



wwPDB EM Validation Summary Report ⓘ

Dec 19, 2022 – 10:20 am GMT

PDB ID : 7NIV
EMDB ID : EMD-12366
Title : Nanodisc reconstituted human ABCB4 in complex with 4B1-Fab and QA2-Fab
(phosphatidylcholine-bound, occluded conformation)
Authors : Nosol, K.; Locher, K.P.
Deposited on : 2021-02-14
Resolution : 3.60 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.dev43
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

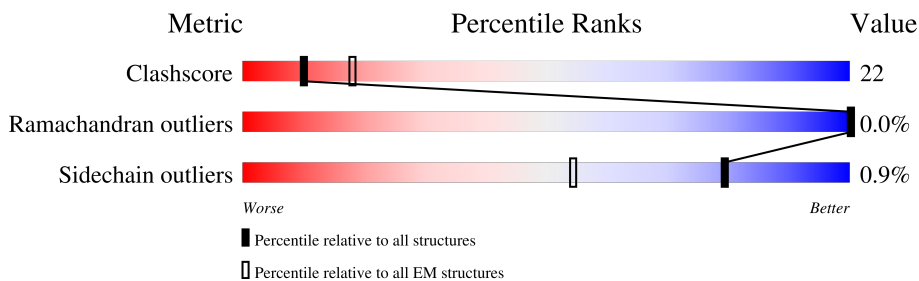
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.60 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 ≥ 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	D	215	<p>97% (Upper red bar), 57% (Green), 40% (Yellow), 11% (Grey)</p>
2	E	234	<p>96% (Upper red bar), 58% (Green), 39% (Yellow), 11% (Grey)</p>
3	A	1279	<p>35% (Upper red bar), 53% (Green), 36% (Yellow), 11% (Grey)</p>
4	B	215	<p>98% (Upper red bar), 56% (Green), 42% (Yellow), 11% (Grey)</p>
5	C	241	<p>81% (Upper red bar), 65% (Green), 32% (Yellow), 11% (Grey)</p>

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 15724 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 QA2 Fab-fragment light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	D	208	1584	988	267	325	4	3	0

- Molecule 2 is a protein called QA2 Fab-fragment light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	E	229	1702	1069	286	339	8	1	0

- Molecule 3 is a protein called Isoform 2 of Phosphatidylcholine translocator ABCB4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	A	1138	8815	5676	1492	1616	31	0	0

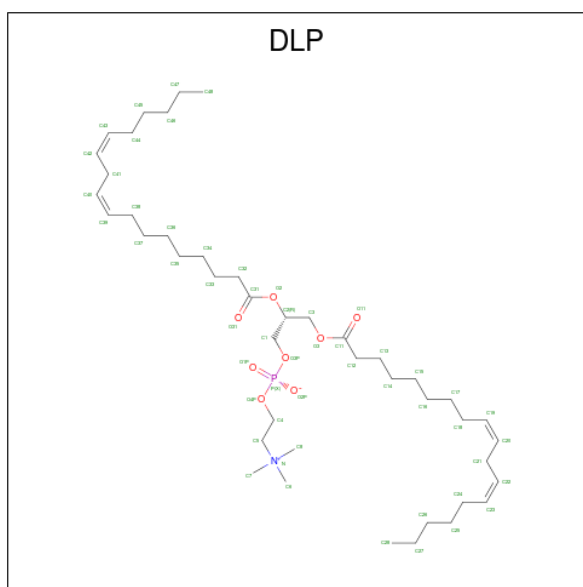
- Molecule 4 is a protein called 4B1 Fab-fragment light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	B	211	1616	1012	272	327	5	3	0

- Molecule 5 is a protein called 4B1 Fab-fragment light chain.

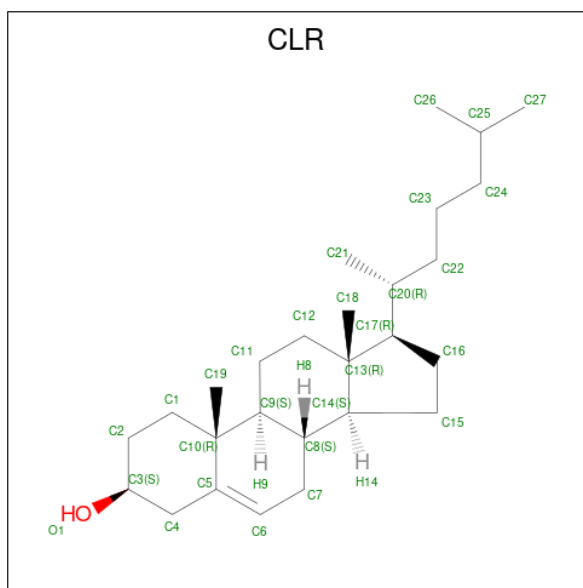
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	C	234	1757	1114	289	348	6	1	0

- Molecule 6 is 1,2-DILINOLEOYL-SN-GLYCERO-3-PHOSPHOCHOLINE (three-letter code: DLP) (formula: C₄₄H₈₀NO₈P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
6	A	1	54	44	1	8	1	0

- Molecule 7 is CHOLESTEROL (three-letter code: CLR) (formula: $C_{27}H_{46}O$).



Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
7	A	1	196	189	7	0
7	A	1	196	189	7	0
7	A	1	196	189	7	0

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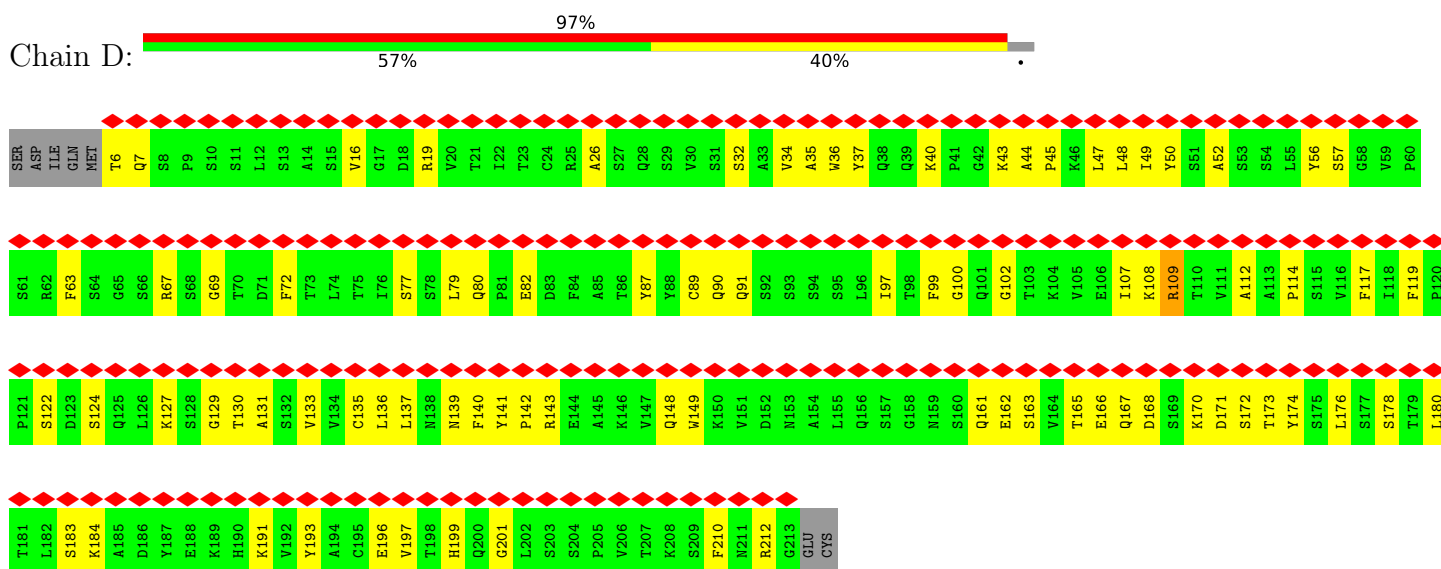
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Mol	Chain	Residues	Atoms			AltConf
7	A	1	Total 196	C 189	O 7	0
7	A	1	Total 196	C 189	O 7	0
7	A	1	Total 196	C 189	O 7	0
7	A	1	Total 196	C 189	O 7	0

