



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 17, 2023 – 12:18 AM EDT

PDB ID : 2ERJ
Title : Crystal structure of the heterotrimeric interleukin-2 receptor in complex with interleukin-2
Authors : Debler, E.W.; Stauber, D.J.; Wilson, I.A.
Deposited on : 2005-10-25
Resolution : 3.00 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

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

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:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.35

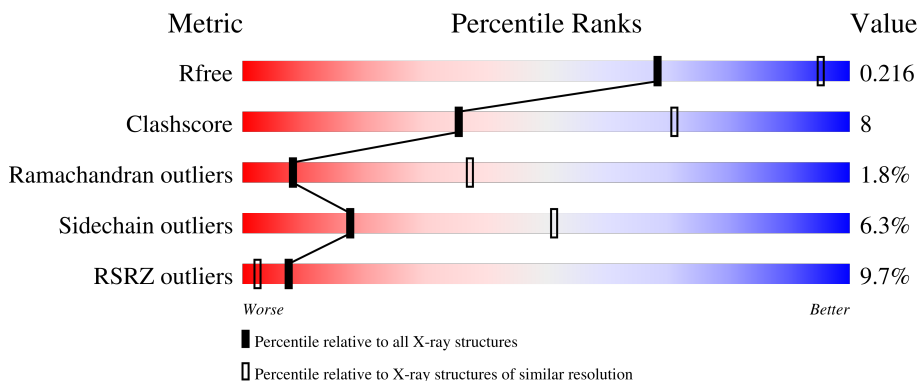
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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.



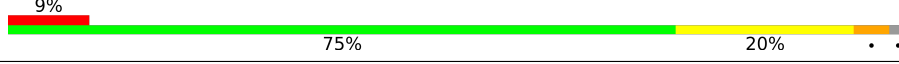
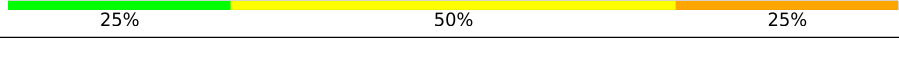
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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 ≥ 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	A	225	 8% 40% 15% 42%
1	E	225	 7% 43% 14% 42%
2	B	219	 7% 71% 20% 7%
2	F	219	 5% 73% 17% 8%
3	C	247	 4% 60% 17% 21%

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Mol	Chain	Length	Quality of chain
3	G	247	
4	D	133	
4	H	133	
5	I	4	
5	M	4	
6	J	2	
7	K	3	
7	O	3	
8	L	2	
8	P	2	
9	N	3	

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
5	NAG	I	2	-	-	-	X
8	NAG	L	2	-	-	-	X
8	NAG	P	1	-	-	-	X

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 11187 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 Interleukin-2 receptor alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	130	1028	637	185	191	15	0	0	0
1	E	131	1033	640	186	192	15	0	0	0

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	GLY	-	cloning artifact	UNP P01589
A	-3	MET	-	cloning artifact	UNP P01589
A	-2	LEU	-	cloning artifact	UNP P01589
A	-1	SER	-	cloning artifact	UNP P01589
A	0	LEU	-	cloning artifact	UNP P01589
A	49	SER	ASN	engineered mutation	UNP P01589
A	68	SER	ASN	engineered mutation	UNP P01589
A	213	THR	-	expression tag	UNP P01589
A	214	GLY	-	expression tag	UNP P01589
A	215	HIS	-	expression tag	UNP P01589
A	216	HIS	-	expression tag	UNP P01589
A	217	HIS	-	expression tag	UNP P01589
A	218	HIS	-	expression tag	UNP P01589
A	219	HIS	-	expression tag	UNP P01589
A	220	HIS	-	expression tag	UNP P01589
E	-4	GLY	-	cloning artifact	UNP P01589
E	-3	MET	-	cloning artifact	UNP P01589
E	-2	LEU	-	cloning artifact	UNP P01589
E	-1	SER	-	cloning artifact	UNP P01589
E	0	LEU	-	cloning artifact	UNP P01589
E	49	SER	ASN	engineered mutation	UNP P01589
E	68	SER	ASN	engineered mutation	UNP P01589
E	213	THR	-	expression tag	UNP P01589
E	214	GLY	-	expression tag	UNP P01589
E	215	HIS	-	expression tag	UNP P01589

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Chain	Residue	Modelled	Actual	Comment	Reference
E	216	HIS	-	expression tag	UNP P01589
E	217	HIS	-	expression tag	UNP P01589
E	218	HIS	-	expression tag	UNP P01589
E	219	HIS	-	expression tag	UNP P01589
E	220	HIS	-	expression tag	UNP P01589

- Molecule 2 is a protein called Interleukin-2 receptor beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	204	Total	C	N	O	S	0	0	0
			1676	1065	298	303	10			
2	F	201	Total	C	N	O	S	0	0	0
			1654	1051	294	299	10			

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	GLY	-	cloning artifact	UNP P14784
B	-3	MET	-	cloning artifact	UNP P14784
B	-2	LEU	-	cloning artifact	UNP P14784
B	-1	SER	-	cloning artifact	UNP P14784
B	0	LEU	-	cloning artifact	UNP P14784
B	207	THR	-	expression tag	UNP P14784
B	208	GLY	-	expression tag	UNP P14784
B	209	HIS	-	expression tag	UNP P14784
B	210	HIS	-	expression tag	UNP P14784
B	211	HIS	-	expression tag	UNP P14784
B	212	HIS	-	expression tag	UNP P14784
B	213	HIS	-	expression tag	UNP P14784
B	214	HIS	-	expression tag	UNP P14784
F	-4	GLY	-	cloning artifact	UNP P14784
F	-3	MET	-	cloning artifact	UNP P14784
F	-2	LEU	-	cloning artifact	UNP P14784
F	-1	SER	-	cloning artifact	UNP P14784
F	0	LEU	-	cloning artifact	UNP P14784
F	207	THR	-	expression tag	UNP P14784
F	208	GLY	-	expression tag	UNP P14784
F	209	HIS	-	expression tag	UNP P14784
F	210	HIS	-	expression tag	UNP P14784
F	211	HIS	-	expression tag	UNP P14784
F	212	HIS	-	expression tag	UNP P14784
F	213	HIS	-	expression tag	UNP P14784

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Chain	Residue	Modelled	Actual	Comment	Reference
F	214	HIS	-	expression tag	UNP P14784

- Molecule 3 is a protein called Cytokine receptor common gamma chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	195	Total	C	N	O	S	0	0	0
			1655	1052	294	301	8			
3	G	195	Total	C	N	O	S	0	0	0
			1655	1052	294	301	8			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	GLY	-	cloning artifact	UNP P31785
C	-3	MET	-	cloning artifact	UNP P31785
C	-2	LEU	-	cloning artifact	UNP P31785
C	-1	SER	-	cloning artifact	UNP P31785
C	0	LEU	-	cloning artifact	UNP P31785
C	53	GLN	ASN	engineered mutation	UNP P31785
C	234	ARG	-	expression tag	UNP P31785
C	235	THR	-	expression tag	UNP P31785
C	236	GLY	-	expression tag	UNP P31785
C	237	HIS	-	expression tag	UNP P31785
C	238	HIS	-	expression tag	UNP P31785
C	239	HIS	-	expression tag	UNP P31785
C	240	HIS	-	expression tag	UNP P31785
C	241	HIS	-	expression tag	UNP P31785
C	242	HIS	-	expression tag	UNP P31785
G	-4	GLY	-	cloning artifact	UNP P31785
G	-3	MET	-	cloning artifact	UNP P31785
G	-2	LEU	-	cloning artifact	UNP P31785
G	-1	SER	-	cloning artifact	UNP P31785
G	0	LEU	-	cloning artifact	UNP P31785
G	53	GLN	ASN	engineered mutation	UNP P31785
G	234	ARG	-	expression tag	UNP P31785
G	235	THR	-	expression tag	UNP P31785
G	236	GLY	-	expression tag	UNP P31785
G	237	HIS	-	expression tag	UNP P31785
G	238	HIS	-	expression tag	UNP P31785
G	239	HIS	-	expression tag	UNP P31785
G	240	HIS	-	expression tag	UNP P31785
G	241	HIS	-	expression tag	UNP P31785

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Chain	Residue	Modelled	Actual	Comment	Reference
G	242	HIS	-	expression tag	UNP P31785

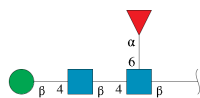
- Molecule 4 is a protein called Interleukin-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	D	131	1068	685	176	201	6	0	0	0
4	H	131	1068	685	176	201	6	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	125	ALA	CYS	engineered mutation	UNP P60568
H	125	ALA	CYS	engineered mutation	UNP P60568

- Molecule 5 is an oligosaccharide called 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.



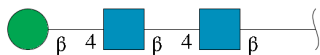
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	I	4	49	28	2	19	0	0	0	
5	M	4	49	28	2	19	0	0	0	

- Molecule 6 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
6	J	2	24	14	1	9	0	0	0	

- Molecule 7 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



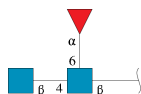
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
7	K	3	39	22	2	15	0	0	0
7	O	3	39	22	2	15	0	0	0

- Molecule 8 is an oligosaccharide called 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			
8	L	2	28	16	2	10	0	0	0
8	P	2	28	16	2	10	0	0	0

- Molecule 9 is an oligosaccharide called 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			
9	N	3	38	22	2	14	0	0	0

- Molecule 10 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).

