



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2024 – 06:05 PM EDT

PDB ID : 1GAL
Title : CRYSTAL STRUCTURE OF GLUCOSE OXIDASE FROM ASPERGILLUS NIGER: REFINED AT 2.3 ANGSTROMS RESOLUTION
Authors : Hecht, H.J.; Kalisz, K.; Hendle, J.; Schmid, R.D.; Schomburg, D.
Deposited on : 1992-08-27
Resolution : 2.30 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 : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 1.20.1
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

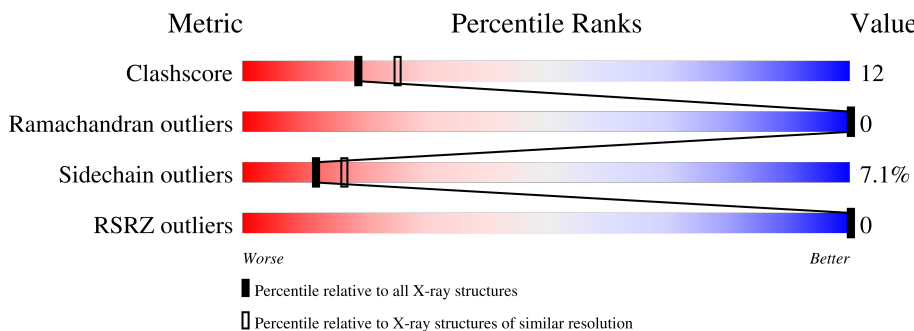
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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))
Clashscore	180529	6698 (2.30-2.30)
Ramachandran outliers	177936	6640 (2.30-2.30)
Sidechain outliers	177891	6640 (2.30-2.30)
RSRZ outliers	164620	5963 (2.30-2.30)

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	583	
2	B	5	

2 Entry composition [i](#)

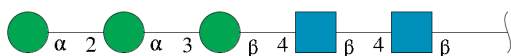
There are 5 unique types of molecules in this entry. The entry contains 4774 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 GLUCOSE OXIDASE.

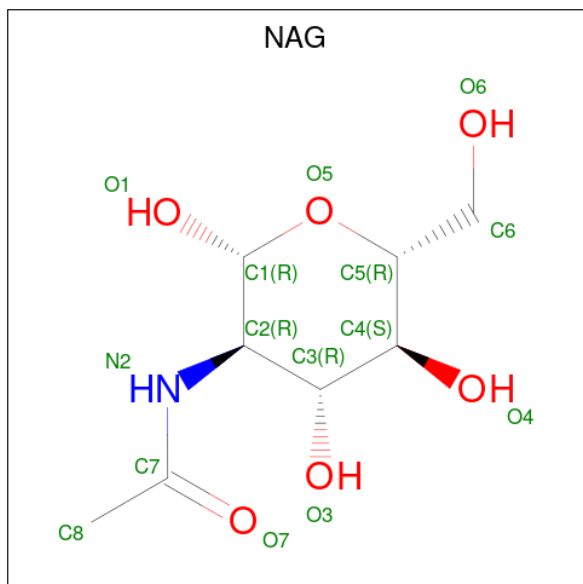
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	581	4452	2801	764	873	14	0	0	0

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



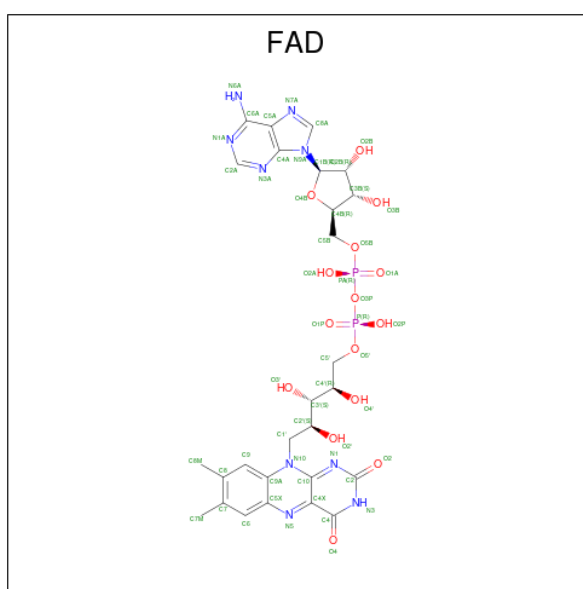
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	5	61	34	2	25	0	0	0

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

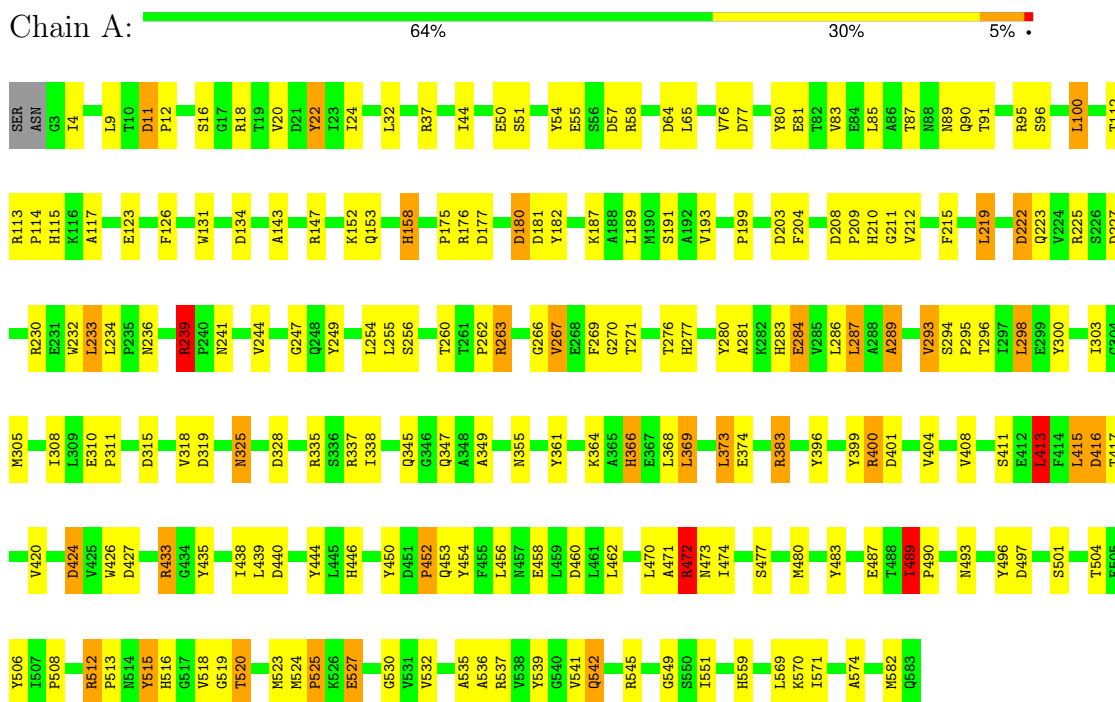
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	152	Total	O	0	0
			152	152		

