wwPDB X-ray Structure Validation Summary Report (i)

Oct 27, 2025 – 09:38 pm GMT

PDB ID	:	9HIB / pdb_00009hib
Title	:	K115 acetylated human muscle pyruvate kinase, isoform M2 (PKM2)
Authors	:	Pavlenko, D.; Nudelman, H.; Shahar, A.; Arbely, E.
Deposited on	:	2024-11-25
Resolution	:	2.17 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i) 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 (i)) were used in the production of this report:

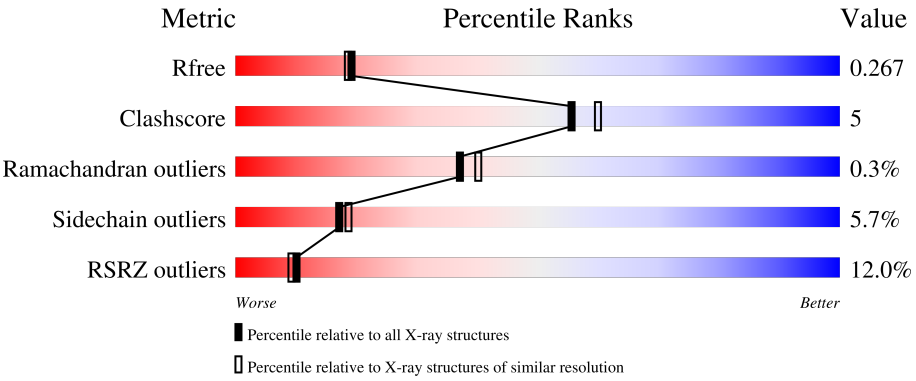
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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 2.17 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	8336 (2.20-2.16)
Clashscore	180529	9404 (2.20-2.16)
Ramachandran outliers	177936	9297 (2.20-2.16)
Sidechain outliers	177891	9297 (2.20-2.16)
RSRZ outliers	164620	8337 (2.20-2.16)

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	537	9% 80% 11% 6%
1	B	537	7% 82% 12%
1	C	537	4% 81% 11%
1	D	537	25% 76% 14% 7%

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 16021 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 Pyruvate kinase PKM.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	505	Total	C	N	O	S	0	2	0
			3900	2450	699	726	25			
1	B	517	Total	C	N	O	S	0	0	0
			3968	2495	706	742	25			
1	C	513	Total	C	N	O	S	0	1	0
			3944	2481	700	737	26			
1	D	502	Total	C	N	O	S	0	0	0
			3852	2424	684	719	25			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	532	HIS	-	expression tag	UNP P14618
A	533	HIS	-	expression tag	UNP P14618
A	534	HIS	-	expression tag	UNP P14618
A	535	HIS	-	expression tag	UNP P14618
A	536	HIS	-	expression tag	UNP P14618
A	537	HIS	-	expression tag	UNP P14618
B	532	HIS	-	expression tag	UNP P14618
B	533	HIS	-	expression tag	UNP P14618
B	534	HIS	-	expression tag	UNP P14618
B	535	HIS	-	expression tag	UNP P14618
B	536	HIS	-	expression tag	UNP P14618
B	537	HIS	-	expression tag	UNP P14618
C	532	HIS	-	expression tag	UNP P14618
C	533	HIS	-	expression tag	UNP P14618
C	534	HIS	-	expression tag	UNP P14618
C	535	HIS	-	expression tag	UNP P14618
C	536	HIS	-	expression tag	UNP P14618
C	537	HIS	-	expression tag	UNP P14618
D	532	HIS	-	expression tag	UNP P14618
D	533	HIS	-	expression tag	UNP P14618
D	534	HIS	-	expression tag	UNP P14618

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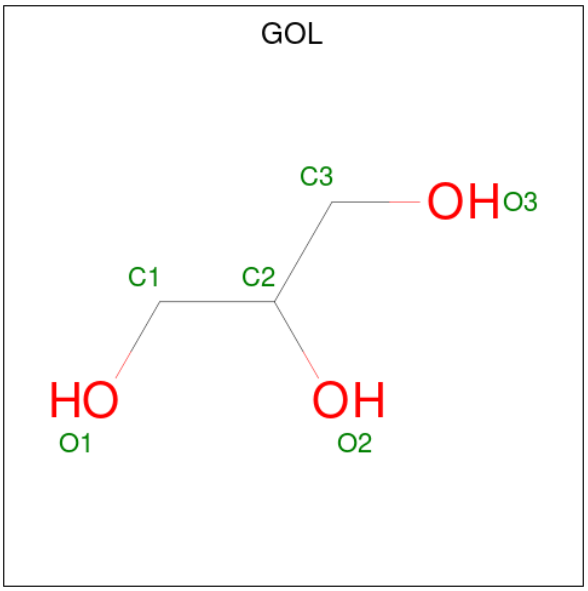
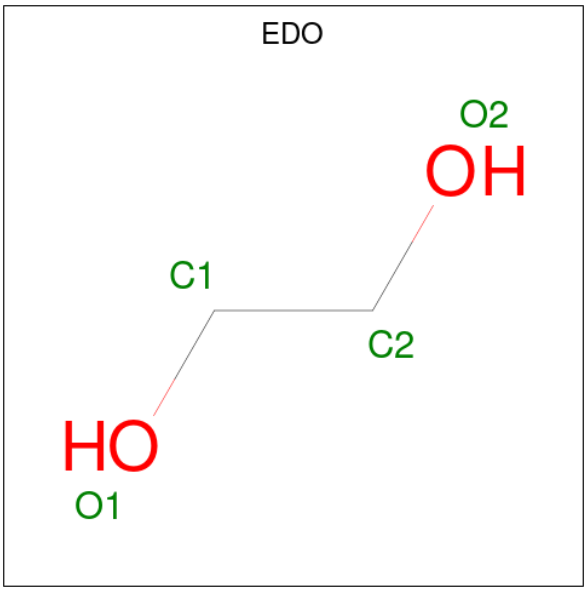
Chain	Residue	Modelled	Actual	Comment	Reference
D	535	HIS	-	expression tag	UNP P14618
D	536	HIS	-	expression tag	UNP P14618
D	537	HIS	-	expression tag	UNP P14618

- Molecule 2 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$) (labeled as "Ligand of Interest" by depositor).

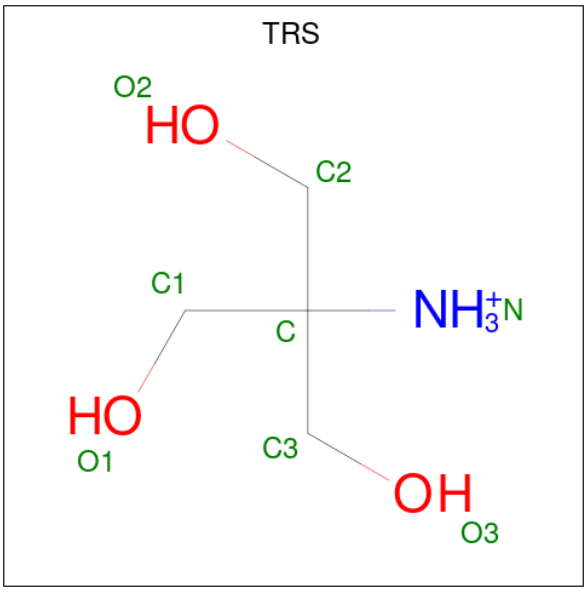


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

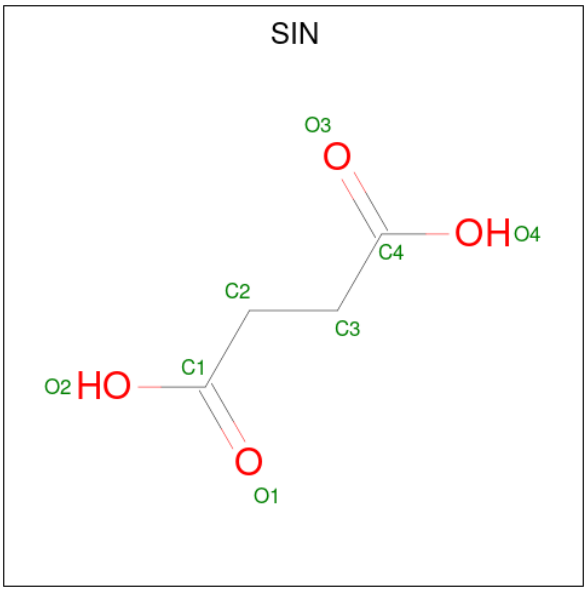
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total Mg 1 1	0	0

- Molecule 5 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: $C_4H_{12}NO_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	C	1	8	4	1	3	0	0

- Molecule 6 is SUCCINIC ACID (CCD ID: SIN) (formula: $C_4H_6O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
6	C	1	8	4	4	0	0

- Molecule 7 is POTASSIUM ION (CCD ID: K) (formula: K) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	C	1	Total K 1 1	0	0

- Molecule 8 is water.

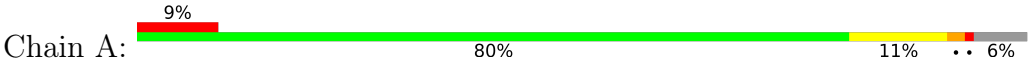
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	25	Total O 25 25	0	0
8	B	126	Total O 126 126	0	0
8	C	110	Total O 110 110	0	0
8	D	6	Total O 6 6	0	0

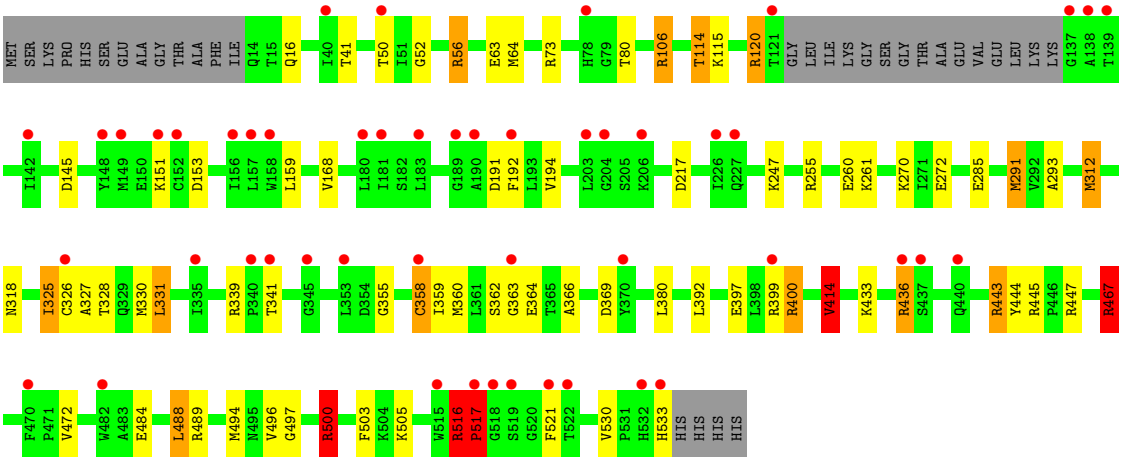
3 Residue-property plots (i)

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: Pyruvate kinase PKM

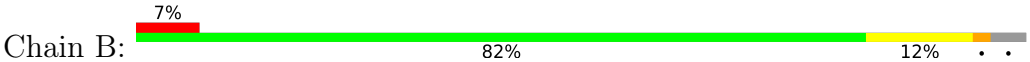
Chain A:

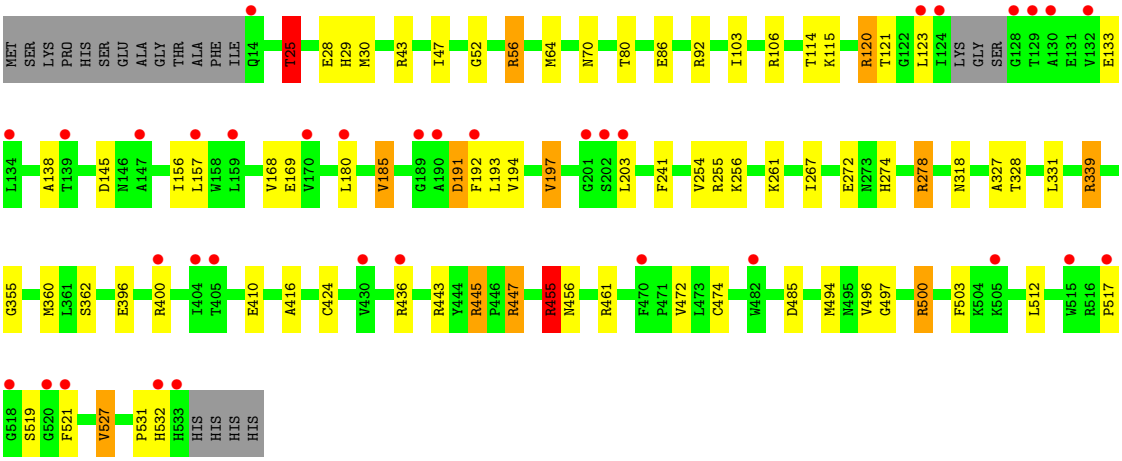




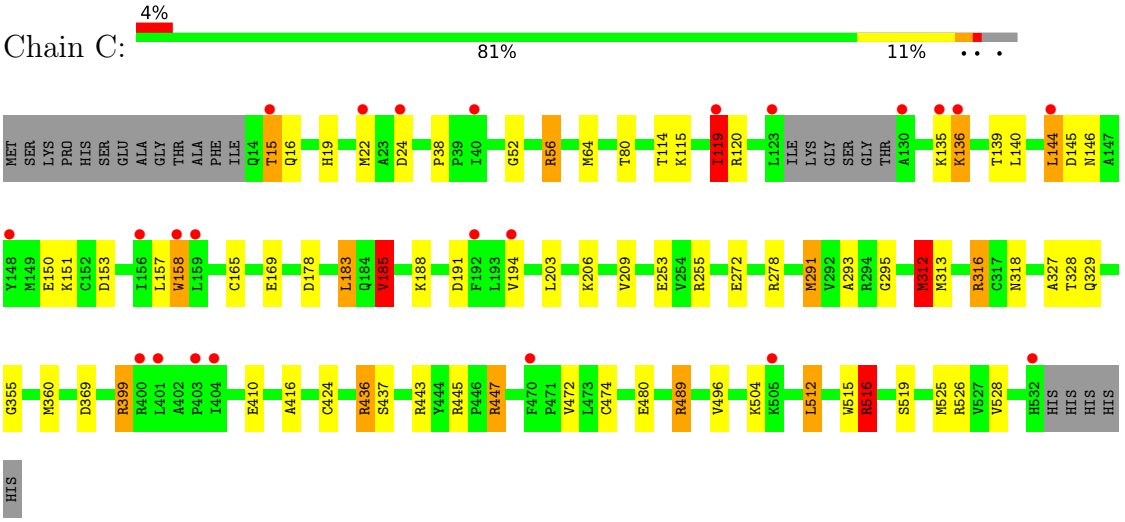
• Molecule 1: Pyruvate kinase PKM

Chain B:

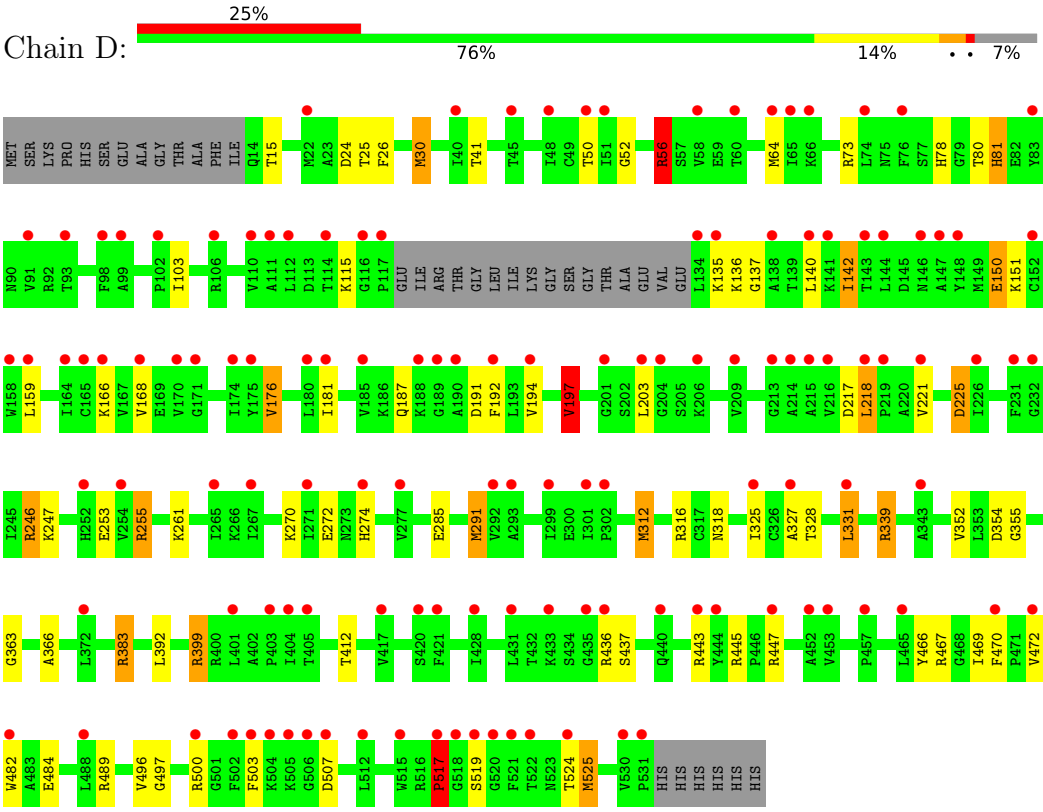




• Molecule 1: Pyruvate kinase PKM



• Molecule 1: Pyruvate kinase PKM



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	81.54Å 154.78Å 100.70Å 90.00° 107.40° 90.00°	Depositor
Resolution (Å)	81.64 – 2.17 81.64 – 2.17	Depositor EDS
% Data completeness (in resolution range)	100.0 (81.64-2.17) 100.0 (81.64-2.17)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.23 (at 2.16Å)	Xtriage
Refinement program	REFMAC 5.8.0430	Depositor
R, R_{free}	0.223 , 0.265 0.226 , 0.267	Depositor DCC
R_{free} test set	6232 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å^2)	42.6	Xtriage
Anisotropy	0.650	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 48.4	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	0.95	EDS
Total number of atoms	16021	wwPDB-VP
Average B, all atoms (Å^2)	69.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.22% 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: MG, GOL, TRS, K, EDO, SIN, ALY