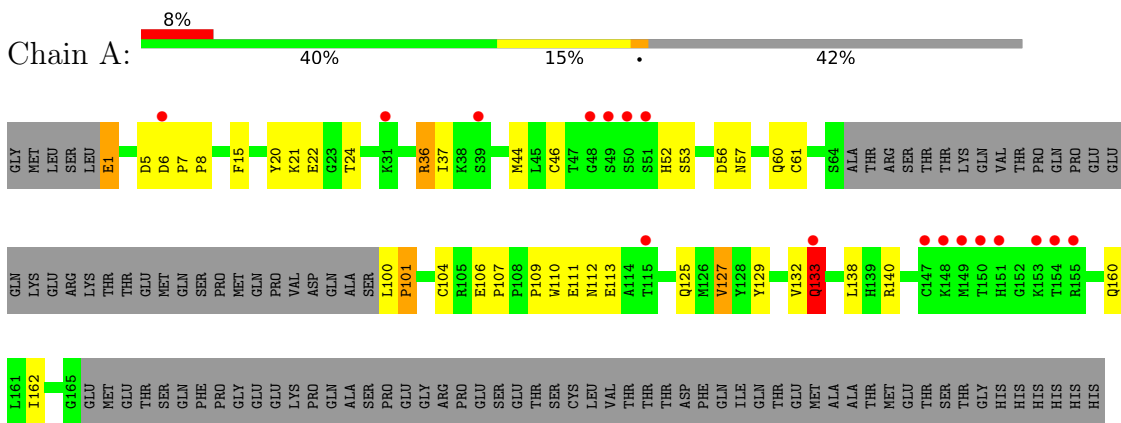


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
10	C	1	Total 14	C 8	N 1	O 5	0	0
10	C	1	Total 14	C 8	N 1	O 5	0	0
10	G	1	Total 14	C 8	N 1	O 5	0	0
10	G	1	Total 14	C 8	N 1	O 5	0	0

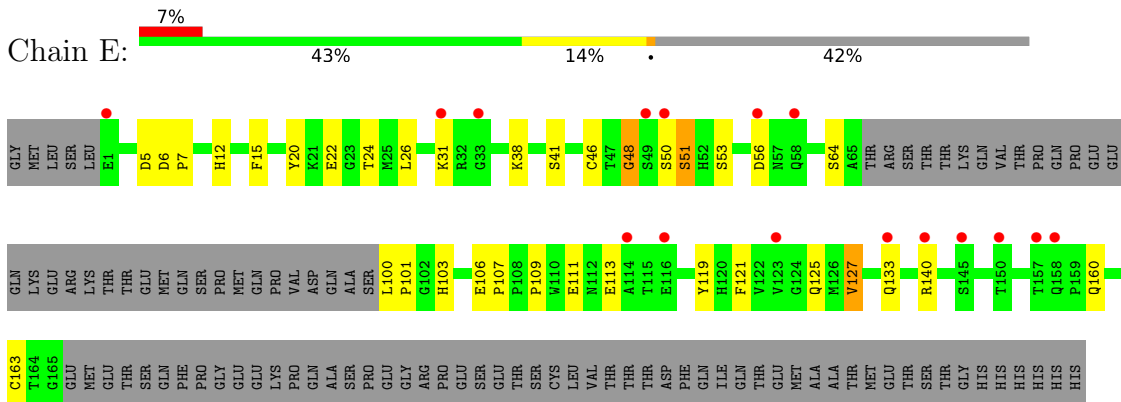
3 Residue-property plots i

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 electron 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 dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

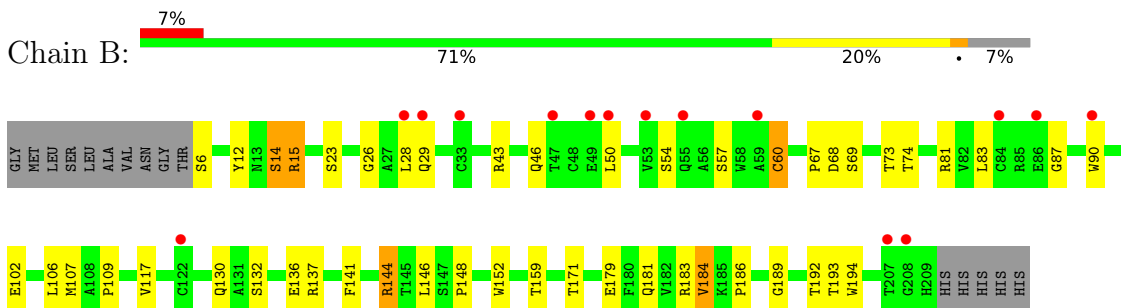
- Molecule 1: Interleukin-2 receptor alpha chain



- Molecule 1: Interleukin-2 receptor alpha chain

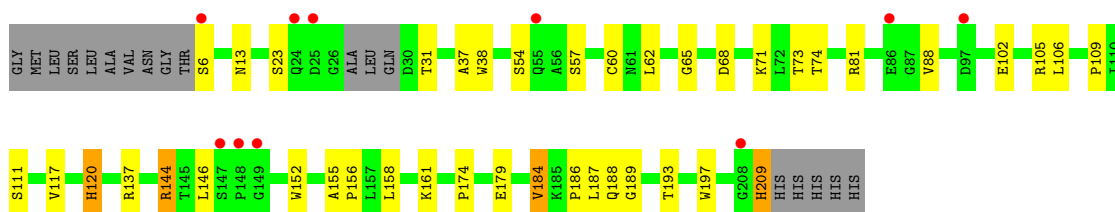


- Molecule 2: Interleukin-2 receptor beta chain



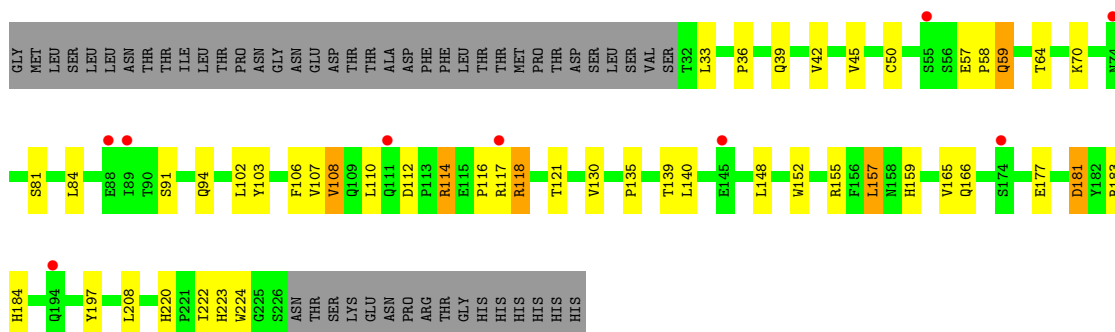
- Molecule 2: Interleukin-2 receptor beta chain

Chain F: 5% 73% 17% 8%



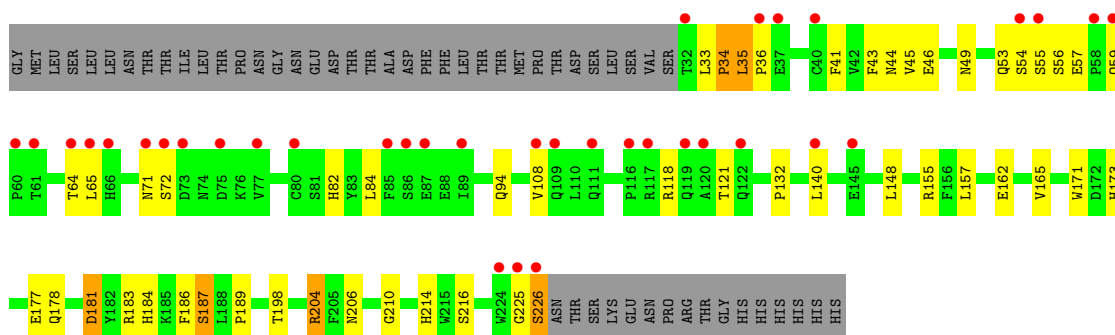
- Molecule 3: Cytokine receptor common gamma chain

Chain C: 4% 60% 17% 21%



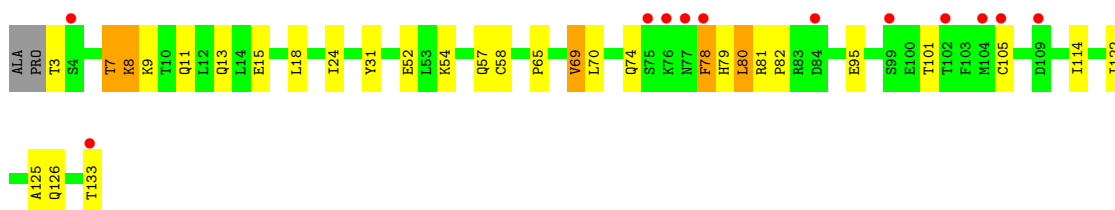
- Molecule 3: Cytokine receptor common gamma chain

Chain G: 15% 58% 18% 21%

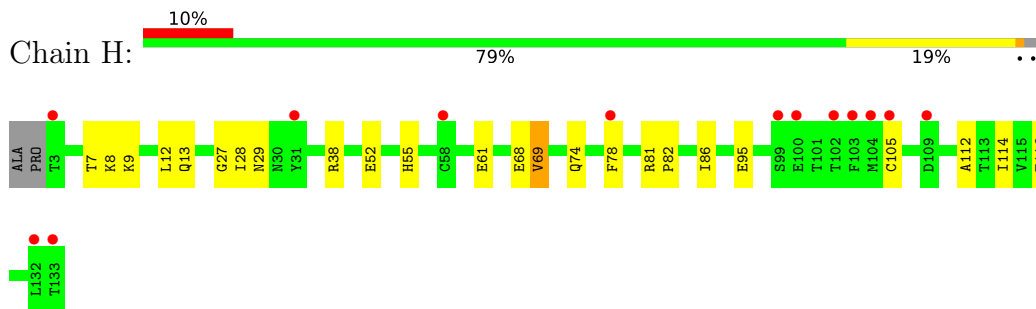


- Molecule 4: Interleukin-2

Chain D: 9% 75% 20% 2%



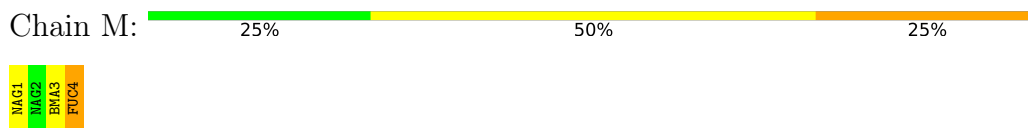
- Molecule 4: Interleukin-2



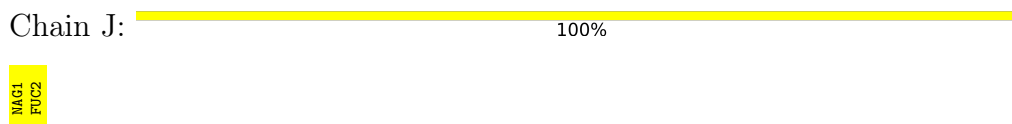
- Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



