



## Full wwPDB EM Validation Report ⓘ

Nov 9, 2022 – 03:02 PM EST

PDB ID : 6TYI  
EMDB ID : EMD-20583  
Title : ExbB-ExbD complex in MSP1E3D1 nanodisc  
Authors : Celia, H.; Botos, I.; Jiang, J.; Buchanan, S.K.  
Deposited on : 2019-08-09  
Resolution : 3.30 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 : 1.8.5 (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)  
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

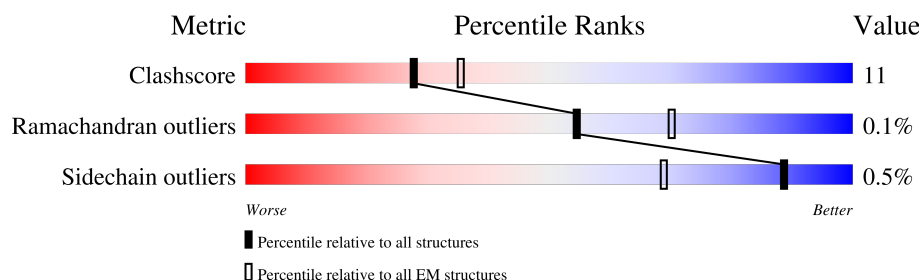
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.30 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	244	
1	B	244	
1	C	244	
1	D	244	
1	E	244	
2	Y	163	
2	Z	163	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	PEV	C	301	-	-	X	-

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 9184 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 Biopolymer transport protein ExbB.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	225	Total	C	N	O	S	0	0
			1702	1084	299	313	6		
1	B	225	Total	C	N	O	S	0	0
			1704	1086	299	313	6		
1	C	226	Total	C	N	O	S	0	0
			1712	1090	300	316	6		
1	D	226	Total	C	N	O	S	0	0
			1712	1090	300	316	6		
1	E	224	Total	C	N	O	S	0	0
			1696	1080	298	312	6		

- Molecule 2 is a protein called Biopolymer transport protein ExbD.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	Y	31	Total	C	N	O	S	0	0
			236	157	35	41	3		
2	Z	29	Total	C	N	O	S	0	0
			224	150	33	38	3		

There are 44 discrepancies between the modelled and reference sequences:

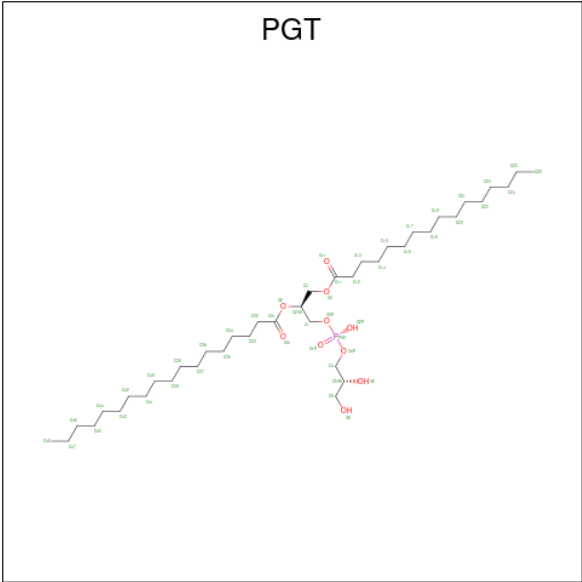
Chain	Residue	Modelled	Actual	Comment	Reference
Y	142	GLU	-	expression tag	UNP P0ABV2
Y	143	ASN	-	expression tag	UNP P0ABV2
Y	144	LEU	-	expression tag	UNP P0ABV2
Y	145	TYR	-	expression tag	UNP P0ABV2
Y	146	PHE	-	expression tag	UNP P0ABV2
Y	147	GLN	-	expression tag	UNP P0ABV2
Y	148	GLY	-	expression tag	UNP P0ABV2
Y	149	ASN	-	expression tag	UNP P0ABV2
Y	150	ALA	-	expression tag	UNP P0ABV2
Y	151	GLY	-	expression tag	UNP P0ABV2
Y	152	SER	-	expression tag	UNP P0ABV2

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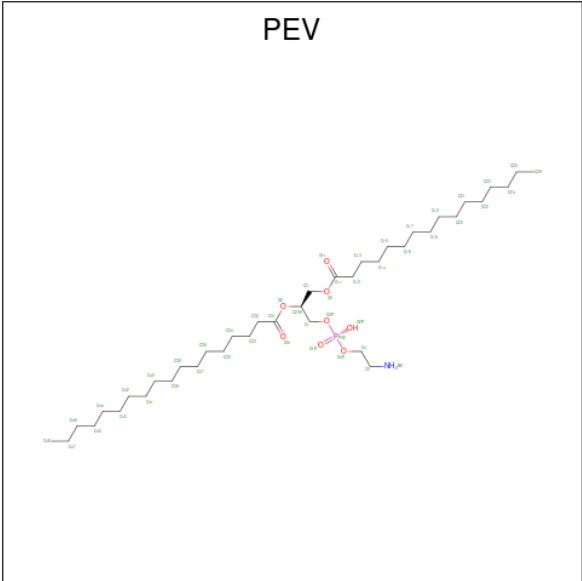
Chain	Residue	Modelled	Actual	Comment	Reference
Y	153	GLY	-	expression tag	UNP P0ABV2
Y	154	HIS	-	expression tag	UNP P0ABV2
Y	155	HIS	-	expression tag	UNP P0ABV2
Y	156	HIS	-	expression tag	UNP P0ABV2
Y	157	HIS	-	expression tag	UNP P0ABV2
Y	158	HIS	-	expression tag	UNP P0ABV2
Y	159	HIS	-	expression tag	UNP P0ABV2
Y	160	HIS	-	expression tag	UNP P0ABV2
Y	161	HIS	-	expression tag	UNP P0ABV2
Y	162	HIS	-	expression tag	UNP P0ABV2
Y	163	HIS	-	expression tag	UNP P0ABV2
Z	142	GLU	-	expression tag	UNP P0ABV2
Z	143	ASN	-	expression tag	UNP P0ABV2
Z	144	LEU	-	expression tag	UNP P0ABV2
Z	145	TYR	-	expression tag	UNP P0ABV2
Z	146	PHE	-	expression tag	UNP P0ABV2
Z	147	GLN	-	expression tag	UNP P0ABV2
Z	148	GLY	-	expression tag	UNP P0ABV2
Z	149	ASN	-	expression tag	UNP P0ABV2
Z	150	ALA	-	expression tag	UNP P0ABV2
Z	151	GLY	-	expression tag	UNP P0ABV2
Z	152	SER	-	expression tag	UNP P0ABV2
Z	153	GLY	-	expression tag	UNP P0ABV2
Z	154	HIS	-	expression tag	UNP P0ABV2
Z	155	HIS	-	expression tag	UNP P0ABV2
Z	156	HIS	-	expression tag	UNP P0ABV2
Z	157	HIS	-	expression tag	UNP P0ABV2
Z	158	HIS	-	expression tag	UNP P0ABV2
Z	159	HIS	-	expression tag	UNP P0ABV2
Z	160	HIS	-	expression tag	UNP P0ABV2
Z	161	HIS	-	expression tag	UNP P0ABV2
Z	162	HIS	-	expression tag	UNP P0ABV2
Z	163	HIS	-	expression tag	UNP P0ABV2

- Molecule 3 is (1S)-2-{{[(2R)-2,3-DIHYDROXYPROPYL]OXY}(HYDROXY)PHOSPHORYL]OXY}-1-[(PALMITOYLOXY)METHYL]ETHYL STEARATE (three-letter code: PGT) (formula: C<sub>40</sub>H<sub>79</sub>O<sub>10</sub>P).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
3	A	1	51	40	10	1	0

- Molecule 4 is (1S)-2-([(2-AMINOETHOXY)(HYDROXY)PHOSPHORYL]OXY)-1-[(PALMITOYLOXY)METHYL]ETHYL STEARATE (three-letter code: PEV) (formula: C<sub>39</sub>H<sub>78</sub>NO<sub>8</sub>P).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
4	B	1	49	39	1	8	1	0
4	C	1	49	39	1	8	1	0

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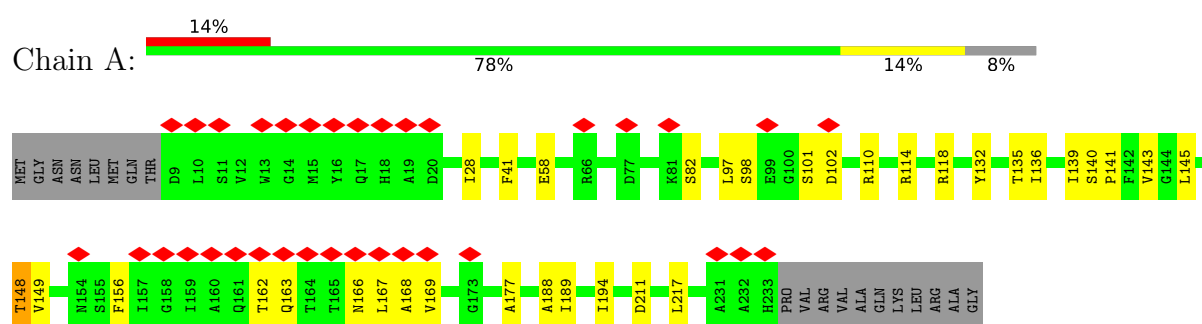
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Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
4	E	1	49	39	1	8	1	0

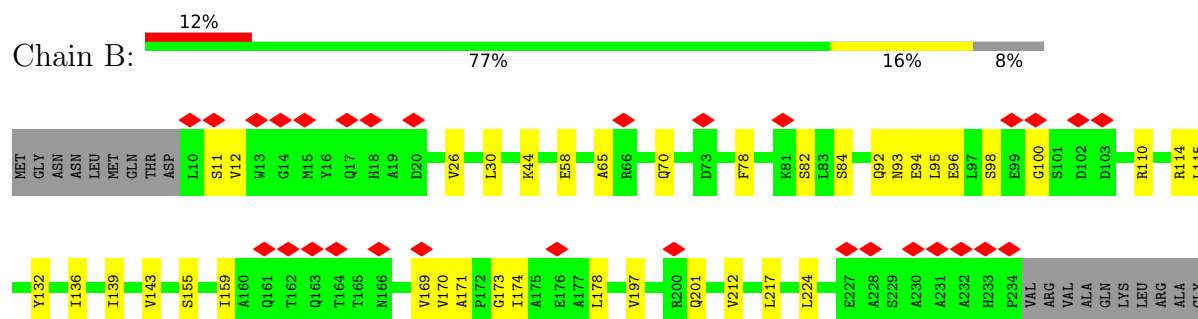
### 3 Residue-property plots [i](#)

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.

