



## wwPDB EM Validation Summary Report ⓘ

Feb 20, 2025 – 09:34 AM EST

PDB ID : 2DFS  
EMDB ID : EMD-1201  
Title : 3-D structure of Myosin-V inhibited state  
Authors : Liu, J.; Taylor, D.W.; Krementsova, E.B.; Trybus, K.M.; Taylor, K.A.  
Deposited on : 2006-03-03  
Resolution : 24.00 Å (reported)  
Based on initial models : 1W7I, 1N2D

This is a wwPDB EM Validation Summary 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>.

---

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

EMDB validation analysis : 0.0.1.dev117  
MolProbity : 4.02b-467  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.41.4

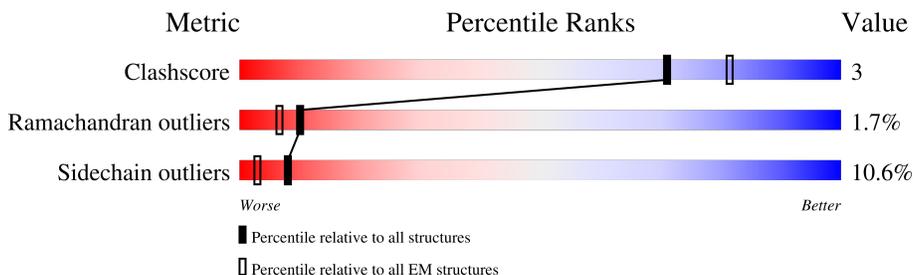
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON CRYSTALLOGRAPHY*

The reported resolution of this entry is 24.00 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	1080	
1	M	1080	
2	B	148	
2	C	148	
2	D	148	
2	E	148	
2	F	148	
2	G	148	

Continued on next page...

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
2	N	148	 57% 29% 6% • 6%
2	O	148	 72% 19% • 5%
2	P	148	 76% 14% • • 6%
2	Q	148	 74% 17% • • 5%
2	R	148	 77% 13% • • 6%
2	S	148	 64% 24% 5% • 5%

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 29614 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 Myosin-5A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	994	Total	C	N	O	S	0	0
			8198	5219	1445	1486	48		
1	M	994	Total	C	N	O	S	0	0
			8198	5219	1445	1486	48		

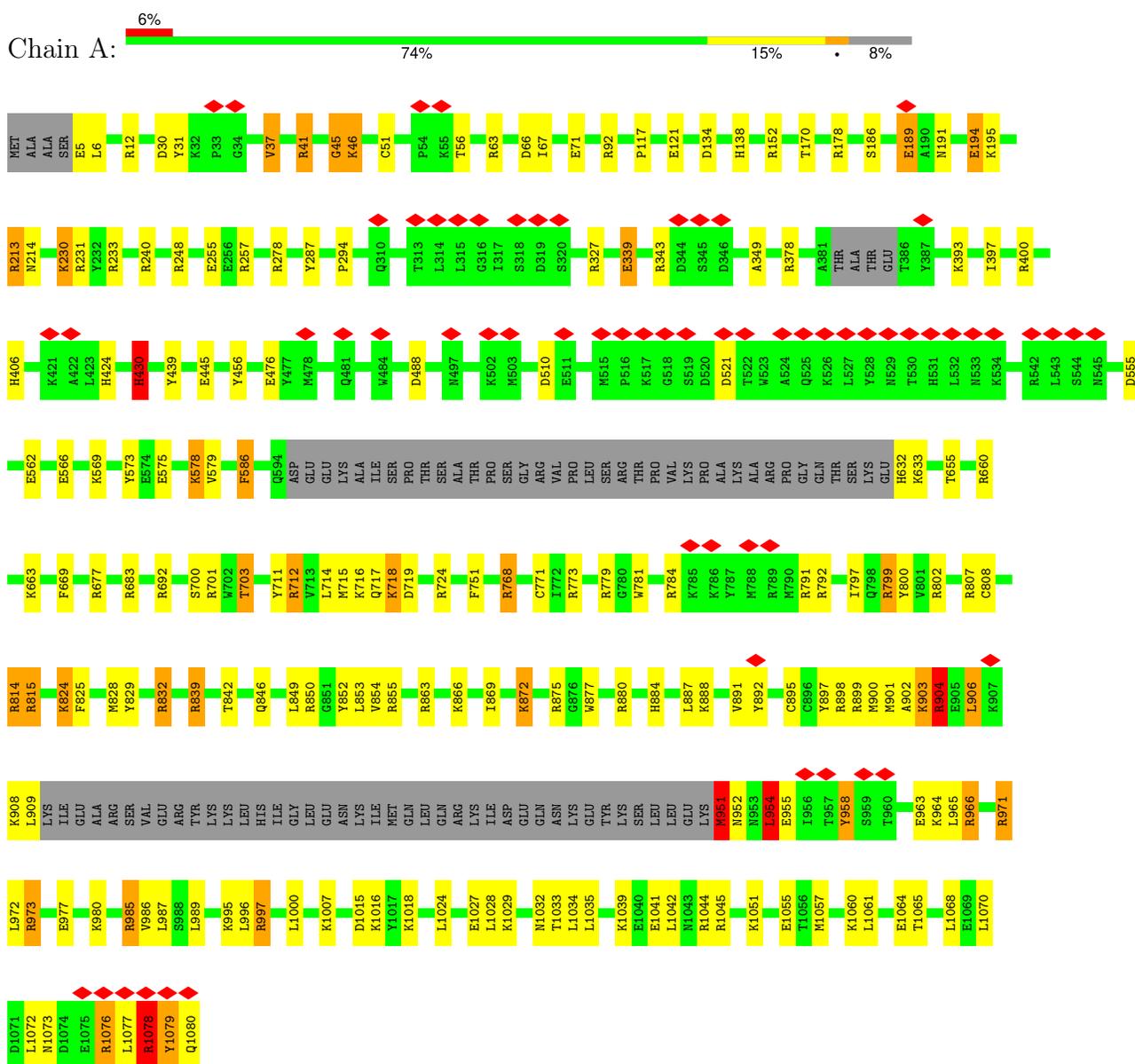
- Molecule 2 is a protein called Calmodulin.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	139	Total	C	N	O	S	0	0
			1093	671	177	236	9		
2	C	141	Total	C	N	O	S	0	0
			1110	682	180	239	9		
2	D	139	Total	C	N	O	S	0	0
			1093	671	177	236	9		
2	E	141	Total	C	N	O	S	0	0
			1110	682	180	239	9		
2	F	139	Total	C	N	O	S	0	0
			1093	671	177	236	9		
2	G	141	Total	C	N	O	S	0	0
			1110	682	180	239	9		
2	N	139	Total	C	N	O	S	0	0
			1093	671	177	236	9		
2	O	141	Total	C	N	O	S	0	0
			1110	682	180	239	9		
2	P	139	Total	C	N	O	S	0	0
			1093	671	177	236	9		
2	Q	141	Total	C	N	O	S	0	0
			1110	682	180	239	9		
2	R	139	Total	C	N	O	S	0	0
			1093	671	177	236	9		
2	S	141	Total	C	N	O	S	0	0
			1110	682	180	239	9		

