Full wwPDB EM Validation Report ⓘ

Jun 25, 2025 – 08:30 am BST

PDB ID	:	8RQ4 / pdb_00008rq4
EMDB ID	:	EMD-19433
Title	:	Cryo-em structure of the rat Multidrug resistance-associated protein 2 (rMrp2) in complex with probenecid
Authors	:	Mazza, T.; Beis, K.
Deposited on	:	2024-01-17
Resolution	:	3.45 Å(reported)
Based on initial model	:	8RQ3

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:

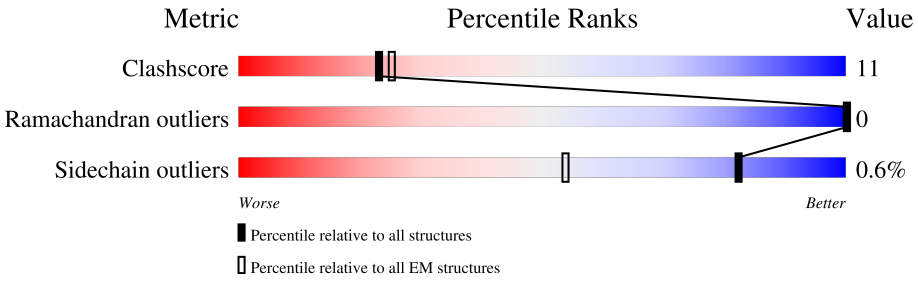
EMDB validation analysis	:	0.0.1.dev118
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

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 3.45 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 <=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	1541	68% 23% 9%

2 Entry composition

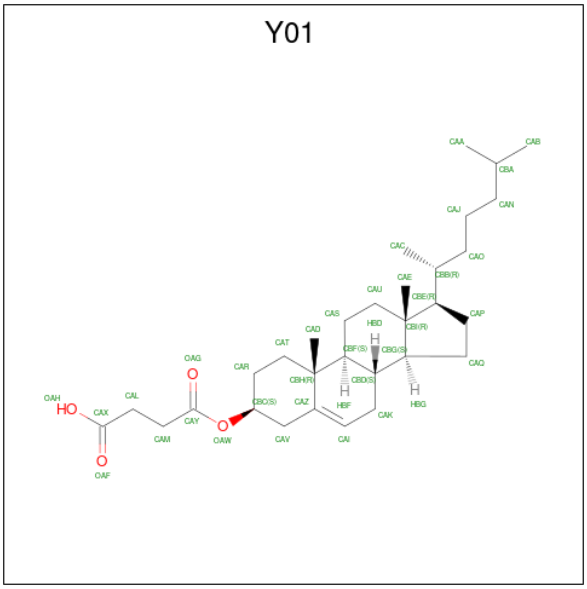
There are 3 unique types of molecules in this entry. The entry contains 11210 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 ATP-binding cassette sub-family C member 2.

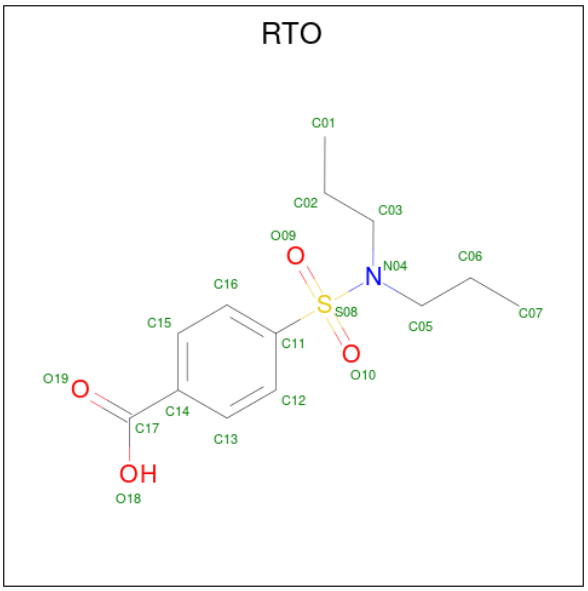
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1402	11137	7225	1866	1997	49	0	0

- Molecule 2 is CHOLESTEROL HEMISUCCINATE (CCD ID: Y01) (formula: $C_{31}H_{50}O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
2	A	1	35	31	4	0

- Molecule 3 is 4-(dipropylsulfamoyl)benzoic acid (CCD ID: RTO) (formula: $C_{13}H_{19}NO_4S$) (labeled as "Ligand of Interest" by depositor).



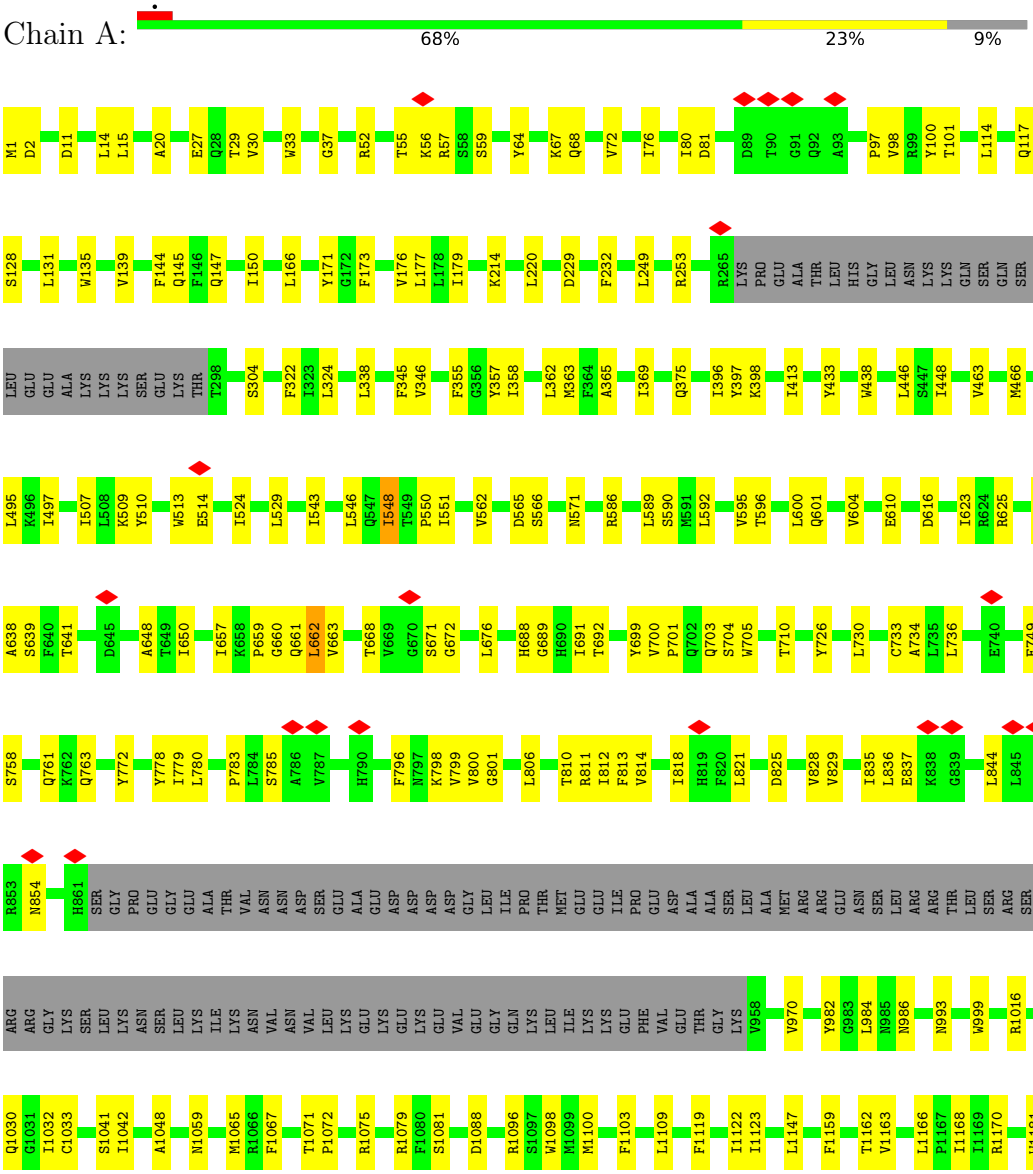
Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total	C	N	O	S	0
			19	13	1	4	1	
3	A	1	Total	C	N	O	S	0
			19	13	1	4	1	

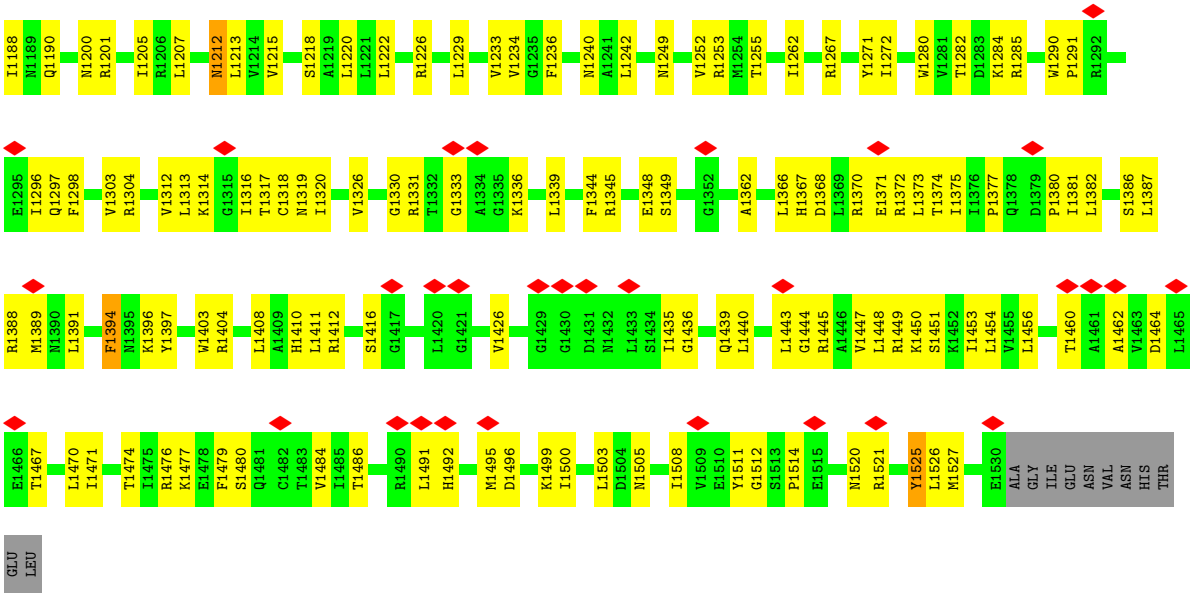
3 Residue-property plots (i)

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

- Molecule 1: ATP-binding cassette sub-family C member 2

Chain A:




