



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:34 PM UTC

PDB ID : 2D20 / pdb_00002d20
Title : Crystal structure of michaelis complex of catalytic-site mutant xylanase from *Streptomyces olivaceoviridis* E-86
Authors : Suzuki, R.; Kuno, A.; Fujimoto, Z.; Ito, S.; Kawahara, S.I.; Kaneko, S.; Hasegawa, T.; Taira, K.
Deposited on : 2005-09-02
Resolution : 1.85 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

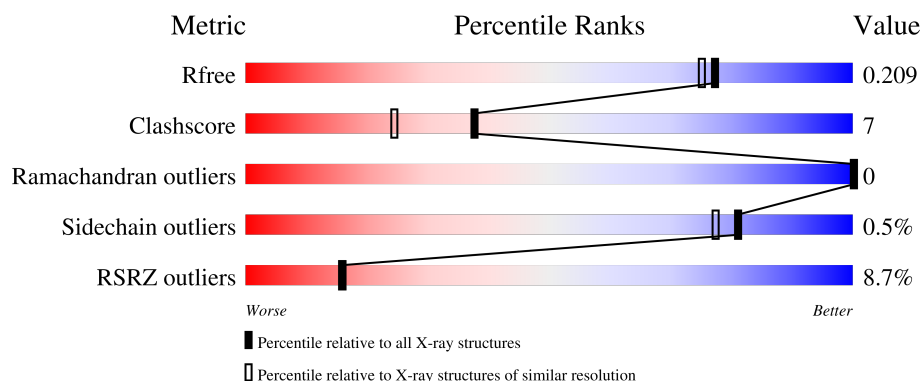
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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	3428 (1.86-1.86)
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)
RSRZ outliers	180081	3429 (1.86-1.86)

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	436	7% 82% 16% .
1	B	436	10% 83% 14% .
2	C	2	100%
2	D	2	50% 50%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	XYS	C	1	X	-	-	-
2	XYS	C	2	X	-	-	-
2	XYS	D	1	X	-	-	-
2	XYS	D	2	X	-	-	-
4	GOL	A	975	-	-	X	-
4	GOL	B	977	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7390 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 ENDO-1,4-BETA-D-XYLANASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	427	Total	C	N	O	S	0	0	0
			3233	1988	588	641	16			
1	B	427	Total	C	N	O	S	0	0	0
			3233	1988	588	641	16			

There are 4 discrepancies between the modelled and reference sequences:

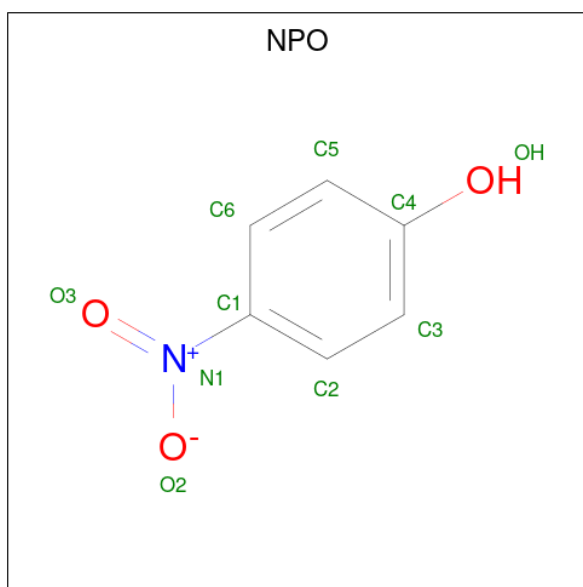
Chain	Residue	Modelled	Actual	Comment	Reference
A	127	SER	ASN	engineered mutation	UNP Q7SI98
A	128	HIS	GLU	engineered mutation	UNP Q7SI98
B	627	SER	ASN	engineered mutation	UNP Q7SI98
B	628	HIS	GLU	engineered mutation	UNP Q7SI98

- Molecule 2 is an oligosaccharide called alpha-D-xylopyranose-(1-4)-alpha-D-xylopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	2	Total	C	O	0	0	0
			18	10	8			
2	D	2	Total	C	O	0	0	0
			19	10	9			

- Molecule 3 is P-NITROPHENOL (CCD ID: NPO) (formula: C₆H₅NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			10	6	1	3		
3	B	1	Total	C	N	O	0	0
			10	6	1	3		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 6	C 3	O 3	0	0
4	B	1	Total 6	C 3	O 3	0	0
4	B	1	Total 6	C 3	O 3	0	0
4	B	1	Total 6	C 3	O 3	0	0
4	B	1	Total 6	C 3	O 3	0	0

