



## Full wwPDB X-ray Structure Validation Report

Dec 12, 2024 – 10:37 PM EST

PDB ID : 7G3U  
Title : Crystal Structure of rat Autotaxin in complex with 5-tert-butyl-2-chloro-4-[[1-methyl-5-[5-(oxetan-3-yl)-1,2-oxazol-3-yl]imidazol-2-yl]methoxy]benzotrile,  
i.e. SMILES c1c(c(cc(c1C(C)(C)C)OCC1=NC=C(N1C)C1=NOC(=C1)C1COC1)Cl)C#N with IC50=0.0167757 microM  
Authors : Stihle, M.; Benz, J.; Hunziker, D.; Mazunin, D.; Rudolph, M.G.  
Deposited on : 2023-06-05  
Resolution : 1.75 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](mailto: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>.

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The following versions of software and data (see [references](#) ①) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 1.21  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.004 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.40

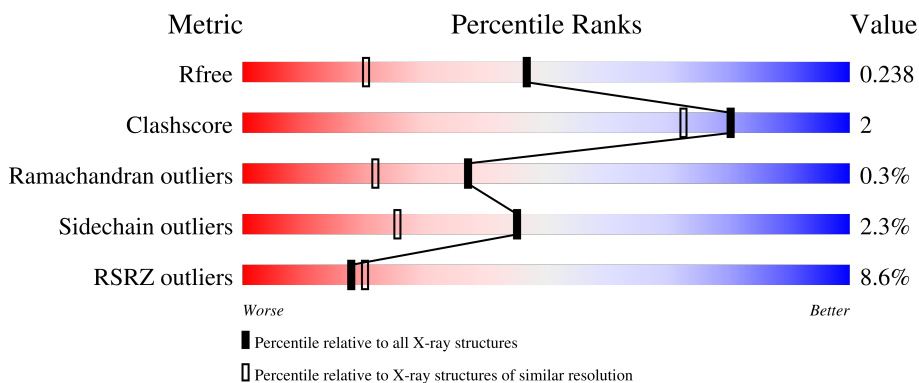
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.75 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))
$R_{free}$	164625	2888 (1.76-1.76)
Clashscore	180529	3097 (1.76-1.76)
Ramachandran outliers	177936	3072 (1.76-1.76)
Sidechain outliers	177891	3072 (1.76-1.76)
RSRZ outliers	164620	2887 (1.76-1.76)

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  $\geq 3$ , 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	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
7	CL	A	906	-	-	X	-



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	8	Total	C	N	O	0	0	0
			94	52	2	40			

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

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

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

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

- Molecule 6 is POTASSIUM ION (three-letter code: K) (formula: K).

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

- Molecule 7 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

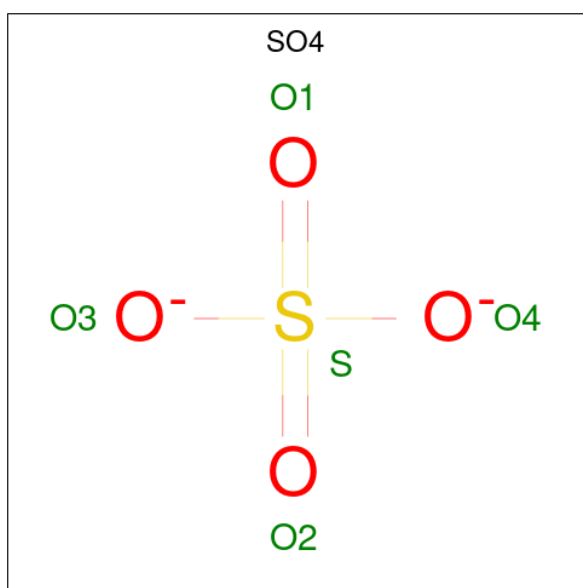
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	Cl	0	0
			1	1		

- Molecule 8 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



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

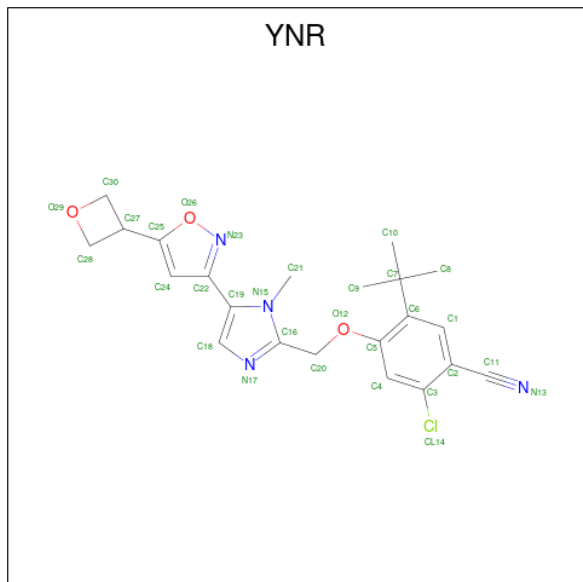
- Molecule 9 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

- Molecule 10 is 5-tert-butyl-2-chloro-4-((5M)-1-methyl-5-[5-(oxetan-3-yl)-1,2-oxazol-3-yl]-

1H-imidazol-2-yl}methoxy)benzonitrile (three-letter code: YNR) (formula: C<sub>22</sub>H<sub>23</sub>ClN<sub>4</sub>O<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	Cl	N			O
10	A	1	60	44	2	8	6	0	1

- Molecule 11 is water.

