wwPDB EM Validation Summary Report ⓘ

Mar 16, 2026 – 11:04 PM JST

PDB ID	:	9J93 / pdb_00009j93
EMDB ID	:	EMD-61251
Title	:	Native GluA1/GluA4 ATD dimer binding with 1D8 and 11B8
Authors	:	Li, X.; Li, R.; Wei, Y.; Zhao, Y.
Deposited on	:	2024-08-22
Resolution	:	3.54 Å(reported)

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

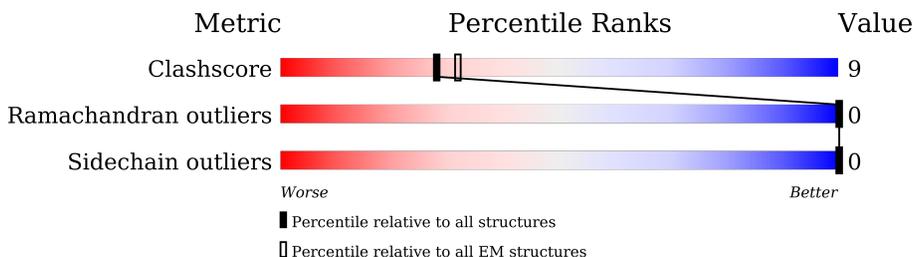|		
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	NOT EXECUTED
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.48.1

1   Overall quality at a glance   ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.54 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	Percentile Ranks	Value
Clashscore		9
Ramachandran outliers		0
Sidechain outliers		0

Worse   *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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%

Mol	Chain	Length	Quality of chain
1	B	884	37% 6% 57%
2	A	906	34% 7% 59%
3	H	218	93% 6%
3	L	218	94% 6% •
4	C	275	55% 28% 17%
5	D	2	50% 50%
5	E	2	100%
5	F	2	50% 50%
5	G	2	50% 50%

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Mol	Chain	Length	Quality of chain
5	I	2	 100%

2   Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 10138 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Glutamate receptor.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	377	Total 3028	C 1931	N 527	O 557	S 13	0	0

- Molecule 2 is a protein called Glutamate receptor.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	A	373	Total 3026	C 1930	N 528	O 556	S 12	1	0

- Molecule 3 is a protein called 1D8 Fab.

Mol	Chain	Residues	Atoms				AltConf	Trace
3	H	217	Total 1085	C 651	N 217	O 217	0	0
3	L	216	Total 1080	C 648	N 216	O 216	0	0

- Molecule 4 is a protein called 11B8 scFV.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	C	229	Total 1765	C 1117	N 295	O 347	S 6	0	0

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-a cetamido-2-deoxy-beta-D-glucopyranose.
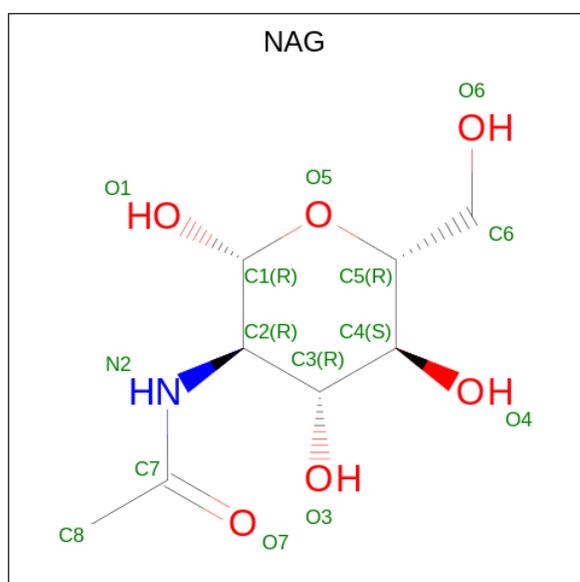

Mol	Chain	Residues	Atoms				AltConf	Trace
5	D	2	Total 28	C 16	N 2	O 10	0	0

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Mol	Chain	Residues	Atoms				AltConf	Trace
5	E	2	Total 28	C 16	N 2	O 10	0	0
5	F	2	Total 28	C 16	N 2	O 10	0	0
5	G	2	Total 28	C 16	N 2	O 10	0	0
5	I	2	Total 28	C 16	N 2	O 10	0	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).

