



Full wwPDB EM Validation Report ⓘ

Oct 5, 2024 – 10:59 PM EDT

PDB ID : 6PTO
EMDB ID : EMD-20473
Title : Structure of Ctf4 trimer in complex with three CMG helicases
Authors : Yuan, Z.; Georgescu, R.; Bai, L.; Santos, R.; Donnell, M.; Li, H.
Deposited on : 2019-07-16
Resolution : 7.00 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:

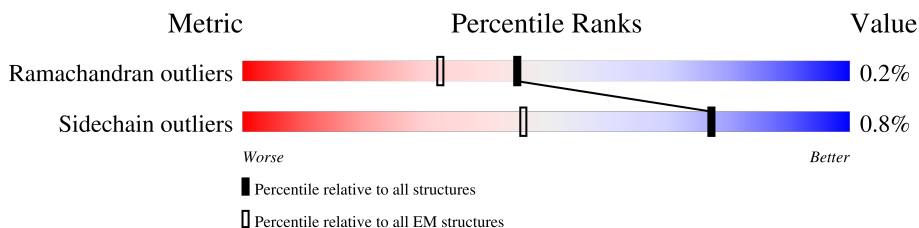
EMDB validation analysis : 0.0.1.dev113
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 7.00 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	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	X	927	46% 54%
1	Y	927	46% 54%
1	Z	927	46% 54%
2	A	208	19% 99%
2	a	208	23% 99%
2	n	208	12% 99%
3	B	213	7% 84% 15%
3	b	213	6% 84% 15%
3	o	213	5% 84% 15%



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Mol	Chain	Length	Quality of chain	
4	C	194	17%	80% 18%
4	c	194	19%	81% 18%
4	p	194	10%	80% 18%
5	D	294	9%	80% 20%
5	d	294	6%	80% 20%
5	q	294	5%	80% 20%
6	E	650	16%	83% 15%
6	e	650	12%	83% 15%
6	r	650	14%	83% 15%
7	2	868	56%	72% 27%
7	F	868	51%	72% 27%
7	h	868	45%	72% 27%
8	3	971	40%	61% 39%
8	G	971	39%	61% 39%
8	i	971	24%	61% 39%
9	4	933	63%	72% 27%
9	H	933	59%	72% 27%
9	j	933	51%	72% 27%
10	5	775	46%	76% 23%
10	I	775	43%	76% 23%
10	k	775	36%	76% 23%
11	6	1017	49%	59% 40%
11	J	1017	45%	59% 40%
11	l	1017	36%	59% 40%
12	7	845	65%	78% 22%

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Mol	Chain	Length	Quality of chain
12	K	845	
12	m	845	

2 Entry composition [i](#)

There are 13 unique types of molecules in this entry. The entry contains 132192 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called DNA polymerase alpha-binding protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	X	424	Total	C	N	O	S	1	0
			3416	2193	566	642	15		
1	Y	431	Total	C	N	O	S	0	0
			3464	2223	574	651	16		
1	Z	424	Total	C	N	O	S	1	0
			3416	2193	566	642	15		

- Molecule 2 is a protein called DNA replication complex GINS protein PSF1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	n	208	Total	C	N	O	S	0	0
			1696	1065	290	331	10		
2	A	208	Total	C	N	O	S	0	0
			1696	1065	290	331	10		
2	a	208	Total	C	N	O	S	0	0
			1696	1065	290	331	10		

- Molecule 3 is a protein called DNA replication complex GINS protein PSF2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	o	181	Total	C	N	O	S	0	0
			1513	978	261	270	4		
3	B	181	Total	C	N	O	S	0	0
			1513	978	261	270	4		
3	b	181	Total	C	N	O	S	0	0
			1513	978	261	270	4		

- Molecule 4 is a protein called DNA replication complex GINS protein PSF3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	p	159	Total	C	N	O	S	0	0
			1288	843	207	232	6		

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Mol	Chain	Residues	Atoms					AltConf	Trace
4	C	159	Total	C	N	O	S	0	0
			1288	843	207	232	6		
4	c	159	Total	C	N	O	S	0	0
			1288	843	207	232	6		

- Molecule 5 is a protein called DNA replication complex GINS protein SLD5.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	q	234	Total	C	N	O	S	0	0
			1924	1224	315	372	13		
5	D	234	Total	C	N	O	S	0	0
			1924	1224	315	372	13		
5	d	234	Total	C	N	O	S	0	0
			1924	1224	315	372	13		

- Molecule 6 is a protein called Cell division control protein 45.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	e	553	Total	C	N	O	S	0	0
			4482	2862	763	844	13		
6	E	553	Total	C	N	O	S	0	0
			4482	2862	763	844	13		
6	r	553	Total	C	N	O	S	0	0
			4482	2862	763	844	13		

- Molecule 7 is a protein called DNA replication licensing factor MCM2.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	h	634	Total	C	N	O	S	0	0
			4970	3122	897	934	17		
7	2	634	Total	C	N	O	S	0	0
			4970	3122	897	934	17		
7	F	634	Total	C	N	O	S	0	0
			4970	3122	897	934	17		

- Molecule 8 is a protein called DNA replication licensing factor MCM3.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	i	594	Total	C	N	O	S	0	0
			4659	2936	832	878	13		
8	3	594	Total	C	N	O	S	0	0
			4659	2936	832	878	13		

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Mol	Chain	Residues	Atoms					AltConf	Trace
8	G	594	Total	C	N	O	S	0	0
			4659	2936	832	878	13		

- Molecule 9 is a protein called DNA replication licensing factor MCM4.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	j	682	Total	C	N	O	S	0	0
			5410	3397	946	1039	28		
9	4	682	Total	C	N	O	S	0	0
			5410	3397	946	1039	28		
9	H	682	Total	C	N	O	S	0	0
			5410	3397	946	1039	28		

- Molecule 10 is a protein called Minichromosome maintenance protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	k	597	Total	C	N	O	S	0	0
			4688	2946	808	910	24		
10	5	597	Total	C	N	O	S	0	0
			4688	2946	808	910	24		
10	I	597	Total	C	N	O	S	0	0
			4688	2946	808	910	24		

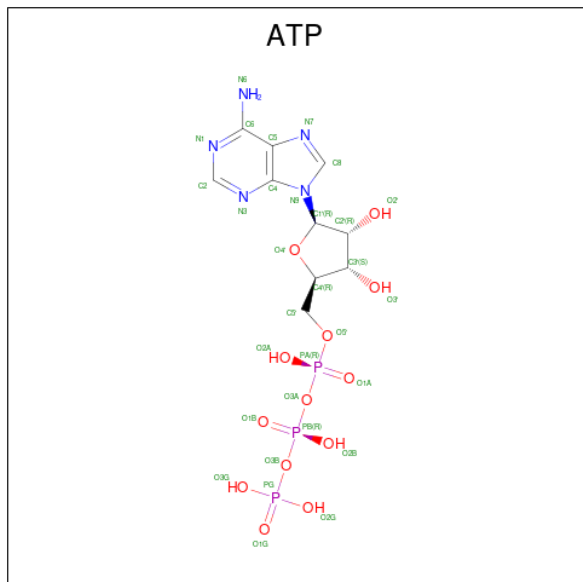
- Molecule 11 is a protein called DNA replication licensing factor MCM6.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	l	614	Total	C	N	O	S	0	0
			4720	2971	836	893	20		
11	6	614	Total	C	N	O	S	0	0
			4720	2971	836	893	20		
11	J	614	Total	C	N	O	S	0	0
			4720	2971	836	893	20		

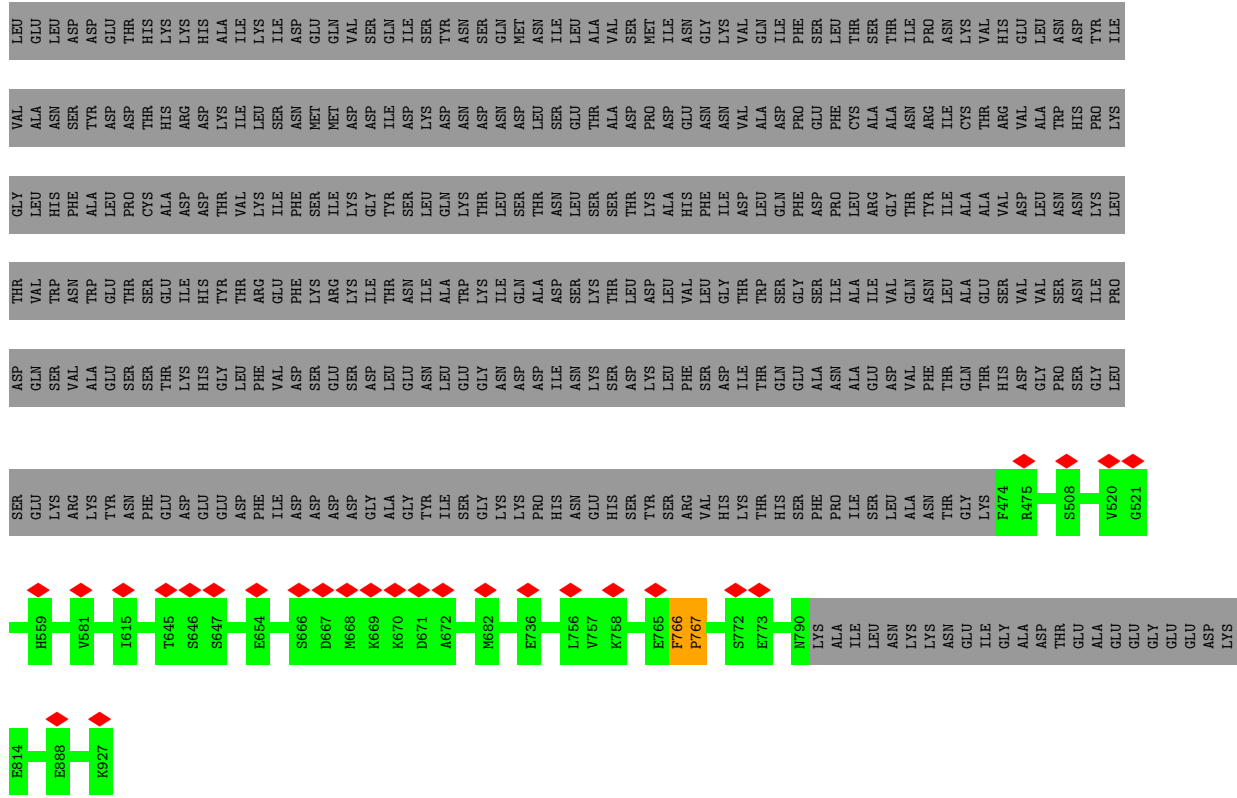
- Molecule 12 is a protein called DNA replication licensing factor MCM7.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	m	663	Total	C	N	O	S	0	0
			5220	3290	904	996	30		
12	7	663	Total	C	N	O	S	0	0
			5220	3290	904	996	30		
12	K	663	Total	C	N	O	S	0	0
			5220	3290	904	996	30		

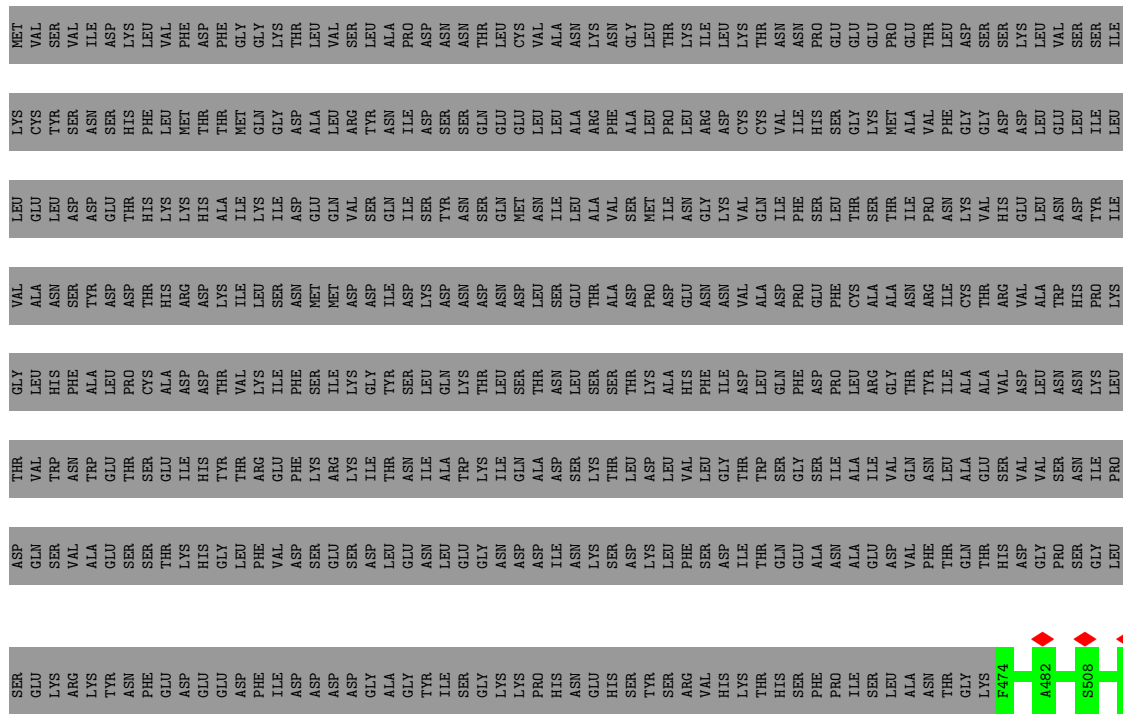
- Molecule 13 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).

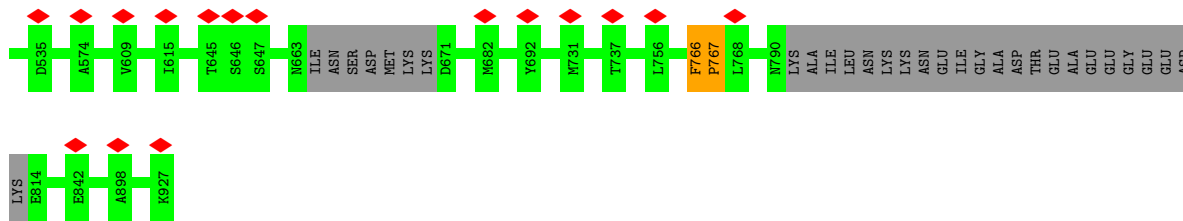


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
13	h	1	Total 31	C 10	N 5	O 13	P 3	0
13	i	1	Total 31	C 10	N 5	O 13	P 3	0
13	k	1	Total 31	C 10	N 5	O 13	P 3	0
13	2	1	Total 31	C 10	N 5	O 13	P 3	0
13	3	1	Total 31	C 10	N 5	O 13	P 3	0
13	5	1	Total 31	C 10	N 5	O 13	P 3	0

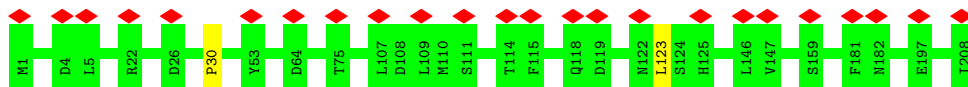


● Molecule 1: DNA polymerase alpha-binding protein

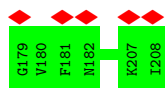
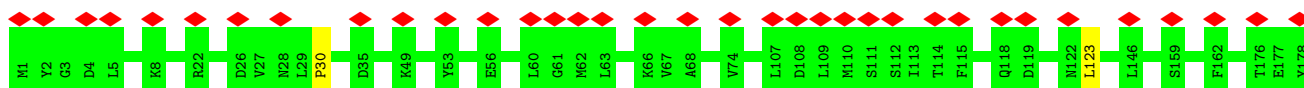




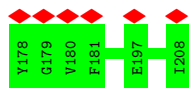
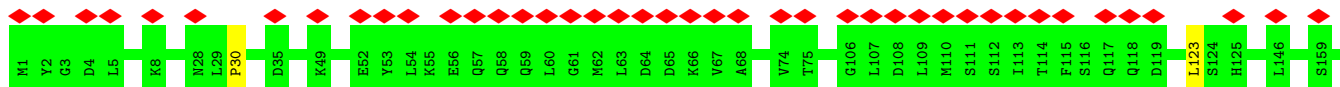
• Molecule 2: DNA replication complex GINS protein PSF1



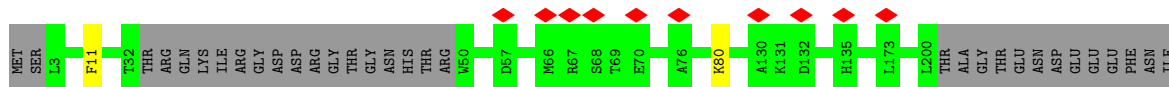
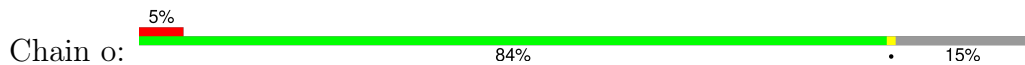
• Molecule 2: DNA replication complex GINS protein PSF1



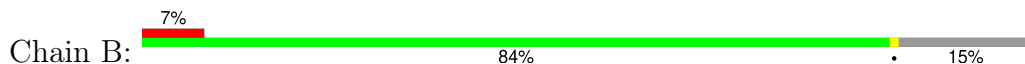
• Molecule 2: DNA replication complex GINS protein PSF1

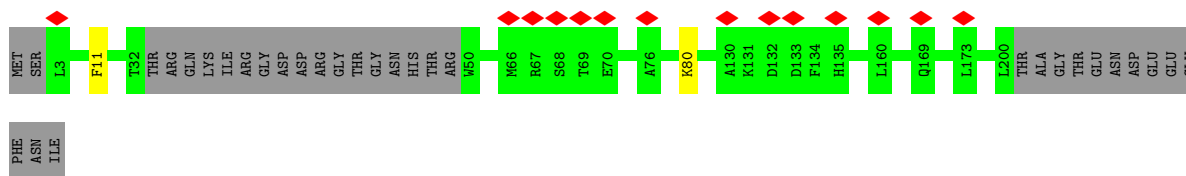


• Molecule 3: DNA replication complex GINS protein PSF2

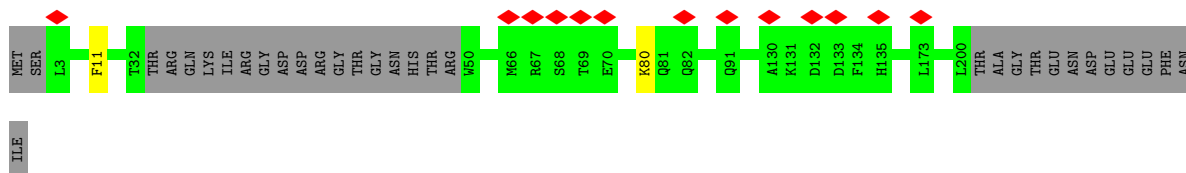
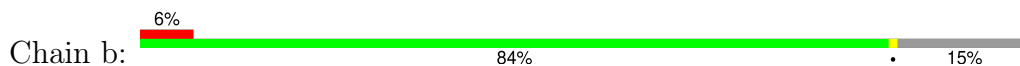


• Molecule 3: DNA replication complex GINS protein PSF2

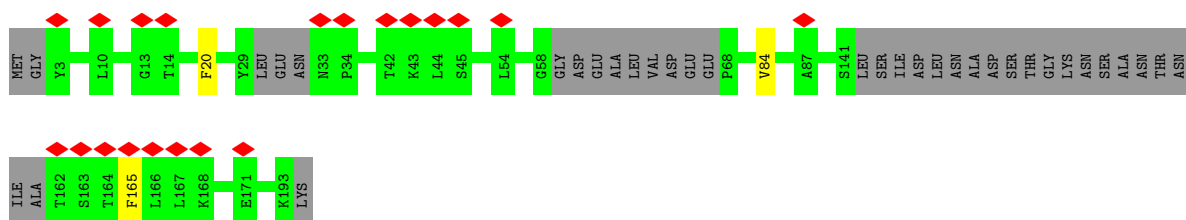
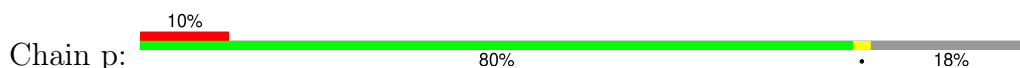