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	0.75	1/3955 (0.0%)	1.40	36/5342 (0.7%)
1	B	0.92	2/4020 (0.0%)	1.38	31/5430 (0.6%)
1	C	0.89	0/3998	1.39	31/5399 (0.6%)
1	D	0.68	1/3902 (0.0%)	1.34	29/5270 (0.6%)
All	All	0.82	4/15875 (0.0%)	1.38	127/21441 (0.6%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	9
1	B	0	6
1	C	0	10
1	D	0	10
All	All	0	35

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	461	ARG	NE-CZ	5.66	1.39	1.33
1	A	325	ILE	C-O	-5.62	1.18	1.24
1	D	447	ARG	NE-CZ	5.20	1.38	1.33
1	B	362	SER	CA-C	5.00	1.54	1.52

The worst 5 of 127 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	358	CYS	CB-CA-C	-23.87	73.79	111.74

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	358	CYS	N-CA-CB	-12.29	92.83	111.64
1	A	358	CYS	N-CA-C	9.83	128.88	108.53
1	A	285	GLU	N-CA-CB	8.39	123.14	110.22
1	A	467	ARG	CG-CD-NE	-8.39	93.54	112.00

There are no chirality outliers.

5 of 35 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	120	ARG	Sidechain
1	A	255	ARG	Sidechain
1	A	339	ARG	Sidechain
1	A	399	ARG	Sidechain
1	A	436	ARG	Sidechain

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3900	0	3967	46	0
1	B	3968	0	4042	24	0
1	C	3944	0	4022	44	0
1	D	3852	0	3929	31	0
2	A	6	0	8	1	0
2	B	6	0	8	0	0
2	C	18	0	24	4	0
2	D	6	0	8	0	0
3	A	8	0	12	0	0
3	B	8	0	12	0	0
3	C	16	0	24	2	0
3	D	4	0	6	0	0
4	B	1	0	0	0	0
5	C	8	0	12	3	0
6	C	8	0	4	1	0
7	C	1	0	0	0	0
8	A	25	0	0	0	0
8	B	126	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	C	110	0	0	3	0
8	D	6	0	0	0	0
All	All	16021	0	16078	145	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.

The worst 5 of 145 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:325:ILE:HA	1:A:358:CYS:SG	2.06	0.94
1:C:312:MET:HE2	1:C:313:MET:CA	2.01	0.89
1:B:25:THR:HG22	1:B:28:GLU:H	1.38	0.89
1:C:437:SER:OG	2:C:608:GOL:H31	1.73	0.88
1:B:43:ARG:HH22	1:B:70:ASN:HD21	1.17	0.88

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	502/537 (94%)	488 (97%)	12 (2%)	2 (0%)	30	32
1	B	512/537 (95%)	503 (98%)	8 (2%)	1 (0%)	44	49
1	C	509/537 (95%)	500 (98%)	7 (1%)	2 (0%)	30	32
1	D	497/537 (93%)	479 (96%)	16 (3%)	2 (0%)	30	32
All	All	2020/2148 (94%)	1970 (98%)	43 (2%)	7 (0%)	37	40

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	517	PRO
1	D	328	THR
1	B	328	THR
1	A	328	THR
1	C	328	THR

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	418/441 (95%)	391 (94%)	27 (6%)	14	14
1	B	425/441 (96%)	405 (95%)	20 (5%)	22	26
1	C	423/441 (96%)	406 (96%)	17 (4%)	27	32
1	D	413/441 (94%)	381 (92%)	32 (8%)	10	10
All	All	1679/1764 (95%)	1583 (94%)	96 (6%)	17	19

5 of 96 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	312	MET
1	D	150	GLU
1	C	424	CYS
1	D	41	THR
1	D	168	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	318	ASN
1	D	16	GLN
1	C	479	GLN
1	D	146	ASN
1	B	252	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

4 non-standard protein/DNA/RNA residues 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	$\#\|Z\| > 2$
1	ALY	C	115	1	10,11,12	0.50	0	7,12,14	1.25	1 (14%)
1	ALY	D	115	1	10,11,12	0.52	0	7,12,14	1.54	2 (28%)
1	ALY	B	115	1	10,11,12	0.56	0	7,12,14	1.57	1 (14%)
1	ALY	A	115	1	10,11,12	0.71	0	7,12,14	1.45	2 (28%)

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
1	ALY	C	115	1	-	3/9/10/12	-
1	ALY	D	115	1	-	6/9/10/12	-
1	ALY	B	115	1	-	4/9/10/12	-
1	ALY	A	115	1	-	6/9/10/12	-

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	115	ALY	CE-NZ-CH	3.47	127.89	122.56
1	C	115	ALY	CE-NZ-CH	3.09	127.30	122.56
1	D	115	ALY	CE-NZ-CH	2.75	126.78	122.56
1	A	115	ALY	CE-NZ-CH	2.39	126.24	122.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	115	ALY	CH3-CH-NZ	2.09	119.79	116.09

There are no chirality outliers.

5 of 19 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	115	ALY	CH3-CH-NZ-CE
1	A	115	ALY	N-CA-CB-CG
1	C	115	ALY	OH-CH-NZ-CE
1	C	115	ALY	CH3-CH-NZ-CE
1	D	115	ALY	N-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 19 ligands modelled in this entry, 2 are monoatomic - leaving 17 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	GOL	C	602	-	5,5,5	0.31	0	5,5,5	0.75	0
2	GOL	C	607	-	5,5,5	0.52	0	5,5,5	0.73	0
2	GOL	D	600	-	5,5,5	0.19	0	5,5,5	0.41	0
3	EDO	A	601	-	3,3,3	0.27	0	2,2,2	0.50	0
2	GOL	B	601	-	5,5,5	0.36	0	5,5,5	0.90	0
3	EDO	C	605	-	3,3,3	1.11	0	2,2,2	1.14	0
3	EDO	B	602	-	3,3,3	0.88	0	2,2,2	1.56	1 (50%)
3	EDO	C	604	-	3,3,3	0.56	0	2,2,2	0.59	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	EDO	C	609	-	3,3,3	1.68	1 (33%)	2,2,2	0.58	0
6	SIN	C	606	7	7,7,7	1.94	2 (28%)	8,8,8	1.17	1 (12%)
2	GOL	C	608	-	5,5,5	0.78	0	5,5,5	1.73	1 (20%)
2	GOL	A	600	-	5,5,5	0.18	0	5,5,5	0.45	0
3	EDO	A	602	-	3,3,3	0.36	0	2,2,2	0.51	0
3	EDO	C	601	-	3,3,3	0.94	0	2,2,2	1.00	0
3	EDO	D	601	-	3,3,3	0.39	0	2,2,2	0.84	0
3	EDO	B	603	4	3,3,3	1.31	0	2,2,2	1.57	0
5	TRS	C	603	-	7,7,7	0.52	0	9,9,9	2.01	3 (33%)

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	GOL	C	602	-	-	2/4/4/4	-
2	GOL	C	607	-	-	4/4/4/4	-
2	GOL	D	600	-	-	4/4/4/4	-
3	EDO	A	601	-	-	0/1/1/1	-
2	GOL	B	601	-	-	3/4/4/4	-
3	EDO	C	605	-	-	1/1/1/1	-
3	EDO	B	602	-	-	1/1/1/1	-
3	EDO	C	604	-	-	1/1/1/1	-
3	EDO	C	609	-	-	0/1/1/1	-
6	SIN	C	606	7	-	2/5/5/5	-
2	GOL	C	608	-	-	1/4/4/4	-
2	GOL	A	600	-	-	0/4/4/4	-
3	EDO	A	602	-	-	1/1/1/1	-
3	EDO	C	601	-	-	1/1/1/1	-
3	EDO	D	601	-	-	1/1/1/1	-
3	EDO	B	603	4	-	0/1/1/1	-
5	TRS	C	603	-	-	4/9/9/9	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	C	606	SIN	O4-C4	-3.86	1.17	1.30
6	C	606	SIN	O1-C1	2.37	1.30	1.22
3	C	609	EDO	O2-C2	2.37	1.54	1.42

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	C	603	TRS	C2-C-N	3.43	118.21	107.98
5	C	603	TRS	C2-C-C1	-3.16	101.03	110.81
5	C	603	TRS	O2-C2-C	-2.46	103.21	111.00
3	B	602	EDO	O1-C1-C2	2.15	127.39	111.91
2	C	608	GOL	O3-C3-C2	2.05	120.05	110.20

There are no chirality outliers.

5 of 26 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	601	GOL	O1-C1-C2-O2
2	B	601	GOL	C1-C2-C3-O3
2	C	602	GOL	C1-C2-C3-O3
2	C	607	GOL	O1-C1-C2-O2
2	C	607	GOL	O1-C1-C2-C3

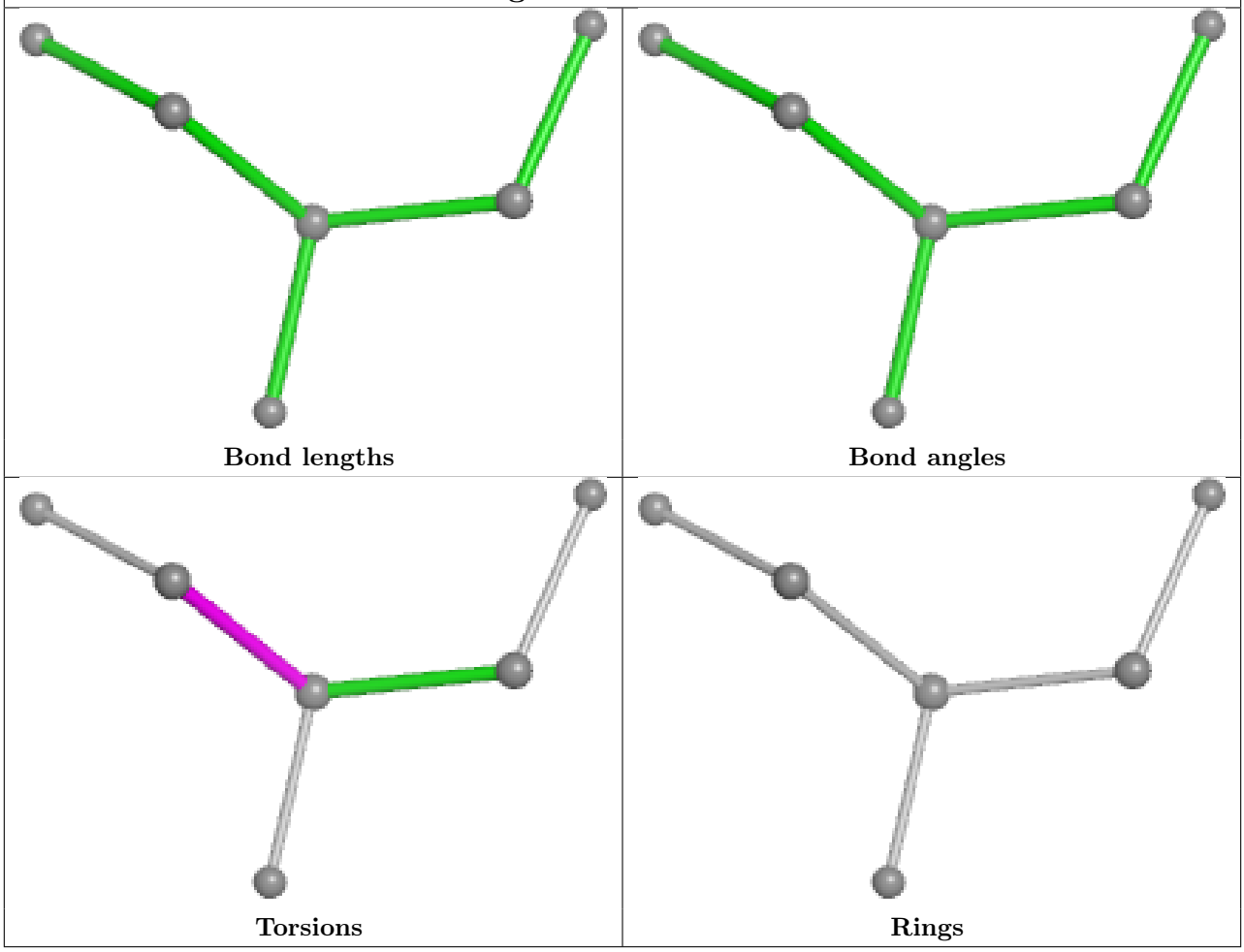
There are no ring outliers.

6 monomers are involved in 8 short contacts:

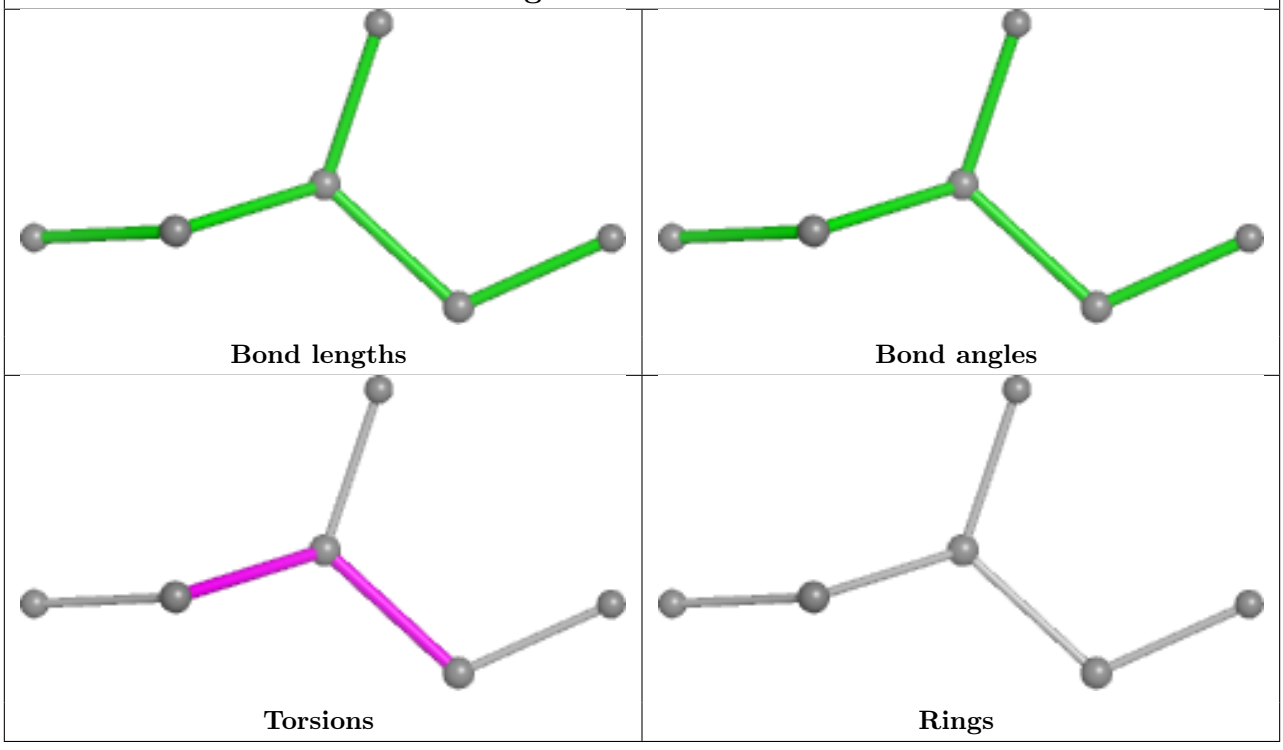
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	607	GOL	1	0
3	C	609	EDO	2	0
6	C	606	SIN	1	0
2	C	608	GOL	3	0
2	A	600	GOL	1	0
5	C	603	TRS	3	0

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.

