



wwPDB EM Validation Summary Report ⓘ

Sep 24, 2026 – 12:59 PM EDT

PDB ID : 37BO / pdb_000037bo
EMDB ID : EMD-78043
Title : Bacillus subtilis GerAA:GerAB:GerAC bound to L-alanine, in glyco-diosgenin
Authors : Cofsky, J.C.; Kruse, A.C.
Deposited on : 2026-07-11
Resolution : 2.09 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:

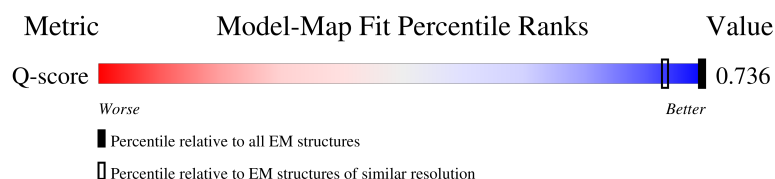
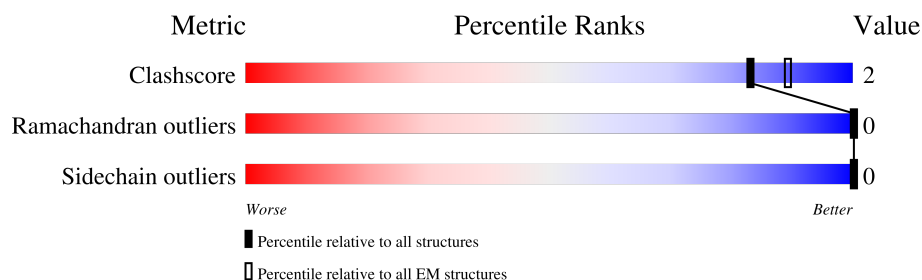
EMDB validation analysis : 0.0.1.dev133
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data 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) : 2.50

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 2.09 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.



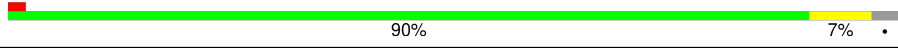
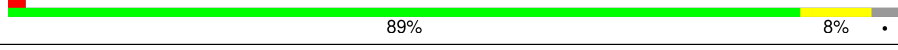
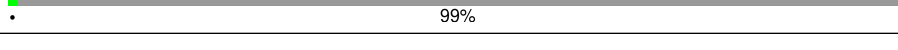
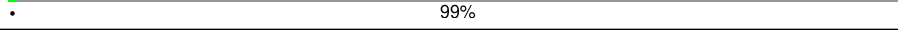
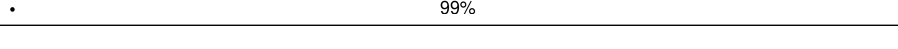
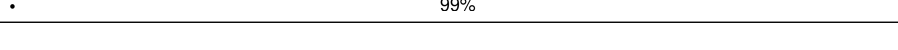
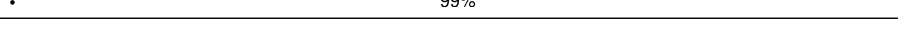
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	2022 (1.60 - 2.59)

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	505	 86% 5% 9%
1	E	505	 86% 5% 9%
1	I	505	 86% 5% 9%
1	M	505	 86% 5% 9%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	Q	505	
2	B	365	
2	F	365	
2	J	365	
2	N	365	
2	R	365	
3	C	356	
3	G	356	
3	K	356	
3	O	356	
3	S	356	

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 33750 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 Spore germination protein A1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	460	Total	C	N	O	S	11	0
			3703	2406	605	682	10		
1	E	460	Total	C	N	O	S	11	0
			3703	2406	605	682	10		
1	I	460	Total	C	N	O	S	11	0
			3703	2406	605	682	10		
1	M	460	Total	C	N	O	S	11	0
			3703	2406	605	682	10		
1	Q	460	Total	C	N	O	S	11	0
			3703	2406	605	682	10		

There are 120 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-22	ASP	-	expression tag	UNP P07868
A	-21	TYR	-	expression tag	UNP P07868
A	-20	LYS	-	expression tag	UNP P07868
A	-19	ASP	-	expression tag	UNP P07868
A	-18	ASP	-	expression tag	UNP P07868
A	-17	ASP	-	expression tag	UNP P07868
A	-16	ASP	-	expression tag	UNP P07868
A	-15	LYS	-	expression tag	UNP P07868
A	-14	GLY	-	expression tag	UNP P07868
A	-13	SER	-	expression tag	UNP P07868
A	-12	LEU	-	expression tag	UNP P07868
A	-11	GLU	-	expression tag	UNP P07868
A	-10	VAL	-	expression tag	UNP P07868
A	-9	LEU	-	expression tag	UNP P07868
A	-8	PHE	-	expression tag	UNP P07868
A	-7	GLN	-	expression tag	UNP P07868
A	-6	GLY	-	expression tag	UNP P07868
A	-5	PRO	-	expression tag	UNP P07868
A	-4	GLY	-	expression tag	UNP P07868
A	-3	GLY	-	expression tag	UNP P07868

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP P07868
A	-1	GLY	-	expression tag	UNP P07868
A	0	SER	-	expression tag	UNP P07868
A	299	ALA	THR	conflict	UNP P07868
E	-22	ASP	-	expression tag	UNP P07868
E	-21	TYR	-	expression tag	UNP P07868
E	-20	LYS	-	expression tag	UNP P07868
E	-19	ASP	-	expression tag	UNP P07868
E	-18	ASP	-	expression tag	UNP P07868
E	-17	ASP	-	expression tag	UNP P07868
E	-16	ASP	-	expression tag	UNP P07868
E	-15	LYS	-	expression tag	UNP P07868
E	-14	GLY	-	expression tag	UNP P07868
E	-13	SER	-	expression tag	UNP P07868
E	-12	LEU	-	expression tag	UNP P07868
E	-11	GLU	-	expression tag	UNP P07868
E	-10	VAL	-	expression tag	UNP P07868
E	-9	LEU	-	expression tag	UNP P07868
E	-8	PHE	-	expression tag	UNP P07868
E	-7	GLN	-	expression tag	UNP P07868
E	-6	GLY	-	expression tag	UNP P07868
E	-5	PRO	-	expression tag	UNP P07868
E	-4	GLY	-	expression tag	UNP P07868
E	-3	GLY	-	expression tag	UNP P07868
E	-2	SER	-	expression tag	UNP P07868
E	-1	GLY	-	expression tag	UNP P07868
E	0	SER	-	expression tag	UNP P07868
E	299	ALA	THR	conflict	UNP P07868
I	-22	ASP	-	expression tag	UNP P07868
I	-21	TYR	-	expression tag	UNP P07868
I	-20	LYS	-	expression tag	UNP P07868
I	-19	ASP	-	expression tag	UNP P07868
I	-18	ASP	-	expression tag	UNP P07868
I	-17	ASP	-	expression tag	UNP P07868
I	-16	ASP	-	expression tag	UNP P07868
I	-15	LYS	-	expression tag	UNP P07868
I	-14	GLY	-	expression tag	UNP P07868
I	-13	SER	-	expression tag	UNP P07868
I	-12	LEU	-	expression tag	UNP P07868
I	-11	GLU	-	expression tag	UNP P07868
I	-10	VAL	-	expression tag	UNP P07868
I	-9	LEU	-	expression tag	UNP P07868

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
I	-8	PHE	-	expression tag	UNP P07868
I	-7	GLN	-	expression tag	UNP P07868
I	-6	GLY	-	expression tag	UNP P07868
I	-5	PRO	-	expression tag	UNP P07868
I	-4	GLY	-	expression tag	UNP P07868
I	-3	GLY	-	expression tag	UNP P07868
I	-2	SER	-	expression tag	UNP P07868
I	-1	GLY	-	expression tag	UNP P07868
I	0	SER	-	expression tag	UNP P07868
I	299	ALA	THR	conflict	UNP P07868
M	-22	ASP	-	expression tag	UNP P07868
M	-21	TYR	-	expression tag	UNP P07868
M	-20	LYS	-	expression tag	UNP P07868
M	-19	ASP	-	expression tag	UNP P07868
M	-18	ASP	-	expression tag	UNP P07868
M	-17	ASP	-	expression tag	UNP P07868
M	-16	ASP	-	expression tag	UNP P07868
M	-15	LYS	-	expression tag	UNP P07868
M	-14	GLY	-	expression tag	UNP P07868
M	-13	SER	-	expression tag	UNP P07868
M	-12	LEU	-	expression tag	UNP P07868
M	-11	GLU	-	expression tag	UNP P07868
M	-10	VAL	-	expression tag	UNP P07868
M	-9	LEU	-	expression tag	UNP P07868
M	-8	PHE	-	expression tag	UNP P07868
M	-7	GLN	-	expression tag	UNP P07868
M	-6	GLY	-	expression tag	UNP P07868
M	-5	PRO	-	expression tag	UNP P07868
M	-4	GLY	-	expression tag	UNP P07868
M	-3	GLY	-	expression tag	UNP P07868
M	-2	SER	-	expression tag	UNP P07868
M	-1	GLY	-	expression tag	UNP P07868
M	0	SER	-	expression tag	UNP P07868
M	299	ALA	THR	conflict	UNP P07868
Q	-22	ASP	-	expression tag	UNP P07868
Q	-21	TYR	-	expression tag	UNP P07868
Q	-20	LYS	-	expression tag	UNP P07868
Q	-19	ASP	-	expression tag	UNP P07868
Q	-18	ASP	-	expression tag	UNP P07868
Q	-17	ASP	-	expression tag	UNP P07868
Q	-16	ASP	-	expression tag	UNP P07868
Q	-15	LYS	-	expression tag	UNP P07868

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
Q	-14	GLY	-	expression tag	UNP P07868
Q	-13	SER	-	expression tag	UNP P07868
Q	-12	LEU	-	expression tag	UNP P07868
Q	-11	GLU	-	expression tag	UNP P07868
Q	-10	VAL	-	expression tag	UNP P07868
Q	-9	LEU	-	expression tag	UNP P07868
Q	-8	PHE	-	expression tag	UNP P07868
Q	-7	GLN	-	expression tag	UNP P07868
Q	-6	GLY	-	expression tag	UNP P07868
Q	-5	PRO	-	expression tag	UNP P07868
Q	-4	GLY	-	expression tag	UNP P07868
Q	-3	GLY	-	expression tag	UNP P07868
Q	-2	SER	-	expression tag	UNP P07868
Q	-1	GLY	-	expression tag	UNP P07868
Q	0	SER	-	expression tag	UNP P07868
Q	299	ALA	THR	conflict	UNP P07868

- Molecule 2 is a protein called Spore germination protein A2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	353	Total	C	N	O	S	6	0
			2882	1968	426	473	15		
2	F	353	Total	C	N	O	S	6	0
			2882	1968	426	473	15		
2	J	353	Total	C	N	O	S	6	0
			2882	1968	426	473	15		
2	N	353	Total	C	N	O	S	6	0
			2882	1968	426	473	15		
2	R	353	Total	C	N	O	S	6	0
			2882	1968	426	473	15		

- Molecule 3 is a protein called Spore germination protein A3.

