



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 01:37 AM UTC

PDB ID : 7P2D / pdb_00007p2d
Title : Structure of alphaMbeta2/Cd11bCD18 headpiece in complex with a nanobody
Authors : Jensen, R.K.; Andersen, G.R.
Deposited on : 2021-07-05
Resolution : 3.20 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
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

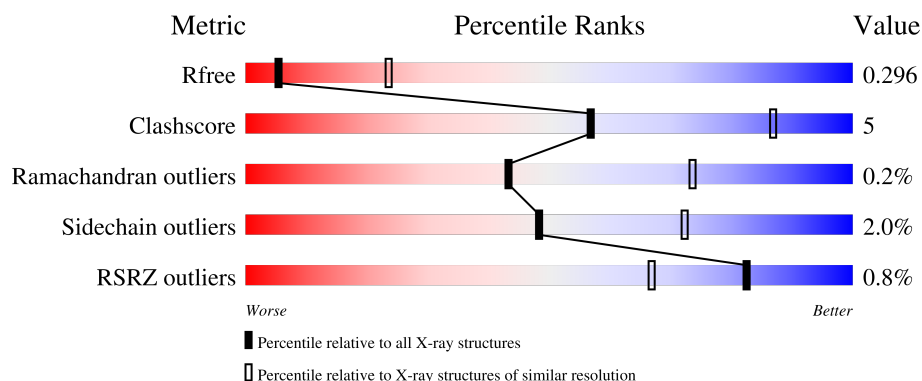
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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	1466 (3.20-3.20)
Clashscore	190562	1573 (3.20-3.20)
Ramachandran outliers	187476	1548 (3.20-3.20)
Sidechain outliers	187428	1547 (3.20-3.20)
RSRZ outliers	180081	1466 (3.20-3.20)

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	763	
2	B	473	
3	C	129	
4	D	2	
4	E	2	

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Mol	Chain	Length	Quality of chain
4	F	2	 50%50%
4	G	2	 50%50%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 10419 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 Isoform 2 of Integrin alpha-M.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	751	5802	3633	1040	1104	25	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	224	ARG	ASN	conflict	UNP P11215
A	681	ARG	ASN	conflict	UNP P11215
A	755	THR	CYS	conflict	UNP P11215
A	757	GLY	-	expression tag	UNP P11215
A	758	LEU	-	expression tag	UNP P11215
A	759	GLU	-	expression tag	UNP P11215
A	760	VAL	-	expression tag	UNP P11215
A	761	LEU	-	expression tag	UNP P11215
A	762	PHE	-	expression tag	UNP P11215
A	763	GLN	-	expression tag	UNP P11215

- Molecule 2 is a protein called Integrin beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	459	3573	2225	634	685	29	0	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	461	LYS	-	expression tag	UNP A0A494C0X7
B	462	ASN	-	expression tag	UNP A0A494C0X7
B	463	CYS	-	expression tag	UNP A0A494C0X7
B	464	GLU	-	expression tag	UNP A0A494C0X7
B	465	PRO	-	expression tag	UNP A0A494C0X7
B	466	ALA	-	expression tag	UNP A0A494C0X7

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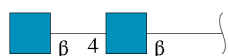
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Chain	Residue	Modelled	Actual	Comment	Reference
B	467	ALA	-	expression tag	UNP A0A494C0X7
B	468	LEU	-	expression tag	UNP A0A494C0X7
B	469	GLN	-	expression tag	UNP A0A494C0X7
B	470	THR	-	expression tag	UNP A0A494C0X7
B	471	LEU	-	expression tag	UNP A0A494C0X7
B	472	PHE	-	expression tag	UNP A0A494C0X7
B	473	GLN	-	expression tag	UNP A0A494C0X7

- Molecule 3 is a protein called hCD11bNb1 nanobody.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	121	Total	C	N	O	S	0	0	0
			916	570	166	175	5			

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
4	E	2	Total	C	N	O	0	0	0
			28	16	2	10			
4	F	2	Total	C	N	O	0	0	0
			28	16	2	10			
4	G	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 5 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Ca	0	0
			2	2		

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆) (labeled as "Ligand of Interest" by depositor).




Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	B	1	14	8	1	5	0	0

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

Chain D:  100%

MAG1
MAG2

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

Chain E:  100%

MAG1
MAG2

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

Chain F:  50% 50%

MAG1
MAG2

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

Chain G:  50% 50%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	114.10Å 114.10Å 250.12Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.95 – 3.20 45.95 – 3.20	Depositor EDS
% Data completeness (in resolution range)	82.8 (45.95-3.20) 82.7 (45.95-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.78 (at 3.01Å)	Xtriage
Refinement program	PHENIX 1.19rc5_4047	Depositor
R, R_{free}	0.261 , 0.295 0.262 , 0.296	Depositor DCC
R_{free} test set	1207 reflections (3.13%)	wwPDB-VP
Wilson B-factor (Å ²)	97.8	Xtriage
Anisotropy	0.168	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 99.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.030 for -h,-k,l	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	10419	wwPDB-VP
Average B, all atoms (Å ²)	127.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.09% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

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

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	0.33	2/5913 (0.0%)	0.71	9/7999 (0.1%)
2	B	0.29	0/3642	0.65	3/4927 (0.1%)
3	C	0.20	0/933	0.57	2/1262 (0.2%)
All	All	0.30	2/10488 (0.0%)	0.68	14/14188 (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	A	0	3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	269	ILE	C-N	-8.81	1.29	1.33
1	A	649	ARG	CG-CD	5.59	1.69	1.52

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	176	TYR	CA-CB-CG	8.38	128.99	113.90
1	A	487	ARG	CB-CG-CD	6.74	126.81	111.30
1	A	649	ARG	CG-CD-NE	6.72	126.78	112.00
2	B	149	PHE	CA-CB-CG	6.53	120.33	113.80
2	B	247	PHE	CB-CA-C	6.06	124.39	111.91
2	B	149	PHE	CB-CA-C	5.98	120.62	109.86
1	A	649	ARG	CB-CA-C	-5.95	99.78	110.37
1	A	390	TYR	CA-CB-CG	5.53	123.86	113.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	106	GLY	CA-C-N	5.37	131.64	121.97
3	C	106	GLY	C-N-CA	5.37	131.64	121.97
1	A	654	GLN	CA-CB-CG	5.23	124.56	114.10
1	A	616	VAL	CA-C-N	5.14	131.36	121.54
1	A	616	VAL	C-N-CA	5.14	131.36	121.54
1	A	720	PHE	CB-CA-C	5.08	122.61	111.09

