Full wwPDB X-ray Structure Validation Report ⓘ

Feb 24, 2025 – 03:11 pm GMT

PDB ID	:	8Q82
Title	:	Photorhabdus laumondii lectin PLL4 in complex with alpha-methyl-fucoside
Authors	:	Melicher, F.; Houser, J.; Paulenova, E.; Wimmerova, M.
Deposited on	:	2023-08-17
Resolution	:	1.95 Å(reported)

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

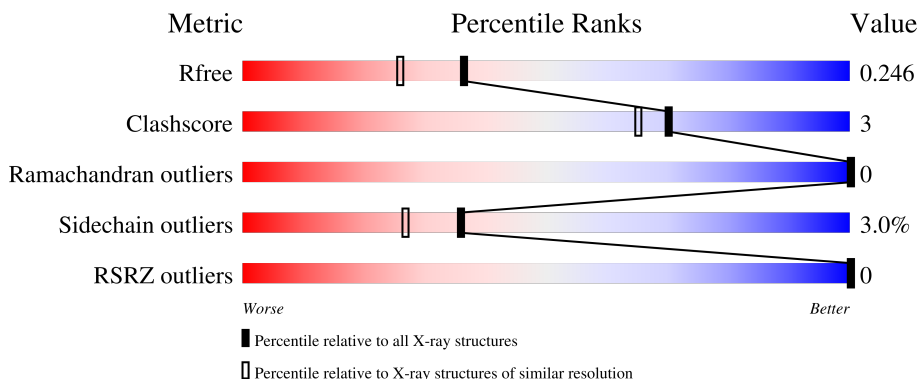|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41

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 1.95 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
Rfree		0.246
Clashscore		3
Ramachandran outliers		0
Sidechain outliers		3.0%
RSRZ outliers		0

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	3187 (1.96-1.96)
Clashscore	180529	3412 (1.96-1.96)
Ramachandran outliers	177936	3390 (1.96-1.96)
Sidechain outliers	177891	3390 (1.96-1.96)
RSRZ outliers	164620	3186 (1.96-1.96)

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	369	83% 8% 9%
1	B	369	82% 7% · 9%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 5459 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 Photorhabdus luminescens subsp. laumondii TTO1 complete genome segment 3/17.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	336	Total	C	N	O	S	0	2	0
			2626	1659	467	499	1			
1	B	336	Total	C	N	O	S	0	1	0
			2619	1654	466	498	1			

- Molecule 2 is methyl alpha-L-fucopyranoside (three-letter code: MFU) (formula: $C_7H_{14}O_5$) (labeled as "Ligand of Interest" by depositor).
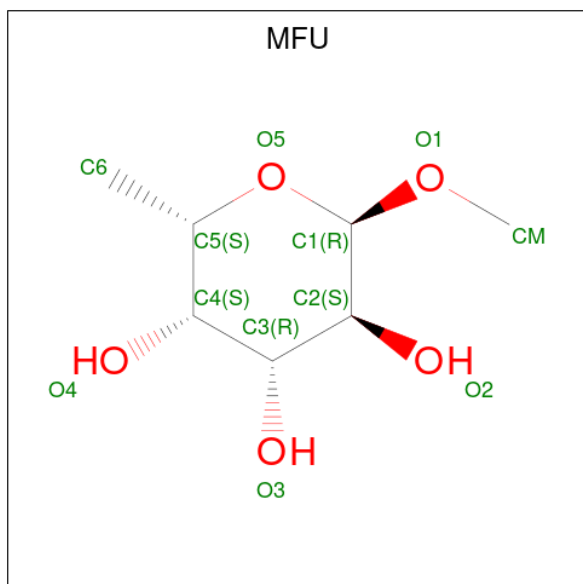
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			12	7	5		
2	A	1	Total	C	O	0	0
			12	7	5		
2	A	1	Total	C	O	0	0
			12	7	5		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total 12	C 7	O 5	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Cl 1	0	0
3	B	1	Total 1	Cl 1	0	0

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total 1	Mg 1	0	0
4	B	1	Total 1	Mg 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	77	Total 77	O 77	0	0
5	B	85	Total 85	O 85	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.
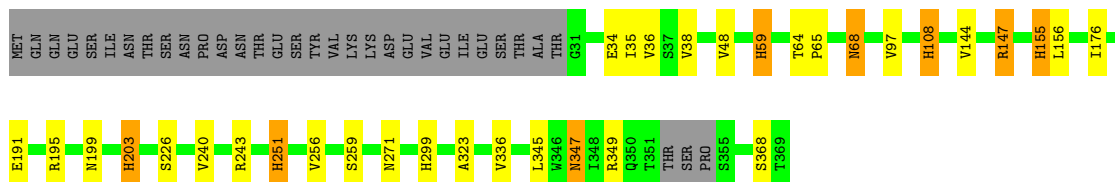
• Molecule 1: Photorhabdus luminescens subsp. laumondii TTO1 complete genome segment 3/17

Chain A:

83%   8%   9%

MET GLN GLN GLU SER ILE ASN THR SER ASN PRO ASP ASN THR GLU SER TYR VAL LYS LYS ASP GLU VAL GLU ILE GLU SER THR ALA THR **G31** E34 I35 V38 V48 H59 S83 R100 H108 I128 N131 V144 R147 N151 H155 N164

