



wwPDB EM Validation Summary Report ⓘ

Apr 22, 2024 – 08:05 pm BST

PDB ID : 6ZHE
EMDB ID : EMD-11219
Title : Cryo-EM structure of DNA-PK dimer
Authors : Chaplin, A.K.; Hardwick, S.W.; Chirgadze, D.Y.; Blundell, T.L.
Deposited on : 2020-06-23
Resolution : 7.24 Å (reported)

This is a wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : 0.0.1.dev92
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

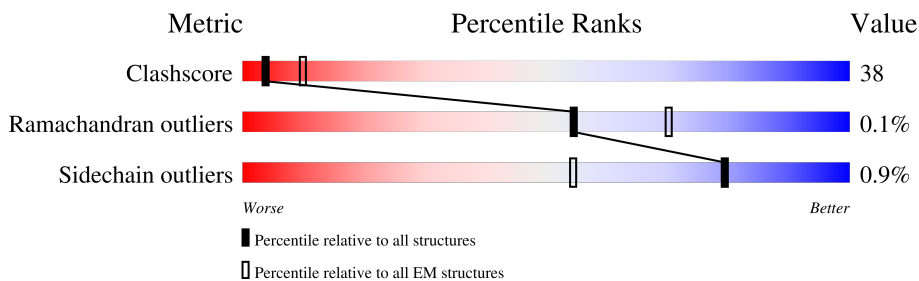
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 7.24 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.



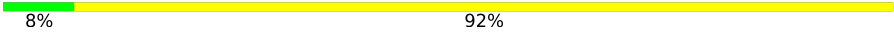

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	4156	
1	F	4156	
2	B	609	
2	G	609	
3	C	732	
3	H	732	
4	J	25	
5	I	27	

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Mol	Chain	Length	Quality of chain
6	D	26	 8% 92%
7	E	28	 18% 82%

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 78785 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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-dependent protein kinase catalytic subunit,DNA-PKcs.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	3768	Total	C	N	O	S	0	0
			29018	18632	4914	5293	179		
1	F	3731	Total	C	N	O	S	0	0
			29012	18636	4896	5295	185		

- Molecule 2 is a protein called X-ray repair cross-complementing protein 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	489	Total	C	N	O	S	0	0
			3789	2430	640	704	15		
2	G	489	Total	C	N	O	S	0	0
			3797	2434	640	708	15		

- Molecule 3 is a protein called X-ray repair cross-complementing protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	705	Total	C	N	O	S	0	0
			5490	3502	927	1037	24		
3	H	700	Total	C	N	O	S	0	0
			5517	3522	929	1041	25		

- Molecule 4 is a DNA chain called DNA (25-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
4	J	25	Total	C	N	O	P	0	0
			509	244	86	154	25		

- Molecule 5 is a DNA chain called DNA (27-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
5	I	27	Total	C	N	O	P	0	0
			552	265	102	158	27		

- Molecule 6 is a DNA chain called DNA (26-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
6	D	26	528	253	89	160	26	0	0

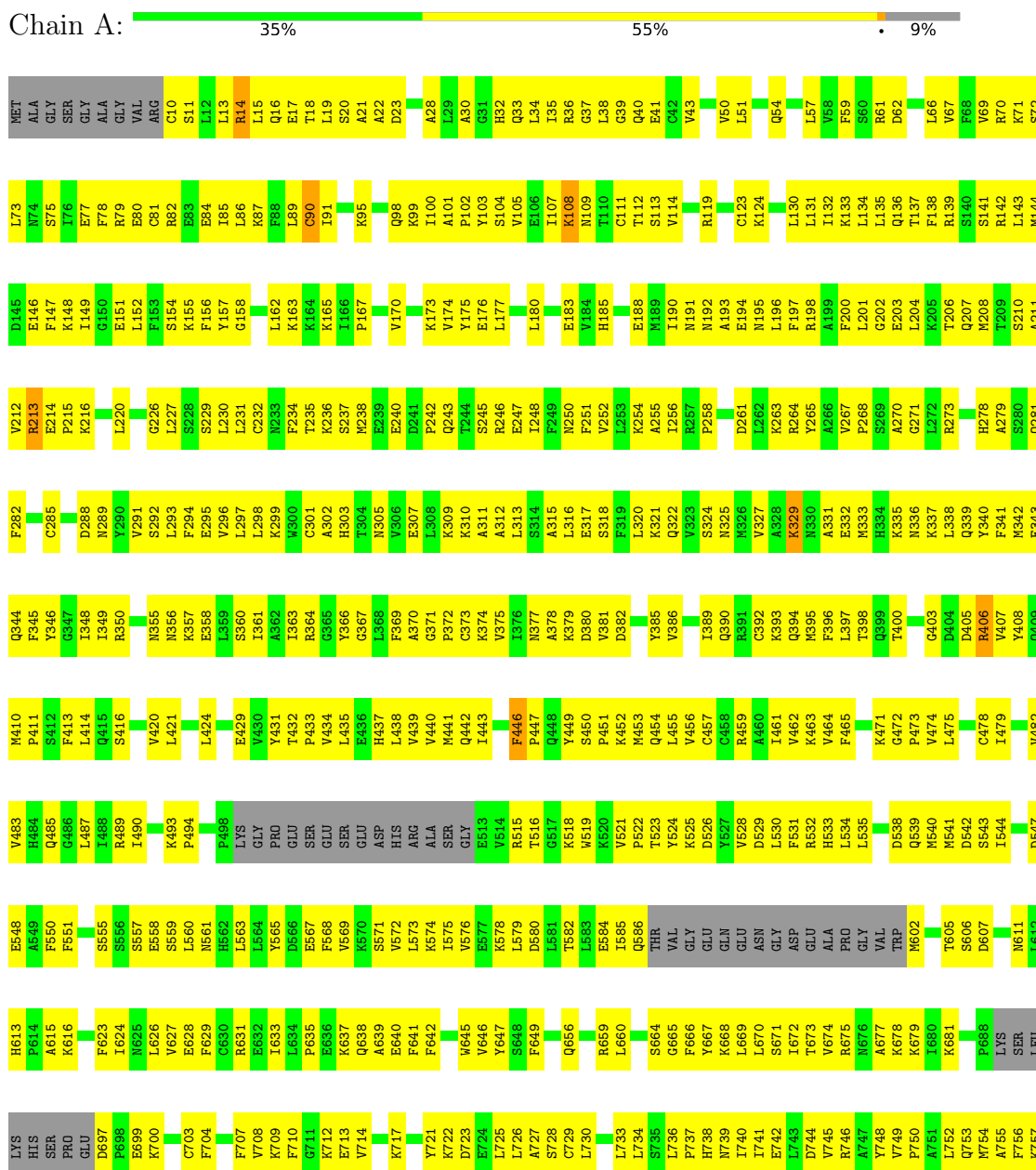
- Molecule 7 is a DNA chain called DNA (28-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
7	E	28	573	275	107	163	28	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 atom inclusion in map 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 diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). 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-dependent protein kinase catalytic subunit,DNA-PKcs



F2854	K2786	LEU	PRO	PHE	H2527	R2456	F2389	I2326	F2260	L2129	F2128	M1859
V2855	H2787	ARG	LEU	VAL	E2528	F2457	H2390	L2327	S2261	L2199	L2129	E1860
S2856	G2788	LEU	VAL	GLU	R2529	V2458	G2391	R2328	G2262	A2200	L2129	S1861
C2857	S2789	ARG	ASP	THR	R2530	V2459	V2392	Y2329	K2263	T2201	G2131	T1862
I2858	L2790	ARG	HIS	GLN	L2531	E2460	L2393	R2330	D2264	P2202	K2132	F1863
Q2859	I2791	ARG	THR	ALA	P2534	H2464	K2394	M2331	P2265	T2203	L2133	Q1866
V2860	T2792	PHE	SER	SER	N2534	F2465	T2395	E2332	M2266	G2204	G2134	I1867
L2861	P2793	MET	PRO	GLN	D2537	F2466	L2396	R2333	S2267	V2205	N2135	I1870
S2862	L2794	ARG	SER	GLY	S2466	T2467	C2397	K2334	K2268	P2206	P2136	M1870
Q2863	Q2795	ASP	SER	THR	T2468	T2468	L2398	N2335	D2269	K2207	L2137	L1871
C2864	Q2796	GLN	ASP	THR	L2539	E2399	E2399	N2336	N2270	R2208	L2138	M1871
H2865	V2797	GLY	SER	GLN	C2469	C2469	L2540	L2337	S2271	E2209	P2139	G1872
A2798	Q2798	LEU	LEU	THR	R2470	R2470	V2401	E2338	V2272	V2210	G1873	R1873
Q2799	R2799	LEU	LEU	ARG	E2471	E2471	L2402	E2339	G2273	L2211	Y1874	Y1874
L2800	D2800	SER	PHE	THR	Q2472	Q2472	C2403	E2340	I2274	A2212	R1875	K1875
R2801	R2801	LEU	ALA	GLN	M2473	M2473	R2404	C2342	Q2275	N2213	F2145	L1876
P2802	L2802	MET	HIS	GLU	Y2474	Y2474	V2405	E2343	L2276	R2214	L2146	L1877
L2804	L2804	GLY	LYS	GLY	N2475	N2475	E2406	L2277	L2215	L2215	C1942	L1878
A2805	A2805	ARG	ARG	SER	E2551	I2476	E2406	A2346	C2278	L2216	V2149	V1879
C2880	K2806	LYS	SER	LEU	F2554	M2479	L2411	K2347	I2279	L2219	V2150	S1882
L2881	Q2807	GLY	GLU	ALA	L2555	T2480	Y2412	Q2348	V2280	M2220	I2151	ASP
A2882	L2808	VAL	LEU	ARG	H2481	H2481	Q2414	K2350	L2285	K2221	M2152	R1883
S2883	F2809	ALA	GLM	TRP	D2482	D2482	L2415	Q2351	P2286	H2222	E2154	L1884
L2884	S2810	GLU	ARG	PRO	N2550	N2550	Q2351	R2352	P2287	V2223	E2155	P1885
Q2885	S2811	GLN	ALA	VAL	F2561	F2561	F2420	Q2353	P2287	F2224	V2156	K1886
Q2886	L2812	LYS	PRO	ALA	R2485	R2485	Q2421	M2356	Q2291	H2225	F2157	D1887
F2887	F2813	ARG	LEU	GLY	D2486	D2486	Q2422	M2356	Q2291	H2225	F2157	V1955
L2890	L2814	GLU	LYS	ILE	L2562	L2562	V2423	D2357	L2294	K2227	P2159	V1956
R2891	L2815	LYS	LYS	GLN	E2564	E2564	M2424	K2359	R2228	P2159	P2160	H1890
L2892	K2816	ILE	VAL	ARG	M2565	M2565	R2425	F2360	A2299	A2161	A2161	E1891
R2893	E2819	SER	GLY	ALA	E2497	E2497	H2426	I2361	S2297	K2162	K2162	K1892
E2894	N2820	THR	PRO	ALA	I2498	I2498	R2427	I2362	E2298	H2163	H2163	S1894
E2895	D2821	ASP	PRO	GLN	F2499	F2499	D2428	I2362	E2298	R2232	R2232	I1896
L2825	T2825	LEU	PHE	GLN	Y2572	Y2572	D2429	C2363	F2300	H2233	C2093	P1971
S2826	L2826	LEU	GLY	GLN	P2573	P2573	E2430	C2363	F2300	H2233	C2093	E1972
S2827	L2826	LEU	LYS	HIS	N2574	N2574	R2431	M2365	Q2301	N2234	M2094	M1897
E2828	S2827	MET	LYS	ASP	P2575	P2575	Q2432	K2366	L2303	E2236	A2095	Q1898
K2829	E2828	LYS	ARG	PHE	M2576	M2576	K2433	V2367	L2304	L2097	L2097	F1900
N2830	K2829	LEU	LEU	THR	L2506	L2506	V2434	T2368	M2305	I2238	A2173	H1901
N2831	L2830	GLY	GLY	LEU	I2507	I2507	C2435	K2369	M2306	K2239	S2174	G1902
L2832	N2831	THR	LEU	THR	Q2508	Q2508	L2436	S2370	M2307	T2240	E2175	S1903
K2835	L2832	GLY	PRO	GLN	G2509	G2509	I2437	F2371	S2308	L2241	N2176	C1904
L2836	K2835	ASP	ASP	ALA	I2511	I2511	I2439	P2372	F2309	V2242	M2177	M1905
L2837	L2836	GLU	GLU	ASP	D2512	D2512	Y2440	F2373	V2310	W2245	G2181	T1906
Q2838	Q2837	VAL	VAL	GLY	E2513	E2513	K2441	A2375	R2311	K2246	I2182	E1907
F2840	D2838	ASN	ASN	ARG	N2514	N2514	M2442	D2376	K2313	D2247	H2183	G1908
M2841	F2840	LYS	LYS	SER	P2515	P2515	M2443	R2377	E2314	G2248	Y2184	M1909
R2842	M2841	VAL	VAL	PHE	G2516	G2516	L2446	F2378	V2315	L2249	M2185	E1910
F2843	F2842	LYS	LYS	ASP	L2517	L2517	K2447	M2379	V2316	S2250	V2186	L1911
L2844	F2843	GLY	TRP	ARG	Q2518	Q2518	P2447	M2380	A2317	I2251	V2187	ARG
N2845	F2843	ALA	ALA	THR	L2520	L2520	V2449	V2382	A2318	P2252	E2188	TYR
F2850	N2845	ALA	ALA	THR	T2521	T2521	E2450	F2383	A2300	R2254	E2189	ASN
F2851	F2850	ARG	ARG	GLY	R2522	R2522	R2451	F2384	F2391	L2255	V2190	GLN
L2852	F2851	THR	THR	LEU	N2523	N2523	R2452	L2385	V2322	I2256	I2193	VAL
L2853	F2851	THR	THR	LEU	F2524	F2524	E2453	L2386	F2257	F2257	I2194	GLU
L2854	F2852	THR	THR	PRO	W2525	W2525	L2454	P2387	E2258	M2126	L2195	SER
L2855	P2853	LEU	LEU	ASP	S2526	S2526	L2455	K2388	K2259	K2127	W2196	PRO

