



wwPDB EM Validation Summary Report ⓘ

Jun 10, 2024 – 03:30 AM EDT

PDB ID : 8FNG
EMDB ID : EMD-29312
Title : Structure of E138K HIV-1 intasome with Dolutegravir bound
Authors : Shan, Z.L.; Passos, D.O.; Strutzenberg, T.S.; Li, M.; Lyumkis, D.
Deposited on : 2022-12-27
Resolution : 2.20 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

EMDB validation analysis	:	0.0.1.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

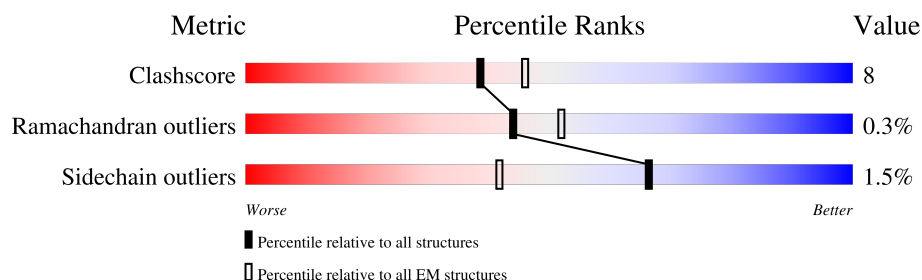
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.20 Å.

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






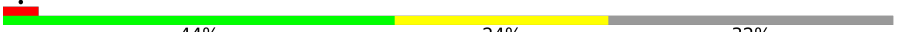
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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

Mol	Chain	Length	Quality of chain
1	A	364	
1	B	364	
1	C	364	
1	D	364	
1	G	364	
1	H	364	
1	I	364	
1	J	364	

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Mol	Chain	Length	Quality of chain
2	E	27	 41% 30% 30%
2	K	27	 41% 30% 30%
3	F	25	 44% 24% 32%
3	L	25	 44% 24% 32%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 12518 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 Lamina-associated polypeptide 2, isoform alpha,Integrase chimera.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	261	Total	C	N	O	S	0	0
			2036	1307	360	360	9		
1	B	242	Total	C	N	O	S	0	0
			1911	1222	338	344	7		
1	C	66	Total	C	N	O	S	0	0
			543	347	102	93	1		
1	D	47	Total	C	N	O		0	0
			388	251	73	64			
1	G	261	Total	C	N	O	S	0	0
			2036	1307	360	360	9		
1	H	242	Total	C	N	O	S	0	0
			1911	1222	338	344	7		
1	I	66	Total	C	N	O	S	0	0
			543	347	102	93	1		
1	J	47	Total	C	N	O		0	0
			388	251	73	64			

There are 216 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-75	GLY	-	expression tag	UNP P42166
A	-74	SER	-	expression tag	UNP P42166
A	-73	HIS	-	expression tag	UNP P42166
A	-72	MET	-	expression tag	UNP P42166
A	-71	PRO	-	expression tag	UNP P42166
A	-70	LYS	-	expression tag	UNP P42166
A	-69	ARG	-	expression tag	UNP P42166
A	-68	GLY	-	expression tag	UNP P42166
A	-67	ARG	-	expression tag	UNP P42166
A	-66	PRO	-	expression tag	UNP P42166
A	-65	ALA	-	expression tag	UNP P42166
A	-64	ALA	-	expression tag	UNP P42166
A	-63	THR	-	expression tag	UNP P42166

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-62	GLU	-	expression tag	UNP P42166
A	-61	VAL	-	expression tag	UNP P42166
A	-60	LYS	-	expression tag	UNP P42166
A	-59	ILE	-	expression tag	UNP P42166
A	-58	PRO	-	expression tag	UNP P42166
A	-57	LYS	-	expression tag	UNP P42166
A	-56	PRO	-	expression tag	UNP P42166
A	-55	ARG	-	expression tag	UNP P42166
A	-54	GLY	-	expression tag	UNP P42166
A	-17	GLN	ARG	conflict	UNP P42166
A	-2	GLY	-	linker	UNP P42166
A	-1	GLY	-	linker	UNP P42166
A	0	GLY	-	linker	UNP P42166
A	140	ALA	GLY	engineered mutation	UNP P12497
B	-75	GLY	-	expression tag	UNP P42166
B	-74	SER	-	expression tag	UNP P42166
B	-73	HIS	-	expression tag	UNP P42166
B	-72	MET	-	expression tag	UNP P42166
B	-71	PRO	-	expression tag	UNP P42166
B	-70	LYS	-	expression tag	UNP P42166
B	-69	ARG	-	expression tag	UNP P42166
B	-68	GLY	-	expression tag	UNP P42166
B	-67	ARG	-	expression tag	UNP P42166
B	-66	PRO	-	expression tag	UNP P42166
B	-65	ALA	-	expression tag	UNP P42166
B	-64	ALA	-	expression tag	UNP P42166
B	-63	THR	-	expression tag	UNP P42166
B	-62	GLU	-	expression tag	UNP P42166
B	-61	VAL	-	expression tag	UNP P42166
B	-60	LYS	-	expression tag	UNP P42166
B	-59	ILE	-	expression tag	UNP P42166
B	-58	PRO	-	expression tag	UNP P42166
B	-57	LYS	-	expression tag	UNP P42166
B	-56	PRO	-	expression tag	UNP P42166
B	-55	ARG	-	expression tag	UNP P42166
B	-54	GLY	-	expression tag	UNP P42166
B	-17	GLN	ARG	conflict	UNP P42166
B	-2	GLY	-	linker	UNP P42166
B	-1	GLY	-	linker	UNP P42166
B	0	GLY	-	linker	UNP P42166
B	140	ALA	GLY	engineered mutation	UNP P12497
C	-75	GLY	-	expression tag	UNP P42166

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-74	SER	-	expression tag	UNP P42166
C	-73	HIS	-	expression tag	UNP P42166
C	-72	MET	-	expression tag	UNP P42166
C	-71	PRO	-	expression tag	UNP P42166
C	-70	LYS	-	expression tag	UNP P42166
C	-69	ARG	-	expression tag	UNP P42166
C	-68	GLY	-	expression tag	UNP P42166
C	-67	ARG	-	expression tag	UNP P42166
C	-66	PRO	-	expression tag	UNP P42166
C	-65	ALA	-	expression tag	UNP P42166
C	-64	ALA	-	expression tag	UNP P42166
C	-63	THR	-	expression tag	UNP P42166
C	-62	GLU	-	expression tag	UNP P42166
C	-61	VAL	-	expression tag	UNP P42166
C	-60	LYS	-	expression tag	UNP P42166
C	-59	ILE	-	expression tag	UNP P42166
C	-58	PRO	-	expression tag	UNP P42166
C	-57	LYS	-	expression tag	UNP P42166
C	-56	PRO	-	expression tag	UNP P42166
C	-55	ARG	-	expression tag	UNP P42166
C	-54	GLY	-	expression tag	UNP P42166
C	-17	GLN	ARG	conflict	UNP P42166
C	-2	GLY	-	linker	UNP P42166
C	-1	GLY	-	linker	UNP P42166
C	0	GLY	-	linker	UNP P42166
C	140	ALA	GLY	engineered mutation	UNP P12497
D	-75	GLY	-	expression tag	UNP P42166
D	-74	SER	-	expression tag	UNP P42166
D	-73	HIS	-	expression tag	UNP P42166
D	-72	MET	-	expression tag	UNP P42166
D	-71	PRO	-	expression tag	UNP P42166
D	-70	LYS	-	expression tag	UNP P42166
D	-69	ARG	-	expression tag	UNP P42166
D	-68	GLY	-	expression tag	UNP P42166
D	-67	ARG	-	expression tag	UNP P42166
D	-66	PRO	-	expression tag	UNP P42166
D	-65	ALA	-	expression tag	UNP P42166
D	-64	ALA	-	expression tag	UNP P42166
D	-63	THR	-	expression tag	UNP P42166
D	-62	GLU	-	expression tag	UNP P42166
D	-61	VAL	-	expression tag	UNP P42166
D	-60	LYS	-	expression tag	UNP P42166

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-59	ILE	-	expression tag	UNP P42166
D	-58	PRO	-	expression tag	UNP P42166
D	-57	LYS	-	expression tag	UNP P42166
D	-56	PRO	-	expression tag	UNP P42166
D	-55	ARG	-	expression tag	UNP P42166
D	-54	GLY	-	expression tag	UNP P42166
D	-17	GLN	ARG	conflict	UNP P42166
D	-2	GLY	-	linker	UNP P42166
D	-1	GLY	-	linker	UNP P42166
D	0	GLY	-	linker	UNP P42166
D	140	ALA	GLY	engineered mutation	UNP P12497
G	-75	GLY	-	expression tag	UNP P42166
G	-74	SER	-	expression tag	UNP P42166
G	-73	HIS	-	expression tag	UNP P42166
G	-72	MET	-	expression tag	UNP P42166
G	-71	PRO	-	expression tag	UNP P42166
G	-70	LYS	-	expression tag	UNP P42166
G	-69	ARG	-	expression tag	UNP P42166
G	-68	GLY	-	expression tag	UNP P42166
G	-67	ARG	-	expression tag	UNP P42166
G	-66	PRO	-	expression tag	UNP P42166
G	-65	ALA	-	expression tag	UNP P42166
G	-64	ALA	-	expression tag	UNP P42166
G	-63	THR	-	expression tag	UNP P42166
G	-62	GLU	-	expression tag	UNP P42166
G	-61	VAL	-	expression tag	UNP P42166
G	-60	LYS	-	expression tag	UNP P42166
G	-59	ILE	-	expression tag	UNP P42166
G	-58	PRO	-	expression tag	UNP P42166
G	-57	LYS	-	expression tag	UNP P42166
G	-56	PRO	-	expression tag	UNP P42166
G	-55	ARG	-	expression tag	UNP P42166
G	-54	GLY	-	expression tag	UNP P42166
G	-17	GLN	ARG	conflict	UNP P42166
G	-2	GLY	-	linker	UNP P42166
G	-1	GLY	-	linker	UNP P42166
G	0	GLY	-	linker	UNP P42166
G	140	ALA	GLY	engineered mutation	UNP P12497
H	-75	GLY	-	expression tag	UNP P42166
H	-74	SER	-	expression tag	UNP P42166
H	-73	HIS	-	expression tag	UNP P42166
H	-72	MET	-	expression tag	UNP P42166

