



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 09:21 AM UTC

PDB ID : 7G3O / pdb_00007g3o
Title : Crystal Structure of rat Autotaxin in complex with 1-[2-(2,3-dihydro-1H-inden-2-ylamino)-5,7-dihydropyrrolo[3,4-d]pyrimidin-6-yl]-2-[2-(1H-triazol-5-yl)ethoxy]ethanone, i.e. SMILES c12c(ccc1)CC(C2)Nc1ncc2c(n1)CN(C2)C(=O)C COCCC1=CN=NN1 with IC50=0.0017376 microM
Authors : Stihle, M.; Benz, J.; Hunziker, D.; Pinard, E.; Rudolph, M.G.
Deposited on : 2023-06-05
Resolution : 1.60 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](#) ①) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (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

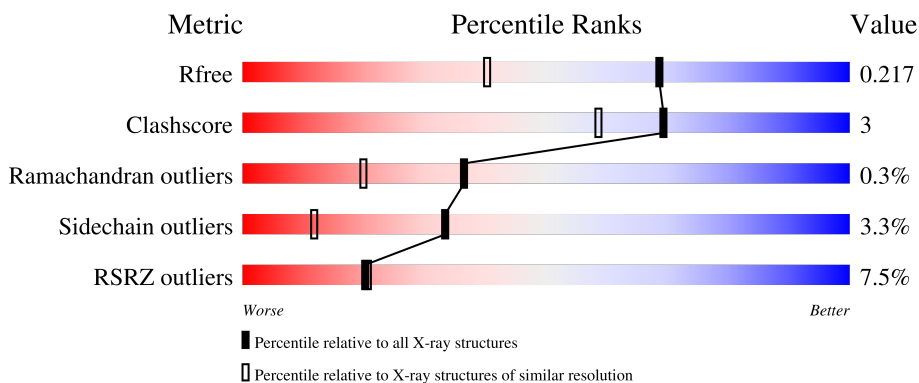
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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	4673 (1.60-1.60)
Clashscore	190562	4931 (1.60-1.60)
Ramachandran outliers	187476	4831 (1.60-1.60)
Sidechain outliers	187428	4830 (1.60-1.60)
RSRZ outliers	180081	4672 (1.60-1.60)

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	846	
2	B	8	

2 Entry composition i

There are 9 unique types of molecules in this entry. The entry contains 7409 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.

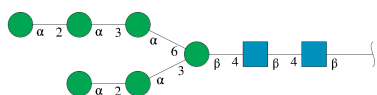
- Molecule 1 is a protein called Isoform 2 of Ectonucleotide pyrophosphatase/phosphodiesterase family member 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	799	6636	4218	1136	1228	54	0	31	0

There are 14 discrepancies between the modelled and reference sequences:

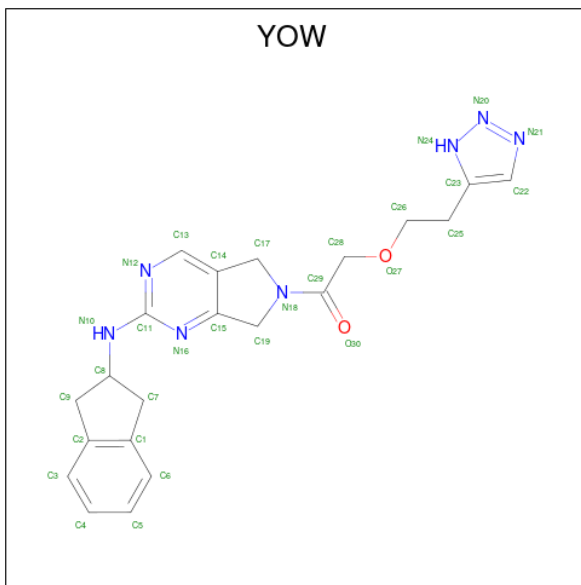
Chain	Residue	Modelled	Actual	Comment	Reference
A	53	ALA	ASN	engineered mutation	UNP Q64610
A	410	ALA	ASN	engineered mutation	UNP Q64610
A	591	THR	ARG	engineered mutation	UNP Q64610
A	863	GLY	-	expression tag	UNP Q64610
A	864	GLY	-	expression tag	UNP Q64610
A	865	ARG	-	expression tag	UNP Q64610
A	866	HIS	-	expression tag	UNP Q64610
A	867	HIS	-	expression tag	UNP Q64610
A	868	HIS	-	expression tag	UNP Q64610
A	869	HIS	-	expression tag	UNP Q64610
A	870	HIS	-	expression tag	UNP Q64610
A	871	HIS	-	expression tag	UNP Q64610
A	872	HIS	-	expression tag	UNP Q64610
A	873	HIS	-	expression tag	UNP Q64610

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[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	8	94	52	2	40	0	0	0

- Molecule 3 is 1-{2-[(2,3-dihydro-1H-inden-2-yl)amino]-5,7-dihydro-6H-pyrrolo[3,4-d]pyrimidin-6-yl}-2-[2-(1H-1,2,3-triazol-5-yl)ethoxy]ethan-1-one (CCD ID: YOW) (formula: C₂₁H₂₃N₇O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	60	42	14	4	0	1

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
4	A	1	1	1	0	0

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

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

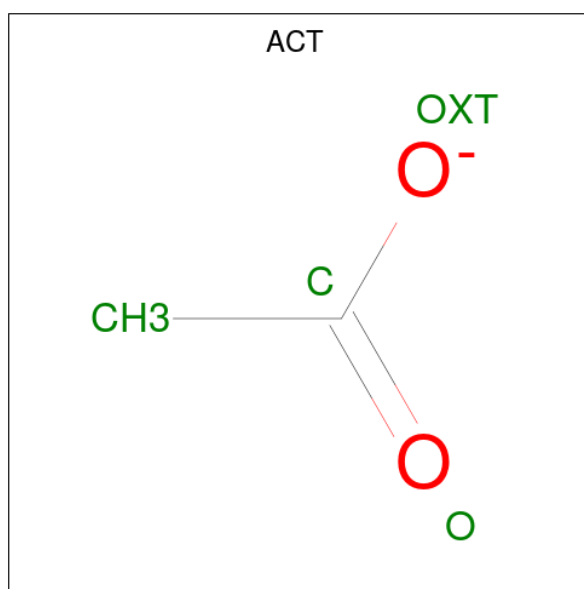
- Molecule 6 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total Na 1 1	0	0