### 3 Residue-property plots

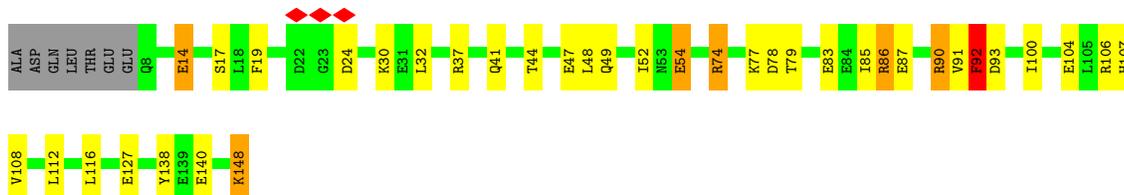
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

- Molecule 1: Myosin-5A

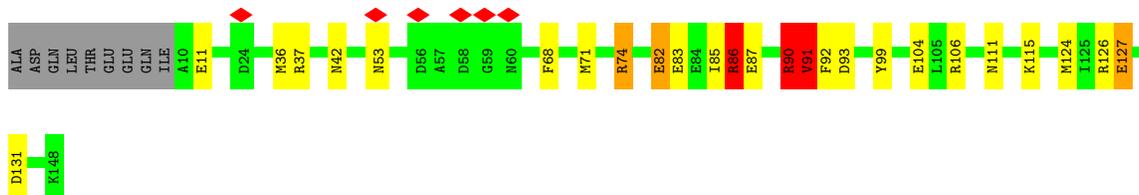


- Molecule 1: Myosin-5A





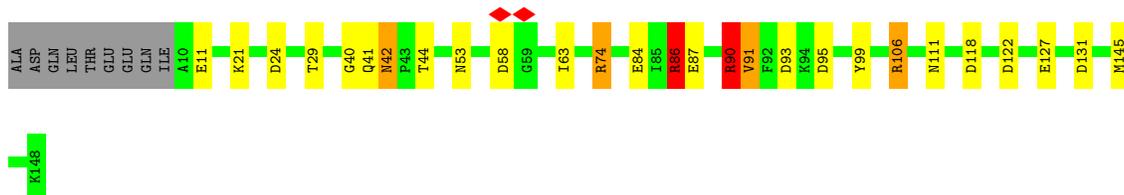
• Molecule 2: Calmodulin



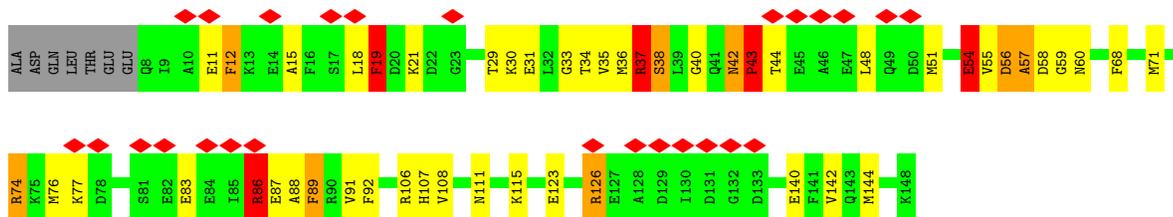
• Molecule 2: Calmodulin



• Molecule 2: Calmodulin



• Molecule 2: Calmodulin



• Molecule 2: Calmodulin

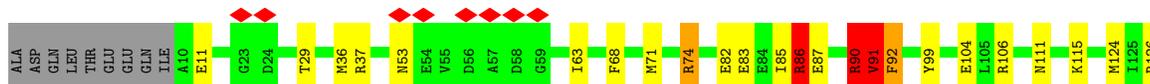




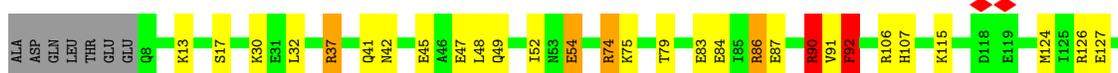
• Molecule 2: Calmodulin



• Molecule 2: Calmodulin



• Molecule 2: Calmodulin

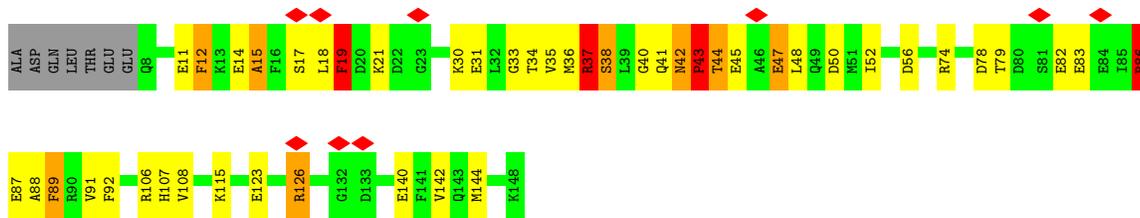


• Molecule 2: Calmodulin



• Molecule 2: Calmodulin





## 4 Experimental information

Property	Value	Source
EM reconstruction method	TOMOGRAPHY	Depositor
Imposed symmetry	2D CRYSTAL, $a$ =Not provided Å, $b$ =Not provided Å, $c$ =Not provided Å, $\gamma$ =Not provided°, space group=Not provided	Depositor
Number of tilted images used	4029	Depositor
Resolution determination method	Not provided	
CTF correction method	CTF gradient correction	Depositor
Microscope	FEI/PHILIPS CM300FEG/ST	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{Å}^2$ )	30	Depositor
Minimum defocus (nm)	12000	Depositor
Maximum defocus (nm)	4000	Depositor
Magnification	24000	Depositor
Image detector	TVIPS TEMCAM-F224 (2k x 2k)	Depositor
