



Full wwPDB X-ray Structure Validation Report ⓘ

May 6, 2025 – 01:09 pm BST

PDB ID : 9QA0 / pdb_00009qa0
Title : Drosophila melanogaster angiotensin converting enzyme homologue, AnCE in complex with IW dipeptide
Authors : Zukowska, J.; Gregory, K.S.; Acharya, K.R.
Deposited on : 2025-02-27
Resolution : 2.20 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 Phenix2.0rc1
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 2.0rc1
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.43.1

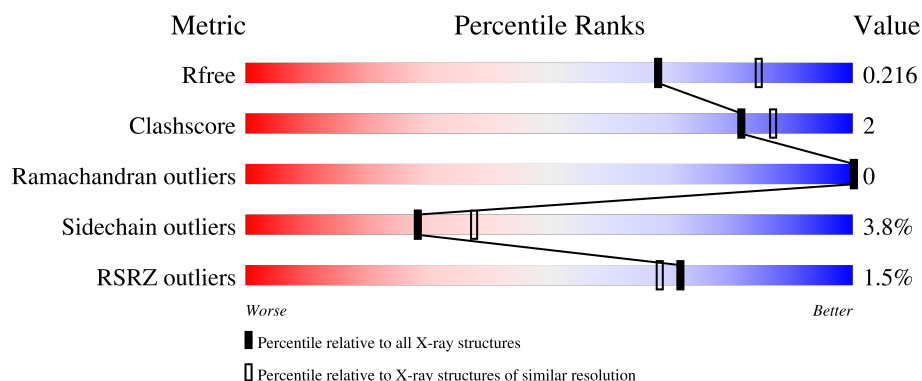
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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}	164625	5791 (2.20-2.20)
Clashscore	180529	6634 (2.20-2.20)
Ramachandran outliers	177936	6560 (2.20-2.20)
Sidechain outliers	177891	6561 (2.20-2.20)
RSRZ outliers	164620	5791 (2.20-2.20)

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	598	<div> <div>84%</div> <div>14%</div> <div>•</div> </div>
2	B	2	<div> <div>50%</div> <div>50%</div> </div>
2	D	2	<div> <div>50%</div> <div>50%</div> </div>
3	C	6	<div> <div>100%</div> </div>

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
6	FLC	A	704	-	X	-	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 5274 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 Angiotensin-converting enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	598	Total	C	N	O	S	0	0	0
			4878	3123	805	930	20			

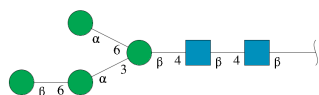
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	346	ILE	THR	conflict	UNP Q10714

- Molecule 2 is a protein called ILE-TRP dipeptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	2	Total	C	N	O	0	0	0
			23	17	3	3			
2	D	2	Total	C	N	O	0	0	0
			23	17	3	3			

- Molecule 3 is an oligosaccharide called beta-D-mannopyranose-(1-6)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

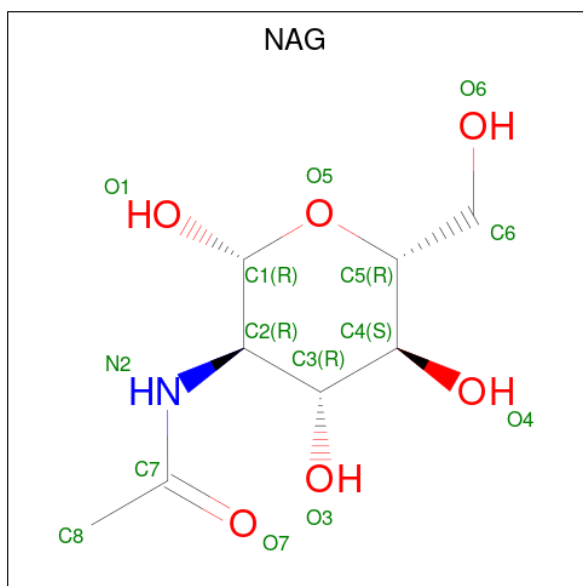


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	6	Total	C	N	O	0	0	0
			72	40	2	30			