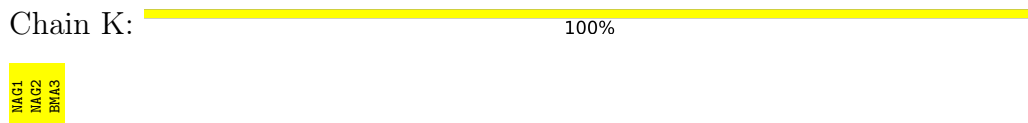
- Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 6: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose




- Molecule 7: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 7: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose




- Molecule 8: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain L:  100%

MAG1
MAG2

- Molecule 8: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain P:  100%

MAG1
MAG2

- Molecule 9: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain N:  33% 67%

MAG1
MAG2
FUC3

4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	57.27Å 70.55Å 129.24Å 83.85° 82.45° 89.72°	Depositor
Resolution (Å)	129.10 – 3.00 45.45 – 3.00	Depositor EDS
% Data completeness (in resolution range)	93.4 (129.10-3.00) 93.4 (45.45-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.76 (at 3.01Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.220 , 0.263 0.220 , 0.216	Depositor DCC
R_{free} test set	1861 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	78.4	Xtrriage
Anisotropy	0.144	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 103.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	11187	wwPDB-VP
Average B, all atoms (Å ²)	92.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.98% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: NAG, FUC, BMA

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	0.43	0/1056	0.55	0/1427
1	E	0.39	0/1061	0.53	0/1434
2	B	0.52	0/1725	0.62	0/2353
2	F	0.54	0/1702	0.62	0/2320
3	C	0.48	0/1710	0.65	0/2329
3	G	0.43	0/1710	0.61	0/2329
4	D	0.48	0/1085	0.61	1/1464 (0.1%)
4	H	0.45	0/1085	0.58	0/1464
All	All	0.47	0/11134	0.60	1/15120 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
4	D	80	LEU	CA-CB-CG	5.13	127.11	115.30

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	1028	0	967	20	0
1	E	1033	0	972	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	1676	0	1615	32	0
2	F	1654	0	1590	31	0
3	C	1655	0	1555	26	0
3	G	1655	0	1555	26	0
4	D	1068	0	1103	16	0
4	H	1068	0	1103	15	0
5	I	49	0	43	0	0
5	M	49	0	43	2	0
6	J	24	0	22	1	0
7	K	39	0	34	0	0
7	O	39	0	34	0	0
8	L	28	0	25	0	0
8	P	28	0	25	0	0
9	N	38	0	34	3	0
10	C	28	0	26	0	0
10	G	28	0	26	0	0
All	All	11187	0	10772	177	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 8.

The worst 5 of 177 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:20:TYR:HB3	1:A:24:THR:HG21	1.50	0.93
3:G:33:LEU:N	3:G:34:PRO:HD2	1.89	0.86
1:E:20:TYR:HB3	1:E:24:THR:HG21	1.58	0.85
2:F:81:ARG:NH2	9:N:3:FUC:H61	1.95	0.81
4:H:69:VAL:HG11	4:H:114:ILE:HD12	1.63	0.81

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

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	126/225 (56%)	108 (86%)	15 (12%)	3 (2%)	6	29
1	E	127/225 (56%)	110 (87%)	14 (11%)	3 (2%)	6	29
2	B	202/219 (92%)	185 (92%)	14 (7%)	3 (2%)	10	42
2	F	197/219 (90%)	181 (92%)	16 (8%)	0	100	100
3	C	193/247 (78%)	171 (89%)	16 (8%)	6 (3%)	4	23
3	G	193/247 (78%)	168 (87%)	19 (10%)	6 (3%)	4	23
4	D	129/133 (97%)	120 (93%)	8 (6%)	1 (1%)	19	57
4	H	129/133 (97%)	121 (94%)	7 (5%)	1 (1%)	19	57
All	All	1296/1648 (79%)	1164 (90%)	109 (8%)	23 (2%)	8	37

5 of 23 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	111	GLU
1	A	133	GLN
3	C	117	ARG
2	B	148	PRO
3	C	181	ASP

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	A	114/200 (57%)	106 (93%)	8 (7%)	15	47
1	E	114/200 (57%)	109 (96%)	5 (4%)	28	65
2	B	186/198 (94%)	174 (94%)	12 (6%)	17	50
2	F	184/198 (93%)	173 (94%)	11 (6%)	19	53
3	C	188/236 (80%)	177 (94%)	11 (6%)	19	54
3	G	188/236 (80%)	173 (92%)	15 (8%)	12	40

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	D	124/125 (99%)	114 (92%)	10 (8%)	11	40
4	H	124/125 (99%)	119 (96%)	5 (4%)	31	68
All	All	1222/1518 (80%)	1145 (94%)	77 (6%)	18	51

5 of 77 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	G	35	LEU
3	G	226	SER
3	G	54	SER
3	G	157	LEU
4	H	95	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	139	HIS
2	F	36	HIS
4	H	119	ASN
3	G	82	HIS
4	D	126	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](#)

23 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	I	1	2,5	14,14,15	0.57	0	17,19,21	1.16	1 (5%)
5	NAG	I	2	5	14,14,15	0.59	0	17,19,21	0.87	1 (5%)
5	BMA	I	3	5	11,11,12	0.71	0	15,15,17	1.46	2 (13%)
5	FUC	I	4	5	10,10,11	0.78	0	14,14,16	0.81	0
6	NAG	J	1	2,6	14,14,15	0.50	0	17,19,21	1.38	3 (17%)
6	FUC	J	2	6	10,10,11	0.66	0	14,14,16	0.58	0
7	NAG	K	1	2,7	14,14,15	0.61	0	17,19,21	0.98	1 (5%)
7	NAG	K	2	7	14,14,15	0.53	0	17,19,21	1.04	2 (11%)
7	BMA	K	3	7	11,11,12	0.50	0	15,15,17	1.30	1 (6%)
8	NAG	L	1	8,3	14,14,15	0.67	0	17,19,21	1.29	2 (11%)
8	NAG	L	2	8	14,14,15	0.69	0	17,19,21	1.48	3 (17%)
5	NAG	M	1	2,5	14,14,15	0.66	0	17,19,21	1.05	1 (5%)
5	NAG	M	2	5	14,14,15	0.56	0	17,19,21	0.91	0
5	BMA	M	3	5	11,11,12	0.65	0	15,15,17	1.92	3 (20%)
5	FUC	M	4	5	10,10,11	0.74	0	14,14,16	0.88	1 (7%)
9	NAG	N	1	2,9	14,14,15	0.47	0	17,19,21	1.55	3 (17%)
9	NAG	N	2	9	14,14,15	0.44	0	17,19,21	1.29	1 (5%)
9	FUC	N	3	9	10,10,11	0.59	0	14,14,16	0.94	1 (7%)
7	NAG	O	1	2,7	14,14,15	0.63	0	17,19,21	1.11	1 (5%)
7	NAG	O	2	7	14,14,15	0.54	0	17,19,21	1.38	2 (11%)
7	BMA	O	3	7	11,11,12	0.64	0	15,15,17	1.04	1 (6%)
8	NAG	P	1	8,3	14,14,15	0.66	0	17,19,21	0.96	2 (11%)
8	NAG	P	2	8	14,14,15	0.65	0	17,19,21	1.28	2 (11%)

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	I	1	2,5	-	2/6/23/26	0/1/1/1
5	NAG	I	2	5	-	4/6/23/26	0/1/1/1
5	BMA	I	3	5	-	2/2/19/22	0/1/1/1
5	FUC	I	4	5	-	-	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	NAG	J	1	2,6	-	2/6/23/26	0/1/1/1
6	FUC	J	2	6	-	-	0/1/1/1
7	NAG	K	1	2,7	-	0/6/23/26	0/1/1/1
7	NAG	K	2	7	-	2/6/23/26	0/1/1/1
7	BMA	K	3	7	-	2/2/19/22	0/1/1/1
8	NAG	L	1	8,3	-	3/6/23/26	0/1/1/1
8	NAG	L	2	8	-	2/6/23/26	0/1/1/1
5	NAG	M	1	2,5	-	0/6/23/26	0/1/1/1
5	NAG	M	2	5	-	0/6/23/26	0/1/1/1
5	BMA	M	3	5	-	0/2/19/22	0/1/1/1
5	FUC	M	4	5	-	-	0/1/1/1
9	NAG	N	1	2,9	-	2/6/23/26	0/1/1/1
9	NAG	N	2	9	-	4/6/23/26	0/1/1/1
9	FUC	N	3	9	-	-	0/1/1/1
7	NAG	O	1	2,7	-	2/6/23/26	0/1/1/1
7	NAG	O	2	7	-	2/6/23/26	0/1/1/1
7	BMA	O	3	7	-	2/2/19/22	0/1/1/1
8	NAG	P	1	8,3	-	3/6/23/26	0/1/1/1
8	NAG	P	2	8	-	3/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	M	3	BMA	C1-O5-C5	5.34	119.43	112.19
9	N	2	NAG	C1-O5-C5	4.40	118.15	112.19
7	K	3	BMA	C1-O5-C5	3.90	117.47	112.19
5	M	3	BMA	C1-C2-C3	3.76	114.29	109.67
7	O	2	NAG	C1-O5-C5	3.73	117.25	112.19

There are no chirality outliers.

