



wwPDB EM Validation Summary Report ⓘ

Mar 6, 2026 – 08:10 PM UTC

PDB ID : 8XAL / pdb_00008xal
EMDB ID : EMD-38201
Title : Cryo-EM structure of SARS-CoV-2 S-BQ.1 in complex with ACE2
Authors : Hsu, H.F.; Wu, M.H.; Chang, Y.C.; Hsu, S.T.D.
Deposited on : 2023-12-04
Resolution : 3.20 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

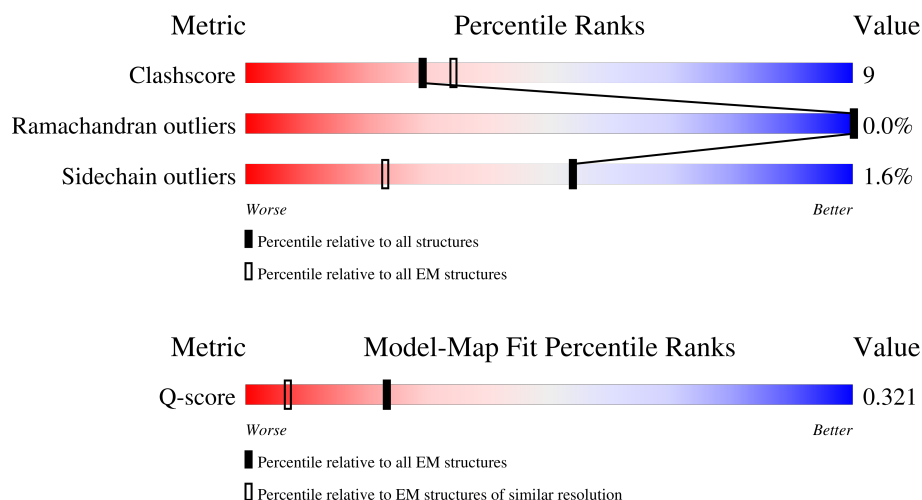
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

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 3.20 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	15020 (2.70 - 3.70)

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	1278	 68% 20% 12%
1	B	1278	 64% 24% 12%
1	C	1278	 69% 19% 12%
2	I	861	 53% 16% 31%

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Mol	Chain	Length	Quality of chain
2	J	861	46% 58% 11% 31%
3	K	2	100%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 36625 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 Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1129	Total	C	N	O	S	0	0
			8813	5623	1476	1674	40		
1	B	1129	Total	C	N	O	S	0	0
			8813	5623	1476	1674	40		
1	C	1129	Total	C	N	O	S	0	0
			8813	5623	1476	1674	40		

There are 363 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	19	ILE	THR	engineered mutation	UNP P0DTC2
A	24	SER	LEU	engineered mutation	UNP P0DTC2
A	?	-	PRO	deletion	UNP P0DTC2
A	?	-	PRO	deletion	UNP P0DTC2
A	?	-	ALA	deletion	UNP P0DTC2
A	?	-	HIS	deletion	UNP P0DTC2
A	?	-	VAL	deletion	UNP P0DTC2
A	137	ASP	GLY	engineered mutation	UNP P0DTC2
A	208	GLY	VAL	engineered mutation	UNP P0DTC2
A	334	ASP	GLY	engineered mutation	UNP P0DTC2
A	366	PHE	SER	engineered mutation	UNP P0DTC2
A	368	PRO	SER	engineered mutation	UNP P0DTC2
A	370	PHE	SER	engineered mutation	UNP P0DTC2
A	371	ALA	THR	engineered mutation	UNP P0DTC2
A	400	ASN	ASP	engineered mutation	UNP P0DTC2
A	403	SER	ARG	engineered mutation	UNP P0DTC2
A	412	ASN	LYS	engineered mutation	UNP P0DTC2
A	435	LYS	ASN	engineered mutation	UNP P0DTC2
A	439	THR	LYS	engineered mutation	UNP P0DTC2
A	447	ARG	LEU	engineered mutation	UNP P0DTC2
A	455	LYS	ASN	engineered mutation	UNP P0DTC2
A	472	ASN	SER	engineered mutation	UNP P0DTC2
A	473	LYS	THR	engineered mutation	UNP P0DTC2
A	479	ALA	GLU	engineered mutation	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	481	VAL	PHE	engineered mutation	UNP P0DTC2
A	493	ARG	GLN	engineered mutation	UNP P0DTC2
A	496	TYR	ASN	engineered mutation	UNP P0DTC2
A	500	HIS	TYR	engineered mutation	UNP P0DTC2
A	609	GLY	ASP	engineered mutation	UNP P0DTC2
A	650	TYR	HIS	engineered mutation	UNP P0DTC2
A	674	LYS	ASN	engineered mutation	UNP P0DTC2
A	676	HIS	PRO	engineered mutation	UNP P0DTC2
A	677	GLY	ARG	engineered mutation	UNP P0DTC2
A	678	SER	ARG	engineered mutation	UNP P0DTC2
A	680	SER	ARG	engineered mutation	UNP P0DTC2
A	759	LYS	ASN	engineered mutation	UNP P0DTC2
A	791	TYR	ASP	engineered mutation	UNP P0DTC2
A	812	PRO	PHE	engineered mutation	UNP P0DTC2
A	851	LYS	ASN	engineered mutation	UNP P0DTC2
A	887	PRO	ALA	engineered mutation	UNP P0DTC2
A	894	PRO	ALA	engineered mutation	UNP P0DTC2
A	937	PRO	ALA	engineered mutation	UNP P0DTC2
A	949	HIS	GLN	engineered mutation	UNP P0DTC2
A	964	LYS	ASN	engineered mutation	UNP P0DTC2
A	981	PRO	LYS	engineered mutation	UNP P0DTC2
A	982	PRO	VAL	engineered mutation	UNP P0DTC2
A	1204	GLU	-	expression tag	UNP P0DTC2
A	1205	PHE	-	expression tag	UNP P0DTC2
A	1206	GLY	-	expression tag	UNP P0DTC2
A	1207	SER	-	expression tag	UNP P0DTC2
A	1208	GLY	-	expression tag	UNP P0DTC2
A	1209	GLY	-	expression tag	UNP P0DTC2
A	1210	TYR	-	expression tag	UNP P0DTC2
A	1211	ILE	-	expression tag	UNP P0DTC2
A	1212	PRO	-	expression tag	UNP P0DTC2
A	1213	GLU	-	expression tag	UNP P0DTC2
A	1214	ALA	-	expression tag	UNP P0DTC2
A	1215	PRO	-	expression tag	UNP P0DTC2
A	1216	ARG	-	expression tag	UNP P0DTC2
A	1217	ASP	-	expression tag	UNP P0DTC2
A	1218	GLY	-	expression tag	UNP P0DTC2
A	1219	GLN	-	expression tag	UNP P0DTC2
A	1220	ALA	-	expression tag	UNP P0DTC2
A	1221	TYR	-	expression tag	UNP P0DTC2
A	1222	VAL	-	expression tag	UNP P0DTC2
A	1223	ARG	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1224	LYS	-	expression tag	UNP P0DTC2
A	1225	ASP	-	expression tag	UNP P0DTC2
A	1226	GLY	-	expression tag	UNP P0DTC2
A	1227	GLU	-	expression tag	UNP P0DTC2
A	1228	TRP	-	expression tag	UNP P0DTC2
A	1229	VAL	-	expression tag	UNP P0DTC2
A	1230	LEU	-	expression tag	UNP P0DTC2
A	1231	LEU	-	expression tag	UNP P0DTC2
A	1232	SER	-	expression tag	UNP P0DTC2
A	1233	THR	-	expression tag	UNP P0DTC2
A	1234	PHE	-	expression tag	UNP P0DTC2
A	1235	LEU	-	expression tag	UNP P0DTC2
A	1236	LYS	-	expression tag	UNP P0DTC2
A	1237	GLY	-	expression tag	UNP P0DTC2
A	1238	GLN	-	expression tag	UNP P0DTC2
A	1239	ASP	-	expression tag	UNP P0DTC2
A	1240	ASN	-	expression tag	UNP P0DTC2
A	1241	SER	-	expression tag	UNP P0DTC2
A	1242	ALA	-	expression tag	UNP P0DTC2
A	1243	ASP	-	expression tag	UNP P0DTC2
A	1244	ILE	-	expression tag	UNP P0DTC2
A	1245	GLN	-	expression tag	UNP P0DTC2
A	1246	HIS	-	expression tag	UNP P0DTC2
A	1247	SER	-	expression tag	UNP P0DTC2
A	1248	GLY	-	expression tag	UNP P0DTC2
A	1249	ARG	-	expression tag	UNP P0DTC2
A	1250	PRO	-	expression tag	UNP P0DTC2
A	1251	LEU	-	expression tag	UNP P0DTC2
A	1252	GLU	-	expression tag	UNP P0DTC2
A	1253	SER	-	expression tag	UNP P0DTC2
A	1254	ARG	-	expression tag	UNP P0DTC2
A	1255	GLY	-	expression tag	UNP P0DTC2
A	1256	PRO	-	expression tag	UNP P0DTC2
A	1257	PHE	-	expression tag	UNP P0DTC2
A	1258	GLU	-	expression tag	UNP P0DTC2
A	1259	GLN	-	expression tag	UNP P0DTC2
A	1260	LYS	-	expression tag	UNP P0DTC2
A	1261	LEU	-	expression tag	UNP P0DTC2
A	1262	ILE	-	expression tag	UNP P0DTC2
A	1263	SER	-	expression tag	UNP P0DTC2
A	1264	GLU	-	expression tag	UNP P0DTC2
A	1265	GLU	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1266	ASP	-	expression tag	UNP P0DTC2
A	1267	LEU	-	expression tag	UNP P0DTC2
A	1268	ASN	-	expression tag	UNP P0DTC2
A	1269	MET	-	expression tag	UNP P0DTC2
A	1270	HIS	-	expression tag	UNP P0DTC2
A	1271	THR	-	expression tag	UNP P0DTC2
A	1272	GLY	-	expression tag	UNP P0DTC2
A	1273	HIS	-	expression tag	UNP P0DTC2
A	1274	HIS	-	expression tag	UNP P0DTC2
A	1275	HIS	-	expression tag	UNP P0DTC2
A	1276	HIS	-	expression tag	UNP P0DTC2
A	1277	HIS	-	expression tag	UNP P0DTC2
A	1278	HIS	-	expression tag	UNP P0DTC2
B	19	ILE	THR	engineered mutation	UNP P0DTC2
B	24	SER	LEU	engineered mutation	UNP P0DTC2
B	?	-	PRO	deletion	UNP P0DTC2
B	?	-	PRO	deletion	UNP P0DTC2
B	?	-	ALA	deletion	UNP P0DTC2
B	?	-	HIS	deletion	UNP P0DTC2
B	?	-	VAL	deletion	UNP P0DTC2
B	137	ASP	GLY	engineered mutation	UNP P0DTC2
B	208	GLY	VAL	engineered mutation	UNP P0DTC2
B	334	ASP	GLY	engineered mutation	UNP P0DTC2
B	366	PHE	SER	engineered mutation	UNP P0DTC2
B	368	PRO	SER	engineered mutation	UNP P0DTC2
B	370	PHE	SER	engineered mutation	UNP P0DTC2
B	371	ALA	THR	engineered mutation	UNP P0DTC2
B	400	ASN	ASP	engineered mutation	UNP P0DTC2
B	403	SER	ARG	engineered mutation	UNP P0DTC2
B	412	ASN	LYS	engineered mutation	UNP P0DTC2
B	435	LYS	ASN	engineered mutation	UNP P0DTC2
B	439	THR	LYS	engineered mutation	UNP P0DTC2
B	447	ARG	LEU	engineered mutation	UNP P0DTC2
B	455	LYS	ASN	engineered mutation	UNP P0DTC2
B	472	ASN	SER	engineered mutation	UNP P0DTC2
B	473	LYS	THR	engineered mutation	UNP P0DTC2
B	479	ALA	GLU	engineered mutation	UNP P0DTC2
B	481	VAL	PHE	engineered mutation	UNP P0DTC2
B	493	ARG	GLN	engineered mutation	UNP P0DTC2
B	496	TYR	ASN	engineered mutation	UNP P0DTC2
B	500	HIS	TYR	engineered mutation	UNP P0DTC2
B	609	GLY	ASP	engineered mutation	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	650	TYR	HIS	engineered mutation	UNP P0DTC2
B	674	LYS	ASN	engineered mutation	UNP P0DTC2
B	676	HIS	PRO	engineered mutation	UNP P0DTC2
B	677	GLY	ARG	engineered mutation	UNP P0DTC2
B	678	SER	ARG	engineered mutation	UNP P0DTC2
B	680	SER	ARG	engineered mutation	UNP P0DTC2
B	759	LYS	ASN	engineered mutation	UNP P0DTC2
B	791	TYR	ASP	engineered mutation	UNP P0DTC2
B	812	PRO	PHE	engineered mutation	UNP P0DTC2
B	851	LYS	ASN	engineered mutation	UNP P0DTC2
B	887	PRO	ALA	engineered mutation	UNP P0DTC2
B	894	PRO	ALA	engineered mutation	UNP P0DTC2
B	937	PRO	ALA	engineered mutation	UNP P0DTC2
B	949	HIS	GLN	engineered mutation	UNP P0DTC2
B	964	LYS	ASN	engineered mutation	UNP P0DTC2
B	981	PRO	LYS	engineered mutation	UNP P0DTC2
B	982	PRO	VAL	engineered mutation	UNP P0DTC2
B	1204	GLU	-	expression tag	UNP P0DTC2
B	1205	PHE	-	expression tag	UNP P0DTC2
B	1206	GLY	-	expression tag	UNP P0DTC2
B	1207	SER	-	expression tag	UNP P0DTC2
B	1208	GLY	-	expression tag	UNP P0DTC2
B	1209	GLY	-	expression tag	UNP P0DTC2
B	1210	TYR	-	expression tag	UNP P0DTC2
B	1211	ILE	-	expression tag	UNP P0DTC2
B	1212	PRO	-	expression tag	UNP P0DTC2
B	1213	GLU	-	expression tag	UNP P0DTC2
B	1214	ALA	-	expression tag	UNP P0DTC2
B	1215	PRO	-	expression tag	UNP P0DTC2
B	1216	ARG	-	expression tag	UNP P0DTC2
B	1217	ASP	-	expression tag	UNP P0DTC2
B	1218	GLY	-	expression tag	UNP P0DTC2
B	1219	GLN	-	expression tag	UNP P0DTC2
B	1220	ALA	-	expression tag	UNP P0DTC2
B	1221	TYR	-	expression tag	UNP P0DTC2
B	1222	VAL	-	expression tag	UNP P0DTC2
B	1223	ARG	-	expression tag	UNP P0DTC2
B	1224	LYS	-	expression tag	UNP P0DTC2
B	1225	ASP	-	expression tag	UNP P0DTC2
B	1226	GLY	-	expression tag	UNP P0DTC2
B	1227	GLU	-	expression tag	UNP P0DTC2
B	1228	TRP	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1229	VAL	-	expression tag	UNP P0DTC2
B	1230	LEU	-	expression tag	UNP P0DTC2
B	1231	LEU	-	expression tag	UNP P0DTC2
B	1232	SER	-	expression tag	UNP P0DTC2
B	1233	THR	-	expression tag	UNP P0DTC2
B	1234	PHE	-	expression tag	UNP P0DTC2
B	1235	LEU	-	expression tag	UNP P0DTC2
B	1236	LYS	-	expression tag	UNP P0DTC2
B	1237	GLY	-	expression tag	UNP P0DTC2
B	1238	GLN	-	expression tag	UNP P0DTC2
B	1239	ASP	-	expression tag	UNP P0DTC2
B	1240	ASN	-	expression tag	UNP P0DTC2
B	1241	SER	-	expression tag	UNP P0DTC2
B	1242	ALA	-	expression tag	UNP P0DTC2
B	1243	ASP	-	expression tag	UNP P0DTC2
B	1244	ILE	-	expression tag	UNP P0DTC2
B	1245	GLN	-	expression tag	UNP P0DTC2
B	1246	HIS	-	expression tag	UNP P0DTC2
B	1247	SER	-	expression tag	UNP P0DTC2
B	1248	GLY	-	expression tag	UNP P0DTC2
B	1249	ARG	-	expression tag	UNP P0DTC2
B	1250	PRO	-	expression tag	UNP P0DTC2
B	1251	LEU	-	expression tag	UNP P0DTC2
B	1252	GLU	-	expression tag	UNP P0DTC2
B	1253	SER	-	expression tag	UNP P0DTC2
B	1254	ARG	-	expression tag	UNP P0DTC2
B	1255	GLY	-	expression tag	UNP P0DTC2
B	1256	PRO	-	expression tag	UNP P0DTC2
B	1257	PHE	-	expression tag	UNP P0DTC2
B	1258	GLU	-	expression tag	UNP P0DTC2
B	1259	GLN	-	expression tag	UNP P0DTC2
B	1260	LYS	-	expression tag	UNP P0DTC2
B	1261	LEU	-	expression tag	UNP P0DTC2
B	1262	ILE	-	expression tag	UNP P0DTC2
B	1263	SER	-	expression tag	UNP P0DTC2
B	1264	GLU	-	expression tag	UNP P0DTC2
B	1265	GLU	-	expression tag	UNP P0DTC2
B	1266	ASP	-	expression tag	UNP P0DTC2
B	1267	LEU	-	expression tag	UNP P0DTC2
B	1268	ASN	-	expression tag	UNP P0DTC2
B	1269	MET	-	expression tag	UNP P0DTC2
B	1270	HIS	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1271	THR	-	expression tag	UNP P0DTC2
B	1272	GLY	-	expression tag	UNP P0DTC2
B	1273	HIS	-	expression tag	UNP P0DTC2
B	1274	HIS	-	expression tag	UNP P0DTC2
B	1275	HIS	-	expression tag	UNP P0DTC2
B	1276	HIS	-	expression tag	UNP P0DTC2
B	1277	HIS	-	expression tag	UNP P0DTC2
B	1278	HIS	-	expression tag	UNP P0DTC2
C	19	ILE	THR	engineered mutation	UNP P0DTC2
C	24	SER	LEU	engineered mutation	UNP P0DTC2
C	?	-	PRO	deletion	UNP P0DTC2
C	?	-	PRO	deletion	UNP P0DTC2
C	?	-	ALA	deletion	UNP P0DTC2
C	?	-	HIS	deletion	UNP P0DTC2
C	?	-	VAL	deletion	UNP P0DTC2
C	137	ASP	GLY	engineered mutation	UNP P0DTC2
C	208	GLY	VAL	engineered mutation	UNP P0DTC2
C	334	ASP	GLY	engineered mutation	UNP P0DTC2
C	366	PHE	SER	engineered mutation	UNP P0DTC2
C	368	PRO	SER	engineered mutation	UNP P0DTC2
C	370	PHE	SER	engineered mutation	UNP P0DTC2
C	371	ALA	THR	engineered mutation	UNP P0DTC2
C	400	ASN	ASP	engineered mutation	UNP P0DTC2
C	403	SER	ARG	engineered mutation	UNP P0DTC2
C	412	ASN	LYS	engineered mutation	UNP P0DTC2
C	435	LYS	ASN	engineered mutation	UNP P0DTC2
C	439	THR	LYS	engineered mutation	UNP P0DTC2
C	447	ARG	LEU	engineered mutation	UNP P0DTC2
C	455	LYS	ASN	engineered mutation	UNP P0DTC2
C	472	ASN	SER	engineered mutation	UNP P0DTC2
C	473	LYS	THR	engineered mutation	UNP P0DTC2
C	479	ALA	GLU	engineered mutation	UNP P0DTC2
C	481	VAL	PHE	engineered mutation	UNP P0DTC2
C	493	ARG	GLN	engineered mutation	UNP P0DTC2
C	496	TYR	ASN	engineered mutation	UNP P0DTC2
C	500	HIS	TYR	engineered mutation	UNP P0DTC2
C	609	GLY	ASP	engineered mutation	UNP P0DTC2
C	650	TYR	HIS	engineered mutation	UNP P0DTC2
C	674	LYS	ASN	engineered mutation	UNP P0DTC2
C	676	HIS	PRO	engineered mutation	UNP P0DTC2
C	677	GLY	ARG	engineered mutation	UNP P0DTC2
C	678	SER	ARG	engineered mutation	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	680	SER	ARG	engineered mutation	UNP P0DTC2
C	759	LYS	ASN	engineered mutation	UNP P0DTC2
C	791	TYR	ASP	engineered mutation	UNP P0DTC2
C	812	PRO	PHE	engineered mutation	UNP P0DTC2
C	851	LYS	ASN	engineered mutation	UNP P0DTC2
C	887	PRO	ALA	engineered mutation	UNP P0DTC2
C	894	PRO	ALA	engineered mutation	UNP P0DTC2
C	937	PRO	ALA	engineered mutation	UNP P0DTC2
C	949	HIS	GLN	engineered mutation	UNP P0DTC2
C	964	LYS	ASN	engineered mutation	UNP P0DTC2
C	981	PRO	LYS	engineered mutation	UNP P0DTC2
C	982	PRO	VAL	engineered mutation	UNP P0DTC2
C	1204	GLU	-	expression tag	UNP P0DTC2
C	1205	PHE	-	expression tag	UNP P0DTC2
C	1206	GLY	-	expression tag	UNP P0DTC2
C	1207	SER	-	expression tag	UNP P0DTC2
C	1208	GLY	-	expression tag	UNP P0DTC2
C	1209	GLY	-	expression tag	UNP P0DTC2
C	1210	TYR	-	expression tag	UNP P0DTC2
C	1211	ILE	-	expression tag	UNP P0DTC2
C	1212	PRO	-	expression tag	UNP P0DTC2
C	1213	GLU	-	expression tag	UNP P0DTC2
C	1214	ALA	-	expression tag	UNP P0DTC2
C	1215	PRO	-	expression tag	UNP P0DTC2
C	1216	ARG	-	expression tag	UNP P0DTC2
C	1217	ASP	-	expression tag	UNP P0DTC2
C	1218	GLY	-	expression tag	UNP P0DTC2
C	1219	GLN	-	expression tag	UNP P0DTC2
C	1220	ALA	-	expression tag	UNP P0DTC2
C	1221	TYR	-	expression tag	UNP P0DTC2
C	1222	VAL	-	expression tag	UNP P0DTC2
C	1223	ARG	-	expression tag	UNP P0DTC2
C	1224	LYS	-	expression tag	UNP P0DTC2
C	1225	ASP	-	expression tag	UNP P0DTC2
C	1226	GLY	-	expression tag	UNP P0DTC2
C	1227	GLU	-	expression tag	UNP P0DTC2
C	1228	TRP	-	expression tag	UNP P0DTC2
C	1229	VAL	-	expression tag	UNP P0DTC2
C	1230	LEU	-	expression tag	UNP P0DTC2
C	1231	LEU	-	expression tag	UNP P0DTC2
C	1232	SER	-	expression tag	UNP P0DTC2
C	1233	THR	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1234	PHE	-	expression tag	UNP P0DTC2
C	1235	LEU	-	expression tag	UNP P0DTC2
C	1236	LYS	-	expression tag	UNP P0DTC2
C	1237	GLY	-	expression tag	UNP P0DTC2
C	1238	GLN	-	expression tag	UNP P0DTC2
C	1239	ASP	-	expression tag	UNP P0DTC2
C	1240	ASN	-	expression tag	UNP P0DTC2
C	1241	SER	-	expression tag	UNP P0DTC2
C	1242	ALA	-	expression tag	UNP P0DTC2
C	1243	ASP	-	expression tag	UNP P0DTC2
C	1244	ILE	-	expression tag	UNP P0DTC2
C	1245	GLN	-	expression tag	UNP P0DTC2
C	1246	HIS	-	expression tag	UNP P0DTC2
C	1247	SER	-	expression tag	UNP P0DTC2
C	1248	GLY	-	expression tag	UNP P0DTC2
C	1249	ARG	-	expression tag	UNP P0DTC2
C	1250	PRO	-	expression tag	UNP P0DTC2
C	1251	LEU	-	expression tag	UNP P0DTC2
C	1252	GLU	-	expression tag	UNP P0DTC2
C	1253	SER	-	expression tag	UNP P0DTC2
C	1254	ARG	-	expression tag	UNP P0DTC2
C	1255	GLY	-	expression tag	UNP P0DTC2
C	1256	PRO	-	expression tag	UNP P0DTC2
C	1257	PHE	-	expression tag	UNP P0DTC2
C	1258	GLU	-	expression tag	UNP P0DTC2
C	1259	GLN	-	expression tag	UNP P0DTC2
C	1260	LYS	-	expression tag	UNP P0DTC2
C	1261	LEU	-	expression tag	UNP P0DTC2
C	1262	ILE	-	expression tag	UNP P0DTC2
C	1263	SER	-	expression tag	UNP P0DTC2
C	1264	GLU	-	expression tag	UNP P0DTC2
C	1265	GLU	-	expression tag	UNP P0DTC2
C	1266	ASP	-	expression tag	UNP P0DTC2
C	1267	LEU	-	expression tag	UNP P0DTC2
C	1268	ASN	-	expression tag	UNP P0DTC2
C	1269	MET	-	expression tag	UNP P0DTC2
C	1270	HIS	-	expression tag	UNP P0DTC2
C	1271	THR	-	expression tag	UNP P0DTC2
C	1272	GLY	-	expression tag	UNP P0DTC2
C	1273	HIS	-	expression tag	UNP P0DTC2
C	1274	HIS	-	expression tag	UNP P0DTC2
C	1275	HIS	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1276	HIS	-	expression tag	UNP P0DTC2
C	1277	HIS	-	expression tag	UNP P0DTC2
C	1278	HIS	-	expression tag	UNP P0DTC2

- Molecule 2 is a protein called Angiotensin-converting enzyme 2, Green fluorescent protein (Fragment).