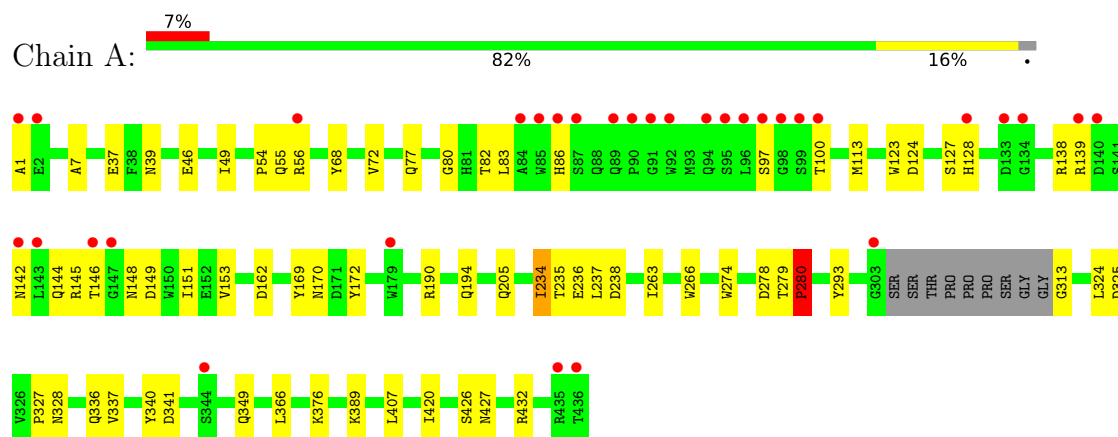
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	355	Total 355	O 355	0	0
5	B	470	Total 470	O 470	0	0

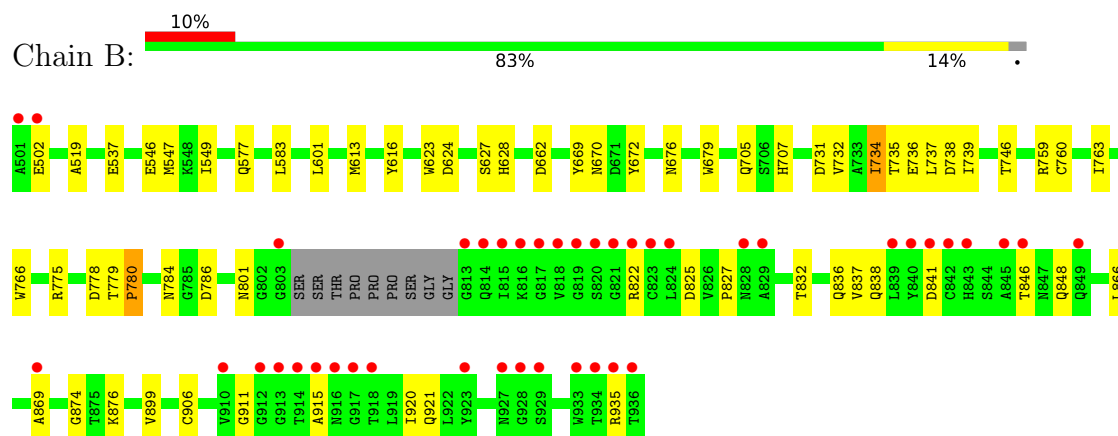
3 Residue-property plots

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.

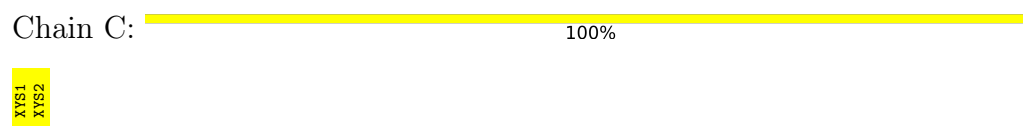
• Molecule 1: ENDO-1,4-BETA-D-XYLANASE



• Molecule 1: ENDO-1,4-BETA-D-XYLANASE



• Molecule 2: alpha-D-xylopyranose-(1-4)-alpha-D-xylopyranose



• Molecule 2: alpha-D-xylopyranose-(1-4)-alpha-D-xylopyranose





4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	78.47Å 94.11Å 139.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.60 – 1.85 44.60 – 1.85	Depositor EDS
% Data completeness (in resolution range)	(Not available) (44.60-1.85) 99.9 (44.60-1.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	7.15 (at 1.86Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.181 , 0.208 0.181 , 0.209	Depositor DCC
R_{free} test set	4472 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	16.9	Xtriage
Anisotropy	0.040	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 43.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7390	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.45% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: XYZ, GOL, NPO

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	0.32	0/3298	0.90	14/4473 (0.3%)
1	B	0.34	0/3298	0.90	11/4473 (0.2%)
All	All	0.33	0/6596	0.90	25/8946 (0.3%)

There are no bond length outliers.

