



## Full wwPDB EM Validation Report ⓘ

Jan 6, 2022 – 04:48 PM JST

PDB ID : 7WH2  
EMDB ID : EMD-32496  
Title : Cryo-electron microscopic structure of the 2-oxoglutarate dehydrogenase (E1)  
with TCAIM complex  
Deposited on : 2021-12-29  
Resolution : 2.86 Å (reported)

This is a Full wwPDB EM Validation Report.

This report is produced by the wwPDB biocuration pipeline after annotation of the structure.

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.

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

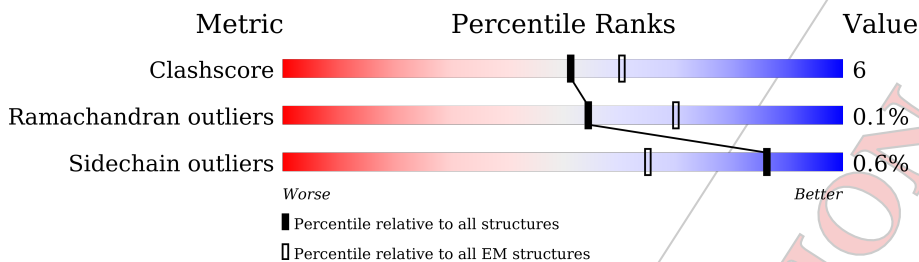
EMDB validation analysis : 0.0.0.dev97  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.25

# 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 2.86 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	911	
1	B	911	
2	C	302	

## 2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 16537 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 2-oxoglutarate dehydrogenase, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	875	Total	C	N	O	S	0	0
			6999	4437	1228	1293	41		
1	B	875	Total	C	N	O	S	0	0
			6999	4437	1228	1293	41		

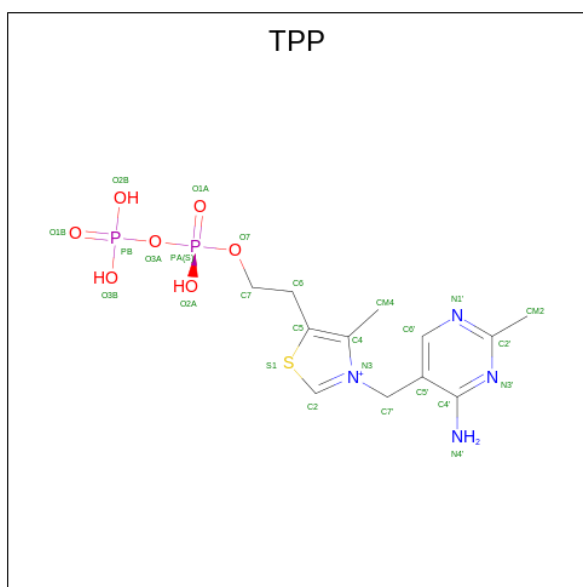
- Molecule 2 is a protein called T-cell activation inhibitor, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	302	Total	C	N	O	S	0	0
			2484	1587	438	443	16		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
3	A	1	Total	Mg	0
			1	1	
3	B	1	Total	Mg	0
			1	1	

- Molecule 4 is THIAMINE DIPHOSPHATE (three-letter code: TPP) (formula: C<sub>12</sub>H<sub>19</sub>N<sub>4</sub>O<sub>7</sub>P<sub>2</sub>S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf	
			Total	C	N	O	P		S
4	A	1	Total	C	N	O	P	S	0
			26	12	4	7	2	1	
4	B	1	Total	C	N	O	P	S	0
			26	12	4	7	2	1	

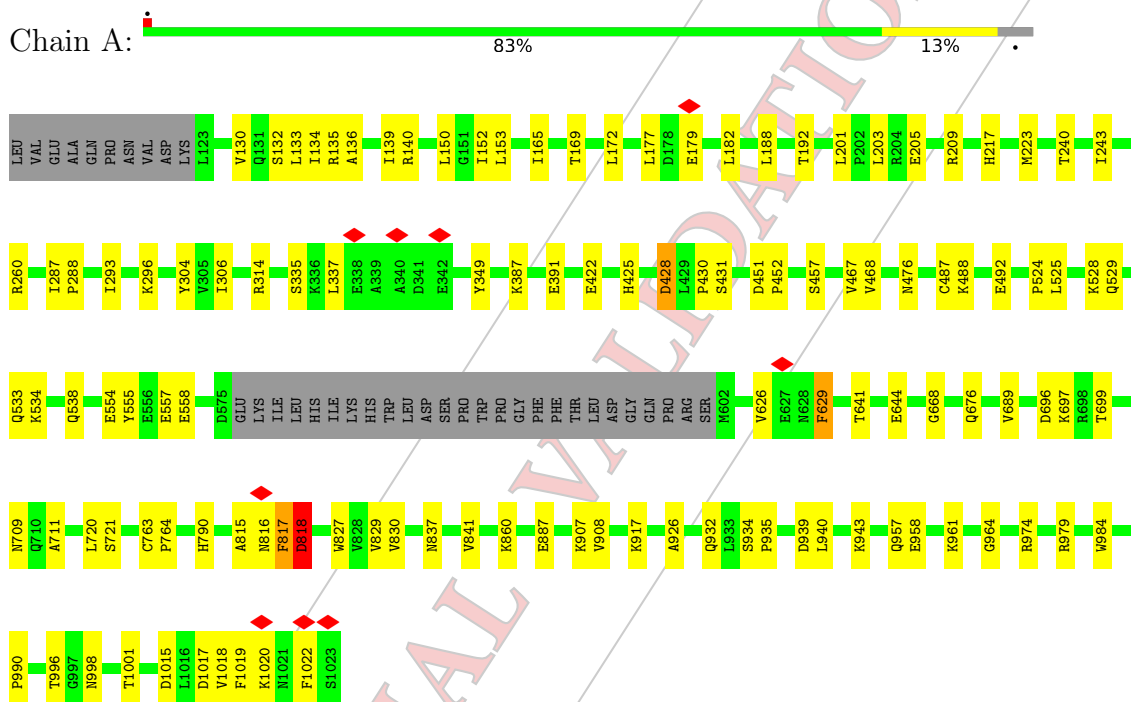
- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		AltConf
			Total	Ca	
5	B	1	Total	Ca	0
			1	1	

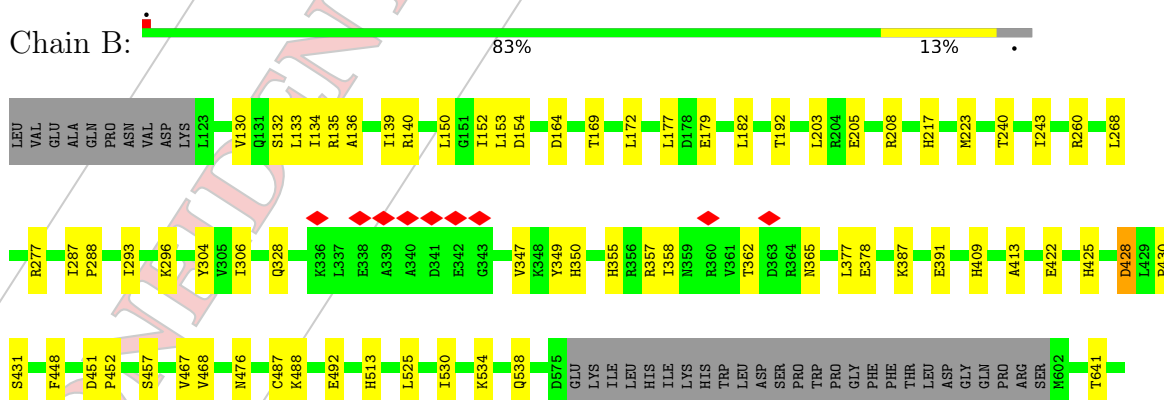
### 3 Residue-property plots [i](#)

