wwPDB EM Validation Summary Report

Jun 21, 2023 – 05:28 pm BST

PDB ID	:	8BX8
EMDB ID	:	EMD-16312
Title	:	In situ outer dynein arm from Chlamydomonas reinhardtii in the post-power stroke state
Authors	:	Zimmermann, N.E.L.; Noga, A.; Obbineni, J.M.; Ishikawa, T.
Deposited on	:	2022-12-08
Resolution	:	30.30 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:

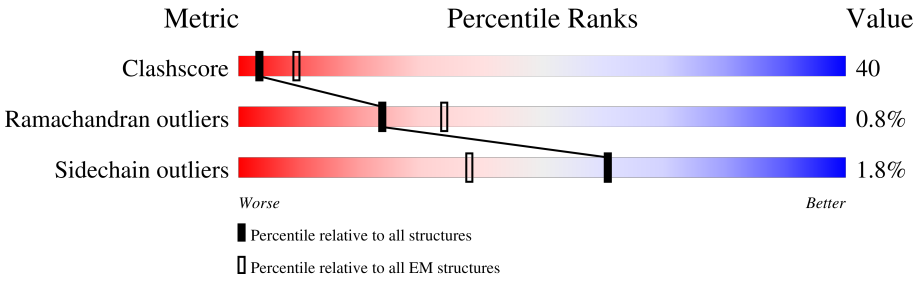
EMDB validation analysis	:	0.0.1.dev50
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

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 30.30 Å.

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



Metric	Whole archive (#Entries)	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 <=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	4620	16% 72% 23%
2	B	4595	13% 72% 25%
3	C	4168	18% 77% 16% 5%
4	D	657	8% 38% 49% 12%
5	E	670	7% 37% 45% 17%
6	F	133	18% 47% 48%
7	G	159	30% 51% 35% 7% 5%
8	H	92	37% 62%

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Mol	Chain	Length	Quality of chain
9	I	110	10% 35% 61%
10	J	95	34% 65%
11	K	93	40% 57%
12	L	111	14% 42% 58%
13	M	87	43% 57%
14	N	117	11% 57% 40%
15	O	132	42% 46% 9%
16	P	122	57% 26% 5% 11%
17	Q	202	72% 65% 29% 5%
18	R	160	64% 78% 15% 6%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
19	ADP	A	4701	-	-	X	-
19	ADP	A	4703	-	-	X	-
19	ADP	B	5405	-	-	X	-
19	ADP	C	4305	-	-	X	-
20	ATP	A	4702	-	-	X	-
20	ATP	B	5403	-	-	X	-
21	MG	A	4705	-	-	X	-

2 Entry composition (i)

There are 21 unique types of molecules in this entry. The entry contains 119530 atoms, of which 156 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 Dynein heavy chain, outer arm protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	4453	33975	21575	5801	6441	158	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	4488	LYS	GLY	conflict	UNP Q22A67

- Molecule 2 is a protein called Outer arm dynein beta heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	4519	34713	22055	5945	6563	150	0	0

- Molecule 3 is a protein called Dynein-1-alpha heavy chain, flagellar inner arm I1 complex protein, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	3947	30427	19395	5159	5724	149	0	0

- Molecule 4 is a protein called Dynein intermediate chain 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	579	4680	2975	791	883	31	0	0

- Molecule 5 is a protein called Flagellar outer dynein arm intermediate protein, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	555	4440	2798	762	858	22	0	0

- Molecule 6 is a protein called Dynein light chain roadblock-type 2 protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	128	Total	C	N	O	S	0	0
			996	625	176	193	2		

- Molecule 7 is a protein called Dynein light chain roadblock-type 2 protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	151	Total	C	N	O	S	0	0
			1024	636	184	203	1		

- Molecule 8 is a protein called Dynein light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	91	Total	C	N	O	S	0	0
			750	483	124	139	4		

- Molecule 9 is a protein called Dynein light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	106	Total	C	N	O	S	0	0
			827	526	134	161	6		

- Molecule 10 is a protein called Dynein light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	95	Total	C	N	O	S	0	0
			807	527	135	140	5		

- Molecule 11 is a protein called Dynein light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	90	Total	C	N	O	S	0	0
			754	489	124	137	4		

- Molecule 12 is a protein called Dynein light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	111	Total	C	N	O	S	0	0
			855	555	145	152	3		

- Molecule 13 is a protein called Dynein light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	87	Total 735	C 477	N 123	O 130	S 5	0	0

- Molecule 14 is a protein called Dynein light chain tctex-type 1 protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	114	Total 852	C 542	N 142	O 165	S 3	0	0

- Molecule 15 is a protein called Dynein light chain 2A.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	O	120	Total 994	C 639	N 173	O 179	S 3	0	0

- Molecule 16 is a protein called Thioredoxin.

Mol	Chain	Residues	Atoms				AltConf	Trace
16	P	109	Total 541	C 323	N 109	O 109	0	0

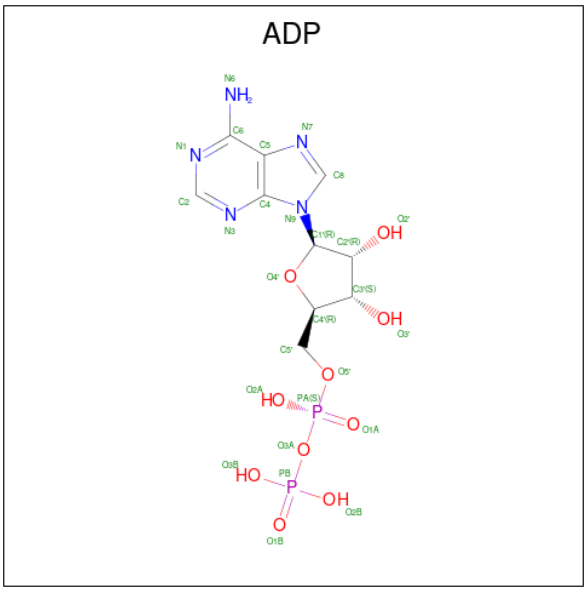
- Molecule 17 is a protein called Dynein light chain 1.

Mol	Chain	Residues	Atoms				AltConf	Trace
17	Q	191	Total 1001	C 607	N 202	O 192	0	0

- Molecule 18 is a protein called Dynein light chain 4A.

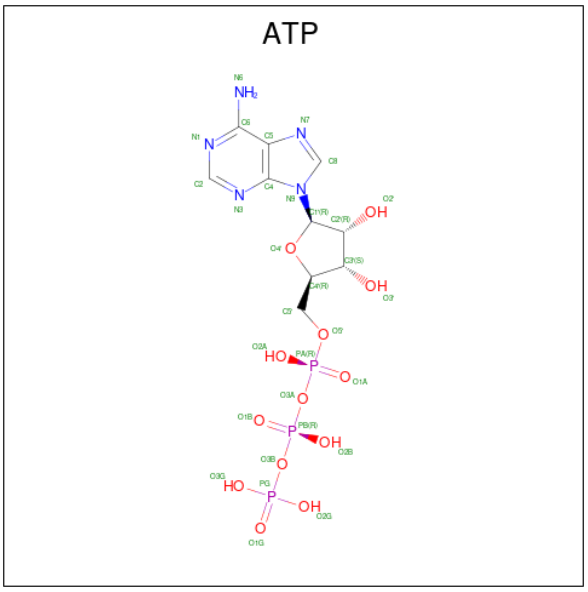
Mol	Chain	Residues	Atoms					AltConf	Trace
18	R	150	Total 895	C 439	H 156	N 150	O 150	0	0

- Molecule 19 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms					AltConf
19	A	1	Total	C	N	O	P	0
			27	10	5	10	2	
19	A	1	Total	C	N	O	P	0
			27	10	5	10	2	
19	B	1	Total	C	N	O	P	0
			27	10	5	10	2	
19	B	1	Total	C	N	O	P	0
			27	10	5	10	2	
19	C	1	Total	C	N	O	P	0
			27	10	5	10	2	
19	C	1	Total	C	N	O	P	0
			27	10	5	10	2	

- Molecule 20 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms					AltConf
20	A	1	Total	C	N	O	P	0
			31	10	5	13	3	
20	B	1	Total	C	N	O	P	0
			31	10	5	13	3	
20	C	1	Total	C	N	O	P	0
			31	10	5	13	3	

- Molecule 21 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

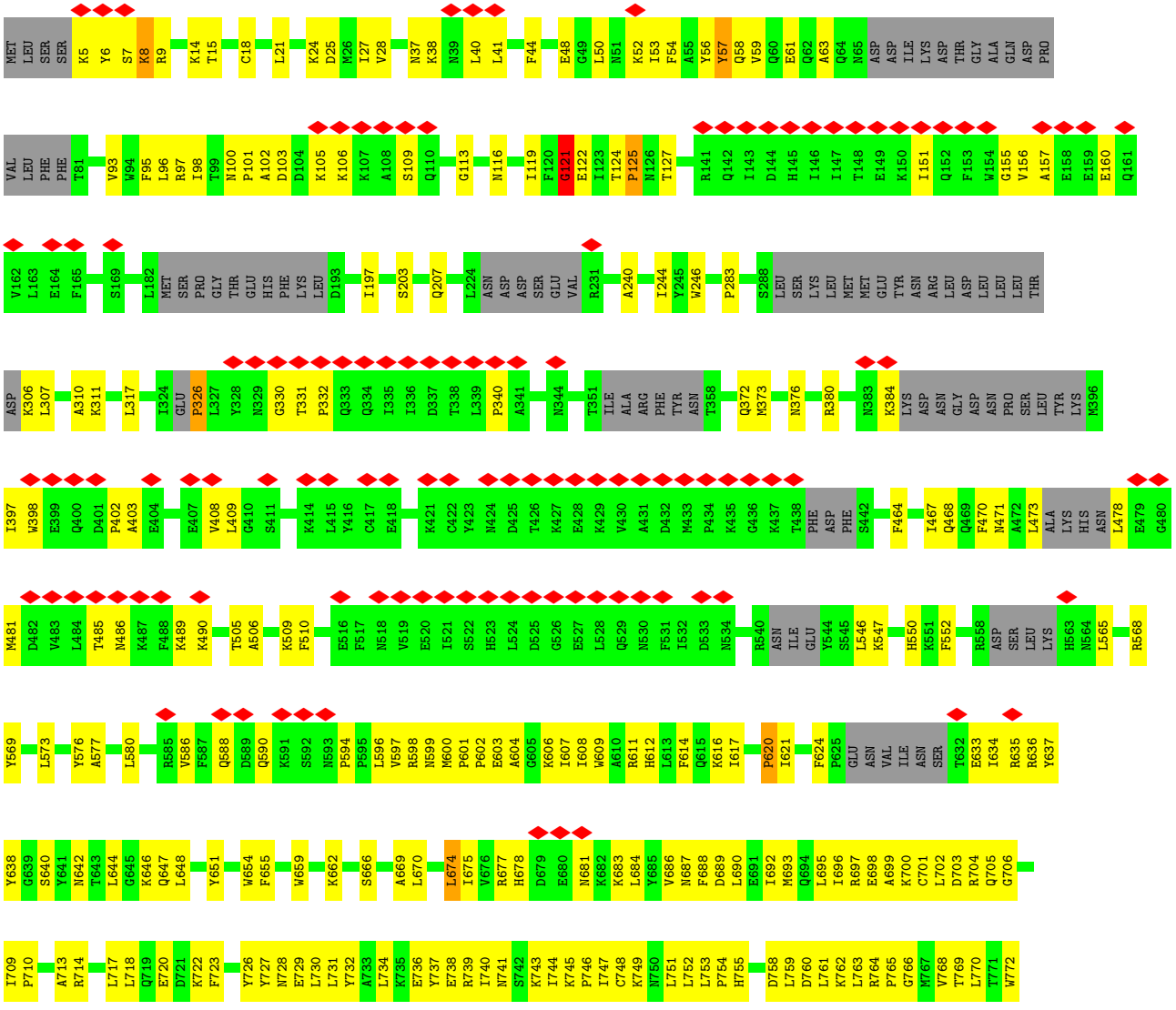
Mol	Chain	Residues	Atoms		AltConf
21	A	3	Total	Mg	0
			3	3	
21	B	3	Total	Mg	0
			3	3	
21	C	3	Total	Mg	0
			3	3	

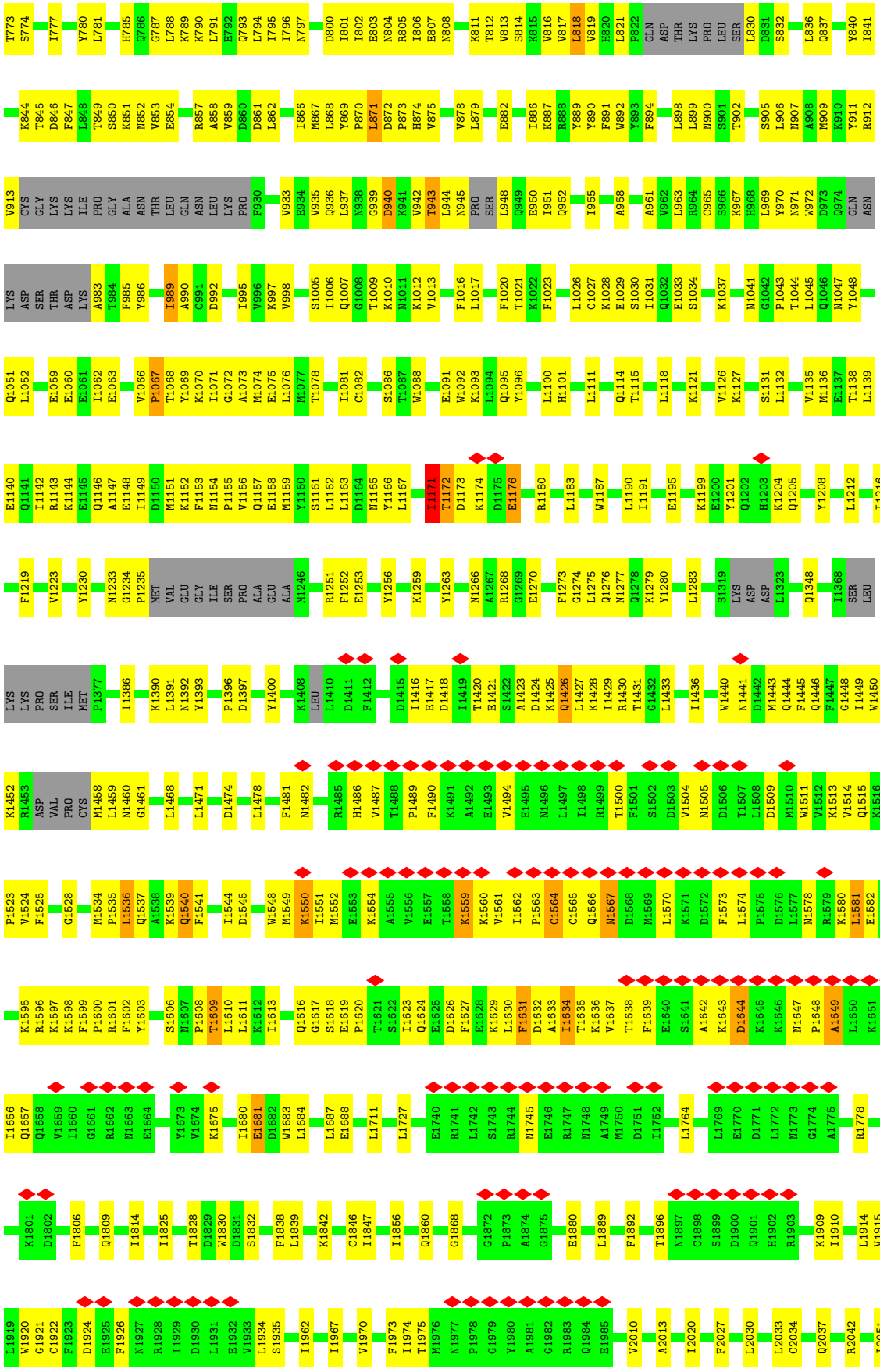
3 Residue-property plots (i)

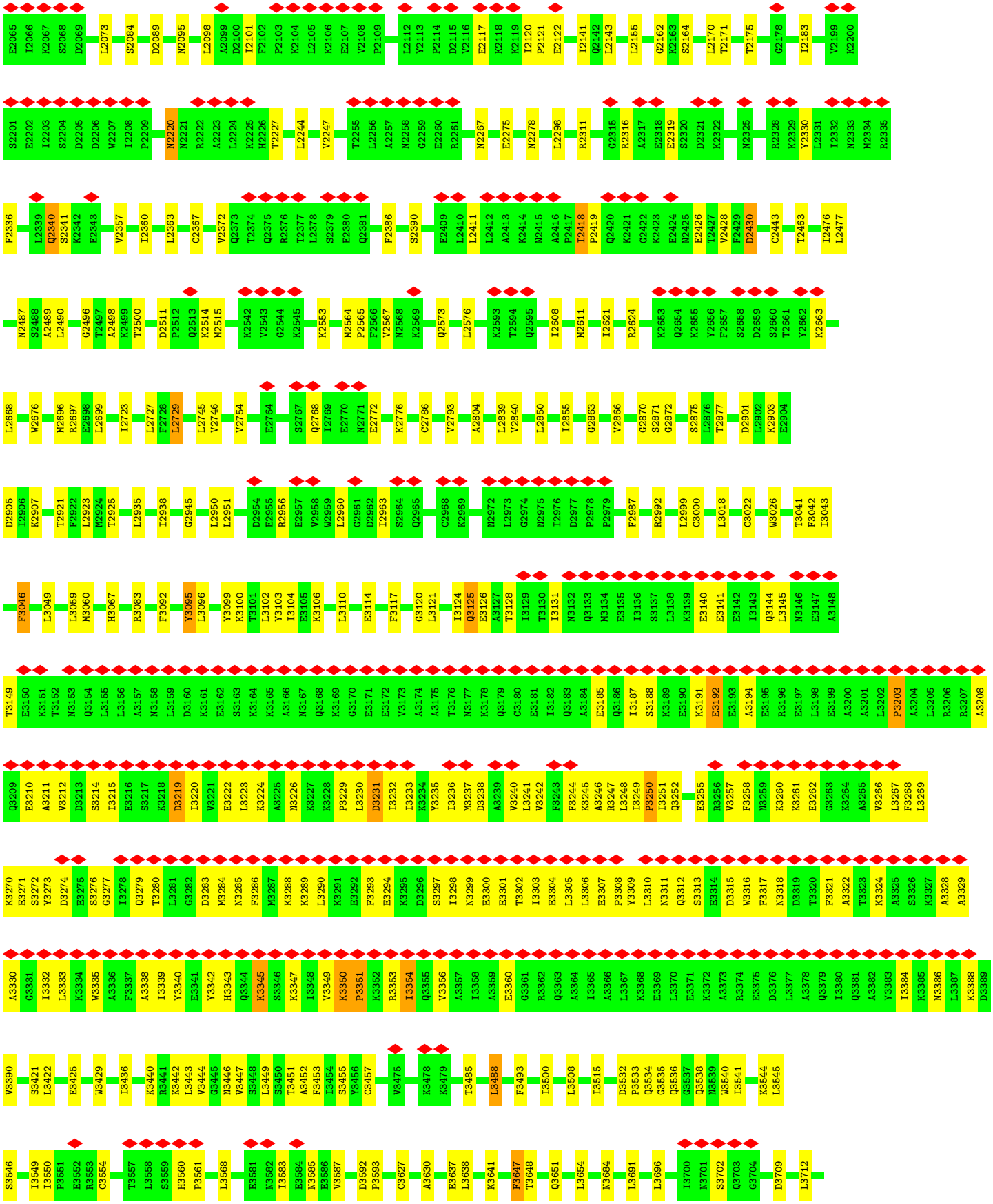
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Dynein heavy chain, outer arm protein