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	235	THR	N-CA-C	8.71	124.31	112.90
1	B	735	THR	N-CA-C	8.13	123.33	113.41
1	B	537	GLU	N-CA-C	7.14	122.08	113.23
1	A	83	LEU	N-CA-C	7.01	119.00	111.36
1	B	546	GLU	N-CA-C	6.83	120.71	112.38
1	A	366	LEU	N-CA-C	-6.73	100.07	110.10
1	A	37	GLU	N-CA-C	6.59	121.41	113.23
1	B	583	LEU	N-CA-C	6.46	119.64	111.69
1	A	46	GLU	N-CA-C	6.21	120.33	112.87
1	B	866	LEU	N-CA-C	-6.11	100.99	110.10
1	A	169	TYR	N-CA-C	-5.92	99.54	109.07
1	A	407	LEU	N-CA-C	-5.88	101.15	109.96
1	B	549	ILE	N-CA-C	5.81	116.00	110.42
1	A	237	LEU	N-CA-C	5.67	118.55	110.10
1	B	577	GLN	N-CA-C	-5.64	102.42	110.59
1	B	669	TYR	N-CA-C	-5.40	100.38	109.07
1	A	77	GLN	N-CA-C	-5.38	103.59	110.53
1	B	737	LEU	N-CA-C	5.38	118.11	110.10
1	B	734	ILE	N-CA-C	-5.33	99.42	107.73
1	A	274	TRP	N-CA-C	-5.19	106.78	113.01
1	A	324	LEU	N-CA-C	-5.15	102.29	109.96
1	B	624	ASP	N-CA-C	-5.12	99.43	108.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	280	PRO	N-CA-C	5.11	122.06	114.80
1	A	234	ILE	N-CA-C	-5.09	99.78	107.73
1	A	49	ILE	N-CA-C	5.04	115.26	110.42

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	3233	0	3043	44	0
1	B	3233	0	3040	45	0
2	C	18	0	15	0	0
2	D	19	0	17	1	0
3	A	10	0	4	2	0
3	B	10	0	5	1	0
4	A	18	0	24	6	0
4	B	24	0	32	7	0
5	A	355	0	0	2	0
5	B	470	0	0	3	0
All	All	7390	0	6180	89	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 7.

