



wwPDB EM Validation Summary Report ⓘ

Mar 14, 2026 – 05:54 AM UTC

PDB ID : 8VSP / pdb_00008vsp
EMDB ID : EMD-43501
Title : Cryo-EM structure of human invariant chain in complex with HLA-DQ
Authors : Wang, N.; Caveney, N.A.; Jude, K.M.; Garcia, K.C.
Deposited on : 2024-01-24
Resolution : 3.12 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:

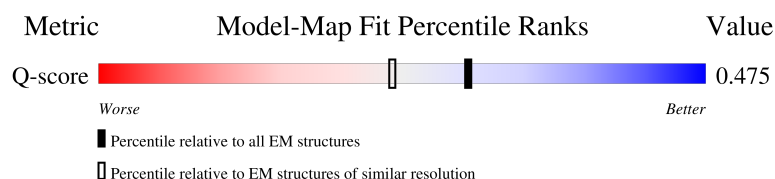
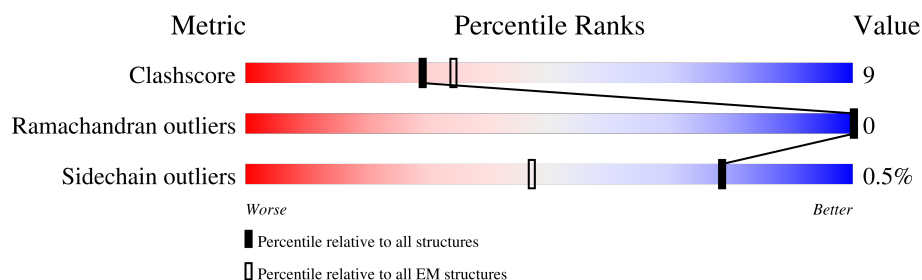
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data 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 3.12 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	14478 (2.62 - 3.62)

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	288	
1	D	288	
1	G	288	
2	B	295	

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Mol	Chain	Length	Quality of chain
2	E	295	 59%12%30%
2	H	295	 59%12%30%
3	C	308	 17%6%77%
3	F	308	 17%6%77%
3	I	308	 17%6%77%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 11388 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 HLA class II histocompatibility antigen, DQ alpha 1 chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	215	Total	C	N	O	S	0	0
			1609	1027	270	309	3		
1	D	215	Total	C	N	O	S	0	0
			1609	1027	270	309	3		
1	G	215	Total	C	N	O	S	0	0
			1609	1027	270	309	3		

There are 102 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	232	ALA	-	expression tag	UNP P01909
A	233	ALA	-	expression tag	UNP P01909
A	234	ALA	-	expression tag	UNP P01909
A	235	LEU	-	expression tag	UNP P01909
A	236	GLU	-	expression tag	UNP P01909
A	237	VAL	-	expression tag	UNP P01909
A	238	LEU	-	expression tag	UNP P01909
A	239	PHE	-	expression tag	UNP P01909
A	240	GLN	-	expression tag	UNP P01909
A	241	GLY	-	expression tag	UNP P01909
A	242	PRO	-	expression tag	UNP P01909
A	243	GLY	-	expression tag	UNP P01909
A	244	ALA	-	expression tag	UNP P01909
A	245	ALA	-	expression tag	UNP P01909
A	246	GLU	-	expression tag	UNP P01909
A	247	ASP	-	expression tag	UNP P01909
A	248	GLN	-	expression tag	UNP P01909
A	249	VAL	-	expression tag	UNP P01909
A	250	ASP	-	expression tag	UNP P01909
A	251	PRO	-	expression tag	UNP P01909
A	252	ARG	-	expression tag	UNP P01909
A	253	LEU	-	expression tag	UNP P01909
A	254	ILE	-	expression tag	UNP P01909
A	255	ASP	-	expression tag	UNP P01909

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Chain	Residue	Modelled	Actual	Comment	Reference
A	256	GLY	-	expression tag	UNP P01909
A	257	LYS	-	expression tag	UNP P01909
A	258	HIS	-	expression tag	UNP P01909
A	259	HIS	-	expression tag	UNP P01909
A	260	HIS	-	expression tag	UNP P01909
A	261	HIS	-	expression tag	UNP P01909
A	262	HIS	-	expression tag	UNP P01909
A	263	HIS	-	expression tag	UNP P01909
A	264	HIS	-	expression tag	UNP P01909
A	265	HIS	-	expression tag	UNP P01909
D	232	ALA	-	expression tag	UNP P01909
D	233	ALA	-	expression tag	UNP P01909
D	234	ALA	-	expression tag	UNP P01909
D	235	LEU	-	expression tag	UNP P01909
D	236	GLU	-	expression tag	UNP P01909
D	237	VAL	-	expression tag	UNP P01909
D	238	LEU	-	expression tag	UNP P01909
D	239	PHE	-	expression tag	UNP P01909
D	240	GLN	-	expression tag	UNP P01909
D	241	GLY	-	expression tag	UNP P01909
D	242	PRO	-	expression tag	UNP P01909
D	243	GLY	-	expression tag	UNP P01909
D	244	ALA	-	expression tag	UNP P01909
D	245	ALA	-	expression tag	UNP P01909
D	246	GLU	-	expression tag	UNP P01909
D	247	ASP	-	expression tag	UNP P01909
D	248	GLN	-	expression tag	UNP P01909
D	249	VAL	-	expression tag	UNP P01909
D	250	ASP	-	expression tag	UNP P01909
D	251	PRO	-	expression tag	UNP P01909
D	252	ARG	-	expression tag	UNP P01909
D	253	LEU	-	expression tag	UNP P01909
D	254	ILE	-	expression tag	UNP P01909
D	255	ASP	-	expression tag	UNP P01909
D	256	GLY	-	expression tag	UNP P01909
D	257	LYS	-	expression tag	UNP P01909
D	258	HIS	-	expression tag	UNP P01909
D	259	HIS	-	expression tag	UNP P01909
D	260	HIS	-	expression tag	UNP P01909
D	261	HIS	-	expression tag	UNP P01909
D	262	HIS	-	expression tag	UNP P01909
D	263	HIS	-	expression tag	UNP P01909

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Chain	Residue	Modelled	Actual	Comment	Reference
D	264	HIS	-	expression tag	UNP P01909
D	265	HIS	-	expression tag	UNP P01909
G	232	ALA	-	expression tag	UNP P01909
G	233	ALA	-	expression tag	UNP P01909
G	234	ALA	-	expression tag	UNP P01909
G	235	LEU	-	expression tag	UNP P01909
G	236	GLU	-	expression tag	UNP P01909
G	237	VAL	-	expression tag	UNP P01909
G	238	LEU	-	expression tag	UNP P01909
G	239	PHE	-	expression tag	UNP P01909
G	240	GLN	-	expression tag	UNP P01909
G	241	GLY	-	expression tag	UNP P01909
G	242	PRO	-	expression tag	UNP P01909
G	243	GLY	-	expression tag	UNP P01909
G	244	ALA	-	expression tag	UNP P01909
G	245	ALA	-	expression tag	UNP P01909
G	246	GLU	-	expression tag	UNP P01909
G	247	ASP	-	expression tag	UNP P01909
G	248	GLN	-	expression tag	UNP P01909
G	249	VAL	-	expression tag	UNP P01909
G	250	ASP	-	expression tag	UNP P01909
G	251	PRO	-	expression tag	UNP P01909
G	252	ARG	-	expression tag	UNP P01909
G	253	LEU	-	expression tag	UNP P01909
G	254	ILE	-	expression tag	UNP P01909
G	255	ASP	-	expression tag	UNP P01909
G	256	GLY	-	expression tag	UNP P01909
G	257	LYS	-	expression tag	UNP P01909
G	258	HIS	-	expression tag	UNP P01909
G	259	HIS	-	expression tag	UNP P01909
G	260	HIS	-	expression tag	UNP P01909
G	261	HIS	-	expression tag	UNP P01909
G	262	HIS	-	expression tag	UNP P01909
G	263	HIS	-	expression tag	UNP P01909
G	264	HIS	-	expression tag	UNP P01909
G	265	HIS	-	expression tag	UNP P01909

- Molecule 2 is a protein called HLA class II histocompatibility antigen, DQ beta 1 chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	207	Total	C	N	O	S	0	0
			1625	1023	286	309	7		

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Mol	Chain	Residues	Atoms					AltConf	Trace
2	E	207	Total	C	N	O	S	0	0
			1625	1023	286	309	7		
2	H	207	Total	C	N	O	S	0	0
			1625	1023	286	309	7		

There are 102 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	230	ALA	-	expression tag	UNP P01920
B	231	ALA	-	expression tag	UNP P01920
B	232	ALA	-	expression tag	UNP P01920
B	233	LEU	-	expression tag	UNP P01920
B	234	GLU	-	expression tag	UNP P01920
B	235	VAL	-	expression tag	UNP P01920
B	236	LEU	-	expression tag	UNP P01920
B	237	PHE	-	expression tag	UNP P01920
B	238	GLN	-	expression tag	UNP P01920
B	239	GLY	-	expression tag	UNP P01920
B	240	PRO	-	expression tag	UNP P01920
B	241	GLY	-	expression tag	UNP P01920
B	242	ALA	-	expression tag	UNP P01920
B	243	ALA	-	expression tag	UNP P01920
B	244	GLU	-	expression tag	UNP P01920
B	245	ASP	-	expression tag	UNP P01920
B	246	GLN	-	expression tag	UNP P01920
B	247	VAL	-	expression tag	UNP P01920
B	248	ASP	-	expression tag	UNP P01920
B	249	PRO	-	expression tag	UNP P01920
B	250	ARG	-	expression tag	UNP P01920
B	251	LEU	-	expression tag	UNP P01920
B	252	ILE	-	expression tag	UNP P01920
B	253	ASP	-	expression tag	UNP P01920
B	254	GLY	-	expression tag	UNP P01920
B	255	LYS	-	expression tag	UNP P01920
B	256	HIS	-	expression tag	UNP P01920
B	257	HIS	-	expression tag	UNP P01920
B	258	HIS	-	expression tag	UNP P01920
B	259	HIS	-	expression tag	UNP P01920
B	260	HIS	-	expression tag	UNP P01920
B	261	HIS	-	expression tag	UNP P01920
B	262	HIS	-	expression tag	UNP P01920
B	263	HIS	-	expression tag	UNP P01920

