



## Full wwPDB EM Validation Report ⓘ

May 6, 2026 – 05:36 PM EDT

PDB ID : 9NI4 / pdb\_00009ni4  
EMDB ID : EMD-49452  
Title : Cryo-EM structure of the PI3K alpha/KRas/HER3 phosphopeptide complex dimer on POPC/POPS/PIP2 nanodiscs  
Authors : Torosyan, H.; Natalia, J.; Verba, K.A.  
Deposited on : 2025-02-25  
Resolution : 2.61 Å(reported)

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

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

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

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

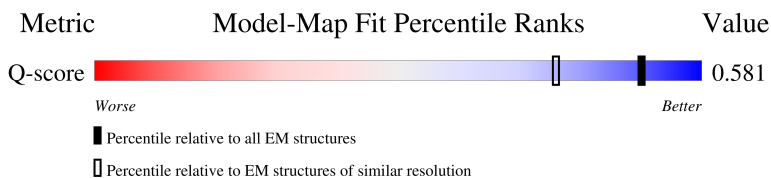
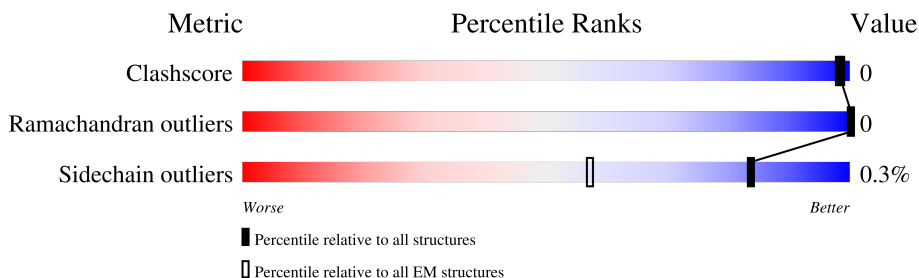
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 2.61 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	8735 ( 2.11 - 3.11 )

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

Mol	Chain	Length	Quality of chain
1	A	1096	 81% 16%
1	B	1096	 81% 16%
2	C	189	 7% 87% 10%
2	D	189	 6% 88% 10%

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 35743 atoms, of which 17837 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 Phosphatidylinositol 4,5-bisphosphate 3-kinase catalytic sub-unit alpha isoform.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	919	Total	C	H	N	O	S	0	0
			15038	4803	7524	1288	1359	64		
1	B	919	Total	C	H	N	O	S	0	0
			15038	4803	7524	1288	1359	64		

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-27	MET	-	expression tag	UNP P42336
A	-26	SER	-	expression tag	UNP P42336
A	-25	TYR	-	expression tag	UNP P42336
A	-24	TYR	-	expression tag	UNP P42336
A	-23	HIS	-	expression tag	UNP P42336
A	-22	HIS	-	expression tag	UNP P42336
A	-21	HIS	-	expression tag	UNP P42336
A	-20	HIS	-	expression tag	UNP P42336
A	-19	HIS	-	expression tag	UNP P42336
A	-18	HIS	-	expression tag	UNP P42336
A	-17	ASP	-	expression tag	UNP P42336
A	-16	TYR	-	expression tag	UNP P42336
A	-15	ASP	-	expression tag	UNP P42336
A	-14	ILE	-	expression tag	UNP P42336
A	-13	PRO	-	expression tag	UNP P42336
A	-12	THR	-	expression tag	UNP P42336
A	-11	THR	-	expression tag	UNP P42336
A	-10	GLU	-	expression tag	UNP P42336
A	-9	ASN	-	expression tag	UNP P42336
A	-8	LEU	-	expression tag	UNP P42336
A	-7	TYR	-	expression tag	UNP P42336
A	-6	PHE	-	expression tag	UNP P42336
A	-5	GLN	-	expression tag	UNP P42336
A	-4	GLY	-	expression tag	UNP P42336
A	-3	ALA	-	expression tag	UNP P42336

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	MET	-	expression tag	UNP P42336
A	-1	GLY	-	expression tag	UNP P42336
A	0	SER	-	expression tag	UNP P42336
B	-27	MET	-	expression tag	UNP P42336
B	-26	SER	-	expression tag	UNP P42336
B	-25	TYR	-	expression tag	UNP P42336
B	-24	TYR	-	expression tag	UNP P42336
B	-23	HIS	-	expression tag	UNP P42336
B	-22	HIS	-	expression tag	UNP P42336
B	-21	HIS	-	expression tag	UNP P42336
B	-20	HIS	-	expression tag	UNP P42336
B	-19	HIS	-	expression tag	UNP P42336
B	-18	HIS	-	expression tag	UNP P42336
B	-17	ASP	-	expression tag	UNP P42336
B	-16	TYR	-	expression tag	UNP P42336
B	-15	ASP	-	expression tag	UNP P42336
B	-14	ILE	-	expression tag	UNP P42336
B	-13	PRO	-	expression tag	UNP P42336
B	-12	THR	-	expression tag	UNP P42336
B	-11	THR	-	expression tag	UNP P42336
B	-10	GLU	-	expression tag	UNP P42336
B	-9	ASN	-	expression tag	UNP P42336
B	-8	LEU	-	expression tag	UNP P42336
B	-7	TYR	-	expression tag	UNP P42336
B	-6	PHE	-	expression tag	UNP P42336
B	-5	GLN	-	expression tag	UNP P42336
B	-4	GLY	-	expression tag	UNP P42336
B	-3	ALA	-	expression tag	UNP P42336
B	-2	MET	-	expression tag	UNP P42336
B	-1	GLY	-	expression tag	UNP P42336
B	0	SER	-	expression tag	UNP P42336

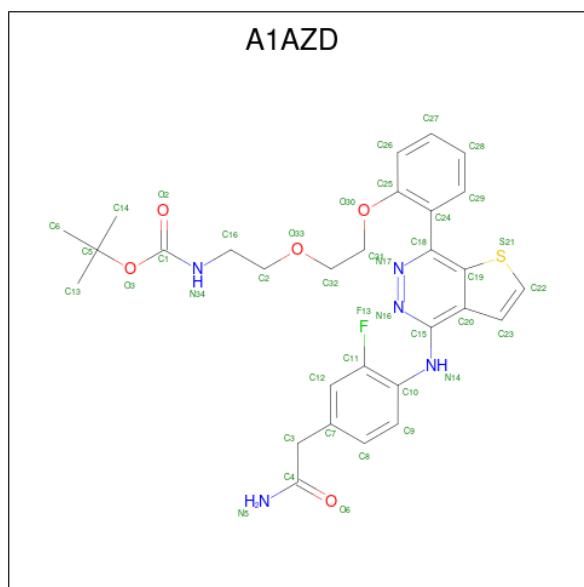
- Molecule 2 is a protein called Isoform 2B of GTPase KRas.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	C	171	Total	C	H	N	O	S	0	0
			2714	854	1349	235	269	7		
2	D	171	Total	C	H	N	O	S	0	0
			2715	854	1350	235	269	7		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	0	GLY	-	expression tag	UNP P01116
D	0	GLY	-	expression tag	UNP P01116

- Molecule 3 is tert-butyl [2-(2-[[[(2P)-2-{4-[4-(2-amino-2-oxoethyl)-2-fluoroanilino]thieno[2,3-d]pyridazin-7-yl}phenyl]oxy}ethoxy)ethyl]carbamate (CCD ID: A1AZD) (formula: C<sub>29</sub>H<sub>32</sub>FN<sub>5</sub>O<sub>5</sub>S) (labeled as "Ligand of Interest" by depositor).

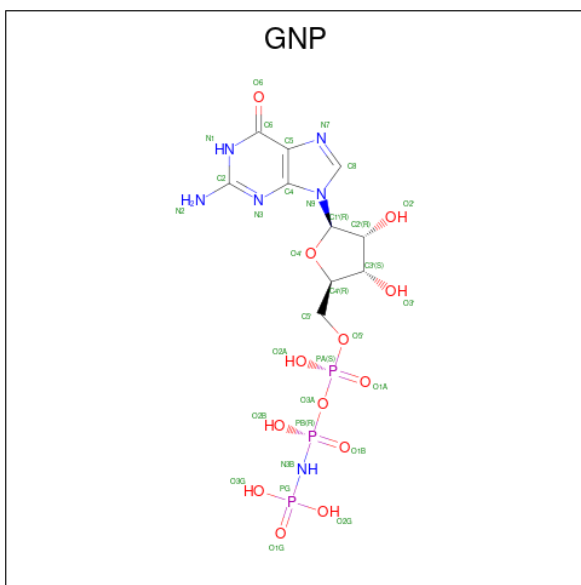


Mol	Chain	Residues	Atoms							AltConf
3	A	1	Total	C	F	H	N	O	S	0
			73	29	1	32	5	5	1	
3	B	1	Total	C	F	H	N	O	S	0
			73	29	1	32	5	5	1	

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

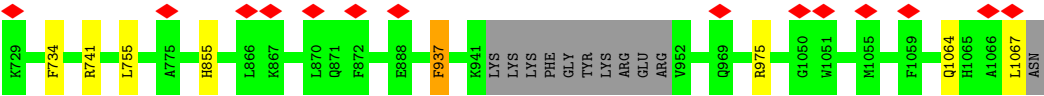
Mol	Chain	Residues	Atoms		AltConf
4	C	1	Total	Mg	0
			1	1	
4	D	1	Total	Mg	0
			1	1	

- Molecule 5 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (CCD ID: GNP) (formula: C<sub>10</sub>H<sub>17</sub>N<sub>6</sub>O<sub>13</sub>P<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).

