



Full wwPDB EM Validation Report ⓘ

May 5, 2025 – 01:59 AM EDT

PDB ID : 8FMV / pdb_00008fmv
EMDB ID : EMD-29297
Title : Heterodimeric ABC transporter BmrCD in the inward-facing conformation bound to substrate and ATP: BmrCD_IF-2HT/ATP
Authors : Tang, Q.; Mchaourab, H.
Deposited on : 2022-12-24
Resolution : 3.34 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

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.dev118
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.43.1

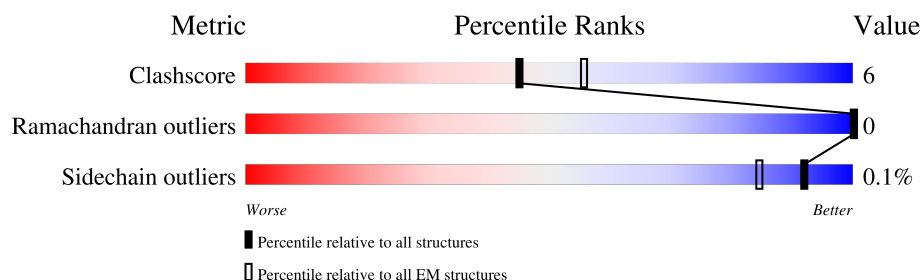
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.34 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 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	681	
2	C	607	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 21272 atoms, of which 10771 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 Probable multidrug resistance ABC transporter ATP-binding/permease protein YheH.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	D	665	10700	3420	5383	905	974	18	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	154	ALA	CYS	engineered mutation	UNP O07549
D	256	ALA	CYS	engineered mutation	UNP O07549
D	351	ALA	CYS	engineered mutation	UNP O07549
D	592	GLN	GLU	engineered mutation	UNP O07549
D	674	LEU	-	expression tag	UNP O07549
D	675	GLU	-	expression tag	UNP O07549
D	676	HIS	-	expression tag	UNP O07549
D	677	HIS	-	expression tag	UNP O07549
D	678	HIS	-	expression tag	UNP O07549
D	679	HIS	-	expression tag	UNP O07549
D	680	HIS	-	expression tag	UNP O07549
D	681	HIS	-	expression tag	UNP O07549

- Molecule 2 is a protein called Probable multidrug resistance ABC transporter ATP-binding/permease protein YheI.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
2	C	569	9038	2896	4557	748	814	23	0	0

There are 24 discrepancies between the modelled and reference sequences:

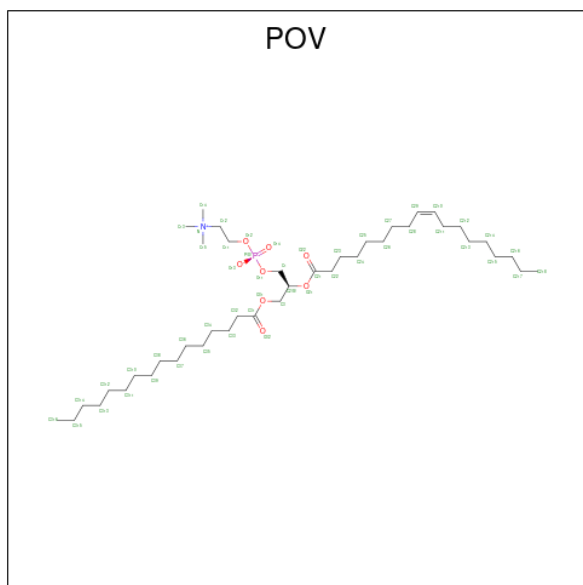
Chain	Residue	Modelled	Actual	Comment	Reference
C	-21	MET	-	initiating methionine	UNP O07550
C	-20	GLY	-	expression tag	UNP O07550
C	-19	SER	-	expression tag	UNP O07550

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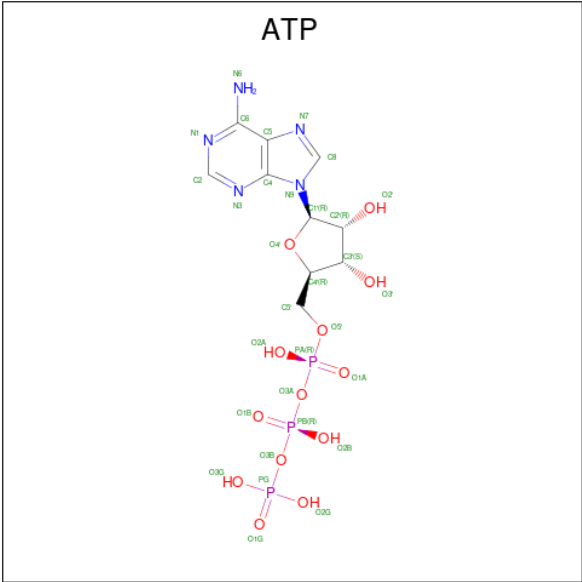
Chain	Residue	Modelled	Actual	Comment	Reference
C	-18	SER	-	expression tag	UNP O07550
C	-17	HIS	-	expression tag	UNP O07550
C	-16	HIS	-	expression tag	UNP O07550
C	-15	HIS	-	expression tag	UNP O07550
C	-14	HIS	-	expression tag	UNP O07550
C	-13	HIS	-	expression tag	UNP O07550
C	-12	HIS	-	expression tag	UNP O07550
C	-11	SER	-	expression tag	UNP O07550
C	-10	SER	-	expression tag	UNP O07550
C	-9	GLY	-	expression tag	UNP O07550
C	-8	LEU	-	expression tag	UNP O07550
C	-7	VAL	-	expression tag	UNP O07550
C	-6	PRO	-	expression tag	UNP O07550
C	-5	ARG	-	expression tag	UNP O07550
C	-4	GLY	-	expression tag	UNP O07550
C	-3	SER	-	expression tag	UNP O07550
C	-2	HIS	-	expression tag	UNP O07550
C	-1	MET	-	expression tag	UNP O07550
C	0	LEU	-	expression tag	UNP O07550
C	1	GLU	-	expression tag	UNP O07550
C	500	GLN	ASP	engineered mutation	UNP O07550

- Molecule 3 is (2S)-3-(hexadecanoyloxy)-2-[(9Z)-octadec-9-enoyloxy]propyl 2-(trimethylammonio)ethyl phosphate (CCD ID: POV) (formula: $C_{42}H_{82}NO_8P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						AltConf
3	D	1	Total	C	H	O	P		0
			85	29	47	8	1		
3	D	1	Total	C	H	O	P		0
			51	17	25	8	1		
3	D	1	Total	C	H	O	P		0
			65	23	33	8	1		
3	D	1	Total	C	H	O	P		0
			40	13	20	6	1		
3	D	1	Total	C	H	N	O	P	0
			31	8	15	1	6	1	
3	D	1	Total	C	H				0
			39	15	24				
3	D	1	Total	C	H	O	P		0
			115	37	69	8	1		
3	D	1	Total	C	H	O	P		0
			82	28	45	8	1		
3	D	1	Total	C	H	O	P		0
			61	21	31	8	1		
3	D	1	Total	C	H	N	O	P	0
			64	20	34	1	8	1	
3	D	1	Total	C	H				0
			83	29	54				
3	D	1	Total	C	H				0
			71	25	46				
3	C	1	Total	C	H	N	O	P	0
			50	15	27	1	6	1	
3	C	1	Total	C	H				0
			47	16	31				
3	C	1	Total	C	H	O	P		0
			65	22	34	8	1		
3	C	1	Total	C	H	N	O	P	0
			113	36	67	1	8	1	
3	C	1	Total	C	H	N	O	P	0
			116	37	69	1	8	1	
3	C	1	Total	C	H	O	P		0
			64	22	33	8	1		
3	C	1	Total	C	H	N	O	P	0
			34	8	18	1	6	1	
3	C	1	Total	C	H				0
			51	18	33				

- Molecule 4 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).

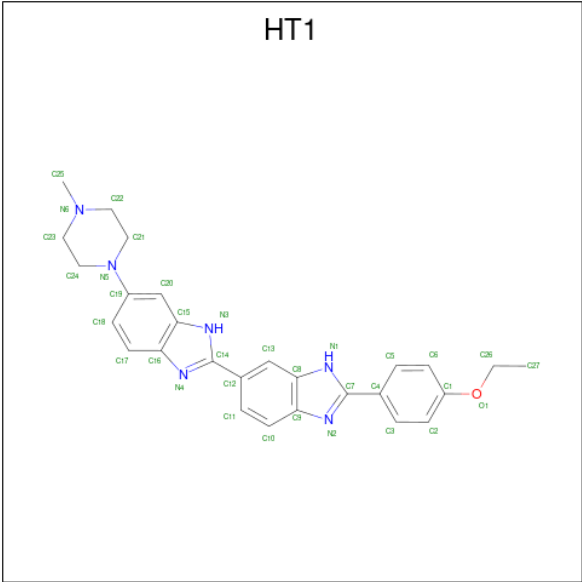


Mol	Chain	Residues	Atoms						AltConf
4	D	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	
4	C	1	Total	C	H	N	O	P	0
			43	10	12	5	13	3	

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
5	D	1	Total	Mg	0
			1	1	

- Molecule 6 is 2'-(4-ETHOXYPHENYL)-5-(4-METHYL-1-PIPERAZINYL)-2,5'-BI-BENZIMIDAZOLE (CCD ID: HT1) (formula: C₂₇H₂₈N₆O) (labeled as "Ligand of Interest" by depositor).

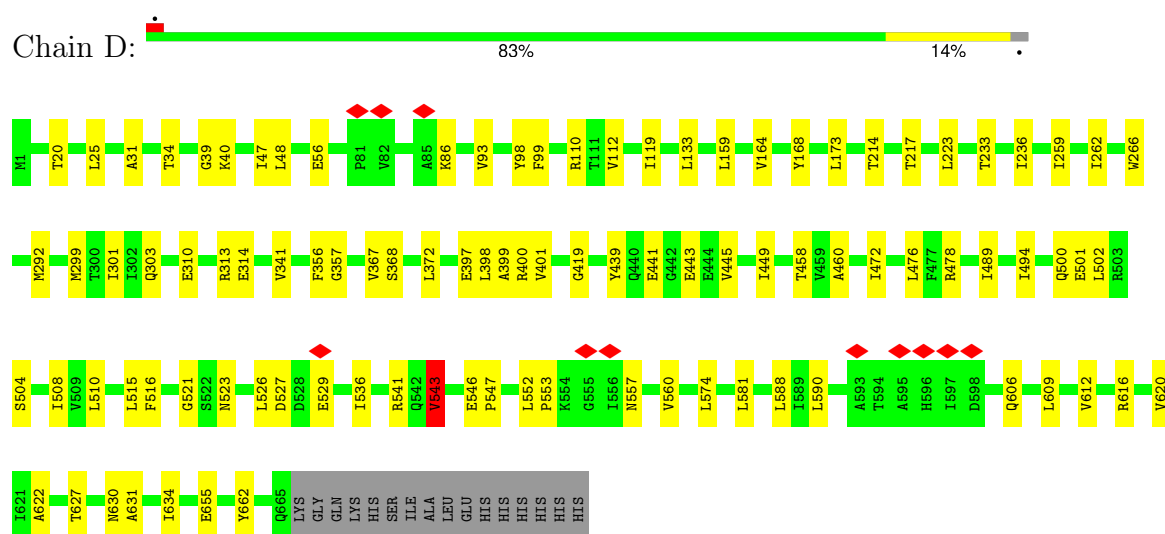


Mol	Chain	Residues	Atoms					AltConf
6	C	1	Total	C	H	N	O	0
			60	27	26	6	1	
6	C	1	Total	C	H	N	O	0
			60	27	26	6	1	

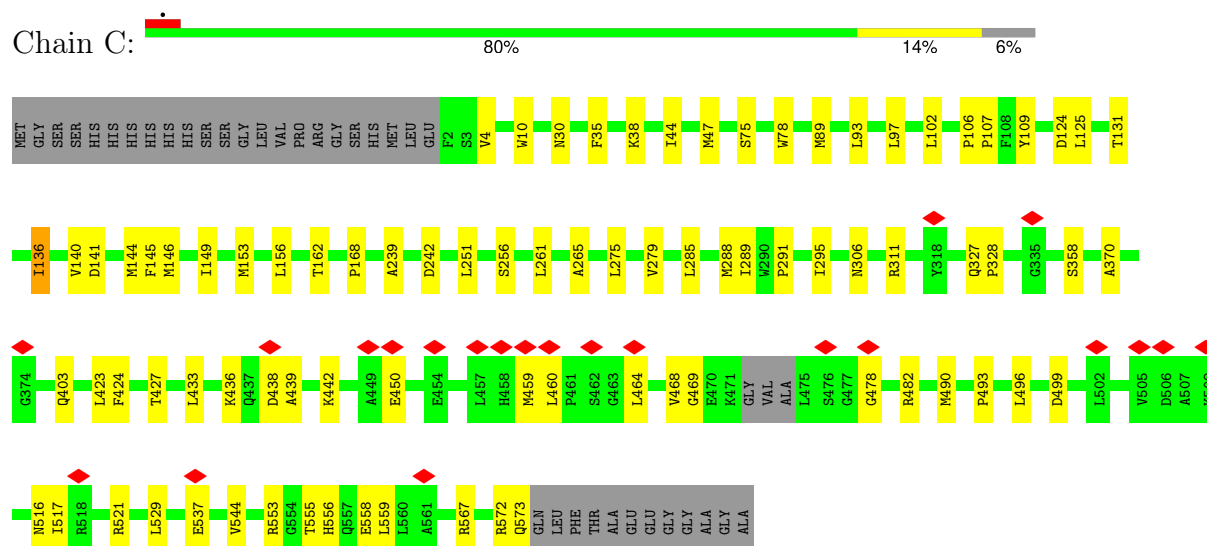
3 Residue-property plots

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

- Molecule 1: Probable multidrug resistance ABC transporter ATP-binding/permease protein YheH