Mol	Chain	Residues	Atoms					AltConf	Trace
2	I	596	Total	C	N	O	S	0	0
			4862	3111	805	917	29		
2	J	596	Total	C	N	O	S	0	0
			4862	3111	805	917	29		

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	616	GLY	-	linker	UNP Q9BYF1
I	617	SER	-	linker	UNP Q9BYF1
I	618	GLY	-	linker	UNP Q9BYF1
I	619	GLY	-	linker	UNP Q9BYF1
I	620	SER	-	linker	UNP Q9BYF1
I	621	GLY	-	linker	UNP Q9BYF1
I	622	SER	-	linker	UNP Q9BYF1
I	623	GLY	-	linker	UNP Q9BYF1
I	624	GLY	-	linker	UNP Q9BYF1
I	625	SER	-	linker	UNP Q9BYF1
I	653	ARG	SER	conflict	UNP A0A059PIQ0
I	695	SER	ALA	conflict	UNP A0A059PIQ0
I	703	ARG	GLN	conflict	UNP A0A059PIQ0
I	829	VAL	ALA	conflict	UNP A0A059PIQ0
J	616	GLY	-	linker	UNP Q9BYF1
J	617	SER	-	linker	UNP Q9BYF1
J	618	GLY	-	linker	UNP Q9BYF1
J	619	GLY	-	linker	UNP Q9BYF1
J	620	SER	-	linker	UNP Q9BYF1
J	621	GLY	-	linker	UNP Q9BYF1
J	622	SER	-	linker	UNP Q9BYF1
J	623	GLY	-	linker	UNP Q9BYF1
J	624	GLY	-	linker	UNP Q9BYF1
J	625	SER	-	linker	UNP Q9BYF1
J	653	ARG	SER	conflict	UNP A0A059PIQ0
J	695	SER	ALA	conflict	UNP A0A059PIQ0

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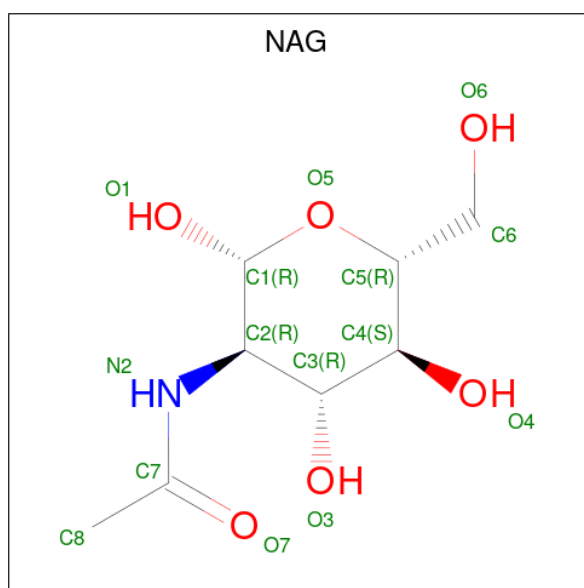
Chain	Residue	Modelled	Actual	Comment	Reference
J	703	ARG	GLN	conflict	UNP A0A059PIQ0
J	829	VAL	ALA	conflict	UNP A0A059PIQ0

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
3	K	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf
4	A	1	Total	C	N	O	0
			14	8	1	5	
4	A	1	Total	C	N	O	0
			14	8	1	5	
4	A	1	Total	C	N	O	0
			14	8	1	5	
4	A	1	Total	C	N	O	0
			14	8	1	5	

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Mol	Chain	Residues	Atoms				AltConf
4	A	1	Total 14	C 8	N 1	O 5	0
4	A	1	Total 14	C 8	N 1	O 5	0
4	A	1	Total 14	C 8	N 1	O 5	0
4	A	1	Total 14	C 8	N 1	O 5	0
4	A	1	Total 14	C 8	N 1	O 5	0
4	A	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	C	1	Total 14	C 8	N 1	O 5	0
4	C	1	Total 14	C 8	N 1	O 5	0
4	C	1	Total 14	C 8	N 1	O 5	0
4	C	1	Total 14	C 8	N 1	O 5	0
4	C	1	Total 14	C 8	N 1	O 5	0
4	C	1	Total 14	C 8	N 1	O 5	0

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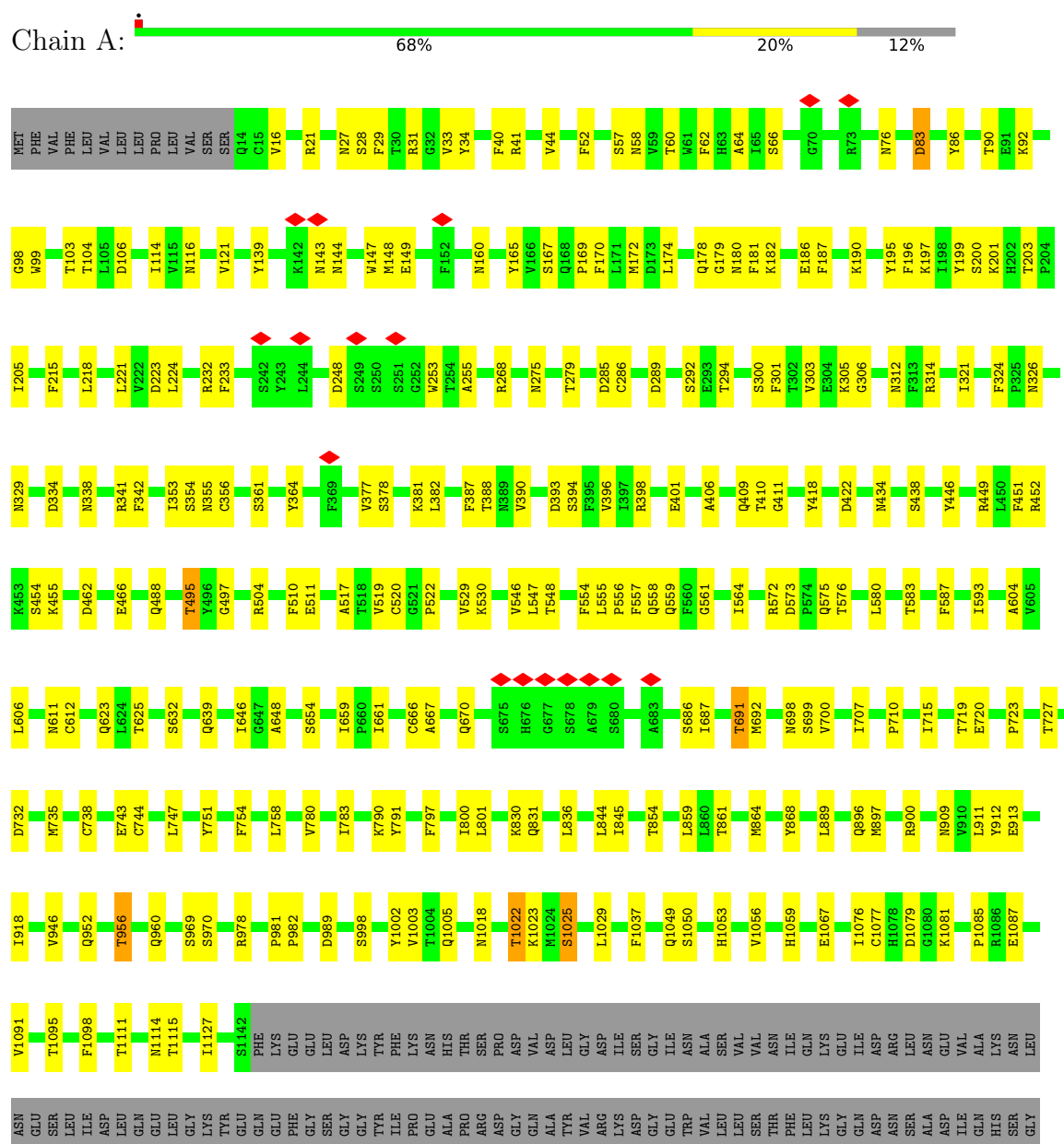
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Mol	Chain	Residues	Atoms				AltConf
4	C	1	Total	C	N	O	0
			14	8	1	5	
4	I	1	Total	C	N	O	0
			14	8	1	5	
4	I	1	Total	C	N	O	0
			14	8	1	5	
4	I	1	Total	C	N	O	0
			14	8	1	5	
4	I	1	Total	C	N	O	0
			14	8	1	5	
4	I	1	Total	C	N	O	0
			14	8	1	5	

3 Residue-property plots

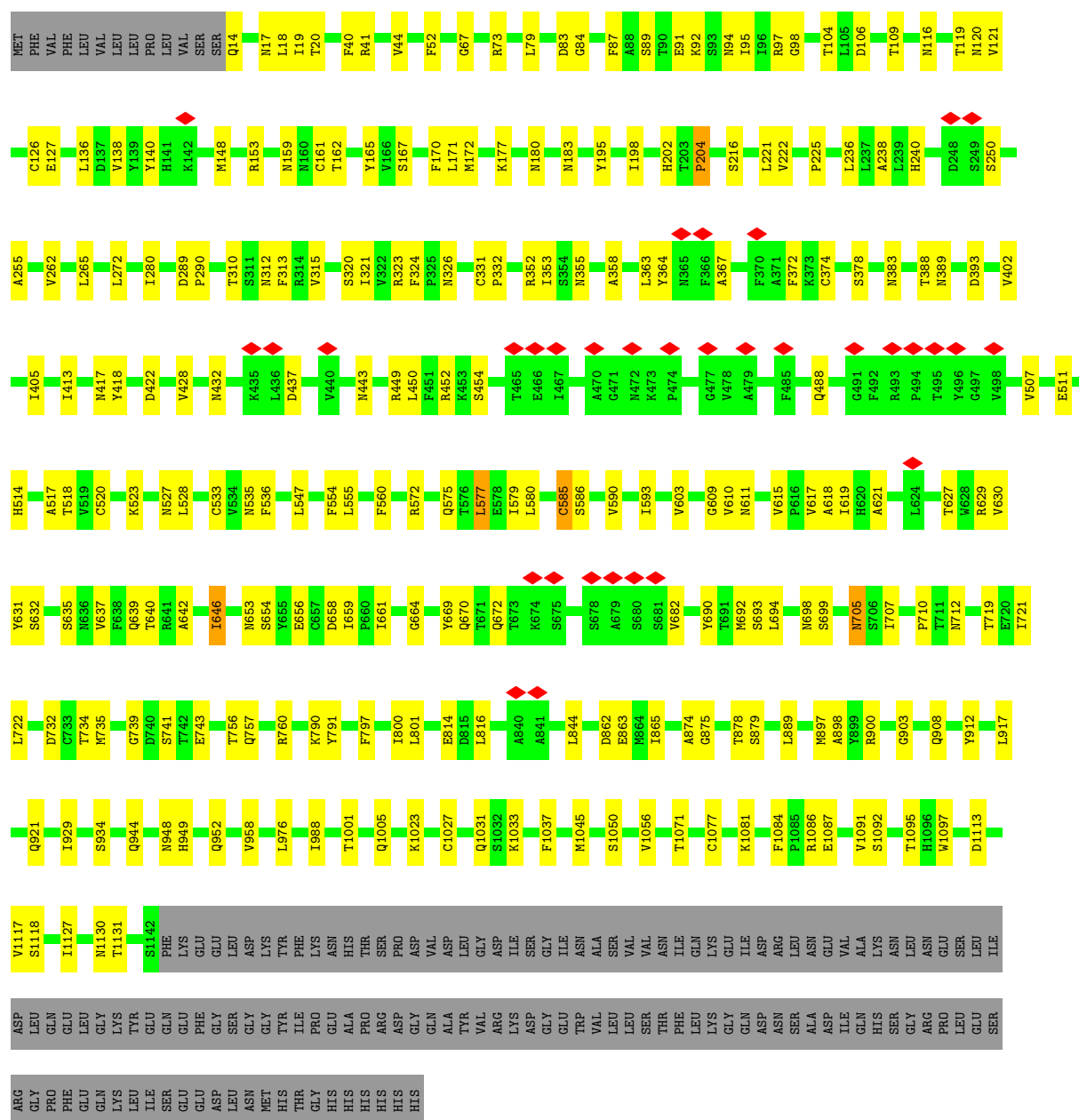
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

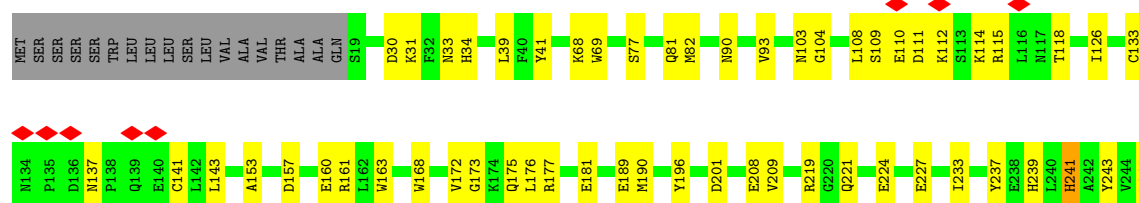


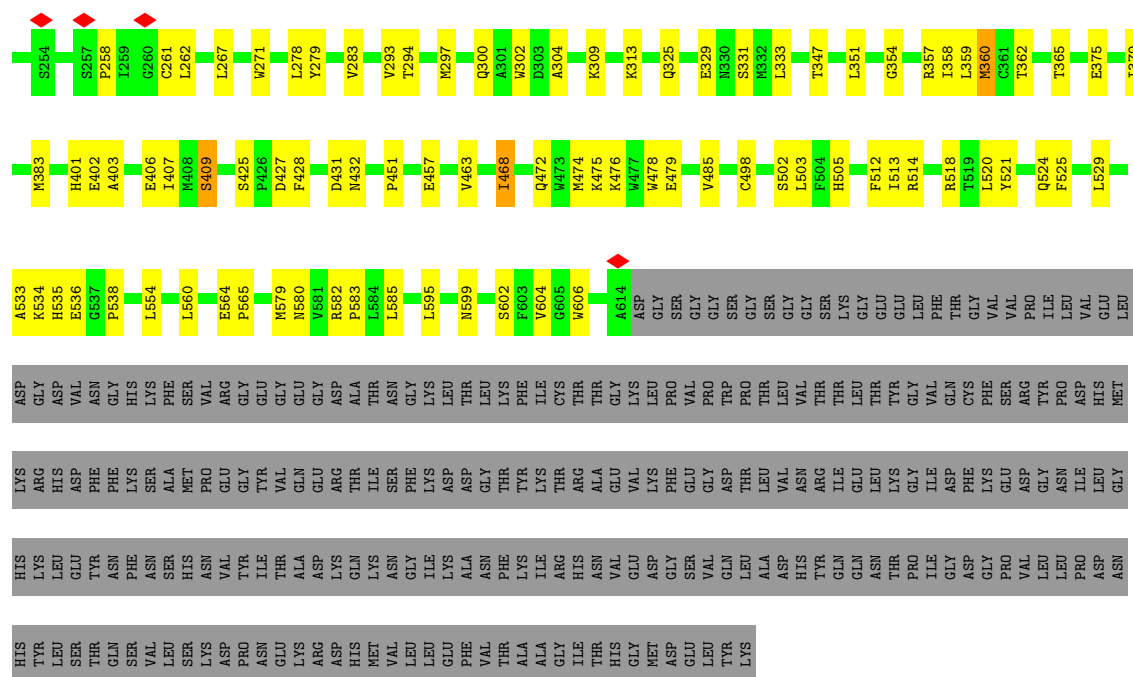
Chain B:



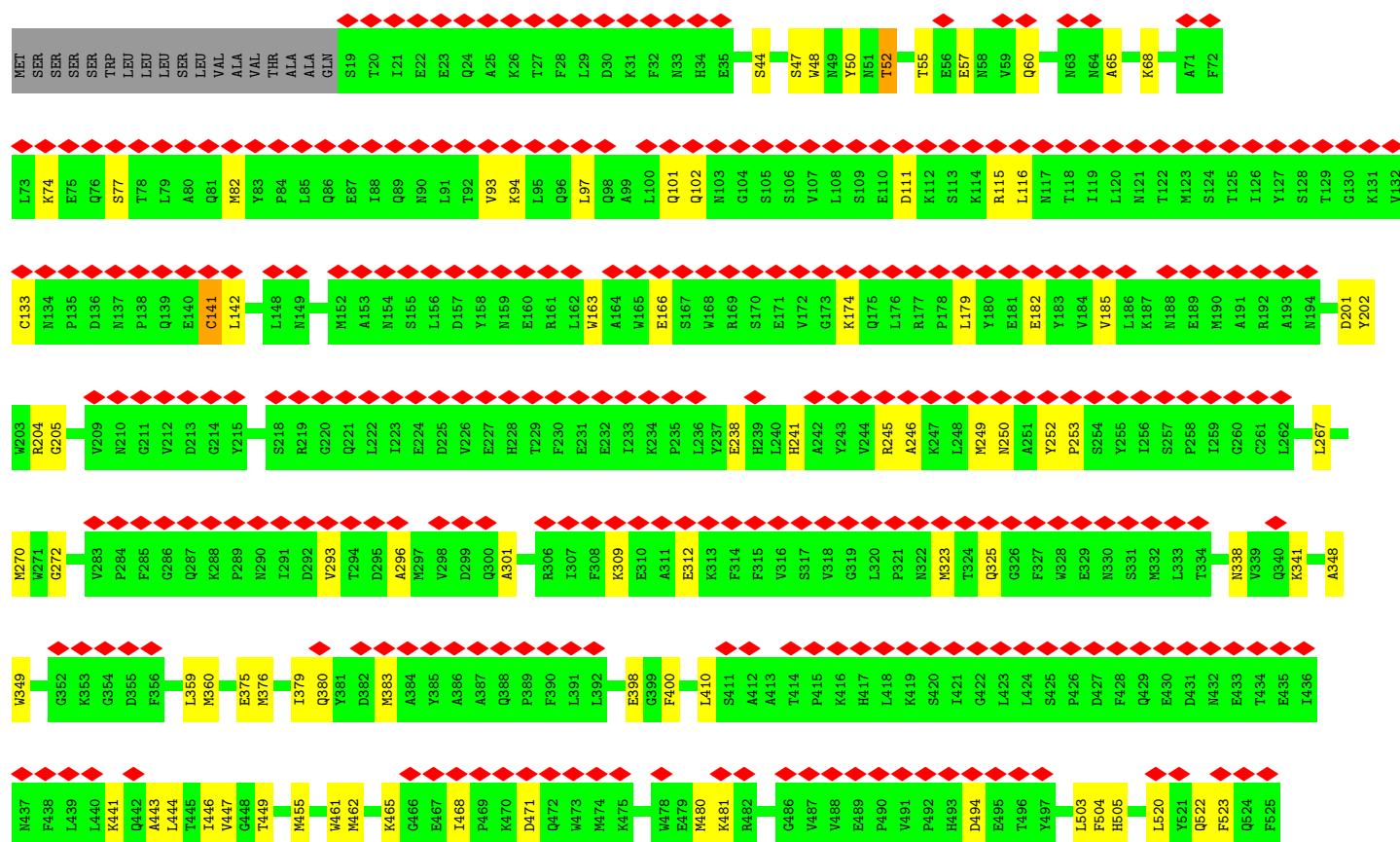


• Molecule 2: Angiotensin-converting enzyme 2, Green fluorescent protein (Fragment)





• Molecule 2: Angiotensin-converting enzyme 2, Green fluorescent protein (Fragment)



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	128951	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	2.813	Depositor
Minimum map value	-0.128	Depositor
Average map value	0.003	Depositor
Map value standard deviation	0.036	Depositor
Recommended contour level	0.2	Depositor
Map size ($\text{\AA}$)	496.80002, 496.80002, 496.80002	wwPDB
Map dimensions	460, 460, 460	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.08, 1.08, 1.08	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.12	0/9026	0.32	0/12289
1	B	0.13	0/9026	0.34	0/12289
1	C	0.13	0/9026	0.36	4/12289 (0.0%)
2	I	0.12	0/4999	0.34	1/6792 (0.0%)
2	J	0.11	0/4999	0.31	0/6792
All	All	0.13	0/37076	0.34	5/50451 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	204	PRO	CA-N-CD	-12.98	93.83	112.00
1	C	619	ILE	N-CA-C	-6.26	107.76	113.71
1	C	204	PRO	N-CD-CG	-6.22	93.88	103.20
2	I	360	MET	CB-CG-SD	5.09	127.97	112.70
1	C	712	ASN	CB-CA-C	5.01	118.36	109.89

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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	8813	0	8607	175	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	8813	0	8609	208	0
1	C	8813	0	8608	152	0
2	I	4862	0	4636	97	0
2	J	4862	0	4639	67	0
3	K	28	0	25	0	0
4	A	140	0	130	3	0
4	B	126	0	115	4	0
4	C	98	0	91	3	0
4	I	70	0	64	1	0
All	All	36625	0	35524	671	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 9.

The worst 5 of 671 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)
2:I:157:ASP:HB2	2:I:161:ARG:HG3	1.57	0.87
1:B:325:PRO:HA	1:B:574:PRO:HB3	1.60	0.84
1:C:126:CYS:HB3	1:C:161:CYS:HA	1.60	0.83
1:A:341:ARG:HH11	1:A:342:PHE:H	1.27	0.80
2:J:97:LEU:HD22	2:J:101:GLN:HE22	1.47	0.80

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	1127/1278 (88%)	1060 (94%)	67 (6%)	0	100	100
1	B	1127/1278 (88%)	1048 (93%)	78 (7%)	1 (0%)	48	79

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	1127/1278 (88%)	1066 (95%)	61 (5%)	0	100	100
2	I	594/861 (69%)	557 (94%)	37 (6%)	0	100	100
2	J	594/861 (69%)	559 (94%)	35 (6%)	0	100	100
All	All	4569/5556 (82%)	4290 (94%)	278 (6%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	835	CYS

5.3.2 Protein sidechains ⓘ

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	981/1113 (88%)	963 (98%)	18 (2%)	51	74
1	B	981/1113 (88%)	955 (97%)	26 (3%)	39	68
1	C	981/1113 (88%)	968 (99%)	13 (1%)	61	78
2	I	526/752 (70%)	521 (99%)	5 (1%)	68	80
2	J	526/752 (70%)	523 (99%)	3 (1%)	78	84
All	All	3995/4843 (82%)	3930 (98%)	65 (2%)	54	75

5 of 65 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	I	241	HIS
2	I	401	HIS
1	B	271	LEU
1	B	269	THR
2	I	409	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 42 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	434	ASN
2	I	540	HIS
1	C	501	GLN
2	I	53	ASN
2	J	60	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

2 monosaccharides 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	$\# Z > 2$
3	NAG	K	1	2,3	14,14,15	0.38	0	17,19,21	0.65	0
3	NAG	K	2	3	14,14,15	0.29	0	17,19,21	0.42	0

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
3	NAG	K	1	2,3	-	4/6/23/26	0/1/1/1
3	NAG	K	2	3	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

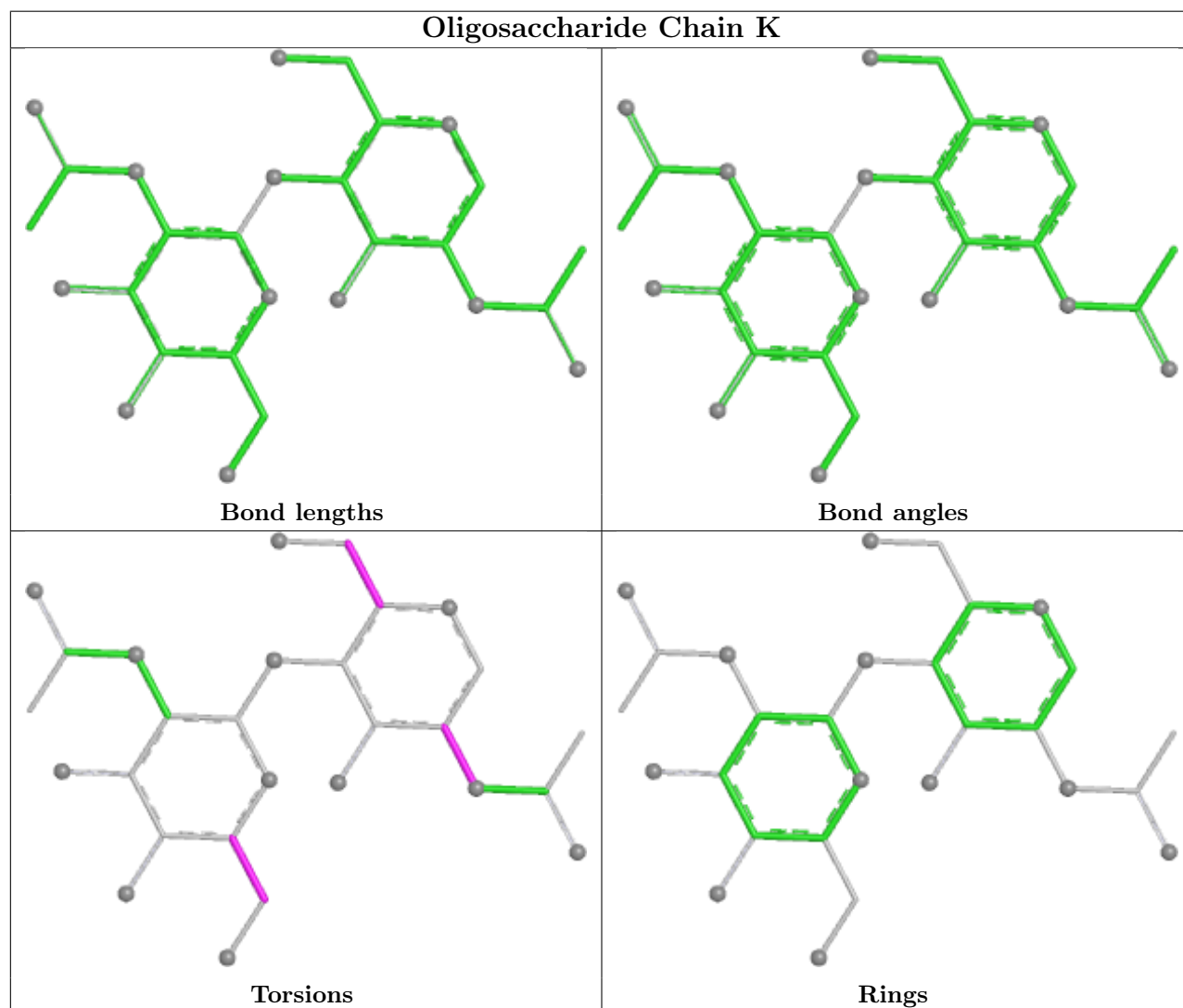
5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	K	1	NAG	O5-C5-C6-O6
3	K	2	NAG	C4-C5-C6-O6
3	K	1	NAG	C4-C5-C6-O6
3	K	2	NAG	O5-C5-C6-O6
3	K	1	NAG	C3-C2-N2-C7

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 oligosaccharide.



