



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 16, 2025 – 06:50 am GMT

PDB ID : 9GBN
Title : Human Angiotensin-1 converting enzyme C-domain in complex with a diprolyl inhibitor- SG15
Authors : Gregory, K.S.; Cozier, G.E.; Acharya, K.R.
Deposited on : 2024-07-31
Resolution : 2.00 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 : 4.02b-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

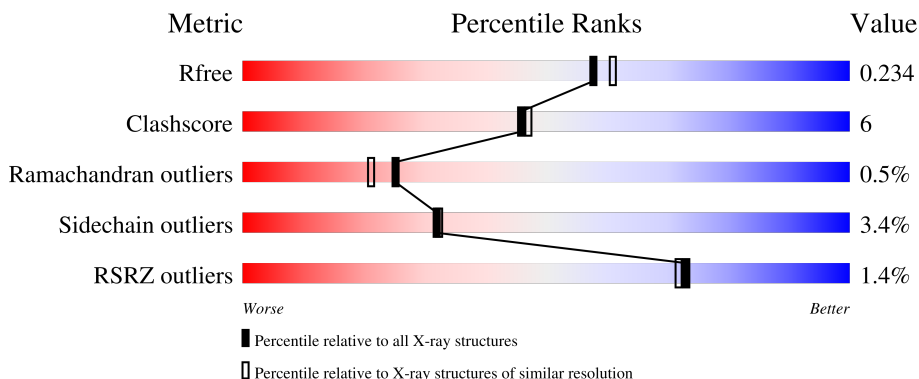
1 Overall quality at a glance

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 $\leq 5\%$. 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	597	 76% 18% . .
2	D	8	 12% 62% 25%

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 5194 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.

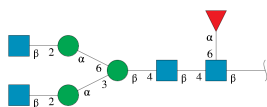
- Molecule 1 is a protein called Angiotensin-converting enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	576	4707	3017	803	863	24	0	2	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
			Total	C	N	O			
2	D	8	99	56	4	39	0	0	0

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

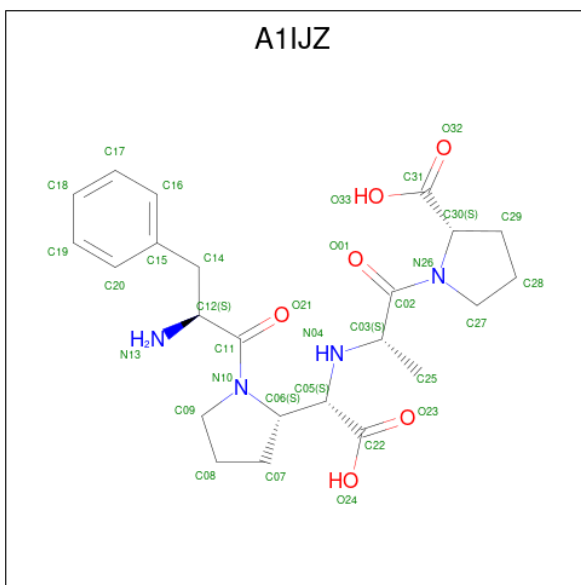
- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 7 is (2S)-1-[(2S)-2-[(1S)-1-[(2S)-1-[(2S)-2-azanyl-3-phenyl-propanoyl]pyrrolidin-2-yl]-2-oxidanyl-2-oxidanylidene-ethyl]amino]propanoyl]pyrrolidine-2-carboxylic acid (three-letter code: A1IJZ) (formula: C₂₃H₃₂N₄O₆) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
7	A	1	Total	C	N	O	0	0
			33	23	4	6		

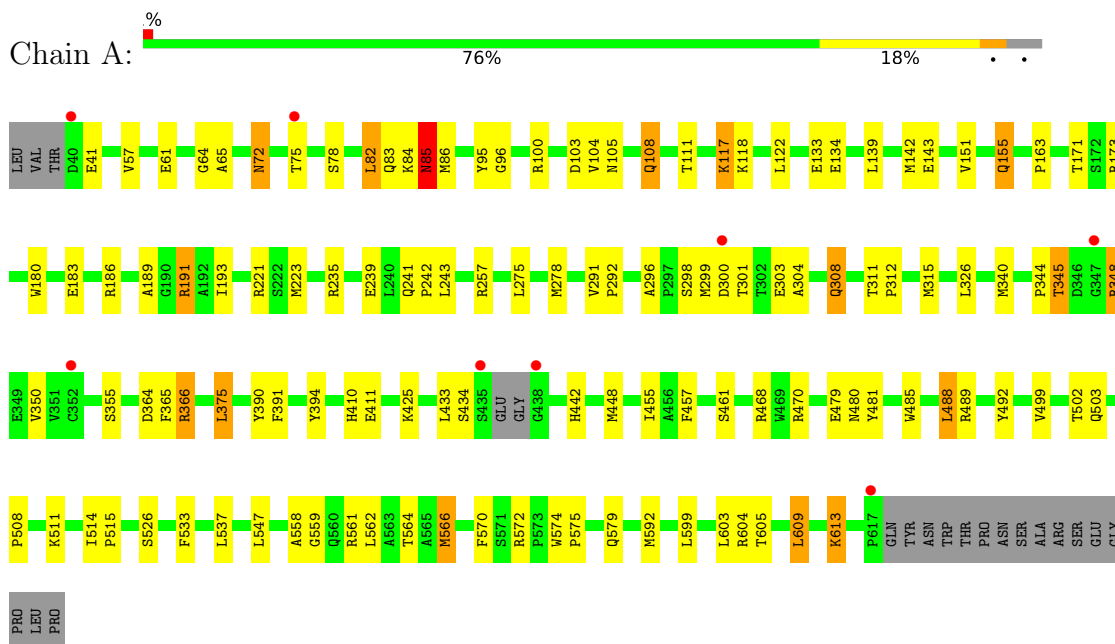
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	334	Total	O	0	0
			334	334		