Maximum voxel value	13.857	Depositor
Minimum voxel value	-0.411	Depositor
Average voxel value	0.042	Depositor
Voxel value standard deviation	0.651	Depositor
Recommended contour level	0.65	Depositor
Tomogram size (Å)	1000.8, 1000.8, 333.6	wwPDB
Tomogram dimensions	180, 180, 60	wwPDB
Tomogram angles (°)	90, 90, 90	wwPDB
Grid spacing (Å)	5.56, 5.56, 5.56	Depositor

## 5 Model quality [i](#)

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

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	0.76	0/8359	1.25	76/11241 (0.7%)
1	M	0.76	0/8359	1.23	74/11241 (0.7%)
2	B	0.78	0/1105	1.39	12/1482 (0.8%)
2	C	0.75	0/1122	1.27	5/1505 (0.3%)
2	D	0.78	0/1105	1.38	15/1482 (1.0%)
2	E	0.74	0/1122	1.27	6/1505 (0.4%)
2	F	0.77	0/1105	1.33	6/1482 (0.4%)
2	G	0.83	0/1122	1.49	16/1505 (1.1%)
2	N	0.78	0/1105	1.35	11/1482 (0.7%)
2	O	0.75	0/1122	1.26	6/1505 (0.4%)
2	P	0.80	0/1105	1.35	13/1482 (0.9%)
2	Q	0.73	0/1122	1.26	6/1505 (0.4%)
2	R	0.77	0/1105	1.32	6/1482 (0.4%)
2	S	0.79	0/1122	1.41	15/1505 (1.0%)
All	All	0.77	0/30080	1.29	267/40404 (0.7%)

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	32
1	M	0	30
2	B	0	8
2	C	0	7
2	D	0	4
2	E	0	8
2	F	0	5
2	G	0	7
2	N	0	8
2	O	0	6
2	P	0	5

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	#Chirality outliers	#Planarity outliers
2	Q	0	7
2	R	0	4
2	S	0	9
All	All	0	140

There are no bond length outliers.