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Chain	Residue	Modelled	Actual	Comment	Reference
E	230	ALA	-	expression tag	UNP P01920
E	231	ALA	-	expression tag	UNP P01920
E	232	ALA	-	expression tag	UNP P01920
E	233	LEU	-	expression tag	UNP P01920
E	234	GLU	-	expression tag	UNP P01920
E	235	VAL	-	expression tag	UNP P01920
E	236	LEU	-	expression tag	UNP P01920
E	237	PHE	-	expression tag	UNP P01920
E	238	GLN	-	expression tag	UNP P01920
E	239	GLY	-	expression tag	UNP P01920
E	240	PRO	-	expression tag	UNP P01920
E	241	GLY	-	expression tag	UNP P01920
E	242	ALA	-	expression tag	UNP P01920
E	243	ALA	-	expression tag	UNP P01920
E	244	GLU	-	expression tag	UNP P01920
E	245	ASP	-	expression tag	UNP P01920
E	246	GLN	-	expression tag	UNP P01920
E	247	VAL	-	expression tag	UNP P01920
E	248	ASP	-	expression tag	UNP P01920
E	249	PRO	-	expression tag	UNP P01920
E	250	ARG	-	expression tag	UNP P01920
E	251	LEU	-	expression tag	UNP P01920
E	252	ILE	-	expression tag	UNP P01920
E	253	ASP	-	expression tag	UNP P01920
E	254	GLY	-	expression tag	UNP P01920
E	255	LYS	-	expression tag	UNP P01920
E	256	HIS	-	expression tag	UNP P01920
E	257	HIS	-	expression tag	UNP P01920
E	258	HIS	-	expression tag	UNP P01920
E	259	HIS	-	expression tag	UNP P01920
E	260	HIS	-	expression tag	UNP P01920
E	261	HIS	-	expression tag	UNP P01920
E	262	HIS	-	expression tag	UNP P01920
E	263	HIS	-	expression tag	UNP P01920
H	230	ALA	-	expression tag	UNP P01920
H	231	ALA	-	expression tag	UNP P01920
H	232	ALA	-	expression tag	UNP P01920
H	233	LEU	-	expression tag	UNP P01920
H	234	GLU	-	expression tag	UNP P01920
H	235	VAL	-	expression tag	UNP P01920
H	236	LEU	-	expression tag	UNP P01920
H	237	PHE	-	expression tag	UNP P01920

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Chain	Residue	Modelled	Actual	Comment	Reference
H	238	GLN	-	expression tag	UNP P01920
H	239	GLY	-	expression tag	UNP P01920
H	240	PRO	-	expression tag	UNP P01920
H	241	GLY	-	expression tag	UNP P01920
H	242	ALA	-	expression tag	UNP P01920
H	243	ALA	-	expression tag	UNP P01920
H	244	GLU	-	expression tag	UNP P01920
H	245	ASP	-	expression tag	UNP P01920
H	246	GLN	-	expression tag	UNP P01920
H	247	VAL	-	expression tag	UNP P01920
H	248	ASP	-	expression tag	UNP P01920
H	249	PRO	-	expression tag	UNP P01920
H	250	ARG	-	expression tag	UNP P01920
H	251	LEU	-	expression tag	UNP P01920
H	252	ILE	-	expression tag	UNP P01920
H	253	ASP	-	expression tag	UNP P01920
H	254	GLY	-	expression tag	UNP P01920
H	255	LYS	-	expression tag	UNP P01920
H	256	HIS	-	expression tag	UNP P01920
H	257	HIS	-	expression tag	UNP P01920
H	258	HIS	-	expression tag	UNP P01920
H	259	HIS	-	expression tag	UNP P01920
H	260	HIS	-	expression tag	UNP P01920
H	261	HIS	-	expression tag	UNP P01920
H	262	HIS	-	expression tag	UNP P01920
H	263	HIS	-	expression tag	UNP P01920

- Molecule 3 is a protein called HLA class II histocompatibility antigen gamma chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	70	Total	C	N	O	S	0	0
			548	355	93	96	4		
3	F	70	Total	C	N	O	S	0	0
			548	355	93	96	4		
3	I	70	Total	C	N	O	S	0	0
			548	355	93	96	4		

There are 39 discrepancies between the modelled and reference sequences:

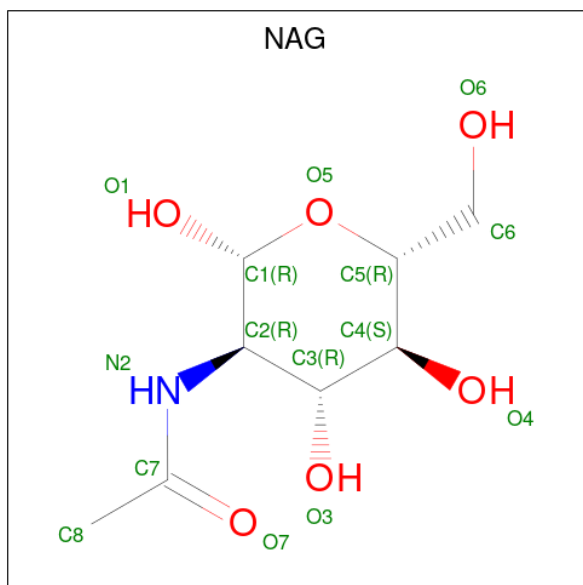
Chain	Residue	Modelled	Actual	Comment	Reference
C	-11	MET	-	initiating methionine	UNP P04233
C	-10	ASP	-	expression tag	UNP P04233

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-9	TYR	-	expression tag	UNP P04233
C	-8	LYS	-	expression tag	UNP P04233
C	-7	ASP	-	expression tag	UNP P04233
C	-6	ASP	-	expression tag	UNP P04233
C	-5	ASP	-	expression tag	UNP P04233
C	-4	ASP	-	expression tag	UNP P04233
C	-3	ALA	-	expression tag	UNP P04233
C	-2	GLY	-	expression tag	UNP P04233
C	-1	THR	-	expression tag	UNP P04233
C	0	SER	-	expression tag	UNP P04233
C	1	ARG	-	expression tag	UNP P04233
F	-11	MET	-	initiating methionine	UNP P04233
F	-10	ASP	-	expression tag	UNP P04233
F	-9	TYR	-	expression tag	UNP P04233
F	-8	LYS	-	expression tag	UNP P04233
F	-7	ASP	-	expression tag	UNP P04233
F	-6	ASP	-	expression tag	UNP P04233
F	-5	ASP	-	expression tag	UNP P04233
F	-4	ASP	-	expression tag	UNP P04233
F	-3	ALA	-	expression tag	UNP P04233
F	-2	GLY	-	expression tag	UNP P04233
F	-1	THR	-	expression tag	UNP P04233
F	0	SER	-	expression tag	UNP P04233
F	1	ARG	-	expression tag	UNP P04233
I	-11	MET	-	initiating methionine	UNP P04233
I	-10	ASP	-	expression tag	UNP P04233
I	-9	TYR	-	expression tag	UNP P04233
I	-8	LYS	-	expression tag	UNP P04233
I	-7	ASP	-	expression tag	UNP P04233
I	-6	ASP	-	expression tag	UNP P04233
I	-5	ASP	-	expression tag	UNP P04233
I	-4	ASP	-	expression tag	UNP P04233
I	-3	ALA	-	expression tag	UNP P04233
I	-2	GLY	-	expression tag	UNP P04233
I	-1	THR	-	expression tag	UNP P04233
I	0	SER	-	expression tag	UNP P04233
I	1	ARG	-	expression tag	UNP P04233

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆) (labeled as "Ligand of Interest" by depositor).

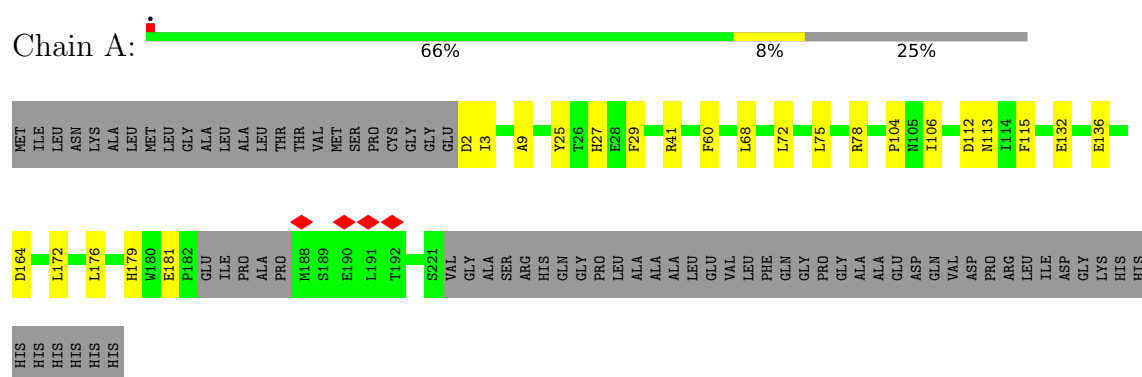


Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
4	A	1	14	8	1	5	0
4	D	1	14	8	1	5	0
4	G	1	14	8	1	5	0

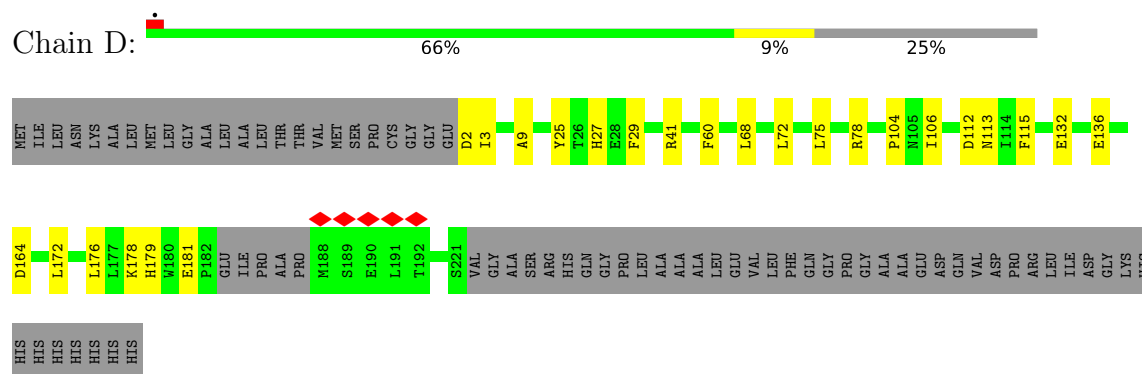
3 Residue-property plots [i](#)

