



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:32 AM UTC

PDB ID : 1HWO / pdb_00001hwo
Title : EBULIN COMPLEXED WITH LACTOSE, TRIGONAL CRYSTAL FORM
Authors : Pascal, J.M.; Day, P.J.; Monzingo, A.F.; Ernst, S.R.; Robertus, J.D.
Deposited on : 2001-01-09
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:

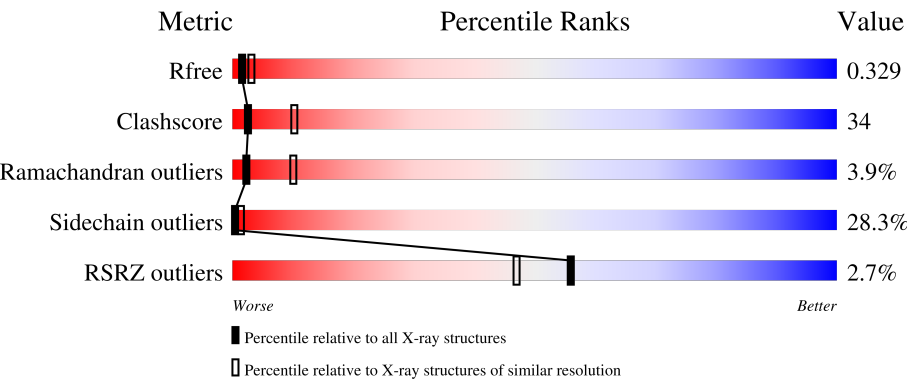
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (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 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	254	2% 33% 48% 17% ..
2	B	266	4% 33% 47% 17% ..
3	C	2	100%
4	D	3	33% 67%

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
3	GLC	C	1	X	-	-	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4117 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 EBULIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	252	Total	C	N	O	S	0	0	0
			1990	1257	341	387	5			

- Molecule 2 is a protein called EBULIN.

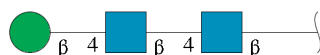
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	263	Total	C	N	O	S	0	0	0
			2028	1253	359	400	16			

- Molecule 3 is an oligosaccharide called beta-D-galactopyranose-(1-4)-alpha-D-glucopyranos e.



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	Trace
3	C	2	Total	C O	0	0	0
			23	12 11			

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



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

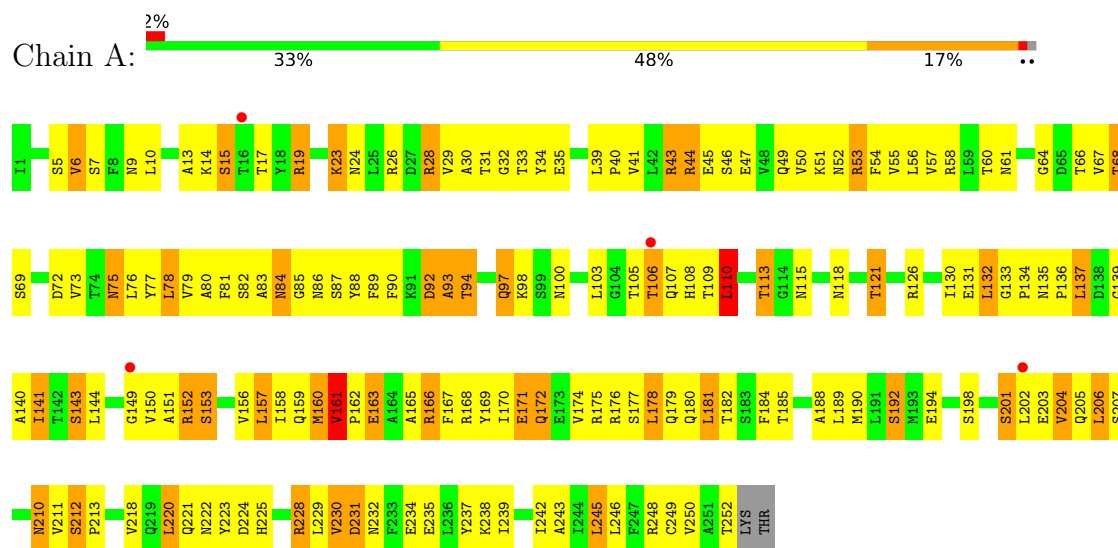
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	14	Total 14	O 14	0	0
5	B	23	Total 23	O 23	0	0

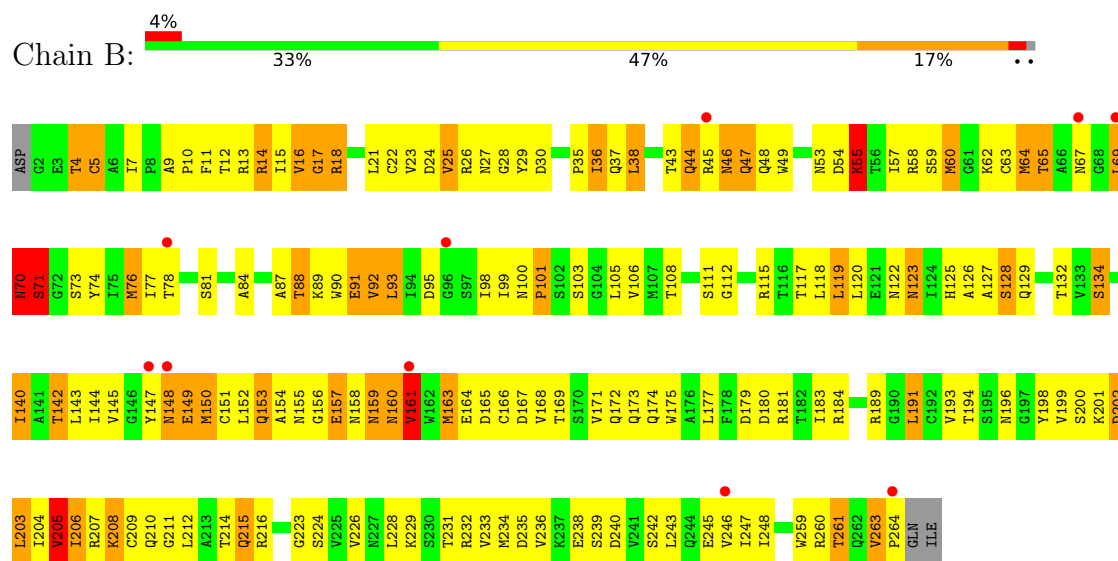
3 Residue-property plots

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: EBULIN



• Molecule 2: EBULIN

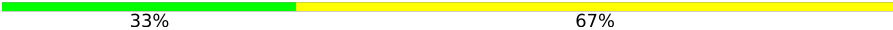


• Molecule 3: beta-D-galactopyranose-(1-4)-alpha-D-glucopyranose



GLC1
GAL2

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

Chain D: 

MAG1
MAG2
BMA3

4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	74.00Å 74.00Å 191.50Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 2.90 30.00 – 2.90	Depositor EDS
% Data completeness (in resolution range)	(Not available) (30.00-2.90) 78.1 (30.00-2.90)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.73 (at 2.89Å)	Xtriage
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.237 , 0.339 0.233 , 0.329	Depositor DCC
R_{free} test set	664 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	37.7	Xtriage
Anisotropy	0.561	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 44.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.068 for -h,-k,l	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	4117	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.63% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GLC, NAG, GAL, BMA

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.28	0/2027	0.67	0/2756
2	B	0.27	0/2065	0.69	0/2813
All	All	0.27	0/4092	0.68	0/5569

There are no bond length outliers.