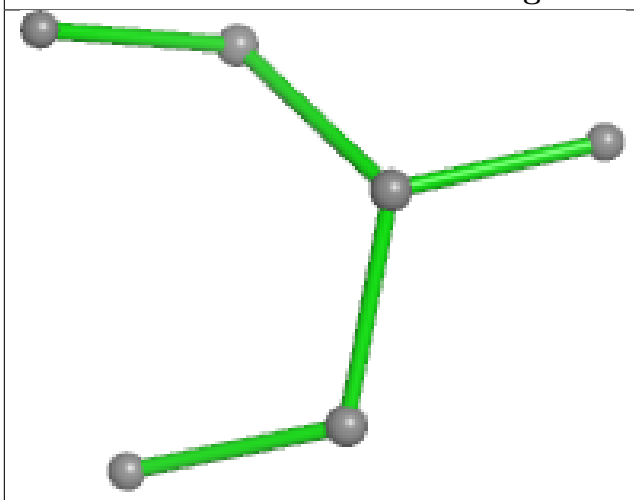
Ligand GOL C 602



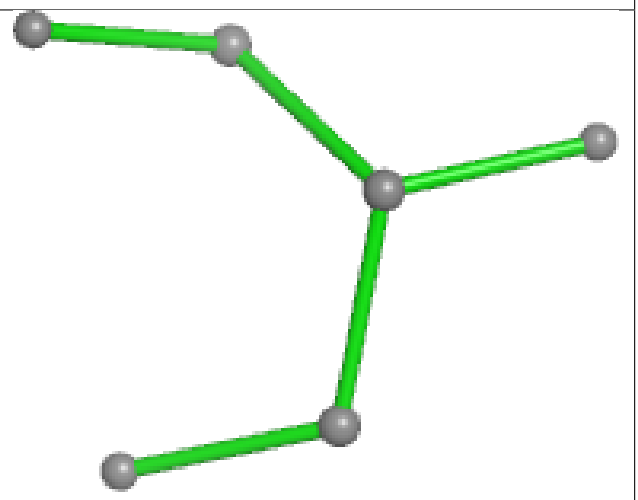
Ligand GOL C 607



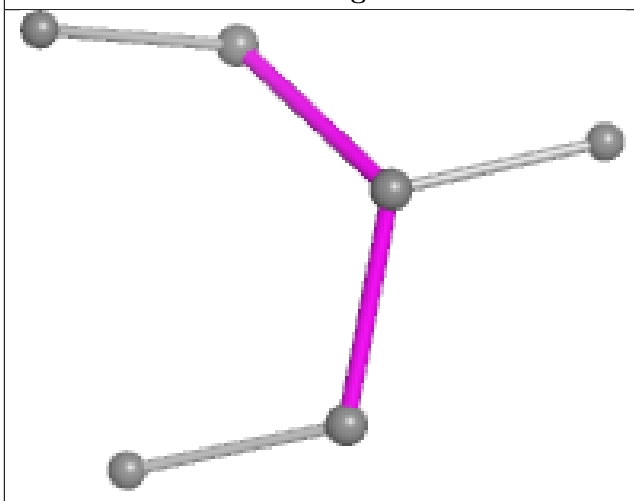
Ligand GOL D 600



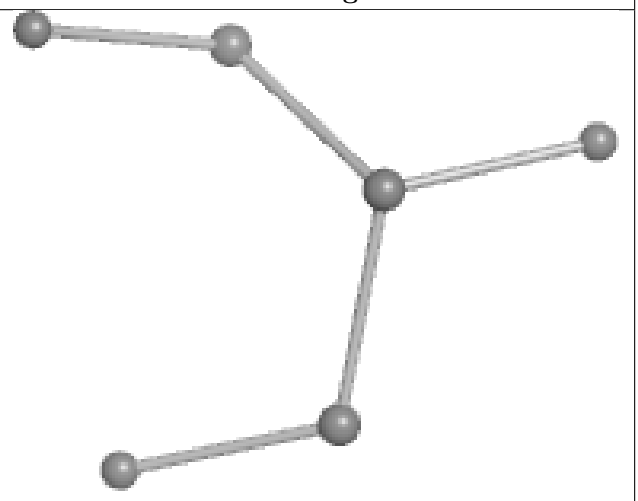
Bond lengths



Bond angles

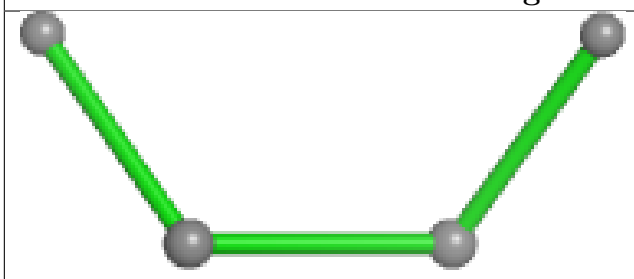


Torsions

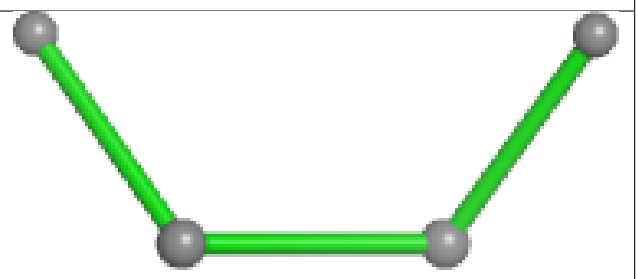


Rings

Ligand EDO A 601



Bond lengths



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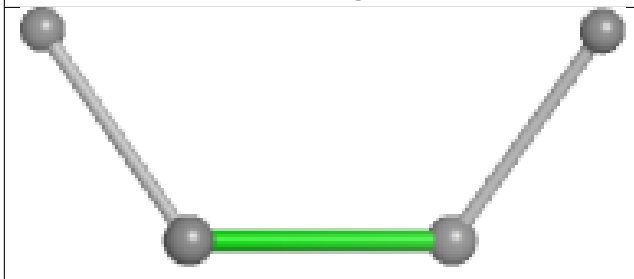
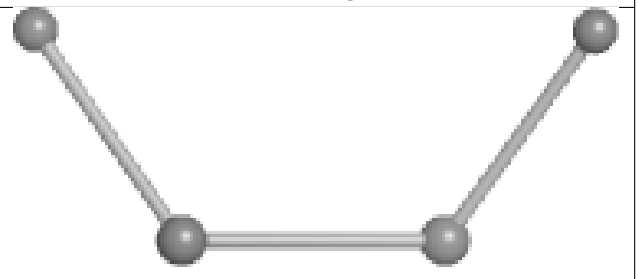
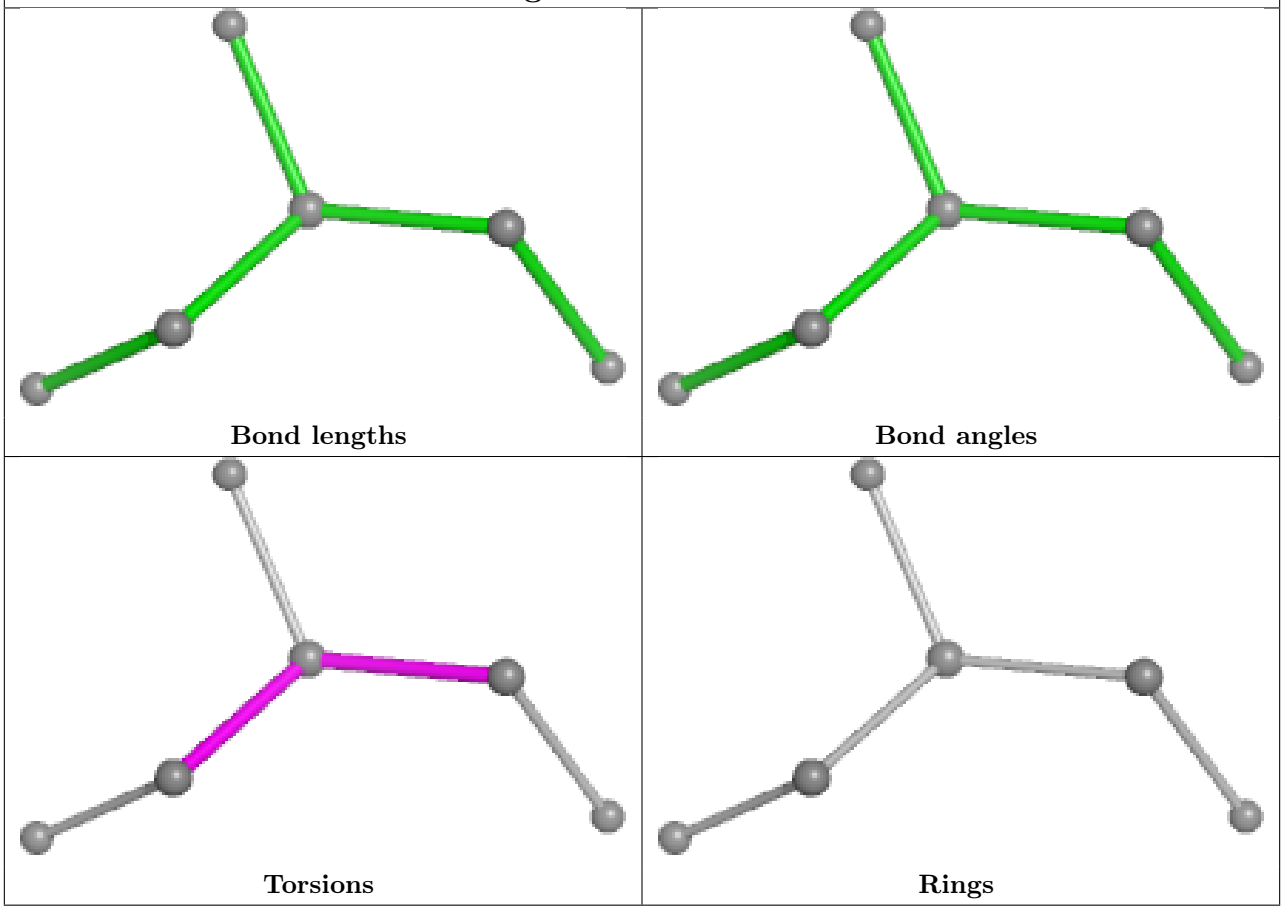


Torsions



Rings

Ligand GOL B 601



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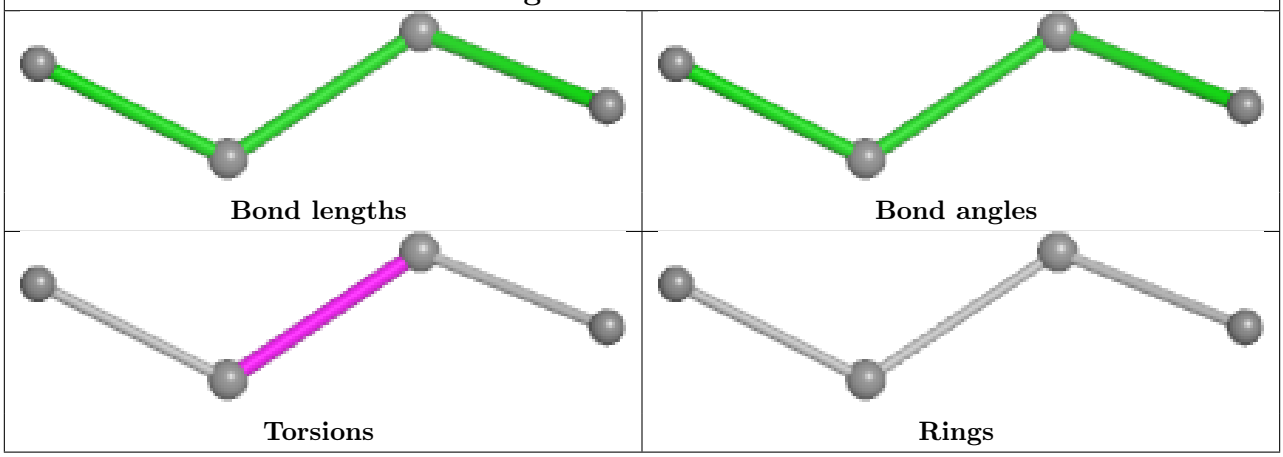

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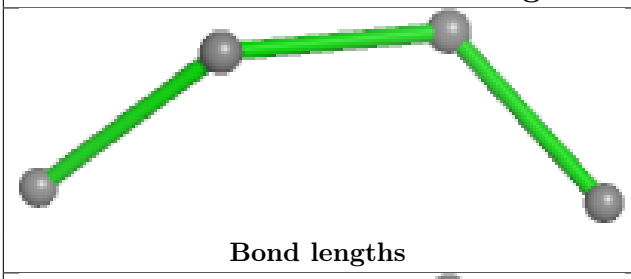
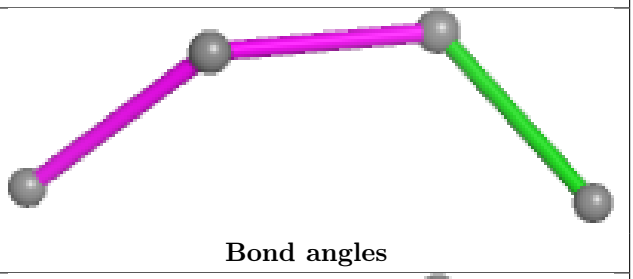
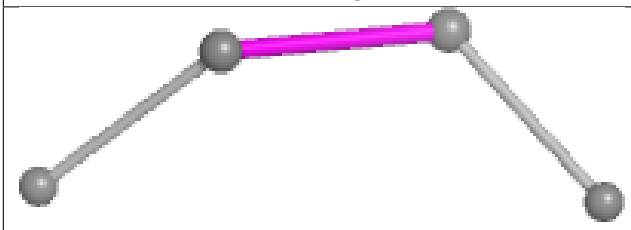


Bond lengths



Bond angles



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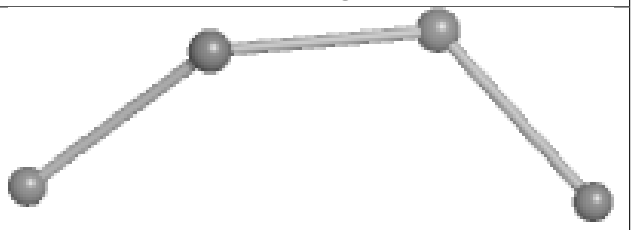

Rings

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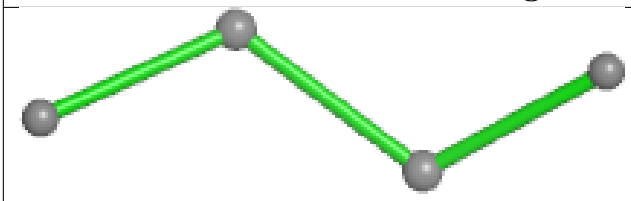
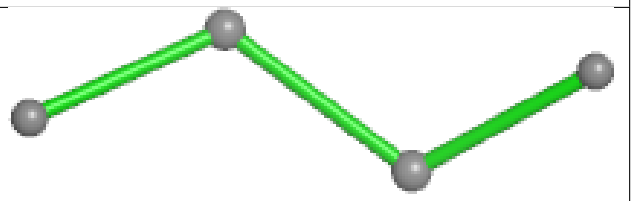
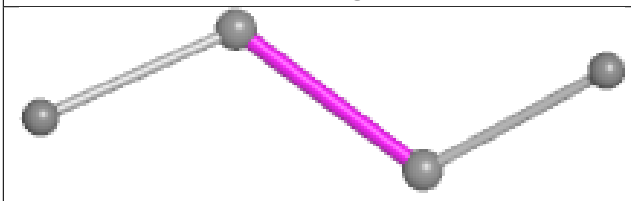


Bond lengths



Bond angles



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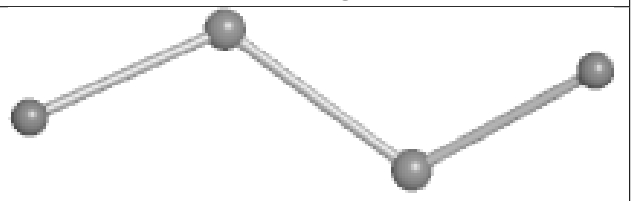
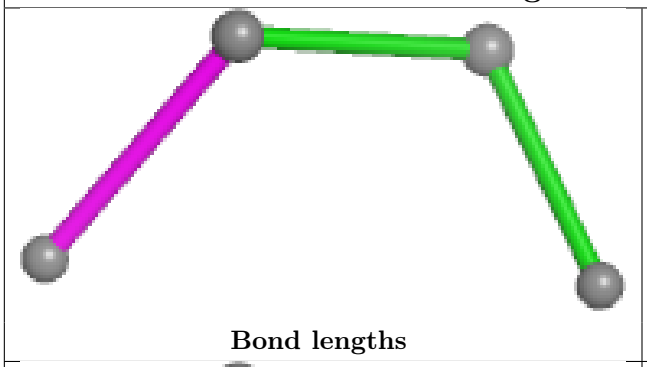
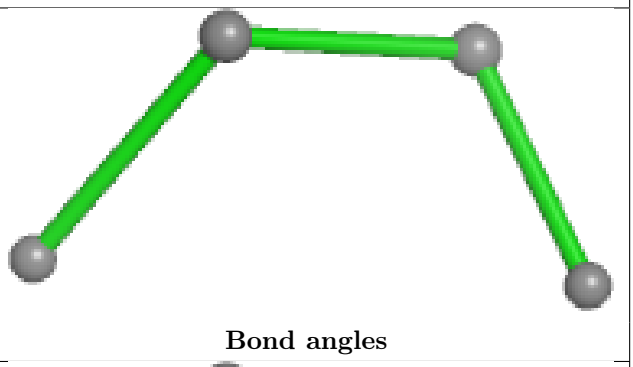