- Molecule 2: Probable multidrug resistance ABC transporter ATP-binding/permease protein YheI



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	133280	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	48.271	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	3.579	Depositor
Minimum map value	-0.203	Depositor
Average map value	0.023	Depositor
Map value standard deviation	0.049	Depositor
Recommended contour level	0.33	Depositor
Map size ($\text{\AA}$)	343.56, 343.56, 343.56	wwPDB
Map dimensions	420, 420, 420	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.818, 0.818, 0.818	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: ATP, HT1, MG, POV

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	0.28	1/5418 (0.0%)	0.44	3/7315 (0.0%)
2	C	0.32	1/4573 (0.0%)	0.46	0/6187
All	All	0.30	2/9991 (0.0%)	0.45	3/13502 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	136	ILE	C-O	-6.85	1.16	1.24
1	D	40	LYS	C-O	-5.11	1.17	1.24

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	655	GLU	N-CA-C	6.45	117.55	108.00
1	D	543	VAL	CA-C-O	-5.79	117.59	122.63
1	D	662	TYR	N-CA-C	-5.31	105.61	112.68

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	5317	5383	5383	73	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	4481	4557	4555	65	0
3	C	228	312	307	4	0
3	D	344	443	443	3	0
4	C	31	12	12	0	0
4	D	31	12	12	1	0
5	D	1	0	0	0	0
6	C	68	52	56	1	0
All	All	10501	10771	10768	129	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 (129) 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:D:543:VAL:HG22	1:D:574:LEU:HG	1.85	0.57
2:C:156:LEU:HD21	3:C:602:POV:H210	1.86	0.57
2:C:124:ASP:OD1	2:C:311:ARG:NH2	2.39	0.55
1:D:292:MET:HE1	2:C:97:LEU:HD23	1.88	0.55
1:D:543:VAL:HG22	1:D:574:LEU:CG	2.37	0.55
2:C:459:MET:SD	2:C:460:LEU:HD12	2.48	0.54
3:D:701:POV:H23A	3:D:701:POV:H3A	1.89	0.54
2:C:450:GLU:O	2:C:516:ASN:ND2	2.41	0.54
1:D:164:VAL:HG21	2:C:251:LEU:HB2	1.90	0.54
2:C:75:SER:HA	2:C:78:TRP:CD1	2.43	0.54
1:D:494:ILE:HG23	1:D:502:LEU:HD22	1.91	0.53
1:D:515:LEU:HD12	1:D:560:VAL:HG13	1.90	0.53
2:C:537:GLU:OE1	2:C:556:HIS:NE2	2.42	0.52
1:D:214:THR:O	1:D:217:THR:OG1	2.28	0.52
2:C:370:ALA:HB3	2:C:544:VAL:HG12	1.90	0.52
1:D:460:ALA:HB3	1:D:634:ILE:HD13	1.92	0.52
2:C:285:LEU:O	2:C:289:ILE:HG23	2.09	0.51
1:D:259:ILE:C	1:D:259:ILE:HD12	2.34	0.51
1:D:612:VAL:O	1:D:616:ARG:NH1	2.44	0.51
2:C:149:ILE:HG21	2:C:288:MET:HB2	1.94	0.50
1:D:620:VAL:HG12	1:D:622:ALA:H	1.75	0.50
2:C:572:ARG:O	2:C:573:GLN:C	2.55	0.50
1:D:310:GLU:OE2	1:D:313:ARG:NH1	2.44	0.50
1:D:546:GLU:N	1:D:547:PRO:CD	2.75	0.50
2:C:427:THR:HB	2:C:464:LEU:O	2.12	0.49
1:D:47:ILE:HD11	2:C:265:ALA:CB	2.42	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:89:MET:HA	2:C:89:MET:HE2	1.93	0.49
2:C:499:ASP:OD1	2:C:529:LEU:HD12	2.13	0.49
1:D:515:LEU:HD12	1:D:560:VAL:CG1	2.43	0.49
1:D:630:ASN:OD1	1:D:630:ASN:N	2.45	0.49
1:D:31:ALA:O	1:D:34:THR:HG22	2.13	0.48
2:C:146:MET:HE1	2:C:295:ILE:HD11	1.93	0.48
1:D:301:ILE:HD11	2:C:424:PHE:CZ	2.49	0.48
1:D:356:PHE:C	2:C:47:MET:HE2	2.38	0.48
1:D:397:GLU:OE2	1:D:400:ARG:NH1	2.45	0.48
2:C:496:LEU:HD22	2:C:517:ILE:HD11	1.95	0.48
2:C:239:ALA:HA	2:C:242:ASP:HB3	1.95	0.48
2:C:555:THR:HG22	2:C:556:HIS:H	1.78	0.48
1:D:47:ILE:HD11	2:C:265:ALA:HB2	1.96	0.48
1:D:521:GLY:N	1:D:553:PRO:O	2.45	0.48
2:C:153:MET:HE2	2:C:162:THR:HG23	1.96	0.48
1:D:543:VAL:HG22	1:D:574:LEU:CD2	2.44	0.47
1:D:458:THR:HB	1:D:631:ALA:HA	1.95	0.47
1:D:508:ILE:HD11	1:D:510:LEU:HD21	1.96	0.47
1:D:266:TRP:HH2	1:D:341:VAL:HG23	1.79	0.47
2:C:436:LYS:HB3	2:C:490:MET:HE1	1.97	0.47
2:C:403:GLN:N	2:C:403:GLN:OE1	2.48	0.47
1:D:501:GLU:O	1:D:504:SER:OG	2.33	0.47
2:C:4:VAL:HG11	2:C:131:THR:HG21	1.96	0.46
1:D:441:GLU:O	1:D:443:GLU:N	2.47	0.46
1:D:25:LEU:HD23	1:D:236:ILE:HD12	1.97	0.46
1:D:527:ASP:OD1	1:D:527:ASP:C	2.59	0.46
2:C:423:LEU:HD13	2:C:468:VAL:HG11	1.98	0.46
1:D:609:LEU:HA	1:D:612:VAL:HG12	1.98	0.46
2:C:493:PRO:O	2:C:521:ARG:NH2	2.46	0.45
2:C:496:LEU:CD2	2:C:517:ILE:HD11	2.46	0.45
1:D:34:THR:CG2	1:D:159:LEU:HD23	2.46	0.45
1:D:543:VAL:HG22	1:D:574:LEU:HD21	1.97	0.45
1:D:303:GLN:NE2	2:C:102:LEU:O	2.50	0.45
2:C:30:ASN:ND2	2:C:144:MET:SD	2.87	0.45
1:D:48:LEU:HD21	2:C:275:LEU:HD22	1.98	0.45
1:D:372:LEU:C	1:D:372:LEU:HD23	2.42	0.45
1:D:20:THR:HB	1:D:173:LEU:HD23	1.99	0.45
1:D:398:LEU:HD22	1:D:398:LEU:H	1.82	0.45
3:D:701:POV:H22A	3:D:701:POV:H27	1.98	0.44
2:C:10:TRP:CH2	2:C:89:MET:HE1	2.52	0.44
1:D:25:LEU:HD21	1:D:233:THR:HA	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:313:ARG:NH2	1:D:314:GLU:OE2	2.51	0.44
1:D:478:ARG:HG3	1:D:502:LEU:CD2	2.48	0.44
2:C:438:ASP:OD1	2:C:438:ASP:C	2.60	0.44
2:C:468:VAL:HG12	2:C:469:GLY:N	2.33	0.44
2:C:4:VAL:HG22	2:C:306:ASN:HA	1.99	0.44
2:C:35:PHE:CE1	3:C:602:POV:H29	2.52	0.44
2:C:144:MET:HB2	3:C:605:POV:H21F	2.00	0.44
1:D:259:ILE:O	1:D:262:ILE:HB	2.18	0.43
1:D:98:TYR:CZ	1:D:112:VAL:HG21	2.53	0.43
1:D:439:TYR:CG	4:D:713:ATP:C2	3.06	0.43
1:D:449:ILE:HG21	1:D:472:ILE:HD11	2.00	0.43
2:C:38:LYS:HD3	2:C:156:LEU:HD23	2.01	0.43
2:C:442:LYS:O	2:C:442:LYS:HD3	2.19	0.43
1:D:223:LEU:HB2	1:D:399:ALA:HB1	1.99	0.43
2:C:136:ILE:O	2:C:140:VAL:HG23	2.19	0.43
2:C:358:SER:O	2:C:553:ARG:NH1	2.46	0.43
1:D:526:LEU:O	1:D:527:ASP:OD1	2.37	0.43
1:D:516:PHE:N	1:D:523:ASN:OD1	2.51	0.43
1:D:299:MET:HE3	2:C:109:TYR:OH	2.19	0.42
1:D:419:GLY:N	1:D:500:GLN:OE1	2.52	0.42
2:C:106:PRO:N	2:C:107:PRO:CD	2.82	0.42
1:D:299:MET:HE1	2:C:102:LEU:HA	2.01	0.42
1:D:494:ILE:HG13	1:D:502:LEU:HD13	2.00	0.42
2:C:4:VAL:HG22	2:C:306:ASN:CA	2.50	0.42
1:D:56:GLU:H	1:D:86:LYS:HB3	1.84	0.42
1:D:489:ILE:CG1	1:D:494:ILE:HD11	2.49	0.42
1:D:552:LEU:O	1:D:557:ASN:N	2.52	0.42
2:C:44:ILE:HD13	2:C:279:VAL:HG21	2.02	0.42
2:C:78:TRP:CE3	2:C:78:TRP:C	2.98	0.42
2:C:93:LEU:HB3	2:C:125:LEU:HD22	2.02	0.42
2:C:555:THR:HG22	2:C:556:HIS:N	2.35	0.42
2:C:559:LEU:O	2:C:567:ARG:NH2	2.52	0.42
1:D:39:GLY:HA2	2:C:261:LEU:HD21	2.02	0.42
2:C:289:ILE:HD11	6:C:610:HT1:H212	2.01	0.42
2:C:436:LYS:HG3	2:C:439:ALA:HB3	2.02	0.42
1:D:93:VAL:HG11	1:D:112:VAL:HG22	2.00	0.42
1:D:439:TYR:HD2	1:D:445:VAL:HG21	1.85	0.42
1:D:529:GLU:O	1:D:529:GLU:CG	2.68	0.42
2:C:168:PRO:HG2	2:C:256:SER:HB2	2.01	0.42
1:D:489:ILE:HG13	1:D:494:ILE:HD11	2.02	0.42
1:D:588:LEU:HD21	1:D:590:LEU:HD21	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:558:GLU:N	2:C:558:GLU:OE1	2.52	0.41
1:D:110:ARG:HG2	1:D:119:ILE:HG22	2.01	0.41
2:C:146:MET:HB3	2:C:291:PRO:HB3	2.02	0.41
2:C:478:GLY:O	2:C:482:ARG:HG3	2.19	0.41
1:D:357:GLY:N	2:C:47:MET:HE2	2.35	0.41
1:D:34:THR:HG23	1:D:159:LEU:HD23	2.03	0.41
1:D:112:VAL:O	1:D:112:VAL:HG23	2.19	0.41
2:C:433:LEU:HD11	2:C:438:ASP:HA	2.02	0.41
3:C:601:POV:H11A	3:C:601:POV:H1A	2.03	0.41
1:D:367:VAL:HG13	1:D:368:SER:N	2.36	0.41
2:C:468:VAL:HG12	2:C:469:GLY:H	1.85	0.41
1:D:541:ARG:CD	1:D:581:LEU:HD13	2.50	0.41
2:C:438:ASP:OD1	2:C:438:ASP:O	2.38	0.41
1:D:606:GLN:NE2	1:D:627:THR:HG22	2.35	0.41
2:C:327:GLN:O	2:C:328:PRO:C	2.64	0.41
1:D:398:LEU:O	1:D:401:VAL:HG12	2.21	0.40
2:C:141:ASP:HA	2:C:145:PHE:HB2	2.03	0.40
1:D:476:LEU:O	1:D:502:LEU:HD21	2.21	0.40
1:D:168:TYR:CG	3:D:709:POV:O22	2.74	0.40
1:D:536:ILE:O	1:D:536:ILE:HG22	2.21	0.40
1:D:99:PHE:HB2	1:D:133:LEU:HD21	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	D	663/681 (97%)	613 (92%)	50 (8%)	0	100	100
2	C	565/607 (93%)	540 (96%)	25 (4%)	0	100	100
All	All	1228/1288 (95%)	1153 (94%)	75 (6%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	567/581 (98%)	566 (100%)	1 (0%)	92	95
2	C	481/508 (95%)	481 (100%)	0	100	100
All	All	1048/1089 (96%)	1047 (100%)	1 (0%)	92	96

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	543	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	338	HIS
1	D	392	GLN
1	D	440	GLN
1	D	505	HIS
2	C	80	HIS
2	C	126	GLN