There are no bond angle outliers.

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	1990	0	1962	137	1
2	B	2028	0	1959	151	1
3	C	23	0	21	2	0
4	D	39	0	34	2	0
5	A	14	0	0	0	0
5	B	23	0	0	0	0
All	All	4117	0	3976	277	1

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 34.

All (277) 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)
2:B:127:ALA:HB3	2:B:211:GLY:HA2	1.33	1.09
2:B:201:LYS:HA	2:B:247:ILE:HD12	1.50	0.92
2:B:150:MET:HB3	2:B:163:MET:HG3	1.51	0.90
2:B:58:ARG:HB3	2:B:63:CYS:HA	1.52	0.89
1:A:50:VAL:HA	1:A:53:ARG:HB2	1.57	0.87
1:A:218:VAL:HB	1:A:230:VAL:HG13	1.61	0.82
1:A:55:VAL:HG23	1:A:73:VAL:HG22	1.61	0.82
2:B:123:ASN:HA	2:B:129:GLN:HE22	1.43	0.82
1:A:115:ASN:HB2	1:A:118:ASN:HD22	1.45	0.81
2:B:203:LEU:HA	2:B:247:ILE:HG22	1.63	0.80
2:B:132:THR:HB	2:B:179:ASP:HB3	1.64	0.79
2:B:263:VAL:HB	2:B:264:PRO:HD2	1.64	0.78
2:B:90:TRP:HH2	2:B:120:LEU:HD21	1.49	0.77
2:B:226:VAL:HG13	2:B:233:VAL:HG22	1.67	0.76
1:A:29:VAL:HA	1:A:73:VAL:HG13	1.69	0.75
1:A:249:CYS:HB2	2:B:5:CYS:HA	1.70	0.73
2:B:216:ARG:HD3	2:B:228:LEU:HD12	1.69	0.73
1:A:137:LEU:HD22	1:A:141:ILE:HD11	1.71	0.72
2:B:69:LEU:HD11	2:B:103:SER:HB3	1.71	0.72
1:A:31:THR:HG22	1:A:32:GLY:H	1.55	0.70
1:A:39:LEU:HB2	1:A:245:LEU:HD11	1.74	0.70
2:B:125:HIS:HD2	2:B:228:LEU:HD13	1.56	0.69
1:A:144:LEU:HA	1:A:149:GLY:HA2	1.73	0.69
1:A:35:GLU:HB3	1:A:40:PRO:HA	1.73	0.69
1:A:39:LEU:HD22	1:A:243:ALA:HA	1.73	0.69
1:A:85:GLY:HA2	1:A:105:THR:HG22	1.73	0.69
1:A:222:ASN:HD21	1:A:228:ARG:HD2	1.58	0.69
2:B:84:ALA:HB3	2:B:87:ALA:HB3	1.74	0.69
2:B:240:ASP:HB3	2:B:243:LEU:HG	1.73	0.69
1:A:159:GLN:HA	1:A:163:GLU:HB2	1.74	0.68
1:A:90:PHE:HB3	1:A:113:THR:HA	1.74	0.68
1:A:206:LEU:HD13	2:B:5:CYS:SG	2.32	0.68
2:B:88:THR:HG23	2:B:89:LYS:HD3	1.76	0.68
2:B:153:GLN:HG2	2:B:173:GLN:HG2	1.75	0.67
1:A:9:ASN:O	1:A:13:ALA:HB2	1.95	0.66
2:B:167:ASP:H	2:B:173:GLN:NE2	1.94	0.66
1:A:89:PHE:HB2	1:A:109:THR:HG22	1.78	0.65
1:A:202:LEU:HD23	1:A:248:ARG:CZ	2.27	0.65
2:B:166:CYS:HA	2:B:173:GLN:HE22	1.61	0.65
1:A:202:LEU:HD12	1:A:203:GLU:N	2.11	0.65
1:A:72:ASP:HB3	1:A:75:ASN:OD1	1.97	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:18:ARG:HG2	2:B:112:GLY:HA3	1.79	0.65
2:B:260:ARG:NH2	2:B:261:THR:HG23	2.12	0.64
1:A:175:ARG:HB3	2:B:149:GLU:OE2	1.96	0.64
1:A:192:SER:HB2	1:A:221:GLN:HG3	1.79	0.64
1:A:161:VAL:HB	1:A:162:PRO:CD	2.29	0.63
1:A:29:VAL:HG21	1:A:76:LEU:HD21	1.79	0.62
2:B:209:CYS:HA	2:B:215:GLN:OE1	1.99	0.62
2:B:27:ASN:HA	3:C:1:GLC:O4	2.00	0.62
2:B:84:ALA:O	2:B:88:THR:HG22	2.00	0.61
2:B:90:TRP:CH2	2:B:120:LEU:HD21	2.32	0.61
2:B:260:ARG:HH21	2:B:261:THR:HG23	1.65	0.61
1:A:90:PHE:HA	1:A:110:LEU:HD12	1.82	0.60
2:B:44:GLN:HB2	2:B:46:ASN:OD1	2.01	0.60
2:B:54:ASP:O	2:B:55:LYS:HB2	2.01	0.60
1:A:140:ALA:O	1:A:144:LEU:HG	2.01	0.60
1:A:130:ILE:O	1:A:132:LEU:HD23	2.02	0.60
2:B:204:ILE:HD12	2:B:246:VAL:HG12	1.83	0.60
1:A:150:VAL:HG22	1:A:151:ALA:H	1.67	0.59
1:A:172:GLN:HE22	1:A:175:ARG:CZ	2.14	0.59
1:A:201:SER:O	1:A:204:VAL:HG12	2.02	0.59
1:A:106:THR:HB	1:A:108:HIS:CD2	2.38	0.59
1:A:238:LYS:HD3	2:B:177:LEU:HD13	1.84	0.59
1:A:89:PHE:HB3	1:A:93:ALA:HB2	1.84	0.59
1:A:174:VAL:O	1:A:178:LEU:HG	2.02	0.59
2:B:7:ILE:HD12	2:B:53:ASN:HD21	1.67	0.58
2:B:103:SER:HB2	2:B:105:LEU:HD13	1.84	0.58
2:B:171:VAL:HA	2:B:174:GLN:HG3	1.85	0.58
2:B:108:THR:HG23	2:B:129:GLN:HG2	1.85	0.58
2:B:145:VAL:HG22	2:B:151:CYS:SG	2.43	0.58
2:B:18:ARG:NH1	2:B:128:SER:HB3	2.19	0.58
1:A:224:ASP:O	1:A:225:HIS:HB2	2.04	0.58
1:A:34:TYR:OH	1:A:250:VAL:HA	2.03	0.57
1:A:144:LEU:HD23	1:A:149:GLY:HA2	1.86	0.57
2:B:24:ASP:HB3	2:B:47:GLN:HG3	1.86	0.57
2:B:152:LEU:HD13	2:B:163:MET:HE1	1.85	0.57
2:B:11:PHE:HD1	2:B:13:ARG:HG3	1.70	0.57
2:B:148:ASN:ND2	2:B:150:MET:HB2	2.19	0.57
1:A:184:PHE:HE1	1:A:190:MET:HE1	1.69	0.57
2:B:263:VAL:CB	2:B:264:PRO:HD2	2.32	0.57
2:B:99:ILE:HB	2:B:106:VAL:HG12	1.87	0.56
2:B:161:VAL:O	2:B:246:VAL:HG23	2.05	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:134:PRO:HD3	1:A:177:SER:OG	2.06	0.56
1:A:250:VAL:HG22	2:B:4:THR:HA	1.87	0.56
1:A:10:LEU:HD11	1:A:137:LEU:HB3	1.87	0.56
2:B:160:ASN:HA	2:B:205:VAL:HG12	1.87	0.56
