



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 14, 2026 – 02:06 PM JST

PDB ID : 24IL / pdb_000024il
Title : alpha-1,2-glucosidase from Arthrobacter humicola A8F5, selaginose complex
Authors : Yasukochi, R.; Fushinobu, S.
Deposited on : 2026-03-04
Resolution : 1.80 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 : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.015 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

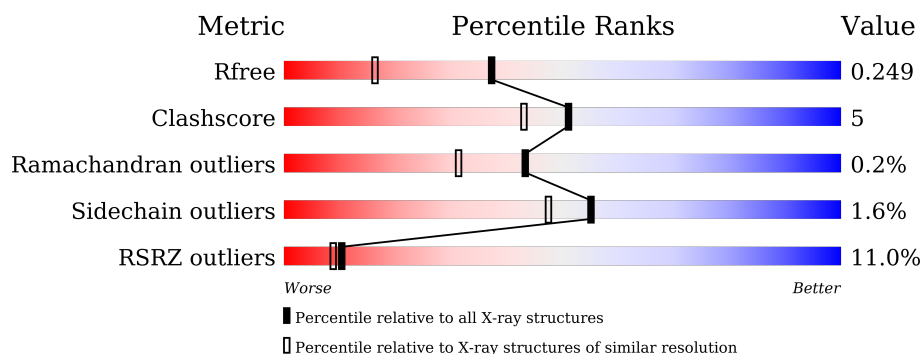
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	639	11% 82% 14% ..
1	B	639	11% 79% 14% ..
2	C	3	33% 67%
2	D	3	100%

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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	GLC	D	3	-	-	X	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 9535 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 alpha-1,2-glucosidase from *Arthrobacter humicola* A8F5.

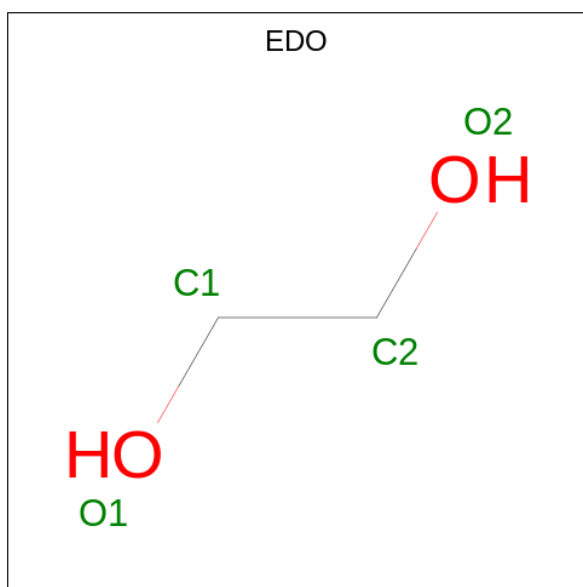
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	621	Total	C	N	O	S	0	0	0
			4651	2931	849	858	13			
1	B	611	Total	C	N	O	S	0	0	0
			4580	2891	833	843	13			

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



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	3	Total	C	O	0	0	0
			34	18	16			
2	D	3	Total	C	O	0	0	0
			34	18	16			

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0

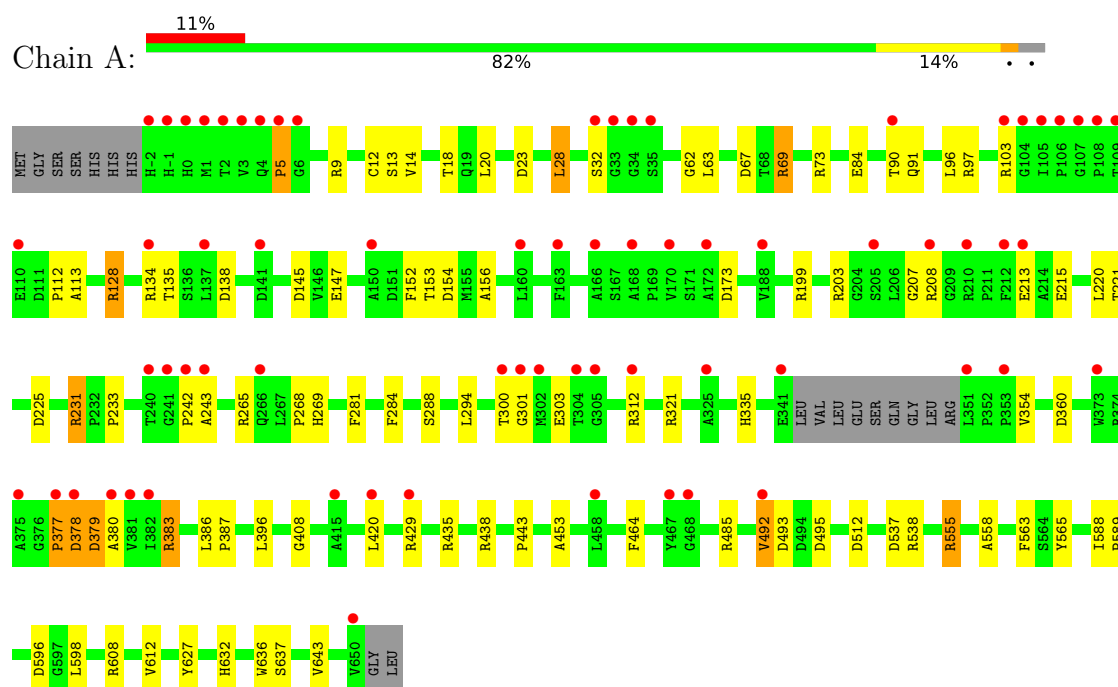
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	101	Total O 101 101	0	0
4	B	103	Total O 103 103	0	0