Rings

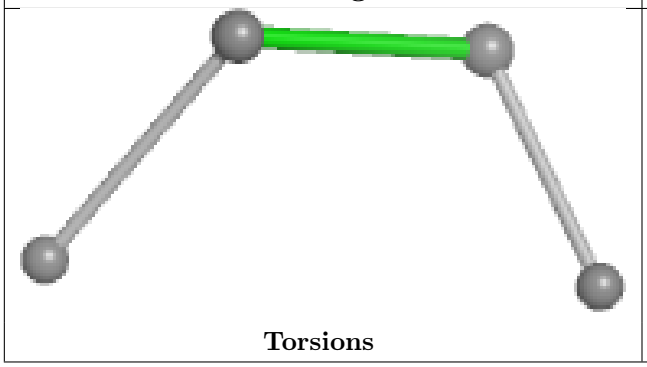
Ligand EDO C 609



Bond lengths



Bond angles



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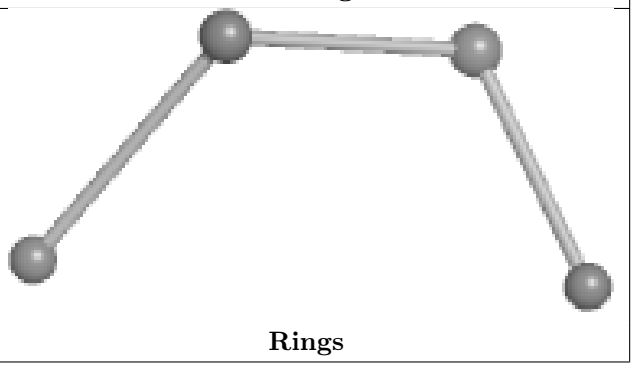

Rings

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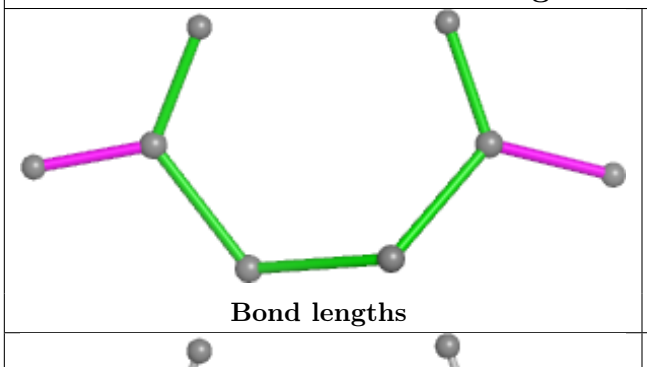

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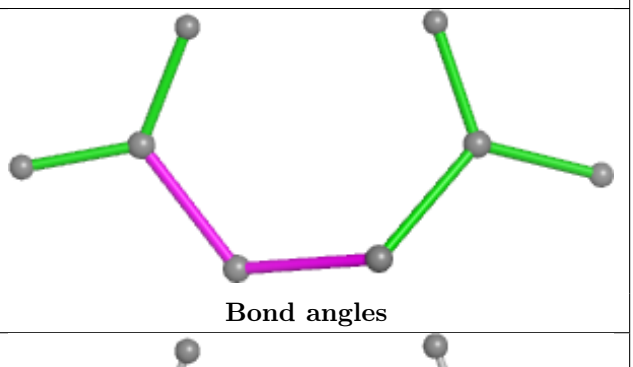

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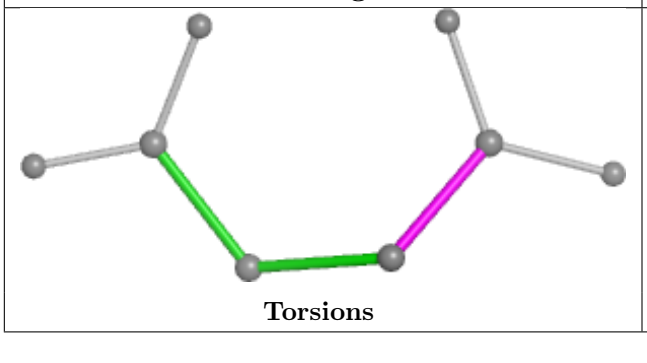

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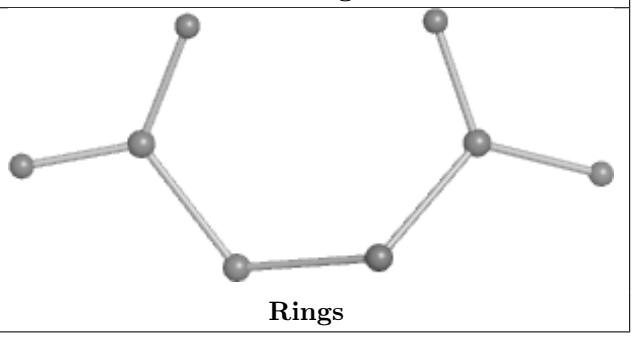
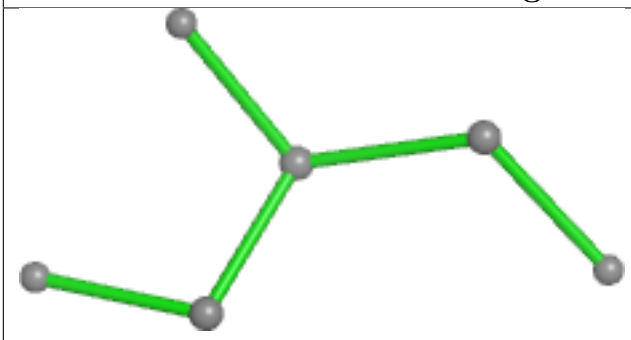


Rings

Ligand GOL C 608



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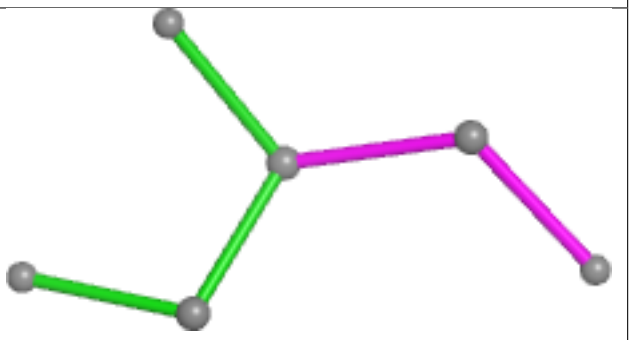
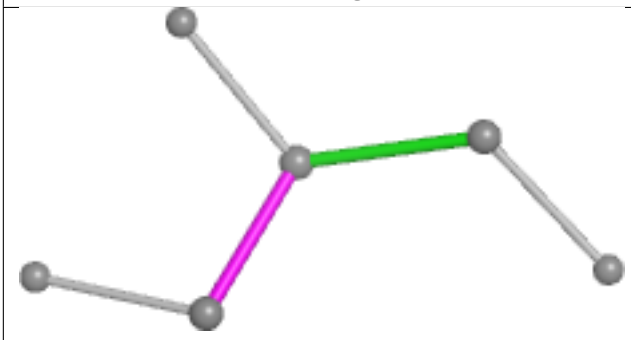


Bond angles



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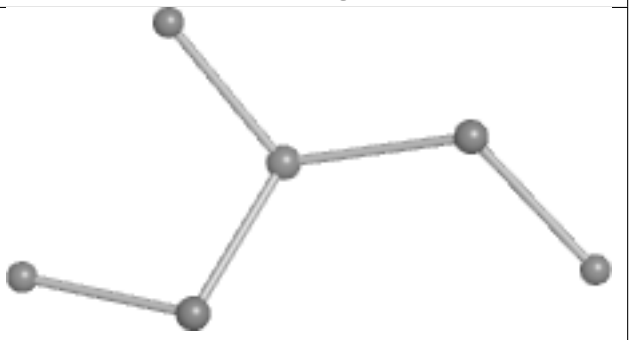
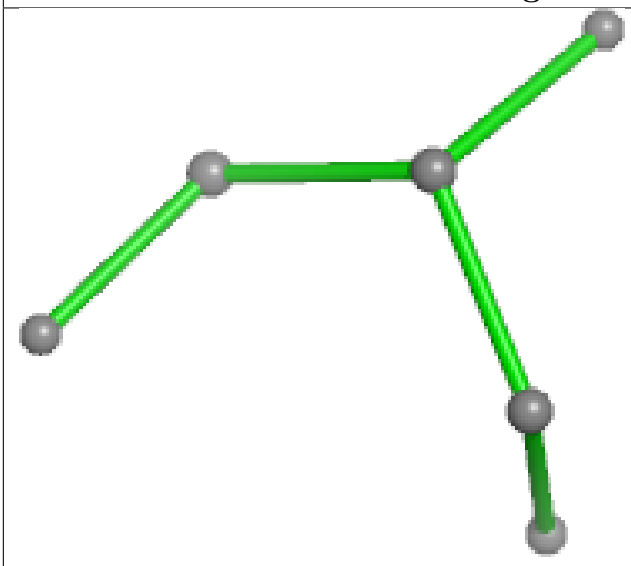


Rings

Ligand GOL A 600



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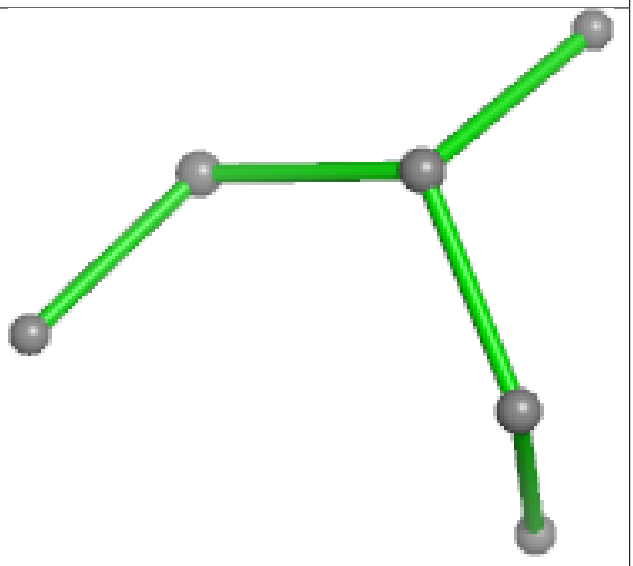
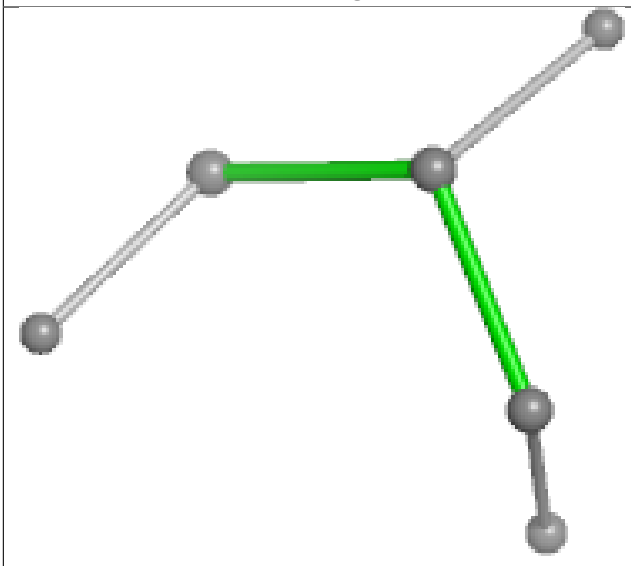
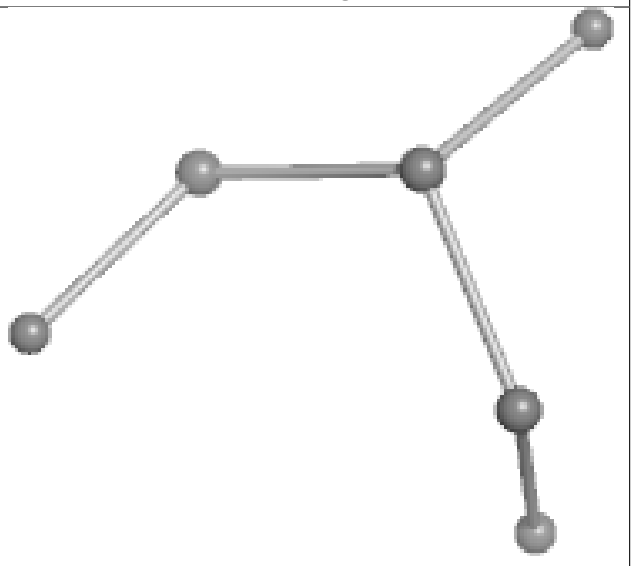


Bond angles

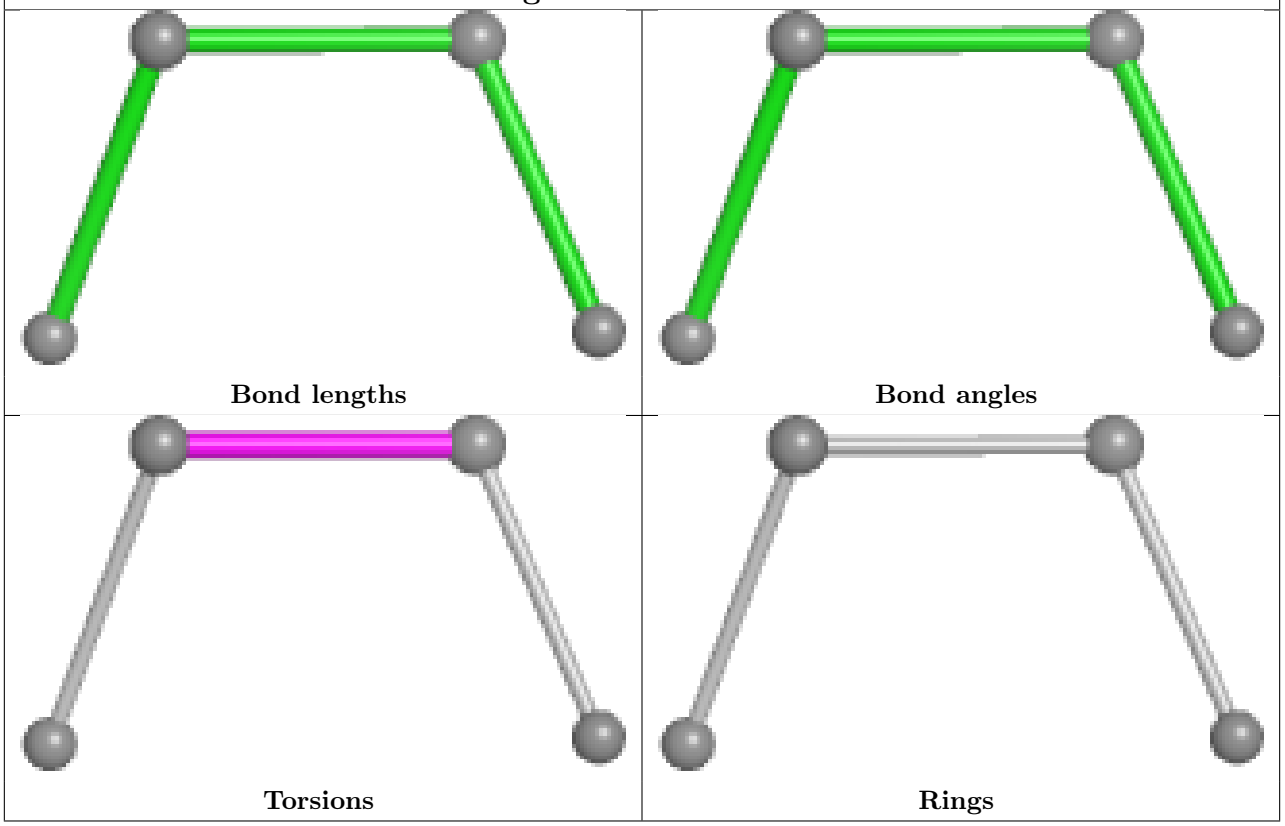


Torsions



Rings

Ligand EDO A 602



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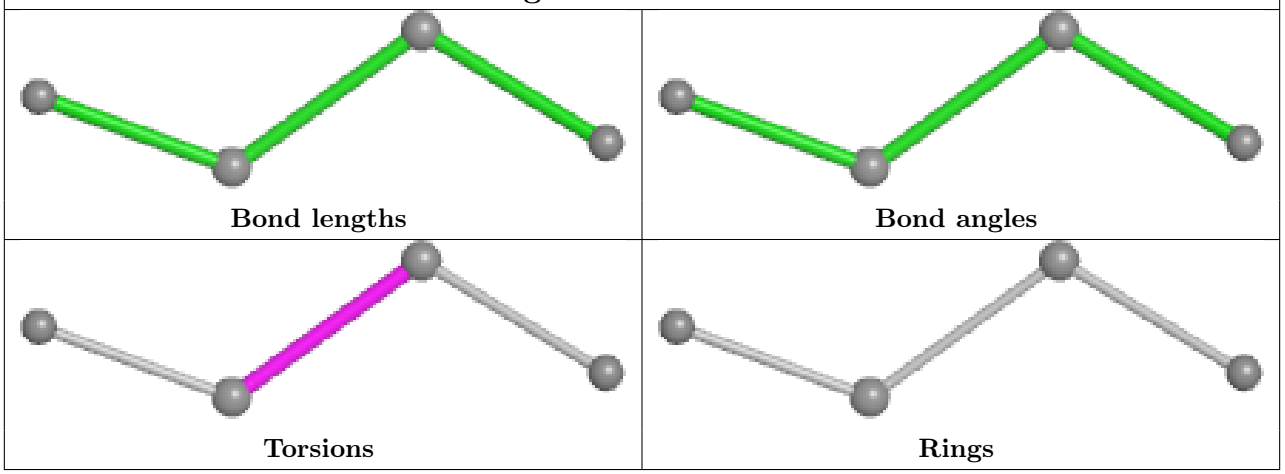
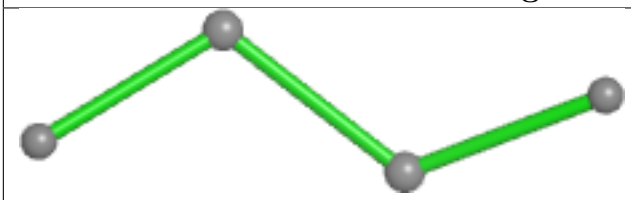
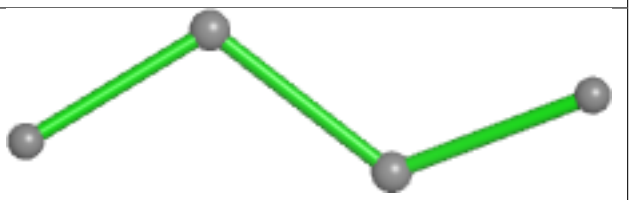


