



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 10, 2026 – 01:33 AM UTC

PDB ID : 5TPS / pdb\_00005tps  
Title : Structure of a Fc heterodimer  
Authors : Zhou, A.; Wei, H.  
Deposited on : 2016-10-21  
Resolution : 2.70 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

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

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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:

MolProbity : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

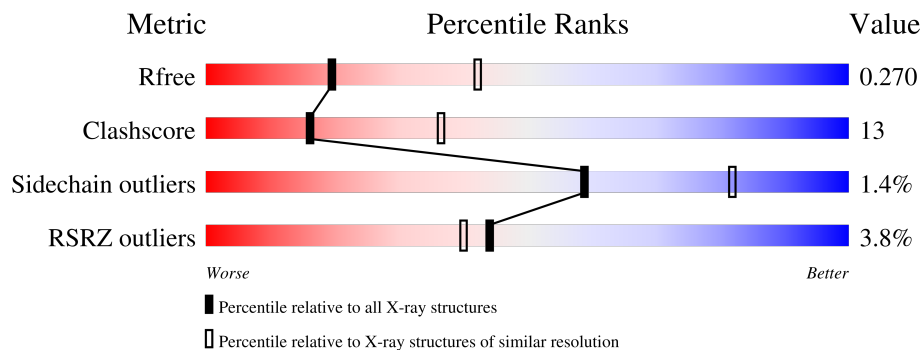
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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 electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	B	243	 5% 53% 25% 21%
2	A	232	 2% 73% 16% 11%
3	C	7	 86% 14%
4	D	9	 33% 67%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3386 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Ig gamma-1 chain C region.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	192	1523	963	260	293	7	0	0	0

There are 21 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	216	GLY	-	expression tag	UNP P01857
B	217	SER	-	expression tag	UNP P01857
B	218	GLY	-	expression tag	UNP P01857
B	219	GLY	-	expression tag	UNP P01857
B	220	GLY	-	expression tag	UNP P01857
B	349	CYS	TYR	engineered mutation	UNP P01857
B	366	SER	THR	engineered mutation	UNP P01857
B	368	ALA	LEU	engineered mutation	UNP P01857
B	405	LYS	PHE	engineered mutation	UNP P01857
B	407	VAL	TYR	engineered mutation	UNP P01857
B	448	GLY	-	expression tag	UNP P01857
B	449	GLY	-	expression tag	UNP P01857
B	450	SER	-	expression tag	UNP P01857
B	451	HIS	-	expression tag	UNP P01857
B	452	HIS	-	expression tag	UNP P01857
B	453	HIS	-	expression tag	UNP P01857
B	454	HIS	-	expression tag	UNP P01857
B	455	HIS	-	expression tag	UNP P01857
B	456	HIS	-	expression tag	UNP P01857
B	457	HIS	-	expression tag	UNP P01857
B	458	HIS	-	expression tag	UNP P01857

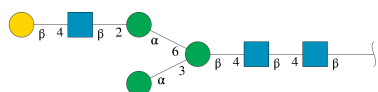
- Molecule 2 is a protein called Ig gamma-1 chain C region.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	A	207	1659	1058	278	316	7	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

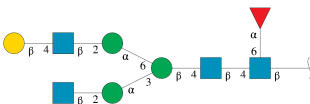
Chain	Residue	Modelled	Actual	Comment	Reference
A	216	GLY	-	expression tag	UNP P01857
A	217	SER	-	expression tag	UNP P01857
A	218	GLY	-	expression tag	UNP P01857
A	219	GLY	-	expression tag	UNP P01857
A	220	GLY	-	expression tag	UNP P01857
A	354	CYS	SER	engineered mutation	UNP P01857
A	366	TRP	THR	engineered mutation	UNP P01857
A	409	ALA	LYS	engineered mutation	UNP P01857

- Molecule 3 is an oligosaccharide called beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	7	86	48	3	35	0	0	0

- Molecule 4 is an oligosaccharide called beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.

