Full wwPDB EM Validation Report (i)

Jun 26, 2025 – 06:09 PM JST

PDB ID	:	7VUI / pdb_00007vui
EMDB ID	:	EMD-32129
Title	:	Cryo-EM structure of a class A orphan GPCR
Authors	:	Liu, Z.J.; Hua, T.; Zhou, Y.L.; Wu, L.J.
Deposited on	:	2021-11-02
Resolution	:	3.30 Å(reported)

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the (i) 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 (1)) were used in the production of this report:

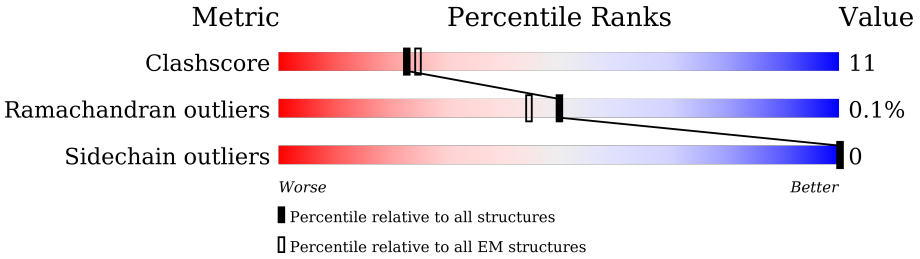
EMDB validation analysis	:	0.0.1.dev118
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
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 3.30 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	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	261	8%, 68%, 21%, 10%
2	B	346	10%, 69%, 29%, •
3	G	71	35%, 70%, 10%, 20%
4	N	157	•, 59%, 21%, 20%
5	R	533	9%, 38%, 14%, 48%

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 8287 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 Isoform Gnas-2 of Guanine nucleotide-binding protein G(s) subunit alpha isoforms short.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	234	1940	1224	349	360	7	0	0

There are 57 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	HIS	-	expression tag	UNP P63092-2
A	-6	HIS	-	expression tag	UNP P63092-2
A	-5	HIS	-	expression tag	UNP P63092-2
A	-4	HIS	-	expression tag	UNP P63092-2
A	-3	HIS	-	expression tag	UNP P63092-2
A	-2	HIS	-	expression tag	UNP P63092-2
A	-1	GLU	-	expression tag	UNP P63092-2
A	0	ASN	-	expression tag	UNP P63092-2
A	1	LEU	-	expression tag	UNP P63092-2
A	2	TYR	-	expression tag	UNP P63092-2
A	3	PHE	-	expression tag	UNP P63092-2
A	4	GLN	-	expression tag	UNP P63092-2
A	49	ASP	GLY	engineered mutation	UNP P63092-2
A	50	ASN	GLU	engineered mutation	UNP P63092-2
A	196	GLY	-	linker	UNP P63092-2
A	197	GLY	-	linker	UNP P63092-2
A	198	SER	-	linker	UNP P63092-2
A	199	GLY	-	linker	UNP P63092-2
A	200	GLY	-	linker	UNP P63092-2
A	201	SER	-	linker	UNP P63092-2
A	202	GLY	-	linker	UNP P63092-2
A	203	GLY	-	linker	UNP P63092-2
A	249	ASP	ALA	engineered mutation	UNP P63092-2
A	252	ASP	SER	engineered mutation	UNP P63092-2
A	?	-	ASN	deletion	UNP P63092-2
A	?	-	MET	deletion	UNP P63092-2
A	?	-	VAL	deletion	UNP P63092-2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	ILE	deletion	UNP P63092-2
A	?	-	ARG	deletion	UNP P63092-2
A	?	-	GLU	deletion	UNP P63092-2
A	?	-	ASP	deletion	UNP P63092-2
A	?	-	ASN	deletion	UNP P63092-2
A	?	-	GLN	deletion	UNP P63092-2
A	?	-	THR	deletion	UNP P63092-2
A	362	ALA	-	expression tag	UNP P63092-2
A	363	ARG	-	expression tag	UNP P63092-2
A	364	ARG	-	expression tag	UNP P63092-2
A	365	ILE	-	expression tag	UNP P63092-2
A	366	PHE	-	expression tag	UNP P63092-2
A	367	ASN	-	expression tag	UNP P63092-2
A	368	ASP	-	expression tag	UNP P63092-2
A	369	CYS	-	expression tag	UNP P63092-2
A	370	LYS	-	expression tag	UNP P63092-2
A	371	ASP	-	expression tag	UNP P63092-2
A	372	ALA	-	expression tag	UNP P63092-2
A	373	ILE	-	expression tag	UNP P63092-2
A	374	LEU	-	expression tag	UNP P63092-2
A	375	GLN	-	expression tag	UNP P63092-2
A	376	MET	-	expression tag	UNP P63092-2
A	377	ASN	-	expression tag	UNP P63092-2
A	378	LEU	-	expression tag	UNP P63092-2
A	379	ARG	-	expression tag	UNP P63092-2
A	380	GLU	-	expression tag	UNP P63092-2
A	381	TYR	-	expression tag	UNP P63092-2
A	382	ASN	-	expression tag	UNP P63092-2
A	383	LEU	-	expression tag	UNP P63092-2
A	384	VAL	-	expression tag	UNP P63092-2

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	338	2600	1604	467	508	21	0	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-5	ILE	-	expression tag	UNP P62873

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	GLY	-	expression tag	UNP P62873
B	-3	ARG	-	expression tag	UNP P62873
B	-2	ALA	-	expression tag	UNP P62873
B	-1	ARG	-	expression tag	UNP P62873
B	0	GLY	-	expression tag	UNP P62873
B	1	PHE	-	expression tag	UNP P62873

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	G	57	436	273	77	83	3	0	0

- Molecule 4 is a protein called Nanobody 35.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	N	126	961	599	168	188	6	0	0

- Molecule 5 is a protein called Chimera of Endo-1,4-beta-xylanase and Probable G-protein coupled receptor 139.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	R	279	2295	1547	365	371	12	0	0

There are 31 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	-211	HIS	-	expression tag	UNP P09850
R	-210	HIS	-	expression tag	UNP P09850
R	-209	HIS	-	expression tag	UNP P09850
R	-208	HIS	-	expression tag	UNP P09850
R	-207	HIS	-	expression tag	UNP P09850
R	-206	HIS	-	expression tag	UNP P09850
R	-205	HIS	-	expression tag	UNP P09850
R	-204	HIS	-	expression tag	UNP P09850
R	-203	HIS	-	expression tag	UNP P09850
R	-202	HIS	-	expression tag	UNP P09850
R	-201	ASP	-	expression tag	UNP P09850
R	-200	TYR	-	expression tag	UNP P09850

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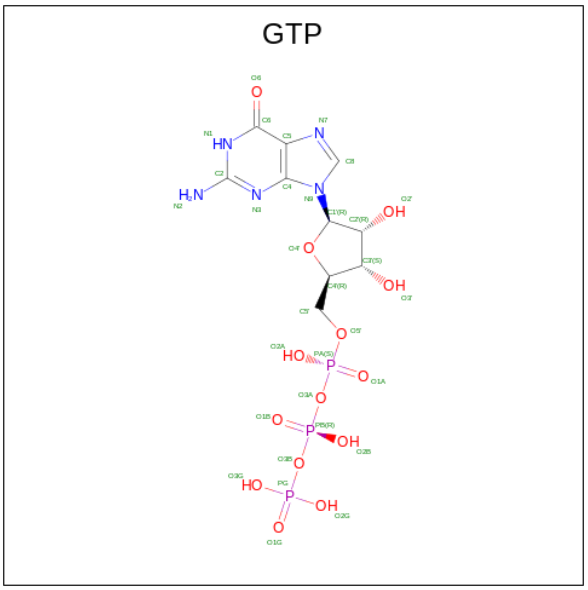
Chain	Residue	Modelled	Actual	Comment	Reference
R	-199	LYS	-	expression tag	UNP P09850
R	-198	ASP	-	expression tag	UNP P09850
R	-197	ASP	-	expression tag	UNP P09850
R	-196	ASP	-	expression tag	UNP P09850
R	-195	ASP	-	expression tag	UNP P09850
R	-194	LYS	-	expression tag	UNP P09850
R	-193	GLU	-	expression tag	UNP P09850
R	-192	ASN	-	expression tag	UNP P09850
R	-191	LEU	-	expression tag	UNP P09850
R	-190	TYR	-	expression tag	UNP P09850
R	-189	PHE	-	expression tag	UNP P09850
R	-188	GLN	-	expression tag	UNP P09850
R	-187	SER	-	expression tag	UNP P09850
R	-186	GLY	-	expression tag	UNP P09850
R	-185	ALA	-	expression tag	UNP P09850
R	-184	PRO	-	expression tag	UNP P09850
R	-173	PHE	ASP	engineered mutation	UNP P09850
R	-62	ASP	ARG	engineered mutation	UNP P09850
R	62	VAL	SER	engineered mutation	UNP Q6DWJ6

- Molecule 6 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$) (labeled as "Ligand of Interest" by depositor).

