



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 06:58 AM UTC

PDB ID : 7FBK / pdb_00007fbk
Title : Crystal structure of SARS-CoV-2 receptor binding domain N501Y mutant in complex with neutralizing nanobody 20G6
Authors : Zhu, J.; Xu, T.; Feng, B.; Liu, J.
Deposited on : 2021-07-11
Resolution : 1.90 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

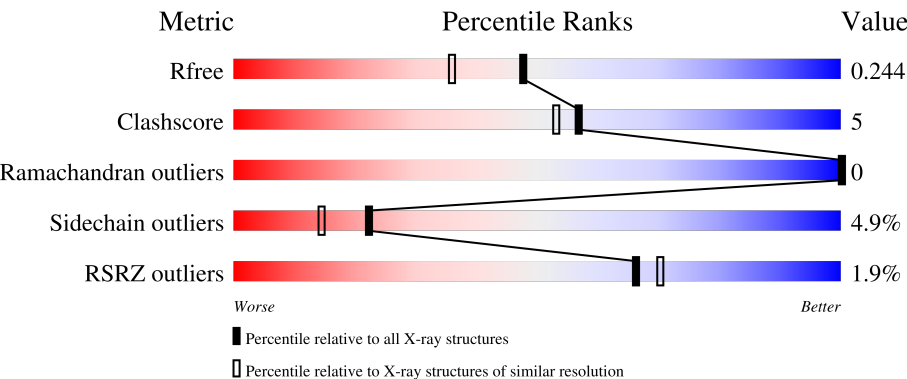
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry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

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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.



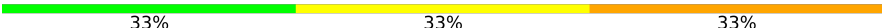
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R _{free}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	230	2% 74% 10% • 15%
1	B	230	74% 11% 15%
2	C	129	4% 71% 15% • 12%
2	D	129	% 69% 16% • 12%
3	E	3	33% 33% 33%

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Mol	Chain	Length	Quality of chain
3	F	3	 33% 33% 33%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5125 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 Spike protein S1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	196	Total	C	N	O	S	0	2	0
			1564	1005	260	291	8			
1	B	196	Total	C	N	O	S	0	1	0
			1555	999	257	291	8			

There are 70 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	326	ASP	-	expression tag	UNP P0DTC2
A	327	ALA	-	expression tag	UNP P0DTC2
A	328	ALA	-	expression tag	UNP P0DTC2
A	329	GLN	-	expression tag	UNP P0DTC2
A	330	PRO	-	expression tag	UNP P0DTC2
A	331	ALA	-	expression tag	UNP P0DTC2
A	501	TYR	ASN	engineered mutation	UNP P0DTC2
A	528	ALA	-	expression tag	UNP P0DTC2
A	529	ALA	-	expression tag	UNP P0DTC2
A	530	ALA	-	expression tag	UNP P0DTC2
A	531	ARG	-	expression tag	UNP P0DTC2
A	532	GLY	-	expression tag	UNP P0DTC2
A	533	GLY	-	expression tag	UNP P0DTC2
A	534	PRO	-	expression tag	UNP P0DTC2
A	535	GLU	-	expression tag	UNP P0DTC2
A	536	GLN	-	expression tag	UNP P0DTC2
A	537	LYS	-	expression tag	UNP P0DTC2
A	538	LEU	-	expression tag	UNP P0DTC2
A	539	ILE	-	expression tag	UNP P0DTC2
A	540	SER	-	expression tag	UNP P0DTC2
A	541	GLU	-	expression tag	UNP P0DTC2
A	542	GLU	-	expression tag	UNP P0DTC2
A	543	ASP	-	expression tag	UNP P0DTC2
A	544	LEU	-	expression tag	UNP P0DTC2
A	545	ASN	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	546	SER	-	expression tag	UNP P0DTC2
A	547	ALA	-	expression tag	UNP P0DTC2
A	548	VAL	-	expression tag	UNP P0DTC2
A	549	ASP	-	expression tag	UNP P0DTC2
A	550	HIS	-	expression tag	UNP P0DTC2
A	551	HIS	-	expression tag	UNP P0DTC2
A	552	HIS	-	expression tag	UNP P0DTC2
A	553	HIS	-	expression tag	UNP P0DTC2
A	554	HIS	-	expression tag	UNP P0DTC2
A	555	HIS	-	expression tag	UNP P0DTC2
B	326	ASP	-	expression tag	UNP P0DTC2
B	327	ALA	-	expression tag	UNP P0DTC2
B	328	ALA	-	expression tag	UNP P0DTC2
B	329	GLN	-	expression tag	UNP P0DTC2
B	330	PRO	-	expression tag	UNP P0DTC2
B	331	ALA	-	expression tag	UNP P0DTC2
B	501	TYR	ASN	engineered mutation	UNP P0DTC2
B	528	ALA	-	expression tag	UNP P0DTC2
B	529	ALA	-	expression tag	UNP P0DTC2
B	530	ALA	-	expression tag	UNP P0DTC2
B	531	ARG	-	expression tag	UNP P0DTC2
B	532	GLY	-	expression tag	UNP P0DTC2
B	533	GLY	-	expression tag	UNP P0DTC2
B	534	PRO	-	expression tag	UNP P0DTC2
B	535	GLU	-	expression tag	UNP P0DTC2
B	536	GLN	-	expression tag	UNP P0DTC2
B	537	LYS	-	expression tag	UNP P0DTC2
B	538	LEU	-	expression tag	UNP P0DTC2
B	539	ILE	-	expression tag	UNP P0DTC2
B	540	SER	-	expression tag	UNP P0DTC2
B	541	GLU	-	expression tag	UNP P0DTC2
B	542	GLU	-	expression tag	UNP P0DTC2
B	543	ASP	-	expression tag	UNP P0DTC2
B	544	LEU	-	expression tag	UNP P0DTC2
B	545	ASN	-	expression tag	UNP P0DTC2
B	546	SER	-	expression tag	UNP P0DTC2
B	547	ALA	-	expression tag	UNP P0DTC2
B	548	VAL	-	expression tag	UNP P0DTC2
B	549	ASP	-	expression tag	UNP P0DTC2
B	550	HIS	-	expression tag	UNP P0DTC2
B	551	HIS	-	expression tag	UNP P0DTC2
B	552	HIS	-	expression tag	UNP P0DTC2