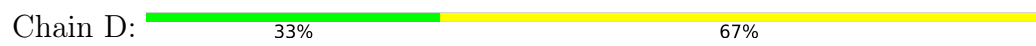


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	D	9	110	62	4	44	0	0	0

- Molecule 5 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>	<b>ZeroOcc</b>	<b>AltConf</b>
5	B	1	Total O 1 1	0	0
5	A	7	Total O 7 7	0	0





MAN1
MAN2
MAN3
MAN4
MAN5
GAL6
MAN7
MAN8
FUC9

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	49.26Å 79.52Å 137.98Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.39 – 2.70 46.39 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.2 (46.39-2.70) 98.1 (46.39-2.70)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.32 (at 2.69Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.202 , 0.271 0.203 , 0.270	Depositor DCC
$R_{free}$ test set	782 reflections (4.51%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	58.0	Xtrriage
Anisotropy	0.298	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 51.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3386	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	72.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.38% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 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: GAL, FUC, BMA, MAN, NAG

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	B	0.59	0/1559	0.90	4/2118 (0.2%)
2	A	0.46	0/1707	0.69	2/2329 (0.1%)
All	All	0.52	0/3266	0.79	6/4447 (0.1%)

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	290	LYS	CA-C-N	-11.78	105.12	119.84
1	B	290	LYS	C-N-CA	-11.78	105.12	119.84
1	B	295	GLN	CA-CB-CG	-7.63	98.84	114.10
1	B	292	ARG	N-CA-C	-5.30	96.17	111.00
2	A	353	PRO	CA-C-N	-5.13	113.56	122.64

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	B	1523	0	1484	65	0
2	A	1659	0	1612	29	0
3	C	86	0	73	2	0
4	D	110	0	94	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	7	0	0	1	0
5	B	1	0	0	0	0
All	All	3386	0	3263	87	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 13.

The worst 5 of 87 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:350:THR:HG21	1:B:441:LEU:HB2	1.62	0.82
1:B:278:TYR:CE1	1:B:322:LYS:HD2	2.16	0.81
1:B:295:GLN:OE1	1:B:299:THR:N	2.15	0.80
1:B:292:ARG:HH22	1:B:300:TYR:HD1	1.27	0.80
2:A:414:LYS:O	2:A:418:GLN:NE2	2.15	0.79

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

### 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 X-ray entries followed by that with respect to entries of similar resolution.

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	B	177/219 (81%)	174 (98%)	3 (2%)	53	79
2	A	192/210 (91%)	190 (99%)	2 (1%)	68	86
All	All	369/429 (86%)	364 (99%)	5 (1%)	59	82

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	337	SER
1	B	399	ASP
1	B	426	SER
2	A	350	THR
2	A	419	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
2	A	362	GLN
2	A	418	GLN
2	A	434	ASN
1	B	362	GLN
1	B	276	ASN