5 of 37 torsion outliers are listed below:

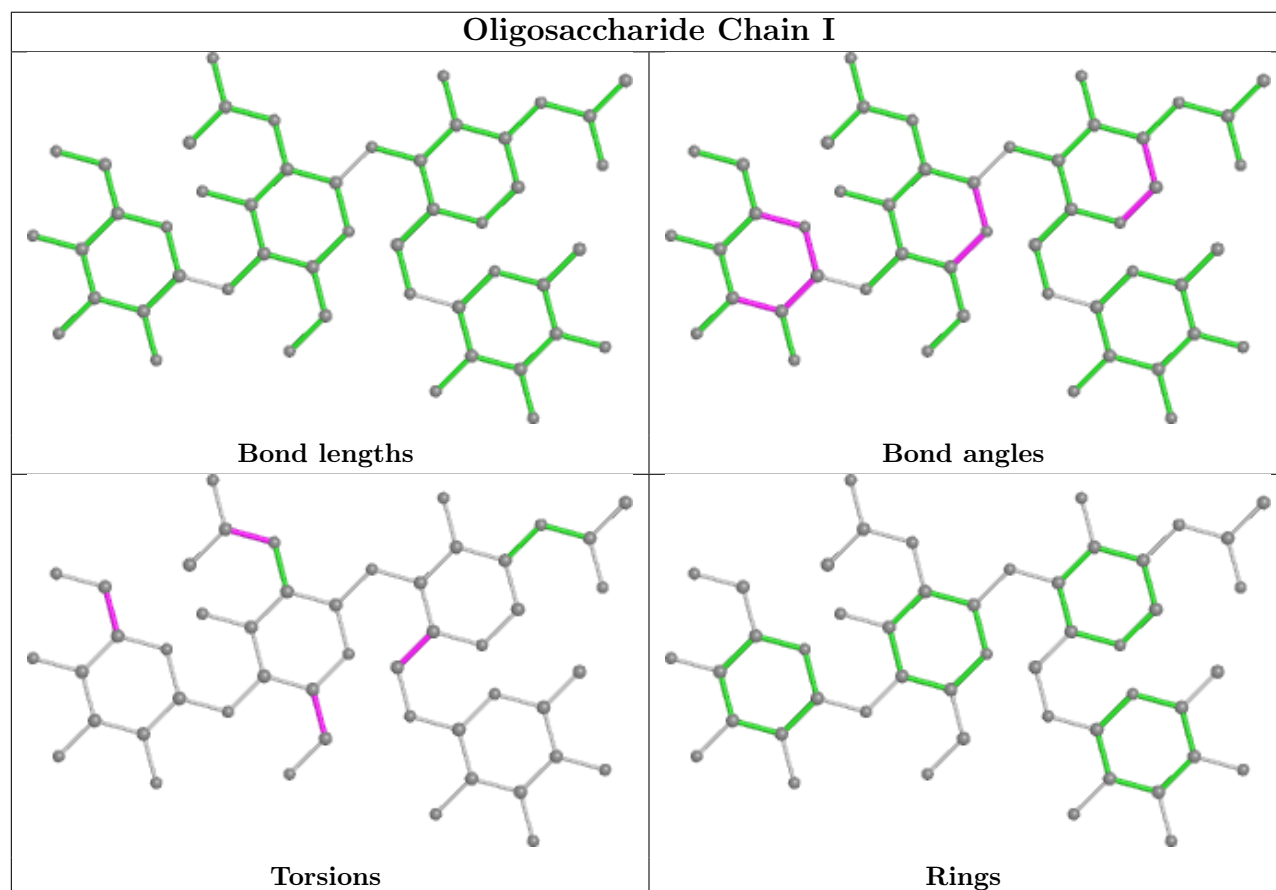
Mol	Chain	Res	Type	Atoms
8	L	2	NAG	C8-C7-N2-C2
8	L	2	NAG	O7-C7-N2-C2
8	P	1	NAG	C3-C2-N2-C7
8	P	1	NAG	C8-C7-N2-C2
8	P	1	NAG	O7-C7-N2-C2

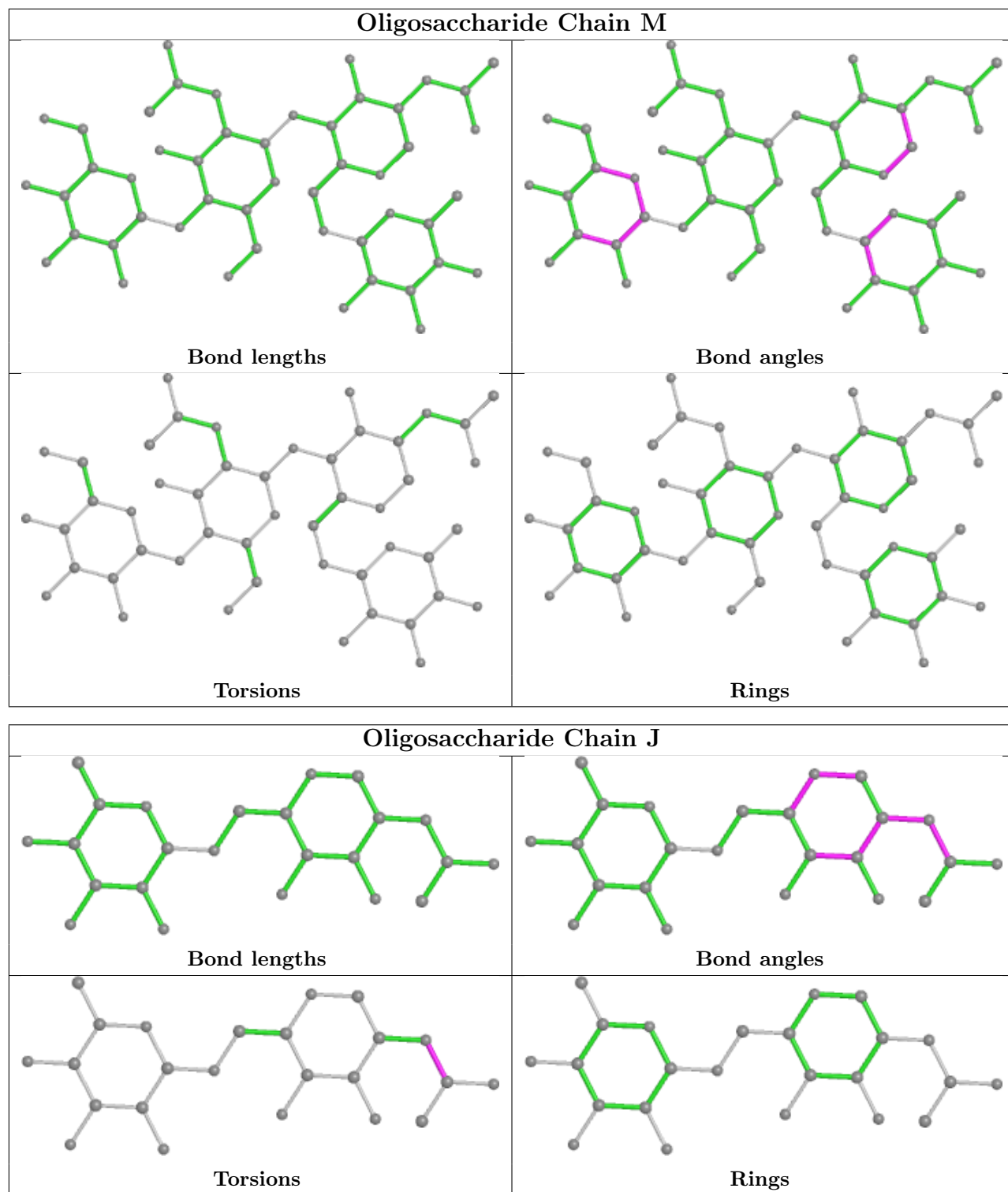
There are no ring outliers.