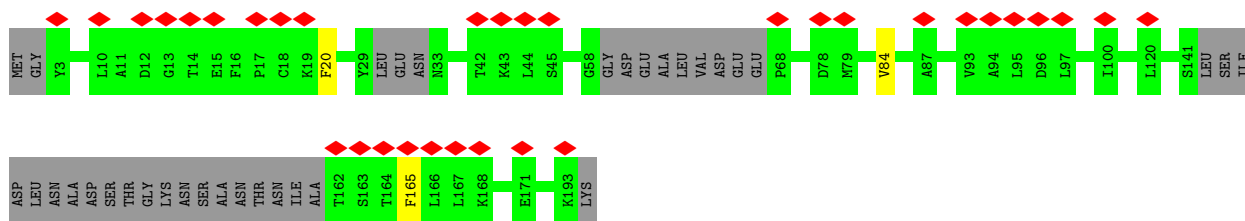
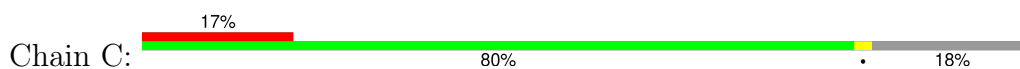
• Molecule 3: DNA replication complex GINS protein PSF2



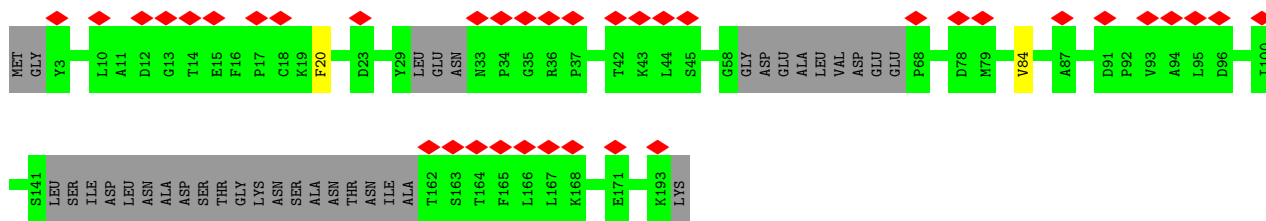
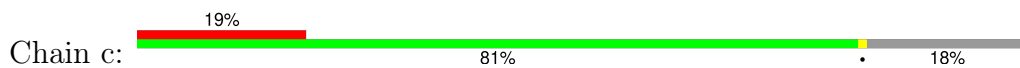
• Molecule 4: DNA replication complex GINS protein PSF3



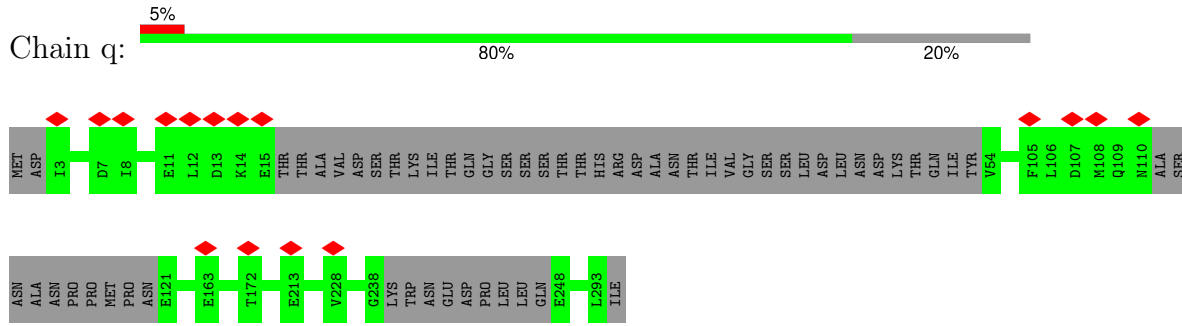
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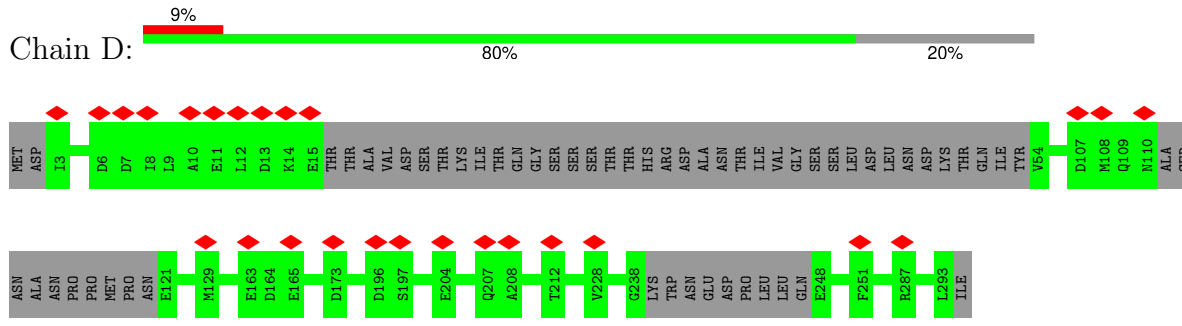
• Molecule 4: DNA replication complex GINS protein PSF3



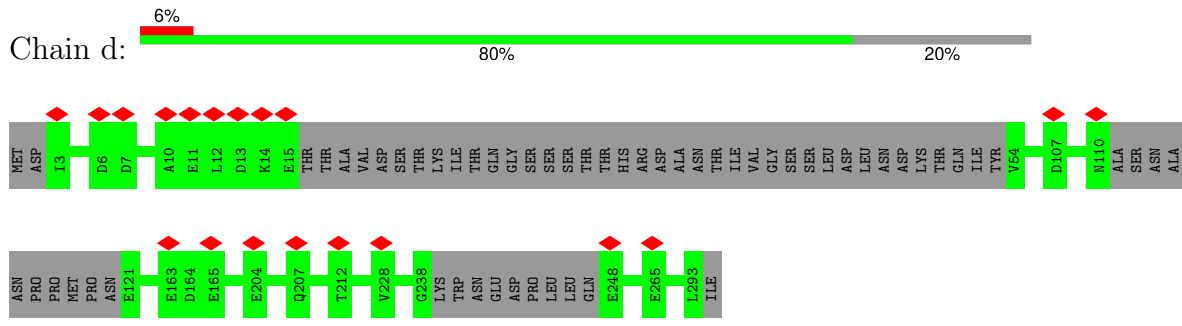
• Molecule 5: DNA replication complex GINS protein SLD5



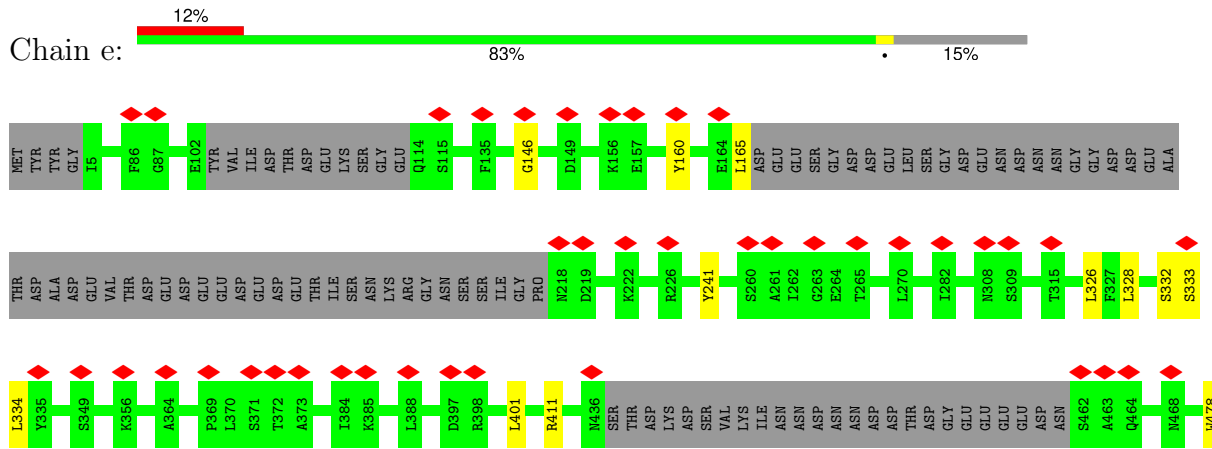
• Molecule 5: DNA replication complex GINS protein SLD5

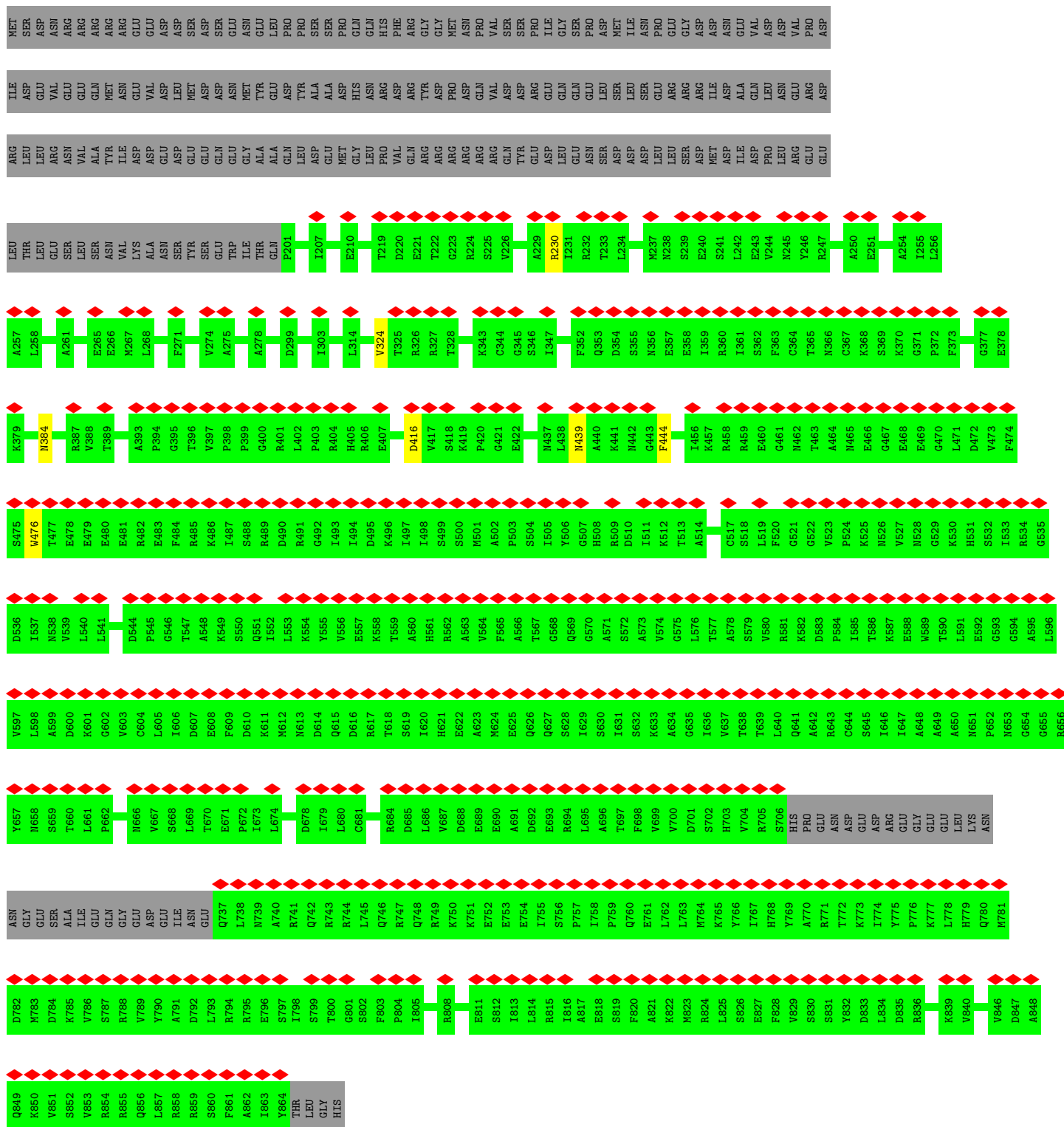


• Molecule 5: DNA replication complex GINS protein SLD5



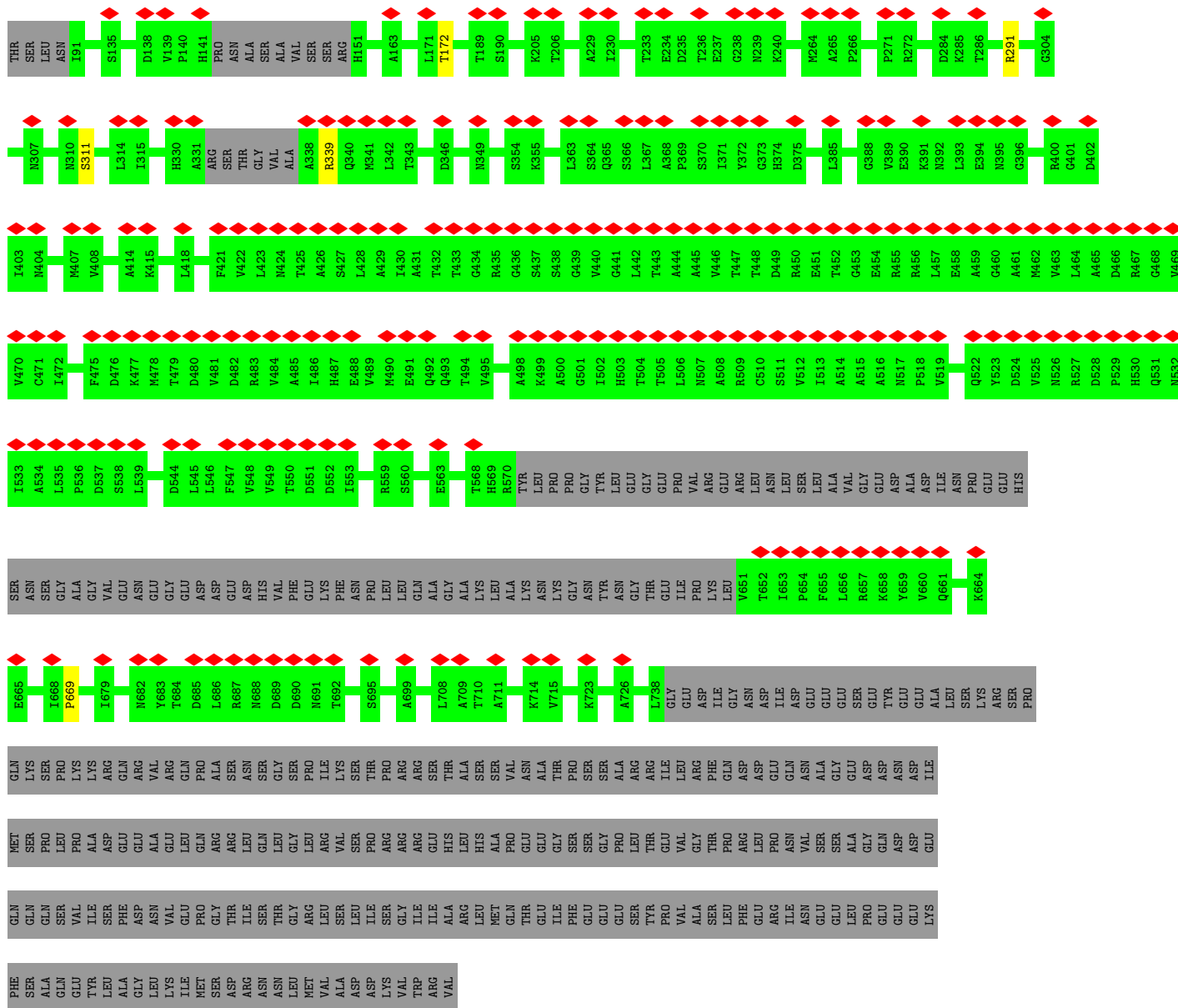
• Molecule 6: Cell division control protein 45



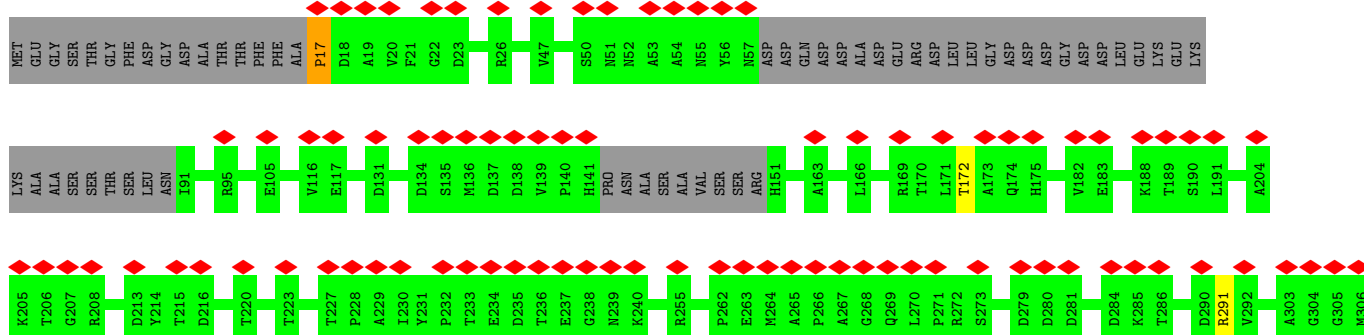
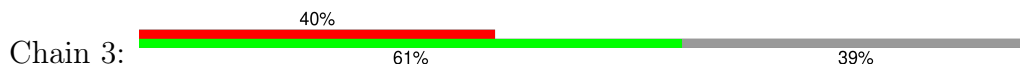


