



Full wwPDB EM Validation Report ⓘ

Jun 10, 2024 – 12:52 PM JST

PDB ID : 8WUX
EMDB ID : EMD-37863
Title : Cryo-EM structure of *H. thermophilus* GroEL-GroES bullet complex
Authors : Liao, Z.; Gopalasingam, C.C.; Kameya, M.; Gerle, C.; Shigematsu, H.; Ishii, M.; Arakawa, T.; Fushinobu, S.
Deposited on : 2023-10-21
Resolution : 2.60 Å(reported)
Based on initial model : 7pbj

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

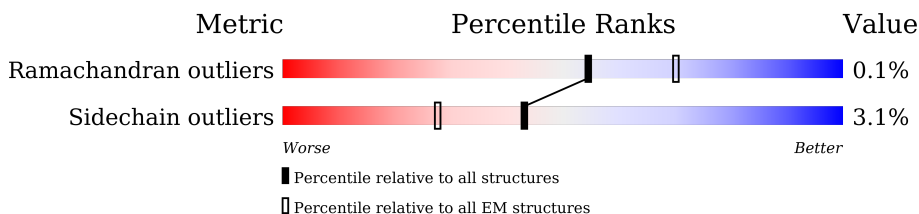
EMDB validation analysis : 0.0.1.dev92
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

1 Overall quality at a glance

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

The reported resolution of this entry is 2.60 Å.

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



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

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	529	96%
1	B	529	97%
1	C	529	97%
1	D	529	96%
1	E	529	96%
1	F	529	97%
1	G	529	96%
1	H	529	30% 99%
1	I	529	30% 99%

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Mol	Chain	Length	Quality of chain
1	J	529	<p>30% 98%</p>
1	K	529	<p>30% 99%</p>
1	L	529	<p>29% 98%</p>
1	M	529	<p>31% 99%</p>
1	N	529	<p>30% 99%</p>
2	a	94	<p>91% 9%</p>
2	b	94	<p>96%</p>
2	c	94	<p>95%</p>
2	d	94	<p>93% 7%</p>
2	e	94	<p>95% 5%</p>
2	f	94	<p>94% 6%</p>
2	g	94	<p>96%</p>

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 61026 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 Chaperonin GroEL.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	527	3954	2486	684	774	10	0	0
1	H	529	3968	2494	686	778	10	0	0
1	B	527	3954	2486	684	774	10	0	0
1	I	529	3968	2494	686	778	10	0	0
1	C	527	3954	2486	684	774	10	0	0
1	J	529	3968	2494	686	778	10	0	0
1	D	527	3954	2486	684	774	10	0	0
1	K	529	3968	2494	686	778	10	0	0
1	E	527	3954	2486	684	774	10	0	0
1	L	529	3968	2494	686	778	10	0	0
1	F	527	3954	2486	684	774	10	0	0
1	M	529	3968	2494	686	778	10	0	0
1	G	527	3954	2486	684	774	10	0	0
1	N	529	3968	2494	686	778	10	0	0

- Molecule 2 is a protein called Co-chaperonin GroES.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	a	94	731	466	121	142	2	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	b	94	731	466	121	142	2	0	0
2	c	94	731	466	121	142	2	0	0
2	d	94	731	466	121	142	2	0	0
2	e	94	731	466	121	142	2	0	0
2	f	94	731	466	121	142	2	0	0
2	g	94	731	466	121	142	2	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

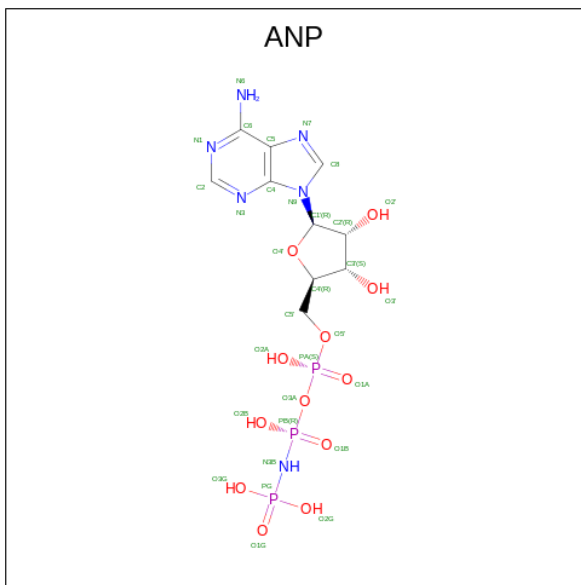
Mol	Chain	Residues	Atoms		AltConf
3	A	1	Total	Mg	0
			1	1	
3	H	1	Total	Mg	0
			1	1	
3	B	1	Total	Mg	0
			1	1	
3	I	1	Total	Mg	0
			1	1	
3	C	1	Total	Mg	0
			1	1	
3	J	1	Total	Mg	0
			1	1	
3	D	1	Total	Mg	0
			1	1	
3	K	1	Total	Mg	0
			1	1	
3	E	1	Total	Mg	0
			1	1	
3	L	1	Total	Mg	0
			1	1	
3	F	1	Total	Mg	0
			1	1	
3	M	1	Total	Mg	0
			1	1	
3	G	1	Total	Mg	0
			1	1	

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Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
3	N	1	1	1	0

- Molecule 4 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula: C₁₀H₁₇N₆O₁₂P₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf	
			Total	C	N	O	P		
4	A	1	Total	31	10	6	12	3	0
4	H	1	Total	31	10	6	12	3	0
4	B	1	Total	31	10	6	12	3	0
4	I	1	Total	31	10	6	12	3	0
4	C	1	Total	31	10	6	12	3	0
4	J	1	Total	31	10	6	12	3	0
4	D	1	Total	31	10	6	12	3	0
4	K	1	Total	31	10	6	12	3	0
4	E	1	Total	31	10	6	12	3	0
4	L	1	Total	31	10	6	12	3	0

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Mol	Chain	Residues	Atoms					AltConf
4	F	1	Total	C	N	O	P	0
			31	10	6	12	3	
4	M	1	Total	C	N	O	P	0
			31	10	6	12	3	
4	G	1	Total	C	N	O	P	0
			31	10	6	12	3	
4	N	1	Total	C	N	O	P	0
			31	10	6	12	3	

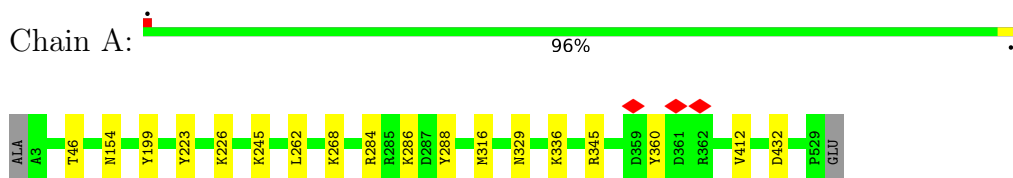
- Molecule 5 is POTASSIUM ION (three-letter code: K) (formula: K) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
5	H	1	Total	K	0
			1	1	
5	I	1	Total	K	0
			1	1	
5	J	1	Total	K	0
			1	1	
5	K	1	Total	K	0
			1	1	
5	L	1	Total	K	0
			1	1	
5	M	1	Total	K	0
			1	1	
5	N	1	Total	K	0
			1	1	

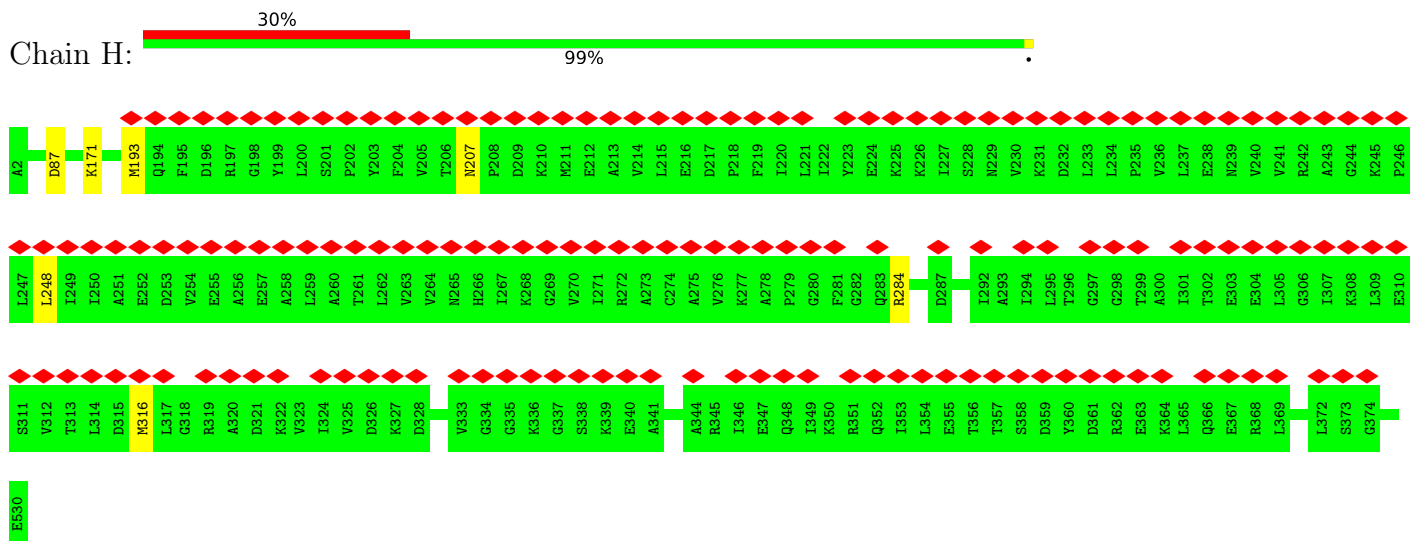
3 Residue-property plots

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.