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	115	ARG	Sidechain
1	A	487	ARG	Sidechain
1	A	649	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	5802	0	5716	61	0
2	B	3573	0	3489	35	0
3	C	916	0	894	4	0
4	D	28	0	25	0	0
4	E	28	0	25	0	0
4	F	28	0	25	1	0
4	G	28	0	25	0	0
5	A	2	0	0	0	0
6	B	14	0	13	0	0
All	All	10419	0	10212	94	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (94) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:430:GLN:HG3	2:B:443:LEU:HB2	1.66	0.77
1:A:414:GLY:HA3	1:A:441:PHE:HB3	1.76	0.68
1:A:650:LEU:HG	1:A:652:GLU:H	1.60	0.67
1:A:663:LEU:HB2	1:A:684:ARG:HB3	1.77	0.66
2:B:322:GLU:O	2:B:329:ASN:ND2	2.30	0.65
1:A:665:LEU:HD11	1:A:701:LEU:HD22	1.82	0.62
1:A:389:GLY:HA2	1:A:405:LEU:HD12	1.82	0.60
1:A:662:ASP:OD2	4:F:1:NAG:N2	2.34	0.59
1:A:364:LEU:HB3	1:A:372:THR:HB	1.86	0.57
1:A:737:LEU:HD23	1:A:743:ARG:HH21	1.70	0.57
1:A:86:LEU:HB3	1:A:110:PHE:HB2	1.86	0.57
2:B:177:GLN:HB2	2:B:203:LEU:HB2	1.87	0.57
2:B:242:ASP:O	2:B:303:ARG:NH2	2.37	0.57
1:A:1:PHE:HA	1:A:554:GLN:HB2	1.87	0.57
3:C:4:GLN:HB2	3:C:26:SER:HB3	1.88	0.56
2:B:67:GLU:HG2	2:B:78:PRO:HB3	1.87	0.56
1:A:335:SER:HB2	1:A:352:THR:HB	1.86	0.56
1:A:123:GLU:H	1:A:368:LYS:HE3	1.71	0.55
1:A:103:VAL:HB	2:B:155:LEU:HD13	1.89	0.55
1:A:334:MET:HE2	2:B:208:LEU:HD21	1.89	0.55
1:A:562:SER:HB3	1:A:565:LEU:HG	1.88	0.55
1:A:713:PRO:HB3	1:A:750:PRO:HA	1.89	0.54
1:A:337:GLU:HB3	1:A:350:LEU:HD13	1.89	0.54
1:A:347:GLY:HA3	1:A:366:THR:HA	1.88	0.54
1:A:579:THR:HG21	1:A:598:ARG:HD2	1.90	0.53
1:A:178:GLU:HG3	1:A:208:ARG:H	1.73	0.53
1:A:385:ASP:OD2	2:B:210:ALA:HB3	2.09	0.53
2:B:358:VAL:HG22	2:B:393:VAL:HG22	1.90	0.53
2:B:361:ASP:HB2	2:B:390:GLN:HB3	1.91	0.53
1:A:360:GLY:HA3	1:A:388:LEU:HB3	1.89	0.53
2:B:287:HIS:NE2	2:B:291:GLU:OE2	2.42	0.53
1:A:24:GLN:HE21	1:A:587:THR:HG23	1.75	0.52
1:A:330:PHE:HB3	1:A:333:GLU:HG3	1.92	0.52
2:B:120:ASP:N	2:B:120:ASP:OD1	2.43	0.51
1:A:362:VAL:HG21	1:A:405:LEU:HD11	1.93	0.50
2:B:317:LYS:NZ	2:B:344:ARG:O	2.45	0.50
1:A:500:GLN:HG2	1:A:531:GLU:H	1.76	0.50
1:A:579:THR:HG23	1:A:585:ASP:OD2	2.13	0.49
1:A:644:LYS:NZ	1:A:648:ASP:OD1	2.45	0.49
1:A:145:ILE:HD12	1:A:302:PHE:HZ	1.76	0.49
1:A:446:CYS:HB3	1:A:460:LEU:HB2	1.95	0.49
1:A:720:PHE:CD1	1:A:743:ARG:HG3	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:105:ILE:HG12	2:B:234:THR:HG21	1.95	0.49
1:A:245:LYS:HD3	1:A:248:ASP:HB3	1.94	0.48
2:B:41:ASP:OD2	2:B:45:GLN:HG2	2.14	0.48
1:A:172:SER:HB3	1:A:222:LEU:HD11	1.94	0.48
1:A:334:MET:HE1	2:B:155:LEU:HD22	1.96	0.48
1:A:337:GLU:HG2	1:A:352:THR:HG22	1.95	0.48
2:B:150:VAL:HG12	2:B:151:ASP:H	1.80	0.47
1:A:515:VAL:HG12	1:A:522:ASP:OD2	2.15	0.47
2:B:151:ASP:OD1	2:B:279:TYR:OH	2.32	0.47
1:A:149:ASP:HB3	1:A:302:PHE:CG	2.51	0.46
1:A:716:LEU:HB3	1:A:747:ALA:HB3	1.97	0.46
1:A:666:ASP:OD2	1:A:673:ARG:HB2	2.15	0.46
2:B:301:THR:HG21	2:B:325:GLU:OE2	2.15	0.46
3:C:108:TRP:O	3:C:111:TRP:NE1	2.49	0.46
1:A:94:HIS:CD2	2:B:155:LEU:HD12	2.51	0.46
1:A:76:SER:OG	1:A:339:PHE:O	2.33	0.46
2:B:435:SER:HB2	2:B:443:LEU:HG	1.97	0.46
3:C:7:GLU:OE2	3:C:112:GLY:HA3	2.16	0.46
1:A:138:LEU:HG	1:A:176:TYR:HD2	1.79	0.45
1:A:339:PHE:HE2	1:A:390:TYR:CD1	2.34	0.45
1:A:415:LEU:HD13	1:A:433:LYS:HG2	1.97	0.45
1:A:71:MET:HE3	1:A:106:LEU:HB3	1.97	0.45
1:A:139:ILE:HG22	1:A:240:ILE:HD12	1.99	0.45
1:A:354:GLY:HA2	1:A:358:TRP:HA	1.99	0.45
2:B:330:VAL:HB	2:B:332:HIS:HB3	1.99	0.45
1:A:31:VAL:HG11	1:A:86:LEU:HD21	1.98	0.44
2:B:428:ARG:HD3	2:B:428:ARG:HA	1.72	0.44
1:A:140:ASP:HB2	1:A:241:THR:HA	1.99	0.44
3:C:91:THR:HG23	3:C:118:THR:HA	1.99	0.44
1:A:71:MET:HE1	1:A:108:PHE:HE2	1.82	0.43
1:A:51:ASP:OD1	1:A:52:TYR:N	2.51	0.43
1:A:61:ARG:HD2	1:A:115:ARG:HA	1.99	0.43
1:A:106:LEU:HD21	1:A:120:LYS:HE3	2.01	0.43
2:B:173:GLU:OE2	2:B:175:GLU:HB2	2.18	0.43
2:B:106:ASP:OD2	2:B:231:ARG:HB2	2.18	0.43
2:B:43:ARG:HG3	2:B:56:ILE:HD13	2.01	0.43
1:A:439:ALA:HB1	1:A:466:TYR:HB2	2.01	0.42
1:A:440:TYR:CD1	2:B:247:PHE:HE1	2.37	0.42
2:B:105:ILE:HA	2:B:234:THR:HB	2.01	0.42
2:B:76:LEU:HD13	2:B:97:PHE:HD1	1.84	0.42
1:A:7:ASN:ND2	1:A:731:GLY:O	2.53	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:260:ASN:O	2:B:284:GLN:NE2	2.47	0.41
1:A:218:VAL:HG11	1:A:237:LEU:HD13	2.02	0.41
2:B:430:GLN:O	2:B:432:ARG:HG2	2.21	0.41
1:A:19:GLY:HA3	1:A:590:ALA:O	2.20	0.41
1:A:447:SER:HB2	1:A:456:THR:HG21	2.02	0.41
1:A:598:ARG:HE	1:A:733:LEU:HD22	1.86	0.41
2:B:51:CYS:HB3	2:B:56:ILE:HG13	2.03	0.41
2:B:332:HIS:HA	2:B:335:LYS:HB3	2.03	0.41
1:A:291:PRO:HA	1:A:292:PRO:HD3	1.91	0.40
2:B:399:ILE:H	2:B:399:ILE:HG13	1.73	0.40
2:B:407:ARG:HD3	2:B:409:LEU:HD23	2.02	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	749/763 (98%)	711 (95%)	37 (5%)	1 (0%)	48	79
2	B	457/473 (97%)	439 (96%)	17 (4%)	1 (0%)	43	73
3	C	119/129 (92%)	117 (98%)	2 (2%)	0	100	100
All	All	1325/1365 (97%)	1267 (96%)	56 (4%)	2 (0%)	43	73

