



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 6, 2024 – 07:43 pm GMT

PDB ID : 5OA2
Title : Crystal structure of ScGas2 in complex with compound 8
Authors : Delso, I.; Valero-Gonzalez, J.; Gomollon-Bel, F.; Castro-Lopez, J.; Fang, W.;
Navratilova, I.; Van Aalten, D.; Tejero, T.; Merino, P.; Hurtado-Guerrero, R.
Deposited on : 2017-06-20
Resolution : 2.15 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

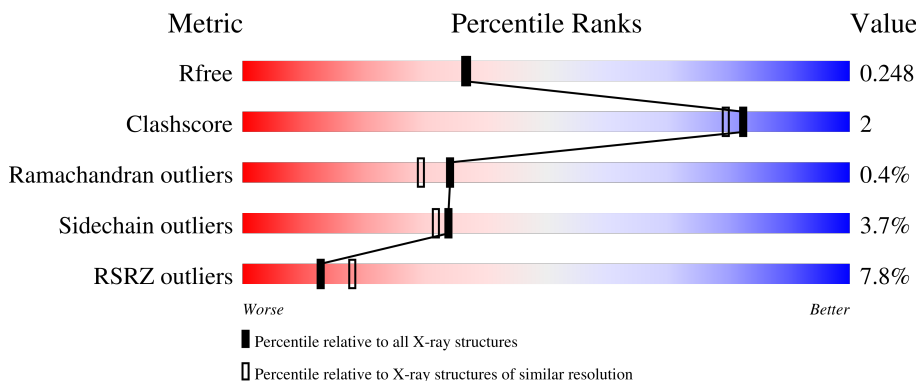
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.15 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}	130704	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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	555	 6% 71% 6% 22%
1	B	555	 5% 73% 5% 22%
1	C	555	 7% 73% 5% 22%
2	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	EDO	A	606	-	-	X	-
4	SO4	B	618	-	-	X	-

2 Entry composition [i](#)

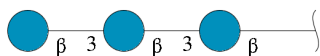
There are 6 unique types of molecules in this entry. The entry contains 11166 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 1,3-beta-glucanosyltransferase GAS2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	434	3487	2229	555	680	23	22	6	0
1	B	434	3484	2227	558	676	23	15	5	0
1	C	435	3502	2238	556	685	23	22	7	0

- Molecule 2 is an oligosaccharide called beta-D-glucopyranose-(1-3)-beta-D-glucopyranose-(1-3)-beta-D-glucopyranose.



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

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: 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	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
3	B	1	Total C O 4 2 2	0	0

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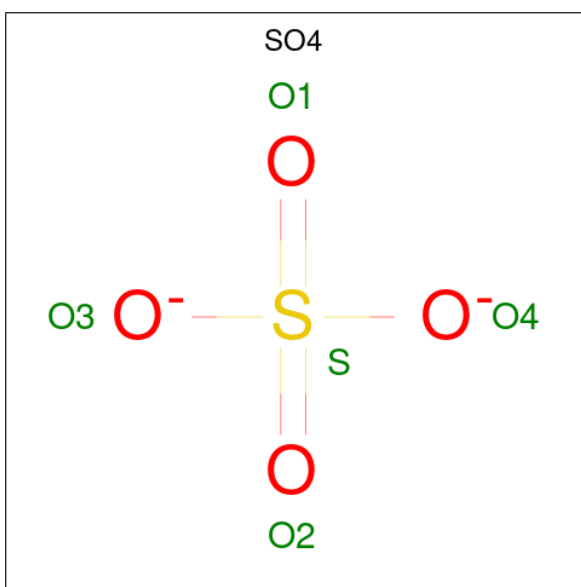
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0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

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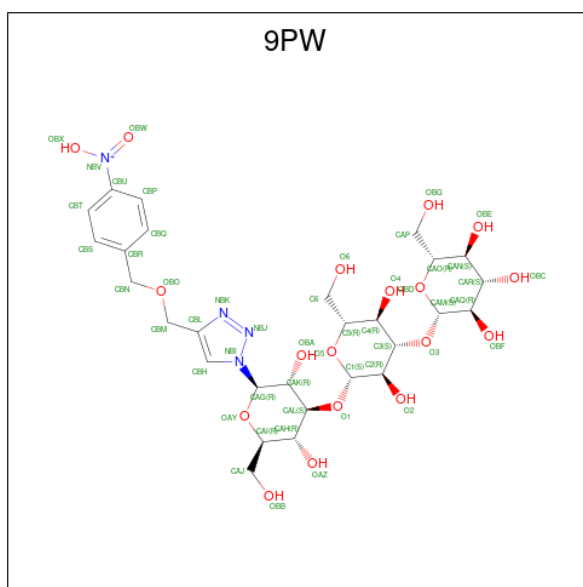
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0

- Molecule 5 is [4-[[1-[(2 {R},3 {R},4 {S},5 {R},6 {R})-6-(hydroxymethyl)-4-[(2 {S},3 {R},4 {S},5 {R},6 {R})-6-(hydroxymethyl)-4-[(2 {S},3 {R},4 {S},5 {S},6 {R})-6-(hydroxymethyl)-3,4,5-tris(oxidanyl)oxan-2-yl]oxy-3,5-bis(oxidanyl)oxan-2-yl]oxy-3,5-bis(oxidanyl)oxan-2-yl]-1,2,3-triazol-4-yl]methoxymethyl]phenyl]-oxidanyl-oxidanylidene-azanium (three-letter code: 9PW) (formula: C₂₈H₄₁N₄O₁₈).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	C	1	50	28	4	18	0	0

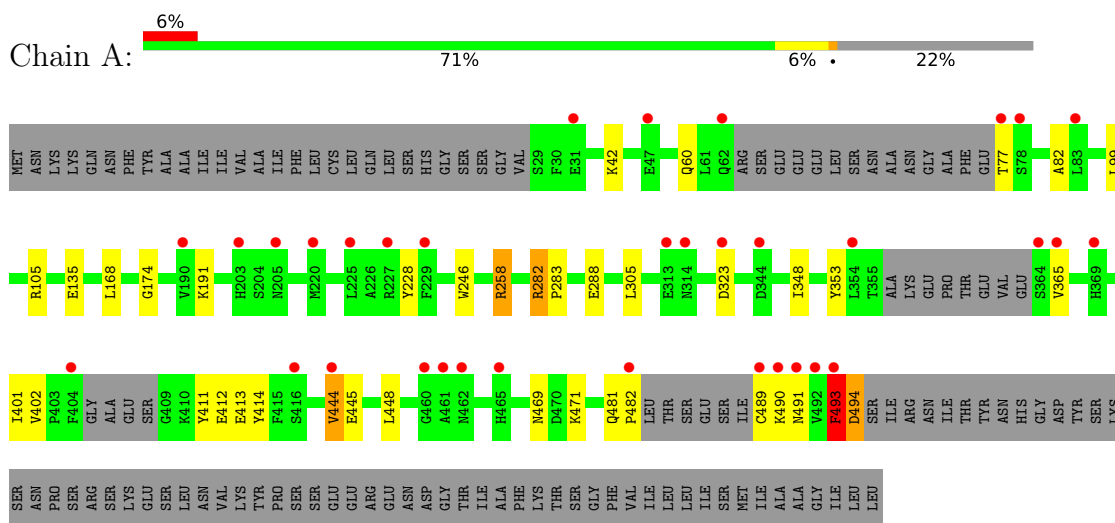
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	154	Total	O	0	0
			154	154		
6	B	164	Total	O	0	0
			164	164		
6	C	115	Total	O	0	0
			115	115		

