Full wwPDB X-ray Structure Validation Report ⓘ

Nov 21, 2023 – 08:04 AM JST

PDB ID	:	7FE4
Title	:	Crystal structure of GH65 alpha-1,2-glucosidase from Flavobacterium johnsoniae in complex with glucose
Authors	:	Nakamura, S.; Miyazaki, T.
Deposited on	:	2021-07-19
Resolution	:	1.40 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:

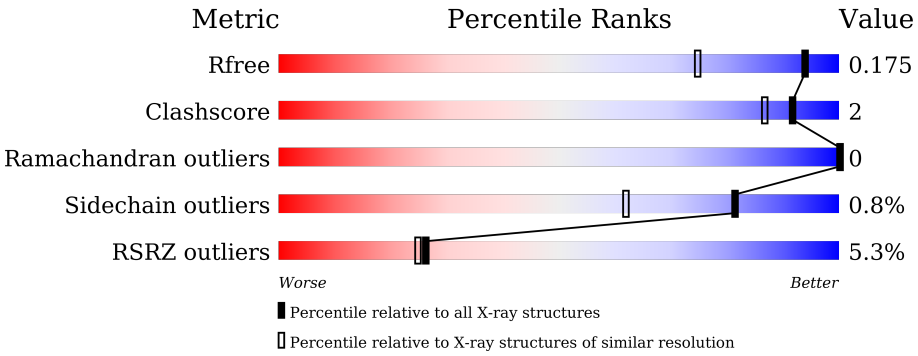
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.40 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}	130704	1714 (1.40-1.40)
Clashscore	141614	1812 (1.40-1.40)
Ramachandran outliers	138981	1763 (1.40-1.40)
Sidechain outliers	138945	1762 (1.40-1.40)
RSRZ outliers	127900	1674 (1.40-1.40)

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	678	7% 92%
1	B	678	6% 91% 5%
1	C	678	3% 93%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 17674 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 Candidate alpha glycoside phosphorylase Glycoside hydrolase family 65.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	659	Total	C	N	O	S	0	8	0
			5300	3375	891	1013	21			
1	B	659	Total	C	N	O	S	0	5	0
			5280	3363	888	1008	21			
1	C	659	Total	C	N	O	S	0	5	0
			5282	3366	888	1007	21			

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	4	MET	-	initiating methionine	UNP A5FBJ5
A	5	GLY	-	expression tag	UNP A5FBJ5
A	6	SER	-	expression tag	UNP A5FBJ5
A	7	SER	-	expression tag	UNP A5FBJ5
A	8	HIS	-	expression tag	UNP A5FBJ5
A	9	HIS	-	expression tag	UNP A5FBJ5
A	10	HIS	-	expression tag	UNP A5FBJ5
A	11	HIS	-	expression tag	UNP A5FBJ5
A	12	HIS	-	expression tag	UNP A5FBJ5
A	13	HIS	-	expression tag	UNP A5FBJ5
A	14	SER	-	expression tag	UNP A5FBJ5
A	15	SER	-	expression tag	UNP A5FBJ5
A	16	GLY	-	expression tag	UNP A5FBJ5
A	17	LEU	-	expression tag	UNP A5FBJ5
A	18	VAL	-	expression tag	UNP A5FBJ5
A	19	PRO	-	expression tag	UNP A5FBJ5
A	20	ARG	-	expression tag	UNP A5FBJ5
A	21	GLY	-	expression tag	UNP A5FBJ5
A	22	SER	-	expression tag	UNP A5FBJ5
A	23	HIS	-	expression tag	UNP A5FBJ5
B	4	MET	-	initiating methionine	UNP A5FBJ5
B	5	GLY	-	expression tag	UNP A5FBJ5

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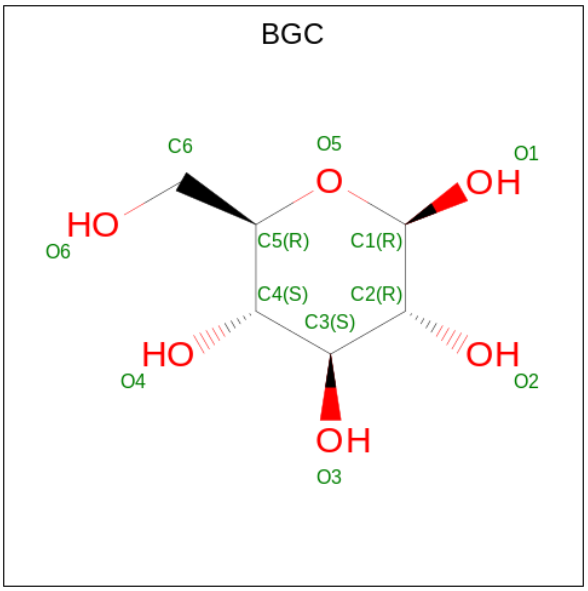
Chain	Residue	Modelled	Actual	Comment	Reference
B	6	SER	-	expression tag	UNP A5FBJ5
B	7	SER	-	expression tag	UNP A5FBJ5
B	8	HIS	-	expression tag	UNP A5FBJ5
B	9	HIS	-	expression tag	UNP A5FBJ5
B	10	HIS	-	expression tag	UNP A5FBJ5
B	11	HIS	-	expression tag	UNP A5FBJ5
B	12	HIS	-	expression tag	UNP A5FBJ5
B	13	HIS	-	expression tag	UNP A5FBJ5
B	14	SER	-	expression tag	UNP A5FBJ5
B	15	SER	-	expression tag	UNP A5FBJ5
B	16	GLY	-	expression tag	UNP A5FBJ5
B	17	LEU	-	expression tag	UNP A5FBJ5
B	18	VAL	-	expression tag	UNP A5FBJ5
B	19	PRO	-	expression tag	UNP A5FBJ5
B	20	ARG	-	expression tag	UNP A5FBJ5
B	21	GLY	-	expression tag	UNP A5FBJ5
B	22	SER	-	expression tag	UNP A5FBJ5
B	23	HIS	-	expression tag	UNP A5FBJ5
C	4	MET	-	initiating methionine	UNP A5FBJ5
C	5	GLY	-	expression tag	UNP A5FBJ5
C	6	SER	-	expression tag	UNP A5FBJ5
C	7	SER	-	expression tag	UNP A5FBJ5
C	8	HIS	-	expression tag	UNP A5FBJ5
C	9	HIS	-	expression tag	UNP A5FBJ5
C	10	HIS	-	expression tag	UNP A5FBJ5
C	11	HIS	-	expression tag	UNP A5FBJ5
C	12	HIS	-	expression tag	UNP A5FBJ5
C	13	HIS	-	expression tag	UNP A5FBJ5
C	14	SER	-	expression tag	UNP A5FBJ5
C	15	SER	-	expression tag	UNP A5FBJ5
C	16	GLY	-	expression tag	UNP A5FBJ5
C	17	LEU	-	expression tag	UNP A5FBJ5
C	18	VAL	-	expression tag	UNP A5FBJ5
C	19	PRO	-	expression tag	UNP A5FBJ5
C	20	ARG	-	expression tag	UNP A5FBJ5
C	21	GLY	-	expression tag	UNP A5FBJ5
C	22	SER	-	expression tag	UNP A5FBJ5
C	23	HIS	-	expression tag	UNP A5FBJ5

- Molecule 2 is beta-D-glucopyranose (three-letter code: BGC) (formula: $C_6H_{12}O_6$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			12	6	6		
2	A	1	Total	C	O	0	0
			12	6	6		
2	A	1	Total	C	O	0	0
			12	6	6		
2	A	1	Total	C	O	0	0
			12	6	6		
2	B	1	Total	C	O	0	0
			12	6	6		
2	B	1	Total	C	O	0	0
			12	6	6		
2	B	1	Total	C	O	0	0
			12	6	6		
2	B	1	Total	C	O	0	0
			12	6	6		
2	C	1	Total	C	O	0	0
			12	6	6		
2	C	1	Total	C	O	0	0
			12	6	6		
2	C	1	Total	C	O	0	0
			12	6	6		
2	C	1	Total	C	O	0	0
			12	6	6		

- Molecule 3 is water.

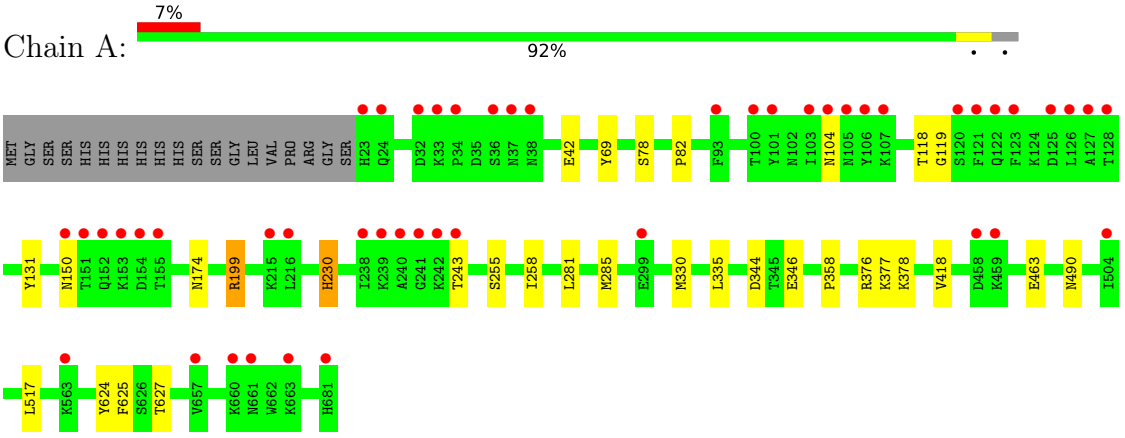
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	561	Total O 561 561	0	0
3	B	537	Total O 537 537	0	0
3	C	570	Total O 570 570	0	0

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.

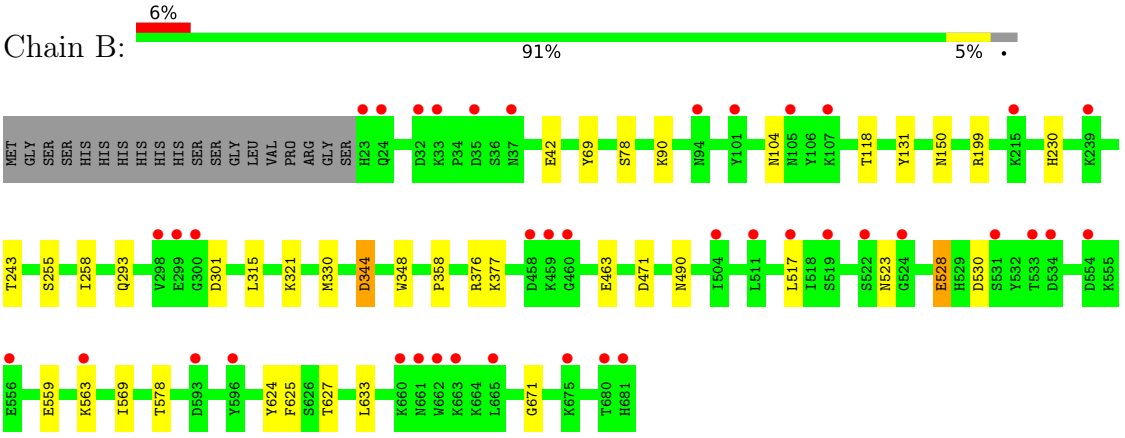
• Molecule 1: Candidate alpha glycoside phosphorylase Glycoside hydrolase family 65

Chain A:



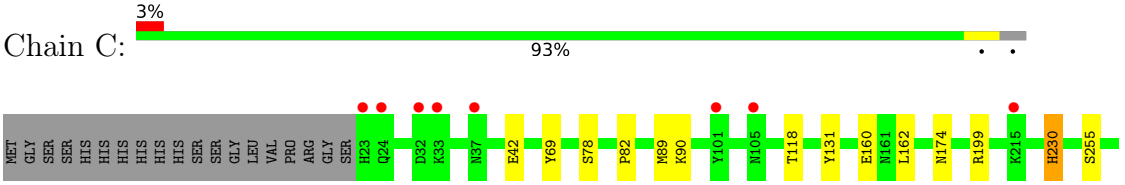
• Molecule 1: Candidate alpha glycoside phosphorylase Glycoside hydrolase family 65

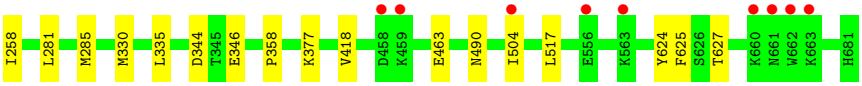
Chain B:



• Molecule 1: Candidate alpha glycoside phosphorylase Glycoside hydrolase family 65

Chain C:




I258
L281
M285
M330
L335
D344
T345
E346
P358
K377
V418
D458
K459
E463
N490
I504
L517
E556
K563
Y624
F625
S626
T627
K660
N661
W662
K663
H681

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	123.50Å 194.20Å 112.01Å 90.00° 116.60° 90.00°	Depositor
Resolution (Å)	44.70 – 1.40 44.66 – 1.40	Depositor EDS
% Data completeness (in resolution range)	98.0 (44.70-1.40) 98.0 (44.66-1.40)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.25 (at 1.40Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.157 , 0.170 0.162 , 0.175	Depositor DCC
R_{free} test set	22421 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å^2)	15.4	Xtriage
Anisotropy	0.161	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 43.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	17674	wwPDB-VP
Average B, all atoms (Å^2)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.31% 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: BGC

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	0.63	0/5429	0.77	2/7367 (0.0%)
1	B	0.70	5/5409 (0.1%)	0.78	1/7340 (0.0%)
1	C	0.65	0/5411	0.77	0/7343
All	All	0.66	5/16249 (0.0%)	0.77	3/22050 (0.0%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	523	ASN	C-O	7.54	1.37	1.23
1	B	530	ASP	CB-CG	6.58	1.65	1.51
1	B	528	GLU	CG-CD	5.78	1.60	1.51
1	B	523	ASN	C-N	5.04	1.42	1.33
1	B	301	ASP	CB-CG	5.01	1.62	1.51

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	376	ARG	NE-CZ-NH2	-6.71	116.94	120.30
1	A	199	ARG	NE-CZ-NH2	-5.78	117.41	120.30
1	A	376	ARG	NE-CZ-NH2	-5.27	117.66	120.30

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	5300	0	5180	16	0
1	B	5280	0	5162	20	0
1	C	5282	0	5168	16	0
2	A	48	0	48	0	0
2	B	48	0	48	0	0
2	C	48	0	48	0	0
3	A	561	0	0	3	0
3	B	537	0	0	9	0
3	C	570	0	0	4	0
All	All	17674	0	15654	52	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 2.

