



# wwPDB EM Validation Summary Report ⓘ

Oct 21, 2024 – 07:53 AM EDT

PDB ID : 9AVG  
EMDB ID : EMD-43901  
Title : Structure of human calcium-sensing receptor in complex with chimeric Gs (miniGis) protein in nanodiscs  
Authors : Zuo, H.; Park, J.; Frangaj, A.; Ye, J.; Lu, G.; Manning, J.J.; Asher, W.B.; Lu, Z.; Hu, G.; Wang, L.; Mendez, J.; Eng, E.; Zhang, Z.; Lin, X.; Grasucci, R.; Hendrickson, W.A.; Clarke, O.B.; Javitch, J.A.; Conigrave, A.D.; Fan, Q.R.  
Deposited on : 2024-03-02  
Resolution : 3.60 Å(reported)  
Based on initial models : 7P00, 7SIL

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

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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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

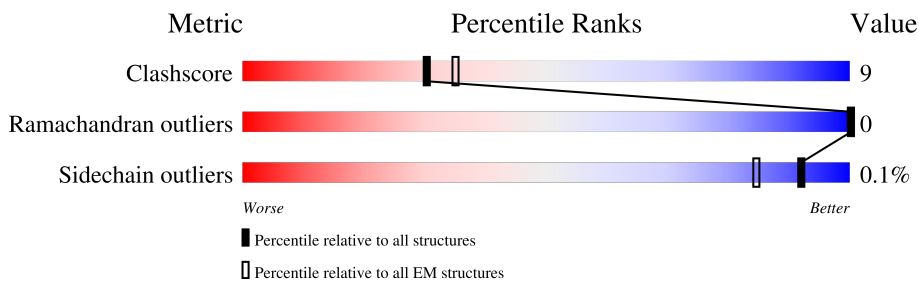
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.60 Å.

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





Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion  $< 40\%$ ). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	Q	911	
1	R	911	
2	A	246	
3	B	348	
4	G	71	
5	C	2	
5	D	2	

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Mol	Chain	Length	Quality of chain
5	E	2	 50% 50%
5	F	2	 50% 50%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
8	PO4	Q	1005	-	-	X	-
8	PO4	R	1004	-	-	X	-

## 2 Entry composition [i](#)

There are 12 unique types of molecules in this entry. The entry contains 17498 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 1 of Extracellular calcium-sensing receptor.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	Q	797	Total	C	N	O	S	0	0
			6280	4090	1024	1131	35		
1	R	796	Total	C	N	O	S	0	0
			6294	4103	1023	1133	35		

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Q	12	ASP	-	insertion	UNP P41180
Q	13	TYR	-	insertion	UNP P41180
Q	14	LYS	-	insertion	UNP P41180
Q	15	ASP	-	insertion	UNP P41180
Q	16	ASP	-	insertion	UNP P41180
Q	17	ASP	-	insertion	UNP P41180
Q	18	ASP	-	insertion	UNP P41180
Q	19	LYS	-	insertion	UNP P41180
R	12	ASP	-	insertion	UNP P41180
R	13	TYR	-	insertion	UNP P41180
R	14	LYS	-	insertion	UNP P41180
R	15	ASP	-	insertion	UNP P41180
R	16	ASP	-	insertion	UNP P41180
R	17	ASP	-	insertion	UNP P41180
R	18	ASP	-	insertion	UNP P41180
R	19	LYS	-	insertion	UNP P41180

- Molecule 2 is a protein called Chimeric mini guanine nucleotide-binding protein G(i)(s) sub-unit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	A	223	Total	C	N	O	S	0	0
			1738	1115	311	305	7		

There are 46 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	20	GLU	ASP	engineered mutation	UNP P63096
A	21	LYS	ARG	engineered mutation	UNP P63096
A	22	GLN	ASN	engineered mutation	UNP P63096
A	24	GLN	ARG	engineered mutation	UNP P63096
A	25	LYS	GLU	engineered mutation	UNP P63096
A	27	LYS	GLY	engineered mutation	UNP P63096
A	28	GLN	GLU	engineered mutation	UNP P63096
A	29	VAL	LYS	engineered mutation	UNP P63096
A	30	TYR	ALA	engineered mutation	UNP P63096
A	31	ARG	ALA	engineered mutation	UNP P63096
A	32	ALA	ARG	engineered mutation	UNP P63096
A	33	THR	GLU	engineered mutation	UNP P63096
A	34	HIS	VAL	engineered mutation	UNP P63096
A	35	ARG	LYS	engineered mutation	UNP P63096
A	42	ASP	GLY	engineered mutation	UNP P63096
A	43	ASN	GLU	engineered mutation	UNP P63096
A	54	ARG	-	linker	UNP P63096
A	55	ILE	-	linker	UNP P63096
A	56	LEU	-	linker	UNP P63096
A	57	HIS	-	linker	UNP P63096
A	58	GLY	-	linker	UNP P63096
A	59	GLY	-	linker	UNP P63096
A	60	SER	-	linker	UNP P63096
A	61	GLY	-	linker	UNP P63096
A	62	GLY	-	linker	UNP P63096
A	63	SER	-	linker	UNP P63096
A	64	GLY	-	linker	UNP P63096
A	65	GLY	-	linker	UNP P63096
A	66	THR	-	linker	UNP P63096
A	67	SER	-	linker	UNP P63096
A	68	GLY	-	linker	UNP P63096
A	111	ASP	ALA	engineered mutation	UNP A0A590UJY2
A	114	ASP	SER	engineered mutation	UNP A0A590UJY2
A	?	-	ASN	deletion	UNP A0A590UJY2
A	?	-	MET	deletion	UNP A0A590UJY2
A	?	-	VAL	deletion	UNP A0A590UJY2
A	?	-	ILE	deletion	UNP A0A590UJY2
A	?	-	ARG	deletion	UNP A0A590UJY2
A	?	-	GLU	deletion	UNP A0A590UJY2
A	?	-	ASP	deletion	UNP A0A590UJY2
A	?	-	ASN	deletion	UNP A0A590UJY2
A	?	-	GLN	deletion	UNP A0A590UJY2
A	?	-	THR	deletion	UNP A0A590UJY2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	124	ASP	LEU	engineered mutation	UNP A0A590UJY2
A	224	ALA	ILE	engineered mutation	UNP A0A590UJY2
A	227	ILE	VAL	engineered mutation	UNP A0A590UJY2

- Molecule 3 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		
3	B	337	2450	1528	439	467	16	0	0

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-7	MET	-	initiating methionine	UNP P62873
B	-6	ASP	-	expression tag	UNP P62873
B	-5	TYR	-	expression tag	UNP P62873
B	-4	LYS	-	expression tag	UNP P62873
B	-3	ASP	-	expression tag	UNP P62873
B	-2	ASP	-	expression tag	UNP P62873
B	-1	ASP	-	expression tag	UNP P62873
B	0	ASP	-	expression tag	UNP P62873
B	1	LYS	-	expression tag	UNP P62873

- Molecule 4 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		
4	G	55	378	240	67	71	0	0

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	C	2	28	16	2	10	0	0

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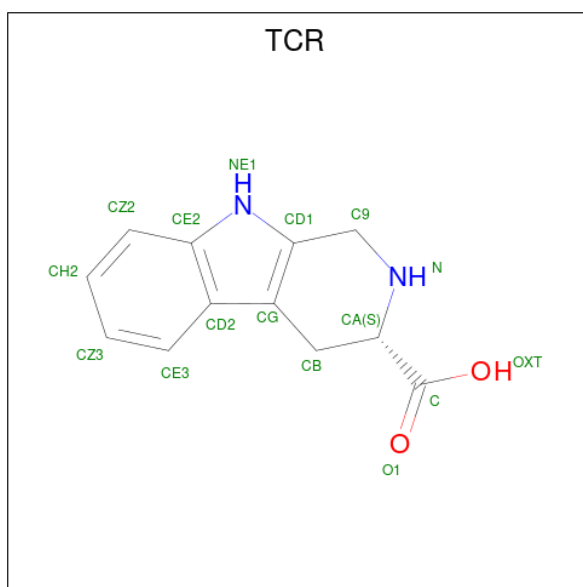
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	D	2	Total	C	N	O	0	0
			28	16	2	10		
5	E	2	Total	C	N	O	0	0
			28	16	2	10		
5	F	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ).



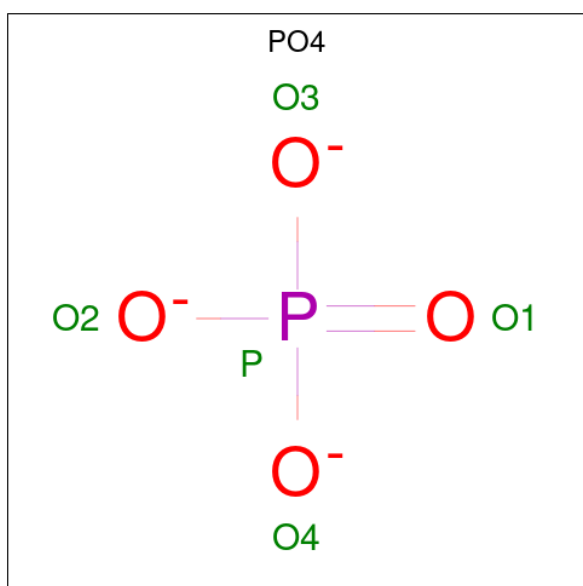
Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
6	Q	1	Total	C	N	O	0
			14	8	1	5	
6	Q	1	Total	C	N	O	0
			14	8	1	5	
6	Q	1	Total	C	N	O	0
			14	8	1	5	
6	R	1	Total	C	N	O	0
			14	8	1	5	
6	R	1	Total	C	N	O	0
			14	8	1	5	

- Molecule 7 is CYCLOMETHYLTRYPTOPHAN (three-letter code: TCR) (formula:  $C_{12}H_{12}N_2O_2$ ).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
7	Q	1	16	12	2	2	0
7	R	1	16	12	2	2	0

- Molecule 8 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



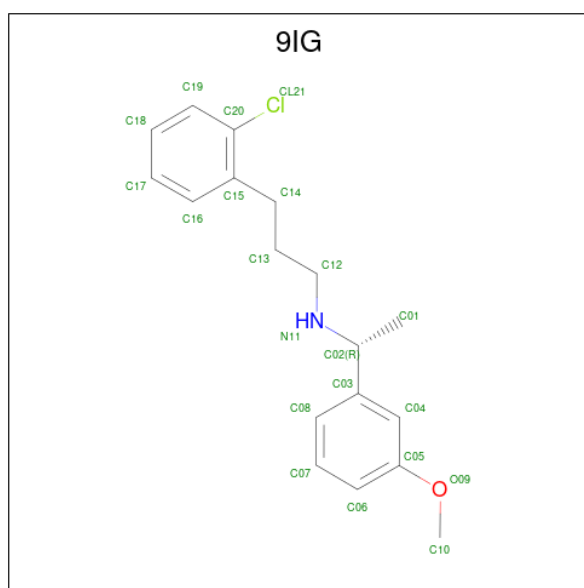
Mol	Chain	Residues	Atoms			AltConf
			Total	O	P	
8	Q	1	5	4	1	0
8	R	1	5	4	1	0



- Molecule 9 is CALCIUM ION (three-letter code: CA) (formula: Ca).