1:A:92:ASP:OD1	1:A:113:THR:HB	2.06	0.55
1:A:161:VAL:HB	1:A:162:PRO:HD3	1.87	0.55
2:B:30:ASP:O	2:B:62:LYS:HG3	2.06	0.55
2:B:55:LYS:O	2:B:89:LYS:HA	2.06	0.55
1:A:170:ILE:HG12	1:A:190:MET:HG3	1.89	0.55
1:A:156:VAL:O	1:A:160:MET:HG3	2.07	0.55
2:B:194:THR:OG1	2:B:207:ARG:HB2	2.07	0.55
4:D:2:NAG:O7	4:D:2:NAG:H3	2.06	0.55
2:B:16:VAL:HG12	2:B:21:LEU:O	2.07	0.55
1:A:133:GLY:O	1:A:137:LEU:HB2	2.08	0.54
1:A:180:GLN:HB2	1:A:182:THR:HG22	1.90	0.54
2:B:199:VAL:HG12	2:B:202:ASP:OD2	2.08	0.54
1:A:26:ARG:O	1:A:30:ALA:HB3	2.08	0.53
2:B:28:GLY:HA2	2:B:46:ASN:HB3	1.89	0.53
1:A:144:LEU:HA	1:A:149:GLY:CA	2.39	0.53
1:A:188:ALA:O	1:A:192:SER:HB3	2.08	0.53
1:A:144:LEU:HD11	1:A:157:LEU:HD13	1.90	0.53
1:A:237:TYR:OH	2:B:223:GLY:HA2	2.09	0.53
2:B:99:ILE:HG13	2:B:105:LEU:O	2.08	0.53
2:B:142:THR:HG21	2:B:261:THR:OG1	2.09	0.52
1:A:93:ALA:HB1	1:A:98:LYS:HD2	1.92	0.52
2:B:224:SER:HB2	2:B:233:VAL:HG11	1.92	0.52
1:A:83:ALA:O	1:A:86:ASN:HB2	2.09	0.52
1:A:15:SER:HA	1:A:178:LEU:HD12	1.91	0.52
2:B:17:GLY:O	2:B:18:ARG:HB2	2.08	0.52
2:B:126:ALA:HB1	2:B:211:GLY:O	2.09	0.52
2:B:216:ARG:CD	2:B:228:LEU:HD12	2.40	0.52
1:A:169:TYR:HE1	2:B:263:VAL:HG22	1.74	0.52
1:A:135:ASN:HB2	1:A:136:PRO:HD3	1.91	0.52
2:B:36:ILE:HG22	2:B:118:LEU:HB2	1.92	0.52
2:B:54:ASP:O	2:B:55:LYS:CB	2.58	0.51
1:A:60:THR:HA	1:A:66:THR:HB	1.92	0.51
1:A:118:ASN:O	1:A:121:THR:HG22	2.10	0.51
2:B:7:ILE:HD12	2:B:53:ASN:ND2	2.25	0.51
2:B:238:GLU:C	2:B:240:ASP:H	2.18	0.51
1:A:174:VAL:HG12	1:A:178:LEU:HD21	1.93	0.51
2:B:194:THR:HG23	2:B:214:THR:OG1	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:203:LEU:HD21	2:B:245:GLU:HB2	1.93	0.51
1:A:29:VAL:HA	1:A:73:VAL:CG1	2.39	0.51
2:B:191:LEU:HA	2:B:208:LYS:HA	1.92	0.51
4:D:2:NAG:O7	4:D:2:NAG:C3	2.58	0.51
2:B:154:ALA:O	2:B:172:GLN:HG2	2.11	0.51
1:A:231:ASP:OD2	2:B:134:SER:HB2	2.11	0.51
1:A:218:VAL:HB	1:A:230:VAL:CG1	2.37	0.51
2:B:154:ALA:HB2	2:B:175:TRP:CH2	2.46	0.51
2:B:200:SER:O	2:B:201:LYS:HB2	2.11	0.51
2:B:248:ILE:O	2:B:248:ILE:HG13	2.10	0.50
2:B:74:TYR:HA	2:B:119:LEU:HA	1.93	0.50
3:C:1:GLC:H3	3:C:2:GAL:O2	2.12	0.50
2:B:226:VAL:HG22	2:B:233:VAL:HG22	1.94	0.50
2:B:194:THR:CB	2:B:207:ARG:HB2	2.42	0.50
2:B:18:ARG:HH11	2:B:128:SER:HB3	1.77	0.49
1:A:24:ASN:O	1:A:28:ARG:HG2	2.12	0.49
1:A:29:VAL:HG12	1:A:73:VAL:HG13	1.94	0.49
1:A:150:VAL:HG12	1:A:153:SER:OG	2.12	0.49
2:B:65:THR:OG1	2:B:76:MET:HE1	2.13	0.49
1:A:140:ALA:HA	1:A:153:SER:HB3	1.94	0.49
2:B:183:ILE:O	2:B:193:VAL:HG23	2.13	0.49
1:A:132:LEU:HB2	1:A:160:MET:HE3	1.94	0.48
2:B:49:TRP:CZ3	2:B:64:MET:HB2	2.48	0.48
1:A:210:ASN:O	2:B:93:LEU:HA	2.13	0.48
2:B:191:LEU:HD13	2:B:206:ILE:HB	1.95	0.48
1:A:139:GLY:O	1:A:143:SER:HB2	2.13	0.48
1:A:157:LEU:O	1:A:161:VAL:HG23	2.14	0.48
1:A:168:ARG:O	1:A:171:GLU:HB3	2.14	0.48
2:B:203:LEU:HD23	2:B:247:ILE:HG22	1.96	0.48
1:A:172:GLN:HE21	1:A:172:GLN:CA	2.26	0.48
2:B:263:VAL:HB	2:B:264:PRO:CD	2.38	0.48
1:A:190:MET:O	1:A:194:GLU:HB2	2.14	0.48
1:A:152:ARG:O	1:A:156:VAL:HG23	2.14	0.47
2:B:160:ASN:O	2:B:161:VAL:HG13	2.13	0.47
2:B:17:GLY:C	2:B:180:ASP:HB3	2.39	0.47
1:A:5:SER:HB2	1:A:56:LEU:HB2	1.96	0.47
1:A:19:ARG:HB2	1:A:175:ARG:HH21	1.79	0.47
1:A:202:LEU:HD12	1:A:202:LEU:C	2.39	0.47
2:B:160:ASN:HD21	2:B:203:LEU:HD21	1.78	0.47
2:B:196:ASN:HA	2:B:207:ARG:NH2	2.29	0.47
2:B:142:THR:HG21	2:B:261:THR:CB	2.44	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:144:ILE:HG12	2:B:175:TRP:CD1	2.50	0.47
1:A:75:ASN:OD1	1:A:77:TYR:HB2	2.15	0.47
1:A:9:ASN:CG	1:A:60:THR:HB	2.41	0.46
1:A:212:SER:HB2	1:A:234:GLU:OE2	2.16	0.46
2:B:156:GLY:O	2:B:159:ASN:HB2	2.16	0.46
1:A:113:THR:HG23	1:A:118:ASN:CG	2.41	0.46
2:B:105:LEU:HB2	2:B:120:LEU:HD12	1.97	0.46
2:B:263:VAL:O	2:B:264:PRO:C	2.59	0.46
2:B:235:ASP:HA	2:B:259:TRP:HZ2	1.80	0.46
2:B:37:GLN:OE1	2:B:115:ARG:HA	2.15	0.46
1:A:239:ILE:HD11	2:B:140:ILE:HG21	1.97	0.46
2:B:74:TYR:HA	2:B:119:LEU:HB3	1.98	0.46
1:A:54:PHE:CD2	1:A:79:VAL:HG21	2.51	0.45
1:A:158:ILE:O	1:A:162:PRO:HG2	2.16	0.45
2:B:91:GLU:O	2:B:98:ILE:HA	2.16	0.45
2:B:167:ASP:C	2:B:169:THR:H	2.25	0.45
2:B:199:VAL:O	2:B:202:ASP:HB2	2.16	0.45
1:A:9:ASN:HA	1:A:60:THR:HB	1.97	0.45