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

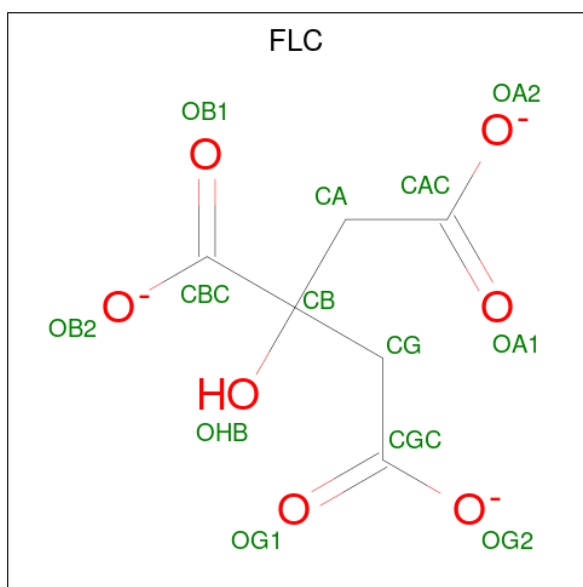
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 6 is CITRATE ANION (CCD ID: FLC) (formula: $C_6H_5O_7$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			13	6	7		

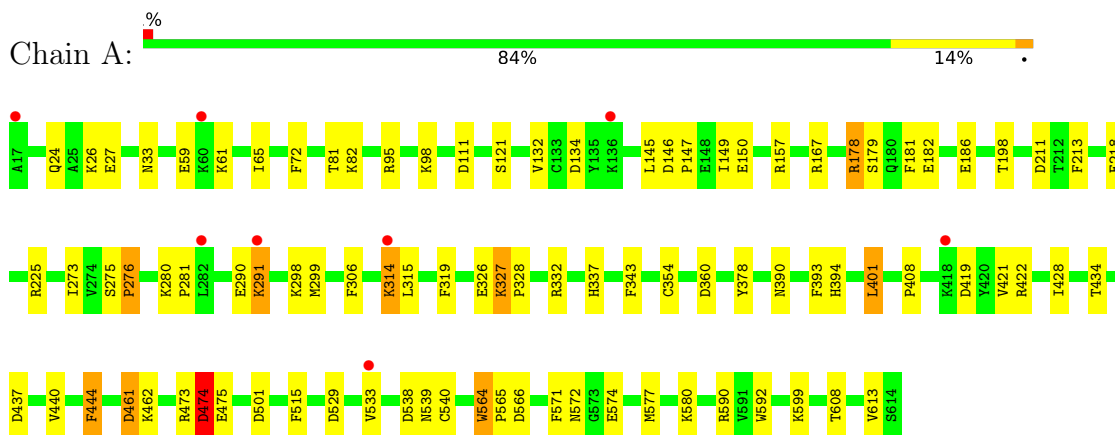
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	230	Total	O	0	0
			230	230		
7	B	4	Total	O	0	0
			4	4		
7	D	2	Total	O	0	0
			2	2		

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: Angiotensin-converting enzyme



- Molecule 2: ILE-TRP dipeptide



- Molecule 2: ILE-TRP dipeptide



- Molecule 3: beta-D-mannopyranose-(1-6)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]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	H 3	Depositor
Cell constants a, b, c, α , β , γ	173.24Å 173.24Å 103.07Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.06 – 2.20 50.06 – 2.20	Depositor EDS
% Data completeness (in resolution range)	100.0 (50.06-2.20) 100.0 (50.06-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.32 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.8.0430 (refmacat 0.4.100)	Depositor
R, R_{free}	0.171 , 0.208 0.177 , 0.216	Depositor DCC
R_{free} test set	3107 reflections (5.31%)	wwPDB-VP
Wilson B-factor (Å ²)	35.6	Xtriage
Anisotropy	0.608	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 26.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.003 for -2/3*h-1/3*k-4/3*l,-1/3*h-2/3*k+4/3*l,-1/3*h+1/3*k+1/3*l 0.000 for -h,1/3*h-1/3*k-4/3*l,-1/3*h-2/3*k+1/3*l 0.000 for -1/3*h+1/3*k+4/3*l,-k,2/3*h+1/3*k+1/3*l 0.000 for -h,2/3*h+1/3*k+4/3*l,1/3*h+2/3*k-1/3*l 0.005 for -1/3*h-2/3*k+4/3*l,-2/3*h-1/3*k-4/3*l,1/3*h-1/3*k-1/3*l 0.000 for 1/3*h+2/3*k-4/3*l,-k,-2/3*h-1/3*k-1/3*l 0.014 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5274	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage'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