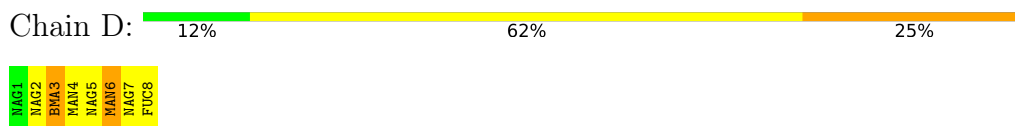
3 Residue-property plots [i](#)

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: 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



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	56.36Å 84.23Å 133.73Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	71.37 – 2.00 71.27 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.9 (71.37-2.00) 99.8 (71.27-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.35 (at 2.00Å)	Xtrriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.178 , 0.232 0.179 , 0.234	Depositor DCC
R_{free} test set	2153 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	26.9	Xtrriage
Anisotropy	0.122	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 32.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5194	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.21% 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: A1IJZ, MAN, NAG, EDO, FUC, CL, 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	0.66	1/4843 (0.0%)	1.32	53/6581 (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	479	GLU	CD-OE1	5.52	1.31	1.25

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	223	MET	CG-SD-CE	-13.04	79.34	100.20
1	A	105	ASN	CB-CA-C	-10.78	88.83	110.40
1	A	433	LEU	CB-CG-CD1	-9.92	94.14	111.00
1	A	173	ARG	NE-CZ-NH2	9.49	125.04	120.30
1	A	433	LEU	CB-CG-CD2	8.80	125.97	111.00
1	A	278	MET	CG-SD-CE	8.43	113.68	100.20
1	A	340	MET	CG-SD-CE	8.18	113.28	100.20
1	A	186	ARG	NE-CZ-NH2	8.16	124.38	120.30
1	A	103	ASP	CB-CA-C	8.07	126.53	110.40
1	A	86	MET	CG-SD-CE	7.82	112.71	100.20
1	A	604	ARG	NE-CZ-NH2	-7.75	116.42	120.30
1	A	257	ARG	NE-CZ-NH1	7.72	124.16	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	348	ARG	CB-CA-C	-7.72	94.97	110.40
1	A	579	GLN	N-CA-CB	-7.42	97.25	110.60
1	A	239	GLU	CB-CA-C	-7.29	95.83	110.40
1	A	257	ARG	CD-NE-CZ	7.28	133.80	123.60
1	A	239	GLU	CB-CG-CD	-7.26	94.59	114.20
1	A	239	GLU	N-CA-CB	7.16	123.49	110.60
1	A	243	LEU	CB-CG-CD2	-6.99	99.11	111.00
1	A	609	LEU	N-CA-CB	-6.93	96.55	110.40
1	A	468	ARG	NE-CZ-NH1	-6.89	116.86	120.30
1	A	85	ASN	CB-CA-C	-6.81	96.78	110.40
1	A	108	GLN	N-CA-CB	-6.34	99.19	110.60
1	A	186	ARG	NE-CZ-NH1	-6.31	117.15	120.30
1	A	142	MET	CG-SD-CE	-6.25	90.20	100.20
1	A	488	LEU	CB-CG-CD1	-6.24	100.40	111.00
1	A	613	LYS	CB-CA-C	-6.08	98.25	110.40
1	A	100	ARG	CA-CB-CG	-5.94	100.32	113.40
1	A	117	LYS	CB-CA-C	5.92	122.24	110.40
1	A	257	ARG	NE-CZ-NH2	-5.91	117.35	120.30
1	A	134	GLU	CB-CA-C	5.86	122.12	110.40
1	A	171	THR	CA-CB-OG1	-5.85	96.72	109.00
1	A	311	THR	CA-CB-OG1	-5.84	96.73	109.00
1	A	604	ARG	CG-CD-NE	-5.84	99.54	111.80
1	A	502	THR	OG1-CB-CG2	-5.74	96.80	110.00
1	A	566	MET	CG-SD-CE	-5.68	91.12	100.20
1	A	603	LEU	CB-CG-CD2	-5.67	101.36	111.00
1	A	95	TYR	N-CA-CB	5.52	120.54	110.60
1	A	561	ARG	CG-CD-NE	-5.50	100.26	111.80
1	A	345	THR	CA-CB-OG1	-5.50	97.46	109.00
1	A	547	LEU	CB-CG-CD2	-5.39	101.84	111.00
1	A	100	ARG	NE-CZ-NH1	-5.38	117.61	120.30
1	A	291	VAL	CB-CA-C	-5.27	101.38	111.40
1	A	111	THR	CA-CB-OG1	-5.26	97.94	109.00
1	A	82	LEU	N-CA-CB	-5.25	99.90	110.40
1	A	191	ARG	CB-CG-CD	-5.24	97.97	111.60
1	A	221	ARG	NE-CZ-NH2	5.24	122.92	120.30
1	A	315	MET	CG-SD-CE	5.23	108.56	100.20
1	A	572	ARG	CD-NE-CZ	5.10	130.73	123.60
1	A	366	ARG	NE-CZ-NH2	-5.09	117.75	120.30
1	A	375	LEU	CB-CG-CD2	5.09	119.65	111.00
1	A	173	ARG	NE-CZ-NH1	-5.06	117.77	120.30
1	A	564	THR	OG1-CB-CG2	-5.05	98.39	110.00

