Full wwPDB EM Validation Report ⓘ

Nov 5, 2022 – 08:58 AM EDT

PDB ID	:	5VFP
EMDB ID	:	EMD-8663
Title	:	Nucleotide-driven Triple-state Remodeling of the AAA-ATPase Channel in the Activated Human 26S Proteasome
Authors	:	Zhu, Y.; Wang, W.L.; Yu, D.; Ouyang, Q.; Lu, Y.; Mao, Y.
Deposited on	:	2017-04-09
Resolution	:	4.20 Å(reported)

This is a Full wwPDB EM Validation 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:

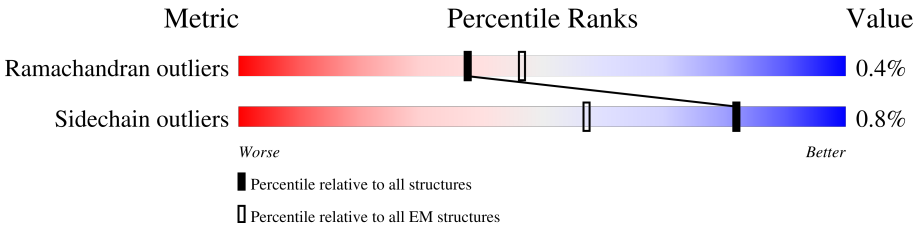
EMDB validation analysis	:	0.0.1.dev43
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

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 4.20 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.



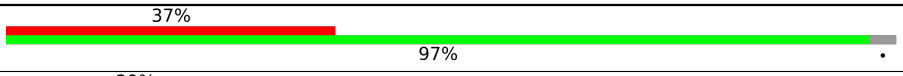
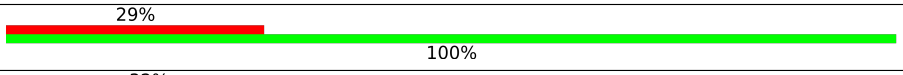
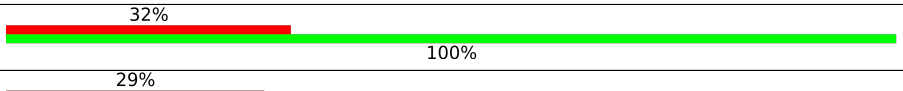
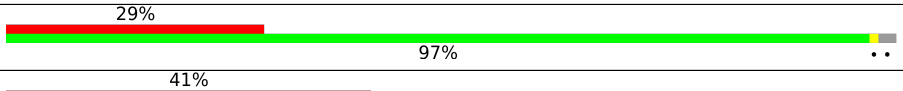
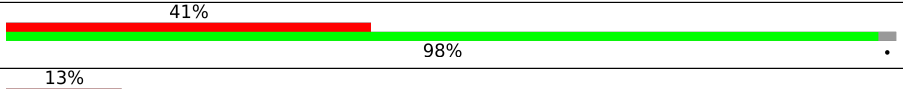
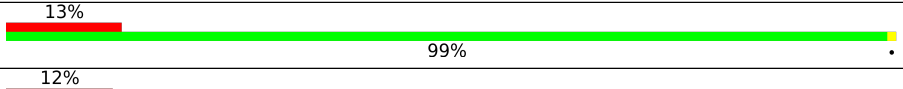
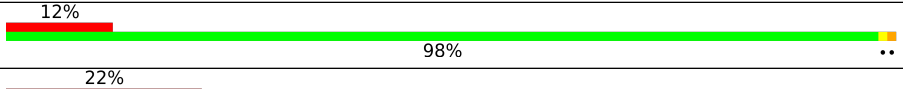
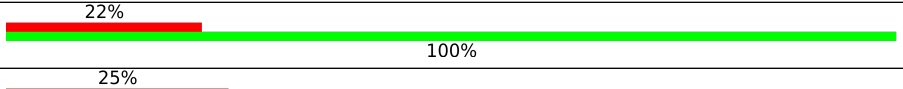
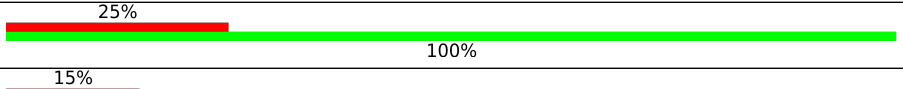
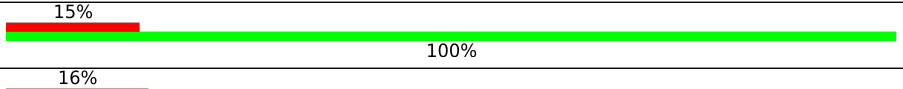
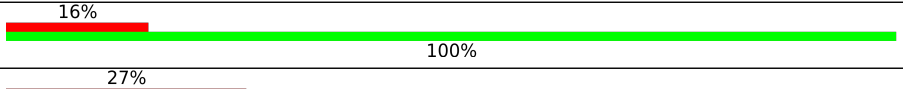
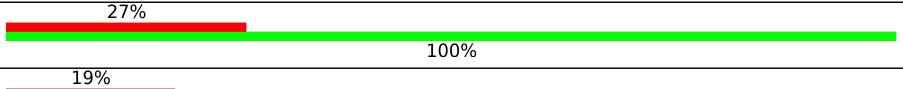
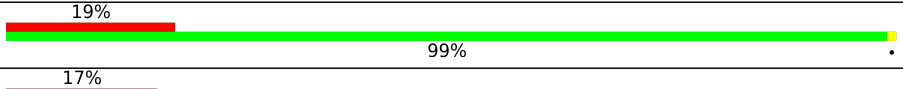
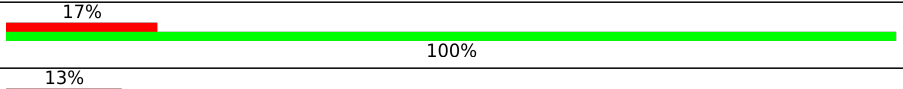
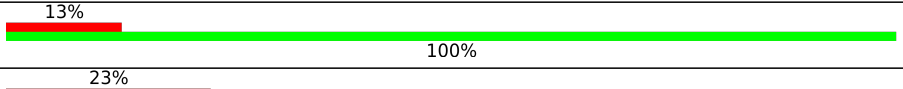
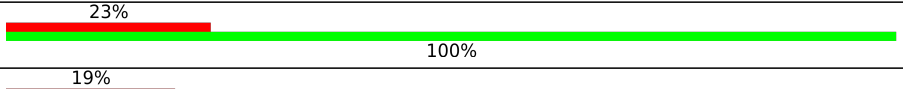
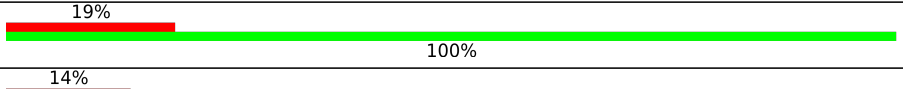
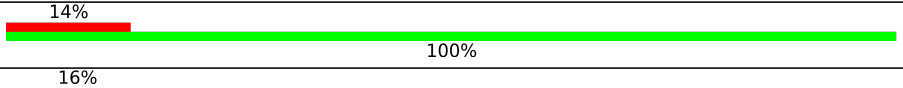
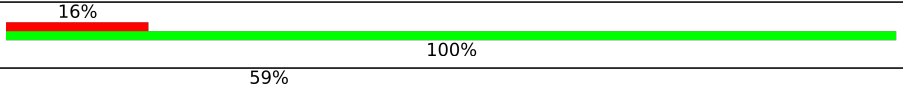
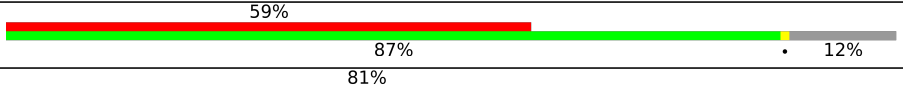
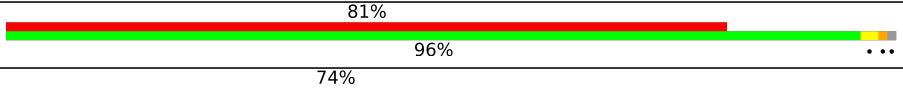
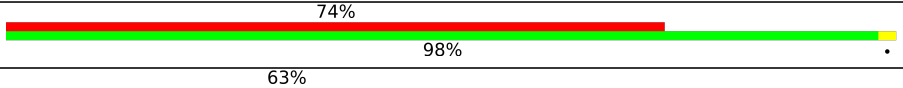
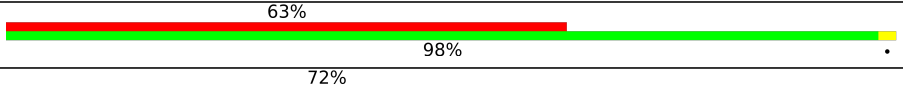
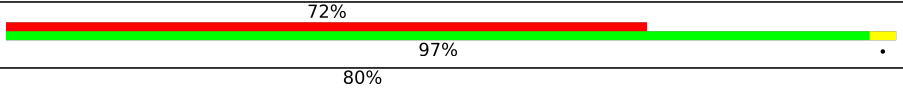
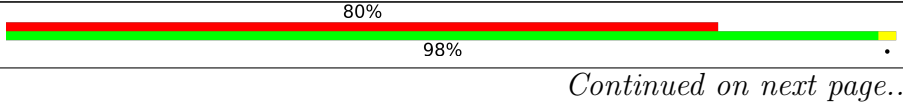
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	G	240	25% 99%
1	g	240	40% 100%
2	H	232	26% 98%
2	h	232	42% 100%
3	I	250	42% 98%
3	i	250	49% 99%
4	J	243	46% 97%
4	j	243	42% 98%
5	K	234	41% 94%

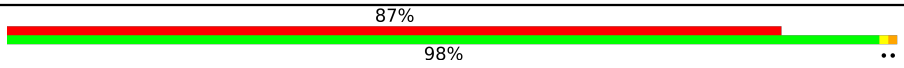
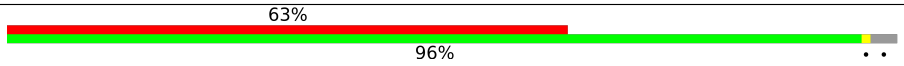
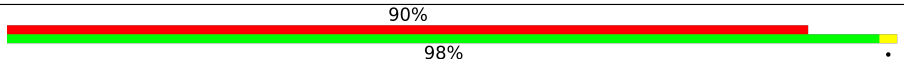
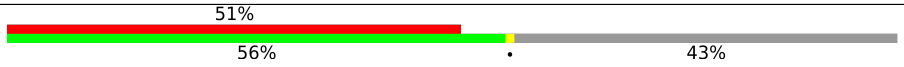
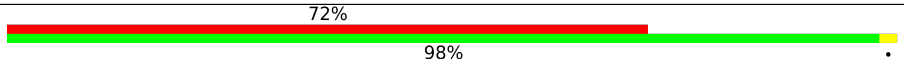
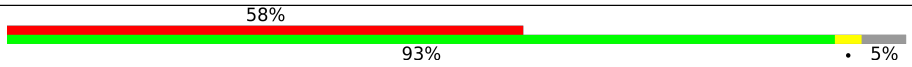
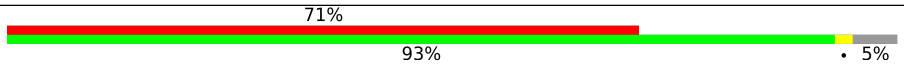
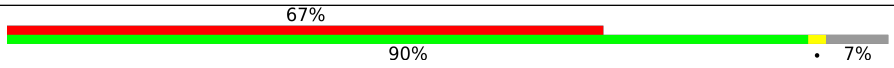
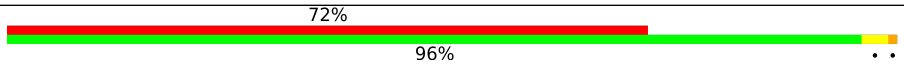
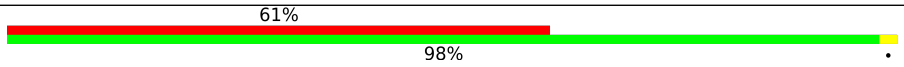
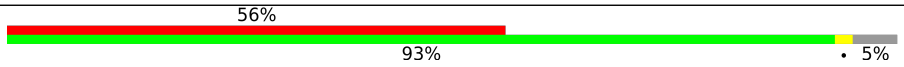
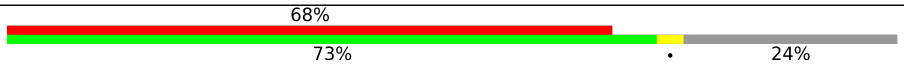
Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	k	234	
6	L	238	
6	l	238	
7	M	245	
7	m	245	
8	N	191	
8	n	191	
9	O	220	
9	o	220	
10	P	204	
10	p	204	
11	Q	199	
11	q	199	
12	R	201	
12	r	201	
13	S	213	
13	s	213	
14	T	215	
14	t	215	
15	U	911	
16	V	480	
17	W	456	
18	Y	378	
19	Z	286	
20	a	373	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
21	b	191	
22	c	287	
23	d	257	
24	e	70	
25	X	380	
26	A	399	
27	B	389	
28	C	392	
29	D	380	
30	E	375	
31	F	396	
32	f	908	

2 Entry composition (i)

There are 34 unique types of molecules in this entry. The entry contains 101342 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 Proteasome subunit alpha type-6.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	G	239	Total	C	N	O	S	0	0
			1820	1157	304	346	13		
1	g	240	Total	C	N	O	S	0	0
			1826	1160	305	348	13		

- Molecule 2 is a protein called Proteasome subunit alpha type-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	H	230	Total	C	N	O	S	0	0
			1688	1070	284	329	5		
2	h	232	Total	C	N	O	S	0	0
			1708	1081	289	333	5		

- Molecule 3 is a protein called Proteasome subunit alpha type-4.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	I	248	Total	C	N	O	S	0	0
			1895	1195	324	368	8		
3	i	250	Total	C	N	O	S	0	0
			1912	1204	329	371	8		

- Molecule 4 is a protein called Proteasome subunit alpha type-7.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	J	239	Total	C	N	O	S	0	0
			1704	1056	308	335	5		
4	j	239	Total	C	N	O	S	0	0
			1704	1056	308	335	5		

- Molecule 5 is a protein called Proteasome subunit alpha type-5.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	K	228	Total	C	N	O	S	0	0
			1729	1086	284	349	10		
5	k	228	Total	C	N	O	S	0	0
			1722	1080	284	348	10		

- Molecule 6 is a protein called Proteasome subunit alpha type-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	L	238	Total	C	N	O	S	0	0
			1850	1159	334	346	11		
6	l	238	Total	C	N	O	S	0	0
			1850	1159	334	346	11		

- Molecule 7 is a protein called Proteasome subunit alpha type-3.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	M	240	Total	C	N	O	S	0	0
			1856	1178	314	353	11		
7	m	240	Total	C	N	O	S	0	0
			1856	1178	314	353	11		

- Molecule 8 is a protein called Proteasome subunit beta type-6.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	N	191	Total	C	N	O	S	0	0
			1430	893	245	280	12		
8	n	191	Total	C	N	O	S	0	0
			1430	893	245	280	12		

- Molecule 9 is a protein called Proteasome subunit beta type-7.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	O	220	Total	C	N	O	S	0	0
			1643	1033	280	318	12		
9	o	220	Total	C	N	O	S	0	0
			1643	1033	280	318	12		

- Molecule 10 is a protein called Proteasome subunit beta type-3.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	P	204	Total	C	N	O	S	0	0
			1585	1010	262	294	19		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					AltConf	Trace
10	p	204	Total	C	N	O	S	0	0
			1585	1010	262	294	19		

- Molecule 11 is a protein called Proteasome subunit beta type-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	Q	199	Total	C	N	O	S	0	0
			1570	1006	265	290	9		
11	q	199	Total	C	N	O	S	0	0
			1570	1006	265	290	9		

- Molecule 12 is a protein called Proteasome subunit beta type-5.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	R	201	Total	C	N	O	S	0	0
			1548	974	273	292	9		
12	r	201	Total	C	N	O	S	0	0
			1548	974	273	292	9		

- Molecule 13 is a protein called Proteasome subunit beta type-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	S	213	Total	C	N	O	S	0	0
			1641	1036	282	313	10		
13	s	213	Total	C	N	O	S	0	0
			1641	1036	282	313	10		

- Molecule 14 is a protein called Proteasome subunit beta type-4.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	T	215	Total	C	N	O	S	0	0
			1667	1052	285	318	12		
14	t	215	Total	C	N	O	S	0	0
			1667	1052	285	318	12		

- Molecule 15 is a protein called 26S proteasome non-ATPase regulatory subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	U	806	Total	C	N	O	S	0	0
			6287	3990	1075	1178	44		

- Molecule 16 is a protein called 26S proteasome non-ATPase regulatory subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	V	473	Total	C	N	O	S	0	0
			3808	2418	676	700	14		

- Molecule 17 is a protein called 26S proteasome non-ATPase regulatory subunit 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	W	456	Total	C	N	O	S	0	0
			3703	2339	635	704	25		

- Molecule 18 is a protein called 26S proteasome non-ATPase regulatory subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	Y	378	Total	C	N	O	S	0	0
			3115	1987	533	578	17		

- Molecule 19 is a protein called 26S proteasome non-ATPase regulatory subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	Z	286	Total	C	N	O	S	0	0
			2281	1457	392	427	5		

- Molecule 20 is a protein called 26S proteasome non-ATPase regulatory subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	a	373	Total	C	N	O	S	0	0
			2995	1911	510	559	15		

- Molecule 21 is a protein called 26S proteasome non-ATPase regulatory subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	b	191	Total	C	N	O	S	0	0
			1458	910	261	279	8		

- Molecule 22 is a protein called 26S proteasome non-ATPase regulatory subunit 14.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	c	278	Total	C	N	O	S	0	0
			2187	1389	374	406	18		

- Molecule 23 is a protein called 26S proteasome non-ATPase regulatory subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	d	257	Total	C	N	O	S	0	0
			2116	1371	346	390	9		

- Molecule 24 is a protein called sem1.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	e	40	Total	C	N	O	S	0	0
			334	200	55	77	2		

- Molecule 25 is a protein called 26S proteasome non-ATPase regulatory subunit 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	X	380	Total	C	N	O	S	0	0
			3009	1918	509	570	12		

- Molecule 26 is a protein called 26S proteasome regulatory subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	A	380	Total	C	N	O	S	0	0
			2893	1817	515	543	18		

- Molecule 27 is a protein called 26S proteasome regulatory subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	B	370	Total	C	N	O	S	0	0
			2806	1763	478	553	12		

- Molecule 28 is a protein called 26S proteasome regulatory subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	C	363	Total	C	N	O	S	0	0
			2859	1804	513	525	17		

- Molecule 29 is a protein called 26S proteasome regulatory subunit 6B.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	D	380	Total	C	N	O	S	0	0
			3040	1923	524	580	13		

- Molecule 30 is a protein called 26S proteasome regulatory subunit 10B.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	E	375	Total	C	N	O	S	0	0
			2860	1796	512	536	16		

- Molecule 31 is a protein called 26S proteasome regulatory subunit 6A.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	F	376	Total	C	N	O	S	0	0
			2859	1802	496	546	15		

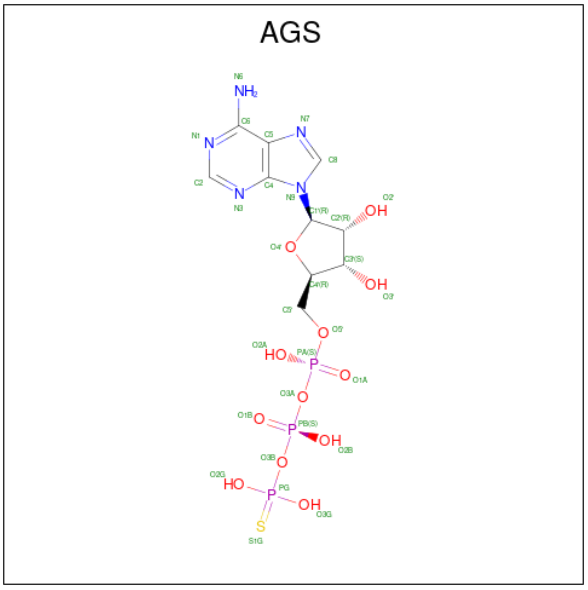
- Molecule 32 is a protein called 26S proteasome non-ATPase regulatory subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	f	689	Total	C	N	O	S	0	0
			5319	3343	904	1037	35		

- Molecule 33 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
33	c	1	Total	Zn	0
			1	1	

- Molecule 34 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (three-letter code: AGS) (formula: $C_{10}H_{16}N_5O_{12}P_3S$).



Mol	Chain	Residues	Atoms						AltConf
34	A	1	Total	C	N	O	P	S	0
			31	10	5	12	3	1	

Continued on next page...

Continued from previous page...