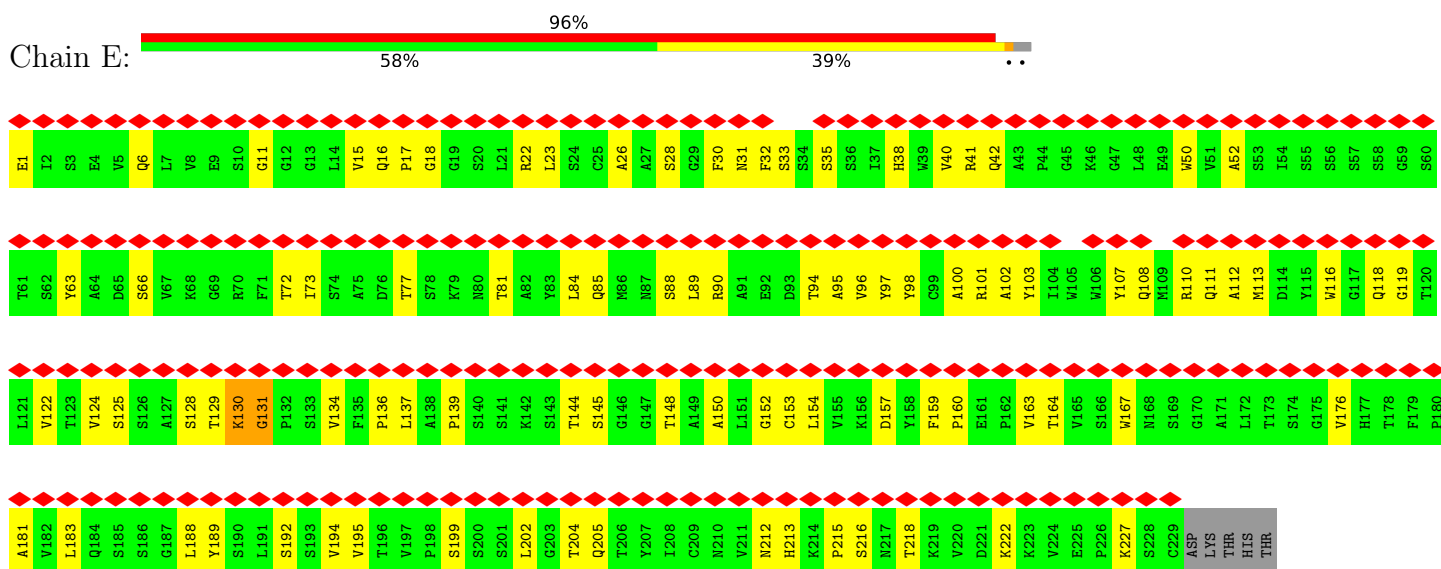
3 Residue-property plots [i](#)

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.

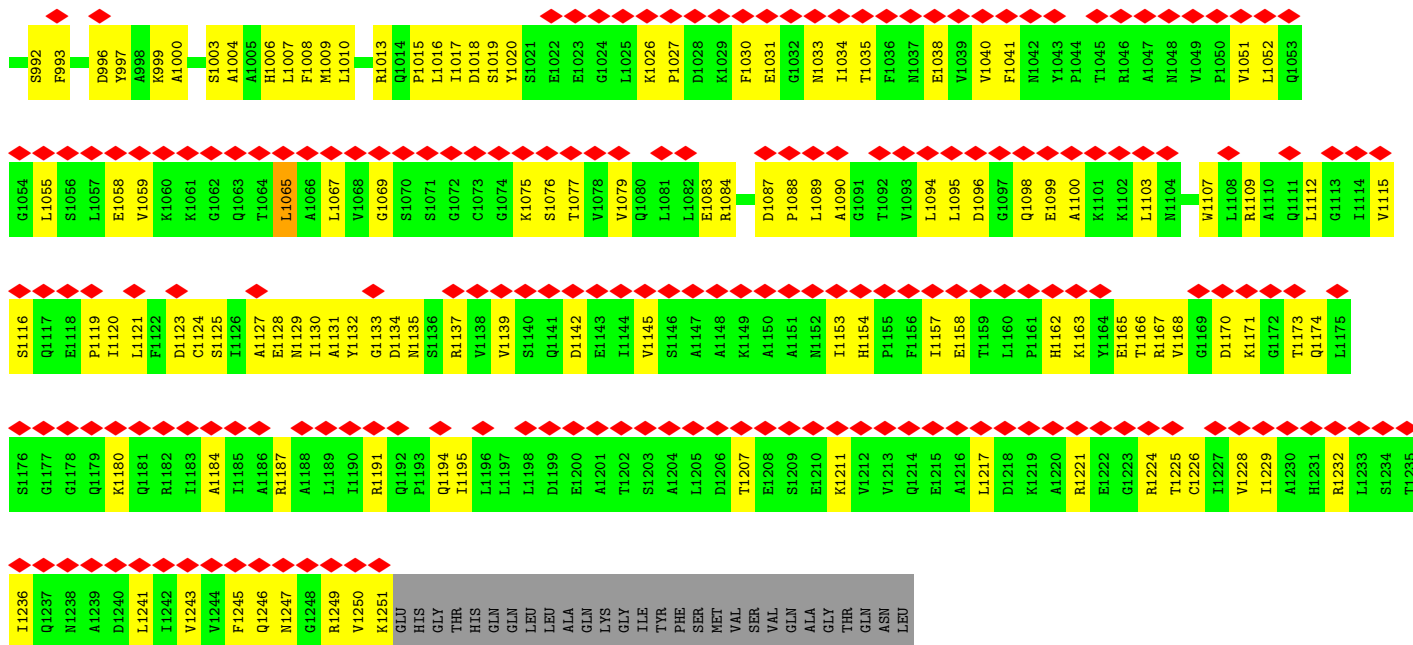
- Molecule 1: QA2 Fab-fragment light chain



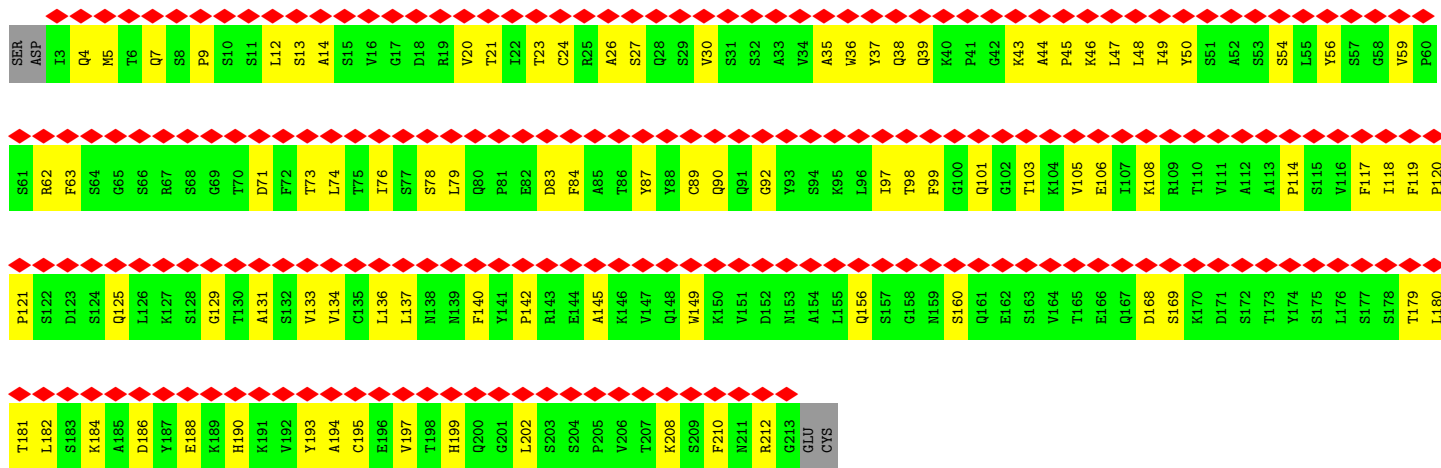
- Molecule 2: QA2 Fab-fragment light chain



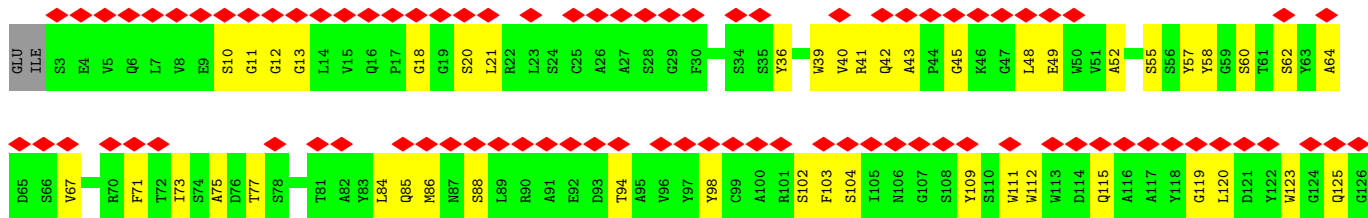
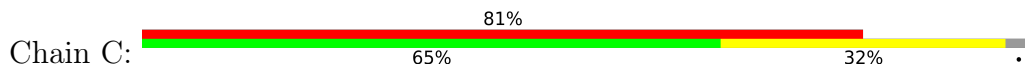
- Molecule 3: Isoform 2 of Phosphatidylcholine translocator ABCB4



• Molecule 4: 4B1 Fab-fragment light chain



• Molecule 5: 4B1 Fab-fragment light chain



T127	L128	V129	T130	V131	S132	S133	A134	S135	T136	K137	G138	P139	S140	V141	F142	P143	L144	A145	P146	S147	S148	K149	S150	T151	S152	G153	G154	T155	A156	A157	L158	G159	C160	L161	V162	K163	D164	Y165	F166	P167	E168	P169	V170	T171	V172	S173	W174	N175	S176	G177	A178	L179	T180	S181	G182	V183	H184	T185	F186
P187	A188	V189	L190	Q191	S192	S193	G194	L195	Y196	S197	L198	S199	S200	V201	V202	T203	V204	P205	S206	S207	S208	L209	G210	T211	Q212	T213	Y214	I215	C216	N217	V218	N219	H220	K221	P222	S223	N224	T225	K226	V227	D228	K229	K230	V231	E232	P233	K234	S235	C236	ASP	LYS	THR	HIS	THR					

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	53949	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 ($e^-/\text{\AA}^2$)	80.4	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.068	Depositor
Minimum map value	-0.060	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.012	Depositor
Map size (Å)	295.68002, 295.68002, 295.68002	wwPDB
Map dimensions	448, 448, 448	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.66, 0.66, 0.66	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: CLR, DLP

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	D	0.27	0/1622	0.52	0/2202
2	E	0.30	0/1743	0.51	0/2374
3	A	0.43	0/8977	0.56	0/12130
4	B	0.29	0/1655	0.54	0/2245
5	C	0.32	0/1805	0.52	0/2464
All	All	0.38	0/15802	0.54	0/21415

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	D	1584	0	1555	92	0
2	E	1702	0	1658	102	0
3	A	8815	0	8972	382	0
4	B	1616	0	1593	68	0
5	C	1757	0	1687	58	0
6	A	54	0	80	6	0
7	A	196	0	322	15	0
All	All	15724	0	15867	682	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 22.