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	163	PRO	Peptide
1	A	191	ARG	Sidechain
1	A	235	ARG	Sidechain
1	A	489	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	4707	0	4547	52	0
2	D	99	0	85	2	0
3	A	14	0	13	0	0
4	A	4	0	6	0	0
5	A	1	0	0	0	0
6	A	2	0	0	0	0
7	A	33	0	0	1	0
8	A	334	0	0	4	0
All	All	5194	0	4651	54	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 6.

All (54) 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:41:GLU:OE2	1:A:108:GLN:HB3	1.79	0.82
2:D:3:BMA:H61	2:D:6:MAN:H5	1.77	0.65
1:A:96:GLY:HA3	1:A:122:LEU:CD2	2.29	0.63
1:A:344:PRO:CG	1:A:348:ARG:HH12	2.11	0.63
1:A:304:ALA:O	1:A:308:GLN:HG3	1.98	0.62
1:A:344:PRO:HG2	1:A:348:ARG:HH12	1.66	0.60
1:A:344:PRO:HG2	1:A:348:ARG:NH1	2.17	0.59
2:D:3:BMA:H61	2:D:6:MAN:C5	2.32	0.59
1:A:57:VAL:O	1:A:61:GLU:HG3	2.05	0.57
1:A:470:ARG:NE	8:A:809:HOH:O	2.34	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:488:LEU:HD22	1:A:492:TYR:HE2	1.71	0.55
1:A:241:GLN:HB2	1:A:242:PRO:HD3	1.89	0.54
1:A:326:LEU:O	1:A:559:GLY:HA3	2.08	0.54
1:A:488:LEU:HD22	1:A:492:TYR:CE2	2.43	0.53
1:A:300:ASP:HB3	1:A:303:GLU:HB3	1.90	0.53
1:A:301:THR:HG21	1:A:375:LEU:HD22	1.92	0.52
1:A:344:PRO:HG2	1:A:350:VAL:HG11	1.93	0.51
1:A:296:ALA:HB1	1:A:442:HIS:CE1	2.47	0.50
1:A:364:ASP:OD2	1:A:366:ARG:NH2	2.36	0.49
1:A:139:LEU:O	1:A:143:GLU:HG3	2.12	0.49
1:A:457:PHE:CE2	1:A:461:SER:HB3	2.48	0.49
1:A:104:VAL:HG12	8:A:847:HOH:O	2.13	0.48
1:A:344:PRO:CG	1:A:348:ARG:NH1	2.75	0.48
1:A:511:LYS:O	1:A:515:PRO:HD2	2.14	0.48
1:A:533:PHE:O	1:A:537:LEU:HG	2.14	0.48
1:A:605:THR:HB	8:A:948:HOH:O	2.13	0.48
1:A:75:THR:HA	1:A:78:SER:HB3	1.97	0.47
1:A:574:TRP:N	1:A:575:PRO:CD	2.78	0.46
1:A:82:LEU:O	1:A:85:ASN:HB2	2.15	0.46
1:A:455:ILE:HD13	1:A:592:MET:CE	2.45	0.46
1:A:304:ALA:O	1:A:308:GLN:CG	2.64	0.46
1:A:562:LEU:HB3	1:A:566:MET:HE2	1.98	0.45
1:A:65:ALA:HB2	1:A:84:LYS:HG3	1.99	0.44
1:A:118:LYS:HE3	1:A:570:PHE:CE2	2.53	0.44
1:A:151:VAL:HG12	1:A:180:TRP:CZ2	2.52	0.44
1:A:537:LEU:HB3	1:A:558:ALA:HB1	2.00	0.44
1:A:480:ASN:O	1:A:481:TYR:C	2.56	0.43
1:A:514:ILE:HB	1:A:515:PRO:HD3	2.00	0.43
1:A:189:ALA:O	1:A:193:ILE:HG12	2.18	0.43
1:A:455:ILE:HD13	1:A:592:MET:HE1	2.00	0.43
1:A:411:GLU:HB2	1:A:526:SER:HB2	1.99	0.43
1:A:183:GLU:OE1	1:A:499:VAL:CG2	2.66	0.43
1:A:485:TRP:CD2	1:A:508:PRO:HG3	2.54	0.43
1:A:183:GLU:OE1	1:A:499:VAL:HG21	2.19	0.43
1:A:448:MET:HE2	1:A:599:LEU:HD11	2.02	0.42
1:A:605:THR:OG1	8:A:801:HOH:O	2.21	0.42
1:A:72:ASN:OD1	1:A:348:ARG:HG2	2.20	0.41
1:A:96:GLY:HA3	1:A:122:LEU:HD21	2.02	0.41
1:A:292:PRO:HD3	1:A:448:MET:HG2	2.02	0.41
1:A:365:PHE:CE1	1:A:391:PHE:HB3	2.54	0.41
1:A:355:SER:HA	7:A:706:A1IJZ:O21	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:275:LEU:N	1:A:275:LEU:HD22	2.37	0.40
1:A:562:LEU:HA	1:A:562:LEU:HD23	1.85	0.40
1:A:299:MET:CE	1:A:304:ALA:HB2	2.51	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	573/597 (96%)	558 (97%)	12 (2%)	3 (0%)	25 21