All (52) 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:293:GLN:HG3	3:B:1147:HOH:O	1.84	0.76
1:A:358:PRO:HG3	3:A:1077:HOH:O	1.88	0.72
1:A:377:LYS:HD3	3:B:1010:HOH:O	1.91	0.70
1:B:559:GLU:O	1:B:563:LYS:HG2	1.96	0.64
1:B:377:LYS:HD3	3:C:1240:HOH:O	1.96	0.64
1:A:463:GLU:HG2	1:A:517:LEU:HD12	1.80	0.63
1:B:463:GLU:HG2	1:B:517:LEU:HD12	1.83	0.60
1:B:358:PRO:HG3	3:B:923:HOH:O	2.01	0.59
3:A:934:HOH:O	1:C:377:LYS:HD3	2.06	0.55
1:C:199:ARG:HG2	3:C:1158:HOH:O	2.10	0.50
1:C:463:GLU:HG2	1:C:517:LEU:HD12	1.93	0.50
1:B:90:LYS:HE3	3:B:921:HOH:O	2.12	0.49
1:B:671:GLY:HA2	3:B:923:HOH:O	2.11	0.49
1:C:504:ILE:HG22	3:C:1574:HOH:O	2.12	0.49
1:A:150:ASN:OD1	1:A:243:THR:OG1	2.29	0.48
1:C:358:PRO:HG3	3:C:1200:HOH:O	2.14	0.48
1:B:150:ASN:OD1	1:B:243:THR:OG1	2.21	0.47
1:C:82:PRO:HG3	1:C:335[B]:LEU:HD11	1.96	0.47
1:C:69:TYR:HB3	1:C:78:SER:HB2	1.98	0.46
1:A:82:PRO:HG3	1:A:335[B]:LEU:HD11	1.98	0.46
1:A:625:PHE:CZ	1:A:627:THR:HB	2.51	0.46
1:B:625:PHE:CZ	1:B:627:THR:HB	2.51	0.46
1:B:118:THR:HA	1:B:131:TYR:O	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:90:LYS:HE2	1:C:162:LEU:HD21	1.99	0.44
1:A:69:TYR:HB3	1:A:78:SER:HB2	2.00	0.44
1:B:199:ARG:HG2	3:B:834:HOH:O	2.17	0.43
1:B:255:SER:HA	1:B:258:ILE:O	2.18	0.43
1:C:174:ASN:HB3	1:C:230:HIS:CG	2.54	0.43
1:A:119:GLY:HA3	1:A:131:TYR:CZ	2.53	0.43
1:C:281:LEU:O	1:C:285:MET:HG2	2.18	0.43
1:B:69:TYR:HB3	1:B:78:SER:HB2	2.00	0.43
1:B:344:ASP:O	1:B:348:TRP:HB2	2.19	0.43
1:C:625:PHE:CZ	1:C:627:THR:HB	2.52	0.43
1:A:330:MET:HA	1:A:624:TYR:O	2.19	0.43
1:C:330:MET:HA	1:C:624:TYR:O	2.18	0.43
1:C:346:GLU:HG2	1:C:418:VAL:HA	2.01	0.43
1:C:255:SER:HA	1:C:258:ILE:O	2.19	0.43
1:A:346:GLU:HG2	1:A:418:VAL:HA	2.00	0.42
1:B:569:ILE:HG12	1:B:578:THR:HG21	2.01	0.42
1:A:199:ARG:HG2	3:A:834:HOH:O	2.18	0.42
1:A:255:SER:HA	1:A:258:ILE:O	2.20	0.42
1:A:378:LYS:HE3	3:B:1108:HOH:O	2.19	0.42
1:A:281:LEU:O	1:A:285:MET:HG2	2.20	0.42
1:B:330:MET:HA	1:B:624:TYR:O	2.20	0.41
1:B:321:LYS:HE3	3:B:1298:HOH:O	2.20	0.41
1:B:104:ASN:ND2	3:B:814:HOH:O	2.54	0.41
1:B:471:ASP:OD2	1:B:528:GLU:OE1	2.38	0.41
1:B:315:LEU:HD22	1:B:633:LEU:HD12	2.02	0.40
1:A:174:ASN:HB3	1:A:230:HIS:CG	2.56	0.40
1:C:118:THR:HA	1:C:131:TYR:O	2.22	0.40
1:A:118:THR:HA	1:A:131:TYR:O	2.22	0.40
1:C:89:MET:HA	1:C:160:GLU:O	2.21	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	665/678 (98%)	646 (97%)	19 (3%)	0	100	100
1	B	662/678 (98%)	644 (97%)	18 (3%)	0	100	100
1	C	662/678 (98%)	643 (97%)	19 (3%)	0	100	100
All	All	1989/2034 (98%)	1933 (97%)	56 (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	573/581 (99%)	568 (99%)	5 (1%)	78	58
1	B	570/581 (98%)	566 (99%)	4 (1%)	84	66
1	C	570/581 (98%)	566 (99%)	4 (1%)	84	66
All	All	1713/1743 (98%)	1700 (99%)	13 (1%)	81	62

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	42	GLU
1	A	104	ASN
1	A	230	HIS
1	A	344	ASP
1	A	490	ASN
1	B	42	GLU
1	B	230	HIS
1	B	344	ASP
1	B	490	ASN
1	C	42	GLU
1	C	230	HIS
1	C	344	ASP
1	C	490	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	85	ASN
1	A	104	ASN
1	A	105	ASN
1	A	259	ASN
1	A	282	ASN
1	B	24	GLN
1	B	85	ASN
1	B	183	HIS
1	B	282	ASN
1	C	24	GLN
1	C	85	ASN
1	C	158	ASN
1	C	282	ASN
1	C	681	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry

12 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	BGC	A	701	-	12,12,12	0.64	0	17,17,17	0.86	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	BGC	A	702	-	12,12,12	0.69	0	17,17,17	1.17	1 (5%)
2	BGC	B	702	-	12,12,12	0.71	0	17,17,17	1.03	0
2	BGC	B	703	-	12,12,12	0.57	0	17,17,17	0.56	0
2	BGC	A	703	-	12,12,12	0.43	0	17,17,17	0.86	1 (5%)
2	BGC	B	701	-	12,12,12	0.52	0	17,17,17	1.15	1 (5%)
2	BGC	C	1003	-	12,12,12	0.75	0	17,17,17	1.27	2 (11%)
2	BGC	C	1001	-	12,12,12	0.59	0	17,17,17	0.95	0
2	BGC	C	1002	-	12,12,12	0.80	0	17,17,17	1.20	2 (11%)
2	BGC	B	704	-	12,12,12	0.58	0	17,17,17	0.73	0
2	BGC	C	1004	-	12,12,12	0.59	0	17,17,17	0.75	0
2	BGC	A	704	-	12,12,12	0.51	0	17,17,17	0.76	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	BGC	A	701	-	-	0/2/22/22	0/1/1/1
2	BGC	A	702	-	-	0/2/22/22	0/1/1/1
2	BGC	B	702	-	-	0/2/22/22	0/1/1/1
2	BGC	B	703	-	-	0/2/22/22	0/1/1/1
2	BGC	A	703	-	-	0/2/22/22	0/1/1/1
2	BGC	B	701	-	-	0/2/22/22	0/1/1/1
2	BGC	C	1003	-	-	0/2/22/22	0/1/1/1
2	BGC	C	1001	-	-	0/2/22/22	0/1/1/1
2	BGC	C	1002	-	-	0/2/22/22	0/1/1/1
2	BGC	B	704	-	-	0/2/22/22	0/1/1/1
2	BGC	C	1004	-	-	0/2/22/22	0/1/1/1
2	BGC	A	704	-	-	0/2/22/22	0/1/1/1

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	1003	BGC	C1-O5-C5	-3.56	106.94	113.66
2	B	701	BGC	O1-C1-O5	-3.03	101.30	110.38
2	A	702	BGC	C1-O5-C5	-2.72	108.53	113.66
2	C	1002	BGC	O1-C1-O5	-2.70	102.27	110.38
2	C	1002	BGC	O5-C1-C2	2.54	114.82	110.28
2	A	701	BGC	O1-C1-O5	-2.40	103.19	110.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	703	BGC	O6-C6-C5	-2.28	103.46	111.29
2	C	1003	BGC	O1-C1-O5	-2.02	104.32	110.38

There are no chirality outliers.

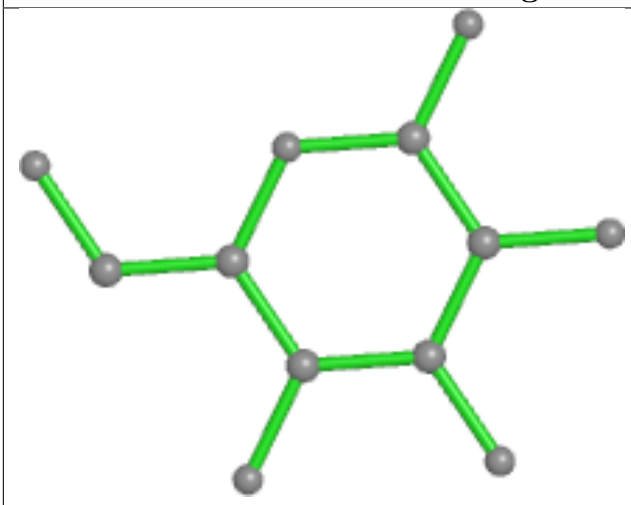
There are no torsion outliers.

There are no ring outliers.

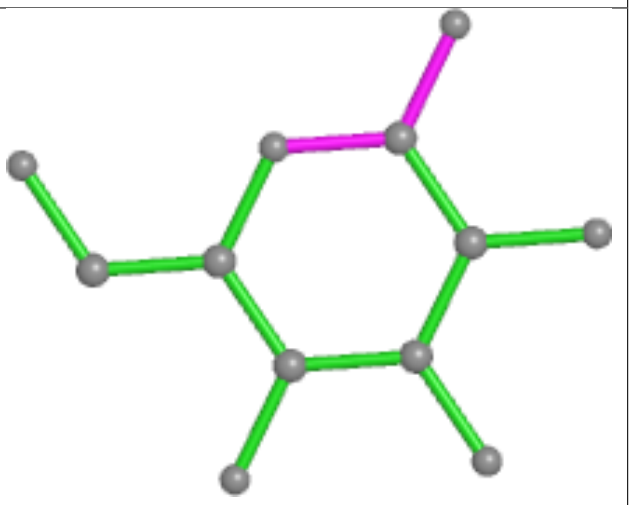
No monomer is involved in short contacts.

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

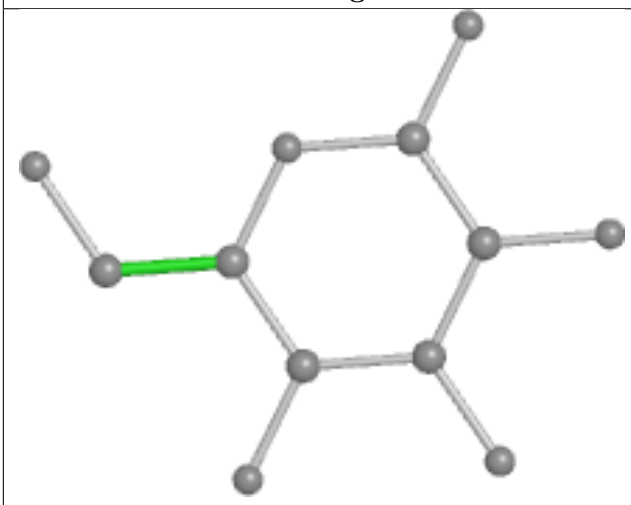
Ligand BGC A 701



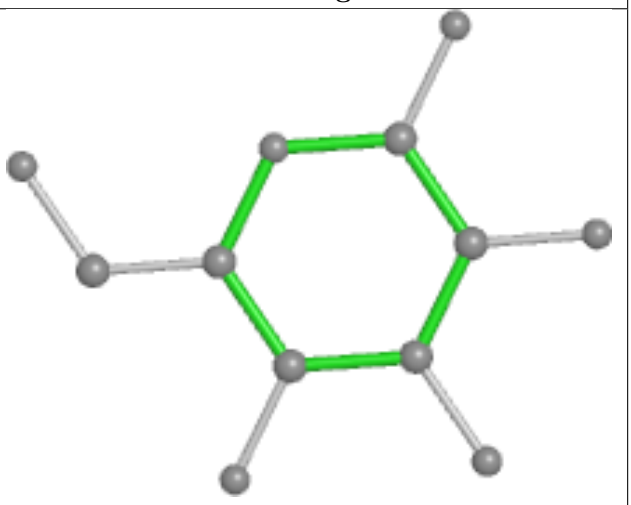
Bond lengths



Bond angles

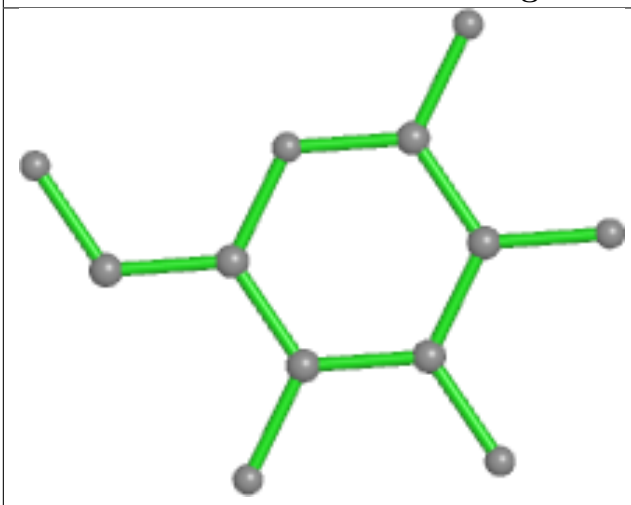


Torsions



Rings

Ligand BGC A 702



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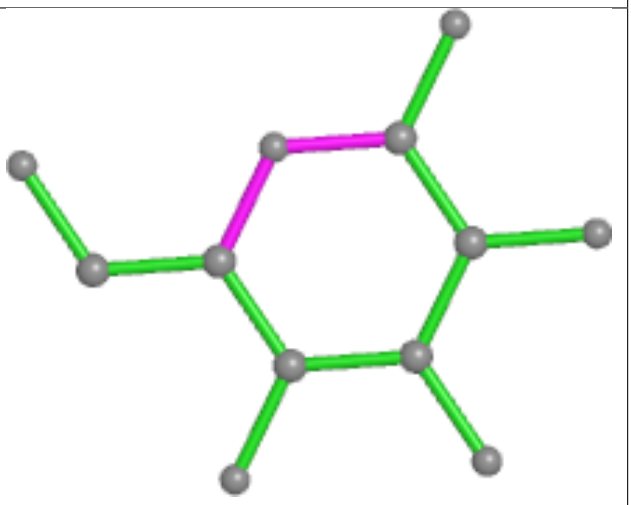

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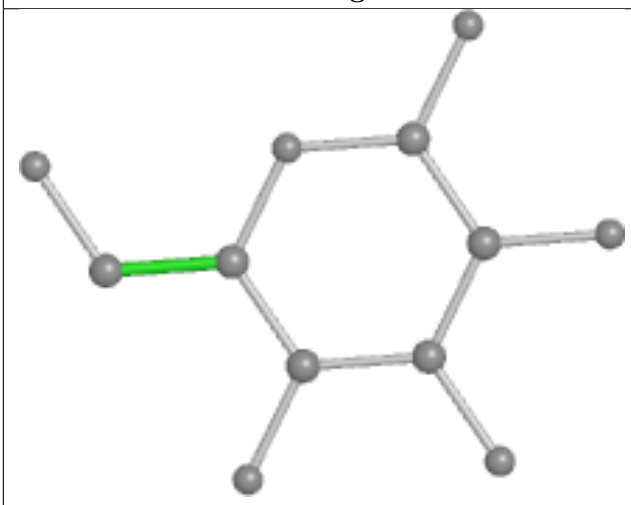