A3931	V3852	T3790	A3720	Q3494	L3416	L3348	K3267	L3135	I3065	D2992
M3952	G3860	Y3791	G3721	F3495	A3417	A3349	T3268	T3136	D3066	W2923
A3854	N3650	S3792	F3722	I3496	D3418	E3350	R3269	E3137	K3067	W2924
Y3855	L3652	D3723	L3652	L3499	F3419	L3351	R3270	I3138	A3068	E2995
G3935	M3654	R3663	L3562	S3500	C3420	E3352	D3271	K3139	M3069	L2926
G3936	M3654	D3563	D3563	I3499	D3421	E3352	W3272	E3140	H3070	L2927
V3937	M3796	Q3564	Q3564	H3501	D3421	R3357	L3273	F3141	G3071	K2928
H3944	F3659	G3565	G3565	M3502	R3425	R3358	V3274	I3142	E3072	L2929
A3945	N3650	G3566	G3566	L3505	E3429	I3359	S3275	S3143	L3073	Y2930
F3946	M3729	V3567	V3567	L3360	A3429	I3359	W3276	F3144	Q3074	R2931
G3947	T3663	L3506	L3506	D3507	ASN	E3361	W3277	I3145	K3075	
A3949	N3664	D3507	D3507	K3508	ALA	E3361	Q3278	S3146	A3076	G2934
T3950	L3666	I3572	I3572	A3511	SER	S3366	S3279	K3147	L3078	E2935
Q3951	M3671	M3573	M3573	A3512	ILE	S3367	R3282	G3149	E3079	D2937
F3952	L3668	A3574	A3574	A3513	ASP	E3368	L3283	W3938	W3008	W2938
L3953	K3669	L3575	L3575	A3514	SER	D3369	R3287	N3150	K3009	L2939
L3954	M3670	K3586	K3586	Q3515	ALA	E3438	R3287	Q3154	S3083	R2940
V3955	K3671	D3587	D3587	H3516	E3438	K3372	L3227	L3157	G3084	G2941
P3960	K3673	K3588	K3588	H3516	P3443	V3373	S3290	K3158	E3085	L2942
F3961	S3674	S3589	S3589	V3518	P3443	I3374	Q3291	K3159	L3086	F2943
L3962	K3675	M3590	M3590	A3375	V3446	A3375	G3292	R3160	S3087	F2944
L3963	P3676	D3591	D3591	E3520	V3446	G3376	C3293	L3160	L3088	S2945
T3964	P3677	V3592	V3592	E3520	K3449	L3377	S3294	L3161	L3089	E2946
G3965	K3681	K3593	K3593	D3523	M3450	Q3379	E3295	L3162	Y3090	L2947
F3967	E3682	A3594	A3594	M3524	K3451	Q3379	L3298	T3163	L3092	G2948
I3968	C3683	E3595	E3595	N3524	K3452	R3380	L3298	W3164	L3092	
N3969	W3686	L3596	L3596	V3529	L3461	A3381	K3302	K3166	Q3093	Q2951
L3970	D3689	M3602	M3602	V3530	R3465	F3382	K3302	R3167	D3094	L2952
L3971	F3690	K3604	K3604	Y3531	L3466	E3388	F3309	K3166	K3095	T2953
L3972	K3691	Y3614	Y3614	F3533	K3464	Q3383	E3309	S3087	D3095	T2953
P3973	V3692	A3615	A3615	L3534	F3465	Q3390	M3310	R3167	E3096	E2946
M3974	E3693	A3616	A3616	L3534	K3455	L3385	M3311	Y3168	Y3096	Q2954
K3975	F3694	L3617	L3617	S3536	A3461	S3386	L3306	P3169	D3097	
E3976	L3695	G3626	G3626	S3537	R3467	S3387	L3307		R3098	L2957
T3977	R3696	A3627	A3627	E3538	L3468	E3393	Y3315	P3175	A3099	L2958
L3979	N3697	F3632	F3632	E3538	L3468	E3394	Y3316	M3176	Q3036	A2959
M3980	E3698	I3633	I3633	S3539	Q3470	E3395	L3317	K3177	Q3037	
Y3981	L3699	Q3634	Q3634	Y3540	L3471	A3396	S3317	M3177	E3038	
S3982	E3700	F3635	F3635	S3541	I3472	A3396	K3318	I3178	T3039	R2962
L3983	I3701	F3636	F3636	F3542	E3473	GLN	M3250	W3179	Y3040	S2963
M3984	Q3704	K3637	K3637	K3542	R3474	PRO	N3251	D3180	L3041	D2964
V3985	Q3705	F3638	F3638	S3542	Y3475	PRO	L3321	D3181	L3042	Y2965
A3987	D3706	I3639	I3639	T3545	Y3475	PRO	A3222	I3182	E2966	E2967
L3988	G3707	T3635	T3635	T3547	K3477	TRP	F3252	I3183	I3045	
L3989	R3708	F3636	F3636	G3548	E3478	SER	F3252	T3184	R3046	K2970
A3990	G3709	G3637	G3637	H3549	T3479	SER	F3252	N3185	S3047	K2971
F3991	P3711	K3638	K3638	H3549	L3480	PRO	S3253	R3186	K3048	Q2972
S3992	P3711	E3639	E3639	N3551	L3482	GLY	A3255	C3187	L3049	Y2972
P3995	L3712	K3642	K3642	K3551	L3482	PRO	A3255	F3189	K3050	E2974
T3999	P3713	H3643	H3643	F3554	E3486	PRO	L3254	L3190	L3052	K2978
M4000	V3717	G3644	G3644	A3555	L3487	PRO	K3257	K3192	L3053	K2978
T4001	I3719	G3645	G3645	R3557	I3487	PRO	L3258	I3193	Q3054	Q2979
		R3646	R3646		P3491	PRO	L3258	E3194	E3056	D2990
					C3492	PRO	L3258	E3195	E3056	W2991
					W3493	PRO	L3258	L3126	E3056	W2992
							L3258	L3126	E3056	V2992
							L3258	L3126	E3056	Q2975
							L3258	L3126	E3056	Y2992
							L3258	L3126	E3056	K2978
							L3258	L3126	E3056	Q2979
							L3258	L3126	E3056	D2973
							L3258	L3126	E3056	E2974
							L3258	L3126	E3056	L3052
							L3258	L3126	E3056	L3053
							L3258	L3126	E3056	L3054
							L3258	L3126	E3056	L3055
							L3258	L3126	E3056	L3056
							L3258	L3126	E3056	L3057
							L3258	L3126	E3056	L3058
							L3258	L3126	E3056	L3059
							L3258	L3126	E3056	L3060
							L3258	L3126	E3056	L3061
							L3258	L3126	E3056	L3062
							L3258	L3126	E3056	L3063
							L3258	L3126	E3056	F3064

M4002 D4003 F4005 V4006 W4007 E4008 F4009 S4010 F4011 F4012 F4013 F4014 M4015 F4016 E4017 F4018 F4019 M4020 M4021 K4022 M4027 A4034 E4035 N4037 W4038 T4044 C4045 Y4046 A4047 A4048 R4049 K4050 L4051 A4052 M4055 C4061 P4062 E4063 L4065 L4066 G4067 H4068 E4069 R4070 A4071 P4072 A4073 F4074 R4075 D4076 Y4077 Y4078

A4079 R4082 F4083 W4084 K4085 M4088 I4089 Q4092 E4095 L4098 S4099 E4100 E4101 T4102 Q4103 M4104 K4105 C4106 L4107 Q4110 D4113 P4114 M4115 I4116 L4117 G4118 T4119 T4120 W4121 P4126 W4127 X6006 X6007 X6008 X6009 X6010 X6011 X6012 X6013 X6014 X6015 X6023

● Molecule 1: DNA-dependent protein kinase catalytic subunit,DNA-PKCs



MET ALA GLY SER GLY VAL ARG C10 S11 L12 L13 R14 L15 Q16 E17 T18 L19 S20 A21 A22 D23 C25 L34 L35 R36 G37 L38 C42 V43 S46 S47 P48 L51 Q54 T55 V58 F59 R61 L66 V67 F68 R70 K71 S72 L73 H74 I75 I76

F77 F78 R79 E80 C81 E83 E84 L85 L86 R87 F88 L89 C90 I91 R95 M96 G97 Q98 R99 I100 S104 V105 E106 I107 K108 C111 Y115 T116 K117 D118 S46 S47 P48 L51 Q54 T55 V58 F59 R61 L66 V67 F68 R70 K71 S72 L73 H74 I75 I76