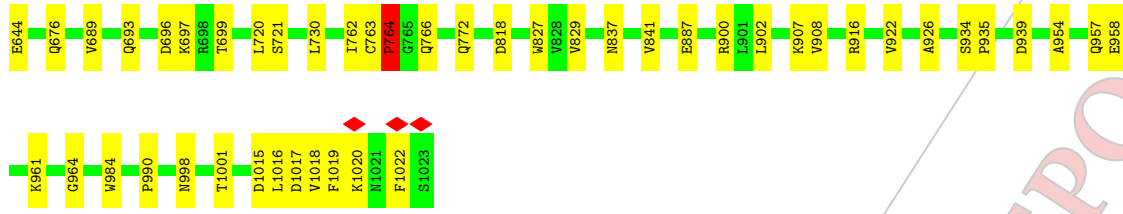
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: 2-oxoglutarate dehydrogenase, mitochondrial

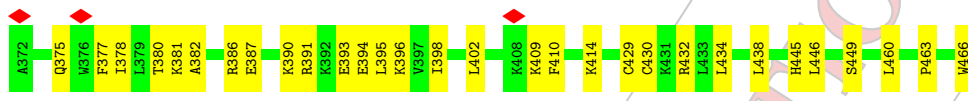
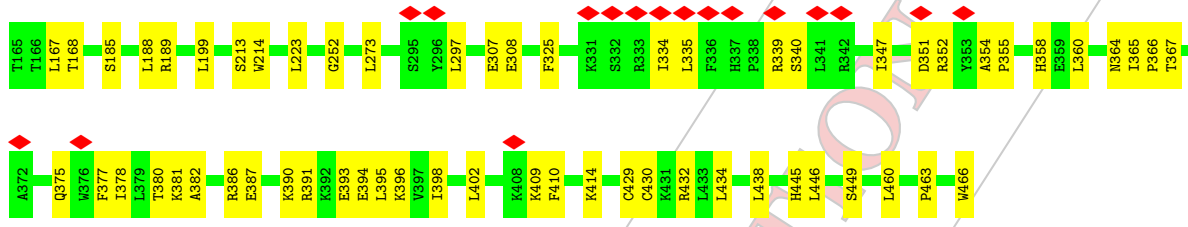
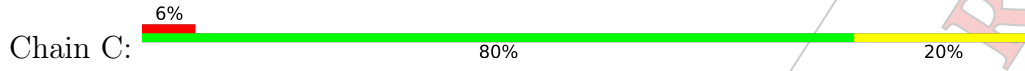


- Molecule 1: 2-oxoglutarate dehydrogenase, mitochondrial





• Molecule 2: T-cell activation inhibitor, mitochondrial



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## 4 Experimental information i

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	1342786	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 ( $e^-/\text{\AA}^2$ )	60	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	2.364	Depositor
Minimum map value	-1.362	Depositor
Average map value	-0.003	Depositor
Map value standard deviation	0.083	Depositor
Recommended contour level	0.143	Depositor
Map size (Å)	218.88, 218.88, 218.88	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.855, 0.855, 0.855	Depositor

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## 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: CA, TPP, 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	0.48	0/7165	0.57	3/9710 (0.0%)
1	B	0.47	0/7165	0.58	2/9710 (0.0%)
2	C	0.33	0/2539	0.51	0/3427
All	All	0.45	0/16869	0.57	5/22847 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	817	PHE	CB-CA-C	5.71	121.82	110.40
1	B	428	ASP	CB-CG-OD1	5.58	123.32	118.30
1	A	428	ASP	CB-CG-OD1	5.52	123.27	118.30
1	A	818	ASP	CB-CA-C	-5.40	99.60	110.40
1	B	764	PRO	N-CA-CB	-5.39	96.67	102.60

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	6999	0	6892	84	0
1	B	6999	0	6892	77	0
2	C	2484	0	2521	39	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	26	0	16	1	0
4	B	26	0	16	0	0
5	B	1	0	0	0	0
All	All	16537	0	16337	192	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 6.

