WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Jan 16, 2025 – 06:31 am GMT

PDB ID	:	9GBO
Title	:	Human Angiotensin-1 converting enzyme C-domain in complex with a diprolyl inhibitor- SG16
Authors	:	Gregory, K.S.; Cozier, G.E.; Acharya, K.R.
Deposited on	:	2024-07-31
Resolution	:	2.00 Å(reported)

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

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 2.00 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.
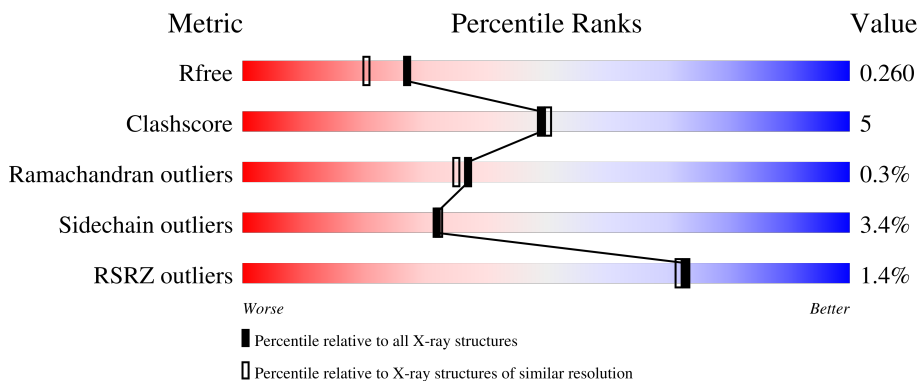
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	9409 (2.00-2.00)
Clashscore	180529	10737 (2.00-2.00)
Ramachandran outliers	177936	10628 (2.00-2.00)
Sidechain outliers	177891	10627 (2.00-2.00)
RSRZ outliers	164620	9409 (2.00-2.00)

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 <=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	597	77% 17% · ·
2	B	8	25% 25% 50%

2 Entry composition (i)

There are 7 unique types of molecules in this entry. The entry contains 5150 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	577	Total 4759	C 3046	N 812	O 877	S 24	0	8	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	64	GLY	GLU	engineered mutation	UNP P12821
A	90	GLN	ASN	engineered mutation	UNP P12821
A	155	GLN	ASN	engineered mutation	UNP P12821
A	337	GLN	ASN	engineered mutation	UNP P12821
A	586	GLN	ASN	engineered mutation	UNP P12821

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.
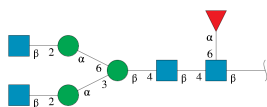
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	8	Total 99	C 56	N 4	O 39	0	0	0

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

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

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 6 is (2 {S})-1-[(2 {S})-2-[[(1 {S})-1-[(2 {S})-1-[(2 {S})-2-azanyl-4-oxidanyl-4-oxid anylidene-butanoyl]pyrrolidin-2-yl]-2-oxidanyl-2-oxidanylidene-ethyl]amino]propanoyl]pyrro lidine-2-carboxylic acid (three-letter code: BJ2) (formula: $C_{18}H_{28}N_4O_8$) (labeled as "Ligand of Interest" by depositor).

BJ2
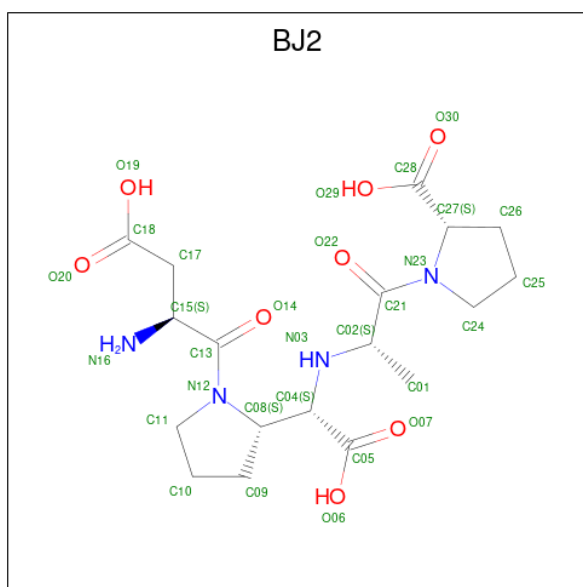
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total 30	C 18	N 4	O 8	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	245	Total 245	O 245	0	0