5.1 Standard geometry

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

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	0.89	3/5004 (0.1%)	1.52	52/6779 (0.8%)
2	B	1.22	0/24	1.15	0/31
2	D	0.82	0/24	0.87	0/31
All	All	0.89	3/5052 (0.1%)	1.52	52/6841 (0.8%)

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	2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	225	ARG	NE-CZ	6.37	1.40	1.33
1	A	178	ARG	NE-CZ	5.14	1.38	1.33
1	A	337	HIS	CE1-NE2	5.02	1.37	1.32

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	211	ASP	CB-CA-C	-10.67	90.90	110.63
1	A	81	THR	CA-CB-OG1	-9.30	95.66	109.60
1	A	27	GLU	CB-CG-CD	8.81	127.57	112.60
1	A	566	ASP	CA-CB-CG	8.62	121.22	112.60
1	A	437	ASP	CA-CB-CG	8.54	121.14	112.60
1	A	181	PHE	CA-CB-CG	-8.21	105.59	113.80
1	A	529	ASP	CA-CB-CG	7.33	119.93	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	419	ASP	CA-CB-CG	6.50	119.10	112.60
1	A	360	ASP	CA-CB-CG	6.42	119.02	112.60
1	A	475	GLU	CB-CA-C	6.30	121.25	110.79
1	A	440	VAL	N-CA-CB	-6.19	102.73	110.47
1	A	580	LYS	CB-CA-C	-6.13	100.56	110.74
1	A	613	VAL	N-CA-CB	-6.12	104.05	110.72
1	A	393	PHE	N-CA-CB	6.11	119.10	110.12
1	A	72	PHE	N-CA-CB	-6.05	101.21	110.16
1	A	314	LYS	CB-CG-CD	6.05	125.21	111.30
1	A	326	GLU	CB-CG-CD	-5.81	102.73	112.60
1	A	225	ARG	CG-CD-NE	5.80	124.76	112.00
1	A	157	ARG	NE-CZ-NH2	-5.79	113.99	119.20
1	A	291	LYS	N-CA-CB	5.78	118.71	110.16
1	A	515	PHE	CA-CB-CG	-5.74	108.06	113.80
1	A	157	ARG	NE-CZ-NH1	5.68	127.19	121.50
1	A	218	GLU	N-CA-CB	5.68	118.47	110.12
1	A	298	LYS	CG-CD-CE	5.67	124.35	111.30
1	A	218	GLU	CG-CD-OE2	-5.66	105.38	118.40
1	A	574	GLU	CG-CD-OE2	-5.65	105.41	118.40
1	A	82	LYS	CB-CG-CD	5.59	124.16	111.30
1	A	461	ASP	N-CA-CB	-5.55	101.68	110.06
1	A	198	THR	CA-CB-OG1	-5.52	101.32	109.60
1	A	444	PHE	CA-CB-CG	-5.51	108.28	113.80
1	A	434	THR	CA-CB-OG1	-5.47	101.39	109.60
1	A	501	ASP	CB-CA-C	5.46	118.81	111.82
1	A	167	ARG	CD-NE-CZ	5.39	131.94	124.40
1	A	299	MET	CG-SD-CE	-5.33	89.17	100.90
1	A	186	GLU	N-CA-CB	5.33	117.74	110.01
1	A	421	VAL	CB-CA-C	-5.31	103.49	110.98
1	A	422	ARG	N-CA-CB	5.29	116.27	110.35
1	A	608	THR	CA-CB-OG1	-5.27	101.69	109.60
1	A	111	ASP	CA-CB-CG	5.26	117.86	112.60
1	A	564	TRP	O-C-N	-5.23	115.30	121.32
1	A	574	GLU	CG-CD-OE1	5.22	130.41	118.40
