



## Full wwPDB EM Validation Report ⓘ

Nov 12, 2022 – 08:10 PM EST

PDB ID : 6Q2J  
EMDB ID : EMD-20572  
Title : Cryo-EM structure of extracellular dimeric complex of RET/GFRAL/GDF15  
Authors : Li, J.; Shang, G.J.; Chen, Y.J.; Brautigam, C.A.; Liou, J.; Zhang, X.W.; Bai, X.C.  
Deposited on : 2019-08-08  
Resolution : 4.10 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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

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

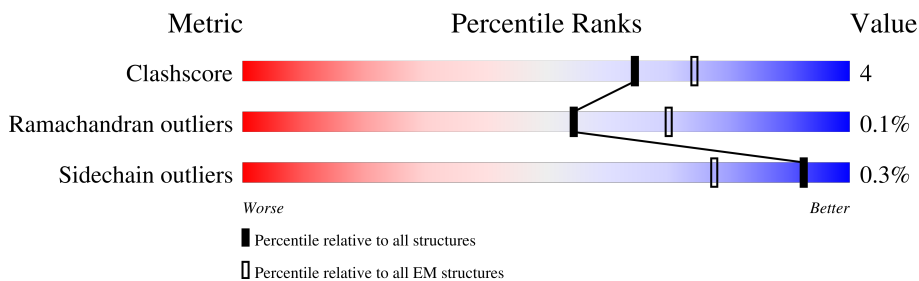
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 4.10 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  $\geq 3$ , 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	135	
1	B	135	
2	C	343	
2	D	343	
3	E	617	
3	F	617	

## 2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 13796 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 Growth/differentiation factor 15.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	108	826	514	149	151	12	0	0
1	B	108	826	514	149	151	12	0	0

There are 46 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	174	MET	-	initiating methionine	UNP Q99988
A	175	GLY	-	expression tag	UNP Q99988
A	176	SER	-	expression tag	UNP Q99988
A	177	SER	-	expression tag	UNP Q99988
A	178	HIS	-	expression tag	UNP Q99988
A	179	HIS	-	expression tag	UNP Q99988
A	180	HIS	-	expression tag	UNP Q99988
A	181	HIS	-	expression tag	UNP Q99988
A	182	HIS	-	expression tag	UNP Q99988
A	183	HIS	-	expression tag	UNP Q99988
A	184	SER	-	expression tag	UNP Q99988
A	185	SER	-	expression tag	UNP Q99988
A	186	GLY	-	expression tag	UNP Q99988
A	187	LEU	-	expression tag	UNP Q99988
A	188	GLU	-	expression tag	UNP Q99988
A	189	VAL	-	expression tag	UNP Q99988
A	190	LEU	-	expression tag	UNP Q99988
A	191	PHE	-	expression tag	UNP Q99988
A	192	GLN	-	expression tag	UNP Q99988
A	193	GLY	-	expression tag	UNP Q99988
A	194	PRO	-	expression tag	UNP Q99988
A	195	HIS	-	expression tag	UNP Q99988
A	196	MET	-	expression tag	UNP Q99988
B	174	MET	-	initiating methionine	UNP Q99988
B	175	GLY	-	expression tag	UNP Q99988
B	176	SER	-	expression tag	UNP Q99988

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Chain	Residue	Modelled	Actual	Comment	Reference
B	177	SER	-	expression tag	UNP Q99988
B	178	HIS	-	expression tag	UNP Q99988
B	179	HIS	-	expression tag	UNP Q99988
B	180	HIS	-	expression tag	UNP Q99988
B	181	HIS	-	expression tag	UNP Q99988
B	182	HIS	-	expression tag	UNP Q99988
B	183	HIS	-	expression tag	UNP Q99988
B	184	SER	-	expression tag	UNP Q99988
B	185	SER	-	expression tag	UNP Q99988
B	186	GLY	-	expression tag	UNP Q99988
B	187	LEU	-	expression tag	UNP Q99988
B	188	GLU	-	expression tag	UNP Q99988
B	189	VAL	-	expression tag	UNP Q99988
B	190	LEU	-	expression tag	UNP Q99988
B	191	PHE	-	expression tag	UNP Q99988
B	192	GLN	-	expression tag	UNP Q99988
B	193	GLY	-	expression tag	UNP Q99988
B	194	PRO	-	expression tag	UNP Q99988
B	195	HIS	-	expression tag	UNP Q99988
B	196	MET	-	expression tag	UNP Q99988

- Molecule 2 is a protein called GDNF family receptor alpha-like.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	190	Total	C	N	O	S	0	0
			1477	907	264	281	25		
2	D	190	Total	C	N	O	S	0	0
			1477	907	264	281	25		

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	353	GLY	-	expression tag	UNP Q6UXV0
C	354	THR	-	expression tag	UNP Q6UXV0
C	355	HIS	-	expression tag	UNP Q6UXV0
C	356	HIS	-	expression tag	UNP Q6UXV0
C	357	HIS	-	expression tag	UNP Q6UXV0
C	358	HIS	-	expression tag	UNP Q6UXV0
C	359	HIS	-	expression tag	UNP Q6UXV0
C	360	HIS	-	expression tag	UNP Q6UXV0
C	361	HIS	-	expression tag	UNP Q6UXV0
C	362	HIS	-	expression tag	UNP Q6UXV0

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Chain	Residue	Modelled	Actual	Comment	Reference
D	353	GLY	-	expression tag	UNP Q6UXV0
D	354	THR	-	expression tag	UNP Q6UXV0
D	355	HIS	-	expression tag	UNP Q6UXV0
D	356	HIS	-	expression tag	UNP Q6UXV0
D	357	HIS	-	expression tag	UNP Q6UXV0
D	358	HIS	-	expression tag	UNP Q6UXV0
D	359	HIS	-	expression tag	UNP Q6UXV0
D	360	HIS	-	expression tag	UNP Q6UXV0
D	361	HIS	-	expression tag	UNP Q6UXV0
D	362	HIS	-	expression tag	UNP Q6UXV0

- Molecule 3 is a protein called Proto-oncogene tyrosine-protein kinase receptor Ret.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	571	4493	2829	793	842	29	0	0
3	F	571	4493	2829	793	842	29	0	0

There are 22 discrepancies between the modelled and reference sequences:

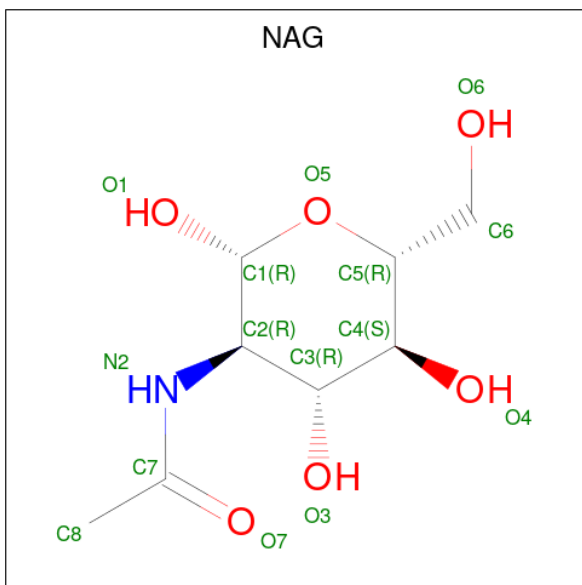
Chain	Residue	Modelled	Actual	Comment	Reference
E	114	HIS	ARG	conflict	UNP P07949
E	636	GLY	-	expression tag	UNP P07949
E	637	THR	-	expression tag	UNP P07949
E	638	HIS	-	expression tag	UNP P07949
E	639	HIS	-	expression tag	UNP P07949
E	640	HIS	-	expression tag	UNP P07949
E	641	HIS	-	expression tag	UNP P07949
E	642	HIS	-	expression tag	UNP P07949
E	643	HIS	-	expression tag	UNP P07949
E	644	HIS	-	expression tag	UNP P07949
E	645	HIS	-	expression tag	UNP P07949
F	114	HIS	ARG	conflict	UNP P07949
F	636	GLY	-	expression tag	UNP P07949
F	637	THR	-	expression tag	UNP P07949
F	638	HIS	-	expression tag	UNP P07949
F	639	HIS	-	expression tag	UNP P07949
F	640	HIS	-	expression tag	UNP P07949
F	641	HIS	-	expression tag	UNP P07949
F	642	HIS	-	expression tag	UNP P07949
F	643	HIS	-	expression tag	UNP P07949

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Chain	Residue	Modelled	Actual	Comment	Reference
F	644	HIS	-	expression tag	UNP P07949
F	645	HIS	-	expression tag	UNP P07949

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf	
			Total	C	N		O
4	E	1	98	56	7	35	0
4	E	1	98	56	7	35	0
4	E	1	98	56	7	35	0
4	E	1	98	56	7	35	0
4	E	1	98	56	7	35	0
4	E	1	98	56	7	35	0
4	E	1	98	56	7	35	0
4	F	1	98	56	7	35	0
4	F	1	98	56	7	35	0
4	F	1	98	56	7	35	0

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Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
4	F	1	Total 98	C 56	N 7	O 35	0
4	F	1	Total 98	C 56	N 7	O 35	0
4	F	1	Total 98	C 56	N 7	O 35	0
4	F	1	Total 98	C 56	N 7	O 35	0

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
5	E	4	Total 4	Ca 4	0
5	F	4	Total 4	Ca 4	0

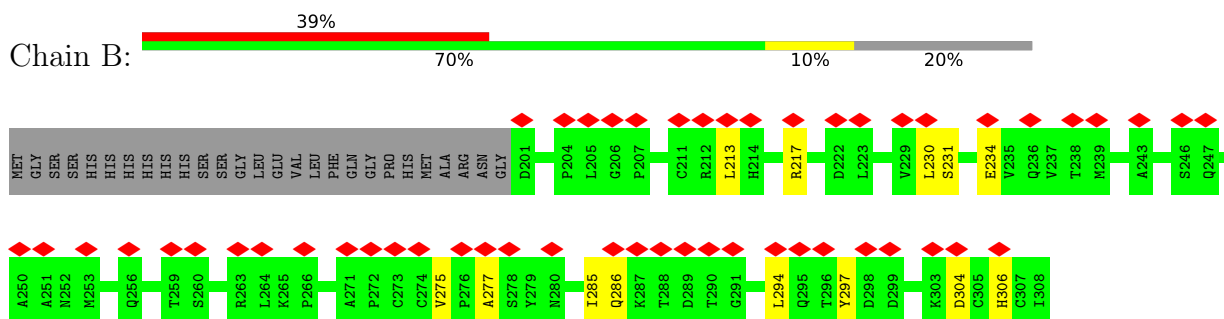
### 3 Residue-property plots i

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

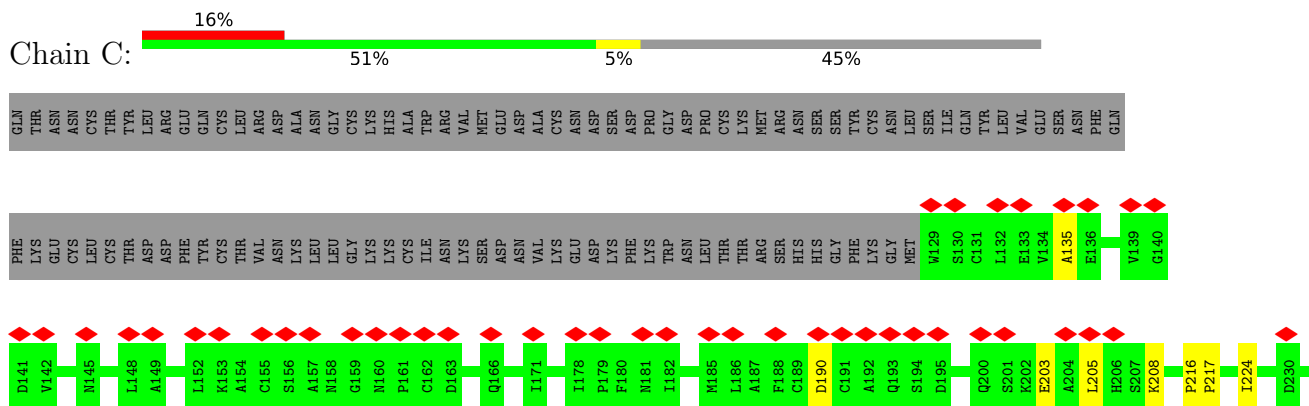
- Molecule 1: Growth/differentiation factor 15



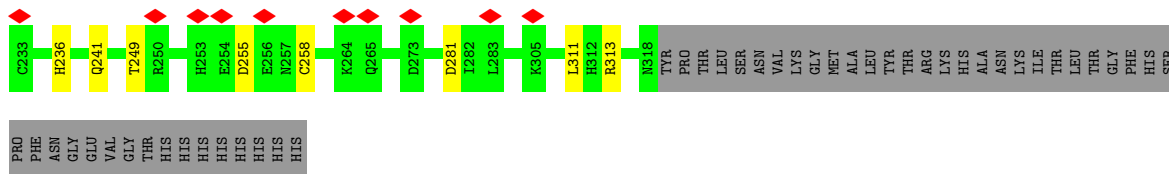
- Molecule 1: Growth/differentiation factor 15



