



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 16, 2023 – 04:12 PM EST

PDB ID : 4P9C
Title : Crystal structure of dCMP deaminase from the cyanophage S-TIM5 in complex with dCMP and dUMP
Authors : Marx, A.; Alian, A.
Deposited on : 2014-04-03
Resolution : 2.60 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 ⓘ 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

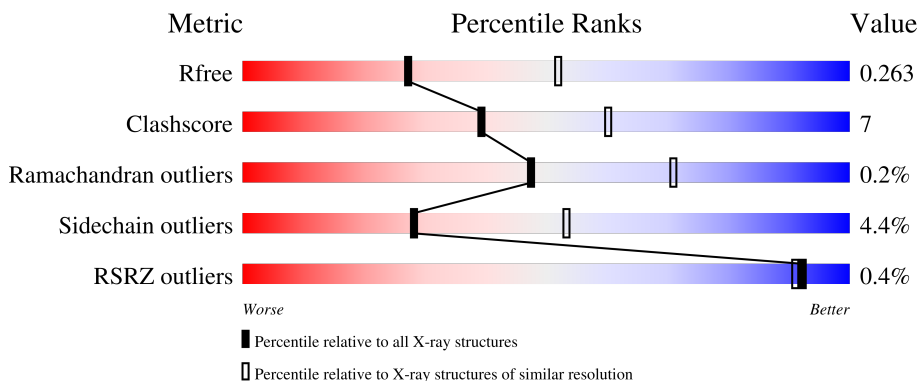
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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 $\leq 5\%$. 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	138	
1	B	138	
1	C	138	
1	D	138	
1	E	138	

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Mol	Chain	Length	Quality of chain	
1	F	138		82% 17% .
1	G	138		86% 11% ..
1	H	138		83% 12% ..
1	I	138		91% 7% ..
1	J	138		81% 15% ..
1	K	138		86% 10% ..
1	L	138		84% 12% ..

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	DU	B	203	-	X	-	-
4	DU	C	203	-	-	X	-
4	DU	F	203	-	-	X	-
4	DU	L	203	-	X	-	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 13446 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 Deoxycytidylate deaminase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	136	1055	658	180	204	13	0	2	0
1	B	136	1055	658	180	204	13	0	2	0
1	C	136	1055	658	180	204	13	0	2	0
1	D	136	1053	657	180	202	14	0	1	0
1	E	136	1058	659	181	205	13	0	2	0
1	F	136	1058	659	181	205	13	0	2	0
1	G	136	1055	658	180	204	13	0	2	0
1	H	135	1042	650	177	203	12	0	1	0
1	I	135	1042	650	177	203	12	0	1	0
1	J	136	1055	658	180	204	13	0	2	0
1	K	136	1055	658	180	204	13	0	2	0
1	L	135	1045	652	177	203	13	0	2	0

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP H6WFU3
A	-1	SER	-	expression tag	UNP H6WFU3
A	0	HIS	-	expression tag	UNP H6WFU3
B	-2	GLY	-	expression tag	UNP H6WFU3
B	-1	SER	-	expression tag	UNP H6WFU3