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	368	VAL
1	A	650	LEU

5.3.2 Protein sidechains ⓘ

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	634/644 (98%)	620 (98%)	14 (2%)	45	71
2	B	400/412 (97%)	392 (98%)	8 (2%)	48	72
3	C	95/103 (92%)	94 (99%)	1 (1%)	65	79
All	All	1129/1159 (97%)	1106 (98%)	23 (2%)	48	72

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	TYR
1	A	176	TYR
1	A	366	THR
1	A	390	TYR
1	A	405	LEU
1	A	419	PHE
1	A	440	TYR
1	A	493	VAL
1	A	538	TYR
1	A	540	PHE
1	A	676	PHE
1	A	720	PHE
1	A	749	PHE
1	A	751	PHE
2	B	103	TYR
2	B	120	ASP
2	B	149	PHE
2	B	247	PHE
2	B	308	TYR
2	B	333	LEU
2	B	360	TYR
2	B	368	VAL
3	C	107	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	24	GLN
1	A	94	HIS
1	A	130	GLN
1	A	148	HIS
1	A	183	HIS
1	A	210	HIS
1	A	282	GLN
1	A	465	HIS
1	A	541	HIS
1	A	671	HIS
2	B	73	GLN
2	B	292	ASN
3	C	109	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

8 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	$\# Z > 2$
4	NAG	D	1	1,4	14,14,15	0.59	0	17,19,21	1.14	1 (5%)
4	NAG	D	2	4	14,14,15	0.39	0	17,19,21	0.67	1 (5%)
4	NAG	E	1	1,4	14,14,15	0.61	0	17,19,21	0.89	1 (5%)
4	NAG	E	2	4	14,14,15	1.09	2 (14%)	17,19,21	0.60	1 (5%)
4	NAG	F	1	1,4	14,14,15	0.56	0	17,19,21	0.74	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAG	F	2	4	14,14,15	0.33	0	17,19,21	0.71	1 (5%)
4	NAG	G	1	2,4	14,14,15	0.85	1 (7%)	17,19,21	1.21	1 (5%)
4	NAG	G	2	4	14,14,15	0.25	0	17,19,21	0.52	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
4	NAG	D	1	1,4	-	4/6/23/26	0/1/1/1
4	NAG	D	2	4	-	4/6/23/26	0/1/1/1
4	NAG	E	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	E	2	4	-	1/6/23/26	0/1/1/1
4	NAG	F	1	1,4	-	0/6/23/26	0/1/1/1
4	NAG	F	2	4	-	1/6/23/26	0/1/1/1
4	NAG	G	1	2,4	-	2/6/23/26	0/1/1/1
4	NAG	G	2	4	-	0/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	2	NAG	C1-C2	3.23	1.56	1.52
4	G	1	NAG	O5-C1	-2.95	1.38	1.43
4	E	2	NAG	O5-C1	2.41	1.47	1.43

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	NAG	C2-N2-C7	3.45	127.53	122.90
4	G	1	NAG	C3-C4-C5	2.66	115.06	110.23
4	F	1	NAG	C1-O5-C5	2.50	115.54	112.19
4	E	2	NAG	O5-C1-C2	-2.23	107.83	111.29
4	E	1	NAG	C3-C4-C5	2.10	114.03	110.23
4	D	2	NAG	C1-O5-C5	2.05	114.93	112.19
4	F	2	NAG	C1-O5-C5	2.03	114.91	112.19

There are no chirality outliers.

All (14) torsion outliers are listed below:

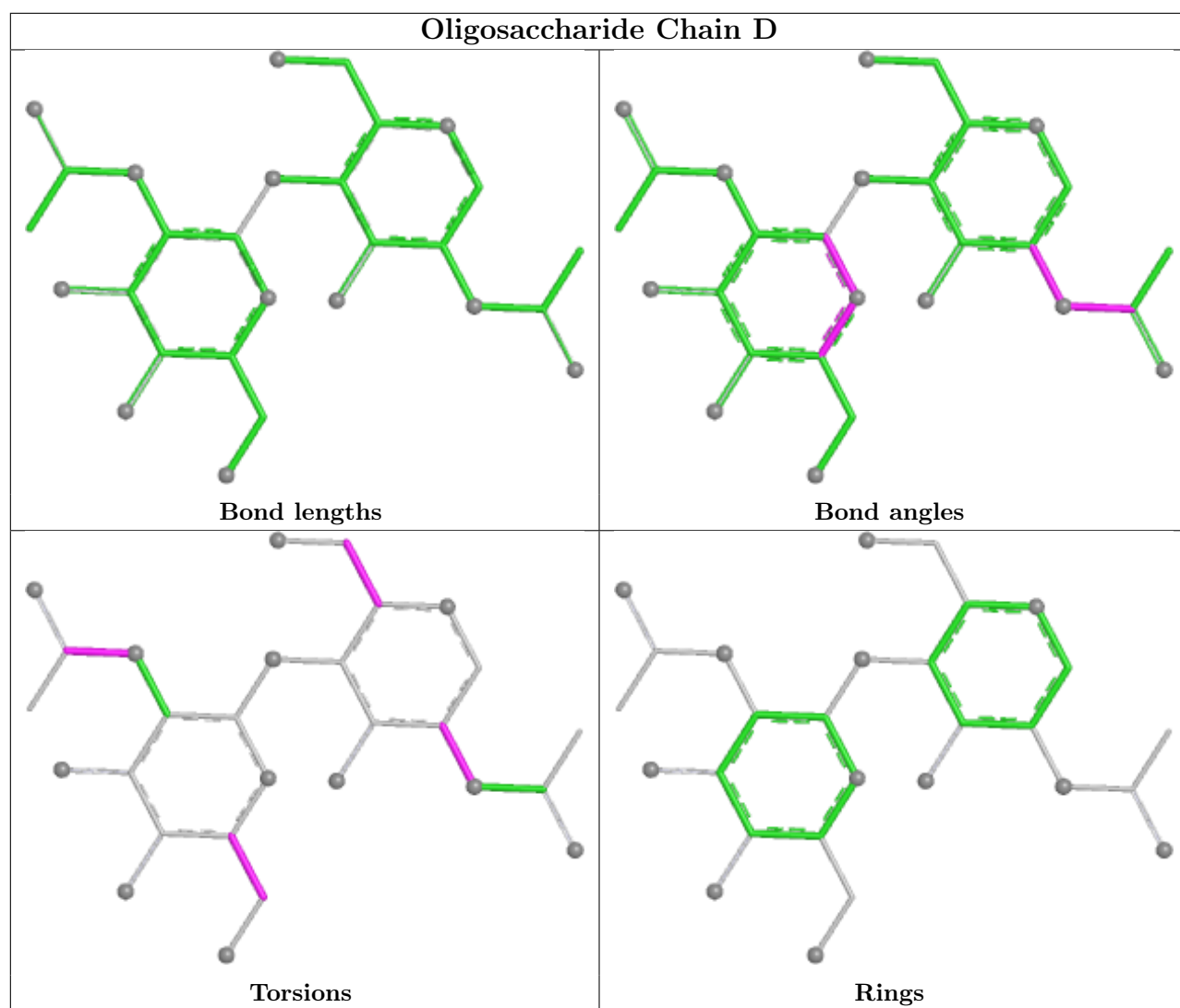
Mol	Chain	Res	Type	Atoms
4	E	1	NAG	O5-C5-C6-O6
4	D	2	NAG	O5-C5-C6-O6
4	D	2	NAG	C8-C7-N2-C2
4	D	2	NAG	O7-C7-N2-C2
4	G	1	NAG	C8-C7-N2-C2
4	G	1	NAG	O7-C7-N2-C2
4	D	1	NAG	C4-C5-C6-O6
4	D	1	NAG	O5-C5-C6-O6
4	D	2	NAG	C4-C5-C6-O6
4	E	2	NAG	O5-C5-C6-O6
4	E	1	NAG	C4-C5-C6-O6
4	D	1	NAG	C1-C2-N2-C7
4	F	2	NAG	C1-C2-N2-C7
4	D	1	NAG	C3-C2-N2-C7

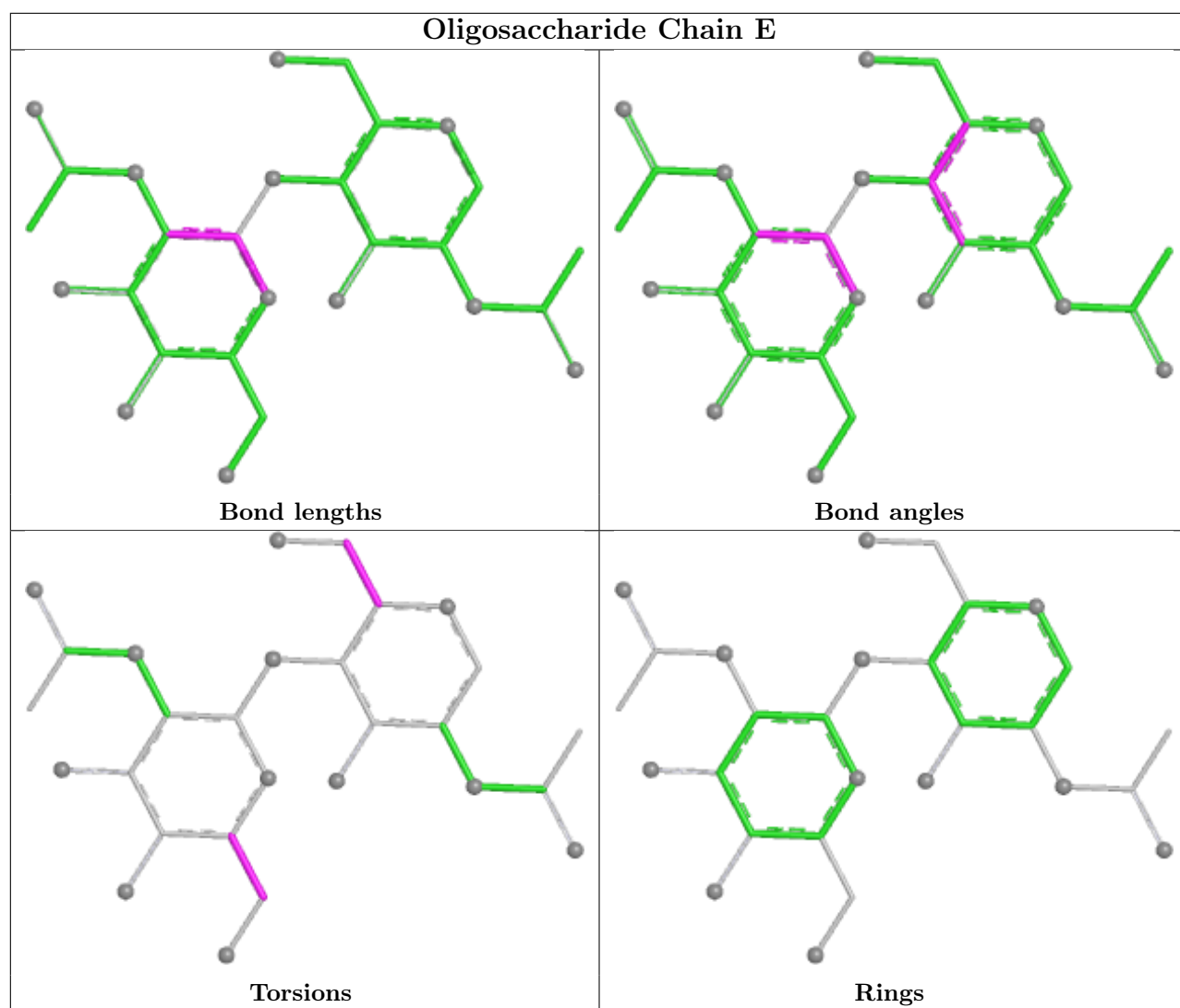
There are no ring outliers.