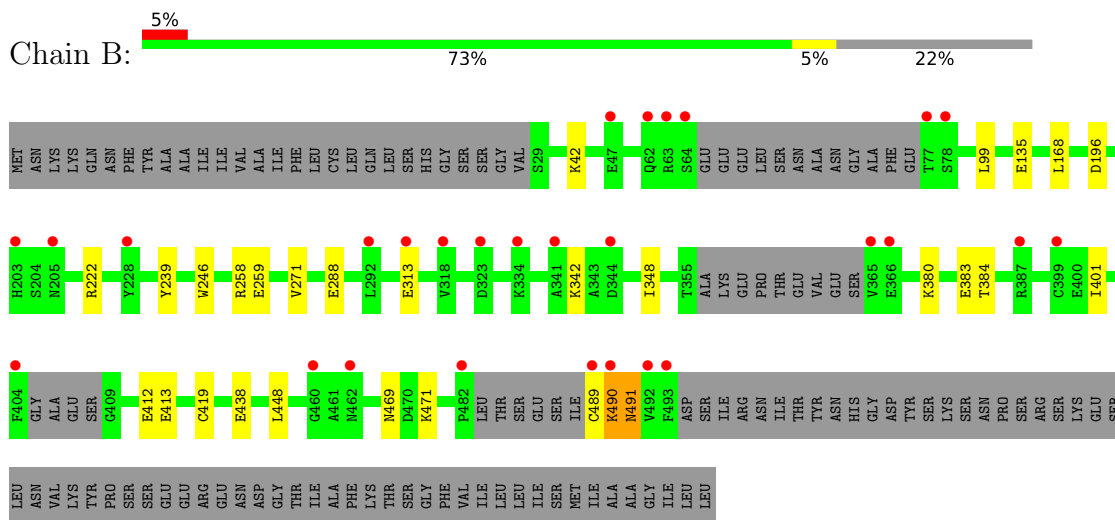
3 Residue-property plots [i](#)

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: 1,3-beta-glucanosyltransferase GAS2

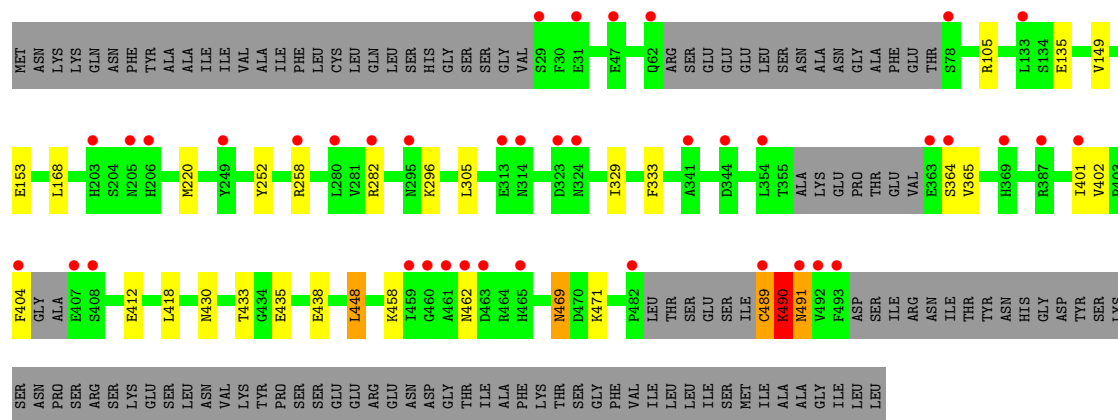


- Molecule 1: 1,3-beta-glucanosyltransferase GAS2



- Molecule 1: 1,3-beta-glucanosyltransferase GAS2





- Molecule 2: beta-D-glucopyranose-(1-3)-beta-D-glucopyranose-(1-3)-beta-D-glucopyranose

Chain D: 33% 67%

BCC1
BCC2
BCC3

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	71.57Å 139.44Å 161.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	105.59 – 2.15 20.00 – 2.15	Depositor EDS
% Data completeness (in resolution range)	99.8 (105.59-2.15) 100.0 (20.00-2.15)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.52 (at 2.15Å)	Xtrriage
Refinement program	REFMAC 5.8.0107	Depositor
R, R_{free}	0.211 , 0.248 0.217 , 0.248	Depositor DCC
R_{free} test set	2669 reflections (3.01%)	wwPDB-VP
Wilson B-factor (Å ²)	32.4	Xtrriage
Anisotropy	0.468	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 45.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11166	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 21.54 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.8673e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: BGC, EDO, 9PW, SO4

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	0.69	8/3589 (0.2%)	0.79	15/4854 (0.3%)
1	B	0.47	2/3583 (0.1%)	0.65	2/4845 (0.0%)
1	C	0.45	2/3607 (0.1%)	0.66	1/4877 (0.0%)
All	All	0.54	12/10779 (0.1%)	0.70	18/14576 (0.1%)

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	B	0	1

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	412	GLU	CB-CG	15.99	1.82	1.52
1	A	414	TYR	CB-CG	15.10	1.74	1.51
1	A	444[A]	VAL	CA-CB	10.81	1.77	1.54
1	A	444[B]	VAL	CA-CB	10.81	1.77	1.54
1	A	444[A]	VAL	CA-C	9.62	1.77	1.52
1	A	444[B]	VAL	CA-C	9.62	1.77	1.52
1	B	412	GLU	CB-CG	8.83	1.69	1.52
1	B	413	GLU	CB-CG	-7.36	1.38	1.52
1	C	458	LYS	CG-CD	5.27	1.70	1.52
1	C	412	GLU	CB-CG	5.12	1.61	1.52
1	A	444[A]	VAL	CB-CG1	5.09	1.63	1.52
1	A	444[B]	VAL	CB-CG1	5.09	1.63	1.52