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	HIS	-	expression tag	UNP H6WUFU3
C	-2	GLY	-	expression tag	UNP H6WUFU3
C	-1	SER	-	expression tag	UNP H6WUFU3
C	0	HIS	-	expression tag	UNP H6WUFU3
D	-2	GLY	-	expression tag	UNP H6WUFU3
D	-1	SER	-	expression tag	UNP H6WUFU3
D	0	HIS	-	expression tag	UNP H6WUFU3
E	-2	GLY	-	expression tag	UNP H6WUFU3
E	-1	SER	-	expression tag	UNP H6WUFU3
E	0	HIS	-	expression tag	UNP H6WUFU3
F	-2	GLY	-	expression tag	UNP H6WUFU3
F	-1	SER	-	expression tag	UNP H6WUFU3
F	0	HIS	-	expression tag	UNP H6WUFU3
G	-2	GLY	-	expression tag	UNP H6WUFU3
G	-1	SER	-	expression tag	UNP H6WUFU3
G	0	HIS	-	expression tag	UNP H6WUFU3
H	-2	GLY	-	expression tag	UNP H6WUFU3
H	-1	SER	-	expression tag	UNP H6WUFU3
H	0	HIS	-	expression tag	UNP H6WUFU3
I	-2	GLY	-	expression tag	UNP H6WUFU3
I	-1	SER	-	expression tag	UNP H6WUFU3
I	0	HIS	-	expression tag	UNP H6WUFU3
J	-2	GLY	-	expression tag	UNP H6WUFU3
J	-1	SER	-	expression tag	UNP H6WUFU3
J	0	HIS	-	expression tag	UNP H6WUFU3
K	-2	GLY	-	expression tag	UNP H6WUFU3
K	-1	SER	-	expression tag	UNP H6WUFU3
K	0	HIS	-	expression tag	UNP H6WUFU3
L	-2	GLY	-	expression tag	UNP H6WUFU3
L	-1	SER	-	expression tag	UNP H6WUFU3
L	0	HIS	-	expression tag	UNP H6WUFU3

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

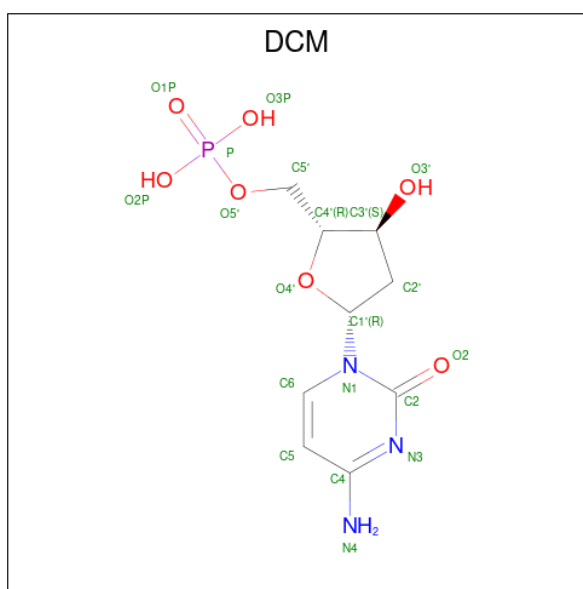
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0
2	B	1	Total Zn 1 1	0	0
2	C	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	E	1	Total	Zn	0	0
			1	1		
2	F	1	Total	Zn	0	0
			1	1		
2	G	1	Total	Zn	0	0
			1	1		
2	H	1	Total	Zn	0	0
			1	1		
2	I	1	Total	Zn	0	0
			1	1		
2	J	1	Total	Zn	0	0
			1	1		
2	K	1	Total	Zn	0	0
			1	1		
2	L	1	Total	Zn	0	0
			1	1		

- Molecule 3 is 2'-DEOXYCYTIDINE-5'-MONOPHOSPHATE (three-letter code: DCM) (formula: C₉H₁₄N₃O₇P).



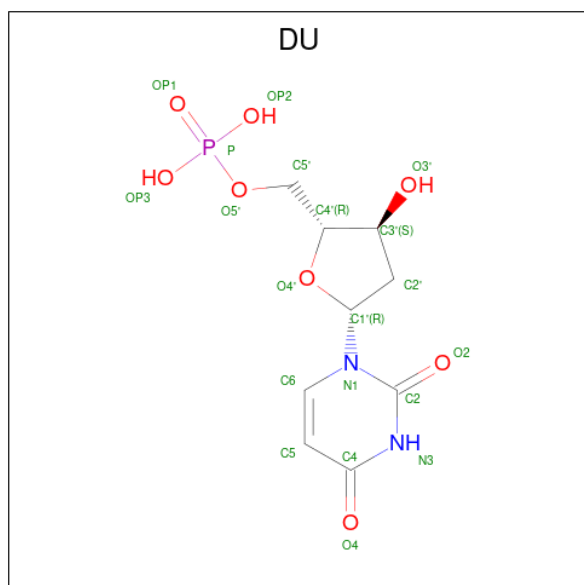
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	B	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	C	1	Total	C	N	O	P	0	0
			20	9	3	7	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	D	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	E	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	F	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	G	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	H	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	I	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	J	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	K	1	Total	C	N	O	P	0	0
			20	9	3	7	1		
3	L	1	Total	C	N	O	P	0	0
			20	9	3	7	1		