Mol	Chain	Residues	Atoms				AltConf
6	A	1	Total 14	C 8	N 1	O 5	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. 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. 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: Glutamate receptor

- Molecule 2: Glutamate receptor

T163 E164 R168 E175 K178 E179 R180 E187 I194 L195 I199 E202 G205 Y208 M218 K224 N231 V232 T233 G234 D242 T243 Q250 K253 T254 R258 D259 H260 T261 R262 Y270 M282 L289 N301 A302 Q315 A322 L323

Q336 N345 E352 M353 K354 E366 K369 A374 THR ASP ALA GLN ALA GLY GLY ASP ASN SER SER VAL GLN ASN ARG THR TYR ILE VAL THR ILE GLU ASP PRO TYR VAL MET LEU LYS LYS ASN ALA ASN GLN PHE GLU GLY ASN ASP ARG TYR GLU GLY TYR

CYS VAL GLU LEU ALA ALA GLU ILE ALA LYS HIS VAL GLY TYR SER TYR ARG LEU GLU ILE VAL SER ASP GLY LYS THR GLY ALA ARG ASP PRO ASP THR LYS ALA TRP ASN GLY MET VAL GLY LEU VAL TYR GLY ARG ALA ASP VAL ALA VAL PRO LEU THR ILE THR LEU VAL

ARG GLU GLU VAL ILE ASP PHE SER LYS PRO PHE MET SER LEU GLY ILE SER ILE MET ILE LYS LYS PRO GLN GLN LYS PRO GLY VAL PHE SER PHE ASP PRO LEU ALA TYR GLU ILE TRP MET CYS ILE VAL PHE ALA TYR ILE GLY VAL SER VAL VAL LEU PHE LEU VAL SER

ARG PHE SER PRO TYR GLU TRP HIS SER GLU GLU PHE GLU GLU GLY ASP GLN ARG ASP GLN THR THR SER ASP GLN GLN SER ASN GLU PHE GLY ILE PHE ASN SER LEU TRP PHE SER LEU GLY ALA PHE MET GLN GLN GLY CYS ASP ILE SER PRO ARG SER LEU SER GLY ARG ILE VAL GLY GLY VAL

TRP TRP PHE PHE THR LEU ILE ILE ILE SER SER TYR THR ALA ASN LEU ALA ALA PHE LEU THR VAL GLU ARG MET VAL SER PRO ILE GLU SER ALA GLU ASP LEU ALA LYS GLN THR GLU ILE ALA TYR GLY THR LEU GLU GLY ALA SER THR LYS GLU PHE PHE ARG SER LYS ILE

ALA VAL PHE GLU LYS MET TRP THR TYR MET LYS SER ALA GLU PRO SER VAL PHE VAL ARG THR THR GLU GLU GLY MET ILE ARG VAL ARG LYS SER LYS GLY LYS TYR ALA TYR LEU LEU GLU SER THR MET ASN GLU TYR ILE GLU GLN ARG LYS PRO CYS ASP THR MET LYS VAL GLY

GLY ASN LEU ASP SER LYS GLY TYR GLY ILE ALA THR PRO LYS GLY SER ALA LEU ARG GLY PRO VAL ASN LEU ALA VAL LEU LYS LEU ASN GLU GLN GLY LEU LEU ASP LYS LEU LYS SER LYS TRP TRP TYR ASP LYS GLY GLU CYS GLY SER LYS ASP SER GLY SER LYS ASP LYS THR

SER ALA LEU LEU SER ASN VAL ALA GLY VAL PHE TYR ILE LEU ILE GLY GLY LEU GLY LEU ALA MET LEU VAL ALA LEU ILE GLU PHE CYS TYR LYS SER ARG SER GLU SER LYS ARG MET LYS GLY PHE CYS LEU ILE PRO GLN GLN SER ILE ASN GLU ALA ILE ARG THR SER THR

LEU PRO ARG ASN SER GLY ALA GLY ALA SER GLY GLY GLY SER GLY GLU ASN GLY ARG VAL VAL SER HIS ASP PHE PRO LYS SER MET GLN SER ILE PRO CYS MET SER HIS SER THR GLY MET PRO LEU GLY ALA THR GLY LEU