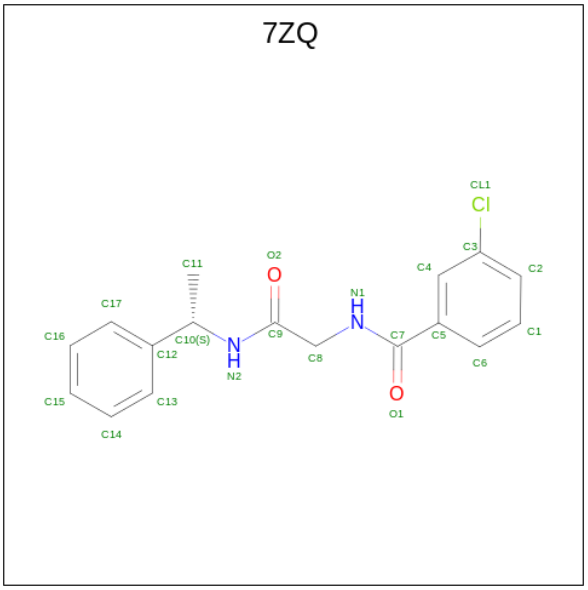


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
6	A	1	32	10	5	14	3	0

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
7	A	1	1	1	0

- Molecule 8 is 3-chloranyl-N-[2-oxidanylidene-2-[[(1S)-1-phenylethyl]amino]ethyl]benzamide (CCD ID: 7ZQ) (formula: $C_{17}H_{17}ClN_2O_2$) (labeled as "Ligand of Interest" by depositor).



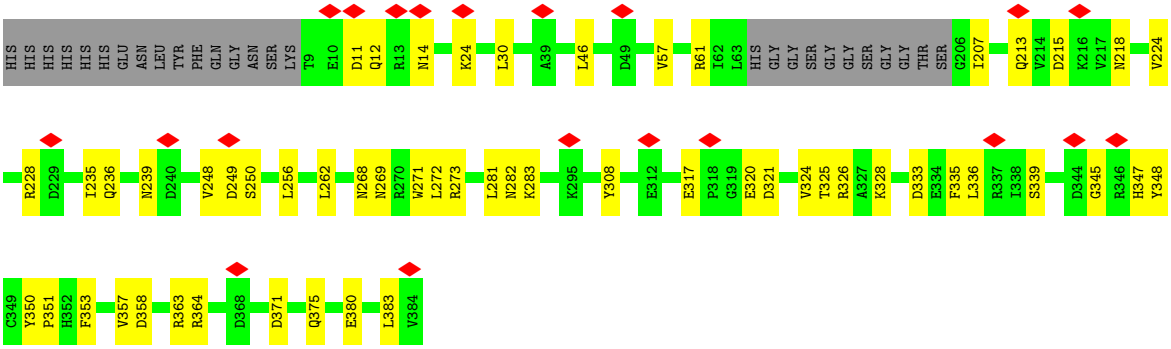
Mol	Chain	Residues	Atoms					AltConf
			Total	C	Cl	N	O	
8	R	1	22	17	1	2	2	0

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.

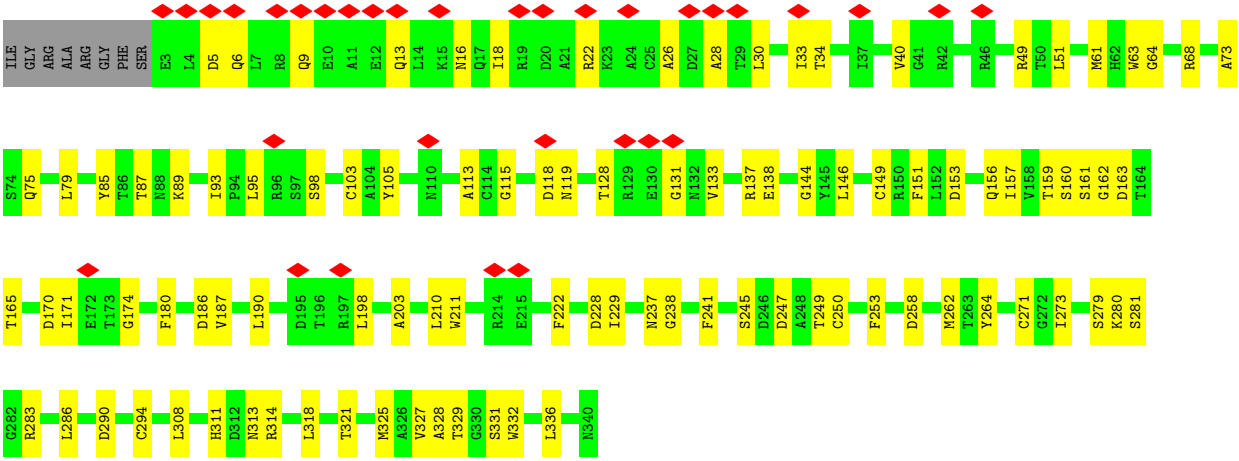
• Molecule 1: Isoform Gnas-2 of Guanine nucleotide-binding protein G(s) subunit alpha isoforms short

Chain A:



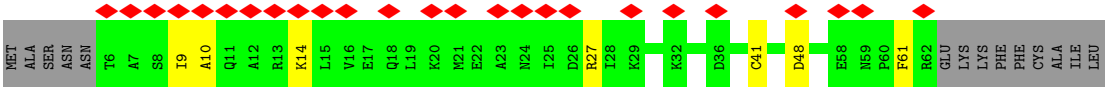
• Molecule 2: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

Chain B:



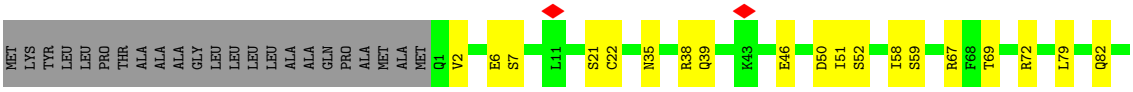
• Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

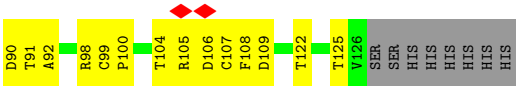
Chain G:



• Molecule 4: Nanobody 35

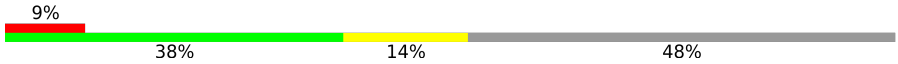
Chain N:

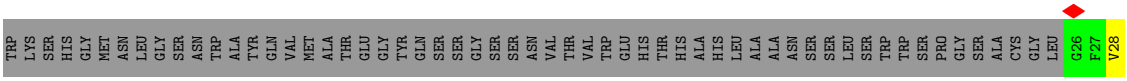


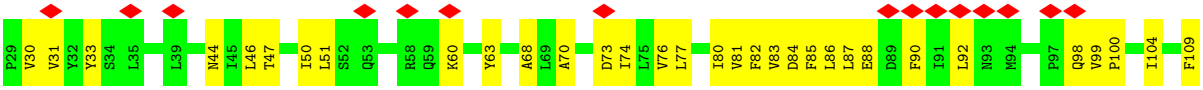


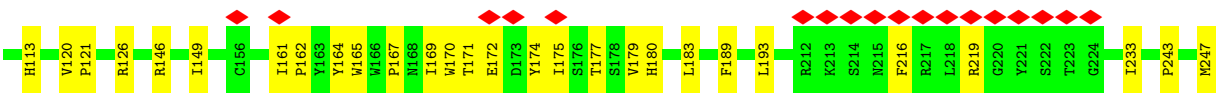
• Molecule 5: Chimera of Endo-1,4-beta-xylanase and Probable G-protein coupled receptor 139

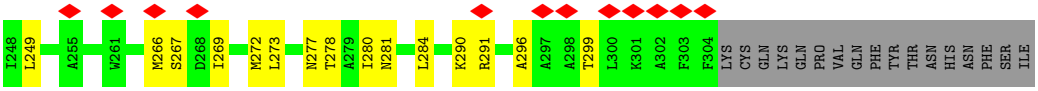
Chain R:











4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	67676	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; Patch CTF refinement	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	20	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	2.022	Depositor
Minimum map value	-0.002	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.023	Depositor
Recommended contour level	0.127	Depositor
Map size (Å)	266.24, 266.24, 266.24	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.04, 1.04, 1.04	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: GTP, 7ZQ, MG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\|>5$	RMSZ	$\#\|Z\|>5$
1	A	0.11	0/1976	0.29	0/2659
2	B	0.10	0/2647	0.29	0/3589
3	G	0.09	0/442	0.25	0/597
4	N	0.10	0/981	0.25	0/1329
5	R	0.13	0/2365	0.35	0/3234
All	All	0.11	0/8411	0.30	0/11408

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1940	0	1920	40	0
2	B	2600	0	2505	67	0
3	G	436	0	448	6	0
4	N	961	0	928	21	0
5	R	2295	0	2381	60	0
6	A	32	0	12	0	0
7	A	1	0	0	0	0
8	R	22	0	0	0	0
All	All	8287	0	8194	182	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 (182) 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)
5:R:68:ALA:HB2	5:R:149:ILE:HD11	1.65	0.79
2:B:79:LEU:HB3	2:B:93:ILE:HB	1.71	0.72
2:B:250:CYS:HB2	2:B:264:TYR:HB2	1.71	0.71
2:B:93:ILE:HG12	2:B:133:VAL:HG21	1.75	0.68
5:R:109:PHE:O	5:R:113:HIS:ND1	2.26	0.68
5:R:171:THR:HG22	5:R:172:GLU:H	1.59	0.68
2:B:119:ASN:ND2	2:B:144:GLY:O	2.28	0.67
2:B:30:LEU:HD22	2:B:262:MET:HE3	1.79	0.65
2:B:271:CYS:HB3	2:B:290:ASP:HB2	1.78	0.65
2:B:40:VAL:HG23	2:B:283:ARG:HH21	1.62	0.65
5:R:216:PHE:HB3	5:R:219:ARG:HG3	1.81	0.63
2:B:49:ARG:HH12	3:G:61:PHE:HA	1.62	0.63
1:A:207:ILE:HG12	1:A:224:VAL:HG12	1.80	0.62
2:B:313:ASN:HB3	2:B:332:TRP:HB2	1.81	0.62
4:N:50:ASP:OD1	4:N:59:SER:OG	2.17	0.62
5:R:243:PRO:HG3	5:R:273:LEU:HD12	1.82	0.62
2:B:75:GLN:O	2:B:98:SER:OG	2.18	0.61
4:N:91:THR:HG23	4:N:125:THR:HA	1.82	0.61
1:A:239:ASN:HD22	2:B:332:TRP:HZ3	1.48	0.61
5:R:84:ASP:O	5:R:88:GLU:HG3	2.00	0.60
2:B:187:VAL:HA	2:B:203:ALA:HA	1.83	0.60
5:R:82:PHE:O	5:R:86:LEU:HB2	2.02	0.59
5:R:233:ILE:HA	5:R:284:LEU:HD21	1.83	0.59
2:B:229:ILE:HG22	2:B:245:SER:HB3	1.83	0.59
1:A:375:GLN:OE1	5:R:219:ARG:NH1	2.36	0.59
1:A:358:ASP:OD2	1:A:364:ARG:NH2	2.35	0.59
2:B:245:SER:OG	2:B:247:ASP:OD1	2.17	0.59
2:B:160:SER:HB3	2:B:190:LEU:HD23	1.84	0.59
1:A:11:ASP:OD1	1:A:12:GLN:N	2.36	0.58
5:R:233:ILE:HG12	5:R:284:LEU:HG	1.84	0.58
5:R:146:ARG:HA	5:R:149:ILE:HG22	1.87	0.57
1:A:308:TYR:OH	1:A:333:ASP:OD2	2.18	0.57
2:B:311:HIS:HE2	2:B:329:THR:HG1	1.50	0.57
1:A:336:LEU:HD11	1:A:351:PRO:HG3	1.86	0.57
1:A:228:ARG:NH1	2:B:186:ASP:OD1	2.39	0.56
2:B:163:ASP:OD2	2:B:165:THR:OG1	2.21	0.56
4:N:38:ARG:NH1	4:N:46:GLU:OE2	2.39	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:R:88:GLU:HA	5:R:92:LEU:HB3	1.88	0.56
5:R:76:VAL:HG13	5:R:80:ILE:HD12	1.88	0.55
2:B:18:ILE:HG22	2:B:22:ARG:HE	1.70	0.55
1:A:383:LEU:HD11	5:R:126:ARG:HD3	1.89	0.55
2:B:294:CYS:HB3	2:B:308:LEU:HB2	1.88	0.55
4:N:7:SER:HB3	4:N:21:SER:HB2	1.87	0.55
1:A:380:GLU:O	5:R:291:ARG:NH1	2.39	0.55
2:B:128:THR:HG23	2:B:131:GLY:H	1.72	0.55
1:A:46:LEU:HD11	1:A:235:ILE:HD11	1.88	0.55
5:R:63:TYR:OH	5:R:291:ARG:NH2	2.40	0.54
1:A:215:ASP:OD2	1:A:363:ARG:NH1	2.40	0.54
5:R:83:VAL:O	5:R:87:LEU:HB2	2.07	0.54
4:N:67:ARG:NH2	4:N:90:ASP:OD1	2.41	0.54
4:N:69:THR:HB	4:N:82:GLN:HB3	1.89	0.54
1:A:57:VAL:O	1:A:61:ARG:HG3	2.08	0.53
2:B:311:HIS:NE2	2:B:329:THR:OG1	2.40	0.53
1:A:317:GLU:HB2	1:A:320:GLU:HG2	1.91	0.53
5:R:33:TYR:HE2	5:R:272:MET:HG2	1.73	0.53
2:B:314:ARG:HH21	2:B:332:TRP:HZ2	1.57	0.53
4:N:104:THR:OG1	4:N:106:ASP:OD1	2.22	0.53
1:A:282:ASN:OD1	1:A:283:LYS:N	2.38	0.52
2:B:61:MET:HE1	2:B:63:TRP:CD1	2.45	0.52
2:B:286:LEU:HB3	2:B:318:LEU:HD21	1.91	0.52
4:N:2:VAL:HG11	4:N:98:ARG:HH21	1.74	0.52
4:N:69:THR:O	4:N:82:GLN:N	2.40	0.52
5:R:164:TYR:HD1	5:R:165:TRP:HD1	1.58	0.52
2:B:13:GLN:HA	2:B:16:ASN:HD21	1.75	0.51
2:B:61:MET:HE3	2:B:328:ALA:HB3	1.92	0.51
2:B:281:SER:HB3	3:G:48:ASP:HB2	1.93	0.51
1:A:268:ASN:HB3	4:N:105:ARG:HG3	1.93	0.50
1:A:11:ASP:HA	1:A:14:ASN:HD21	1.77	0.50
4:N:22:CYS:HB3	4:N:79:LEU:HB3	1.92	0.50
1:A:250:SER:OG	1:A:282:ASN:O	2.25	0.50
2:B:229:ILE:HA	2:B:245:SER:HA	1.94	0.49
2:B:79:LEU:HB2	2:B:95:LEU:HD11	1.93	0.49
2:B:5:ASP:N	2:B:5:ASP:OD1	2.44	0.49
4:N:52:SER:O	4:N:72:ARG:NH1	2.46	0.49
2:B:33:ILE:HG13	2:B:34:THR:HG23	1.95	0.49
5:R:247:MET:SD	5:R:267:SER:HA	2.52	0.49
1:A:273:ARG:O	1:A:347:HIS:ND1	2.46	0.49
5:R:44:ASN:HA	5:R:47:THR:HG22	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:R:83:VAL:HA	5:R:87:LEU:HD23	1.95	0.48
2:B:331:SER:OG	2:B:332:TRP:N	2.47	0.48
2:B:6:GLN:NE2	2:B:9:GLN:OE1	2.43	0.48