### 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](#)

16 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
3	NAG	C	1	3,1	14,14,15	1.42	1 (7%)	17,19,21	1.05	1 (5%)
3	NAG	C	2	3	14,14,15	0.69	1 (7%)	17,19,21	0.52	0
3	BMA	C	3	3	11,11,12	1.50	2 (18%)	15,15,17	1.05	2 (13%)
3	MAN	C	4	3	11,11,12	1.10	2 (18%)	15,15,17	2.44	3 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	NAG	C	5	3	14,14,15	0.43	0	17,19,21	1.36	1 (5%)
3	GAL	C	6	3	11,11,12	1.73	2 (18%)	15,15,17	1.11	2 (13%)
3	MAN	C	7	3	11,11,12	1.55	2 (18%)	15,15,17	1.56	3 (20%)
4	NAG	D	1	2,4	14,14,15	0.21	0	17,19,21	0.50	0
4	NAG	D	2	4	14,14,15	0.78	1 (7%)	17,19,21	0.65	0
4	BMA	D	3	4	11,11,12	1.30	1 (9%)	15,15,17	1.00	1 (6%)
4	MAN	D	4	4	11,11,12	1.28	2 (18%)	15,15,17	2.11	2 (13%)
4	NAG	D	5	4	14,14,15	0.81	1 (7%)	17,19,21	1.32	1 (5%)
4	GAL	D	6	4	11,11,12	1.79	4 (36%)	15,15,17	0.92	0
4	MAN	D	7	4	11,11,12	1.29	1 (9%)	15,15,17	1.03	0
4	NAG	D	8	4	14,14,15	0.49	0	17,19,21	0.70	0
4	FUC	D	9	4	10,10,11	0.88	0	14,14,16	0.84	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	C	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	C	2	3	-	0/6/23/26	0/1/1/1
3	BMA	C	3	3	-	2/2/19/22	0/1/1/1
3	MAN	C	4	3	-	0/2/19/22	0/1/1/1
3	NAG	C	5	3	-	2/6/23/26	0/1/1/1
3	GAL	C	6	3	-	2/2/19/22	0/1/1/1
3	MAN	C	7	3	-	1/2/19/22	0/1/1/1
4	NAG	D	1	2,4	-	0/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	BMA	D	3	4	-	0/2/19/22	0/1/1/1
4	MAN	D	4	4	-	0/2/19/22	0/1/1/1
4	NAG	D	5	4	-	1/6/23/26	0/1/1/1
4	GAL	D	6	4	-	1/2/19/22	0/1/1/1
4	MAN	D	7	4	-	1/2/19/22	0/1/1/1
4	NAG	D	8	4	-	0/6/23/26	0/1/1/1
4	FUC	D	9	4	-	-	0/1/1/1

The worst 5 of 20 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1	NAG	C1-C2	4.61	1.58	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	6	GAL	C2-C3	3.94	1.58	1.52
3	C	7	MAN	C1-C2	3.75	1.61	1.52
4	D	6	GAL	O5-C1	-3.58	1.37	1.43
3	C	6	GAL	C1-C2	3.42	1.60	1.52

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	4	MAN	C1-O5-C5	6.94	121.48	112.19
3	C	4	MAN	C1-O5-C5	6.35	120.70	112.19
3	C	4	MAN	O2-C2-C3	-5.73	98.29	110.15
4	D	5	NAG	C1-O5-C5	4.54	118.28	112.19
3	C	5	NAG	C1-O5-C5	3.84	117.34	112.19