2:B:92:VAL:HG13	2:B:98:ILE:HG23	1.97	0.45
1:A:172:GLN:HE21	1:A:172:GLN:HA	1.81	0.45
1:A:201:SER:O	1:A:205:GLN:HG3	2.17	0.45
2:B:76:MET:HG2	2:B:77:ILE:N	2.31	0.45
1:A:126:ARG:O	1:A:130:ILE:HG13	2.17	0.45
1:A:162:PRO:O	1:A:165:ALA:HB3	2.17	0.45
1:A:167:PHE:HB2	1:A:170:ILE:HD12	1.98	0.45
1:A:44:ARG:H	1:A:47:GLU:HG3	1.81	0.45
1:A:207:SER:O	1:A:211:VAL:HG21	2.17	0.45
2:B:14:ARG:HB2	2:B:134:SER:O	2.16	0.45
2:B:157:GLU:O	2:B:158:ASN:HB2	2.16	0.45
2:B:37:GLN:HB3	2:B:117:THR:HA	1.98	0.45
1:A:31:THR:CB	1:A:43:ARG:HH21	2.29	0.45
1:A:250:VAL:O	2:B:5:CYS:HB2	2.17	0.45
2:B:25:VAL:HG21	2:B:60:MET:HE2	1.98	0.45
2:B:150:MET:HE2	2:B:164:GLU:HA	1.98	0.45
2:B:153:GLN:HG3	2:B:164:GLU:HB2	2.00	0.44
1:A:53:ARG:HA	1:A:53:ARG:HD2	1.48	0.44
1:A:161:VAL:CB	1:A:162:PRO:CD	2.95	0.44
1:A:29:VAL:HG12	1:A:73:VAL:HA	2.00	0.44
1:A:94:THR:O	1:A:97:GLN:HG2	2.16	0.44
1:A:87:SER:HB3	1:A:105:THR:OG1	2.16	0.44
1:A:133:GLY:C	1:A:136:PRO:HD2	2.42	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:151:CYS:N	2:B:166:CYS:SG	2.90	0.44
2:B:204:ILE:HG22	2:B:205:VAL:N	2.31	0.44
2:B:15:ILE:HD12	2:B:49:TRP:CD1	2.53	0.44
2:B:147:TYR:HB2	2:B:236:VAL:HG21	1.99	0.44
2:B:45:ARG:HD2	2:B:60:MET:HA	1.98	0.44
2:B:234:MET:O	2:B:234:MET:HG3	2.17	0.44
2:B:232:ARG:HB3	2:B:248:ILE:HB	1.98	0.44
2:B:48:GLN:O	2:B:59:SER:HB2	2.17	0.43
2:B:99:ILE:CB	2:B:106:VAL:HG12	2.46	0.43
2:B:198:TYR:CE2	2:B:229:LYS:HG2	2.53	0.43
1:A:172:GLN:HA	1:A:172:GLN:NE2	2.33	0.43
1:A:78:LEU:O	1:A:90:PHE:HE2	2.01	0.43
1:A:172:GLN:HE22	1:A:175:ARG:NH1	2.16	0.43
2:B:9:ALA:HB1	2:B:10:PRO:CD	2.48	0.43
1:A:220:LEU:HD12	1:A:220:LEU:HA	1.85	0.43
1:A:6:VAL:O	1:A:58:ARG:HB2	2.18	0.43
2:B:91:GLU:HB3	2:B:99:ILE:HG23	2.00	0.43
2:B:100:ASN:HA	2:B:101:PRO:HD2	1.81	0.43
1:A:166:ARG:O	1:A:242:ILE:HA	2.18	0.43
2:B:36:ILE:HD11	2:B:49:TRP:CH2	2.53	0.43
2:B:65:THR:O	2:B:76:MET:O	2.36	0.43
2:B:65:THR:HB	2:B:87:ALA:O	2.19	0.43
1:A:212:SER:H	1:A:213:PRO:HD2	1.84	0.43
2:B:202:ASP:O	2:B:247:ILE:HB	2.18	0.43
1:A:5:SER:CB	1:A:56:LEU:HB2	2.49	0.42
1:A:72:ASP:HB2	1:A:79:VAL:HG22	2.01	0.42
2:B:150:MET:HG2	2:B:164:GLU:C	2.44	0.42
1:A:144:LEU:CD2	1:A:149:GLY:HA2	2.49	0.42
1:A:220:LEU:HB2	1:A:228:ARG:O	2.18	0.42
2:B:199:VAL:O	2:B:248:ILE:HD11	2.19	0.42
2:B:57:ILE:CD1	2:B:90:TRP:HB2	2.49	0.42
2:B:216:ARG:CZ	2:B:228:LEU:HD12	2.48	0.42
1:A:113:THR:HG23	1:A:118:ASN:ND2	2.34	0.42
1:A:140:ALA:HB1	1:A:157:LEU:HD12	2.01	0.42
2:B:69:LEU:O	2:B:70:ASN:HB2	2.18	0.42
2:B:71:SER:HA	2:B:105:LEU:HD21	2.01	0.42
1:A:103:LEU:HD12	1:A:103:LEU:H	1.85	0.42
1:A:41:VAL:HA	1:A:245:LEU:O	2.19	0.42
1:A:51:LYS:O	1:A:51:LYS:HG2	2.19	0.42
1:A:223:TYR:C	1:A:225:HIS:H	2.28	0.42
2:B:21:LEU:HB2	2:B:38:LEU:HG	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:226:VAL:HG22	2:B:233:VAL:CG2	2.48	0.42
2:B:163:MET:N	2:B:163:MET:HE2	2.35	0.42
2:B:35:PRO:HB3	2:B:74:TYR:CE1	2.55	0.42
1:A:166:ARG:H	1:A:166:ARG:HG2	1.55	0.42
1:A:80:ALA:HB1	1:A:88:TYR:O	2.19	0.42
2:B:27:ASN:HB2	2:B:29:TYR:CD1	2.55	0.42
1:A:234:GLU:HG2	2:B:181:ARG:NH1	2.35	0.41
2:B:46:ASN:OD1	2:B:46:ASN:N	2.53	0.41
2:B:69:LEU:CD1	2:B:103:SER:HB3	2.45	0.41
2:B:70:ASN:O	2:B:71:SER:C	2.63	0.41
1:A:67:VAL:HB	1:A:141:ILE:HG23	2.03	0.41
1:A:135:ASN:N	1:A:136:PRO:CD	2.83	0.41
1:A:141:ILE:H	1:A:141:ILE:HG13	1.68	0.41
1:A:181:LEU:HD22	1:A:181:LEU:HA	1.91	0.41
2:B:153:GLN:NE2	2:B:172:GLN:HE21	2.18	0.41
1:A:60:THR:HG23	1:A:64:GLY:O	2.20	0.41
1:A:57:VAL:O	1:A:68:THR:HA	2.20	0.41
1:A:169:TYR:CE1	2:B:263:VAL:HG22	2.53	0.41
2:B:45:ARG:HE	2:B:60:MET:CG	2.33	0.41
2:B:11:PHE:CD1	2:B:13:ARG:HG3	2.53	0.41
1:A:81:PHE:CE2	1:A:88:TYR:HB2	2.56	0.41
2:B:159:ASN:O	2:B:205:VAL:HG12	2.20	0.41
2:B:238:GLU:O	2:B:239:SER:HB2	2.20	0.41
1:A:92:ASP:CG	1:A:113:THR:HB	2.46	0.41
2:B:16:VAL:HG13	2:B:22:CYS:SG	2.61	0.41
1:A:23:LYS:HE2	1:A:23:LYS:HB3	1.89	0.40
1:A:19:ARG:HB2	1:A:175:ARG:NH2	2.36	0.40
2:B:177:LEU:HD23	2:B:183:ILE:HG23	2.02	0.40
1:A:189:LEU:CD2	2:B:263:VAL:HG11	2.52	0.40
1:A:202:LEU:HD23	1:A:248:ARG:NH2	2.35	0.40
1:A:212:SER:N	1:A:213:PRO:HD2	2.37	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:105:THR:CG2	2:B:147:TYR:OH[6_655]	2.12	0.08