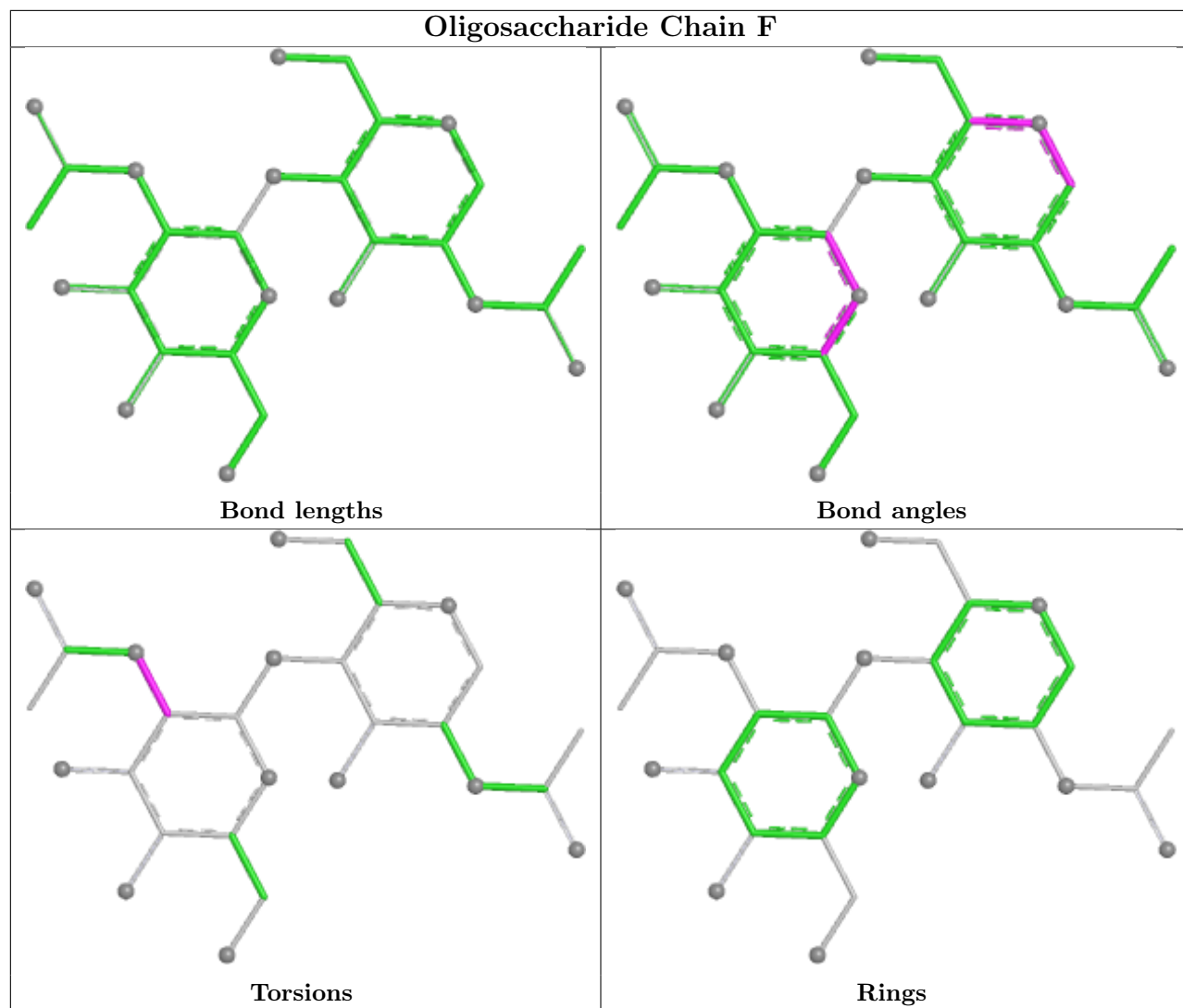
1 monomer is involved in 1 short contact:

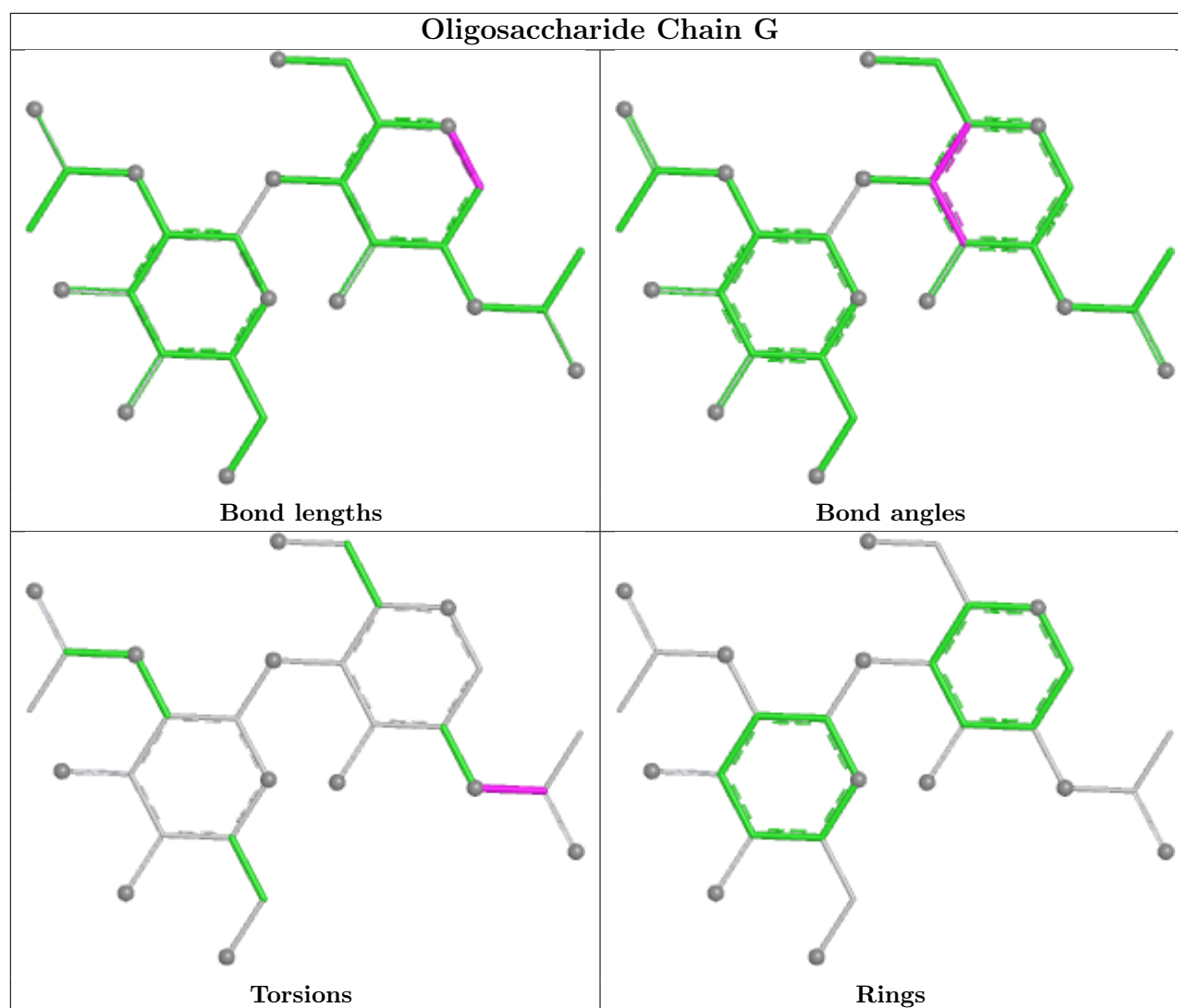
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	F	1	NAG	1	0