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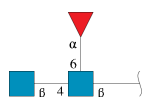
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Chain	Residue	Modelled	Actual	Comment	Reference
B	553	HIS	-	expression tag	UNP P0DTC2
B	554	HIS	-	expression tag	UNP P0DTC2
B	555	HIS	-	expression tag	UNP P0DTC2

- Molecule 2 is a protein called New antigen receptor variable domain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	113	Total	C	N	O	S	0	0	0
			883	543	153	183	4			
2	D	113	Total	C	N	O	S	0	0	0
			883	543	153	183	4			

- Molecule 3 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
3	E	3	Total	C	N	O	0	0	0
			38	22	2	14			
3	F	3	Total	C	N	O	0	0	0
			38	22	2	14			

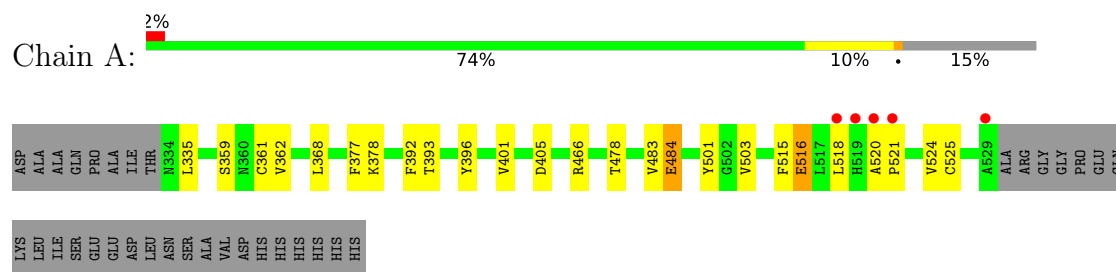
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	45	Total	O	0	0
			45	45		
4	B	65	Total	O	0	0
			65	65		
4	C	3	Total	O	0	0
			3	3		
4	D	51	Total	O	0	0
			51	51		