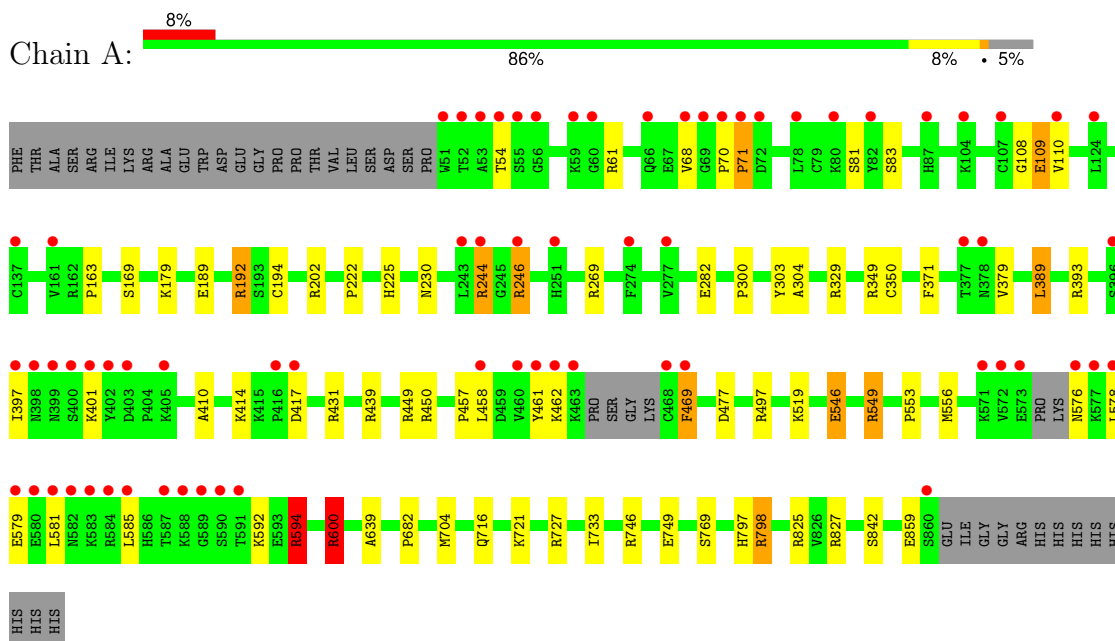
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	670	Total	O	0	0
			670	670		



### 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)]alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucofuranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucofuranose



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	84.53Å 92.59Å 121.14Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	69.32 – 1.75 69.32 – 1.75	Depositor EDS
% Data completeness (in resolution range)	77.2 (69.32-1.75) 77.2 (69.32-1.75)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.90 (at 1.75Å)	Xtrriage
Refinement program	REFMAC 5.8.0230	Depositor
R, $R_{free}$	0.184 , 0.232 0.195 , 0.238	Depositor DCC
$R_{free}$ test set	4925 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.8	Xtrriage
Anisotropy	0.053	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 33.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7431	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.44% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CA, SO4, NAG, MAN, CL, K, NA, ZN, YNR, ACT

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	0.88	4/6809 (0.1%)	0.93	14/9230 (0.2%)

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	12

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	546	GLU	CD-OE1	12.74	1.39	1.25
1	A	859	GLU	CD-OE1	7.04	1.33	1.25
1	A	282	GLU	CD-OE2	-5.23	1.19	1.25
1	A	189	GLU	CD-OE2	5.18	1.31	1.25

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	202	ARG	NE-CZ-NH2	-10.35	115.12	120.30
1	A	827	ARG	CG-CD-NE	-7.31	96.45	111.80
1	A	349	ARG	NE-CZ-NH1	-6.41	117.09	120.30
1	A	798	ARG	NE-CZ-NH2	-6.40	117.10	120.30
1	A	431	ARG	NE-CZ-NH2	-6.29	117.16	120.30
1	A	746	ARG	NE-CZ-NH1	-6.25	117.18	120.30
1	A	749	GLU	CB-CA-C	-6.19	98.01	110.40
1	A	439	ARG	NE-CZ-NH2	-5.73	117.44	120.30
1	A	192	ARG	NE-CZ-NH1	-5.72	117.44	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	194[A]	CYS	CA-CB-SG	-5.47	104.16	114.00
1	A	194[B]	CYS	CA-CB-SG	-5.47	104.16	114.00
1	A	798	ARG	NE-CZ-NH1	5.46	123.03	120.30
1	A	600	ARG	NE-CZ-NH2	-5.32	117.64	120.30
1	A	393	ARG	NE-CZ-NH2	-5.17	117.72	120.30

There are no chirality outliers.