Chain A:



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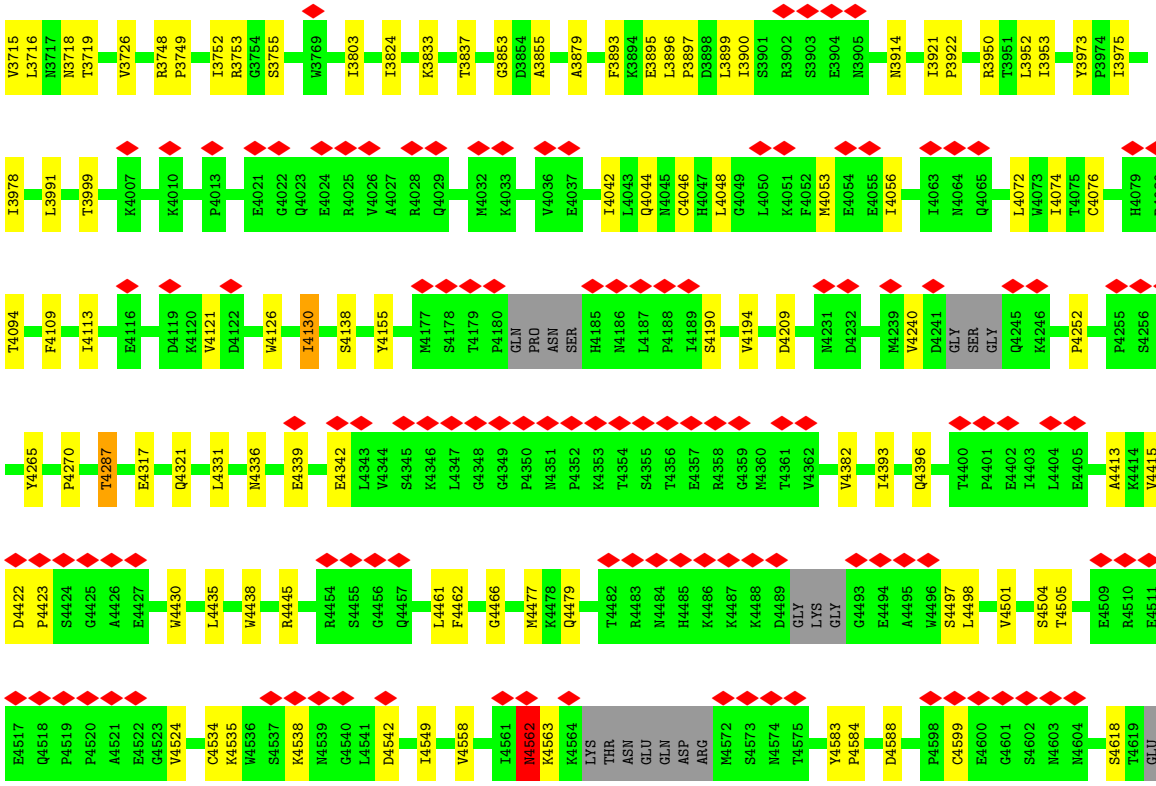
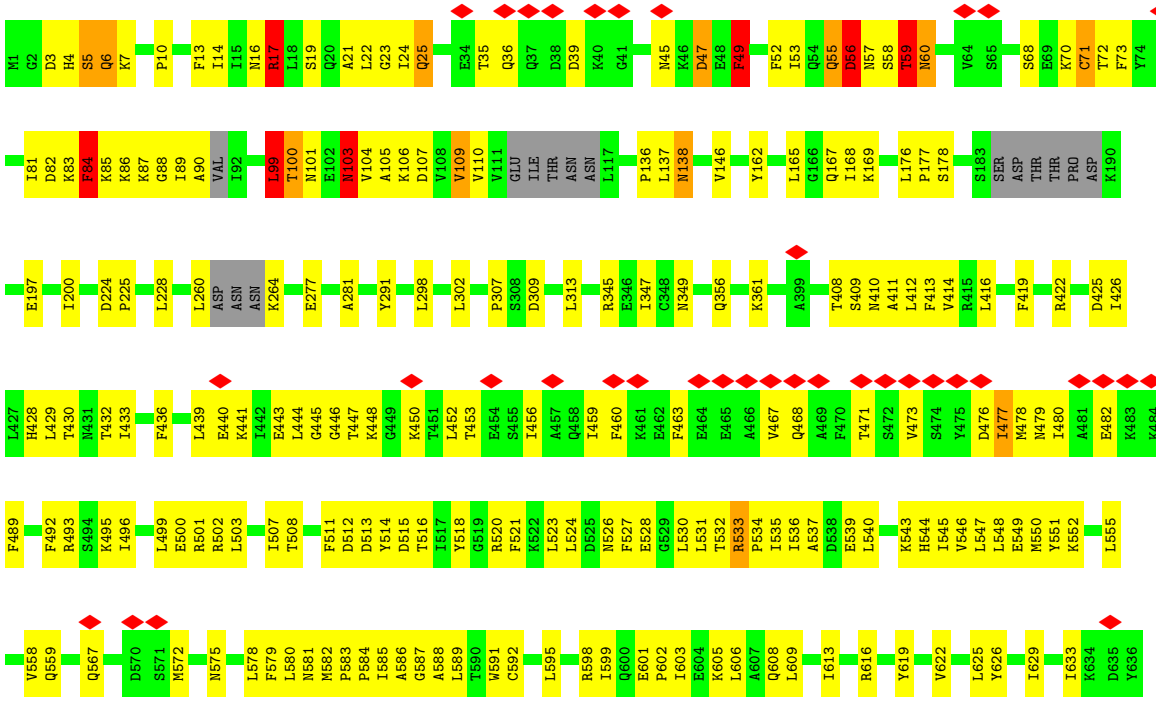
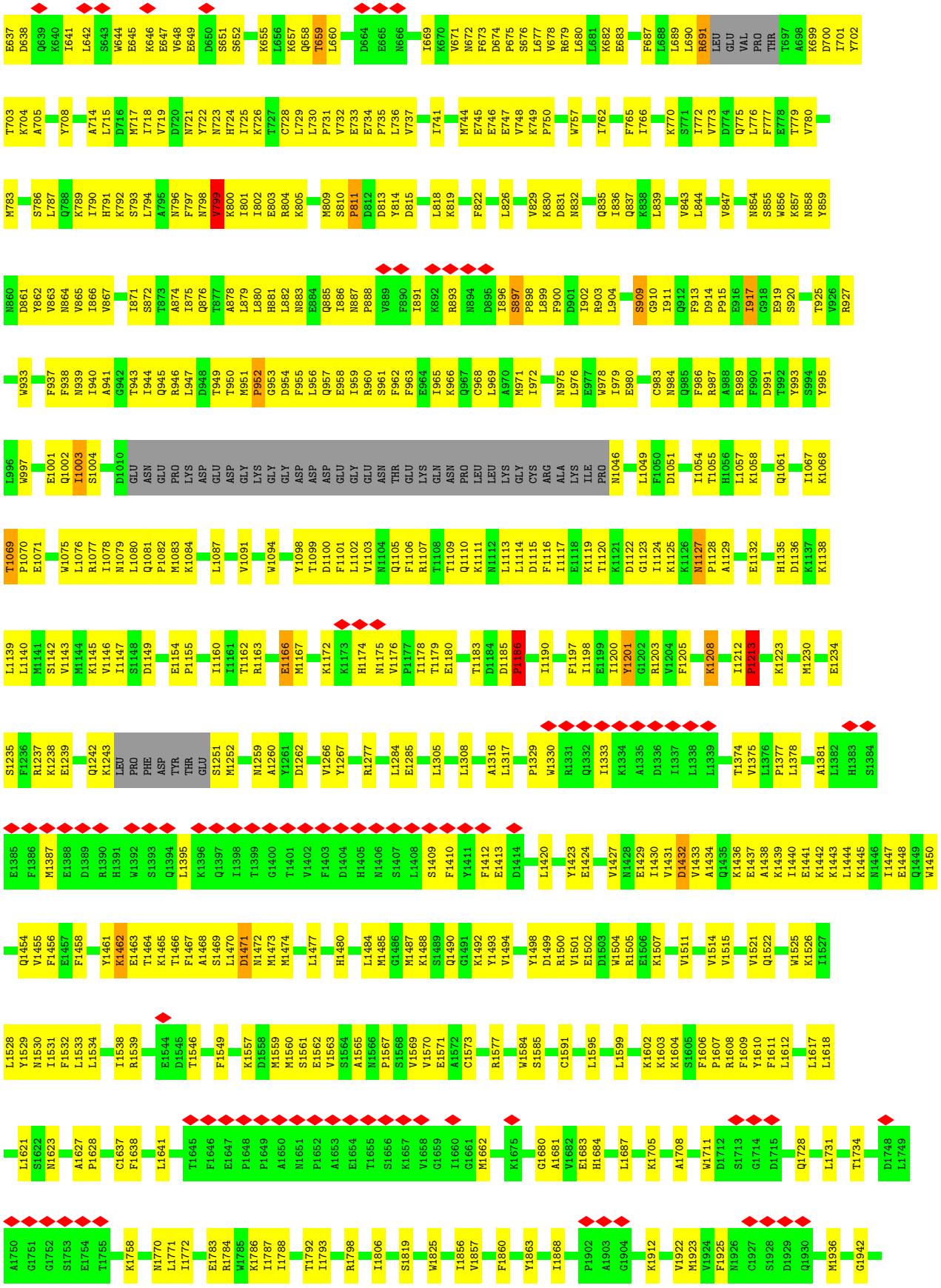
S2201 E2202 I2203 S2204 D2205 D2206 V2207 I2208 P2209 N2220 N2221 R2222 A2223 L2224 K2225 H2226 T2227 L2244 V2247 T2255 L2256 A2257 N2258 G2259 E2260 R2261 N2267 E2275 N2278 L2298 R2311 G2315 R2316 A2317 E2318 E2319 S2320 D2321 K2322 N2325 R2328 K2329 Y2330 L2331 I2332 N2333 M2334 R2335
F2336 L2339 Q2340 S2341 K2342 E2343 V2357 I2360 L2363 C2367 V2372 Q2373 T2374 Q2375 R2376 T2377 L2378 S2379 E2380 Q2381 F2386 S2390 E2409 L2410 L2411 L2412 A2413 K2414 N2415 A2416 P2417 I2418 P2419 Q2420 K2421 G2422 K2423 E2424 N2425 E2426 T2427 V2428 F2429 D2430 C2443 T2463 I2476 L2477
N2487 S2488 A2489 L2490 G2496 T2497 A2498 K2499 T2500 D2511 P2512 Q2513 K2514 M2515 K2542 V2543 G2544 K2545 K2553 M2564 P2565 F2566 V2567 N2568 K2569 Q2573 L2576 K2593 T2594 Q2595 I2608 M2611 I2621 R2624 K2653 Q2654 K2655 Y2656 F2657 S2658 D2659 S2660 T2661 Y2662 K2663
L2668 W2676 M2696 R2697 E2698 L2699 I2723 L2727 F2728 L2729 L2745 V2746 V2754 E2764 S2767 Q2768 I2769 E2770 N2771 E2772 K2776 C2786 V2793 A2804 L2839 V2840 L2850 I2855 G2863 V2866 G2870 S2871 G2872 S2875 L2876 T2877 D2901 L2902 K2903 E2904
D2905 I2906 K2907 T2921 F2922 L2923 M2924 T2925 L2935 I2938 G2945 L2950 L2951 D2954 E2955 R2956 E2957 V2958 W2959 L2960 G2961 D2962 I2963 S2964 Q2965 C2968 K2969 N2972 L2973 G2974 N2975 I2976 D2977 P2978 P2979 F2987 R2992 L2999 C3000 L3018 C3022 W3026 T3041 F3042 I3043
F3046 L3049 L3059 M3060 H3067 R3083 F3092 Y3095 L3096 Y3099 K3100 T3101 L3102 Y3103 I3104 E3105 K3106 L3110 E3114 F3117 G3120 L3121 I3124 Q3125 E3126 A3127 T3128 I3129 T3130 I3131 N3132 Q3133 M3134 E3135 I3136 S3137 L3138 K3139 E3140 E3141 E3142 I3143 Q3144 L3145 N3146 E3147 A3148
T3149 E3150 K3151 T3152 N3153 Q3154 L3155 L3156 A3157 N3158 L3159 D3160 K3161 E3162 S3163 K3164 K3165 A3166 N3167 Q3168 K3169 G3170 E3171 E3172 V3173 A3174 A3175 T3176 N3177 K3178 Q3179 C3180 E3181 I3182 Q3183 A3184 E3185 Q3186 I3187 S3188 K3189 E3190 K3191 E3192 E3193 A3194 E3195 R3196 E3197 L3198 E3199 A3200 A3201 L3202 P3203 A3204 L3205 R3206 R3207 A3208
Q3209 E3210 A3211 V3212 D3213 S3214 I3215 E3216 S3217 K3218 D3219 I3220 V3221 E3222 L3223 K3224 A3225 N3226 K3227 K3228 P3229 L3230 D3231 I3232 I3233 K3234 Y3235 I3236 M3237 D3238 A3239 Y3240 L3241 V3242 F3243 F3244 K3245 A3246 R3247 L3248 I3249 P3250 I3251 Q3252 E3255 R3256 V3257 F3258 N3259 K3260 K3261 E3262 G3263 K3264 A3265 V3266 L3267 F3268 L3269
K3270 E3271 S3272 Y3273 D3274 E3275 S3276 G3277 I3278 Q3279 T3280 L3281 G3282 D3283 M3284 N3285 F3286 M3287 K3288 K3289 L3290 K3291 E3292 F3293 E3294 K3295 D3296 S3297 I3298 N3299 E3300 E3301 T3302 I3303 E3304 L3305 L3306 E3307 P3308 Y3309 L3310 N3311 Q3312 S3313 E3314 D3315 W3316 F3317 N3318 D3319 T3320 F3321 A3322 T3323 K3324 A3325 S3326 K3327 A3328 A3329
A3330 G3331 I3332 L3333 K3334 W3335 A3336 F3337 A3338 I3339 Y3340 E3341 Y3342 H3343 Q3344 K3345 S3346 K3347 I3348 V3349 K3350 P3351 K3352 R3353 I3354 Q3355 V3356 A3357 I3358 A3359 E3360 G3361 R3362 Q3363 A3364 I3365 A3366 L3367 K3368 E3369 L3370 E3371 K3372 A3373 R3374 E3375 D3376 L3377 A3378 Q3379 I3380 Q3381 A3382 Y3383 I3384 K3385 N3386 L3387 K3388 D3389
V3390 S3421 L3422 E3425 W3429 I3436 K3440 R3441 K3442 L3443 V3444 G3445 N3446 V3447 S3448 L3449 S3450 T3451 A3452 F3453 I3454 S3455 Y3456 C3457 V3475 K3478 K3479 T3485 L3488 F3493 I3500 L3508 I3515 D3532 P3533 Q3534 G3535 Q3536 Q3537 Q3538 N3539 W3540 I3541 K3544 L3545
S3546 I3549 I3550 P3551 E3552 R3553 C3554 T3557 L3558 S3559 H3560 P3561 L3568 E3581 N3582 I3583 E3584 N3585 E3586 V3587 D3592 P3593 C3627 A3630 E3637 L3638 K3641 F3647 T3648 Q3651 L3654 N3684 L3691 L3696 I3700 N3701 S3702 Q3703 G3704 D3709 L3712



• Molecule 2: Outer arm dynein beta heavy chain

Chain B:

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T703 K704 A705 Y708 A714 L715 D716 M717 I718 V719 D720 N721 Y722 N723 H724 I725 K726 T727 C728 L729 L730 P731 V732 E733 E734 P735 L736 V737 I741 M744 E745 E746 E747 V748 K749 P750 W757 I762 F765 I766 K770 S771 I772 V773 D774 Q775 L776 F777 E778 T779 V780
M783 S786 L787 Q788 K789 I790 H791 K792 S793 L794 A795 N796 F797 N798 V799 K800 I801 I802 E803 R804 K805 M809 S810 P811 D812 D813 Y814 D815 L818 K819 F822 L826 V829 K830 D831 N832 W757 Q835 I836 Q837 K838 L839 V843 L844 V847 N854 S855 W856 K857 N858 Y859
N860 D861 Y862 V863 N864 V865 I866 V867 I871 S872 T873 A874 I875 Q876 T877 A878 L879 L880 H881 L882 N883 E884 Q885 I886 N887 P888 V889 F890 I891 K892 R893 N894 D895 I896 S897 P898 L899 F900 D901 I902 R903 L904 S909 G910 I911 Q912 F913 D914 P915 E916 I917 G918 E919 S920 T925 V926 R927
W933 F937 F938 N939 I940 A941 G942 T943 I944 Q945 R946 L947 D948 T949 T950 M951 P952 G953 D954 F955 L956 Q957 E958 I959 R960 S961 F962 F963 E964 I965 K966 Q967 C968 L969 A970 M971 I972 N975 L976 E977 W978 I979 E980 C983 N984 Q985 F986 R987 A988 R989 F990 D991 T992 Y993 S994 Y995
L996 W997 E1001 Q1002 I1003 S1004 D1010 GLU ASN GLU PRO LYS ASP GLU ASP GLY LYS GLY GLY ASP ASP ASP GLU GLY GLU ASN THR GLU LYS GLN ASN PRO LEU LEU LYS GLY CYS ARG ALA LYS ILE PRO N1046 L1049 F1050 D1051 I1054 T1055 H1056 L1057 K1058 Q1061 I1067 K1068
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L1139 L1140 M1141 S1142 V1143 M1144 K1145 V1146 I1147 S1148 D1149 E1154 P1155 I1160 I1161 T1162 R1163 E1166 M1167 K1172 K1173 H1174 N1175 V1176 P1177 I1178 T1179 E1180 T1183 D1184 D1185 P1186 I1190 F1197 I1198 E1199 I1200 Y1201 G1202 R1203 V1204 F1205 K1208 I1212 P1213 K1223 M1230 E1234
S1235 F1236 R1237 K1238 E1239 Q1242 K1243 LEU PRO PHE ASP TYR THR GLU S1251 M1252 N1259 A1260 Y1261 D1262 V1266 Y1267 R1277 L1284 E1285 L1305 L1308 A1316 L1317 P1329 W1330 R1331 Q1332 I1333 K1334 A1335 D1336 I1337 L1338 L1339 T1374 V1375 L1376 P1377 L1378 A1381 L1382 H1383 S1384
E1385 F1386 M1387 E1388 D1389 R1390 H1391 W1392 S1393 Q1394 L1395 K1396 Q1397 I1398 T1399 G1400 T1401 V1402 F1403 D1404 H1405 N1406 S1407 L1408 S1409 F1410 Y1411 F1412 E1413 D1414 L1420 Y1423 E1424 V1427 N1428 E1429 I1430 V1431 D1432 V1433 A1434 Q1435 K1436 E1437 A1438 K1439 I1440 E1441 K1442 K1443 L1444 K1445 N1446 I1447 E1448 Q1449 W1450
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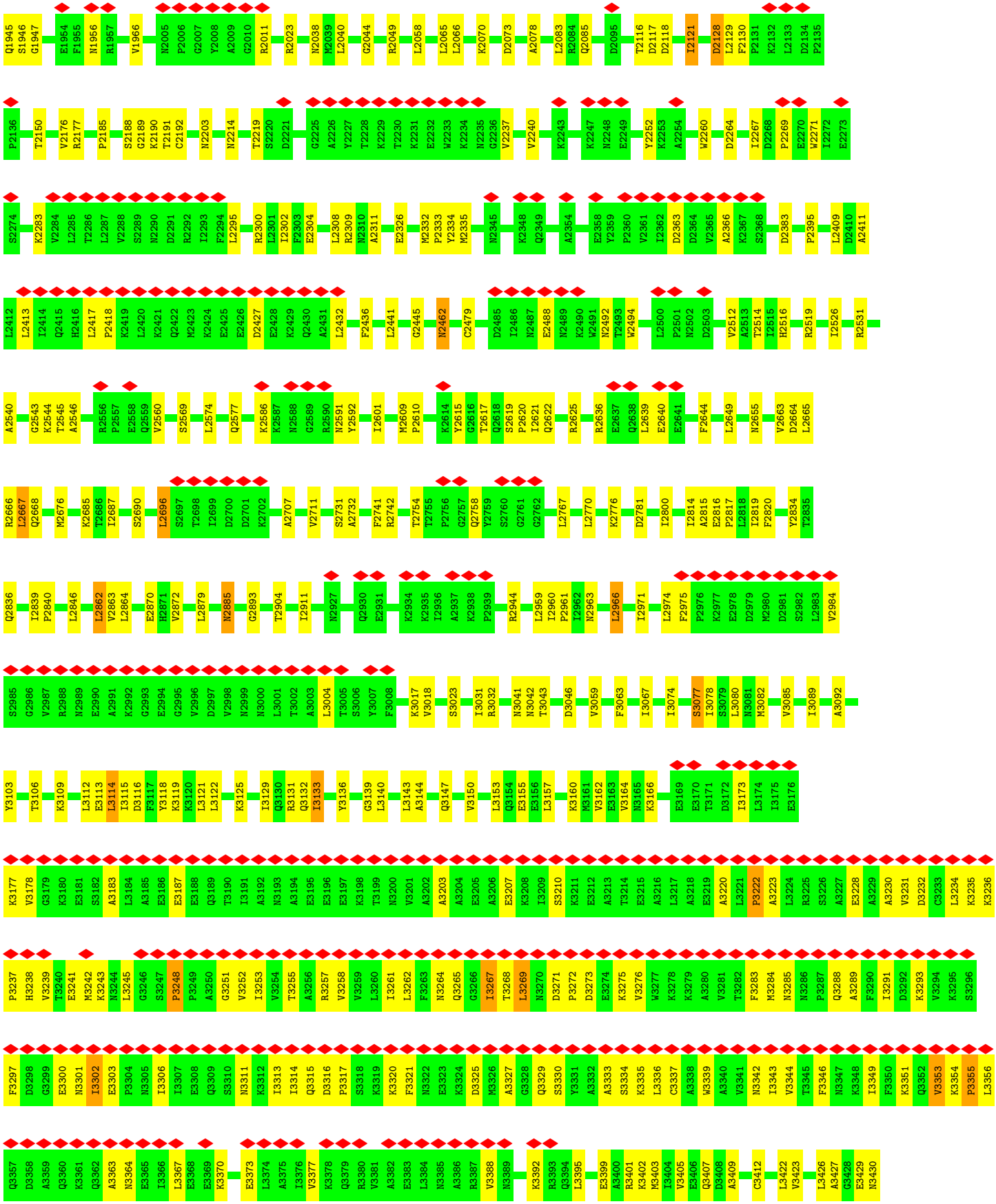
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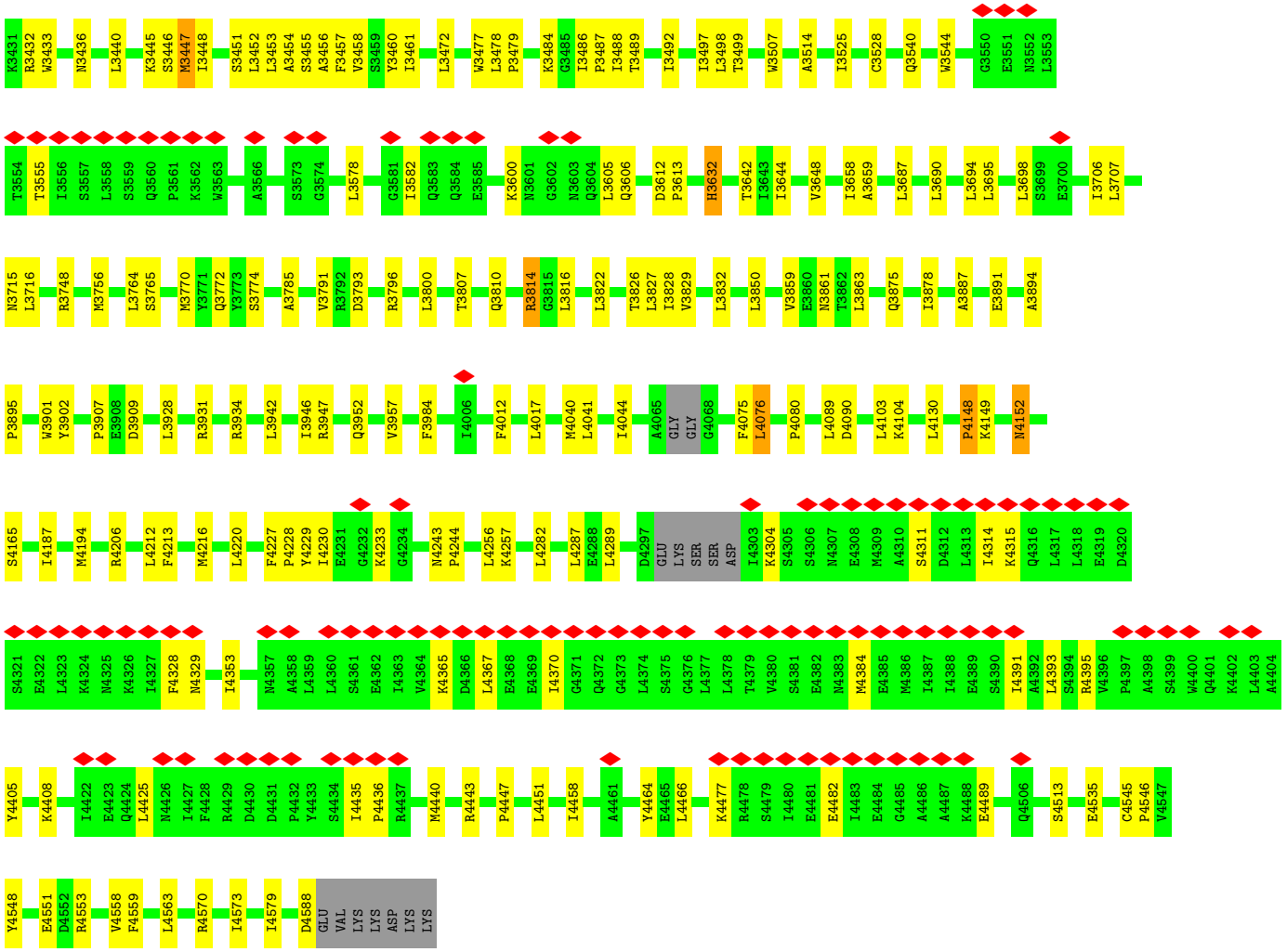
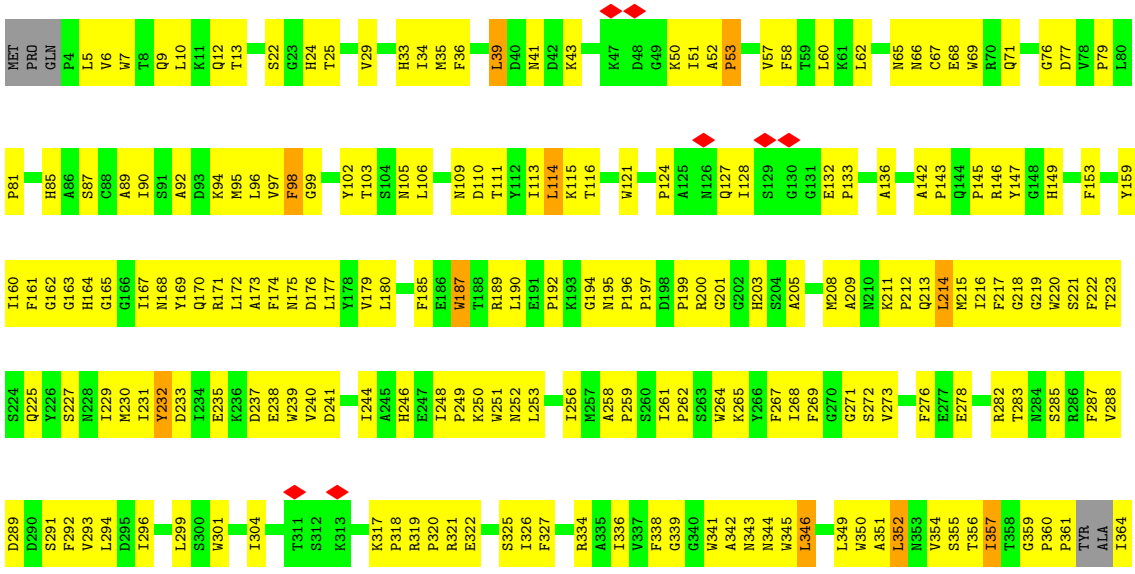
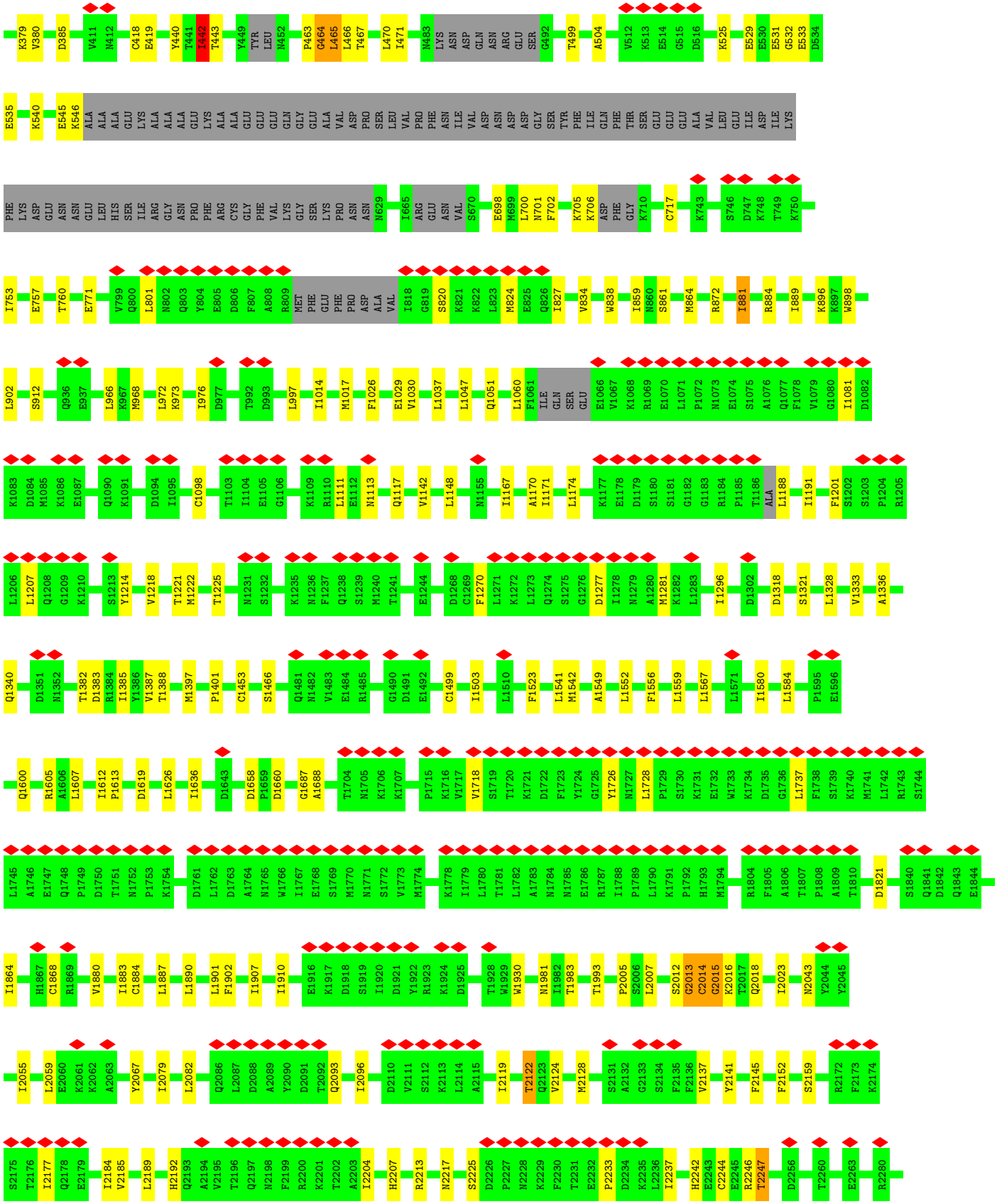


• Molecule 3: Dynein-1-alpha heavy chain, flagellar inner arm I1 complex protein, putative

Chain C:

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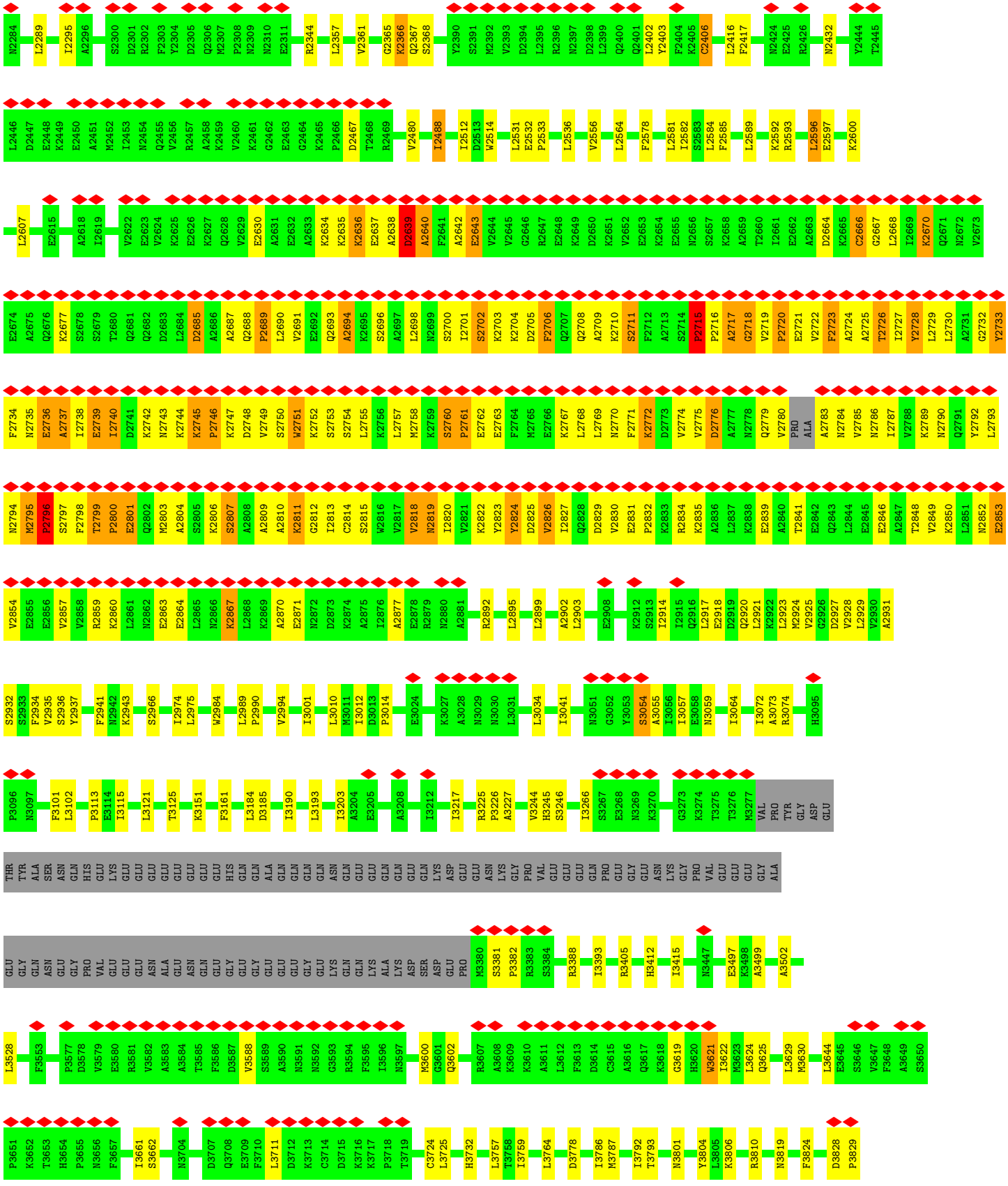
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THR TYR ALA SER ASN GLN HIS GLU LYS GLU GLU GLU GLU GLU GLU GLU GLU HIS GLN GLN ALA GLN GLN GLN GLN GLN ASN GLN GLU GLU GLN GLN GLN GLN GLN LYS LYS ASP GLU GLU ASN LYS GLY PRO VAL GLU GLU GLU GLN PRO GLU GLY GLU ASN LYS GLY PRO VAL GLU GLU GLU GLY ALA
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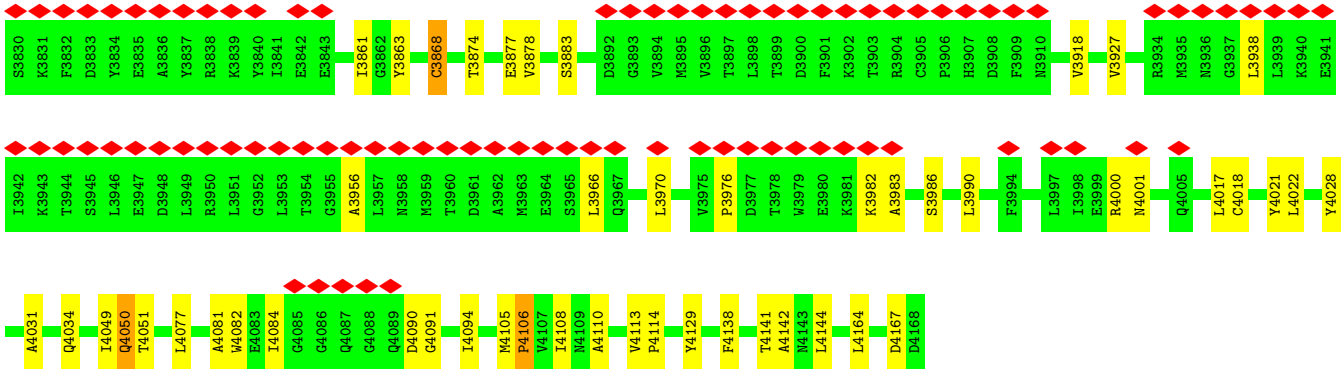
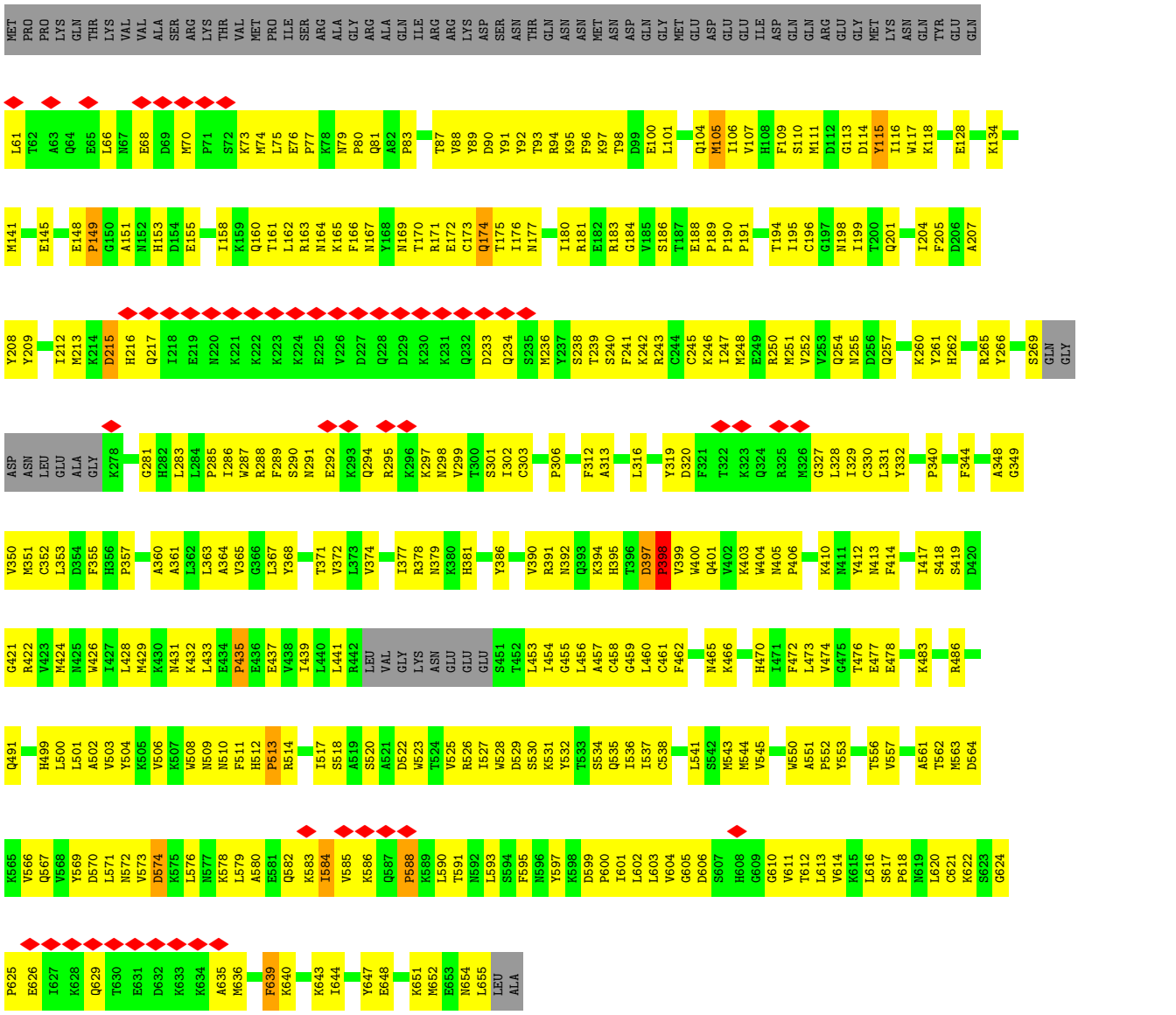
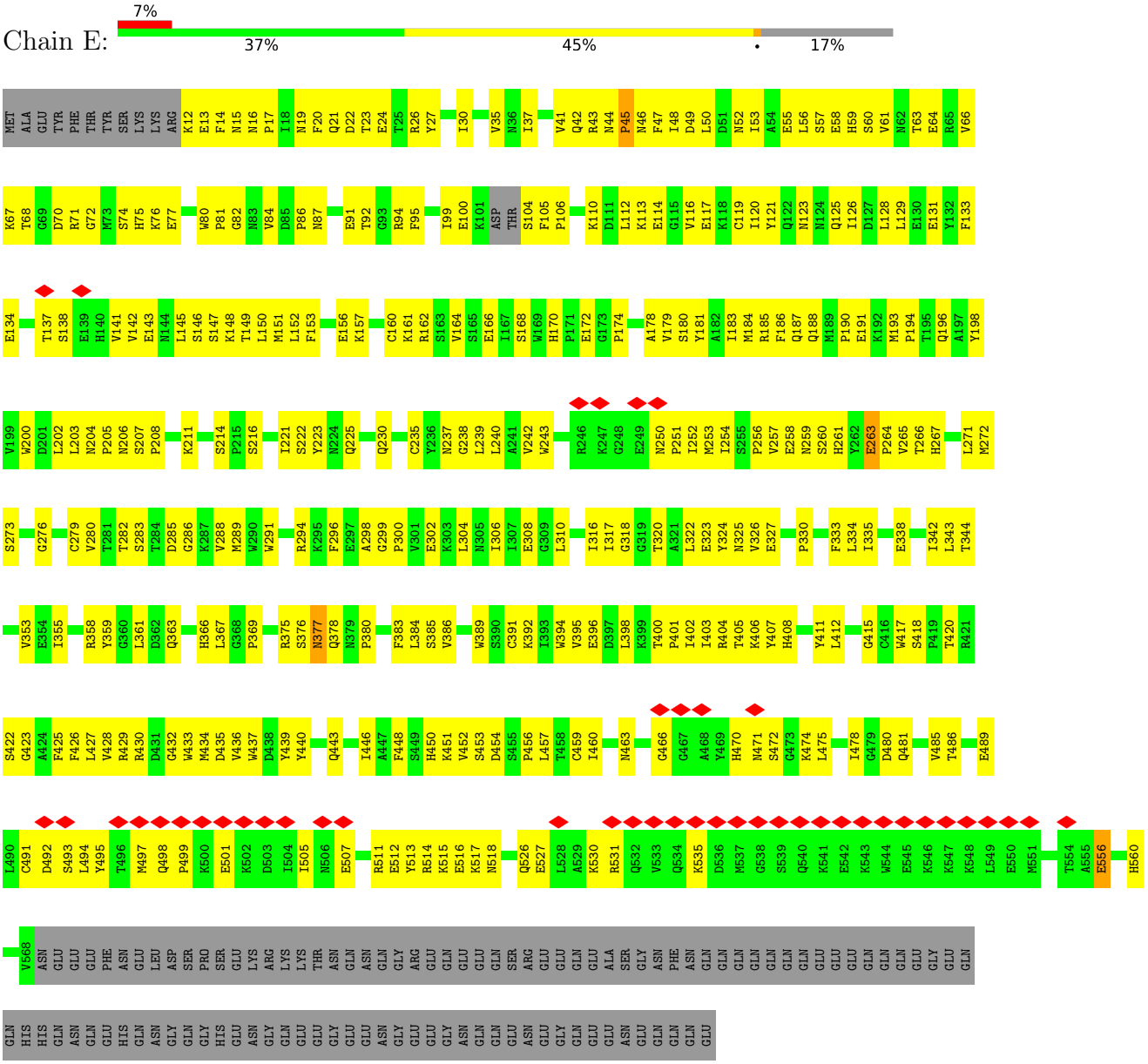


• Molecule 4: Dynein intermediate chain 2



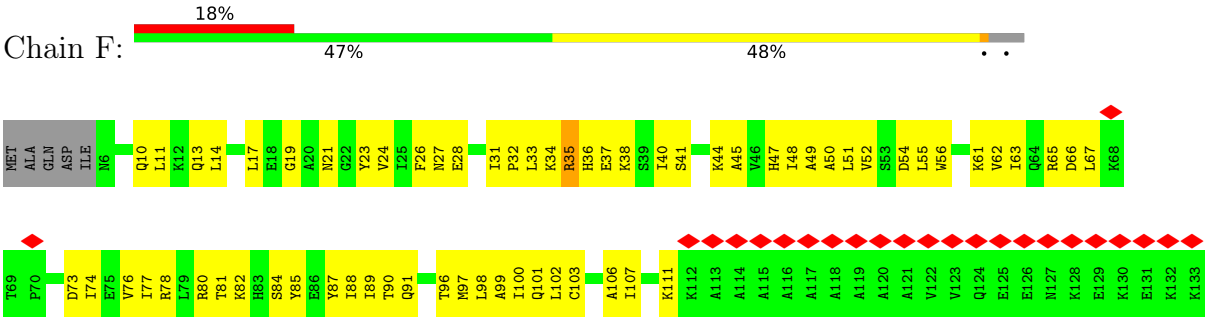
• Molecule 5: Flagellar outer dynein arm intermediate protein, putative

Chain E:



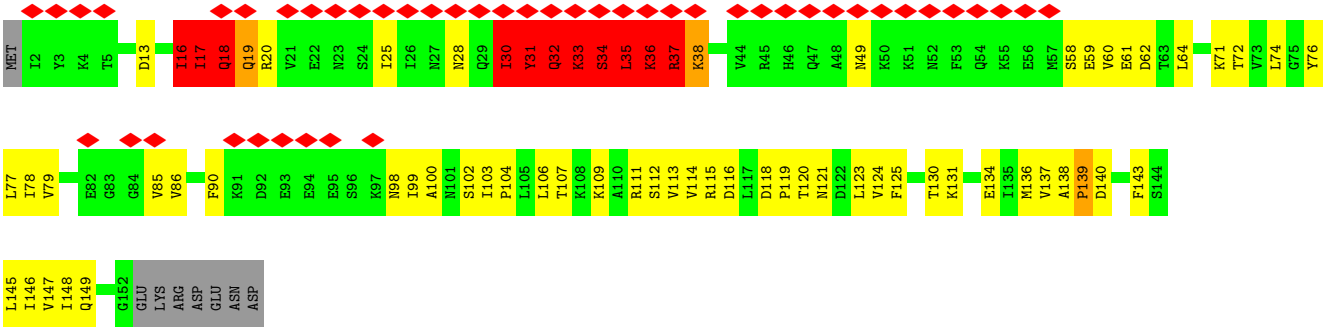
• Molecule 6: Dynein light chain roadblock-type 2 protein

Chain F:



• Molecule 7: Dynein light chain roadblock-type 2 protein

Chain G:

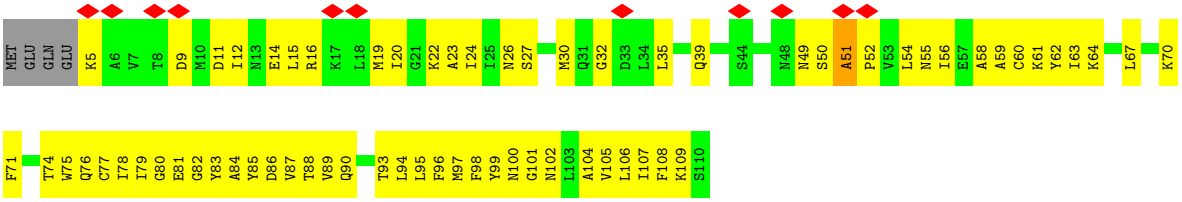


• Molecule 8: Dynein light chain

Chain H:

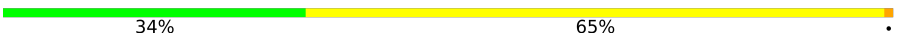
• Molecule 9: Dynein light chain

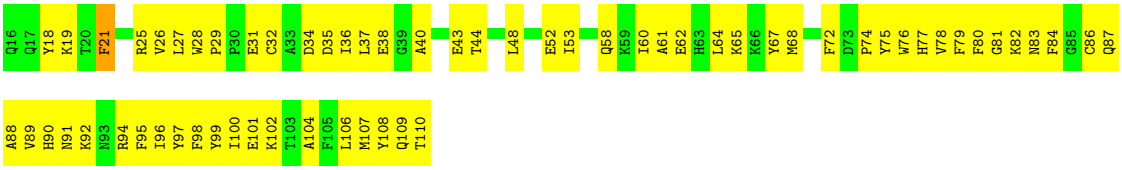
Chain I:



• Molecule 10: Dynein light chain

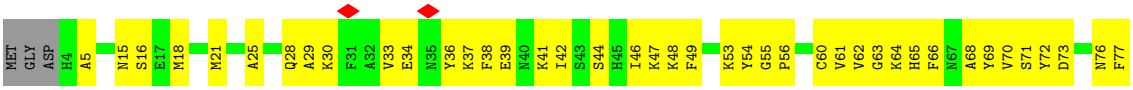
Chain J:



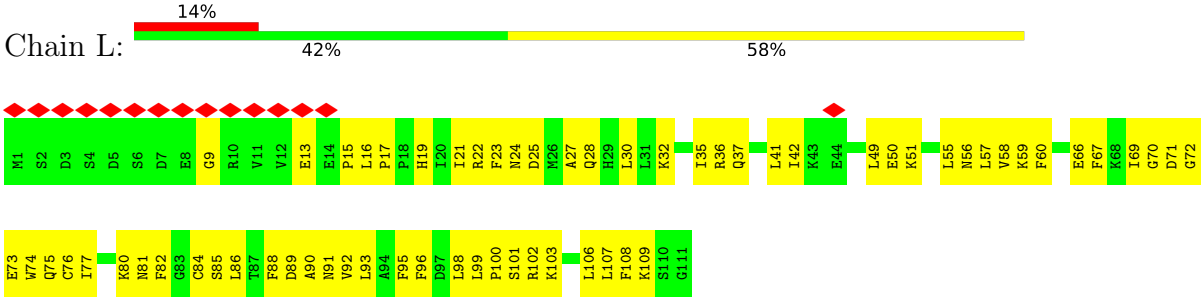


• Molecule 11: Dynein light chain

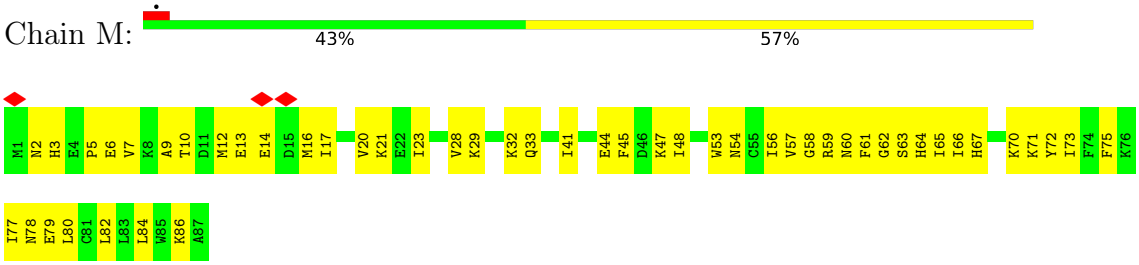
Chain K:



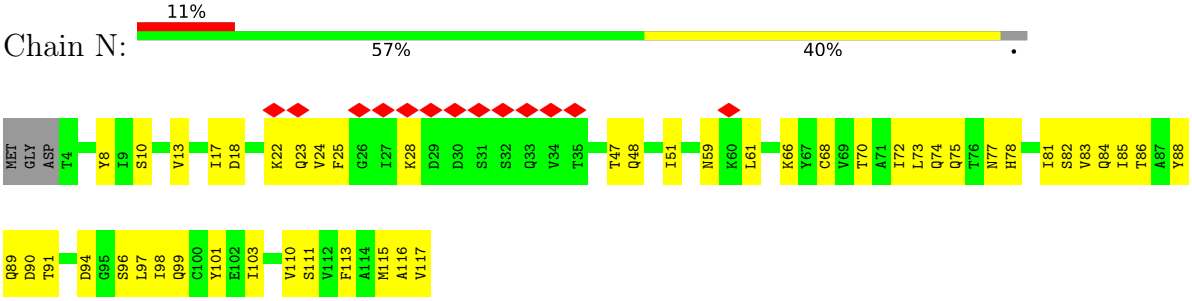
• Molecule 12: Dynein light chain



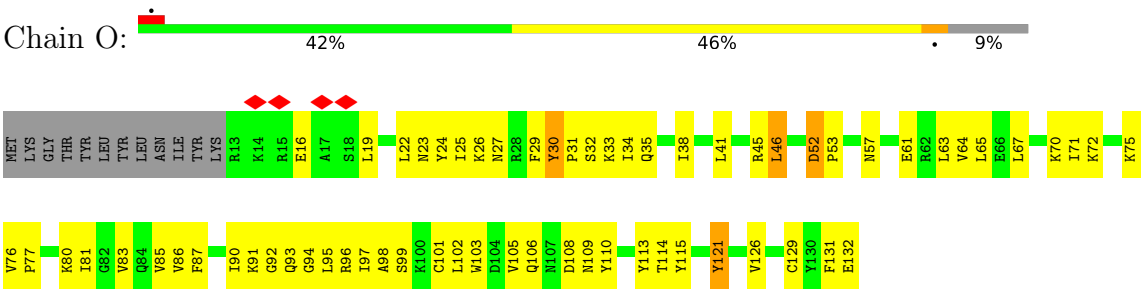
• Molecule 13: Dynein light chain



• Molecule 14: Dynein light chain tctex-type 1 protein



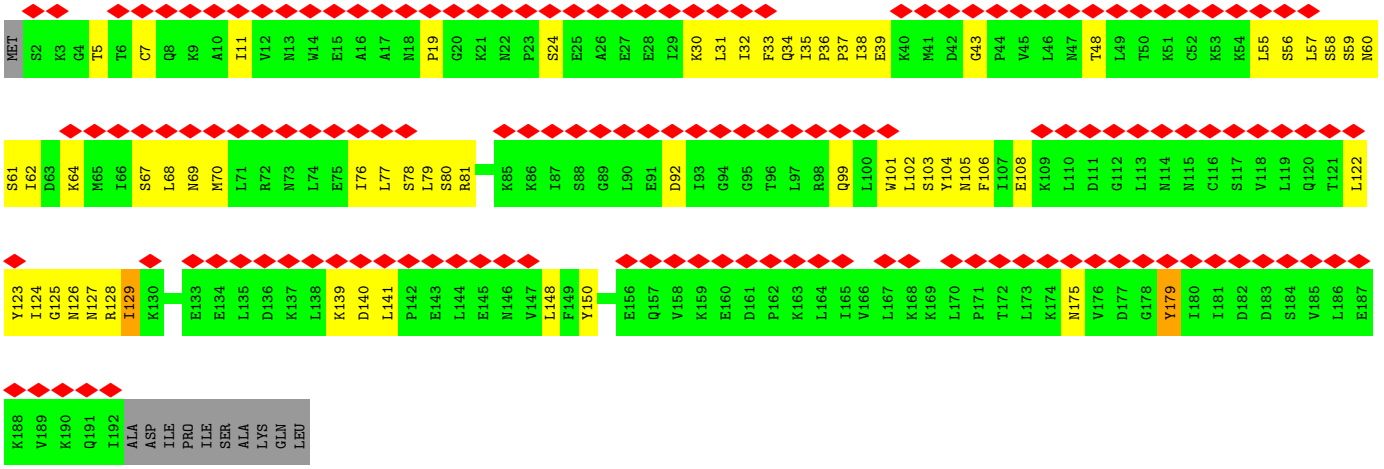
• Molecule 15: Dynein light chain 2A



• Molecule 16: Thioredoxin

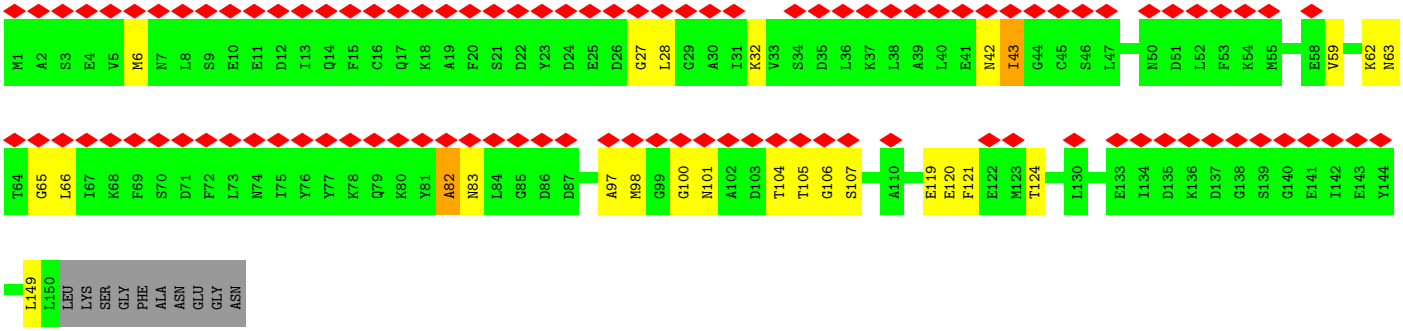
• Molecule 17: Dynein light chain 1

Chain Q:



• Molecule 18: Dynein light chain 4A

Chain R:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SUBTOMOGRAM AVERAGING	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of subtomograms used	2131	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	80.0	Depositor
Minimum defocus (nm)	3000	Depositor
Maximum defocus (nm)	4000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	1.222	Depositor
Minimum map value	-0.797	Depositor
Average map value	0.014	Depositor
Map value standard deviation	0.196	Depositor
Recommended contour level	0.14	Depositor
Map size (Å)	628.26, 628.26, 628.26	wwPDB
Map dimensions	74, 74, 74	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	8.49, 8.49, 8.49	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ADP, ATP, 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	0.72	7/34544 (0.0%)	0.81	24/46728 (0.1%)
2	B	0.72	7/35318 (0.0%)	0.82	37/47792 (0.1%)
3	C	0.88	63/31033 (0.2%)	0.89	52/42007 (0.1%)
4	D	0.63	1/4789 (0.0%)	0.74	6/6477 (0.1%)
5	E	0.61	0/4540	0.64	0/6136
6	F	0.57	0/1008	0.58	0/1355
7	G	0.63	0/1030	0.98	11/1403 (0.8%)
8	H	0.63	0/767	0.61	0/1031
9	I	0.66	0/838	0.59	0/1131
10	J	0.61	0/832	0.65	0/1119
11	K	0.62	0/776	0.60	0/1038
12	L	0.61	0/872	0.61	0/1176
13	M	0.62	0/752	0.61	0/1006
14	N	0.66	0/864	0.67	0/1175
15	O	0.64	0/1012	0.64	0/1358
16	P	1.92	3/538 (0.6%)	1.60	15/746 (2.0%)
17	Q	0.34	0/1004	0.59	1/1385 (0.1%)
18	R	0.83	1/738 (0.1%)	0.95	2/1025 (0.2%)
All	All	0.76	82/121255 (0.1%)	0.82	148/164088 (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
1	A	0	4
2	B	0	11
3	C	0	2
4	D	0	1
7	G	0	12

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Mol	Chain	#Chirality outliers	#Planarity outliers
16	P	0	2
All	All	0	32

The worst 5 of 82 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1067	PRO	N-CD	51.23	2.19	1.47
2	B	59	THR	C-N	-39.10	0.44	1.34
16	P	62	LYS	C-N	-30.49	0.64	1.34
16	P	15	SER	C-N	20.55	1.81	1.34
1	A	1649	ALA	C-N	-17.39	0.94	1.34

The worst 5 of 148 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	1171	ILE	CA-C-N	-49.33	8.66	117.20
1	A	1171	ILE	C-N-CA	-46.87	4.53	121.70
2	B	59	THR	O-C-N	-39.36	59.73	122.70
2	B	49	PHE	O-C-N	-27.91	78.05	122.70
3	C	467	THR	N-CA-CB	23.78	155.48	110.30

There are no chirality outliers.

5 of 32 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1171	ILE	Mainchain,Peptide
1	A	121	GLY	Mainchain
1	A	1649	ALA	Mainchain
2	B	25	GLN	Peptide
2	B	49	PHE	Mainchain

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	33975	0	32349	2867	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	34713	0	33234	2520	0
3	C	30427	0	29349	1401	0
4	D	4680	0	4509	1322	0
5	E	4440	0	4304	1005	0
6	F	996	0	1019	262	0
7	G	1024	0	883	185	0
8	H	750	0	734	218	0
9	I	827	0	826	292	0
10	J	807	0	772	261	0
11	K	754	0	715	127	0
12	L	855	0	854	214	0
13	M	735	0	735	235	0
14	N	852	0	796	199	0
15	O	994	0	1017	307	0
16	P	541	0	217	55	0
17	Q	1001	0	490	284	0
18	R	739	156	339	37	0
19	A	54	0	23	33	0
19	B	54	0	24	19	0
19	C	54	0	22	33	0
20	A	31	0	12	10	0
20	B	31	0	12	44	0
20	C	31	0	12	1	0
21	A	3	0	0	2	0
21	B	3	0	0	0	0
21	C	3	0	0	0	0
All	All	119374	156	113247	9374	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 40.

The worst 5 of 9374 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)
10:J:86:CYS:SG	11:K:61:VAL:HG22	1.24	1.74
2:B:1474:MET:SD	2:B:1515:VAL:HG11	1.32	1.66
1:A:935:VAL:HG22	1:A:944:LEU:CD2	1.23	1.65
1:A:3232:ILE:HG12	1:A:3316:TRP:CZ3	1.14	1.65
2:B:582:MET:HE1	2:B:587:GLY:CA	1.26	1.65

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	4391/4620 (95%)	4177 (95%)	189 (4%)	25 (1%)	25 66
2	B	4491/4595 (98%)	4255 (95%)	199 (4%)	37 (1%)	19 60
3	C	3923/4168 (94%)	3692 (94%)	208 (5%)	23 (1%)	25 66
4	D	569/657 (87%)	546 (96%)	16 (3%)	7 (1%)	13 50
5	E	551/670 (82%)	531 (96%)	18 (3%)	2 (0%)	34 72
6	F	126/133 (95%)	120 (95%)	6 (5%)	0	100 100
7	G	147/159 (92%)	134 (91%)	7 (5%)	6 (4%)	3 23
8	H	89/92 (97%)	88 (99%)	1 (1%)	0	100 100
9	I	104/110 (94%)	100 (96%)	3 (3%)	1 (1%)	15 55
10	J	93/95 (98%)	90 (97%)	3 (3%)	0	100 100
11	K	88/93 (95%)	85 (97%)	3 (3%)	0	100 100
12	L	109/111 (98%)	104 (95%)	4 (4%)	1 (1%)	17 57
13	M	85/87 (98%)	83 (98%)	2 (2%)	0	100 100
14	N	112/117 (96%)	105 (94%)	7 (6%)	0	100 100
15	O	118/132 (89%)	112 (95%)	4 (3%)	2 (2%)	9 42
16	P	103/122 (84%)	90 (87%)	7 (7%)	6 (6%)	1 18
17	Q	189/202 (94%)	173 (92%)	13 (7%)	3 (2%)	9 44
18	R	148/160 (92%)	121 (82%)	19 (13%)	8 (5%)	2 19
All	All	15436/16323 (95%)	14606 (95%)	709 (5%)	121 (1%)	24 60

5 of 121 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	101	PRO
1	A	125	PRO
1	A	127	THR
1	A	151	ILE

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Mol	Chain	Res	Type
1	A	1171	ILE

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	3430/4197 (82%)	3358 (98%)	72 (2%)	53 72
2	B	3520/4145 (85%)	3441 (98%)	79 (2%)	52 71
3	C	3139/3691 (85%)	3089 (98%)	50 (2%)	62 79
4	D	511/600 (85%)	507 (99%)	4 (1%)	81 89
5	E	488/597 (82%)	484 (99%)	4 (1%)	81 89
6	F	105/109 (96%)	104 (99%)	1 (1%)	76 86
7	G	86/149 (58%)	86 (100%)	0	100 100
8	H	82/83 (99%)	82 (100%)	0	100 100
9	I	91/95 (96%)	91 (100%)	0	100 100
10	J	82/82 (100%)	81 (99%)	1 (1%)	71 83
11	K	80/82 (98%)	80 (100%)	0	100 100
12	L	90/99 (91%)	90 (100%)	0	100 100
13	M	78/78 (100%)	78 (100%)	0	100 100
14	N	84/104 (81%)	84 (100%)	0	100 100
15	O	108/119 (91%)	106 (98%)	2 (2%)	57 75
17	Q	11/186 (6%)	11 (100%)	0	100 100
All	All	11985/14416 (83%)	11772 (98%)	213 (2%)	61 77

5 of 213 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	3032	ARG
2	B	4408	LYS
3	C	4050	GLN
2	B	3222	PRO

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Mol	Chain	Res	Type
2	B	3793	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 211 such sidechains are listed below:

Mol	Chain	Res	Type
3	C	9	GLN
3	C	2483	ASN
12	L	28	GLN
3	C	126	ASN
3	C	1300	GLN

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

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	$\#\|Z\| > 2$
19	ADP	A	4701	21	24,29,29	0.95	1 (4%)	29,45,45	1.44	5 (17%)
19	ADP	B	5405	21	24,29,29	0.65	0	29,45,45	0.93	2 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
19	ADP	C	4306	21	24,29,29	0.66	0	29,45,45	0.86	2 (6%)
20	ATP	C	4302	21	26,33,33	0.69	0	31,52,52	0.89	2 (6%)
19	ADP	B	5406	21	24,29,29	0.66	0	29,45,45	0.75	1 (3%)
20	ATP	B	5403	21	26,33,33	0.66	0	31,52,52	0.83	1 (3%)
19	ADP	C	4305	3,21	24,29,29	0.70	1 (4%)	29,45,45	1.03	2 (6%)
19	ADP	A	4703	21	24,29,29	0.94	1 (4%)	29,45,45	1.47	4 (13%)
20	ATP	A	4702	21	26,33,33	0.93	1 (3%)	31,52,52	1.40	4 (12%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
19	ADP	A	4701	21	-	7/12/32/32	0/3/3/3
19	ADP	B	5405	21	-	1/12/32/32	0/3/3/3
19	ADP	C	4306	21	-	4/12/32/32	0/3/3/3
20	ATP	C	4302	21	-	1/18/38/38	0/3/3/3
19	ADP	B	5406	21	-	2/12/32/32	0/3/3/3
20	ATP	B	5403	21	-	1/18/38/38	0/3/3/3
19	ADP	C	4305	3,21	-	5/12/32/32	0/3/3/3
19	ADP	A	4703	21	-	6/12/32/32	0/3/3/3
20	ATP	A	4702	21	-	3/18/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
19	A	4703	ADP	C5-C4	2.32	1.47	1.40
19	A	4701	ADP	C5-C4	2.29	1.47	1.40
20	A	4702	ATP	C5-C4	2.11	1.46	1.40
19	C	4305	ADP	C8-N7	-2.11	1.30	1.34

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
20	A	4702	ATP	PB-O3B-PG	-3.71	120.09	132.83
19	A	4703	ADP	PA-O3A-PB	-3.55	120.64	132.83
19	A	4701	ADP	C3'-C2'-C1'	3.52	106.28	100.98
19	A	4703	ADP	C3'-C2'-C1'	3.47	106.19	100.98

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
20	A	4702	ATP	N3-C2-N1	-3.27	123.57	128.68

There are no chirality outliers.

5 of 30 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
19	A	4701	ADP	PB-O3A-PA-O5'
19	A	4701	ADP	C5'-O5'-PA-O1A
19	A	4701	ADP	C5'-O5'-PA-O2A
19	A	4703	ADP	PB-O3A-PA-O5'
19	A	4703	ADP	C5'-O5'-PA-O1A

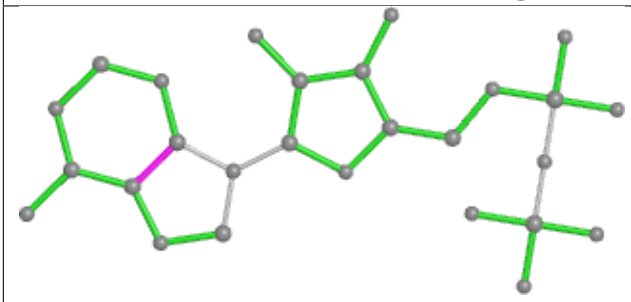
There are no ring outliers.

9 monomers are involved in 140 short contacts:

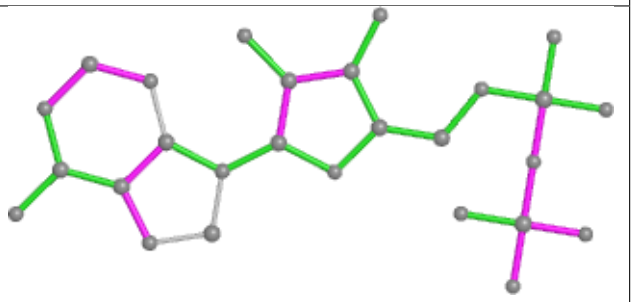
Mol	Chain	Res	Type	Clashes	Symm-Clashes
19	A	4701	ADP	12	0
19	B	5405	ADP	16	0
19	C	4306	ADP	8	0
20	C	4302	ATP	1	0
19	B	5406	ADP	3	0
20	B	5403	ATP	44	0
19	C	4305	ADP	25	0
19	A	4703	ADP	21	0
20	A	4702	ATP	10	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