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	155	GLN
1	A	64	GLY
1	A	72	ASN

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	504/520 (97%)	487 (97%)	17 (3%)	32 32

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

Mol	Chain	Res	Type
1	A	83	GLN
1	A	85	ASN
1	A	117	LYS
1	A	133	GLU
1	A	155	GLN
1	A	298	SER
1	A	308	GLN
1	A	312	PRO
1	A	345	THR
1	A	390	TYR
1	A	394	TYR
1	A	410	HIS
1	A	425	LYS
1	A	434	SER
1	A	503	GLN
1	A	609	LEU
1	A	613	LYS

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	87	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	D	1	2,1	14,14,15	0.45	0	17,19,21	1.09	0
2	NAG	D	2	2	14,14,15	0.35	0	17,19,21	1.38	4 (23%)
2	BMA	D	3	2	11,11,12	0.65	0	15,15,17	1.28	2 (13%)
2	MAN	D	4	2	11,11,12	0.71	0	15,15,17	2.21	3 (20%)
2	NAG	D	5	2	14,14,15	0.34	0	17,19,21	1.36	3 (17%)
2	MAN	D	6	2	11,11,12	1.31	2 (18%)	15,15,17	1.58	2 (13%)
2	NAG	D	7	2	14,14,15	0.52	0	17,19,21	1.16	3 (17%)
2	FUC	D	8	2	10,10,11	0.45	0	14,14,16	0.83	1 (7%)

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

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	6	MAN	C2-C3	2.53	1.56	1.52
2	D	6	MAN	O5-C5	2.26	1.48	1.43

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	4	MAN	C1-O5-C5	6.61	121.15	112.19
2	D	6	MAN	C1-O5-C5	3.62	117.09	112.19
2	D	4	MAN	C1-C2-C3	3.59	114.08	109.67

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	2	NAG	C1-C2-N2	3.52	116.51	110.49
2	D	6	MAN	C1-C2-C3	3.15	113.54	109.67
2	D	5	NAG	C2-N2-C7	2.81	126.91	122.90
2	D	4	MAN	O5-C1-C2	2.79	115.07	110.77
2	D	2	NAG	O3-C3-C2	-2.59	104.11	109.47
2	D	7	NAG	C2-N2-C7	2.48	126.43	122.90
2	D	7	NAG	C1-O5-C5	2.47	115.54	112.19
2	D	2	NAG	C1-O5-C5	2.45	115.50	112.19
2	D	3	BMA	C1-C2-C3	2.42	112.64	109.67
2	D	7	NAG	O3-C3-C2	2.38	114.40	109.47
2	D	5	NAG	C3-C4-C5	-2.21	106.29	110.24
2	D	5	NAG	O5-C5-C6	2.08	110.47	107.20
2	D	2	NAG	C6-C5-C4	-2.03	108.24	113.00
2	D	8	FUC	O2-C2-C3	-2.01	106.11	110.14
2	D	3	BMA	O2-C2-C3	2.00	114.15	110.14

There are no chirality outliers.