All (89) 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:205:GLN:HE22	3:A:453:NPO:H5	1.44	0.83
1:B:911:GLY:H	4:B:977:GOL:H31	1.46	0.79
1:A:336:GLN:HB2	1:A:376:LYS:HE3	1.65	0.77
1:B:547:MET:HE3	1:B:616:TYR:CE2	2.21	0.75
1:B:921:GLN:HE22	4:B:977:GOL:H32	1.53	0.72
1:A:142:ASN:HA	1:A:145:ARG:NH1	2.06	0.71
1:A:142:ASN:HA	1:A:145:ARG:HH12	1.60	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:327:PRO:HA	4:A:975:GOL:O1	1.98	0.64
1:A:234:ILE:HD12	1:A:263:ILE:HG12	1.80	0.63
1:A:238:ASP:HB2	1:A:280:PRO:HB2	1.81	0.63
1:B:827:PRO:HG3	1:B:838:GLN:HG2	1.82	0.62
1:A:145:ARG:HH11	1:A:145:ARG:HB2	1.65	0.60
1:A:113:MET:HE2	1:A:162:ASP:HB3	1.83	0.60
1:A:190:ARG:O	1:A:194:GLN:HG3	2.02	0.60
1:B:921:GLN:NE2	4:B:977:GOL:H32	2.16	0.60
1:A:389:LYS:HE3	5:A:1184:HOH:O	2.02	0.58
1:A:340:TYR:CD2	4:A:975:GOL:H32	2.39	0.58
1:B:547:MET:HE2	1:B:623:TRP:CH2	2.39	0.57
1:B:502:GLU:HG3	1:B:801:ASN:OD1	2.04	0.57
1:B:778:ASP:O	1:B:779:THR:C	2.47	0.57
1:A:313:GLY:HA2	1:A:349:GLN:HE22	1.70	0.56
1:B:738:ASP:HB2	1:B:780:PRO:HB2	1.86	0.56
1:A:337:VAL:HG23	1:A:420:ILE:HB	1.88	0.56
1:A:39:ASN:HB3	4:A:972:GOL:H12	1.89	0.54
1:A:278:ASP:O	1:A:279:THR:C	2.50	0.54
1:B:672:TYR:HB3	1:B:705:GLN:NE2	2.23	0.54
1:B:825:ASP:OD1	4:B:976:GOL:H31	2.08	0.54
1:B:547:MET:HE2	1:B:623:TRP:HH2	1.73	0.53
1:B:869:ALA:HB3	5:B:1203:HOH:O	2.09	0.52
1:B:837:VAL:HG23	1:B:920:ILE:HB	1.91	0.52
1:B:676:ASN:HB3	1:B:679:TRP:CD2	2.44	0.52
1:B:876:LYS:HG2	5:B:1148:HOH:O	2.10	0.52
1:B:874:GLY:HA2	1:B:921:GLN:OE1	2.10	0.51
1:B:822:ARG:HE	1:B:915:ALA:HA	1.75	0.51
1:A:1:ALA:HA	1:A:7:ALA:HB1	1.93	0.50
1:A:145:ARG:NH1	1:A:145:ARG:HB2	2.26	0.50
1:A:328:ASN:N	4:A:975:GOL:O1	2.34	0.50
1:A:142:ASN:O	1:A:146:THR:HG23	2.12	0.50
1:A:279:THR:N	1:A:280:PRO:HD3	2.27	0.49
1:B:822:ARG:HG2	1:B:822:ARG:HH11	1.78	0.49
1:B:899:VAL:HG22	1:B:906:CYS:SG	2.52	0.49
1:B:822:ARG:NH1	1:B:841:ASP:OD1	2.45	0.49
1:A:432:ARG:HG2	5:A:1143:HOH:O	2.12	0.49
1:B:876:LYS:HG3	5:B:1203:HOH:O	2.12	0.49
1:B:935:ARG:HG3	1:B:935:ARG:HH11	1.78	0.49
1:B:779:THR:N	1:B:780:PRO:HD3	2.28	0.48
1:A:172:TYR:HB3	1:A:205:GLN:NE2	2.28	0.48
1:A:82:THR:HG23	1:A:124:ASP:O	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:127:SER:HA	1:A:170:ASN:O	2.14	0.48
1:B:775:ARG:HH22	3:B:953:NPO:C6	2.27	0.48
1:B:734:ILE:HD12	1:B:763:ILE:HG12	1.96	0.47
1:A:144:GLN:HE22	1:A:148:ASN:HA	1.78	0.47
1:A:97:SER:O	1:A:100:THR:HG22	2.14	0.46
1:B:832:THR:HG23	4:B:971:GOL:C1	2.46	0.46
1:A:54:PRO:HB2	1:A:55:GLN:NE2	2.30	0.46
1:A:145:ARG:HH11	1:A:145:ARG:CB	2.29	0.45
1:B:736:GLU:HG2	1:B:766:TRP:CE3	2.52	0.44
1:A:426:SER:O	1:A:427:ASN:HB2	2.17	0.44
1:B:705:GLN:HE21	1:B:707:HIS:CD2	2.35	0.44
1:B:739:ILE:HD13	1:B:746:THR:HG22	1.99	0.44
1:A:325:ASP:OD1	4:A:975:GOL:C1	2.66	0.44
1:B:846:THR:C	1:B:848:GLN:H	2.24	0.44
1:B:628:HIS:NE2	1:B:705:GLN:OE1	2.50	0.44
1:B:628:HIS:CE1	2:D:1:XYS:H1	2.52	0.43
1:B:836:GLN:HB2	1:B:876:LYS:HE3	2.00	0.43
1:A:127:SER:OG	1:A:128:HIS:ND1	2.48	0.43
1:B:627:SER:HA	1:B:670:ASN:O	2.18	0.43
1:A:325:ASP:OD1	4:A:975:GOL:H11	2.19	0.43
1:B:627:SER:OG	1:B:628:HIS:HD2	2.01	0.43
1:A:205:GLN:NE2	3:A:453:NPO:H5	2.24	0.43
1:A:149:ASP:O	1:A:153:VAL:HG23	2.19	0.42
1:B:911:GLY:H	4:B:977:GOL:C3	2.23	0.42
1:A:293:TYR:CD1	1:A:293:TYR:C	2.98	0.42
1:A:86:HIS:NE2	1:A:139:ARG:NH1	2.68	0.42
1:A:138:ARG:CZ	1:A:151:ILE:HD12	2.49	0.42
1:B:519:ALA:HB2	1:B:766:TRP:CE3	2.55	0.42
1:B:784:ASN:OD1	1:B:786:ASP:OD1	2.38	0.42
1:A:236:GLU:HG2	1:A:266:TRP:CE3	2.55	0.41
1:A:80:GLY:HA3	1:A:123:TRP:CE3	2.55	0.41
1:B:732:VAL:HG23	1:B:760:CYS:HA	2.02	0.41
1:A:340:TYR:O	1:A:341:ASP:C	2.63	0.41
1:B:705:GLN:HE21	1:B:707:HIS:HD2	1.66	0.41
1:A:236:GLU:HG2	1:A:266:TRP:CZ3	2.55	0.41
1:B:613:MET:HE2	1:B:662:ASP:HB3	2.02	0.41
1:A:68:TYR:CZ	1:A:72:VAL:HG21	2.56	0.41
1:B:935:ARG:HG3	1:B:935:ARG:NH1	2.36	0.41
1:B:832:THR:HG23	4:B:971:GOL:H11	2.04	0.40
1:A:56:ARG:HG2	1:A:56:ARG:HH11	1.86	0.40
1:B:731:ASP:OD1	1:B:759:ARG:HD3	2.22	0.40