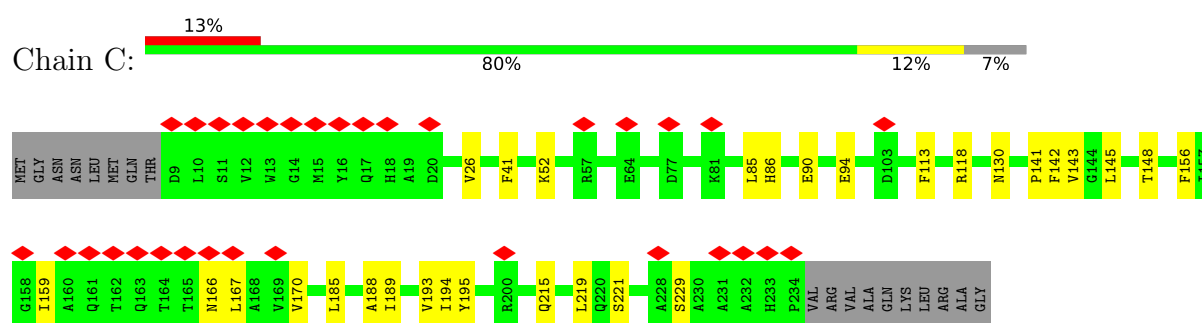
- Molecule 1: Biopolymer transport protein ExbB



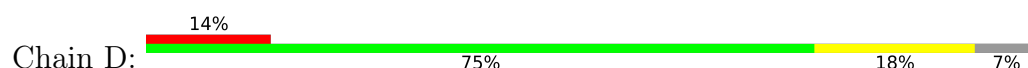
- Molecule 1: Biopolymer transport protein ExbB



- Molecule 1: Biopolymer transport protein ExbB

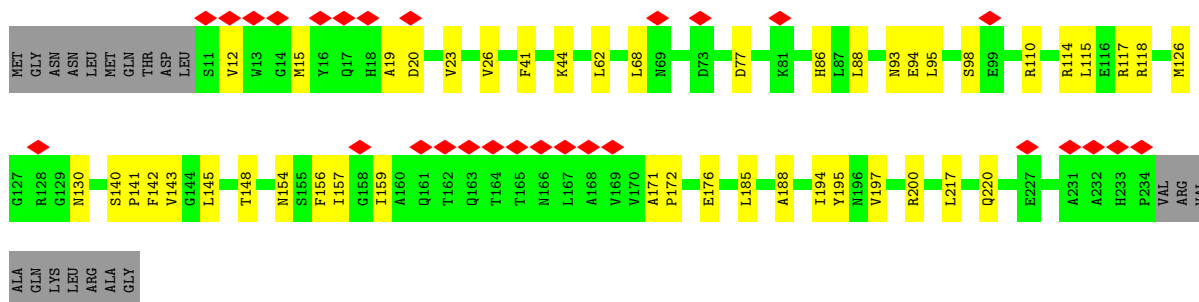
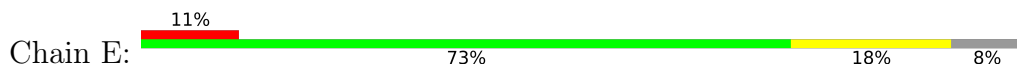


- Molecule 1: Biopolymer transport protein ExbB

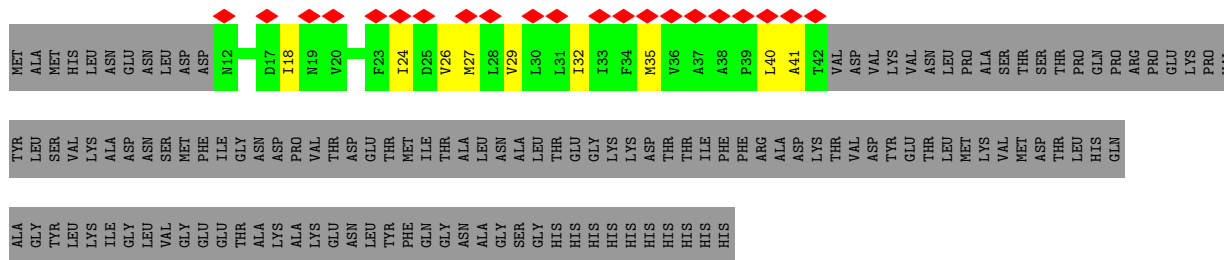




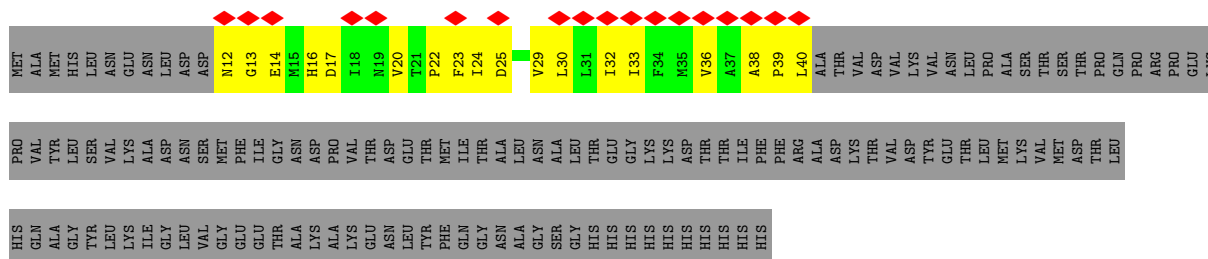
- Molecule 1: Biopolymer transport protein ExbB



- Molecule 2: Biopolymer transport protein ExbD



- Molecule 2: Biopolymer transport protein ExbD



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	85936	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 ( $e^-/\text{\AA}^2$ )	1.6	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	5.057	Depositor
Minimum map value	-3.357	Depositor
Average map value	0.008	Depositor
Map value standard deviation	0.148	Depositor
Recommended contour level	0.8	Depositor
Map size (Å)	203.51999, 203.51999, 203.51999	wwPDB
Map dimensions	192, 192, 192	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.06, 1.06, 1.06	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: PGT, PEV

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	0.50	0/1727	0.54	0/2337
1	B	0.49	0/1730	0.53	0/2342
1	C	0.50	0/1738	0.55	0/2353
1	D	0.51	0/1738	0.54	0/2353
1	E	0.51	0/1722	0.54	0/2331
2	Y	0.34	0/240	0.51	0/328
2	Z	0.39	0/228	0.54	0/311
All	All	0.50	0/9123	0.54	0/12355

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	1702	0	1732	42	0
1	B	1704	0	1737	31	0
1	C	1712	0	1741	37	0
1	D	1712	0	1741	36	0
1	E	1696	0	1726	36	0
2	Y	236	0	247	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	Z	224	0	235	25	0
3	A	51	0	78	12	0
4	B	49	0	77	13	0
4	C	49	0	77	24	0
4	E	49	0	77	8	0
All	All	9184	0	9468	200	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 11.