The worst 5 of 682 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:E:107:TYR:HD2	3:A:467:TYR:CD1	1.49	1.29
3:A:877:LEU:O	3:A:878:LEU:HD12	1.39	1.22
2:E:107:TYR:CD2	3:A:467:TYR:CD1	2.33	1.16
3:A:797:ARG:HB2	3:A:1020:TYR:CD2	1.88	1.08
1:D:32:SER:HB3	1:D:67:ARG:CD	1.84	1.06

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	D	208/215 (97%)	188 (90%)	20 (10%)	0	100	100
2	E	227/234 (97%)	200 (88%)	26 (12%)	1 (0%)	34	71
3	A	1132/1279 (88%)	1018 (90%)	114 (10%)	0	100	100
4	B	211/215 (98%)	197 (93%)	14 (7%)	0	100	100
5	C	232/241 (96%)	213 (92%)	19 (8%)	0	100	100
All	All	2010/2184 (92%)	1816 (90%)	193 (10%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	E	131	GLY

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	185/190 (97%)	184 (100%)	1 (0%)	88	95
2	E	191/196 (97%)	189 (99%)	2 (1%)	76	88
3	A	926/1048 (88%)	915 (99%)	11 (1%)	71	87
4	B	187/189 (99%)	186 (100%)	1 (0%)	88	95
5	C	194/201 (96%)	194 (100%)	0	100	100
All	All	1683/1824 (92%)	1668 (99%)	15 (1%)	79	90

5 of 15 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	743	ASP
3	A	1065	LEU
3	A	746	VAL
4	B	87	TYR
3	A	885	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 37 such sidechains are listed below:

Mol	Chain	Res	Type
4	B	156	GLN
5	C	175	ASN
5	C	42	GLN
5	C	87	ASN
3	A	464	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

8 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
7	CLR	A	1303	-	31,31,31	1.01	1 (3%)	48,48,48	1.71	11 (22%)
7	CLR	A	1308	-	31,31,31	1.10	1 (3%)	48,48,48	1.64	15 (31%)
7	CLR	A	1302	-	31,31,31	1.07	1 (3%)	48,48,48	1.66	10 (20%)
7	CLR	A	1305	-	31,31,31	0.98	1 (3%)	48,48,48	1.96	15 (31%)
6	DLP	A	1301	-	53,53,53	1.18	5 (9%)	59,61,61	0.83	2 (3%)
7	CLR	A	1307	-	31,31,31	0.99	1 (3%)	48,48,48	1.62	11 (22%)
7	CLR	A	1304	-	31,31,31	1.02	1 (3%)	48,48,48	1.63	9 (18%)
7	CLR	A	1306	-	31,31,31	1.01	1 (3%)	48,48,48	1.63	13 (27%)

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
7	CLR	A	1303	-	-	7/10/68/68	0/4/4/4
7	CLR	A	1308	-	-	7/10/68/68	0/4/4/4
7	CLR	A	1302	-	-	3/10/68/68	0/4/4/4
7	CLR	A	1305	-	-	10/10/68/68	0/4/4/4

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	DLP	A	1301	-	-	23/57/57/57	-
7	CLR	A	1307	-	-	0/10/68/68	0/4/4/4
7	CLR	A	1304	-	-	2/10/68/68	0/4/4/4
7	CLR	A	1306	-	-	4/10/68/68	0/4/4/4

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	1301	DLP	O3-C11	3.19	1.42	1.33
6	A	1301	DLP	O2-C31	3.09	1.43	1.34
7	A	1308	CLR	C16-C17	2.82	1.60	1.54
7	A	1307	CLR	C16-C17	2.80	1.60	1.54
7	A	1306	CLR	C16-C17	2.77	1.60	1.54

The worst 5 of 86 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	1305	CLR	C1-C2-C3	5.64	117.71	110.47
7	A	1305	CLR	C8-C7-C6	-5.19	105.28	112.73
7	A	1302	CLR	C1-C2-C3	4.31	116.00	110.47
7	A	1308	CLR	C13-C17-C20	-4.13	113.02	119.49
7	A	1304	CLR	C7-C8-C14	-4.04	105.05	110.91

There are no chirality outliers.

5 of 56 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	1301	DLP	C32-C31-O2-C2
6	A	1301	DLP	O31-C31-O2-C2
6	A	1301	DLP	C4-O4P-P-O1P
6	A	1301	DLP	C4-O4P-P-O2P
7	A	1308	CLR	C13-C17-C20-C21

There are no ring outliers.

8 monomers are involved in 21 short contacts:

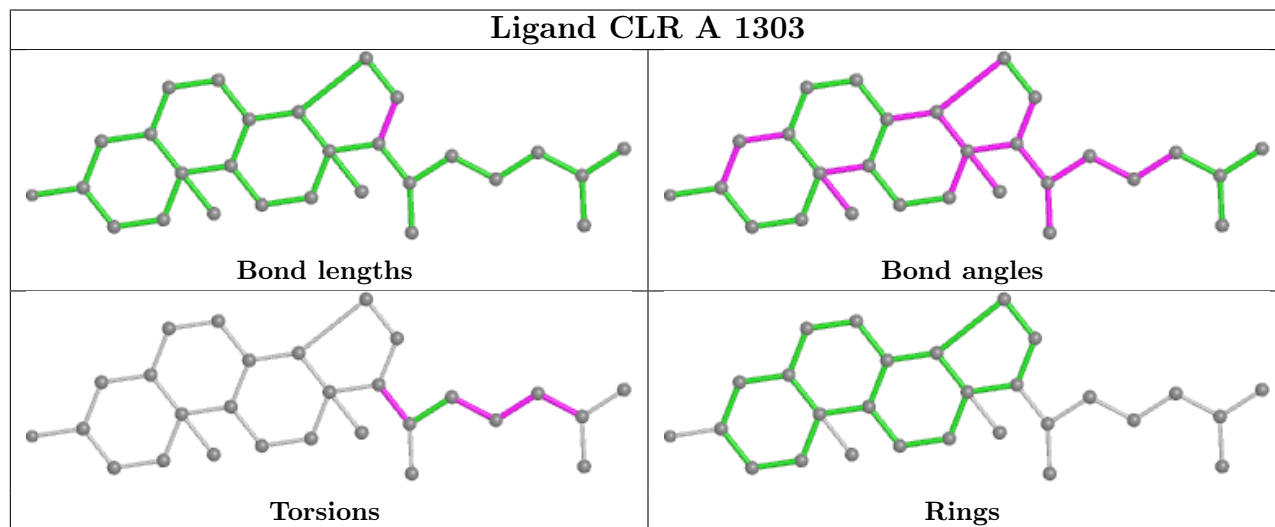
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	1303	CLR	4	0
7	A	1308	CLR	1	0
7	A	1302	CLR	2	0