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 25 ligands modelled in this entry, 1 is monoatomic - leaving 24 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	$\# Z > 2$
6	HT1	C	611	-	37,39,39	0.72	0	34,56,56	0.95	2 (5%)
3	POV	D	704	-	19,19,51	0.56	0	22,22,59	0.73	1 (4%)
3	POV	D	707	-	45,45,51	0.42	0	48,50,59	0.49	1 (2%)
3	POV	C	602	-	15,15,51	0.88	1 (6%)	14,14,59	0.56	0
3	POV	C	608	-	17,17,51	0.24	0	16,16,59	0.14	0
3	POV	D	712	-	23,23,51	0.23	0	21,21,59	0.13	0
3	POV	C	605	-	46,46,51	0.36	0	52,54,59	0.32	0
3	POV	C	603	-	30,30,51	0.49	0	33,35,59	0.64	1 (3%)
3	POV	C	606	-	30,30,51	0.47	0	33,35,59	0.69	1 (3%)
3	POV	C	601	-	22,22,51	0.40	0	27,28,59	0.46	0
3	POV	D	706	-	14,14,51	0.28	0	13,13,59	0.16	0
3	POV	D	702	-	25,25,51	0.51	0	28,30,59	0.60	1 (3%)
3	POV	D	709	-	29,29,51	0.51	0	32,34,59	0.66	1 (3%)
3	POV	D	708	-	36,36,51	0.48	0	39,41,59	0.67	2 (5%)
3	POV	D	705	-	15,15,51	0.49	0	17,20,59	0.51	0
3	POV	D	710	-	29,29,51	0.39	0	35,37,59	0.40	0
6	HT1	C	610	-	37,39,39	0.77	1 (2%)	34,56,56	0.96	3 (8%)
4	ATP	D	713	5	28,33,33	0.79	0	34,52,52	0.93	2 (5%)
3	POV	D	711	-	27,27,51	0.23	0	25,25,59	0.12	0
3	POV	C	607	-	15,15,51	0.43	0	19,21,59	0.45	0
3	POV	D	701	-	37,37,51	0.46	0	40,42,59	0.65	1 (2%)
3	POV	D	703	-	30,30,51	0.57	0	30,33,59	0.78	2 (6%)
3	POV	C	604	-	45,45,51	0.38	0	51,53,59	0.44	0
4	ATP	C	609	-	28,33,33	0.82	1 (3%)	34,52,52	0.99	2 (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
6	HT1	C	611	-	-	3/7/25/25	0/6/6/6
3	POV	D	704	-	-	4/18/18/55	-
3	POV	D	707	-	-	18/47/47/55	-
3	POV	C	602	-	-	2/13/13/55	-
3	POV	C	608	-	-	2/15/15/55	-
3	POV	D	712	-	-	3/19/19/55	-
3	POV	C	605	-	-	10/50/50/55	-
3	POV	C	603	-	-	6/32/32/55	-
3	POV	C	606	-	-	8/32/32/55	-
3	POV	C	601	-	-	3/23/23/55	-
3	POV	D	706	-	-	2/12/12/55	-
3	POV	D	702	-	-	10/27/27/55	-
3	POV	D	709	-	-	11/31/31/55	-
3	POV	D	708	-	-	5/38/38/55	-
3	POV	D	705	-	-	5/15/15/55	-
3	POV	D	710	-	-	10/33/33/55	-
6	HT1	C	610	-	-	0/7/25/25	0/6/6/6
4	ATP	D	713	5	-	4/18/38/38	0/3/3/3
3	POV	D	711	-	-	5/23/23/55	-
3	POV	C	607	-	-	3/16/16/55	-
3	POV	D	701	-	-	22/39/39/55	-
3	POV	D	703	-	-	6/29/29/55	-
3	POV	C	604	-	-	17/49/49/55	-
4	ATP	C	609	-	-	4/18/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	602	POV	C29-C210	3.26	1.50	1.31
4	C	609	ATP	C1'-N9	-2.31	1.44	1.49
6	C	610	HT1	C20-C15	-2.21	1.38	1.41

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	703	POV	O21-C21-O22	-2.83	122.07	125.70
6	C	611	HT1	C20-C19-N5	-2.68	119.07	122.11
3	D	703	POV	O13-P-O14	2.46	120.41	110.83
3	D	701	POV	O13-P-O14	2.44	120.35	110.83
3	D	709	POV	O13-P-O14	2.44	120.33	110.83
3	D	704	POV	O13-P-O14	2.44	120.33	110.83
4	D	713	ATP	C5-C6-N6	2.38	123.93	120.31
3	C	603	POV	O13-P-O14	2.35	120.00	110.83
3	D	707	POV	O13-P-O14	2.35	120.00	110.83
3	C	606	POV	O13-P-O14	2.35	119.99	110.83
3	D	708	POV	O21-C21-C22	2.34	116.54	111.48
6	C	611	HT1	C21-N5-C19	2.32	124.43	118.11
6	C	610	HT1	C21-N5-C19	2.31	124.42	118.11
4	C	609	ATP	C4'-O4'-C1'	-2.26	107.85	109.92
3	D	708	POV	O13-P-O14	2.23	119.50	110.83
6	C	610	HT1	C24-N5-C19	2.21	124.12	118.11
6	C	610	HT1	C20-C19-N5	-2.20	119.61	122.11
4	C	609	ATP	C5-C6-N6	2.20	123.67	120.31
3	D	702	POV	O13-P-O14	2.20	119.41	110.83
4	D	713	ATP	O2B-PB-O3B	2.10	112.94	107.27

There are no chirality outliers.

All (163) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	D	701	POV	C1-O11-P-O12
3	D	701	POV	C1-O11-P-O13
3	D	701	POV	C1-O11-P-O14
3	D	702	POV	C22-C21-O21-C2
3	D	703	POV	O22-C21-O21-C2
3	D	705	POV	C1-O11-P-O12
3	D	705	POV	C1-O11-P-O13
3	D	705	POV	C1-O11-P-O14
3	D	705	POV	O22-C21-O21-C2
3	D	708	POV	O22-C21-O21-C2
3	D	709	POV	C211-C210-C29-C28
3	D	710	POV	C11-O12-P-O13
3	D	710	POV	C12-C11-O12-P
3	C	604	POV	O22-C21-O21-C2
3	C	605	POV	O12-C11-C12-N
3	C	605	POV	C22-C21-O21-C2
3	C	605	POV	O22-C21-O21-C2
3	C	606	POV	C22-C21-O21-C2

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Mol	Chain	Res	Type	Atoms
3	C	607	POV	C12-C11-O12-P
4	C	609	ATP	O4'-C4'-C5'-O5'
3	D	707	POV	C32-C31-O31-C3
3	D	701	POV	O32-C31-O31-C3
3	D	702	POV	O32-C31-O31-C3
3	D	707	POV	O32-C31-O31-C3
3	D	702	POV	O22-C21-O21-C2
3	D	701	POV	C32-C31-O31-C3
3	D	708	POV	C22-C21-O21-C2
3	C	604	POV	C22-C21-O21-C2
3	D	702	POV	C32-C31-O31-C3
3	C	603	POV	O32-C31-O31-C3
3	C	606	POV	O22-C21-O21-C2
3	C	603	POV	C32-C31-O31-C3
4	C	609	ATP	C3'-C4'-C5'-O5'
3	D	704	POV	C32-C31-O31-C3
3	D	701	POV	C31-C32-C33-C34
3	D	701	POV	C311-C310-C39-C38
4	D	713	ATP	O4'-C4'-C5'-O5'
4	D	713	ATP	C3'-C4'-C5'-O5'
3	D	707	POV	C21-C22-C23-C24
3	D	704	POV	O32-C31-O31-C3
3	C	606	POV	C211-C210-C29-C28
3	D	701	POV	C21-C22-C23-C24
3	D	707	POV	C2-C3-O31-C31
3	D	709	POV	O22-C21-O21-C2
3	D	709	POV	C22-C21-O21-C2
3	D	710	POV	C22-C21-O21-C2
3	D	710	POV	O22-C21-O21-C2
3	D	701	POV	C211-C210-C29-C28
3	C	607	POV	O11-C1-C2-O21
3	D	701	POV	C2-C1-O11-P
6	C	611	HT1	C2-C1-O1-C26
3	D	701	POV	C22-C21-O21-C2
3	C	604	POV	C1-C2-C3-O31
6	C	611	HT1	C6-C1-O1-C26
3	C	604	POV	C31-C32-C33-C34
3	D	701	POV	O22-C21-O21-C2
3	D	711	POV	C39-C310-C311-C312
3	D	711	POV	C213-C214-C215-C216
3	C	603	POV	C34-C35-C36-C37
3	D	704	POV	C34-C35-C36-C37

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Mol	Chain	Res	Type	Atoms
3	D	710	POV	C23-C24-C25-C26
3	D	701	POV	C22-C23-C24-C25
3	C	604	POV	C36-C37-C38-C39
3	C	601	POV	C23-C24-C25-C26
4	D	713	ATP	PG-O3B-PB-O3A
3	C	603	POV	C24-C25-C26-C27
3	C	604	POV	C26-C27-C28-C29
3	D	709	POV	C25-C26-C27-C28
3	C	604	POV	C2-C1-O11-P
3	D	712	POV	C26-C27-C28-C29
3	C	605	POV	C31-C32-C33-C34
3	D	703	POV	C211-C210-C29-C28
3	C	604	POV	C32-C31-O31-C3
3	C	605	POV	C32-C31-O31-C3
3	D	707	POV	C212-C213-C214-C215
3	C	604	POV	C22-C23-C24-C25
3	D	710	POV	C25-C26-C27-C28
3	D	701	POV	O11-C1-C2-C3
3	D	707	POV	O11-C1-C2-C3
3	C	604	POV	C34-C35-C36-C37
3	D	702	POV	C23-C24-C25-C26
3	D	702	POV	C32-C33-C34-C35
3	D	708	POV	C31-C32-C33-C34
3	D	701	POV	O11-C1-C2-O21
3	D	701	POV	C24-C25-C26-C27
3	D	711	POV	C23-C24-C25-C26
3	C	606	POV	C23-C24-C25-C26
3	C	604	POV	C24-C25-C26-C27
3	C	604	POV	O32-C31-O31-C3
3	C	605	POV	O32-C31-O31-C3
3	D	709	POV	C2-C3-O31-C31
3	D	708	POV	C1-C2-O21-C21
3	D	709	POV	C1-C2-O21-C21
3	D	707	POV	C215-C216-C217-C218
3	D	702	POV	O11-C1-C2-O21
3	C	604	POV	O11-C1-C2-O21
3	D	709	POV	C1-C2-C3-O31
3	D	712	POV	C310-C311-C312-C313
3	D	709	POV	C33-C34-C35-C36
3	D	705	POV	O12-C11-C12-N
3	D	710	POV	O12-C11-C12-N
3	C	604	POV	O12-C11-C12-N

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Mol	Chain	Res	Type	Atoms
3	C	607	POV	O12-C11-C12-N
3	D	707	POV	O11-C1-C2-O21
3	D	709	POV	O21-C2-C3-O31
3	C	604	POV	O21-C2-C3-O31
3	D	701	POV	C35-C36-C37-C38
3	D	710	POV	C11-O12-P-O11
3	D	702	POV	C2-C1-O11-P
3	D	712	POV	C36-C37-C38-C39
3	D	703	POV	C211-C212-C213-C214
3	D	701	POV	C3-C2-O21-C21
3	C	604	POV	C3-C2-O21-C21
3	C	606	POV	C3-C2-O21-C21
3	C	604	POV	O11-C1-C2-C3
3	D	711	POV	C29-C210-C211-C212
3	D	706	POV	C210-C211-C212-C213
3	D	706	POV	C24-C25-C26-C27
6	C	611	HT1	C27-C26-O1-C1
3	D	707	POV	C24-C25-C26-C27
3	C	605	POV	C214-C215-C216-C217
3	D	707	POV	C1-C2-O21-C21
3	D	710	POV	C3-C2-O21-C21
3	D	701	POV	C34-C35-C36-C37
3	C	603	POV	C23-C24-C25-C26
3	D	707	POV	C312-C313-C314-C315
3	C	603	POV	C35-C36-C37-C38
3	D	701	POV	O21-C2-C3-O31
3	D	707	POV	C39-C310-C311-C312
3	D	707	POV	C34-C35-C36-C37
4	D	713	ATP	PG-O3B-PB-O1B
3	D	709	POV	C32-C33-C34-C35
3	D	701	POV	C32-C33-C34-C35
3	C	606	POV	C25-C26-C27-C28
3	D	702	POV	O11-C1-C2-C3
3	D	707	POV	O21-C2-C3-O31
3	C	602	POV	C27-C28-C29-C210
3	D	703	POV	C1-C2-O21-C21
3	D	703	POV	C3-C2-O21-C21
3	C	605	POV	C33-C34-C35-C36
3	D	707	POV	C3-C2-O21-C21
3	D	707	POV	C1-C2-C3-O31
3	C	606	POV	C212-C213-C214-C215
3	C	608	POV	C211-C212-C213-C214

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Mol	Chain	Res	Type	Atoms
4	C	609	ATP	PA-O3A-PB-O2B
3	D	707	POV	C211-C212-C213-C214
3	C	602	POV	C29-C210-C211-C212
3	C	601	POV	O11-C1-C2-O21
3	D	709	POV	C31-C32-C33-C34
3	C	605	POV	C213-C214-C215-C216
3	D	701	POV	C1-C2-C3-O31
3	D	702	POV	C3-C2-O21-C21
3	D	710	POV	C1-C2-O21-C21
3	D	707	POV	C311-C312-C313-C314
3	D	708	POV	O32-C31-O31-C3
3	C	601	POV	C2-C1-O11-P
3	C	608	POV	C211-C210-C29-C28
3	D	711	POV	C21-C22-C23-C24
3	C	605	POV	C215-C216-C217-C218
3	D	703	POV	O31-C31-C32-C33
3	D	704	POV	O11-C1-C2-C3
4	C	609	ATP	PA-O3A-PB-O1B
3	C	606	POV	C29-C210-C211-C212