E151 L152 F153 S154 K155 E159 L162 K163 K164 F165 V170 L171 E172 K173 V174 E176 L177 L178 M180 L181 G182 H185 P186 S187 E188 M189 N191 M192 A193 E194 F197 R198 F200 L201 G202 L203 L204 K205 L206 T209 S210 A211 V212 R213 E214 P215 L216 T217 F218 V219 L220

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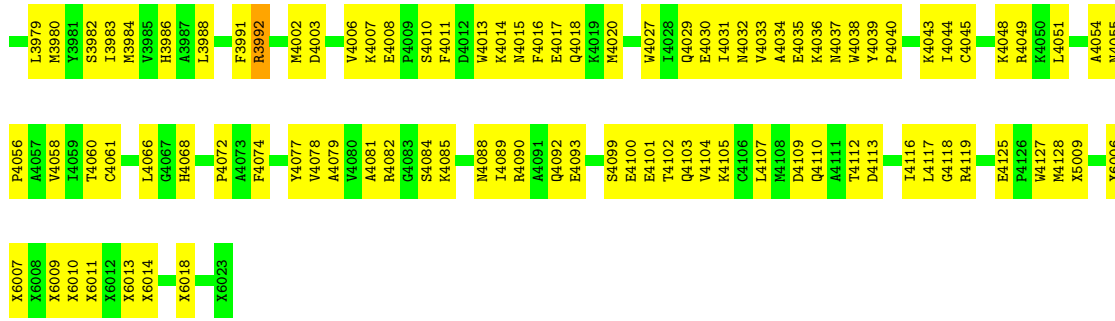
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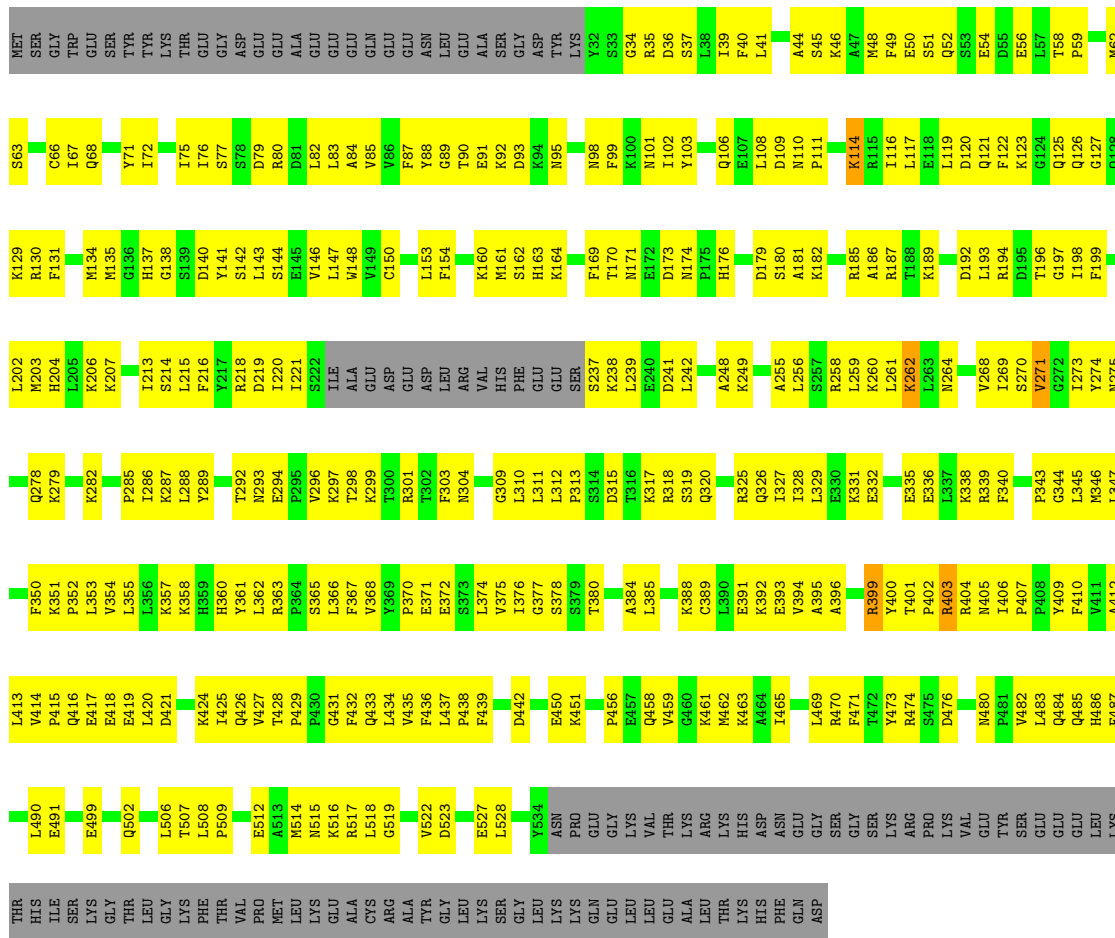
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H2865	S2865	L2542	M2475	L2542	L2411	L2411	L2216	L2216	ARG	L2144	ARG	L1933
A2866	S2866	N2543	I2476	N2543	Y2412	Y2412	M2217	M2217	GLU	L2146	GLU	L1934
L2869	S2869	S2544	L2477	S2544	L2413	L2413	N2283	N2283	GLN	A2147	GLN	E1935
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A2874	S2874	Y2546	W2479	Y2546	L2415	L2415	L2285	L2285	GLU	V2150	GLU	R1937
S2877	S2877	S2547	I2480	S2547	K2418	K2418	P2287	P2287	ALA	I2151	ALA	R1938
A2878	S2878	L2550	D2482	L2550	E2419	E2419	Y2288	Y2288	ASN	M2152	ASN	L1939
L2881	S2881	E2551	Y2484	E2551	F2420	F2420	D2289	D2289	GLY	T2153	GLY	Y1940
L2882	S2882	L2552	R2485	L2552	V2421	V2421	P2290	P2290	ASP	E2154	ASP	H1941
S2883	S2883	H2553	R2485	H2553	M2424	M2424	Q2291	Q2291	ASP	E2154	ASP	E1946
L2884	S2884	L2555	E2490	L2555	R2425	R2425	C2292	C2292	VAL	F2156	VAL	C1947
Q2886	S2886	S2556	T2491	S2556	H2426	H2426	G2293	G2293	LEU	F2157	LEU	M1948
P2887	S2887	L2557	D2492	L2557	R2427	R2427	I2294	I2294	GLU	R2227	GLU	I1949
V2888	S2888	A2558	N2493	A2558	D2429	D2429	Q2295	Q2295	LEU	F2158	LEU	I1949
G2889	S2889	T2559	S2495	T2559	E2430	E2430	S2296	S2296	MET	Y2160	MET	S1950
L2890	S2890	L2561	Q2497	L2561	K2432	K2432	Y2297	Y2297	SER	K2162	SER	V1951
R2891	S2891	L2562	F2498	L2562	W2434	W2434	E2298	E2298	SER	K2162	SER	F1947
L2892	S2892	E2564	K2500	E2564	C2435	C2435	Y2299	Y2299	LEU	H2163	LEU	S1968
L2893	S2893	L2566	D2503	L2566	I2438	I2438	F2300	F2300	TYR	P2167	TYR	E1969
E2894	S2894	S2567	D2504	S2567	L2439	L2439	L2303	L2303	LEU	L2168	LEU	K1970
L2897	S2897	L2568	V2505	L2568	M2442	M2442	V2304	V2304	ALA	Q2170	ALA	E1972
P2902	S2902	S2569	L2506	S2569	M2443	M2443	M2307	M2307	SER	L2171	SER	K1973
ALA	GLU	F2823	I2507	F2823	I2507	I2507	L2237	L2237	THR	M2086	THR	F1967
LEU	LEU	T2824	G2508	T2824	G2508	G2508	L2238	L2238	LEU	M2086	LEU	S1968
LEU	LEU	T2825	L2510	T2825	L2510	L2510	L2239	L2239	LEU	M2091	LEU	E1969
PRO	PRO	K2829	L2511	K2829	L2511	L2511	L2240	L2240	VAL	H2091	VAL	K1970
ALA	ALA	N2831	E2513	N2831	E2513	E2513	L2241	L2241	ALA	E2092	ALA	E1972
ARG	ARG	K2835	L2514	K2835	L2514	L2514	L2242	L2242	SER	M2099	SER	K1973
GLY	GLY	D2839	L2515	D2839	L2515	L2515	L2243	L2243	THR	L2100	THR	L1976
GLY	GLY	N2845	L2517	N2845	L2517	L2517	L2244	L2244	LEU	L2100	LEU	L1977
ALA	ALA	T2846	Q2518	T2846	Q2518	Q2518	L2245	L2245	GLU	V2101	GLU	F1978
ALA	ALA	A2767	I2521	A2767	I2521	I2521	L2246	L2246	GLU	V2101	GLU	F1979
ALA	ALA	Q2768	R2522	Q2768	R2522	R2522	L2247	L2247	GLU	V2101	GLU	F1979
ALA	ALA						L2248	L2248	GLU	V2101	GLU	F1979
ALA	ALA						L2249	L2249	MET	H2104	MET	N1980
LEU	LEU						L2250	L2250	SER	H2105	SER	L1981
LEU	LEU						L2251	L2251	GLN	R2106	GLN	I1982
PRO	PRO						L2252	L2252	PHE	S2107	PHE	D1983
ALA	ALA						L2253	L2253	ASP	M2185	ASP	F1984
LYS	LYS						L2254	L2254	PHE	M2185	PHE	K1985
ARG	ARG						L2255	L2255	SER	E2115	SER	R1986
VAL	VAL						L2256	L2256	THR	P2119	THR	ARG
ARG	ARG						L2257	L2257	GLY	R2120	GLY	TYR
GLY	GLY						L2258	L2258	VAL	D2121	VAL	ASN
GLY	GLY						L2259	L2259	GLN	L2122	GLN	PHE
ALA	ALA						L2260	L2260	SER	L2122	SER	PRO



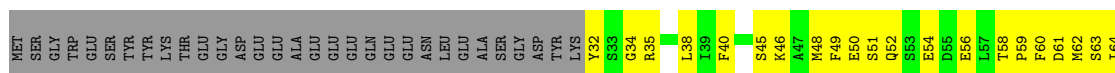
- Molecule 2: X-ray repair cross-complementing protein 6

