Full wwPDB X-ray Structure Validation Report ⓘ

Jun 11, 2026 – 05:29 pm BST

PDB ID	:	9RD6 / pdb_00009rd6
Title	:	Crystal structure of the 4CHRD domain of human chordin with Anderson-Evans polyoxotungstate
Authors	:	Snee, M.; Baldock, C.
Deposited on	:	2025-06-01
Resolution	:	3.28 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:

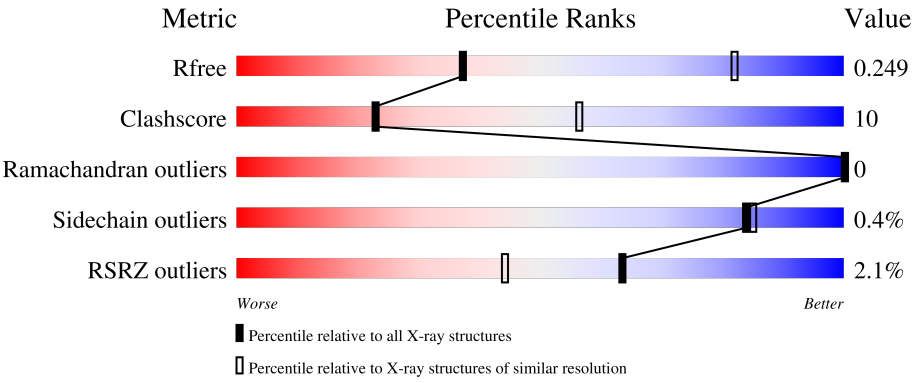
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 (i)

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

The reported resolution of this entry is 3.28 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	1303 (3.30-3.26)
Clashscore	190562	1354 (3.30-3.26)
Ramachandran outliers	187476	1334 (3.30-3.26)
Sidechain outliers	187428	1333 (3.30-3.26)
RSRZ outliers	180081	1303 (3.30-3.26)

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 <=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	945	% 37% 13% 50%
1	B	945	% 38% 12% 50%
2	C	3	100%
2	D	3	67% 33%
2	E	3	100%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7423 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 Chordin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	476	Total	C	N	O	S	0	3	0
			3530	2235	640	641	14			
1	B	474	Total	C	N	O	S	0	1	0
			3446	2190	611	630	15			

There are 32 discrepancies between the modelled and reference sequences:

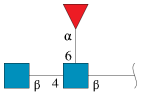
Chain	Residue	Modelled	Actual	Comment	Reference
A	11	GLU	-	expression tag	UNP Q9H2X0
A	12	THR	-	expression tag	UNP Q9H2X0
A	13	GLY	-	expression tag	UNP Q9H2X0
A	14	GLY	-	expression tag	UNP Q9H2X0
A	15	SER	-	expression tag	UNP Q9H2X0
A	16	ASP	-	expression tag	UNP Q9H2X0
A	17	TYR	-	expression tag	UNP Q9H2X0
A	18	LYS	-	expression tag	UNP Q9H2X0
A	19	ASP	-	expression tag	UNP Q9H2X0
A	20	ASP	-	expression tag	UNP Q9H2X0
A	21	ASP	-	expression tag	UNP Q9H2X0
A	22	ASP	-	expression tag	UNP Q9H2X0
A	23	LYS	-	expression tag	UNP Q9H2X0
A	24	GLY	-	expression tag	UNP Q9H2X0
A	25	GLY	-	expression tag	UNP Q9H2X0
A	26	SER	-	expression tag	UNP Q9H2X0
B	11	GLU	-	expression tag	UNP Q9H2X0
B	12	THR	-	expression tag	UNP Q9H2X0
B	13	GLY	-	expression tag	UNP Q9H2X0
B	14	GLY	-	expression tag	UNP Q9H2X0
B	15	SER	-	expression tag	UNP Q9H2X0
B	16	ASP	-	expression tag	UNP Q9H2X0
B	17	TYR	-	expression tag	UNP Q9H2X0
B	18	LYS	-	expression tag	UNP Q9H2X0
B	19	ASP	-	expression tag	UNP Q9H2X0

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	20	ASP	-	expression tag	UNP Q9H2X0
B	21	ASP	-	expression tag	UNP Q9H2X0
B	22	ASP	-	expression tag	UNP Q9H2X0
B	23	LYS	-	expression tag	UNP Q9H2X0
B	24	GLY	-	expression tag	UNP Q9H2X0
B	25	GLY	-	expression tag	UNP Q9H2X0
B	26	SER	-	expression tag	UNP Q9H2X0

- Molecule 2 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.

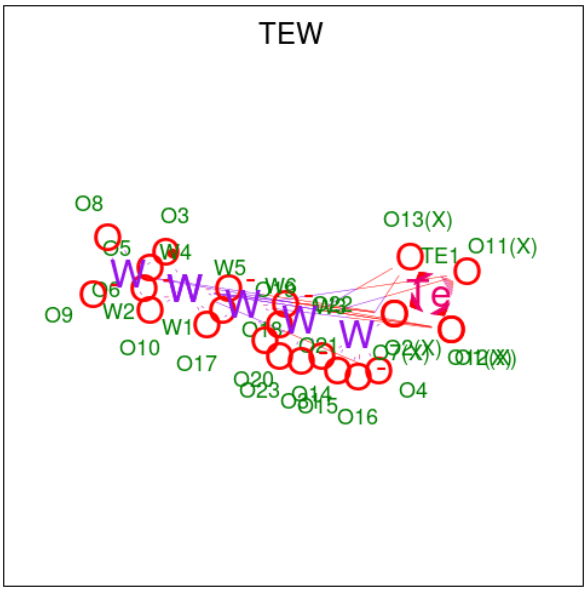


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
2	C	3	Total C N O 38 22 2 14	0	0	0
2	D	3	Total C N O 38 22 2 14	0	0	0
2	E	3	Total C N O 38 22 2 14	0	0	0

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Ca 1 1	0	0
3	B	3	Total Ca 3 3	0	0

- Molecule 4 is 6-tungstotellurate(VI) (CCD ID: TEW) (formula: $O_{24}TeW_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	O	Te	W	0	0
			31	24	1	6		
4	A	1	Total	O	Te	W	0	1
			62	48	2	12		
4	A	1	Total	O	Te	W	0	0
			30	23	1	6		
4	A	1	Total	O	Te	W	0	0
			31	24	1	6		
4	A	1	Total	O	Te	W	0	0
			30	23	1	6		
4	A	1	Total	O	Te	W	0	0
			31	24	1	6		
4	A	1	Total	O	Te	W	0	0
			31	24	1	6		
4	B	1	Total	O	Te	W	0	0
			31	24	1	6		
4	B	1	Total	O	Te	W	0	0
			31	24	1	6		

- Molecule 5 is water.

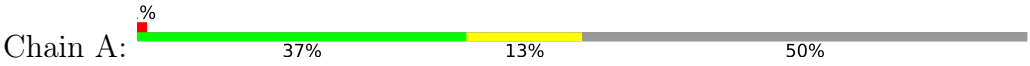
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	14	Total	O	0	0
			14	14		
5	B	7	Total	O	0	0
			7	7		