5.6 Ligand geometry

31 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
4	NAG	B	1308	1	14,14,15	0.27	0	17,19,21	0.47	0
4	NAG	A	1301	-	14,14,15	0.24	0	17,19,21	0.42	0
4	NAG	I	904	-	14,14,15	0.21	0	17,19,21	0.42	0
4	NAG	B	1306	1	14,14,15	0.32	0	17,19,21	0.58	0
4	NAG	C	1302	1	14,14,15	0.67	1 (7%)	17,19,21	0.87	1 (5%)
4	NAG	A	1310	-	14,14,15	0.62	0	17,19,21	0.78	1 (5%)
4	NAG	B	1304	-	14,14,15	0.20	0	17,19,21	0.43	0
4	NAG	A	1302	1	14,14,15	0.53	0	17,19,21	0.53	0
4	NAG	B	1302	-	14,14,15	0.21	0	17,19,21	0.43	0
4	NAG	C	1301	1	14,14,15	0.43	0	17,19,21	0.38	0
4	NAG	A	1305	1	14,14,15	0.87	1 (7%)	17,19,21	1.01	1 (5%)
4	NAG	C	1307	1	14,14,15	0.19	0	17,19,21	0.40	0
4	NAG	A	1306	1	14,14,15	0.26	0	17,19,21	0.47	0
4	NAG	B	1305	1	14,14,15	0.53	0	17,19,21	0.69	1 (5%)
4	NAG	C	1305	-	14,14,15	0.21	0	17,19,21	0.43	0
4	NAG	I	903	2	14,14,15	0.25	0	17,19,21	0.48	0
4	NAG	A	1308	1	14,14,15	0.25	0	17,19,21	0.51	0
4	NAG	C	1306	1	14,14,15	0.25	0	17,19,21	0.49	0
4	NAG	C	1303	1	14,14,15	0.23	0	17,19,21	0.47	0
4	NAG	I	901	-	14,14,15	0.20	0	17,19,21	0.44	0
4	NAG	I	902	-	14,14,15	0.52	0	17,19,21	0.85	1 (5%)
4	NAG	I	905	2	14,14,15	0.29	0	17,19,21	0.48	0
4	NAG	A	1309	1	14,14,15	0.32	0	17,19,21	0.59	0
4	NAG	A	1303	1	14,14,15	0.26	0	17,19,21	0.40	0
4	NAG	B	1309	1	14,14,15	0.23	0	17,19,21	0.42	0
4	NAG	A	1307	-	14,14,15	0.64	1 (7%)	17,19,21	1.03	2 (11%)
4	NAG	C	1304	1	14,14,15	0.29	0	17,19,21	0.56	0
4	NAG	A	1304	-	14,14,15	0.45	0	17,19,21	0.39	0
4	NAG	B	1303	-	14,14,15	0.41	0	17,19,21	0.35	0
4	NAG	B	1307	1	14,14,15	0.22	0	17,19,21	0.55	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAG	B	1301	-	14,14,15	1.59	2 (14%)	17,19,21	1.27	2 (11%)

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
4	NAG	B	1308	1	-	3/6/23/26	0/1/1/1
4	NAG	A	1301	-	-	2/6/23/26	0/1/1/1
4	NAG	I	904	-	-	0/6/23/26	0/1/1/1
4	NAG	B	1306	1	-	0/6/23/26	0/1/1/1
4	NAG	C	1302	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1310	-	-	0/6/23/26	0/1/1/1
4	NAG	B	1304	-	-	3/6/23/26	0/1/1/1
4	NAG	A	1302	1	-	4/6/23/26	0/1/1/1
4	NAG	B	1302	-	-	4/6/23/26	0/1/1/1
4	NAG	C	1301	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1305	1	-	2/6/23/26	0/1/1/1
4	NAG	C	1307	1	-	0/6/23/26	0/1/1/1
4	NAG	A	1306	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1305	1	-	0/6/23/26	0/1/1/1
4	NAG	C	1305	-	-	0/6/23/26	0/1/1/1
4	NAG	I	903	2	-	2/6/23/26	0/1/1/1
4	NAG	A	1308	1	-	2/6/23/26	0/1/1/1
4	NAG	C	1306	1	-	2/6/23/26	0/1/1/1
4	NAG	C	1303	1	-	2/6/23/26	0/1/1/1
4	NAG	I	901	-	-	2/6/23/26	0/1/1/1
4	NAG	I	902	-	-	2/6/23/26	0/1/1/1
4	NAG	I	905	2	-	2/6/23/26	0/1/1/1
4	NAG	A	1309	1	-	4/6/23/26	0/1/1/1
4	NAG	A	1303	1	-	0/6/23/26	0/1/1/1
4	NAG	B	1309	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1307	-	-	2/6/23/26	0/1/1/1
4	NAG	C	1304	1	-	3/6/23/26	0/1/1/1
4	NAG	A	1304	-	-	4/6/23/26	0/1/1/1
4	NAG	B	1303	-	-	3/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	B	1307	1	-	3/6/23/26	0/1/1/1
4	NAG	B	1301	-	-	4/6/23/26	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1301	NAG	O5-C1	-4.08	1.36	1.43
4	B	1301	NAG	C1-C2	3.70	1.57	1.52
4	A	1305	NAG	O5-C1	2.69	1.48	1.43
4	C	1302	NAG	C1-C2	2.26	1.55	1.52
4	A	1307	NAG	O5-C1	-2.16	1.40	1.43

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1305	NAG	C1-O5-C5	3.93	117.45	112.19
4	B	1301	NAG	C4-C3-C2	3.41	116.02	111.02
4	C	1302	NAG	C1-O5-C5	3.09	116.33	112.19
4	A	1310	NAG	C1-O5-C5	2.90	116.07	112.19
4	I	902	NAG	C1-O5-C5	2.89	116.06	112.19

There are no chirality outliers.

5 of 63 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1305	NAG	C4-C5-C6-O6
4	A	1305	NAG	O5-C5-C6-O6
4	A	1309	NAG	O5-C5-C6-O6
4	C	1304	NAG	O5-C5-C6-O6
4	A	1304	NAG	O5-C5-C6-O6

There are no ring outliers.

10 monomers are involved in 11 short contacts:

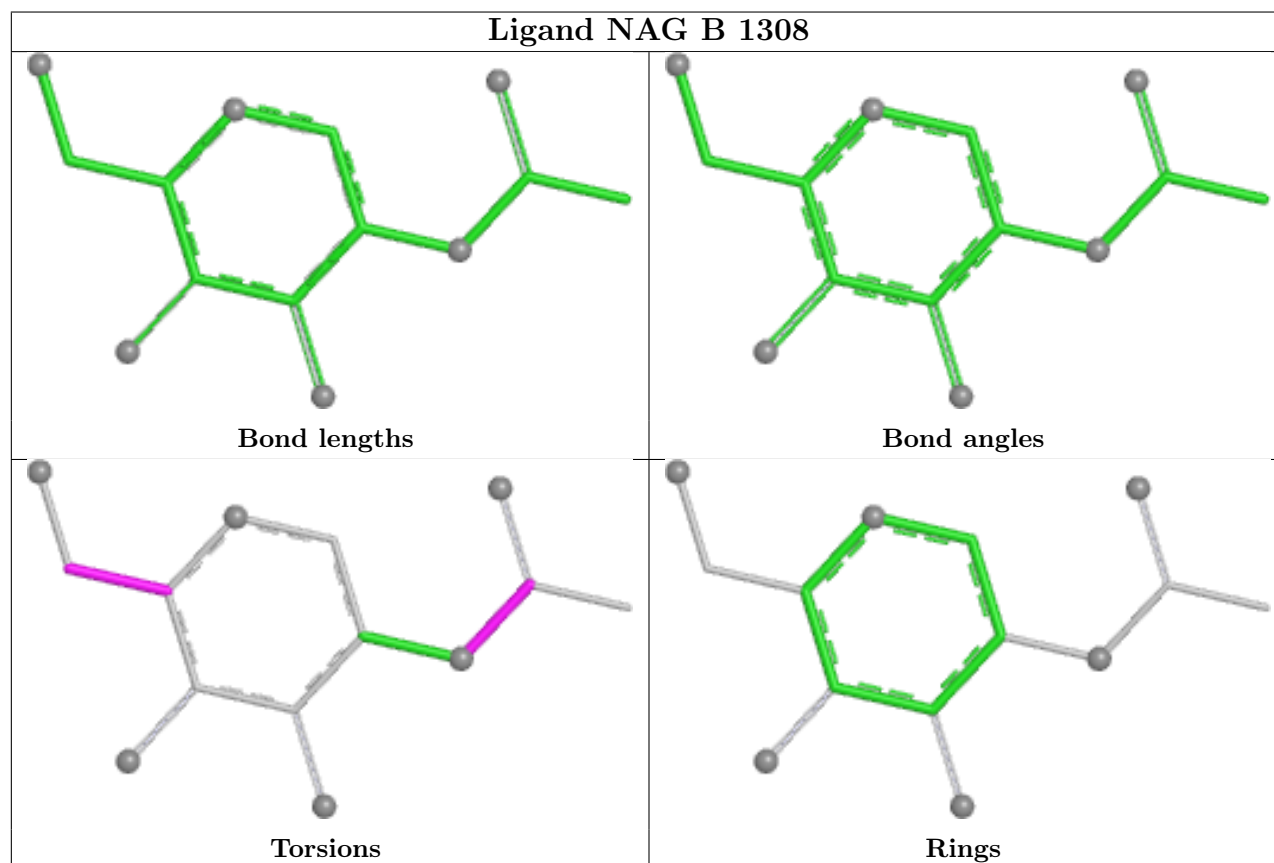
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1308	NAG	1	0
4	C	1302	NAG	2	0
4	A	1302	NAG	1	0
4	B	1305	NAG	1	0
4	A	1308	NAG	1	0

Continued on next page...

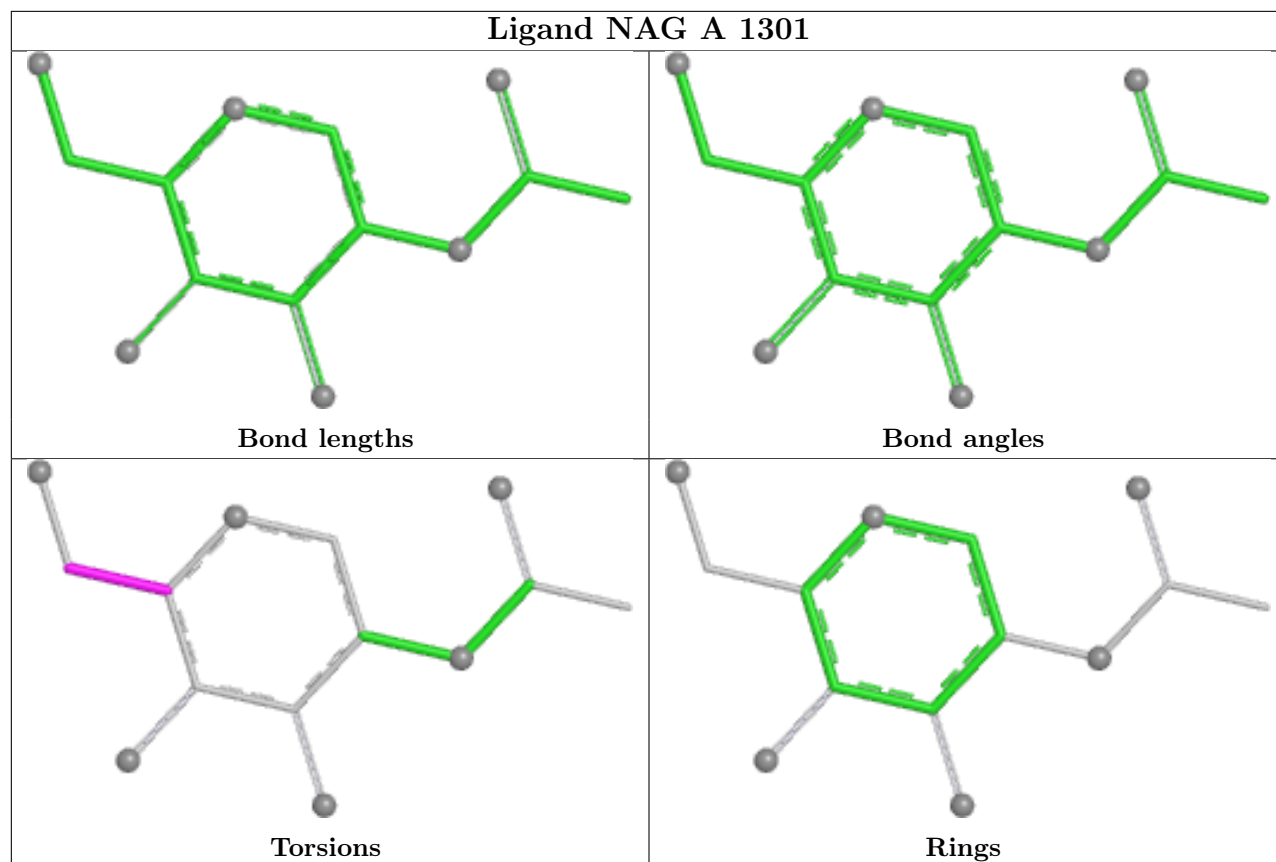
Continued from previous page...

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	1303	NAG	1	0
4	I	902	NAG	1	0
4	A	1309	NAG	1	0
4	B	1303	NAG	1	0
4	B	1301	NAG	1	0

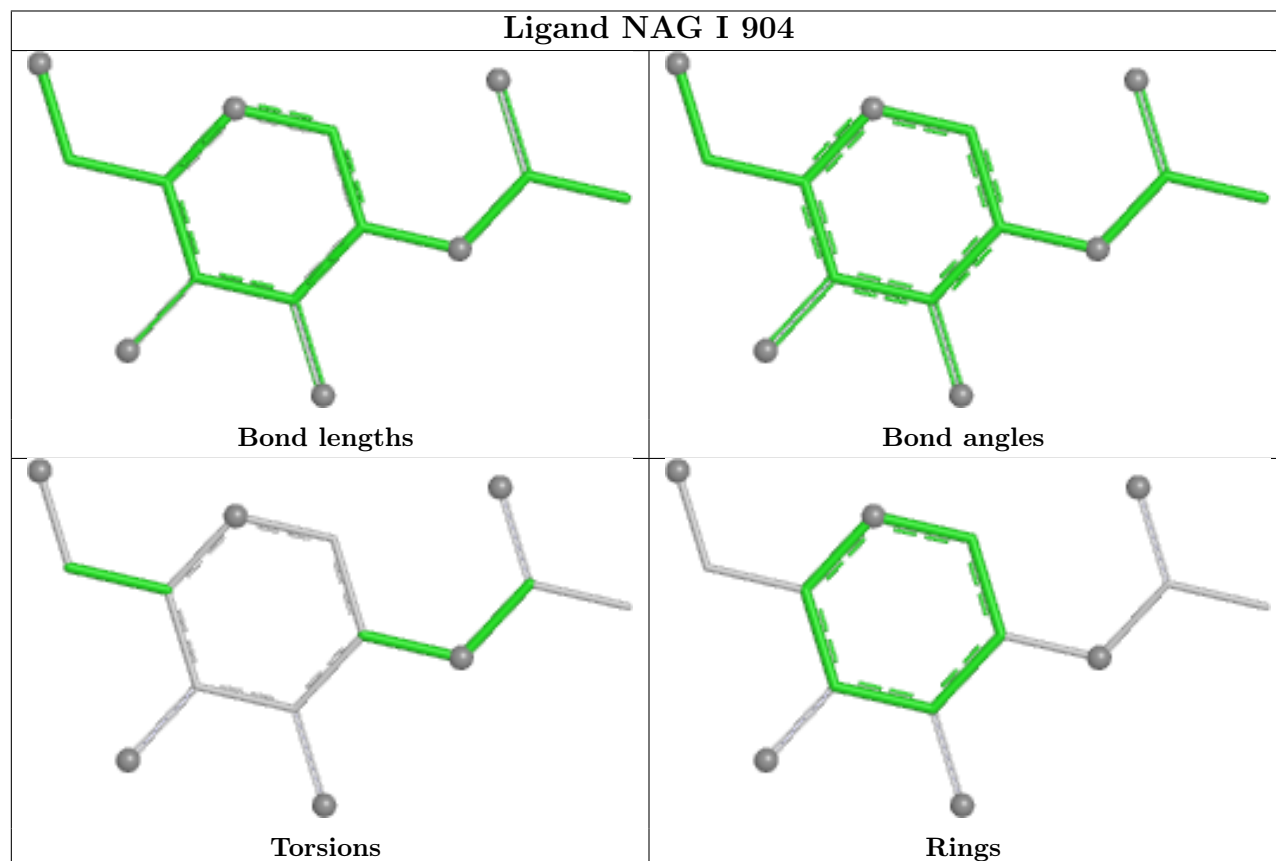
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

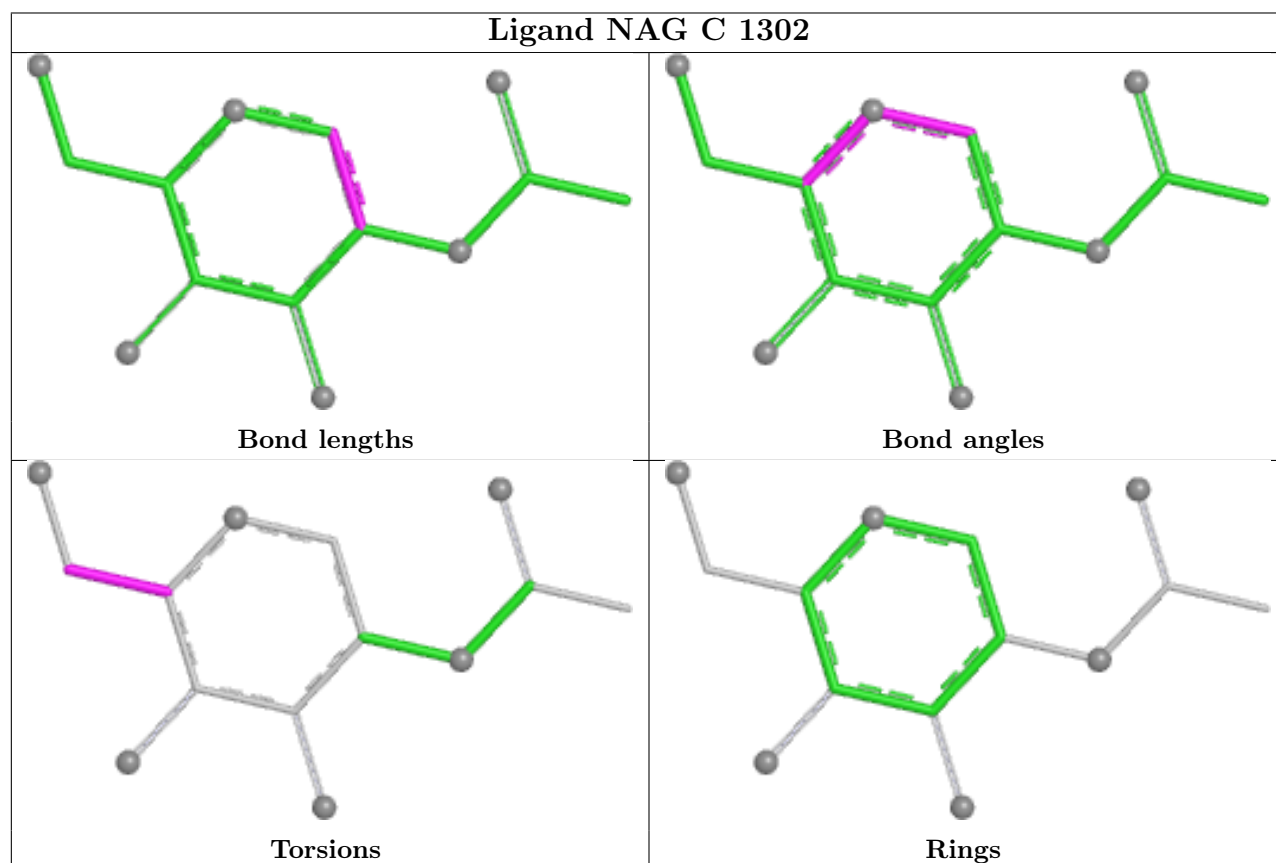
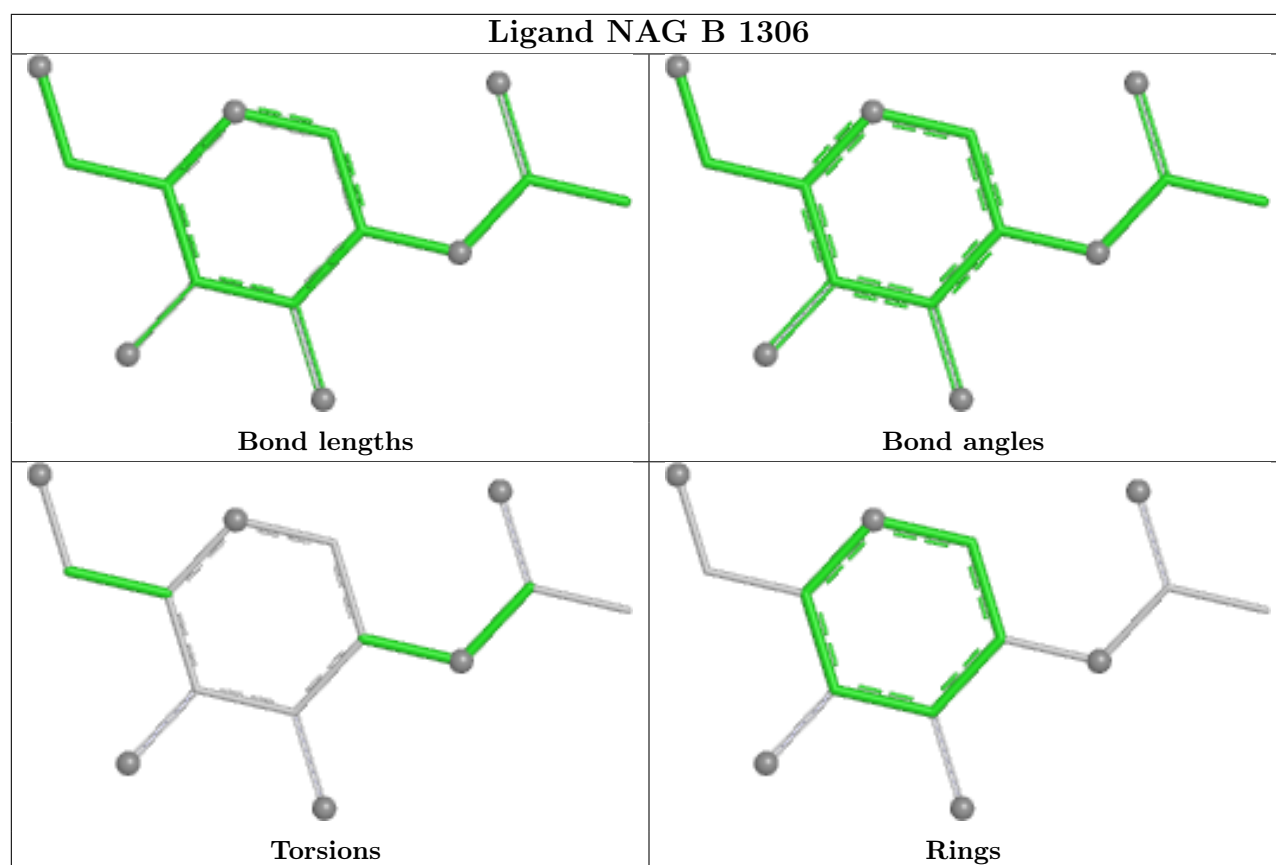


