



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2026 – 11:59 PM UTC

PDB ID : 4Y4K / pdb_00004y4k
Title : Crystal structure of the mCD1d/EF77/iNKTCR ternary complex
Authors : Zajonc, D.M.; Birkholz, A.M.
Deposited on : 2015-02-10
Resolution : 2.90 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
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
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

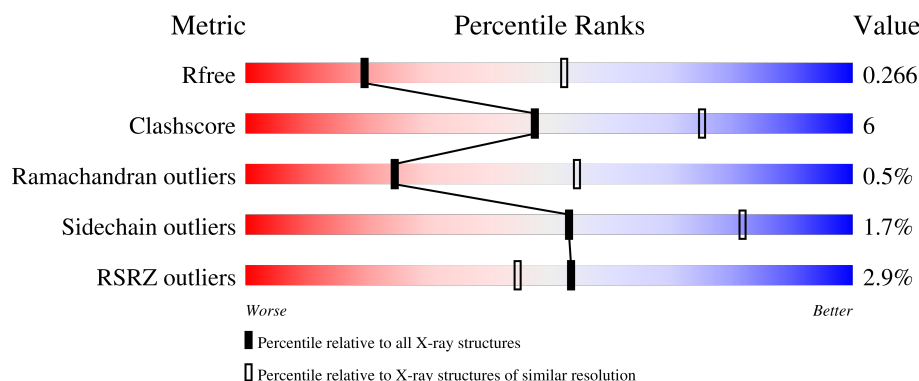
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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	285	
2	B	99	
3	C	209	
4	D	241	
5	E	3	

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 6308 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 Antigen-presenting glycoprotein CD1d1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	268	Total	C	N	O	S	0	0	0
			2049	1314	339	383	13			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	201	HIS	ASP	variant	UNP P11609
A	280	HIS	-	expression tag	UNP P11609
A	281	HIS	-	expression tag	UNP P11609
A	282	HIS	-	expression tag	UNP P11609
A	283	HIS	-	expression tag	UNP P11609
A	284	HIS	-	expression tag	UNP P11609
A	285	HIS	-	expression tag	UNP P11609

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	96	Total	C	N	O	S	0	1	0
			752	484	125	137	6			

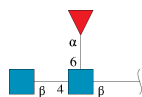
- Molecule 3 is a protein called chimeric TCR Valpha14Jalpha18 chain (mouse variable, human constant domain).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	202	Total	C	N	O	S	0	1	0
			1513	945	260	300	8			

- Molecule 4 is a protein called chimeric TCR Vbeta8.2 chain (mouse variable, human constant domain).

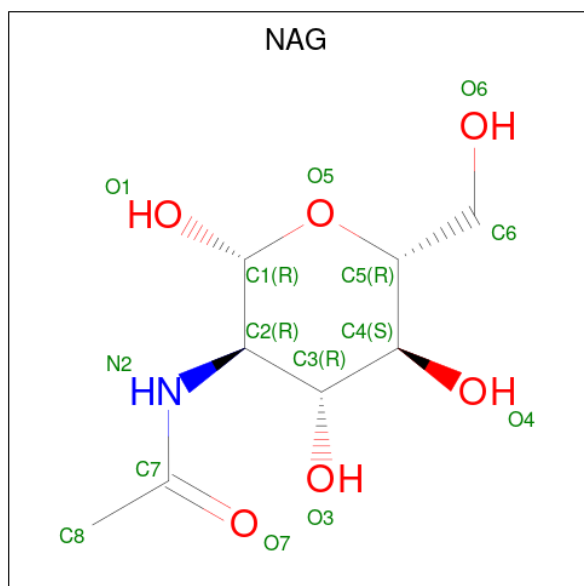
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	239	Total	C	N	O	S	0	1	0
			1872	1177	332	357	6			

- Molecule 5 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.



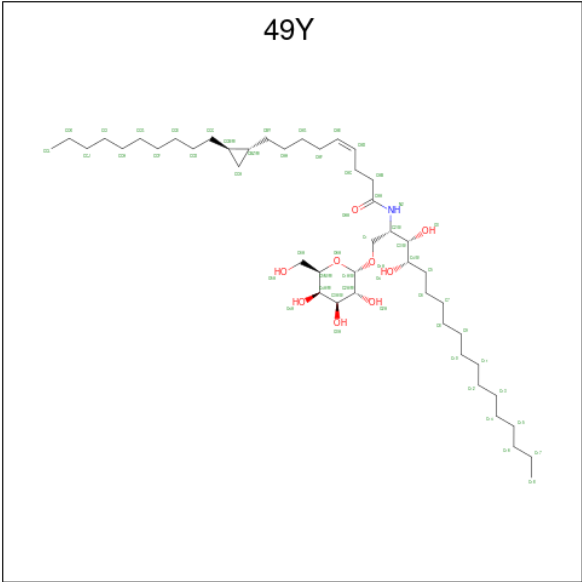
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	E	3	Total	C	N	O	0	0	0
			38	22	2	14			

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 7 is (4Z)-9-[(1R,2R)-2-decylcyclopropyl]-N-[(2S,3S,4S)-1-(alpha-D-galactopyranosyloxy)-3,4-dihydroxyoctadecan-2-yl]non-4-enamide (CCD ID: 49Y) (formula: $C_{46}H_{87}NO_9$).