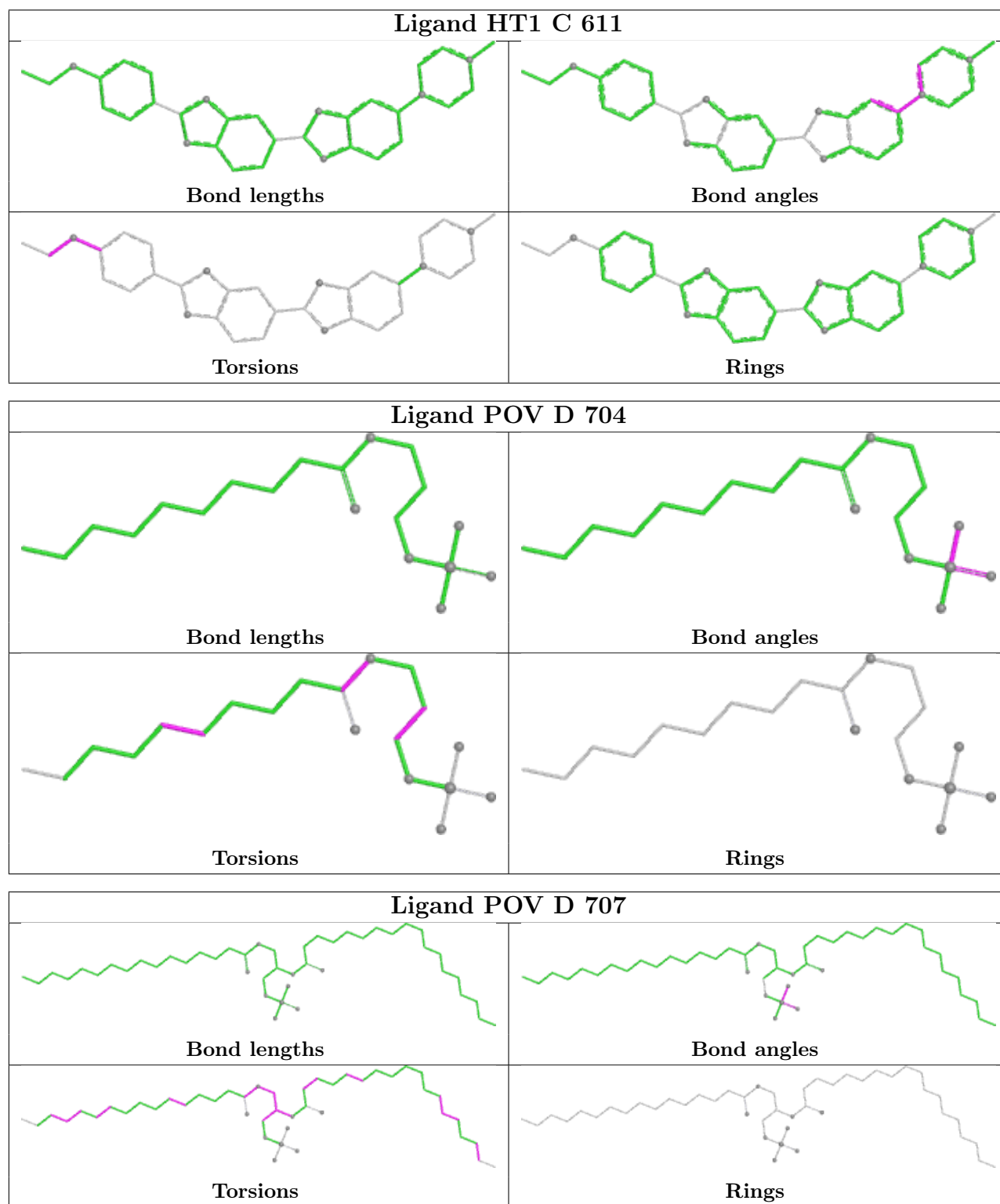
There are no ring outliers.

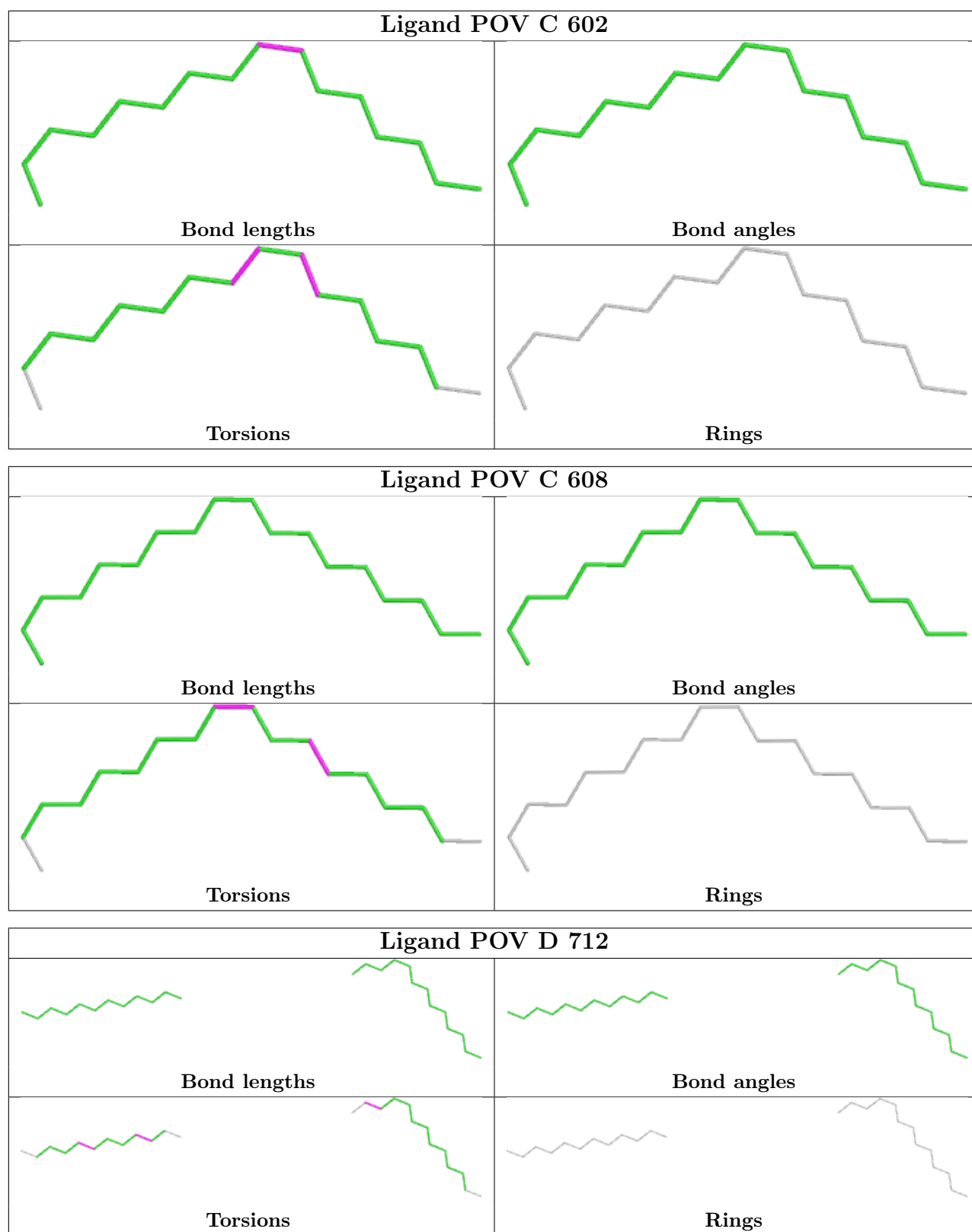
7 monomers are involved in 9 short contacts:

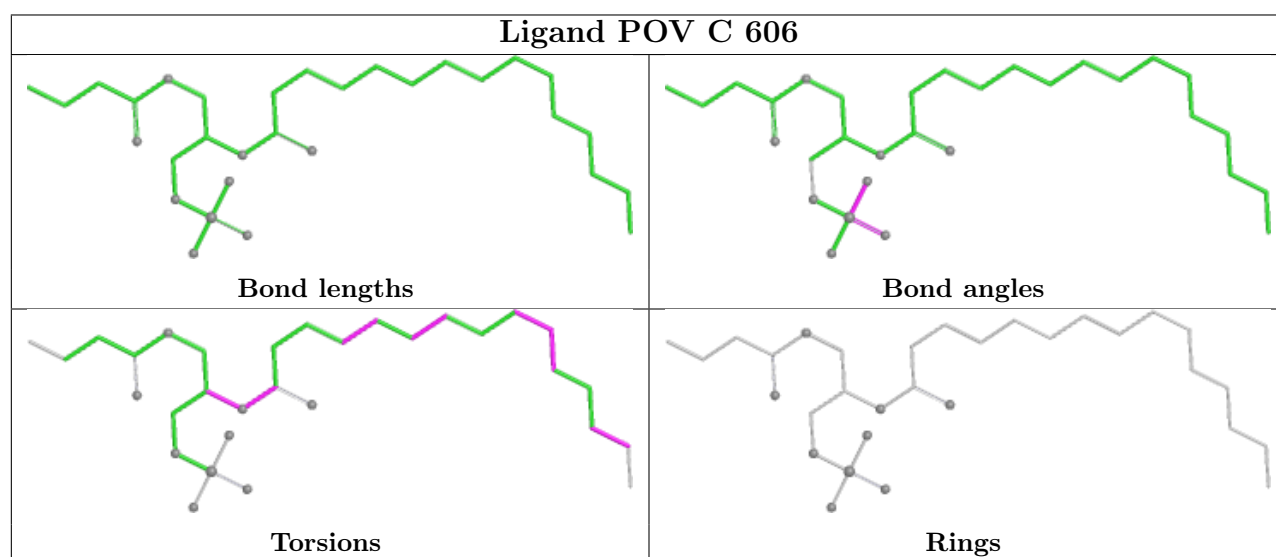
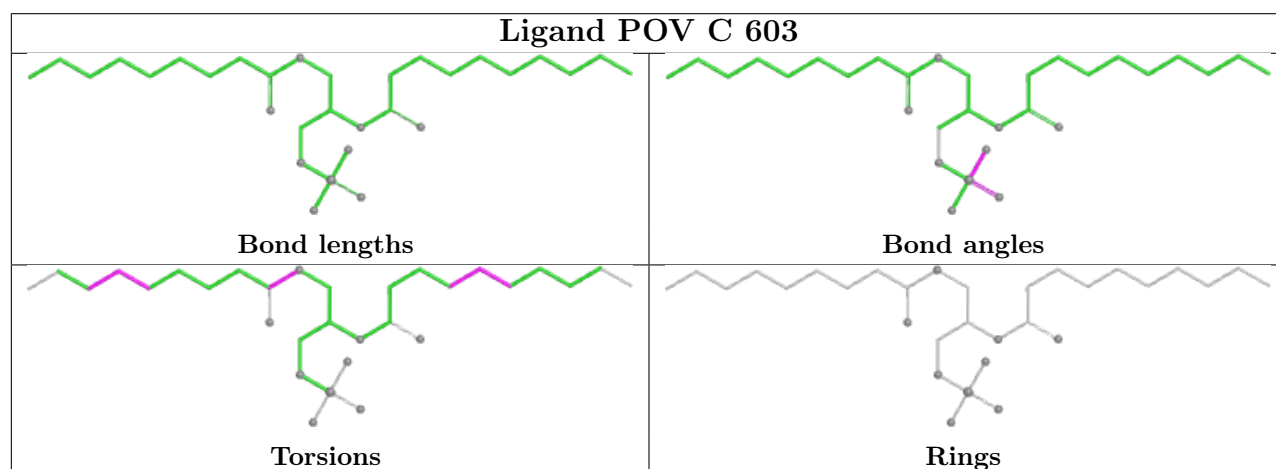
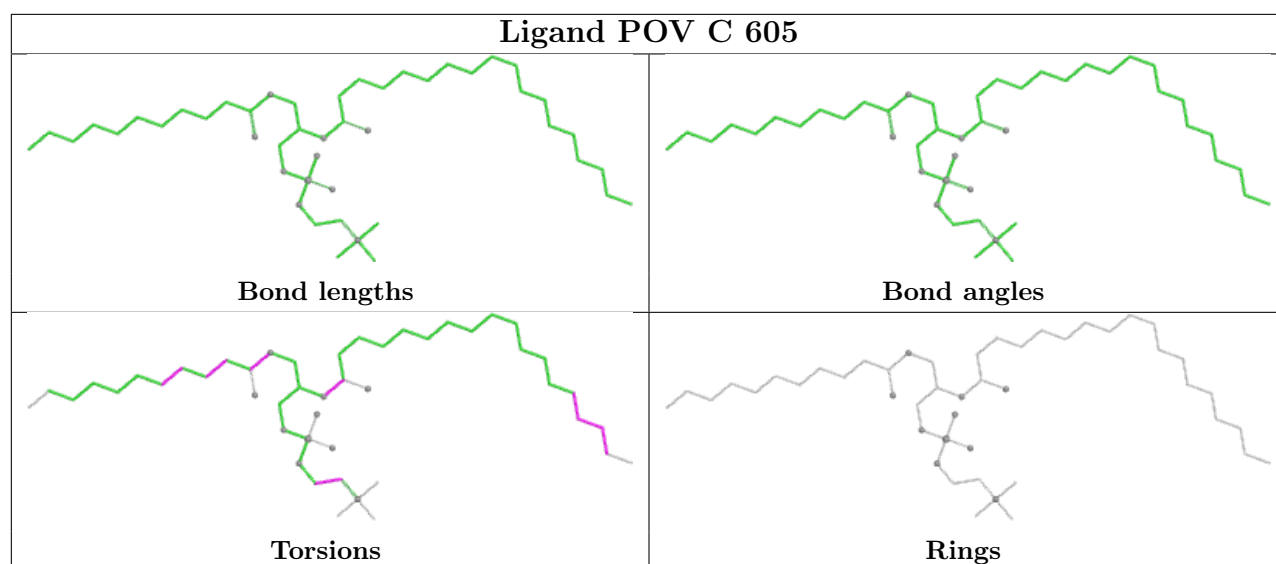
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	602	POV	2	0
3	C	605	POV	1	0
3	C	601	POV	1	0
3	D	709	POV	1	0
6	C	610	HT1	1	0
4	D	713	ATP	1	0
3	D	701	POV	2	0