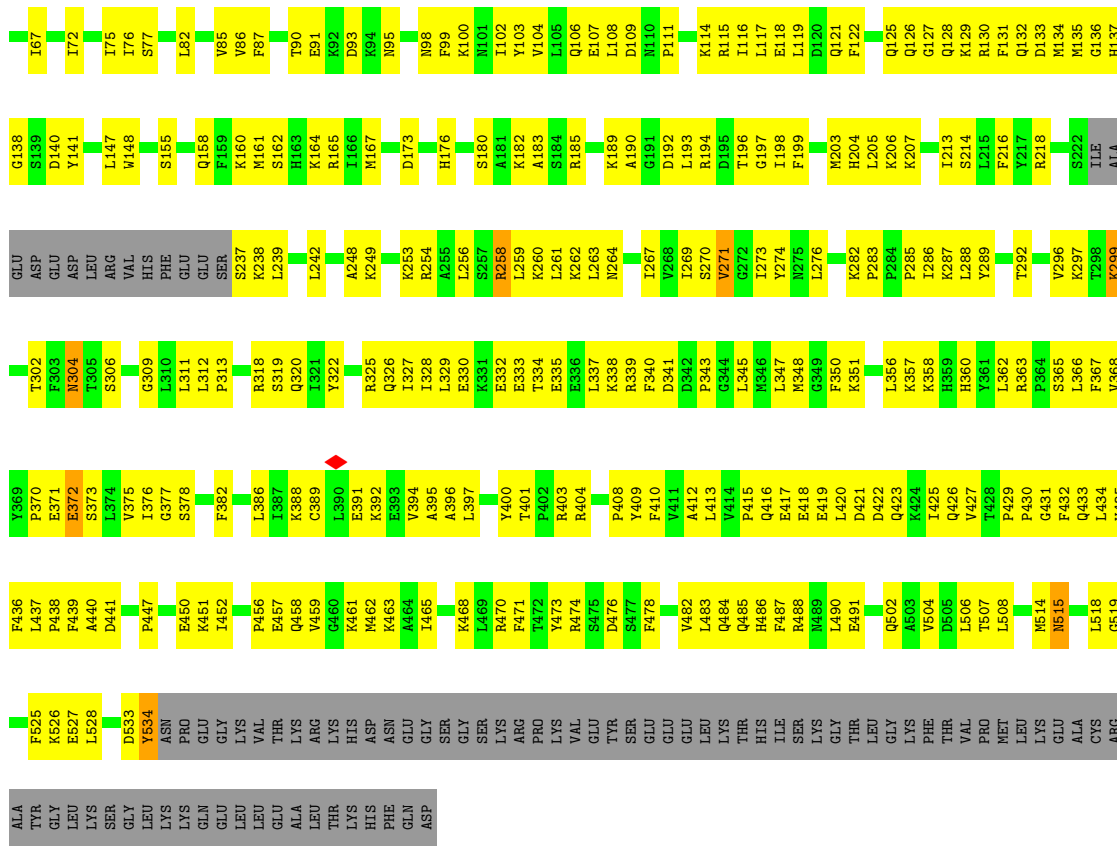
Chain B: 31% 49% 20%



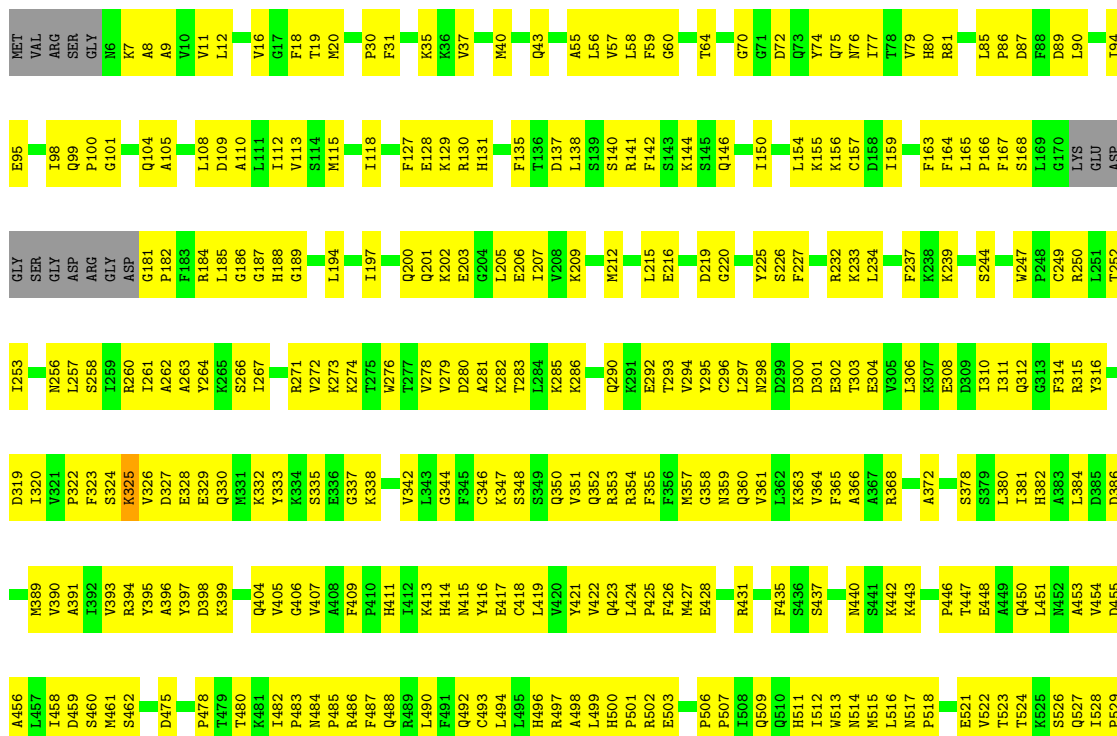
- Molecule 2: X-ray repair cross-complementing protein 6

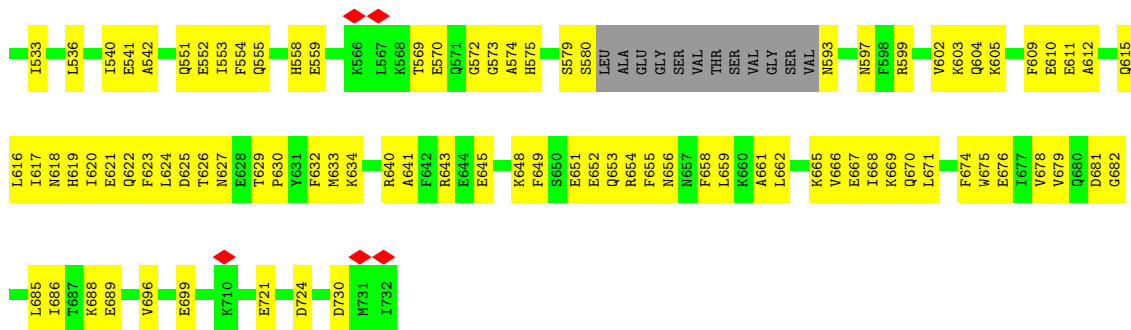
Chain G: 35% 44% 20%



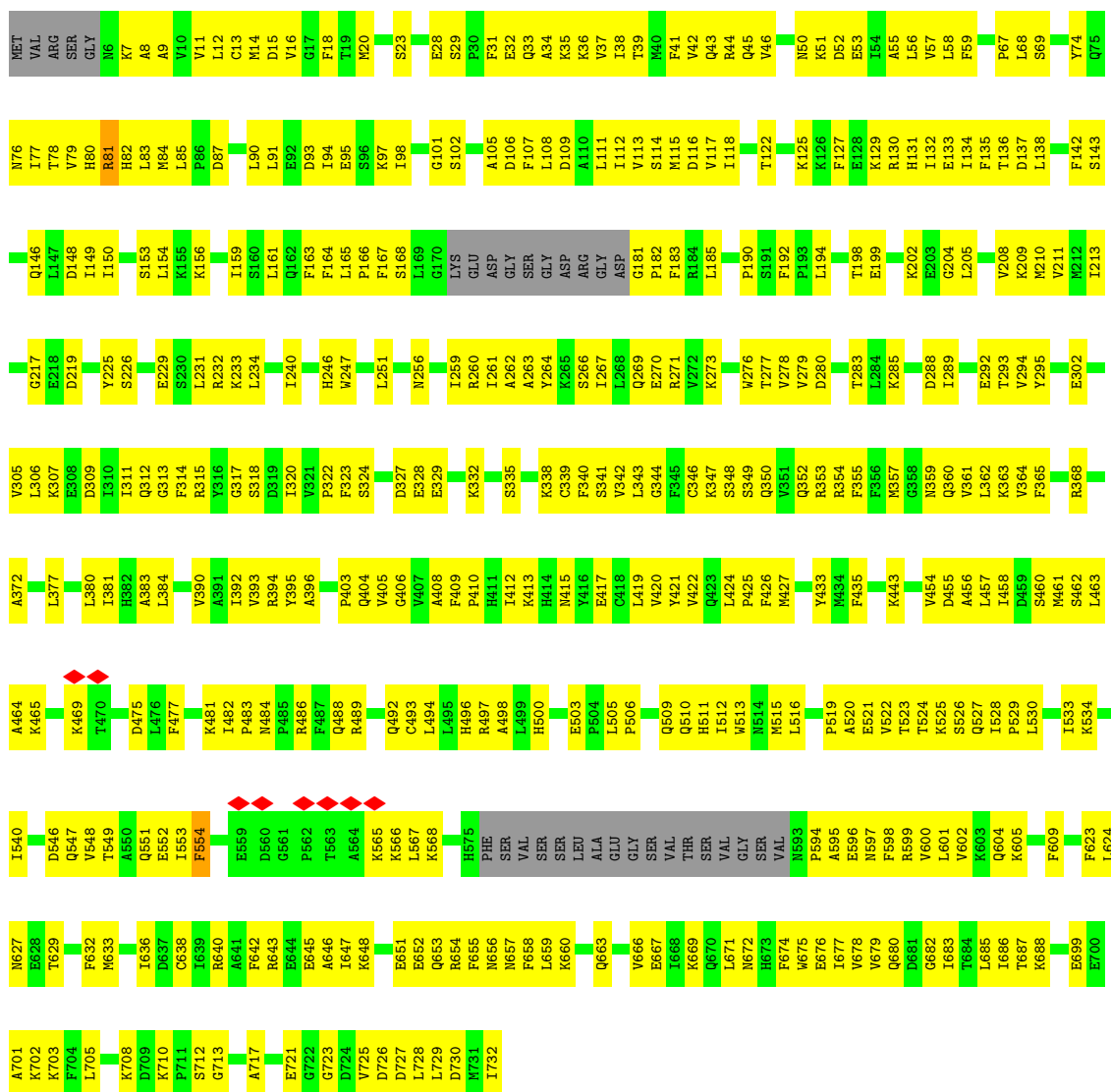


• Molecule 3: X-ray repair cross-complementing protein 5



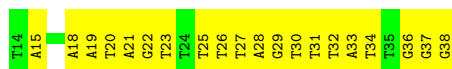


• Molecule 3: X-ray repair cross-complementing protein 5

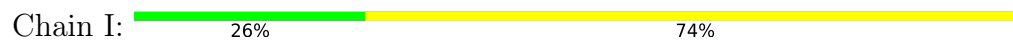


• Molecule 4: DNA (25-MER)





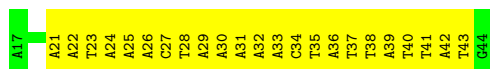
- Molecule 5: DNA (27-MER)



- Molecule 6: DNA (26-MER)



- Molecule 7: DNA (28-MER)



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	10808	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	52.97	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.469	Depositor
Minimum map value	-0.111	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.020	Depositor
Recommended contour level	0.085	Depositor
Map size (Å)	588.0, 588.0, 588.0	wwPDB
Map dimensions	560, 560, 560	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.05, 1.05, 1.05	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.35	0/29462	0.54	1/39939 (0.0%)
1	F	0.33	0/29464	0.51	2/39913 (0.0%)
2	B	0.33	0/3864	0.56	0/5226
2	G	0.31	0/3871	0.55	0/5236
3	C	0.30	0/5595	0.49	0/7557
3	H	0.29	0/5625	0.50	0/7589
4	J	0.68	0/570	1.01	0/876
5	I	0.77	0/620	0.97	0/953
6	D	0.82	0/591	0.99	0/908
7	E	0.80	0/644	0.95	0/990
All	All	0.35	0/80306	0.55	3/109187 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	2259	LYS	CB-CG-CD	5.69	126.38	111.60
1	F	1721	HIS	C-N-CA	-5.38	108.24	121.70
1	A	2939	LEU	CB-CG-CD2	-5.16	102.23	111.00

There are no chirality outliers.