All (12) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	192	ARG	Sidechain
1	A	244	ARG	Sidechain
1	A	246	ARG	Sidechain
1	A	329	ARG	Sidechain
1	A	469	PHE	Peptide
1	A	497	ARG	Sidechain
1	A	549	ARG	Sidechain
1	A	594	ARG	Sidechain
1	A	600	ARG	Sidechain
1	A	71	PRO	Peptide
1	A	798	ARG	Sidechain
1	A	825	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	6588	0	6370	33	0
2	B	94	0	79	0	0
3	A	1	0	0	0	0
4	A	1	0	0	0	0
5	A	2	0	0	0	0
6	A	1	0	0	0	0
7	A	1	0	0	2	0
8	A	8	0	6	0	0
9	A	5	0	0	0	0
10	A	60	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
11	A	670	0	0	5	0
All	All	7431	0	6455	33	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (33) 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:594:ARG:HH21	1:A:594:ARG:HG2	1.36	0.89
1:A:594:ARG:HG2	1:A:594:ARG:NH2	1.99	0.71
1:A:458:LEU:HA	1:A:461[A]:TYR:CE2	2.30	0.67
1:A:169:SER:OG	7:A:906:CL:CL	2.43	0.65
1:A:594:ARG:NH2	1:A:594:ARG:CG	2.62	0.62
1:A:639:ALA:HB2	11:A:1345:HOH:O	2.00	0.61
1:A:222:PRO:HA	1:A:225:HIS:CE1	2.38	0.59
1:A:108:GLY:O	1:A:109:GLU:O	2.22	0.56
1:A:230:ASN:ND2	11:A:1013:HOH:O	2.38	0.56
1:A:450[A]:ARG:NH1	11:A:1001:HOH:O	2.10	0.51
1:A:163:PRO:HB3	1:A:350:CYS:O	2.10	0.50
1:A:304:ALA:HB1	7:A:906:CL:CL	2.50	0.49
1:A:269:ARG:HB3	1:A:300:PRO:HA	1.95	0.49
1:A:842:SER:OG	11:A:1002:HOH:O	2.19	0.49
1:A:458:LEU:HA	1:A:461[A]:TYR:CZ	2.50	0.47
1:A:70:PRO:HA	1:A:71:PRO:HA	1.77	0.46
1:A:461[A]:TYR:CE1	1:A:462:LYS:HG2	2.51	0.45
1:A:704:MET:HA	1:A:797:HIS:NE2	2.31	0.45
1:A:300:PRO:HD2	1:A:303:TYR:OH	2.16	0.45
1:A:733:ILE:O	1:A:769:SER:HA	2.17	0.45
1:A:576:ASN:HD21	1:A:578:LEU:HD12	1.82	0.45
1:A:576:ASN:ND2	1:A:579:GLU:OE2	2.50	0.45
1:A:546:GLU:CD	1:A:600:ARG:HH22	2.20	0.44
1:A:410:ALA:O	1:A:414:LYS:HG3	2.18	0.43
1:A:727:ARG:HD2	11:A:1026:HOH:O	2.18	0.43
1:A:449:ARG:O	1:A:450[A]:ARG:HB2	2.18	0.43
1:A:61:ARG:NH1	1:A:68:VAL:HG21	2.33	0.43
1:A:682:PRO:HB3	1:A:716:GLN:HB3	2.01	0.43
1:A:721[A]:LYS:HA	1:A:721[A]:LYS:HD2	1.90	0.42
1:A:553:PRO:HA	1:A:556[A]:MET:HE1	2.02	0.42
1:A:581:LEU:O	1:A:585:LEU:HG	2.20	0.41
1:A:371:PHE:CE1	1:A:457:PRO:HA	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:389:LEU:HD23	1:A:389:LEU:N	2.36	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	814/846 (96%)	781 (96%)	31 (4%)	2 (0%)	44 28

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	109	GLU
1	A	477	ASP

### 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	743/765 (97%)	726 (98%)	17 (2%)	45 25

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	THR

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Mol	Chain	Res	Type
1	A	81	SER
1	A	83	SER
1	A	110	VAL
1	A	179	LYS
1	A	244	ARG
1	A	246	ARG
1	A	379	VAL
1	A	389	LEU
1	A	397	ILE
1	A	401	LYS
1	A	417	ASP
1	A	469	PHE
1	A	519	LYS
1	A	549	ARG
1	A	592	LYS
1	A	594	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	398	ASN
1	A	419	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

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	1,2	14,14,15	1.29	2 (14%)	17,19,21	2.11	5 (29%)
2	NAG	B	2	2	14,14,15	1.17	0	17,19,21	1.59	3 (17%)
2	MAN	B	3	2	11,11,12	1.39	2 (18%)	15,15,17	2.51	5 (33%)
2	MAN	B	4	2	11,11,12	1.96	4 (36%)	15,15,17	3.08	5 (33%)
2	MAN	B	5	2	11,11,12	1.57	2 (18%)	15,15,17	1.85	5 (33%)
2	MAN	B	6	2	11,11,12	1.36	2 (18%)	15,15,17	2.06	5 (33%)
2	MAN	B	7	2	11,11,12	1.48	2 (18%)	15,15,17	3.02	4 (26%)
2	MAN	B	8	2	11,11,12	1.84	2 (18%)	15,15,17	2.55	6 (40%)

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	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	1/6/23/26	0/1/1/1
2	MAN	B	3	2	-	2/2/19/22	1/1/1/1
2	MAN	B	4	2	-	0/2/19/22	0/1/1/1
2	MAN	B	5	2	-	0/2/19/22	0/1/1/1
2	MAN	B	6	2	-	0/2/19/22	0/1/1/1
2	MAN	B	7	2	-	2/2/19/22	0/1/1/1
2	MAN	B	8	2	-	2/2/19/22	0/1/1/1

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	8	MAN	C2-C3	4.19	1.58	1.52
2	B	4	MAN	O5-C5	3.24	1.49	1.43
2	B	8	MAN	O3-C3	3.14	1.50	1.43
2	B	7	MAN	C1-C2	3.01	1.59	1.52
2	B	7	MAN	C2-C3	2.81	1.56	1.52
2	B	4	MAN	O5-C1	2.78	1.48	1.43
2	B	3	MAN	C2-C3	2.70	1.56	1.52
2	B	4	MAN	C6-C5	2.59	1.60	1.51
2	B	6	MAN	C6-C5	2.38	1.59	1.51
2	B	4	MAN	C2-C3	2.33	1.56	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	3	MAN	O3-C3	2.33	1.48	1.43
2	B	5	MAN	C1-C2	2.21	1.57	1.52
2	B	1	NAG	O5-C1	2.16	1.47	1.43
2	B	5	MAN	C2-C3	2.11	1.55	1.52
2	B	1	NAG	C4-C5	2.07	1.57	1.53
2	B	6	MAN	O5-C5	2.01	1.47	1.43