All (11) torsion outliers are listed below:

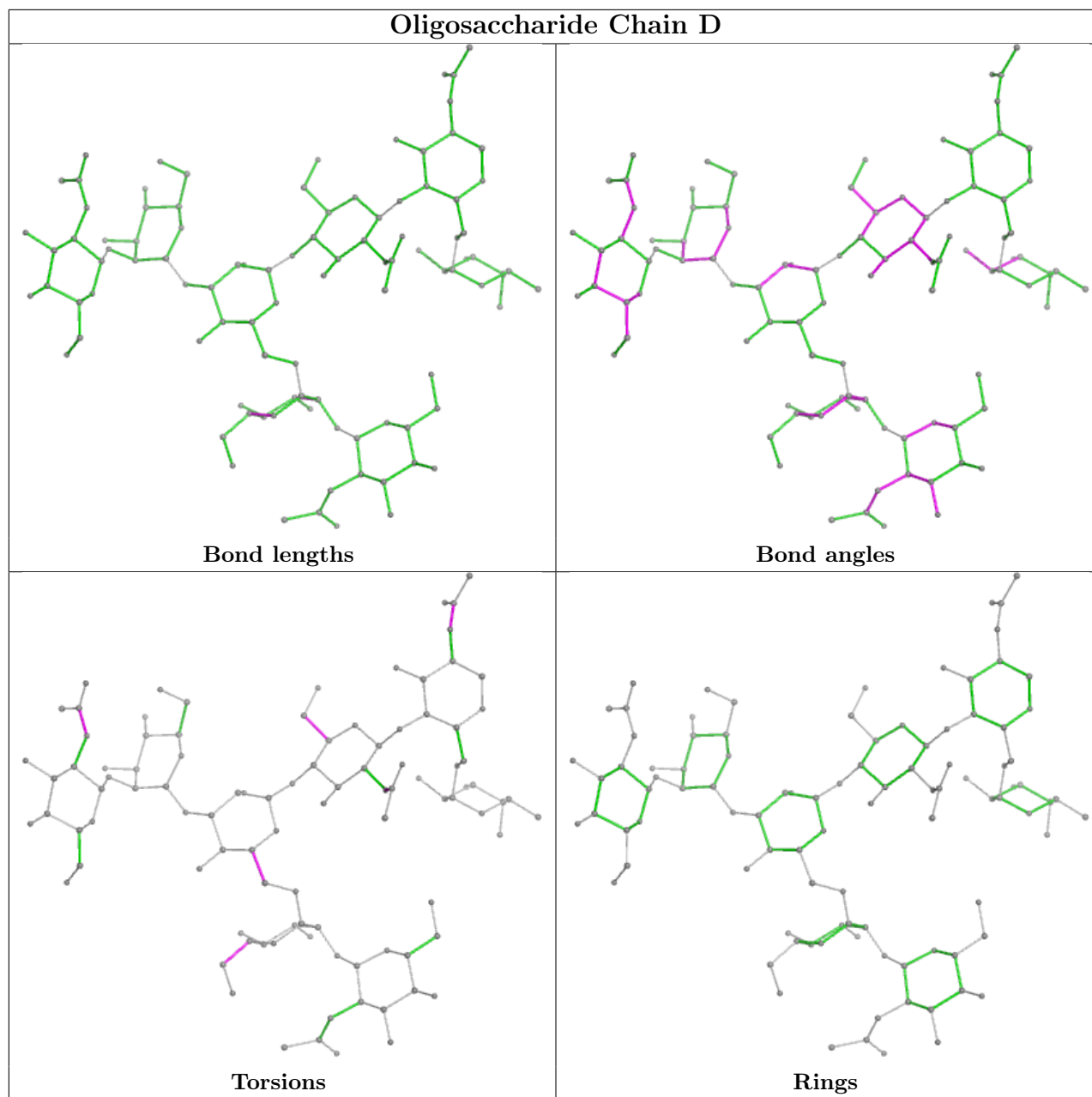
Mol	Chain	Res	Type	Atoms
2	D	2	NAG	C8-C7-N2-C2
2	D	2	NAG	O7-C7-N2-C2
2	D	5	NAG	C8-C7-N2-C2
2	D	3	BMA	O5-C5-C6-O6
2	D	5	NAG	O7-C7-N2-C2
2	D	1	NAG	C8-C7-N2-C2
2	D	3	BMA	C4-C5-C6-O6
2	D	1	NAG	O7-C7-N2-C2
2	D	6	MAN	C4-C5-C6-O6
2	D	6	MAN	O5-C5-C6-O6
2	D	2	NAG	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	6	MAN	2	0
2	D	3	BMA	2	0