There are no planarity outliers.

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	29018	0	28461	2369	0
1	F	29012	0	28652	2188	0
2	B	3789	0	3721	347	0
2	G	3797	0	3734	318	0
3	C	5490	0	5397	391	0
3	H	5517	0	5468	380	0
4	J	509	0	271	33	0
5	I	552	0	301	35	0
6	D	528	0	282	49	0
7	E	573	0	312	48	0
All	All	78785	0	76599	5907	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 38.

The worst 5 of 5907 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)
1:A:3443:PRO:HB2	1:A:3478:GLU:CB	1.66	1.26
2:G:271:VAL:HG12	2:G:370:PRO:CA	1.72	1.20
1:A:446:PHE:H	1:A:447:PRO:CD	1.54	1.19
2:G:271:VAL:CG1	2:G:370:PRO:HA	1.72	1.17
2:G:273:ILE:CG1	2:G:368:VAL:HG22	1.75	1.13

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 PDB entries followed by that with respect to all EM entries.

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	3714/4156 (89%)	3263 (88%)	446 (12%)	5 (0%)	51	86
1	F	3675/4156 (88%)	3257 (89%)	416 (11%)	2 (0%)	51	86

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	485/609 (80%)	422 (87%)	63 (13%)	0	100	100
2	G	485/609 (80%)	428 (88%)	56 (12%)	1 (0%)	47	81
3	C	699/732 (96%)	633 (91%)	66 (9%)	0	100	100
3	H	694/732 (95%)	625 (90%)	69 (10%)	0	100	100
All	All	9752/10994 (89%)	8628 (88%)	1116 (11%)	8 (0%)	54	86

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	446	PHE
1	A	3487	ILE
2	G	372	GLU
1	F	2257	PHE
1	A	2333	ARG

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 PDB entries followed by that with respect to all EM entries.

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	3033/3671 (83%)	3004 (99%)	29 (1%)	76	86
1	F	3087/3671 (84%)	3063 (99%)	24 (1%)	81	89
2	B	400/548 (73%)	391 (98%)	9 (2%)	50	70
2	G	402/548 (73%)	395 (98%)	7 (2%)	60	78
3	C	591/649 (91%)	590 (100%)	1 (0%)	93	96
3	H	601/649 (93%)	597 (99%)	4 (1%)	84	90
All	All	8114/9736 (83%)	8040 (99%)	74 (1%)	79	87

5 of 74 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	3586	LYS
3	H	209	LYS

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Mol	Chain	Res	Type
1	F	3799	ARG
2	G	271	VAL
1	A	3614	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 71 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	3093	GLN
1	F	3249	GLN
2	G	126	GLN
1	A	3850	HIS
1	A	3808	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](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	F	2
1	A	2

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	F	4128:MET	C	5009:UNK	N	96.98
1	A	4128:MET	C	5009:UNK	N	96.43
1	A	5016:UNK	C	6004:UNK	N	49.12
1	F	5016:UNK	C	6004:UNK	N	48.83

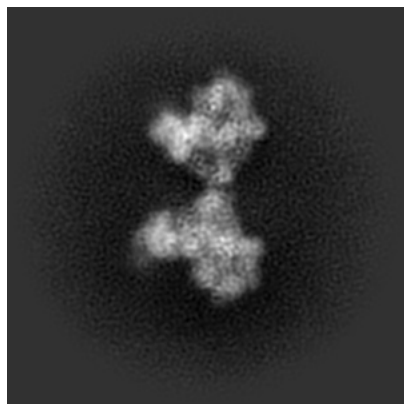
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-11219. These allow visual inspection of the internal detail of the map and identification of artifacts.

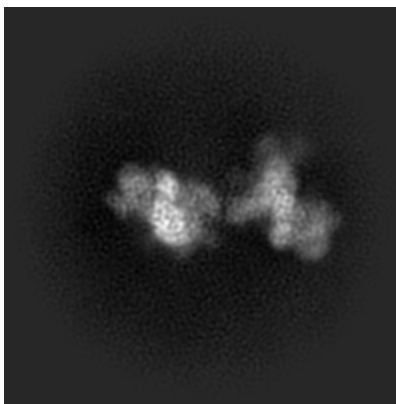
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

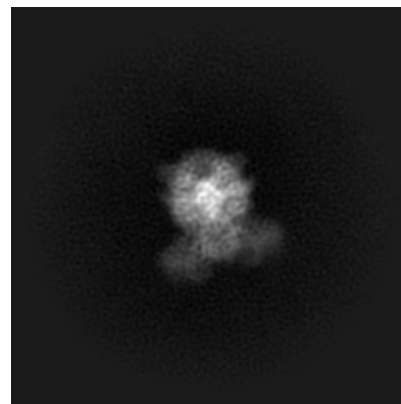
6.1.1 Primary map



X

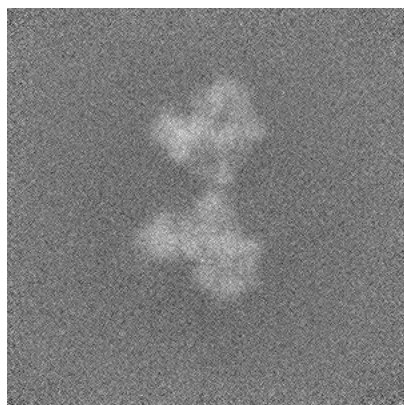


Y

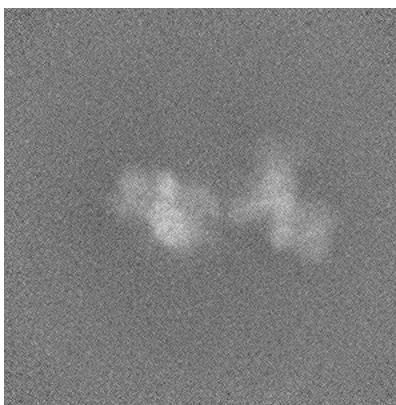


Z

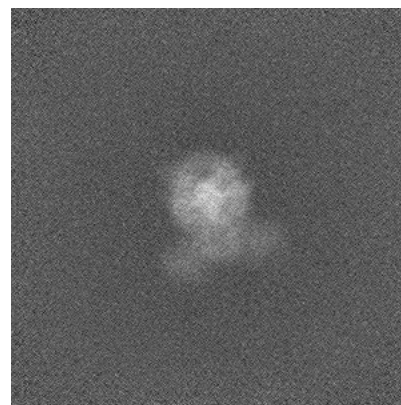
6.1.2 Raw map



X



Y

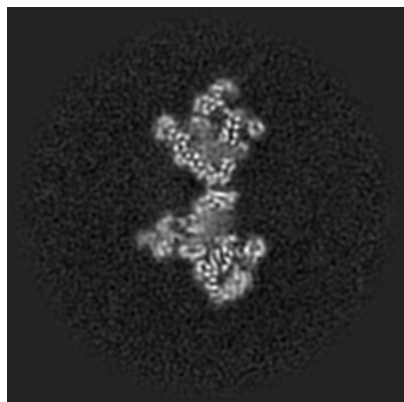


Z

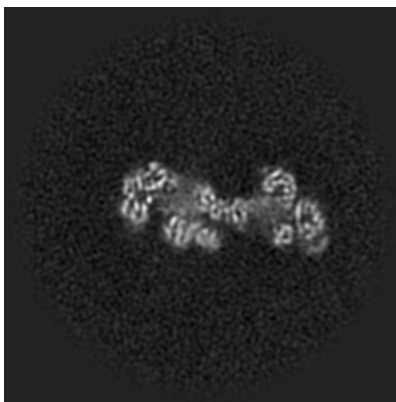
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

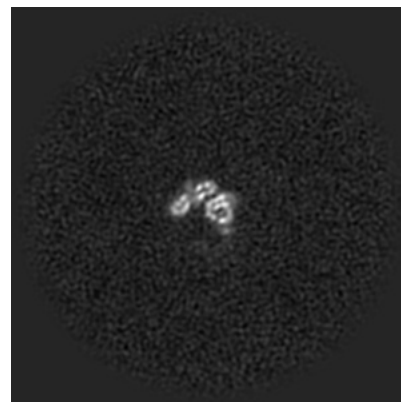
6.2.1 Primary map



X Index: 280

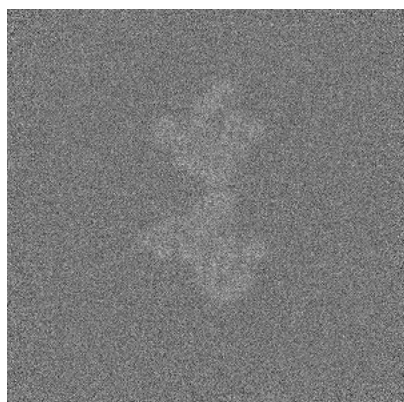


Y Index: 280

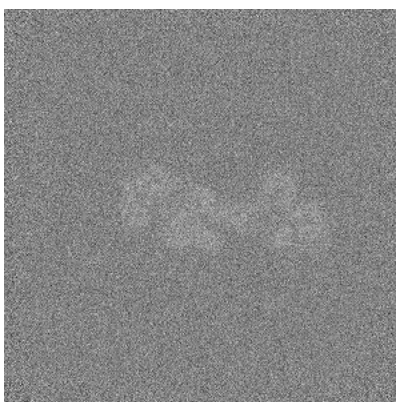


Z Index: 280

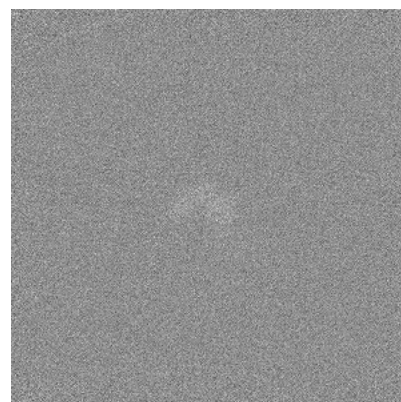
6.2.2 Raw map



X Index: 280



Y Index: 280

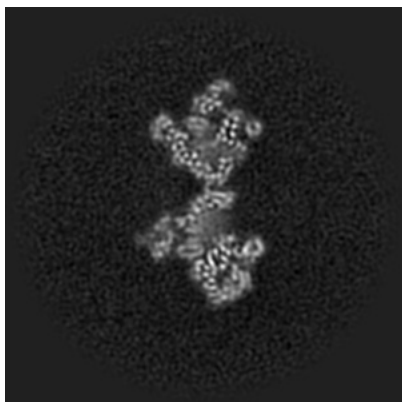


Z Index: 280

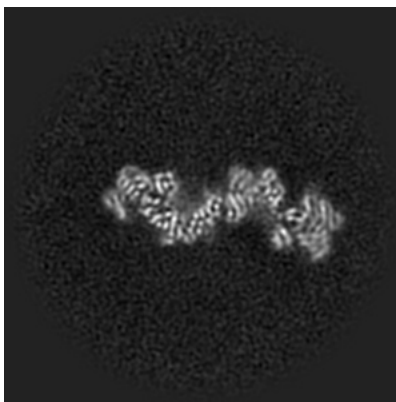
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