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	4	MAN	C1-O5-C5	9.28	124.62	112.19
2	B	7	MAN	C1-C2-C3	8.13	121.48	109.64
2	B	8	MAN	O3-C3-C2	6.02	122.34	110.05
2	B	7	MAN	O2-C2-C3	-5.91	97.92	110.15
2	B	3	MAN	C2-C3-C4	-5.50	101.18	110.86
2	B	8	MAN	O2-C2-C3	4.58	119.64	110.15
2	B	3	MAN	C1-C2-C3	4.44	116.11	109.64
2	B	2	NAG	O5-C1-C2	-4.23	104.75	111.29
2	B	1	NAG	O5-C5-C6	4.21	115.87	107.66
2	B	3	MAN	O2-C2-C1	-4.20	99.62	109.22
2	B	4	MAN	O6-C6-C5	4.13	125.41	111.33
2	B	7	MAN	O5-C5-C6	4.12	115.67	107.66
2	B	6	MAN	C1-O5-C5	3.98	117.52	112.19
2	B	1	NAG	O4-C4-C5	-3.74	100.12	109.32
2	B	6	MAN	O3-C3-C2	-3.65	102.60	110.05
2	B	1	NAG	O5-C1-C2	-3.63	105.67	111.29
2	B	5	MAN	O2-C2-C3	-3.63	102.63	110.15
2	B	5	MAN	O6-C6-C5	-3.63	98.98	111.33
2	B	1	NAG	C1-O5-C5	3.39	116.73	112.19
2	B	4	MAN	O5-C5-C6	3.27	114.02	107.66
2	B	3	MAN	O3-C3-C2	3.25	116.68	110.05
2	B	8	MAN	C6-C5-C4	3.23	120.94	113.02
2	B	5	MAN	C1-C2-C3	3.10	114.17	109.64
2	B	8	MAN	O5-C5-C4	-3.02	103.48	110.83
2	B	2	NAG	O7-C7-C8	-2.96	116.79	122.05
2	B	4	MAN	C1-C2-C3	2.78	113.69	109.64
2	B	6	MAN	O5-C5-C6	2.76	113.03	107.66
2	B	8	MAN	C2-C3-C4	-2.74	106.05	110.86
2	B	3	MAN	O5-C5-C6	2.66	112.84	107.66
2	B	1	NAG	O3-C3-C4	-2.56	104.35	110.38
2	B	6	MAN	O3-C3-C4	2.55	116.40	110.38
2	B	7	MAN	O3-C3-C4	-2.45	104.59	110.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	4	MAN	O4-C4-C5	2.34	115.09	109.32
2	B	2	NAG	O7-C7-N2	2.29	126.02	121.98
2	B	5	MAN	O5-C1-C2	-2.22	105.48	110.79
2	B	8	MAN	C1-O5-C5	-2.07	109.42	112.19
2	B	6	MAN	O2-C2-C3	-2.06	105.88	110.15
2	B	5	MAN	C3-C4-C5	2.05	113.95	110.23

There are no chirality outliers.

All (7) torsion outliers are listed below:

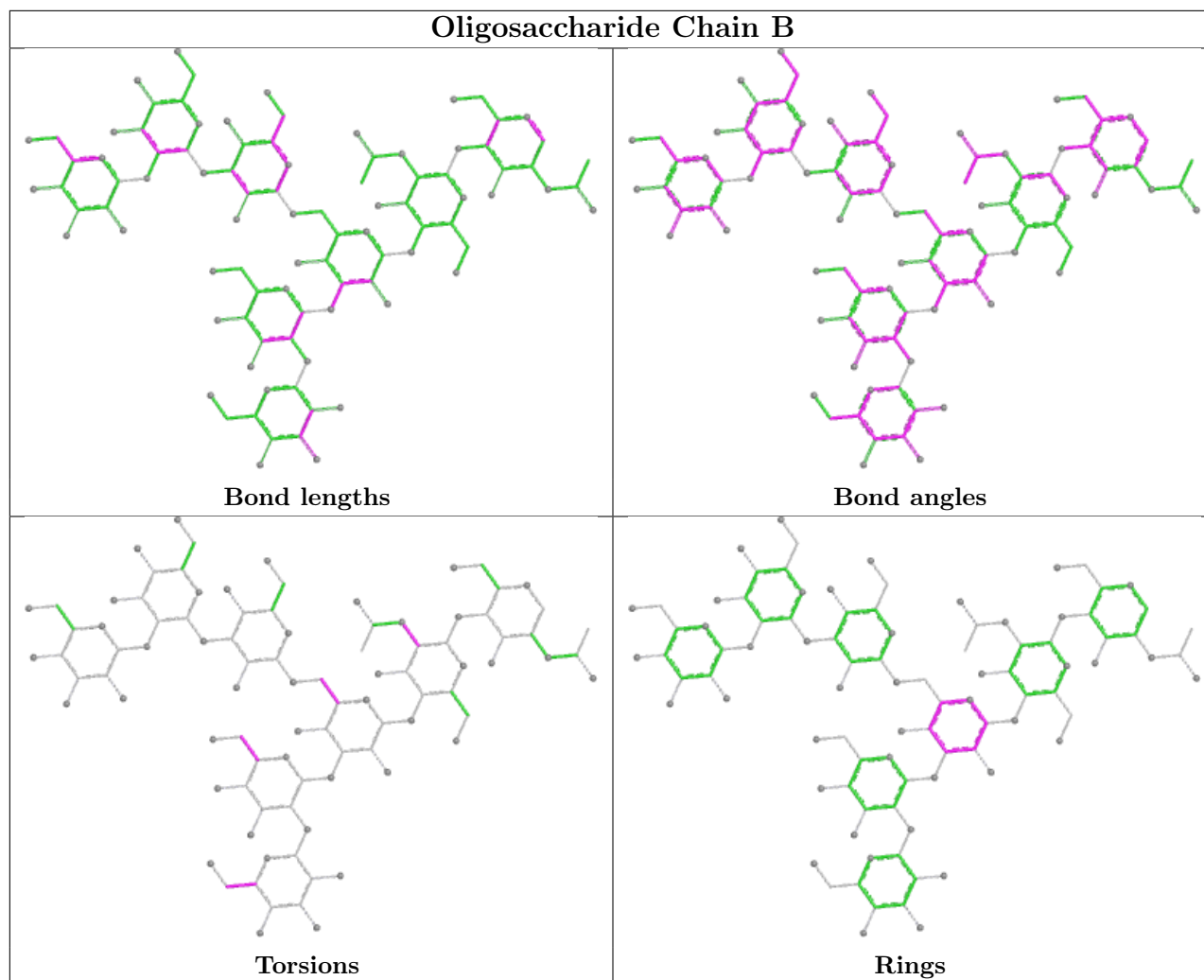
Mol	Chain	Res	Type	Atoms
2	B	7	MAN	O5-C5-C6-O6
2	B	3	MAN	C4-C5-C6-O6
2	B	7	MAN	C4-C5-C6-O6
2	B	3	MAN	O5-C5-C6-O6
2	B	8	MAN	C4-C5-C6-O6
2	B	8	MAN	O5-C5-C6-O6
2	B	2	NAG	C1-C2-N2-C7