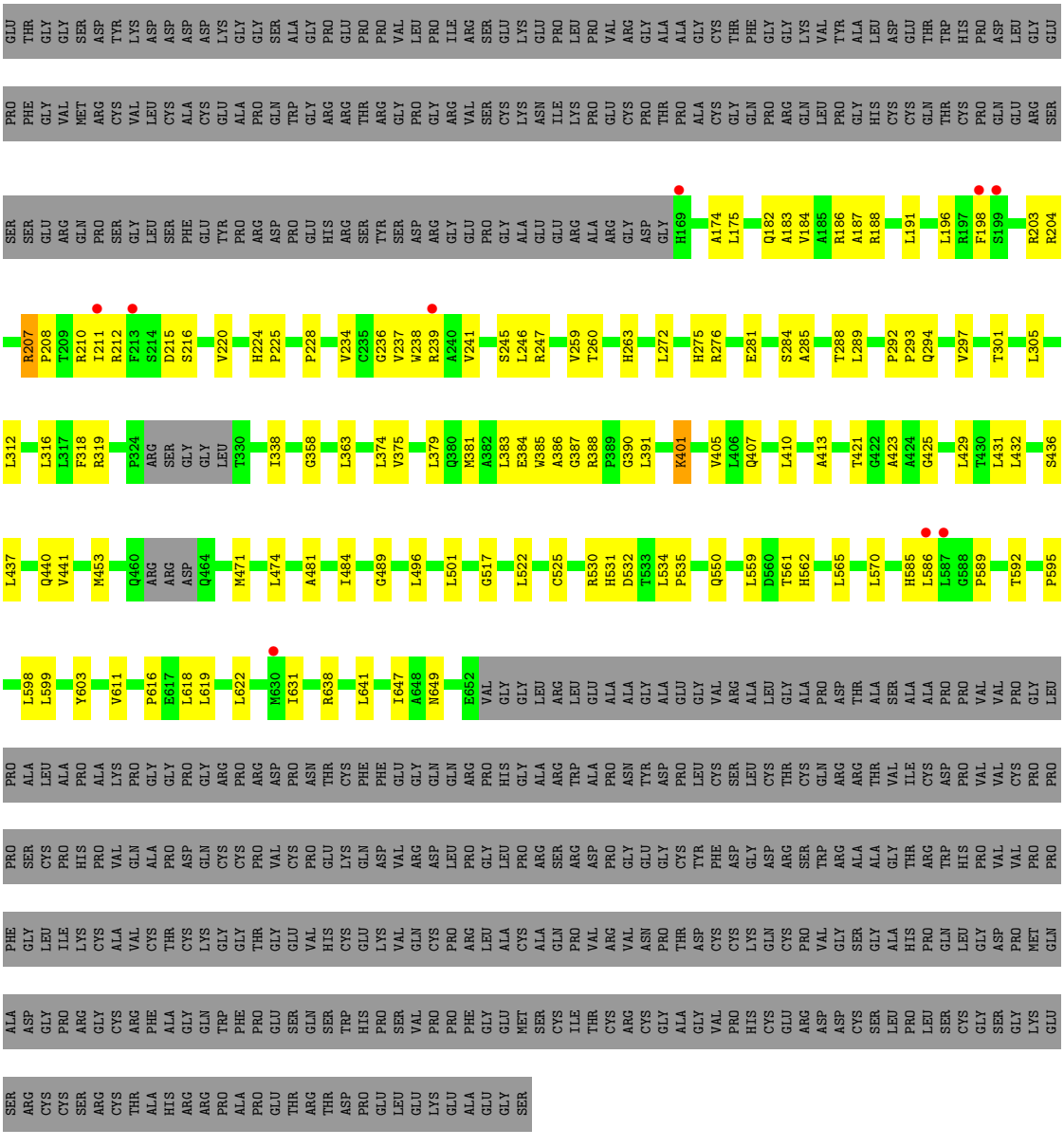
3 Residue-property plots (i)

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: Chordin

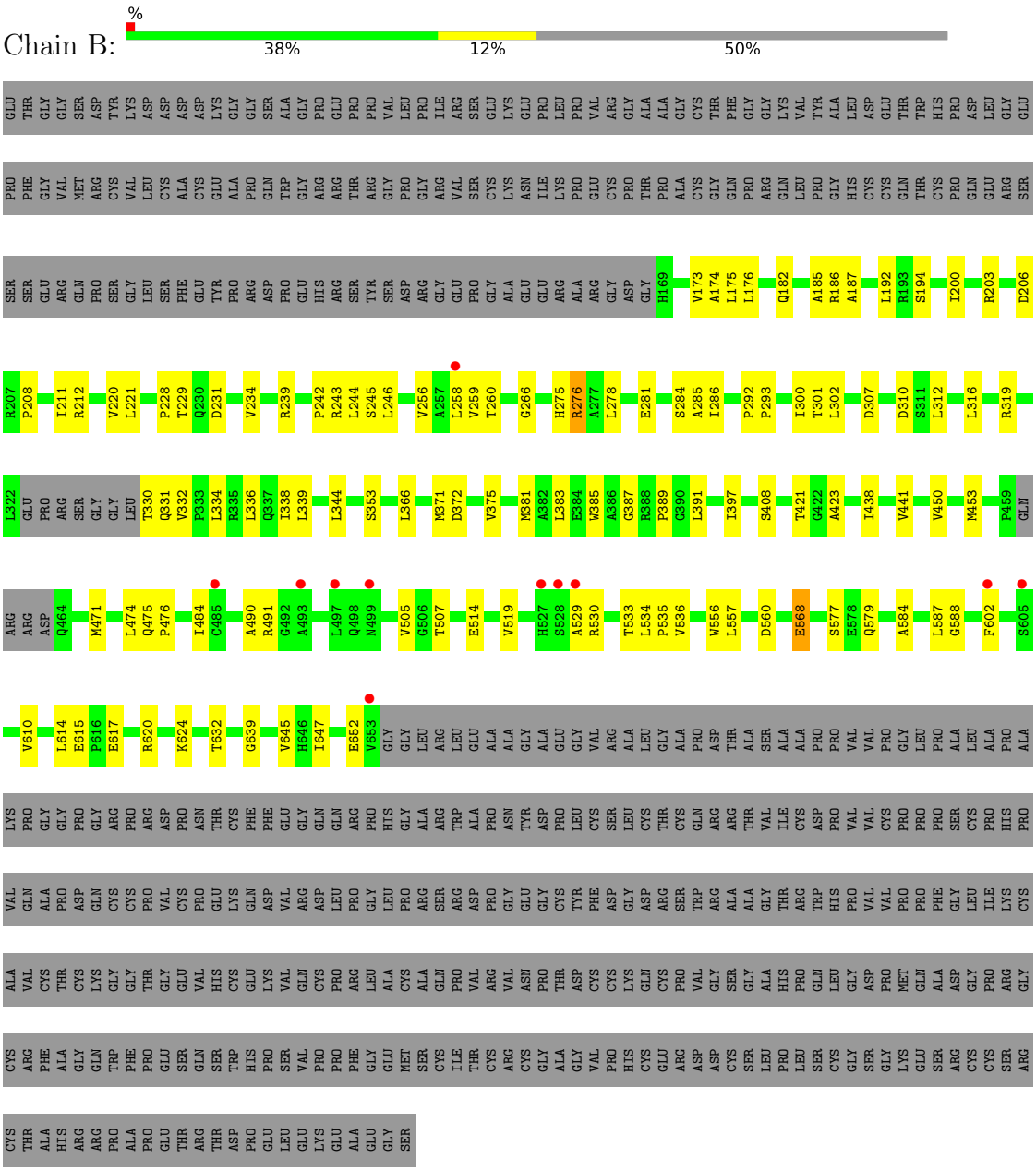
Chain A:





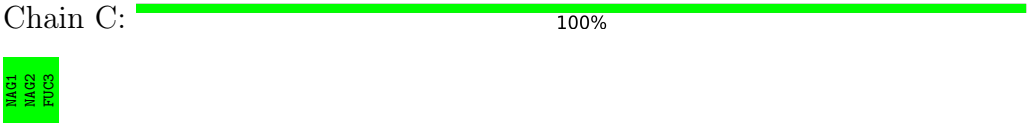
• Molecule 1: Chordin

Chain B:



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

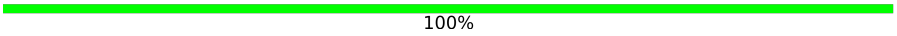
Chain C:



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

Chain D:

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

Chain E: 

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 2 2	Depositor
Cell constants a, b, c, α, β, γ	91.30Å 91.30Å 323.66Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	79.52 – 3.28 79.52 – 3.28	Depositor EDS
% Data completeness (in resolution range)	99.8 (79.52-3.28) 91.3 (79.52-3.28)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.47 (at 3.26Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.210 , 0.247 0.210 , 0.249	Depositor DCC
R_{free} test set	1072 reflections (2.68%)	wwPDB-VP
Wilson B-factor (Å^2)	106.4	Xtriage
Anisotropy	0.141	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 84.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7423	wwPDB-VP
Average B, all atoms (Å^2)	130.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.77% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: CA, FUC, NAG, TEW

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	0.11	0/3612	0.36	0/4926
1	B	0.11	0/3515	0.33	0/4799
All	All	0.11	0/7127	0.34	0/9725

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	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	638	ARG	Sidechain
1	B	276	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	3530	0	3543	76	1
1	B	3446	0	3434	74	0
2	C	38	0	34	0	0
2	D	38	0	34	0	0
2	E	38	0	34	0	0
3	A	1	0	0	0	0
3	B	3	0	0	0	0
4	A	246	0	0	6	1
4	B	62	0	0	1	0
5	A	14	0	0	0	0
5	B	7	0	0	0	0
All	All	7423	0	7079	150	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 10.