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



5.6 Ligand geometry [i](#)

Of 6 ligands modelled in this entry, 3 are 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
7	A1IJZ	A	706	5	35,35,35	3.77	12 (34%)	42,49,49	1.98	12 (28%)
3	NAG	A	701	1	14,14,15	0.43	0	17,19,21	1.62	2 (11%)
4	EDO	A	702	-	3,3,3	0.22	0	2,2,2	0.11	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
7	A1IJZ	A	706	5	-	5/36/56/56	0/3/3/3
3	NAG	A	701	1	-	0/6/23/26	0/1/1/1
4	EDO	A	702	-	-	0/1/1/1	-

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	706	A1IJZ	C07-C06	-10.76	1.34	1.53
7	A	706	A1IJZ	C06-N10	10.64	1.60	1.47
7	A	706	A1IJZ	C30-N26	8.40	1.64	1.47
7	A	706	A1IJZ	C02-N26	6.78	1.50	1.34
7	A	706	A1IJZ	C09-N10	-6.02	1.36	1.47
7	A	706	A1IJZ	C29-C30	-5.95	1.39	1.53
7	A	706	A1IJZ	C11-N10	4.61	1.45	1.34
7	A	706	A1IJZ	C27-N26	-3.25	1.41	1.47
7	A	706	A1IJZ	O24-C22	-2.81	1.21	1.30
7	A	706	A1IJZ	C19-C20	2.45	1.44	1.38
7	A	706	A1IJZ	C19-C18	2.37	1.44	1.38
7	A	706	A1IJZ	C28-C29	2.06	1.60	1.51

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	706	A1IJZ	C25-C03-N04	-5.30	97.63	108.85
3	A	701	NAG	C1-O5-C5	4.98	118.94	112.19
7	A	706	A1IJZ	O33-C31-O32	-4.62	113.60	124.09
7	A	706	A1IJZ	O33-C31-C30	4.21	127.97	113.38
7	A	706	A1IJZ	C28-C29-C30	3.81	112.15	104.18
7	A	706	A1IJZ	O24-C22-O23	-3.11	117.04	124.09
7	A	706	A1IJZ	C14-C12-C11	-3.02	102.03	109.27
7	A	706	A1IJZ	C20-C15-C16	2.90	122.72	118.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	706	A1IJZ	C09-N10-C06	-2.62	107.62	111.74
7	A	706	A1IJZ	C28-C27-N26	2.54	107.71	103.25
7	A	706	A1IJZ	O23-C22-C05	2.32	129.66	121.70
3	A	701	NAG	C2-N2-C7	2.14	125.95	122.90
7	A	706	A1IJZ	C07-C08-C09	-2.10	99.02	104.98
7	A	706	A1IJZ	C14-C12-N13	2.08	119.52	111.46

There are no chirality outliers.

All (5) torsion outliers are listed below:

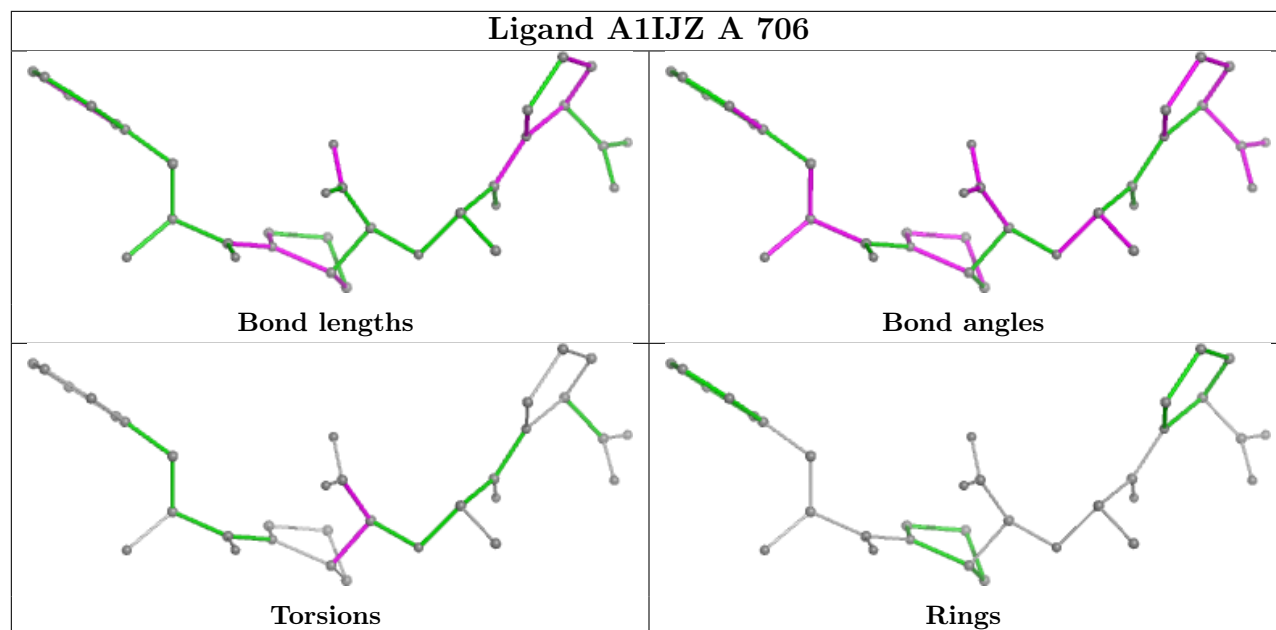
Mol	Chain	Res	Type	Atoms
7	A	706	A1IJZ	C22-C05-C06-C07
7	A	706	A1IJZ	N04-C05-C22-O23
7	A	706	A1IJZ	N04-C05-C22-O24
7	A	706	A1IJZ	N04-C05-C06-C07
7	A	706	A1IJZ	C22-C05-C06-N10