- Molecule 4 is 2'-DEOXYURIDINE-5'-MONOPHOSPHATE (three-letter code: DU) (formula: C₉H₁₃N₂O₈P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	B	1	Total	C	N	O	P	0	0
			20	9	2	8	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	C	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	D	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	E	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	F	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	G	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	H	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	I	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	J	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	K	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	L	1	Total	C	N	O	P	0	0
			20	9	2	8	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	28	Total	O	0	0
			28	28		
5	B	35	Total	O	0	0
			35	35		
5	C	38	Total	O	0	0
			38	38		
5	D	33	Total	O	0	0
			33	33		
5	E	31	Total	O	0	0
			31	31		
5	F	39	Total	O	0	0
			39	39		
5	G	23	Total	O	0	0
			23	23		
5	H	22	Total	O	0	0
			22	22		
5	I	21	Total	O	0	0
			21	21		

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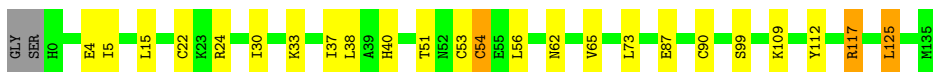
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	J	22	Total O 22 22	0	0
5	K	21	Total O 21 21	0	0
5	L	13	Total O 13 13	0	0

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: Deoxycytidylate deaminase

Chain A:  81% 15% ..




- Molecule 1: Deoxycytidylate deaminase

Chain B:  83% 14% ..




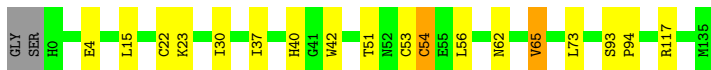
- Molecule 1: Deoxycytidylate deaminase

Chain C:  83% 13% ..




- Molecule 1: Deoxycytidylate deaminase

Chain D:  86% 12% ..




- Molecule 1: Deoxycytidylate deaminase

Chain E:  90% 9% ..

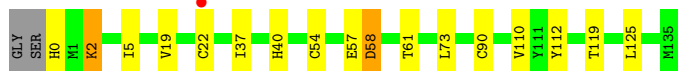
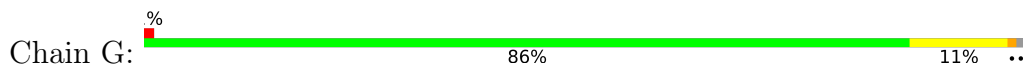


- Molecule 1: Deoxycytidylate deaminase

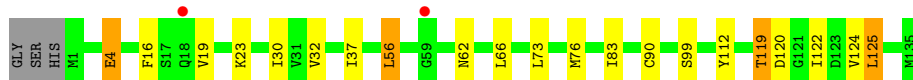
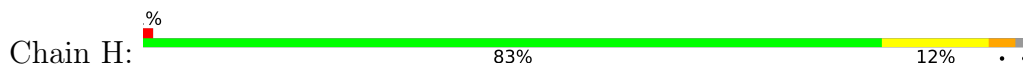
Chain F:  82% 17% ..