3 Residue-property plots ⓘ

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

Chain A:
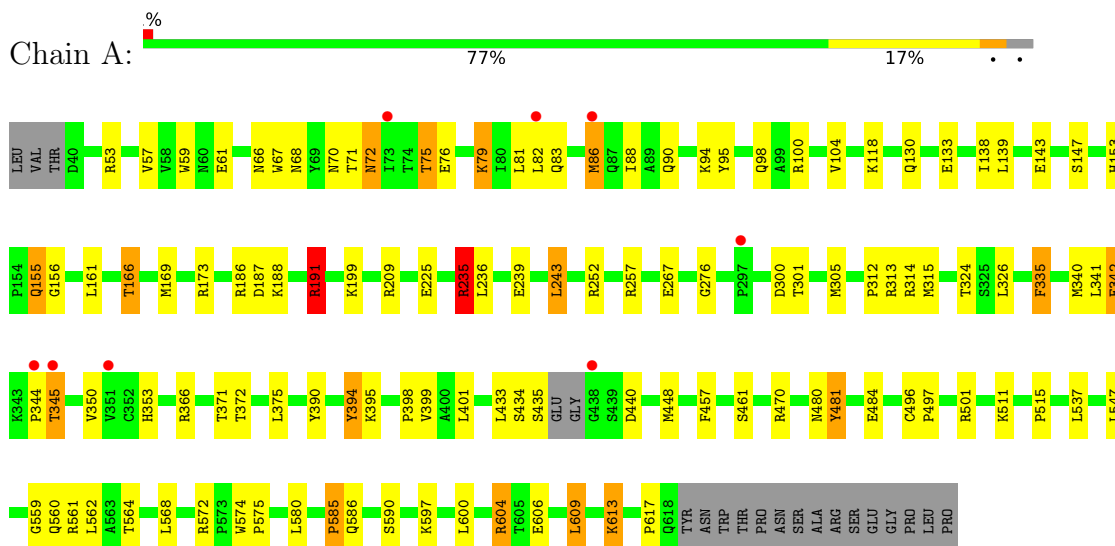
• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain B:
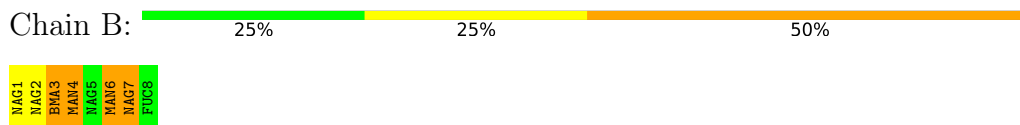
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	56.78Å 84.92Å 135.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	67.62 – 2.00 67.62 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.8 (67.62-2.00) 99.7 (67.62-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.39 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.196 , 0.255 0.200 , 0.260	Depositor DCC
R_{free} test set	2100 reflections (4.68%)	wwPDB-VP
Wilson B-factor (Å^2)	27.3	Xtriage
Anisotropy	0.409	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 34.5	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	5150	wwPDB-VP
Average B, all atoms (Å^2)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.55% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: CL, BJ2, FUC, NAG, MAN, ZN, BMA

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	0.68	1/4896 (0.0%)	1.30	56/6652 (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	4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	209	ARG	NE-CZ	5.43	1.40	1.33

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	342	GLU	CB-CA-C	-10.65	89.10	110.40
1	A	191	ARG	NE-CZ-NH1	-10.55	115.02	120.30
1	A	340	MET	CG-SD-CE	9.85	115.96	100.20
1	A	315	MET	CG-SD-CE	9.55	115.49	100.20
1	A	94	LYS	CD-CE-NZ	-9.50	89.85	111.70
1	A	86	MET	CG-SD-CE	8.36	113.57	100.20
1	A	166	THR	OG1-CB-CG2	-8.09	91.39	110.00
1	A	257	ARG	NE-CZ-NH2	-8.02	116.29	120.30
1	A	305	MET	CG-SD-CE	-7.75	87.79	100.20
1	A	609	LEU	N-CA-CB	-7.68	95.05	110.40
1	A	604	ARG	NE-CZ-NH2	-7.54	116.53	120.30
1	A	191	ARG	NE-CZ-NH2	7.42	124.01	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	53	ARG	CG-CD-NE	-7.18	96.72	111.80
1	A	166	THR	CA-CB-OG1	-7.12	94.05	109.00
1	A	586	GLN	N-CA-CB	-7.01	97.98	110.60
1	A	585	PRO	N-CA-CB	-7.00	94.90	102.60
1	A	81	LEU	CB-CG-CD2	6.94	122.80	111.00
1	A	186	ARG	NE-CZ-NH2	6.78	123.69	120.30
1	A	53	ARG	CB-CA-C	-6.66	97.08	110.40
1	A	609	LEU	CB-CG-CD2	-6.60	99.77	111.00
1	A	82	LEU	N-CA-CB	6.56	123.52	110.40
1	A	98	GLN	N-CA-CB	6.52	122.33	110.60
1	A	173	ARG	NE-CZ-NH2	6.51	123.56	120.30
1	A	90	GLN	CB-CA-C	-6.30	97.81	110.40
1	A	173	ARG	NE-CZ-NH1	-6.12	117.24	120.30
1	A	501	ARG	NE-CZ-NH2	-6.10	117.25	120.30
1	A	372	THR	CA-CB-OG1	-6.04	96.31	109.00
1	A	609	LEU	CB-CG-CD1	-6.04	100.72	111.00
1	A	239	GLU	CB-CG-CD	-5.94	98.15	114.20
1	A	199	LYS	CB-CG-CD	5.87	126.86	111.60
1	A	100	ARG	NE-CZ-NH1	-5.85	117.37	120.30
1	A	448	MET	CG-SD-CE	5.84	109.55	100.20
1	A	561	ARG	CG-CD-NE	-5.83	99.55	111.80
1	A	313	ARG	CB-CA-C	5.62	121.63	110.40
1	A	82	LEU	CB-CG-CD1	5.61	120.53	111.00
1	A	300	ASP	CB-CA-C	5.57	121.55	110.40
1	A	481	TYR	CB-CG-CD2	-5.56	117.66	121.00
1	A	236	LEU	CB-CG-CD1	-5.53	101.59	111.00
1	A	79	LYS	N-CA-CB	5.53	120.55	110.60
1	A	324	THR	CA-CB-OG1	-5.45	97.56	109.00
1	A	225	GLU	CG-CD-OE1	5.43	129.16	118.30
1	A	394	TYR	CA-CB-CG	5.33	123.53	113.40
1	A	257	ARG	CD-NE-CZ	5.32	131.05	123.60
1	A	82	LEU	CB-CG-CD2	5.29	120.00	111.00
1	A	75	THR	CA-CB-OG1	-5.29	97.90	109.00
1	A	155	GLN	CB-CA-C	5.24	120.88	110.40
1	A	395	LYS	CD-CE-NZ	-5.21	99.72	111.70
1	A	235	ARG	CA-CB-CG	-5.20	101.96	113.40
1	A	139	LEU	CB-CG-CD1	-5.16	102.24	111.00
1	A	572	ARG	CB-CA-C	-5.15	100.10	110.40
1	A	547	LEU	CB-CG-CD2	-5.13	102.28	111.00
1	A	235	ARG	CG-CD-NE	-5.11	101.07	111.80
1	A	95	TYR	N-CA-CB	5.09	119.77	110.60
1	A	345	THR	CA-CB-OG1	-5.08	98.33	109.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	68	ASN	CB-CA-C	-5.04	100.32	110.40
1	A	597	LYS	CD-CE-NZ	-5.02	100.15	111.70