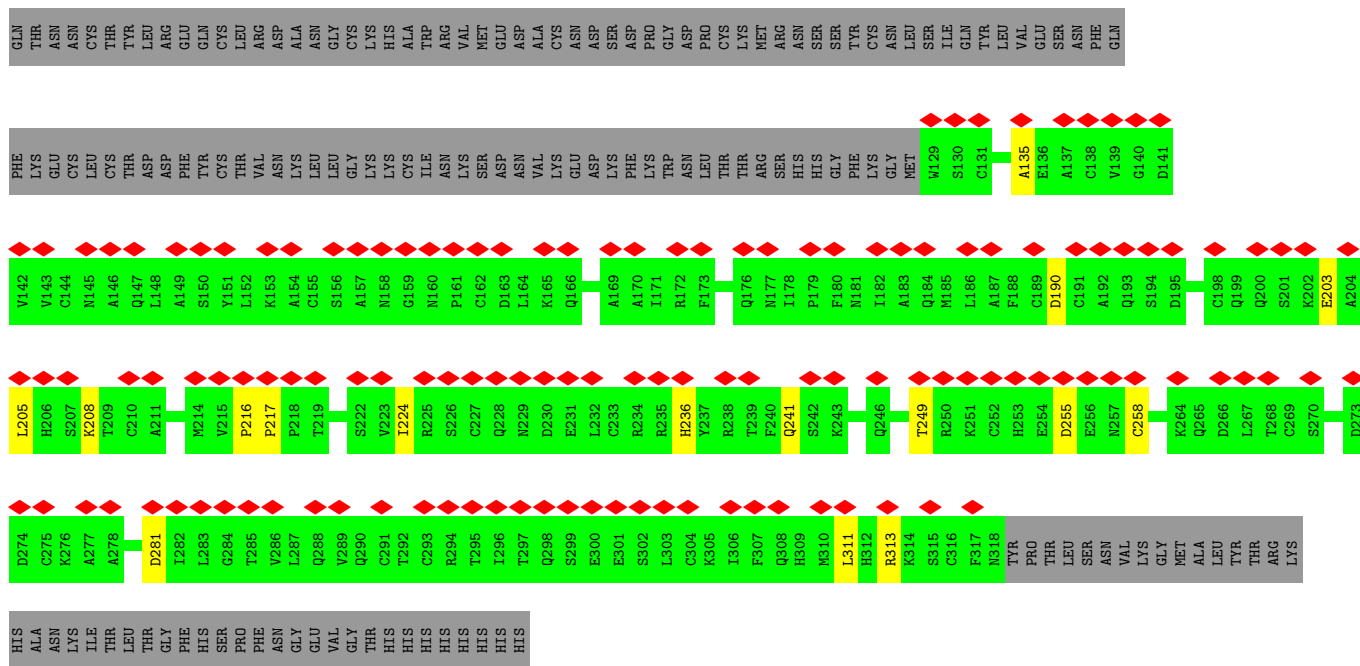
- Molecule 2: GDNF family receptor alpha-like



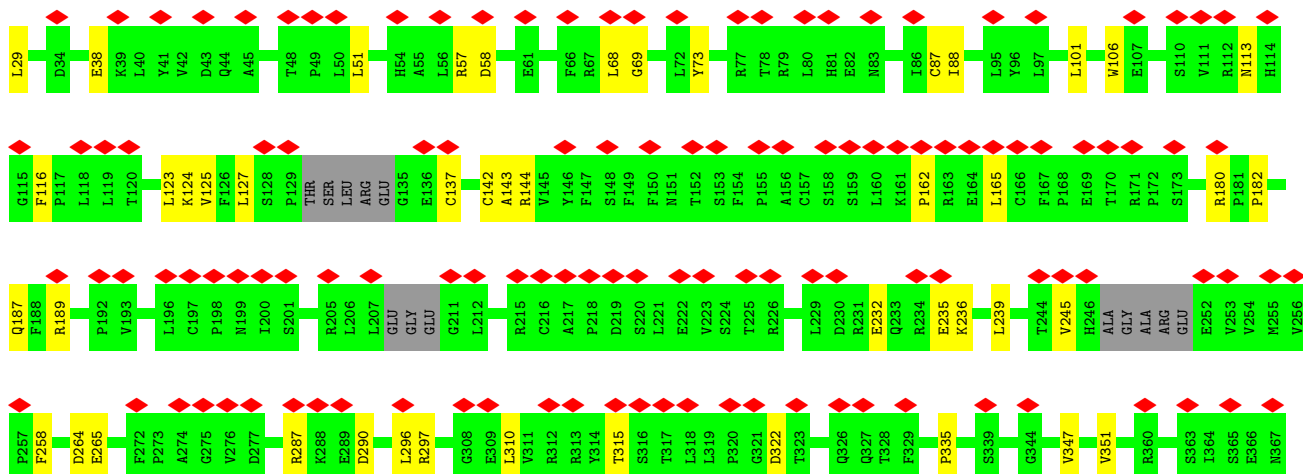
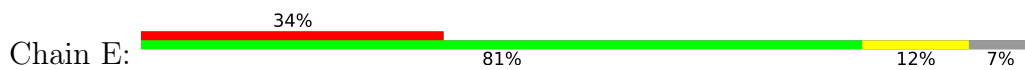


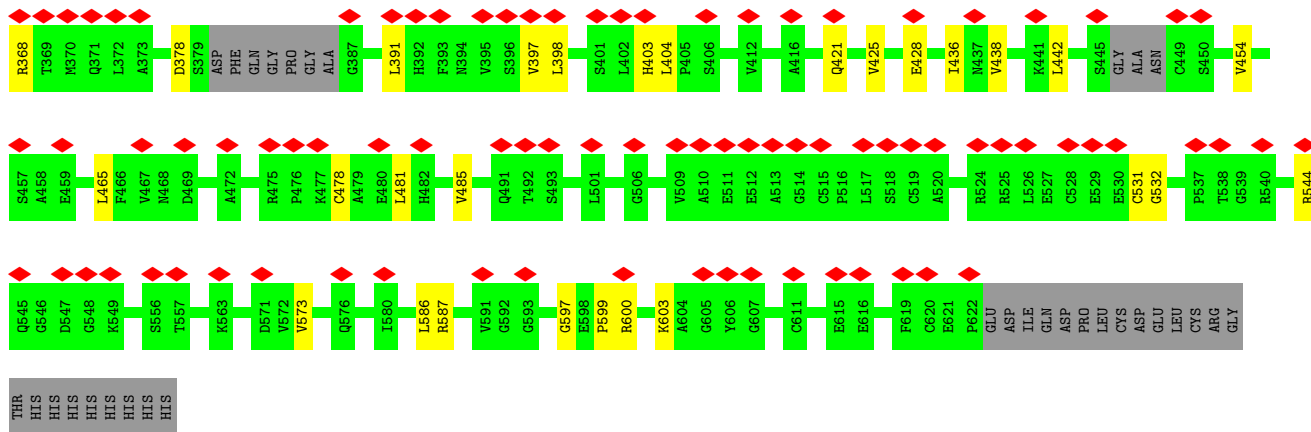


● Molecule 2: GDNF family receptor alpha-like

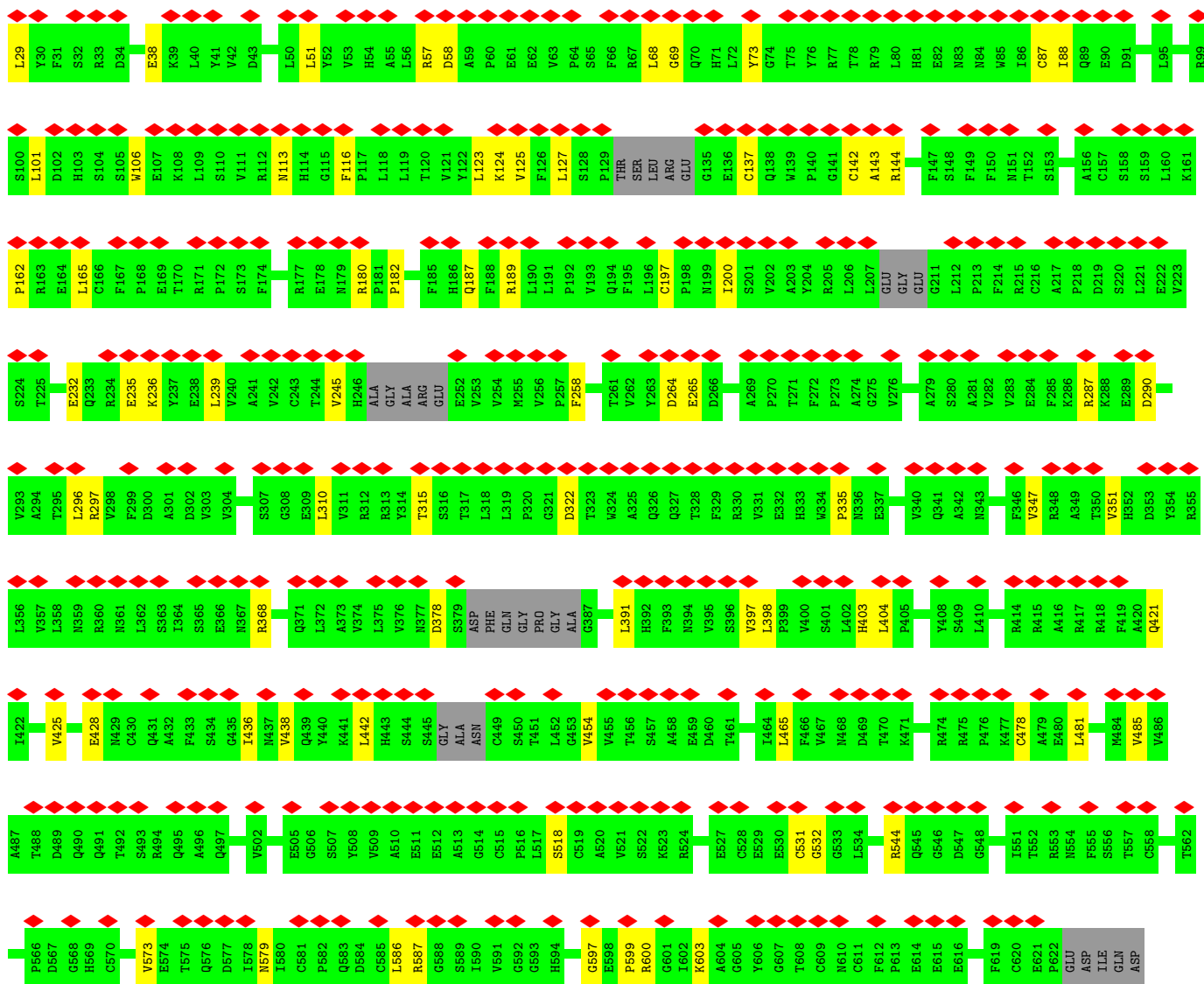
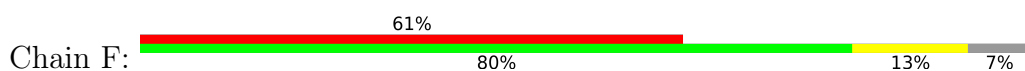


● Molecule 3: Proto-oncogene tyrosine-protein kinase receptor Ret





● Molecule 3: Proto-oncogene tyrosine-protein kinase receptor Ret



PRO  
LEU  
CYS  
ASP  
GLU  
LEU  
CYS  
ARG  
GLY  
THR  
HIS  
HIS  
HIS  
HIS  
HIS  
HIS  
HIS

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	520480	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	46729	Depositor
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.210	Depositor
Minimum map value	-0.139	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.006	Depositor
Recommended contour level	0.036	Depositor
Map size (Å)	256.80002, 256.80002, 256.80002	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	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: NAG, CA

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	0.30	0/846	0.51	0/1153
1	B	0.30	0/846	0.51	0/1153
2	C	0.32	0/1502	0.52	0/2030
2	D	0.32	0/1502	0.52	0/2030
3	E	0.34	0/4599	0.58	2/6252 (0.0%)
3	F	0.34	0/4599	0.58	2/6252 (0.0%)
All	All	0.33	0/13894	0.56	4/18870 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	378	ASP	CB-CG-OD1	6.86	124.48	118.30
3	E	378	ASP	CB-CG-OD1	6.83	124.44	118.30
3	E	404	LEU	CA-CB-CG	5.10	127.03	115.30
3	F	404	LEU	CA-CB-CG	5.09	127.02	115.30

There are no chirality outliers.

There are no planarity outliers.

### 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	826	0	809	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	826	0	809	8	0
2	C	1477	0	1418	8	0
2	D	1477	0	1418	8	0
3	E	4493	0	4346	40	0
3	F	4493	0	4346	42	0
4	E	98	0	91	1	0
4	F	98	0	91	1	0
5	E	4	0	0	0	0
5	F	4	0	0	0	0
All	All	13796	0	13328	113	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 4.