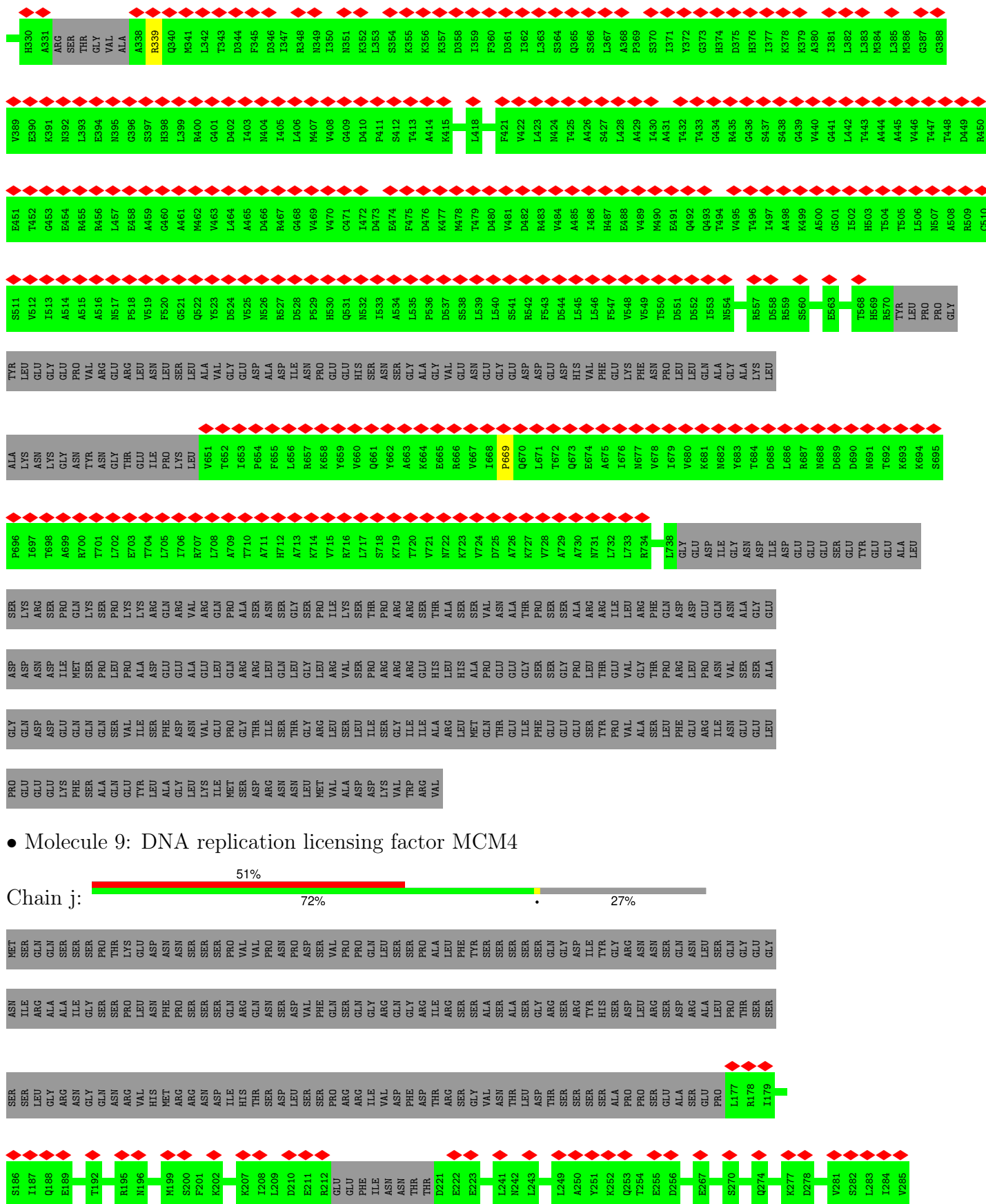
● Molecule 8: DNA replication licensing factor MCM3

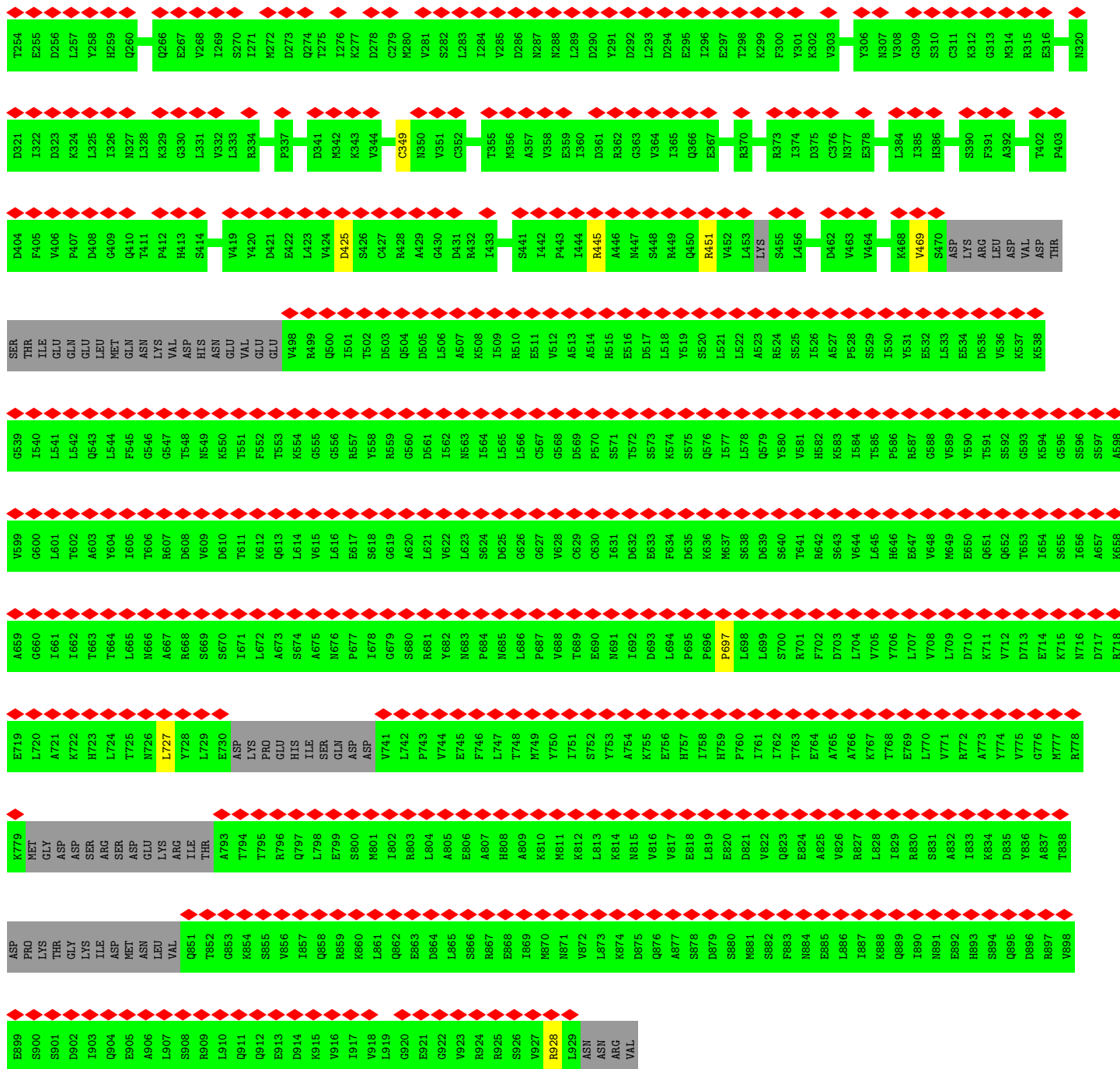




- Molecule 8: DNA replication licensing factor MCM3



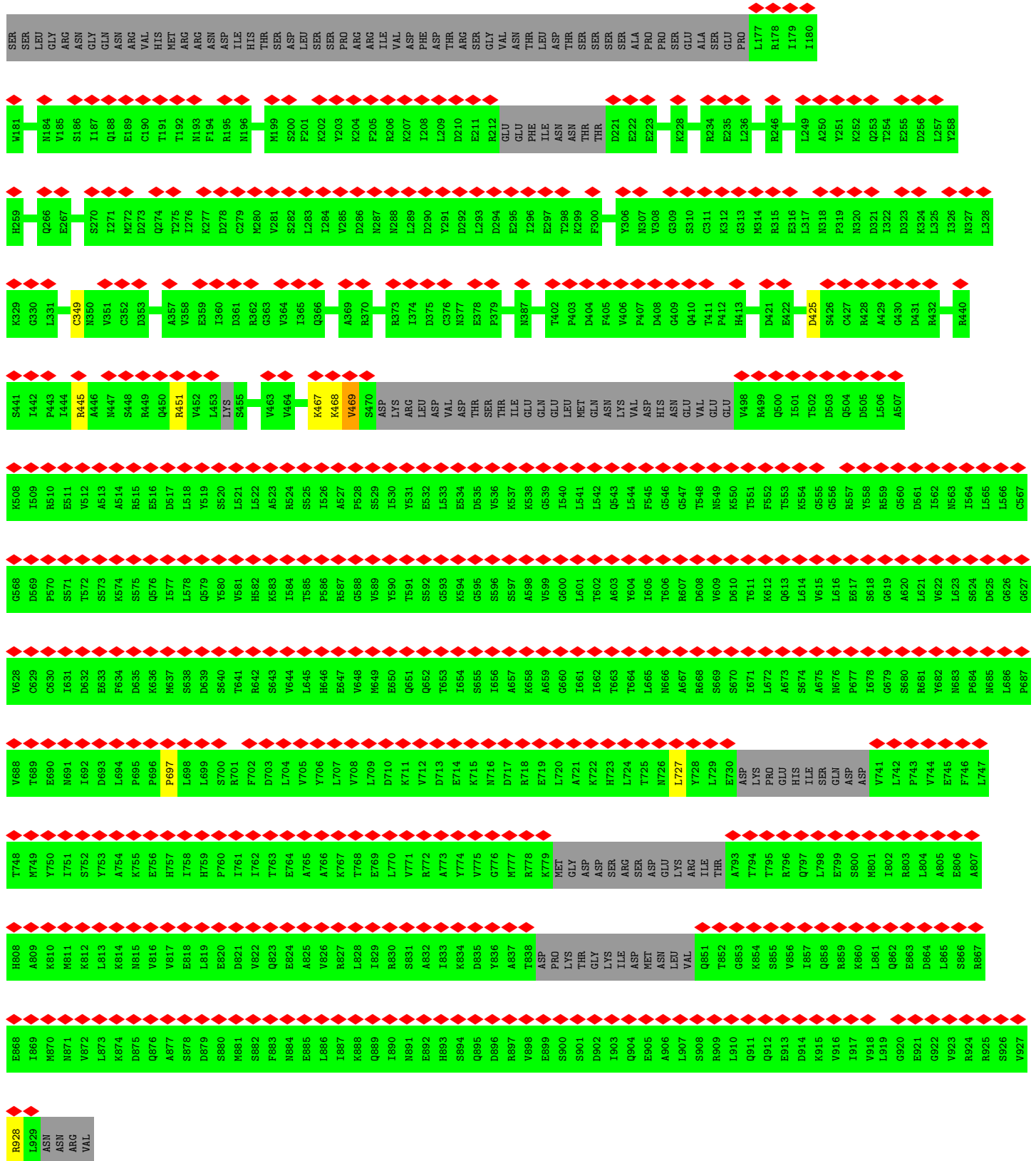




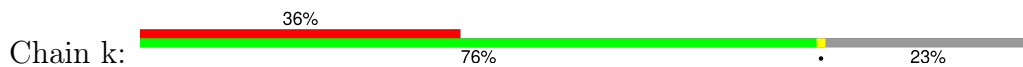
● Molecule 9: DNA replication licensing factor MCM4

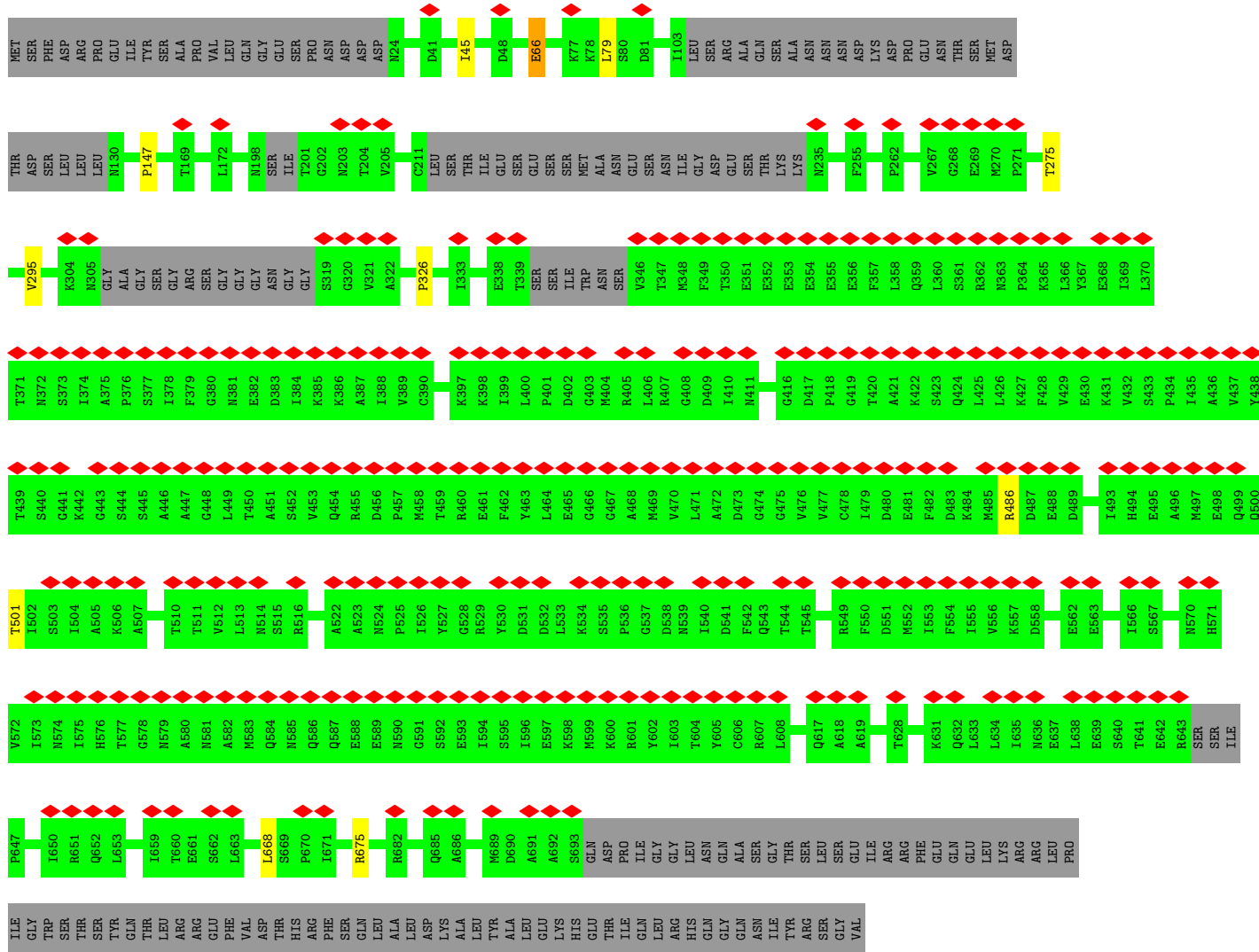


MET	ASN
SER	ILE
GLN	ARG
THR	ALA
GLY	ALA
SER	ILE
SER	GLY
PRO	SER
THR	PRO
LYS	PRO
GLU	LEU
LEU	LEU
VAL	ASN
ASN	PHE
THR	PRO
SER	SER
SER	SER
GLN	SER
PRO	GLN
PRO	PRO
VAL	ARG
VAL	ARG
VAL	GLN
PRO	ASN
ASN	ASN
PRO	ASP
PRO	VAL
VAL	PHE
VAL	GLN
PRO	SER
PRO	PRO
GLN	GLN
GLY	GLY
LEU	ARG
LEU	LEU
SER	SER
SER	TYR
SER	TYR
GLY	HIS
ARG	GLY
ASN	ASP
ASN	LEU
ASN	ARG
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LEU	LEU
LEU	LEU
PRO	PRO
THR	THR
GLY	SER

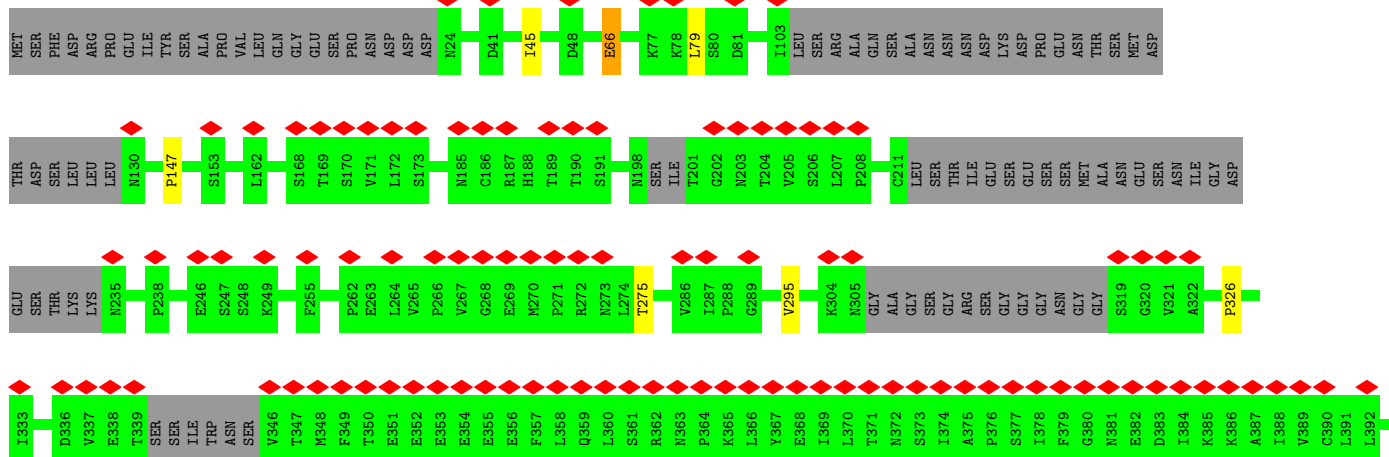
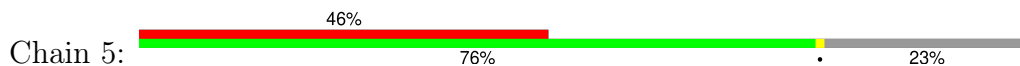


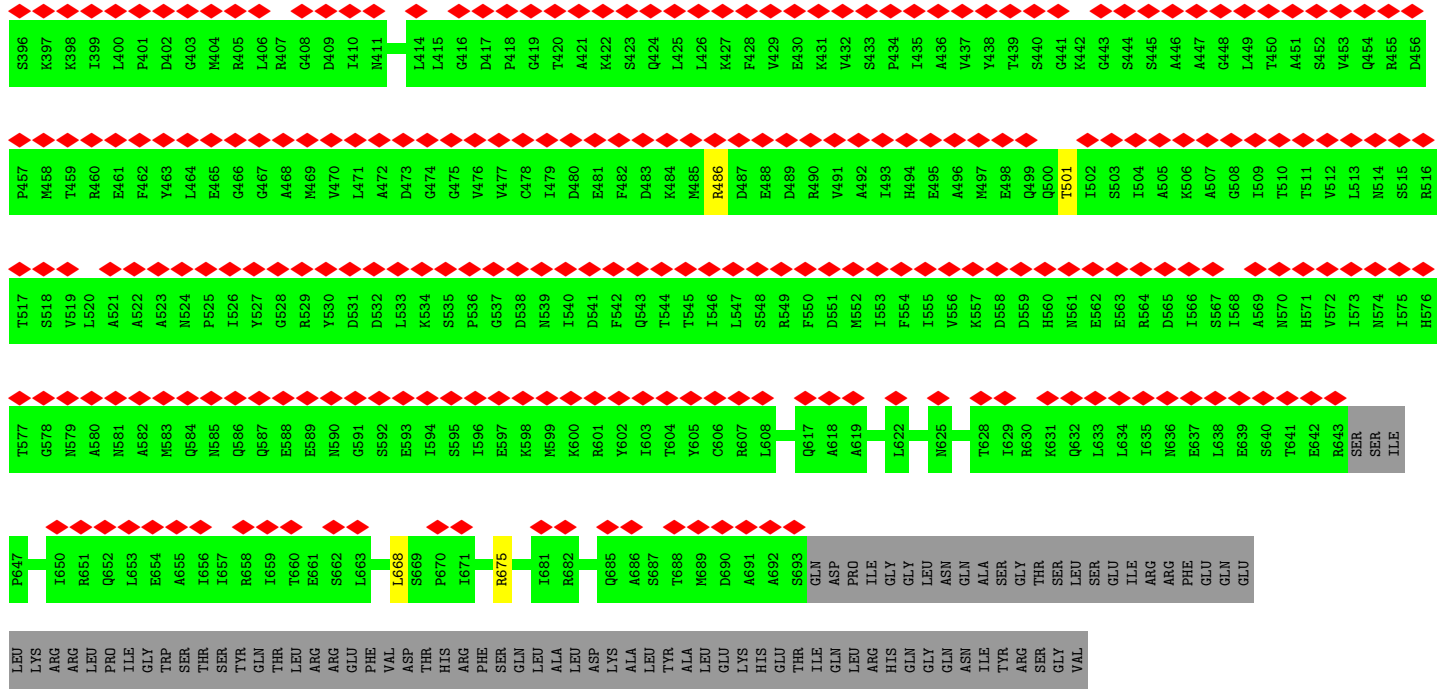
• Molecule 10: Minichromosome maintenance protein 5