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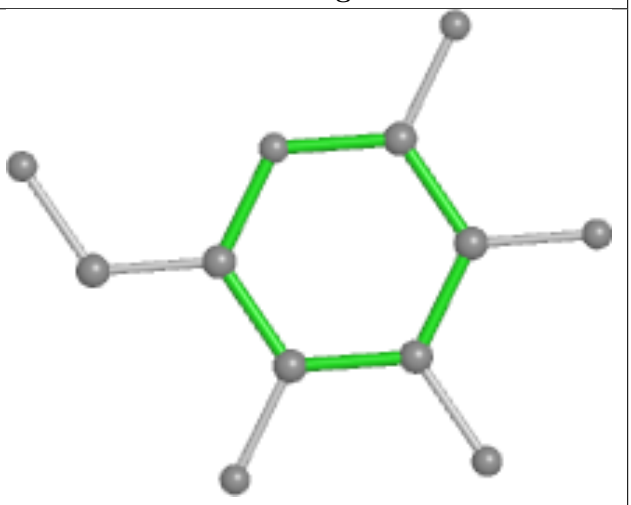
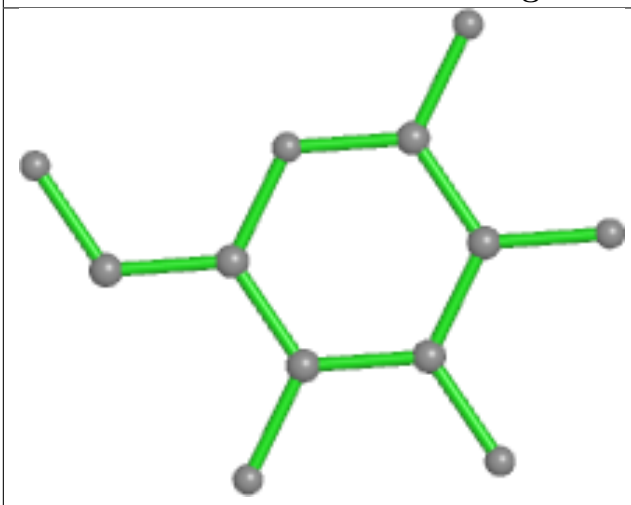


Rings

Ligand BGC B 702



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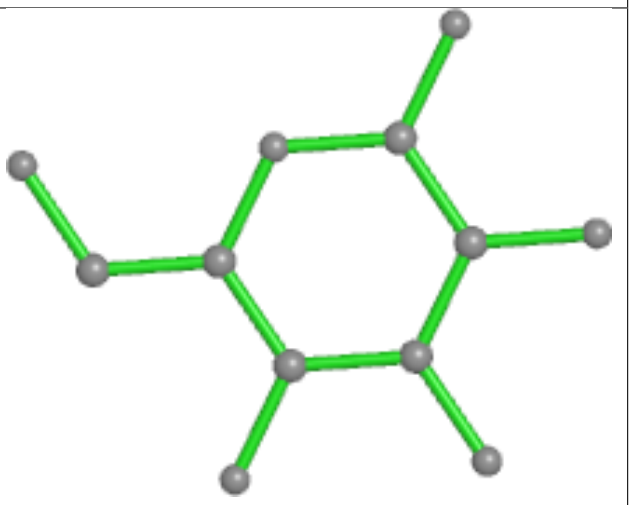

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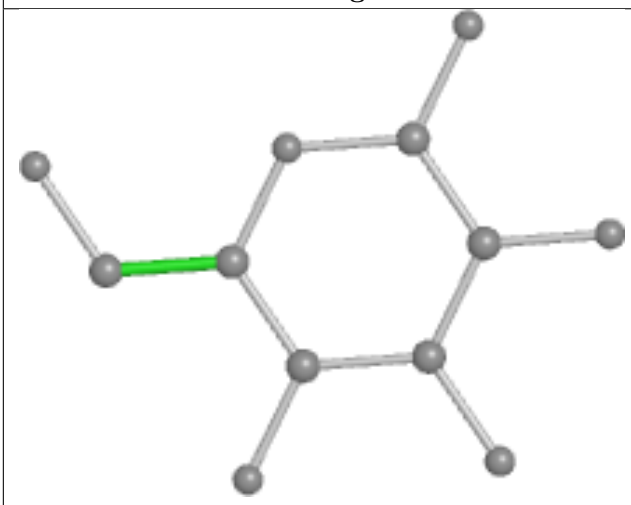

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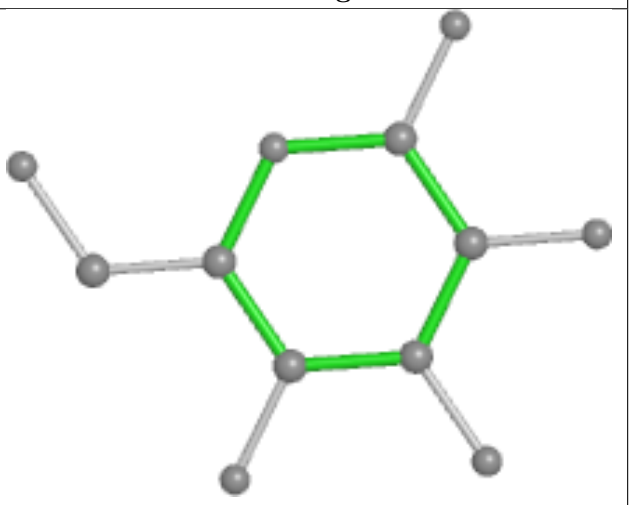
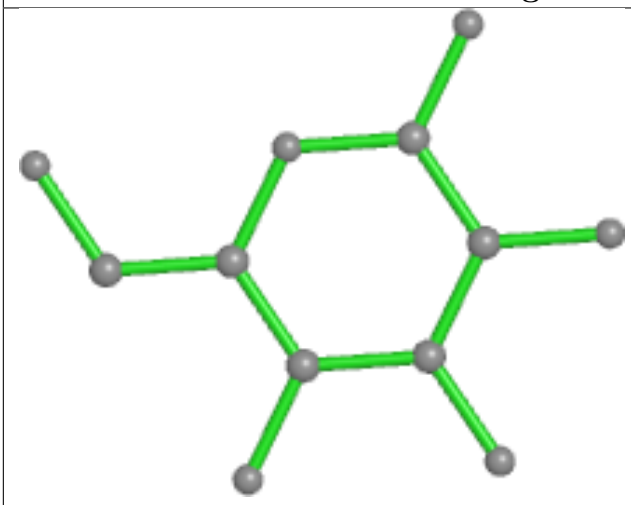


Rings

Ligand BGC B 703



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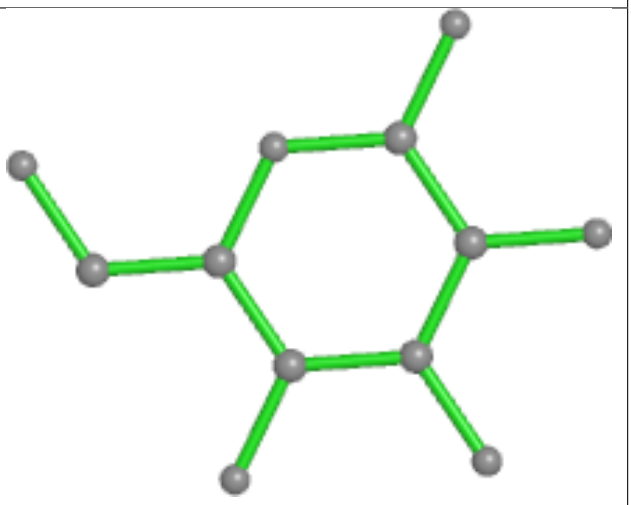

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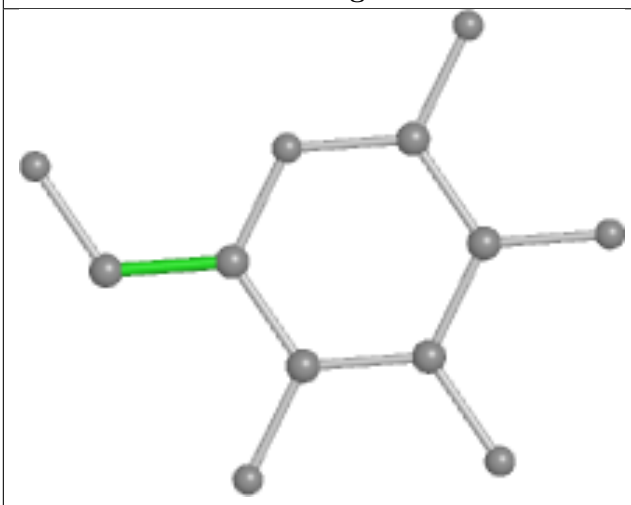

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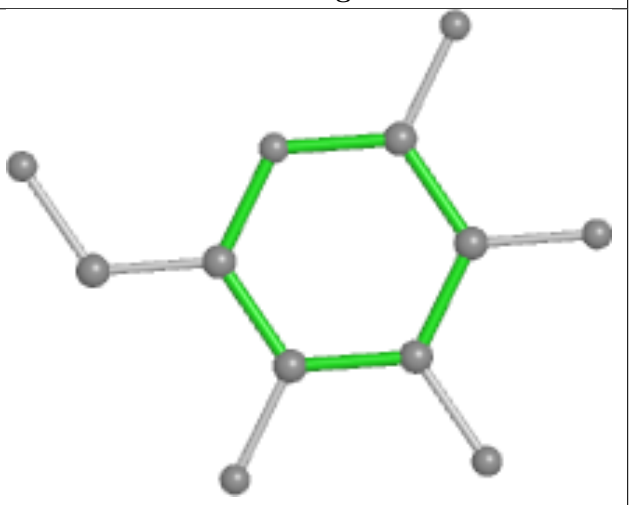
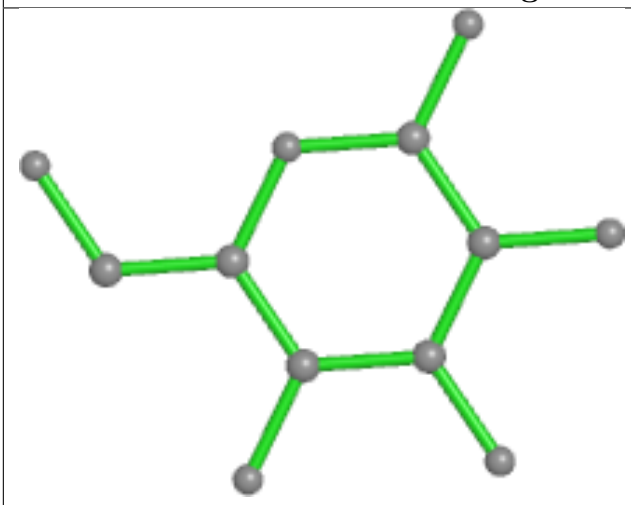


Rings

Ligand BGC A 703



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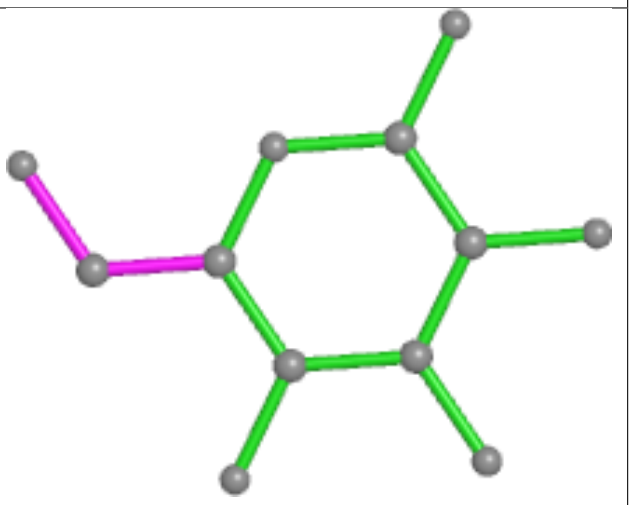

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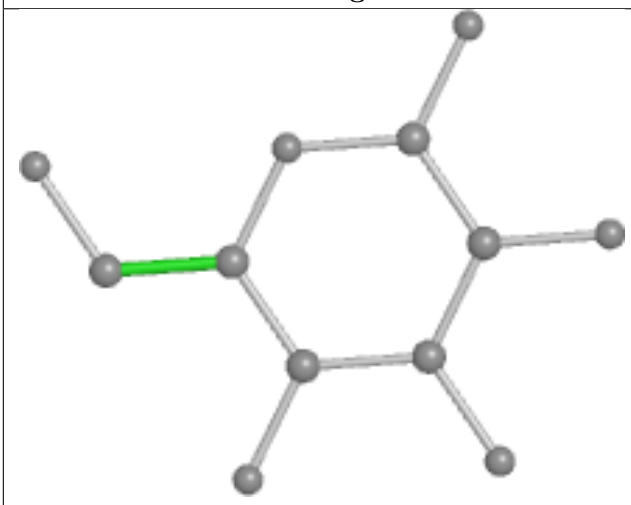

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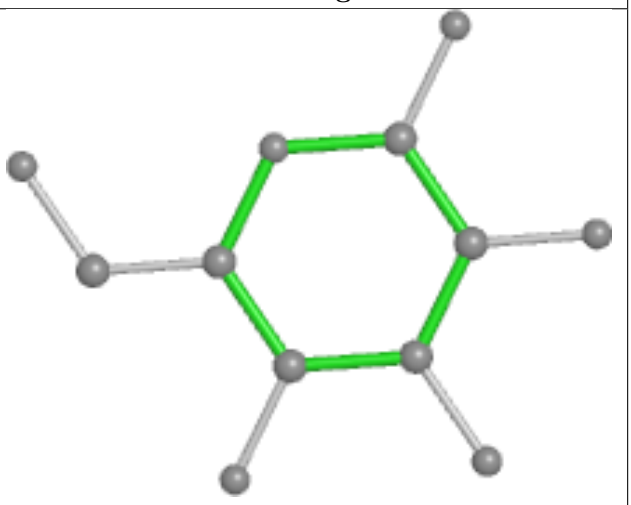

Rings

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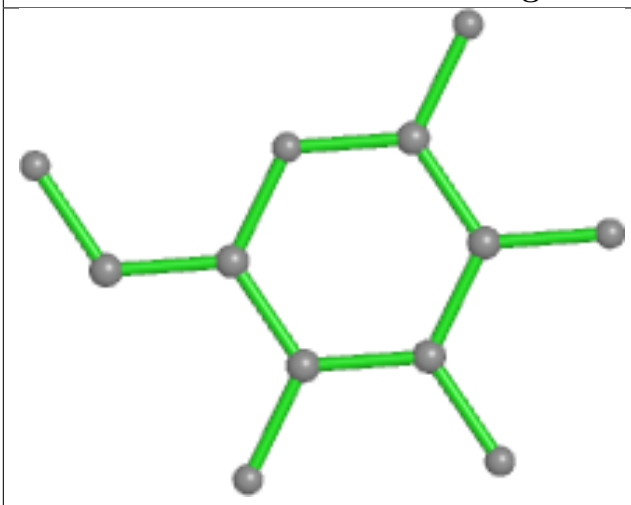

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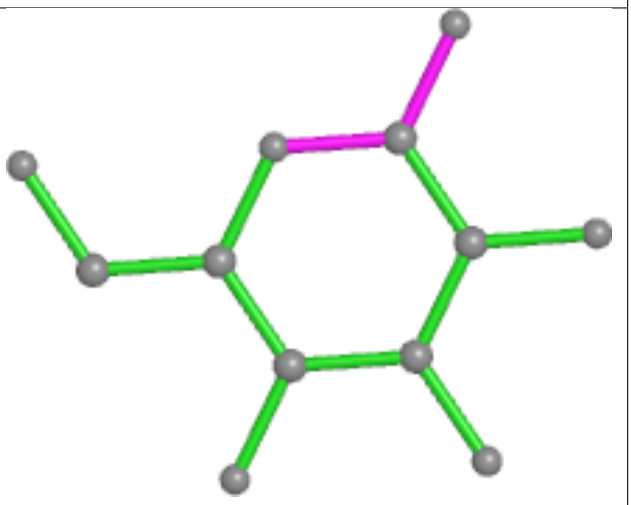

