W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

Full wwPDB EM Validation Report ⓘ

Nov 10, 2024 – 07:44 PM EST

PDB ID	:	7MT8
EMDB ID	:	EMD-23977
Title	:	Rhodopsin kinase (GRK1)-S5E/S488E/T489E in complex with rhodopsin
Authors	:	Chen, Q.; Chen, C.-L.; Tesmer, J.J.G.
Deposited on	:	2021-05-13
Resolution	:	5.80 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:

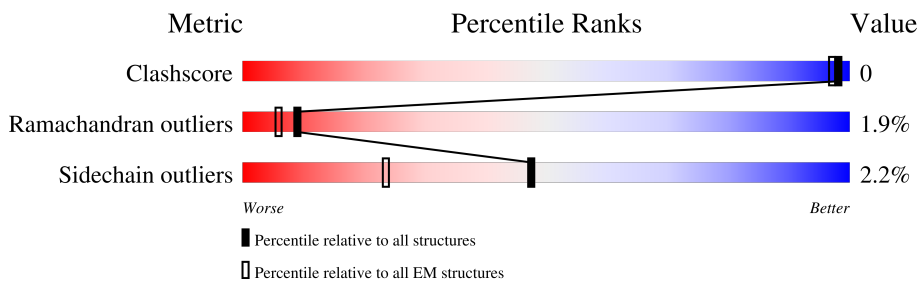|		
EMDB validation analysis	:	0.0.1.dev113
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 5.80 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	Percentile Ranks	Value
Clashscore		0
Ramachandran outliers		1.9%
Sidechain outliers		2.2%

Worse　　　　　　　　　　　　　　　*Better*

■ Percentile relative to all structures

▯ Percentile relative to all EM structures

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%

Mol	Chain	Length	Quality of chain
1	1-G	543	60% · · 36%
1	2-G	543	61% · · 36%
1	3-G	543	61% · · 36%
1	4-G	543	60% · · 36%
1	5-G	543	62% · 36%
1	6-G	543	61% · 36%
2	1-R	348	90% · 7%
2	2-R	348	91% ·· 7%
2	3-R	348	90% · · 7%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	4-R	348	90% 7%
2	5-R	348	88% 7%
2	6-R	348	88% 5% 7%

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 32177 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 Rhodopsin kinase GRK1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	1-G	346	Total	C	N	O	S	0	0
			2745	1756	469	507	13		
1	2-G	346	Total	C	N	O	S	0	0
			2746	1756	470	507	13		
1	3-G	346	Total	C	N	O	S	0	0
			2746	1756	470	507	13		
1	4-G	346	Total	C	N	O	S	0	0
			2746	1756	470	507	13		
1	5-G	346	Total	C	N	O	S	0	0
			2746	1756	470	507	13		
1	6-G	346	Total	C	N	O	S	0	0
			2746	1756	470	507	13		

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	5	GLU	SER	engineered mutation	UNP P28327
G	488	GLU	SER	engineered mutation	UNP P28327
G	489	GLU	THR	engineered mutation	UNP P28327
G	536	VAL	-	expression tag	UNP P28327
G	537	ASP	-	expression tag	UNP P28327
G	538	HIS	-	expression tag	UNP P28327
G	539	HIS	-	expression tag	UNP P28327
G	540	HIS	-	expression tag	UNP P28327
G	541	HIS	-	expression tag	UNP P28327
G	542	HIS	-	expression tag	UNP P28327
G	543	HIS	-	expression tag	UNP P28327

- Molecule 2 is a protein called Rhodopsin.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	1-R	324	Total	C	N	O	S	0	0
			2575	1715	396	438	26		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					AltConf	Trace
2	2-R	324	Total	C	N	O	S	0	0
			2575	1715	396	438	26		
2	3-R	324	Total	C	N	O	S	0	0
			2575	1715	396	438	26		
2	4-R	324	Total	C	N	O	S	0	0
			2575	1715	396	438	26		
2	5-R	324	Total	C	N	O	S	0	0
			2575	1715	396	438	26		
2	6-R	324	Total	C	N	O	S	0	0
			2575	1715	396	438	26		

- Molecule 3 is SANGIVAMYCIN (three-letter code: SGV) (formula: $C_{12}H_{15}N_5O_5$).
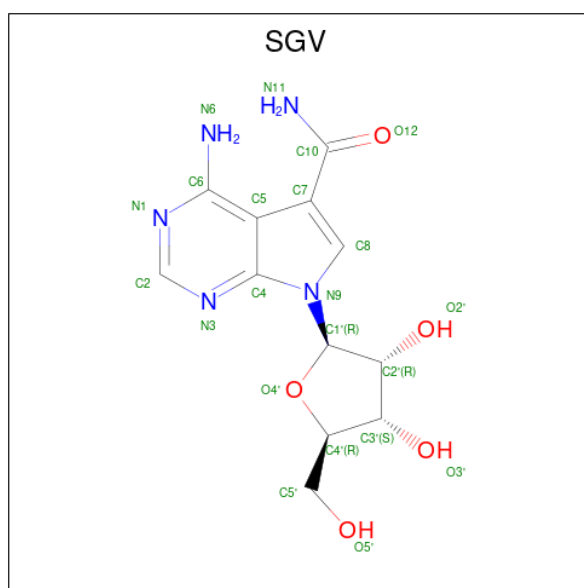
Mol	Chain	Residues	Atoms				AltConf
3	1-G	1	Total	C	N	O	0
			22	12	5	5	
3	2-G	1	Total	C	N	O	0
			22	12	5	5	
3	3-G	1	Total	C	N	O	0
			22	12	5	5	
3	4-G	1	Total	C	N	O	0
			22	12	5	5	
3	5-G	1	Total	C	N	O	0
			22	12	5	5	
3	6-G	1	Total	C	N	O	0
			22	12	5	5	

- Molecule 4 is RETINAL (three-letter code: RET) (formula: $C_{20}H_{28}O$).

RET

Mol	Chain	Residues	Atoms		AltConf
4	1-R	1	Total 20	C 20	0
4	2-R	1	Total 20	C 20	0
4	3-R	1	Total 20	C 20	0
4	4-R	1	Total 20	C 20	0
4	5-R	1	Total 20	C 20	0
4	6-R	1	Total 20	C 20	0

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. 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. 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: Rhodopsin kinase GRK1

Chain 1-G:

- Molecule 1: Rhodopsin kinase GRK1

Chain 2-G:

- Molecule 1: Rhodopsin kinase GRK1

Chain 3-G:

• Molecule 1: Rhodopsin kinase GRK1

Chain 4-G: 60%   36%

• Molecule 1: Rhodopsin kinase GRK1

Chain 5-G: 62%   36%

• Molecule 1: Rhodopsin kinase GRK1

Chain 6-G: 61%   36%

GLY ALA GLY ASP GLY LEU PHE GLN PRO LEU LEU ARG ALA VAL LEU ALA HIS LEU GLY GLN ALA PRO PHE GLN GLU PHE LEU ASP SER LEU TYR PHE LEU ARG PHE LEU GLN TRP LYS TRP LEU GLU ALA GLN PRO M182 D185 G196 K211 M264 D280 Q287 D332

E338 L339 K340 K415 A478 K479 N480 K497 S508 GLY THR CYS PRO ILE PRO TRP GLN GLU GLU MET ILE GLU THR GLY VAL PHE GLY ASP LEU ASN VAL TRP ARG PRO ASP GLY VAL ASP HIS HIS HIS HIS HIS HIS