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	191	ARG	Sidechain
1	A	235	ARG	Sidechain
1	A	252	ARG	Sidechain
1	A	314	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	4759	0	4586	46	0
2	B	99	0	85	2	0
3	A	1	0	0	0	0
4	A	14	0	13	0	0
5	A	2	0	0	0	0
6	A	30	0	0	3	0
7	A	245	0	0	2	0
All	All	5150	0	4684	51	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 (51) 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)
6:A:705:BJ2:C27	6:A:705:BJ2:N23	1.69	1.21
1:A:83:GLN:HB2	7:A:1017:HOH:O	1.64	0.95
1:A:66:ASN:O	1:A:70:ASN:ND2	2.13	0.81
2:B:3:BMA:H2	2:B:4:MAN:O5	1.84	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:6:MAN:O6	2:B:7:NAG:H82	1.86	0.75
1:A:301:THR:HG21	1:A:375:LEU:HD13	1.75	0.67
1:A:71:THR:O	1:A:72:ASN:HB2	1.96	0.65
1:A:187:ASP:HA	1:A:191:ARG:HD2	1.78	0.64
1:A:75:THR:HG22	1:A:79:LYS:NZ	2.13	0.64
1:A:67:TRP:CD1	1:A:366:ARG:NH1	2.66	0.63
1:A:57:VAL:O	1:A:61:GLU:HG3	2.00	0.62
1:A:590:SER:HB2	7:A:967:HOH:O	2.03	0.58
1:A:312:PRO:HG2	1:A:342:GLU:HG3	1.88	0.55
1:A:470:ARG:HH22	1:A:484[B]:GLU:CD	2.11	0.54
1:A:335:PHE:C	1:A:335:PHE:CD1	2.81	0.54
1:A:267:GLU:OE1	1:A:613:LYS:HD3	2.07	0.54
1:A:457:PHE:CE2	1:A:461:SER:HB3	2.44	0.53
6:A:705:BJ2:N23	6:A:705:BJ2:C28	2.64	0.53
1:A:433:LEU:HD23	1:A:434:SER:N	2.23	0.52
1:A:75:THR:HG22	1:A:79:LYS:HZ3	1.73	0.52
6:A:705:BJ2:C27	6:A:705:BJ2:C21	2.81	0.51
1:A:344:PRO:CG	1:A:350:VAL:HG11	2.40	0.51
1:A:161:LEU:O	1:A:166:THR:HG23	2.11	0.51
1:A:600:LEU:HD21	1:A:604:ARG:NH1	2.27	0.50
1:A:433:LEU:HD22	1:A:435:SER:H	1.77	0.50
1:A:613:LYS:NZ	1:A:617:PRO:HG3	2.27	0.49
1:A:341:LEU:O	1:A:371:THR:OG1	2.22	0.48
1:A:433:LEU:HD23	1:A:434:SER:H	1.79	0.47
1:A:560:GLN:HE21	1:A:564:THR:HG23	1.79	0.47
1:A:76:GLU:HA	1:A:79:LYS:HE2	1.97	0.47
1:A:613:LYS:HE2	1:A:613:LYS:HB3	1.28	0.46
1:A:169:MET:O	1:A:276:GLY:HA2	2.17	0.45
1:A:574:TRP:N	1:A:575:PRO:CD	2.80	0.45
1:A:118:LYS:HB2	1:A:118:LYS:HE2	1.46	0.45
1:A:143:GLU:O	1:A:147[B]:SER:HB2	2.17	0.45
1:A:480:ASN:O	1:A:481:TYR:C	2.55	0.45
1:A:326:LEU:O	1:A:559:GLY:HA3	2.18	0.43
1:A:398:PRO:HG2	1:A:401:LEU:HD12	2.00	0.43
1:A:496:CYS:HB2	1:A:497:PRO:HD2	2.01	0.43
1:A:59:TRP:CD1	1:A:88:ILE:HD11	2.54	0.42
1:A:433:LEU:CD2	1:A:435:SER:H	2.32	0.42
1:A:511:LYS:O	1:A:515:PRO:HD2	2.20	0.41
1:A:613:LYS:HZ2	1:A:617:PRO:HG3	1.84	0.41
1:A:243:LEU:HD13	1:A:600:LEU:HB2	2.03	0.41
1:A:153:HIS:HB2	1:A:156:GLY:HA3	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:480:ASN:O	1:A:484[A]:GLU:HG2	2.21	0.41
1:A:568:LEU:HD11	1:A:580:LEU:CD1	2.50	0.41
1:A:606:GLU:O	1:A:609:LEU:HB3	2.21	0.41
1:A:537:LEU:HD11	1:A:562:LEU:HG	2.02	0.40
1:A:67:TRP:NE1	1:A:366:ARG:NH1	2.68	0.40
1:A:560:GLN:HE21	1:A:564:THR:CG2	2.34	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	582/597 (98%)	563 (97%)	17 (3%)	2 (0%)	37 35