5:R:46:LEU:O	5:R:50:ILE:HG12	2.14	0.48
1:A:325:THR:HA	1:A:328:LYS:HG2	1.95	0.48
5:R:76:VAL:HG11	5:R:278:THR:HG21	1.95	0.48
1:A:308:TYR:O	1:A:326:ARG:NH1	2.47	0.47
2:B:113:ALA:HB2	2:B:151:PHE:HE1	1.78	0.47
2:B:198:LEU:HB3	2:B:210:LEU:HD11	1.95	0.47
1:A:30:LEU:HD22	2:B:89:LYS:HE3	1.97	0.47
1:A:248:VAL:HG21	1:A:335:PHE:CZ	2.49	0.47
1:A:269:ASN:HB3	1:A:272:LEU:HB2	1.97	0.47
2:B:73:ALA:HB2	2:B:103:CYS:SG	2.55	0.47
1:A:350:TYR:OH	1:A:371:ASP:OD2	2.26	0.47
4:N:51:ILE:HG22	4:N:58:ILE:HG12	1.97	0.47
2:B:247:ASP:OD1	2:B:249:THR:OG1	2.32	0.47
2:B:149:CYS:HB3	2:B:159:THR:HG23	1.95	0.47
5:R:169:ILE:HD12	5:R:174:TYR:HE2	1.79	0.47
5:R:146:ARG:O	5:R:149:ILE:HG22	2.14	0.47
2:B:228:ASP:N	2:B:228:ASP:OD1	2.48	0.46
2:B:51:LEU:HB2	2:B:336:LEU:HB2	1.98	0.46
2:B:283:ARG:HG2	3:G:41:CYS:SG	2.56	0.46
5:R:70:ALA:O	5:R:74:ILE:HG12	2.15	0.46
4:N:6:GLU:HB2	4:N:122:THR:HG23	1.96	0.46
2:B:115:GLY:HA3	2:B:146:LEU:HD23	1.98	0.45
2:B:137:ARG:NH1	2:B:138:GLU:O	2.49	0.45
1:A:236:GLN:HG2	1:A:271:TRP:CD1	2.52	0.45
5:R:98:GLN:O	5:R:164:TYR:OH	2.29	0.45
5:R:169:ILE:HA	5:R:174:TYR:HE2	1.81	0.45
5:R:99:VAL:HB	5:R:100:PRO:HD3	1.98	0.45
2:B:63:TRP:CD2	2:B:321:THR:HG22	2.52	0.45
4:N:100:PRO:HD2	4:N:107:CYS:HB2	1.99	0.45
5:R:161:ILE:N	5:R:162:PRO:HD2	2.32	0.45
1:A:11:ASP:HA	1:A:14:ASN:ND2	2.33	0.44
1:A:357:VAL:O	1:A:357:VAL:HG13	2.17	0.44
1:A:380:GLU:OE2	5:R:60:LYS:HD3	2.17	0.44
5:R:60:LYS:HD2	5:R:63:TYR:CE1	2.52	0.44
1:A:262:LEU:HD12	4:N:108:PHE:HE1	1.83	0.44
2:B:26:ALA:O	2:B:28:ALA:N	2.49	0.44
5:R:33:TYR:CE2	5:R:272:MET:HG2	2.51	0.44
5:R:249:LEU:HD23	5:R:249:LEU:HA	1.85	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:68:ARG:HG2	2:B:85:TYR:CE2	2.53	0.44
2:B:161:SER:OG	2:B:162:GLY:N	2.51	0.44
2:B:237:ASN:OD1	2:B:238:GLY:N	2.51	0.44
4:N:7:SER:N	4:N:21:SER:O	2.47	0.44
5:R:167:PRO:HG3	5:R:180:HIS:ND1	2.33	0.44
5:R:266:MET:HA	5:R:269:ILE:HG22	1.99	0.44
1:A:248:VAL:HG21	1:A:335:PHE:HZ	1.83	0.43
1:A:321:ASP:HB3	1:A:324:VAL:HG12	2.00	0.43
1:A:281:LEU:HD12	1:A:353:PHE:CE1	2.53	0.43
2:B:13:GLN:HA	2:B:16:ASN:ND2	2.33	0.43
2:B:171:ILE:H	2:B:171:ILE:HD12	1.84	0.43
1:A:249:ASP:OD1	1:A:283:LYS:HD2	2.19	0.43
2:B:170:ASP:O	2:B:174:GLY:N	2.47	0.43
5:R:33:TYR:HE1	5:R:85:PHE:HD2	1.66	0.43
2:B:279:SER:OG	2:B:280:LYS:N	2.49	0.43
1:A:336:LEU:HA	1:A:339:SER:HB3	2.01	0.43
2:B:64:GLY:HA2	2:B:105:TYR:CD2	2.53	0.43
4:N:39:GLN:H	4:N:92:ALA:HB1	1.84	0.43
5:R:169:ILE:HG13	5:R:170:TRP:CE3	2.54	0.43
5:R:281:ASN:C	5:R:281:ASN:HD22	2.27	0.43
2:B:222:PHE:HE1	2:B:258:ASP:HA	1.83	0.42
2:B:241:PHE:CE1	2:B:253:PHE:HB2	2.54	0.42
2:B:180:PHE:HB3	2:B:211:TRP:CE3	2.54	0.42
3:G:10:ALA:O	3:G:14:LYS:HG2	2.19	0.42
2:B:146:LEU:HD11	2:B:159:THR:HG22	2.02	0.42
4:N:35:ASN:ND2	4:N:109:ASP:OD2	2.46	0.42
5:R:33:TYR:CD1	5:R:81:VAL:HG13	2.54	0.42
5:R:51:LEU:HD22	5:R:63:TYR:HD2	1.82	0.42
5:R:277:ASN:C	5:R:277:ASN:HD22	2.28	0.42
5:R:277:ASN:HA	5:R:280:ILE:HG22	2.01	0.42
5:R:164:TYR:HD1	5:R:165:TRP:CD1	2.38	0.42
5:R:189:PHE:HA	5:R:193:LEU:HB2	2.01	0.42
1:A:269:ASN:ND2	1:A:272:LEU:HD13	2.34	0.42
2:B:118:ASP:OD1	2:B:118:ASP:N	2.51	0.42
5:R:30:VAL:HG22	5:R:90:PHE:CE2	2.54	0.42
5:R:290:LYS:H	5:R:290:LYS:HG2	1.64	0.42
5:R:177:THR:HG22	5:R:179:VAL:H	1.85	0.42
2:B:286:LEU:HD22	2:B:327:VAL:HG21	2.01	0.41
2:B:153:ASP:OD1	2:B:156:GLN:N	2.53	0.41
5:R:30:VAL:HG22	5:R:90:PHE:CZ	2.55	0.41
5:R:269:ILE:HD12	5:R:272:MET:HE3	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:151:PHE:HA	2:B:157:ILE:HG22	2.02	0.41
2:B:325:MET:HE3	2:B:325:MET:HB3	1.90	0.41
5:R:100:PRO:O	5:R:104:ILE:HG12	2.21	0.41
1:A:213:GLN:HA	1:A:218:ASN:HA	2.03	0.41
5:R:68:ALA:HB2	5:R:149:ILE:CD1	2.45	0.41
1:A:345:GLY:HA2	1:A:348:TYR:HE1	1.86	0.41
3:G:27:ARG:HA	3:G:27:ARG:HD3	1.82	0.41
5:R:183:LEU:HA	5:R:183:LEU:HD23	1.86	0.41
1:A:256:LEU:HD23	1:A:256:LEU:HA	1.84	0.41
5:R:73:ASP:O	5:R:77:LEU:HD13	2.21	0.41
5:R:120:VAL:HB	5:R:121:PRO:HD3	2.03	0.41
5:R:169:ILE:HD12	5:R:174:TYR:CE2	2.56	0.41
4:N:69:THR:N	4:N:82:GLN:O	2.54	0.40
5:R:28:VAL:HA	5:R:31:VAL:HG12	2.03	0.40
2:B:250:CYS:SG	2:B:273:ILE:HG12	2.62	0.40
5:R:92:LEU:HD12	5:R:92:LEU:HA	1.95	0.40
1:A:24:LYS:HE2	1:A:24:LYS:HB3	1.95	0.40
2:B:49:ARG:HD3	2:B:87:THR:OG1	2.21	0.40
2:B:160:SER:HB2	2:B:187:VAL:HG13	2.04	0.40
4:N:99:CYS:HB3	4:N:107:CYS:HB3	1.64	0.40
3:G:9:ILE:HD12	3:G:9:ILE:H	1.87	0.40
5:R:296:ALA:HA	5:R:299:THR:HG22	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	230/261 (88%)	227 (99%)	3 (1%)	0	100	100
2	B	336/346 (97%)	325 (97%)	11 (3%)	0	100	100
3	G	55/71 (78%)	54 (98%)	1 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
4	N	124/157 (79%)	118 (95%)	6 (5%)	0	100	100
5	R	277/533 (52%)	255 (92%)	21 (8%)	1 (0%)	30	61
All	All	1022/1368 (75%)	979 (96%)	42 (4%)	1 (0%)	50	76