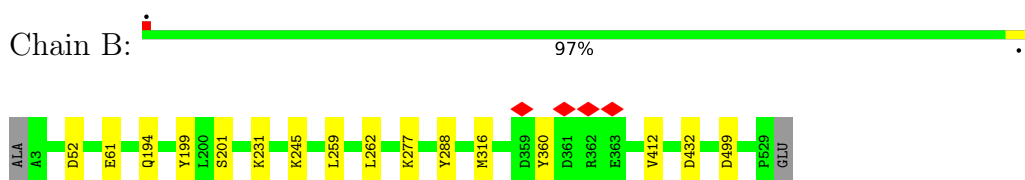
- Molecule 1: Chaperonin GroEL



- Molecule 1: Chaperonin GroEL

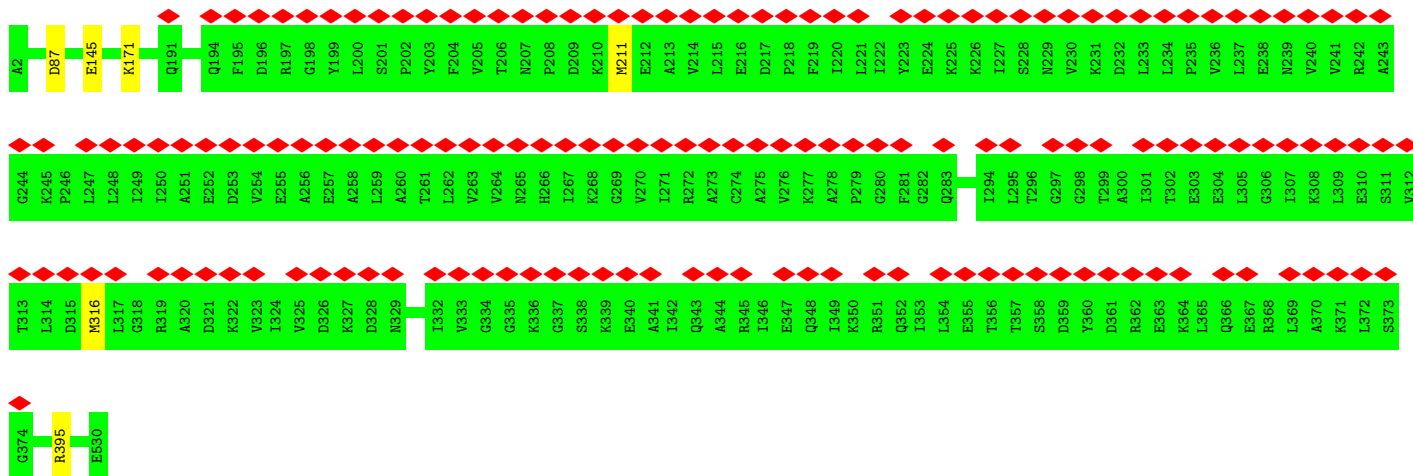


- Molecule 1: Chaperonin GroEL

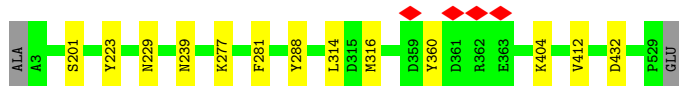


- Molecule 1: Chaperonin GroEL

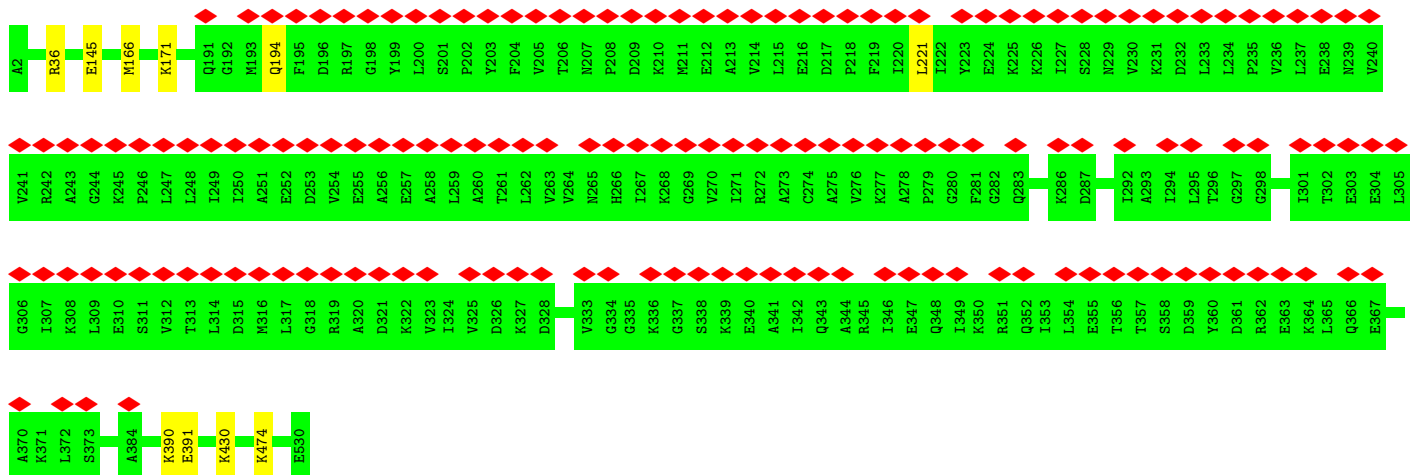




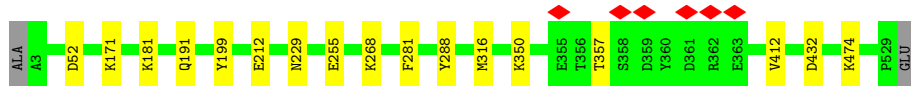
• Molecule 1: Chaperonin GroEL



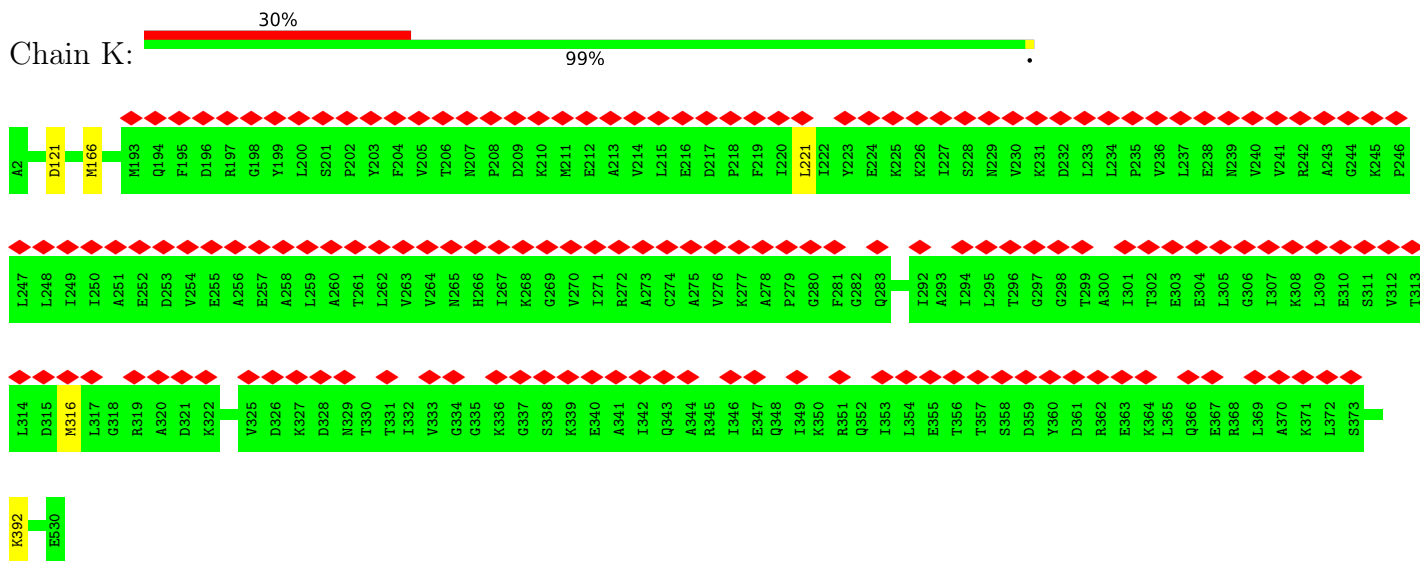
• Molecule 1: Chaperonin GroEL



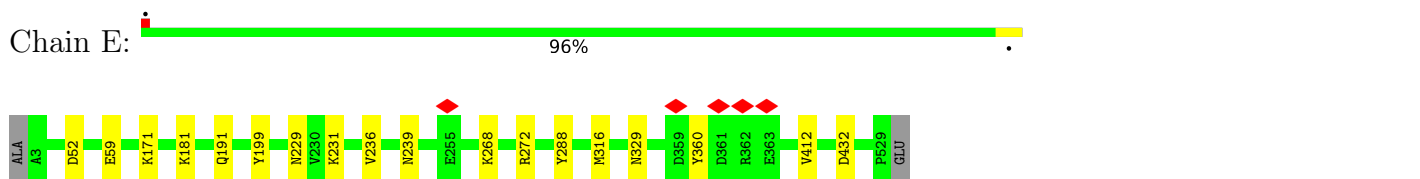
• Molecule 1: Chaperonin GroEL



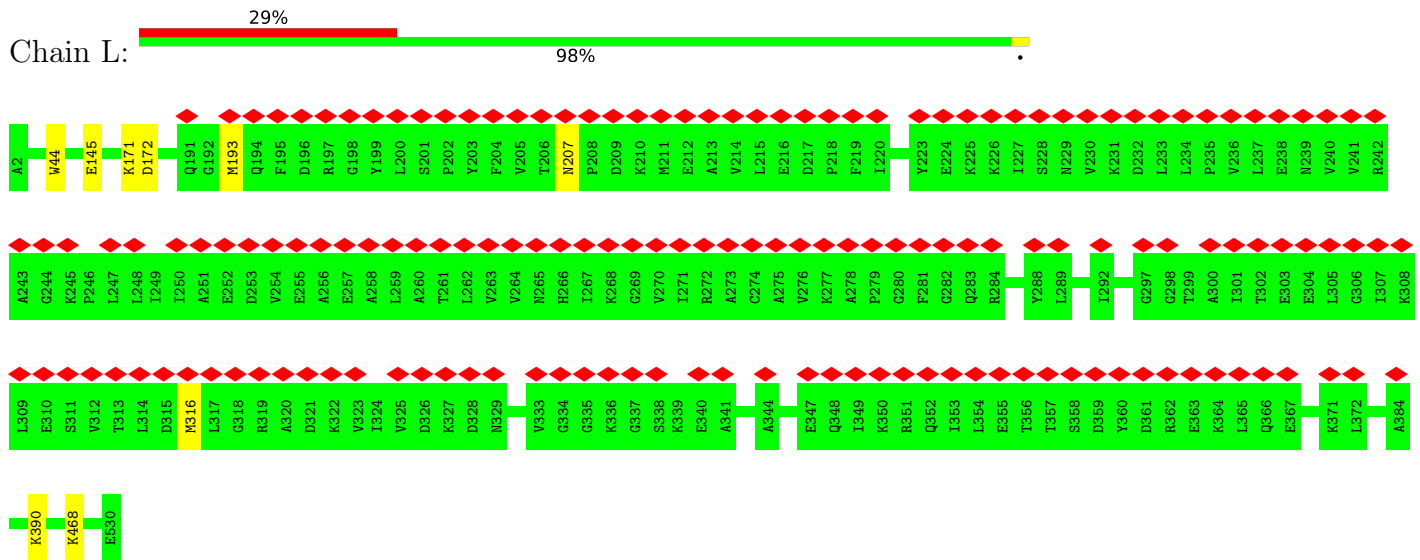
• Molecule 1: Chaperonin GroEL



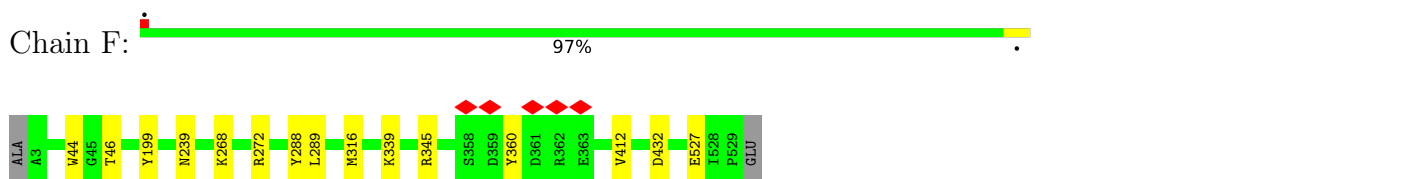
• Molecule 1: Chaperonin GroEL



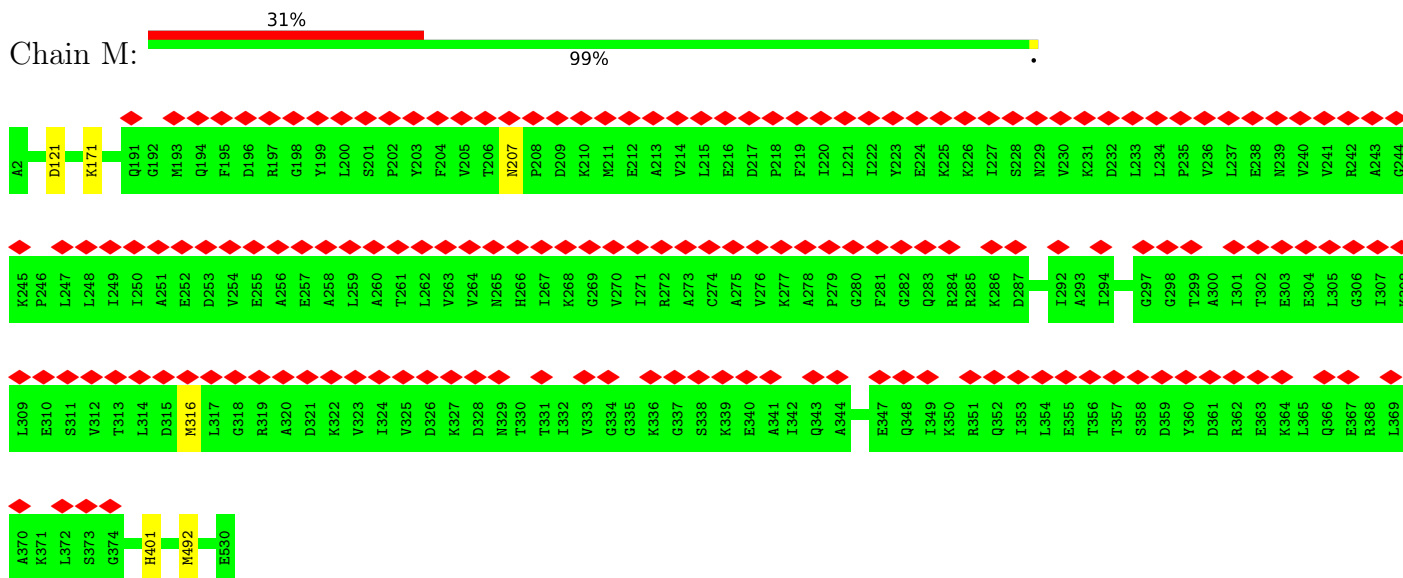
• Molecule 1: Chaperonin GroEL



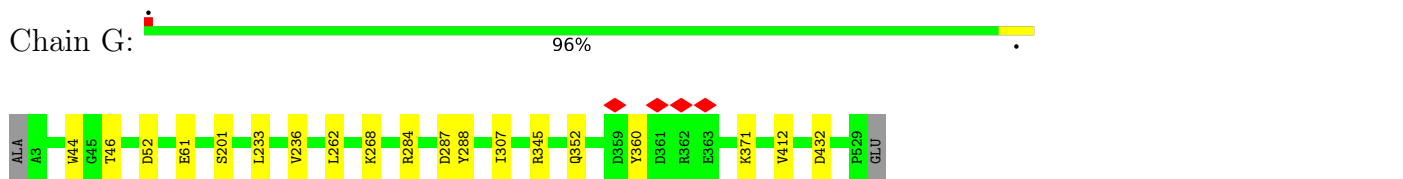
• Molecule 1: Chaperonin GroEL



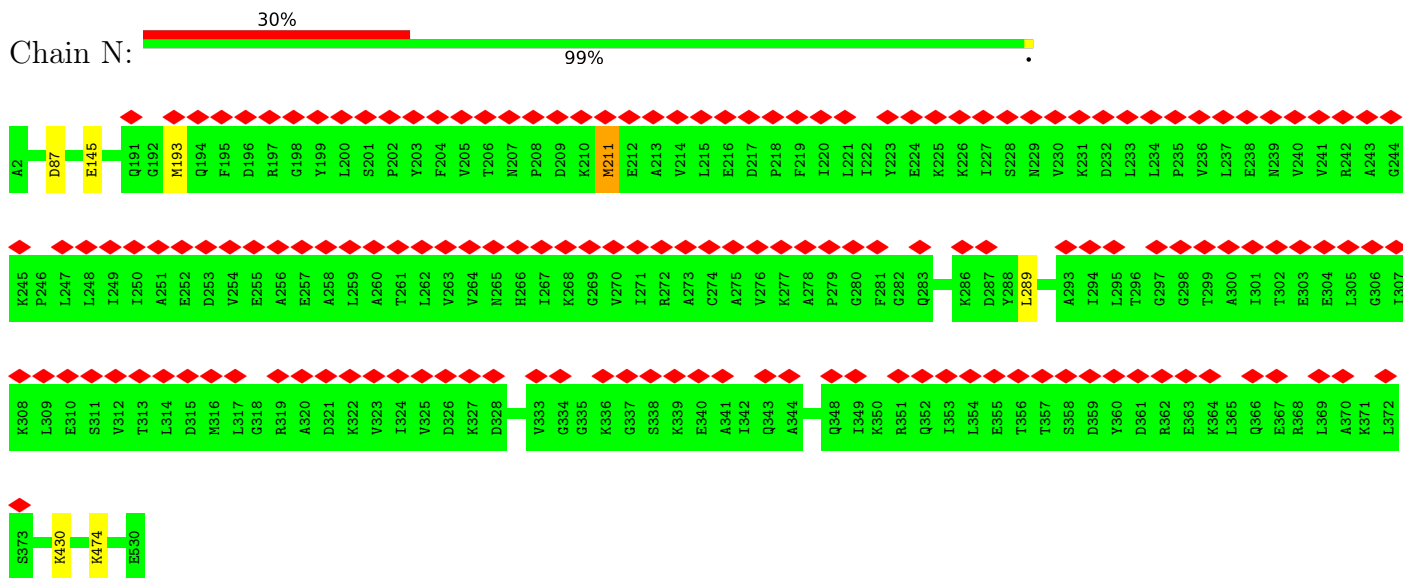
• Molecule 1: Chaperonin GroEL



• Molecule 1: Chaperonin GroEL



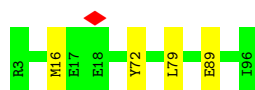
• Molecule 1: Chaperonin GroEL



• Molecule 2: Co-chaperonin GroES



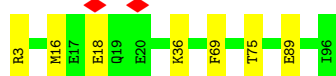
● Molecule 2: Co-chaperonin GroES

Chain b:  96%

● Molecule 2: Co-chaperonin GroES

Chain c:  95%

● Molecule 2: Co-chaperonin GroES

Chain d:  93% 7%

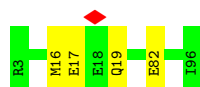
● Molecule 2: Co-chaperonin GroES

Chain e:  95% 5%

● Molecule 2: Co-chaperonin GroES

Chain f:  94% 6%

● Molecule 2: Co-chaperonin GroES

Chain g:  96%

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C7	Depositor
Number of particles used	20238	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	JEOL CRYO ARM 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	49.97	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	1600	Depositor
Magnification	60000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.580	Depositor
Minimum map value	-0.182	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.016	Depositor
Recommended contour level	0.0549	Depositor
Map size (Å)	385.024, 385.024, 385.024	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.752, 0.752, 0.752	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: MG, K, ANP

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	0.25	0/3991	0.52	0/5389
1	B	0.25	0/3991	0.51	0/5389
1	C	0.25	0/3991	0.50	0/5389
1	D	0.25	0/3991	0.51	0/5389
1	E	0.25	0/3991	0.50	0/5389
1	F	0.25	0/3991	0.51	0/5389
1	G	0.25	0/3991	0.50	1/5389 (0.0%)
1	H	0.24	0/4005	0.48	0/5408
1	I	0.24	0/4005	0.47	0/5408
1	J	0.25	0/4005	0.48	0/5408
1	K	0.24	0/4005	0.47	0/5408
1	L	0.24	0/4005	0.47	0/5408
1	M	0.24	0/4005	0.48	0/5408
1	N	0.24	0/4005	0.48	1/5408 (0.0%)
2	a	0.31	0/739	0.62	0/993
2	b	0.27	0/739	0.58	0/993
2	c	0.31	0/739	0.65	1/993 (0.1%)
2	d	0.31	0/739	0.64	0/993
2	e	0.29	0/739	0.58	0/993
2	f	0.29	0/739	0.59	0/993
2	g	0.27	0/739	0.58	0/993
All	All	0.25	0/61145	0.50	3/82530 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	c	76	GLU	CA-CB-CG	5.61	125.74	113.40
1	G	233	LEU	CA-CB-CG	5.08	127.00	115.30
1	N	211	MET	CA-CB-CG	5.04	121.86	113.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	525/529 (99%)	516 (98%)	9 (2%)	0	100	100
1	B	525/529 (99%)	518 (99%)	7 (1%)	0	100	100
1	C	525/529 (99%)	519 (99%)	6 (1%)	0	100	100
1	D	525/529 (99%)	518 (99%)	7 (1%)	0	100	100
1	E	525/529 (99%)	518 (99%)	7 (1%)	0	100	100
1	F	525/529 (99%)	519 (99%)	6 (1%)	0	100	100
1	G	525/529 (99%)	519 (99%)	5 (1%)	1 (0%)	47	71
1	H	527/529 (100%)	512 (97%)	14 (3%)	1 (0%)	47	71
1	I	527/529 (100%)	513 (97%)	14 (3%)	0	100	100
1	J	527/529 (100%)	516 (98%)	11 (2%)	0	100	100
1	K	527/529 (100%)	512 (97%)	15 (3%)	0	100	100
1	L	527/529 (100%)	513 (97%)	13 (2%)	1 (0%)	47	71
1	M	527/529 (100%)	512 (97%)	14 (3%)	1 (0%)	47	71
1	N	527/529 (100%)	511 (97%)	16 (3%)	0	100	100
2	a	92/94 (98%)	85 (92%)	6 (6%)	1 (1%)	14	30
2	b	92/94 (98%)	86 (94%)	6 (6%)	0	100	100
2	c	92/94 (98%)	85 (92%)	7 (8%)	0	100	100
2	d	92/94 (98%)	84 (91%)	8 (9%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	e	92/94 (98%)	87 (95%)	5 (5%)	0	100	100
2	f	92/94 (98%)	83 (90%)	9 (10%)	0	100	100
2	g	92/94 (98%)	85 (92%)	6 (6%)	1 (1%)	14	30
All	All	8008/8064 (99%)	7811 (98%)	191 (2%)	6 (0%)	54	75

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	H	207	ASN
1	L	207	ASN
1	M	207	ASN
2	g	17	GLU
2	a	71	LYS
1	G	307	ILE

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	417/418 (100%)	399 (96%)	18 (4%)	29	54
1	B	417/418 (100%)	401 (96%)	16 (4%)	33	59
1	C	417/418 (100%)	404 (97%)	13 (3%)	40	66
1	D	417/418 (100%)	400 (96%)	17 (4%)	30	56
1	E	417/418 (100%)	399 (96%)	18 (4%)	29	54
1	F	417/418 (100%)	402 (96%)	15 (4%)	35	61
1	G	417/418 (100%)	400 (96%)	17 (4%)	30	56
1	H	418/418 (100%)	412 (99%)	6 (1%)	67	85
1	I	418/418 (100%)	412 (99%)	6 (1%)	67	85
1	J	418/418 (100%)	408 (98%)	10 (2%)	49	74
1	K	418/418 (100%)	413 (99%)	5 (1%)	71	87
1	L	418/418 (100%)	410 (98%)	8 (2%)	57	79

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	M	418/418 (100%)	413 (99%)	5 (1%)	71	87
1	N	418/418 (100%)	411 (98%)	7 (2%)	60	81
2	a	82/82 (100%)	75 (92%)	7 (8%)	10	21
2	b	82/82 (100%)	78 (95%)	4 (5%)	25	48
2	c	82/82 (100%)	77 (94%)	5 (6%)	18	38
2	d	82/82 (100%)	75 (92%)	7 (8%)	10	21
2	e	82/82 (100%)	77 (94%)	5 (6%)	18	38
2	f	82/82 (100%)	76 (93%)	6 (7%)	14	28
2	g	82/82 (100%)	79 (96%)	3 (4%)	34	60
All	All	6419/6426 (100%)	6221 (97%)	198 (3%)	43	66

All (198) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	46	THR
1	A	154	ASN
1	A	199	TYR
1	A	223	TYR
1	A	226	LYS
1	A	245	LYS
1	A	262	LEU
1	A	268	LYS
1	A	284	ARG
1	A	286	LYS
1	A	288	TYR
1	A	316	MET
1	A	329	ASN
1	A	336	LYS
1	A	345	ARG
1	A	360	TYR
1	A	412	VAL
1	A	432	ASP
1	H	87	ASP
1	H	171	LYS
1	H	193	MET
1	H	248	LEU
1	H	284	ARG
1	H	316	MET
2	a	16	MET

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Mol	Chain	Res	Type
2	a	32	THR
2	a	66	LYS
2	a	72	TYR
2	a	76	GLU
2	a	78	GLU
2	a	89	GLU
1	B	52	ASP
1	B	61	GLU
1	B	194	GLN
1	B	199	TYR
1	B	201	SER
1	B	231	LYS
1	B	245	LYS
1	B	259	LEU
1	B	262	LEU
1	B	277	LYS
1	B	288	TYR
1	B	316	MET
1	B	360	TYR
1	B	412	VAL
1	B	432	ASP
1	B	499	ASP
1	I	87	ASP
1	I	145	GLU
1	I	171	LYS
1	I	211	MET
1	I	316	MET
1	I	395	ARG
2	b	16	MET
2	b	72	TYR
2	b	79	LEU
2	b	89	GLU
1	C	201	SER
1	C	223	TYR
1	C	229	ASN
1	C	239	ASN
1	C	277	LYS
1	C	281	PHE
1	C	288	TYR
1	C	314	LEU
1	C	316	MET
1	C	360	TYR

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Mol	Chain	Res	Type
1	C	404	LYS
1	C	412	VAL
1	C	432	ASP
1	J	36	ARG
1	J	145	GLU
1	J	166	MET
1	J	171	LYS
1	J	194	GLN
1	J	221	LEU
1	J	390	LYS
1	J	391	GLU
1	J	430	LYS
1	J	474	LYS
2	c	16	MET
2	c	66	LYS
2	c	69	PHE
2	c	76	GLU
2	c	85	LEU
1	D	52	ASP
1	D	171	LYS
1	D	181	LYS
1	D	191	GLN
1	D	199	TYR
1	D	212	GLU
1	D	229	ASN
1	D	255	GLU
1	D	268	LYS
1	D	281	PHE
1	D	288	TYR
1	D	316	MET
1	D	350	LYS
1	D	357	THR
1	D	412	VAL
1	D	432	ASP
1	D	474	LYS
1	K	121	ASP
1	K	166	MET
1	K	221	LEU
1	K	316	MET
1	K	392	LYS
2	d	3	ARG
2	d	16	MET

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Mol	Chain	Res	Type
2	d	18	GLU
2	d	36	LYS
2	d	69	PHE
2	d	75	THR
2	d	89	GLU
1	E	52	ASP
1	E	59	GLU
1	E	171	LYS
1	E	181	LYS
1	E	191	GLN
1	E	199	TYR
1	E	229	ASN
1	E	231	LYS
1	E	236	VAL
1	E	239	ASN
1	E	268	LYS
1	E	272	ARG
1	E	288	TYR
1	E	316	MET
1	E	329	ASN
1	E	360	TYR
1	E	412	VAL
1	E	432	ASP
1	L	44	TRP
1	L	145	GLU
1	L	171	LYS
1	L	172	ASP
1	L	193	MET
1	L	316	MET
1	L	390	LYS
1	L	468	LYS
2	e	16	MET
2	e	17	GLU
2	e	49	LYS
2	e	69	PHE
2	e	72	TYR
1	F	44	TRP
1	F	46	THR
1	F	199	TYR
1	F	239	ASN
1	F	268	LYS
1	F	272	ARG