All (150) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:475:GLN:HG3	1:B:476:PRO:HD2	1.54	0.90
1:B:259:VAL:HG12	1:B:266:GLY:HA2	1.62	0.79
1:B:208:PRO:HB3	1:B:258:LEU:HD21	1.68	0.74
1:B:275:HIS:C	1:B:276:ARG:HH11	1.97	0.73
1:A:388:ARG:HG2	1:A:390:GLY:H	1.54	0.71
1:A:183:ALA:HA	1:A:204:ARG:HB3	1.74	0.70
1:B:307:ASP:HA	1:B:491:ARG:HH12	1.58	0.69
1:A:603:TYR:OH	4:A:1004:TEW:O2	2.12	0.68
1:B:186:ARG:HB2	1:B:300:ILE:HG21	1.76	0.67
1:B:557:LEU:HB3	1:B:647:ILE:HD11	1.77	0.67
1:B:389:PRO:HG2	1:B:391:LEU:HD13	1.76	0.66
1:B:208:PRO:HA	1:B:260:THR:HG22	1.76	0.66
1:B:421:THR:HG23	1:B:423:ALA:H	1.61	0.66
1:A:215:ASP:OD1	1:A:216:SER:N	2.29	0.66
1:B:281:GLU:HG3	1:B:302:LEU:HB3	1.80	0.64
1:A:204:ARG:NH2	1:A:288:THR:OG1	2.31	0.64
1:A:413:ALA:HB2	1:A:550:GLN:HG2	1.80	0.64
1:A:211:ILE:HD11	1:A:234:VAL:HG11	1.81	0.63
1:B:200:ILE:HG13	1:B:234:VAL:HB	1.81	0.63
1:A:239[A]:ARG:HG2	4:A:1003[A]:TEW:O23	1.99	0.62
4:A:1003[B]:TEW:O16	1:B:239:ARG:NH1	2.31	0.62
1:A:421:THR:HG23	1:A:423:ALA:H	1.64	0.62
1:B:536:VAL:HG21	1:B:645:VAL:HG12	1.82	0.61

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:522:LEU:HD13	1:A:570:LEU:HD21	1.82	0.60
1:B:228:PRO:HB3	1:B:234:VAL:HG22	1.82	0.59
1:A:247:ARG:NH1	4:A:1002:TEW:O19	2.36	0.59
1:A:431:LEU:HD12	1:A:496:LEU:HD22	1.85	0.58
1:B:316:LEU:HD21	1:B:383:LEU:HD12	1.86	0.58
1:B:577:SER:C	1:B:579:GLN:H	2.10	0.58
1:A:496:LEU:HD12	1:A:501:LEU:HD12	1.84	0.58
1:B:176:LEU:HB2	1:B:185:ALA:HB3	1.85	0.57
1:B:371:MET:HG3	1:B:490:ALA:HB3	1.86	0.57
1:B:174:ALA:HB3	1:B:187:ALA:HB3	1.84	0.57
1:B:281:GLU:OE2	1:B:284:SER:OG	2.23	0.56
1:A:203:ARG:HH11	1:A:288:THR:HG23	1.69	0.56
1:B:212:ARG:HG3	1:B:220:VAL:HG13	1.86	0.56
1:A:207[B]:ARG:HG3	1:A:228:PRO:HG3	1.86	0.56
1:A:208:PRO:HA	1:A:260:THR:HG22	1.87	0.56
1:A:297:VAL:HG11	1:A:391:LEU:HD11	1.88	0.56
1:B:276:ARG:N	1:B:276:ARG:HD2	2.20	0.56
1:A:338:ILE:HD13	1:A:363:LEU:HD21	1.88	0.56
1:A:559:LEU:HB2	1:A:647:ILE:HG21	1.88	0.56
1:B:285:ALA:HB2	1:B:397:ILE:HA	1.88	0.55
1:B:336:LEU:HD11	1:B:381:MET:HG2	1.89	0.55
1:A:175:LEU:O	1:A:319:ARG:NH2	2.40	0.55
1:A:595:PRO:HG2	1:A:618:LEU:HG	1.88	0.54
1:A:281:GLU:OE2	1:A:284:SER:OG	2.24	0.54
1:A:212:ARG:HD3	1:A:220:VAL:HG22	1.90	0.54
1:B:441:VAL:HG21	1:B:471:MET:HE1	1.91	0.53
1:A:174:ALA:HB3	1:A:187:ALA:HB3	1.90	0.53
1:A:405:VAL:HG11	1:A:530:ARG:HE	1.74	0.53
1:B:652:GLU:OE1	1:B:652:GLU:N	2.41	0.53
1:B:200:ILE:HD13	1:B:211:ILE:HD12	1.91	0.53
1:A:429:LEU:HD23	1:A:437:LEU:HD11	1.91	0.52
1:B:206:ASP:OD1	1:B:206:ASP:N	2.41	0.52
1:B:530:ARG:NH2	1:B:568[A]:GLU:OE1	2.39	0.52
1:B:243:ARG:HA	1:B:246:LEU:HB2	1.91	0.52
1:B:421:THR:HG21	1:B:514:GLU:HG2	1.90	0.52
1:B:632:THR:HG22	1:B:639:GLY:HA2	1.92	0.52
1:B:175:LEU:O	1:B:319:ARG:NH2	2.36	0.51
1:A:301:THR:HG21	1:A:381:MET:SD	2.51	0.51
1:B:332:VAL:HG11	1:B:385:TRP:HE1	1.75	0.51
1:A:441:VAL:HG21	1:A:471:MET:HE1	1.93	0.51
1:A:585:HIS:CE1	1:A:598:LEU:HD13	2.47	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:174:ALA:HB2	1:A:272:LEU:HD23	1.94	0.50
1:A:196:LEU:HB3	1:A:238:TRP:HB3	1.93	0.50
1:B:339:LEU:HB3	1:B:344:LEU:HA	1.92	0.50
1:B:301:THR:HB	1:B:316:LEU:HD13	1.93	0.49
1:A:622:LEU:HD23	1:A:647:ILE:HB	1.93	0.49
1:B:334:LEU:HD13	1:B:385:TRP:HA	1.93	0.49
1:A:198:PHE:CZ	1:A:236:GLY:HA3	2.48	0.49
1:A:559:LEU:HD23	1:A:649:ASN:HB3	1.93	0.49
1:B:385:TRP:C	1:B:387:GLY:H	2.21	0.49
1:A:586:LEU:HB2	1:A:599:LEU:HD11	1.95	0.48
1:B:176:LEU:HD21	1:B:256:VAL:HG13	1.94	0.48
1:B:203:ARG:NH2	4:B:1005:TEW:O31	2.32	0.48
1:A:375:VAL:HG11	1:A:489:GLY:HA2	1.96	0.48
1:A:589:PRO:HB2	1:A:592:THR:HB	1.96	0.48
1:A:204:ARG:NE	4:A:1007:TEW:O6	2.47	0.47
1:B:450:VAL:HA	1:B:507:THR:HG22	1.95	0.47
1:B:438:ILE:HD13	1:B:484:ILE:HB	1.95	0.47
1:B:221:LEU:HD13	1:B:245:SER:HB3	1.95	0.47
1:B:330:THR:O	1:B:331:GLN:HG3	2.15	0.47
1:A:210:ARG:HB2	1:A:259:VAL:CG1	2.45	0.47
1:A:405:VAL:HG13	1:A:407:GLN:HE21	1.80	0.47
1:B:529:ALA:O	1:B:533:THR:HG23	2.15	0.47
1:A:436:SER:HB3	1:A:484:ILE:HD11	1.97	0.46
1:B:453:MET:HB3	1:B:505:VAL:HG22	1.97	0.46
1:A:305:LEU:HD22	1:A:312:LEU:HD13	1.96	0.46
1:B:286:ILE:HG23	1:B:300:ILE:HG22	1.98	0.46
1:A:453:MET:HG3	1:A:471:MET:HB2	1.98	0.46
1:A:186:ARG:HH12	1:A:188:ARG:HD2	1.81	0.46
1:A:182:GLN:HE22	1:A:293:PRO:HA	1.80	0.46
1:B:312:LEU:HB2	1:B:366:LEU:HD11	1.98	0.46
1:A:289:LEU:HD11	1:A:294:GLN:HB2	1.98	0.45
4:A:1003[A]:TEW:O15	1:B:610:VAL:HG11	2.16	0.45
1:A:631:ILE:HB	1:A:641:LEU:HB2	1.98	0.45
1:B:242:PRO:HB2	1:B:244:LEU:HG	1.99	0.45
1:A:316:LEU:HD21	1:A:383:LEU:HD22	2.00	0.44
1:A:318:PHE:CE2	1:A:358:GLY:HA2	2.52	0.44
1:A:401[A]:LYS:H	1:A:401[A]:LYS:HG2	1.49	0.44
1:B:192:LEU:O	1:B:194:SER:N	2.50	0.44
1:A:565:LEU:HB3	1:A:611:VAL:CG2	2.48	0.44
1:B:474:LEU:O	1:B:475:GLN:HB3	2.16	0.44
1:B:614:LEU:HA	1:B:614:LEU:HD23	1.79	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:385:TRP:C	1:A:387:GLY:H	2.26	0.43
1:B:560:ASP:OD1	1:B:560:ASP:N	2.47	0.43
1:A:440:GLN:HB3	1:A:534:LEU:HD11	2.00	0.43
1:B:182:GLN:OE1	1:B:182:GLN:N	2.38	0.43
1:B:587:LEU:HD12	1:B:588:GLY:O	2.18	0.43
1:A:275:HIS:ND1	1:A:276:ARG:O	2.44	0.43
1:B:408:SER:HB2	1:B:519:VAL:HG12	2.01	0.43
1:B:173:VAL:HB	1:B:278:LEU:HD21	2.00	0.43
1:B:453:MET:HB3	1:B:453:MET:HE2	1.92	0.43
1:B:615:GLU:HB3	1:B:617:GLU:OE1	2.18	0.43
1:B:372:ASP:HA	1:B:375:VAL:HG12	2.00	0.43
1:B:584:ALA:HB2	1:B:602:PHE:HE2	1.83	0.43
1:A:191:LEU:HD11	1:A:246:LEU:HD22	2.00	0.43
1:A:374:LEU:HB2	1:A:379:LEU:HD22	2.01	0.43
1:B:330:THR:HA	1:B:353:SER:HB2	2.00	0.43
1:A:237:VAL:HG21	1:A:525:CYS:HA	2.00	0.43
1:A:534:LEU:HD23	1:A:535:PRO:HD2	2.00	0.43
1:B:278:LEU:HA	1:B:281:GLU:HB2	2.00	0.43
1:B:534:LEU:HD23	1:B:534:LEU:HA	1.85	0.42
1:A:241:VAL:HG12	1:A:245:SER:HB2	2.02	0.42
1:A:259:VAL:HG23	1:A:263:HIS:O	2.19	0.42
1:B:292:PRO:HA	1:B:293:PRO:HD3	1.79	0.42
1:A:224:HIS:ND1	1:A:225:PRO:HD2	2.33	0.42
1:A:410:LEU:HD23	1:A:517:GLY:N	2.34	0.42
1:B:535:PRO:HD3	1:B:556:TRP:CZ3	2.54	0.42
1:A:474:LEU:HB3	1:A:481:ALA:HB2	2.01	0.42
1:B:338:ILE:HG12	1:B:381:MET:HG3	2.01	0.42
1:B:624:LYS:HB3	1:B:624:LYS:HE2	1.72	0.42
1:A:239[A]:ARG:H	1:A:239[A]:ARG:HG3	1.42	0.42
1:A:410:LEU:HD12	1:A:425:GLY:HA3	2.00	0.42
1:A:559:LEU:HD12	1:A:559:LEU:HA	1.78	0.41
1:A:384:GLU:HG3	1:A:386:ALA:H	1.85	0.41
1:B:229:THR:OG1	1:B:231:ASP:OD1	2.26	0.41
1:A:301:THR:HB	1:A:316:LEU:HD13	2.02	0.41
1:A:184:VAL:CG1	1:A:288:THR:HG22	2.50	0.41
1:A:285:ALA:HB3	1:A:301:THR:CG2	2.51	0.41
1:A:531:HIS:O	1:A:532:ASP:C	2.64	0.41
1:B:620:ARG:O	1:B:624:LYS:HG2	2.21	0.41
1:B:285:ALA:HB3	1:B:301:THR:CG2	2.51	0.41
1:A:297:VAL:HA	1:A:319:ARG:O	2.21	0.41
1:A:561:THR:HG23	1:A:562:HIS:CE1	2.56	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:292:PRO:HA	1:A:293:PRO:HD3	1.79	0.41
1:A:431:LEU:HD23	1:A:432:LEU:O	2.21	0.41
1:A:616:PRO:HA	1:A:619:LEU:HB2	2.03	0.41
1:B:310:ASP:HB3	1:B:371:MET:HE1	2.03	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:247:ARG:NH2	4:A:1002:TEW:O12[5_555]	2.16	0.04

