



## Full wwPDB EM Validation Report ⓘ

Nov 20, 2022 – 01:36 am GMT

PDB ID : 6GDG  
EMDB ID : EMD-4390  
Title : Cryo-EM structure of the adenosine A2A receptor bound to a miniGs heterotrimer  
Authors : Garcia-Nafria, J.; Lee, Y.  
Deposited on : 2018-04-23  
Resolution : 4.11 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.2

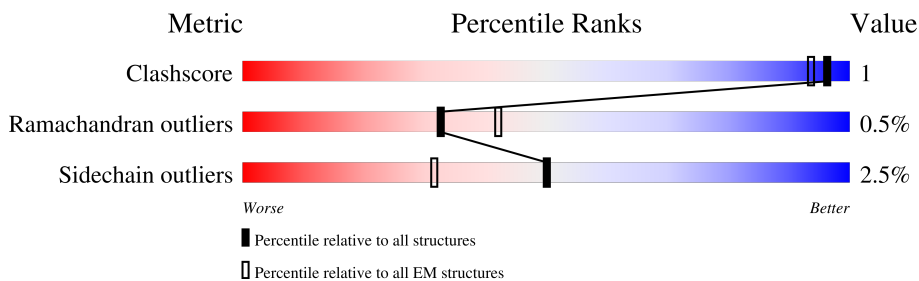
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 4.11 Å.

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



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

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

Mol	Chain	Length	Quality of chain
1	A	479	
2	B	339	
3	C	71	
4	D	248	
5	E	156	

## 2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 7223 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 TrxA, Adenosine receptor A2a.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	264	1913	1273	317	307	16	0	0

There are 66 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-162	MET	-	initiating methionine	UNP Q14F07
A	-161	LEU	-	expression tag	UNP Q14F07
A	-160	LEU	-	expression tag	UNP Q14F07
A	-159	VAL	-	expression tag	UNP Q14F07
A	-158	ASN	-	expression tag	UNP Q14F07
A	-157	GLN	-	expression tag	UNP Q14F07
A	-156	SER	-	expression tag	UNP Q14F07
A	-155	HIS	-	expression tag	UNP Q14F07
A	-154	GLN	-	expression tag	UNP Q14F07
A	-153	GLY	-	expression tag	UNP Q14F07
A	-152	PHE	-	expression tag	UNP Q14F07
A	-151	ASN	-	expression tag	UNP Q14F07
A	-150	LYS	-	expression tag	UNP Q14F07
A	-149	GLU	-	expression tag	UNP Q14F07
A	-148	HIS	-	expression tag	UNP Q14F07
A	-147	THR	-	expression tag	UNP Q14F07
A	-146	SER	-	expression tag	UNP Q14F07
A	-145	LYS	-	expression tag	UNP Q14F07
A	-144	MET	-	expression tag	UNP Q14F07
A	-143	VAL	-	expression tag	UNP Q14F07
A	-142	SER	-	expression tag	UNP Q14F07
A	-141	ALA	-	expression tag	UNP Q14F07
A	-140	ILE	-	expression tag	UNP Q14F07
A	-139	VAL	-	expression tag	UNP Q14F07
A	-138	LEU	-	expression tag	UNP Q14F07
A	-137	TYR	-	expression tag	UNP Q14F07
A	-136	VAL	-	expression tag	UNP Q14F07
A	-135	LEU	-	expression tag	UNP Q14F07

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-134	LEU	-	expression tag	UNP Q14F07
A	-133	ALA	-	expression tag	UNP Q14F07
A	-132	ALA	-	expression tag	UNP Q14F07
A	-131	ALA	-	expression tag	UNP Q14F07
A	-130	ALA	-	expression tag	UNP Q14F07
A	-129	HIS	-	expression tag	UNP Q14F07
A	-128	SER	-	expression tag	UNP Q14F07
A	-127	ALA	-	expression tag	UNP Q14F07
A	-126	PHE	-	expression tag	UNP Q14F07
A	-125	ALA	-	expression tag	UNP Q14F07
A	-124	ALA	-	expression tag	UNP Q14F07
A	-123	HIS	-	expression tag	UNP Q14F07
A	-122	HIS	-	expression tag	UNP Q14F07
A	-121	HIS	-	expression tag	UNP Q14F07
A	-120	HIS	-	expression tag	UNP Q14F07
A	-119	HIS	-	expression tag	UNP Q14F07
A	-118	HIS	-	expression tag	UNP Q14F07
A	-117	HIS	-	expression tag	UNP Q14F07
A	-116	HIS	-	expression tag	UNP Q14F07
A	-115	HIS	-	expression tag	UNP Q14F07
A	-114	HIS	-	expression tag	UNP Q14F07
A	-113	GLU	-	expression tag	UNP Q14F07
A	-112	ASN	-	expression tag	UNP Q14F07
A	-111	LEU	-	expression tag	UNP Q14F07
A	-110	TYR	-	expression tag	UNP Q14F07
A	-109	PHE	-	expression tag	UNP Q14F07
A	-108	GLN	-	expression tag	UNP Q14F07
A	-107	GLY	-	expression tag	UNP Q14F07
A	-75	SER	CYS	conflict	UNP Q14F07
A	-72	SER	CYS	conflict	UNP Q14F07
A	-25	ALA	LYS	conflict	UNP Q14F07
A	2	GLU	-	linker	UNP Q14F07
A	3	ALA	-	linker	UNP Q14F07
A	4	ALA	-	linker	UNP Q14F07
A	5	ALA	-	linker	UNP Q14F07
A	6	LYS	-	linker	UNP Q14F07
A	7	ALA	-	linker	UNP Q14F07
A	154	ALA	ASN	conflict	UNP P29274