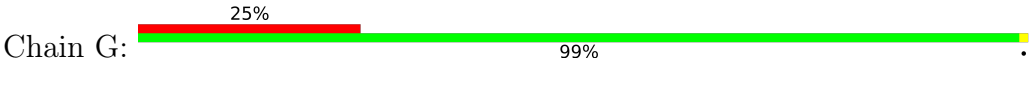
Mol	Chain	Residues	Atoms						AltConf
34	D	1	Total	C	N	O	P	S	0
			31	10	5	12	3	1	
34	E	1	Total	C	N	O	P	S	0
			31	10	5	12	3	1	
34	F	1	Total	C	N	O	P	S	0
			31	10	5	12	3	1	

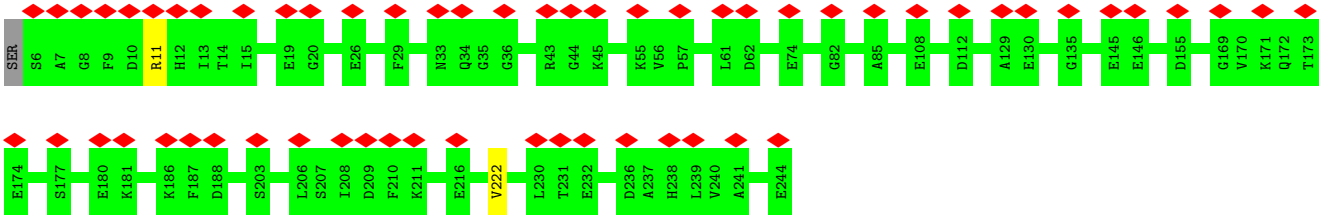
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and 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: Proteasome subunit alpha type-6

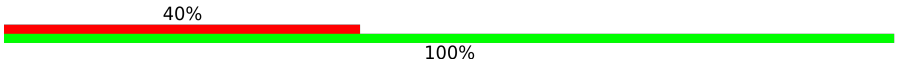
Chain G:

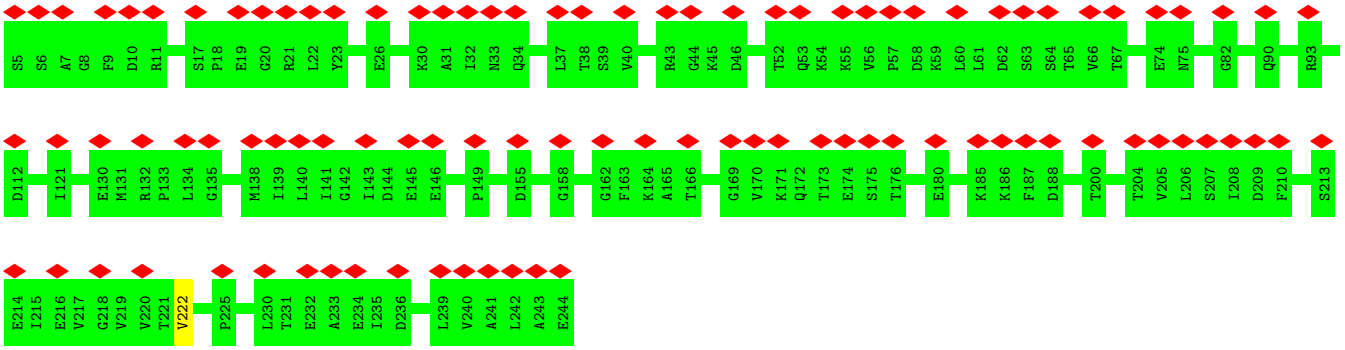




• Molecule 1: Proteasome subunit alpha type-6

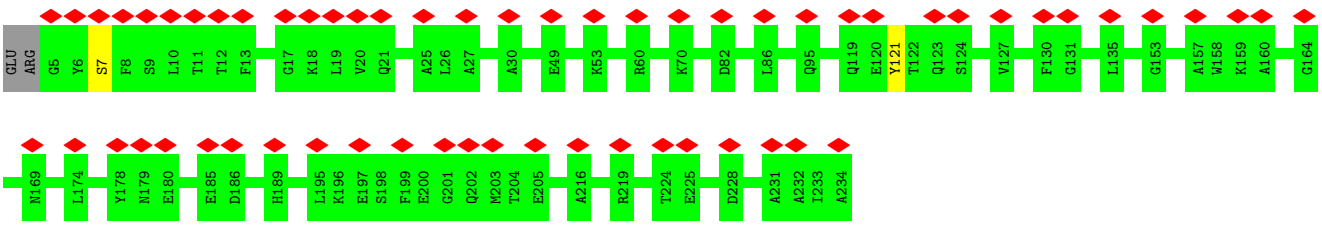
Chain g:





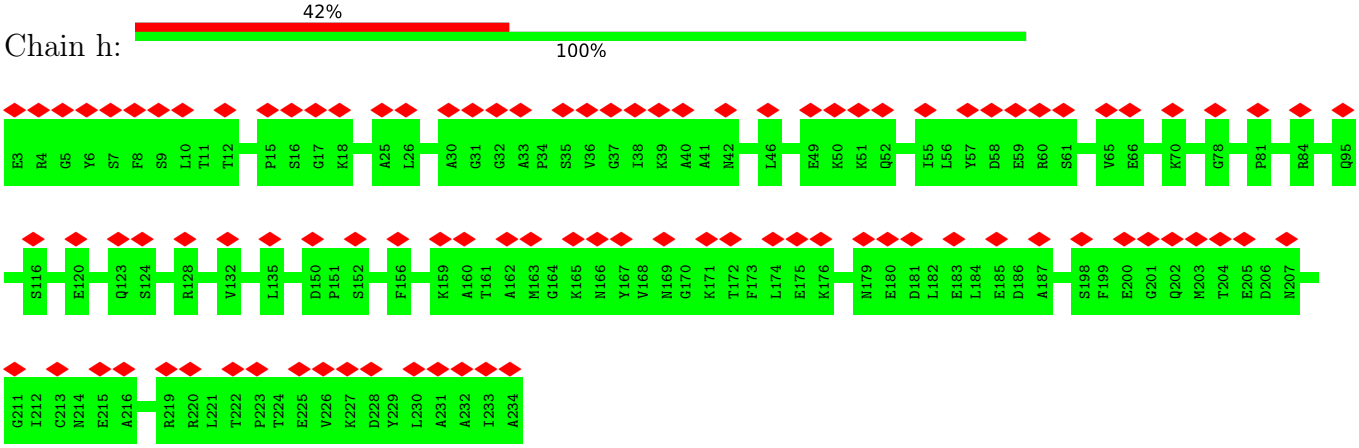
• Molecule 2: Proteasome subunit alpha type-2

Chain H:



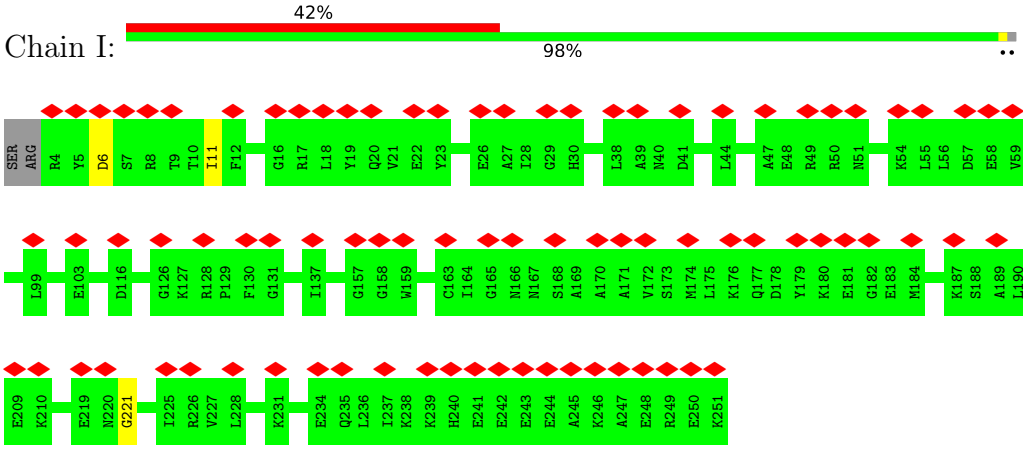
• Molecule 2: Proteasome subunit alpha type-2

Chain h:



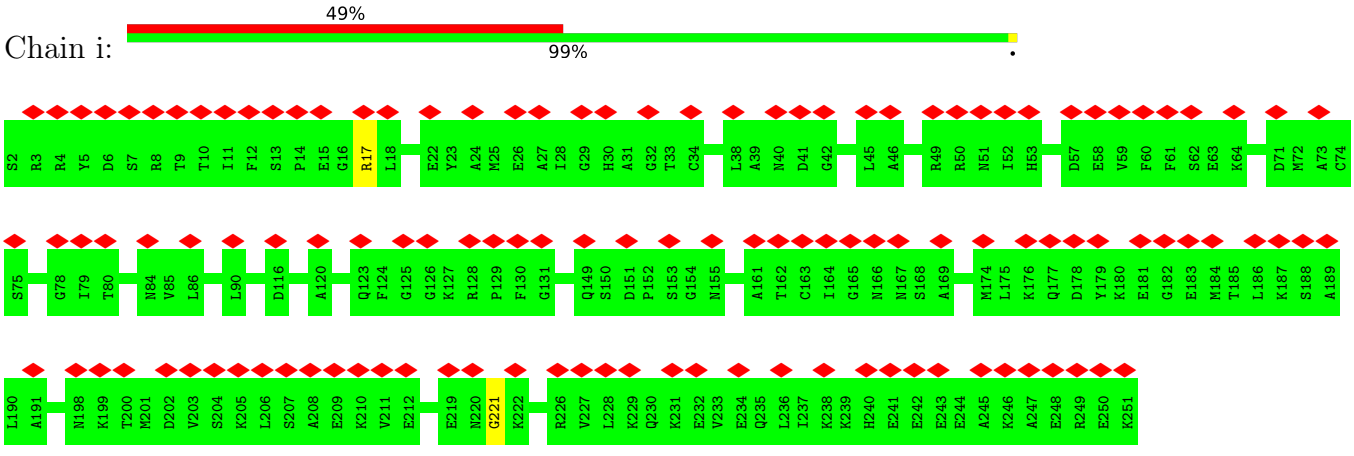
• Molecule 3: Proteasome subunit alpha type-4

Chain I:



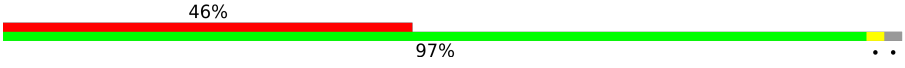
• Molecule 3: Proteasome subunit alpha type-4

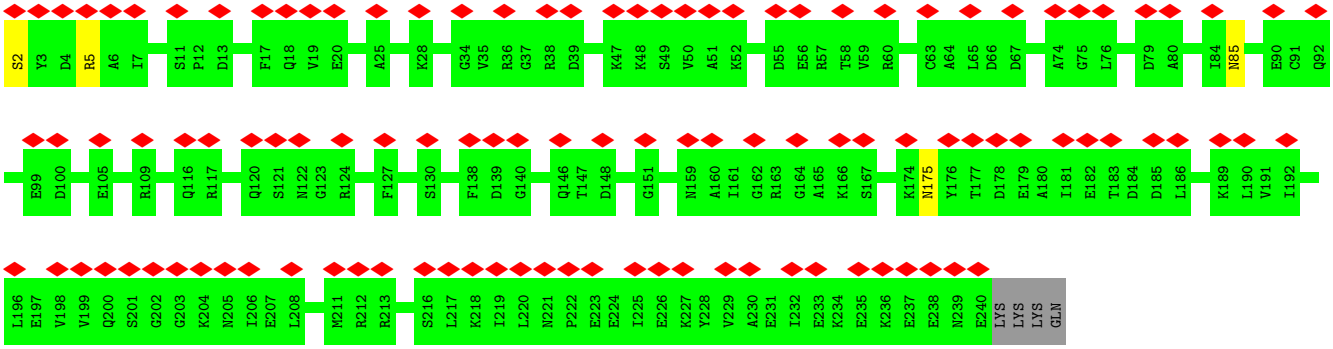
Chain i:



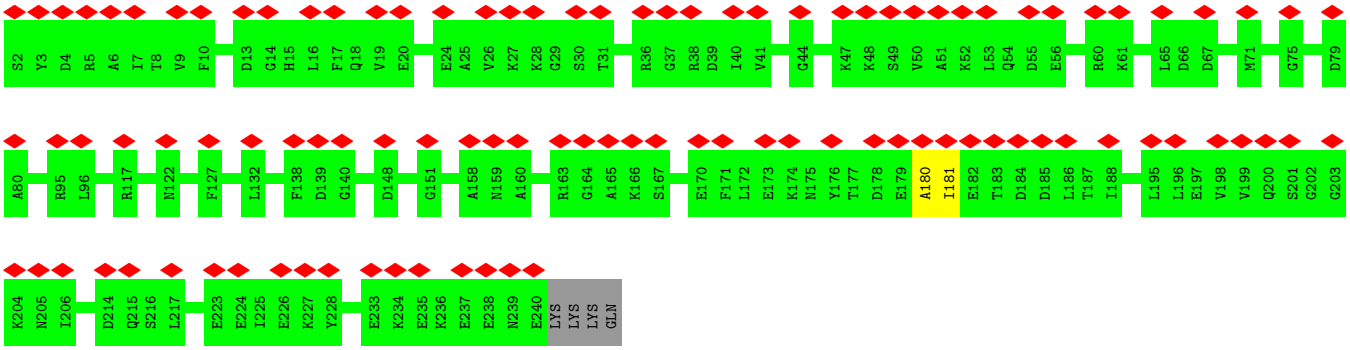
• Molecule 4: Proteasome subunit alpha type-7

Chain J:

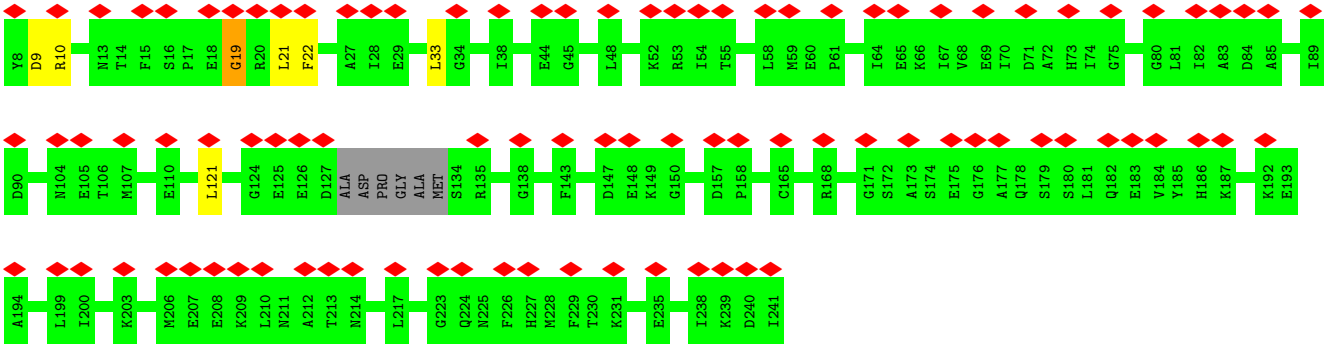




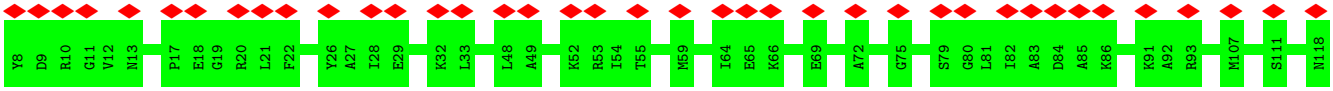
• Molecule 4: Proteasome subunit alpha type-7

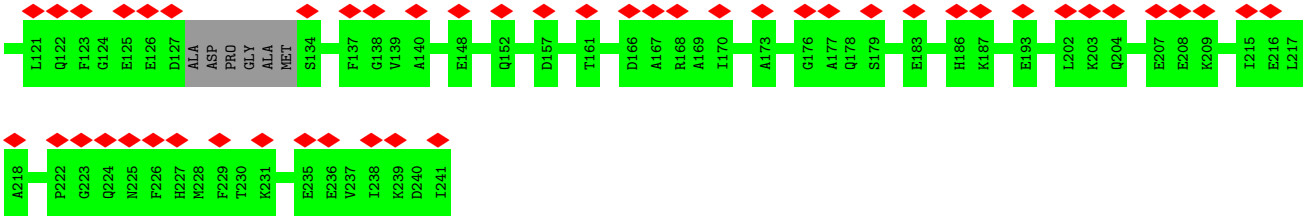


• Molecule 5: Proteasome subunit alpha type-5



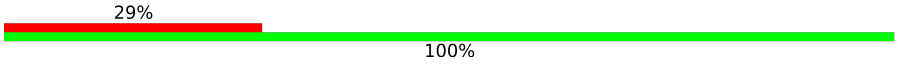
• Molecule 5: Proteasome subunit alpha type-5

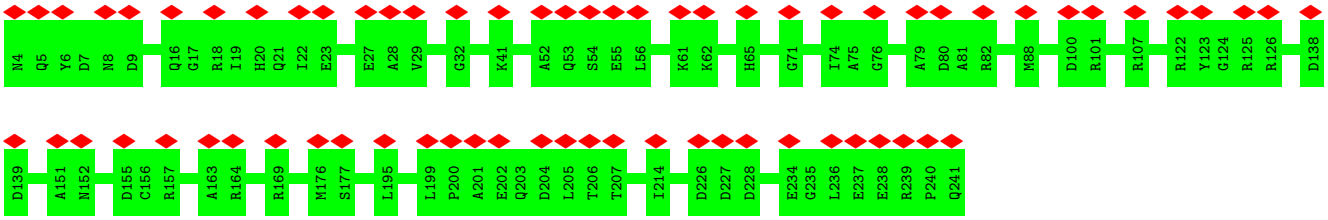




• Molecule 6: Proteasome subunit alpha type-1

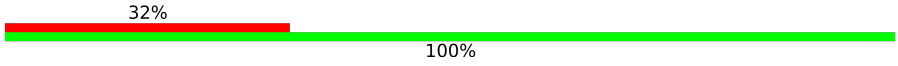
Chain L:

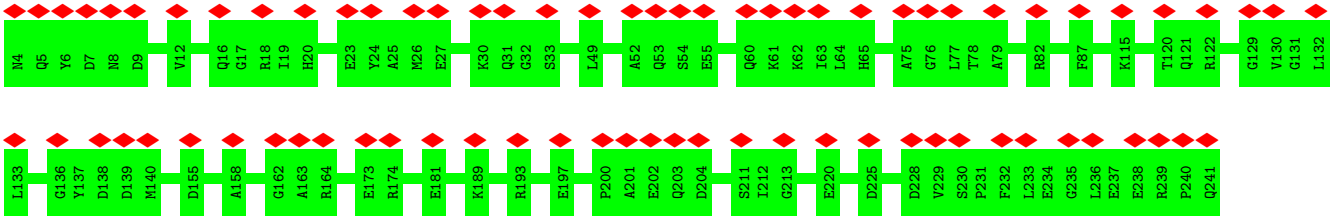




• Molecule 6: Proteasome subunit alpha type-1

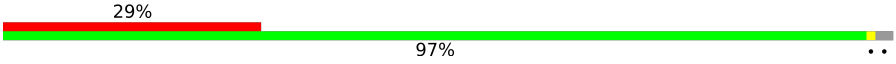
Chain l:

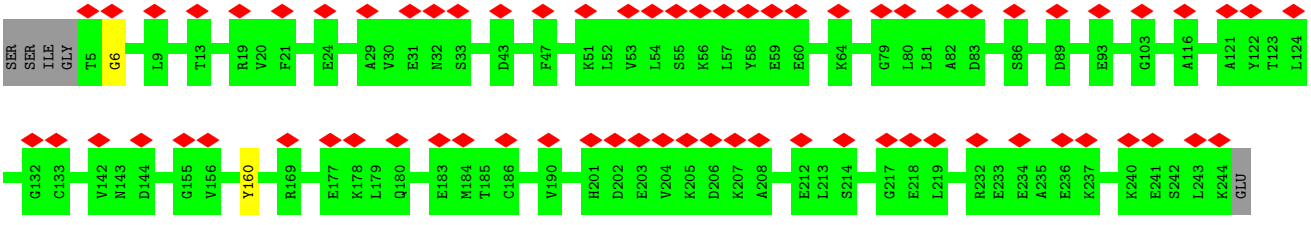




• Molecule 7: Proteasome subunit alpha type-3

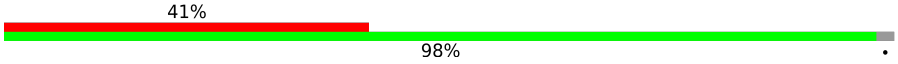
Chain M:

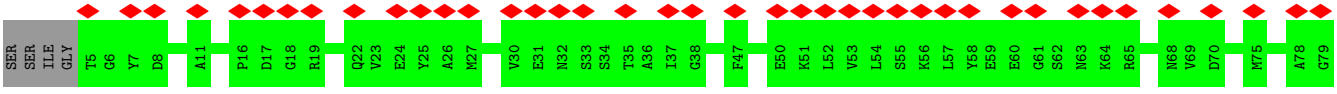


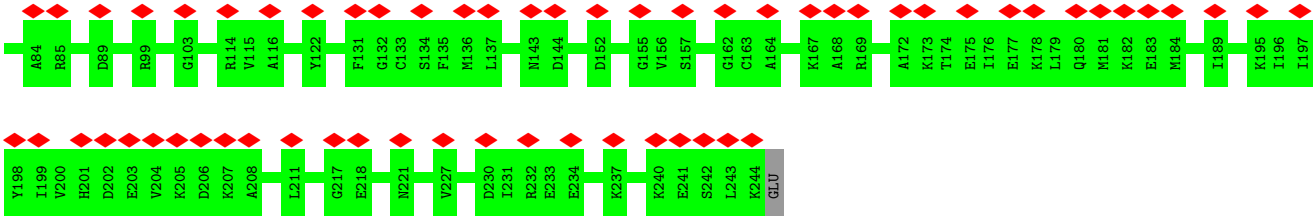


• Molecule 7: Proteasome subunit alpha type-3

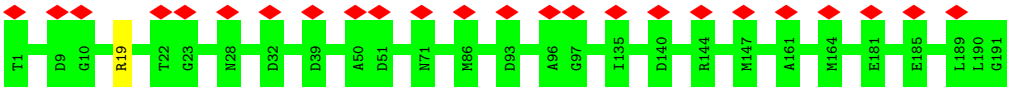
Chain m:



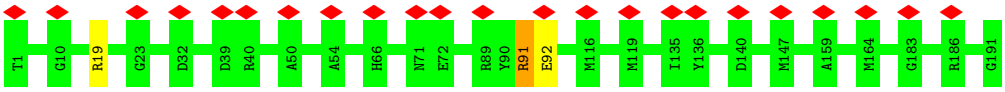




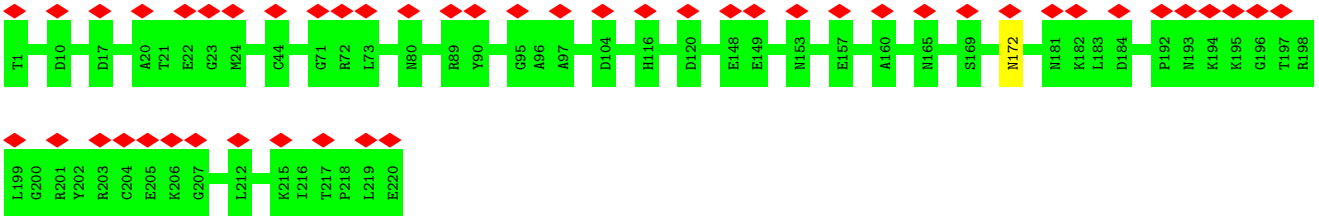
• Molecule 8: Proteasome subunit beta type-6



