



wwPDB EM Validation Summary Report ⓘ

Apr 28, 2024 – 04:47 am BST

PDB ID : 2VDC
EMDB ID : EMD-1440
Title : THE 9.5 Å RESOLUTION STRUCTURE OF GLUTAMATE SYNTHASE FROM CRYO-ELECTRON MICROSCOPY AND ITS OLIGOMERIZATION BEHAVIOR IN SOLUTION: FUNCTIONAL IMPLICATIONS.
Authors : Cotteville, M.; Larquet, E.; Jonic, S.; Petoukhov, M.V.; Caprini, G.; Paravisi, S.; Svergun, D.I.; Vanoni, M.A.; Boisset, N.
Deposited on : 2007-10-04
Resolution : 9.50 Å (reported)
Based on initial model : 2VDC

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

EMDB validation analysis : 0.0.1.dev92
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

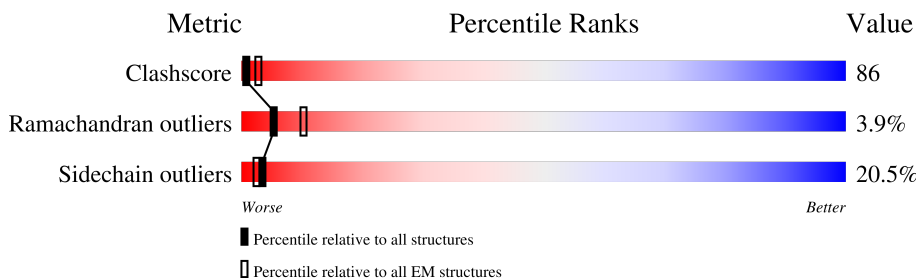
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 9.50 Å.

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



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

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

Mol	Chain	Length	Quality of chain
1	A	1472	<div style="display: flex; justify-content: space-between;"> 29% 26% 52% 20% . </div>
1	B	1472	<div style="display: flex; justify-content: space-between;"> 29% 30% 49% 17% . </div>
1	C	1472	<div style="display: flex; justify-content: space-between;"> 31% 27% 51% 20% . </div>
1	D	1472	<div style="display: flex; justify-content: space-between;"> 30% 30% 49% 17% . </div>
1	E	1472	<div style="display: flex; justify-content: space-between;"> 30% 26% 51% 20% . </div>
1	F	1472	<div style="display: flex; justify-content: space-between;"> 31% 30% 49% 17% . </div>
2	G	456	<div style="display: flex; justify-content: space-between;"> 21% 18% 49% 25% 8% </div>

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Mol	Chain	Length	Quality of chain
2	H	456	
2	I	456	
2	J	456	
2	K	456	
2	L	456	

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	OMT	A	2473	-	X	-	-
3	OMT	B	2473	-	X	-	-
3	OMT	C	2473	-	X	-	-
3	OMT	D	2473	-	X	-	-
3	OMT	E	2473	-	X	-	-
3	OMT	F	2473	-	X	-	-
6	F3S	A	2476	-	-	X	-
6	F3S	B	2476	-	-	X	-
6	F3S	C	2476	-	-	X	-
6	F3S	D	2476	-	-	X	-
6	F3S	E	2476	-	-	X	-
6	F3S	F	2476	-	-	X	-
7	SF4	G	483	-	-	X	-
7	SF4	H	483	-	-	X	-
7	SF4	I	483	-	-	X	-
7	SF4	J	483	-	-	X	-
7	SF4	K	483	-	-	X	-
7	SF4	L	483	-	-	X	-

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 89598 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.

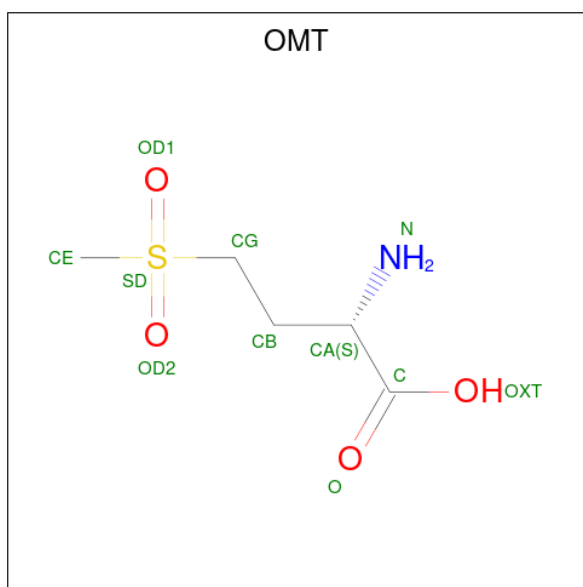
- Molecule 1 is a protein called GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1472	11337	7109	2036	2132	60	0	0
1	B	1472	11337	7109	2036	2132	60	0	0
1	C	1472	11337	7109	2036	2132	60	0	0
1	D	1472	11337	7109	2036	2132	60	0	0
1	E	1472	11337	7109	2036	2132	60	0	0
1	F	1472	11337	7109	2036	2132	60	0	0

- Molecule 2 is a protein called GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN.

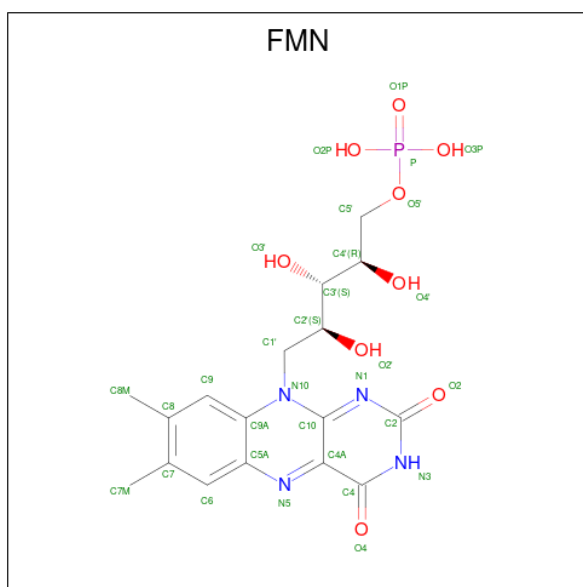
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	G	456	3468	2163	624	666	15	0	0
2	H	456	3468	2163	624	666	15	0	0
2	I	456	3468	2163	624	666	15	0	0
2	J	456	3468	2163	624	666	15	0	0
2	K	456	3468	2163	624	666	15	0	0
2	L	456	3468	2163	624	666	15	0	0

- Molecule 3 is S-DIOXYMETHIONINE (three-letter code: OMT) (formula: C₅H₁₁NO₄S).



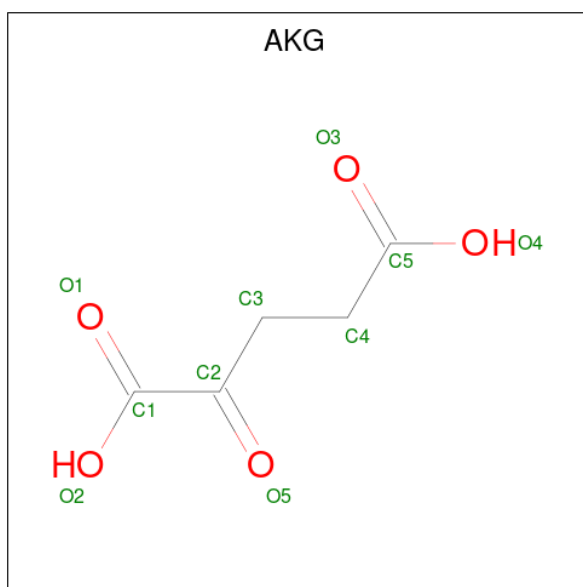
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	S	
3	A	1	Total	C	N	O	S	0
			11	5	1	4	1	
3	B	1	Total	C	N	O	S	0
			11	5	1	4	1	
3	C	1	Total	C	N	O	S	0
			11	5	1	4	1	
3	D	1	Total	C	N	O	S	0
			11	5	1	4	1	
3	E	1	Total	C	N	O	S	0
			11	5	1	4	1	
3	F	1	Total	C	N	O	S	0
			11	5	1	4	1	

- Molecule 4 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).



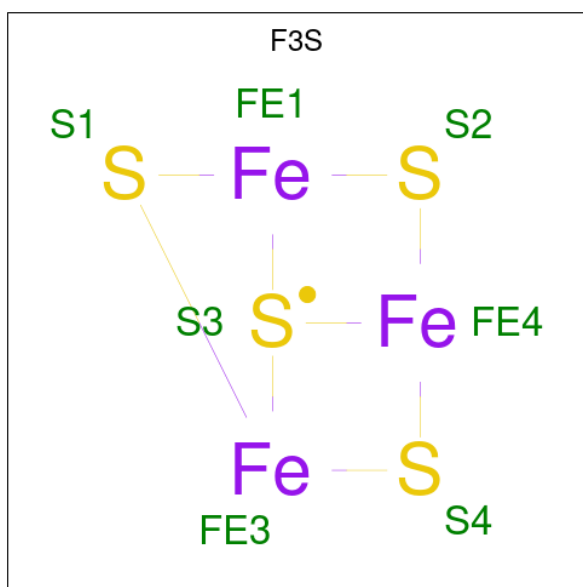
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
4	A	1	Total	C	N	O	P	0
			31	17	4	9	1	
4	B	1	Total	C	N	O	P	0
			31	17	4	9	1	
4	C	1	Total	C	N	O	P	0
			31	17	4	9	1	
4	D	1	Total	C	N	O	P	0
			31	17	4	9	1	
4	E	1	Total	C	N	O	P	0
			31	17	4	9	1	
4	F	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 5 is 2-OXOGLUTARIC ACID (three-letter code: AKG) (formula: C₅H₆O₅).



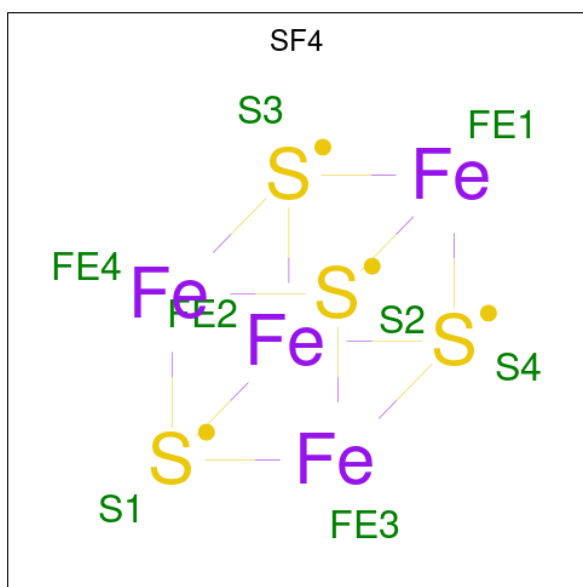
Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
5	A	1	10	5	5	0
5	B	1	10	5	5	0
5	C	1	10	5	5	0
5	D	1	10	5	5	0
5	E	1	10	5	5	0
5	F	1	10	5	5	0

- Molecule 6 is FE3-S4 CLUSTER (three-letter code: F3S) (formula: Fe₃S₄).



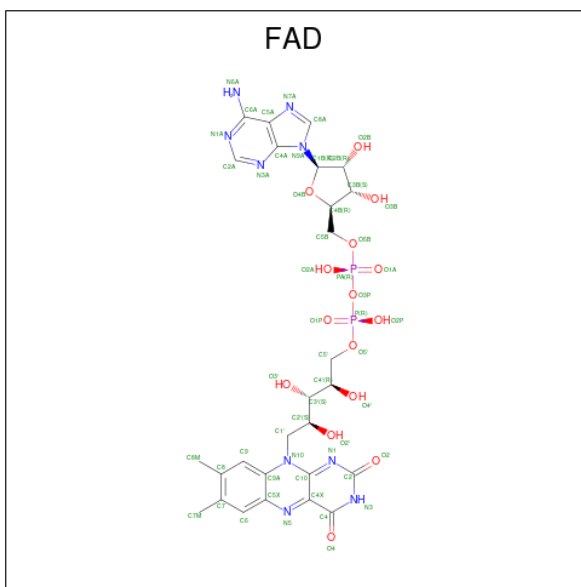
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
6	A	1	7	3	4	0
6	B	1	7	3	4	0
6	C	1	7	3	4	0
6	D	1	7	3	4	0
6	E	1	7	3	4	0
6	F	1	7	3	4	0

- Molecule 7 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe₄S₄).



Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
7	G	1	8	4	4	0
7	G	1	8	4	4	0
7	H	1	8	4	4	0
7	H	1	8	4	4	0
7	I	1	8	4	4	0
7	I	1	8	4	4	0
7	J	1	8	4	4	0
7	J	1	8	4	4	0
7	K	1	8	4	4	0
7	K	1	8	4	4	0
7	L	1	8	4	4	0
7	L	1	8	4	4	0

- Molecule 8 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: C₂₇H₃₃N₉O₁₅P₂).

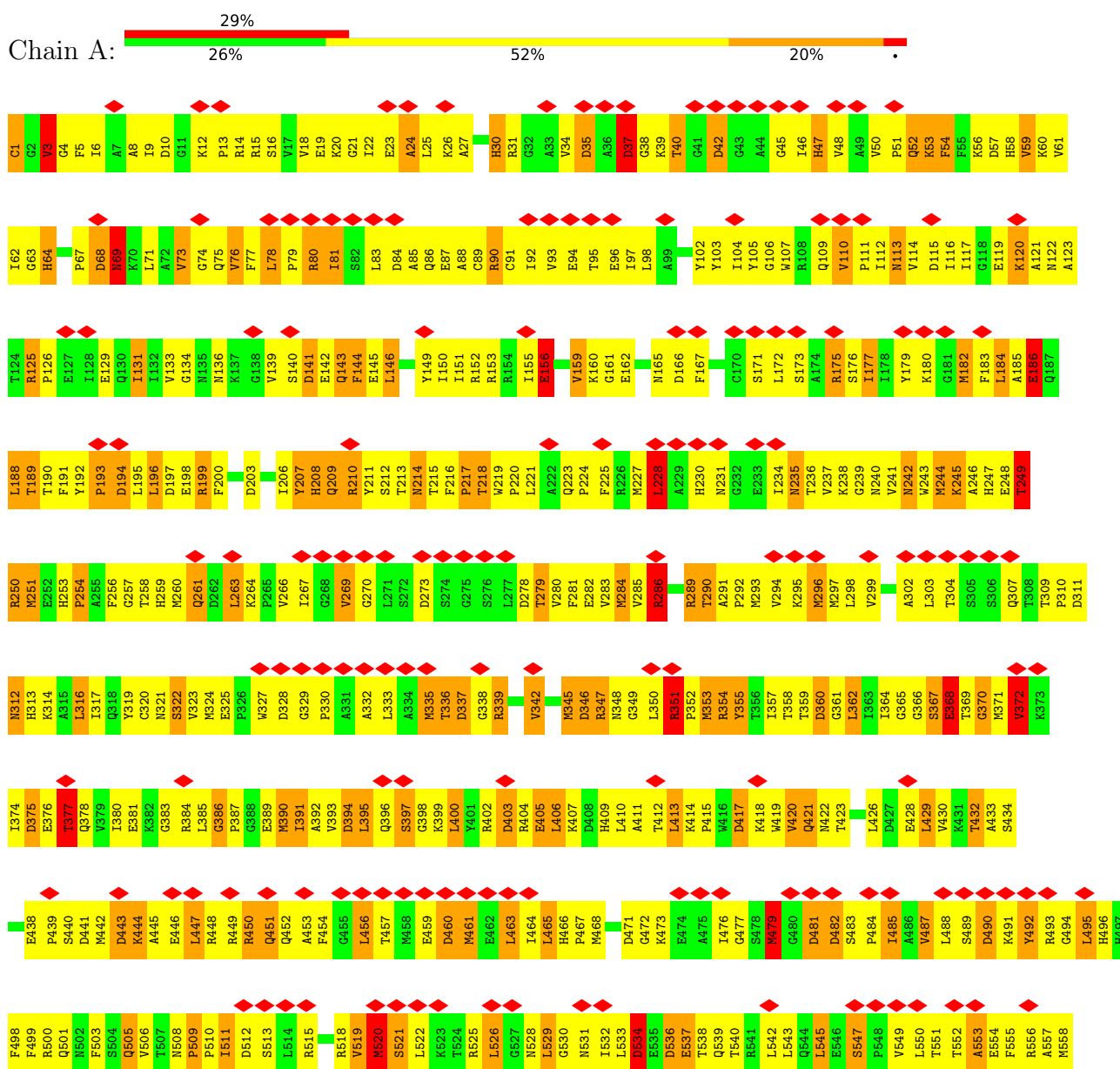


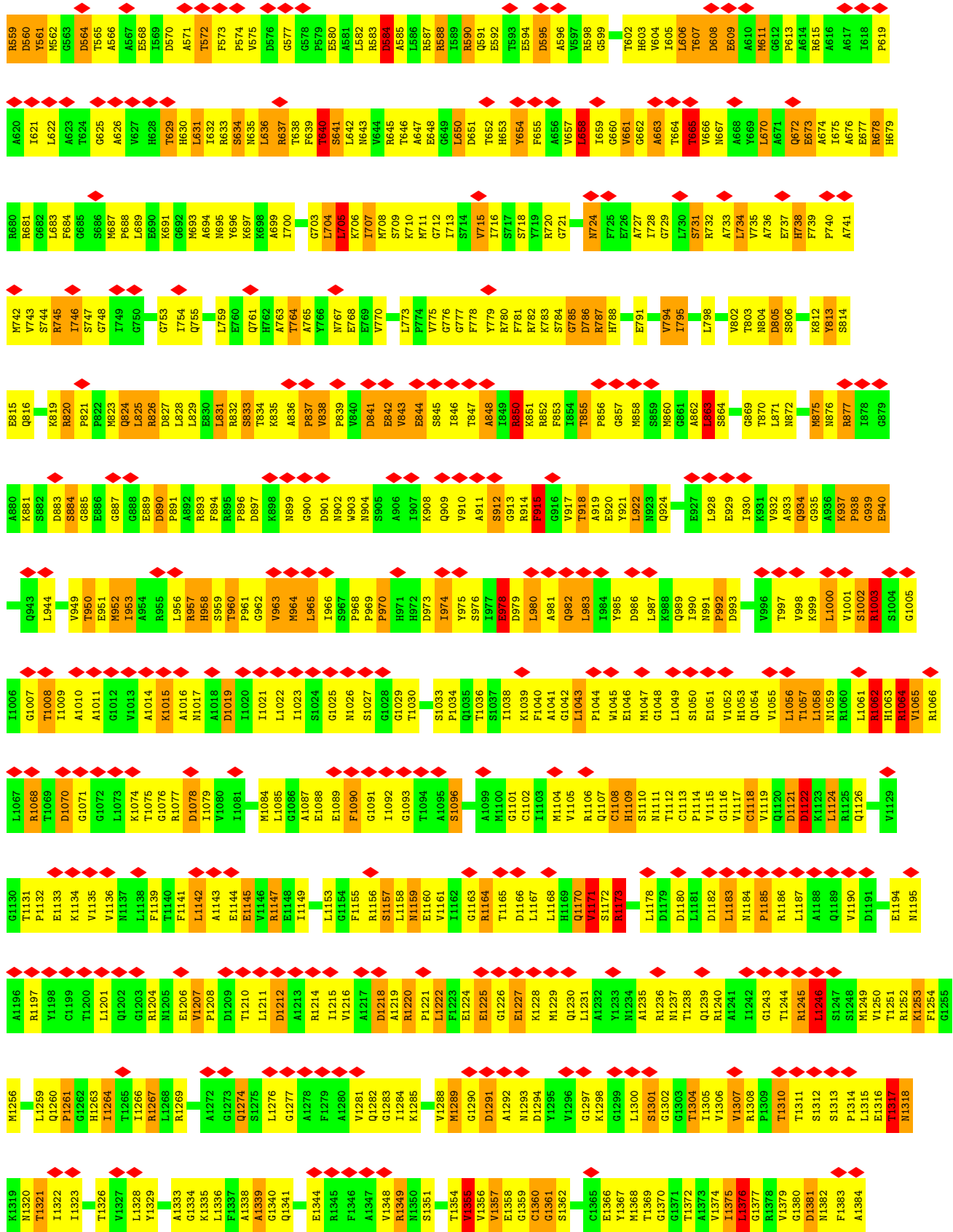
Mol	Chain	Residues	Atoms				AltConf	
			Total	C	N	O		P
8	G	1	53	27	9	15	2	0
8	H	1	53	27	9	15	2	0
8	I	1	53	27	9	15	2	0
8	J	1	53	27	9	15	2	0
8	K	1	53	27	9	15	2	0
8	L	1	53	27	9	15	2	0