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

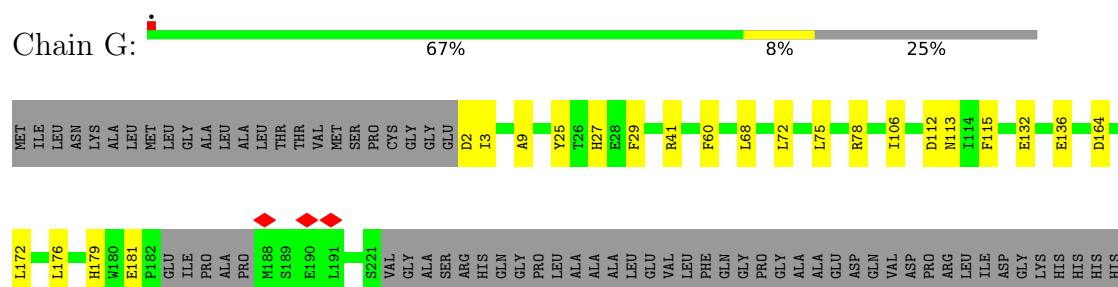
- Molecule 1: HLA class II histocompatibility antigen, DQ alpha 1 chain



- Molecule 1: HLA class II histocompatibility antigen, DQ alpha 1 chain

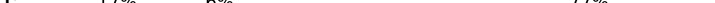


- Molecule 1: HLA class II histocompatibility antigen, DQ alpha 1 chain



[illegible]

- Molecule 3: HLA class II histocompatibility antigen gamma chain

Chain F:  17% 6% 77%

GLY	HIS	HIS	VAL	PRO	GLN	L49	MET
HIS	VAL	ASP	ASP	ASP	ASN	Y50	ASP
ASN	ASN	LEU	LEU	LEU	ALA	T51	LYS
SER	THR	THR	THR	THR	PRO	F53	ASP
GLU	CYS	CYS	CYS	CYS	LEU	L60	ASP
GLU	GLN	GLN	GLN	GLN	VAL	L61	ASP
LEU	GLU	GLU	GLU	GLU	TYR	A62	ALA
LEU	GLU	GLU	GLU	GLU	PRO	G63	THR
GLU	VAL	VAL	VAL	VAL	PRO	Q64	SER
GLU	SER	SER	SER	SER	LEU	L71	ARG
ASP	HIS	HIS	HIS	HIS	LYS	L78	HIS
PRO	ILE	ILE	ILE	ILE	GLY	L91	ARG
SER	SER	SER	SER	SER	PHE	L92	ARG
GLY	ALA	ALA	ALA	ALA	PRO	E91	ARG
LEU	HIS	HIS	HIS	HIS	GLU	N92	SER
GLY	PRO	PRO	PRO	PRO	ASN	L93	ARG
VAL	GLY	GLY	GLY	GLY	LEU	R94	SER
THR	THR	THR	THR	THR	ARG	L100	CYS
GLN	PHE	PHE	PHE	PHE	HIS	P101	ARG
ASN	ARG	ARG	ARG	ARG	LEU	V104	GLU
PRO	PRO	PRO	PRO	PRO	LYS	M109	ASP
ASP	ASP	ASP	ASP	ASP	ASN	M115	GLN
VAL	VAL	VAL	VAL	VAL	THR	Q116	LYS
PRO	GLY	GLY	GLY	GLY	ILE	ALA	VAL
MET	ASN	ASN	ASN	ASN	ASP	LEU	ASP
	TYR	TYR	TYR	TYR	TRP	LEU	GLN
	LEU	LEU	LEU	LEU	LYS	PRO	ARG
	PRO	PRO	PRO	PRO	VAL	MET	ASP
	LEU	LEU	LEU	LEU	PHE	GLY	LEU
	GLN	GLN	GLN	GLN	GLU	ALA	ILE
	CYS	CYS	CYS	CYS	SER	LEU	SER
	TYR	TYR	TYR	TYR	TRP	PRO	ASN
	GLY	GLY	GLY	GLY	MET	GLN	ASN
	ILE	ILE	ILE	ILE	HIS	GLY	GLU
	GLY	GLY	GLY	GLY	TRP	MET	GLN
	TYR	TYR	TYR	TYR	LEU	ASN	LEU
	CYS	CYS	CYS	CYS	PHE	ALA	PRO
	CYS	CYS	CYS	CYS	GLU	THR	LEU
	VAL	VAL	VAL	VAL	MET	LYS	ARG
	PHE	PHE	PHE	PHE	SER	TYR	ARG
	PRO	PRO	PRO	PRO	ARG	GLY	PRO
	ASN	ASN	ASN	ASN	HIS	MET	GLY
	THR	THR	THR	THR	LEU	THR	ALA
	VAL	VAL	VAL	VAL	GLN	ASP	PRO
	PRO	PRO	PRO	PRO	LYS	HIS	GLU
	THR	THR	THR	THR	ARG	LEU	SER
	ARG	ARG	ARG	ARG	ALA	VAL	LYS
	SER	SER	SER	SER	PRO	ASP	CYS
	ARG	ARG	ARG	ARG	THR	MET	ARG
	ASP	ASP	ASP	ASP	ILE	G47	ARG
	LEU	LEU	LEU	LEU	LEU	L49	LEU
	PRO	PRO	PRO	PRO	PRO	Y50	PRO
	ASN	ASN	ASN	ASN	ASN	T51	ASN
	LEU	LEU	LEU	LEU	LEU	F53	LEU
	GLU	GLU	GLU	GLU	GLU	L60	GLU
	VAL	VAL	VAL	VAL	VAL	A62	VAL
	THR	THR	THR	THR	THR	G63	THR
	SER	SER	SER	SER	SER	Q64	SER
	ASP	ASP	ASP	ASP	ASP	L71	ASP
	PRO	PRO	PRO	PRO	PRO	L78	PRO
	SER	SER	SER	SER	SER	E91	SER
	GLY	GLY	GLY	GLY	GLY	N92	GLY
	LEU	LEU	LEU	LEU	LEU	L93	LEU
	GLY	GLY	GLY	GLY	GLY	R94	GLY
	THR	THR	THR	THR	THR	L100	THR
	GLN	GLN	GLN	GLN	GLN	P101	GLN
	ASP	ASP	ASP	ASP	ASP	V104	ASP
	LEU	LEU	LEU	LEU	LEU	M109	LEU
	GLY	GLY	GLY	GLY	GLY	M115	GLY
	VAL	VAL	VAL	VAL	VAL	Q116	VAL
	PRO	PRO	PRO	PRO	PRO	ALA	PRO
	MET	MET	MET	MET	MET	LEU	MET

- Molecule 3: HLA class II histocompatibility antigen gamma chain

Chain I: 17% 6% 77%

[illegible]

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	421582	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.626	Depositor
Minimum map value	-0.041	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.021	Depositor
Recommended contour level	0.00402	Depositor
Map size ($\text{\AA}$)	302.04, 302.04, 302.04	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.2585, 1.2585, 1.2585	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: NAG

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	0.17	0/1650	0.27	0/2255
1	D	0.17	0/1650	0.27	0/2255
1	G	0.17	0/1650	0.27	0/2255
2	B	0.24	0/1663	0.36	0/2269
2	E	0.24	0/1663	0.36	0/2269
2	H	0.24	0/1663	0.36	0/2269
3	C	0.19	0/557	0.33	0/753
3	F	0.19	0/557	0.33	0/753
3	I	0.20	0/557	0.33	0/753
All	All	0.21	0/11610	0.32	0/15831

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	1609	0	1468	27	0
1	D	1609	0	1468	29	0
1	G	1609	0	1468	27	0
2	B	1625	0	1481	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	1625	0	1481	23	0
2	H	1625	0	1481	23	0
3	C	548	0	590	61	0
3	F	548	0	590	56	0
3	I	548	0	590	56	0
4	A	14	0	13	0	0
4	D	14	0	13	0	0
4	G	14	0	13	0	0
All	All	11388	0	10656	204	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 9.

The worst 5 of 204 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)
3:F:50:TYR:CE1	3:I:50:TYR:HE1	1.43	1.36
3:C:50:TYR:CE1	3:F:50:TYR:HE1	1.44	1.35
3:C:50:TYR:HE1	3:I:50:TYR:CE1	1.46	1.32
3:F:50:TYR:CE1	3:I:50:TYR:CE1	2.20	1.29
3:C:50:TYR:CE1	3:F:50:TYR:CE1	2.20	1.28

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	211/288 (73%)	204 (97%)	7 (3%)	0	100	100
1	D	211/288 (73%)	204 (97%)	7 (3%)	0	100	100
1	G	211/288 (73%)	204 (97%)	7 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	201/295 (68%)	192 (96%)	9 (4%)	0	100	100
2	E	201/295 (68%)	192 (96%)	9 (4%)	0	100	100
2	H	201/295 (68%)	192 (96%)	9 (4%)	0	100	100
3	C	68/308 (22%)	68 (100%)	0	0	100	100
3	F	68/308 (22%)	68 (100%)	0	0	100	100
3	I	68/308 (22%)	68 (100%)	0	0	100	100
All	All	1440/2673 (54%)	1392 (97%)	48 (3%)	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	165/248 (66%)	165 (100%)	0	100	100
1	D	165/248 (66%)	165 (100%)	0	100	100
1	G	165/248 (66%)	165 (100%)	0	100	100
2	B	166/258 (64%)	166 (100%)	0	100	100
2	E	166/258 (64%)	166 (100%)	0	100	100
2	H	166/258 (64%)	166 (100%)	0	100	100
3	C	61/275 (22%)	59 (97%)	2 (3%)	33	61
3	F	61/275 (22%)	59 (97%)	2 (3%)	33	61
3	I	61/275 (22%)	59 (97%)	2 (3%)	33	61
All	All	1176/2343 (50%)	1170 (100%)	6 (0%)	78	83

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	F	91	GLU
3	I	53	PHE

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Mol	Chain	Res	Type
3	I	91	GLU
3	C	91	GLU
3	C	53	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
3	F	75	GLN
3	F	92	ASN
3	I	92	ASN
3	I	64	GLN
3	I	75	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 ligands are 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	$\# Z > 2$
4	NAG	G	301	-	14,14,15	0.22	0	17,19,21	0.42	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAG	D	301	-	14,14,15	0.22	0	17,19,21	0.42	0
4	NAG	A	301	-	14,14,15	0.22	0	17,19,21	0.42	0

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
4	NAG	G	301	-	-	2/6/23/26	0/1/1/1
4	NAG	D	301	-	-	2/6/23/26	0/1/1/1
4	NAG	A	301	-	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