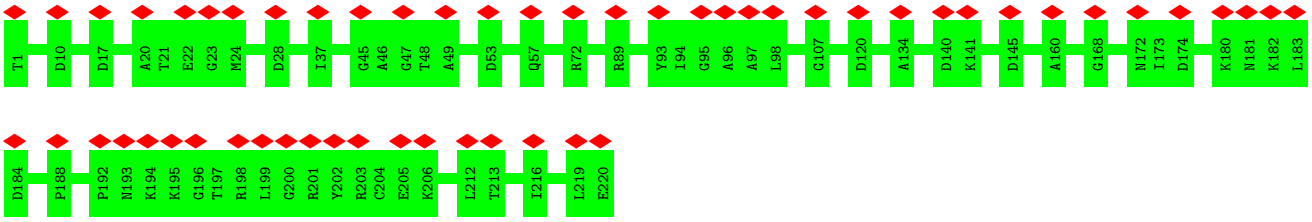
• Molecule 8: Proteasome subunit beta type-6



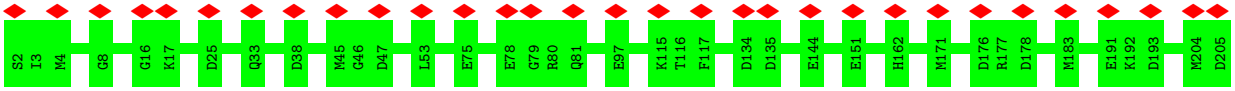
• Molecule 9: Proteasome subunit beta type-7



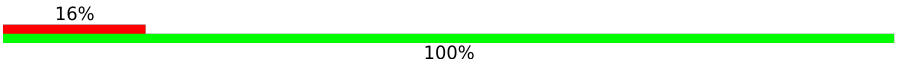
• Molecule 9: Proteasome subunit beta type-7

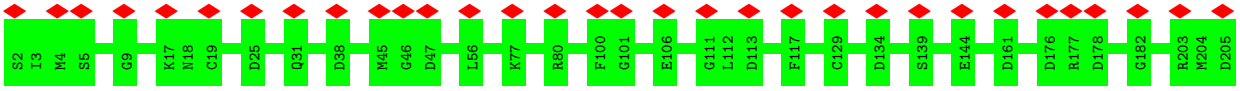


• Molecule 10: Proteasome subunit beta type-3

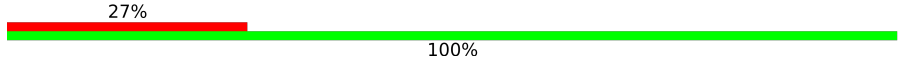


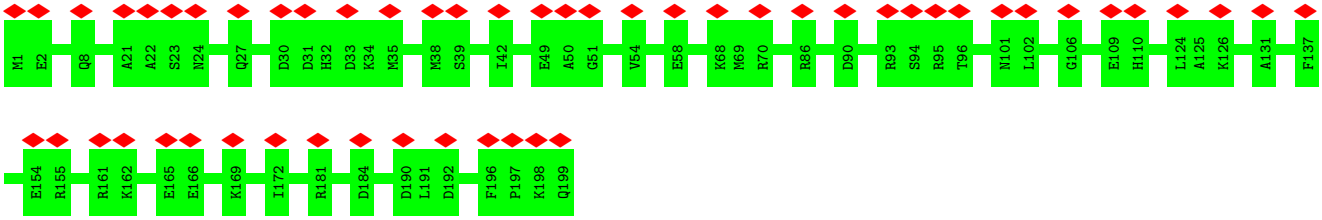
• Molecule 10: Proteasome subunit beta type-3



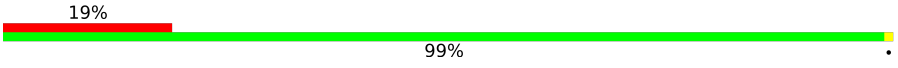


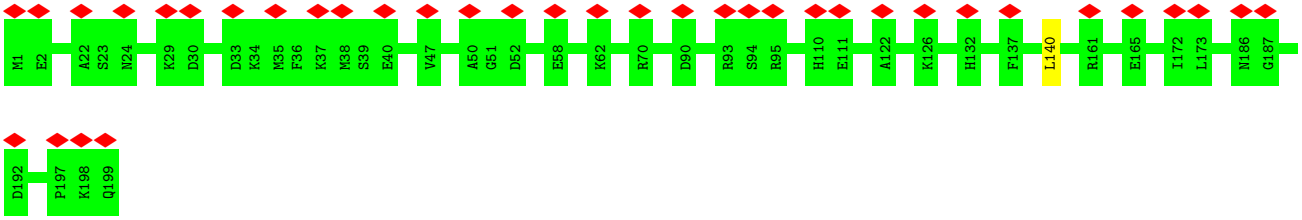
• Molecule 11: Proteasome subunit beta type-2



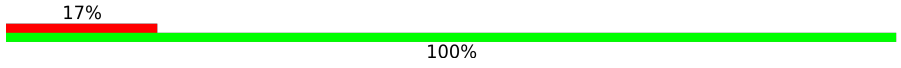


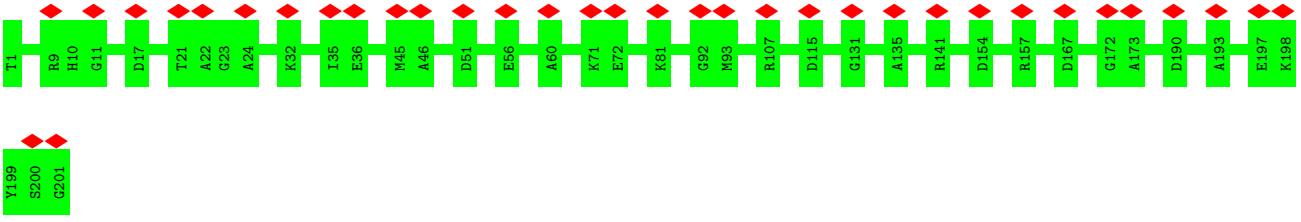
• Molecule 11: Proteasome subunit beta type-2



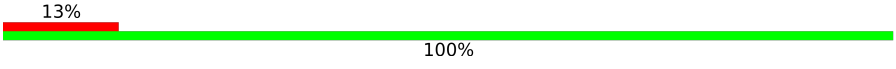


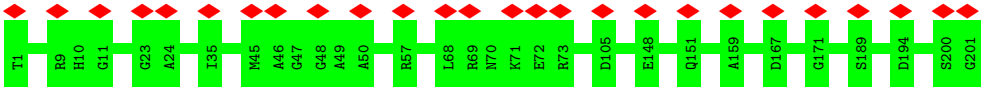
• Molecule 12: Proteasome subunit beta type-5



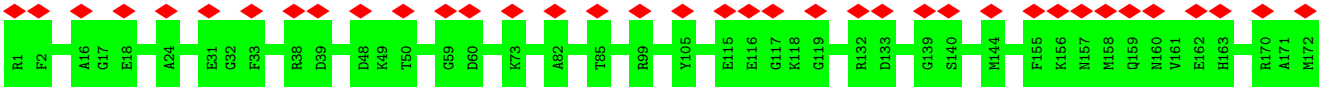


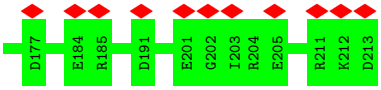
• Molecule 12: Proteasome subunit beta type-5



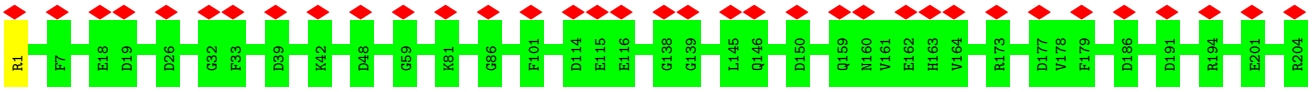


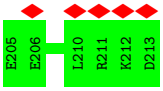
• Molecule 13: Proteasome subunit beta type-1



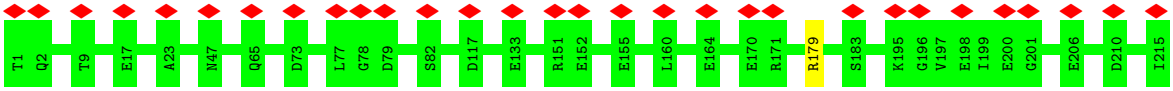


• Molecule 13: Proteasome subunit beta type-1

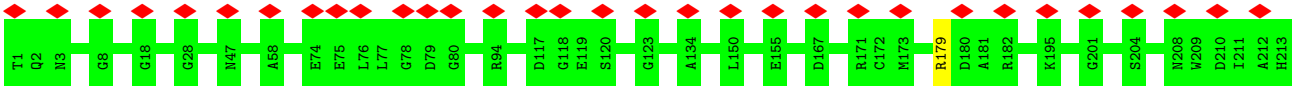




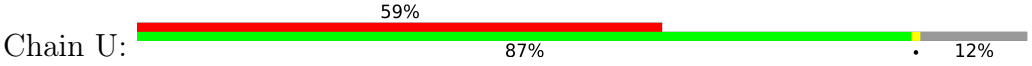
• Molecule 14: Proteasome subunit beta type-4

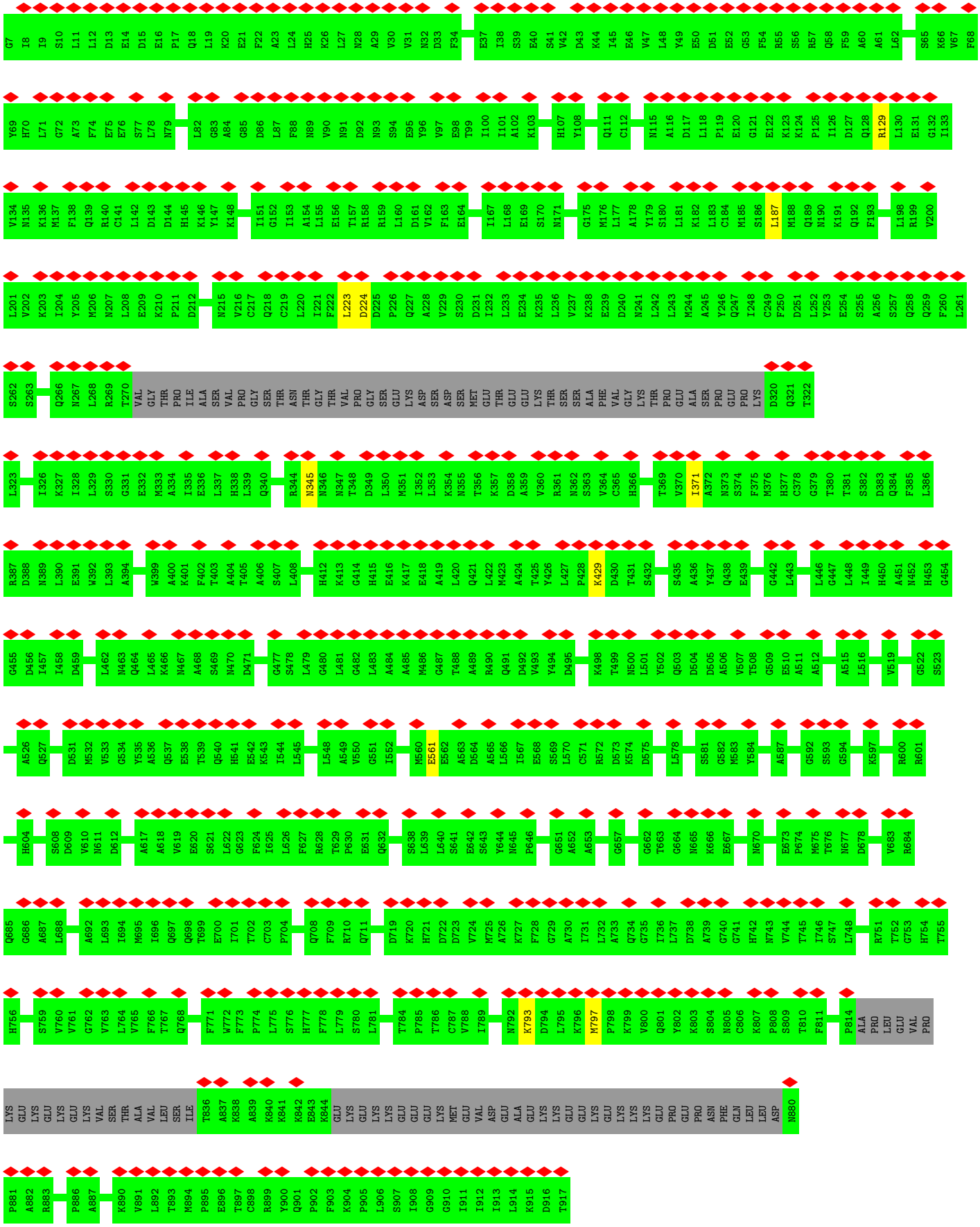


• Molecule 14: Proteasome subunit beta type-4



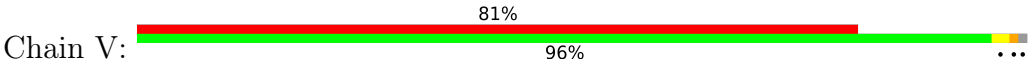
• Molecule 15: 26S proteasome non-ATPase regulatory subunit 1

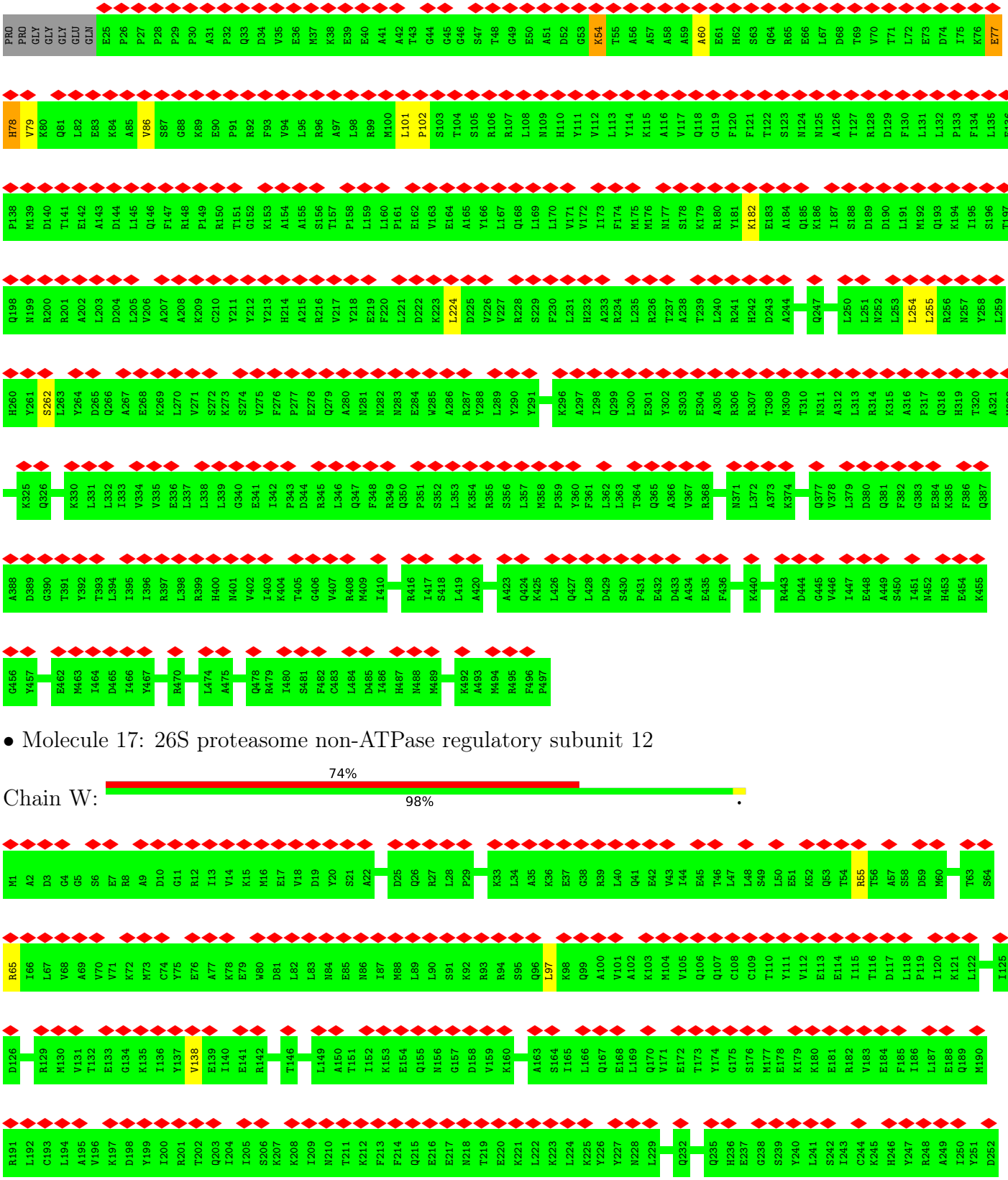



G7 I8 I9 S10 L11 L12 D13 E14 D15 E16 P17 Q18 L19 K20 E21 F22 A23 L24 H25 K26 L27 N28 A29 V30 V31 N32 D33 F34 E37 I38 S39 E40 S41 V42 D43 K44 I45 E46 V47 L48 Y49 E50 D51 E52 G53 F54 R55 S56 R57 Q58 F59 A60 A61 L62 S65 K66 V67 F68
Y69 H70 L71 G72 A73 F74 E75 E76 S77 L78 N79 L82 G83 A84 G85 D86 L87 F88 N89 V90 N91 D92 N93 S94 E95 Y96 V97 E98 T99 I100 I101 A102 K103 H107 Y108 Q111 C112 N115 A116 D117 L118 P119 E120 G121 E122 K123 K124 P125 I126 D127 Q128 R129 L130 E131 G132 I133
V134 N135 K136 M137 F138 Q139 R140 C141 L142 D143 D144 H145 K146 Y147 K148 I151 G152 I153 A154 L155 E156 T157 R158 R159 L160 D161 V162 F163 E164 I167 L168 E169 S170 N171 G175 M176 L177 A178 Y179 S180 L181 K182 L183 C184 M185 S186 L187 M188 Q189 N190 K191 Q192 F193 L198 R199 V200
L201 V202 K203 I204 Y205 M206 N207 L208 E209 K210 P211 D212 N215 V216 C217 Q218 C219 L220 I221 F222 L223 D224 D225 P226 Q227 A228 V229 S230 D231 I232 L233 E234 K235 L236 V237 K238 E239 D240 N241 L242 L243 M244 A245 Y246 Q247 I248 C249 F250 D251 L252 Y253 E254 S255 A256 S257 Q258 Q259 F260 L261
S262 S263 Q266 N267 L268 R269 T270 VAL GLY THR PRO ILE ALA SER VAL PRO GLY SER THR ASN THR GLY THR VAL PRO GLY SER GLU LYS ASP SER ASP SER MET GLU THR GLU GLU LYS THR SER SER ALA PHE VAL GLY LYS THR PRO GLU ALA SER PRO GLU PRO LYS D320 Q321 T322
L323 I326 K327 I328 L329 S330 G331 E332 M333 A334 I335 E336 L337 H338 L339 Q340 R344 N345 N346 N347 T348 D349 L350 M351 I352 L353 K354 N355 T356 K357 D358 A359 V360 R361 N362 S363 V364 C365 H366 T369 V370 I371 A372 N373 S374 F375 M376 H377 C378 G379 T380 T381 S382 D383 Q384 F385 L386
R387 D388 N389 L390 E391 W392 L393 A394 W399 A400 K401 F402 T403 A404 T405 A406 S407 L408 H412 K413 G414 H415 E416 K417 E418 A419 L420 Q421 L422 M423 A424 T425 Y426 L427 P428 K429 D430 T431 S432 S435 A436 Y437 Q438 E439 G442 L443 L446 G447 L448 I449 H450 A451 N452 H453 G454
G455 D456 I457 I458 D459 L462 N463 Q464 L465 K466 N467 A468 S469 N470 D471 G477 S478 L479 G480 L481 G482 L483 A484 A485 M486 G487 T488 A489 R490 Q491 D492 V493 Y494 D495 K498 T499 N500 L501 Y502 Q503 D504 D505 A506 V507 T508 G509 E510 A511 A512 A515 L516 V519 G522 S523
A526 Q527 D531 M532 V533 G534 Y535 A536 Q537 E538 T539 Q540 H541 E542 K543 I544 L545 L548 A549 V550 G551 I552 M560 E561 E562 A563 D564 A565 L566 I567 E568 S569 L570 C571 R572 D573 K574 D575 L578 S581 G582 M583 Y584 A587 G592 S593 G594 K597 R600 R601
H604 S608 D609 V610 N611 D612 A617 A618 V619 E620 S621 L622 G623 F624 I625 L626 F627 R628 T629 P630 E631 Q632 S638 L639 L640 S641 E642 S643 Y644 N645 P646 G651 A652 A653 G657 G662 T663 G664 N665 K666 E667 N670 E673 P674 M675 T676 N677 D678 V683 R684
Q685 G686 A687 L688 A692 L693 I694 M695 I696 Q697 Q698 T699 E700 I701 T702 C703 P704 Q708 F709 R710 Q711 D719 K720 H721 D722 D723 V724 M725 A726 K727 F728 G729 A730 I731 L732 A733 Q734 G735 I736 L737 D738 A739 G740 G741 H742 N743 V744 T745 I746 S747 L748 R751 T752 G753 H754 T755
H756 S759 V760 V761 G762 V763 L764 V765 F766 T767 Q768 F771 W772 F773 P774 L775 S776 H777 F778 L779 S780 L781 T784 P785 T786 C787 V788 I789 N792 K793 D794 L795 K796 M797 P798 K799 V800 Q801 Y802 K803 S804 N805 C806 K807 P808 S809 T810 F811 P814 ALA PRO LEU GLU VAL PRO
LYS GLU LYS GLU LYS GLU LYS VAL SER THR ALA VAL LEU SER ILE T836 A837 K838 A839 K840 K841 K842 E843 K844 GLU LYS GLU LYS LYS GLU GLU GLU LYS MET GLU VAL ASP GLU ALA GLU LYS LYS GLU GLU LYS GLU LYS LYS LYS GLU PRO GLU PRO ASN PHE GLN LEU LEU ASP N880
P881 A882 R883 P886 A887 K890 V891 L892 T893 M894 P895 E896 T897 C898 R899 Y900 Q901 P902 F903 K904 P905 L906 S907 I908 G909 G910 I911 I912 I913 L914 K915 D916 T917