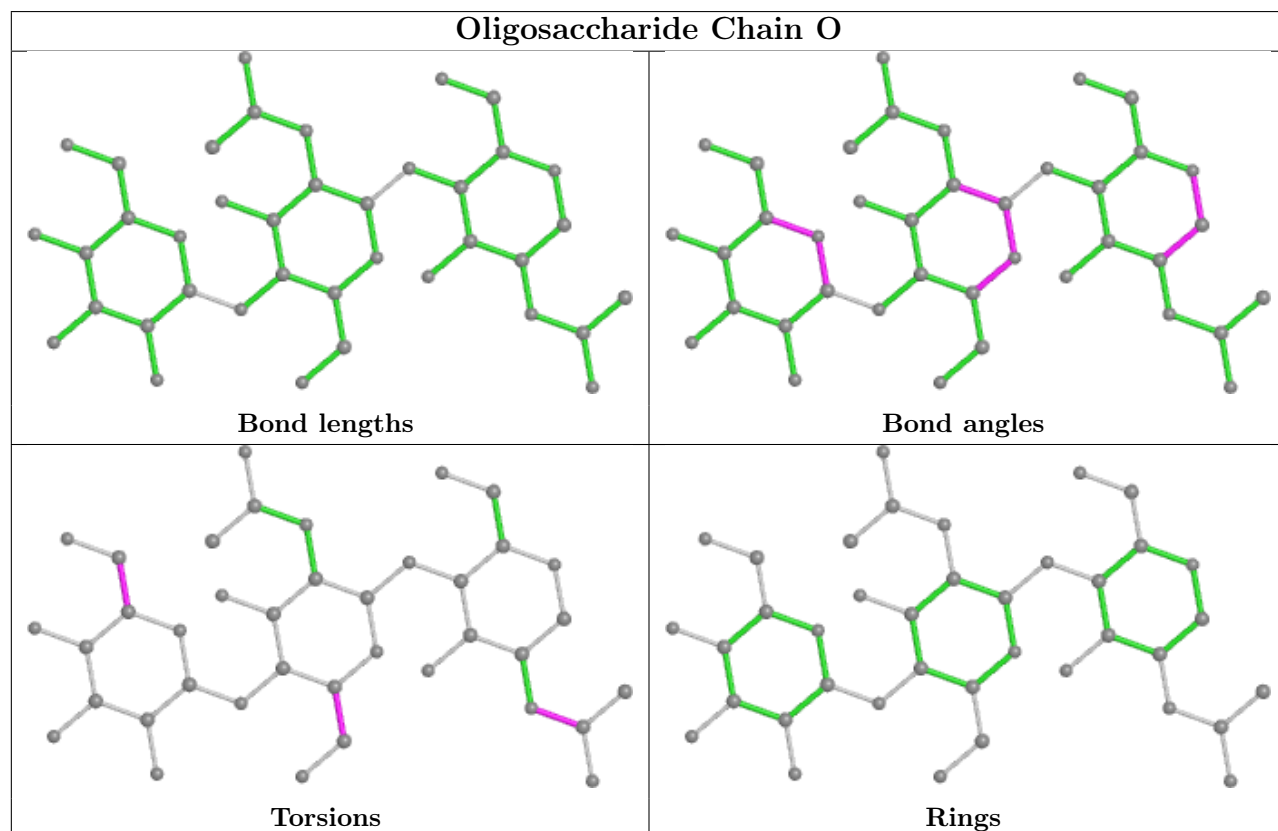
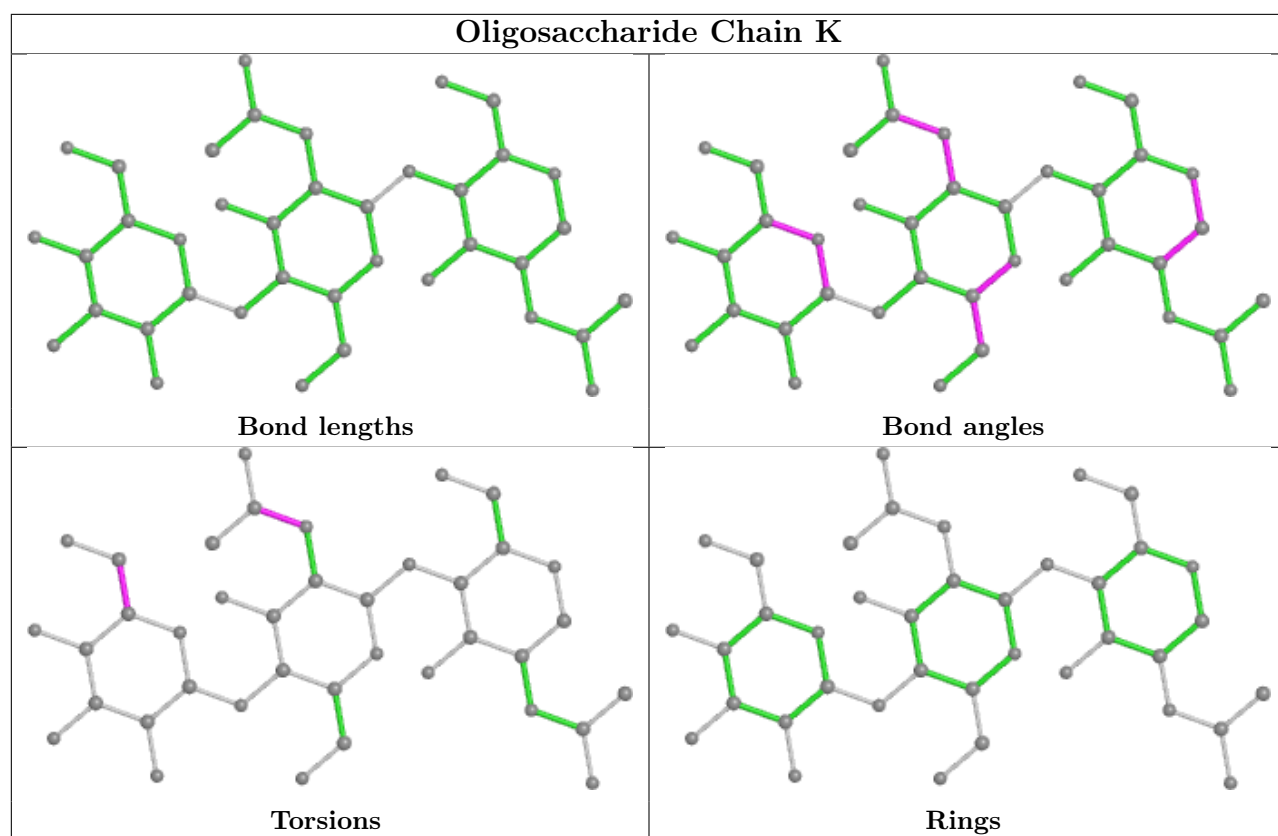
4 monomers are involved in 6 short contacts:

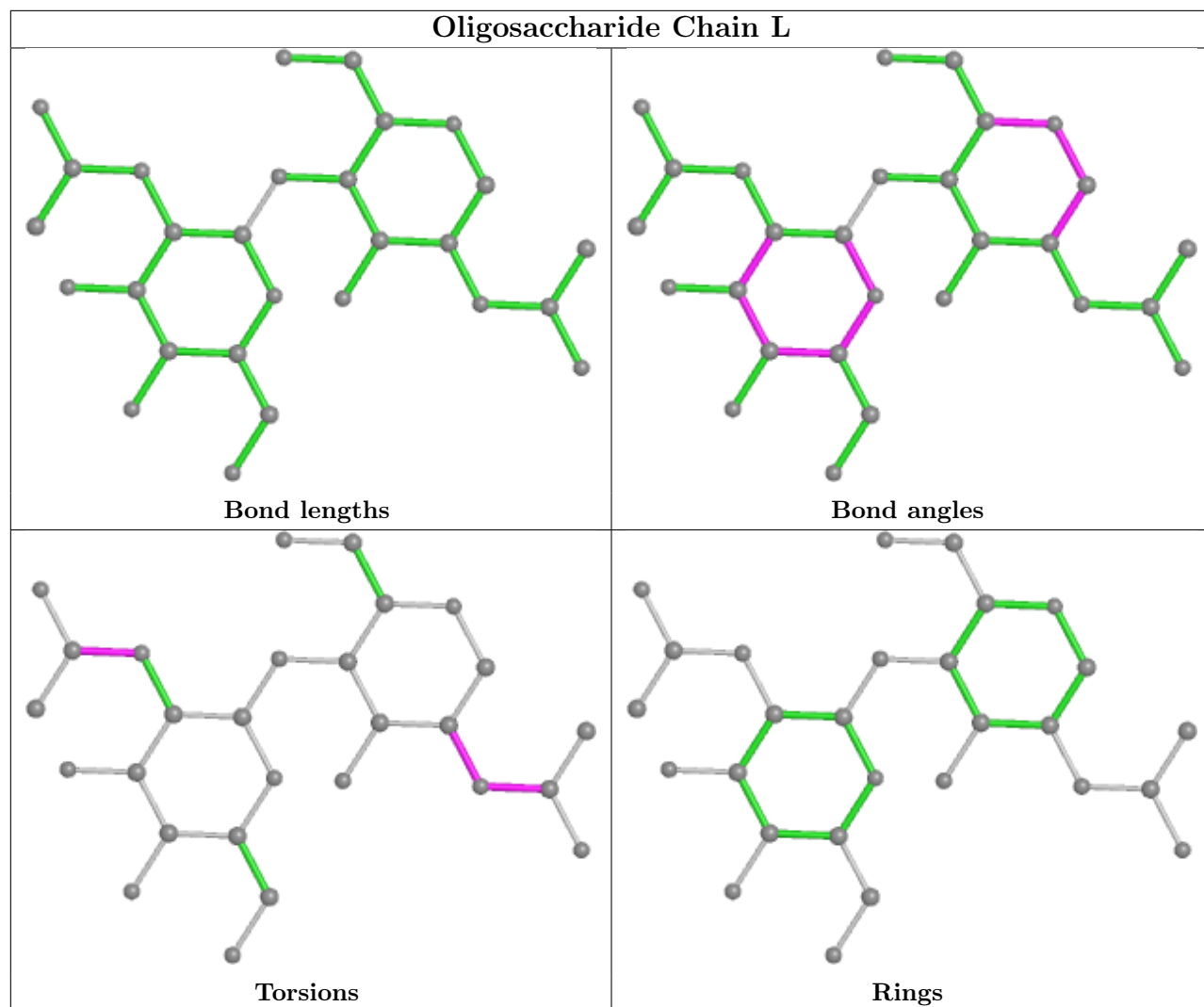
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	J	2	FUC	1	0
9	N	1	NAG	1	0
5	M	4	FUC	2	0
9	N	3	FUC	2	0