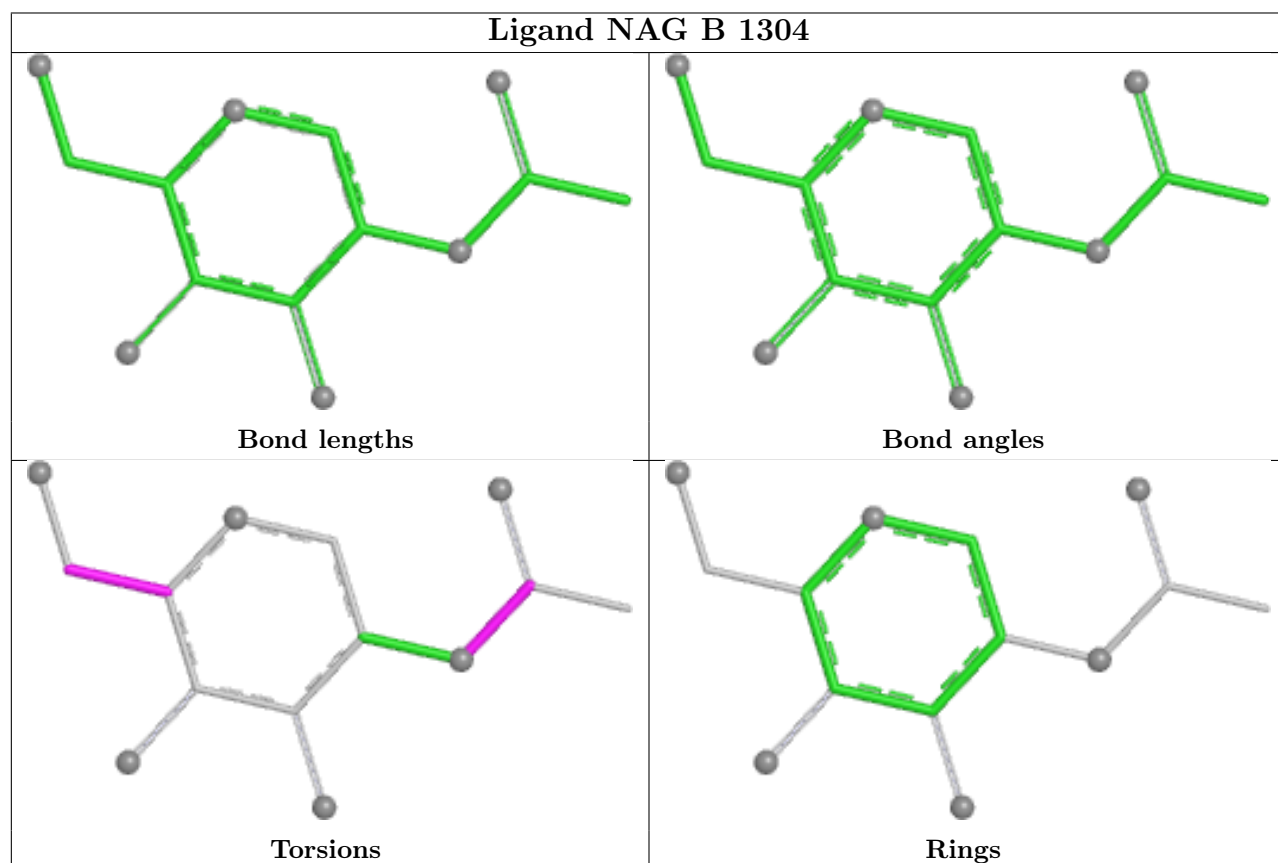
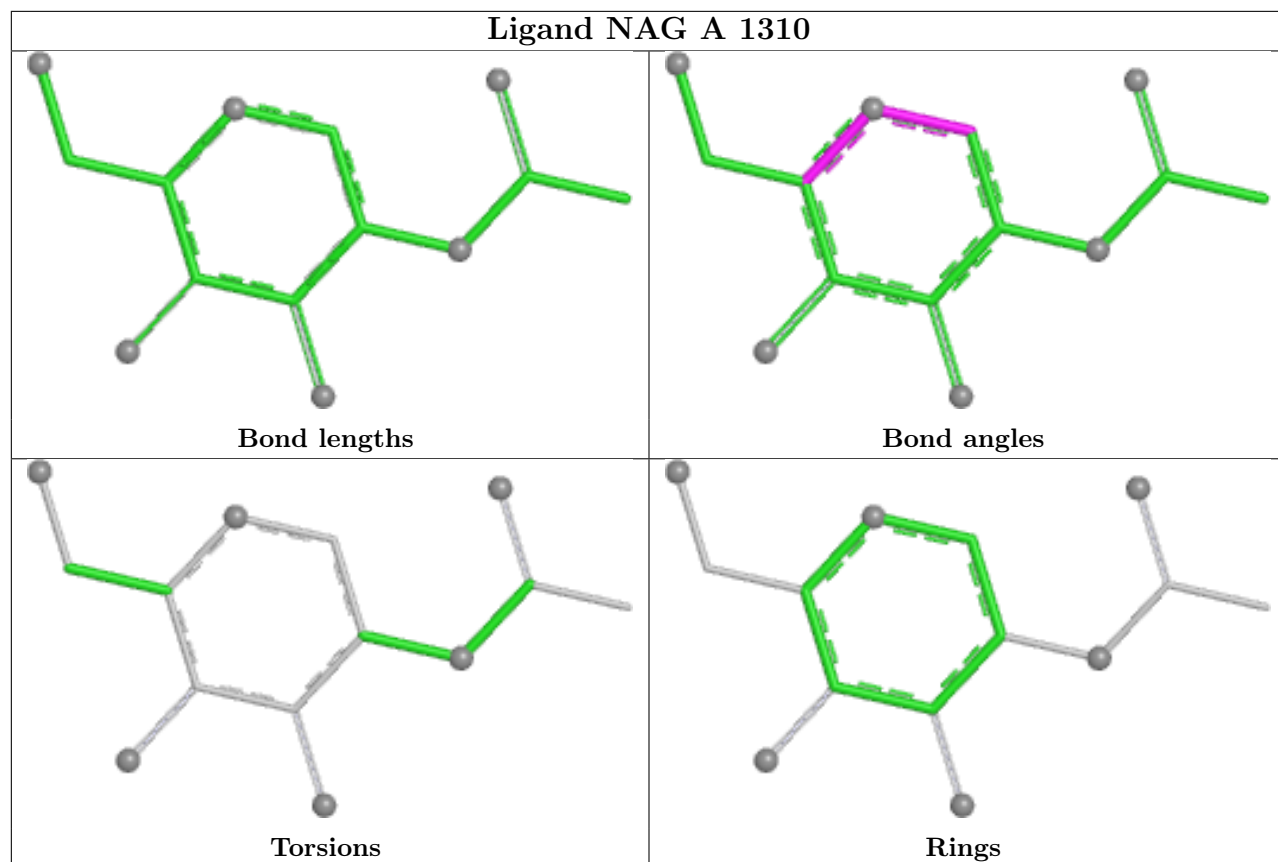
Ligand NAG A 1301