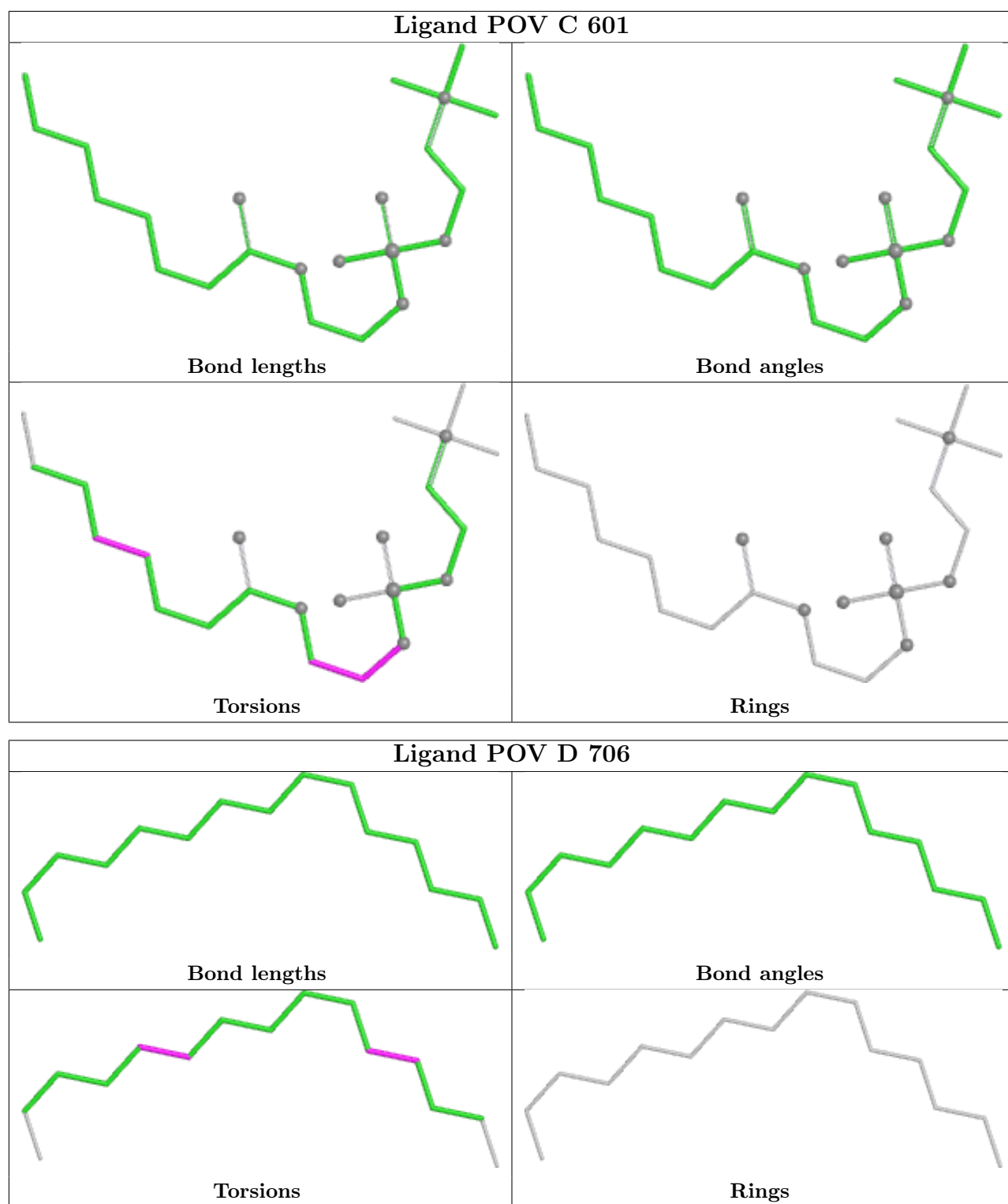
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

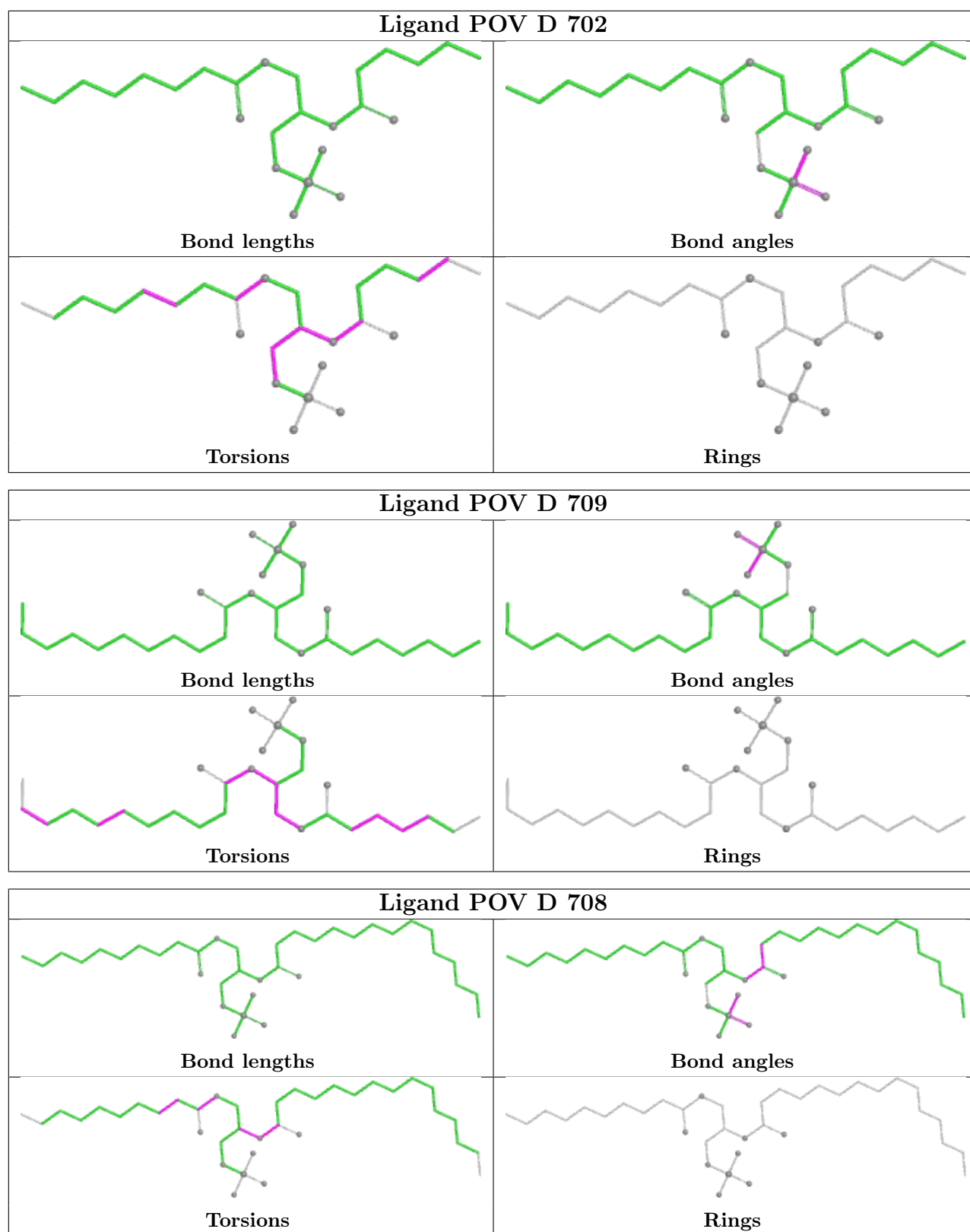
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