• Molecule 3: 1D8 Fab

Chain H: 93%   6%

UNK X2 X18 X83 X100 X103 X140 X150 X151 X157 X158 X159 X168 X185 X188 X199 X200 X201 X218

• Molecule 3: 1D8 Fab

Chain L: 94%   6% •

X1 X9 X103 X136 X137 X138 X139 X149 X150 X151 X176 X177 X178 X179 X195 X196 X197 X216 UNK UNK

• Molecule 4: 11B8 scFV

Chain C: 55%   28%   17%

E1 V2 L20 G26 F29 Y32 W33 M34 S35 Q39 G44 L45 E46 W47 I51 N52 P53 D54 S55 S56 S57 I58 D66 K67 I70 S71 N74 K85 Y94 R98 P99 R100 G101 V105 M106 D107 Y108 W109 G110 Q111 G112 T113 S114 V115 T116 V117

SER SER GLY GLY GLY GLY SER GLY GLY GLY SER GLY GLY GLY SER GLY GLY SER N135 I136 V137 L138 T139 Q140 S144 S148 Q151 I155 V163 S169 W173 Y174 Q175 Q176 K177 Q180 P181 P182 L185 I186 F187 L188 A189 S190 K191 L192 R199 F200 S201 R206

L211 T212 I213 A222 C226 Q227 Q228 T229 D232 P233 Y234 T235 F236 K241 R246 ALA TRP SER HIS PRO GLN PHE GLU LYS GLY GLY SER GLY GLY SER GLY GLY SER ASN TRP SER HIS PRO GLN PHE GLU LYS

• Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:

50%   50%

NAG1 NAG2

• Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:

100%

NAG1 NAG2

• Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:

50%   50%

NAG1 NAG2

• Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain G:

50%   50%

NAG1 NAG2

• Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I:

100%

NAG1 NAG2

4   Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	138139	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	60	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOCONTINUUM (6k x 4k)	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#|Z|>5$	RMSZ	$\#|Z|>5$
1	B	0.15	0/3099	0.33	0/4198
2	A	0.18	0/3100	0.39	0/4193
4	C	0.30	0/1805	0.53	3/2448 (0.1%)
All	All	0.20	0/8004	0.41	3/10839 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	C	29	PHE	N-CA-CB	-5.55	103.88	111.65
4	C	229	THR	N-CA-C	-5.32	105.89	112.38
4	C	234	TYR	N-CA-C	-5.01	107.32	112.93

There are no chirality outliers.

There are no planarity outliers.

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	B	3028	0	2969	38	0
2	A	3026	0	2979	52	0
3	H	1085	0	242	7	0
3	L	1080	0	232	6	0
4	C	1765	0	1727	72	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	D	28	0	25	2	0
5	E	28	0	25	0	0
5	F	28	0	25	1	0
5	G	28	0	25	1	0
5	I	28	0	25	1	0
6	A	14	0	13	4	0
All	All	10138	0	8287	173	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 9.

The worst 5 of 173 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)
2:A:231:ASN:OD1	2:A:354:LYS:HG3	1.38	1.21
2:A:231:ASN:HD22	6:A:901:NAG:C1	1.56	1.18
4:C:173:TRP:CZ3	4:C:226:CYS:SG	2.43	1.12
2:A:231:ASN:ND2	6:A:901:NAG:C1	2.17	1.07
4:C:98:ARG:HH22	4:C:106:MET:HB2	1.34	0.93

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 PDB entries followed by that with respect to all EM entries.

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	B	375/884 (42%)	352 (94%)	23 (6%)	0	100	100
2	A	372/906 (41%)	346 (93%)	26 (7%)	0	100	100
4	C	225/275 (82%)	196 (87%)	29 (13%)	0	100	100
All	All	972/2065 (47%)	894 (92%)	78 (8%)	0	100	100

There are no Ramachandran outliers to report.

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 PDB entries followed by that with respect to all EM entries.

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	B	329/757 (44%)	329 (100%)	0	100	100
2	A	327/769 (42%)	327 (100%)	0	100	100
4	C	193/220 (88%)	193 (100%)	0	100	100
All	All	849/1746 (49%)	849 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	84	HIS
1	B	314	ASN
2	A	2	ASN
2	A	101	ASN
2	A	251	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 ⓘ