• Molecule 16: 26S proteasome non-ATPase regulatory subunit 3

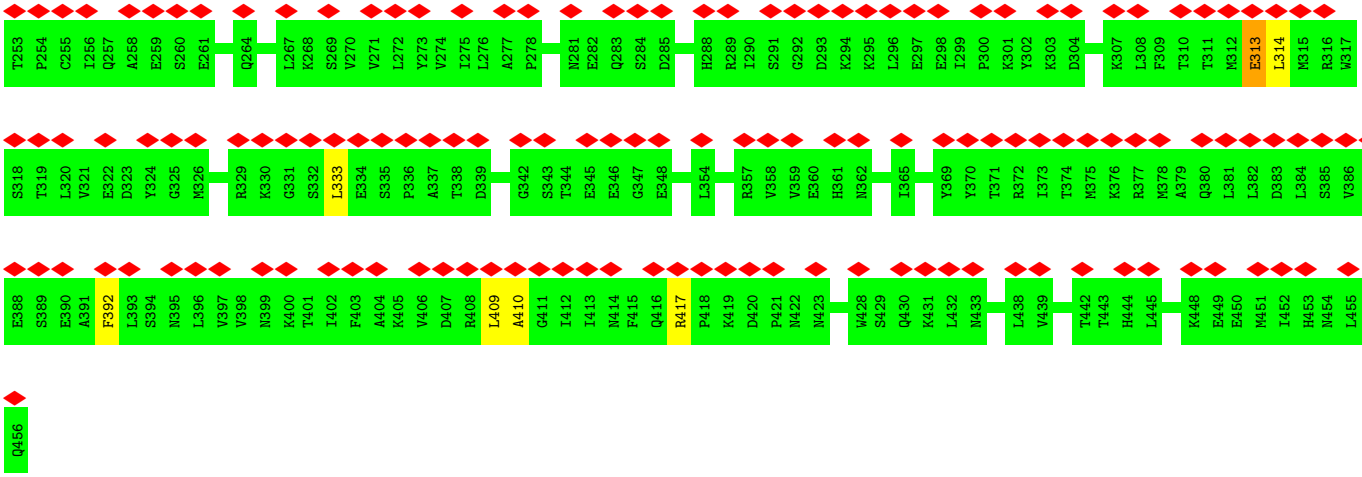
Chain V:





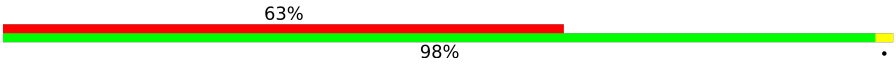
• Molecule 17: 26S proteasome non-ATPase regulatory subunit 12

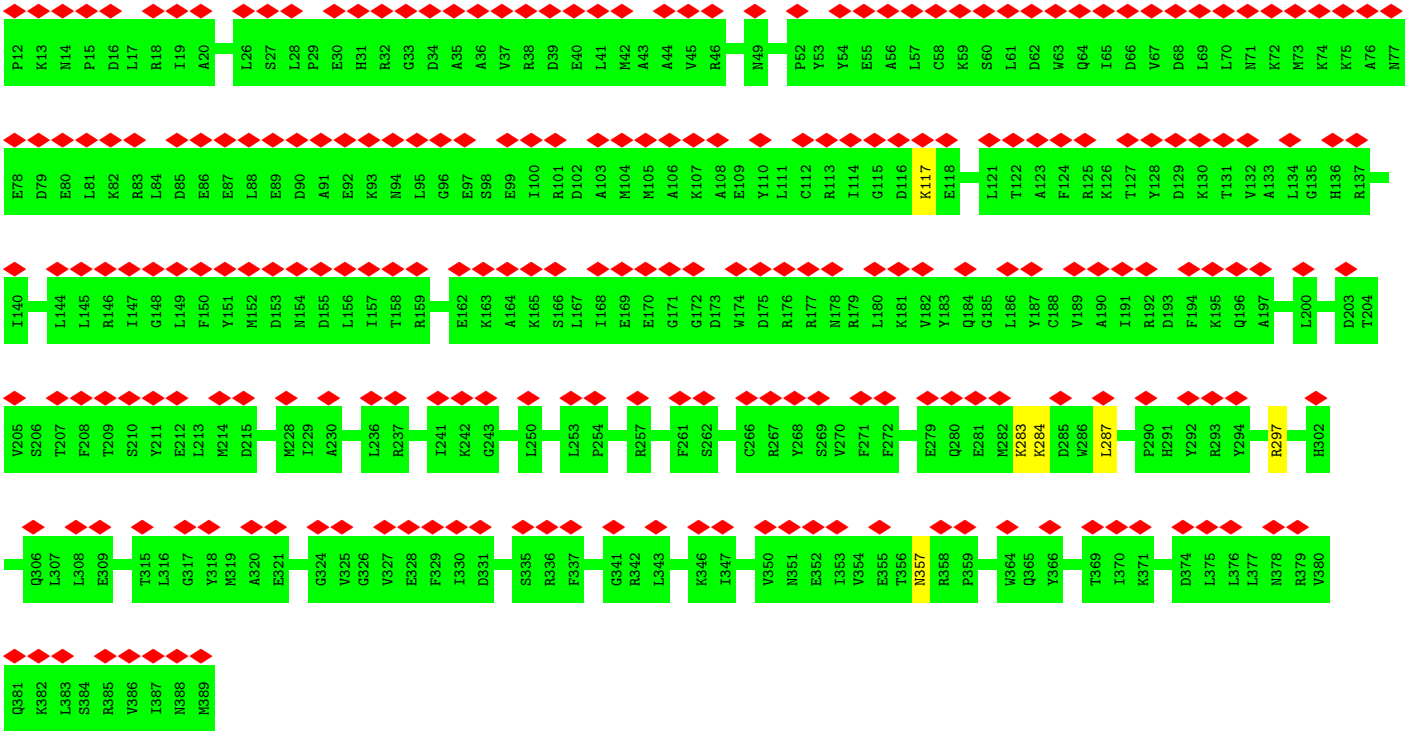
Chain W:



• Molecule 18: 26S proteasome non-ATPase regulatory subunit 6

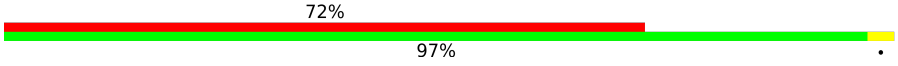
Chain Y:

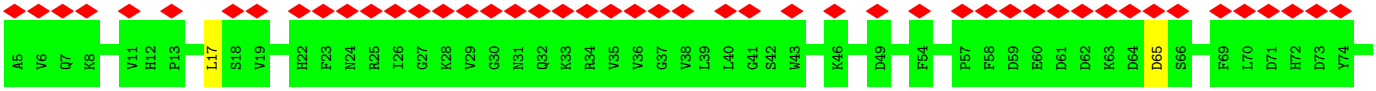


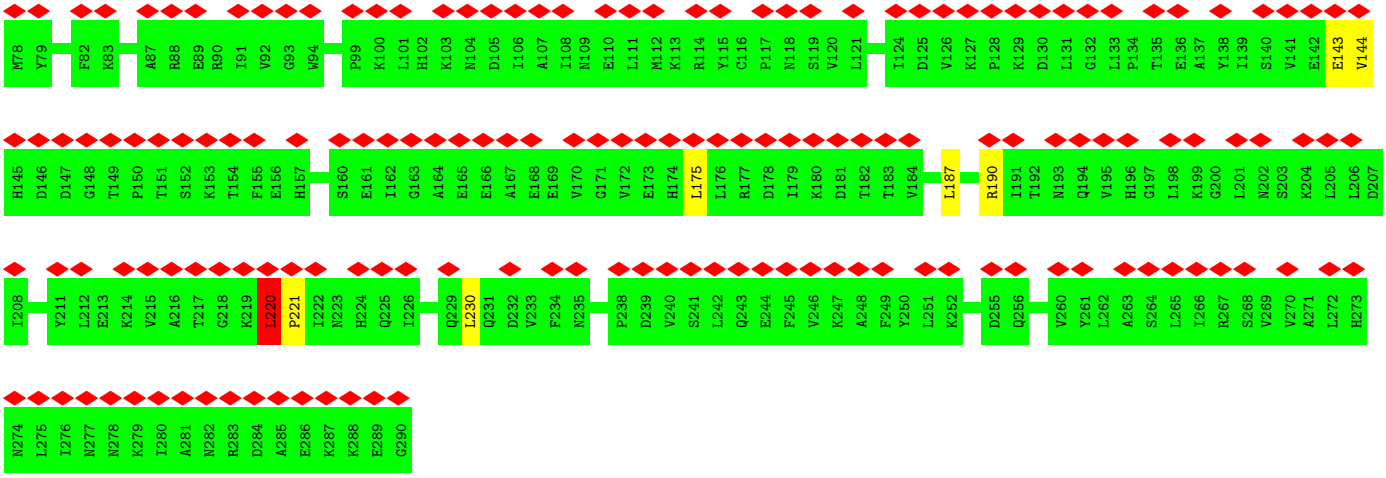


• Molecule 19: 26S proteasome non-ATPase regulatory subunit 7

Chain Z:

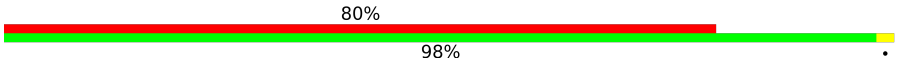






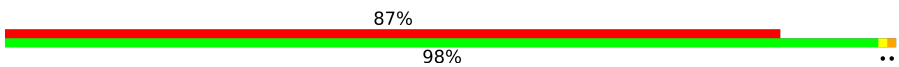
• Molecule 20: 26S proteasome non-ATPase regulatory subunit 13

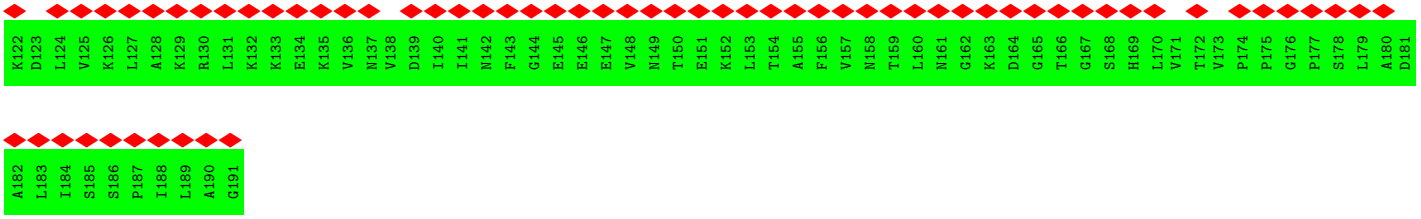
Chain a:



• Molecule 21: 26S proteasome non-ATPase regulatory subunit 4

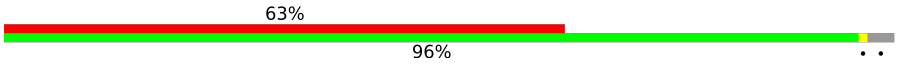
Chain b:

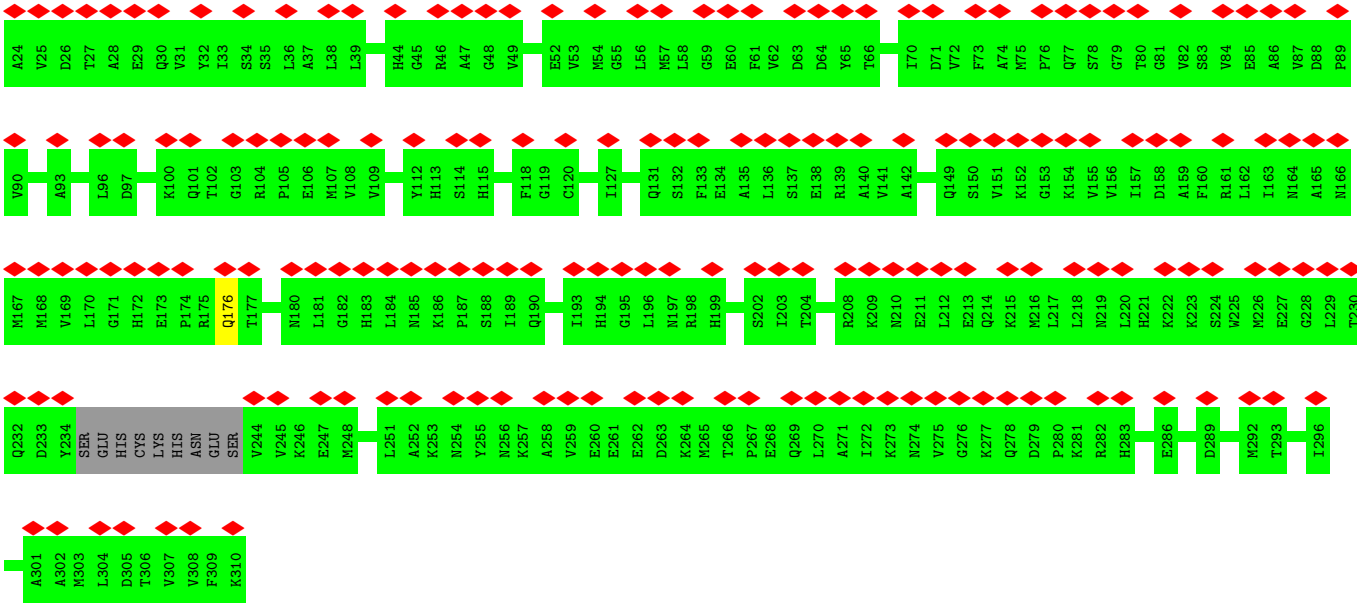




• Molecule 22: 26S proteasome non-ATPase regulatory subunit 14

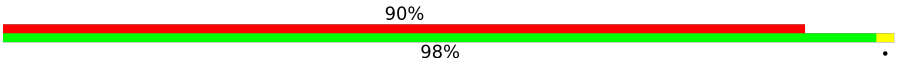
Chain c:

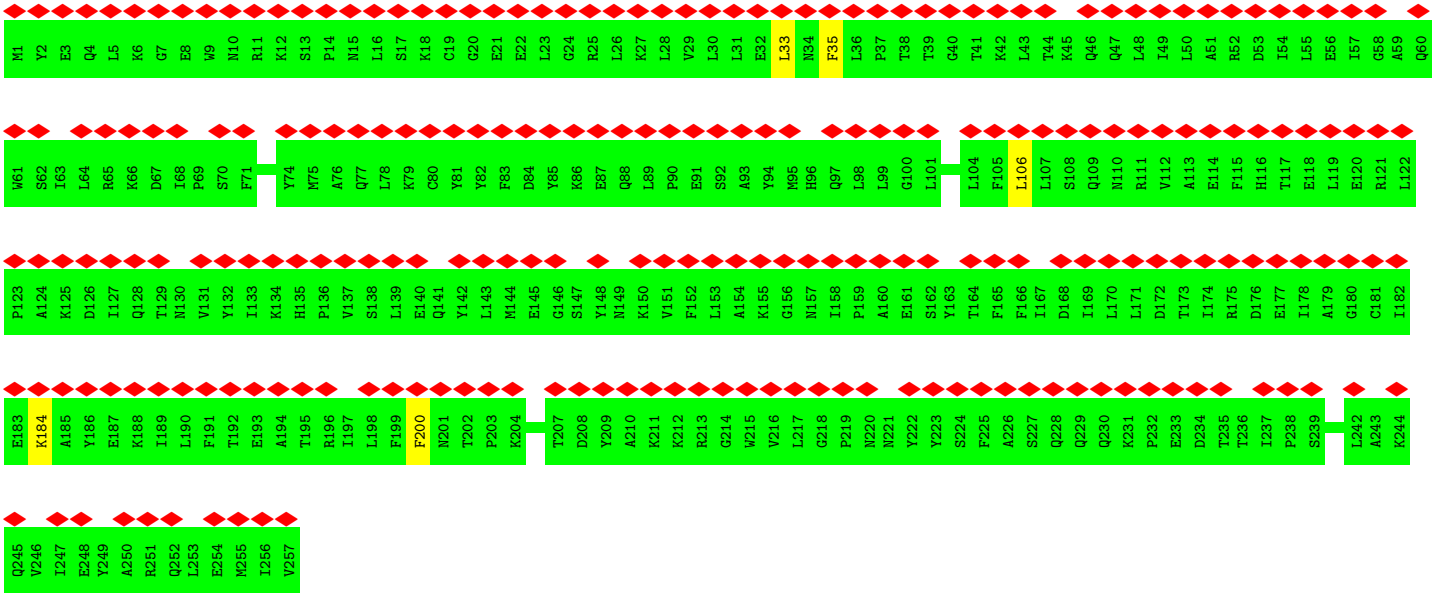




• Molecule 23: 26S proteasome non-ATPase regulatory subunit 8

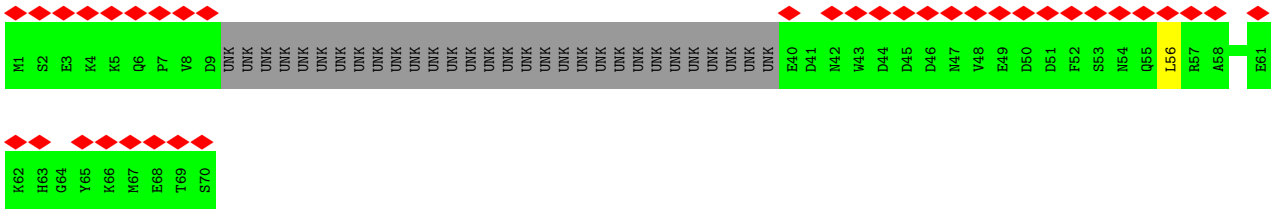
Chain d:





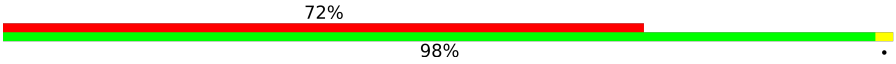
• Molecule 24: sem1

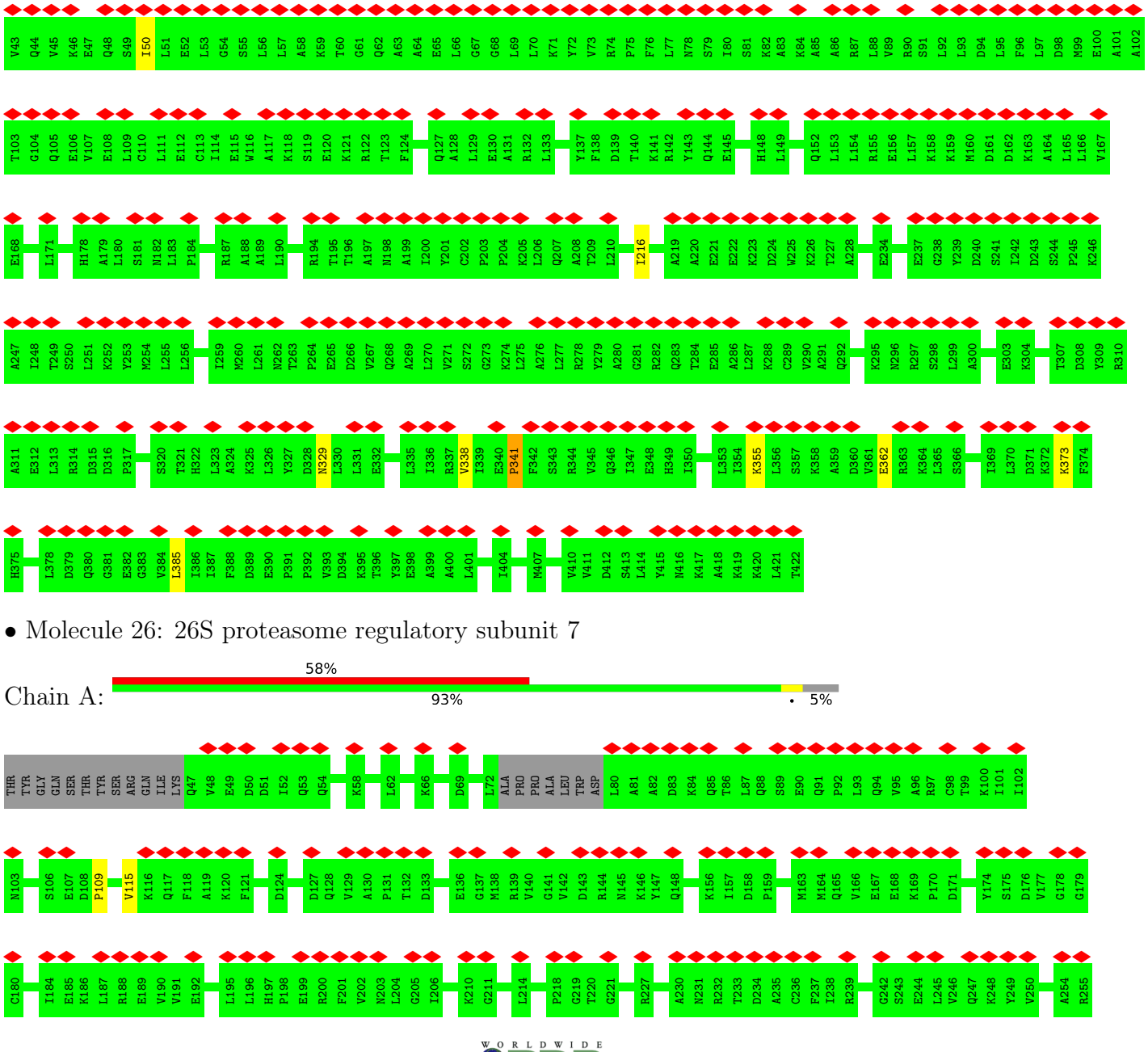
Chain e:



• Molecule 25: 26S proteasome non-ATPase regulatory subunit 11

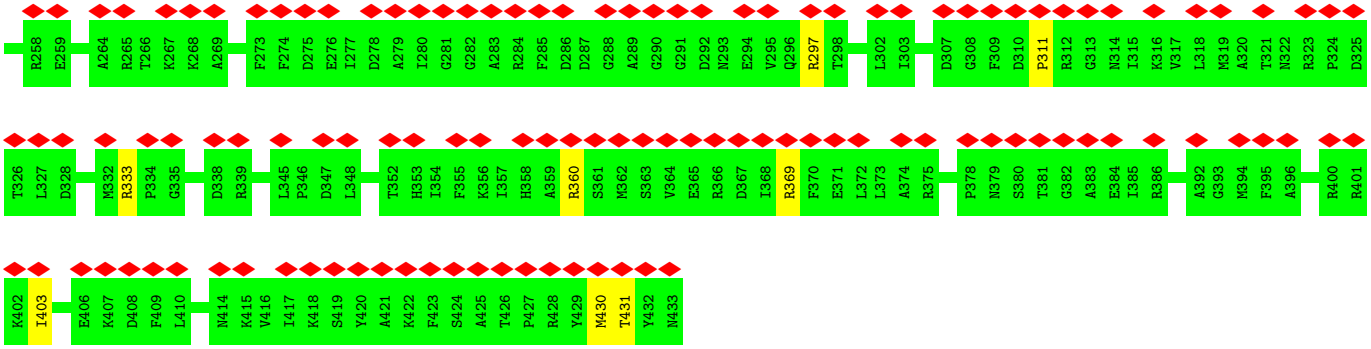
Chain X:





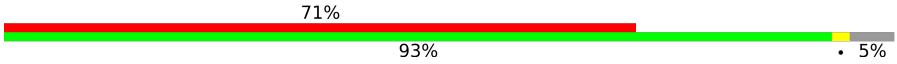
• Molecule 26: 26S proteasome regulatory subunit 7

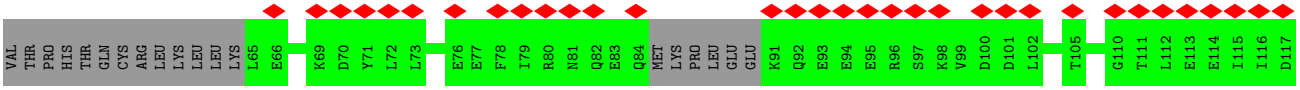
Chain A:

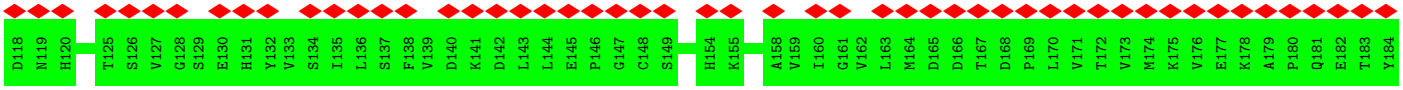


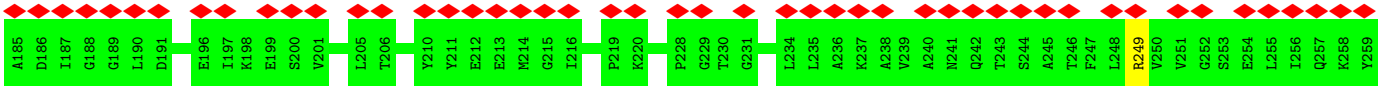
• Molecule 27: 26S proteasome regulatory subunit 4

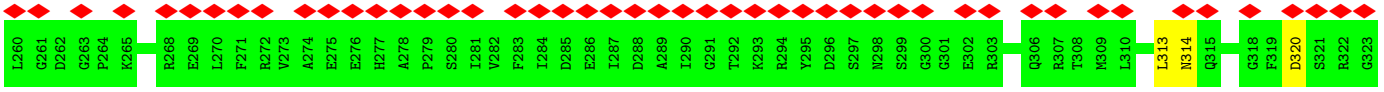
Chain B:

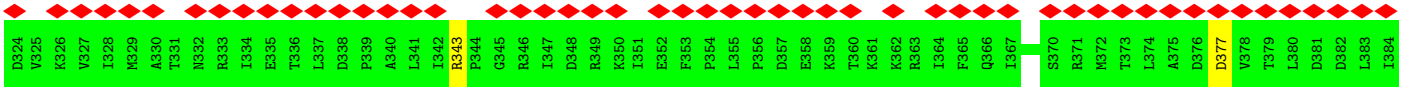


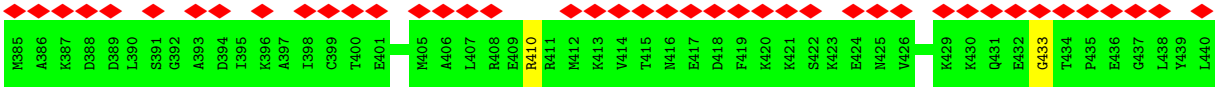






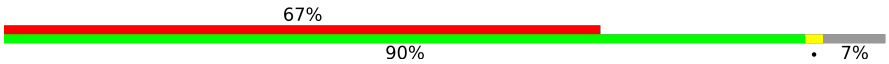


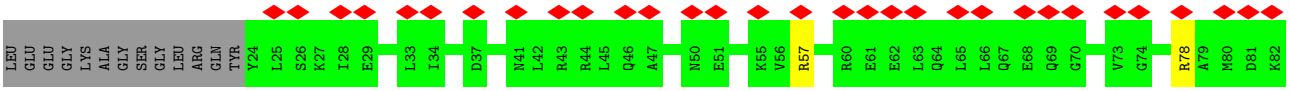


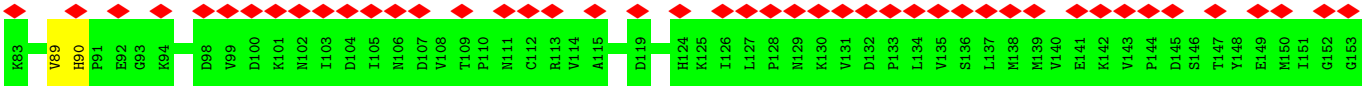


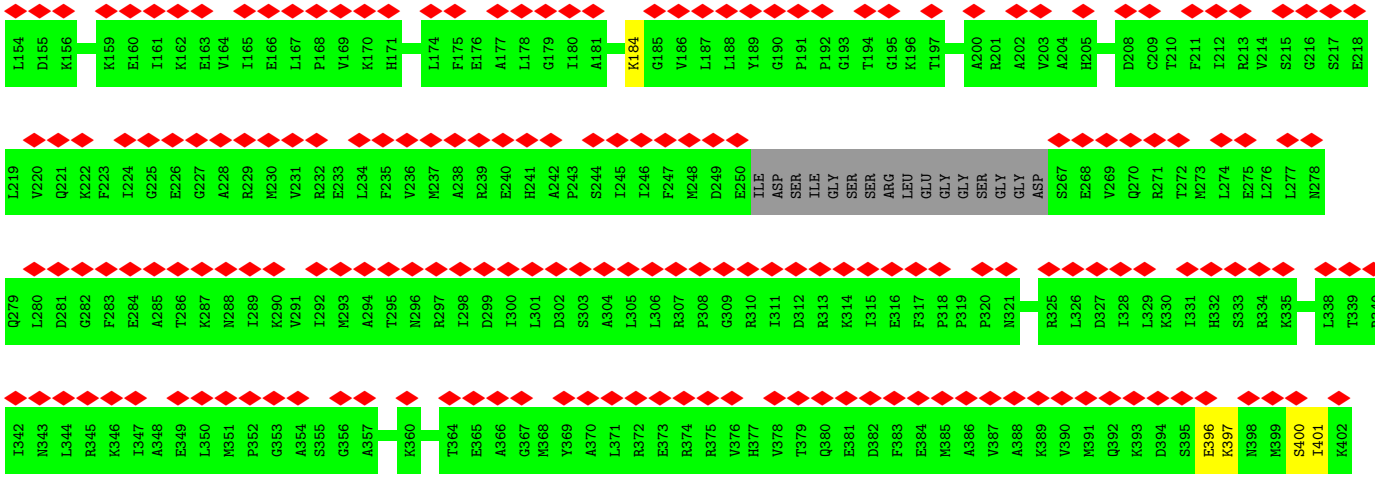
• Molecule 28: 26S proteasome regulatory subunit 8

Chain C:



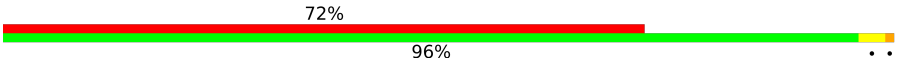


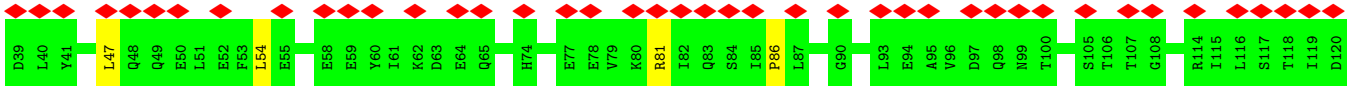




• Molecule 29: 26S proteasome regulatory subunit 6B

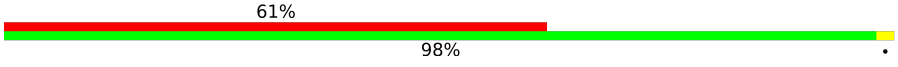
Chain D:

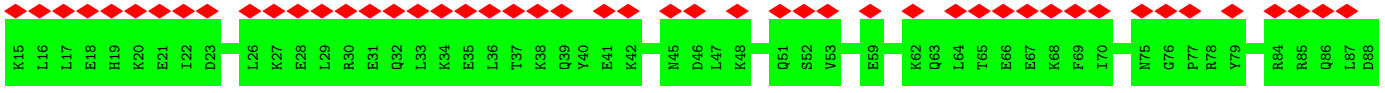


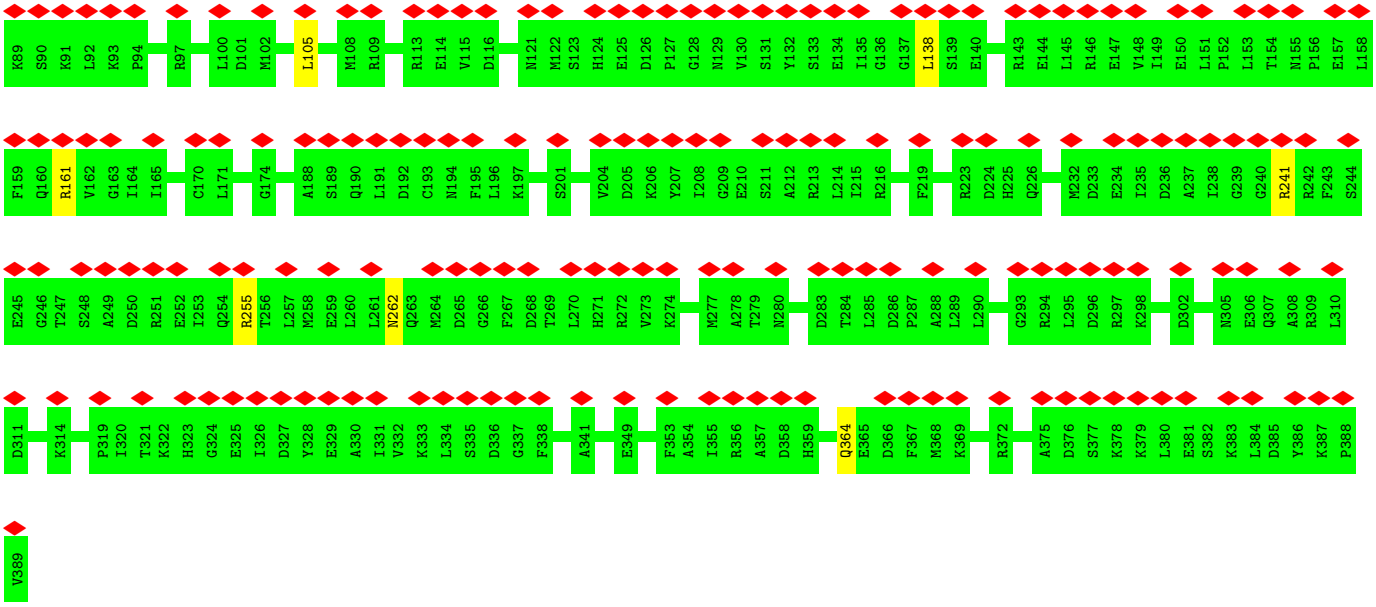


• Molecule 30: 26S proteasome regulatory subunit 10B

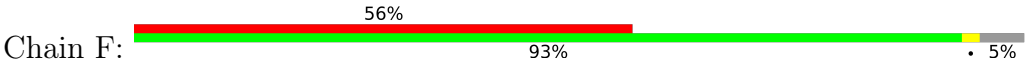
Chain E:

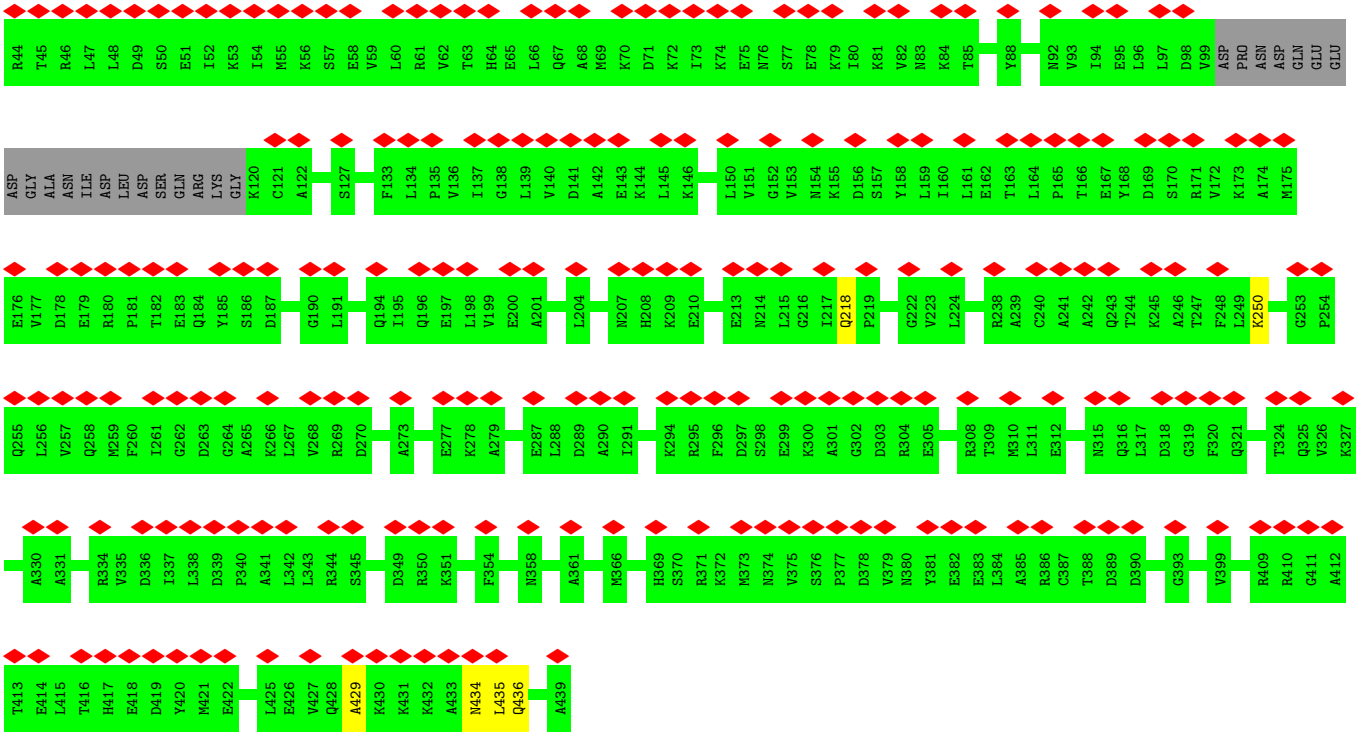




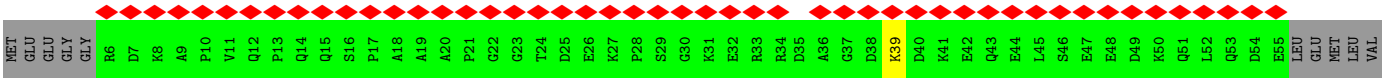


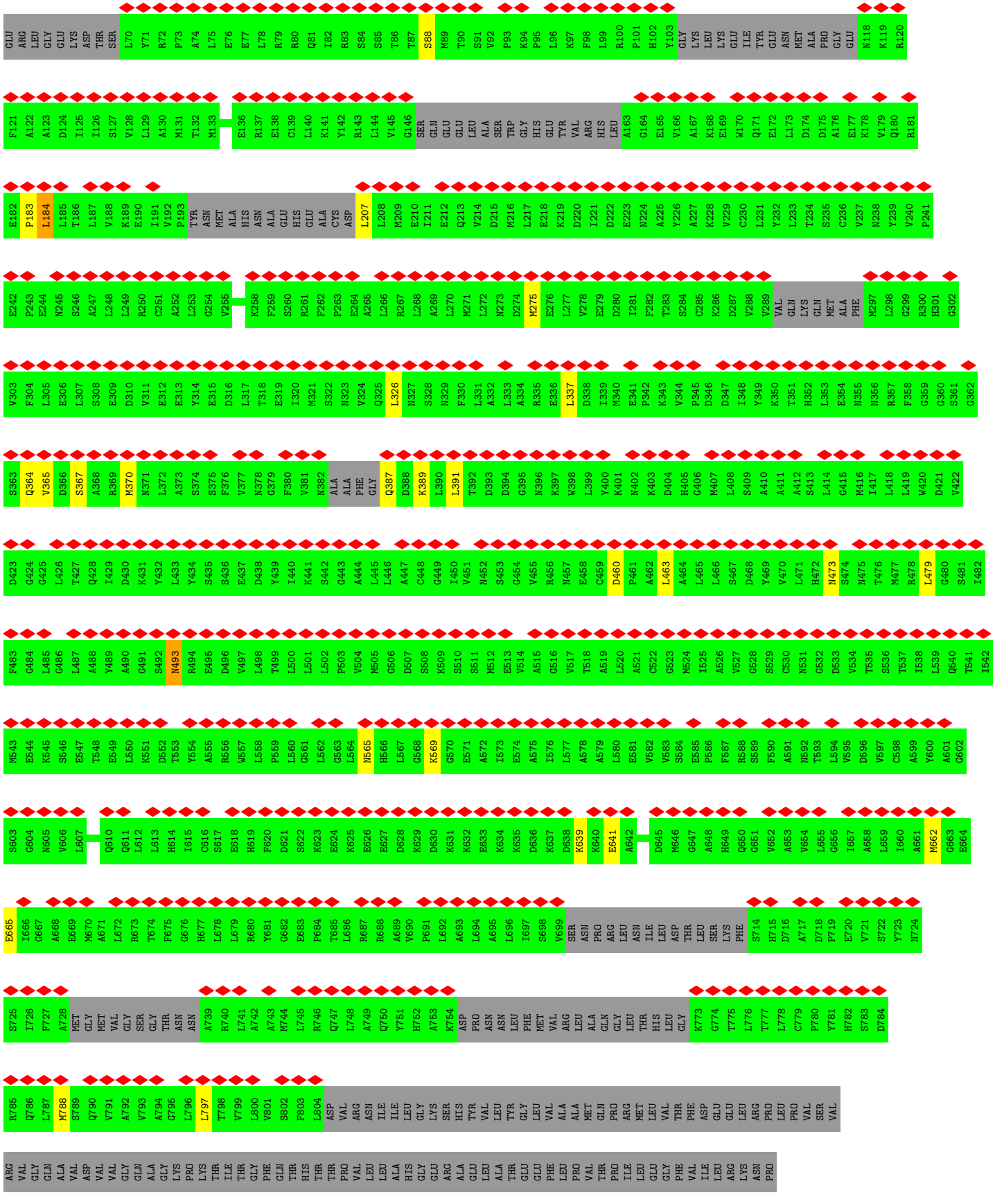
• Molecule 31: 26S proteasome regulatory subunit 6A





• Molecule 32: 26S proteasome non-ATPase regulatory subunit 2




GLU ARG LEU GLY GLU LYS ASP THR SER L70 Y71 R72 P73 A74 L75 E76 E77 L78 R79 R80 Q81 I82 R83 S84 S85 T86 T87 S88 M89 T90 S91 V92 P93 K94 P95 L96 K97 F98 L99 R100 P101 H102 Y103 GLY LYS LEU LYS GLU ILE TYR GLU ASN MET ALA PRO GLY GLU N118 K119 R120
F121 A122 A123 D124 I125 I126 S127 V128 L129 A130 M131 T132 M133 E136 R137 E138 C139 L140 K141 Y142 R143 L144 V145 G146 SER GLN GLU GLU LEU ALA SER TRP GLY HIS GLU TYR VAL ARG HIS LEU A163 G164 E165 V166 A167 K168 E169 W170 Q171 E172 L173 D174 D175 A176 E177 K178 V179 Q180 R181
E182 P183 L184 L185 T186 L187 V188 K189 E190 I191 V192 P193 TYR ASN MET ALA HIS ASN ALA GLU HIS GLU ALA CYS ASP L207 L208 M209 E210 I211 E212 Q213 V214 D215 M216 L217 E218 K219 D220 I221 D222 E223 N224 A225 Y226 A227 K228 V229 C230 L231 Y232 L233 T234 S235 C236 V237 N238 Y239 V240 P241
E242 P243 E244 N245 S246 A247 L248 L249 R250 C251 A252 L253 G254 V255 K258 F259 S260 R261 P262 P263 E264 A265 L266 R267 L268 A269 L270 M271 L272 N273 D274 M275 E276 L277 V278 E279 D280 I281 F282 T283 S284 C285 K286 D287 V288 V289 VAL GLN LYS GLN MET ALA PHE M297 L298 G299 R300 H301 G302
V303 F304 L305 E306 L307 S308 E309 D310 V311 E312 E313 Y314 E315 D316 L317 T318 E319 I320 M321 S322 N323 V324 Q325 L326 N327 S328 N329 F330 L331 A332 L333 A334 R335 E336 L337 D338 I339 M340 E341 P342 K343 V344 P345 D346 D347 I348 Y349 K350 T351 H352 L353 E354 N355 N356 R357 F358 G359 G360 S361 G362
S363 Q364 V365 D366 S367 A368 R369 M370 N371 L372 A373 S374 S375 F376 V377 N378 G379 F380 V381 N382 ALA ALA PHE GLY Q387 D388 K389 L390 L391 T392 D393 D394 G395 N396 K397 W398 L399 Y400 K401 N402 K403 D404 H405 G406 M407 L408 S409 A410 A411 A412 S413 L414 G415 M416 I417 L418 L419 W420 D421 V422
D423 G424 G425 L426 T427 Q428 I429 D430 K431 Y432 L433 Y434 S435 S436 E437 D438 Y439 I440 K441 S442 G443 A444 L445 L446 A447 C448 G449 I450 V451 N452 S453 G454 V455 R456 N457 E458 C459 D460 P461 A462 L463 A464 L465 L466 S467 D468 Y469 V470 L471 H472 N473 S474 N475 T476 M477 R478 L479 G480 S481 I482
F483 G484 L485 G486 L487 A488 Y489 A490 G491 S492 N493 R494 E495 D496 V497 L498 T499 L500 L501 L502 P503 V504 M505 G506 D507 S508 K509 S510 S511 M512 E513 V514 A515 G516 V517 T518 A519 L520 A521 C522 G523 M524 I525 A526 V527 G528 S529 C530 N531 G532 D533 V534 T535 S536 T537 I538 L539 Q540 T541 I542
M543 E544 K545 S546 E547 T548 E549 L550 K551 D552 T553 Y554 A555 R556 W557 L558 P559 L560 G561 L562 G563 L564 N565 H566 L567 G568 K569 G570 E571 A572 I573 E574 A575 I576 L577 A578 A579 L580 E581 V582 V583 S584 E585 P586 F587 R588 S589 F590 A591 N592 T593 L594 V595 D596 V597 C598 A599 Y600 A601 G602
S603 G604 N605 V606 L607 Q610 Q611 L612 L613 H614 I615 C616 S617 E618 H619 F620 D621 S622 K623 E624 K625 E626 E627 D628 K629 D630 K631 K632 E633 K634 K635 D636 K637 D638 K639 K640 E641 A642 D645 M646 G647 A648 H649 Q650 G651 V652 A653 V654 L655 G656 I657 A658 L659 I660 A661 M662 G663 E664
E665 I666 G667 A668 E669 M670 A671 L672 R673 T674 F675 G676 H677 L678 L679 R680 Y681 G682 E683 P684 T685 L686 R687 R688 A689 V690 P691 L692 A693 L694 A695 L696 I697 S698 V699 SER ASN PRO ARG LEU ASN ILE LEU ASP THR LEU SER LYS PHE S714 H715 D716 A717 D718 P719 E720 V721 S722 Y723 N724
S725 I726 F727 A728 MET GLY MET VAL GLY SER GLY THR ASN ASN A739 R740 L741 A742 A743 M744 L745 R746 Q747 L748 A749 Q750 Y751 H752 A753 K754 ASP PRO ASN ASN LEU PHE MET VAL ARG LEU ALA GLN GLY LEU THR HIS LEU GLY K773 G774 T775 L776 T777 L778 C779 P780 Y781 H782 S783 D784
R785 Q786 L787 N788 S789 Q790 V791 A792 V793 A794 G795 L796 L797 T798 V799 L800 V801 S802 P803 L804 ASP VAL ARG ASN ILE ILE LEU GLY LYS SER HIS TYR VAL LEU TYR GLY LEU VAL ALA ALA MET GLN PRO ARG MET LEU VAL THR PHE ASP GLU GLU LEU ARG PRO LEU PRO VAL SER VAL
ARG VAL GLY GLN ALA VAL ASP VAL VAL GLY GLN ALA GLY LYS PRO LYS THR ILE THR GLY PHE GLN THR HIS THR THR PRO VAL LEU LEU ALA HIS GLY GLU ARG ALA GLU LEU ALA THR GLU GLU PHE LEU PRO VAL THR PRO ILE LEU GLU GLY PHE VAL ILE LEU ARG LYS ASN PRO