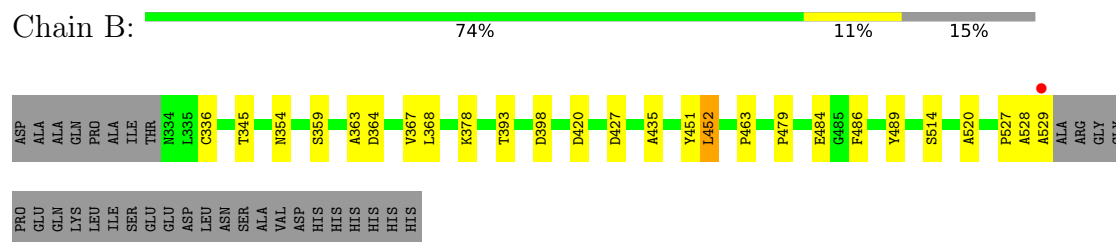
3 Residue-property plots

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

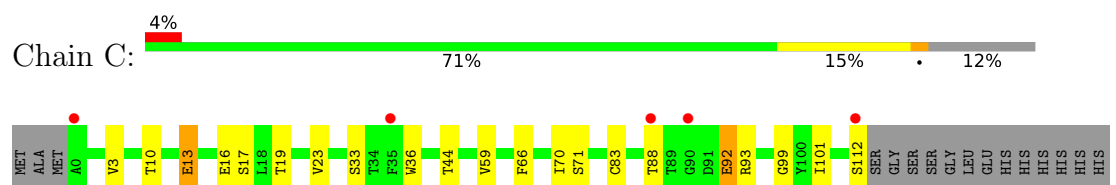
- Molecule 1: Spike protein S1



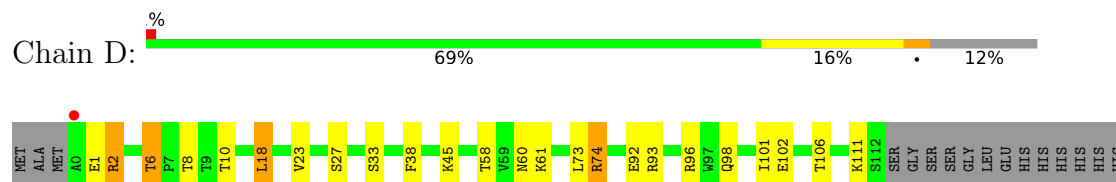
- Molecule 1: Spike protein S1



- Molecule 2: New antigen receptor variable domain



- Molecule 2: New antigen receptor variable domain



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose





- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:  33% 33% 33%



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α , β , γ	53.51Å 90.53Å 162.46Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.82 – 1.90 19.82 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.82-1.90) 99.8 (19.82-1.90)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.31 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.197 , 0.239 0.204 , 0.244	Depositor DCC
R_{free} test set	3030 reflections (4.80%)	wwPDB-VP
Wilson B-factor (Å ²)	37.9	Xtriage
Anisotropy	0.742	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 39.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	5125	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.83% 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

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	1.14	1/1615 (0.1%)	1.37	6/2198 (0.3%)
1	B	1.24	5/1603 (0.3%)	1.37	4/2183 (0.2%)
2	C	1.07	0/898	1.44	2/1213 (0.2%)
2	D	1.32	3/898 (0.3%)	1.50	2/1213 (0.2%)
All	All	1.19	9/5014 (0.2%)	1.41	14/6807 (0.2%)

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	106	THR	C-O	9.35	1.34	1.24
1	B	514	SER	C-O	8.79	1.34	1.24
2	D	98	GLN	C-O	6.63	1.32	1.23
1	B	435	ALA	C-O	6.01	1.31	1.23
1	A	401	VAL	C-O	5.74	1.30	1.24
2	D	60	ASN	C-O	5.48	1.30	1.23
1	B	463	PRO	C-O	-5.09	1.16	1.23
1	B	527	PRO	C-O	-5.05	1.17	1.24
1	B	489	TYR	N-CA	5.04	1.52	1.46

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	478	THR	CA-CB-OG1	-7.13	98.91	109.60
1	A	405	ASP	CA-CB-CG	6.51	119.11	112.60
1	B	479	PRO	N-CA-CB	6.49	109.37	103.34
2	C	19	THR	CA-CB-OG1	-6.34	100.09	109.60
2	D	61	LYS	CA-C-O	-5.53	114.56	120.42
2	D	8	THR	CA-CB-OG1	-5.37	101.55	109.60
1	A	501	TYR	CA-C-N	5.32	125.15	120.10
1	A	501	TYR	C-N-CA	5.32	125.15	120.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	345	THR	CA-CB-OG1	-5.23	101.76	109.60
1	B	484	GLU	CB-CG-CD	5.12	121.30	112.60
1	A	361	CYS	O-C-N	5.11	128.40	123.29
2	C	66	PHE	CA-CB-CG	5.09	118.89	113.80
1	A	501	TYR	CA-C-O	-5.07	116.18	121.55
1	B	486	PHE	CA-CB-CG	-5.01	108.79	113.80

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1564	0	1484	15	0
1	B	1555	0	1469	11	0
2	C	883	0	847	10	0
2	D	883	0	847	13	0
3	E	38	0	34	1	0
3	F	38	0	34	1	0
4	A	45	0	0	1	0
4	B	65	0	0	1	0
4	C	3	0	0	0	0
4	D	51	0	0	3	0
All	All	5125	0	4715	44	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 5.