All (192) 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:C:380:THR:HG23	2:C:381:LYS:HG3	1.64	0.80
1:A:829:VAL:H	1:A:934:SER:HB2	1.50	0.77
1:A:457:SER:OG	1:B:425:HIS:O	2.08	0.72
2:C:351:ASP:HA	2:C:366:PRO:HB3	1.71	0.71
1:A:984:TRP:HH2	1:A:1022:PHE:CD2	2.09	0.70
2:C:297:LEU:HD21	2:C:334:ILE:HD11	1.74	0.69
2:C:432:ARG:HH11	2:C:466:TRP:HE3	1.40	0.68
1:B:134:ILE:HD13	1:B:192:THR:HG21	1.76	0.67
1:A:534:LYS:NZ	1:A:538:GLN:OE1	2.27	0.66
1:B:534:LYS:NZ	1:B:538:GLN:OE1	2.27	0.66
2:C:167:LEU:HD22	2:C:466:TRP:HD1	1.61	0.65
1:A:984:TRP:CH2	1:A:1022:PHE:CD2	2.85	0.65
2:C:377:PHE:O	2:C:381:LYS:NZ	2.30	0.65
1:B:984:TRP:HH2	1:B:1022:PHE:CD2	2.16	0.64
1:A:696:ASP:HB2	1:B:525:LEU:HD22	1.80	0.64
1:A:525:LEU:HD23	1:A:528:LYS:HD2	1.80	0.63
2:C:185:SER:OG	2:C:189:ARG:NH2	2.33	0.62
1:A:934:SER:HB3	1:A:935:PRO:HD3	1.82	0.62
1:A:188:LEU:HD11	1:A:201:LEU:HD12	1.82	0.61
1:A:984:TRP:CH2	1:A:1022:PHE:HD2	2.17	0.61
1:A:296:LYS:HE3	1:A:488:LYS:HG3	1.84	0.60
1:A:907:LYS:NZ	1:A:958:GLU:OE2	2.35	0.60
2:C:307:GLU:O	2:C:308:GLU:HG3	2.02	0.60
1:B:296:LYS:HE3	1:B:488:LYS:HG3	1.84	0.59
1:A:626:VAL:HB	1:A:629:PHE:HB2	1.85	0.59
1:B:907:LYS:NZ	1:B:958:GLU:OE2	2.35	0.59
1:B:902:LEU:HD23	1:B:954:ALA:HB3	1.85	0.58
1:A:816:ASN:C	1:A:818:ASP:H	2.06	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:934:SER:HB3	1:B:935:PRO:HD3	1.85	0.58
1:A:425:HIS:O	1:B:457:SER:OG	2.18	0.58
1:A:984:TRP:HH2	1:A:1022:PHE:CE2	2.23	0.57
2:C:167:LEU:HD13	2:C:466:TRP:HE1	1.69	0.57
1:A:763:CYS:CB	1:A:827:TRP:HZ3	2.18	0.57
1:B:205:GLU:OE2	1:B:208:ARG:NE	2.30	0.57
1:A:829:VAL:H	1:A:934:SER:CB	2.18	0.56
1:A:790:HIS:O	1:A:860:LYS:NZ	2.39	0.56
1:B:984:TRP:CH2	1:B:1022:PHE:HD2	2.24	0.55
1:B:984:TRP:CH2	1:B:1022:PHE:CD2	2.94	0.55
1:A:467:VAL:HG23	1:A:468:VAL:HG13	1.89	0.55
2:C:429:CYS:HG	2:C:466:TRP:HH2	1.54	0.54
1:B:328:GLN:N	1:B:328:GLN:OE1	2.41	0.54
1:A:763:CYS:HA	1:A:827:TRP:CZ3	2.43	0.53
1:B:467:VAL:HG23	1:B:468:VAL:HG13	1.89	0.53
1:A:182:LEU:HD23	1:A:203:LEU:HD23	1.90	0.53
1:A:957:GLN:HE21	1:A:964:GLY:HA3	1.74	0.53
1:A:641:THR:HA	1:A:644:GLU:HG3	1.91	0.53
1:B:641:THR:HA	1:B:644:GLU:HG3	1.91	0.53
1:B:957:GLN:HE21	1:B:964:GLY:HA3	1.74	0.53
1:A:134:ILE:HD13	1:A:192:THR:HG21	1.91	0.53
4:A:1102:TPP:HN42	4:A:1102:TPP:C2	2.22	0.52
1:B:377:LEU:HD13	1:B:413:ALA:HB2	1.92	0.52
2:C:382:ALA:O	2:C:386:ARG:HG3	2.09	0.52
1:B:169:THR:HG21	1:B:179:GLU:HG2	1.90	0.52
1:A:696:ASP:OD1	1:A:697:LYS:N	2.43	0.52
1:A:169:THR:HG21	1:A:179:GLU:HG2	1.90	0.52
1:A:934:SER:CB	1:A:935:PRO:HD3	2.40	0.51
1:B:696:ASP:OD1	1:B:697:LYS:N	2.43	0.51
1:A:136:ALA:O	1:A:140:ARG:N	2.44	0.51
1:B:730:LEU:HD13	1:B:762:ILE:HG12	1.93	0.51
2:C:168:THR:HG22	2:C:438:LEU:HD11	1.91	0.51
1:B:130:VAL:O	1:B:133:LEU:HB3	2.11	0.51
2:C:402:LEU:HB3	2:C:430:CYS:SG	2.51	0.51
1:A:451:ASP:OD1	1:A:452:PRO:HD2	2.11	0.51
1:B:136:ALA:O	1:B:140:ARG:N	2.44	0.50
2:C:347:ILE:HB	2:C:364:ASN:HA	1.93	0.50
2:C:365:ILE:HD11	2:C:378:ILE:HD11	1.94	0.50
1:B:451:ASP:OD1	1:B:452:PRO:HD2	2.11	0.50
1:A:457:SER:HB3	1:B:428:ASP:HB3	1.93	0.50
2:C:167:LEU:HD13	2:C:466:TRP:NE1	2.25	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:130:VAL:O	1:A:133:LEU:HB3	2.11	0.50
1:A:205:GLU:HG3	1:A:209:ARG:HE	1.77	0.50
1:A:940:LEU:HA	1:A:943:LYS:HE2	1.94	0.50
2:C:446:LEU:HD12	2:C:460:LEU:HB2	1.93	0.50
1:A:422:GLU:OE1	1:A:721:SER:OG	2.24	0.50
1:A:668:GLY:HA2	1:A:711:ALA:HB2	1.94	0.49
1:B:829:VAL:HG22	1:B:934:SER:HB2	1.94	0.49
1:B:132:SER:O	1:B:135:ARG:HB2	2.12	0.49
1:A:152:ILE:HD11	1:A:529:GLN:HG2	1.93	0.49
1:B:150:LEU:HD21	1:B:530:ILE:HG12	1.95	0.48
1:A:428:ASP:HB3	1:B:457:SER:HB3	1.95	0.48
1:A:132:SER:O	1:A:135:ARG:HB2	2.13	0.48
1:B:306:ILE:HD13	1:B:387:LYS:HG2	1.96	0.48
1:B:696:ASP:OD1	1:B:697:LYS:HG3	2.14	0.48
1:A:676:GLN:NE2	1:A:720:LEU:HG	2.29	0.48
1:B:358:ILE:HD13	1:B:365:ASN:HB3	1.95	0.48
1:B:998:ASN:HB3	1:B:1001:THR:HG22	1.94	0.48
1:B:268:LEU:HB3	1:B:277:ARG:HD2	1.96	0.48
1:A:763:CYS:HA	1:A:827:TRP:HZ3	1.79	0.47
1:B:347:VAL:HG22	1:B:350:HIS:CD2	2.49	0.47
1:B:763:CYS:SG	1:B:827:TRP:HZ3	2.38	0.47
1:B:387:LYS:O	1:B:391:GLU:HG2	2.15	0.47
1:B:676:GLN:NE2	1:B:720:LEU:HG	2.29	0.47
1:A:696:ASP:OD1	1:A:697:LYS:HG3	2.14	0.47
1:B:422:GLU:OE1	1:B:721:SER:OG	2.24	0.47
2:C:352:ARG:HA	2:C:352:ARG:NE	2.30	0.47
1:A:293:ILE:HG13	1:A:487:CYS:HB3	1.97	0.47
1:B:182:LEU:HD23	1:B:203:LEU:HD23	1.97	0.47
1:A:815:ALA:C	1:A:817:PHE:H	2.18	0.47
1:B:766:GLN:HG3	1:B:772:GLN:HG2	1.96	0.47
1:B:293:ILE:HG13	1:B:487:CYS:HB3	1.97	0.47
1:A:306:ILE:HD13	1:A:387:LYS:HG2	1.95	0.46
1:B:378:GLU:OE2	1:B:409:HIS:ND1	2.46	0.46
1:A:763:CYS:HB3	1:A:764:PRO:HD3	1.98	0.46
1:A:387:LYS:O	1:A:391:GLU:HG2	2.15	0.46
1:B:240:THR:HG23	1:B:243:ILE:HB	1.97	0.45
1:B:984:TRP:HH2	1:B:1022:PHE:CE2	2.34	0.45
1:B:961:LYS:HB3	1:B:990:PRO:HG3	1.97	0.45
1:A:961:LYS:HB3	1:A:990:PRO:HG3	1.97	0.45
2:C:335:LEU:HD13	2:C:375:GLN:HG2	1.99	0.45
2:C:199:LEU:HD12	2:C:223:LEU:HD22	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:304:TYR:HE2	1:A:306:ILE:HD11	1.83	0.44
1:B:347:VAL:HG23	1:B:349:TYR:H	1.83	0.44
2:C:387:GLU:OE2	2:C:391:ARG:HD2	2.18	0.44
2:C:339:ARG:HA	2:C:339:ARG:HD2	1.80	0.44
2:C:339:ARG:HG3	2:C:340:SER:H	1.82	0.44
1:B:837:ASN:O	1:B:841:VAL:HG23	2.18	0.44
1:A:428:ASP:HB3	1:B:457:SER:CB	2.48	0.44
1:A:837:ASN:O	1:A:841:VAL:HG23	2.18	0.44
1:A:996:THR:HG21	1:A:1001:THR:HG23	2.00	0.44
2:C:354:ALA:HB1	2:C:355:PRO:HD2	2.00	0.44
2:C:410:PHE:HE2	2:C:438:LEU:H	1.66	0.44
2:C:432:ARG:NH1	2:C:466:TRP:CE3	2.86	0.44
1:B:287:ILE:HB	1:B:288:PRO:HD3	2.00	0.43
1:B:448:PHE:HA	1:B:513:HIS:HD2	1.83	0.43
1:A:217:HIS:HB3	1:A:476:ASN:HB3	2.01	0.43
1:A:998:ASN:HB3	1:A:1001:THR:HG22	2.00	0.43
1:B:355:HIS:CE1	1:B:357:ARG:HB3	2.53	0.43
1:A:140:ARG:HB3	1:A:165:ILE:HD11	2.00	0.43
2:C:414:LYS:HG2	2:C:445:HIS:ND1	2.33	0.43
1:B:448:PHE:HA	1:B:513:HIS:CD2	2.53	0.43
2:C:396:LYS:HE3	2:C:396:LYS:HB3	1.87	0.43
1:A:287:ILE:HB	1:A:288:PRO:HD3	2.00	0.43
1:B:217:HIS:HB3	1:B:476:ASN:HB3	2.00	0.43
1:B:939:ASP:N	1:B:939:ASP:OD1	2.51	0.43
1:A:974:ARG:HE	1:A:979:ARG:HA	1.83	0.43
1:B:829:VAL:HG22	1:B:934:SER:CB	2.49	0.43
2:C:409:LYS:NZ	2:C:434:LEU:O	2.48	0.43
1:A:816:ASN:C	1:A:818:ASP:N	2.71	0.43
1:A:830:VAL:HG12	1:A:932:GLN:HA	2.00	0.43
1:A:957:GLN:NE2	1:A:964:GLY:HA3	2.33	0.43
1:A:135:ARG:NH1	1:B:135:ARG:NH1	2.67	0.43
1:B:260:ARG:HE	1:B:260:ARG:HB2	1.72	0.42
2:C:167:LEU:HD13	2:C:466:TRP:CD1	2.54	0.42
1:A:887:GLU:HG3	1:A:926:ALA:HB1	2.02	0.42
1:B:488:LYS:O	1:B:492:GLU:HG3	2.19	0.42
1:A:139:ILE:HG12	1:A:223:MET:HG3	2.01	0.42
1:A:488:LYS:O	1:A:492:GLU:HG3	2.19	0.42
1:A:939:ASP:N	1:A:939:ASP:OD1	2.51	0.42
1:B:957:GLN:NE2	1:B:964:GLY:HA3	2.33	0.42
2:C:390:LYS:O	2:C:393:GLU:HG3	2.19	0.42
1:A:974:ARG:HA	1:A:974:ARG:HD2	1.75	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:709:ASN:OD1	1:A:709:ASN:N	2.53	0.42
1:A:1017:ASP:HA	1:A:1020:LYS:HB3	2.01	0.42
1:B:887:GLU:HG3	1:B:926:ALA:HB1	2.02	0.42
2:C:188:LEU:HD23	2:C:188:LEU:HA	1.90	0.42
2:C:213:SER:OG	2:C:214:TRP:N	2.53	0.42
1:A:428:ASP:OD1	1:A:428:ASP:O	2.38	0.42
1:B:916:ARG:HD2	1:B:922:VAL:HA	2.02	0.42
1:B:1017:ASP:HA	1:B:1020:LYS:HB3	2.02	0.42
1:A:335:SER:C	1:A:337:LEU:H	2.23	0.42
2:C:252:GLY:H	2:C:273:LEU:CD1	2.32	0.42
1:A:457:SER:CB	1:B:428:ASP:HB3	2.50	0.41
1:B:304:TYR:HE2	1:B:306:ILE:HD11	1.83	0.41
1:B:908:VAL:HG22	1:B:958:GLU:HB2	2.02	0.41
2:C:325:PHE:HD1	2:C:367:THR:HA	1.84	0.41
1:A:689:VAL:HG13	1:A:699:THR:HG23	2.02	0.41
1:A:524:PRO:HB3	1:B:693:GLN:OE1	2.21	0.41
1:A:555:TYR:O	1:A:558:GLU:HG2	2.21	0.41
1:A:763:CYS:HB2	1:A:827:TRP:HZ3	1.86	0.41
1:B:689:VAL:HG13	1:B:699:THR:HG23	2.02	0.41
1:B:430:PRO:O	1:B:431:SER:OG	2.33	0.41
1:A:240:THR:HG23	1:A:243:ILE:HB	2.03	0.41
1:A:908:VAL:HG22	1:A:958:GLU:HB2	2.02	0.41
1:A:554:GLU:O	1:A:557:GLU:HG3	2.21	0.41
1:B:136:ALA:CB	1:B:164:ASP:HB3	2.51	0.41
1:B:428:ASP:O	1:B:428:ASP:OD1	2.38	0.41
2:C:395:LEU:HA	2:C:398:ILE:HG22	2.01	0.41
1:A:150:LEU:HD23	1:A:533:GLN:OE1	2.21	0.41
1:B:900:ARG:HE	1:B:1016:LEU:HA	1.85	0.41
2:C:358:HIS:CE1	2:C:360:LEU:HG	2.55	0.41
2:C:394:GLU:OE2	2:C:395:LEU:HD12	2.20	0.41
1:A:172:LEU:HD12	1:A:177:LEU:HB2	2.03	0.41
1:B:134:ILE:O	1:B:135:ARG:C	2.59	0.41
1:A:314:ARG:HD3	1:A:349:TYR:HA	2.03	0.40
1:B:172:LEU:HD12	1:B:177:LEU:HB2	2.03	0.40
1:B:1015:ASP:HB3	1:B:1018:VAL:HG23	2.03	0.40
1:A:1015:ASP:HB3	1:A:1018:VAL:HG23	2.04	0.40
2:C:449:SER:O	2:C:463:PRO:HA	2.22	0.40
1:A:260:ARG:HE	1:A:260:ARG:HB2	1.72	0.40
1:A:430:PRO:O	1:A:431:SER:OG	2.33	0.40
1:B:136:ALA:HB2	1:B:164:ASP:HB3	2.03	0.40
1:B:139:ILE:HG12	1:B:223:MET:HG3	2.02	0.40