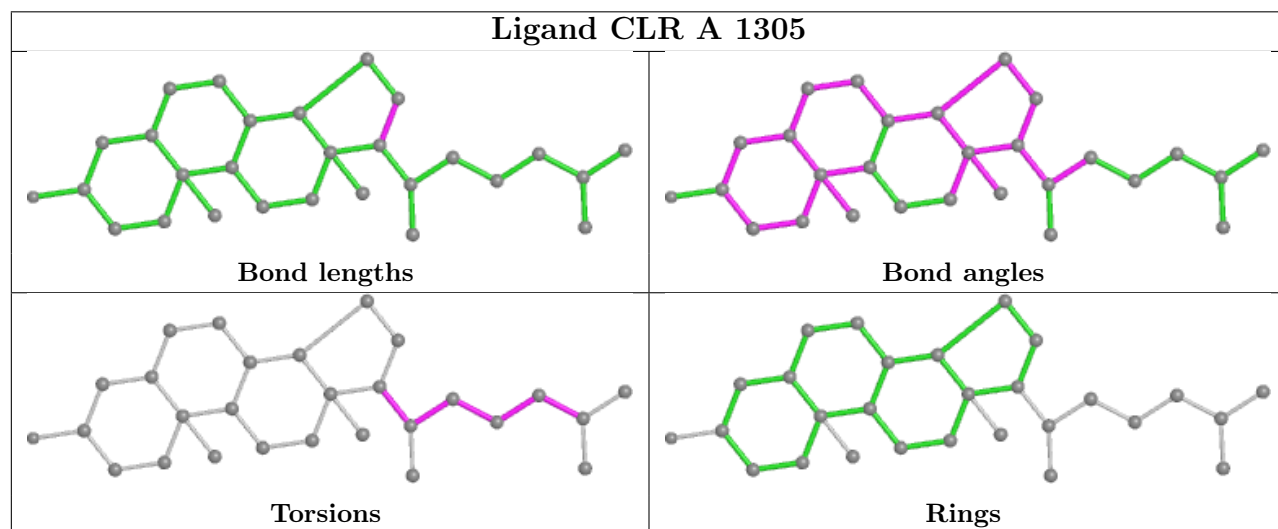
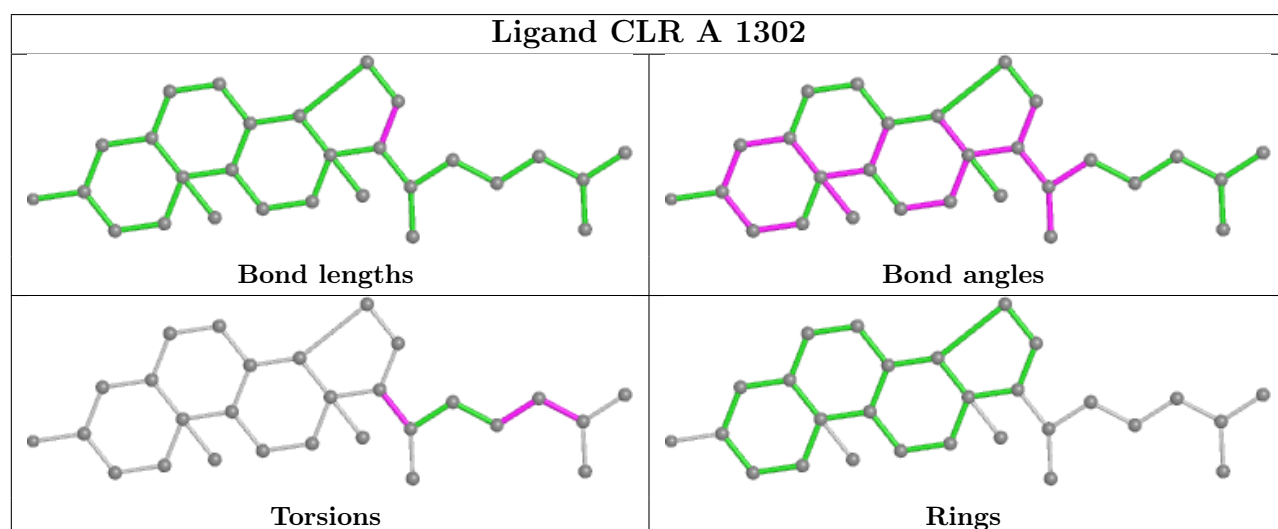
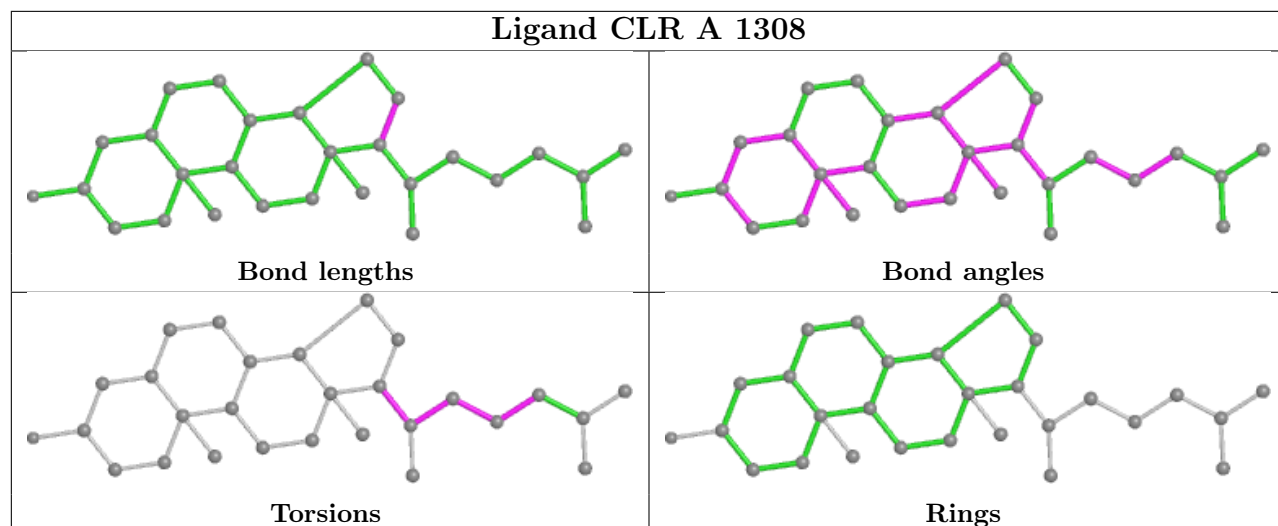
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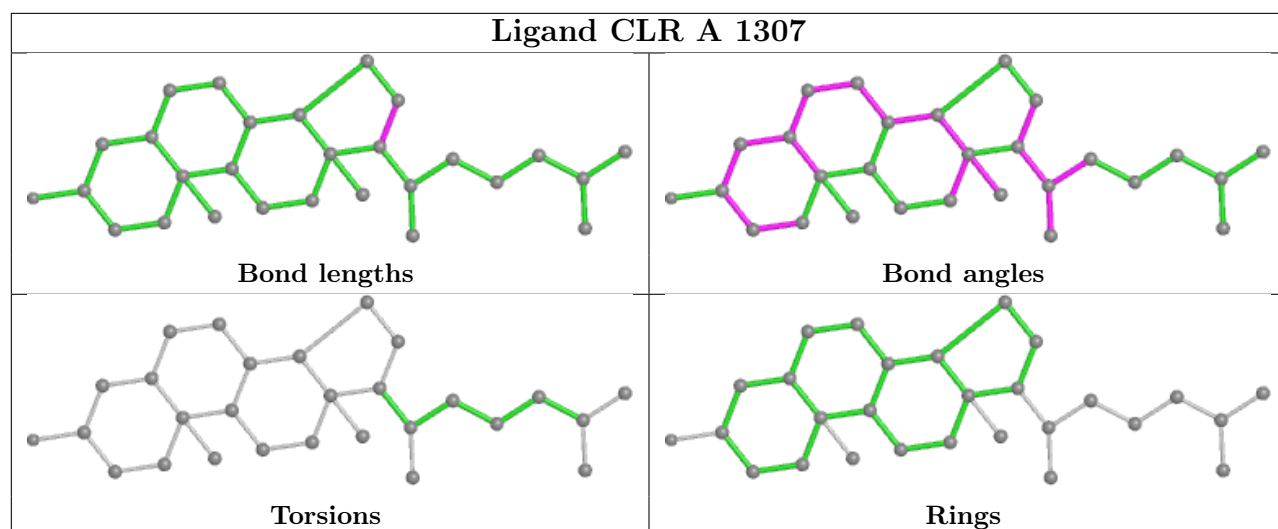
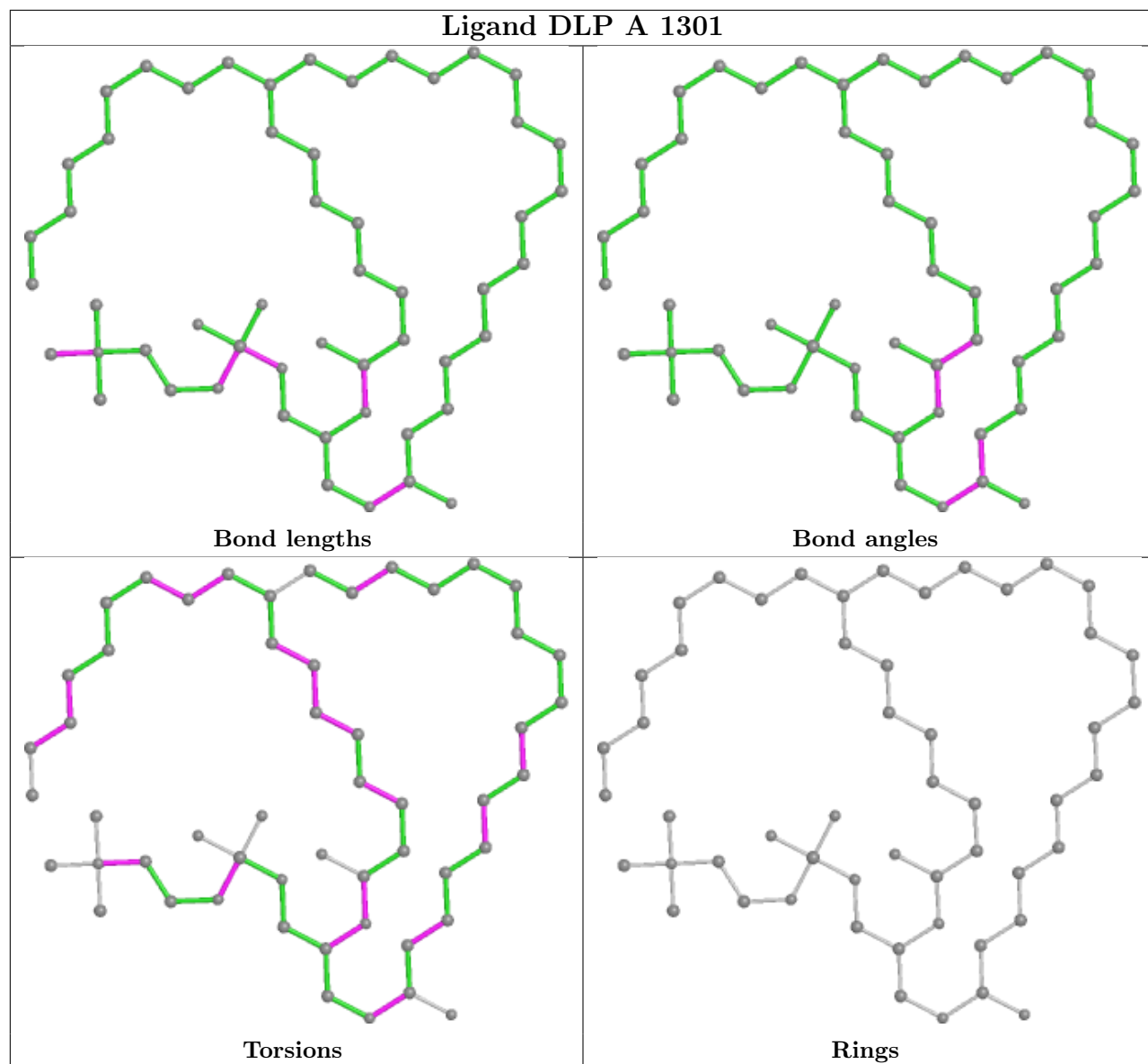
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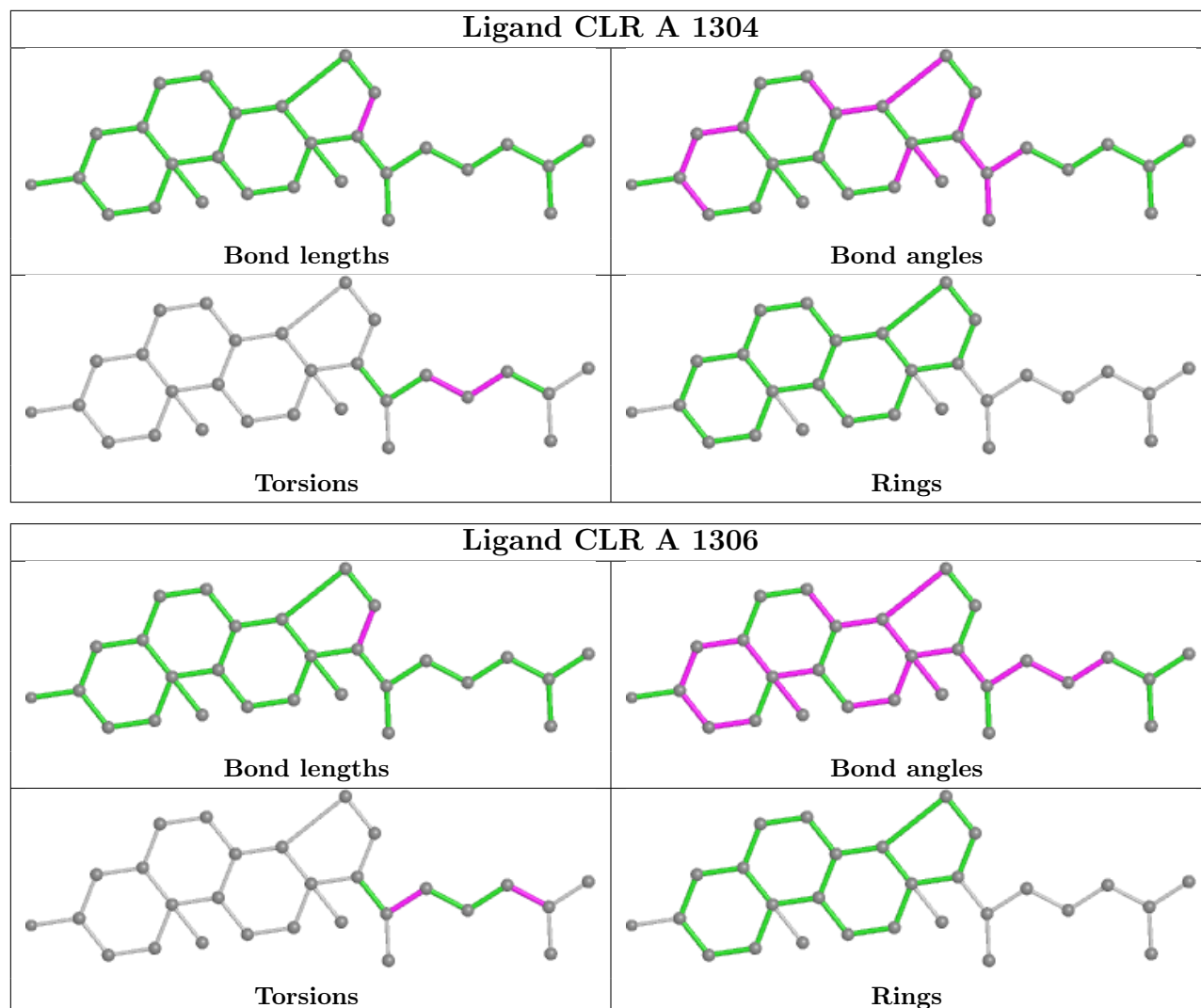
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	1305	CLR	3	0
6	A	1301	DLP	6	0
7	A	1307	CLR	2	0
7	A	1304	CLR	1	0
7	A	1306	CLR	2	0