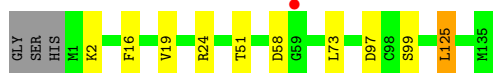
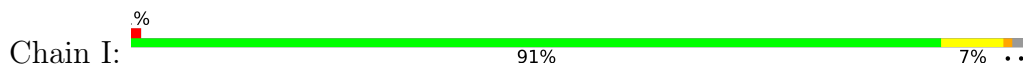
- Molecule 1: Deoxycytidylate deaminase



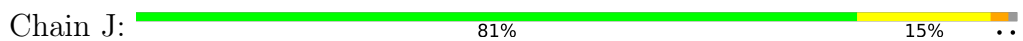
- Molecule 1: Deoxycytidylate deaminase



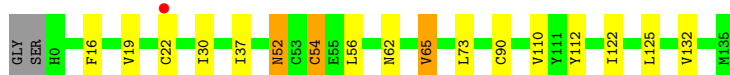
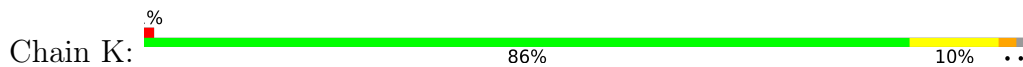
- Molecule 1: Deoxycytidylate deaminase



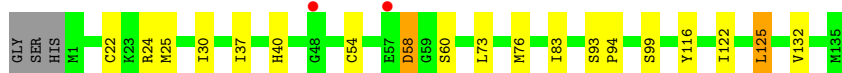
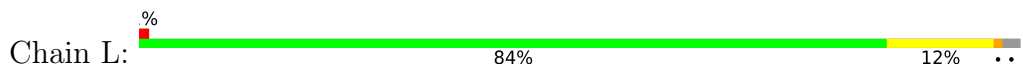
- Molecule 1: Deoxycytidylate deaminase



- Molecule 1: Deoxycytidylate deaminase



- Molecule 1: Deoxycytidylate deaminase



4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	135.05Å 147.21Å 100.47Å 90.00° 95.62° 90.00°	Depositor
Resolution (Å)	99.99 – 2.60 49.63 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.9 (99.99-2.60) 99.9 (49.63-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.42 (at 2.61Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.231 , 0.268 0.228 , 0.263	Depositor DCC
R_{free} test set	3031 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	37.5	Xtrriage
Anisotropy	0.281	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 34.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.014 for $-1/2^*h+1/2^*k-1,1/2^*h-1/2^*k-1,-1/2^*h-1/2^*k$ 0.021 for $-1/2^*h-1/2^*k-1,-1/2^*h-1/2^*k+1,-1/2^*h+1/2^*k$	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	13446	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 49.20 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to $7.7164e-05$. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.37	0/1080	0.50	0/1452
1	B	0.54	0/1080	0.53	0/1452
1	C	0.56	2/1080 (0.2%)	0.55	0/1452
1	D	0.39	0/1078	0.48	0/1449
1	E	0.45	0/1080	0.49	0/1452
1	F	0.54	1/1080 (0.1%)	0.49	0/1452
1	G	0.40	0/1080	0.48	0/1452
1	H	0.40	0/1063	0.49	0/1429
1	I	0.41	0/1063	0.53	0/1429
1	J	0.59	1/1080 (0.1%)	0.58	0/1452
1	K	0.42	0/1080	0.49	0/1452
1	L	0.42	0/1069	0.52	0/1437
All	All	0.46	4/12913 (0.0%)	0.51	0/17360

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	J	69	GLU	CD-OE1	-5.54	1.19	1.25
1	C	22[A]	CYS	CB-SG	5.52	1.91	1.82
1	C	22[B]	CYS	CB-SG	5.52	1.91	1.82
1	F	53	CYS	CB-SG	-5.44	1.73	1.81