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	871/911 (96%)	821 (94%)	50 (6%)	0	100	100
1	B	871/911 (96%)	830 (95%)	39 (4%)	2 (0%)	47	75
2	C	300/302 (99%)	272 (91%)	28 (9%)	0	100	100
All	All	2042/2124 (96%)	1923 (94%)	117 (6%)	2 (0%)	54	79

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	153	LEU
1	B	764	PRO

### 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	767/801 (96%)	762 (99%)	5 (1%)	84	94
1	B	767/801 (96%)	761 (99%)	6 (1%)	81	93
2	C	280/280 (100%)	280 (100%)	0	100	100
All	All	1814/1882 (96%)	1803 (99%)	11 (1%)	86	95

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	153	LEU
1	A	629	PHE
1	A	818	ASP
1	A	917	LYS
1	A	1019	PHE
1	B	152	ILE
1	B	154	ASP
1	B	362	THR
1	B	764	PRO
1	B	818	ASP
1	B	1019	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	676	GLN
1	A	773	ASN
1	A	816	ASN
1	A	894	ASN
1	B	355	HIS
1	B	513	HIS
1	B	552	GLN
1	B	676	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 monosaccharides in this entry.

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

Of 5 ligands modelled in this entry, 3 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	TPP	B	1102	3	22,27,27	0.59	0	29,40,40	0.77	1 (3%)
4	TPP	A	1102	3	22,27,27	0.75	0	29,40,40	0.91	1 (3%)

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	TPP	B	1102	3	-	1/16/17/17	0/2/2/2
4	TPP	A	1102	3	-	3/16/17/17	0/2/2/2

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1102	TPP	C7'-N3-C2	-2.15	121.47	125.35
4	A	1102	TPP	C5-C4-N3	2.12	111.81	107.57

There are no chirality outliers.