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.

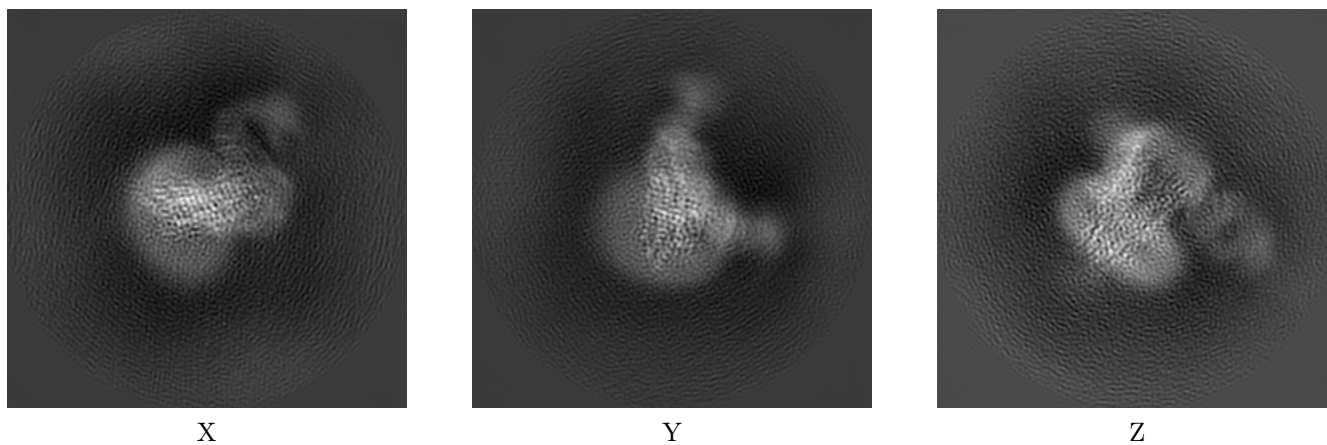
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-12366. 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](#)