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









5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	$\# Z > 2$
6	NAG	B	501	2	14,14,15	0.68	0	17,19,21	0.74	1 (5%)

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
6	NAG	B	501	2	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	501	NAG	C1-O5-C5	2.64	115.72	112.19

There are no chirality outliers.

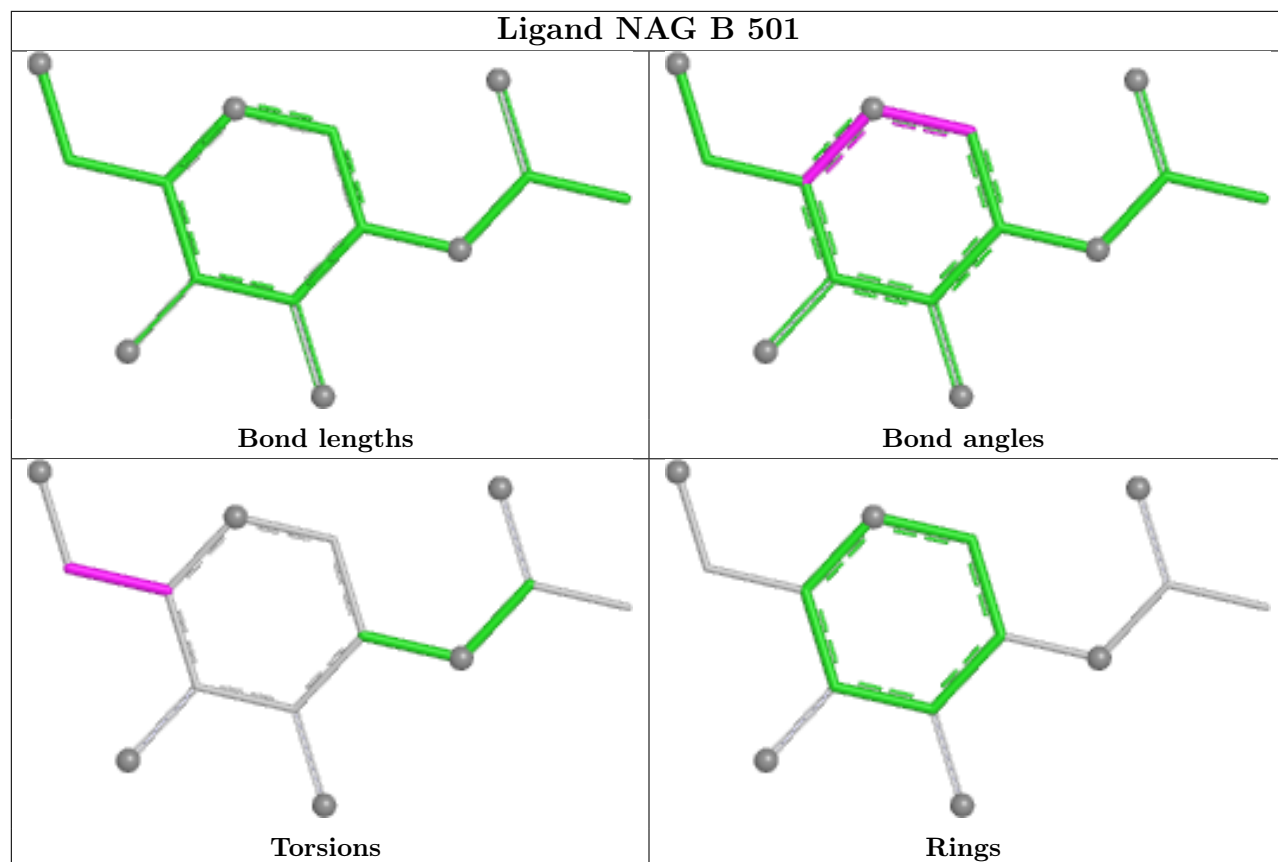
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	501	NAG	O5-C5-C6-O6
6	B	501	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 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	751/763 (98%)	-0.07	6 (0%) 82 67	41, 109, 197, 261	0
2	B	459/473 (97%)	0.09	4 (0%) 81 64	72, 127, 183, 226	0
3	C	121/129 (93%)	0.22	1 (0%) 82 67	98, 172, 226, 251	0
All	All	1331/1365 (97%)	0.01	11 (0%) 82 67	41, 122, 201, 261	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	146	PHE	3.3
1	A	292	PRO	3.3
2	B	314	ILE	3.1
2	B	228	ILE	2.7
1	A	125	LEU	2.5
1	A	616	VAL	2.4
1	A	332	HIS	2.3
1	A	296	VAL	2.2
2	B	443	LEU	2.2
3	C	77	GLY	2.1
1	A	704	PRO	2.1