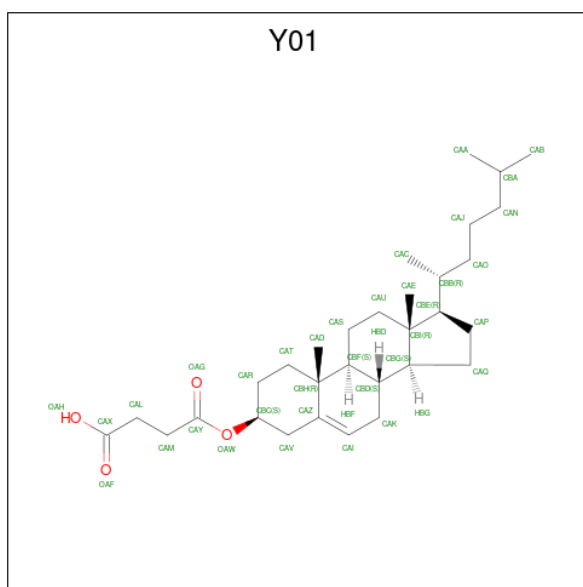
Mol	Chain	Residues	Atoms		AltConf
9	Q	3	Total	Ca	0
			3	3	
9	R	3	Total	Ca	0
			3	3	

- Molecule 10 is 3-(2-chlorophenyl)-N-[(1R)-1-(3-methoxyphenyl)ethyl]propan-1-amine (three-letter code: 9IG) (formula: C<sub>18</sub>H<sub>22</sub>ClNO).



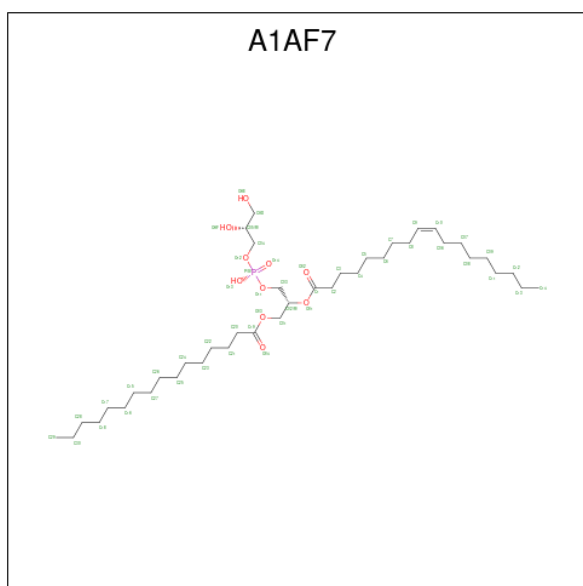
Mol	Chain	Residues	Atoms					AltConf
10	Q	1	Total	C	Cl	N	O	0
			21	18	1	1	1	
10	R	1	Total	C	Cl	N	O	0
			21	18	1	1	1	

- Molecule 11 is CHOLESTEROL HEMISUCCINATE (three-letter code: Y01) (formula: C<sub>31</sub>H<sub>50</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
11	Q	1	35	31	4	0

- Molecule 12 is (19R,22S,25R)-22,25,26-trihydroxy-16,22-dioxo-17,21,23-trioxa-22lambda a 5 -phosphahexacosan-19-yl (9Z)-octadec-9-enoate (three-letter code: A1AF7) (formula:  $C_{40}H_{77}O_{10}P$ ).

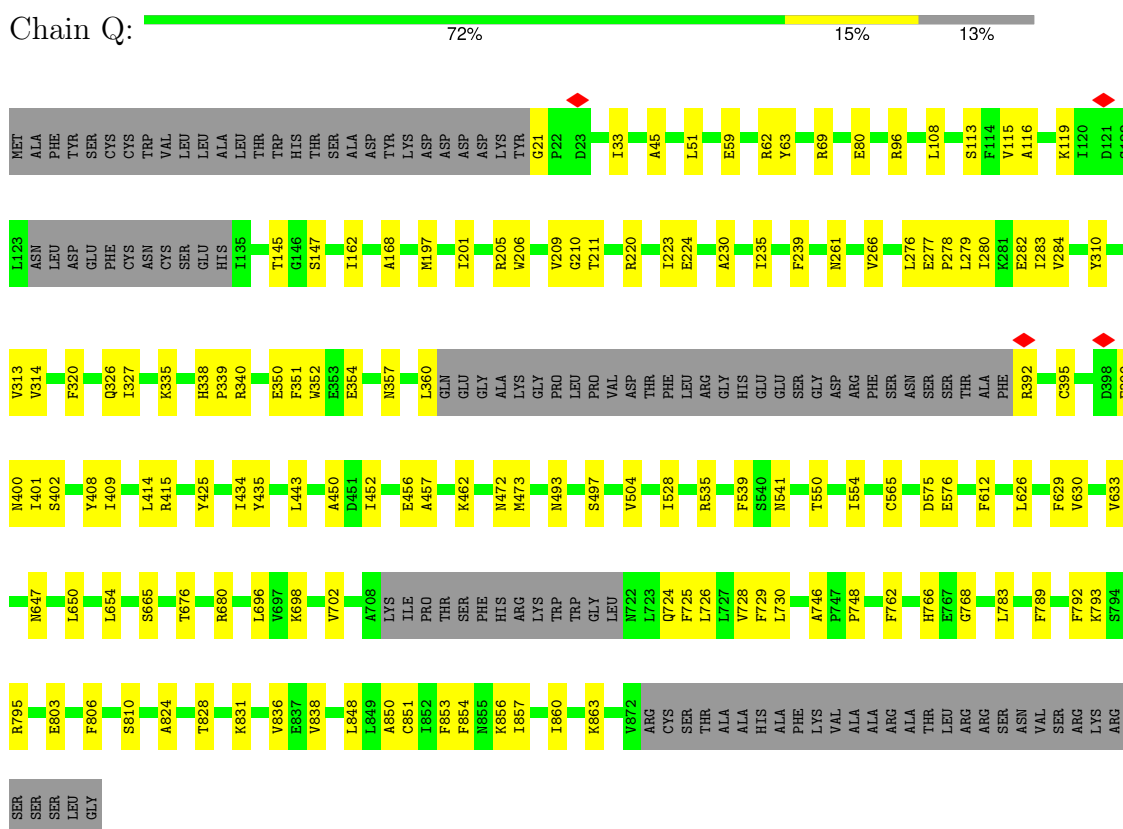


Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
12	R	1	51	40	10	1	0

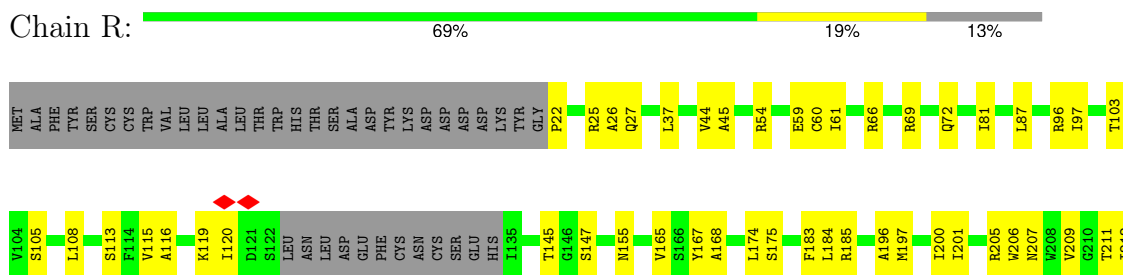
### 3 Residue-property plots [i](#)

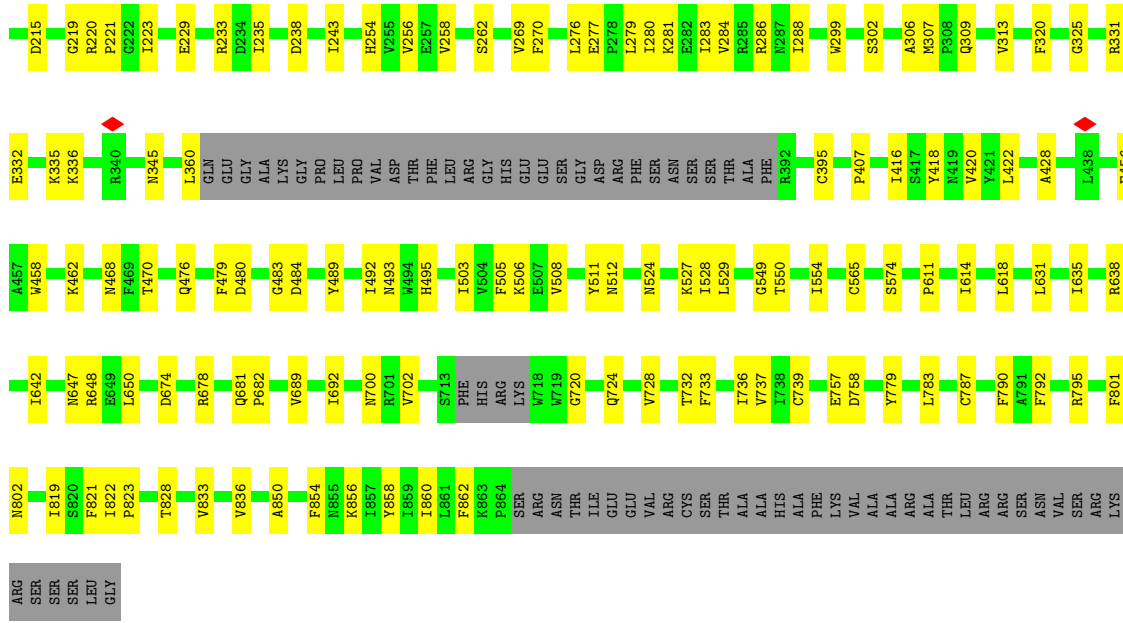
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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 1 of Extracellular calcium-sensing receptor