All (200) 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:C:52:LYS:NZ	4:C:301:PEV:H42	1.23	1.42
1:A:132:TYR:CE1	3:A:301:PGT:H202	1.58	1.37
1:C:52:LYS:NZ	4:C:301:PEV:C4	1.93	1.29
1:C:52:LYS:HZ2	4:C:301:PEV:C4	1.46	1.26
1:E:200:ARG:HG2	4:E:301:PEV:O2P	1.40	1.20
1:D:98:SER:OG	1:D:110:ARG:NH1	1.80	1.14
4:B:301:PEV:H31	4:C:301:PEV:H31	1.33	1.10
4:B:301:PEV:H321	4:B:301:PEV:H32	1.26	1.09
1:A:132:TYR:OH	3:A:301:PGT:H211	1.60	0.99
1:C:52:LYS:HZ1	4:C:301:PEV:H42	1.32	0.93
1:D:98:SER:HG	1:D:110:ARG:HH12	1.14	0.93
1:A:132:TYR:CZ	3:A:301:PGT:H202	2.05	0.92
1:A:132:TYR:HE1	3:A:301:PGT:H202	1.10	0.92
1:E:200:ARG:CG	4:E:301:PEV:O2P	2.17	0.91
1:D:196:ASN:HD21	2:Z:16:HIS:H	1.16	0.88
4:B:301:PEV:H121	4:C:301:PEV:H31	1.56	0.88
1:C:52:LYS:HZ3	4:C:301:PEV:H42	1.38	0.87
1:B:58:GLU:OE1	1:B:84:SER:HB2	1.75	0.87
4:B:301:PEV:H321	4:B:301:PEV:C3	2.01	0.86
1:A:132:TYR:HE1	3:A:301:PGT:C20	1.88	0.86
1:C:52:LYS:HZ1	4:C:301:PEV:C4	1.80	0.83
1:A:132:TYR:CE1	3:A:301:PGT:C20	2.53	0.82
1:A:132:TYR:OH	3:A:301:PGT:C21	2.30	0.80
1:C:156:PHE:HZ	2:Z:33:ILE:HG12	1.47	0.79
1:E:145:LEU:HD21	2:Y:26:VAL:HG11	1.66	0.78
4:B:301:PEV:HN61	4:C:301:PEV:C31	1.99	0.76
4:B:301:PEV:H142	4:C:301:PEV:O11	1.84	0.76
1:A:98:SER:OG	1:A:110:ARG:NH1	2.18	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:132:TYR:CE2	1:A:136:ILE:CD1	2.69	0.76
1:B:58:GLU:HG2	1:B:78:PHE:CE2	2.21	0.75
2:Z:20:VAL:HG22	2:Z:22:PRO:HD3	1.69	0.75
1:C:145:LEU:HD13	2:Z:23:PHE:HB3	1.69	0.73
4:B:301:PEV:H31	4:C:301:PEV:C3	2.16	0.72
1:C:52:LYS:NZ	4:C:301:PEV:H41	2.00	0.72
1:A:132:TYR:CE2	1:A:136:ILE:HD12	2.26	0.71
1:B:155:SER:HB2	1:B:173:GLY:HA3	1.73	0.69
4:B:301:PEV:H121	4:C:301:PEV:C3	2.22	0.69
1:C:52:LYS:HZ1	4:C:301:PEV:H41	1.58	0.68
1:C:141:PRO:HD3	1:C:188:ALA:HB2	1.75	0.67
1:A:132:TYR:CE2	1:A:136:ILE:HD11	2.29	0.67
4:B:301:PEV:N6	4:C:301:PEV:O31	2.28	0.67
4:B:301:PEV:N6	4:C:301:PEV:C31	2.58	0.67
1:B:92:GLN:NE2	1:B:96:GLU:OE1	2.27	0.67
1:A:168:ALA:HA	2:Y:40:LEU:HD21	1.76	0.66
1:A:211:ASP:OD1	1:E:117:ARG:NH1	2.25	0.66
1:C:145:LEU:HA	1:C:148:THR:HG22	1.76	0.65
1:D:50:ASN:OD1	1:D:53:ARG:NH1	2.31	0.64
1:A:189:ILE:HD11	1:E:142:PHE:HB3	1.80	0.64
1:D:148:THR:HG21	2:Z:25:ASP:HB3	1.79	0.63
2:Y:24:ILE:HD12	2:Z:24:ILE:HG13	1.79	0.63
2:Z:17:ASP:OD1	2:Z:17:ASP:N	2.34	0.60
1:D:145:LEU:HD22	1:E:185:LEU:HD11	1.83	0.60
1:B:98:SER:OG	1:B:110:ARG:NH2	2.30	0.60
1:D:178:LEU:HG	2:Z:29:VAL:HG21	1.85	0.59
1:D:165:THR:HG22	1:D:166:ASN:H	1.66	0.59
1:D:178:LEU:HD11	2:Z:29:VAL:HG11	1.85	0.58
1:A:167:LEU:HG	1:A:169:VAL:HG13	1.86	0.58
1:B:170:VAL:HG12	1:B:174:ILE:HG12	1.87	0.57
1:E:41:PHE:HB2	1:E:194:ILE:HD13	1.86	0.57
1:E:20:ASP:OD2	1:E:154:ASN:ND2	2.38	0.57
1:C:193:VAL:HG21	4:C:301:PEV:H191	1.86	0.57
1:E:94:GLU:OE1	1:E:110:ARG:NH1	2.37	0.57
1:D:12:VAL:HG23	1:D:179:LEU:HD21	1.87	0.56
1:D:10:LEU:HD21	1:D:14:GLY:HA3	1.86	0.56
1:A:148:THR:HG22	1:A:149:VAL:N	2.20	0.56
1:E:98:SER:HG	1:E:110:ARG:HH12	1.54	0.56
2:Z:30:LEU:HA	2:Z:33:ILE:HD12	1.88	0.55
1:C:52:LYS:HZ2	4:C:301:PEV:H42	1.07	0.55
1:B:93:ASN:ND2	1:B:114:ARG:HH22	2.04	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:58:GLU:HG2	1:B:78:PHE:CD2	2.43	0.54
4:B:301:PEV:H11	4:C:301:PEV:H2	1.89	0.54
1:B:94:GLU:HB2	1:B:114:ARG:HH11	1.72	0.54
1:A:58:GLU:OE2	1:A:82:SER:OG	2.20	0.54
1:C:113:PHE:HD2	1:D:218:LEU:HD21	1.73	0.54
2:Z:24:ILE:H	2:Z:24:ILE:HD12	1.73	0.54
1:D:15:MET:HE2	1:D:179:LEU:HD22	1.90	0.53
1:B:78:PHE:HB3	1:B:82:SER:OG	2.09	0.53
1:E:141:PRO:HG3	2:Y:18:ILE:HG23	1.90	0.53
1:A:145:LEU:HD12	1:A:148:THR:CG2	2.39	0.52
1:A:132:TYR:CZ	1:A:136:ILE:HD11	2.44	0.52
1:D:195:TYR:OH	2:Z:14:GLU:HG3	2.10	0.52
1:A:139:ILE:O	1:A:143:VAL:HG23	2.11	0.51
1:A:135:THR:HG21	3:A:301:PGT:H352	1.92	0.51
1:B:84:SER:OG	1:B:212:VAL:HG11	2.11	0.51
1:A:148:THR:CG2	1:A:149:VAL:N	2.75	0.50
1:E:62:LEU:HD11	1:E:88:LEU:HD11	1.93	0.50
1:D:93:ASN:ND2	1:D:114:ARG:HH12	2.08	0.50
1:C:156:PHE:CZ	2:Z:33:ILE:HG12	2.37	0.50
1:A:41:PHE:HB2	1:A:194:ILE:HD13	1.94	0.50
1:B:174:ILE:HD11	2:Y:35:MET:SD	2.52	0.50
1:D:32:LEU:O	1:D:36:VAL:HG13	2.12	0.49
1:E:93:ASN:ND2	1:E:114:ARG:HH22	2.11	0.49
1:D:203:GLY:HA3	2:Z:12:ASN:HB3	1.94	0.49
1:C:142:PHE:CZ	2:Z:20:VAL:HG13	2.47	0.49
1:D:174:ILE:HD11	2:Z:32:ILE:HG21	1.95	0.48
1:A:145:LEU:HD12	1:A:148:THR:HG21	1.96	0.48
1:C:86:HIS:HB3	1:C:118:ARG:NH2	2.29	0.48
1:E:44:LYS:NZ	1:E:126:MET:O	2.47	0.48
1:B:65:ALA:O	1:B:70:GLN:NE2	2.47	0.48
1:A:140:SER:HB3	1:A:188:ALA:HB2	1.96	0.47
1:D:93:ASN:HD22	1:D:114:ARG:HH12	1.60	0.47
1:C:130:ASN:HB3	1:C:195:TYR:CE1	2.50	0.47
1:D:197:VAL:O	1:D:201:GLN:HG2	2.14	0.47
1:A:132:TYR:OH	3:A:301:PGT:C20	2.63	0.47
1:C:41:PHE:HB2	1:C:194:ILE:HD13	1.96	0.47
1:D:196:ASN:ND2	2:Z:16:HIS:H	1.98	0.47
1:C:189:ILE:HG21	4:C:301:PEV:H241	1.96	0.46
1:D:166:ASN:O	1:D:168:ALA:N	2.48	0.46
1:A:118:ARG:HD3	1:A:118:ARG:HA	1.64	0.46
4:C:301:PEV:N6	4:C:301:PEV:O3P	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:148:THR:HG21	2:Z:25:ASP:CB	2.45	0.46
1:A:132:TYR:OH	3:A:301:PGT:H202	2.15	0.46
1:A:141:PRO:HD3	1:A:188:ALA:HB2	1.98	0.46
1:B:95:LEU:HD21	1:B:224:LEU:HD21	1.98	0.46
2:Z:36:VAL:HG22	2:Z:40:LEU:HD23	1.97	0.46
1:A:140:SER:N	1:A:141:PRO:HD2	2.31	0.45
1:D:41:PHE:HB2	1:D:194:ILE:HD13	1.98	0.45
1:E:197:VAL:HG21	4:E:301:PEV:H362	1.98	0.45
1:D:140:SER:N	1:D:141:PRO:HD2	2.31	0.45
1:A:132:TYR:HH	3:A:301:PGT:H211	1.75	0.45
1:D:178:LEU:CG	2:Z:29:VAL:HG21	2.47	0.45
1:D:199:ALA:HB1	2:Z:13:GLY:HA3	1.99	0.45
1:A:166:ASN:HD21	2:Y:41:ALA:HA	1.82	0.45
1:B:110:ARG:HD3	1:C:221:SER:HB2	1.98	0.45
4:B:301:PEV:C3	4:C:301:PEV:H31	2.24	0.45
1:E:19:ALA:HB1	1:E:23:VAL:HB	1.98	0.45
1:E:200:ARG:CD	4:E:301:PEV:O2P	2.64	0.45
1:B:139:ILE:HD13	1:B:139:ILE:HA	1.77	0.44
4:E:301:PEV:H342	4:E:301:PEV:H2	1.99	0.44
1:A:148:THR:OG1	1:A:177:ALA:O	2.24	0.44
1:B:11:SER:OG	1:B:12:VAL:N	2.49	0.44
1:B:30:LEU:HD23	1:B:30:LEU:HA	1.78	0.44
1:C:130:ASN:HB3	1:C:195:TYR:HE1	1.82	0.44
1:B:78:PHE:O	1:B:82:SER:OG	2.35	0.44
1:A:132:TYR:CZ	3:A:301:PGT:C20	2.91	0.44
1:C:166:ASN:OD1	1:C:167:LEU:N	2.50	0.44
1:E:26:VAL:HG13	1:E:143:VAL:HG12	2.00	0.44
1:A:156:PHE:HZ	1:B:171:ALA:HA	1.82	0.44
1:C:26:VAL:HG13	1:C:143:VAL:HG12	2.00	0.44
1:B:93:ASN:HD22	1:B:114:ARG:HH22	1.66	0.44
2:Y:27:MET:SD	2:Z:24:ILE:HG21	2.57	0.44
1:A:217:LEU:HD23	1:A:217:LEU:HA	1.71	0.44
1:C:215:GLN:O	1:C:219:LEU:HG	2.18	0.44
1:D:139:ILE:HD11	4:E:301:PEV:H182	2.00	0.44
1:E:68:LEU:HD23	1:E:68:LEU:HA	1.82	0.44
2:Z:38:ALA:HB3	2:Z:39:PRO:HD3	2.00	0.44
1:C:159:ILE:HD12	1:C:170:VAL:HB	2.01	0.43
4:E:301:PEV:H211	4:E:301:PEV:H181	1.90	0.43
1:E:145:LEU:O	1:E:148:THR:HG22	2.18	0.43
1:B:217:LEU:HA	1:B:217:LEU:HD23	1.74	0.43
1:E:98:SER:OG	1:E:110:ARG:NH1	2.35	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:162:THR:HG23	1:A:163:GLN:H	1.83	0.43
1:B:178:LEU:HD21	2:Y:32:ILE:HG21	2.01	0.43
1:C:141:PRO:HD3	1:C:188:ALA:CB	2.47	0.43
1:B:132:TYR:CZ	1:B:136:ILE:HD11	2.53	0.43
1:C:145:LEU:HA	1:C:145:LEU:HD23	1.86	0.43
1:E:15:MET:HB3	1:E:176:GLU:OE2	2.18	0.42
1:B:26:VAL:HG13	1:B:143:VAL:HG12	2.02	0.42
1:B:100:GLY:O	1:C:229:SER:OG	2.26	0.42
1:E:86:HIS:HB3	1:E:118:ARG:NH1	2.35	0.42
1:A:110:ARG:O	1:A:114:ARG:HG3	2.19	0.42
4:C:301:PEV:H432	4:C:301:PEV:H402	1.86	0.42
1:D:110:ARG:O	1:D:114:ARG:HG3	2.20	0.42
1:E:185:LEU:HD23	1:E:185:LEU:HA	1.90	0.42
1:B:44:LYS:HD3	1:B:44:LYS:HA	1.66	0.42
1:E:130:ASN:HB3	1:E:195:TYR:CE1	2.55	0.42
1:E:156:PHE:O	1:E:159:ILE:HG22	2.19	0.42
1:E:157:ILE:HA	1:E:157:ILE:HD13	1.79	0.42
1:D:164:THR:HG21	1:D:169:VAL:HG11	2.01	0.42
1:E:93:ASN:HD22	1:E:114:ARG:HH22	1.67	0.42
1:C:145:LEU:CD1	2:Z:23:PHE:HB3	2.47	0.42
1:D:150:TRP:HZ2	1:E:12:VAL:HG11	1.85	0.42
4:B:301:PEV:H411	4:C:301:PEV:H192	2.02	0.41
1:C:85:LEU:HA	1:C:85:LEU:HD12	1.77	0.41
1:C:118:ARG:HA	1:C:118:ARG:HD2	1.90	0.41
1:E:62:LEU:HA	1:E:62:LEU:HD23	1.88	0.41
1:A:97:LEU:HD23	1:A:97:LEU:HA	1.87	0.41
1:C:90:GLU:O	1:C:94:GLU:HG2	2.19	0.41
1:D:131:GLY:HA3	4:E:301:PEV:O1P	2.20	0.41
1:C:86:HIS:HB3	1:C:118:ARG:HH22	1.86	0.41
1:D:140:SER:HB2	1:D:188:ALA:HB2	2.01	0.41
1:E:95:LEU:HG	1:E:220:GLN:HE21	1.85	0.41
1:E:140:SER:N	1:E:141:PRO:HD2	2.35	0.41
1:E:171:ALA:N	1:E:172:PRO:HD2	2.36	0.41
1:C:156:PHE:HD1	1:C:156:PHE:HA	1.69	0.41
1:D:44:LYS:HE3	1:D:48:PHE:HE2	1.84	0.41
2:Z:36:VAL:O	2:Z:36:VAL:HG13	2.21	0.41
1:A:28:ILE:HD13	1:A:28:ILE:HA	1.94	0.41
1:A:101:SER:OG	1:A:102:ASP:N	2.54	0.41
1:B:115:LEU:HD23	1:B:115:LEU:HA	1.87	0.41
1:B:132:TYR:OH	1:B:136:ILE:HD11	2.22	0.40
1:E:141:PRO:HD3	1:E:188:ALA:CB	2.51	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:148:THR:CG2	2:Y:29:VAL:HG11	2.50	0.40
1:C:185:LEU:HD23	1:C:185:LEU:HA	1.90	0.40
1:D:163:GLN:NE2	1:D:164:THR:O	2.54	0.40
1:E:115:LEU:HD12	1:E:217:LEU:HG	2.04	0.40
1:B:197:VAL:O	1:B:201:GLN:HG3	2.22	0.40
1:E:12:VAL:HA	1:E:15:MET:CE	2.51	0.40
1:B:159:ILE:HG22	1:B:169:VAL:HG23	2.03	0.40
1:D:48:PHE:HZ	1:D:202:ILE:HG12	1.87	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	223/244 (91%)	212 (95%)	11 (5%)	0	100	100
1	B	223/244 (91%)	217 (97%)	6 (3%)	0	100	100
1	C	224/244 (92%)	215 (96%)	9 (4%)	0	100	100
1	D	224/244 (92%)	211 (94%)	12 (5%)	1 (0%)	34	66
1	E	222/244 (91%)	213 (96%)	9 (4%)	0	100	100
2	Y	29/163 (18%)	28 (97%)	1 (3%)	0	100	100
2	Z	27/163 (17%)	19 (70%)	8 (30%)	0	100	100
All	All	1172/1546 (76%)	1115 (95%)	56 (5%)	1 (0%)	54	81