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	250/254 (98%)	207 (83%)	36 (14%)	7 (3%)	4	15
2	B	261/266 (98%)	207 (79%)	41 (16%)	13 (5%)	1	6
All	All	511/520 (98%)	414 (81%)	77 (15%)	20 (4%)	2	10

All (20) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	75	ASN
1	A	93	ALA
1	A	110	LEU
1	A	161	VAL
2	B	5	CYS
2	B	55	LYS
2	B	101	PRO
1	A	100	ASN
2	B	18	ARG
2	B	70	ASN
2	B	71	SER
2	B	160	ASN
2	B	161	VAL
2	B	205	VAL
1	A	43	ARG
2	B	155	ASN
2	B	168	VAL
1	A	84	ASN
2	B	17	GLY
2	B	263	VAL

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	221/223 (99%)	156 (71%)	65 (29%)	0	1
2	B	228/231 (99%)	166 (73%)	62 (27%)	0	1
All	All	449/454 (99%)	322 (72%)	127 (28%)	0	1

All (127) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	VAL
1	A	7	SER
1	A	14	LYS
1	A	15	SER
1	A	17	THR
1	A	19	ARG
1	A	23	LYS
1	A	28	ARG
1	A	33	THR
1	A	44	ARG
1	A	45	GLU
1	A	46	SER
1	A	49	GLN
1	A	52	ASN
1	A	53	ARG
1	A	61	ASN
1	A	68	THR
1	A	69	SER
1	A	78	LEU
1	A	82	SER
1	A	84	ASN
1	A	92	ASP
1	A	94	THR
1	A	97	GLN
1	A	106	THR
1	A	107	GLN
1	A	110	LEU
1	A	113	THR
1	A	121	THR
1	A	131	GLU
1	A	132	LEU