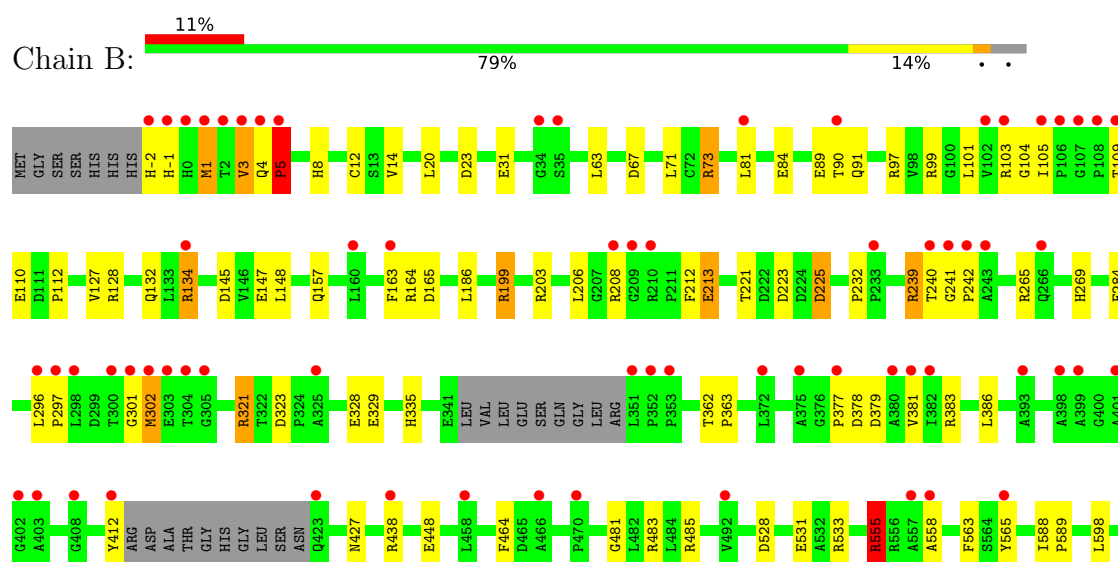
3 Residue-property plots [i](#)

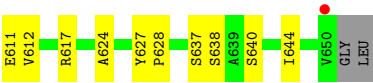
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: alpha-1,2-glucosidase from *Arthrobacter humicola* A8F5



- Molecule 1: alpha-1,2-glucosidase from *Arthrobacter humicola* A8F5





● Molecule 2: alpha-D-glucopyranose-(1-1)-alpha-D-glucopyranose-(1-2)-alpha-D-glucopyranose



● Molecule 2: alpha-D-glucopyranose-(1-1)-alpha-D-glucopyranose-(1-2)-alpha-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.80Å 108.08Å 105.44Å 90.00° 93.28° 90.00°	Depositor
Resolution (Å)	48.16 – 1.80 48.16 – 1.80	Depositor EDS
% Data completeness (in resolution range)	99.0 (48.16-1.80) 99.0 (48.16-1.80)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.25 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.199 , 0.240 0.211 , 0.249	Depositor DCC
R_{free} test set	5603 reflections (4.86%)	wwPDB-VP
Wilson B-factor (Å ²)	28.5	Xtriage
Anisotropy	0.050	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 35.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9535	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.85% 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: EDO, GLC

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	1.02	2/4772 (0.0%)	1.47	43/6513 (0.7%)
1	B	1.01	3/4699 (0.1%)	1.45	31/6413 (0.5%)
All	All	1.01	5/9471 (0.1%)	1.46	74/12926 (0.6%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	5
1	B	0	5
All	All	0	10

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	8	HIS	ND1-CE1	6.15	1.38	1.32
1	A	453	ALA	CA-CB	-5.83	1.44	1.53
1	A	565	TYR	C-O	-5.46	1.17	1.24
1	B	624	ALA	C-N	-5.29	1.28	1.32
1	B	611	GLU	CD-OE2	5.17	1.35	1.25