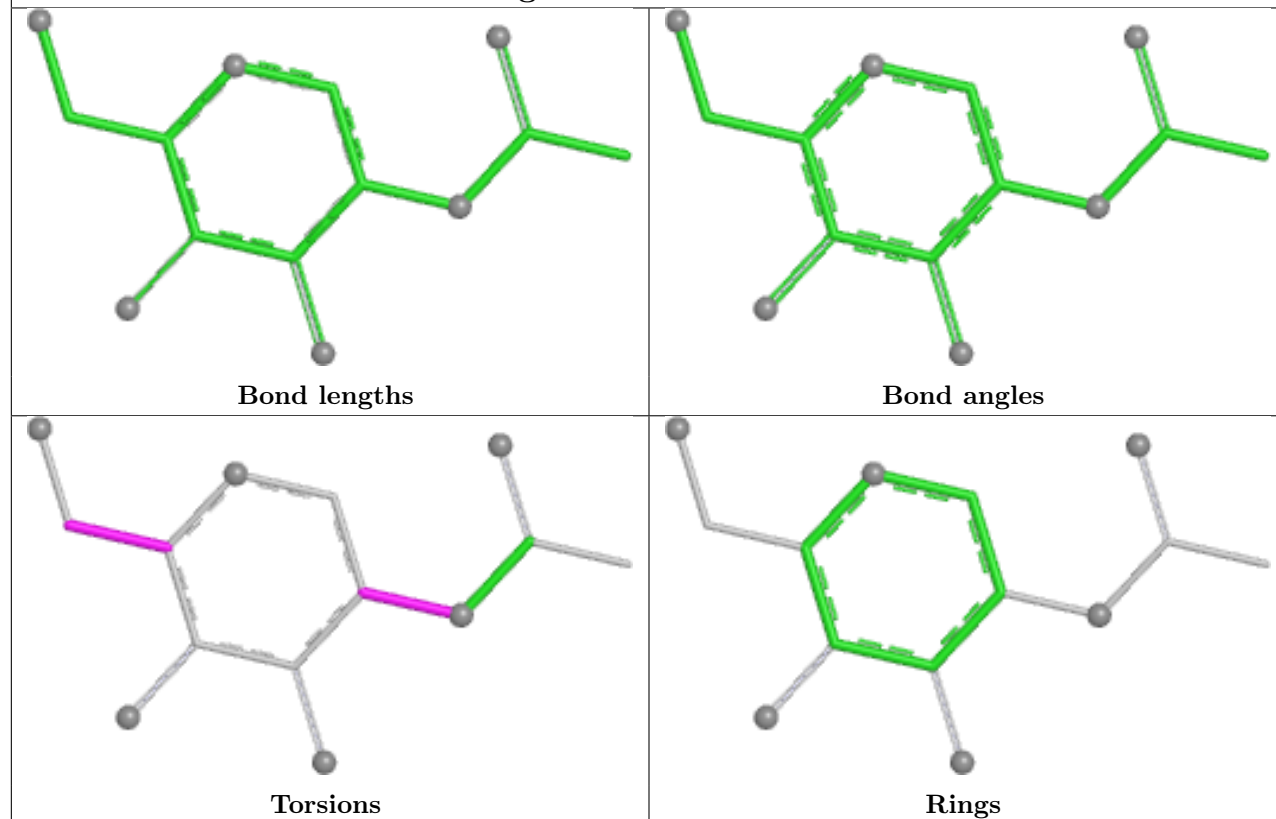
Ligand NAG I 904



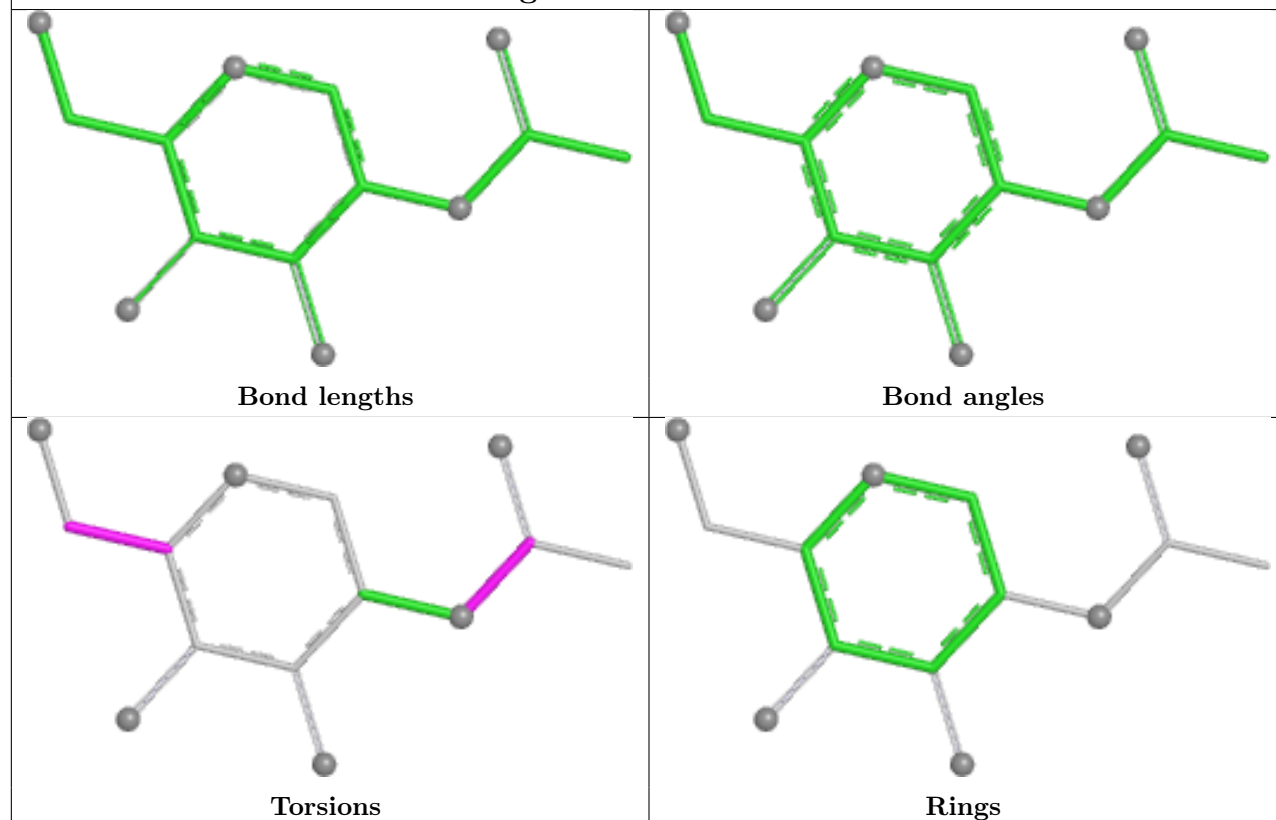




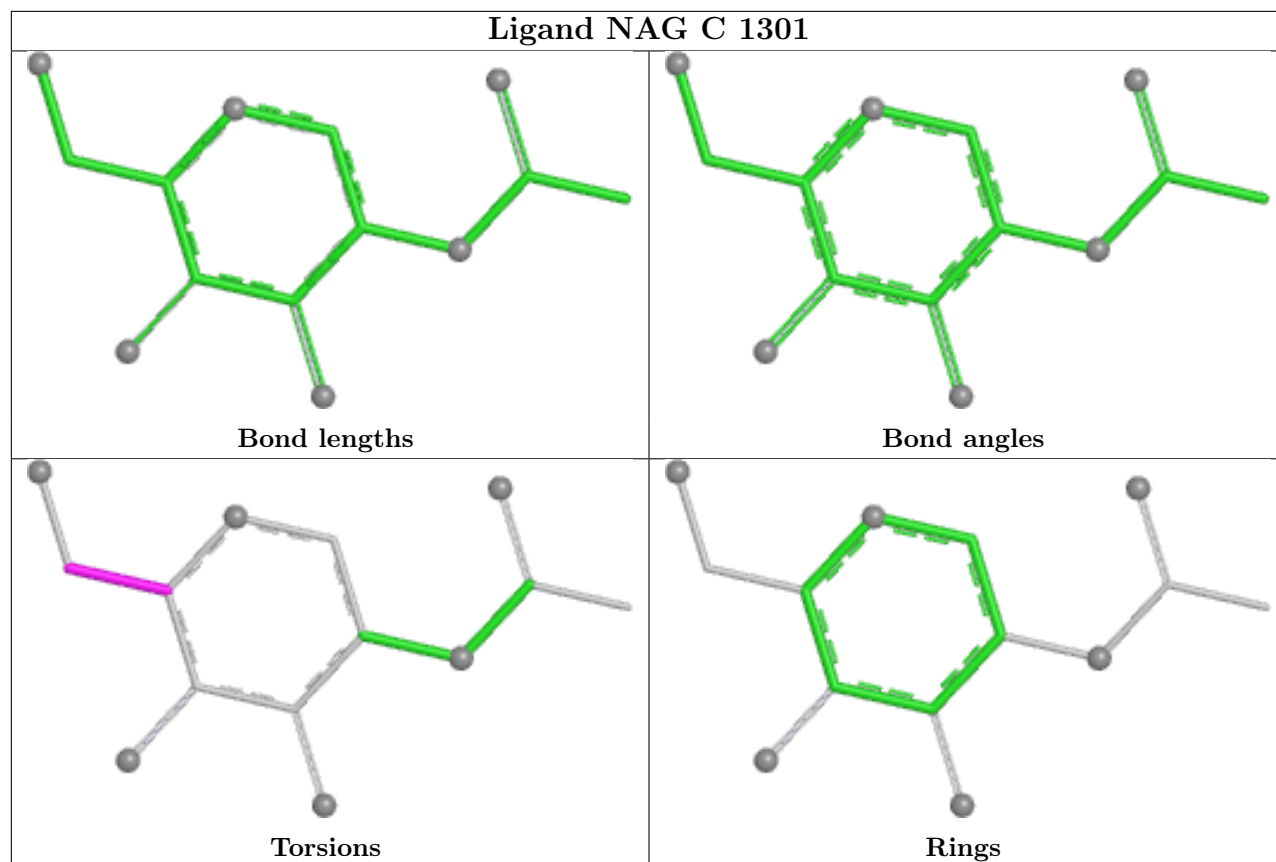
Ligand NAG A 1302



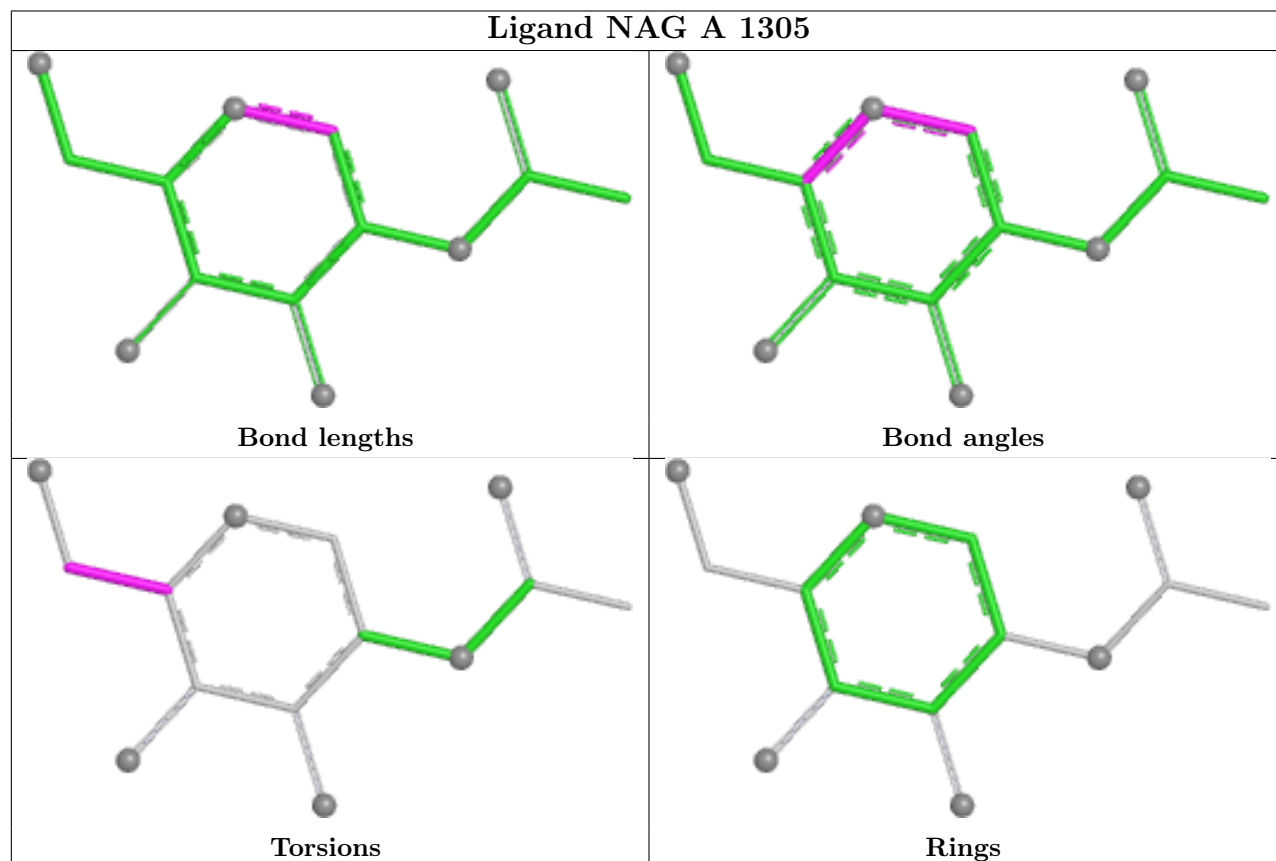
Ligand NAG B 1302



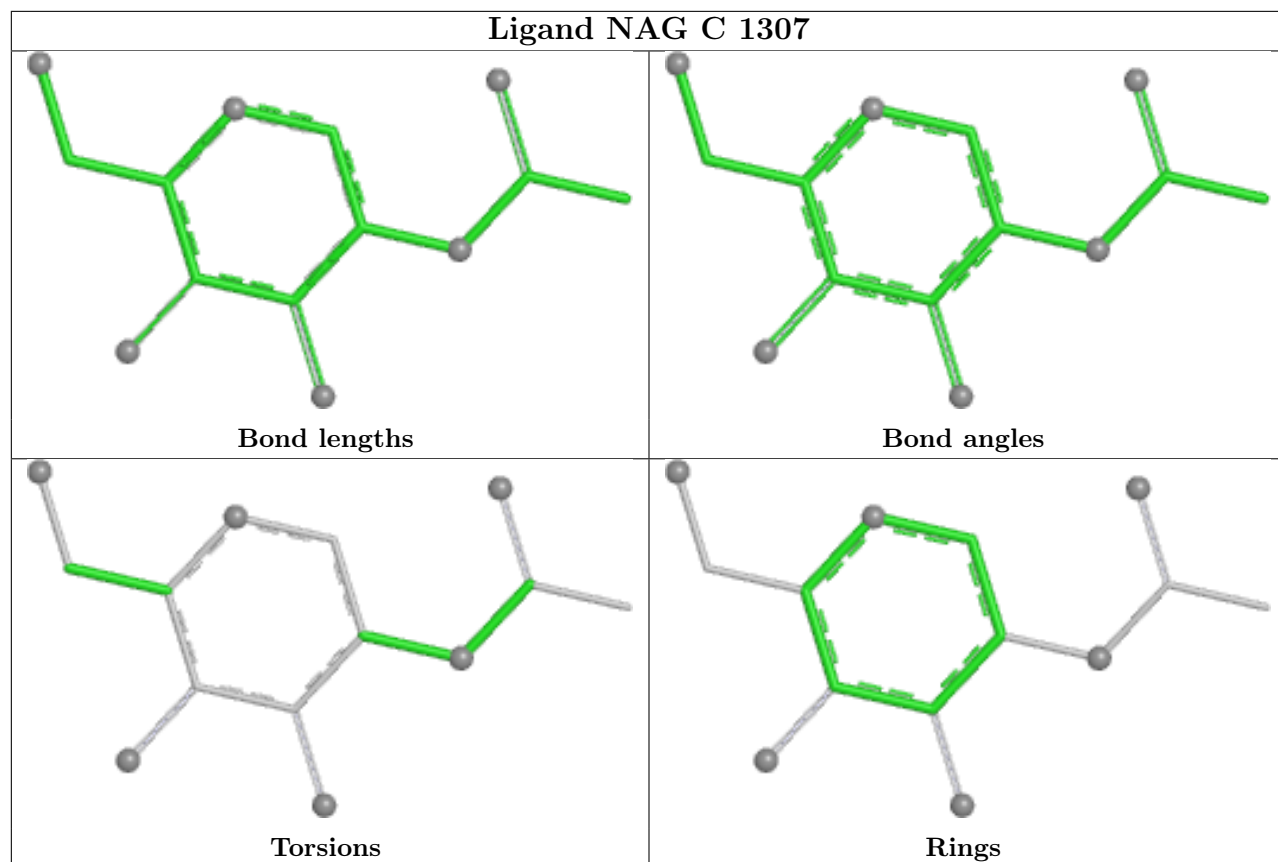
Ligand NAG C 1301



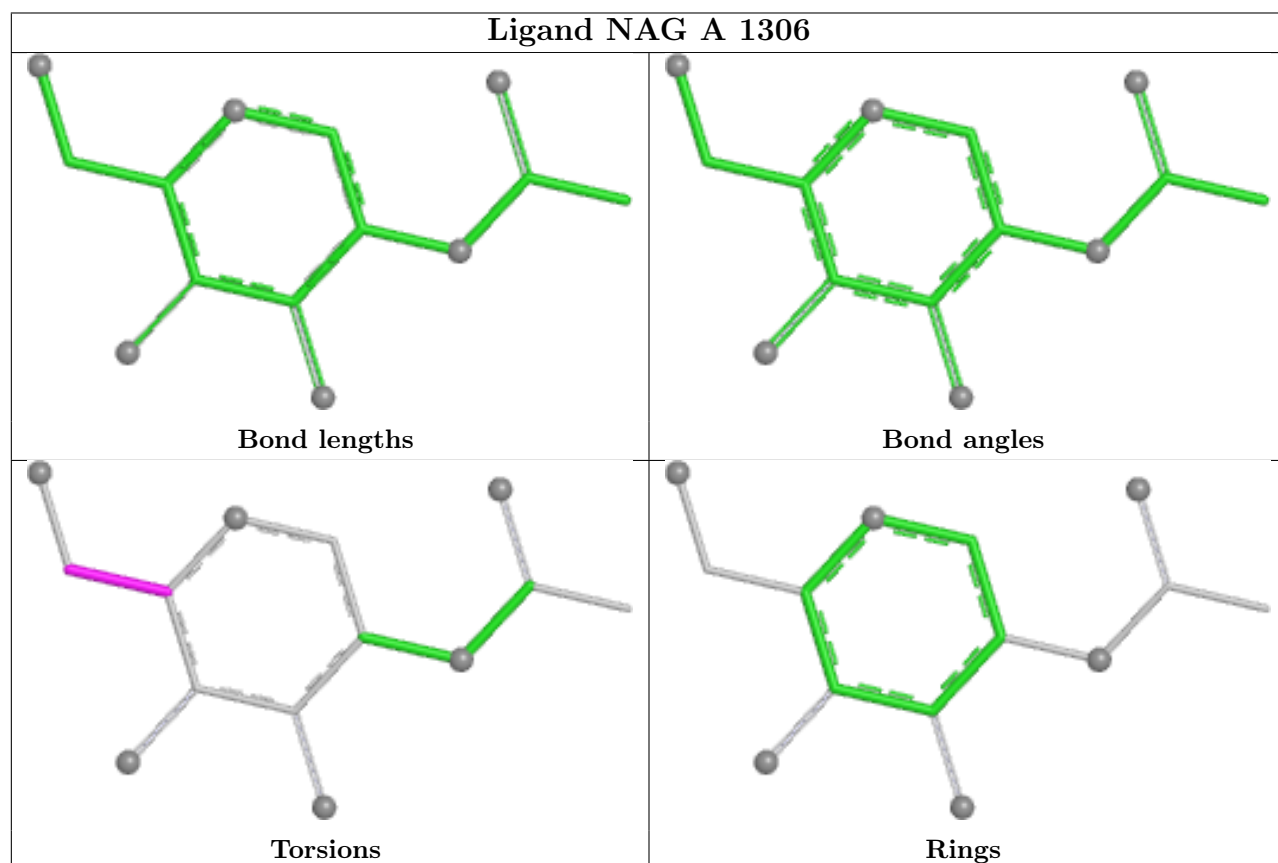
Ligand NAG A 1305



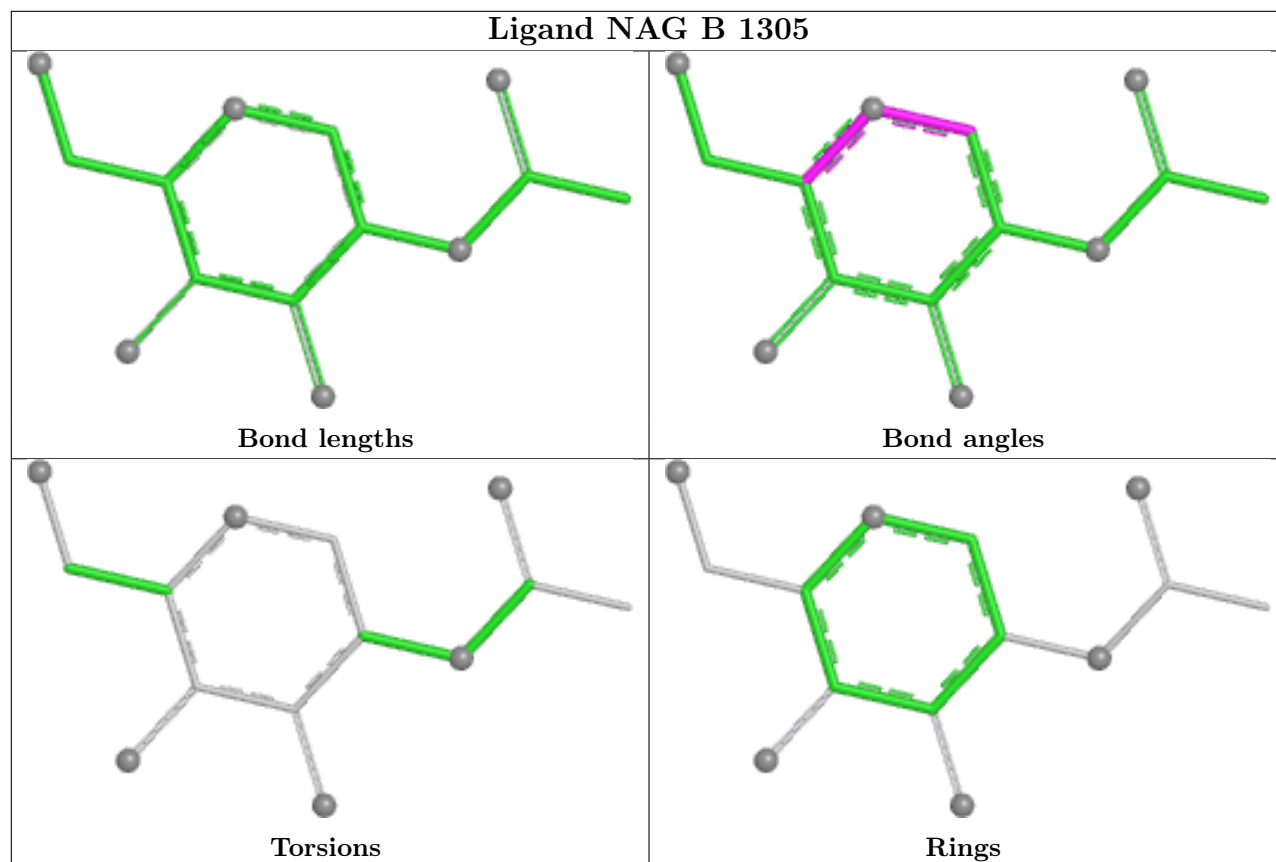
Ligand NAG C 1307



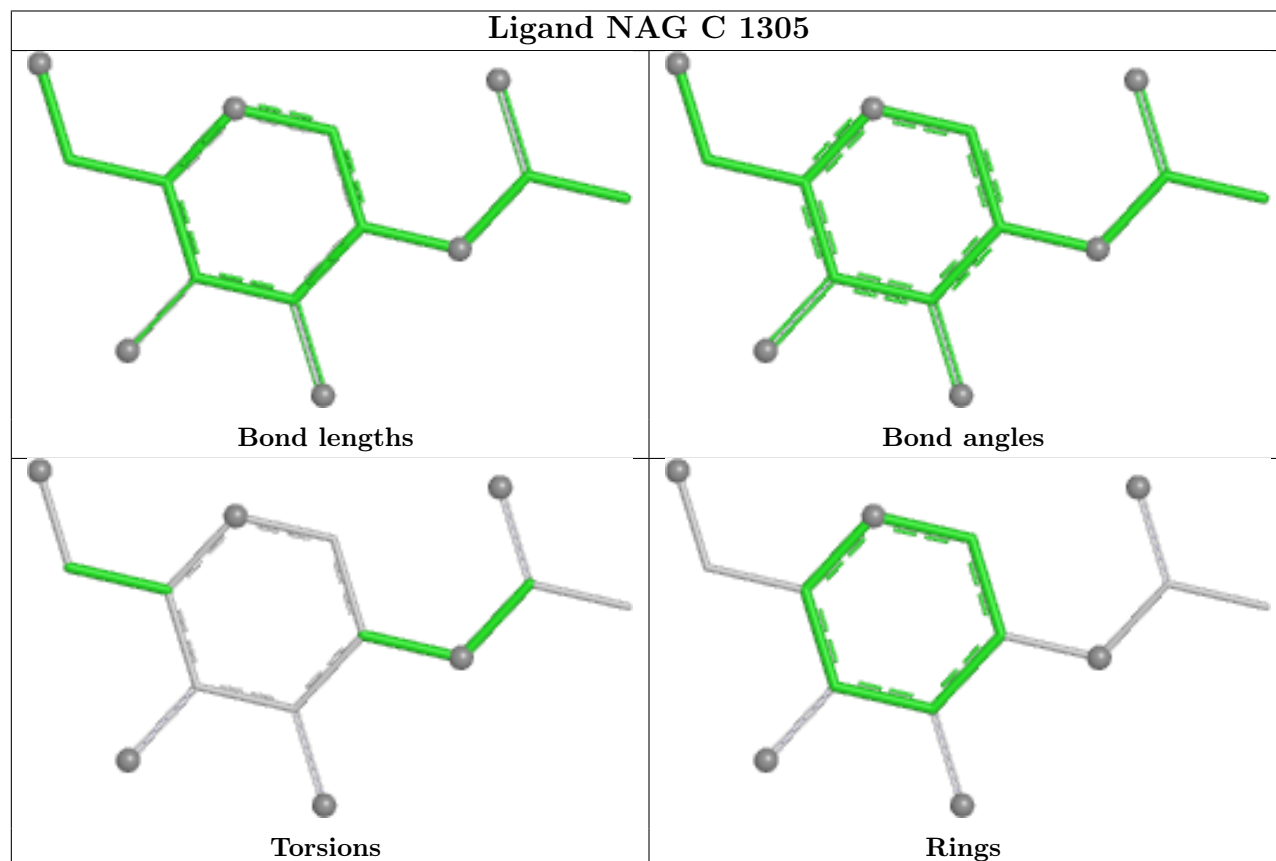
Ligand NAG A 1306

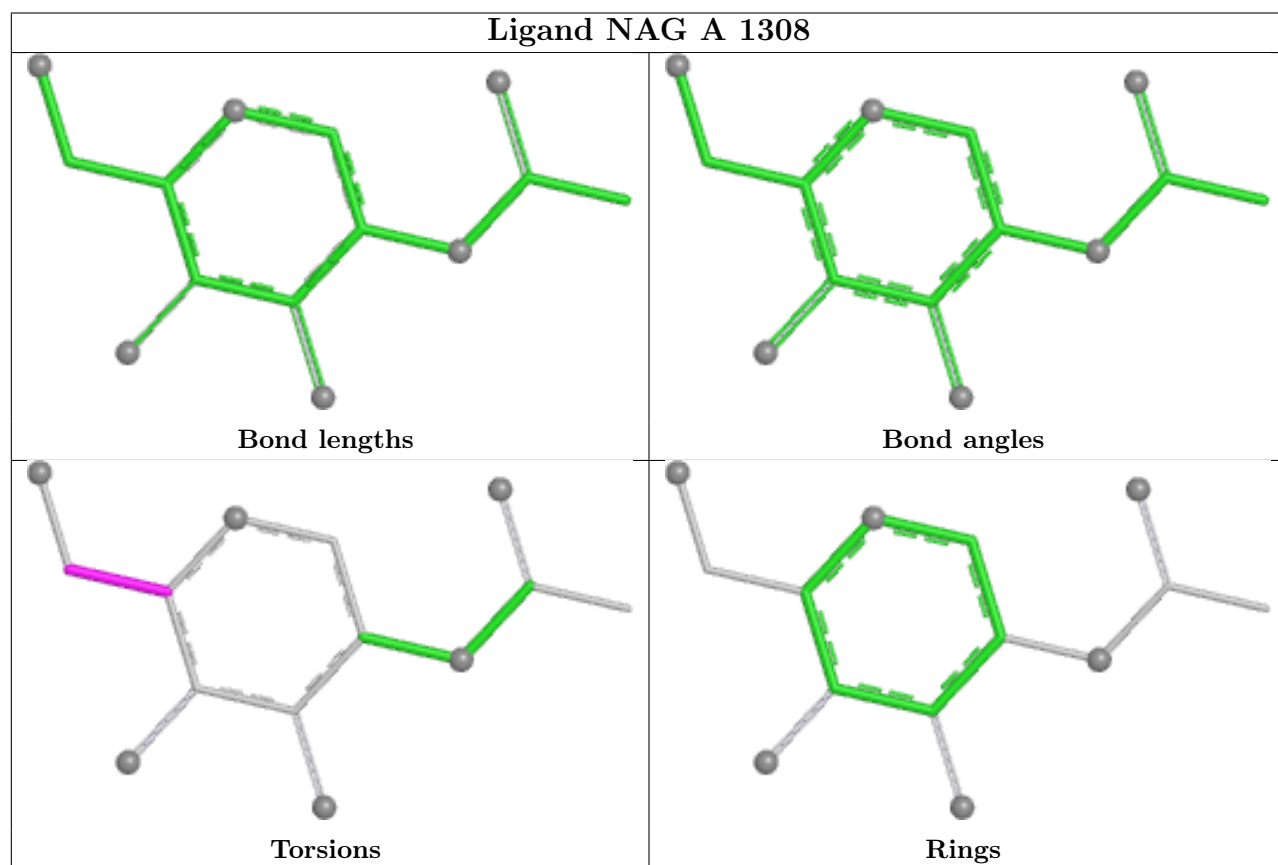
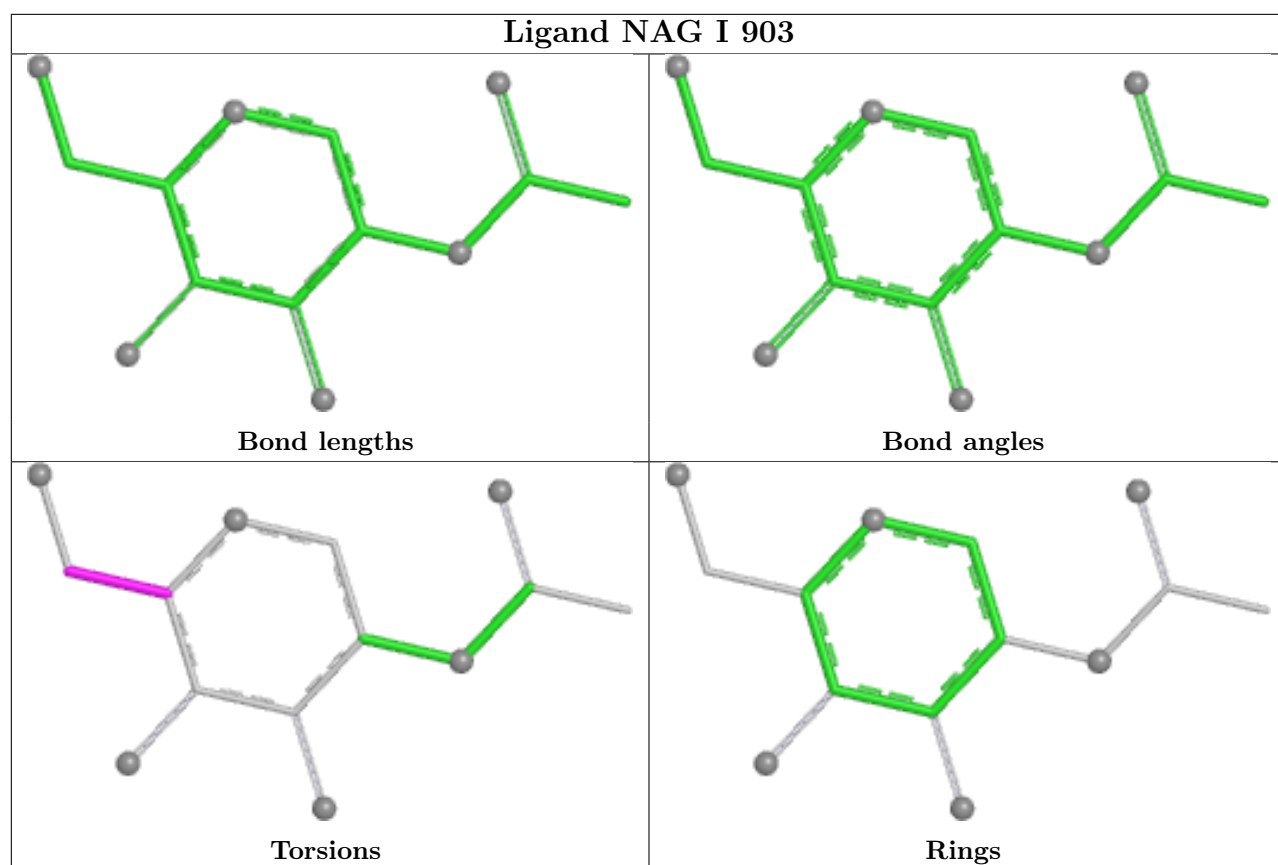


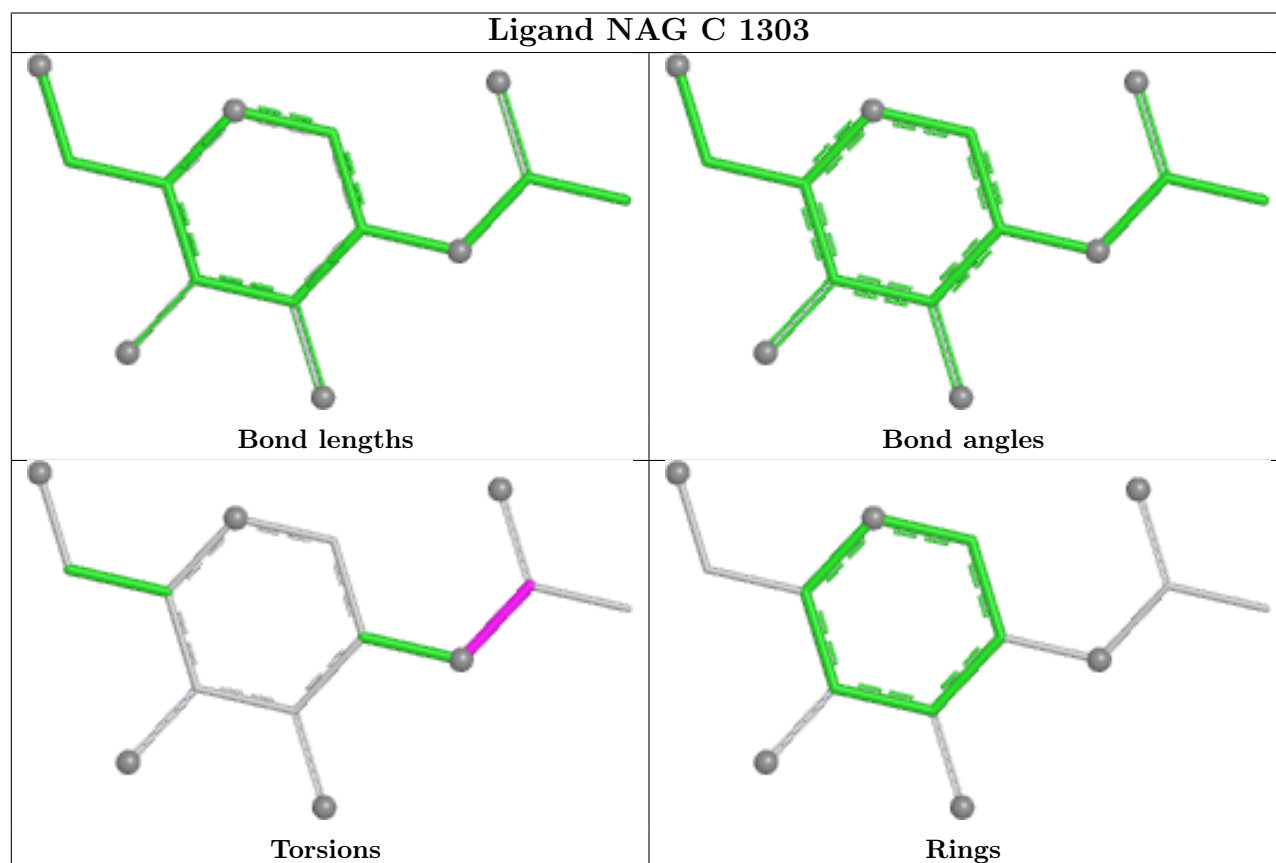
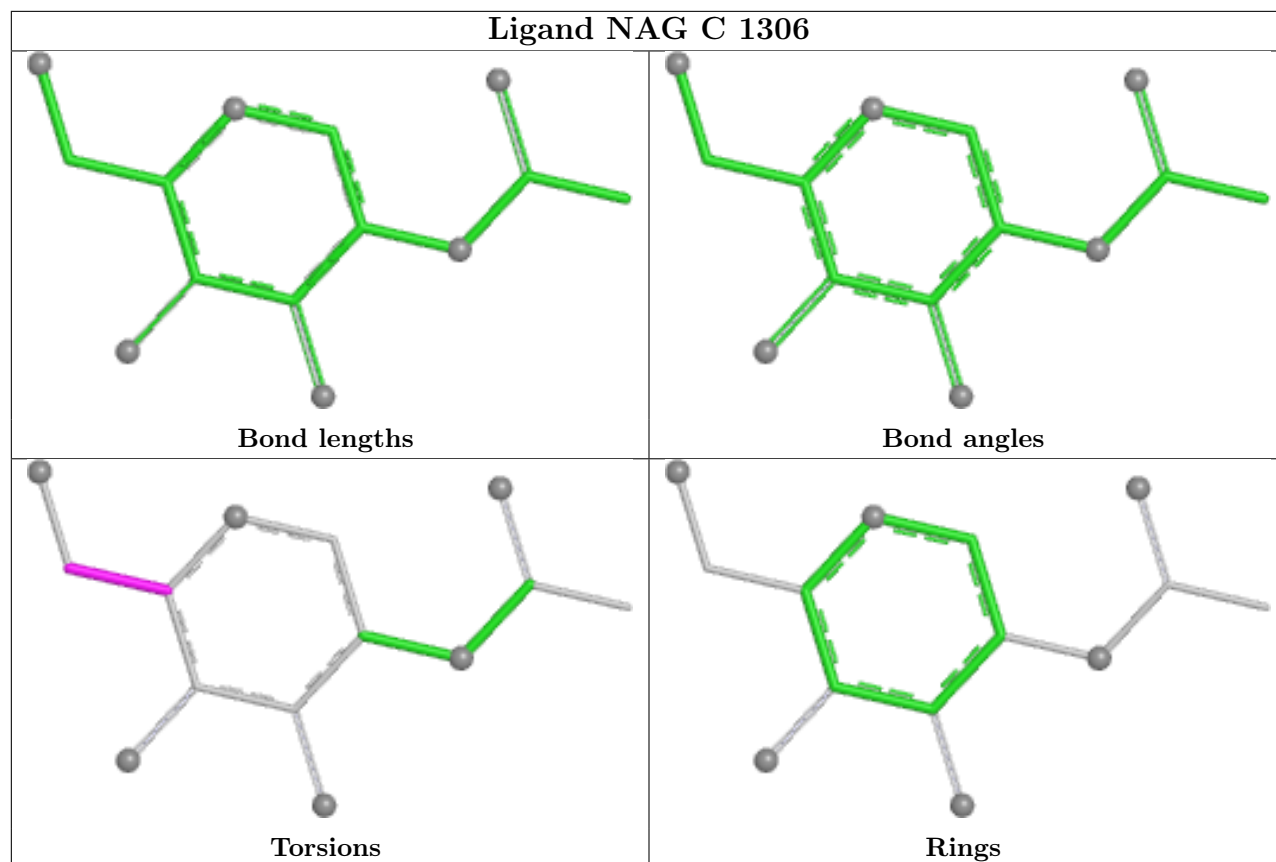
Ligand NAG B 1305

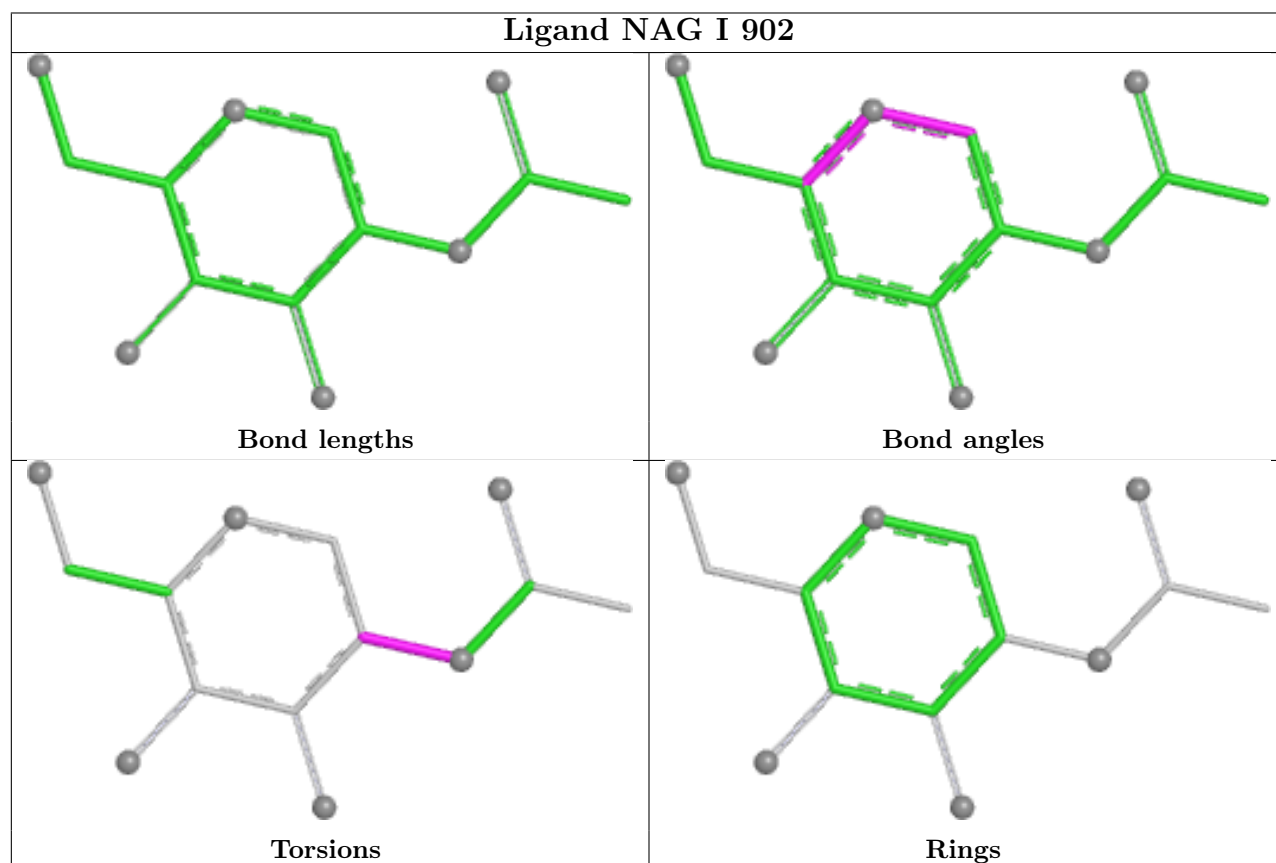
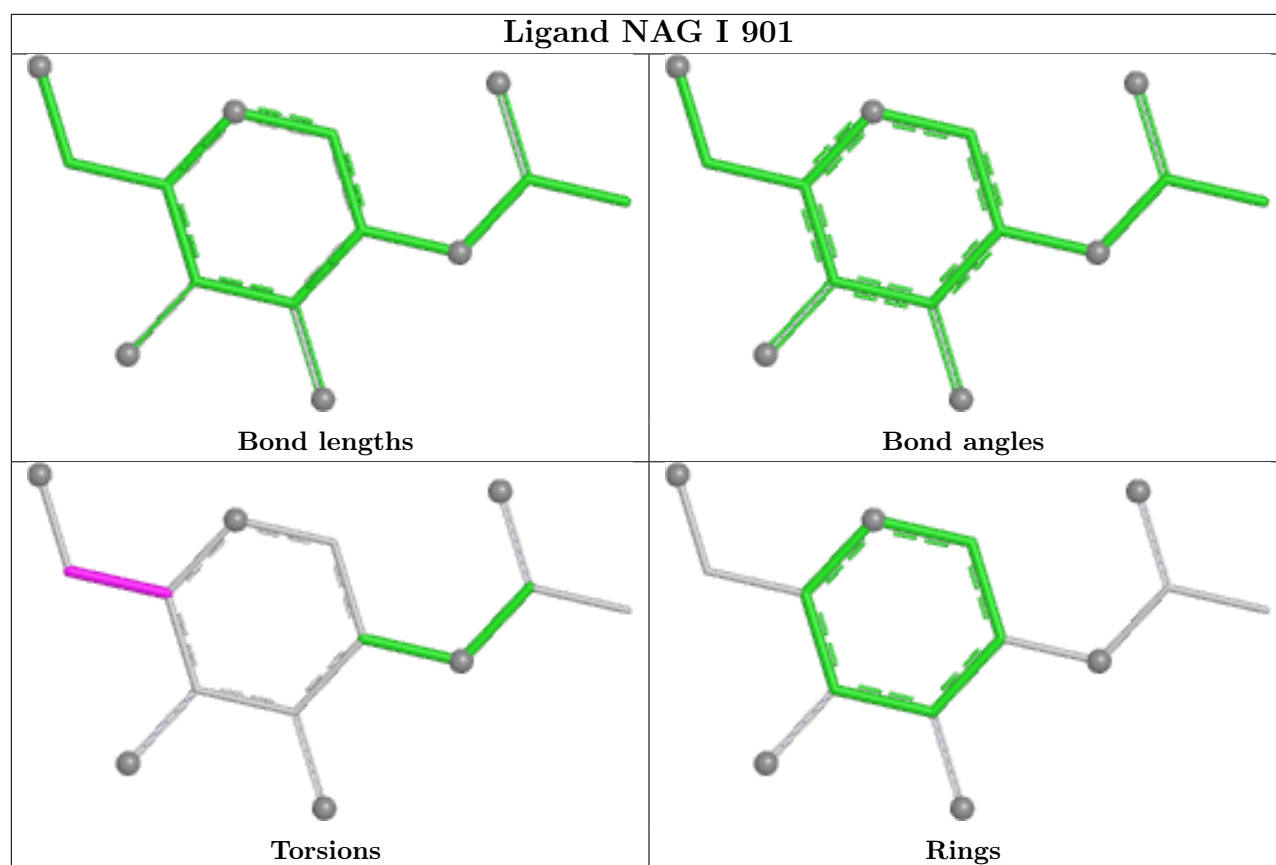