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	R	175	ILE

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	210/230 (91%)	210 (100%)	0	100	100
2	B	281/286 (98%)	281 (100%)	0	100	100
3	G	46/58 (79%)	46 (100%)	0	100	100
4	N	104/127 (82%)	104 (100%)	0	100	100
5	R	255/467 (55%)	255 (100%)	0	100	100
All	All	896/1168 (77%)	896 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	A	239	ASN
2	B	13	GLN
2	B	119	ASN
2	B	259	GLN
2	B	340	ASN
4	N	53	GLN
5	R	44	ASN
5	R	251	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
6	GTP	A	401	7	26,34,34	0.94	2 (7%)	32,54,54	2.09	11 (34%)
8	7ZQ	R	401	-	23,23,23	1.79	5 (21%)	30,30,30	0.93	1 (3%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	GTP	A	401	7	-	2/18/38/38	0/3/3/3
8	7ZQ	R	401	-	-	1/17/17/17	0/2/2/2

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	R	401	7ZQ	C9-N2	5.37	1.45	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	R	401	7ZQ	C7-N1	5.31	1.45	1.33
6	A	401	GTP	C8-N7	-2.68	1.30	1.35
8	R	401	7ZQ	O1-C7	-2.15	1.18	1.23
8	R	401	7ZQ	O2-C9	-2.15	1.18	1.23
6	A	401	GTP	C5-C6	-2.03	1.43	1.47
8	R	401	7ZQ	C3-CL1	2.02	1.78	1.74

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	401	GTP	C8-N7-C5	4.90	112.33	102.99
6	A	401	GTP	C5-C6-N1	4.85	122.51	113.95
6	A	401	GTP	C2-N1-C6	-3.38	118.87	125.10
6	A	401	GTP	PA-O3A-PB	-2.86	123.02	132.83
6	A	401	GTP	O6-C6-C5	-2.85	118.81	124.37
6	A	401	GTP	O3G-PG-O3B	2.84	114.17	104.64
6	A	401	GTP	C3'-C2'-C1'	2.84	105.25	100.98
6	A	401	GTP	O2G-PG-O3B	2.83	114.12	104.64
6	A	401	GTP	PB-O3B-PG	-2.71	123.51	132.83
8	R	401	7ZQ	C10-N2-C9	-2.25	119.69	122.90
6	A	401	GTP	O2B-PB-O1B	-2.25	101.13	112.24
6	A	401	GTP	O2A-PA-O1A	-2.24	101.18	112.24

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	401	GTP	PB-O3B-PG-O2G
6	A	401	GTP	PB-O3B-PG-O3G
8	R	401	7ZQ	N2-C10-C12-C13

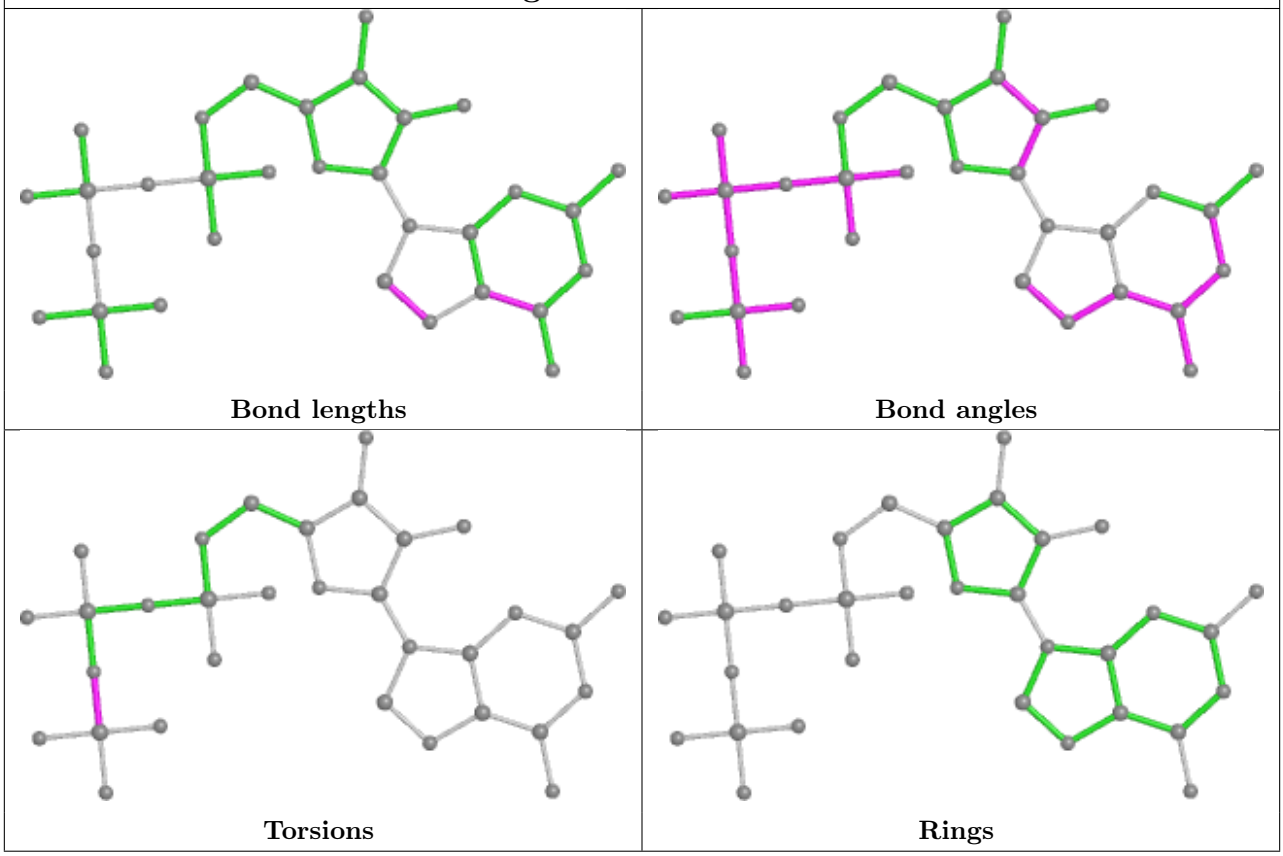
There are no ring outliers.

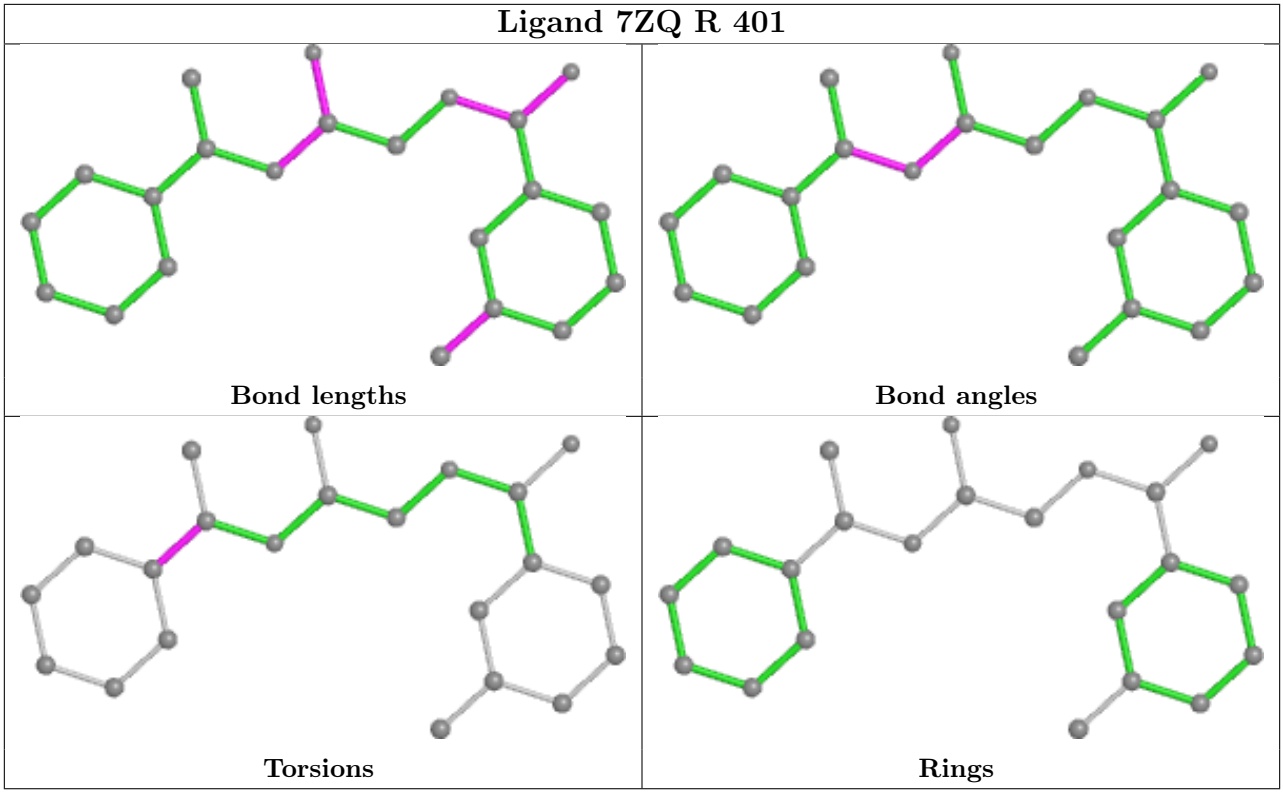
No monomer is involved in short contacts.