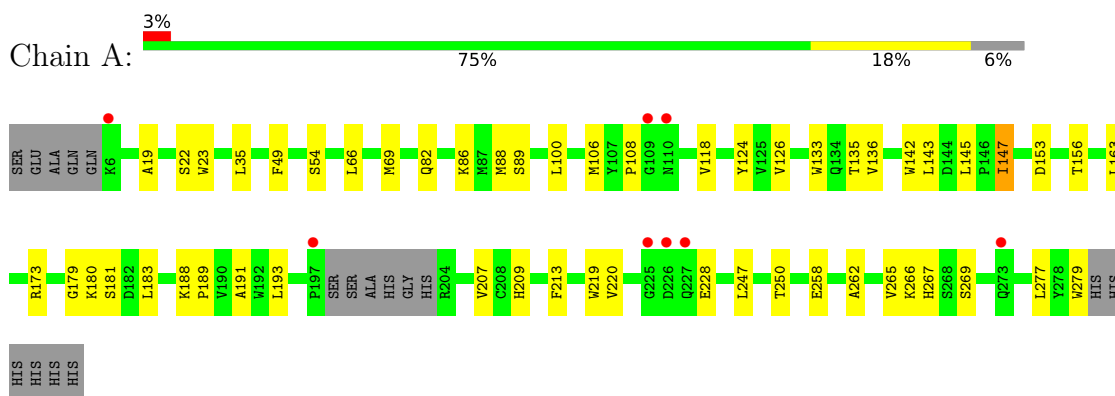


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			56	46	1	9		

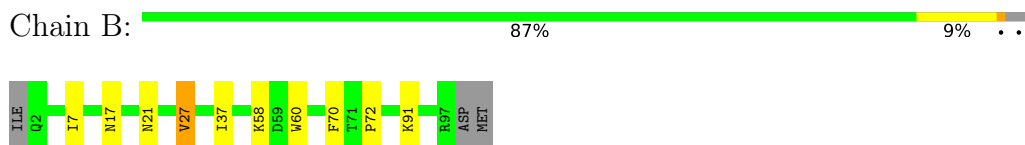
3 Residue-property plots

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.

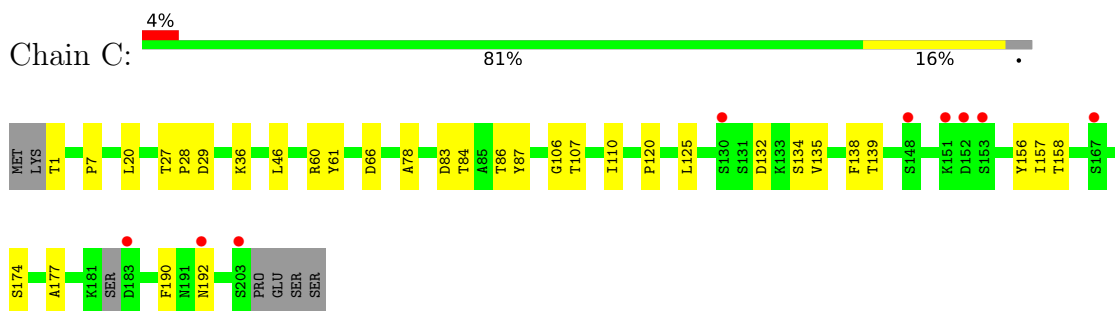
- Molecule 1: Antigen-presenting glycoprotein CD1d1



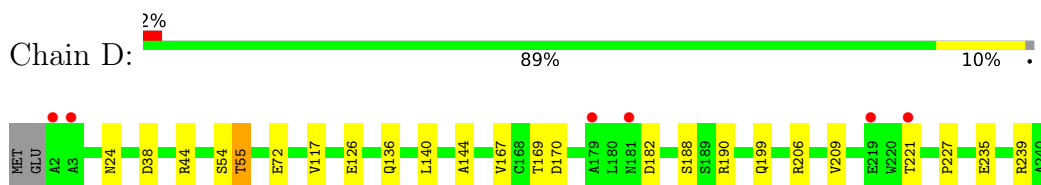
- Molecule 2: Beta-2-microglobulin



- Molecule 3: chimeric TCR Valpha14Jalpha18 chain (mouse variable, human constant domain)