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	706	A1IJZ	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 all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	576/597 (96%)	-0.41	8 (1%) 73 72	10, 30, 57, 84	2 (0%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	40[A]	ASP	3.5
1	A	352	CYS	2.8
1	A	435	SER	2.6
1	A	438	GLY	2.4
1	A	617	PRO	2.2
1	A	347	GLY	2.2
1	A	75	THR	2.1
1	A	300	ASP	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](#)

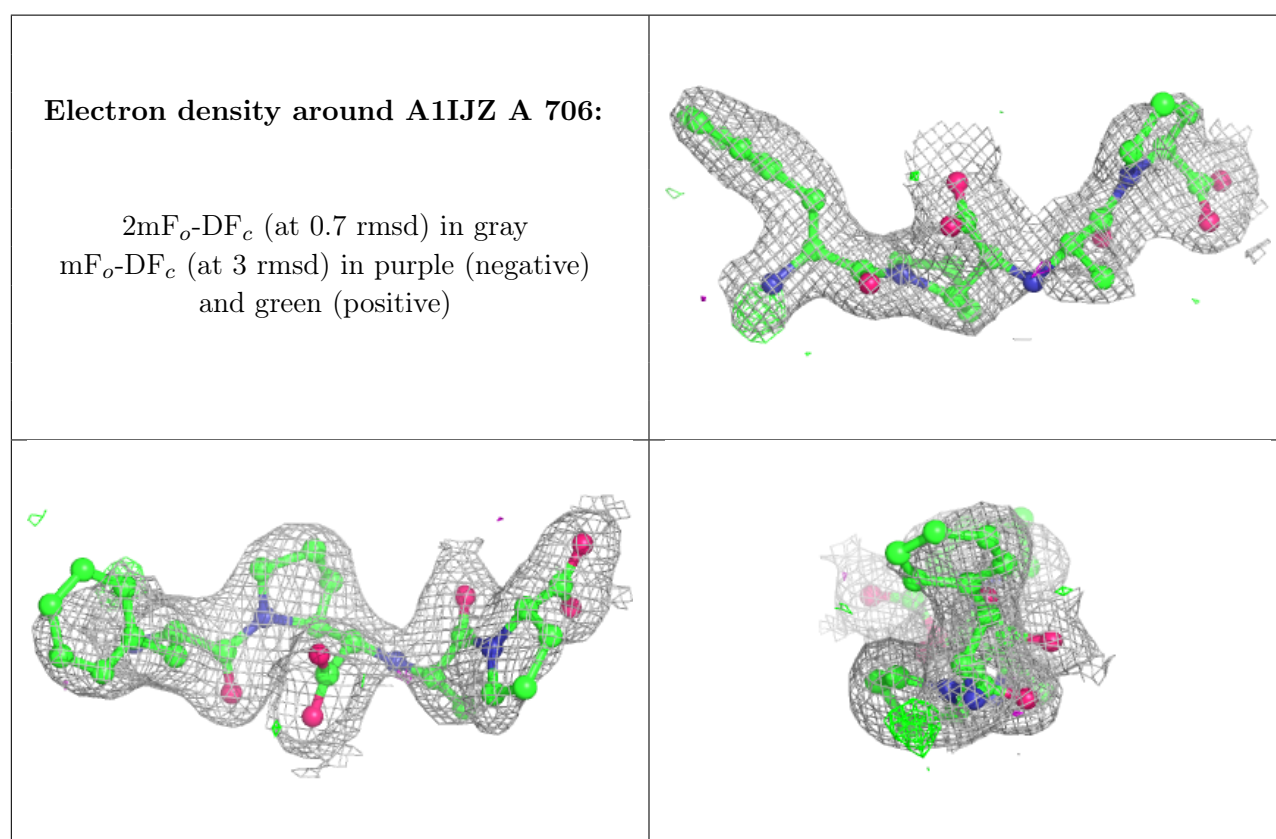
SUGAR-RSR INFOmissingINFO

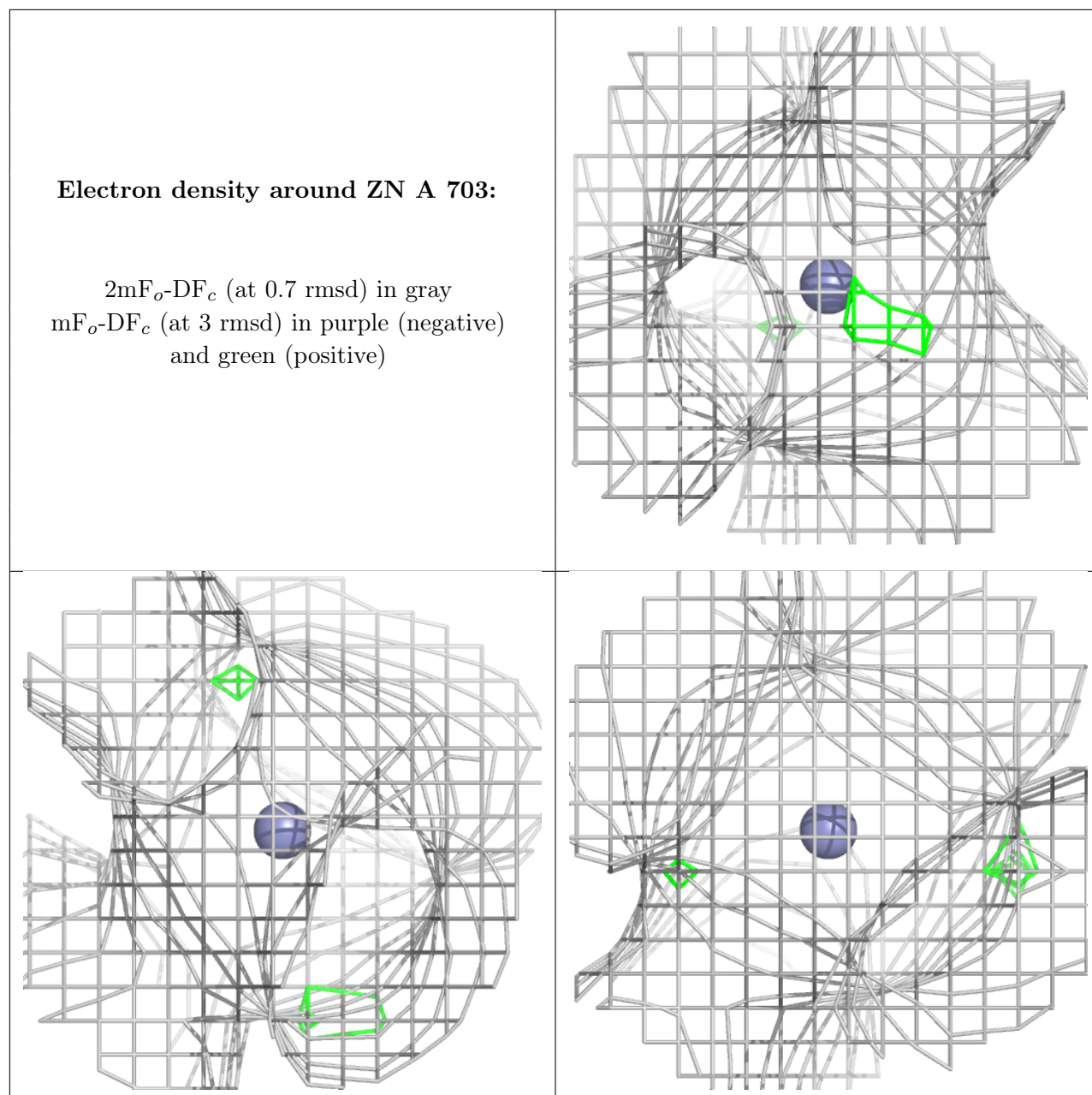
6.4 Ligands [i](#)

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(\AA^2)	$Q < 0.9$
3	NAG	A	701	14/15	0.77	0.14	57,73,95,99	0
4	EDO	A	702	4/4	0.84	0.15	41,48,50,57	0
7	A1IJZ	A	706	33/33	0.94	0.09	24,32,55,59	0
6	CL	A	705	1/1	0.99	0.04	22,22,22,22	0
6	CL	A	704	1/1	0.99	0.02	21,21,21,21	0
5	ZN	A	703	1/1	1.00	0.01	22,22,22,22	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.