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	444[A]	VAL	CB-CA-C	13.16	136.40	111.40
1	A	444[B]	VAL	CB-CA-C	13.16	136.40	111.40
1	A	444[A]	VAL	CA-CB-CG1	11.35	127.92	110.90
1	A	444[B]	VAL	CA-CB-CG1	11.35	127.92	110.90
1	A	412	GLU	CA-CB-CG	-8.29	95.16	113.40
1	A	414	TYR	CB-CG-CD2	-8.10	116.14	121.00
1	A	414	TYR	CB-CG-CD1	7.96	125.77	121.00
1	C	365	VAL	CG1-CB-CG2	6.77	121.73	110.90
1	A	444[A]	VAL	CG1-CB-CG2	-5.78	101.65	110.90
1	A	444[B]	VAL	CG1-CB-CG2	-5.78	101.65	110.90
1	A	444[A]	VAL	N-CA-C	-5.70	95.61	111.00
1	A	444[B]	VAL	N-CA-C	-5.70	95.61	111.00
1	B	413	GLU	CA-CB-CG	5.43	125.35	113.40
1	A	444[A]	VAL	N-CA-CB	-5.30	99.84	111.50
1	A	444[B]	VAL	N-CA-CB	-5.30	99.84	111.50
1	A	258	ARG	NE-CZ-NH1	5.15	122.87	120.30
1	B	222	ARG	NE-CZ-NH2	-5.12	117.74	120.30
1	A	414	TYR	CA-CB-CG	-5.00	103.90	113.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	313	GLU	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3487	0	3332	29	0
1	B	3484	0	3335	10	0
1	C	3502	0	3344	13	0
2	D	34	0	30	0	0
3	A	40	0	60	6	0
3	B	64	0	96	2	0
3	C	52	0	78	1	0
4	A	10	0	0	0	0
4	B	10	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	50	0	0	0	0
6	A	154	0	0	1	0
6	B	164	0	0	1	0
6	C	115	0	0	0	0
All	All	11166	0	10275	52	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 2.

All (52) 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:444[A]:VAL:CA	1:A:444[A]:VAL:CB	1.77	1.59
1:A:444[A]:VAL:CA	1:A:444[A]:VAL:HB	2.06	0.84
1:A:444[A]:VAL:CB	1:A:444[A]:VAL:HA	2.11	0.78
1:A:60:GLN:HA	3:A:606:EDO:H11	1.69	0.73
1:A:258:ARG:NH2	1:B:419:CYS:O	2.26	0.69
1:A:444[A]:VAL:CA	1:A:444[A]:VAL:CG2	2.72	0.65
1:B:490:LYS:HA	1:B:491:ASN:HB3	1.79	0.63
1:A:489:CYS:SG	1:A:490:LYS:N	2.72	0.62
1:A:444[B]:VAL:HG13	1:A:445:GLU:N	2.14	0.62
1:A:411:TYR:CZ	1:A:444[B]:VAL:HG11	2.34	0.62
1:A:82:ALA:HB3	3:A:606:EDO:H12	1.83	0.61
1:C:433:THR:OG1	1:C:435[A]:GLU:HG2	2.00	0.60
1:A:444[A]:VAL:CA	1:A:445:GLU:N	2.64	0.57
1:A:174:GLY:HA2	3:A:607:EDO:C1	2.35	0.57
1:A:282:ARG:HA	1:A:283:PRO:C	2.26	0.56
1:A:174:GLY:HA2	3:A:607:EDO:H11	1.90	0.54
1:A:481:GLN:HB3	1:A:482:PRO:CD	2.38	0.54
3:A:606:EDO:H22	6:A:732:HOH:O	2.08	0.53
1:C:489:CYS:O	1:C:490:LYS:HB2	2.08	0.53
1:A:444[B]:VAL:CG1	1:A:445:GLU:N	2.71	0.53
1:C:489:CYS:SG	1:C:490:LYS:N	2.83	0.52
1:A:493:PHE:CG	1:A:494:ASP:N	2.78	0.51
1:B:258:ARG:NH1	4:B:618:SO4:O2	2.45	0.49
1:A:82:ALA:CB	3:A:606:EDO:H12	2.43	0.49
1:C:490:LYS:HD3	1:C:491:ASN:N	2.28	0.48
1:A:282:ARG:HG2	1:A:283:PRO:HA	1.95	0.47
1:C:418:LEU:HD12	1:C:448:LEU:HD22	1.96	0.47
1:A:191:LYS:HD2	1:A:228:TYR:CE2	2.50	0.47
1:A:444[A]:VAL:CB	1:A:444[A]:VAL:H	2.26	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:42:LYS:HE3	1:B:348:ILE:HD11	1.97	0.46
1:B:196:ASP:HA	3:B:607:EDO:H12	1.97	0.45
1:A:42:LYS:HE3	1:A:348:ILE:HD11	1.98	0.45
1:B:259:GLU:HG2	6:B:732:HOH:O	2.16	0.44
1:B:258:ARG:NH1	4:B:618:SO4:S	2.91	0.44
1:A:246:TRP:CG	1:A:288:GLU:HB3	2.53	0.44
1:A:481:GLN:HB3	1:A:482:PRO:HD2	1.99	0.43
1:C:149:VAL:O	1:C:153:GLU:HG2	2.18	0.43
1:C:252:TYR:CE2	1:C:258:ARG:HG3	2.54	0.43
1:C:329:ILE:HG23	1:C:333:PHE:HB3	2.00	0.43
1:A:348:ILE:HD12	1:A:353:TYR:HB2	2.01	0.43
1:C:418:LEU:HD12	1:C:448:LEU:CD2	2.49	0.43
1:C:105:ARG:HB2	1:C:305:LEU:HD22	2.01	0.42
1:C:430:ASN:HB3	1:C:435[A]:GLU:HG3	2.02	0.42
1:B:239:TYR:O	1:B:271:VAL:HA	2.20	0.42
1:B:246:TRP:CG	1:B:288:GLU:HB3	2.55	0.42
1:C:220:MET:O	3:C:615:EDO:H22	2.20	0.41
1:C:469:ASN:N	1:C:469:ASN:HD22	2.18	0.41
1:A:105:ARG:HB2	1:A:305:LEU:HD22	2.02	0.41
1:B:384:THR:HG21	3:B:607:EDO:H22	2.03	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	430/555 (78%)	415 (96%)	14 (3%)	1 (0%)	47 46
1	B	429/555 (77%)	416 (97%)	12 (3%)	1 (0%)	47 46
1	C	432/555 (78%)	417 (96%)	12 (3%)	3 (1%)	22 15
All	All	1291/1665 (78%)	1248 (97%)	38 (3%)	5 (0%)	34 29