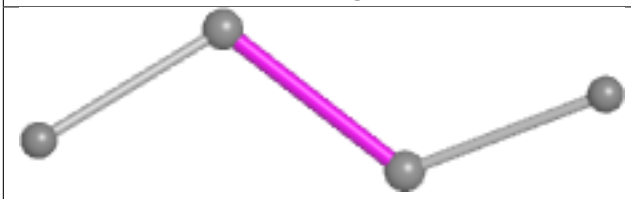
Ligand EDO D 601



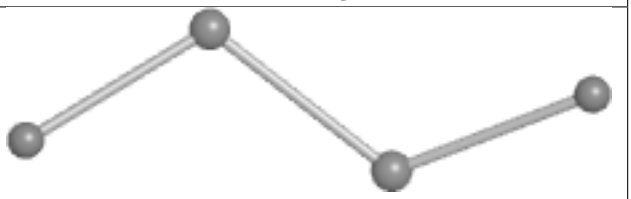
Bond lengths



Bond angles

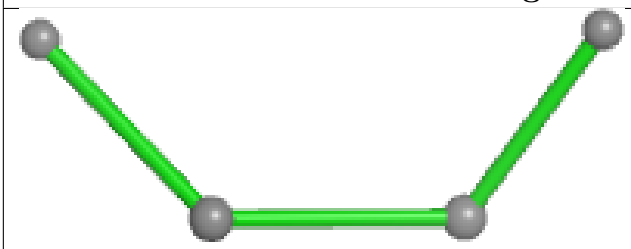


Torsions

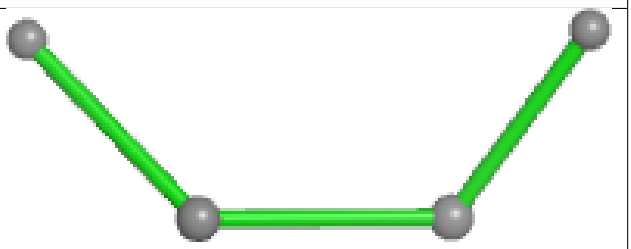


Rings

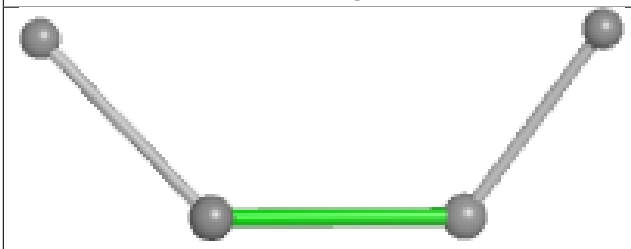
Ligand EDO B 603



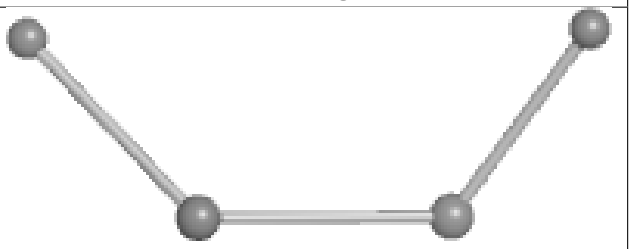
Bond lengths



Bond angles

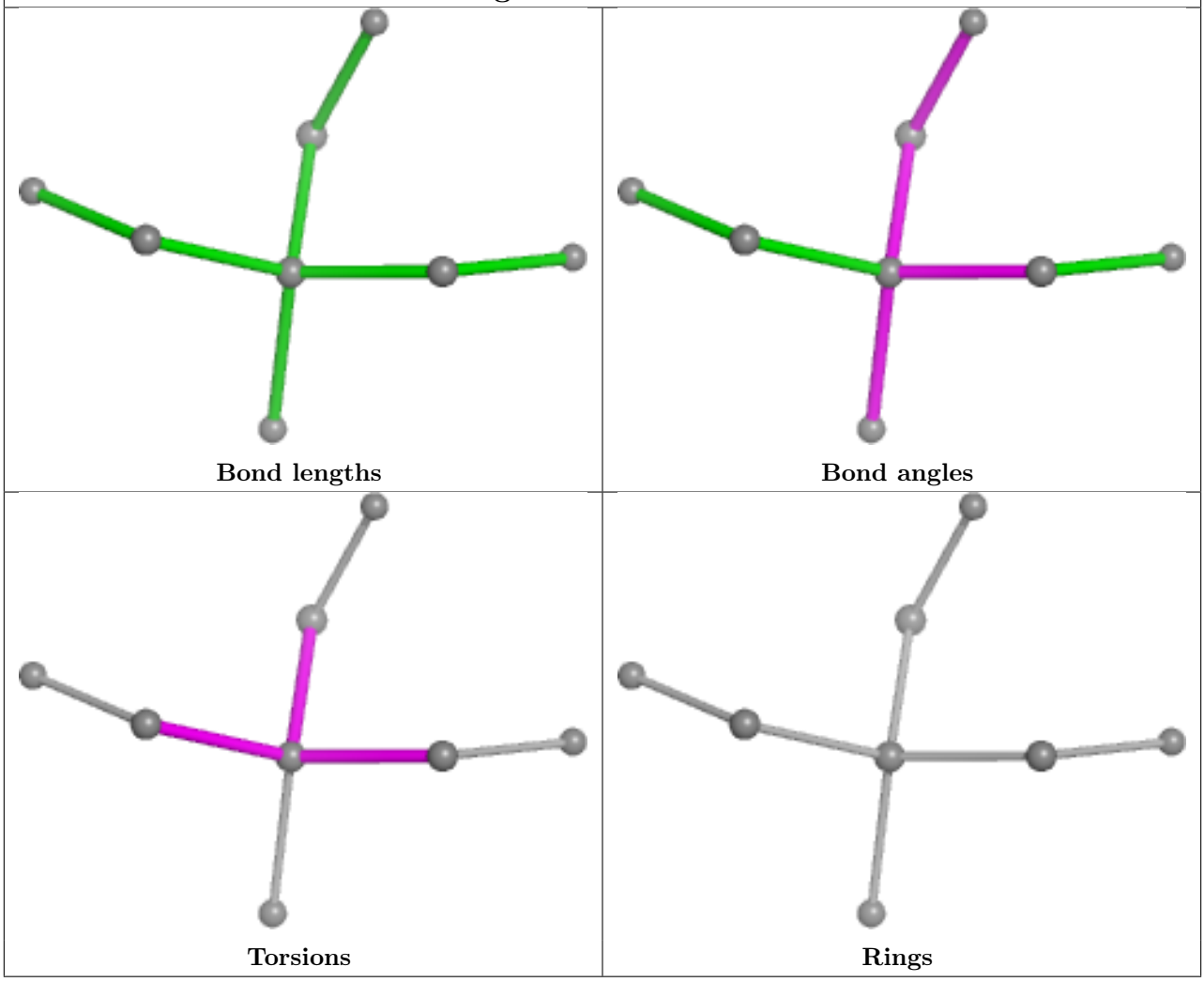


Torsions



Rings

Ligand TRS C 603



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	504/537 (93%)	0.75	49 (9%)	15	14	24, 67, 117, 150	2 (0%)
1	B	516/537 (96%)	0.31	35 (6%)	25	24	31, 50, 104, 120	0
1	C	512/537 (95%)	0.20	23 (4%)	39	38	24, 52, 89, 113	1 (0%)
1	D	501/537 (93%)	1.47	136 (27%)	2	2	49, 87, 159, 185	0
All	All	2033/2148 (94%)	0.68	243 (11%)	10	9	24, 63, 120, 185	3 (0%)

The worst 5 of 243 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	124	ILE	8.2
1	D	159	LEU	6.3
1	D	117	PRO	6.2
1	A	326	CYS	5.9
1	D	134	LEU	5.4

6.2 Non-standard residues in protein, DNA, RNA chains

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
1	ALY	D	115	12/13	0.63	0.21	105,114,121,122	0
1	ALY	A	115	12/13	0.69	0.19	69,77,90,92	0
1	ALY	C	115	12/13	0.86	0.14	50,59,81,88	0
1	ALY	B	115	12/13	0.88	0.15	45,56,80,90	0

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

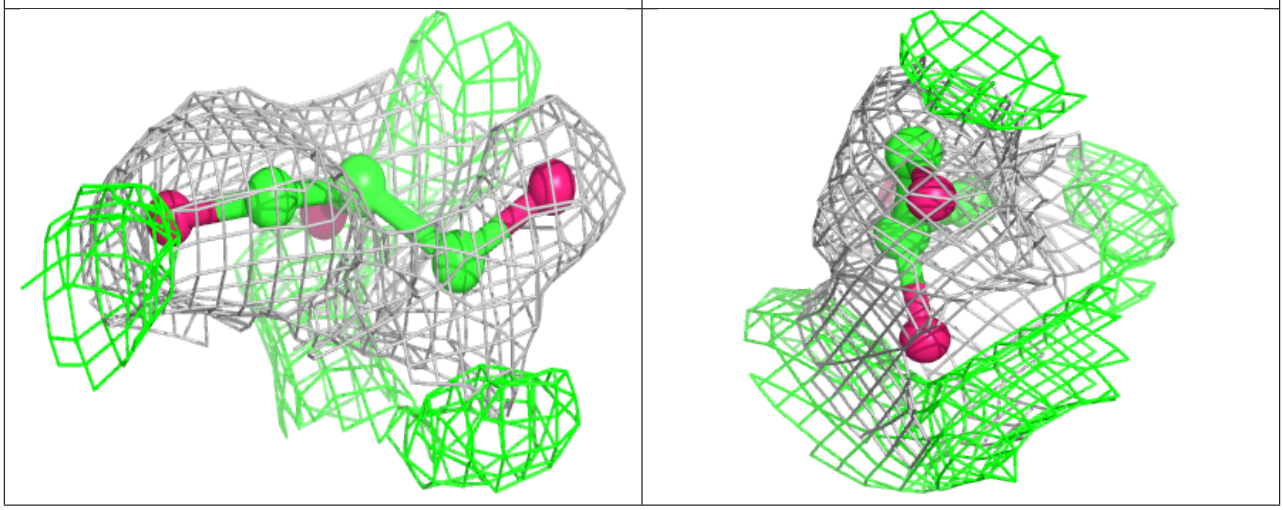
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	GOL	C	607	6/6	0.67	0.22	70,84,88,92	0
3	EDO	A	601	4/4	0.73	0.19	88,91,92,93	0
3	EDO	D	601	4/4	0.76	0.22	80,82,84,87	0
3	EDO	A	602	4/4	0.80	0.14	60,61,62,64	0
2	GOL	C	608	6/6	0.80	0.20	42,43,44,44	0
3	EDO	C	609	4/4	0.82	0.25	46,47,47,48	0
2	GOL	B	601	6/6	0.83	0.17	53,62,63,67	0
3	EDO	C	605	4/4	0.84	0.22	64,68,70,71	0
5	TRS	C	603	8/8	0.86	0.17	52,54,55,60	0
3	EDO	C	601	4/4	0.87	0.17	54,55,55,61	0
2	GOL	A	600	6/6	0.88	0.13	64,71,72,73	0
7	K	C	610	1/1	0.88	0.16	72,72,72,72	0
6	SIN	C	606	8/8	0.89	0.11	48,59,72,74	0
2	GOL	D	600	6/6	0.89	0.11	80,82,84,85	0
3	EDO	B	603	4/4	0.90	0.12	43,45,47,49	0
3	EDO	B	602	4/4	0.90	0.17	52,54,54,55	0
2	GOL	C	602	6/6	0.91	0.13	57,60,65,66	0
4	MG	B	604	1/1	0.94	0.06	51,51,51,51	0
3	EDO	C	604	4/4	0.94	0.11	58,59,59,60	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.

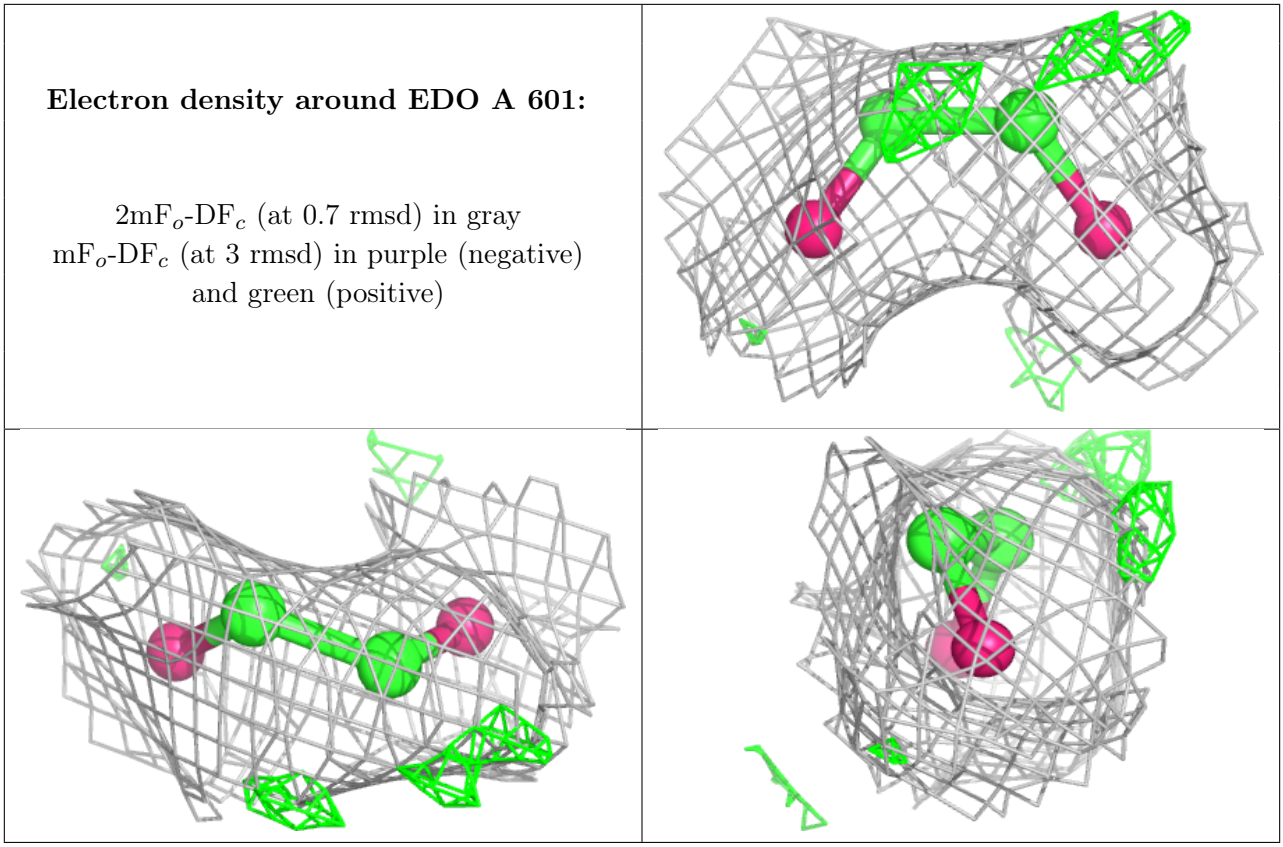
Electron density around GOL C 607:

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



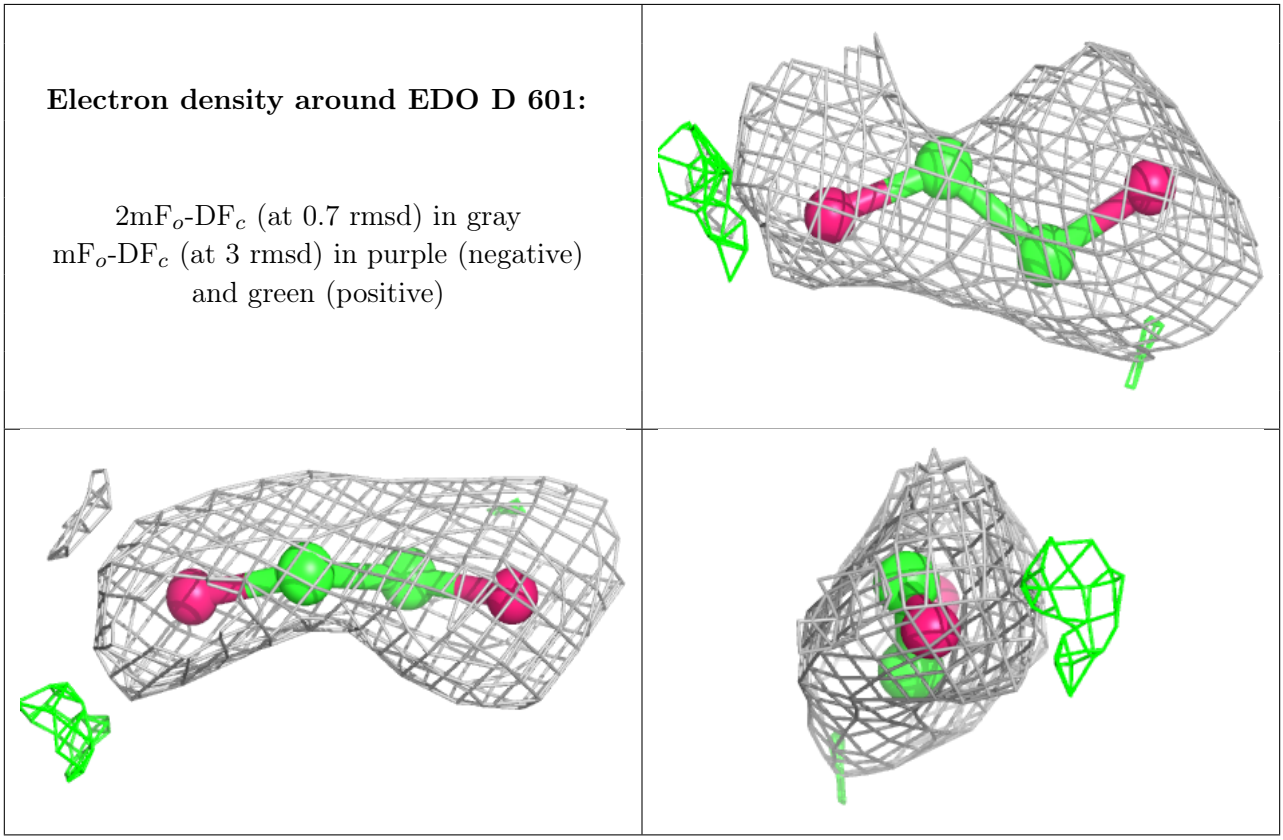
Electron density around EDO A 601:

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



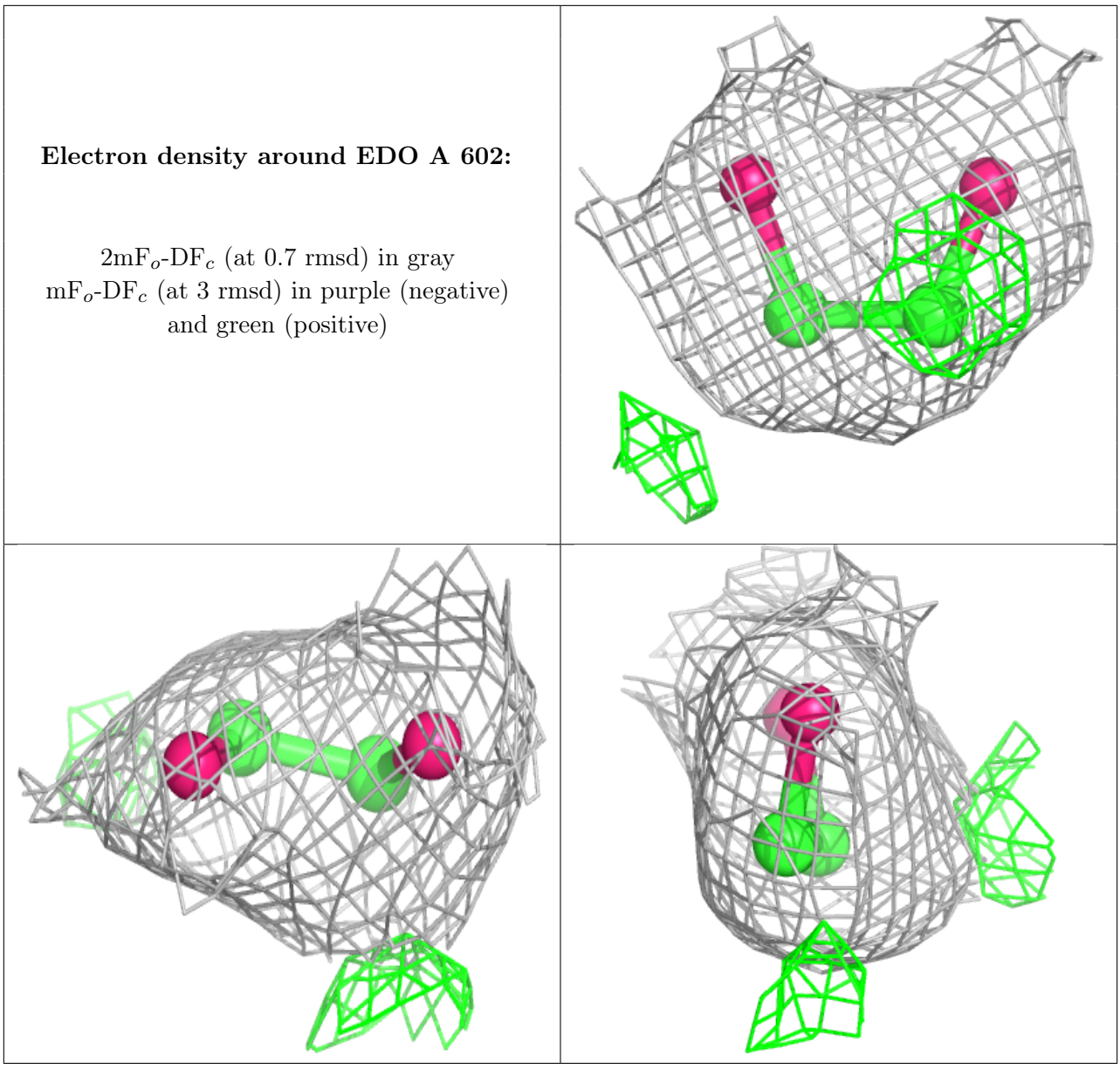
Electron density around EDO D 601:

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



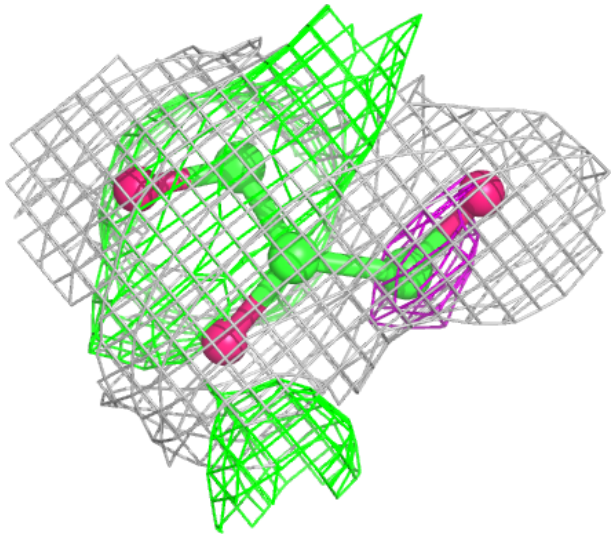
Electron density around EDO A 602:

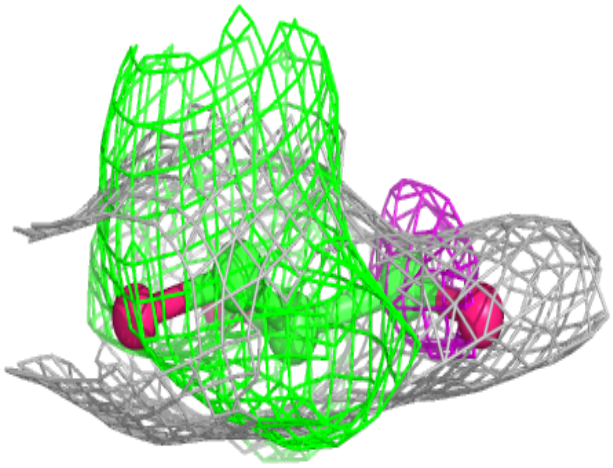
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

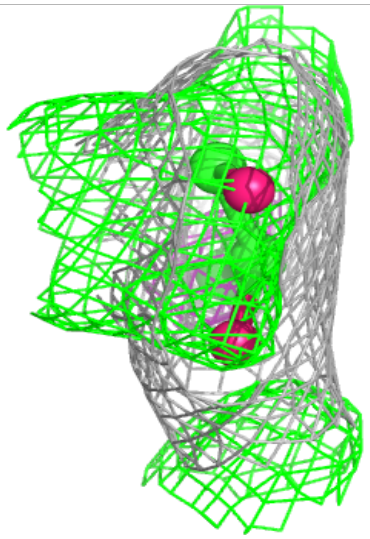


Electron density around GOL C 608:

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

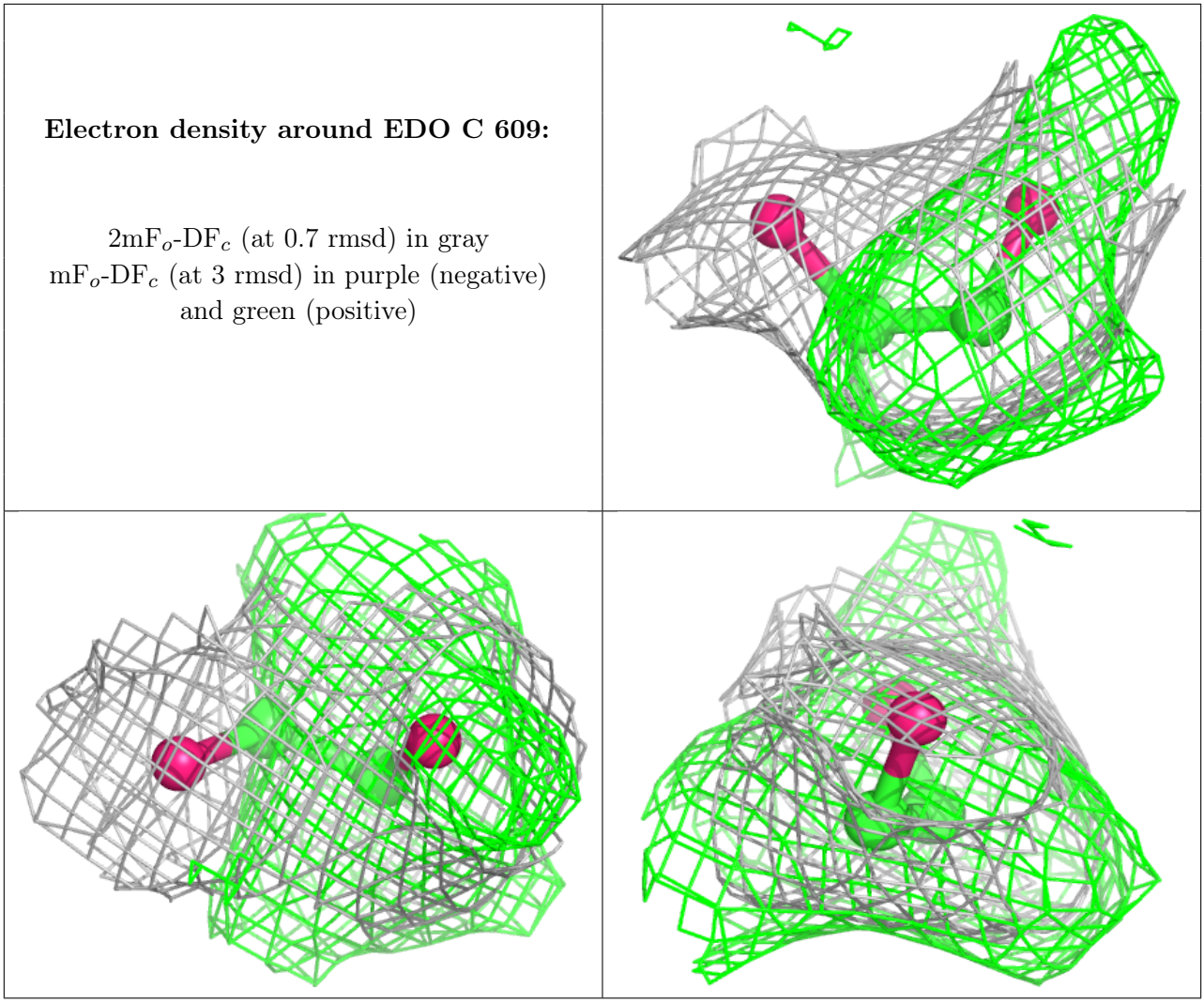






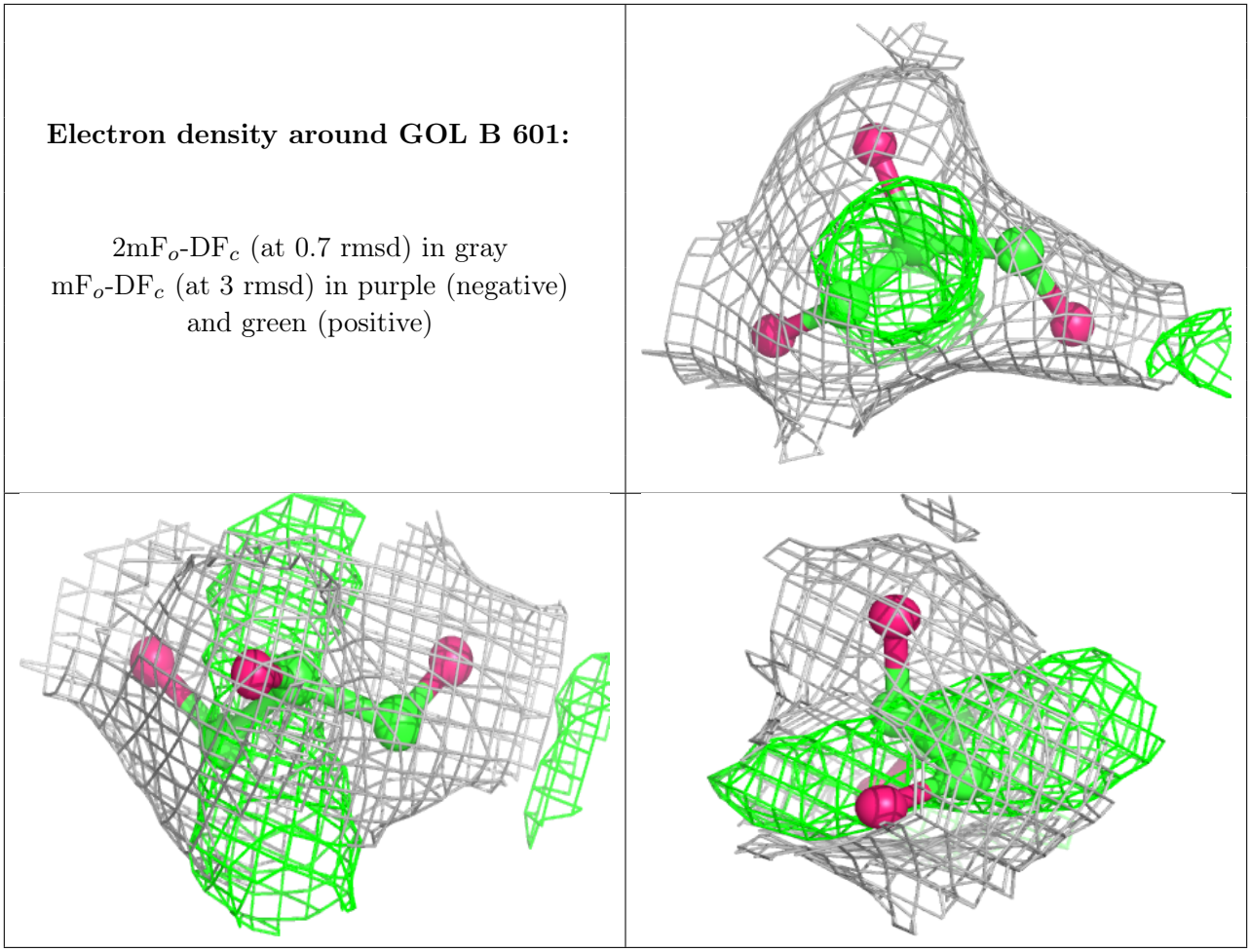
Electron density around EDO C 609:

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



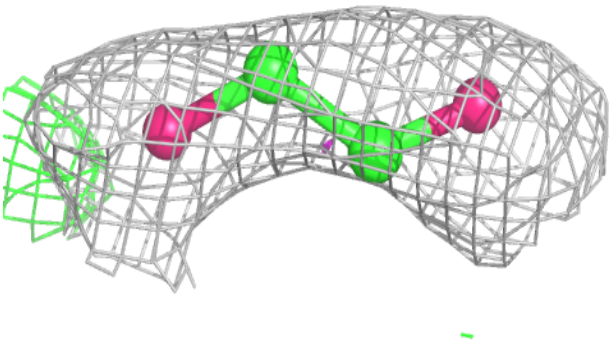
Electron density around GOL B 601:

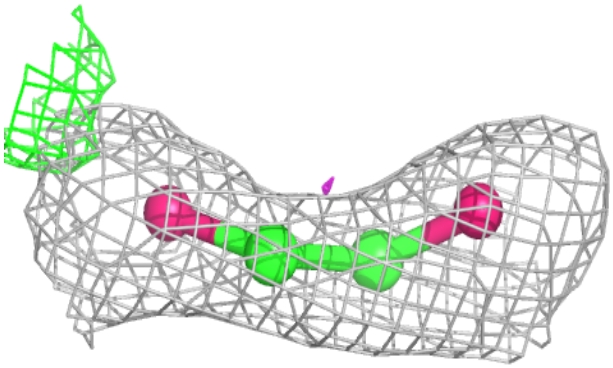
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

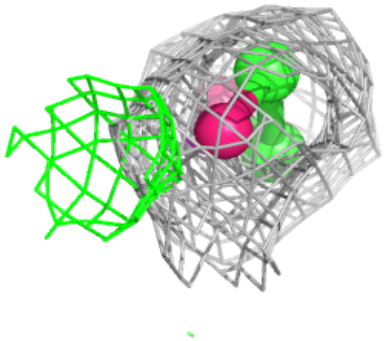


Electron density around EDO C 605:

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

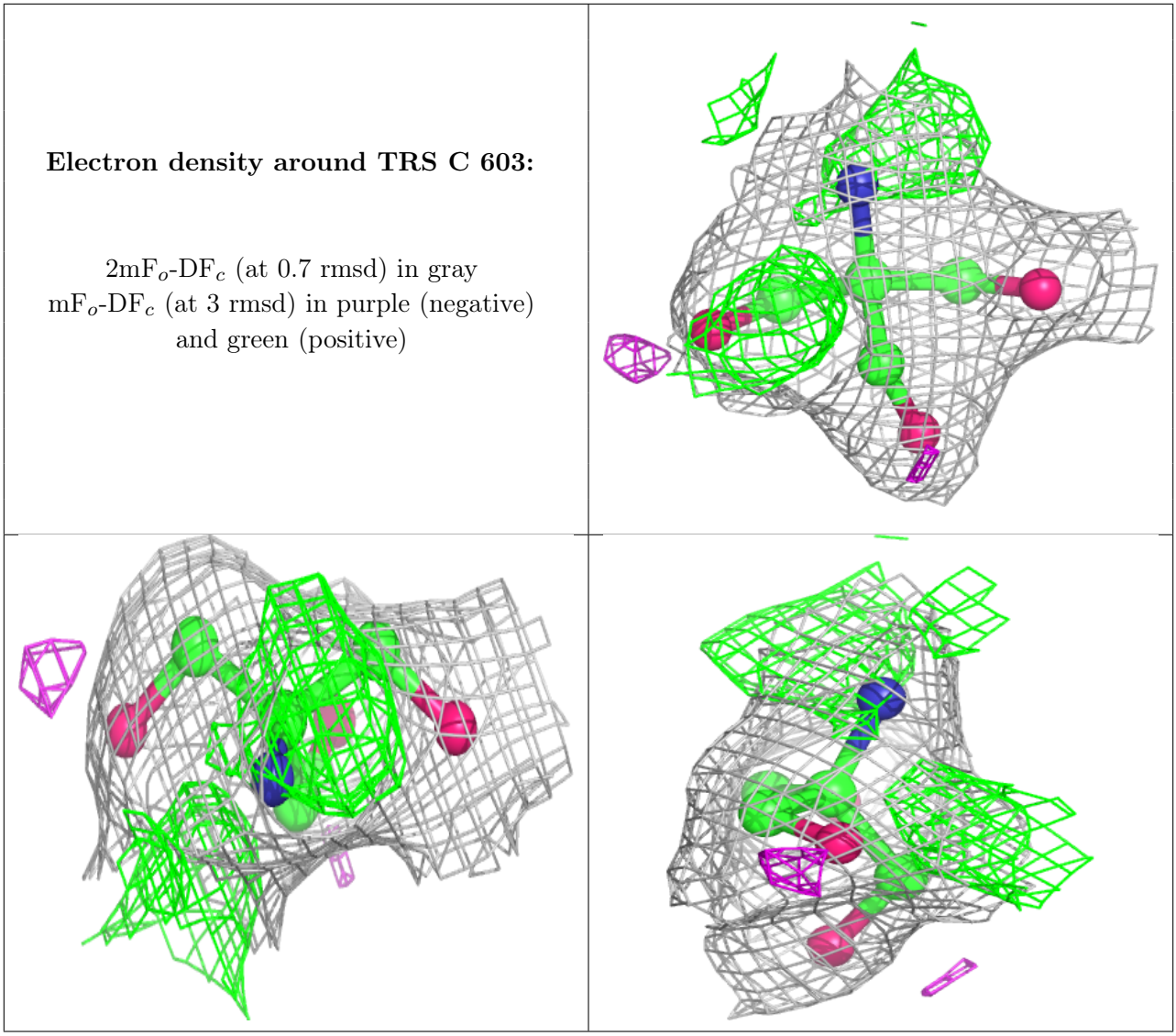






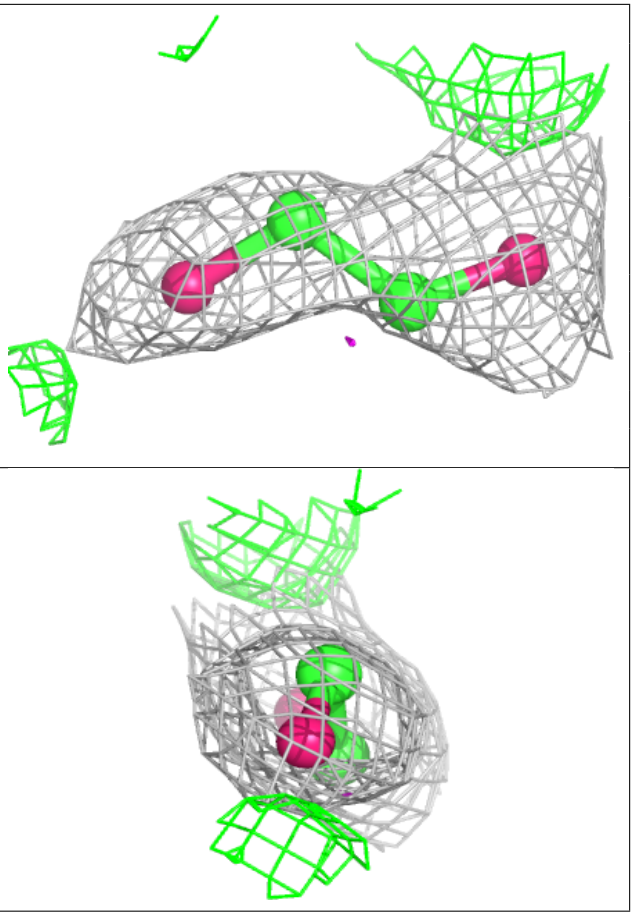
Electron density around TRS C 603:

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



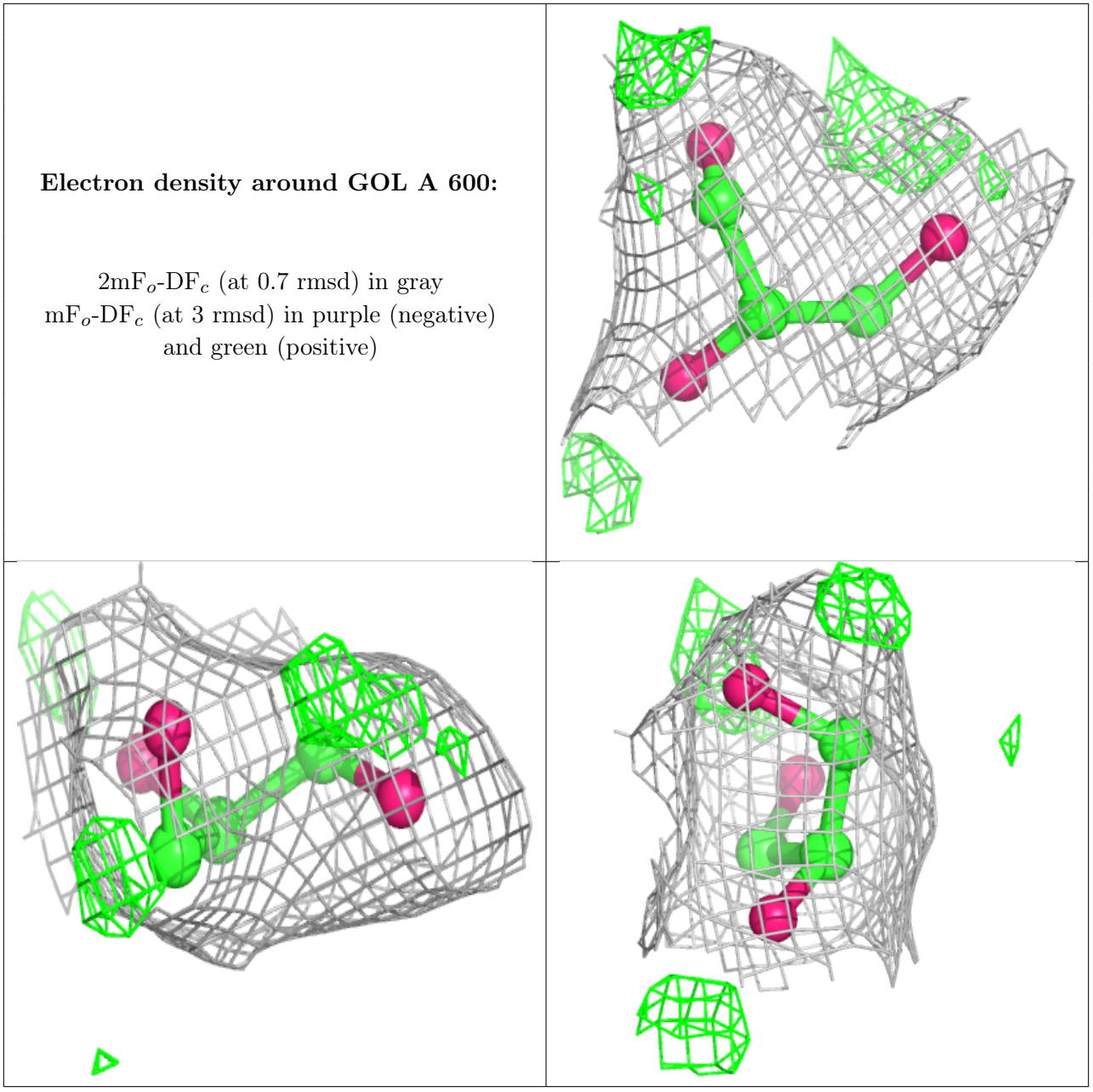
Electron density around EDO C 601:

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



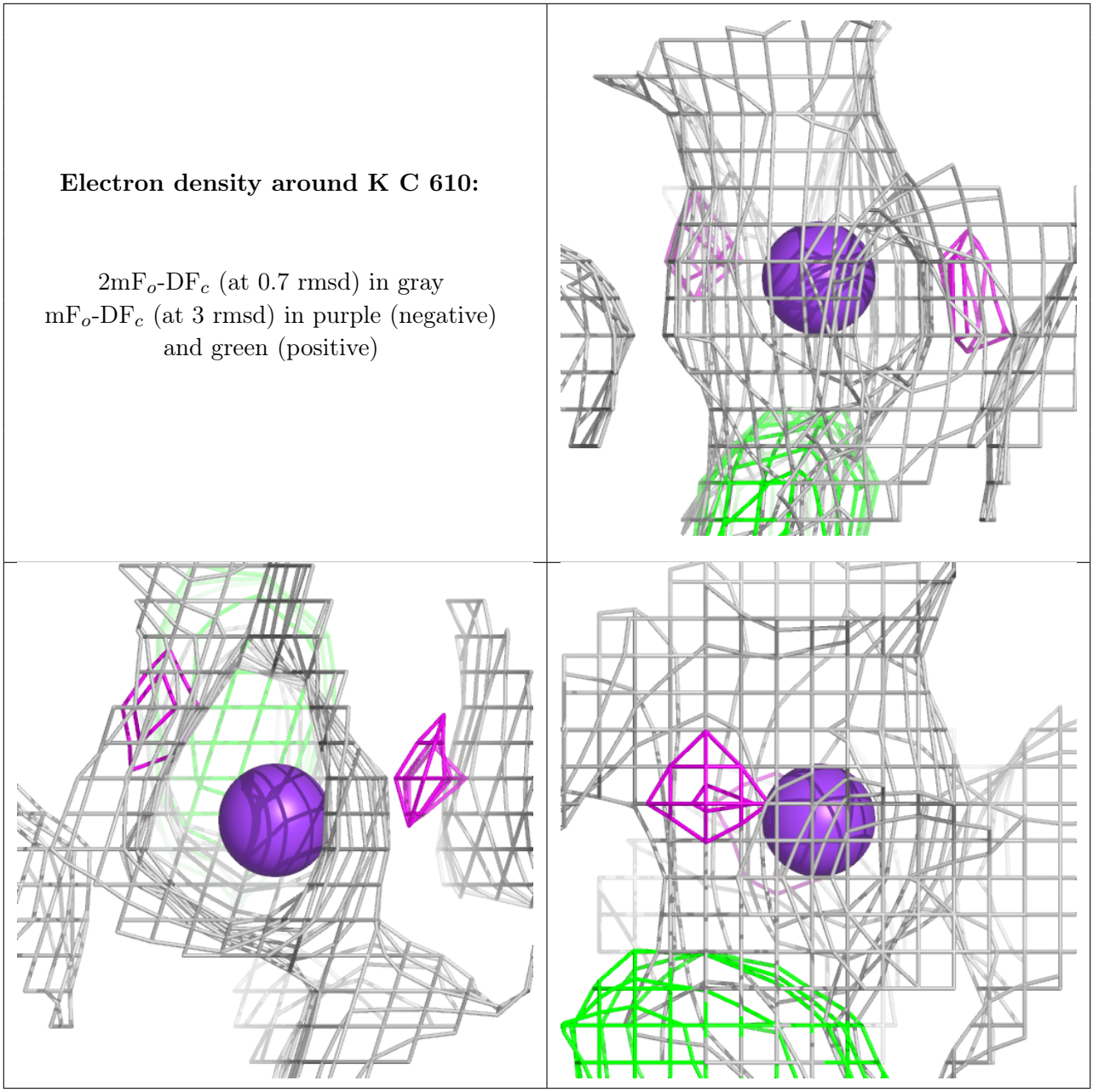
Electron density around GOL A 600:

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



Electron density around K C 610:

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



Electron density around SIN C 606:

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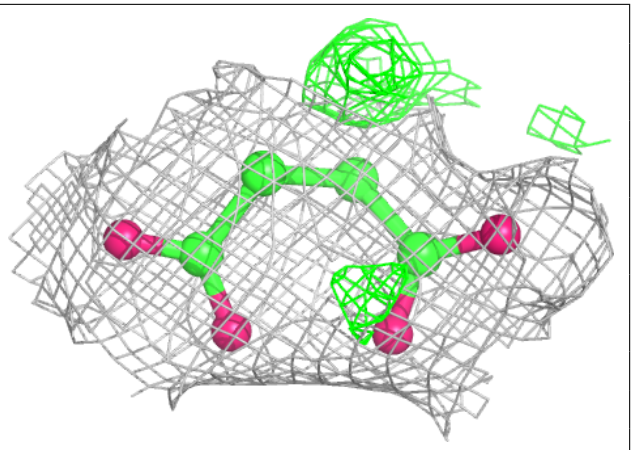
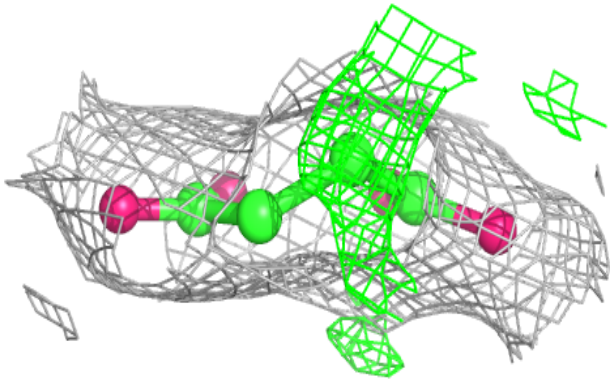
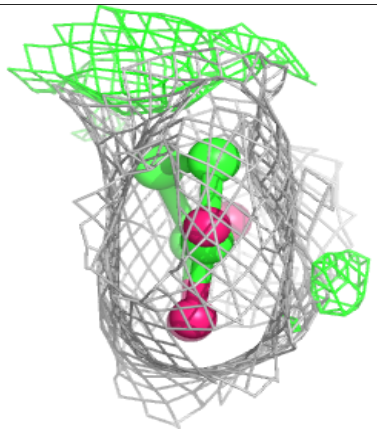
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