All (74) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	213	GLU	CB-CG-CD	9.16	128.17	112.60
1	B	225	ASP	CA-CB-CG	8.37	120.97	112.60
1	A	67	ASP	CA-CB-CG	8.17	120.77	112.60
1	B	1	MET	CG-SD-CE	7.61	117.64	100.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	627	TYR	CA-C-O	7.42	124.11	119.29
1	A	438	ARG	CA-CB-CG	7.30	128.69	114.10
1	B	5	PRO	N-CA-C	-7.14	97.75	112.47
1	B	438	ARG	CA-CB-CG	6.82	127.74	114.10
1	B	269	HIS	CA-CB-CG	-6.81	106.99	113.80
1	A	225	ASP	CA-CB-CG	6.76	119.36	112.60
1	A	221	THR	OG1-CB-CG2	-6.65	96.00	109.30
1	B	412	TYR	CA-C-O	-6.62	109.56	120.80
1	B	638	SER	N-CA-C	-6.61	104.16	111.36
1	A	67	ASP	CB-CA-C	6.56	121.20	111.17
1	A	598	LEU	N-CA-CB	6.34	120.11	110.28
1	A	354	VAL	N-CA-CB	6.21	119.47	111.83
1	B	323	ASP	CA-CB-CG	6.19	118.79	112.60
1	A	608	ARG	CD-NE-CZ	6.19	133.06	124.40
1	A	360	ASP	CA-CB-CG	6.06	118.66	112.60
1	A	596	ASP	CA-CB-CG	6.06	118.66	112.60
1	A	537	ASP	CA-CB-CG	6.03	118.63	112.60
1	B	448	GLU	N-CA-CB	6.00	119.04	110.16
1	A	90	THR	OG1-CB-CG2	-5.94	97.42	109.30
1	B	611	GLU	CG-CD-OE2	5.92	132.02	118.40
1	A	300	THR	CA-CB-OG1	-5.90	100.75	109.60
1	B	386	LEU	O-C-N	-5.86	115.20	120.71
1	A	5	PRO	N-CA-C	-5.79	100.53	112.47
1	A	173	ASP	CA-CB-CG	5.79	118.39	112.60
1	B	203	ARG	CB-CA-C	-5.78	96.73	109.56
1	B	464	PHE	CA-CB-CG	5.74	119.54	113.80
1	A	637	SER	CA-C-O	5.74	126.69	120.55
1	B	67	ASP	CA-CB-CG	5.71	118.31	112.60
1	B	213	GLU	CB-CG-CD	5.68	122.26	112.60
1	B	239	ARG	CD-NE-CZ	-5.66	116.48	124.40
1	A	269	HIS	CA-CB-CG	-5.61	108.19	113.80
1	A	377	PRO	N-CA-CB	-5.60	96.48	102.76
1	A	464	PHE	CA-CB-CG	5.58	119.38	113.80
1	B	221	THR	CA-CB-OG1	-5.58	101.23	109.60
1	B	213	GLU	CA-C-O	-5.56	114.15	120.32
1	B	23	ASP	CA-CB-CG	5.54	118.14	112.60
1	A	493	ASP	CB-CA-C	-5.49	98.89	109.37
1	A	555	ARG	CA-CB-CG	5.47	125.05	114.10
1	A	485	ARG	NE-CZ-NH1	-5.47	116.03	121.50
1	A	134	ARG	CD-NE-CZ	5.47	132.06	124.40
1	A	231	ARG	CD-NE-CZ	5.46	132.05	124.40
1	A	153	THR	CA-CB-OG1	5.45	117.78	109.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	443	PRO	N-CA-CB	-5.45	96.60	102.60
1	A	396	LEU	N-CA-C	-5.45	105.25	111.14
1	B	627	TYR	CA-C-O	5.45	122.83	119.29
1	A	495	ASP	CB-CA-C	-5.45	100.55	110.63
1	B	232	PRO	N-CA-CB	-5.42	96.64	102.60
1	A	18	THR	CA-CB-OG1	-5.39	101.52	109.60
1	A	438	ARG	N-CA-CB	-5.37	101.47	109.69
1	B	134	ARG	CD-NE-CZ	5.29	131.80	124.40
1	B	128	ARG	CD-NE-CZ	5.27	131.77	124.40
1	A	627	TYR	CB-CA-C	5.25	116.11	110.08
1	B	8	HIS	CB-CG-CD2	5.22	137.99	131.20
1	A	288	SER	N-CA-C	-5.21	105.68	111.36
1	A	632	HIS	CA-CB-CG	5.19	118.99	113.80
1	B	99	ARG	CD-NE-CZ	5.18	131.66	124.40
1	A	23	ASP	CA-CB-CG	5.18	117.78	112.60
1	B	145	ASP	CA-CB-CG	5.15	117.75	112.60
1	B	90	THR	OG1-CB-CG2	-5.15	99.00	109.30
1	A	281	PHE	CB-CA-C	5.15	119.73	111.91
1	A	538	ARG	CG-CD-NE	-5.12	100.74	112.00
1	A	435	ARG	NE-CZ-NH1	-5.12	116.38	121.50
1	B	223	ASP	CA-CB-CG	5.11	117.71	112.60
1	A	492	VAL	N-CA-CB	-5.11	102.48	111.93
1	A	145	ASP	CA-CB-CG	5.08	117.68	112.60
1	B	483	ARG	N-CA-C	-5.07	105.64	111.07
1	A	128	ARG	CD-NE-CZ	5.07	131.50	124.40
1	B	438	ARG	CB-CA-C	5.05	117.78	109.90
1	B	611	GLU	CG-CD-OE1	-5.05	106.77	118.40
1	A	408	GLY	N-CA-C	-5.03	108.71	114.69

There are no chirality outliers.

All (10) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	203	ARG	Sidechain
1	A	383	ARG	Sidechain
1	A	555	ARG	Sidechain
1	A	69	ARG	Sidechain
1	A	9	ARG	Sidechain
1	B	164	ARG	Sidechain
1	B	321	ARG	Sidechain
1	B	555	ARG	Sidechain
1	B	73	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	B	97	ARG	Sidechain