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	473/945 (50%)	449 (95%)	24 (5%)	0	100	100
1	B	469/945 (50%)	448 (96%)	21 (4%)	0	100	100
All	All	942/1890 (50%)	897 (95%)	45 (5%)	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	369/761 (48%)	365 (99%)	4 (1%)	65 76
1	B	354/761 (46%)	352 (99%)	2 (1%)	78 82
All	All	723/1522 (48%)	717 (99%)	6 (1%)	84 79

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	207[A]	ARG
1	A	207[B]	ARG
1	A	401[A]	LYS
1	A	401[B]	LYS
1	B	568[A]	GLU
1	B	568[B]	GLU

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

Mol	Chain	Res	Type
1	A	440	GLN
1	A	504	ASN
1	A	550	GLN
1	A	566	HIS
1	B	562	HIS
1	B	564	HIS
1	B	585	HIS

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)

9 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	NAG	C	1	2,1	14,14,15	0.31	0	17,19,21	0.40	0
2	NAG	C	2	2	14,14,15	0.42	0	17,19,21	0.37	0
2	FUC	C	3	2	10,10,11	0.73	0	14,14,16	0.82	0
2	NAG	D	1	2,1	14,14,15	0.60	1 (7%)	17,19,21	0.77	0
2	NAG	D	2	2	14,14,15	0.27	0	17,19,21	0.37	0
2	FUC	D	3	2	10,10,11	0.73	0	14,14,16	0.79	0
2	NAG	E	1	2,1	14,14,15	0.27	0	17,19,21	0.46	0
2	NAG	E	2	2	14,14,15	0.26	0	17,19,21	0.45	0
2	FUC	E	3	2	10,10,11	0.73	0	14,14,16	0.84	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	NAG	C	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	FUC	C	3	2	-	-	0/1/1/1
2	NAG	D	1	2,1	-	1/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
2	FUC	D	3	2	-	-	0/1/1/1
2	NAG	E	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	E	2	2	-	0/6/23/26	0/1/1/1
2	FUC	E	3	2	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	1	NAG	O5-C1	-2.08	1.40	1.43