The worst 5 of 267 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	997	ARG	NE-CZ-NH1	12.11	126.36	120.30
1	A	951	MET	CA-CB-CG	10.38	130.94	113.30
2	E	74	ARG	NE-CZ-NH1	10.34	125.47	120.30
2	Q	74	ARG	NE-CZ-NH1	10.20	125.40	120.30
1	M	1076	ARG	NE-CZ-NH1	10.10	125.35	120.30

There are no chirality outliers.

5 of 140 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	152	ARG	Sidechain
1	A	191	ASN	Peptide
1	A	213	ARG	Sidechain
1	A	233	ARG	Sidechain
1	A	41	ARG	Sidechain

## 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	8198	0	8280	64	72
1	M	8198	0	8280	64	56
2	B	1093	0	1027	10	371
2	C	1110	0	1046	15	0
2	D	1093	0	1027	2	0
2	E	1110	0	1046	7	0
2	F	1093	0	1027	3	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	G	1110	0	1046	50	0
2	N	1093	0	1027	9	387
2	O	1110	0	1046	14	0
2	P	1093	0	1027	3	0
2	Q	1110	0	1046	10	0
2	R	1093	0	1027	4	0
2	S	1110	0	1046	31	0
All	All	29614	0	28998	196	443

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 3.

The worst 5 of 196 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:906:LEU:HD21	2:G:15:ALA:HB1	1.58	0.84
2:C:92:PHE:CE2	2:C:108:VAL:HG22	2.14	0.83
1:M:906:LEU:HD21	2:S:15:ALA:HB1	1.61	0.81
1:A:951:MET:HG3	2:G:59:GLY:H	1.46	0.81
1:A:906:LEU:CD2	2:G:15:ALA:HB1	2.17	0.74

The worst 5 of 443 symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:99:TYR:CA	2:N:94:LYS:N[5_555]	0.37	1.83
2:B:99:TYR:CD1	2:N:94:LYS:CG[5_555]	0.39	1.81
2:B:92:PHE:CB	2:N:97:ASN:O[5_555]	0.41	1.79
2:B:129:ASP:CG	1:M:712:ARG:CB[5_555]	0.48	1.72
2:B:91:VAL:O	2:N:99:TYR:CE2[5_555]	0.50	1.70

## 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	986/1080 (91%)	939 (95%)	39 (4%)	8 (1%)	16	55
1	M	986/1080 (91%)	942 (96%)	37 (4%)	7 (1%)	19	57
2	B	137/148 (93%)	123 (90%)	7 (5%)	7 (5%)	1	15
2	C	139/148 (94%)	129 (93%)	8 (6%)	2 (1%)	9	41
2	D	137/148 (93%)	124 (90%)	11 (8%)	2 (2%)	8	40
2	E	139/148 (94%)	129 (93%)	8 (6%)	2 (1%)	9	41
2	F	137/148 (93%)	124 (90%)	7 (5%)	6 (4%)	2	17
2	G	139/148 (94%)	128 (92%)	5 (4%)	6 (4%)	2	17
2	N	137/148 (93%)	123 (90%)	8 (6%)	6 (4%)	2	17
2	O	139/148 (94%)	128 (92%)	10 (7%)	1 (1%)	19	57
2	P	137/148 (93%)	127 (93%)	8 (6%)	2 (2%)	8	40
2	Q	139/148 (94%)	128 (92%)	8 (6%)	3 (2%)	5	29
2	R	137/148 (93%)	123 (90%)	9 (7%)	5 (4%)	3	20
2	S	139/148 (94%)	129 (93%)	4 (3%)	6 (4%)	2	17
All	All	3628/3936 (92%)	3396 (94%)	169 (5%)	63 (2%)	10	37

5 of 63 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	186	SER
2	B	41	GLN
2	B	91	VAL
2	B	93	ASP
2	B	115	LYS

### 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	886/961 (92%)	794 (90%)	92 (10%)	5	19

*Continued on next page...*

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	M	886/961 (92%)	798 (90%)	88 (10%)	6	21
2	B	118/126 (94%)	107 (91%)	11 (9%)	7	23
2	C	120/126 (95%)	106 (88%)	14 (12%)	4	16
2	D	118/126 (94%)	106 (90%)	12 (10%)	6	20
2	E	120/126 (95%)	107 (89%)	13 (11%)	5	19
2	F	118/126 (94%)	104 (88%)	14 (12%)	4	16
2	G	120/126 (95%)	105 (88%)	15 (12%)	3	15
2	N	118/126 (94%)	106 (90%)	12 (10%)	6	20
2	O	120/126 (95%)	106 (88%)	14 (12%)	4	16
2	P	118/126 (94%)	105 (89%)	13 (11%)	5	18
2	Q	120/126 (95%)	108 (90%)	12 (10%)	6	20
2	R	118/126 (94%)	106 (90%)	12 (10%)	6	20
2	S	120/126 (95%)	104 (87%)	16 (13%)	3	13
All	All	3200/3434 (93%)	2862 (89%)	338 (11%)	8	19