I1188 N1189 Q1190 N1200 R1201 I1205 R1206 L1207 N1212 L1213 V1214 V1215 S1218 A1219 L1220 L1221 L1222 R1226 L1229 V1233 V1234 G1235 F1236 N1240 A1241 L1242 M1249 V1252 R1253 N1254 T1255 I1262 R1267 Y1271 I1272 W1280 V1281 T1282 D1283 K1284 R1285 W1290 P1291 R1292
E1295 I1296 Q1297 F1298 V1303 R1304 V1312 L1313 K1314 G1315 I1316 T1317 C1318 N1319 I1320 V1326 G1330 R1331 T1332 G1333 A1334 G1335 K1336 L1339 F1344 R1345 E1348 S1349 G1352 A1362 L1366 H1367 D1368 L1369 R1370 E1371 R1372 L1373 T1374 I1375 T1376 P1377 Q1378 D1379 P1380 I1381 L1382 S1386 L1387
R1388 M1389 N1390 L1391 F1394 N1395 K1396 Y1397 W1403 R1404 L1408 A1409 H1410 L1411 R1412 S1416 G1417 L1420 G1421 V1426 G1429 G1430 D1431 N1432 L1433 S1434 I1435 G1436 Q1439 L1440 L1443 G1444 R1445 A1446 V1447 L1448 R1449 K1450 S1451 K1452 I1453 L1454 V1455 L1456 T1460 A1461 A1462 V1463 D1464 L1465
E1466 T1467 L1470 I1471 T1474 I1475 R1476 K1477 E1478 F1479 S1480 Q1481 C1482 T1483 V1484 T1485 T1486 R1490 L1491 H1492 M1495 D1496 K1499 I1500 L1503 D1504 N1505 I1508 V1509 E1510 Y1511 G1512 S1513 P1514 E1515 N1520 R1521 Y1525 L1526 M1527 E1530 ALA GLY ILE GLU ASN VAL ASN HIS THR
GLU LEU

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	247763	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 ($e^-/Å^2$)	52.8	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.721	Depositor
Minimum map value	-0.439	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.013	Depositor
Recommended contour level	0.0497	Depositor
Map size (Å)	286.0, 286.0, 286.0	wwPDB
Map dimensions	440, 440, 440	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.65, 0.65, 0.65	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: RTO, Y01

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	0.25	0/11373	0.34	0/15429

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

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	11137	0	11433	244	0
2	A	35	0	49	6	0
3	A	38	0	0	1	0
All	All	11210	0	11482	248	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 (248) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1391:LEU:HD21	1:A:1448:LEU:HD21	1.59	0.84