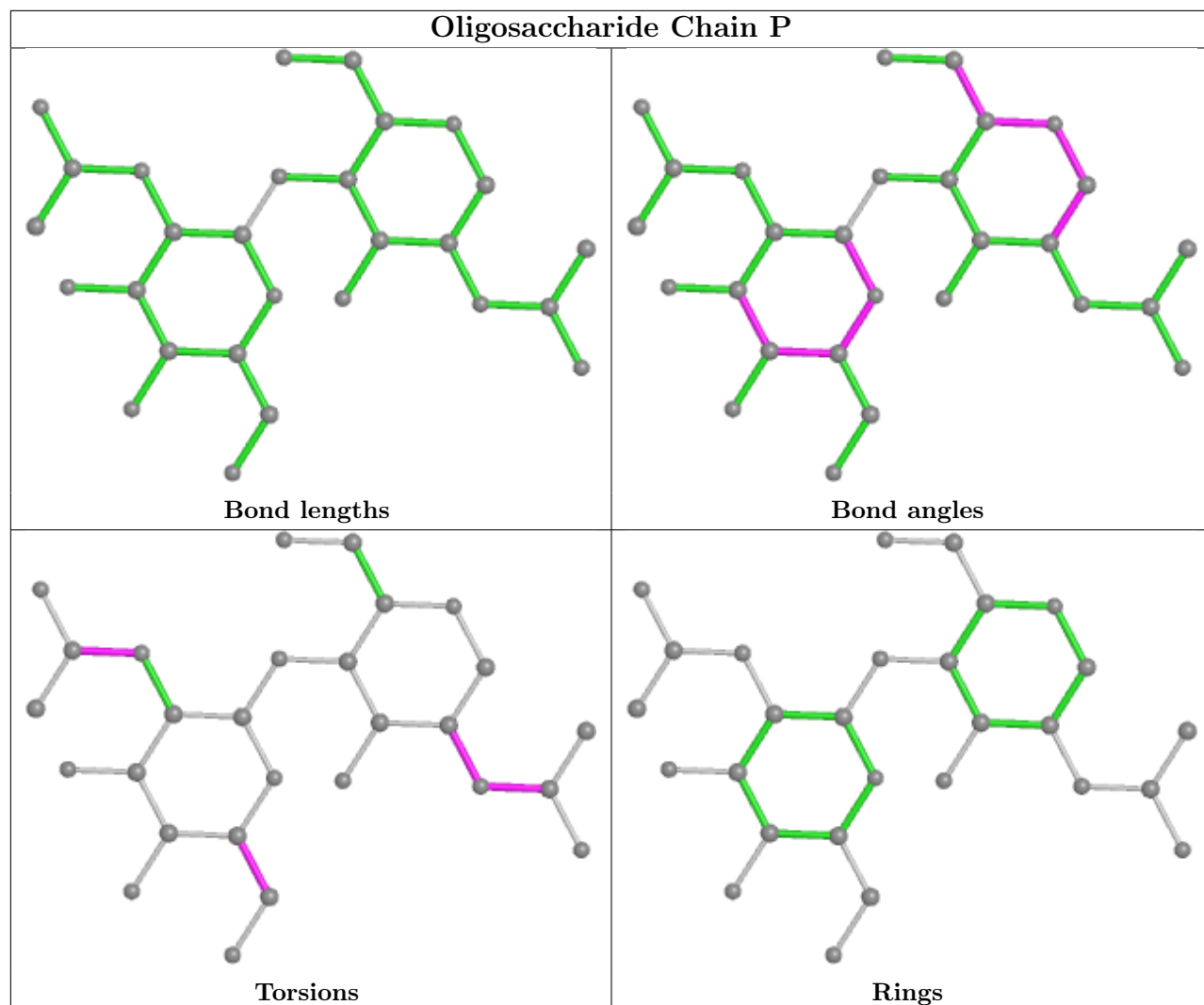
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

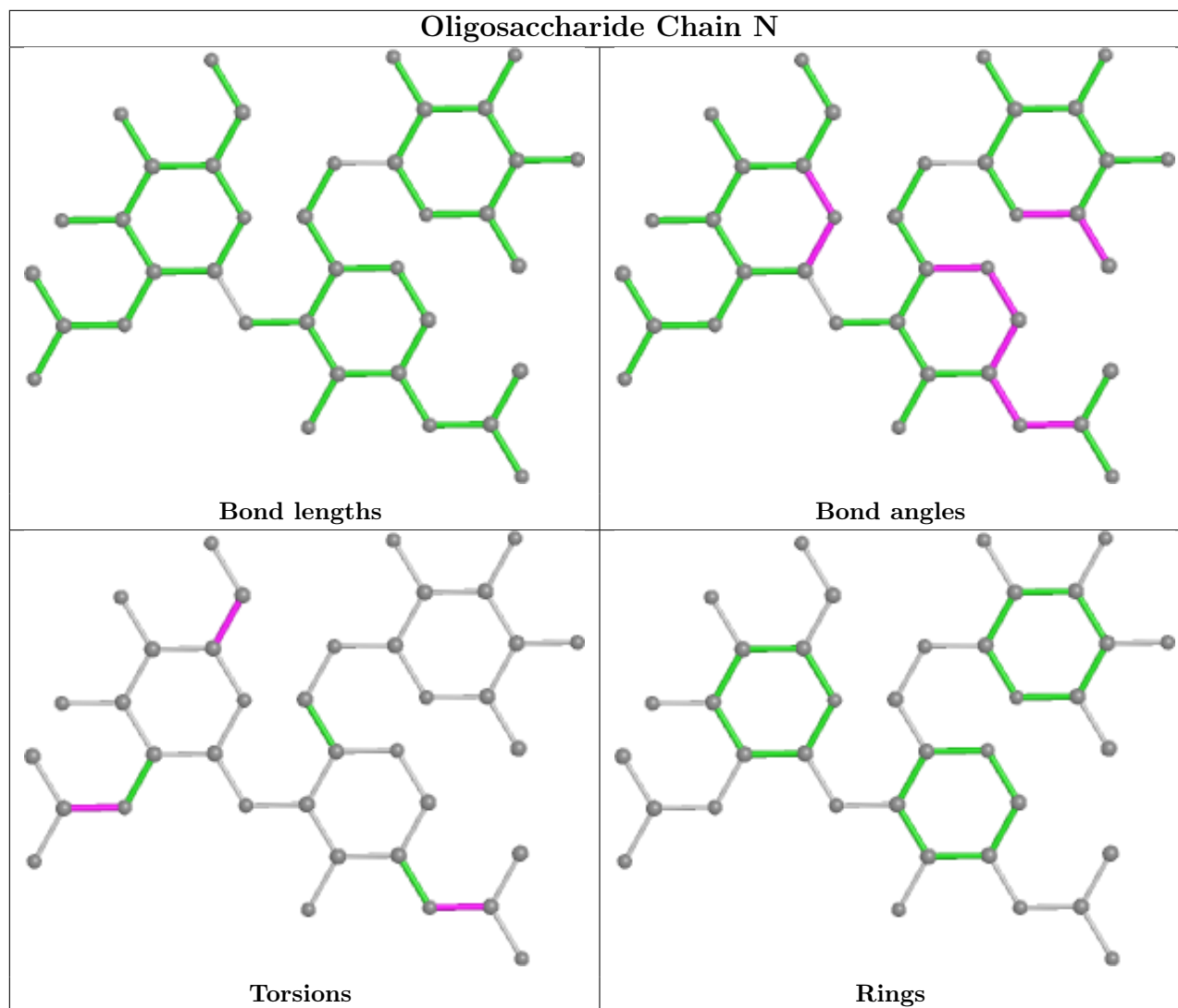












5.6 Ligand geometry [i](#)

4 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	$\# Z > 2$
10	NAG	C	400	3	14,14,15	0.40	0	17,19,21	1.85	3 (17%)
10	NAG	G	400	3	14,14,15	0.54	0	17,19,21	1.61	4 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
10	NAG	G	500	3	14,14,15	0.53	0	17,19,21	1.03	2 (11%)
10	NAG	C	500	3	14,14,15	0.53	0	17,19,21	1.38	3 (17%)

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
10	NAG	C	400	3	-	4/6/23/26	0/1/1/1
10	NAG	G	400	3	-	4/6/23/26	0/1/1/1
10	NAG	G	500	3	-	0/6/23/26	0/1/1/1
10	NAG	C	500	3	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	C	400	NAG	C1-O5-C5	4.61	118.44	112.19
10	G	400	NAG	O5-C5-C6	3.79	113.15	107.20
10	G	400	NAG	C1-O5-C5	3.35	116.73	112.19
10	C	500	NAG	C1-O5-C5	3.23	116.57	112.19
10	C	400	NAG	O5-C5-C6	3.20	112.22	107.20

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
10	G	400	NAG	C8-C7-N2-C2
10	G	400	NAG	O7-C7-N2-C2
10	C	400	NAG	O5-C5-C6-O6
10	G	400	NAG	O5-C5-C6-O6
10	G	400	NAG	C4-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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, 95th 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 ²)	Q < 0.9
1	A	130/225 (57%)	0.95	17 (13%) 3 1	85, 91, 96, 97	0
1	E	131/225 (58%)	0.81	16 (12%) 4 1	86, 92, 96, 98	0
2	B	204/219 (93%)	0.60	15 (7%) 14 4	82, 91, 96, 100	0
2	F	201/219 (91%)	0.43	10 (4%) 28 10	82, 92, 96, 100	0
3	C	195/247 (78%)	0.54	9 (4%) 32 12	88, 92, 97, 102	0
3	G	195/247 (78%)	1.07	36 (18%) 1 0	87, 93, 97, 102	0
4	D	131/133 (98%)	0.75	12 (9%) 9 3	83, 92, 100, 103	0
4	H	131/133 (98%)	0.72	13 (9%) 7 2	84, 92, 100, 105	0
All	All	1318/1648 (79%)	0.72	128 (9%) 7 2	82, 92, 97, 105	0

The worst 5 of 128 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	G	54	SER	12.3
4	H	102	THR	9.1
2	F	25	ASP	7.9
1	A	49	SER	7.8
4	H	133	THR	7.8