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	3	MAN	C1-C2-C3-C4-C5-O5

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 11 ligands modelled in this entry, 6 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	-	3,3,3	1.19	0	3,3,3	1.89	2 (66%)
10	YNR	A	910[B]	-	25,33,33	1.00	1 (4%)	33,49,49	1.31	3 (9%)
9	SO4	A	909	3	4,4,4	0.71	0	6,6,6	0.50	0
10	YNR	A	910[A]	-	25,33,33	1.19	2 (8%)	33,49,49	1.12	5 (15%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
8	ACT	A	907	-	3,3,3	1.44	0	3,3,3	0.72	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
10	YNR	A	910[B]	-	-	1/14/27/27	0/4/4/4
10	YNR	A	910[A]	-	-	2/14/27/27	0/4/4/4

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
10	A	910[A]	YNR	C24-C25	-4.15	1.34	1.39
10	A	910[B]	YNR	C24-C25	-3.78	1.34	1.39
10	A	910[A]	YNR	C19-C22	-2.77	1.43	1.48

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	A	910[B]	YNR	C24-C25-C27	4.40	134.04	128.95
10	A	910[B]	YNR	C22-C19-N15	3.40	132.58	123.26
10	A	910[A]	YNR	C24-C25-C27	3.31	132.77	128.95
8	A	908	ACT	OXT-C-CH3	2.41	125.14	115.05
10	A	910[B]	YNR	C19-N15-C16	-2.39	105.93	109.57
8	A	908	ACT	OXT-C-O	-2.18	113.93	122.03
10	A	910[A]	YNR	C19-N15-C16	-2.12	106.33	109.57
10	A	910[A]	YNR	C20-O12-C5	-2.06	113.68	117.76
10	A	910[A]	YNR	C2-C3-CL14	2.02	121.17	119.45
10	A	910[A]	YNR	C9-C7-C6	-2.00	107.06	110.87

There are no chirality outliers.

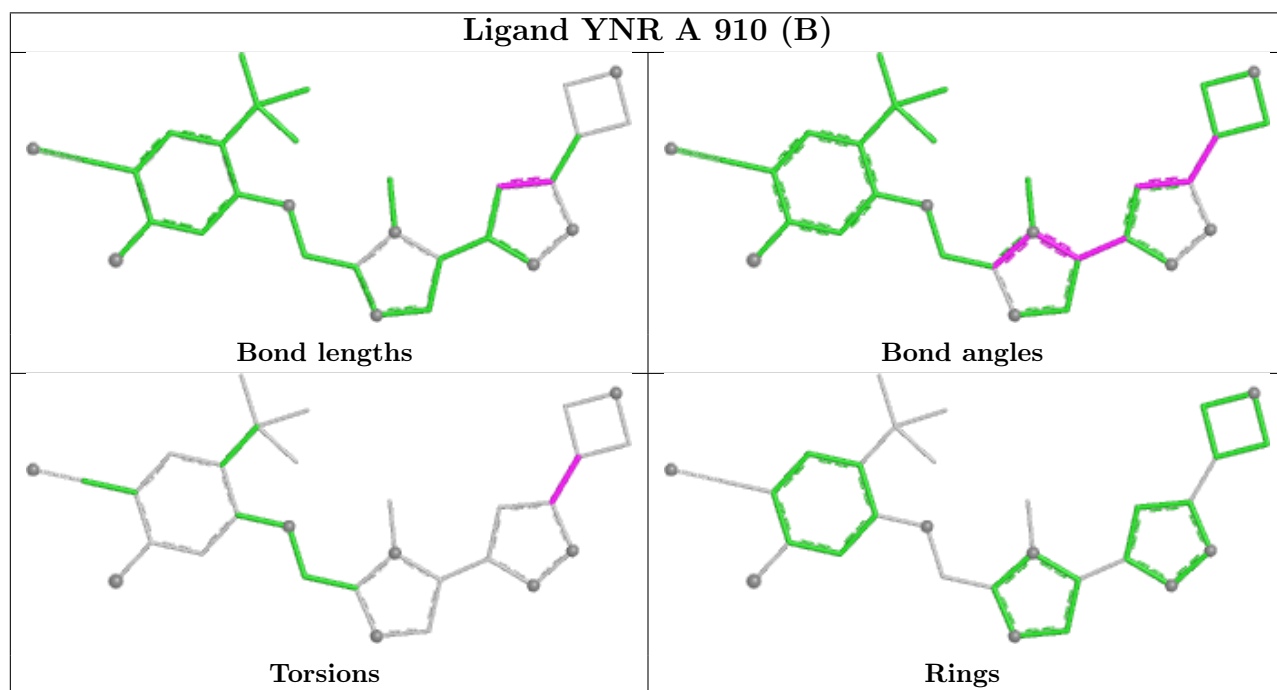
All (3) torsion outliers are listed below:

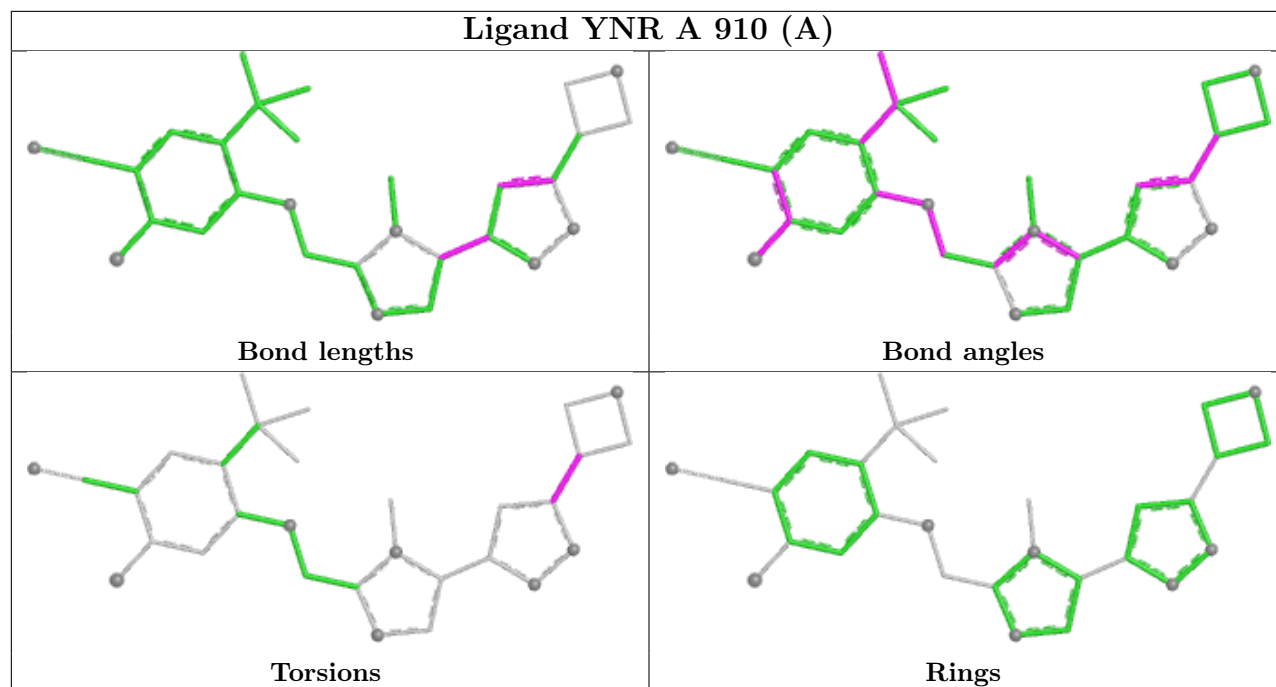
Mol	Chain	Res	Type	Atoms
10	A	910[A]	YNR	C24-C25-C27-C30
10	A	910[B]	YNR	C24-C25-C27-C28
10	A	910[A]	YNR	C24-C25-C27-C28

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	804/846 (95%)	0.23	69 (8%) <b>18</b> <b>20</b>	12, 26, 68, 159	15 (1%)

All (69) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	51	TRP	7.9
1	A	572	VAL	7.8
1	A	397	ILE	7.3
1	A	469	PHE	6.7
1	A	578	LEU	6.1
1	A	468	CYS	5.4
1	A	68	VAL	5.4
1	A	463	LYS	5.1
1	A	581	LEU	5.0
1	A	461[A]	TYR	4.8
1	A	70	PRO	4.3
1	A	573	GLU	3.8
1	A	52	THR	3.8
1	A	71	PRO	3.7
1	A	378	ASN	3.5
1	A	243	LEU	3.4
1	A	585	LEU	3.4
1	A	398	ASN	3.4
1	A	53	ALA	3.3
1	A	274	PHE	3.2
1	A	60	GLY	3.2
1	A	577	LYS	3.1
1	A	571	LYS	3.1
1	A	402	TYR	3.0
1	A	104	LYS	3.0
1	A	54	THR	3.0
1	A	251	HIS	2.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	401	LYS	2.9
1	A	462	LYS	2.9
1	A	584	ARG	2.8
1	A	69	GLY	2.8
1	A	55	SER	2.8
1	A	583	LYS	2.8
1	A	72	ASP	2.7
1	A	59	LYS	2.7
1	A	588	LYS	2.7
1	A	78	LEU	2.6
1	A	458	LEU	2.6
1	A	860	SER	2.6
1	A	403	ASP	2.5
1	A	110	VAL	2.5
1	A	400	SER	2.5
1	A	87	HIS	2.5
1	A	396	SER	2.5
1	A	244	ARG	2.5
1	A	417	ASP	2.5
1	A	82	TYR	2.5
1	A	246	ARG	2.4
1	A	377	THR	2.4
1	A	66	GLN	2.4
1	A	589	GLY	2.3
1	A	161	VAL	2.3
1	A	277	VAL	2.3
1	A	416	PRO	2.2
1	A	56	GLY	2.2
1	A	591	THR	2.2
1	A	80	LYS	2.2
1	A	580	GLU	2.2
1	A	576	ASN	2.2
1	A	124	LEU	2.2
1	A	137	CYS	2.2
1	A	590	SER	2.1
1	A	460	VAL	2.1
1	A	405	LYS	2.1
1	A	579	GLU	2.1
1	A	107	CYS	2.1
1	A	587	THR	2.0
1	A	399	ASN	2.0
1	A	582	ASN	2.0



