Full wwPDB X-ray Structure Validation Report ⓘ

Jan 9, 2025 – 04:09 PM JST

PDB ID	:	9KX8
Title	:	Mistletoe Lectin I from Viscum album complexed with epimer form of lactose
Authors	:	Saeed, A.; Betzel, C.; Brognaro, H.; Rajaiah Prabhu, P.; Alves Franca, B.; Khaliq, B.; Mehmood, S.; Akrem, A.
Deposited on	:	2024-12-06
Resolution	:	2.28 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:

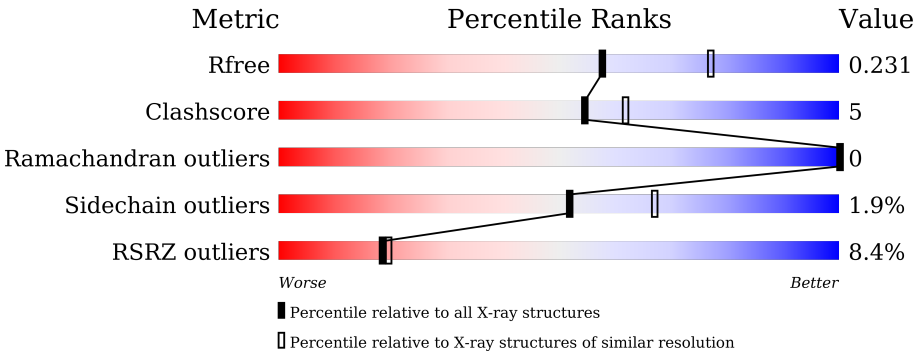
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.28 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	8487 (2.30-2.26)
Clashscore	180529	9437 (2.30-2.26)
Ramachandran outliers	177936	9341 (2.30-2.26)
Sidechain outliers	177891	9342 (2.30-2.26)
RSRZ outliers	164620	8487 (2.30-2.26)

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	247	8% 91% 9%
2	B	263	9% 88% 11%
3	C	2	100%
3	D	2	100%
4	E	2	100%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	GOL	A	302	-	-	X	-

2 Entry composition (i)

There are 11 unique types of molecules in this entry. The entry contains 4142 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 Beta-galactoside-specific lectin 1 chain A isoform 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	247	Total	C	N	O	S	0	0	0
			1930	1225	333	368	4			

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	15	ALA	GLU	conflict	UNP P81446
A	19	SER	ARG	conflict	UNP P81446
A	41	SER	ARG	conflict	UNP P81446
A	51	ALA	GLN	conflict	UNP P81446
A	96	GLY	ALA	conflict	UNP P81446
A	106	LYS	ARG	conflict	UNP P81446
A	108	ALA	SER	conflict	UNP P81446
A	128	VAL	ILE	conflict	UNP P81446
A	208	HIS	GLN	conflict	UNP P81446
A	222	LEU	ILE	conflict	UNP P81446
A	223	SER	PRO	conflict	UNP P81446

- Molecule 2 is a protein called Beta-galactoside-specific lectin 1 chain B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	263	Total	C	N	O	S	0	0	0
			1993	1231	356	392	14			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1	ALA	ASP	conflict	UNP P81446
B	148	HIS	PHE	conflict	UNP P81446
B	149	ALA	ARG	conflict	UNP P81446
B	161	HIS	TRP	conflict	UNP P81446
B	167	ALA	ILE	conflict	UNP P81446

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Chain	Residue	Modelled	Actual	Comment	Reference
B	242	ALA	LYS	conflict	UNP P81446
B	244	ALA	ARG	conflict	UNP P81446

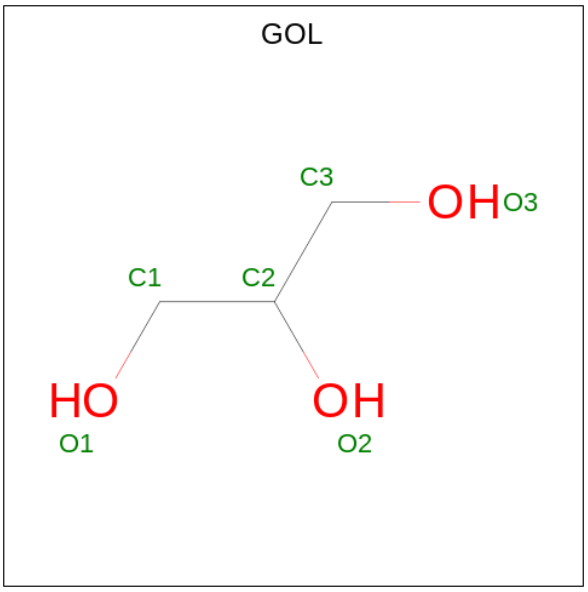
- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

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

- Molecule 4 is an oligosaccharide called beta-D-galactopyranose-(1-4)-alpha-D-idopyranose.

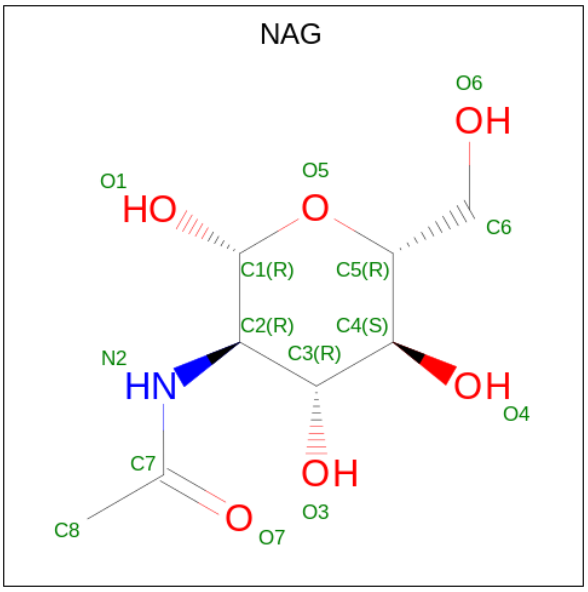
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
4	E	2	Total C O 23 12 11	0	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$) (labeled as "Ligand of Interest" by depositor).



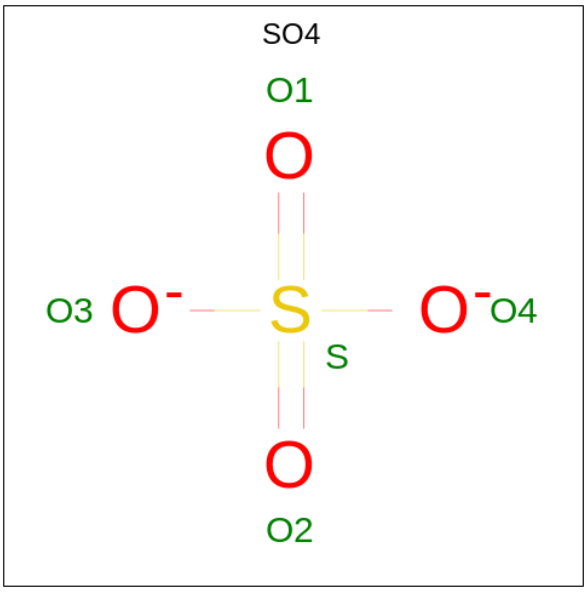
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	3	3		
5	A	1	Total	C	O	0	0
			6	3	3		
5	A	1	Total	C	O	0	0
			6	3	3		
5	B	1	Total	C	O	0	0
			6	3	3		
5	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$) (labeled as "Ligand of Interest" by depositor).



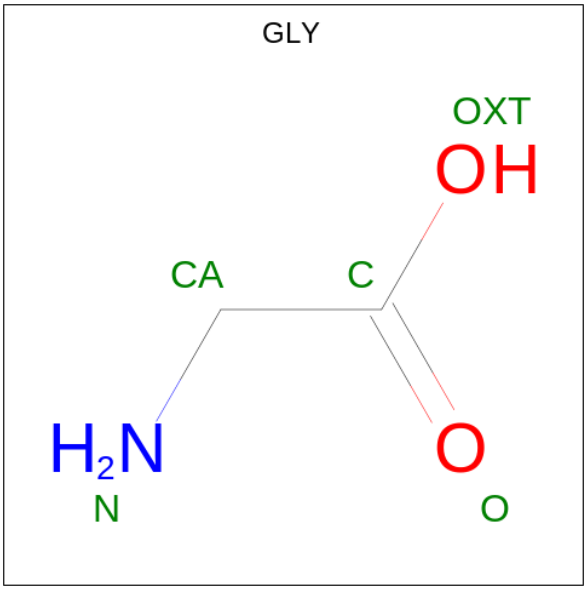
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C N O 14 8 1 5	0	0
6	B	1	Total C N O 14 8 1 5	0	0
6	B	1	Total C N O 15 8 1 6	0	0

- Molecule 7 is SULFATE ION (three-letter code: SO4) (formula: O_4S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total O S 5 4 1	0	0
7	A	1	Total O S 5 4 1	0	0
7	B	1	Total O S 5 4 1	0	0

- Molecule 8 is GLYCINE (three-letter code: GLY) (formula: $C_2H_5NO_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total C N O 5 2 1 2	0	0

- Molecule 9 is CHLORIDE ION (three-letter code: CL) (formula: Cl) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 10 is SODIUM ION (three-letter code: NA) (formula: Na) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	1	Total Na 1 1	0	0

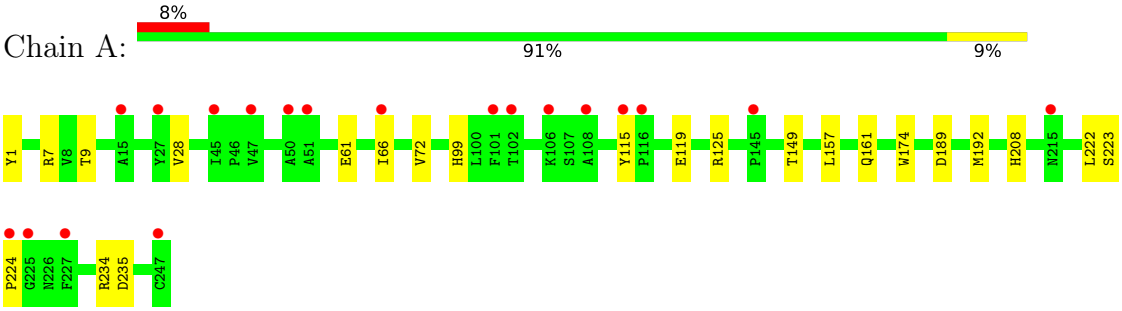
- Molecule 11 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	A	7	Total O 7 7	0	0
11	B	37	Total O 37 37	0	0

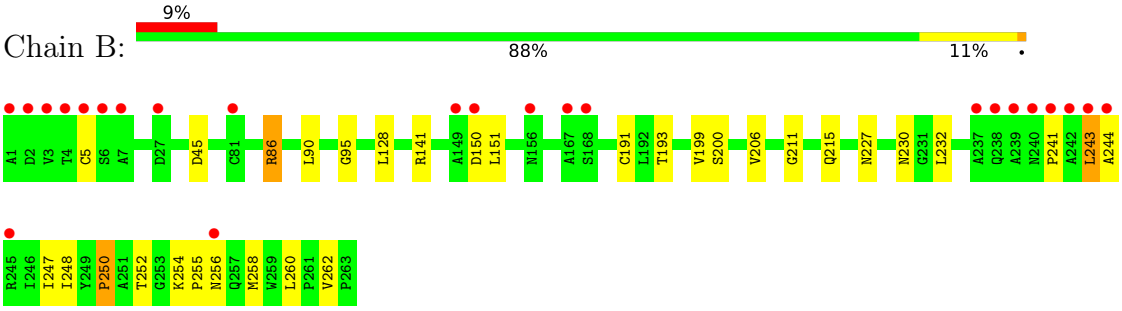
3 Residue-property plots (i)

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.

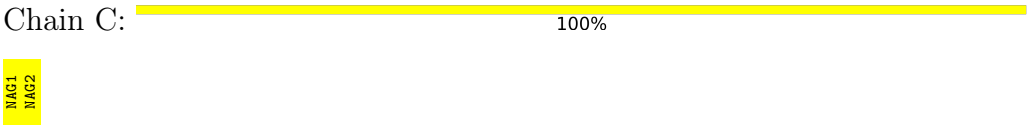
• Molecule 1: Beta-galactoside-specific lectin 1 chain A isoform 1



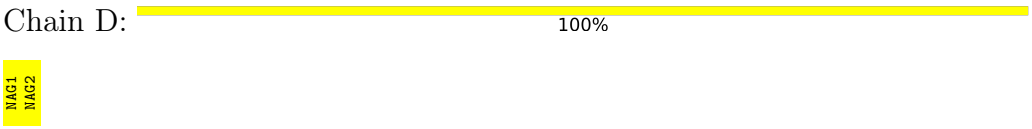
• Molecule 2: Beta-galactoside-specific lectin 1 chain B



• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

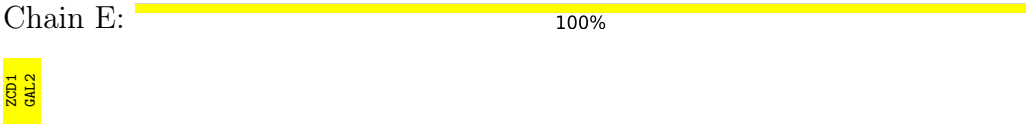


• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



• Molecule 4: beta-D-galactopyranose-(1-4)-alpha-D-idopyranose

Chain E:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α, β, γ	107.86Å 107.86Å 311.39Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	40.77 – 2.28 40.77 – 2.28	Depositor EDS
% Data completeness (in resolution range)	97.9 (40.77-2.28) 97.8 (40.77-2.28)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.35 (at 2.29Å)	Xtriage
Refinement program	PHENIX (1.21.2_5419: ???)	Depositor
R, R_{free}	0.209 , 0.231 0.209 , 0.231	Depositor DCC
R_{free} test set	2459 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å^2)	72.6	Xtriage
Anisotropy	0.138	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 49.4	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	0.96	EDS
Total number of atoms	4142	wwPDB-VP
Average B, all atoms (Å^2)	76.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.07% of the height of the origin peak. No significant pseudotranslation is detected.*

[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, ZCD, GAL, NA, NAG, GOL, SO4

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	0.40	0/1971	0.62	0/2685
2	B	0.41	0/2032	0.64	0/2772
All	All	0.41	0/4003	0.63	0/5457

There are no bond length outliers.

There are no bond angle outliers.

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	A	1930	0	1905	19	0
2	B	1993	0	1924	22	0
3	C	28	0	25	0	0
3	D	28	0	25	0	0
4	E	23	0	10	0	0
5	A	18	0	24	6	0
5	B	12	0	16	1	0
6	A	14	0	13	0	0
6	B	29	0	28	0	0
7	A	10	0	0	0	0
7	B	5	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	A	5	0	2	0	0
9	A	2	0	0	0	0
10	A	1	0	0	0	0
11	A	7	0	0	0	0
11	B	37	0	0	0	0
All	All	4142	0	3972	38	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 (38) 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:149:THR:H	5:A:301:GOL:H32	1.49	0.77
5:A:302:GOL:H32	2:B:141:ARG:HE	1.58	0.68
1:A:174:TRP:CG	2:B:260:LEU:HD12	2.29	0.67
2:B:193:THR:HG22	2:B:215:GLN:HG2	1.79	0.64
1:A:189:ASP:OD1	1:A:192:MET:HG3	1.98	0.64
5:A:302:GOL:H32	2:B:141:ARG:NE	2.15	0.61
2:B:260:LEU:HD22	2:B:262:VAL:HG23	1.82	0.60
1:A:235:ASP:HB3	5:A:302:GOL:H31	1.83	0.58
2:B:193:THR:CG2	2:B:215:GLN:HG2	2.34	0.57
2:B:193:THR:HG21	2:B:206:VAL:HG22	1.87	0.57
1:A:115:TYR:HB2	5:A:303:GOL:H11	1.90	0.54
2:B:260:LEU:HD22	2:B:262:VAL:CG2	2.41	0.51
1:A:28:VAL:HG12	1:A:72:VAL:HG23	1.93	0.51
2:B:256:ASN:ND2	5:B:302:GOL:H32	2.25	0.51
1:A:125:ARG:HG2	1:A:157:LEU:HD21	1.93	0.50
2:B:128:LEU:HD12	2:B:211:GLY:HA2	1.94	0.49
1:A:174:TRP:CD2	2:B:260:LEU:HD12	2.48	0.48
2:B:199:VAL:HG22	2:B:250:PRO:HD3	1.95	0.47
1:A:235:ASP:O	5:A:302:GOL:H12	2.15	0.47
2:B:241:PRO:O	2:B:244:ALA:HB2	2.15	0.46
1:A:9:THR:HB	1:A:61:GLU:HG2	1.99	0.45
2:B:255:PRO:HA	2:B:258:MET:HG3	1.99	0.45
1:A:1:TYR:OH	1:A:99:HIS:HB3	2.17	0.45
2:B:232:LEU:HD12	2:B:248:ILE:HD12	1.99	0.44
2:B:252:THR:HB	2:B:254:LYS:HG2	2.00	0.44
2:B:243:LEU:H	2:B:243:LEU:HG	1.37	0.43
1:A:7:ARG:HG2	1:A:9:THR:HG23	2.00	0.43
1:A:234:ARG:HD2	2:B:95:GLY:O	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:86:ARG:O	2:B:90:LEU:CD2	2.67	0.42
1:A:223:SER:OG	1:A:224:PRO:HD3	2.19	0.42
2:B:191:CYS:O	2:B:193:THR:HG23	2.19	0.42
1:A:119:GLU:OE1	1:A:125:ARG:HD3	2.20	0.41
2:B:227:ASN:HB3	2:B:230:ASN:OD1	2.21	0.41
1:A:66:ILE:HD13	1:A:66:ILE:HA	1.91	0.41
1:A:115:TYR:O	1:A:119:GLU:OE2	2.38	0.41
2:B:200:SER:HA	2:B:247:ILE:HD12	2.02	0.41
1:A:157:LEU:O	1:A:161:GLN:HG2	2.22	0.40
1:A:222:LEU:HD23	1:A:222:LEU:HA	1.79	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	245/247 (99%)	238 (97%)	7 (3%)	0	100	100
2	B	261/263 (99%)	254 (97%)	7 (3%)	0	100	100
All	All	506/510 (99%)	492 (97%)	14 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	211/211 (100%)	210 (100%)	1 (0%)	86 93
2	B	218/218 (100%)	211 (97%)	7 (3%)	34 47
All	All	429/429 (100%)	421 (98%)	8 (2%)	52 67