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Mol	Chain	Res	Type
1	F	288	TYR
1	F	289	LEU
1	F	316	MET
1	F	339	LYS
1	F	345	ARG
1	F	360	TYR
1	F	412	VAL
1	F	432	ASP
1	F	527	GLU
1	M	121	ASP
1	M	171	LYS
1	M	316	MET
1	M	401	HIS
1	M	492	MET
2	f	16	MET
2	f	36	LYS
2	f	60	LYS
2	f	65	ASP
2	f	82	GLU
2	f	87	MET
1	G	44	TRP
1	G	46	THR
1	G	52	ASP
1	G	61	GLU
1	G	201	SER
1	G	236	VAL
1	G	262	LEU
1	G	268	LYS
1	G	284	ARG
1	G	287	ASP
1	G	288	TYR
1	G	345	ARG
1	G	352	GLN
1	G	360	TYR
1	G	371	LYS
1	G	412	VAL
1	G	432	ASP
1	N	87	ASP
1	N	145	GLU
1	N	193	MET
1	N	211	MET
1	N	289	LEU

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Mol	Chain	Res	Type
1	N	430	LYS
1	N	474	LYS
2	g	16	MET
2	g	19	GLN
2	g	82	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	239	ASN
1	A	348	GLN
1	B	329	ASN
2	e	21	GLN
2	g	21	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 35 ligands modelled in this entry, 21 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	ANP	B	602	3	29,33,33	2.42	6 (20%)	31,52,52	1.51	3 (9%)
4	ANP	F	602	3	29,33,33	2.42	6 (20%)	31,52,52	1.50	3 (9%)
4	ANP	M	603	5,3	29,33,33	2.41	6 (20%)	31,52,52	1.56	5 (16%)
4	ANP	G	602	3	29,33,33	2.43	6 (20%)	31,52,52	1.50	3 (9%)
4	ANP	E	602	3	29,33,33	2.42	6 (20%)	31,52,52	1.49	3 (9%)
4	ANP	J	603	5,3	29,33,33	2.44	6 (20%)	31,52,52	1.56	5 (16%)
4	ANP	H	603	5,3	29,33,33	2.43	6 (20%)	31,52,52	1.54	5 (16%)
4	ANP	L	603	5,3	29,33,33	2.43	6 (20%)	31,52,52	1.56	5 (16%)
4	ANP	C	602	3	29,33,33	2.40	6 (20%)	31,52,52	1.56	4 (12%)
4	ANP	K	603	5,3	29,33,33	2.43	6 (20%)	31,52,52	1.57	5 (16%)
4	ANP	A	602	3	29,33,33	2.43	6 (20%)	31,52,52	1.49	3 (9%)
4	ANP	N	603	5,3	29,33,33	2.43	6 (20%)	31,52,52	1.56	5 (16%)
4	ANP	D	602	3	29,33,33	2.44	6 (20%)	31,52,52	1.47	3 (9%)
4	ANP	I	603	5,3	29,33,33	2.43	6 (20%)	31,52,52	1.55	5 (16%)

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	ANP	B	602	3	-	3/14/38/38	0/3/3/3
4	ANP	F	602	3	-	2/14/38/38	0/3/3/3
4	ANP	M	603	5,3	-	1/14/38/38	0/3/3/3
4	ANP	G	602	3	-	2/14/38/38	0/3/3/3
4	ANP	E	602	3	-	2/14/38/38	0/3/3/3
4	ANP	J	603	5,3	-	2/14/38/38	0/3/3/3
4	ANP	H	603	5,3	-	2/14/38/38	0/3/3/3
4	ANP	L	603	5,3	-	1/14/38/38	0/3/3/3
4	ANP	C	602	3	-	1/14/38/38	0/3/3/3
4	ANP	K	603	5,3	-	1/14/38/38	0/3/3/3
4	ANP	A	602	3	-	1/14/38/38	0/3/3/3
4	ANP	N	603	5,3	-	2/14/38/38	0/3/3/3
4	ANP	D	602	3	-	1/14/38/38	0/3/3/3
4	ANP	I	603	5,3	-	2/14/38/38	0/3/3/3

All (84) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	602	ANP	PB-O3A	8.71	1.70	1.59
4	I	603	ANP	PB-O3A	8.68	1.70	1.59
4	G	602	ANP	PB-O3A	8.67	1.70	1.59
4	B	602	ANP	PB-O3A	8.67	1.70	1.59
4	A	602	ANP	PB-O3A	8.67	1.70	1.59
4	K	603	ANP	PB-O3A	8.66	1.70	1.59
4	H	603	ANP	PB-O3A	8.64	1.70	1.59
4	J	603	ANP	PB-O3A	8.64	1.70	1.59
4	E	602	ANP	PB-O3A	8.63	1.69	1.59
4	F	602	ANP	PB-O3A	8.62	1.69	1.59
4	N	603	ANP	PB-O3A	8.62	1.69	1.59
4	L	603	ANP	PB-O3A	8.61	1.69	1.59
4	M	603	ANP	PB-O3A	8.55	1.69	1.59
4	C	602	ANP	PB-O3A	8.50	1.69	1.59
4	D	602	ANP	PG-N3B	6.26	1.79	1.63
4	J	603	ANP	PG-N3B	6.24	1.79	1.63
4	N	603	ANP	PG-N3B	6.23	1.79	1.63
4	K	603	ANP	PG-N3B	6.22	1.79	1.63
4	H	603	ANP	PG-N3B	6.22	1.79	1.63
4	G	602	ANP	PG-N3B	6.21	1.79	1.63
4	E	602	ANP	PG-N3B	6.21	1.79	1.63
4	A	602	ANP	PG-N3B	6.21	1.79	1.63
4	I	603	ANP	PG-N3B	6.20	1.79	1.63
4	M	603	ANP	PG-N3B	6.20	1.79	1.63
4	C	602	ANP	PG-N3B	6.18	1.79	1.63
4	L	603	ANP	PG-N3B	6.18	1.79	1.63
4	F	602	ANP	PG-N3B	6.17	1.79	1.63
4	B	602	ANP	PG-N3B	6.17	1.79	1.63
4	L	603	ANP	PG-O1G	4.54	1.53	1.46
4	J	603	ANP	PG-O1G	4.54	1.53	1.46
4	I	603	ANP	PG-O1G	4.52	1.53	1.46
4	K	603	ANP	PG-O1G	4.51	1.53	1.46
4	N	603	ANP	PG-O1G	4.51	1.53	1.46
4	H	603	ANP	PG-O1G	4.49	1.53	1.46
4	M	603	ANP	PG-O1G	4.48	1.53	1.46
4	A	602	ANP	PG-O1G	4.47	1.53	1.46
4	G	602	ANP	PG-O1G	4.46	1.53	1.46
4	D	602	ANP	PG-O1G	4.45	1.53	1.46
4	E	602	ANP	PG-O1G	4.45	1.53	1.46
4	B	602	ANP	PG-O1G	4.44	1.53	1.46
4	C	602	ANP	PG-O1G	4.42	1.53	1.46
4	F	602	ANP	PG-O1G	4.40	1.53	1.46
4	J	603	ANP	PB-O1B	2.68	1.50	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	N	603	ANP	PB-O1B	2.68	1.50	1.46
4	I	603	ANP	PB-O1B	2.64	1.50	1.46
4	H	603	ANP	PB-O1B	2.63	1.50	1.46
4	C	602	ANP	PB-O1B	2.62	1.50	1.46
4	L	603	ANP	PB-O1B	2.62	1.50	1.46
4	M	603	ANP	PB-O1B	2.62	1.50	1.46
4	A	602	ANP	PB-O1B	2.60	1.50	1.46
4	F	602	ANP	PB-O1B	2.59	1.50	1.46
4	K	603	ANP	PB-O1B	2.58	1.50	1.46
4	D	602	ANP	PB-O1B	2.55	1.50	1.46
4	G	602	ANP	PB-O1B	2.55	1.50	1.46
4	B	602	ANP	PB-O1B	2.53	1.50	1.46
4	E	602	ANP	PB-O1B	2.48	1.50	1.46
4	A	602	ANP	C8-N7	-2.39	1.30	1.34
4	C	602	ANP	C8-N7	-2.39	1.30	1.34
4	E	602	ANP	C8-N7	-2.37	1.30	1.34
4	F	602	ANP	C8-N7	-2.35	1.30	1.34
4	N	603	ANP	C8-N7	-2.35	1.30	1.34
4	G	602	ANP	C8-N7	-2.35	1.30	1.34
4	K	603	ANP	C8-N7	-2.35	1.30	1.34
4	J	603	ANP	C8-N7	-2.35	1.30	1.34
4	I	603	ANP	C8-N7	-2.35	1.30	1.34
4	M	603	ANP	C8-N7	-2.34	1.30	1.34
4	D	602	ANP	C8-N7	-2.33	1.30	1.34
4	B	602	ANP	C8-N7	-2.33	1.30	1.34
4	L	603	ANP	C8-N7	-2.32	1.30	1.34
4	H	603	ANP	C8-N7	-2.30	1.30	1.34
4	A	602	ANP	PB-O2B	-2.19	1.50	1.56
4	G	602	ANP	PB-O2B	-2.18	1.50	1.56
4	J	603	ANP	PB-O2B	-2.18	1.50	1.56
4	I	603	ANP	PB-O2B	-2.17	1.50	1.56
4	N	603	ANP	PB-O2B	-2.17	1.50	1.56
4	D	602	ANP	PB-O2B	-2.16	1.50	1.56
4	E	602	ANP	PB-O2B	-2.16	1.50	1.56
4	F	602	ANP	PB-O2B	-2.16	1.50	1.56
4	C	602	ANP	PB-O2B	-2.15	1.51	1.56
4	K	603	ANP	PB-O2B	-2.15	1.51	1.56
4	B	602	ANP	PB-O2B	-2.14	1.51	1.56
4	H	603	ANP	PB-O2B	-2.14	1.51	1.56
4	L	603	ANP	PB-O2B	-2.13	1.51	1.56
4	M	603	ANP	PB-O2B	-2.13	1.51	1.56

All (57) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	K	603	ANP	O2B-PB-O1B	5.11	120.63	109.92
4	C	602	ANP	O2B-PB-O1B	5.09	120.60	109.92
4	J	603	ANP	O2B-PB-O1B	5.09	120.59	109.92
4	L	603	ANP	O2B-PB-O1B	5.08	120.58	109.92
4	M	603	ANP	O2B-PB-O1B	5.08	120.57	109.92
4	N	603	ANP	O2B-PB-O1B	5.08	120.56	109.92
4	I	603	ANP	O2B-PB-O1B	5.07	120.56	109.92
4	H	603	ANP	O2B-PB-O1B	5.06	120.53	109.92
4	F	602	ANP	O2B-PB-O1B	5.03	120.47	109.92
4	B	602	ANP	O2B-PB-O1B	5.02	120.45	109.92
4	G	602	ANP	O2B-PB-O1B	4.99	120.38	109.92
4	A	602	ANP	O2B-PB-O1B	4.94	120.28	109.92
4	E	602	ANP	O2B-PB-O1B	4.89	120.17	109.92
4	D	602	ANP	O2B-PB-O1B	4.82	120.03	109.92
4	C	602	ANP	O1G-PG-N3B	-3.76	106.23	111.77
4	N	603	ANP	O1G-PG-N3B	-3.75	106.25	111.77
4	K	603	ANP	O1G-PG-N3B	-3.74	106.26	111.77
4	J	603	ANP	O1G-PG-N3B	-3.72	106.29	111.77
4	I	603	ANP	O1G-PG-N3B	-3.70	106.33	111.77
4	L	603	ANP	O1G-PG-N3B	-3.69	106.33	111.77
4	M	603	ANP	O1G-PG-N3B	-3.69	106.34	111.77
4	H	603	ANP	O1G-PG-N3B	-3.60	106.47	111.77
4	D	602	ANP	O1G-PG-N3B	-3.59	106.48	111.77
4	F	602	ANP	O1G-PG-N3B	-3.59	106.48	111.77
4	A	602	ANP	O1G-PG-N3B	-3.57	106.51	111.77
4	E	602	ANP	O1G-PG-N3B	-3.56	106.52	111.77
4	B	602	ANP	O1G-PG-N3B	-3.56	106.53	111.77
4	G	602	ANP	O1G-PG-N3B	-3.54	106.56	111.77
4	C	602	ANP	O2G-PG-O3G	2.70	114.83	107.64
4	L	603	ANP	O2G-PG-O3G	2.69	114.81	107.64
4	K	603	ANP	O2G-PG-O3G	2.69	114.79	107.64
4	I	603	ANP	O2G-PG-O3G	2.68	114.78	107.64
4	J	603	ANP	O2G-PG-O3G	2.68	114.78	107.64
4	N	603	ANP	O2G-PG-O3G	2.66	114.72	107.64
4	H	603	ANP	O2G-PG-O3G	2.65	114.70	107.64
4	M	603	ANP	O2G-PG-O3G	2.65	114.69	107.64
4	B	602	ANP	O2G-PG-O3G	2.55	114.43	107.64
4	F	602	ANP	O2G-PG-O3G	2.54	114.40	107.64
4	E	602	ANP	O2G-PG-O3G	2.54	114.40	107.64
4	G	602	ANP	O2G-PG-O3G	2.54	114.40	107.64
4	A	602	ANP	O2G-PG-O3G	2.52	114.36	107.64
4	D	602	ANP	O2G-PG-O3G	2.50	114.28	107.64
4	C	602	ANP	PB-O3A-PA	-2.25	124.68	132.62

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	M	603	ANP	PB-O3A-PA	-2.23	124.75	132.62
4	K	603	ANP	O3A-PB-N3B	-2.23	100.41	106.59
4	K	603	ANP	PB-O3A-PA	-2.23	124.77	132.62
4	L	603	ANP	O3A-PB-N3B	-2.22	100.43	106.59
4	L	603	ANP	PB-O3A-PA	-2.22	124.80	132.62
4	M	603	ANP	O3A-PB-N3B	-2.18	100.53	106.59
4	J	603	ANP	O3A-PB-N3B	-2.18	100.55	106.59
4	N	603	ANP	PB-O3A-PA	-2.17	124.96	132.62
4	J	603	ANP	PB-O3A-PA	-2.17	124.99	132.62
4	I	603	ANP	O3A-PB-N3B	-2.14	100.64	106.59
4	N	603	ANP	O3A-PB-N3B	-2.14	100.64	106.59
4	H	603	ANP	O3A-PB-N3B	-2.14	100.65	106.59
4	I	603	ANP	PB-O3A-PA	-2.12	125.13	132.62
4	H	603	ANP	PB-O3A-PA	-2.11	125.18	132.62

There are no chirality outliers.

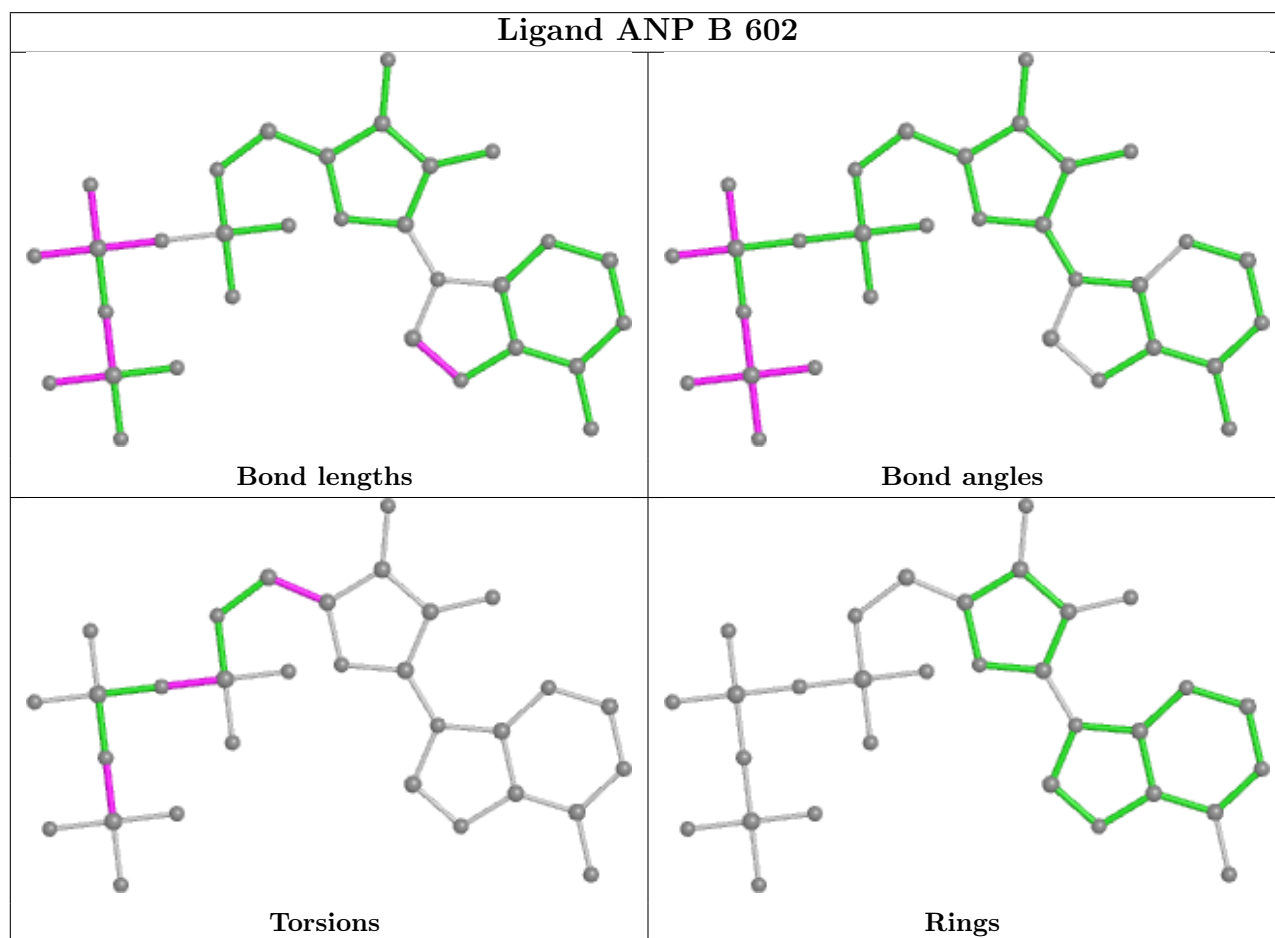
All (23) torsion outliers are listed below:

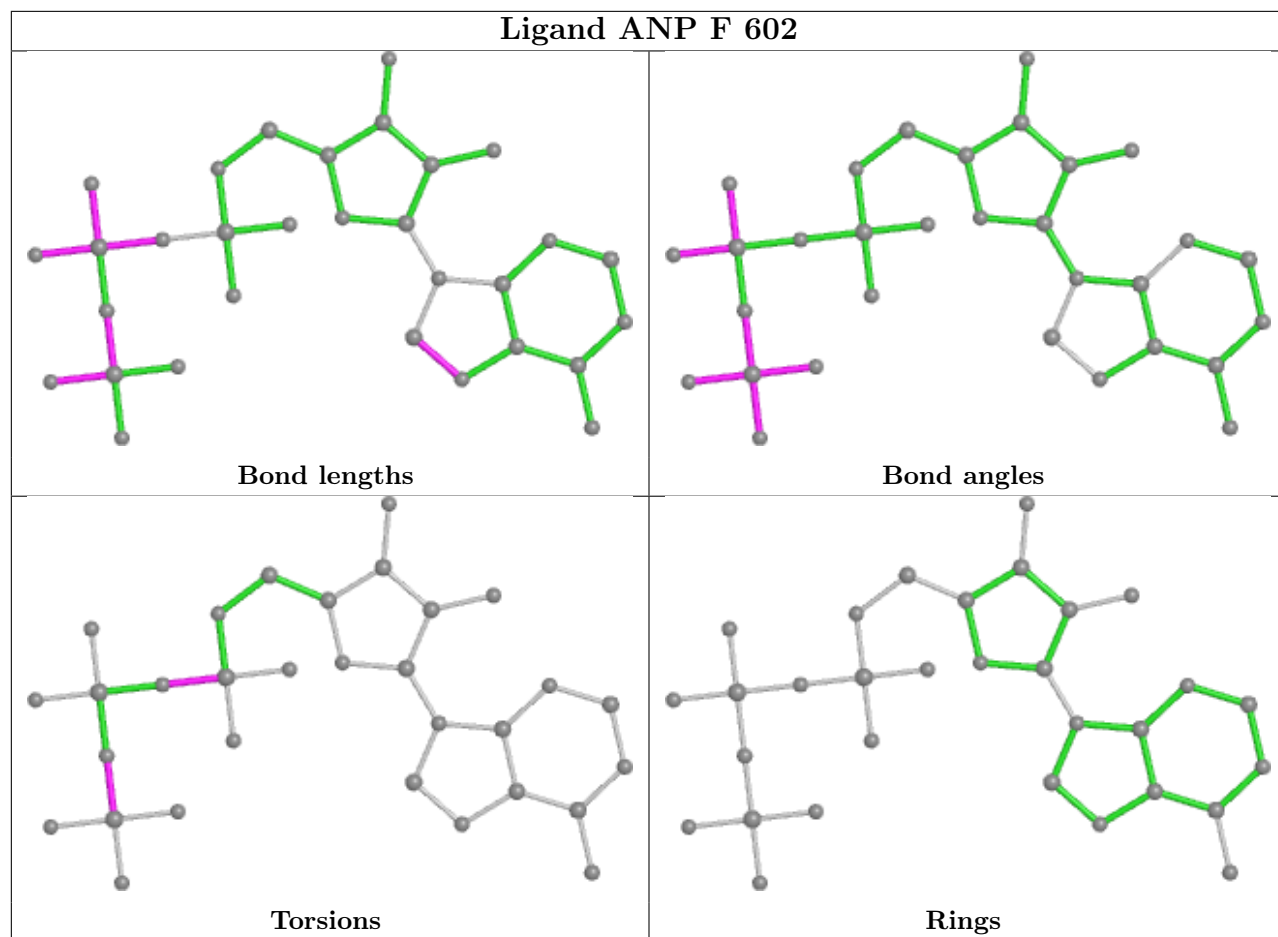
Mol	Chain	Res	Type	Atoms
4	A	602	ANP	PB-N3B-PG-O1G
4	B	602	ANP	PB-N3B-PG-O1G
4	I	603	ANP	PB-N3B-PG-O1G
4	C	602	ANP	PB-N3B-PG-O1G
4	J	603	ANP	PB-N3B-PG-O1G
4	D	602	ANP	PB-N3B-PG-O1G
4	K	603	ANP	PB-N3B-PG-O1G
4	E	602	ANP	PB-N3B-PG-O1G
4	L	603	ANP	PB-N3B-PG-O1G
4	F	602	ANP	PB-N3B-PG-O1G
4	M	603	ANP	PB-N3B-PG-O1G
4	G	602	ANP	PB-N3B-PG-O1G
4	N	603	ANP	PB-N3B-PG-O1G
4	H	603	ANP	PB-O3A-PA-O1A
4	B	602	ANP	PB-O3A-PA-O1A
4	I	603	ANP	PB-O3A-PA-O1A
4	J	603	ANP	PB-O3A-PA-O1A
4	E	602	ANP	PB-O3A-PA-O1A
4	F	602	ANP	PB-O3A-PA-O1A
4	G	602	ANP	PB-O3A-PA-O1A
4	N	603	ANP	PB-O3A-PA-O1A
4	B	602	ANP	C3'-C4'-C5'-O5'
4	H	603	ANP	PB-N3B-PG-O1G

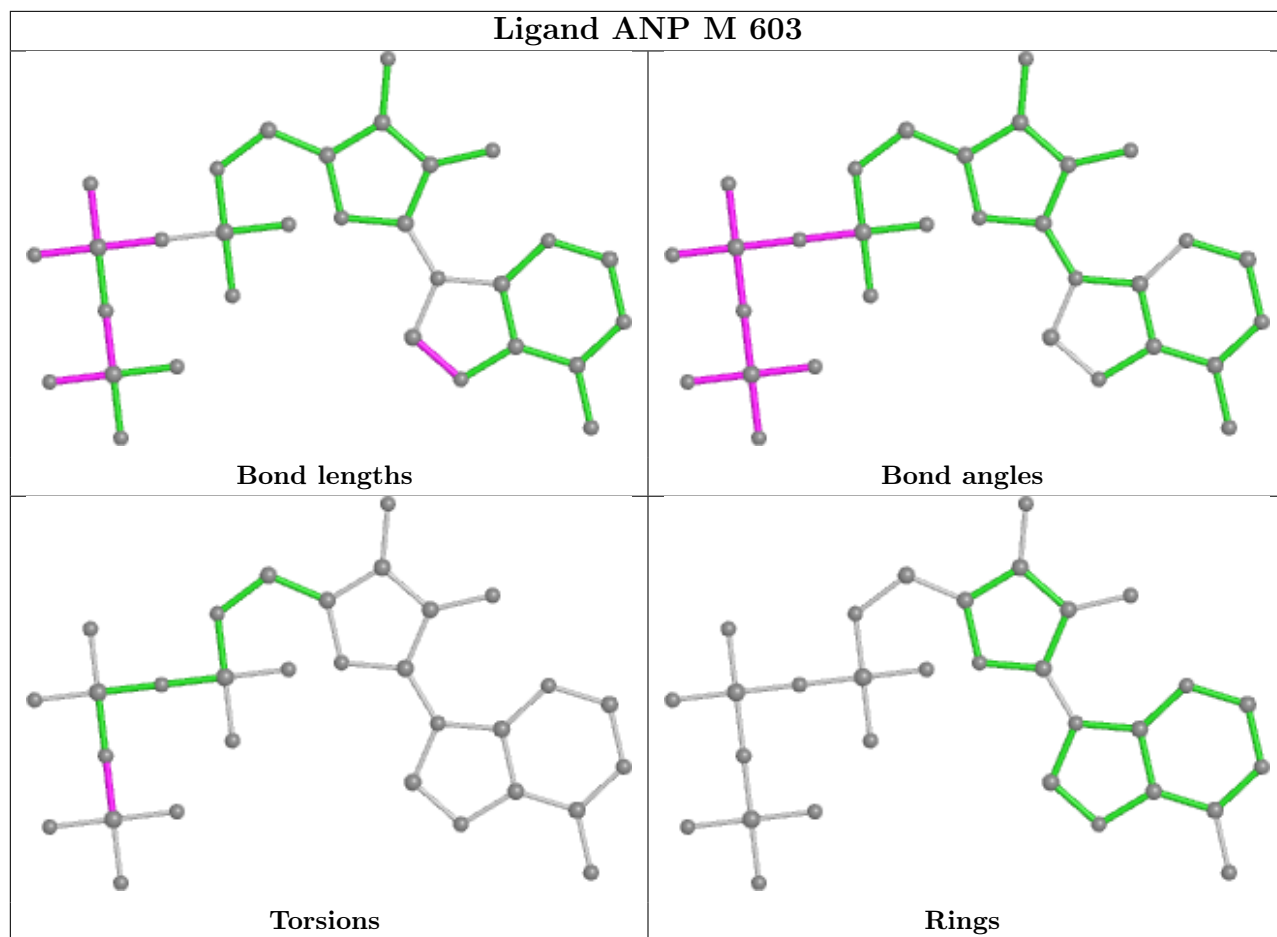
There are no ring outliers.

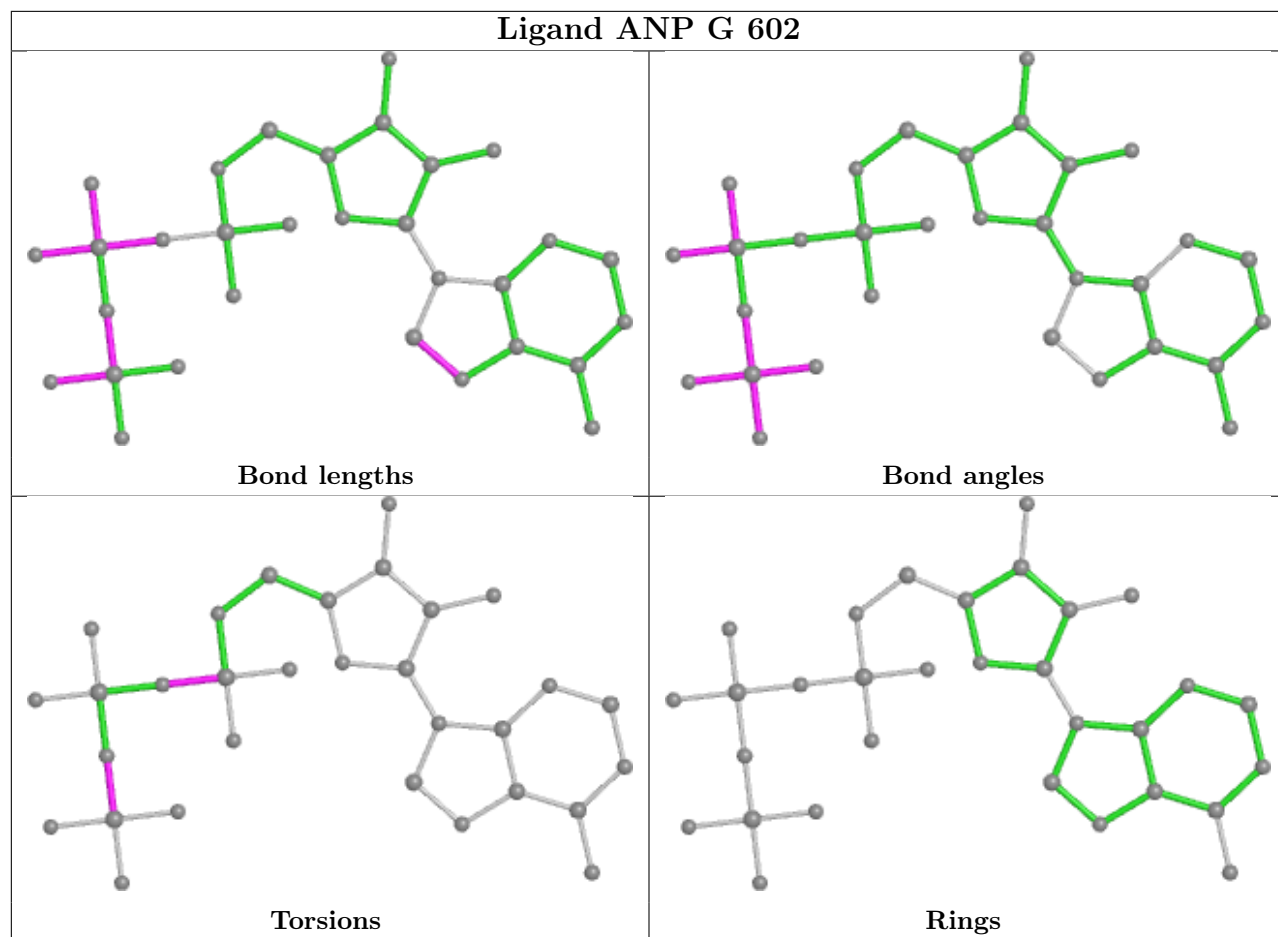
No monomer is involved in short contacts.

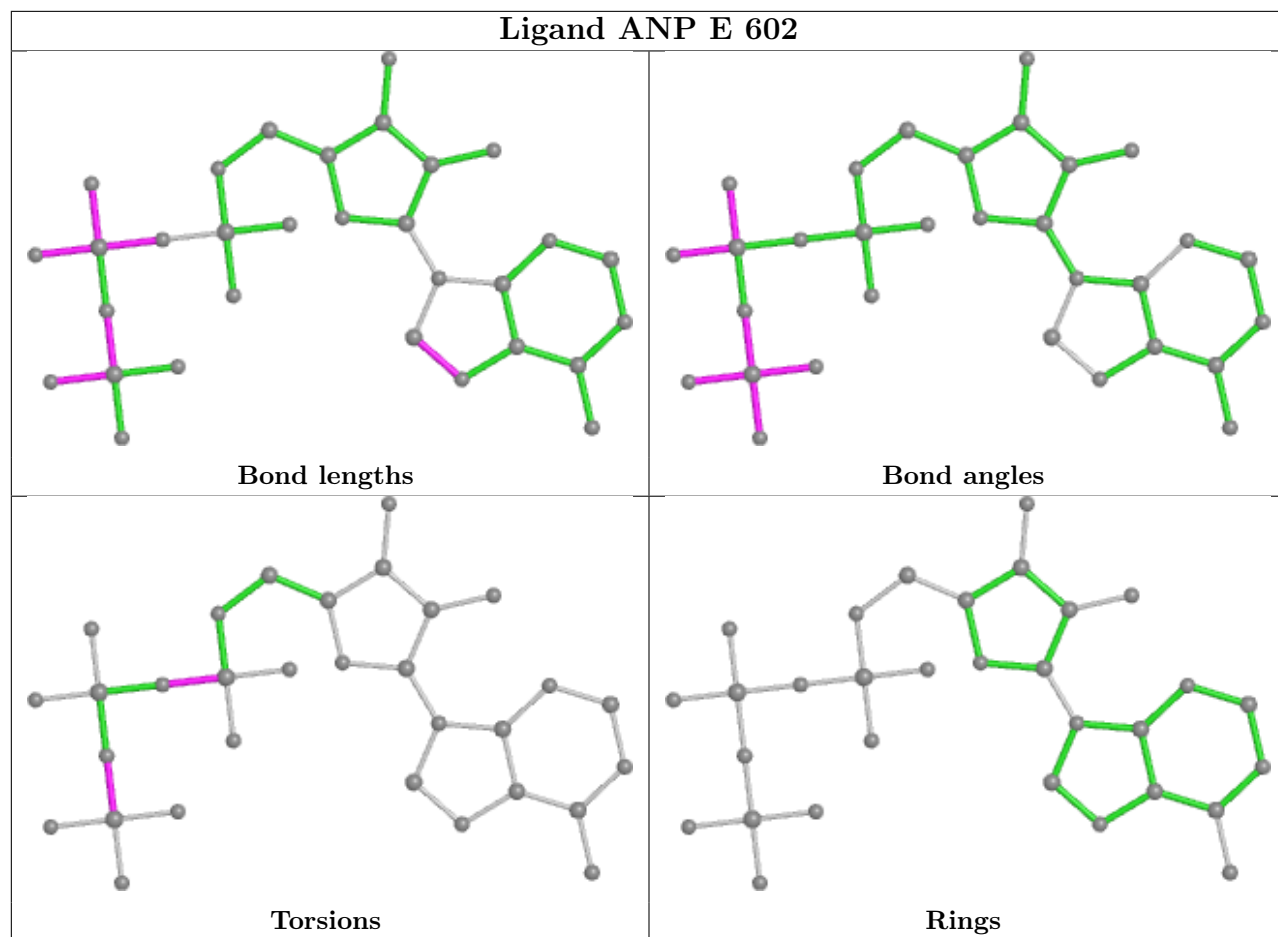
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