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	4651	0	4542	47	0
1	B	4580	0	4477	51	0
2	C	34	0	30	2	0
2	D	34	0	30	9	0
3	A	20	0	30	1	0
3	B	12	0	18	1	0
4	A	101	0	0	6	0
4	B	103	0	0	0	0
All	All	9535	0	9127	96	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 (96) 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:91:GLN:HG2	4:A:893:HOH:O	1.67	0.93
1:B:301:GLY:O	1:B:302:MET:O	1.90	0.89
1:B:63:LEU:HD11	1:B:127:VAL:HG21	1.63	0.80
1:A:63:LEU:HD22	1:A:220:LEU:HD21	1.66	0.77
1:A:32:SER:HB2	1:A:73:ARG:HH22	1.53	0.73
1:B:565:TYR:HE2	2:D:3:GLC:HO2	1.36	0.70
1:A:321:ARG:NH1	4:A:801:HOH:O	2.21	0.70
2:D:2:GLC:O2	2:D:3:GLC:H1	1.94	0.65
1:A:301:GLY:HA2	4:A:888:HOH:O	1.98	0.63
1:A:32:SER:HB2	1:A:73:ARG:NH2	2.13	0.63
1:A:63:LEU:CD2	1:A:220:LEU:HD21	2.28	0.63
1:B:565:TYR:HE2	2:D:3:GLC:O2	1.83	0.61
1:B:301:GLY:O	1:B:302:MET:C	2.42	0.61
1:A:303:GLU:O	1:A:312:ARG:NH2	2.34	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:PRO:O	1:A:243:ALA:HB3	1.99	0.61
2:D:1:GLC:H5	2:D:2:GLC:H2	1.83	0.60
1:A:154:ASP:OD2	1:A:156:ALA:HB3	2.03	0.59
1:A:63:LEU:C	1:A:63:LEU:HD23	2.28	0.59
1:B:-1:HIS:NE2	1:B:165:ASP:OD1	2.35	0.58
1:A:28:LEU:HD21	1:A:62:GLY:HA2	1.86	0.57
1:B:321:ARG:O	1:B:328:GLU:HG2	2.05	0.57
1:B:598:LEU:HD13	1:B:644:ILE:HD11	1.87	0.57
1:A:63:LEU:HD22	1:A:220:LEU:CD2	2.35	0.56
1:A:492:VAL:HG11	1:A:512:ASP:HA	1.88	0.54
1:B:206:LEU:HB3	1:B:212:PHE:HB2	1.88	0.54
1:B:84:GLU:OE2	1:B:103:ARG:NH1	2.34	0.54
1:B:301:GLY:C	1:B:302:MET:O	2.49	0.53
2:C:1:GLC:H5	2:C:2:GLC:H2	1.91	0.53
1:A:233:PRO:HB3	4:A:858:HOH:O	2.08	0.53
1:A:14:VAL:HG22	3:A:705:EDO:H22	1.91	0.52
1:A:208:ARG:CD	1:B:558:ALA:O	2.58	0.52
2:D:2:GLC:O2	2:D:3:GLC:C1	2.56	0.52
1:A:5:PRO:O	1:B:84:GLU:OE1	2.29	0.51
1:A:588:ILE:HB	1:A:589:PRO:HD3	1.93	0.51
1:A:91:GLN:CG	4:A:893:HOH:O	2.41	0.50
1:A:265:ARG:O	1:A:268:PRO:HD3	2.11	0.50
1:A:558:ALA:O	1:B:208:ARG:CD	2.60	0.50
1:A:378:ASP:O	1:A:379:ASP:C	2.55	0.49
1:A:112:PRO:HG2	1:B:563:PHE:HB3	1.94	0.49
1:B:4:GLN:C	1:B:5:PRO:O	2.52	0.49
1:B:528:ASP:OD1	1:B:531:GLU:HG3	2.11	0.49
1:A:84:GLU:OE2	1:A:103:ARG:HD2	2.12	0.49
1:A:429:ARG:HD3	1:B:109:THR:HG22	1.95	0.48
1:A:284:PHE:HA	1:A:335:HIS:O	2.12	0.48
1:B:379:ASP:OD2	1:B:383:ARG:NE	2.43	0.48
1:B:1:MET:HE2	1:B:163:PHE:HB2	1.95	0.48
1:A:231:ARG:NH2	4:A:802:HOH:O	2.31	0.48
1:B:241:GLY:O	1:B:242:PRO:C	2.57	0.48
1:B:132:GLN:OE1	1:B:134:ARG:NE	2.46	0.47
1:A:63:LEU:CD2	1:A:220:LEU:CD2	2.91	0.47
1:A:208:ARG:NE	1:B:558:ALA:O	2.47	0.47
1:B:378:ASP:HB3	1:B:381:VAL:HG23	1.95	0.47
1:B:81:LEU:CD1	1:B:104:GLY:HA3	2.45	0.47
1:B:637:SER:O	1:B:640:SER:HB2	2.15	0.47
1:B:362:THR:N	1:B:363:PRO:HD2	2.30	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:PRO:O	1:A:243:ALA:CB	2.62	0.46
1:A:69:ARG:O	1:A:152:PHE:HA	2.16	0.46
2:C:1:GLC:C5	2:C:2:GLC:H2	2.45	0.46
1:A:63:LEU:CD2	1:A:63:LEU:C	2.88	0.46
1:B:14:VAL:HG22	3:B:701:EDO:H22	1.98	0.46
1:B:147:GLU:HA	1:B:199:ARG:HD2	1.98	0.45
1:A:147:GLU:HA	1:A:199:ARG:HD2	1.97	0.45
1:A:429:ARG:HD3	1:B:109:THR:CG2	2.47	0.45
1:B:132:GLN:NE2	1:B:213:GLU:OE1	2.47	0.45
1:A:13:SER:HB2	1:A:96:LEU:HG	1.99	0.45
2:D:1:GLC:H5	2:D:2:GLC:C2	2.47	0.45
1:A:128:ARG:HE	1:A:215:GLU:CD	2.25	0.45
1:B:533:ARG:O	1:B:533:ARG:HD3	2.16	0.44
1:B:427:ASN:HD21	2:D:3:GLC:H1	1.82	0.44
2:D:1:GLC:C5	2:D:2:GLC:H2	2.47	0.43
1:A:294:LEU:HD22	1:A:643:VAL:HG21	2.00	0.43
1:B:71:LEU:HD13	1:B:186:LEU:HD21	2.00	0.43
1:B:481:GLY:O	1:B:485:ARG:HG2	2.19	0.43
1:B:89:GLU:OE2	1:B:91:GLN:NE2	2.50	0.43
1:B:225:ASP:O	1:B:265:ARG:NE	2.48	0.43
1:B:3:VAL:HG11	1:B:31:GLU:HG3	2.00	0.42
1:A:138:ASP:O	1:A:207:GLY:HA3	2.20	0.42
1:B:12:CYS:HA	1:B:20:LEU:O	2.20	0.42
1:B:-2:HIS:CE1	1:B:157:GLN:HG3	2.55	0.42
1:B:284:PHE:HA	1:B:335:HIS:O	2.20	0.42
1:B:328:GLU:C	1:B:329:GLU:HG3	2.44	0.42
1:B:105:ILE:HG22	1:B:105:ILE:O	2.19	0.42
1:A:379:ASP:O	1:A:380:ALA:C	2.63	0.42
1:A:386:LEU:N	1:A:387:PRO:CD	2.83	0.41
1:A:563:PHE:HB3	1:B:112:PRO:HG2	2.01	0.41
1:B:427:ASN:ND2	2:D:3:GLC:H1	2.36	0.41
1:B:296:LEU:N	1:B:297:PRO:CD	2.83	0.41
1:B:555:ARG:HD2	1:B:617:ARG:HD2	2.01	0.41
1:A:103:ARG:HH12	1:B:628:PRO:HB2	1.86	0.40
1:A:294:LEU:HD22	1:A:643:VAL:CG2	2.51	0.40
1:A:379:ASP:OD2	1:A:383:ARG:NE	2.54	0.40
1:A:12:CYS:HA	1:A:20:LEU:O	2.21	0.40
1:A:113:ALA:O	1:A:135:THR:HA	2.21	0.40
1:B:73:ARG:O	1:B:148:LEU:HA	2.21	0.40
1:B:239:ARG:HH11	1:B:239:ARG:HD2	1.59	0.40
1:B:588:ILE:N	1:B:589:PRO:CD	2.84	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	617/639 (97%)	586 (95%)	31 (5%)	0	100	100
1	B	605/639 (95%)	576 (95%)	26 (4%)	3 (0%)	24	14
All	All	1222/1278 (96%)	1162 (95%)	57 (5%)	3 (0%)	43	31