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

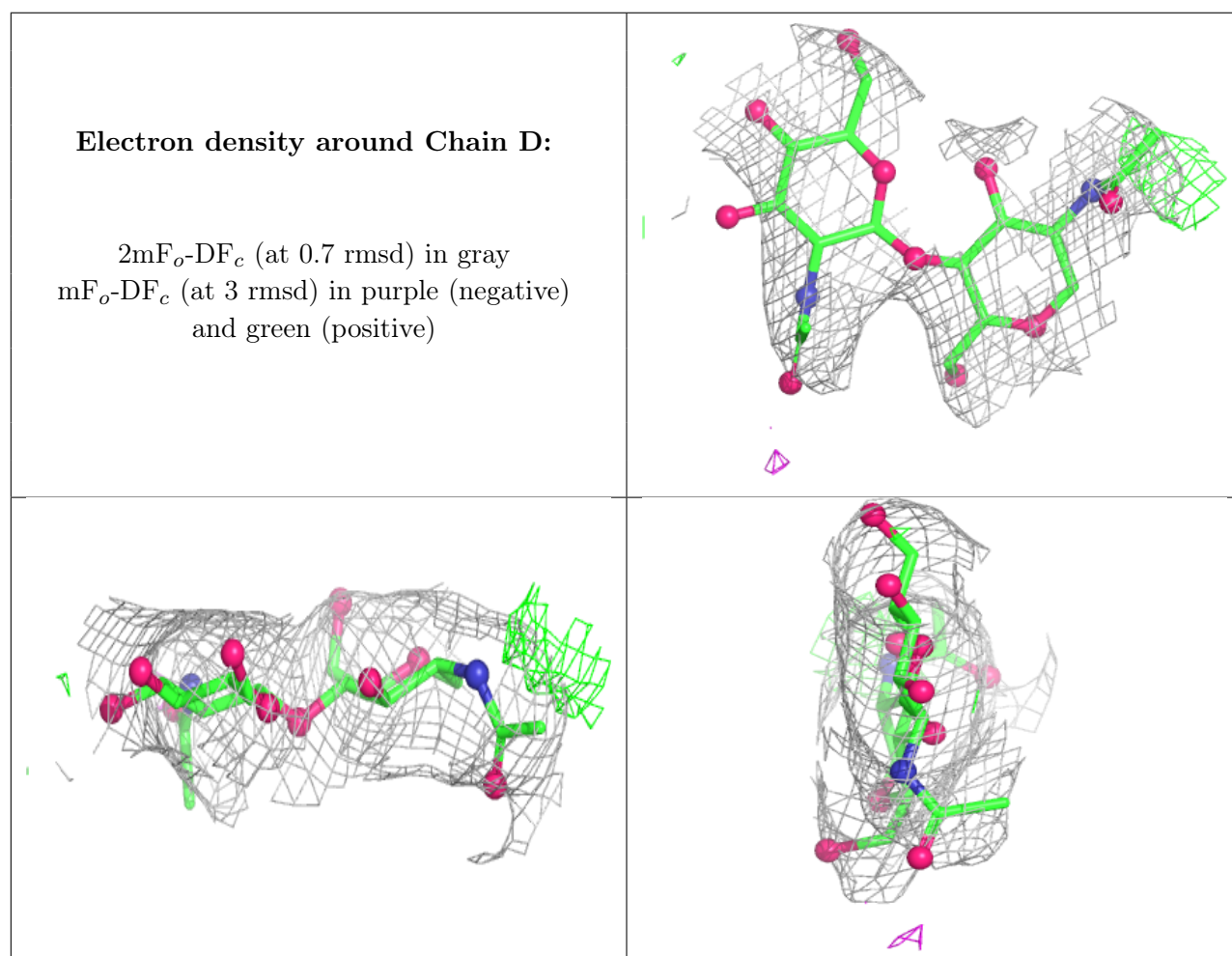
There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

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

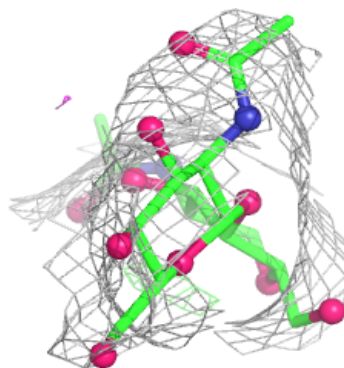
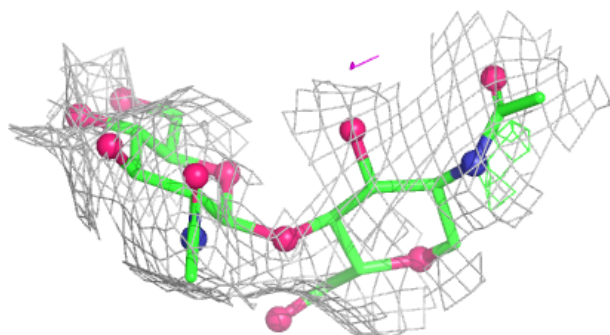
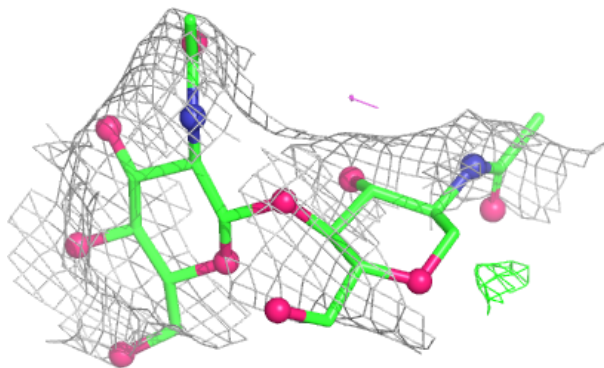
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	NAG	D	2	14/15	0.55	0.12	104,128,146,154	0
4	NAG	F	2	14/15	0.60	0.09	167,177,189,191	0
4	NAG	E	2	14/15	0.61	0.08	134,163,175,182	0
4	NAG	D	1	14/15	0.70	0.11	80,104,127,143	0
4	NAG	G	2	14/15	0.73	0.11	131,169,207,216	0
4	NAG	E	1	14/15	0.76	0.11	110,140,161,176	0
4	NAG	G	1	14/15	0.77	0.09	100,127,155,157	0
4	NAG	F	1	14/15	0.85	0.08	99,139,178,196	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.