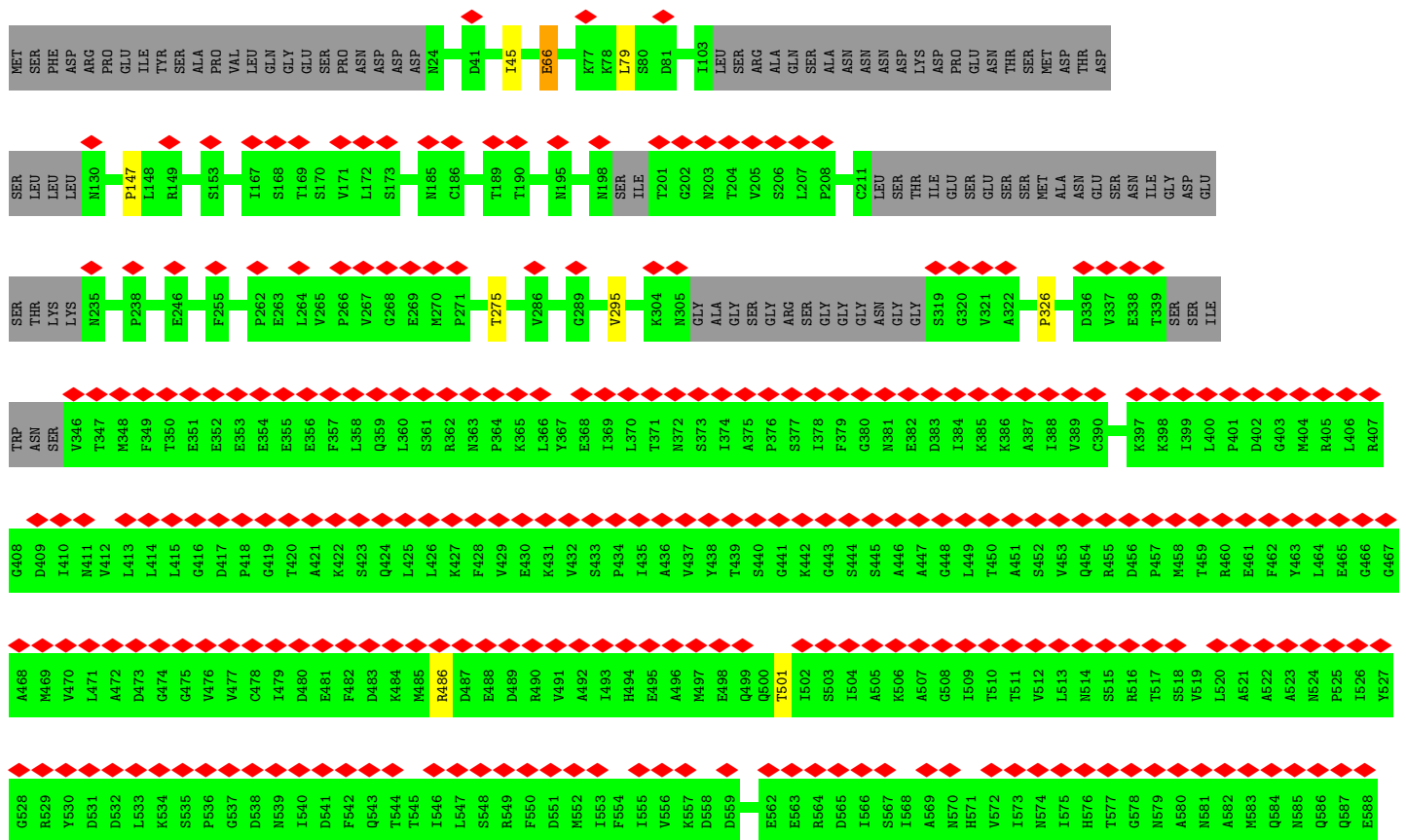
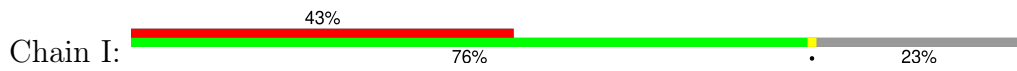


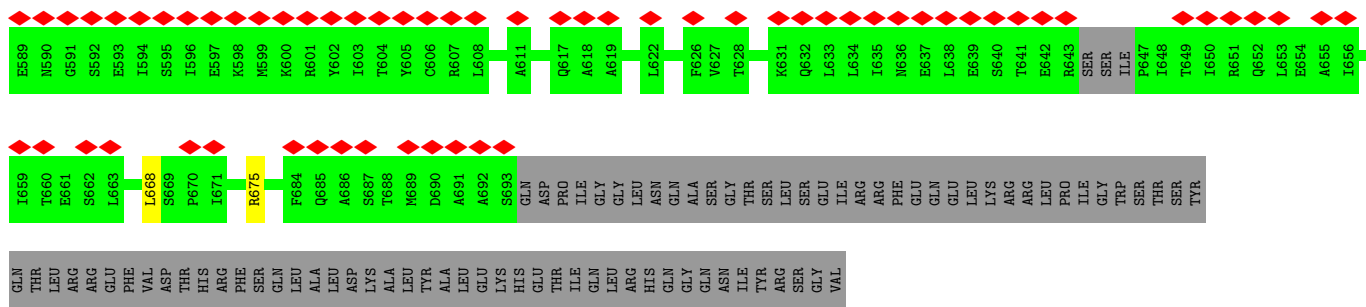
• Molecule 10: Minichromosome maintenance protein 5



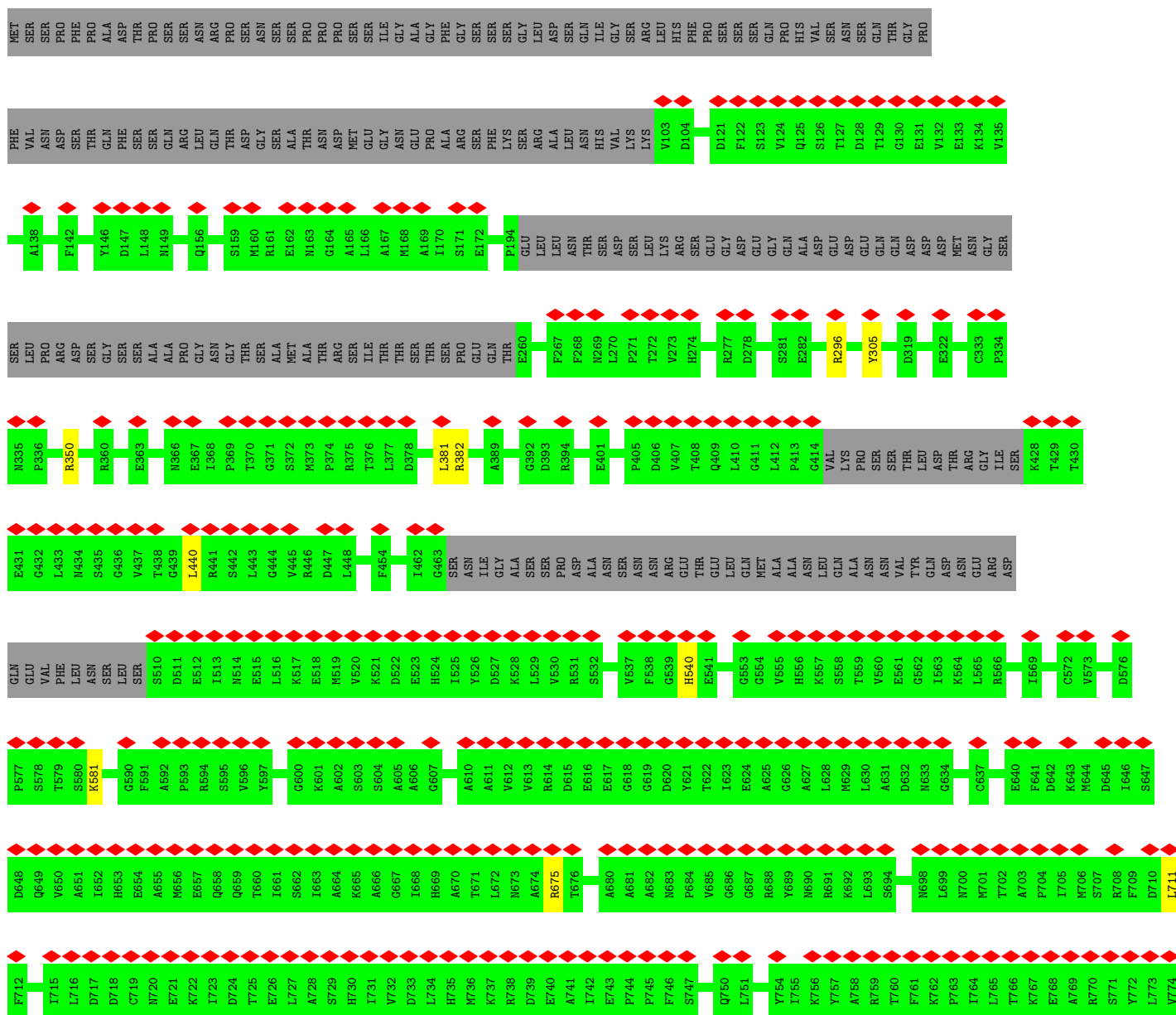


● Molecule 10: Minichromosome maintenance protein 5



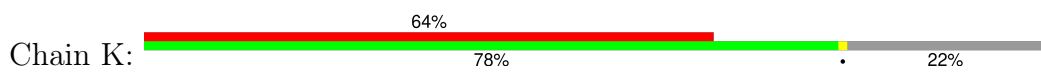


• Molecule 11: DNA replication licensing factor MCM6



I548	D608	R668	THR
S649	D609	Q669	LEU
K550	E610	D670	ASN
A651	K611	S671	VAL
G552	L612	S672	TRP
I653	A613	R673	HIS
N554	E614	E674	LEU
T655	H615	M675	ILE
T556	V616	D676	GLU
L657	T617	S677	ASN
N558	Y618	K678	THR
A659	V619	F679	LEU
R660	H620	S680	LYS
S661	M621	F681	PHE
I663	H622	G682	THR
A664	N623	Q683	ILE
A665	K624	A684	THR
A666	Q625	T685	MET
A667	P626	P686	THR
P668	D627	R687	ASP
L570	L628	T688	GLN
Y571	F630	L689	GLY
R572	T631	G691	ASP
G573	P632	I692	VAL
Y574	V633	I693	SER
N575	E634	R694	THR
P576	P635	L695	PRO
R577	S636	S696	LYS
L578	K637	Q697	LEU
S579	M638	A698	ILE
P580	E640	L699	VAL
D582	Y641	R699	THR
N583	I642	A700	THR
I584	A643	K701	VAL
N585	Y644	L702	ALA
L586	A645	L703	ALA
P587	K646	R704	ARG
A588	T647	L705	THR
A589	K648	V708	VAL
L590	R649	D709	ALA
L591	P650	I710	ASN
S592	V651	D711	ASN
R593	M652	D712	ILE
F594	S653	V713	GLU
D595	E654	E714	GLY
I596	A655	E715	THR
L597	V656	A716	GLN
F598	M657	L717	ASP
L599	D658	R718	ALA
M600	Y659	L719	GLN
L601	V660	V720	ASP
D602	P661	R721	GLU
I603	Q662	V722	LEU
P604	A663	S723	LEU
S605	Y664	K724	LEU
R606	I665	E725	GLY
D607	R666	S726	THR
			SER

• Molecule 12: DNA replication licensing factor MCM7



M1	P61	Y134	P194	S286	V381	D441	P501
S2	K62	K135	N195	E287	R382	K442	V502
A3	Y63	D136	L196	E288	Q383	R443	T503
A4	M64	D137	T197	C289	H384	V444	D504
L5	A65	V138	R198	S290	K385	G445	E505
P6	M66	L139	R199	Q291	K386	D446	M506
S7	L67	D140	F204	N292	LYS	G447	I507
I8	Q68	V141	K205	Q293	PHE	M448	L508
O9	K69	I142	P206	T294	ALA	M449	L509
L10	N72	L143	L207	R303	SER	I450	G510
P11	R73	Q144	S208	A304	PHE	R451	G511
V12	E74	Q145	Q209	F310	SER	G452	A512
D13	Y14	R146	N210	Q320	T394	D453	L513
Y14	L75	R147	C211	Q321	S395	D454	V514
N15	I80	L148	A212	V322	D396	N455	L515
N16	D83	N150	R213	V323	E397	V456	A516
L17	F18	E151	R214	P323	E398	C457	D517
F18	N19	R152	Y215	V324	E399	L458	N518
N19	E20	M153	R216	V325	R400	M459	G519
E20	L86	L154	LYS	H326	M401	G460	I520
I21	Q87	S155	ALA	R329	V402	D461	C521
T22	Y88	R157	I220	N336	E403	P462	C522
F24	Q89	D156	L225	G337	L404	G463	I523
L25	N90	T158	S226	T338	T405	V464	D524
V26	E91	ASN	V227	L339	I406	A465	E525
V26	K92	GLU	I230	V340	S407	K466	F526
T27	F93	ILE	K231	R341	G408	S467	D527
F28	L94	ARG	G232	V410	D409	Q468	K528
K29	Q95	SER	D233	Y411	V410	L469	M529
Q30	G96	GLU	I245	L343	M412	L470	D530
D31	T97	ASN	T246	P345	M413	K471	E531
THR	LEU	LEU	R247	G346	L414	A472	S532
LEU	LEU	MET	I246	D347	A415	I473	D533
LEU	LEU	THR	T247	I354	K416	K475	T535
LEU	LEU	ASP	D263	F355	S417	I476	A536
LEU	LEU	THR	Q264	L356	I418	S477	I537
LEU	LEU	THR	C265	P357	A419	P478	H538
LEU	LEU	THR	Y267	A358	P420	R479	E539
LEU	LEU	THR	E268	P359	E421	G480	V540
LEU	LEU	THR	V269	Y360	I422	V481	M541
LEU	LEU	THR	Q271	T361	Y423	Y482	E542
LEU	LEU	THR	E272	G362	G424	T483	Q543
LEU	LEU	THR	V273	F363	M425	T484	Q544
LEU	LEU	THR	N274	K364	L426	G485	T545
LEU	LEU	THR	S275	A365	D427	K486	I546
LEU	LEU	THR	F278	L366	V428	G487	S547
LEU	LEU	THR	T279	K367	K429	S488	I548
LEU	LEU	THR	P280	A368	K430	S489	S549
LEU	LEU	THR	L127	G369	A431	G490	K550
LEU	LEU	THR	F192	F370	L432	V491	A551
LEU	LEU	THR	P193	N274	L433	G492	G552
LEU	LEU	THR	T189	G375	L434	L493	I553
LEU	LEU	THR	E190	L366	L435	L494	N554
LEU	LEU	THR	L191	K367	L436	A495	T555
LEU	LEU	THR	F192	A368	L437	A496	T556
LEU	LEU	THR	P193	G369	V437	V497	L557
LEU	LEU	THR	T189	L370	G439	M498	N558
LEU	LEU	THR	E190	E377	G439	V499	A559
LEU	LEU	THR	L191	A378	V440	K499	D560
LEU	LEU	THR	F192	F380			

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	53117	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	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	0.076	Depositor
Minimum map value	-0.035	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.0234	Depositor
Map size (Å)	429.6, 429.6, 429.6	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.074, 1.074, 1.074	Depositor

5 Model quality i

5.1 Standard geometry i

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

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	X	0.41	0/3501	0.60	3/4741 (0.1%)
1	Y	0.40	0/3550	0.61	3/4806 (0.1%)
1	Z	0.41	0/3500	0.62	3/4738 (0.1%)
2	A	0.42	0/1718	0.66	2/2314 (0.1%)
2	a	0.42	0/1718	0.66	2/2314 (0.1%)
2	n	0.43	0/1718	0.66	2/2314 (0.1%)
3	B	0.46	1/1545 (0.1%)	0.65	0/2092
3	b	0.46	1/1545 (0.1%)	0.65	0/2092
3	o	0.46	1/1545 (0.1%)	0.65	0/2092
4	C	0.47	0/1320	0.63	1/1784 (0.1%)
4	c	0.47	0/1320	0.63	0/1784
4	p	0.47	0/1320	0.63	1/1784 (0.1%)
5	D	0.43	0/1956	0.58	0/2638
5	d	0.43	0/1956	0.58	0/2638
5	q	0.43	0/1956	0.58	0/2638
6	E	0.46	1/4563 (0.0%)	0.67	5/6173 (0.1%)
6	e	0.46	1/4563 (0.0%)	0.67	5/6173 (0.1%)
6	r	0.46	1/4563 (0.0%)	0.67	5/6173 (0.1%)
7	2	0.45	0/5051	0.64	1/6821 (0.0%)
7	F	0.45	0/5051	0.64	1/6821 (0.0%)
7	h	0.45	0/5051	0.64	1/6821 (0.0%)
8	3	0.44	0/4739	0.78	3/6425 (0.0%)
8	G	0.44	0/4739	0.78	3/6425 (0.0%)
8	i	0.44	0/4739	0.78	3/6425 (0.0%)
9	4	0.37	0/5479	0.61	2/7392 (0.0%)
9	H	0.38	1/5479 (0.0%)	0.65	5/7392 (0.1%)
9	j	0.37	0/5479	0.61	2/7392 (0.0%)
10	5	0.47	0/4750	0.69	4/6412 (0.1%)
10	I	0.47	0/4750	0.69	4/6412 (0.1%)
10	k	0.47	0/4750	0.69	4/6412 (0.1%)
11	6	0.43	0/4789	0.65	3/6466 (0.0%)
11	J	0.43	0/4789	0.65	3/6466 (0.0%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
11	l	0.43	0/4789	0.65	3/6466 (0.0%)
12	7	0.37	0/5299	0.61	3/7160 (0.0%)
12	K	0.37	0/5299	0.61	3/7160 (0.0%)
12	m	0.37	0/5299	0.61	3/7160 (0.0%)
All	All	0.43	7/134178 (0.0%)	0.66	83/181316 (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	X	0	1
1	Y	0	1
1	Z	0	1
8	3	0	1
8	G	0	1
8	i	0	1
All	All	0	6

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	E	478	TRP	CB-CG	-6.10	1.39	1.50
6	e	478	TRP	CB-CG	-6.08	1.39	1.50
6	r	478	TRP	CB-CG	-6.07	1.39	1.50
3	o	11	PHE	C-N	-5.28	1.22	1.34
3	B	11	PHE	C-N	-5.27	1.22	1.34
3	b	11	PHE	C-N	-5.25	1.22	1.34
9	H	467	LYS	C-N	5.08	1.45	1.34