P165 R243 W250 H251 H299 A323 P324 T325 V338 L339 H343 A344 L345 W346 N347 T351 THR SER PRO S355 L360 S368 T369

• Molecule 1: Photorhabdus luminescens subsp. laumondii TTO1 complete genome segment 3/17

Chain B:

82%   7%   •   9%

MET GLN GLN GLU SER ILE ASN THR SER ASN PRO ASP ASN THR GLU SER TYR VAL LYS LYS ASP GLU VAL GLU ILE GLU SER THR ALA THR **G31** E34 I35 V36 S37 V38 V48 H59 T64 P65 N68 V97 H108 V144 R147 H155 L156 I176

E191 R195 N199 H203 S226 V240 R243 H251 V256 S259 N271 H299 A323 V336 L345 W346 N347 I348 R349 Q350 T351 THR SER PRO S355 S368 T369

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	70.01Å 82.86Å 70.30Å 90.00° 105.36° 90.00°	Depositor
Resolution (Å)	41.46 – 1.95 41.46 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.9 (41.46-1.95) 98.7 (41.46-1.95)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.41 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.8.0419	Depositor
R, R_{free}	0.205 , 0.240 0.212 , 0.246	Depositor DCC
R_{free} test set	2799 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å^2)	32.0	Xtriage
Anisotropy	0.042	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 25.1	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.247 for l,-k,h	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	5459	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 6.27% 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, MG, MFU

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	0.44	0/2713	0.76	0/3733
1	B	0.46	0/2706	0.76	0/3723
All	All	0.45	0/5419	0.76	0/7456

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	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	243	ARG	Sidechain
1	B	147	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	2626	0	2435	14	0
1	B	2619	0	2427	20	0
2	A	36	0	42	1	0
2	B	12	0	14	1	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	77	0	0	1	0
5	B	85	0	0	0	0
All	All	5459	0	4918	34	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 3.

All (34) 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:B:191:GLU:OE2	1:B:203:HIS:ND1	2.31	0.56
1:B:271:ASN:O	2:B:401:MFU:O4	2.24	0.56
1:B:35:ILE:HD12	1:B:36:VAL:N	2.21	0.56
1:B:256:VAL:HG23	1:B:259:SER:HB3	1.89	0.53
1:A:250:TRP:CE2	2:A:401:MFU:H4	2.44	0.53
1:A:38:VAL:HG23	1:A:325:THR:HG22	1.93	0.51
1:A:35:ILE:HD12	1:A:368:SER:HA	1.93	0.50
1:B:195:ARG:NH1	1:B:199:ASN:OD1	2.38	0.50
1:B:68:ASN:O	1:B:68:ASN:ND2	2.43	0.50
1:A:48:VAL:HG11	1:A:345:LEU:CD2	2.44	0.48
1:B:35:ILE:CD1	1:B:36:VAL:HG13	2.44	0.48
1:B:38:VAL:HG22	1:B:48:VAL:HG22	1.96	0.47
1:B:48:VAL:O	1:B:59:HIS:HA	2.14	0.47
1:B:336:VAL:O	1:B:347:ASN:HA	2.13	0.47
1:B:48:VAL:HG11	1:B:345:LEU:CD2	2.45	0.46
1:A:35:ILE:HG23	5:A:531:HOH:O	2.14	0.46
1:A:48:VAL:HG11	1:A:345:LEU:HD21	1.98	0.46
1:A:338:VAL:O	1:A:345:LEU:HD12	2.16	0.45
1:B:147:ARG:HD2	1:B:176:ILE:HG13	1.99	0.45
1:B:48:VAL:HG11	1:B:345:LEU:HD21	1.98	0.45
1:B:226:SER:HB3	1:B:243:ARG:HB3	1.99	0.45
1:A:339:LEU:HD11	1:A:343:HIS:HA	1.99	0.45
1:A:144:VAL:O	1:A:155:HIS:HA	2.18	0.44
1:B:35:ILE:HD12	1:B:35:ILE:C	2.38	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:34:GLU:N	1:A:323:ALA:HB3	2.34	0.42
1:B:34:GLU:N	1:B:323:ALA:HB3	2.34	0.42
1:B:240:VAL:O	1:B:251:HIS:HA	2.19	0.42
1:A:147:ARG:NH1	1:A:151:ASN:OD1	2.53	0.42
1:B:144:VAL:O	1:B:155:HIS:HA	2.19	0.42
1:A:83:SER:HB2	1:A:131:ASN:OD1	2.20	0.42
1:A:100:ARG:HG3	1:A:128:ILE:HG13	2.01	0.42
1:A:164:ASN:HB3	1:A:165:PRO:HA	2.01	0.41
1:B:64:THR:HB	1:B:65:PRO:HD2	2.02	0.41
1:B:97:VAL:O	1:B:108:HIS:HA	2.21	0.41

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	334/369 (90%)	325 (97%)	9 (3%)	0	100	100
1	B	333/369 (90%)	324 (97%)	9 (3%)	0	100	100
All	All	667/738 (90%)	649 (97%)	18 (3%)	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 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	284/314 (90%)	278 (98%)	6 (2%)	48	43
1	B	283/314 (90%)	272 (96%)	11 (4%)	27	17
All	All	567/628 (90%)	550 (97%)	17 (3%)	36	27