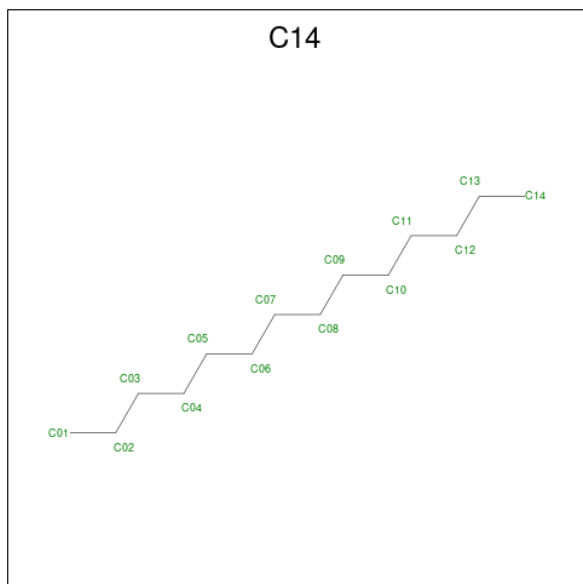
Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	5	Total	C	N	O	S	0	0
			43	26	6	10	1		
3	G	5	Total	C	N	O	S	0	0
			43	26	6	10	1		
3	K	5	Total	C	N	O	S	0	0
			43	26	6	10	1		
3	O	5	Total	C	N	O	S	0	0
			43	26	6	10	1		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					AltConf	Trace
3	S	5	Total	C	N	O	S	0	0
			43	26	6	10	1		

- Molecule 4 is TETRADECANE (CCD ID: C14) (formula: $C_{14}H_{30}$).



Mol	Chain	Residues	Atoms		AltConf
4	A	1	Total	C	0
			14	14	
4	E	1	Total	C	0
			14	14	
4	I	1	Total	C	0
			14	14	
4	M	1	Total	C	0
			14	14	
4	Q	1	Total	C	0
			14	14	

- Molecule 5 is SODIUM ION (CCD ID: NA) (formula: Na).

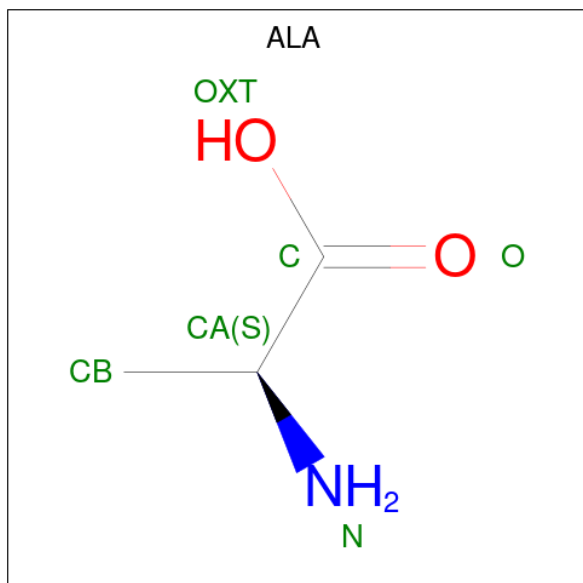
Mol	Chain	Residues	Atoms		AltConf
5	B	1	Total	Na	0
			1	1	
5	F	1	Total	Na	0
			1	1	
5	J	1	Total	Na	0
			1	1	

Continued on next page...

Continued from previous page...

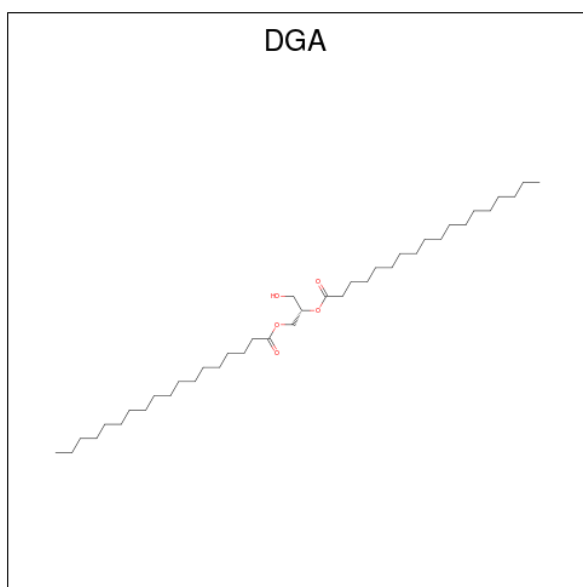
Mol	Chain	Residues	Atoms		AltConf
5	N	1	Total	Na	0
			1	1	
5	R	1	Total	Na	0
			1	1	

- Molecule 6 is ALANINE (CCD ID: ALA) (formula: $C_3H_7NO_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf
6	B	1	Total	C	N	O	0
			6	3	1	2	
6	F	1	Total	C	N	O	0
			6	3	1	2	
6	J	1	Total	C	N	O	0
			6	3	1	2	
6	N	1	Total	C	N	O	0
			6	3	1	2	
6	R	1	Total	C	N	O	0
			6	3	1	2	

- Molecule 7 is DIACYL GLYCEROL (CCD ID: DGA) (formula: $C_{39}H_{76}O_5$).



Mol	Chain	Residues	Atoms			AltConf
7	C	1	Total	C	O	0
			11	7	4	
7	G	1	Total	C	O	0
			11	7	4	
7	K	1	Total	C	O	0
			11	7	4	
7	O	1	Total	C	O	0
			11	7	4	
7	S	1	Total	C	O	0
			11	7	4	

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		AltConf
8	A	54	Total	O	0
			54	54	
8	B	35	Total	O	0
			35	35	
8	C	1	Total	O	0
			1	1	
8	E	54	Total	O	0
			54	54	
8	F	35	Total	O	0
			35	35	
8	G	1	Total	O	0
			1	1	
8	I	54	Total	O	0
			54	54	

Continued on next page...

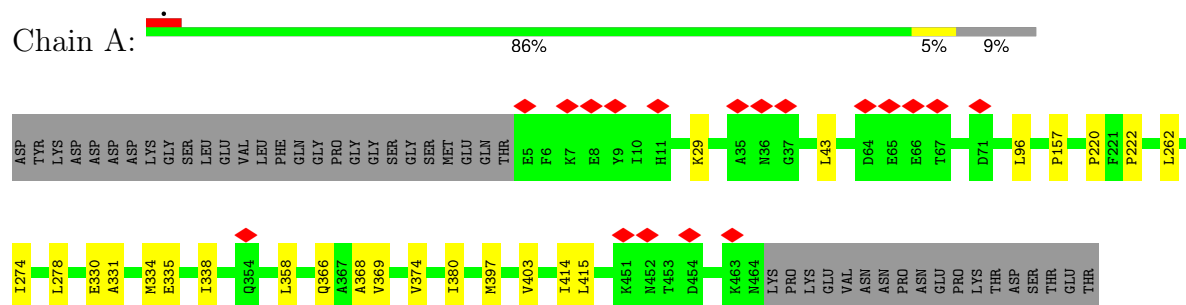
Continued from previous page...

Mol	Chain	Residues	Atoms		AltConf
8	J	35	Total 35	O 35	0
8	K	1	Total 1	O 1	0
8	M	54	Total 54	O 54	0
8	N	35	Total 35	O 35	0
8	O	1	Total 1	O 1	0
8	Q	54	Total 54	O 54	0
8	R	35	Total 35	O 35	0
8	S	1	Total 1	O 1	0

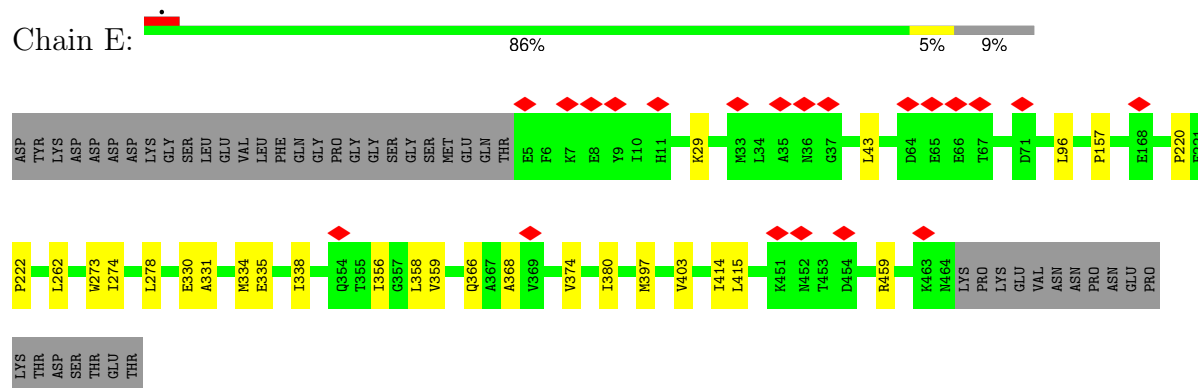
3 Residue-property plots

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

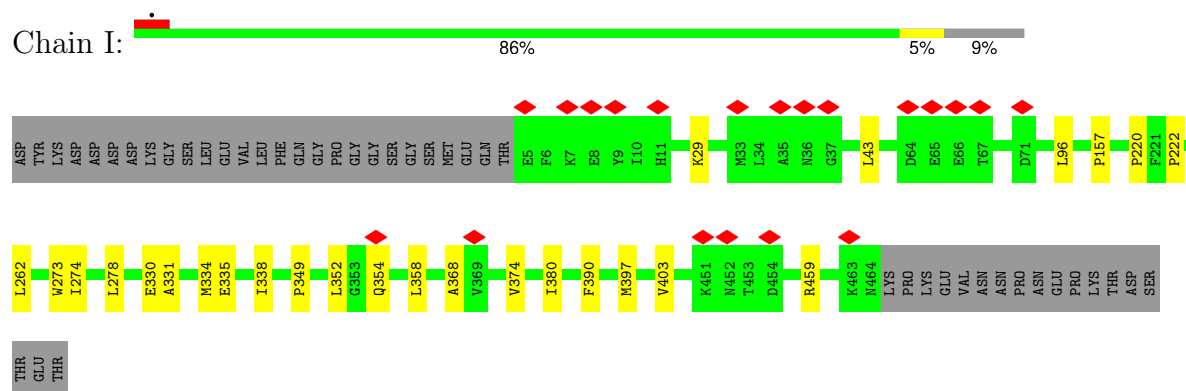
• Molecule 1: Spore germination protein A1