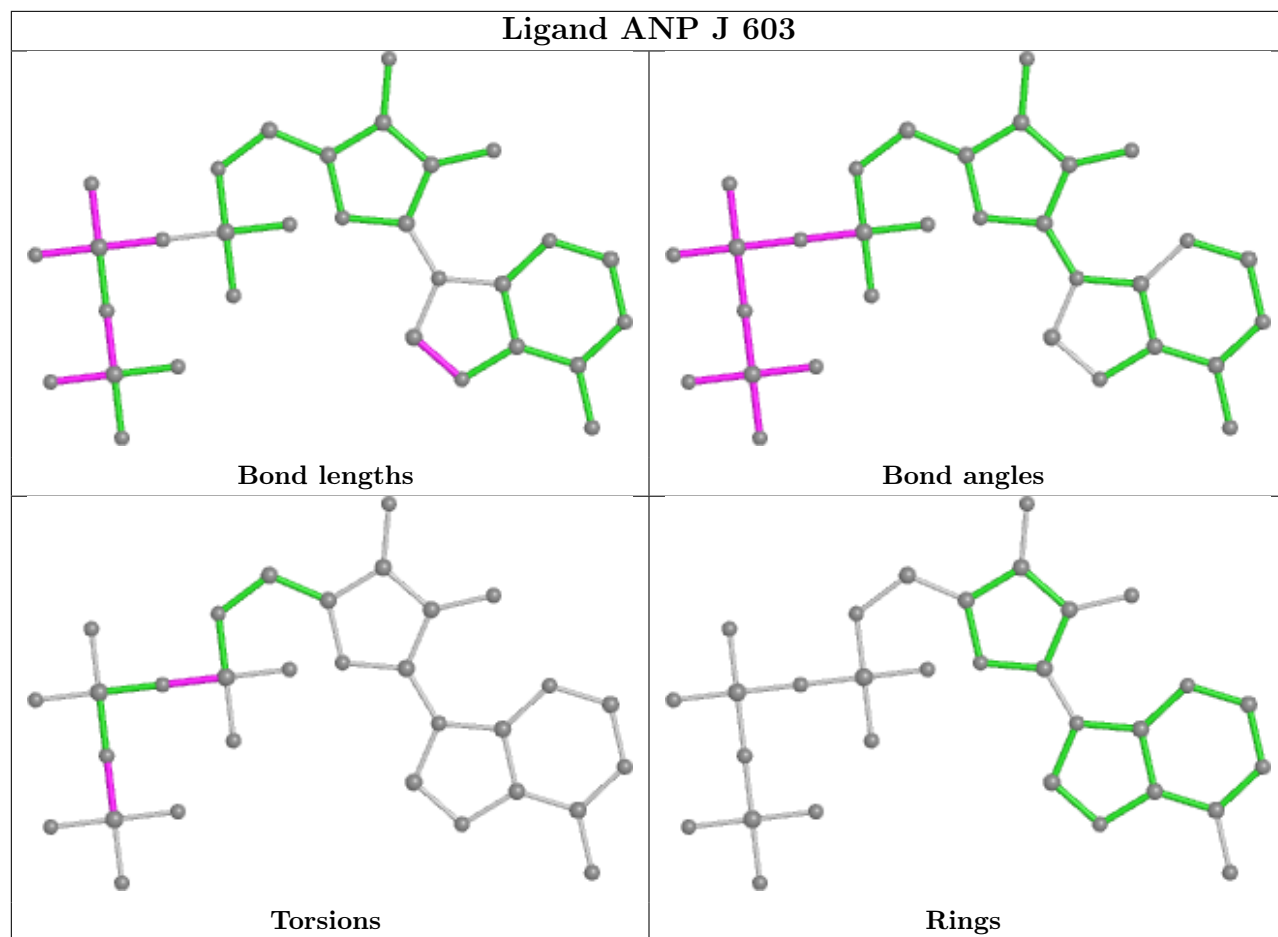


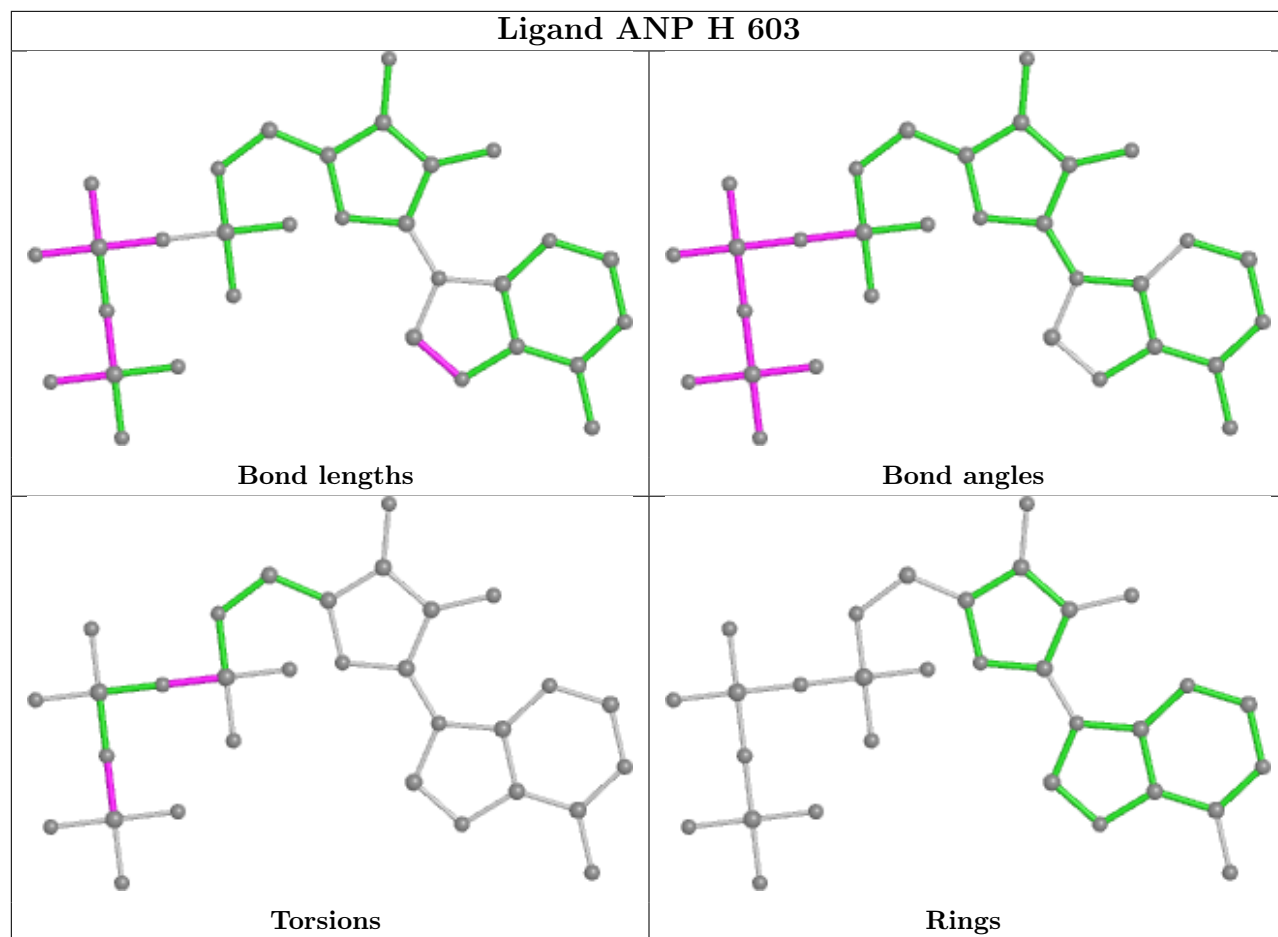


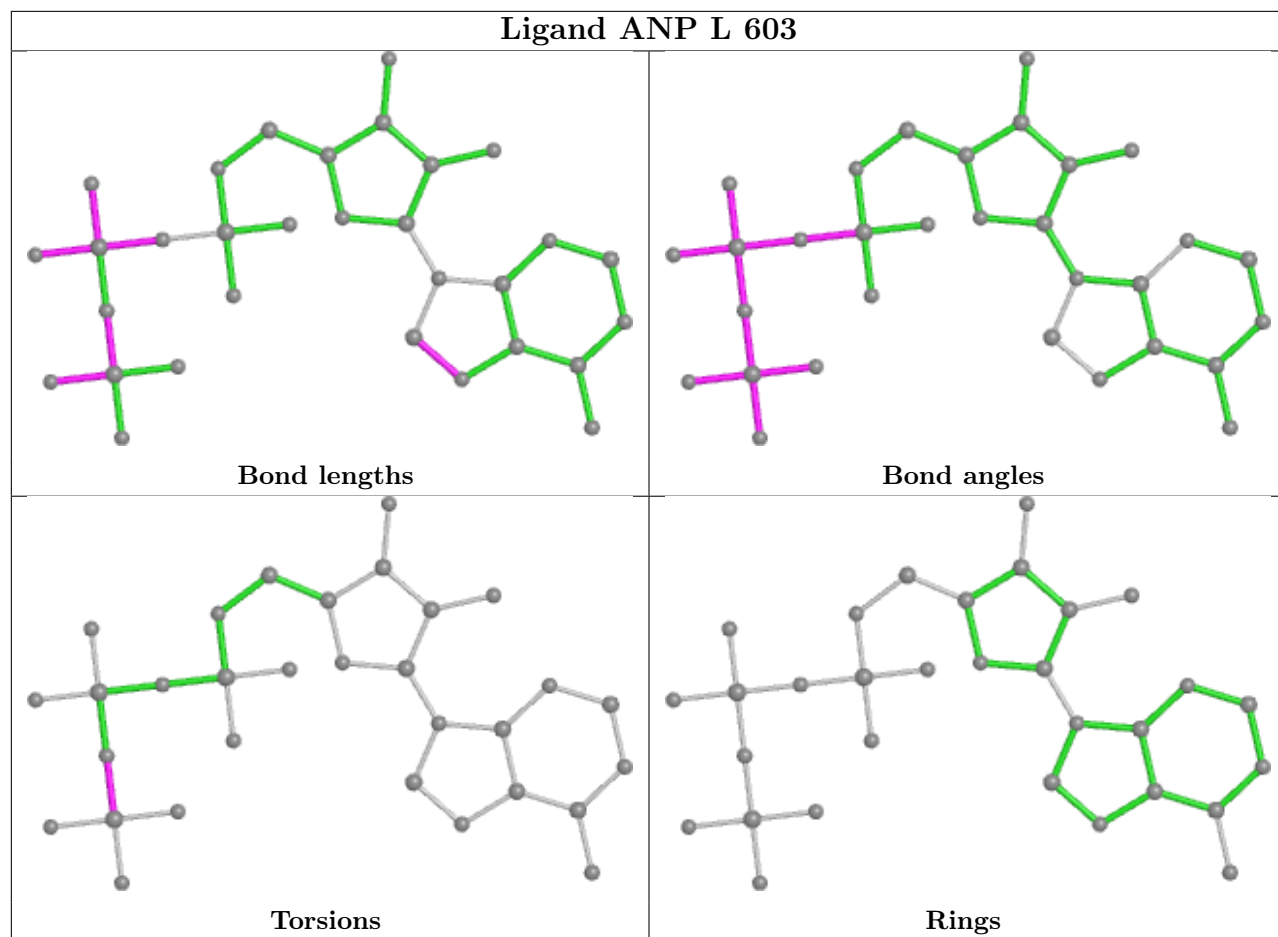


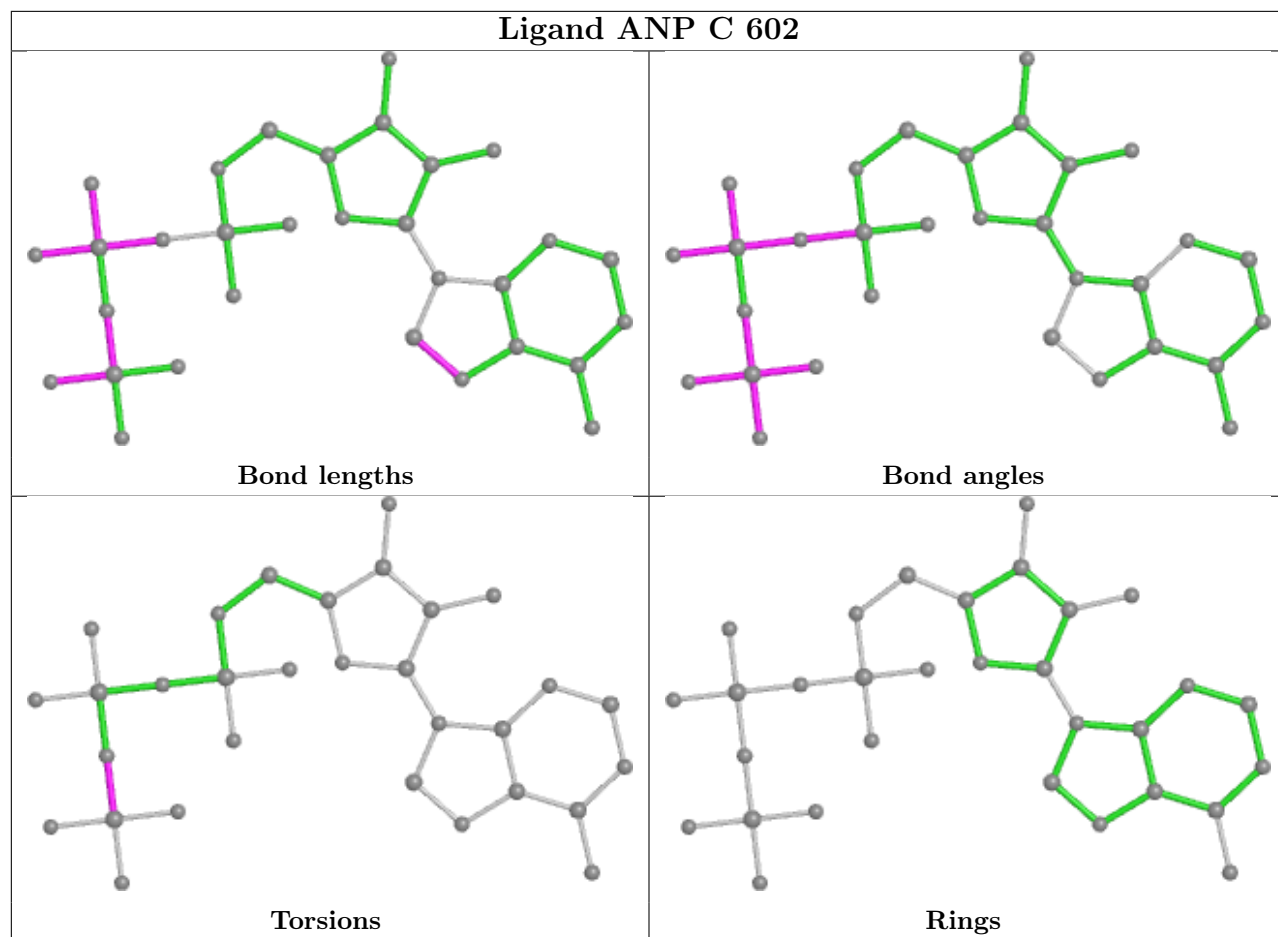


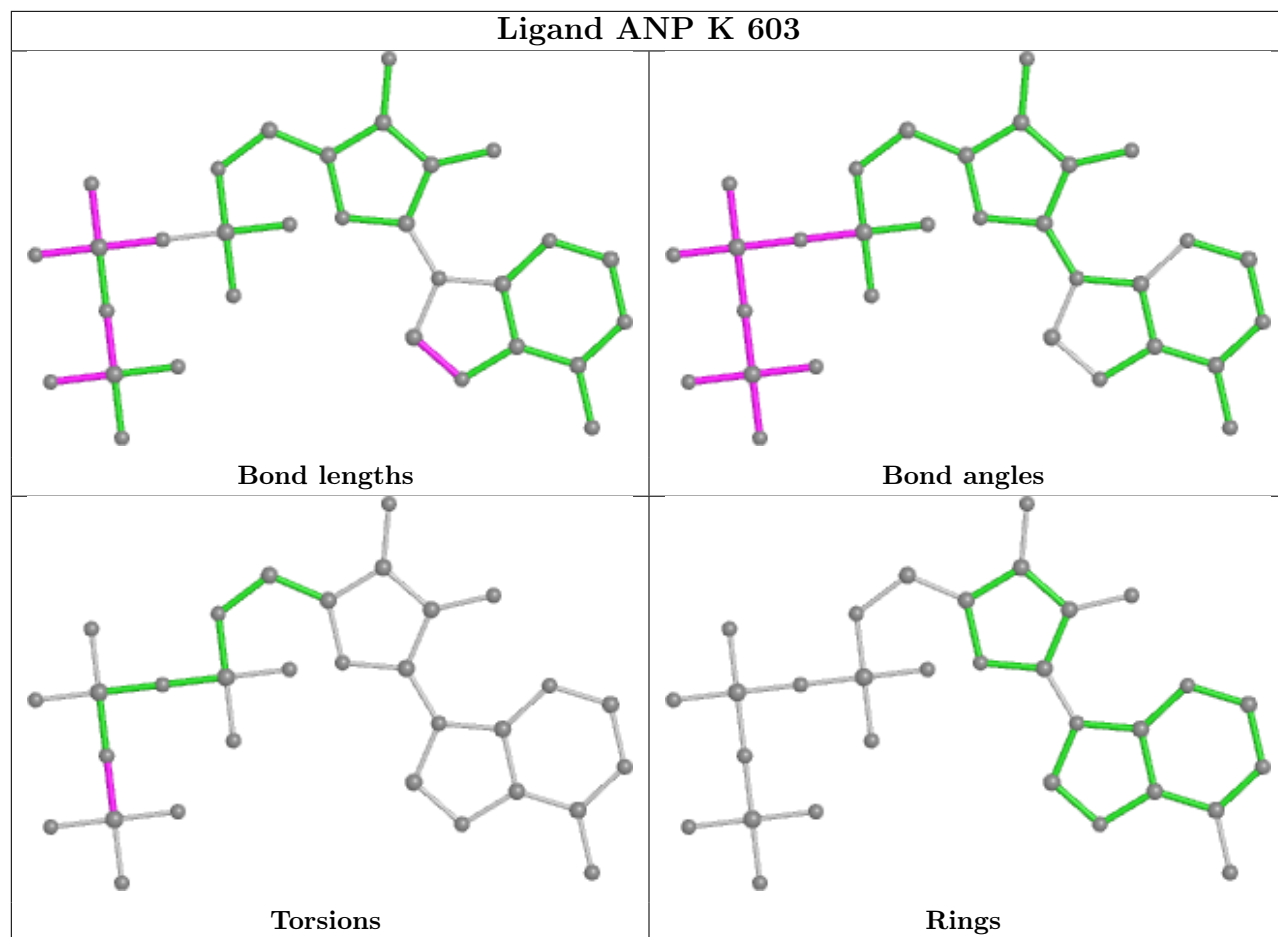


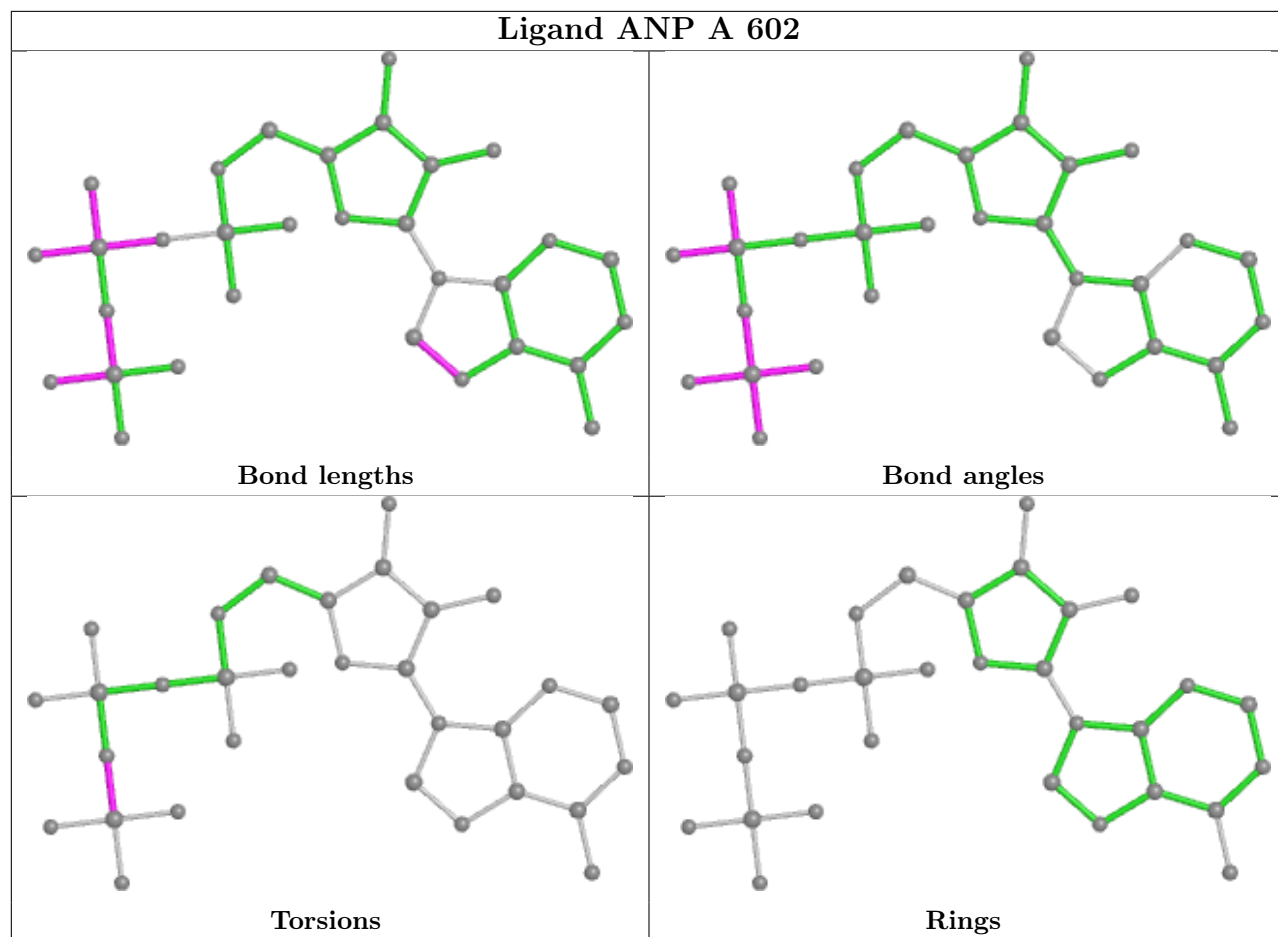


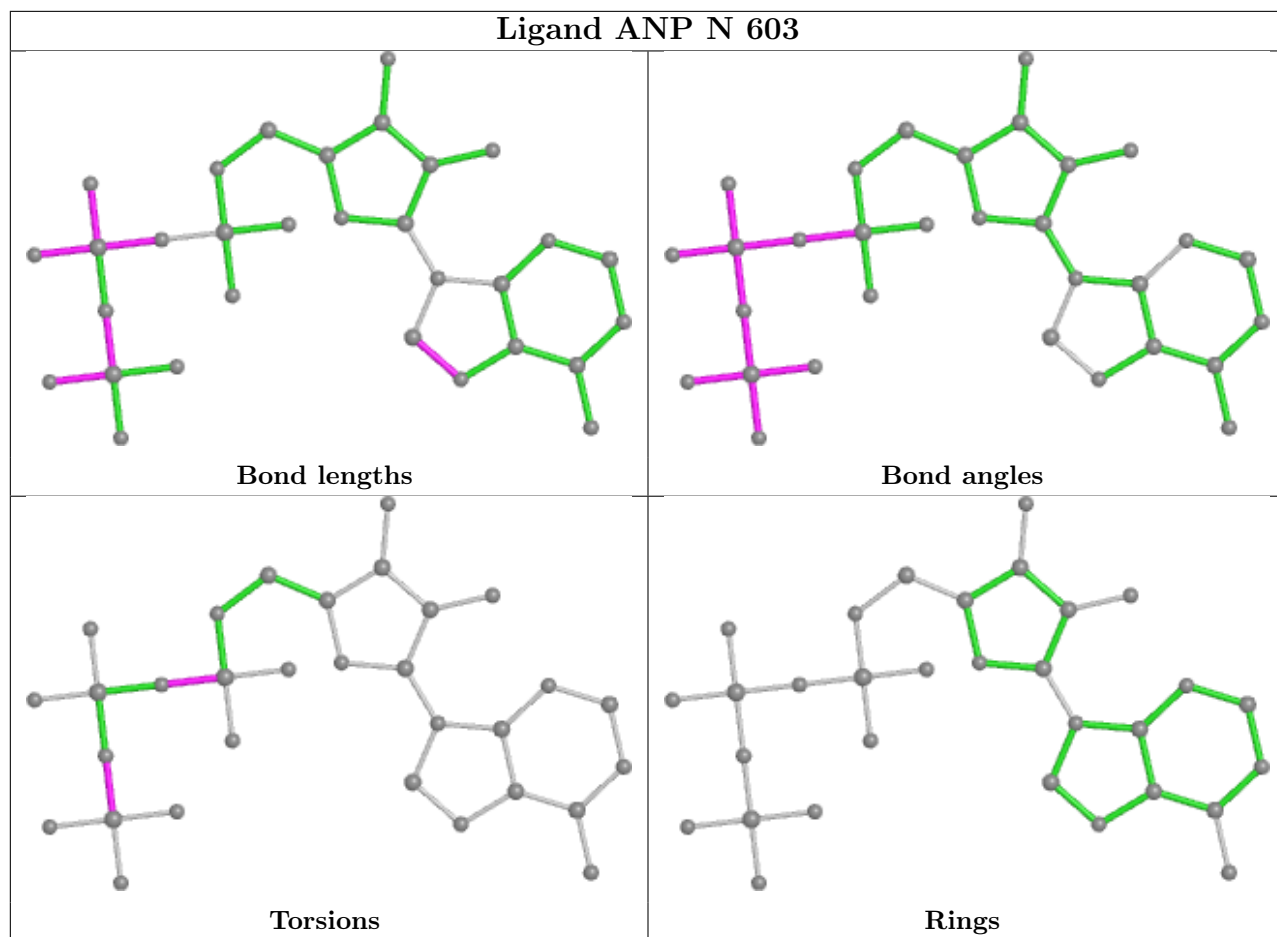


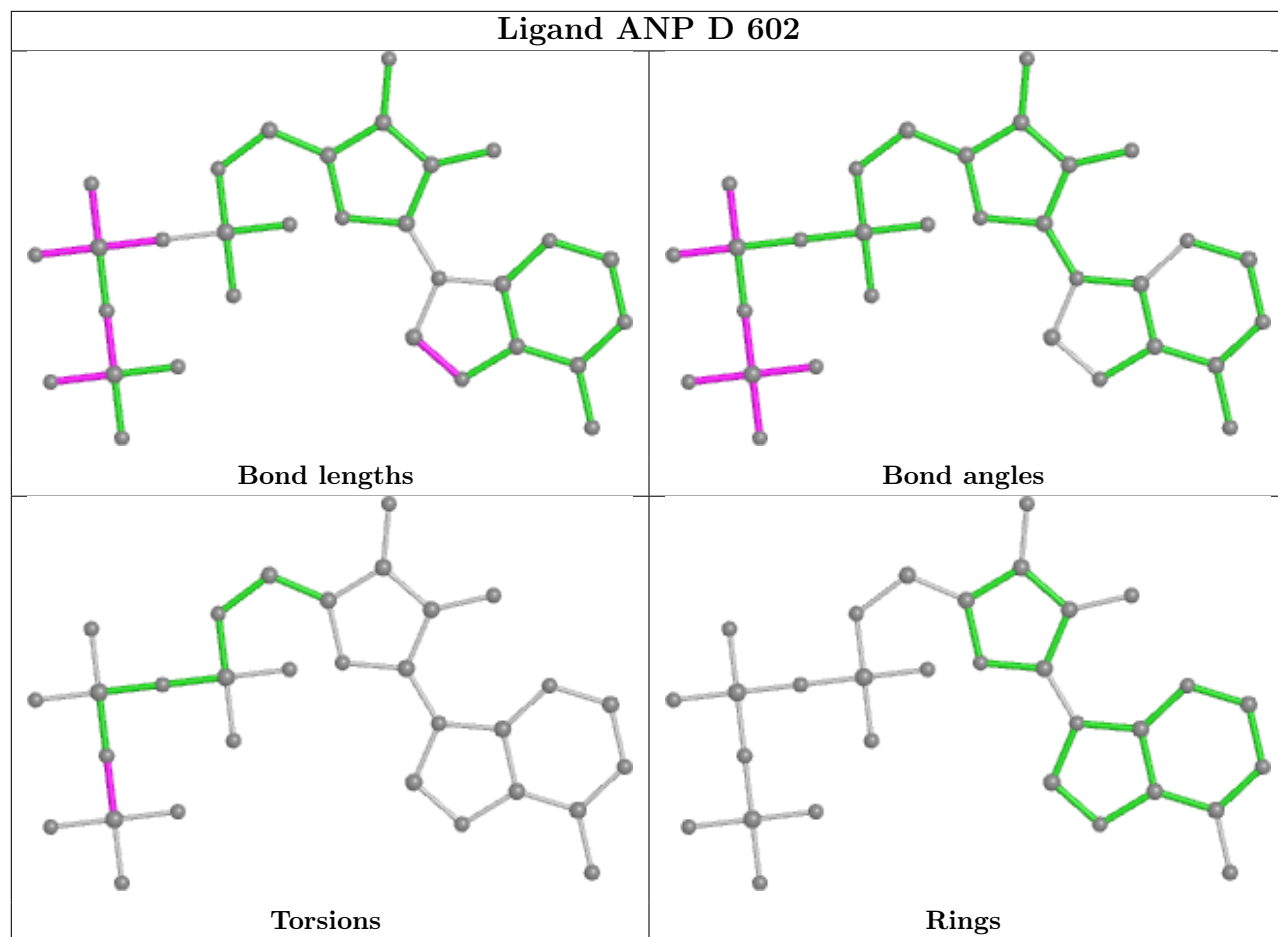


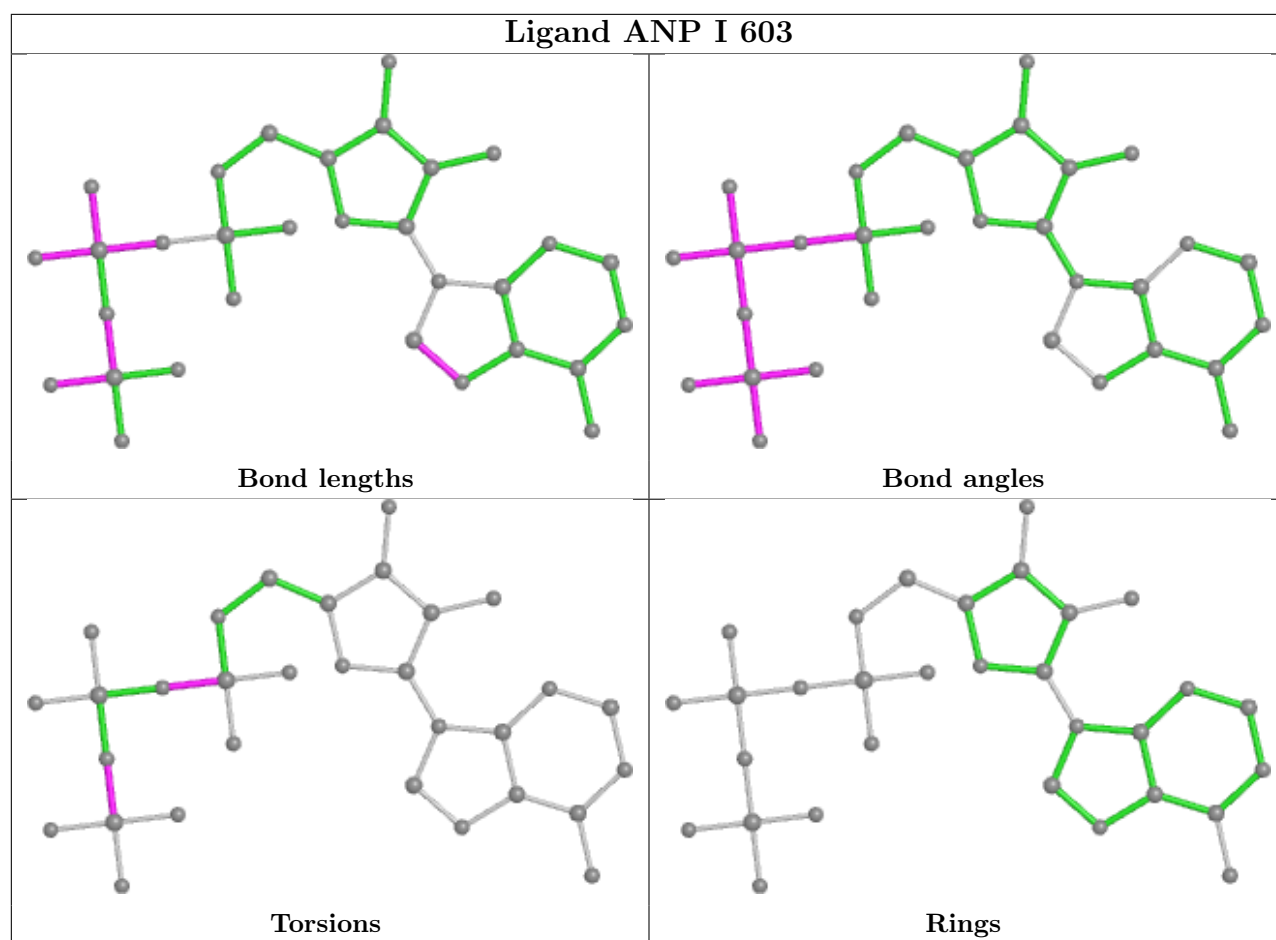












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

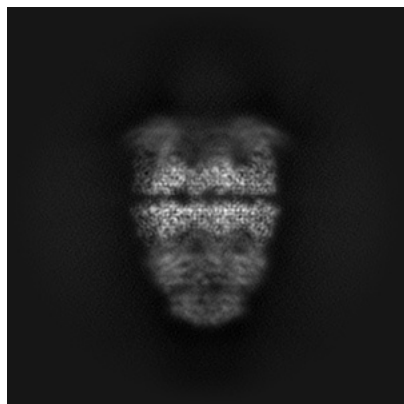
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-37863. These allow visual inspection of the internal detail of the map and identification of artifacts.

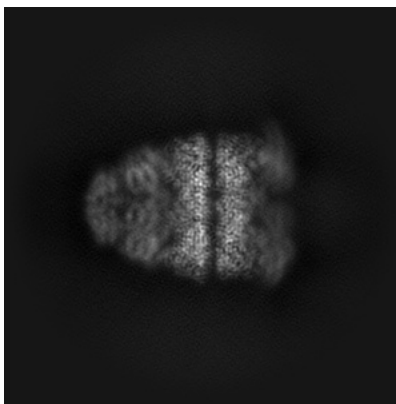
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

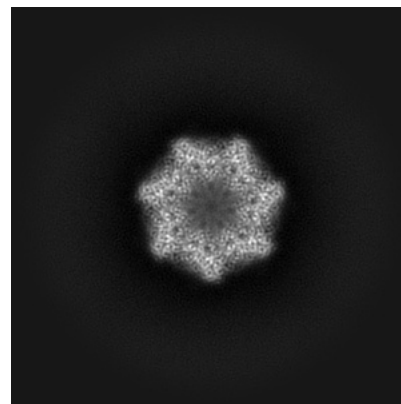