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:466:MET:HB2	1:A:589:LEU:HD21	1.61	0.81
1:A:507:ILE:HD11	1:A:1381:ILE:HG22	1.65	0.78
1:A:661:GLN:HE22	1:A:825:ASP:HB3	1.50	0.77
1:A:1181:TRP:NE1	1:A:1185:GLN:OE1	2.21	0.73
1:A:733:CYS:SG	1:A:734:ALA:N	2.65	0.70
1:A:1373:LEU:HD21	1:A:1453:ILE:HB	1.73	0.69
1:A:463:VAL:HA	1:A:466:MET:HE2	1.73	0.69
1:A:64:TYR:OH	1:A:118:HIS:ND1	2.25	0.69
1:A:837:GLU:OE1	1:A:847:LYS:NZ	2.27	0.68
1:A:818:ILE:HA	1:A:821:LEU:HG	1.74	0.68
1:A:763:GLN:HE22	1:A:785:SER:HB3	1.59	0.68
1:A:1443:LEU:HD22	1:A:1471:ILE:HG22	1.76	0.68
1:A:1387:LEU:HD13	1:A:1426:VAL:HG11	1.77	0.66
1:A:657:ILE:HG12	1:A:663:VAL:HG21	1.76	0.66
1:A:780:LEU:HD12	1:A:783:PRO:HG3	1.77	0.66
1:A:346:VAL:HG21	1:A:1234:VAL:HG21	1.79	0.65
1:A:1371:GLU:O	1:A:1449:ARG:NH2	2.30	0.65
1:A:844:LEU:HD13	1:A:851:PHE:HB3	1.79	0.64
1:A:661:GLN:NE2	1:A:662:LEU:O	2.27	0.64
1:A:1280:TRP:HA	1:A:1367:HIS:CD2	2.32	0.63
1:A:1072:PRO:HD2	1:A:1075:ARG:HE	1.63	0.63
1:A:1212:ASN:C	1:A:1212:ASN:HD22	2.05	0.63
1:A:1059:ASN:ND2	1:A:1272:ILE:O	2.31	0.62
1:A:1212:ASN:C	1:A:1212:ASN:ND2	2.57	0.62
1:A:986:ASN:ND2	1:A:1103:PHE:O	2.32	0.62
1:A:1297:GLN:NE2	1:A:1318:CYS:O	2.32	0.62
1:A:1201:ARG:NH2	3:A:1701:RTO:O18	2.32	0.62
1:A:828:VAL:HB	1:A:835:ILE:HD11	1.82	0.61
1:A:1282:THR:O	1:A:1284:LYS:N	2.33	0.61
1:A:1298:PHE:O	1:A:1317:THR:HA	2.02	0.60
1:A:1030:GLN:NE2	2:A:1700:Y01:OAH	2.35	0.60
1:A:413:ILE:HG22	1:A:1163:VAL:HG13	1.83	0.59
1:A:616:ASP:OD1	1:A:616:ASP:N	2.34	0.59
1:A:1388:ARG:NH2	1:A:1397:TYR:O	2.34	0.59
1:A:1316:ILE:HG22	1:A:1508:ILE:HG12	1.84	0.59
1:A:993:ASN:ND2	1:A:1240:ASN:OD1	2.36	0.59
1:A:1314:LYS:NZ	1:A:1505:ASN:O	2.36	0.59
1:A:1495:MET:SD	1:A:1495:MET:N	2.75	0.59
1:A:1041:SER:OG	1:A:1096:ARG:NH1	2.29	0.58
1:A:67:LYS:HB3	1:A:117:GLN:HE22	1.67	0.58
1:A:72:VAL:HG12	1:A:114:LEU:HD11	1.86	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1304:ARG:HA	1:A:1312:VAL:HG23	1.85	0.58
1:A:1290:TRP:HD1	1:A:1372:ARG:HE	1.52	0.58
1:A:120:ARG:NH1	1:A:128:SER:OG	2.36	0.57
1:A:97:PRO:HA	1:A:100:TYR:CZ	2.39	0.57
1:A:1474:THR:HA	1:A:1477:LYS:HG2	1.86	0.57
1:A:1464:ASP:HB3	1:A:1467:THR:HG23	1.88	0.56
1:A:999:TRP:HA	1:A:1019:ARG:HH11	1.70	0.56
1:A:1212:ASN:ND2	1:A:1212:ASN:O	2.39	0.55
1:A:1371:GLU:HG2	1:A:1372:ARG:HG2	1.88	0.55
1:A:638:ALA:HA	1:A:689:GLY:HA3	1.88	0.55
1:A:829:VAL:HG23	1:A:836:LEU:HB2	1.89	0.55
1:A:81:ASP:HB2	1:A:166:LEU:HD11	1.89	0.55
1:A:513:TRP:HH2	1:A:1445:ARG:HH11	1.52	0.55
1:A:1207:LEU:HD12	1:A:1249:ASN:HA	1.88	0.55
1:A:796:PHE:HD1	1:A:800:VAL:HG23	1.71	0.55
1:A:1222:LEU:HD22	1:A:1229:LEU:HD11	1.89	0.55
1:A:229:ASP:OD1	1:A:229:ASP:N	2.36	0.54
1:A:98:VAL:HA	1:A:101:THR:HG22	1.88	0.54
1:A:970:VAL:HA	1:A:1048:ALA:HB2	1.89	0.54
1:A:1404:ARG:O	1:A:1408:LEU:HD12	2.08	0.54
1:A:1284:LYS:NZ	1:A:1285:ARG:O	2.40	0.54
1:A:1290:TRP:H	1:A:1372:ARG:NH2	2.06	0.54
1:A:1067:PHE:O	1:A:1071:THR:OG1	2.26	0.53
1:A:355:PHE:O	1:A:357:TYR:N	2.40	0.53
1:A:144:PHE:O	1:A:147:GLN:HG3	2.09	0.53
1:A:631:LYS:HA	1:A:659:PRO:HD3	1.89	0.53
1:A:813:PHE:HD2	1:A:814:VAL:N	2.06	0.53
1:A:1527:MET:SD	1:A:1527:MET:N	2.70	0.53
1:A:1525:TYR:O	1:A:1526:LEU:HD12	2.09	0.53
1:A:623:ILE:HD13	1:A:691:ILE:HB	1.90	0.53
1:A:1326:VAL:HG22	1:A:1499:LYS:HB3	1.90	0.53
1:A:139:VAL:O	1:A:171:TYR:OH	2.24	0.52
1:A:1476:ARG:NH2	1:A:1496:ASP:OD2	2.41	0.52
1:A:1368:ASP:N	1:A:1368:ASP:OD1	2.42	0.52
1:A:550:PRO:HG3	1:A:586:ARG:HH21	1.74	0.52
1:A:799:VAL:HG12	1:A:800:VAL:HG13	1.92	0.52
1:A:304:SER:N	1:A:610:GLU:OE1	2.42	0.52
1:A:1330:GLY:H	1:A:1336:LYS:HD3	1.73	0.52
1:A:1317:THR:H	1:A:1508:ILE:HD11	1.74	0.52
1:A:703:GLN:NE2	1:A:704:SER:O	2.42	0.52
1:A:726:TYR:O	1:A:730:LEU:HD23	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:668:THR:HG22	1:A:671:SER:HB2	1.90	0.51
1:A:1377:PRO:HG2	1:A:1380:PRO:HG3	1.92	0.51
1:A:848:LYS:HA	1:A:852:ALA:HB2	1.92	0.51
1:A:232:PHE:O	1:A:1190:GLN:NE2	2.35	0.51
1:A:796:PHE:O	1:A:801:GLY:N	2.44	0.51
1:A:1215:VAL:HG21	1:A:1242:LEU:HD12	1.92	0.50
1:A:29:THR:HG23	1:A:33:TRP:CH2	2.46	0.50
1:A:1500:ILE:HG12	1:A:1514:PRO:HG3	1.92	0.50
1:A:661:GLN:NE2	1:A:825:ASP:HB3	2.22	0.50
1:A:1394:PHE:HB3	1:A:1396:LYS:HG2	1.93	0.49
1:A:1200:ASN:OD1	1:A:1253:ARG:NH1	2.45	0.49
1:A:1297:GLN:OE1	1:A:1319:ASN:ND2	2.41	0.49
1:A:1496:ASP:OD1	1:A:1496:ASP:N	2.37	0.49
1:A:1456:LEU:HB2	1:A:1486:THR:HA	1.93	0.49
1:A:705:TRP:HB3	1:A:1168:ILE:HD12	1.94	0.49
1:A:1499:LYS:HE2	1:A:1512:GLY:H	1.78	0.49
1:A:11:ASP:HB3	1:A:14:LEU:HD12	1.94	0.49
1:A:433:TYR:HB3	1:A:595:VAL:HG13	1.95	0.49
1:A:699:TYR:OH	1:A:701:PRO:HB3	2.12	0.49
1:A:375:GLN:HG3	1:A:1205:ILE:HG12	1.94	0.48
1:A:1386:SER:OG	1:A:1389:MET:SD	2.66	0.48
1:A:1319:ASN:O	1:A:1511:TYR:OH	2.25	0.48
1:A:982:TYR:OH	1:A:1100:MET:HG2	2.14	0.48
1:A:657:ILE:HD13	1:A:812:ILE:HD11	1.95	0.48
1:A:27:GLU:OE1	1:A:145:GLN:HA	2.13	0.47
1:A:510:TYR:CE2	1:A:1375:ILE:HG12	2.49	0.47
1:A:1331:ARG:HD3	1:A:1505:ASN:H	1.76	0.47
1:A:1410:HIS:HE1	1:A:1470:LEU:HD13	1.79	0.47
1:A:135:TRP:CH2	1:A:177:LEU:HD23	2.49	0.47
1:A:397:TYR:CZ	1:A:1162:THR:HG21	2.50	0.47
1:A:1345:ARG:NH2	1:A:1362:ALA:HA	2.30	0.47
1:A:1503:LEU:HD12	1:A:1508:ILE:HG23	1.95	0.47
1:A:493:LYS:HE3	1:A:524:ILE:HD11	1.95	0.47
1:A:55:THR:HG23	1:A:57:ARG:H	1.80	0.47
1:A:495:LEU:HD11	1:A:1081:SER:HB2	1.97	0.47
1:A:1290:TRP:HZ2	1:A:1373:LEU:HG	1.79	0.47
1:A:641:THR:HG23	1:A:648:ALA:HA	1.96	0.47
1:A:1098:TRP:NE1	1:A:1255:THR:OG1	2.42	0.47
1:A:1213:LEU:HD23	1:A:1213:LEU:HA	1.78	0.47
1:A:29:THR:HG22	1:A:30:VAL:HG23	1.96	0.47
1:A:173:PHE:O	1:A:176:VAL:HG12	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1520:ASN:O	1:A:1521:ARG:HG2	2.15	0.46
1:A:806:LEU:HB2	1:A:811:ARG:HH11	1.80	0.46
1:A:52:ARG:HA	1:A:52:ARG:HD3	1.67	0.46
1:A:76:ILE:O	1:A:80:ILE:HG22	2.15	0.46
1:A:1344:PHE:HB3	1:A:1370:ARG:HD2	1.97	0.46
1:A:220:LEU:HD23	1:A:220:LEU:HA	1.81	0.46
1:A:1026:LEU:HD23	1:A:1026:LEU:HA	1.82	0.46
1:A:177:LEU:HD12	1:A:177:LEU:HA	1.73	0.46
1:A:639:SER:OG	1:A:688:HIS:O	2.32	0.46
1:A:592:LEU:HD12	1:A:592:LEU:HA	1.72	0.45
1:A:548:ILE:HD12	1:A:551:ILE:HB	1.99	0.45
1:A:1491:LEU:HD11	1:A:1526:LEU:HD22	1.97	0.45
1:A:848:LYS:HA	1:A:848:LYS:HD3	1.69	0.45
1:A:1184:LYS:O	1:A:1188:ILE:HG12	2.15	0.45
1:A:639:SER:OG	1:A:688:HIS:ND1	2.49	0.45
1:A:1411:LEU:HD22	1:A:1440:LEU:HB3	1.98	0.45
1:A:214:LYS:HE3	1:A:214:LYS:HB2	1.67	0.45
1:A:117:GLN:HG2	1:A:131:LEU:HD21	1.99	0.45
1:A:1313:LEU:HD21	1:A:1339:LEU:HD13	1.99	0.45
1:A:64:TYR:O	1:A:68:GLN:HG2	2.17	0.45
1:A:546:LEU:HD12	1:A:590:SER:OG	2.17	0.45
1:A:596:THR:O	1:A:600:LEU:HD23	2.16	0.45
1:A:625:ARG:HD3	1:A:625:ARG:HA	1.76	0.45
2:A:1700:Y01:HAE2	2:A:1700:Y01:HBB	1.67	0.45
1:A:1032:ILE:HG13	1:A:1033:CYS:N	2.32	0.44
1:A:1079:ARG:CZ	1:A:1267:ARG:HD2	2.47	0.44
1:A:1454:LEU:HB3	1:A:1484:VAL:HG13	1.99	0.44
1:A:772:TYR:HD1	1:A:772:TYR:O	1.99	0.44
1:A:571:ASN:OD1	1:A:571:ASN:N	2.47	0.44
1:A:1435:ILE:O	1:A:1439:GLN:HG2	2.17	0.44
1:A:397:TYR:CE2	1:A:1162:THR:HG21	2.52	0.44
1:A:1212:ASN:O	1:A:1215:VAL:HG12	2.17	0.44
1:A:448:ILE:HD11	1:A:466:MET:HE1	1.99	0.44
1:A:662:LEU:HB2	1:A:811:ARG:HE	1.81	0.44
1:A:1088:ASP:OD1	1:A:1088:ASP:C	2.61	0.44
1:A:1290:TRP:CD1	1:A:1291:PRO:HD3	2.52	0.44
1:A:322:PHE:HE1	1:A:438:TRP:NE1	2.16	0.44
1:A:476:LEU:HD23	1:A:476:LEU:HA	1.82	0.44
1:A:749:GLU:HG3	1:A:754:GLY:HA2	2.00	0.44
1:A:1366:LEU:HD11	1:A:1370:ARG:HH11	1.83	0.44
1:A:758:SER:OG	1:A:761:GLN:HG3	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1460:THR:HG22	1:A:1462:ALA:H	1.83	0.44
1:A:796:PHE:CD1	1:A:800:VAL:HG23	2.52	0.43
1:A:1290:TRP:CD1	1:A:1372:ARG:HH21	2.37	0.43
1:A:1444:GLY:O	1:A:1448:LEU:HD23	2.18	0.43
1:A:1450:LYS:HA	1:A:1450:LYS:HE2	1.98	0.43
1:A:984:LEU:HD23	1:A:984:LEU:HA	1.75	0.43
1:A:1042:ILE:HD13	1:A:1042:ILE:HA	1.85	0.43
1:A:1207:LEU:HD11	1:A:1252:VAL:HG21	2.00	0.43
1:A:550:PRO:HG3	1:A:586:ARG:HE	1.81	0.43
1:A:700:VAL:CG1	1:A:780:LEU:HD13	2.49	0.43
1:A:1500:ILE:HD13	1:A:1500:ILE:HA	1.91	0.43
1:A:672:GLY:O	1:A:676:LEU:N	2.47	0.43
1:A:778:TYR:O	1:A:779:ILE:HD13	2.19	0.43
1:A:1290:TRP:CD1	1:A:1372:ARG:HE	2.34	0.43
1:A:55:THR:OG1	1:A:56:LYS:N	2.52	0.43
1:A:324:LEU:HD23	1:A:324:LEU:HA	1.84	0.43
1:A:736:LEU:HD12	1:A:736:LEU:HA	1.88	0.43
1:A:1079:ARG:HD3	1:A:1267:ARG:HB3	2.01	0.43
1:A:120:ARG:HD3	1:A:126:LYS:O	2.18	0.43
1:A:601:GLN:O	1:A:604:VAL:HG12	2.18	0.43
1:A:57:ARG:HH12	1:A:59:SER:N	2.17	0.43
1:A:1147:LEU:HD23	1:A:1147:LEU:HA	1.84	0.42
1:A:1348:GLU:H	1:A:1348:GLU:HG2	1.65	0.42
1:A:1373:LEU:HA	1:A:1373:LEU:HD23	1.82	0.42
1:A:1119:PHE:HA	1:A:1122:ILE:HD12	2.01	0.42
1:A:1447:VAL:HA	1:A:1479:PHE:CE2	2.55	0.42
1:A:29:THR:HG23	1:A:33:TRP:CZ3	2.55	0.42
1:A:147:GLN:HA	1:A:150:ILE:HG22	2.00	0.42
1:A:1290:TRP:HB3	1:A:1372:ARG:HH21	1.84	0.42
1:A:1382:LEU:HD23	1:A:1382:LEU:HA	1.82	0.42
1:A:1476:ARG:O	1:A:1480:SER:HB3	2.19	0.42
1:A:1492:HIS:C	1:A:1495:MET:HE1	2.44	0.42
1:A:529:LEU:HD23	1:A:529:LEU:HA	1.91	0.42
1:A:543:ILE:HD11	2:A:1700:Y01:HAQ2	2.02	0.42
1:A:448:ILE:HD11	1:A:466:MET:CE	2.50	0.42
1:A:514:GLU:H	1:A:514:GLU:CD	2.27	0.42
2:A:1700:Y01:HAE1	2:A:1700:Y01:HBD	1.75	0.42
1:A:634:LYS:HB2	1:A:692:THR:OG1	2.20	0.42
1:A:1079:ARG:HD2	1:A:1271:TYR:CE2	2.55	0.42
1:A:565:ASP:OD1	1:A:566:SER:N	2.52	0.42
1:A:1282:THR:O	1:A:1282:THR:HG22	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:493:LYS:O	1:A:497:ILE:HG22	2.20	0.41
1:A:1065:MET:HE3	1:A:1065:MET:HB3	1.84	0.41
1:A:1374:THR:HG22	1:A:1451:SER:OG	2.20	0.41
1:A:33:TRP:O	1:A:37:GLY:N	2.44	0.41
1:A:1109:LEU:HD23	1:A:1109:LEU:HA	1.88	0.41
1:A:1345:ARG:CZ	1:A:1362:ALA:HA	2.50	0.41
2:A:1700:Y01:HAO1	2:A:1700:Y01:HAP1	1.74	0.41
1:A:798:LYS:HD3	1:A:798:LYS:HA	1.88	0.41
1:A:851:PHE:HD1	1:A:851:PHE:HA	1.80	0.41
1:A:365:ALA:O	1:A:369:ILE:HG12	2.19	0.41
1:A:398:LYS:HE2	1:A:398:LYS:HB2	1.63	0.41
1:A:1331:ARG:NH1	1:A:1333:GLY:HA3	2.34	0.41
1:A:345:PHE:CZ	1:A:1226:ARG:HD3	2.56	0.41
1:A:562:VAL:HG12	1:A:1016:ARG:HD2	2.02	0.41
1:A:1296:ILE:HD11	1:A:1320:ILE:HD12	2.03	0.41
1:A:358:ILE:HD13	1:A:358:ILE:HA	1.86	0.41
1:A:15:LEU:HA	1:A:20:ALA:HB1	2.02	0.41
1:A:1218:SER:O	1:A:1222:LEU:HG	2.20	0.41
1:A:1454:LEU:HD21	1:A:1479:PHE:CZ	2.56	0.41
1:A:1262:ILE:HD12	1:A:1262:ILE:HA	1.87	0.41
1:A:1284:LYS:HD2	1:A:1284:LYS:HA	1.90	0.41
1:A:850:VAL:HG12	1:A:854:ASN:HD21	1.85	0.41
1:A:1123:ILE:HD13	1:A:1123:ILE:HA	1.87	0.41
1:A:1303:VAL:HG22	1:A:1349:SER:HA	2.03	0.41
1:A:1435:ILE:HG13	1:A:1436:GLY:H	1.86	0.41
1:A:396:ILE:HD13	1:A:396:ILE:HA	1.88	0.41
1:A:446:LEU:HA	1:A:446:LEU:HD23	1.72	0.41
1:A:1233:VAL:HA	1:A:1236:PHE:CD1	2.56	0.41
1:A:179:ILE:HD13	1:A:179:ILE:HA	1.94	0.40
1:A:249:LEU:HD11	1:A:253:ARG:HH21	1.86	0.40
1:A:338:LEU:HD21	1:A:362:LEU:HB3	2.03	0.40
1:A:507:ILE:HA	1:A:510:TYR:HB2	2.02	0.40
1:A:509:LYS:HE3	1:A:509:LYS:HB3	1.80	0.40
1:A:1:MET:SD	1:A:2:ASP:HB2	2.62	0.40
1:A:631:LYS:HB3	1:A:657:ILE:O	2.22	0.40
1:A:1403:TRP:CZ3	1:A:1412:ARG:HD3	2.56	0.40
1:A:1412:ARG:HD2	1:A:1416:SER:OG	2.22	0.40
2:A:1700:Y01:HAC3	2:A:1700:Y01:HAJ1	1.75	0.40
1:A:660:GLY:H	1:A:810:THR:HB	1.87	0.40
1:A:1159:PHE:HA	1:A:1162:THR:HG22	2.03	0.40
1:A:1166:LEU:HD21	1:A:1170:ARG:HH22	1.86	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1220:LEU:HD23	1:A:1220:LEU:HA	1.76	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	1396/1541 (91%)	1333 (96%)	63 (4%)	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	A	1241/1364 (91%)	1233 (99%)	8 (1%)	84 91