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

Mol	Chain	Res	Type
1	A	59	HIS
1	A	108	HIS
1	A	251	HIS
1	A	299	HIS
1	A	347	ASN
1	A	360	LEU
1	B	59	HIS
1	B	68	ASN
1	B	108	HIS
1	B	155	HIS
1	B	156	LEU
1	B	203	HIS
1	B	251	HIS
1	B	299	HIS
1	B	347	ASN
1	B	349	ARG
1	B	368	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	$\#|Z| > 2$
2	MFU	B	401	-	12,12,12	0.32	0	17,17,17	0.56	0
2	MFU	A	402	-	12,12,12	0.45	0	17,17,17	0.67	0
2	MFU	A	401	-	12,12,12	0.21	0	17,17,17	0.69	0
2	MFU	A	403	-	12,12,12	0.29	0	17,17,17	0.82	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	MFU	B	401	-	-	0/2/22/22	0/1/1/1
2	MFU	A	402	-	-	0/2/22/22	0/1/1/1
2	MFU	A	401	-	-	0/2/22/22	0/1/1/1
2	MFU	A	403	-	-	0/2/22/22	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

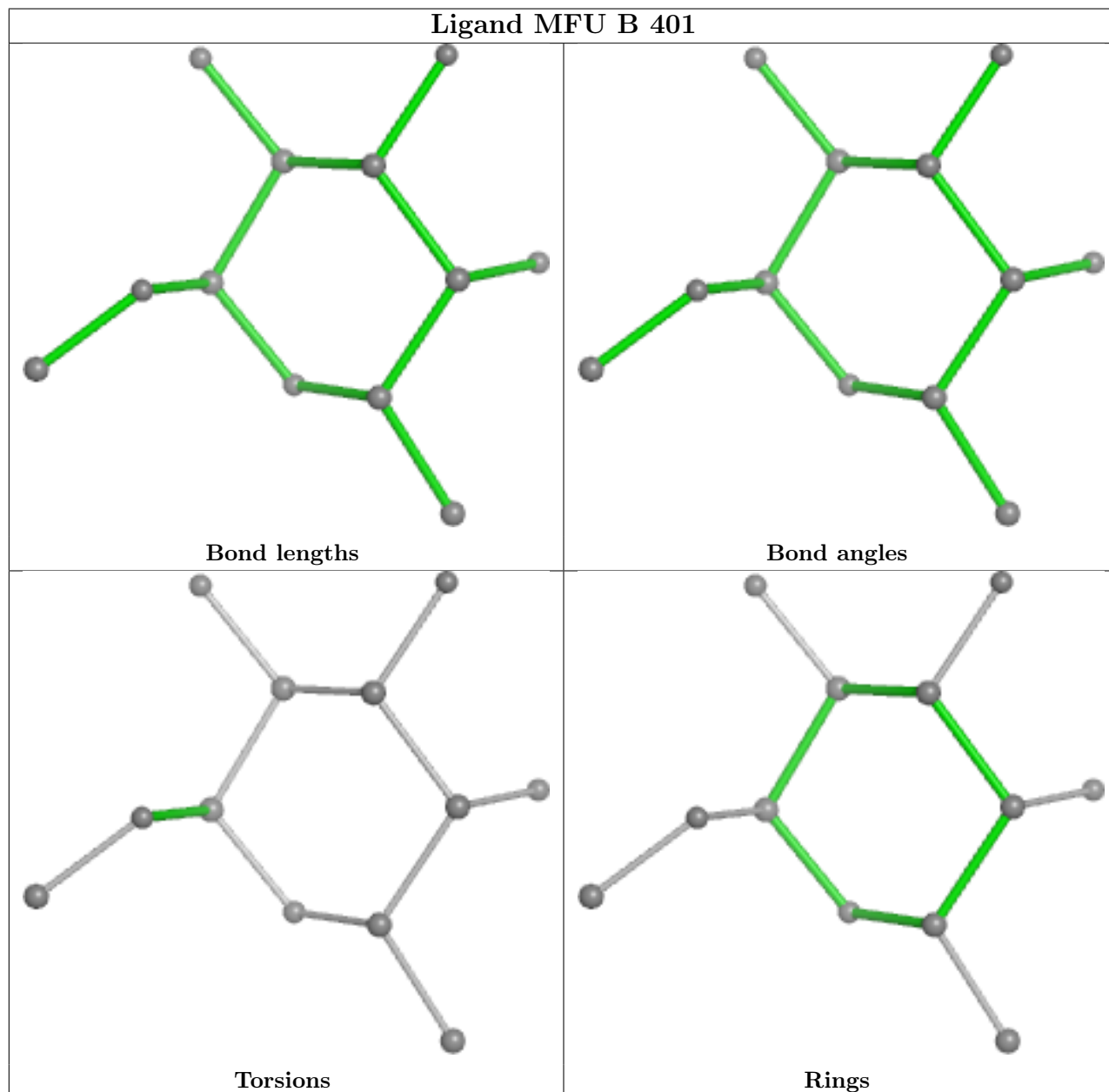There are no chirality outliers.