All (44) 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:427:ASP:O	2:D:96:ARG:NH2	1.87	1.07
2:D:6:THR:HG22	4:D:237:HOH:O	1.65	0.94
2:D:6:THR:CG2	4:D:237:HOH:O	2.28	0.66
1:B:368:LEU:HD21	3:F:1:NAG:H83	1.79	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:516[A]:GLU:OE1	1:A:518:LEU:HD11	2.00	0.61
2:D:2:ARG:NH1	4:D:201:HOH:O	2.30	0.60
2:C:3:VAL:HG23	2:C:101:ILE:HG22	1.88	0.55
1:A:368:LEU:HD21	3:E:1:NAG:H83	1.87	0.55
2:D:101:ILE:HG22	2:D:102:GLU:N	2.22	0.54
1:A:466[B]:ARG:CZ	2:D:93:ARG:HD2	2.38	0.53
2:D:74:ARG:HH11	2:D:74:ARG:HG2	1.74	0.53
2:C:92:GLU:H	2:C:92:GLU:CD	2.18	0.52
2:D:74:ARG:HH11	2:D:74:ARG:CG	2.23	0.52
2:D:18:LEU:HB3	2:D:73:LEU:HD11	1.91	0.51
1:A:359:SER:HA	1:A:524:VAL:CG2	2.41	0.51
2:C:13:GLU:O	2:C:16:GLU:HG3	2.12	0.49
1:B:528:ALA:O	1:B:529:ALA:C	2.54	0.49
2:C:92:GLU:CD	2:C:92:GLU:N	2.71	0.48
1:B:420:ASP:OD2	4:B:601:HOH:O	2.20	0.47
2:C:36:TRP:CZ3	2:C:83:CYS:HB3	2.49	0.47
1:B:451:TYR:C	1:B:452:LEU:HG	2.39	0.47
1:A:520:ALA:HB1	1:A:521:PRO:HD2	1.98	0.46
1:A:377:PHE:O	2:C:99:GLY:HA3	2.16	0.46
2:D:1:GLU:HG3	2:D:27:SER:HB2	1.98	0.46
1:A:335:LEU:HA	1:A:362:VAL:O	2.16	0.45
1:A:362:VAL:HA	1:A:525:CYS:O	2.16	0.45
1:A:393:THR:HG23	1:A:520:ALA:HB3	1.97	0.45
2:C:92:GLU:N	2:C:92:GLU:OE2	2.49	0.45
1:A:378:LYS:HD3	2:C:101:ILE:HD11	1.99	0.45
1:B:393:THR:CG2	1:B:520:ALA:HB3	2.47	0.45
1:B:364:ASP:O	1:B:367:VAL:HG12	2.16	0.44
2:D:101:ILE:CG2	2:D:102:GLU:N	2.79	0.44
1:A:359:SER:HA	1:A:524:VAL:HG22	2.00	0.44
1:B:378:LYS:HD3	2:D:101:ILE:HD11	1.99	0.44
1:A:466[B]:ARG:NH2	4:A:601:HOH:O	2.08	0.43
1:B:354:ASN:O	1:B:398:ASP:HA	2.18	0.43
1:A:396:TYR:CE2	1:A:516[B]:GLU:HG3	2.54	0.43
1:A:483:VAL:HG12	1:A:484:GLU:O	2.19	0.43
1:B:336:CYS:SG	1:B:363:ALA:HB2	2.58	0.43
1:B:393:THR:HG21	1:B:520:ALA:HB3	2.01	0.42
2:C:17:SER:HB2	2:C:70:ILE:O	2.20	0.41
1:A:392:PHE:CE1	1:A:515:PHE:HB3	2.56	0.41
2:C:17:SER:HB3	2:C:71:SER:HA	2.02	0.40
2:D:92:GLU:O	2:D:93:ARG:C	2.64	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	196/230 (85%)	188 (96%)	8 (4%)	0	100	100
1	B	195/230 (85%)	192 (98%)	3 (2%)	0	100	100
2	C	111/129 (86%)	108 (97%)	3 (3%)	0	100	100
2	D	111/129 (86%)	110 (99%)	1 (1%)	0	100	100
All	All	613/718 (85%)	598 (98%)	15 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all 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	169/194 (87%)	165 (98%)	4 (2%)	43	38
1	B	168/194 (87%)	166 (99%)	2 (1%)	63	63
2	C	98/111 (88%)	88 (90%)	10 (10%)	7	2
2	D	98/111 (88%)	87 (89%)	11 (11%)	6	2
All	All	533/610 (87%)	506 (95%)	27 (5%)	22	13