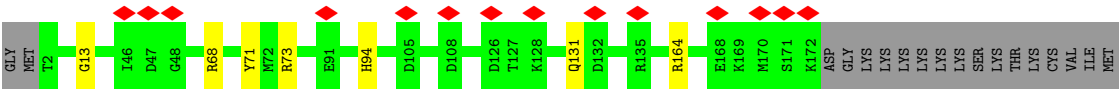
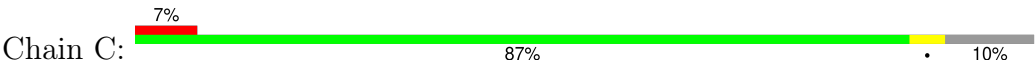


Mol	Chain	Residues	Atoms						AltConf
5	C	1	Total 45	C 10	H 13	N 6	O 13	P 3	0
5	D	1	Total 45	C 10	H 13	N 6	O 13	P 3	0

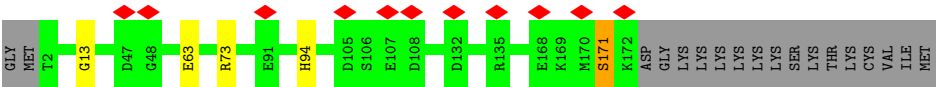
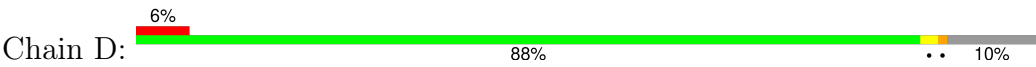




• Molecule 2: Isoform 2B of GTPase KRas



• Molecule 2: Isoform 2B of GTPase KRas





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	280864	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 ( $e^-/\text{\AA}^2$ )	47.7	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	4.031	Depositor
Minimum map value	-2.239	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.065	Depositor
Recommended contour level	0.33	Depositor
Map size (Å)	366.8672, 366.8672, 366.8672	wwPDB
Map dimensions	448, 448, 448	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.8189, 0.8189, 0.8189	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: GNP, A1AZD, 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	0.80	8/7681 (0.1%)	1.33	23/10376 (0.2%)
1	B	0.86	10/7682 (0.1%)	1.34	21/10379 (0.2%)
2	C	0.81	1/1386 (0.1%)	1.28	5/1867 (0.3%)
2	D	0.92	3/1386 (0.2%)	1.37	3/1867 (0.2%)
All	All	0.84	22/18135 (0.1%)	1.33	52/24489 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	9
1	B	0	2
2	C	0	1
2	D	0	2
All	All	0	14

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	755	LEU	C-O	-15.47	1.06	1.24
2	D	171	SER	C-O	-13.49	1.09	1.23
1	A	497	ASN	C-O	-10.09	1.12	1.24
1	B	855	HIS	CE1-NE2	-8.84	1.23	1.32
1	B	855	HIS	CD2-NE2	-7.87	1.29	1.37
1	A	281	ARG	CZ-NH2	-7.31	1.24	1.33
1	A	403	CYS	C-O	-6.95	1.15	1.24
1	A	361	TYR	C-O	-6.93	1.15	1.23
1	B	138	ASP	C-O	-6.63	1.16	1.24
2	D	171	SER	C-N	6.34	1.42	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	281	ARG	CZ-NH1	-6.29	1.24	1.32
2	C	94	HIS	C-O	-6.13	1.17	1.24
1	A	189	GLN	C-O	-6.07	1.16	1.23
1	B	434	ASP	C-O	-6.00	1.12	1.24
2	D	94	HIS	C-O	-5.90	1.17	1.24
1	B	325	LYS	C-O	-5.89	1.16	1.23
1	A	612	ARG	C-O	-5.82	1.16	1.24
1	B	199	SER	CA-CB	-5.71	1.45	1.53
1	B	855	HIS	CG-CD2	-5.70	1.29	1.35
1	A	689	GLU	C-O	-5.18	1.17	1.24
1	B	609	PRO	N-CD	-5.15	1.40	1.47
1	B	741	ARG	CZ-NH2	-5.12	1.26	1.33

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	171	SER	O-C-N	-12.69	105.93	122.56
1	B	203	ASP	CA-CB-CG	9.66	122.26	112.60
1	B	200	PRO	N-CA-C	-9.28	102.26	113.86
1	A	937	PHE	CA-CB-CG	8.44	122.24	113.80
1	A	612	ARG	CA-CB-CG	8.37	130.85	114.10
1	A	497	ASN	CA-C-O	-8.35	112.23	121.00
1	B	300	ASP	CA-CB-CG	8.20	120.80	112.60
1	B	302	PHE	CA-CB-CG	7.95	121.75	113.80
1	B	452	LEU	N-CA-C	-7.93	102.72	111.36
1	A	500	VAL	N-CA-C	-7.71	103.35	110.82
1	A	795	GLN	CA-C-O	-7.08	111.35	119.14
2	D	94	HIS	CA-C-O	-6.63	113.86	120.82
1	B	937	PHE	CA-CB-CG	6.54	120.34	113.80
1	A	612	ARG	CB-CG-CD	-6.36	96.67	111.30
1	B	202	ASN	CA-CB-CG	6.27	118.87	112.60
2	D	63	GLU	CB-CG-CD	-6.23	102.01	112.60
1	A	826	ASN	CA-CB-CG	6.22	118.82	112.60
1	A	281	ARG	CD-NE-CZ	5.99	132.78	124.40
1	A	689	GLU	N-CA-CB	-5.93	101.09	110.28
1	B	612	ARG	NE-CZ-NH2	5.91	124.52	119.20
1	B	678	LYS	N-CA-CB	-5.82	100.20	110.39
1	B	644	TYR	N-CA-CB	-5.79	102.07	110.70
1	A	630	GLN	CA-C-O	-5.69	113.92	120.24
1	B	755	LEU	O-C-N	-5.61	116.17	122.12
1	B	488	ASP	CA-C-O	-5.56	115.38	121.89
1	A	154	ARG	NE-CZ-NH2	5.52	124.17	119.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	201	ASN	CA-CB-CG	5.48	118.08	112.60
2	C	94	HIS	CA-C-O	-5.48	115.07	120.82
1	B	609	PRO	CA-C-N	5.46	128.05	120.29
1	B	609	PRO	C-N-CA	5.46	128.05	120.29
2	C	164	ARG	NE-CZ-NH2	5.35	124.01	119.20
1	A	959	ASP	CA-CB-CG	5.34	117.94	112.60
1	B	855	HIS	CA-CB-CG	5.26	119.06	113.80
1	B	184	LYS	CA-CB-CG	5.25	124.61	114.10
1	A	960	PHE	CA-CB-CG	5.25	119.05	113.80
1	A	612	ARG	CA-C-N	5.25	125.77	119.94
1	A	612	ARG	C-N-CA	5.25	125.77	119.94
2	C	131	GLN	CA-C-O	-5.22	115.02	120.55
1	A	693	ARG	NE-CZ-NH2	5.21	123.89	119.20
1	B	325	LYS	CA-C-O	-5.18	115.05	121.11
1	A	1064	GLN	N-CA-C	-5.15	105.75	111.36
1	B	137	GLN	CA-C-O	-5.15	114.05	119.97
1	A	612	ARG	CA-C-O	-5.14	114.06	119.97
2	C	68	ARG	NE-CZ-NH2	5.12	123.81	119.20
2	C	73	ARG	NE-CZ-NH2	5.11	123.80	119.20
1	A	795	GLN	O-C-N	5.11	129.34	122.49
1	B	630	GLN	CA-C-O	-5.11	115.64	120.90
1	B	678	LYS	CB-CA-C	5.08	120.53	110.17
1	A	625	ASP	CA-C-N	5.03	126.98	120.44
1	A	625	ASP	C-N-CA	5.03	126.98	120.44
1	A	497	ASN	O-C-N	5.00	127.23	122.03
1	A	899	ARG	NE-CZ-NH2	5.00	123.70	119.20

There are no chirality outliers.

All (14) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1023	ARG	Sidechain
1	A	115	ARG	Sidechain
1	A	162	ARG	Sidechain
1	A	281	ARG	Sidechain
1	A	309	ARG	Sidechain
1	A	401	ARG	Sidechain
1	A	537	ARG	Sidechain
1	A	612	ARG	Sidechain
1	A	651	ARG	Sidechain
1	B	693	ARG	Sidechain
1	B	975	ARG	Sidechain

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Mol	Chain	Res	Type	Group
2	C	71	TYR	Sidechain
2	D	171	SER	Mainchain
2	D	73	ARG	Sidechain

## 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	7514	7524	7517	2	0
1	B	7514	7524	7518	4	0
2	C	1365	1349	1347	1	0
2	D	1365	1350	1347	1	0
3	A	41	32	0	0	0
3	B	41	32	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	C	32	13	13	1	0
5	D	32	13	13	1	0
All	All	17906	17837	17755	8	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 0.