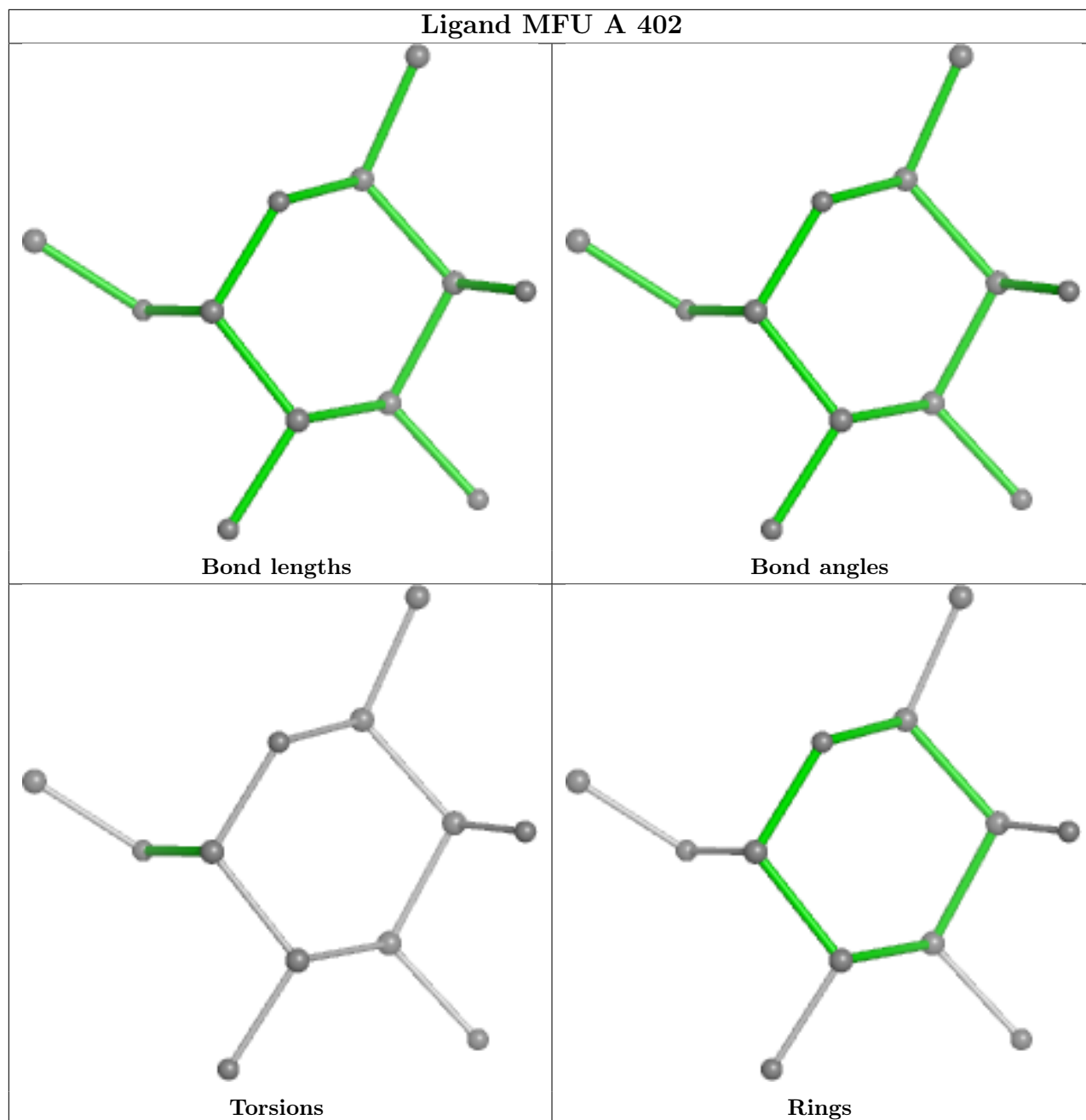There are no torsion outliers.

There are no ring outliers.