All (4) torsion outliers are listed below:

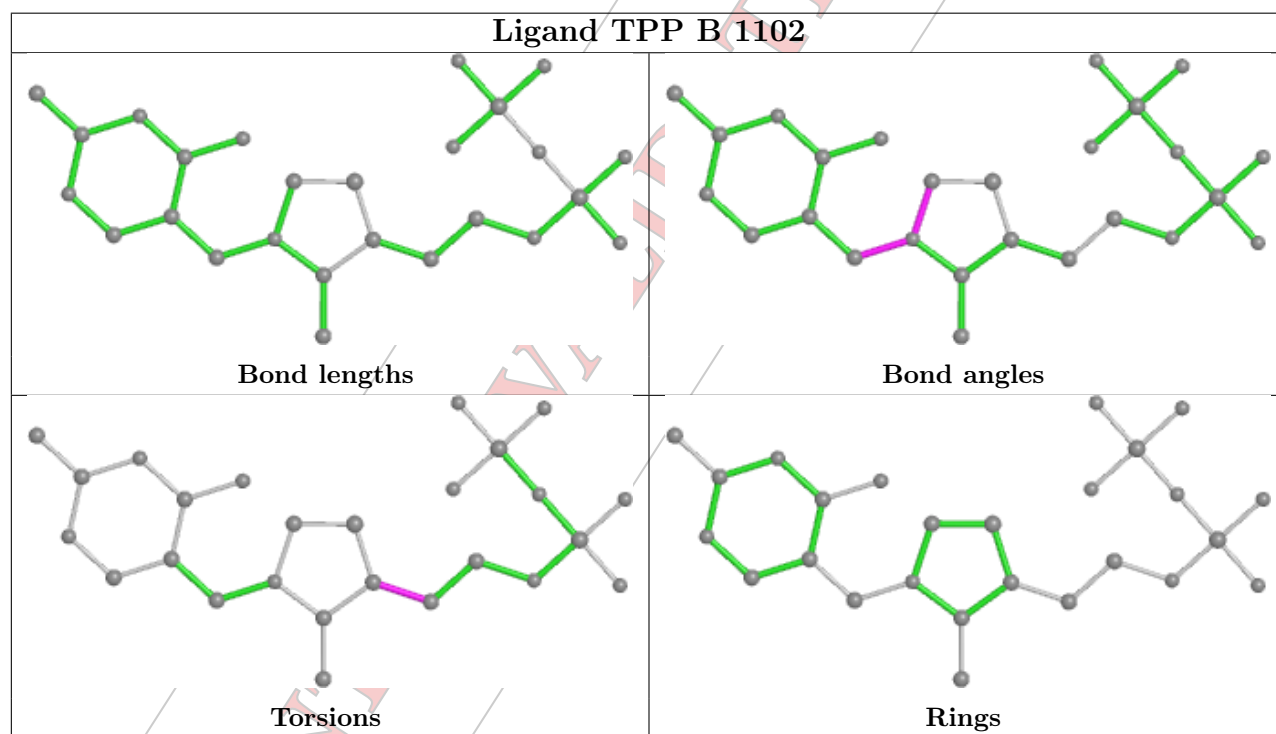
Mol	Chain	Res	Type	Atoms
4	A	1102	TPP	C4'-C5'-C7'-N3
4	B	1102	TPP	C4-C5-C6-C7
4	A	1102	TPP	PA-O3A-PB-O1B
4	A	1102	TPP	PB-O3A-PA-O2A

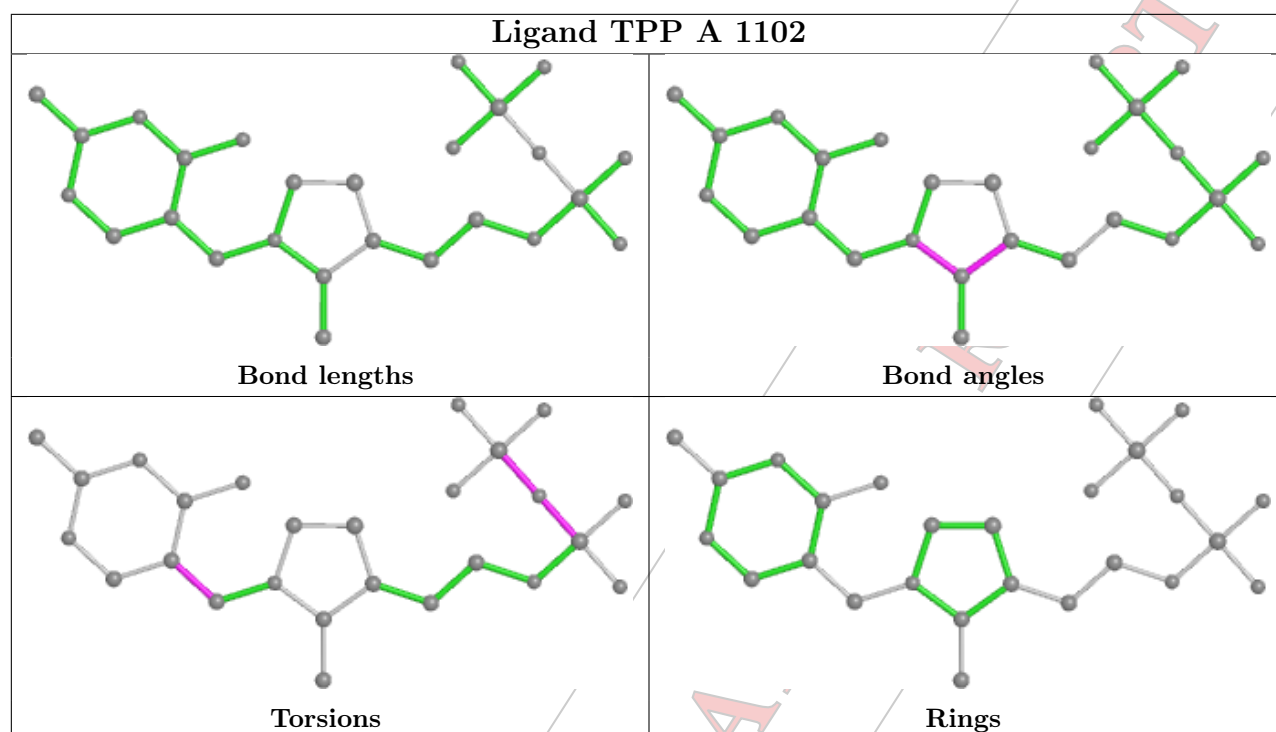
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1102	TPP	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.

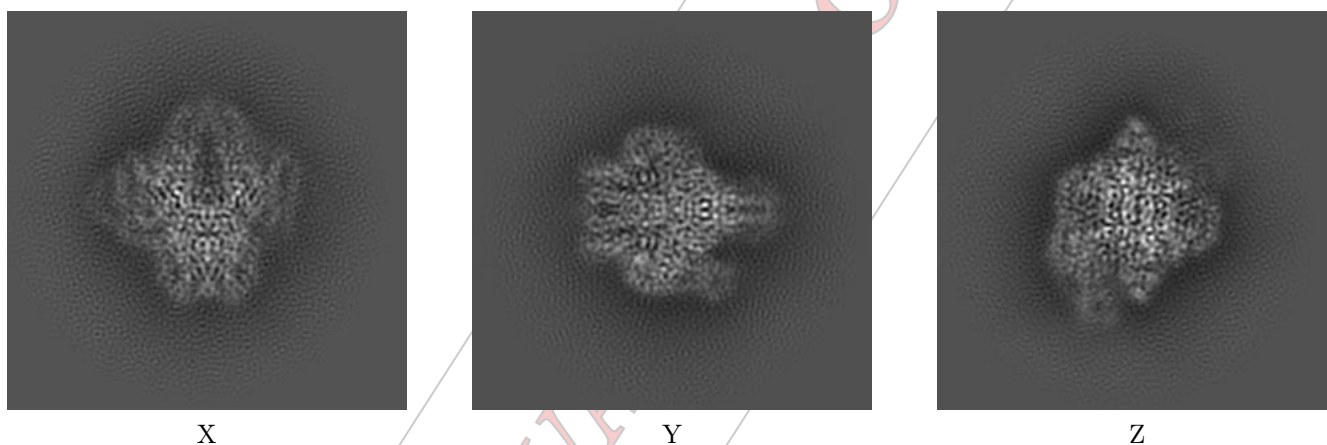
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-32496. 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](#)