All (8) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:13:GLY:H	5:D:202:GNP:HNB3	1.30	0.76
2:C:13:GLY:H	5:C:202:GNP:HNB3	1.32	0.75
1:B:1064:GLN:OE1	1:B:1067:LEU:HD23	2.00	0.61
1:B:1064:GLN:HA	1:B:1067:LEU:HB3	1.90	0.53
1:B:431:ASP:C	1:B:431:ASP:OD1	2.55	0.50
1:A:1064:GLN:HE22	1:A:1067:LEU:HD23	1.82	0.45
1:B:718:ILE:HG21	1:B:734:PHE:CZ	2.54	0.43
1:A:154:ARG:HD2	1:A:165:TYR:CG	2.55	0.41

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	908/1096 (83%)	895 (99%)	13 (1%)	0	100	100
1	B	909/1096 (83%)	887 (98%)	22 (2%)	0	100	100
2	C	169/189 (89%)	167 (99%)	2 (1%)	0	100	100
2	D	169/189 (89%)	165 (98%)	4 (2%)	0	100	100
All	All	2155/2570 (84%)	2114 (98%)	41 (2%)	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	842/999 (84%)	841 (100%)	1 (0%)	88	96
1	B	842/999 (84%)	838 (100%)	4 (0%)	81	91
2	C	151/167 (90%)	151 (100%)	0	100	100
2	D	151/167 (90%)	151 (100%)	0	100	100
All	All	1986/2332 (85%)	1981 (100%)	5 (0%)	84	94

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	937	PHE
1	B	247	GLN

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Mol	Chain	Res	Type
1	B	672	LYS
1	B	678	LYS
1	B	937	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (34) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	238	GLN
1	A	269	GLN
1	A	347	ASN
1	A	362	HIS
1	A	388	ASN
1	A	428	ASN
1	A	556	HIS
1	A	643	GLN
1	A	759	HIS
1	A	809	GLN
1	A	827	GLN
1	A	871	GLN
1	A	885	ASN
1	A	993	GLN
1	A	1064	GLN
1	B	160	HIS
1	B	269	GLN
1	B	347	ASN
1	B	556	HIS
1	B	597	GLN
1	B	661	GLN
1	B	670	HIS
1	B	827	GLN
1	B	936	HIS
1	B	940	HIS
1	B	981	GLN
1	B	993	GLN
1	B	1014	GLN
1	B	1047	HIS
2	C	26	ASN
2	C	27	HIS
2	C	95	HIS
2	D	61	GLN
2	D	99	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

Of 6 ligands modelled in this entry, 2 are monoatomic - leaving 4 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	$\# Z  > 2$
5	GNP	C	202	4	34,34,34	1.93	8 (23%)	47,54,54	1.49	7 (14%)
3	A1AZD	A	1101	-	44,44,44	1.01	2 (4%)	53,61,61	1.11	5 (9%)
5	GNP	D	202	4	34,34,34	1.94	8 (23%)	47,54,54	1.72	9 (19%)
3	A1AZD	B	1101	-	44,44,44	2.63	12 (27%)	53,61,61	2.29	13 (24%)

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
5	GNP	C	202	4	-	4/18/38/38	0/3/3/3
3	A1AZD	A	1101	-	-	3/27/27/27	0/4/4/4
5	GNP	D	202	4	-	6/18/38/38	0/3/3/3
3	A1AZD	B	1101	-	-	5/27/27/27	0/4/4/4



All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1101	A1AZD	C24-C18	-12.59	1.36	1.49
3	B	1101	A1AZD	C1-N34	4.93	1.44	1.34
5	C	202	GNP	PB-O3A	-4.54	1.53	1.59
3	B	1101	A1AZD	O3-C5	-4.39	1.40	1.48
5	D	202	GNP	PB-O3A	-4.33	1.53	1.59
5	C	202	GNP	PA-O3A	-4.12	1.55	1.59
5	C	202	GNP	C5-N7	-4.09	1.30	1.39
5	D	202	GNP	C5-N7	-4.04	1.31	1.39
5	D	202	GNP	PA-O3A	-4.00	1.55	1.59
5	D	202	GNP	PG-O2G	-3.81	1.46	1.56
5	D	202	GNP	PG-O3G	-3.76	1.46	1.56
5	D	202	GNP	PG-N3B	-3.72	1.53	1.63
5	C	202	GNP	PG-O3G	-3.68	1.47	1.56
5	C	202	GNP	PG-O2G	-3.57	1.47	1.56
3	B	1101	A1AZD	C4-N5	3.44	1.43	1.32
3	B	1101	A1AZD	C20-C19	-3.36	1.35	1.41
3	B	1101	A1AZD	C15-N14	3.02	1.42	1.36
5	C	202	GNP	PG-N3B	-2.96	1.55	1.63
5	D	202	GNP	PB-O2B	-2.90	1.49	1.56
3	B	1101	A1AZD	O3-C1	2.88	1.40	1.34
3	B	1101	A1AZD	C15-N16	-2.88	1.29	1.33
5	C	202	GNP	PB-O2B	-2.86	1.49	1.56
5	D	202	GNP	PB-N3B	-2.82	1.56	1.63
3	B	1101	A1AZD	O2-C1	-2.75	1.16	1.21
3	A	1101	A1AZD	C20-C19	-2.59	1.36	1.41
5	C	202	GNP	PB-N3B	-2.58	1.56	1.63
3	B	1101	A1AZD	C29-C24	-2.47	1.36	1.40
3	B	1101	A1AZD	C20-C15	-2.36	1.39	1.42
3	B	1101	A1AZD	O6-C4	-2.25	1.17	1.23
3	A	1101	A1AZD	O3-C5	-2.10	1.44	1.48

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1101	A1AZD	O3-C1-N34	7.83	121.12	110.00
3	B	1101	A1AZD	C20-C19-S21	-6.46	102.94	111.64
3	B	1101	A1AZD	C19-S21-C22	5.69	98.76	91.24
3	B	1101	A1AZD	O2-C1-N34	-5.20	117.10	124.93
5	D	202	GNP	O3A-PB-N3B	-5.08	92.51	106.59
5	C	202	GNP	O3A-PB-N3B	-4.79	93.31	106.59
5	C	202	GNP	O2B-PB-O3A	4.47	119.55	104.64
5	D	202	GNP	O2G-PG-O1G	-4.34	102.57	113.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1101	A1AZD	C19-C20-C23	4.22	118.46	111.42
5	D	202	GNP	O2B-PB-O3A	4.17	118.56	104.64
5	D	202	GNP	O1B-PB-N3B	-4.15	105.66	111.77
3	B	1101	A1AZD	C23-C22-S21	-4.02	105.63	113.90
3	B	1101	A1AZD	C10-N14-C15	-3.33	119.51	129.28
5	C	202	GNP	N9-C4-N3	3.07	132.10	125.95
3	B	1101	A1AZD	C12-C11-C10	-3.07	120.29	123.43
3	A	1101	A1AZD	C19-S21-C22	-2.96	87.33	91.24
5	D	202	GNP	N9-C4-N3	2.90	131.75	125.95
3	A	1101	A1AZD	C12-C11-C10	-2.81	120.55	123.43
5	D	202	GNP	O2G-PG-O3G	2.80	115.13	107.59
3	B	1101	A1AZD	C3-C4-N5	2.75	121.30	116.54
3	A	1101	A1AZD	C20-C19-S21	2.67	115.23	111.64
3	B	1101	A1AZD	C25-C24-C18	-2.67	119.47	123.28
5	C	202	GNP	O1B-PB-N3B	-2.52	108.06	111.77
5	C	202	GNP	C5-C4-N3	-2.52	124.38	128.39
3	A	1101	A1AZD	C19-C18-N17	-2.47	118.44	121.68
5	D	202	GNP	C5-C4-N3	-2.41	124.56	128.39
5	D	202	GNP	C6-C5-N7	-2.28	126.14	130.29
5	D	202	GNP	O3A-PA-O1A	2.23	117.42	110.70
5	C	202	GNP	C6-C5-N7	-2.21	126.26	130.29
3	B	1101	A1AZD	O3-C1-O2	-2.17	121.78	125.64
3	A	1101	A1AZD	C9-C10-C11	2.14	119.56	117.23
3	B	1101	A1AZD	O30-C25-C26	-2.11	119.35	123.95
5	C	202	GNP	C4-C5-N7	2.03	113.88	110.67
3	B	1101	A1AZD	C9-C10-C11	2.01	119.42	117.23

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	202	GNP	PB-N3B-PG-O1G
5	C	202	GNP	PG-N3B-PB-O1B
5	D	202	GNP	PB-N3B-PG-O1G
5	D	202	GNP	PG-N3B-PB-O1B
5	D	202	GNP	O4'-C4'-C5'-O5'
5	C	202	GNP	O4'-C4'-C5'-O5'
5	D	202	GNP	C3'-C4'-C5'-O5'
3	B	1101	A1AZD	O3-C1-N34-C16
5	C	202	GNP	C3'-C4'-C5'-O5'
3	B	1101	A1AZD	O2-C1-N34-C16
3	A	1101	A1AZD	C19-C18-C24-C25