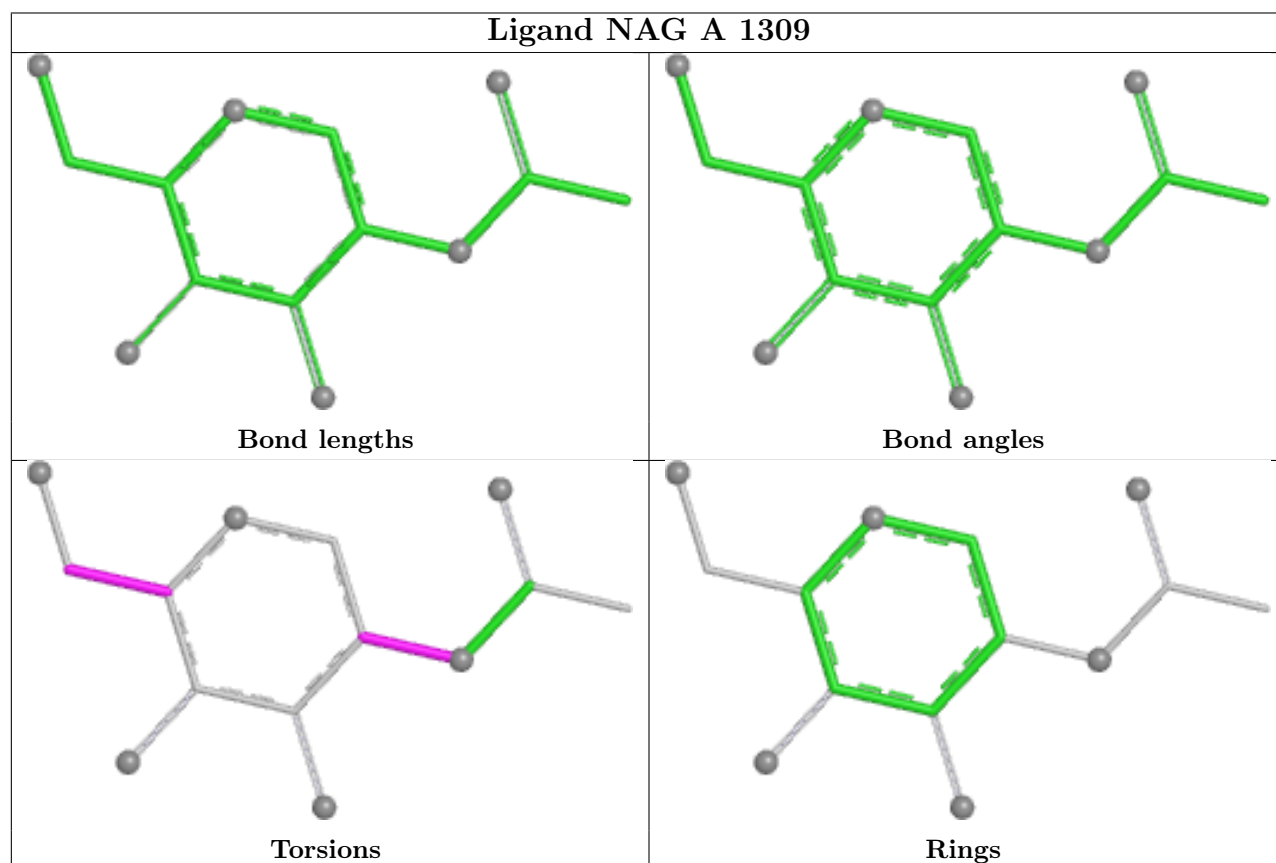
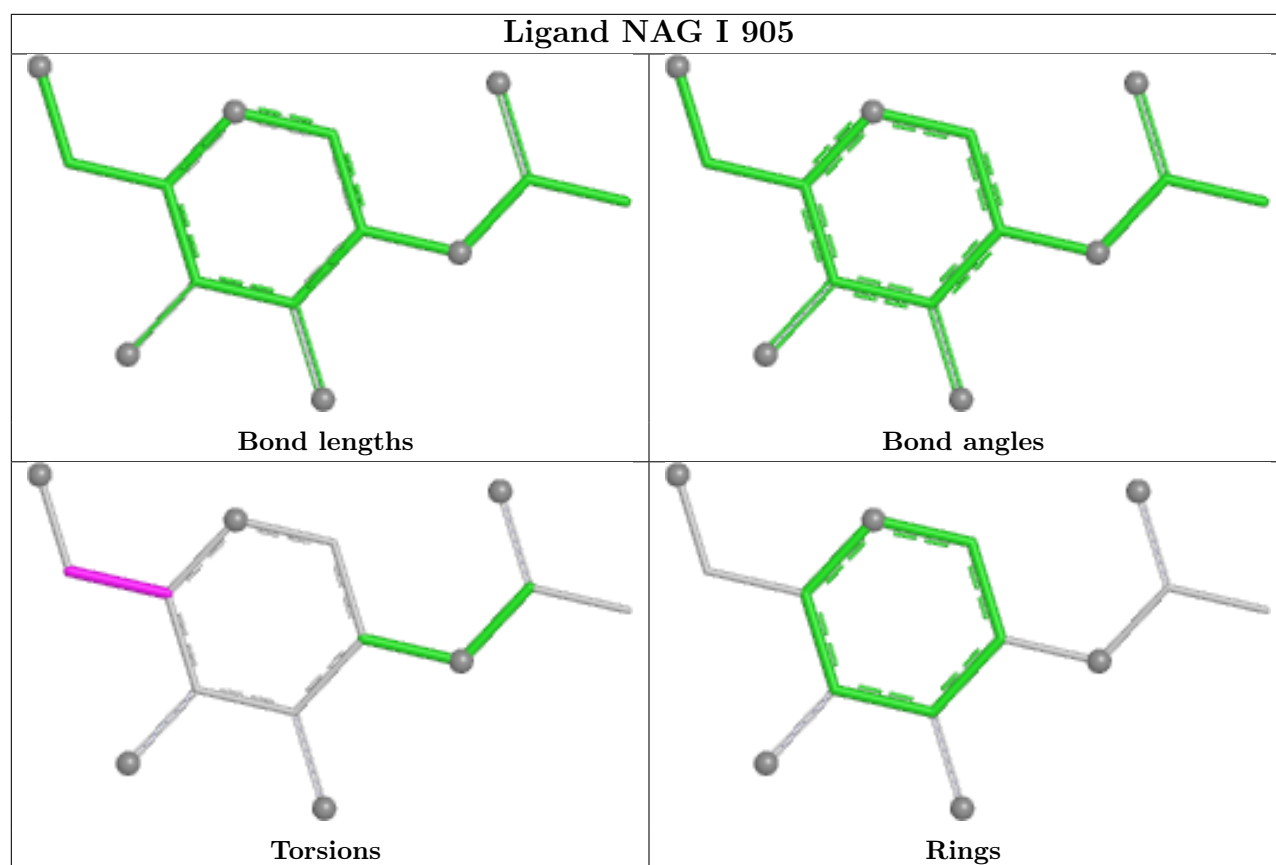
Ligand NAG C 1305

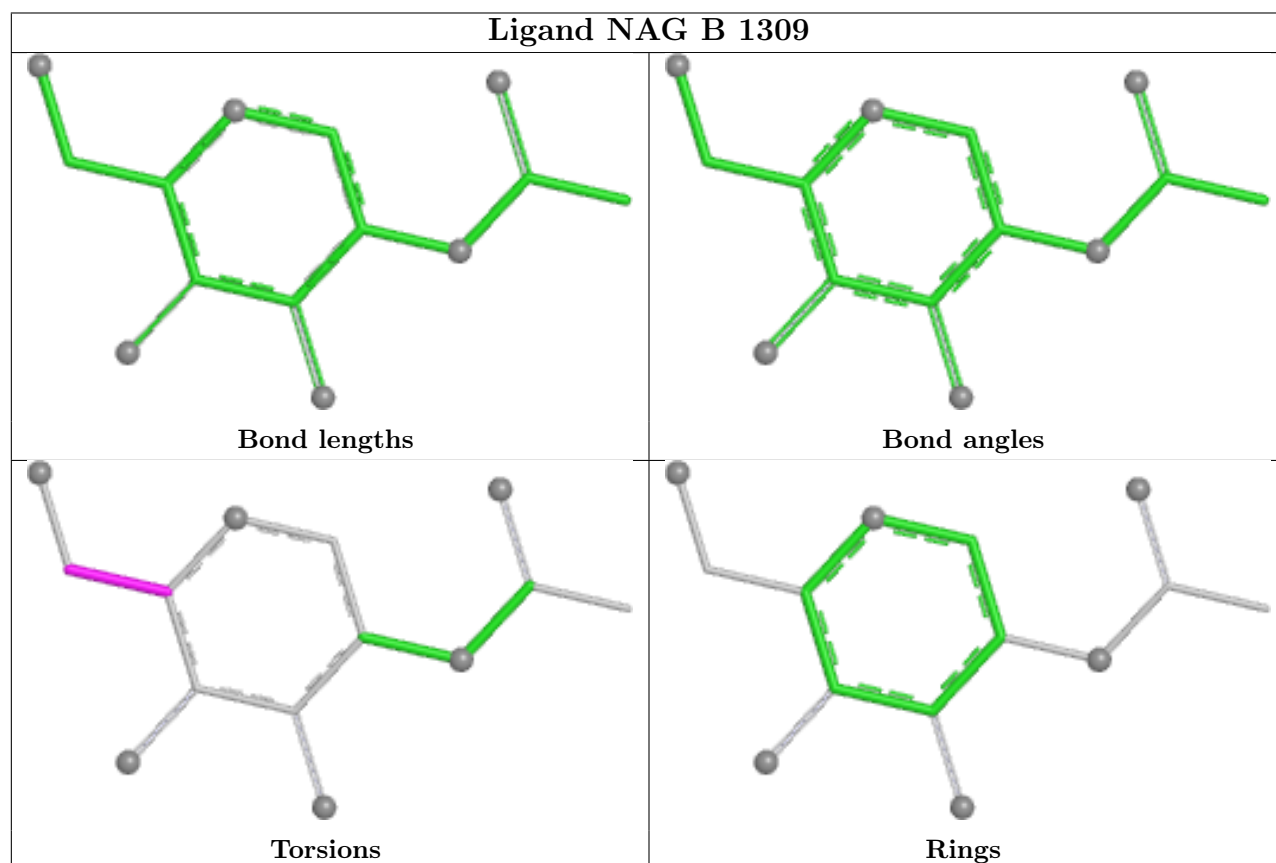
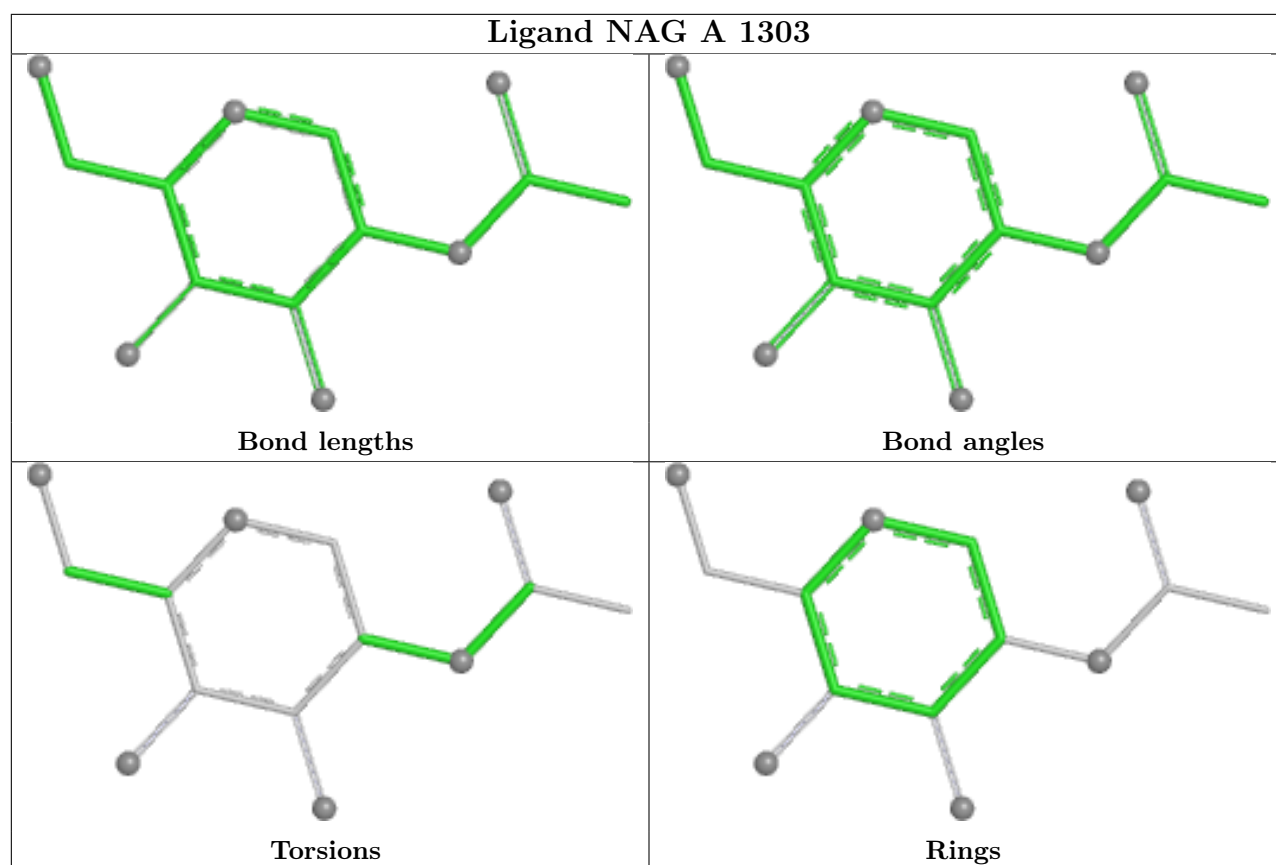