All (83) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	3	17	PRO	CA-C-O	-29.20	50.11	120.20
8	i	17	PRO	CA-C-O	-29.18	50.16	120.20
8	G	17	PRO	CA-C-O	-29.18	50.17	120.20
8	G	17	PRO	CA-C-N	15.27	150.79	117.20
8	3	17	PRO	CA-C-N	15.26	150.76	117.20
8	i	17	PRO	CA-C-N	15.21	150.66	117.20
1	Z	766	PHE	C-N-CD	-13.96	89.89	120.60
8	i	17	PRO	O-C-N	-13.09	101.76	122.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	G	17	PRO	O-C-N	-13.01	101.88	122.70
8	3	17	PRO	O-C-N	-12.99	101.92	122.70
9	H	467	LYS	O-C-N	11.84	141.64	122.70
9	H	467	LYS	C-N-CA	-11.70	92.46	121.70
1	Y	766	PHE	C-N-CD	-10.78	96.89	120.60
1	X	766	PHE	C-N-CD	-10.29	97.95	120.60
9	H	467	LYS	CA-C-N	-8.91	97.60	117.20
1	Z	766	PHE	C-N-CA	8.50	157.70	122.00
1	Y	766	PHE	C-N-CA	8.30	156.86	122.00
1	X	766	PHE	C-N-CA	8.10	156.01	122.00
10	I	79	LEU	CA-CB-CG	7.64	132.88	115.30
10	5	79	LEU	CA-CB-CG	7.61	132.79	115.30
10	k	79	LEU	CA-CB-CG	7.59	132.77	115.30
12	m	628	LEU	CA-CB-CG	7.45	132.44	115.30
12	7	139	LEU	CA-CB-CG	7.44	132.42	115.30
12	K	628	LEU	CA-CB-CG	7.44	132.42	115.30
12	K	139	LEU	CA-CB-CG	7.44	132.40	115.30
12	7	628	LEU	CA-CB-CG	7.43	132.39	115.30
12	m	139	LEU	CA-CB-CG	7.43	132.39	115.30
11	6	440	LEU	CA-CB-CG	7.42	132.36	115.30
11	l	440	LEU	CA-CB-CG	7.41	132.34	115.30
11	J	440	LEU	CA-CB-CG	7.41	132.34	115.30
10	k	668	LEU	CA-CB-CG	7.26	131.99	115.30
10	5	668	LEU	CA-CB-CG	7.26	131.99	115.30
10	I	668	LEU	CA-CB-CG	7.25	131.97	115.30
9	4	727	LEU	CA-CB-CG	6.74	130.81	115.30
9	j	727	LEU	CA-CB-CG	6.74	130.79	115.30
9	H	727	LEU	CA-CB-CG	6.73	130.79	115.30
7	F	416	ASP	CB-CG-OD1	6.28	123.95	118.30
7	2	416	ASP	CB-CG-OD1	6.19	123.87	118.30
7	h	416	ASP	CB-CG-OD1	6.15	123.83	118.30
2	n	123	LEU	CB-CG-CD1	-6.08	100.67	111.00
2	a	123	LEU	CB-CG-CD1	-6.06	100.70	111.00
2	A	123	LEU	CB-CG-CD1	-6.04	100.73	111.00
6	r	333	SER	N-CA-C	6.04	127.30	111.00
6	e	333	SER	N-CA-C	6.03	127.27	111.00
6	E	333	SER	N-CA-C	6.02	127.25	111.00
10	I	66	GLU	N-CA-C	5.95	127.06	111.00
10	k	66	GLU	N-CA-C	5.93	127.02	111.00
10	5	66	GLU	N-CA-C	5.92	127.00	111.00
6	e	326	LEU	N-CA-C	-5.87	95.15	111.00
6	E	326	LEU	N-CA-C	-5.87	95.16	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	r	326	LEU	N-CA-C	-5.87	95.16	111.00
6	E	328	LEU	CA-CB-CG	5.83	128.72	115.30
6	e	328	LEU	CA-CB-CG	5.81	128.66	115.30
6	r	328	LEU	CA-CB-CG	5.81	128.66	115.30
11	6	382	ARG	N-CA-C	5.65	126.25	111.00
11	J	382	ARG	N-CA-C	5.65	126.25	111.00
11	l	382	ARG	N-CA-C	5.64	126.24	111.00
6	r	401	LEU	CA-CB-CG	5.64	128.27	115.30
6	e	401	LEU	CA-CB-CG	5.63	128.24	115.30
6	E	401	LEU	CA-CB-CG	5.62	128.22	115.30
2	a	123	LEU	CA-CB-CG	5.60	128.18	115.30
2	n	123	LEU	CA-CB-CG	5.58	128.14	115.30
2	A	123	LEU	CA-CB-CG	5.57	128.12	115.30
11	6	711	LEU	CA-CB-CG	-5.53	102.58	115.30
11	J	711	LEU	CA-CB-CG	-5.52	102.59	115.30
12	7	25	LEU	CA-CB-CG	5.52	127.99	115.30
1	X	767	PRO	CA-N-CD	-5.51	103.79	111.50
12	m	25	LEU	CA-CB-CG	5.50	127.96	115.30
12	K	25	LEU	CA-CB-CG	5.50	127.96	115.30
11	l	711	LEU	CA-CB-CG	-5.50	102.64	115.30
6	e	165	LEU	CA-CB-CG	5.40	127.73	115.30
6	E	165	LEU	CA-CB-CG	5.38	127.68	115.30
6	r	165	LEU	CA-CB-CG	5.37	127.65	115.30
1	Y	767	PRO	CA-N-CD	-5.17	104.25	111.50
10	I	45	ILE	N-CA-C	5.14	124.88	111.00
10	5	45	ILE	N-CA-C	5.14	124.87	111.00
10	k	45	ILE	N-CA-C	5.11	124.80	111.00
9	4	425	ASP	CB-CG-OD2	5.09	122.89	118.30
1	Z	767	PRO	CA-N-CD	-5.08	104.39	111.50
9	H	425	ASP	CB-CG-OD2	5.06	122.85	118.30
9	j	425	ASP	CB-CG-OD2	5.04	122.84	118.30
4	p	165	PHE	N-CA-C	5.03	124.57	111.00
4	C	165	PHE	N-CA-C	5.01	124.52	111.00

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
8	3	17	PRO	Mainchain
8	G	17	PRO	Mainchain
1	X	766	PHE	Peptide
1	Y	766	PHE	Peptide

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Mol	Chain	Res	Type	Group
1	Z	766	PHE	Peptide
8	i	17	PRO	Mainchain

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	X	419/927 (45%)	408 (97%)	10 (2%)	1 (0%)	44	78
1	Y	427/927 (46%)	414 (97%)	12 (3%)	1 (0%)	44	78
1	Z	417/927 (45%)	407 (98%)	9 (2%)	1 (0%)	44	78
2	A	206/208 (99%)	179 (87%)	26 (13%)	1 (0%)	25	64
2	a	206/208 (99%)	180 (87%)	25 (12%)	1 (0%)	25	64
2	n	206/208 (99%)	180 (87%)	25 (12%)	1 (0%)	25	64
3	B	177/213 (83%)	150 (85%)	27 (15%)	0	100	100
3	b	177/213 (83%)	150 (85%)	27 (15%)	0	100	100
3	o	177/213 (83%)	150 (85%)	27 (15%)	0	100	100
4	C	151/194 (78%)	140 (93%)	11 (7%)	0	100	100
4	c	151/194 (78%)	139 (92%)	12 (8%)	0	100	100
4	p	151/194 (78%)	139 (92%)	12 (8%)	0	100	100
5	D	226/294 (77%)	202 (89%)	24 (11%)	0	100	100
5	d	226/294 (77%)	202 (89%)	24 (11%)	0	100	100
5	q	226/294 (77%)	202 (89%)	24 (11%)	0	100	100
6	E	543/650 (84%)	476 (88%)	64 (12%)	3 (1%)	22	60
6	e	543/650 (84%)	476 (88%)	64 (12%)	3 (1%)	22	60

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
6	r	543/650 (84%)	476 (88%)	64 (12%)	3 (1%)	22	60
7	2	630/868 (73%)	538 (85%)	92 (15%)	0	100	100
7	F	630/868 (73%)	538 (85%)	92 (15%)	0	100	100
7	h	630/868 (73%)	537 (85%)	93 (15%)	0	100	100
8	3	584/971 (60%)	506 (87%)	77 (13%)	1 (0%)	44	78
8	G	584/971 (60%)	506 (87%)	76 (13%)	2 (0%)	37	73
8	i	584/971 (60%)	505 (86%)	77 (13%)	2 (0%)	37	73
9	4	668/933 (72%)	579 (87%)	88 (13%)	1 (0%)	48	83
9	H	668/933 (72%)	578 (86%)	88 (13%)	2 (0%)	37	73
9	j	668/933 (72%)	579 (87%)	88 (13%)	1 (0%)	48	83
10	5	583/775 (75%)	493 (85%)	89 (15%)	1 (0%)	44	78
10	I	583/775 (75%)	493 (85%)	89 (15%)	1 (0%)	44	78
10	k	583/775 (75%)	493 (85%)	89 (15%)	1 (0%)	44	78
11	6	606/1017 (60%)	506 (84%)	99 (16%)	1 (0%)	44	78
11	J	606/1017 (60%)	506 (84%)	99 (16%)	1 (0%)	44	78
11	l	606/1017 (60%)	507 (84%)	98 (16%)	1 (0%)	44	78
12	7	653/845 (77%)	556 (85%)	97 (15%)	0	100	100
12	K	653/845 (77%)	555 (85%)	98 (15%)	0	100	100
12	m	653/845 (77%)	555 (85%)	98 (15%)	0	100	100
All	All	16344/23685 (69%)	14200 (87%)	2114 (13%)	30 (0%)	45	78

All (30) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
9	j	469	VAL
9	H	469	VAL
6	e	334	LEU
6	E	334	LEU
6	r	334	LEU
9	H	468	LYS
1	Z	767	PRO
6	e	332	SER
10	k	147	PRO
11	l	305	TYR
6	E	332	SER

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Mol	Chain	Res	Type
10	5	147	PRO
11	6	305	TYR
6	r	332	SER
10	I	147	PRO
11	J	305	TYR
1	X	767	PRO
2	n	30	PRO
2	A	30	PRO
2	a	30	PRO
8	i	311	SER
8	i	669	PRO
8	3	669	PRO
8	G	311	SER
8	G	669	PRO
1	Y	767	PRO
6	e	146	GLY
6	E	146	GLY
9	4	469	VAL
6	r	146	GLY

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	X	377/825 (46%)	377 (100%)	0	100	100
1	Y	383/825 (46%)	383 (100%)	0	100	100
1	Z	377/825 (46%)	377 (100%)	0	100	100
2	A	193/193 (100%)	193 (100%)	0	100	100
2	a	193/193 (100%)	193 (100%)	0	100	100
2	n	193/193 (100%)	193 (100%)	0	100	100
3	B	171/198 (86%)	170 (99%)	1 (1%)	84	88
3	b	171/198 (86%)	170 (99%)	1 (1%)	84	88
3	o	171/198 (86%)	170 (99%)	1 (1%)	84	88

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	C	144/173 (83%)	142 (99%)	2 (1%)	62	75
4	c	144/173 (83%)	142 (99%)	2 (1%)	62	75
4	p	144/173 (83%)	142 (99%)	2 (1%)	62	75
5	D	225/279 (81%)	225 (100%)	0	100	100
5	d	225/279 (81%)	225 (100%)	0	100	100
5	q	225/279 (81%)	225 (100%)	0	100	100
6	E	499/586 (85%)	496 (99%)	3 (1%)	84	88
6	e	499/586 (85%)	496 (99%)	3 (1%)	84	88
6	r	499/586 (85%)	496 (99%)	3 (1%)	84	88
7	2	535/770 (70%)	529 (99%)	6 (1%)	70	80
7	F	535/770 (70%)	529 (99%)	6 (1%)	70	80
7	h	535/770 (70%)	529 (99%)	6 (1%)	70	80
8	3	515/835 (62%)	512 (99%)	3 (1%)	84	88
8	G	515/835 (62%)	512 (99%)	3 (1%)	84	88
8	i	515/835 (62%)	512 (99%)	3 (1%)	84	88
9	4	610/848 (72%)	605 (99%)	5 (1%)	79	85
9	H	610/848 (72%)	604 (99%)	6 (1%)	73	82
9	j	610/848 (72%)	605 (99%)	5 (1%)	79	85
10	5	534/688 (78%)	527 (99%)	7 (1%)	65	77
10	I	534/688 (78%)	527 (99%)	7 (1%)	65	77
10	k	534/688 (78%)	527 (99%)	7 (1%)	65	77
11	6	493/886 (56%)	487 (99%)	6 (1%)	67	78
11	J	493/886 (56%)	487 (99%)	6 (1%)	67	78
11	l	493/886 (56%)	487 (99%)	6 (1%)	67	78
12	7	585/753 (78%)	581 (99%)	4 (1%)	81	87
12	K	585/753 (78%)	581 (99%)	4 (1%)	81	87
12	m	585/753 (78%)	581 (99%)	4 (1%)	81	87
All	All	14649/21102 (69%)	14537 (99%)	112 (1%)	77	85

All (112) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	o	80	LYS

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Mol	Chain	Res	Type
4	p	20	PHE
4	p	84	VAL
6	e	160	TYR
6	e	241	TYR
6	e	411	ARG
7	h	230	ARG
7	h	324	VAL
7	h	384	ASN
7	h	439	ASN
7	h	444	PHE
7	h	476	TRP
8	i	172	THR
8	i	291	ARG
8	i	339	ARG
9	j	349	CYS
9	j	445	ARG
9	j	451	ARG
9	j	697	PRO
9	j	928	ARG
10	k	66	GLU
10	k	275	THR
10	k	295	VAL
10	k	326	PRO
10	k	486	ARG
10	k	501	THR
10	k	675	ARG
11	l	296	ARG
11	l	350	ARG
11	l	381	LEU
11	l	540	HIS
11	l	581	LYS
11	l	675	ARG
12	m	117	PHE
12	m	329	ARG
12	m	479	ARG
12	m	718	ARG
3	B	80	LYS
4	C	20	PHE
4	C	84	VAL
6	E	160	TYR
6	E	241	TYR
6	E	411	ARG

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Mol	Chain	Res	Type
7	2	230	ARG
7	2	324	VAL
7	2	384	ASN
7	2	439	ASN
7	2	444	PHE
7	2	476	TRP
8	3	172	THR
8	3	291	ARG
8	3	339	ARG
9	4	349	CYS
9	4	445	ARG
9	4	451	ARG
9	4	697	PRO
9	4	928	ARG
10	5	66	GLU
10	5	275	THR
10	5	295	VAL
10	5	326	PRO
10	5	486	ARG
10	5	501	THR
10	5	675	ARG
11	6	296	ARG
11	6	350	ARG
11	6	381	LEU
11	6	540	HIS
11	6	581	LYS
11	6	675	ARG
12	7	117	PHE
12	7	329	ARG
12	7	479	ARG
12	7	718	ARG
3	b	80	LYS
4	c	20	PHE
4	c	84	VAL
6	r	160	TYR
6	r	241	TYR
6	r	411	ARG
7	F	230	ARG
7	F	324	VAL
7	F	384	ASN
7	F	439	ASN
7	F	444	PHE

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Mol	Chain	Res	Type
7	F	476	TRP
8	G	172	THR
8	G	291	ARG
8	G	339	ARG
9	H	349	CYS
9	H	445	ARG
9	H	451	ARG
9	H	469	VAL
9	H	697	PRO
9	H	928	ARG
10	I	66	GLU
10	I	275	THR
10	I	295	VAL
10	I	326	PRO
10	I	486	ARG
10	I	501	THR
10	I	675	ARG
11	J	296	ARG
11	J	350	ARG
11	J	381	LEU
11	J	540	HIS
11	J	581	LYS
11	J	675	ARG
12	K	117	PHE
12	K	329	ARG
12	K	479	ARG
12	K	718	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (241) such sidechains are listed below:

Mol	Chain	Res	Type
1	X	527	HIS
1	X	573	GLN
1	Y	507	ASN
1	Y	510	GLN
1	Y	548	GLN
1	Y	678	ASN
1	Y	753	ASN
1	Y	790	ASN
1	Z	622	ASN
1	Z	790	ASN
2	n	28	ASN

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Mol	Chain	Res	Type
2	n	39	ASN
2	n	90	GLN
2	n	182	ASN
3	o	103	GLN
4	p	21	GLN
4	p	41	ASN
4	p	130	GLN
4	p	133	GLN
4	p	181	HIS
6	e	7	GLN
6	e	18	ASN
6	e	22	HIS
6	e	26	GLN
6	e	52	GLN
6	e	55	GLN
6	e	70	HIS
6	e	155	GLN
6	e	289	ASN
6	e	331	HIS
6	e	374	GLN
6	e	395	ASN
6	e	402	GLN
6	e	468	ASN
6	e	497	GLN
6	e	563	GLN
6	e	604	ASN
7	h	202	ASN
7	h	238	ASN
7	h	245	ASN
7	h	333	GLN
7	h	340	ASN
7	h	433	ASN
7	h	526	ASN
7	h	551	GLN
7	h	779	HIS
7	h	780	GLN
7	h	809	HIS
8	i	51	ASN
8	i	52	ASN
8	i	57	ASN
8	i	210	HIS
8	i	312	ASN

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Mol	Chain	Res	Type
8	i	330	HIS
8	i	351	ASN
8	i	503	HIS
8	i	554	ASN
8	i	677	ASN
9	j	184	ASN
9	j	196	ASN
9	j	274	GLN
9	j	413	HIS
9	j	858	GLN
9	j	876	GLN
10	k	53	ASN
10	k	67	HIS
10	k	203	ASN
10	k	254	GLN
10	k	302	ASN
10	k	539	ASN
10	k	561	ASN
10	k	574	ASN
10	k	617	GLN
10	k	652	GLN
11	l	182	GLN
11	l	514	ASN
11	l	570	ASN
11	l	750	GLN
11	l	814	ASN
11	l	833	GLN
12	m	87	GLN
12	m	292	ASN
12	m	293	GLN
12	m	316	GLN
12	m	326	HIS
12	m	379	GLN
12	m	468	GLN
12	m	657	ASN
12	m	683	GLN
2	A	28	ASN
2	A	39	ASN
2	A	90	GLN
2	A	182	ASN
3	B	103	GLN
4	C	21	GLN

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Mol	Chain	Res	Type
4	C	41	ASN
4	C	133	GLN
4	C	181	HIS
6	E	13	ASN
6	E	18	ASN
6	E	22	HIS
6	E	26	GLN
6	E	52	GLN
6	E	55	GLN
6	E	70	HIS
6	E	155	GLN
6	E	289	ASN
6	E	331	HIS
6	E	374	GLN
6	E	395	ASN
6	E	402	GLN
6	E	497	GLN
6	E	563	GLN
6	E	604	ASN
7	2	202	ASN
7	2	238	ASN
7	2	245	ASN
7	2	333	GLN
7	2	340	ASN
7	2	433	ASN
7	2	526	ASN
7	2	551	GLN
7	2	779	HIS
7	2	780	GLN
7	2	809	HIS
8	3	51	ASN
8	3	52	ASN
8	3	57	ASN
8	3	210	HIS
8	3	312	ASN
8	3	330	HIS
8	3	351	ASN
8	3	554	ASN
8	3	677	ASN
9	4	184	ASN
9	4	196	ASN
9	4	274	GLN

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Mol	Chain	Res	Type
9	4	413	HIS
9	4	858	GLN
9	4	876	GLN
10	5	53	ASN
10	5	67	HIS
10	5	203	ASN
10	5	254	GLN
10	5	539	ASN
10	5	561	ASN
10	5	574	ASN
10	5	617	GLN
10	5	652	GLN
11	6	182	GLN
11	6	514	ASN
11	6	570	ASN
11	6	750	GLN
11	6	814	ASN
11	6	833	GLN
12	7	87	GLN
12	7	292	ASN
12	7	293	GLN
12	7	316	GLN
12	7	326	HIS
12	7	379	GLN
12	7	468	GLN
12	7	657	ASN
12	7	683	GLN
2	a	28	ASN
2	a	39	ASN
2	a	90	GLN
2	a	182	ASN
3	b	103	GLN
3	b	135	HIS
4	c	21	GLN
4	c	41	ASN
4	c	133	GLN
4	c	181	HIS
6	r	18	ASN
6	r	22	HIS
6	r	26	GLN
6	r	52	GLN
6	r	55	GLN