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	208	HIS
2	B	5	CYS
2	B	45	ASP
2	B	86	ARG
2	B	150	ASP
2	B	151	LEU
2	B	243	LEU
2	B	250	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	215	ASN
2	B	187	ASN
2	B	256	ASN

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)

6 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the

expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	NAG	C	1	2,3	14,14,15	0.70	0	17,19,21	1.62	4 (23%)
3	NAG	C	2	3	14,14,15	0.67	0	17,19,21	1.10	1 (5%)
3	NAG	D	1	2,3	14,14,15	0.68	0	17,19,21	1.84	5 (29%)
3	NAG	D	2	3	14,14,15	0.70	0	17,19,21	1.43	2 (11%)
4	ZCD	E	1	4	12,12,12	0.88	0	17,17,17	1.16	3 (17%)
4	GAL	E	2	4	11,11,12	0.79	0	15,15,17	3.23	4 (26%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	C	1	2,3	-	2/6/23/26	0/1/1/1
3	NAG	C	2	3	-	2/6/23/26	0/1/1/1
3	NAG	D	1	2,3	-	2/6/23/26	0/1/1/1
3	NAG	D	2	3	-	2/6/23/26	0/1/1/1
4	ZCD	E	1	4	-	0/2/22/22	0/1/1/1
4	GAL	E	2	4	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	E	2	GAL	C1-C2-C3	-9.73	97.71	109.67
4	E	2	GAL	O5-C1-C2	-5.83	101.77	110.77
3	D	1	NAG	C1-O5-C5	4.97	118.93	112.19
4	E	2	GAL	C1-O5-C5	-3.30	107.72	112.19
3	D	2	NAG	C1-O5-C5	3.23	116.57	112.19
3	C	1	NAG	C2-N2-C7	3.08	127.30	122.90
3	C	2	NAG	C1-O5-C5	2.99	116.25	112.19
3	D	1	NAG	O4-C4-C3	-2.83	103.81	110.35
3	C	1	NAG	C3-C4-C5	-2.81	105.23	110.24
3	D	1	NAG	C3-C4-C5	-2.80	105.24	110.24
3	C	1	NAG	C1-O5-C5	2.73	115.89	112.19
3	D	2	NAG	O5-C1-C2	-2.55	107.26	111.29
3	C	1	NAG	O5-C1-C2	-2.48	107.37	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	D	1	NAG	O4-C4-C5	2.38	115.22	109.30
4	E	1	ZCD	O5-C5-C6	-2.26	100.81	106.44
4	E	1	ZCD	C6-C5-C4	2.25	118.28	113.00
3	D	1	NAG	C4-C3-C2	2.13	114.14	111.02
4	E	1	ZCD	C1-O5-C5	-2.03	109.83	113.66
4	E	2	GAL	O3-C3-C4	2.00	114.98	110.35

There are no chirality outliers.

All (8) torsion outliers are listed below:

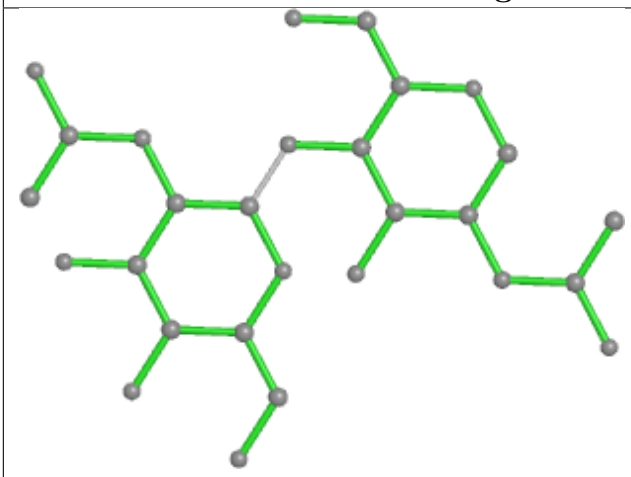
Mol	Chain	Res	Type	Atoms
3	C	2	NAG	C4-C5-C6-O6
3	C	1	NAG	C8-C7-N2-C2
3	C	1	NAG	O7-C7-N2-C2
3	D	2	NAG	C8-C7-N2-C2
3	D	2	NAG	O7-C7-N2-C2
3	D	1	NAG	C4-C5-C6-O6
3	C	2	NAG	O5-C5-C6-O6
3	D	1	NAG	O5-C5-C6-O6

There are no ring outliers.

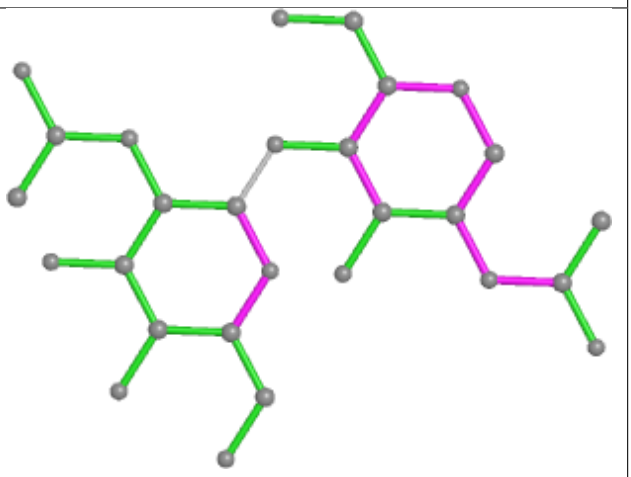
No monomer is involved in short contacts.

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

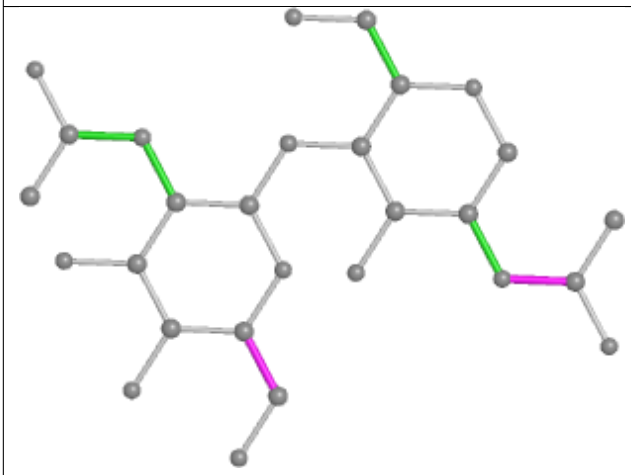
Oligosaccharide Chain C



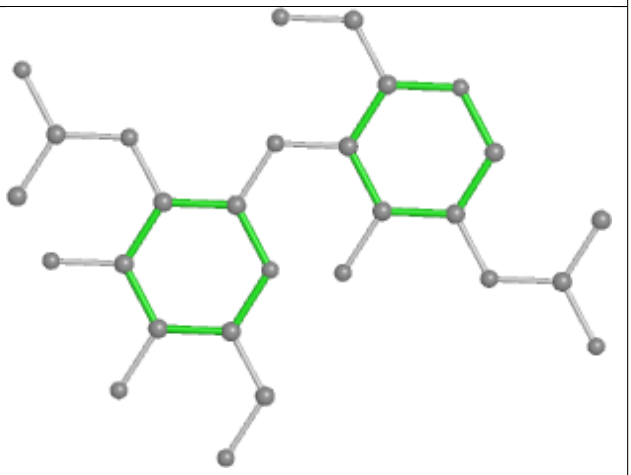
Bond lengths



Bond angles

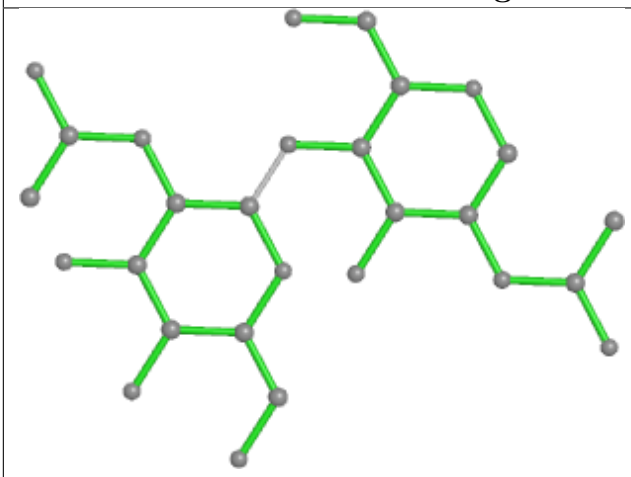


Torsions

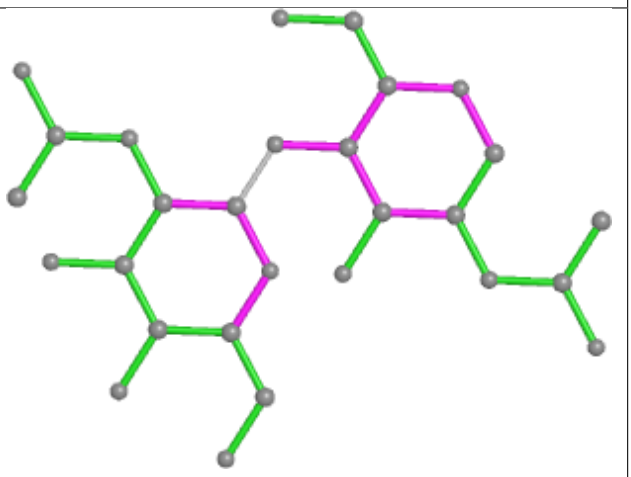


Rings

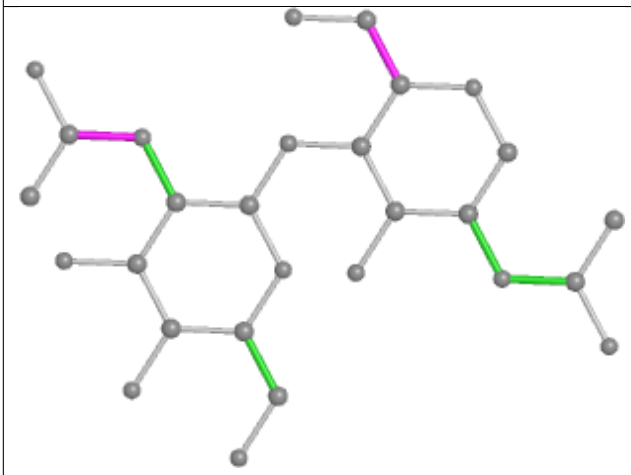
Oligosaccharide Chain D



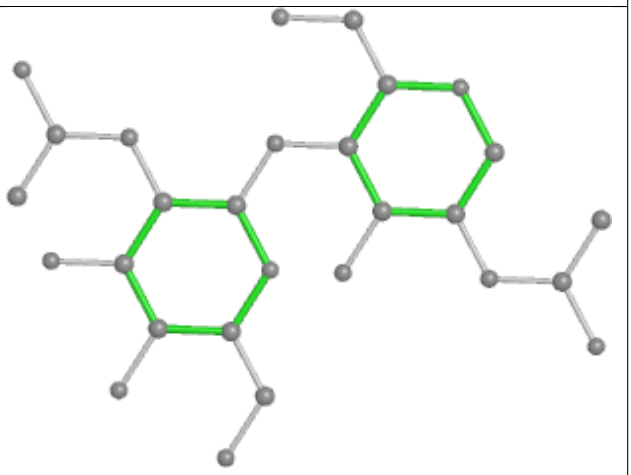
Bond lengths



Bond angles

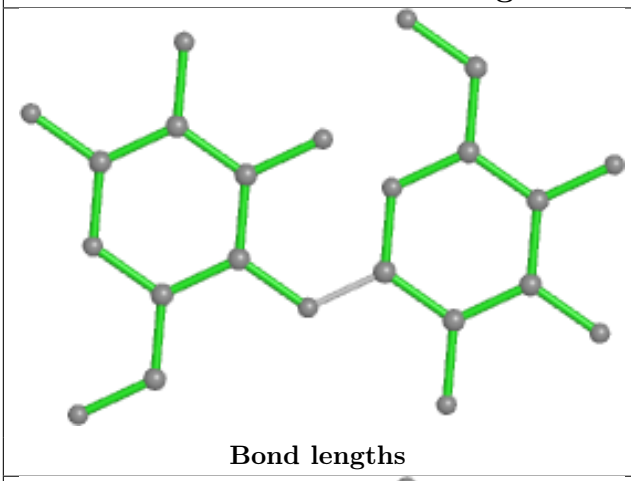


Torsions

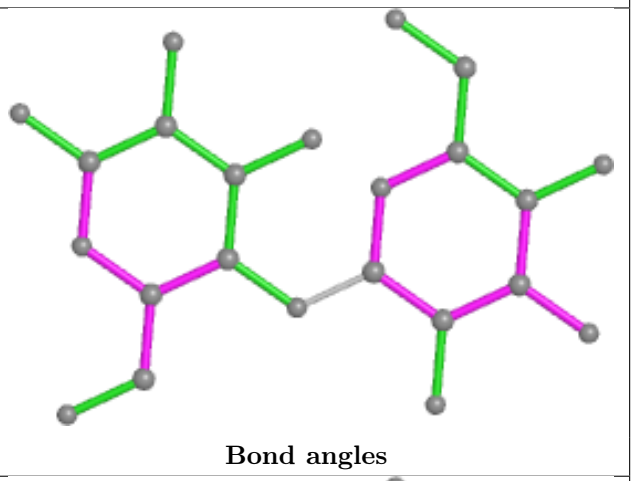


Rings

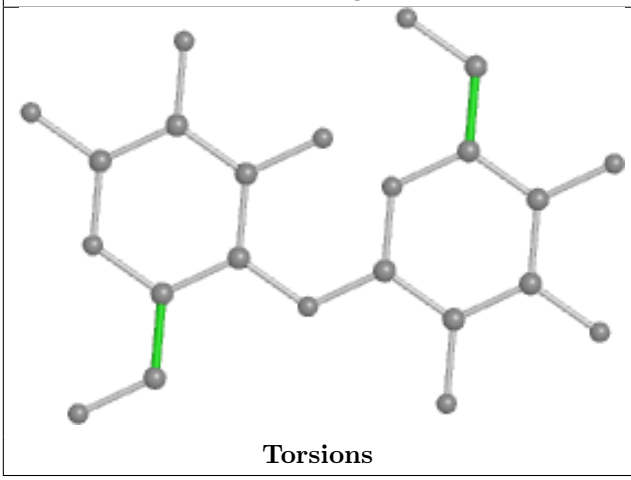
Oligosaccharide Chain E



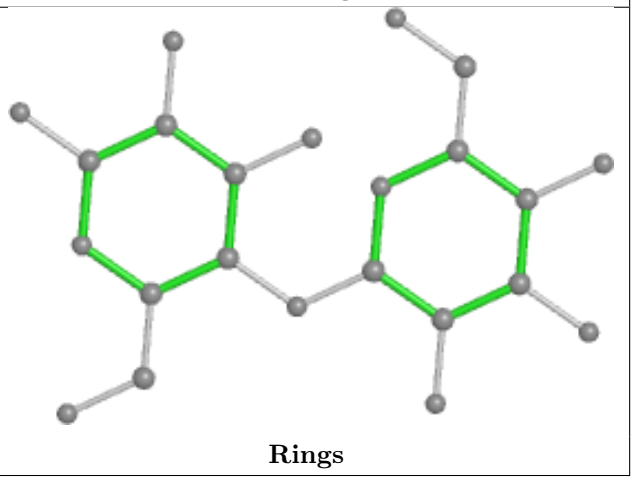
Bond lengths



Bond angles



Torsions



Rings

5.6 Ligand geometry (i)

Of 15 ligands modelled in this entry, 3 are monoatomic - leaving 12 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	$\#\|Z\| > 2$
8	GLY	A	306	-	4,4,4	1.14	1 (25%)	3,4,4	1.99	1 (33%)
5	GOL	B	301	-	5,5,5	0.32	0	5,5,5	0.43	0
5	GOL	A	302	-	5,5,5	0.33	0	5,5,5	0.67	0
6	NAG	B	303	2	14,14,15	0.90	0	17,19,21	1.80	5 (29%)
7	SO4	A	305	-	4,4,4	0.64	0	6,6,6	0.34	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
7	SO4	B	305	-	4,4,4	0.77	0	6,6,6	0.37	0
5	GOL	A	303	-	5,5,5	0.25	0	5,5,5	0.43	0
6	NAG	B	304	-	15,15,15	0.64	0	21,21,21	1.67	5 (23%)
5	GOL	A	301	-	5,5,5	0.43	0	5,5,5	0.65	0
5	GOL	B	302	-	5,5,5	0.28	0	5,5,5	0.39	0
6	NAG	A	304	1	14,14,15	0.77	1 (7%)	17,19,21	1.54	3 (17%)
7	SO4	A	309	-	4,4,4	0.70	0	6,6,6	0.13	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
8	GLY	A	306	-	-	0/2/2/2	-
5	GOL	B	301	-	-	2/4/4/4	-
5	GOL	A	302	-	-	4/4/4/4	-
6	NAG	B	303	2	-	4/6/23/26	0/1/1/1
5	GOL	A	303	-	-	4/4/4/4	-
6	NAG	B	304	-	-	2/6/26/26	0/1/1/1
5	GOL	A	301	-	-	4/4/4/4	-
5	GOL	B	302	-	-	3/4/4/4	-
6	NAG	A	304	1	-	1/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	A	306	GLY	OXT-C	-2.15	1.23	1.30
6	A	304	NAG	C1-C2	2.10	1.55	1.52