10 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	#$|Z| > 2$
5	NAG	D	1	5	14,14,15	0.20	0	17,19,21	0.47	0
5	NAG	D	2	5	14,14,15	0.88	1 (7%)	17,19,21	1.04	1 (5%)
5	NAG	E	1	5,1	14,14,15	0.19	0	17,19,21	0.44	0
5	NAG	E	2	5	14,14,15	0.26	0	17,19,21	0.51	0
5	NAG	F	1	5,2	14,14,15	0.26	0	17,19,21	0.50	0
5	NAG	F	2	5	14,14,15	0.38	0	17,19,21	0.36	0
5	NAG	G	1	5,2	14,14,15	0.33	0	17,19,21	0.60	0
5	NAG	G	2	5	14,14,15	0.62	1 (7%)	17,19,21	0.58	0
5	NAG	I	1	5,2	14,14,15	0.28	0	17,19,21	0.41	0
5	NAG	I	2	5	14,14,15	0.41	0	17,19,21	0.39	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
5	NAG	D	1	5	-	0/6/23/26	0/1/1/1
5	NAG	D	2	5	-	2/6/23/26	0/1/1/1
5	NAG	E	1	5,1	-	0/6/23/26	0/1/1/1
5	NAG	E	2	5	-	3/6/23/26	0/1/1/1
5	NAG	F	1	5,2	-	2/6/23/26	0/1/1/1
5	NAG	F	2	5	-	4/6/23/26	0/1/1/1
5	NAG	G	1	5,2	-	2/6/23/26	0/1/1/1
5	NAG	G	2	5	-	2/6/23/26	0/1/1/1
5	NAG	I	1	5,2	-	1/6/23/26	0/1/1/1
5	NAG	I	2	5	-	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)
5	D	2	NAG	O5-C1	2.88	1.48	1.43
5	G	2	NAG	C1-C2	2.14	1.55	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	D	2	NAG	C1-O5-C5	4.00	117.61	112.19

There are no chirality outliers.

5 of 18 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	G	1	NAG	O5-C5-C6-O6
5	F	2	NAG	C4-C5-C6-O6
5	D	2	NAG	O5-C5-C6-O6
5	F	2	NAG	O5-C5-C6-O6
5	G	1	NAG	C4-C5-C6-O6

There are no ring outliers.

7 monomers are involved in 5 short contacts:

| Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	G	2	NAG	1	0
5	I	2	NAG	1	0
5	D	2	NAG	1	0
5	F	1	NAG	1	0
5	I	1	NAG	1	0
5	D	1	NAG	2	0
5	G	1	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 D