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Mol	Chain	Res	Type
6	r	70	HIS
6	r	155	GLN
6	r	289	ASN
6	r	331	HIS
6	r	374	GLN
6	r	395	ASN
6	r	468	ASN
6	r	497	GLN
6	r	563	GLN
6	r	604	ASN
7	F	202	ASN
7	F	238	ASN
7	F	245	ASN
7	F	333	GLN
7	F	340	ASN
7	F	433	ASN
7	F	526	ASN
7	F	551	GLN
7	F	779	HIS
7	F	780	GLN
7	F	809	HIS
8	G	51	ASN
8	G	52	ASN
8	G	57	ASN
8	G	210	HIS
8	G	312	ASN
8	G	330	HIS
8	G	351	ASN
8	G	503	HIS
8	G	554	ASN
8	G	677	ASN
9	H	184	ASN
9	H	196	ASN
9	H	274	GLN
9	H	413	HIS
9	H	858	GLN
9	H	876	GLN
10	I	53	ASN
10	I	67	HIS
10	I	203	ASN
10	I	254	GLN
10	I	539	ASN

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Mol	Chain	Res	Type
10	I	561	ASN
10	I	574	ASN
10	I	617	GLN
10	I	652	GLN
11	J	182	GLN
11	J	514	ASN
11	J	570	ASN
11	J	750	GLN
11	J	814	ASN
11	J	833	GLN
12	K	87	GLN
12	K	150	ASN
12	K	292	ASN
12	K	293	GLN
12	K	316	GLN
12	K	326	HIS
12	K	379	GLN
12	K	468	GLN
12	K	657	ASN
12	K	683	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

6 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
13	ATP	5	801	-	28,33,33	0.74	0	34,52,52	1.69	5 (14%)
13	ATP	h	901	-	28,33,33	0.81	0	34,52,52	1.21	3 (8%)
13	ATP	3	1001	-	28,33,33	0.90	0	34,52,52	1.27	3 (8%)
13	ATP	2	901	-	28,33,33	0.82	0	34,52,52	1.21	3 (8%)
13	ATP	i	1001	-	28,33,33	0.89	0	34,52,52	1.27	3 (8%)
13	ATP	k	801	-	28,33,33	0.74	0	34,52,52	1.68	5 (14%)

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
13	ATP	5	801	-	-	4/18/38/38	0/3/3/3
13	ATP	h	901	-	-	6/18/38/38	0/3/3/3
13	ATP	3	1001	-	-	5/18/38/38	0/3/3/3
13	ATP	2	901	-	-	6/18/38/38	0/3/3/3
13	ATP	i	1001	-	-	5/18/38/38	0/3/3/3
13	ATP	k	801	-	-	4/18/38/38	0/3/3/3

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
13	5	801	ATP	C4'-O4'-C1'	-5.00	105.34	109.92
13	k	801	ATP	C4'-O4'-C1'	-4.88	105.46	109.92
13	k	801	ATP	N3-C2-N1	-4.29	122.85	128.67
13	5	801	ATP	N3-C2-N1	-4.28	122.87	128.67
13	k	801	ATP	O4'-C1'-N9	3.92	113.94	108.75
13	5	801	ATP	O4'-C1'-N9	3.89	113.91	108.75
13	3	1001	ATP	N3-C2-N1	-3.61	123.78	128.67
13	i	1001	ATP	N3-C2-N1	-3.57	123.83	128.67
13	2	901	ATP	N3-C2-N1	-3.34	124.14	128.67
13	h	901	ATP	N3-C2-N1	-3.30	124.19	128.67
13	k	801	ATP	C4-C5-N7	-2.86	106.32	109.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
13	5	801	ATP	C4-C5-N7	-2.83	106.34	109.34
13	h	901	ATP	C4-C5-N7	-2.67	106.52	109.34
13	2	901	ATP	C4-C5-N7	-2.64	106.55	109.34
13	k	801	ATP	O3G-PG-O2G	2.28	116.35	107.80
13	5	801	ATP	O3G-PG-O2G	2.26	116.29	107.80
13	i	1001	ATP	C2'-C3'-C4'	2.15	106.76	102.61
13	3	1001	ATP	C2'-C3'-C4'	2.15	106.76	102.61
13	3	1001	ATP	C4-C5-N7	-2.13	107.08	109.34
13	i	1001	ATP	C4-C5-N7	-2.09	107.12	109.34
13	2	901	ATP	O2A-PA-O1A	2.03	121.89	112.44
13	h	901	ATP	O2A-PA-O1A	2.02	121.86	112.44

There are no chirality outliers.

All (30) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
13	h	901	ATP	C5'-O5'-PA-O1A
13	h	901	ATP	C5'-O5'-PA-O2A
13	h	901	ATP	C5'-O5'-PA-O3A
13	i	1001	ATP	C5'-O5'-PA-O2A
13	i	1001	ATP	C5'-O5'-PA-O3A
13	k	801	ATP	C5'-O5'-PA-O2A
13	2	901	ATP	C5'-O5'-PA-O1A
13	2	901	ATP	C5'-O5'-PA-O2A
13	2	901	ATP	C5'-O5'-PA-O3A
13	3	1001	ATP	C5'-O5'-PA-O2A
13	3	1001	ATP	C5'-O5'-PA-O3A
13	5	801	ATP	C5'-O5'-PA-O2A
13	h	901	ATP	C3'-C4'-C5'-O5'
13	2	901	ATP	C3'-C4'-C5'-O5'
13	h	901	ATP	O4'-C4'-C5'-O5'
13	2	901	ATP	O4'-C4'-C5'-O5'
13	i	1001	ATP	O4'-C4'-C5'-O5'
13	3	1001	ATP	O4'-C4'-C5'-O5'
13	k	801	ATP	O4'-C4'-C5'-O5'
13	5	801	ATP	O4'-C4'-C5'-O5'
13	i	1001	ATP	C3'-C4'-C5'-O5'
13	3	1001	ATP	C3'-C4'-C5'-O5'
13	k	801	ATP	C5'-O5'-PA-O3A
13	5	801	ATP	C5'-O5'-PA-O3A
13	h	901	ATP	C4'-C5'-O5'-PA
13	2	901	ATP	C4'-C5'-O5'-PA

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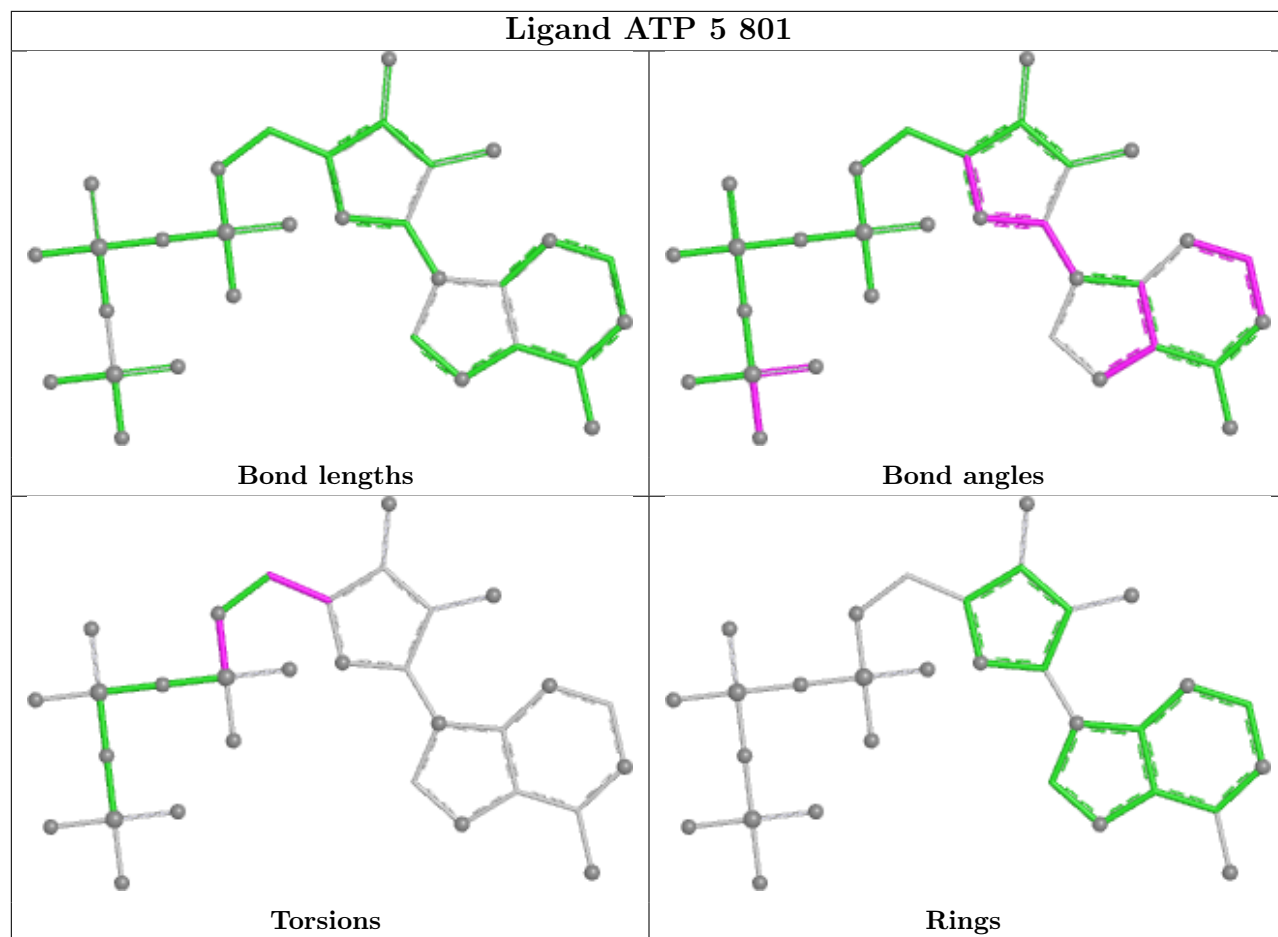
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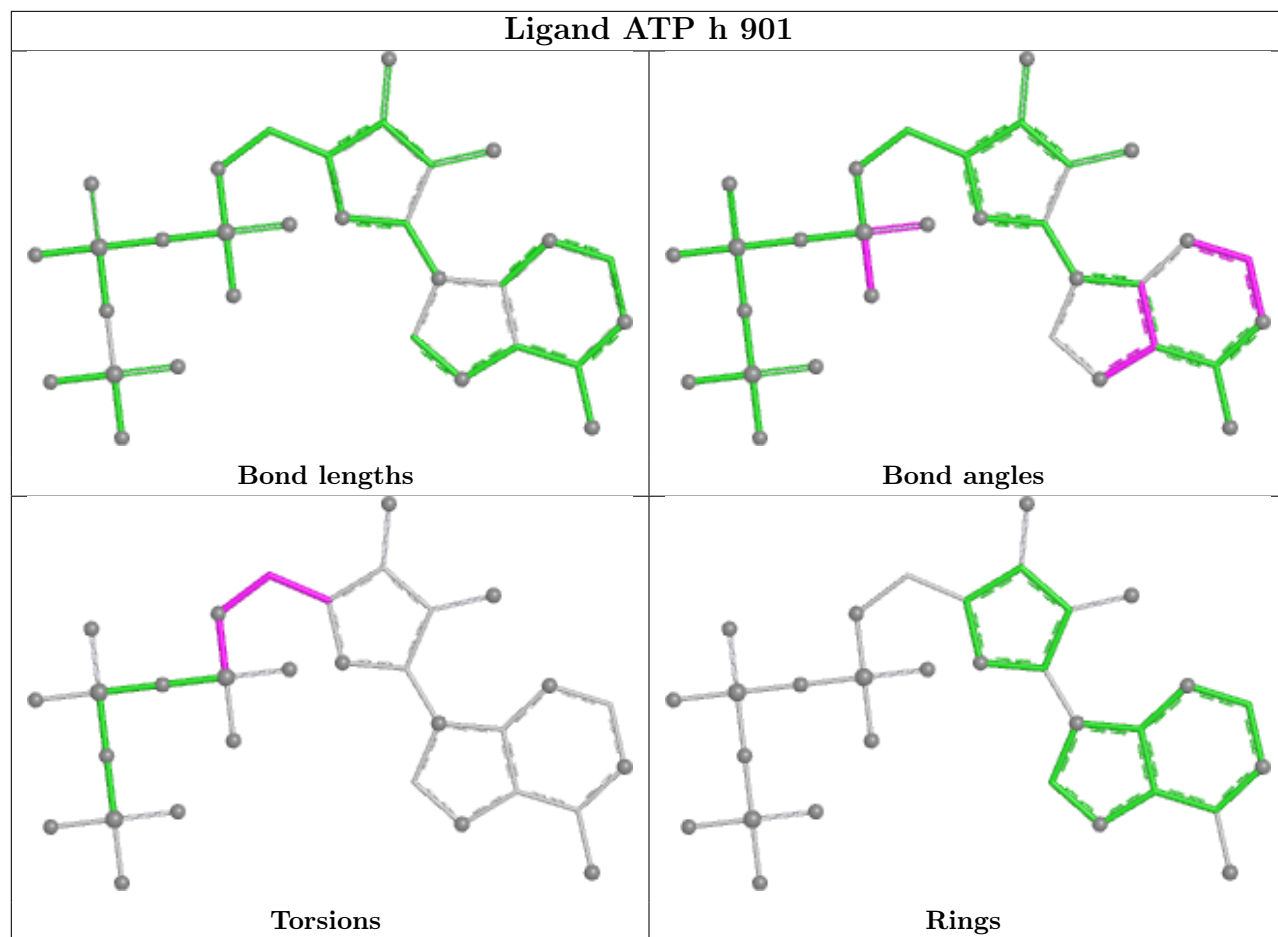
Mol	Chain	Res	Type	Atoms
13	k	801	ATP	C3'-C4'-C5'-O5'
13	5	801	ATP	C3'-C4'-C5'-O5'
13	i	1001	ATP	PG-O3B-PB-O2B
13	3	1001	ATP	PG-O3B-PB-O2B

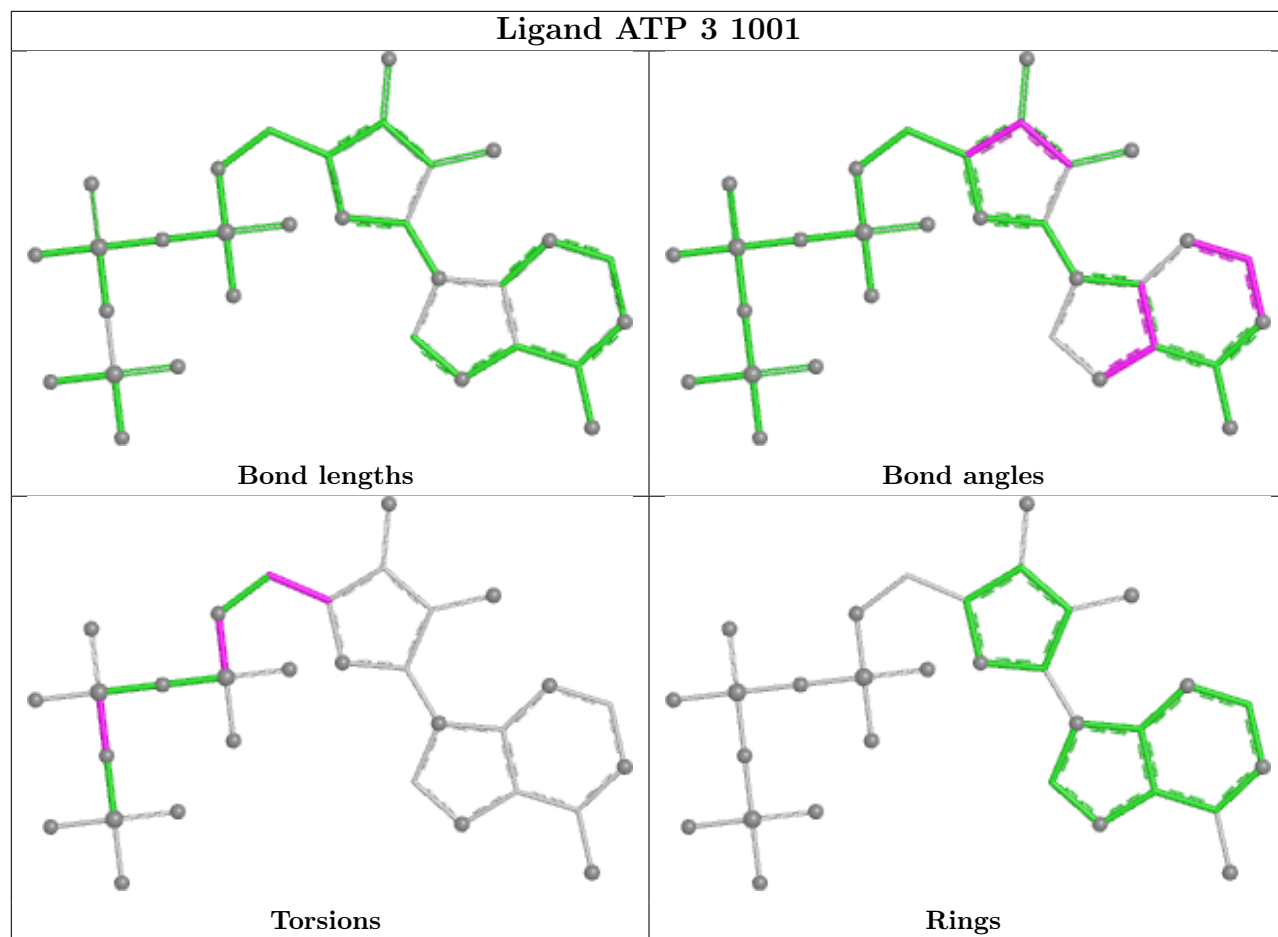
There are no ring outliers.

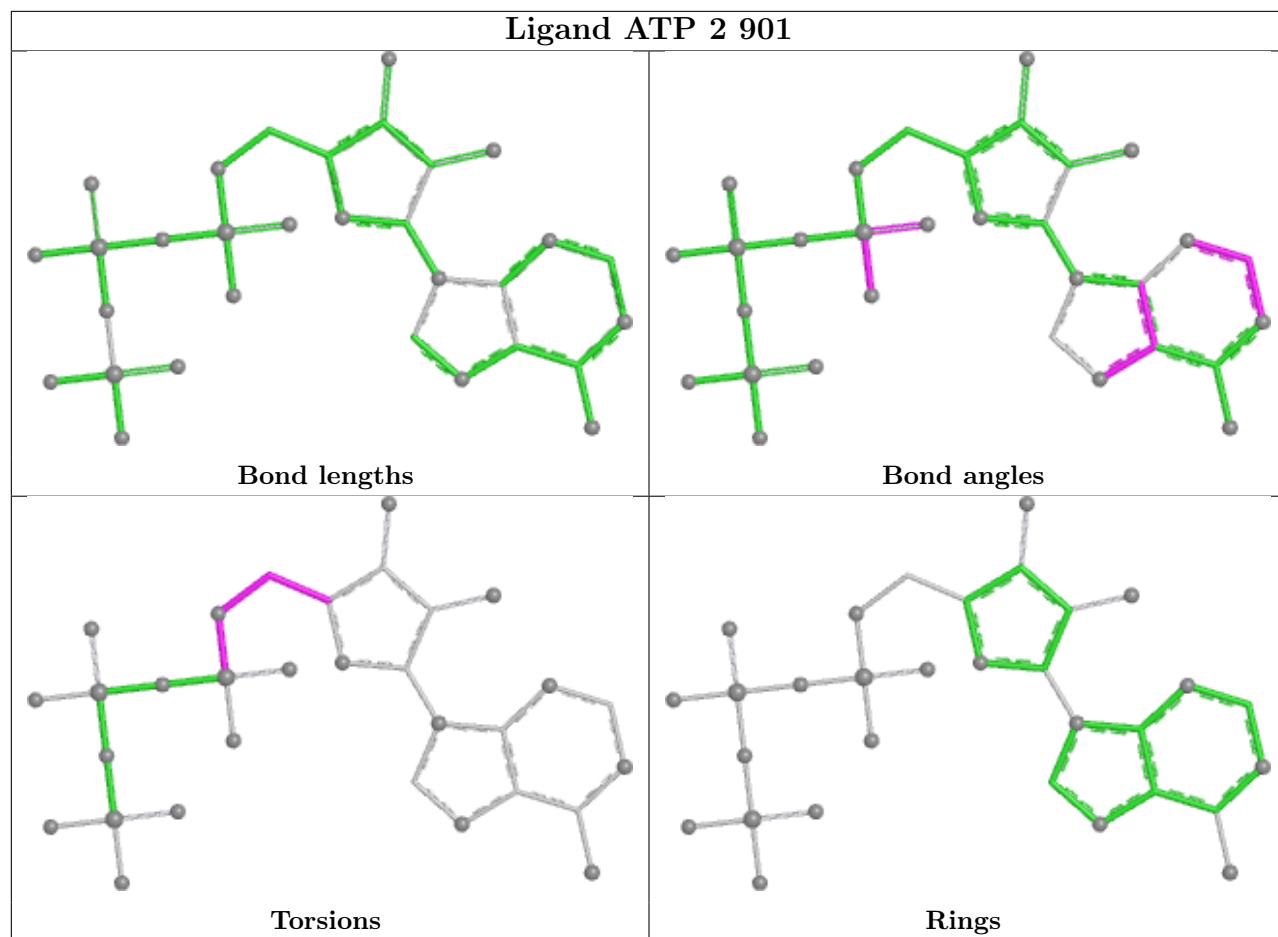
No monomer is involved in short contacts.