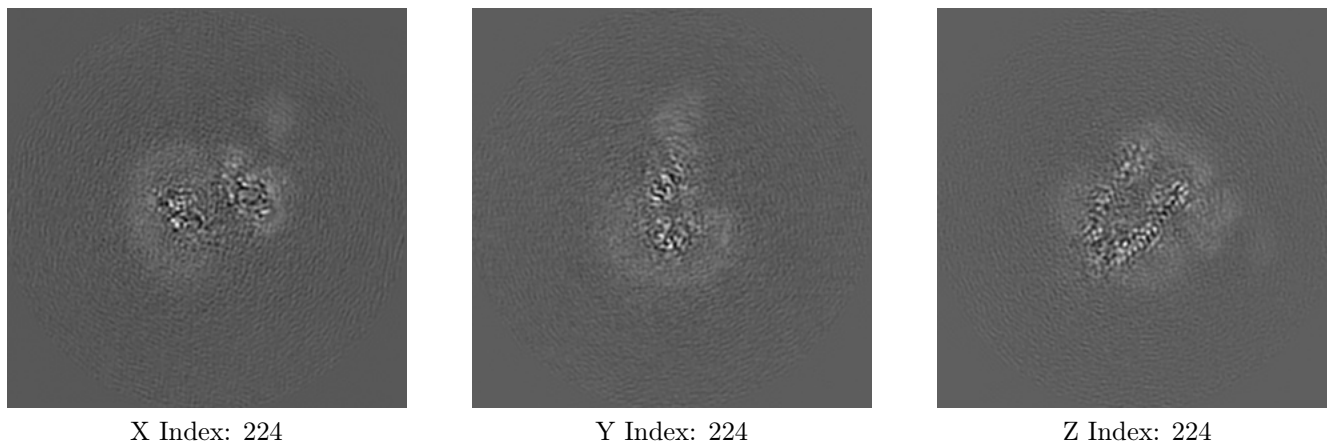
6.1.1 Primary map



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

6.2 Central slices [i](#)

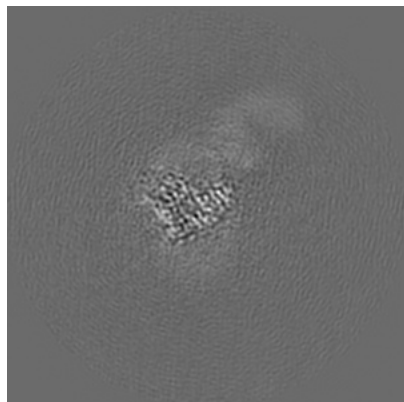
6.2.1 Primary map



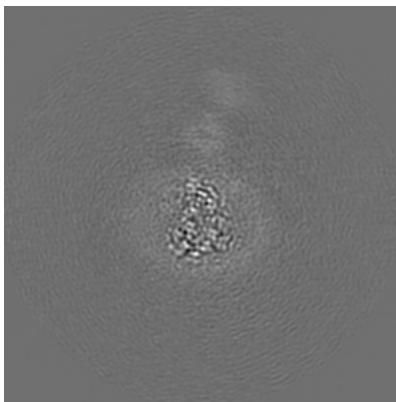
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

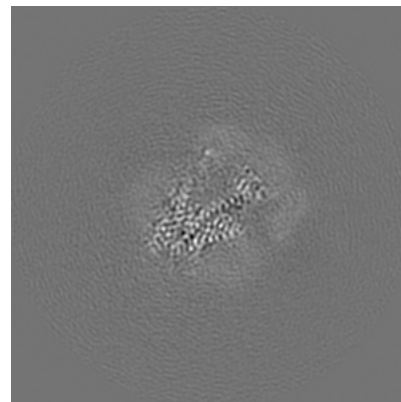
6.3.1 Primary map



X Index: 187



Y Index: 196



Z Index: 210

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 0.012. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

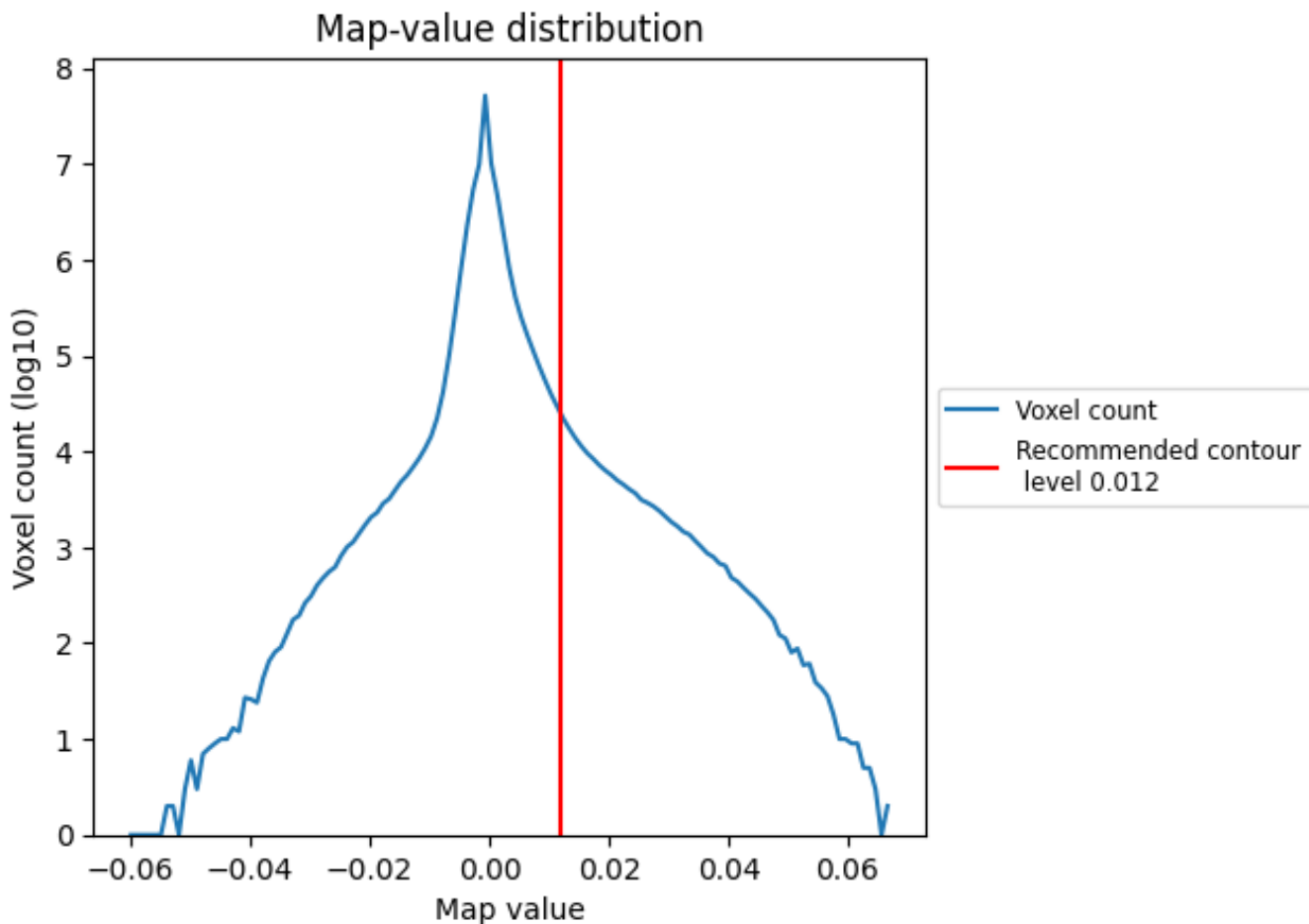
6.5 Mask visualisation

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

7 Map analysis [i](#)

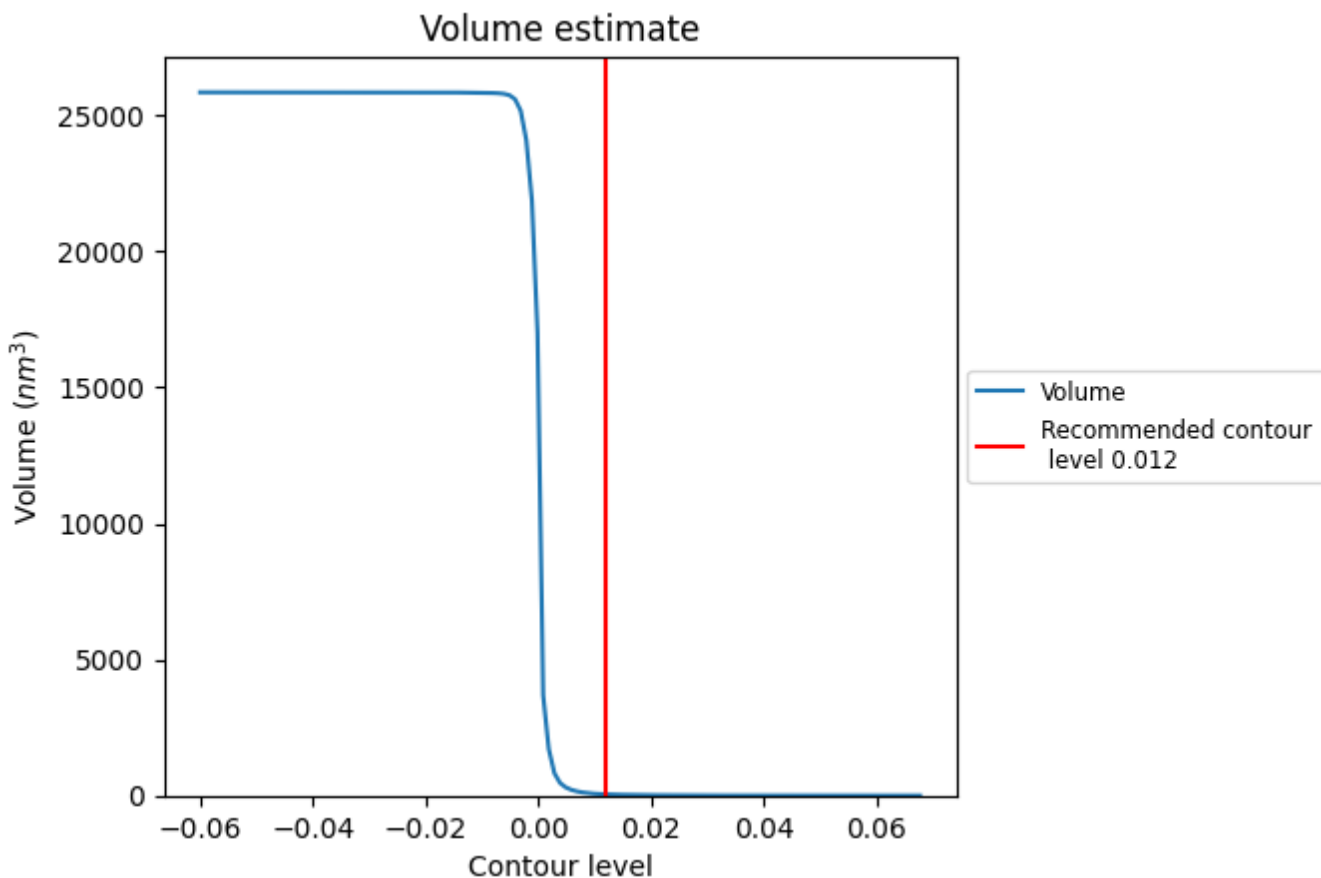
This section contains the results of statistical analysis of the map.