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	72	ASN
1	A	353	HIS

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	511/520 (98%)	494 (97%)	17 (3%)	33 33

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

Mol	Chain	Res	Type
1	A	86	MET
1	A	104	VAL
1	A	130	GLN
1	A	133	GLU
1	A	138	ILE
1	A	155	GLN
1	A	188	LYS
1	A	235	ARG
1	A	243	LEU
1	A	335	PHE
1	A	345	THR
1	A	390	TYR
1	A	394	TYR
1	A	399	VAL
1	A	440	ASP
1	A	585	PRO
1	A	613	LYS

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	91	HIS
1	A	560	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 ⓘ

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	0.37	0	17,19,21	1.24	3 (17%)
2	NAG	B	2	2	14,14,15	0.44	0	17,19,21	1.38	2 (11%)
2	BMA	B	3	2	11,11,12	1.23	1 (9%)	15,15,17	1.90	5 (33%)
2	MAN	B	4	2	11,11,12	0.91	0	15,15,17	2.50	6 (40%)
2	NAG	B	5	2	14,14,15	0.29	0	17,19,21	0.73	0
2	MAN	B	6	2	11,11,12	1.53	2 (18%)	15,15,17	1.53	2 (13%)
2	NAG	B	7	2	14,14,15	0.46	0	17,19,21	1.31	2 (11%)
2	FUC	B	8	2	10,10,11	0.40	0	14,14,16	0.76	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
2	NAG	B	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1
2	BMA	B	3	2	-	2/2/19/22	0/1/1/1
2	MAN	B	4	2	-	2/2/19/22	0/1/1/1
2	NAG	B	5	2	-	4/6/23/26	0/1/1/1
2	MAN	B	6	2	-	1/2/19/22	0/1/1/1
2	NAG	B	7	2	-	2/6/23/26	0/1/1/1
2	FUC	B	8	2	-	-	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	6	MAN	O5-C5	3.25	1.50	1.43
2	B	3	BMA	O5-C5	2.79	1.49	1.43
2	B	6	MAN	C2-C3	2.74	1.56	1.52

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	4	MAN	C1-O5-C5	5.52	119.67	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	4	MAN	C1-C2-C3	5.46	116.37	109.67
2	B	6	MAN	C1-O5-C5	4.27	117.98	112.19
2	B	2	NAG	C2-N2-C7	-3.80	117.49	122.90
2	B	7	NAG	C1-O5-C5	3.74	117.26	112.19
2	B	3	BMA	O3-C3-C4	3.58	118.63	110.35
2	B	4	MAN	C3-C4-C5	-3.06	104.78	110.24
2	B	3	BMA	C3-C4-C5	-2.96	104.96	110.24
2	B	3	BMA	C1-O5-C5	2.81	116.00	112.19
2	B	2	NAG	O3-C3-C2	-2.69	103.89	109.47
2	B	1	NAG	C1-C2-N2	2.63	114.97	110.49
2	B	3	BMA	O4-C4-C3	2.58	116.31	110.35
2	B	7	NAG	O3-C3-C2	2.57	114.79	109.47
2	B	6	MAN	O2-C2-C3	2.43	115.00	110.14
2	B	1	NAG	O3-C3-C2	-2.40	104.49	109.47
2	B	4	MAN	O5-C1-C2	2.28	114.29	110.77
2	B	4	MAN	O4-C4-C5	2.26	114.90	109.30
2	B	3	BMA	O5-C5-C6	2.18	110.62	107.20
2	B	1	NAG	O5-C5-C4	-2.16	105.57	110.83
2	B	4	MAN	C2-C3-C4	-2.01	107.42	110.89

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	2	NAG	C8-C7-N2-C2
2	B	2	NAG	O7-C7-N2-C2
2	B	5	NAG	C8-C7-N2-C2
2	B	5	NAG	O7-C7-N2-C2
2	B	4	MAN	O5-C5-C6-O6
2	B	4	MAN	C4-C5-C6-O6
2	B	3	BMA	C4-C5-C6-O6
2	B	7	NAG	C8-C7-N2-C2
2	B	7	NAG	O7-C7-N2-C2
2	B	3	BMA	O5-C5-C6-O6
2	B	6	MAN	C4-C5-C6-O6
2	B	5	NAG	C4-C5-C6-O6
2	B	5	NAG	O5-C5-C6-O6

There are no ring outliers.

4 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	6	MAN	1	0
2	B	4	MAN	1	0
2	B	3	BMA	1	0
2	B	7	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.