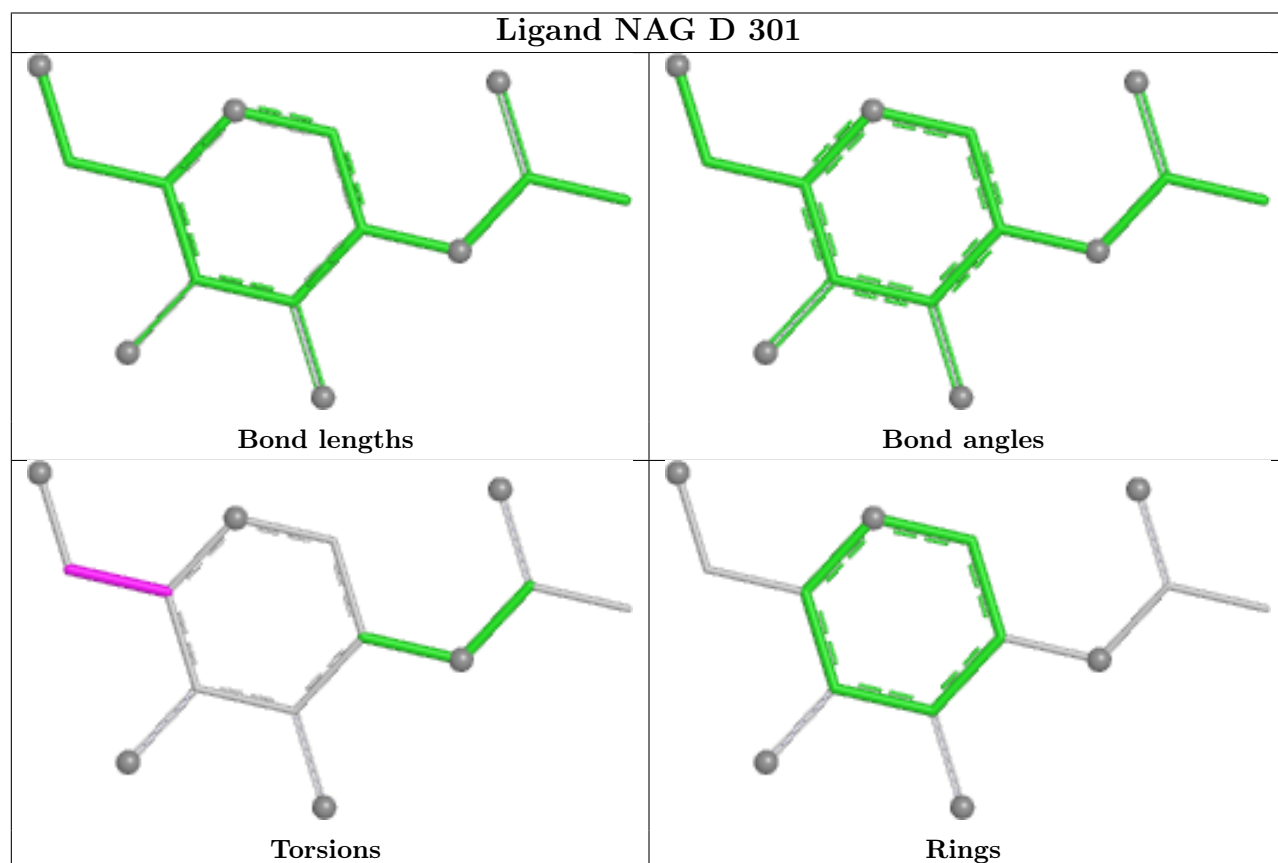
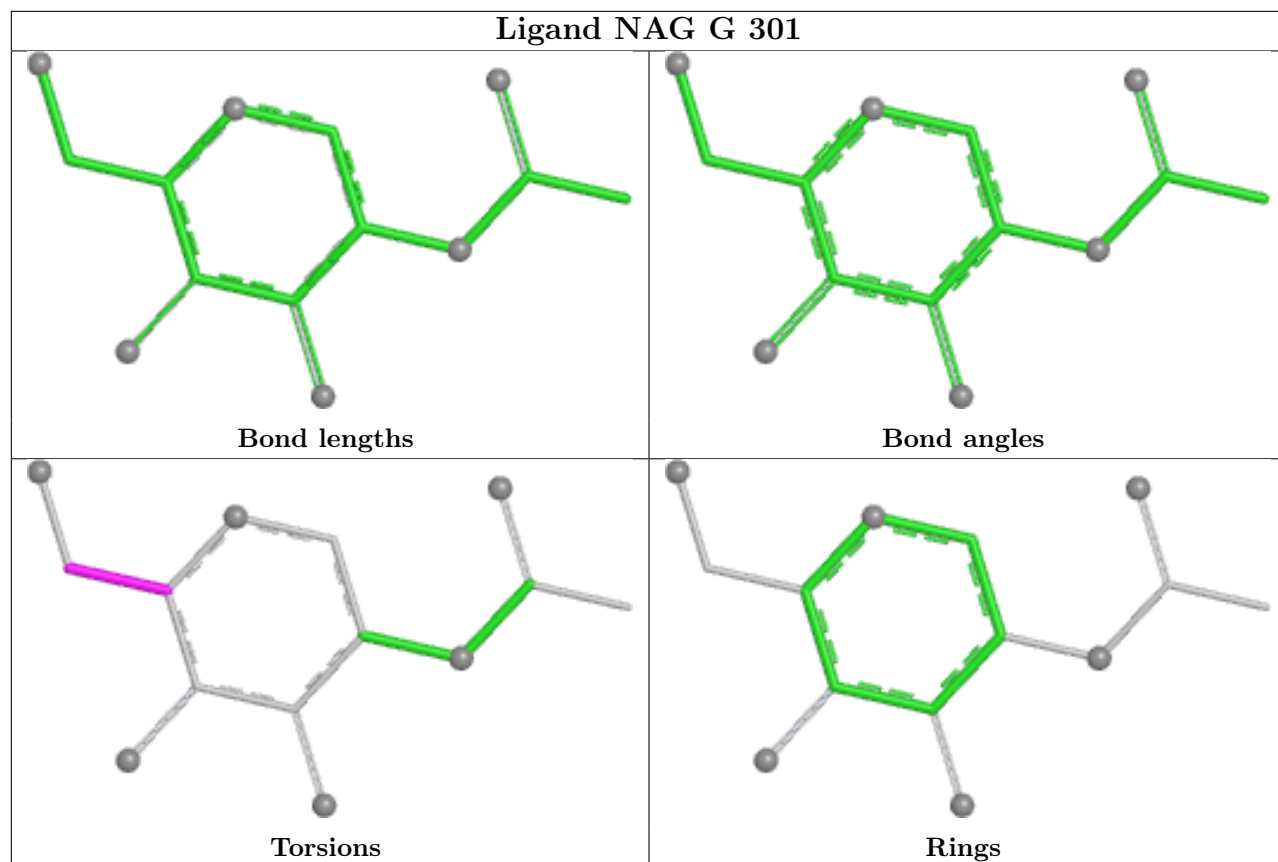
5 of 6 torsion outliers are listed below:

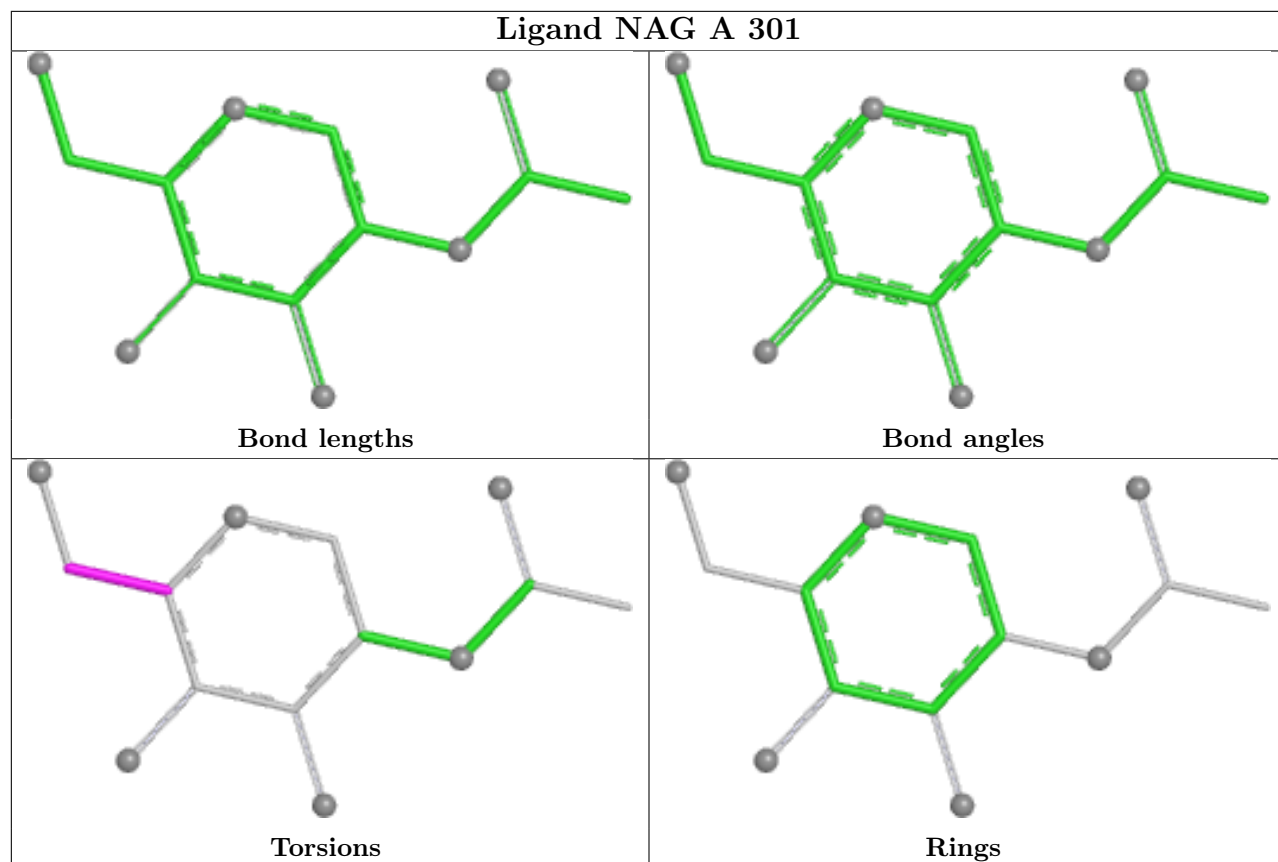
Mol	Chain	Res	Type	Atoms
4	A	301	NAG	O5-C5-C6-O6
4	D	301	NAG	O5-C5-C6-O6
4	G	301	NAG	O5-C5-C6-O6
4	A	301	NAG	C4-C5-C6-O6
4	G	301	NAG	C4-C5-C6-O6

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.