- Molecule 4: chimeric TCR Vbeta8.2 chain (mouse variable, human constant domain)



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

Chain E:

100%

MAG1
MAG2
FUC3

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	78.96Å 191.07Å 151.08Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	95.54 – 2.90 95.53 – 2.90	Depositor EDS
% Data completeness (in resolution range)	97.1 (95.54-2.90) 97.1 (95.53-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.17	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.16 (at 2.90Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.207 , 0.267 0.211 , 0.266	Depositor DCC
R_{free} test set	1272 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	35.3	Xtriage
Anisotropy	0.712	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 37.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	6308	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.63% 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: 49Y, 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	0.77	0/2111	0.90	0/2888
2	B	0.71	0/782	0.88	0/1074
3	C	0.76	0/1543	0.90	0/2106
4	D	0.75	0/1923	0.88	2/2622 (0.1%)
All	All	0.75	0/6359	0.89	2/8690 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	126	GLU	CA-C-N	5.53	126.75	119.84
4	D	126	GLU	C-N-CA	5.53	126.75	119.84

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	2049	0	1858	32	0
2	B	752	0	682	5	0
3	C	1513	0	1406	17	0
4	D	1872	0	1769	14	0
5	E	38	0	34	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	28	0	26	1	0
7	A	56	0	87	3	0
All	All	6308	0	5862	68	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 6.

All (68) 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:88:MET:HA	1:A:88:MET:HE2	1.63	0.80
3:C:20:LEU:HD22	3:C:107:THR:HG21	1.71	0.72
3:C:60:ARG:NH2	3:C:83:ASP:OD2	2.25	0.69
1:A:267:HIS:ND1	1:A:269:SER:HB3	2.09	0.68
1:A:35:LEU:HD12	1:A:183:LEU:HD23	1.76	0.67
1:A:258:GLU:HB3	1:A:279:TRP:CD1	2.32	0.64
3:C:36:LYS:HB2	3:C:46:LEU:HD11	1.80	0.62
1:A:88:MET:HE1	1:A:145:LEU:HD23	1.82	0.62
1:A:153:ASP:OD2	1:A:156:THR:OG1	2.14	0.61
4:D:170:ASP:OD1	4:D:190:ARG:NH1	2.34	0.60
3:C:87:TYR:O	3:C:106:GLY:HA2	2.03	0.59
1:A:188:LYS:HA	1:A:269:SER:OG	2.02	0.58
4:D:199:GLN:HA	4:D:239:ARG:O	2.04	0.58
1:A:133:TRP:CH2	7:A:306:49Y:H15	2.39	0.57
1:A:219:TRP:HB3	1:A:266:LYS:HB2	1.91	0.53
1:A:135:THR:HG23	1:A:147:ILE:HD12	1.91	0.53
4:D:182:ASP:OD1	4:D:182:ASP:N	2.41	0.53
2:B:17:ASN:HA	2:B:72:PRO:O	2.09	0.52
1:A:179:GLY:O	1:A:180:LYS:C	2.53	0.52
4:D:24:ASN:HD21	4:D:72:GLU:CD	2.17	0.51
3:C:46:LEU:HD22	3:C:61:TYR:CE2	2.46	0.50
2:B:7:ILE:HD12	2:B:91:LYS:HD2	1.94	0.50
3:C:7:PRO:O	3:C:107:THR:HG23	2.13	0.48
3:C:125:LEU:HD12	3:C:125:LEU:N	2.28	0.48
1:A:106:MET:HE3	1:A:173:ARG:NH2	2.28	0.48
4:D:169:THR:O	4:D:170:ASP:C	2.57	0.48
2:B:21:ASN:HB3	2:B:70:PHE:CE1	2.49	0.47
1:A:88:MET:O	1:A:89:SER:C	2.57	0.47
1:A:88:MET:HE2	1:A:88:MET:CA	2.42	0.46
1:A:19:ALA:HB2	1:A:23:TRP:CE3	2.50	0.46
1:A:189:PRO:HB3	1:A:213:PHE:HB3	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:66:LEU:HD21	7:A:306:49Y:H26	1.97	0.46
3:C:138:PHE:HB2	3:C:190:PHE:CZ	2.51	0.46
1:A:69:MET:HE2	1:A:163:LEU:HD21	1.99	0.45
3:C:134:SER:OG	3:C:135:VAL:N	2.49	0.45
2:B:27:VAL:HG21	2:B:37:ILE:CD1	2.47	0.45
3:C:157:ILE:HG12	3:C:177:ALA:HB2	1.99	0.45
1:A:220:VAL:HG22	1:A:265:VAL:HG22	1.99	0.44
3:C:84:THR:HG23	3:C:110:ILE:HA	2.00	0.44
4:D:54:SER:O	4:D:55:THR:HG23	2.18	0.44
4:D:167:VAL:HA	4:D:190:ARG:O	2.17	0.44
2:B:58:LYS:C	2:B:60:TRP:H	2.26	0.44
4:D:144:ALA:HB2	4:D:209:VAL:HG21	1.99	0.44
4:D:188:SER:OG	4:D:190:ARG:NH1	2.51	0.44
1:A:207:VAL:HG22	1:A:250:THR:HG22	2.00	0.43
4:D:136:GLN:NE2	4:D:136:GLN:HA	2.33	0.43
3:C:60:ARG:HH22	3:C:83:ASP:CG	2.27	0.43
4:D:117:VAL:HG12	4:D:227:PRO:HB2	2.00	0.43
1:A:82:GLN:O	1:A:86:LYS:HG3	2.19	0.43
1:A:156:THR:HG23	7:A:306:49Y:H61	2.01	0.42
4:D:140:LEU:N	4:D:140:LEU:HD12	2.34	0.42
1:A:142:TRP:CZ3	1:A:143:LEU:HD23	2.55	0.42
1:A:262:ALA:HA	1:A:277:LEU:O	2.20	0.42
4:D:206:ARG:NH1	4:D:235:GLU:HG2	2.35	0.41
1:A:49:PHE:HB3	1:A:54:SER:HB2	2.02	0.41
1:A:100:LEU:HG	1:A:118:VAL:HG22	2.03	0.41
1:A:124:TYR:CZ	1:A:136:VAL:HG11	2.55	0.41
3:C:27:THR:HA	3:C:28:PRO:HA	1.92	0.41
3:C:66:ASP:OD1	3:C:66:ASP:C	2.63	0.41
3:C:1:THR:HG23	3:C:1:THR:O	2.20	0.41
1:A:88:MET:CE	1:A:145:LEU:HD23	2.48	0.41
1:A:118:VAL:HB	1:A:126:VAL:HB	2.03	0.41
4:D:38:ASP:OD2	4:D:44:ARG:NH2	2.54	0.41
1:A:193:LEU:HD11	1:A:277:LEU:HB3	2.03	0.41
3:C:156:TYR:O	3:C:177:ALA:HA	2.20	0.41
1:A:191:ALA:HA	1:A:209:HIS:O	2.21	0.40
1:A:22:SER:OG	6:A:305:NAG:H82	2.22	0.40
3:C:120:PRO:HA	3:C:139:THR:O	2.22	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	264/285 (93%)	250 (95%)	12 (4%)	2 (1%)	16	44
2	B	95/99 (96%)	91 (96%)	4 (4%)	0	100	100
3	C	199/209 (95%)	181 (91%)	16 (8%)	2 (1%)	12	39
4	D	238/241 (99%)	224 (94%)	14 (6%)	0	100	100
All	All	796/834 (95%)	746 (94%)	46 (6%)	4 (0%)	24	54