5 of 338 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	M	1018	LYS
2	P	53	ASN
1	M	1032	ASN
2	N	18	LEU
2	Q	30	LYS

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

Mol	Chain	Res	Type
1	M	395	HIS
2	Q	107	HIS
1	M	493	GLN
2	N	107	HIS
1	M	463	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](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

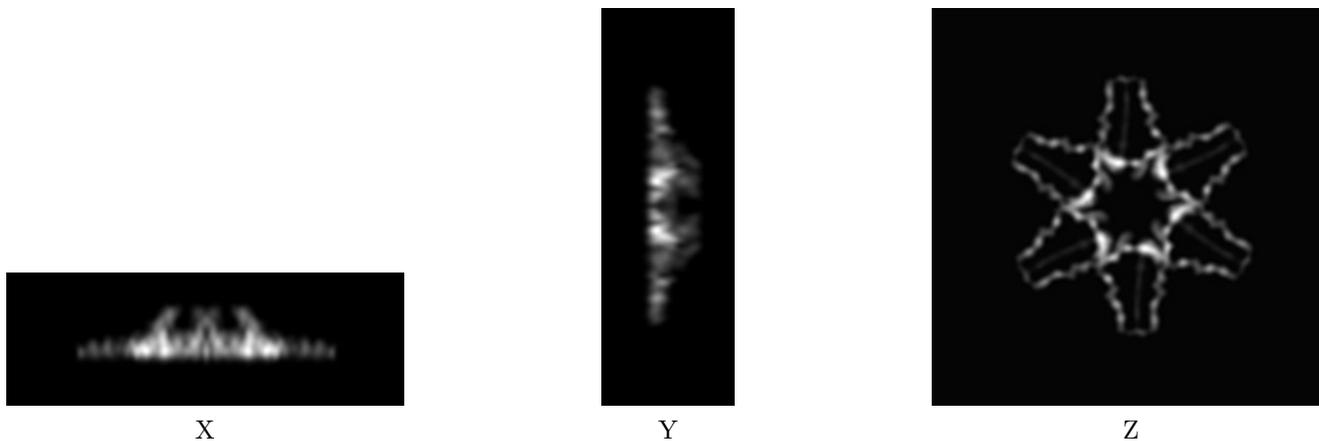
## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Tomogram visualisation [i](#)

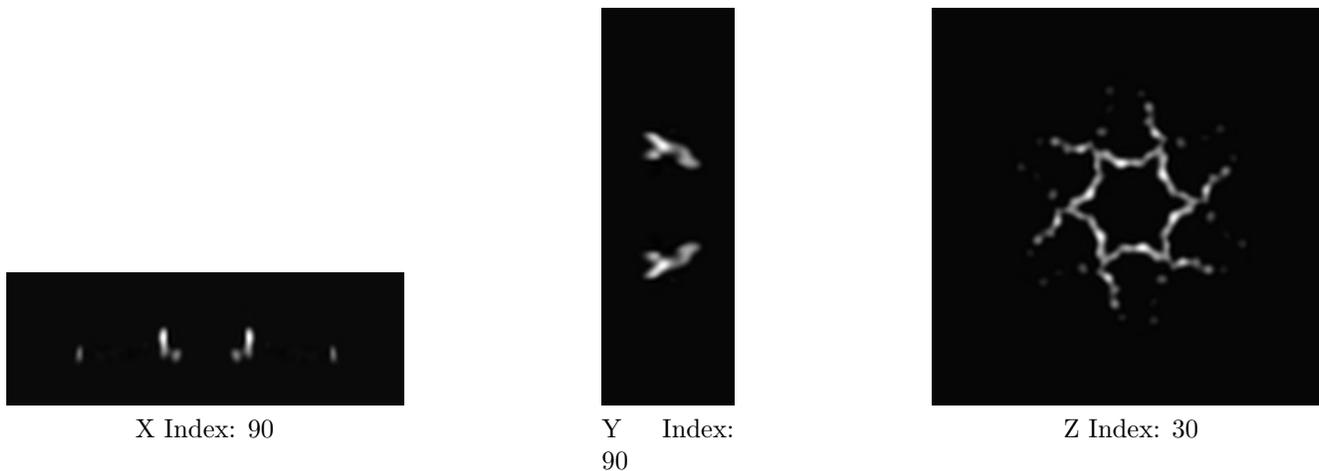
This section contains visualisations of the EMDB entry EMD-1201. These allow visual inspection of the internal detail of the tomogram and identification of artifacts.