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	363	MET
1	A	548	ILE
1	A	650	ILE
1	A	662	LEU
1	A	710	THR

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Mol	Chain	Res	Type
1	A	1212	ASN
1	A	1394	PHE
1	A	1525	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	117	GLN
1	A	218	HIS
1	A	443	GLN
1	A	499	ASN
1	A	628	ASN
1	A	661	GLN
1	A	1011	ASN
1	A	1143	GLN
1	A	1212	ASN
1	A	1299	ASN
1	A	1432	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry

3 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	$\#\|Z\| > 2$
3	RTO	A	1701	-	19,19,19	2.00	5 (26%)	26,26,26	3.05	8 (30%)
2	Y01	A	1700	-	38,38,38	1.86	9 (23%)	57,57,57	2.03	16 (28%)
3	RTO	A	1702	-	19,19,19	1.99	4 (21%)	26,26,26	3.00	5 (19%)

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
3	RTO	A	1701	-	-	7/22/22/22	0/1/1/1
2	Y01	A	1700	-	-	12/19/77/77	0/4/4/4
3	RTO	A	1702	-	-	4/22/22/22	0/1/1/1

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1701	RTO	S08-N04	5.74	1.71	1.63
3	A	1702	RTO	S08-N04	5.54	1.71	1.63
2	A	1700	Y01	CAS-CBF	-4.79	1.45	1.53
3	A	1702	RTO	C11-S08	3.89	1.81	1.76
2	A	1700	Y01	CAQ-CAP	3.77	1.64	1.54
3	A	1701	RTO	C11-S08	3.46	1.81	1.76
2	A	1700	Y01	CAI-CAZ	3.45	1.40	1.33
2	A	1700	Y01	OAW-CAY	3.31	1.43	1.34
2	A	1700	Y01	CBI-CBE	-3.09	1.49	1.55
2	A	1700	Y01	CBH-CAZ	-3.07	1.46	1.52
2	A	1700	Y01	CAK-CAI	-2.71	1.44	1.50
2	A	1700	Y01	CBH-CBF	2.66	1.60	1.56
3	A	1702	RTO	O10-S08	2.63	1.46	1.43
3	A	1701	RTO	O10-S08	2.60	1.46	1.43
3	A	1701	RTO	O09-S08	2.55	1.46	1.43
3	A	1702	RTO	O09-S08	2.44	1.46	1.43
2	A	1700	Y01	CBI-CBG	-2.33	1.50	1.55
3	A	1701	RTO	C05-N04	-2.12	1.45	1.48

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	1701	RTO	O10-S08-O09	-11.51	100.87	119.52
3	A	1702	RTO	O10-S08-O09	-11.46	100.94	119.52
3	A	1702	RTO	O10-S08-N04	5.94	112.11	106.69
3	A	1701	RTO	O10-S08-N04	5.76	111.94	106.69
3	A	1701	RTO	O09-S08-N04	5.74	111.93	106.69
2	A	1700	Y01	CBI-CBE-CBB	-5.11	111.48	119.49
2	A	1700	Y01	CBI-CBG-CBD	-5.09	106.85	114.38
3	A	1702	RTO	O09-S08-N04	4.92	111.17	106.69
2	A	1700	Y01	CAV-CAZ-CBH	4.91	122.94	116.42
2	A	1700	Y01	OAW-CAY-CAM	4.15	120.44	111.50
3	A	1702	RTO	O10-S08-C11	3.83	112.89	108.05
2	A	1700	Y01	CBG-CBI-CBE	3.77	104.53	100.07
2	A	1700	Y01	CAV-CAZ-CAI	-3.53	115.53	120.61
2	A	1700	Y01	CAC-CBB-CBE	-3.25	107.95	112.92
2	A	1700	Y01	CBH-CBF-CBD	-3.13	108.04	112.73
2	A	1700	Y01	CAQ-CBG-CBD	-2.80	114.47	119.08
2	A	1700	Y01	CBF-CBD-CBG	-2.75	105.41	109.09
2	A	1700	Y01	CAP-CAQ-CBG	-2.73	99.72	105.13
2	A	1700	Y01	CBH-CAZ-CAI	-2.67	118.81	122.90
3	A	1701	RTO	C06-C05-N04	-2.42	109.75	113.29
3	A	1701	RTO	C11-S08-N04	2.37	110.12	107.30
3	A	1701	RTO	O09-S08-C11	2.28	110.93	108.05
3	A	1701	RTO	C02-C03-N04	-2.28	109.95	113.29
2	A	1700	Y01	CAD-CBH-CBF	-2.26	108.98	111.68
3	A	1701	RTO	O10-S08-C11	2.16	110.78	108.05
2	A	1700	Y01	CBC-OAW-CAY	-2.06	112.72	117.79
3	A	1702	RTO	O18-C17-C14	2.06	120.19	114.85
2	A	1700	Y01	CAJ-CAO-CBB	-2.03	109.19	115.03
2	A	1700	Y01	CAP-CBE-CBI	2.00	106.25	103.84

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1700	Y01	CAC-CBB-CBE-CBI
3	A	1702	RTO	C02-C03-N04-S08
3	A	1702	RTO	C02-C03-N04-C05
3	A	1701	RTO	C16-C11-S08-O10
2	A	1700	Y01	CAM-CAY-OAW-CBC
3	A	1701	RTO	C12-C11-S08-O10
2	A	1700	Y01	OAG-CAY-OAW-CBC
2	A	1700	Y01	CAC-CBB-CBE-CAP
2	A	1700	Y01	CAN-CAJ-CAO-CBB

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Mol	Chain	Res	Type	Atoms
2	A	1700	Y01	CAO-CBB-CBE-CBI
3	A	1701	RTO	C03-N04-S08-O10
3	A	1701	RTO	C16-C11-S08-N04
2	A	1700	Y01	CAJ-CAN-CBA-CAB
3	A	1701	RTO	C12-C11-S08-N04
2	A	1700	Y01	CAO-CBB-CBE-CAP
3	A	1702	RTO	C16-C11-S08-O10
3	A	1702	RTO	C12-C11-S08-O10
2	A	1700	Y01	CAJ-CAN-CBA-CAA
3	A	1701	RTO	C03-N04-S08-C11
2	A	1700	Y01	CAX-CAL-CAM-CAY
2	A	1700	Y01	CAL-CAM-CAY-OAG
2	A	1700	Y01	CAL-CAM-CAY-OAW
3	A	1701	RTO	C03-N04-S08-O09

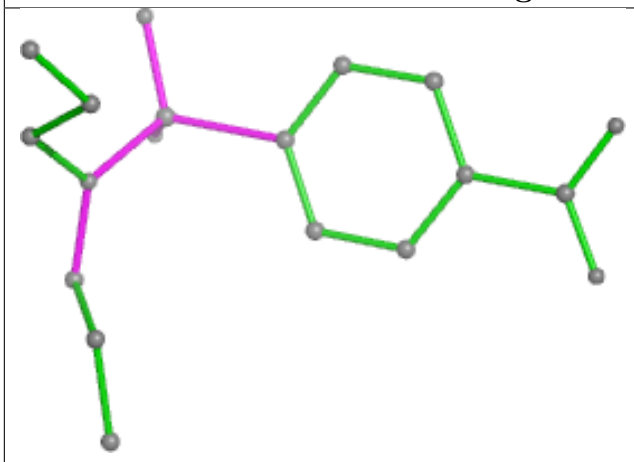
There are no ring outliers.

2 monomers are involved in 7 short contacts:

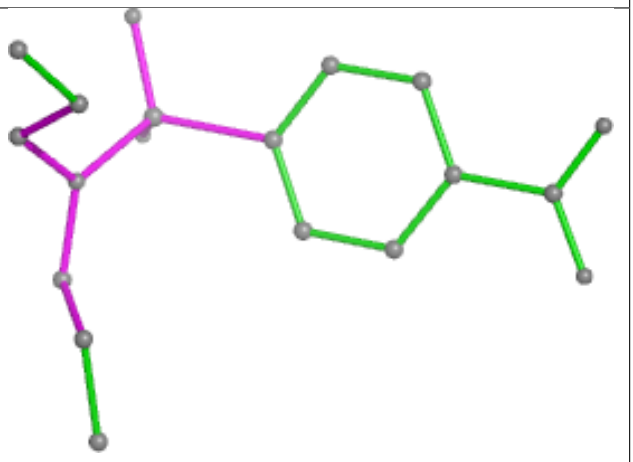
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1701	RTO	1	0
2	A	1700	Y01	6	0

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 then 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.