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

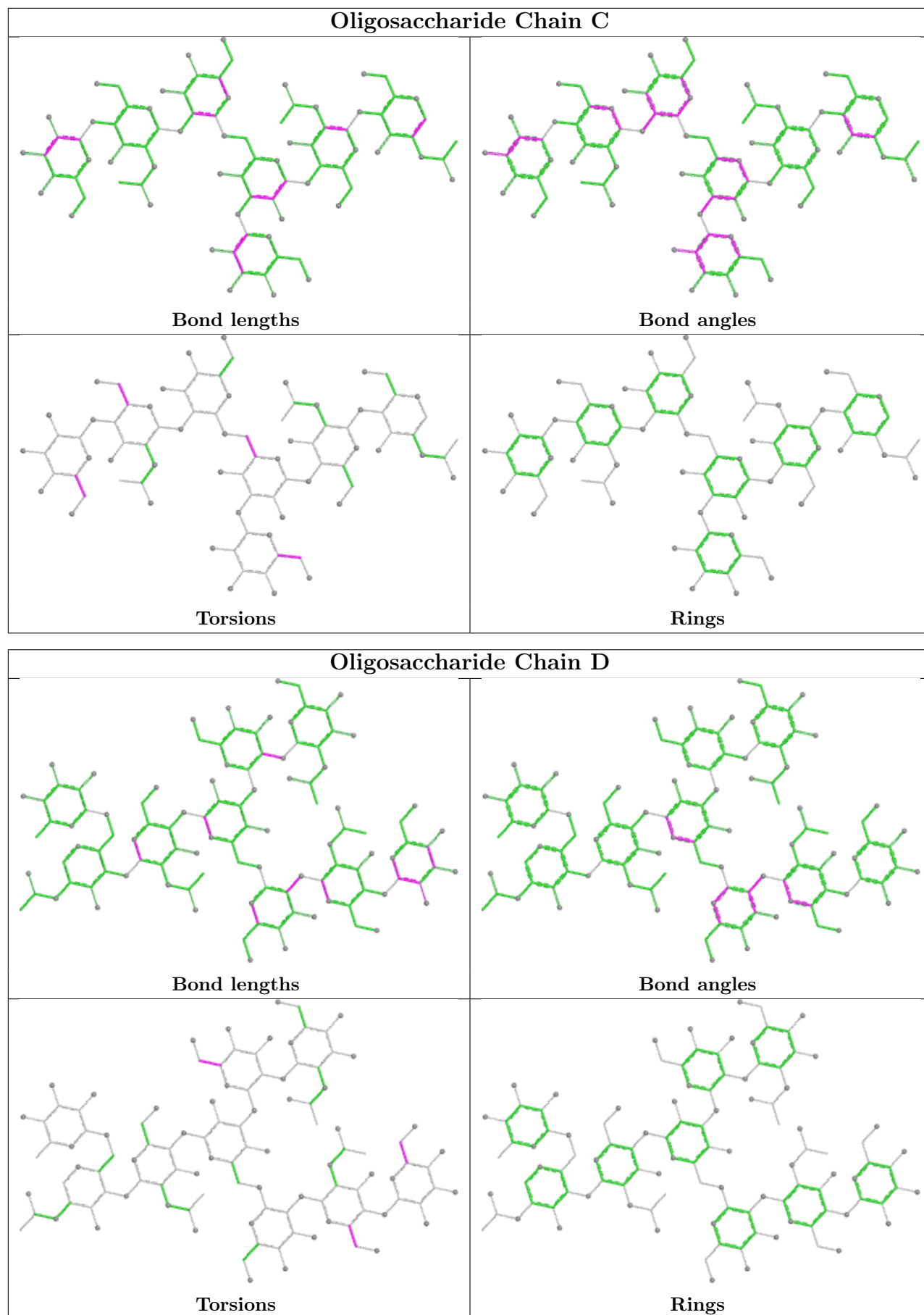
Mol	Chain	Res	Type	Atoms
3	C	3	BMA	O5-C5-C6-O6
3	C	6	GAL	O5-C5-C6-O6
3	C	3	BMA	C4-C5-C6-O6
3	C	6	GAL	C4-C5-C6-O6
3	C	7	MAN	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	3	BMA	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 oligosaccharide.



## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	B	192/243 (79%)	0.49	11 (5%) 29 26	40, 77, 136, 176	0
2	A	207/232 (89%)	-0.02	4 (1%) 66 63	31, 56, 117, 142	0
All	All	399/475 (84%)	0.23	15 (3%) 44 40	31, 66, 127, 176	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	300	TYR	6.4
1	B	302	VAL	3.7
2	A	412	VAL	3.5
1	B	299	THR	3.3
2	A	366	TRP	2.8

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q < 0.9’ lists the number of atoms with occupancy less than 0.9.