3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

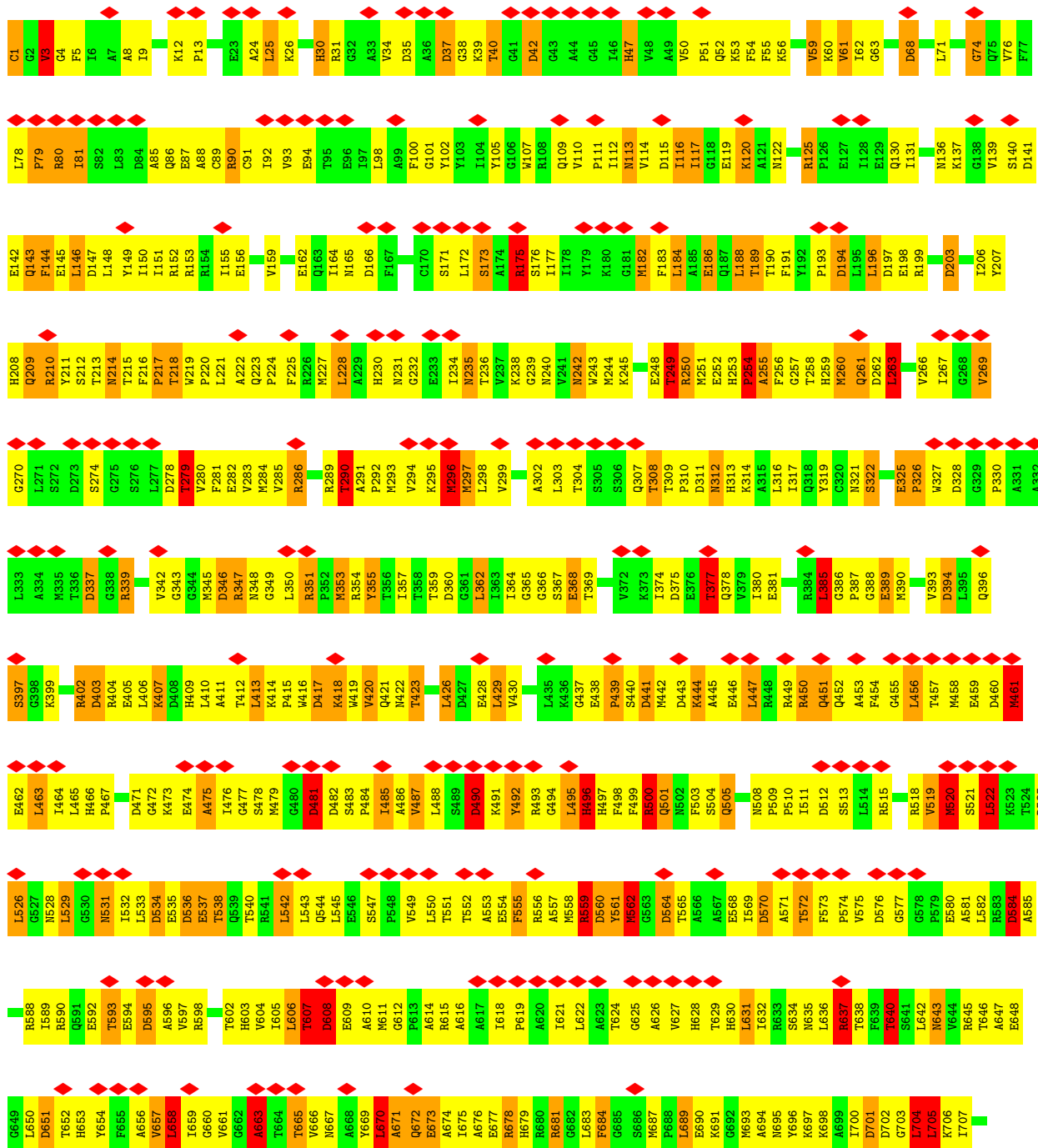
• Molecule 1: GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN

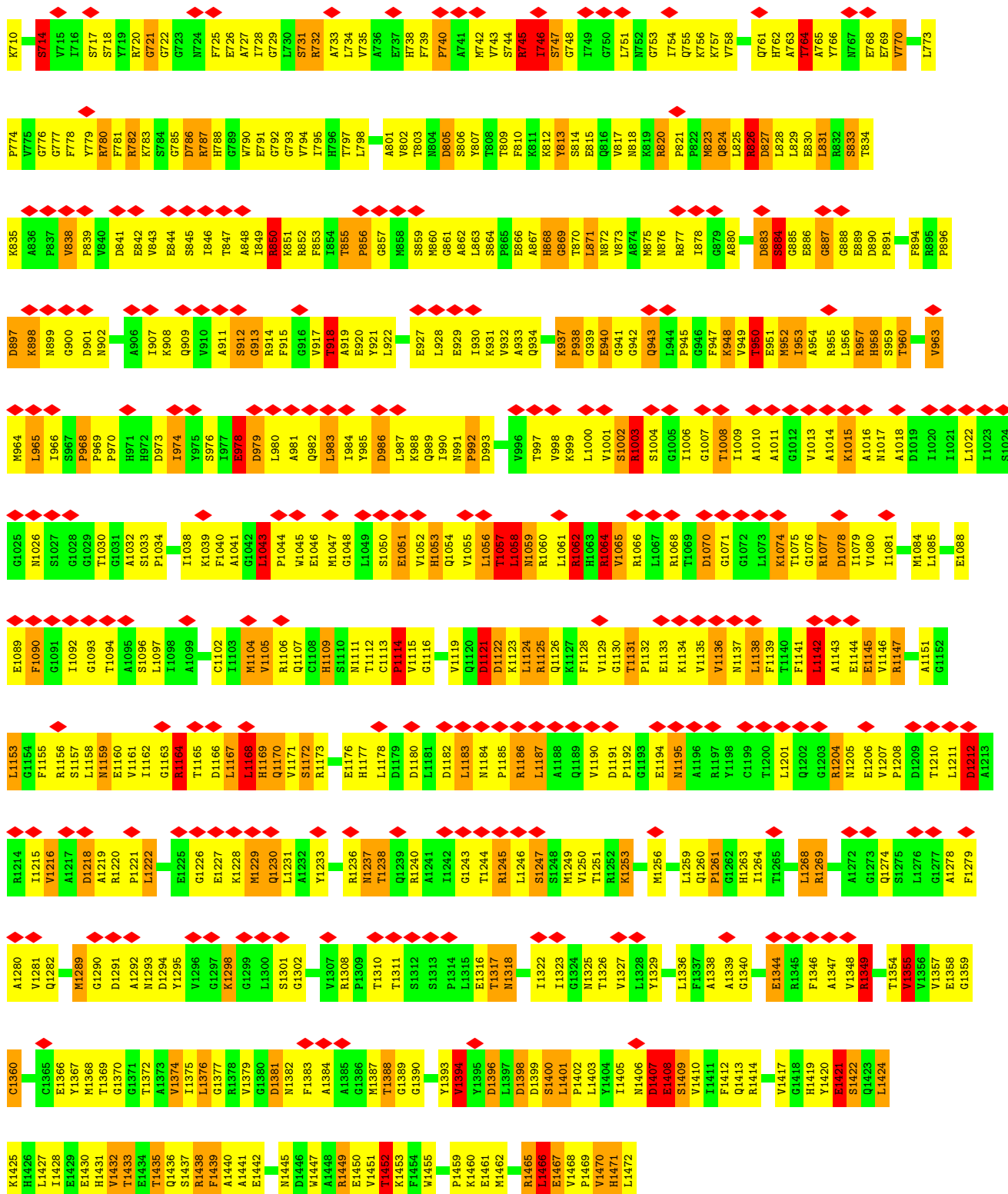






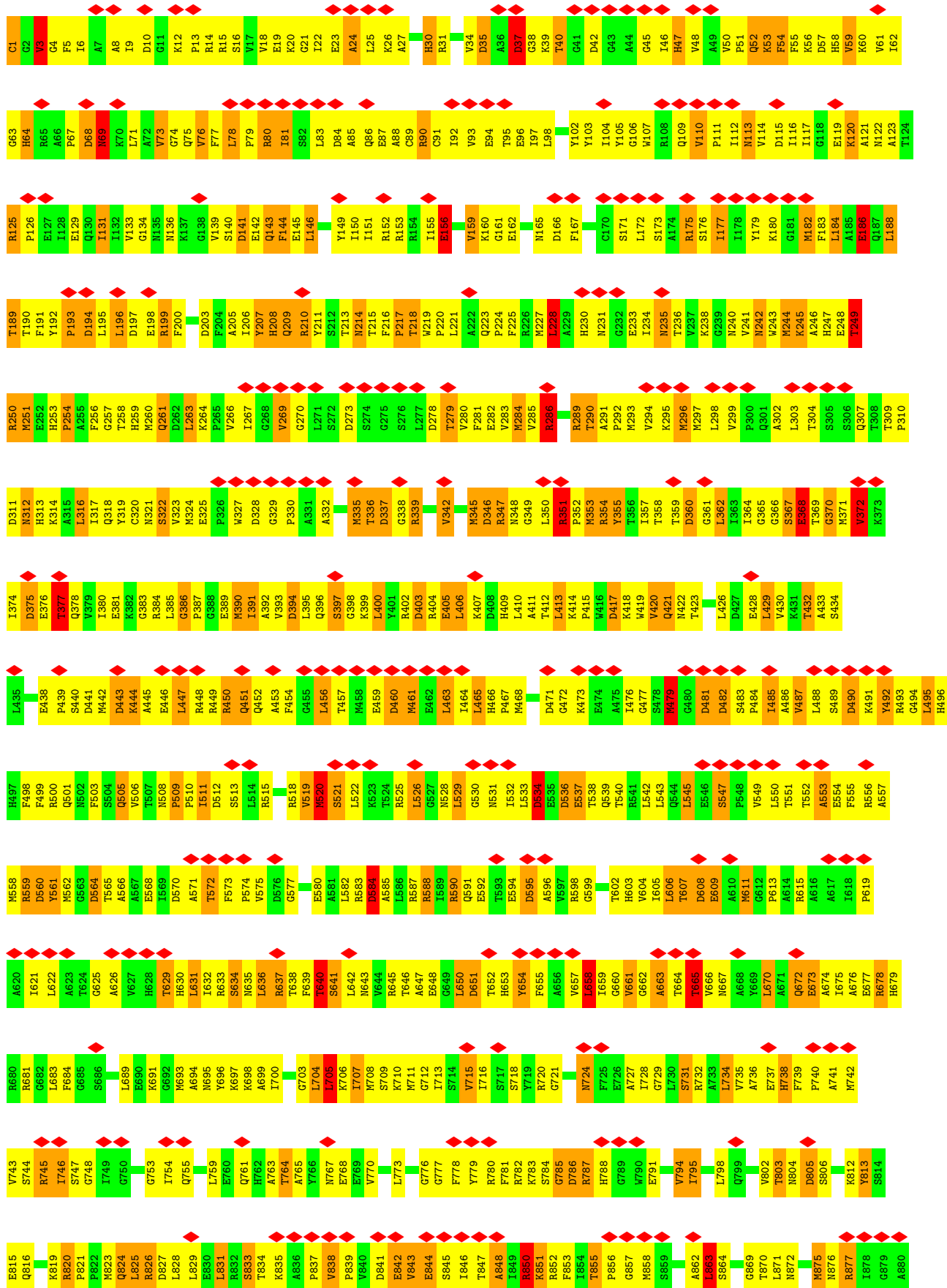
• Molecule 1: GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN

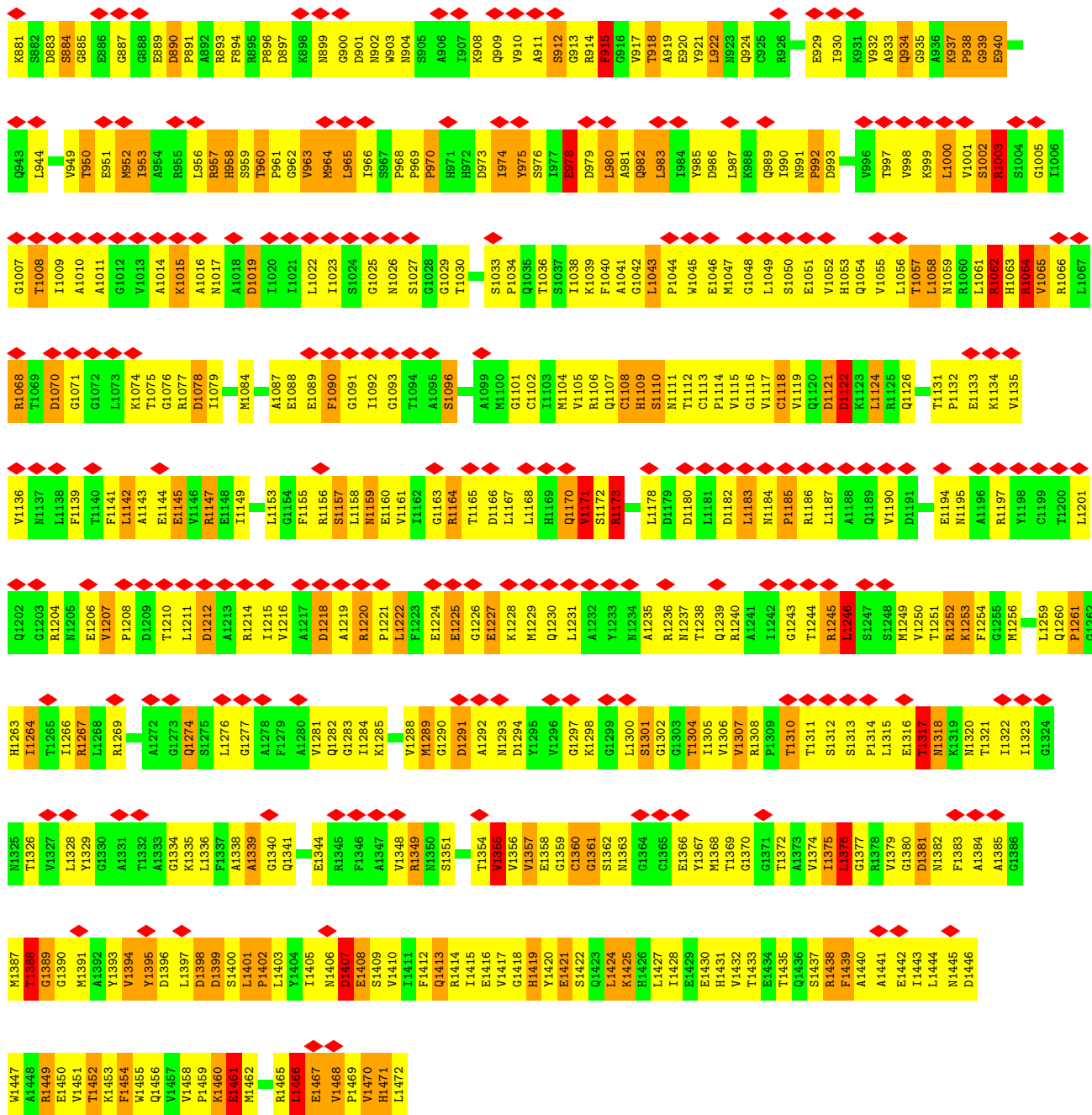




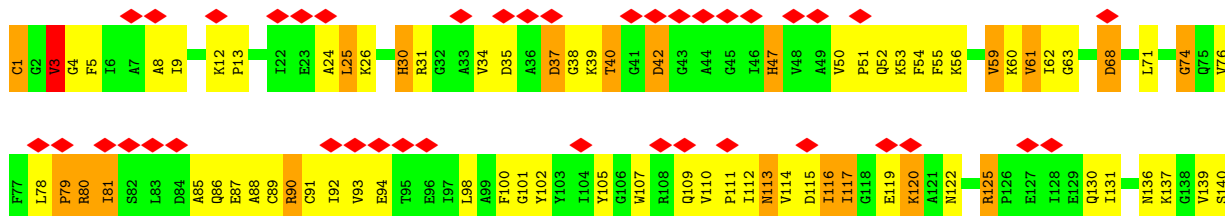
● Molecule 1: GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN