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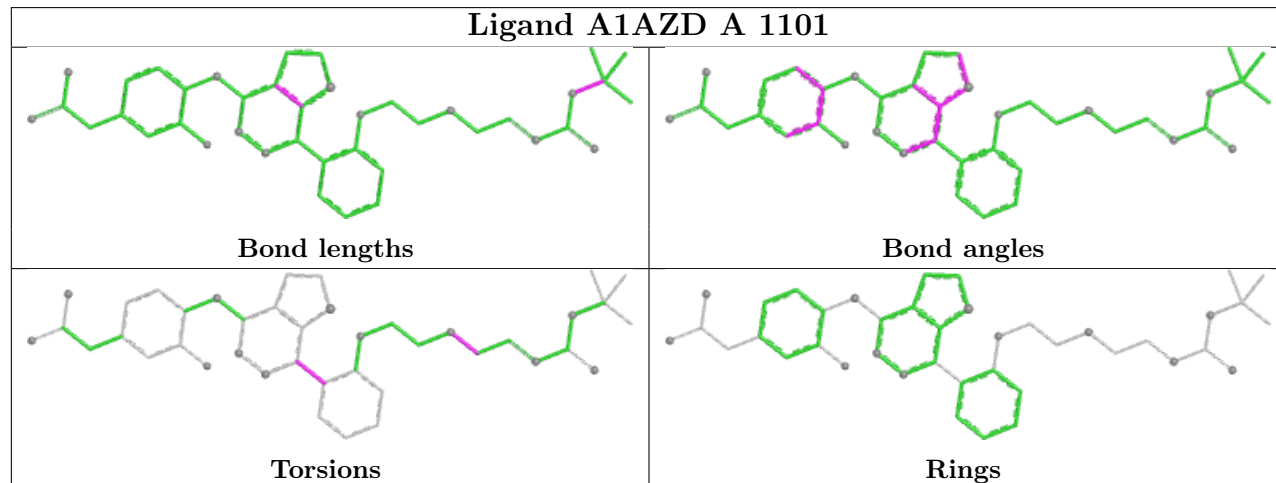
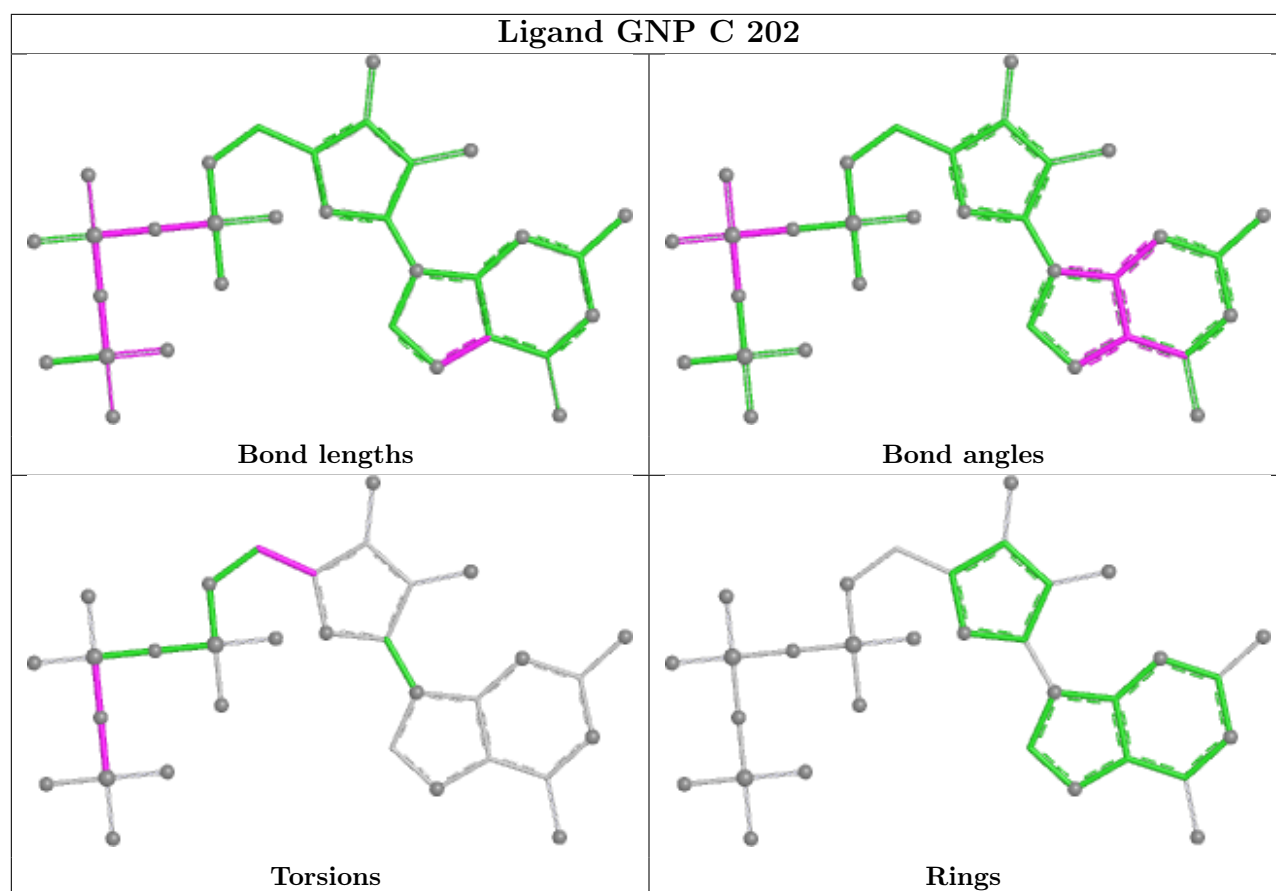
Mol	Chain	Res	Type	Atoms
3	B	1101	A1AZD	C19-C18-C24-C25
3	A	1101	A1AZD	N17-C18-C24-C25
3	B	1101	A1AZD	C31-C32-O33-C2
5	D	202	GNP	PB-O3A-PA-O2A
3	A	1101	A1AZD	C16-C2-O33-C32
5	D	202	GNP	PB-O3A-PA-O1A
3	B	1101	A1AZD	N17-C18-C24-C25

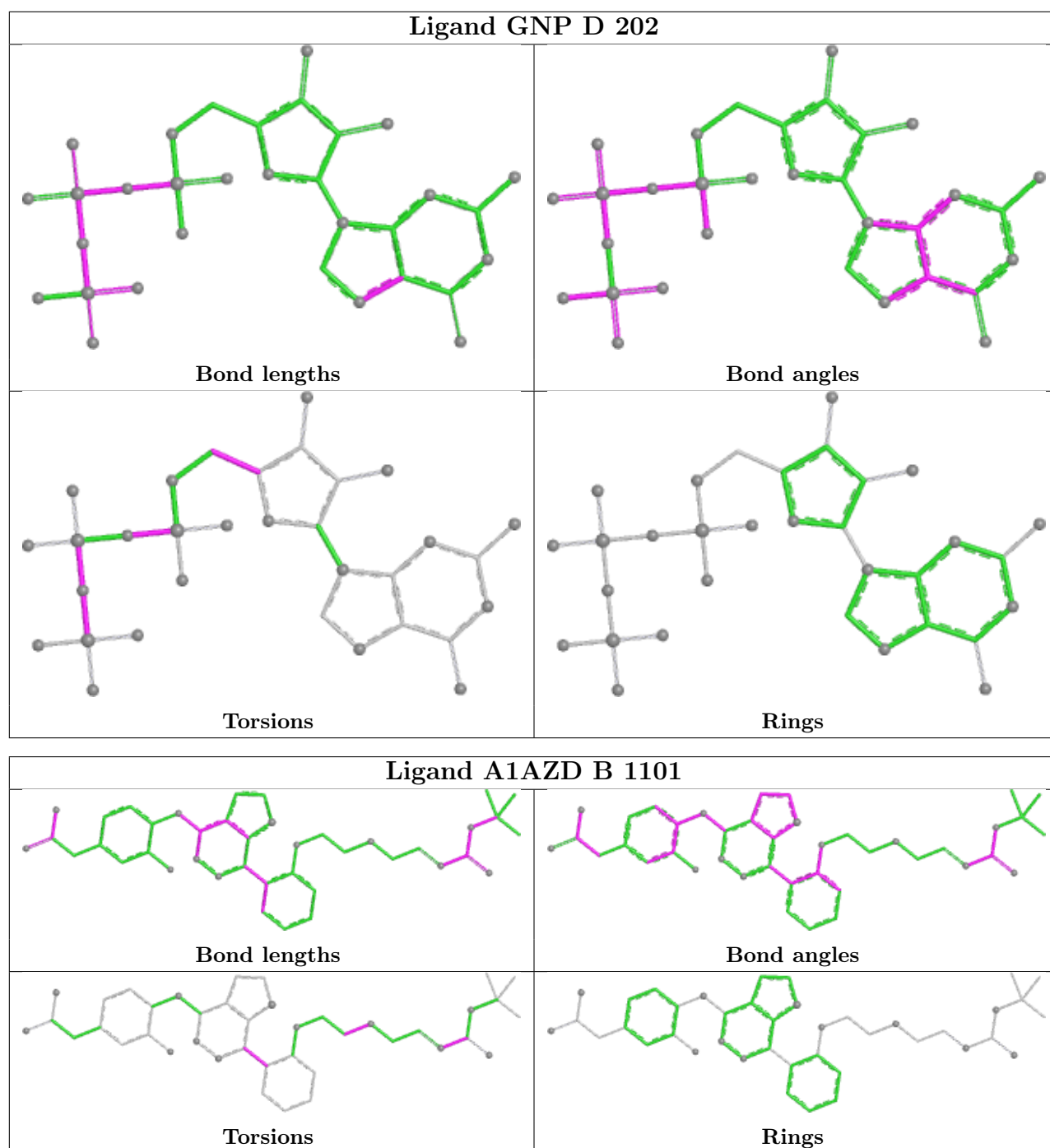
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	202	GNP	1	0
5	D	202	GNP	1	0

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





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

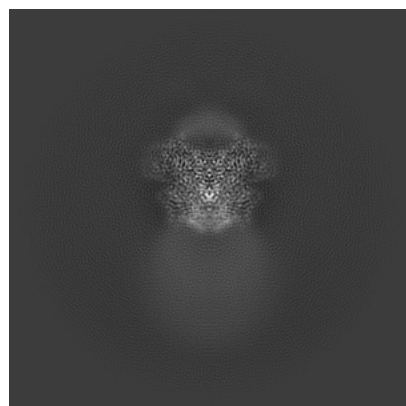
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-49452. These allow visual inspection of the internal detail of the map and identification of artifacts.