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	462	ASN
1	C	490	LYS
1	C	491	ASN
1	A	493	PHE
1	B	491	ASN

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	388/485 (80%)	372 (96%)	16 (4%)	30	29
1	B	387/485 (80%)	374 (97%)	13 (3%)	37	35
1	C	390/485 (80%)	376 (96%)	14 (4%)	35	33
All	All	1165/1455 (80%)	1122 (96%)	43 (4%)	34	32

All (43) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	THR
1	A	99	LEU
1	A	135	GLU
1	A	168	LEU
1	A	282	ARG
1	A	323	ASP
1	A	365	VAL
1	A	401	ILE
1	A	402	VAL
1	A	413	GLU
1	A	448	LEU
1	A	469	ASN
1	A	471	LYS
1	A	491	ASN
1	A	493	PHE
1	A	494	ASP

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Mol	Chain	Res	Type
1	B	99	LEU
1	B	135	GLU
1	B	168	LEU
1	B	342	LYS
1	B	380	LYS
1	B	383	GLU
1	B	401	ILE
1	B	438	GLU
1	B	448	LEU
1	B	469	ASN
1	B	471	LYS
1	B	489	CYS
1	B	490	LYS
1	C	135	GLU
1	C	168	LEU
1	C	282	ARG
1	C	296	LYS
1	C	364	SER
1	C	401	ILE
1	C	402	VAL
1	C	404	PHE
1	C	438	GLU
1	C	448	LEU
1	C	469	ASN
1	C	471	LYS
1	C	489	CYS
1	C	490	LYS

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	150	HIS
1	A	491	ASN
1	B	469	ASN
1	C	469	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](#)

3 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	BGC	D	1	2	12,12,12	0.55	0	17,17,17	0.67	0
2	BGC	D	2	2	11,11,12	0.31	0	15,15,17	1.08	1 (6%)
2	BGC	D	3	2	11,11,12	0.36	0	15,15,17	1.26	3 (20%)

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	BGC	D	1	2	-	0/2/22/22	0/1/1/1
2	BGC	D	2	2	-	0/2/19/22	0/1/1/1
2	BGC	D	3	2	-	2/2/19/22	0/1/1/1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	3	BGC	O5-C5-C6	3.07	112.02	107.20
2	D	2	BGC	O5-C5-C6	2.13	110.55	107.20
2	D	3	BGC	C1-C2-C3	2.12	112.27	109.67
2	D	3	BGC	C1-O5-C5	2.12	115.06	112.19

There are no chirality outliers.

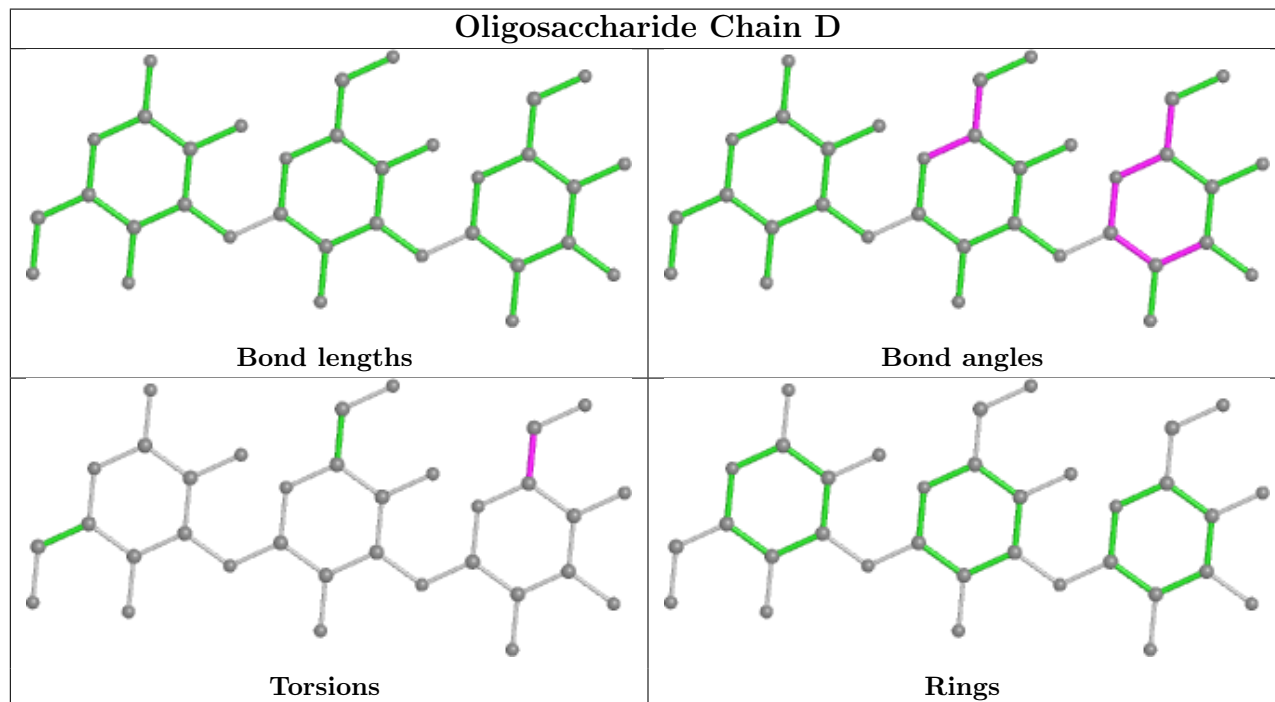
All (2) torsion outliers are listed below:

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

There are no ring outliers.

No monomer is involved in short contacts.