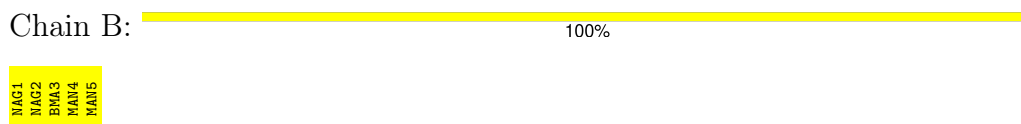
3 Residue-property plots [i](#)

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: GLUCOSE OXIDASE



- Molecule 2: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



4 Data and refinement statistics i

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	66.50Å 66.50Å 214.50Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	10.00 – 2.30 10.00 – 2.31	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-2.30) 83.7 (10.00-2.31)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.61 (at 2.30Å)	Xtrriage
Refinement program	PROLSQ, X-PLOR	Depositor
R, R_{free}	0.181 , (Not available) 0.163 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	20.9	Xtrriage
Anisotropy	0.209	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 43.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.044 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4774	wwPDB-VP
Average B, all atoms (Å ²)	14.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.30% 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 i

5.1 Standard geometry i

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

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	0.83	0/4560	1.95	103/6219 (1.7%)

There are no bond length outliers.

All (103) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	545	ARG	NE-CZ-NH2	-25.90	107.35	120.30
1	A	545	ARG	NE-CZ-NH1	24.57	132.59	120.30
1	A	512	ARG	NE-CZ-NH1	21.22	130.91	120.30
1	A	95	ARG	NE-CZ-NH1	20.86	130.73	120.30
1	A	472	ARG	NE-CZ-NH1	17.48	129.04	120.30
1	A	383	ARG	NE-CZ-NH1	14.86	127.73	120.30
1	A	95	ARG	NE-CZ-NH2	-14.06	113.27	120.30
1	A	230	ARG	NE-CZ-NH1	13.82	127.21	120.30
1	A	433	ARG	NE-CZ-NH2	-13.26	113.67	120.30
1	A	433	ARG	NE-CZ-NH1	13.22	126.91	120.30
1	A	400	ARG	NE-CZ-NH2	-12.49	114.06	120.30
1	A	328	ASP	CB-CG-OD1	12.34	129.40	118.30
1	A	239	ARG	NE-CZ-NH1	11.80	126.20	120.30
1	A	337	ARG	NE-CZ-NH2	-11.40	114.60	120.30
1	A	18	ARG	NE-CZ-NH1	11.11	125.85	120.30
1	A	400	ARG	NE-CZ-NH1	10.98	125.79	120.30
1	A	147	ARG	NE-CZ-NH2	-10.76	114.92	120.30
1	A	208	ASP	CB-CG-OD1	10.61	127.85	118.30
1	A	176	ARG	NE-CZ-NH2	-10.13	115.24	120.30
1	A	239	ARG	NE-CZ-NH2	-9.81	115.39	120.30
1	A	512	ARG	NE-CZ-NH2	-9.47	115.57	120.30
1	A	433	ARG	CD-NE-CZ	9.40	136.76	123.60
1	A	203	ASP	CB-CG-OD1	8.95	126.35	118.30
1	A	58	ARG	NE-CZ-NH2	-8.78	115.91	120.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	416	ASP	CB-CG-OD2	-8.25	110.88	118.30
1	A	383	ARG	NE-CZ-NH2	-8.14	116.23	120.30
1	A	18	ARG	CD-NE-CZ	8.14	134.99	123.60
1	A	435	TYR	CB-CG-CD2	-8.08	116.15	121.00
1	A	515	TYR	CB-CG-CD1	-7.87	116.28	121.00
1	A	230	ARG	NE-CZ-NH2	-7.80	116.40	120.30
1	A	22	TYR	CB-CG-CD1	7.56	125.53	121.00
1	A	225	ARG	NE-CZ-NH1	7.46	124.03	120.30
1	A	191	SER	N-CA-CB	7.39	121.58	110.50
1	A	512	ARG	CD-NE-CZ	7.36	133.90	123.60
1	A	374	GLU	CG-CD-OE1	-7.31	103.69	118.30
1	A	539	TYR	CB-CG-CD2	-7.21	116.67	121.00
1	A	181	ASP	CB-CG-OD2	-7.18	111.83	118.30
1	A	263	ARG	NE-CZ-NH1	6.95	123.78	120.30
1	A	80	TYR	CB-CG-CD1	-6.91	116.85	121.00
1	A	542	GLN	CA-CB-CG	6.90	128.57	113.40
1	A	374	GLU	OE1-CD-OE2	6.87	131.54	123.30
1	A	472	ARG	NE-CZ-NH2	-6.82	116.89	120.30
1	A	208	ASP	N-CA-CB	6.72	122.69	110.60
1	A	65	LEU	CA-CB-CG	6.61	130.50	115.30
1	A	337	ARG	NH1-CZ-NH2	6.59	126.65	119.40
1	A	493	ASN	CA-CB-CG	6.57	127.86	113.40
1	A	219	LEU	CA-CB-CG	6.40	130.02	115.30
1	A	180	ASP	CB-CA-C	6.40	123.19	110.40
1	A	319	ASP	CB-CG-OD1	6.29	123.96	118.30
1	A	366	HIS	CA-CB-CG	-6.20	103.05	113.60
1	A	399	TYR	CB-CG-CD2	-6.17	117.30	121.00
1	A	54	TYR	CB-CG-CD2	-6.14	117.32	121.00
1	A	537	ARG	NE-CZ-NH1	6.11	123.36	120.30
1	A	551	ILE	N-CA-C	6.08	127.42	111.00
1	A	460	ASP	CB-CG-OD2	-6.03	112.88	118.30
1	A	444	TYR	CB-CG-CD2	-5.86	117.48	121.00
1	A	369	LEU	CA-CB-CG	5.82	128.68	115.30
1	A	191	SER	CB-CA-C	-5.80	99.07	110.10
1	A	77	ASP	CB-CG-OD2	5.77	123.50	118.30
1	A	497	ASP	CB-CG-OD1	5.76	123.48	118.30
1	A	222	ASP	CB-CG-OD1	5.75	123.48	118.30
1	A	284	GLU	CA-CB-CG	5.75	126.05	113.40
1	A	58	ARG	NE-CZ-NH1	5.66	123.13	120.30
1	A	452	PRO	N-CD-CG	-5.59	94.81	103.20
1	A	519	GLY	N-CA-C	5.58	127.06	113.10
1	A	177	ASP	CB-CG-OD1	5.57	123.31	118.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	361	TYR	CB-CG-CD2	-5.47	117.72	121.00
1	A	239	ARG	CD-NE-CZ	5.47	131.25	123.60
1	A	134	ASP	CB-CG-OD1	5.46	123.22	118.30
1	A	267	VAL	N-CA-CB	-5.44	99.53	111.50
1	A	180	ASP	N-CA-CB	-5.38	100.91	110.60
1	A	512	ARG	NH1-CZ-NH2	-5.36	113.51	119.40
1	A	525	PRO	N-CD-CG	-5.33	95.21	103.20
1	A	446	HIS	O-C-N	5.32	131.21	122.70
1	A	234	LEU	CB-CA-C	5.30	120.27	110.20
1	A	411	SER	CB-CA-C	-5.29	100.05	110.10
1	A	446	HIS	CA-CB-CG	-5.29	104.61	113.60
1	A	227	ASP	CB-CG-OD2	5.28	123.06	118.30
1	A	11	ASP	CB-CG-OD2	-5.27	113.56	118.30
1	A	57	ASP	CB-CG-OD1	5.27	123.04	118.30
1	A	559	HIS	CA-CB-CG	-5.26	104.66	113.60
1	A	267	VAL	CG1-CB-CG2	5.25	119.30	110.90
1	A	415	LEU	O-C-N	5.22	131.05	122.70
1	A	383	ARG	CA-C-N	5.18	126.57	116.20
1	A	520	THR	CA-CB-CG2	-5.18	105.14	112.40
1	A	289	ALA	N-CA-CB	-5.17	102.87	110.10
1	A	123	GLU	CG-CD-OE1	-5.16	107.99	118.30
1	A	123	GLU	OE1-CD-OE2	5.16	129.49	123.30
1	A	64	ASP	CB-CG-OD2	5.15	122.94	118.30
1	A	427	ASP	CB-CG-OD2	5.15	122.93	118.30
1	A	458	GLU	CG-CD-OE2	5.13	128.57	118.30
1	A	427	ASP	N-CA-C	-5.10	97.24	111.00
1	A	90	GLN	O-C-N	5.09	130.85	122.70
1	A	57	ASP	CB-CG-OD2	-5.09	113.72	118.30
1	A	315	ASP	CB-CG-OD2	-5.08	113.73	118.30
1	A	401	ASP	CB-CG-OD2	5.06	122.86	118.30
1	A	271	THR	CA-CB-OG1	-5.06	98.37	109.00
1	A	489	ILE	CG1-CB-CG2	-5.06	100.28	111.40
1	A	413	LEU	CA-CB-CG	5.04	126.88	115.30
1	A	208	ASP	O-C-N	5.03	130.65	121.10
1	A	18	ARG	NH1-CZ-NH2	-5.02	113.88	119.40
1	A	337	ARG	CD-NE-CZ	-5.01	116.59	123.60
1	A	400	ARG	CG-CD-NE	-5.00	101.29	111.80