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,

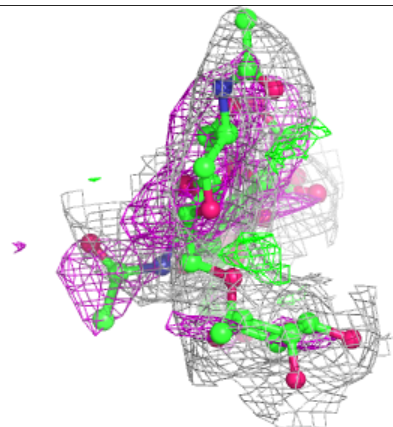
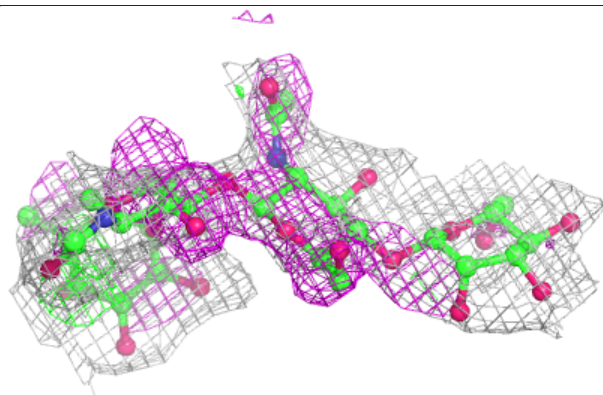
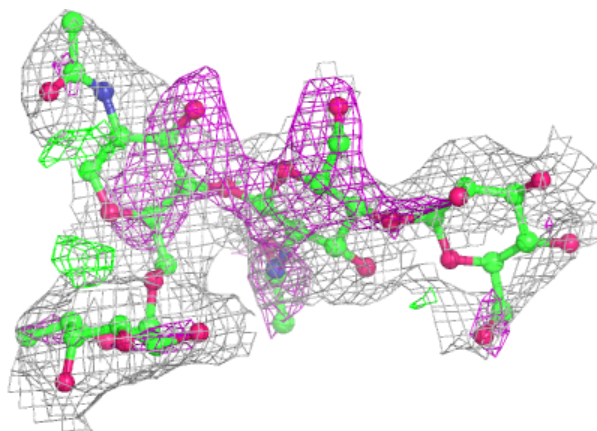
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
7	BMA	K	3	11/12	0.63	0.32	106,108,109,109	0
5	BMA	M	3	11/12	0.67	0.31	108,110,112,113	0
8	NAG	P	2	14/15	0.70	0.40	114,116,117,117	0
9	NAG	N	2	14/15	0.72	0.33	108,111,112,113	0
9	NAG	N	1	14/15	0.73	0.32	97,98,101,105	0
7	BMA	O	3	11/12	0.76	0.28	97,99,100,101	0
8	NAG	P	1	14/15	0.77	0.48	105,107,110,112	0
5	BMA	I	3	11/12	0.79	0.29	114,116,117,117	0
5	NAG	I	2	14/15	0.79	0.48	101,105,108,111	0
7	NAG	K	2	14/15	0.79	0.28	94,96,99,103	0
8	NAG	L	2	14/15	0.80	0.52	97,99,101,102	0
9	FUC	N	3	10/11	0.82	0.30	102,102,102,102	0
7	NAG	O	2	14/15	0.85	0.22	80,86,88,93	0
5	NAG	I	1	14/15	0.85	0.27	77,85,88,94	0
5	NAG	M	2	14/15	0.87	0.23	91,94,99,104	0
6	NAG	J	1	14/15	0.88	0.16	94,95,96,97	0
6	FUC	J	2	10/11	0.90	0.35	96,97,97,97	0
7	NAG	K	1	14/15	0.90	0.20	85,86,87,90	0
8	NAG	L	1	14/15	0.91	0.22	88,89,91,95	0
5	NAG	M	1	14/15	0.92	0.16	73,79,81,86	0
5	FUC	I	4	10/11	0.92	0.13	72,74,75,76	0
7	NAG	O	1	14/15	0.92	0.19	74,75,78,79	0
5	FUC	M	4	10/11	0.94	0.14	70,70,72,72	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.

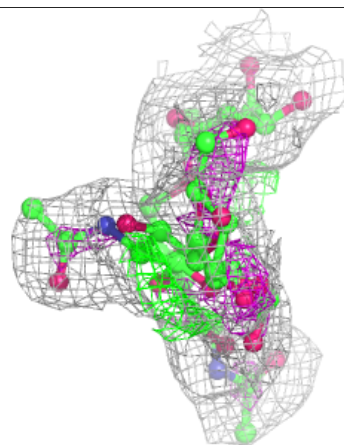
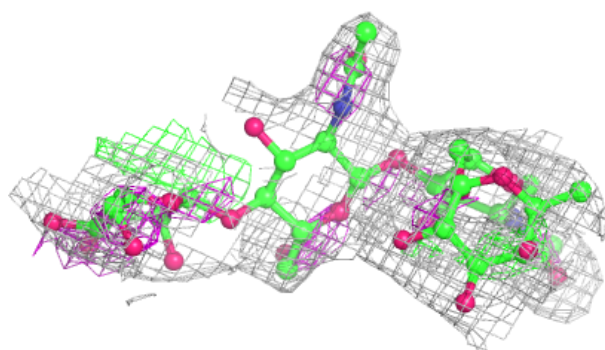
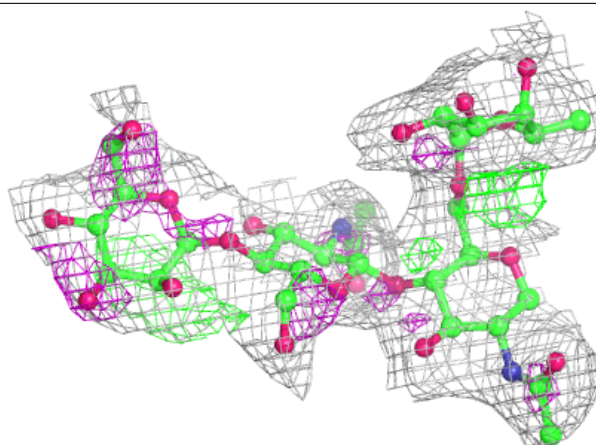
Electron density around Chain I:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

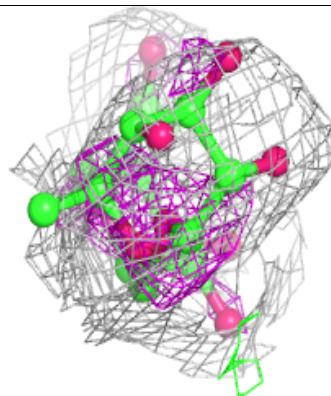
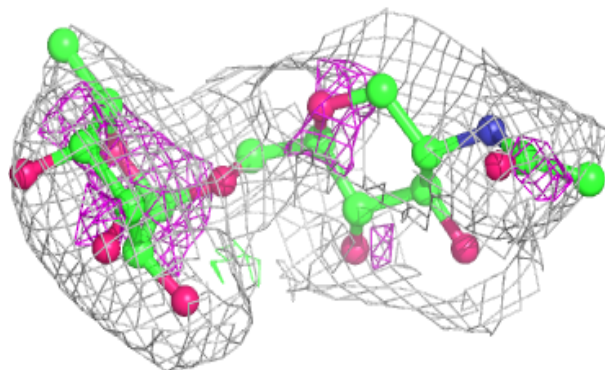
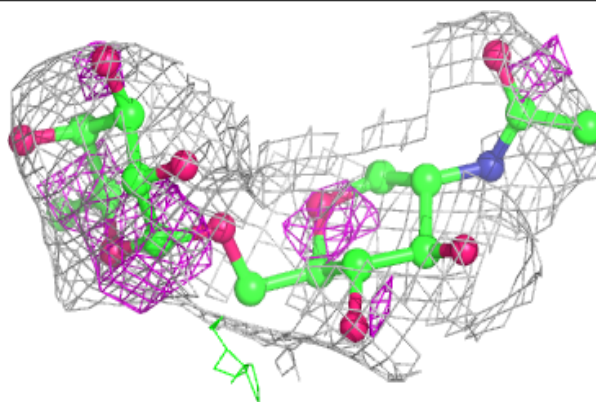


Electron density around Chain M:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

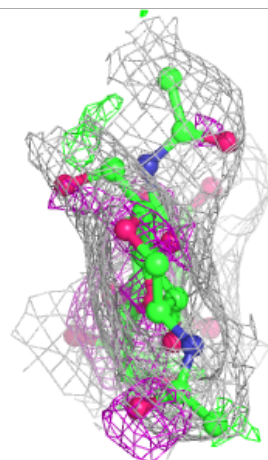
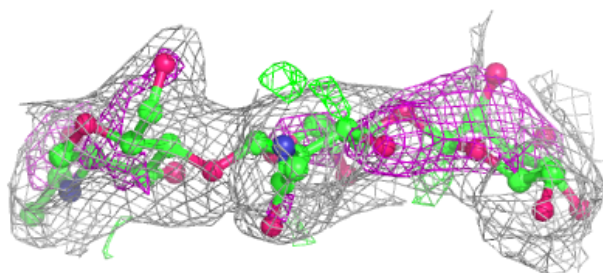
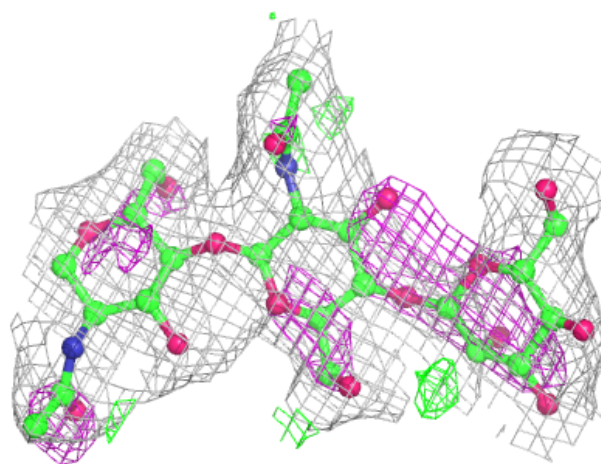
**Electron density around Chain J:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