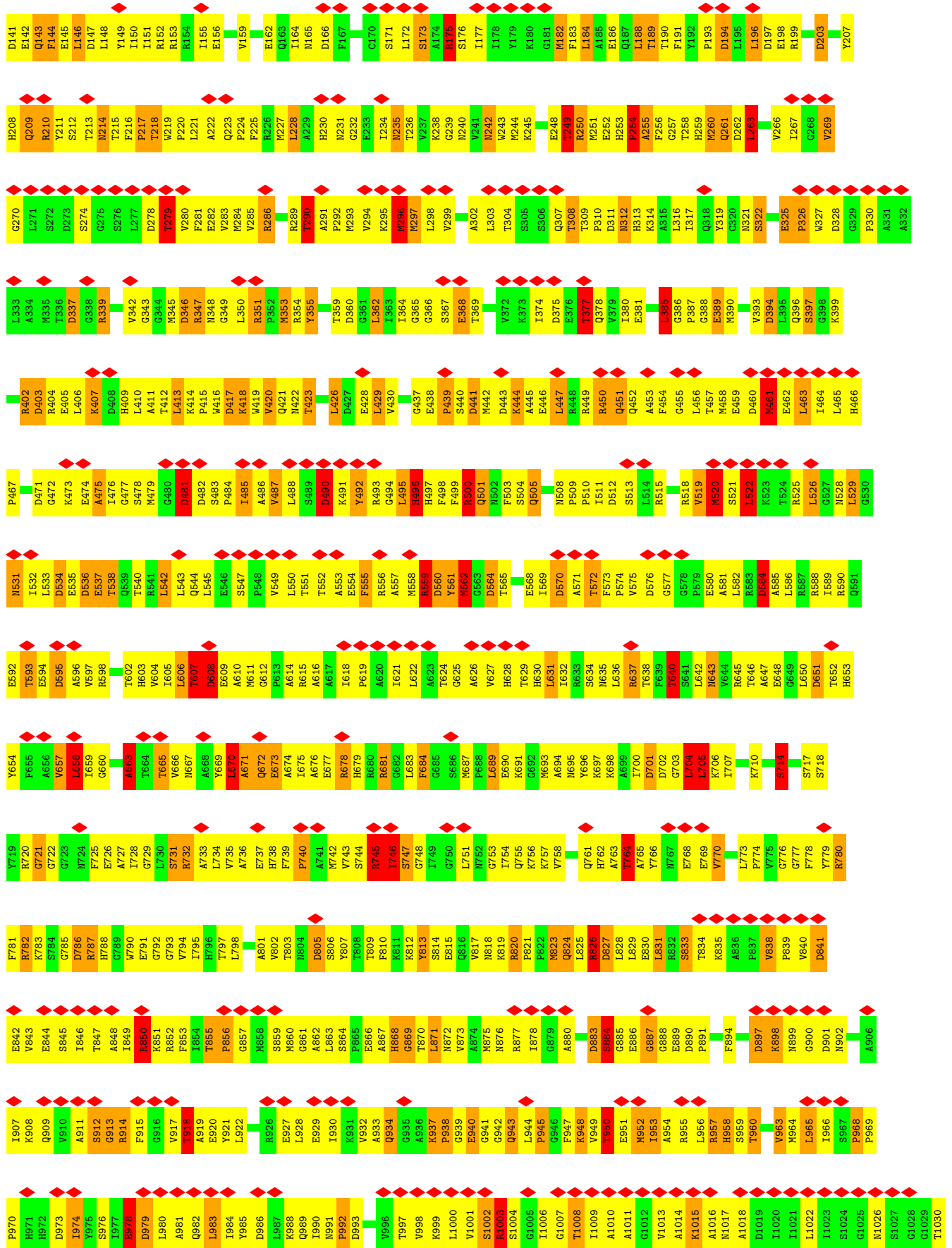


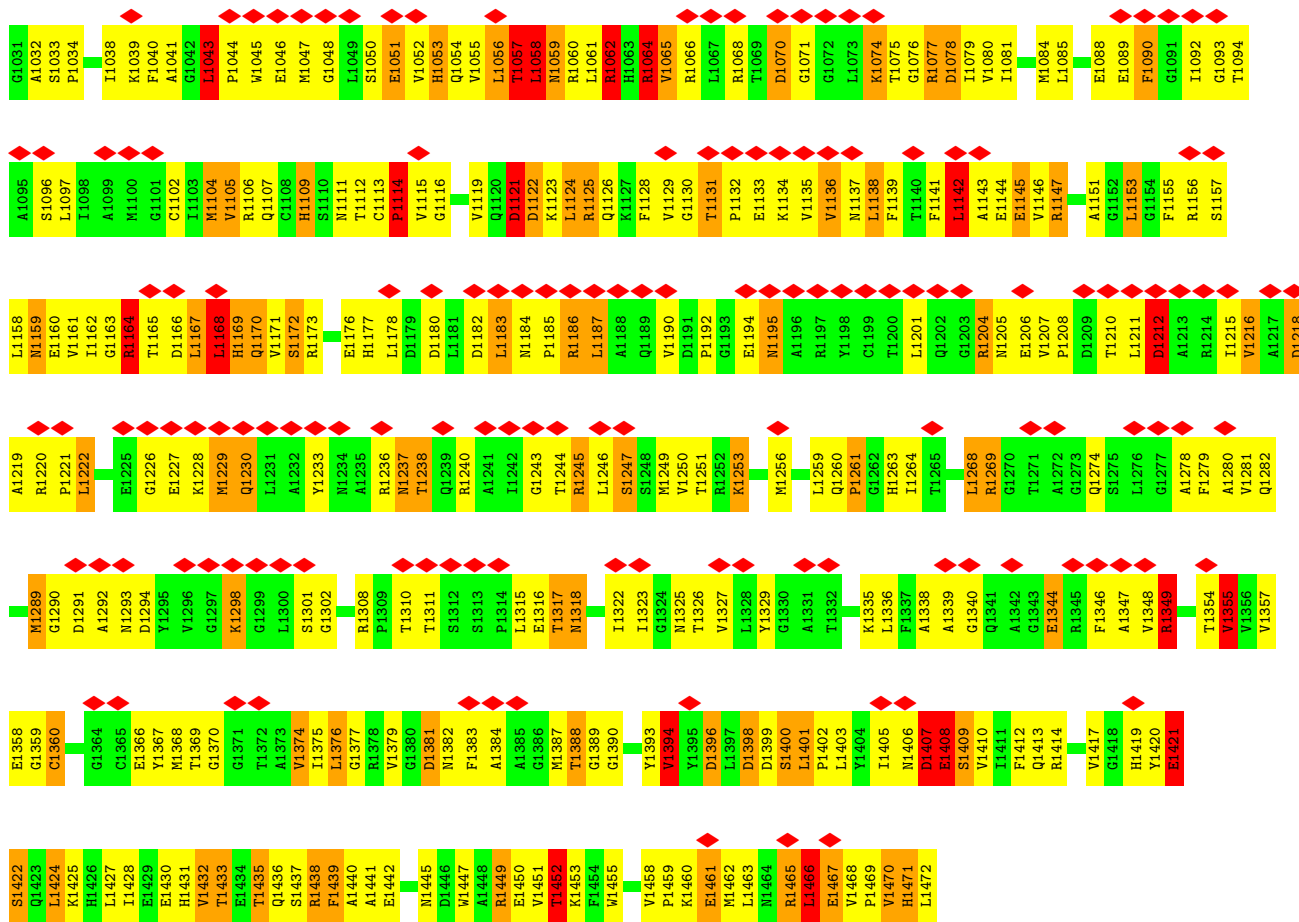




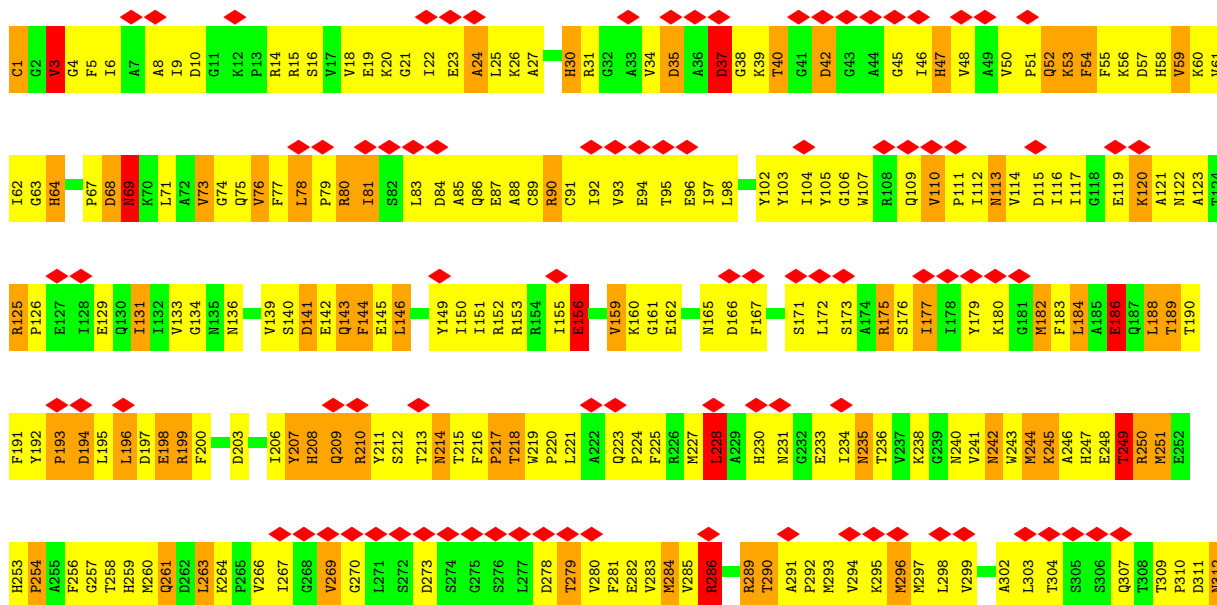
• Molecule 1: GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN

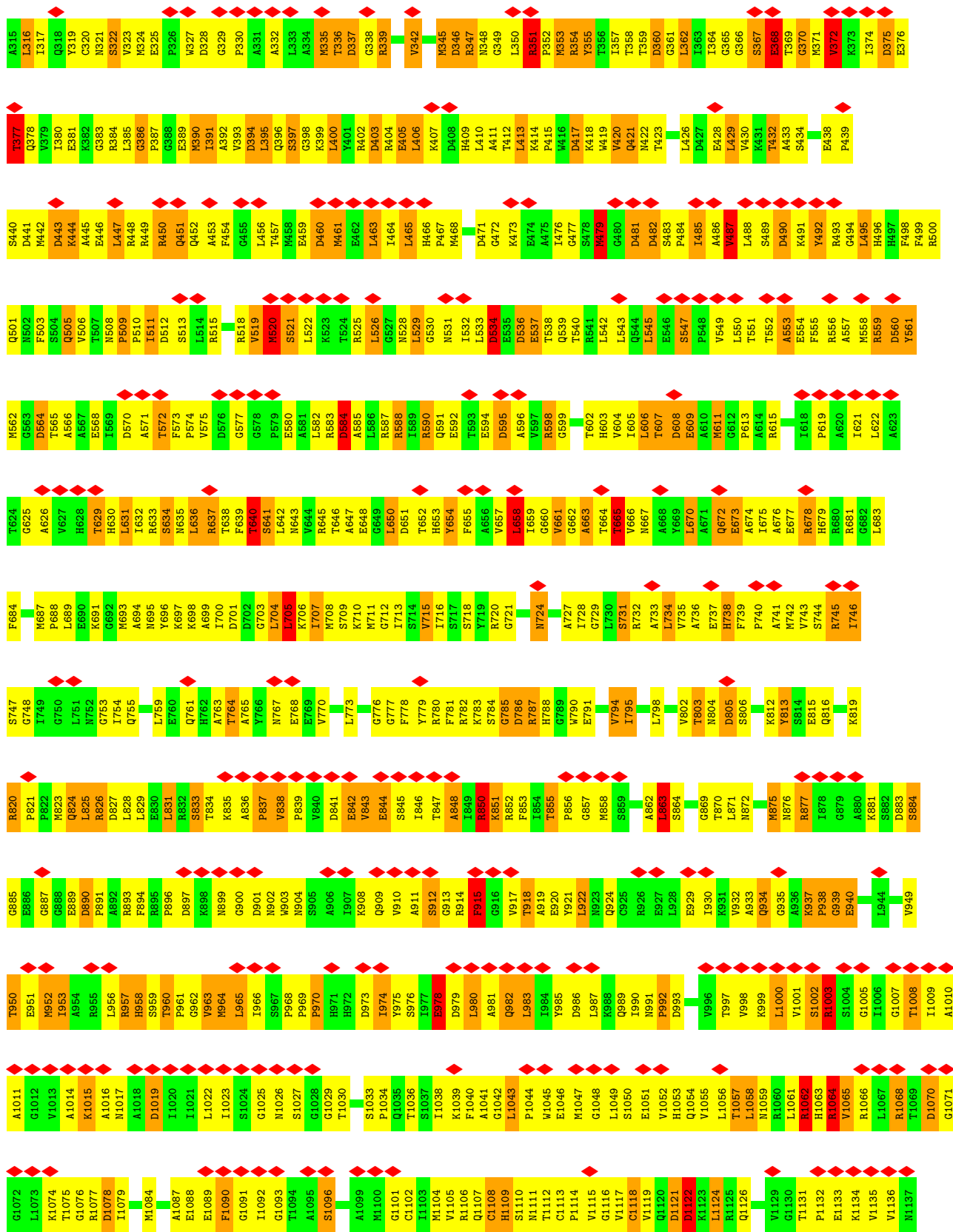


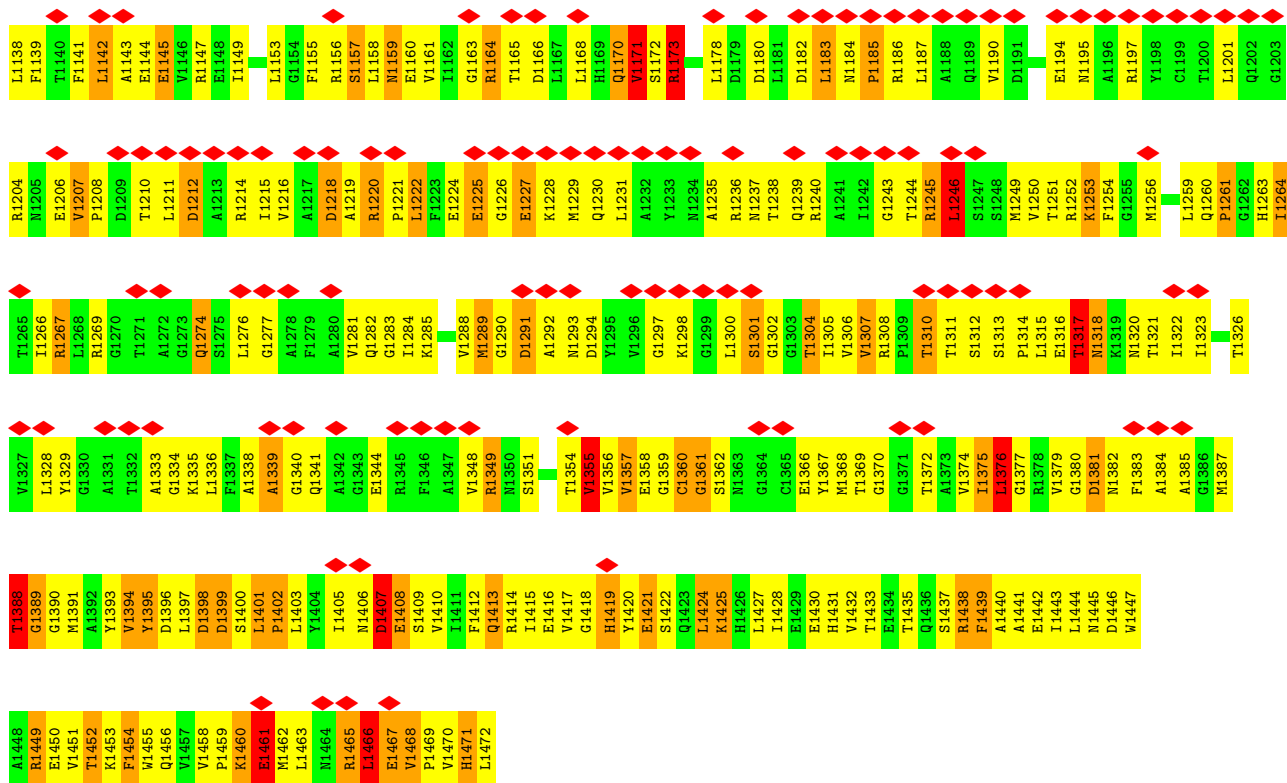




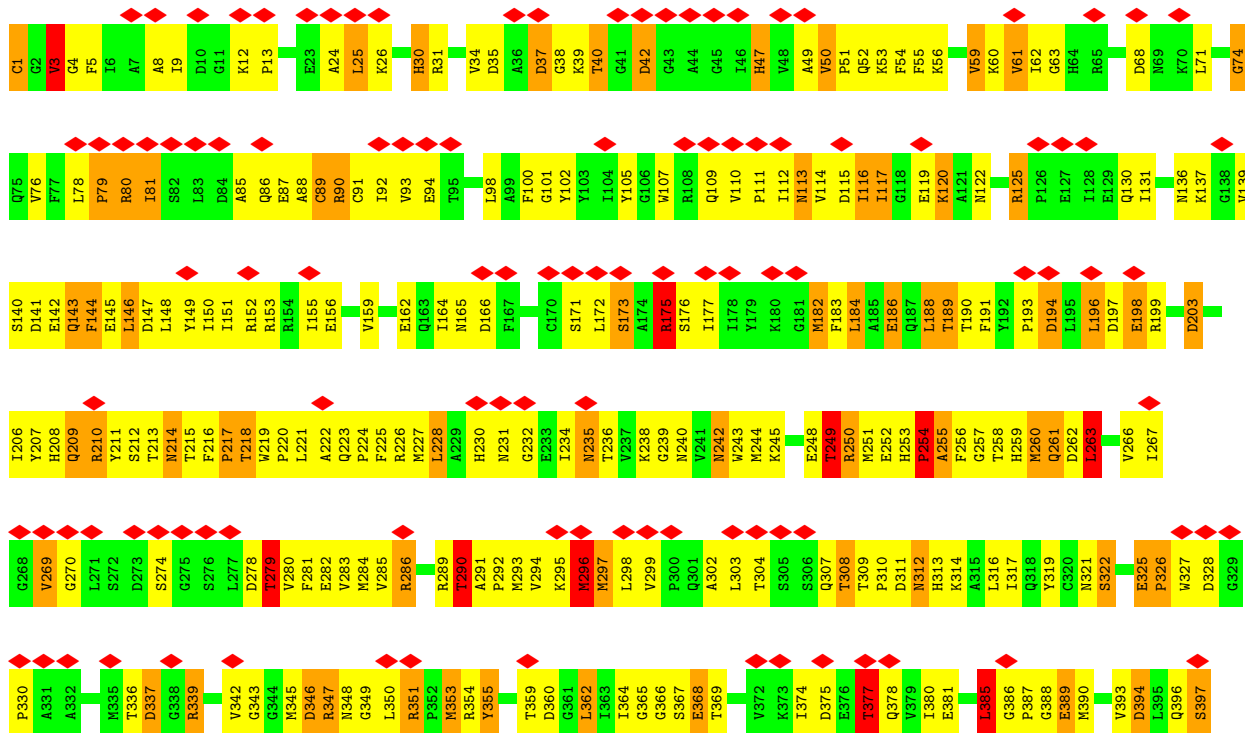
• Molecule 1: GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN



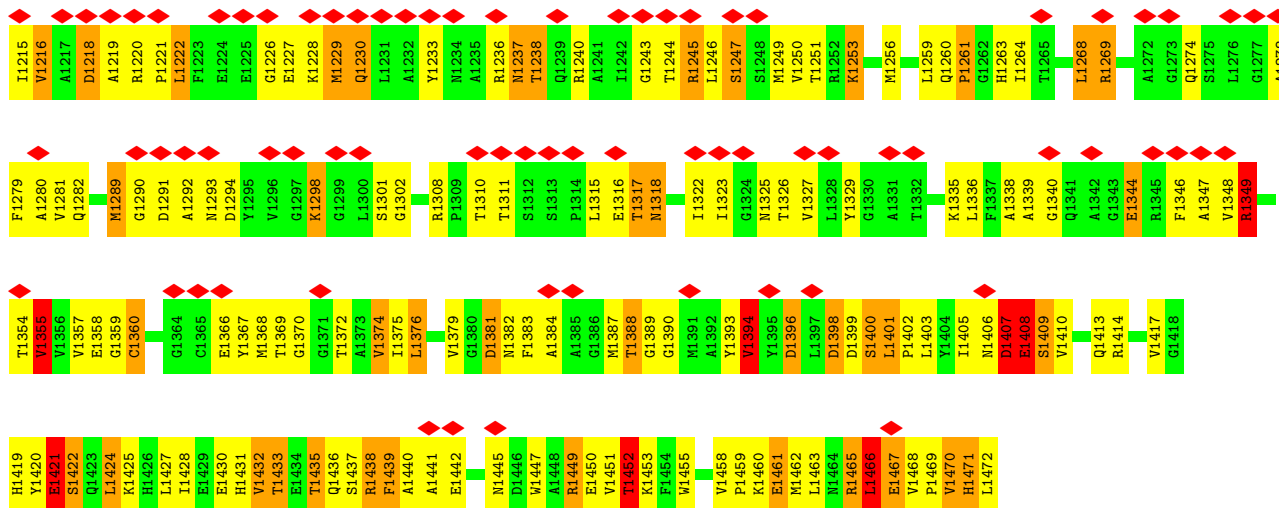




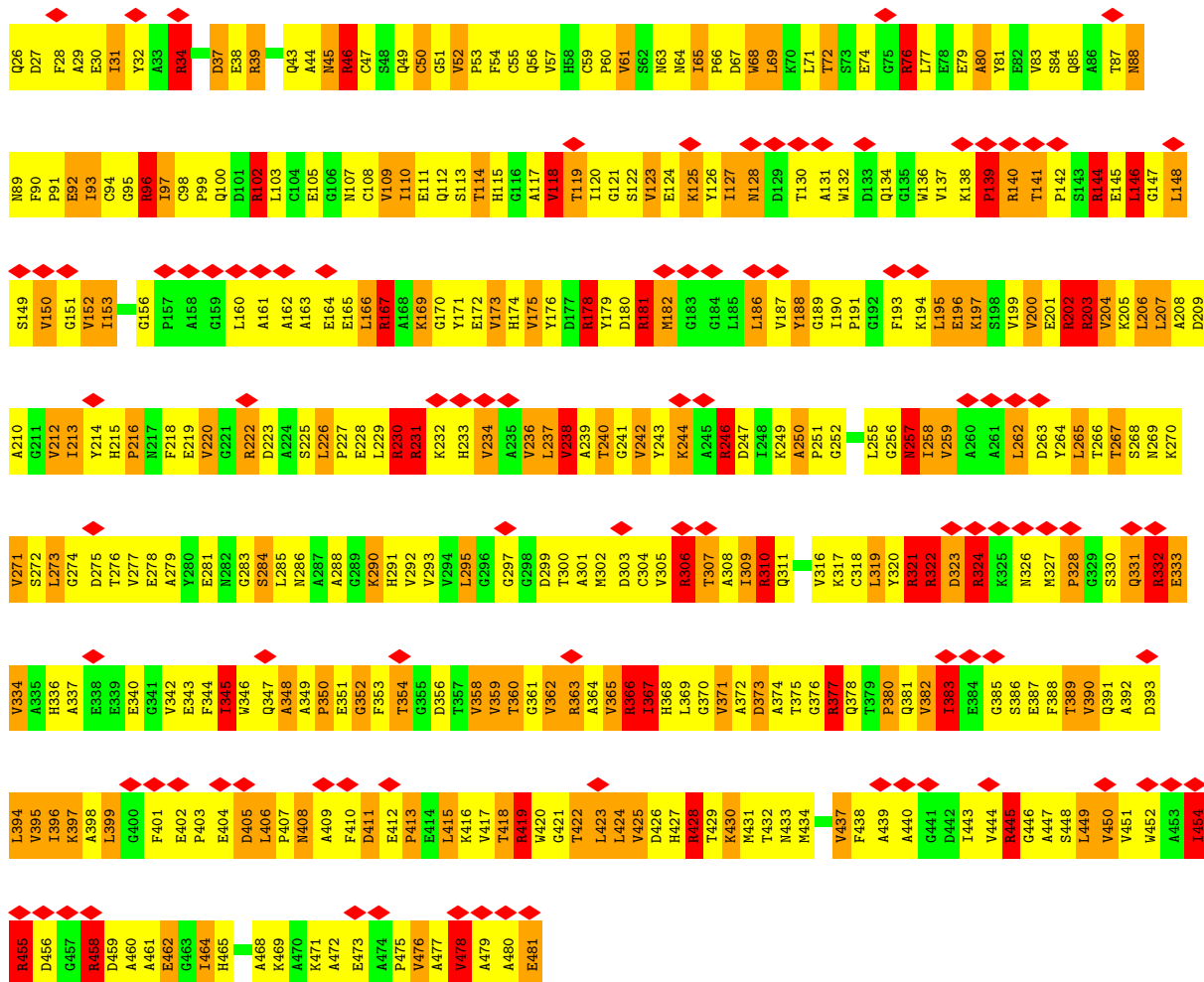
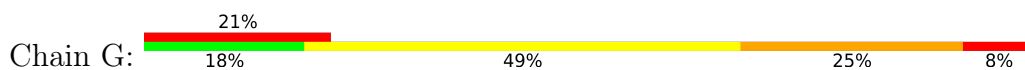
• Molecule 1: GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN



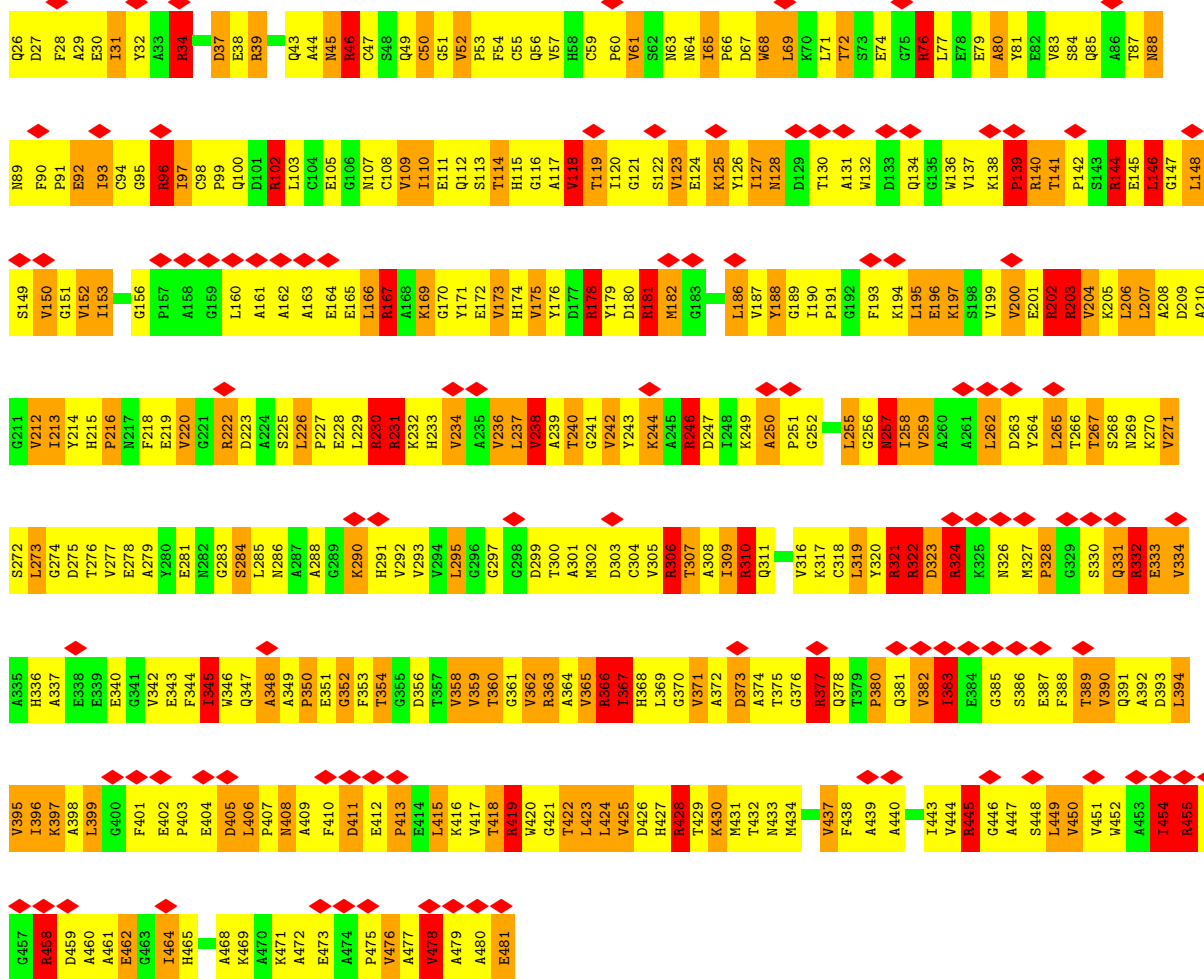
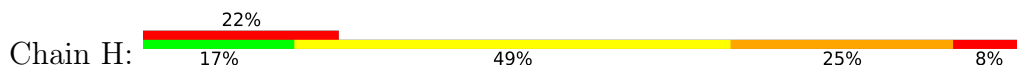
G1154	F1090	V963	S1024	K898	G776	V715	T652	R590	G527	G399	K999
F1155	G1091	M964	G1025	N899	G777	I716	H653	Q891	M528	K402	K399
R1156	I1092	L965	N1026	G900	F778	S717	Y654	E592	L529	R403	R402
S1157	G1093	L966	N1027	D901	Y779	T718	F655	T593	G530	D404	D403
L1158	G1094	S967	T1030	N902	R780	Y719	A656	E594	N531	R405	R404
M1159	A1095	P968	T1031	A906	R781	R720	V657	D595	I532	E407	E405
E1160	L1096	P969	G1032	K908	R782	G721	L658	A596	L533	L406	L406
I1161	A1032	P970	S1033	K909	K783	G722	I659	R597	D534	E408	E408
I1162	L1097	H971	P1034	Q909	S784	G723	G660	R598	D535	L410	L410
G1163	I1098	H972	P1034	Q909	G785	N724	G661	A475	D536	A411	A411
R1164	I1099	D973	I1038	V910	D786	E725	G662	E474	D537	L412	L412
T1165	C1102	Y974	K1039	A911	R787	F726	A663	A475	T538	L413	L413
L1166	I1103	Y975	F1040	A912	H788	A727	T664	A476	I476	T411	T411
L1167	M1104	S976	F1041	G913	G789	G728	T665	S478	S478	L414	L414
L1168	V1105	I977	G1042	R914	W790	L730	V666	M479	M479	K414	K414
H1169	L1043	E978	L1043	R915	E791	S731	N667	G480	G480	P415	P415
Q1170	P1044	D979	P1044	F915	G792	R732	E609	G481	G481	M416	M416
H1171	G1108	L980	W1045	G916	G793	A733	A668	D482	D482	D417	D417
S1172	H1109	L981	W1045	V917	W794	L734	Y669	S483	S483	K418	K418
R1173	M1110	Q982	E1046	T918	I795	L735	A670	S484	S484	W420	W420
E1176	M1111	L983	M1047	A919	H796	A736	L671	P484	P484	Q421	Q421
H1177	G1048	L984	G1048	E920	T797	E737	Q672	I485	I485	M422	M422
L1178	L1049	Y985	L1049	Y921	L798	H738	E673	A486	A486	N422	N422
D1179	S1050	D986	S1050	L922	Q799	F739	A674	V487	V487	T423	T423
D1180	E1051	L987	E1051	R926	Q800	P740	I675	L488	L488	L426	L426
L1181	V1052	K988	V1052	E927	A801	H740	A676	S489	S489	D427	D427
D1182	H1053	Q989	H1053	L928	B802	A741	E677	S490	S490	E428	E428
L1183	Q1054	L990	Q1054	E929	T803	W742	R678	D490	D490	E429	E429
M1184	V1055	Q990	V1055	E930	N804	V743	H679	K491	K491	L429	L429
P1185	L1056	P992	L1056	R931	D805	S744	R680	Y492	Y492	V430	V430
R1186	T1057	D993	T1057	V932	E806	I746	G682	R493	R493	L435	L435
L1187	M1059	V996	M1059	Q933	Y807	S747	F684	C494	C494	K436	K436
A1188	R1060	T997	R1060	A934	T809	G748	G685	L495	L495	G437	G437
H1189	L1061	T998	L1061	G935	F810	G749	G686	S502	S502	E438	E438
G1190	R1062	V998	R1062	Q936	X811	I749	P688	F497	F497	P439	P439
V1190	H1063	K999	H1063	P938	K812	G750	M687	S504	S504	S440	S440
D1191	L1064	L1000	L1064	G939	Y813	L751	G688	F499	F499	D441	D441
L1191	R1065	V1001	R1065	E940	S814	N752	L689	R500	R500	M442	M442
P1192	R1066	L1002	P1192	G941	E815	G753	E690	Q501	Q501	D443	D443
G1193	L1067	S1003	L1067	G942	Q816	I754	G692	N502	N502	K444	K444
E1194	V1135	S1004	V1135	Q943	R820	Q755	M693	S504	S504	A445	A445
M1195	L1136	G1005	L1136	L944	P821	K756	A694	Q505	Q505	E446	E446
A1196	I1006	I1006	I1006	P945	R822	K757	N695	N508	N508	L447	L447
R1197	D1070	G1007	D1070	S946	K824	V758	Y696	P509	P509	R448	R448
Y1198	G1071	T1008	G1071	K948	L824	L759	K697	P510	P510	R449	R449
C1199	G1072	T1008	G1072	R949	L825	E760	K698	P511	P511	R450	R450
T1200	L1073	I1009	L1073	V950	R826	H762	I700	D512	D512	Q451	Q451
L1201	K1074	A1010	K1074	E951	D827	A763	D701	S513	S513	Q452	Q452
Q1202	T1075	A1011	T1075	N952	L828	W764	D702	L514	L514	A453	A453
G1203	G1012	V1013	G1012	R953	L829	A765	G703	R515	R515	F454	F454
R1204	R1077	V1013	R1077	I954	L830	Y766	N643	R518	R518	G455	G455
N1205	D1078	A1014	D1078	A954	R831	N767	L705	R519	R519	L456	L456
E1206	I1079	K1015	I1079	R955	R832	E768	K706	M520	M520	T457	T457
P1208	V1080	N1016	V1080	L956	S833	V770	I707	S521	S521	M458	M458
D1209	I1081	A1016	I1081	R957	R834	V771	K710	L522	L522	E459	E459
L1210	M1084	A1018	M1084	H958	T834	L773	G649	K523	K523	D460	D460
L1211	E1088	I1020	L1211	S959	R894	P774	S714	L525	L525	W461	W461
D1212	E1089	I1021	D1212	T960	R896	V775		R589	R589	E462	E462
A1213			A1213		R897						
R1214			R1214								



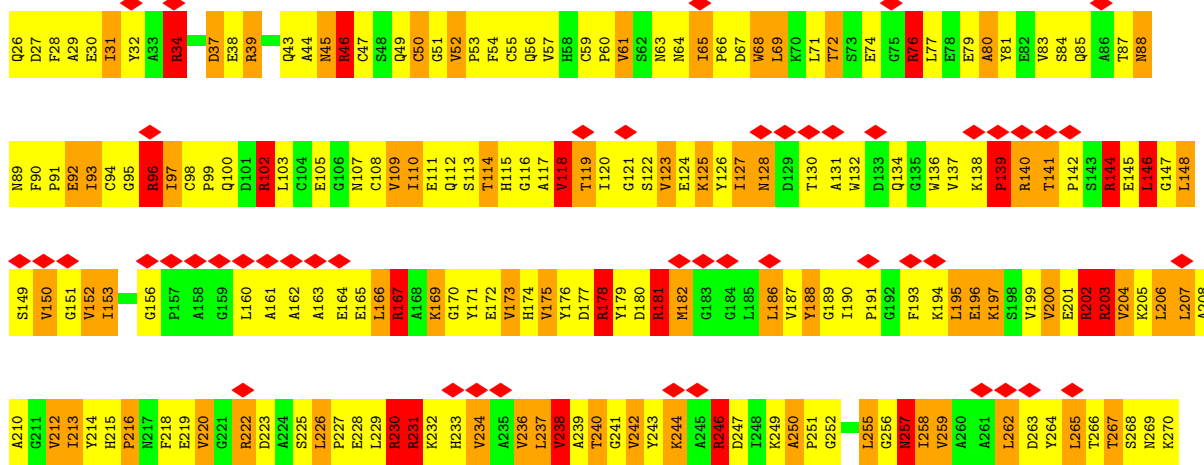
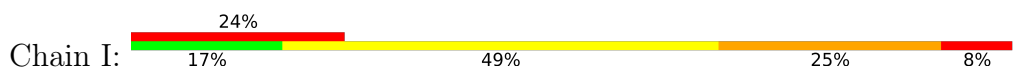
• Molecule 2: GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN

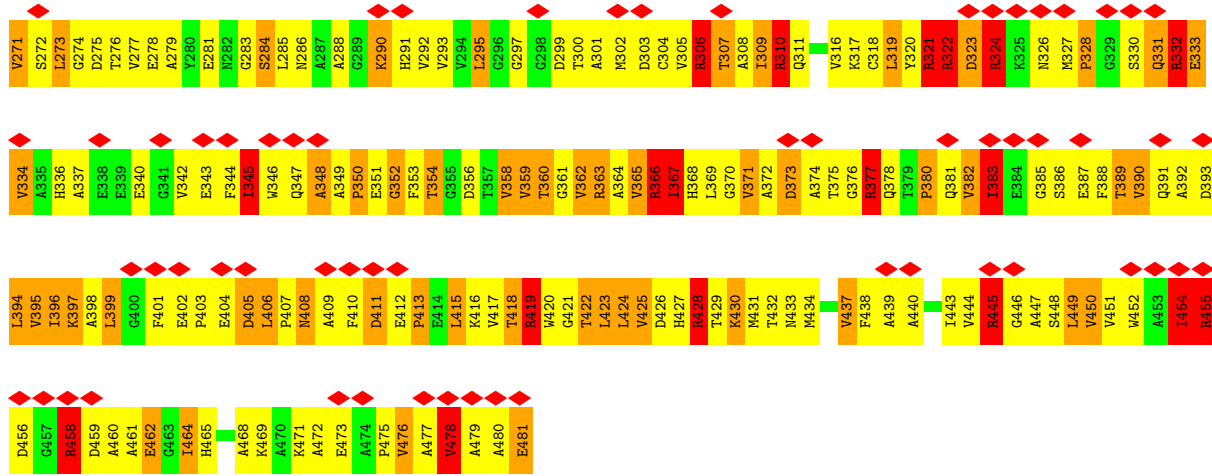


• Molecule 2: GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN

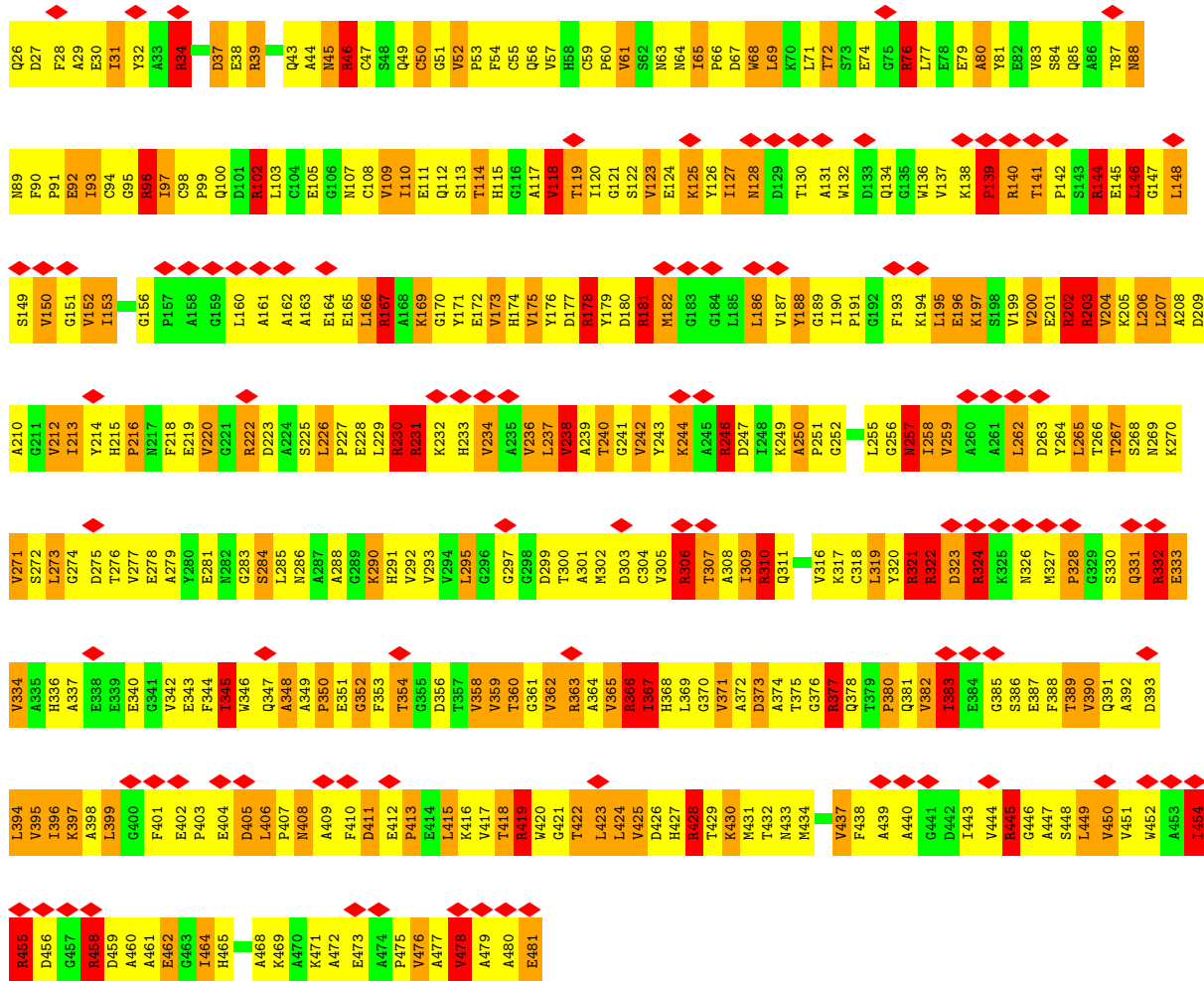
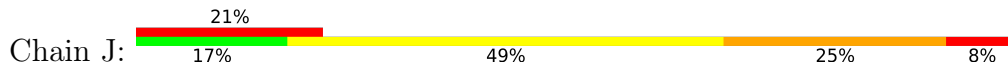


• Molecule 2: GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN

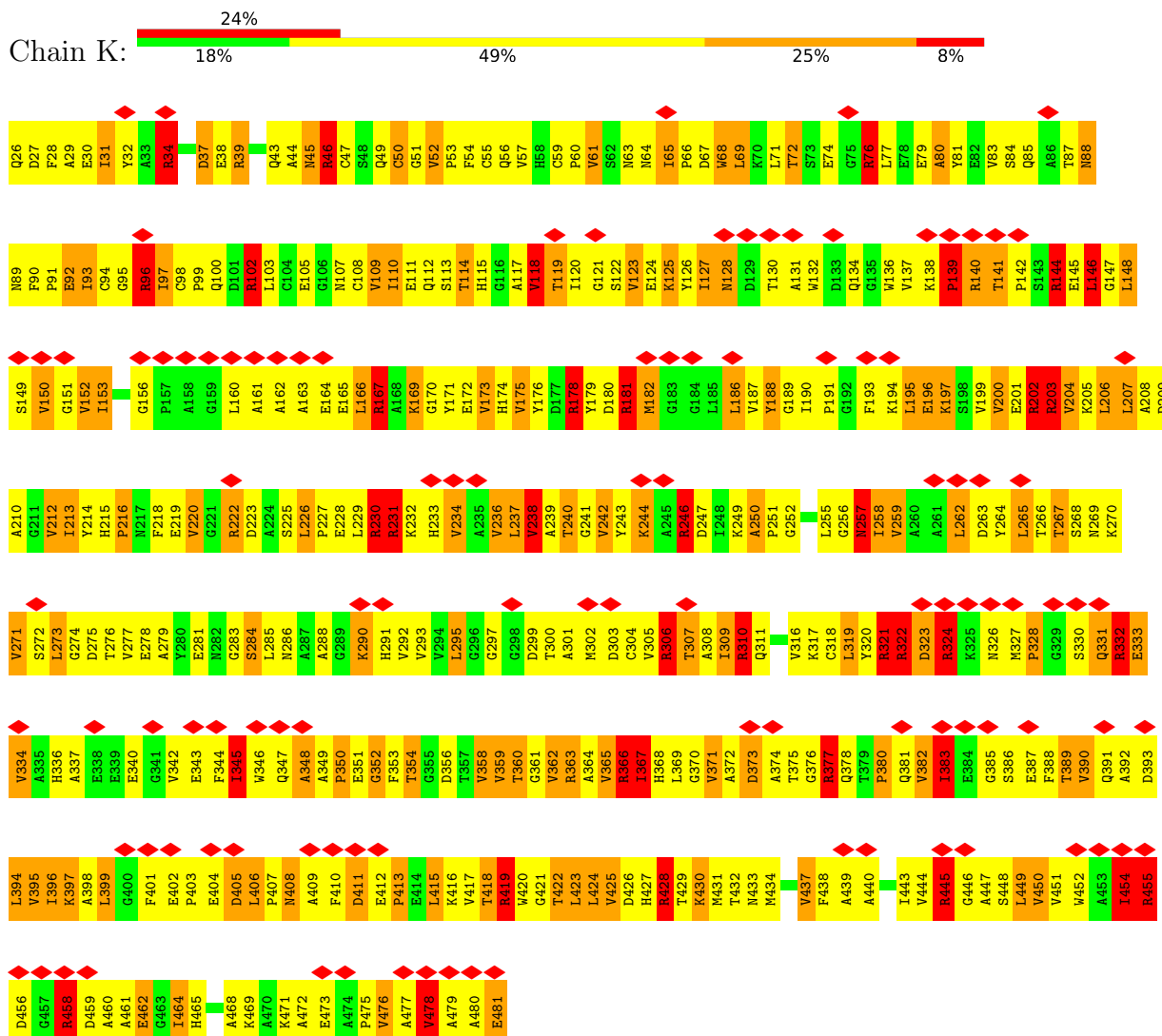




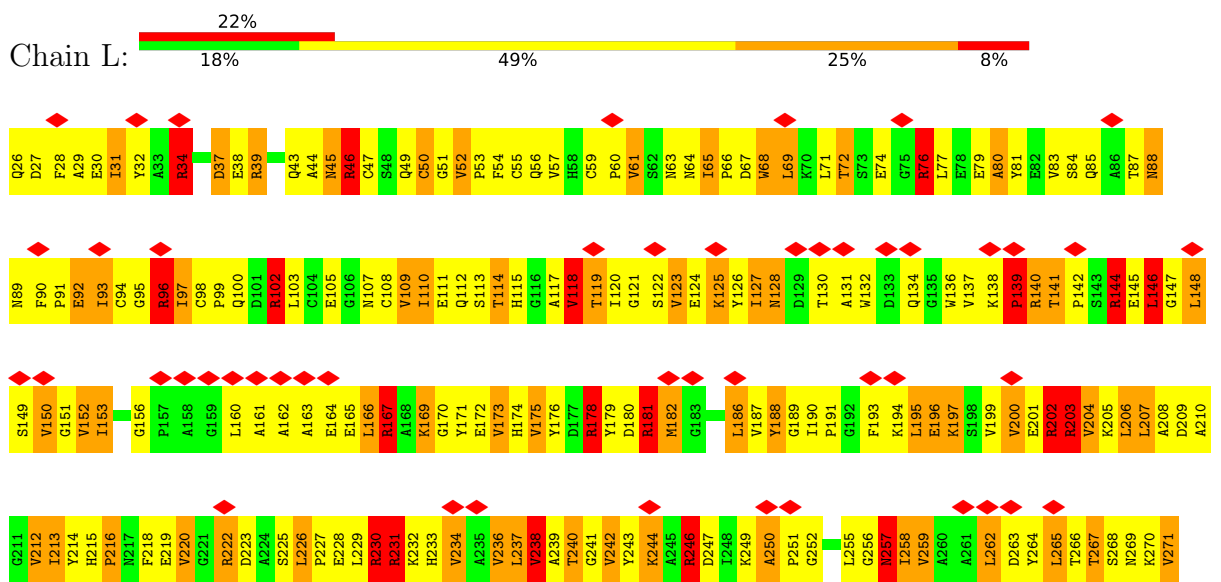
● Molecule 2: GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN

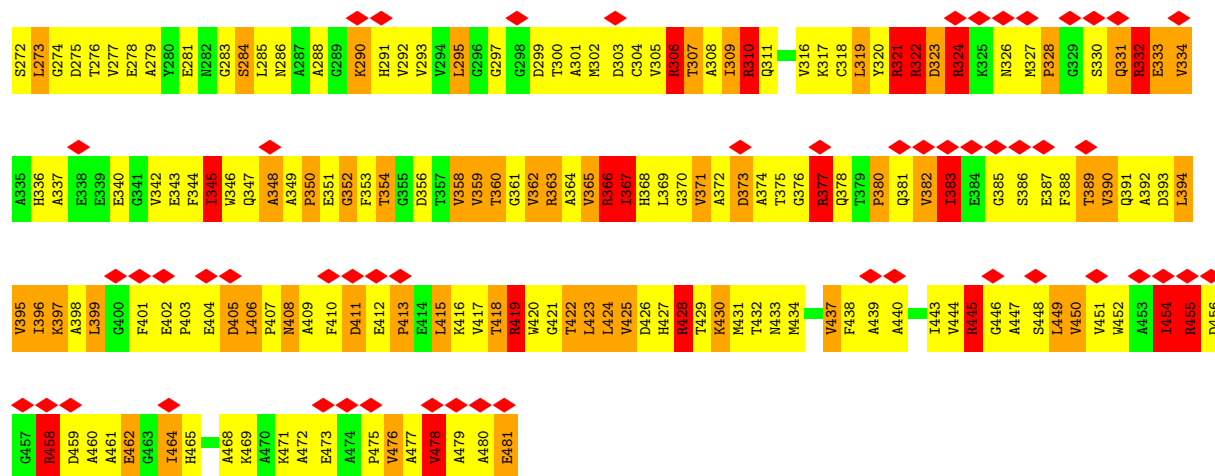


● Molecule 2: GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN



• Molecule 2: GLUTAMATE SYNTHASE [NADPH] SMALL CHAIN





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, I	Depositor
Number of particles used	12800	Depositor
Resolution determination method	Not provided	
CTF correction method	WIENER FILTERING OF VOLUMES FROM FOCAL SERIES	Depositor
Microscope	JEOL 2010UHR	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	10	Depositor
Minimum defocus (nm)	1700	Depositor
Maximum defocus (nm)	3200	Depositor
Magnification	50000	Depositor
Image detector	KODAK SO-163 FILM	Depositor
Maximum map value	1332.420	Depositor
Minimum map value	-799.538	Depositor
Average map value	5.063	Depositor
Map value standard deviation	98.686	Depositor
Recommended contour level	125.0	Depositor
Map size (Å)	304.8, 304.8, 304.8	wwPDB
Map dimensions	192, 192, 192	wwPDB
Map angles (°)	90, 90, 90	wwPDB
Pixel spacing (Å)	1.5875, 1.5875, 1.5875	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: FMN, AKG, F3S, FAD, SF4, OMT

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	A	1.06	7/11545 (0.1%)	1.58	200/15613 (1.3%)
1	B	1.10	7/11545 (0.1%)	1.58	192/15613 (1.2%)
1	C	1.06	8/11545 (0.1%)	1.58	201/15613 (1.3%)
1	D	1.10	7/11545 (0.1%)	1.58	191/15613 (1.2%)
1	E	1.06	7/11545 (0.1%)	1.58	200/15613 (1.3%)
1	F	1.10	7/11545 (0.1%)	1.58	194/15613 (1.2%)
2	G	1.00	0/3533	1.78	76/4793 (1.6%)
2	H	1.00	0/3533	1.78	76/4793 (1.6%)
2	I	1.00	0/3533	1.78	76/4793 (1.6%)
2	J	1.00	0/3533	1.78	76/4793 (1.6%)
2	K	1.00	0/3533	1.78	76/4793 (1.6%)
2	L	1.00	0/3533	1.78	76/4793 (1.6%)
All	All	1.07	43/90468 (0.0%)	1.63	1634/122436 (1.3%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	1	3
1	B	0	2
1	C	1	3
1	D	0	2
1	E	1	3
1	F	0	2
2	G	0	31
2	H	0	31
2	I	0	31
2	J	0	31
2	K	0	31

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Mol	Chain	#Chirality outliers	#Planarity outliers
2	L	0	31
All	All	3	201

The worst 5 of 43 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	838	VAL	CA-CB	-7.81	1.38	1.54
1	A	838	VAL	CA-CB	-7.78	1.38	1.54
1	E	838	VAL	CA-CB	-7.76	1.38	1.54
1	E	746	ILE	CA-CB	-7.49	1.37	1.54
1	A	746	ILE	CA-CB	-7.46	1.37	1.54

The worst 5 of 1634 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	45	ASN	CB-CG-OD1	-39.98	41.63	121.60
2	L	45	ASN	CB-CG-OD1	-39.98	41.63	121.60
2	G	45	ASN	CB-CG-OD1	-39.98	41.65	121.60
2	J	45	ASN	CB-CG-OD1	-39.98	41.65	121.60
2	I	45	ASN	CB-CG-OD1	-39.95	41.70	121.60

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	915	PHE	CA
1	C	915	PHE	CA
1	E	915	PHE	CA

5 of 201 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1002	SER	Mainchain
1	A	1171	VAL	Peptide
1	A	325	GLU	Mainchain
1	B	1168	LEU	Mainchain
1	B	725	PHE	Mainchain

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen

atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	11337	0	11347	1766	0
1	B	11337	0	11350	1542	0
1	C	11337	0	11347	1762	0
1	D	11337	0	11350	1536	0
1	E	11337	0	11347	1774	0
1	F	11337	0	11350	1543	0
2	G	3468	0	3397	1086	0
2	H	3468	0	3397	1079	0
2	I	3468	0	3397	1089	0
2	J	3468	0	3399	1075	0
2	K	3468	0	3399	1080	0
2	L	3468	0	3399	1078	0
3	A	11	0	10	3	0
3	B	11	0	10	0	0
3	C	11	0	10	3	0
3	D	11	0	10	0	0
3	E	11	0	10	3	0
3	F	11	0	10	1	0
4	A	31	0	19	4	0
4	B	31	0	19	7	0
4	C	31	0	19	3	0
4	D	31	0	19	7	0
4	E	31	0	19	4	0
4	F	31	0	19	6	0
5	A	10	0	4	0	0
5	B	10	0	4	2	0
5	C	10	0	4	0	0
5	D	10	0	4	2	0
5	E	10	0	4	0	0
5	F	10	0	4	1	0
6	A	7	0	0	3	0
6	B	7	0	0	3	0
6	C	7	0	0	3	0
6	D	7	0	0	3	0
6	E	7	0	0	6	0
6	F	7	0	0	3	0
7	G	16	0	0	2	0
7	H	16	0	0	2	0
7	I	16	0	0	2	0
7	J	16	0	0	2	0
7	K	16	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	L	16	0	0	2	0
8	G	53	0	31	18	0
8	H	53	0	31	18	0
8	I	53	0	31	18	0
8	J	53	0	31	18	0
8	K	53	0	31	18	0
8	L	53	0	31	17	0
All	All	89598	0	88863	15415	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 86.

The worst 5 of 15415 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1263:HIS:CE1	1:D:900:GLY:CA	1.77	1.66
1:A:782:ARG:CG	2:J:53:PRO:HD2	1.19	1.65
1:E:782:ARG:CG	2:L:53:PRO:HD2	1.19	1.64
1:F:182:MET:CE	1:F:217:PRO:HB2	1.30	1.61
1:A:902:ASN:HB2	1:C:1227:GLU:CG	1.13	1.61

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	1470/1472 (100%)	1174 (80%)	231 (16%)	65 (4%)	2	22
1	B	1470/1472 (100%)	1191 (81%)	215 (15%)	64 (4%)	2	22
1	C	1470/1472 (100%)	1175 (80%)	230 (16%)	65 (4%)	2	22
1	D	1470/1472 (100%)	1191 (81%)	215 (15%)	64 (4%)	2	22

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	1470/1472 (100%)	1174 (80%)	231 (16%)	65 (4%)	2	22
1	F	1470/1472 (100%)	1192 (81%)	214 (15%)	64 (4%)	2	22
2	G	454/456 (100%)	419 (92%)	25 (6%)	10 (2%)	6	35
2	H	454/456 (100%)	420 (92%)	24 (5%)	10 (2%)	6	35
2	I	454/456 (100%)	420 (92%)	24 (5%)	10 (2%)	6	35
2	J	454/456 (100%)	419 (92%)	25 (6%)	10 (2%)	6	35
2	K	454/456 (100%)	420 (92%)	24 (5%)	10 (2%)	6	35
2	L	454/456 (100%)	420 (92%)	24 (5%)	10 (2%)	6	35
All	All	11544/11568 (100%)	9615 (83%)	1482 (13%)	447 (4%)	5	23

5 of 447 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	25	LEU
1	A	444	LYS
1	A	451	GLN
1	A	705	LEU
1	A	712	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	A	1201/1201 (100%)	985 (82%)	216 (18%)	1	10
1	B	1201/1201 (100%)	981 (82%)	220 (18%)	1	10
1	C	1201/1201 (100%)	985 (82%)	216 (18%)	1	10
1	D	1201/1201 (100%)	981 (82%)	220 (18%)	1	10
1	E	1201/1201 (100%)	985 (82%)	216 (18%)	1	10
1	F	1201/1201 (100%)	981 (82%)	220 (18%)	1	10
2	G	358/358 (100%)	257 (72%)	101 (28%)	0	2
2	H	358/358 (100%)	257 (72%)	101 (28%)	0	2

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	I	358/358 (100%)	257 (72%)	101 (28%)	0	2
2	J	358/358 (100%)	257 (72%)	101 (28%)	0	2
2	K	358/358 (100%)	257 (72%)	101 (28%)	0	2
2	L	358/358 (100%)	257 (72%)	101 (28%)	0	2
All	All	9354/9354 (100%)	7440 (80%)	1914 (20%)	3	7

5 of 1914 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	336	THR
2	K	347	GLN
1	F	380	ILE
2	K	242	VAL
2	L	399	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 277 such sidechains are listed below:

Mol	Chain	Res	Type
2	G	45	ASN
2	G	433	ASN
2	J	291	HIS
1	C	724	ASN
1	C	635	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

42 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
7	SF4	H	483	2	0,12,12	-	-	-		
6	F3S	E	2476	1	0,9,9	-	-	-		
4	FMN	F	2474	-	33,33,33	1.37	4 (12%)	48,50,50	2.59	20 (41%)
6	F3S	D	2476	1	0,9,9	-	-	-		
7	SF4	G	482	2	0,12,12	-	-	-		
8	FAD	L	484	-	53,58,58	1.89	19 (35%)	68,89,89	1.26	9 (13%)
4	FMN	A	2474	-	33,33,33	1.48	5 (15%)	48,50,50	2.72	20 (41%)
7	SF4	I	482	2	0,12,12	-	-	-		
4	FMN	E	2474	-	33,33,33	1.48	5 (15%)	48,50,50	2.73	20 (41%)
5	AKG	B	2475	-	9,9,9	3.48	4 (44%)	11,11,11	2.80	4 (36%)
4	FMN	D	2474	-	33,33,33	1.37	4 (12%)	48,50,50	2.59	20 (41%)
7	SF4	K	482	2	0,12,12	-	-	-		
7	SF4	G	483	2	0,12,12	-	-	-		
7	SF4	L	483	2	0,12,12	-	-	-		
3	OMT	E	2473	-	9,10,10	4.27	5 (55%)	11,14,14	4.46	6 (54%)
4	FMN	B	2474	-	33,33,33	1.37	4 (12%)	48,50,50	2.59	20 (41%)
7	SF4	J	483	2	0,12,12	-	-	-		
8	FAD	I	484	-	53,58,58	1.89	19 (35%)	68,89,89	1.26	8 (11%)
3	OMT	B	2473	-	9,10,10	4.15	5 (55%)	11,14,14	5.78	5 (45%)
8	FAD	H	484	-	53,58,58	1.89	19 (35%)	68,89,89	1.26	9 (13%)
3	OMT	C	2473	-	9,10,10	4.28	5 (55%)	11,14,14	4.47	6 (54%)
4	FMN	C	2474	-	33,33,33	1.48	5 (15%)	48,50,50	2.73	20 (41%)
5	AKG	D	2475	-	9,9,9	3.49	4 (44%)	11,11,11	2.80	4 (36%)
3	OMT	A	2473	-	9,10,10	4.28	5 (55%)	11,14,14	4.47	6 (54%)
6	F3S	C	2476	1	0,9,9	-	-	-		
7	SF4	L	482	2	0,12,12	-	-	-		
5	AKG	A	2475	-	9,9,9	3.09	4 (44%)	11,11,11	2.92	4 (36%)
3	OMT	D	2473	-	9,10,10	4.14	5 (55%)	11,14,14	5.79	5 (45%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	AKG	F	2475	-	9,9,9	3.48	4 (44%)	11,11,11	2.80	4 (36%)
8	FAD	J	484	-	53,58,58	1.89	19 (35%)	68,89,89	1.26	8 (11%)
8	FAD	G	484	-	53,58,58	1.89	19 (35%)	68,89,89	1.26	8 (11%)
3	OMT	F	2473	-	9,10,10	4.15	5 (55%)	11,14,14	5.79	5 (45%)
7	SF4	J	482	2	0,12,12	-	-	-	-	-
7	SF4	I	483	2	0,12,12	-	-	-	-	-
8	FAD	K	484	-	53,58,58	1.89	19 (35%)	68,89,89	1.26	8 (11%)
6	F3S	B	2476	1	0,9,9	-	-	-	-	-
5	AKG	E	2475	-	9,9,9	3.08	4 (44%)	11,11,11	2.91	4 (36%)
6	F3S	F	2476	1	0,9,9	-	-	-	-	-
7	SF4	K	483	2	0,12,12	-	-	-	-	-
7	SF4	H	482	2	0,12,12	-	-	-	-	-
5	AKG	C	2475	-	9,9,9	3.08	4 (44%)	11,11,11	2.92	4 (36%)
6	F3S	A	2476	1	0,9,9	-	-	-	-	-

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
7	SF4	H	483	2	-	-	0/6/5/5
6	F3S	E	2476	1	-	-	0/3/3/3
4	FMN	F	2474	-	-	4/18/18/18	0/3/3/3
6	F3S	D	2476	1	-	-	0/3/3/3
7	SF4	G	482	2	-	-	0/6/5/5
8	FAD	L	484	-	-	3/30/50/50	0/6/6/6
4	FMN	A	2474	-	-	7/18/18/18	0/3/3/3
7	SF4	I	482	2	-	-	0/6/5/5
4	FMN	E	2474	-	-	7/18/18/18	0/3/3/3
5	AKG	B	2475	-	-	1/9/9/9	-
4	FMN	D	2474	-	-	4/18/18/18	0/3/3/3
7	SF4	K	482	2	-	-	0/6/5/5
7	SF4	G	483	2	-	-	0/6/5/5
7	SF4	L	483	2	-	-	0/6/5/5
3	OMT	E	2473	-	-	5/10/10/10	-
4	FMN	B	2474	-	-	4/18/18/18	0/3/3/3
7	SF4	J	483	2	-	-	0/6/5/5
8	FAD	I	484	-	-	3/30/50/50	0/6/6/6

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	OMT	B	2473	-	-	5/10/10/10	-
8	FAD	H	484	-	-	3/30/50/50	0/6/6/6
3	OMT	C	2473	-	-	5/10/10/10	-
4	FMN	C	2474	-	-	7/18/18/18	0/3/3/3
5	AKG	D	2475	-	-	1/9/9/9	-
3	OMT	A	2473	-	-	5/10/10/10	-
6	F3S	C	2476	1	-	-	0/3/3/3
7	SF4	L	482	2	-	-	0/6/5/5
5	AKG	A	2475	-	-	2/9/9/9	-
3	OMT	D	2473	-	-	5/10/10/10	-
5	AKG	F	2475	-	-	1/9/9/9	-
8	FAD	J	484	-	-	3/30/50/50	0/6/6/6
8	FAD	G	484	-	-	3/30/50/50	0/6/6/6
3	OMT	F	2473	-	-	5/10/10/10	-
7	SF4	J	482	2	-	-	0/6/5/5
7	SF4	I	483	2	-	-	0/6/5/5
8	FAD	K	484	-	-	3/30/50/50	0/6/6/6
6	F3S	B	2476	1	-	-	0/3/3/3
5	AKG	E	2475	-	-	2/9/9/9	-
6	F3S	F	2476	1	-	-	0/3/3/3
7	SF4	K	483	2	-	-	0/6/5/5
7	SF4	H	482	2	-	-	0/6/5/5
5	AKG	C	2475	-	-	2/9/9/9	-
6	F3S	A	2476	1	-	-	0/3/3/3

The worst 5 of 195 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	2473	OMT	CB-CG	-7.01	1.45	1.52
3	A	2473	OMT	CB-CG	-6.97	1.45	1.52
3	E	2473	OMT	CB-CG	-6.93	1.45	1.52
3	B	2473	OMT	CG-SD	-6.88	1.69	1.78
3	F	2473	OMT	CG-SD	-6.86	1.69	1.78

The worst 5 of 227 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	2473	OMT	OD2-SD-CG	-16.66	96.68	108.34
3	F	2473	OMT	OD2-SD-CG	-16.64	96.69	108.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	2473	OMT	OD2-SD-CG	-16.63	96.70	108.34
3	C	2473	OMT	OD2-SD-CE	-11.63	97.22	108.91
3	A	2473	OMT	OD2-SD-CE	-11.61	97.24	108.91

There are no chirality outliers.

5 of 90 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	2473	OMT	C-CA-CB-CG
3	A	2473	OMT	CB-CG-SD-OD1
3	A	2473	OMT	CB-CG-SD-OD2
3	B	2473	OMT	N-CA-CB-CG
3	B	2473	OMT	C-CA-CB-CG

There are no ring outliers.

31 monomers are involved in 186 short contacts:

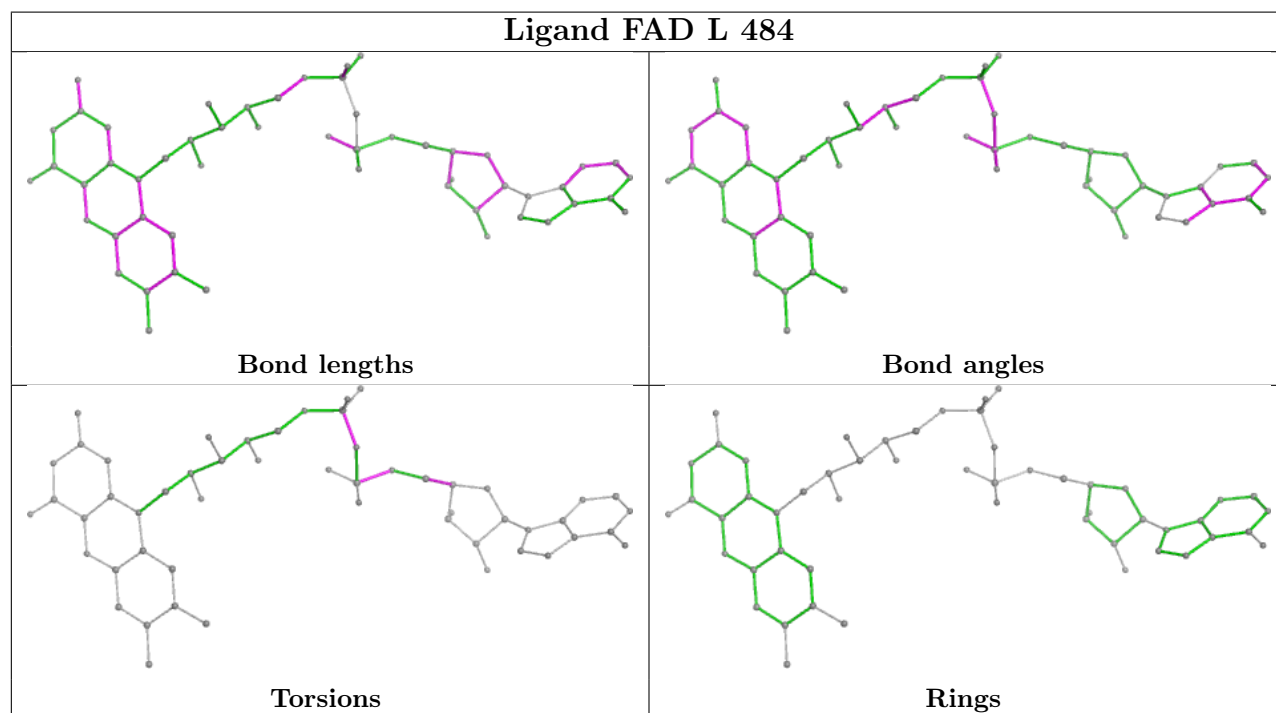
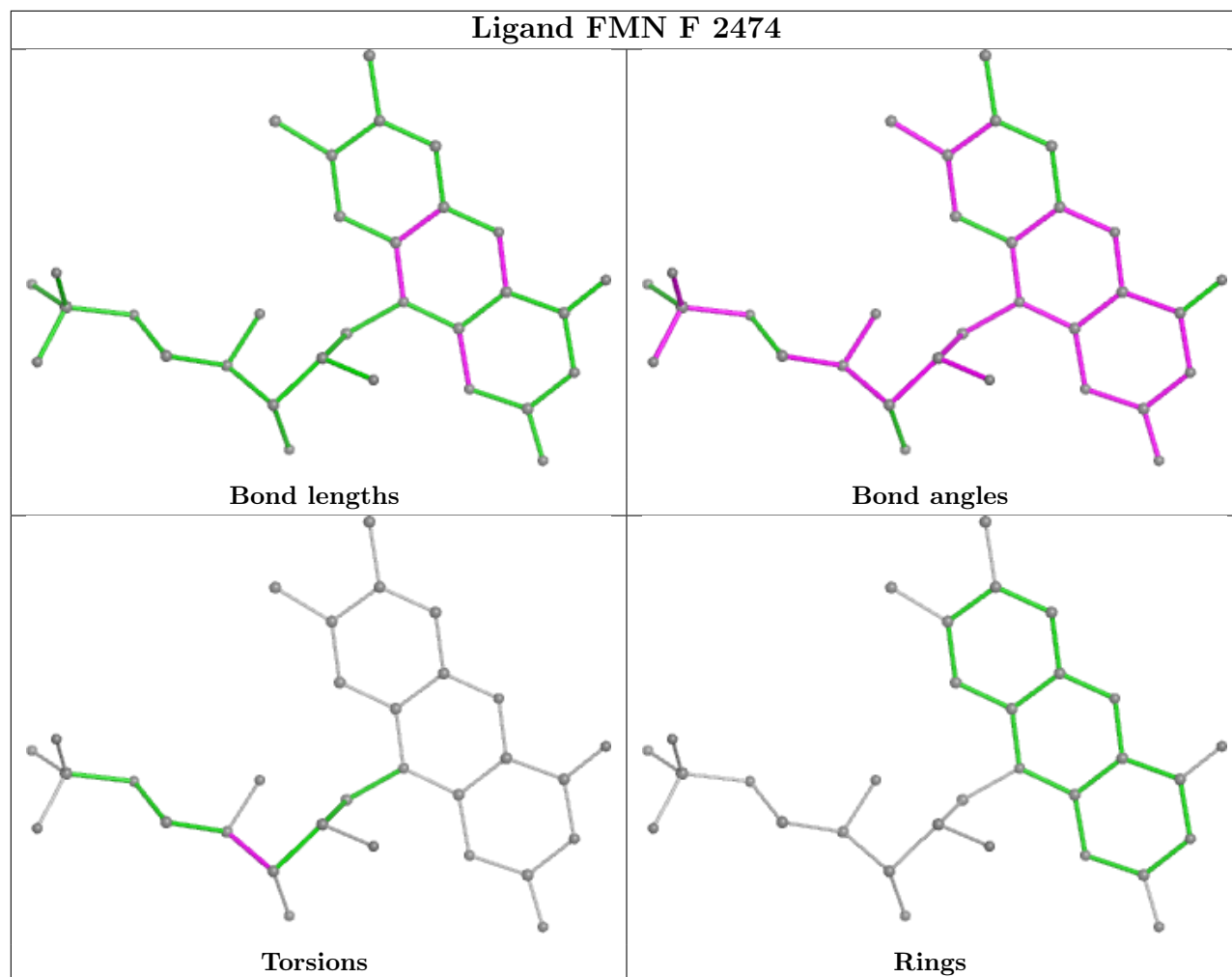
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	H	483	SF4	2	0
6	E	2476	F3S	6	0
4	F	2474	FMN	6	0
6	D	2476	F3S	3	0
8	L	484	FAD	17	0
4	A	2474	FMN	4	0
4	E	2474	FMN	4	0
5	B	2475	AKG	2	0
4	D	2474	FMN	7	0
7	G	483	SF4	2	0
7	L	483	SF4	2	0
3	E	2473	OMT	3	0
4	B	2474	FMN	7	0
7	J	483	SF4	2	0
8	I	484	FAD	18	0
8	H	484	FAD	18	0
3	C	2473	OMT	3	0
4	C	2474	FMN	3	0
5	D	2475	AKG	2	0
3	A	2473	OMT	3	0
6	C	2476	F3S	3	0
5	F	2475	AKG	1	0
8	J	484	FAD	18	0

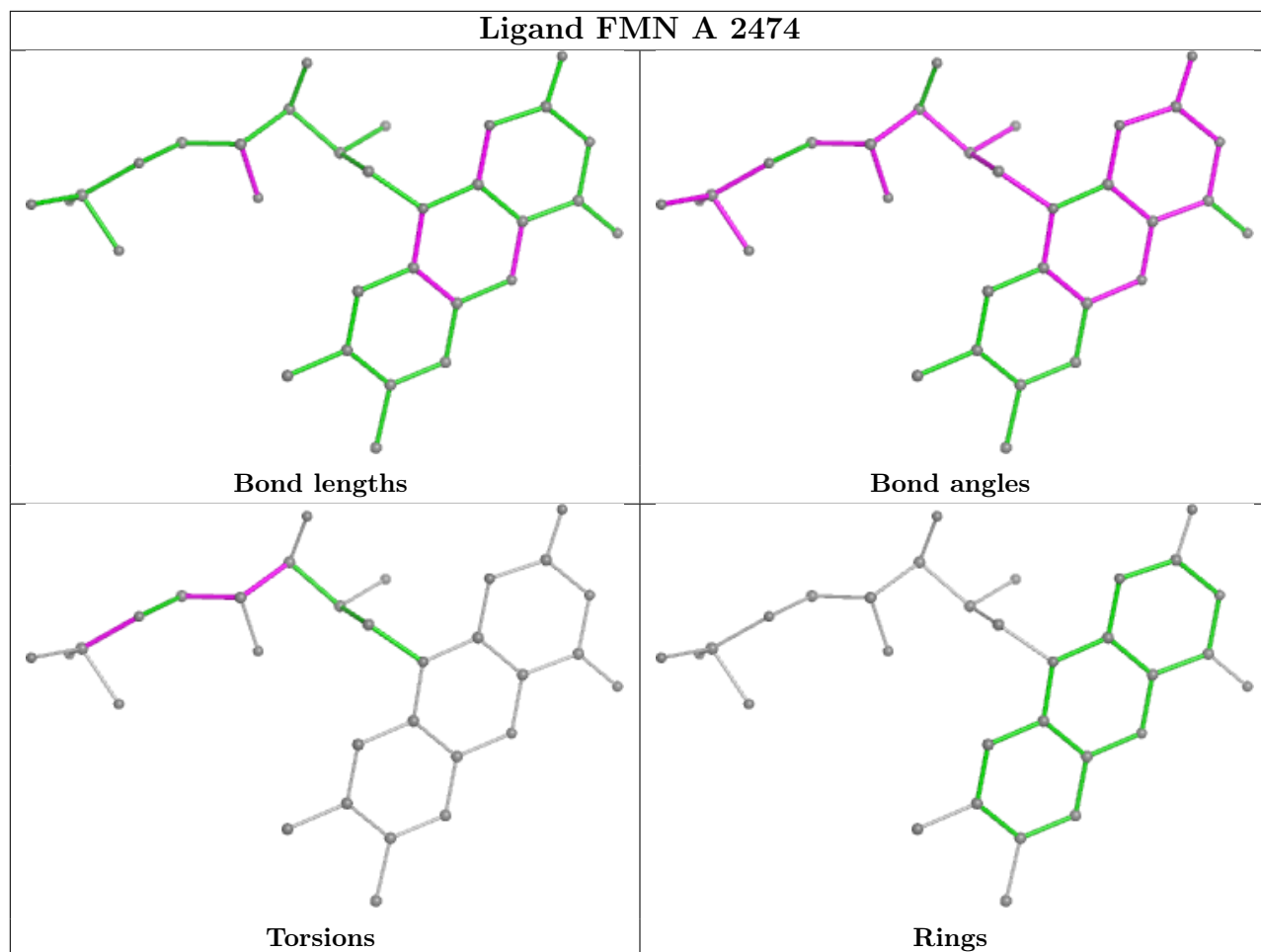
Continued on next page...

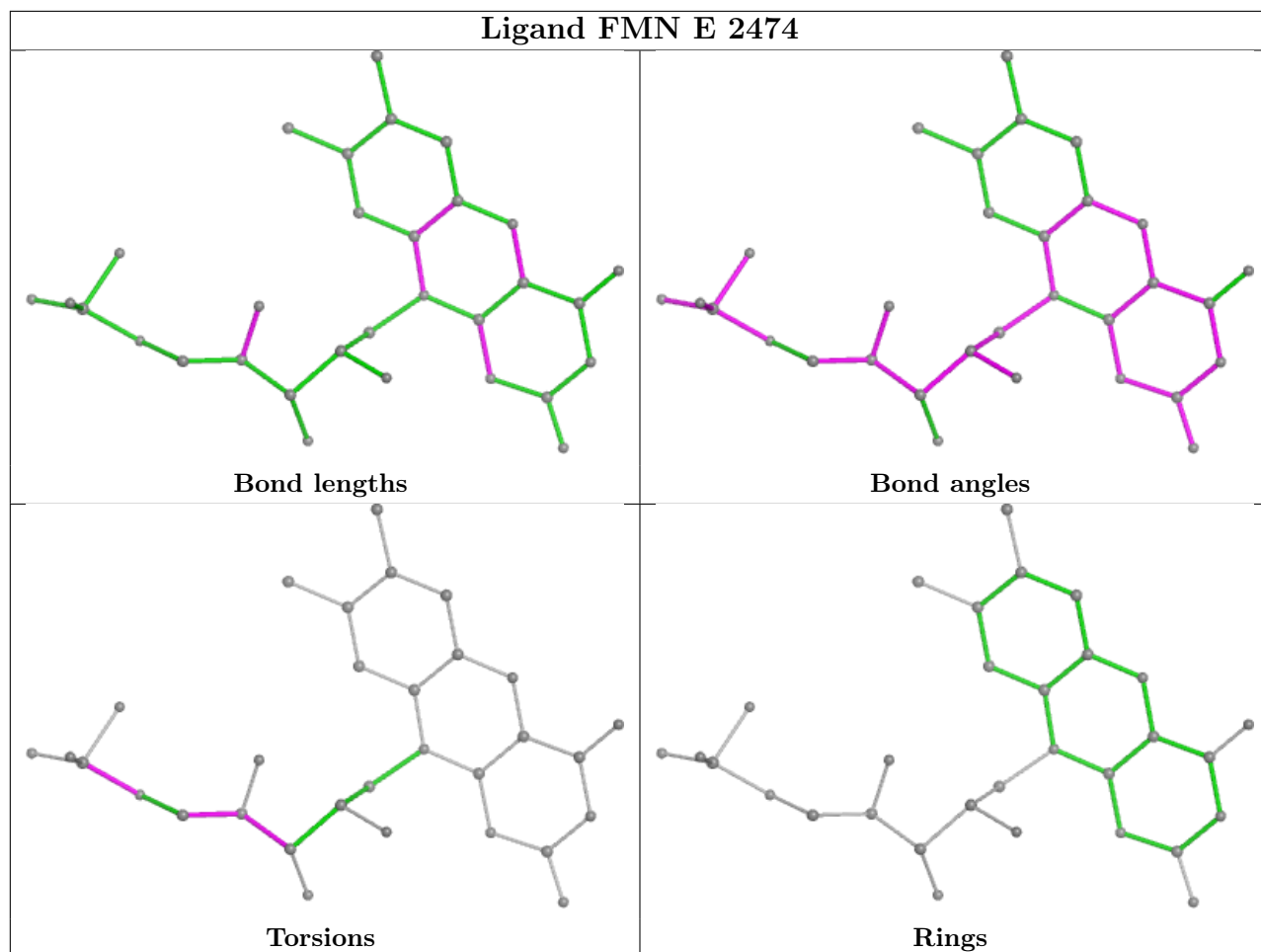
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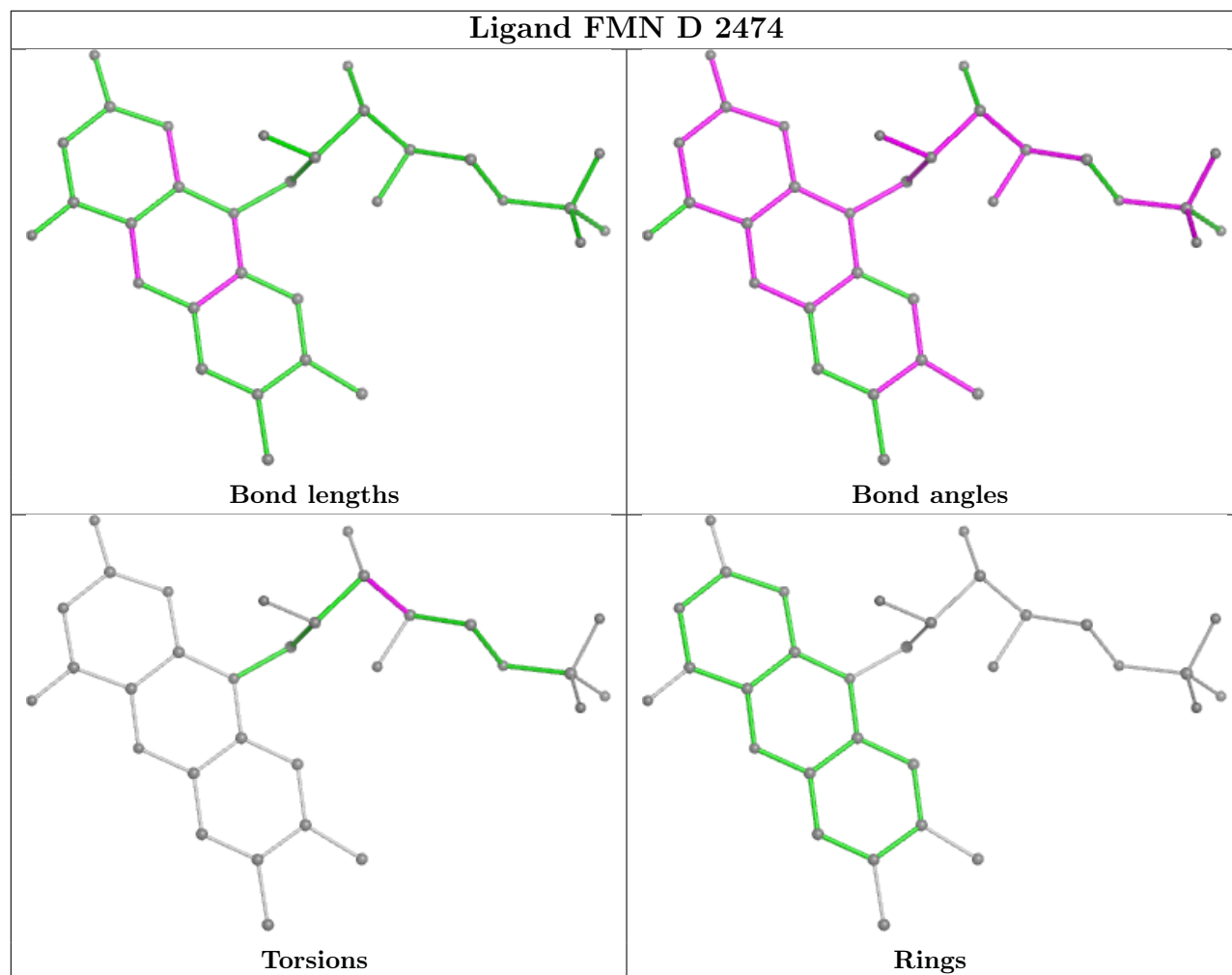
Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	G	484	FAD	18	0
3	F	2473	OMT	1	0
7	I	483	SF4	2	0
8	K	484	FAD	18	0
6	B	2476	F3S	3	0
6	F	2476	F3S	3	0
7	K	483	SF4	2	0
6	A	2476	F3S	3	0

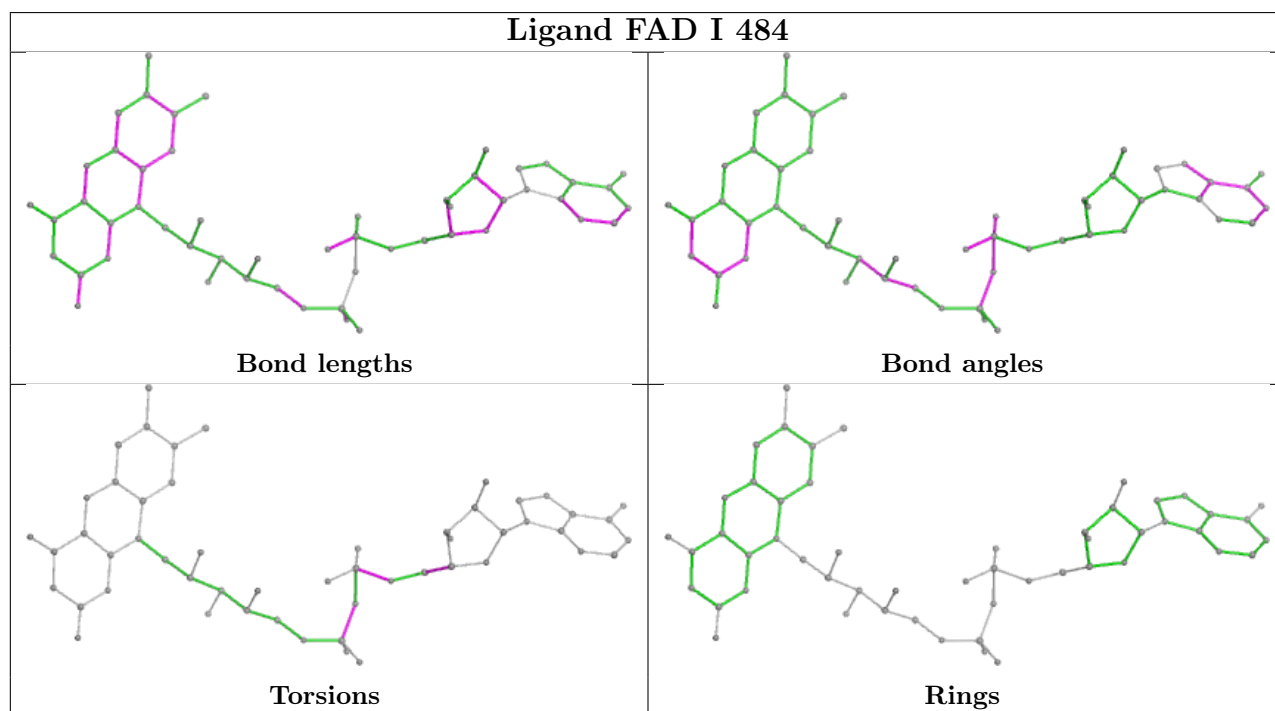
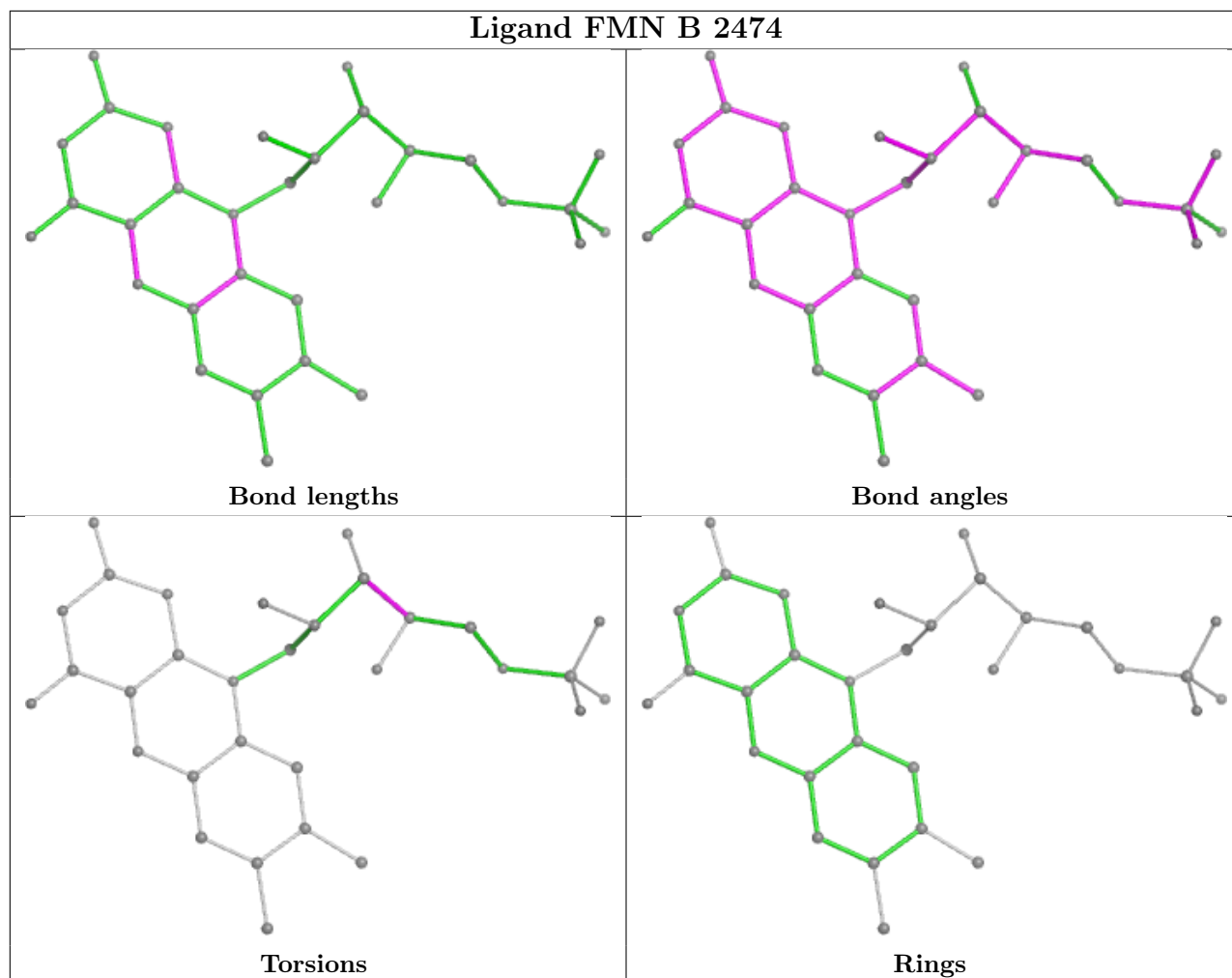
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