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Chain	Residue	Modelled	Actual	Comment	Reference
H	-71	PRO	-	expression tag	UNP P42166
H	-70	LYS	-	expression tag	UNP P42166
H	-69	ARG	-	expression tag	UNP P42166
H	-68	GLY	-	expression tag	UNP P42166
H	-67	ARG	-	expression tag	UNP P42166
H	-66	PRO	-	expression tag	UNP P42166
H	-65	ALA	-	expression tag	UNP P42166
H	-64	ALA	-	expression tag	UNP P42166
H	-63	THR	-	expression tag	UNP P42166
H	-62	GLU	-	expression tag	UNP P42166
H	-61	VAL	-	expression tag	UNP P42166
H	-60	LYS	-	expression tag	UNP P42166
H	-59	ILE	-	expression tag	UNP P42166
H	-58	PRO	-	expression tag	UNP P42166
H	-57	LYS	-	expression tag	UNP P42166
H	-56	PRO	-	expression tag	UNP P42166
H	-55	ARG	-	expression tag	UNP P42166
H	-54	GLY	-	expression tag	UNP P42166
H	-17	GLN	ARG	conflict	UNP P42166
H	-2	GLY	-	linker	UNP P42166
H	-1	GLY	-	linker	UNP P42166
H	0	GLY	-	linker	UNP P42166
H	140	ALA	GLY	engineered mutation	UNP P12497
I	-75	GLY	-	expression tag	UNP P42166
I	-74	SER	-	expression tag	UNP P42166
I	-73	HIS	-	expression tag	UNP P42166
I	-72	MET	-	expression tag	UNP P42166
I	-71	PRO	-	expression tag	UNP P42166
I	-70	LYS	-	expression tag	UNP P42166
I	-69	ARG	-	expression tag	UNP P42166
I	-68	GLY	-	expression tag	UNP P42166
I	-67	ARG	-	expression tag	UNP P42166
I	-66	PRO	-	expression tag	UNP P42166
I	-65	ALA	-	expression tag	UNP P42166
I	-64	ALA	-	expression tag	UNP P42166
I	-63	THR	-	expression tag	UNP P42166
I	-62	GLU	-	expression tag	UNP P42166
I	-61	VAL	-	expression tag	UNP P42166
I	-60	LYS	-	expression tag	UNP P42166
I	-59	ILE	-	expression tag	UNP P42166
I	-58	PRO	-	expression tag	UNP P42166
I	-57	LYS	-	expression tag	UNP P42166

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Chain	Residue	Modelled	Actual	Comment	Reference
I	-56	PRO	-	expression tag	UNP P42166
I	-55	ARG	-	expression tag	UNP P42166
I	-54	GLY	-	expression tag	UNP P42166
I	-17	GLN	ARG	conflict	UNP P42166
I	-2	GLY	-	linker	UNP P42166
I	-1	GLY	-	linker	UNP P42166
I	0	GLY	-	linker	UNP P42166
I	140	ALA	GLY	engineered mutation	UNP P12497
J	-75	GLY	-	expression tag	UNP P42166
J	-74	SER	-	expression tag	UNP P42166
J	-73	HIS	-	expression tag	UNP P42166
J	-72	MET	-	expression tag	UNP P42166
J	-71	PRO	-	expression tag	UNP P42166
J	-70	LYS	-	expression tag	UNP P42166
J	-69	ARG	-	expression tag	UNP P42166
J	-68	GLY	-	expression tag	UNP P42166
J	-67	ARG	-	expression tag	UNP P42166
J	-66	PRO	-	expression tag	UNP P42166
J	-65	ALA	-	expression tag	UNP P42166
J	-64	ALA	-	expression tag	UNP P42166
J	-63	THR	-	expression tag	UNP P42166
J	-62	GLU	-	expression tag	UNP P42166
J	-61	VAL	-	expression tag	UNP P42166
J	-60	LYS	-	expression tag	UNP P42166
J	-59	ILE	-	expression tag	UNP P42166
J	-58	PRO	-	expression tag	UNP P42166
J	-57	LYS	-	expression tag	UNP P42166
J	-56	PRO	-	expression tag	UNP P42166
J	-55	ARG	-	expression tag	UNP P42166
J	-54	GLY	-	expression tag	UNP P42166
J	-17	GLN	ARG	conflict	UNP P42166
J	-2	GLY	-	linker	UNP P42166
J	-1	GLY	-	linker	UNP P42166
J	0	GLY	-	linker	UNP P42166
J	140	ALA	GLY	engineered mutation	UNP P12497

- Molecule 2 is a DNA chain called DNA (27-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
2	E	19	Total	C	N	O	P	0	0
			384	185	67	114	18		
2	K	19	Total	C	N	O	P	0	0
			384	185	67	114	18		

- | Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|--------------|----------|---------|----------|---------|---------|-------|
| 3 | F | 17 | Total
371 | C
176 | N
73 | O
104 | P
18 | 1 | 0 |
| 3 | L | 17 | Total
371 | C
176 | N
73 | O
104 | P
18 | 1 | 0 |

- | Mol | Chain | Residues | Atoms | AltConf |
|-----|-------|----------|-----------------|---------|
| 4 | A | 2 | Total Mg
2 2 | 0 |
| 4 | G | 2 | Total Mg
2 2 | 0 |

- | Mol | Chain | Residues | Atoms | AltConf |
|-----|-------|----------|-----------------|---------|
| 5 | A | 1 | Total Zn
1 1 | 0 |
| 5 | G | 1 | Total Zn
1 1 | 0 |

- # DLU
-
- The chemical structure of DLU (1,3-bis(2,4,6-trifluorophenyl)pyrrolidine) is shown. The molecule consists of a central pyrrolidine ring substituted with two 2,4,6-trifluorophenyl groups. The atoms are labeled as follows:
- Central Pyrrolidine Ring:**
 - Nitrogen atoms: NBC (top), NBD (bottom).
 - Carbon atoms: CBA(R) (top-left), CAY (top-right), CAX (bottom-right), CBB(S) (bottom-left), CAO (bottom).
 - Oxygen atoms: OAC (top), OAD (top-right), OAE (top-right), OAB (bottom-right), OAO (bottom-left).
 - Hydrogen atoms: HBB (bottom-left, attached to CBB(S)).
 - 2,4,6-Trifluorophenyl Groups:**
 - Top-right group (attached to CAY):
 - Carbon atoms: CAW (top), CAZ (bottom), CAK (bottom).
 - Oxygen atom: OAD (top-right).
 - Bottom-right group (attached to CAX):
 - Carbon atoms: CAV (top), CAI (top-right), CAJ (bottom-left), CAT (bottom).
 - Fluorine atoms: FAG (top-left), FAF (bottom).

Mol	Chain	Residues	Atoms					AltConf
6	A	1	Total	C	F	N	O	0
			30	20	2	3	5	
6	G	1	Total	C	F	N	O	0
			30	20	2	3	5	

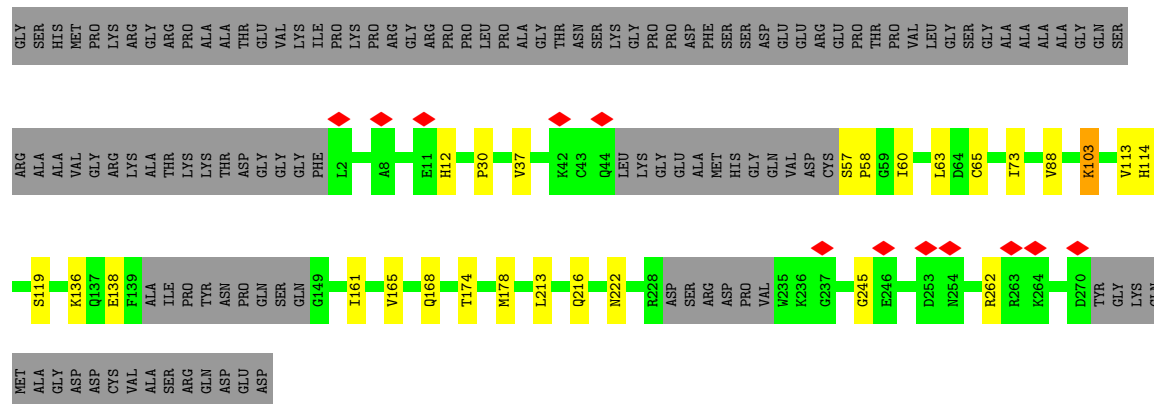
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		AltConf
7	A	286	Total	O	0
			286	286	
7	B	75	Total	O	0
			75	75	
7	C	43	Total	O	0
			43	43	
7	D	48	Total	O	0
			48	48	
7	E	62	Total	O	0
			62	62	
7	F	79	Total	O	0
			79	79	
7	G	286	Total	O	0
			286	286	
7	H	75	Total	O	0
			75	75	
7	I	43	Total	O	0
			43	43	
7	J	48	Total	O	0
			48	48	
7	K	62	Total	O	0
			62	62	
7	L	79	Total	O	0
			79	79	