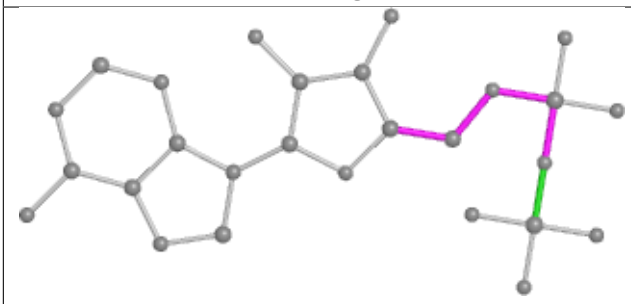
Ligand ADP A 4701



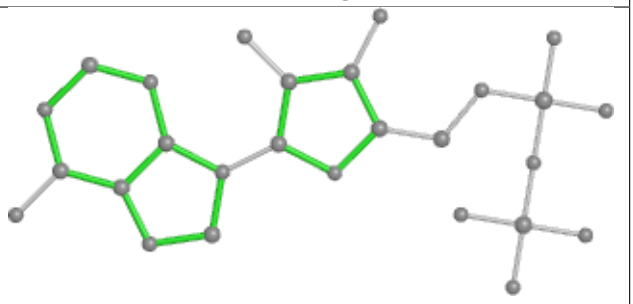
Bond lengths



Bond angles

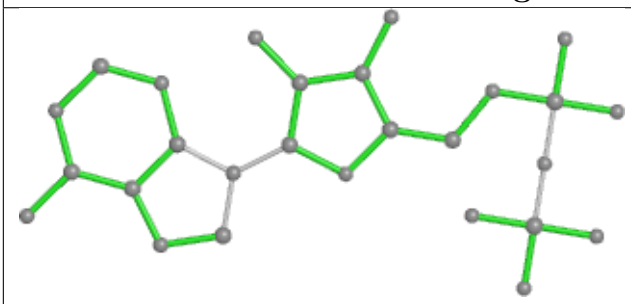


Torsions

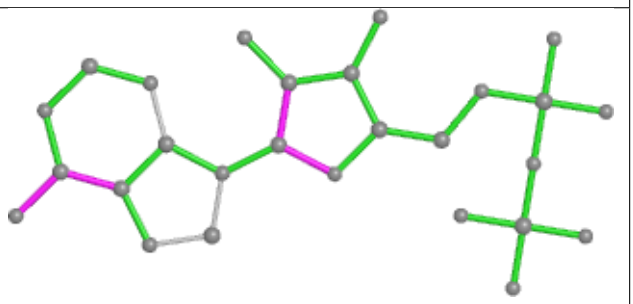


Rings

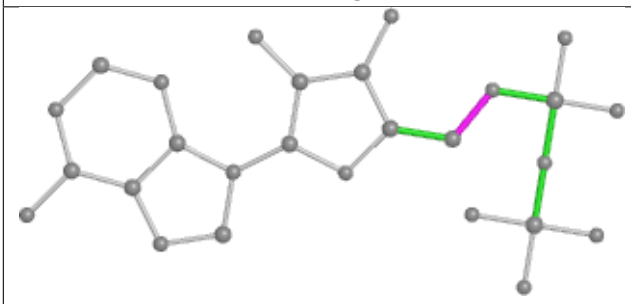
Ligand ADP B 5405



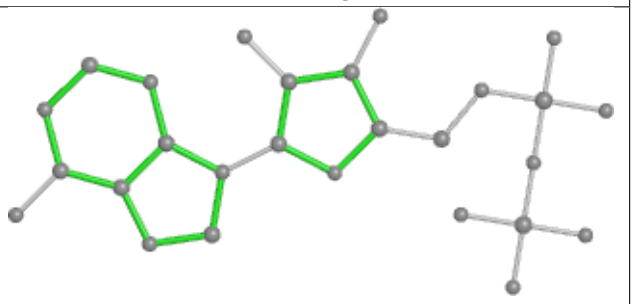
Bond lengths



Bond angles

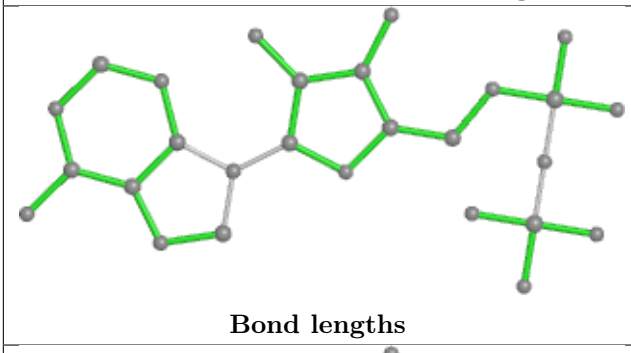


Torsions

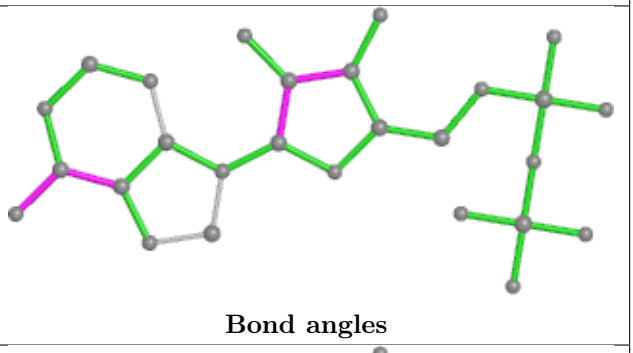


Rings

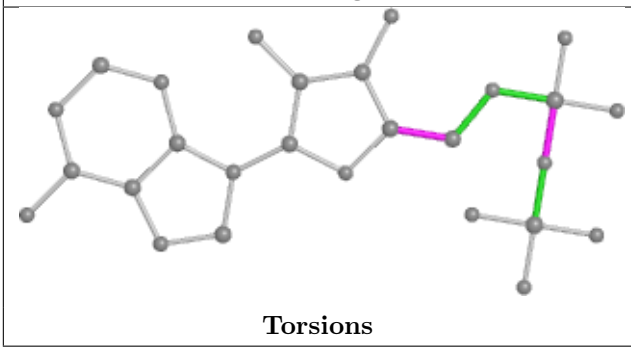
Ligand ADP C 4306



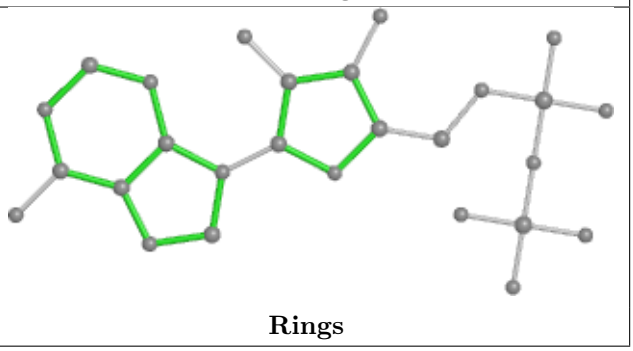
Bond lengths



Bond angles

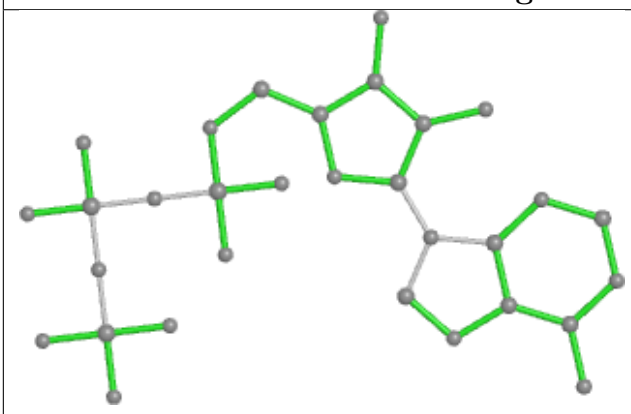


Torsions

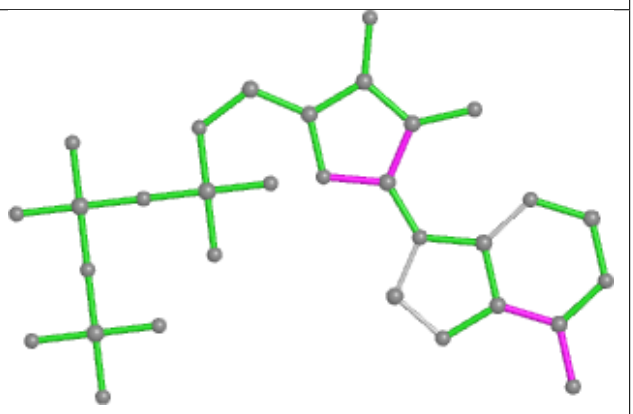


Rings

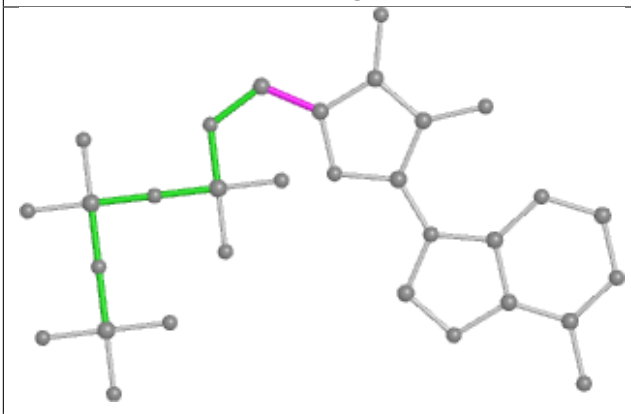
Ligand ATP C 4302



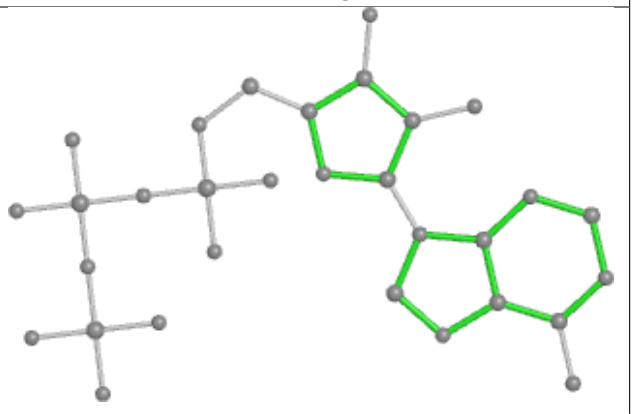
Bond lengths



Bond angles

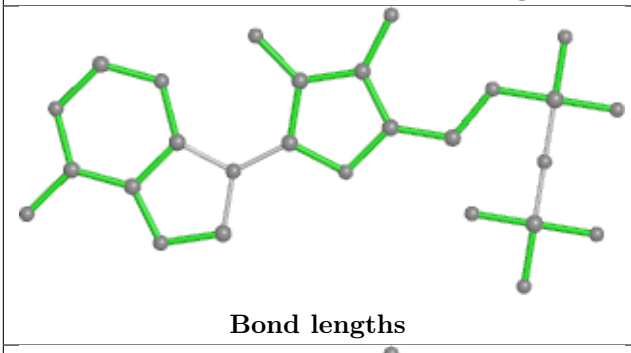


Torsions

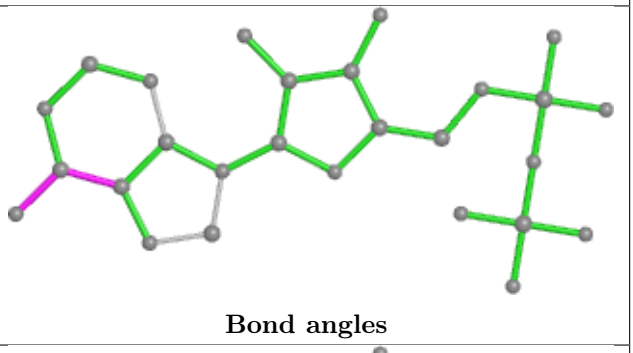


Rings

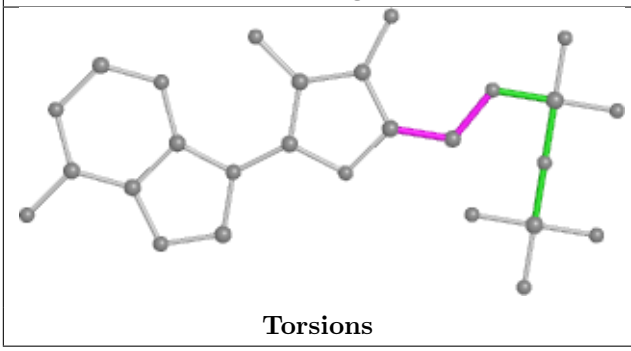
Ligand ADP B 5406



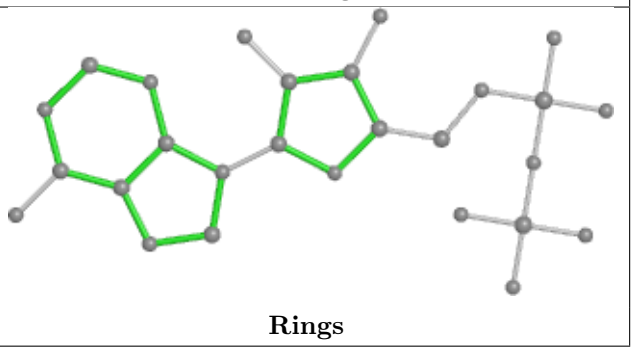
Bond lengths



Bond angles

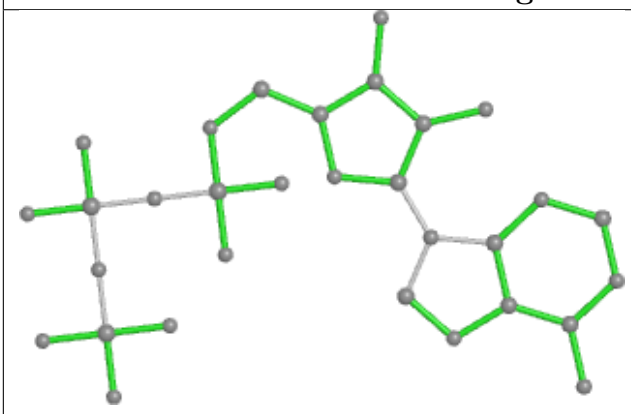


Torsions

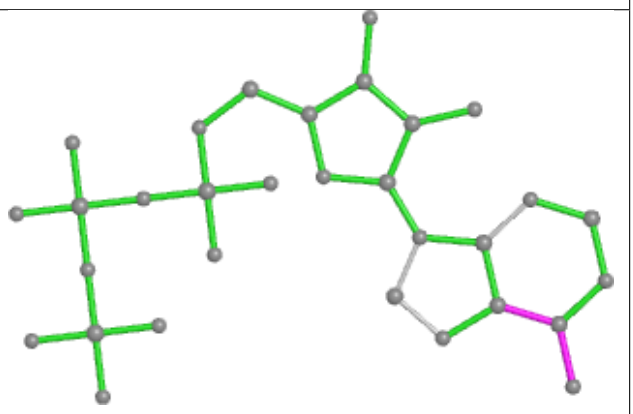


Rings

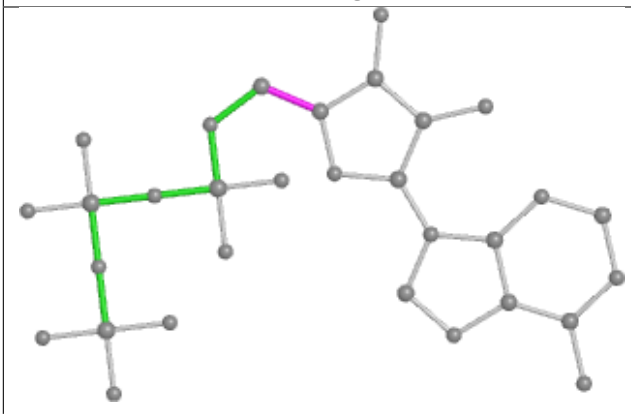
Ligand ATP B 5403



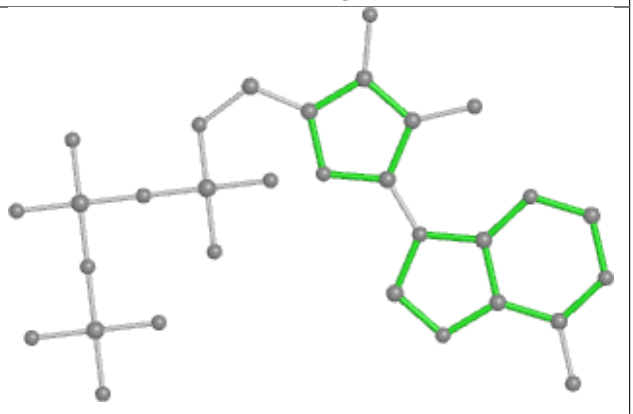
Bond lengths



Bond angles

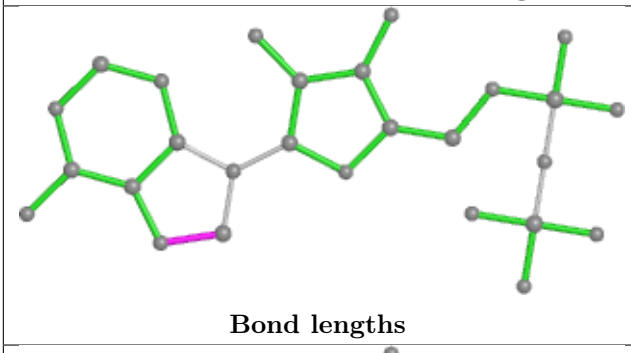


Torsions

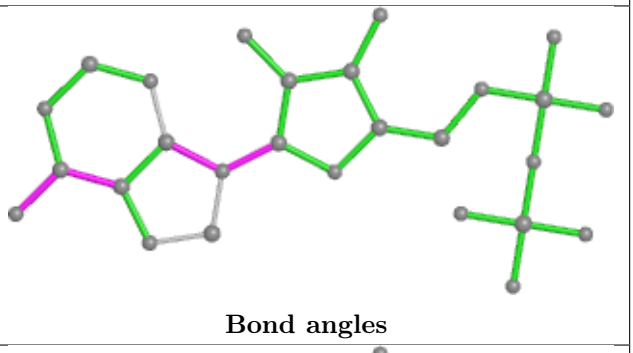


Rings

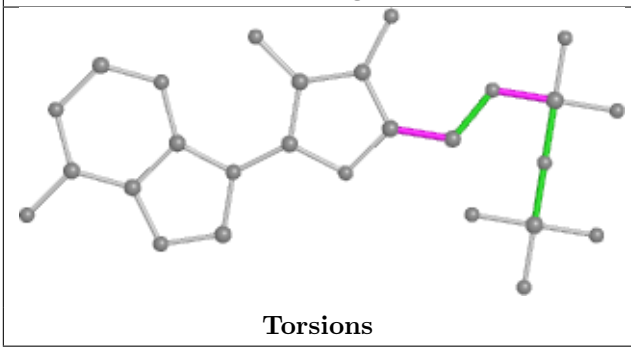
Ligand ADP C 4305



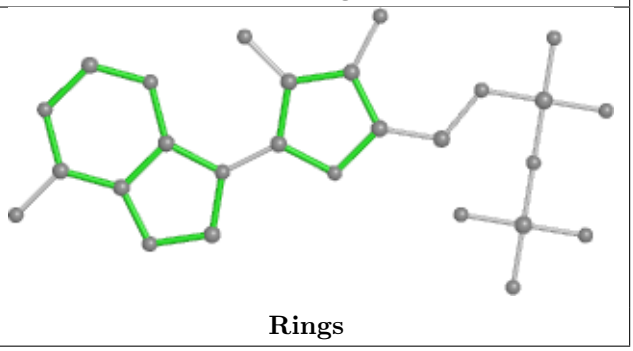
Bond lengths



Bond angles

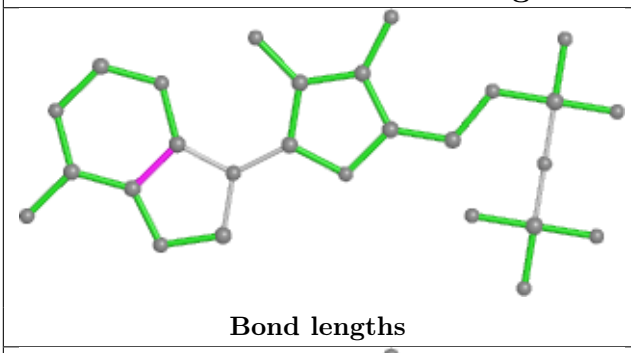


Torsions

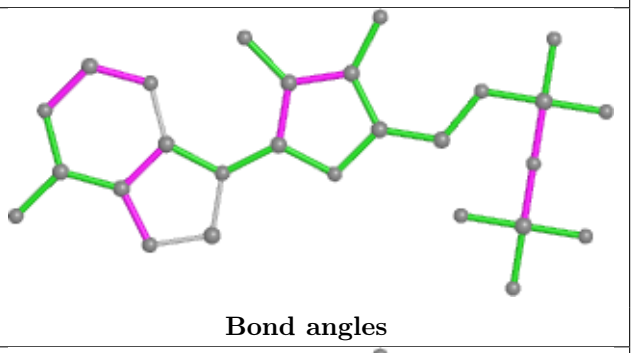


Rings

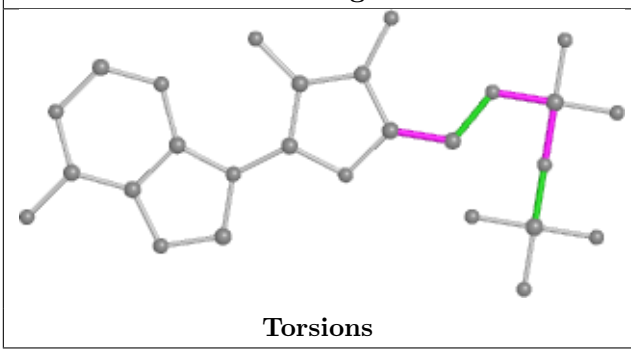
Ligand ADP A 4703



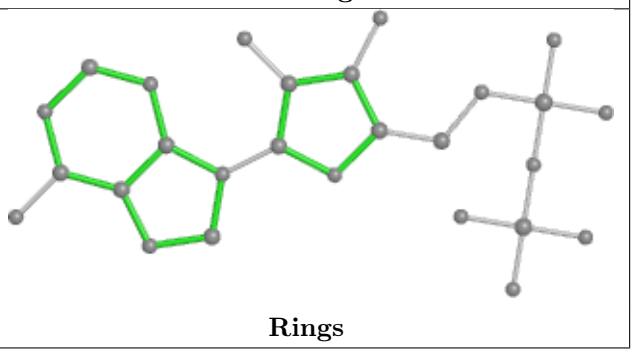
Bond lengths



Bond angles

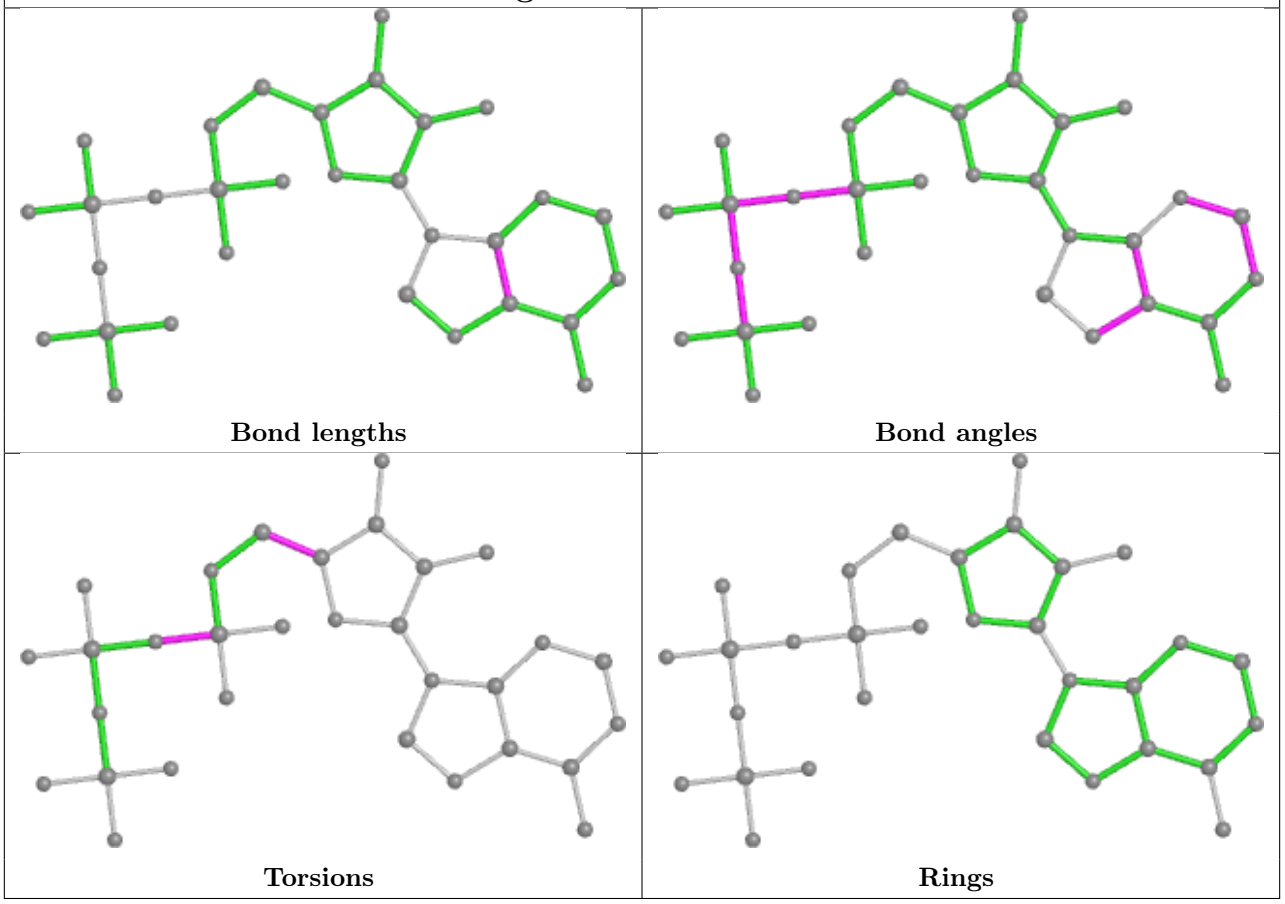


Torsions



Rings

Ligand ATP A 4702



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
2	B	10
1	A	9
16	P	4
4	D	2
7	G	1
18	R	1