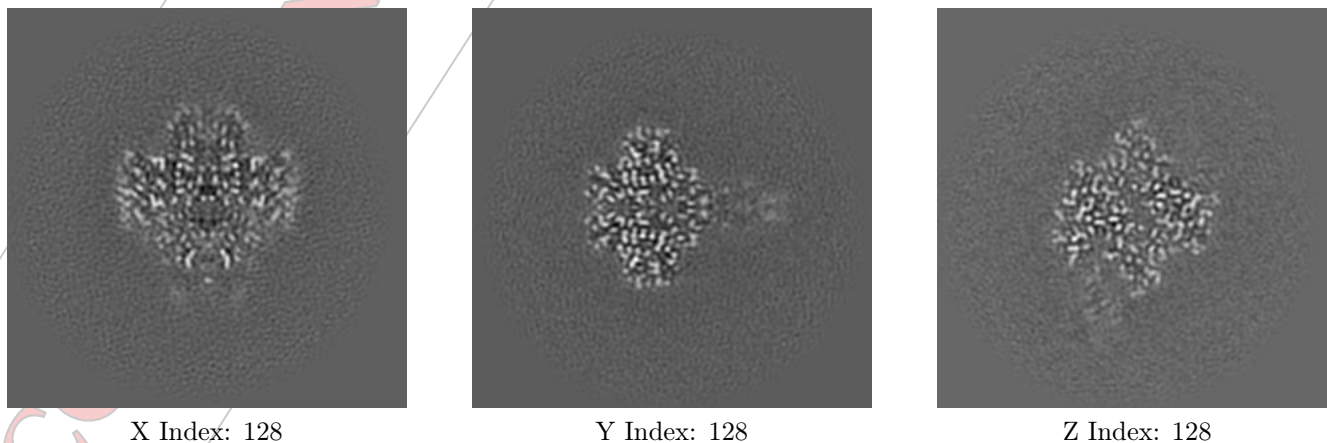
#### 6.1.1 Primary map



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

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

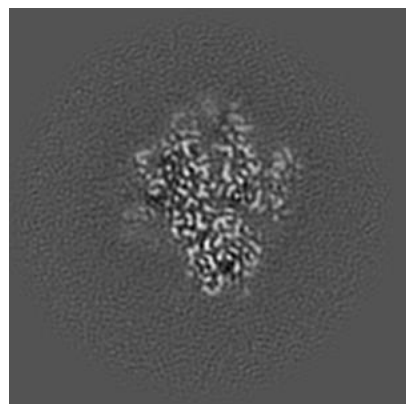
#### 6.2.1 Primary map



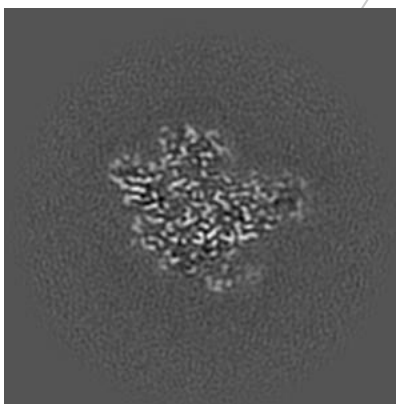
The images above show central slices of the map in three orthogonal directions.

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

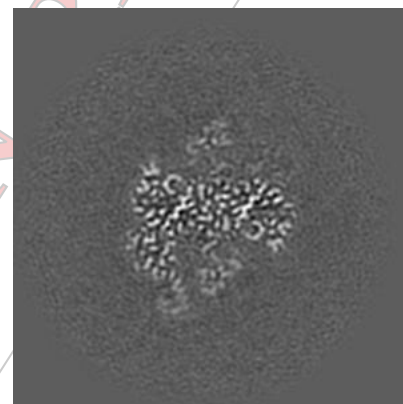
### 6.3.1 Primary map



X Index: 120



Y Index: 116

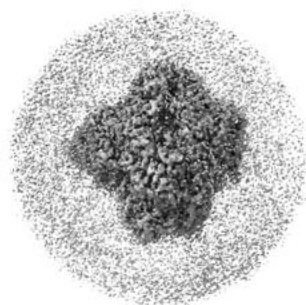


Z Index: 121

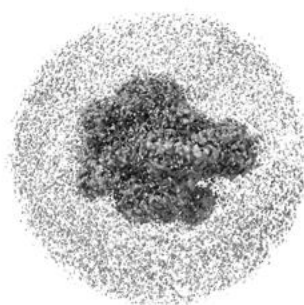
The images above show the largest variance slices of the map in three orthogonal directions.

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

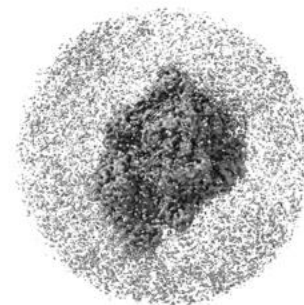
### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.143. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

## 6.5 Mask visualisation [i](#)

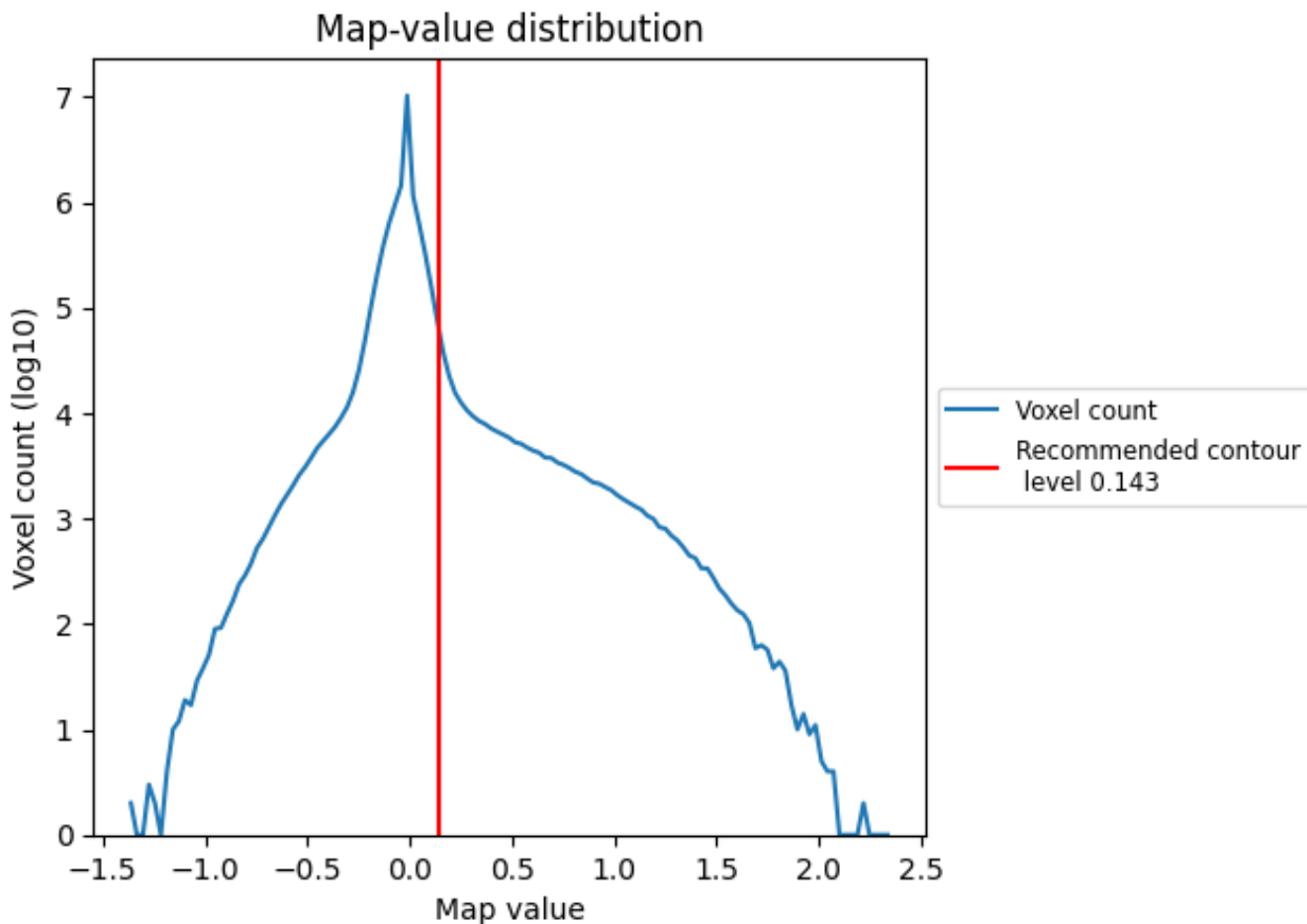
This section was not generated. No masks/segmentation were deposited.