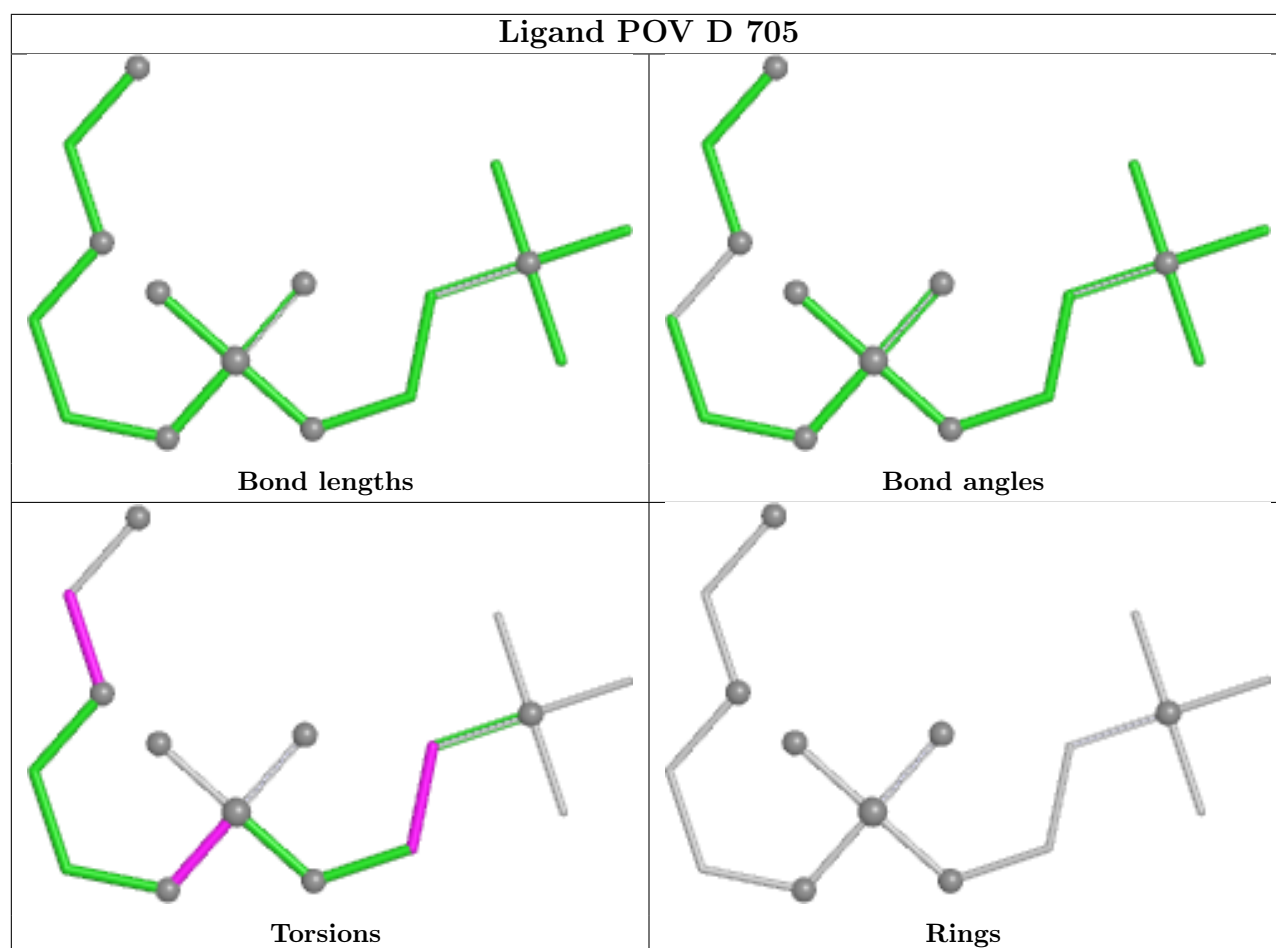


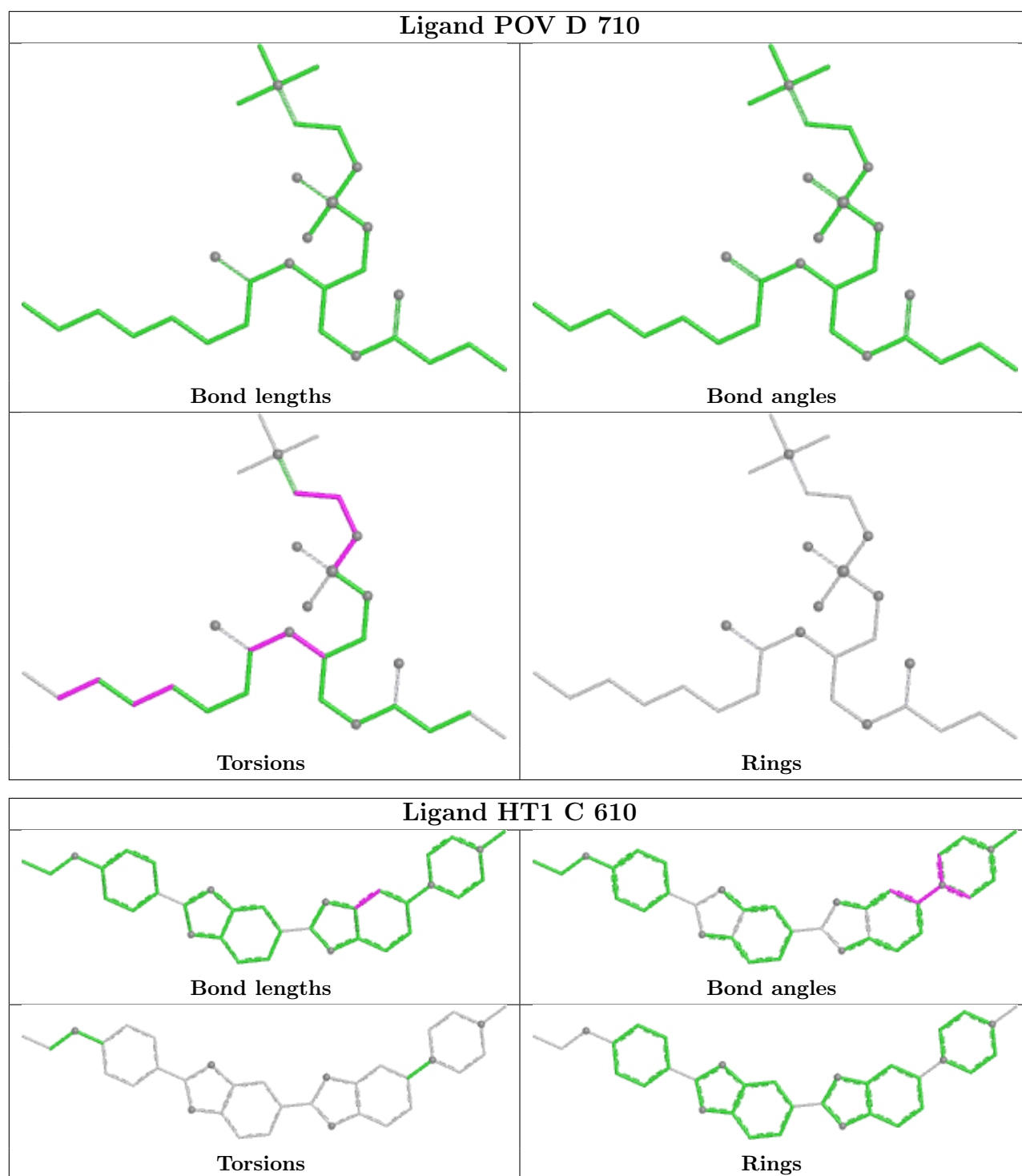


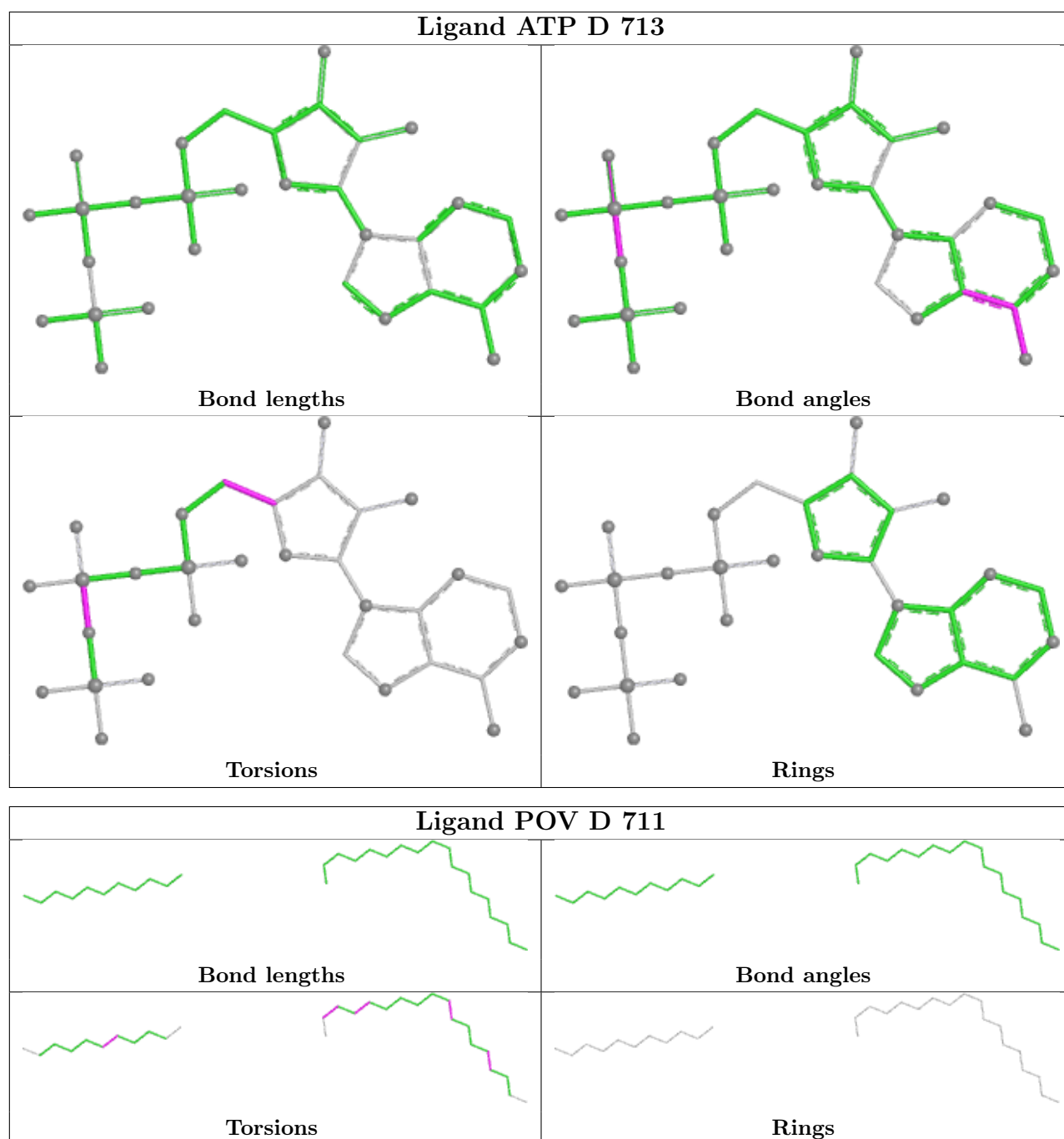


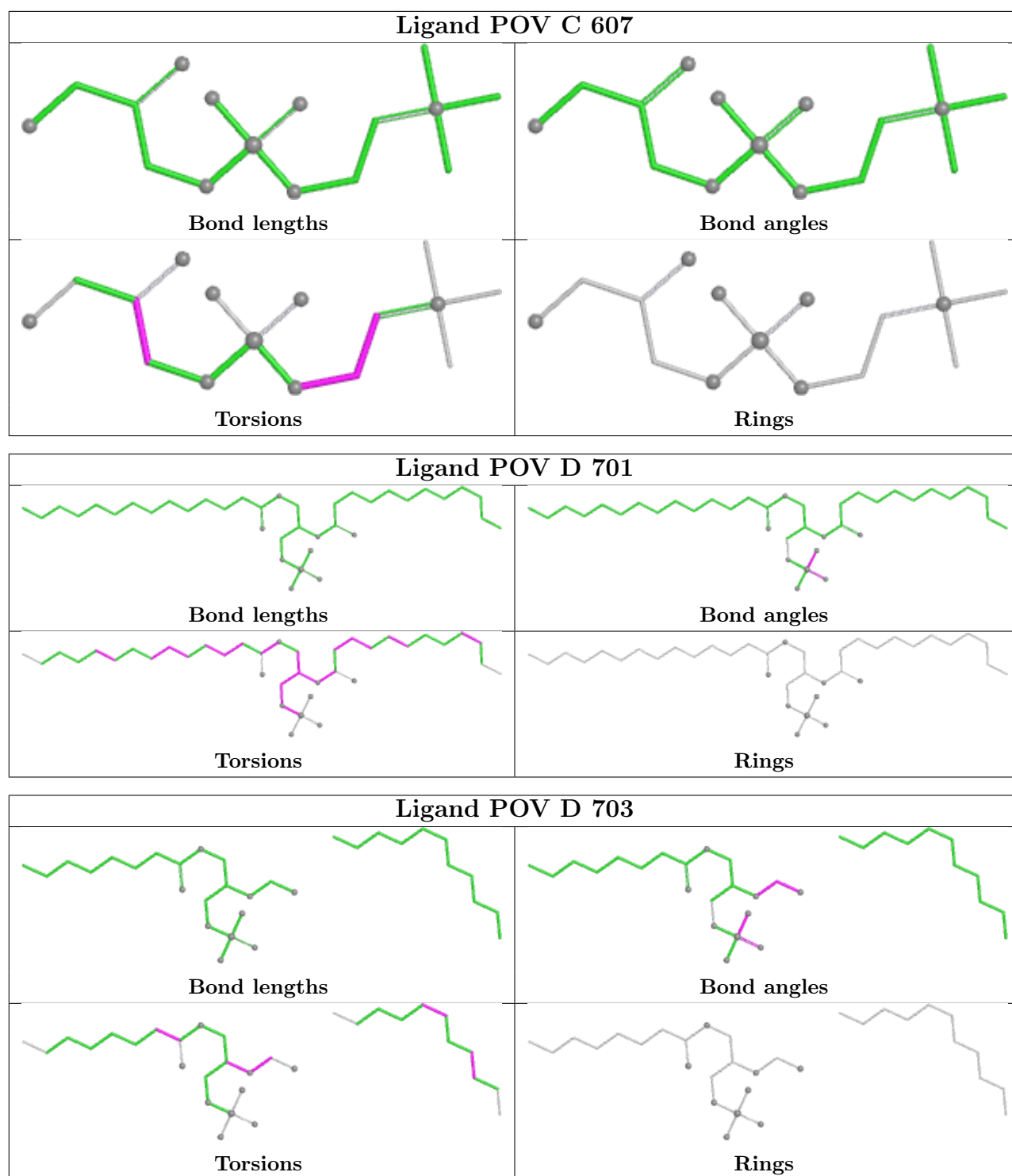


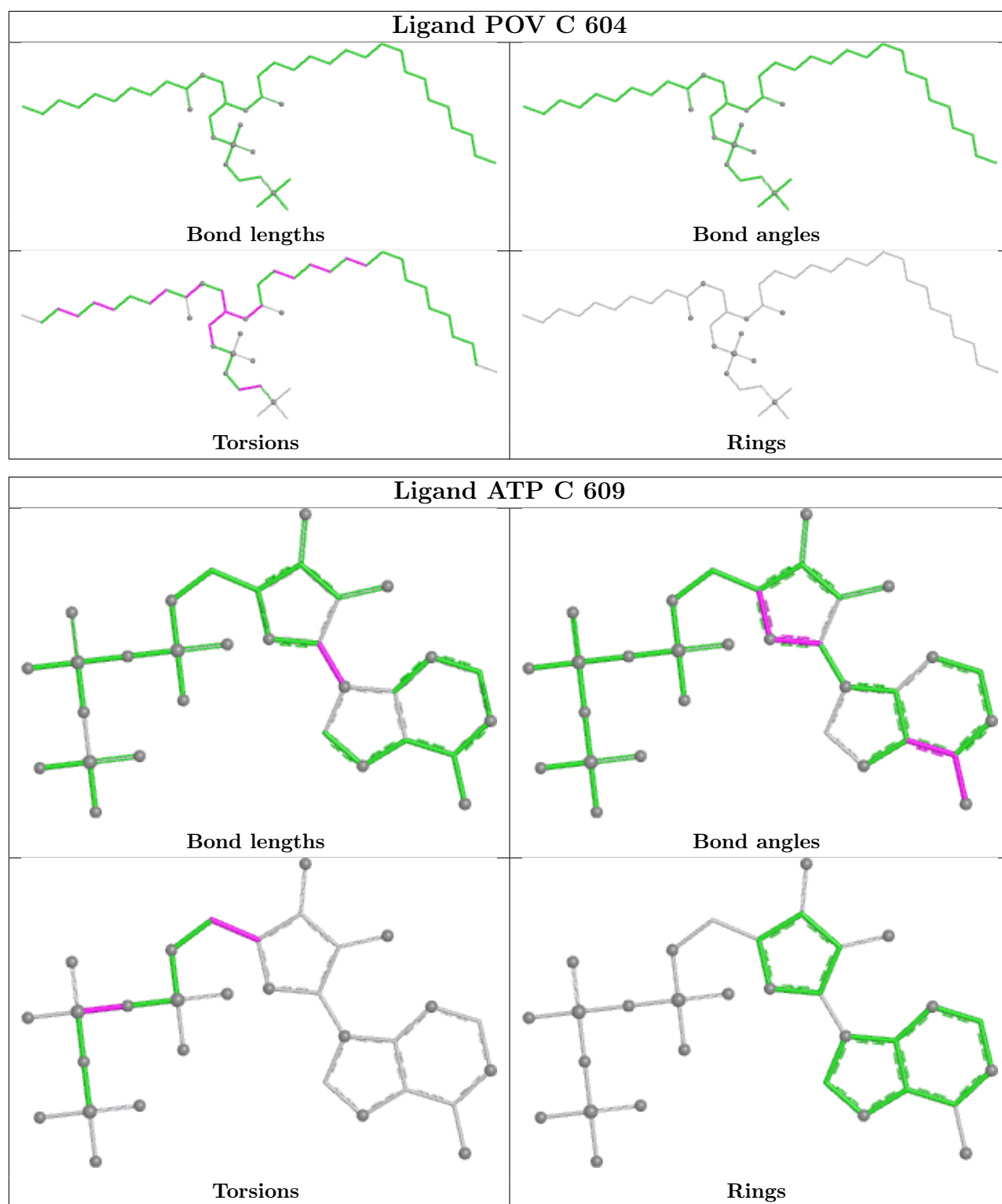












5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

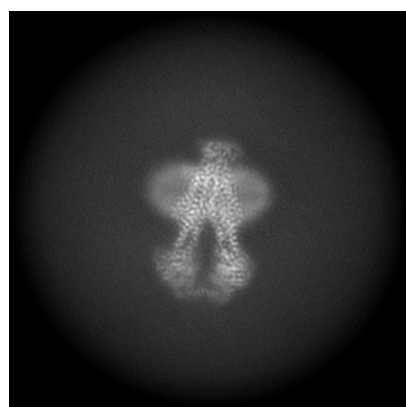
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-29297. These allow visual inspection of the internal detail of the map and identification of artifacts.