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	484	GLU
1	A	503	VAL

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Mol	Chain	Res	Type
1	A	516[A]	GLU
1	A	516[B]	GLU
1	B	359	SER
1	B	452	LEU
2	C	10	THR
2	C	13	GLU
2	C	23	VAL
2	C	33	SER
2	C	44	THR
2	C	59	VAL
2	C	88	THR
2	C	92	GLU
2	C	93	ARG
2	C	112	SER
2	D	2	ARG
2	D	6	THR
2	D	10	THR
2	D	18	LEU
2	D	23	VAL
2	D	33	SER
2	D	38	PHE
2	D	45	LYS
2	D	58	THR
2	D	74	ARG
2	D	111	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	394	ASN
1	A	450	ASN
1	A	481	ASN
1	A	498	GLN
1	B	450	ASN
1	B	474	GLN
2	D	21	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

6 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	E	1	3,1	14,14,15	0.50	0	17,19,21	1.56	3 (17%)
3	NAG	E	2	3	14,14,15	0.40	0	17,19,21	1.32	2 (11%)
3	FUC	E	3	3	10,10,11	0.57	0	14,14,16	0.81	0
3	NAG	F	1	3,1	14,14,15	0.74	0	17,19,21	1.23	1 (5%)
3	NAG	F	2	3	14,14,15	0.55	0	17,19,21	1.52	4 (23%)
3	FUC	F	3	3	10,10,11	0.67	0	14,14,16	1.04	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
3	NAG	E	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	E	2	3	-	2/6/23/26	0/1/1/1
3	FUC	E	3	3	-	-	0/1/1/1
3	NAG	F	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	F	2	3	-	0/6/23/26	0/1/1/1
3	FUC	F	3	3	-	-	0/1/1/1

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	1	NAG	C1-O5-C5	4.23	117.85	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	2	NAG	C2-N2-C7	2.82	126.67	122.90
3	F	2	NAG	C3-C4-C5	-2.64	105.45	110.23
3	E	2	NAG	C1-O5-C5	2.59	115.65	112.19
3	E	1	NAG	O6-C6-C5	2.54	119.97	111.33
3	F	1	NAG	C1-C2-N2	-2.39	106.66	110.43
3	E	1	NAG	C3-C4-C5	-2.35	105.97	110.23
3	F	2	NAG	O5-C5-C4	-2.33	105.17	110.83
3	F	2	NAG	O5-C1-C2	2.26	114.79	111.29
3	E	2	NAG	C4-C3-C2	2.14	114.16	111.02

There are no chirality outliers.

All (2) torsion outliers are listed below:

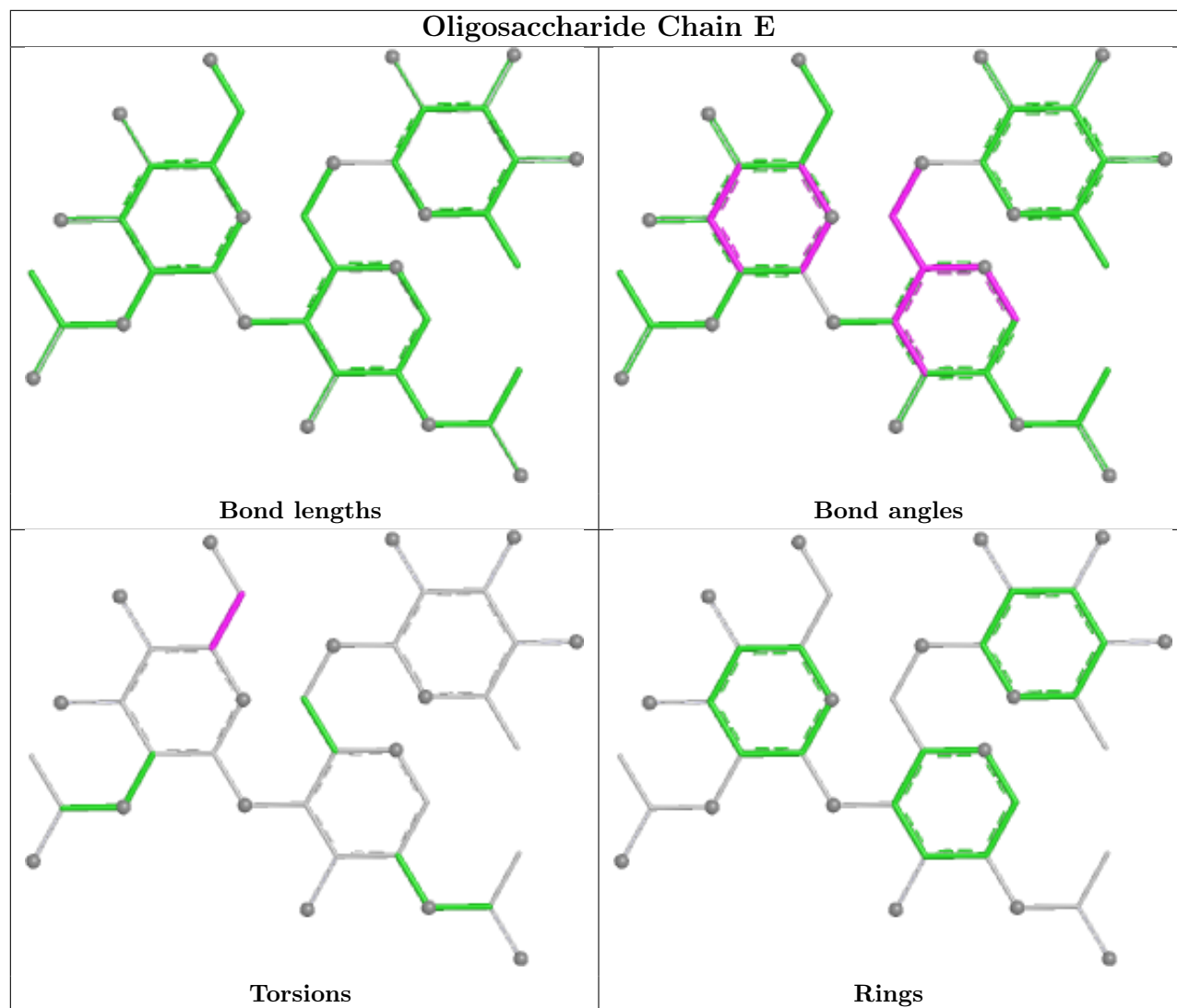
Mol	Chain	Res	Type	Atoms
3	E	2	NAG	C4-C5-C6-O6
3	E	2	NAG	O5-C5-C6-O6