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	4452	0	4239	104	0
2	B	61	0	52	0	0
3	A	56	0	52	0	0
4	A	53	0	31	2	0
5	A	152	0	0	7	0
All	All	4774	0	4374	104	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 12.

All (104) 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:383:ARG:NH1	5:A:838:HOH:O	1.84	1.09
1:A:325:ASN:ND2	1:A:433:ARG:HD2	1.91	0.85
1:A:115:HIS:HD2	1:A:117:ALA:H	1.24	0.84
1:A:4:ILE:HD11	1:A:233:LEU:HD13	1.65	0.79
1:A:22:TYR:CE2	1:A:284:GLU:HG2	2.18	0.78
1:A:22:TYR:HE2	1:A:284:GLU:HG2	1.49	0.77
1:A:283:HIS:HD2	1:A:582:MET:SD	2.09	0.76
1:A:400:ARG:O	1:A:404:VAL:HB	1.94	0.67
1:A:50:GLU:HG2	1:A:100:LEU:CD1	2.28	0.64
1:A:417:THR:HA	1:A:420:VAL:O	1.99	0.63
1:A:187:LYS:HD3	5:A:761:HOH:O	1.99	0.63
1:A:490:PRO:HB3	1:A:506:TYR:OH	1.98	0.63
1:A:296:THR:HB	1:A:438:ILE:HG22	1.81	0.61
1:A:81:GLU:HB2	1:A:91:THR:HG23	1.82	0.61
1:A:472:ARG:HD3	1:A:487:GLU:OE1	2.01	0.60
1:A:126:PHE:O	1:A:525:PRO:HD3	2.01	0.60
1:A:4:ILE:CD1	1:A:233:LEU:HD13	2.31	0.60
1:A:325:ASN:HD22	1:A:433:ARG:HD2	1.66	0.60
1:A:338:ILE:HA	1:A:483:TYR:O	2.03	0.59
1:A:152:LYS:HE2	1:A:182:TYR:CE1	2.39	0.58
1:A:472:ARG:NH1	1:A:487:GLU:OE2	2.37	0.57
1:A:477:SER:O	1:A:480:MET:HB2	2.05	0.57