- Molecule 2: Rhodopsin

Chain 1-R: 90%   7%

M1 P7 N8 K16 Y29 K66 L72 F91 E113 N145 W161 Q184 G324 LYS ASN PRO LEU GLY ASP ASP GLU ALA SER THR THR VAL SER LYS THR GLU THR SER GLN VAL ALA PRO ALA

- Molecule 2: Rhodopsin

Chain 2-R: 91%   7%

M1 K16 L72 F91 W161 I189 D190 Y191 P285 G324 LYS ASN PRO LEU GLY ASP ASP GLU ALA SER THR THR VAL SER LYS THR GLU THR SER GLN VAL ALA PRO ALA

- Molecule 2: Rhodopsin

Chain 3-R: 90%   7%

M1 K16 A26 V63 L72 F91 N145 W161 Q184 Y191 Y192 T193 P285 T289 G324 LYS ASN PRO LEU GLY ASP ASP GLU ALA SER THR THR VAL SER LYS THR GLU THR SER GLN VAL ALA PRO ALA

- Molecule 2: Rhodopsin

Chain 4-R: 90%   7%

M1 P7 N8 K16 P23 F91 N145 F146 R147 W161 Q184 P194 G324 LYS ASN PRO LEU GLY ASP ASP GLU ALA SER THR THR VAL SER LYS THR GLU THR SER GLN VAL ALA PRO ALA

- Molecule 2: Rhodopsin

Chain 5-R: 88%   7%

M1 N2 K16 R21 L31 M44 F45 L46 L47 T70 P71 L72 F91 K141 W161 H195 N200 E247 T289 M317 G324 LYS ASN PRO LEU GLY ASP ASP GLU ALA SER THR THR VAL SER LYS THR GLU THR SER GLN VAL ALA PRO ALA

- Molecule 2: Rhodopsin

Chain 6-R: 88%   5%   7%

M1 N8 K16 Y29 Y30 L31 V63 K66 Y74 F91 E113 W161 Q184 I189 P194 H195 E196 E197 E247 P285 T289 G324 LYS ASN PRO LEU GLY ASP ASP GLU ALA SER THR THR VAL SER LYS THR GLU THR SER GLN VAL ALA

PRO ALA

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	132721	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	54	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.294	Depositor
Minimum map value	-0.173	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.006	Depositor
Recommended contour level	0.059	Depositor
Map size (Å)	276.48, 276.48, 276.48	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.08, 1.08, 1.08	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	1-G	0.92	0/2802	1.00	5/3769 (0.1%)
1	2-G	0.92	0/2803	0.99	5/3771 (0.1%)
1	3-G	0.92	0/2803	1.00	6/3771 (0.2%)
1	4-G	0.92	0/2803	1.00	6/3771 (0.2%)
1	5-G	0.92	0/2803	0.99	5/3771 (0.1%)
1	6-G	0.92	0/2803	0.99	1/3771 (0.0%)
2	1-R	0.87	0/2657	0.89	1/3621 (0.0%)
2	2-R	0.87	0/2657	0.90	2/3621 (0.1%)
2	3-R	0.87	0/2657	0.90	1/3621 (0.0%)
2	4-R	0.87	0/2657	0.91	2/3621 (0.1%)
2	5-R	0.87	0/2657	0.91	2/3621 (0.1%)
2	6-R	0.87	0/2657	0.93	4/3621 (0.1%)
All	All	0.90	0/32759	0.95	40/44350 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	1-G	0	1
1	2-G	0	1
1	3-G	0	1
1	4-G	0	1
1	5-G	0	1
1	6-G	0	1
All	All	0	6

There are no bond length outliers.

All (40) bond angle outliers are listed below:

W O R L D W I D E
wwPDB
PROTEIN DATA BANK

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	2-G	312	TYR	CB-CG-CD2	-7.55	116.47	121.00
1	1-G	312	TYR	CB-CG-CD2	-7.14	116.71	121.00
1	3-G	202	PHE	CB-CG-CD1	7.06	125.74	120.80
1	3-G	312	TYR	CB-CG-CD2	-6.97	116.82	121.00
1	2-G	312	TYR	CB-CG-CD1	6.91	125.15	121.00
1	1-G	312	TYR	CB-CG-CD1	6.88	125.13	121.00
1	5-G	202	PHE	CB-CG-CD1	6.82	125.57	120.80
1	3-G	202	PHE	CB-CG-CD2	-6.76	116.07	120.80
1	1-G	202	PHE	CB-CG-CD1	6.75	125.52	120.80
1	5-G	202	PHE	CB-CG-CD2	-6.65	116.14	120.80
1	1-G	202	PHE	CB-CG-CD2	-6.25	116.42	120.80
1	5-G	312	TYR	CB-CG-CD2	-6.21	117.27	121.00
2	6-R	91	PHE	CB-CG-CD1	6.20	125.14	120.80
1	3-G	312	TYR	CB-CG-CD1	6.09	124.66	121.00
1	4-G	202	PHE	CB-CG-CD1	6.01	125.01	120.80
2	6-R	74	TYR	CB-CG-CD2	-5.97	117.42	121.00
2	4-R	91	PHE	CB-CG-CD1	5.96	124.97	120.80
2	5-R	91	PHE	CB-CG-CD1	5.82	124.87	120.80
1	4-G	312	TYR	CB-CG-CD2	-5.78	117.53	121.00
2	2-R	91	PHE	CB-CG-CD1	5.78	124.85	120.80
1	4-G	312	TYR	CB-CG-CD1	5.70	124.42	121.00
2	6-R	74	TYR	CB-CG-CD1	5.69	124.41	121.00
1	4-G	202	PHE	CB-CG-CD2	-5.68	116.82	120.80
1	5-G	312	TYR	CB-CG-CD1	5.66	124.39	121.00
1	2-G	202	PHE	CB-CG-CD1	5.60	124.72	120.80
2	6-R	91	PHE	CB-CG-CD2	-5.52	116.94	120.80
2	1-R	91	PHE	CB-CG-CD1	5.49	124.64	120.80
2	3-R	91	PHE	CB-CG-CD1	5.42	124.59	120.80
2	4-R	91	PHE	CB-CG-CD2	-5.39	117.03	120.80
1	4-G	478	ALA	N-CA-CB	5.38	117.63	110.10
2	5-R	91	PHE	CB-CG-CD2	-5.34	117.06	120.80
1	2-G	478	ALA	N-CA-CB	5.33	117.56	110.10
1	3-G	486	ALA	N-CA-CB	5.32	117.55	110.10
1	5-G	195	ARG	N-CA-C	-5.23	96.88	111.00
1	2-G	202	PHE	CB-CG-CD2	-5.22	117.14	120.80
1	4-G	195	ARG	N-CA-C	-5.22	96.91	111.00
1	3-G	478	ALA	N-CA-CB	5.14	117.30	110.10
1	1-G	195	ARG	N-CA-C	-5.14	97.13	111.00
2	2-R	91	PHE	CB-CG-CD2	-5.12	117.22	120.80
1	6-G	478	ALA	N-CA-CB	5.07	117.20	110.10

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	1-G	182	MET	Peptide
1	2-G	182	MET	Peptide
1	3-G	182	MET	Peptide
1	4-G	182	MET	Peptide
1	5-G	182	MET	Peptide
1	6-G	182	MET	Peptide

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	1-G	2745	0	2726	0	0
1	2-G	2746	0	2727	1	0
1	3-G	2746	0	2727	0	0
1	4-G	2746	0	2727	1	0
1	5-G	2746	0	2727	1	0
1	6-G	2746	0	2727	0	0
2	1-R	2575	0	2550	1	0
2	2-R	2575	0	2550	2	0
2	3-R	2575	0	2550	2	0
2	4-R	2575	0	2550	1	0
2	5-R	2575	0	2550	1	0
2	6-R	2575	0	2550	2	0
3	1-G	22	0	15	0	0
3	2-G	22	0	15	0	0
3	3-G	22	0	15	0	0
3	4-G	22	0	15	0	0
3	5-G	22	0	15	0	0
3	6-G	22	0	15	0	0
4	1-R	20	0	27	2	0
4	2-R	20	0	27	3	0
4	3-R	20	0	27	3	0
4	4-R	20	0	27	1	0
4	5-R	20	0	27	2	0
4	6-R	20	0	27	2	0
All	All	32177	0	31913	22	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 0.