ASN
TYR
ASP
LEU

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	66246	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TECNAI ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/Å^2$)	10	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	0.023	Depositor
Minimum map value	-0.010	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.008	Depositor
Map size (Å)	420.0, 420.0, 420.0	wwPDB
Map dimensions	560, 560, 560	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.75, 0.75, 0.75	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, AGS

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	G	0.37	0/1853	0.60	0/2515
1	g	0.36	0/1859	0.58	0/2523
2	H	0.38	0/1723	0.60	1/2346 (0.0%)
2	h	0.35	0/1743	0.56	0/2372
3	I	0.37	0/1925	0.65	0/2606
3	i	0.36	0/1942	0.64	0/2628
4	J	0.37	0/1728	0.59	0/2358
4	j	0.35	0/1728	0.58	0/2358
5	K	0.35	0/1755	0.66	2/2375 (0.1%)
5	k	0.34	0/1747	0.58	0/2364
6	L	0.38	0/1885	0.60	0/2552
6	l	0.36	0/1885	0.59	0/2552
7	M	0.39	0/1891	0.60	1/2552 (0.0%)
7	m	0.39	0/1891	0.58	0/2552
8	N	0.39	0/1454	0.55	0/1967
8	n	0.38	0/1454	0.57	0/1967
9	O	0.36	0/1670	0.57	0/2265
9	o	0.36	0/1670	0.57	0/2265
10	P	0.37	0/1614	0.54	0/2177
10	p	0.37	0/1614	0.55	0/2177
11	Q	0.40	0/1603	0.62	0/2174
11	q	0.42	0/1603	0.64	0/2174
12	R	0.39	0/1579	0.53	0/2134
12	r	0.38	0/1579	0.52	0/2134
13	S	0.36	0/1671	0.54	0/2253
13	s	0.37	0/1671	0.55	0/2253
14	T	0.39	0/1700	0.56	0/2305
14	t	0.37	0/1700	0.55	0/2305
15	U	0.34	0/6396	0.66	4/8646 (0.0%)
16	V	0.37	0/3883	0.72	3/5247 (0.1%)
17	W	0.34	0/3751	0.69	3/5042 (0.1%)
18	Y	0.36	0/3173	0.71	1/4273 (0.0%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#|Z| >5	RMSZ	#|Z| >5
19	Z	0.35	0/2324	0.73	4/3150 (0.1%)
20	a	0.32	0/3053	0.68	4/4133 (0.1%)
21	b	0.33	0/1478	0.70	1/2001 (0.0%)
22	c	0.36	0/2226	0.70	1/3007 (0.0%)
23	d	0.35	0/2162	0.72	1/2919 (0.0%)
24	e	0.38	0/338	0.78	1/450 (0.2%)
25	X	0.33	0/3053	0.62	0/4115
26	A	0.34	0/2939	0.61	0/3970
27	B	0.33	0/2844	0.63	2/3846 (0.1%)
28	C	0.33	0/2896	0.65	1/3895 (0.0%)
29	D	0.37	0/3090	0.71	4/4168 (0.1%)
30	E	0.32	0/2904	0.57	1/3924 (0.0%)
31	F	0.35	0/2897	0.64	3/3912 (0.1%)
32	f	0.31	0/5393	0.68	1/7271 (0.0%)
All	All	0.36	0/102937	0.63	39/139172 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	G	0	1
1	g	0	1
3	I	0	1
4	J	0	1
4	j	0	1
5	K	0	4
7	M	0	1
8	n	0	1
9	O	0	1
15	U	0	2
16	V	0	3
19	Z	0	2
20	a	0	2
21	b	0	1
23	d	0	2
25	X	0	2
26	A	0	1
28	C	0	2
29	D	0	6
All	All	0	35

There are no bond length outliers.

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
21	b	21	PHE	C-N-CA	8.09	141.92	121.70
29	D	368	ASP	C-N-CA	7.78	141.14	121.70
24	e	56	LEU	CA-CB-CG	7.42	132.36	115.30
20	a	180	LEU	CA-CB-CG	7.18	131.82	115.30
18	Y	287	LEU	CA-CB-CG	7.11	131.64	115.30
17	W	409	LEU	CA-CB-CG	7.05	131.52	115.30
16	V	254	LEU	CA-CB-CG	6.99	131.38	115.30
15	U	224	ASP	CB-CG-OD1	6.85	124.46	118.30
27	B	320	ASP	CB-CG-OD1	6.71	124.33	118.30
5	K	21	LEU	C-N-CA	6.67	138.39	121.70
16	V	77	GLU	C-N-CA	6.63	138.28	121.70
29	D	54	LEU	CA-CB-CG	6.53	130.31	115.30
20	a	187	ASP	CB-CG-OD1	6.46	124.11	118.30
31	F	434	ASN	C-N-CA	6.37	137.62	121.70
19	Z	187	LEU	CA-CB-CG	6.27	129.73	115.30
15	U	371	ILE	CG1-CB-CG2	-6.22	97.72	111.40
19	Z	175	LEU	CA-CB-CG	6.18	129.50	115.30
15	U	223	LEU	CA-CB-CG	6.02	129.14	115.30
15	U	187	LEU	CA-CB-CG	6.01	129.12	115.30
31	F	429	ALA	C-N-CA	5.86	136.36	121.70
30	E	105	LEU	CA-CB-CG	5.77	128.56	115.30
20	a	310	LEU	CA-CB-CG	5.76	128.54	115.30
27	B	313	LEU	CA-CB-CG	5.75	128.53	115.30
7	M	6	GLY	C-N-CA	5.71	135.97	121.70
29	D	368	ASP	N-CA-C	5.64	126.23	111.00
32	f	493	ASN	N-CA-C	-5.59	95.91	111.00
29	D	407	ILE	C-N-CA	5.53	135.53	121.70
17	W	97	LEU	CA-CB-CG	5.53	128.01	115.30
20	a	8	LEU	CA-CB-CG	5.48	127.91	115.30
5	K	19	GLY	C-N-CA	5.46	135.35	121.70
28	C	396	GLU	CA-CB-CG	5.45	125.40	113.40
2	H	7	SER	C-N-CA	5.40	135.19	121.70
31	F	435	LEU	CA-CB-CG	5.33	127.55	115.30
22	c	231	LEU	CA-CB-CG	5.25	127.38	115.30
19	Z	65	ASP	CB-CG-OD1	5.12	122.91	118.30
19	Z	220	LEU	CB-CG-CD1	5.07	119.63	111.00
16	V	101	LEU	CA-CB-CG	5.07	126.96	115.30
23	d	106	LEU	CA-CB-CG	5.07	126.95	115.30
17	W	313	GLU	C-N-CA	5.05	134.32	121.70

There are no chirality outliers.

All (35) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
26	A	333	ARG	Sidechain
28	C	397	LYS	Peptide
28	C	400	SER	Peptide
29	D	124	LEU	Peptide
29	D	125	LYS	Peptide
29	D	150	SER	Peptide
29	D	368	ASP	Peptide
29	D	407	ILE	Peptide
29	D	86	PRO	Peptide
1	G	222	VAL	Peptide
3	I	6	ASP	Peptide
4	J	2	SER	Peptide
5	K	121	LEU	Peptide
5	K	19	GLY	Peptide
5	K	22	PHE	Peptide
5	K	9	ASP	Peptide
7	M	160	TYR	Peptide
9	O	172	ASN	Peptide
15	U	561	GLU	Peptide
15	U	793	LYS	Peptide
16	V	77	GLU	Peptide
16	V	78	HIS	Mainchain
16	V	79	VAL	Peptide
25	X	362	GLU	Peptide
25	X	385	LEU	Peptide
19	Z	143	GLU	Peptide
19	Z	220	LEU	Peptide
20	a	165	THR	Peptide
20	a	285	PRO	Peptide
21	b	22	LEU	Peptide
23	d	200	PHE	Peptide
23	d	33	LEU	Peptide
1	g	222	VAL	Peptide
4	j	180	ALA	Peptide
8	n	91	ARG	Peptide

5.2 Too-close contacts (i)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

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	G	237/240 (99%)	210 (89%)	27 (11%)	0	100	100
1	g	238/240 (99%)	218 (92%)	20 (8%)	0	100	100
2	H	228/232 (98%)	213 (93%)	15 (7%)	0	100	100
2	h	230/232 (99%)	226 (98%)	4 (2%)	0	100	100
3	I	246/250 (98%)	226 (92%)	19 (8%)	1 (0%)	34	72
3	i	248/250 (99%)	227 (92%)	20 (8%)	1 (0%)	34	72
4	J	237/243 (98%)	218 (92%)	19 (8%)	0	100	100
4	j	237/243 (98%)	216 (91%)	20 (8%)	1 (0%)	34	72
5	K	224/234 (96%)	205 (92%)	18 (8%)	1 (0%)	34	72
5	k	224/234 (96%)	206 (92%)	18 (8%)	0	100	100
6	L	236/238 (99%)	225 (95%)	11 (5%)	0	100	100
6	l	236/238 (99%)	224 (95%)	12 (5%)	0	100	100
7	M	238/245 (97%)	221 (93%)	17 (7%)	0	100	100
7	m	238/245 (97%)	222 (93%)	16 (7%)	0	100	100
8	N	189/191 (99%)	180 (95%)	8 (4%)	1 (0%)	29	68
8	n	189/191 (99%)	178 (94%)	8 (4%)	3 (2%)	9	45
9	O	218/220 (99%)	207 (95%)	11 (5%)	0	100	100
9	o	218/220 (99%)	207 (95%)	11 (5%)	0	100	100
10	P	202/204 (99%)	193 (96%)	9 (4%)	0	100	100
10	p	202/204 (99%)	190 (94%)	12 (6%)	0	100	100
11	Q	197/199 (99%)	178 (90%)	19 (10%)	0	100	100
11	q	197/199 (99%)	177 (90%)	20 (10%)	0	100	100
12	R	199/201 (99%)	187 (94%)	12 (6%)	0	100	100
12	r	199/201 (99%)	189 (95%)	10 (5%)	0	100	100
13	S	211/213 (99%)	205 (97%)	6 (3%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
13	s	211/213 (99%)	204 (97%)	7 (3%)	0	100	100
14	T	213/215 (99%)	206 (97%)	7 (3%)	0	100	100
14	t	213/215 (99%)	204 (96%)	9 (4%)	0	100	100
15	U	798/911 (88%)	721 (90%)	77 (10%)	0	100	100
16	V	471/480 (98%)	411 (87%)	55 (12%)	5 (1%)	14	52
17	W	454/456 (100%)	400 (88%)	51 (11%)	3 (1%)	22	62
18	Y	376/378 (100%)	325 (86%)	48 (13%)	3 (1%)	19	60
19	Z	284/286 (99%)	246 (87%)	35 (12%)	3 (1%)	14	52
20	a	371/373 (100%)	331 (89%)	39 (10%)	1 (0%)	41	76
21	b	189/191 (99%)	170 (90%)	17 (9%)	2 (1%)	14	52
22	c	274/287 (96%)	235 (86%)	38 (14%)	1 (0%)	34	72
23	d	255/257 (99%)	219 (86%)	35 (14%)	1 (0%)	34	72
24	e	36/70 (51%)	29 (81%)	7 (19%)	0	100	100
25	X	378/380 (100%)	341 (90%)	35 (9%)	2 (0%)	29	68
26	A	376/399 (94%)	327 (87%)	45 (12%)	4 (1%)	14	52
27	B	366/389 (94%)	322 (88%)	42 (12%)	2 (0%)	29	68
28	C	359/392 (92%)	320 (89%)	36 (10%)	3 (1%)	19	60
29	D	378/380 (100%)	323 (85%)	49 (13%)	6 (2%)	9	45
30	E	373/375 (100%)	340 (91%)	33 (9%)	0	100	100
31	F	372/396 (94%)	337 (91%)	33 (9%)	2 (0%)	29	68
32	f	669/908 (74%)	579 (86%)	82 (12%)	8 (1%)	13	50
All	All	12934/13558 (95%)	11738 (91%)	1142 (9%)	54 (0%)	38	72

All (54) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
16	V	78	HIS
16	V	262	SER
17	W	314	LEU
18	Y	283	LYS
18	Y	284	LYS
8	n	92	GLU
29	D	148	ASP
29	D	409	LYS
32	f	337	LEU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
32	f	364	GLN
32	f	367	SER
32	f	665	GLU
16	V	60	ALA
21	b	22	LEU
8	n	91	ARG
27	B	377	ASP
31	F	436	GLN
32	f	183	PRO
32	f	365	VAL
5	K	10	ARG
17	W	313	GLU
17	W	410	ALA
19	Z	220	LEU
22	c	176	GLN
23	d	35	PHE
29	D	126	PRO
32	f	184	LEU
32	f	326	LEU
16	V	54	LYS
20	a	187	ASP
4	j	181	ILE
25	X	355	LYS
26	A	431	THR
28	C	89	VAL
29	D	299	PHE
8	N	19	ARG
18	Y	117	LYS
3	i	221	GLY
8	n	19	ARG
28	C	90	HIS
3	I	221	GLY
16	V	102	PRO
26	A	109	PRO
29	D	153	MET
19	Z	221	PRO
26	A	115	VAL
27	B	433	GLY
28	C	401	ILE
21	b	23	PRO
31	F	218	GLN
25	X	341	PRO

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
26	A	311	PRO
19	Z	144	VAL
29	D	125	LYS

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	G	192/205 (94%)	191 (100%)	1 (0%)	88 93
1	g	193/205 (94%)	193 (100%)	0	100 100
2	H	162/190 (85%)	161 (99%)	1 (1%)	86 92
2	h	164/190 (86%)	164 (100%)	0	100 100
3	I	191/210 (91%)	190 (100%)	1 (0%)	88 93
3	i	193/210 (92%)	192 (100%)	1 (0%)	88 93
4	J	152/207 (73%)	149 (98%)	3 (2%)	55 73
4	j	152/207 (73%)	152 (100%)	0	100 100
5	K	187/196 (95%)	186 (100%)	1 (0%)	88 93
5	k	186/196 (95%)	186 (100%)	0	100 100
6	L	198/204 (97%)	198 (100%)	0	100 100
6	l	198/204 (97%)	198 (100%)	0	100 100
7	M	192/202 (95%)	192 (100%)	0	100 100
7	m	192/202 (95%)	192 (100%)	0	100 100
8	N	148/148 (100%)	148 (100%)	0	100 100
8	n	148/148 (100%)	148 (100%)	0	100 100
9	O	177/181 (98%)	177 (100%)	0	100 100
9	o	177/181 (98%)	177 (100%)	0	100 100
10	P	172/173 (99%)	172 (100%)	0	100 100
10	p	172/173 (99%)	172 (100%)	0	100 100
11	Q	164/170 (96%)	164 (100%)	0	100 100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
11	q	164/170 (96%)	163 (99%)	1 (1%)	86 92
12	R	153/156 (98%)	153 (100%)	0	100 100
12	r	153/156 (98%)	153 (100%)	0	100 100
13	S	174/178 (98%)	174 (100%)	0	100 100
13	s	174/178 (98%)	173 (99%)	1 (1%)	86 92
14	T	175/178 (98%)	174 (99%)	1 (1%)	86 92
14	t	175/178 (98%)	174 (99%)	1 (1%)	86 92
15	U	685/779 (88%)	681 (99%)	4 (1%)	86 92
16	V	410/414 (99%)	405 (99%)	5 (1%)	71 83
17	W	416/416 (100%)	410 (99%)	6 (1%)	67 80
18	Y	334/334 (100%)	332 (99%)	2 (1%)	86 92
19	Z	257/257 (100%)	253 (98%)	4 (2%)	62 79
20	a	333/333 (100%)	332 (100%)	1 (0%)	92 95
21	b	167/167 (100%)	167 (100%)	0	100 100
22	c	243/252 (96%)	243 (100%)	0	100 100
23	d	231/231 (100%)	230 (100%)	1 (0%)	91 94
24	e	38/38 (100%)	38 (100%)	0	100 100
25	X	327/327 (100%)	321 (98%)	6 (2%)	59 76
26	A	298/343 (87%)	293 (98%)	5 (2%)	60 78
27	B	300/345 (87%)	296 (99%)	4 (1%)	69 82
28	C	315/340 (93%)	312 (99%)	3 (1%)	76 86
29	D	333/333 (100%)	330 (99%)	3 (1%)	78 87
30	E	298/329 (91%)	292 (98%)	6 (2%)	55 73
31	F	296/340 (87%)	295 (100%)	1 (0%)	92 95
32	f	580/763 (76%)	559 (96%)	21 (4%)	35 60
All	All	10739/11537 (93%)	10655 (99%)	84 (1%)	82 89

All (84) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	11	ARG
2	H	121	TYR
3	I	11	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
4	J	5	ARG
4	J	85	ASN
4	J	175	ASN
5	K	33	LEU
14	T	179	ARG
15	U	129	ARG
15	U	345	ASN
15	U	429	LYS
15	U	797	MET
16	V	54	LYS
16	V	86	VAL
16	V	182	LYS
16	V	224	LEU
16	V	255	LEU
17	W	55	ARG
17	W	65	ARG
17	W	138	VAL
17	W	333	LEU
17	W	392	PHE
17	W	417	ARG
18	Y	297	ARG
18	Y	357	ASN
19	Z	17	LEU
19	Z	190	ARG
19	Z	220	LEU
19	Z	230	LEU
20	a	188	LEU
23	d	184	LYS
3	i	17	ARG
11	q	140	LEU
13	s	1	ARG
14	t	179	ARG
25	X	50	ILE
25	X	216	ILE
25	X	329	ASN
25	X	338	VAL
25	X	341	PRO
25	X	373	LYS
26	A	297	ARG
26	A	360	ARG
26	A	369	ARG
26	A	403	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
26	A	430	MET
27	B	249	ARG
27	B	314	ASN
27	B	343	ARG
27	B	410	ARG
28	C	57	ARG
28	C	78	ARG
28	C	184	LYS
29	D	47	LEU
29	D	81	ARG
29	D	384	MET
30	E	138	LEU
30	E	161	ARG
30	E	241	ARG
30	E	255	ARG
30	E	262	ASN
30	E	364	GLN
31	F	250	LYS
32	f	39	LYS
32	f	88	SER
32	f	184	LEU
32	f	207	LEU
32	f	275	MET
32	f	370	MET
32	f	387	GLN
32	f	389	LYS
32	f	391	LEU
32	f	460	ASP
32	f	463	LEU
32	f	473	ASN
32	f	479	LEU
32	f	493	ASN
32	f	565	ASN
32	f	569	LYS
32	f	639	LYS
32	f	641	GLU
32	f	662	MET
32	f	788	MET
32	f	797	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (66) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	123	GLN
3	I	20	GLN
3	I	119	GLN
3	I	146	GLN
4	J	15	HIS
4	J	85	ASN
4	J	175	ASN
5	K	99	HIS
5	K	118	ASN
5	K	214	ASN
6	L	121	GLN
8	N	28	ASN
10	P	93	ASN
12	R	38	ASN
14	T	65	GLN
15	U	475	HIS
15	U	768	GLN
15	U	880	ASN
16	V	118	GLN
16	V	283	ASN
16	V	473	GLN
17	W	235	GLN
17	W	444	HIS
18	Y	178	ASN
18	Y	306	GLN
20	a	18	GLN
20	a	62	ASN
20	a	169	HIS
20	a	193	GLN
20	a	249	GLN
22	c	128	ASN
22	c	254	ASN
22	c	256	ASN
22	c	295	ASN
24	e	6	GLN
3	i	146	GLN
3	i	149	GLN
3	i	167	ASN
5	k	214	ASN
7	m	101	ASN
9	o	62	ASN
11	q	87	ASN
11	q	168	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
12	r	38	ASN
14	t	61	GLN
14	t	65	GLN
25	X	296	ASN
26	A	150	HIS
27	B	131	HIS
28	C	90	HIS
28	C	221	GLN
28	C	332	HIS
28	C	398	ASN
29	D	133	HIS
29	D	286	GLN
29	D	295	GLN
29	D	353	ASN
30	E	194	ASN
30	E	339	ASN
31	F	333	ASN
32	f	387	GLN
32	f	452	ASN
32	f	473	ASN
32	f	493	ASN
32	f	540	GLN
32	f	752	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