I268
ARG
ASP
TYR
GLY
LYS
GLN
MET
ALA
GLY
PRO
ASP
ASP
CYS
VAL
ALA
SER
SER
ARG
GLN
GLN
ASP
GLU
ASP

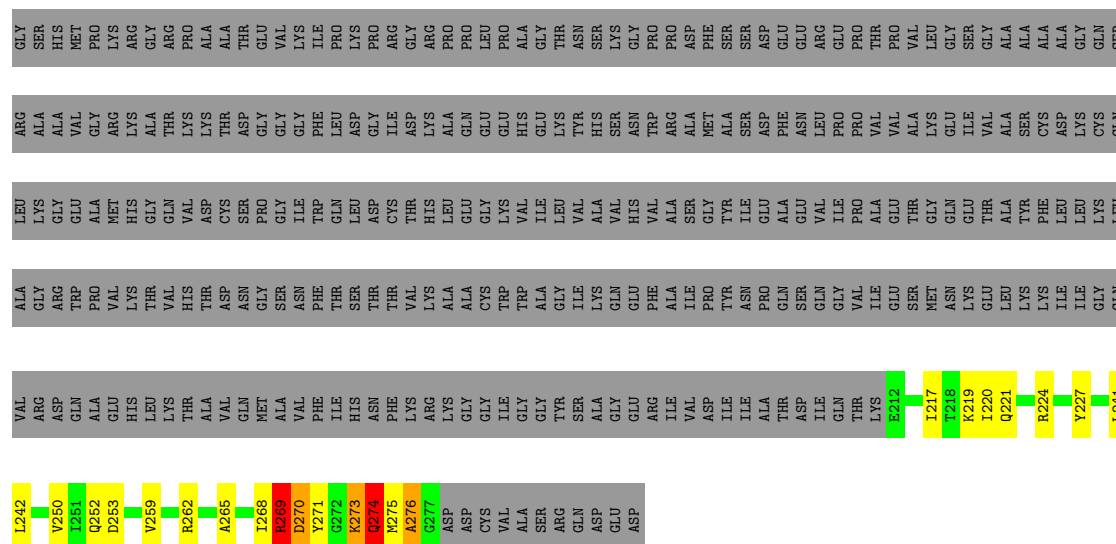
- Molecule 1: Lamina-associated polypeptide 2, isoform alpha,Integrase chimera

Chain H:  59% 7% 34%



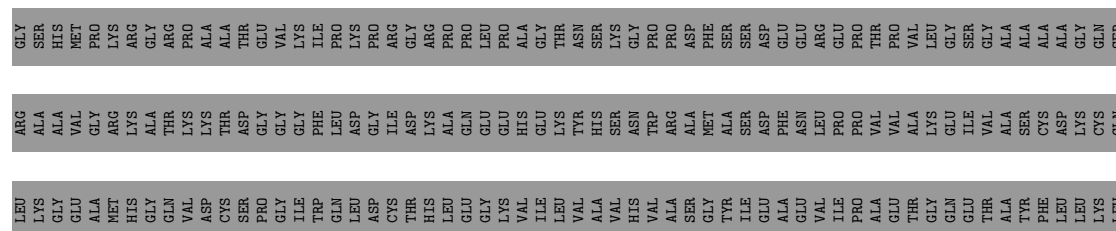
- Molecule 1: Lamina-associated polypeptide 2, isoform alpha,Integrase chimera

Chain I:  12% 5% 82%



- Molecule 1: Lamina-associated polypeptide 2, isoform alpha,Integrase chimera

Chain J:  10% 1% 87%



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

VAL
ARG
ASP
GLN
ALA
GLU
HIS
LEU
THR
VAL
ALA
VAL
GLN
MET
ALA
VAL
PHE
ILE
HIS
ASN
PHE
LYS
ARG
LYS
GLY
GLY
ILE
GLY
GLY
TYR
SER
ALA
GLY
GLU
PHE
ARG
ILE
VAL
ASP
ILE
ILE
ALA
THR
ASP
ILE
GLN
THR
VAL
LYS
GLU
LEU
GLN
LYS
GLN
ILE
THR
LYS
ILE
GLN
Y222
Y226

D229
S230
P233
K236
G237
P238
G247
A248
V249
P261
R262
K266
I267
I268
ARG
ASP
TYR
GLY
LYS
GLN
MET
ALA
GLY
ASP
CYS
VAL
ALA
SER
ARG
GLN
ASP
GLU
ASP

• Molecule 2: DNA (27-MER)



A15
C16
T17
T20
A21
G22
A23
T28
T29
C30
C31
C32
G33
DC
DC
DC
DA
DC
DG
DC
DT

• Molecule 2: DNA (27-MER)



A15
C16
T17
T20
A21
G22
A23
T28
T29
C30
C31
C32
G33
DC
DC
DC
DA
DC
DG
DC
DT

• Molecule 3: DNA (25-MER)



DA
DG
DC
DG
DT
DG
DG
DG
C5
G6
G7
G8
C14
T17
C20
A21

• Molecule 3: DNA (25-MER)



DA
DG
DC
DG
DT
DG
DG
DG
C5
G6
G7
G8
C14
T17
C20
A21

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	470601	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 ($e^-/\text{\AA}^2$)	54	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	58139	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	2.268	Depositor
Minimum map value	-0.635	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.034	Depositor
Recommended contour level	0.2	Depositor
Map size (Å)	330.24, 330.24, 330.24	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.85999995, 0.85999995, 0.85999995	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, DLU, MG

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	0.26	0/2078	0.47	0/2797
1	B	0.34	1/1948 (0.1%)	0.56	2/2625 (0.1%)
1	C	1.01	8/553 (1.4%)	0.87	3/741 (0.4%)
1	D	0.34	0/397	0.74	1/535 (0.2%)
1	G	0.26	0/2078	0.47	0/2797
1	H	0.34	1/1948 (0.1%)	0.57	2/2625 (0.1%)
1	I	1.02	7/553 (1.3%)	0.87	3/741 (0.4%)
1	J	0.34	0/397	0.74	1/535 (0.2%)
2	E	0.54	0/429	0.94	0/660
2	K	0.54	0/429	0.94	0/660
3	F	0.55	0/416	0.84	0/637
3	L	0.55	0/416	0.84	0/637
All	All	0.46	17/11642 (0.1%)	0.65	12/15990 (0.1%)

The worst 5 of 17 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	58	PRO	CG-CD	-9.62	1.19	1.50
1	H	58	PRO	CG-CD	-9.61	1.19	1.50
1	I	276	ALA	N-CA	-7.74	1.30	1.46
1	C	276	ALA	N-CA	-7.61	1.31	1.46
1	C	273	LYS	C-O	-5.62	1.12	1.23

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	58	PRO	N-CD-CG	-13.16	83.45	103.20
1	H	58	PRO	N-CD-CG	-13.16	83.45	103.20
1	D	233	PRO	N-CD-CG	-8.15	90.98	103.20
1	J	233	PRO	N-CD-CG	-8.12	91.01	103.20
1	H	58	PRO	CA-CB-CG	-7.77	89.24	104.00

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	2036	0	2072	37	0
1	B	1911	0	1938	18	0
1	C	543	0	569	24	0
1	D	388	0	406	7	0
1	G	2036	0	2072	38	0
1	H	1911	0	1938	19	0
1	I	543	0	569	25	0
1	J	388	0	406	8	0
2	E	384	0	217	8	0
2	K	384	0	217	8	0
3	F	371	0	203	6	0
3	L	371	0	203	6	0
4	A	2	0	0	0	0
4	G	2	0	0	0	0
5	A	1	0	0	0	0
5	G	1	0	0	0	0
6	A	30	0	18	0	0
6	G	30	0	18	0	0
7	A	286	0	0	9	0
7	B	75	0	0	1	0
7	C	43	0	0	4	0
7	D	48	0	0	0	0
7	E	62	0	0	1	0
7	F	79	0	0	2	0
7	G	286	0	0	9	0
7	H	75	0	0	2	0
7	I	43	0	0	4	0
7	J	48	0	0	0	0
7	K	62	0	0	1	0
7	L	79	0	0	2	0
All	All	12518	0	10846	174	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 8.

The worst 5 of 174 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:C:224:ARG:HH22	1:C:273:LYS:HD3	1.41	0.85
1:I:224:ARG:HH22	1:I:273:LYS:HD3	1.40	0.84
1:H:30:PRO:HG2	1:I:275:MET:HA	1.68	0.74
1:I:269:ARG:HA	7:I:302:HOH:O	1.89	0.73
1:C:269:ARG:HA	7:C:303:HOH:O	1.88	0.72

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	257/364 (71%)	255 (99%)	2 (1%)	0	100	100
1	B	234/364 (64%)	233 (100%)	1 (0%)	0	100	100
1	C	64/364 (18%)	59 (92%)	3 (5%)	2 (3%)	4	2
1	D	45/364 (12%)	43 (96%)	2 (4%)	0	100	100
1	G	257/364 (71%)	255 (99%)	2 (1%)	0	100	100
1	H	234/364 (64%)	233 (100%)	1 (0%)	0	100	100
1	I	64/364 (18%)	59 (92%)	3 (5%)	2 (3%)	4	2
1	J	45/364 (12%)	43 (96%)	2 (4%)	0	100	100
All	All	1200/2912 (41%)	1180 (98%)	16 (1%)	4 (0%)	44	46

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	274	GLN
1	C	270	ASP

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Mol	Chain	Res	Type
1	I	270	ASP
1	I	274	GLN

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	217/294 (74%)	214 (99%)	3 (1%)	67	80
1	B	202/294 (69%)	199 (98%)	3 (2%)	65	78
1	C	57/294 (19%)	56 (98%)	1 (2%)	59	72
1	D	41/294 (14%)	40 (98%)	1 (2%)	49	62
1	G	217/294 (74%)	214 (99%)	3 (1%)	67	80
1	H	202/294 (69%)	199 (98%)	3 (2%)	65	78
1	I	57/294 (19%)	56 (98%)	1 (2%)	59	72
1	J	41/294 (14%)	40 (98%)	1 (2%)	49	62
All	All	1034/2352 (44%)	1018 (98%)	16 (2%)	66	78