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

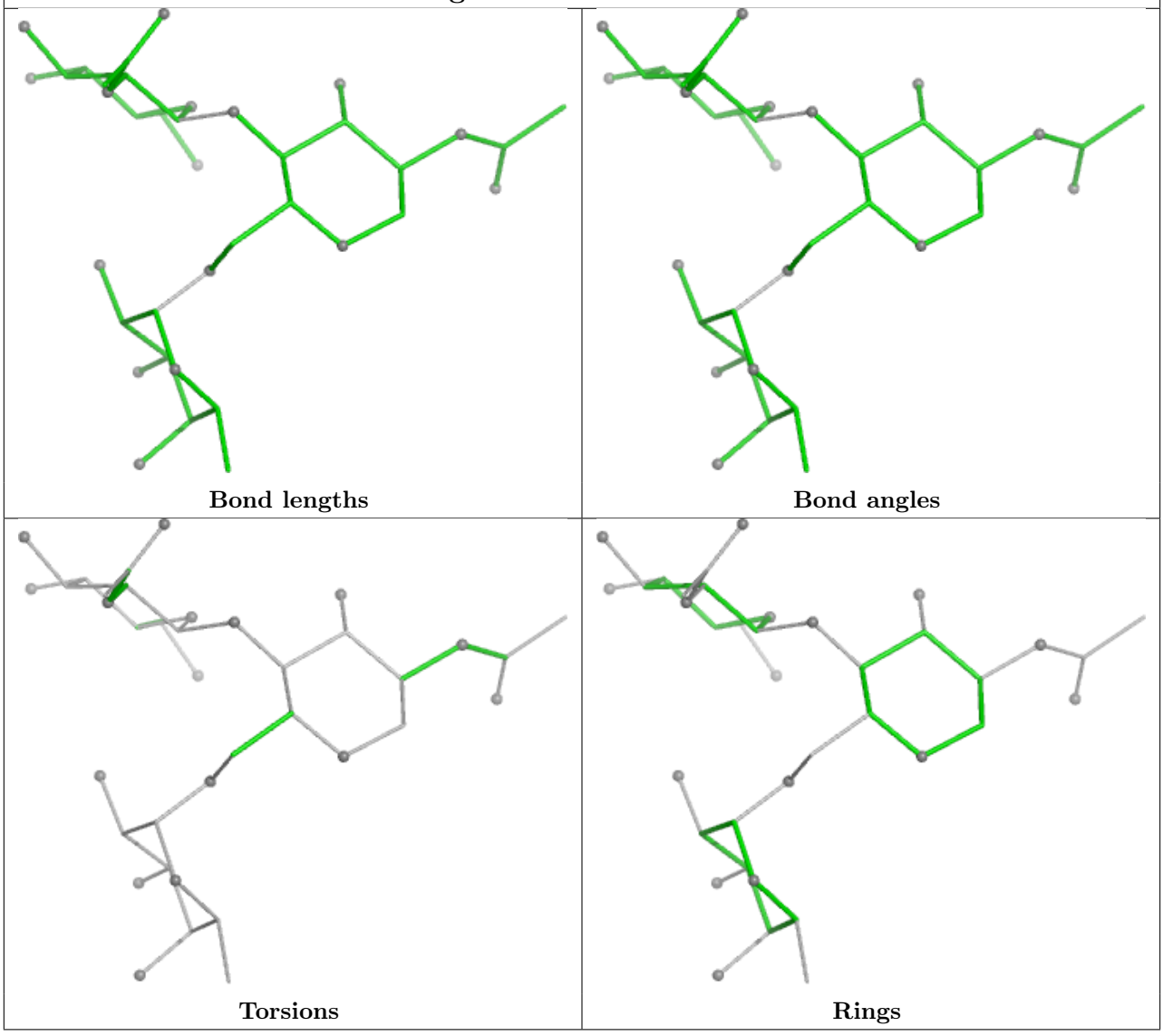
Mol	Chain	Res	Type	Atoms
2	E	1	NAG	C4-C5-C6-O6
2	E	1	NAG	O5-C5-C6-O6
2	D	1	NAG	C4-C5-C6-O6

There are no ring outliers.

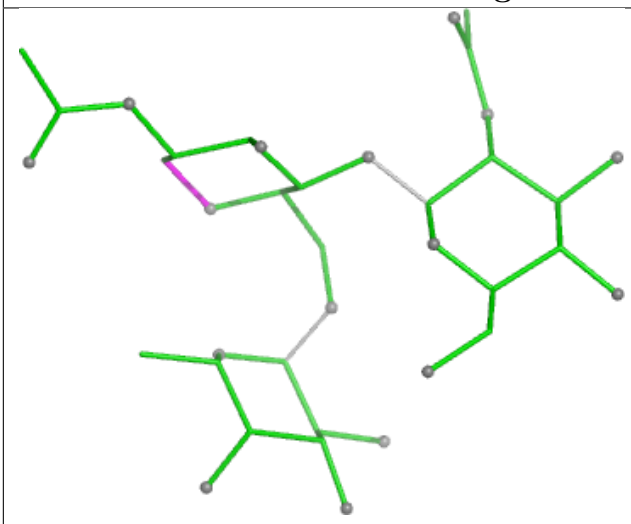
No monomer is involved in short contacts.