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	167	LEU

### 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	174/190 (92%)	173 (99%)	1 (1%)	86	91
1	B	175/190 (92%)	175 (100%)	0	100	100
1	C	176/190 (93%)	176 (100%)	0	100	100
1	D	176/190 (93%)	173 (98%)	3 (2%)	60	78
1	E	174/190 (92%)	173 (99%)	1 (1%)	86	91
2	Y	27/141 (19%)	27 (100%)	0	100	100
2	Z	26/141 (18%)	26 (100%)	0	100	100
All	All	928/1232 (75%)	923 (100%)	5 (0%)	89	93

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

Mol	Chain	Res	Type
1	A	148	THR
1	D	77	ASP
1	D	82	SER
1	D	98	SER
1	E	77	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	69	ASN
1	B	70	GLN
1	B	93	ASN
1	D	18	HIS
1	D	93	ASN
1	D	125	GLN
1	D	163	GLN
1	D	196	ASN
1	D	215	GLN
1	E	69	ASN

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Mol	Chain	Res	Type
1	E	93	ASN
1	E	154	ASN
1	E	161	GLN
1	E	196	ASN
2	Z	12	ASN
2	Z	16	HIS

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

4 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	PEV	B	301	-	48,48,48	0.26	0	51,53,53	0.46	0
4	PEV	E	301	-	48,48,48	0.94	4 (8%)	51,53,53	1.19	3 (5%)
3	PGT	A	301	-	50,50,50	1.26	5 (10%)	53,56,56	1.06	3 (5%)
4	PEV	C	301	-	48,48,48	0.94	4 (8%)	51,53,53	1.17	3 (5%)

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	PEV	B	301	-	-	11/52/52/52	-
4	PEV	E	301	-	-	33/52/52/52	-
3	PGT	A	301	-	-	30/55/55/55	-
4	PEV	C	301	-	-	29/52/52/52	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	301	PGT	O3-C11	3.48	1.43	1.33
3	A	301	PGT	O2-C2	-3.22	1.38	1.46
4	E	301	PEV	O2-C2	-2.58	1.40	1.46
4	C	301	PEV	O2-C2	-2.36	1.40	1.46
4	C	301	PEV	O3-C11	2.36	1.40	1.33
3	A	301	PGT	O2-C31	2.33	1.40	1.34
4	E	301	PEV	O3-C11	2.29	1.40	1.33
4	C	301	PEV	O2-C31	2.27	1.40	1.34
4	E	301	PEV	O2-C31	2.24	1.40	1.34
4	E	301	PEV	O3-C3	-2.16	1.40	1.45
4	C	301	PEV	O3-C3	-2.11	1.40	1.45
3	A	301	PGT	P-O2P	-2.10	1.45	1.55
3	A	301	PGT	C12-C11	2.07	1.56	1.50

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	301	PEV	O2-C31-C32	4.70	121.63	111.50
4	C	301	PEV	O2-C31-C32	4.34	120.86	111.50
3	A	301	PGT	O2-C31-C32	3.37	118.76	111.50
3	A	301	PGT	O3-C11-C12	2.88	120.95	111.91
4	C	301	PEV	O3-C11-C12	2.77	120.61	111.91
4	E	301	PEV	O3-C11-C12	2.39	119.41	111.91
3	A	301	PGT	O2P-P-O1P	-2.31	100.80	112.24
4	C	301	PEV	O2P-P-O1P	-2.30	100.88	112.24
4	E	301	PEV	O2P-P-O1P	-2.16	101.55	112.24

There are no chirality outliers.