- Molecule 7 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total K 1 1	0	0

- Molecule 8 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



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

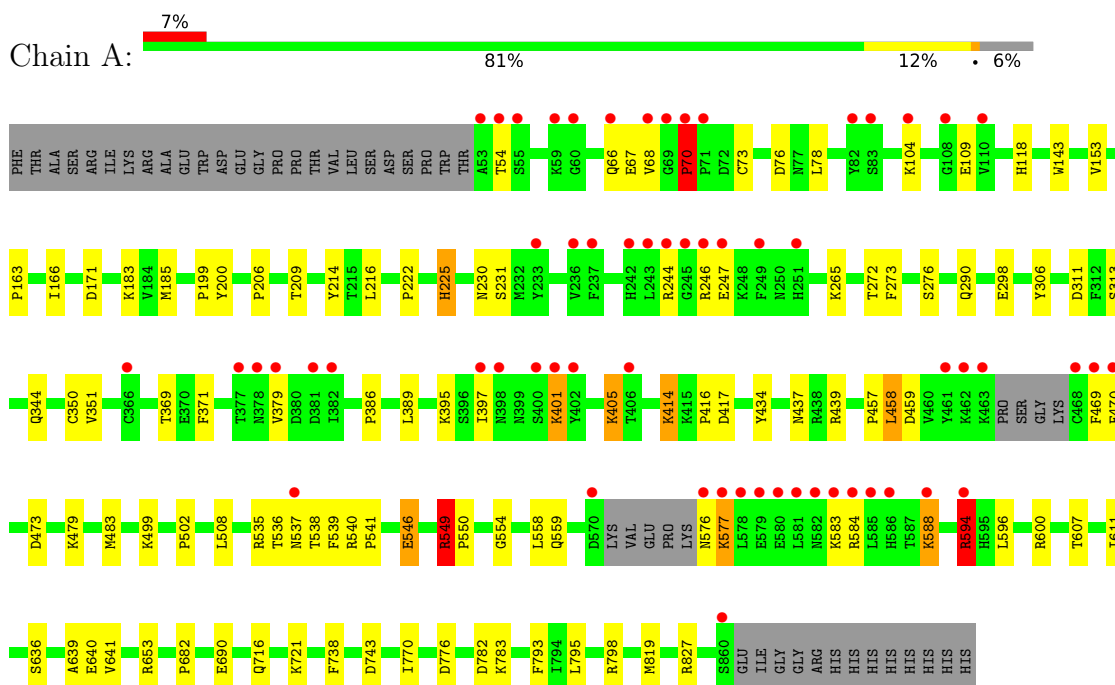
- Molecule 9 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	598	Total O 602 602	0	5

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: Isoform 2 of Ectonucleotide pyrophosphatase/phosphodiesterase family member 2



- Molecule 2: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	83.94Å 91.59Å 120.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	72.87 – 1.60 72.87 – 1.60	Depositor EDS
% Data completeness (in resolution range)	75.6 (72.87-1.60) 75.8 (72.87-1.60)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.02 (at 1.60Å)	Xtrriage
Refinement program	REFMAC 5.8.0222	Depositor
R, R_{free}	0.169 , 0.209 0.180 , 0.217	Depositor DCC
R_{free} test set	4744 reflections (3.86%)	wwPDB-VP
Wilson B-factor (Å ²)	19.5	Xtrriage
Anisotropy	0.034	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 31.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7409	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.36% 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: ACT, YOW, BMA, ZN, NA, MAN, K, 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	1.20	29/6889 (0.4%)	1.18	14/9336 (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	7

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	273	PHE	N-CA	8.61	1.57	1.46
1	A	546	GLU	CD-OE1	8.23	1.41	1.25
1	A	369	THR	N-CA	-6.69	1.37	1.46
1	A	231	SER	N-CA	6.65	1.54	1.45
1	A	216	LEU	C-O	-6.57	1.16	1.24
1	A	265	LYS	C-O	-6.33	1.16	1.24
1	A	76	ASP	N-CA	6.19	1.53	1.45
1	A	690	GLU	C-O	-6.09	1.16	1.24
1	A	143	TRP	C-O	-6.02	1.17	1.24
1	A	554	GLY	C-O	-5.92	1.18	1.24
1	A	437	ASN	C-O	-5.76	1.16	1.23
1	A	738	PHE	N-CA	5.62	1.53	1.46
1	A	276	SER	N-CA	5.58	1.52	1.46
1	A	118	HIS	CE1-NE2	5.57	1.38	1.32
1	A	782	ASP	C-O	-5.56	1.16	1.24
1	A	770	ILE	N-CA	-5.51	1.39	1.46
1	A	247	GLU	N-CA	5.48	1.52	1.46
1	A	559	GLN	C-O	5.47	1.30	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	153	VAL	N-CA	-5.43	1.40	1.46
1	A	298	GLU	N-CA	5.33	1.53	1.45
1	A	214	TYR	N-CA	-5.30	1.39	1.46
1	A	290	GLN	N-CA	5.28	1.52	1.46
1	A	313	SER	N-CA	-5.20	1.40	1.46
1	A	185	MET	N-CA	5.18	1.52	1.46
1	A	558	LEU	C-O	-5.17	1.17	1.23
1	A	459	ASP	N-CA	5.12	1.52	1.46
1	A	502	PRO	C-O	5.12	1.29	1.23
1	A	776	ASP	N-CA	5.10	1.53	1.46
1	A	607	THR	C-O	-5.04	1.18	1.23

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	344	GLN	CB-CA-C	-7.24	98.77	110.79
1	A	546	GLU	CB-CG-CD	7.02	124.53	112.60
1	A	225	HIS	CA-CB-CG	6.44	120.24	113.80
1	A	209	THR	CA-CB-OG1	-5.81	100.89	109.60
1	A	827	ARG	CG-CD-NE	-5.75	99.35	112.00
1	A	272	THR	CB-CA-C	5.72	119.04	109.89
1	A	200	TYR	OH-CZ-CE2	-5.70	102.81	119.90
1	A	743	ASP	CA-CB-CG	5.50	118.10	112.60
1	A	70	PRO	C-N-CD	-5.41	108.70	120.60
1	A	200	TYR	CE1-CZ-OH	5.41	136.13	119.90
1	A	473	ASP	CA-CB-CG	5.32	117.92	112.60
1	A	416	PRO	CA-C-N	-5.19	114.92	122.86
1	A	416	PRO	C-N-CA	-5.19	114.92	122.86
1	A	311	ASP	CA-CB-CG	5.10	117.70	112.60

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	246	ARG	Sidechain
1	A	439	ARG	Sidechain
1	A	549	ARG	Sidechain
1	A	584	ARG	Sidechain
1	A	594	ARG	Sidechain
1	A	653	ARG	Sidechain
1	A	798	ARG	Sidechain

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	6636	0	6444	46	0
2	B	94	0	79	0	0
3	A	60	0	0	0	0
4	A	1	0	0	0	0
5	A	2	0	0	1	0
6	A	1	0	0	0	0
7	A	1	0	0	0	0
8	A	12	0	9	0	0
9	A	602	0	0	3	0
All	All	7409	0	6532	46	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 3.