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	240	THR
1	B	302	MET
1	B	5	PRO

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	459/474 (97%)	451 (98%)	8 (2%)	53	45
1	B	452/474 (95%)	445 (98%)	7 (2%)	57	49
All	All	911/948 (96%)	896 (98%)	15 (2%)	55	47

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	LEU
1	A	97	ARG
1	A	377	PRO
1	A	378	ASP
1	A	379	ASP
1	A	420	LEU
1	A	612	VAL
1	A	636	TRP
1	B	3	VAL
1	B	101	LEU
1	B	110	GLU
1	B	199	ARG
1	B	377	PRO
1	B	555	ARG
1	B	612	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	388	ASN
1	A	423	GLN
1	A	634	GLN
1	B	388	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

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	$\# Z > 2$
2	GLC	C	1	2	11,11,12	1.43	3 (27%)	15,15,17	1.75	3 (20%)
2	GLC	C	2	2	11,11,12	1.18	2 (18%)	15,15,17	2.02	3 (20%)
2	GLC	C	3	2	12,12,12	0.75	1 (8%)	17,17,17	1.35	2 (11%)
2	GLC	D	1	2	11,11,12	1.29	1 (9%)	15,15,17	1.86	4 (26%)
2	GLC	D	2	2	11,11,12	1.50	3 (27%)	15,15,17	1.98	3 (20%)
2	GLC	D	3	2	12,12,12	0.63	0	17,17,17	1.63	5 (29%)

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	GLC	C	1	2	-	0/2/19/22	0/1/1/1
2	GLC	C	2	2	-	0/2/19/22	0/1/1/1
2	GLC	C	3	2	-	2/2/22/22	0/1/1/1
2	GLC	D	1	2	-	0/2/19/22	0/1/1/1
2	GLC	D	2	2	-	0/2/19/22	0/1/1/1
2	GLC	D	3	2	-	2/2/22/22	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2	GLC	C2-C3	3.08	1.57	1.52
2	C	1	GLC	C4-C5	3.07	1.59	1.53
2	D	2	GLC	O2-C2	2.76	1.49	1.43
2	D	1	GLC	C4-C5	2.58	1.58	1.53
2	C	3	GLC	C3-C2	-2.25	1.46	1.52
2	D	2	GLC	O5-C5	2.22	1.47	1.43
2	C	1	GLC	O4-C4	2.20	1.48	1.43
2	C	1	GLC	C4-C3	2.16	1.57	1.52
2	C	2	GLC	O2-C2	2.12	1.47	1.43
2	C	2	GLC	O5-C5	2.09	1.47	1.43

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1	GLC	O5-C1-C2	-5.62	102.09	110.77
2	C	2	GLC	O5-C1-C2	5.09	118.62	110.77
2	C	1	GLC	O5-C1-C2	-4.58	103.70	110.77
2	D	2	GLC	C1-O5-C5	4.44	118.21	112.19
2	D	2	GLC	O5-C1-C2	4.30	117.42	110.77
2	C	2	GLC	C1-O5-C5	4.11	117.76	112.19
2	D	2	GLC	O2-C2-C3	3.38	116.91	110.14
2	D	3	GLC	C4-C3-C2	2.99	116.05	110.82
2	C	1	GLC	O5-C5-C6	-2.74	102.90	107.20
2	D	3	GLC	O5-C5-C4	-2.72	104.75	109.69
2	C	3	GLC	C4-C3-C2	-2.65	106.19	110.82
2	C	2	GLC	C1-C2-C3	2.60	112.87	109.67
2	D	1	GLC	O2-C2-C3	2.49	115.14	110.14
2	D	3	GLC	O5-C1-C2	2.39	114.55	110.28
2	C	3	GLC	O1-C1-C2	-2.37	102.35	109.03
2	D	1	GLC	O2-C2-C1	2.37	114.00	109.15
2	C	1	GLC	C1-O5-C5	2.37	115.40	112.19
2	D	1	GLC	O6-C6-C5	-2.26	103.54	111.29
2	D	3	GLC	C1-O5-C5	-2.06	109.78	113.66
2	D	3	GLC	O3-C3-C2	-2.03	105.64	110.35

There are no chirality outliers.

All (4) torsion outliers are listed below:

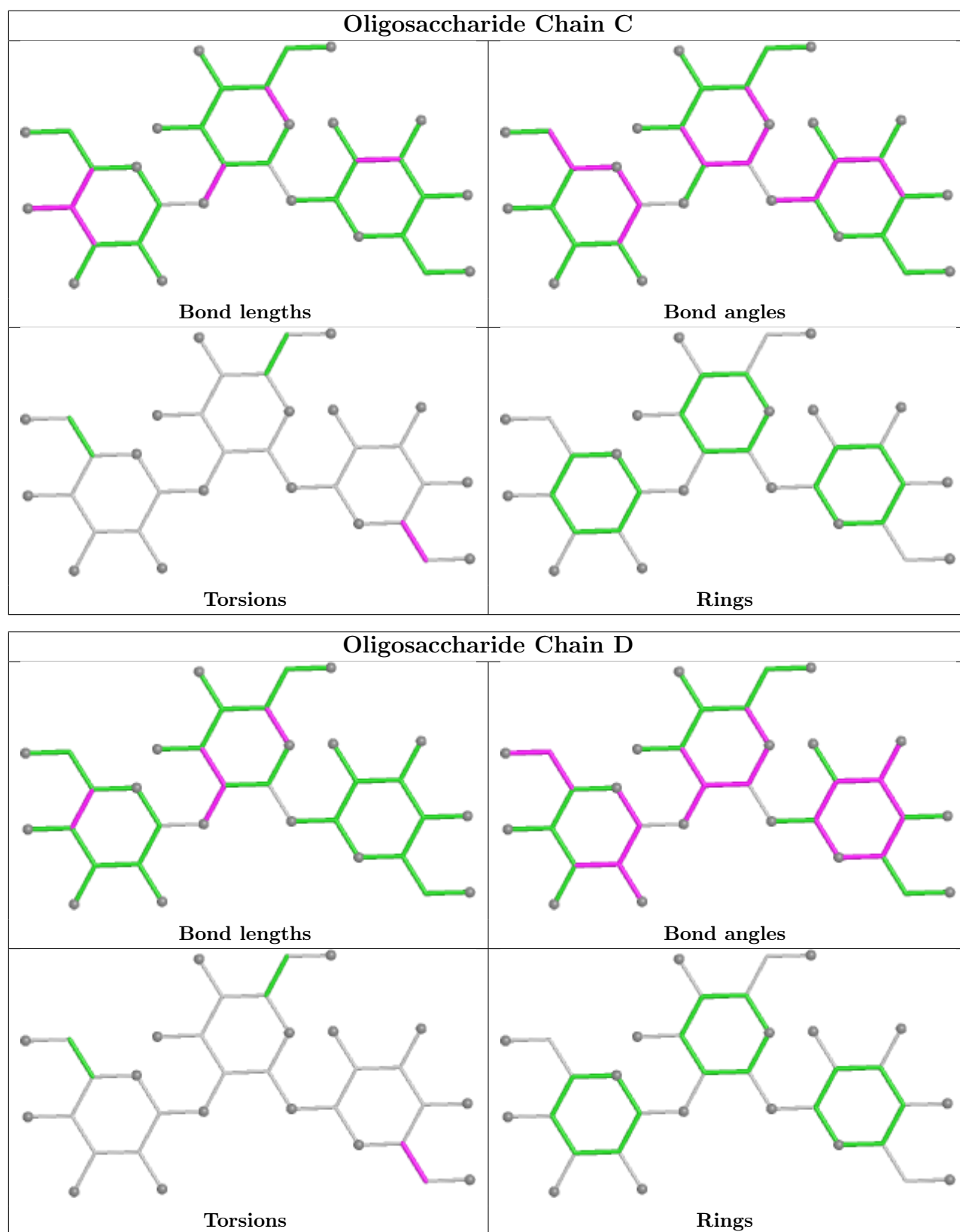
Mol	Chain	Res	Type	Atoms
2	C	3	GLC	C4-C5-C6-O6
2	D	3	GLC	O5-C5-C6-O6
2	D	3	GLC	C4-C5-C6-O6
2	C	3	GLC	O5-C5-C6-O6

There are no ring outliers.

5 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	2	GLC	2	0
2	D	1	GLC	3	0
2	D	2	GLC	5	0
2	C	1	GLC	2	0
2	D	3	GLC	6	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 ⓘ

8 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	EDO	A	701	-	3,3,3	0.33	0	2,2,2	0.80	0
3	EDO	B	701	-	3,3,3	0.52	0	2,2,2	0.61	0
3	EDO	A	702	-	3,3,3	0.58	0	2,2,2	0.20	0
3	EDO	A	705	-	3,3,3	0.41	0	2,2,2	0.55	0
3	EDO	B	702	-	3,3,3	0.13	0	2,2,2	0.74	0
3	EDO	A	703	-	3,3,3	0.34	0	2,2,2	0.92	0
3	EDO	B	703	-	3,3,3	0.67	0	2,2,2	0.62	0
3	EDO	A	704	-	3,3,3	0.26	0	2,2,2	0.58	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	EDO	A	701	-	-	1/1/1/1	-
3	EDO	B	701	-	-	1/1/1/1	-
3	EDO	A	702	-	-	0/1/1/1	-
3	EDO	A	705	-	-	1/1/1/1	-
3	EDO	B	702	-	-	0/1/1/1	-
3	EDO	A	703	-	-	0/1/1/1	-
3	EDO	B	703	-	-	0/1/1/1	-
3	EDO	A	704	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	701	EDO	O1-C1-C2-O2
3	A	705	EDO	O1-C1-C2-O2
3	B	701	EDO	O1-C1-C2-O2

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	701	EDO	1	0
3	A	705	EDO	1	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	621/639 (97%)	0.77	68 (10%)	10	9	18, 31, 67, 115	0
1	B	611/639 (95%)	0.83	68 (11%)	10	8	19, 31, 66, 118	0
All	All	1232/1278 (96%)	0.80	136 (11%)	10	9	18, 31, 67, 118	0

All (136) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	242	PRO	5.3
1	A	108	PRO	5.0
1	B	304	THR	4.9
1	B	243	ALA	4.9
1	B	301	GLY	4.9
1	B	108	PRO	4.9
1	A	0	HIS	4.7
1	A	3	VAL	4.6
1	B	3	VAL	4.6
1	A	106	PRO	4.6
1	B	5	PRO	4.6
1	B	0	HIS	4.5
1	B	650	VAL	4.4
1	A	351	LEU	4.4
1	B	300	THR	4.4
1	A	33	GLY	4.3
1	B	1	MET	4.3
1	A	34	GLY	4.3
1	B	106	PRO	4.1
1	A	300	THR	4.1
1	A	5	PRO	4.0
1	B	302	MET	4.0
1	B	2	THR	3.9
1	B	241	GLY	3.9