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



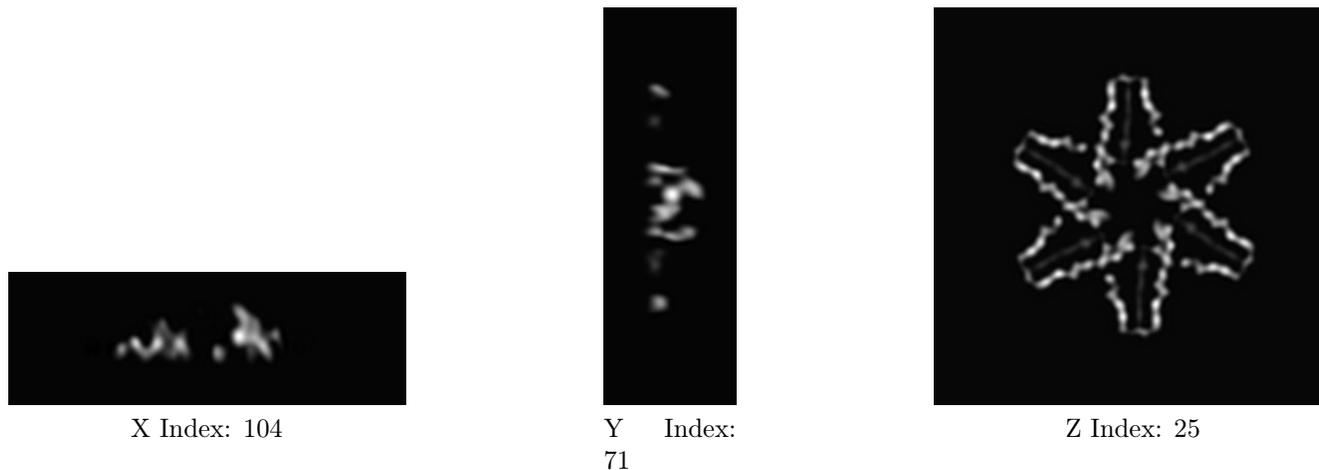
The images above show the tomogram projected in three orthogonal directions.

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



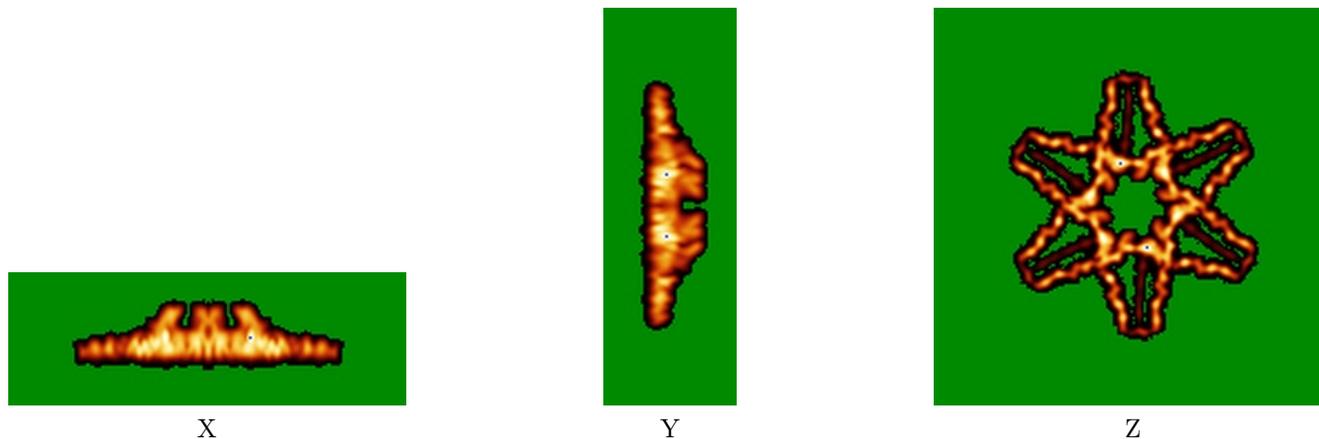
The images above show central slices of the tomogram in three orthogonal directions.