All (46) 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:539[A]:PHE:O	1:A:541[A]:PRO:HD3	1.65	0.96
1:A:549:ARG:HH11	1:A:549:ARG:HB3	1.40	0.87
1:A:594:ARG:HH21	1:A:594:ARG:CG	2.03	0.72
1:A:230:ASN:ND2	9:A:1004:HOH:O	2.00	0.65
1:A:549:ARG:HH11	1:A:549:ARG:CB	2.10	0.64
1:A:171[B]:ASP:OD1	5:A:903:CA:CA	1.74	0.62
1:A:641:VAL:HG23	1:A:721[B]:LYS:HD3	1.88	0.56
1:A:539[A]:PHE:O	1:A:541[A]:PRO:CD	2.48	0.54
1:A:371:PHE:CE1	1:A:457:PRO:HA	2.42	0.54
1:A:54:THR:HA	1:A:73:CYS:HB3	1.91	0.53
1:A:538[B]:THR:O	1:A:538[B]:THR:CG2	2.54	0.53
1:A:594:ARG:HH21	1:A:594:ARG:HG3	1.74	0.53
1:A:538[B]:THR:O	1:A:538[B]:THR:HG23	2.09	0.51
1:A:458:LEU:C	1:A:458:LEU:HD12	2.36	0.51
1:A:594:ARG:NH1	1:A:636:SER:HB3	2.26	0.51
1:A:546:GLU:OE2	1:A:600[B]:ARG:NH1	2.43	0.50
1:A:594:ARG:HH21	1:A:594:ARG:HG2	1.73	0.50
1:A:401:LYS:CE	1:A:401:LYS:HA	2.42	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:537[B]:ASN:O	1:A:538[B]:THR:HB	2.11	0.50
1:A:163:PRO:HB3	1:A:350:CYS:O	2.12	0.49
1:A:793:PHE:CE2	1:A:819:MET:HE3	2.47	0.48
1:A:171[A]:ASP:OD2	1:A:306:TYR:OH	2.29	0.48
1:A:68:VAL:O	1:A:70:PRO:HD3	2.15	0.47
1:A:588:LYS:HA	1:A:588:LYS:HE3	1.96	0.47
1:A:470:PHE:C	1:A:470:PHE:CD1	2.95	0.44
1:A:596:LEU:HD21	1:A:600[B]:ARG:HB3	1.98	0.44
1:A:682:PRO:HB3	1:A:716:GLN:HB3	2.00	0.43
1:A:540[A]:ARG:HD3	1:A:540[A]:ARG:HA	1.65	0.43
1:A:639:ALA:HB2	9:A:1314:HOH:O	2.18	0.43
1:A:537[B]:ASN:HD21	1:A:540[B]:ARG:HH21	1.67	0.43
1:A:479[A]:LYS:HE2	9:A:1132:HOH:O	2.18	0.43
1:A:535:ARG:HG2	1:A:536[A]:THR:HG23	1.99	0.42
1:A:546:GLU:CD	1:A:600[B]:ARG:HH22	2.27	0.42
1:A:576:ASN:OD1	1:A:577:LYS:N	2.51	0.42
1:A:414:LYS:HD3	1:A:414:LYS:HA	1.74	0.42
1:A:222:PRO:HA	1:A:225:HIS:CE1	2.55	0.41
1:A:78:LEU:HD23	1:A:78:LEU:HA	1.83	0.41
1:A:206:PRO:HD3	1:A:434:TYR:CE1	2.56	0.41
1:A:793:PHE:CD1	1:A:795:LEU:HG	2.55	0.41
1:A:483:MET:HE2	1:A:483:MET:HA	2.02	0.41
1:A:401:LYS:HA	1:A:401:LYS:HE3	2.02	0.41
1:A:508[B]:LEU:HD12	1:A:508[B]:LEU:HA	1.83	0.41
1:A:166:ILE:HD12	1:A:351:VAL:HG11	2.02	0.41
1:A:199:PRO:HG3	1:A:499:LYS:HE3	2.03	0.40
1:A:550:PRO:HB2	1:A:611:ILE:HG12	2.03	0.40
1:A:405:LYS:HE2	1:A:405:LYS:HB3	1.97	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	824/846 (97%)	795 (96%)	27 (3%)	2 (0%)	43 24

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	109	GLU
1	A	70	PRO

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	754/765 (99%)	730 (97%)	24 (3%)	34 12

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	66	GLN
1	A	67	GLU
1	A	70	PRO
1	A	104	LYS
1	A	183	LYS
1	A	244	ARG
1	A	379	VAL
1	A	386	PRO
1	A	389	LEU
1	A	395	LYS
1	A	397	ILE
1	A	401	LYS
1	A	405	LYS
1	A	414	LYS
1	A	417	ASP
1	A	458	LEU
1	A	469	PHE
1	A	549	ARG
1	A	577	LYS

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Mol	Chain	Res	Type
1	A	583	LYS
1	A	588	LYS
1	A	594	ARG
1	A	640	GLU
1	A	783	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	134	GLN
1	A	257	GLN
1	A	436	ASN
1	A	471	GLN

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](#)