All (22) 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)
4:R:401:RET:H181	4:R:401:RET:C8	2.35	0.56
4:R:401:RET:H181	4:R:401:RET:C8	2.36	0.55
4:R:401:RET:H181	4:R:401:RET:C8	2.35	0.55
4:R:401:RET:H181	4:R:401:RET:C8	2.37	0.55
4:R:401:RET:H181	4:R:401:RET:C8	2.36	0.54
4:R:401:RET:H181	4:R:401:RET:H8	1.91	0.53
4:R:401:RET:H181	4:R:401:RET:H8	1.93	0.51
2:R:195:HIS:H	2:R:200:ASN:HB2	1.78	0.48
4:R:401:RET:H181	4:R:401:RET:H8	1.95	0.48
1:G:185:ASP:H	2:R:147:ARG:HB3	1.79	0.48
4:R:401:RET:H181	4:R:401:RET:C8	2.42	0.48
4:R:401:RET:H181	4:R:401:RET:H8	1.97	0.47
1:G:474:ARG:HA	1:G:474:ARG:HE	1.80	0.47
2:R:191:TYR:CD2	4:R:401:RET:H182	2.50	0.46
2:R:66:LYS:H	2:R:66:LYS:CD	2.31	0.44
2:R:191:TYR:CD2	4:R:401:RET:H182	2.54	0.42
1:G:275:HIS:CE1	1:G:322:LEU:HD13	2.56	0.41
2:R:72:LEU:H	2:R:72:LEU:HD23	1.85	0.41
4:R:401:RET:H181	4:R:401:RET:H8	2.01	0.41
2:R:66:LYS:H	2:R:66:LYS:HD2	1.85	0.40
2:R:72:LEU:HD23	2:R:72:LEU:H	1.86	0.40
2:R:195:HIS:CE1	2:R:197:GLU:HB2	2.57	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	1-G	342/543 (63%)	311 (91%)	24 (7%)	7 (2%)	6	31
1	2-G	342/543 (63%)	316 (92%)	19 (6%)	7 (2%)	6	31

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles		
1	3-G	342/543 (63%)	314 (92%)	21 (6%)	7 (2%)	6	31	
1	4-G	342/543 (63%)	314 (92%)	18 (5%)	10 (3%)	3	23	
1	5-G	342/543 (63%)	314 (92%)	23 (7%)	5 (2%)	8	40	
1	6-G	342/543 (63%)	316 (92%)	19 (6%)	7 (2%)	6	31	
2	1-R	322/348 (92%)	299 (93%)	18 (6%)	5 (2%)	8	38	
2	2-R	322/348 (92%)	300 (93%)	20 (6%)	2 (1%)	22	61	
2	3-R	322/348 (92%)	298 (92%)	18 (6%)	6 (2%)	6	32	
2	4-R	322/348 (92%)	298 (92%)	17 (5%)	7 (2%)	5	29	
2	5-R	322/348 (92%)	299 (93%)	18 (6%)	5 (2%)	8	38	
2	6-R	322/348 (92%)	298 (92%)	18 (6%)	6 (2%)	6	32	
All	All	3984/5346 (74%)	3677 (92%)	233 (6%)	74 (2%)	9	32	

All (74) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1-G	315	LEU
1	2-G	280	ASP
1	2-G	478	ALA
1	3-G	486	ALA
2	3-R	145	ASN
1	4-G	280	ASP
1	4-G	315	LEU
1	4-G	440	ASP
1	4-G	478	ALA
1	5-G	280	ASP
1	6-G	415	LYS
1	1-G	280	ASP
1	1-G	478	ALA
1	1-G	484	VAL
2	2-R	16	LYS
1	3-G	478	ALA
2	3-R	16	LYS
1	4-G	480	ASN
1	5-G	287	GLN
1	5-G	395	LYS
1	5-G	482	GLN
2	5-R	16	LYS
2	5-R	21	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	6-G	185	ASP
1	6-G	280	ASP
1	6-G	478	ALA
2	1-R	16	LYS
2	1-R	145	ASN
1	2-G	184	GLU
1	2-G	334	GLY
1	2-G	482	GLN
1	3-G	185	ASP
1	3-G	287	GLN
1	4-G	342	GLY
2	4-R	16	LYS
2	5-R	2	ASN
2	6-R	16	LYS
2	6-R	194	PRO
2	1-R	29	TYR
2	1-R	184	GLN
1	3-G	280	ASP
2	3-R	184	GLN
2	3-R	191	TYR
1	4-G	186	TRP
2	4-R	8	ASN
2	4-R	184	GLN
1	5-G	196	GLY
2	6-R	29	TYR
2	6-R	184	GLN
1	1-G	186	TRP
1	2-G	186	TRP
2	2-R	285	PRO
1	3-G	186	TRP
1	6-G	196	GLY
1	6-G	332	ASP
2	6-R	8	ASN
1	2-G	196	GLY
2	3-R	285	PRO
1	4-G	287	GLN
2	4-R	145	ASN
2	4-R	194	PRO
2	5-R	31	LEU
1	6-G	480	ASN
1	1-G	196	GLY
2	1-R	7	PRO

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	3-G	196	GLY
2	4-R	7	PRO
2	4-R	23	PRO
2	3-R	26	ALA
1	4-G	183	GLY
2	5-R	141	LYS
2	6-R	285	PRO
1	1-G	266	ILE
1	4-G	196	GLY

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	1-G	285/449 (64%)	275 (96%)	10 (4%)	31	51
1	2-G	286/449 (64%)	280 (98%)	6 (2%)	48	66
1	3-G	286/449 (64%)	280 (98%)	6 (2%)	48	66
1	4-G	286/449 (64%)	279 (98%)	7 (2%)	44	62
1	5-G	286/449 (64%)	283 (99%)	3 (1%)	73	82
1	6-G	286/449 (64%)	280 (98%)	6 (2%)	48	66
2	1-R	276/296 (93%)	272 (99%)	4 (1%)	62	75
2	2-R	276/296 (93%)	272 (99%)	4 (1%)	62	75
2	3-R	276/296 (93%)	270 (98%)	6 (2%)	47	65
2	4-R	276/296 (93%)	274 (99%)	2 (1%)	81	87
2	5-R	276/296 (93%)	265 (96%)	11 (4%)	27	47
2	6-R	276/296 (93%)	268 (97%)	8 (3%)	37	56
All	All	3371/4470 (75%)	3298 (98%)	73 (2%)	47	65