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	192	ASN
1	A	228	GLU
3	C	78	ALA
1	A	108	PRO

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	208/249 (84%)	205 (99%)	3 (1%)	59	85
2	B	80/93 (86%)	79 (99%)	1 (1%)	61	86
3	C	162/188 (86%)	157 (97%)	5 (3%)	35	69
4	D	200/208 (96%)	198 (99%)	2 (1%)	68	89
All	All	650/738 (88%)	639 (98%)	11 (2%)	53	82

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	147	ILE
1	A	181	SER
1	A	247	LEU
2	B	27	VAL
3	C	29	ASP
3	C	86	THR
3	C	132	ASP
3	C	158	THR
3	C	174	SER
4	D	55	THR
4	D	221	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	55	GLN
1	A	60	ASN
1	A	134	GLN
1	A	186	GLN
3	C	52	GLN
3	C	124	GLN
4	D	24	ASN
4	D	136	GLN
4	D	210	GLN
4	D	222	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

3 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	E	1	1,5	14,14,15	0.63	0	17,19,21	1.24	1 (5%)
5	NAG	E	2	5	14,14,15	0.62	0	17,19,21	1.49	3 (17%)
5	FUC	E	3	5	10,10,11	0.98	1 (10%)	14,14,16	1.56	3 (21%)

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	E	1	1,5	-	0/6/23/26	0/1/1/1
5	NAG	E	2	5	-	2/6/23/26	0/1/1/1
5	FUC	E	3	5	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	E	3	FUC	C2-C3	2.47	1.56	1.52

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	E	3	FUC	O3-C3-C2	3.52	117.25	110.05
5	E	2	NAG	C3-C4-C5	-3.24	104.36	110.23
5	E	1	NAG	C1-O5-C5	3.10	116.34	112.19
5	E	3	FUC	O2-C2-C3	2.84	116.02	110.15
5	E	2	NAG	O4-C4-C5	2.73	116.04	109.32
5	E	3	FUC	O5-C1-C2	-2.02	105.96	110.79
5	E	2	NAG	C1-O5-C5	2.01	114.88	112.19

There are no chirality outliers.