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
2	NAG	B	1	2,1	14,14,15	1.37	2 (14%)	17,19,21	1.35	1 (5%)
2	NAG	B	2	2	14,14,15	1.76	3 (21%)	17,19,21	3.26	5 (29%)
2	BMA	B	3	2	11,11,12	1.54	3 (27%)	15,15,17	2.77	7 (46%)
2	MAN	B	4	2	11,11,12	1.69	3 (27%)	15,15,17	2.32	4 (26%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	MAN	B	5	2	11,11,12	1.38	1 (9%)	15,15,17	2.00	5 (33%)
2	MAN	B	6	2	11,11,12	1.60	3 (27%)	15,15,17	1.51	3 (20%)
2	MAN	B	7	2	11,11,12	1.43	2 (18%)	15,15,17	2.43	6 (40%)
2	MAN	B	8	2	11,11,12	1.49	1 (9%)	15,15,17	1.95	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	NAG	B	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	0/6/23/26	0/1/1/1
2	BMA	B	3	2	-	0/2/19/22	0/1/1/1
2	MAN	B	4	2	-	1/2/19/22	0/1/1/1
2	MAN	B	5	2	-	1/2/19/22	0/1/1/1
2	MAN	B	6	2	-	0/2/19/22	0/1/1/1
2	MAN	B	7	2	-	0/2/19/22	0/1/1/1
2	MAN	B	8	2	-	0/2/19/22	0/1/1/1

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2	NAG	C8-C7	3.84	1.58	1.50
2	B	8	MAN	C2-C3	3.49	1.57	1.52
2	B	2	NAG	C6-C5	3.27	1.62	1.51
2	B	3	BMA	C2-C3	3.21	1.57	1.52
2	B	1	NAG	O5-C1	3.13	1.49	1.43
2	B	4	MAN	C2-C3	3.00	1.57	1.52
2	B	6	MAN	O5-C1	2.87	1.48	1.43
2	B	5	MAN	C2-C3	2.58	1.56	1.52
2	B	6	MAN	O5-C5	2.58	1.48	1.43
2	B	7	MAN	C1-C2	2.57	1.58	1.52
2	B	7	MAN	O2-C2	2.40	1.48	1.43
2	B	2	NAG	O6-C6	2.34	1.52	1.42
2	B	1	NAG	C1-C2	-2.17	1.49	1.52
2	B	4	MAN	O5-C5	2.16	1.47	1.43
2	B	3	BMA	O3-C3	2.15	1.48	1.43
2	B	3	BMA	O5-C1	2.09	1.47	1.43
2	B	4	MAN	O3-C3	2.07	1.48	1.43
2	B	6	MAN	C4-C5	2.03	1.57	1.53

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	NAG	C1-O5-C5	10.89	126.79	112.19
2	B	3	BMA	C1-O5-C5	8.39	123.43	112.19
2	B	4	MAN	C1-O5-C5	5.94	120.15	112.19
2	B	7	MAN	C1-O5-C5	5.31	119.30	112.19
2	B	8	MAN	O3-C3-C2	5.26	120.79	110.05
2	B	2	NAG	C2-N2-C7	4.16	128.47	122.90
2	B	7	MAN	O2-C2-C1	4.02	118.42	109.22
2	B	5	MAN	O6-C6-C5	-3.98	97.77	111.33
2	B	4	MAN	O3-C3-C2	3.90	118.02	110.05
2	B	7	MAN	O5-C5-C4	3.83	120.15	110.83
2	B	2	NAG	C3-C4-C5	3.79	117.11	110.23
2	B	6	MAN	O5-C5-C6	3.41	114.31	107.66
2	B	7	MAN	C3-C4-C5	3.22	116.07	110.23
2	B	1	NAG	O5-C1-C2	-3.16	106.40	111.29
2	B	4	MAN	O4-C4-C5	3.09	116.93	109.32
2	B	5	MAN	O5-C5-C4	2.90	117.89	110.83
2	B	3	BMA	O2-C2-C3	2.66	115.67	110.15
2	B	3	BMA	O6-C6-C5	-2.56	102.63	111.33
2	B	5	MAN	O4-C4-C5	2.55	115.60	109.32
2	B	6	MAN	C1-O5-C5	2.52	115.56	112.19
2	B	3	BMA	C1-C2-C3	2.51	113.31	109.64
2	B	2	NAG	O7-C7-C8	-2.49	117.63	122.05
2	B	2	NAG	O5-C5-C6	2.47	112.48	107.66
2	B	4	MAN	O4-C4-C3	-2.44	104.62	110.38
2	B	7	MAN	C6-C5-C4	-2.44	107.03	113.02
2	B	7	MAN	O2-C2-C3	-2.36	105.27	110.15
2	B	8	MAN	O5-C5-C6	2.32	112.18	107.66
2	B	8	MAN	O5-C5-C4	-2.30	105.24	110.83
2	B	5	MAN	O5-C5-C6	-2.30	103.20	107.66
2	B	3	BMA	O5-C1-C2	2.20	116.05	110.79
2	B	5	MAN	O4-C4-C3	-2.17	105.26	110.38
2	B	3	BMA	O2-C2-C1	-2.12	104.36	109.22
2	B	6	MAN	O2-C2-C3	-2.06	105.89	110.15
2	B	3	BMA	O4-C4-C5	-2.03	104.32	109.32

There are no chirality outliers.