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## 7 Map analysis [i](#)

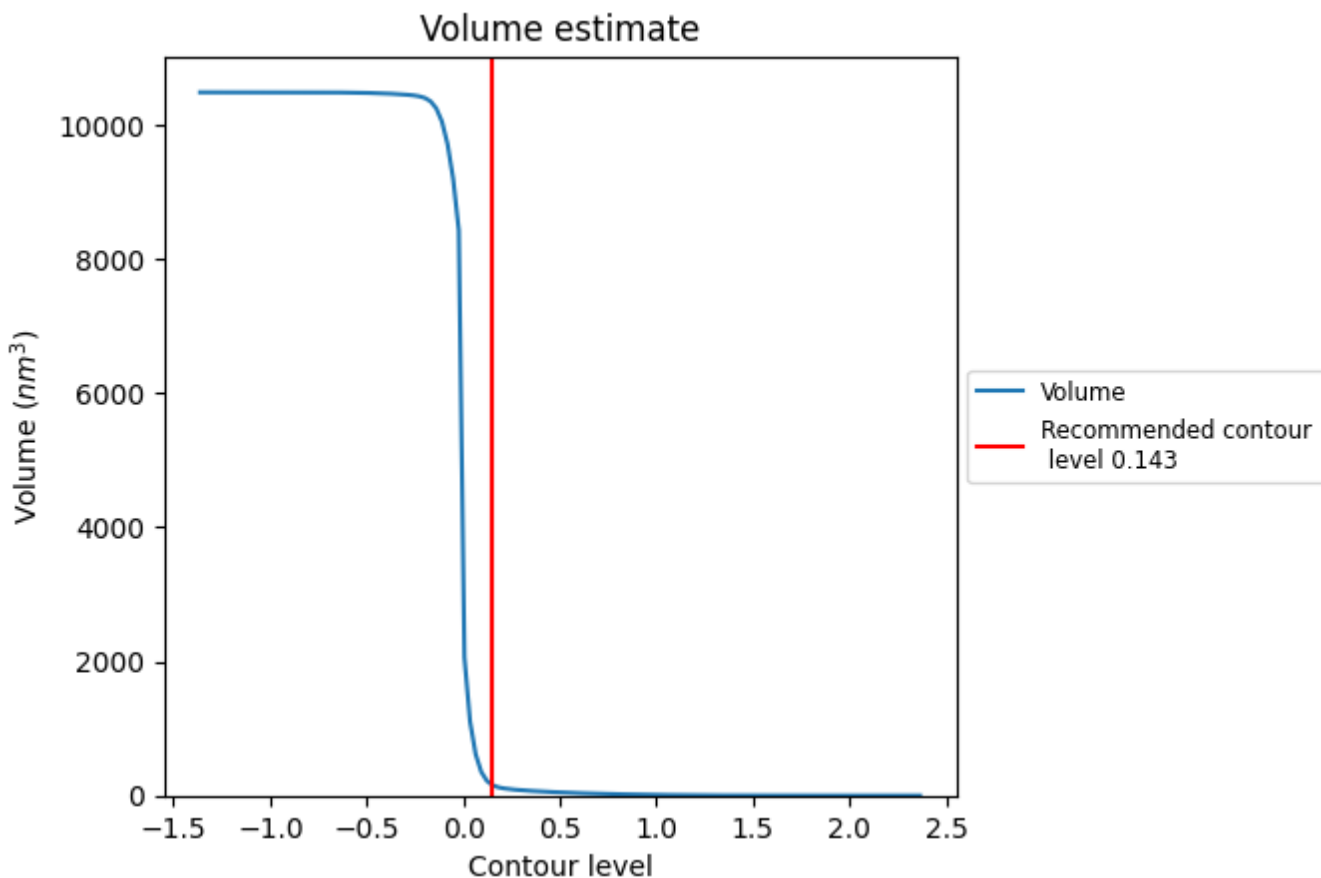
This section contains the results of statistical analysis of the map.

### 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.

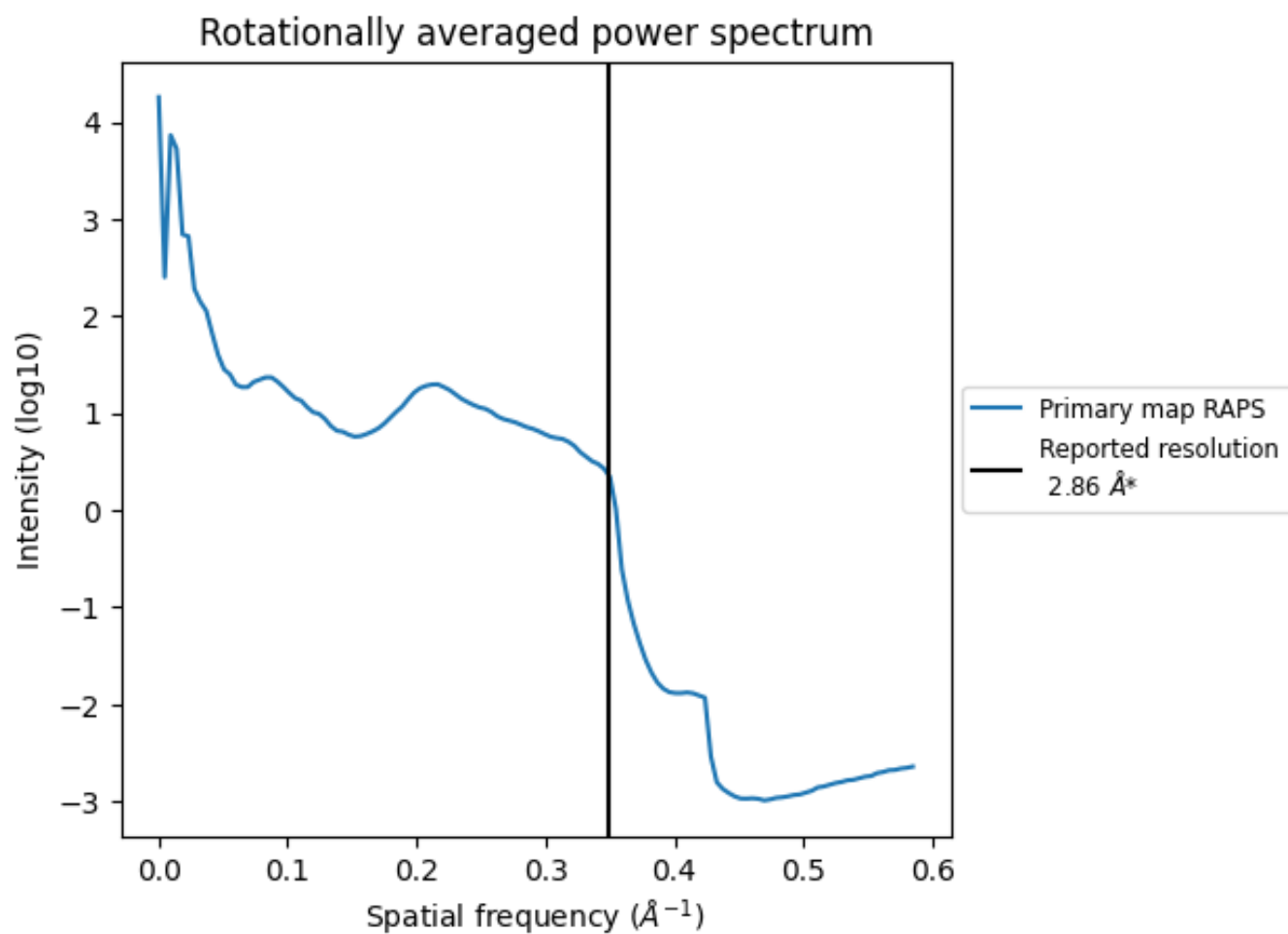
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 174 nm<sup>3</sup>; this corresponds to an approximate mass of 157 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 0.350 Å<sup>-1</sup>