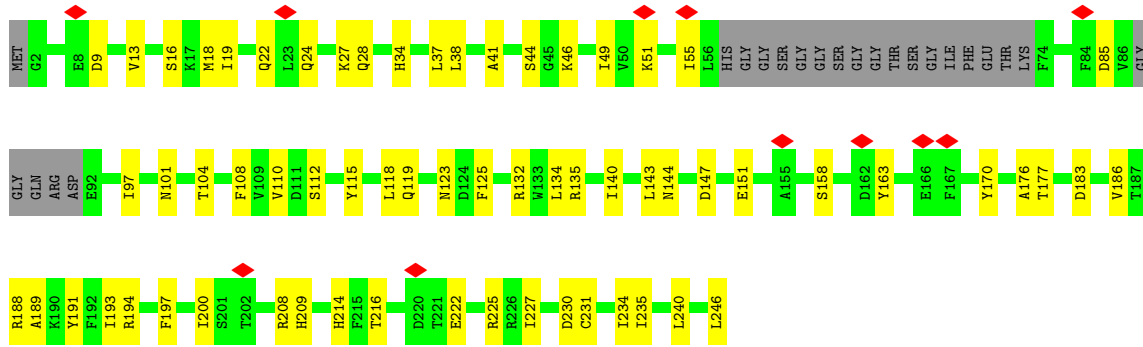


- Molecule 1: Isoform 1 of Extracellular calcium-sensing receptor

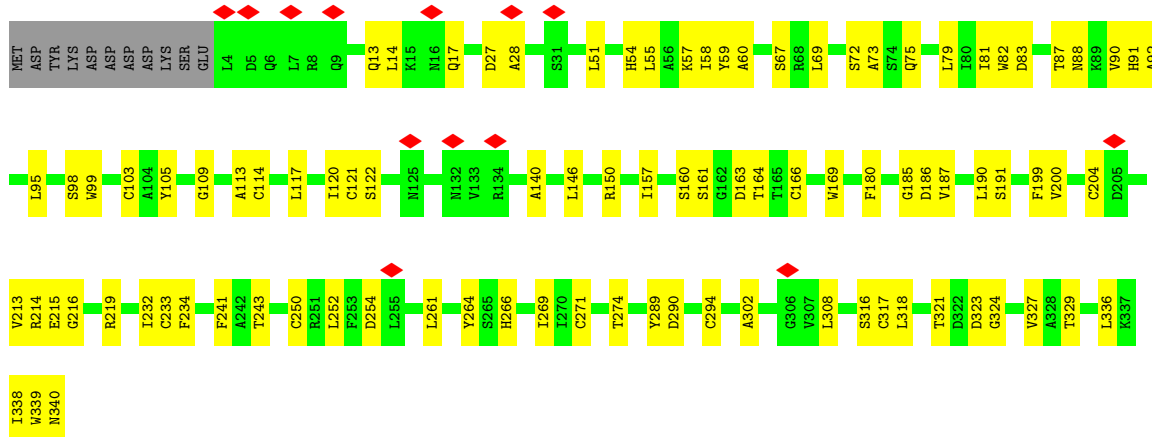




• Molecule 2: Chimeric mini guanine nucleotide-binding protein G(i)(s) subunit alpha



• Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1



- Molecule 4: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

Chain G:  63% 14% 23%



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:  50% 50%



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:  100%



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:  50% 50%



- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:  50% 50%



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	45862	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	67.9	Depositor
Minimum defocus (nm)	1100	Depositor
Maximum defocus (nm)	1900	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	4.140	Depositor
Minimum map value	0.000	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.040	Depositor
Recommended contour level	0.25	Depositor
Map size (Å)	422.4, 422.4, 422.4	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.825, 0.825, 0.825	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: 9IG, PO4, NAG, CA, TCR, A1AF7, 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	Q	0.30	0/6439	0.48	0/8743
1	R	0.30	0/6456	0.48	0/8763
2	A	0.26	0/1773	0.51	0/2401
3	B	0.27	0/2497	0.53	0/3409
4	G	0.24	0/384	0.42	0/528
All	All	0.29	0/17549	0.49	0/23844

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	Q	6280	0	6170	93	0
1	R	6294	0	6196	106	0
2	A	1738	0	1665	45	0
3	B	2450	0	2258	64	0
4	G	378	0	348	7	0
5	C	28	0	25	0	0
5	D	28	0	25	2	0
5	E	28	0	25	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	F	28	0	25	1	0
6	Q	42	0	39	1	0
6	R	28	0	26	0	0
7	Q	16	0	11	2	0
7	R	16	0	11	2	0
8	Q	5	0	0	2	0
8	R	5	0	0	3	0
9	Q	3	0	0	0	0
9	R	3	0	0	0	0
10	Q	21	0	0	0	0
10	R	21	0	0	1	0
11	Q	35	0	49	3	0
12	R	51	0	0	0	0
All	All	17498	0	16873	302	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 9.

The worst 5 of 302 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)
3:B:54:HIS:HE2	3:B:72:SER:HG	1.27	0.83
1:R:197:MET:HG3	1:R:320:PHE:HE2	1.51	0.76
1:Q:335:LYS:HA	1:Q:401:ILE:HD11	1.66	0.75
2:A:18:MET:O	2:A:22:GLN:NE2	2.21	0.74
1:R:828:THR:HG23	1:R:833:VAL:HG22	1.71	0.72

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	Q	789/911 (87%)	766 (97%)	23 (3%)	0	100	100
1	R	788/911 (86%)	771 (98%)	17 (2%)	0	100	100
2	A	217/246 (88%)	206 (95%)	11 (5%)	0	100	100
3	B	335/348 (96%)	317 (95%)	18 (5%)	0	100	100
4	G	53/71 (75%)	53 (100%)	0	0	100	100
All	All	2182/2487 (88%)	2113 (97%)	69 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 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	Q	678/790 (86%)	678 (100%)	0	100	100
1	R	682/790 (86%)	682 (100%)	0	100	100
2	A	171/215 (80%)	171 (100%)	0	100	100
3	B	239/291 (82%)	238 (100%)	1 (0%)	89	95
4	G	32/58 (55%)	32 (100%)	0	100	100
All	All	1802/2144 (84%)	1801 (100%)	1 (0%)	92	97

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

Mol	Chain	Res	Type
3	B	340	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
3	B	75	GLN
3	B	17	GLN
2	A	22	GLN
1	R	524	ASN

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Mol	Chain	Res	Type
2	A	146	GLN

### 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](#)

8 monosaccharides 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
5	NAG	C	1	5,1	14,14,15	0.25	0	17,19,21	0.68	1 (5%)
5	NAG	C	2	5	14,14,15	0.24	0	17,19,21	0.41	0
5	NAG	D	1	5,1	14,14,15	0.32	0	17,19,21	0.47	0
5	NAG	D	2	5	14,14,15	0.18	0	17,19,21	0.50	0
5	NAG	E	1	5,1	14,14,15	0.24	0	17,19,21	0.67	1 (5%)
5	NAG	E	2	5	14,14,15	0.22	0	17,19,21	0.41	0
5	NAG	F	1	5,1	14,14,15	0.35	0	17,19,21	0.48	0
5	NAG	F	2	5	14,14,15	0.19	0	17,19,21	0.43	0

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
5	NAG	C	1	5,1	-	2/6/23/26	0/1/1/1

*Continued on next page...*

*Continued from previous page...*

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	C	2	5	-	4/6/23/26	0/1/1/1
5	NAG	D	1	5,1	-	2/6/23/26	0/1/1/1
5	NAG	D	2	5	-	2/6/23/26	0/1/1/1
5	NAG	E	1	5,1	-	4/6/23/26	0/1/1/1
5	NAG	E	2	5	-	4/6/23/26	0/1/1/1
5	NAG	F	1	5,1	-	2/6/23/26	0/1/1/1
5	NAG	F	2	5	-	4/6/23/26	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	1	NAG	C1-O5-C5	2.25	115.20	112.19
5	E	1	NAG	C1-O5-C5	2.21	115.15	112.19

There are no chirality outliers.

5 of 24 torsion outliers are listed below:

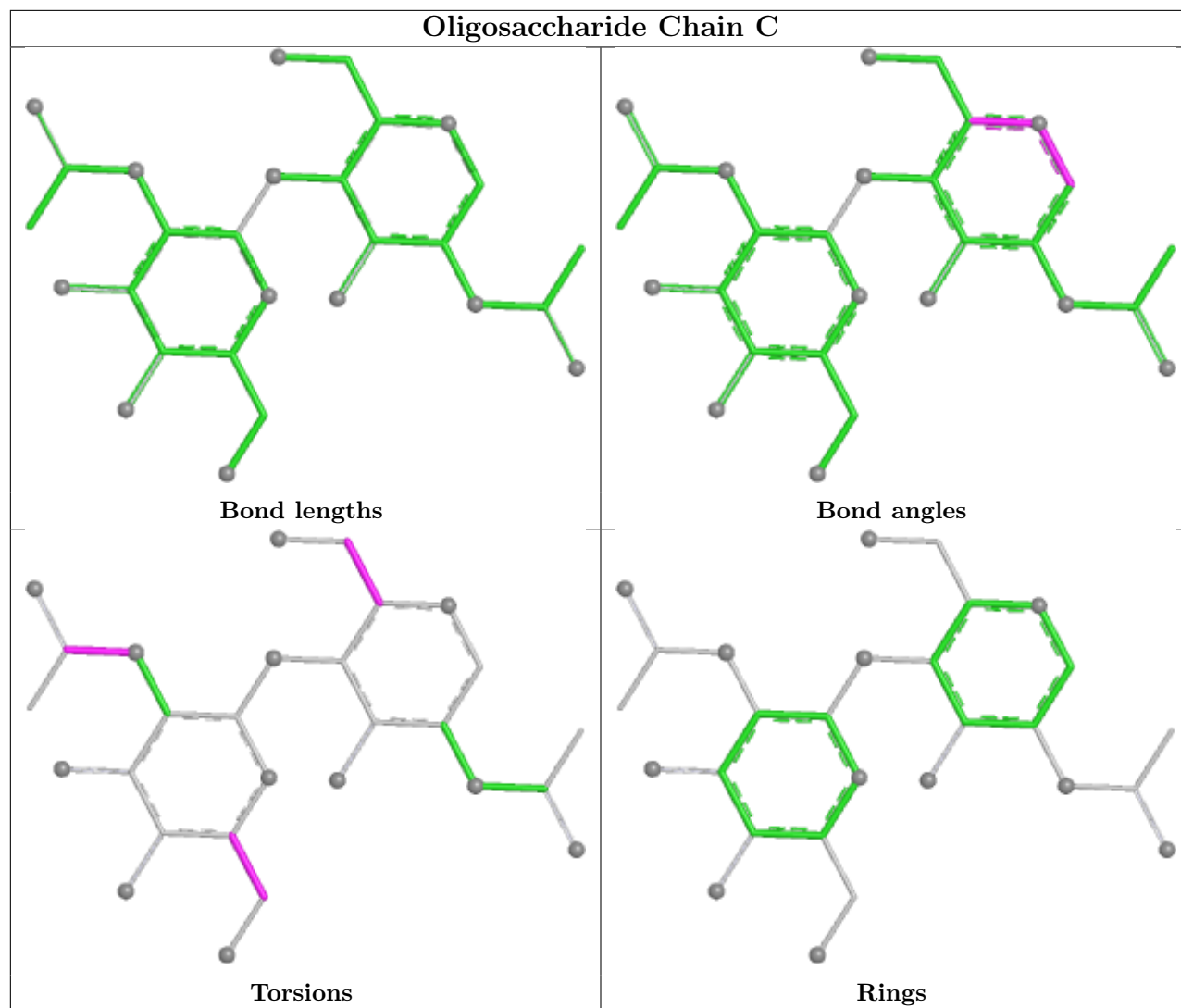
Mol	Chain	Res	Type	Atoms
5	F	1	NAG	O5-C5-C6-O6
5	C	2	NAG	O5-C5-C6-O6
5	F	1	NAG	C4-C5-C6-O6
5	F	2	NAG	O5-C5-C6-O6
5	F	2	NAG	C4-C5-C6-O6