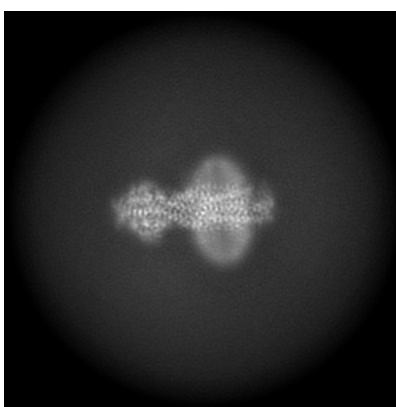
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

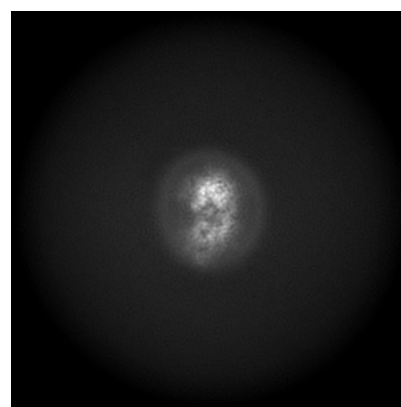
6.1.1 Primary map



X



Y

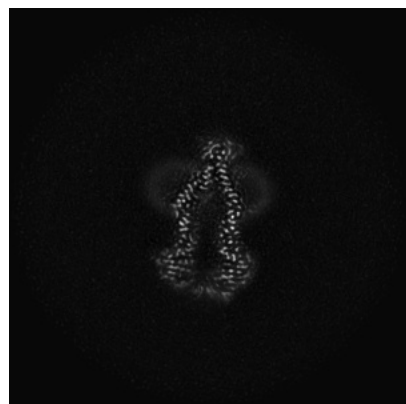


Z

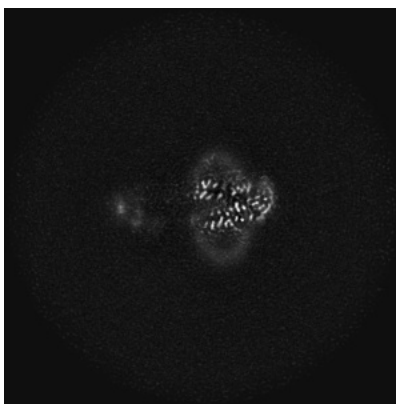
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

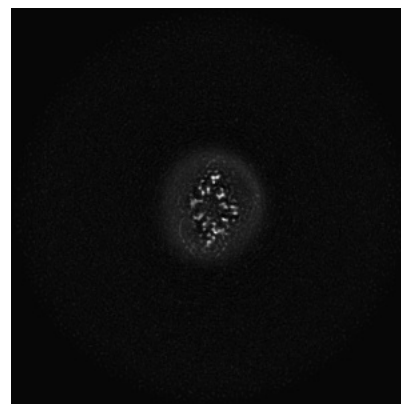
6.2.1 Primary map



X Index: 210



Y Index: 210

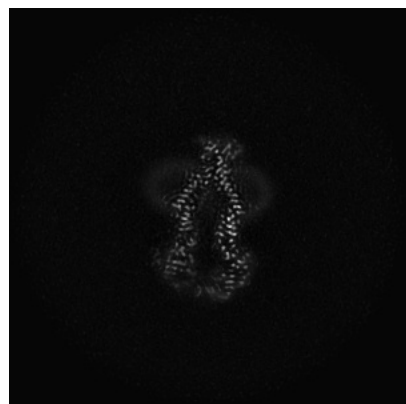


Z Index: 210

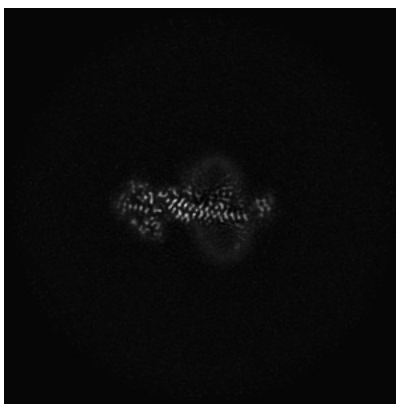
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

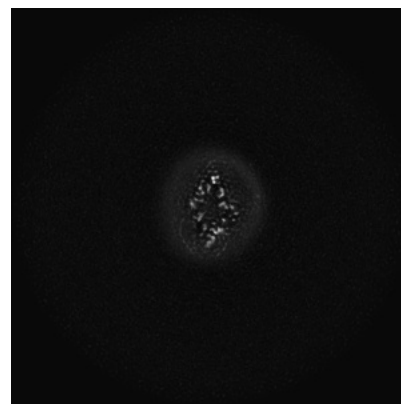
6.3.1 Primary map



X Index: 212



Y Index: 232

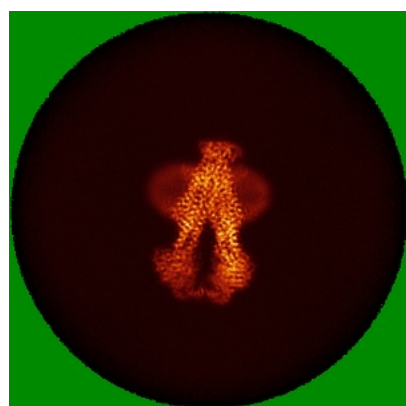


Z Index: 211

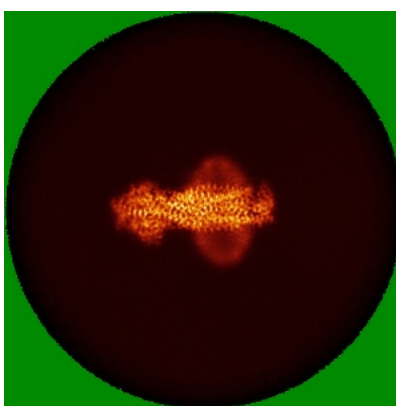
The images above show the largest variance slices of the map in three orthogonal directions.

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

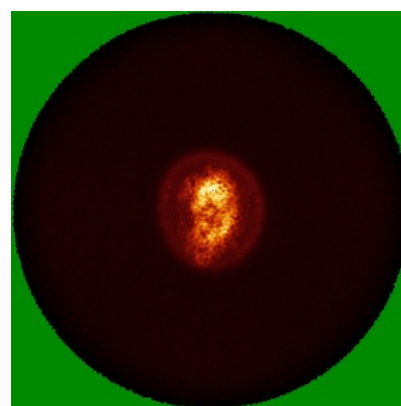
6.4.1 Primary map



X



Y

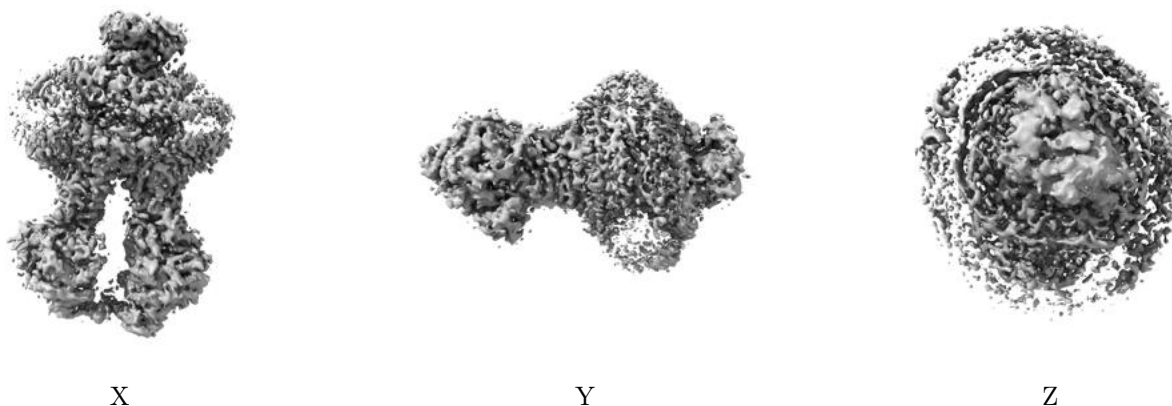


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.33. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

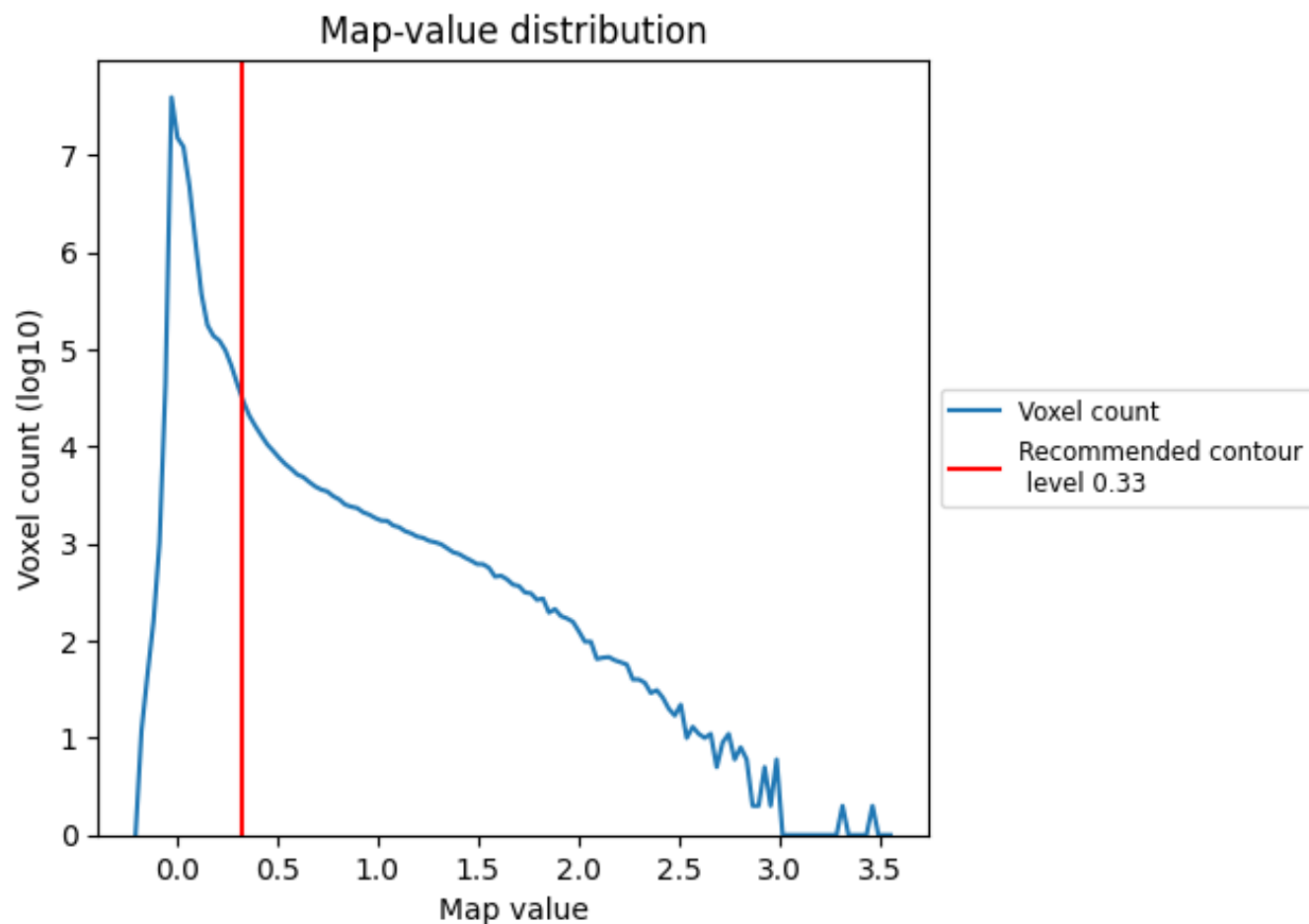
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

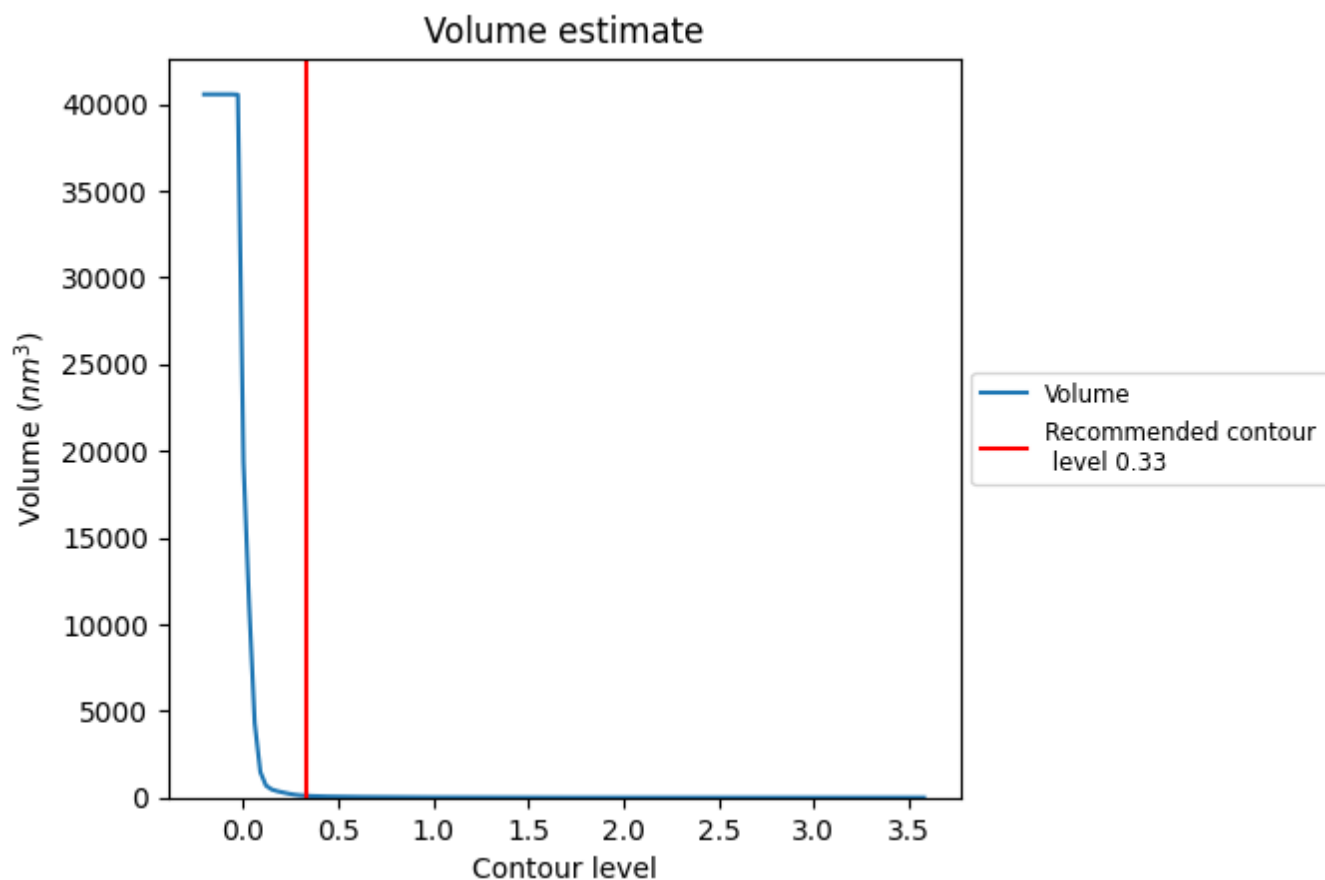
This section contains the results of statistical analysis of the map.