All (73) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	1-G	191	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	1-G	202	PHE
1	1-G	245	ARG
1	1-G	264	MET
1	1-G	266	ILE
1	1-G	312	TYR
1	1-G	347	LYS
1	1-G	390	ARG
1	1-G	451	LEU
1	1-G	482	GLN
2	1-R	8	ASN
2	1-R	72	LEU
2	1-R	113	GLU
2	1-R	161	TRP
1	2-G	202	PHE
1	2-G	264	MET
1	2-G	306	HIS
1	2-G	390	ARG
1	2-G	457	TRP
1	2-G	482	GLN
2	2-R	16	LYS
2	2-R	72	LEU
2	2-R	161	TRP
2	2-R	189	ILE
1	3-G	202	PHE
1	3-G	230	GLN
1	3-G	236	LYS
1	3-G	264	MET
1	3-G	287	GLN
1	3-G	390	ARG
2	3-R	63	VAL
2	3-R	72	LEU
2	3-R	145	ASN
2	3-R	161	TRP
2	3-R	193	THR
2	3-R	289	THR
1	4-G	7	GLU
1	4-G	184	GLU
1	4-G	186	TRP
1	4-G	202	PHE
1	4-G	264	MET
1	4-G	390	ARG
1	4-G	451	LEU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	4-R	16	LYS
2	4-R	161	TRP
1	5-G	202	PHE
1	5-G	264	MET
1	5-G	474	ARG
2	5-R	21	ARG
2	5-R	44	MET
2	5-R	45	PHE
2	5-R	47	LEU
2	5-R	70	THR
2	5-R	72	LEU
2	5-R	141	LYS
2	5-R	161	TRP
2	5-R	247	GLU
2	5-R	289	THR
2	5-R	317	MET
1	6-G	211	LYS
1	6-G	264	MET
1	6-G	287	GLN
1	6-G	338	GLU
1	6-G	340	LYS
1	6-G	497	LYS
2	6-R	8	ASN
2	6-R	31	LEU
2	6-R	63	VAL
2	6-R	113	GLU
2	6-R	161	TRP
2	6-R	189	ILE
2	6-R	247	GLU
2	6-R	289	THR

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

Mol	Chain	Res	Type
2	1-R	100	HIS
1	2-G	304	HIS
1	2-G	307	GLN
2	2-R	100	HIS
2	3-R	100	HIS
2	3-R	200	ASN
1	4-G	275	HIS
2	4-R	100	HIS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	4-R	195	HIS
1	5-G	275	HIS
2	5-R	15	ASN
1	6-G	297	GLN
2	6-R	64	GLN
2	6-R	73	ASN
2	6-R	195	HIS
2	6-R	237	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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

12 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	SGV	6-G	601	-	22,24,24	1.43	4 (18%)	22,36,36	1.16	2 (9%)
3	SGV	3-G	601	-	22,24,24	1.43	4 (18%)	22,36,36	1.08	2 (9%)
4	RET	4-R	401	-	20,20,21	2.66	3 (15%)	27,27,28	0.83	0
4	RET	2-R	401	-	20,20,21	2.66	3 (15%)	27,27,28	0.86	1 (3%)
3	SGV	1-G	601	-	22,24,24	1.42	4 (18%)	22,36,36	1.22	2 (9%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
4	RET	1-R	401	-	20,20,21	2.65	3 (15%)	27,27,28	0.86	0
3	SGV	4-G	601	-	22,24,24	1.42	4 (18%)	22,36,36	1.18	2 (9%)
4	RET	3-R	401	-	20,20,21	2.62	3 (15%)	27,27,28	0.83	0
4	RET	6-R	401	-	20,20,21	2.64	3 (15%)	27,27,28	0.92	0
4	RET	5-R	401	-	20,20,21	2.62	3 (15%)	27,27,28	0.92	0
3	SGV	5-G	601	-	22,24,24	1.41	4 (18%)	22,36,36	1.20	2 (9%)
3	SGV	2-G	601	-	22,24,24	1.42	4 (18%)	22,36,36	1.16	1 (4%)

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	SGV	6-G	601	-	-	1/3/26/26	0/3/3/3
3	SGV	3-G	601	-	-	1/3/26/26	0/3/3/3
4	RET	4-R	401	-	-	0/13/30/31	0/1/1/1
4	RET	2-R	401	-	-	0/13/30/31	0/1/1/1
3	SGV	1-G	601	-	-	0/3/26/26	0/3/3/3
4	RET	1-R	401	-	-	0/13/30/31	0/1/1/1
3	SGV	4-G	601	-	-	0/3/26/26	0/3/3/3
4	RET	3-R	401	-	-	0/13/30/31	0/1/1/1
4	RET	6-R	401	-	-	0/13/30/31	0/1/1/1
4	RET	5-R	401	-	-	0/13/30/31	0/1/1/1
3	SGV	5-G	601	-	-	0/3/26/26	0/3/3/3
3	SGV	2-G	601	-	-	0/3/26/26	0/3/3/3

All (42) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	2-R	401	RET	C14-C13	10.52	1.40	1.33
4	4-R	401	RET	C14-C13	10.48	1.40	1.33
4	6-R	401	RET	C14-C13	10.43	1.40	1.33
4	1-R	401	RET	C14-C13	10.32	1.40	1.33
4	3-R	401	RET	C14-C13	10.28	1.40	1.33
4	5-R	401	RET	C14-C13	10.25	1.40	1.33
3	3-G	601	SGV	C7-C10	-3.36	1.45	1.50
3	6-G	601	SGV	C7-C10	-3.33	1.45	1.50
4	1-R	401	RET	C15-C14	-3.32	1.37	1.49
4	4-R	401	RET	C15-C14	-3.27	1.37	1.49
4	6-R	401	RET	C15-C14	-3.27	1.37	1.49

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	5-R	401	RET	C15-C14	-3.26	1.37	1.49
4	3-R	401	RET	C15-C14	-3.26	1.37	1.49
4	2-R	401	RET	C15-C14	-3.24	1.37	1.49
3	2-G	601	SGV	C7-C10	-3.15	1.46	1.50
3	4-G	601	SGV	C7-C10	-3.02	1.46	1.50
3	1-G	601	SGV	C7-C10	-3.01	1.46	1.50
3	5-G	601	SGV	C7-C10	-2.90	1.46	1.50
3	3-G	601	SGV	C10-N11	2.79	1.38	1.33
3	4-G	601	SGV	C10-N11	2.77	1.38	1.33
3	1-G	601	SGV	C10-N11	2.77	1.38	1.33
3	5-G	601	SGV	C10-N11	2.75	1.38	1.33
3	2-G	601	SGV	C10-N11	2.71	1.38	1.33
3	6-G	601	SGV	O4'-C1'	2.71	1.44	1.40
3	6-G	601	SGV	C10-N11	2.69	1.37	1.33
3	4-G	601	SGV	O4'-C1'	2.69	1.44	1.40
3	5-G	601	SGV	O4'-C1'	2.65	1.44	1.40
3	1-G	601	SGV	O4'-C1'	2.64	1.44	1.40
3	2-G	601	SGV	O4'-C1'	2.63	1.44	1.40
3	5-G	601	SGV	C2-N3	2.61	1.36	1.32
4	1-R	401	RET	C12-C13	-2.61	1.40	1.46
3	6-G	601	SGV	C2-N3	2.60	1.36	1.32
3	2-G	601	SGV	C2-N3	2.60	1.36	1.32
3	3-G	601	SGV	C2-N3	2.58	1.36	1.32
3	4-G	601	SGV	C2-N3	2.56	1.36	1.32
4	4-R	401	RET	C12-C13	-2.56	1.40	1.46
4	3-R	401	RET	C12-C13	-2.55	1.40	1.46
3	1-G	601	SGV	C2-N3	2.53	1.36	1.32
3	3-G	601	SGV	O4'-C1'	2.52	1.44	1.40
4	2-R	401	RET	C12-C13	-2.51	1.40	1.46
4	5-R	401	RET	C12-C13	-2.49	1.40	1.46
4	6-R	401	RET	C12-C13	-2.47	1.40	1.46