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	I	269	ARG
1	H	222	ASN
1	G	20	ARG
1	H	119	SER
1	D	236	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	114	HIS
1	G	114	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 8 ligands modelled in this entry, 6 are monoatomic - leaving 2 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	$\# Z > 2$
6	DLU	G	304	4	31,33,33	4.91	14 (45%)	34,49,49	2.00	13 (38%)
6	DLU	A	304	4	31,33,33	4.90	14 (45%)	34,49,49	2.00	13 (38%)

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
6	DLU	G	304	4	-	0/9/35/35	0/4/4/4
6	DLU	A	304	4	-	0/9/35/35	0/4/4/4

The worst 5 of 28 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	G	304	DLU	CAO-NBD	15.83	1.62	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	304	DLU	CAO-NBD	15.77	1.62	1.46
6	G	304	DLU	CAY-CAW	15.02	1.56	1.36
6	A	304	DLU	CAY-CAW	14.94	1.56	1.36
6	A	304	DLU	CAR-NAP	8.50	1.48	1.33

The worst 5 of 26 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	G	304	DLU	OAQ-CAL-CAM	5.52	121.28	110.73
6	A	304	DLU	OAQ-CAL-CAM	5.50	121.25	110.73
6	G	304	DLU	CAL-CAM-CBA	3.38	118.95	110.28
6	A	304	DLU	CAL-CAM-CBA	3.37	118.94	110.28
6	A	304	DLU	CAU-CAJ-CAT	2.88	119.65	116.62

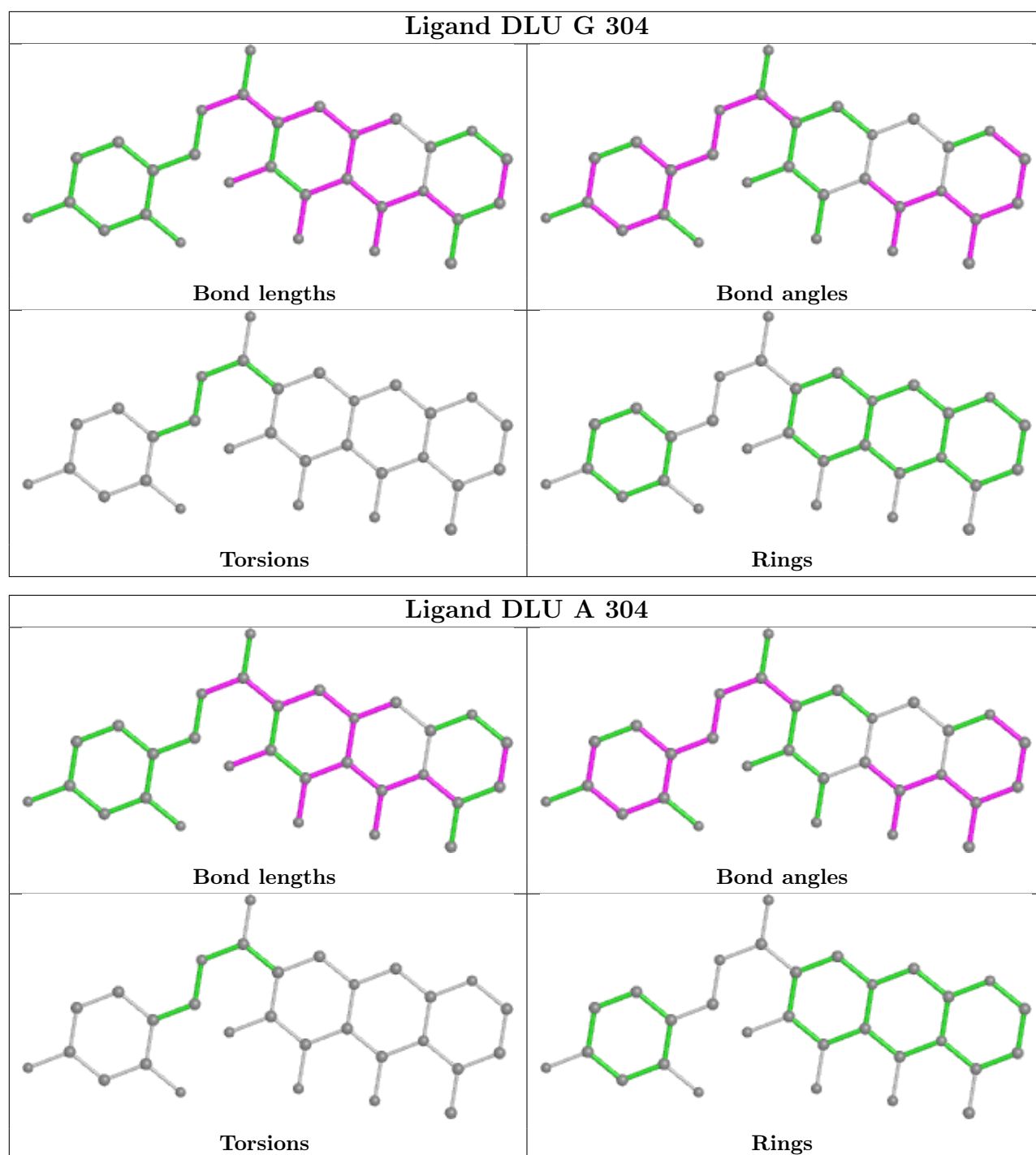
There are no chirality outliers.

There are no torsion outliers.

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.

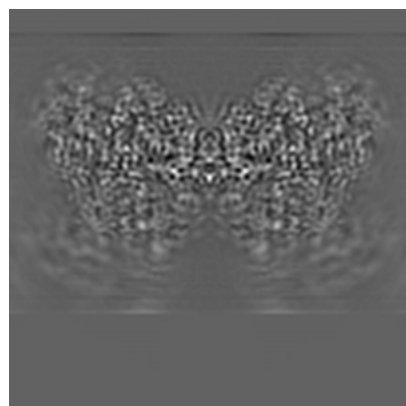
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-29312. These allow visual inspection of the internal detail of the map and identification of artifacts.

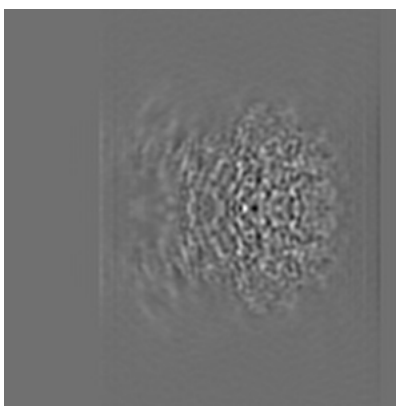
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

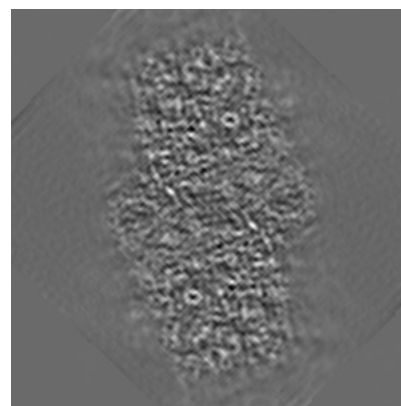
6.1.1 Primary map



X

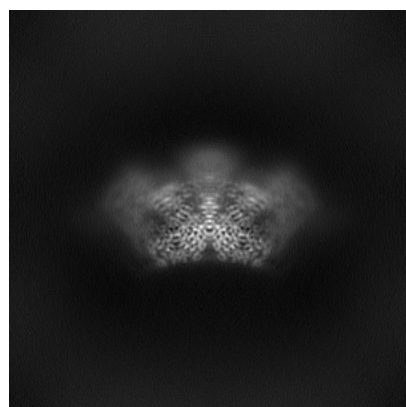


Y

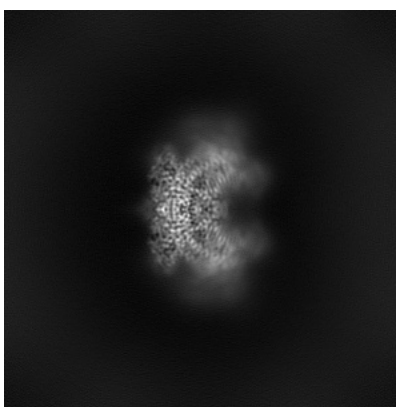


Z

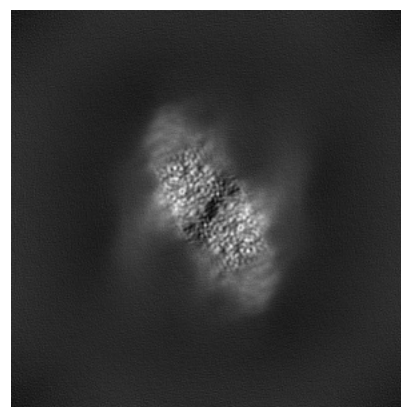
6.1.2 Raw map



X



Y

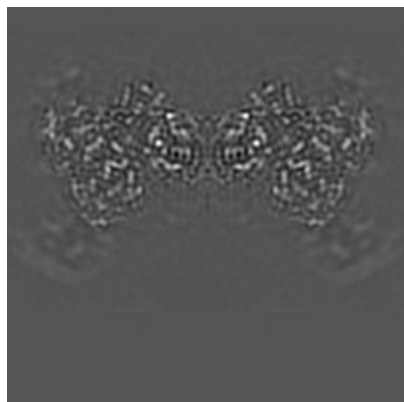


Z

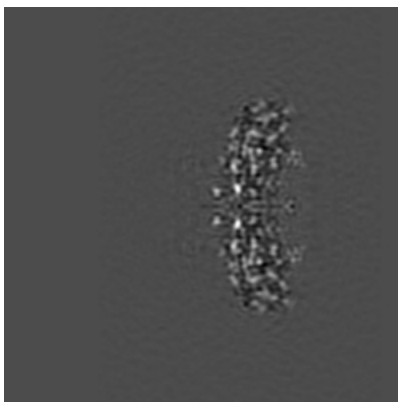
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