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:523:MET:HA	1:A:532:VAL:HG23	1.87	0.56
1:A:383:ARG:NH2	5:A:839:HOH:O	2.37	0.56
1:A:355:ASN:OD1	1:A:366:HIS:HE1	1.89	0.56
1:A:189:LEU:HD11	1:A:474:ILE:HD12	1.88	0.56
1:A:143:ALA:HB2	1:A:569:LEU:HD11	1.89	0.55
1:A:383:ARG:HD3	1:A:456:LEU:HD13	1.89	0.55
1:A:16:SER:HB3	1:A:277:HIS:HB3	1.87	0.55
1:A:44:ILE:O	1:A:241:ASN:HB2	2.07	0.55
1:A:50:GLU:HG2	1:A:100:LEU:HD12	1.89	0.54
1:A:51:SER:O	1:A:247:GLY:HA2	2.07	0.54
1:A:153:GLN:O	1:A:158:HIS:HB2	2.08	0.54
1:A:152:LYS:HE2	1:A:182:TYR:CD1	2.44	0.54
1:A:289:ALA:HB1	1:A:293:VAL:HG22	1.89	0.54
1:A:364:LYS:HE3	1:A:462:LEU:HD13	1.90	0.53
1:A:269:PHE:O	1:A:276:THR:HA	2.08	0.53
1:A:193:VAL:HG21	1:A:212:VAL:HG23	1.91	0.53
1:A:115:HIS:CD2	1:A:117:ALA:H	2.16	0.53
1:A:284:GLU:HG3	1:A:286:LEU:HD21	1.90	0.53
1:A:158:HIS:CE1	1:A:175:PRO:HB3	2.45	0.52
1:A:236:ASN:O	1:A:239:ARG:HB2	2.10	0.52
1:A:50:GLU:OE1	4:A:600:FAD:H1B	2.10	0.52
1:A:325:ASN:ND2	1:A:433:ARG:CD	2.68	0.52
1:A:295:PRO:HG3	1:A:520:THR:HB	1.92	0.52
1:A:263:ARG:HG3	1:A:542:GLN:OE1	2.10	0.51
1:A:222:ASP:O	1:A:223:GLN:HB2	2.10	0.51
1:A:408:VAL:O	5:A:834:HOH:O	2.19	0.51
1:A:4:ILE:HD11	1:A:233:LEU:CD1	2.38	0.50
1:A:76:VAL:HG12	1:A:76:VAL:O	2.12	0.50
1:A:373:LEU:HG	1:A:396:TYR:HB3	1.94	0.50
1:A:212:VAL:HA	1:A:349:ALA:O	2.12	0.49
1:A:294:SER:N	1:A:295:PRO:HD2	2.28	0.49
1:A:501:SER:O	1:A:504:THR:HB	2.13	0.49
1:A:287:LEU:CD2	1:A:298:LEU:HD13	2.43	0.49
1:A:325:ASN:HD21	1:A:433:ARG:HD2	1.74	0.48
1:A:255:LEU:HD11	1:A:303:ILE:HD11	1.94	0.48
1:A:413:LEU:HD13	1:A:471:ALA:HB2	1.95	0.48
1:A:232:TRP:O	1:A:236:ASN:ND2	2.44	0.48
1:A:300:TYR:HE1	1:A:440:ASP:O	1.95	0.48
1:A:383:ARG:HD2	1:A:453:GLN:OE1	2.14	0.48
1:A:87:THR:OG1	1:A:508:PRO:HB3	2.14	0.47
1:A:490:PRO:HB3	1:A:506:TYR:CZ	2.49	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:472:ARG:HH11	1:A:487:GLU:CD	2.18	0.47
1:A:571:ILE:O	1:A:574:ALA:HB3	2.14	0.47
1:A:453:GLN:HB3	1:A:456:LEU:HD12	1.96	0.46
1:A:474:ILE:O	1:A:480:MET:HG3	2.15	0.46
1:A:347:GLN:HA	1:A:415:LEU:O	2.15	0.46
1:A:310:GLU:HB3	1:A:311:PRO:HD3	1.98	0.46
1:A:249:TYR:HB2	1:A:270:GLY:O	2.15	0.46
1:A:85:LEU:O	1:A:89:ASN:N	2.48	0.46
1:A:204:PHE:CD1	1:A:209:PRO:HA	2.51	0.46
1:A:55:GLU:OE2	5:A:854:HOH:O	2.21	0.45
1:A:112:THR:HB	1:A:204:PHE:HB3	1.98	0.45
1:A:489:ILE:HD11	5:A:766:HOH:O	2.15	0.45
1:A:489:ILE:HA	1:A:490:PRO:C	2.36	0.45
1:A:373:LEU:HB2	5:A:846:HOH:O	2.17	0.45
1:A:472:ARG:HD2	1:A:496:TYR:CE1	2.52	0.45
1:A:450:TYR:CE2	1:A:452:PRO:HG3	2.52	0.45
1:A:335:ARG:HB3	1:A:489:ILE:HG23	1.99	0.44
1:A:266:GLY:HA3	1:A:280:TYR:HA	1.98	0.44
1:A:269:PHE:CZ	1:A:277:HIS:HB2	2.53	0.44
1:A:11:ASP:HA	1:A:12:PRO:HD2	1.81	0.44
1:A:424:ASP:HB3	1:A:426:TRP:HZ3	1.82	0.44
1:A:518:VAL:HA	1:A:549:GLY:O	2.18	0.43
1:A:20:VAL:O	1:A:281:ALA:HA	2.18	0.43
1:A:24:ILE:HG12	1:A:286:LEU:HD12	1.99	0.43
1:A:369:LEU:O	1:A:373:LEU:HD13	2.19	0.43
1:A:81:GLU:HB2	1:A:91:THR:CG2	2.49	0.43
1:A:318:VAL:HG21	1:A:541:VAL:HG22	2.01	0.43
1:A:305:MET:CE	1:A:308:ILE:HD13	2.49	0.42
1:A:527:GLU:CD	1:A:527:GLU:H	2.23	0.42
1:A:182:TYR:HA	1:A:345:GLN:O	2.19	0.42
1:A:113:ARG:HB3	1:A:114:PRO:HD2	2.02	0.42
1:A:325:ASN:HD22	1:A:433:ARG:CD	2.29	0.41
1:A:256:SER:O	1:A:262:PRO:HA	2.21	0.41
1:A:535:ALA:O	1:A:536:ALA:HB3	2.21	0.41
1:A:131:TRP:CZ2	1:A:570:LYS:HD3	2.56	0.41
1:A:210:HIS:CD2	1:A:211:GLY:N	2.89	0.41
1:A:524:MET:O	1:A:530:GLY:HA3	2.21	0.41
1:A:454:TYR:OH	1:A:513:PRO:HB3	2.21	0.41
1:A:515:TYR:CD2	4:A:600:FAD:HM73	2.56	0.41
1:A:199:PRO:O	1:A:211:GLY:HA3	2.20	0.40
1:A:24:ILE:HA	1:A:286:LEU:O	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	579/583 (99%)	554 (96%)	25 (4%)	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	466/468 (100%)	433 (93%)	33 (7%)	12 17