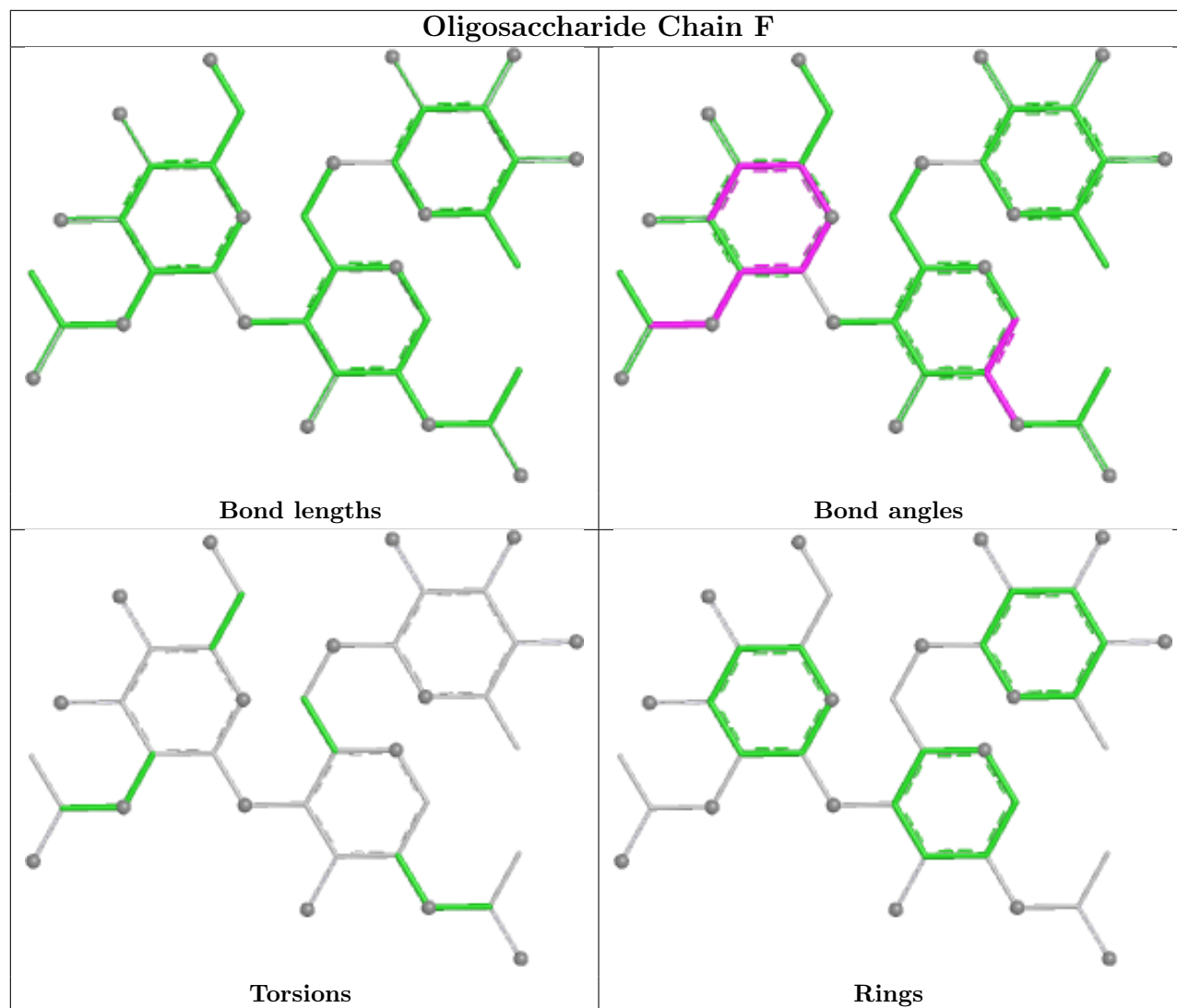
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	1	NAG	1	0
3	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](#)