1	A	475	GLU	N-CA-CB	-5.21	102.47	110.12
1	A	343	PHE	CA-CB-CG	-5.20	108.60	113.80
1	A	538	ASP	CA-CB-CG	5.18	117.78	112.60
1	A	134	ASP	CA-CB-CG	5.14	117.75	112.60
1	A	474	ASP	CA-CB-CG	5.14	117.74	112.60
1	A	211	ASP	CA-CB-CG	5.13	117.73	112.60
1	A	95	ARG	CB-CA-C	5.12	119.28	110.79
1	A	218	GLU	CG-CD-OE1	5.11	130.14	118.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	186	GLU	CB-CG-CD	5.09	121.26	112.60
1	A	33	ASN	CB-CA-C	5.07	119.26	110.84
1	A	327	LYS	CB-CG-CD	5.02	122.84	111.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	332	ARG	Sidechain
1	A	473	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	4878	0	4680	23	0
2	B	23	0	20	0	0
2	D	23	0	20	1	0
3	C	72	0	61	0	0
4	A	1	0	0	0	0
5	A	28	0	26	0	0
6	A	13	0	5	0	0
7	A	230	0	0	0	0
7	B	4	0	0	0	0
7	D	2	0	0	1	0
All	All	5274	0	4812	24	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 (24) 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:59:GLU:OE1	1:A:121:SER:HB3	1.88	0.72
1:A:280:LYS:HB3	1:A:281:PRO:HD2	1.76	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:61:LYS:O	1:A:65:ILE:HG12	1.96	0.65
1:A:306:PHE:CD1	1:A:401:LEU:HD13	2.47	0.50
1:A:276:PRO:HB3	1:A:592:TRP:CH2	2.50	0.47
1:A:590:ARG:HG2	1:A:590:ARG:NH1	2.30	0.45
1:A:315:LEU:HD13	1:A:319:PHE:CD2	2.52	0.44
1:A:146:ASP:HA	1:A:147:PRO:HA	1.71	0.43
1:A:132:VAL:HG22	1:A:149:ILE:HD11	2.01	0.43
1:A:145:LEU:HA	1:A:149:ILE:HB	2.00	0.43
1:A:444:PHE:CD1	1:A:444:PHE:C	2.97	0.42
1:A:474:ASP:OD1	1:A:474:ASP:C	2.61	0.42
1:A:564:TRP:CG	1:A:565:PRO:HD3	2.54	0.42
1:A:327:LYS:HB2	1:A:354:CYS:HB3	2.01	0.42
1:A:213:PHE:CE1	1:A:577:MET:HE1	2.55	0.42
1:A:390:ASN:HD22	1:A:564:TRP:CG	2.38	0.42
1:A:599:LYS:HB2	1:A:599:LYS:HE3	1.90	0.42
1:A:408:PRO:HD2	1:A:539:ASN:OD1	2.20	0.42
1:A:275:SER:HA	1:A:276:PRO:HD3	1.87	0.41
1:A:571:PHE:HD1	1:A:572:ASN:HB3	1.86	0.41
2:D:1628:ILE:N	7:D:1701:HOH:O	2.54	0.40
1:A:178:ARG:NH1	1:A:182:GLU:OE2	2.54	0.40
1:A:590:ARG:HG2	1:A:590:ARG:HH11	1.86	0.40
1:A:428:ILE:HD13	1:A:428:ILE:HA	1.91	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	596/598 (100%)	581 (98%)	15 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	520/520 (100%)	501 (96%)	19 (4%)	29	39
2	B	2/2 (100%)	1 (50%)	1 (50%)	0	0
2	D	2/2 (100%)	2 (100%)	0	100	100
All	All	524/524 (100%)	504 (96%)	20 (4%)	28	37