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Mol	Chain	Res	Type	RSRZ
1	B	90	THR	3.9
1	B	105	ILE	3.9
1	A	650	VAL	3.8
1	B	240	THR	3.7
1	A	243	ALA	3.7
1	B	351	LEU	3.6
1	A	302	MET	3.5
1	A	242	PRO	3.5
1	A	105	ILE	3.5
1	A	304	THR	3.5
1	A	205	SER	3.4
1	B	353	PRO	3.4
1	A	-1	HIS	3.4
1	A	-2	HIS	3.3
1	A	109	THR	3.3
1	A	353	PRO	3.1
1	A	377	PRO	3.1
1	A	301	GLY	3.1
1	B	209	GLY	3.1
1	B	298	LEU	3.1
1	A	240	THR	3.1
1	A	4	GLN	3.0
1	B	109	THR	3.0
1	B	34	GLY	3.0
1	A	160	LEU	3.0
1	A	90	THR	3.0
1	B	305	GLY	3.0
1	A	2	THR	3.0
1	B	-2	HIS	2.9
1	A	1	MET	2.9
1	A	172	ALA	2.9
1	B	565	TYR	2.9
1	B	160	LEU	2.9
1	B	458	LEU	2.9
1	B	381	VAL	2.9
1	B	466	ALA	2.8
1	B	102	VAL	2.8
1	A	381	VAL	2.7
1	B	412	TYR	2.7
1	A	137	LEU	2.7
1	B	107	GLY	2.7
1	A	35	SER	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	377	PRO	2.7
1	A	241	GLY	2.6
1	B	375	ALA	2.6
1	B	402	GLY	2.6
1	A	415	ALA	2.6
1	B	557	ALA	2.6
1	A	208	ARG	2.6
1	B	372	LEU	2.6
1	A	380	ALA	2.6
1	A	110	GLU	2.5
1	A	305	GLY	2.5
1	A	492	VAL	2.5
1	B	163	PHE	2.5
1	B	401	ALA	2.5
1	B	266	GLN	2.5
1	B	303	GLU	2.5
1	B	352	PRO	2.5
1	B	103	ARG	2.5
1	B	-1	HIS	2.5
1	A	213	GLU	2.5
1	A	141	ASP	2.5
1	A	212	PHE	2.4
1	A	378	ASP	2.4
1	B	4	GLN	2.4
1	B	393	ALA	2.4
1	A	170	VAL	2.4
1	B	325	ALA	2.3
1	B	382	ILE	2.3
1	A	468	GLY	2.3
1	B	492	VAL	2.3
1	A	373	TRP	2.3
1	A	467	TYR	2.3
1	B	35	SER	2.3
1	A	103	ARG	2.3
1	A	312	ARG	2.3
1	B	408	GLY	2.3
1	A	32	SER	2.3
1	B	208	ARG	2.2
1	B	81	LEU	2.2
1	A	163	PHE	2.2
1	A	210	ARG	2.2
1	B	438	ARG	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	107	GLY	2.2
1	B	296	LEU	2.2
1	B	233	PRO	2.2
1	A	325	ALA	2.2
1	B	403	ALA	2.2
1	B	134	ARG	2.1
1	B	380	ALA	2.1
1	B	398	ALA	2.1
1	A	266	GLN	2.1
1	B	210	ARG	2.1
1	A	458	LEU	2.1
1	B	470	PRO	2.1
1	A	382	ILE	2.1
1	A	6	GLY	2.1
1	A	104	GLY	2.1
1	A	420	LEU	2.1
1	A	375	ALA	2.1
1	B	399	ALA	2.1
1	B	558	ALA	2.1
1	A	134	ARG	2.1
1	A	188	VAL	2.0
1	B	297	PRO	2.0
1	A	150	ALA	2.0
1	A	166	ALA	2.0
1	A	168	ALA	2.0
1	A	429	ARG	2.0
1	A	341	GLU	2.0
1	B	423	GLN	2.0

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

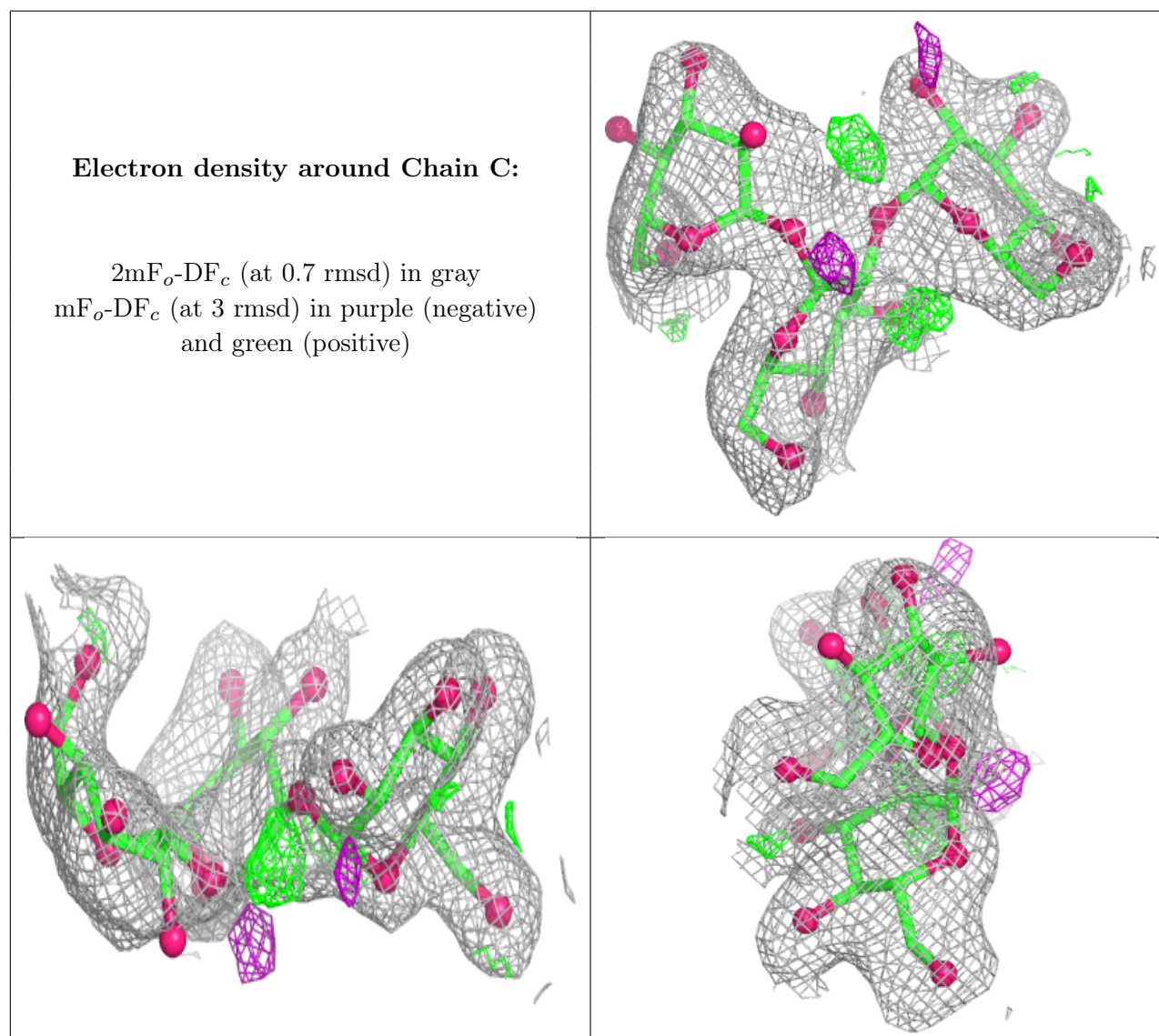
There are no non-standard protein/DNA/RNA residues in this entry.