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

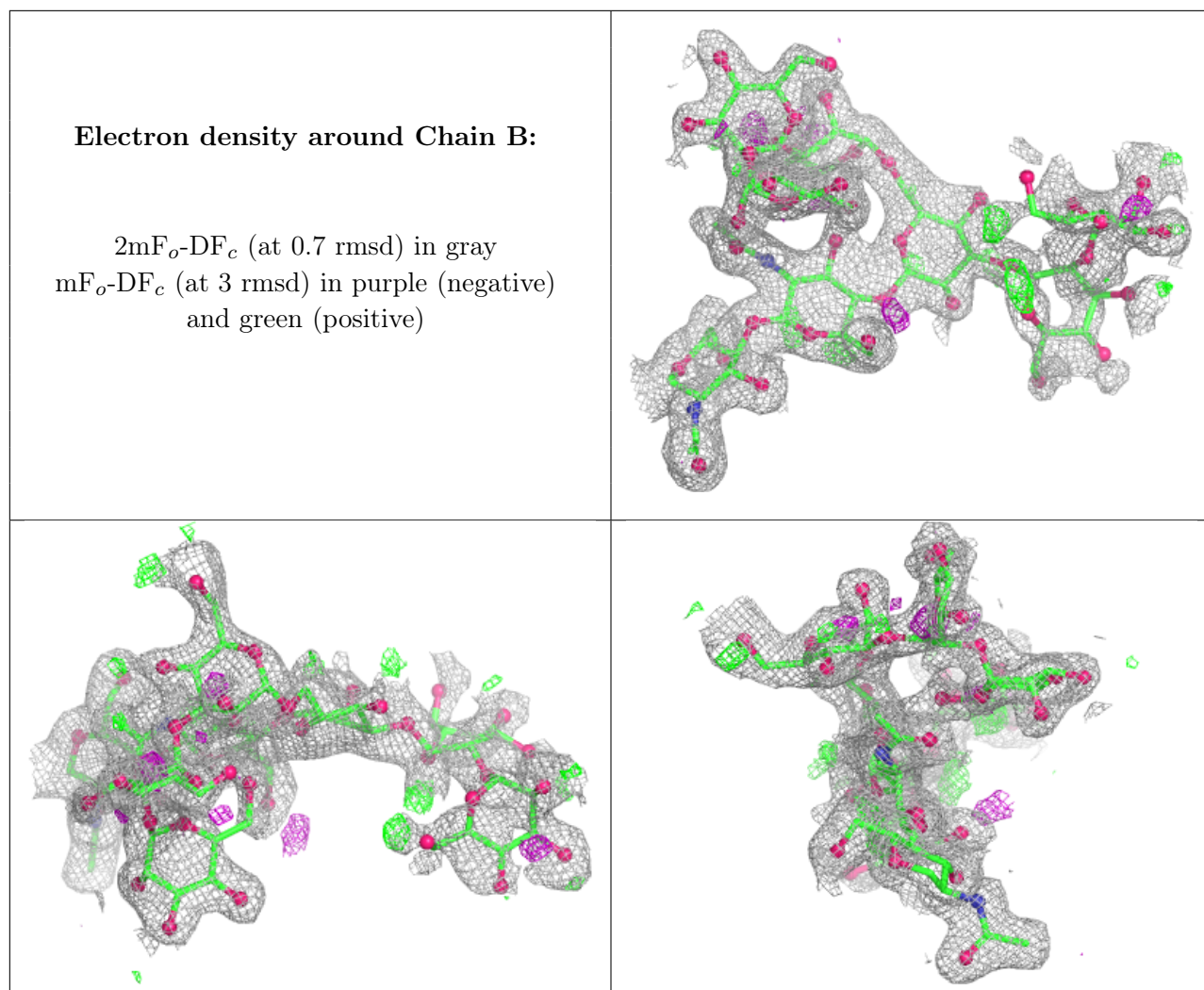
There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	MAN	B	7	11/12	0.43	0.18	86,98,106,108	0
2	MAN	B	8	11/12	0.63	0.17	42,74,94,96	0
2	MAN	B	4	11/12	0.75	0.14	51,57,59,60	0
2	MAN	B	3	11/12	0.76	0.13	57,60,74,74	0
2	MAN	B	5	11/12	0.80	0.15	43,54,58,60	0
2	MAN	B	6	11/12	0.86	0.14	37,41,50,53	0
2	NAG	B	2	14/15	0.90	0.09	23,32,43,49	0
2	NAG	B	1	14/15	0.97	0.05	13,17,19,20	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, 95<sup>th</sup> 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.