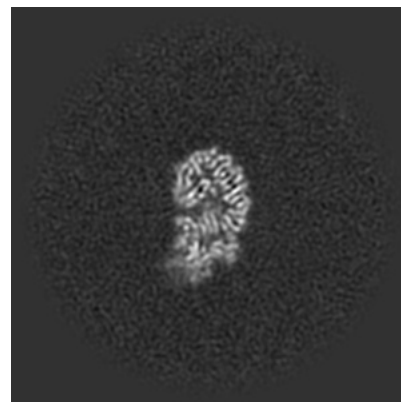
6.3.1 Primary map



X Index: 282

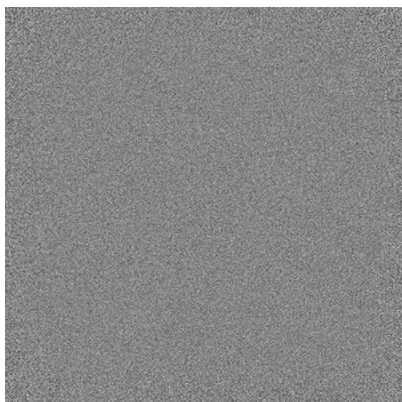


Y Index: 299

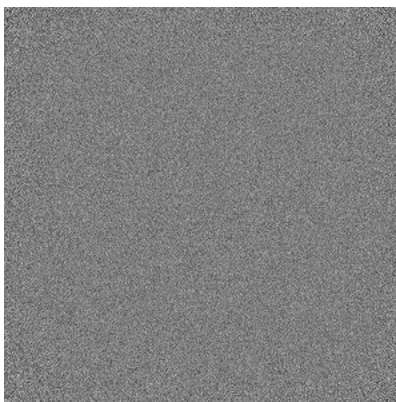


Z Index: 225

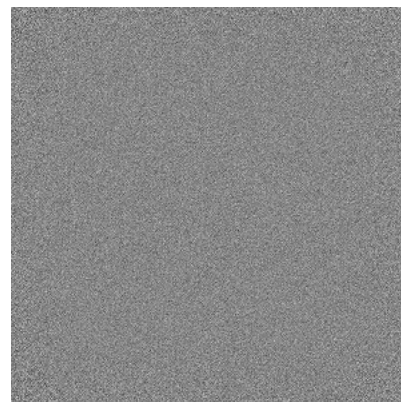
6.3.2 Raw map



X Index: 0



Y Index: 0

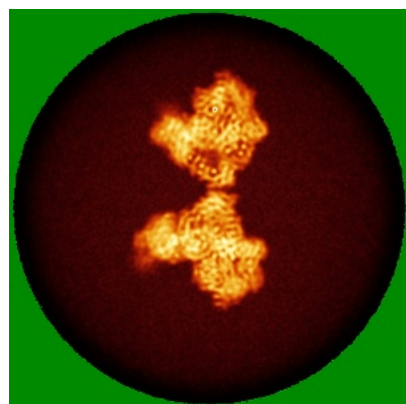


Z Index: 0

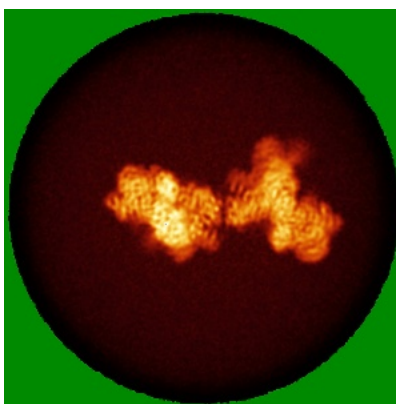
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

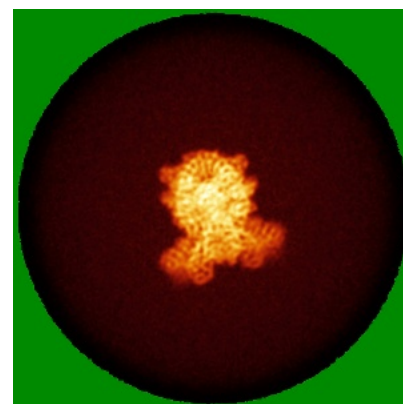
6.4.1 Primary map



X

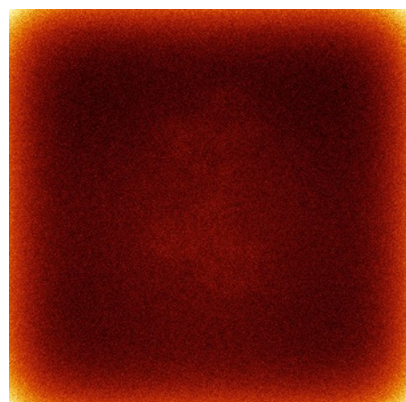


Y

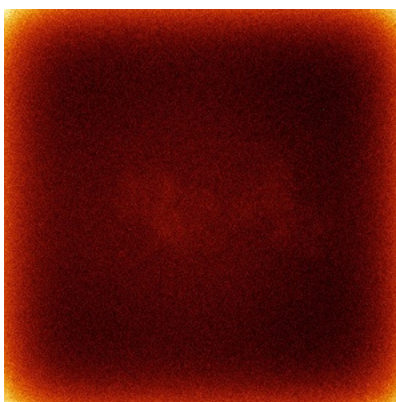


Z

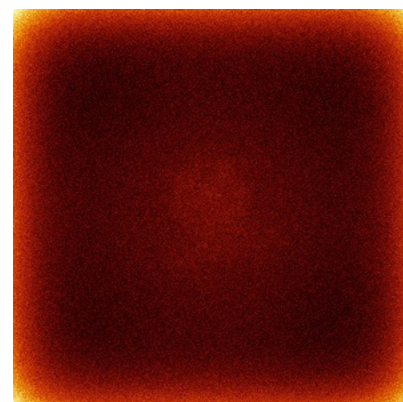
6.4.2 Raw map



X



Y



Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

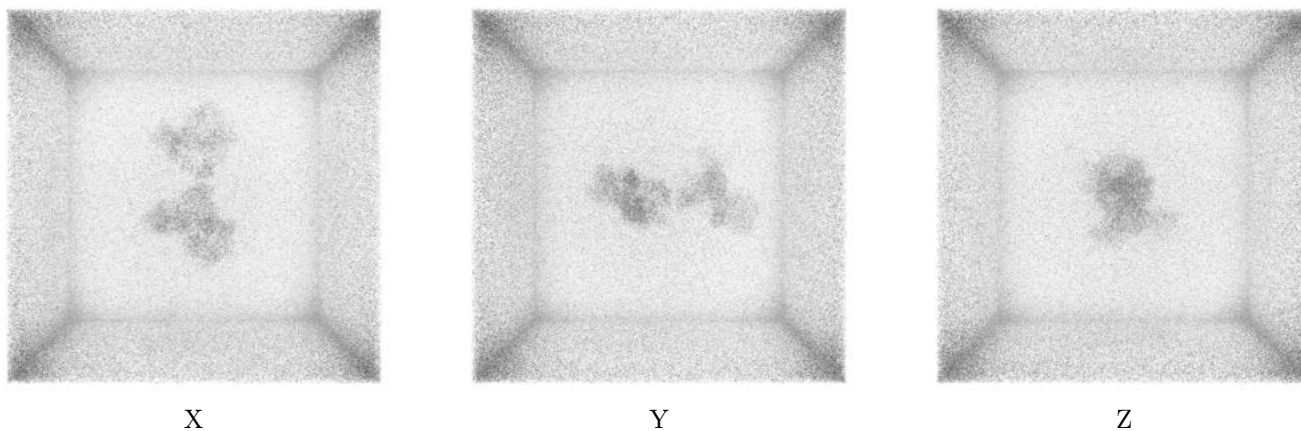
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.085. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

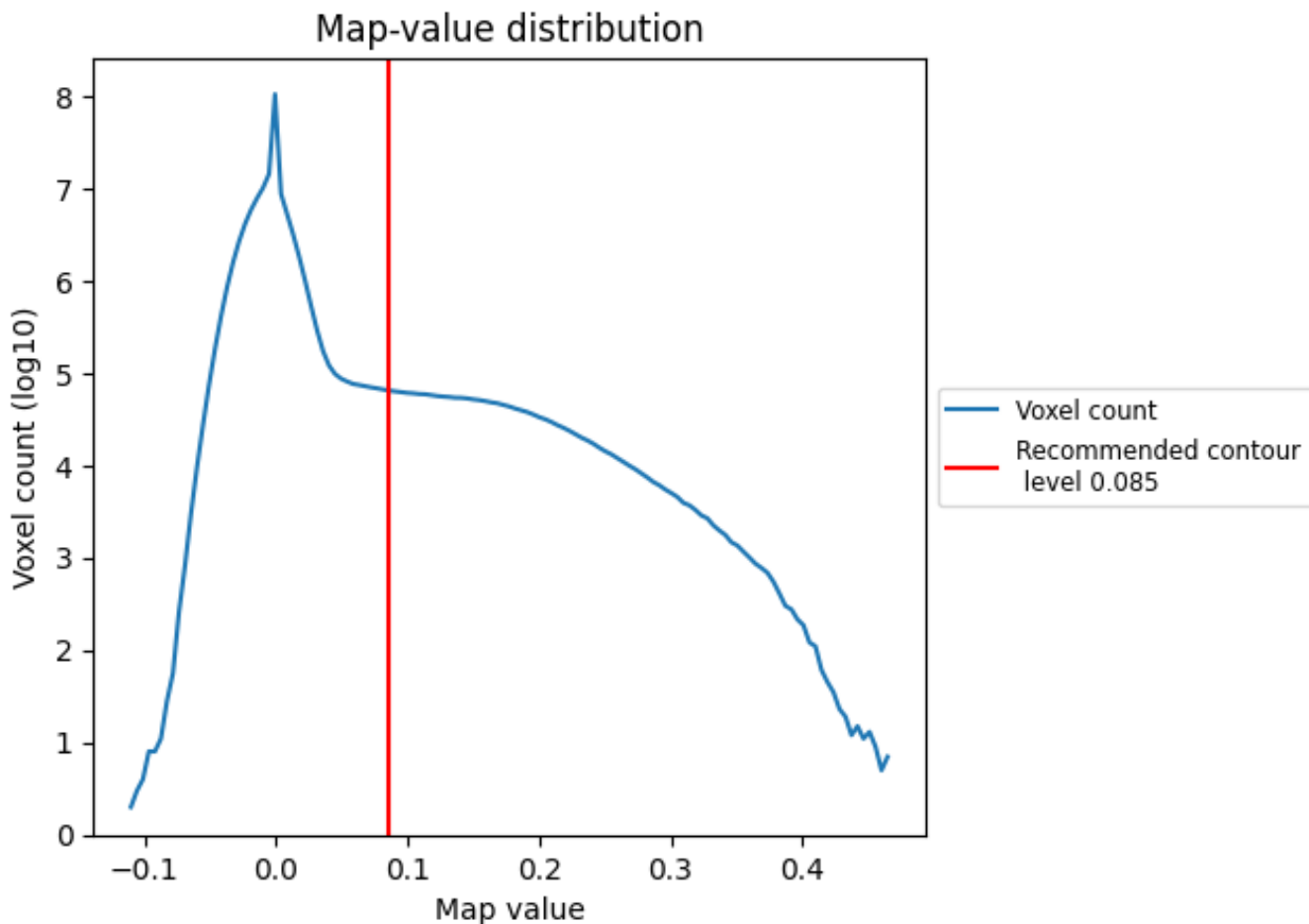
6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis [i](#)