All (103) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	301	PGT	O2-C2-C3-O3
3	A	301	PGT	C4-O4P-P-O1P
4	B	301	PEV	C32-C31-O2-C2
4	B	301	PEV	O31-C31-O2-C2
4	B	301	PEV	O11-C11-O3-C3
4	B	301	PEV	C12-C11-O3-C3
4	C	301	PEV	O2-C2-C3-O3
4	C	301	PEV	C5-C4-O4P-P
4	C	301	PEV	O4P-C4-C5-N6
4	E	301	PEV	C32-C31-O2-C2
4	E	301	PEV	O31-C31-O2-C2
4	E	301	PEV	C1-O3P-P-O1P
3	A	301	PGT	C11-C12-C13-C14
4	E	301	PEV	C11-C12-C13-C14
4	C	301	PEV	C40-C41-C42-C43
3	A	301	PGT	C4-O4P-P-O3P
4	C	301	PEV	C4-O4P-P-O3P
4	E	301	PEV	C1-O3P-P-O4P
4	E	301	PEV	C4-O4P-P-O3P
4	C	301	PEV	C12-C11-O3-C3
4	E	301	PEV	C34-C35-C36-C37
4	E	301	PEV	C15-C16-C17-C18
4	E	301	PEV	C20-C21-C22-C23
4	C	301	PEV	C18-C19-C20-C21
4	C	301	PEV	C20-C21-C22-C23
4	E	301	PEV	C21-C22-C23-C24
4	E	301	PEV	C17-C18-C19-C20
3	A	301	PGT	C12-C11-O3-C3
3	A	301	PGT	C35-C36-C37-C38
4	C	301	PEV	O11-C11-O3-C3
3	A	301	PGT	C17-C18-C19-C20
4	E	301	PEV	C39-C40-C41-C42
3	A	301	PGT	C31-C32-C33-C34
4	C	301	PEV	C32-C33-C34-C35
3	A	301	PGT	C13-C14-C15-C16
4	E	301	PEV	C32-C33-C34-C35
4	C	301	PEV	C34-C35-C36-C37
4	E	301	PEV	C16-C17-C18-C19
4	C	301	PEV	C43-C44-C45-C46
4	C	301	PEV	C39-C40-C41-C42
3	A	301	PGT	C32-C33-C34-C35
3	A	301	PGT	C43-C44-C45-C46
3	A	301	PGT	C19-C20-C21-C22

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Mol	Chain	Res	Type	Atoms
3	A	301	PGT	C20-C21-C22-C23
4	E	301	PEV	C35-C36-C37-C38
3	A	301	PGT	O11-C11-O3-C3
3	A	301	PGT	C44-C45-C46-C47
4	E	301	PEV	C12-C13-C14-C15
4	C	301	PEV	C17-C18-C19-C20
3	A	301	PGT	C40-C41-C42-C43
3	A	301	PGT	C32-C31-O2-C2
4	C	301	PEV	C32-C31-O2-C2
4	C	301	PEV	O31-C31-O2-C2
4	E	301	PEV	C31-C32-C33-C34
3	A	301	PGT	O31-C31-O2-C2
4	E	301	PEV	C1-C2-C3-O3
4	E	301	PEV	C23-C24-C25-C26
4	C	301	PEV	C31-C32-C33-C34
4	E	301	PEV	C22-C23-C24-C25
3	A	301	PGT	C45-C46-C47-C48
4	E	301	PEV	O4P-C4-C5-N6
4	E	301	PEV	C18-C19-C20-C21
4	E	301	PEV	C43-C44-C45-C46
4	E	301	PEV	C42-C43-C44-C45
3	A	301	PGT	C12-C13-C14-C15
4	C	301	PEV	C14-C15-C16-C17
4	C	301	PEV	C11-C12-C13-C14
4	C	301	PEV	C35-C36-C37-C38
3	A	301	PGT	C1-C2-C3-O3
4	C	301	PEV	C1-C2-C3-O3
3	A	301	PGT	O3P-C1-C2-O2
4	C	301	PEV	C12-C13-C14-C15
3	A	301	PGT	C14-C15-C16-C17
4	C	301	PEV	C1-O3P-P-O4P
4	C	301	PEV	C1-O3P-P-O1P
4	C	301	PEV	C4-O4P-P-O1P
4	E	301	PEV	C1-O3P-P-O2P
4	E	301	PEV	C4-O4P-P-O2P
3	A	301	PGT	O3P-C1-C2-C3
4	E	301	PEV	C36-C37-C38-C39
4	E	301	PEV	O2-C2-C3-O3
4	B	301	PEV	C35-C36-C37-C38
4	E	301	PEV	C45-C46-C47-C48
4	B	301	PEV	C37-C38-C39-C40
4	E	301	PEV	C2-C1-O3P-P

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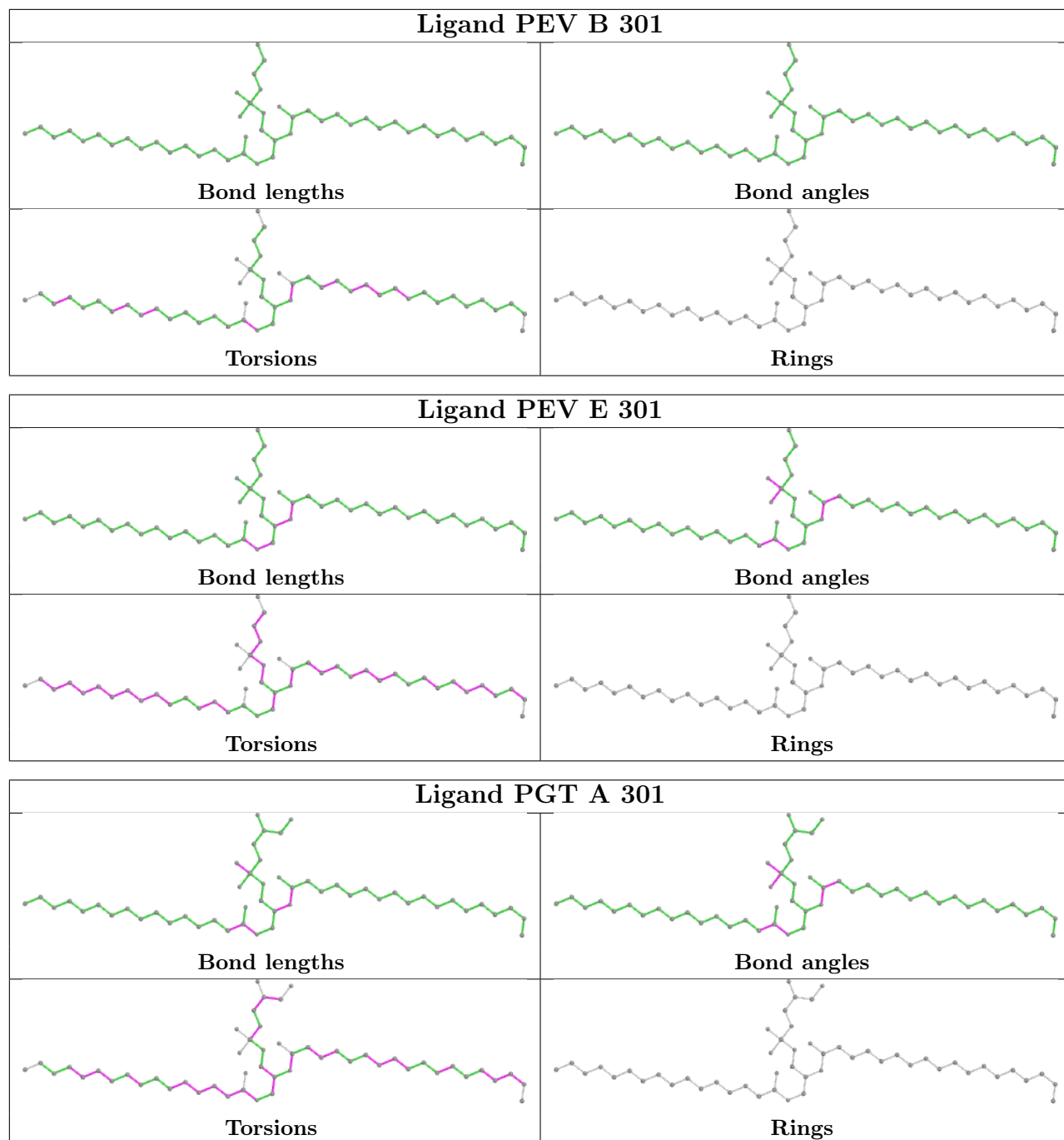
Mol	Chain	Res	Type	Atoms
3	A	301	PGT	C36-C37-C38-C39
4	E	301	PEV	C41-C42-C43-C44
4	B	301	PEV	C22-C23-C24-C25
3	A	301	PGT	C37-C38-C39-C40
3	A	301	PGT	C21-C22-C23-C24
4	C	301	PEV	C36-C37-C38-C39
4	C	301	PEV	C23-C24-C25-C26
4	B	301	PEV	C32-C33-C34-C35
3	A	301	PGT	O4P-C4-C5-C6
4	B	301	PEV	C18-C19-C20-C21
4	C	301	PEV	C16-C17-C18-C19
3	A	301	PGT	O5-C5-C6-O6
4	B	301	PEV	C34-C35-C36-C37
4	E	301	PEV	C19-C20-C21-C22
3	A	301	PGT	O3-C11-C12-C13
4	E	301	PEV	C5-C4-O4P-P
4	B	301	PEV	C16-C17-C18-C19
4	C	301	PEV	O3-C11-C12-C13

There are no ring outliers.