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LEU
1	A	32	LEU
1	A	37	ARG
1	A	83	VAL
1	A	96	SER
1	A	100	LEU
1	A	158	HIS
1	A	180	ASP
1	A	215	PHE
1	A	219	LEU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	233	LEU
1	A	239	ARG
1	A	244	VAL
1	A	254	LEU
1	A	260	THR
1	A	267	VAL
1	A	287	LEU
1	A	293	VAL
1	A	298	LEU
1	A	325	ASN
1	A	368	LEU
1	A	373	LEU
1	A	413	LEU
1	A	416	ASP
1	A	424	ASP
1	A	439	LEU
1	A	470	LEU
1	A	472	ARG
1	A	473	ASN
1	A	489	ILE
1	A	512	ARG
1	A	516	HIS
1	A	527	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	115	HIS
1	A	158	HIS
1	A	275	ASN
1	A	278	ASN
1	A	283	HIS
1	A	325	ASN
1	A	476	ASN

5.3.3 RNA

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](#)

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
2	NAG	B	1	2,1	14,14,15	1.18	1 (7%)	17,19,21	0.86	0
2	NAG	B	2	2	14,14,15	1.06	1 (7%)	17,19,21	1.86	5 (29%)
2	BMA	B	3	2	11,11,12	0.75	0	15,15,17	2.15	5 (33%)
2	MAN	B	4	2	11,11,12	0.91	0	15,15,17	1.69	3 (20%)
2	MAN	B	5	2	11,11,12	0.95	0	15,15,17	2.06	5 (33%)

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	B	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	3/6/23/26	0/1/1/1
2	BMA	B	3	2	-	2/2/19/22	0/1/1/1
2	MAN	B	4	2	-	0/2/19/22	0/1/1/1
2	MAN	B	5	2	-	2/2/19/22	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	NAG	O7-C7	-3.13	1.16	1.23
2	B	2	NAG	O7-C7	-2.96	1.16	1.23

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	5	MAN	C1-O5-C5	4.71	118.49	112.19
2	B	3	BMA	C1-C2-C3	-4.48	103.13	109.64
2	B	4	MAN	O2-C2-C3	4.08	118.61	110.15
2	B	2	NAG	C1-C2-N2	3.98	116.71	110.43
2	B	3	BMA	C2-C3-C4	3.83	117.59	110.86
2	B	4	MAN	C1-C2-C3	-3.69	104.27	109.64
2	B	3	BMA	O3-C3-C2	-3.63	102.64	110.05
2	B	2	NAG	O7-C7-C8	-3.12	116.49	122.05
2	B	2	NAG	O5-C1-C2	-3.00	106.66	111.29
2	B	5	MAN	O2-C2-C3	2.95	116.25	110.15
2	B	2	NAG	O7-C7-N2	2.78	126.90	121.98
2	B	5	MAN	C1-C2-C3	-2.69	105.73	109.64
2	B	5	MAN	C2-C3-C4	2.43	115.14	110.86
2	B	2	NAG	C1-O5-C5	2.43	115.44	112.19
2	B	3	BMA	O5-C1-C2	-2.42	105.01	110.79
2	B	5	MAN	O3-C3-C4	2.42	116.08	110.38
2	B	4	MAN	C6-C5-C4	2.15	118.31	113.02
2	B	3	BMA	O5-C5-C4	-2.13	105.66	110.83

There are no chirality outliers.

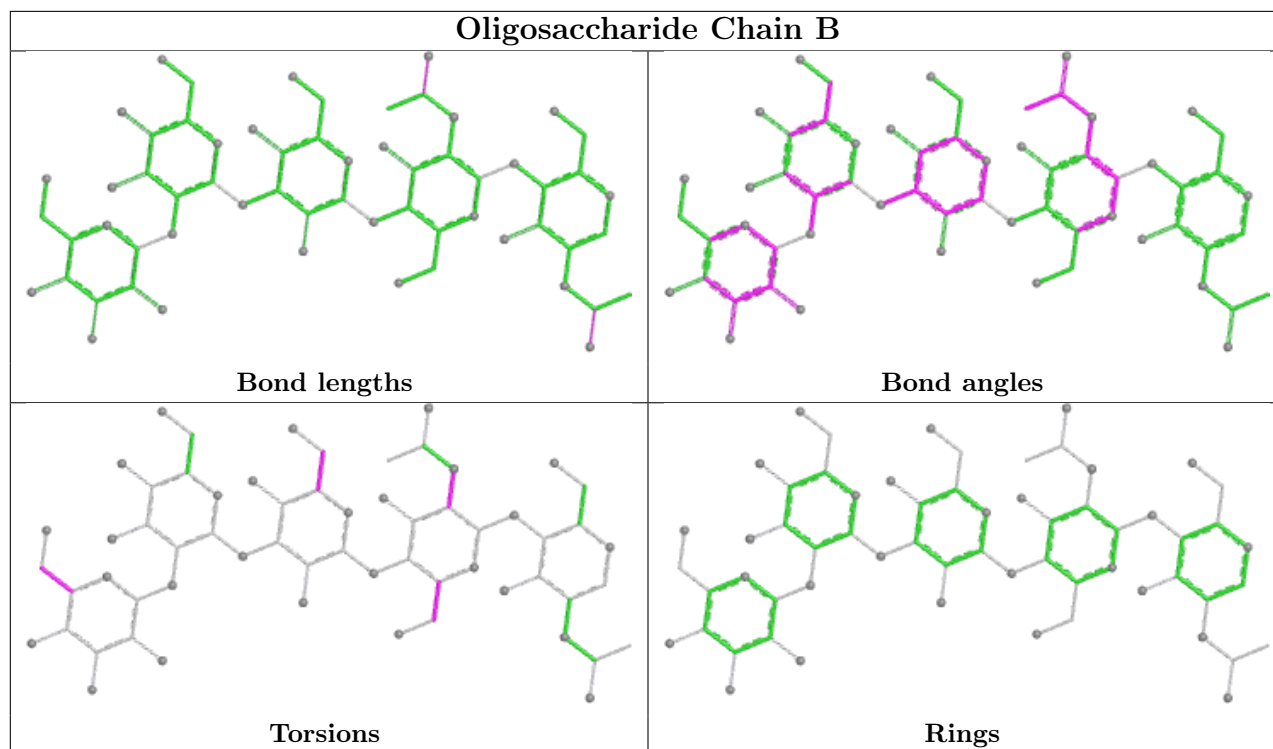
All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	5	MAN	O5-C5-C6-O6
2	B	3	BMA	O5-C5-C6-O6
2	B	3	BMA	C4-C5-C6-O6
2	B	5	MAN	C4-C5-C6-O6
2	B	2	NAG	O5-C5-C6-O6
2	B	2	NAG	C3-C2-N2-C7
2	B	2	NAG	C1-C2-N2-C7