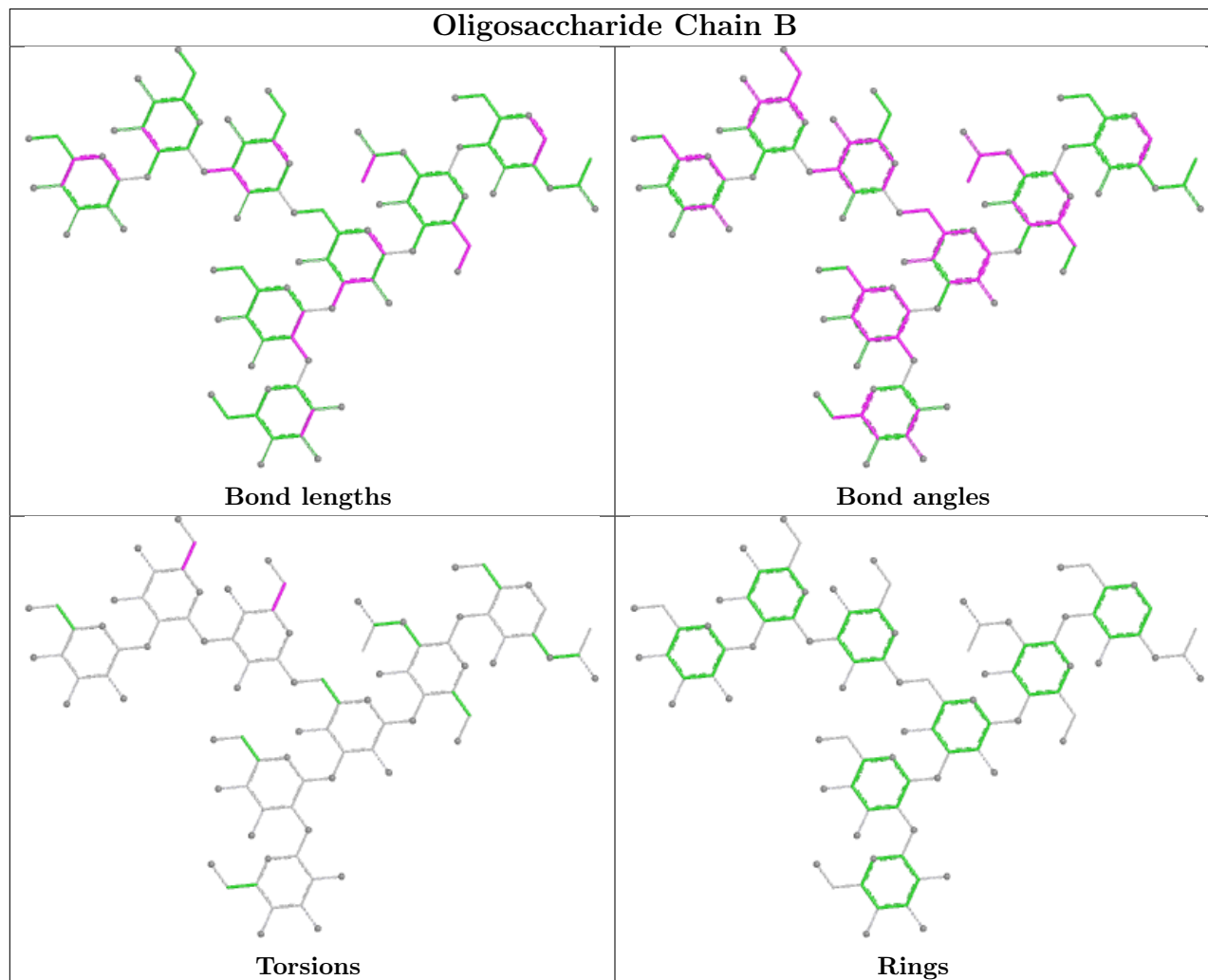
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	5	MAN	C4-C5-C6-O6
2	B	4	MAN	O5-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](#)

Of 10 ligands modelled in this entry, 5 are monoatomic - leaving 5 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
8	ACT	A	908	7	3,3,3	1.20	1 (33%)	3,3,3	2.24	1 (33%)
3	YOW	A	901[A]	4	33,34,34	2.95	13 (39%)	35,47,47	1.86	9 (25%)
8	ACT	A	907	-	3,3,3	1.18	0	3,3,3	0.24	0
3	YOW	A	901[B]	4	33,34,34	2.31	12 (36%)	35,47,47	1.91	7 (20%)
8	ACT	A	909	-	3,3,3	0.88	0	3,3,3	0.35	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	YOW	A	901[A]	4	-	3/15/31/31	0/5/5/5
3	YOW	A	901[B]	4	-	5/15/31/31	0/5/5/5

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	901[A]	YOW	C23-N24	9.65	1.48	1.35
3	A	901[A]	YOW	C19-N18	5.81	1.55	1.46
3	A	901[A]	YOW	N24-N20	5.78	1.42	1.35
3	A	901[B]	YOW	C19-N18	4.88	1.53	1.46
3	A	901[A]	YOW	C11-N10	4.61	1.40	1.34
3	A	901[B]	YOW	C5-C6	4.56	1.46	1.38
3	A	901[A]	YOW	C5-C6	4.56	1.46	1.38
3	A	901[B]	YOW	C22-N21	4.42	1.44	1.35
3	A	901[B]	YOW	C11-N10	4.35	1.39	1.34
3	A	901[B]	YOW	C22-C23	4.01	1.44	1.35
3	A	901[A]	YOW	C22-C23	3.48	1.43	1.35
3	A	901[B]	YOW	C23-N24	3.44	1.39	1.35
3	A	901[A]	YOW	C22-N21	3.34	1.42	1.35
3	A	901[B]	YOW	C11-N12	3.29	1.39	1.34
3	A	901[A]	YOW	O27-C28	3.21	1.50	1.42
3	A	901[A]	YOW	C11-N12	3.21	1.39	1.34
3	A	901[B]	YOW	C28-C29	-3.03	1.45	1.52
3	A	901[B]	YOW	C25-C26	2.69	1.59	1.51
3	A	901[A]	YOW	C29-N18	2.64	1.40	1.35
3	A	901[A]	YOW	C28-C29	-2.30	1.47	1.52
3	A	901[A]	YOW	C7-C8	2.11	1.56	1.53
3	A	901[B]	YOW	C7-C8	2.11	1.56	1.53
8	A	908	ACT	CH3-C	2.08	1.57	1.49

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	901[B]	YOW	N21-N20	-2.03	1.28	1.31
3	A	901[A]	YOW	C5-C4	2.01	1.42	1.38
3	A	901[B]	YOW	C5-C4	2.01	1.42	1.38

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	901[B]	YOW	C14-C17-N18	-6.25	99.48	102.42
3	A	901[A]	YOW	C14-C17-N18	-5.34	99.91	102.42
3	A	901[B]	YOW	O27-C28-C29	-4.00	100.16	110.37
3	A	901[B]	YOW	C9-C2-C1	3.69	112.98	110.50
3	A	901[A]	YOW	C9-C2-C1	3.69	112.98	110.50
3	A	901[A]	YOW	O27-C26-C25	-3.54	98.39	109.53
3	A	901[A]	YOW	C2-C9-C8	-3.46	99.47	102.89
3	A	901[B]	YOW	C2-C9-C8	-3.43	99.51	102.89
3	A	901[B]	YOW	C22-C23-N24	-3.20	101.88	105.50
8	A	908	ACT	OXT-C-CH3	3.13	128.16	115.05
3	A	901[A]	YOW	C23-N24-N20	-3.09	106.63	112.33
3	A	901[A]	YOW	C22-N21-N20	2.13	111.11	108.83
3	A	901[A]	YOW	C6-C1-C2	2.11	122.53	120.12
3	A	901[B]	YOW	C6-C1-C2	2.11	122.53	120.12
3	A	901[A]	YOW	C1-C7-C8	-2.10	100.82	102.89
3	A	901[B]	YOW	C1-C7-C8	-2.10	100.82	102.89
3	A	901[A]	YOW	C5-C6-C1	-2.01	117.94	120.88

There are no chirality outliers.