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## 8 Fourier-Shell correlation

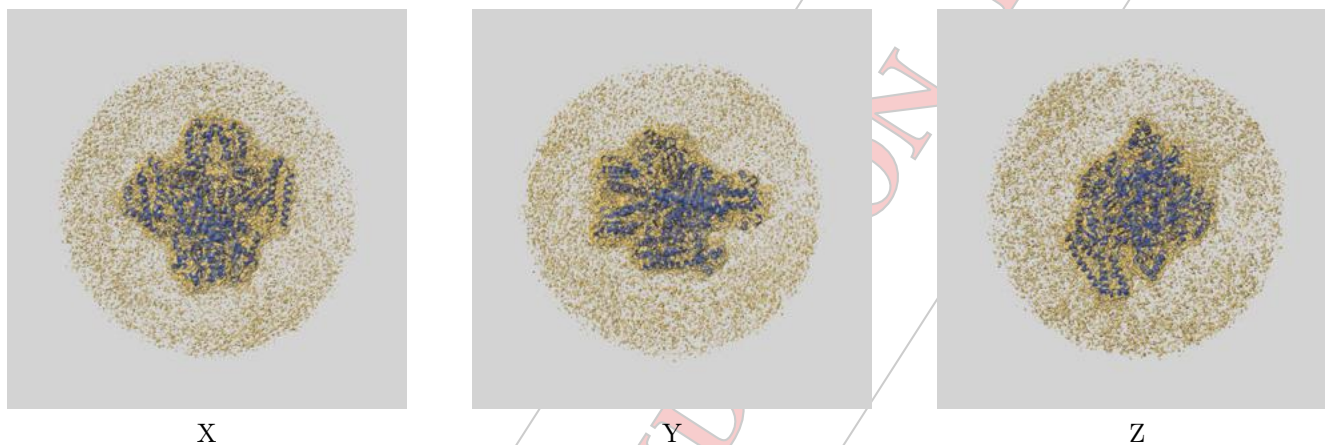
This section was not generated. No FSC curve or half-maps provided.

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

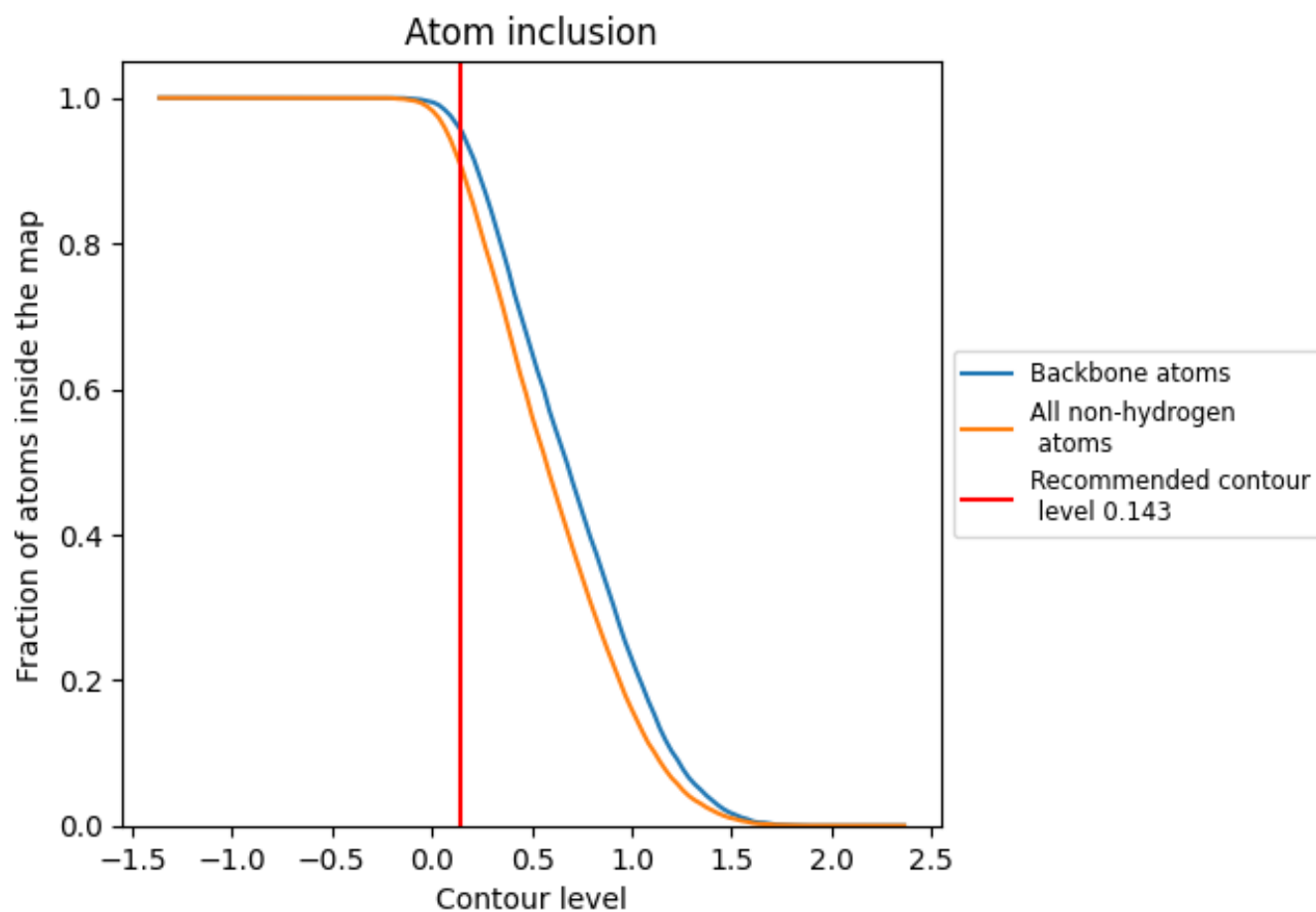
This section contains information regarding the fit between EMDB map EMD-32496 and PDB model 7WH2. Per-residue inclusion information can be found in section 3 on page 5.

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



The images above show the 3D surface view of the map at the recommended contour level 0.143 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 Atom inclusion [i](#)



At the recommended contour level, 96% of all backbone atoms, 91% of all non-hydrogen atoms, are inside the map.

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