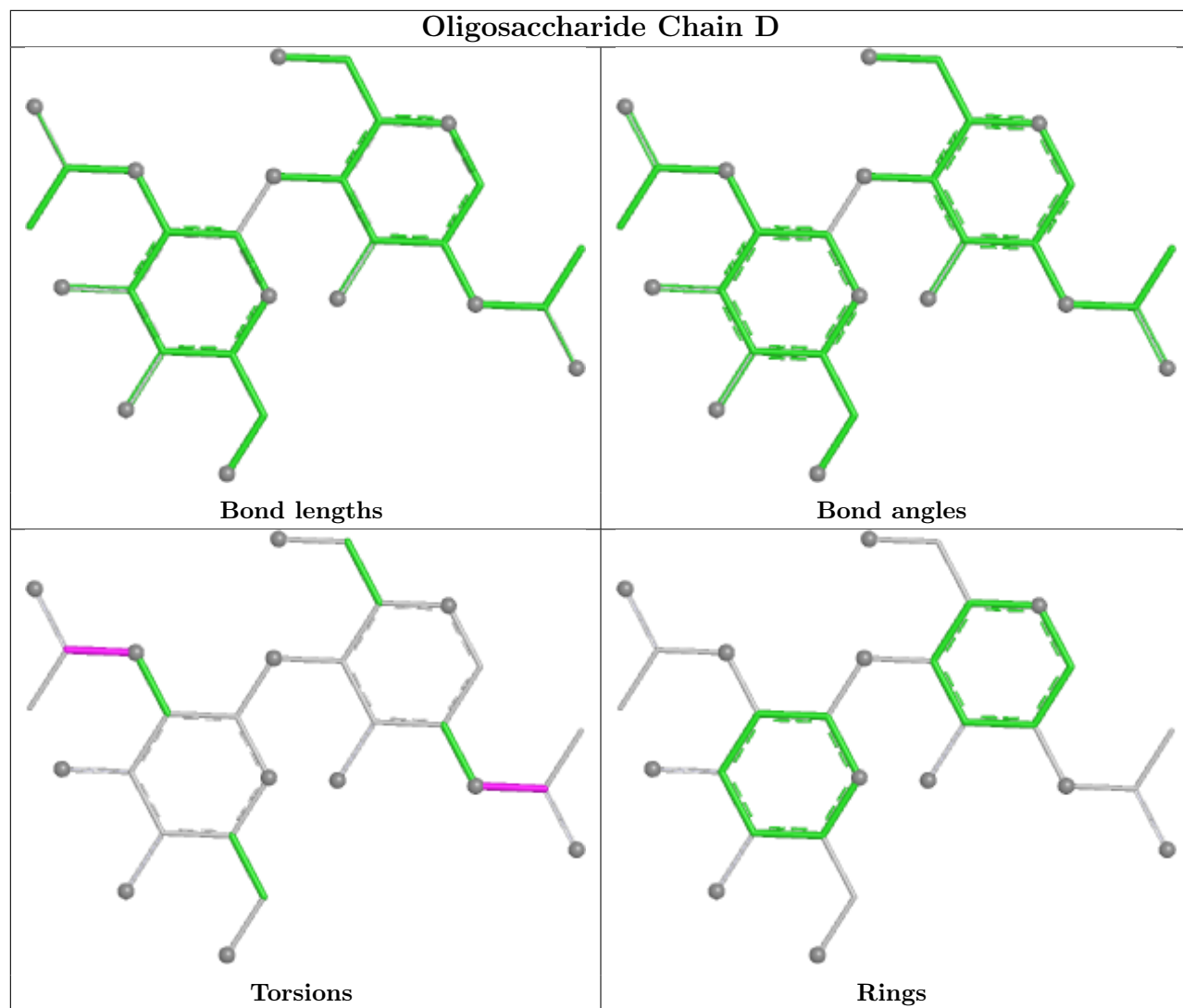
There are no ring outliers.

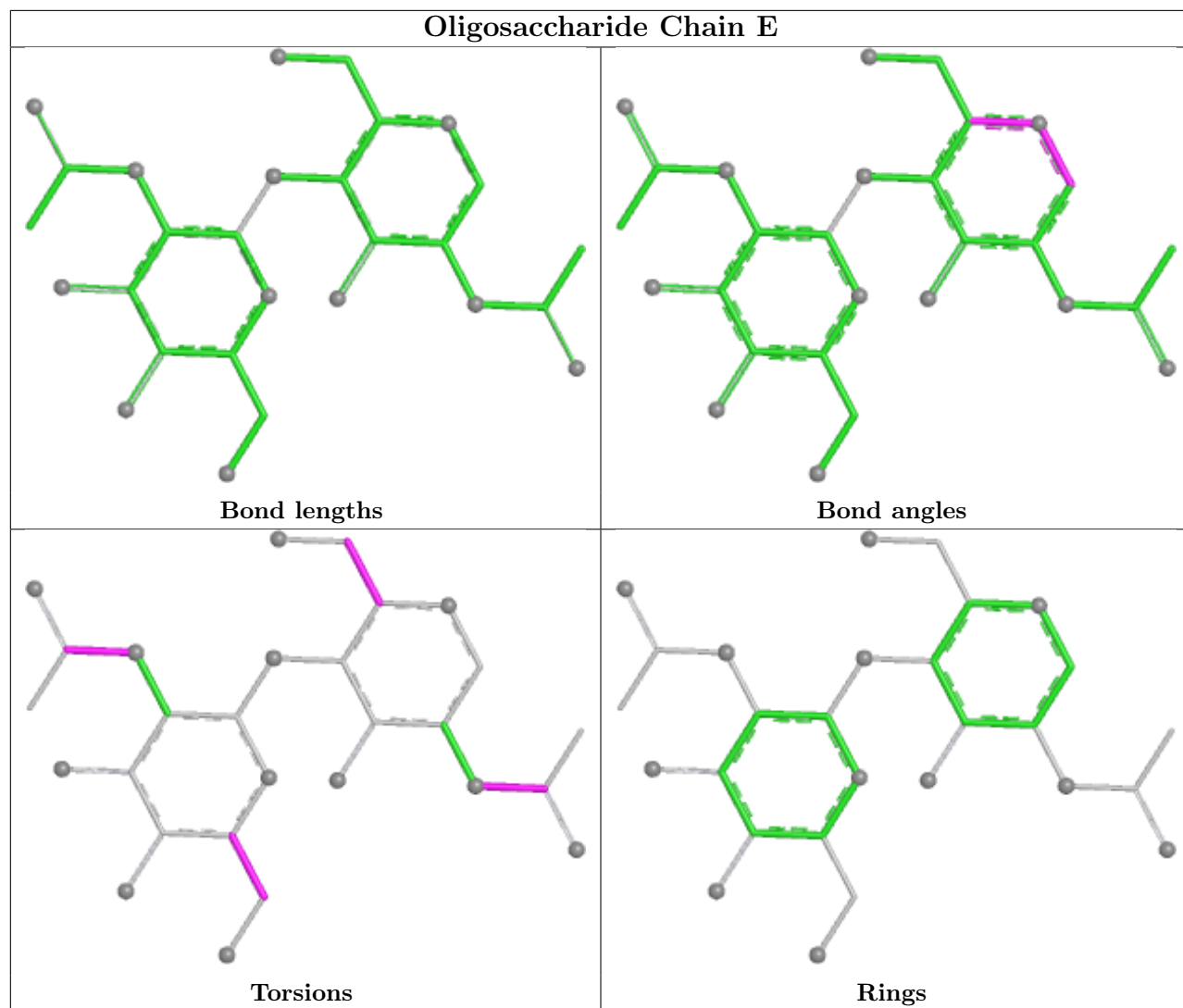
4 monomers are involved in 4 short contacts:

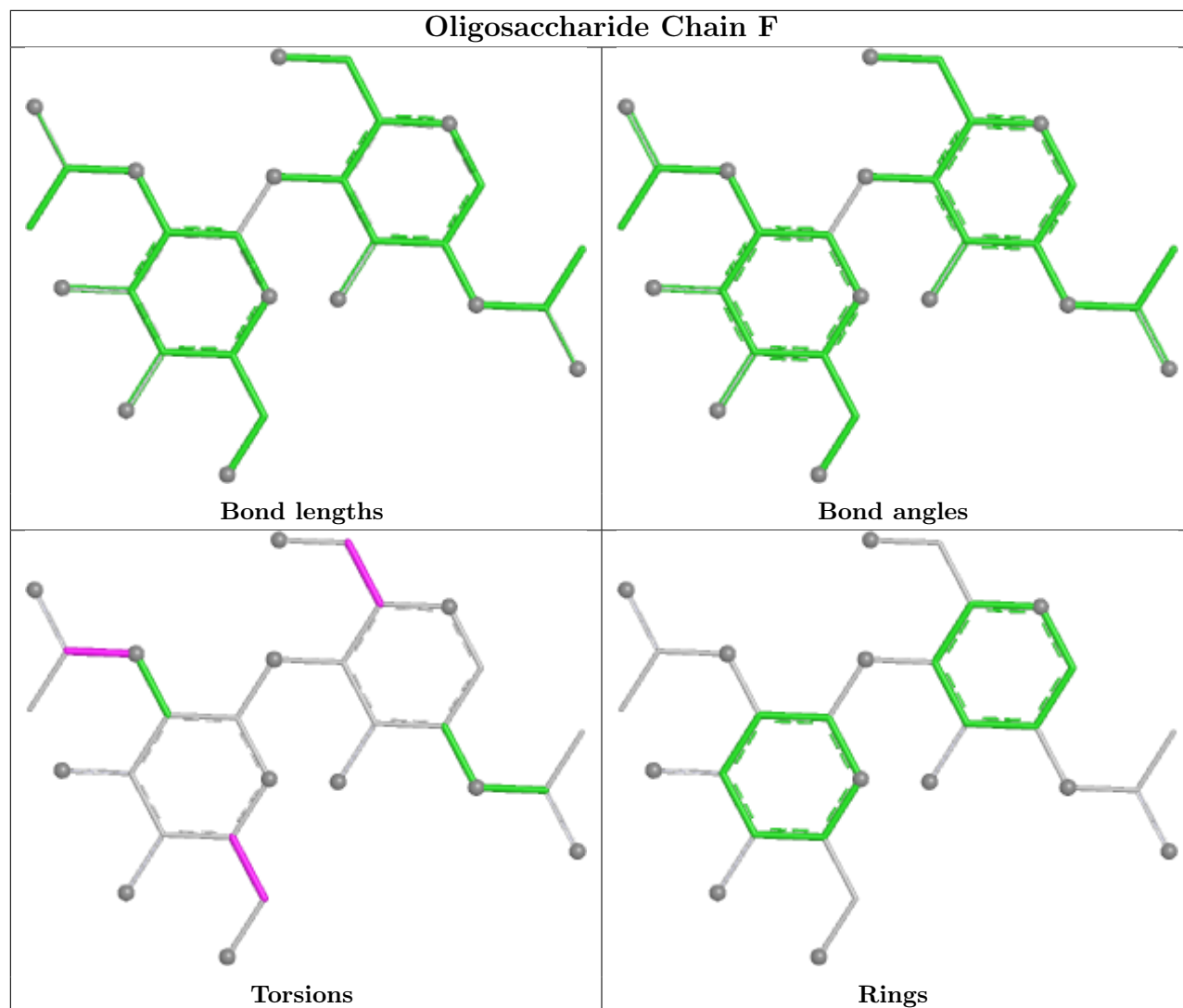
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	2	NAG	1	0
5	D	1	NAG	2	0
5	F	1	NAG	1	0
5	E	1	NAG	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.