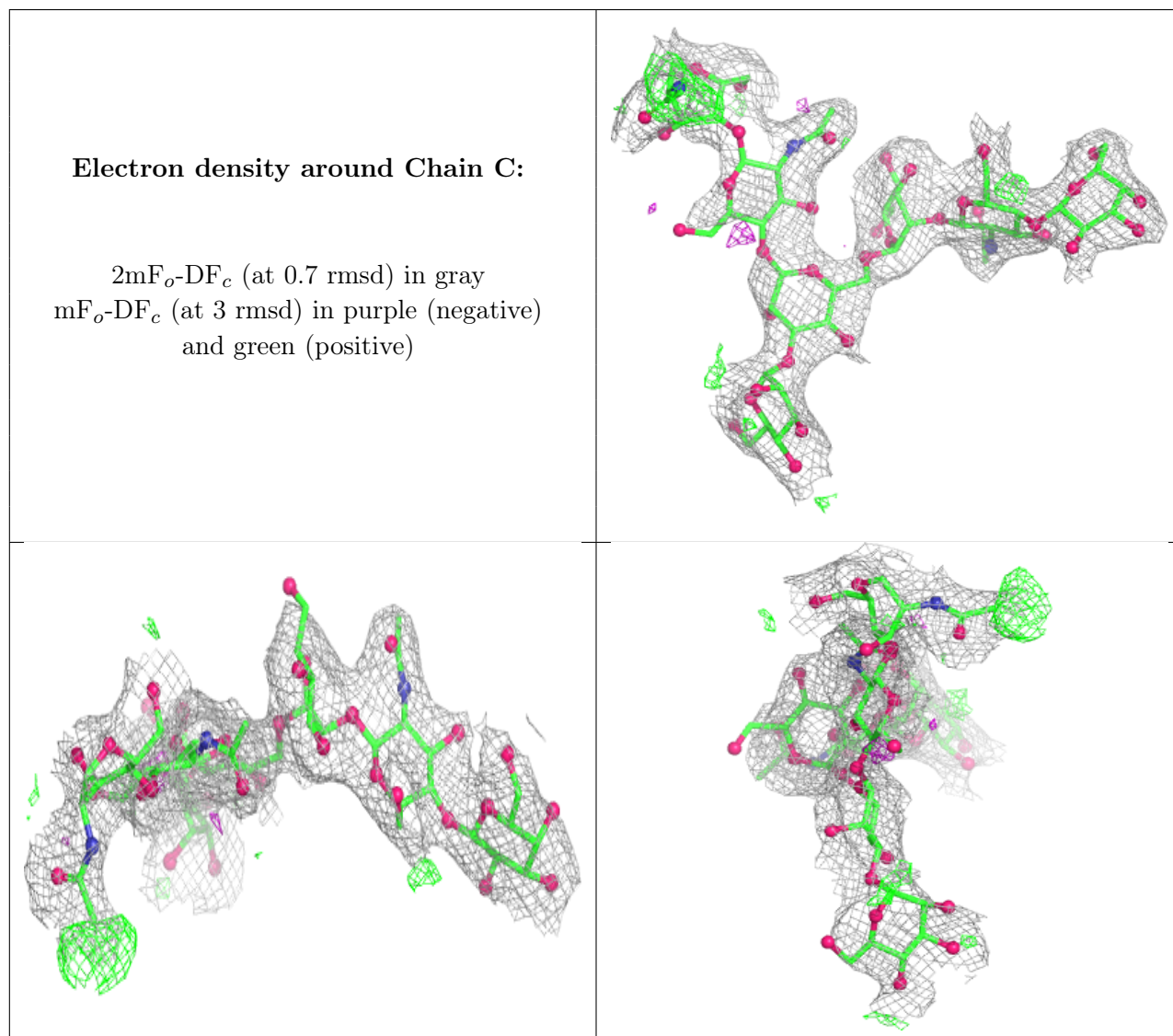
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	NAG	C	1	14/15	0.41	0.16	75,98,112,114	0
3	MAN	C	7	11/12	0.71	0.15	77,90,100,104	0
3	NAG	C	2	14/15	0.73	0.15	84,111,119,120	0
4	NAG	D	8	14/15	0.73	0.13	78,92,101,107	0
3	BMA	C	3	11/12	0.84	0.12	86,97,104,108	0