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1055	0	1042	18	0
1	B	1055	0	1042	16	0
1	C	1055	0	1042	30	0
1	D	1053	0	1042	17	0
1	E	1058	0	1043	10	0
1	F	1058	0	1043	21	0
1	G	1055	0	1044	11	0
1	H	1042	0	1030	12	0
1	I	1042	0	1030	5	0
1	J	1055	0	1042	17	0
1	K	1055	0	1042	11	0
1	L	1045	0	1037	17	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
2	G	1	0	0	0	0
2	H	1	0	0	0	0
2	I	1	0	0	0	0
2	J	1	0	0	0	0
2	K	1	0	0	0	0
2	L	1	0	0	0	0
3	A	20	0	12	0	0
3	B	20	0	12	0	0
3	C	20	0	12	1	0
3	D	20	0	12	1	0
3	E	20	0	12	1	0
3	F	20	0	12	1	0
3	G	20	0	12	0	0
3	H	20	0	12	0	0
3	I	20	0	12	0	0
3	J	20	0	12	0	0
3	K	20	0	12	0	0
3	L	20	0	12	0	0
4	A	20	0	11	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	20	0	10	1	0
4	C	20	0	11	7	0
4	D	20	0	10	1	0
4	E	20	0	11	2	0
4	F	20	0	11	7	0
4	G	20	0	10	3	0
4	H	20	0	10	0	0
4	I	20	0	11	3	0
4	J	20	0	10	5	0
4	K	20	0	11	0	0
4	L	20	0	10	3	0
5	A	28	0	0	1	0
5	B	35	0	0	3	0
5	C	38	0	0	0	0
5	D	33	0	0	1	0
5	E	31	0	0	0	0
5	F	39	0	0	0	0
5	G	23	0	0	3	0
5	H	22	0	0	0	0
5	I	21	0	0	2	0
5	J	22	0	0	1	0
5	K	21	0	0	0	0
5	L	13	0	0	0	0
All	All	13446	0	12749	188	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 7.

The worst 5 of 188 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:L:22[C]:CYS:SG	1:L:22[C]:CYS:CB	2.05	1.42
1:J:22[B]:CYS:SG	1:J:22[B]:CYS:CB	2.08	1.42
1:D:22[C]:CYS:SG	1:D:22[C]:CYS:CB	2.08	1.41
1:C:0:HIS:O	1:C:1:MET:HB2	1.68	0.92
1:C:1:MET:HE2	1:C:6:LYS:HB2	1.51	0.90

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	136/138 (99%)	136 (100%)	0	0	100	100
1	B	136/138 (99%)	135 (99%)	1 (1%)	0	100	100
1	C	136/138 (99%)	134 (98%)	1 (1%)	1 (1%)	22	43
1	D	136/138 (99%)	135 (99%)	1 (1%)	0	100	100
1	E	136/138 (99%)	135 (99%)	1 (1%)	0	100	100
1	F	136/138 (99%)	133 (98%)	3 (2%)	0	100	100
1	G	136/138 (99%)	134 (98%)	0	2 (2%)	10	21
1	H	134/138 (97%)	132 (98%)	2 (2%)	0	100	100
1	I	134/138 (97%)	133 (99%)	1 (1%)	0	100	100
1	J	136/138 (99%)	135 (99%)	1 (1%)	0	100	100
1	K	136/138 (99%)	135 (99%)	1 (1%)	0	100	100
1	L	135/138 (98%)	133 (98%)	2 (2%)	0	100	100
All	All	1627/1656 (98%)	1610 (99%)	14 (1%)	3 (0%)	47	71

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	1	MET
1	G	58	ASP
1	G	57	GLU

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	119/118 (101%)	113 (95%)	6 (5%)	24	47
1	B	119/118 (101%)	112 (94%)	7 (6%)	19	39
1	C	119/118 (101%)	114 (96%)	5 (4%)	30	55
1	D	119/118 (101%)	114 (96%)	5 (4%)	30	55
1	E	119/118 (101%)	117 (98%)	2 (2%)	60	81
1	F	119/118 (101%)	111 (93%)	8 (7%)	16	33
1	G	119/118 (101%)	114 (96%)	5 (4%)	30	55
1	H	117/118 (99%)	111 (95%)	6 (5%)	24	46
1	I	117/118 (99%)	111 (95%)	6 (5%)	24	46
1	J	119/118 (101%)	113 (95%)	6 (5%)	24	47
1	K	119/118 (101%)	115 (97%)	4 (3%)	37	63
1	L	118/118 (100%)	114 (97%)	4 (3%)	37	63
All	All	1423/1416 (100%)	1359 (96%)	64 (4%)	28	52