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



5.6 Ligand geometry [i](#)

44 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	$\# Z > 2$
4	SO4	A	611	-	4,4,4	0.38	0	6,6,6	0.15	0
3	EDO	B	604	-	3,3,3	0.41	0	2,2,2	0.36	0
3	EDO	B	606	-	3,3,3	0.45	0	2,2,2	0.27	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	EDO	A	601	-	3,3,3	0.47	0	2,2,2	0.28	0
3	EDO	B	601	-	3,3,3	0.47	0	2,2,2	0.54	0
3	EDO	B	607	-	3,3,3	0.42	0	2,2,2	0.53	0
5	9PW	C	604	-	51,54,54	2.68	8 (15%)	66,78,78	0.95	3 (4%)
3	EDO	B	603	-	3,3,3	0.49	0	2,2,2	0.24	0
3	EDO	C	609	-	3,3,3	0.44	0	2,2,2	0.31	0
3	EDO	C	614	-	3,3,3	0.40	0	2,2,2	0.42	0
3	EDO	C	611	-	3,3,3	0.28	0	2,2,2	0.65	0
3	EDO	B	611	-	3,3,3	0.50	0	2,2,2	0.23	0
3	EDO	A	605	-	3,3,3	0.44	0	2,2,2	0.36	0
3	EDO	A	607	-	3,3,3	0.20	0	2,2,2	0.24	0
4	SO4	B	617	-	4,4,4	0.35	0	6,6,6	0.13	0
3	EDO	A	606	-	3,3,3	0.42	0	2,2,2	0.45	0
3	EDO	A	609	-	3,3,3	0.86	0	2,2,2	0.49	0
3	EDO	B	616	-	3,3,3	0.45	0	2,2,2	0.33	0
3	EDO	C	610	-	3,3,3	0.42	0	2,2,2	0.35	0
3	EDO	C	608	-	3,3,3	0.53	0	2,2,2	0.15	0
3	EDO	B	608	-	3,3,3	0.38	0	2,2,2	0.27	0
3	EDO	C	613	-	3,3,3	0.45	0	2,2,2	0.34	0
3	EDO	B	612	-	3,3,3	0.48	0	2,2,2	0.13	0
3	EDO	A	604	-	3,3,3	0.57	0	2,2,2	0.37	0
4	SO4	B	618	-	4,4,4	0.30	0	6,6,6	0.18	0
3	EDO	A	602	-	3,3,3	0.56	0	2,2,2	0.08	0
4	SO4	A	612	-	4,4,4	0.34	0	6,6,6	0.16	0
3	EDO	C	616	-	3,3,3	0.43	0	2,2,2	0.25	0
3	EDO	C	615	-	3,3,3	0.44	0	2,2,2	0.54	0
3	EDO	B	615	-	3,3,3	0.45	0	2,2,2	0.31	0
3	EDO	B	610	-	3,3,3	0.48	0	2,2,2	0.23	0
3	EDO	B	613	-	3,3,3	0.50	0	2,2,2	0.21	0
3	EDO	C	612	-	3,3,3	0.60	0	2,2,2	0.11	0
3	EDO	C	605	-	3,3,3	0.52	0	2,2,2	0.15	0
3	EDO	B	605	-	3,3,3	0.54	0	2,2,2	0.04	0
3	EDO	C	607	-	3,3,3	0.46	0	2,2,2	0.25	0
3	EDO	B	602	-	3,3,3	0.44	0	2,2,2	0.34	0
3	EDO	B	609	-	3,3,3	0.39	0	2,2,2	0.45	0
3	EDO	A	610	-	3,3,3	0.44	0	2,2,2	0.41	0
3	EDO	C	606	-	3,3,3	0.49	0	2,2,2	0.22	0
3	EDO	B	614	-	3,3,3	0.50	0	2,2,2	0.28	0
3	EDO	A	608	-	3,3,3	0.47	0	2,2,2	0.34	0
3	EDO	C	617	-	3,3,3	0.50	0	2,2,2	0.27	0
3	EDO	A	603	-	3,3,3	0.59	0	2,2,2	0.14	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	B	604	-	-	1/1/1/1	-
3	EDO	B	606	-	-	1/1/1/1	-
3	EDO	A	601	-	-	1/1/1/1	-
3	EDO	B	601	-	-	1/1/1/1	-
3	EDO	B	607	-	-	1/1/1/1	-
5	9PW	C	604	-	-	5/20/88/88	0/5/5/5
3	EDO	B	603	-	-	0/1/1/1	-
3	EDO	C	609	-	-	0/1/1/1	-
3	EDO	C	614	-	-	1/1/1/1	-
3	EDO	C	611	-	-	1/1/1/1	-
3	EDO	B	611	-	-	1/1/1/1	-
3	EDO	A	605	-	-	0/1/1/1	-
3	EDO	A	607	-	-	0/1/1/1	-
3	EDO	A	606	-	-	1/1/1/1	-
3	EDO	A	609	-	-	0/1/1/1	-
3	EDO	B	616	-	-	0/1/1/1	-
3	EDO	C	610	-	-	1/1/1/1	-
3	EDO	C	608	-	-	1/1/1/1	-
3	EDO	B	608	-	-	1/1/1/1	-
3	EDO	C	613	-	-	1/1/1/1	-
3	EDO	B	612	-	-	1/1/1/1	-
3	EDO	A	604	-	-	1/1/1/1	-
3	EDO	A	602	-	-	1/1/1/1	-
3	EDO	C	616	-	-	0/1/1/1	-
3	EDO	C	615	-	-	1/1/1/1	-
3	EDO	B	615	-	-	0/1/1/1	-
3	EDO	B	610	-	-	1/1/1/1	-
3	EDO	B	613	-	-	1/1/1/1	-
3	EDO	C	612	-	-	1/1/1/1	-
3	EDO	C	605	-	-	1/1/1/1	-
3	EDO	B	605	-	-	1/1/1/1	-
3	EDO	C	607	-	-	1/1/1/1	-
3	EDO	B	602	-	-	1/1/1/1	-
3	EDO	B	609	-	-	0/1/1/1	-
3	EDO	A	610	-	-	0/1/1/1	-
3	EDO	C	606	-	-	1/1/1/1	-
3	EDO	B	614	-	-	1/1/1/1	-
3	EDO	A	608	-	-	1/1/1/1	-
3	EDO	C	617	-	-	0/1/1/1	-
3	EDO	A	603	-	-	1/1/1/1	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	604	9PW	OBW-NBV	15.62	1.49	1.22
5	C	604	9PW	CBN-CBR	-5.33	1.38	1.50
5	C	604	9PW	CBU-NBV	-4.60	1.34	1.45
5	C	604	9PW	NBK-NBJ	-4.60	1.26	1.34
5	C	604	9PW	NBJ-NBI	-3.72	1.28	1.34
5	C	604	9PW	OAY-CAG	2.47	1.45	1.42
5	C	604	9PW	CBH-NBI	-2.20	1.33	1.35
5	C	604	9PW	CBH-CBL	-2.07	1.33	1.36

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	604	9PW	CBT-CBU-NBV	2.56	121.30	119.38
5	C	604	9PW	CAM-O3-C3	-2.43	111.95	117.96
5	C	604	9PW	CAI-OAY-CAG	2.36	112.84	108.81

There are no chirality outliers.