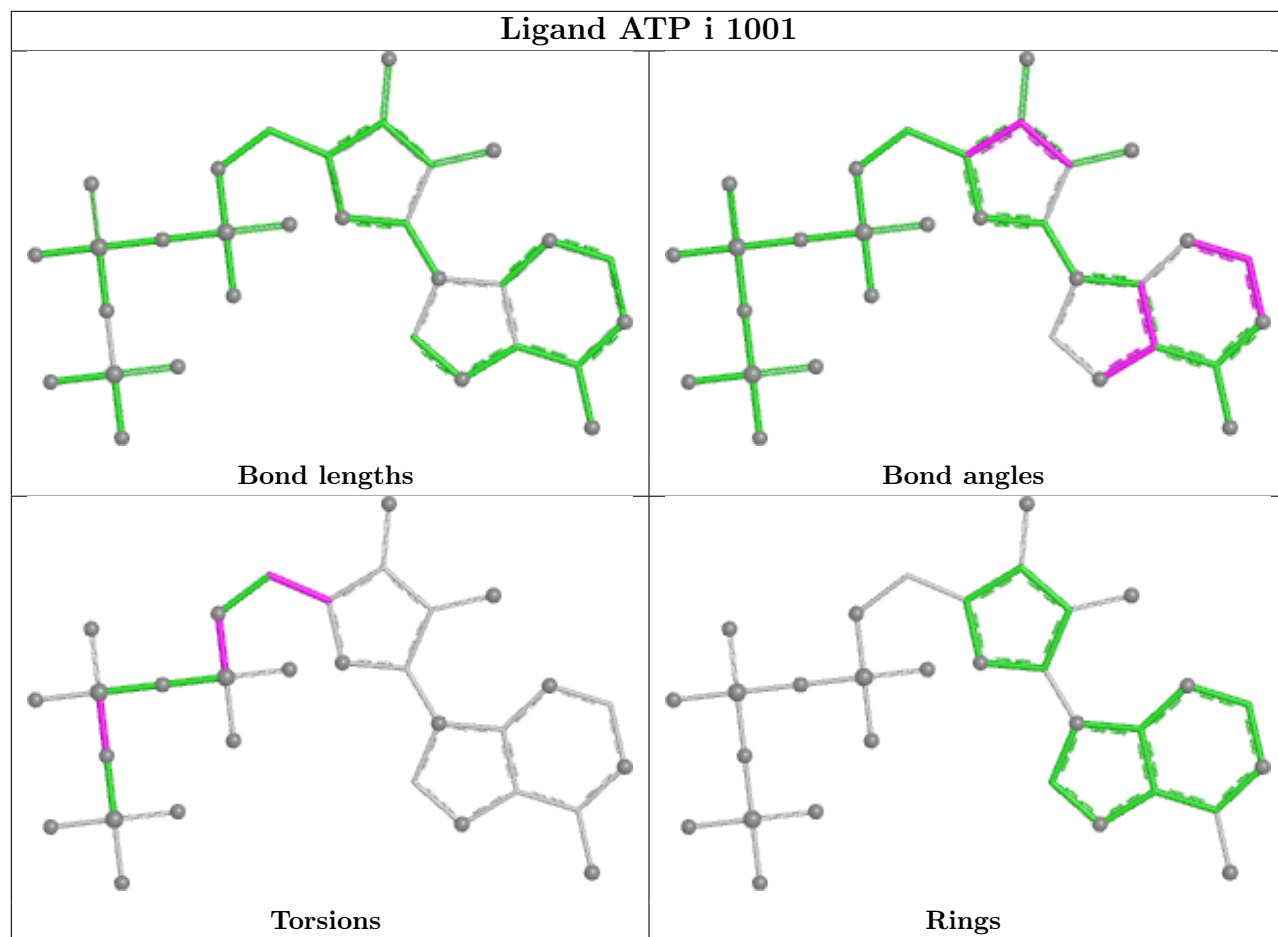
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

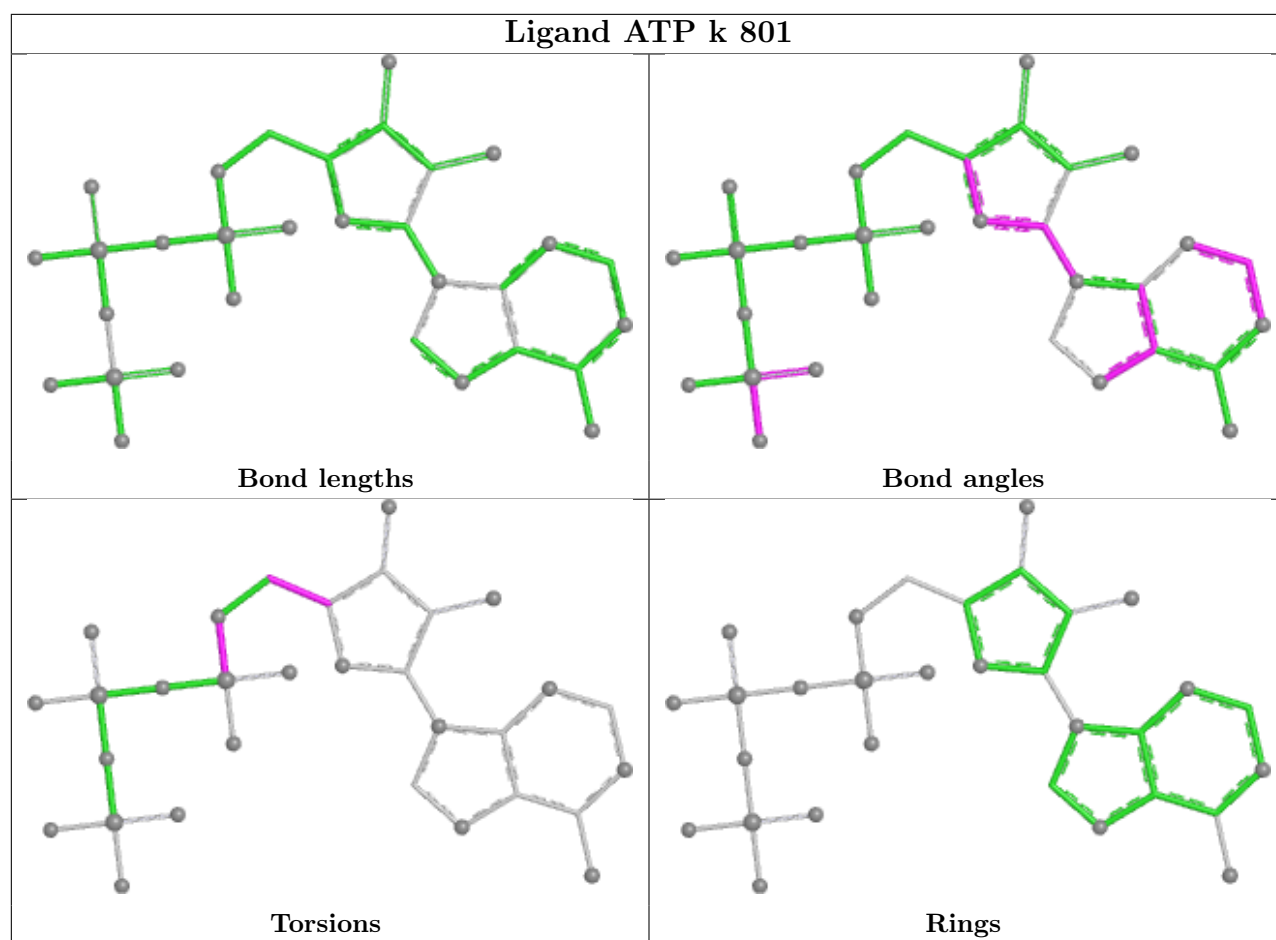












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	Z	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	Z	776:ILE	C	777:ARG	N	2.04

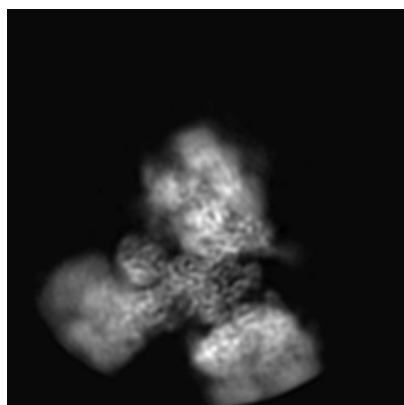
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-20473. These allow visual inspection of the internal detail of the map and identification of artifacts.

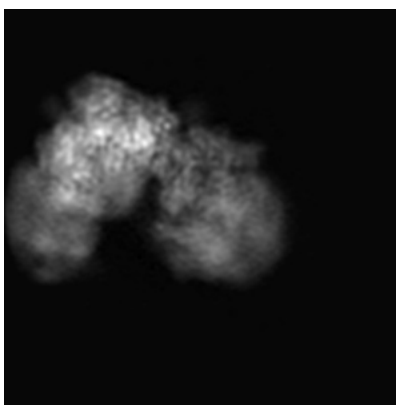
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

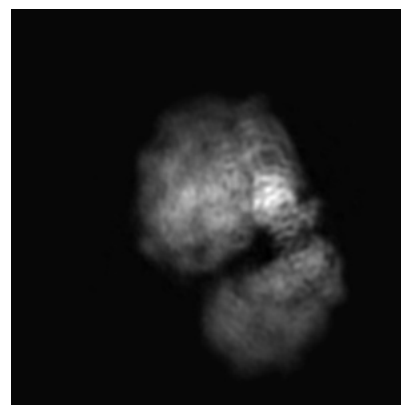
6.1.1 Primary map



X



Y

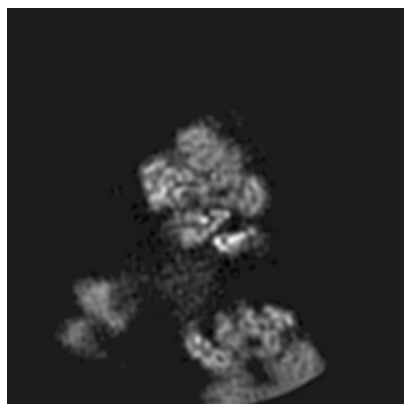


Z

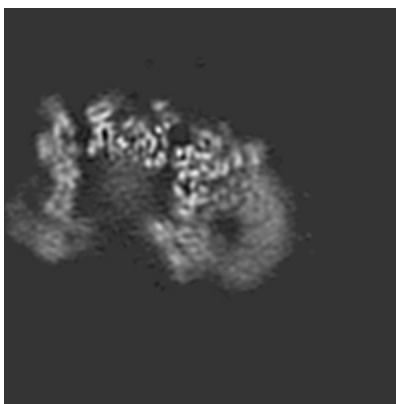
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

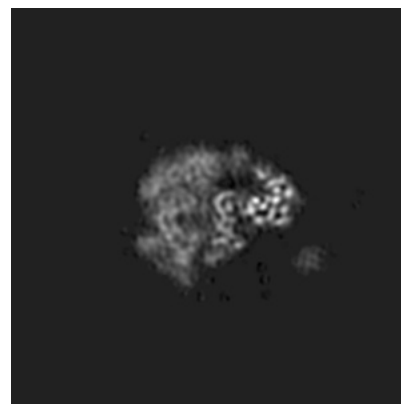
6.2.1 Primary map



X Index: 200



Y Index: 200

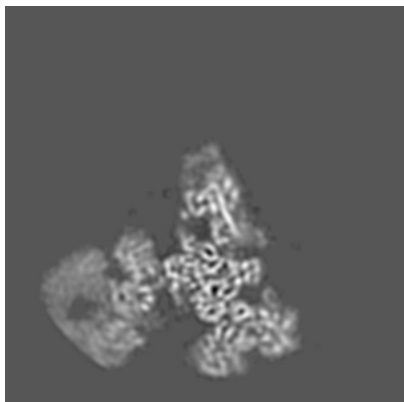


Z Index: 200

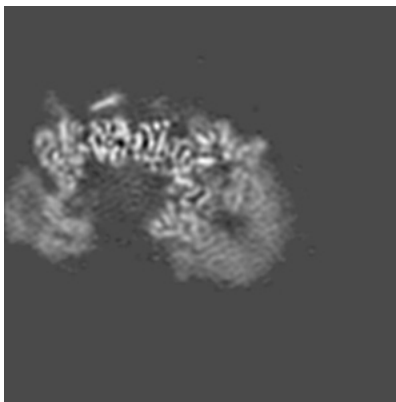
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [\(i\)](#)

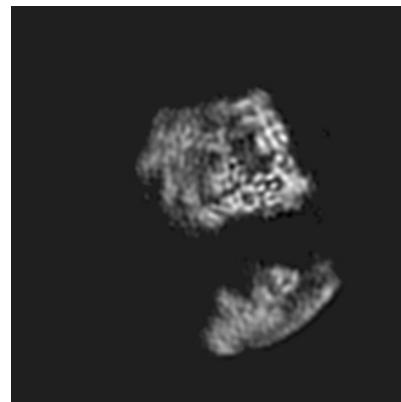
6.3.1 Primary map



X Index: 265



Y Index: 207



Z Index: 66

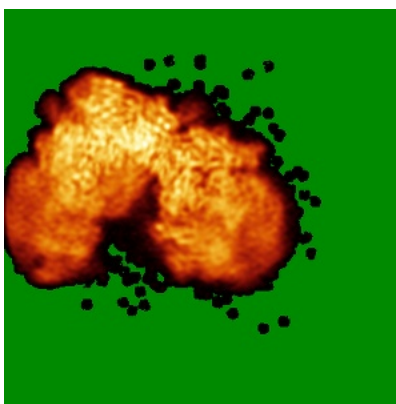
The images above show the largest variance slices of the map in three orthogonal directions.

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

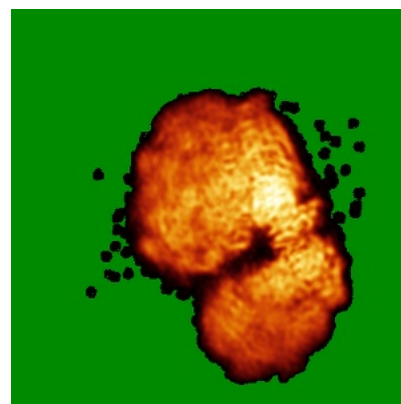
6.4.1 Primary map



X



Y

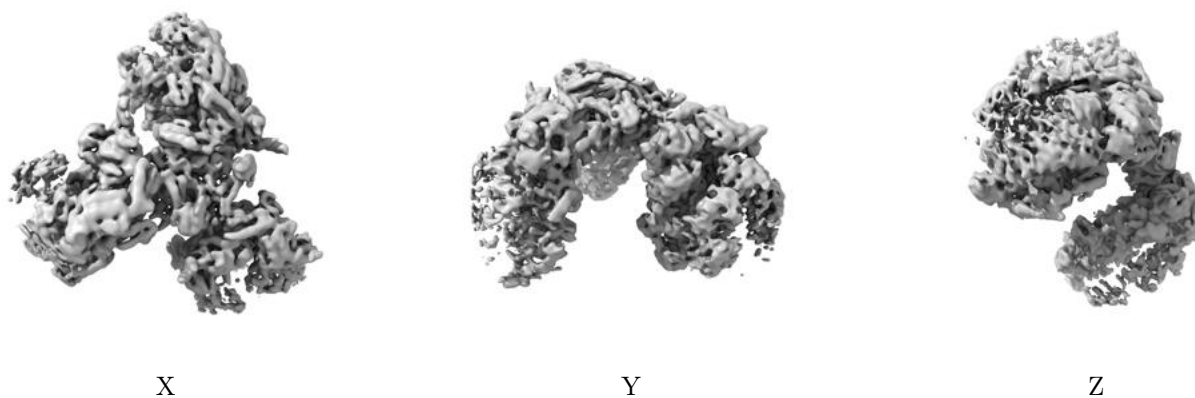


Z

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

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0234. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

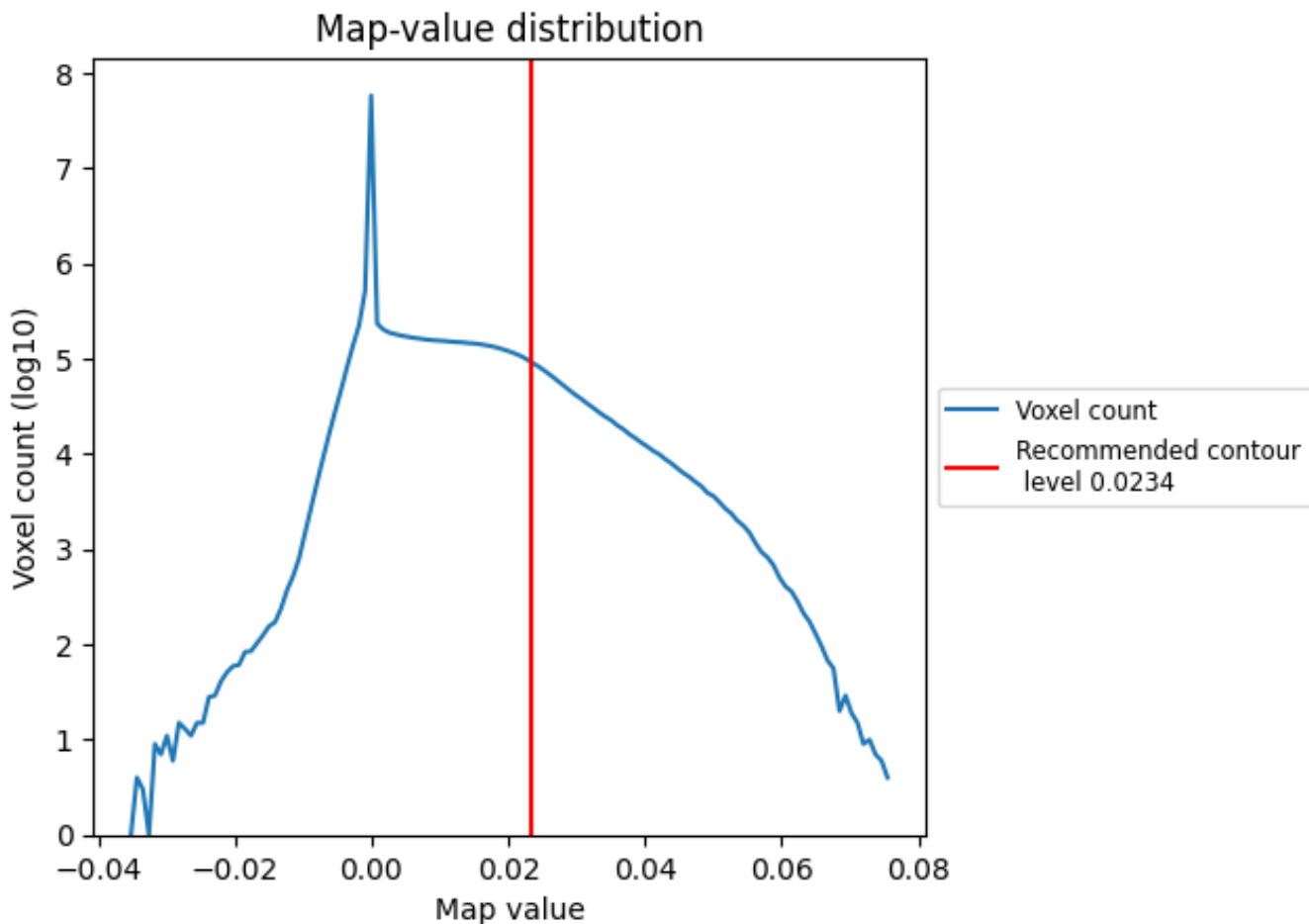
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