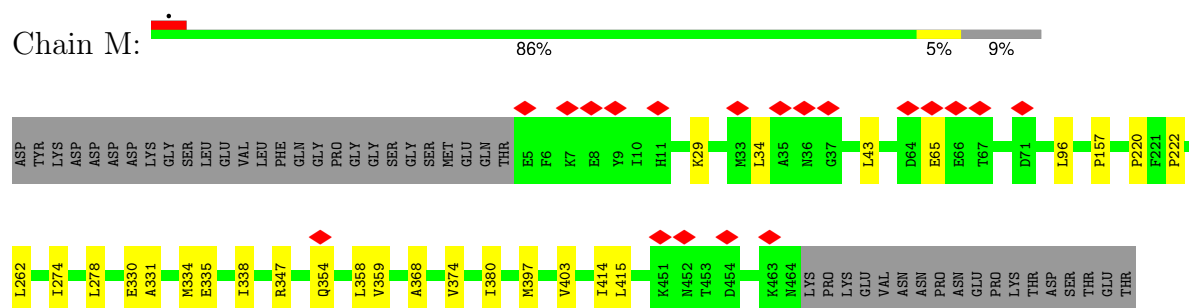
• Molecule 1: Spore germination protein A1



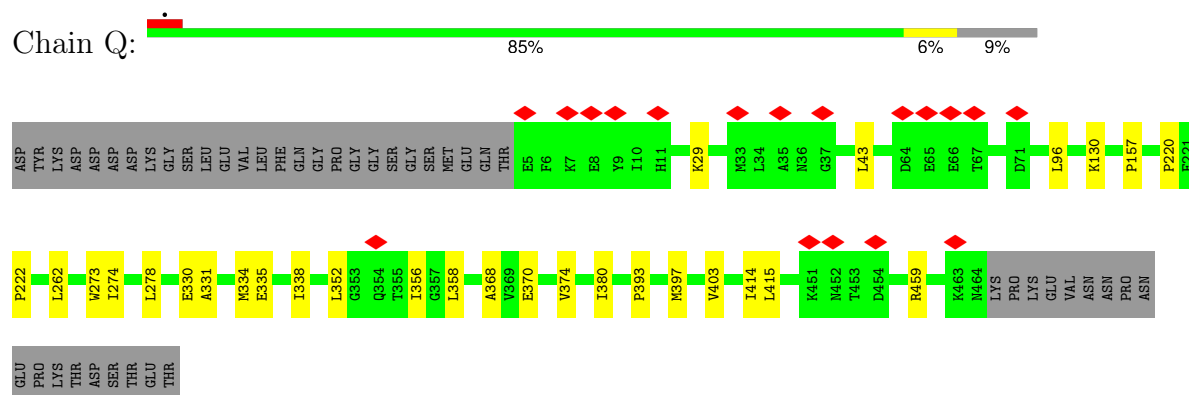
• Molecule 1: Spore germination protein A1



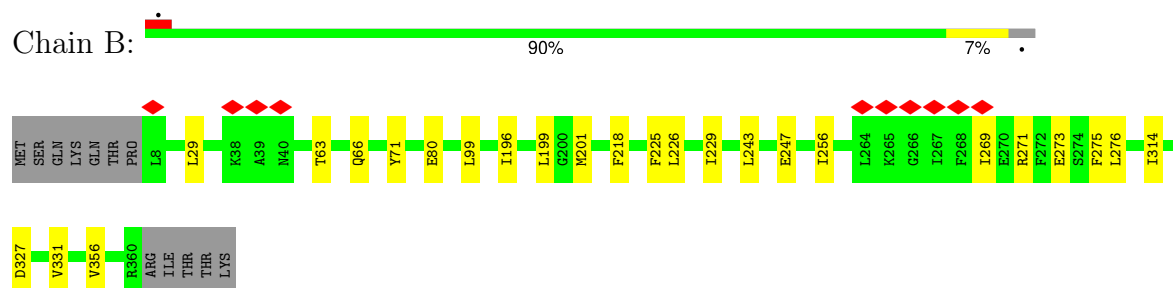
- Molecule 1: Spore germination protein A1



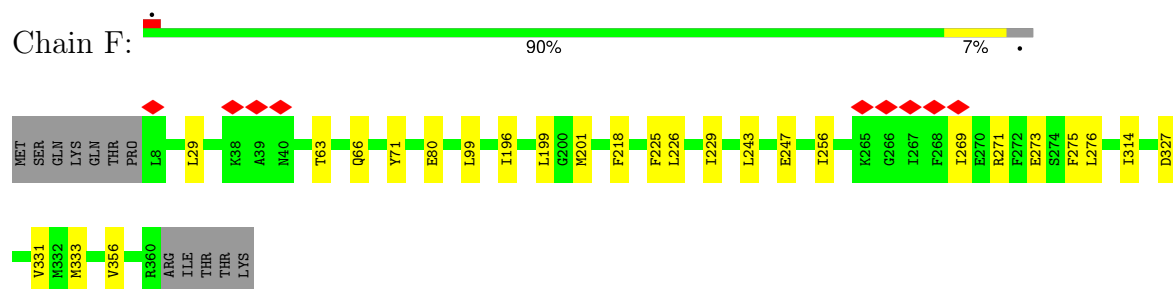
- Molecule 1: Spore germination protein A1



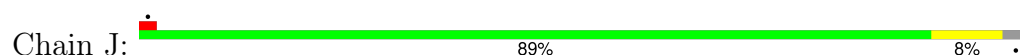
- Molecule 2: Spore germination protein A2



- Molecule 2: Spore germination protein A2



- Molecule 2: Spore germination protein A2





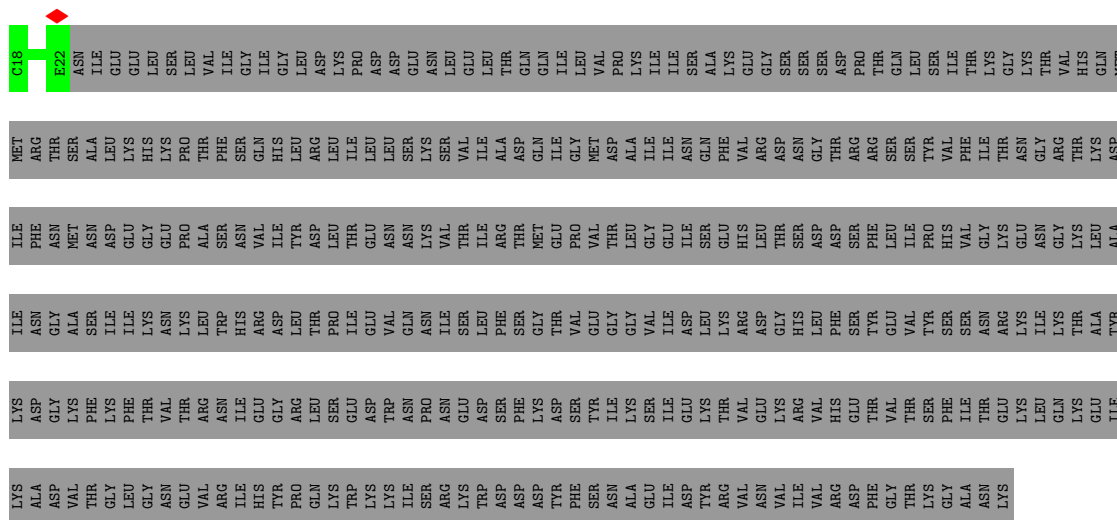
Chain N: 89% 8% .



Chain R: 89% 8%



Chain C: 99%



99%



99%



99%



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

- Molecule 3: Spore germination protein A3

Chain S: 99%

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

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C5	Depositor
Number of particles used	340242	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	53.8	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	165000	Depositor
Image detector	TFS FALCON 4i (4k x 4k)	Depositor
Maximum map value	59.516	Depositor
Minimum map value	-33.583	Depositor
Average map value	0.011	Depositor
Map value standard deviation	1.306	Depositor
Recommended contour level	6	Depositor
Map size (Å)	331.52002, 331.52002, 331.52002	wwPDB
Map dimensions	448, 448, 448	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.74000007, 0.74000007, 0.74000007	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: C14, NA, DGA

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	0.16	0/3770	0.29	0/5108
1	E	0.16	0/3770	0.29	0/5108
1	I	0.16	0/3770	0.29	0/5108
1	M	0.15	0/3770	0.29	0/5108
1	Q	0.16	0/3770	0.29	0/5108
2	B	0.20	0/2959	0.35	0/4017
2	F	0.20	0/2959	0.35	0/4017
2	J	0.20	0/2959	0.35	0/4017
2	N	0.20	0/2959	0.35	0/4017
2	R	0.20	0/2959	0.35	0/4017
3	C	0.20	0/44	0.23	0/59
3	G	0.21	0/44	0.23	0/59
3	K	0.20	0/44	0.23	0/59
3	O	0.20	0/44	0.23	0/59
3	S	0.20	0/44	0.23	0/59
All	All	0.17	0/33865	0.32	0/45920

There are no bond length outliers.

There are no bond angle outliers.

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	3703	0	3867	21	0
1	E	3703	0	3867	24	0
1	I	3703	0	3867	23	0
1	M	3703	0	3867	23	0
1	Q	3703	0	3867	24	0
2	B	2882	0	3035	14	0
2	F	2882	0	3035	15	0
2	J	2882	0	3035	16	0
2	N	2882	0	3035	16	0
2	R	2882	0	3035	16	0
3	C	43	0	28	0	0
3	G	43	0	28	0	0
3	K	43	0	28	0	0
3	O	43	0	28	0	0
3	S	43	0	28	0	0
4	A	14	0	30	2	0
4	E	14	0	30	2	0
4	I	14	0	30	2	0
4	M	14	0	30	2	0
4	Q	14	0	30	2	0
5	B	1	0	0	0	0
5	F	1	0	0	0	0
5	J	1	0	0	0	0
5	N	1	0	0	0	0
5	R	1	0	0	0	0
6	B	6	0	4	0	0
6	F	6	0	4	0	0
6	J	6	0	4	0	0
6	N	6	0	4	0	0
6	R	6	0	4	0	0
7	C	11	0	3	0	0
7	G	11	0	3	0	0
7	K	11	0	3	0	0
7	O	11	0	3	0	0
7	S	11	0	3	0	0
8	A	54	0	0	0	0
8	B	35	0	0	0	0
8	C	1	0	0	0	0
8	E	54	0	0	0	0
8	F	35	0	0	0	0
8	G	1	0	0	0	0
8	I	54	0	0	0	0
8	J	35	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	K	1	0	0	0	0
8	M	54	0	0	0	0
8	N	35	0	0	0	0
8	O	1	0	0	0	0
8	Q	54	0	0	0	0
8	R	35	0	0	0	0
8	S	1	0	0	0	0
All	All	33750	0	34835	160	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 2.

