5 of 44 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	947	ASP	3.9
2	B	1243	GLU	3.7
2	G	305	ILE	3.6
2	B	1043	MET	3.3
4	D	2	DT	3.3

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
5	SO4	B	1401	5/5	0.95	0.26	30,30,30,30	0
5	SO4	G	1401	5/5	0.95	0.13	78,81,95,107	0

6.5 Other polymers [i](#)

There are no such residues in this entry.