Oligosaccharide Chain B
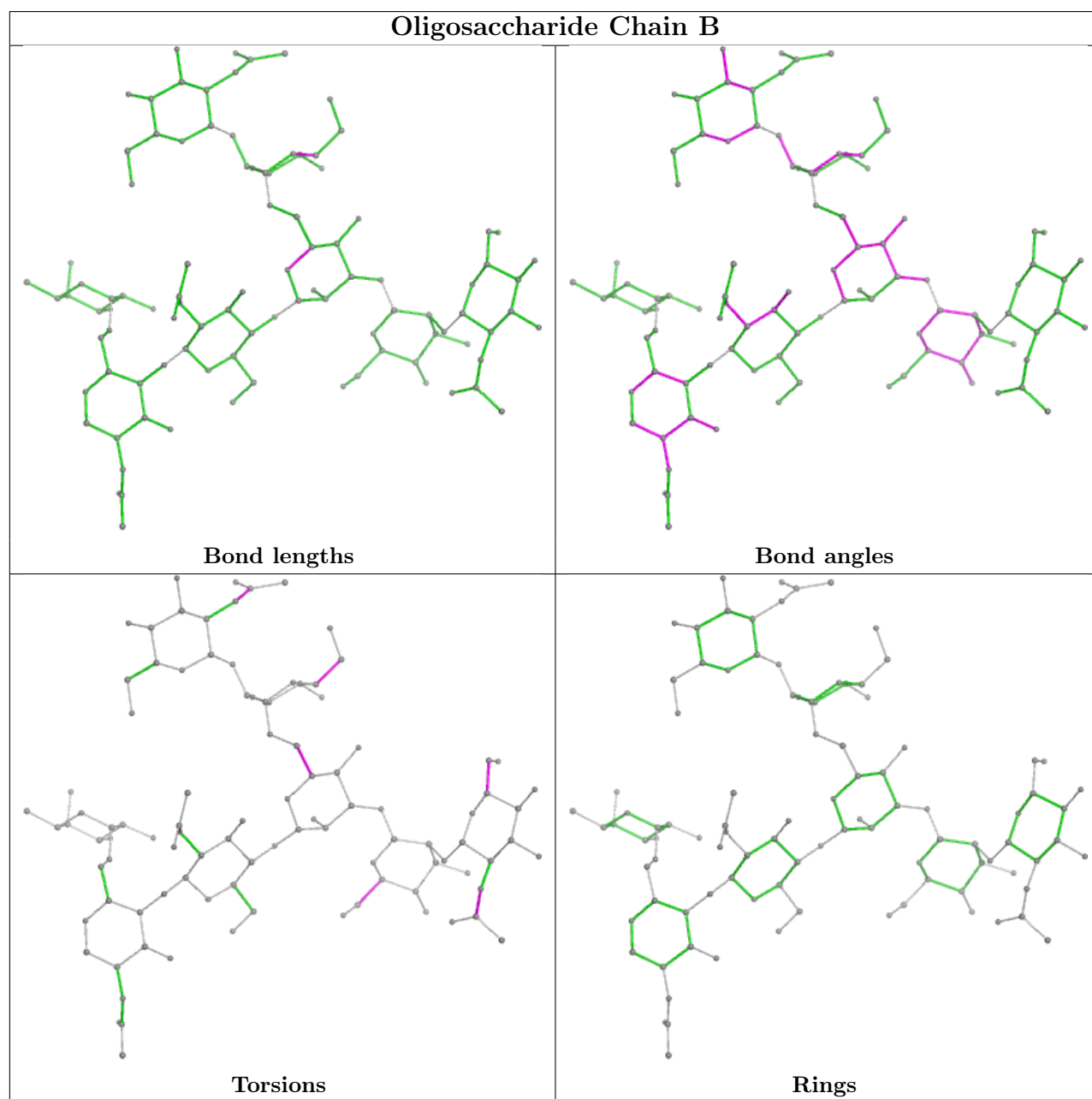
5.6 Ligand geometry ⓘ

Of 5 ligands modelled in this entry, 3 are monoatomic - leaving 2 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	BJ2	A	705	3	30,31,31	3.82	14 (46%)	36,44,44	2.34	11 (30%)
4	NAG	A	702	1	14,14,15	0.47	0	17,19,21	1.13	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	BJ2	A	705	3	-	5/36/56/56	0/2/2/2
4	NAG	A	702	1	-	0/6/23/26	0/1/1/1

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	705	BJ2	C27-N23	11.16	1.69	1.47
6	A	705	BJ2	C08-N12	-8.35	1.36	1.47
6	A	705	BJ2	C21-N23	7.02	1.50	1.34
6	A	705	BJ2	C26-C27	-5.58	1.40	1.53
6	A	705	BJ2	C09-C08	5.36	1.62	1.53
6	A	705	BJ2	C04-N03	5.11	1.52	1.46
6	A	705	BJ2	C11-N12	4.62	1.56	1.47
6	A	705	BJ2	C13-N12	4.58	1.45	1.34
6	A	705	BJ2	C10-C09	-3.83	1.35	1.51
6	A	705	BJ2	C24-N23	-3.68	1.40	1.47
6	A	705	BJ2	C25-C24	3.00	1.62	1.51
6	A	705	BJ2	C25-C26	2.52	1.62	1.51
6	A	705	BJ2	C04-C08	-2.36	1.51	1.54
6	A	705	BJ2	C02-C21	2.02	1.57	1.53

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	705	BJ2	O29-C28-O30	-6.97	108.27	124.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	705	BJ2	O29-C28-C27	6.17	134.76	113.38
6	A	705	BJ2	O19-C18-C17	4.47	128.41	114.07
6	A	705	BJ2	C25-C26-C27	4.08	112.72	104.18
4	A	702	NAG	C1-O5-C5	3.63	117.11	112.19
6	A	705	BJ2	C10-C09-C08	-2.84	99.39	104.16
6	A	705	BJ2	C26-C27-C28	2.74	115.86	111.36
6	A	705	BJ2	O19-C18-O20	-2.71	116.55	123.30
6	A	705	BJ2	C11-N12-C08	-2.57	107.70	111.74
6	A	705	BJ2	O20-C18-C17	-2.43	115.00	122.80
6	A	705	BJ2	C13-C15-N16	2.25	117.58	109.21
6	A	705	BJ2	C17-C15-C13	-2.12	104.19	109.27

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	705	BJ2	C05-C04-C08-C09
6	A	705	BJ2	N03-C04-C08-C09
6	A	705	BJ2	N16-C15-C17-C18
6	A	705	BJ2	C05-C04-C08-N12
6	A	705	BJ2	O14-C13-C15-N16

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	705	BJ2	3	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 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.