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	423/436 (97%)	410 (97%)	13 (3%)	0	100	100
1	B	352/436 (81%)	341 (97%)	11 (3%)	0	100	100
All	All	775/872 (89%)	751 (97%)	24 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all 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	314/341 (92%)	313 (100%)	1 (0%)	86	85
1	B	240/341 (70%)	238 (99%)	2 (1%)	73	67
All	All	554/682 (81%)	551 (100%)	3 (0%)	81	77

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	280	PRO
1	B	601	LEU
1	B	780	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	55	GLN
1	A	89	GLN
1	A	194	GLN
1	A	205	GLN
1	A	223	GLN
1	A	343	HIS
1	A	349	GLN
1	B	705	GLN
1	B	723	GLN
1	B	798	ASN
1	B	828	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 ⓘ

4 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	$\# Z > 2$
2	XYS	C	1	2,3	9,9,10	1.77	4 (44%)	10,12,14	1.92	2 (20%)
2	XYS	C	2	2	9,9,10	0.65	0	10,12,14	0.78	1 (10%)
2	XYS	D	1	2	10,10,10	1.58	3 (30%)	14,14,14	1.41	2 (14%)
2	XYS	D	2	2	9,9,10	0.60	0	10,12,14	0.72	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
2	XYS	C	1	2,3	1/1/3/4	-	1/1/1/1
2	XYS	C	2	2	1/1/3/4	-	0/1/1/1
2	XYS	D	1	2	1/1/4/4	-	0/1/1/1
2	XYS	D	2	2	1/1/3/4	-	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	XYS	C2-C3	2.71	1.56	1.52
2	D	1	XYS	C4-C3	-2.56	1.48	1.52
2	C	1	XYS	O5-C5	2.52	1.47	1.43
2	C	1	XYS	C4-C3	-2.45	1.48	1.52
2	D	1	XYS	C5-C4	2.21	1.57	1.52
2	C	1	XYS	C5-C4	2.09	1.57	1.52
2	D	1	XYS	O5-C5	2.05	1.47	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	XYS	C4-C3-C2	-4.77	105.25	110.92
2	D	1	XYS	C4-C3-C2	-3.57	104.58	110.86
2	C	1	XYS	C5-C4-C3	-3.13	105.08	109.64
2	D	1	XYS	C5-C4-C3	-3.06	105.19	109.64
2	C	2	XYS	C4-C3-C2	-2.18	108.33	110.92

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	C	1	XYS	C1
2	C	2	XYS	C1
2	D	1	XYS	C1
2	D	2	XYS	C1

There are no torsion outliers.