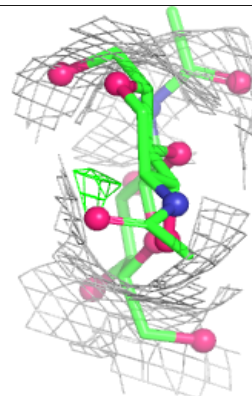
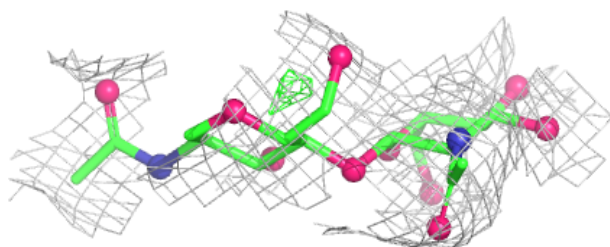
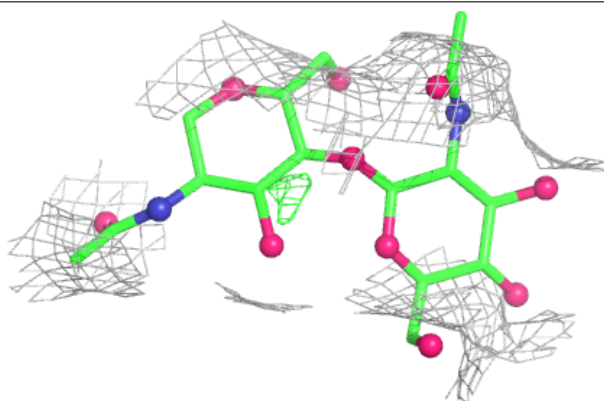


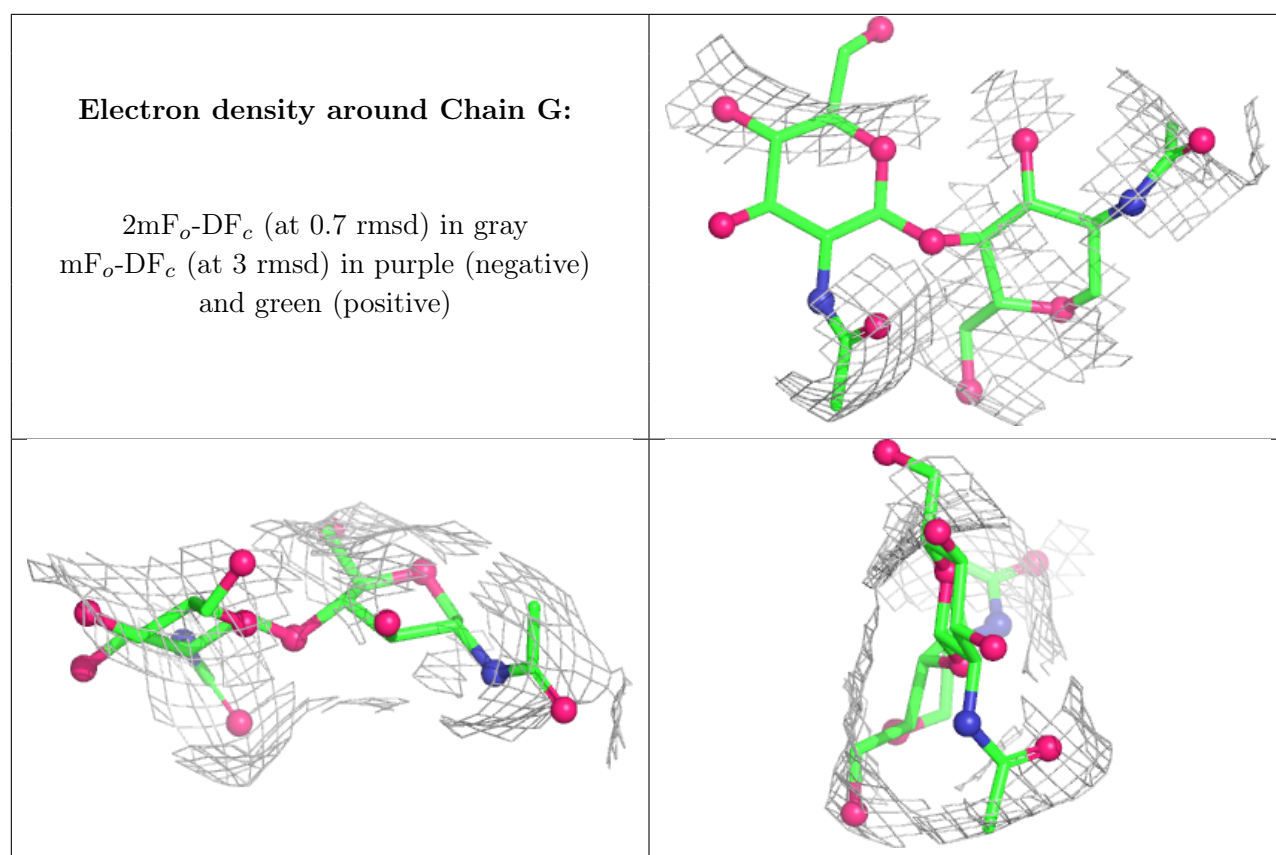
Electron density around Chain E:

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

**Electron density around Chain F:**

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





6.4 Ligands [i](#)

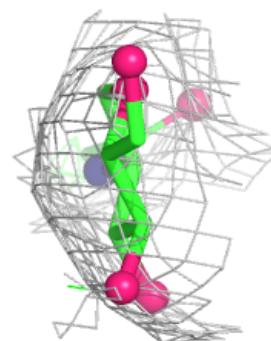
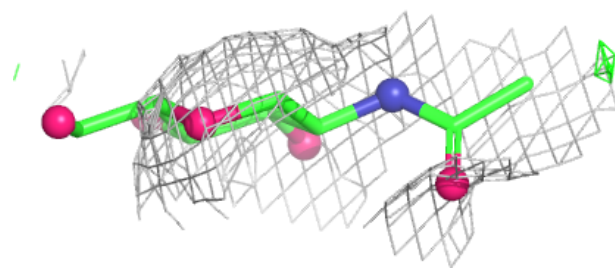
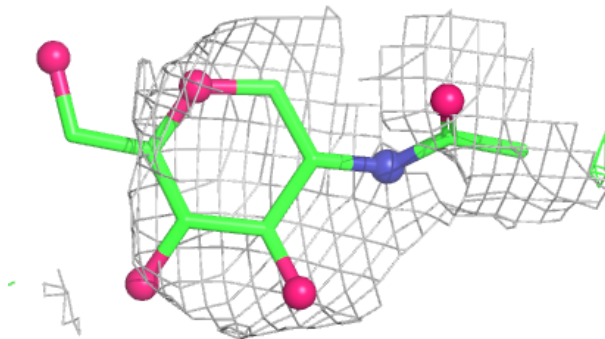
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	NAG	B	501	14/15	0.11	0.11	172,188,204,213	0
5	CA	A	2002	1/1	0.97	0.05	78,78,78,78	0
5	CA	A	2001	1/1	0.97	0.05	100,100,100,100	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.

Electron density around NAG B 501:

$2mF_o-DF_c$ (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.