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

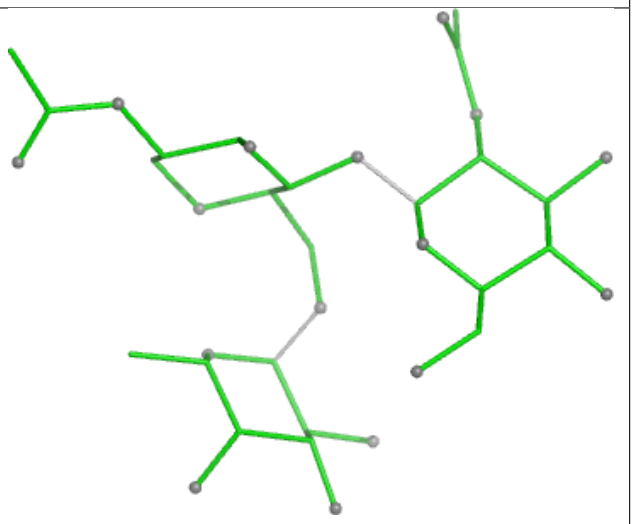
Oligosaccharide Chain C



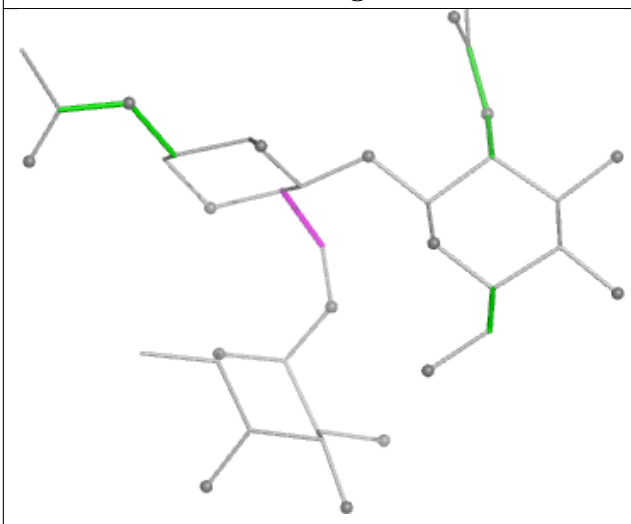
Oligosaccharide Chain D



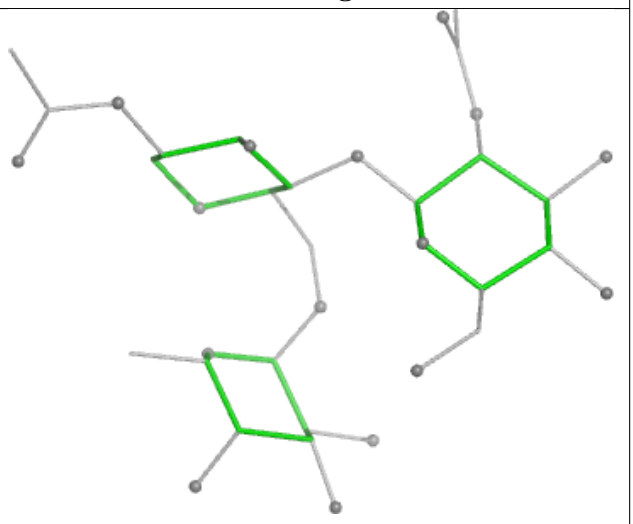
Bond lengths



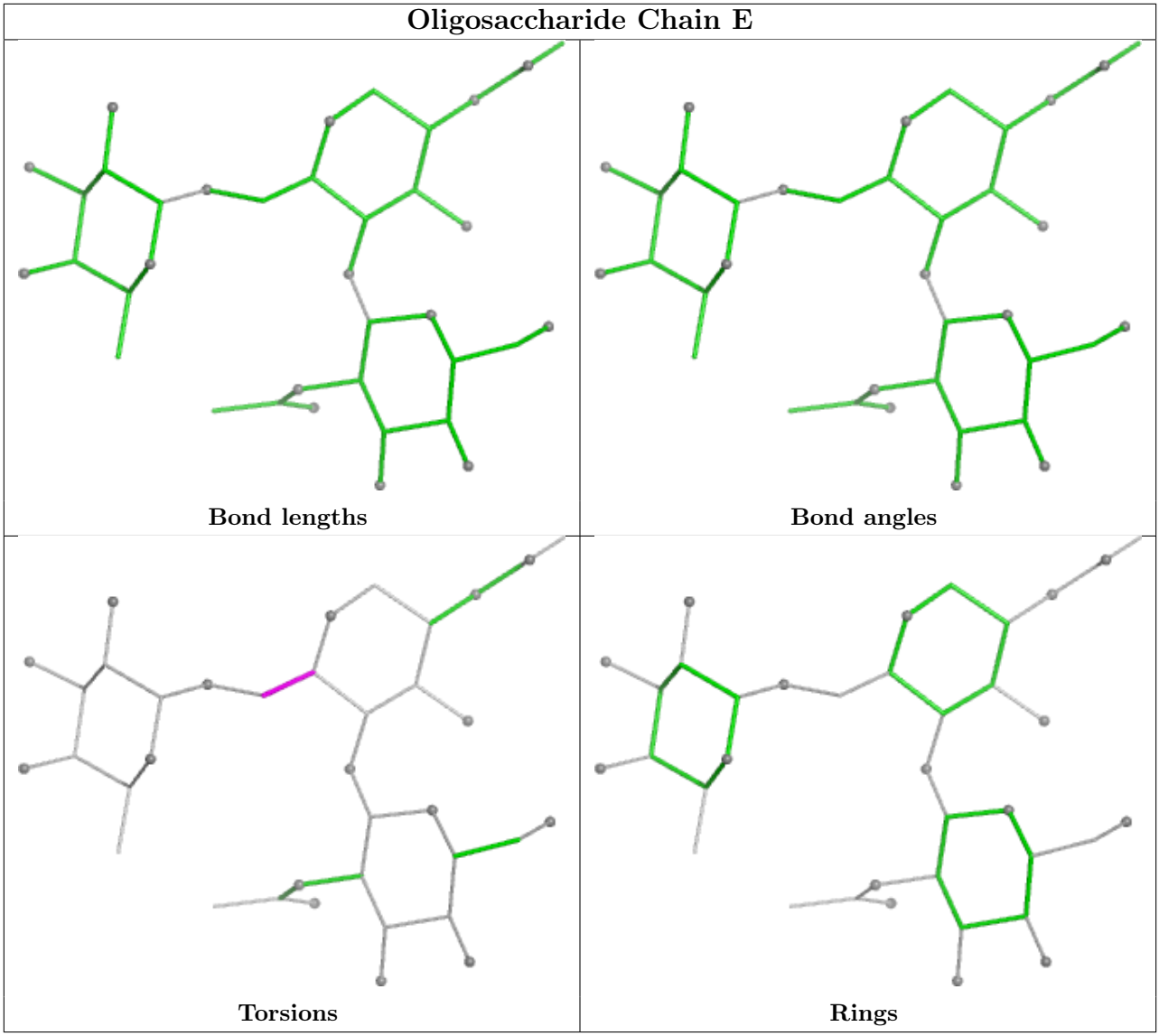
Bond angles



Torsions



Rings



5.6 Ligand geometry (i)

Of 14 ligands modelled in this entry, 4 are monoatomic - leaving 10 for Mogul analysis.

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	$\#\|Z\| > 2$
4	TEW	B	1005	-	24,42,42	1.07	0	12,129,129	0.72	0
4	TEW	A	1005	-	24,42,42	1.06	0	12,129,129	0.60	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	TEW	A	1003[A]	-	24,42,42	1.06	0	12,129,129	0.65	0
4	TEW	B	1004	-	24,42,42	1.06	0	12,129,129	0.54	0
4	TEW	A	1006	1	21,41,42	1.04	0	12,124,129	0.96	0
4	TEW	A	1004	1	20,39,42	1.01	0	0,111,129	-	-
4	TEW	A	1003[B]	-	24,42,42	1.06	0	12,129,129	0.49	0
4	TEW	A	1002	1	24,42,42	1.06	1 (4%)	12,129,129	0.55	0
4	TEW	A	1007	-	24,42,42	1.06	0	12,129,129	0.53	0
4	TEW	A	1008	-	24,42,42	1.06	0	12,129,129	0.57	0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1002	TEW	W5-O22	-2.00	1.71	2.10

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

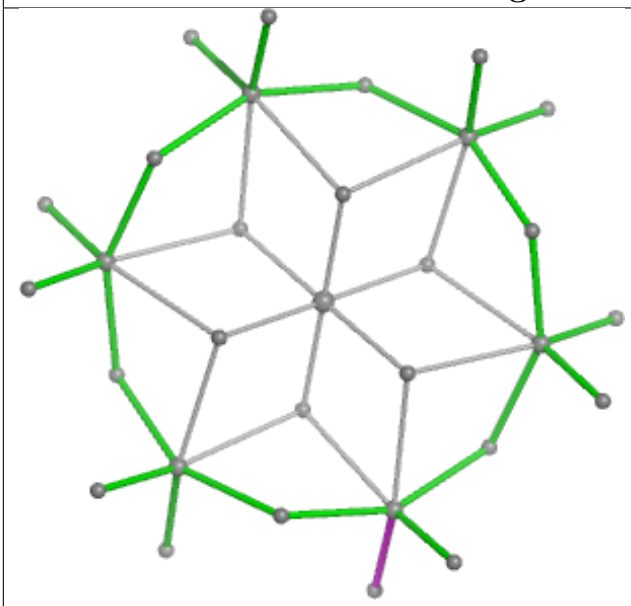
There are no ring outliers.

6 monomers are involved in 8 short contacts:

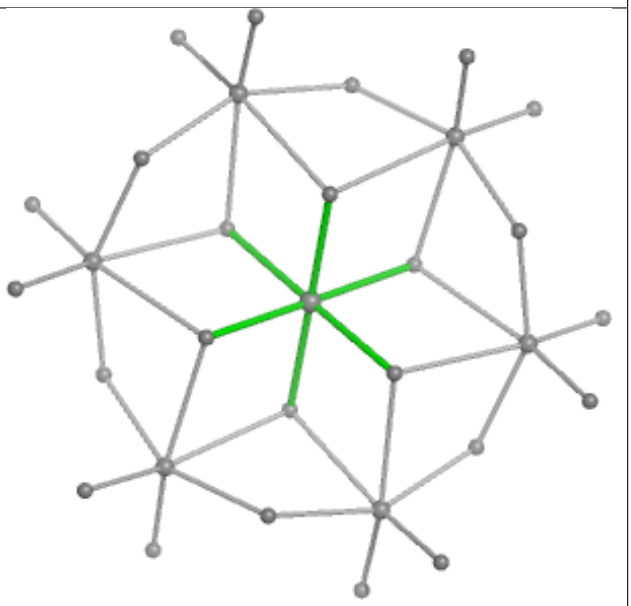
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1005	TEW	1	0
4	A	1003[A]	TEW	2	0
4	A	1004	TEW	1	0
4	A	1003[B]	TEW	1	0
4	A	1002	TEW	1	1
4	A	1007	TEW	1	0

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 then 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.