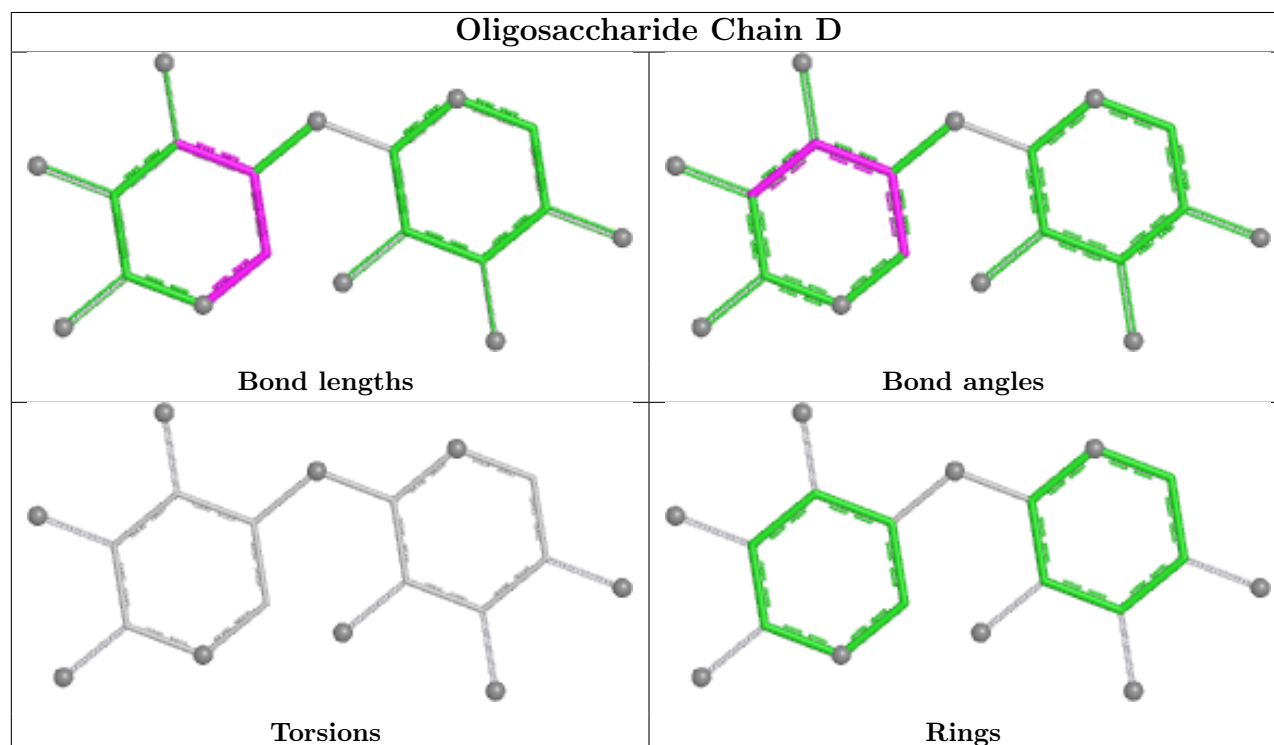
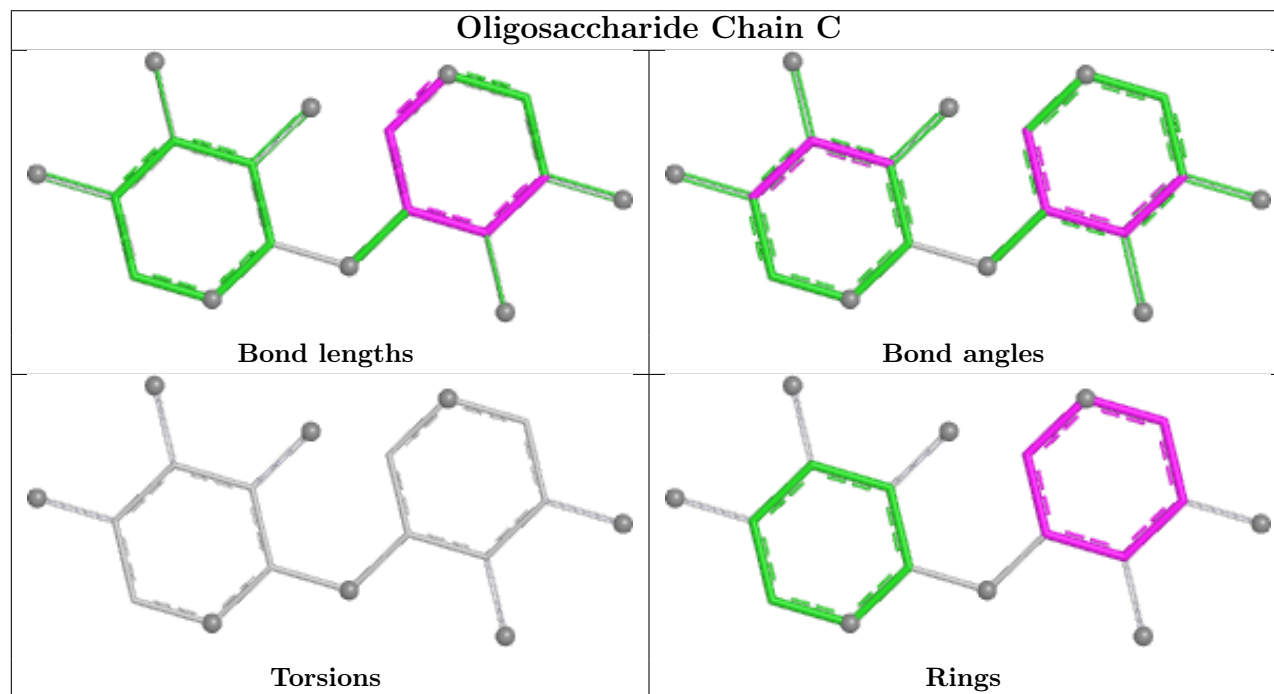
All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1	XYS	C1-C2-C3-C4-C5-O5

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	1	XYS	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