## 5.6 Ligand geometry [i](#)

Of 19 ligands modelled in this entry, 6 are monoatomic - leaving 13 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	$\# Z  > 2$
8	PO4	Q	1005	-	4,4,4	1.08	0	6,6,6	0.50	0
11	Y01	Q	1010	-	38,38,38	1.30	2 (5%)	57,57,57	2.03	10 (17%)
10	9IG	Q	1009	-	22,22,22	0.78	0	27,28,28	1.09	2 (7%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
7	TCR	R	1003	-	17,18,18	2.20	2 (11%)	16,26,26	1.31	2 (12%)
6	NAG	Q	1002	1	14,14,15	0.19	0	17,19,21	0.45	0
10	9IG	R	1008	-	22,22,22	0.77	0	27,28,28	1.11	2 (7%)
8	PO4	R	1004	-	4,4,4	1.12	0	6,6,6	0.47	0
12	A1AF7	R	1009	-	50,50,50	0.88	3 (6%)	53,56,56	0.82	1 (1%)
6	NAG	Q	1003	1	14,14,15	0.20	0	17,19,21	0.44	0
7	TCR	Q	1004	-	17,18,18	1.97	2 (11%)	16,26,26	1.22	3 (18%)
6	NAG	R	1002	1	14,14,15	0.23	0	17,19,21	0.46	0
6	NAG	Q	1001	1	14,14,15	0.45	0	17,19,21	0.72	1 (5%)
6	NAG	R	1001	1	14,14,15	0.20	0	17,19,21	0.44	0

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
11	Y01	Q	1010	-	-	13/19/77/77	0/4/4/4
10	9IG	Q	1009	-	-	4/13/13/13	0/2/2/2
7	TCR	R	1003	-	-	2/4/13/13	0/3/3/3
6	NAG	Q	1002	1	-	1/6/23/26	0/1/1/1
10	9IG	R	1008	-	-	5/13/13/13	0/2/2/2
12	A1AF7	R	1009	-	-	27/55/55/55	-
6	NAG	Q	1003	1	-	1/6/23/26	0/1/1/1
7	TCR	Q	1004	-	-	0/4/13/13	0/3/3/3
6	NAG	R	1002	1	-	0/6/23/26	0/1/1/1
6	NAG	Q	1001	1	-	4/6/23/26	0/1/1/1
6	NAG	R	1001	1	-	0/6/23/26	0/1/1/1

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	R	1003	TCR	CB-CG	-7.31	1.43	1.51
7	Q	1004	TCR	CB-CG	-6.50	1.44	1.51
11	Q	1010	Y01	CAK-CAI	-4.50	1.41	1.50
7	R	1003	TCR	C9-N	3.85	1.51	1.46
11	Q	1010	Y01	CAI-CAZ	2.77	1.38	1.33

The worst 5 of 21 bond angle outliers are listed below:



Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	Q	1010	Y01	CAV-CAZ-CBH	8.26	127.00	116.42
11	Q	1010	Y01	CAV-CAZ-CAI	-5.46	113.16	120.57
11	Q	1010	Y01	OAW-CAY-OAG	-5.16	111.64	123.70
11	Q	1010	Y01	OAW-CAY-CAM	5.15	122.63	111.48
12	R	1009	A1AF7	O13-P-O14	3.25	127.57	112.44

There are no chirality outliers.

5 of 57 torsion outliers are listed below:

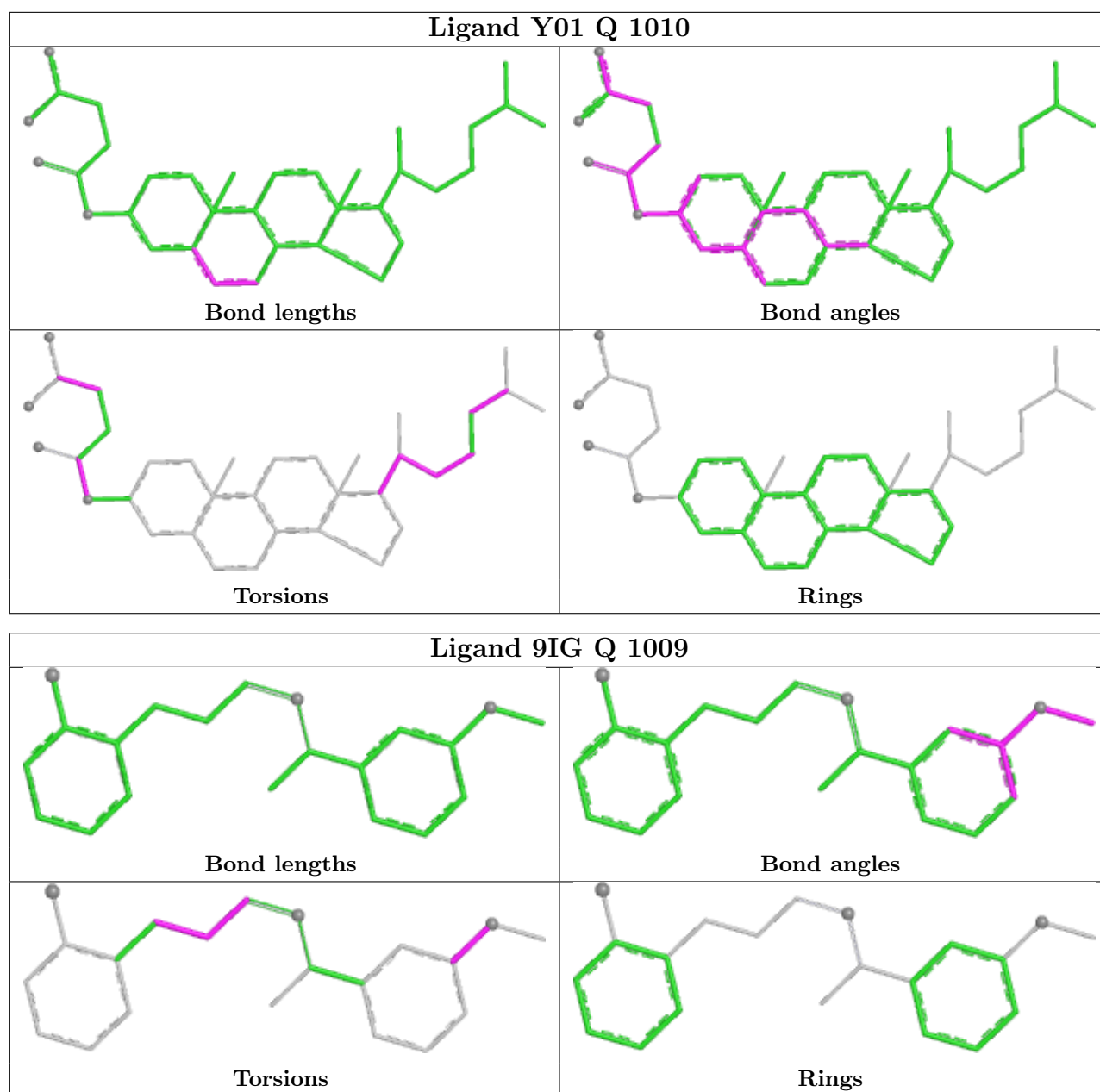
Mol	Chain	Res	Type	Atoms
10	Q	1009	9IG	C12-C13-C14-C15
11	Q	1010	Y01	OAG-CAY-OAW-CBC
11	Q	1010	Y01	CAM-CAY-OAW-CBC
12	R	1009	A1AF7	C03-O11-P-O12
12	R	1009	A1AF7	C03-O11-P-O13