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	336	2377	1486	411	461	19	0	0

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	44	262	161	47	51	3	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	68	SER	CYS	conflict	UNP P59768

- Molecule 4 is a protein called Guanine nucleotide-binding protein G(s) subunit alpha isoforms short, Guanine nucleotide-binding protein G(s) subunit alpha isoforms short.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	225	1721	1096	308	312	5	0	0

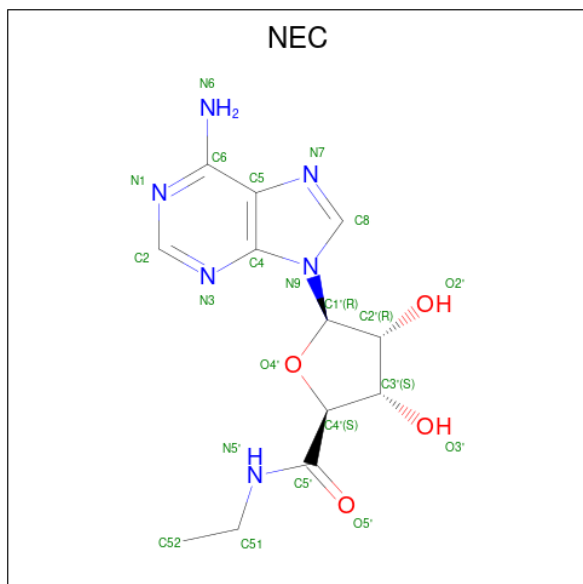
There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	49	ASP	GLY	conflict	UNP P63092
D	50	ASN	GLU	conflict	UNP P63092
D	196	GLY	-	linker	UNP P63092
D	197	GLY	-	linker	UNP P63092
D	198	SER	-	linker	UNP P63092
D	199	GLY	-	linker	UNP P63092
D	200	GLY	-	linker	UNP P63092
D	201	SER	-	linker	UNP P63092
D	202	GLY	-	linker	UNP P63092
D	203	GLY	-	linker	UNP P63092
D	249	ASP	ALA	conflict	UNP P63092
D	252	ASP	SER	conflict	UNP P63092
D	362	ALA	ILE	conflict	UNP P63092
D	365	ILE	VAL	conflict	UNP P63092

- Molecule 5 is a protein called nanobody Nb35.

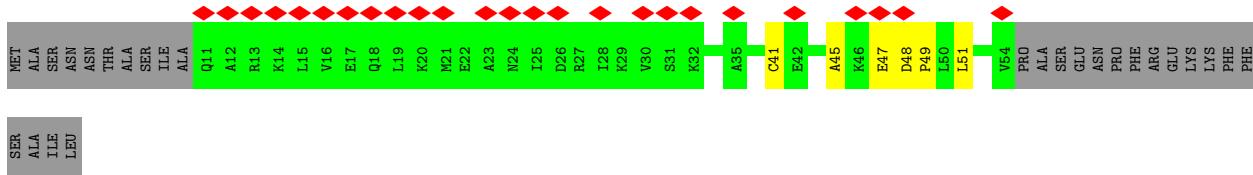
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	128	928	583	157	182	6	0	0

- Molecule 6 is N-ETHYL-5'-CARBOXAMIDO ADENOSINE (three-letter code: NEC) (formula: C<sub>12</sub>H<sub>16</sub>N<sub>6</sub>O<sub>4</sub>).

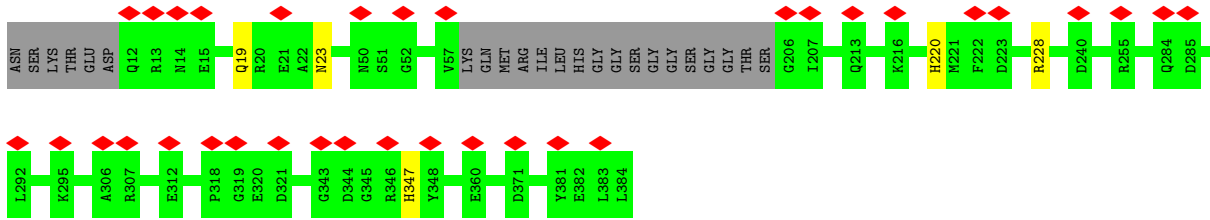
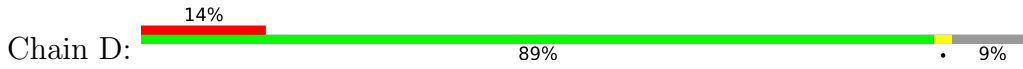


Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
6	A	1	22	12	6	4	0

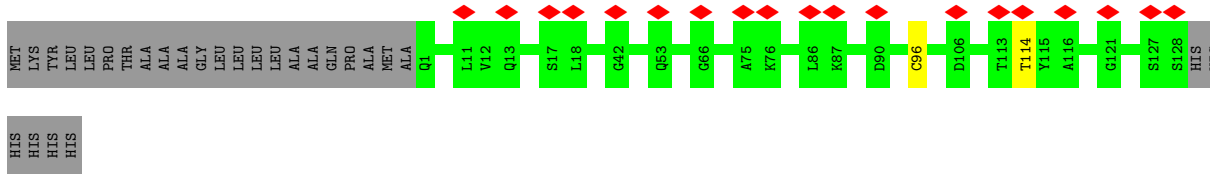
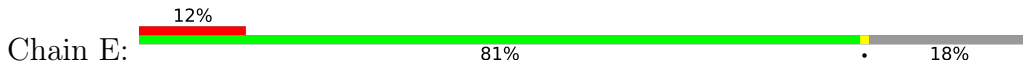




- Molecule 4: Guanine nucleotide-binding protein G(s) subunit alpha isoforms short, Guanine nucleotide-binding protein G(s) subunit alpha isoforms short



- Molecule 5: nanobody Nb35





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	128002	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 ( $e^-/\text{\AA}^2$ )	30	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.290	Depositor
Minimum map value	-0.178	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.012	Depositor
Recommended contour level	0.0631	Depositor
Map size (Å)	160.50002, 160.50002, 160.50002	wwPDB
Map dimensions	150, 150, 150	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	Depositor

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NEC

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	0.38	0/1957	0.52	0/2686
2	B	0.34	0/2424	0.52	0/3314
3	C	0.34	0/265	0.44	0/366
4	D	0.36	0/1758	0.52	0/2390
5	E	0.36	0/948	0.51	0/1289
All	All	0.36	0/7352	0.51	0/10045

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 [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1913	0	1870	4	0
2	B	2377	0	2142	6	0
3	C	262	0	188	1	0
4	D	1721	0	1573	1	0
5	E	928	0	850	0	0
6	A	22	0	16	0	0
All	All	7223	0	6639	11	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 1.

All (11) 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:B:86:THR:HG21	4:D:19:GLN:HE22	1.59	0.66
1:A:54:ALA:HB1	1:A:87:LEU:HD21	1.93	0.49
1:A:280:ASN:ND2	1:A:284:ASN:HD21	2.12	0.47
2:B:51:LEU:HD11	2:B:338:ILE:HD11	1.98	0.46
1:A:55:VAL:HA	1:A:59:ALA:HB3	1.96	0.46
2:B:158:VAL:HG11	2:B:192:LEU:HD21	1.98	0.45
2:B:230:ASN:HD22	2:B:230:ASN:N	2.15	0.45
2:B:201:SER:HG	2:B:211:TRP:HE1	1.67	0.43
2:B:145:TYR:O	2:B:162:GLY:N	2.51	0.42
3:C:41:CYS:O	3:C:45:ALA:N	2.54	0.41
1:A:103:TYR:CE1	1:A:107:ARG:HG3	2.56	0.41

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	258/479 (54%)	250 (97%)	8 (3%)	0	100	100
2	B	334/339 (98%)	319 (96%)	14 (4%)	1 (0%)	41	76
3	C	42/71 (59%)	39 (93%)	0	3 (7%)	1	16
4	D	221/248 (89%)	208 (94%)	13 (6%)	0	100	100
5	E	126/156 (81%)	112 (89%)	13 (10%)	1 (1%)	19	58
All	All	981/1293 (76%)	928 (95%)	48 (5%)	5 (0%)	32	67

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	47	GLU
3	C	49	PRO
3	C	48	ASP
5	E	114	THR
2	B	53	GLY

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	179/393 (46%)	174 (97%)	5 (3%)	43	64
2	B	228/282 (81%)	222 (97%)	6 (3%)	46	66
3	C	14/58 (24%)	13 (93%)	1 (7%)	14	41
4	D	163/219 (74%)	159 (98%)	4 (2%)	47	68
5	E	92/126 (73%)	91 (99%)	1 (1%)	73	84
All	All	676/1078 (63%)	659 (98%)	17 (2%)	50	68

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	64	ILE
1	A	95	LEU
1	A	102	ARG
1	A	107	ARG
1	A	291	ARG
2	B	198	LEU
2	B	230	ASN
2	B	234	PHE
2	B	266	HIS
2	B	292	PHE
2	B	294	CYS
3	C	51	LEU
4	D	23	ASN
4	D	220	HIS
4	D	228	ARG

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Mol	Chain	Res	Type
4	D	347	HIS
5	E	96	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	89	GLN
1	A	181	ASN
1	A	280	ASN
2	B	88	ASN
4	D	19	GLN
5	E	31	ASN
5	E	77	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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

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	NEC	A	400	-	21,24,24	1.06	2 (9%)	21,35,35	1.76	5 (23%)

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	NEC	A	400	-	-	1/7/27/27	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	400	NEC	C5-C4	2.63	1.47	1.40
6	A	400	NEC	C2-N3	2.22	1.35	1.32

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	400	NEC	N3-C2-N1	-3.74	122.84	128.68
6	A	400	NEC	C2'-C3'-C4'	3.65	105.89	101.64
6	A	400	NEC	C3'-C2'-C1'	3.46	106.18	100.98
6	A	400	NEC	C4-C5-N7	-2.84	106.44	109.40
6	A	400	NEC	C2-N1-C6	2.01	122.19	118.75

There are no chirality outliers.