All (113) 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)
3:E:29:LEU:HB2	3:E:127:LEU:HD11	1.84	0.60
3:F:297:ARG:HH21	3:F:351:VAL:HG11	1.67	0.59
3:E:297:ARG:HH21	3:E:351:VAL:HG11	1.67	0.59
3:F:29:LEU:HB2	3:F:127:LEU:HD11	1.84	0.58
2:D:236:HIS:HD2	2:D:281:ASP:HB3	1.69	0.58
3:E:287:ARG:NH2	3:E:398:LEU:O	2.37	0.58
2:C:236:HIS:HD2	2:C:281:ASP:HB3	1.69	0.57
1:B:286:GLN:NE2	1:B:297:TYR:OH	2.38	0.57
3:E:29:LEU:HD22	3:E:57:ARG:HA	1.87	0.57
3:F:287:ARG:NH2	3:F:398:LEU:O	2.37	0.57
1:A:286:GLN:NE2	1:A:297:TYR:OH	2.38	0.57
3:F:29:LEU:HD22	3:F:57:ARG:HA	1.87	0.56
3:E:57:ARG:NH2	3:E:182:PRO:O	2.38	0.56
3:F:57:ARG:NH2	3:F:182:PRO:O	2.38	0.56
3:E:235:GLU:HG3	3:E:236:LYS:HG3	1.88	0.55
1:B:231:SER:HB3	1:B:285:ILE:HD12	1.88	0.55
1:A:231:SER:HB3	1:A:285:ILE:HD12	1.88	0.54
3:F:235:GLU:HG3	3:F:236:LYS:HG3	1.88	0.54
3:E:137:CYS:O	3:E:144:ARG:NH2	2.41	0.54
3:F:137:CYS:O	3:F:144:ARG:NH2	2.41	0.54
3:F:425:VAL:HG11	3:F:485:VAL:HG11	1.94	0.50
3:E:425:VAL:HG11	3:E:485:VAL:HG11	1.94	0.50
1:A:213:LEU:HD11	1:A:304:ASP:HA	1.93	0.50
1:B:213:LEU:HD11	1:B:304:ASP:HA	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:68:LEU:HD22	3:F:123:LEU:HD13	1.94	0.49
2:D:203:GLU:HG3	2:D:208:LYS:HD3	1.95	0.49
2:C:135:ALA:HB2	2:C:205:LEU:HD11	1.95	0.49
2:D:135:ALA:HB2	2:D:205:LEU:HD11	1.95	0.49
2:D:190:ASP:OD1	2:D:313:ARG:NH1	2.47	0.48
3:E:68:LEU:HD22	3:E:123:LEU:HD13	1.94	0.48
2:C:203:GLU:HG3	2:C:208:LYS:HD3	1.95	0.48
3:F:478:CYS:HB3	3:F:481:LEU:HD21	1.96	0.48
3:F:58:ASP:HA	3:F:180:ARG:HD2	1.96	0.48
3:E:58:ASP:HA	3:E:180:ARG:HD2	1.96	0.47
3:E:162:PRO:HA	3:E:165:LEU:HB2	1.96	0.47
3:E:478:CYS:HB3	3:E:481:LEU:HD21	1.96	0.47
2:C:190:ASP:OD1	2:C:313:ARG:NH1	2.47	0.47
3:F:162:PRO:HA	3:F:165:LEU:HB2	1.96	0.47
2:C:255:ASP:HB3	2:C:258:CYS:HB3	1.96	0.47
3:F:403:HIS:NE2	3:F:428:GLU:OE1	2.47	0.47
1:A:275:VAL:HG11	1:B:275:VAL:HG11	1.96	0.47
3:F:454:VAL:HG22	3:F:465:LEU:HB3	1.97	0.47
3:E:296:LEU:HD22	3:E:391:LEU:HD22	1.97	0.47
3:E:454:VAL:HG22	3:E:465:LEU:HB3	1.97	0.47
2:D:255:ASP:HB3	2:D:258:CYS:HB3	1.96	0.47
3:E:403:HIS:NE2	3:E:428:GLU:OE1	2.47	0.46
2:C:224:ILE:HD11	2:C:311:LEU:HD11	1.98	0.46
3:F:315:THR:HG21	4:F:703:NAG:H82	1.96	0.46
3:E:442:LEU:HD22	3:E:454:VAL:HG23	1.98	0.46
3:F:322:ASP:OD2	3:F:368:ARG:NH2	2.48	0.46
3:E:315:THR:HG21	4:E:703:NAG:H82	1.96	0.46
3:E:322:ASP:OD2	3:E:368:ARG:NH2	2.48	0.46
3:F:442:LEU:HD22	3:F:454:VAL:HG23	1.98	0.46
3:E:142:CYS:SG	3:E:143:ALA:N	2.89	0.46
3:F:232:GLU:HA	3:F:347:VAL:HG11	1.98	0.46
3:F:296:LEU:HD22	3:F:391:LEU:HD22	1.97	0.46
3:E:232:GLU:HA	3:E:347:VAL:HG11	1.98	0.45
3:F:142:CYS:SG	3:F:143:ALA:N	2.89	0.45
2:D:224:ILE:HD11	2:D:311:LEU:HD11	1.98	0.45
1:B:277:ALA:HB2	1:B:306:HIS:HD2	1.81	0.45
3:E:531:CYS:SG	3:E:532:GLY:N	2.91	0.44
3:F:68:LEU:HD23	3:F:125:VAL:HG22	2.00	0.44
1:A:277:ALA:HB2	1:A:306:HIS:HD2	1.81	0.44
3:F:38:GLU:HB2	3:F:51:LEU:HD23	1.99	0.44
3:E:68:LEU:HD23	3:E:125:VAL:HG22	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:531:CYS:SG	3:F:532:GLY:N	2.91	0.44
3:E:73:TYR:HE2	3:E:124:LYS:HE3	1.83	0.43
3:F:310:LEU:HD11	3:F:335:PRO:HG3	2.00	0.43
1:A:217:ARG:NH1	1:A:234:GLU:OE2	2.45	0.43
2:D:241:GLN:O	2:D:249:THR:OG1	2.37	0.43
3:F:73:TYR:HE2	3:F:124:LYS:HE3	1.83	0.43
1:A:285:ILE:HG12	1:A:294:LEU:HG	2.00	0.43
3:E:38:GLU:HB2	3:E:51:LEU:HD23	1.99	0.43
2:C:241:GLN:O	2:C:249:THR:OG1	2.37	0.43
1:B:285:ILE:HG12	1:B:294:LEU:HG	2.00	0.43
3:E:264:ASP:OD1	3:E:265:GLU:N	2.52	0.42
3:F:264:ASP:OD1	3:F:265:GLU:N	2.52	0.42
3:F:287:ARG:HD2	3:F:436:ILE:HD11	2.02	0.42
3:E:310:LEU:HD11	3:E:335:PRO:HG3	2.00	0.42
1:B:217:ARG:NH1	1:B:234:GLU:OE2	2.45	0.42
1:A:230:LEU:HB3	1:A:285:ILE:HG22	2.02	0.42
3:E:287:ARG:HD2	3:E:436:ILE:HD11	2.02	0.42
3:F:587:ARG:HE	3:F:600:ARG:HD3	1.85	0.42
1:B:230:LEU:HB3	1:B:285:ILE:HG22	2.02	0.42
3:F:436:ILE:HG22	3:F:438:VAL:HG23	2.02	0.42
3:E:187:GLN:HE22	3:E:189:ARG:HB2	1.85	0.41
3:F:187:GLN:HE22	3:F:189:ARG:HB2	1.85	0.41
3:E:101:LEU:HB3	3:E:106:TRP:HE1	1.85	0.41
3:E:421:GLN:HE21	3:E:573:VAL:HB	1.85	0.41
3:E:436:ILE:HG22	3:E:438:VAL:HG23	2.01	0.41
2:D:216:PRO:HA	2:D:217:PRO:HD3	1.92	0.41
3:F:101:LEU:HB3	3:F:106:TRP:HE1	1.85	0.41
3:F:113:ASN:ND2	3:F:116:PHE:O	2.54	0.41
2:C:216:PRO:HA	2:C:217:PRO:HD3	1.92	0.41
3:E:113:ASN:ND2	3:E:116:PHE:O	2.54	0.41
3:E:597:GLY:HA2	3:E:603:LYS:HB2	2.01	0.41
3:F:239:LEU:HB2	3:F:258:PHE:HD2	1.86	0.41
3:E:239:LEU:HB2	3:E:258:PHE:HD2	1.86	0.41
3:F:290:ASP:OD1	3:F:290:ASP:N	2.54	0.41
3:F:597:GLY:HA2	3:F:603:LYS:HB2	2.01	0.41
3:F:162:PRO:HB3	3:F:245:VAL:HG21	2.03	0.41
3:F:518:SER:OG	3:F:579:ASN:O	2.35	0.41
3:E:69:GLY:N	3:E:124:LYS:O	2.54	0.41
3:F:197:CYS:HB3	3:F:200:ILE:HD12	2.03	0.41
3:E:368:ARG:H	3:E:397:VAL:HG23	1.86	0.41
3:F:87:CYS:SG	3:F:88:ILE:N	2.94	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:162:PRO:HB3	3:E:245:VAL:HG21	2.03	0.40
3:E:290:ASP:N	3:E:290:ASP:OD1	2.54	0.40
3:E:87:CYS:SG	3:E:88:ILE:N	2.94	0.40
3:E:587:ARG:HE	3:E:600:ARG:HD3	1.85	0.40
3:F:69:GLY:N	3:F:124:LYS:O	2.54	0.40
3:F:421:GLN:HE21	3:F:573:VAL:HB	1.85	0.40
3:F:368:ARG:H	3:F:397:VAL:HG23	1.85	0.40

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	106/135 (78%)	102 (96%)	4 (4%)	0	100	100
1	B	106/135 (78%)	102 (96%)	4 (4%)	0	100	100
2	C	188/343 (55%)	180 (96%)	8 (4%)	0	100	100
2	D	188/343 (55%)	180 (96%)	8 (4%)	0	100	100
3	E	559/617 (91%)	527 (94%)	31 (6%)	1 (0%)	47	80
3	F	559/617 (91%)	527 (94%)	31 (6%)	1 (0%)	47	80
All	All	1706/2190 (78%)	1618 (95%)	86 (5%)	2 (0%)	54	84

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	E	599	PRO
3	F	599	PRO

### 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	94/116 (81%)	94 (100%)	0	100	100
1	B	94/116 (81%)	94 (100%)	0	100	100
2	C	171/310 (55%)	171 (100%)	0	100	100
2	D	171/310 (55%)	171 (100%)	0	100	100
3	E	501/537 (93%)	499 (100%)	2 (0%)	91	94
3	F	501/537 (93%)	499 (100%)	2 (0%)	91	94
All	All	1532/1926 (80%)	1528 (100%)	4 (0%)	92	95

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	E	544	ARG
3	E	586	LEU
3	F	544	ARG
3	F	586	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	286	GLN
1	A	306	HIS
3	E	187	GLN
3	E	443	HIS
1	B	286	GLN
1	B	306	HIS
3	F	187	GLN
3	F	443	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 22 ligands modelled in this entry, 8 are monoatomic - leaving 14 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
4	NAG	F	705	3	14,14,15	0.36	0	17,19,21	0.40	0
4	NAG	E	703	3	14,14,15	0.55	0	17,19,21	0.42	0
4	NAG	E	706	3	14,14,15	0.27	0	17,19,21	0.36	0
4	NAG	E	705	3	14,14,15	0.36	0	17,19,21	0.40	0
4	NAG	F	703	3	14,14,15	0.55	0	17,19,21	0.43	0
4	NAG	F	706	3	14,14,15	0.27	0	17,19,21	0.36	0
4	NAG	E	704	3	14,14,15	0.31	0	17,19,21	0.60	1 (5%)
4	NAG	F	701	3	14,14,15	0.28	0	17,19,21	0.47	0
4	NAG	F	704	3	14,14,15	0.31	0	17,19,21	0.59	1 (5%)
4	NAG	E	707	3	14,14,15	0.38	0	17,19,21	0.58	0
4	NAG	E	702	3	14,14,15	0.21	0	17,19,21	0.51	0
4	NAG	F	702	3	14,14,15	0.22	0	17,19,21	0.51	0
4	NAG	E	701	3	14,14,15	0.27	0	17,19,21	0.46	0
4	NAG	F	707	3	14,14,15	0.38	0	17,19,21	0.58	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	F	705	3	-	2/6/23/26	0/1/1/1
4	NAG	E	703	3	-	2/6/23/26	0/1/1/1
4	NAG	E	706	3	-	0/6/23/26	0/1/1/1
4	NAG	E	705	3	-	2/6/23/26	0/1/1/1
4	NAG	F	703	3	-	2/6/23/26	0/1/1/1
4	NAG	F	706	3	-	0/6/23/26	0/1/1/1
4	NAG	E	704	3	-	2/6/23/26	0/1/1/1
4	NAG	F	701	3	-	1/6/23/26	0/1/1/1
4	NAG	F	704	3	-	2/6/23/26	0/1/1/1
4	NAG	E	707	3	-	2/6/23/26	0/1/1/1
4	NAG	E	702	3	-	0/6/23/26	0/1/1/1
4	NAG	F	702	3	-	0/6/23/26	0/1/1/1
4	NAG	E	701	3	-	1/6/23/26	0/1/1/1
4	NAG	F	707	3	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	704	NAG	C1-O5-C5	2.07	115.00	112.19
4	F	704	NAG	C1-O5-C5	2.06	114.99	112.19

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	705	NAG	O5-C5-C6-O6
4	F	705	NAG	O5-C5-C6-O6
4	E	703	NAG	C4-C5-C6-O6
4	E	705	NAG	C4-C5-C6-O6
4	F	703	NAG	C4-C5-C6-O6
4	F	705	NAG	C4-C5-C6-O6
4	E	703	NAG	O5-C5-C6-O6
4	F	703	NAG	O5-C5-C6-O6
4	E	707	NAG	O5-C5-C6-O6
4	F	707	NAG	O5-C5-C6-O6
4	E	707	NAG	C4-C5-C6-O6
4	F	707	NAG	C4-C5-C6-O6
4	E	704	NAG	C4-C5-C6-O6
4	F	704	NAG	C4-C5-C6-O6