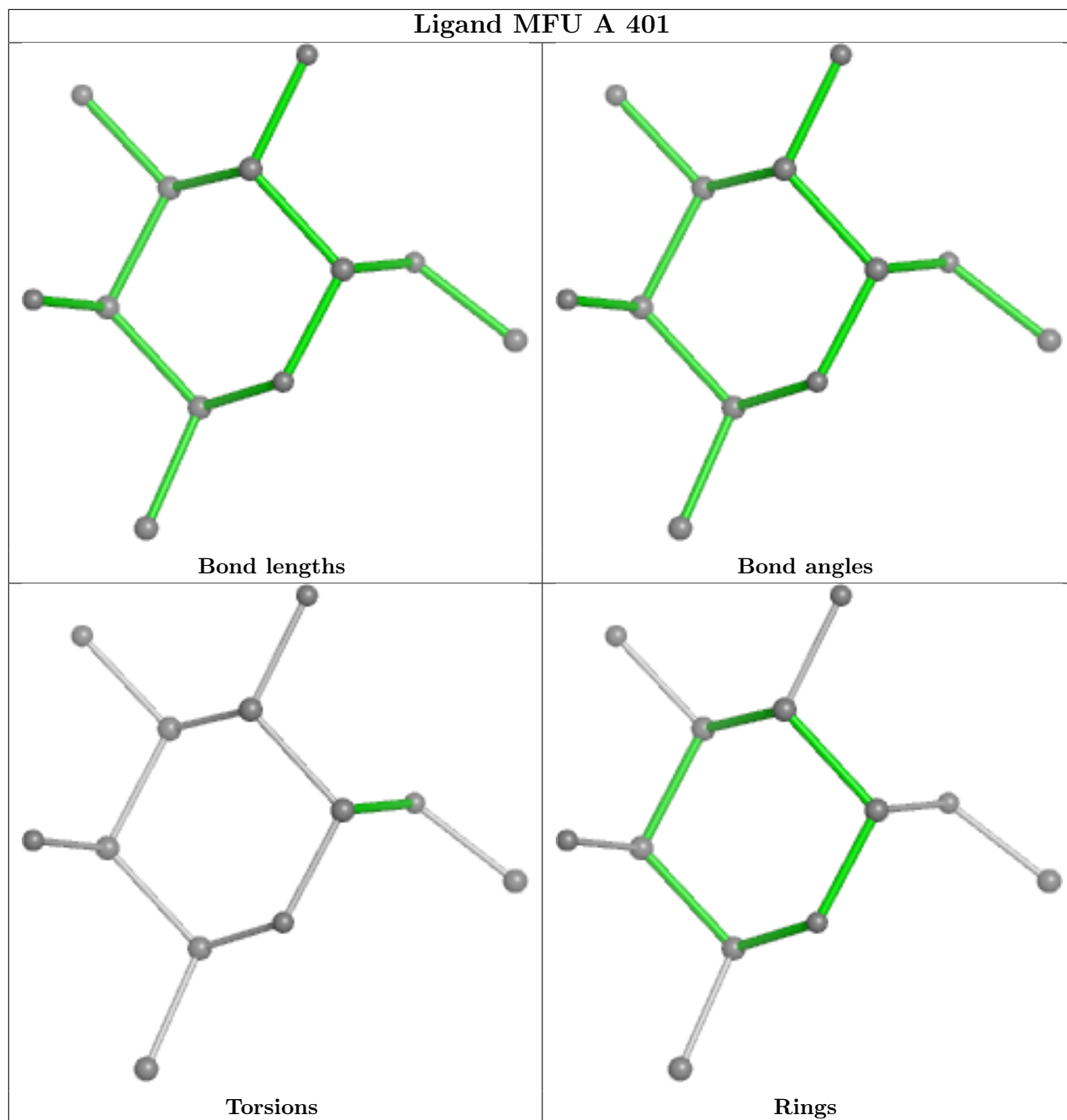2 monomers are involved in 2 short contacts:

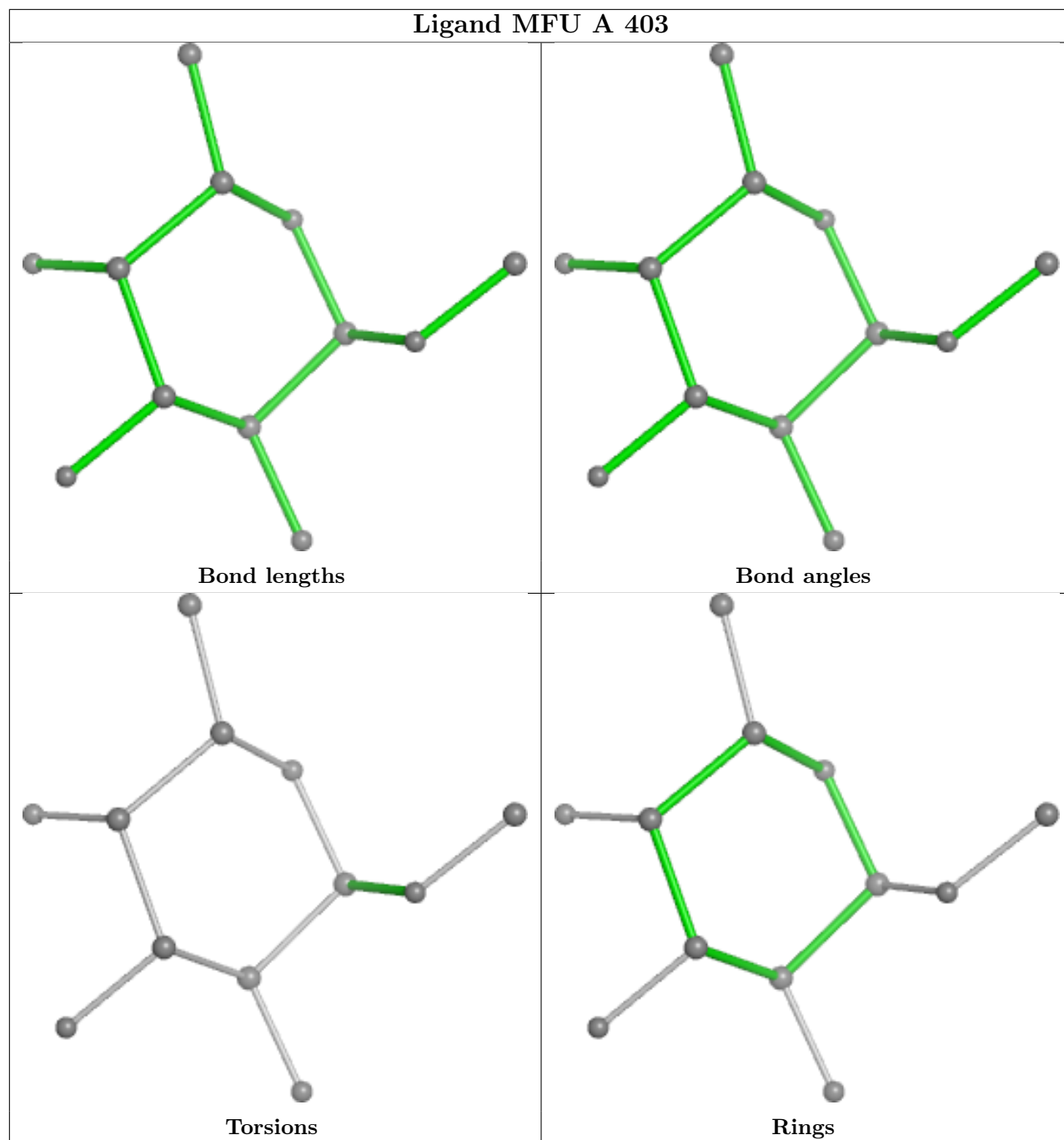| Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	401	MFU	1	0
2	A	401	MFU	1	0