All (33) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	604	9PW	CBP-CBU-NBV-OBW
5	C	604	9PW	CBT-CBU-NBV-OBW
3	A	601	EDO	O1-C1-C2-O2
3	A	602	EDO	O1-C1-C2-O2
3	A	603	EDO	O1-C1-C2-O2
3	B	601	EDO	O1-C1-C2-O2
3	B	604	EDO	O1-C1-C2-O2
3	B	605	EDO	O1-C1-C2-O2
3	B	608	EDO	O1-C1-C2-O2
3	B	612	EDO	O1-C1-C2-O2
3	B	614	EDO	O1-C1-C2-O2
3	C	608	EDO	O1-C1-C2-O2
3	C	611	EDO	O1-C1-C2-O2
3	C	613	EDO	O1-C1-C2-O2
3	C	614	EDO	O1-C1-C2-O2
3	A	606	EDO	O1-C1-C2-O2
3	B	602	EDO	O1-C1-C2-O2
3	B	611	EDO	O1-C1-C2-O2
3	B	613	EDO	O1-C1-C2-O2
3	C	615	EDO	O1-C1-C2-O2
3	A	604	EDO	O1-C1-C2-O2

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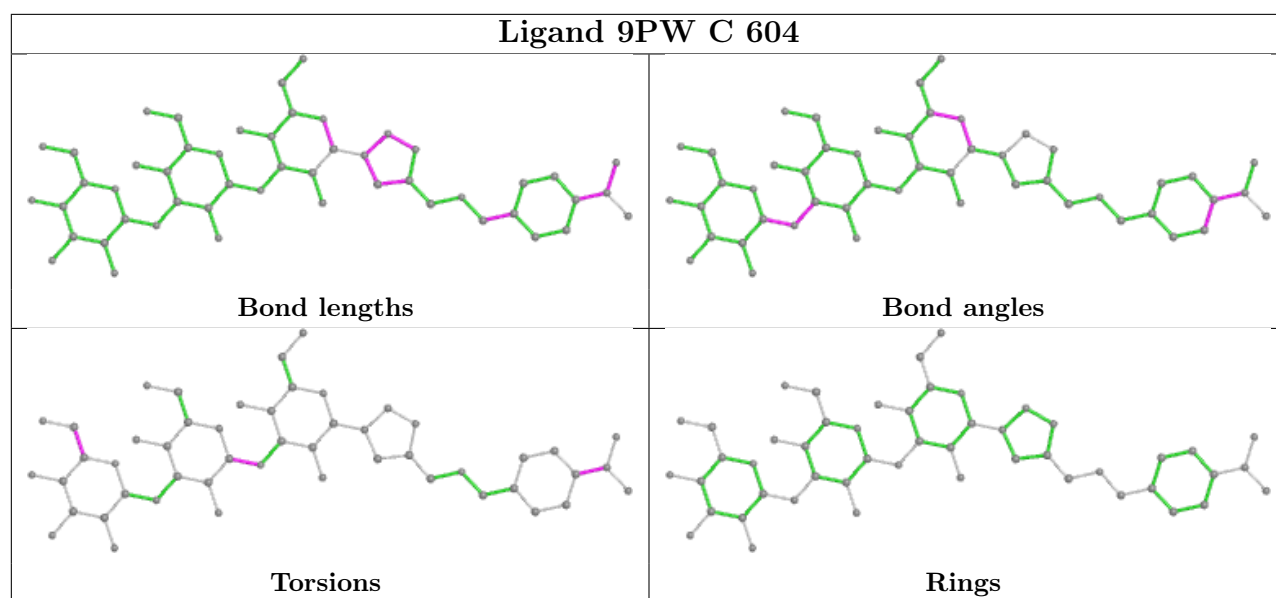
Mol	Chain	Res	Type	Atoms
3	B	606	EDO	O1-C1-C2-O2
3	B	607	EDO	O1-C1-C2-O2
3	B	610	EDO	O1-C1-C2-O2
3	C	605	EDO	O1-C1-C2-O2
3	C	612	EDO	O1-C1-C2-O2
3	C	610	EDO	O1-C1-C2-O2
5	C	604	9PW	OBD-CAO-CAP-OBG
3	C	606	EDO	O1-C1-C2-O2
5	C	604	9PW	O5-C1-O1-CAL
5	C	604	9PW	C2-C1-O1-CAL
3	A	608	EDO	O1-C1-C2-O2
3	C	607	EDO	O1-C1-C2-O2

There are no ring outliers.

5 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	607	EDO	2	0
3	A	607	EDO	2	0
3	A	606	EDO	4	0
4	B	618	SO4	2	0
3	C	615	EDO	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	434/555 (78%)	0.43	34 (7%) 13 18	22, 34, 63, 77	5 (1%)
1	B	434/555 (78%)	0.34	28 (6%) 18 25	22, 33, 55, 84	4 (0%)
1	C	435/555 (78%)	0.52	40 (9%) 9 13	23, 40, 64, 84	5 (1%)
All	All	1303/1665 (78%)	0.43	102 (7%) 13 18	22, 35, 62, 84	14 (1%)

All (102) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	489	CYS	10.3
1	A	489	CYS	9.6
1	B	493	PHE	8.6
1	A	364	SER	8.4
1	C	460	GLY	7.3
1	B	64	SER	6.9
1	A	460	GLY	6.6
1	B	77	THR	6.5
1	C	407	GLU	6.5
1	A	491	ASN	6.0
1	B	63	ARG	5.8
1	A	77	THR	5.8
1	C	363	GLU	5.6
1	B	313	GLU	5.5
1	A	203	HIS	5.3
1	B	78	SER	5.2
1	C	324	ASN	5.1
1	C	62	GLN	4.9
1	A	462	ASN	4.9
1	A	465	HIS	4.8
1	C	205	ASN	4.7
1	A	78	SER	4.4
1	A	492	VAL	4.4