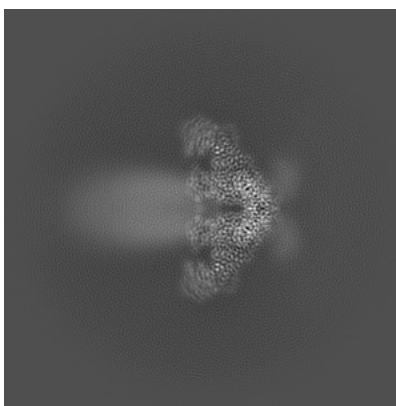
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

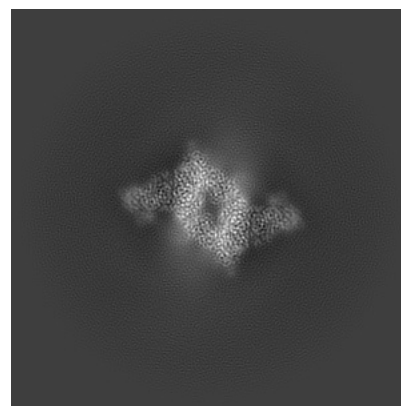
#### 6.1.1 Primary map



X

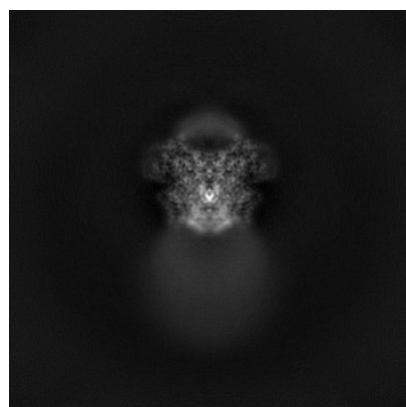


Y

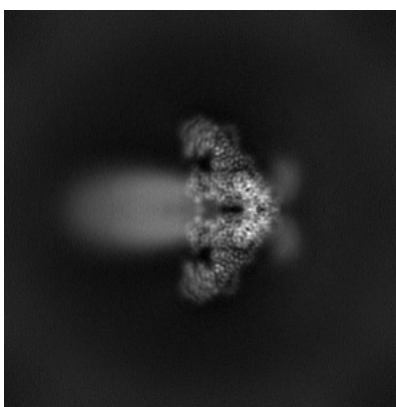


Z

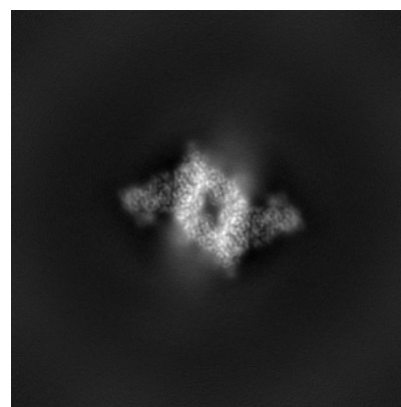
#### 6.1.2 Raw map



X



Y



Z

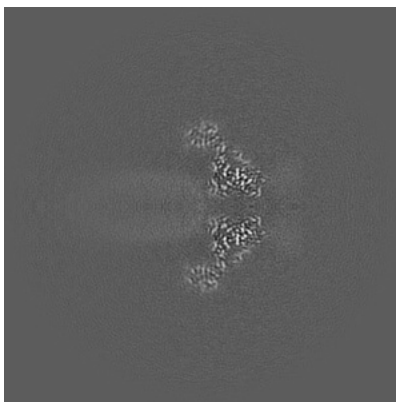
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