The worst 5 of 160 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:334:MET:HG2	4:A:501:C14:H052	1.78	0.66
1:I:334:MET:HG2	4:I:501:C14:H052	1.78	0.66
1:E:334:MET:HG2	4:E:501:C14:H052	1.78	0.66
1:M:334:MET:HG2	4:M:501:C14:H052	1.78	0.66
1:Q:334:MET:HG2	4:Q:501:C14:H052	1.78	0.66

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	469/505 (93%)	466 (99%)	3 (1%)	0	100	100
1	E	469/505 (93%)	466 (99%)	3 (1%)	0	100	100
1	I	469/505 (93%)	466 (99%)	3 (1%)	0	100	100
1	M	469/505 (93%)	466 (99%)	3 (1%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	Q	469/505 (93%)	466 (99%)	3 (1%)	0	100	100
2	B	357/365 (98%)	350 (98%)	7 (2%)	0	100	100
2	F	357/365 (98%)	350 (98%)	7 (2%)	0	100	100
2	J	357/365 (98%)	350 (98%)	7 (2%)	0	100	100
2	N	357/365 (98%)	350 (98%)	7 (2%)	0	100	100
2	R	357/365 (98%)	350 (98%)	7 (2%)	0	100	100
3	C	3/356 (1%)	3 (100%)	0	0	100	100
3	G	3/356 (1%)	3 (100%)	0	0	100	100
3	K	3/356 (1%)	3 (100%)	0	0	100	100
3	O	3/356 (1%)	3 (100%)	0	0	100	100
3	S	3/356 (1%)	3 (100%)	0	0	100	100
All	All	4145/6130 (68%)	4095 (99%)	50 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	418/447 (94%)	418 (100%)	0	100	100
1	E	418/447 (94%)	418 (100%)	0	100	100
1	I	418/447 (94%)	418 (100%)	0	100	100
1	M	418/447 (94%)	418 (100%)	0	100	100
1	Q	418/447 (94%)	418 (100%)	0	100	100
2	B	317/323 (98%)	317 (100%)	0	100	100
2	F	317/323 (98%)	317 (100%)	0	100	100
2	J	317/323 (98%)	317 (100%)	0	100	100
2	N	317/323 (98%)	317 (100%)	0	100	100
2	R	317/323 (98%)	317 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	C	5/323 (2%)	5 (100%)	0	100	100
3	G	5/323 (2%)	5 (100%)	0	100	100
3	K	5/323 (2%)	5 (100%)	0	100	100
3	O	5/323 (2%)	5 (100%)	0	100	100
3	S	5/323 (2%)	5 (100%)	0	100	100
All	All	3700/5465 (68%)	3700 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	I	434	GLN
2	R	189	ASN
2	J	260	GLN
1	Q	434	GLN
2	J	189	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 20 ligands modelled in this entry, 5 are monoatomic - leaving 15 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
7	DGA	S	401	3	10,10,43	0.27	0	12,12,45	0.30	0
4	C14	A	501	-	13,13,13	0.24	0	12,12,12	0.25	0
6	ALA	R	2002	-	5,5,5	1.19	1 (20%)	6,6,6	1.48	2 (33%)
4	C14	E	501	-	13,13,13	0.24	0	12,12,12	0.25	0
7	DGA	C	401	3	10,10,43	0.27	0	12,12,45	0.30	0
4	C14	Q	501	-	13,13,13	0.24	0	12,12,12	0.26	0
4	C14	I	501	-	13,13,13	0.24	0	12,12,12	0.25	0
6	ALA	N	2002	-	5,5,5	1.18	1 (20%)	6,6,6	1.48	2 (33%)
7	DGA	K	401	3	10,10,43	0.26	0	12,12,45	0.30	0
4	C14	M	501	-	13,13,13	0.24	0	12,12,12	0.25	0
6	ALA	F	2002	-	5,5,5	1.19	1 (20%)	6,6,6	1.47	2 (33%)
7	DGA	G	401	3	10,10,43	0.27	0	12,12,45	0.30	0
6	ALA	J	2002	-	5,5,5	1.20	1 (20%)	6,6,6	1.48	2 (33%)
7	DGA	O	401	3	10,10,43	0.28	0	12,12,45	0.30	0
6	ALA	B	2002	-	5,5,5	1.20	1 (20%)	6,6,6	1.48	2 (33%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	DGA	S	401	3	-	0/9/9/45	-
4	C14	A	501	-	-	6/11/11/11	-
6	ALA	R	2002	-	-	2/4/4/4	-
4	C14	E	501	-	-	6/11/11/11	-
7	DGA	C	401	3	-	0/9/9/45	-
4	C14	Q	501	-	-	6/11/11/11	-
4	C14	I	501	-	-	6/11/11/11	-
6	ALA	N	2002	-	-	2/4/4/4	-
7	DGA	K	401	3	-	0/9/9/45	-
4	C14	M	501	-	-	6/11/11/11	-
6	ALA	F	2002	-	-	2/4/4/4	-
7	DGA	G	401	3	-	0/9/9/45	-
6	ALA	J	2002	-	-	2/4/4/4	-
7	DGA	O	401	3	-	0/9/9/45	-

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	ALA	B	2002	-	-	2/4/4/4	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	2002	ALA	OXT-C	-2.38	1.23	1.30
6	J	2002	ALA	OXT-C	-2.38	1.23	1.30
6	R	2002	ALA	OXT-C	-2.37	1.23	1.30
6	B	2002	ALA	OXT-C	-2.37	1.23	1.30
6	N	2002	ALA	OXT-C	-2.35	1.23	1.30

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	2002	ALA	OXT-C-O	-2.78	117.76	124.08
6	N	2002	ALA	OXT-C-O	-2.78	117.77	124.08
6	R	2002	ALA	OXT-C-O	-2.78	117.77	124.08
6	J	2002	ALA	OXT-C-O	-2.78	117.78	124.08
6	F	2002	ALA	OXT-C-O	-2.77	117.79	124.08

There are no chirality outliers.

5 of 40 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	501	C14	C07-C08-C09-C10
4	I	501	C14	C07-C08-C09-C10
4	A	501	C14	C07-C08-C09-C10
4	M	501	C14	C07-C08-C09-C10
4	Q	501	C14	C07-C08-C09-C10

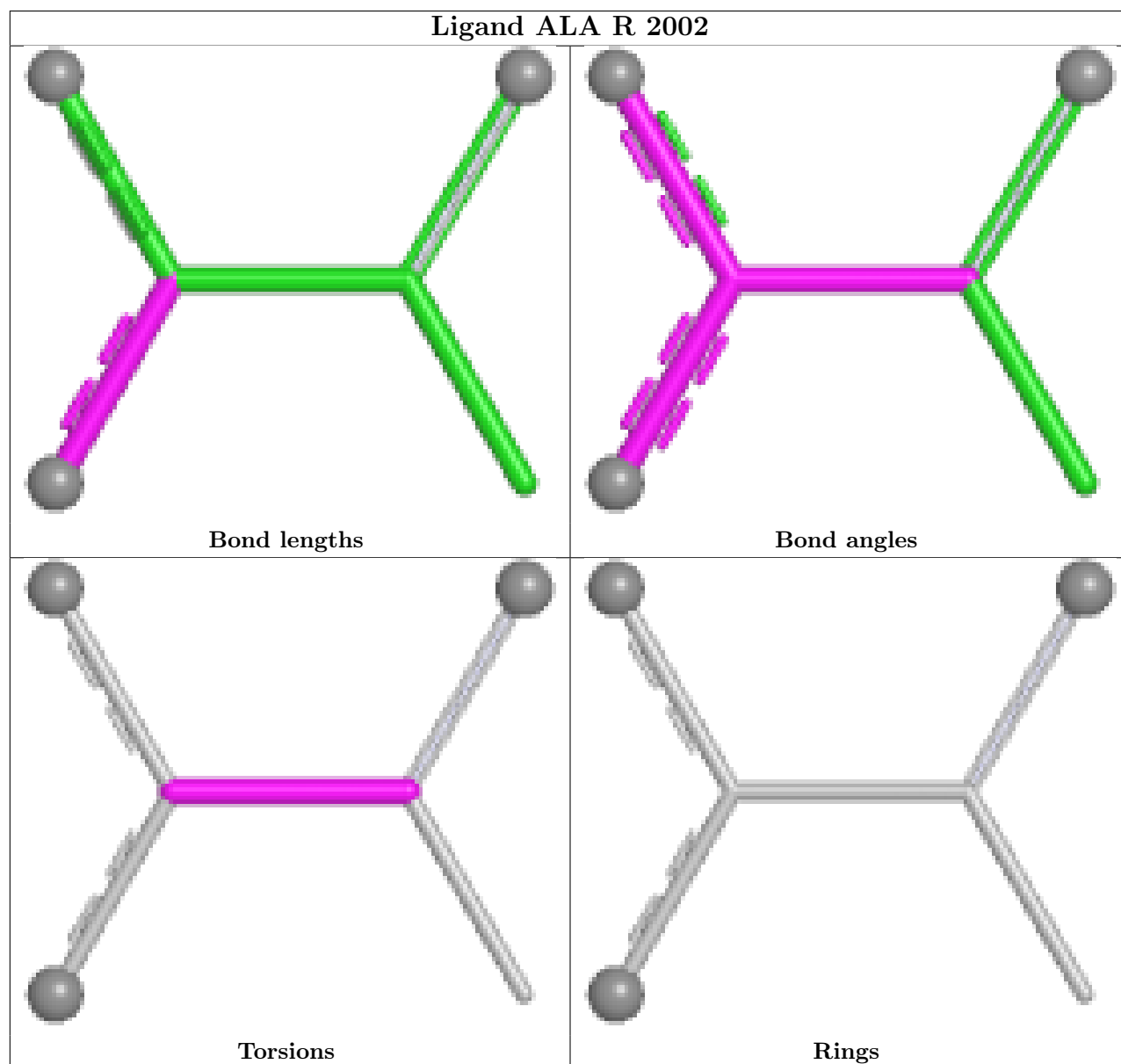
There are no ring outliers.