9 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	$\# Z > 2$
3	NPO	A	453	2	10,10,10	1.21	1 (10%)	11,13,13	0.58	0
4	GOL	B	977	-	5,5,5	0.16	0	5,5,5	0.36	0
4	GOL	A	973	-	5,5,5	0.18	0	5,5,5	0.30	0
4	GOL	B	974	-	5,5,5	0.18	0	5,5,5	0.36	0
4	GOL	B	976	-	5,5,5	0.16	0	5,5,5	0.34	0
4	GOL	A	975	-	5,5,5	0.19	0	5,5,5	0.33	0
3	NPO	B	953	-	10,10,10	1.02	0	11,13,13	0.58	0
4	GOL	A	972	-	5,5,5	0.18	0	5,5,5	0.33	0
4	GOL	B	971	-	5,5,5	0.13	0	5,5,5	0.30	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	NPO	A	453	2	-	0/2/4/4	0/1/1/1
4	GOL	B	977	-	-	0/4/4/4	-
4	GOL	A	973	-	-	0/4/4/4	-
4	GOL	B	974	-	-	0/4/4/4	-
4	GOL	B	976	-	-	0/4/4/4	-
4	GOL	A	975	-	-	0/4/4/4	-
3	NPO	B	953	-	-	0/2/4/4	0/1/1/1
4	GOL	A	972	-	-	0/4/4/4	-
4	GOL	B	971	-	-	0/4/4/4	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	453	NPO	OH-C4	2.09	1.41	1.37

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

7 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	453	NPO	2	0
4	B	977	GOL	4	0
4	B	976	GOL	1	0
4	A	975	GOL	5	0
3	B	953	NPO	1	0
4	A	972	GOL	1	0
4	B	971	GOL	2	0

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	427/436 (97%)	0.16	32 (7%) 20 22	9, 17, 38, 50	0
1	B	427/436 (97%)	0.13	42 (9%) 13 13	8, 14, 40, 58	0
All	All	854/872 (97%)	0.15	74 (8%) 16 16	8, 16, 40, 58	0

All (74) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	819	GLY	8.8
1	B	501	ALA	5.8
1	A	436	THR	5.8
1	B	936	THR	5.3
1	A	97	SER	4.3
1	B	813	GLY	4.1
1	B	818	VAL	4.1
1	A	1	ALA	4.0
1	B	820	SER	3.8
1	A	92	TRP	3.8
1	B	842	CYS	3.7
1	B	817	GLY	3.6
1	A	435	ARG	3.5
1	B	840	TYR	3.4
1	B	869	ALA	3.3
1	B	917	GLY	3.2
1	B	910	VAL	3.2
1	B	843	HIS	3.2
1	B	839	LEU	3.2
1	A	56	ARG	3.1
1	B	927	ASN	3.1
1	B	822	ARG	3.1
1	A	179	TRP	3.0
1	A	100	THR	3.0

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Mol	Chain	Res	Type	RSRZ
1	B	823	CYS	3.0
1	B	928	GLY	3.0
1	A	344	SER	2.9
1	B	845	ALA	2.9
1	B	915	ALA	2.9
1	A	85	TRP	2.9
1	A	96	LEU	2.9
1	B	849	GLN	2.9
1	B	824	LEU	2.9
1	B	816	LYS	2.8
1	B	828	ASN	2.8
1	A	89	GLN	2.7
1	B	829	ALA	2.7
1	A	303	GLY	2.7
1	B	914	THR	2.7
1	B	934	THR	2.7
1	B	821	GLY	2.6
1	A	140	ASP	2.6
1	A	146	THR	2.6
1	B	929	SER	2.6
1	A	143	LEU	2.6
1	A	134	GLY	2.6
1	A	98	GLY	2.6
1	B	935	ARG	2.6
1	B	502	GLU	2.6
1	A	147	GLY	2.6
1	B	923	TYR	2.5
1	A	84	ALA	2.5
1	B	913	GLY	2.5
1	A	95	SER	2.5
1	B	815	ILE	2.4
1	A	94	GLN	2.4
1	B	814	GLN	2.4
1	B	841	ASP	2.4
1	B	803	GLY	2.4
1	A	133	ASP	2.4
1	B	846	THR	2.3
1	B	916	ASN	2.3
1	B	918	THR	2.2
1	A	91	GLY	2.2
1	A	142	ASN	2.2
1	A	86	HIS	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	933	TRP	2.1
1	A	139	ARG	2.1
1	A	87	SER	2.0
1	A	90	PRO	2.0
1	A	2	GLU	2.0
1	A	99	SER	2.0
1	A	128	HIS	2.0
1	B	912	GLY	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](#)