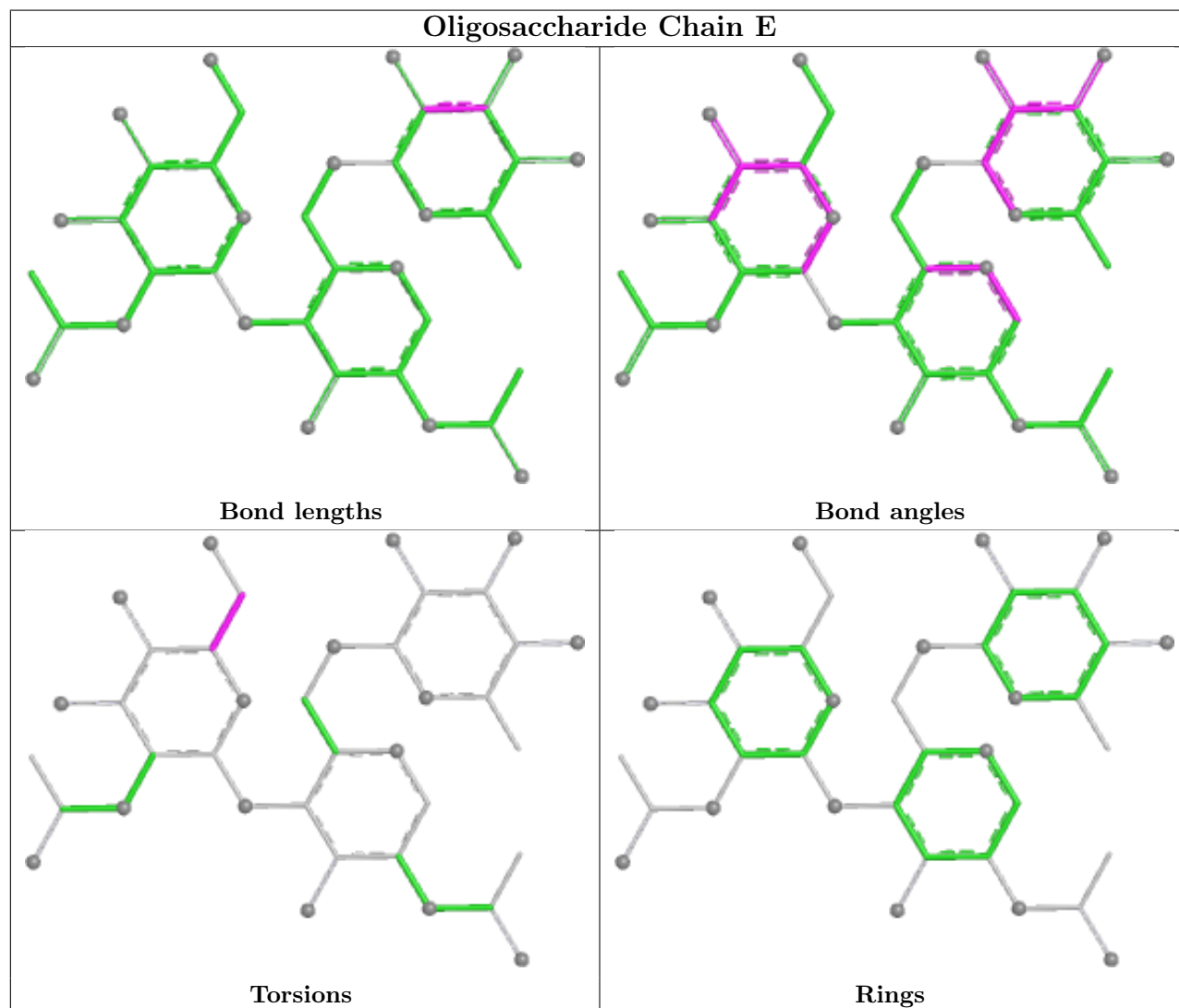
All (2) torsion outliers are listed below:

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

There are no ring outliers.

No monomer is involved in short contacts.

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](#)

3 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
7	49Y	A	306	-	57,57,57	1.01	2 (3%)	64,69,69	1.38	8 (12%)
6	NAG	A	305	1	14,14,15	0.51	0	17,19,21	1.63	2 (11%)
6	NAG	A	301	1	14,14,15	0.68	0	17,19,21	1.94	6 (35%)

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
7	49Y	A	306	-	-	21/54/79/79	0/2/2/2
6	NAG	A	305	1	-	2/6/23/26	0/1/1/1
6	NAG	A	301	1	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	306	49Y	O1A-C1A	4.74	1.48	1.40
7	A	306	49Y	CAB-CAA	2.14	1.55	1.51