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.

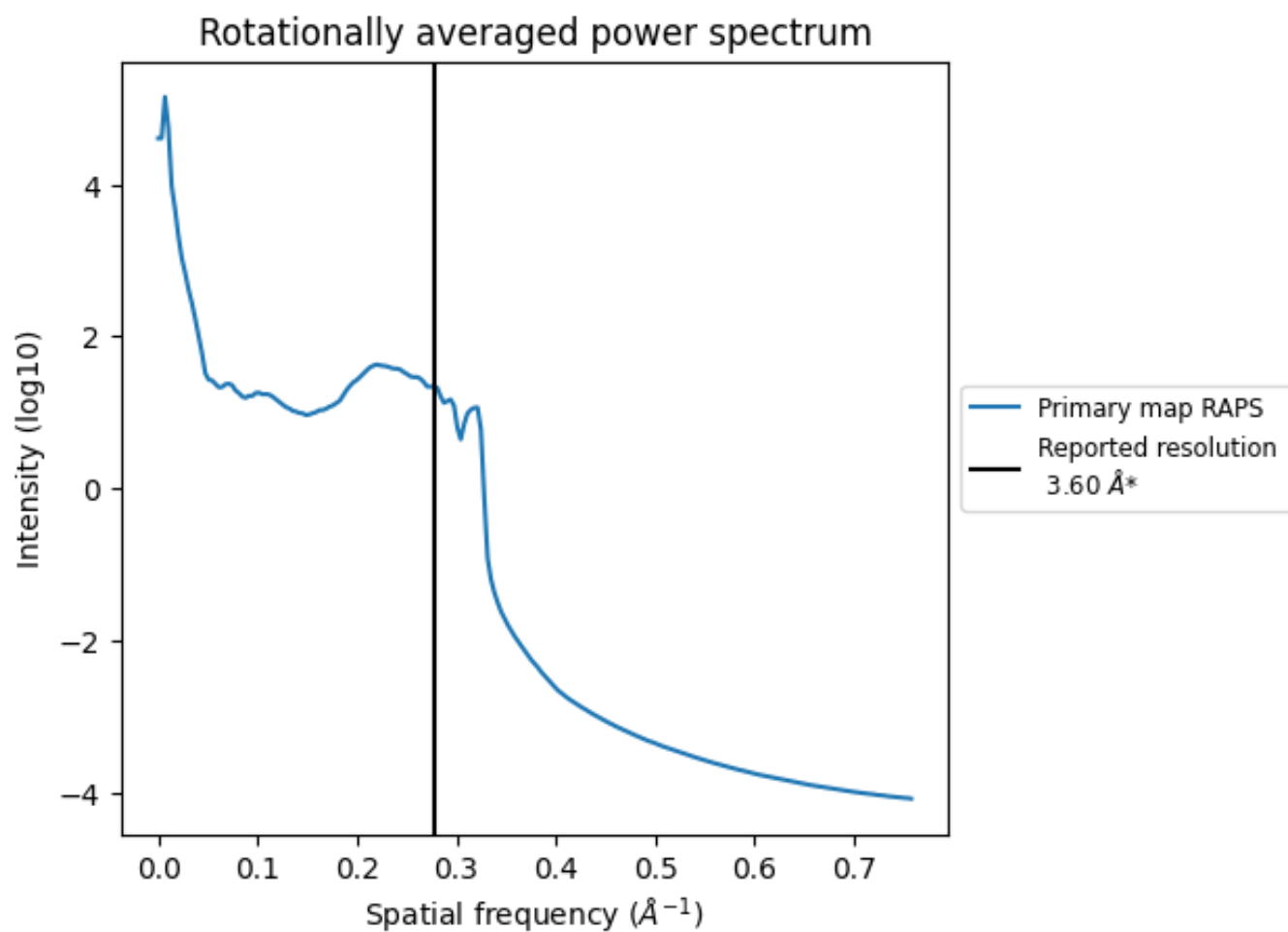
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 45 nm³; this corresponds to an approximate mass of 41 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](#)

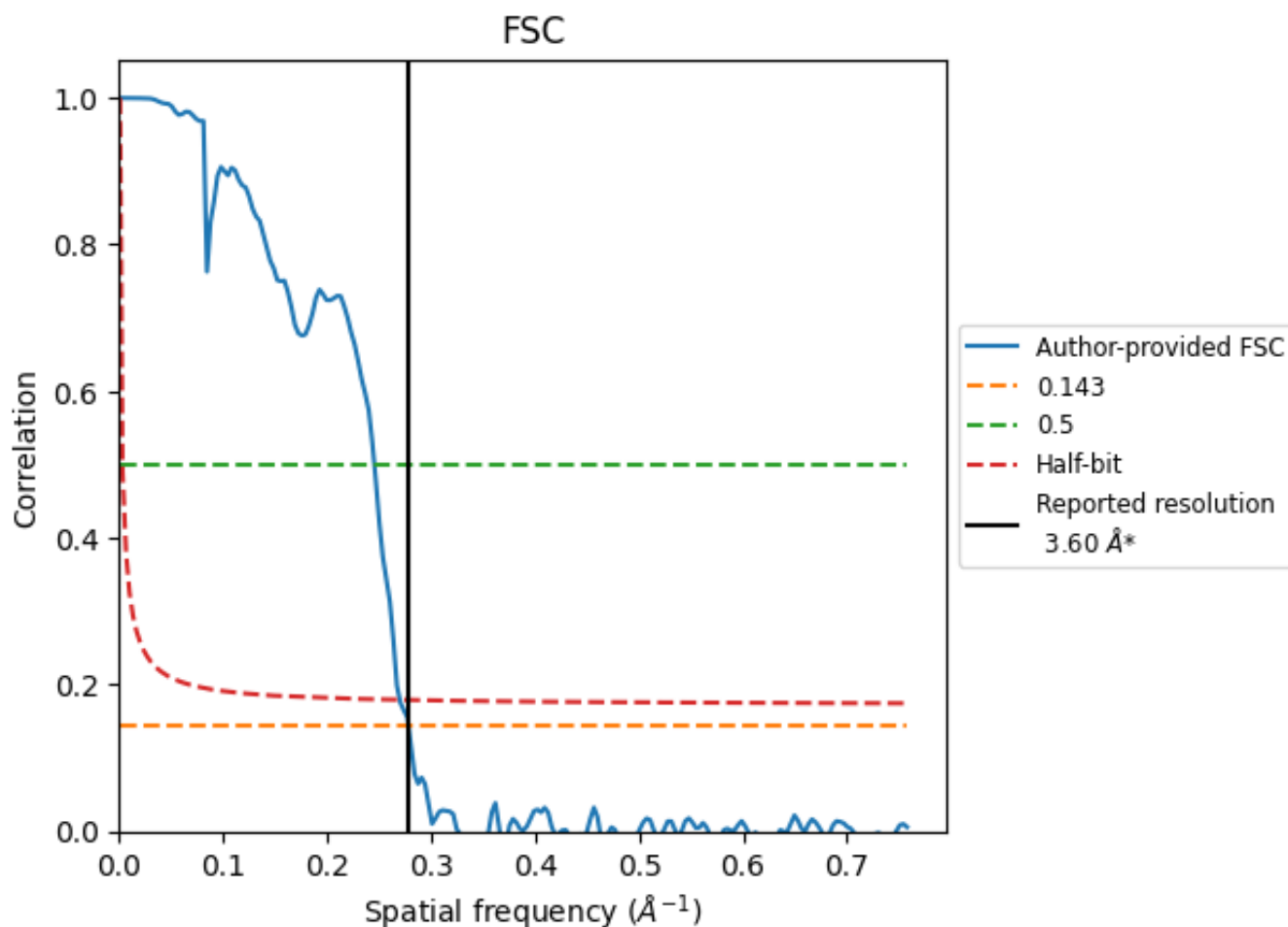


*Reported resolution corresponds to spatial frequency of 0.278\AA^{-1}

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 0.278 Å⁻¹

8.2 Resolution estimates [i](#)

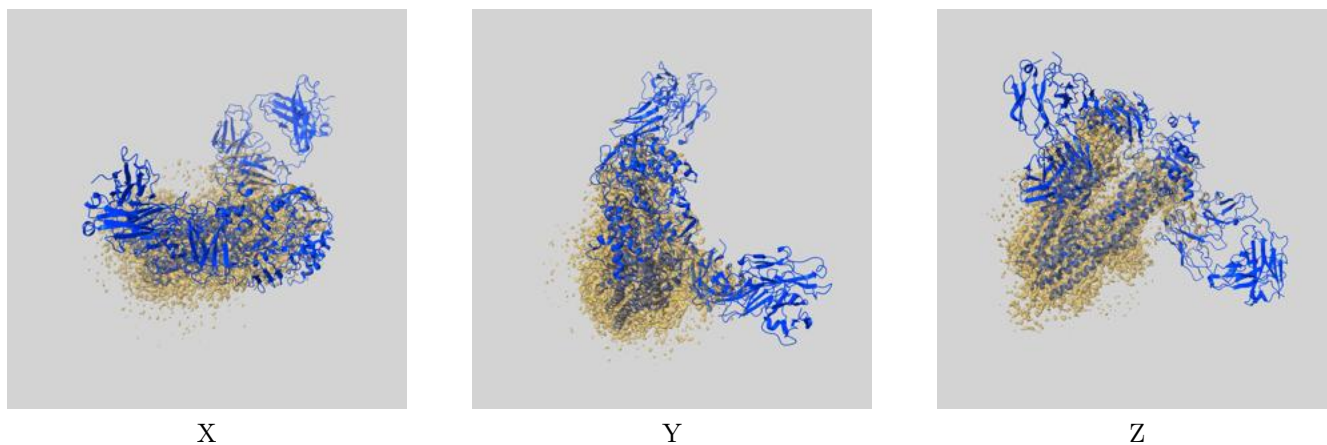
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.60	-	-
Author-provided FSC curve	3.59	4.07	3.70
Unmasked-calculated*	-	-	-