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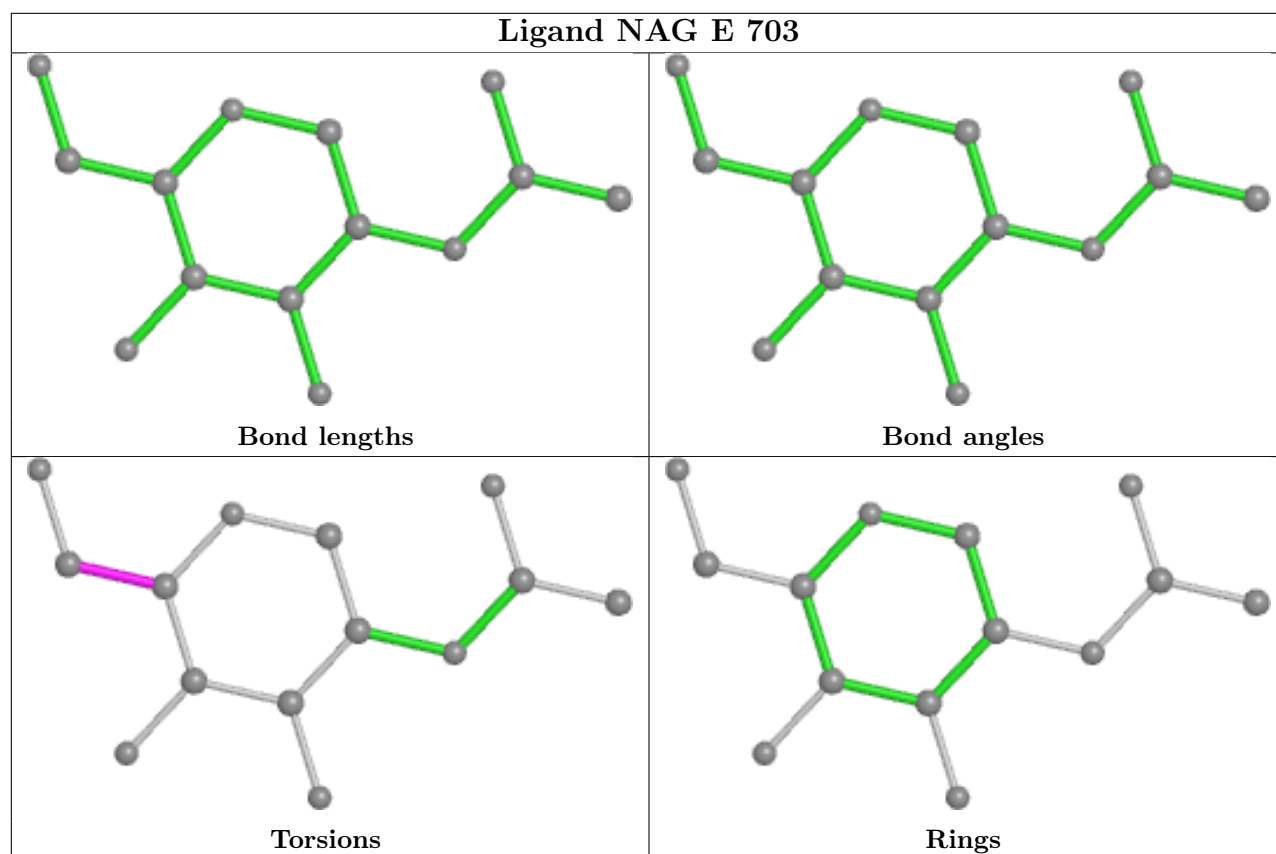
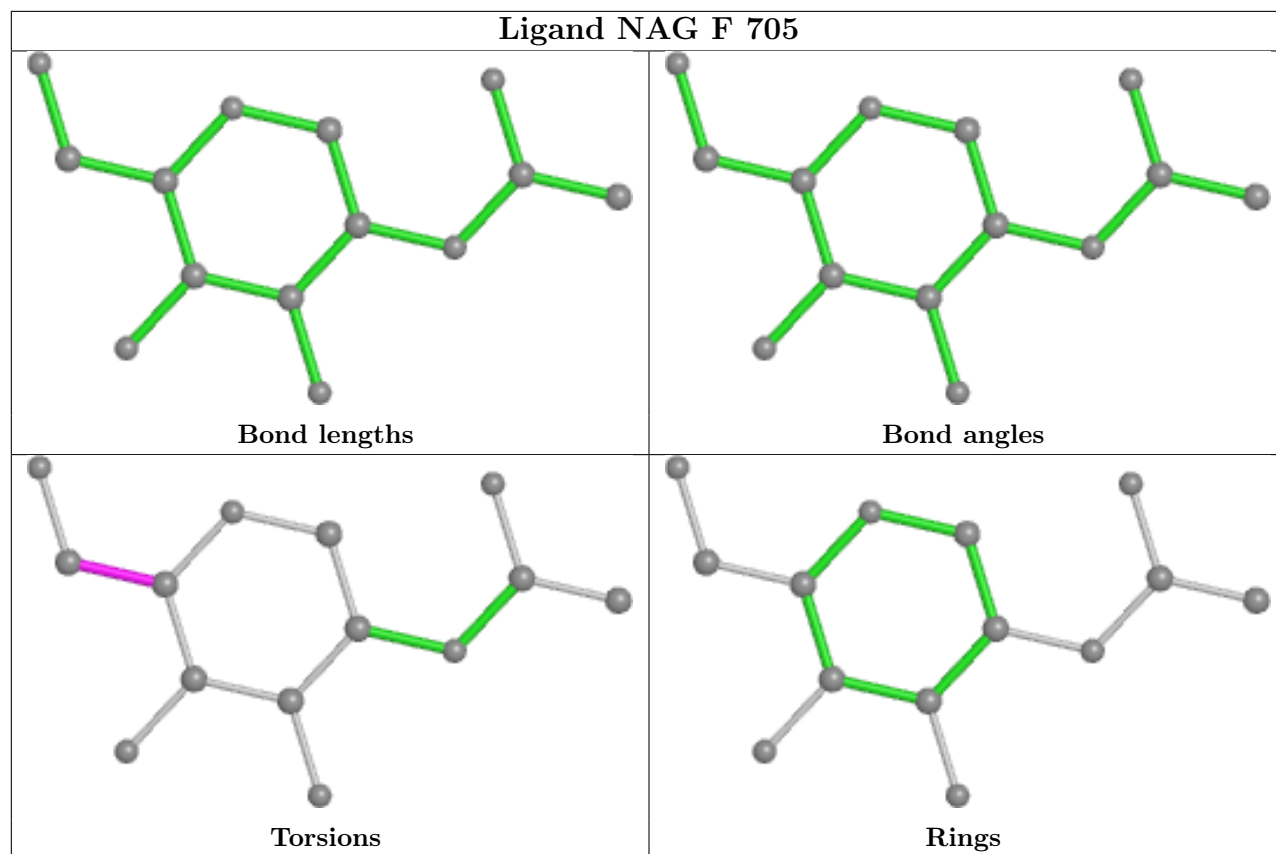
Mol	Chain	Res	Type	Atoms
4	E	701	NAG	O5-C5-C6-O6
4	F	701	NAG	O5-C5-C6-O6
4	E	704	NAG	O5-C5-C6-O6
4	F	704	NAG	O5-C5-C6-O6

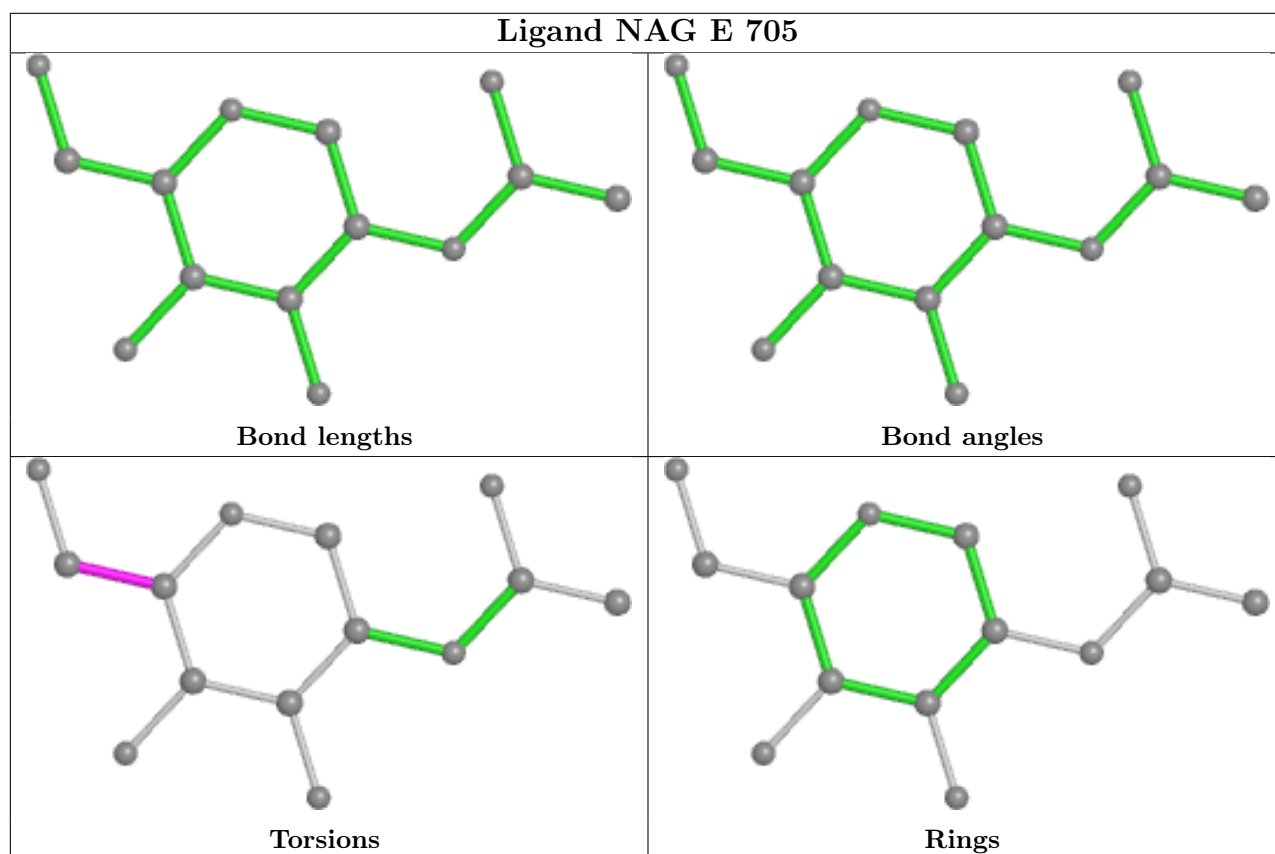
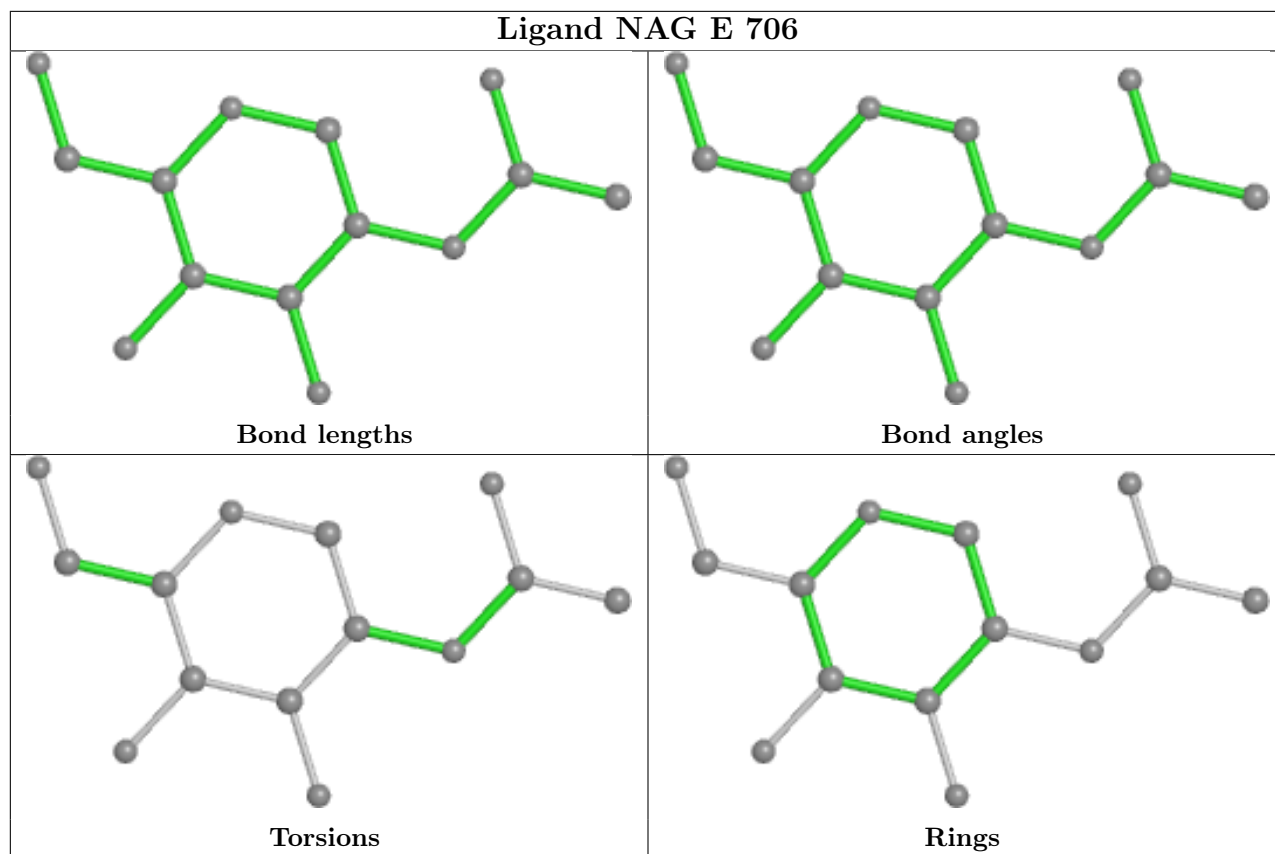
There are no ring outliers.

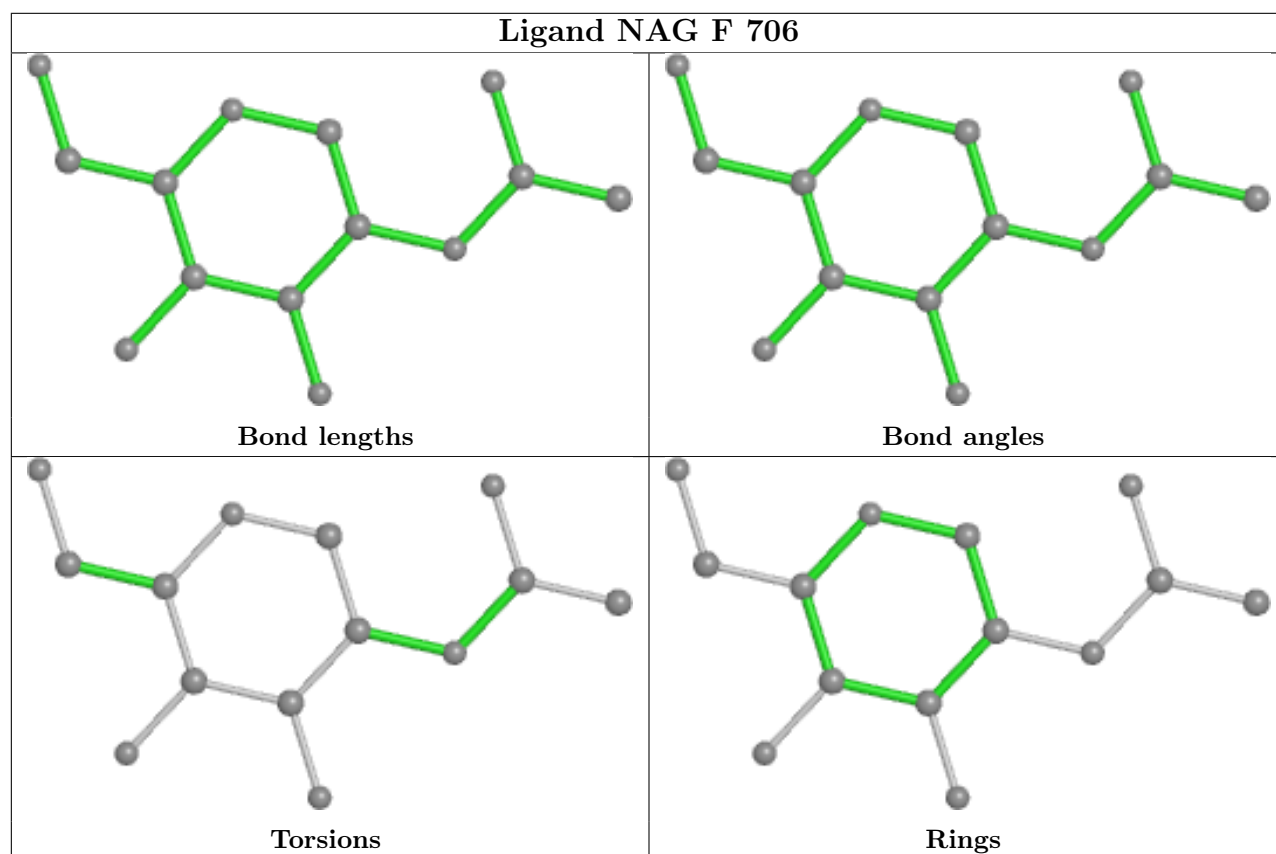
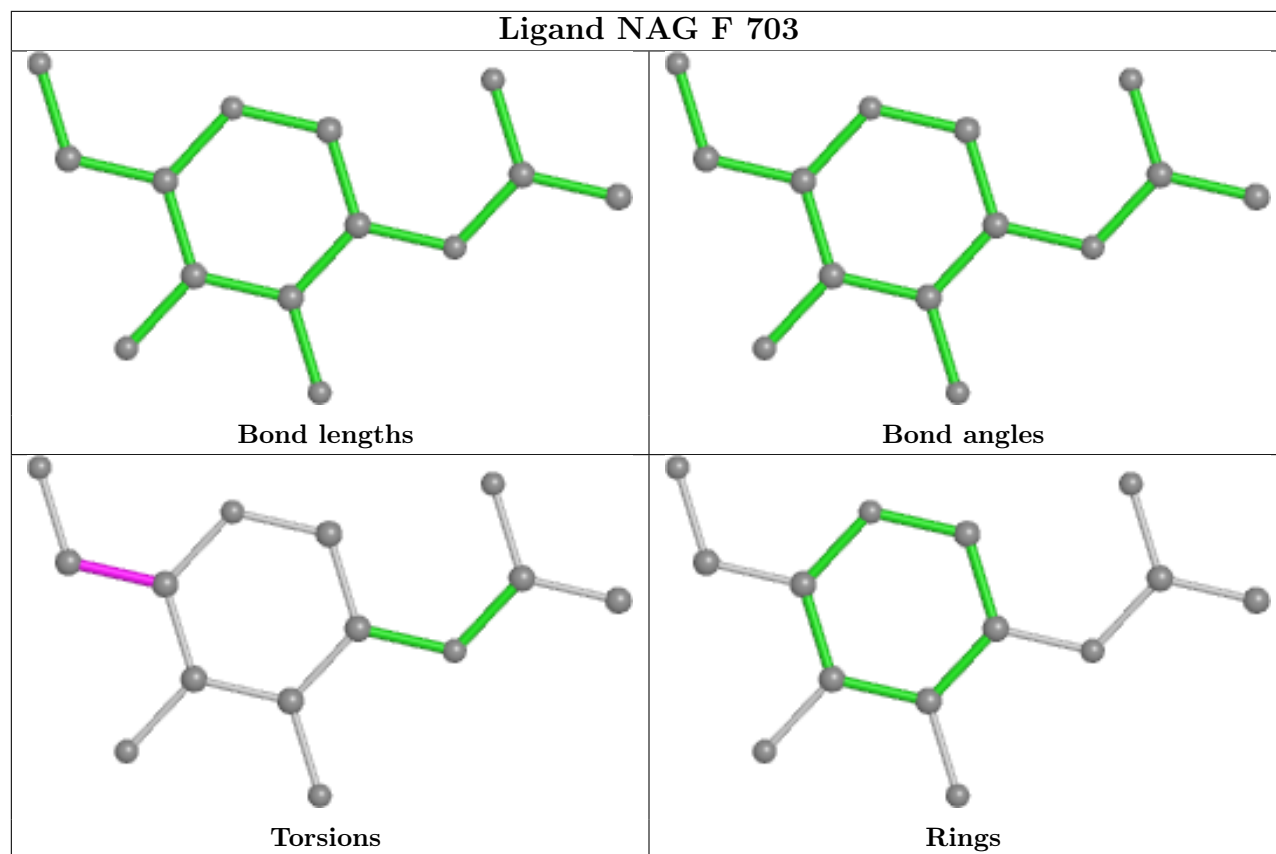
2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	E	703	NAG	1	0
4	F	703	NAG	1	0