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 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 MFU B 401

Bond lengths

Bond angles

Torsions

Rings

Ligand MFU A 402

Bond lengths

Bond angles

Torsions

Rings

Ligand MFU A 401

Bond lengths

Bond angles

Torsions

Rings

Ligand MFU A 403

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	336/369 (91%)	-1.07	0	100	100	13, 33, 49, 67	2 (0%)
1	B	336/369 (91%)	-1.06	0	100	100	17, 35, 49, 72	1 (0%)
All	All	672/738 (91%)	-1.07	0	100	100	13, 34, 49, 72	3 (0%)

There are no RSRZ outliers to report.

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 ⓘ

There are no monosaccharides in this entry.

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.
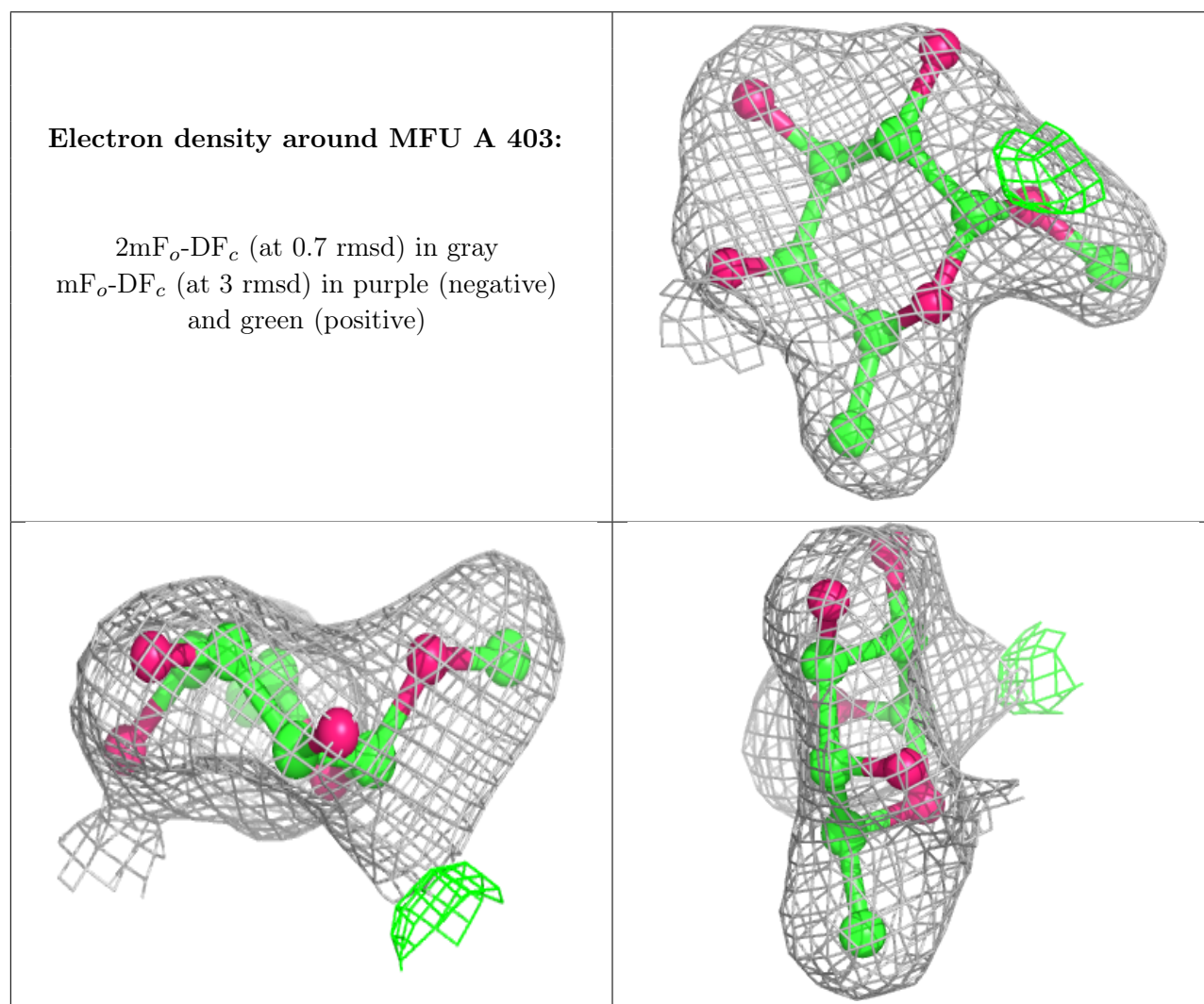
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å²)	Q<0.9
3	CL	A	404	1/1	0.95	0.07	50,50,50,50	0
3	CL	B	402	1/1	0.96	0.07	52,52,52,52	0
2	MFU	A	403	12/12	0.98	0.05	44,50,55,61	0
2	MFU	B	401	12/12	0.98	0.06	43,52,63,64	0
2	MFU	A	401	12/12	0.98	0.06	50,56,60,66	0
2	MFU	A	402	12/12	0.98	0.05	41,45,49,49	0
4	MG	A	405	1/1	0.98	0.09	38,38,38,38	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	MG	B	403	1/1	0.99	0.06	38,38,38,38	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.
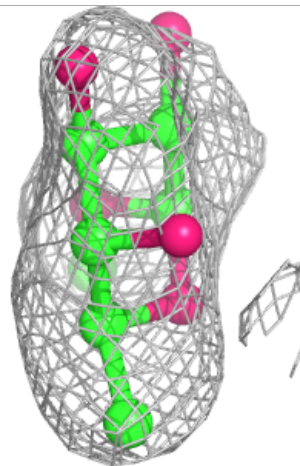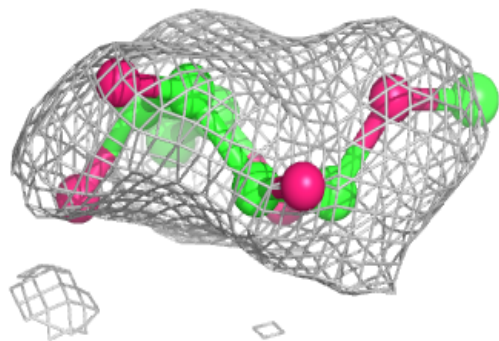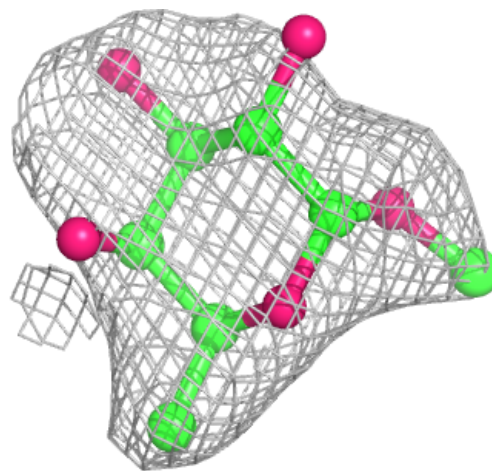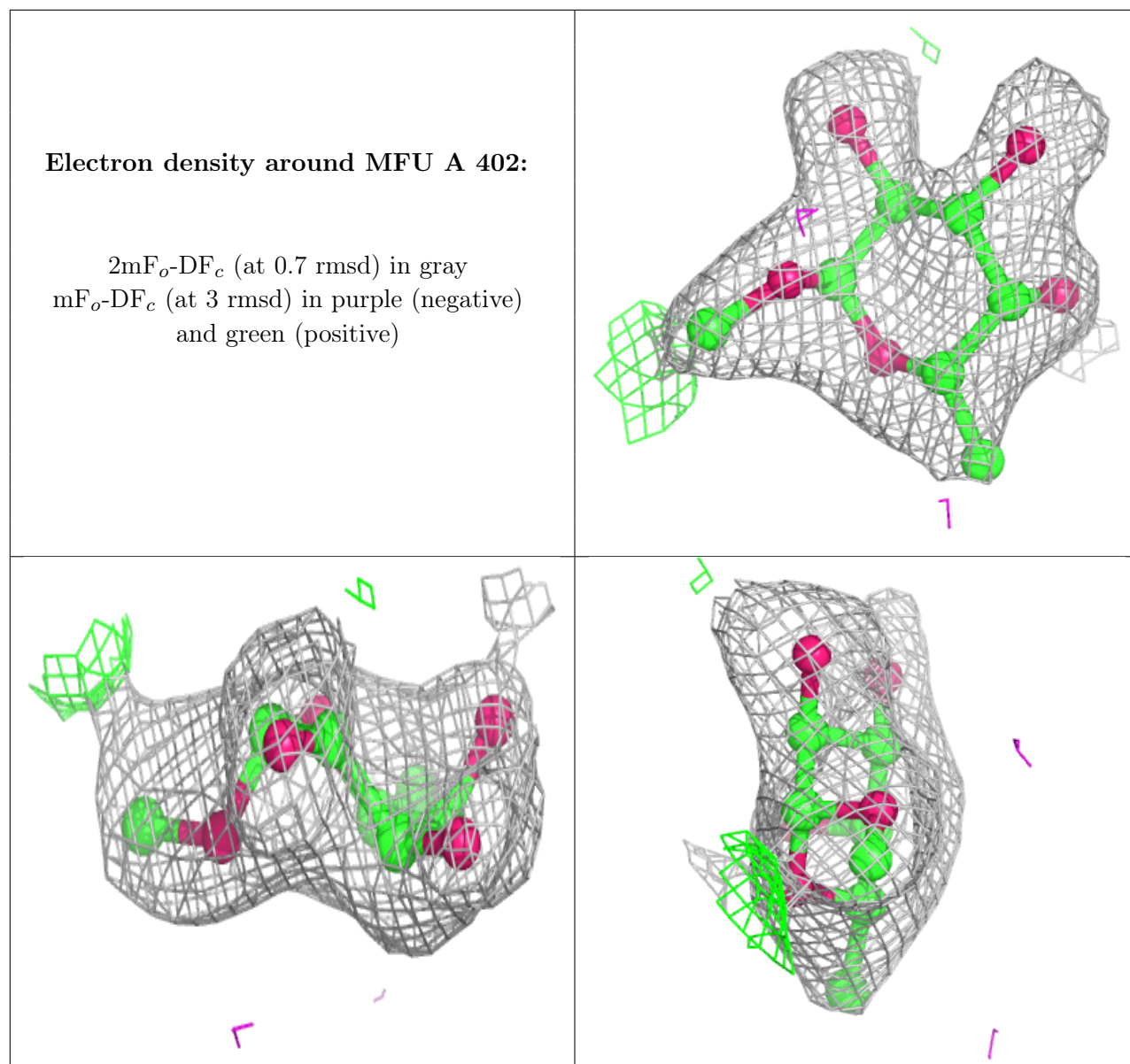