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Mol	Chain	Res	Type
1	A	137	LEU
1	A	141	ILE
1	A	143	SER
1	A	152	ARG
1	A	153	SER
1	A	157	LEU
1	A	160	MET
1	A	161	VAL
1	A	163	GLU
1	A	166	ARG
1	A	171	GLU
1	A	172	GLN
1	A	176	ARG
1	A	178	LEU
1	A	179	GLN
1	A	181	LEU
1	A	185	THR
1	A	192	SER
1	A	198	SER
1	A	201	SER
1	A	204	VAL
1	A	206	LEU
1	A	210	ASN
1	A	212	SER
1	A	220	LEU
1	A	228	ARG
1	A	229	LEU
1	A	230	VAL
1	A	231	ASP
1	A	232	ASN
1	A	235	GLU
1	A	245	LEU
1	A	246	LEU
1	A	252	THR
2	B	4	THR
2	B	12	THR
2	B	14	ARG
2	B	16	VAL
2	B	23	VAL
2	B	25	VAL
2	B	26	ARG
2	B	36	ILE

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Mol	Chain	Res	Type
2	B	38	LEU
2	B	43	THR
2	B	44	GLN
2	B	46	ASN
2	B	47	GLN
2	B	55	LYS
2	B	60	MET
2	B	64	MET
2	B	65	THR
2	B	67	ASN
2	B	69	LEU
2	B	70	ASN
2	B	71	SER
2	B	73	SER
2	B	76	MET
2	B	78	THR
2	B	81	SER
2	B	88	THR
2	B	91	GLU
2	B	92	VAL
2	B	93	LEU
2	B	95	ASP
2	B	111	SER
2	B	119	LEU
2	B	122	ASN
2	B	123	ASN
2	B	128	SER
2	B	134	SER
2	B	140	ILE
2	B	142	THR
2	B	143	LEU
2	B	148	ASN
2	B	149	GLU
2	B	150	MET
2	B	153	GLN
2	B	157	GLU
2	B	159	ASN
2	B	161	VAL
2	B	163	MET
2	B	165	ASP
2	B	184	ARG
2	B	189	ARG

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Mol	Chain	Res	Type
2	B	191	LEU
2	B	202	ASP
2	B	203	LEU
2	B	205	VAL
2	B	206	ILE
2	B	208	LYS
2	B	210	GLN
2	B	212	LEU
2	B	215	GLN
2	B	231	THR
2	B	242	SER
2	B	261	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	84	ASN
1	A	107	GLN
1	A	118	ASN
1	A	159	GLN
1	A	172	GLN
1	A	179	GLN
1	A	180	GLN
1	A	196	ASN
1	A	222	ASN
2	B	48	GLN
2	B	53	ASN
2	B	67	ASN
2	B	70	ASN
2	B	100	ASN
2	B	123	ASN
2	B	125	HIS
2	B	129	GLN
2	B	135	ASN
2	B	153	GLN
2	B	158	ASN
2	B	159	ASN
2	B	173	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 ⓘ

5 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	GLC	C	1	3	12,12,12	0.49	0	17,17,17	0.45	0
3	GAL	C	2	3	11,11,12	0.52	0	15,15,17	0.45	0
4	NAG	D	1	2,4	14,14,15	0.52	0	17,19,21	0.71	1 (5%)
4	NAG	D	2	4	14,14,15	0.62	0	17,19,21	0.73	0
4	BMA	D	3	4	11,11,12	0.47	0	15,15,17	0.21	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	GLC	C	1	3	1/1/5/5	1/2/22/22	0/1/1/1
3	GAL	C	2	3	-	0/2/19/22	0/1/1/1
4	NAG	D	1	2,4	-	0/6/23/26	0/1/1/1
4	NAG	D	2	4	-	2/6/23/26	0/1/1/1
4	BMA	D	3	4	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	NAG	C2-N2-C7	-2.01	120.21	122.90

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	C	1	GLC	C1

All (3) torsion outliers are listed below:

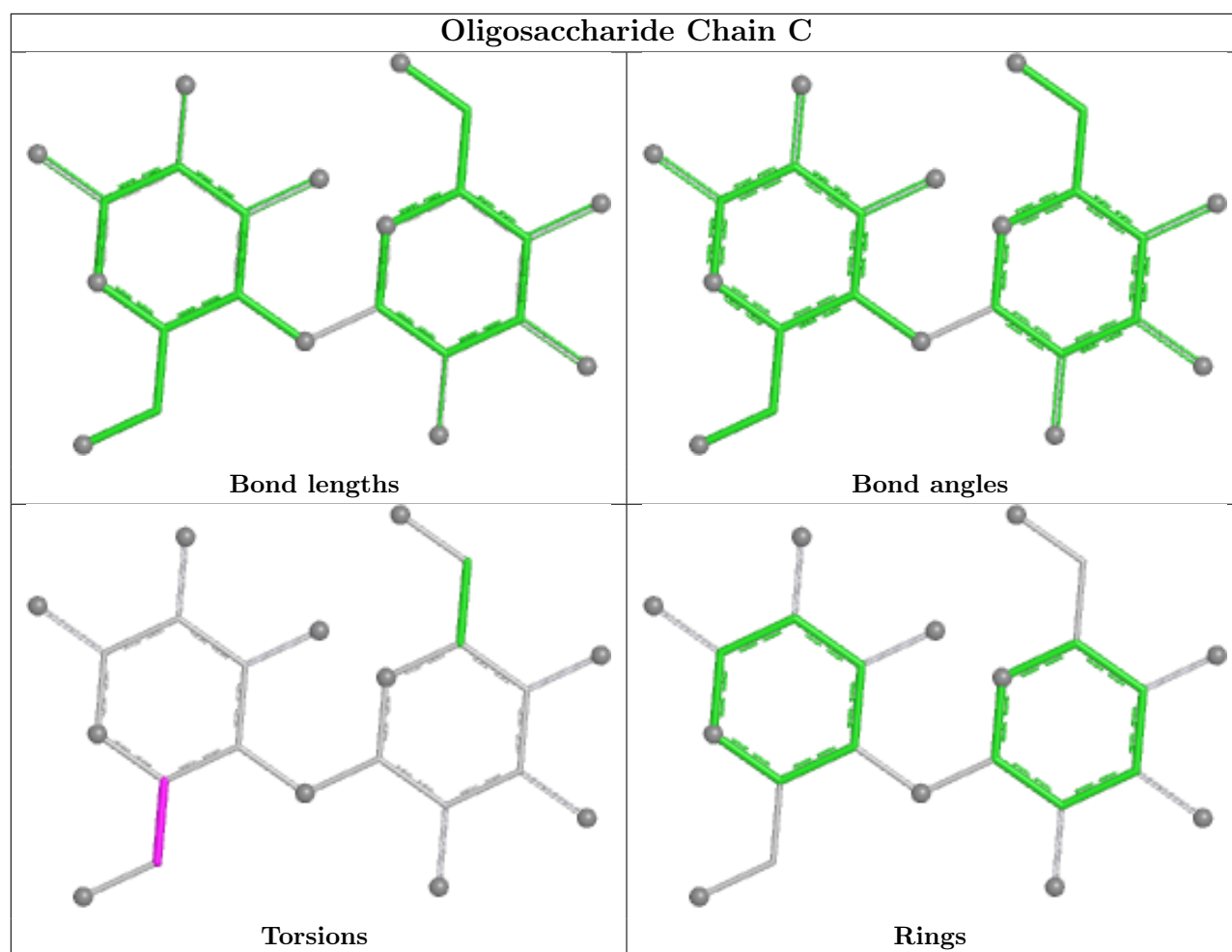
Mol	Chain	Res	Type	Atoms
4	D	2	NAG	C3-C2-N2-C7
3	C	1	GLC	O5-C5-C6-O6
4	D	2	NAG	C1-C2-N2-C7