All (1) torsion outliers are listed below:

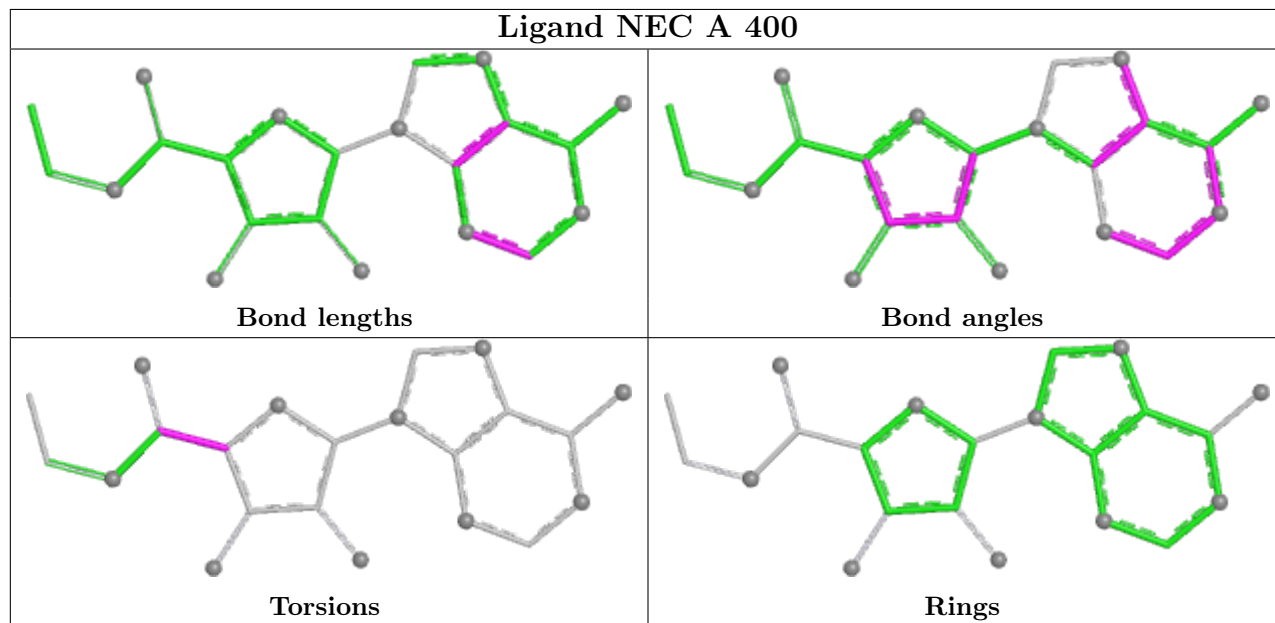
Mol	Chain	Res	Type	Atoms
6	A	400	NEC	O4'-C4'-C5'-N5'

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-4390. These allow visual inspection of the internal detail of the map and identification of artifacts.

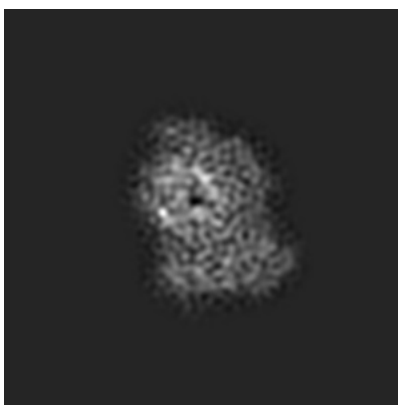
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

#### 6.1.1 Primary map



X



Y

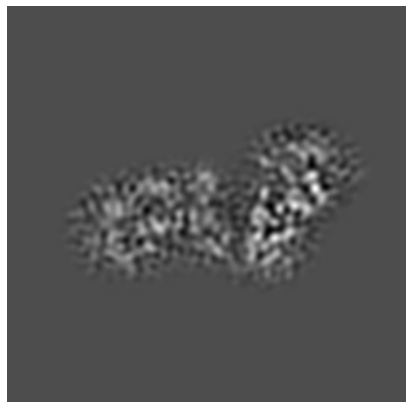


Z

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

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

#### 6.2.1 Primary map



X Index: 75



Y Index: 75



Z Index: 75



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: 85



Y Index: 107

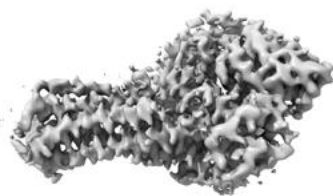


Z Index: 74

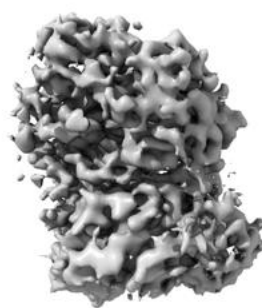
The images above show the largest variance slices of the map in three orthogonal directions.