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](#)

5 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	A	608	1	14,14,15	1.10	1 (7%)	17,19,21	3.06	5 (29%)
4	FAD	A	600	-	54,58,58	1.94	13 (24%)	71,89,89	2.48	25 (35%)
3	NAG	A	609	1	14,14,15	1.17	1 (7%)	17,19,21	1.52	2 (11%)
3	NAG	A	605	1	14,14,15	1.39	3 (21%)	17,19,21	2.00	6 (35%)
3	NAG	A	604	1	14,14,15	1.23	2 (14%)	17,19,21	2.57	11 (64%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	A	608	1	-	2/6/23/26	0/1/1/1
4	FAD	A	600	-	-	4/30/50/50	0/6/6/6
3	NAG	A	609	1	-	4/6/23/26	0/1/1/1
3	NAG	A	605	1	-	0/6/23/26	0/1/1/1
3	NAG	A	604	1	-	2/6/23/26	0/1/1/1

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	600	FAD	P-O3P	-5.39	1.53	1.59
4	A	600	FAD	C6-C7	-4.71	1.33	1.39
4	A	600	FAD	C8-C7	4.38	1.51	1.40
4	A	600	FAD	O5'-C5'	3.85	1.59	1.44
4	A	600	FAD	PA-O2A	-3.83	1.37	1.55
4	A	600	FAD	C1'-C2'	3.82	1.58	1.52
3	A	605	NAG	O7-C7	-3.66	1.15	1.23
3	A	604	NAG	O7-C7	-3.25	1.16	1.23
4	A	600	FAD	O4B-C1B	2.83	1.44	1.40
4	A	600	FAD	P-O2P	-2.81	1.42	1.55
3	A	609	NAG	O7-C7	-2.77	1.17	1.23
4	A	600	FAD	PA-O5B	-2.75	1.48	1.59
3	A	608	NAG	O7-C7	-2.73	1.17	1.23
4	A	600	FAD	C6-C5X	2.42	1.43	1.40
4	A	600	FAD	O3B-C3B	-2.33	1.37	1.43
4	A	600	FAD	C9-C9A	-2.24	1.36	1.39
3	A	605	NAG	C2-N2	2.22	1.49	1.46
3	A	605	NAG	O5-C5	-2.20	1.39	1.43
3	A	604	NAG	O5-C1	2.19	1.47	1.43
4	A	600	FAD	C4X-N5	2.11	1.35	1.30

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	600	FAD	O4B-C1B-N9A	-10.02	95.46	108.75
3	A	608	NAG	C1-C2-N2	7.08	121.59	110.43
4	A	600	FAD	C5A-C6A-N1A	-6.44	104.89	120.23
3	A	608	NAG	C4-C3-C2	-6.25	101.86	111.02
3	A	608	NAG	C1-O5-C5	5.74	119.89	112.19
4	A	600	FAD	C9-C9A-N10	5.52	129.27	121.85
3	A	604	NAG	C2-N2-C7	5.16	129.82	122.90
4	A	600	FAD	C5A-C6A-N6A	5.15	128.15	120.31
3	A	608	NAG	O5-C1-C2	-4.77	103.91	111.29

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	605	NAG	O5-C1-C2	-4.63	104.12	111.29
4	A	600	FAD	C1B-N9A-C4A	-4.41	118.90	126.64
3	A	609	NAG	O6-C6-C5	4.37	126.22	111.33
4	A	600	FAD	N6A-C6A-N1A	4.04	126.96	118.33
3	A	604	NAG	O5-C1-C2	-4.03	105.06	111.29
3	A	605	NAG	C1-O5-C5	3.78	117.25	112.19
4	A	600	FAD	C6-C5X-C9A	3.70	124.14	119.05
4	A	600	FAD	O3B-C3B-C4B	3.66	121.59	111.08
4	A	600	FAD	C9-C9A-C5X	-3.50	113.84	120.03
4	A	600	FAD	C5'-C4'-C3'	-3.30	106.00	112.22
4	A	600	FAD	C9A-C9-C8	3.30	125.85	119.22
4	A	600	FAD	O5B-C5B-C4B	-3.16	98.23	108.99
4	A	600	FAD	C4-C4X-C10	2.97	122.02	116.93
3	A	604	NAG	C6-C5-C4	-2.93	105.83	113.02
3	A	604	NAG	C4-C3-C2	-2.90	106.78	111.02
3	A	605	NAG	C1-C2-N2	-2.87	105.91	110.43
3	A	604	NAG	C8-C7-N2	-2.85	111.39	116.12
4	A	600	FAD	C10-C4X-N5	-2.80	119.09	124.81
3	A	605	NAG	O5-C5-C4	-2.78	104.07	110.83
3	A	604	NAG	O3-C3-C2	2.76	115.14	109.40
3	A	609	NAG	C1-C2-N2	2.71	114.71	110.43
3	A	604	NAG	O3-C3-C4	-2.69	104.04	110.38
3	A	608	NAG	O3-C3-C2	2.68	114.97	109.40
4	A	600	FAD	O2B-C2B-C3B	2.68	120.40	111.82
4	A	600	FAD	C1'-C2'-C3'	-2.64	102.51	109.66
4	A	600	FAD	O2P-P-O1P	2.62	124.63	112.44
4	A	600	FAD	N3A-C2A-N1A	-2.56	125.20	128.67
4	A	600	FAD	C2B-C3B-C4B	-2.54	97.70	102.61
4	A	600	FAD	O2A-PA-O3P	2.46	113.93	107.27
3	A	604	NAG	O4-C4-C5	-2.45	103.30	109.32
3	A	604	NAG	C1-O5-C5	-2.44	108.91	112.19
3	A	604	NAG	O7-C7-C8	2.35	126.23	122.05
4	A	600	FAD	O3'-C3'-C4'	2.28	114.12	108.93
4	A	600	FAD	C7M-C7-C6	2.20	123.44	119.57
3	A	604	NAG	C1-C2-N2	2.08	113.71	110.43
4	A	600	FAD	C4X-C10-N1	-2.06	119.55	124.59
3	A	605	NAG	O7-C7-C8	2.04	125.69	122.05
4	A	600	FAD	O3'-C3'-C2'	-2.04	104.31	108.93
3	A	605	NAG	O7-C7-N2	-2.02	118.41	121.98
4	A	600	FAD	C4B-O4B-C1B	-2.01	108.08	109.92

There are no chirality outliers.