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	GLN
1	A	26	LYS
1	A	98	LYS
1	A	150	GLU
1	A	179	SER
1	A	273	ILE
1	A	276	PRO
1	A	290	GLU
1	A	291	LYS
1	A	314	LYS
1	A	328	PRO
1	A	378	TYR
1	A	394	HIS
1	A	401	LEU
1	A	461	ASP
1	A	462	LYS
1	A	474	ASP
1	A	533	VAL
1	A	540	CYS
2	B	1701	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	229	GLN

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 ⓘ

6 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$
3	NAG	C	1	3,1	14,14,15	0.63	0	17,19,21	1.26	2 (11%)
3	NAG	C	2	3	14,14,15	0.47	0	17,19,21	1.10	2 (11%)
3	BMA	C	3	3	11,11,12	0.93	1 (9%)	15,15,17	1.43	3 (20%)
3	MAN	C	4	3	11,11,12	0.88	0	15,15,17	2.35	5 (33%)
3	BMA	C	5	3	11,11,12	2.06	3 (27%)	15,15,17	2.96	6 (40%)
3	MAN	C	6	3	11,11,12	1.84	3 (27%)	15,15,17	2.57	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
3	NAG	C	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	C	2	3	-	2/6/23/26	0/1/1/1
3	BMA	C	3	3	-	1/2/19/22	0/1/1/1
3	MAN	C	4	3	-	2/2/19/22	0/1/1/1
3	BMA	C	5	3	-	2/2/19/22	0/1/1/1
3	MAN	C	6	3	-	1/2/19/22	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	6	MAN	C2-C3	4.82	1.59	1.52
3	C	5	BMA	O5-C5	4.48	1.52	1.43
3	C	5	BMA	C2-C3	-3.96	1.46	1.52
3	C	5	BMA	C4-C5	3.01	1.59	1.53
3	C	6	MAN	C4-C5	2.47	1.58	1.53
3	C	3	BMA	C2-C3	-2.22	1.49	1.52
3	C	6	MAN	O5-C5	2.01	1.47	1.43

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	6	MAN	C1-C2-C3	6.88	118.13	109.67
3	C	5	BMA	C2-C3-C4	-6.88	98.99	110.89
3	C	4	MAN	C1-O5-C5	6.27	120.69	112.19
3	C	5	BMA	O3-C3-C4	4.66	121.11	110.35
3	C	5	BMA	C1-O5-C5	4.61	118.44	112.19
3	C	3	BMA	C1-O5-C5	3.84	117.40	112.19
3	C	5	BMA	O5-C1-C2	3.71	116.50	110.77
3	C	4	MAN	C3-C4-C5	3.54	116.55	110.24
3	C	6	MAN	O3-C3-C2	3.40	116.51	109.99
3	C	6	MAN	O5-C1-C2	3.30	115.87	110.77
3	C	6	MAN	C1-O5-C5	3.01	116.28	112.19
3	C	5	BMA	O2-C2-C3	-2.94	104.25	110.14
3	C	1	NAG	C2-N2-C7	2.94	127.08	122.90
3	C	5	BMA	C3-C4-C5	-2.88	105.11	110.24
3	C	4	MAN	O2-C2-C3	2.80	115.74	110.14
3	C	4	MAN	O5-C1-C2	2.76	115.04	110.77
3	C	6	MAN	O4-C4-C5	2.68	115.95	109.30
3	C	6	MAN	O4-C4-C3	-2.52	104.52	110.35
3	C	1	NAG	C4-C3-C2	2.24	114.30	111.02
3	C	3	BMA	C2-C3-C4	-2.21	107.08	110.89
3	C	3	BMA	O5-C1-C2	2.18	114.14	110.77
3	C	4	MAN	O4-C4-C3	-2.15	105.37	110.35
3	C	2	NAG	O6-C6-C5	-2.10	104.08	111.29
3	C	2	NAG	C4-C3-C2	2.04	114.01	111.02