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

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 5 ligands modelled in this entry, 1 is monoatomic - leaving 4 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	$\#\|Z\| > 2$
34	AGS	A	501	-	26,33,33	0.84	1 (3%)	26,52,52	1.21	2 (7%)
34	AGS	E	401	-	26,33,33	0.74	0	26,52,52	1.68	2 (7%)
34	AGS	D	501	-	26,33,33	0.79	2 (7%)	26,52,52	1.22	3 (11%)
34	AGS	F	501	-	26,33,33	0.77	0	26,52,52	1.56	4 (15%)

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
34	AGS	A	501	-	-	5/17/38/38	0/3/3/3
34	AGS	E	401	-	-	6/17/38/38	0/3/3/3
34	AGS	D	501	-	-	8/17/38/38	0/3/3/3
34	AGS	F	501	-	-	6/17/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
34	D	501	AGS	C8-N7	-2.05	1.31	1.34
34	A	501	AGS	PG-S1G	2.03	1.95	1.90
34	D	501	AGS	PG-S1G	2.02	1.95	1.90

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
34	E	401	AGS	PA-O3A-PB	-7.28	107.86	132.83
34	F	501	AGS	PA-O3A-PB	-5.52	113.87	132.83
34	D	501	AGS	PA-O3A-PB	-4.65	116.87	132.83
34	A	501	AGS	PA-O3A-PB	-4.52	117.30	132.83
34	F	501	AGS	C3'-C2'-C1'	2.74	105.11	100.98
34	F	501	AGS	C4-C5-N7	2.54	112.05	109.40

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
34	E	401	AGS	C5-C6-N6	2.33	123.89	120.35
34	D	501	AGS	C5-C6-N6	2.28	123.82	120.35
34	A	501	AGS	C5-C6-N6	2.24	123.75	120.35
34	F	501	AGS	C5-C6-N6	2.09	123.53	120.35
34	D	501	AGS	O3G-PG-O3B	2.04	111.45	104.64

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
34	A	501	AGS	C5'-O5'-PA-O1A
34	D	501	AGS	C5'-O5'-PA-O1A
34	E	401	AGS	PB-O3B-PG-O2G
34	E	401	AGS	C5'-O5'-PA-O1A
34	E	401	AGS	C5'-O5'-PA-O2A
34	F	501	AGS	PB-O3B-PG-O2G
34	F	501	AGS	C5'-O5'-PA-O1A
34	A	501	AGS	O4'-C4'-C5'-O5'
34	A	501	AGS	C3'-C4'-C5'-O5'
34	D	501	AGS	O4'-C4'-C5'-O5'
34	D	501	AGS	C3'-C4'-C5'-O5'
34	E	401	AGS	O4'-C4'-C5'-O5'
34	D	501	AGS	C4'-C5'-O5'-PA
34	D	501	AGS	C5'-O5'-PA-O3A
34	F	501	AGS	C5'-O5'-PA-O3A
34	D	501	AGS	C5'-O5'-PA-O2A
34	F	501	AGS	C5'-O5'-PA-O2A
34	A	501	AGS	C4'-C5'-O5'-PA
34	D	501	AGS	PB-O3A-PA-O2A
34	F	501	AGS	O4'-C4'-C5'-O5'
34	A	501	AGS	PG-O3B-PB-O2B
34	E	401	AGS	PB-O3B-PG-O3G
34	E	401	AGS	C5'-O5'-PA-O3A
34	F	501	AGS	C4'-C5'-O5'-PA
34	D	501	AGS	PB-O3A-PA-O1A

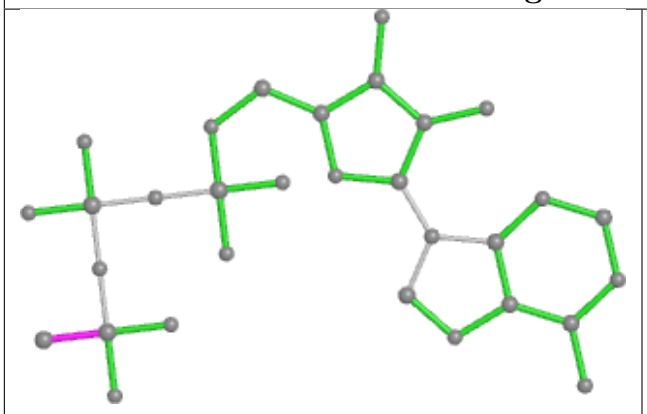
There are no ring outliers.

No monomer is involved in short contacts.

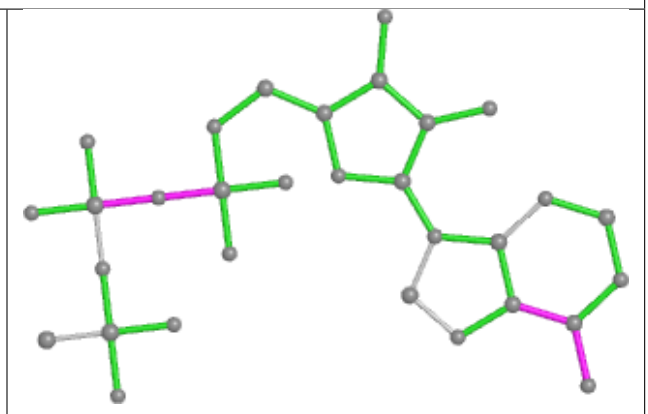
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

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.

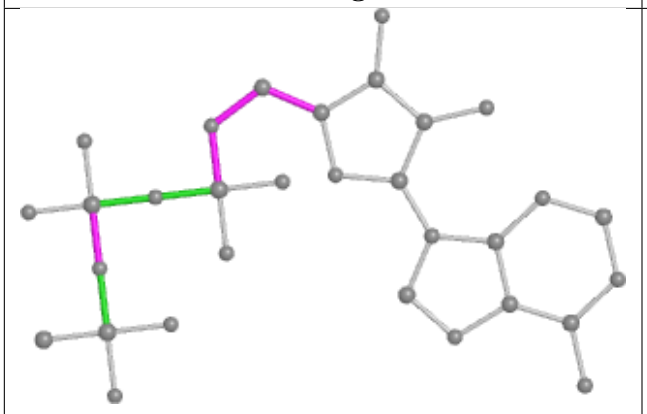
Ligand AGS A 501



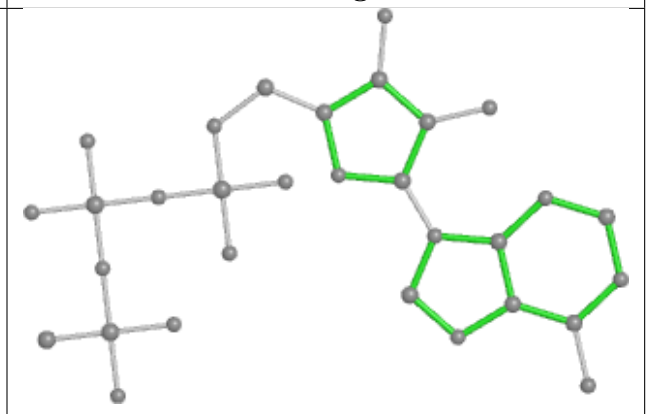
Bond lengths



Bond angles

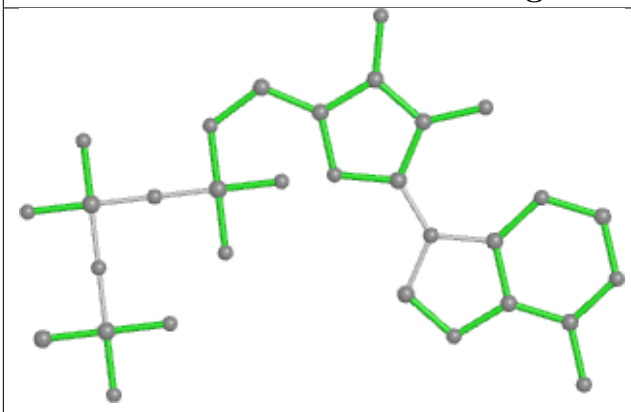


Torsions

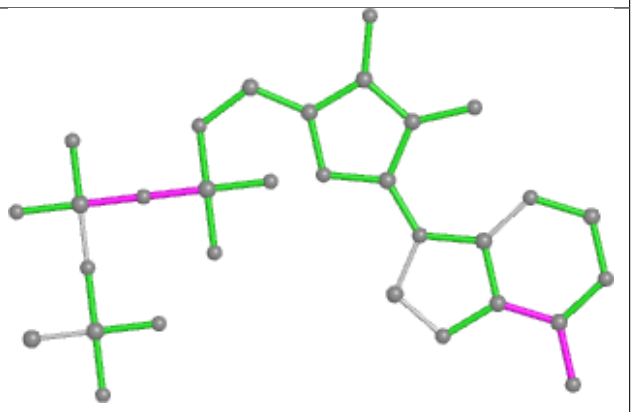


Rings

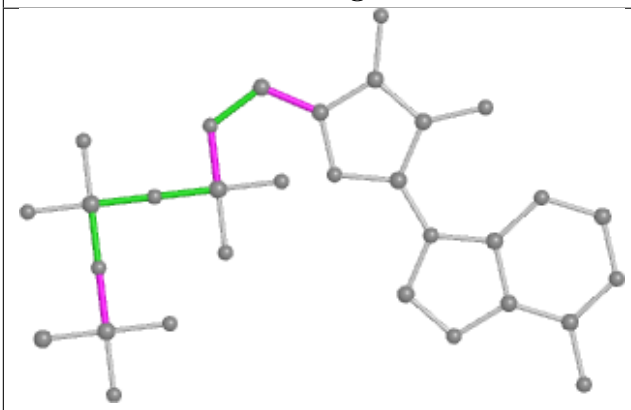
Ligand AGS E 401



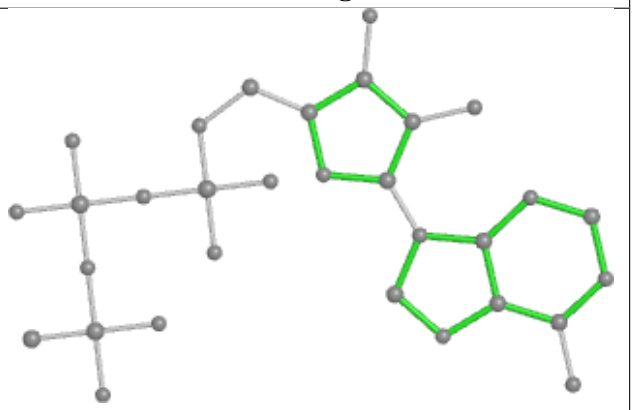
Bond lengths



Bond angles

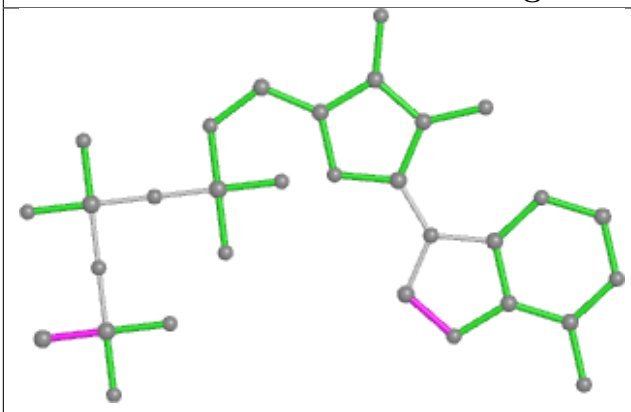


Torsions

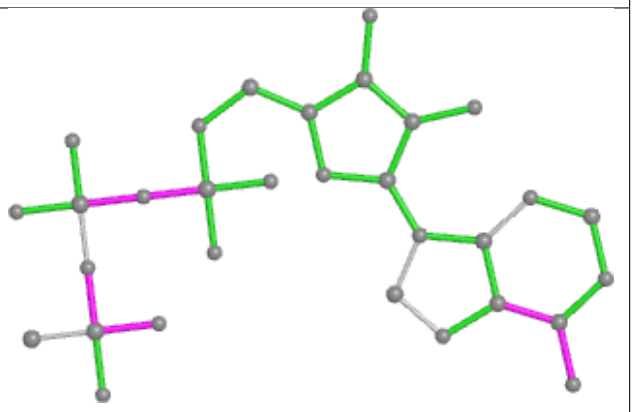


Rings

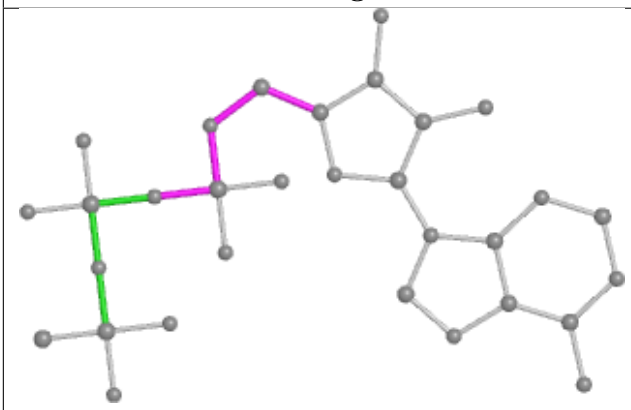
Ligand AGS D 501



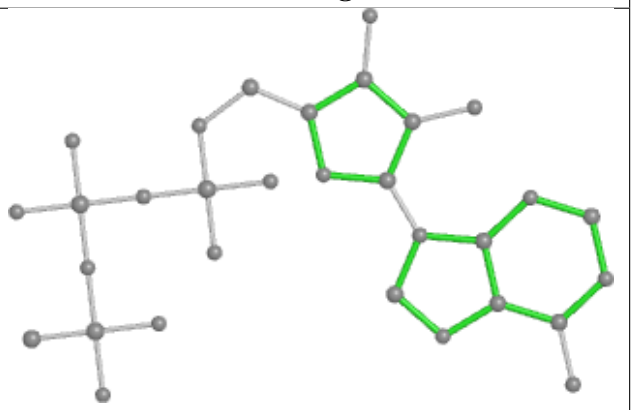
Bond lengths



Bond angles

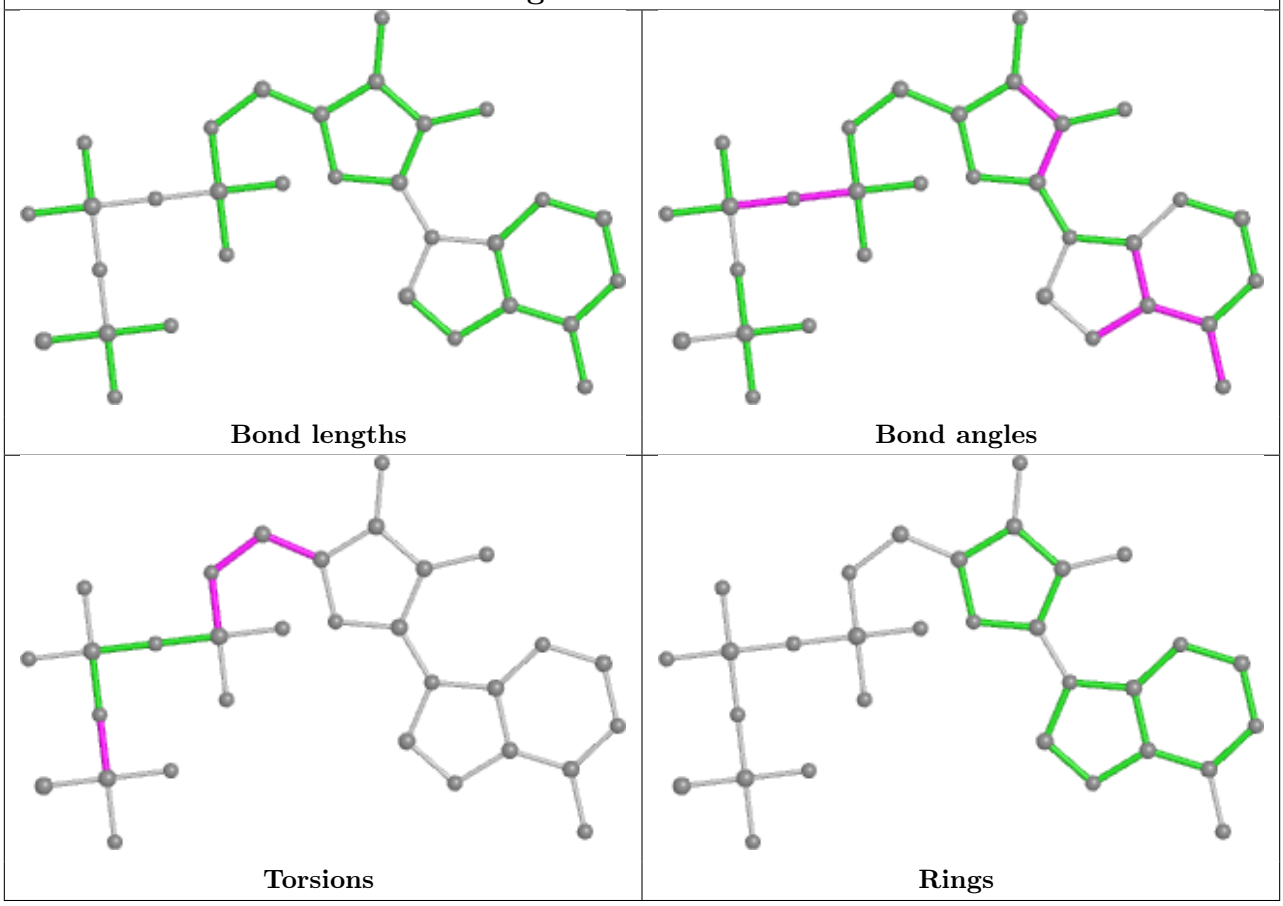


Torsions



Rings

Ligand AGS F 501



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

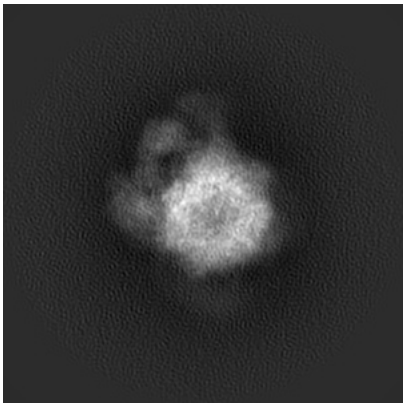
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-8663. These allow visual inspection of the internal detail of the map and identification of artifacts.

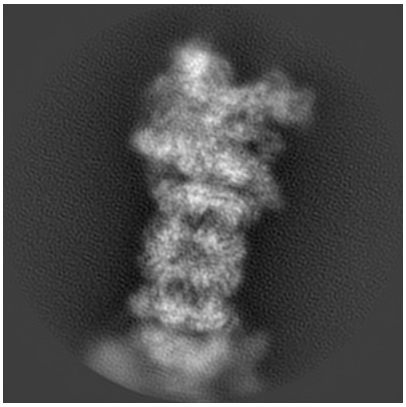
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

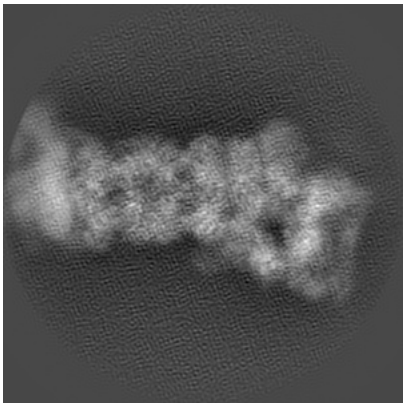
6.1.1 Primary map



X



Y

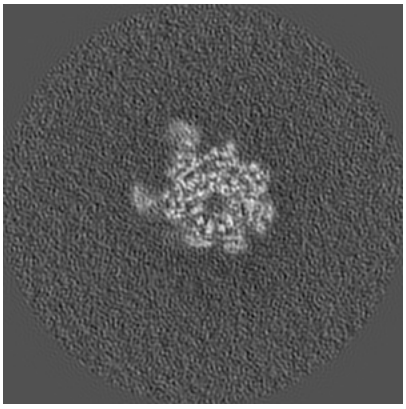


Z

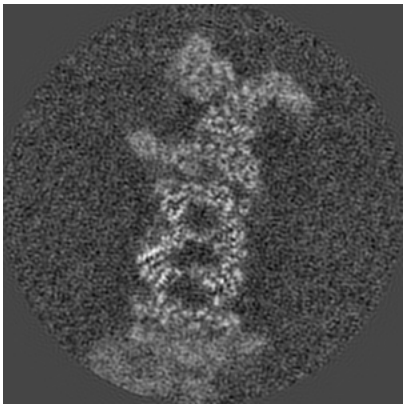
The images above show the map projected in three orthogonal directions.