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

### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0631. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

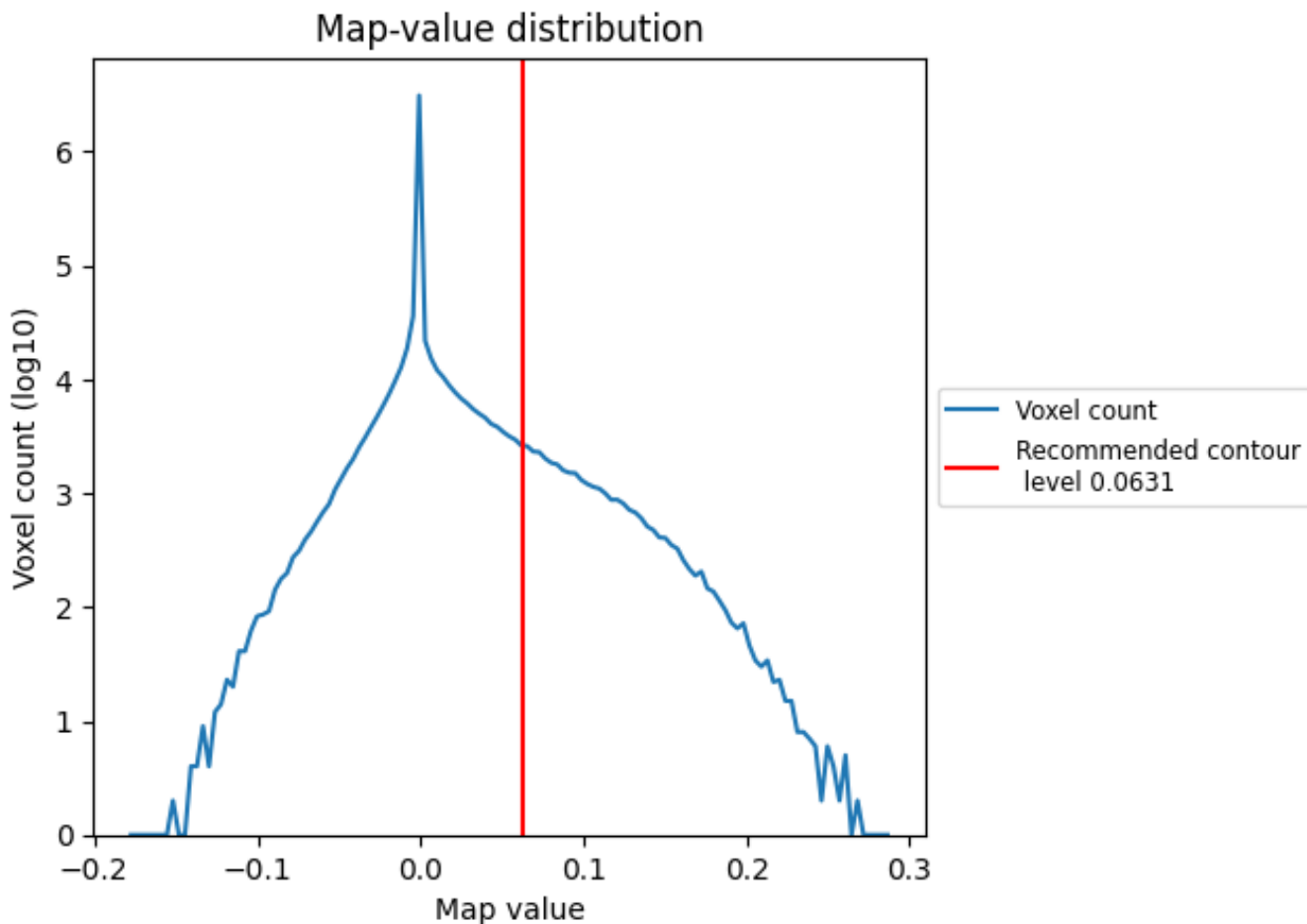
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

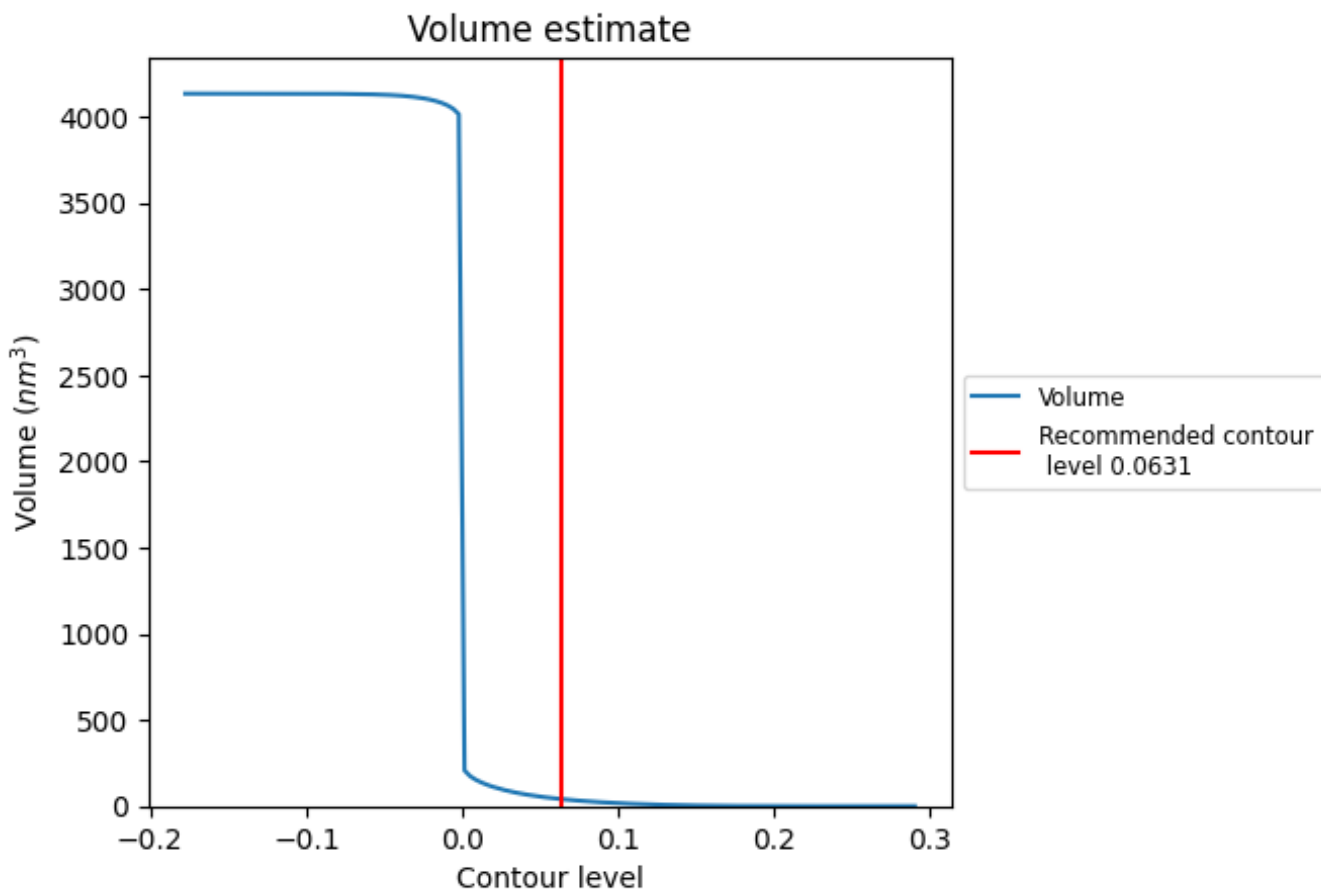
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