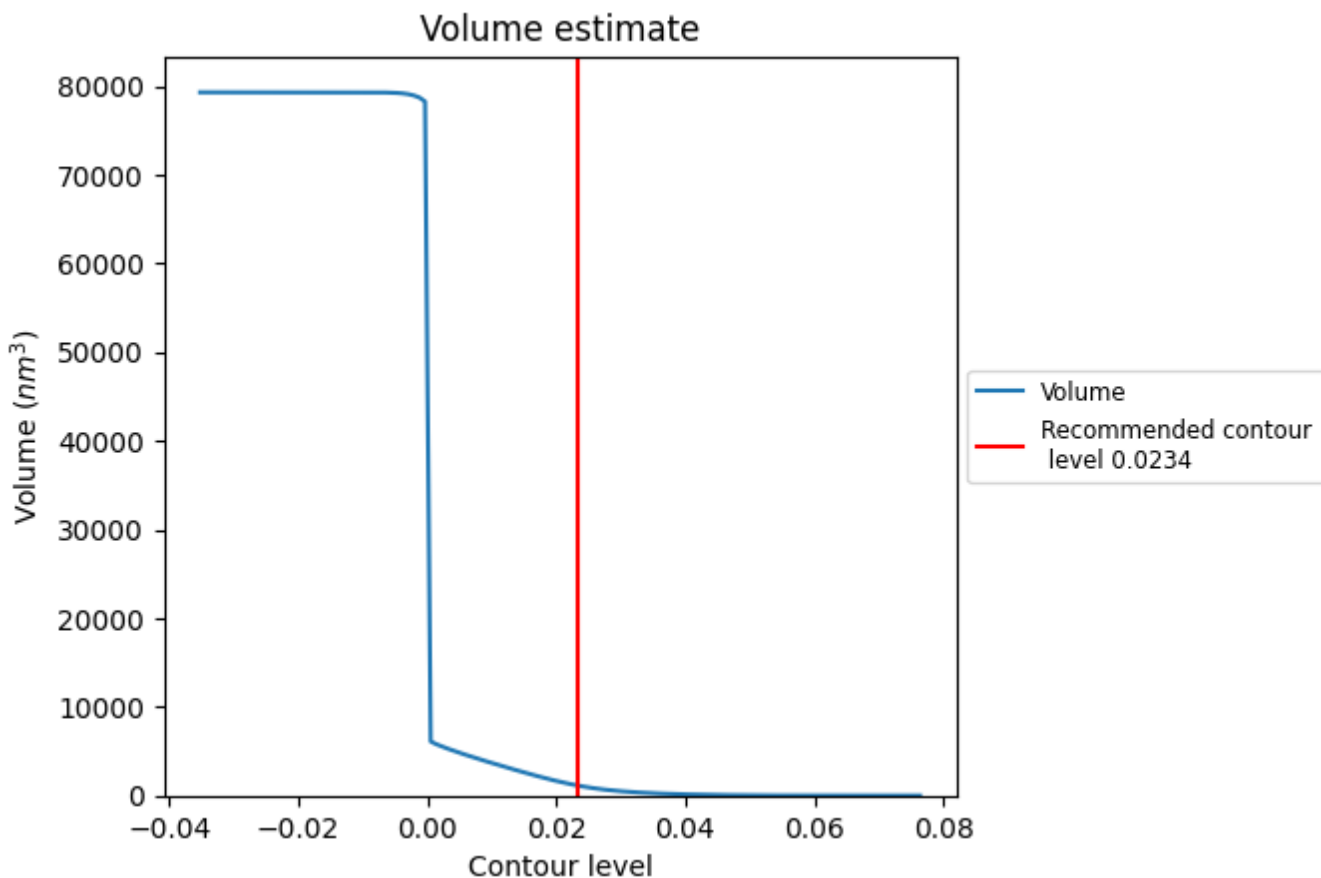
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

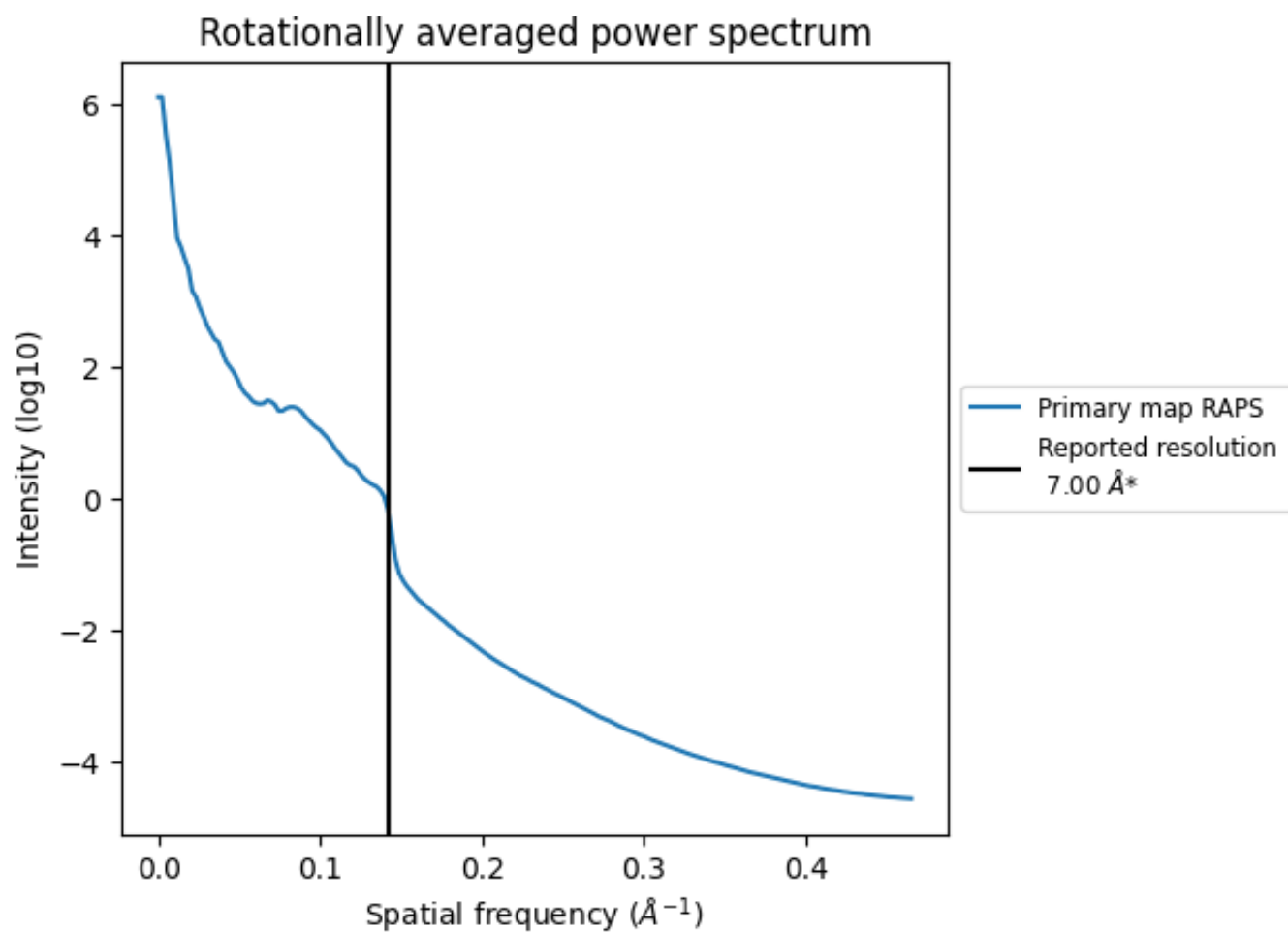
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 1122 nm³; this corresponds to an approximate mass of 1014 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 0.143\AA^{-1}

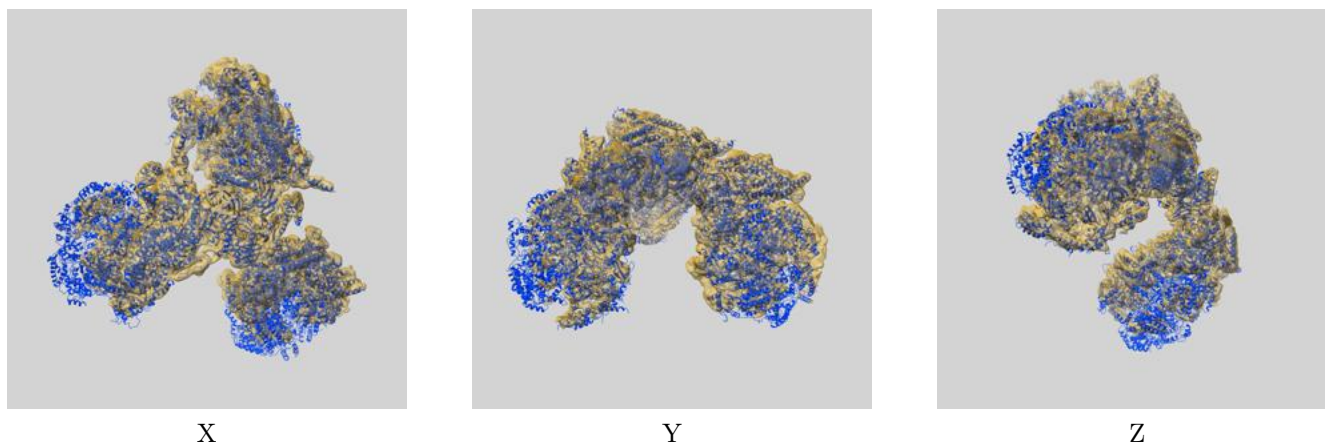
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

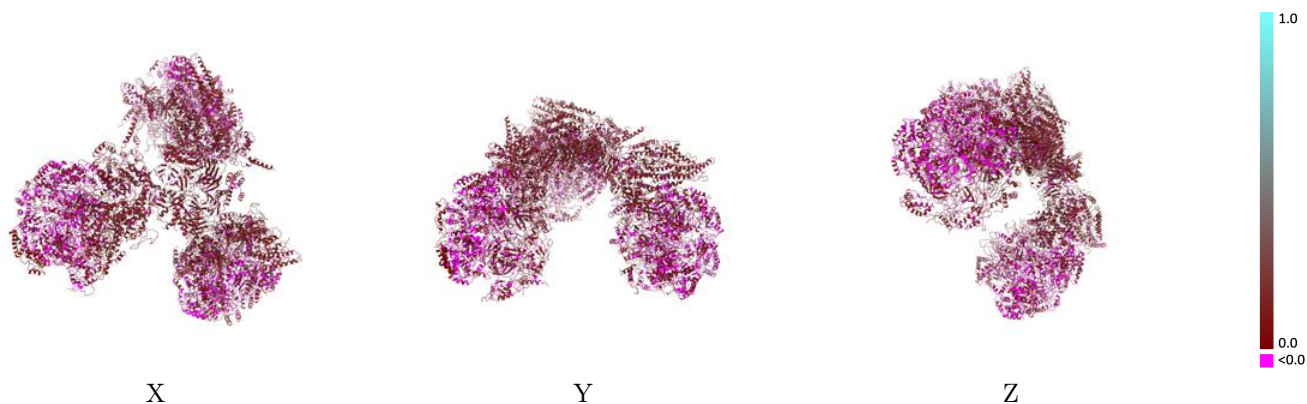
This section contains information regarding the fit between EMDB map EMD-20473 and PDB model 6PTO. Per-residue inclusion information can be found in section 3 on page 9.

9.1 Map-model overlay [i](#)



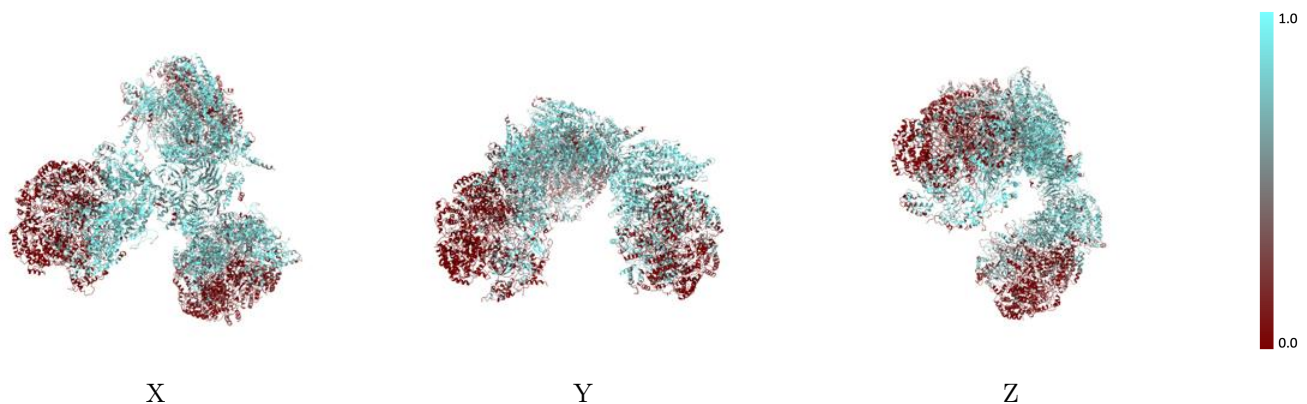
The images above show the 3D surface view of the map at the recommended contour level 0.0234 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



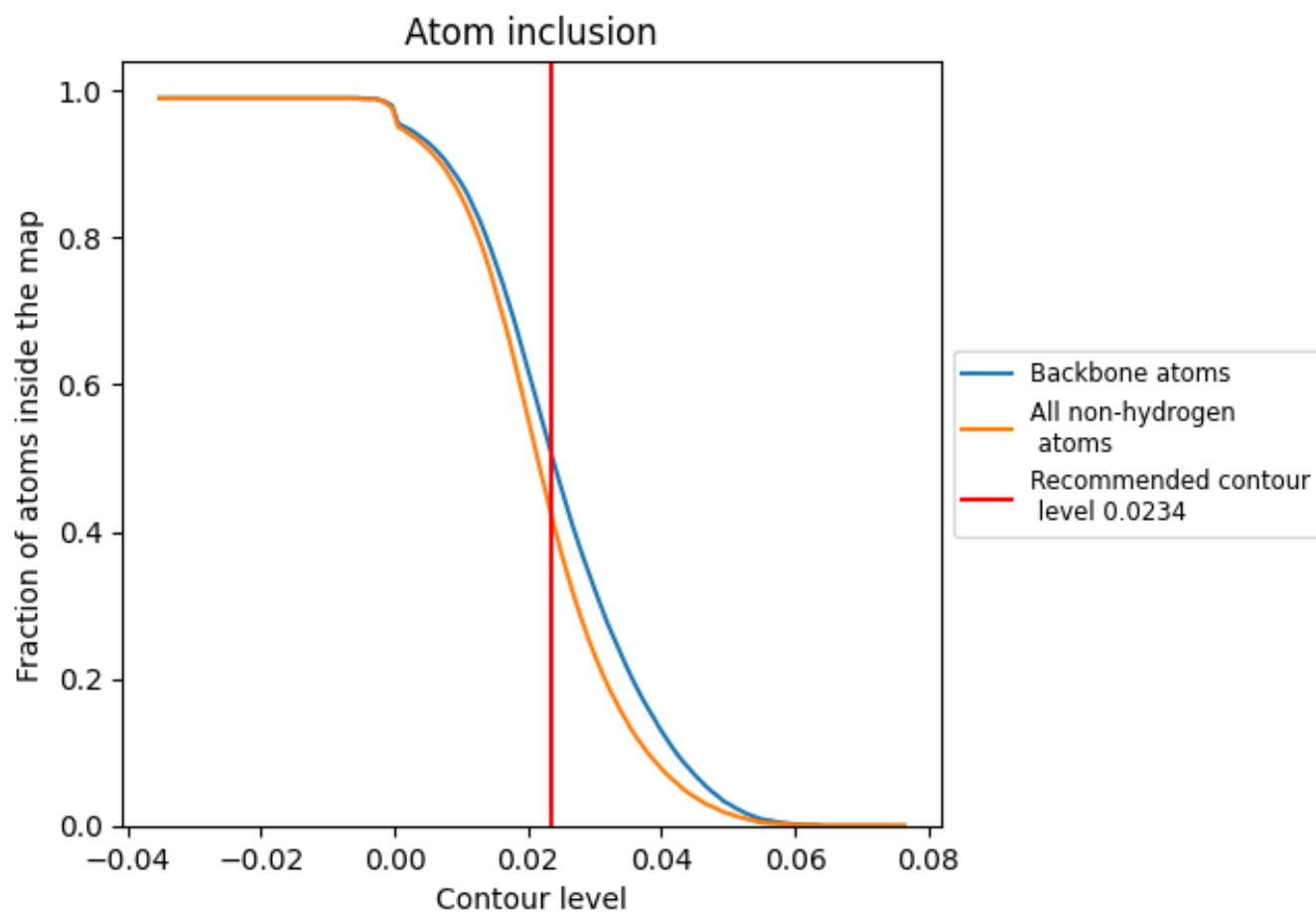
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0234).







































































9.4 Atom inclusion [i](#)



At the recommended contour level, 51% of all backbone atoms, 43% 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 (0.0234) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4260	 0.0870
2	 0.2190	 0.0410
3	 0.2970	 0.0790
4	 0.1310	 0.0410
5	 0.3340	 0.0720
6	 0.1700	 0.0510
7	 0.1560	 0.0520
A	 0.6580	 0.1510
B	 0.7130	 0.1650
C	 0.6750	 0.1510
D	 0.7320	 0.1650
E	 0.6710	 0.1370
F	 0.2620	 0.0490
G	 0.3150	 0.0730
H	 0.1730	 0.0370
I	 0.3690	 0.0780
J	 0.2410	 0.0570
K	 0.1670	 0.0350
X	 0.7230	 0.1610
Y	 0.7180	 0.1510
Z	 0.7200	 0.1520
a	 0.6520	 0.1330
b	 0.7170	 0.1590
c	 0.6720	 0.1470
d	 0.7660	 0.1680
e	 0.7240	 0.1340
h	 0.3570	 0.0330
i	 0.5370	 0.0840
j	 0.2780	 0.0500
k	 0.4550	 0.0760
l	 0.3830	 0.0590
m	 0.3770	 0.0560
n	 0.7410	 0.1570
o	 0.7400	 0.1680
p	 0.7610	 0.1550



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Chain	Atom inclusion	Q-score
q	 0.7800	 0.1700
r	 0.7000	 0.1360