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 GTP A 401





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.

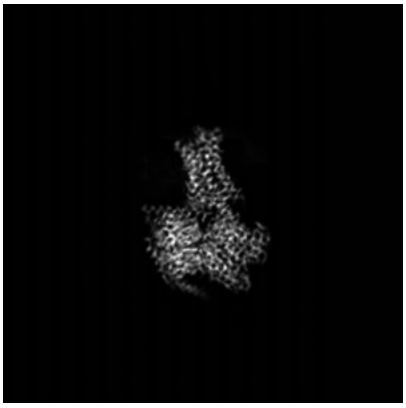
6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-32129. These allow visual inspection of the internal detail of the map and identification of artifacts.

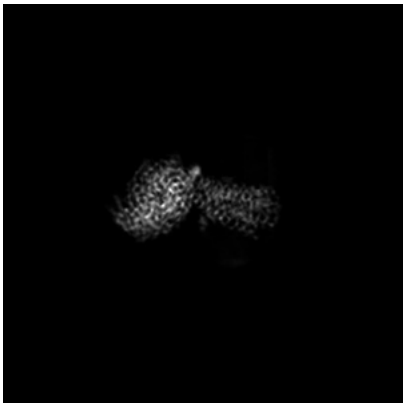
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections (i)

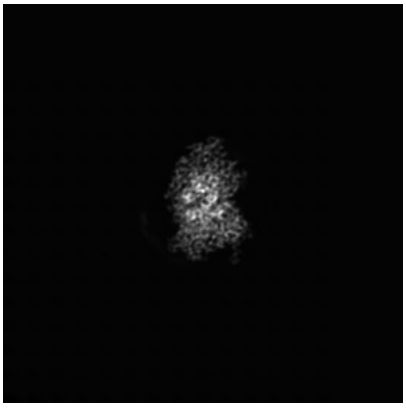
6.1.1 Primary map



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: 128

Y Index: 128

Z Index: 128

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: 132

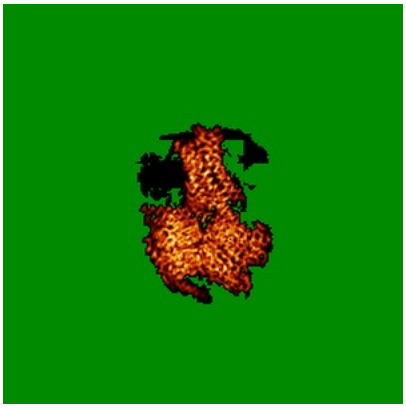
Y Index: 132

Z Index: 106

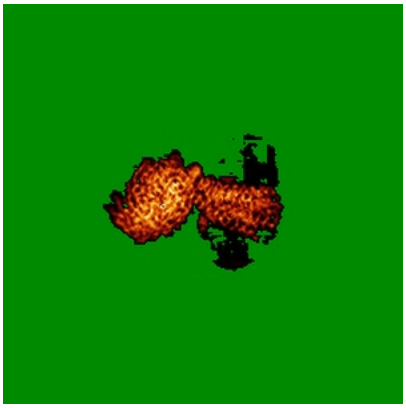
The images above show the largest variance slices of the map in three orthogonal directions.

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

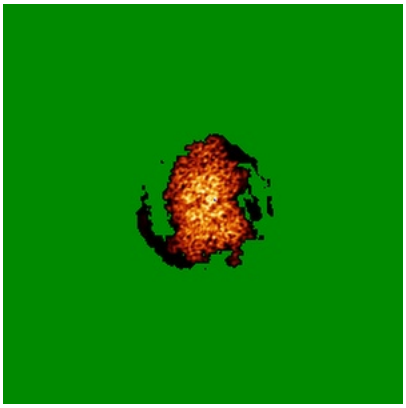
6.4.1 Primary map



X



Y

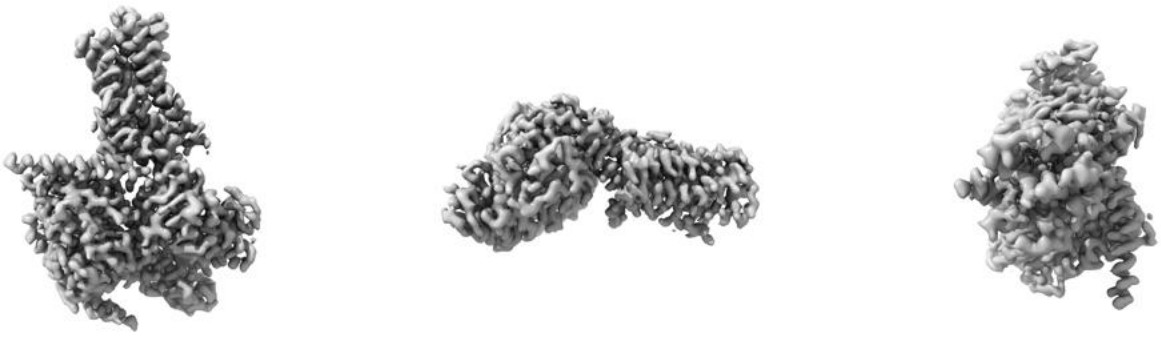


Z

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



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.127. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

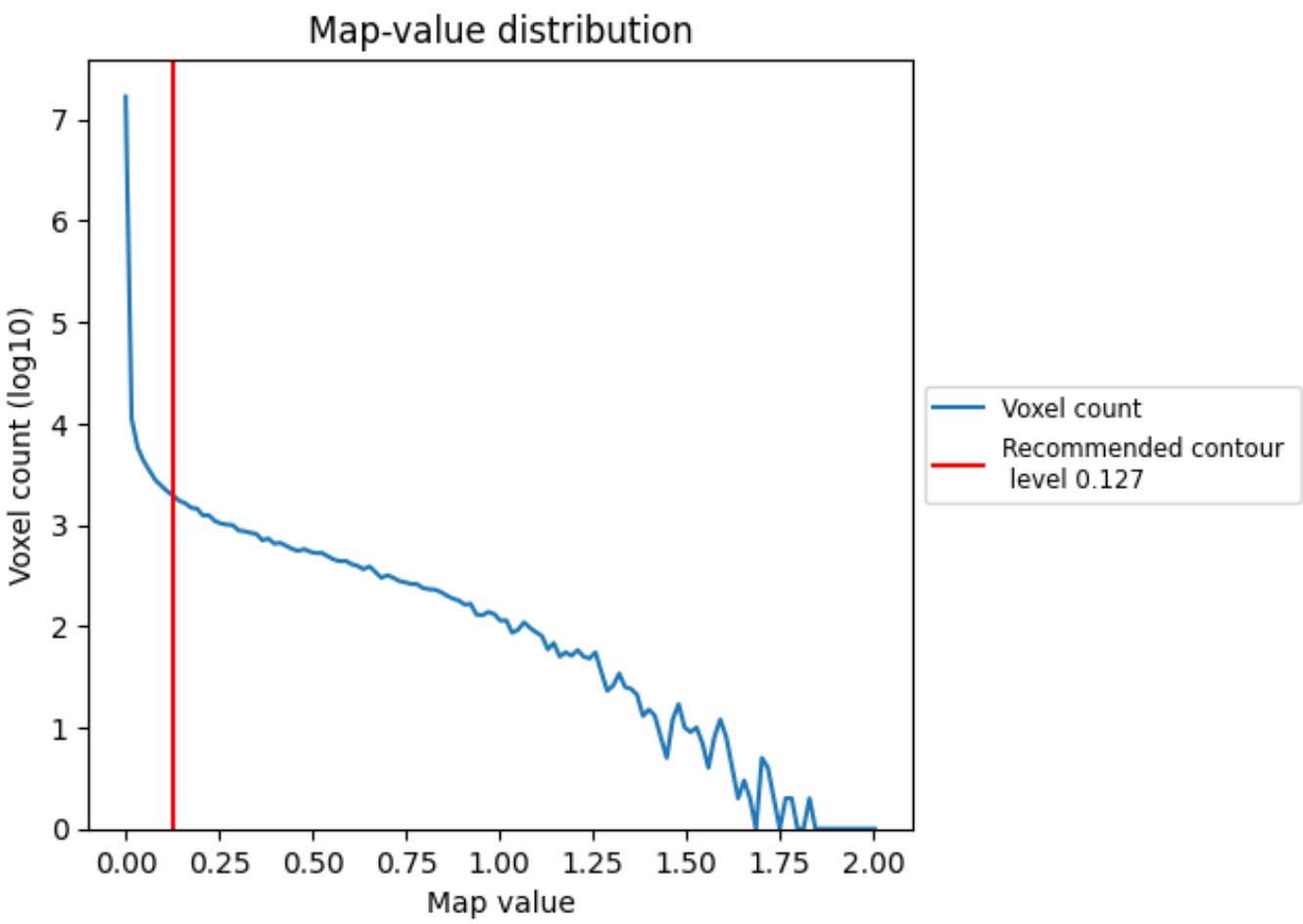
6.6 Mask visualisation (i)