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

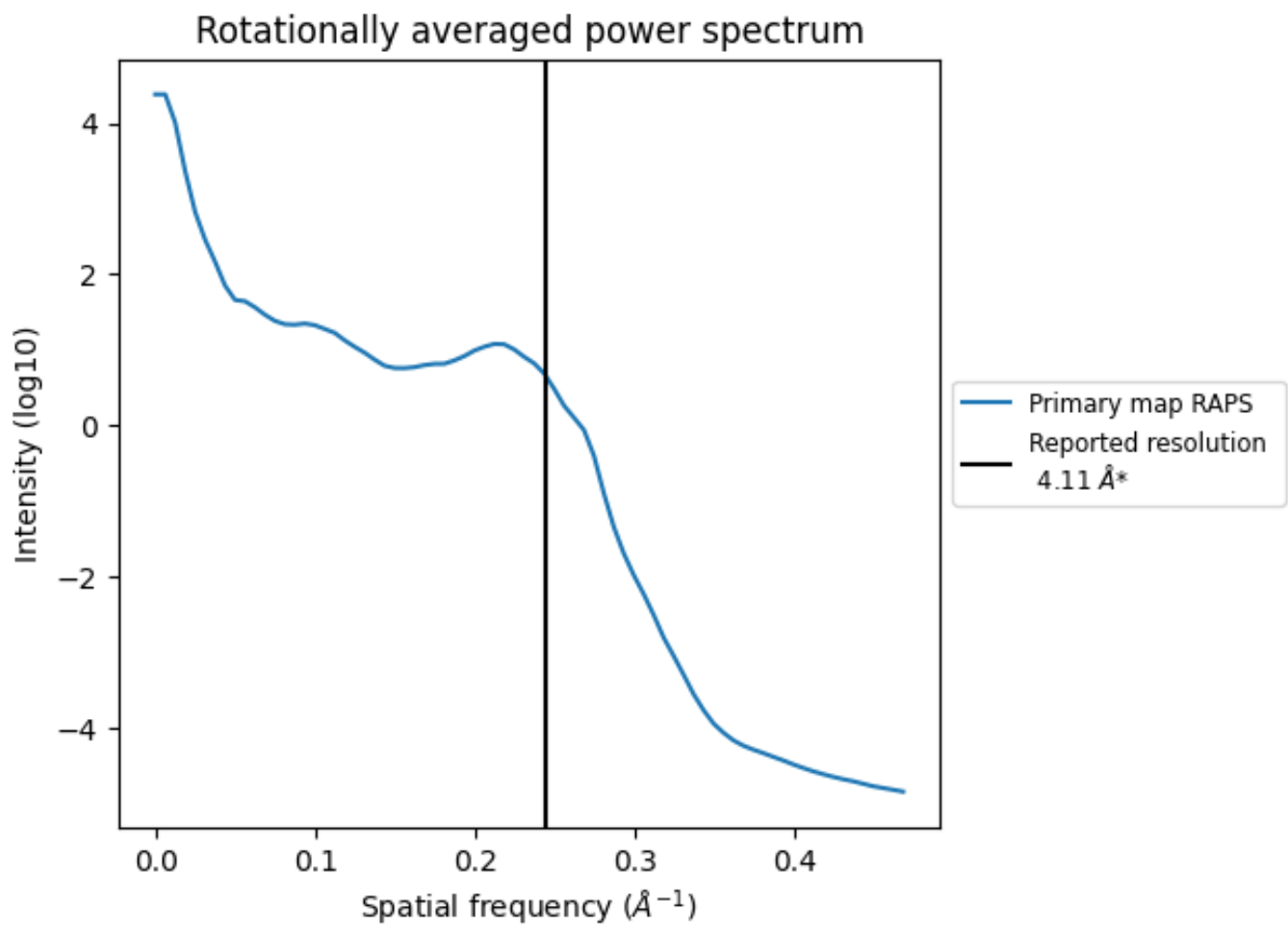
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 41  $\text{nm}^3$ ; this corresponds to an approximate mass of 37 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