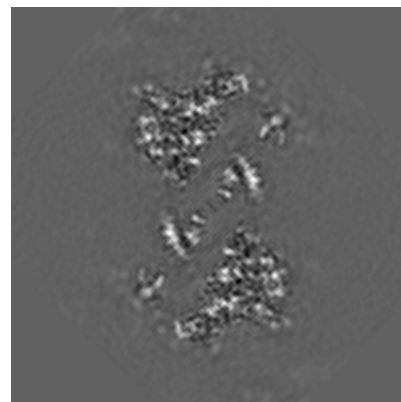
6.2.1 Primary map



X Index: 160

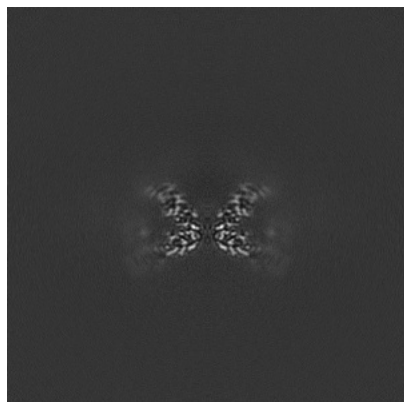


Y Index: 160

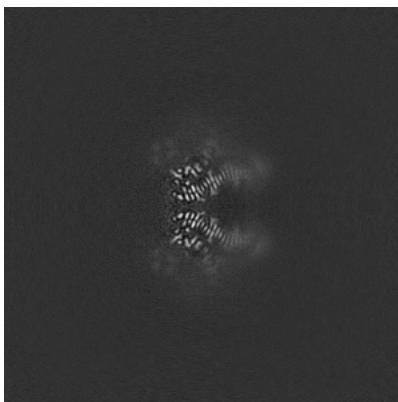


Z Index: 160

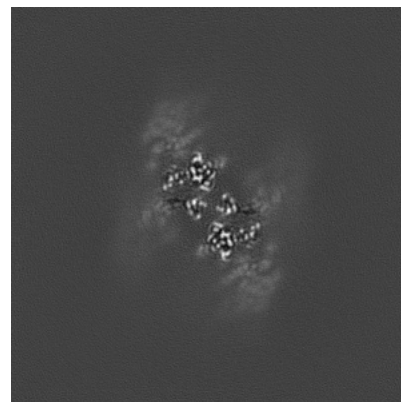
6.2.2 Raw map



X Index: 192



Y Index: 192

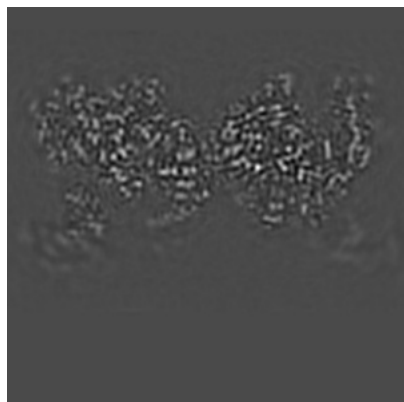


Z Index: 192

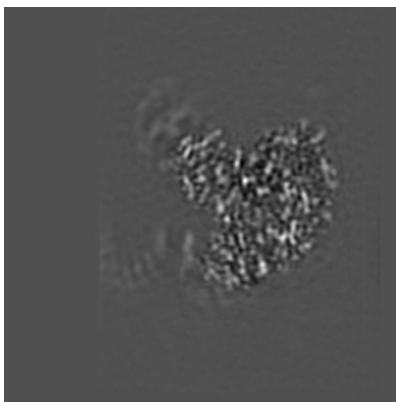
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

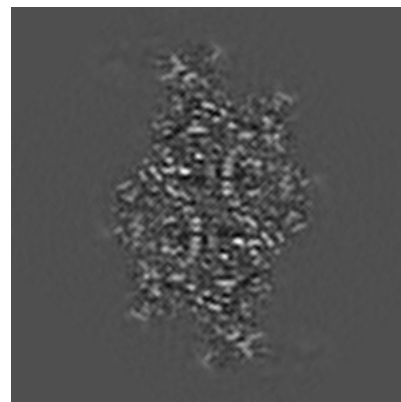
6.3.1 Primary map



X Index: 150

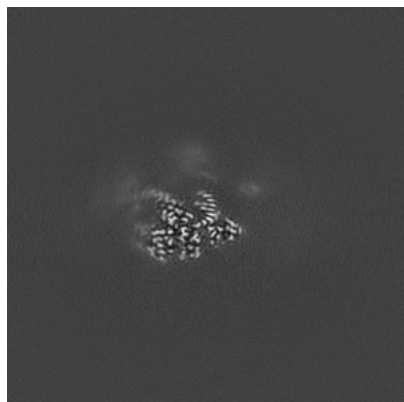


Y Index: 105

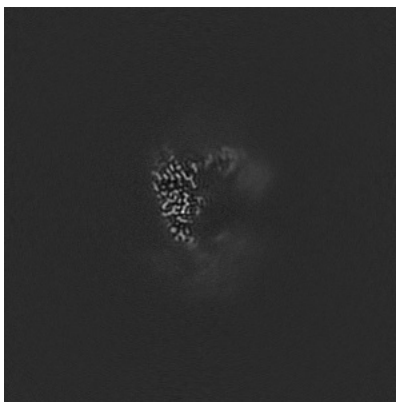


Z Index: 190

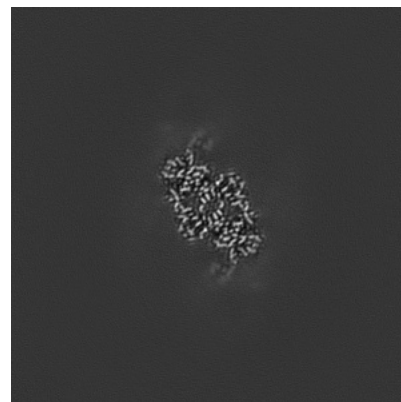
6.3.2 Raw map



X Index: 211



Y Index: 177

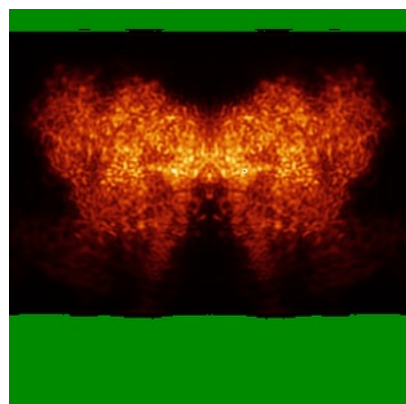


Z Index: 168

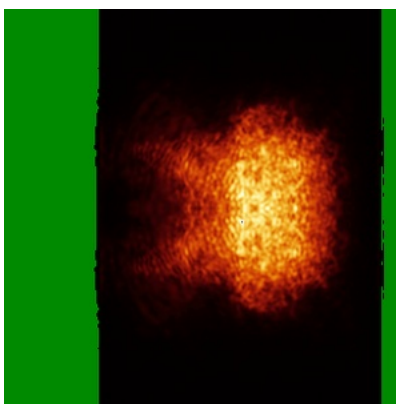
The images above show the largest variance slices of the map in three orthogonal directions.