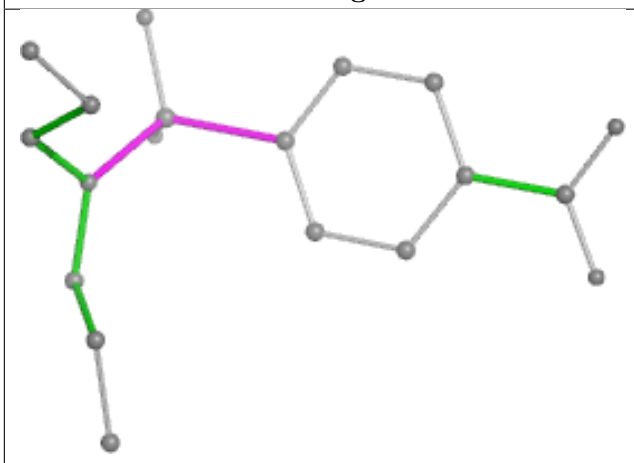
Ligand RTO A 1701



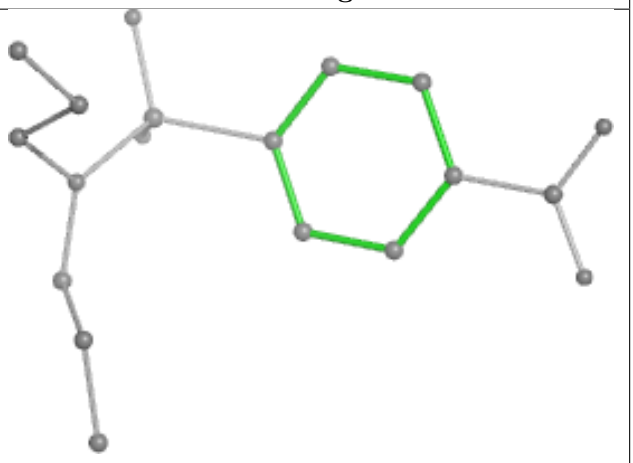
Bond lengths



Bond angles

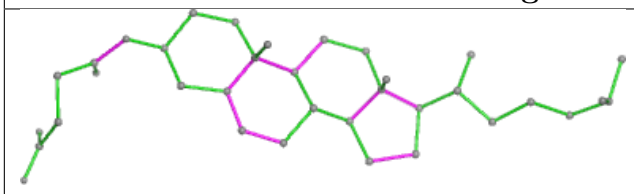


Torsions

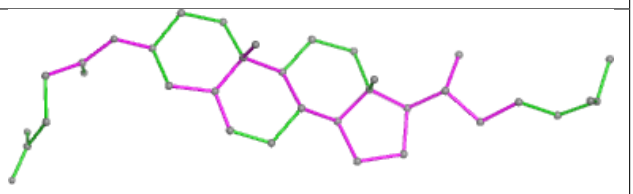


Rings

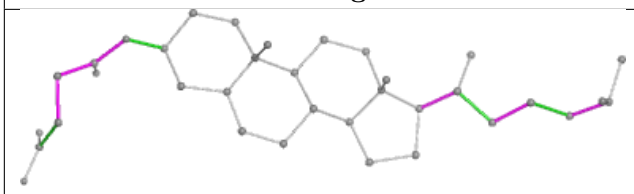
Ligand Y01 A 1700



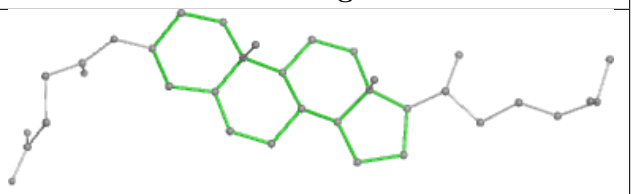
Bond lengths



Bond angles

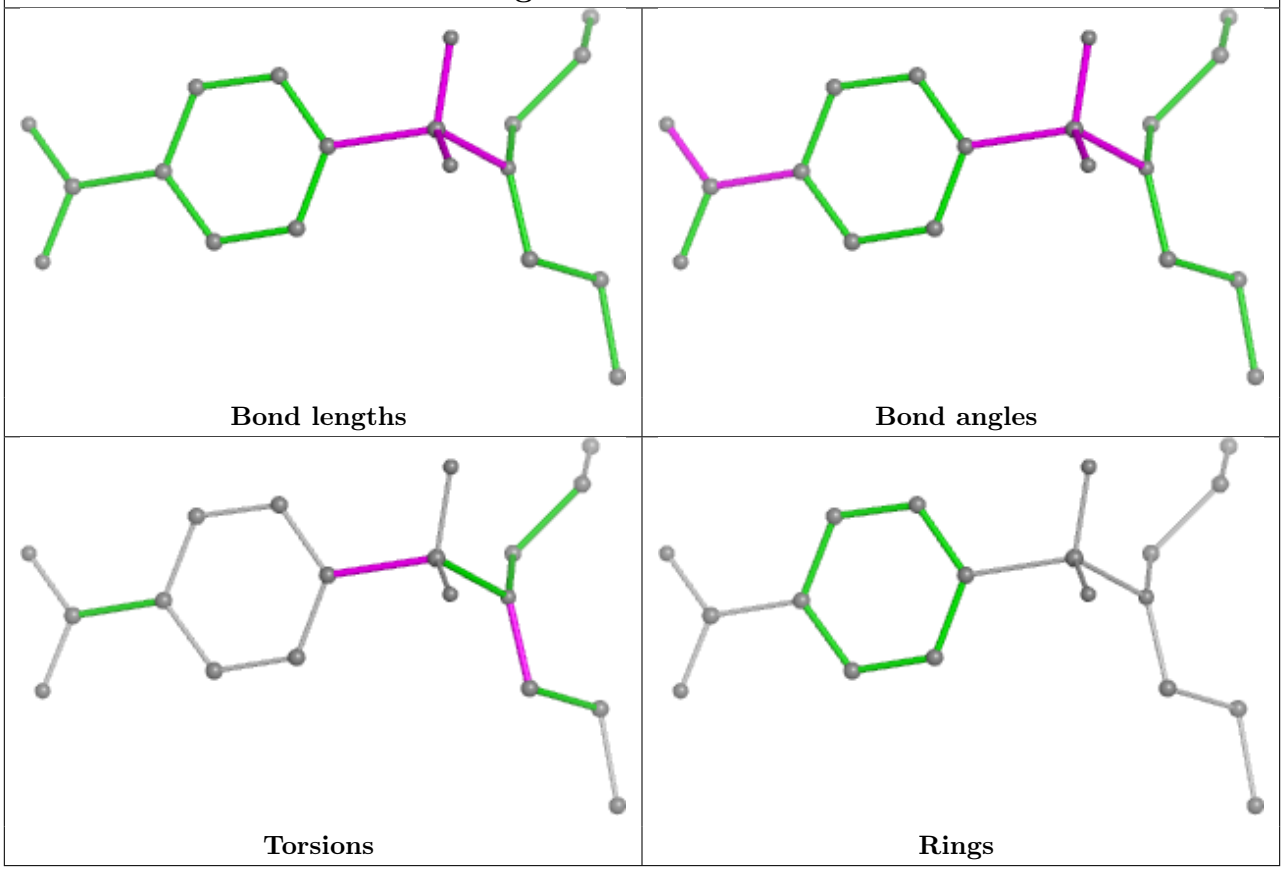


Torsions



Rings

Ligand RTO A 1702



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.

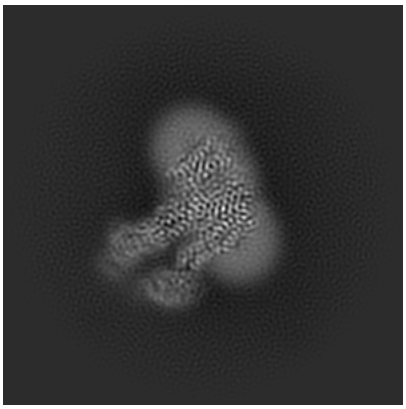
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-19433. These allow visual inspection of the internal detail of the map and identification of artifacts.

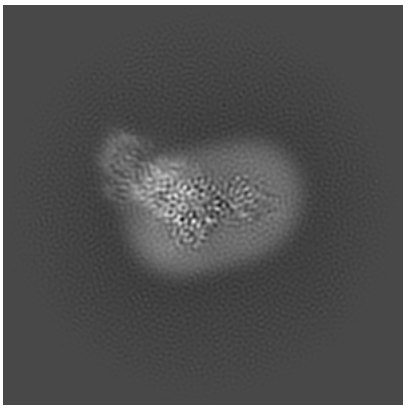
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

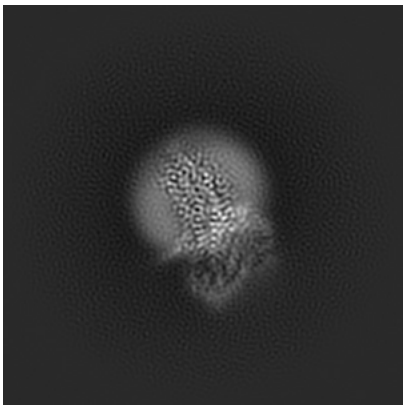
6.1.1 Primary map



X

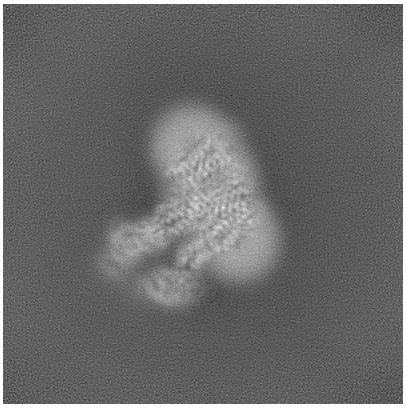


Y

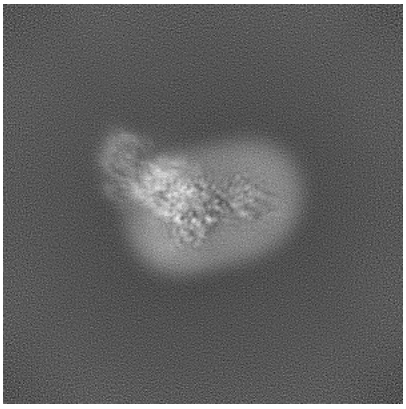


Z

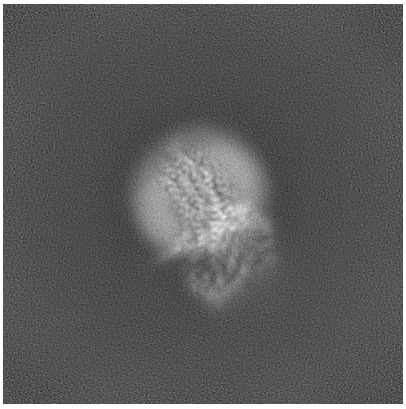
6.1.2 Raw map



X



Y

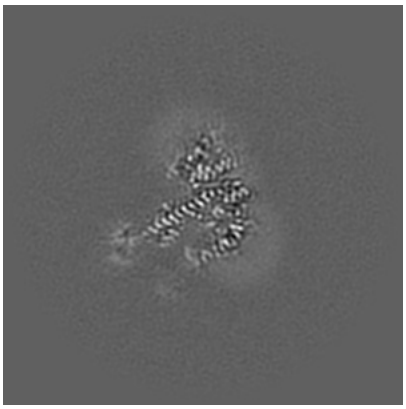


Z

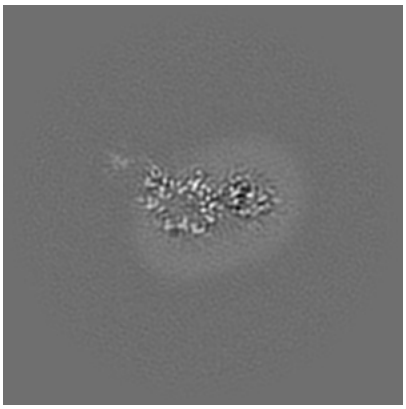
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

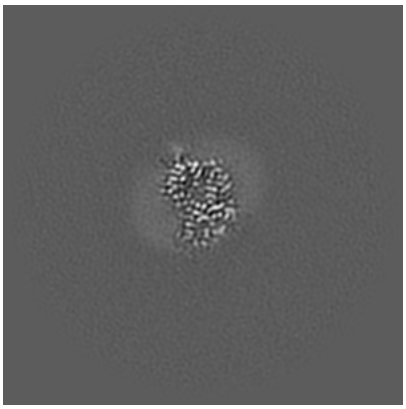
6.2.1 Primary map



X Index: 220

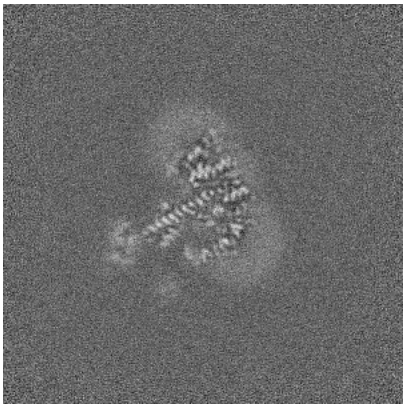


Y Index: 220

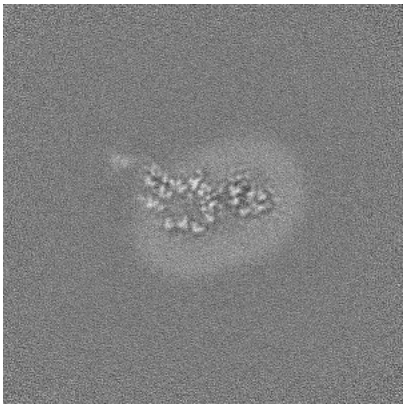


Z Index: 220

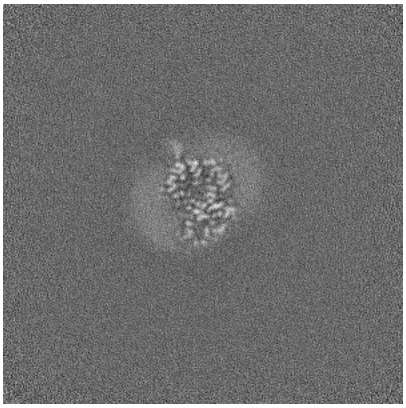
6.2.2 Raw map



X Index: 220



Y Index: 220

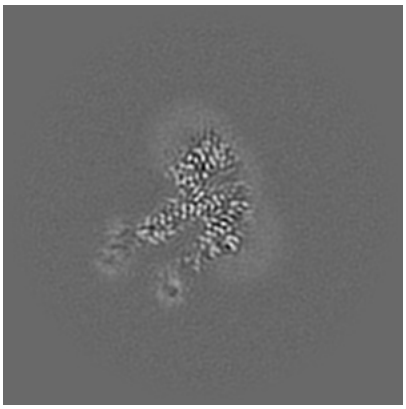


Z Index: 220

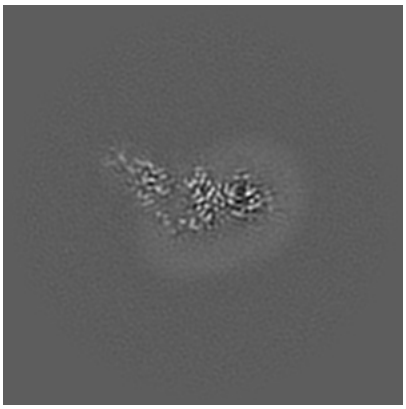
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