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	4	MAN	O5-C5-C6-O6

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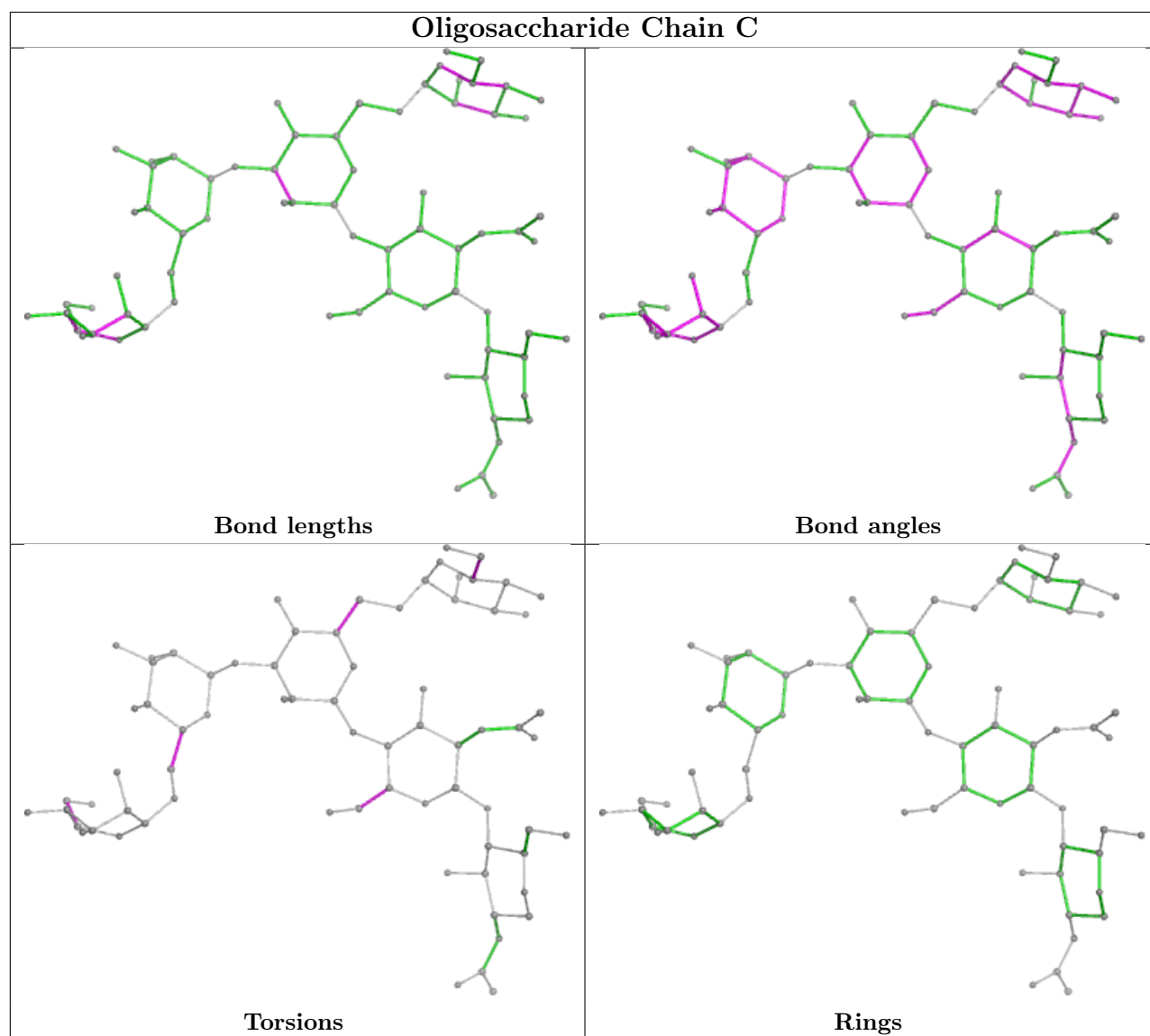
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Mol	Chain	Res	Type	Atoms
3	C	5	BMA	O5-C5-C6-O6
3	C	2	NAG	O5-C5-C6-O6
3	C	2	NAG	C4-C5-C6-O6
3	C	4	MAN	C4-C5-C6-O6
3	C	5	BMA	C4-C5-C6-O6
3	C	3	BMA	O5-C5-C6-O6
3	C	6	MAN	O5-C5-C6-O6