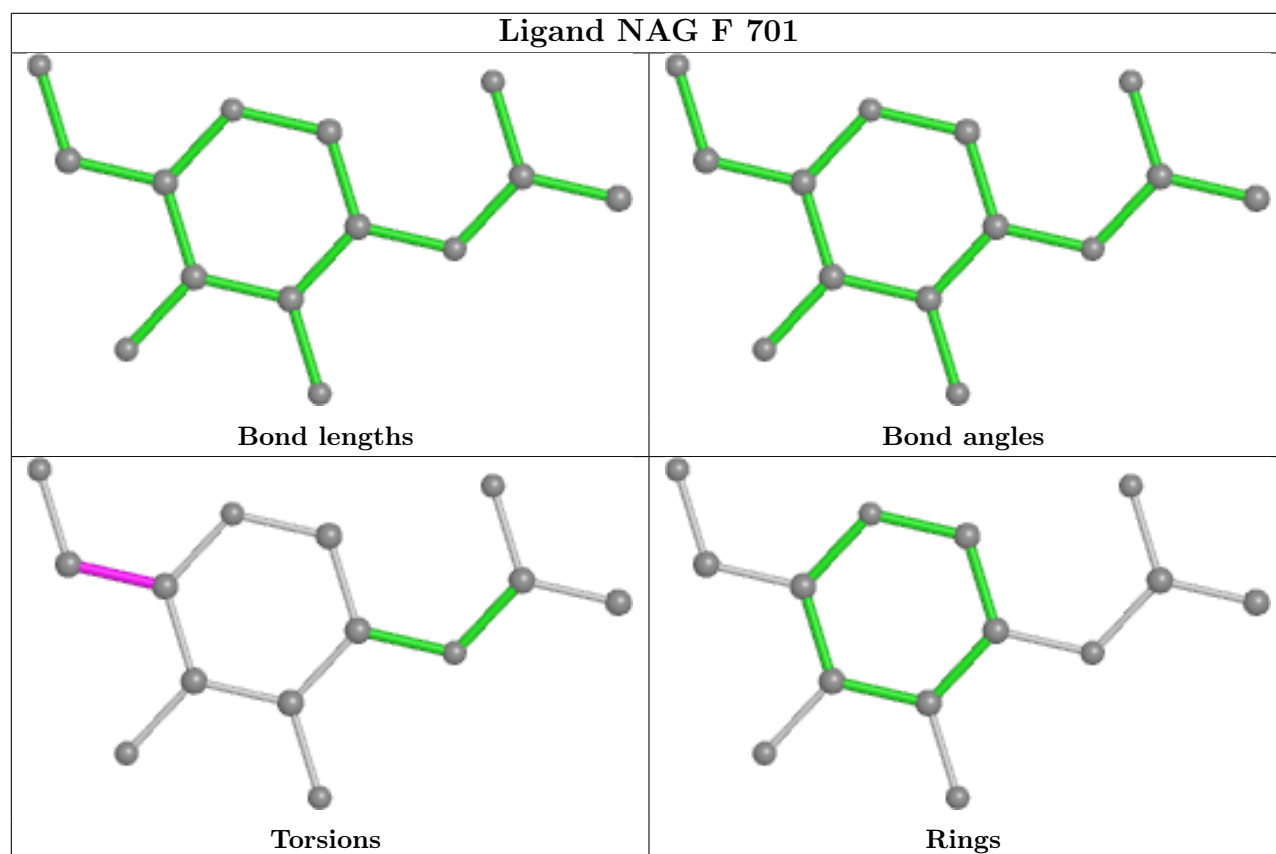
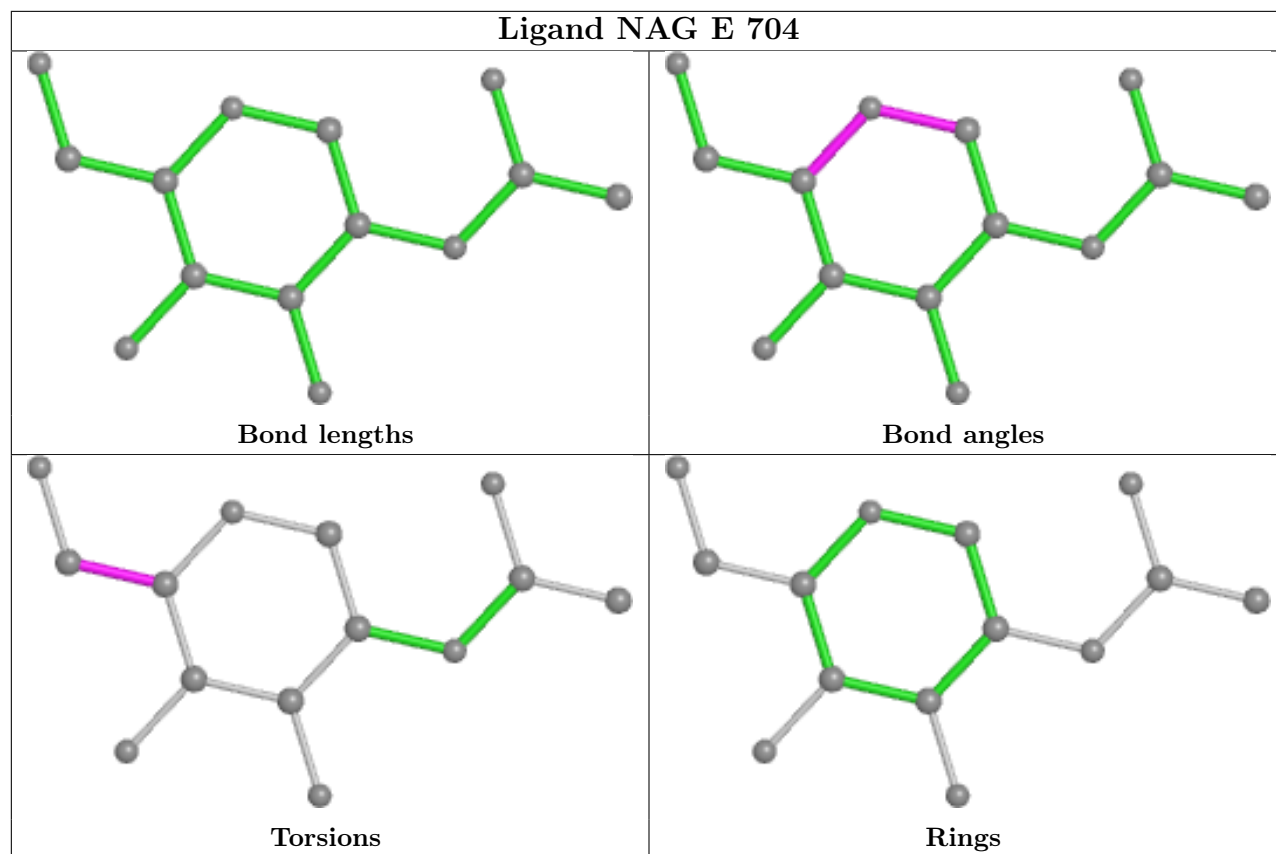
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

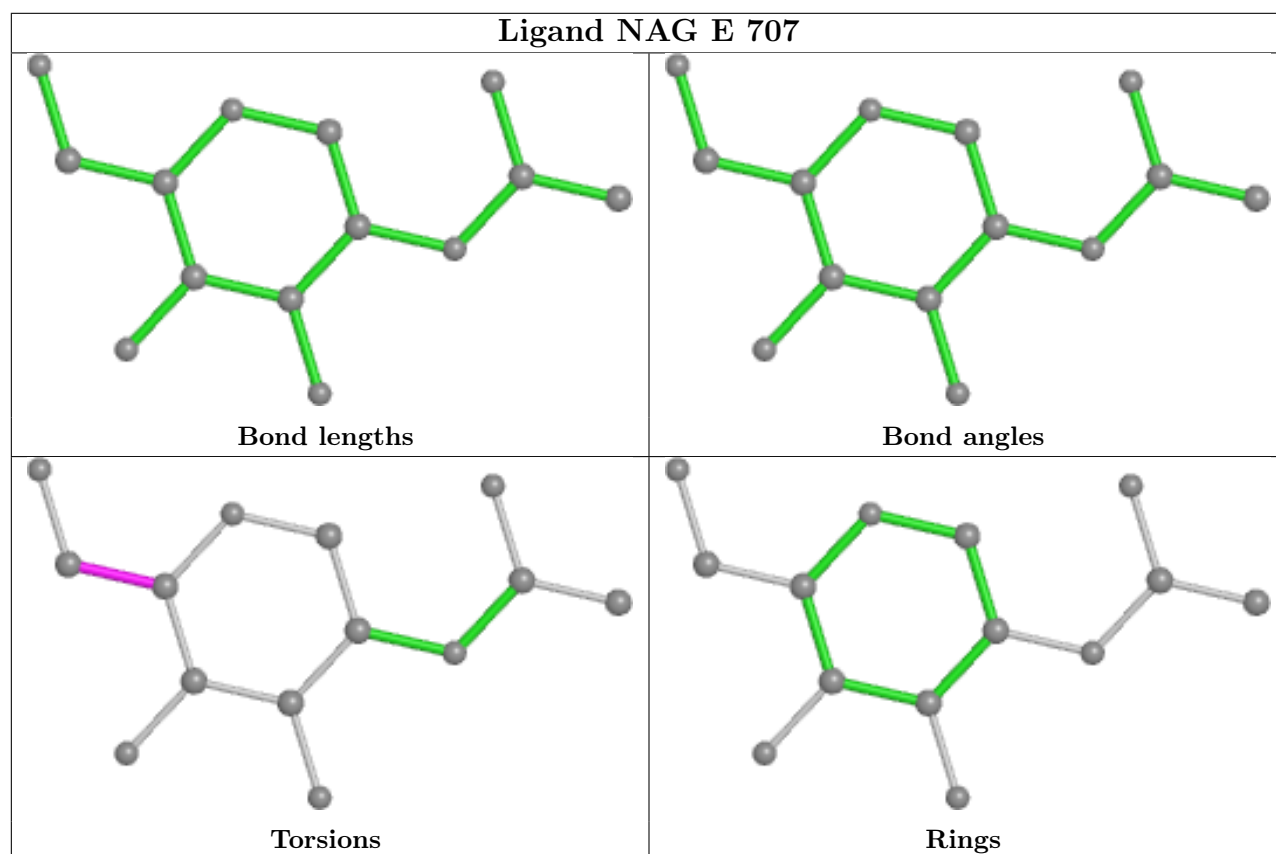
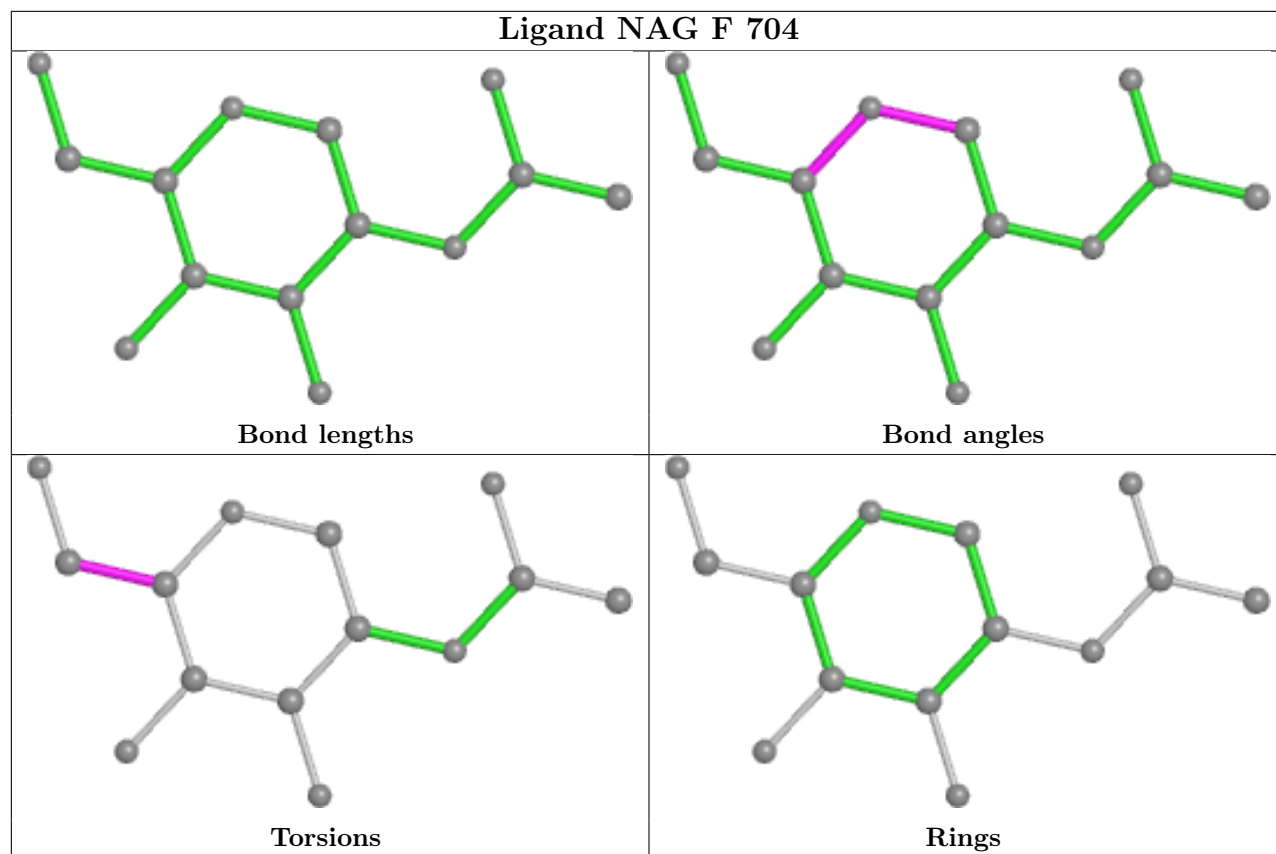