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	306	49Y	C6-C5-C4	-5.04	105.85	114.11
6	A	305	NAG	C1-O5-C5	4.76	118.56	112.19
6	A	301	NAG	C3-C4-C5	-4.22	102.58	110.23
6	A	301	NAG	C1-O5-C5	3.32	116.63	112.19
7	A	306	49Y	O3-C3-C4	-3.03	102.05	108.93
6	A	301	NAG	O5-C1-C2	-2.95	106.73	111.29
6	A	301	NAG	O4-C4-C5	2.80	116.22	109.32
7	A	306	49Y	O4-C4-C5	-2.77	102.84	109.14
7	A	306	49Y	CCA-CBZ-CBY	-2.72	115.70	120.62
7	A	306	49Y	C12-C11-C10	-2.72	100.61	114.37
7	A	306	49Y	O6A-C1A-O1A	2.62	116.23	110.04
6	A	305	NAG	O5-C5-C6	2.45	112.43	107.66
7	A	306	49Y	C12-C13-C14	-2.31	102.68	114.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	301	NAG	C4-C3-C2	-2.31	107.63	111.02
6	A	301	NAG	O4-C4-C3	2.19	115.55	110.38
7	A	306	49Y	OAA-CAA-CAB	-2.06	118.30	122.02

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	306	49Y	CCA-CCB-CCC-CCD
6	A	305	NAG	O5-C5-C6-O6
6	A	305	NAG	C4-C5-C6-O6
7	A	306	49Y	CAG-CAH-CBY-CBZ
7	A	306	49Y	C3-C4-C5-C6
7	A	306	49Y	O4-C4-C5-C6
7	A	306	49Y	C4A-C5M-C6A-O5A
7	A	306	49Y	CCG-CCH-CCI-CCJ
7	A	306	49Y	CCE-CCF-CCG-CCH
7	A	306	49Y	C11-C10-C9-C8
7	A	306	49Y	O6A-C5M-C6A-O5A
7	A	306	49Y	CBZ-CCB-CCC-CCD
7	A	306	49Y	C6-C7-C8-C9
7	A	306	49Y	CCF-CCG-CCH-CCI
7	A	306	49Y	CCB-CCC-CCD-CCE
7	A	306	49Y	CAA-CAB-CAC-CAD
7	A	306	49Y	CAD-CAE-CAF-CAG
7	A	306	49Y	C4-C5-C6-C7
7	A	306	49Y	C10-C11-C12-C13
7	A	306	49Y	CCD-CCE-CCF-CCG
7	A	306	49Y	CAE-CAF-CAG-CAH
7	A	306	49Y	CAB-CAC-CAD-CAE
7	A	306	49Y	C11-C12-C13-C14

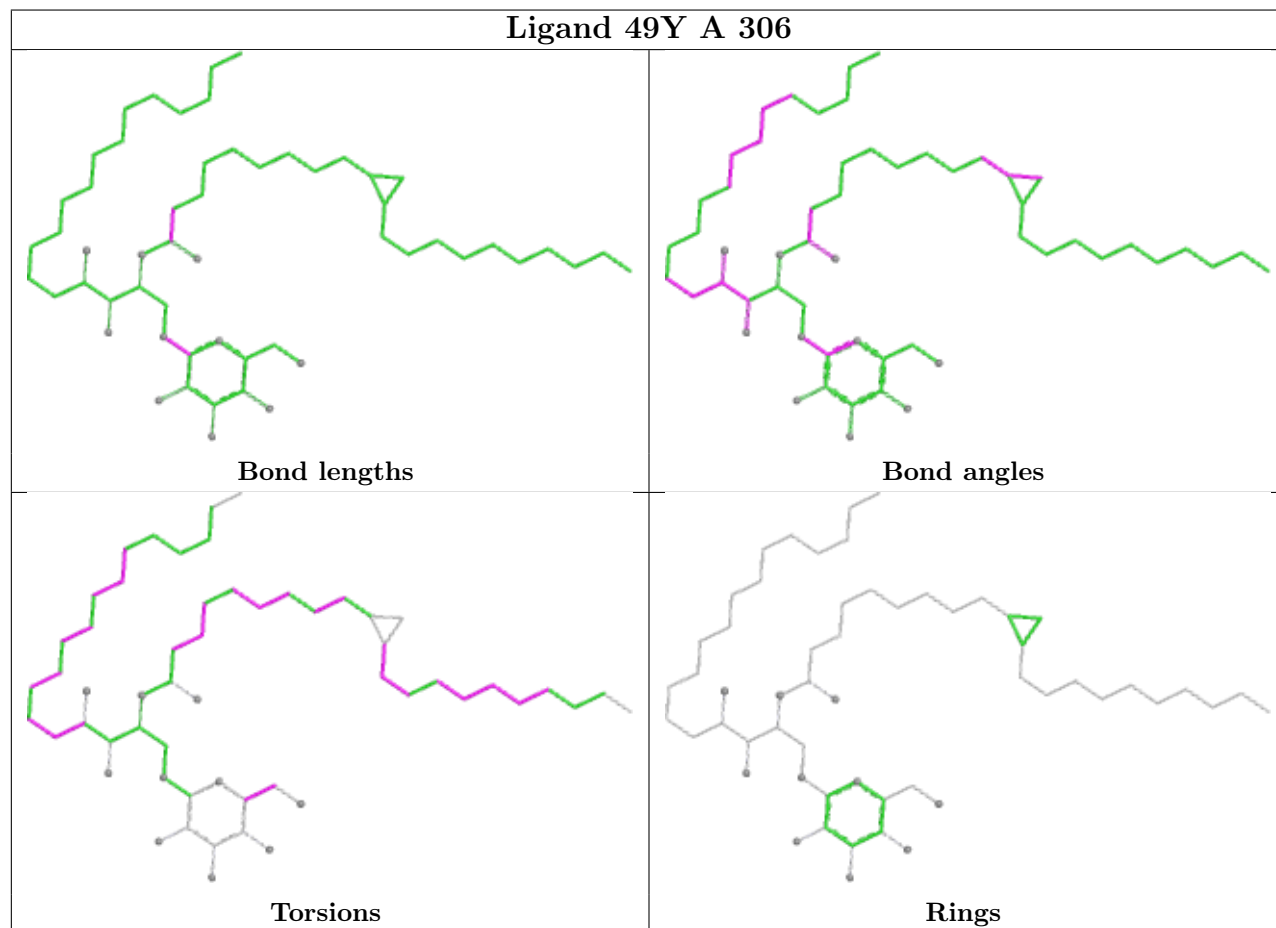
There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	306	49Y	3	0
6	A	305	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 Fit of model and data