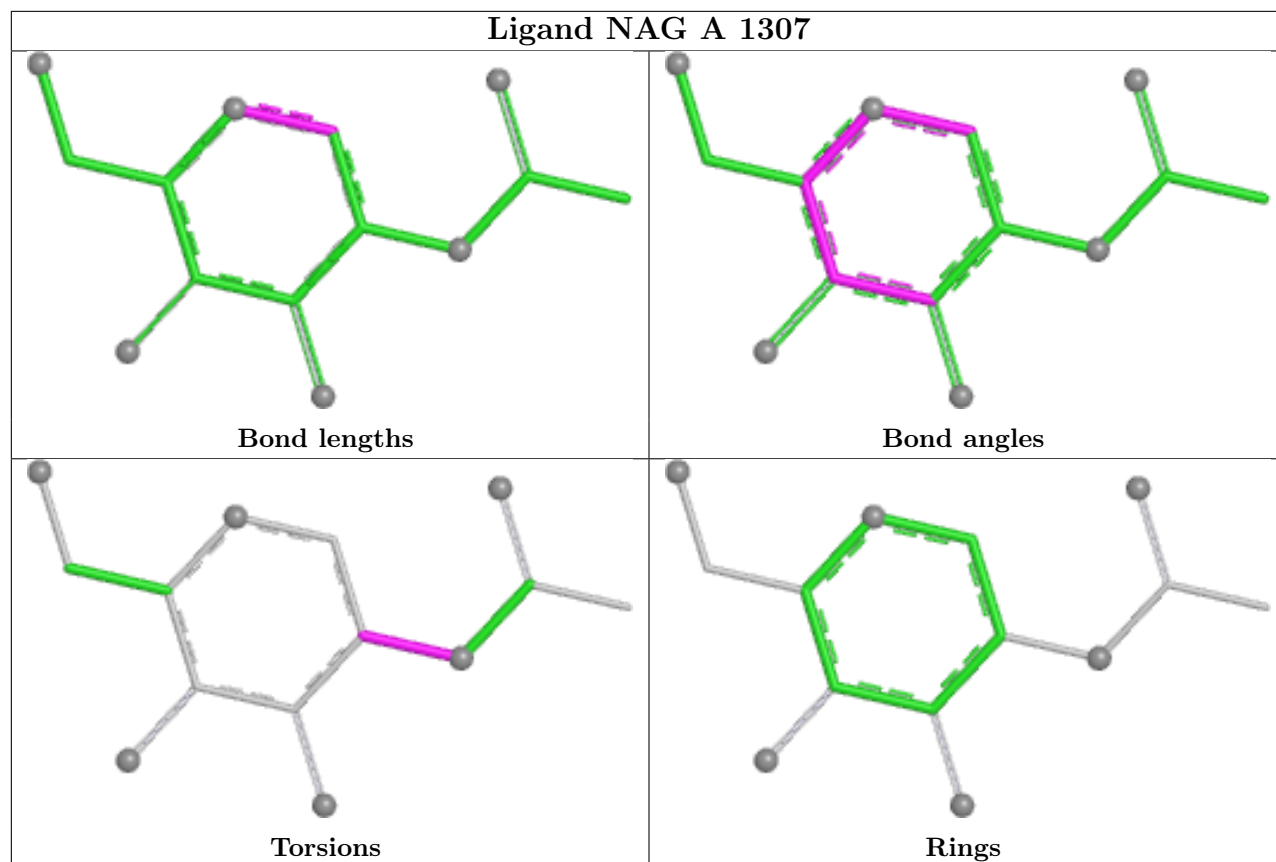




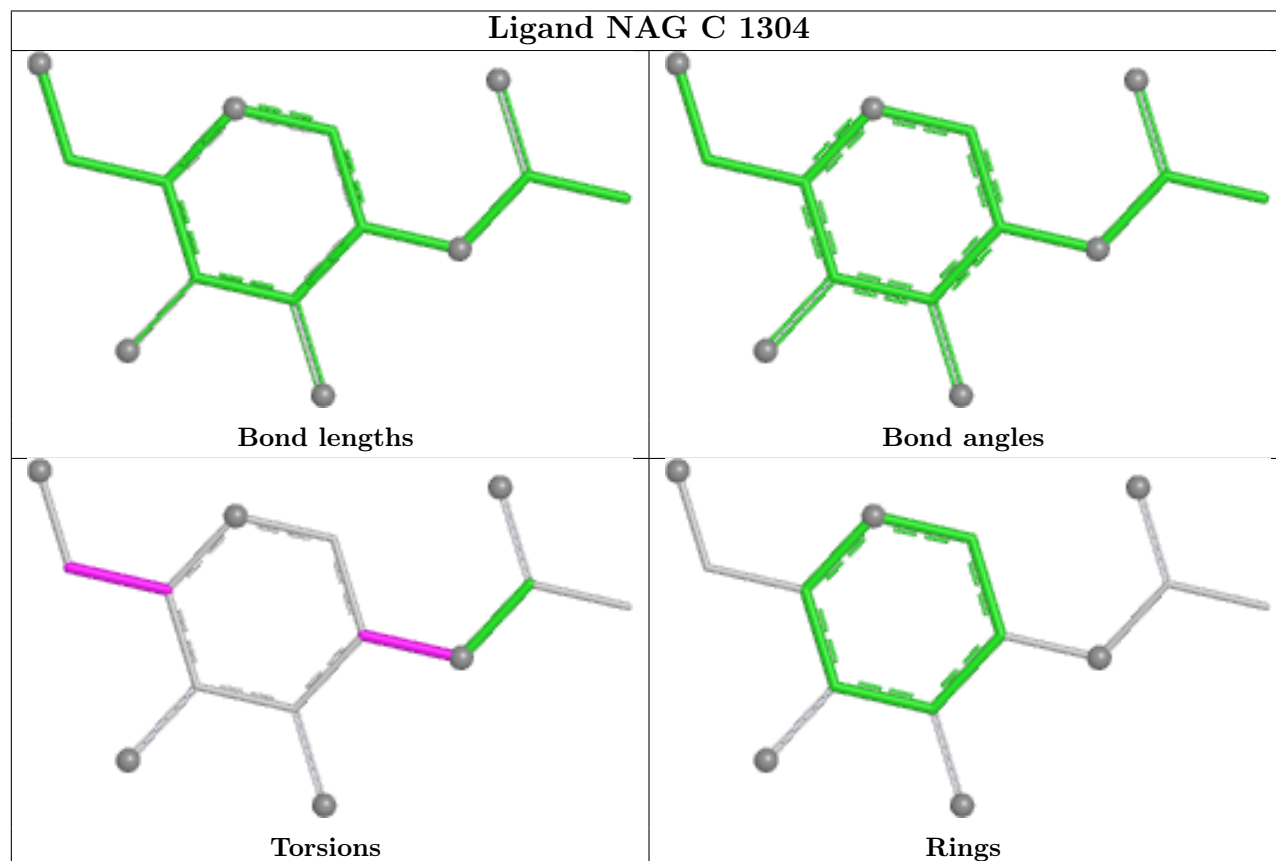




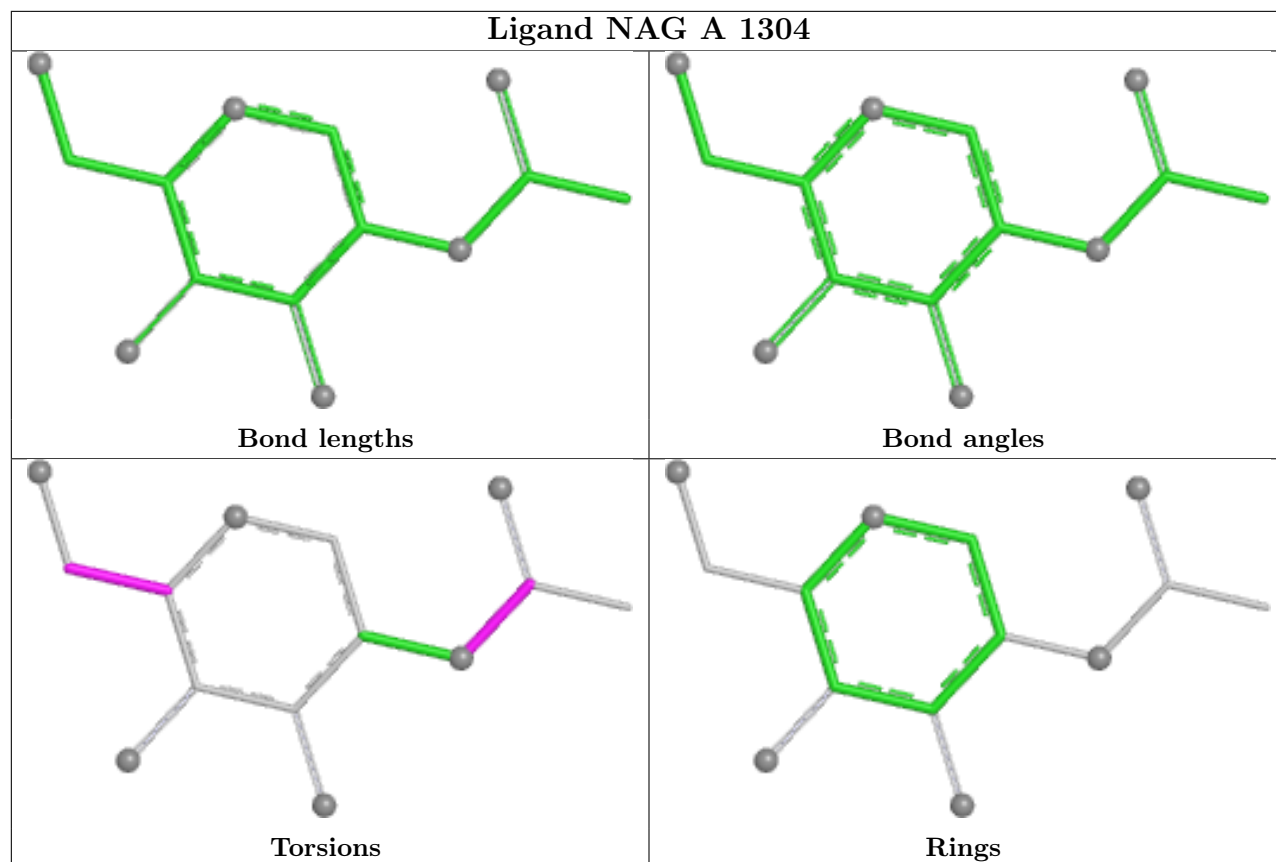
Ligand NAG A 1307



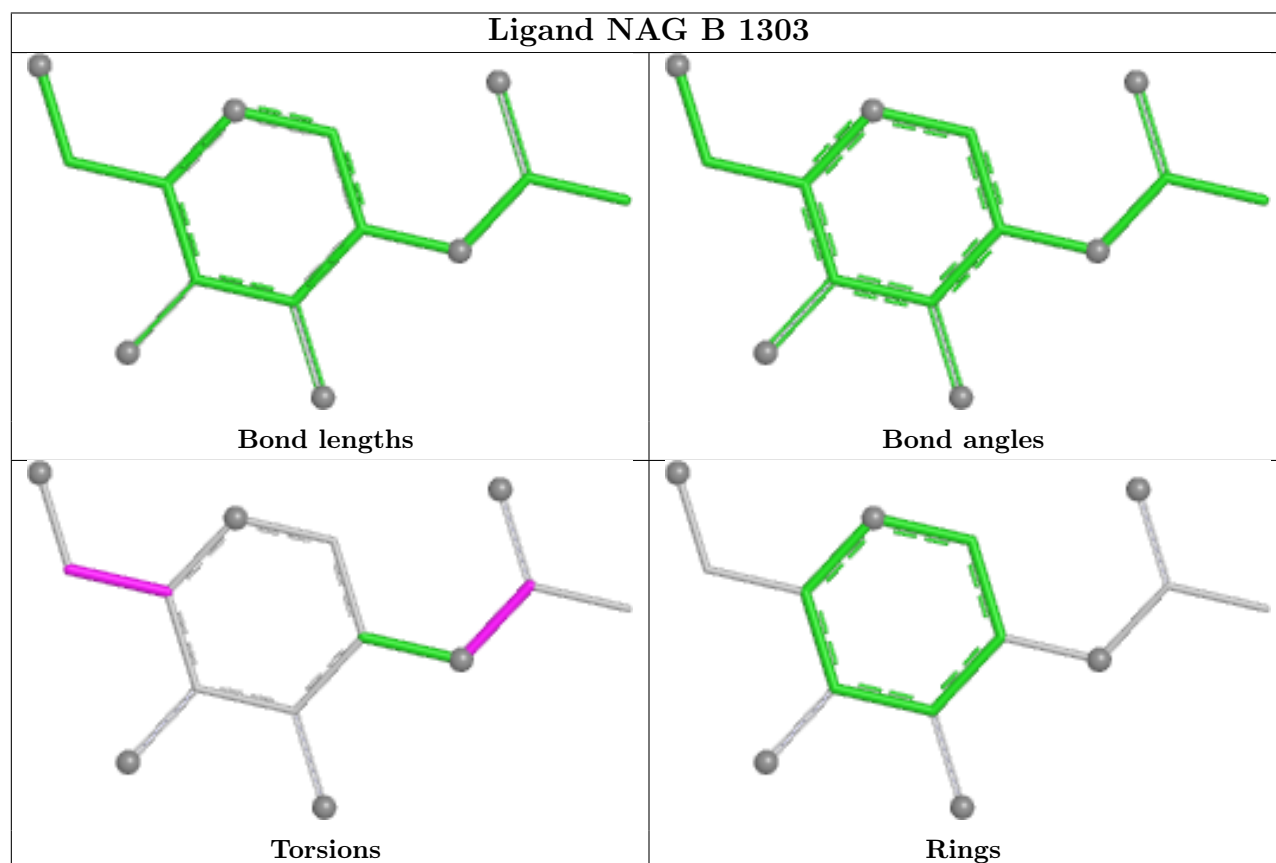
Ligand NAG C 1304



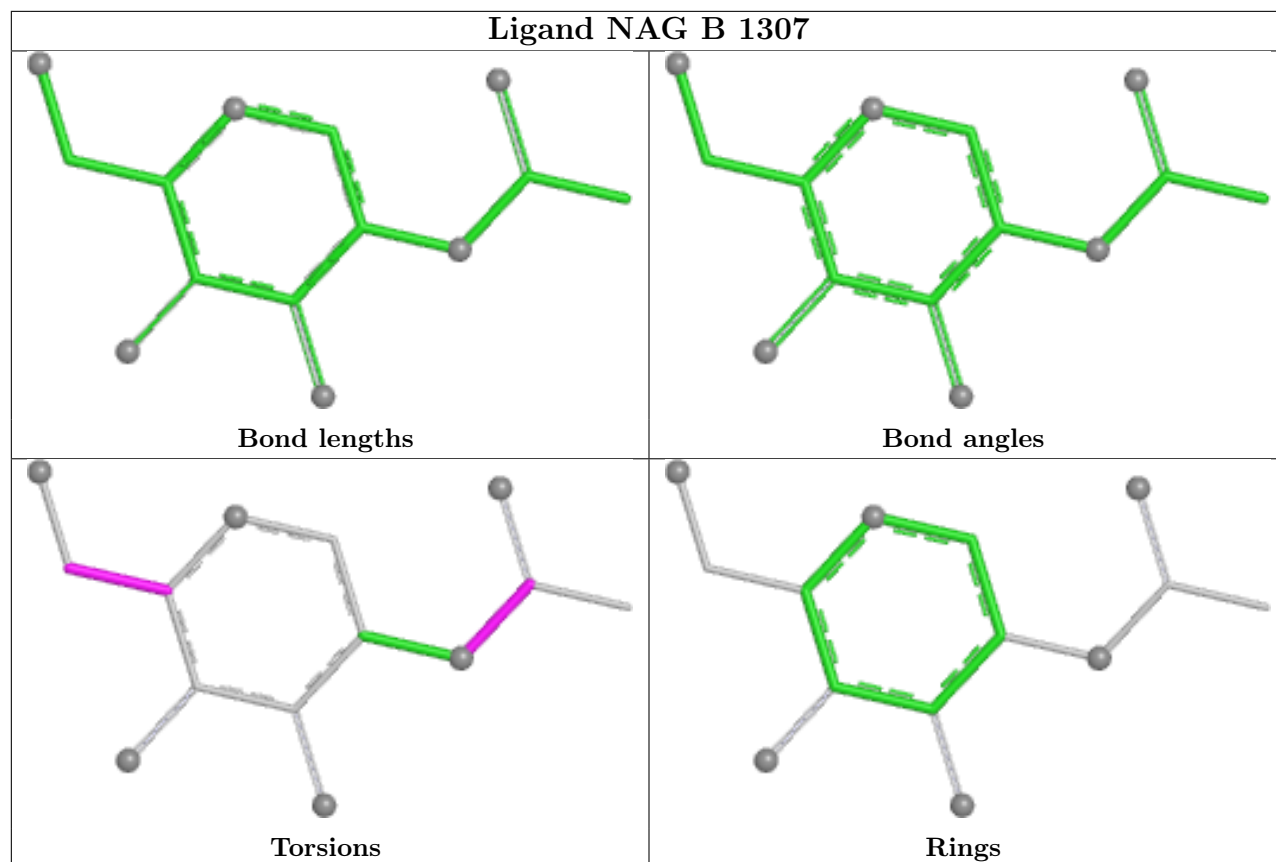
Ligand NAG A 1304



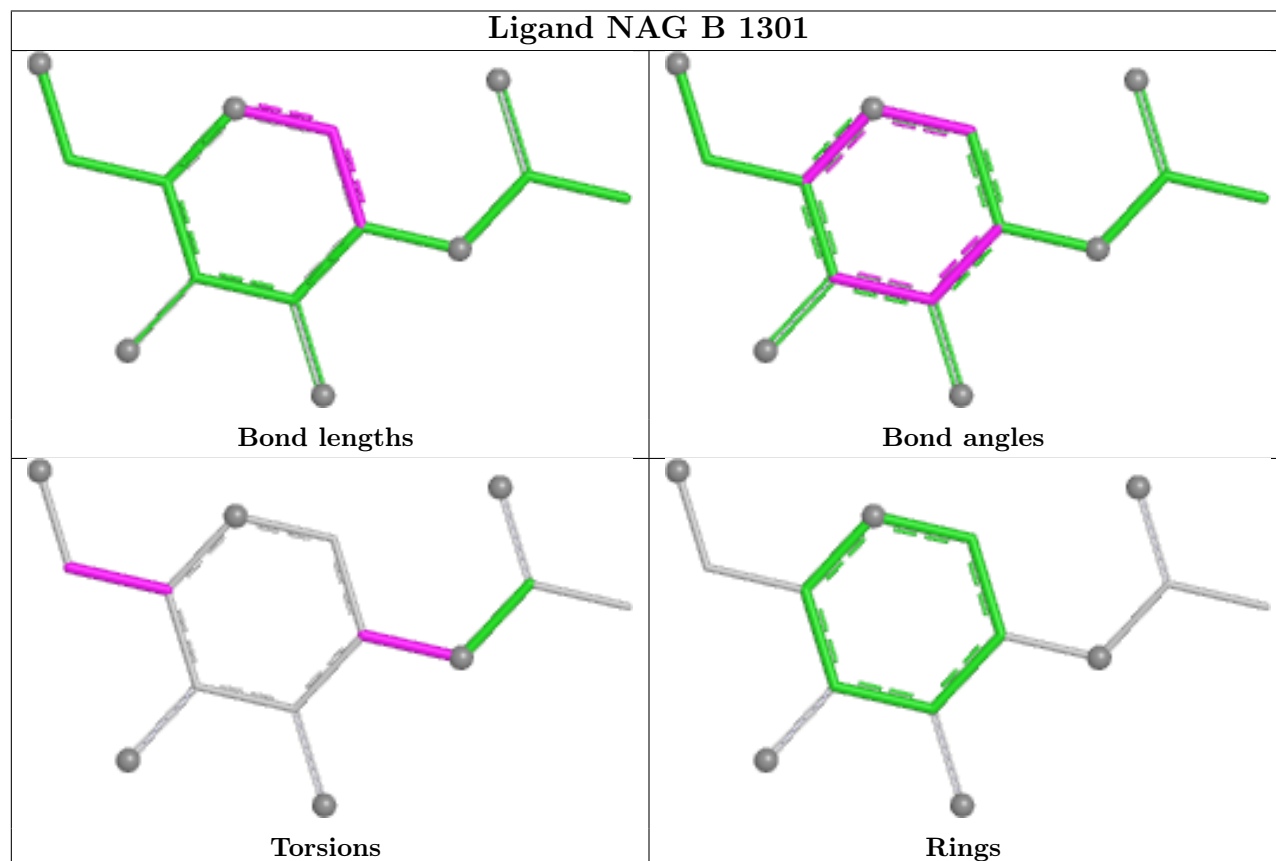
Ligand NAG B 1303



Ligand NAG B 1307



Ligand NAG B 1301



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.

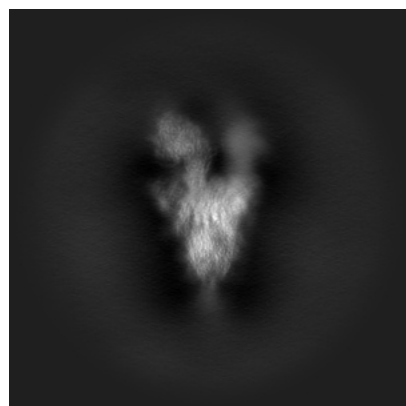
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-38201. These allow visual inspection of the internal detail of the map and identification of artifacts.

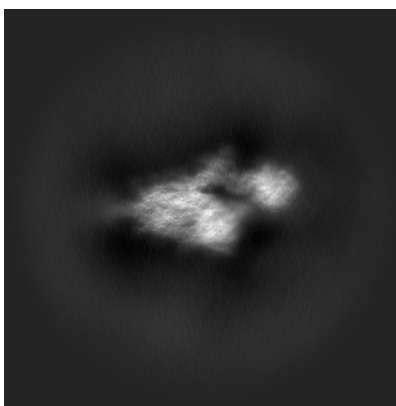
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

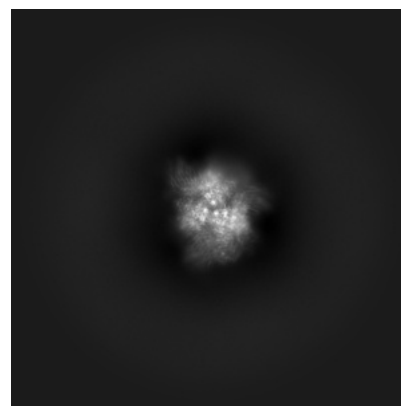
6.1.1 Primary map



X

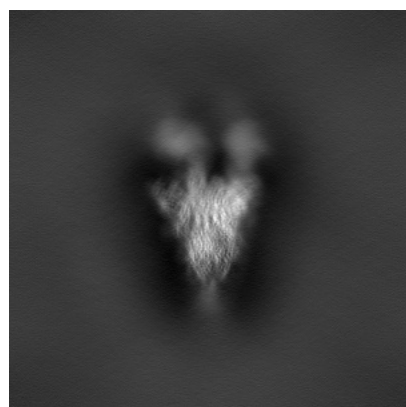


Y

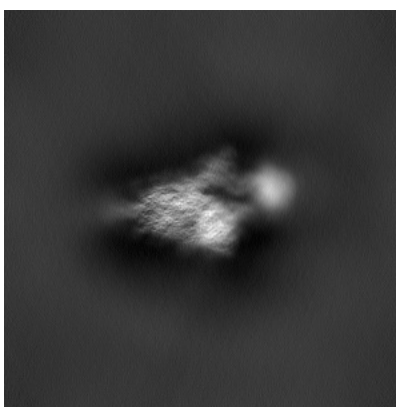


Z

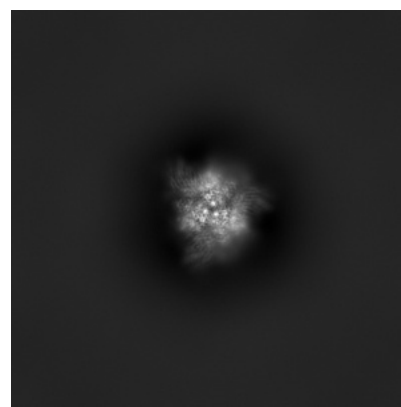
6.1.2 Raw map



X



Y

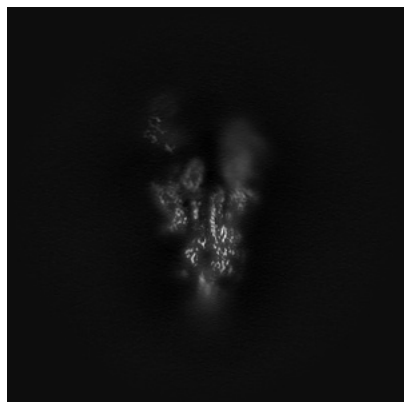


Z

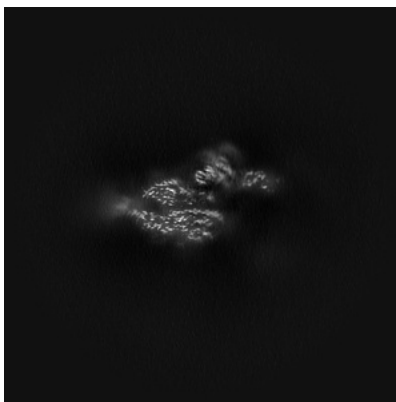
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

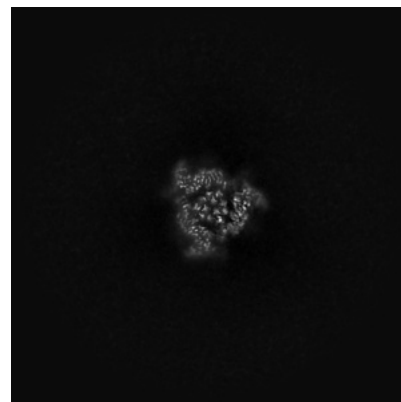
6.2.1 Primary map



X Index: 230

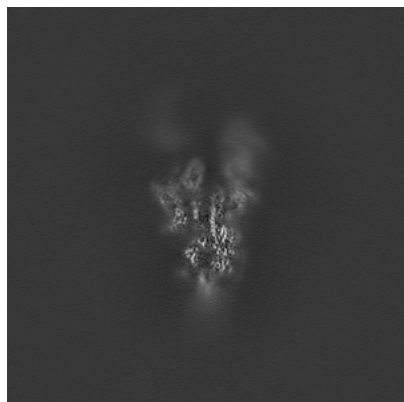


Y Index: 230

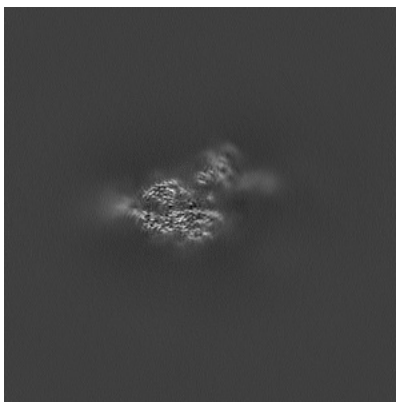


Z Index: 230

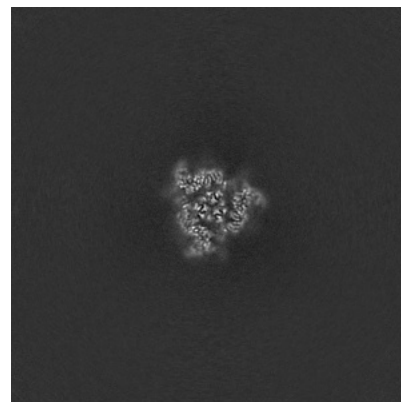
6.2.2 Raw map



X Index: 230



Y Index: 230

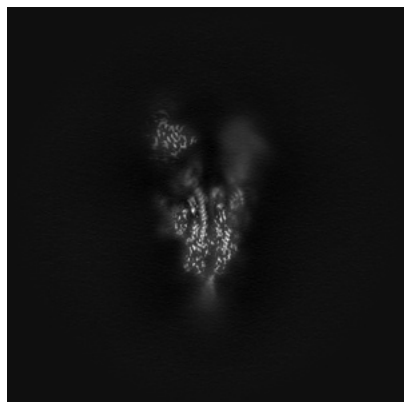


Z Index: 230

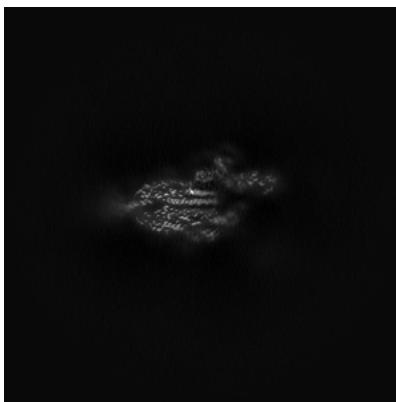
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

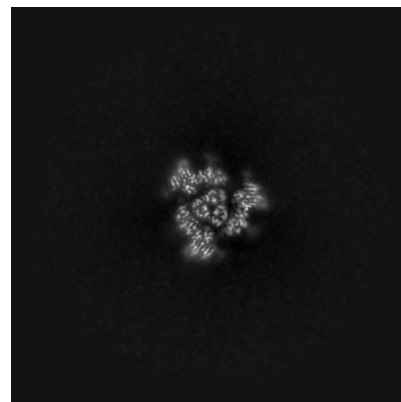
6.3.1 Primary map



X Index: 237

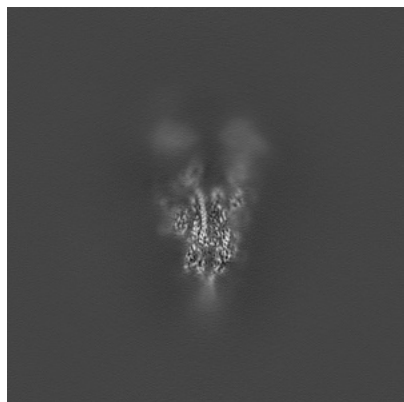


Y Index: 225

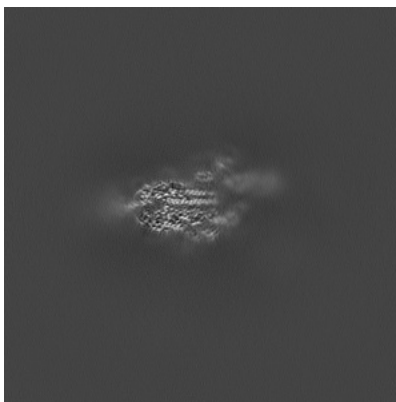


Z Index: 237

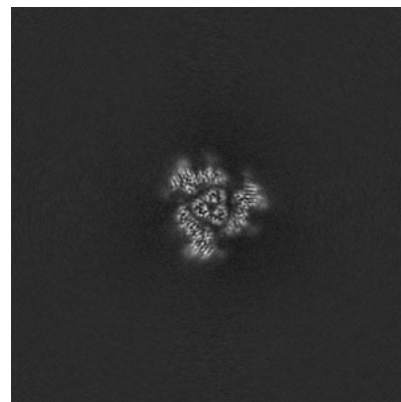
6.3.2 Raw map



X Index: 236



Y Index: 225



Z Index: 237

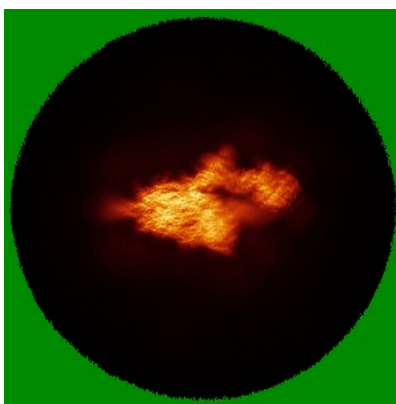
The images above show the largest variance slices of the map in three orthogonal directions.