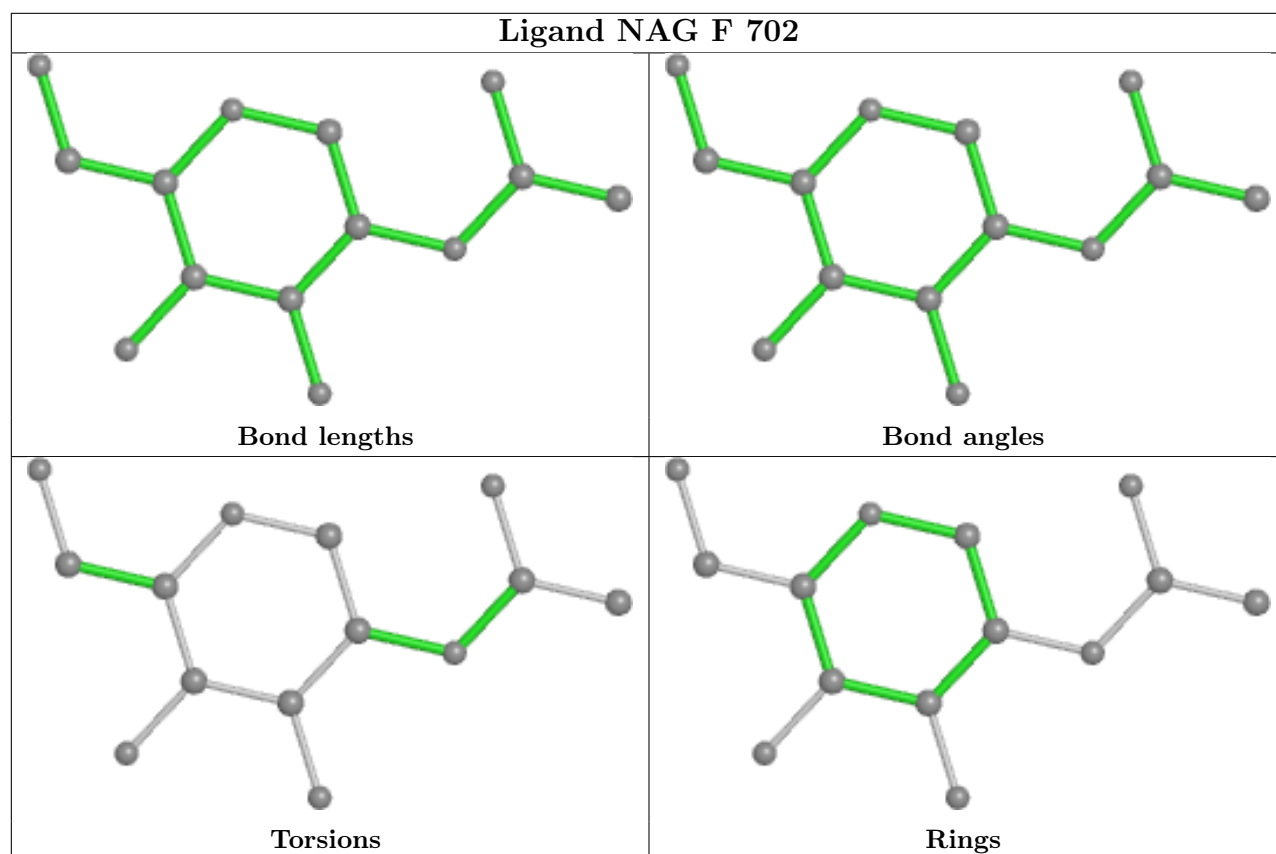
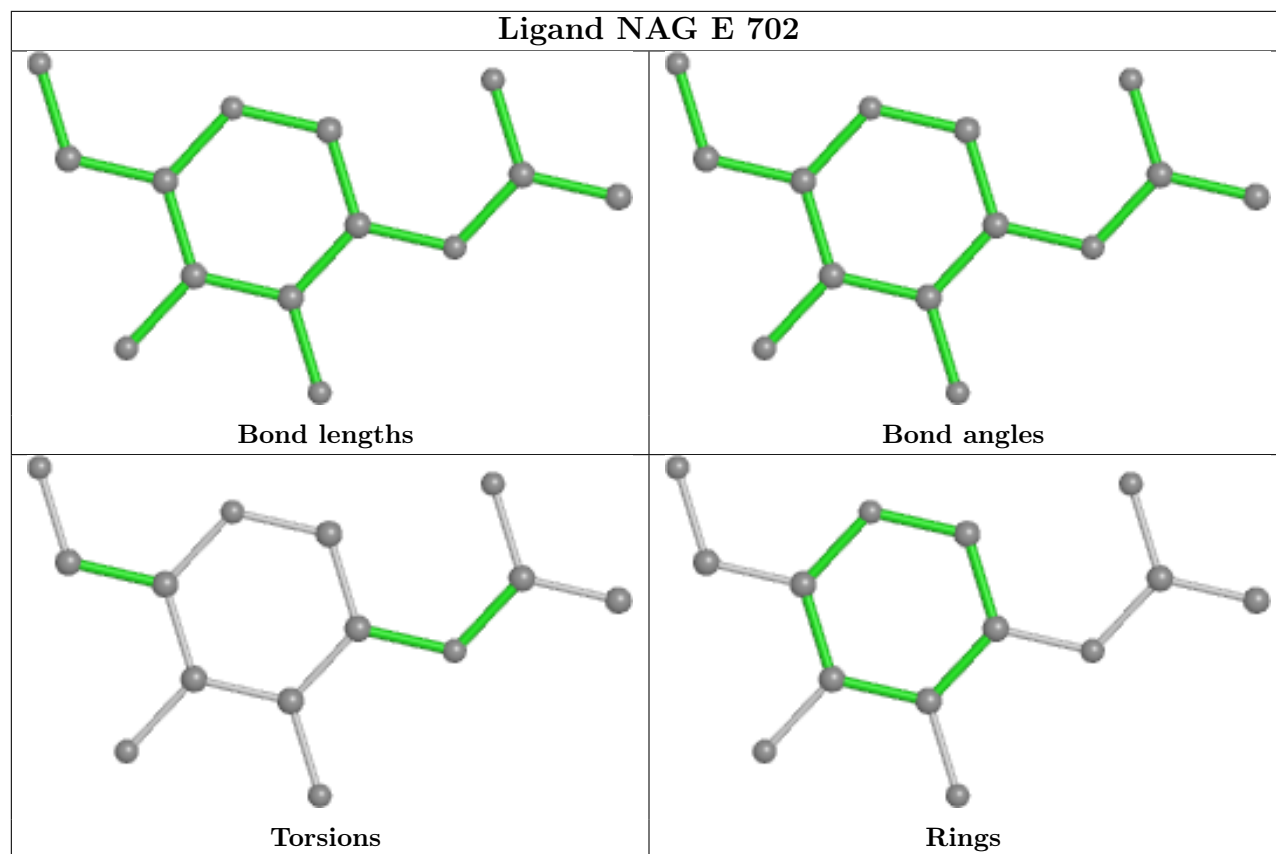


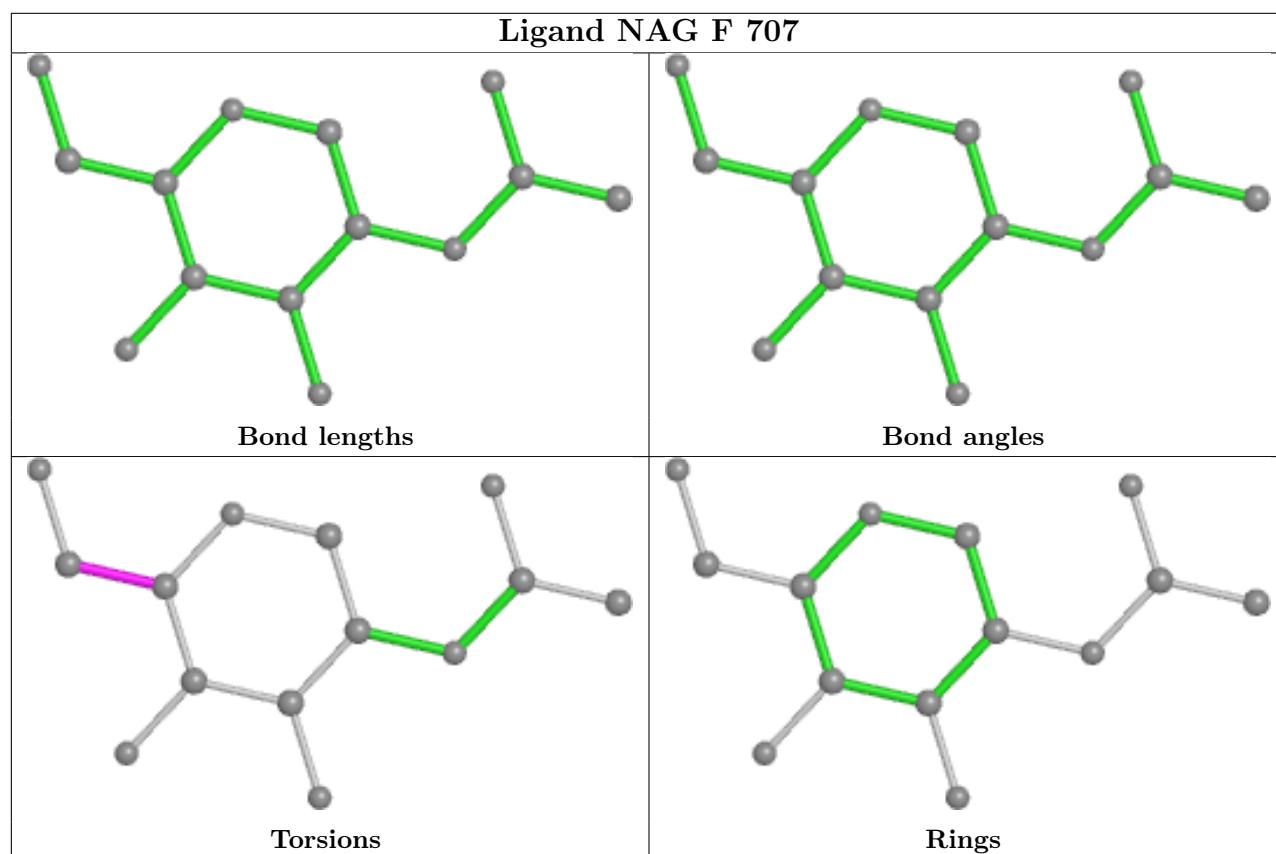
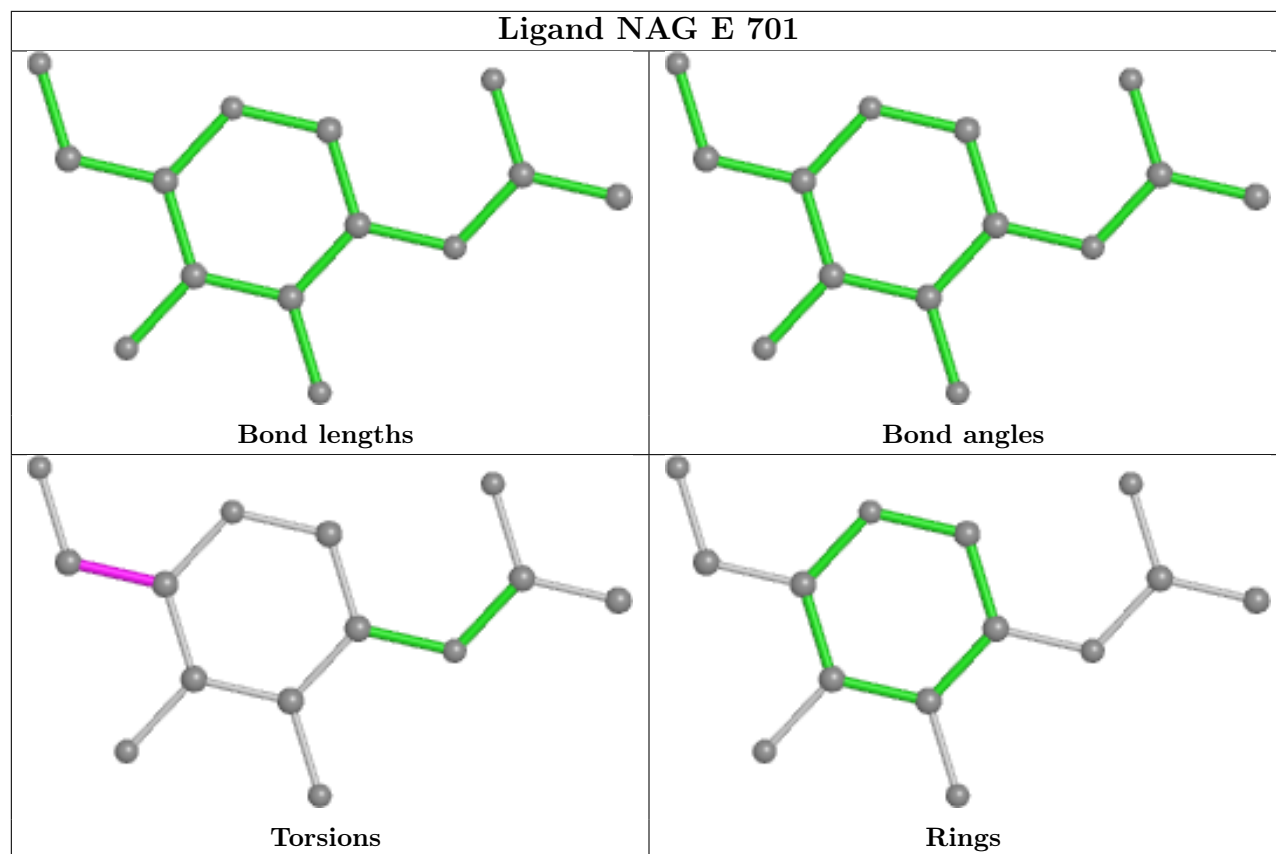












## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

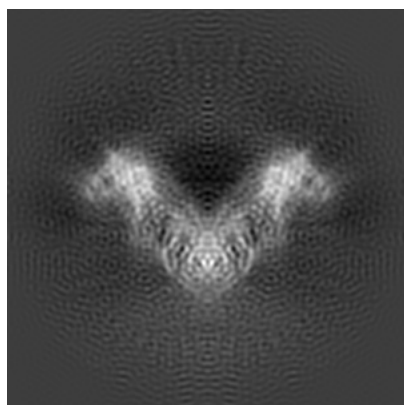
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-20572. These allow visual inspection of the internal detail of the map and identification of artifacts.

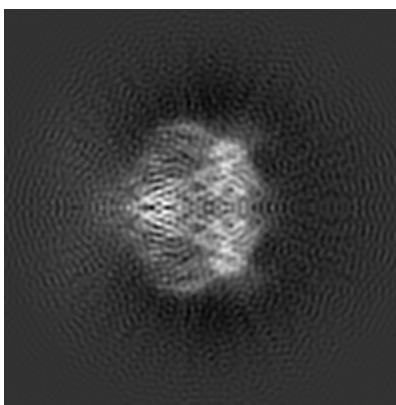
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

### 6.1 Orthogonal projections [i](#)

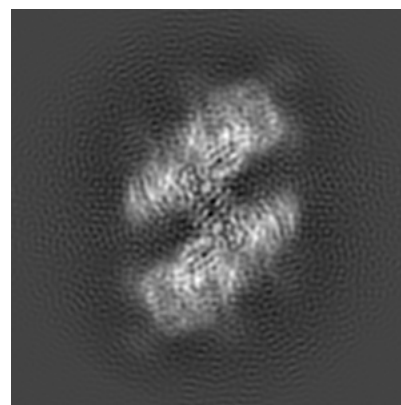
#### 6.1.1 Primary map



X



Y

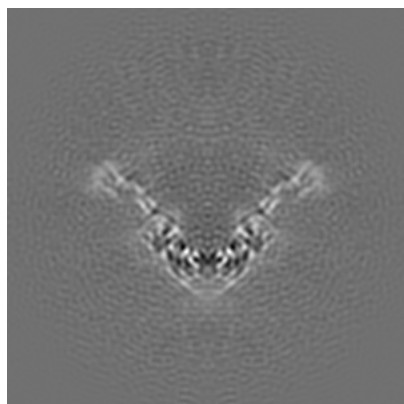


Z

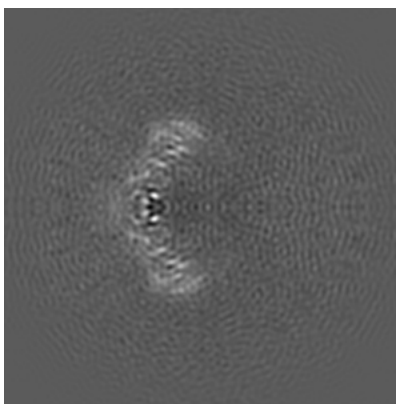
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

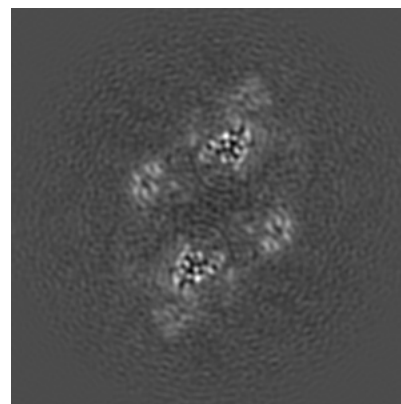
#### 6.2.1 Primary map



X Index: 120



Y Index: 120

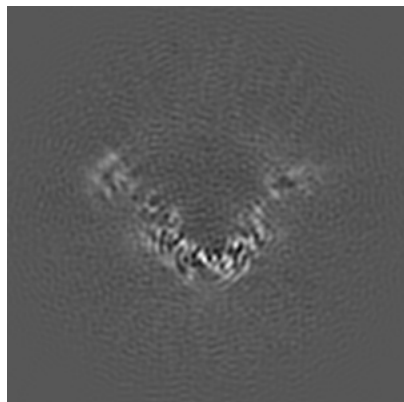


Z Index: 120

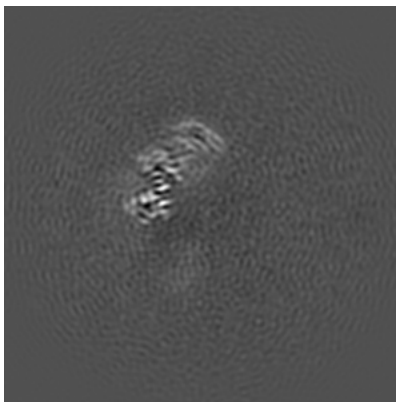
The images above show central slices of the map in three orthogonal directions.

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

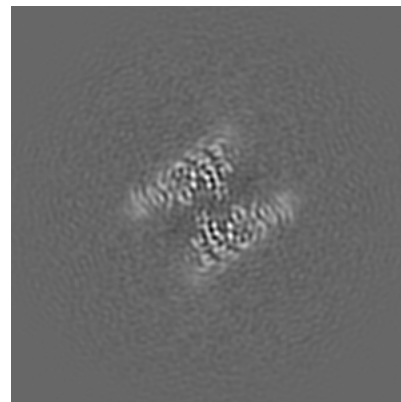
### 6.3.1 Primary map



X Index: 117



Y Index: 108



Z Index: 96

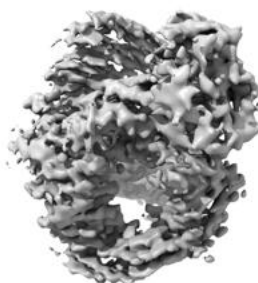
The images above show the largest variance slices of the map in three orthogonal directions.

## 6.4 Orthogonal surface views [i](#)

### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.036. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

## 6.5 Mask visualisation

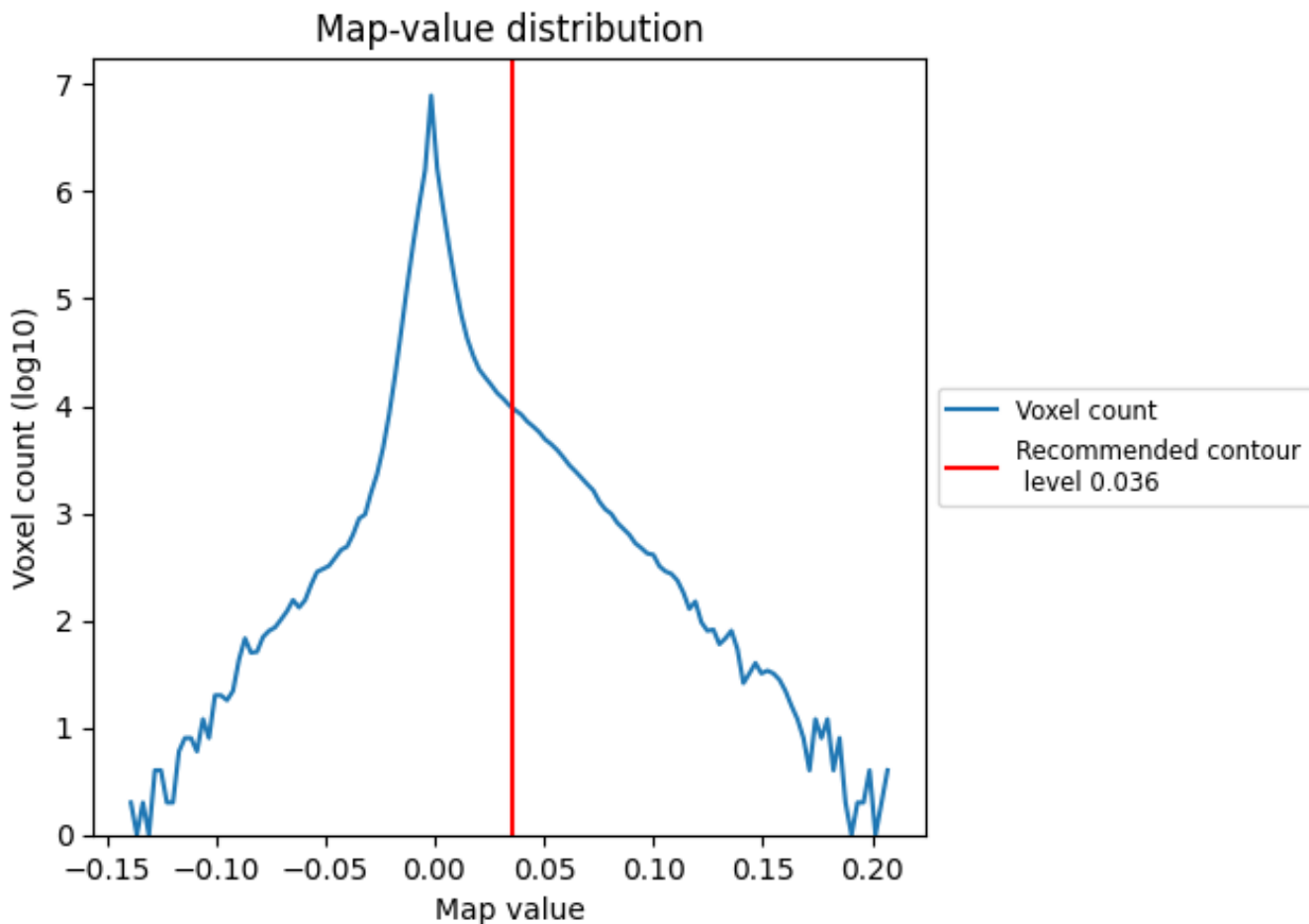
This section was not generated. No masks/segmentation were deposited.



## 7 Map analysis [i](#)

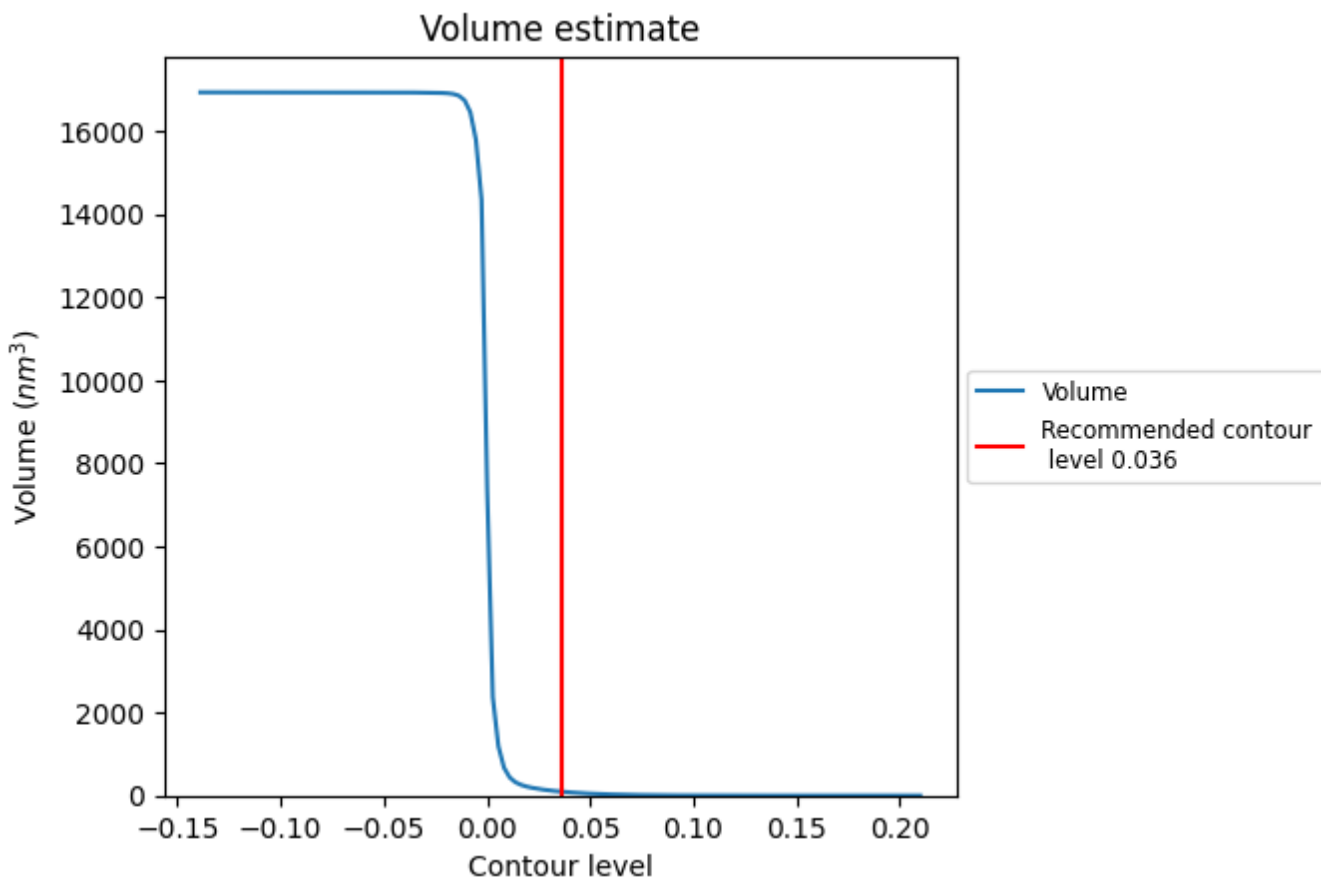
This section contains the results of statistical analysis of the map.