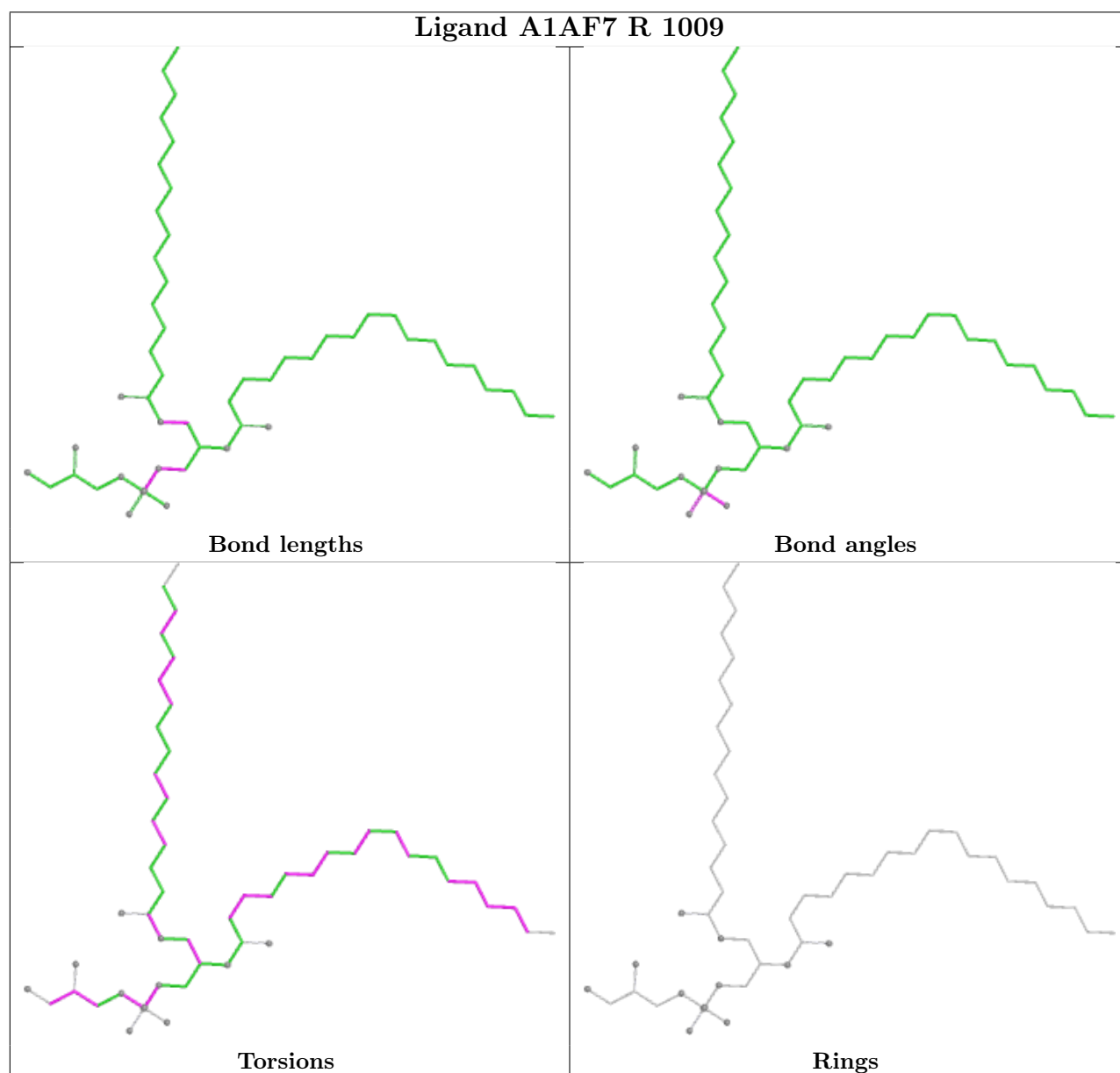
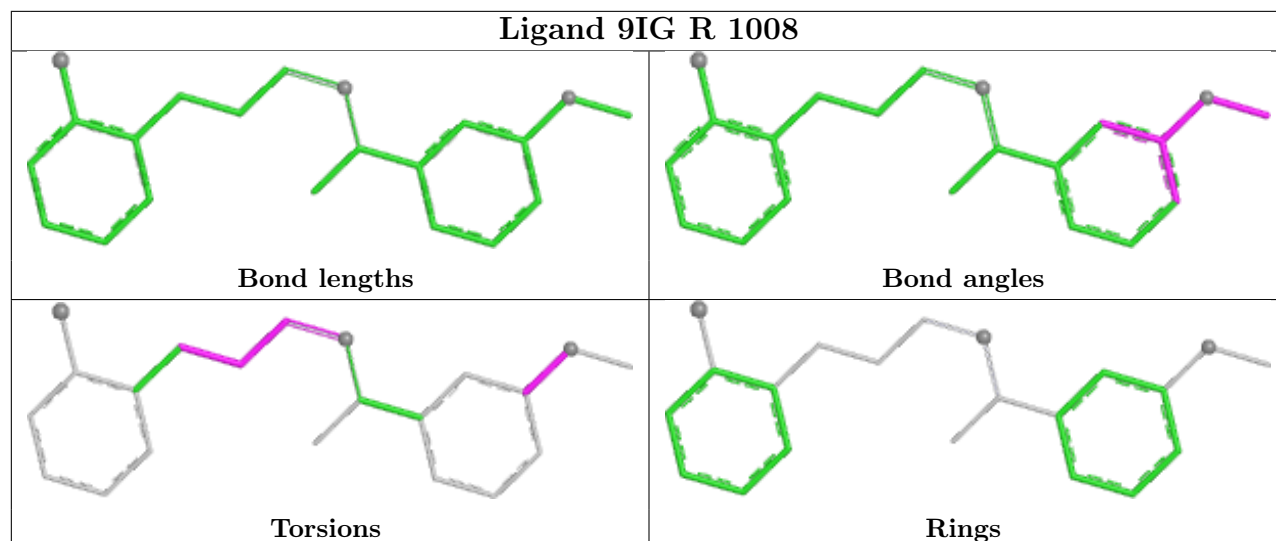
There are no ring outliers.

7 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	Q	1005	PO4	2	0
11	Q	1010	Y01	3	0
7	R	1003	TCR	2	0
10	R	1008	9IG	1	0
8	R	1004	PO4	3	0
7	Q	1004	TCR	2	0
6	Q	1001	NAG	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

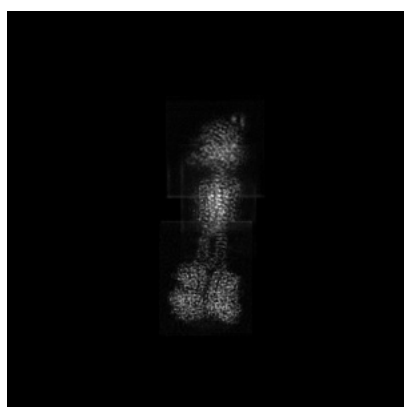
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-43901. These allow visual inspection of the internal detail of the map and identification of artifacts.

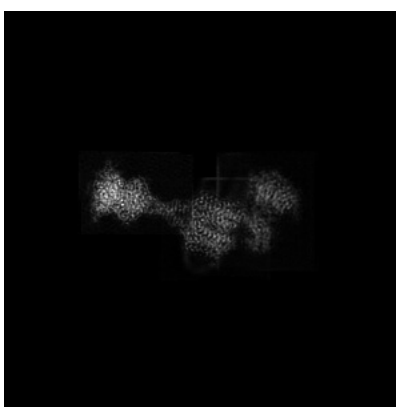
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

### 6.1 Orthogonal projections [i](#)

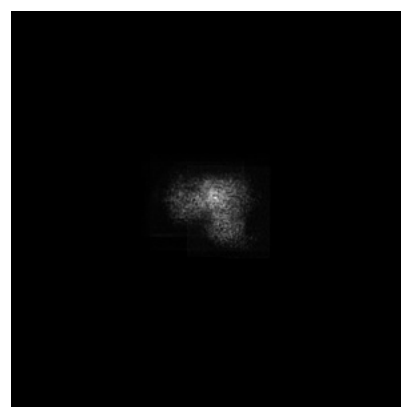
#### 6.1.1 Primary map



X



Y

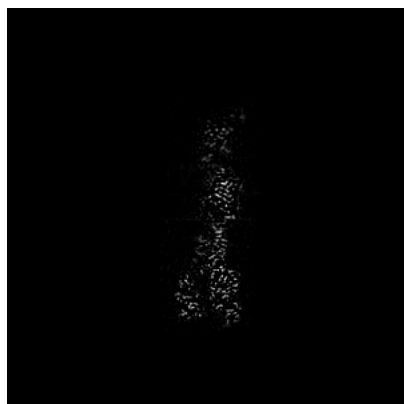


Z

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

### 6.2 Central slices [i](#)

#### 6.2.1 Primary map



X Index: 256



Y Index: 256

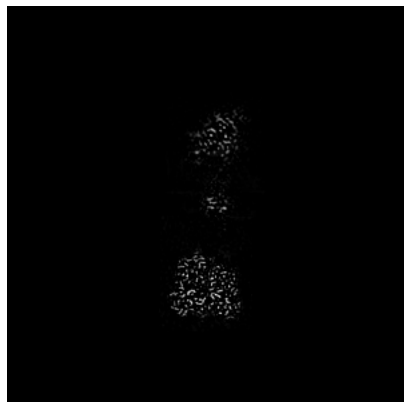


Z Index: 256

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

## 6.3 Largest variance slices [i](#)

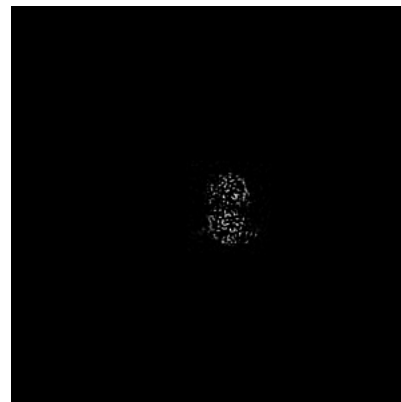
### 6.3.1 Primary map



X Index: 272



Y Index: 271

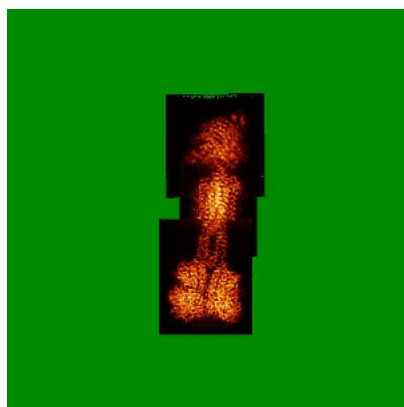


Z Index: 142

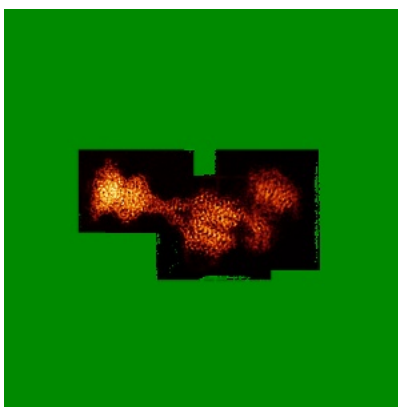
The images above show the largest variance slices of the map in three orthogonal directions.