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.

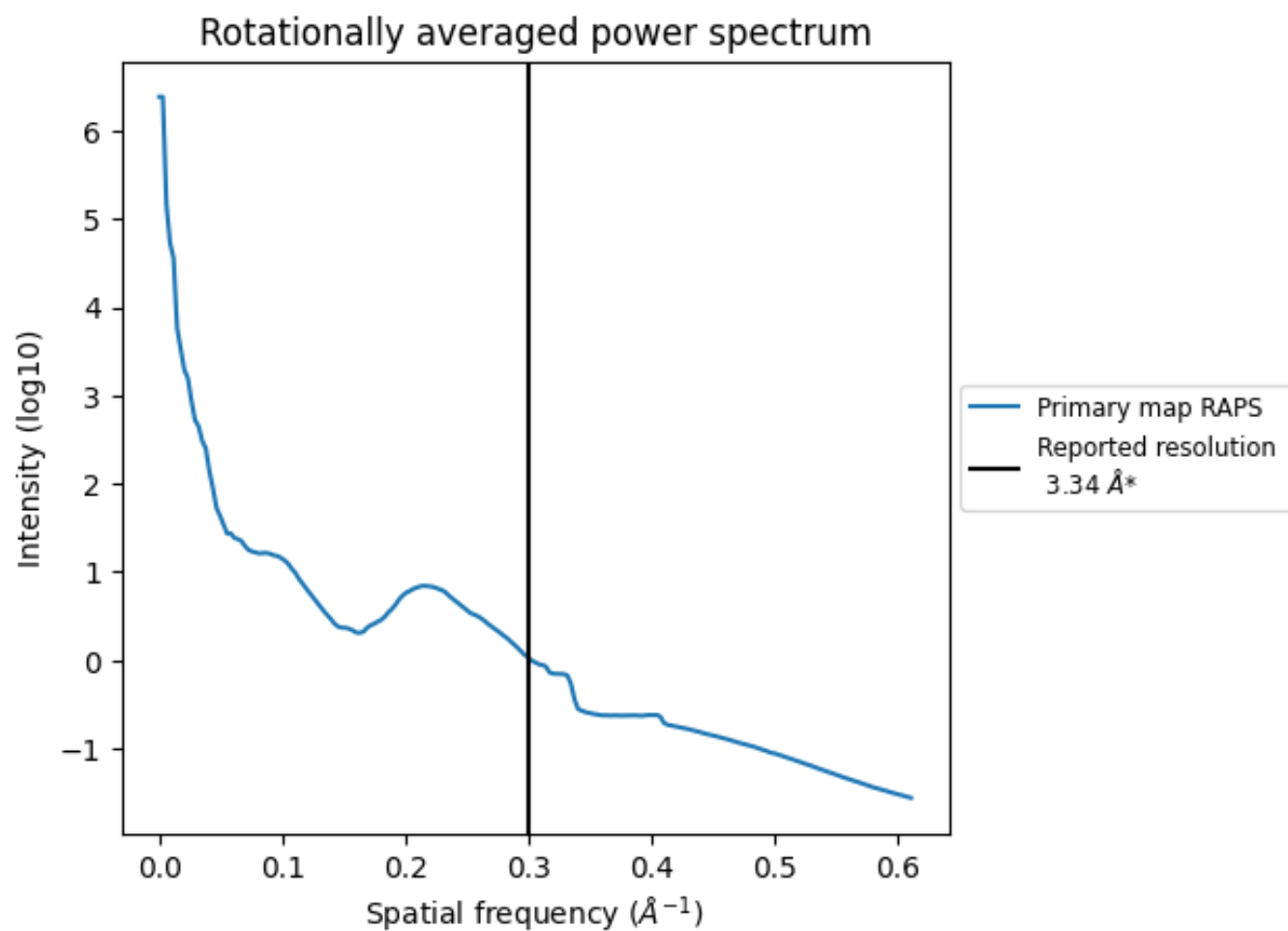
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 105 nm^3 ; this corresponds to an approximate mass of 95 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 0.299 Å⁻¹

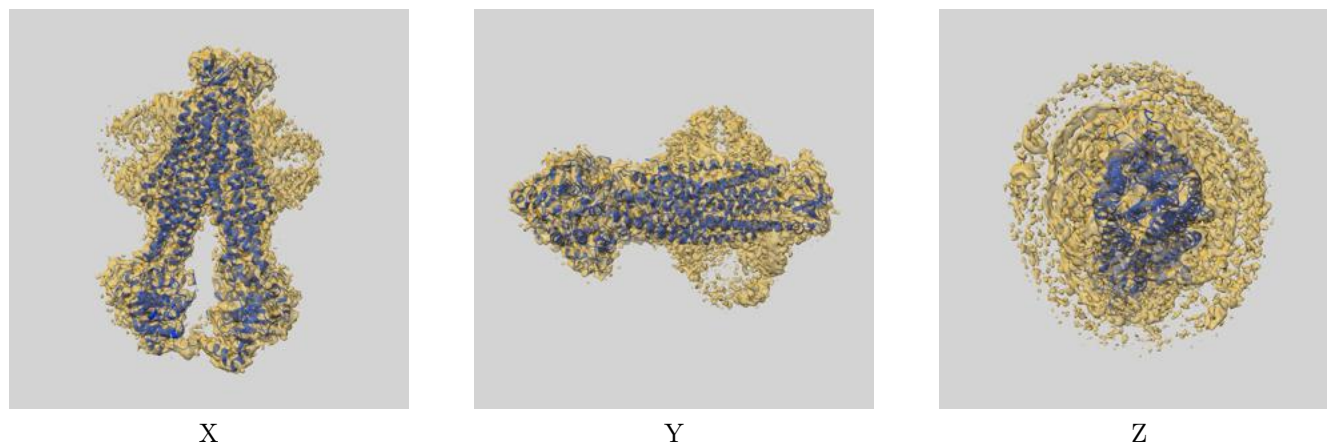
8 Fourier-Shell correlation ⓘ

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

9 Map-model fit [i](#)

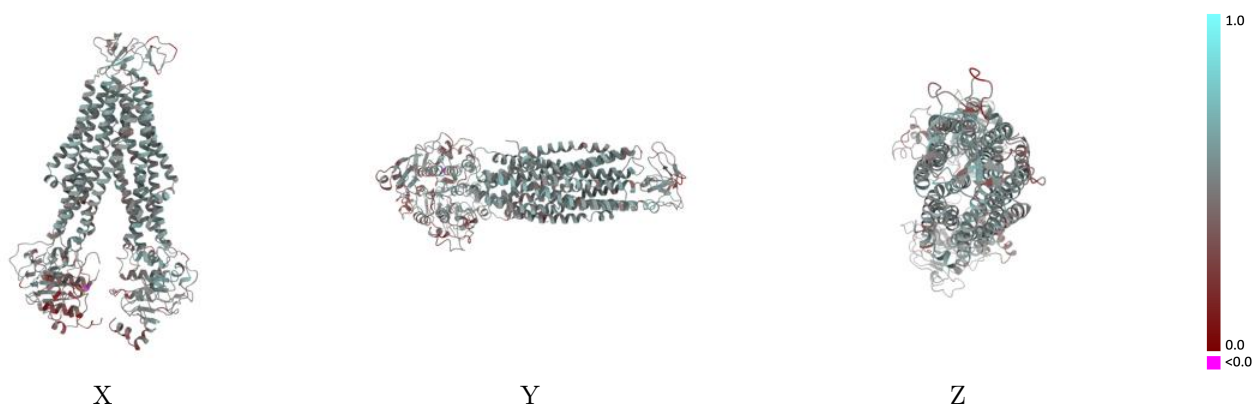
This section contains information regarding the fit between EMDB map EMD-29297 and PDB model 8FMV. Per-residue inclusion information can be found in [section 3](#) on [page 8](#).

9.1 Map-model overlay [i](#)



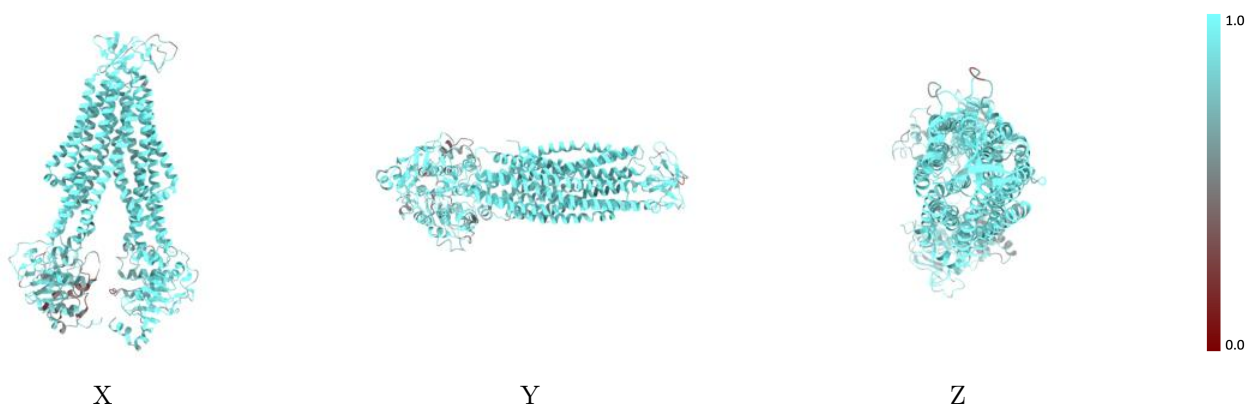
The images above show the 3D surface view of the map at the recommended contour level 0.33 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



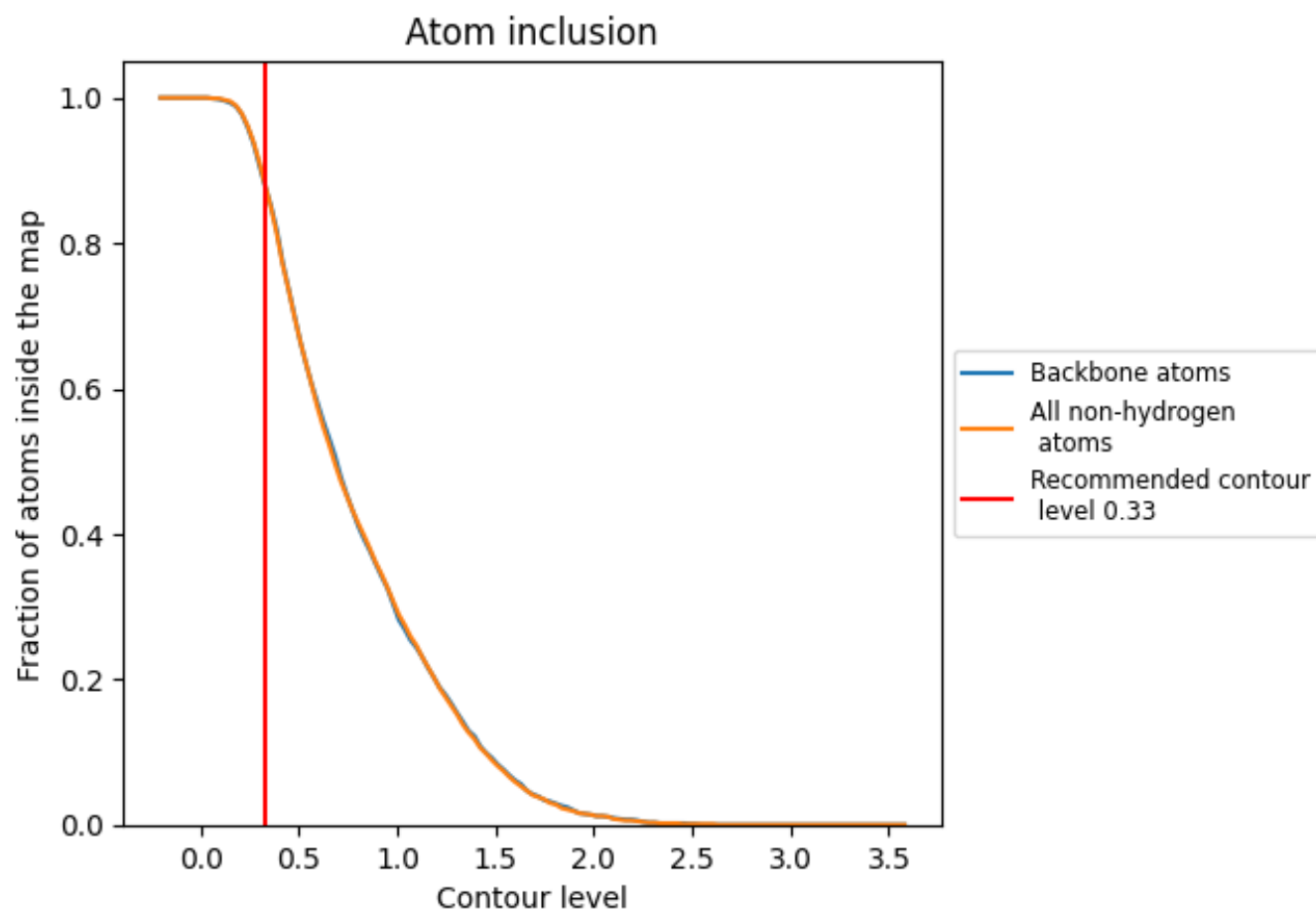
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.33).

9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 88% 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 (0.33) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8780	0.4890
C	0.8540	0.4800
D	0.9020	0.4970