### 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.

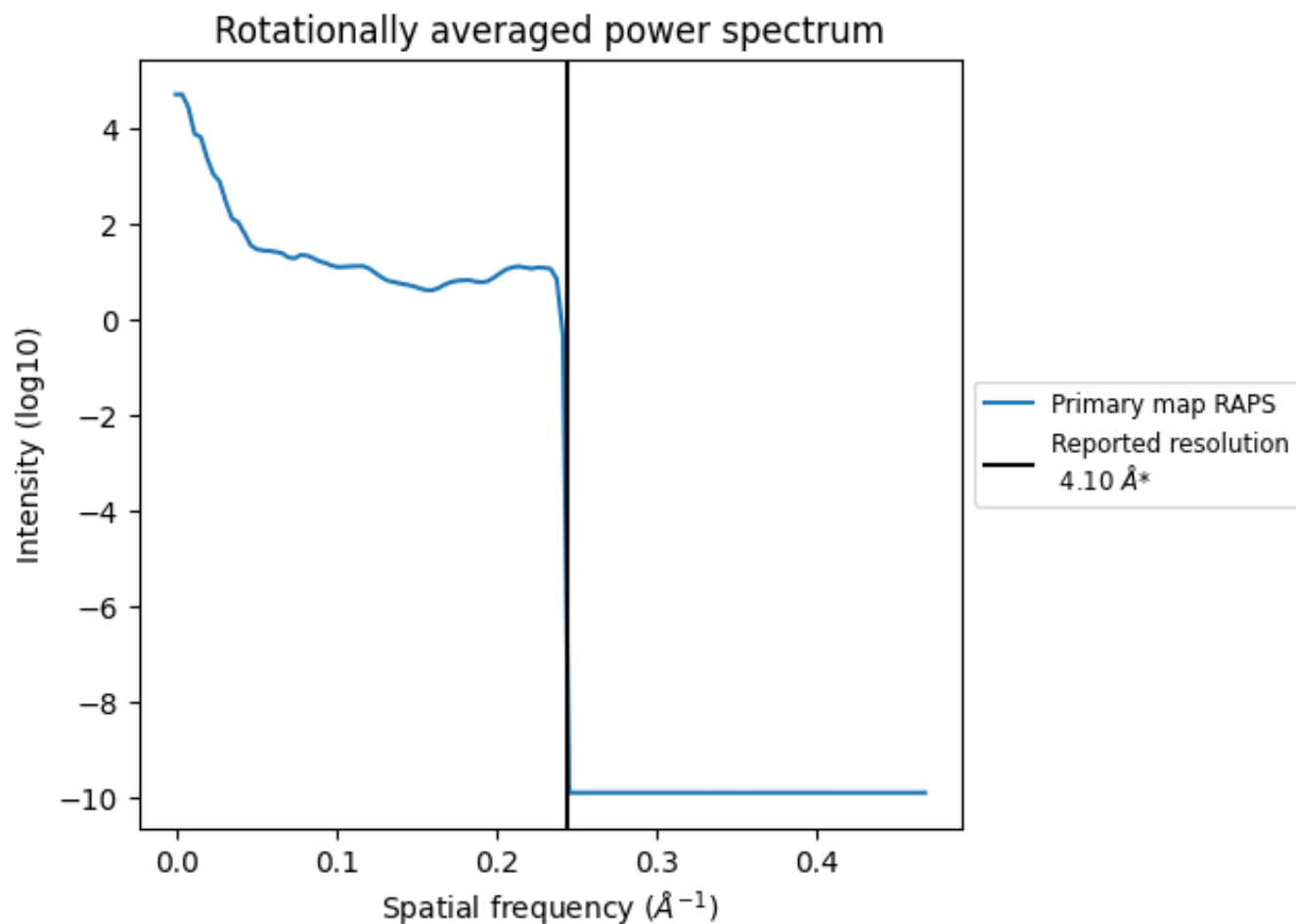
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 95 nm<sup>3</sup>; this corresponds to an approximate mass of 86 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 0.244 Å<sup>-1</sup>

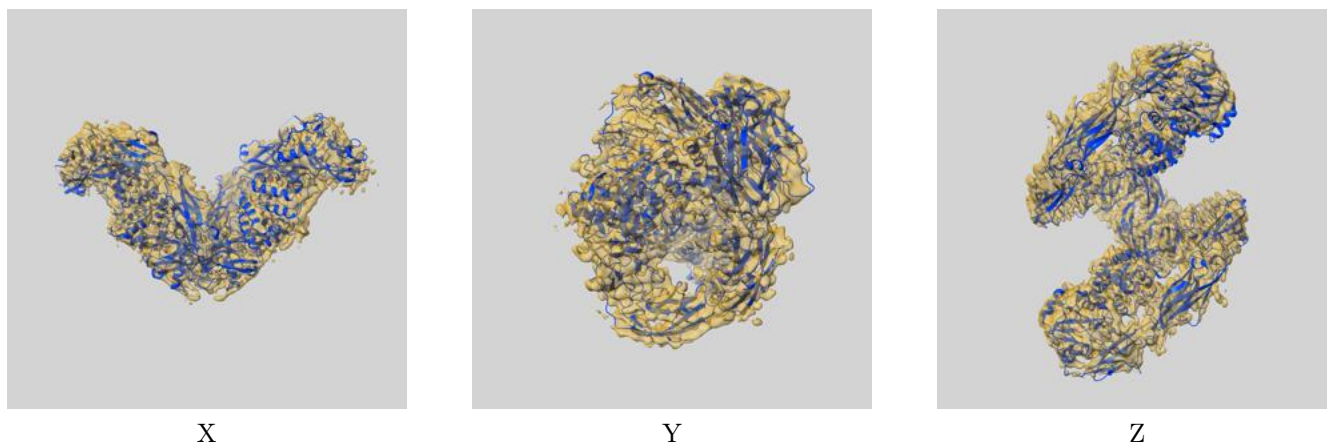
## 8 Fourier-Shell correlation

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

## 9 Map-model fit [i](#)

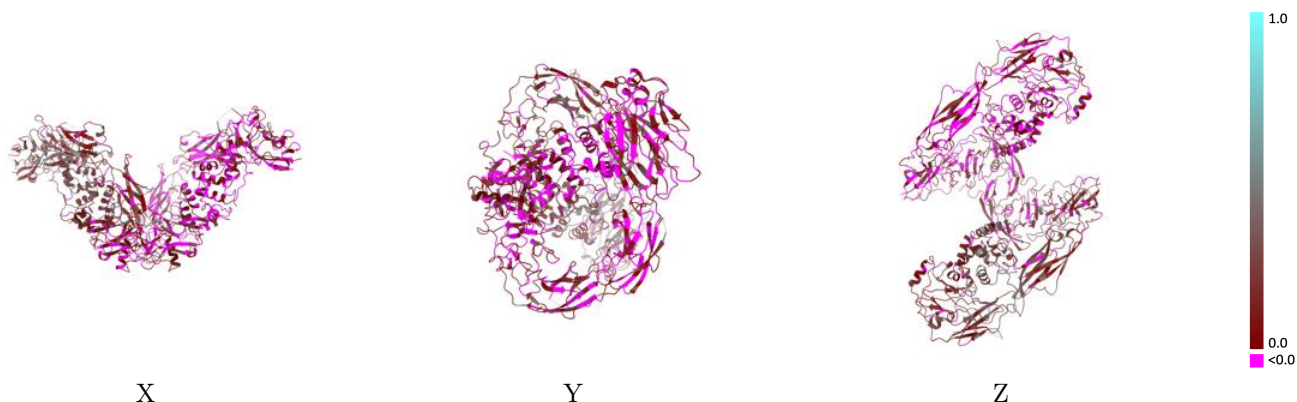
This section contains information regarding the fit between EMDB map EMD-20572 and PDB model 6Q2J. Per-residue inclusion information can be found in section 3 on page 8.

### 9.1 Map-model overlay [i](#)



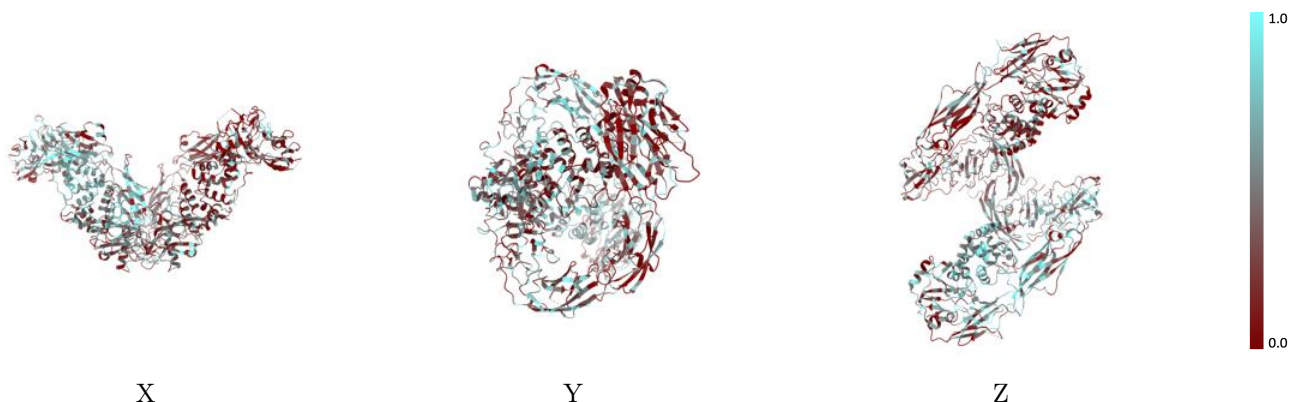
The images above show the 3D surface view of the map at the recommended contour level 0.036 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



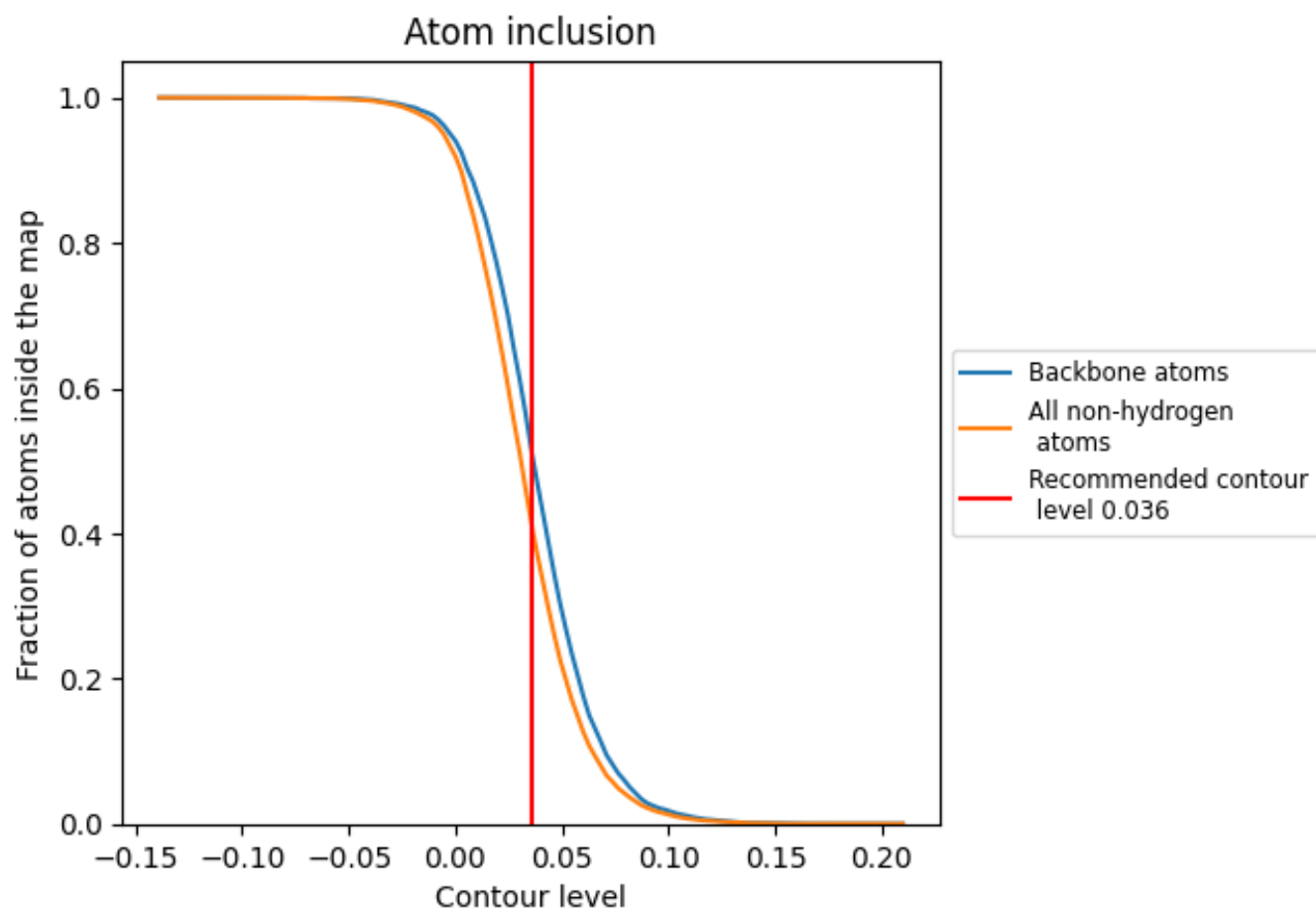
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.036).















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 51% of all backbone atoms, 41% 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 (0.036) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4080	 0.1110
A	 0.4086	 0.0640
B	 0.4383	 0.0510
C	 0.5568	 0.2230
D	 0.3008	 -0.0030
E	 0.4996	 0.2120
F	 0.2973	 0.0280