6.1.1 Primary map



X

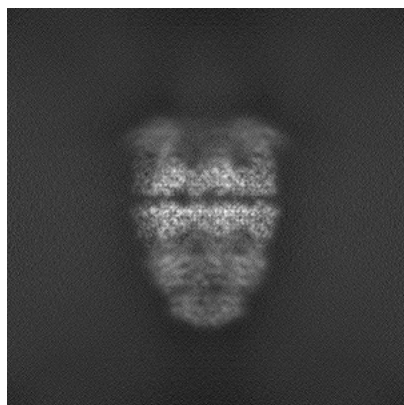


Y

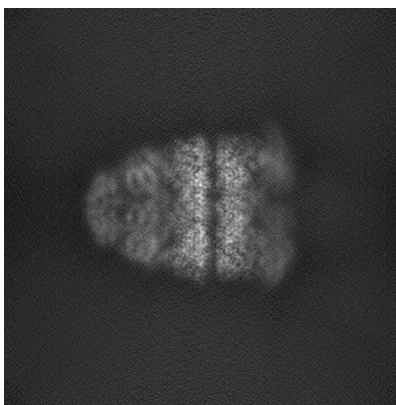


Z

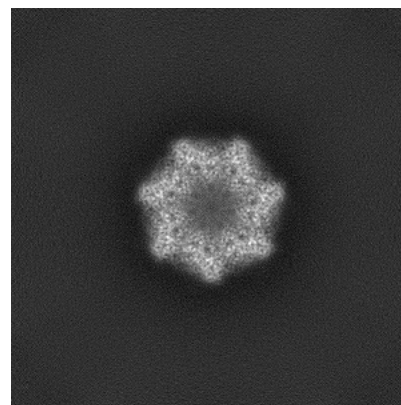
6.1.2 Raw map



X



Y

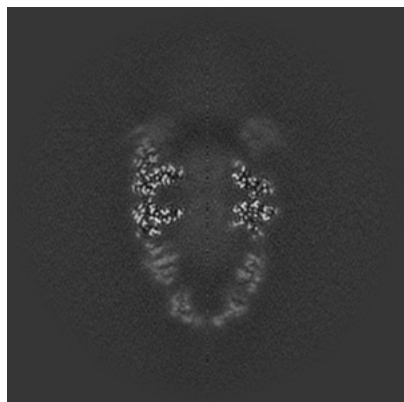


Z

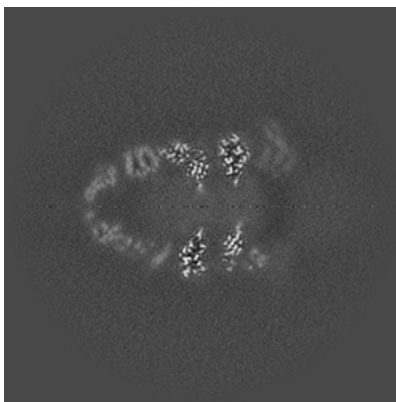
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

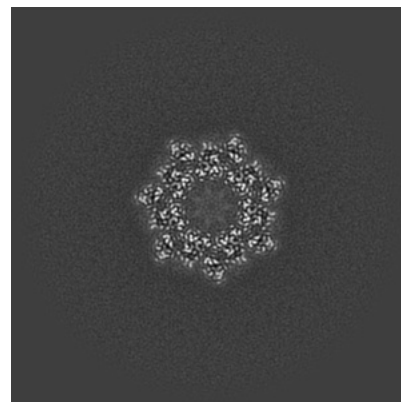
6.2.1 Primary map



X Index: 256

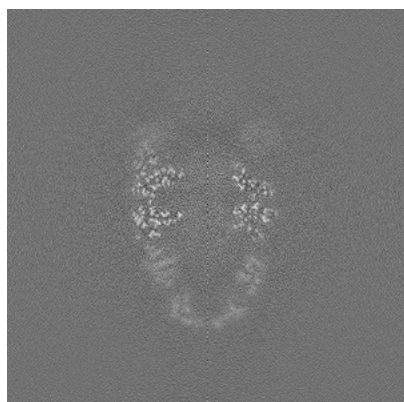


Y Index: 256

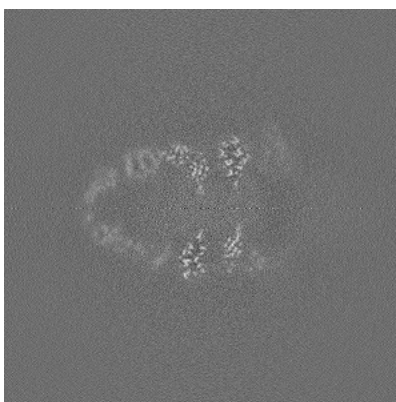


Z Index: 256

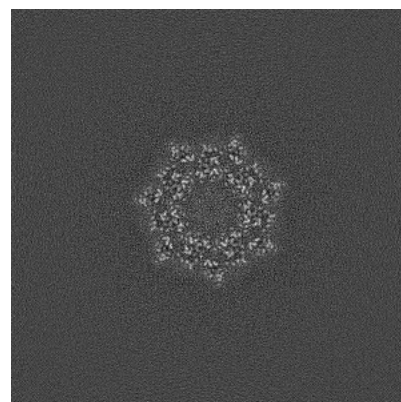
6.2.2 Raw map



X Index: 256



Y Index: 256

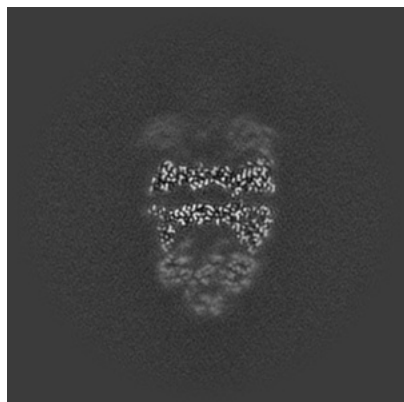


Z Index: 256

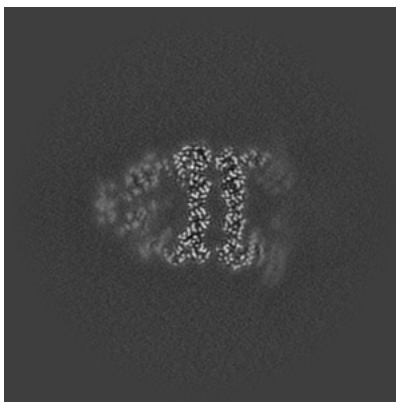
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