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	A	304	NAG	C1-O5-C5	4.35	118.08	112.19
6	B	304	NAG	C4-C3-C2	4.28	116.62	110.34
6	B	303	NAG	C3-C4-C5	-3.59	103.83	110.24
6	B	303	NAG	O5-C1-C2	-3.53	105.72	111.29
8	A	306	GLY	OXT-C-O	-2.98	115.87	123.30
6	B	304	NAG	C1-C2-C3	2.90	114.50	110.54
6	B	304	NAG	C3-C2-N2	-2.86	105.22	110.62

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	B	303	NAG	O4-C4-C5	2.54	115.60	109.30
6	A	304	NAG	C2-N2-C7	2.36	126.26	122.90
6	B	303	NAG	C1-C2-N2	2.33	114.47	110.49
6	B	303	NAG	C6-C5-C4	2.26	118.30	113.00
6	A	304	NAG	O4-C4-C5	2.25	114.88	109.30
6	B	304	NAG	C2-N2-C7	2.25	128.64	123.18
6	B	304	NAG	C3-C4-C5	2.18	114.13	110.24

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	301	GOL	O1-C1-C2-C3
5	A	301	GOL	C1-C2-C3-O3
5	A	302	GOL	O1-C1-C2-C3
5	A	302	GOL	C1-C2-C3-O3
5	A	303	GOL	O1-C1-C2-C3
5	A	303	GOL	C1-C2-C3-O3
5	B	301	GOL	C1-C2-C3-O3
5	B	302	GOL	C1-C2-C3-O3
6	B	303	NAG	O5-C5-C6-O6
6	B	303	NAG	C4-C5-C6-O6
6	B	303	NAG	C8-C7-N2-C2
6	B	303	NAG	O7-C7-N2-C2
6	B	304	NAG	C8-C7-N2-C2
6	B	304	NAG	O7-C7-N2-C2
5	B	301	GOL	O2-C2-C3-O3
5	A	301	GOL	O1-C1-C2-O2
5	A	301	GOL	O2-C2-C3-O3
5	A	302	GOL	O2-C2-C3-O3
6	A	304	NAG	O5-C5-C6-O6
5	A	302	GOL	O1-C1-C2-O2
5	A	303	GOL	O1-C1-C2-O2
5	A	303	GOL	O2-C2-C3-O3
5	B	302	GOL	O2-C2-C3-O3
5	B	302	GOL	O1-C1-C2-C3

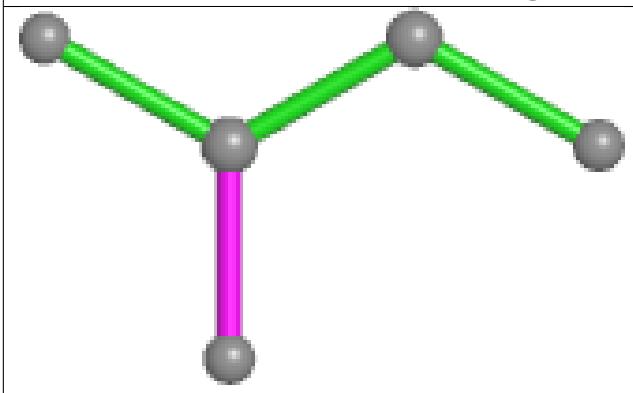
There are no ring outliers.

4 monomers are involved in 7 short contacts:

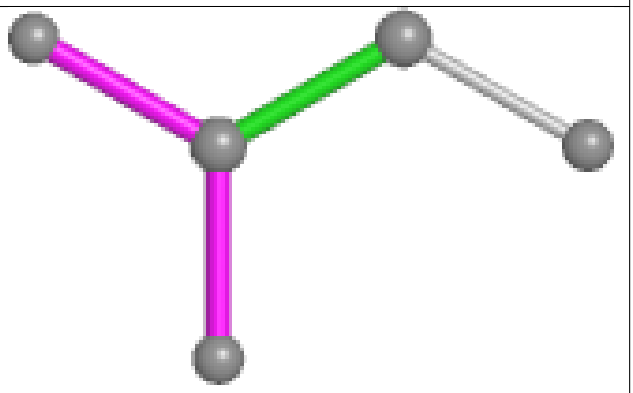
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	302	GOL	4	0
5	A	303	GOL	1	0
5	A	301	GOL	1	0
5	B	302	GOL	1	0

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.