### 7.3 Rotationally averaged power spectrum [i](#)



\*Reported resolution corresponds to spatial frequency of  $0.243 \text{\AA}^{-1}$

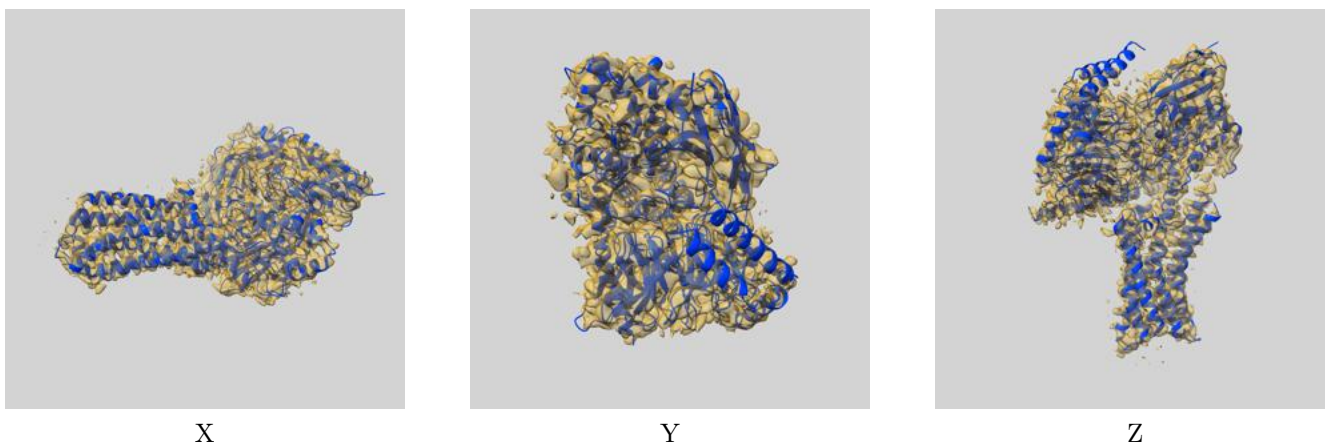
## 8 Fourier-Shell correlation

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

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

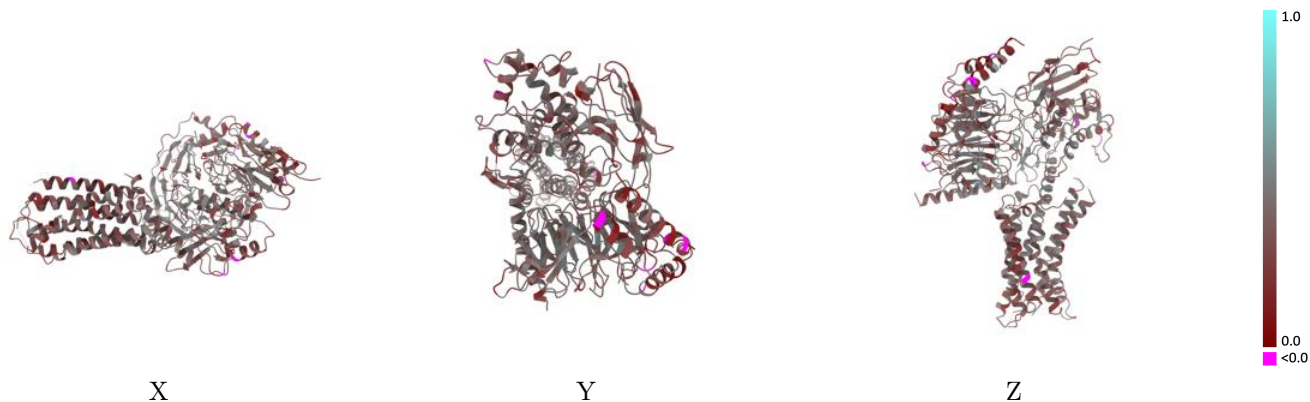
This section contains information regarding the fit between EMDB map EMD-4390 and PDB model 6GDG. Per-residue inclusion information can be found in section [3](#) on page [7](#).