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, 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	196/230 (85%)	0.03	5 (2%) 57 61	26, 50, 81, 116	2 (1%)
1	B	196/230 (85%)	-0.09	1 (0%) 87 89	24, 46, 74, 109	1 (0%)
2	C	113/129 (87%)	0.42	5 (4%) 39 41	47, 66, 95, 113	0
2	D	113/129 (87%)	-0.04	1 (0%) 81 83	36, 46, 68, 85	0
All	All	618/718 (86%)	0.05	12 (1%) 66 70	24, 51, 85, 116	3 (0%)

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	519	HIS	4.1
1	A	520	ALA	3.8
1	A	521	PRO	3.6
2	D	0	ALA	3.2
2	C	0	ALA	3.1
2	C	88	THR	2.7
2	C	112	SER	2.7
2	C	35	PHE	2.7
1	A	529	ALA	2.6
1	B	529	ALA	2.5
2	C	90	GLY	2.4
1	A	518	LEU	2.1

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

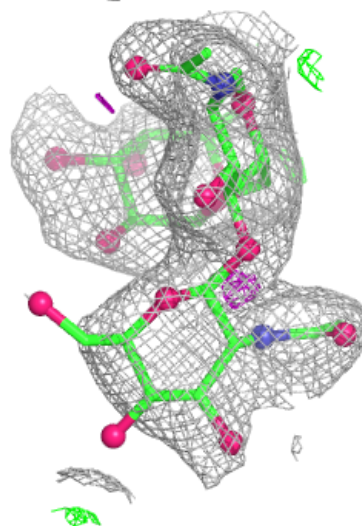
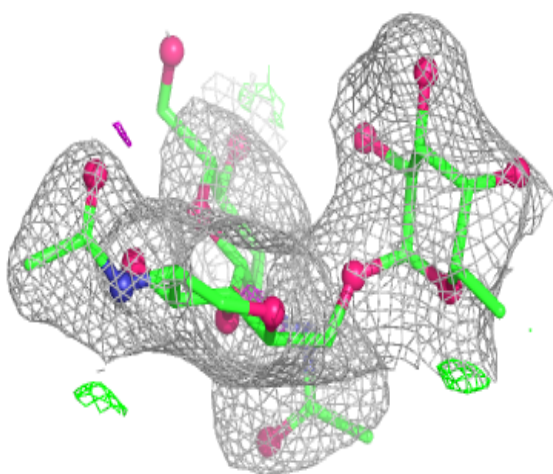
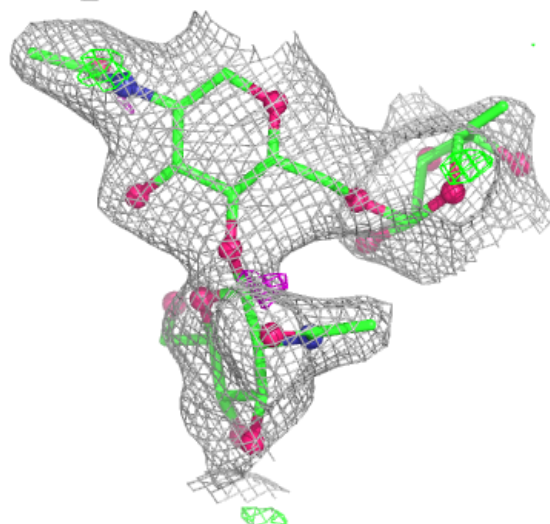
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists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