All (8) torsion outliers are listed below:

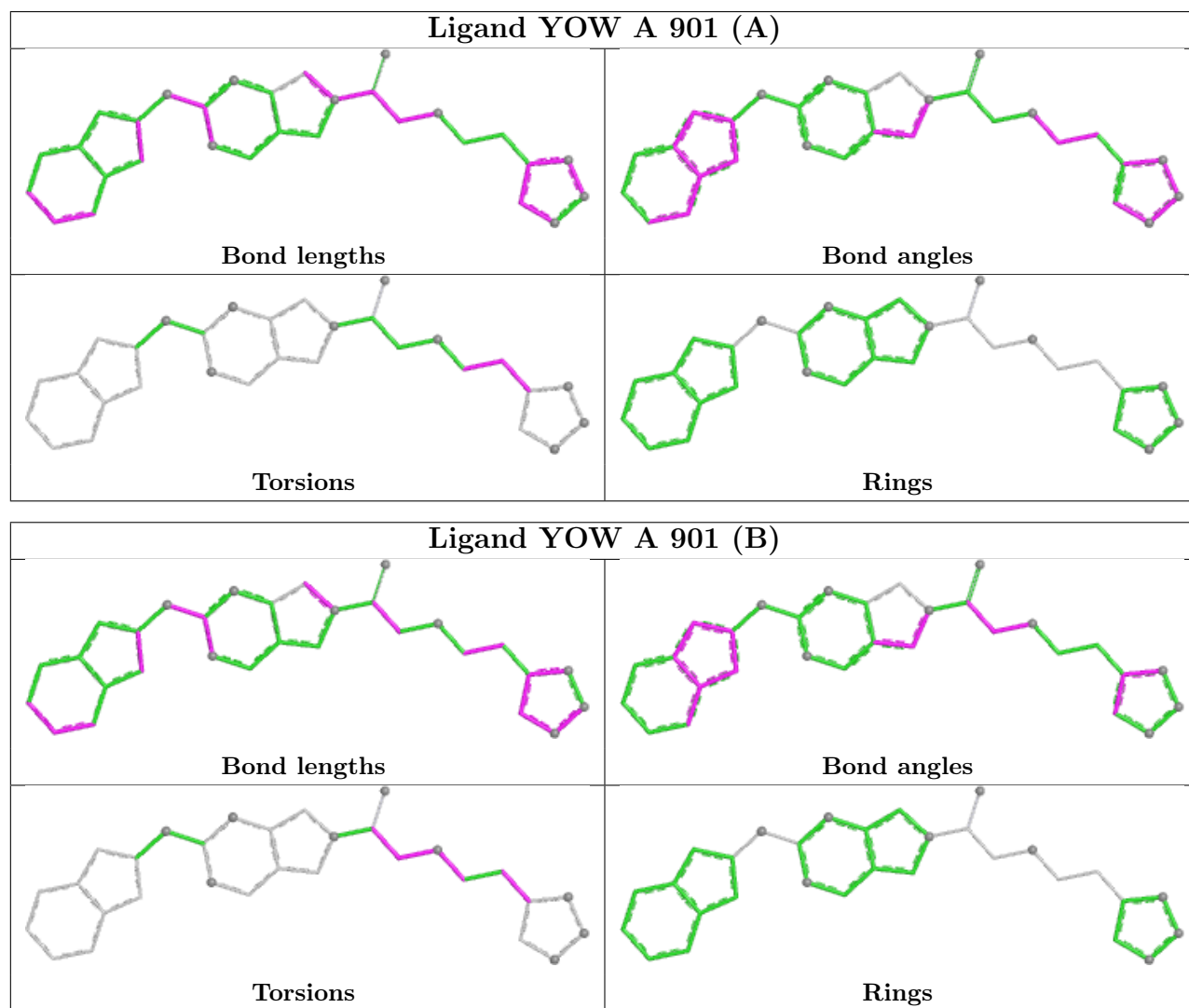
Mol	Chain	Res	Type	Atoms
3	A	901[A]	YOW	C23-C25-C26-O27
3	A	901[B]	YOW	C22-C23-C25-C26
3	A	901[B]	YOW	O27-C28-C29-N18
3	A	901[A]	YOW	N24-C23-C25-C26
3	A	901[B]	YOW	C29-C28-O27-C26
3	A	901[B]	YOW	O27-C28-C29-O30
3	A	901[B]	YOW	C25-C26-O27-C28
3	A	901[A]	YOW	C22-C23-C25-C26

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

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	799/846 (94%)	0.16	60 (7%) 20 20	9, 22, 60, 125	31 (3%)

All (60) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	578	LEU	6.8
1	A	469	PHE	6.5
1	A	581	LEU	5.4
1	A	71	PRO	5.2
1	A	70	PRO	5.2
1	A	468	CYS	5.1
1	A	463	LYS	4.6
1	A	53	ALA	4.2
1	A	397	ILE	4.1
1	A	54	THR	4.1
1	A	585	LEU	3.9
1	A	237[A]	PHE	3.9
1	A	577	LYS	3.8
1	A	249	PHE	3.8
1	A	860	SER	3.7
1	A	378	ASN	3.6
1	A	245	GLY	3.6
1	A	402	TYR	3.6
1	A	68	VAL	3.4
1	A	242	HIS	3.3
1	A	243	LEU	3.3
1	A	579	GLU	3.2
1	A	461	TYR	3.2
1	A	570	ASP	3.2
1	A	59	LYS	3.1
1	A	580	GLU	3.1
1	A	55	SER	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	583	LYS	2.9
1	A	400	SER	2.8
1	A	247	GLU	2.7
1	A	398	ASN	2.7
1	A	537[A]	ASN	2.7
1	A	462	LYS	2.7
1	A	251	HIS	2.6
1	A	582	ASN	2.6
1	A	366	CYS	2.6
1	A	82	TYR	2.6
1	A	576	ASN	2.6
1	A	584	ARG	2.6
1	A	401	LYS	2.6
1	A	69	GLY	2.5
1	A	246	ARG	2.5
1	A	381	ASP	2.5
1	A	377	THR	2.5
1	A	470	PHE	2.4
1	A	110	VAL	2.4
1	A	60	GLY	2.3
1	A	244	ARG	2.3
1	A	379	VAL	2.3
1	A	83	SER	2.2
1	A	236	VAL	2.2
1	A	66	GLN	2.2
1	A	108	GLY	2.2
1	A	233	TYR	2.2
1	A	406	THR	2.1
1	A	586	HIS	2.1
1	A	104	LYS	2.1
1	A	588	LYS	2.0
1	A	382	ILE	2.0
1	A	594	ARG	2.0