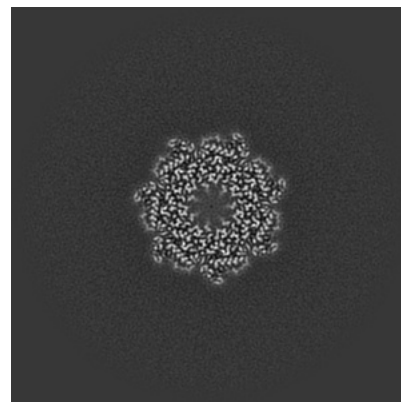
6.3.1 Primary map



X Index: 299

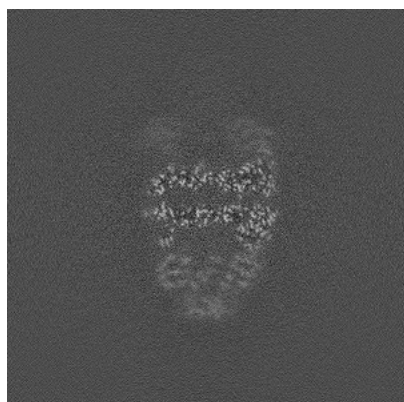


Y Index: 213

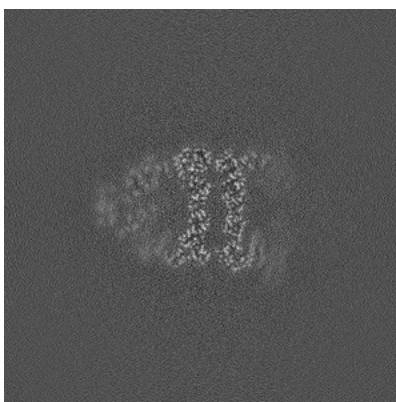


Z Index: 251

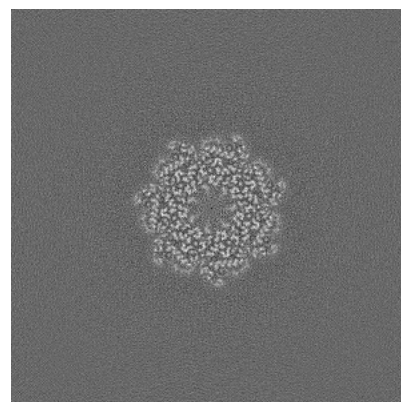
6.3.2 Raw map



X Index: 295



Y Index: 213

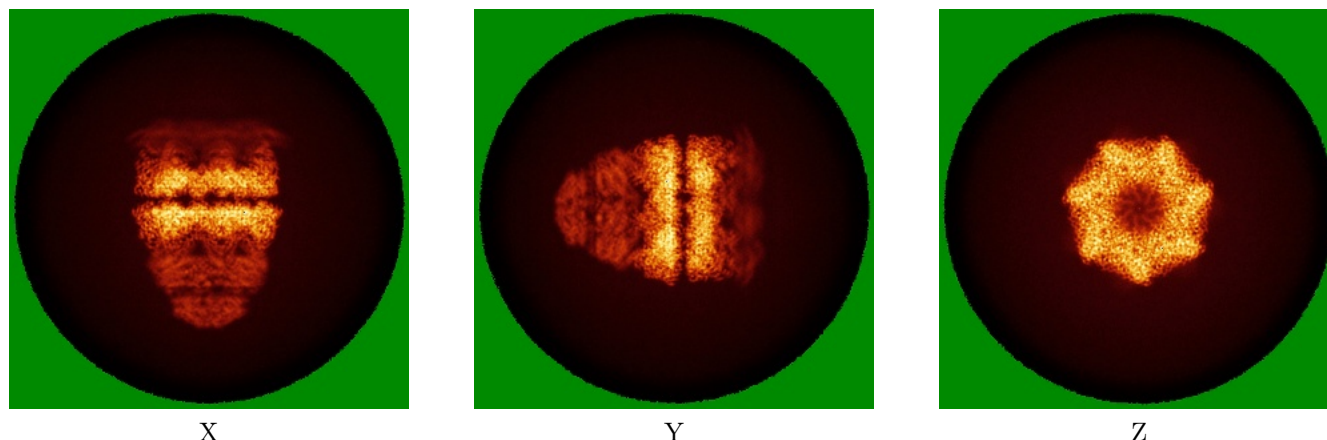


Z Index: 251

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

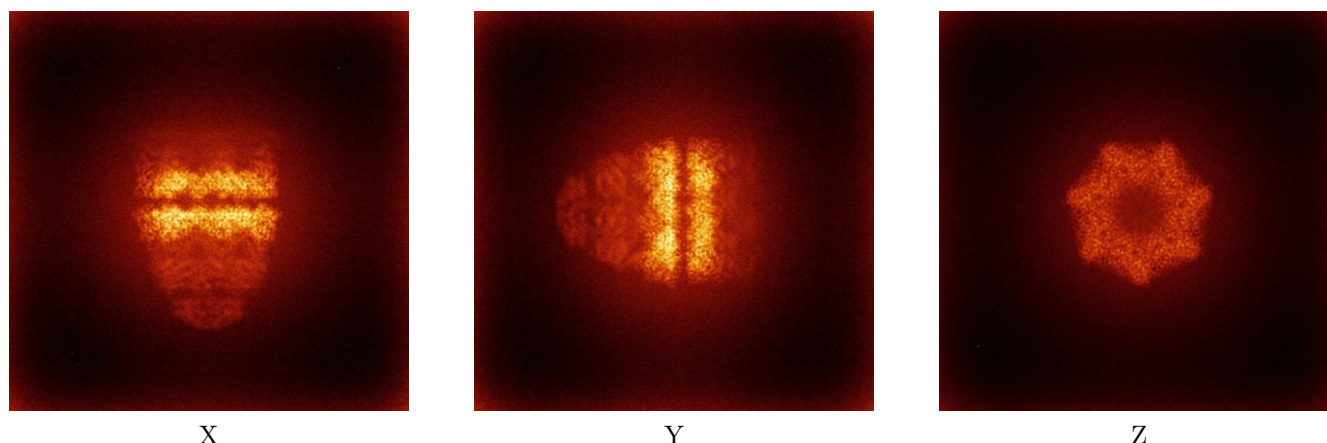


X

Y

Z

6.4.2 Raw map



X

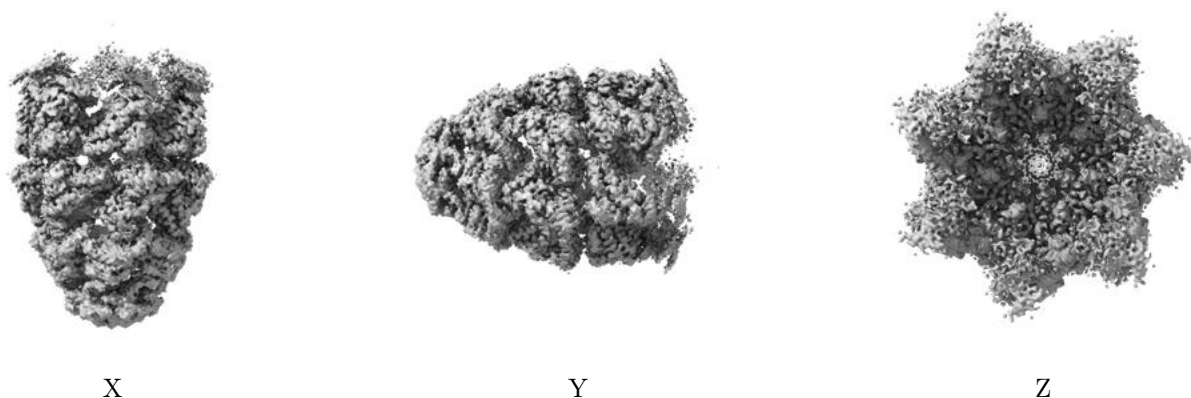
Y

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.

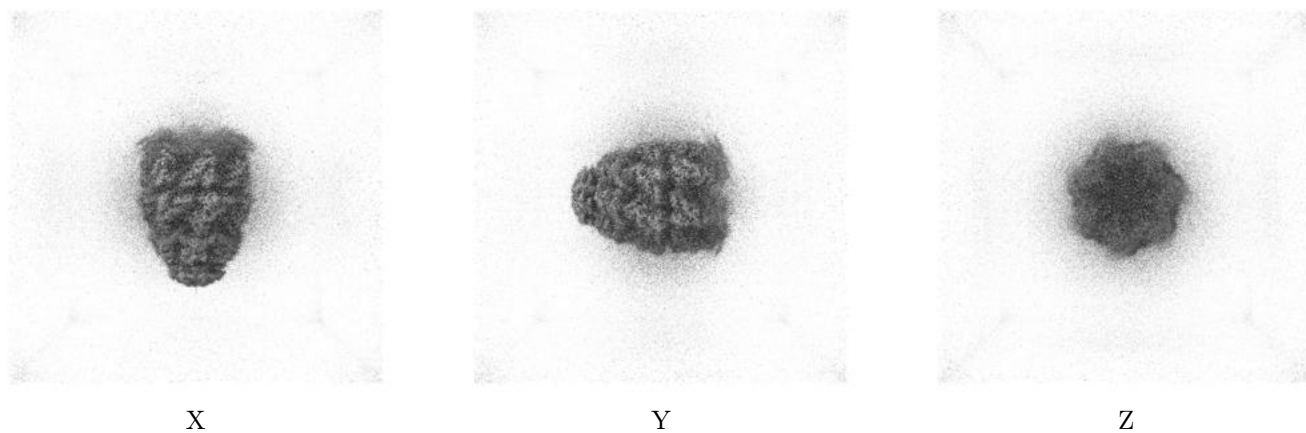
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0549. 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.

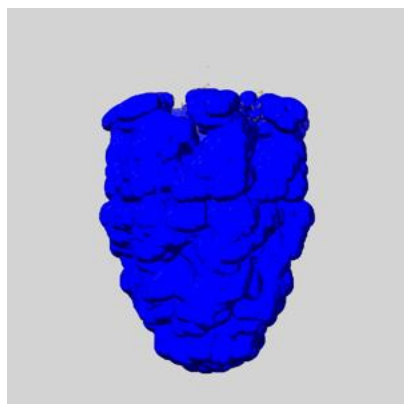
6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

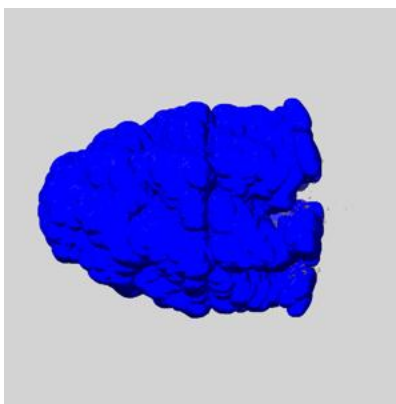
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

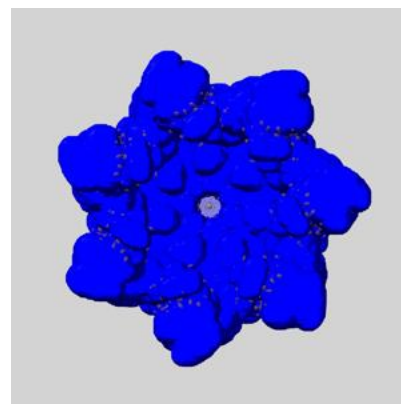
6.6.1 emd_37863_msk_1.map [i](#)



X



Y

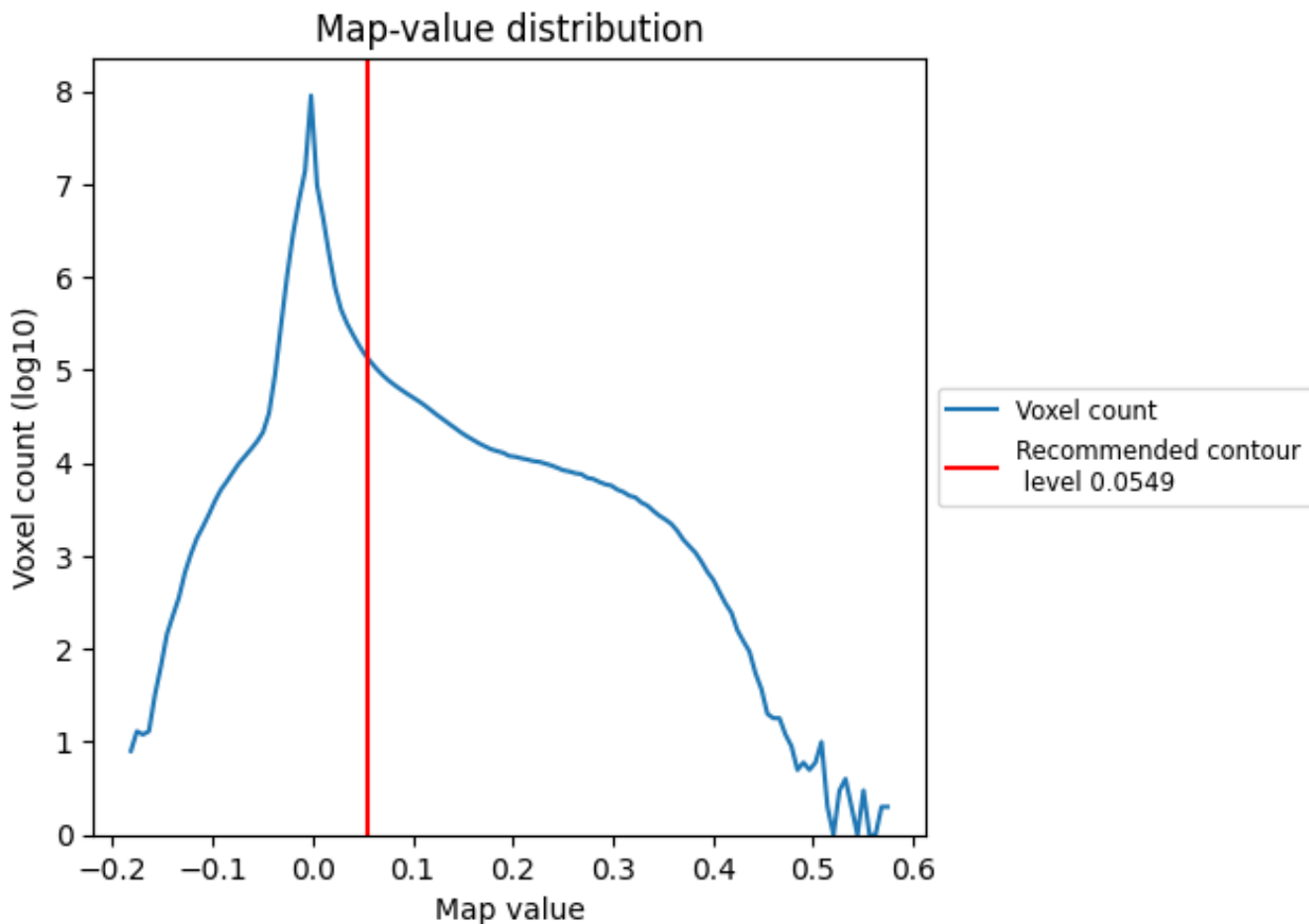


Z

7 Map analysis [i](#)

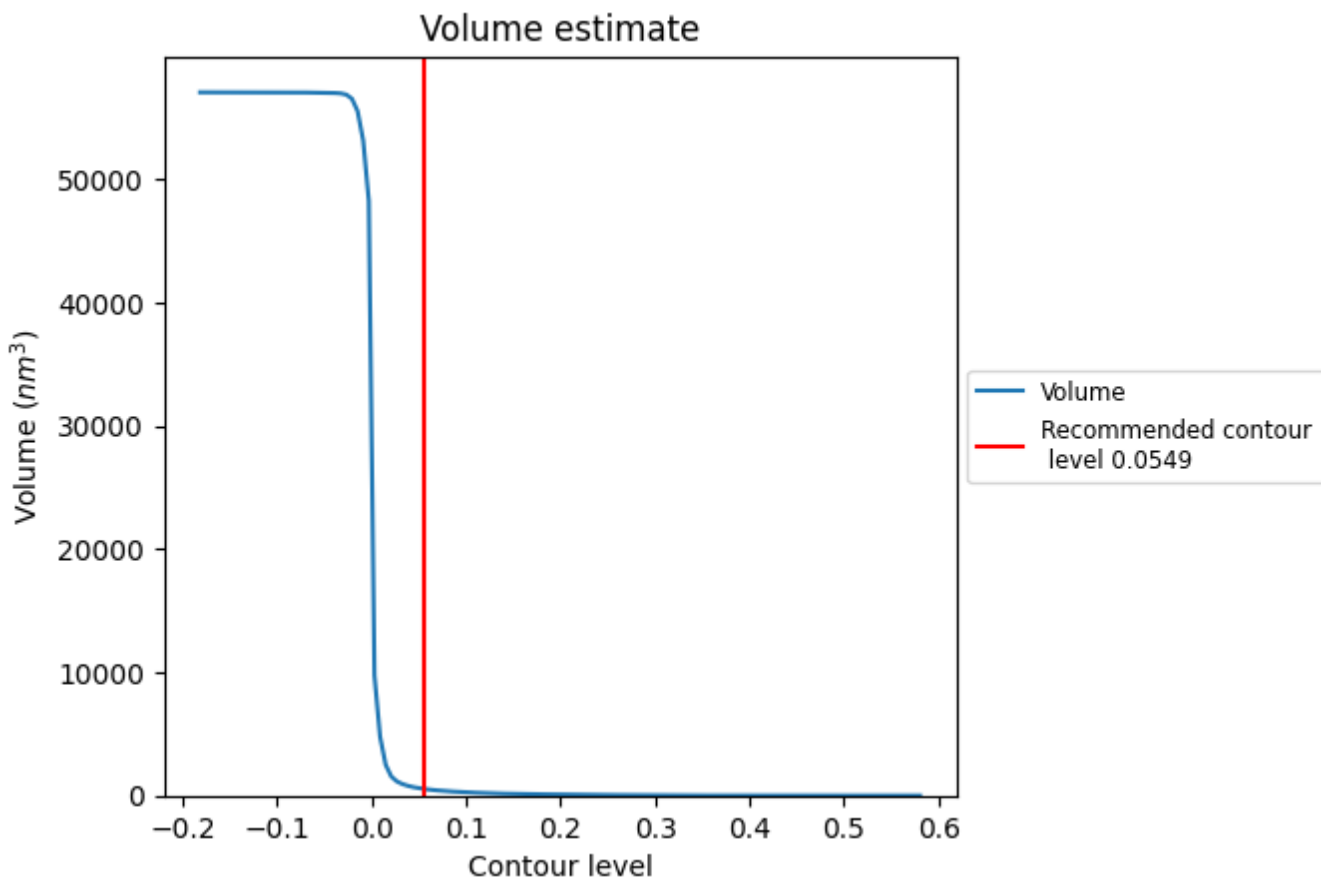
This section contains the results of statistical analysis of the map.