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

7 Map analysis (i)

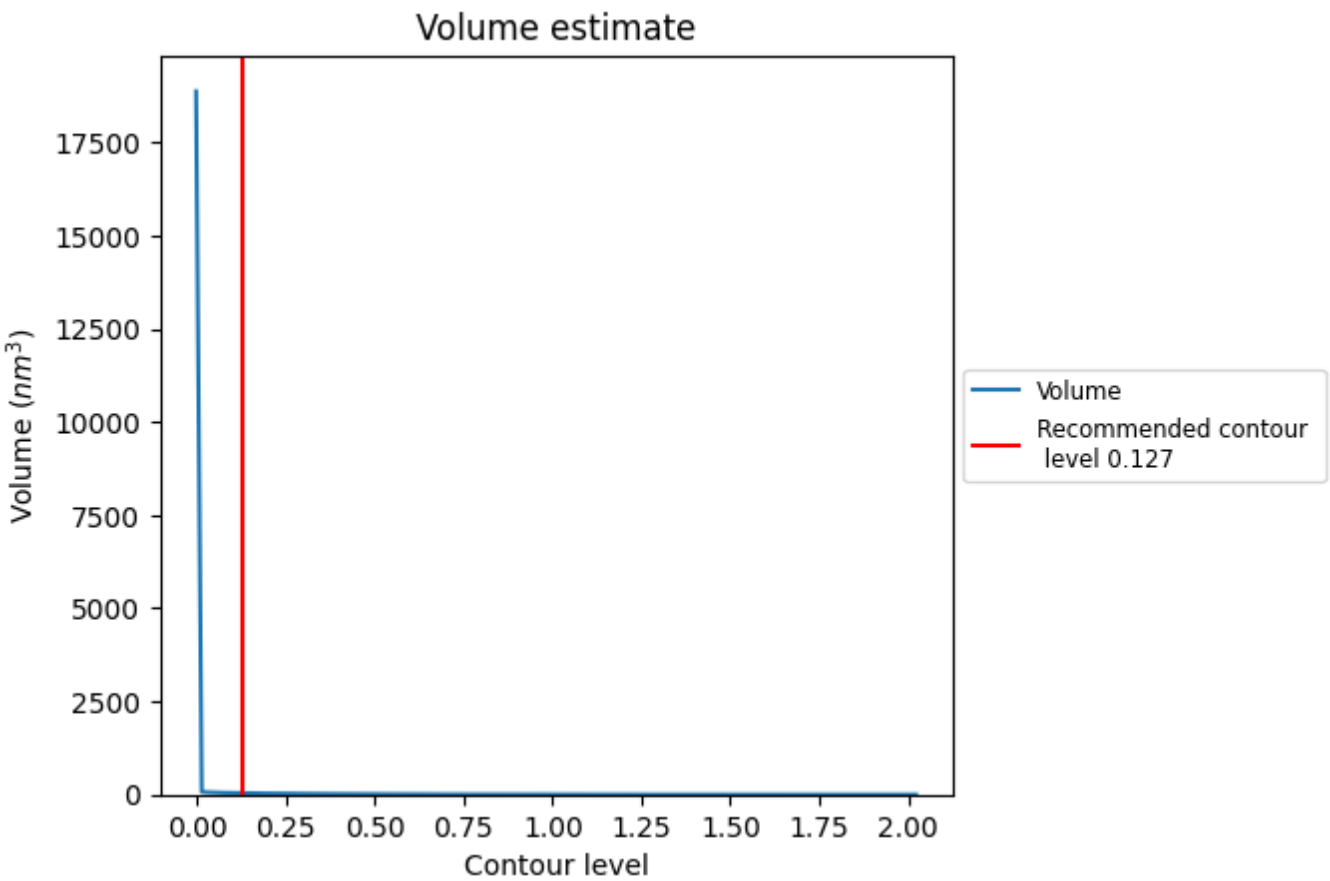
This section contains the results of statistical analysis of the map.

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.

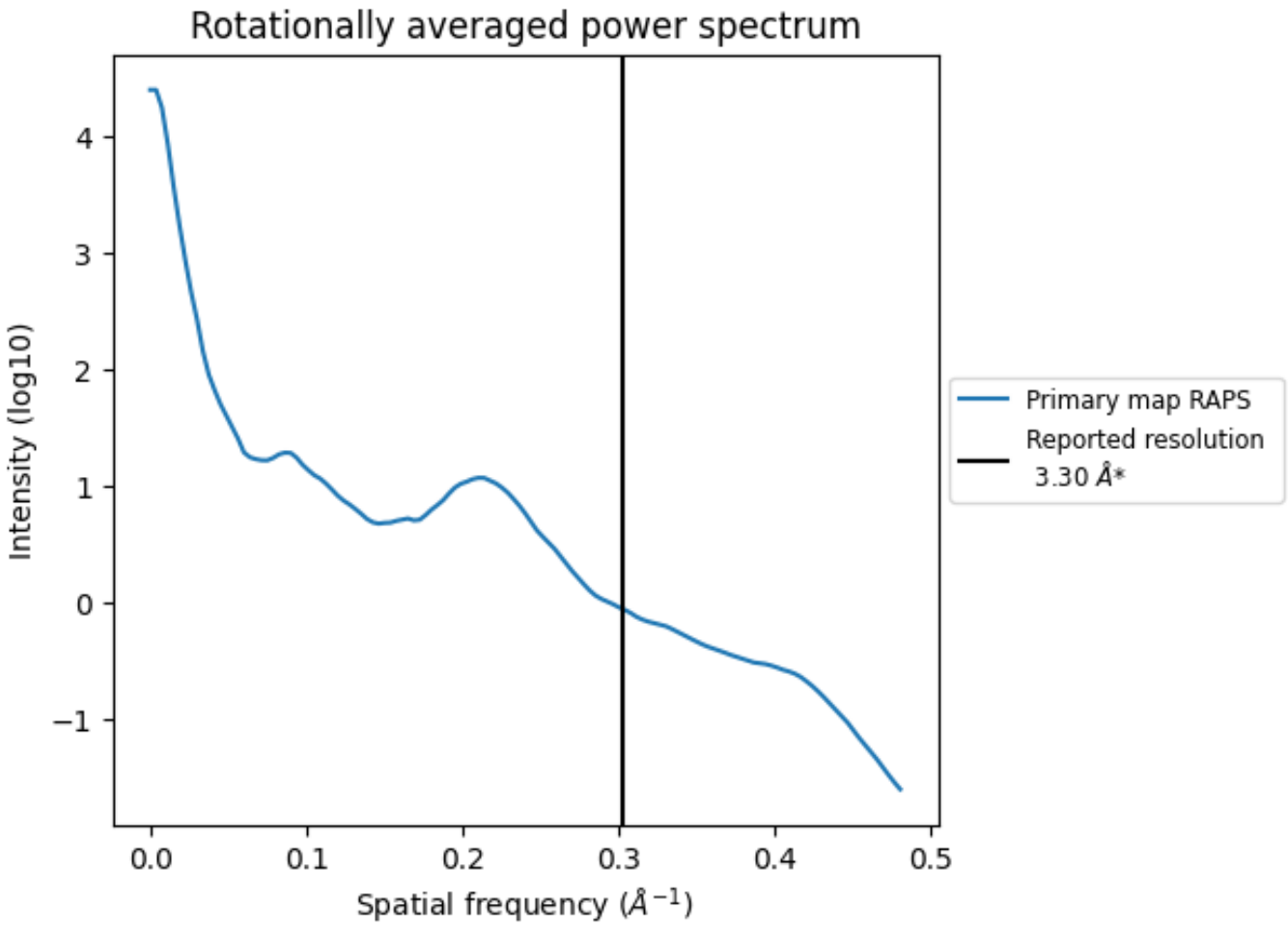
7.2 Volume estimate (i)