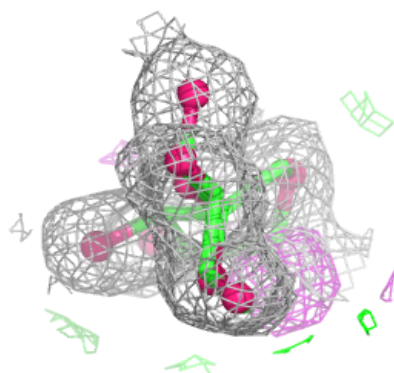
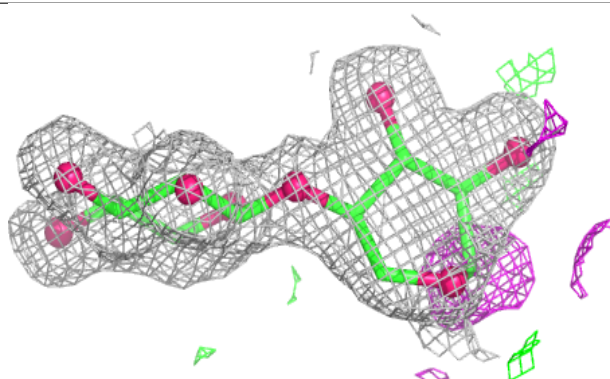
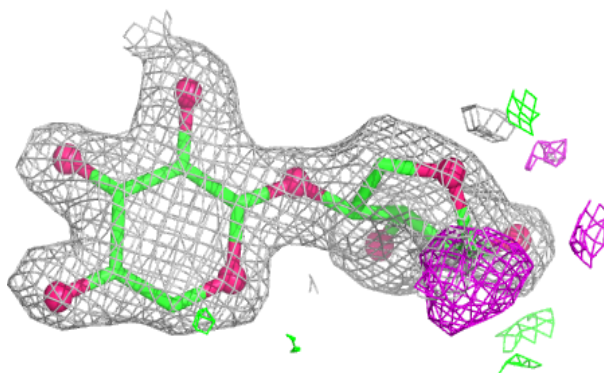
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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
2	XYS	D	1	10/10	0.84	0.13	20,25,29,32	0
2	XYS	C	1	9/10	0.86	0.15	35,38,42,43	0
2	XYS	C	2	9/10	0.87	0.11	29,35,37,37	0
2	XYS	D	2	9/10	0.93	0.08	17,22,23,24	0

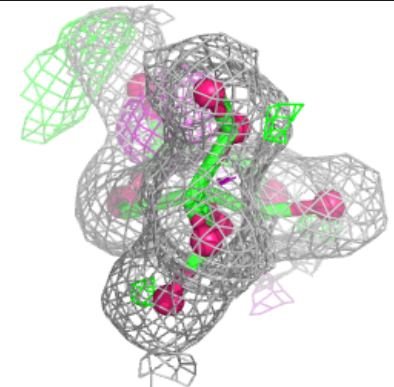
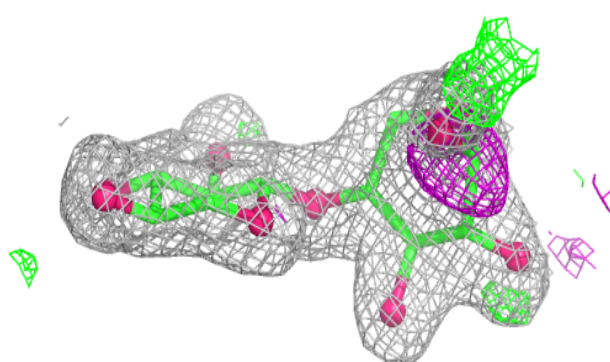
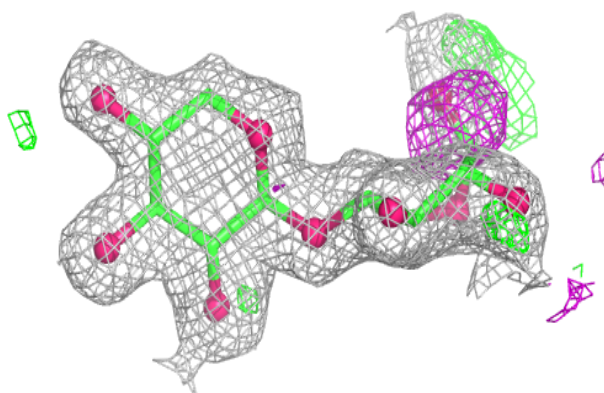
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain C:

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

**Electron density around Chain D:**

$2mF_o-DF_c$ (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($\text{\AA}^2$)	Q<0.9
3	NPO	A	453	10/10	0.50	0.24	47,52,56,57	0
3	NPO	B	953	10/10	0.66	0.28	64,64,66,66	0
4	GOL	A	975	6/6	0.70	0.26	30,32,37,39	0
4	GOL	B	974	6/6	0.75	0.26	47,48,48,48	0
4	GOL	B	976	6/6	0.77	0.19	48,49,49,51	0
4	GOL	A	972	6/6	0.78	0.25	34,36,37,37	0
4	GOL	B	977	6/6	0.78	0.21	45,45,45,47	0
4	GOL	B	971	6/6	0.86	0.17	30,34,36,38	0
4	GOL	A	973	6/6	0.92	0.12	23,28,28,30	0

6.5 Other polymers [i](#)

There are no such residues in this entry.