All (12) torsion outliers are listed below:

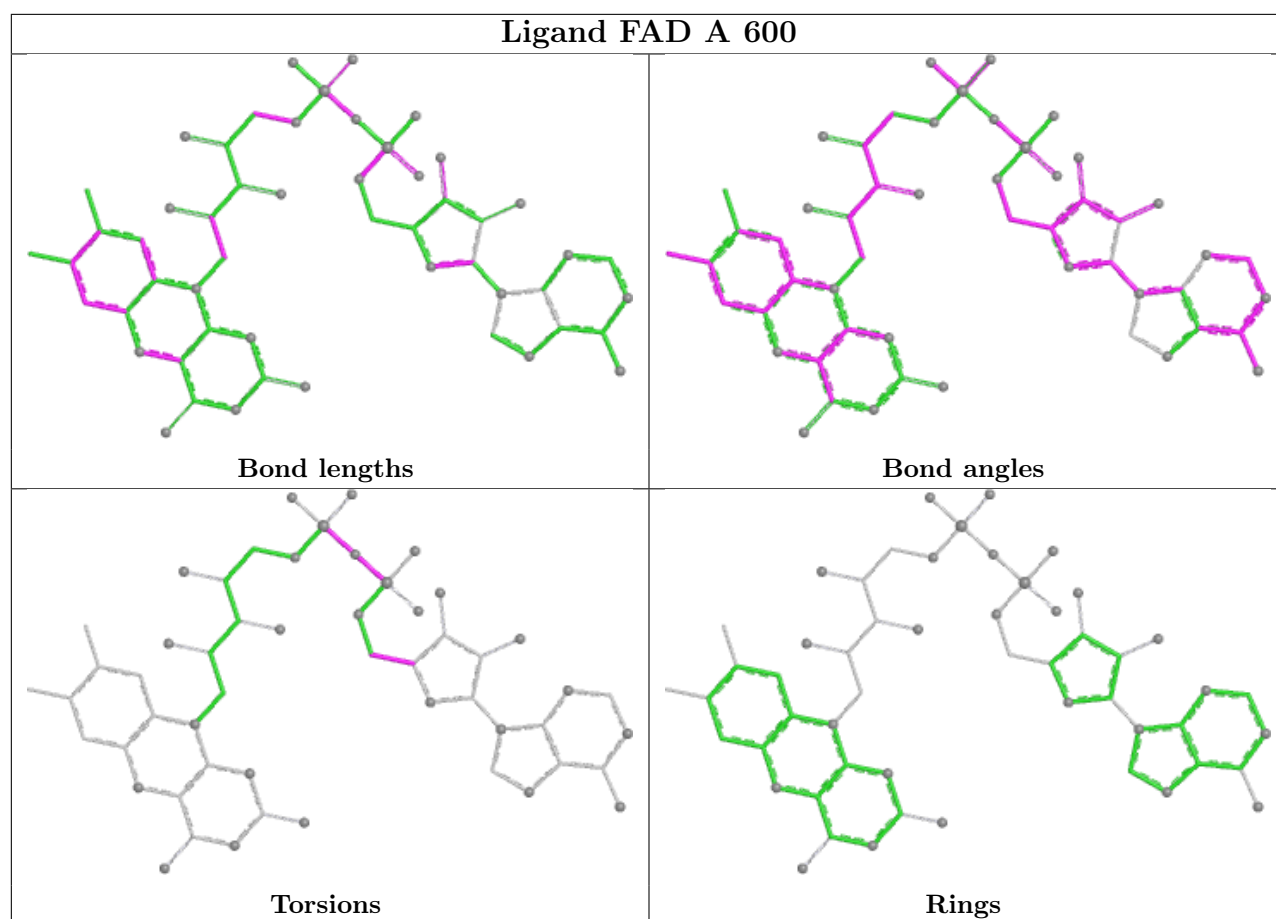
Mol	Chain	Res	Type	Atoms
3	A	609	NAG	O5-C5-C6-O6
3	A	608	NAG	O5-C5-C6-O6
3	A	609	NAG	C4-C5-C6-O6
3	A	608	NAG	C4-C5-C6-O6
3	A	609	NAG	C8-C7-N2-C2
3	A	609	NAG	O7-C7-N2-C2
3	A	604	NAG	O5-C5-C6-O6
4	A	600	FAD	PA-O3P-P-O5'
4	A	600	FAD	P-O3P-PA-O2A
3	A	604	NAG	C3-C2-N2-C7
4	A	600	FAD	P-O3P-PA-O1A
4	A	600	FAD	O4B-C4B-C5B-O5B

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	600	FAD	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 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 [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	581/583 (99%)	-0.76	0 100 100	2, 11, 29, 67	0

There are no RSRZ outliers to report.