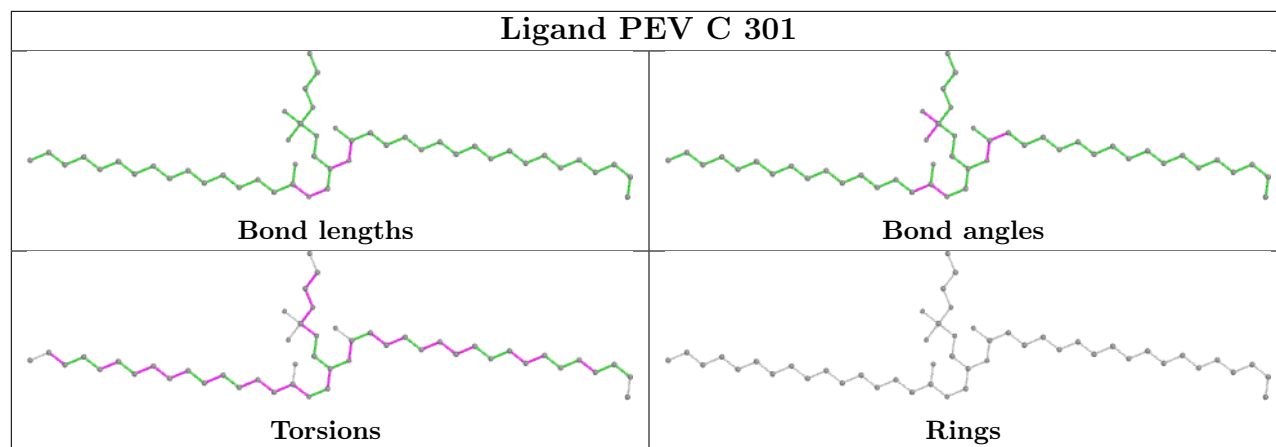
4 monomers are involved in 46 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	301	PEV	13	0
4	E	301	PEV	8	0
3	A	301	PGT	12	0
4	C	301	PEV	24	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-20583. These allow visual inspection of the internal detail of the map and identification of artifacts.

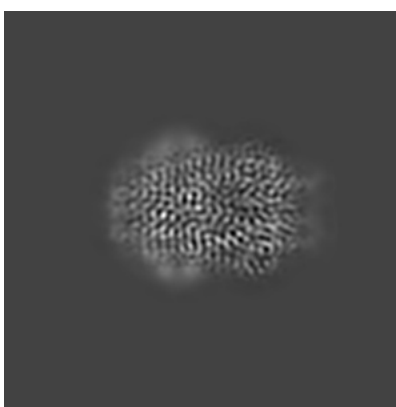
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

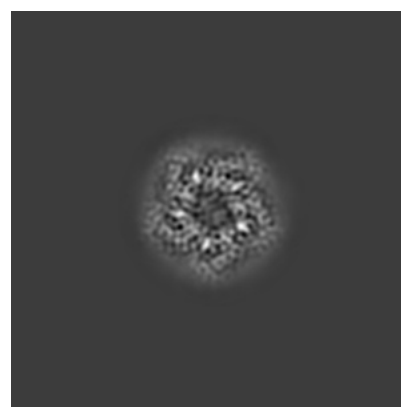
#### 6.1.1 Primary map



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: 96



Y Index: 96



Z Index: 96

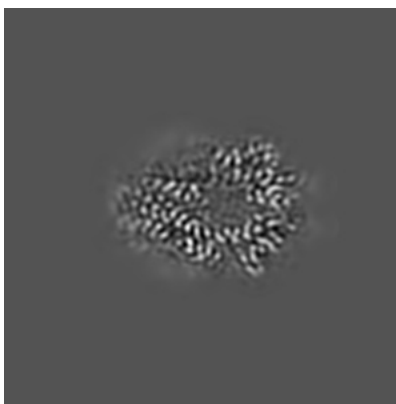
The images above show central slices of the map in three orthogonal directions.

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

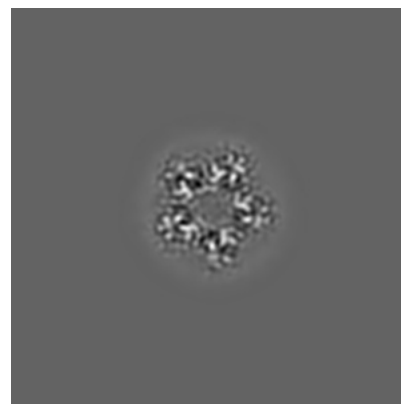
### 6.3.1 Primary map



X Index: 83



Y Index: 85

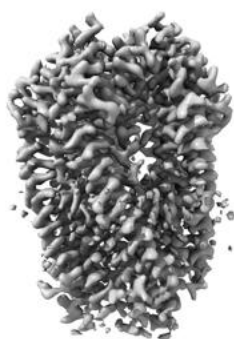


Z Index: 92

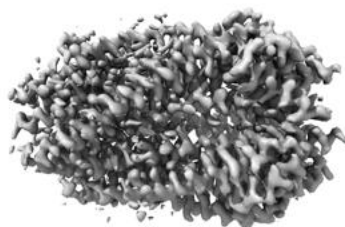
The images above show the largest variance slices of the map in three orthogonal directions.

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

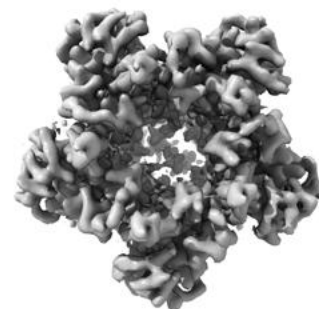
### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.8. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

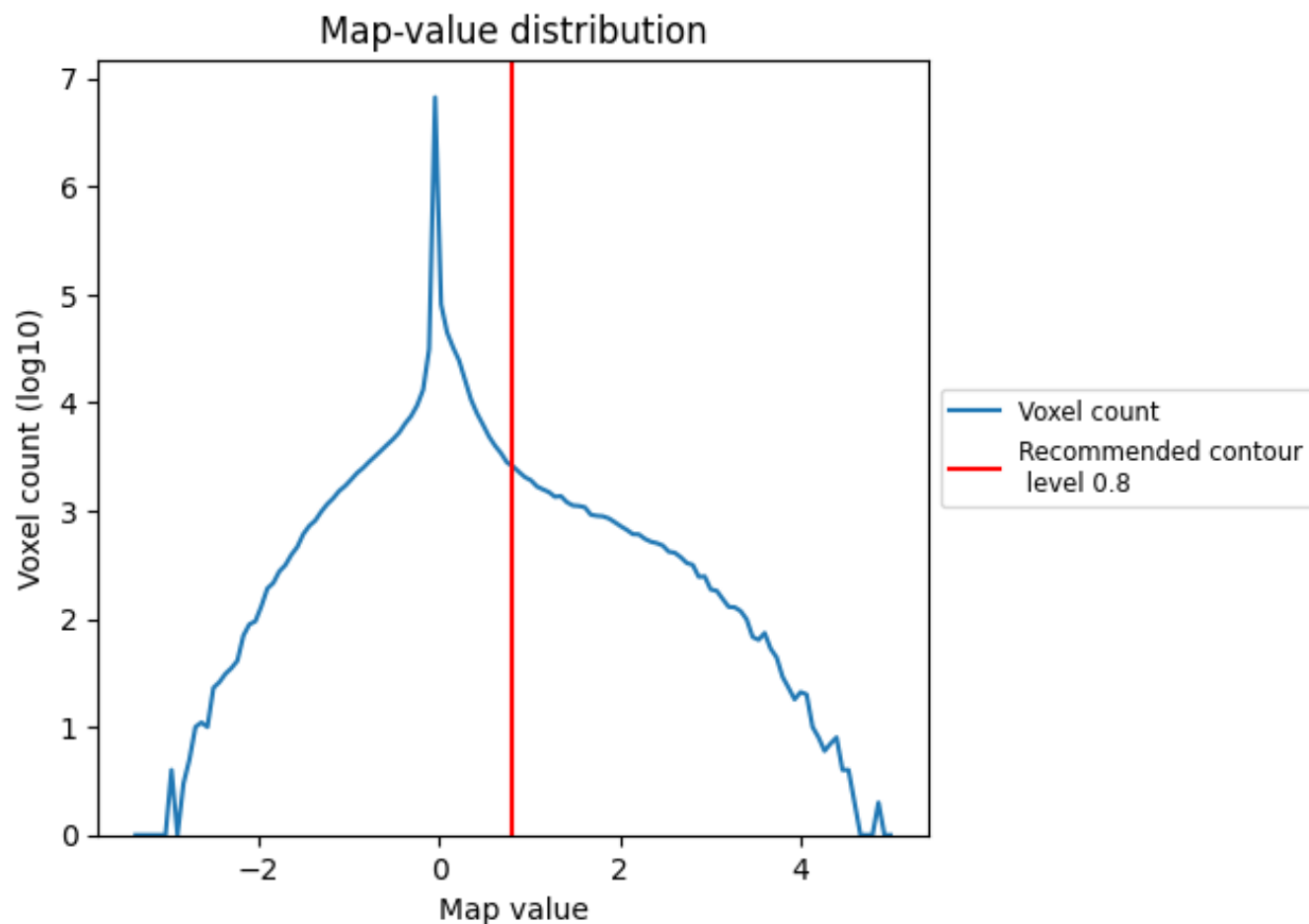
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