6.1 Protein, DNA and RNA chains

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	268/285 (94%)	0.12	8 (2%)	52	43	21, 33, 67, 86	0
2	B	96/99 (96%)	0.10	0	100	100	20, 40, 55, 63	1 (1%)
3	C	202/209 (96%)	0.16	9 (4%)	38	30	15, 33, 74, 92	1 (0%)
4	D	239/241 (99%)	-0.08	6 (2%)	58	48	20, 33, 51, 72	1 (0%)
All	All	805/834 (96%)	0.07	23 (2%)	53	45	15, 34, 68, 92	3 (0%)

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	181	ASN	5.5
1	A	110	ASN	4.3
4	D	2	ALA	3.7
1	A	226	ASP	3.7
3	C	183	ASP	3.5
3	C	151	LYS	3.4
3	C	152	ASP	3.2
3	C	153	SER	3.2
3	C	192	ASN	3.1
1	A	197	PRO	3.0
4	D	179	ALA	3.0
4	D	221	THR	2.9
3	C	167	SER	2.8
1	A	273	GLN	2.6
1	A	225	GLY	2.6
1	A	6	LYS	2.6
3	C	203	SER	2.5
4	D	219	GLU	2.2
3	C	130	SER	2.2
1	A	227	GLN	2.1
4	D	3	ALA	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	109	GLY	2.0
3	C	148	SER	2.0