Ligand BJ2 A 705

Bond lengths

Bond angles

Torsions

Rings
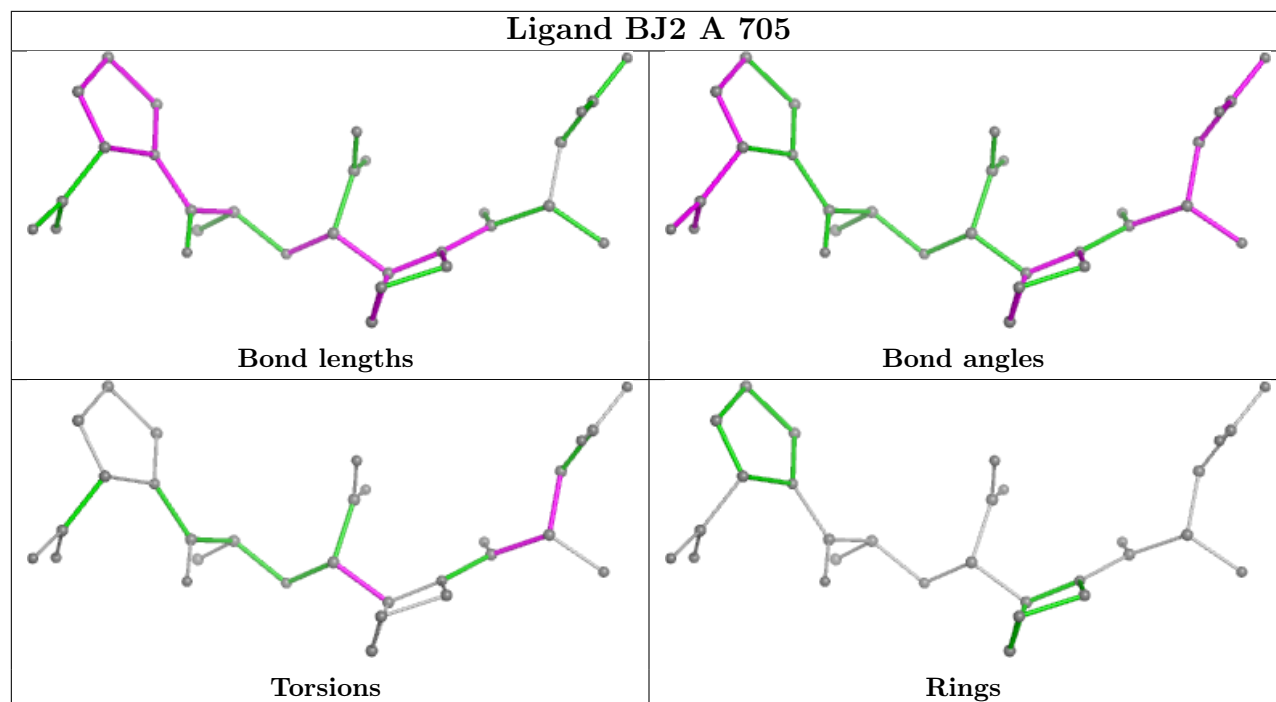
5.7 Other polymers ⓘ

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 ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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(Å²)	Q<0.9
1	A	577/597 (96%)	-0.24	8 (1%)	73	72	7, 32, 61, 91	8 (1%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	82	LEU	3.8
1	A	438	GLY	3.0
1	A	86	MET	2.9
1	A	344	PRO	2.5
1	A	345	THR	2.3
1	A	73	ILE	2.1
1	A	351	VAL	2.1
1	A	297	PRO	2.1