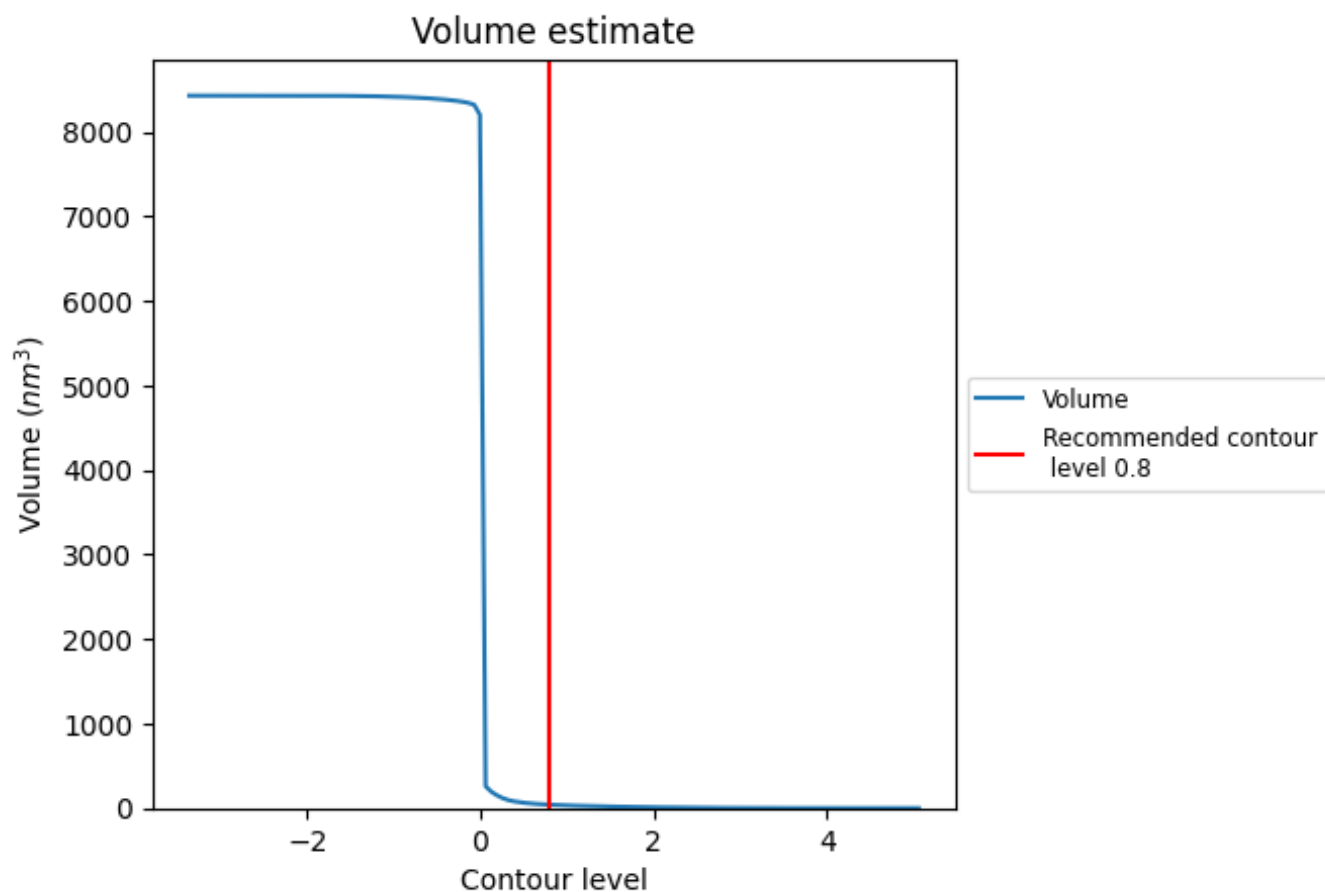
This section contains the results of statistical analysis of the map.

### 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.

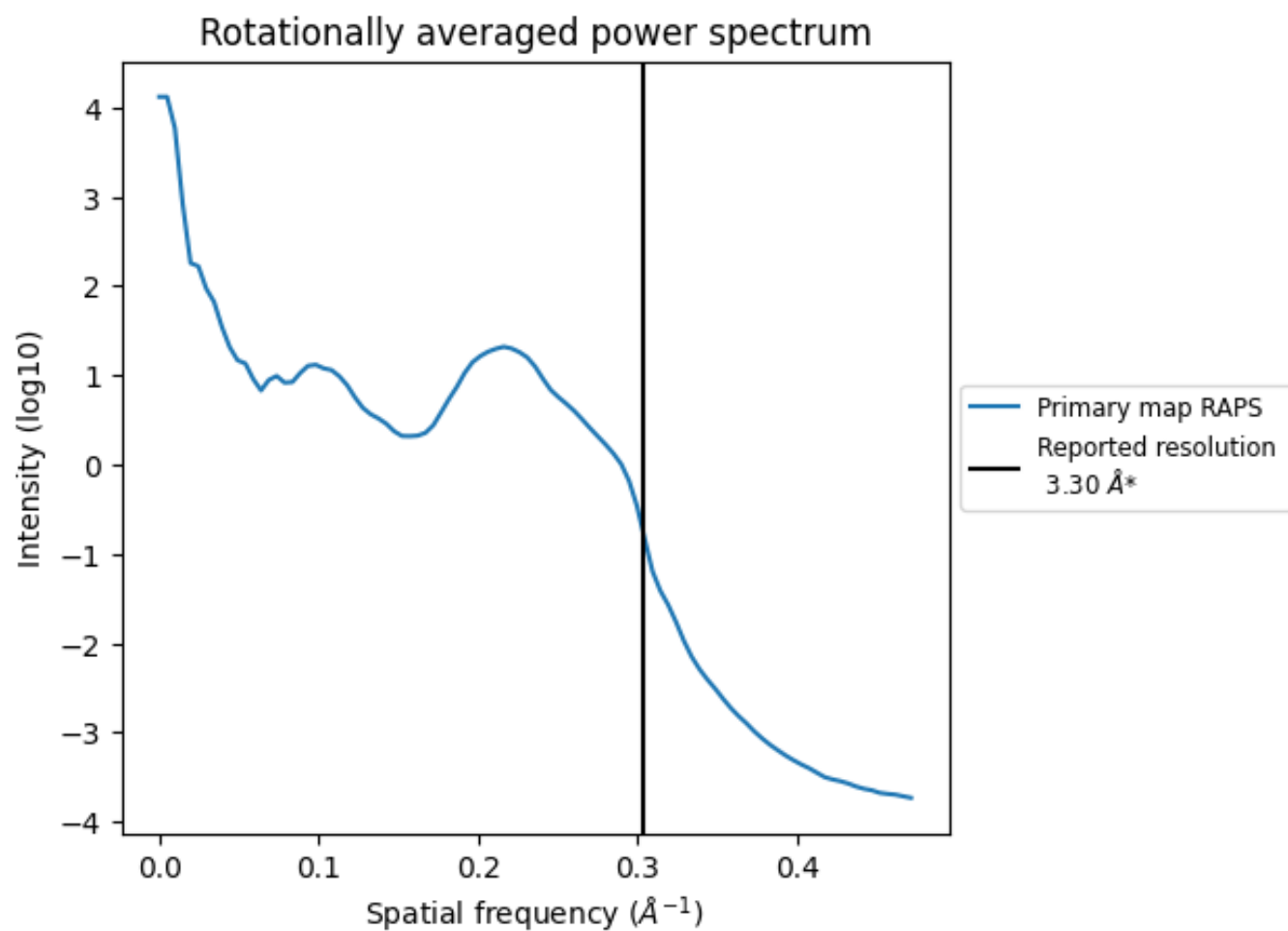
## 7.2 Volume estimate [i](#)



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 ⓘ



\*Reported resolution corresponds to spatial frequency of 0.303 Å<sup>-1</sup>

## 8 Fourier-Shell correlation

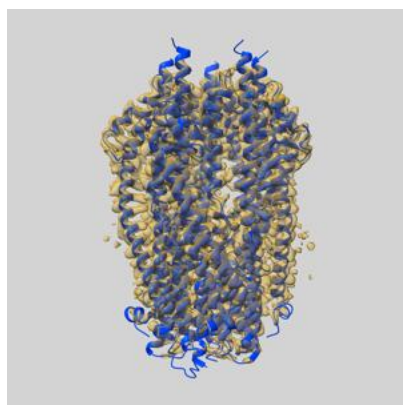
This section was not generated. No FSC curve or half-maps provided.