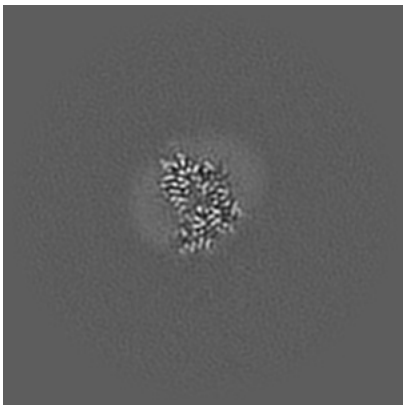
6.3.1 Primary map



X Index: 230

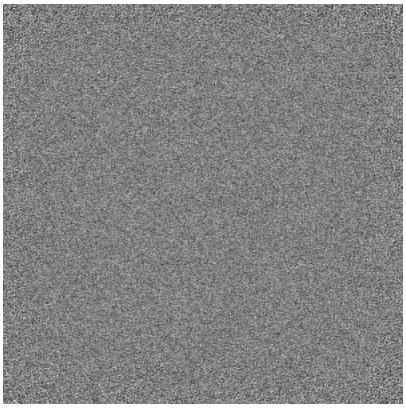


Y Index: 213

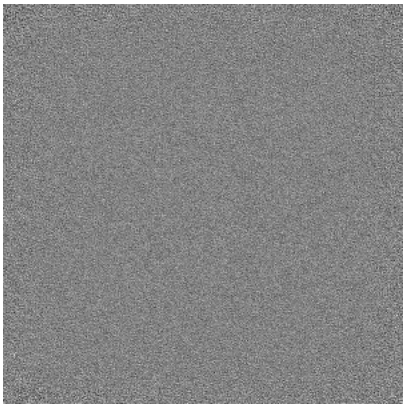


Z Index: 214

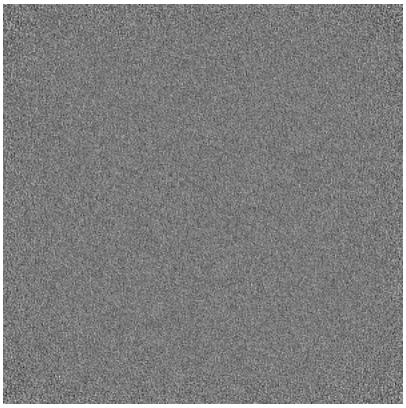
6.3.2 Raw map



X Index: 0



Y Index: 0

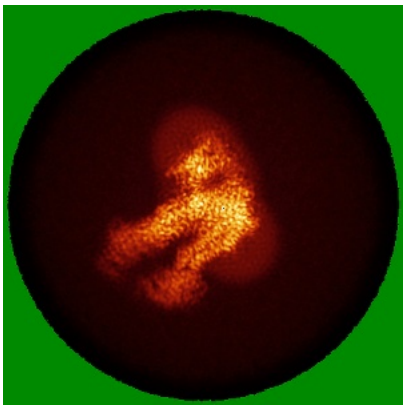


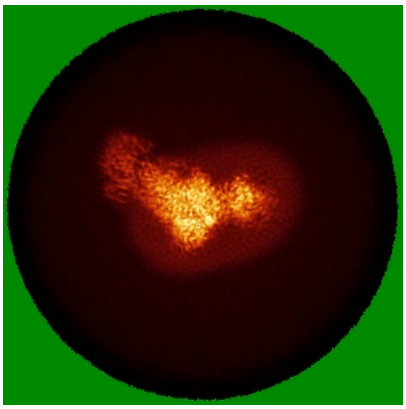
Z Index: 439

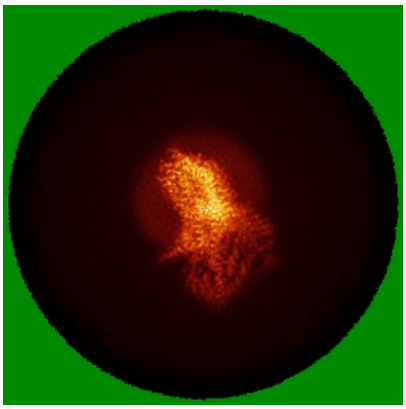
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

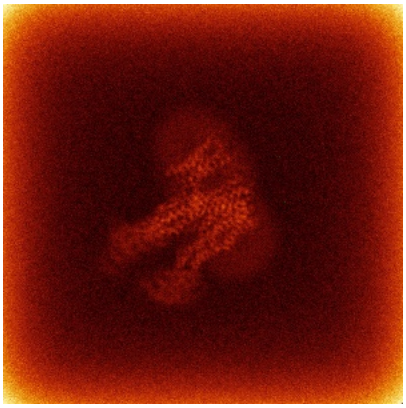
6.4.1 Primary map

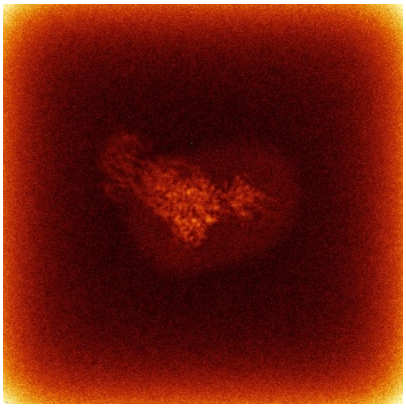

X

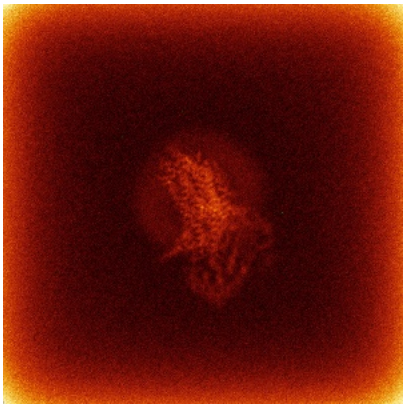

Y


Z

6.4.2 Raw map


X

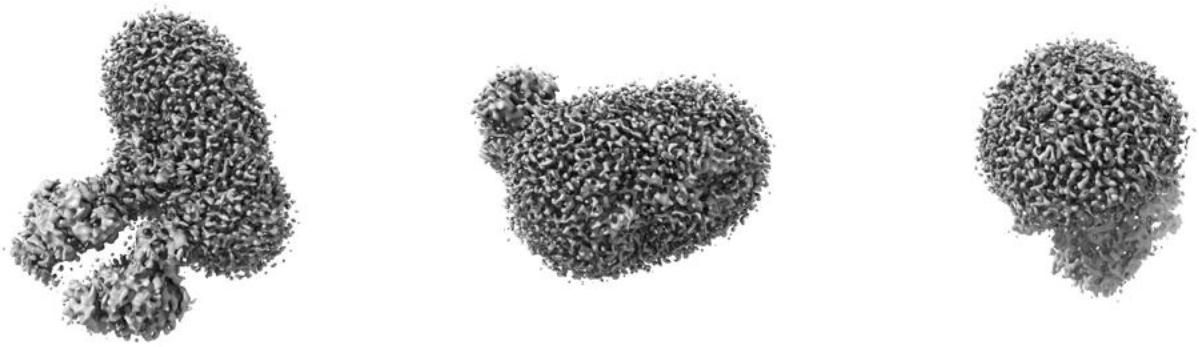

Y


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)

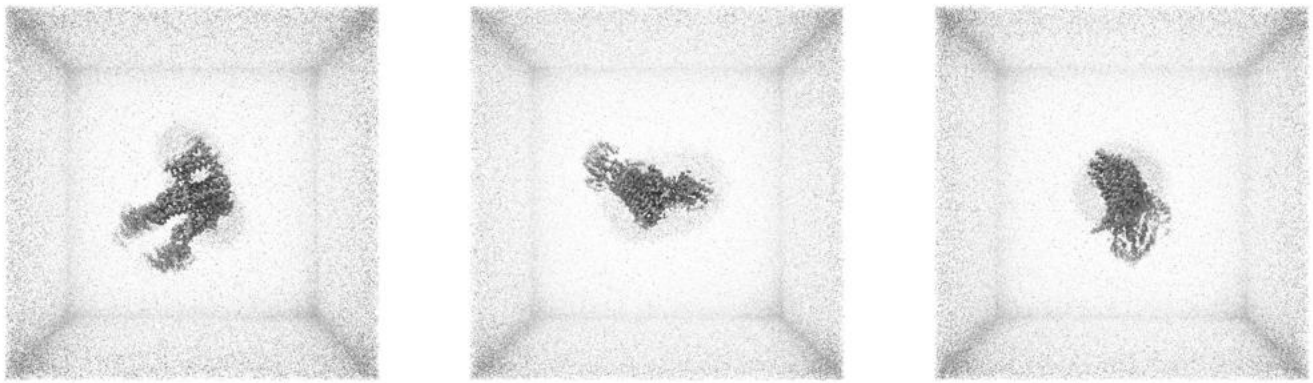
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.0497. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