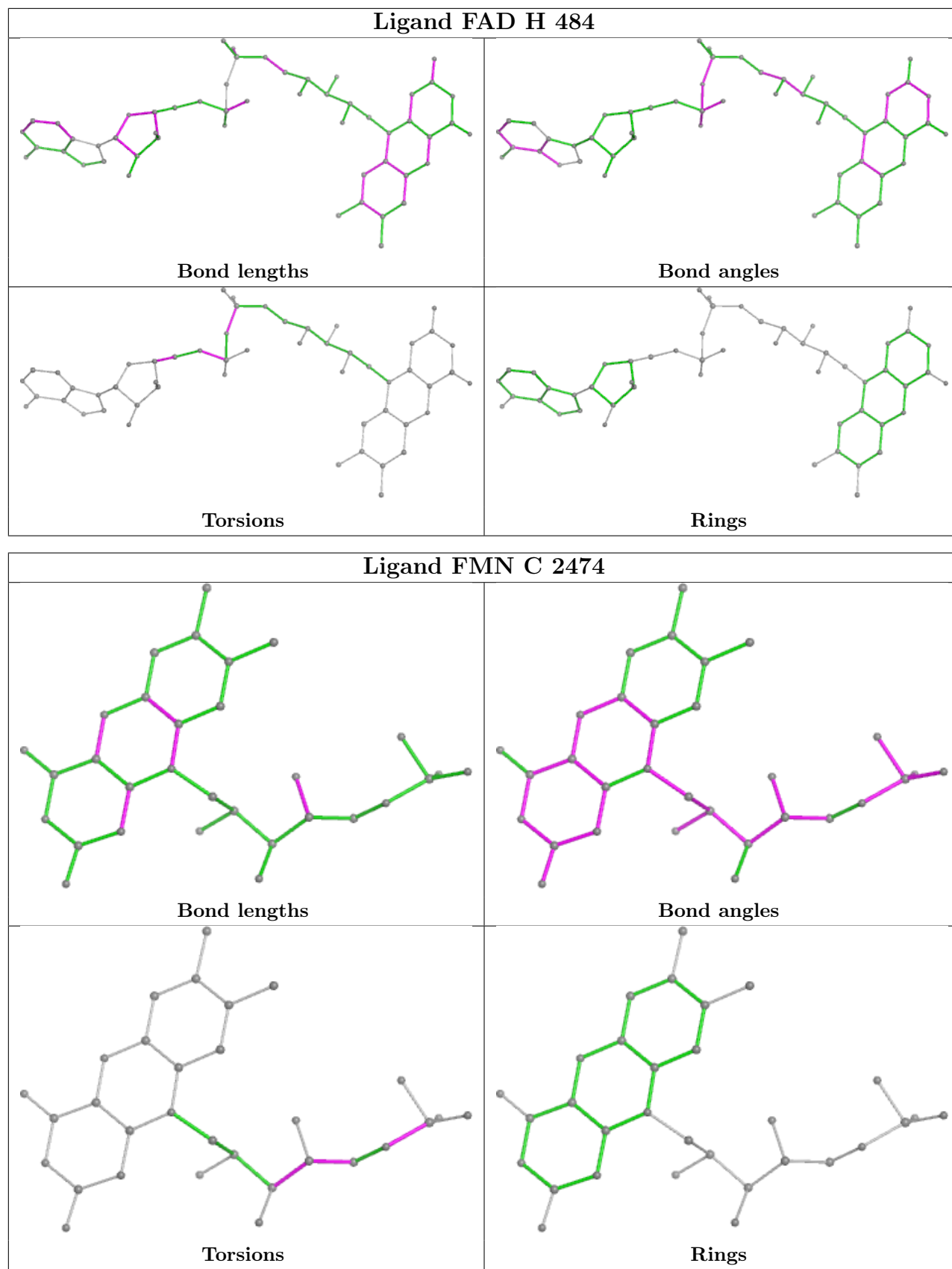


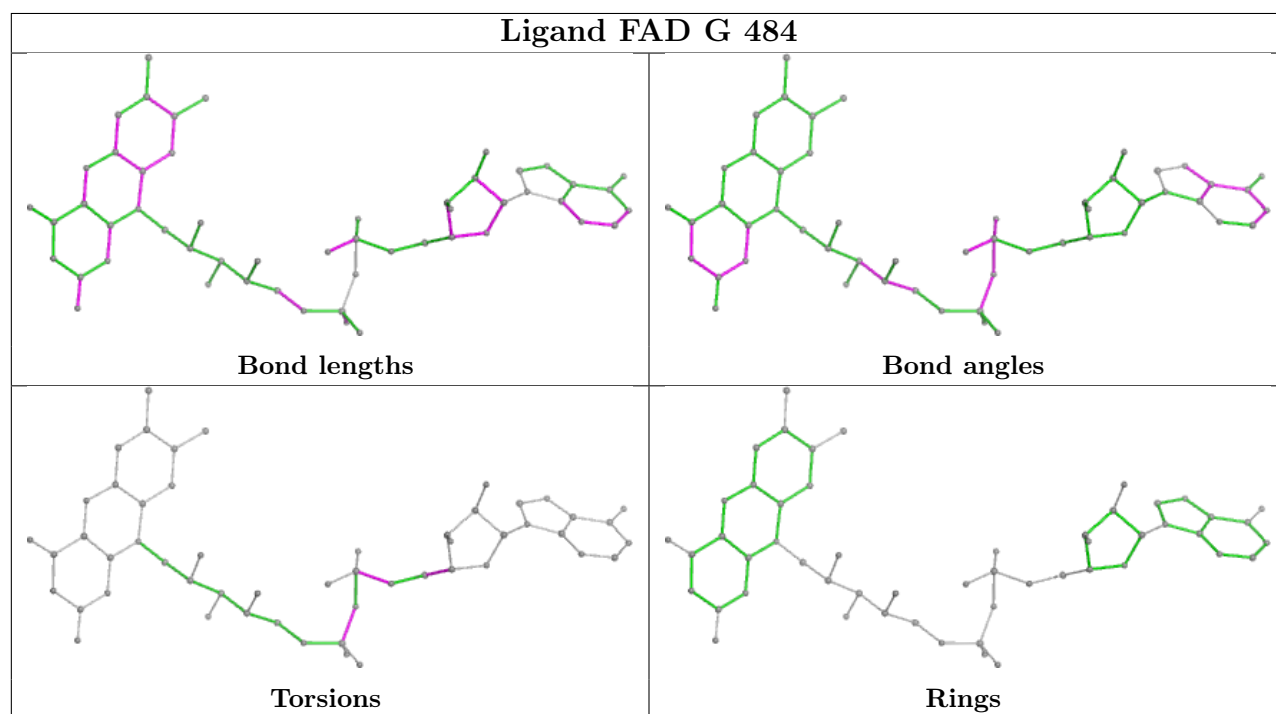
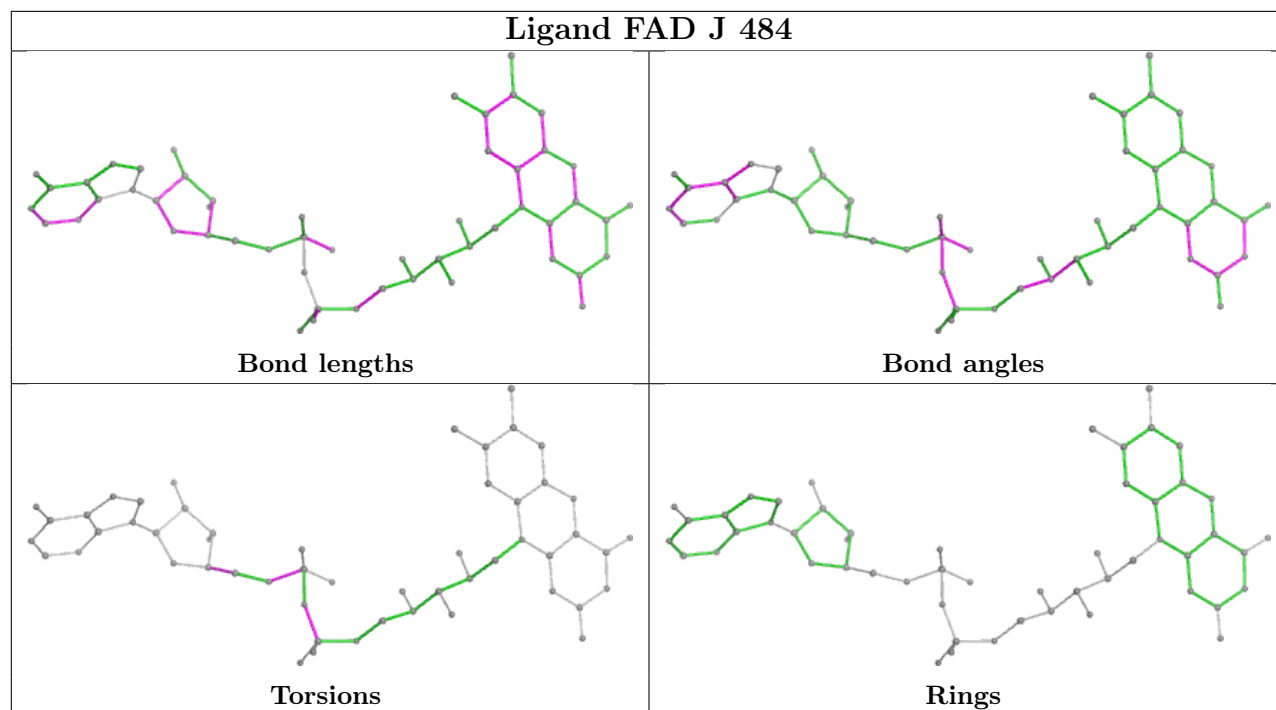


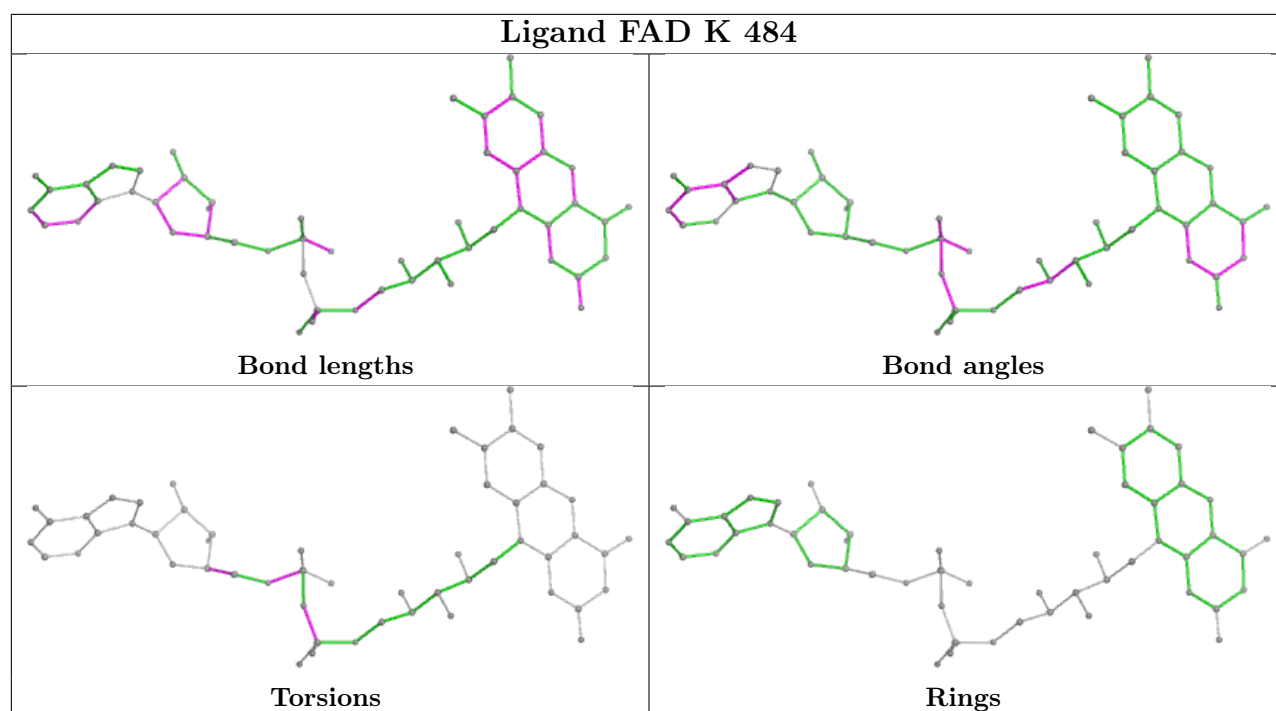












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-1440. These allow visual inspection of the internal detail of the map and identification of artifacts.

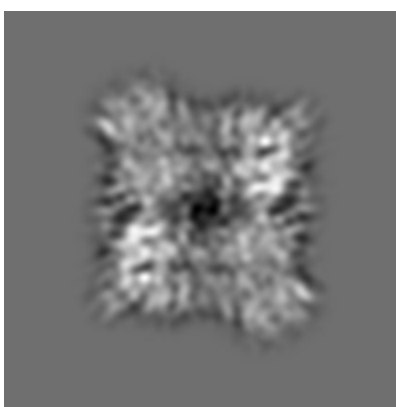
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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: 96



Y Index: 96



Z Index: 96

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

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

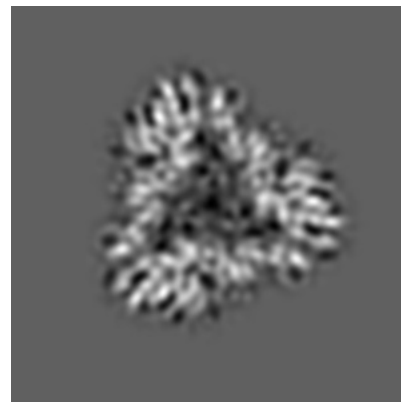
6.3.1 Primary map



X Index: 96



Y Index: 98

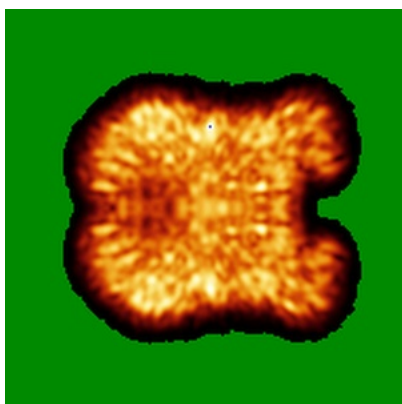


Z Index: 59

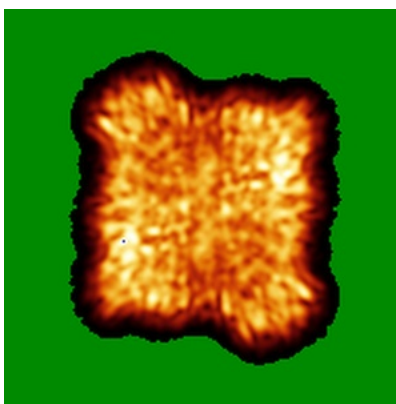
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



X



Y

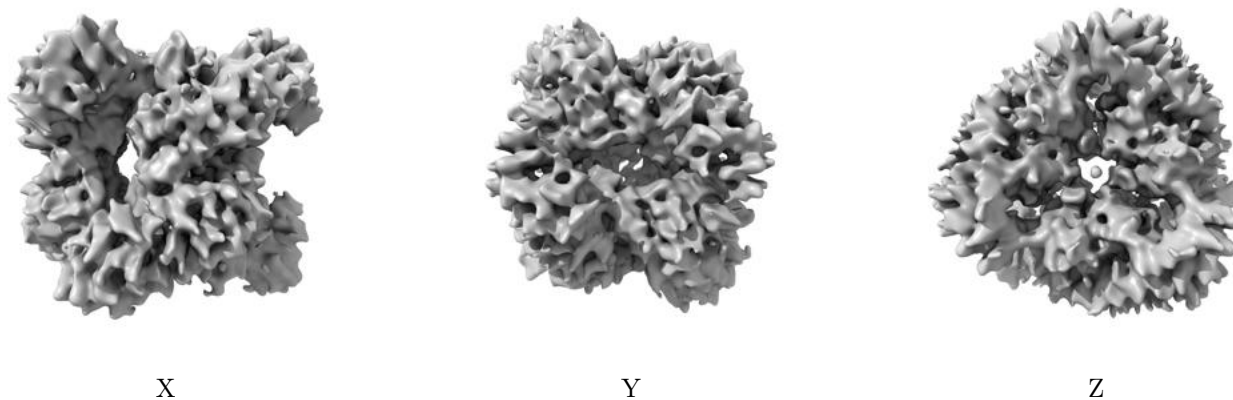


Z

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 125.0. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

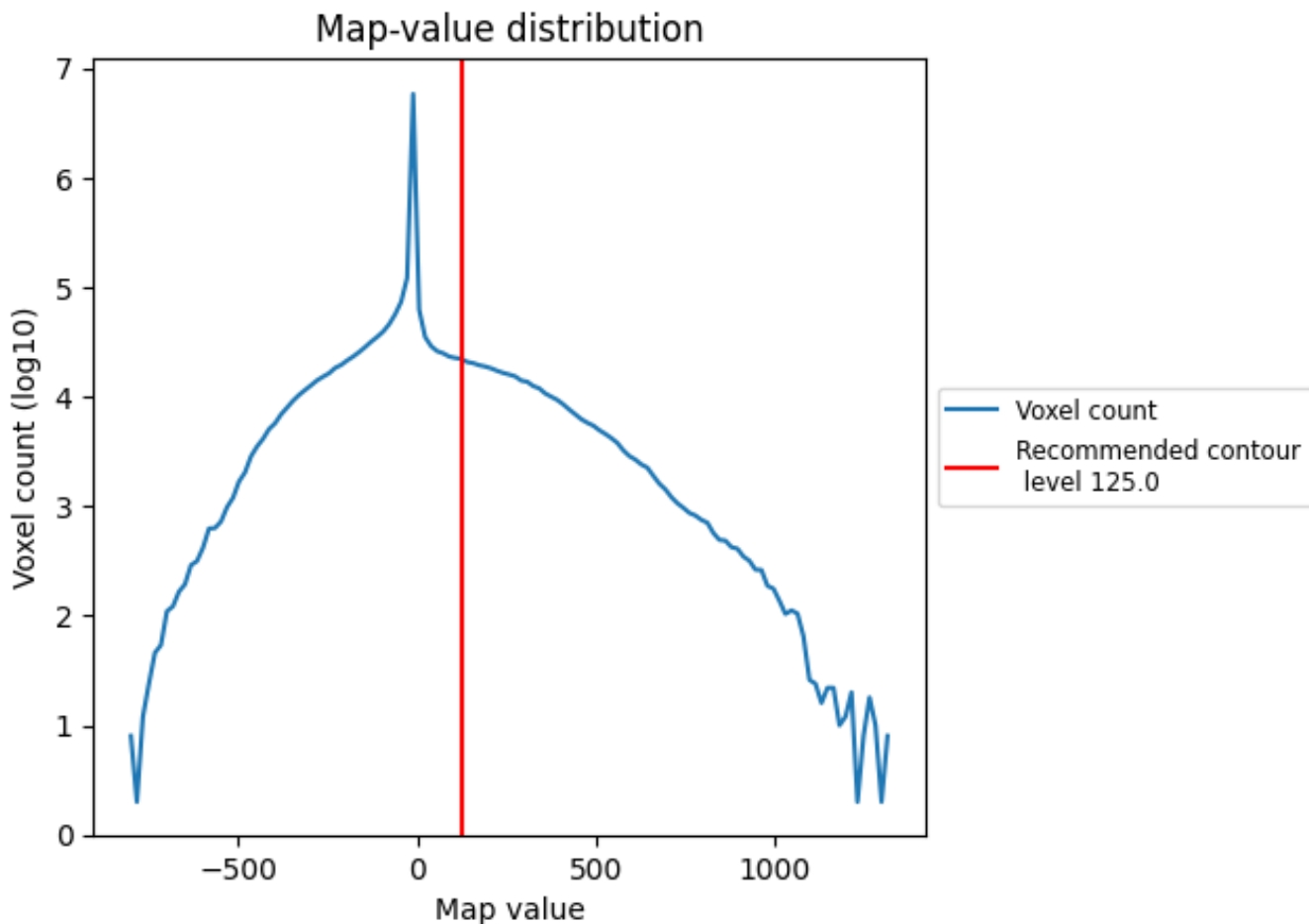
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