The worst 5 of 27 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	3250:PRO	C	3251:ILE	N	5.80
1	A	3251:ILE	C	3252:GLN	N	4.89
1	A	24:LYS	C	25:ASP	N	3.36
1	B	79:PRO	C	80:PRO	N	3.22
1	D	216:HIS	C	217:GLN	N	2.93

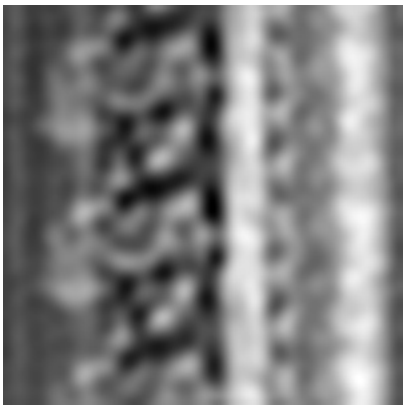
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-16312. These allow visual inspection of the internal detail of the map and identification of artifacts.

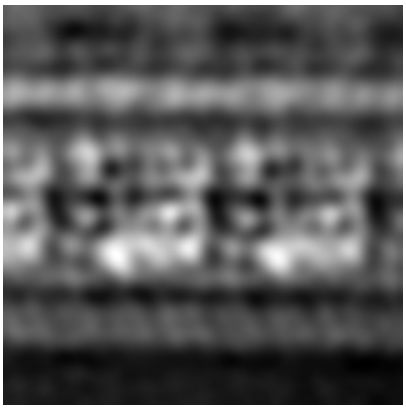
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

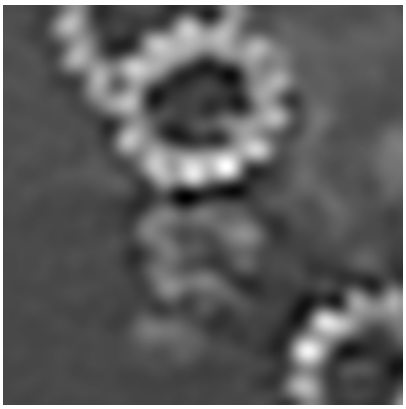
6.1.1 Primary map



X

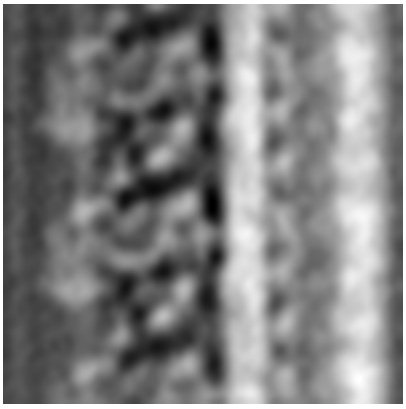


Y

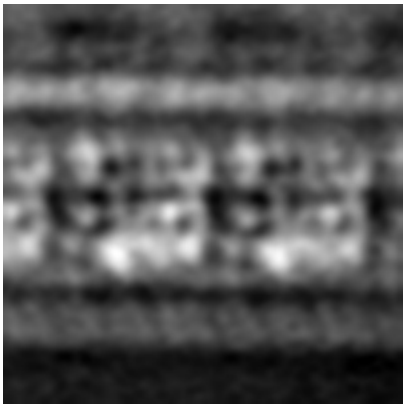


Z

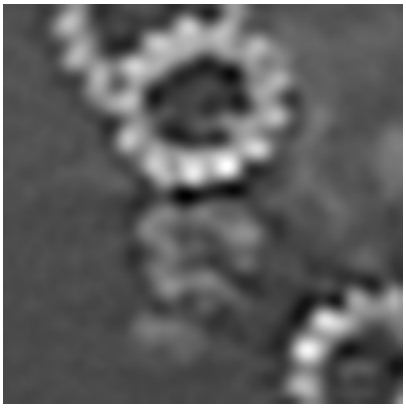
6.1.2 Raw map



X



Y

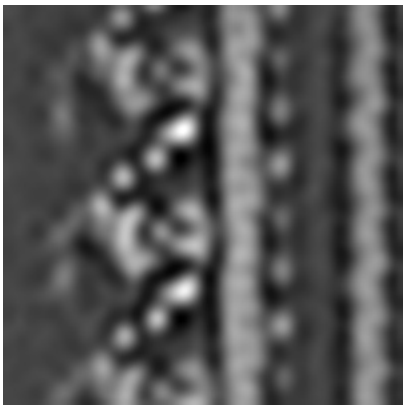


Z

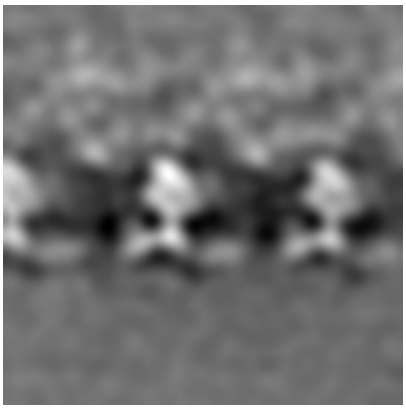
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

6.2.1 Primary map



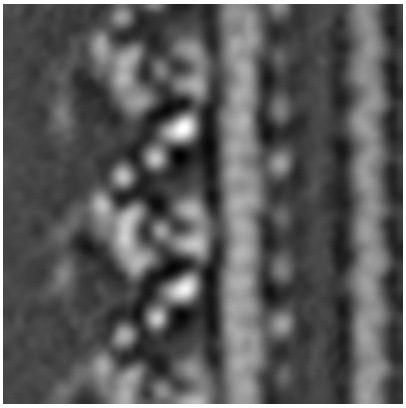
X Index: 37



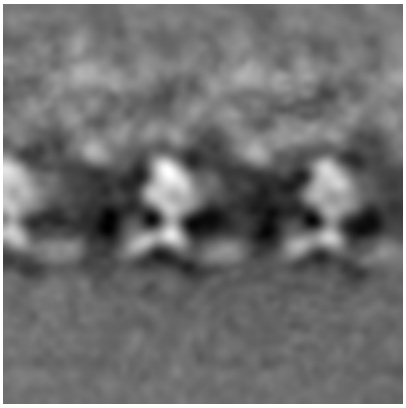
Y Index: 37

Z Index: 37

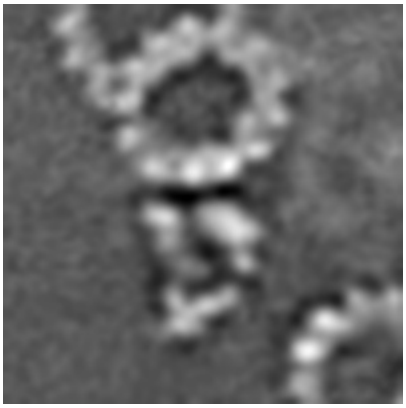
6.2.2 Raw map



X Index: 37



Y Index: 37



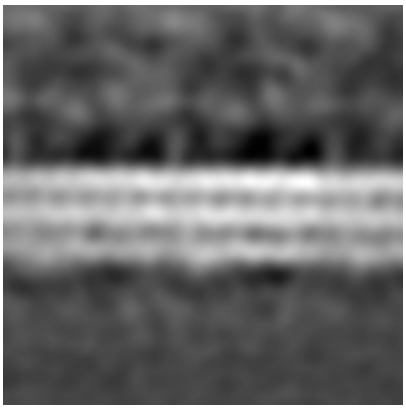
Z Index: 37

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: 41

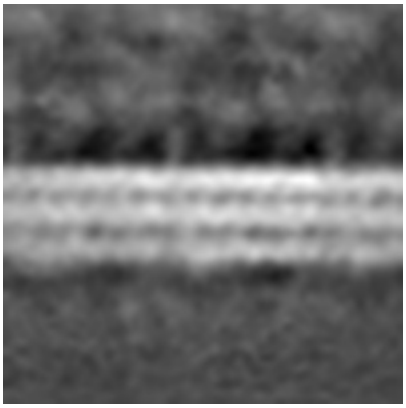


Y Index: 43

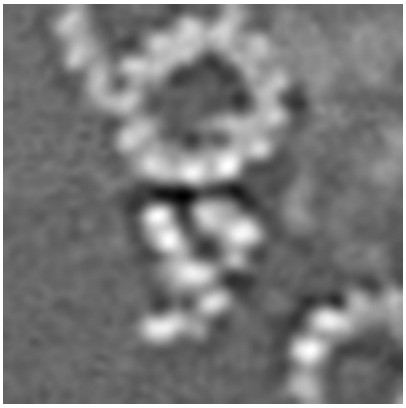
Z Index: 21

6.3.2 Raw map

X Index: 41



Y Index: 43

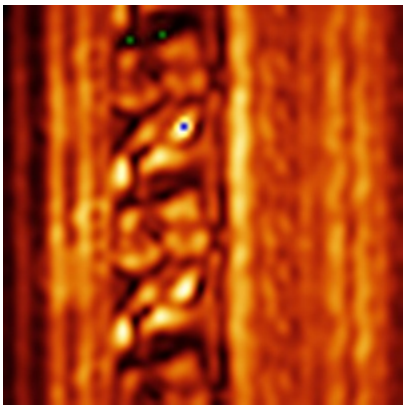


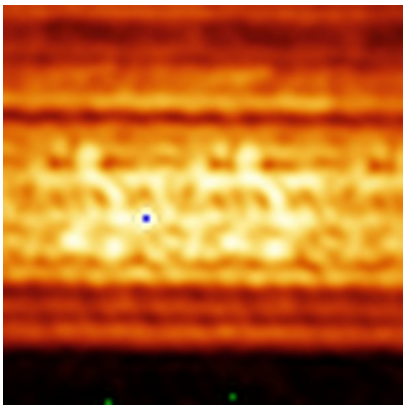
Z Index: 35

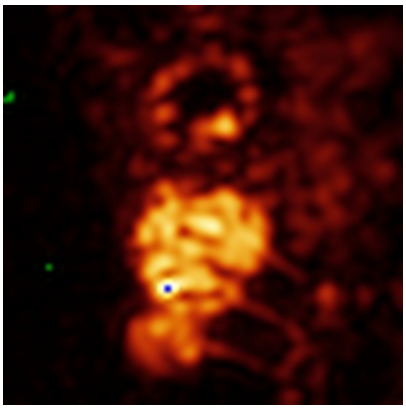
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

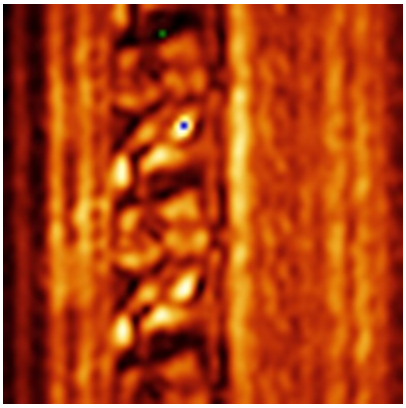
6.4.1 Primary map

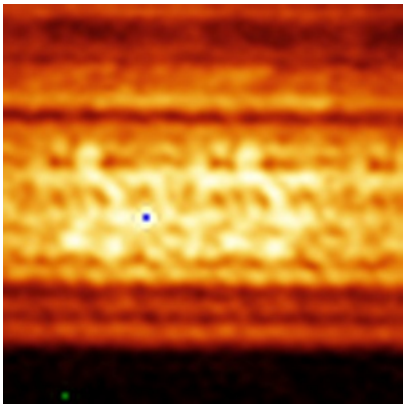

X

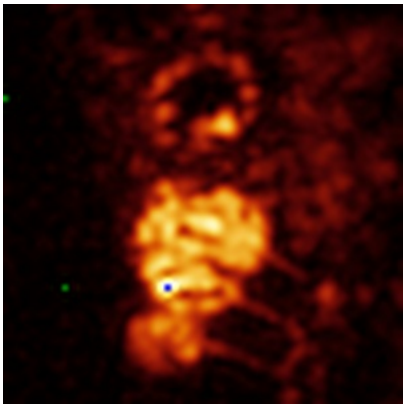

Y


Z

6.4.2 Raw map


X

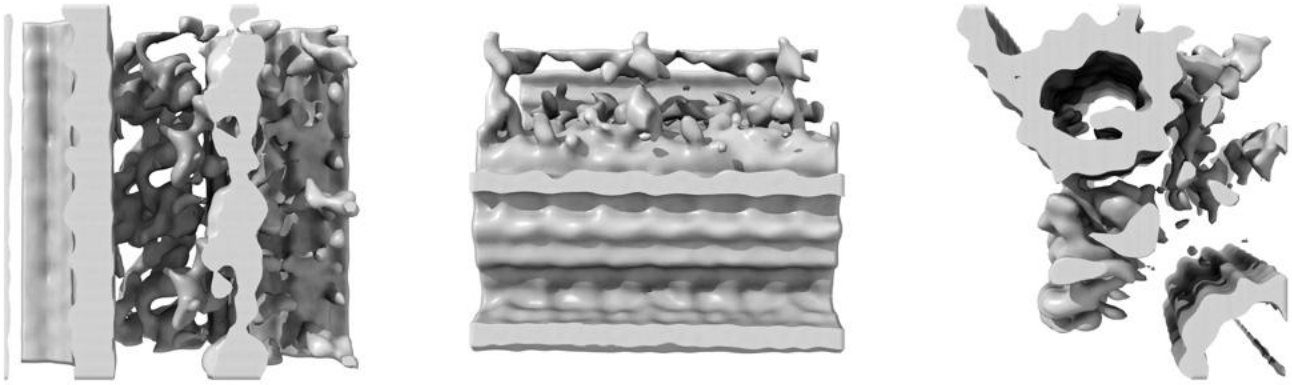

Y


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



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.14. 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

X Y Z

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.

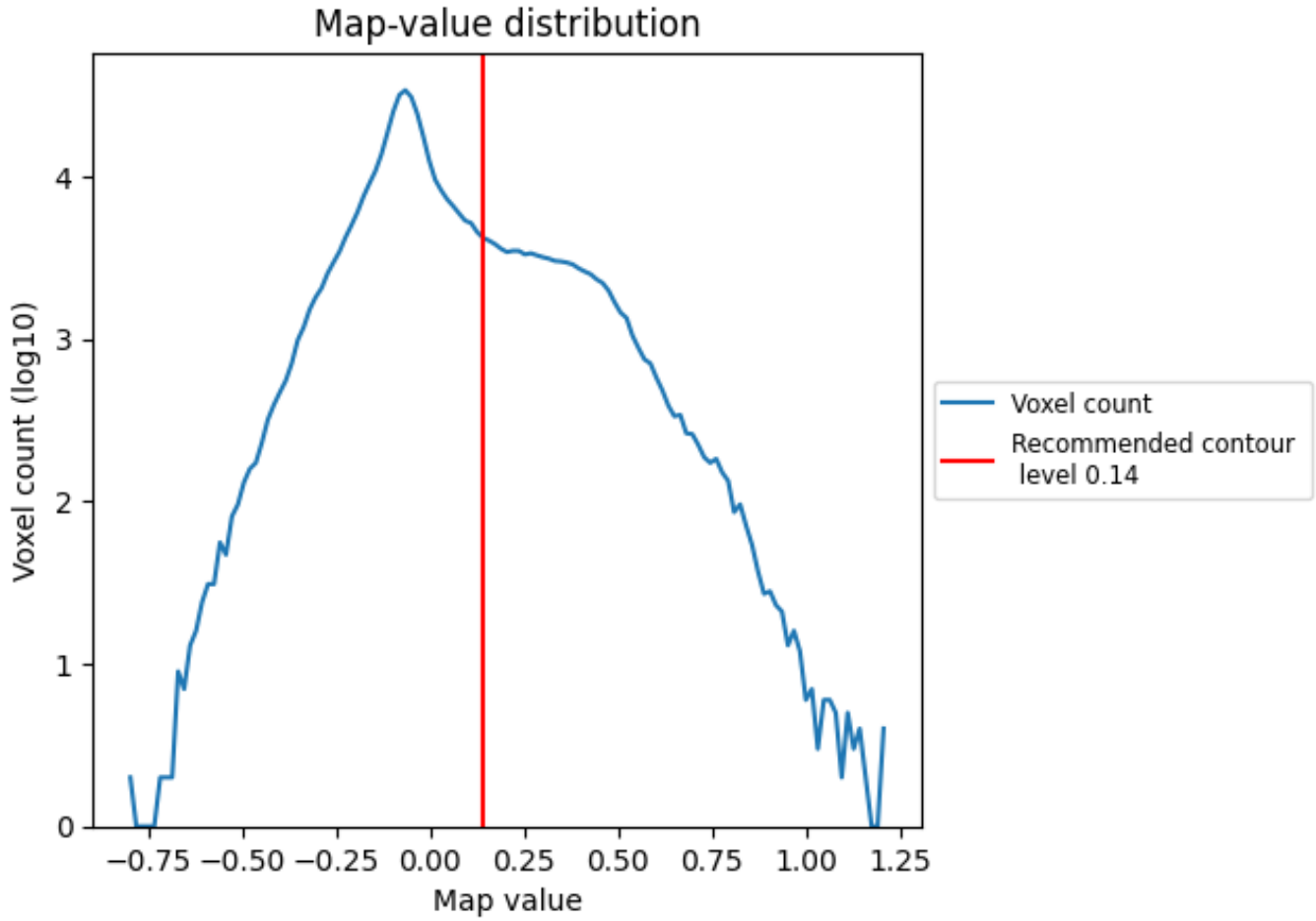
6.6 Mask visualisation (i)