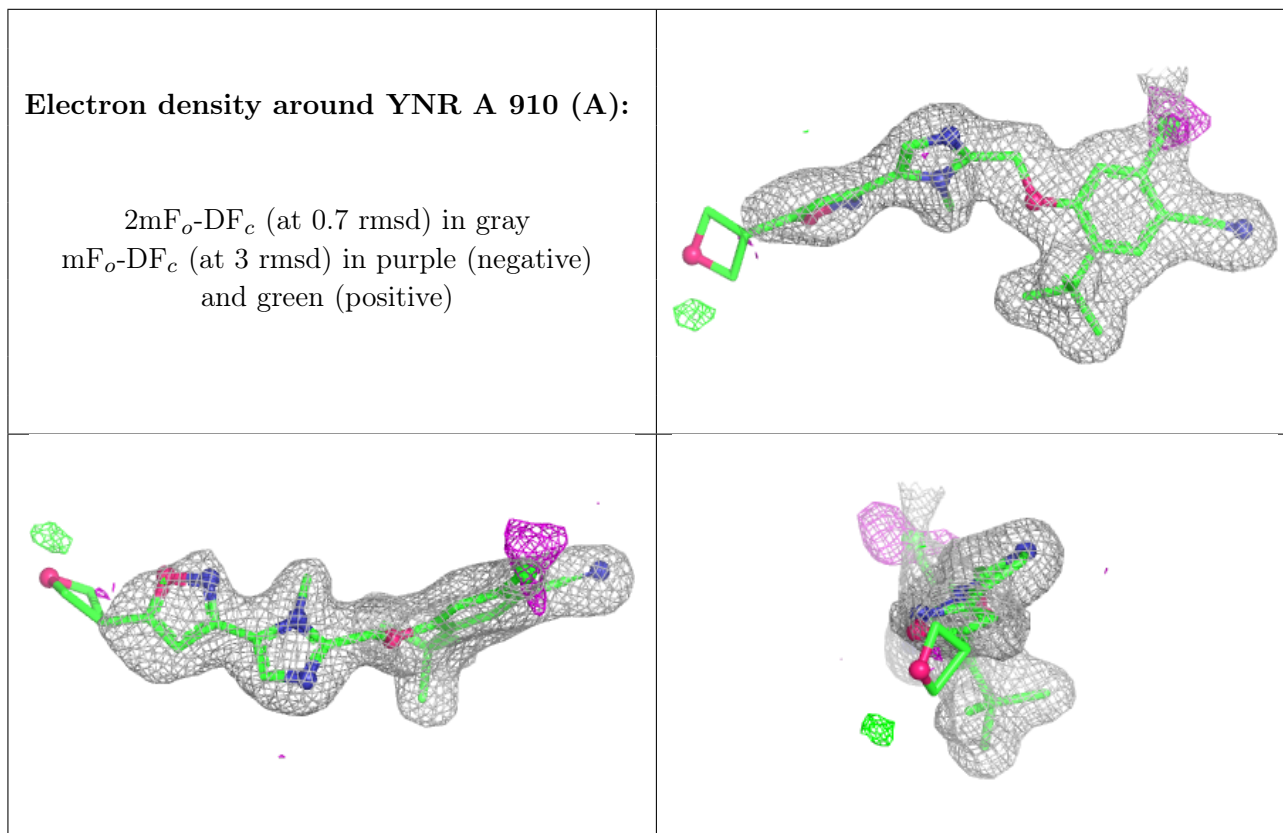
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
7	CL	A	906	1/1	0.86	0.11	20,20,20,20	1
8	ACT	A	907	4/4	0.88	0.16	29,37,40,43	0
8	ACT	A	908	4/4	0.91	0.12	32,35,35,39	0
10	YNR	A	910[A]	30/30	0.92	0.12	21,28,81,87	30
10	YNR	A	910[B]	30/30	0.92	0.12	22,32,87,91	30
9	SO4	A	909	5/5	0.93	0.12	35,74,80,90	0
4	NA	A	902	1/1	0.94	0.07	33,33,33,33	0
5	CA	A	904	1/1	0.98	0.09	50,50,50,50	0
6	K	A	905	1/1	0.98	0.04	29,29,29,29	0

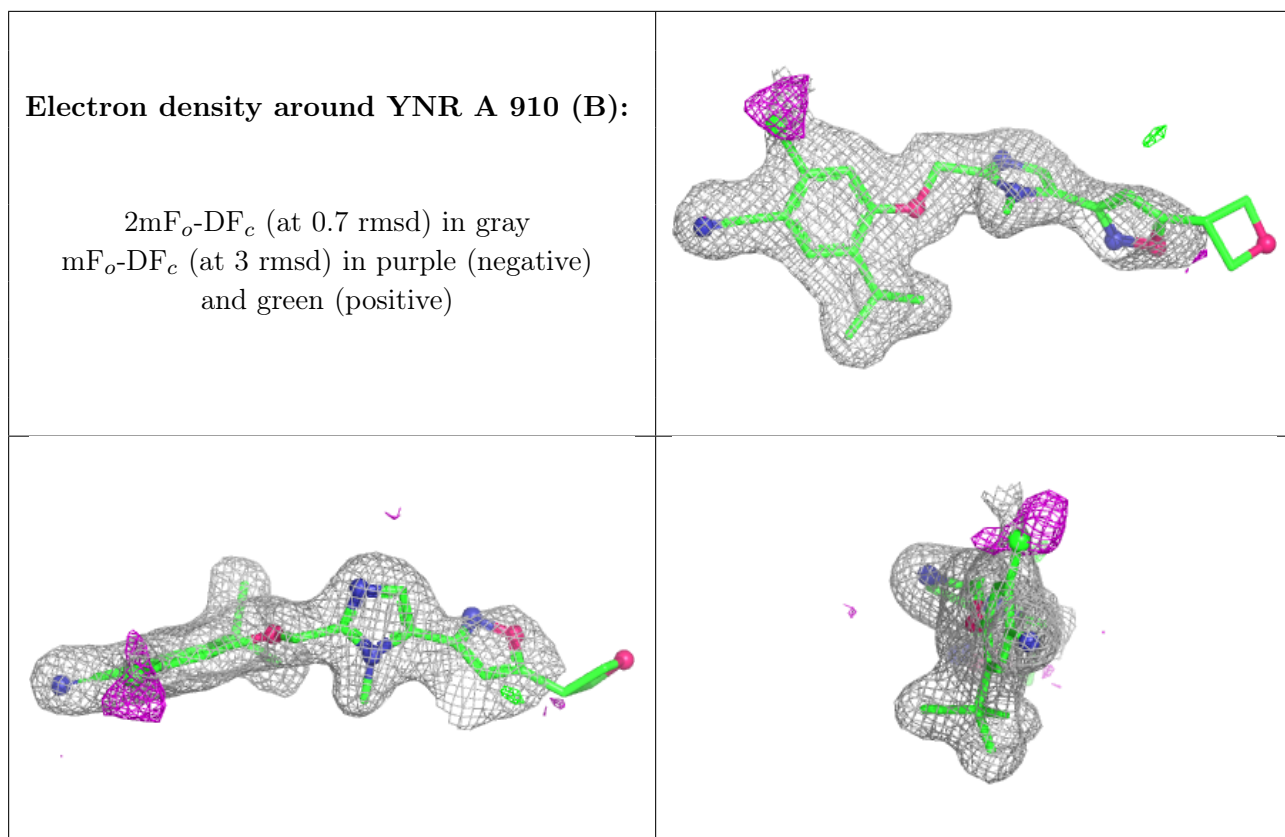
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	CA	A	903	1/1	0.99	0.02	18,18,18,18	0
3	ZN	A	901	1/1	1.00	0.03	21,21,21,21	0

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.