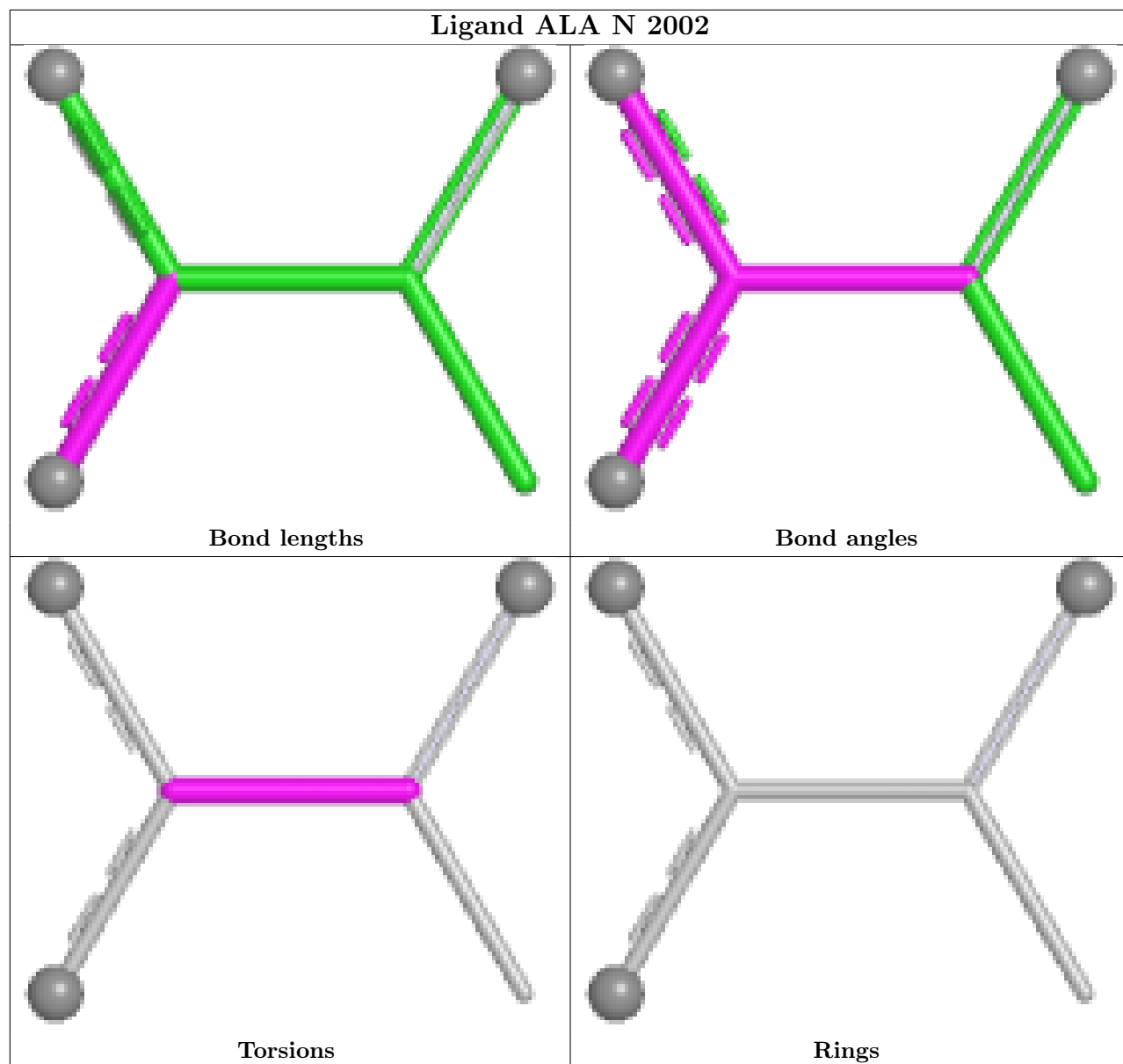
5 monomers are involved in 10 short contacts:

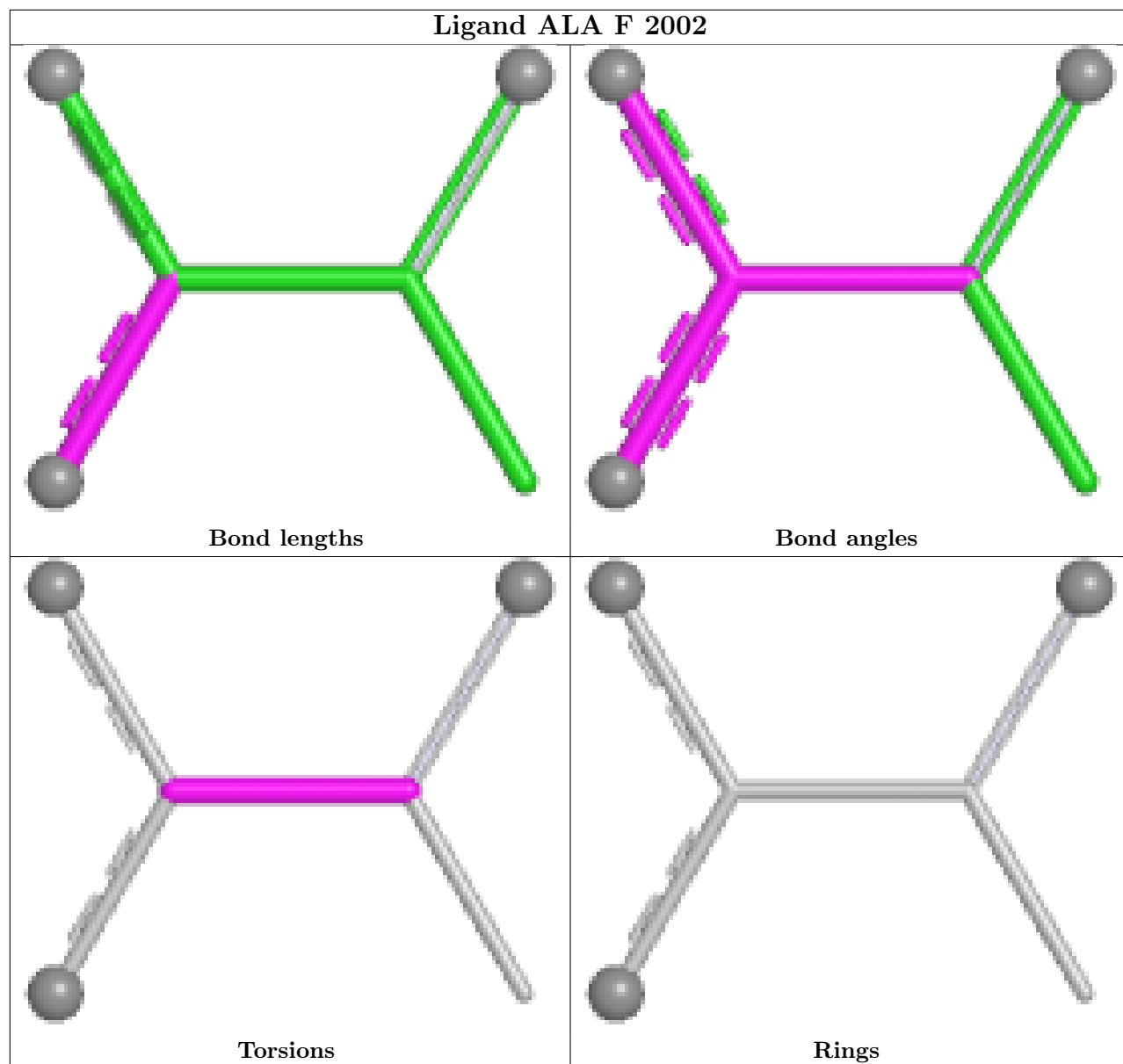
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	501	C14	2	0
4	E	501	C14	2	0
4	Q	501	C14	2	0
4	I	501	C14	2	0
4	M	501	C14	2	0

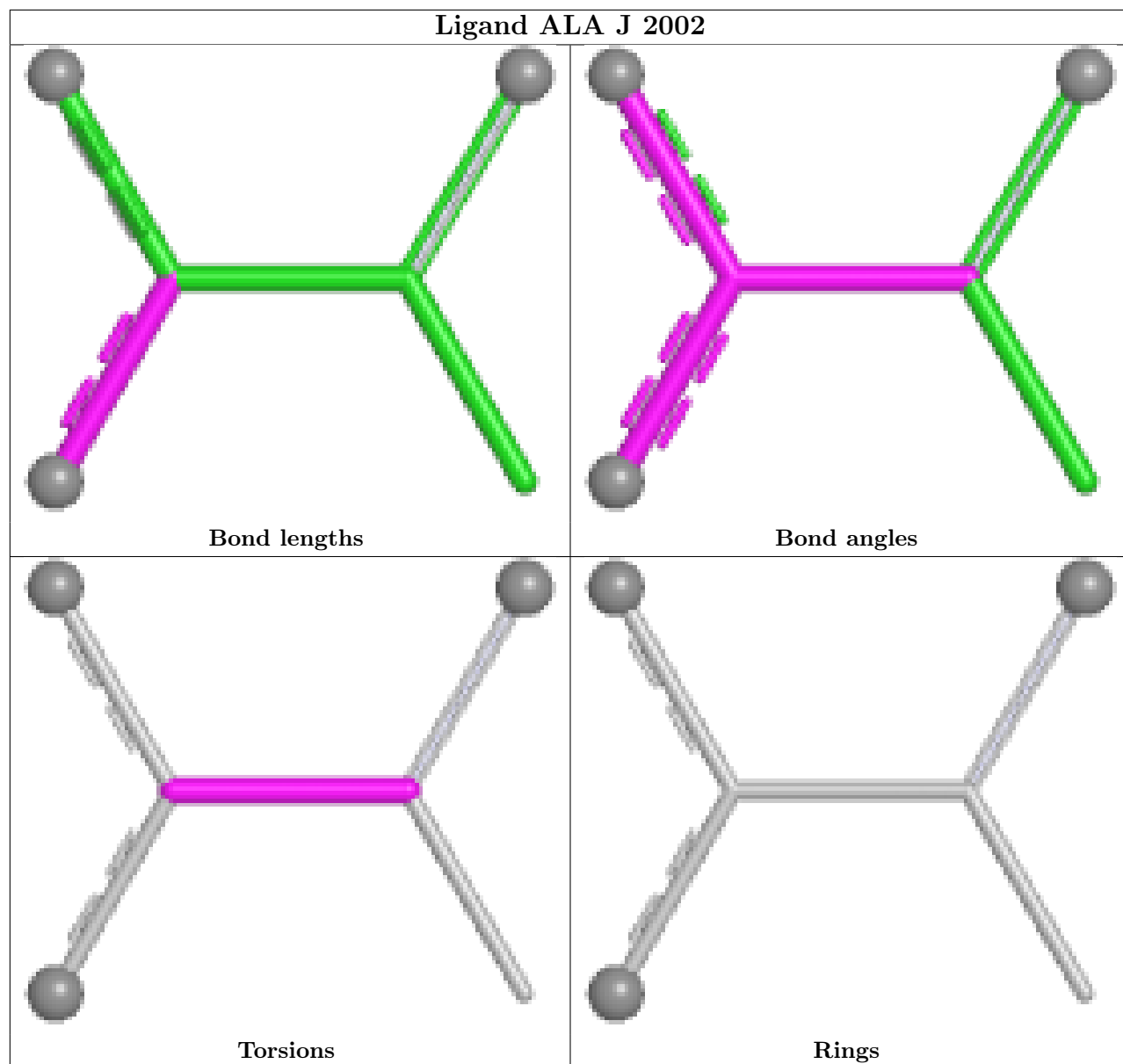
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