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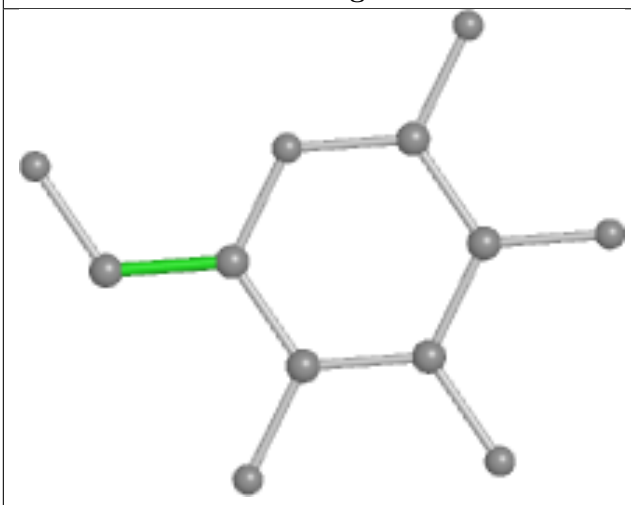

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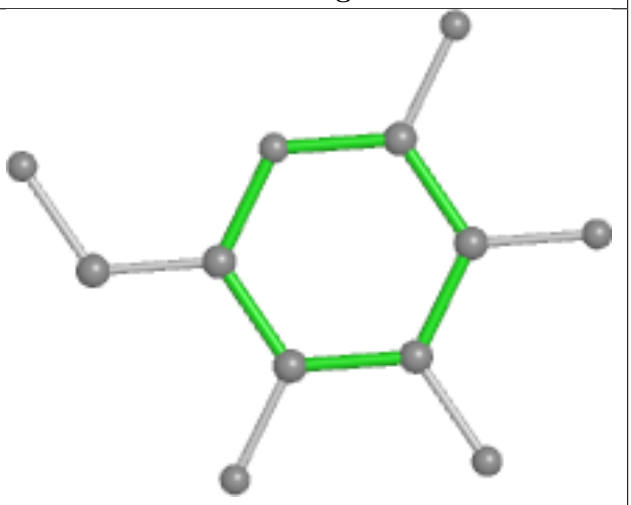
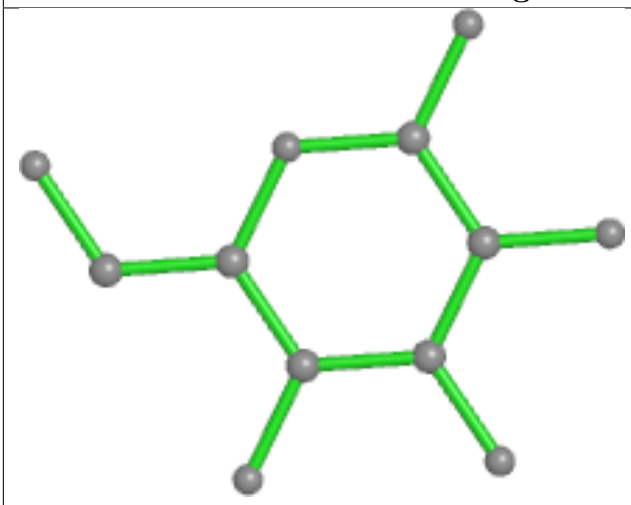
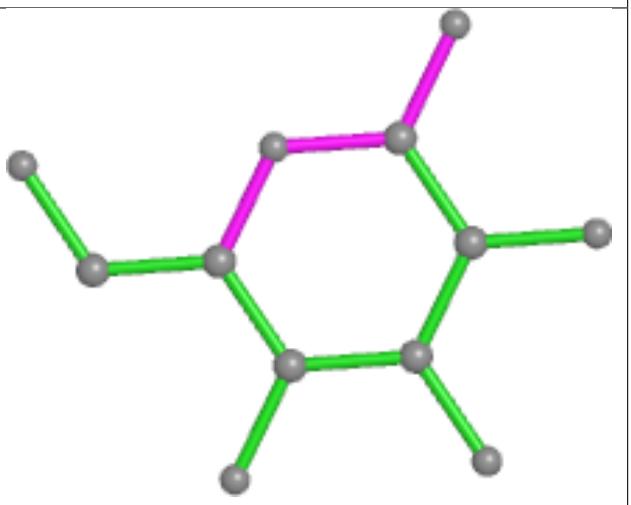


Rings

Ligand BGC C 1003



Bond lengths



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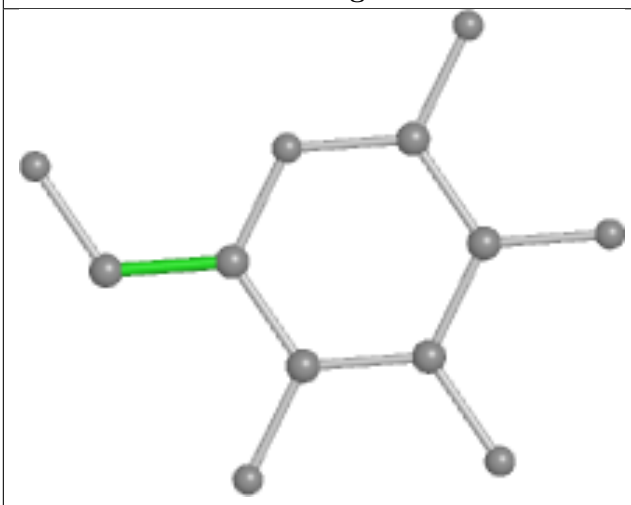

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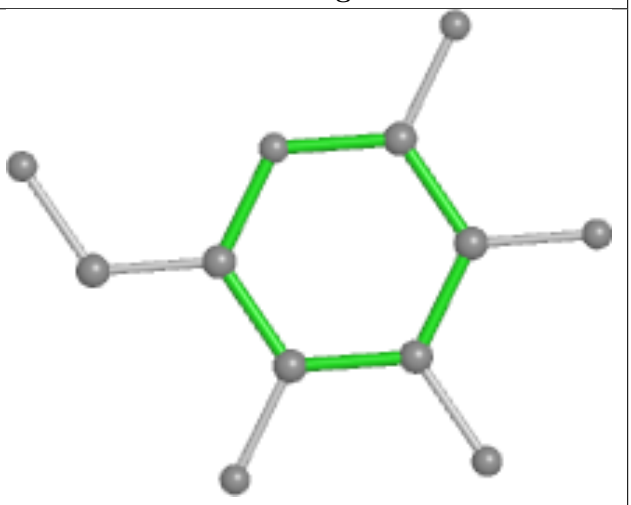
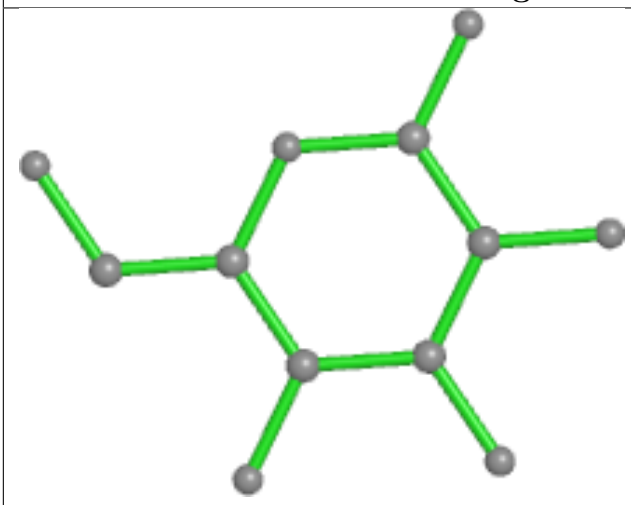


Rings

Ligand BGC C 1001



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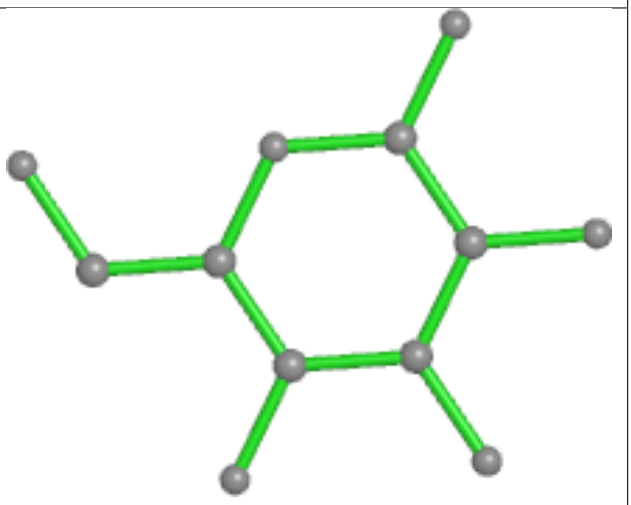

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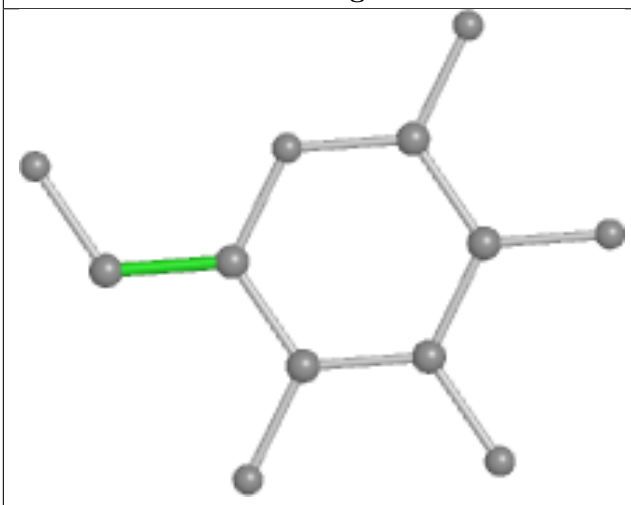

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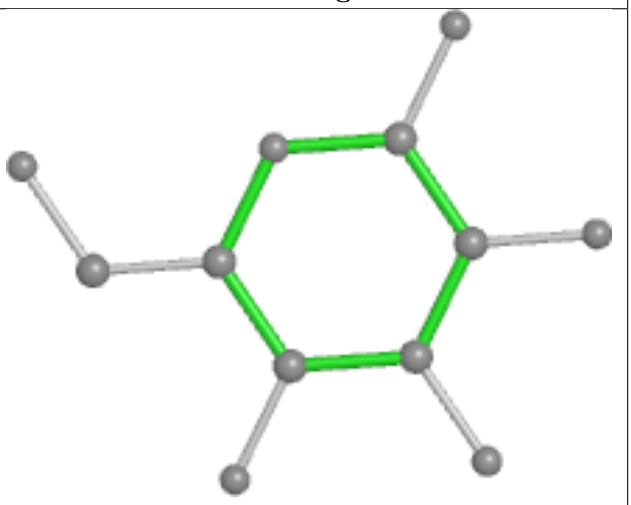
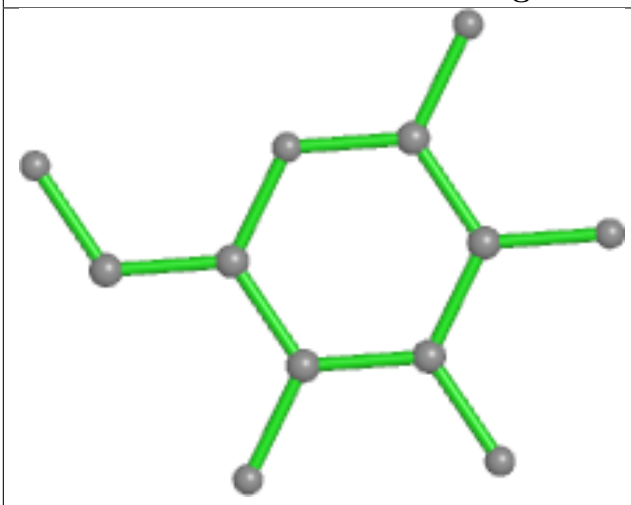
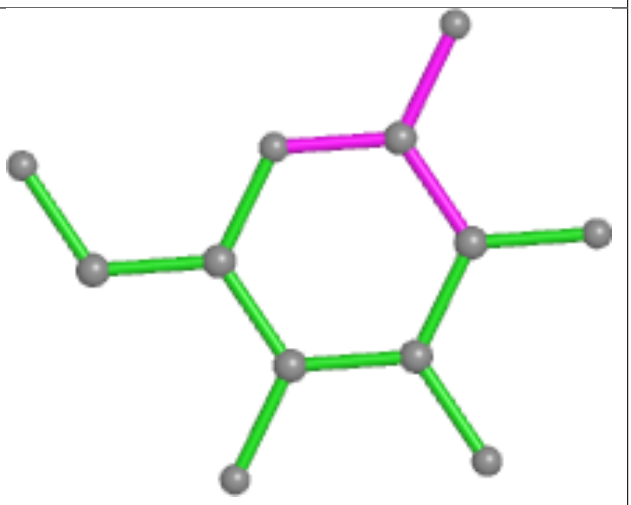


Rings

Ligand BGC C 1002



Bond lengths



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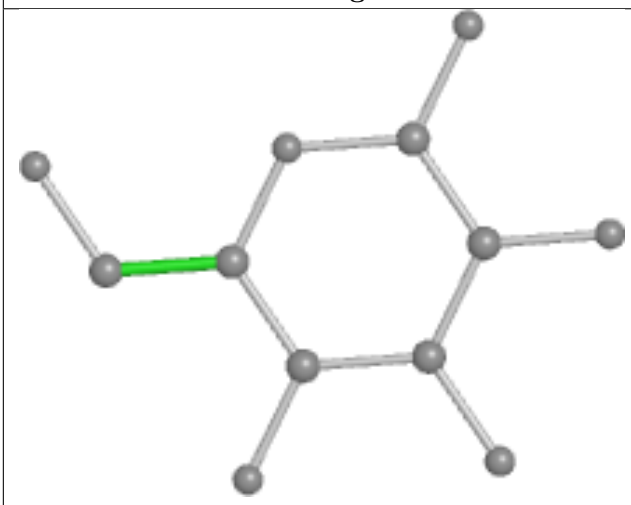

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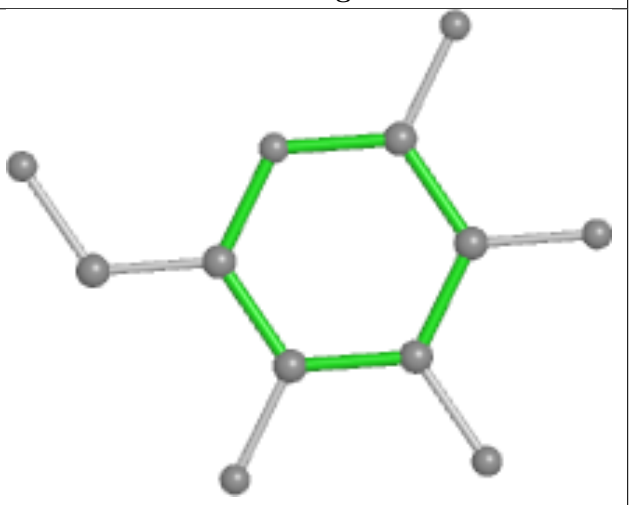
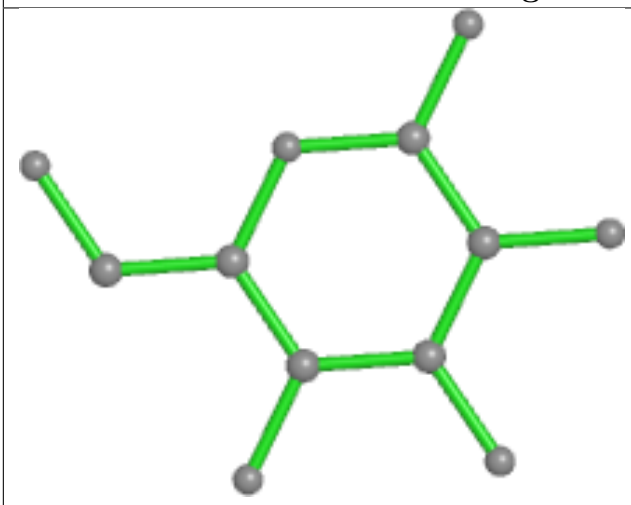