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

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

6.3 Carbohydrates ⓘ

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.
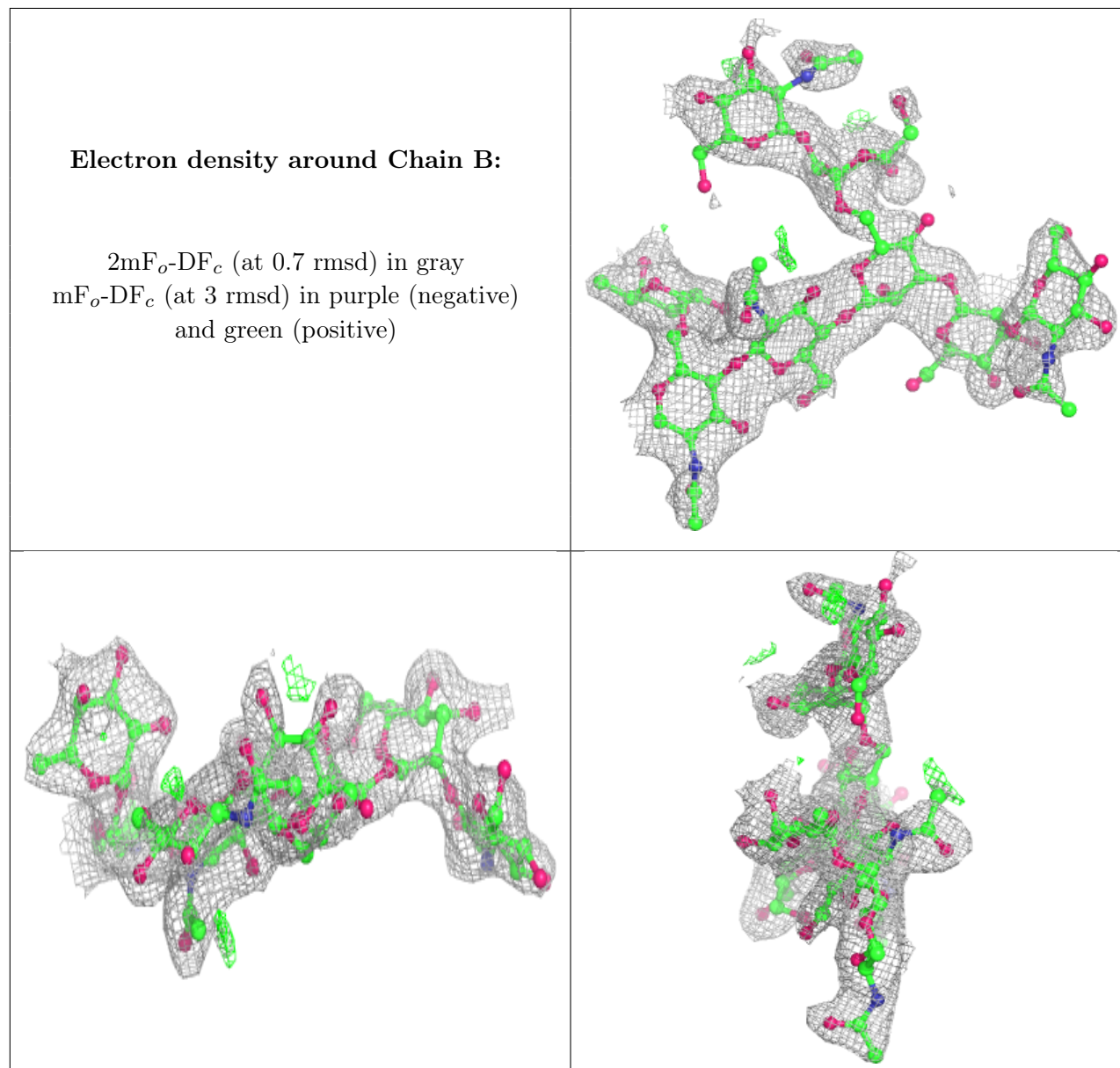
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å²)	Q<0.9
2	NAG	B	5	14/15	0.67	0.15	64,88,94,101	0
2	MAN	B	6	11/12	0.76	0.13	57,67,78,79	0
2	BMA	B	3	11/12	0.78	0.10	67,74,90,93	0
2	NAG	B	7	14/15	0.80	0.14	33,56,65,67	14