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

Of 4 ligands modelled in this entry, 1 is monoatomic - leaving 3 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	FLC	A	704	-	12,12,12	1.19	2 (16%)	17,17,17	1.44	4 (23%)
5	NAG	A	702	1	14,14,15	0.67	0	17,19,21	2.22	4 (23%)
5	NAG	A	703	1	14,14,15	0.65	0	17,19,21	1.72	4 (23%)

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	FLC	A	704	-	-	12/16/16/16	-
5	NAG	A	702	1	-	2/6/23/26	0/1/1/1
5	NAG	A	703	1	-	2/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	704	FLC	CB-CBC	2.12	1.55	1.53
6	A	704	FLC	OG2-CGC	-2.01	1.24	1.30

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	702	NAG	C1-C2-N2	-7.18	98.22	110.49
5	A	703	NAG	C1-C2-N2	3.46	116.41	110.49
5	A	703	NAG	C3-C4-C5	-3.21	104.51	110.24
6	A	704	FLC	OB1-CBC-CB	-3.07	117.91	122.25
5	A	702	NAG	C4-C3-C2	2.73	115.03	111.02
5	A	702	NAG	O7-C7-N2	-2.62	117.13	121.95

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	702	NAG	O7-C7-C8	2.40	126.52	122.06
5	A	703	NAG	C4-C3-C2	-2.40	107.50	111.02
6	A	704	FLC	CB-CA-CAC	2.39	119.61	113.81
6	A	704	FLC	OB2-CBC-CB	2.18	116.84	113.05
5	A	703	NAG	O5-C5-C4	-2.17	105.55	110.83
6	A	704	FLC	OA1-CAC-CA	-2.06	116.92	122.94

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	704	FLC	CAC-CA-CB-CBC
6	A	704	FLC	CAC-CA-CB-CG
6	A	704	FLC	CG-CB-CBC-OB1
6	A	704	FLC	CG-CB-CBC-OB2
6	A	704	FLC	OHB-CB-CBC-OB1
6	A	704	FLC	OHB-CB-CBC-OB2
6	A	704	FLC	CA-CB-CG-CGC
6	A	704	FLC	CBC-CB-CG-CGC
6	A	704	FLC	OHB-CB-CG-CGC
5	A	702	NAG	C8-C7-N2-C2
5	A	702	NAG	O7-C7-N2-C2
6	A	704	FLC	CAC-CA-CB-OHB
6	A	704	FLC	CA-CB-CBC-OB1
6	A	704	FLC	CA-CB-CBC-OB2
5	A	703	NAG	C4-C5-C6-O6
5	A	703	NAG	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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	598/598 (100%)	-0.38	8 (1%) 74 71	26, 37, 65, 93	0
2	B	2/2 (100%)	1.84	1 (50%) 0 0	51, 51, 51, 64	0
2	D	2/2 (100%)	-0.66	0 100 100	32, 32, 32, 35	0
All	All	602/602 (100%)	-0.38	9 (1%) 71 68	26, 37, 65, 93	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	17	ALA	4.4
2	B	1701	ILE	2.8
1	A	60	LYS	2.7
1	A	314	LYS	2.5
1	A	291	LYS	2.4
1	A	136	LYS	2.4
1	A	418	LYS	2.3
1	A	282	LEU	2.3
1	A	533	VAL	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](#)