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Mol	Chain	Res	Type	RSRZ
1	C	323	ASP	4.3
1	B	323	ASP	4.1
1	A	205	ASN	4.0
1	C	461	ALA	4.0
1	A	225	LEU	3.9
1	B	203	HIS	3.9
1	B	205	ASN	3.9
1	A	369	HIS	3.9
1	C	465	HIS	3.9
1	B	62	GLN	3.8
1	B	462	ASN	3.7
1	B	366	GLU	3.7
1	C	404	PHE	3.7
1	C	463	ASP	3.6
1	A	444[A]	VAL	3.6
1	A	62	GLN	3.4
1	C	462	ASN	3.3
1	A	490	LYS	3.3
1	C	344	ASP	3.3
1	C	249	TYR	3.2
1	B	404	PHE	3.1
1	A	83	LEU	3.1
1	A	365	VAL	3.1
1	A	323	ASP	3.1
1	C	313	GLU	3.1
1	B	460	GLY	3.0
1	B	482	PRO	3.0
1	B	489	CYS	3.0
1	C	408	SER	3.0
1	C	78	SER	2.8
1	C	47	GLU	2.8
1	B	490	LYS	2.8
1	C	482	PRO	2.8
1	A	461	ALA	2.7
1	A	31[A]	GLU	2.7
1	C	491	ASN	2.7
1	C	354	LEU	2.7
1	A	313	GLU	2.6
1	B	365	VAL	2.6
1	A	493	PHE	2.6
1	C	369	HIS	2.6
1	C	31[A]	GLU	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	47	GLU	2.6
1	C	493	PHE	2.5
1	A	482	PRO	2.5
1	B	387	ARG	2.5
1	A	416	SER	2.5
1	B	292	LEU	2.4
1	A	404	PHE	2.4
1	A	354	LEU	2.4
1	A	314	ASN	2.4
1	B	344	ASP	2.4
1	C	401	ILE	2.4
1	B	492	VAL	2.4
1	A	190	VAL	2.3
1	C	387	ARG	2.3
1	C	459	ILE	2.3
1	C	29	SER	2.3
1	B	334	LYS	2.3
1	C	282	ARG	2.3
1	A	229	PHE	2.3
1	A	47	GLU	2.2
1	C	203	HIS	2.2
1	C	258	ARG	2.2
1	A	220	MET	2.2
1	B	228	TYR	2.2
1	C	280	LEU	2.2
1	C	364	SER	2.1
1	C	206	HIS	2.1
1	C	341	ALA	2.1
1	C	133	LEU	2.1
1	B	341	ALA	2.1
1	A	344	ASP	2.0
1	C	314	ASN	2.0
1	C	295	ASN	2.0
1	B	399	CYS	2.0
1	B	318	VAL	2.0
1	A	227	ARG	2.0
1	C	492	VAL	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

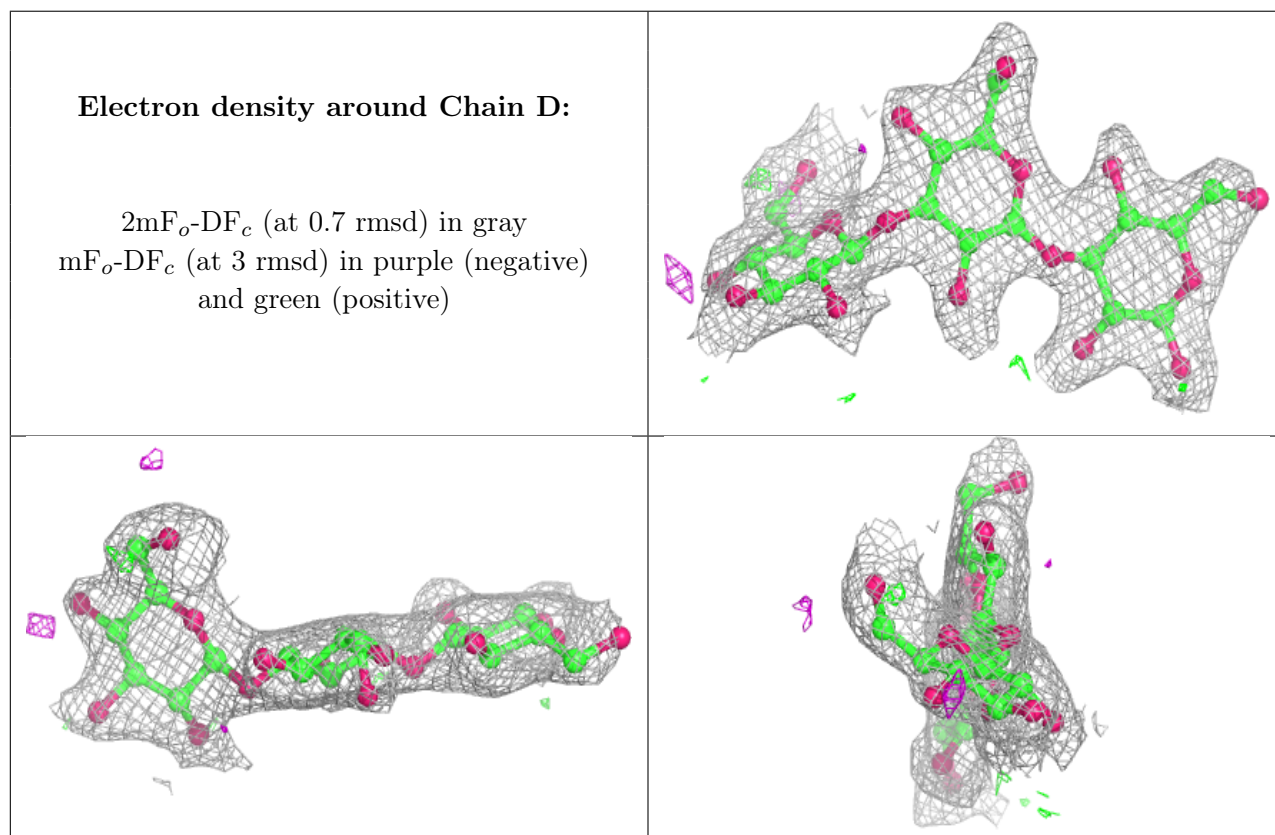
There are no non-standard protein/DNA/RNA residues in this entry.

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
2	BGC	D	1	12/12	0.82	0.22	50,52,53,54	0
2	BGC	D	3	11/12	0.84	0.18	43,44,45,45	0
2	BGC	D	2	11/12	0.90	0.20	45,46,48,48	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.