X Y Z

These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

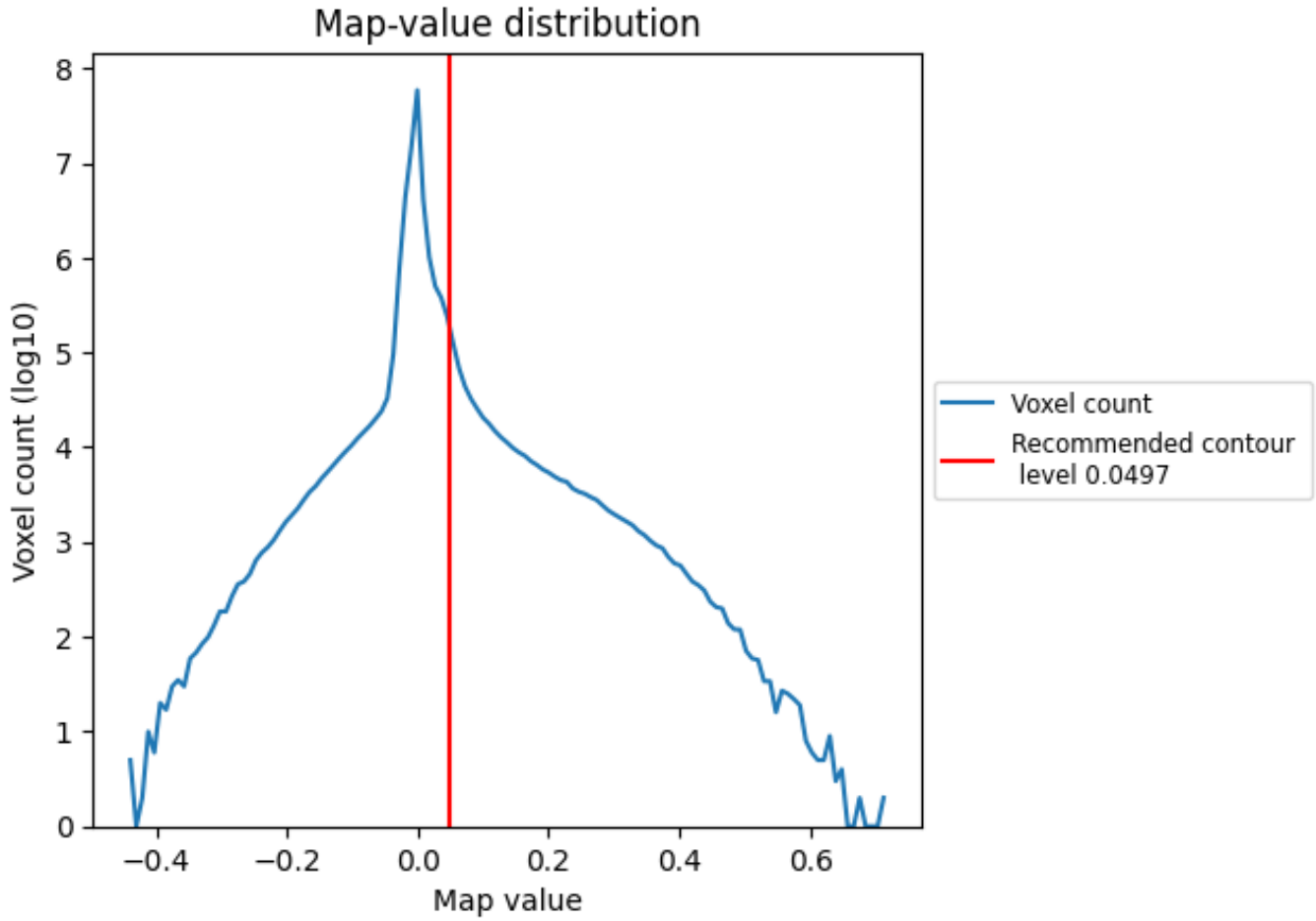
6.6 Mask visualisation (i)

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

7 Map analysis

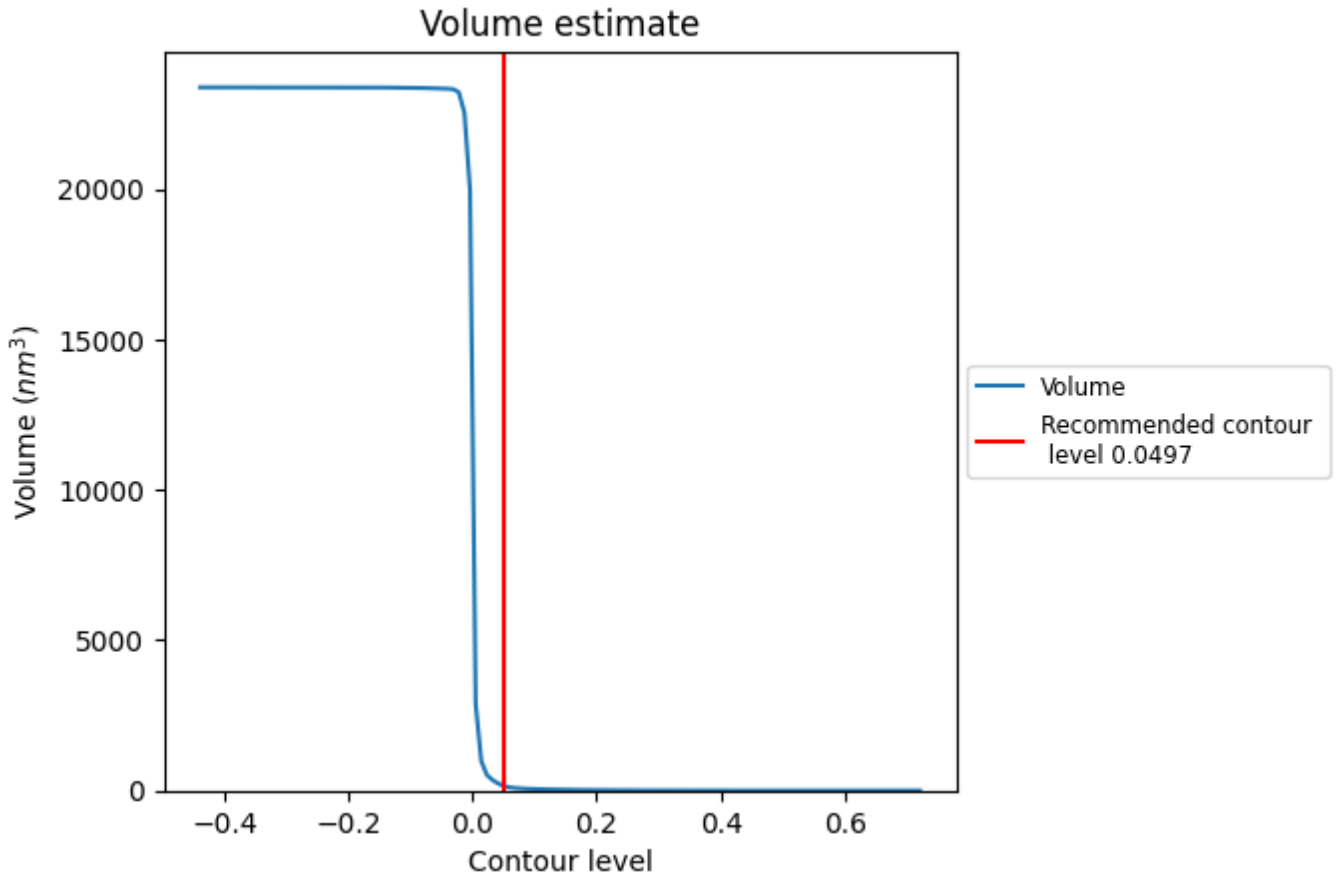
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

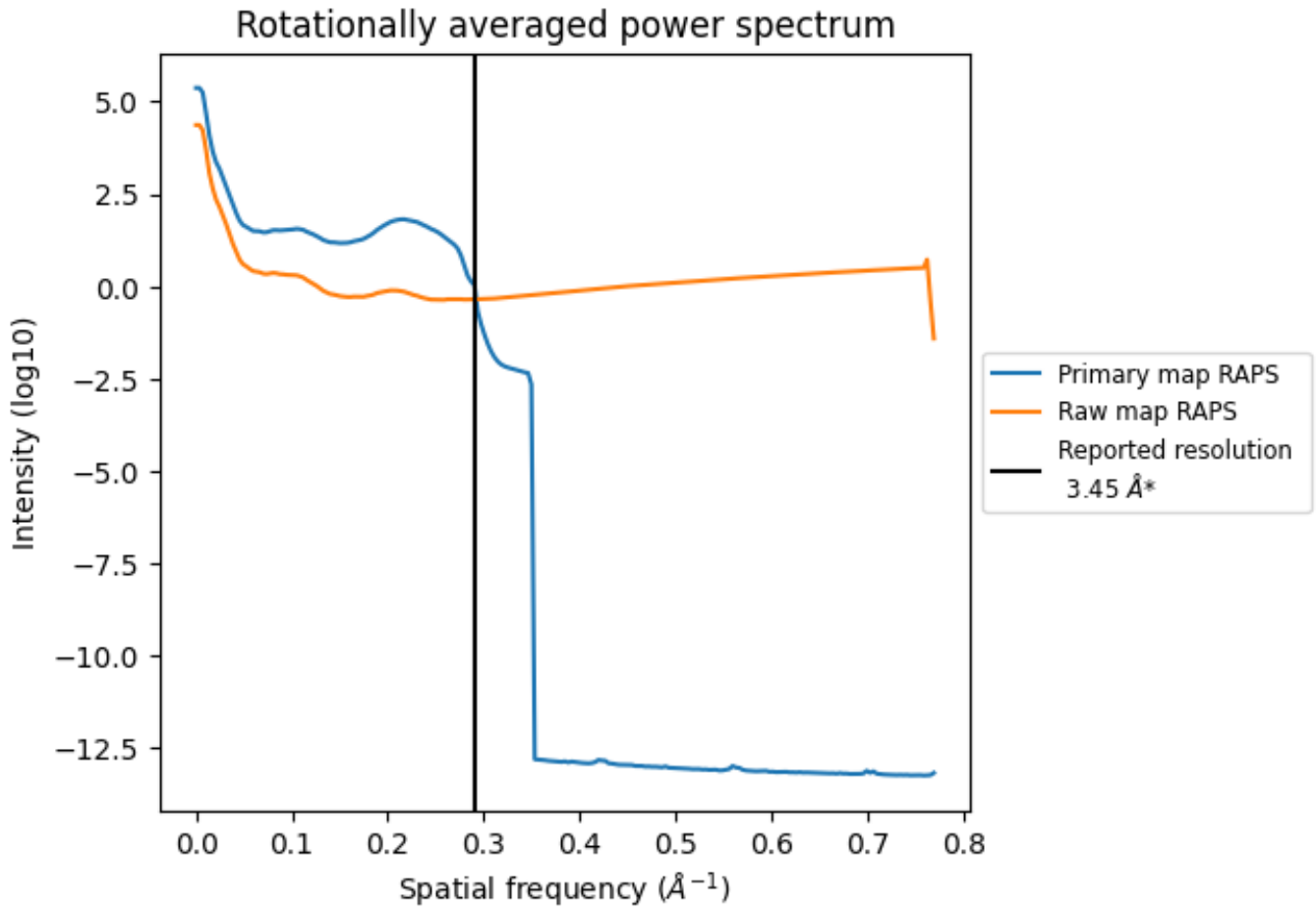
7.2 Volume estimate



The volume at the recommended contour level is 159 nm^3; this corresponds to an approximate mass of 143 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)