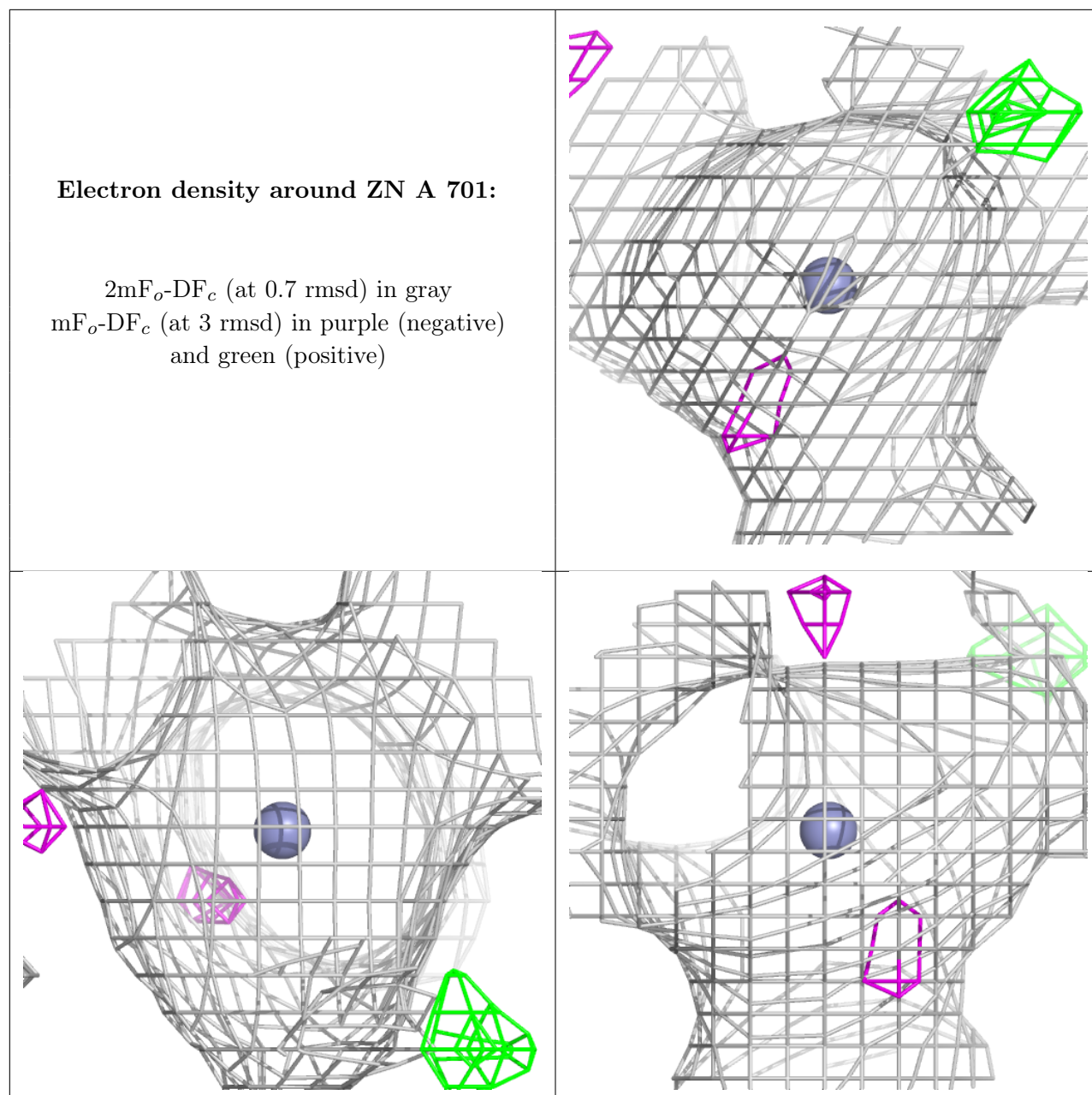
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6.4 Ligands

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
5	NAG	A	702	14/15	0.79	0.15	62,78,98,100	0
6	FLC	A	704	13/13	0.81	0.16	76,101,116,156	0
5	NAG	A	703	14/15	0.83	0.17	52,91,111,113	0
4	ZN	A	701	1/1	1.00	0.02	34,34,34,34	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 ⓘ

There are no such residues in this entry.