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



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

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



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

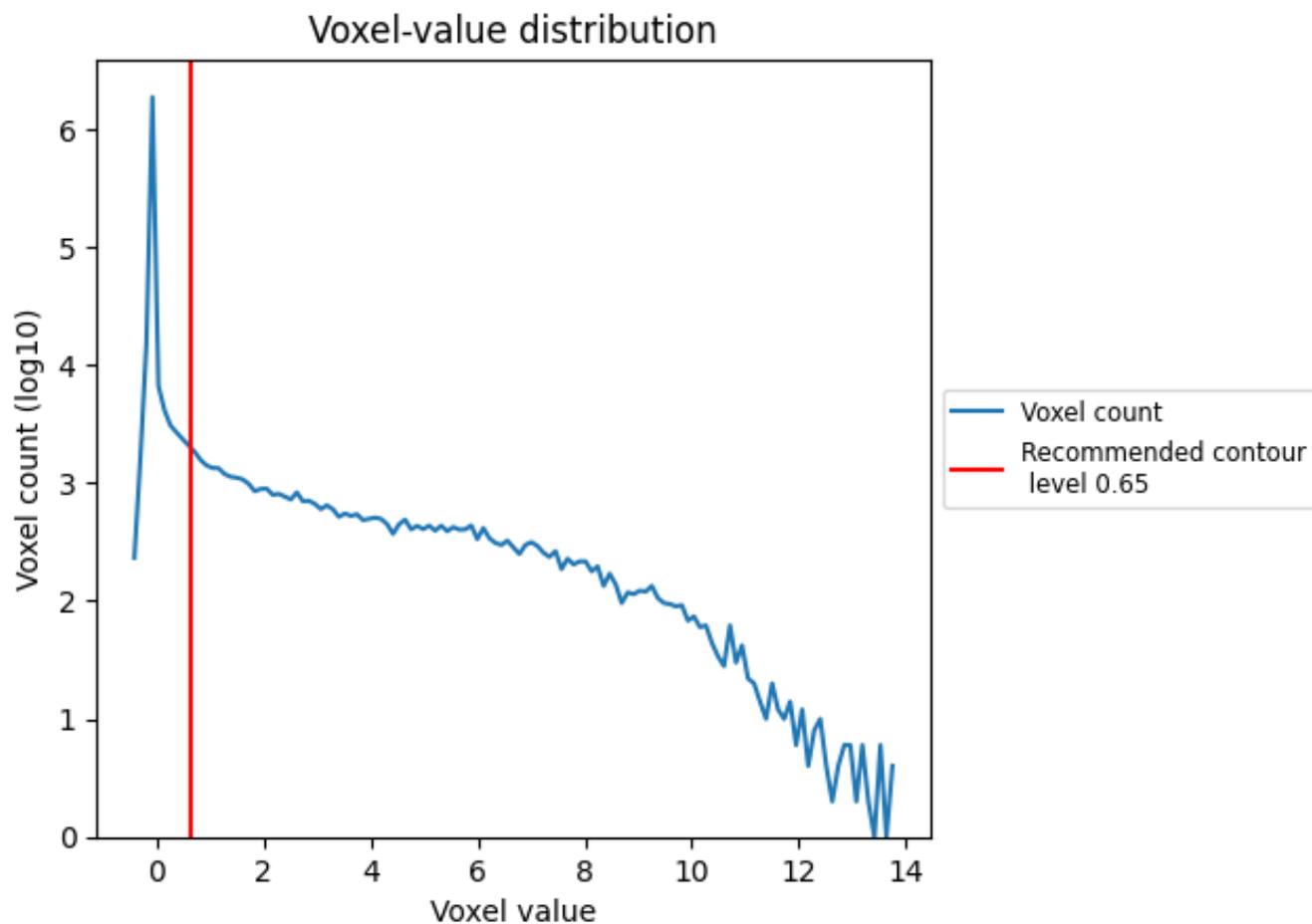
### 6.5 Mask visualisation [i](#)

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

## 7 Tomogram analysis [i](#)

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

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



The voxel-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic.

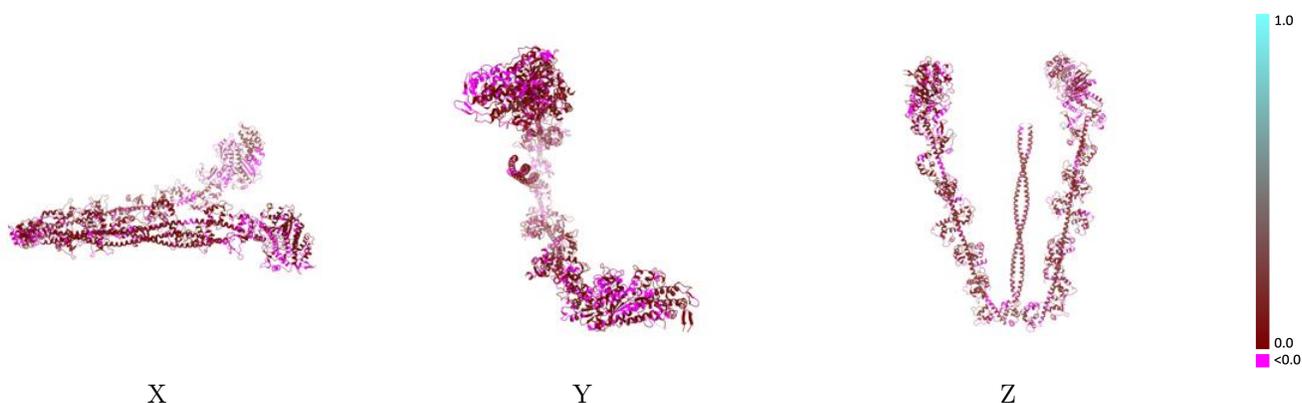
## 8 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-1201 and PDB model 2DFS. Per-residue inclusion information can be found in section 3 on page 5.