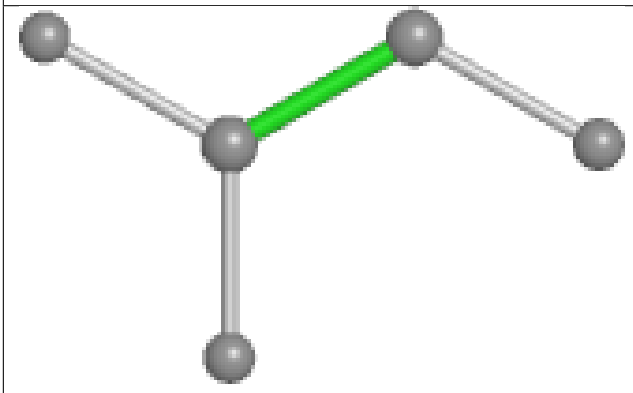
Ligand GLY A 306



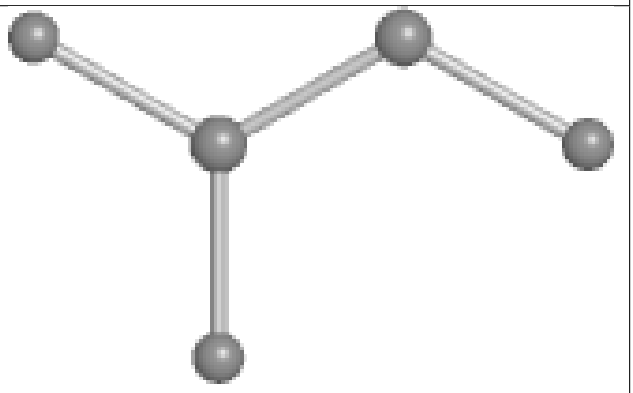
Bond lengths



Bond angles

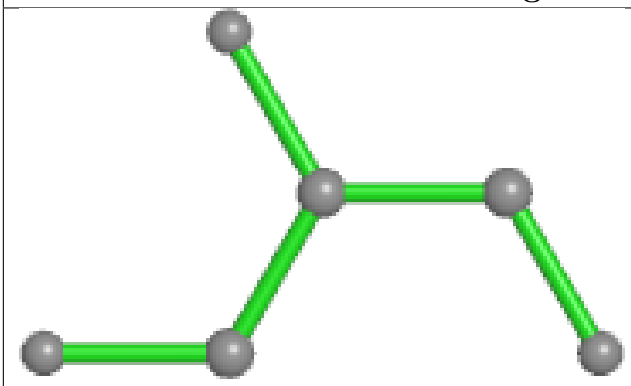


Torsions

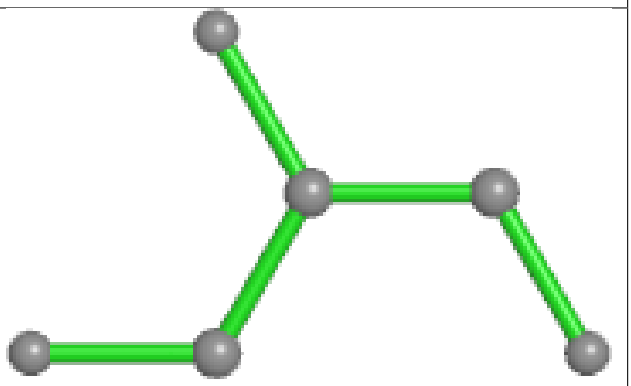


Rings

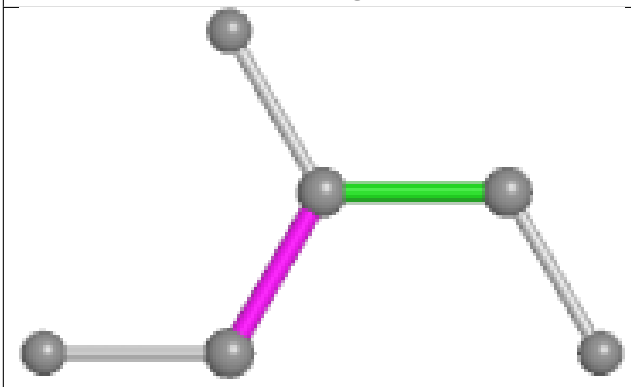
Ligand GOL B 301



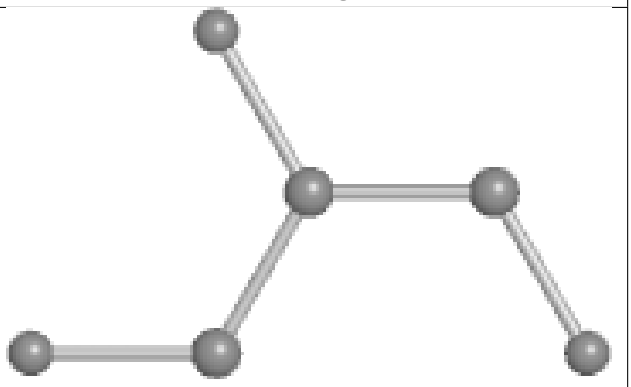
Bond lengths



Bond angles

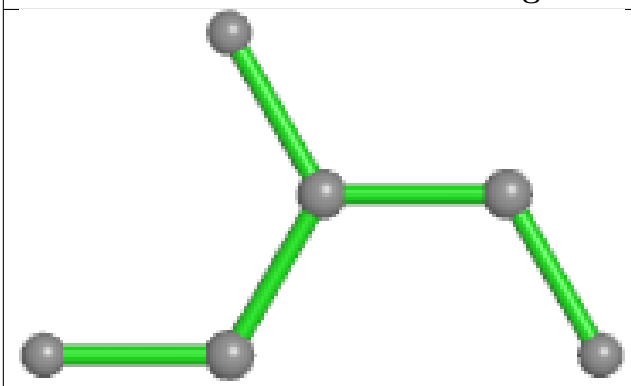


Torsions

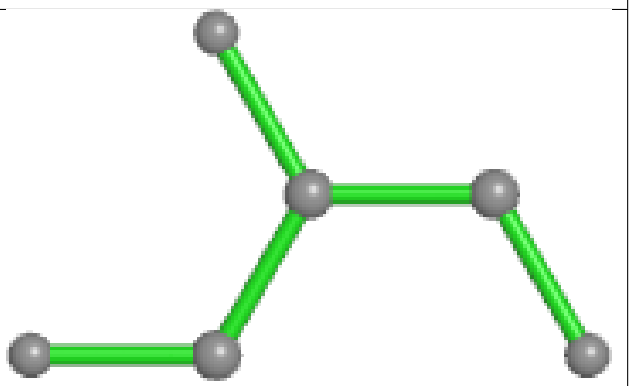


Rings

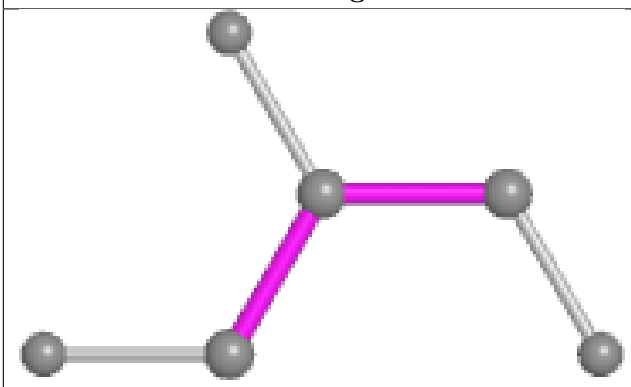
Ligand GOL A 302



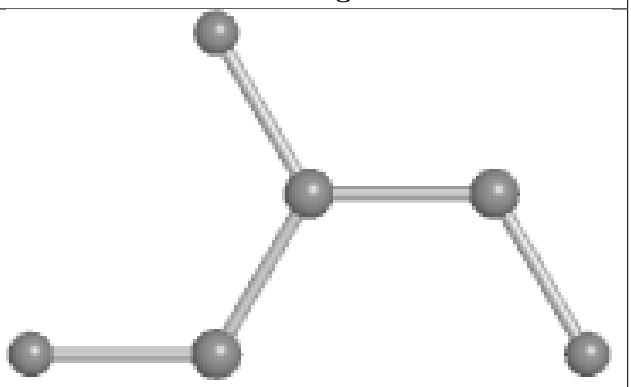
Bond lengths



Bond angles

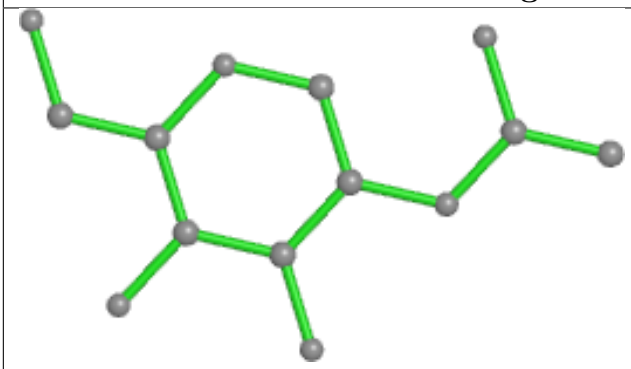


Torsions

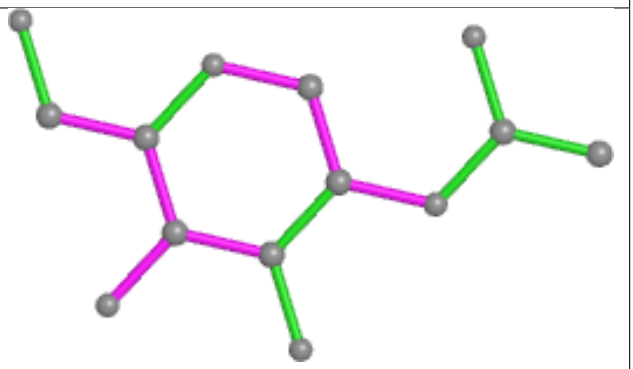


Rings

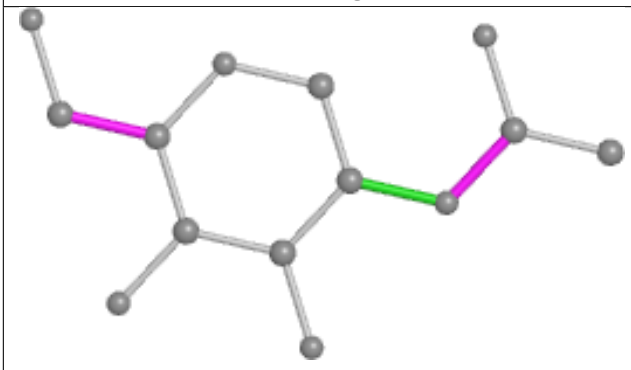
Ligand NAG B 303



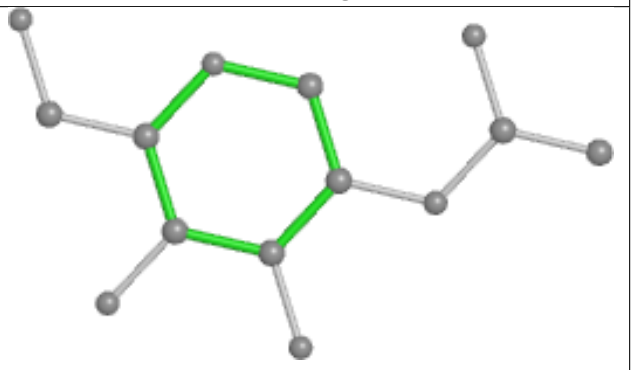
Bond lengths



Bond angles

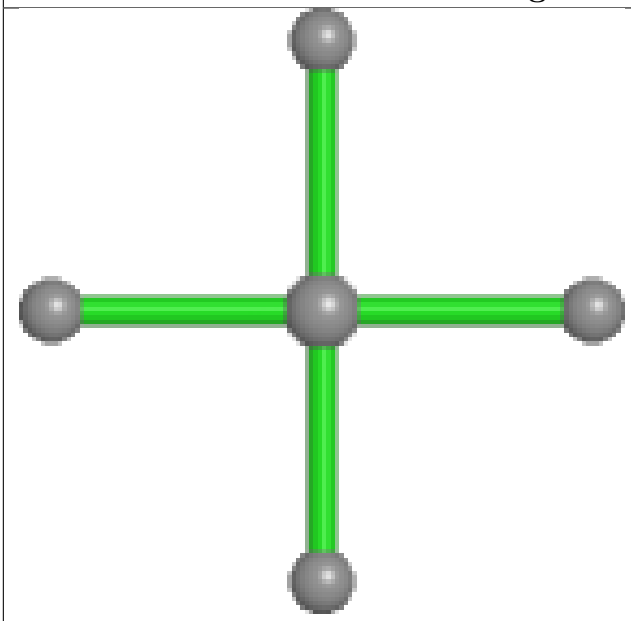


Torsions

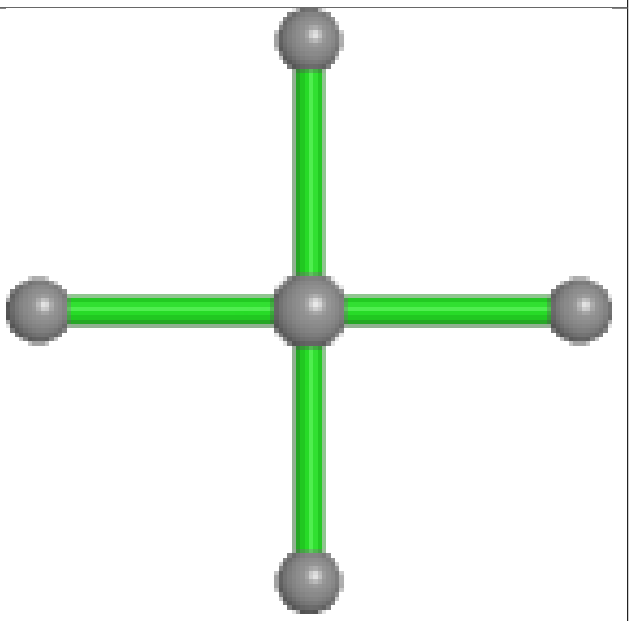


Rings

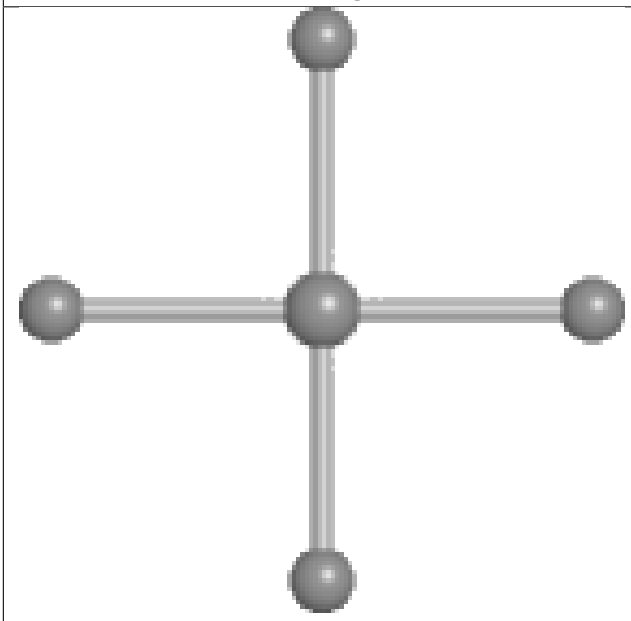
Ligand SO4 A 305



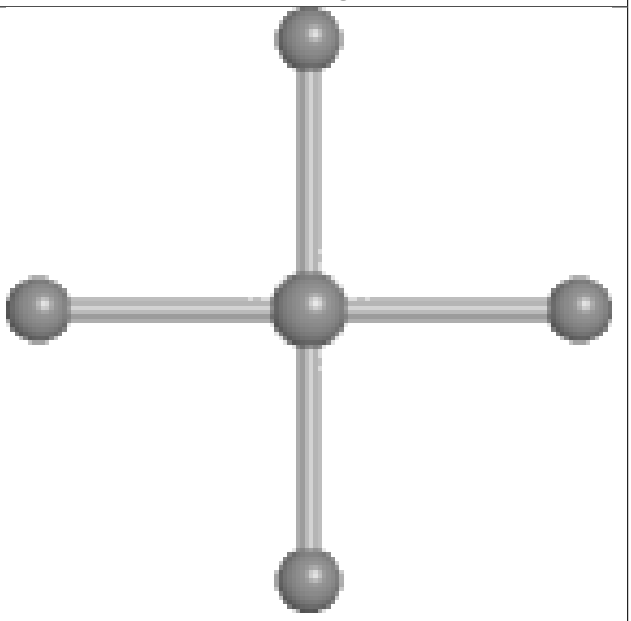
Bond lengths



Bond angles

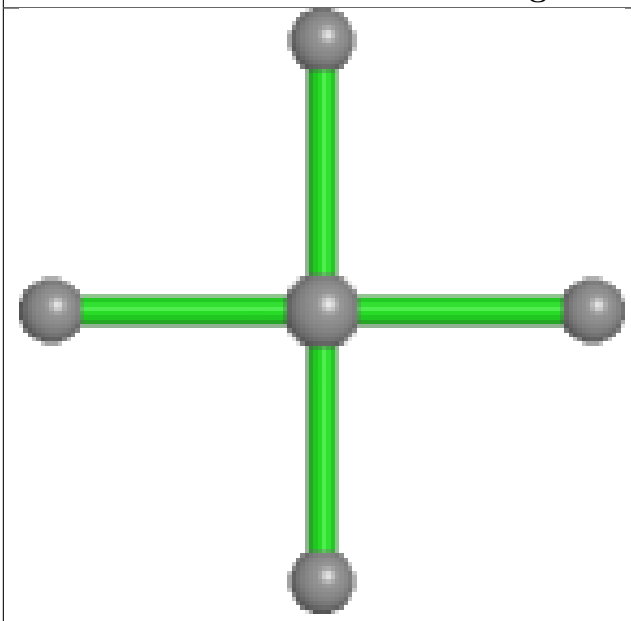


Torsions

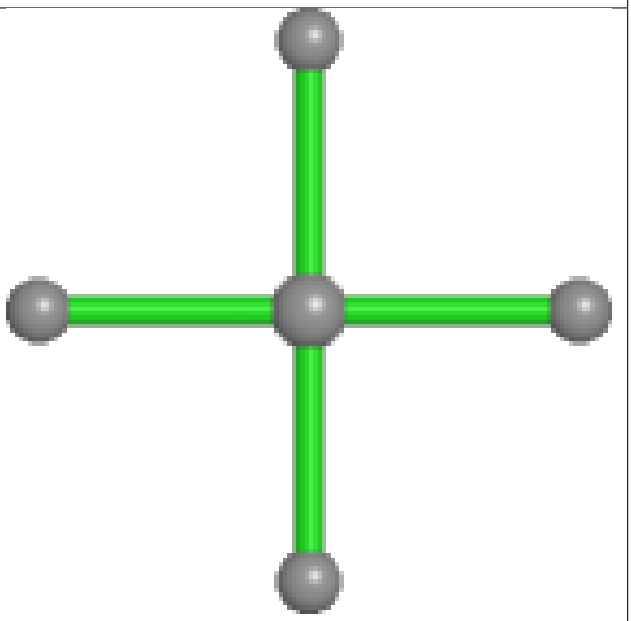


Rings

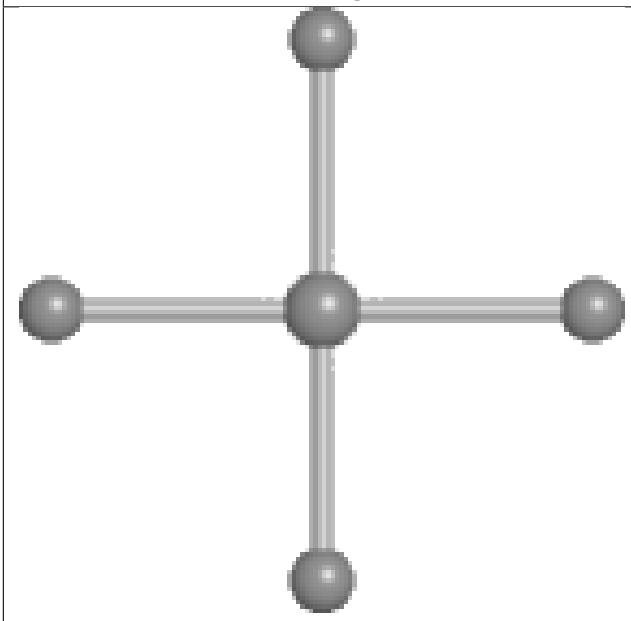
Ligand SO4 B 305



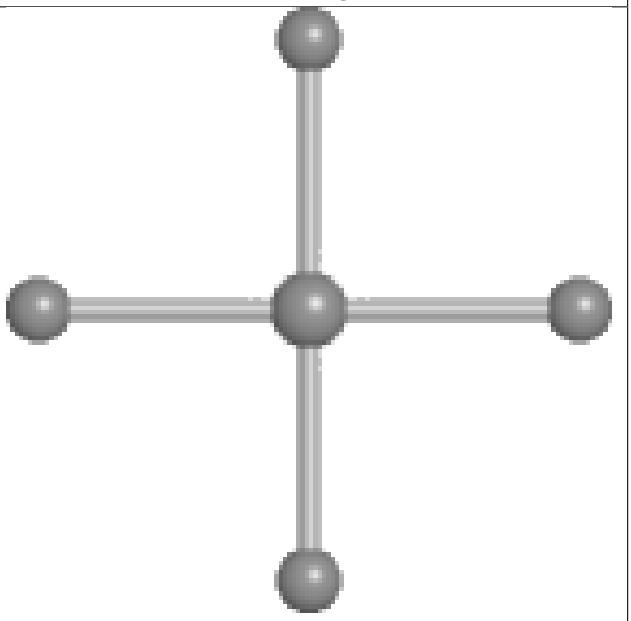
Bond lengths



Bond angles

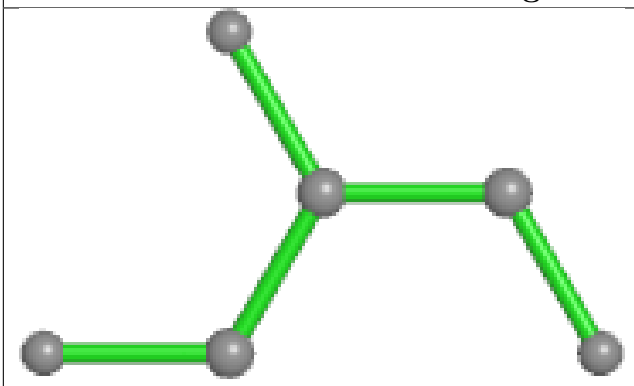


Torsions

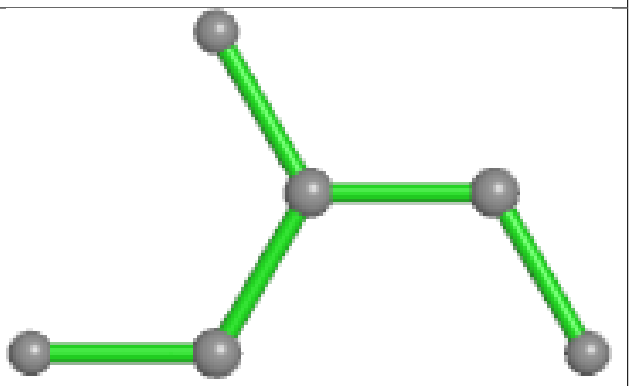


Rings

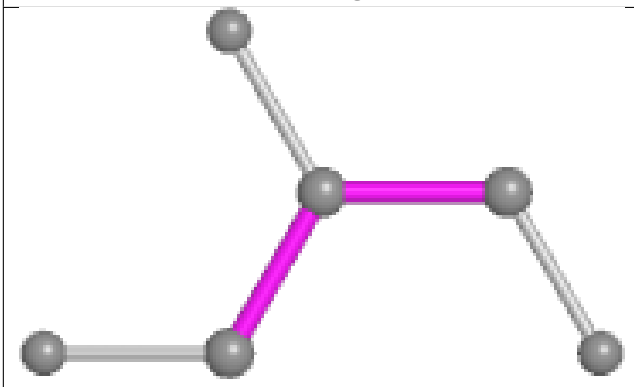
Ligand GOL A 303



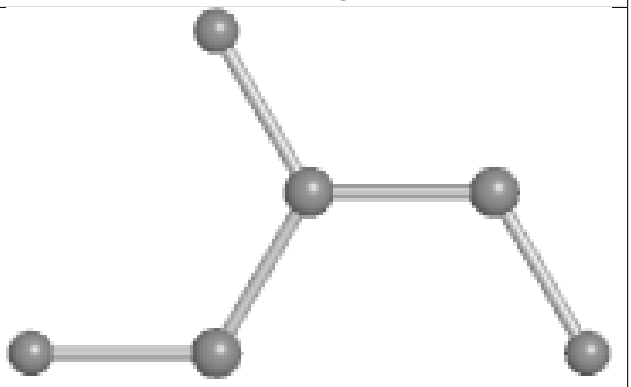
Bond lengths



Bond angles

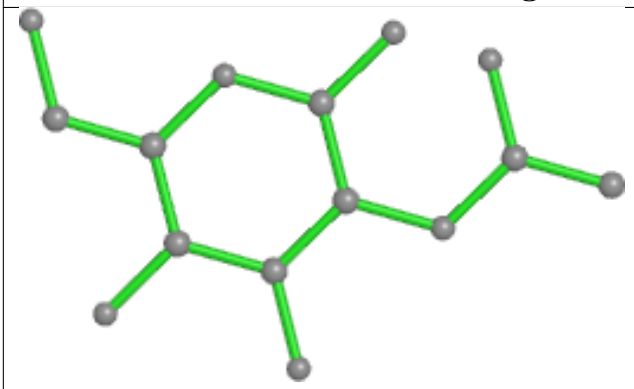


Torsions

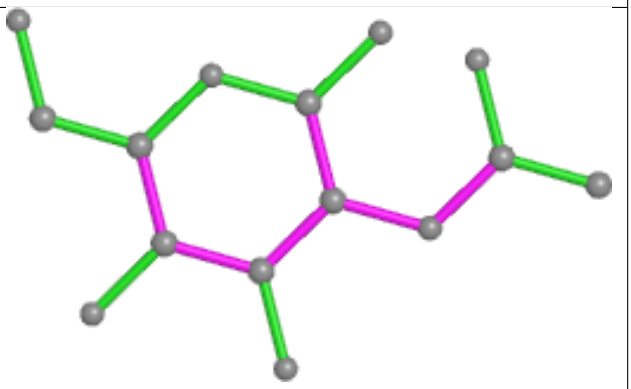


Rings

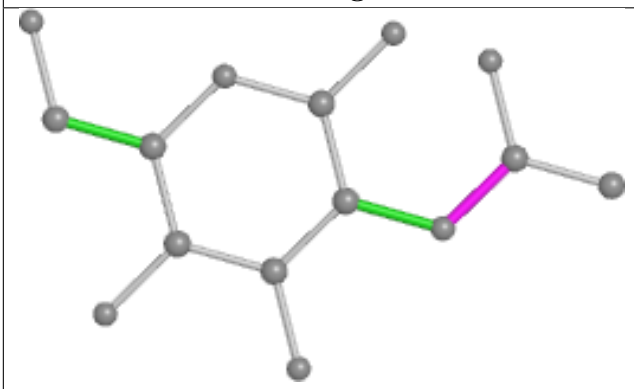
Ligand NAG B 304



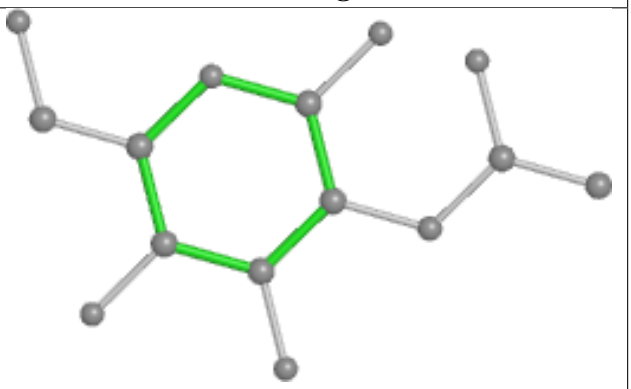
Bond lengths



Bond angles

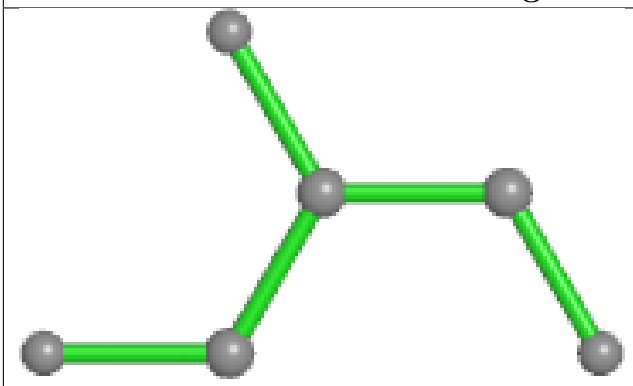


Torsions

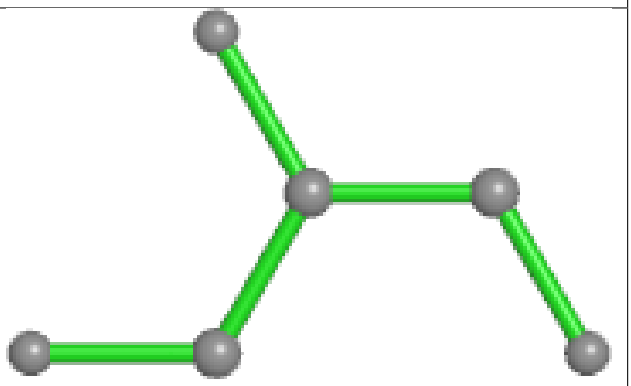


Rings

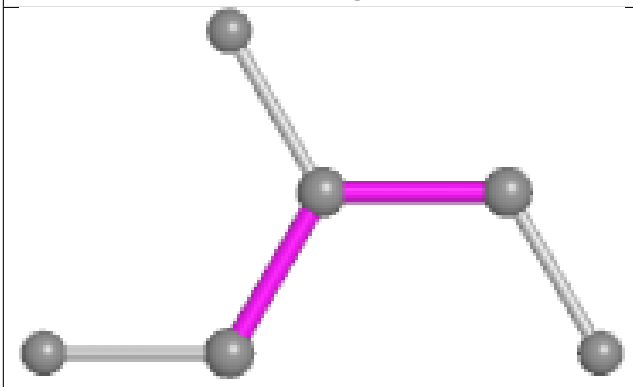
Ligand GOL A 301



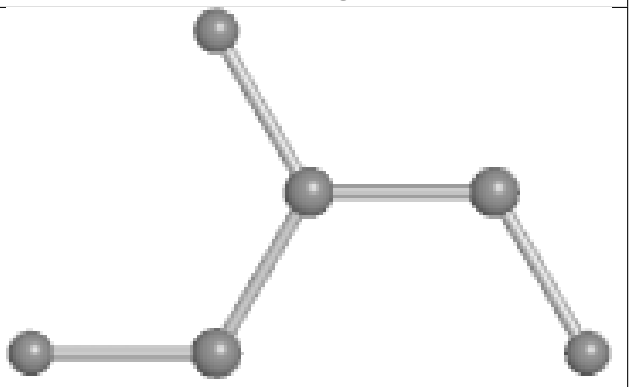
Bond lengths



Bond angles

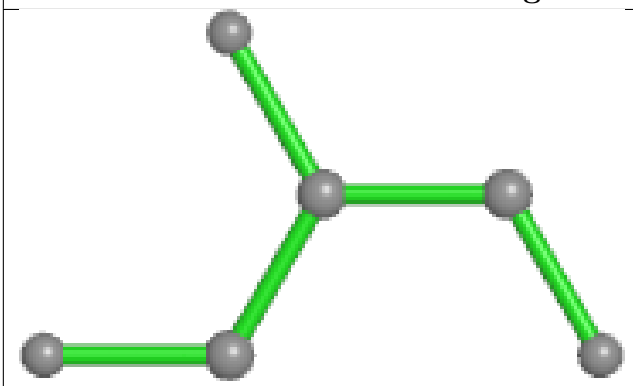


Torsions

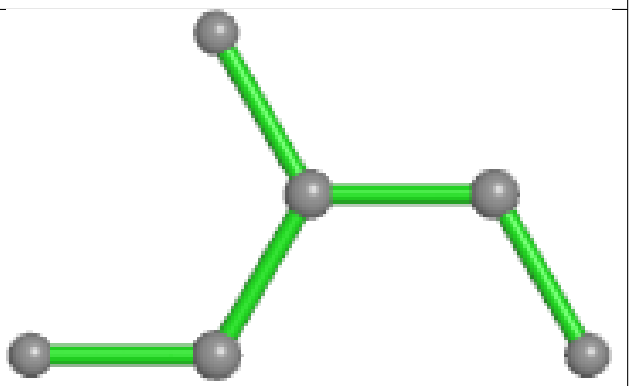


Rings

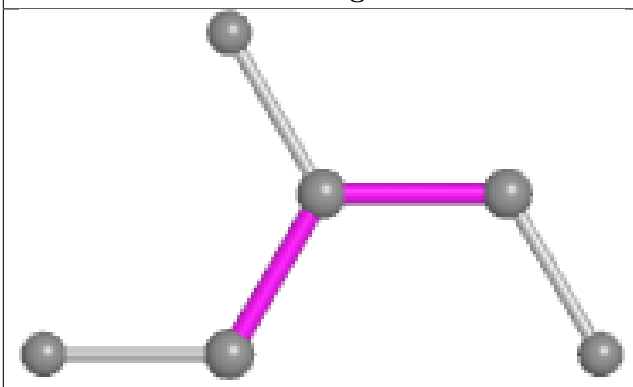
Ligand GOL B 302



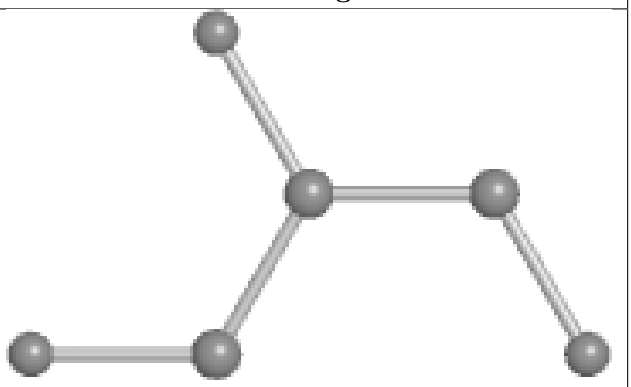
Bond lengths