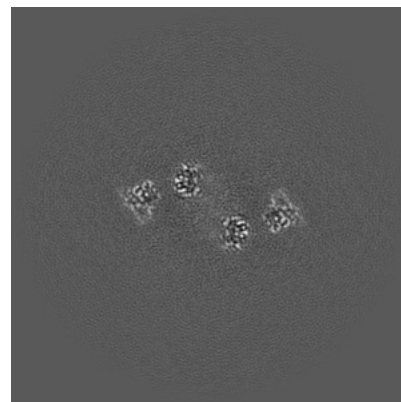
### 6.2.1 Primary map



X Index: 224

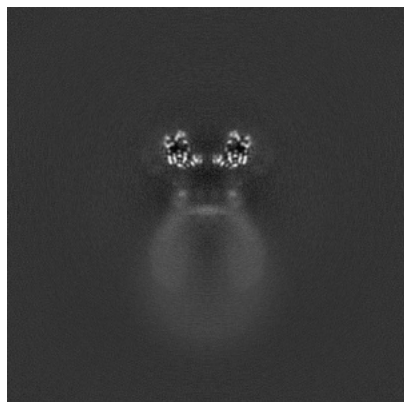


Y Index: 224

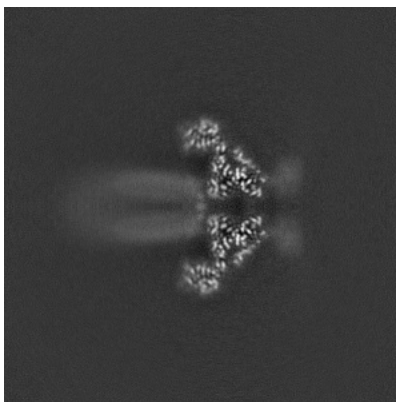


Z Index: 224

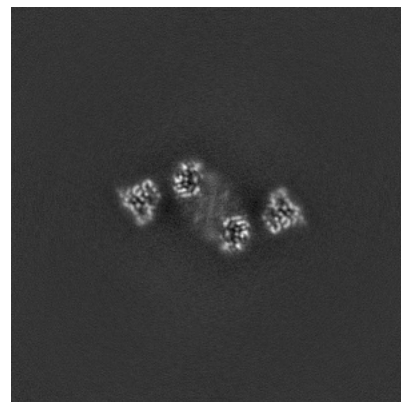
### 6.2.2 Raw map



X Index: 224



Y Index: 224



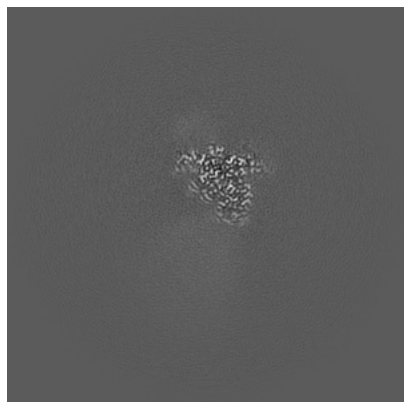
Z Index: 224

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

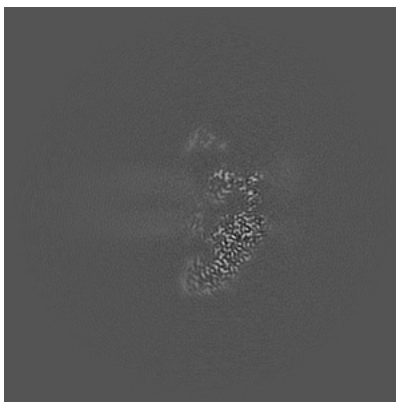


## 6.3 Largest variance slices [i](#)

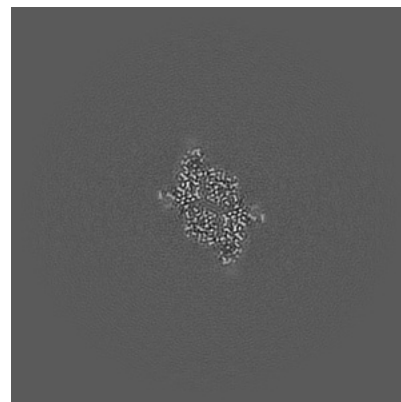
### 6.3.1 Primary map



X Index: 197

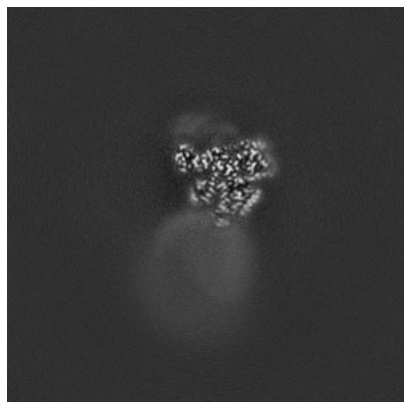


Y Index: 233



Z Index: 274

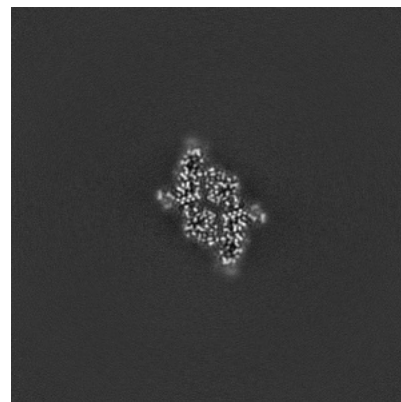
### 6.3.2 Raw map



X Index: 206



Y Index: 214



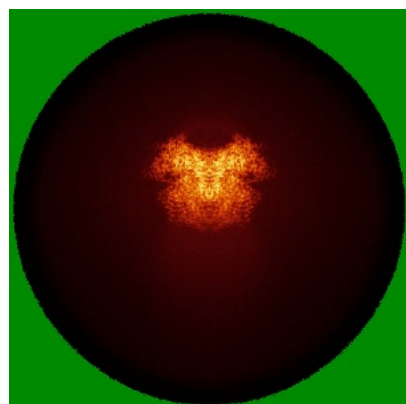
Z Index: 274

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

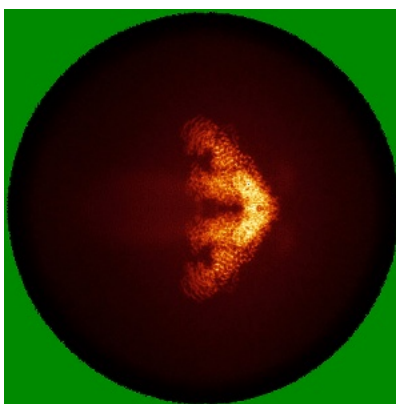


## 6.4 Orthogonal standard-deviation projections (False-color) [i](#)

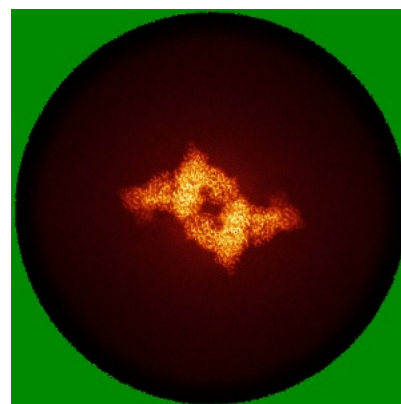
### 6.4.1 Primary map



X

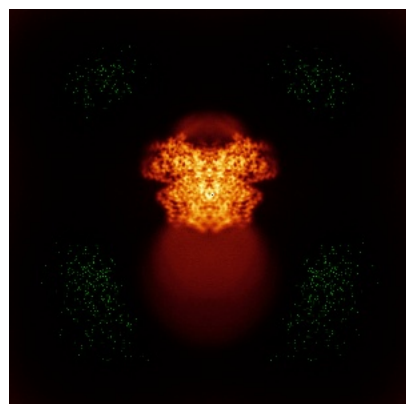


Y

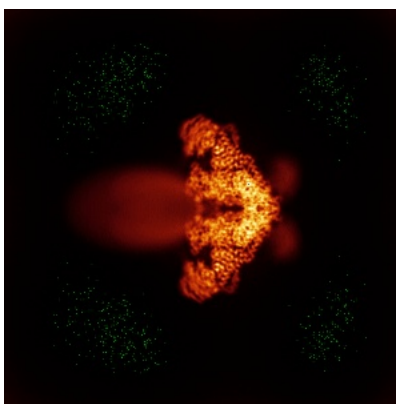


Z

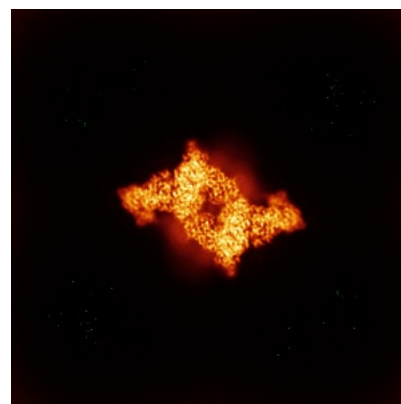
### 6.4.2 Raw map



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



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.33. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

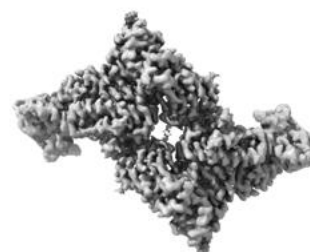
### 6.5.2 Raw map



X



Y



Z

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.

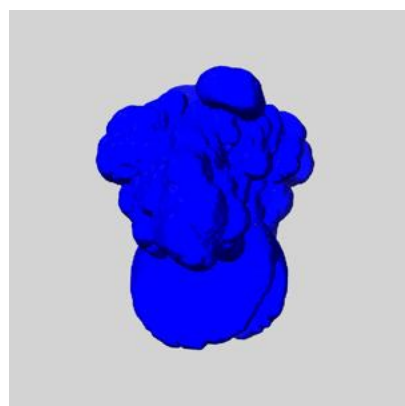
## 6.6 Mask visualisation [i](#)

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

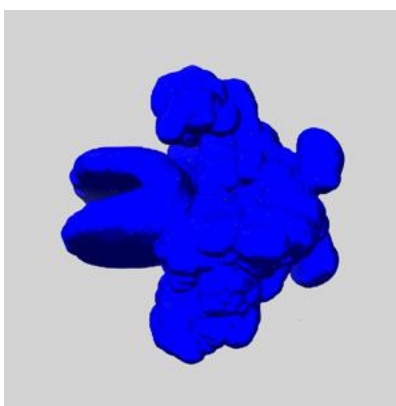
A mask typically either:

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

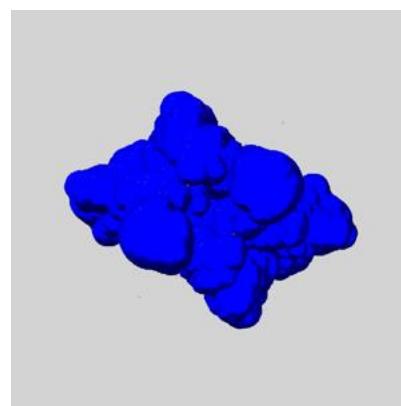
### 6.6.1 emd\_49452\_msk\_1.map [i](#)



X



Y

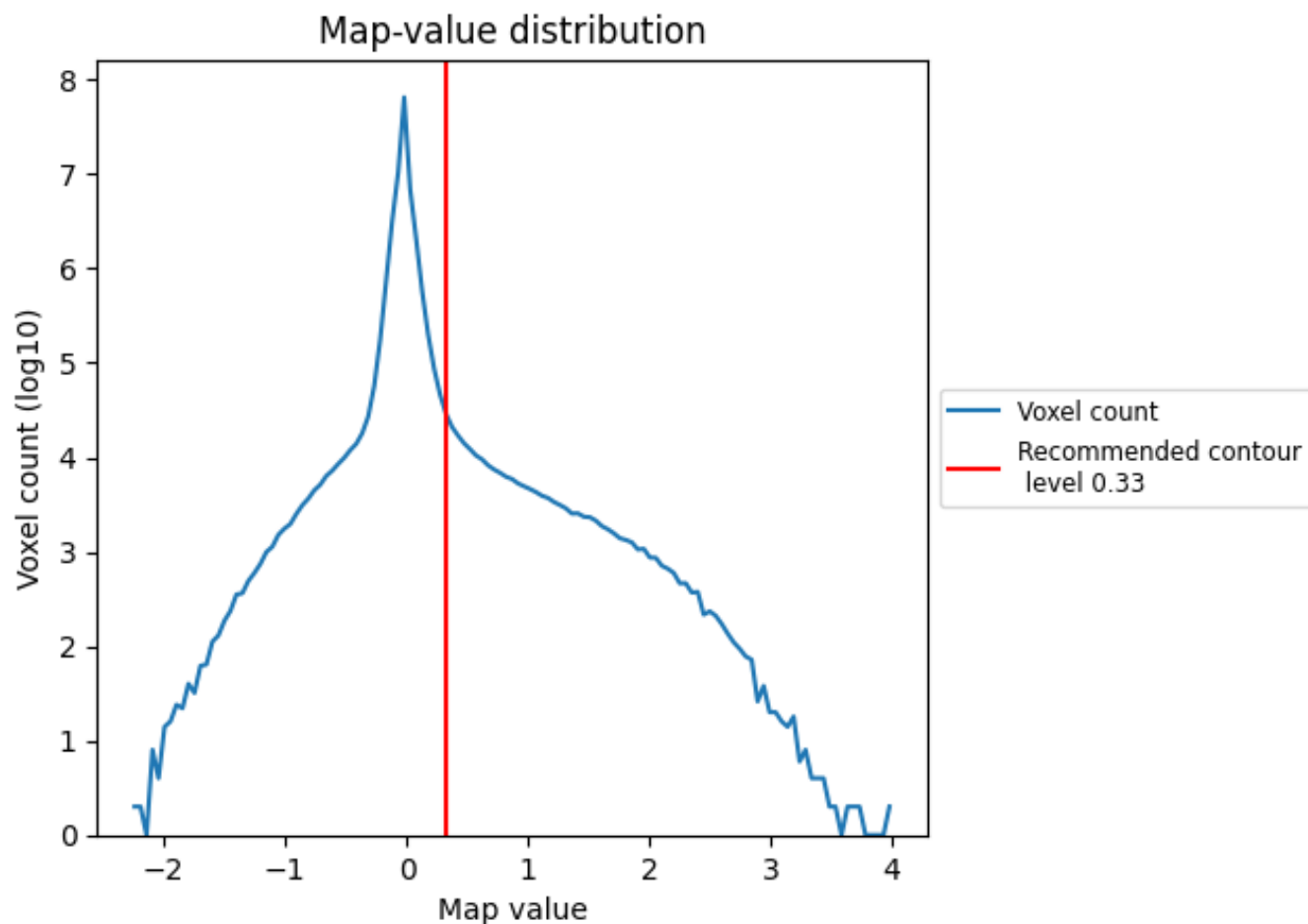


Z

## 7 Map analysis [i](#)

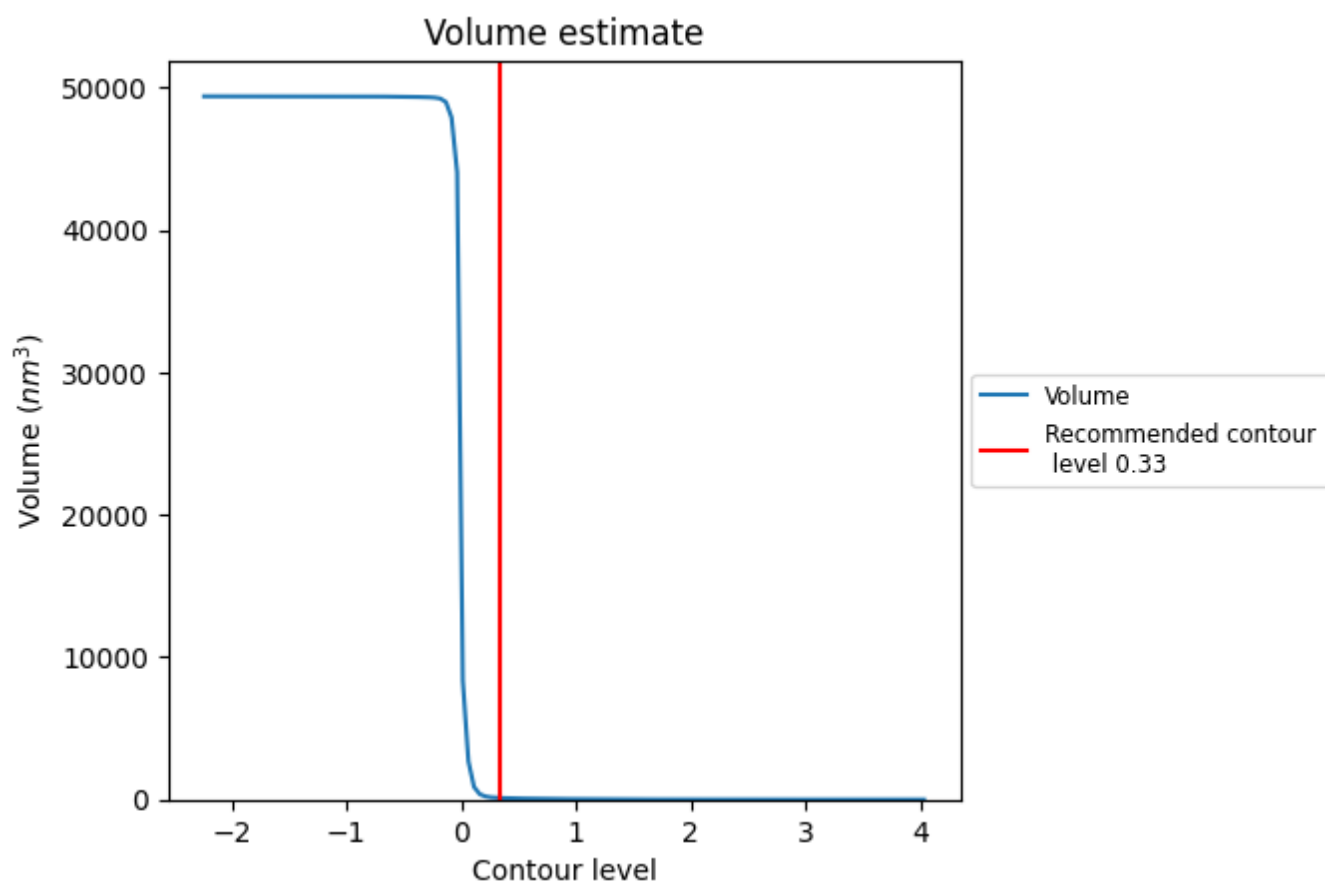
This section contains the results of statistical analysis of the map.