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

9 Map-model fit [i](#)

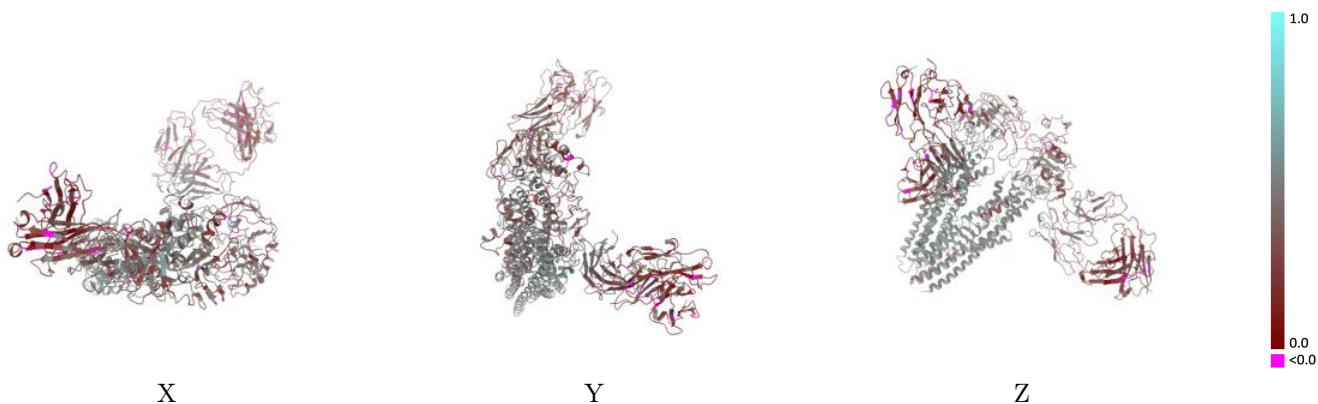
This section contains information regarding the fit between EMDB map EMD-12366 and PDB model 7NIV. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay [i](#)



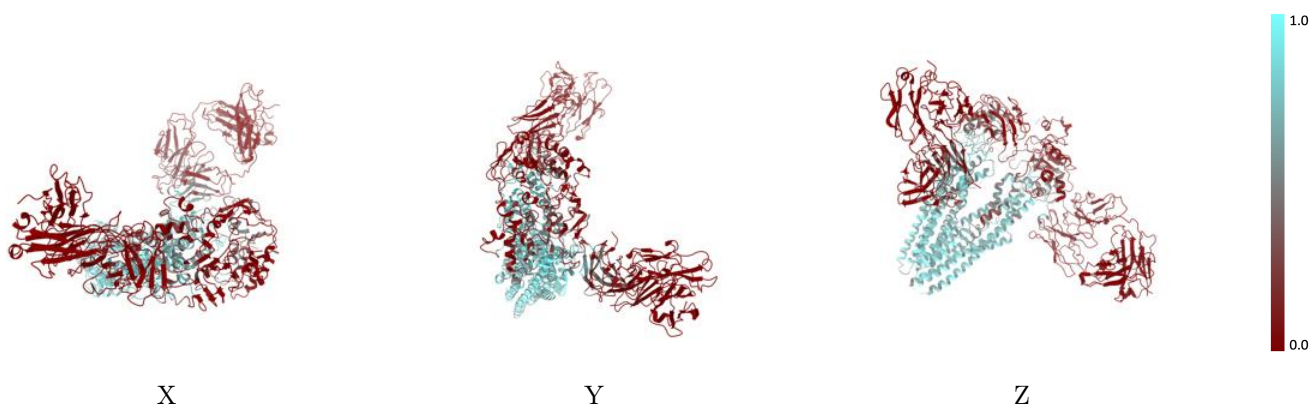
The images above show the 3D surface view of the map at the recommended contour level 0.012 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



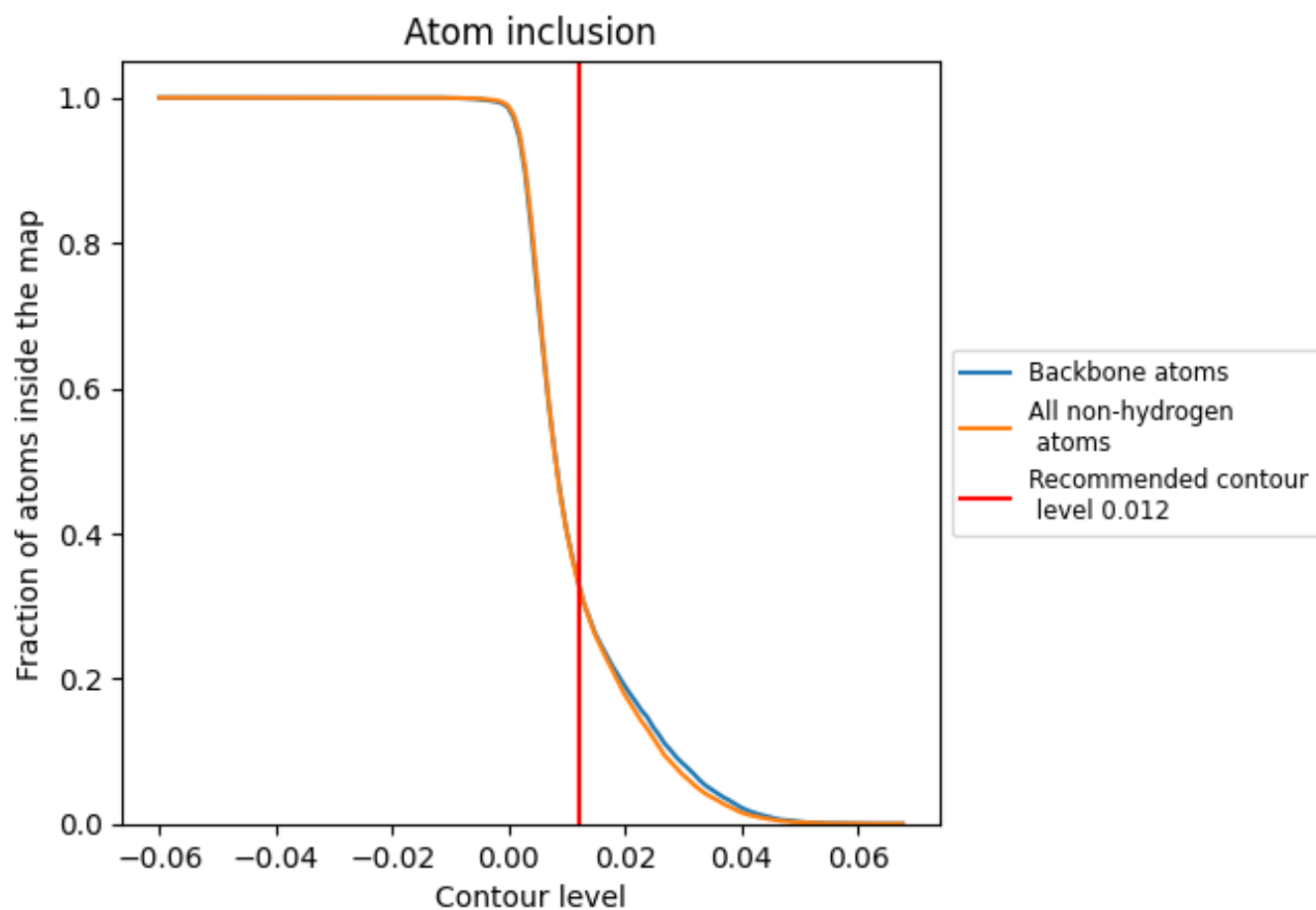
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.012).













9.4 Atom inclusion [i](#)



At the recommended contour level, 33% of all backbone atoms, 33% 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 (0.012) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.3306	 0.3820
A	 0.5252	 0.4420
B	 0.0183	 0.2670
C	 0.1629	 0.3300
D	 0.0135	 0.3020
E	 0.0568	 0.2960