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

7 Map analysis

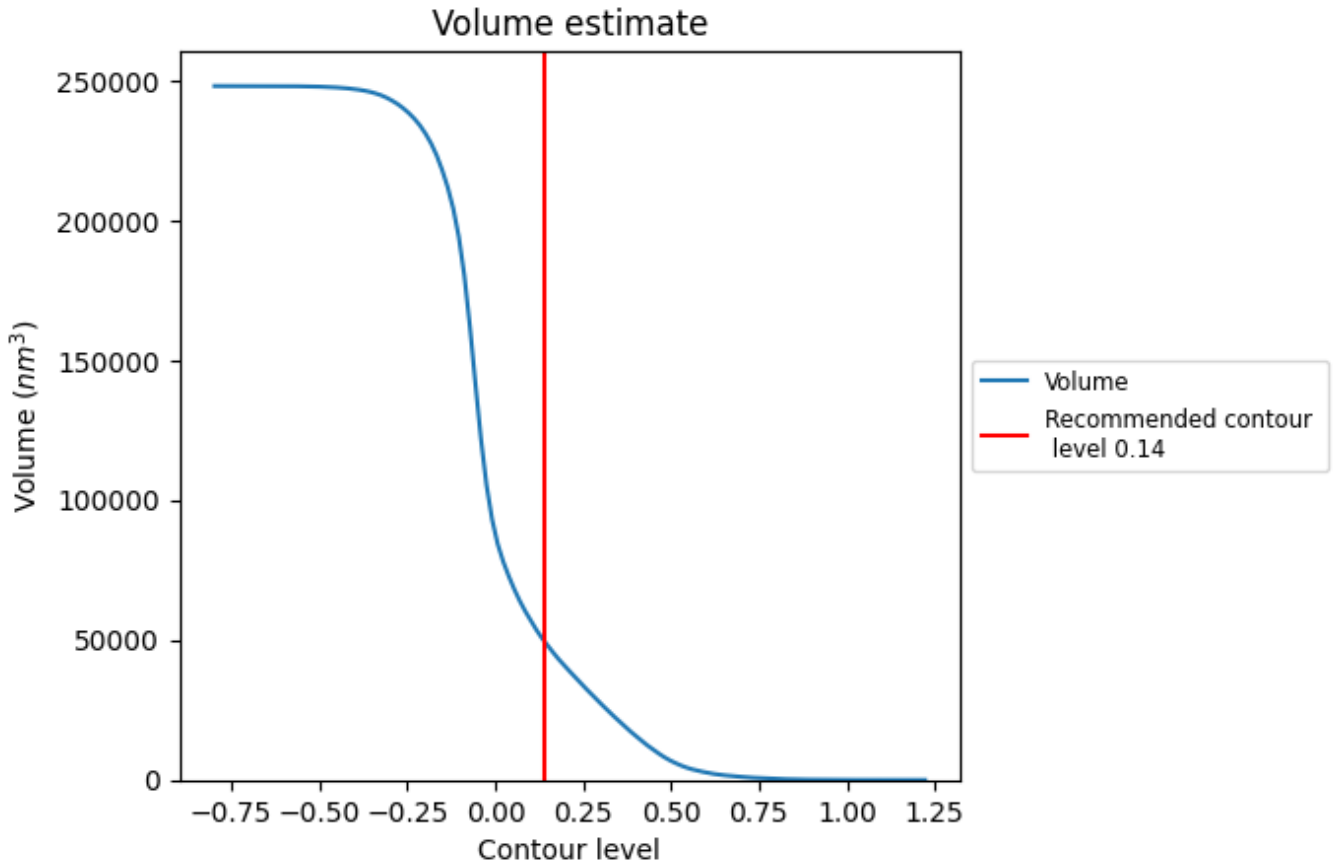
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

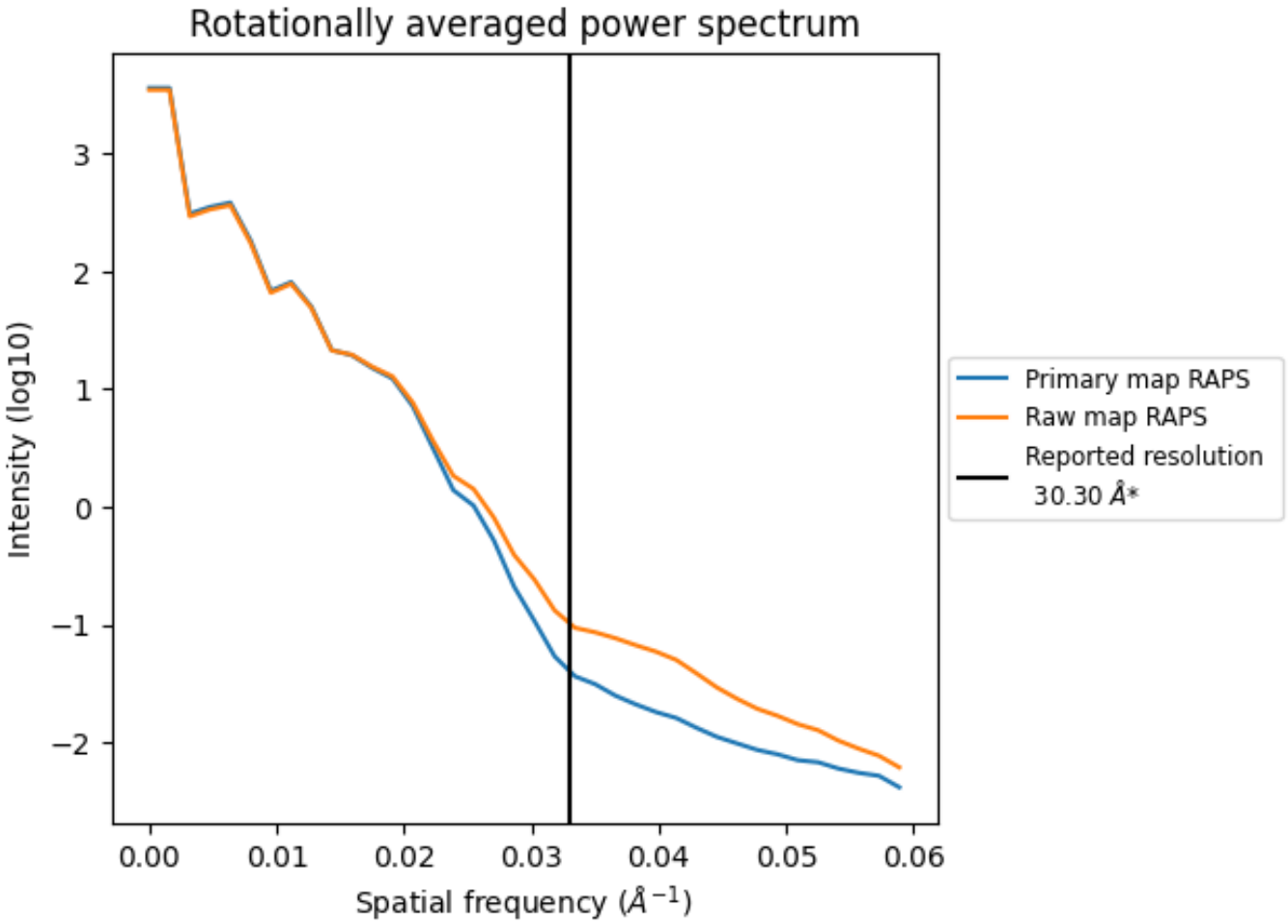
7.2 Volume estimate (i)



The volume at the recommended contour level is 49562 nm^3; this corresponds to an approximate mass of 44771 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)

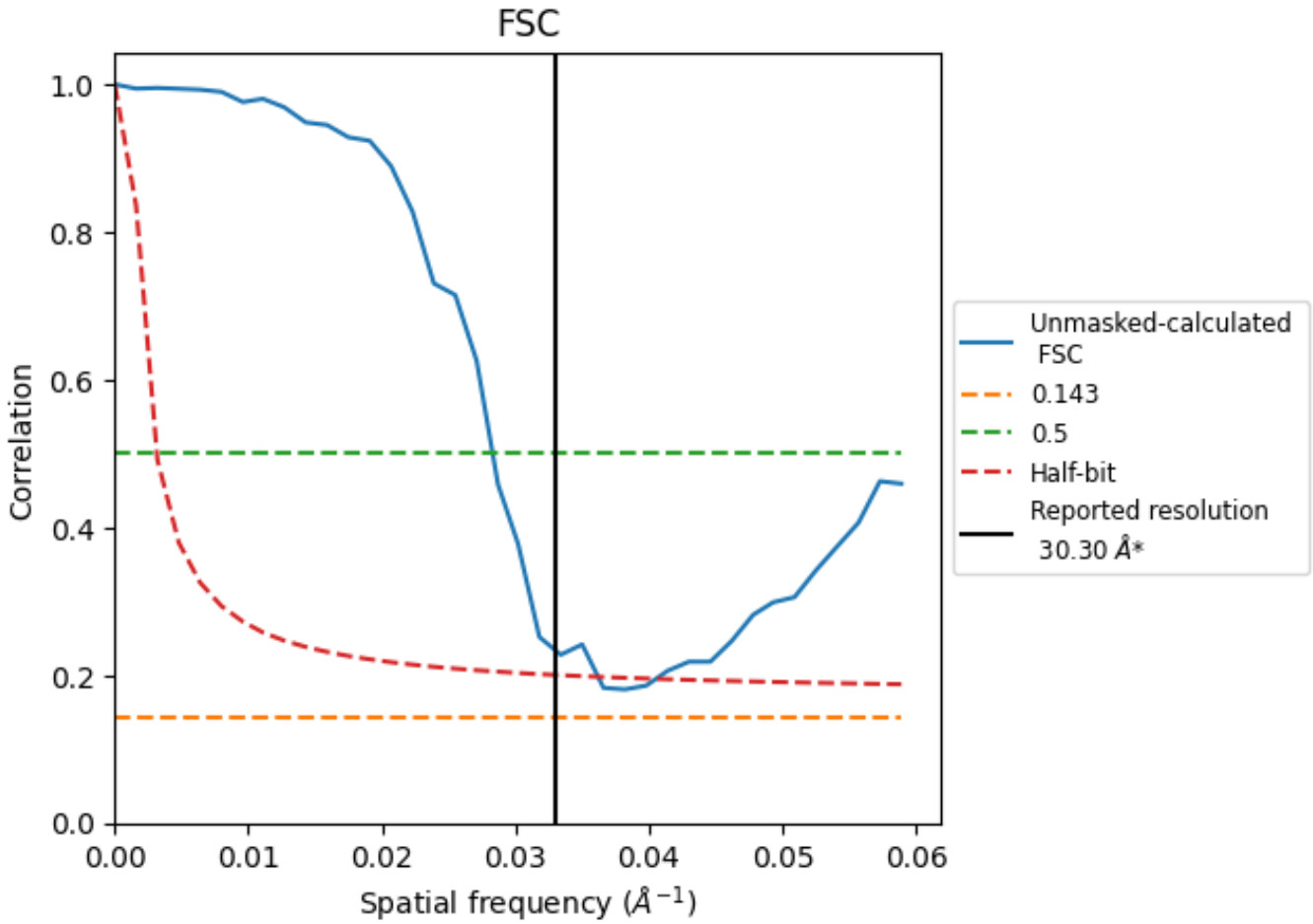


*Reported resolution corresponds to spatial frequency of 0.033 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.033 Å^{-1}

8.2 Resolution estimates (i)

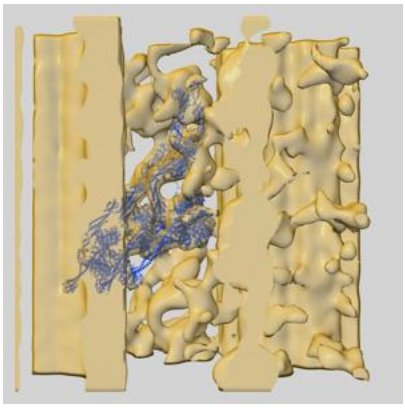
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	30.30	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	-	35.34	27.62

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

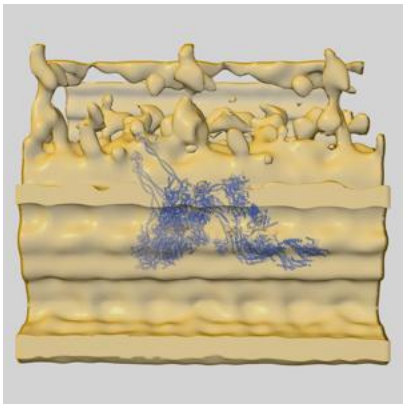
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-16312 and PDB model 8BX8. Per-residue inclusion information can be found in section 3 on page 9.

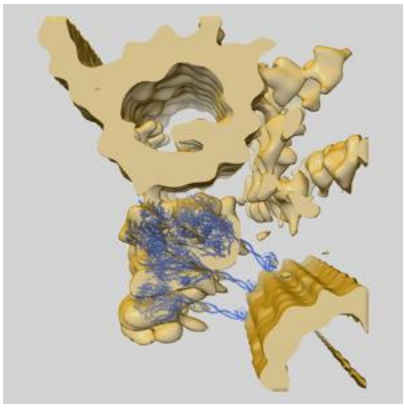
9.1 Map-model overlay



X



Y



Z

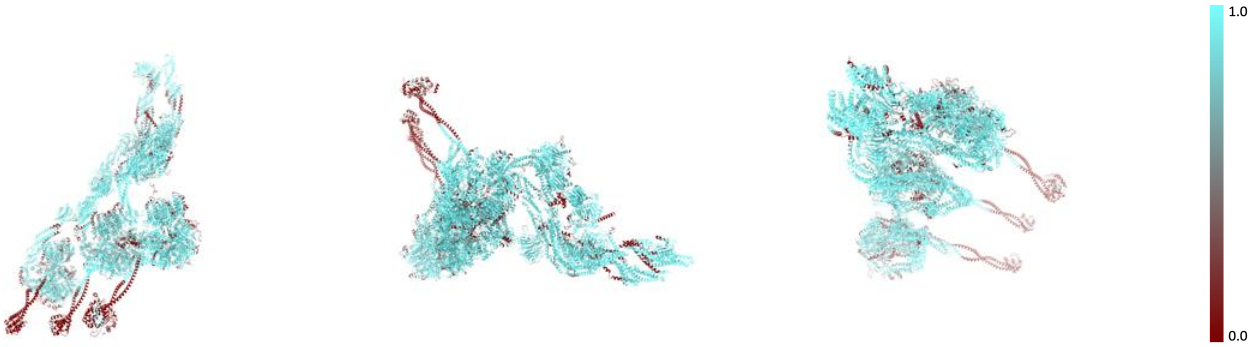
The images above show the 3D surface view of the map at the recommended contour level 0.14 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model (i)

X Y Z

The images above show the model with each residue coloured according 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.

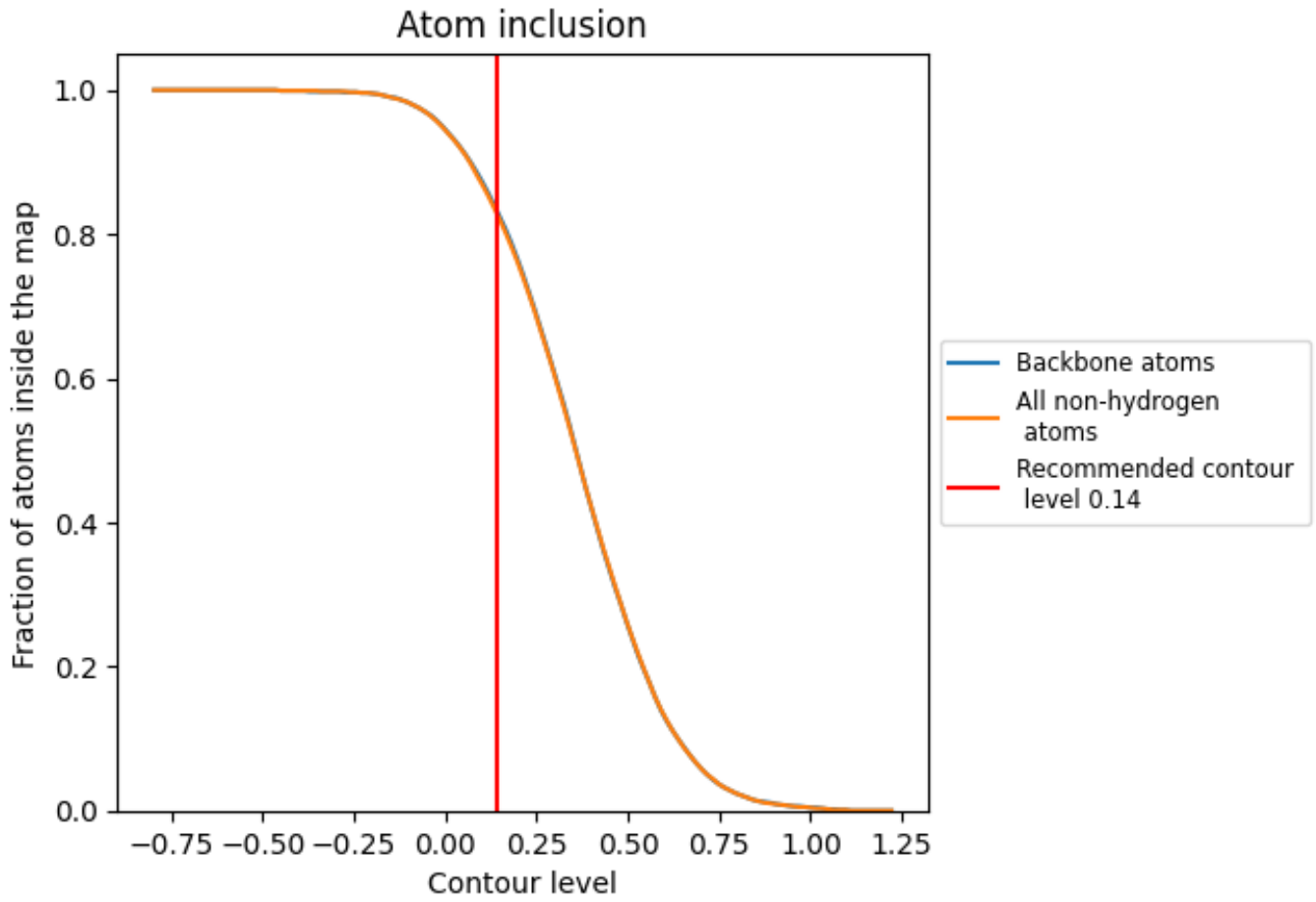
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

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 (0.14).

9.4 Atom inclusion (i)



At the recommended contour level, 83% of all backbone atoms, 83% 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 (0.14) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8300	0.0430
A	0.8230	0.0470
B	0.8570	0.0480
C	0.7930	0.0360
D	0.9090	0.0380
E	0.9000	0.0390
F	0.8060	0.0450
G	0.7350	0.0200
H	0.9840	0.0390
I	0.8590	0.0400
J	0.9870	0.0630
K	0.9720	0.0530
L	0.8830	0.0290
M	0.9310	0.0400
N	0.8960	0.0440
O	0.9600	0.0410
P	0.9850	0.0670
Q	0.2450	0.0610
R	0.3110	-0.0180