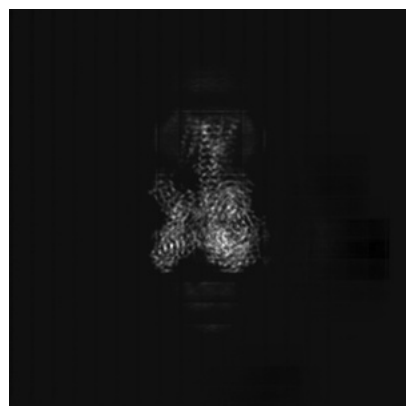
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-43501. These allow visual inspection of the internal detail of the map and identification of artifacts.

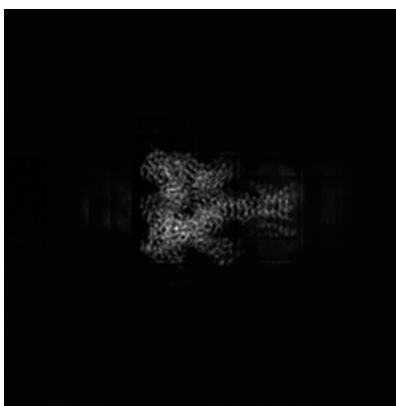
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

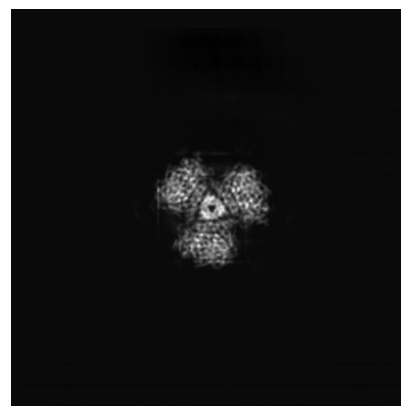
6.1.1 Primary map



X

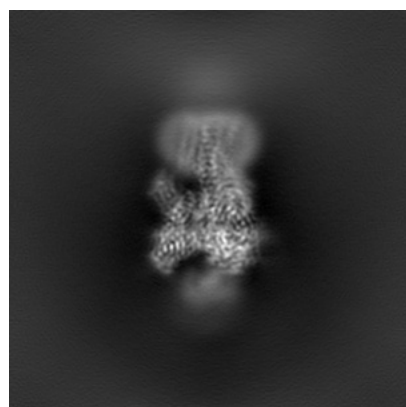


Y

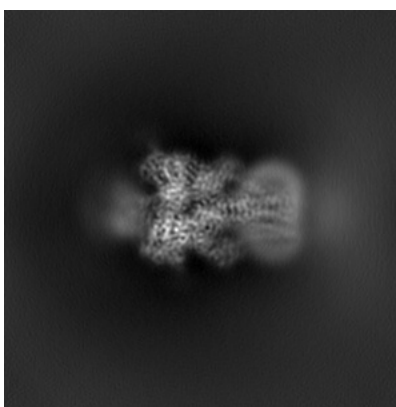


Z

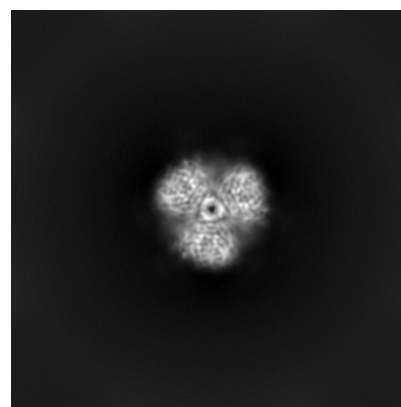
6.1.2 Raw map



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: 120

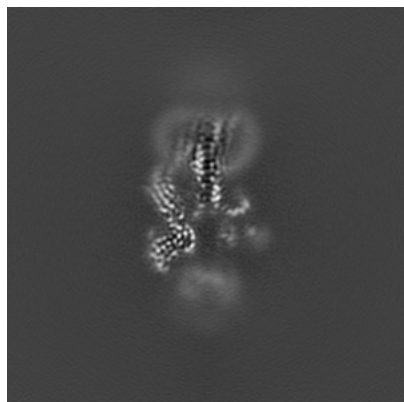


Y Index: 120

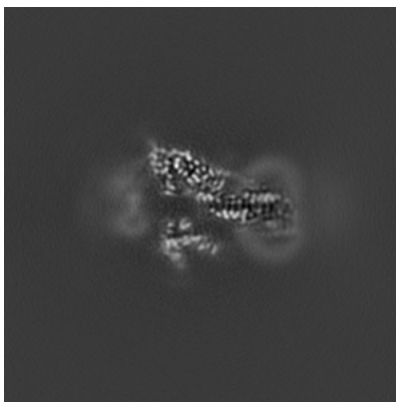


Z Index: 120

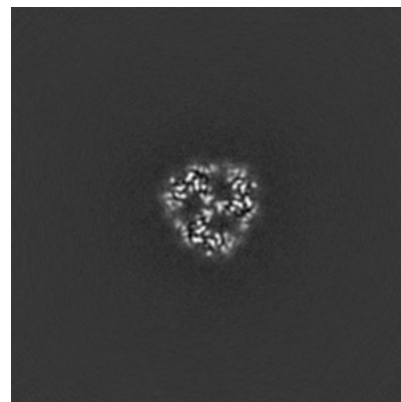
6.2.2 Raw map



X Index: 120



Y Index: 120



Z Index: 120

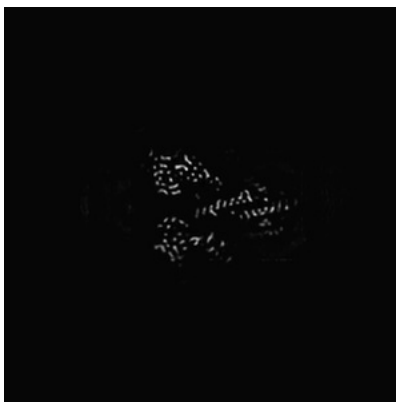
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

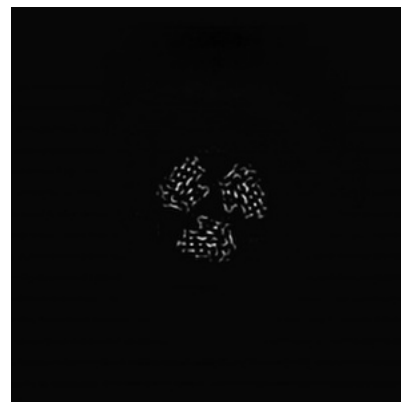
6.3.1 Primary map



X Index: 116

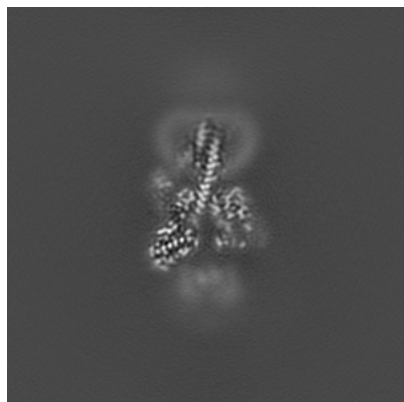


Y Index: 124

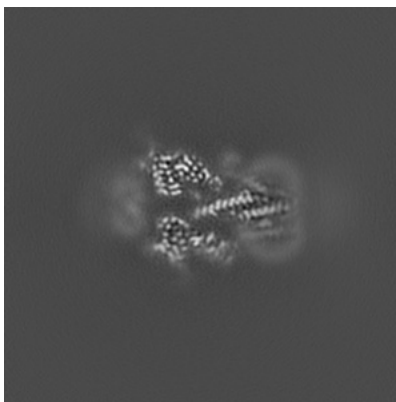


Z Index: 98

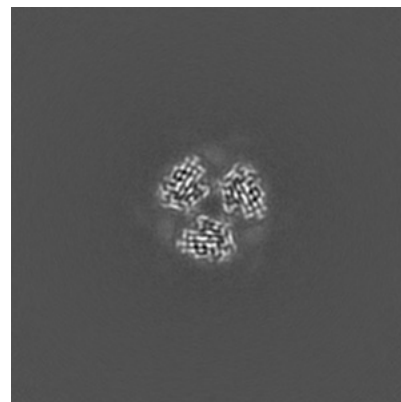
6.3.2 Raw map



X Index: 116



Y Index: 124

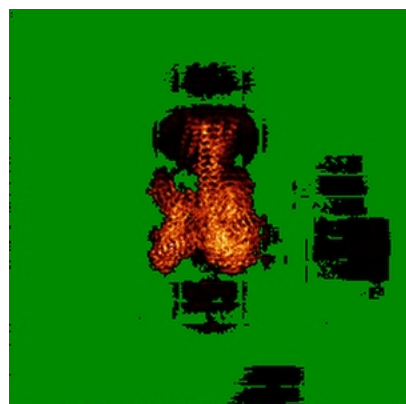


Z Index: 98

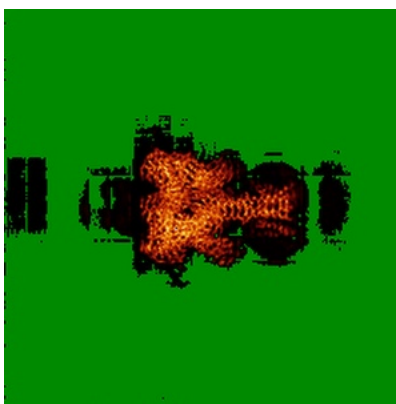
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) ⓘ