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain E

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain F

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain G

Bond lengths

Bond angles

Torsions

Rings
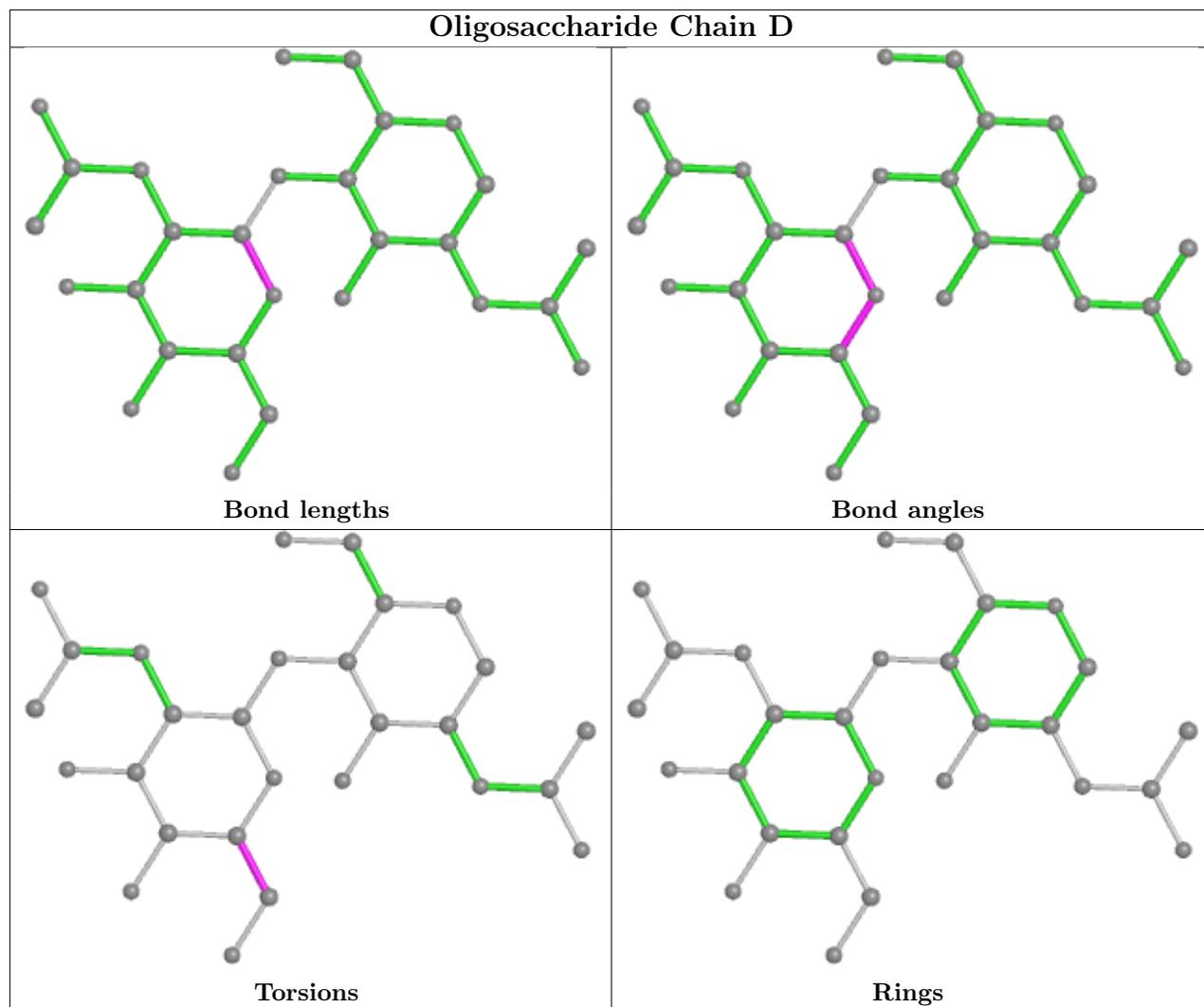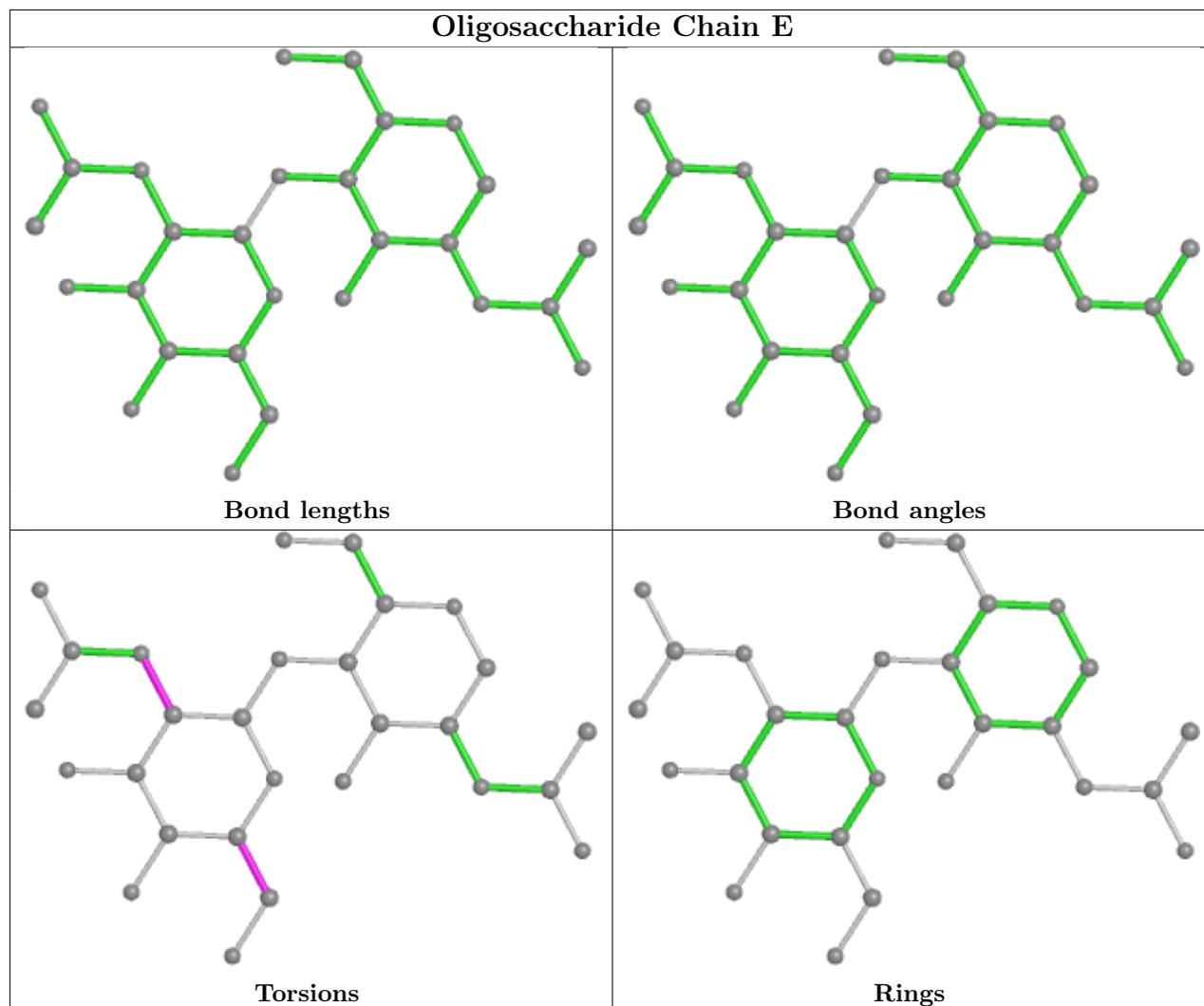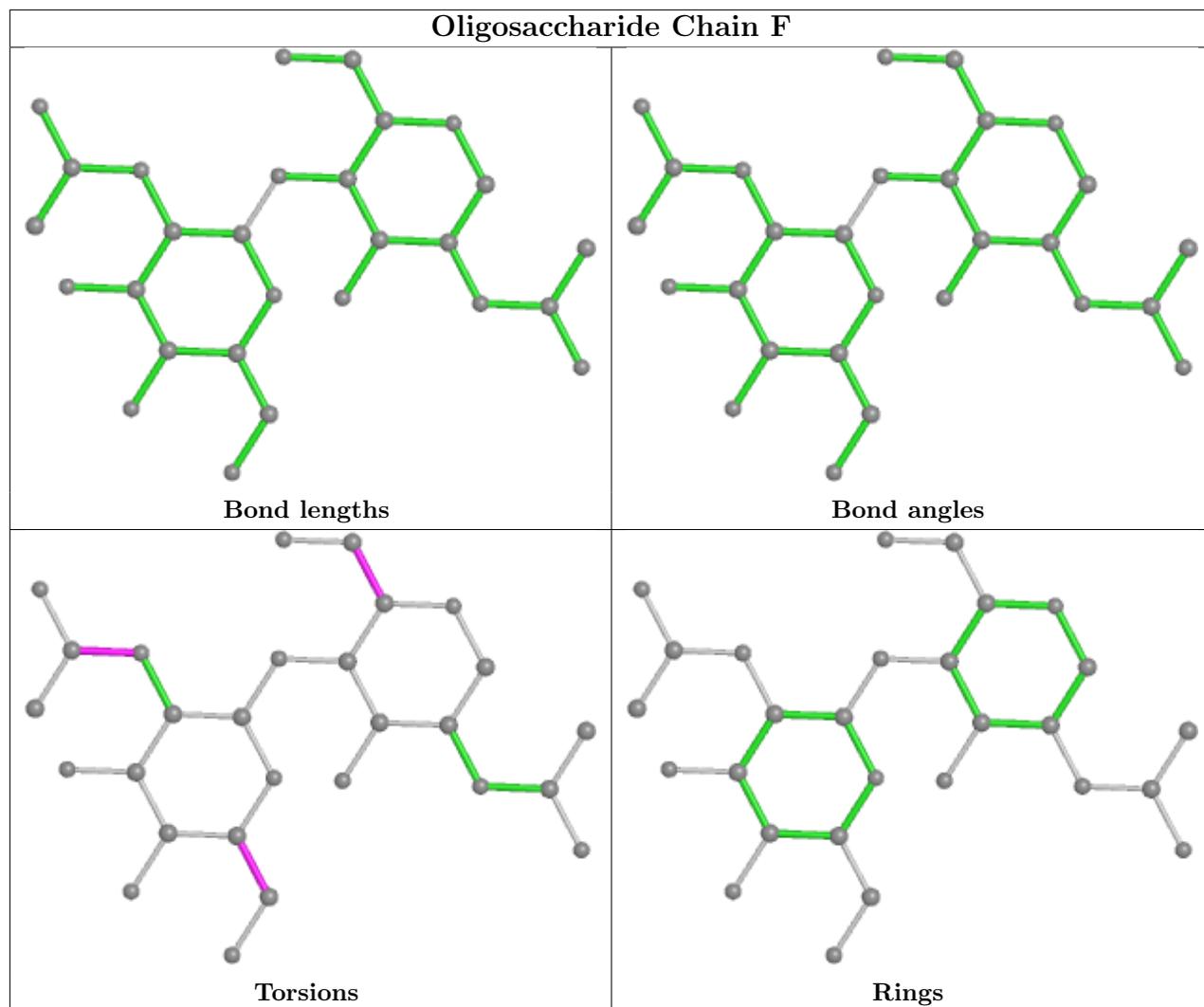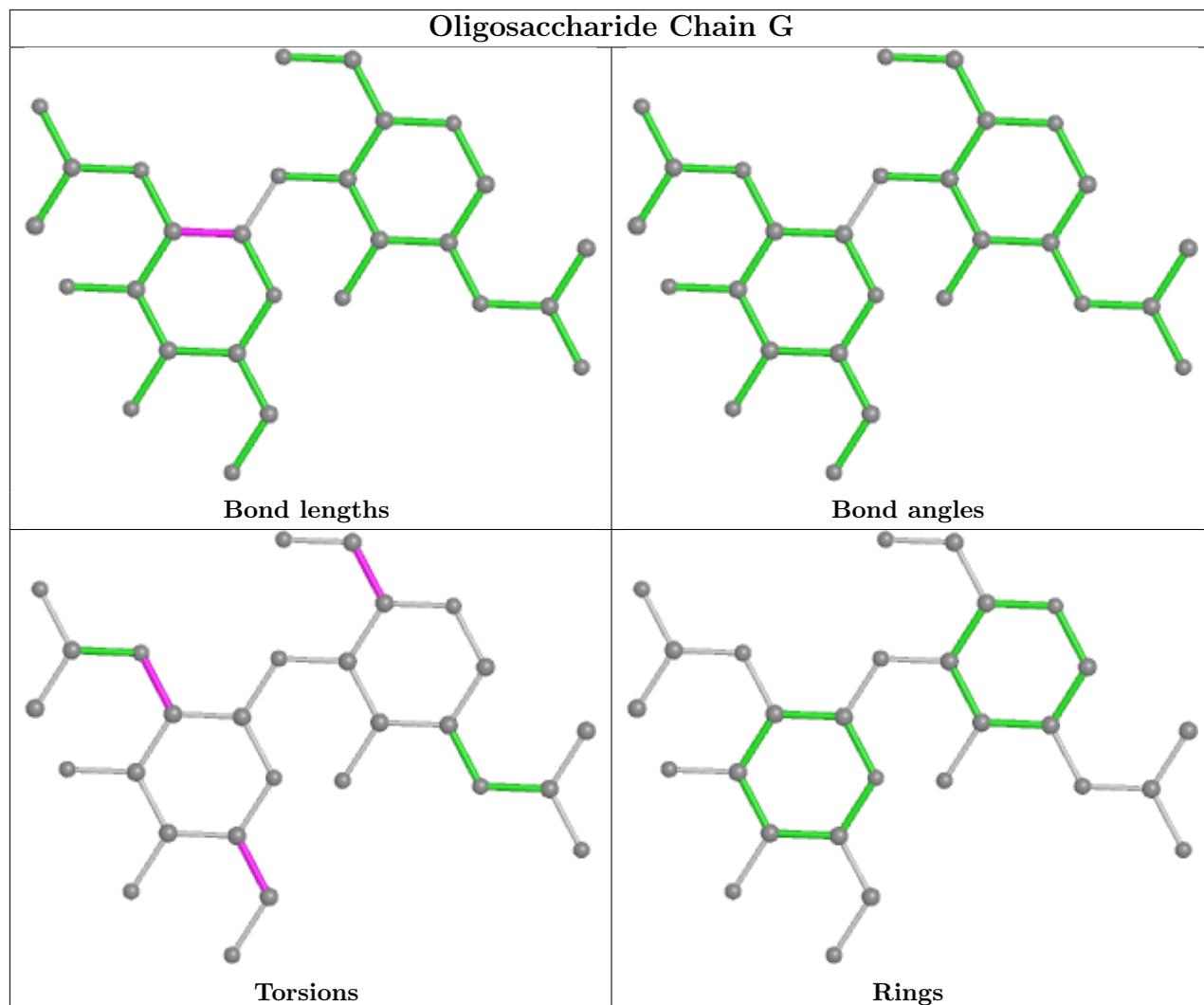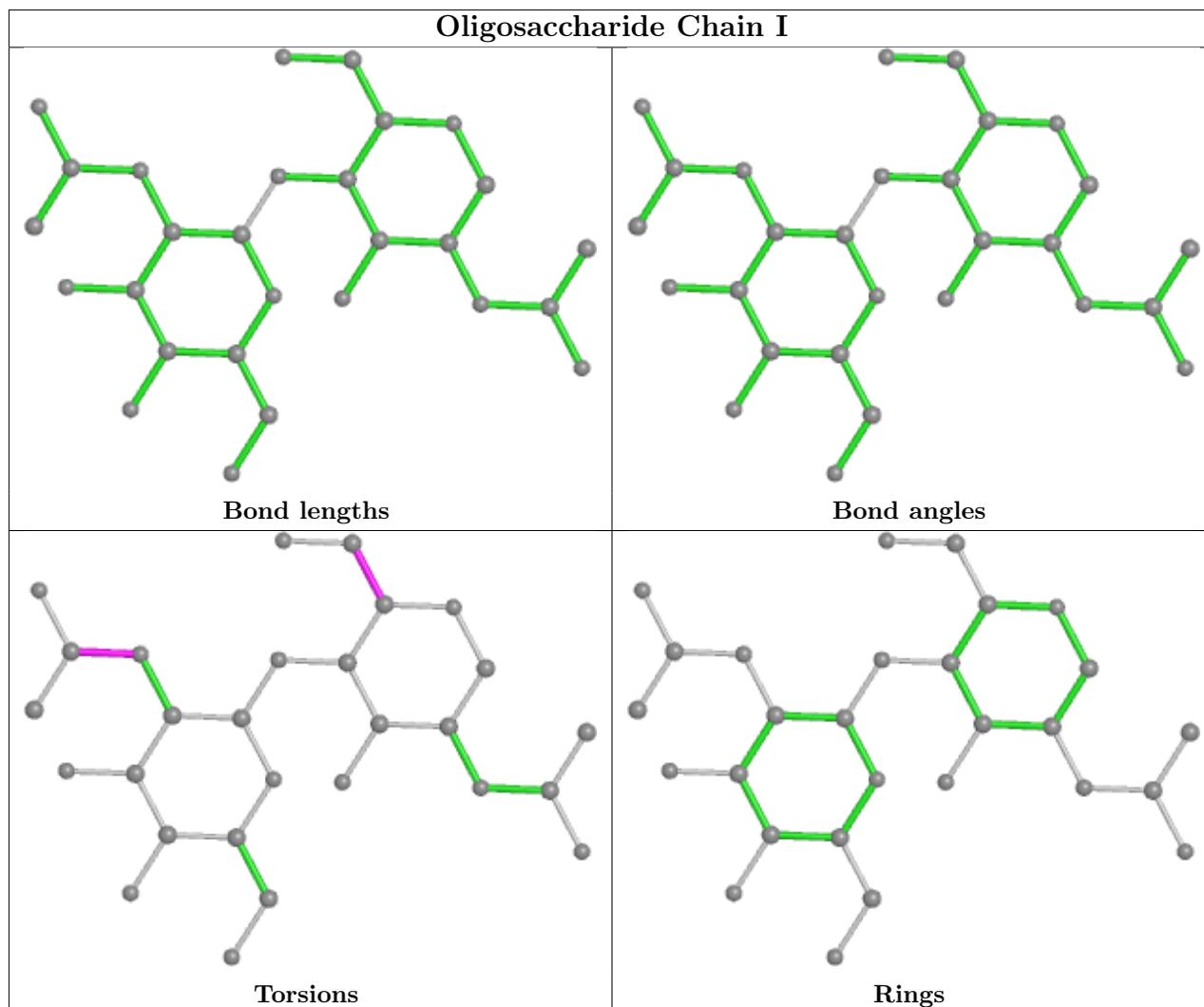
5.6 Ligand geometry ⓘ

1 ligand is 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	$\#|Z| > 2$
6	NAG	A	901	-	14,14,15	0.39	0	17,19,21	1.24	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	NAG	A	901	-	-	5/6/23/26	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	901	NAG	C2-N2-C7	4.31	129.04	122.90

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	901	NAG	C8-C7-N2-C2
6	A	901	NAG	O7-C7-N2-C2
6	A	901	NAG	C4-C5-C6-O6
6	A	901	NAG	O5-C5-C6-O6
6	A	901	NAG	C3-C2-N2-C7

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	901	NAG	4	0

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.