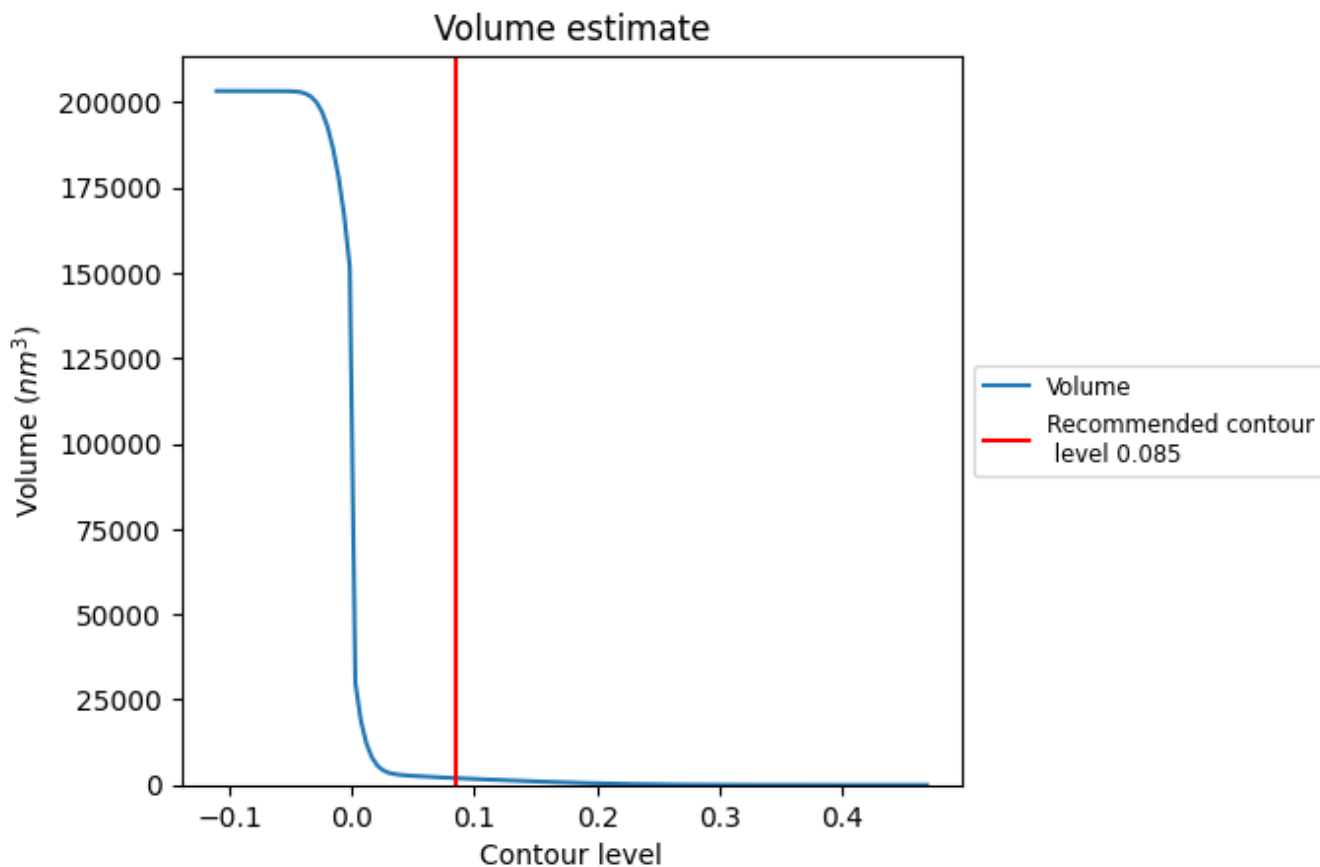
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

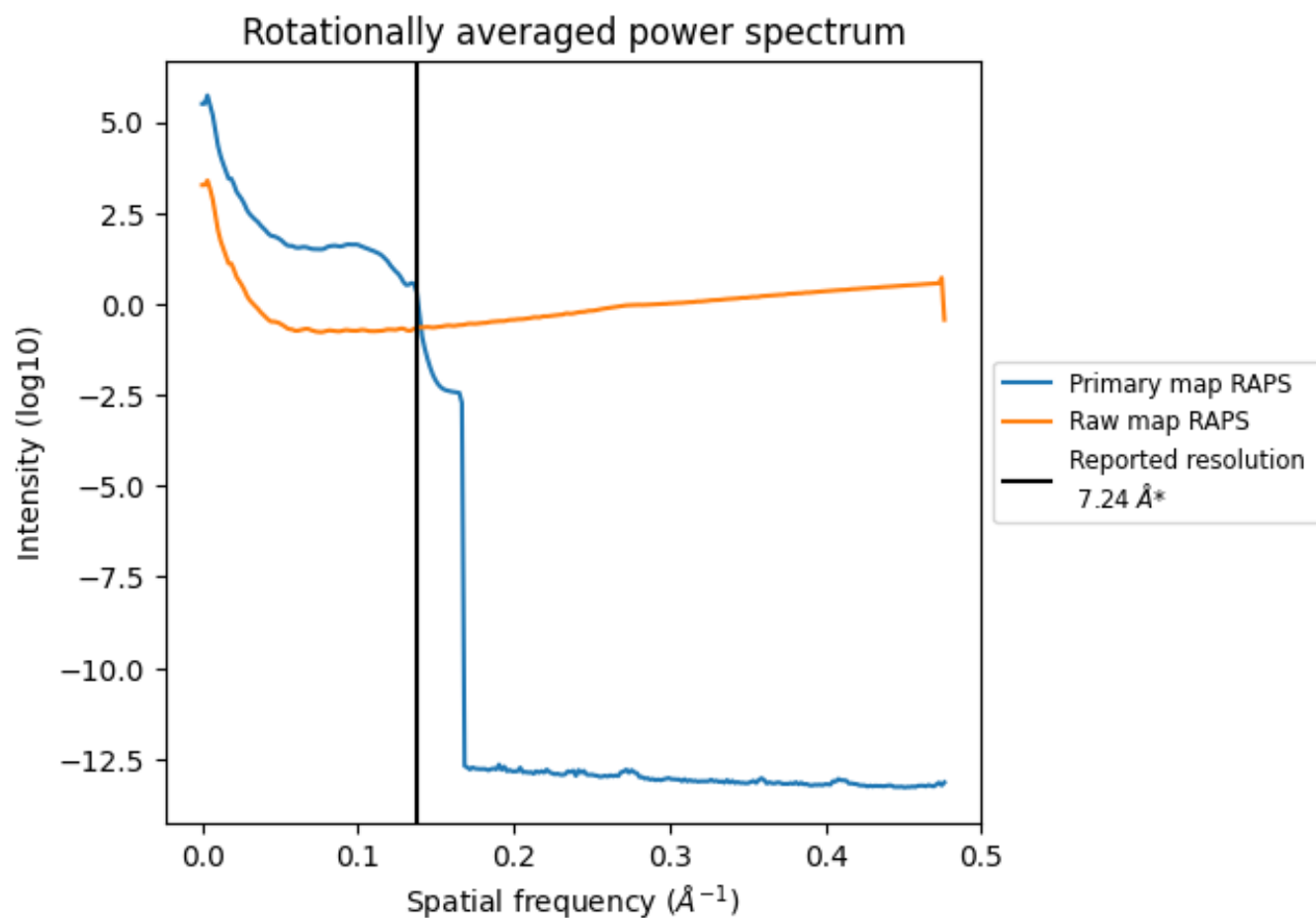
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 1998 nm^3 ; this corresponds to an approximate mass of 1805 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum [i](#)

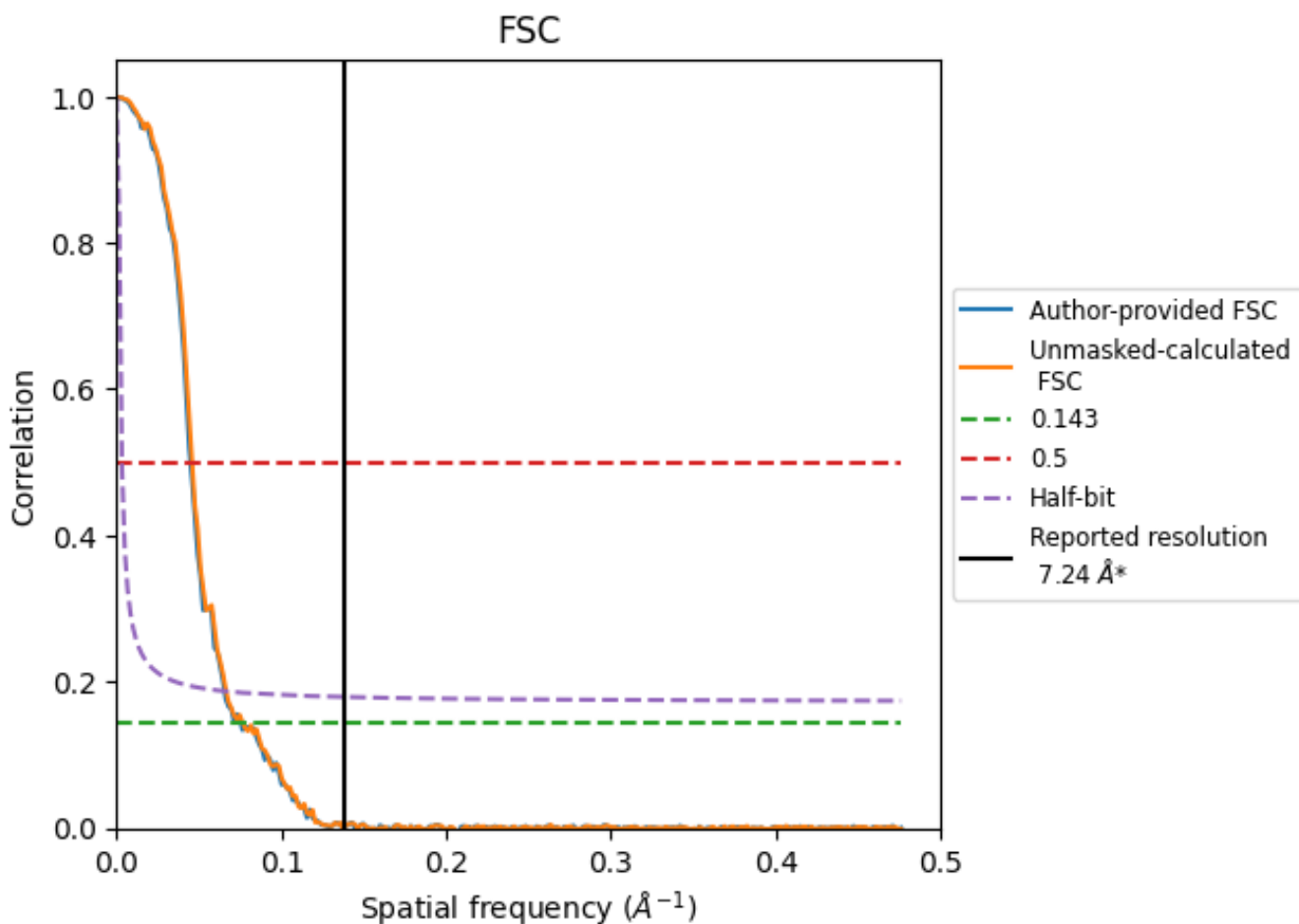


*Reported resolution corresponds to spatial frequency of 0.138 Å⁻¹

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.138 Å⁻¹

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	7.24	-	-
Author-provided FSC curve	13.23	22.27	15.24
Unmasked-calculated*	13.02	21.74	14.99