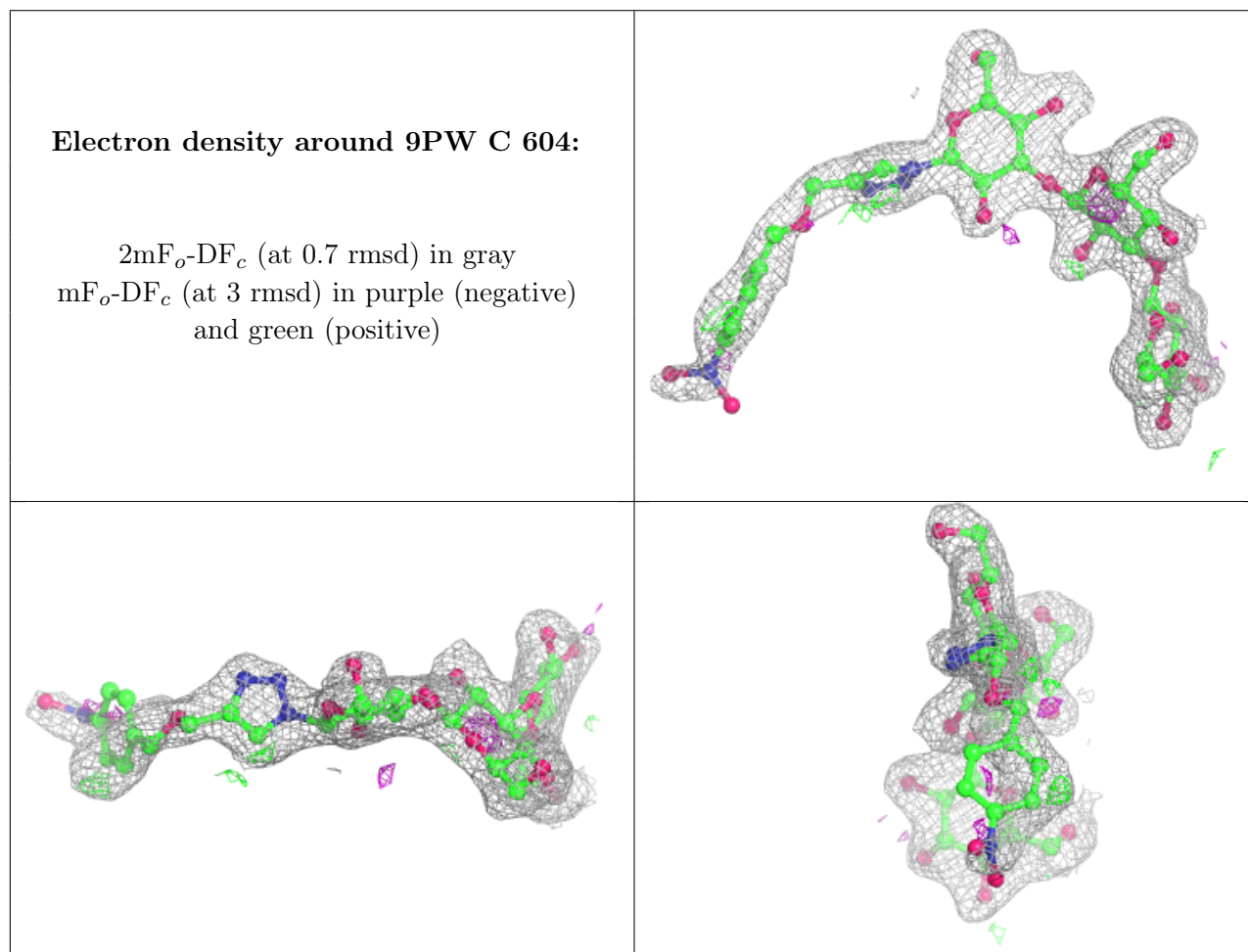
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	EDO	B	605	4/4	0.51	0.34	48,50,50,53	0
3	EDO	C	608	4/4	0.51	0.26	61,61,61,62	0
3	EDO	B	614	4/4	0.58	0.23	63,63,64,65	0
3	EDO	A	609	4/4	0.58	0.35	38,39,39,40	0
3	EDO	B	616	4/4	0.66	0.39	64,66,66,68	0
3	EDO	C	612	4/4	0.66	0.25	45,46,47,47	0
3	EDO	A	605	4/4	0.68	0.28	68,68,68,69	0
3	EDO	B	603	4/4	0.69	0.29	68,70,70,70	0
3	EDO	A	601	4/4	0.71	0.23	76,77,77,77	0
3	EDO	C	617	4/4	0.71	0.18	58,59,60,60	0
3	EDO	A	602	4/4	0.72	0.22	52,53,54,55	0
3	EDO	C	613	4/4	0.73	0.23	62,63,63,63	0
3	EDO	B	615	4/4	0.76	0.14	63,64,64,65	0
3	EDO	B	602	4/4	0.77	0.17	60,61,62,63	0
3	EDO	C	606	4/4	0.77	0.25	57,58,59,59	0
3	EDO	A	604	4/4	0.78	0.28	42,42,43,44	0
3	EDO	B	610	4/4	0.78	0.29	60,60,61,61	0
5	9PW	C	604	50/50	0.79	0.24	35,48,68,69	0
3	EDO	C	609	4/4	0.80	0.27	54,54,54,54	0
3	EDO	B	608	4/4	0.81	0.24	42,43,43,43	0
3	EDO	A	608	4/4	0.82	0.37	44,45,45,45	0
3	EDO	B	613	4/4	0.82	0.18	41,44,44,45	0
3	EDO	A	603	4/4	0.82	0.14	43,46,46,46	0
3	EDO	C	607	4/4	0.84	0.28	52,53,53,54	0
3	EDO	C	610	4/4	0.84	0.47	52,53,54,55	0
3	EDO	C	614	4/4	0.85	0.24	53,53,54,54	0
3	EDO	B	611	4/4	0.85	0.17	60,61,62,62	0
3	EDO	B	604	4/4	0.85	0.46	52,53,54,54	0
3	EDO	C	615	4/4	0.86	0.35	44,44,44,45	0
3	EDO	A	610	4/4	0.86	0.23	62,62,62,63	0
3	EDO	B	612	4/4	0.86	0.18	50,50,51,52	0
3	EDO	B	609	4/4	0.87	0.22	59,60,60,60	0
3	EDO	B	607	4/4	0.88	0.31	41,42,42,42	0
3	EDO	C	605	4/4	0.89	0.31	44,45,46,47	0
3	EDO	C	616	4/4	0.89	0.13	59,59,60,60	0
3	EDO	A	607	4/4	0.89	0.22	31,33,33,33	0
3	EDO	A	606	4/4	0.89	0.24	33,35,35,36	0
3	EDO	B	601	4/4	0.90	0.30	46,46,47,49	0
4	SO4	A	611	5/5	0.93	0.23	57,59,61,61	0
3	EDO	B	606	4/4	0.93	0.14	55,55,56,57	0
4	SO4	A	612	5/5	0.94	0.28	67,69,70,70	0
4	SO4	B	618	5/5	0.96	0.19	61,61,61,62	0
3	EDO	C	611	4/4	0.96	0.19	36,37,37,37	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	SO4	B	617	5/5	0.97	0.20	57,59,61,61	0

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



6.5 Other polymers [i](#)

There are no such residues in this entry.