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

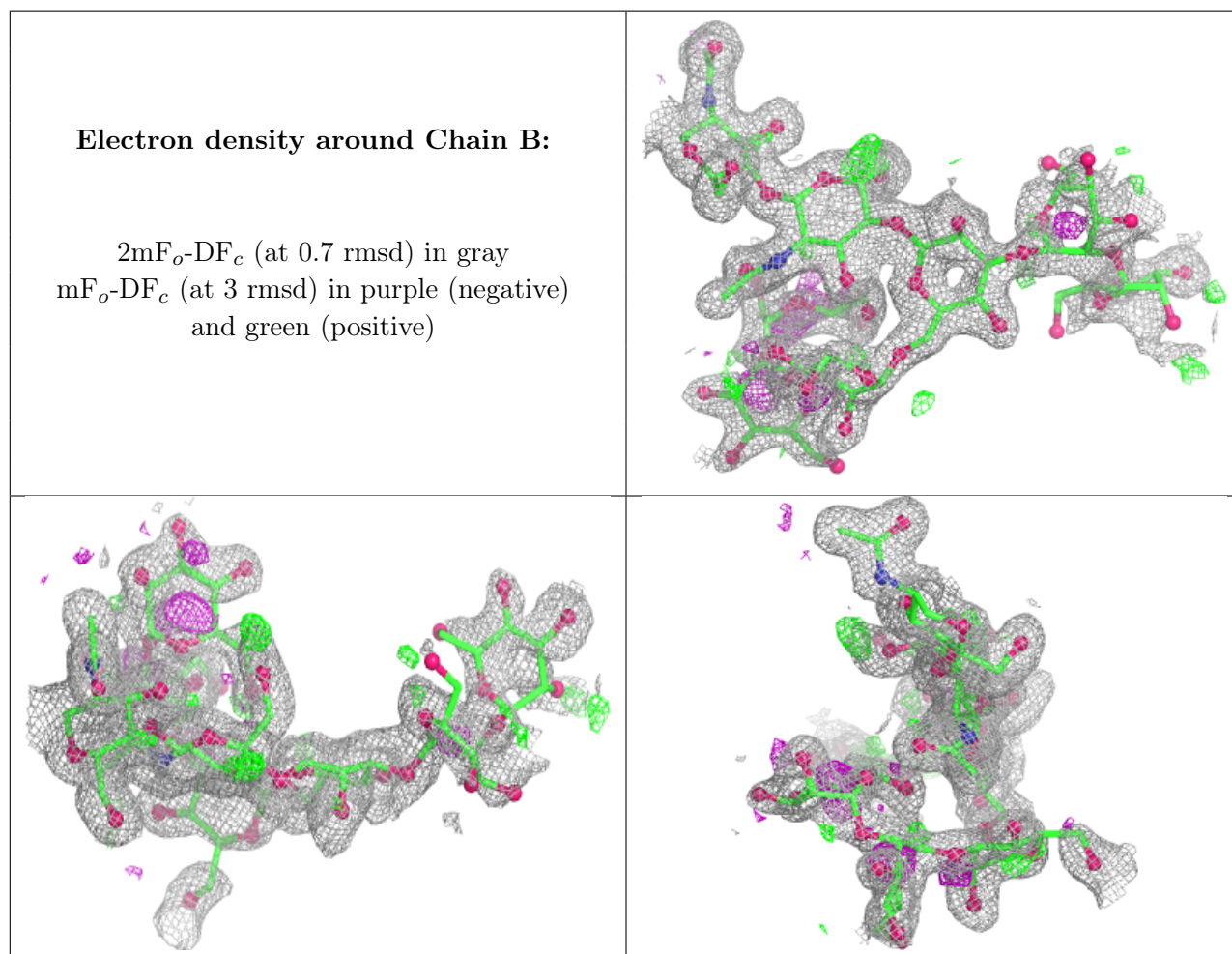
There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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	7	11/12	0.39	0.19	81,88,95,95	0
2	MAN	B	8	11/12	0.65	0.17	35,83,92,94	0
2	BMA	B	3	11/12	0.70	0.14	51,60,69,75	0
2	MAN	B	4	11/12	0.72	0.15	50,60,65,65	0
2	MAN	B	5	11/12	0.79	0.17	38,53,55,64	0
2	MAN	B	6	11/12	0.85	0.19	35,46,53,54	0
2	NAG	B	2	14/15	0.88	0.11	23,28,37,48	0
2	NAG	B	1	14/15	0.97	0.05	12,14,18,20	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.