Bond angles

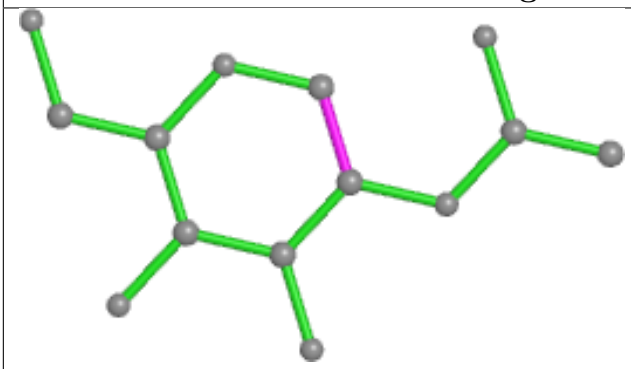


Torsions

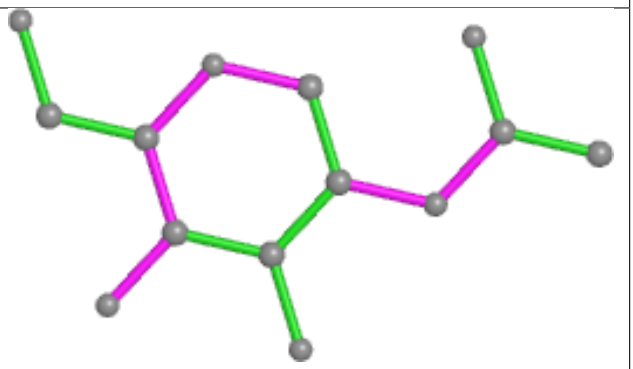


Rings

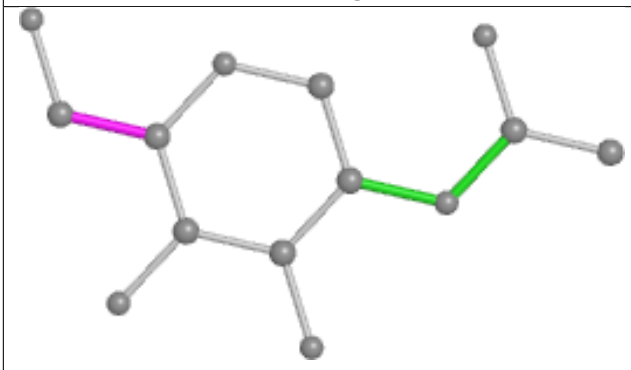
Ligand NAG A 304



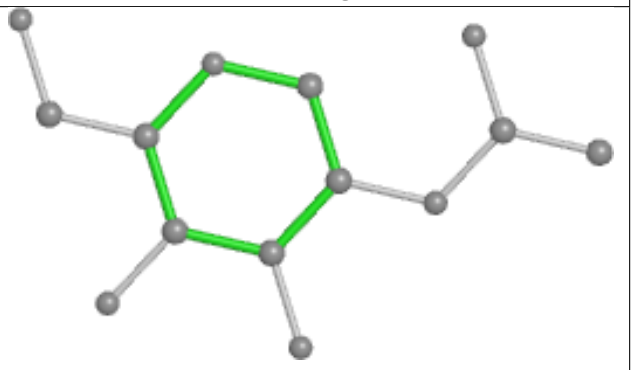
Bond lengths



Bond angles

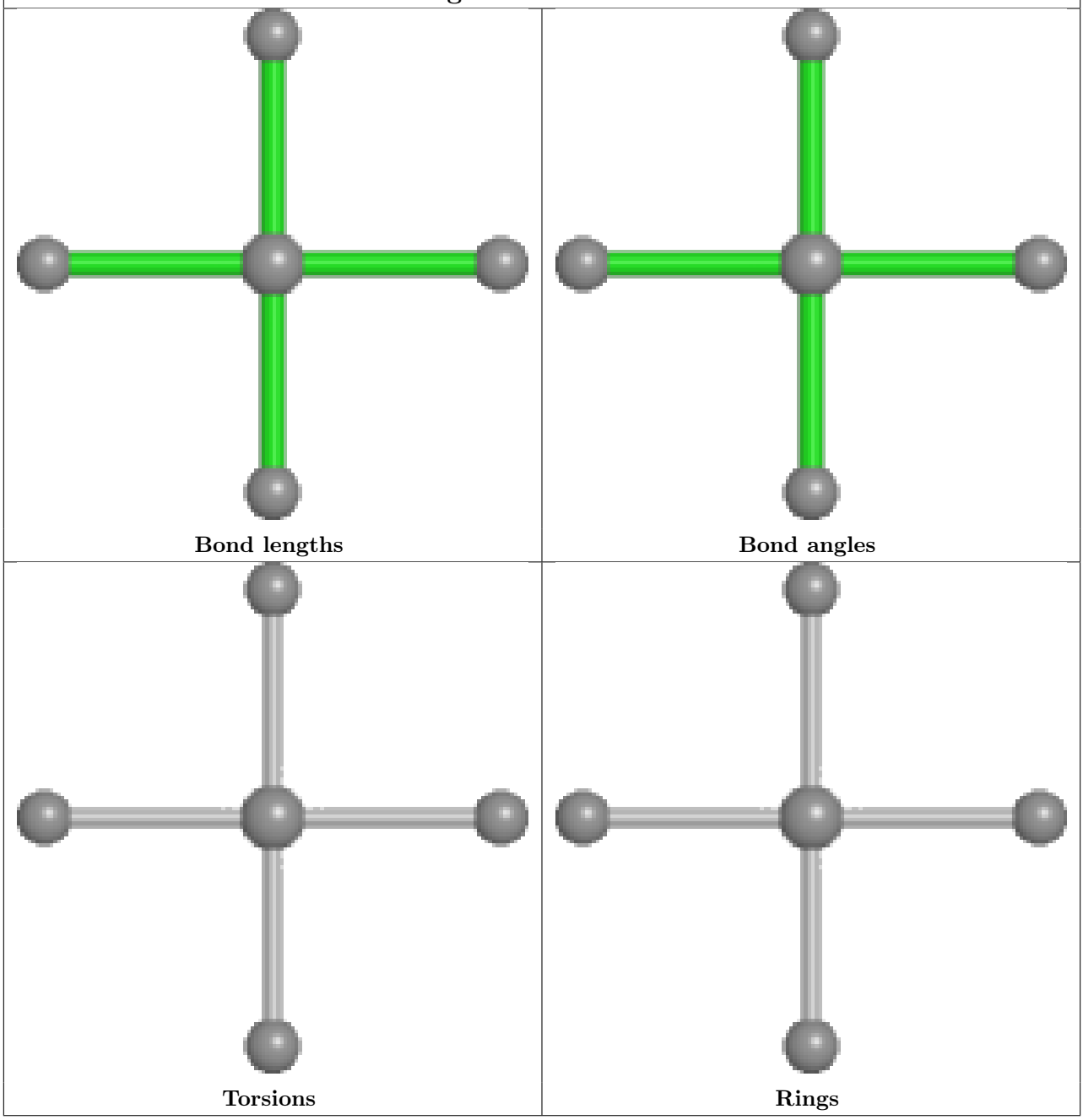


Torsions



Rings

Ligand SO4 A 309



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

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, 95^{th} 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	247/247 (100%)	0.52	19 (7%)	21	22	62, 77, 103, 119	0
2	B	263/263 (100%)	0.40	24 (9%)	16	17	56, 70, 97, 120	0
All	All	510/510 (100%)	0.46	43 (8%)	18	19	56, 73, 101, 120	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	1	ALA	7.1
2	B	244	ALA	5.4
2	B	7	ALA	5.2
2	B	242	ALA	4.8
2	B	243	LEU	4.6
2	B	167	ALA	4.2
1	A	47	VAL	4.0
2	B	6	SER	3.9
1	A	51	ALA	3.8
1	A	115	TYR	3.5
2	B	5	CYS	3.4
2	B	245	ARG	3.2
1	A	145	PRO	3.2
1	A	108	ALA	3.2
2	B	239	ALA	3.2
1	A	27	TYR	3.0
2	B	237	ALA	3.0
2	B	4	THR	2.9
1	A	225	GLY	2.9
1	A	247	CYS	2.8
1	A	102	THR	2.7
1	A	224	PRO	2.7
2	B	149	ALA	2.5
1	A	50	ALA	2.4

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Mol	Chain	Res	Type	RSRZ
2	B	241	PRO	2.4
2	B	2	ASP	2.4
1	A	227	PHE	2.4
1	A	116	PRO	2.4
1	A	106	LYS	2.3
2	B	27	ASP	2.3
2	B	81	CYS	2.3
2	B	256	ASN	2.3
2	B	3	VAL	2.3
1	A	15	ALA	2.2
2	B	240	ASN	2.2
1	A	215	ASN	2.2
2	B	168	SER	2.1
2	B	238	GLN	2.1
1	A	101	PHE	2.1
2	B	150	ASP	2.1
1	A	45	ILE	2.0
1	A	66	ILE	2.0
2	B	156	ASN	2.0

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)

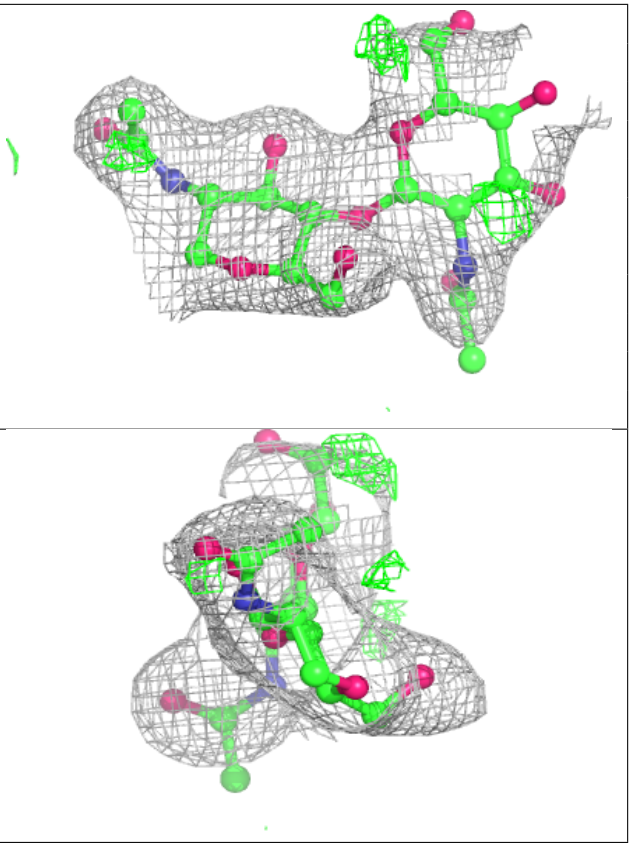
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

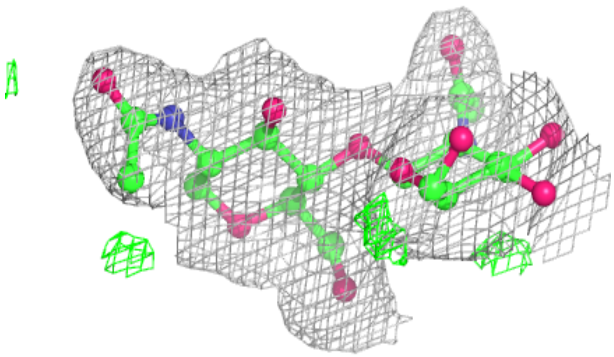
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	NAG	D	2	14/15	0.59	0.19	100,109,114,114	0
4	GAL	E	2	11/12	0.76	0.15	89,94,103,108	0
3	NAG	D	1	14/15	0.86	0.14	72,89,95,99	0
3	NAG	C	2	14/15	0.87	0.13	89,98,113,115	0
4	ZCD	E	1	12/12	0.90	0.10	67,78,84,95	0
3	NAG	C	1	14/15	0.94	0.10	67,71,84,85	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 C:

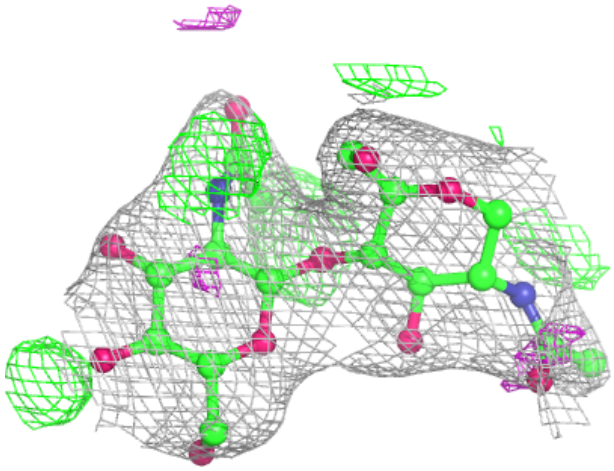
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

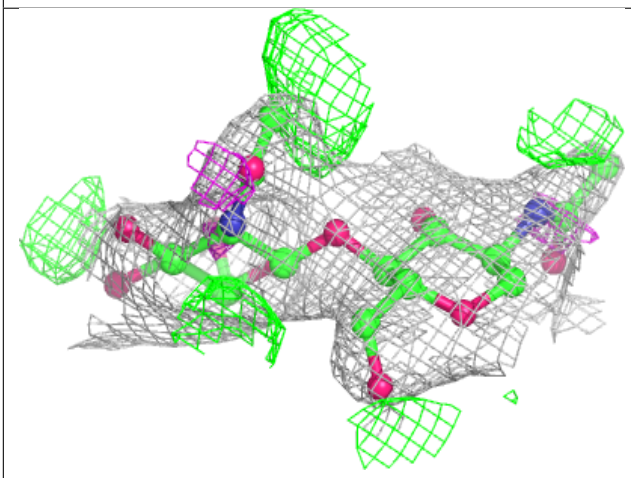


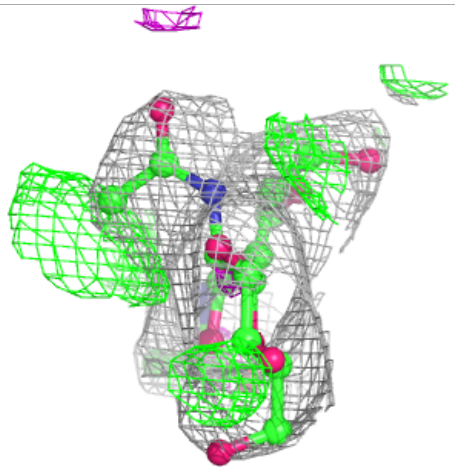


Electron density around Chain D:

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

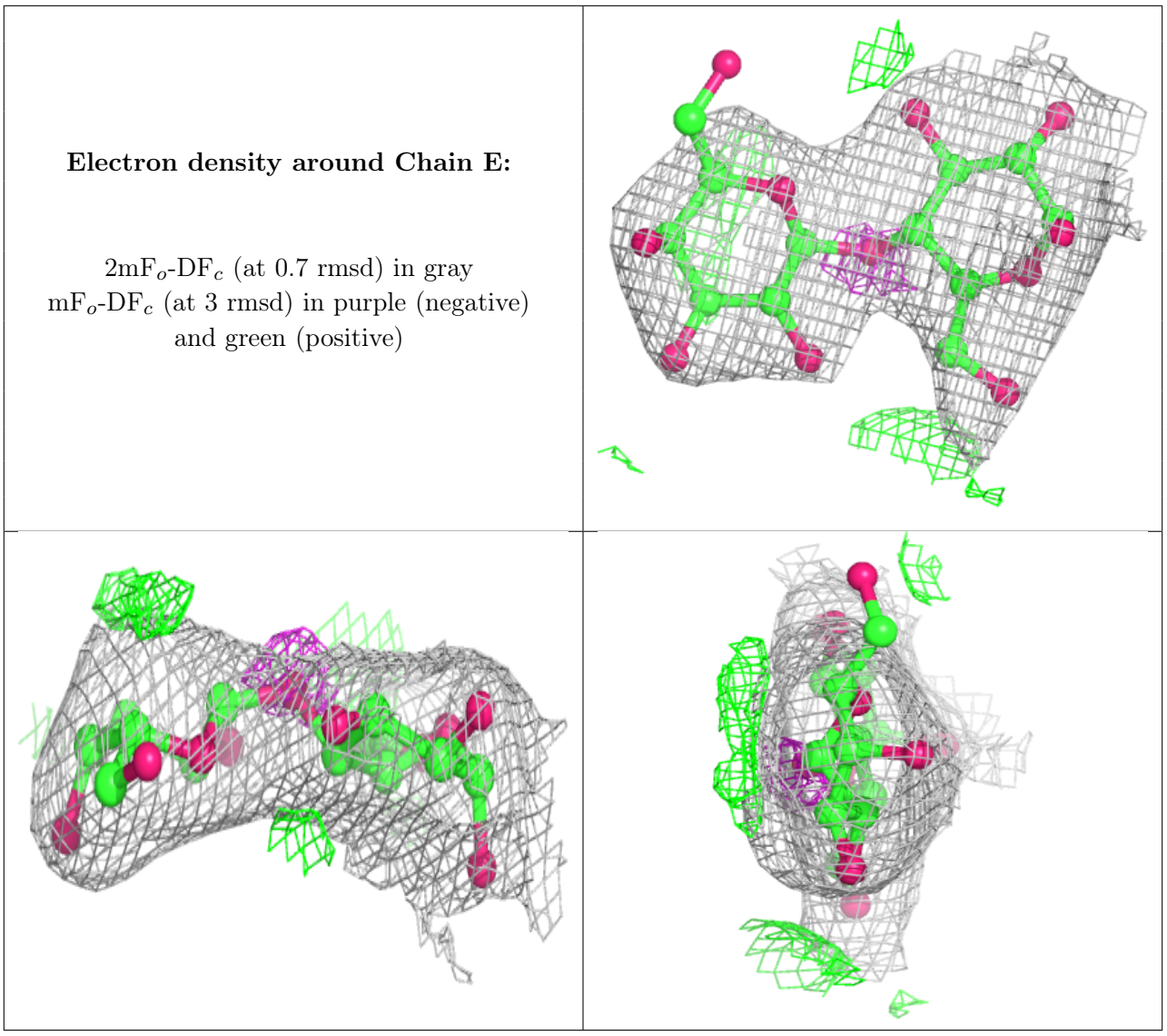






Electron density around Chain E:

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



6.4 Ligands

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, 95^{th} 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
7	SO4	B	305	5/5	0.67	0.20	90,91,102,112	0
5	GOL	A	303	6/6	0.70	0.35	87,94,98,101	0
6	NAG	B	303	14/15	0.71	0.19	91,102,108,111	0
6	NAG	B	304	15/15	0.72	0.16	121,126,129,129	0
5	GOL	B	301	6/6	0.74	0.24	89,96,102,106	0
7	SO4	A	309	5/5	0.75	0.11	113,121,124,129	0
6	NAG	A	304	14/15	0.75	0.17	102,105,110,111	0

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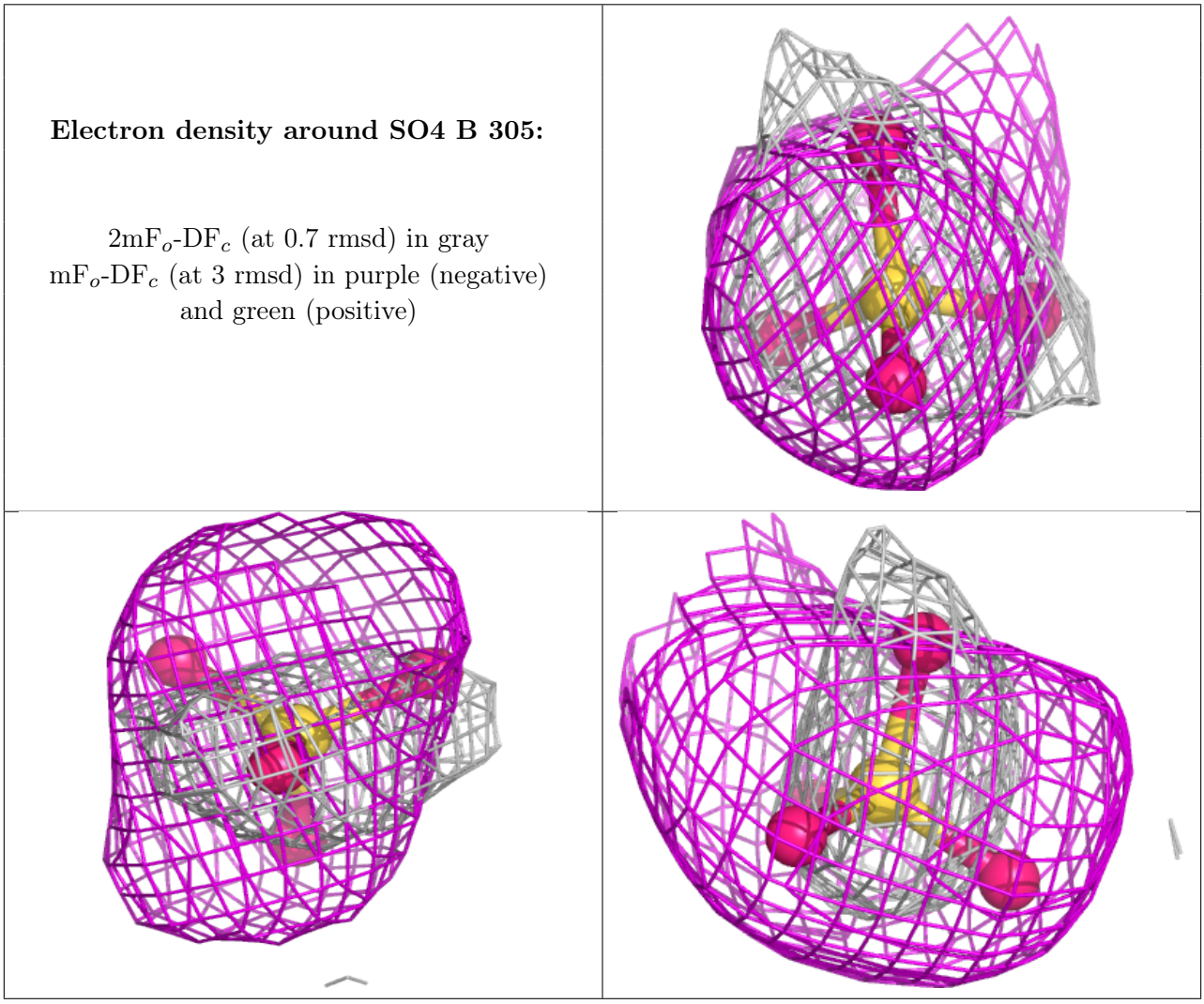
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	GOL	A	302	6/6	0.76	0.22	86,87,89,92	0
5	GOL	A	301	6/6	0.80	0.15	80,84,87,100	0
5	GOL	B	302	6/6	0.83	0.17	92,96,103,107	0
9	CL	A	307	1/1	0.88	0.27	112,112,112,112	0
10	NA	A	310	1/1	0.88	0.49	100,100,100,100	0
9	CL	A	308	1/1	0.90	0.26	104,104,104,104	0
8	GLY	A	306	5/5	0.90	0.17	63,69,80,86	0
7	SO4	A	305	5/5	0.98	0.05	72,74,81,82	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.

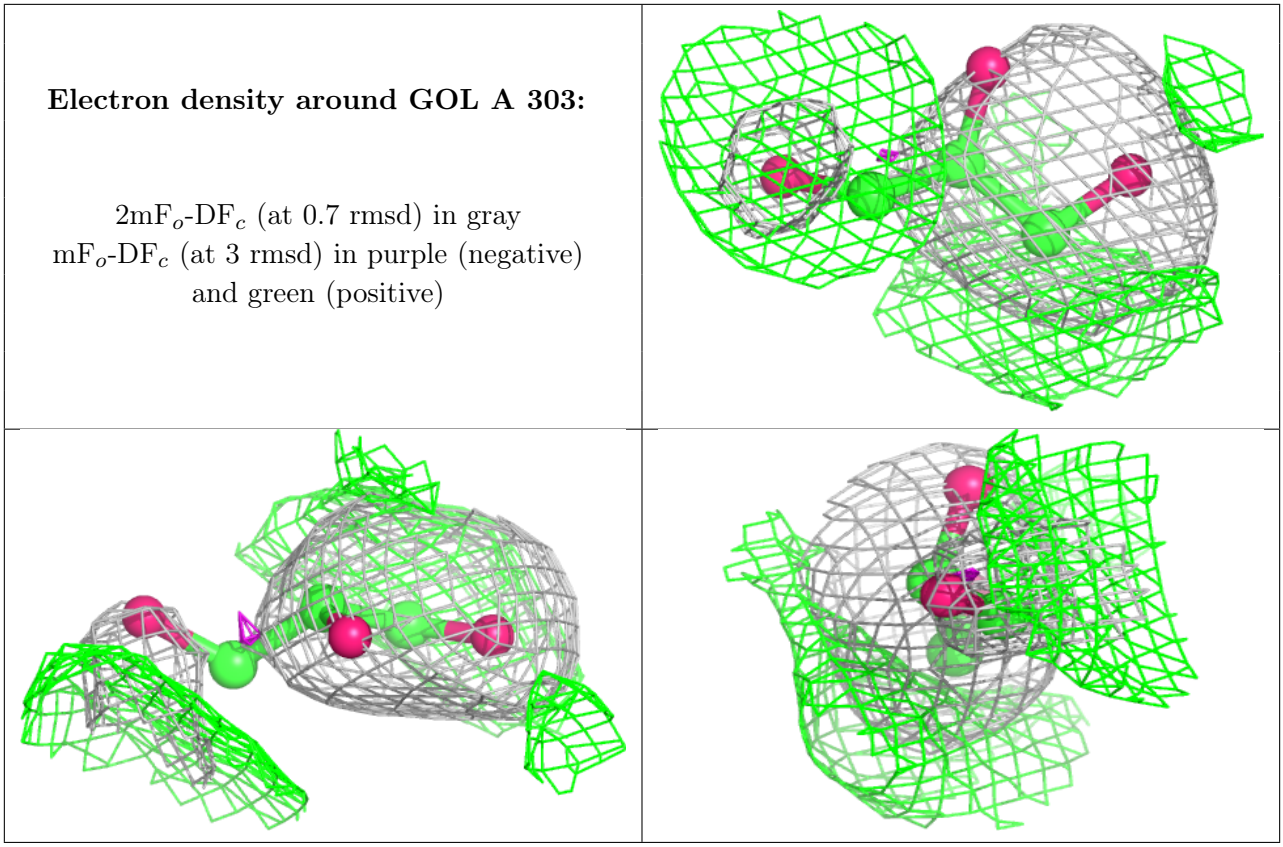
Electron density around SO4 B 305:

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



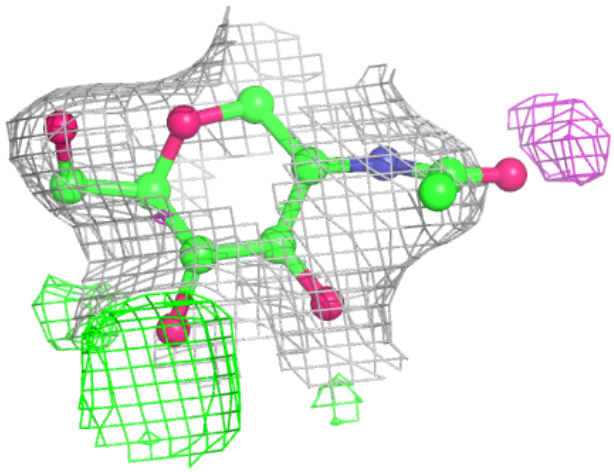
Electron density around GOL A 303:

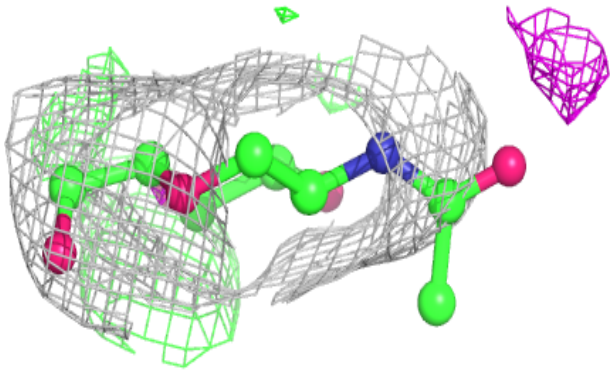
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



Electron density around NAG B 303:

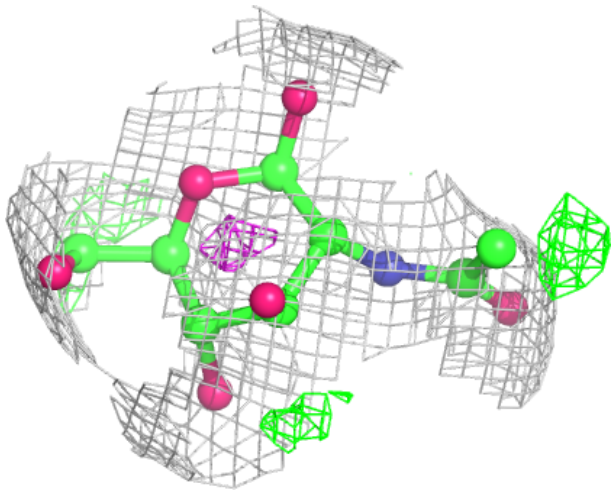
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

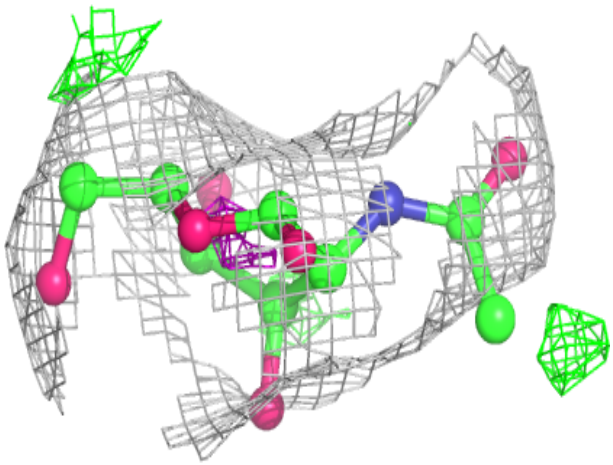


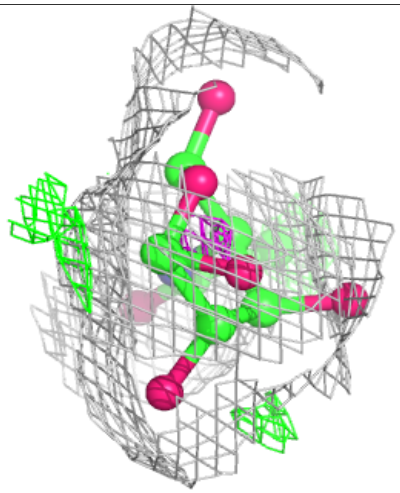


Electron density around NAG B 304:

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

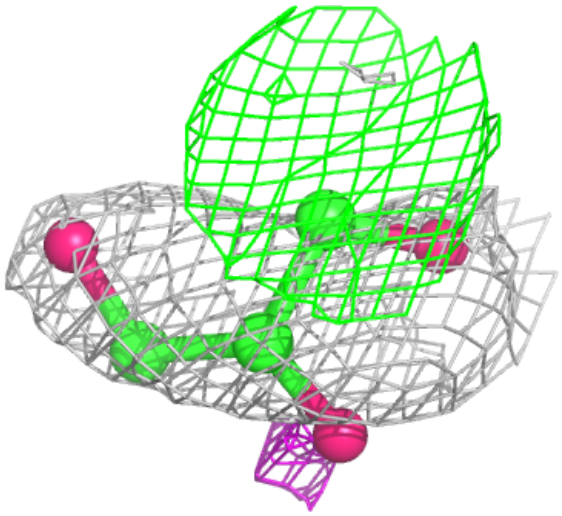


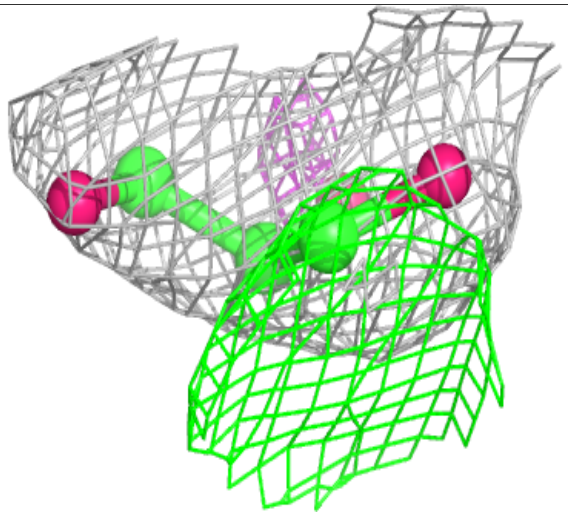


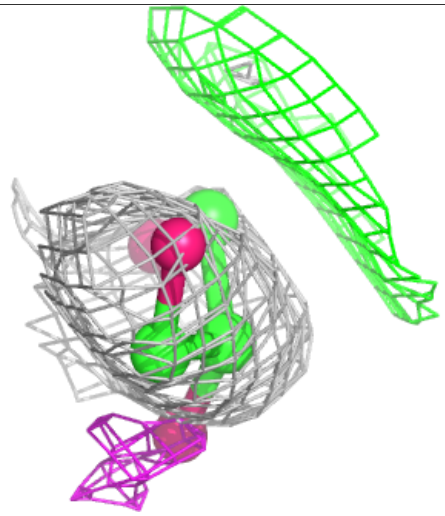


Electron density around GOL B 301:

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

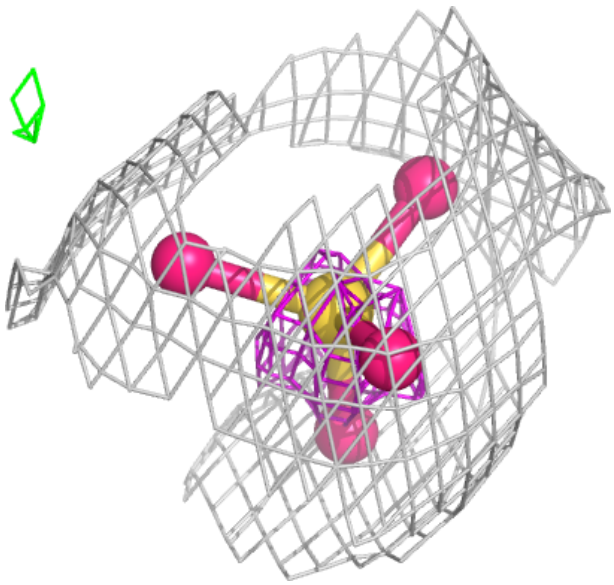


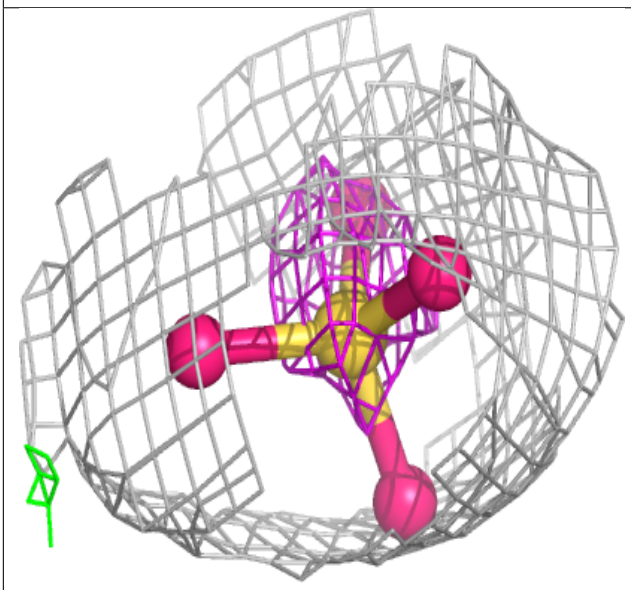


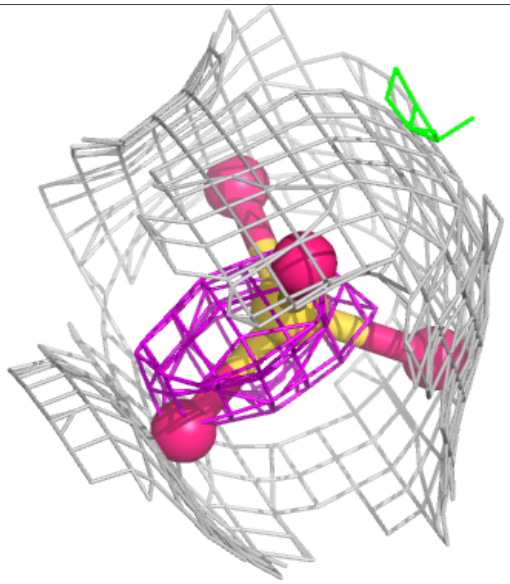


Electron density around SO4 A 309:

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

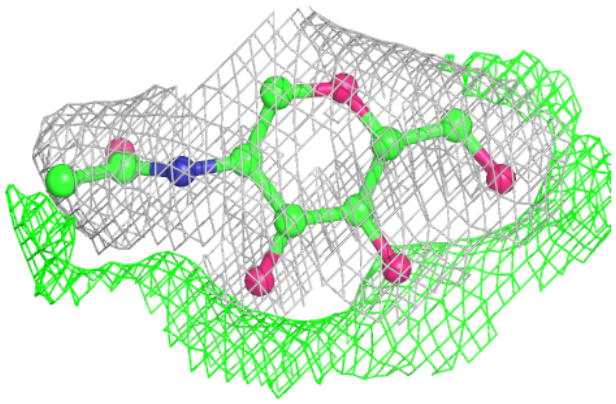


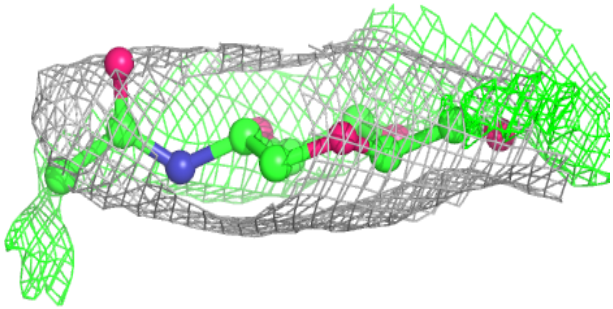


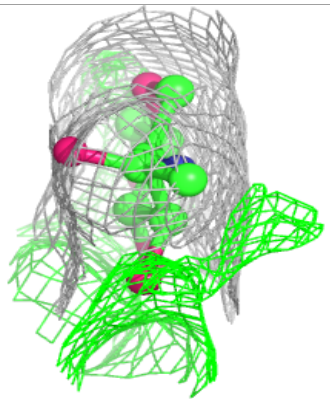


Electron density around NAG A 304:

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

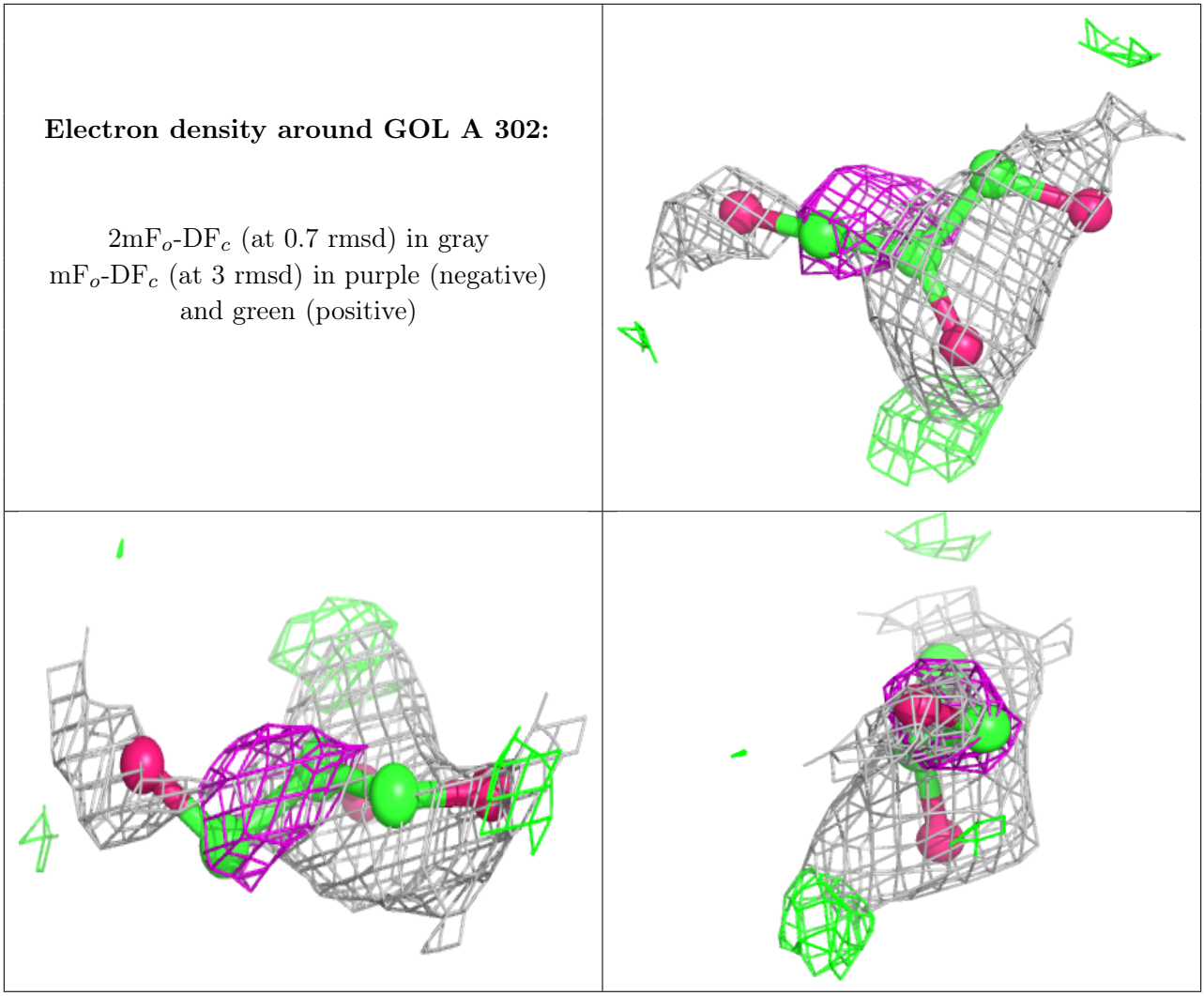






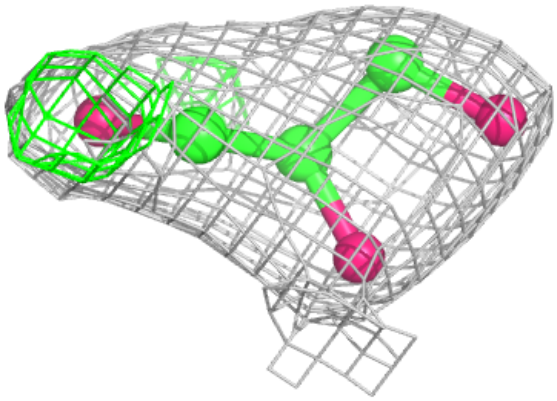
Electron density around GOL A 302:

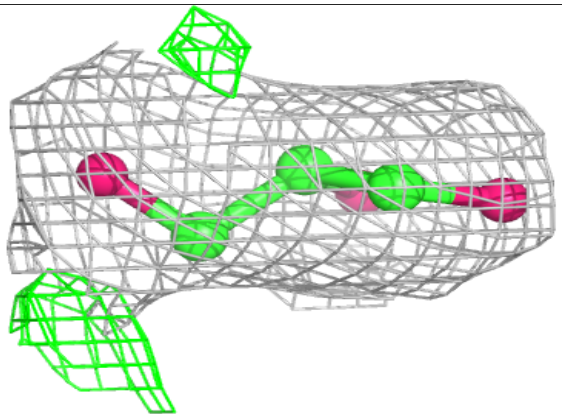
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

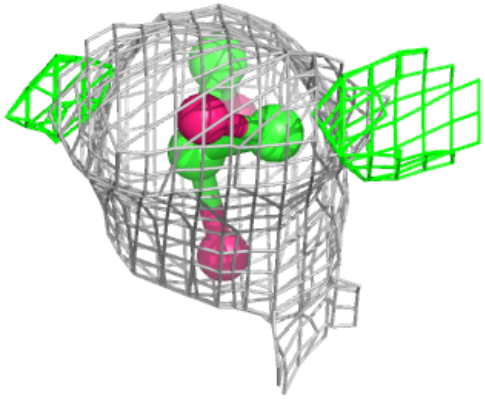


Electron density around GOL A 301:

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

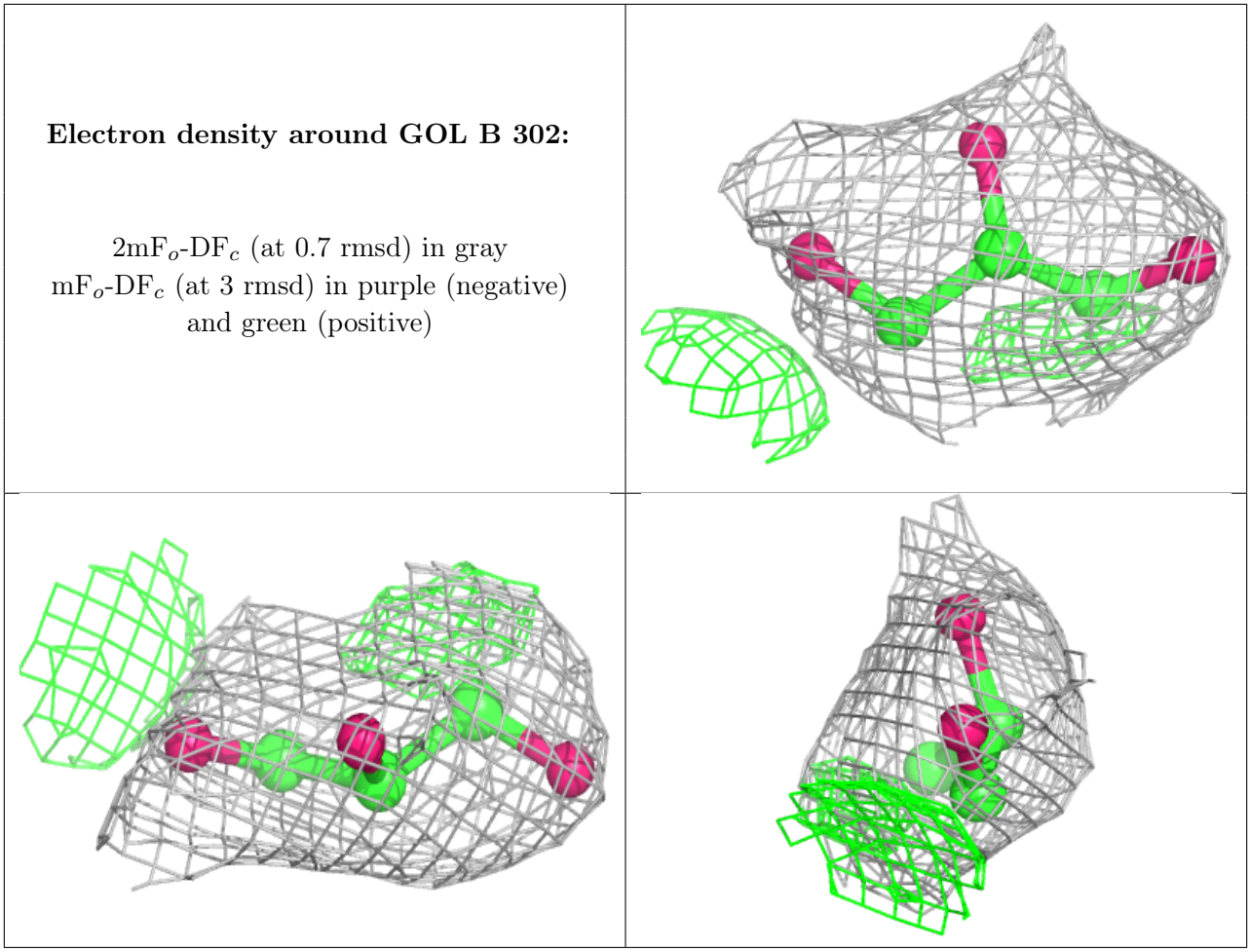






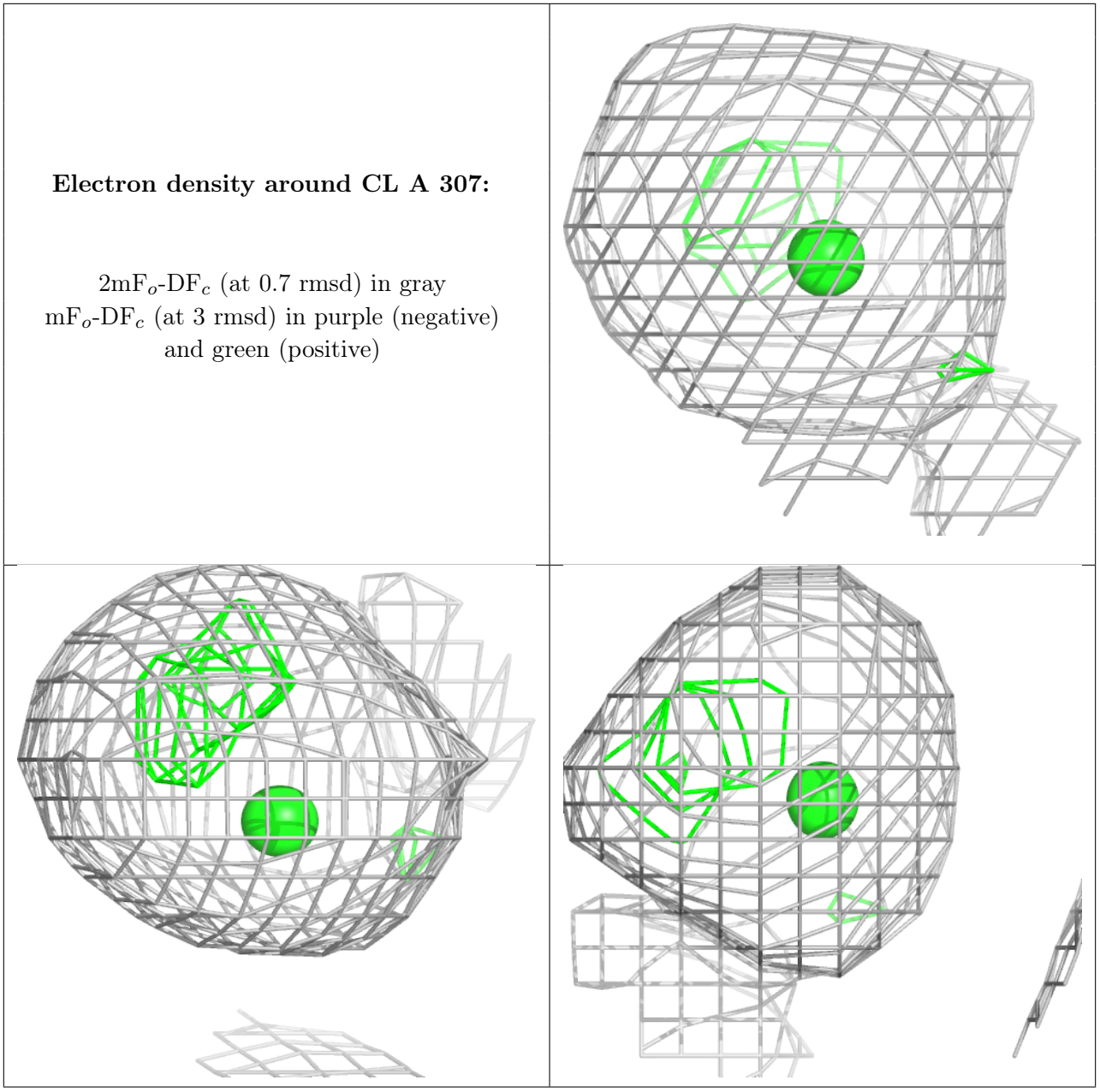
Electron density around GOL B 302:

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



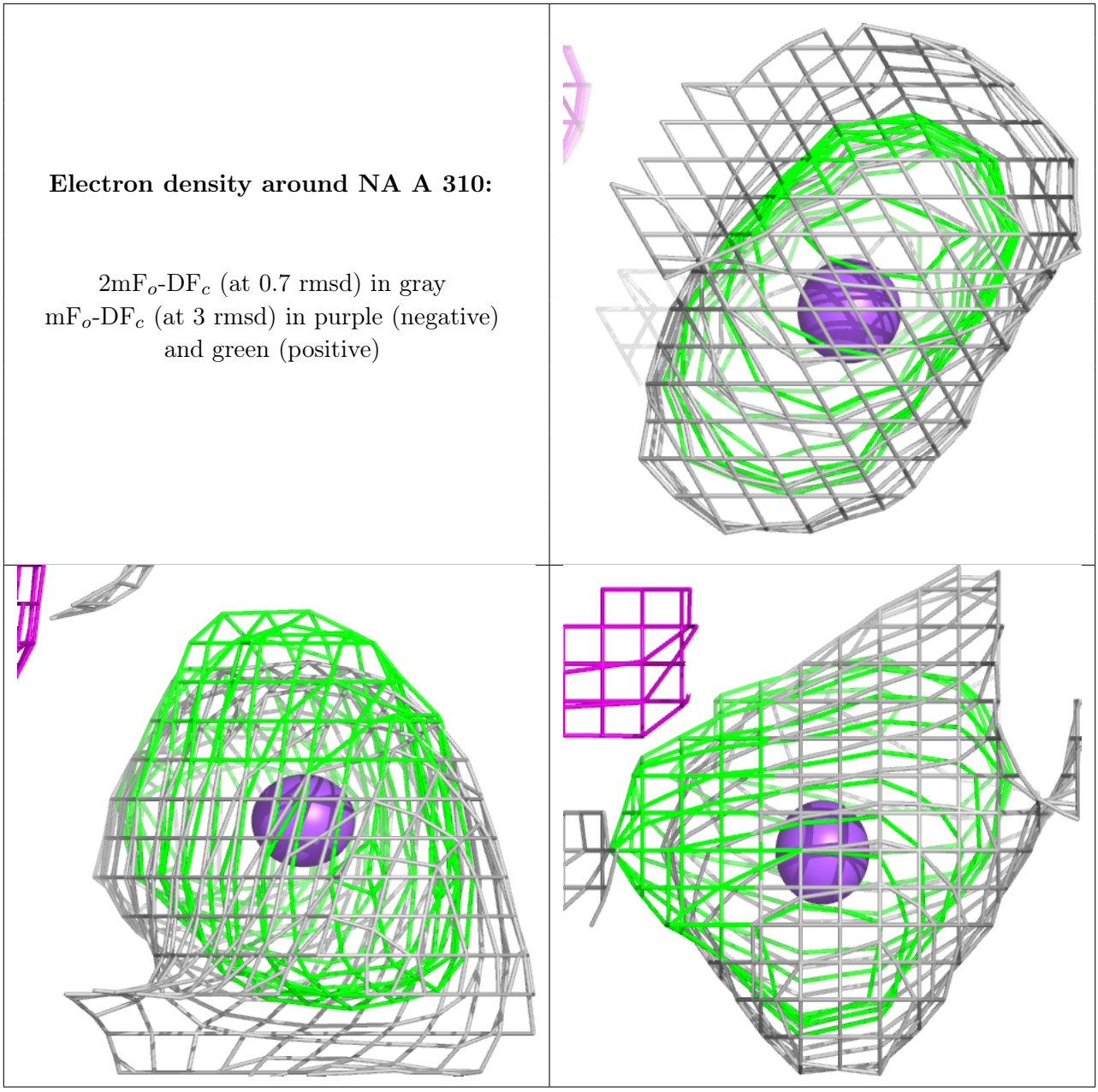
Electron density around CL A 307:

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



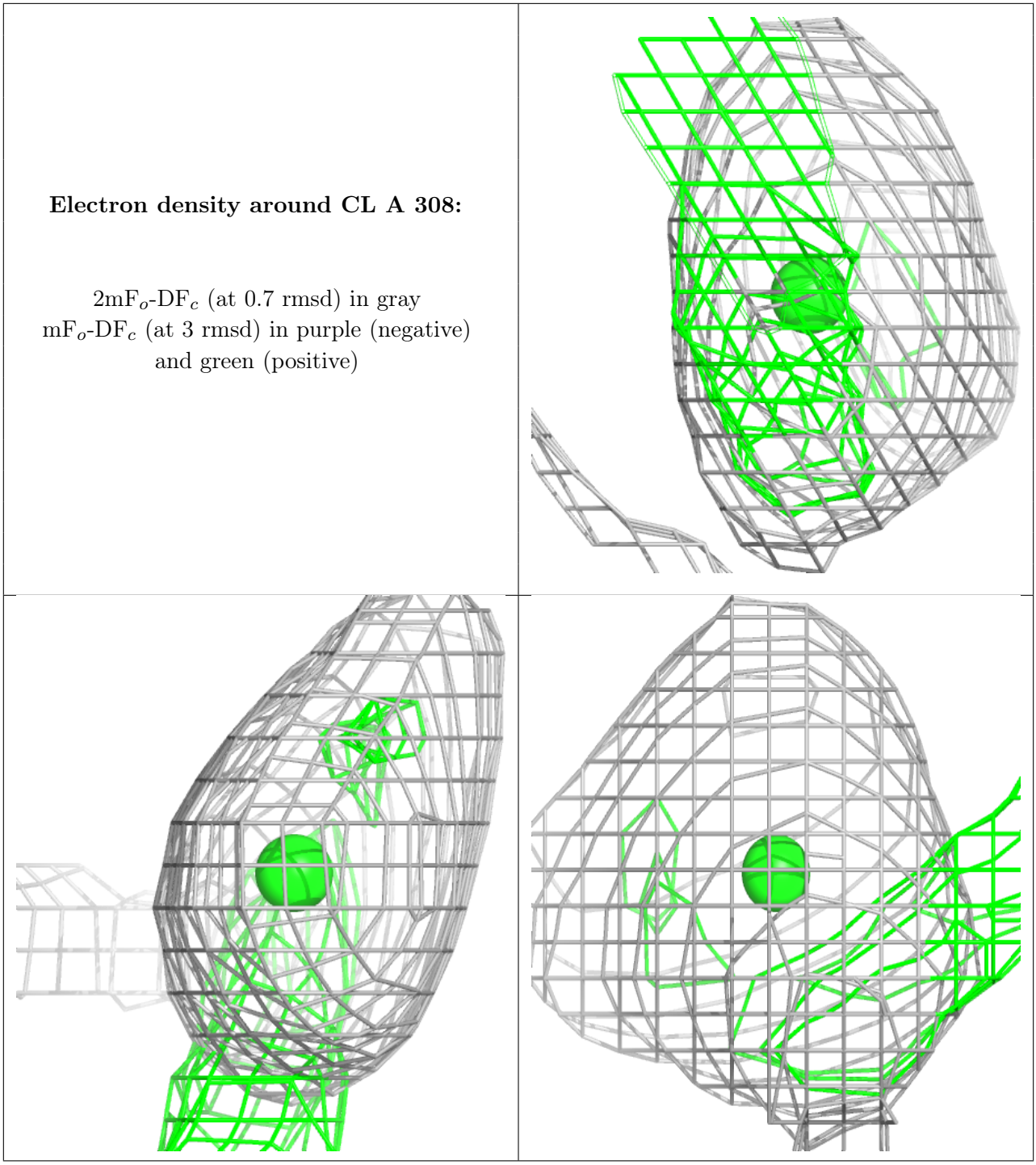
Electron density around NA A 310:

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



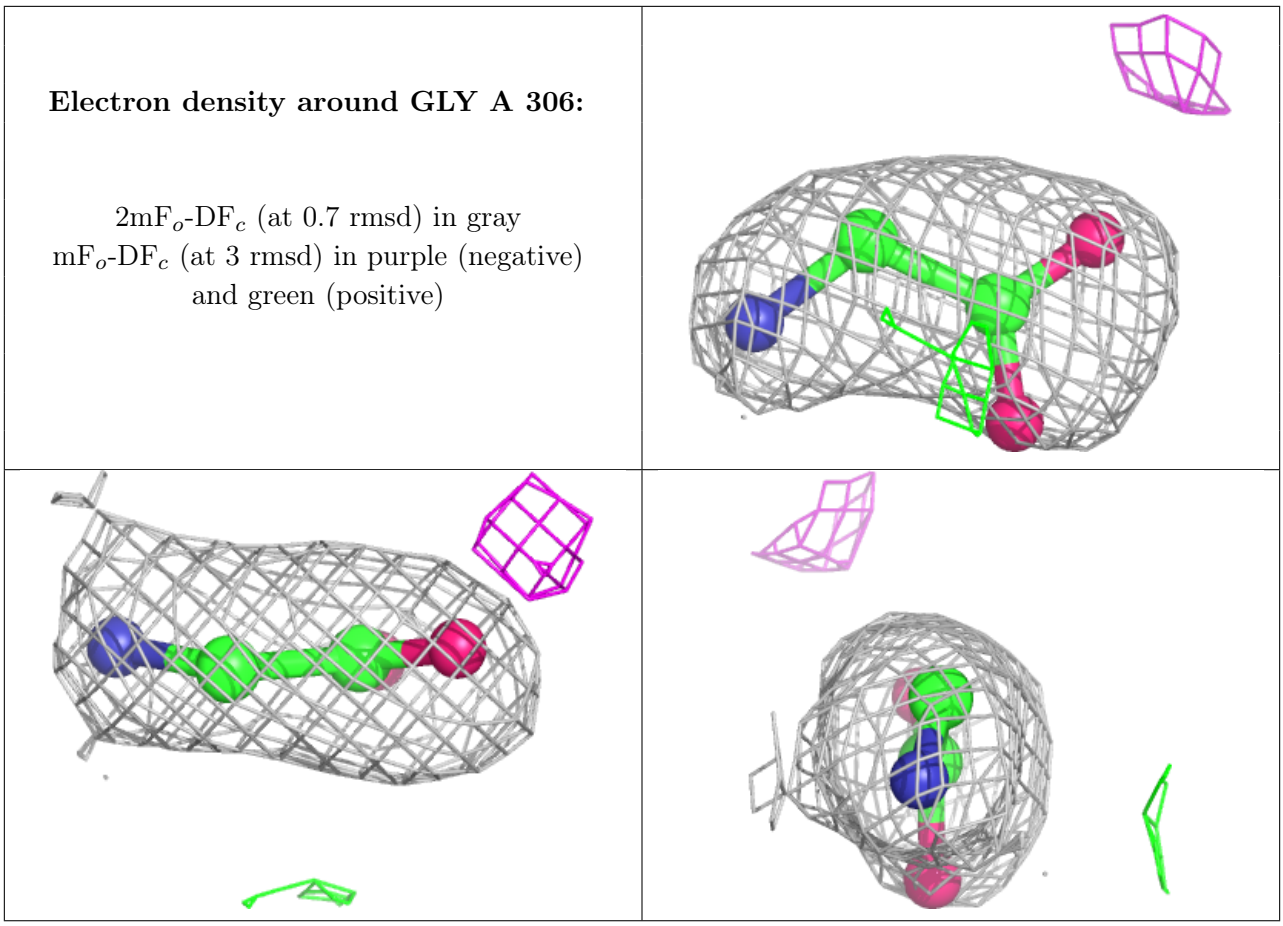
Electron density around CL A 308:

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



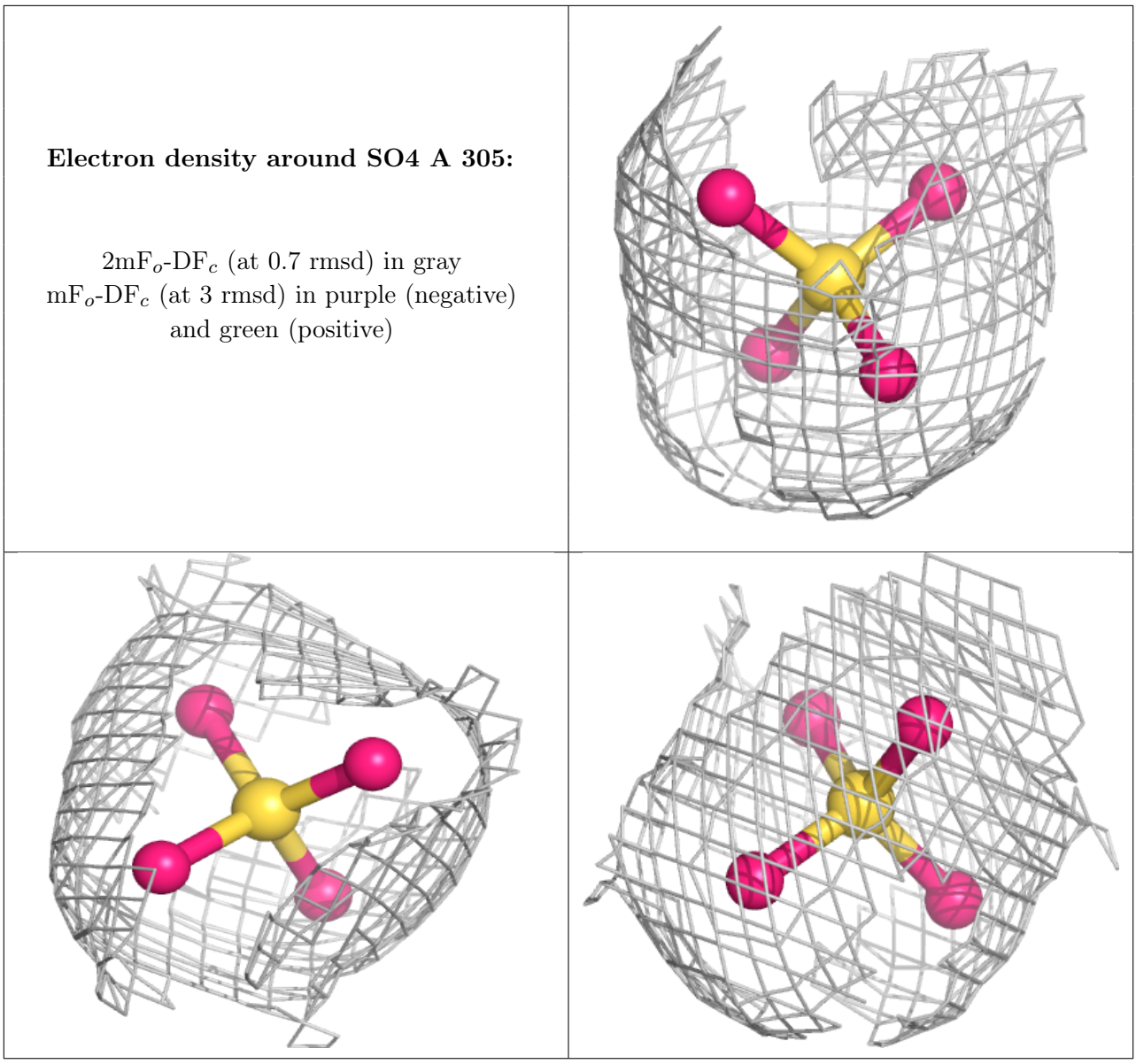
Electron density around GLY A 306:

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



Electron density around SO4 A 305:

$2mF_o$-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.