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	1-G	601	SGV	C4'-O4'-C1'	-3.09	107.10	109.92
3	5-G	601	SGV	C4'-O4'-C1'	-2.90	107.27	109.92
3	4-G	601	SGV	C4'-O4'-C1'	-2.85	107.31	109.92
3	6-G	601	SGV	C4'-O4'-C1'	-2.81	107.35	109.92
3	3-G	601	SGV	C4'-O4'-C1'	-2.37	107.76	109.92
3	5-G	601	SGV	O12-C10-C7	2.31	122.95	120.23
3	4-G	601	SGV	O12-C10-C7	2.24	122.86	120.23

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	1-G	601	SGV	O12-C10-C7	2.17	122.78	120.23
4	2-R	401	RET	C18-C5-C6	-2.10	122.19	124.48
3	3-G	601	SGV	C7-C10-N11	-2.08	115.04	118.27
3	6-G	601	SGV	C7-C10-N11	-2.07	115.07	118.27
3	2-G	601	SGV	O12-C10-C7	2.04	122.64	120.23

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	3-G	601	SGV	O12-C10-C7-C8
3	6-G	601	SGV	O12-C10-C7-C8

There are no ring outliers.

6 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	4-R	401	RET	1	0
4	2-R	401	RET	3	0
4	1-R	401	RET	2	0
4	3-R	401	RET	3	0
4	6-R	401	RET	2	0
4	5-R	401	RET	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 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 SGV G 601

Bond lengths

Bond angles

Torsions

Rings

Ligand RET R 401

Bond lengths

Bond angles

Torsions

Rings
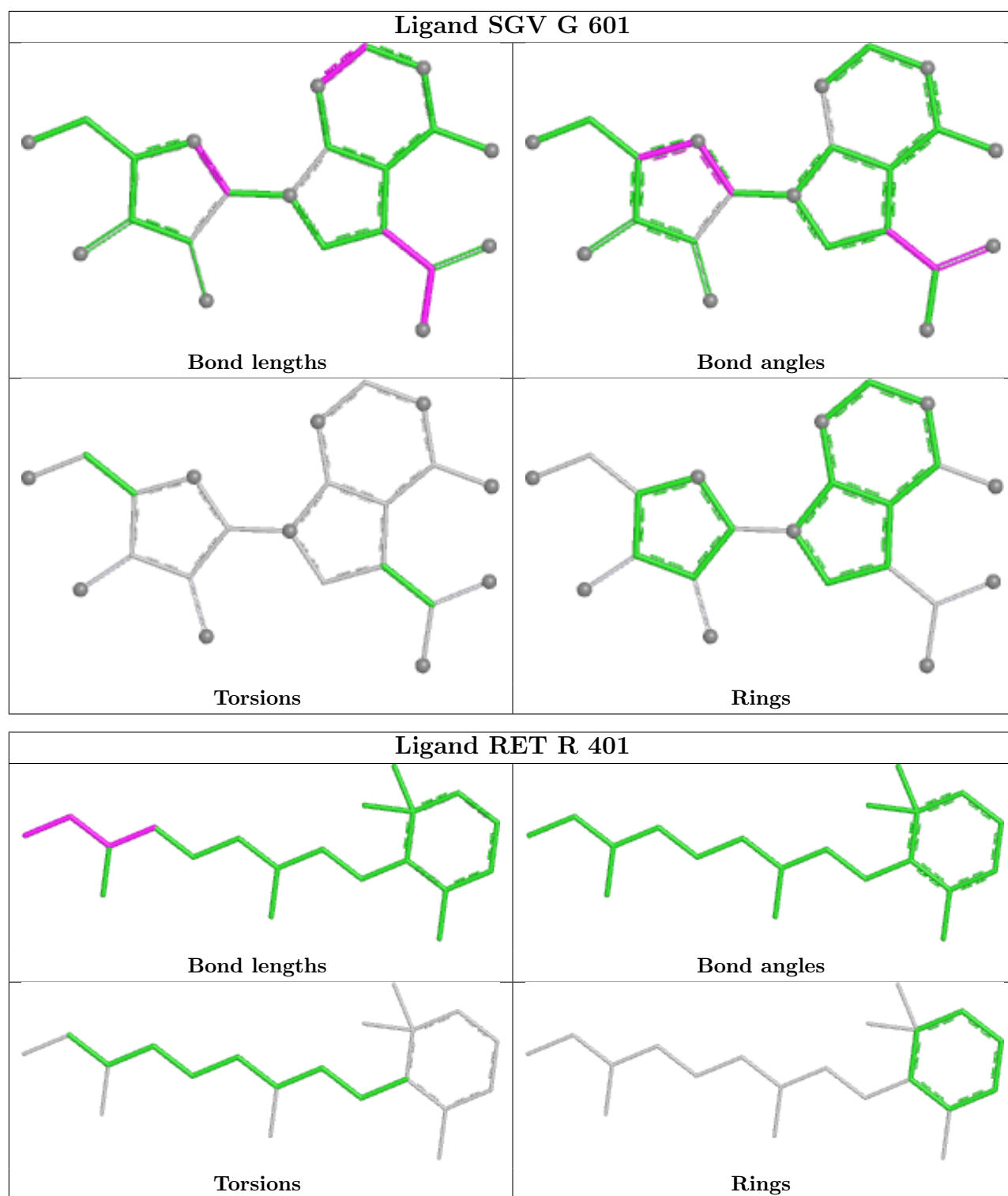
5.7 Other polymers ⓘ

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-23977. 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 ⓘ

6.1.1　Primary map

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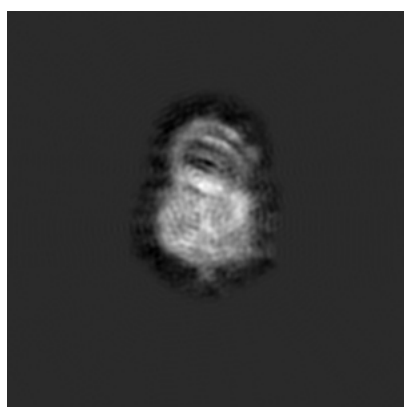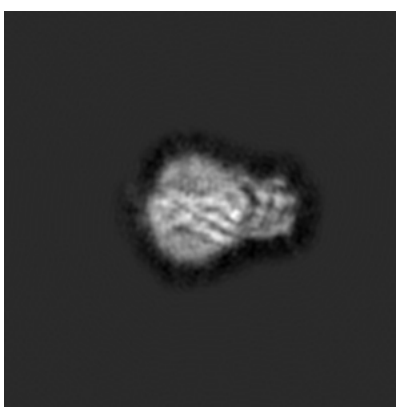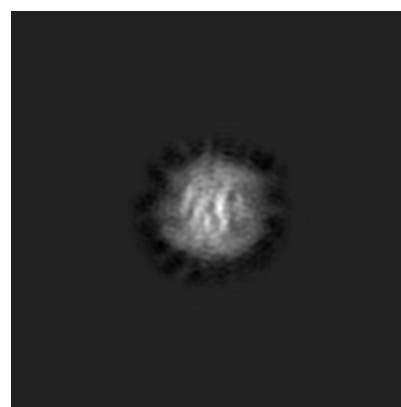
The images above show the map projected in three orthogonal directions.