### 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.

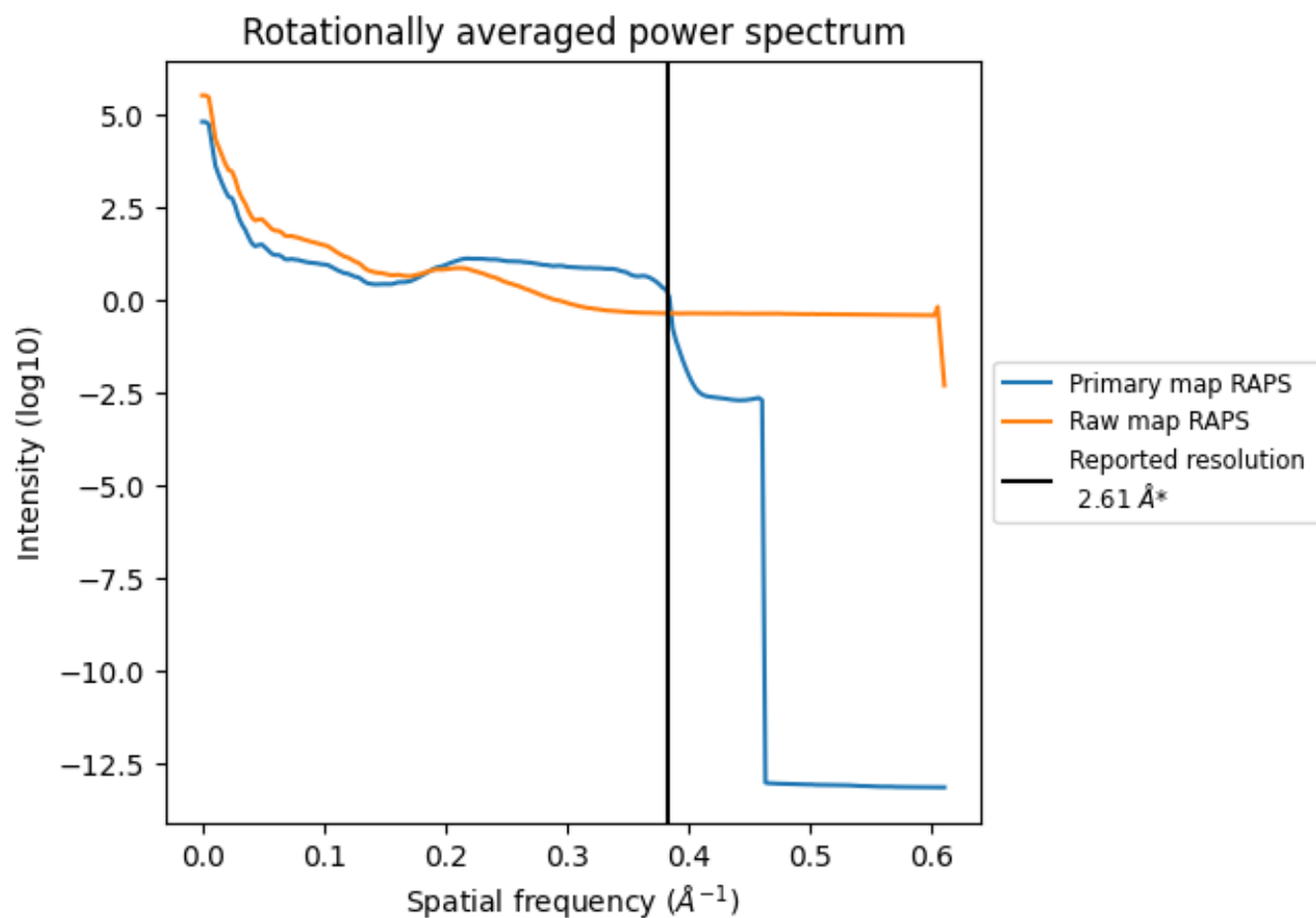
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 118 nm<sup>3</sup>; this corresponds to an approximate mass of 106 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 ⓘ

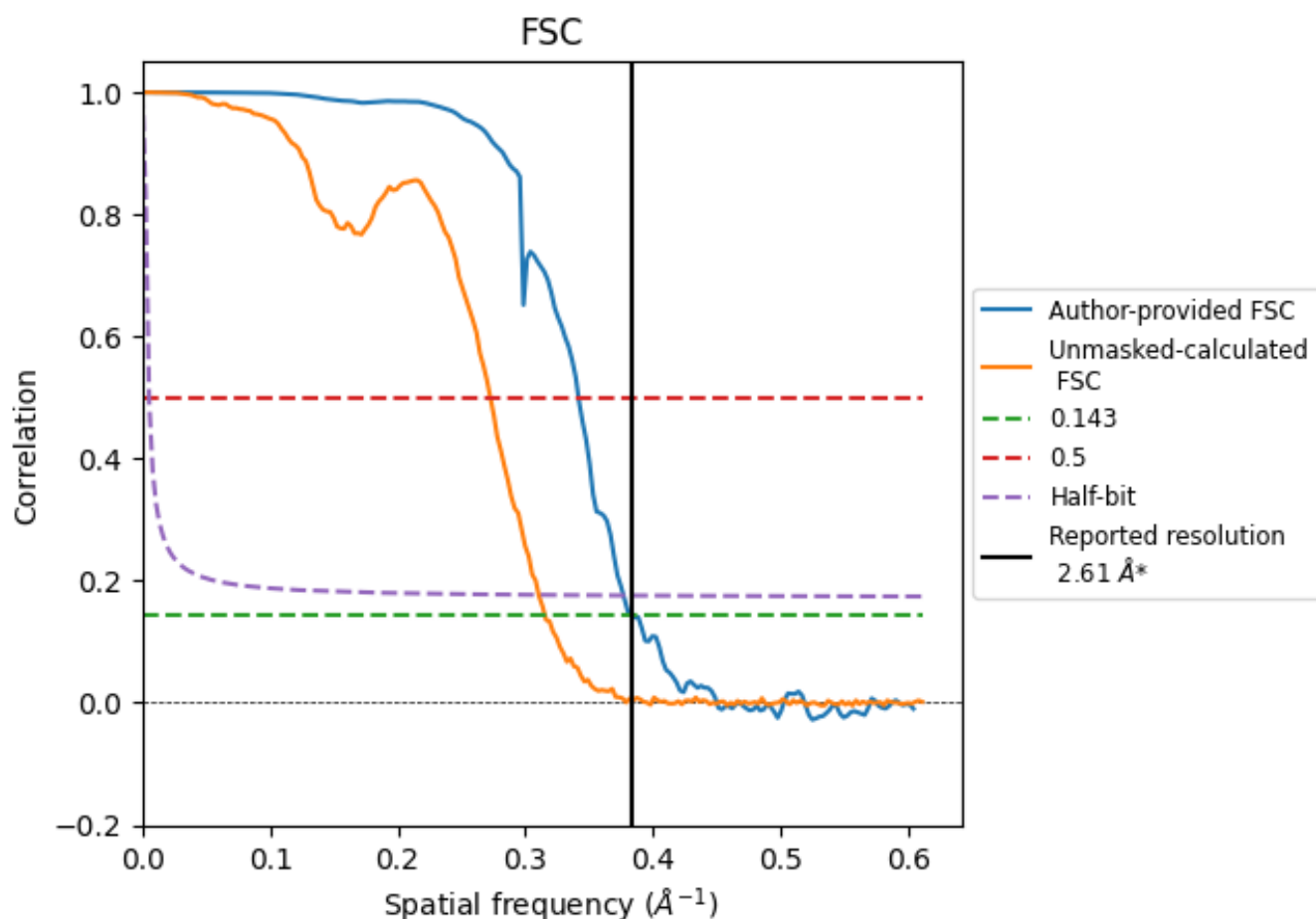


\*Reported resolution corresponds to spatial frequency of 0.383 Å<sup>-1</sup>

## 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 0.383  $\text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.61	-	-
Author-provided FSC curve	2.61	2.93	2.65
Unmasked-calculated*	3.17	3.67	3.22