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

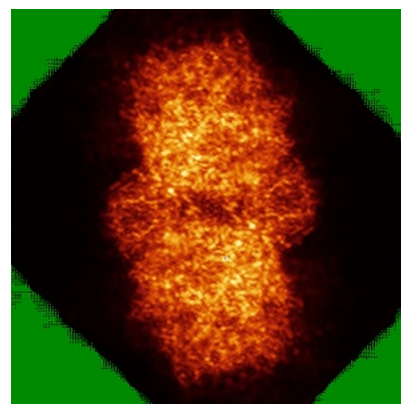
6.4.1 Primary map



X

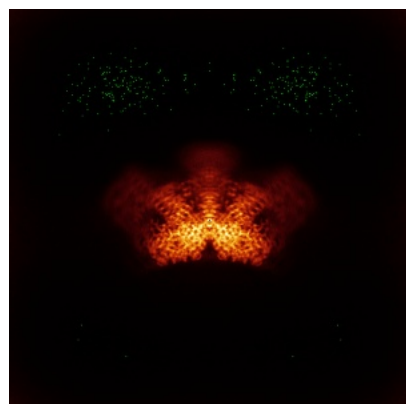


Y

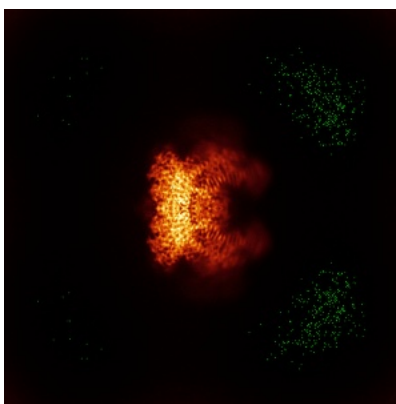


Z

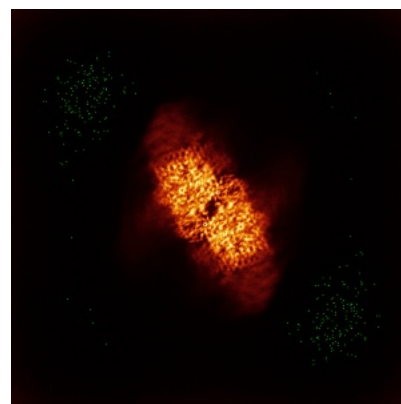
6.4.2 Raw map



X



Y



Z

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

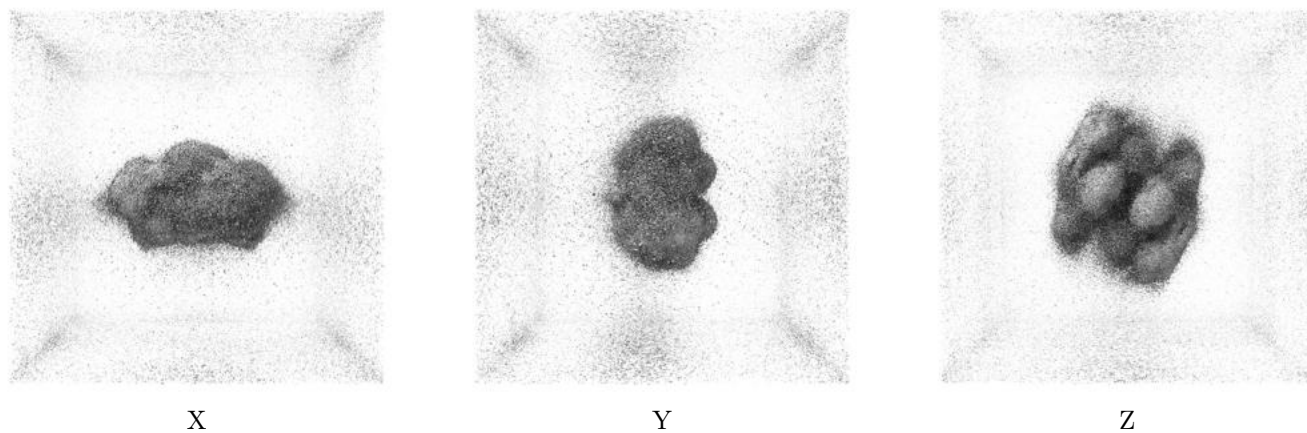
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



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

6.5.2 Raw map



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

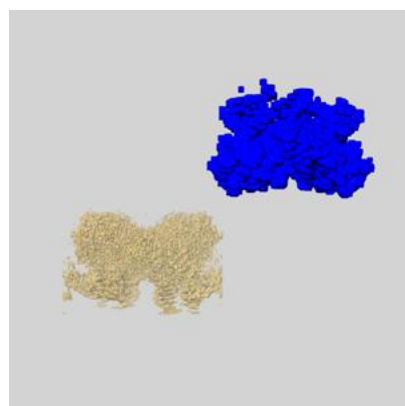
6.6 Mask visualisation [i](#)

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

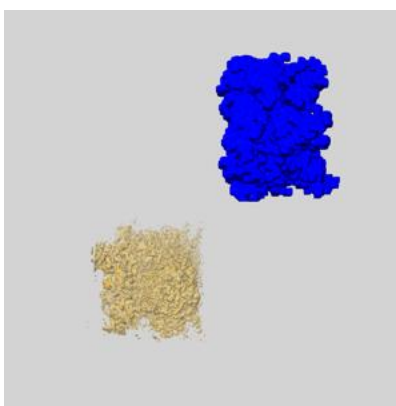
A mask typically either:

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

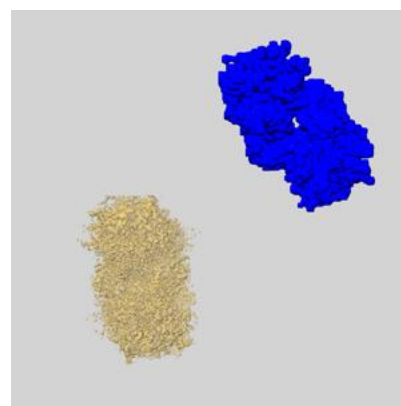
6.6.1 emd_29312_msk_1.map [i](#)



X



Y

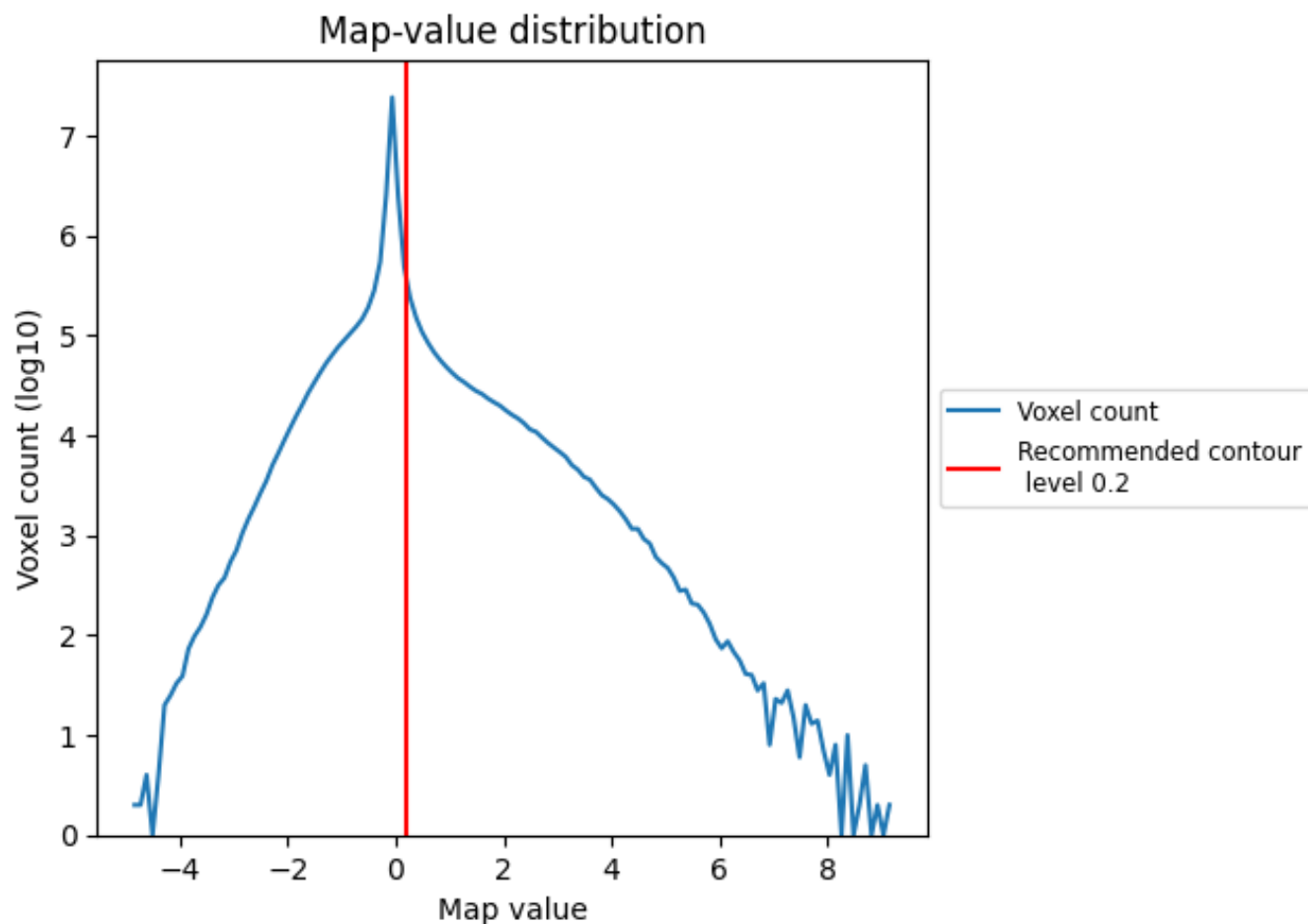


Z

7 Map analysis [i](#)

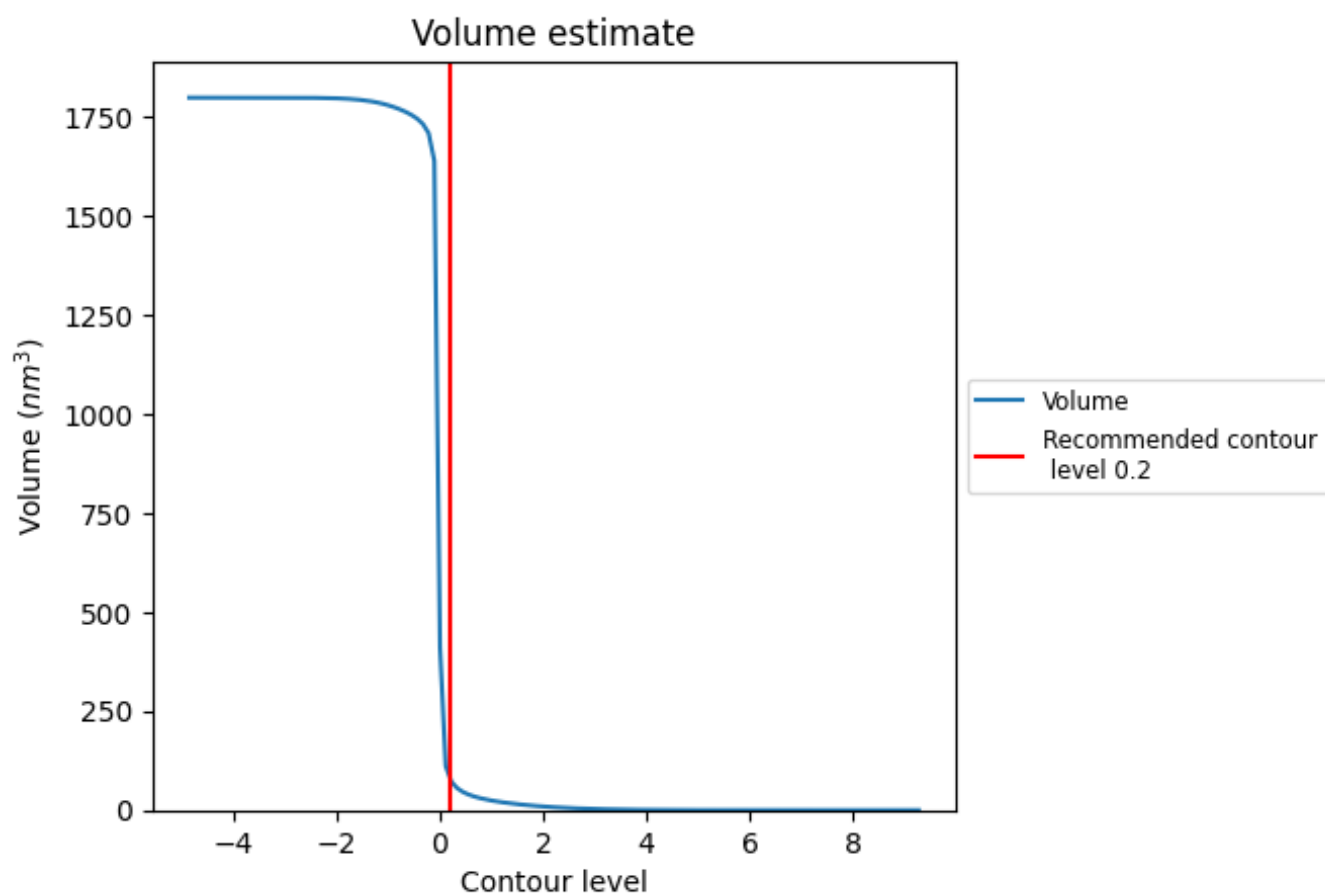
This section contains the results of statistical analysis of the map.