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

This section was not generated.

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

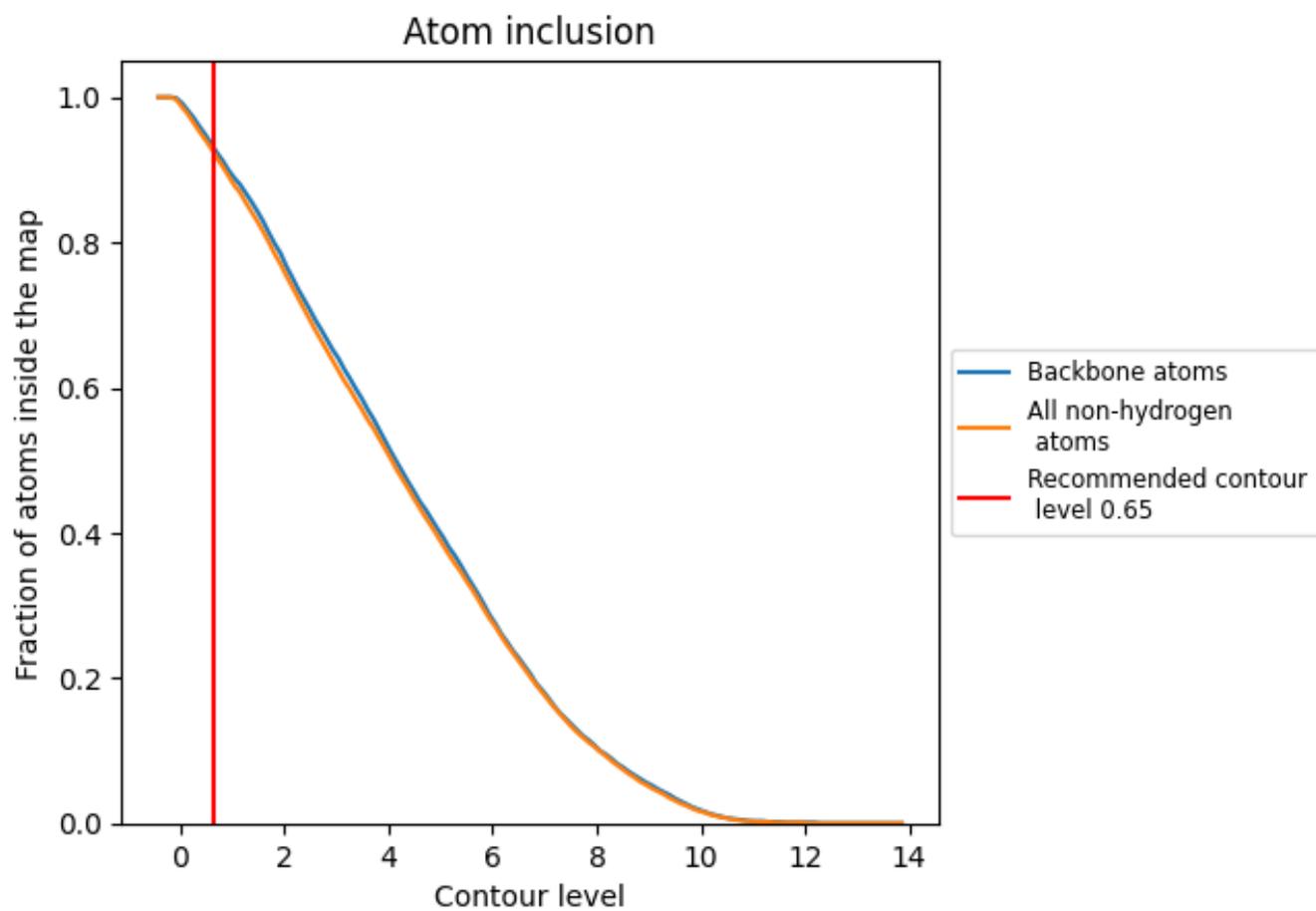


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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

This section was not generated.

## 8.4 Atom inclusion [i](#)



At the recommended contour level, 93% of all backbone atoms, 92% of all non-hydrogen atoms, are inside the map.

## 8.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.65) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9240	 0.0430
A	 0.9260	 0.0410
B	 0.9510	 0.0460
C	 0.9790	 0.0490
D	 0.9540	 0.0620
E	 0.9940	 0.0550
F	 0.9900	 0.0600
G	 0.7940	 0.0350
M	 0.8740	 0.0300
N	 0.9980	 0.0700
O	 0.9940	 0.0610
P	 0.9140	 0.0460
Q	 0.9660	 0.0520
R	 0.9870	 0.0560
S	 0.9120	 0.0400