Rings

Ligand BGC B 704



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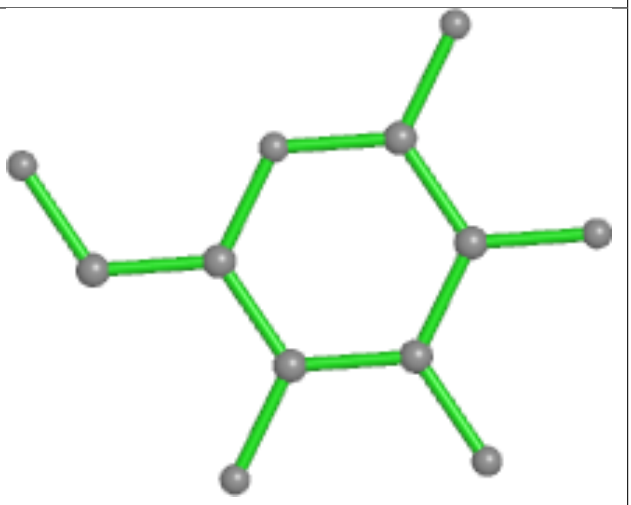

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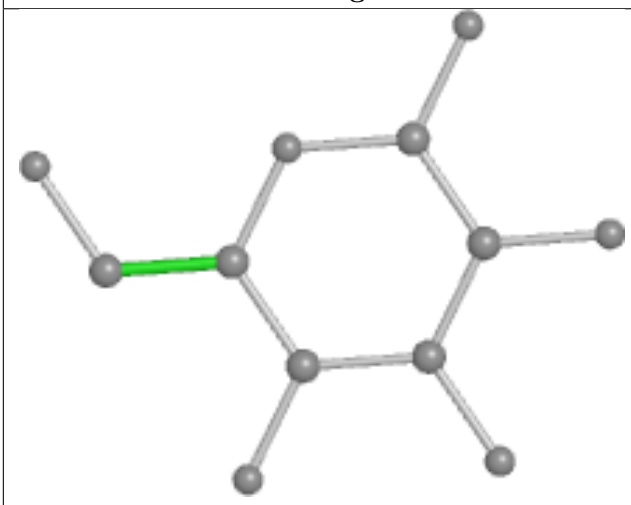

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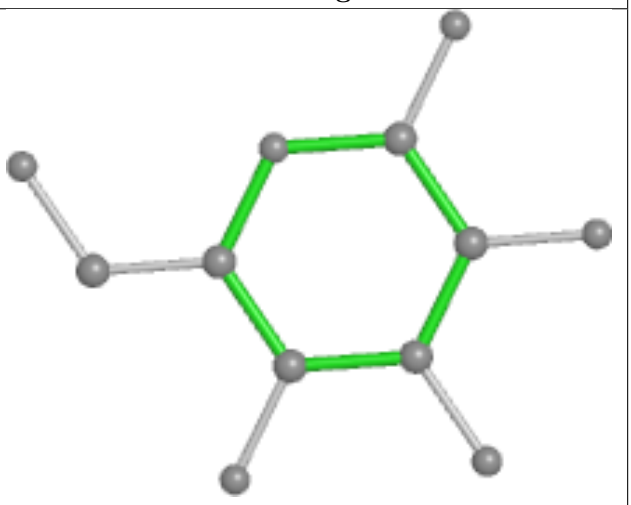
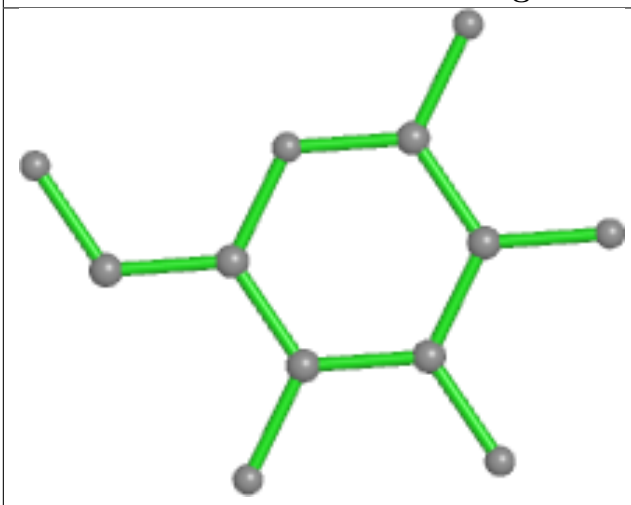
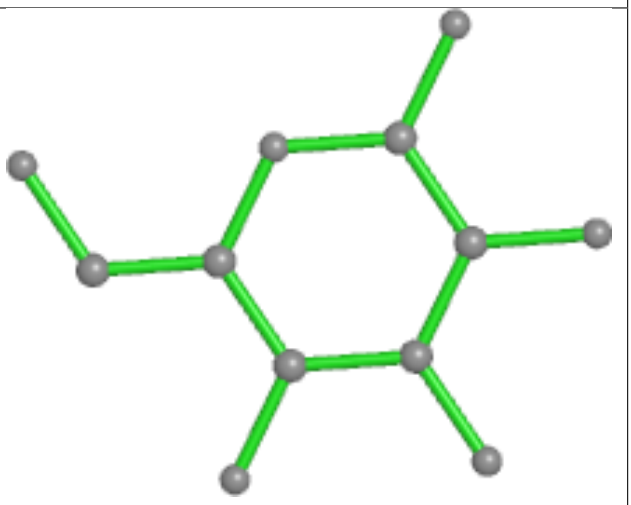


Rings

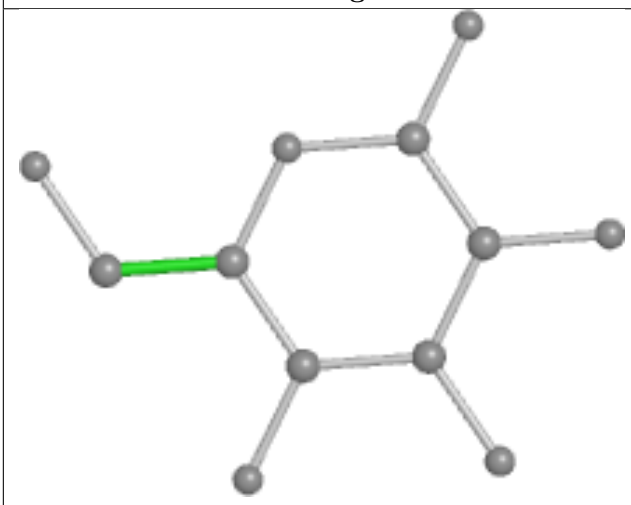
Ligand BGC C 1004



Bond lengths



Bond angles



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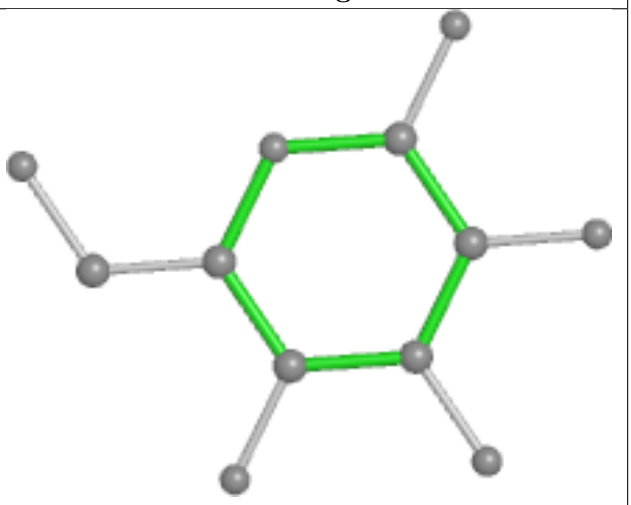
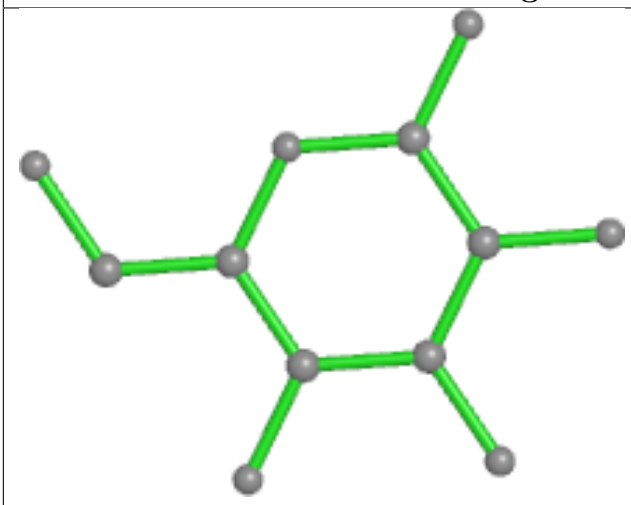


Rings

Ligand BGC A 704



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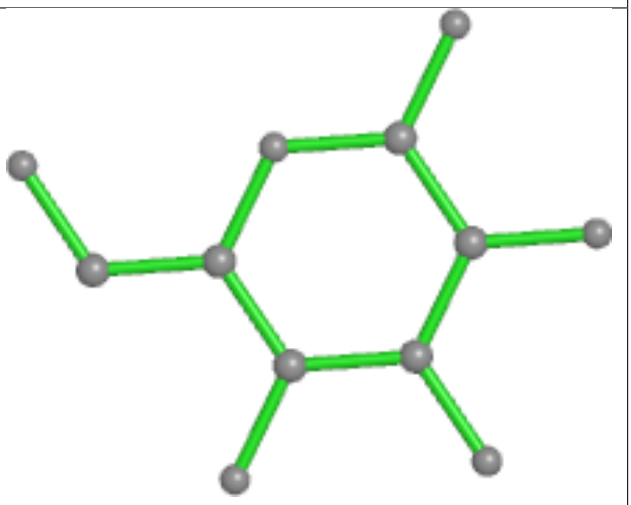
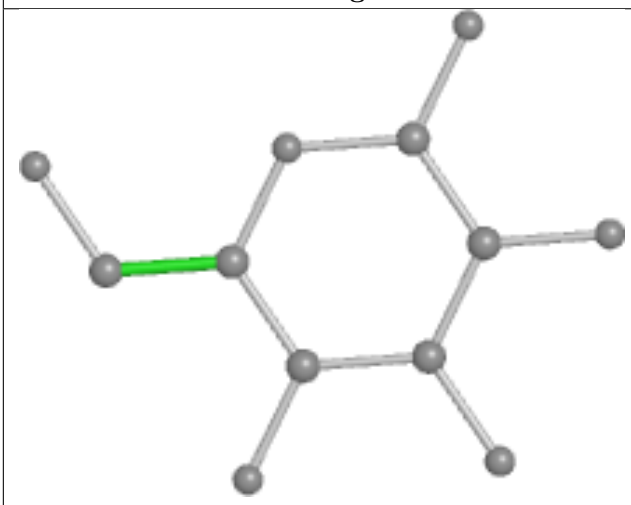
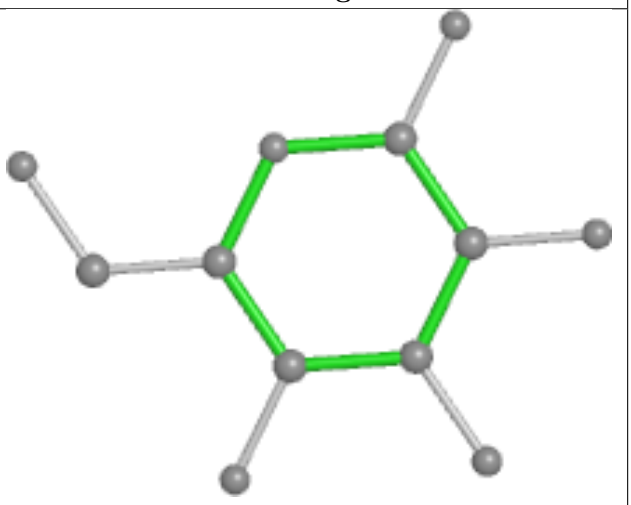


Bond angles



Torsions



Rings

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	659/678 (97%)	0.38	48 (7%)	15	13	12, 22, 45, 65	0
1	B	659/678 (97%)	0.44	40 (6%)	21	19	12, 26, 48, 61	0
1	C	659/678 (97%)	0.25	17 (2%)	56	55	15, 25, 42, 54	0
All	All	1977/2034 (97%)	0.36	105 (5%)	26	25	12, 24, 46, 65	0

All (105) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	101	TYR	9.0
1	A	23	HIS	6.0
1	A	239	LYS	5.6
1	A	153	LYS	5.4
1	C	504	ILE	5.3
1	A	125	ASP	5.2
1	A	100	THR	5.2
1	A	150	ASN	5.1
1	A	126	LEU	5.1
1	A	33	LYS	5.1
1	A	152	GLN	4.6
1	B	458	ASP	4.5
1	A	242	LYS	4.5
1	A	504	ILE	4.4
1	B	504	ILE	4.4
1	A	241	GLY	4.3
1	A	243	THR	4.3
1	C	23	HIS	4.3
1	B	37	ASN	4.0
1	A	151	THR	3.9
1	B	101	TYR	3.9
1	B	662	TRP	3.8
1	A	154	ASP	3.8

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Mol	Chain	Res	Type	RSRZ
1	C	101	TYR	3.8
1	A	37	ASN	3.7
1	C	215	LYS	3.7
1	C	660	LYS	3.6
1	A	240	ALA	3.6
1	A	122	GLN	3.6
1	C	458	ASP	3.5
1	B	33	LYS	3.5
1	B	681	HIS	3.4
1	A	458	ASP	3.3
1	A	155	THR	3.3
1	B	23	HIS	3.3
1	B	459	LYS	3.3
1	A	32	ASP	3.3
1	A	660	LYS	3.2
1	C	33	LYS	3.2
1	B	215	LYS	3.2
1	B	680	THR	3.2
1	C	663	LYS	3.1
1	C	37	ASN	3.1
1	B	460	GLY	3.1
1	B	511	LEU	3.0
1	A	107	LYS	2.9
1	A	106	TYR	2.9
1	A	105	ASN	2.9
1	C	661	ASN	2.8
1	B	660	LYS	2.8
1	A	563	LYS	2.8
1	C	24	GLN	2.7
1	A	24	GLN	2.7
1	B	661	ASN	2.7
1	B	533	THR	2.7
1	A	103	ILE	2.6
1	A	215	LYS	2.6
1	B	522	SER	2.6
1	A	663	LYS	2.6
1	A	123	PHE	2.6
1	B	663	LYS	2.6
1	A	128	THR	2.6
1	B	596	TYR	2.6
1	A	681	HIS	2.5
1	C	459	LYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	519	SER	2.5
1	A	657	VAL	2.5
1	A	238	ILE	2.4
1	B	534	ASP	2.4
1	C	105	ASN	2.4
1	A	216	LEU	2.4
1	B	24	GLN	2.4
1	B	32	ASP	2.4
1	B	524	GLY	2.4
1	B	299	GLU	2.4
1	B	239	LYS	2.3
1	B	35	ASP	2.3
1	C	662	TRP	2.3
1	B	105	ASN	2.3
1	B	517	LEU	2.3
1	B	556	GLU	2.3
1	C	556	GLU	2.3
1	B	300	GLY	2.3
1	C	32	ASP	2.3
1	A	34	PRO	2.2
1	A	121	PHE	2.2
1	A	459	LYS	2.2
1	A	38	ASN	2.2
1	B	94	ASN	2.2
1	C	563	LYS	2.2
1	B	554	ASP	2.2
1	B	675	LYS	2.2
1	B	298	VAL	2.1
1	A	127	ALA	2.1
1	B	563	LYS	2.1
1	A	120	SER	2.1
1	B	531	SER	2.1
1	B	107	LYS	2.1
1	A	93	PHE	2.1
1	A	104	ASN	2.0
1	B	593	ASP	2.0
1	A	36	SER	2.0
1	A	661	ASN	2.0
1	B	665	LEU	2.0
1	A	299	GLU	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)

There are no monosaccharides in this entry.