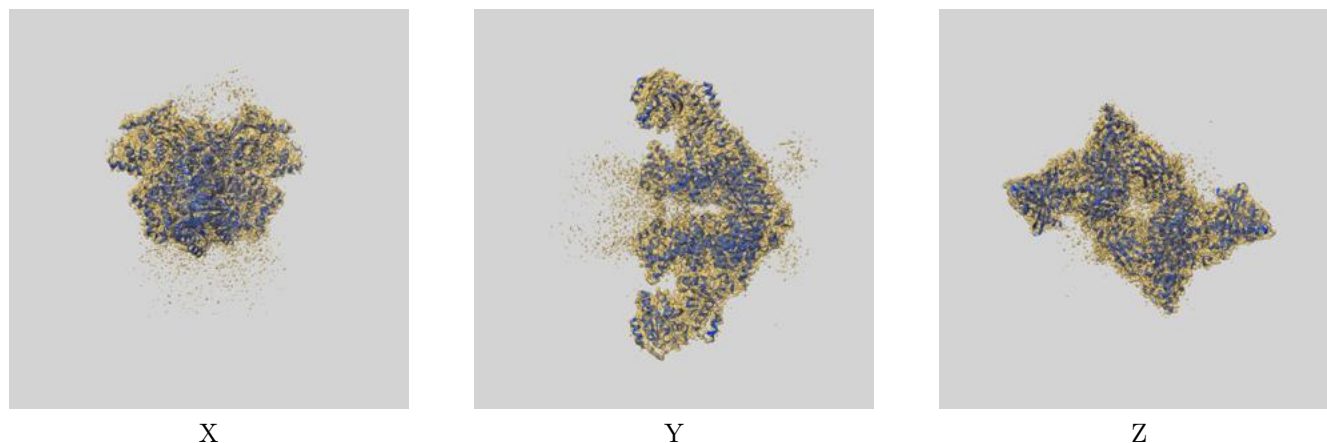
\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.17 differs from the reported value 2.61 by more than 10 %



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

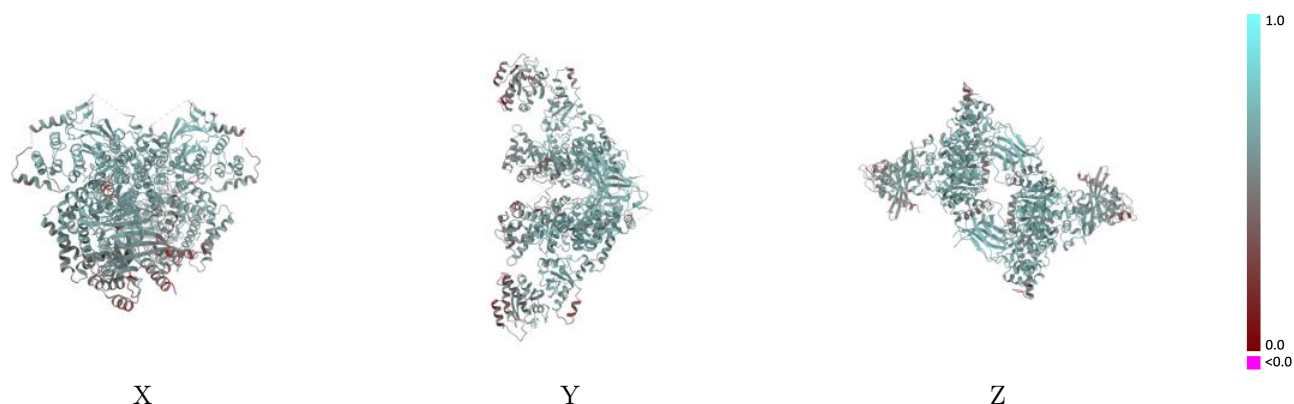
This section contains information regarding the fit between EMDB map EMD-49452 and PDB model 9NI4. Per-residue inclusion information can be found in section 3 on page 7.

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



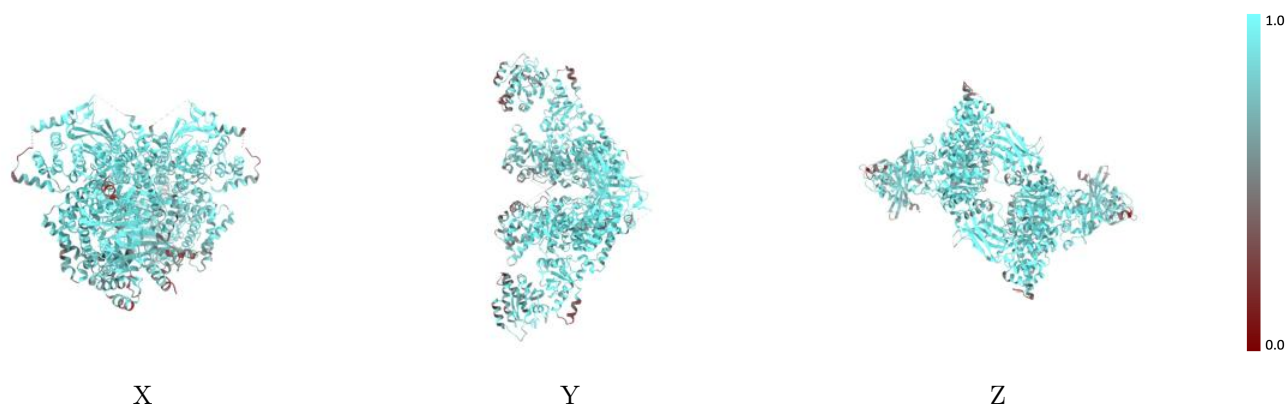
The images above show the 3D surface view of the map at the recommended contour level 0.33 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



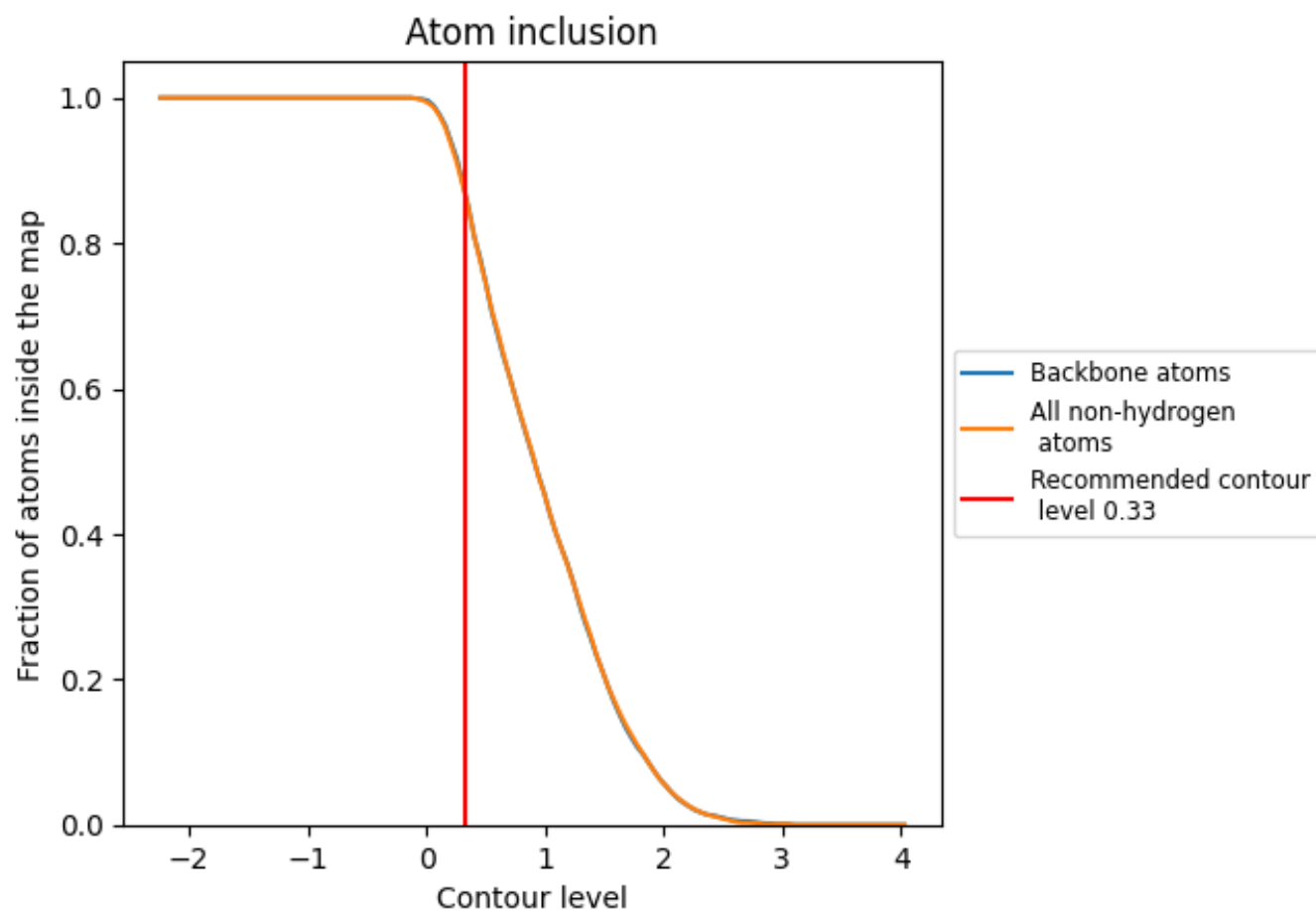
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.33).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 87% of all backbone atoms, 87% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.33) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.8660	<div></div> 0.5810
A	<div></div> 0.8890	<div></div> 0.5970
B	<div></div> 0.8880	<div></div> 0.5980
C	<div></div> 0.7630	<div></div> 0.4940
D	<div></div> 0.7730	<div></div> 0.4950