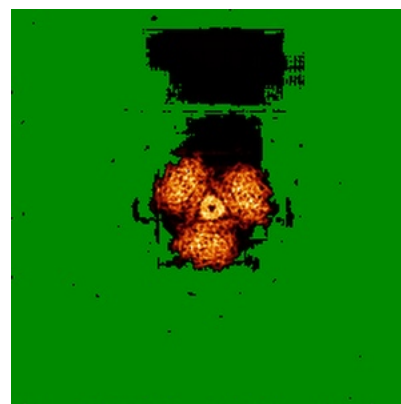
6.4.1 Primary map



X

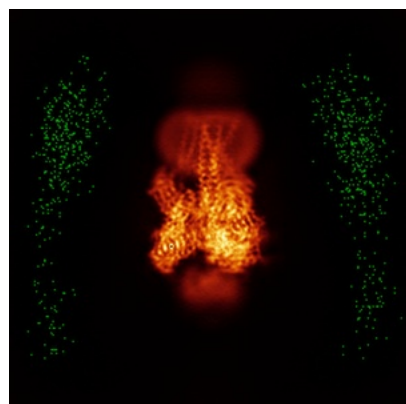


Y

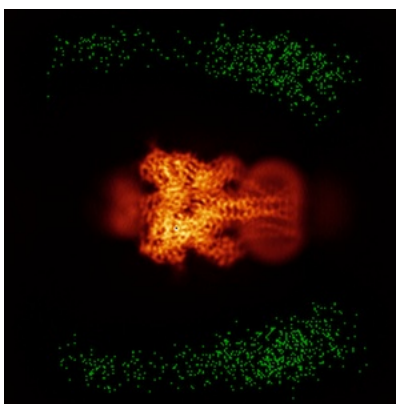


Z

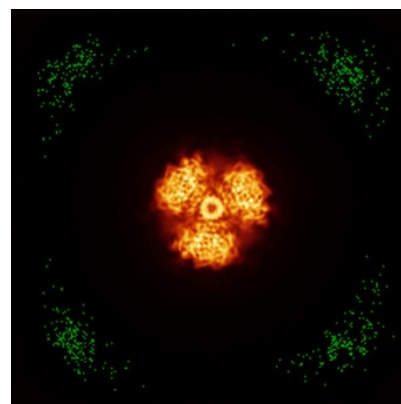
6.4.2 Raw map



X



Y

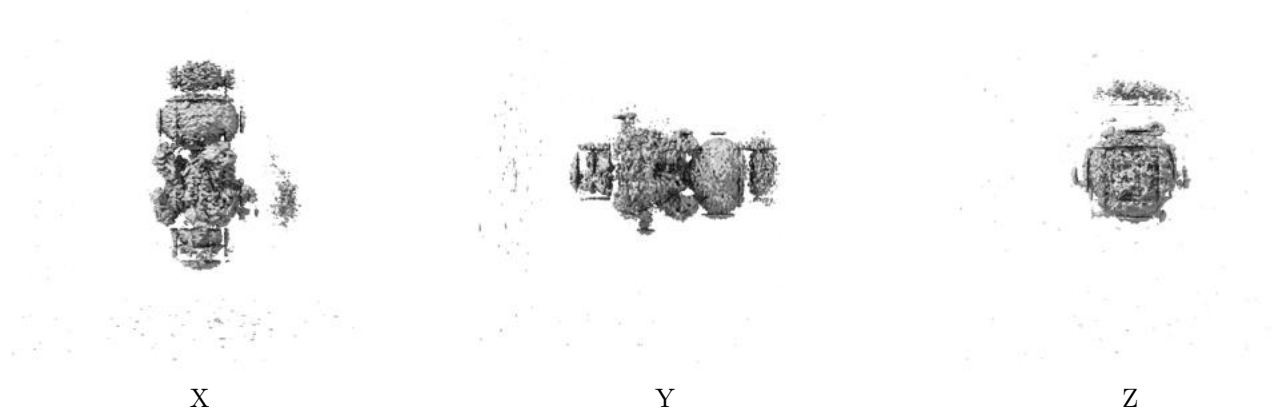


Z

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.

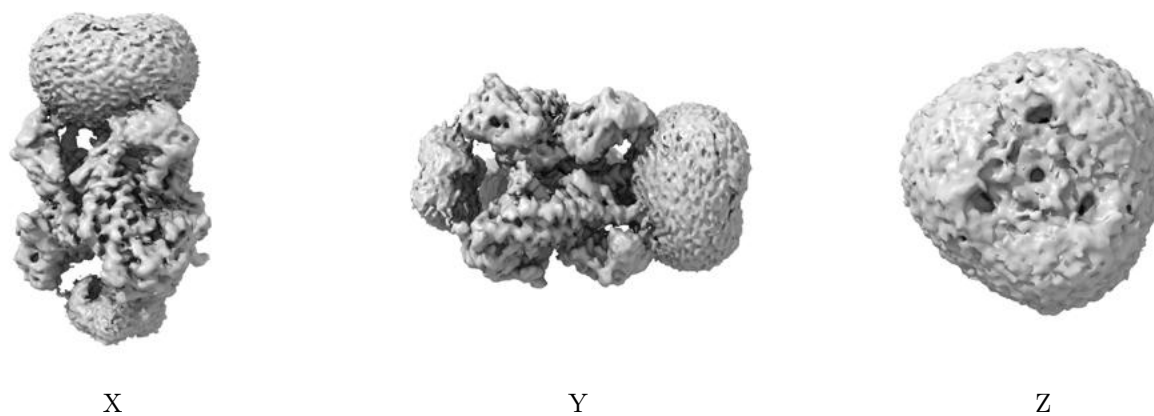
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.00402. 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.

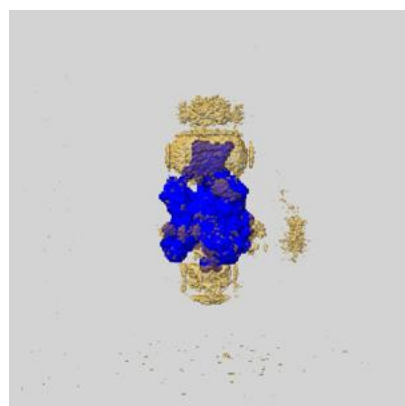
6.6 Mask visualisation [i](#)

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

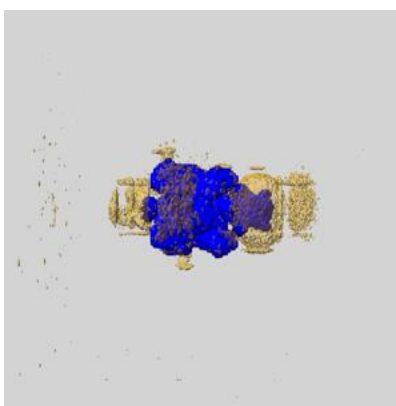
A mask typically either:

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

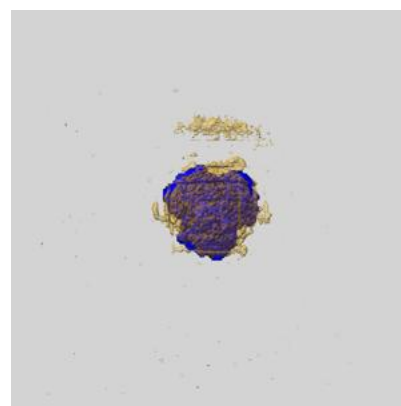
6.6.1 emd_43501_msk_1.map [i](#)