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



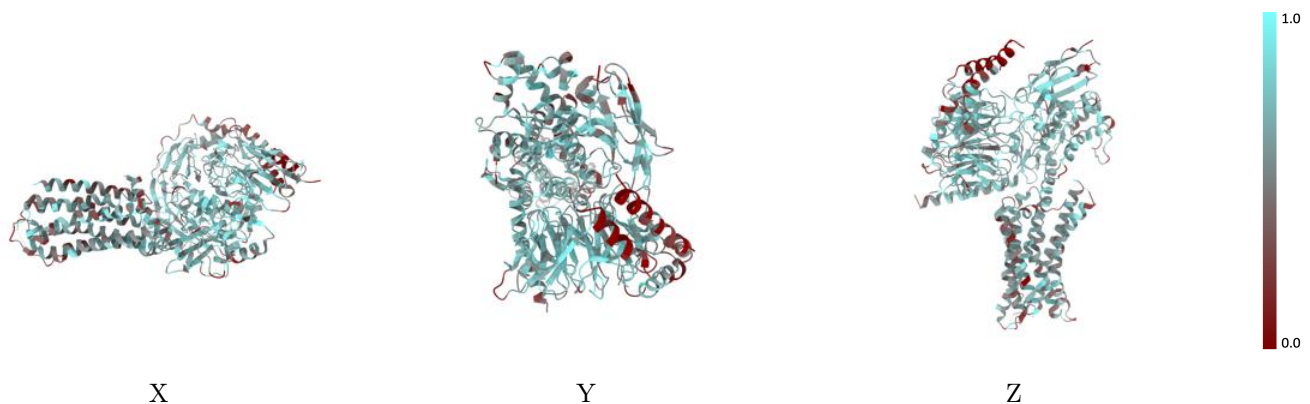
The images above show the 3D surface view of the map at the recommended contour level 0.0631 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 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.

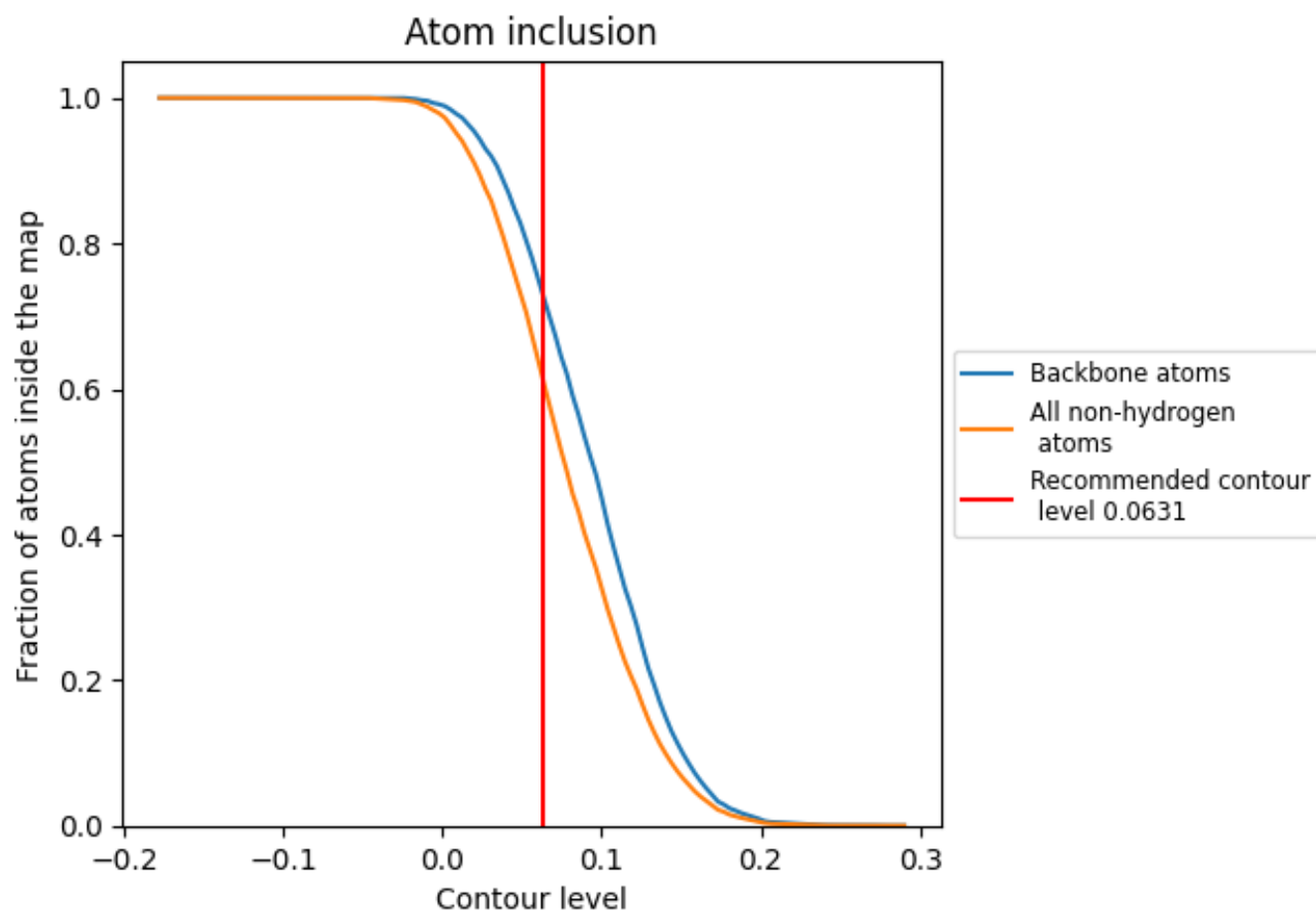
## 9.3 Atom inclusion mapped to coordinate model [i](#)



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 (0.0631).















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 73% of all backbone atoms, 61% of all non-hydrogen atoms, are inside the map.

## 9.5 Map-model fit summary [i](#)

The table lists the average atom inclusion at the recommended contour level (0.0631) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6139	 0.3640
A	 0.5617	 0.3440
B	 0.6401	 0.3830
C	 0.3946	 0.2620
D	 0.6554	 0.3790
E	 0.6422	 0.3580