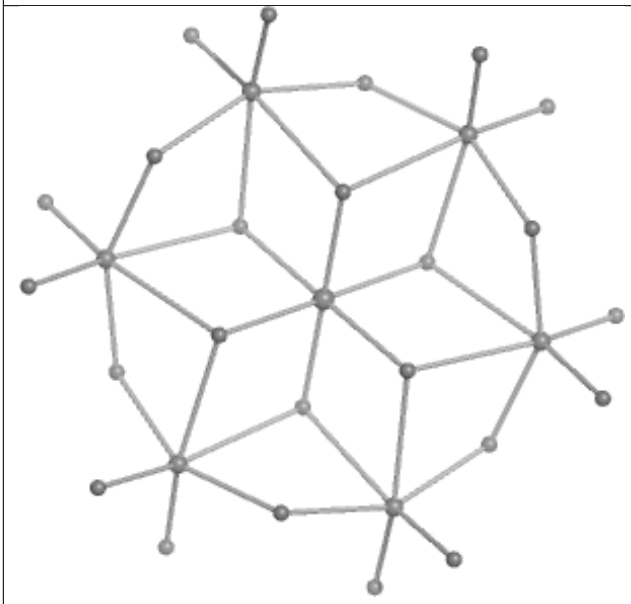
Ligand TEW A 1002



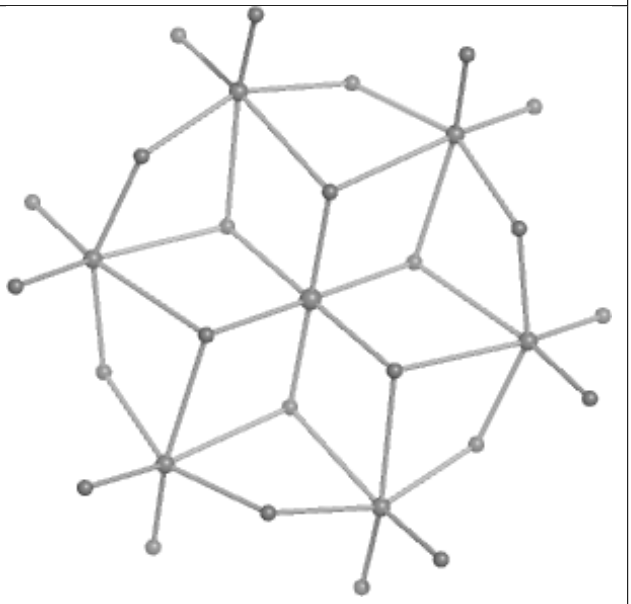
Bond lengths



Bond angles



Torsions



Rings

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, 95^{th} 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	476/945 (50%)	-0.11	9 (1%)	66	48	53, 112, 178, 223	3 (0%)
1	B	474/945 (50%)	0.02	11 (2%)	61	41	47, 122, 195, 258	1 (0%)
All	All	950/1890 (50%)	-0.05	20 (2%)	63	44	47, 118, 189, 258	4 (0%)

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	239[A]	ARG	4.7
1	A	198	PHE	3.0
1	B	499	ASN	2.8
1	A	211	ILE	2.6
1	B	497	LEU	2.5
1	B	529	ALA	2.4
1	B	653	VAL	2.4
1	B	528	SER	2.4
1	A	586	LEU	2.3
1	A	199	SER	2.3
1	A	630	MET	2.2
1	B	258	LEU	2.2
1	B	602	PHE	2.2
1	A	169	HIS	2.1
1	B	605	SER	2.1
1	A	587	LEU	2.1
1	B	485	CYS	2.0
1	B	493	ALA	2.0
1	B	527	HIS	2.0
1	A	213	PHE	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)

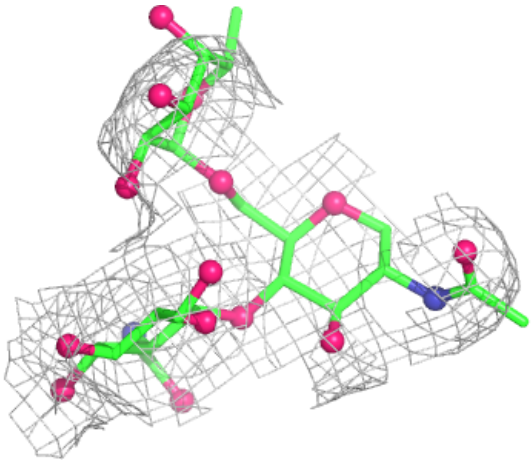
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

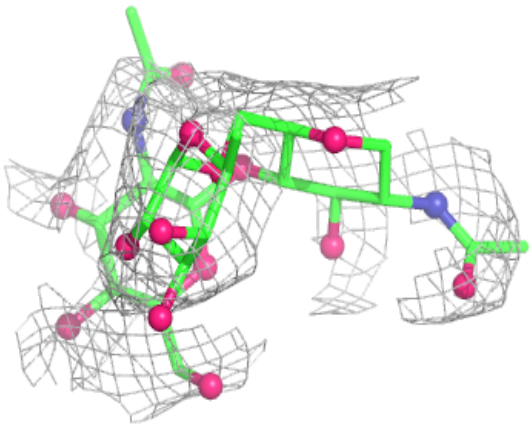
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	FUC	D	3	10/11	0.03	0.13	242,254,263,270	0
2	NAG	D	2	14/15	0.12	0.10	199,249,258,266	0
2	FUC	E	3	10/11	0.29	0.14	232,243,257,271	0
2	FUC	C	3	10/11	0.53	0.12	164,174,186,195	0
2	NAG	E	2	14/15	0.74	0.09	164,182,185,195	0
2	NAG	C	2	14/15	0.78	0.11	165,183,198,203	0
2	NAG	D	1	14/15	0.82	0.07	182,209,230,241	0
2	NAG	C	1	14/15	0.91	0.07	103,117,158,167	0
2	NAG	E	1	14/15	0.91	0.09	118,132,165,194	0

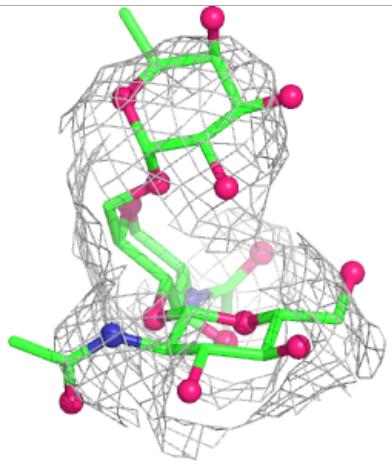
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

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)

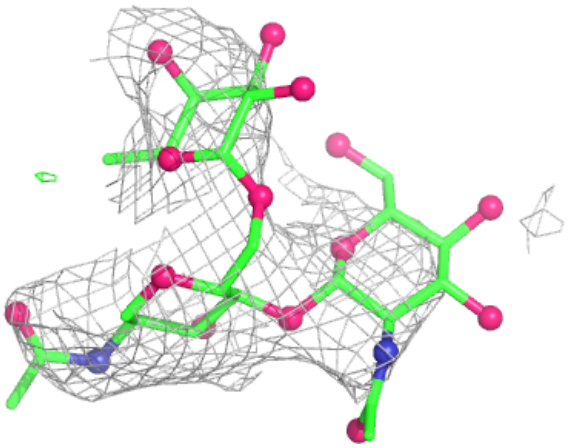


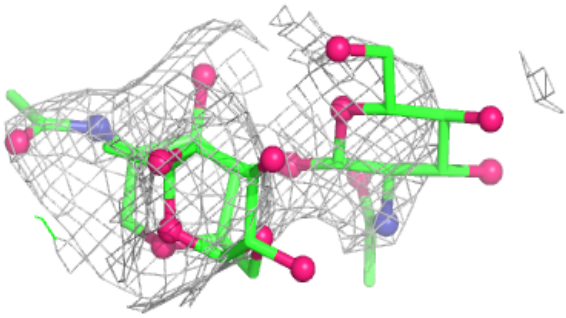


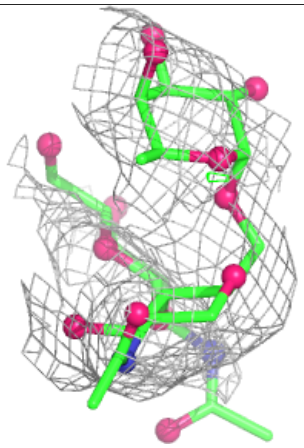


Electron density around Chain D:

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

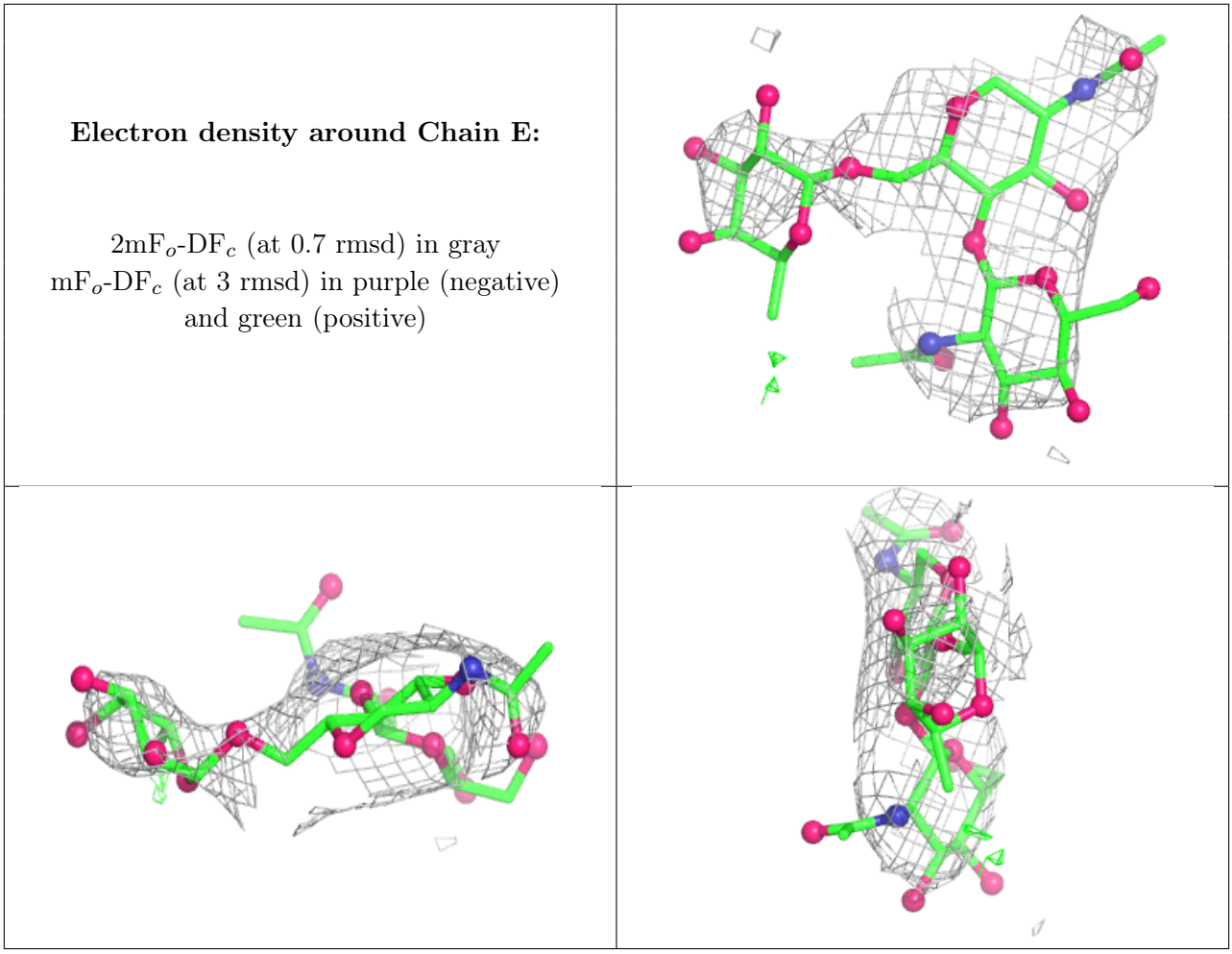






Electron density around Chain E:

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



6.4 Ligands

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, 95^{th} 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	CA	A	1001	1/1	0.77	0.15	149,149,149,149	0
4	TEW	A	1008	31/31	0.85	0.09	359,395,408,410	31
3	CA	B	1002	1/1	0.90	0.09	139,139,139,139	0
3	CA	B	1001	1/1	0.92	0.05	119,119,119,119	0
4	TEW	B	1005	31/31	0.92	0.07	313,381,404,415	31
3	CA	B	1003	1/1	0.93	0.07	129,129,129,129	0
4	TEW	A	1007	31/31	0.94	0.06	196,292,339,397	31
4	TEW	A	1005	31/31	0.96	0.06	177,219,240,244	31
4	TEW	A	1004	30/31	0.97	0.06	171,236,261,284	0
4	TEW	A	1002	31/31	0.98	0.06	194,238,262,273	31

Continued on next page...

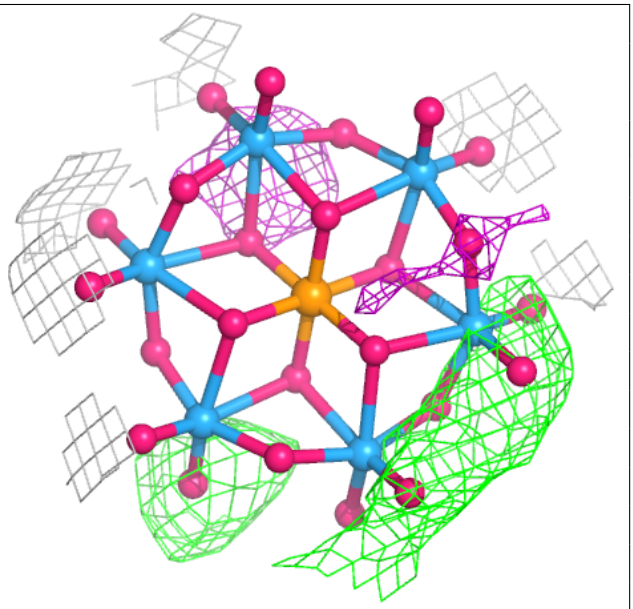
Continued from previous page...

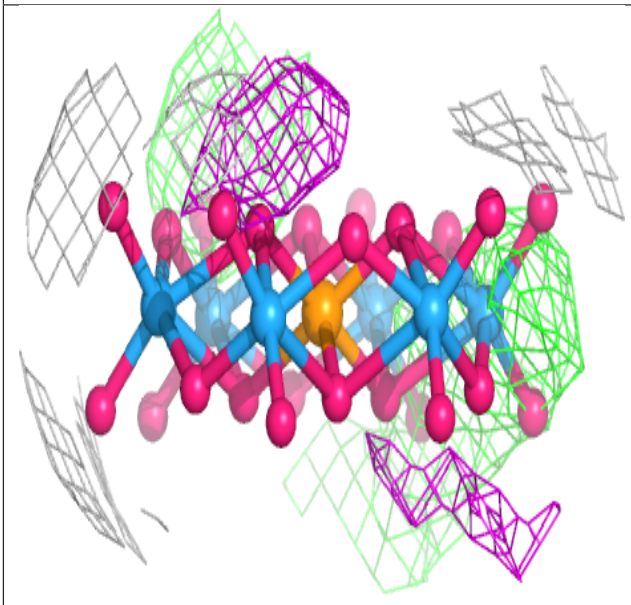
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	TEW	A	1003[A]	31/31	0.99	0.06	97,131,141,159	31
4	TEW	A	1003[B]	31/31	0.99	0.06	119,132,146,161	31
4	TEW	B	1004	31/31	0.99	0.04	177,230,239,265	31
4	TEW	A	1006	30/31	0.99	0.04	221,234,242,243	30

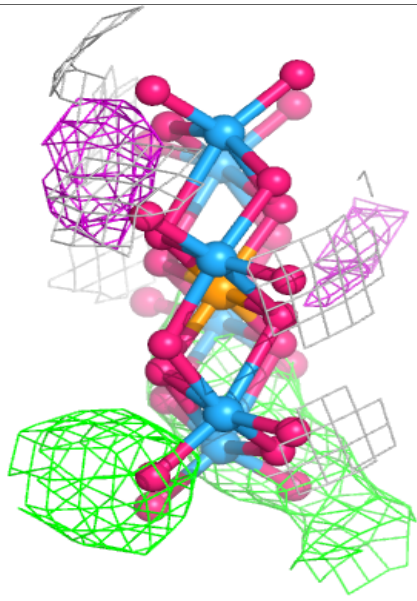
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around TEW A 1002:

$2mF_o$-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.