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

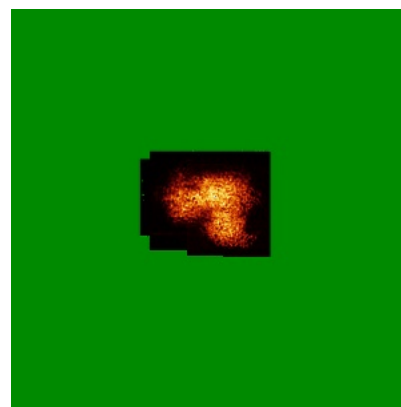
### 6.4.1 Primary map



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

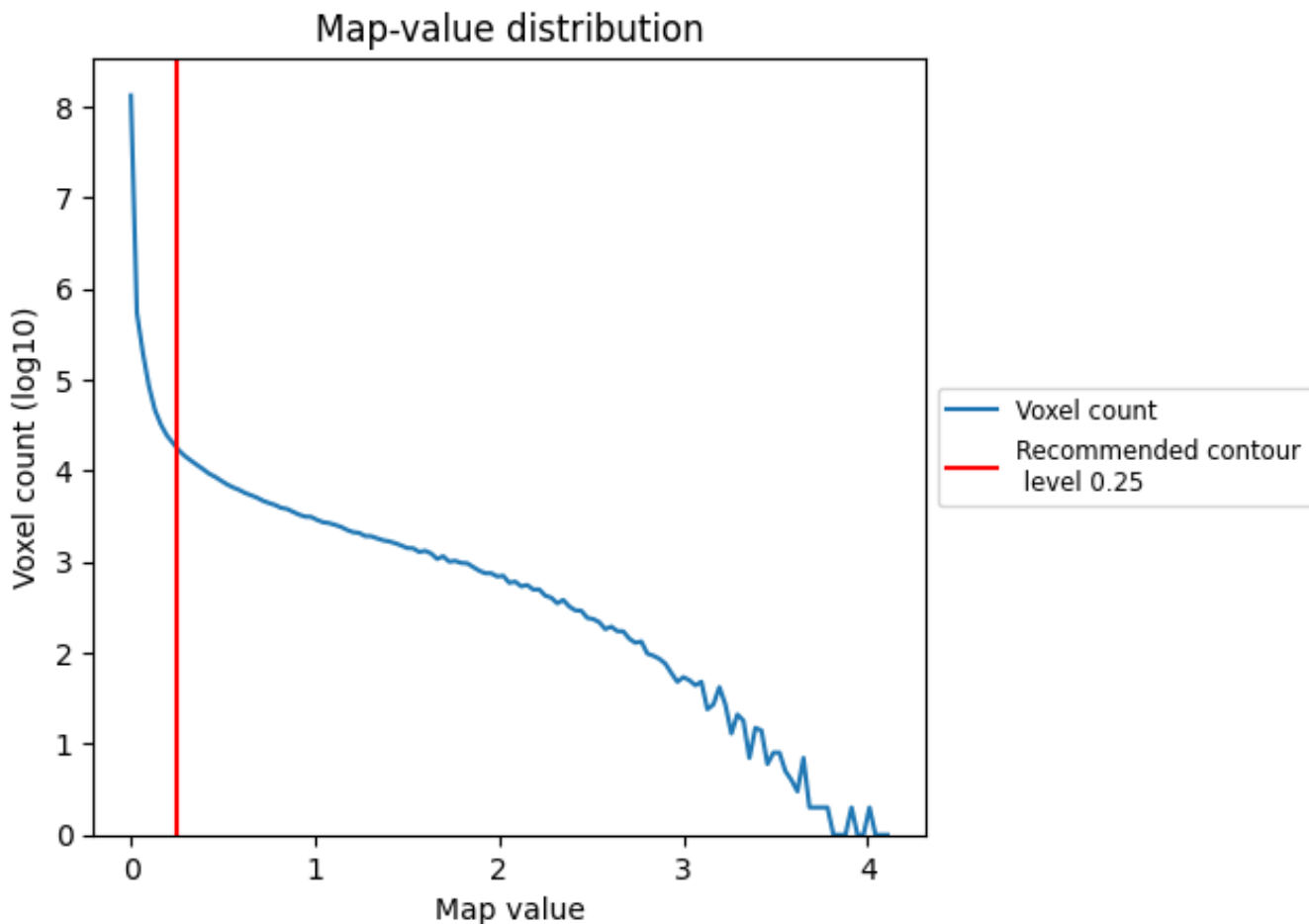
## 6.6 Mask visualisation [i](#)

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.

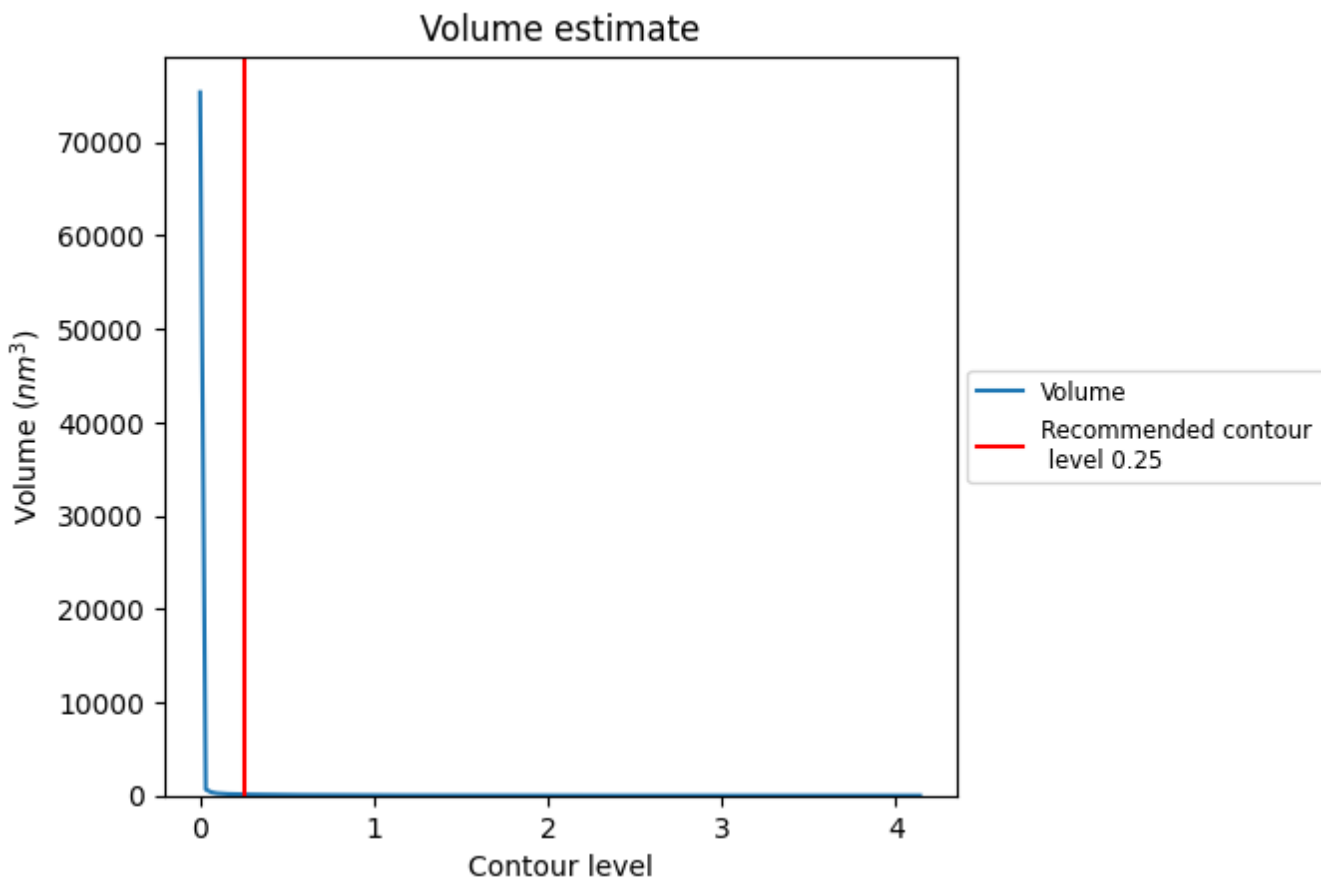
### 7.1 Map-value distribution [i](#)



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.



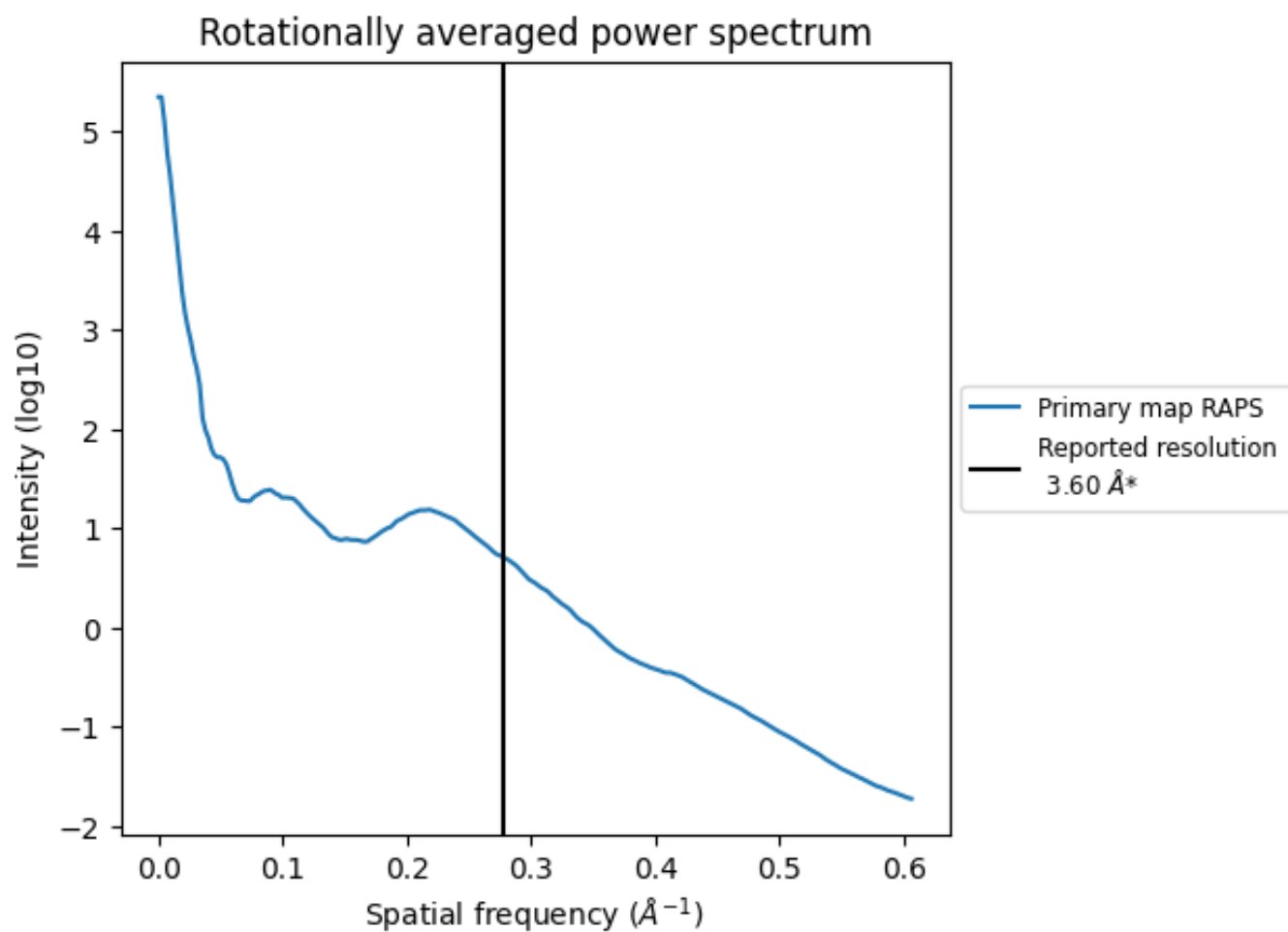
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 127  $\text{nm}^3$ ; this corresponds to an approximate mass of 115 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