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.

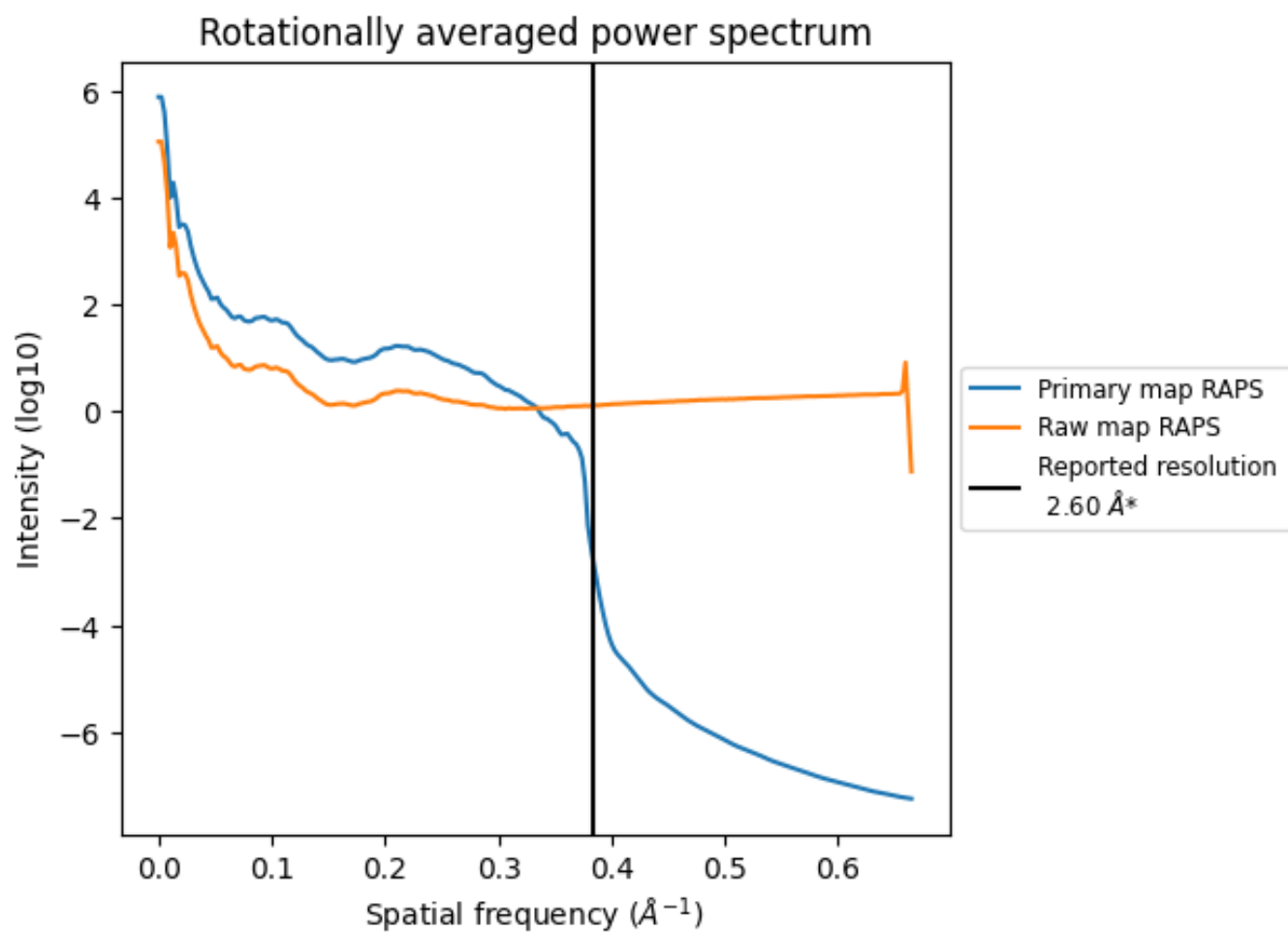
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 543 nm^3 ; this corresponds to an approximate mass of 491 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

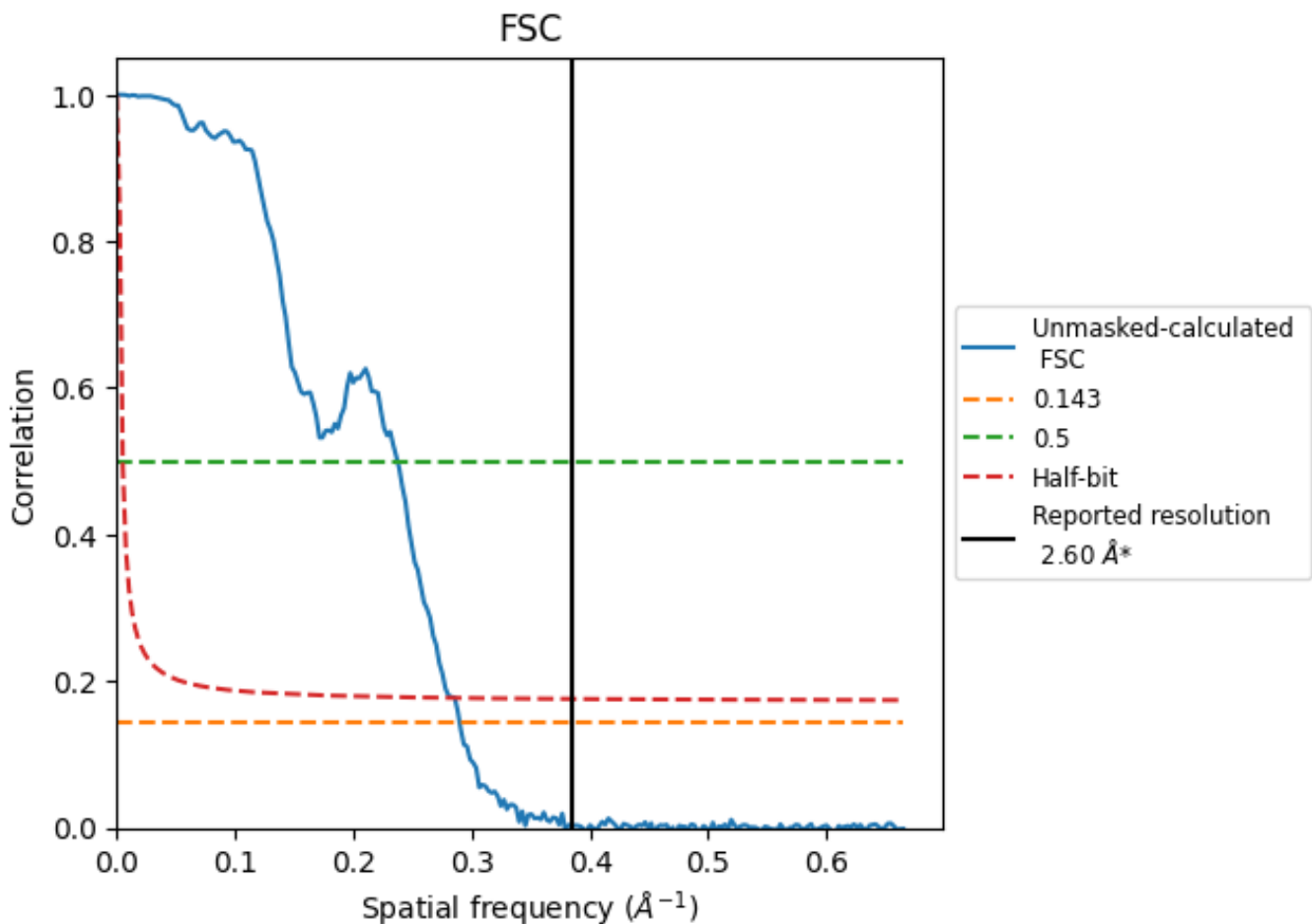


*Reported resolution corresponds to spatial frequency of 0.385 Å⁻¹

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.385 Å⁻¹

8.2 Resolution estimates [i](#)

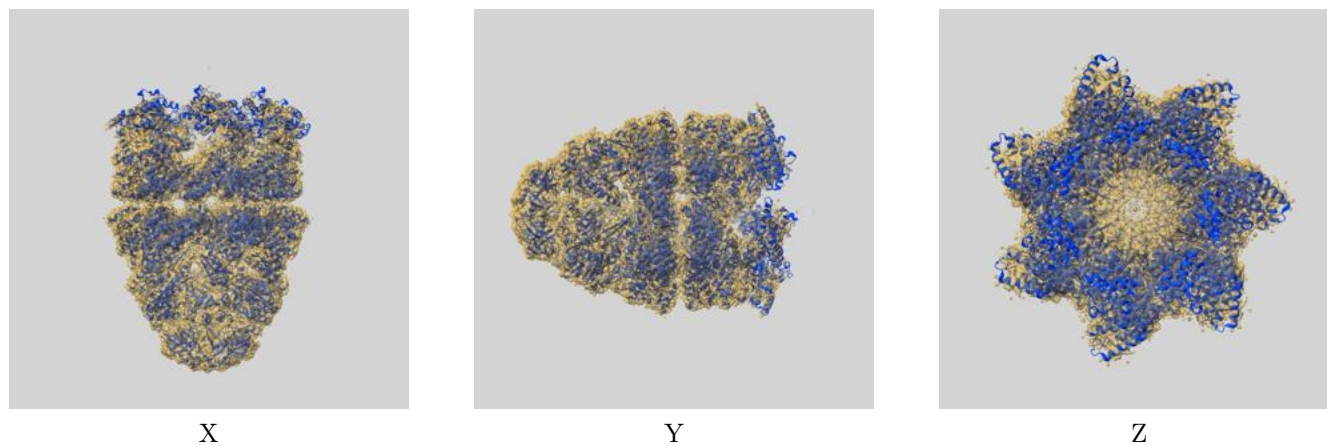
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.60	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.45	4.21	3.50

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.45 differs from the reported value 2.6 by more than 10 %

9 Map-model fit [i](#)

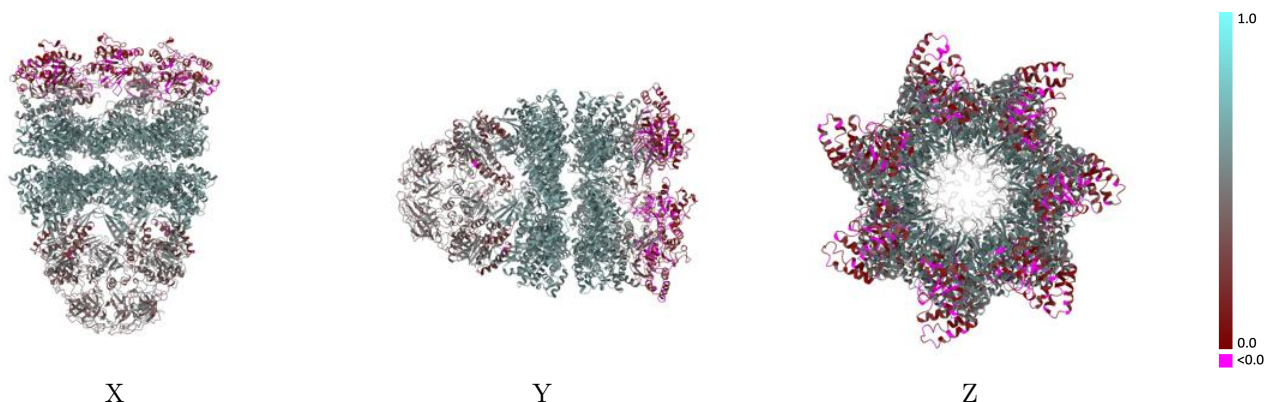
This section contains information regarding the fit between EMDB map EMD-37863 and PDB model 8WUX. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay [i](#)



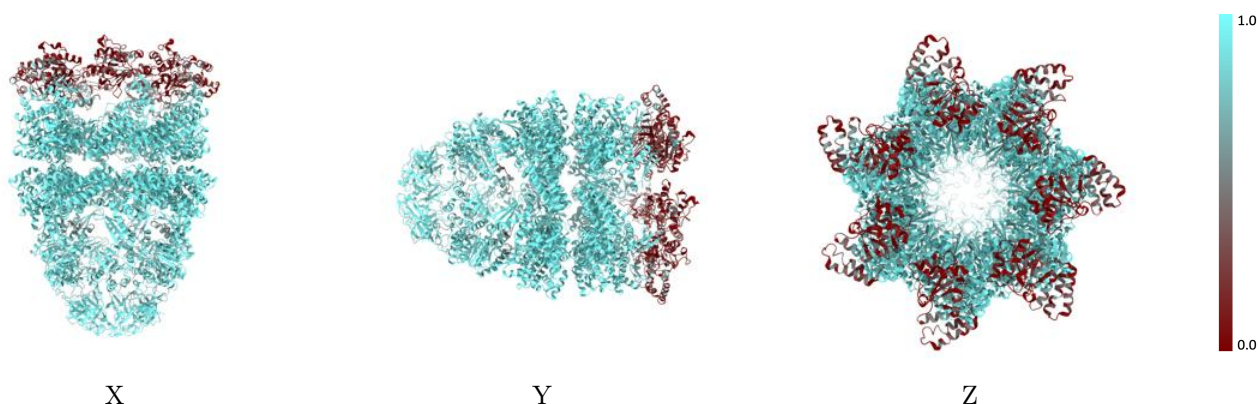
The images above show the 3D surface view of the map at the recommended contour level 0.0549 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



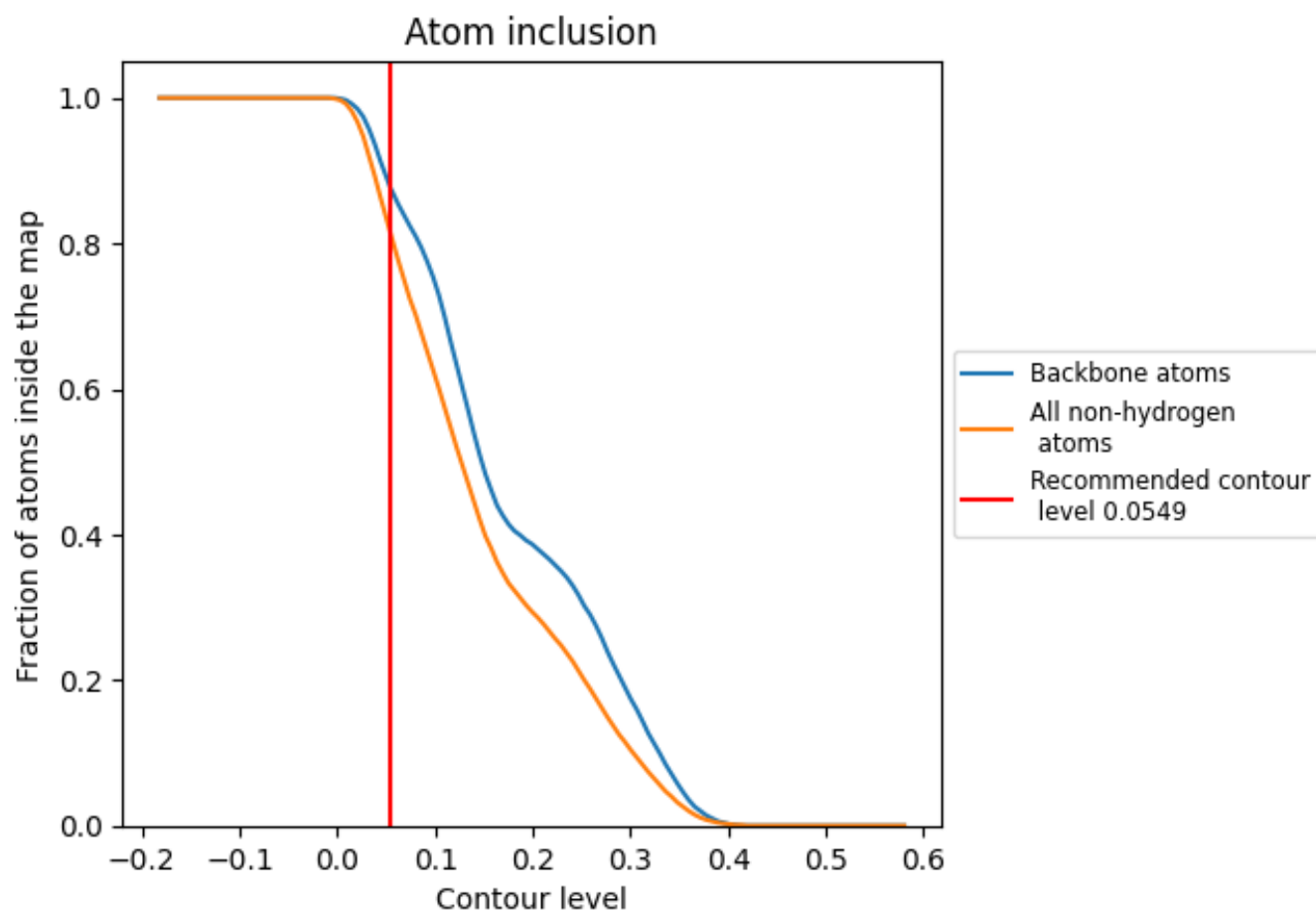
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0549).













































9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 81% 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 (0.0549) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8120	 0.4530
A	 0.9380	 0.5220
B	 0.9380	 0.5200
C	 0.9370	 0.5230
D	 0.9380	 0.5210
E	 0.9390	 0.5180
F	 0.9390	 0.5210
G	 0.9380	 0.5190
H	 0.6730	 0.3890
I	 0.6740	 0.3930
J	 0.6740	 0.3960
K	 0.6730	 0.3970
L	 0.6760	 0.3930
M	 0.6720	 0.3950
N	 0.6730	 0.3890
a	 0.8920	 0.4070
b	 0.8780	 0.4140
c	 0.8770	 0.4180
d	 0.8730	 0.4020
e	 0.8770	 0.4150
f	 0.8880	 0.4060
g	 0.8840	 0.4080