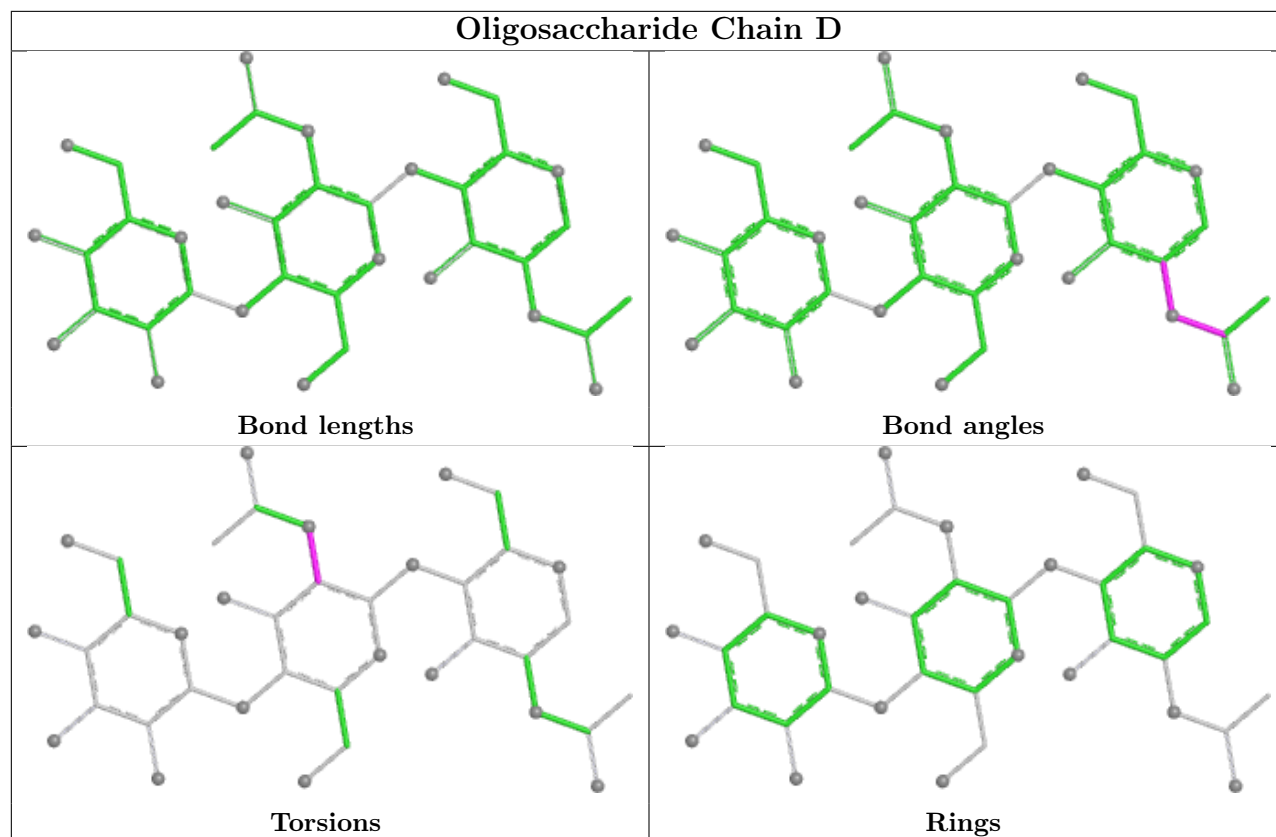
There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	2	GAL	1	0
4	D	2	NAG	2	0
3	C	1	GLC	2	0

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





5.6 Ligand geometry [i](#)

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	252/254 (99%)	0.27	4 (1%) 70 62	2, 24, 46, 84	0
2	B	263/266 (98%)	0.51	10 (3%) 44 36	7, 29, 49, 63	0
All	All	515/520 (99%)	0.39	14 (2%) 56 47	2, 27, 47, 84	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	161	VAL	2.9
1	A	149	GLY	2.9
2	B	67	ASN	2.7
2	B	264	PRO	2.7
2	B	45	ARG	2.5
1	A	16	THR	2.5
2	B	78	THR	2.3
2	B	148	ASN	2.3
2	B	246	VAL	2.3
2	B	69	LEU	2.2
1	A	106	THR	2.2
2	B	96	GLY	2.1
1	A	202	LEU	2.1
2	B	147	TYR	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.