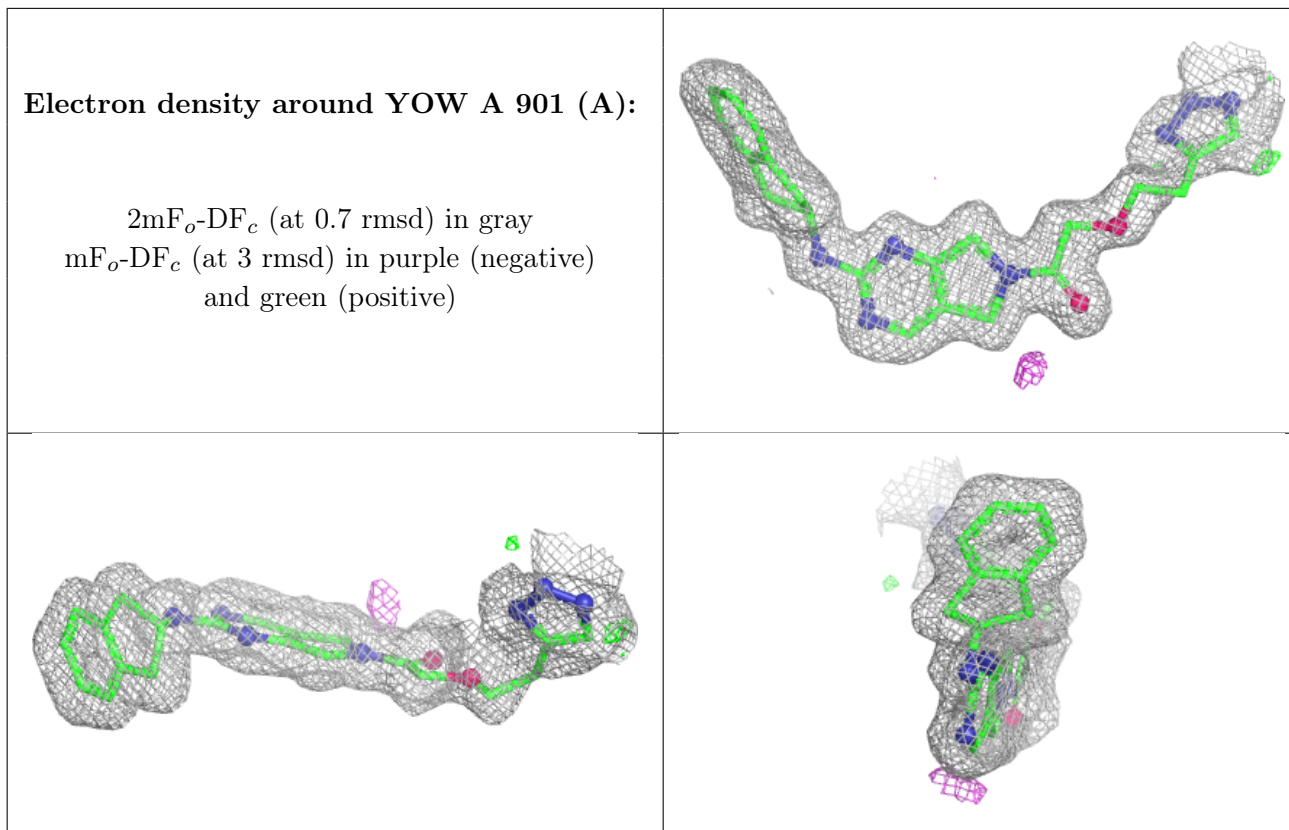


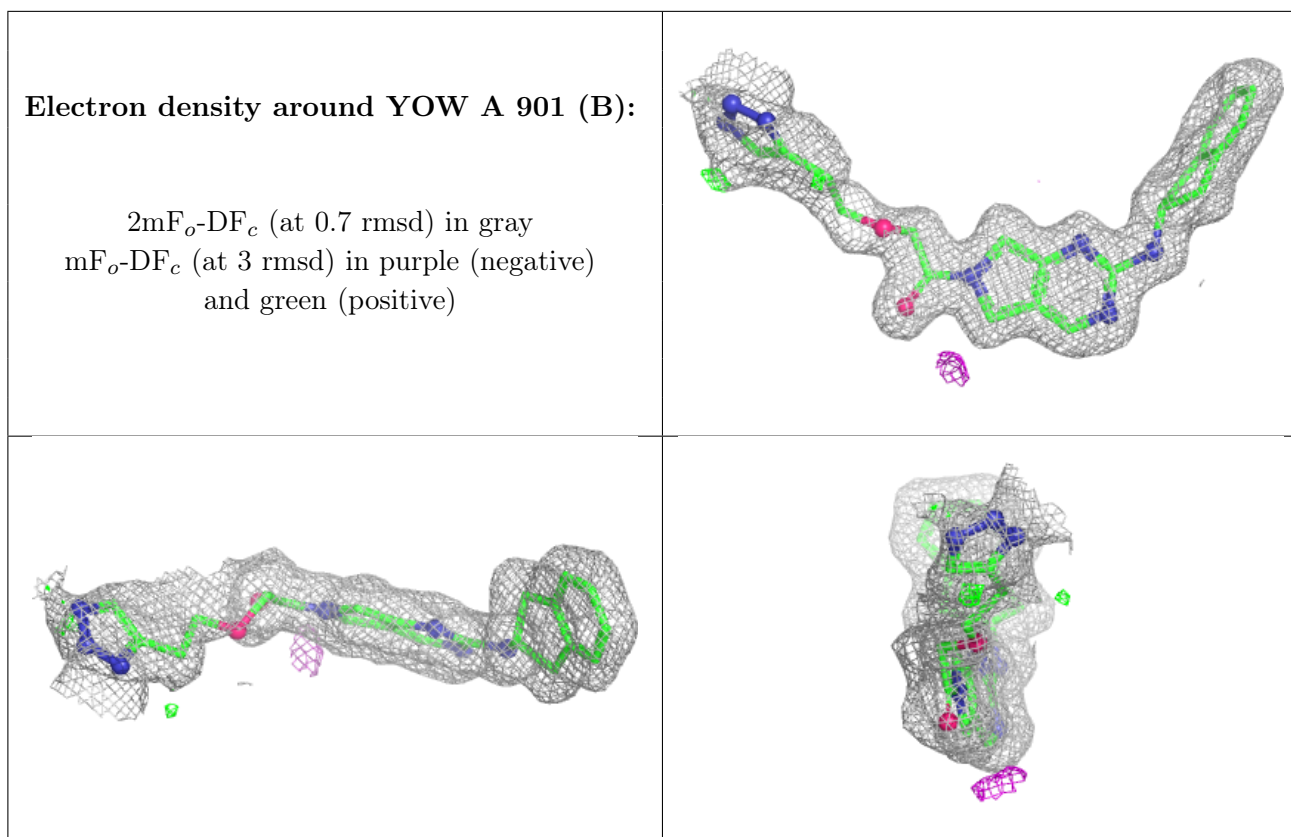
6.4 Ligands [i](#)

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
8	ACT	A	908	4/4	0.83	0.15	29,36,37,41	0
8	ACT	A	909	4/4	0.91	0.12	31,37,43,50	0
8	ACT	A	907	4/4	0.93	0.12	27,30,35,36	0
6	NA	A	904	1/1	0.94	0.09	28,28,28,28	0
3	YOW	A	901[A]	30/30	0.95	0.07	13,17,36,36	30
3	YOW	A	901[B]	30/30	0.95	0.07	13,19,43,45	30
7	K	A	906	1/1	0.98	0.05	22,22,22,22	0
5	CA	A	905	1/1	0.99	0.03	13,13,13,13	0
5	CA	A	903	1/1	0.99	0.09	28,28,28,28	0
4	ZN	A	902	1/1	1.00	0.01	18,18,18,18	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.