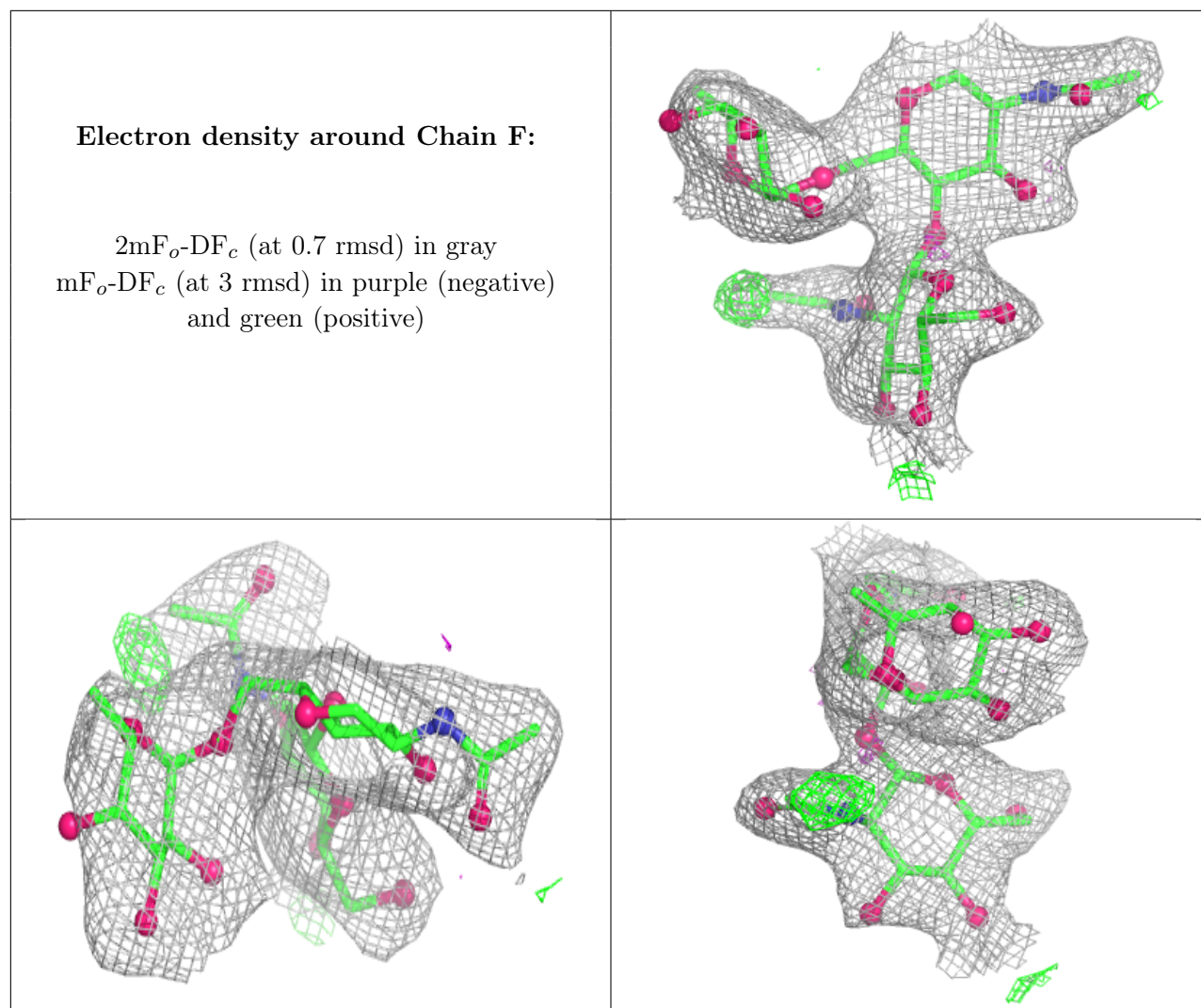
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	FUC	E	3	10/11	0.64	0.12	87,107,115,115	0
3	NAG	E	2	14/15	0.66	0.12	82,100,105,114	0
3	FUC	F	3	10/11	0.75	0.11	79,92,103,105	0
3	NAG	F	2	14/15	0.77	0.09	70,78,86,94	0
3	NAG	E	1	14/15	0.88	0.08	55,62,87,100	0
3	NAG	F	1	14/15	0.91	0.08	44,55,81,93	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 E:

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





6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.