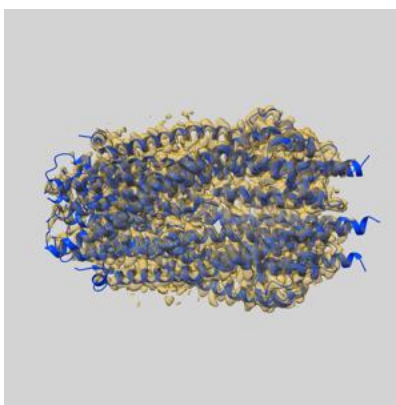
## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-20583 and PDB model 6TYI. Per-residue inclusion information can be found in section [3](#) on page [8](#).

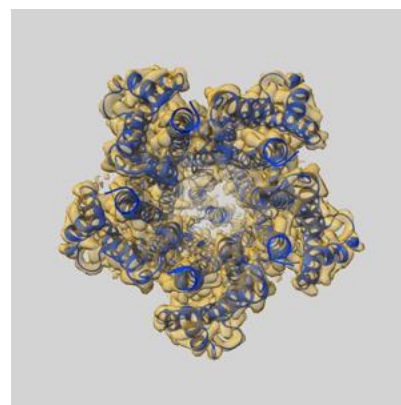
### 9.1 Map-model overlay [i](#)



X



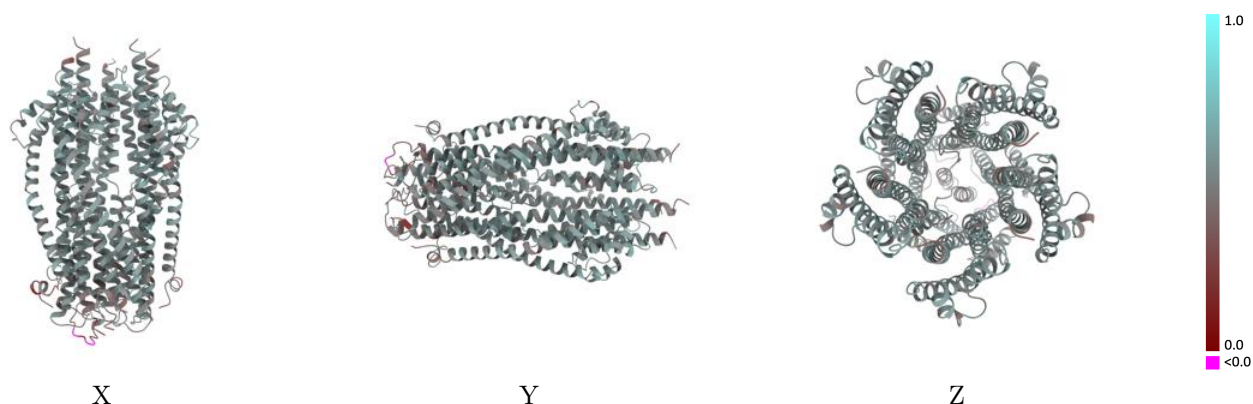
Y



Z

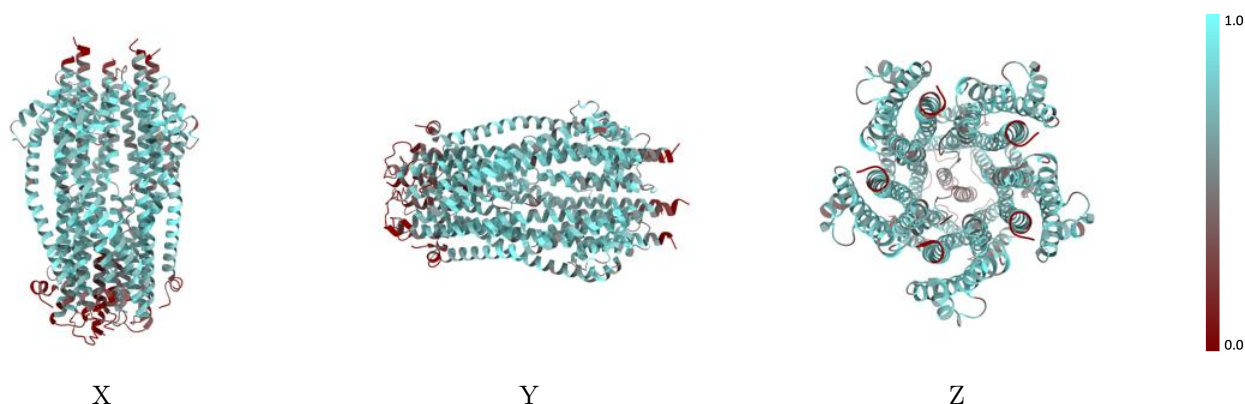
The images above show the 3D surface view of the map at the recommended contour level 0.8 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



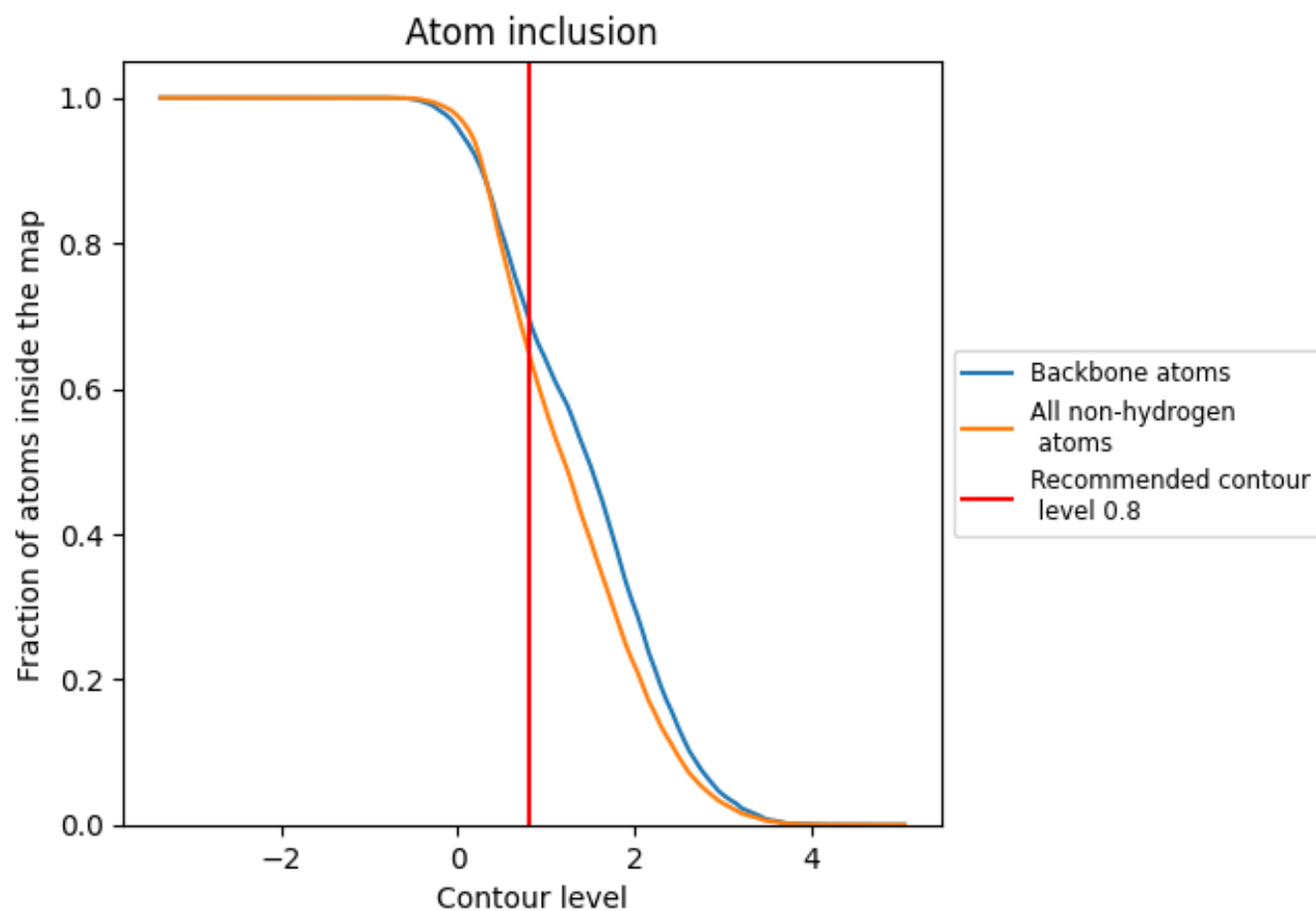
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.8).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 70% of all backbone atoms, 65% 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 (0.8) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div><div></div></div> 0.6523	<div><div></div></div> 0.5160
A	<div><div></div></div> 0.6518	<div><div></div></div> 0.5050
B	<div><div></div></div> 0.6750	<div><div></div></div> 0.5210
C	<div><div></div></div> 0.6713	<div><div></div></div> 0.5190
D	<div><div></div></div> 0.6623	<div><div></div></div> 0.5190
E	<div><div></div></div> 0.6845	<div><div></div></div> 0.5310
Y	<div><div></div></div> 0.3178	<div><div></div></div> 0.4700
Z	<div><div></div></div> 0.3661	<div><div></div></div> 0.4490

1.0

0.0

<0.0