Electron density around MFU A 403:

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

Electron density around MFU B 401:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
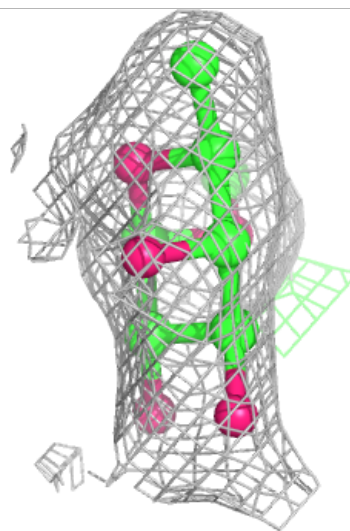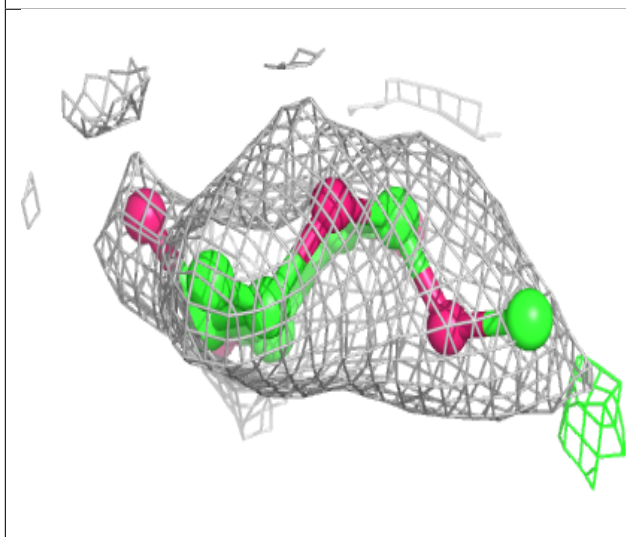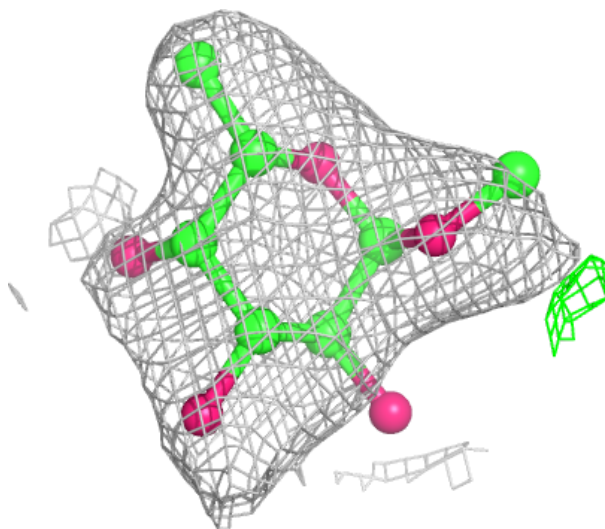
Electron density around MFU A 401:

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

Electron density around MFU A 402:

$2mF_o$-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.