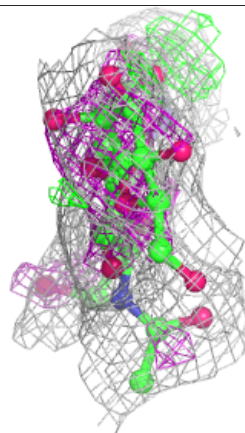
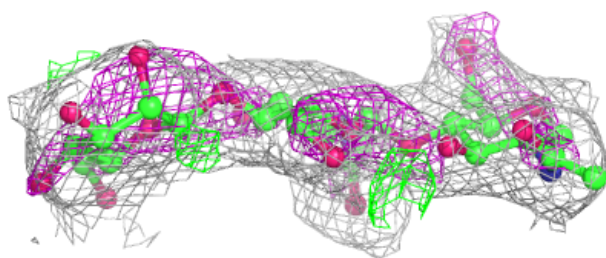
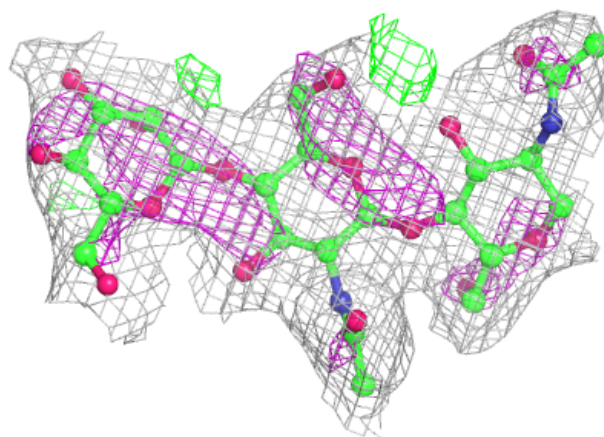
Electron density around Chain K:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



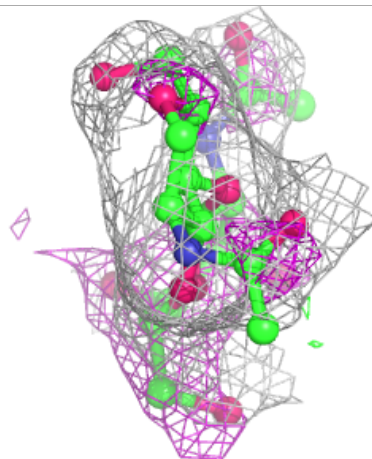
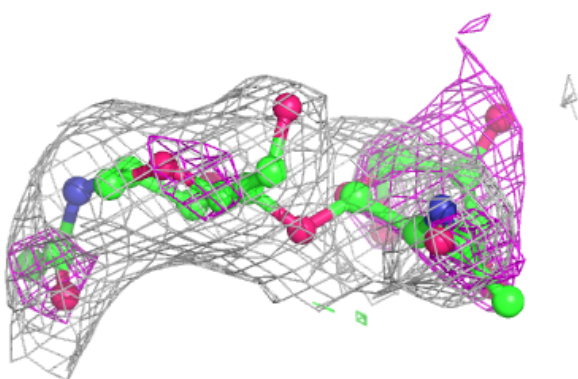
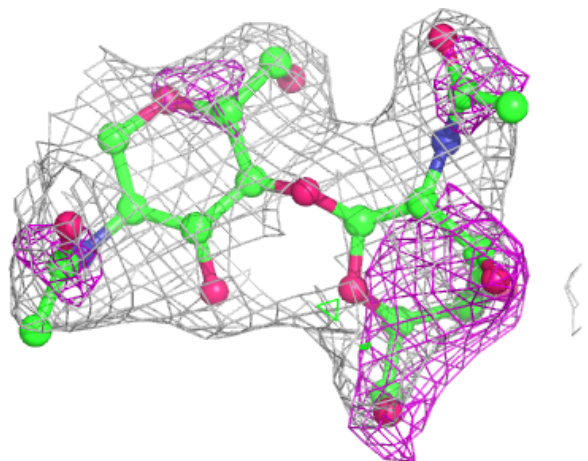
Electron density around Chain O:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



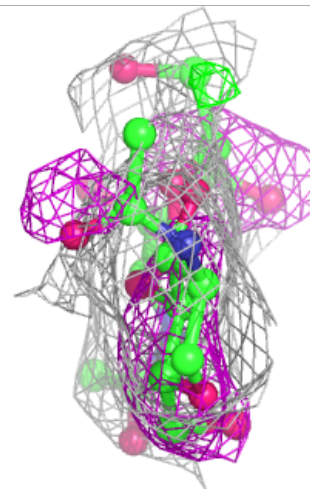
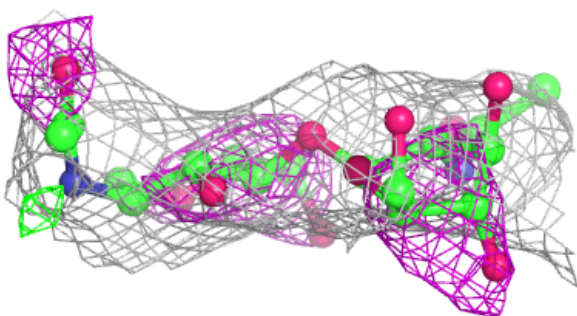
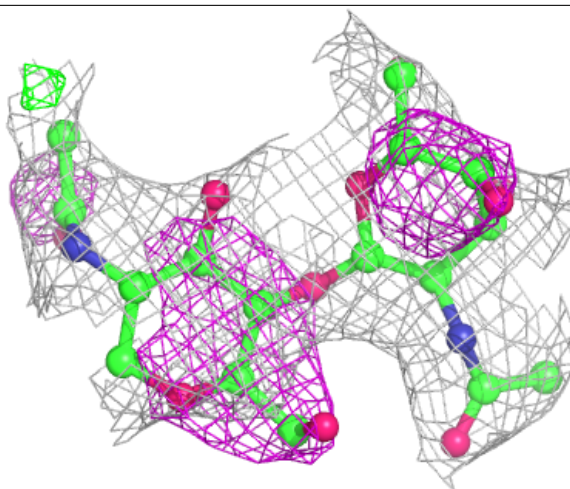
Electron density around Chain L:

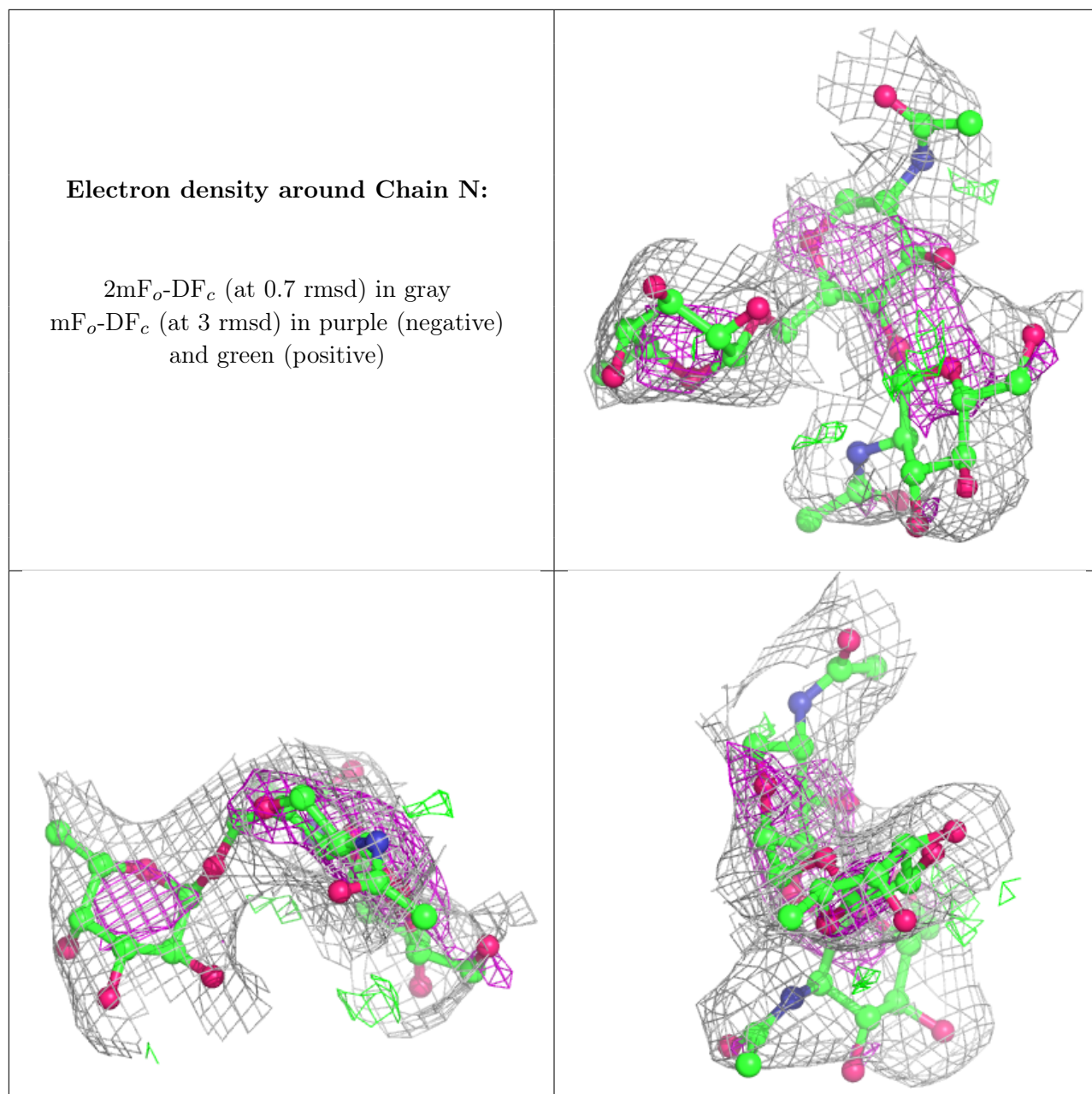
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain P:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.4 Ligands [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, 95th 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 ²)	Q < 0.9
10	NAG	G	500	14/15	0.65	0.23	99,101,104,104	0
10	NAG	C	500	14/15	0.66	0.24	94,95,96,96	0
10	NAG	G	400	14/15	0.75	0.18	101,103,104,105	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
10	NAG	C	400	14/15	0.86	0.13	85,88,88,89	0

6.5 Other polymers [i](#)

There are no such residues in this entry.