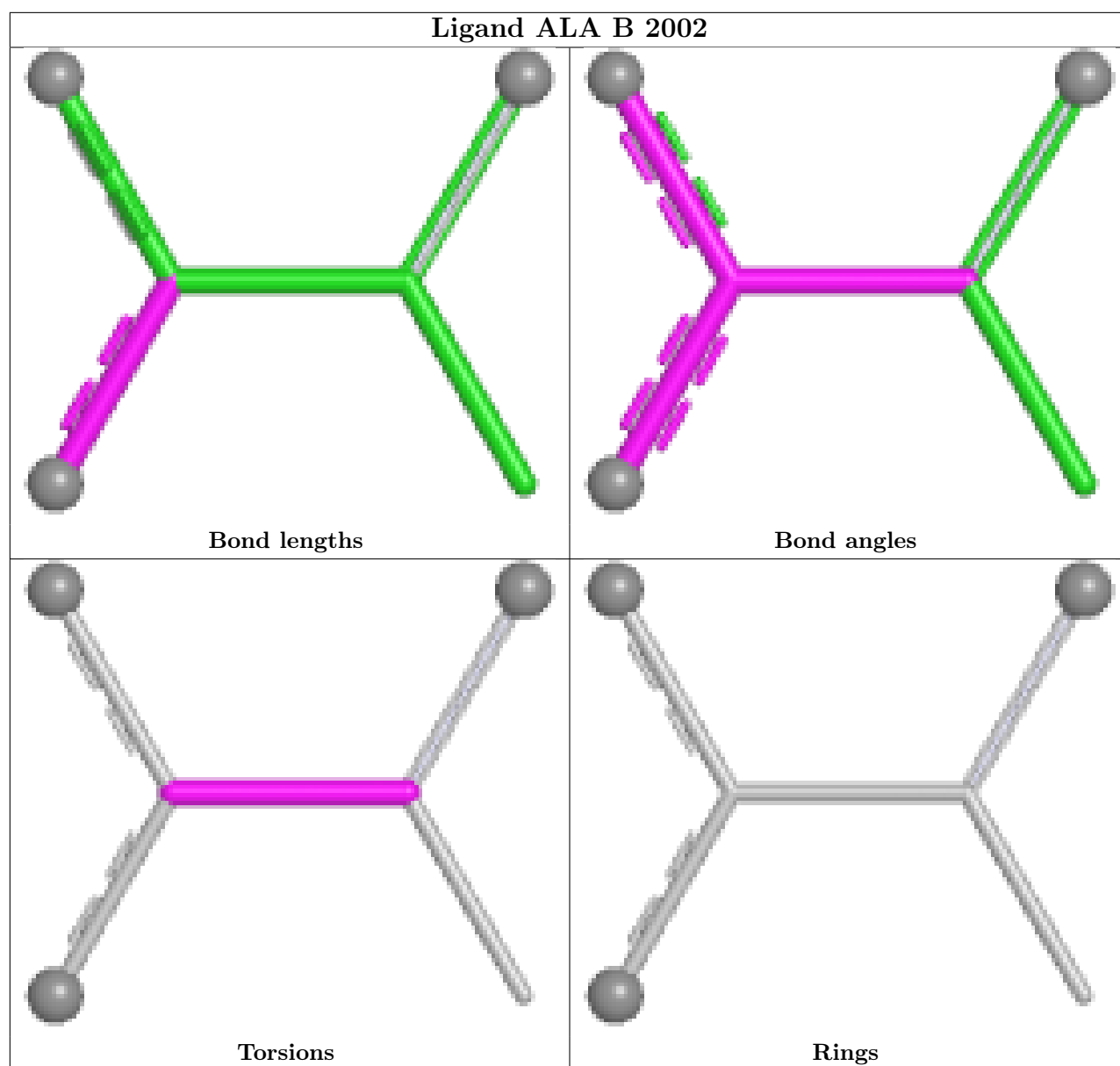
bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 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.

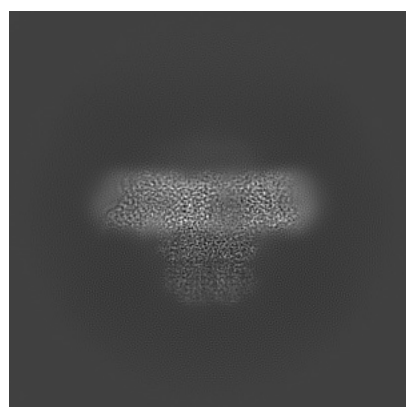
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-78043. These allow visual inspection of the internal detail of the map and identification of artifacts.

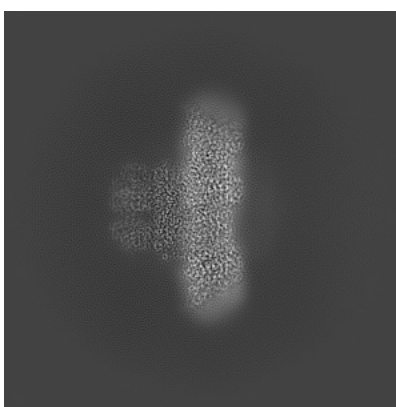
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

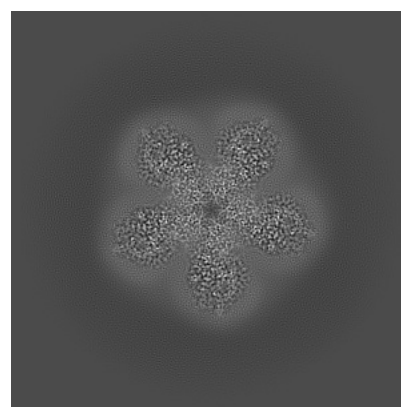
6.1.1 Primary map



X



Y

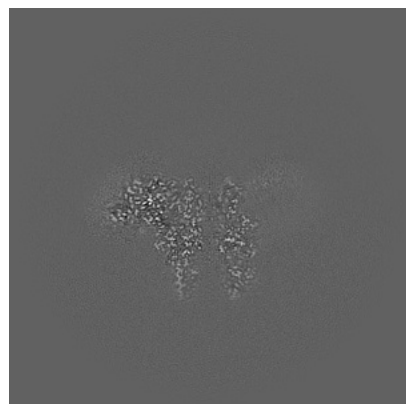


Z

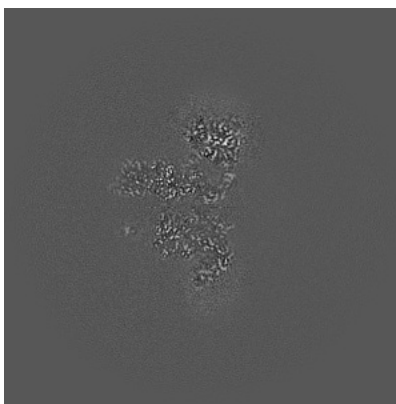
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

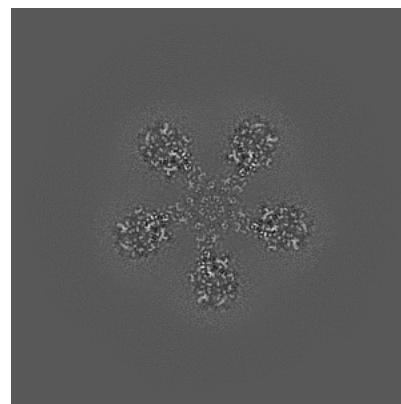
6.2.1 Primary map



X Index: 224



Y Index: 224

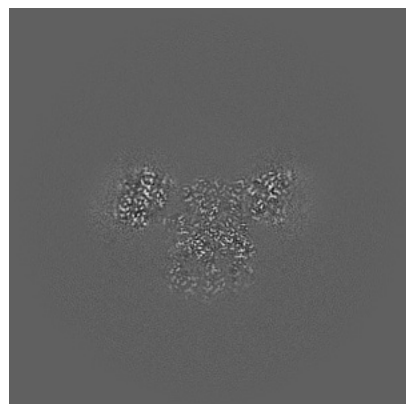


Z Index: 224

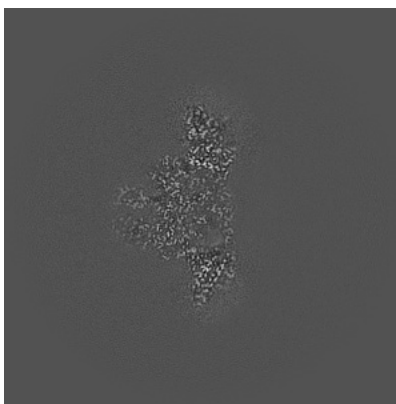
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

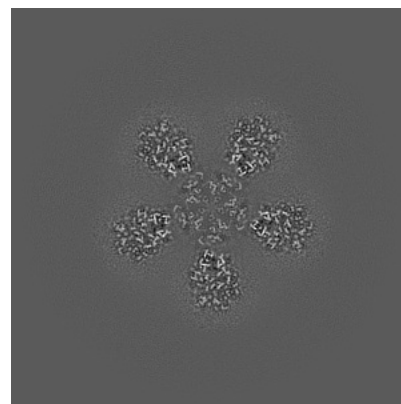
6.3.1 Primary map



X Index: 246



Y Index: 205

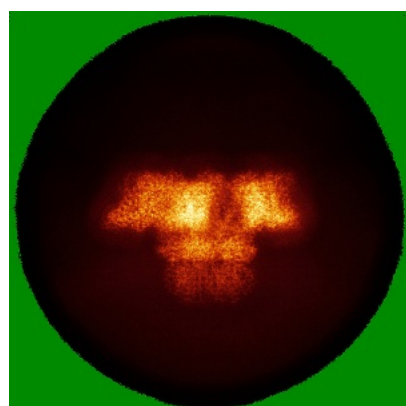


Z Index: 219

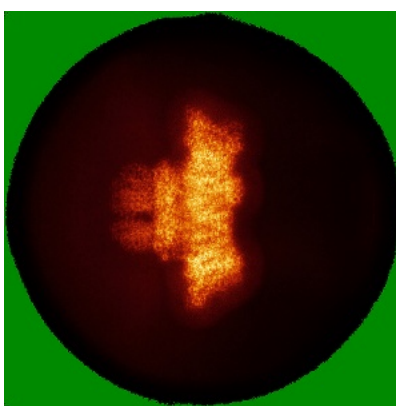
The images above show the largest variance slices of the map in three orthogonal directions.