X



Y

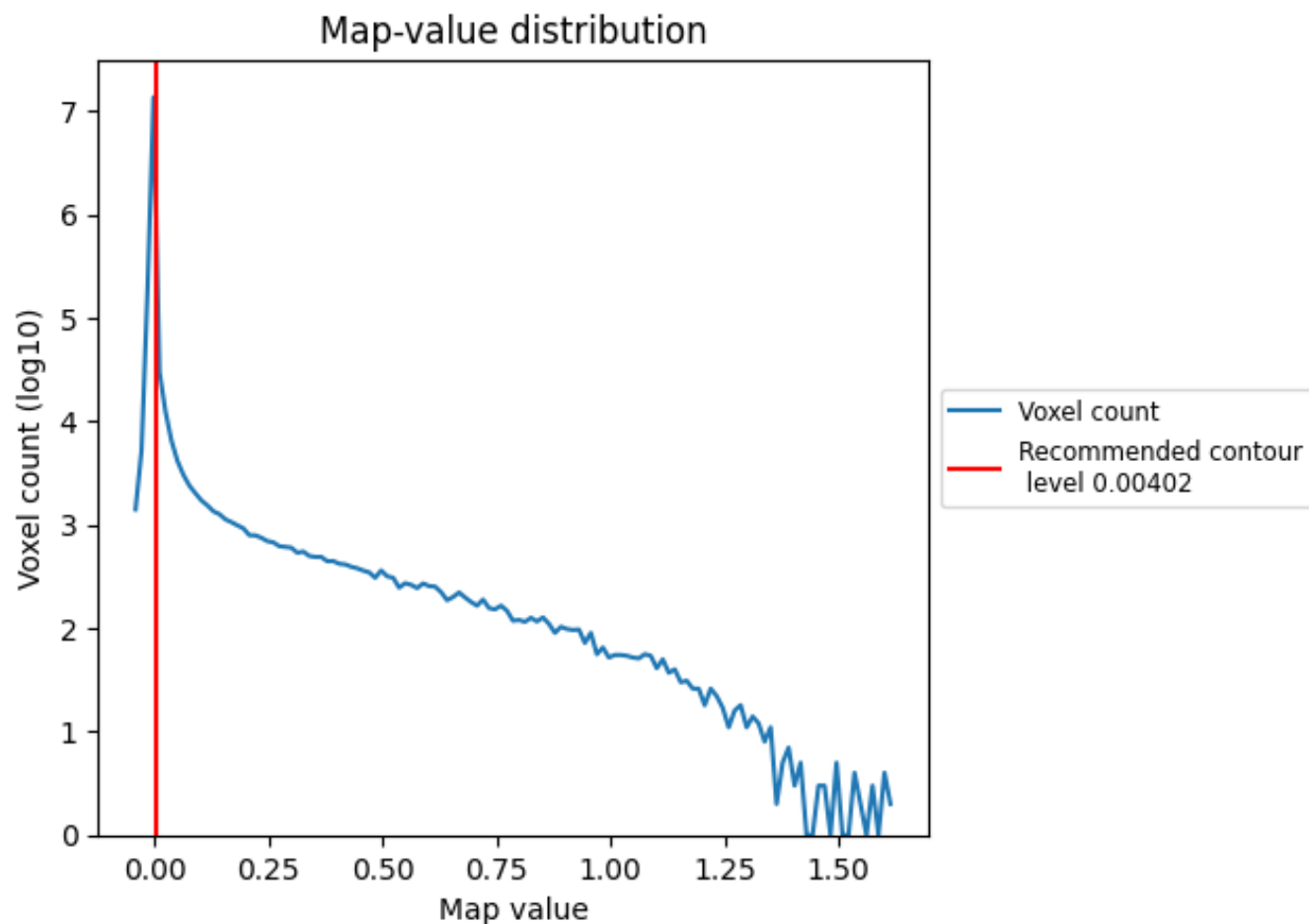


Z

7 Map analysis [i](#)

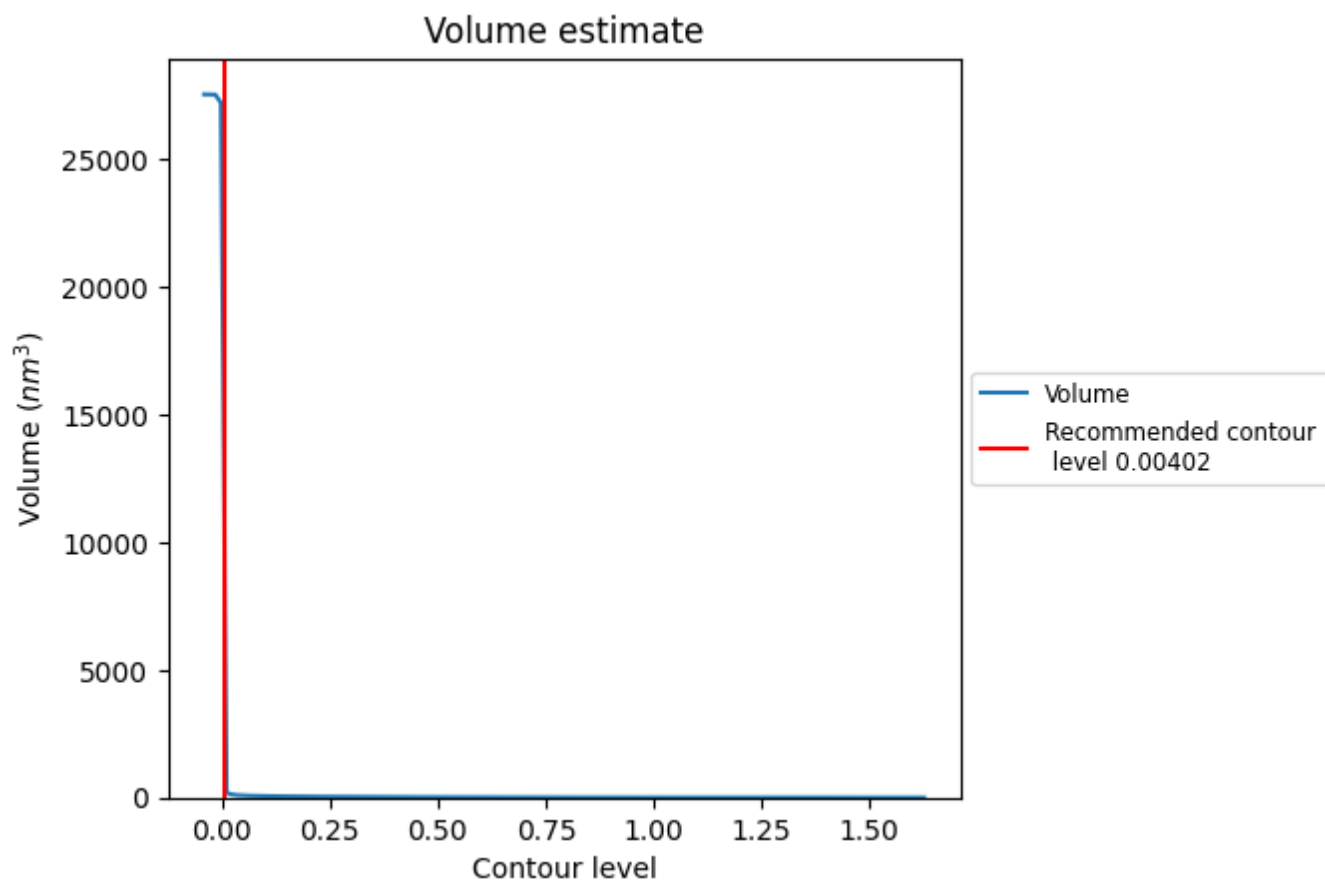
This section contains the results of statistical analysis of the map.

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.

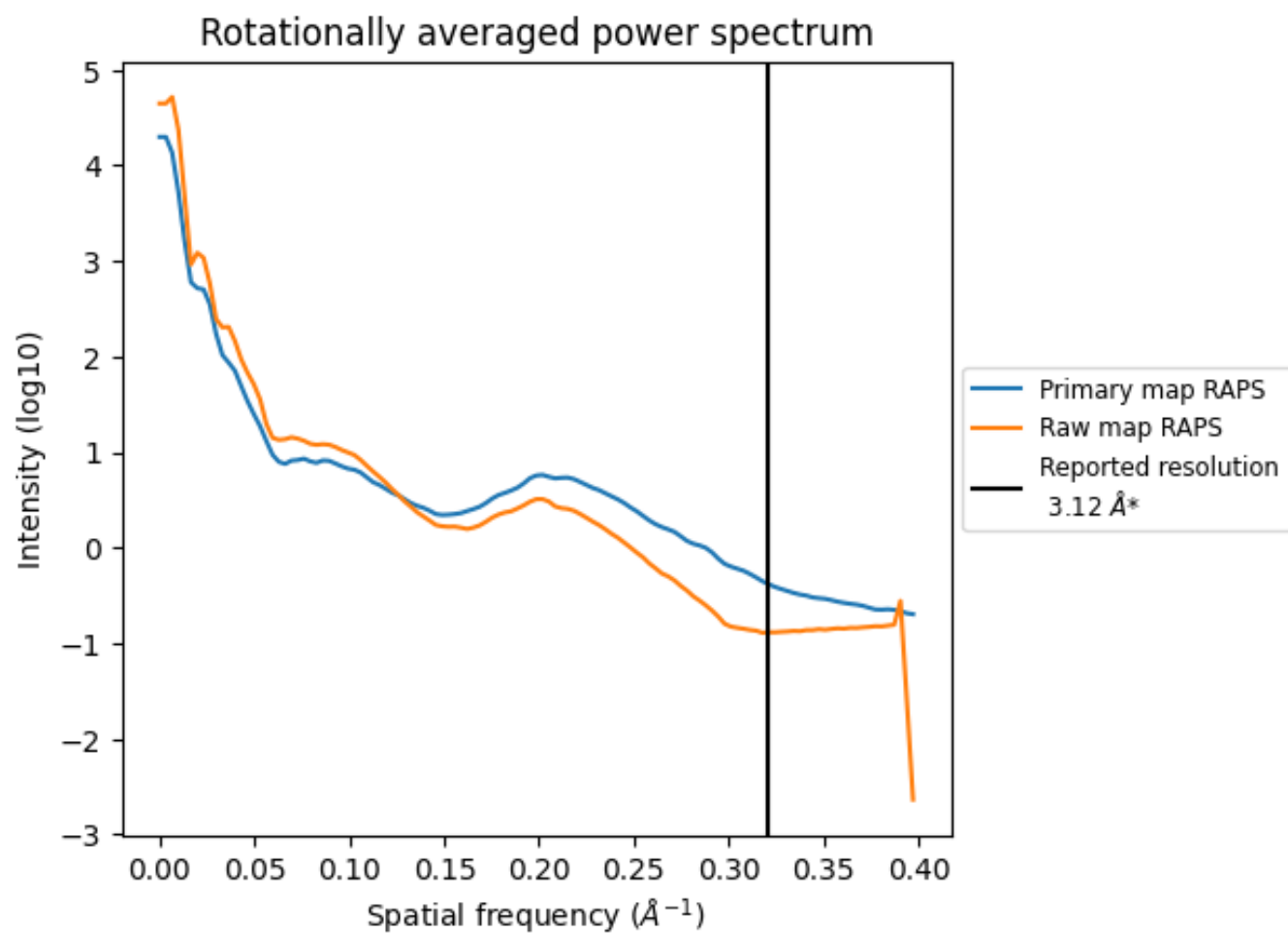
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 14020 nm^3 ; this corresponds to an approximate mass of 12665 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 ⓘ