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.

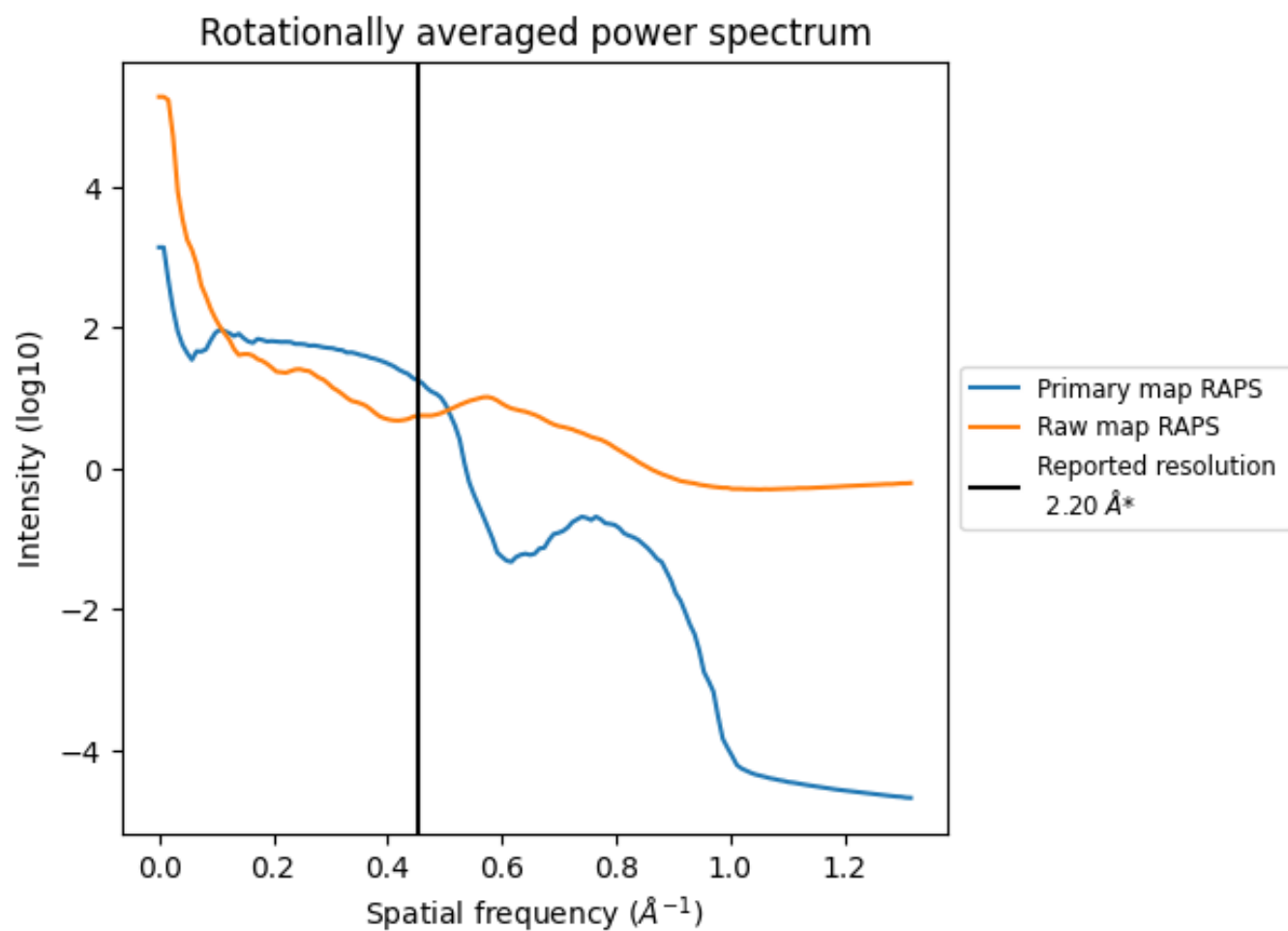
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 81 nm³; this corresponds to an approximate mass of 74 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 ⓘ

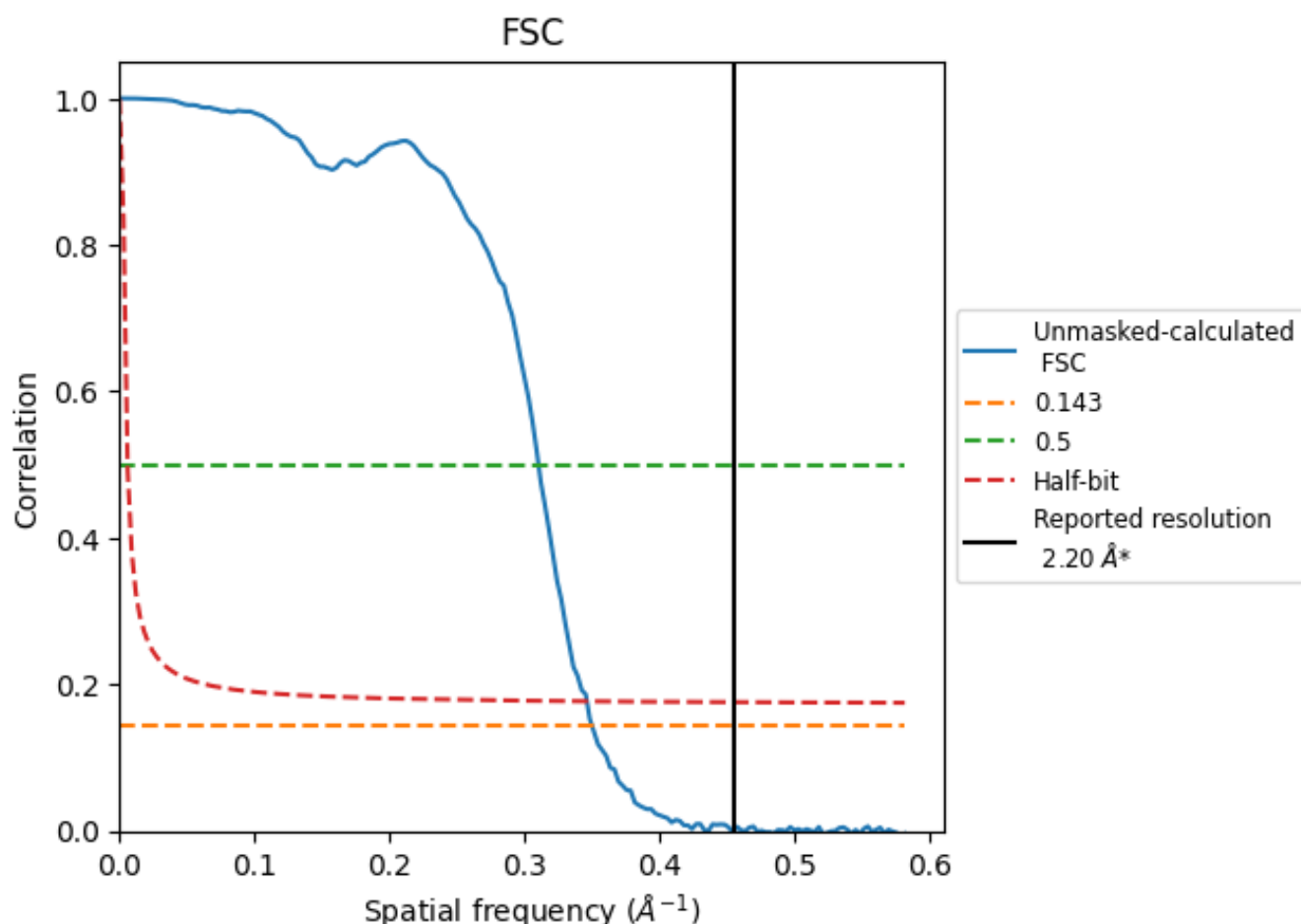


*Reported resolution corresponds to spatial frequency of 0.455 Å⁻¹

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 0.455 Å⁻¹

8.2 Resolution estimates [i](#)

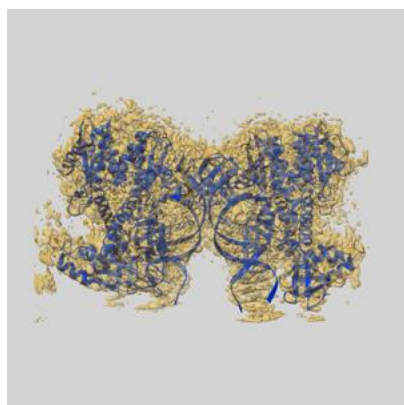
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	2.86	3.22	2.89

*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 2.86 differs from the reported value 2.2 by more than 10 %

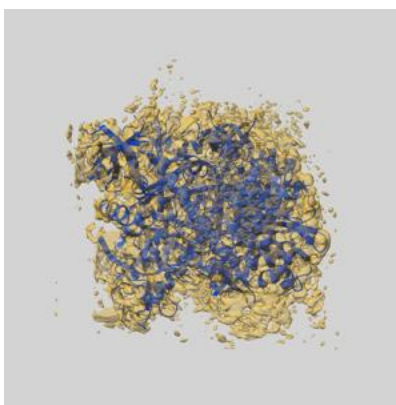
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-29312 and PDB model 8FNG. Per-residue inclusion information can be found in section [3](#) on page [12](#).