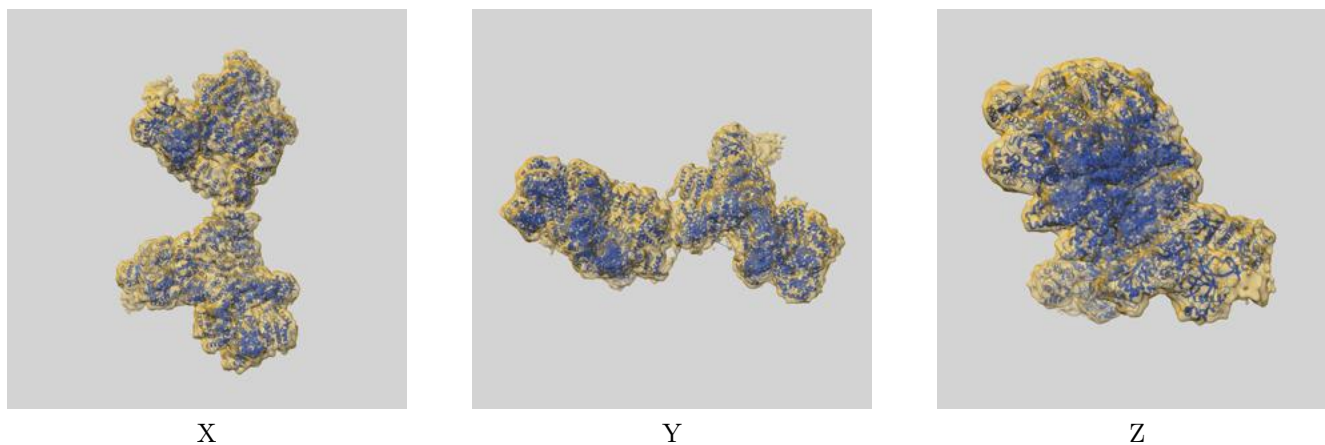
*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from author-provided FSC intersecting FSC 0.143 CUT-OFF 13.23 differs from the reported value 7.24 by more than 10 %

The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 13.02 differs from the reported value 7.24 by more than 10 %

9 Map-model fit [i](#)

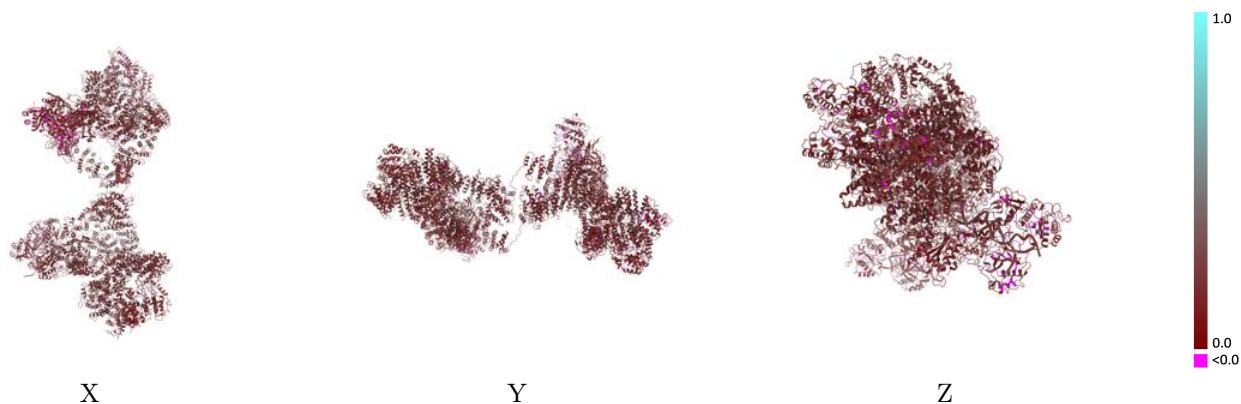
This section contains information regarding the fit between EMDB map EMD-11219 and PDB model 6ZHE. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay [i](#)



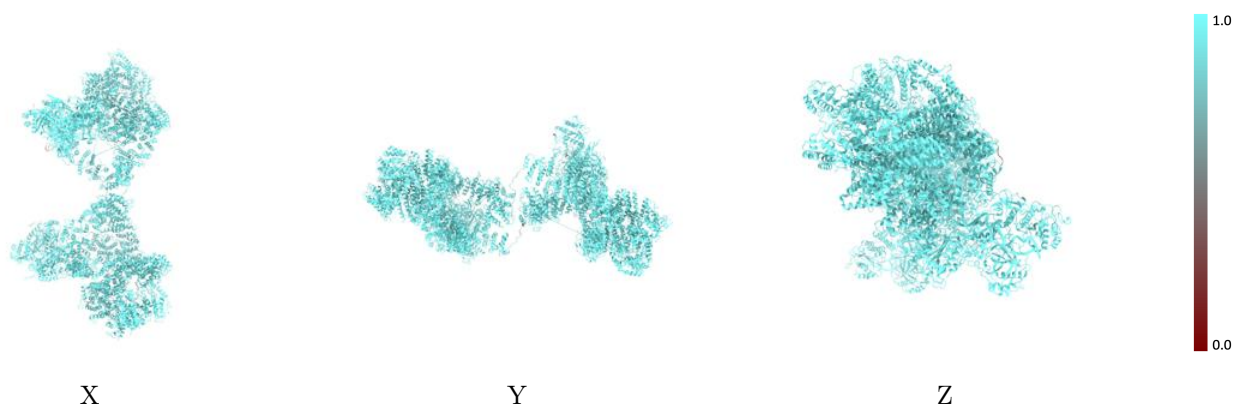
The images above show the 3D surface view of the map at the recommended contour level 0.085 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



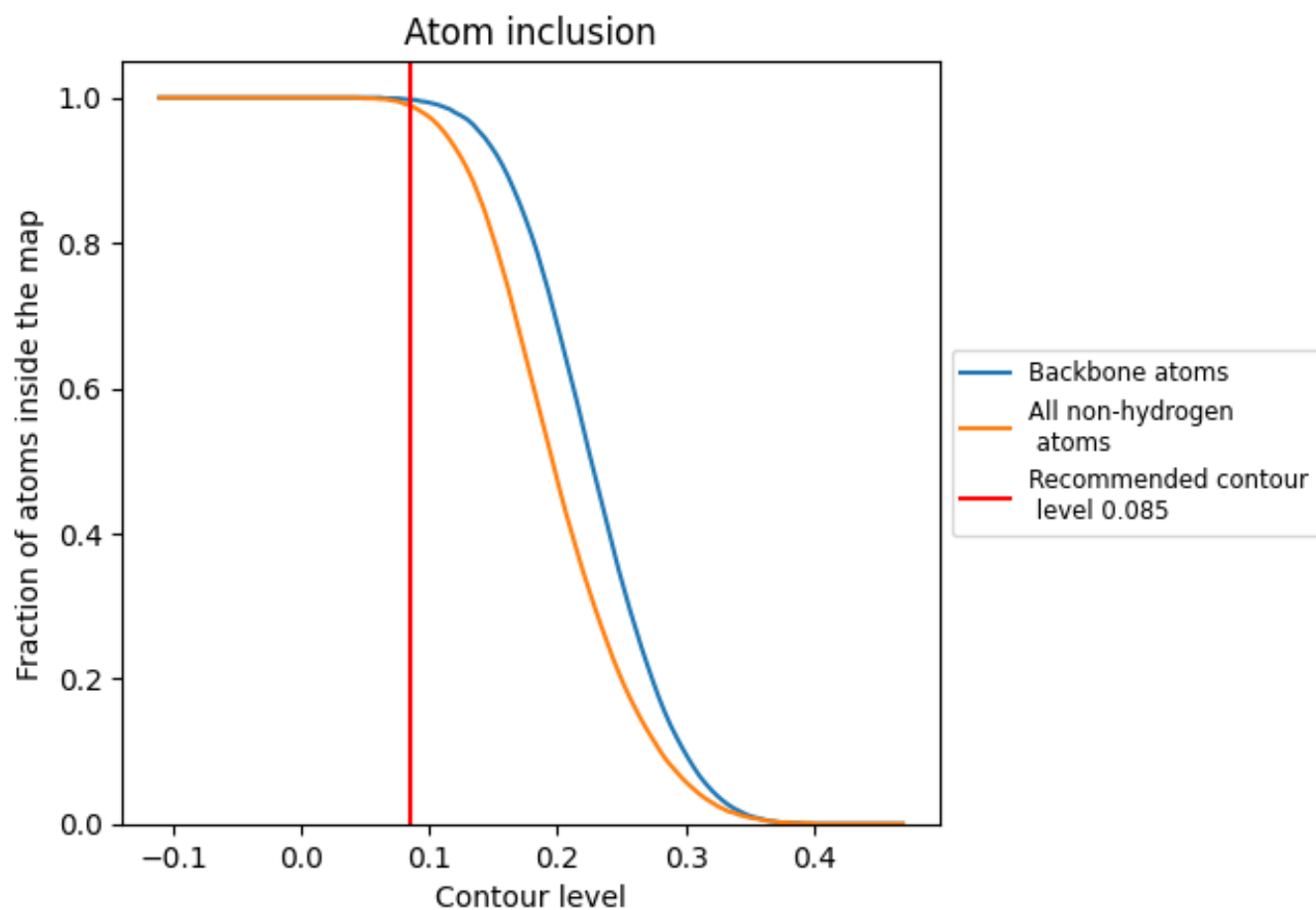
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.085).























9.4 Atom inclusion [i](#)



At the recommended contour level, 100% of all backbone atoms, 99% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.085) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9890	 0.1950
A	 0.9910	 0.2070
B	 0.9950	 0.1870
C	 0.9840	 0.1740
D	 1.0000	 0.2510
E	 1.0000	 0.2500
F	 0.9890	 0.1970
G	 0.9900	 0.1600
H	 0.9730	 0.1600
I	 1.0000	 0.2540
J	 1.0000	 0.2430