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

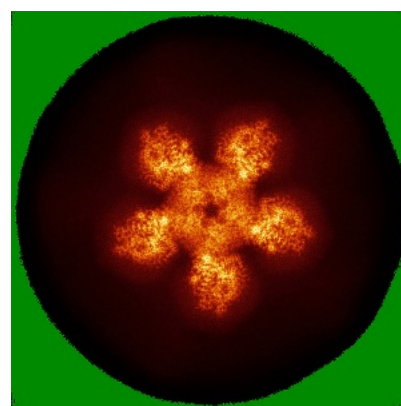
6.4.1 Primary map



X



Y

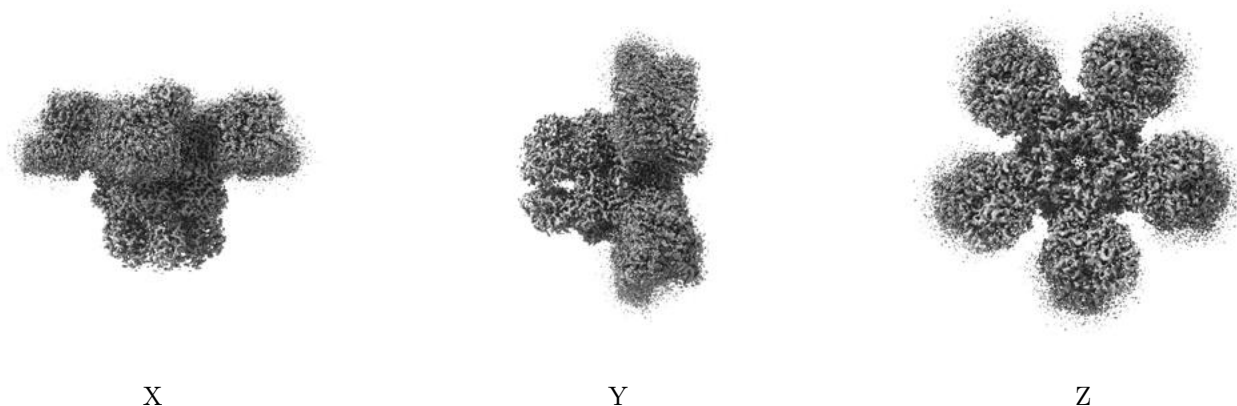


Z

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

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 6.0. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

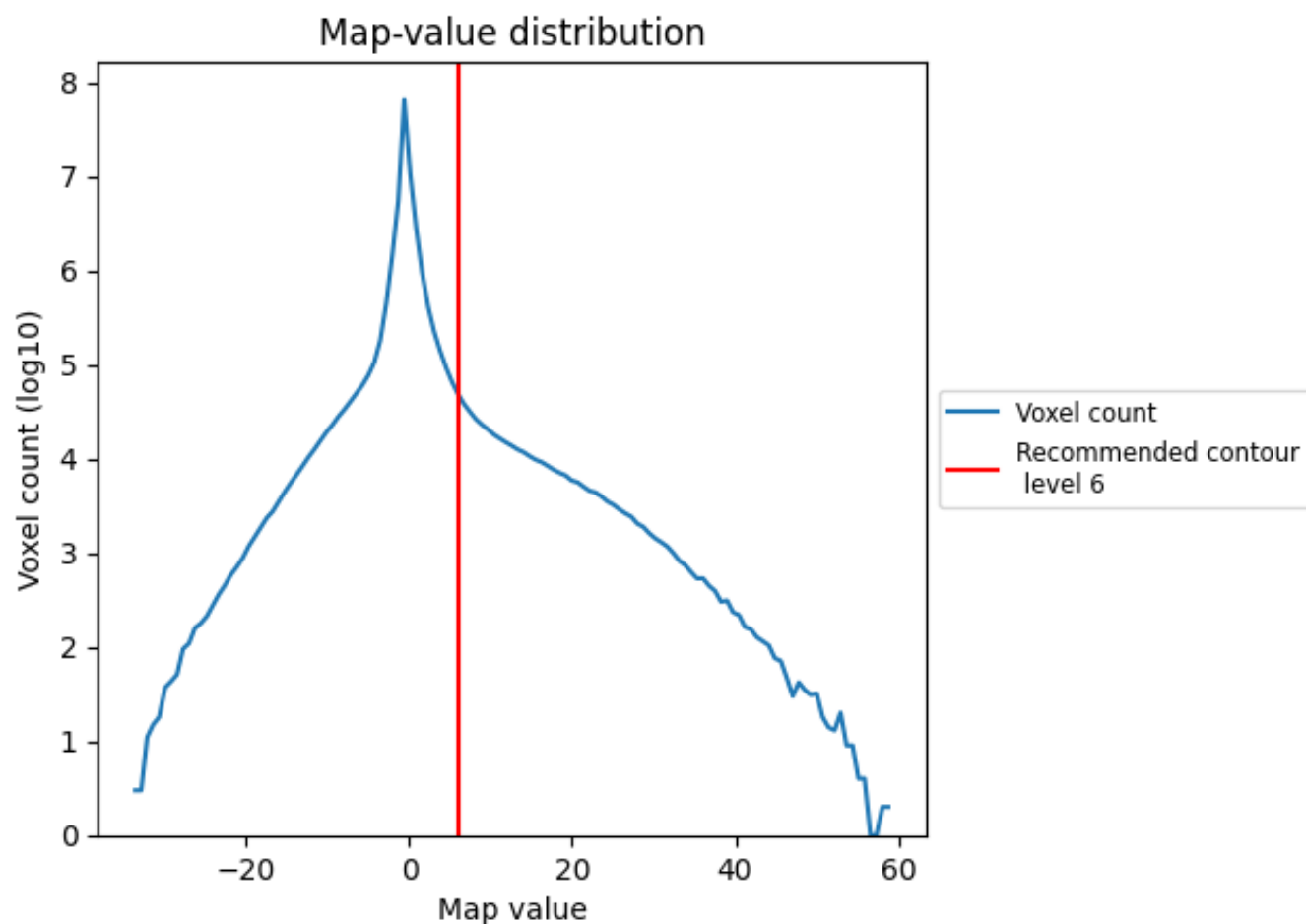
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

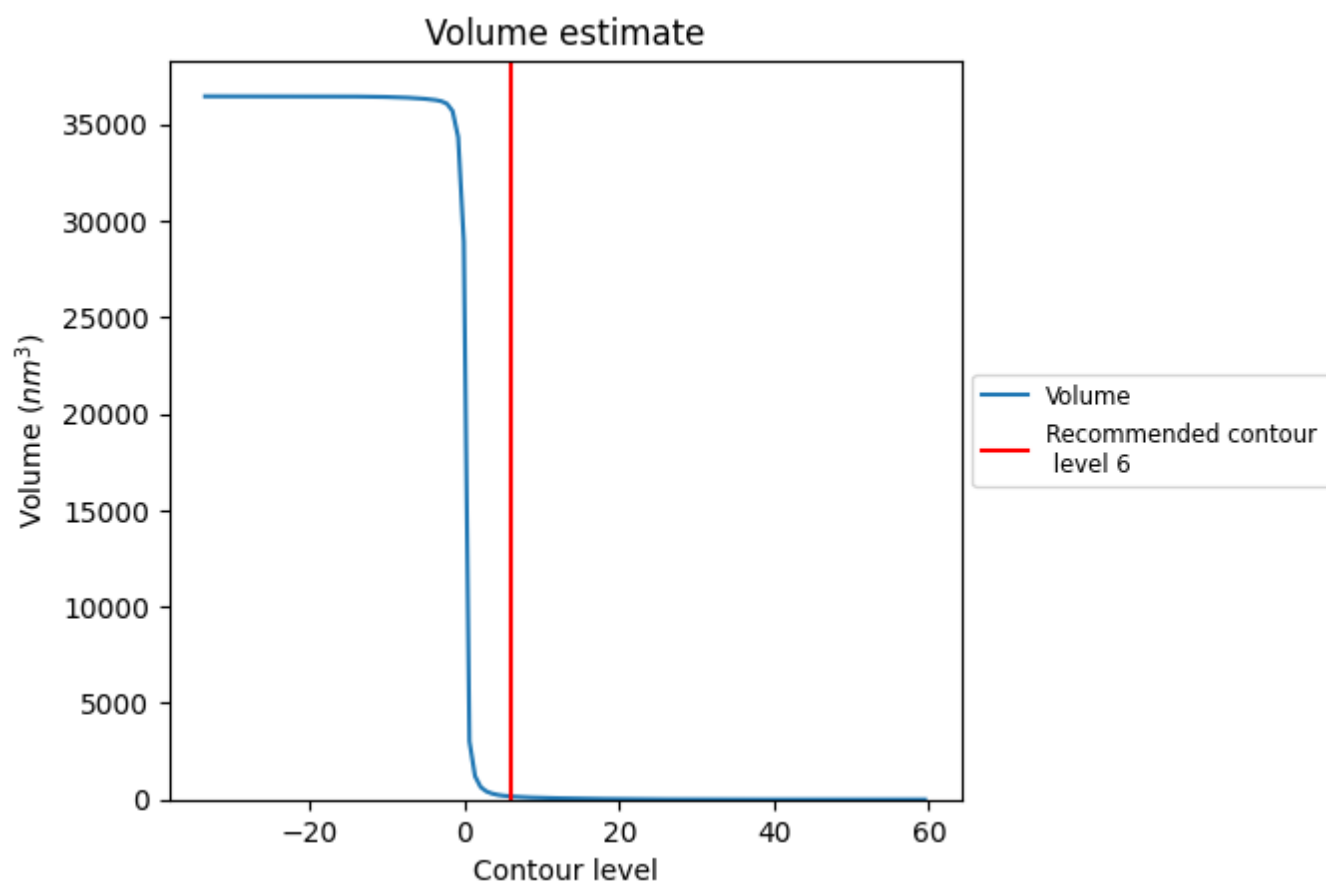
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

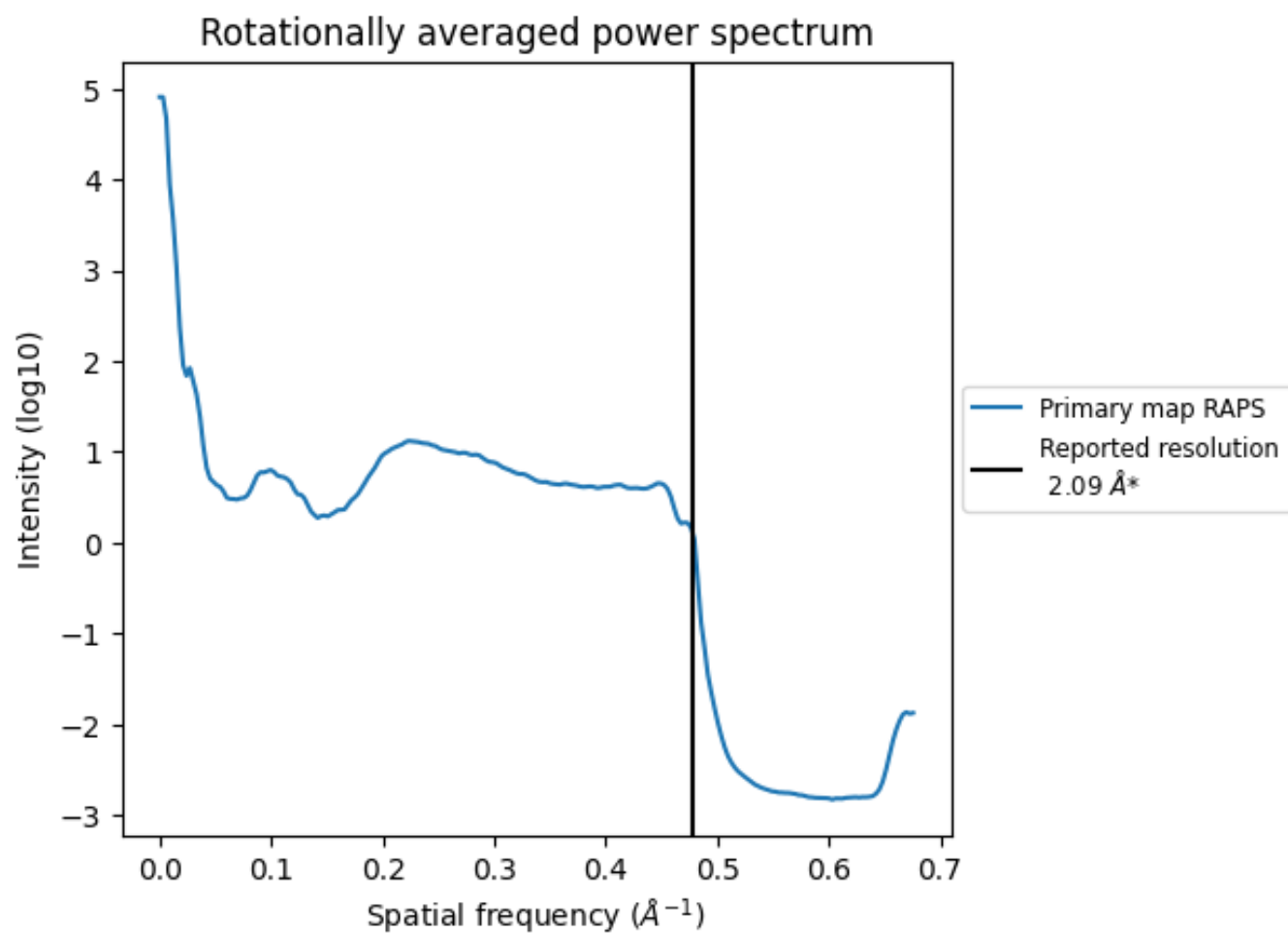
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 161 nm^3 ; this corresponds to an approximate mass of 145 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 0.478 Å⁻¹