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

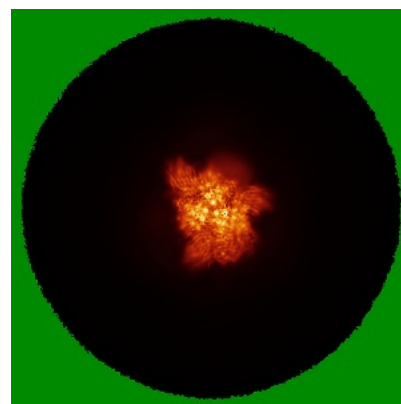
6.4.1 Primary map



X

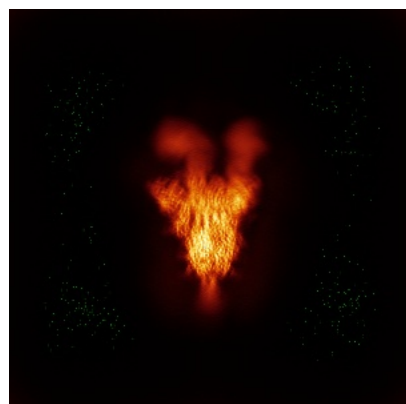


Y

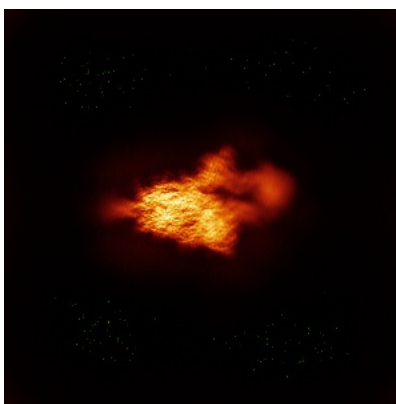


Z

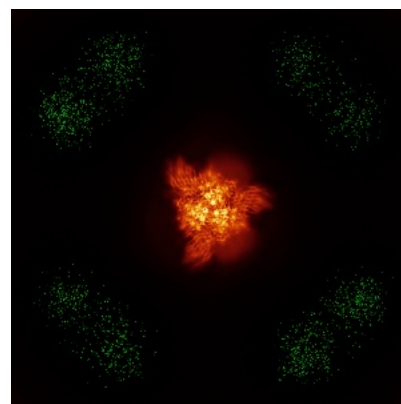
6.4.2 Raw map



X



Y

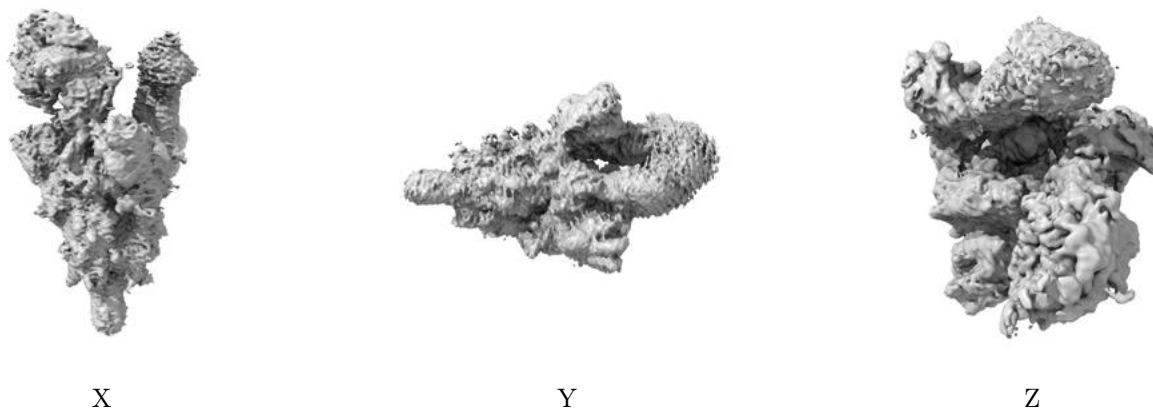


Z

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

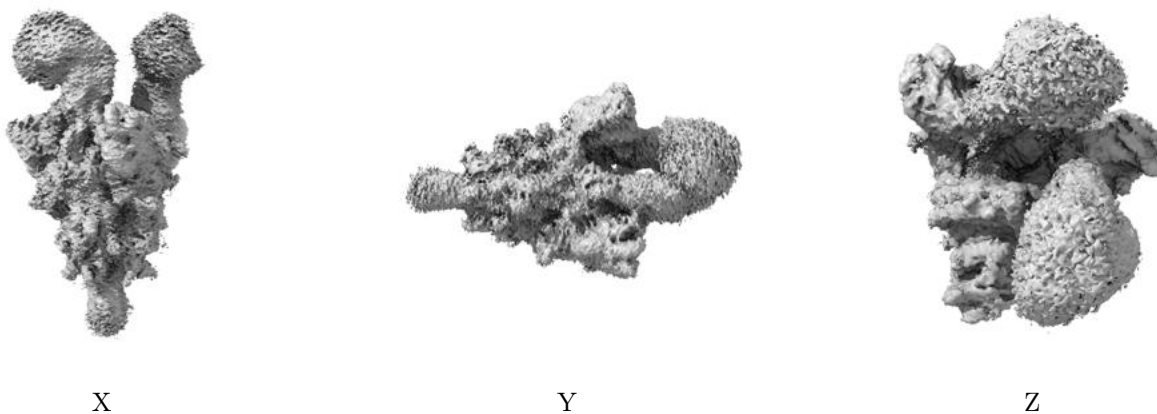
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.2. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

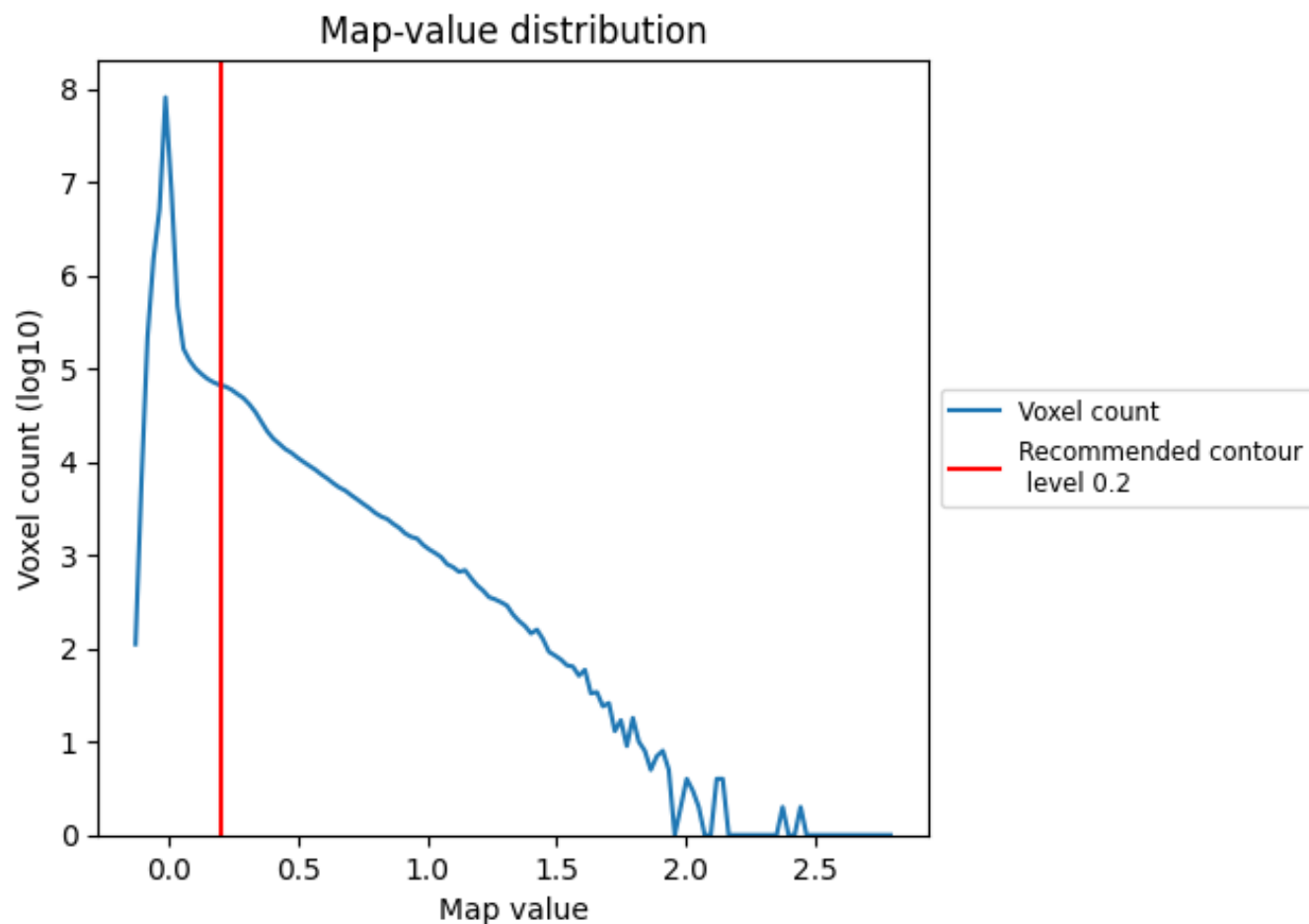
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

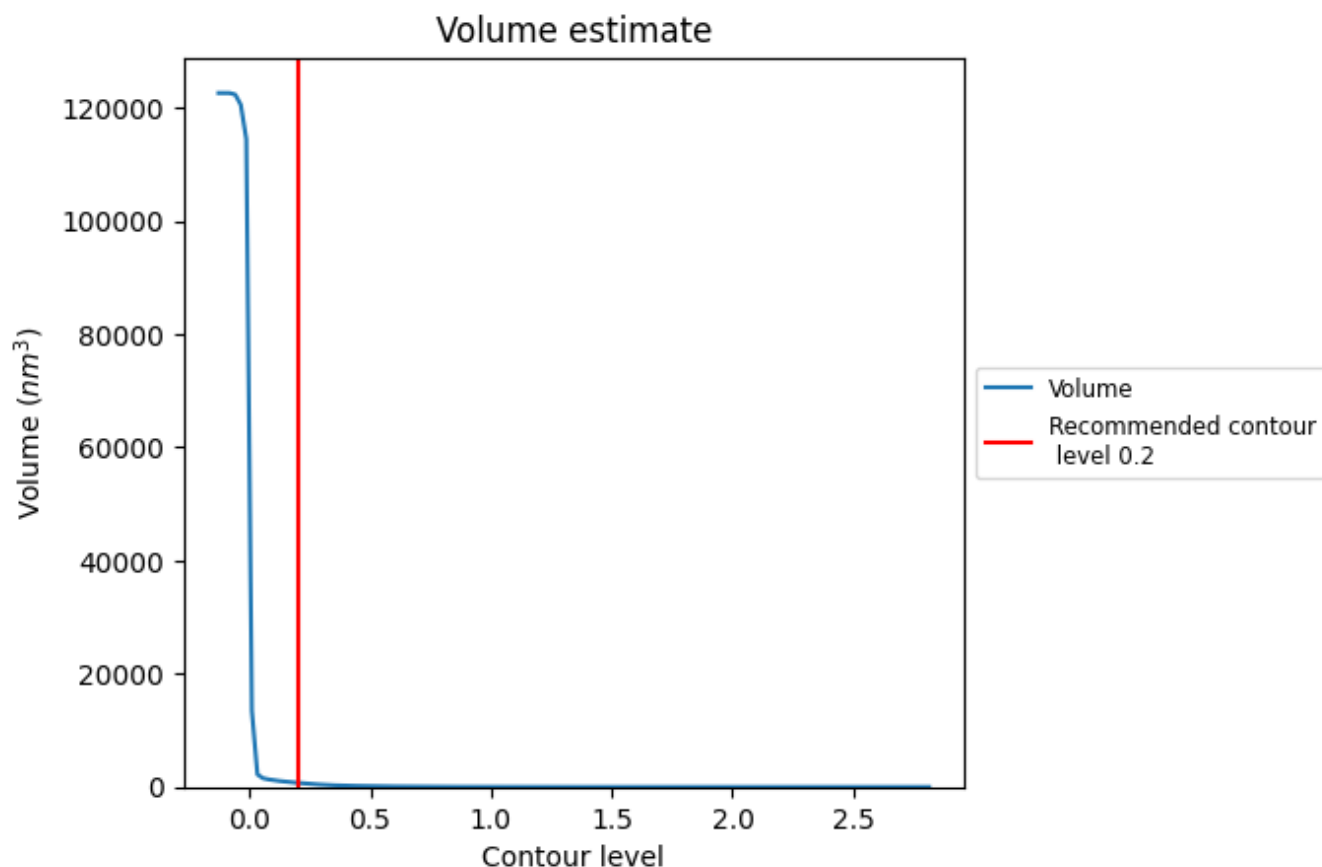
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

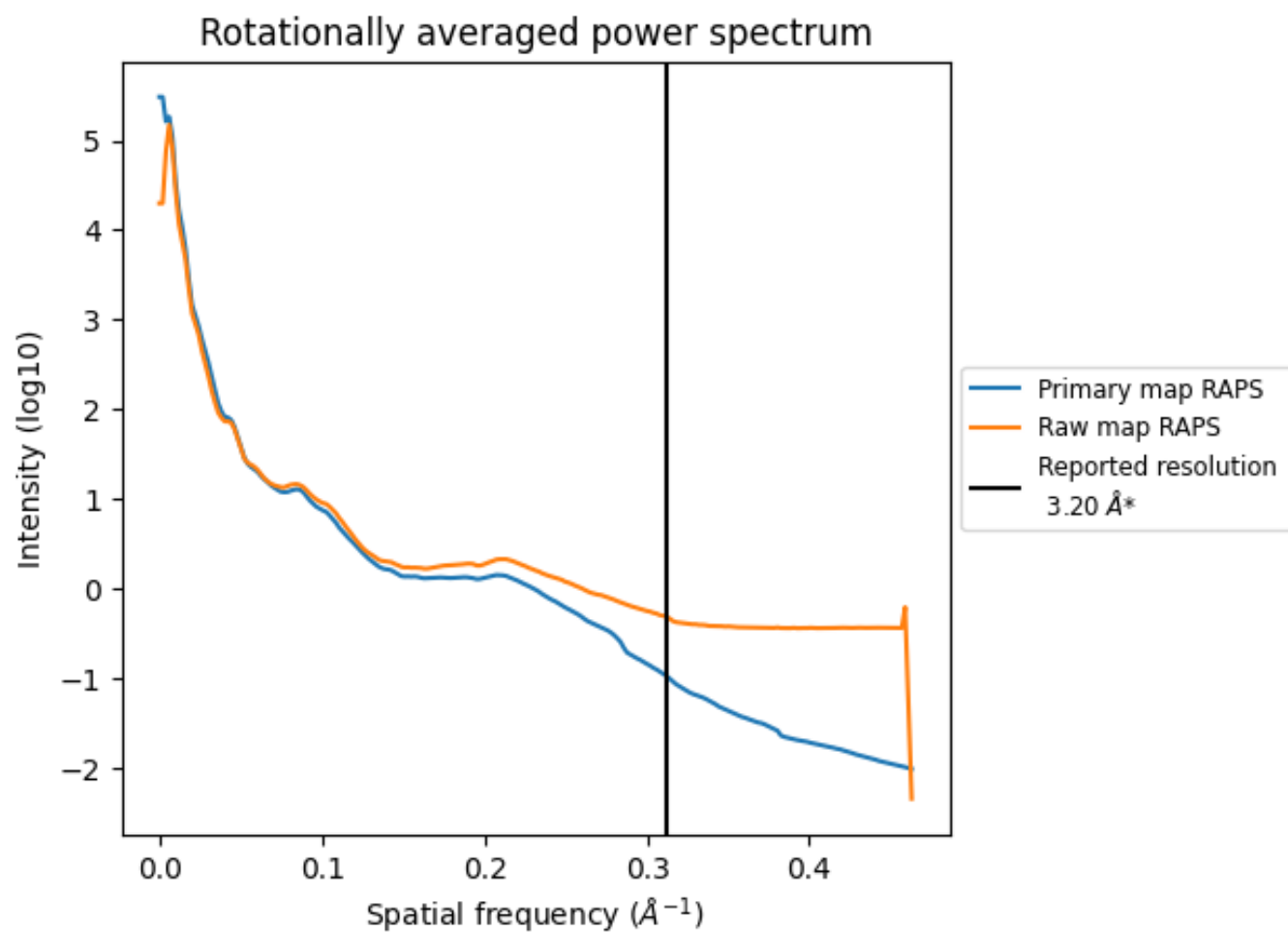
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 729 nm^3 ; this corresponds to an approximate mass of 658 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 ⓘ

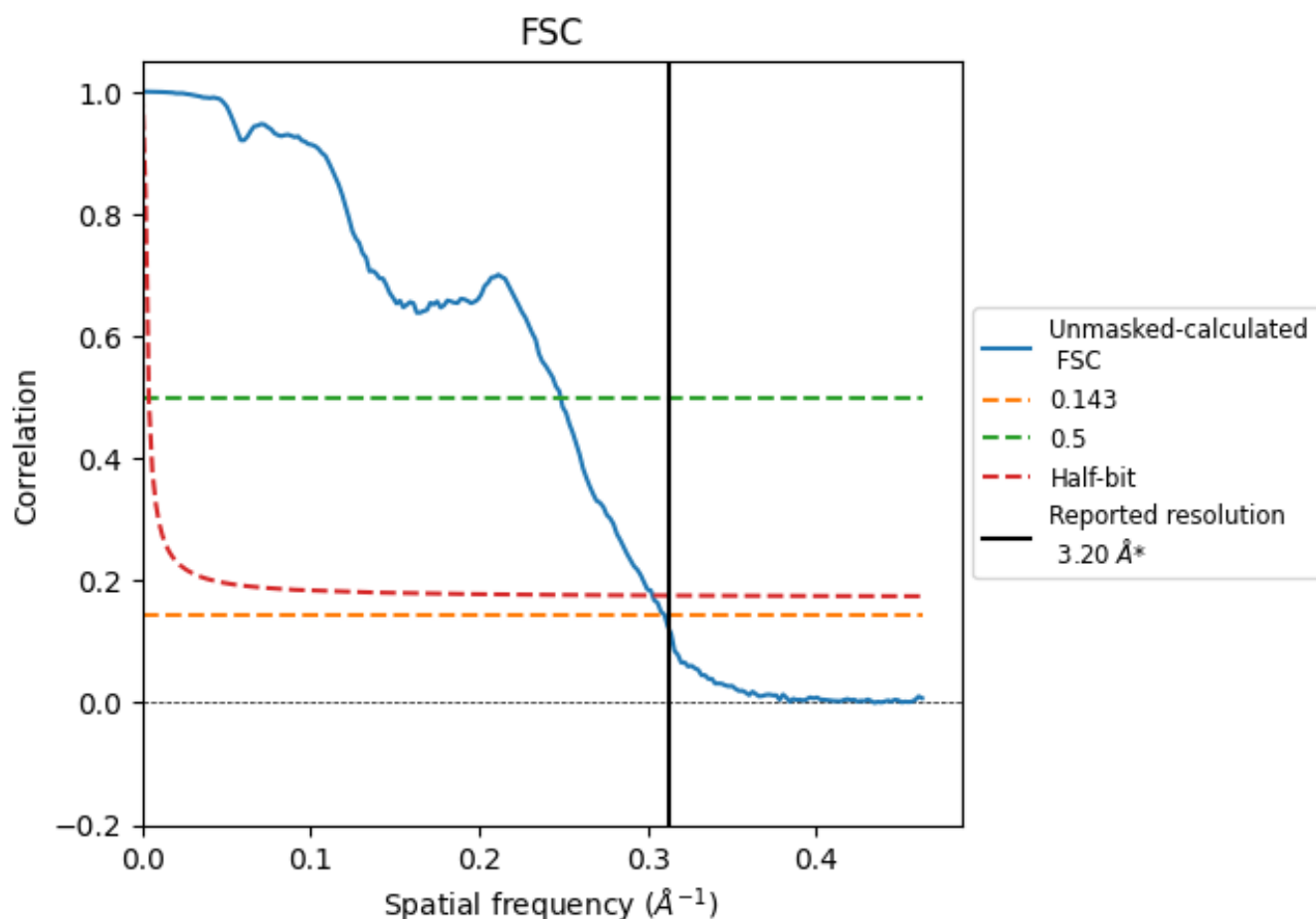


*Reported resolution corresponds to spatial frequency of 0.312 $\text{\AA}^{-1}$

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 0.312 Å⁻¹

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.22	4.03	3.30

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

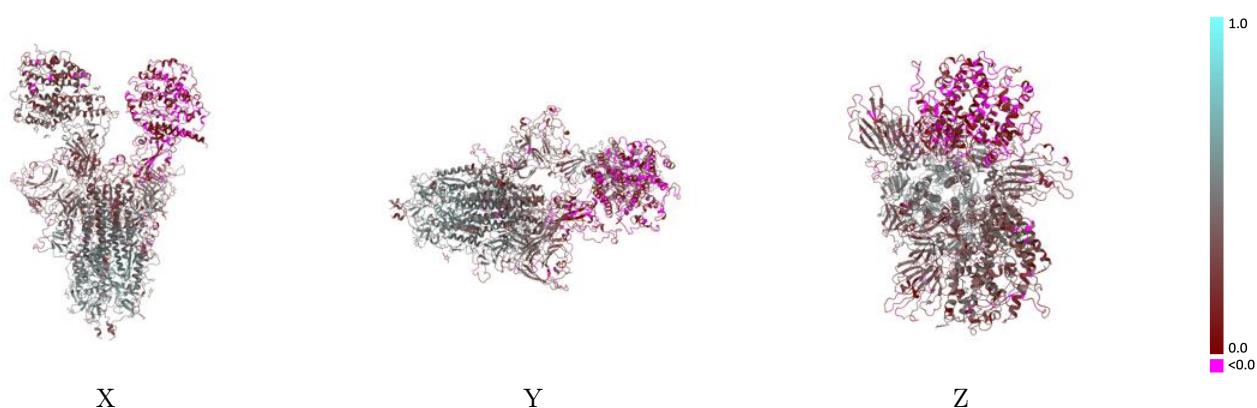
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-38201 and PDB model 8XAL. Per-residue inclusion information can be found in section 3 on page 17.

9.1 Map-model overlay [i](#)

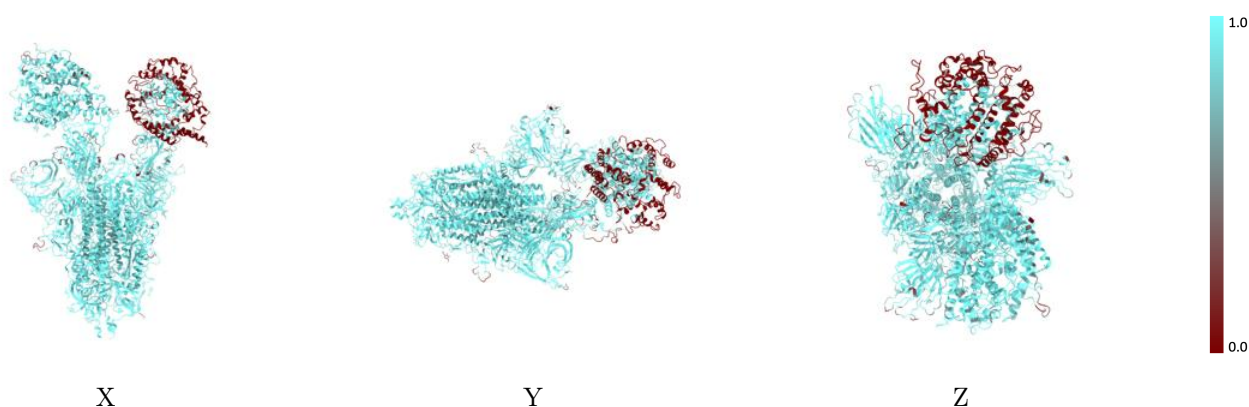
This section was not generated.

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



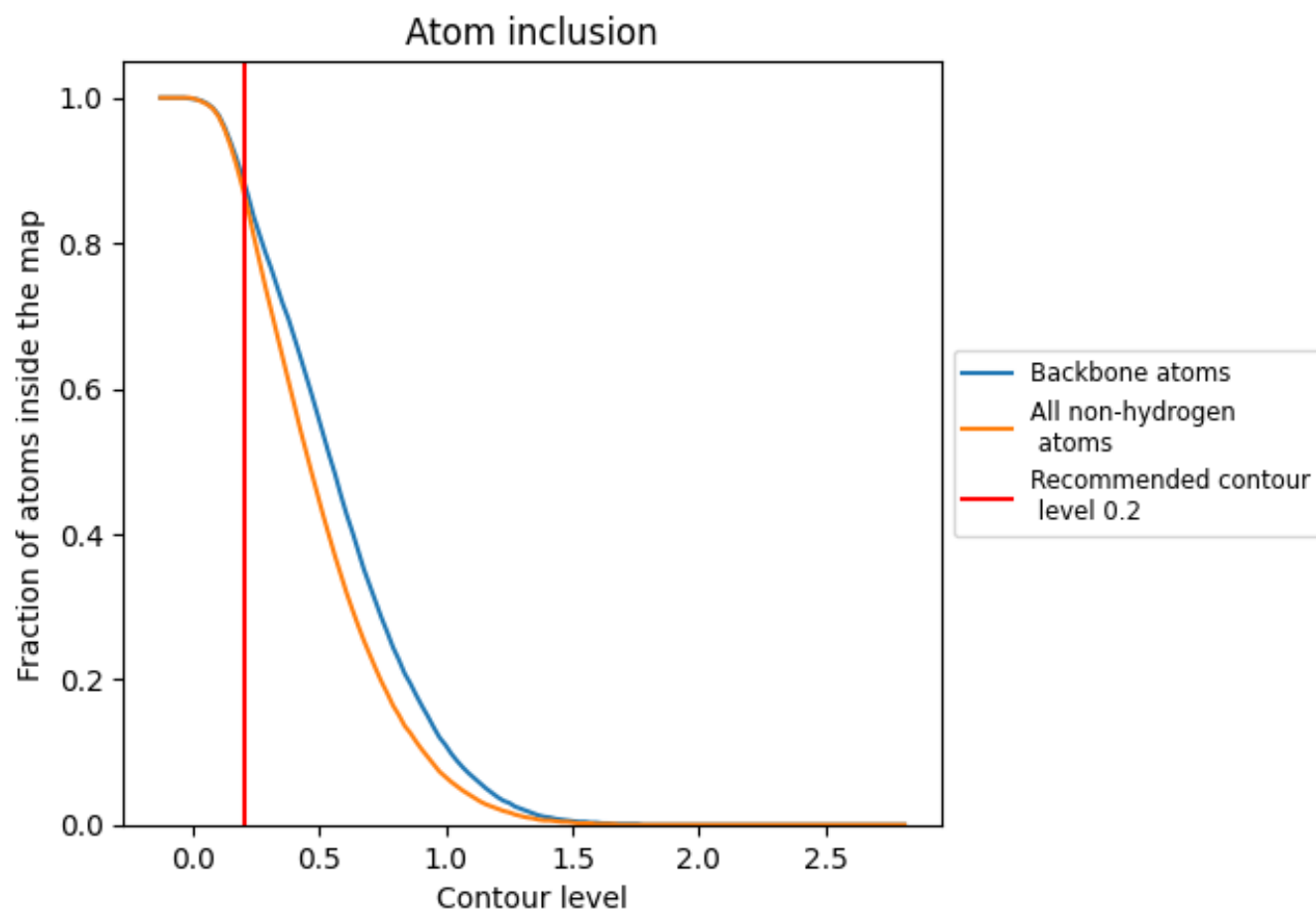
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.2).

9.4 Atom inclusion [i](#)



At the recommended contour level, 89% of all backbone atoms, 87% 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 (0.2) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8720	0.3210
A	0.9740	0.3970
B	0.9470	0.3310
C	0.9550	0.3780
I	0.9280	0.3220
J	0.3340	0.0590
K	0.7860	0.2800

1.0

0.0

<0.0