6.2　Central slices ⓘ
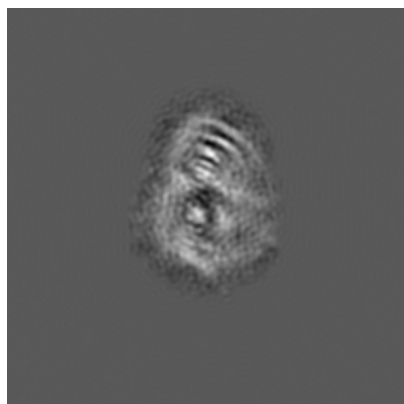
6.2.1　Primary map
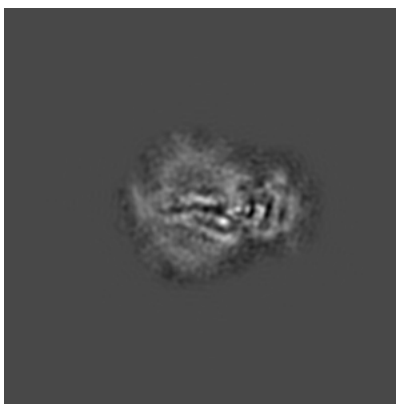
X Index: 128	Y Index: 128	Z Index: 128
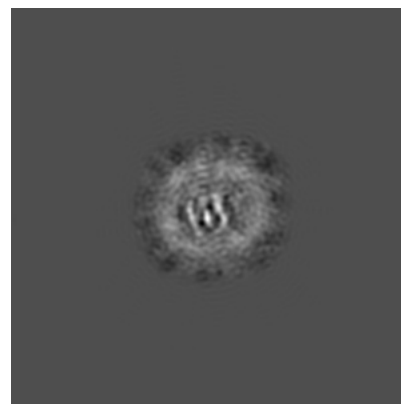
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices ⓘ
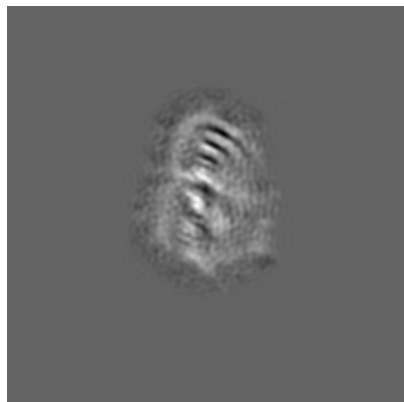
6.3.1 Primary map
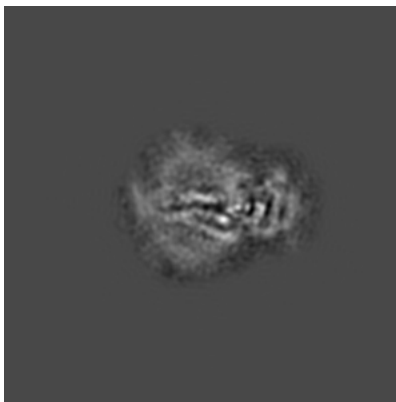
| X Index: 125 | Y Index: 128 | Z Index: 133 |
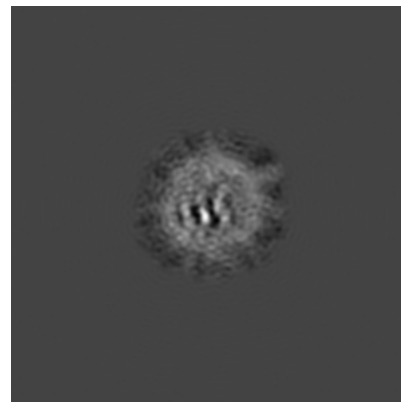
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map

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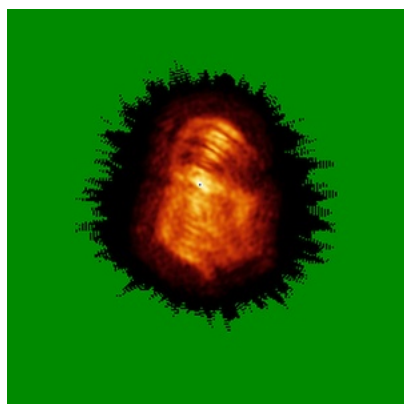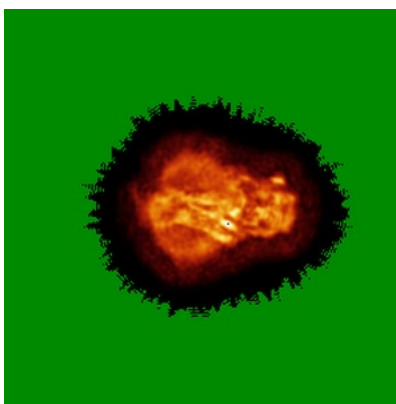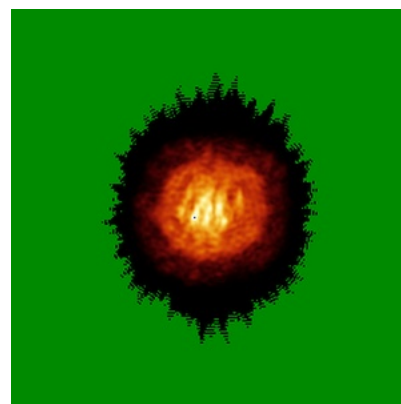
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5   Orthogonal surface views ⓘ

6.5.1   Primary map

X   Y   Z
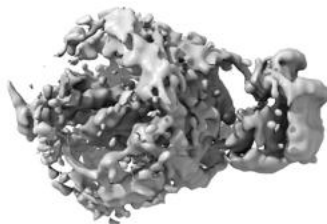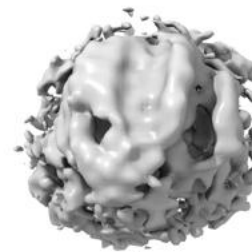
The images above show the 3D surface view of the map at the recommended contour level 0.059.
These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.6   Mask visualisation ⓘ