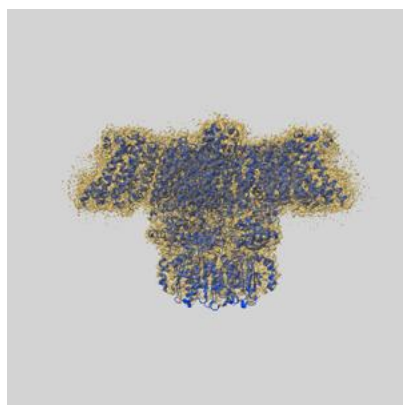
8 Fourier-Shell correlation

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

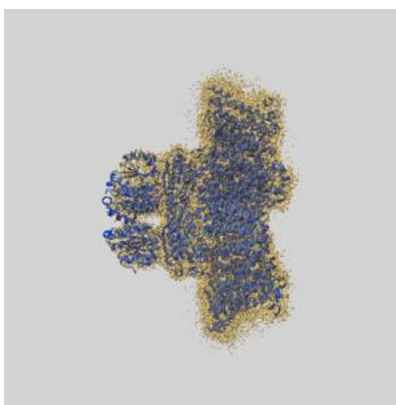
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-78043 and PDB model 37BO. Per-residue inclusion information can be found in section [3](#) on page [12](#).

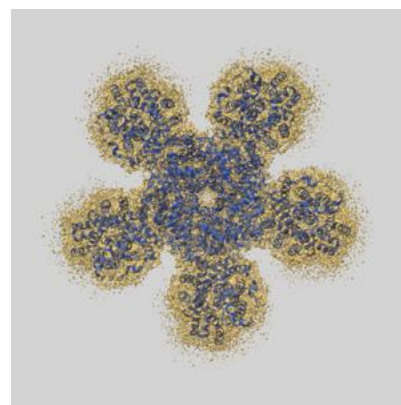
9.1 Map-model overlay [i](#)



X



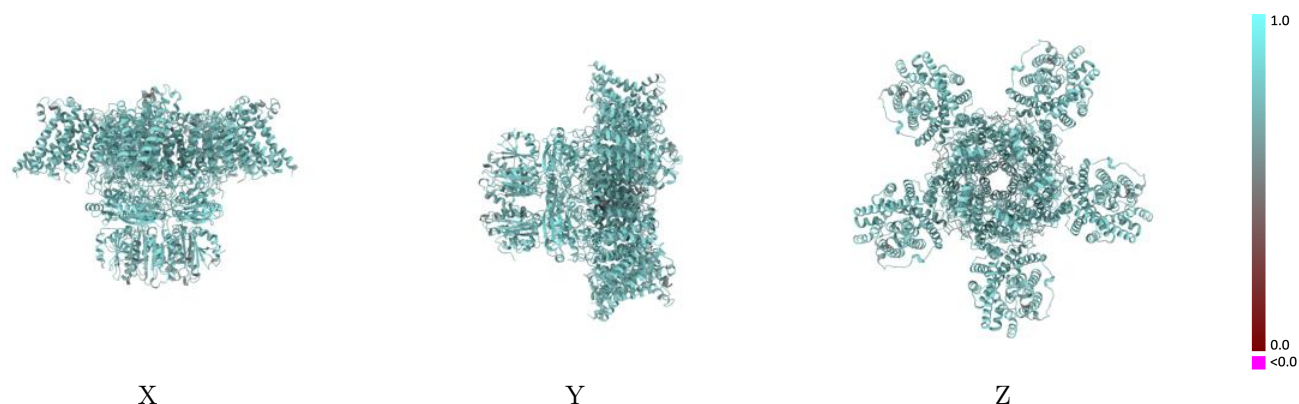
Y



Z

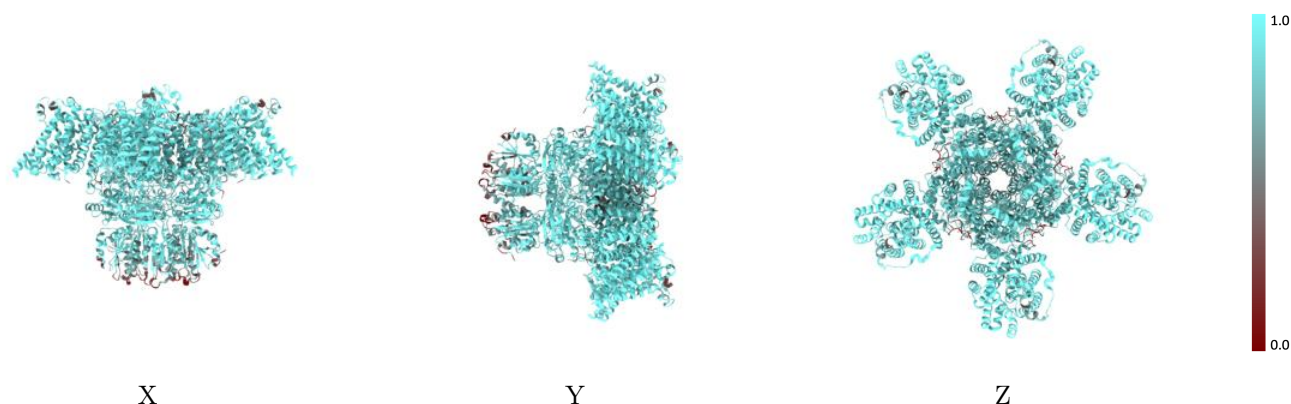
The images above show the 3D surface view of the map at the recommended contour level 6.0 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



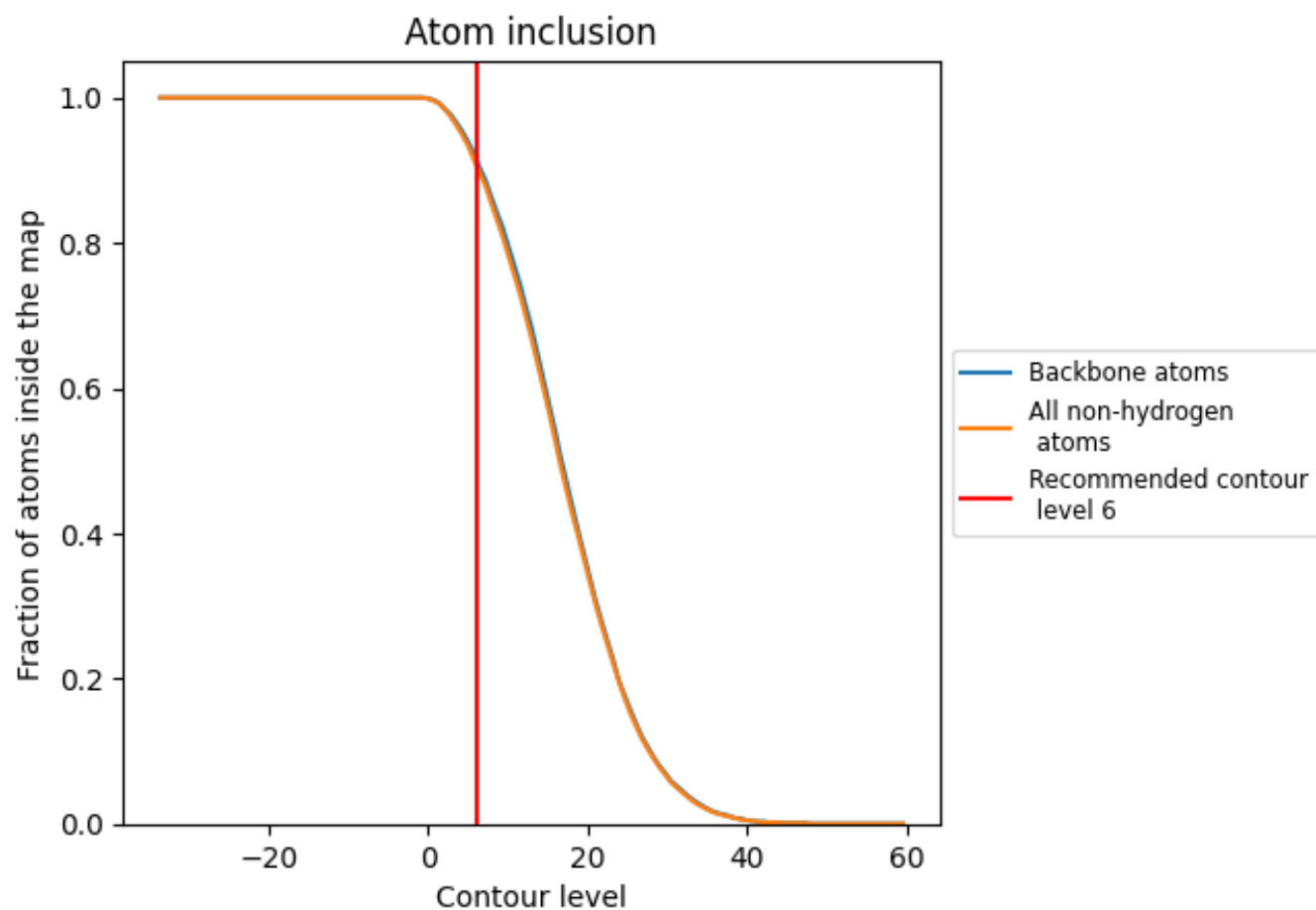
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (6).

9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 91% 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 (6) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9070	0.7360
A	0.8900	0.7530
B	0.9470	0.7190
C	0.4340	0.6280
E	0.8840	0.7510
F	0.9470	0.7180
G	0.4530	0.6270
I	0.8840	0.7520
J	0.9490	0.7170
K	0.4340	0.6240
M	0.8870	0.7520
N	0.9460	0.7160
O	0.4340	0.6250
Q	0.8860	0.7520
R	0.9460	0.7170
S	0.4340	0.6250

1.0
0.0
<0.0