The volume at the recommended contour level is 39 nm^3; this corresponds to an approximate mass of 35 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 0.303 Å^{-1}

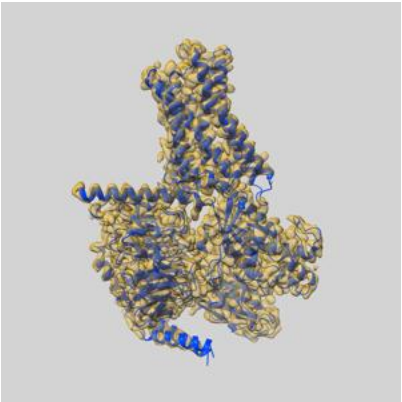
8 Fourier-Shell correlation (i)

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

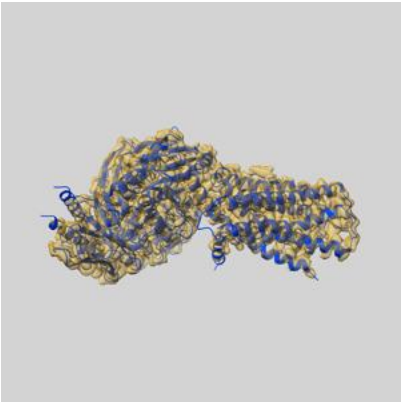
9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-32129 and PDB model 7VUI. Per-residue inclusion information can be found in section 3 on page 8.

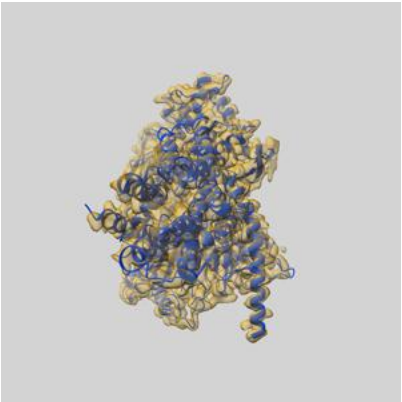
9.1 Map-model overlay (i)



X



Y



Z

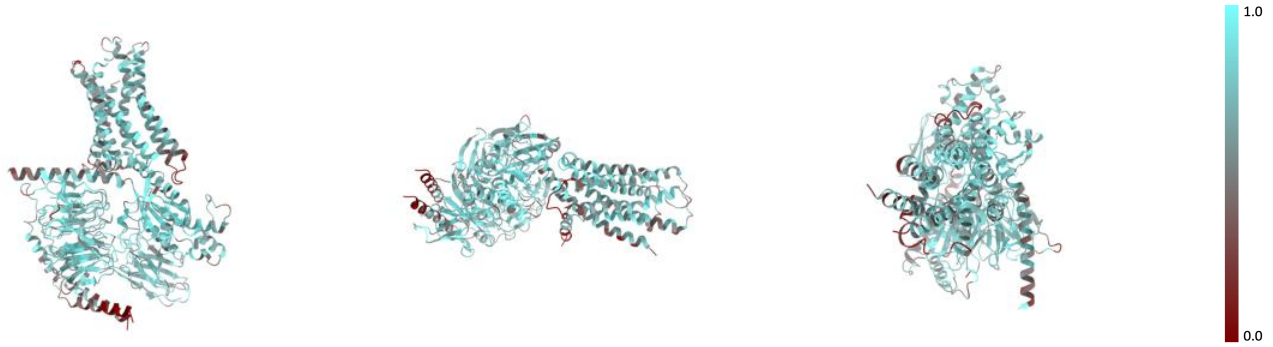
The images above show the 3D surface view of the map at the recommended contour level 0.127 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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.

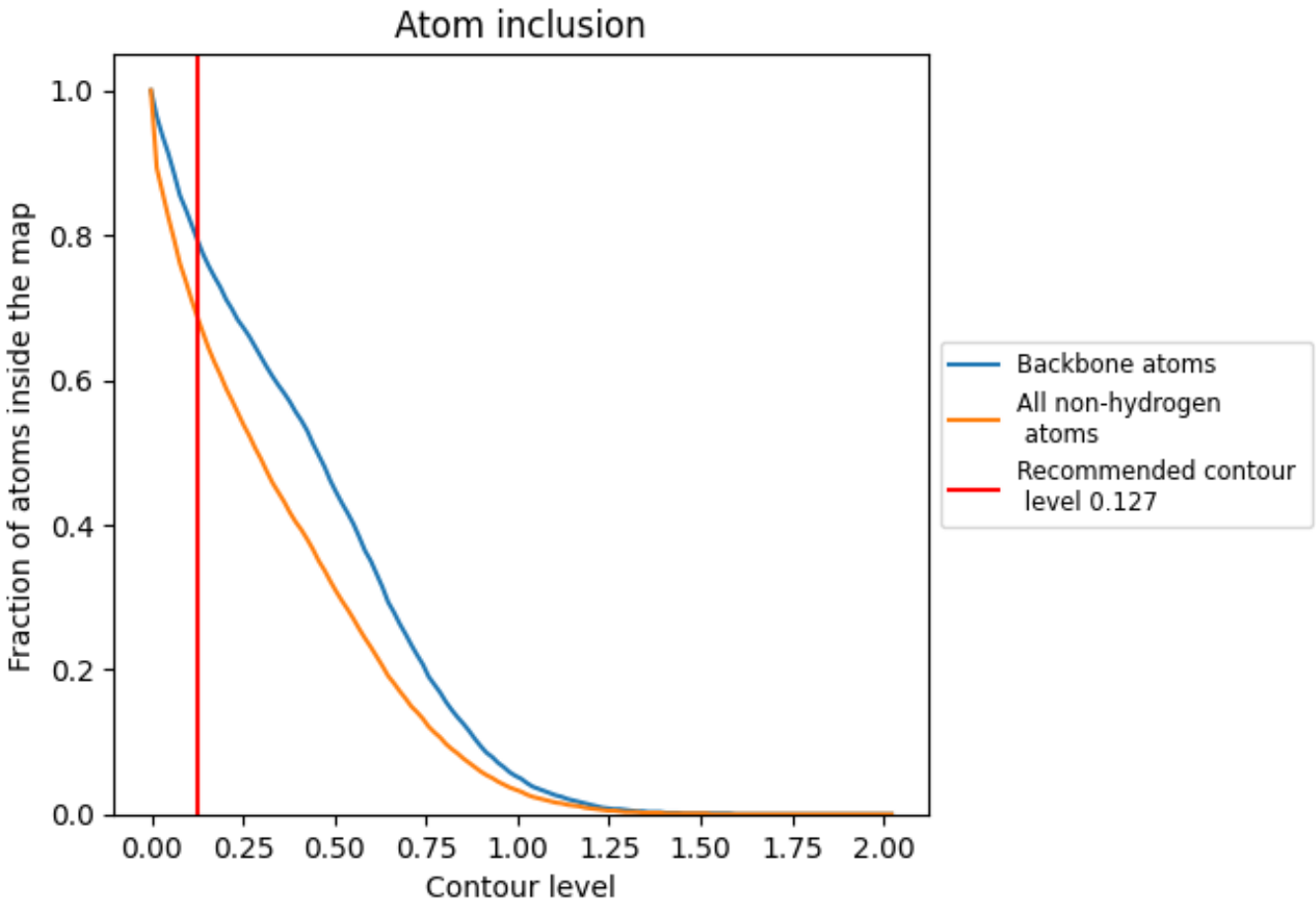
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.127).

9.4 Atom inclusion (i)



At the recommended contour level, 79% of all backbone atoms, 68% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.127) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6840	0.3890
A	0.7270	0.4210
B	0.7130	0.4180
G	0.4800	0.2770
N	0.7400	0.4220
R	0.6320	0.3380