### 7.3 Rotationally averaged power spectrum [i](#)



\*Reported resolution corresponds to spatial frequency of 0.278 Å<sup>-1</sup>

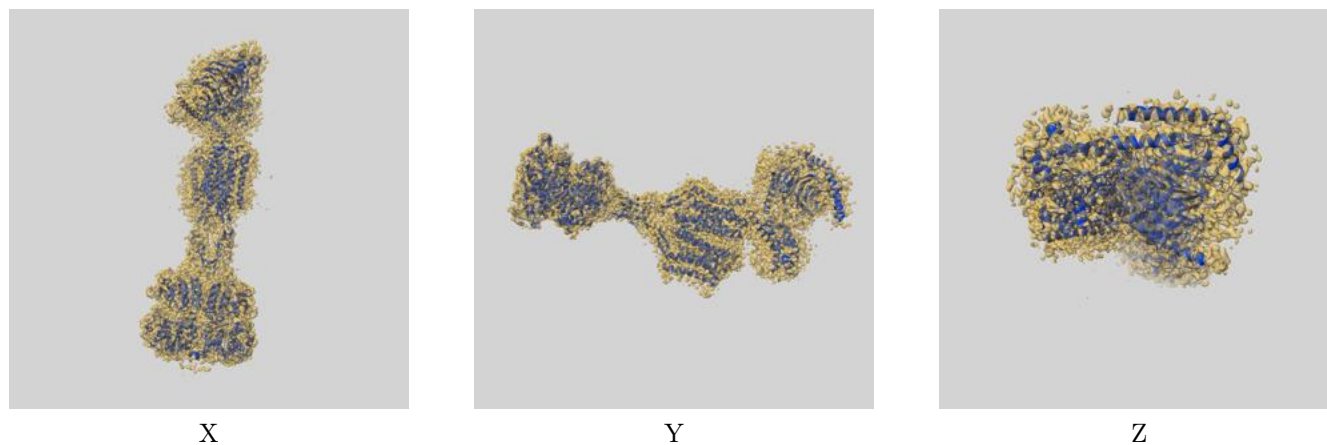
## 8 Fourier-Shell correlation

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

## 9 Map-model fit [i](#)

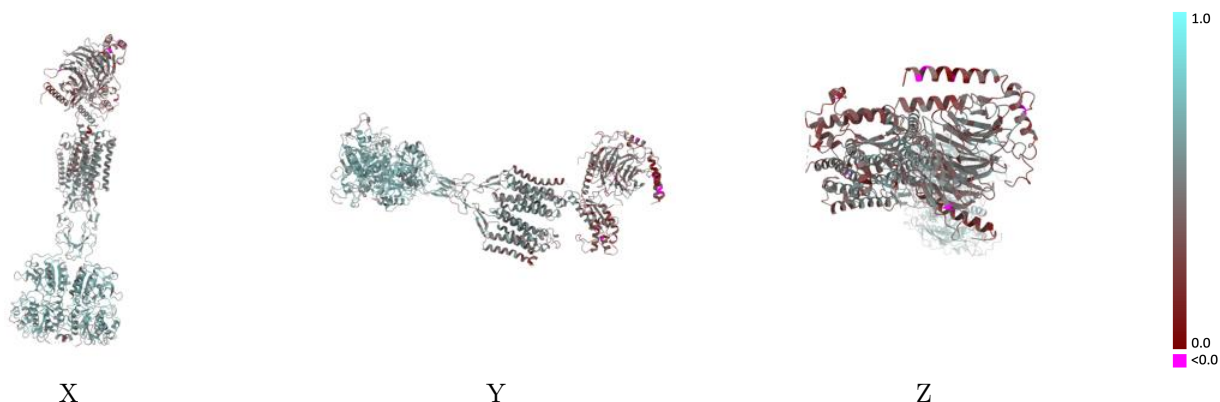
This section contains information regarding the fit between EMDB map EMD-43901 and PDB model 9AVG. Per-residue inclusion information can be found in section 3 on page 11.

### 9.1 Map-model overlay [i](#)



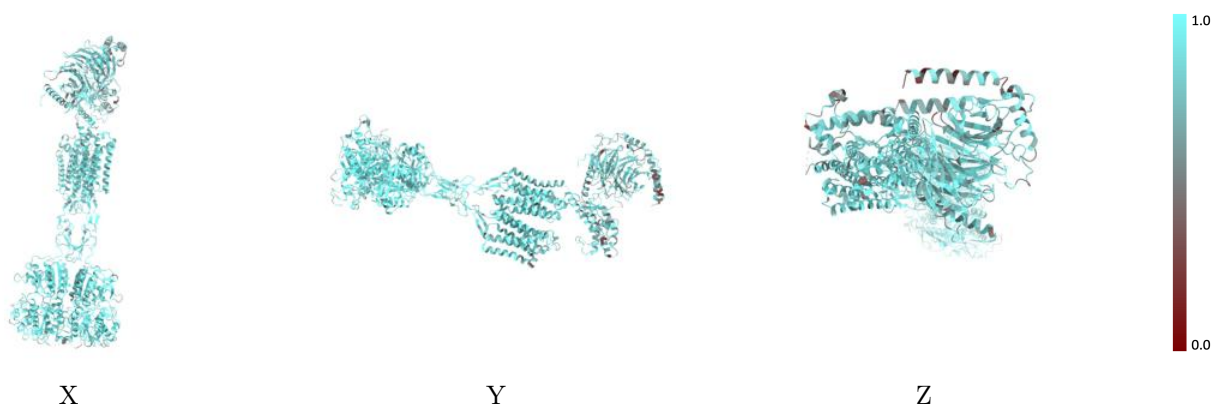
The images above show the 3D surface view of the map at the recommended contour level 0.25 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



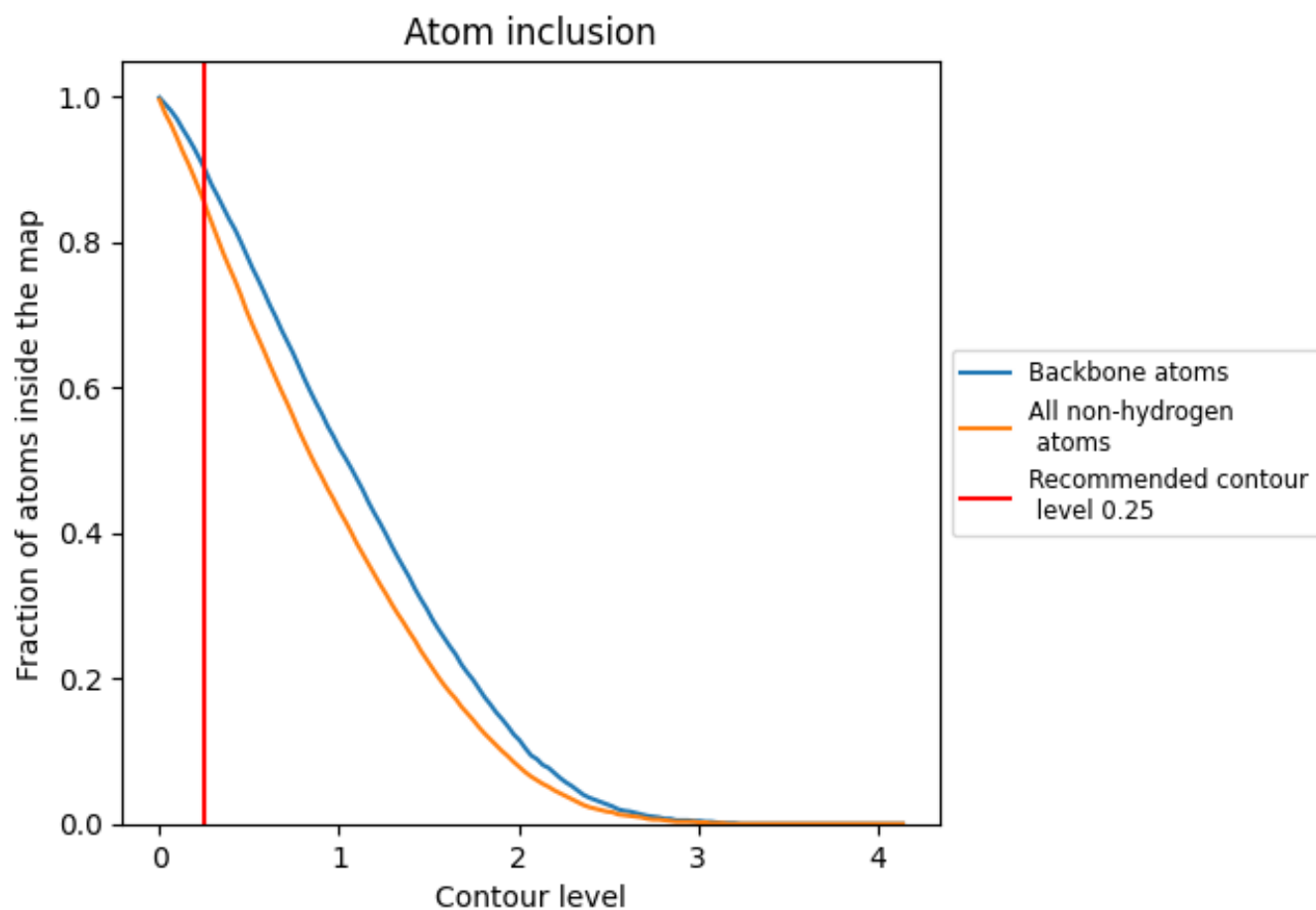
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

## 9.3 Atom inclusion mapped to coordinate model [\(i\)](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.25).





















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 90% of all backbone atoms, 85% 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 (0.25) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8540	 0.5090
A	 0.7590	 0.3560
B	 0.7630	 0.4040
C	 0.7140	 0.4700
D	 0.7860	 0.5120
E	 0.7500	 0.4770
F	 0.8570	 0.5360
G	 0.7130	 0.3380
Q	 0.8840	 0.5540
R	 0.8920	 0.5550