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	MAN	B	4	11/12	0.82	0.12	51,76,94,102	0
2	NAG	B	2	14/15	0.86	0.10	50,57,63,70	0
2	FUC	B	8	10/11	0.90	0.09	42,51,61,68	0
2	NAG	B	1	14/15	0.92	0.08	44,49,64,71	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.
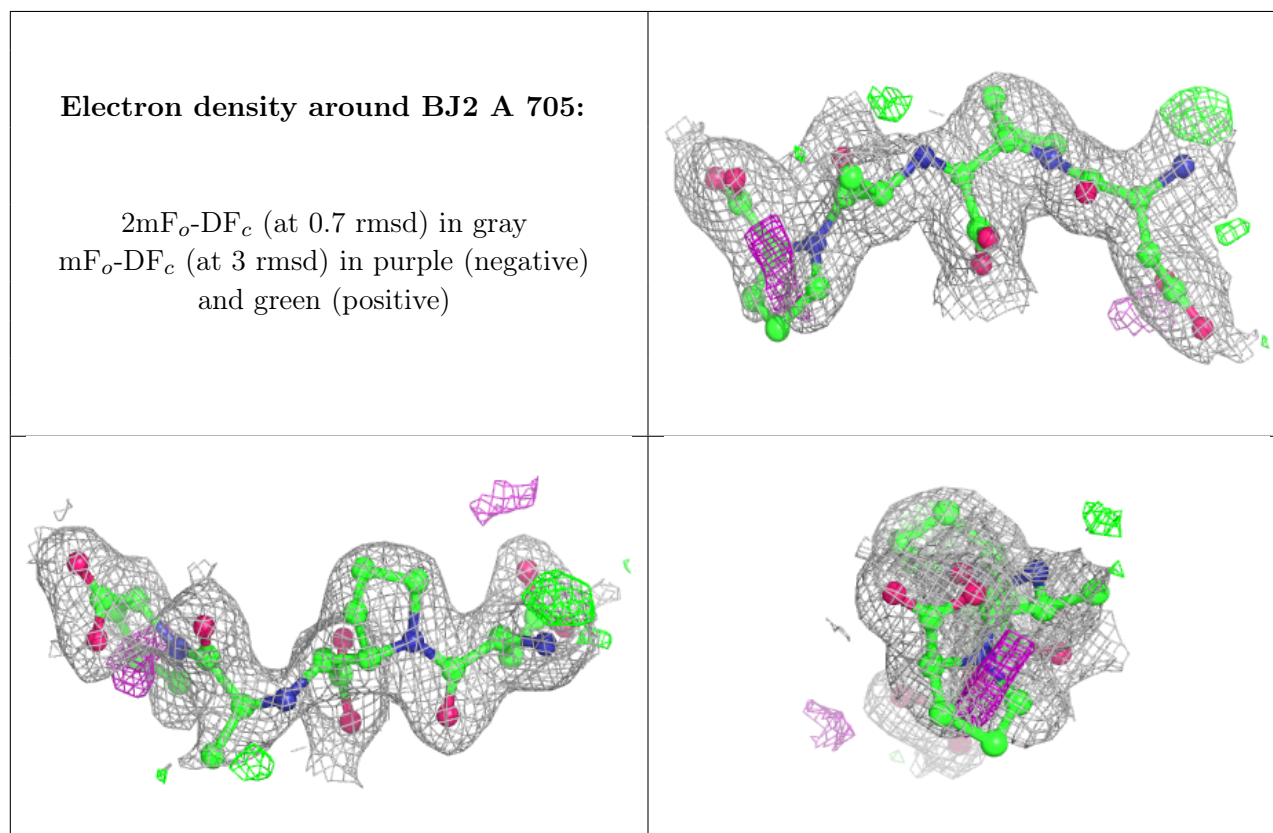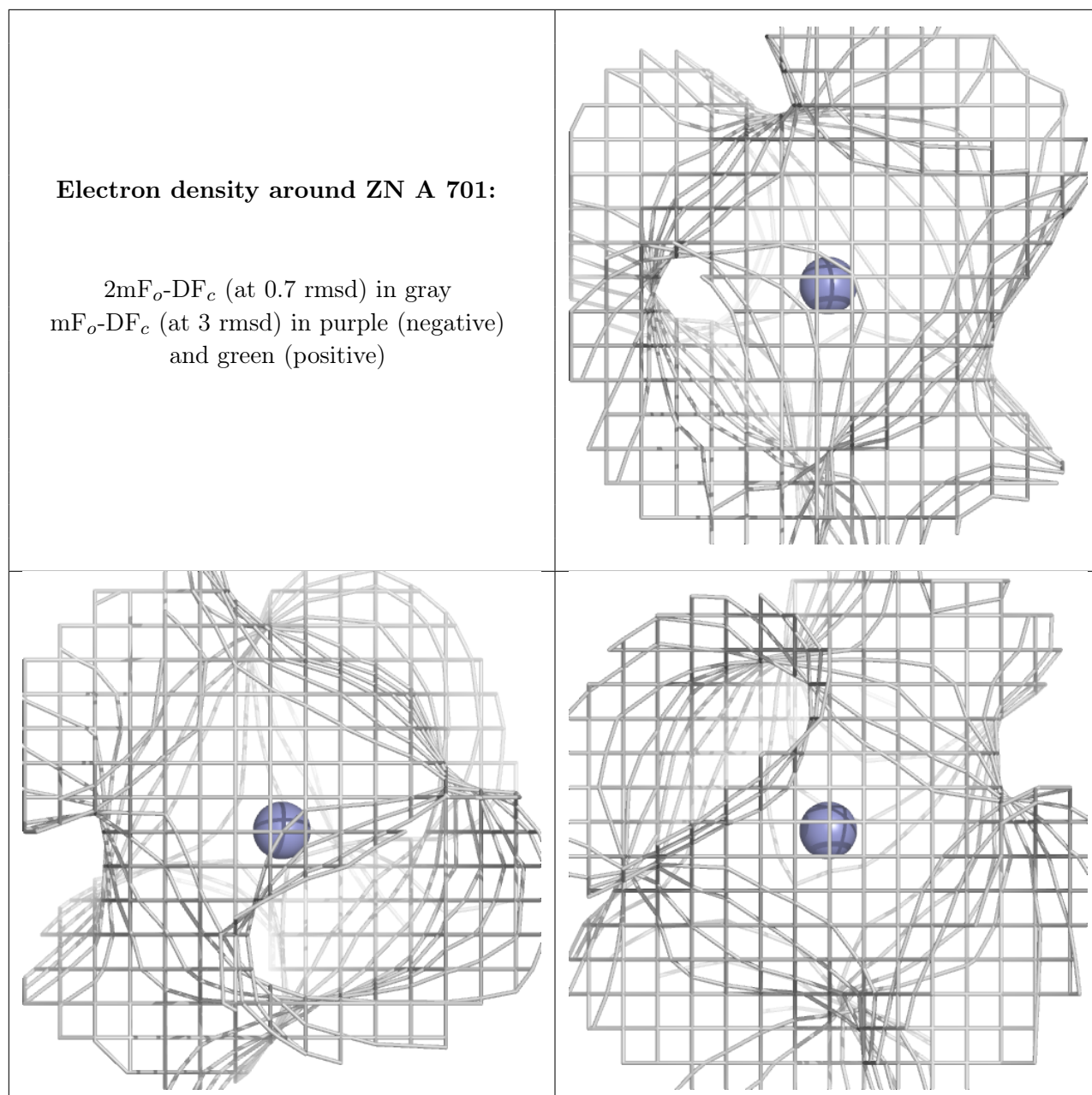

Electron density around Chain B:

$2mF_o$-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
4	NAG	A	702	14/15	0.72	0.14	71,86,97,97	0
6	BJ2	A	705	30/30	0.91	0.10	27,39,50,58	0
5	CL	A	704	1/1	0.99	0.06	24,24,24,24	0
3	ZN	A	701	1/1	1.00	0.01	25,25,25,25	0
5	CL	A	703	1/1	1.00	0.03	23,23,23,23	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 BJ2 A 705:

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

Electron density around ZN A 701:

$2mF_o$-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 ⓘ

There are no such residues in this entry.