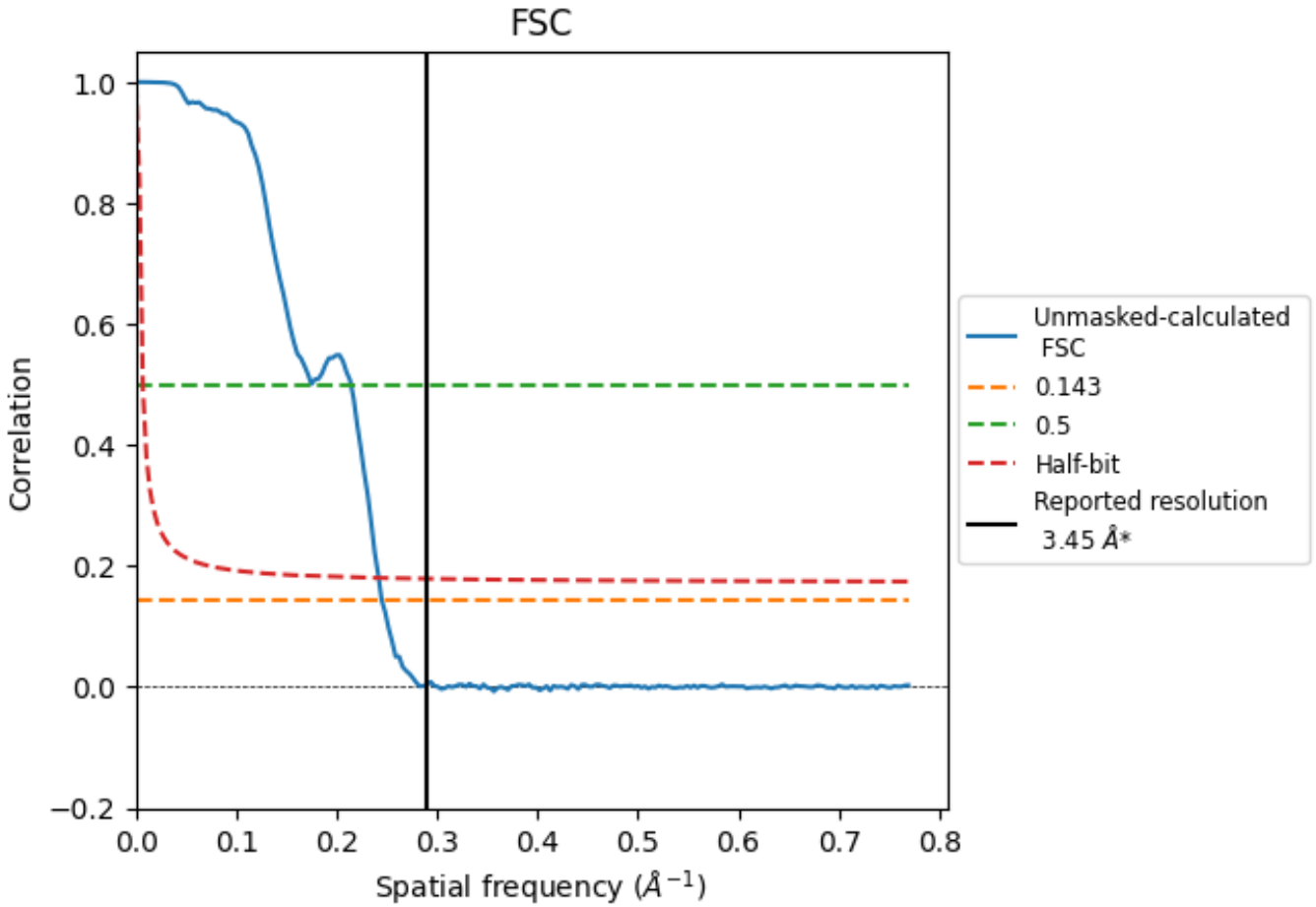


*Reported resolution corresponds to spatial frequency of 0.290 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.290 Å^{-1}

8.2 Resolution estimates (i)

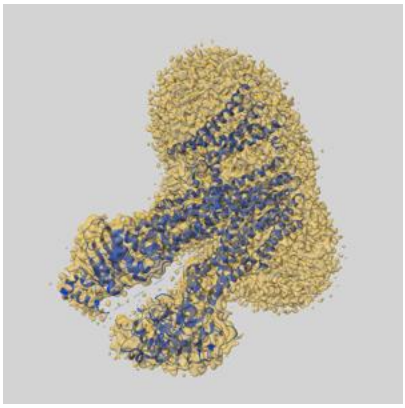
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.45	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.08	4.67	4.14

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.08 differs from the reported value 3.45 by more than 10 %

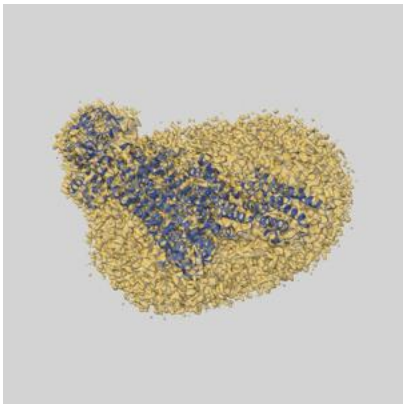
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-19433 and PDB model 8RQ4. Per-residue inclusion information can be found in section 3 on page 5.

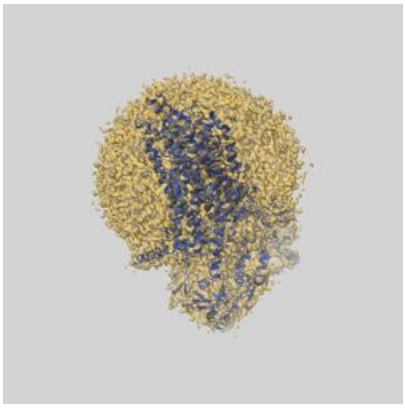
9.1 Map-model overlay



X



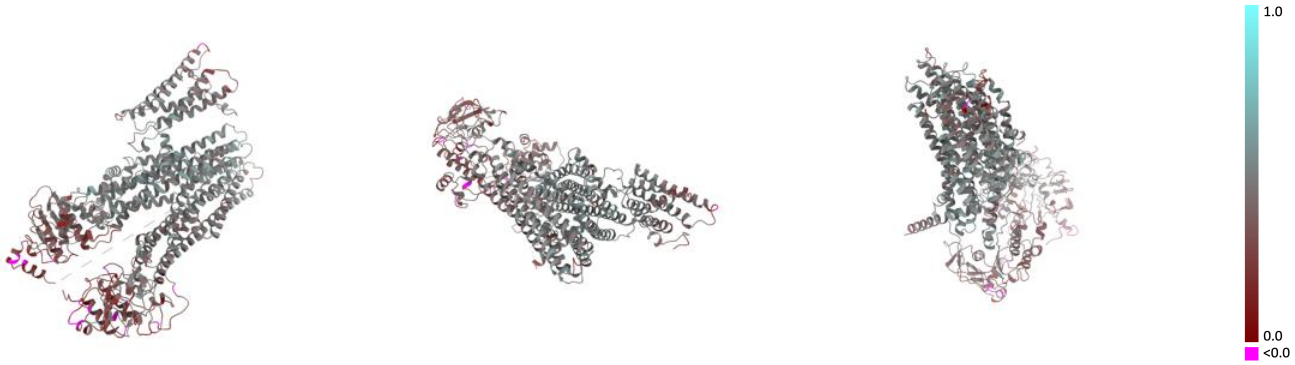
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0497 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.

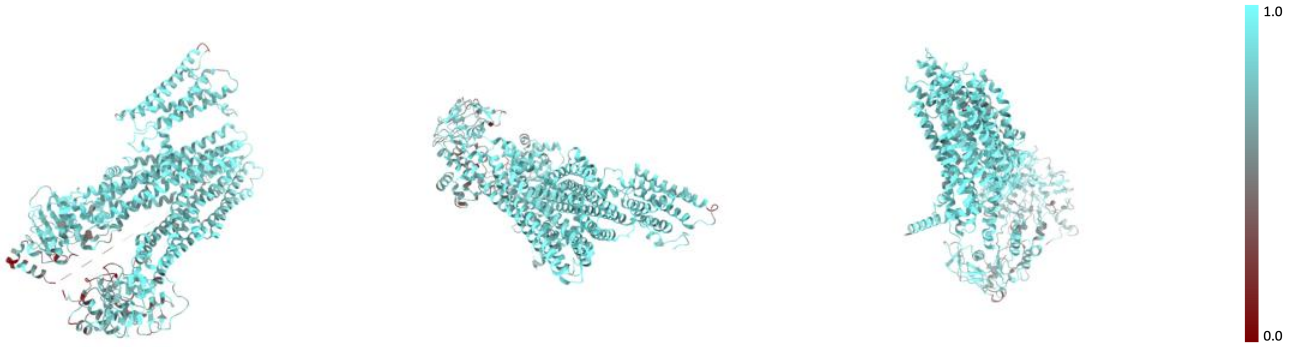
9.2 Q-score mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according 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.

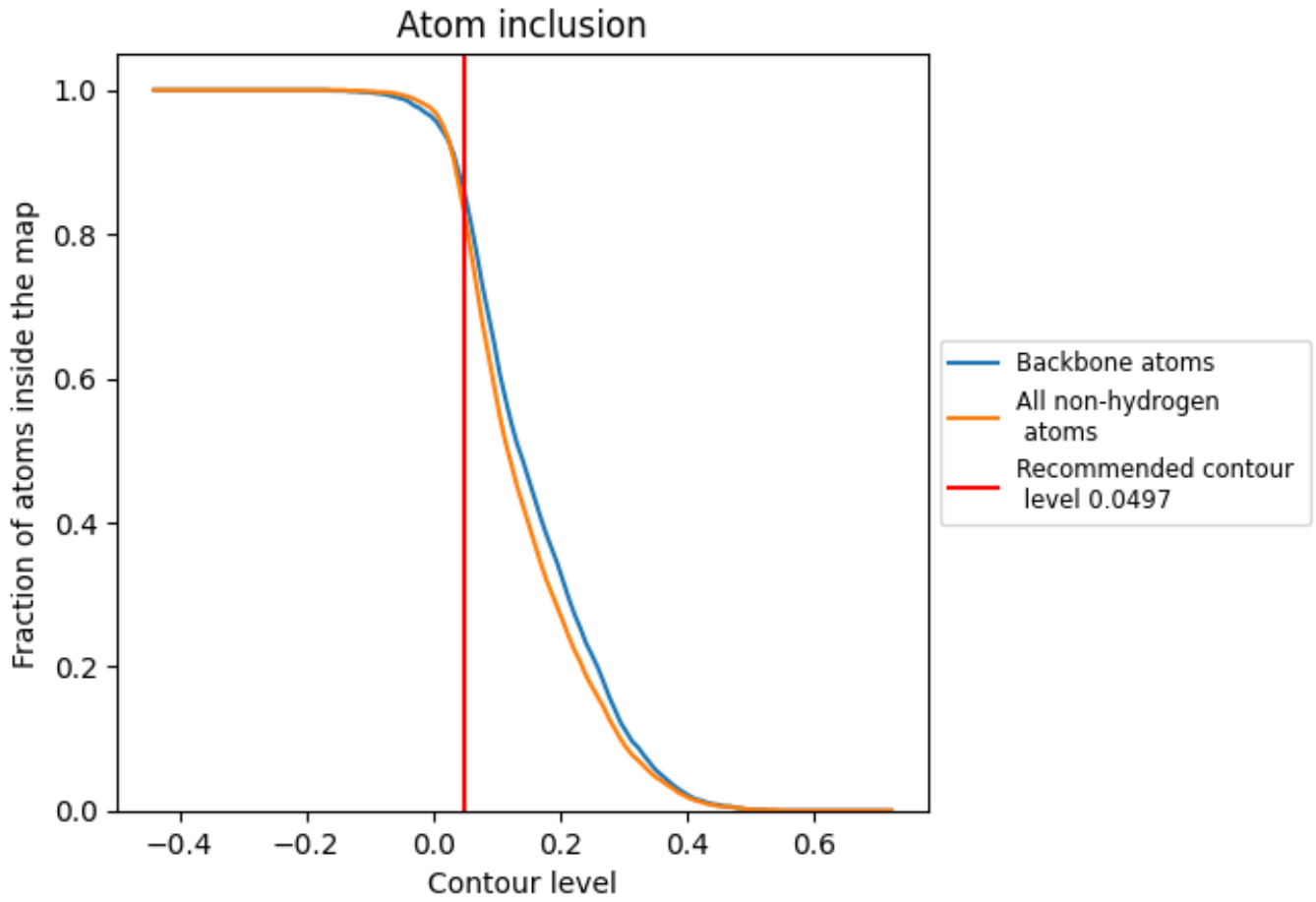
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

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 (0.0497).

9.4 Atom inclusion (i)



At the recommended contour level, 86% of all backbone atoms, 83% 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 (0.0497) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8260	0.4200
A	0.8260	0.4200