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

7 Map analysis (i)

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

7.1 Map-value distribution (i)
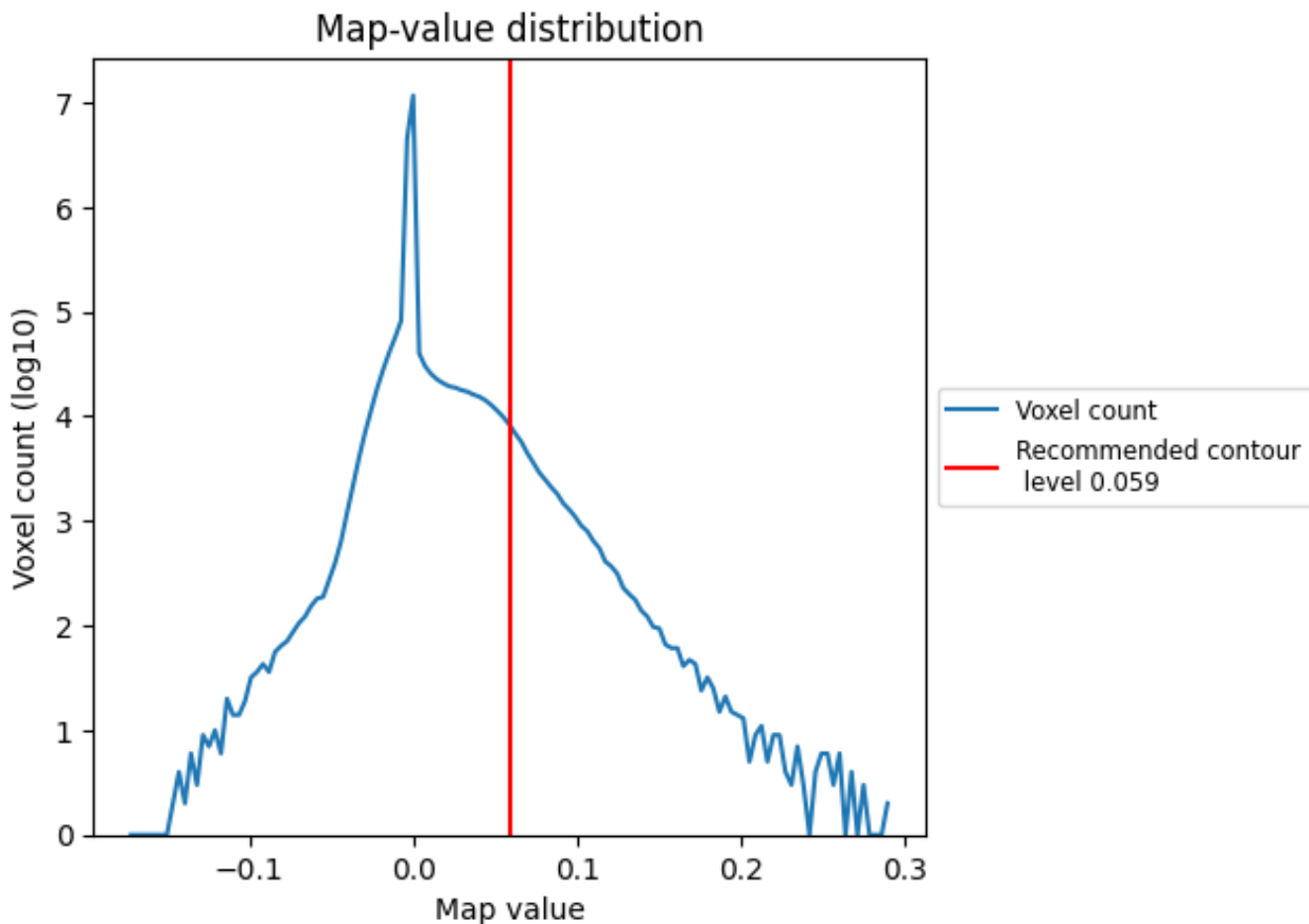
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate (i)
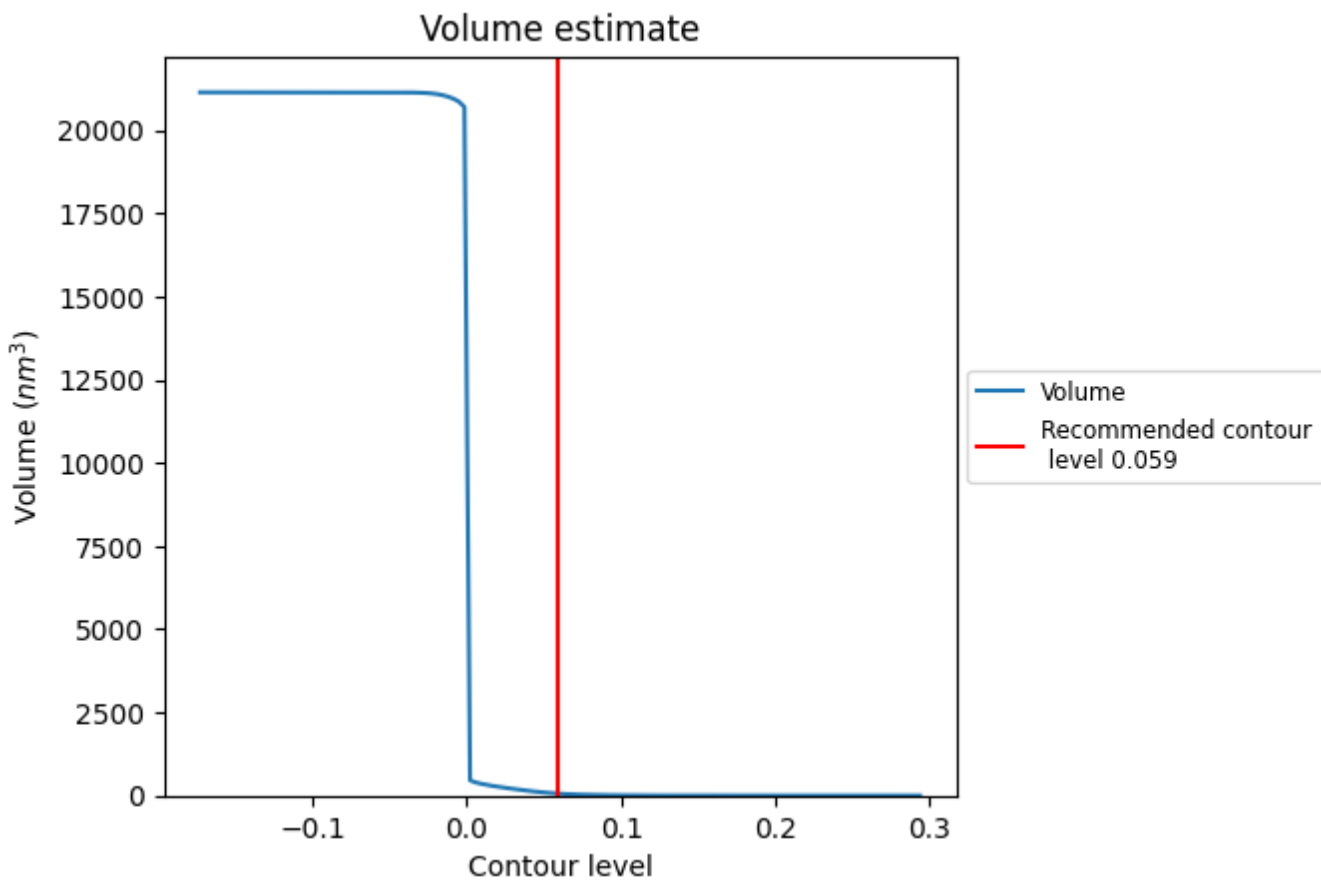
The volume at the recommended contour level is 59 nm^3; this corresponds to an approximate mass of 54 kDa.