6.2 Central slices

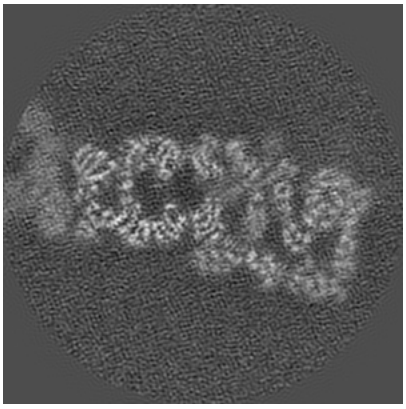
6.2.1 Primary map



X Index: 280



Y Index: 280

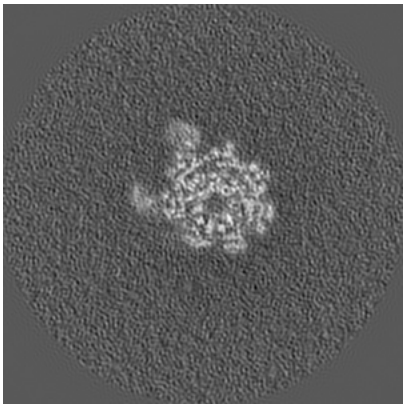


Z Index: 280

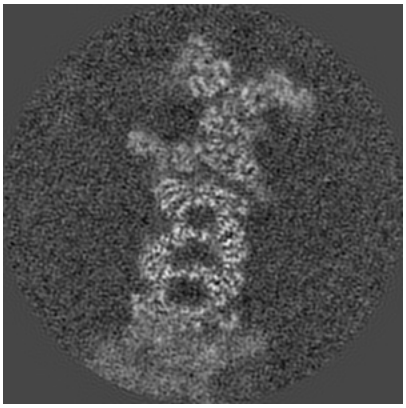
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

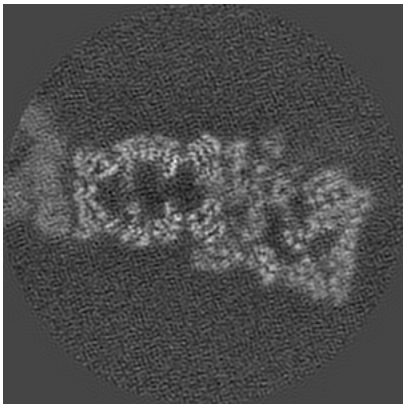
6.3.1 Primary map



X Index: 281



Y Index: 277



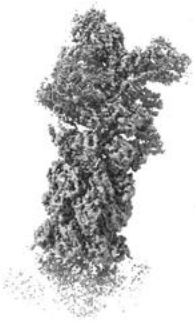
Z Index: 275

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

6.4 Orthogonal surface views (i)

6.4.1 Primary map

X



Y

Z

The images above show the 3D surface view of the map at the recommended contour level 0.008. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

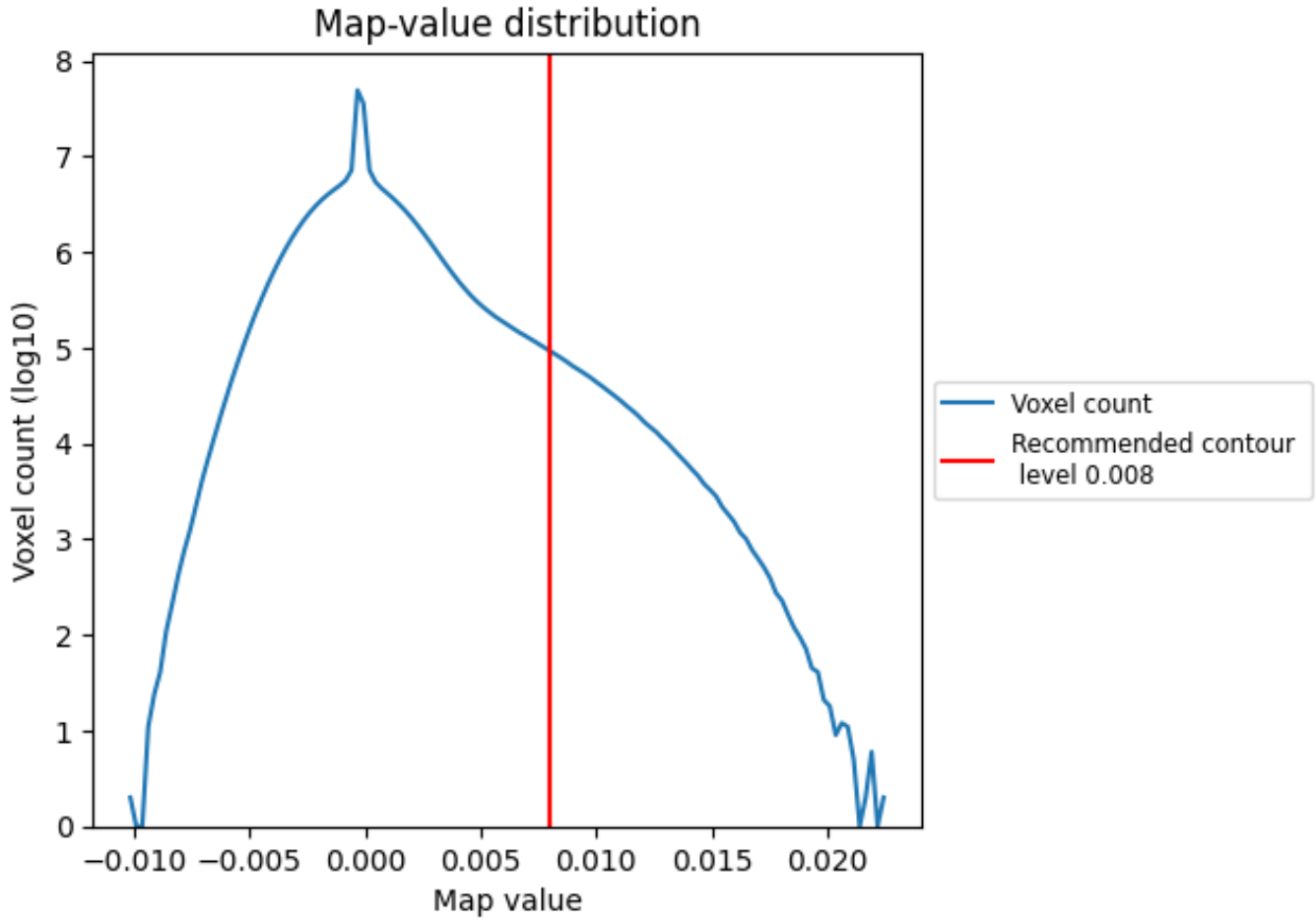
6.5 Mask visualisation (i)

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

7 Map analysis

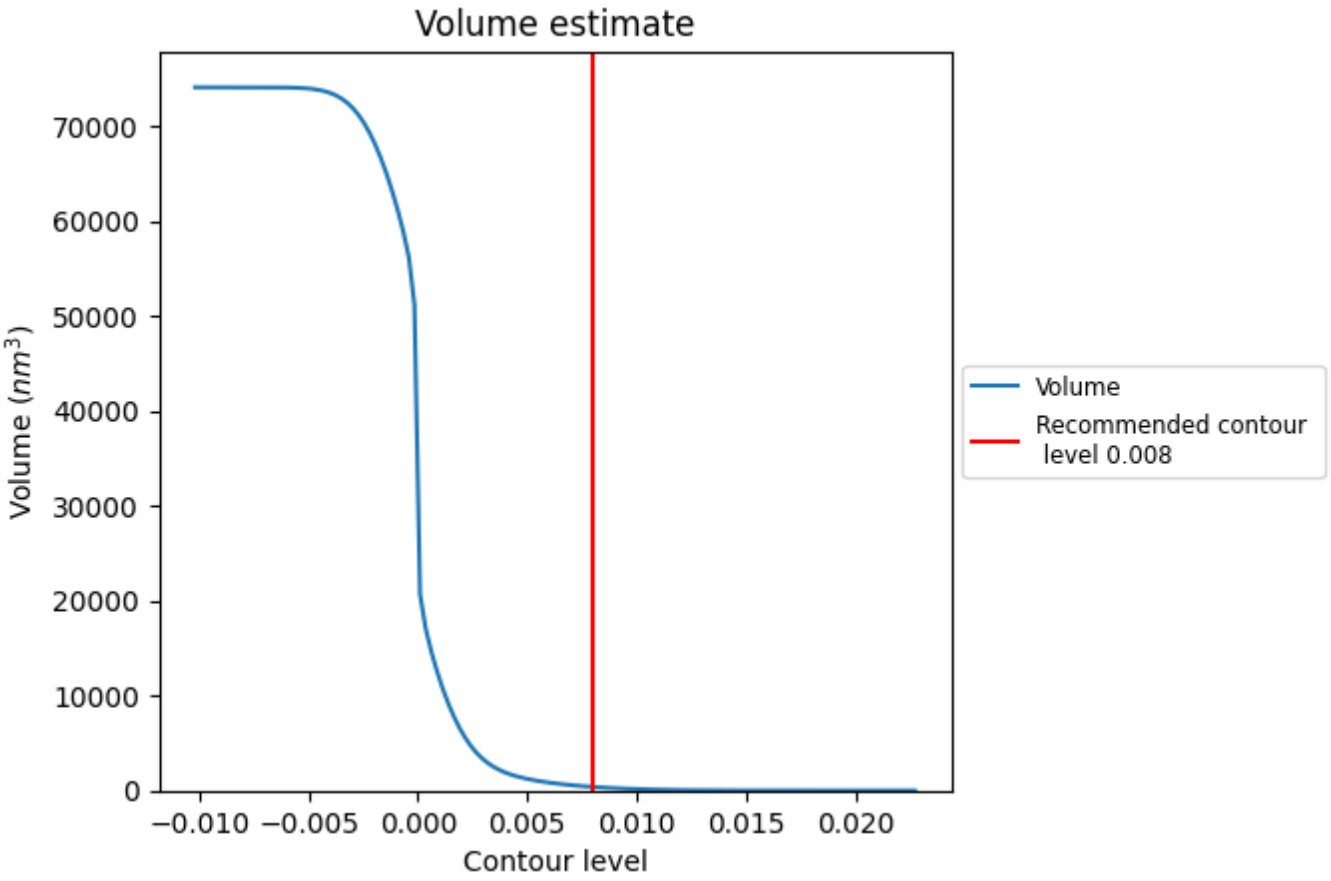
This section contains the results of statistical analysis of the map.

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.

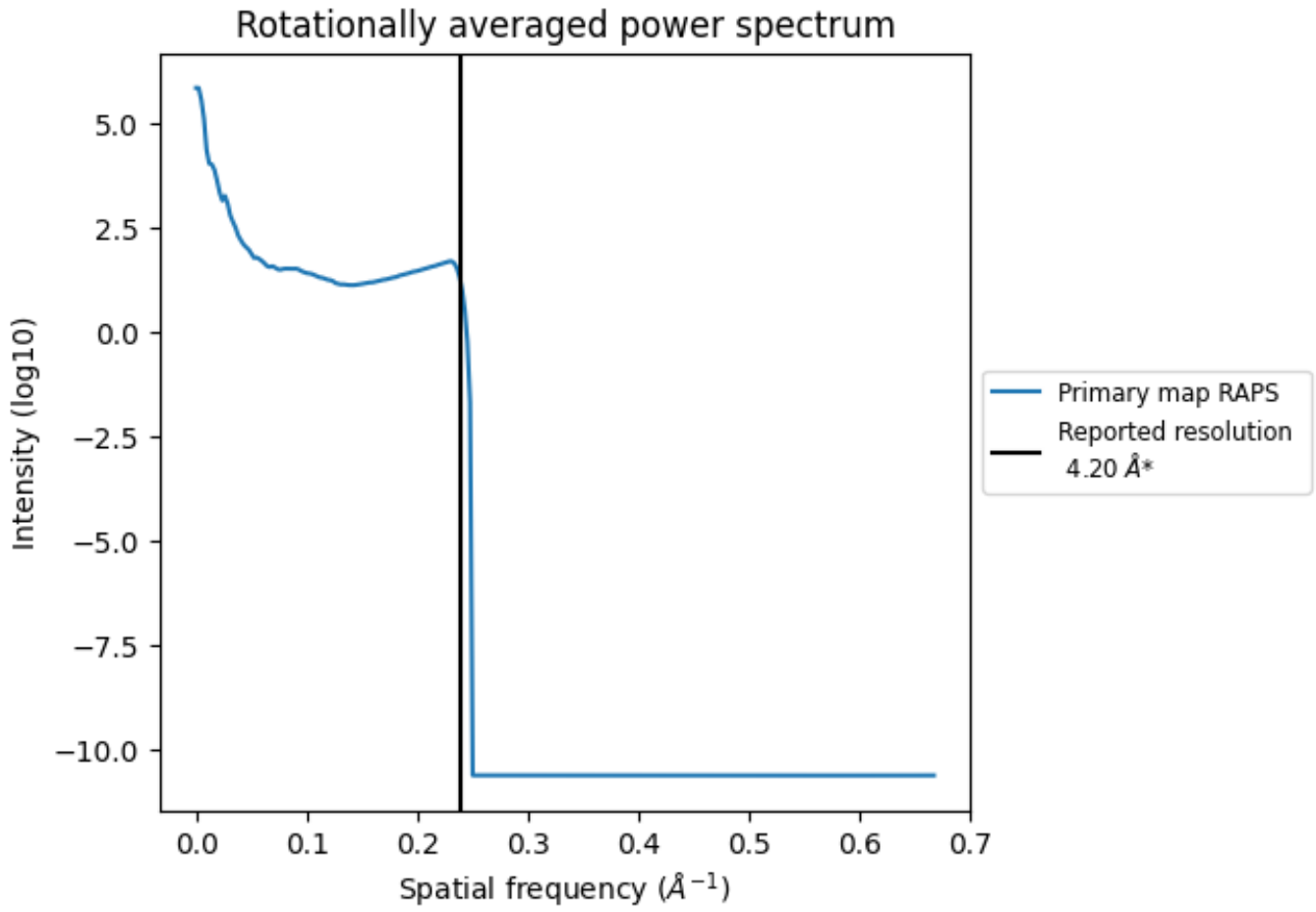
7.2 Volume estimate



The volume at the recommended contour level is 381 nm^3; this corresponds to an approximate mass of 344 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 0.238 $Å^{-1}$

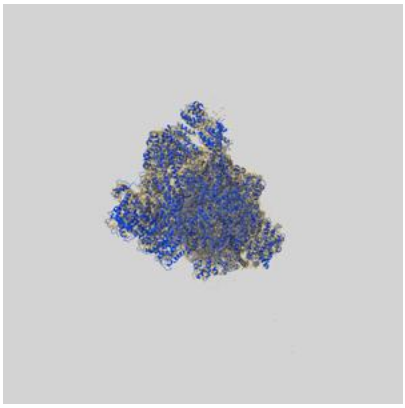
8 Fourier-Shell correlation (i)

This section was not generated. No FSC curve or half-maps provided.

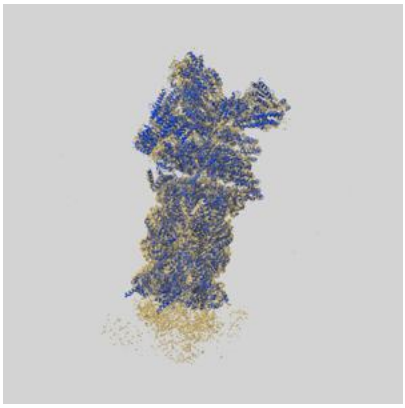
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-8663 and PDB model 5VFP. Per-residue inclusion information can be found in section 3 on page 12.

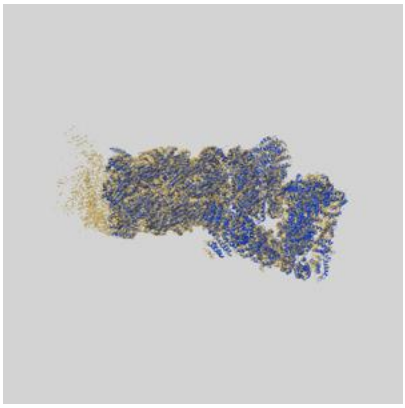
9.1 Map-model overlay



X



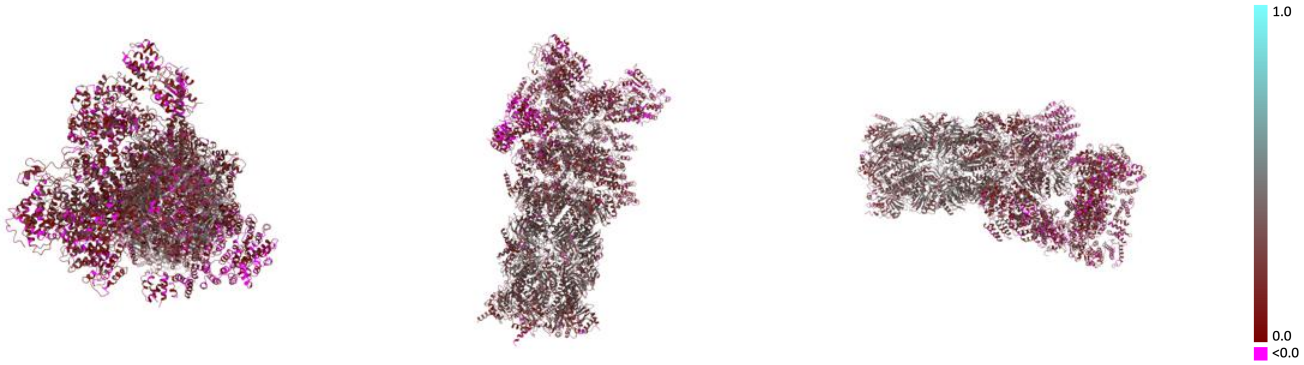
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.008 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.

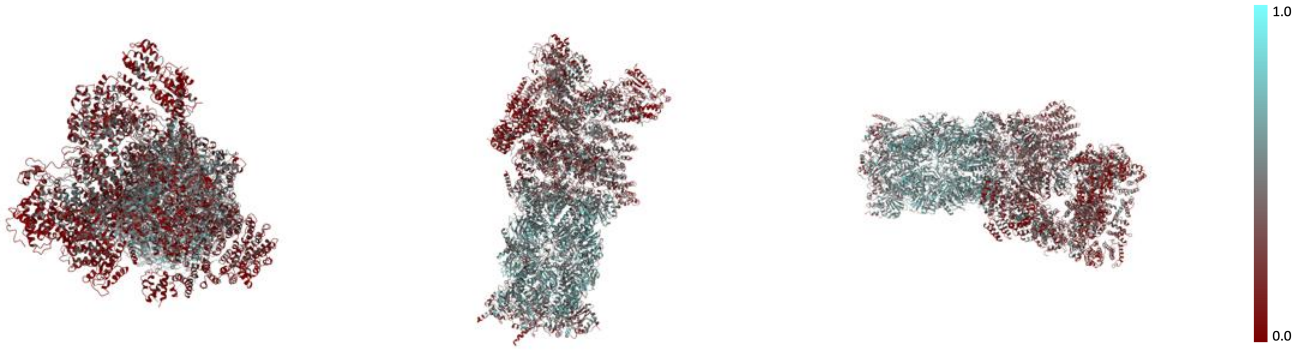
9.2 Q-score mapped to coordinate model (i)



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.

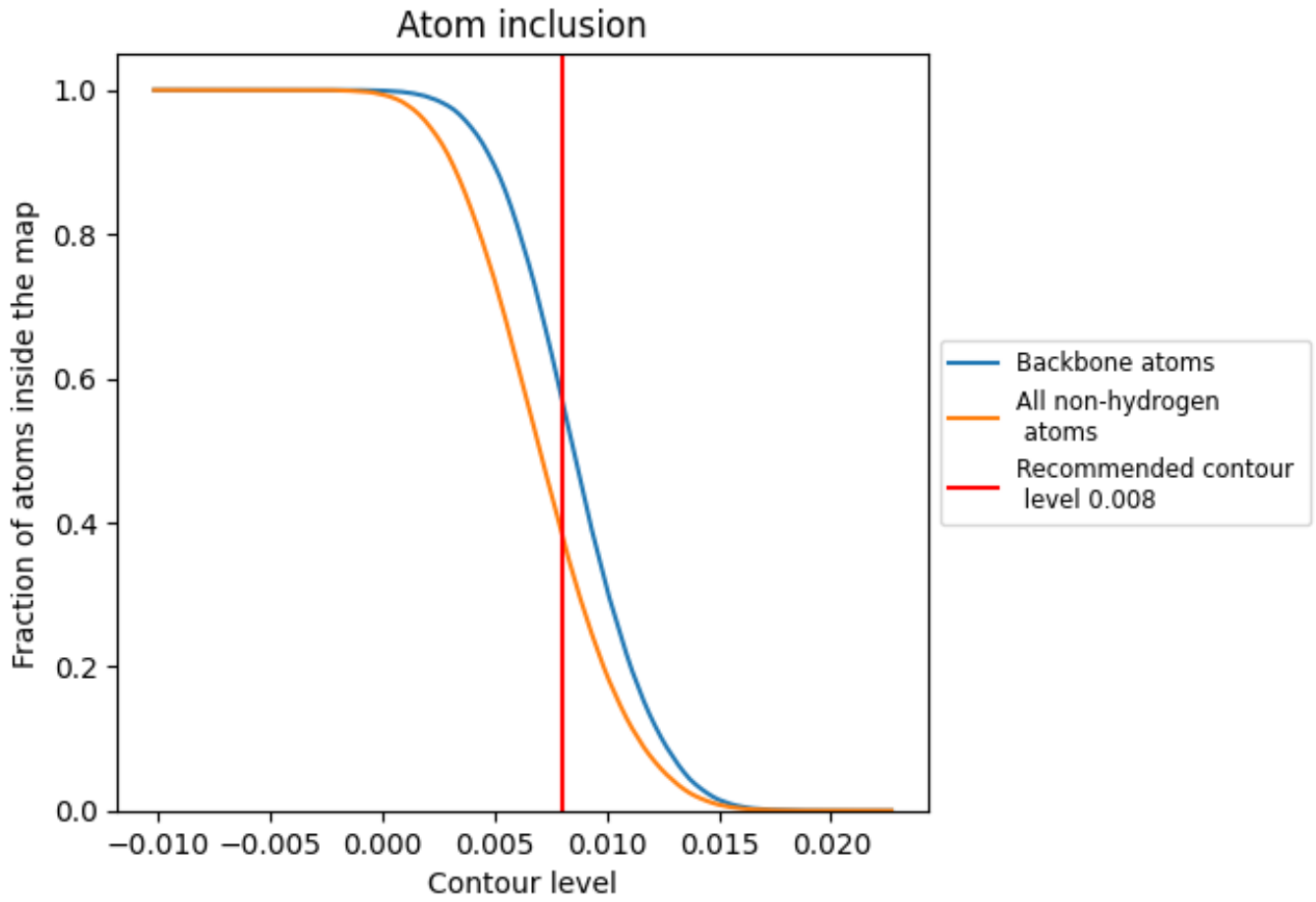
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.008).

9.4 Atom inclusion (i)



At the recommended contour level, 57% of all backbone atoms, 38% 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 (0.008) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.3844	0.2500
A	0.3479	0.2590
B	0.2809	0.2520
C	0.2833	0.2300
D	0.2945	0.2570
E	0.3565	0.2650
F	0.3604	0.2590
G	0.5151	0.3320
H	0.5355	0.3240
I	0.4578	0.2840
J	0.4328	0.2700
K	0.4492	0.2760
L	0.5042	0.3020
M	0.5069	0.3020
N	0.6130	0.3610
O	0.5520	0.3400
P	0.5706	0.3530
Q	0.5420	0.3170
R	0.5981	0.3540
S	0.5439	0.3410
T	0.5946	0.3570
U	0.2997	0.1860
V	0.2058	0.1670
W	0.2573	0.1650
X	0.2744	0.2240
Y	0.3161	0.1800
Z	0.2806	0.1930
a	0.2282	0.1600
b	0.1568	0.1470
c	0.3048	0.1920
d	0.1329	0.1380
e	0.1788	0.1800
f	0.1531	0.0730
g	0.4371	0.2810
h	0.4470	0.2890

Continued on next page...

Continued from previous page...

Chain	Atom inclusion	Q-score
i	0.4194	0.2660
j	0.4484	0.2800
k	0.4549	0.2810
l	0.5086	0.2900
m	0.4568	0.2710
n	0.6044	0.3600
o	0.5341	0.3320
p	0.5668	0.3490
q	0.5733	0.3350
r	0.6061	0.3570
s	0.5738	0.3460
t	0.6137	0.3510