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

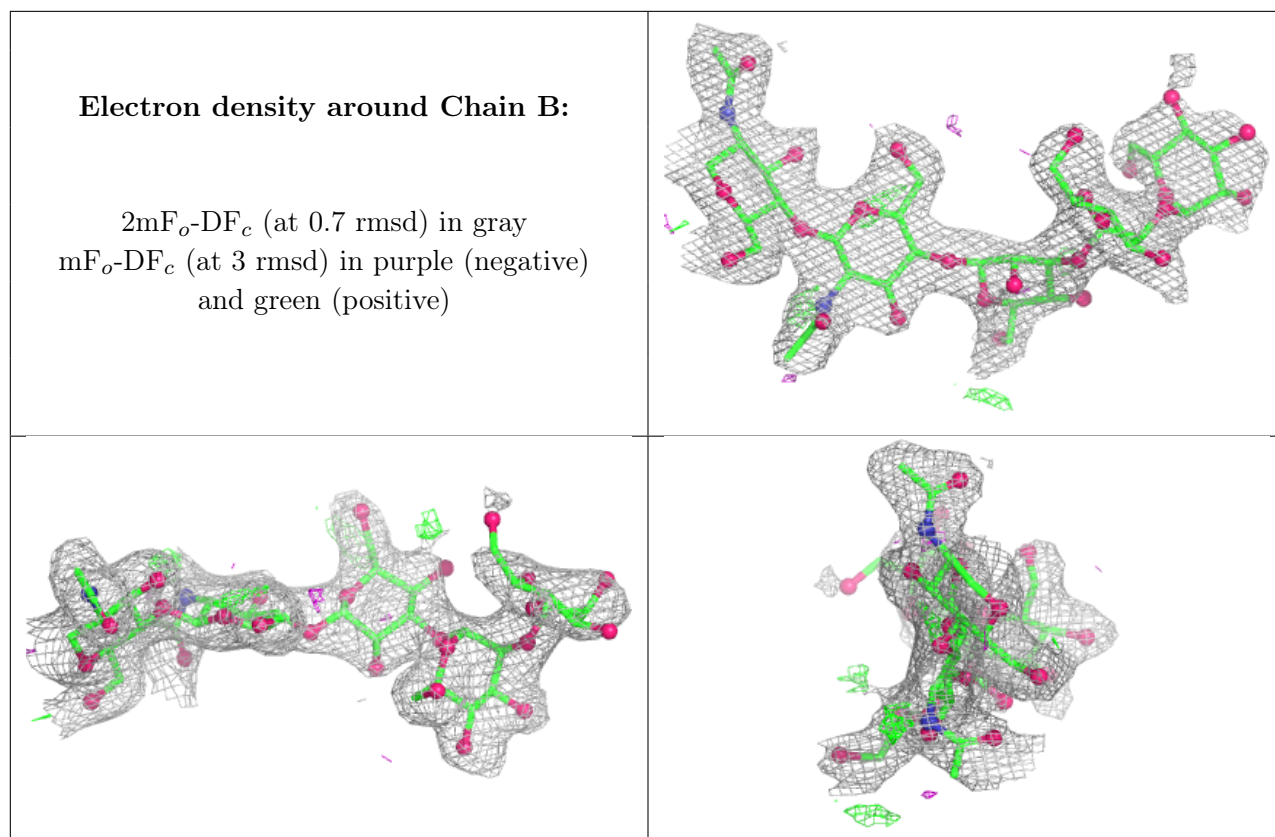
There are no non-standard protein/DNA/RNA residues in this entry.

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
2	MAN	B	5	11/12	0.76	0.09	68,68,68,68	0
2	BMA	B	3	11/12	0.82	0.10	54,54,54,54	0
2	NAG	B	2	14/15	0.83	0.10	30,30,30,30	0
2	MAN	B	4	11/12	0.85	0.10	57,57,57,57	0
2	NAG	B	1	14/15	0.89	0.07	22,22,22,22	0

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

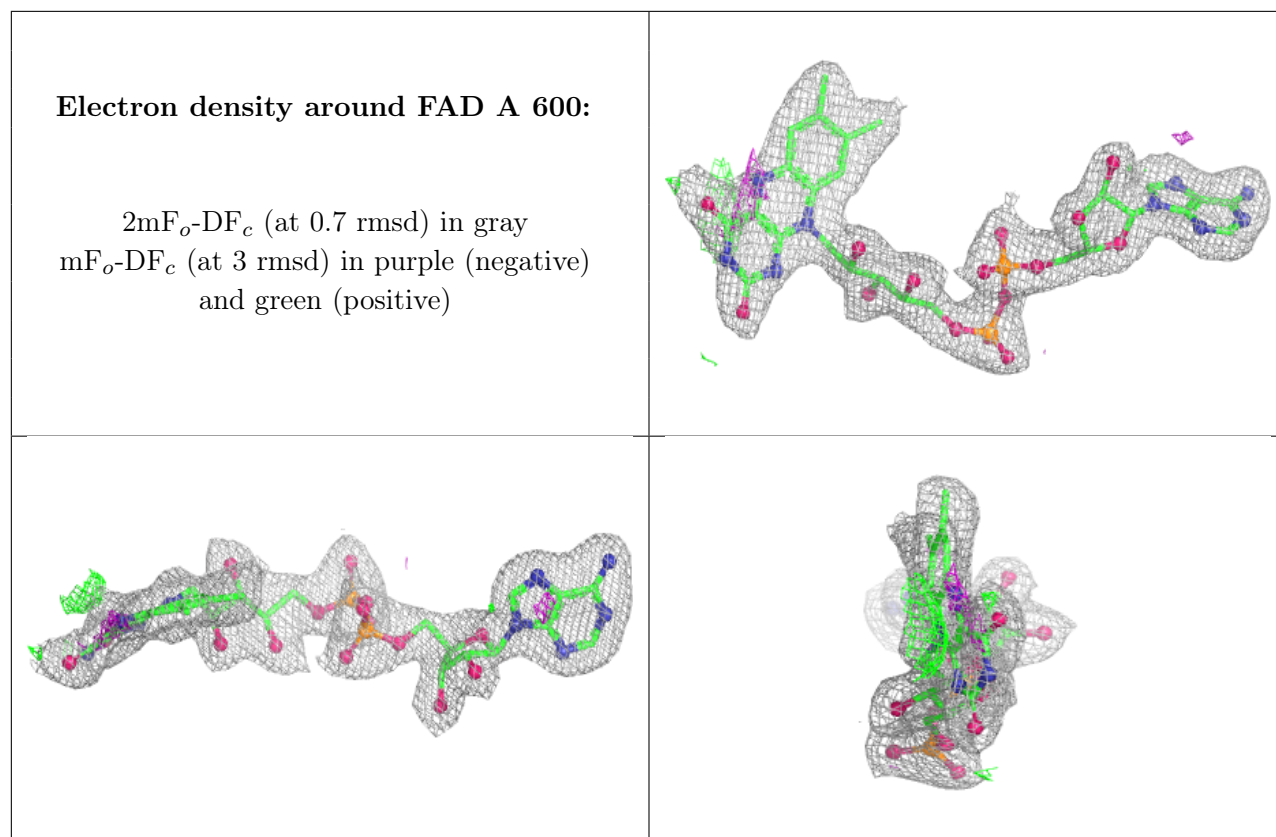


6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NAG	A	609	14/15	0.56	0.14	76,76,76,76	0
3	NAG	A	608	14/15	0.66	0.12	65,65,65,65	0
3	NAG	A	604	14/15	0.86	0.08	23,23,23,23	0
3	NAG	A	605	14/15	0.94	0.06	17,17,17,17	0
4	FAD	A	600	53/53	0.96	0.06	5,5,5,5	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.