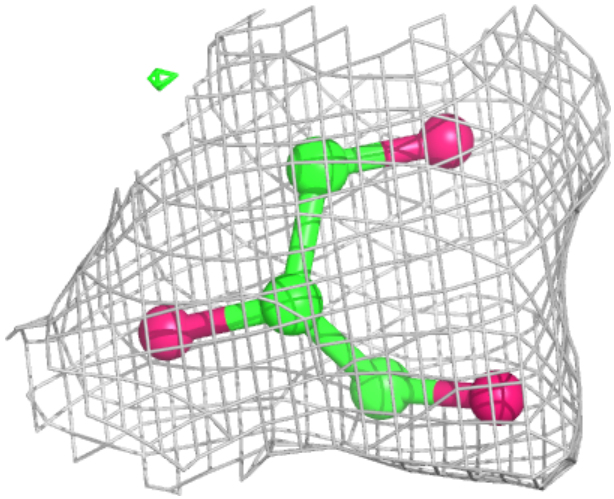


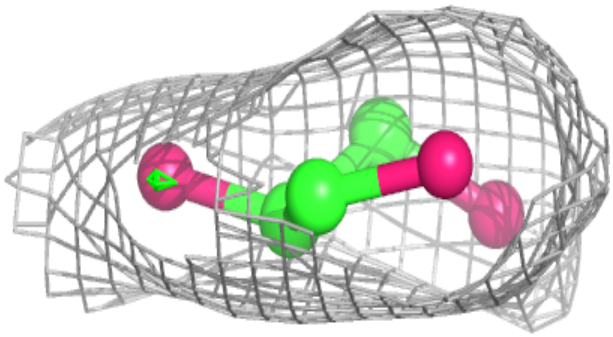


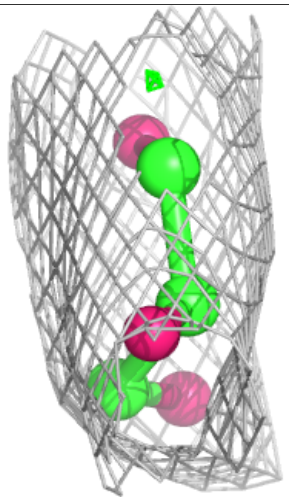


Electron density around GOL D 600:

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

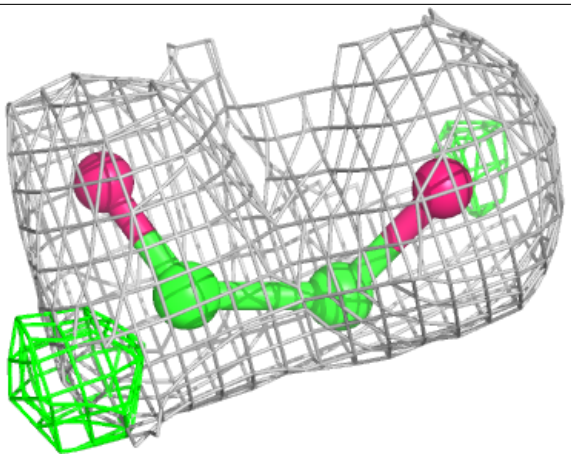


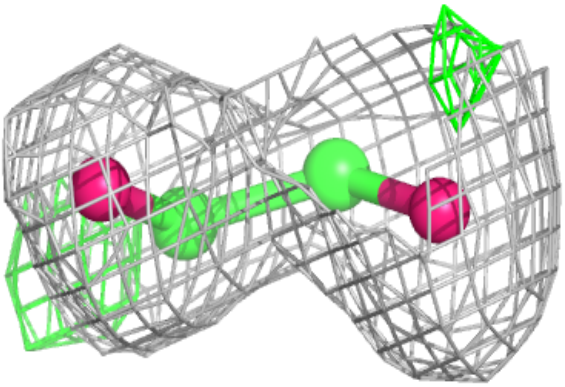


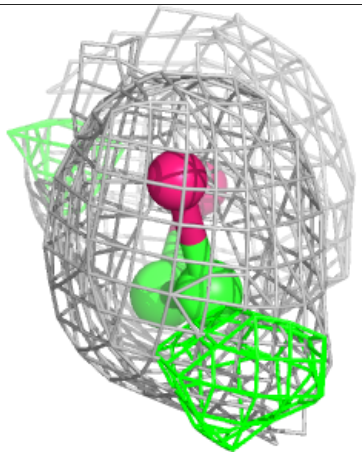


Electron density around EDO B 603:

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

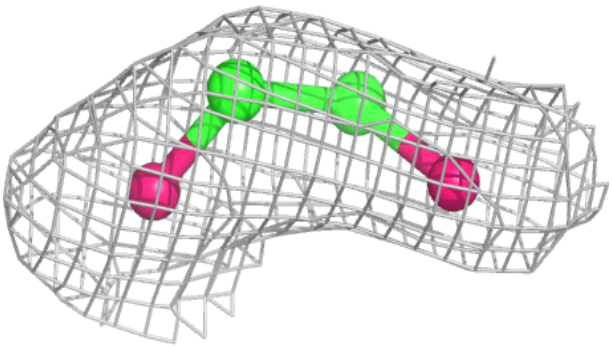


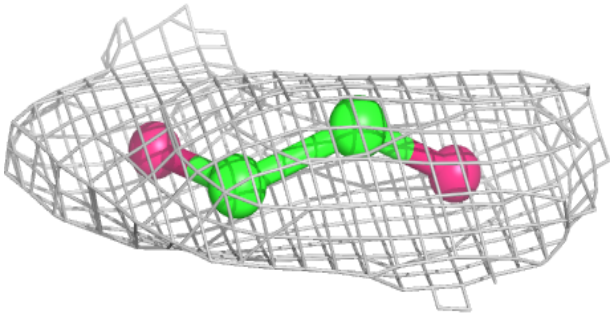


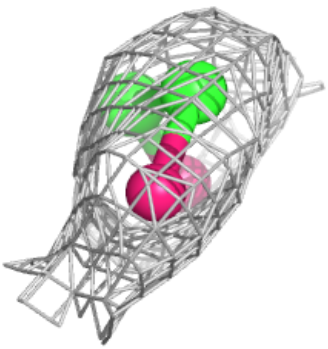


Electron density around EDO B 602:

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

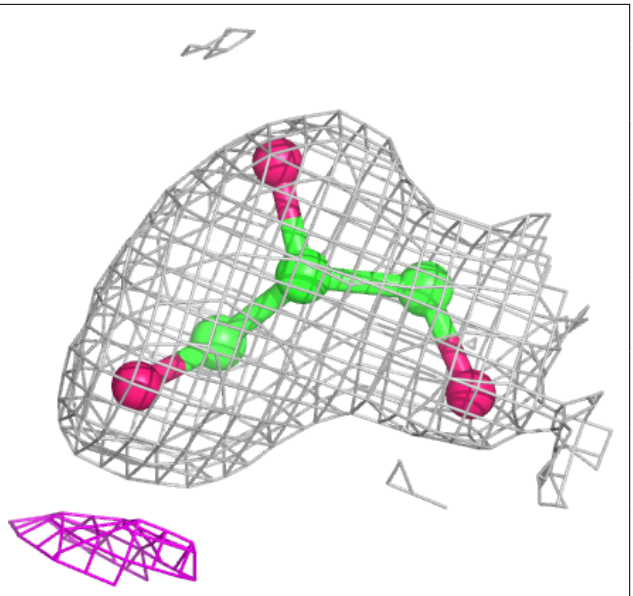


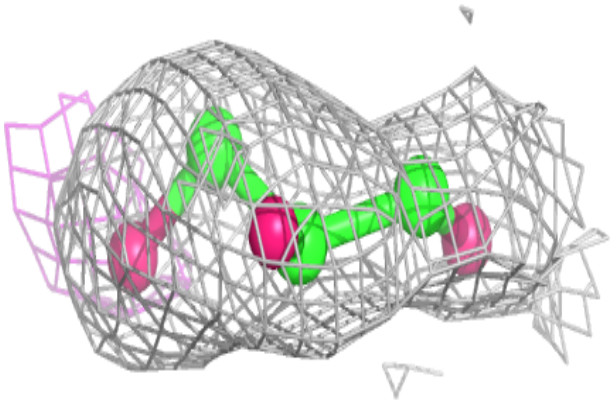


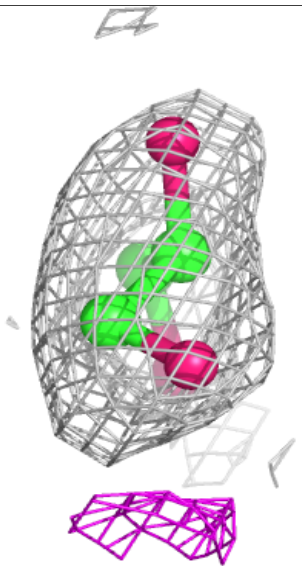


Electron density around GOL C 602:

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

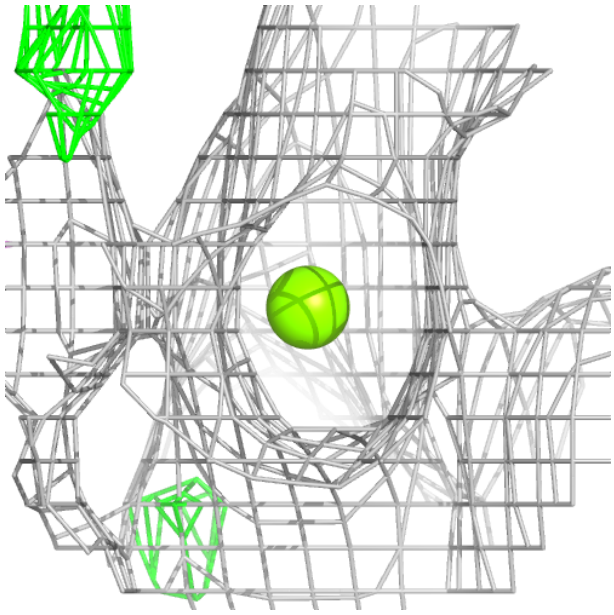


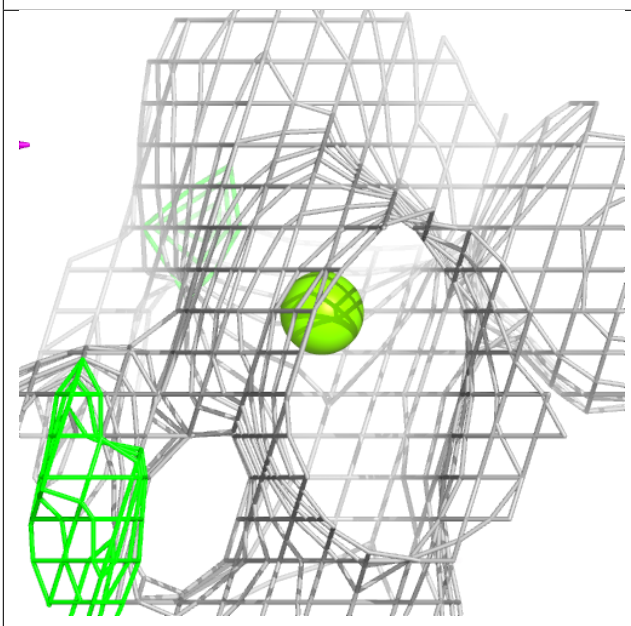


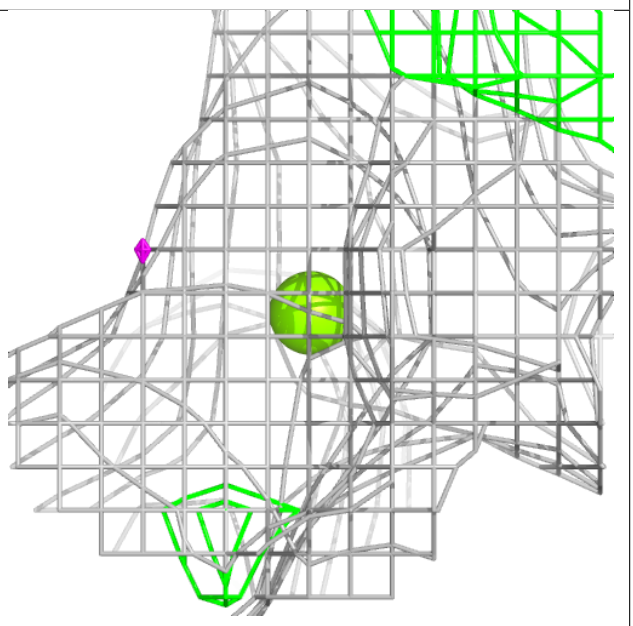


Electron density around MG B 604:

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

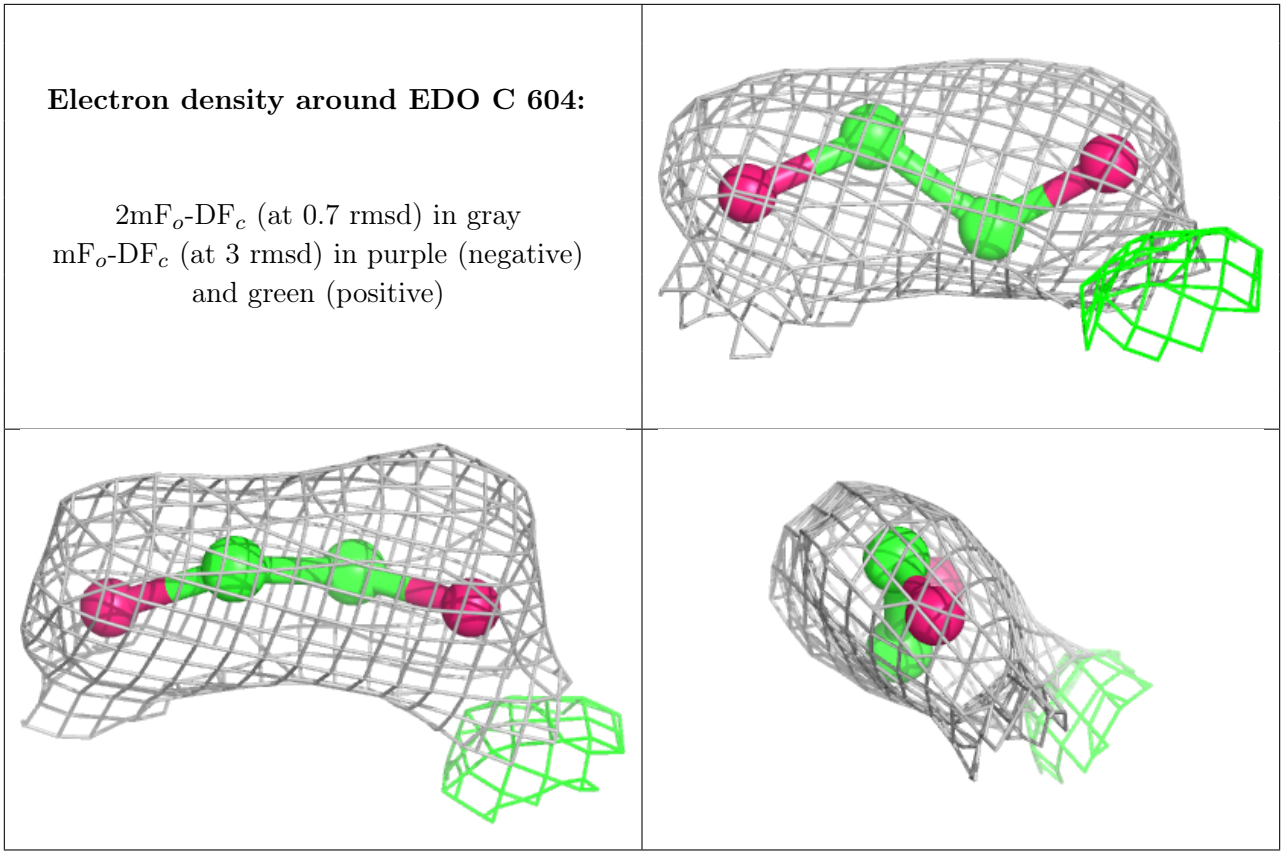






Electron density around EDO C 604:

$2mF_o$-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 (i)

There are no such residues in this entry.