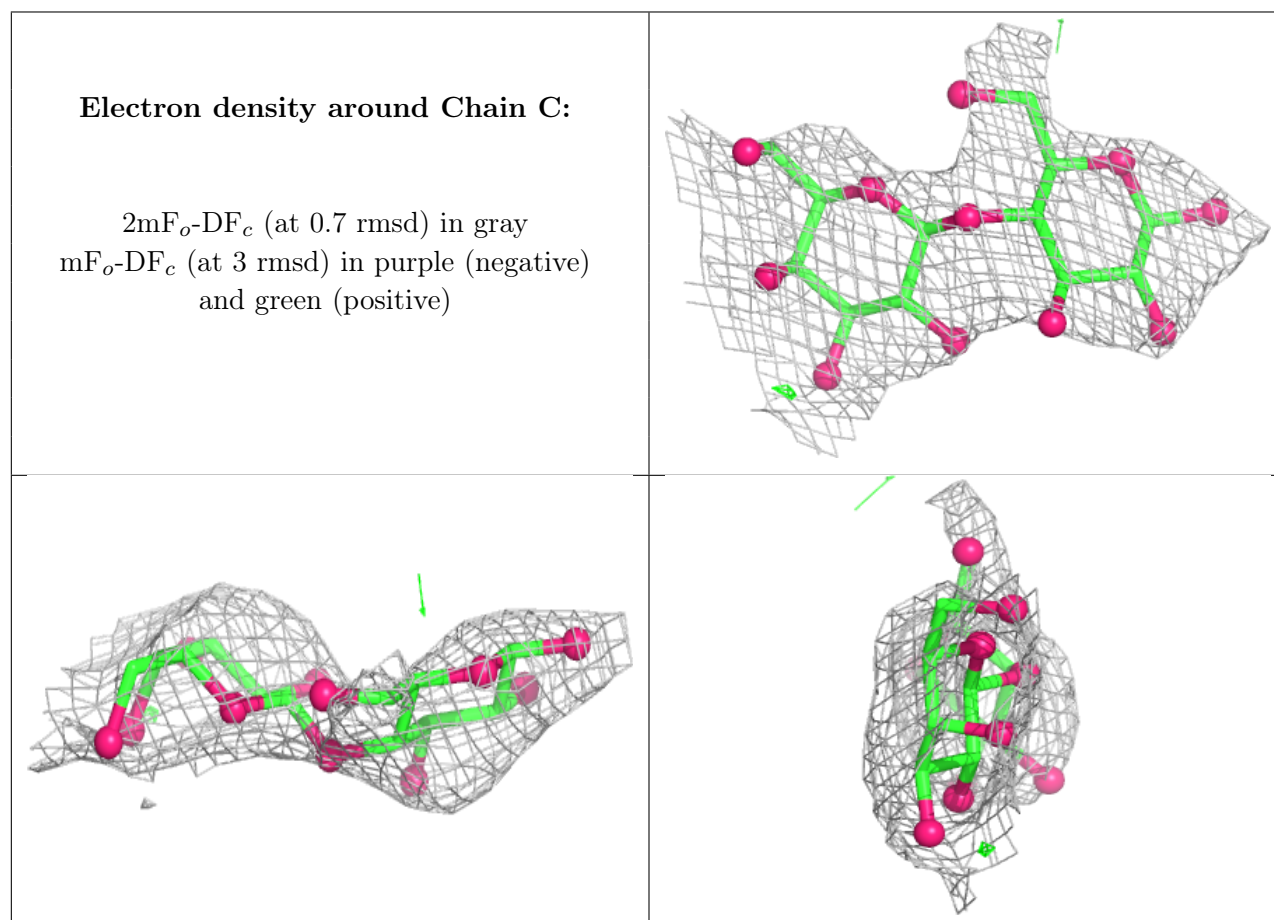
6.3 Carbohydrates [i](#)

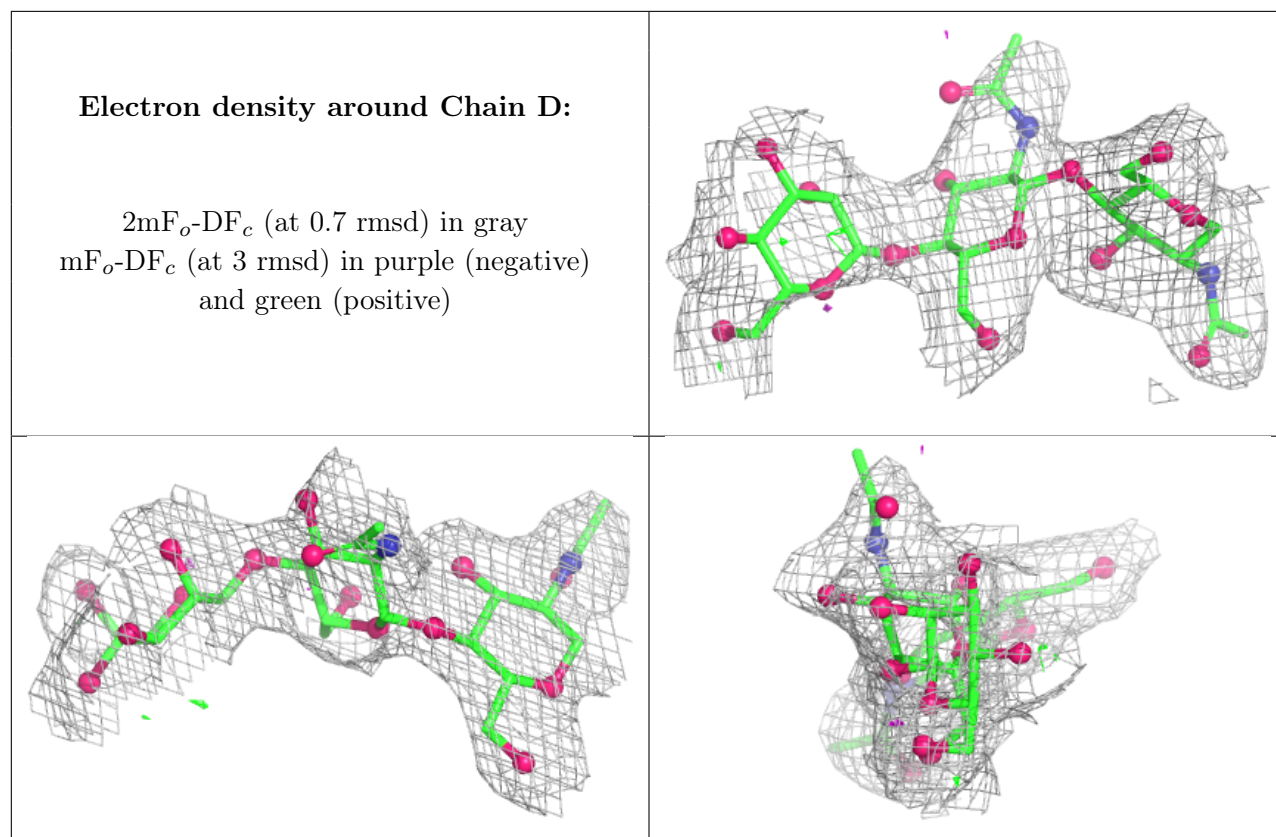
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

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
4	BMA	D	3	11/12	0.30	0.17	75,75,75,75	0
3	GLC	C	1	12/12	0.63	0.14	53,53,53,53	0
4	NAG	D	2	14/15	0.67	0.14	52,52,52,52	0
3	GAL	C	2	11/12	0.83	0.13	35,35,35,35	0
4	NAG	D	1	14/15	0.89	0.08	21,21,21,21	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.