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 ⓘ
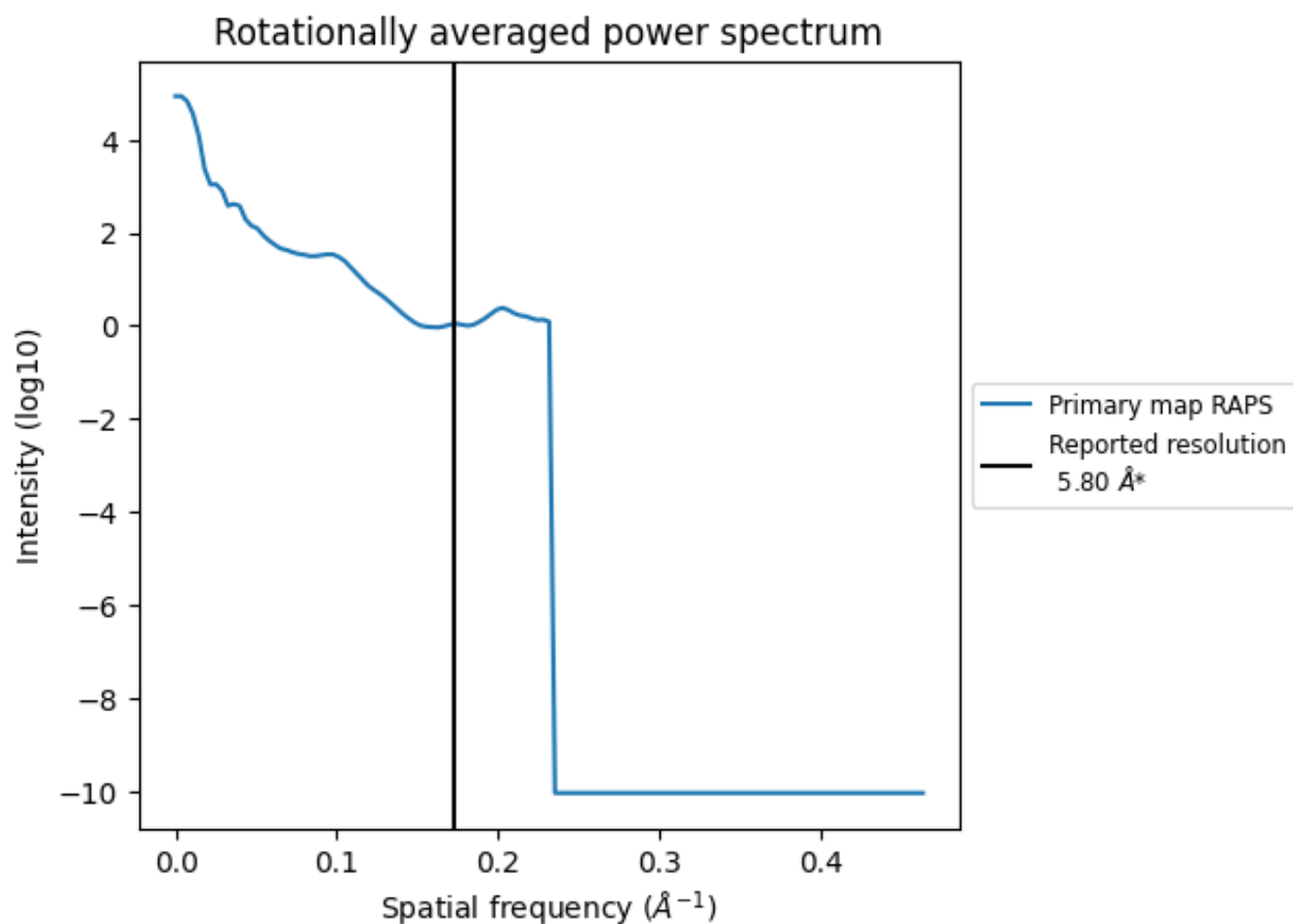
*Reported resolution corresponds to spatial frequency of 0.172 Å^{-1}

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 ⓘ
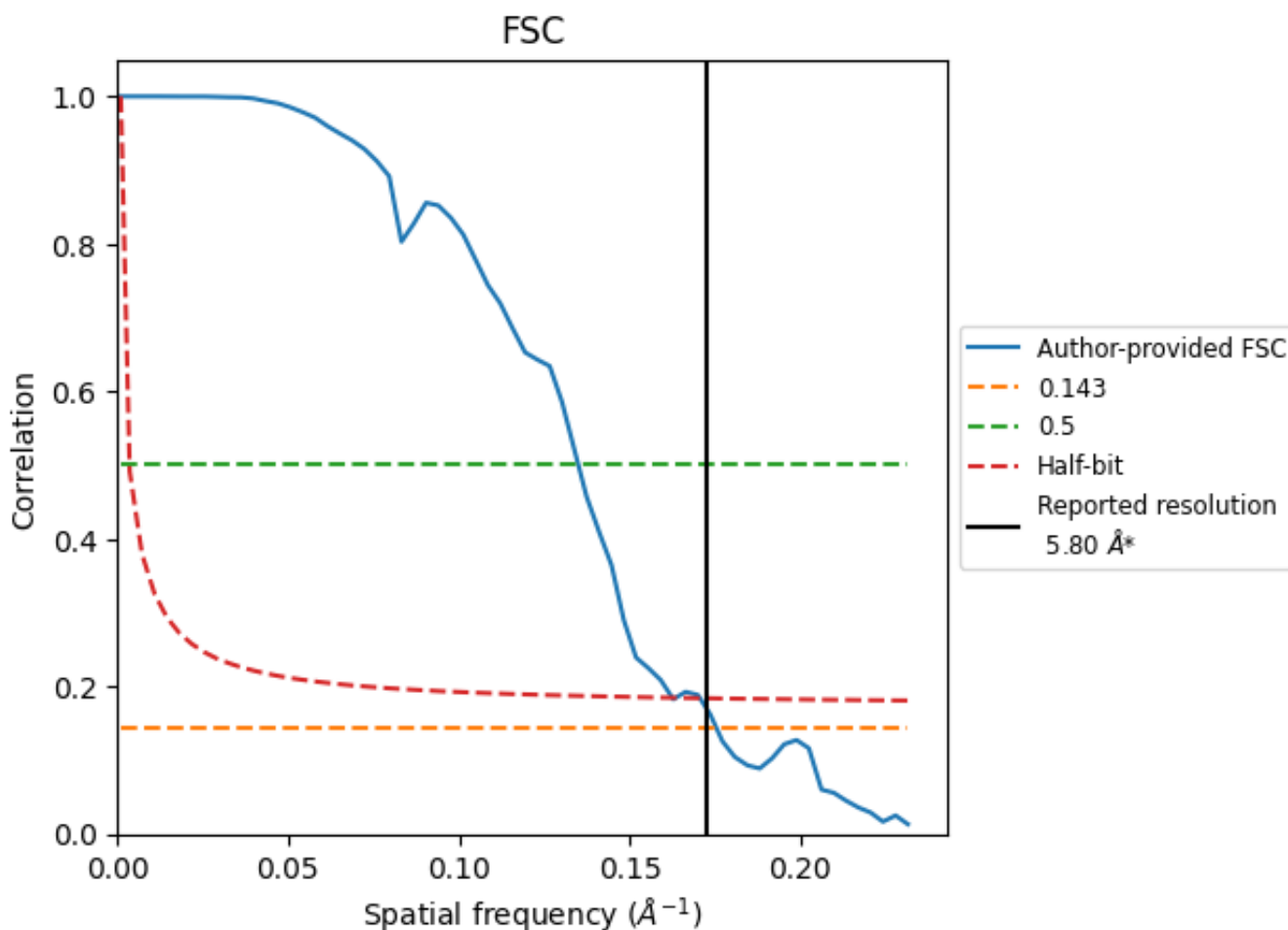
*Reported resolution corresponds to spatial frequency of 0.172 Å^{-1}

8.2 Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	5.80	-	-
Author-provided FSC curve	5.70	7.41	6.15
Unmasked-calculated*	-	-	-

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

9 Map-model fit ⓘ

This section was not generated.