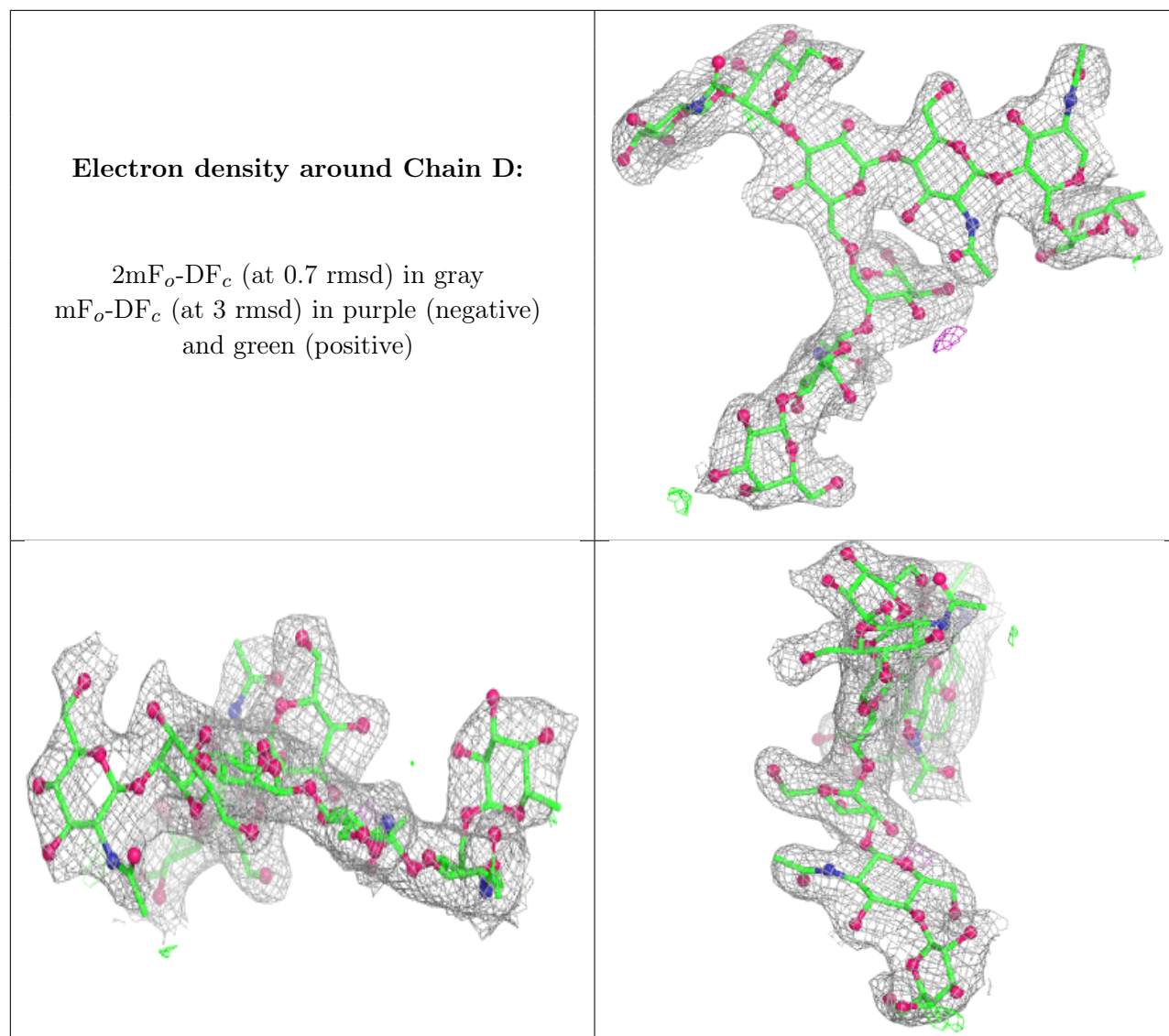
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	NAG	C	5	14/15	0.86	0.11	69,80,87,91	0
3	MAN	C	4	11/12	0.87	0.10	80,88,100,106	0
3	GAL	C	6	11/12	0.89	0.12	69,82,90,94	0
4	FUC	D	9	10/11	0.90	0.11	61,75,84,85	0
4	GAL	D	6	11/12	0.92	0.11	52,62,77,79	0
4	NAG	D	2	14/15	0.93	0.09	49,57,61,61	0
4	MAN	D	7	11/12	0.93	0.07	62,68,73,82	0
4	MAN	D	4	11/12	0.94	0.06	51,58,69,69	0
4	NAG	D	1	14/15	0.95	0.07	48,56,64,65	0
4	BMA	D	3	11/12	0.96	0.06	37,51,63,70	0
4	NAG	D	5	14/15	0.96	0.07	45,54,70,71	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.





## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.