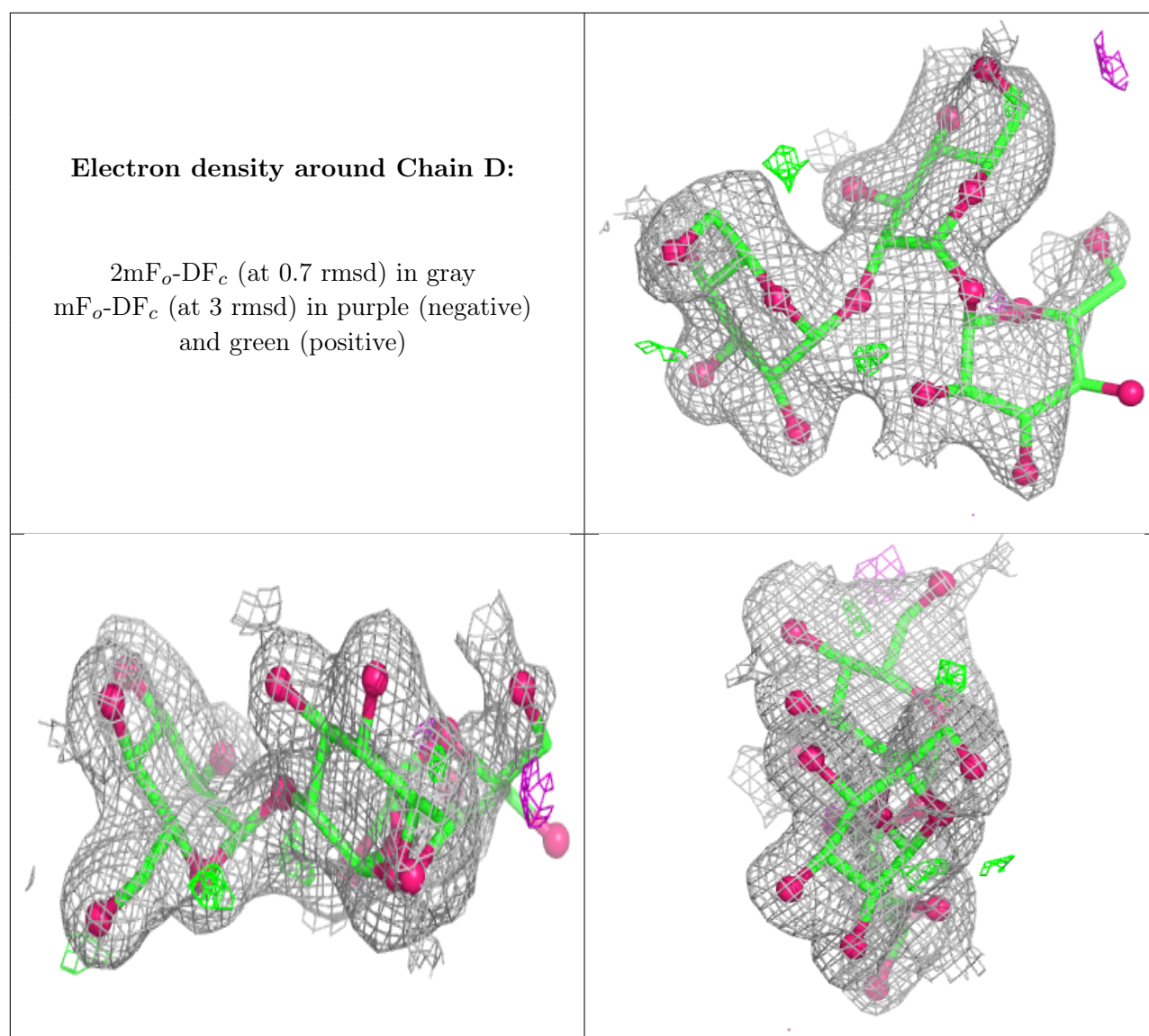
6.3 Carbohydrates [i](#)

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	GLC	D	3	12/12	0.75	0.18	56,72,85,91	0
2	GLC	C	3	12/12	0.76	0.17	53,62,75,75	0
2	GLC	D	2	11/12	0.87	0.13	39,46,60,67	0
2	GLC	C	2	11/12	0.87	0.12	36,40,52,53	0
2	GLC	C	1	11/12	0.88	0.13	22,33,42,46	0
2	GLC	D	1	11/12	0.89	0.11	26,37,44,51	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
3	EDO	A	703	4/4	0.61	0.21	39,41,45,47	0
3	EDO	A	704	4/4	0.69	0.22	35,46,53,55	0
3	EDO	A	701	4/4	0.82	0.15	24,28,28,30	0
3	EDO	B	702	4/4	0.83	0.17	34,48,54,58	0
3	EDO	B	703	4/4	0.84	0.15	29,37,44,44	0
3	EDO	A	702	4/4	0.92	0.11	30,38,42,48	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	EDO	A	705	4/4	0.93	0.12	23,36,40,42	0
3	EDO	B	701	4/4	0.95	0.09	24,37,38,39	0

6.5 Other polymers [i](#)

There are no such residues in this entry.