6.4 Ligands (i)

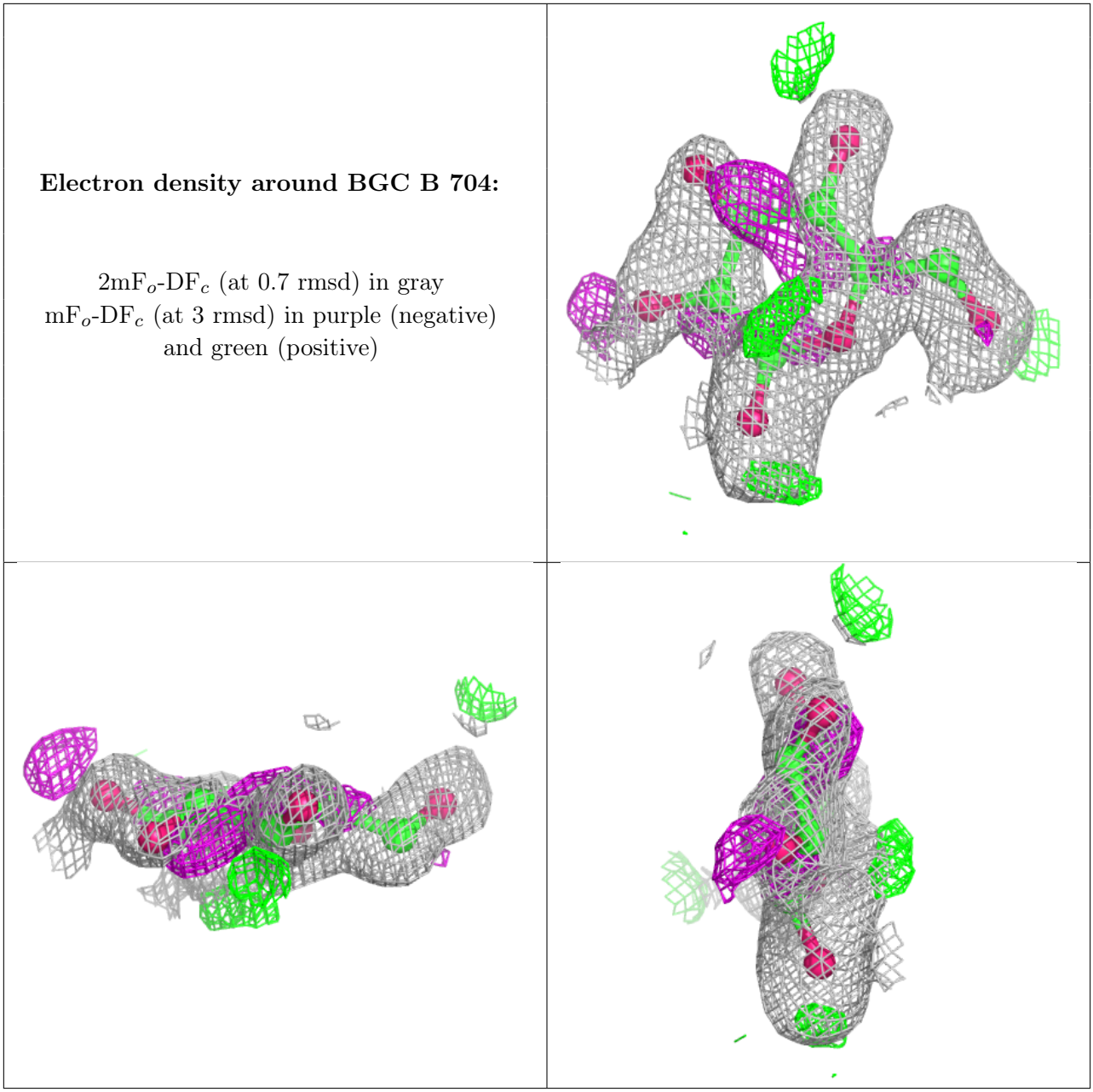
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
2	BGC	B	704	12/12	0.61	0.27	36,42,42,44	0
2	BGC	C	1001	12/12	0.80	0.22	31,33,34,35	0
2	BGC	A	704	12/12	0.82	0.19	26,29,30,31	0
2	BGC	C	1004	12/12	0.82	0.17	24,28,29,30	0
2	BGC	B	703	12/12	0.89	0.16	27,30,33,34	0
2	BGC	C	1003	12/12	0.91	0.12	16,17,19,20	0
2	BGC	B	701	12/12	0.91	0.12	17,19,21,22	0
2	BGC	A	703	12/12	0.93	0.10	19,23,25,25	0
2	BGC	C	1002	12/12	0.93	0.12	17,18,18,20	0
2	BGC	B	702	12/12	0.94	0.11	17,18,20,21	0
2	BGC	A	702	12/12	0.96	0.11	13,14,15,17	0
2	BGC	A	701	12/12	0.97	0.10	14,15,16,17	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.

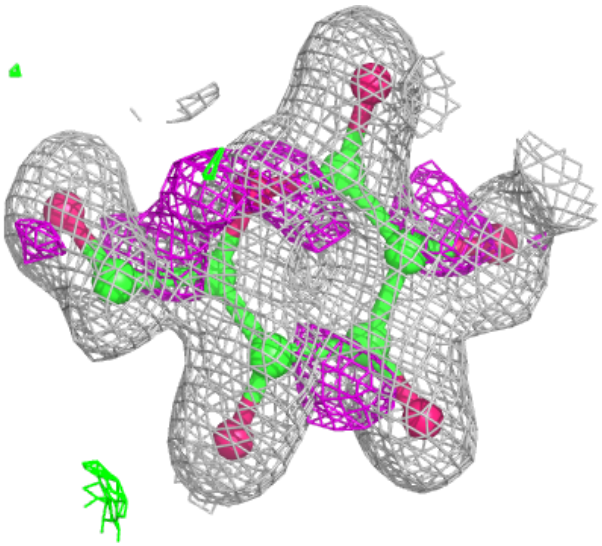
Electron density around BGC B 704:

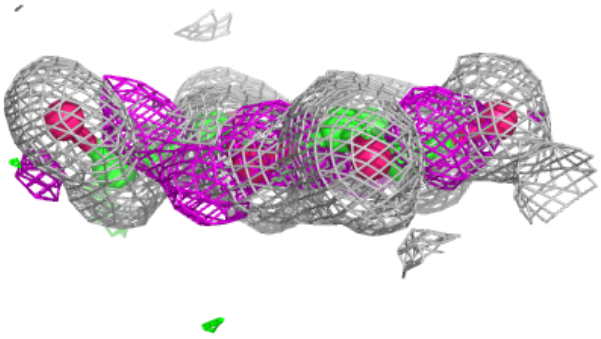
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

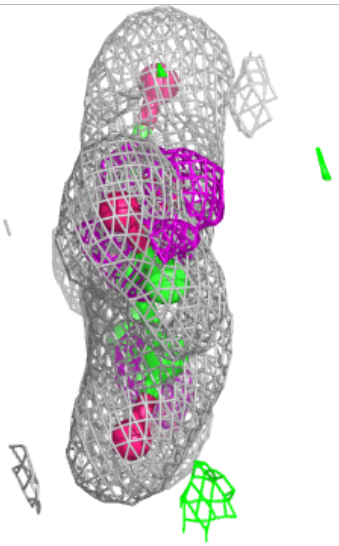


Electron density around BGC C 1001:

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

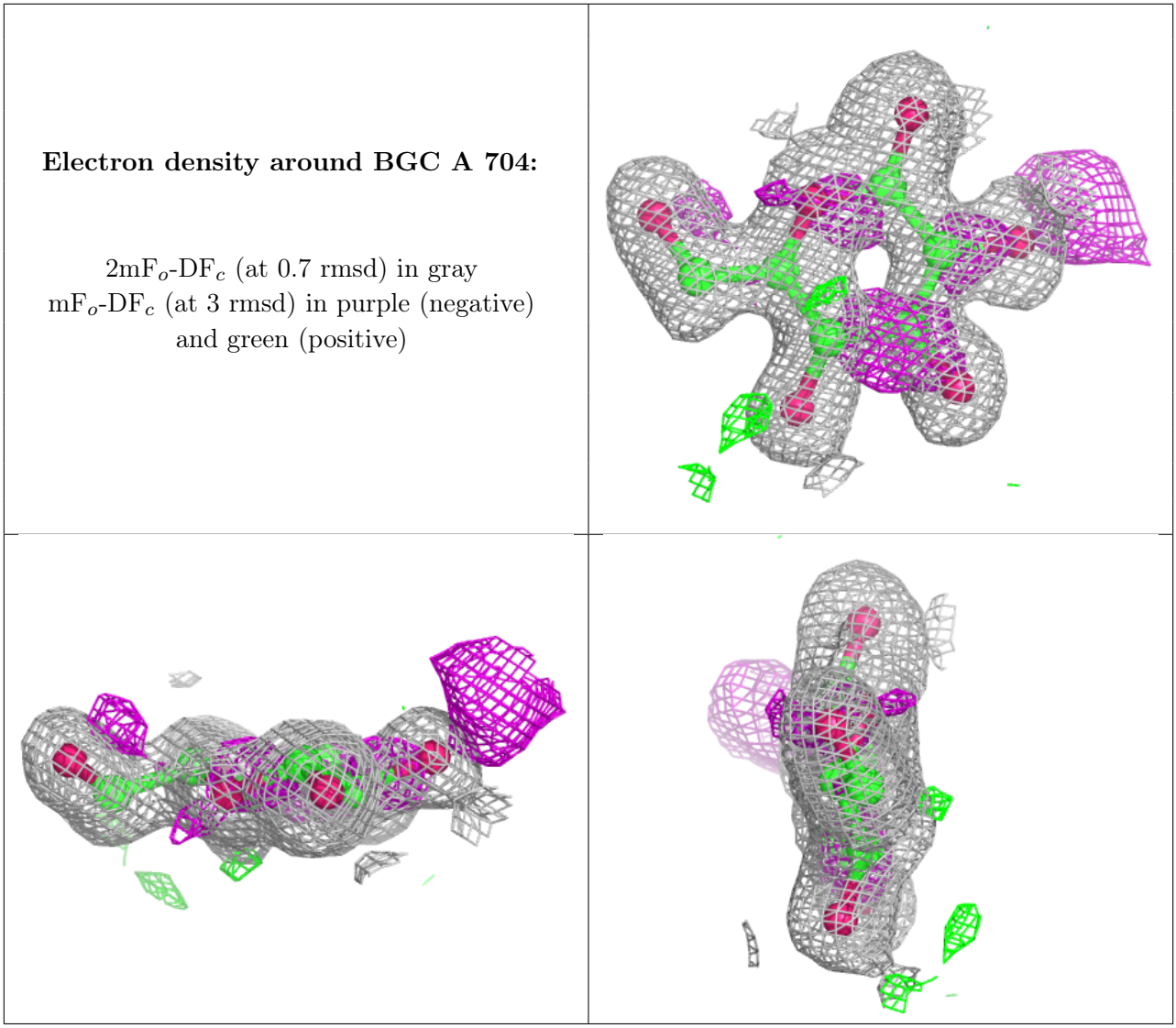






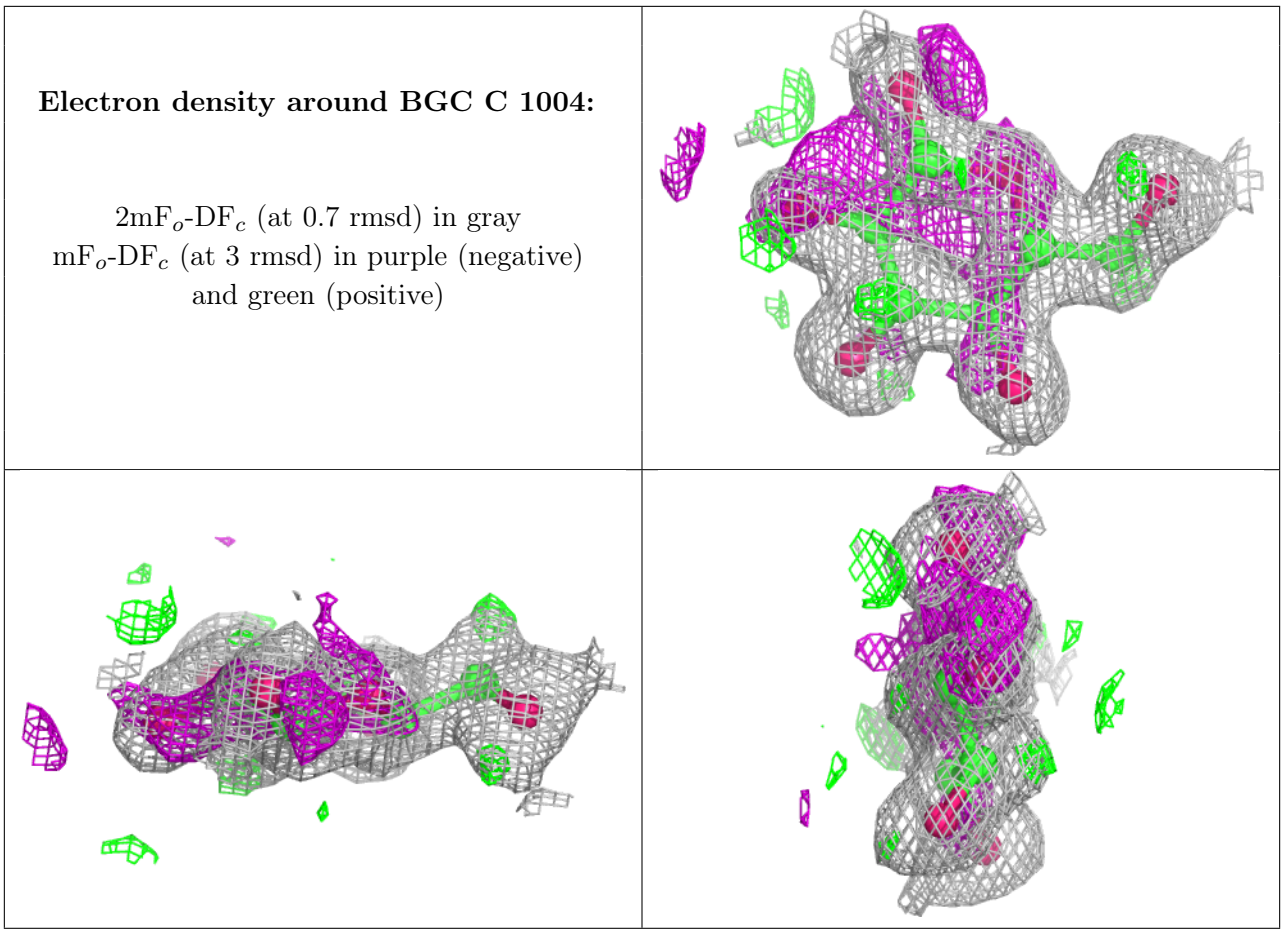
Electron density around BGC A 704:

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



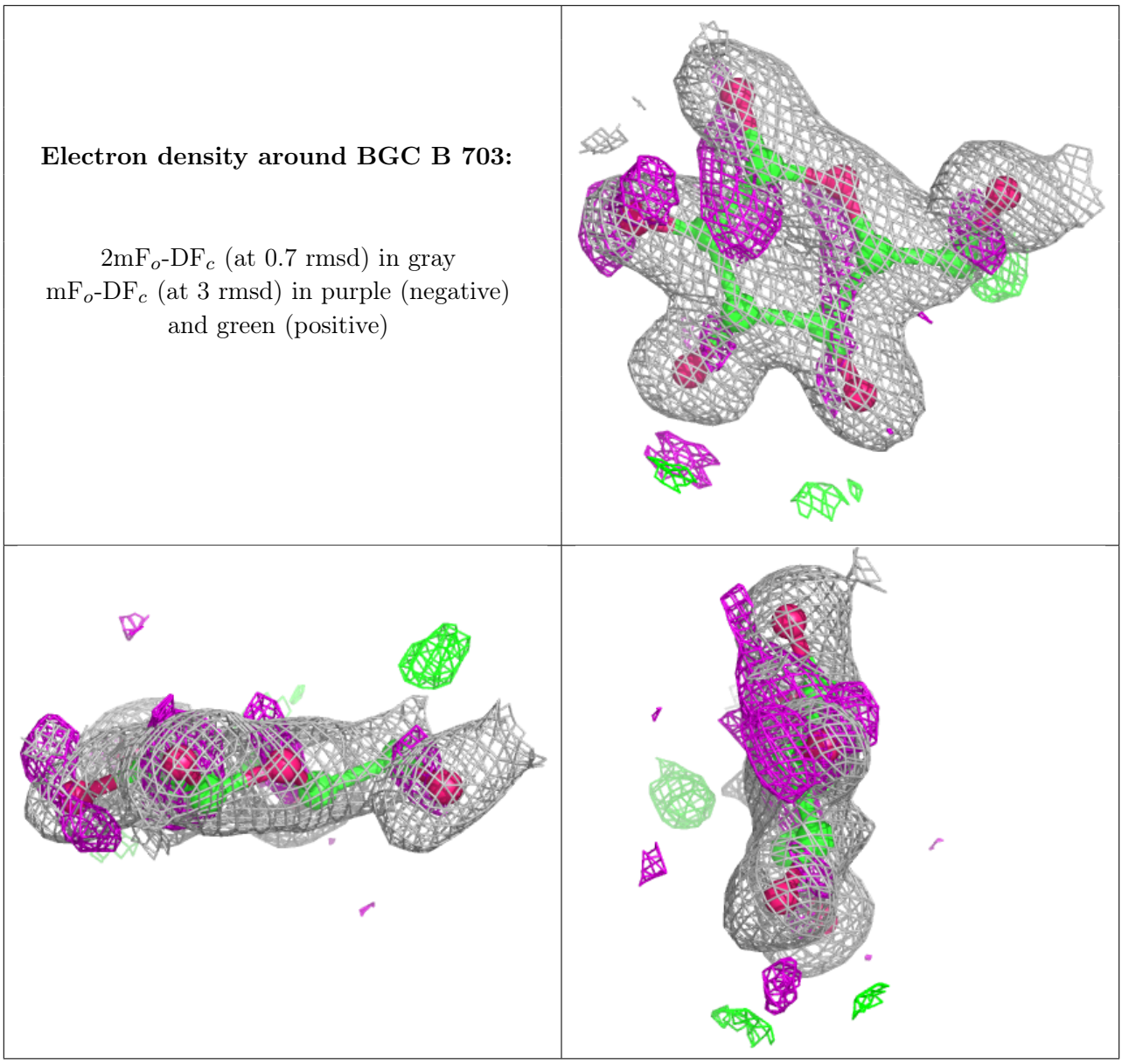
Electron density around BGC C 1004:

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



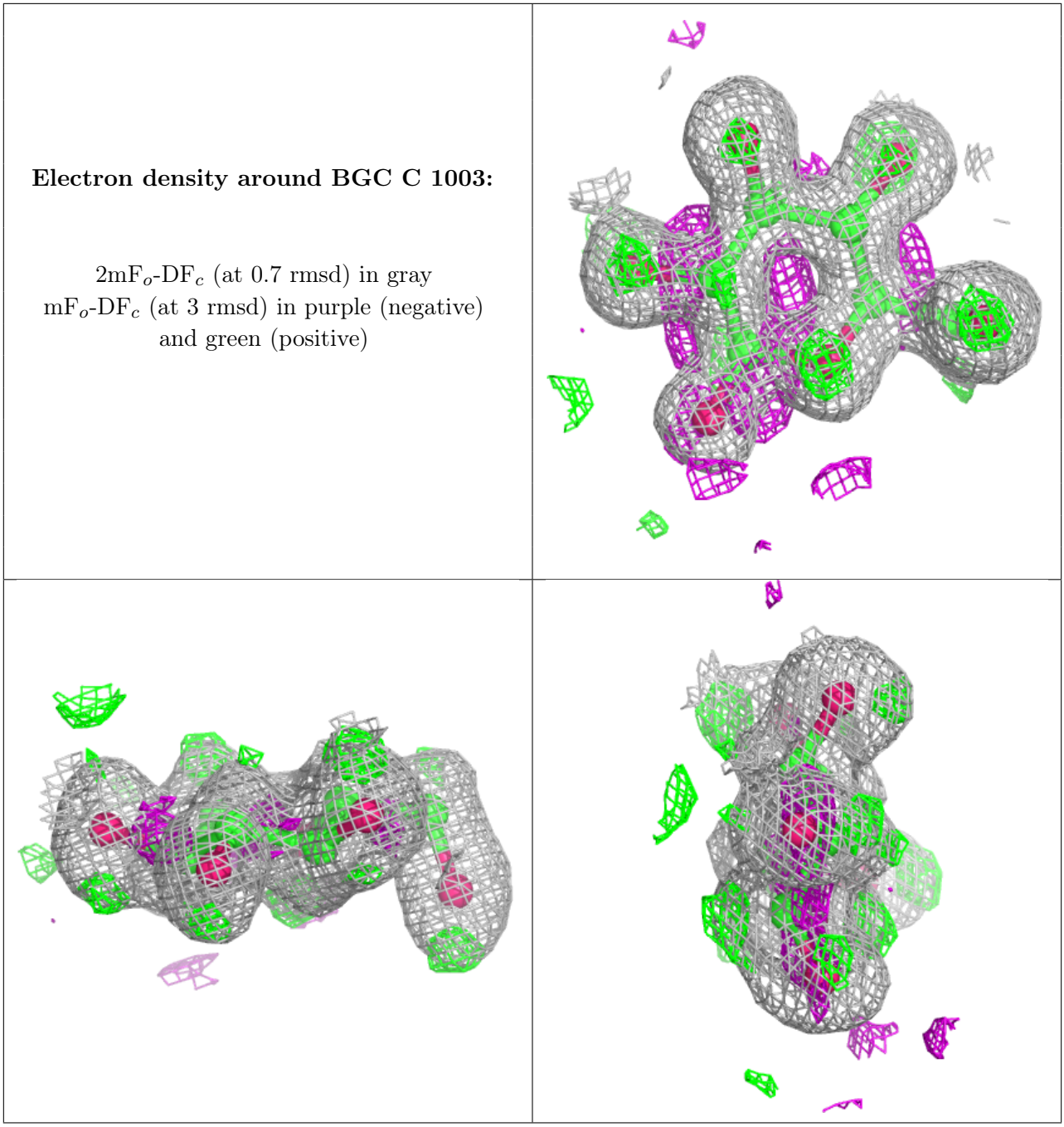
Electron density around BGC B 703:

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



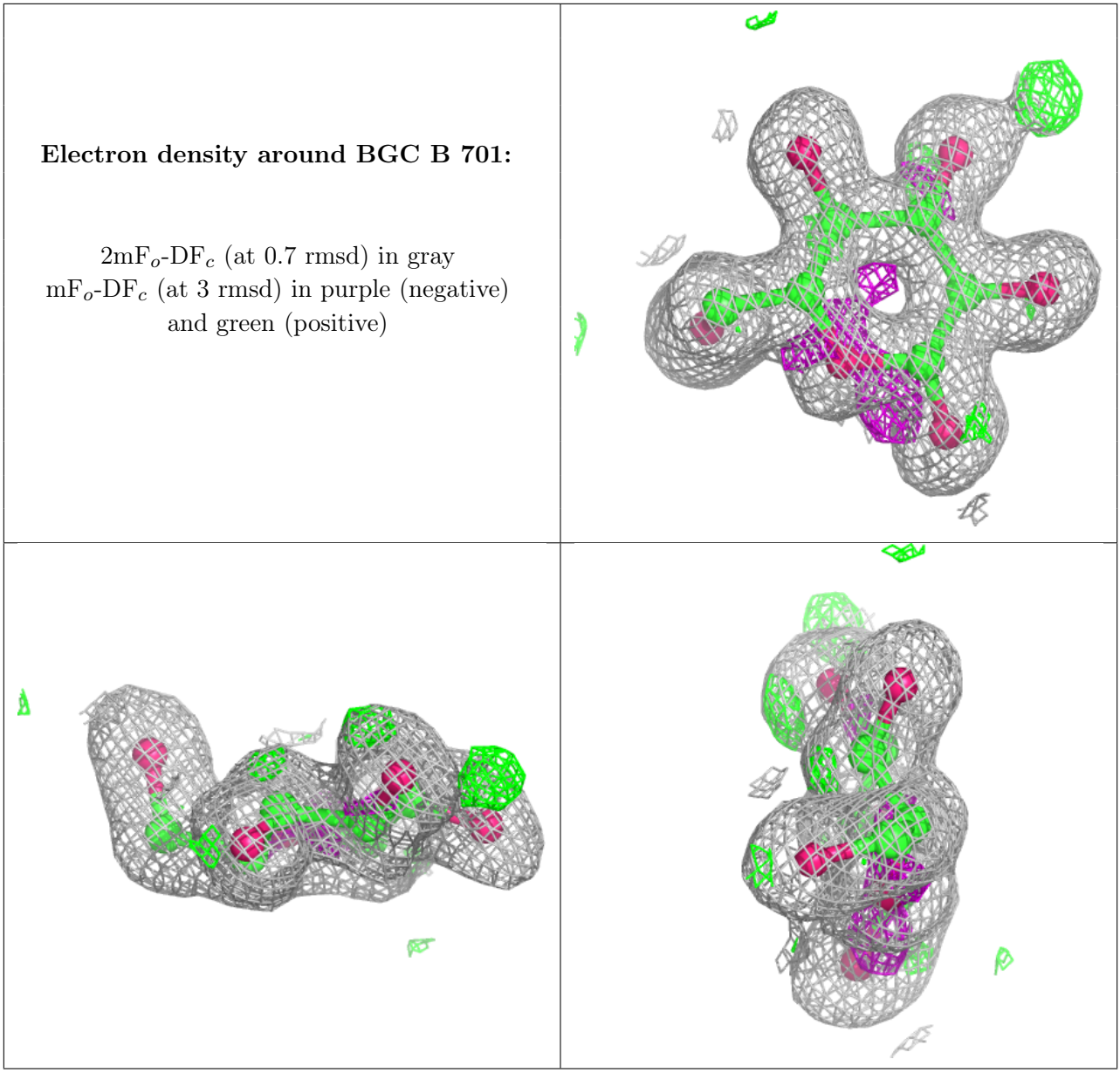
Electron density around BGC C 1003:

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



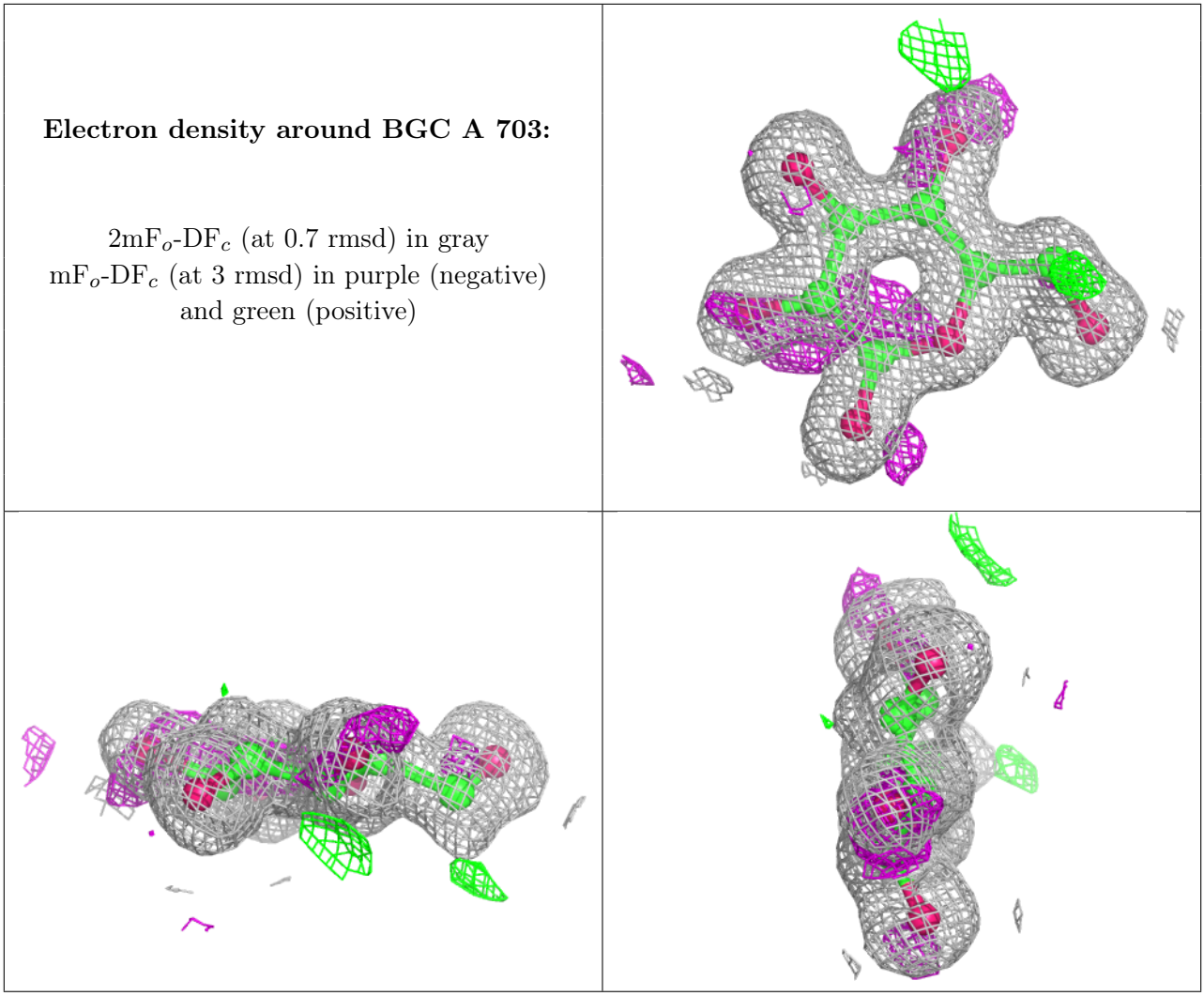
Electron density around BGC B 701:

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



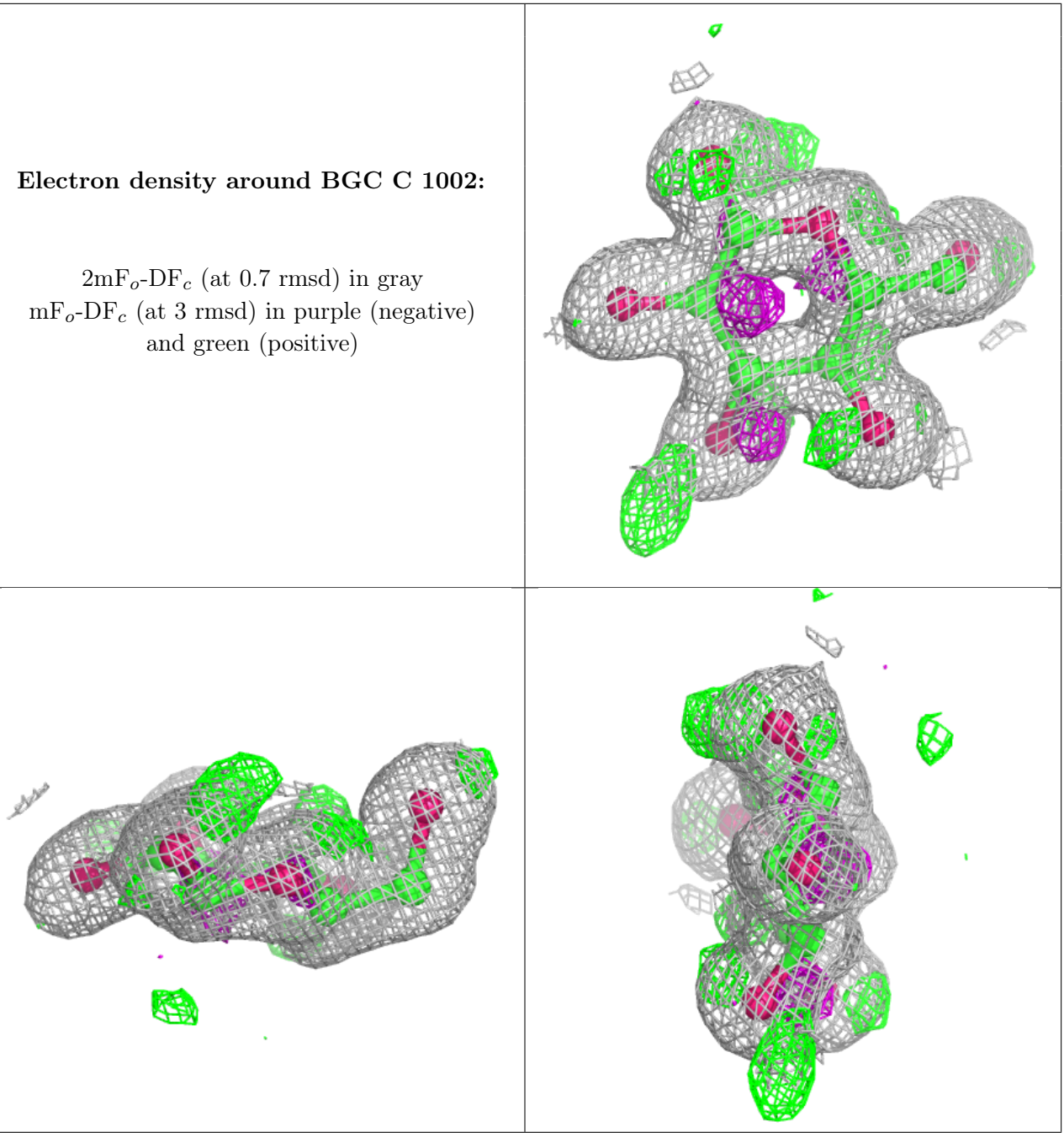
Electron density around BGC A 703:

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



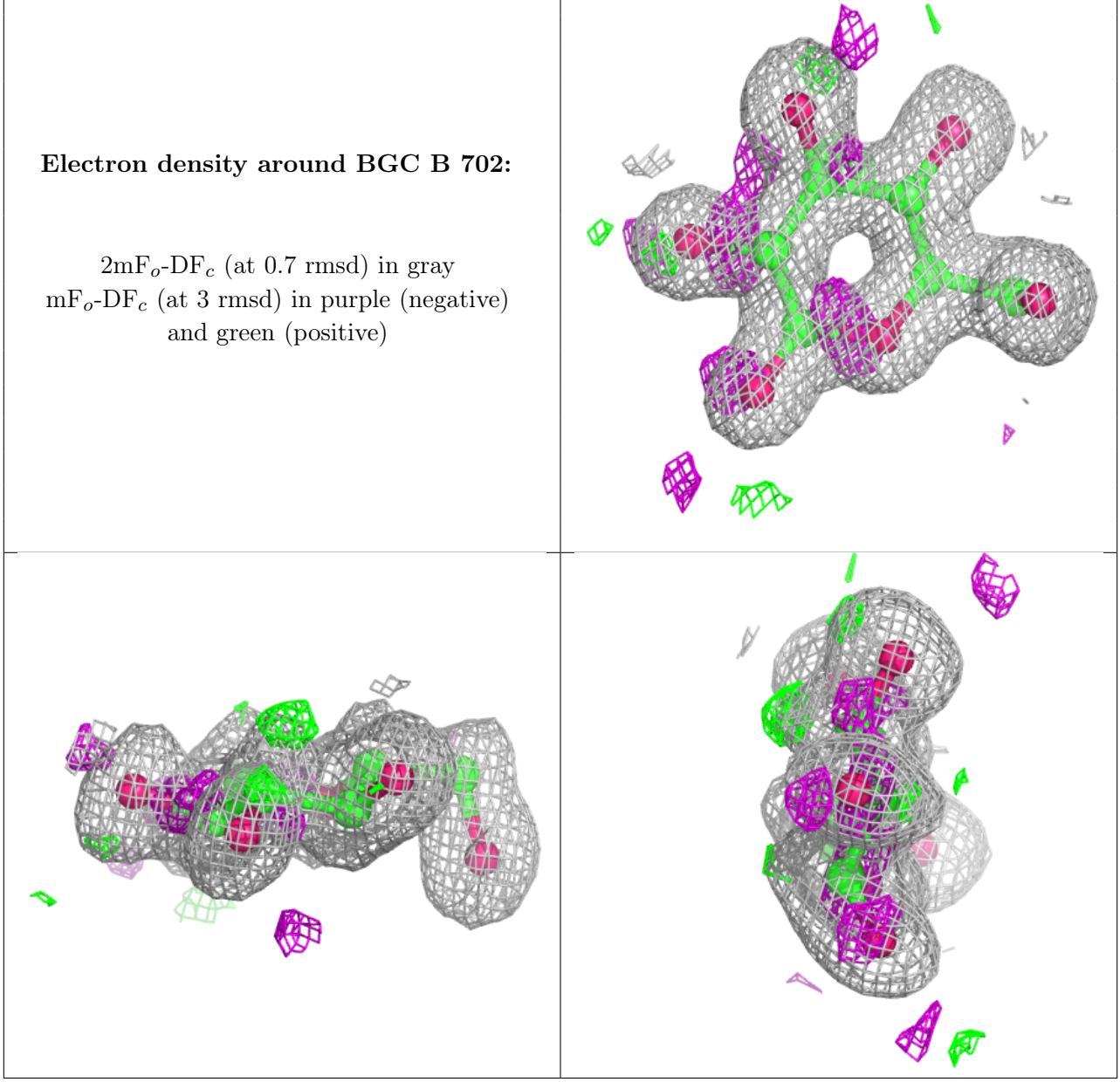
Electron density around BGC C 1002:

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



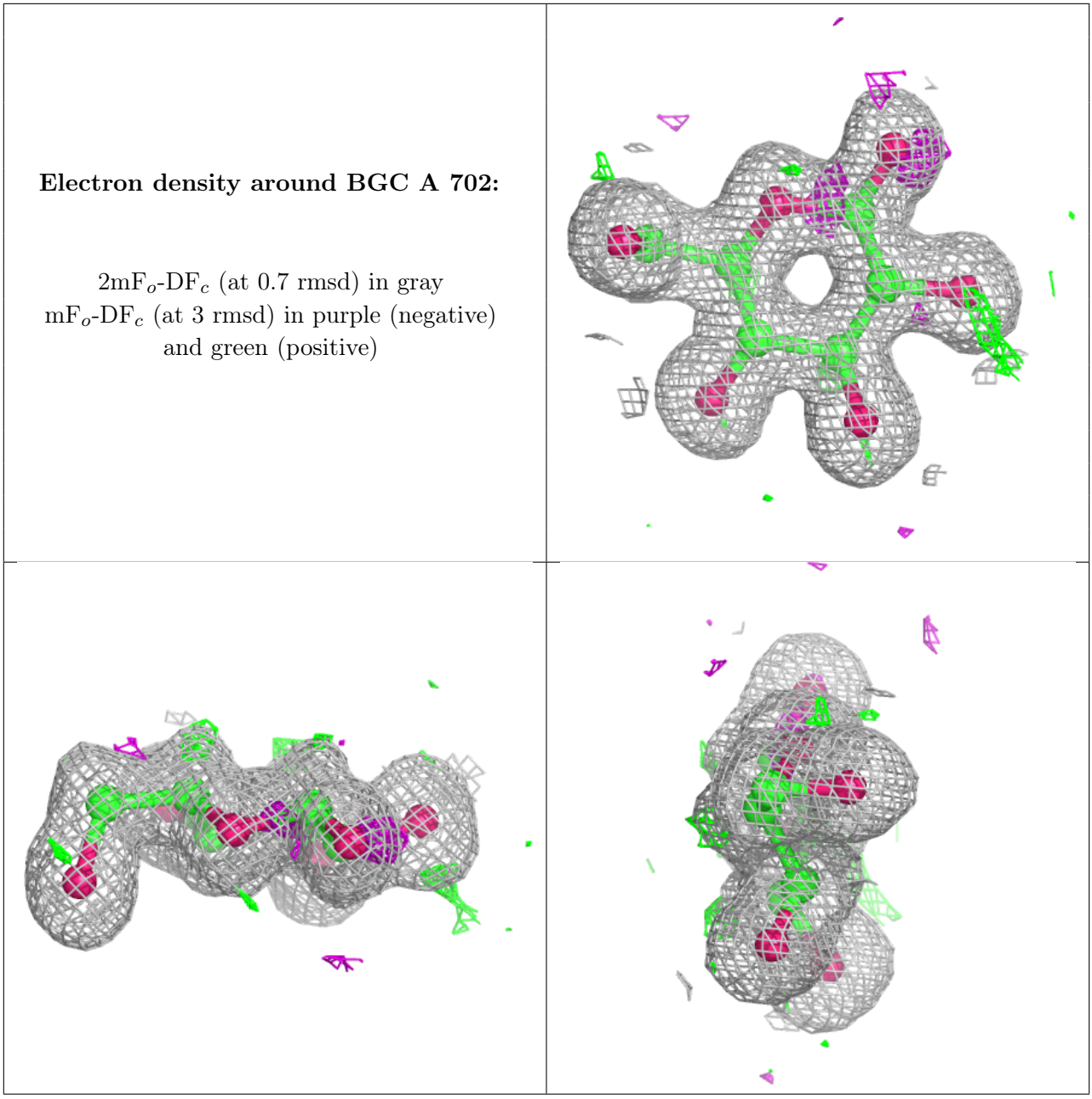
Electron density around BGC B 702:

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



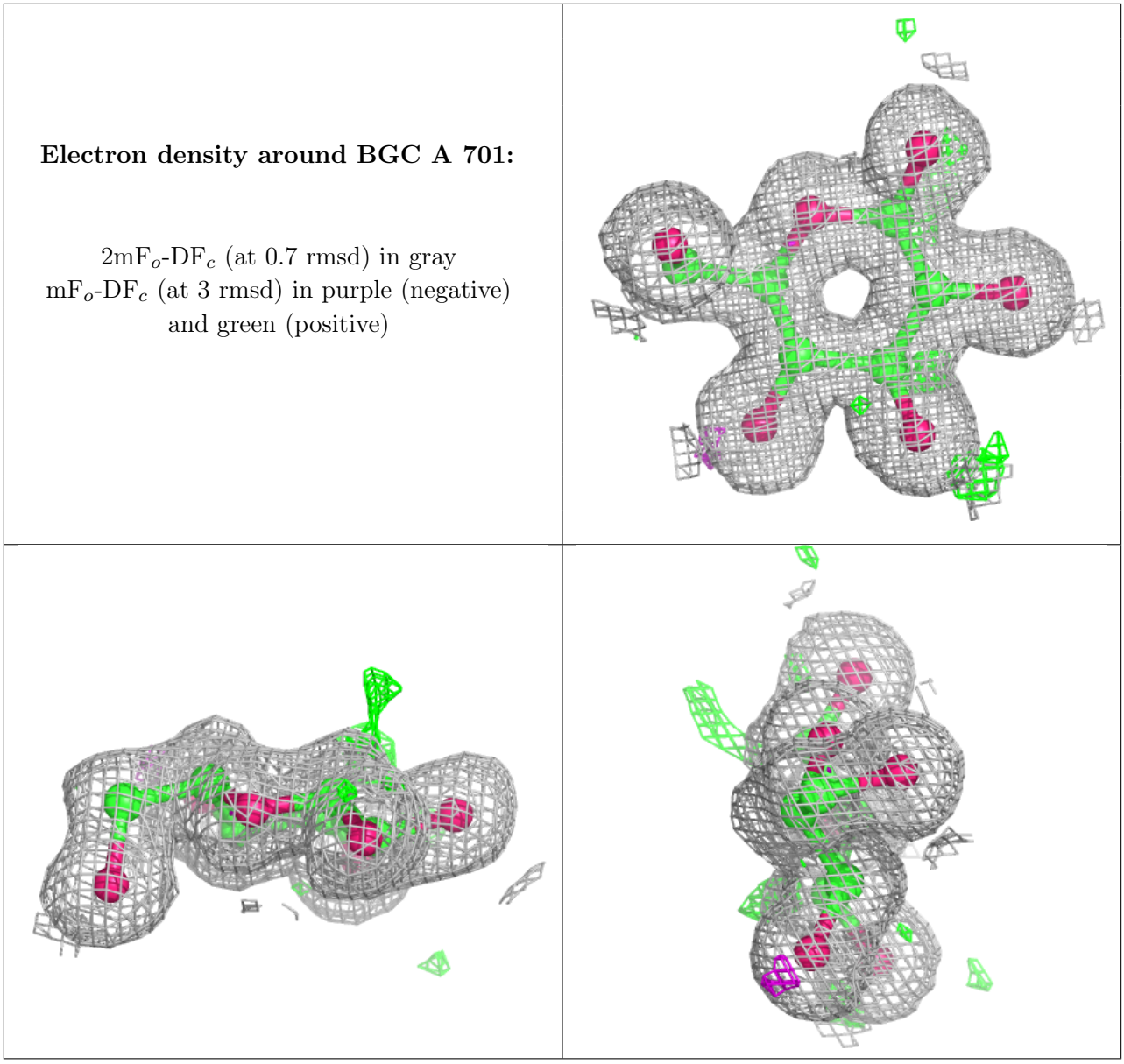
Electron density around BGC A 702:

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



Electron density around BGC A 701:

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



6.5 Other polymers

There are no such residues in this entry.