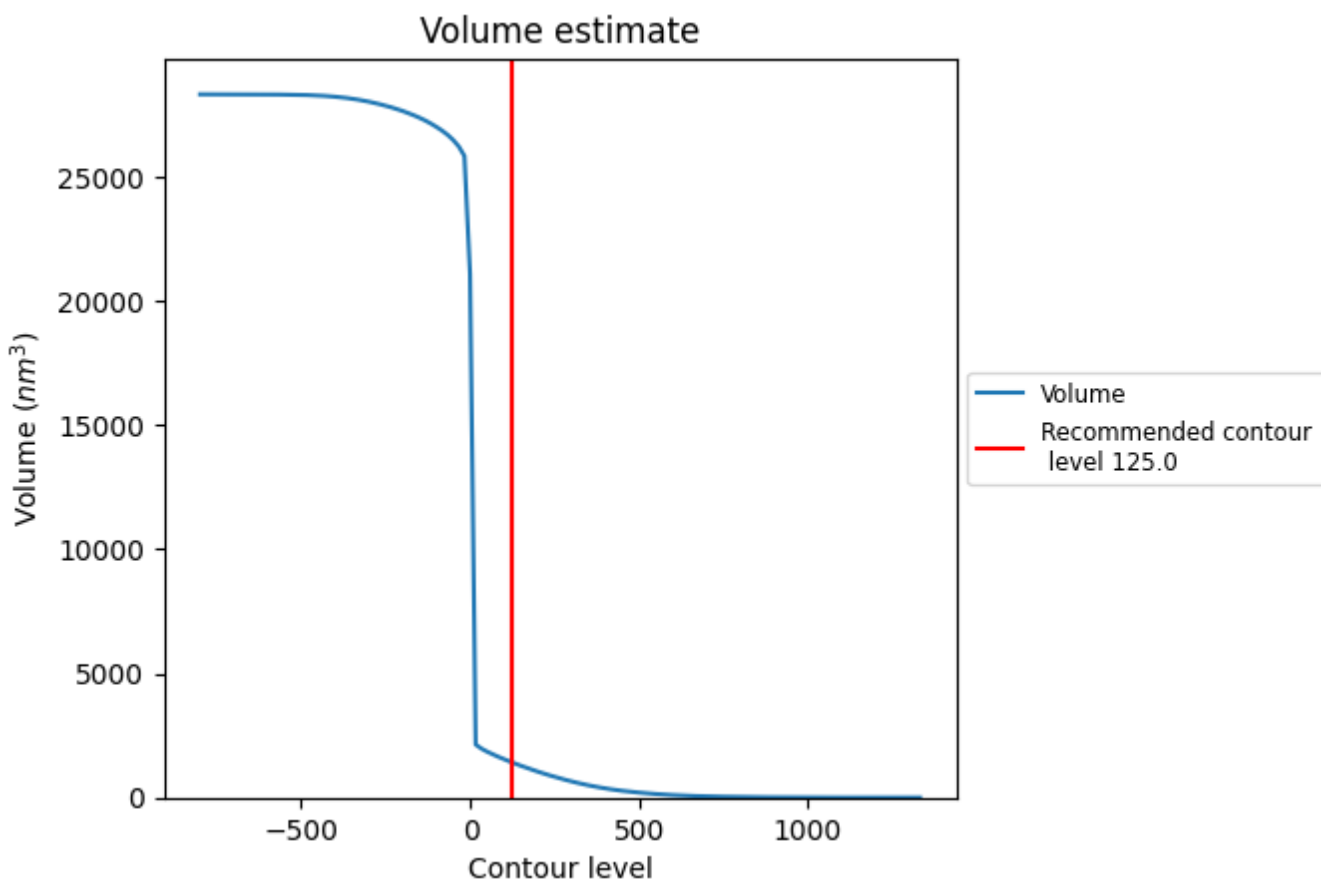
This section contains the results of statistical analysis of the map.

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.

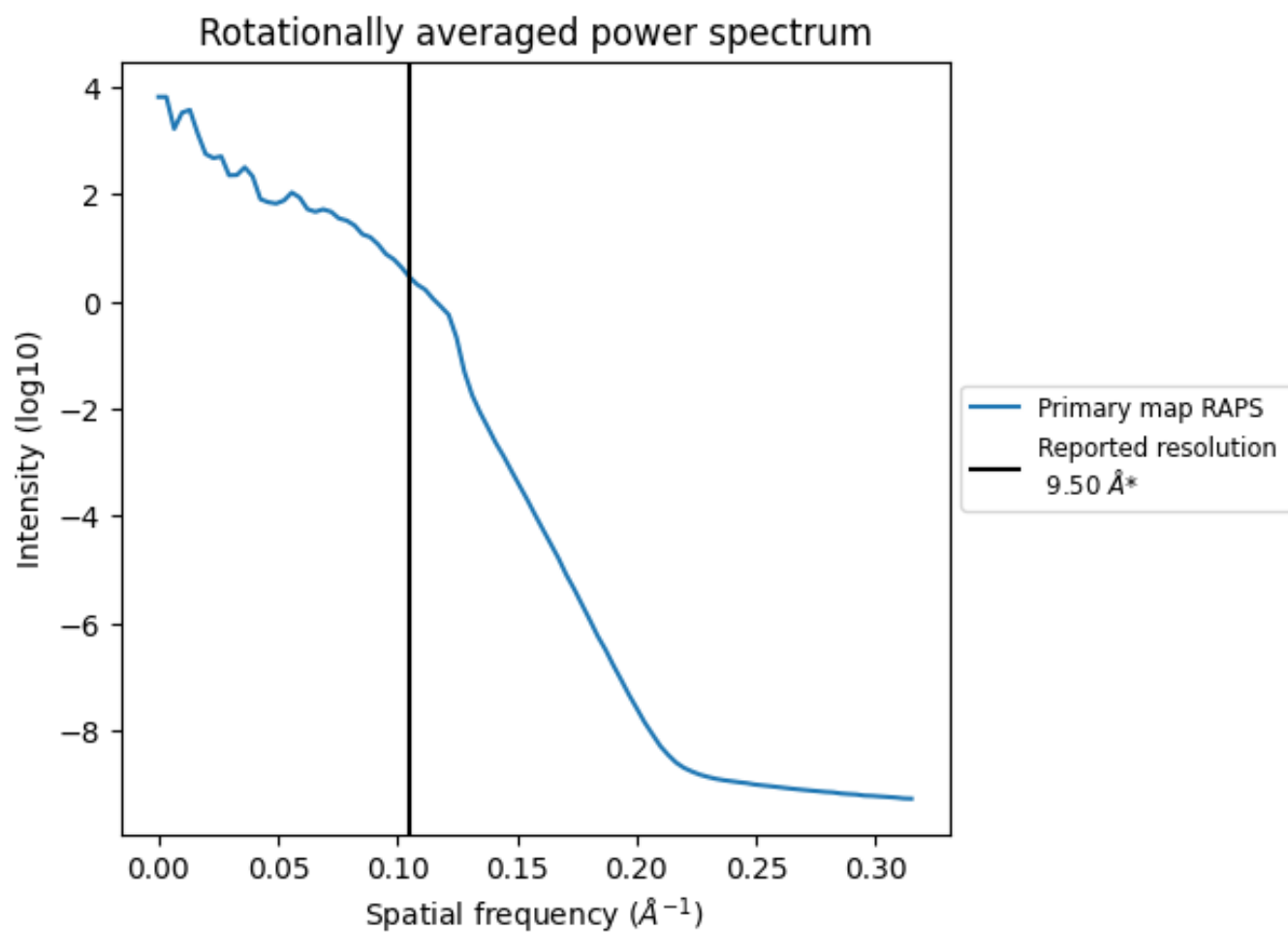
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 1412 nm³; this corresponds to an approximate mass of 1276 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](#)

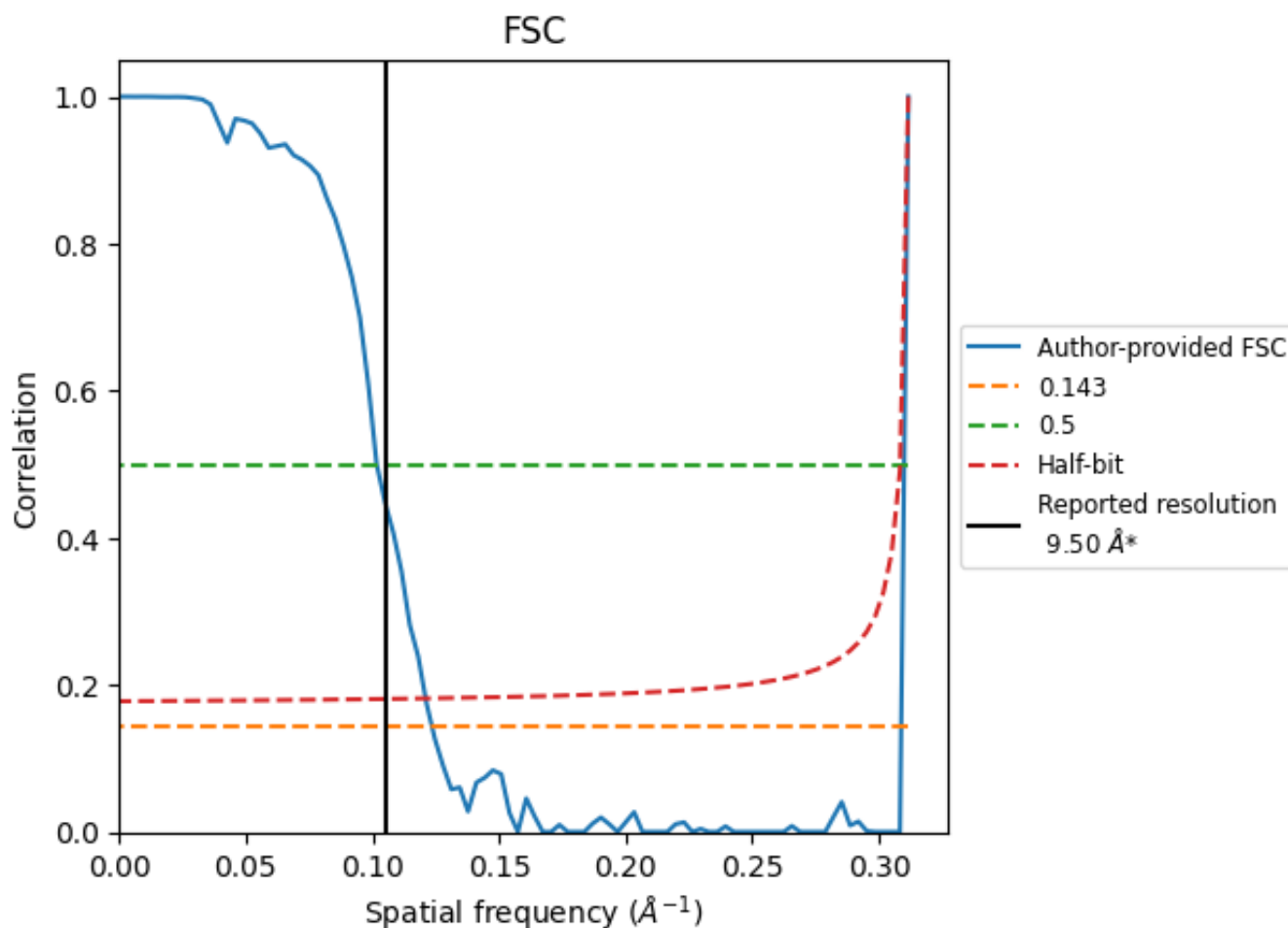


*Reported resolution corresponds to spatial frequency of 0.105 Å⁻¹

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.105 Å⁻¹

8.2 Resolution estimates [i](#)

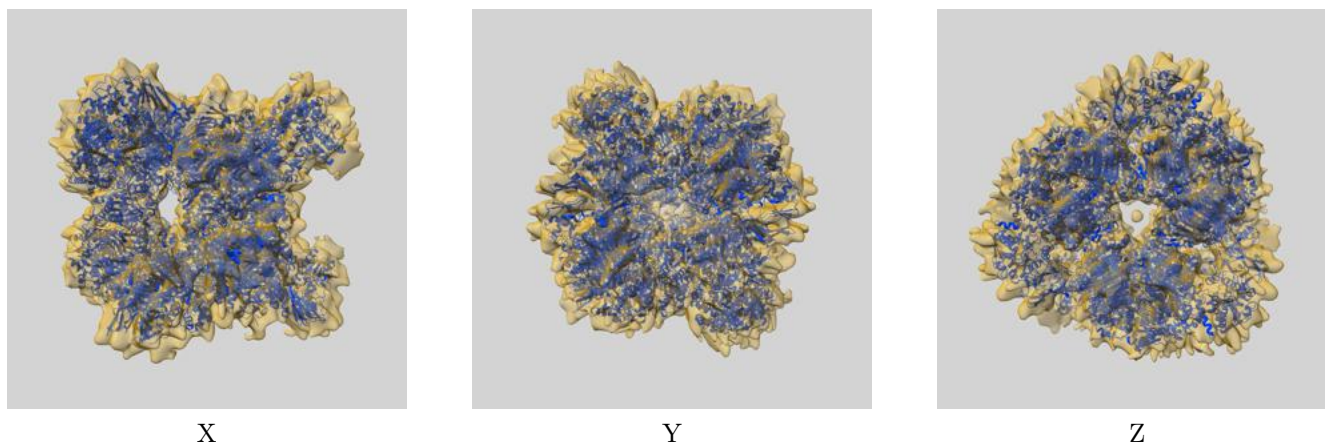
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	-	-	-
Author-provided FSC curve	8.10	9.83	8.26
Unmasked-calculated*	-	-	-

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

9 Map-model fit [i](#)

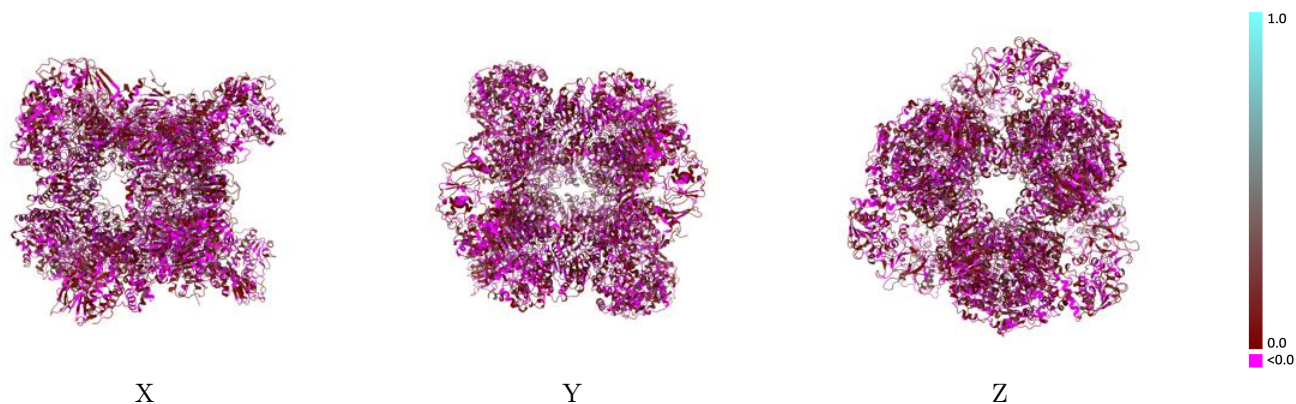
This section contains information regarding the fit between EMDB map EMD-1440 and PDB model 2VDC. Per-residue inclusion information can be found in section [3](#) on page [11](#).

9.1 Map-model overlay [i](#)



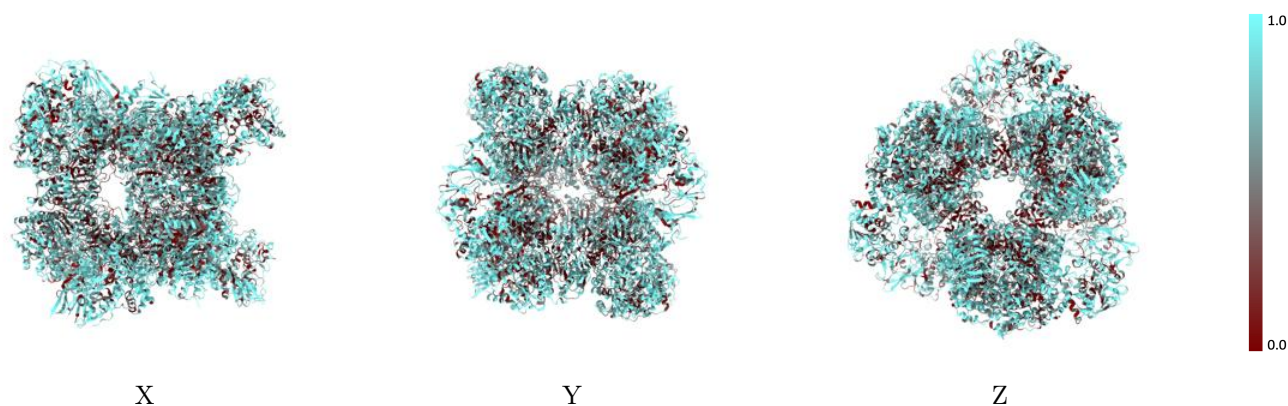
The images above show the 3D surface view of the map at the recommended contour level 125.0 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



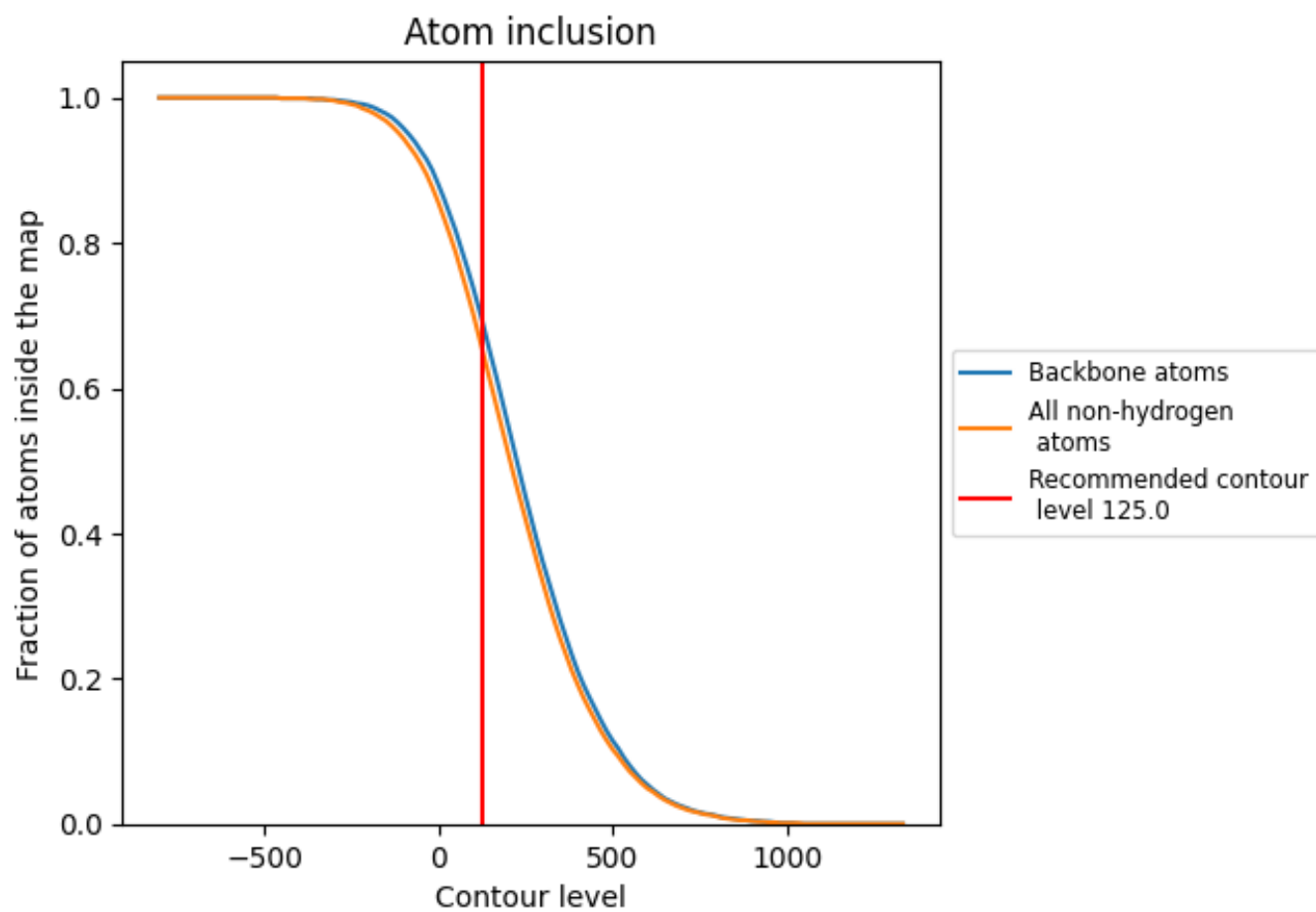
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (125.0).



























9.4 Atom inclusion [i](#)



At the recommended contour level, 70% of all backbone atoms, 66% 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 (125.0) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6560	 0.0430
A	 0.6470	 0.0430
B	 0.6460	 0.0430
C	 0.6350	 0.0400
D	 0.6350	 0.0430
E	 0.6360	 0.0450
F	 0.6350	 0.0410
G	 0.7250	 0.0460
H	 0.7080	 0.0430
I	 0.7010	 0.0470
J	 0.7250	 0.0490
K	 0.7010	 0.0470
L	 0.7080	 0.0430