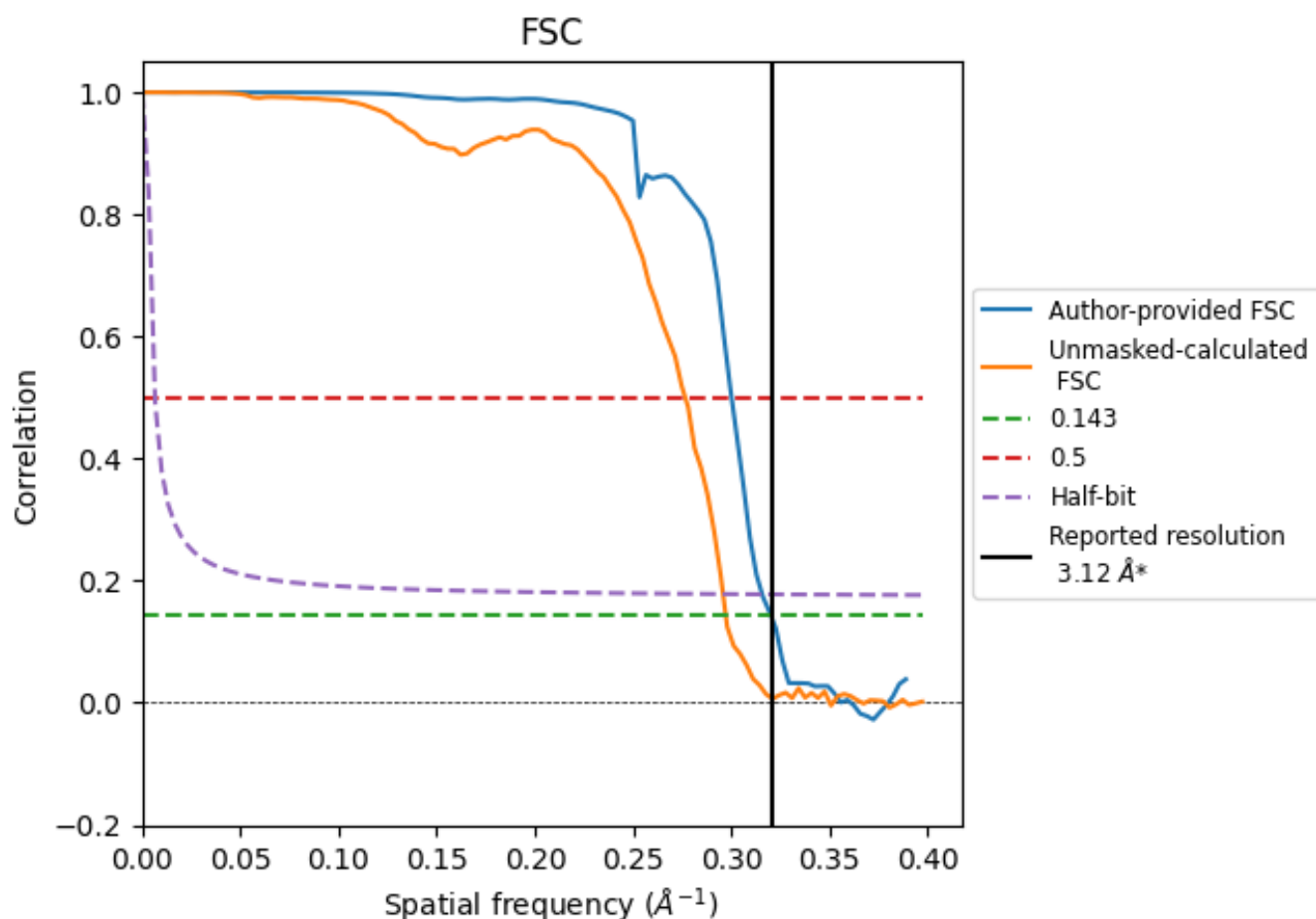


*Reported resolution corresponds to spatial frequency of 0.321 Å⁻¹

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 $0.321 \text{ \AA}^{-1}$

8.2 Resolution estimates [i](#)

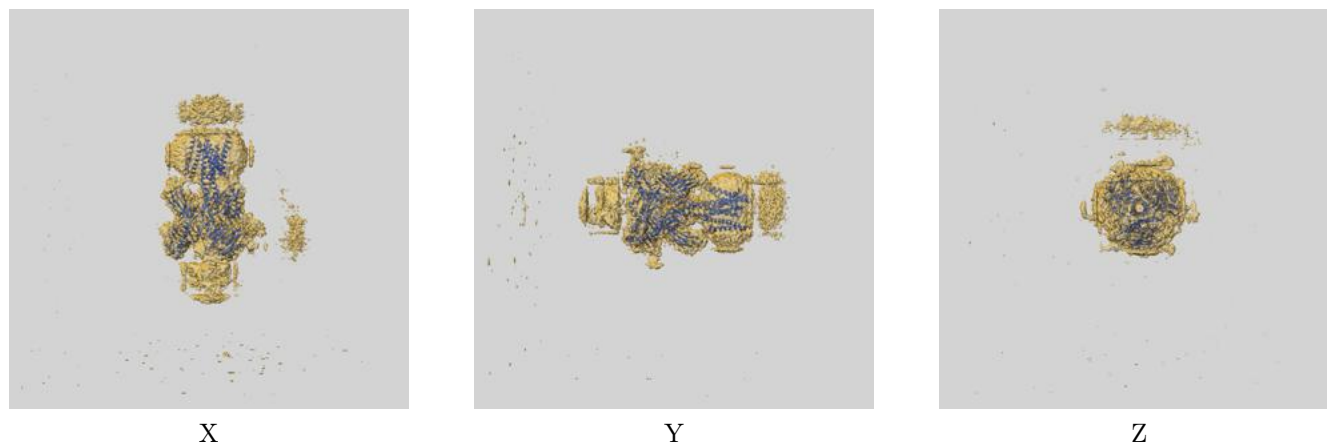
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.12	-	-
Author-provided FSC curve	3.12	3.33	3.17
Unmasked-calculated*	3.36	3.62	3.38

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit [i](#)

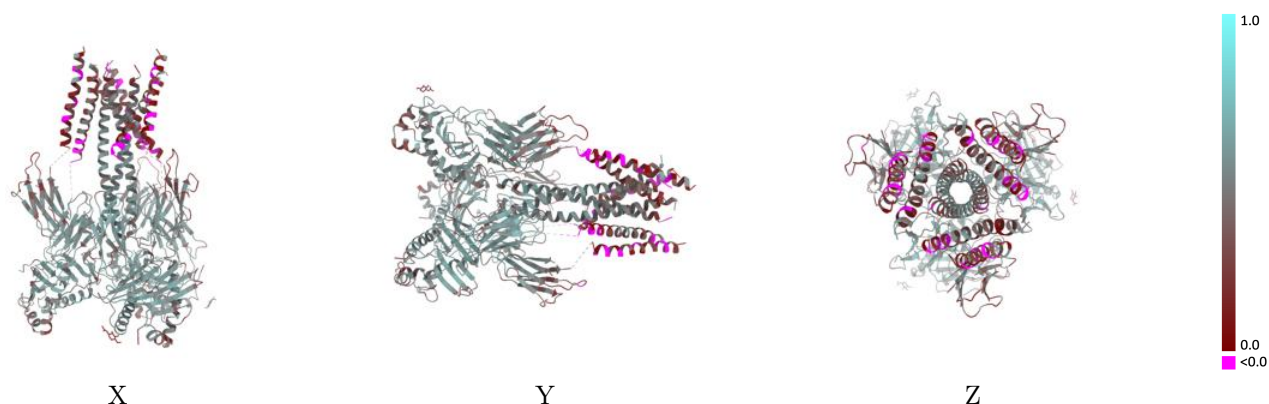
This section contains information regarding the fit between EMDB map EMD-43501 and PDB model 8VSP. Per-residue inclusion information can be found in section [3](#) on page [12](#).

9.1 Map-model overlay [i](#)



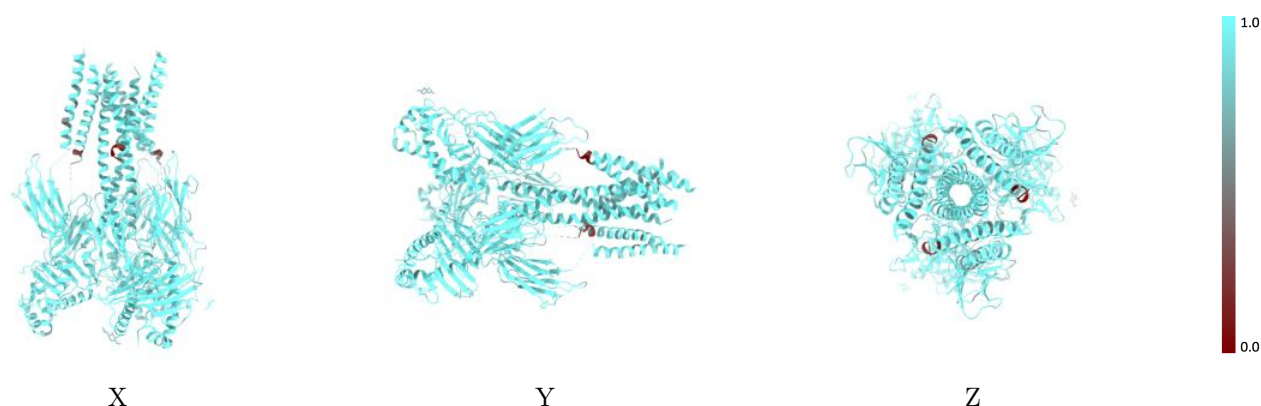
The images above show the 3D surface view of the map at the recommended contour level 0.00402 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



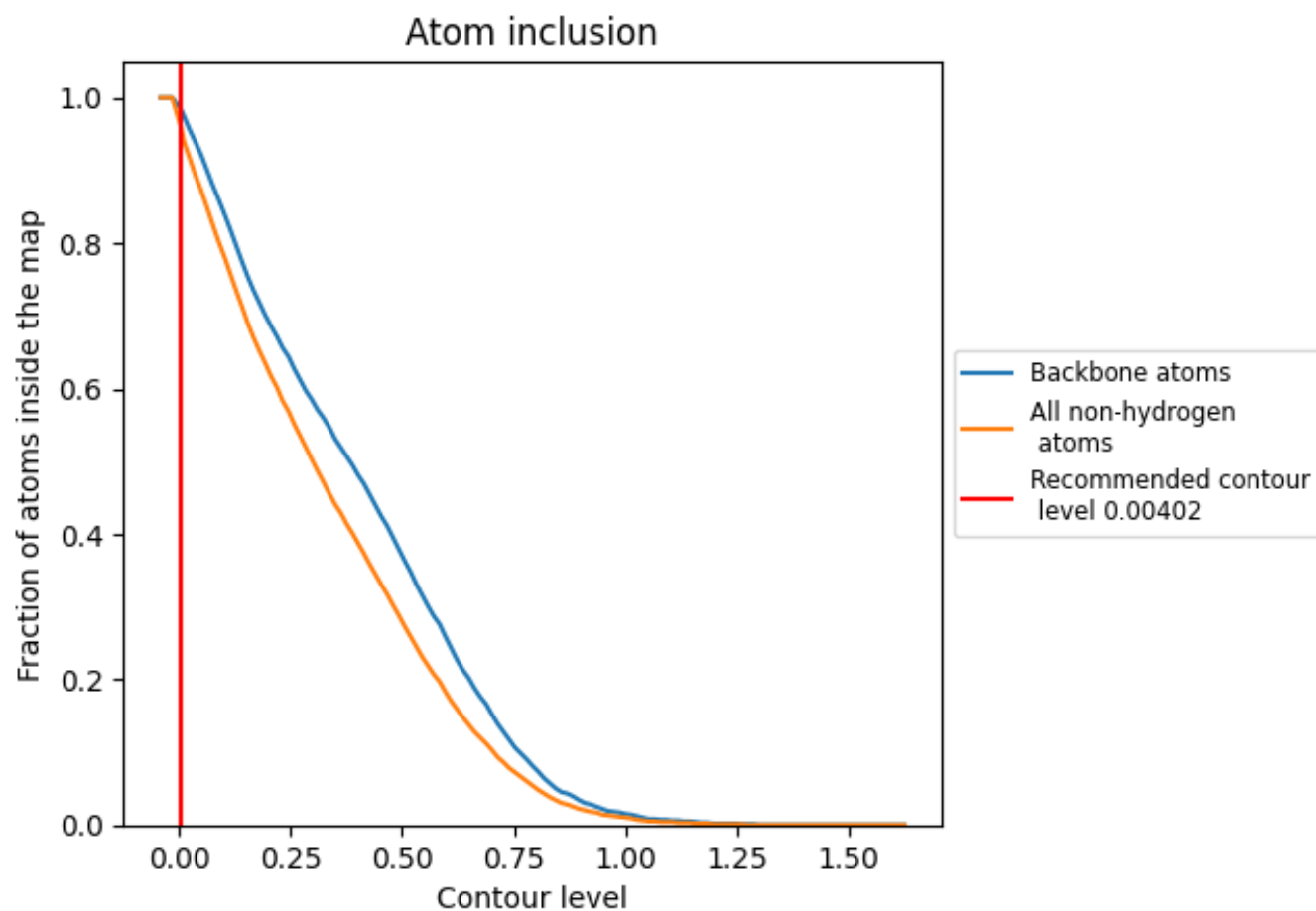
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.00402).

9.4 Atom inclusion [i](#)



At the recommended contour level, 98% of all backbone atoms, 96% 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 (0.00402) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9600	0.4750
A	0.9680	0.5210
B	0.9520	0.4450
C	0.9570	0.4730
D	0.9580	0.5060
E	0.9560	0.4390
F	0.9590	0.4660
G	0.9690	0.5120
H	0.9560	0.4360
I	0.9590	0.4650

1.0

0.0

<0.0