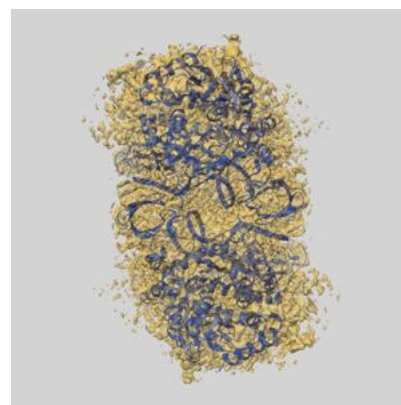
9.1 Map-model overlay [i](#)



X



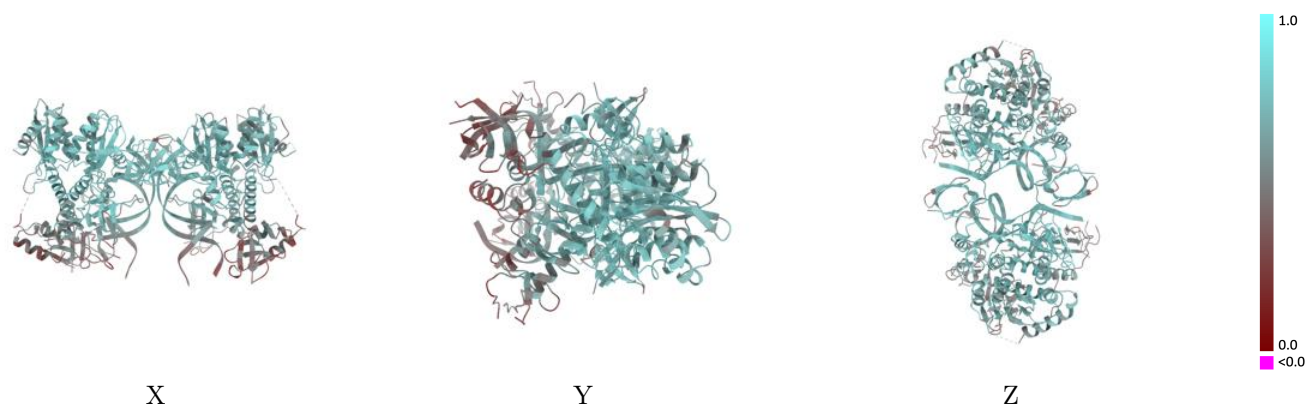
Y



Z

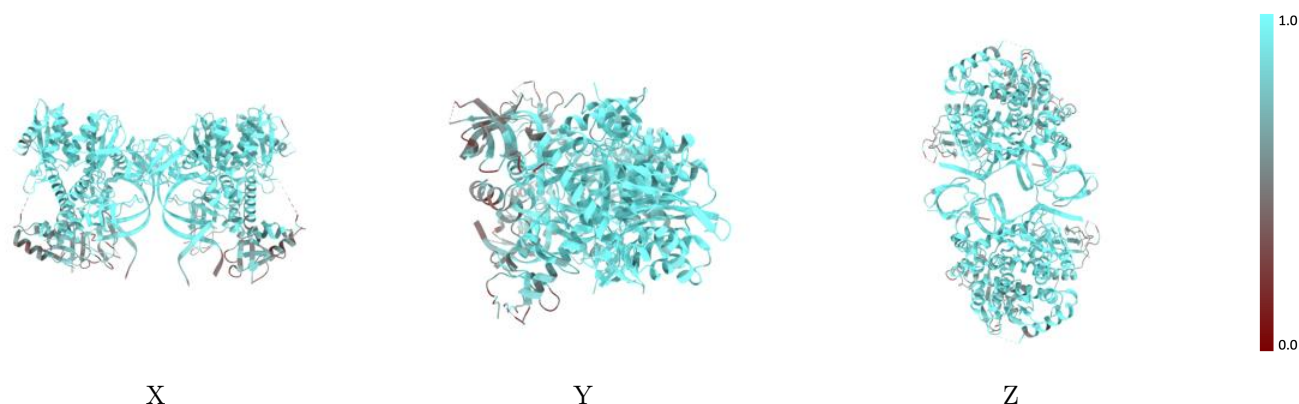
The images above show the 3D surface view of the map at the recommended contour level 0.2 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



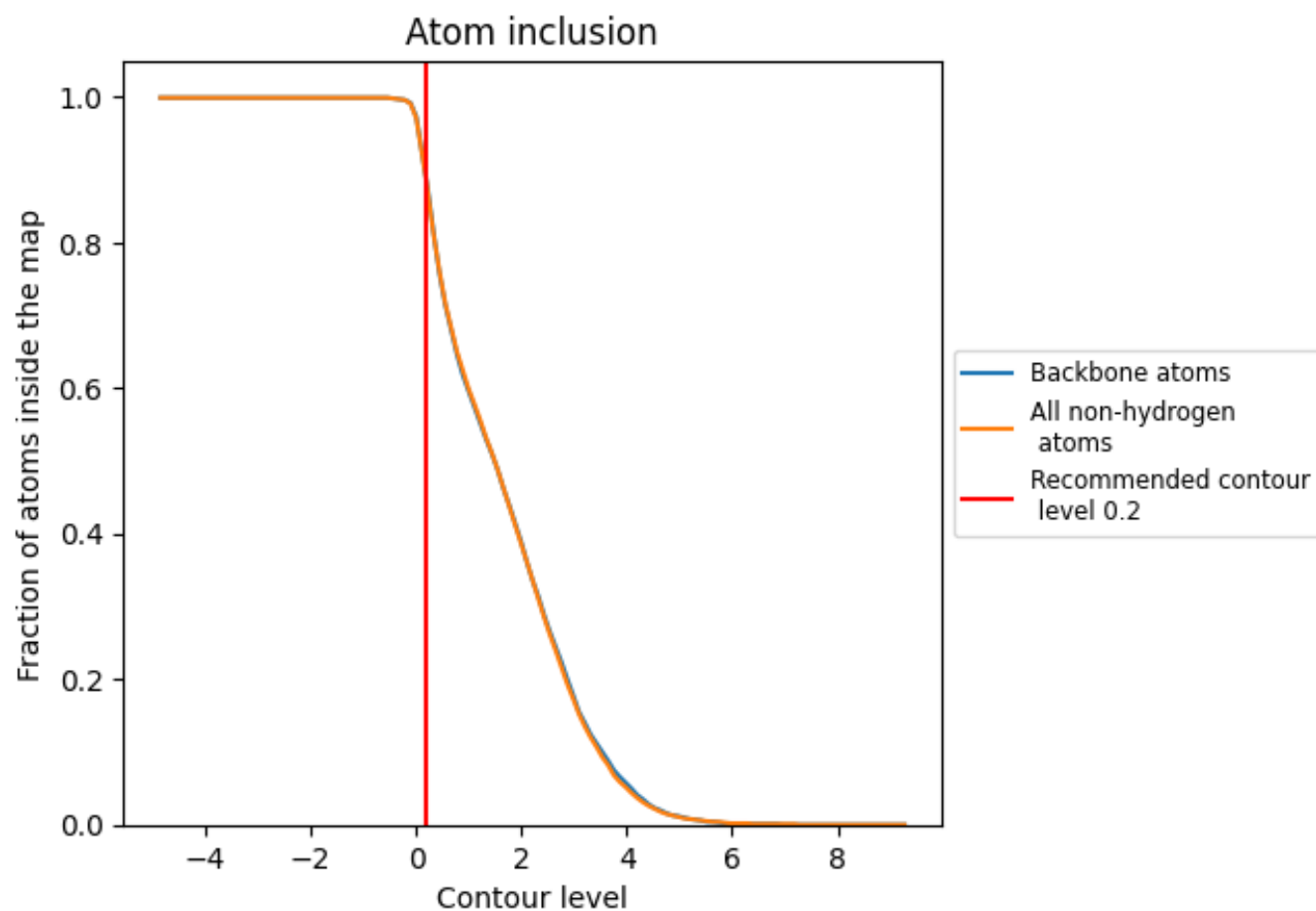
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.2).

9.4 Atom inclusion [i](#)



At the recommended contour level, 89% of all backbone atoms, 88% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.2) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div><div></div>0.8840</div>	<div><div></div>0.6250</div>
A	<div><div></div>0.9150</div>	<div><div></div>0.6620</div>
B	<div><div></div>0.8220</div>	<div><div></div>0.5650</div>
C	<div><div></div>0.9240</div>	<div><div></div>0.6420</div>
D	<div><div></div>0.9550</div>	<div><div></div>0.6700</div>
E	<div><div></div>0.9060</div>	<div><div></div>0.6180</div>
F	<div><div></div>0.8740</div>	<div><div></div>0.6000</div>
G	<div><div></div>0.9160</div>	<div><div></div>0.6670</div>
H	<div><div></div>0.8260</div>	<div><div></div>0.5830</div>
I	<div><div></div>0.9350</div>	<div><div></div>0.6570</div>
J	<div><div></div>0.9570</div>	<div><div></div>0.6670</div>
K	<div><div></div>0.9010</div>	<div><div></div>0.6180</div>
L	<div><div></div>0.8910</div>	<div><div></div>0.6040</div>

1.0

0.0

<0.0