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

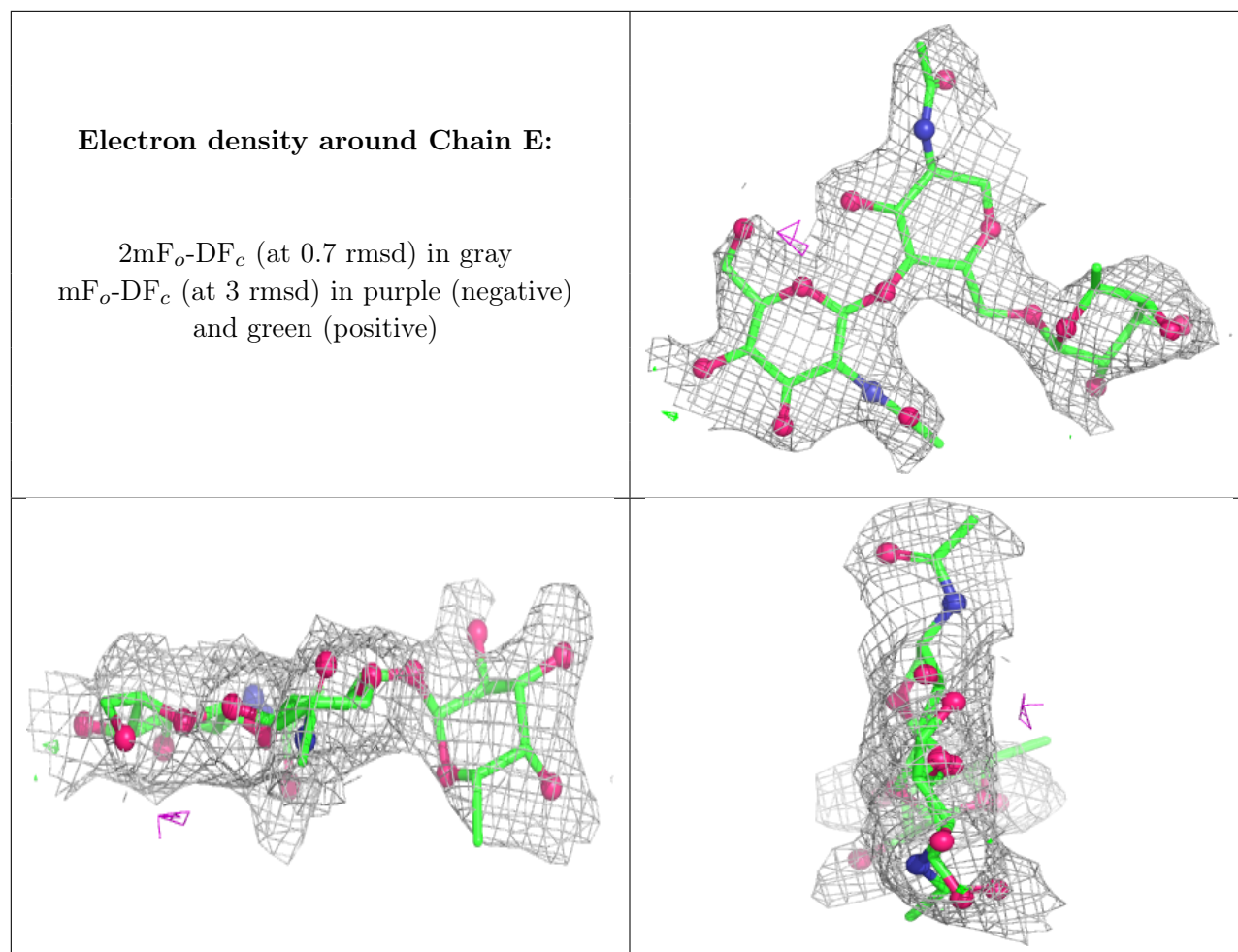
There are no non-standard protein/DNA/RNA residues in this entry.

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($\text{\AA}^2$)	Q<0.9
5	FUC	E	3	10/11	0.78	0.16	50,56,58,59	0
5	NAG	E	2	14/15	0.81	0.13	48,53,54,55	0
5	NAG	E	1	14/15	0.88	0.11	31,35,47,54	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](#)

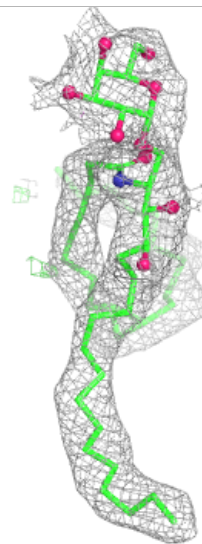
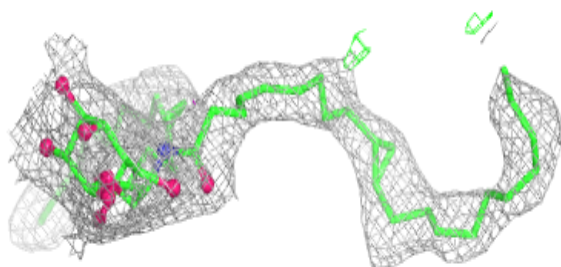
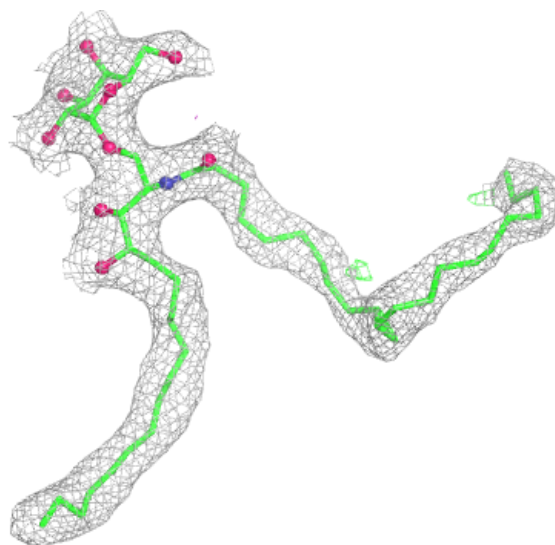
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	NAG	A	305	14/15	0.87	0.11	47,53,56,56	0
6	NAG	A	301	14/15	0.90	0.10	21,25,26,28	0
7	49Y	A	306	56/56	0.94	0.11	19,22,48,49	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around 49Y A 306:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.