5 of 64 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	K	54	CYS
1	K	73	LEU
1	E	65	VAL
1	E	57	GLU
1	L	58	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 18 such sidechains are listed below:

Mol	Chain	Res	Type
1	K	0	HIS
1	L	40	HIS
1	K	52	ASN
1	F	40	HIS
1	J	40	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](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 36 ligands modelled in this entry, 12 are monoatomic - leaving 24 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
4	DU	L	203	-	21,21,21	3.16	14 (66%)	31,31,31	2.50	13 (41%)
3	DCM	J	202	-	21,21,21	1.38	5 (23%)	31,31,31	0.91	2 (6%)
4	DU	A	203	2	21,21,21	1.13	1 (4%)	31,31,31	1.75	7 (22%)
3	DCM	F	202	-	21,21,21	1.34	5 (23%)	31,31,31	0.88	1 (3%)
4	DU	E	203	2	21,21,21	1.14	1 (4%)	31,31,31	1.74	7 (22%)
3	DCM	I	202	-	21,21,21	1.42	5 (23%)	31,31,31	0.99	2 (6%)
4	DU	J	203	-	21,21,21	3.15	13 (61%)	31,31,31	2.50	12 (38%)
4	DU	C	203	2	21,21,21	1.14	1 (4%)	31,31,31	1.74	7 (22%)
4	DU	B	203	-	21,21,21	3.44	15 (71%)	31,31,31	2.61	14 (45%)
4	DU	G	203	-	21,21,21	3.21	12 (57%)	31,31,31	2.41	13 (41%)
3	DCM	H	202	-	21,21,21	1.37	3 (14%)	31,31,31	0.95	2 (6%)
4	DU	K	203	2	21,21,21	3.21	13 (61%)	31,31,31	2.28	13 (41%)
3	DCM	L	202	-	21,21,21	1.40	3 (14%)	31,31,31	1.03	3 (9%)
3	DCM	D	202	-	21,21,21	1.36	5 (23%)	31,31,31	0.90	2 (6%)
3	DCM	E	202	-	21,21,21	1.42	5 (23%)	31,31,31	0.92	2 (6%)
4	DU	F	203	2	21,21,21	1.14	1 (4%)	31,31,31	1.76	7 (22%)
4	DU	I	203	-	21,21,21	2.73	12 (57%)	31,31,31	2.12	13 (41%)
3	DCM	G	202	-	21,21,21	1.35	2 (9%)	31,31,31	0.92	2 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	DU	H	203	-	21,21,21	2.95	13 (61%)	31,31,31	2.62	12 (38%)
3	DCM	C	202	-	21,21,21	1.37	3 (14%)	31,31,31	0.93	1 (3%)
3	DCM	B	202	-	21,21,21	1.36	4 (19%)	31,31,31	0.86	1 (3%)
4	DU	D	203	2	21,21,21	3.81	12 (57%)	31,31,31	1.96	8 (25%)
3	DCM	K	202	-	21,21,21	1.40	4 (19%)	31,31,31	0.91	1 (3%)
3	DCM	A	202	-	21,21,21	1.42	4 (19%)	31,31,31	0.88	2 (6%)

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
4	DU	L	203	-	-	4/10/22/22	0/2/2/2
3	DCM	J	202	-	-	0/10/22/22	0/2/2/2
4	DU	A	203	2	-	5/10/22/22	0/2/2/2
3	DCM	F	202	-	-	1/10/22/22	0/2/2/2
4	DU	E	203	2	-	5/10/22/22	0/2/2/2
3	DCM	I	202	-	-	5/10/22/22	0/2/2/2
4	DU	J	203	-	-	3/10/22/22	0/2/2/2
4	DU	C	203	2	-	5/10/22/22	0/2/2/2
4	DU	B	203	-	-	3/10/22/22	0/2/2/2
4	DU	G	203	-	-	3/10/22/22	0/2/2/2
3	DCM	H	202	-	-	2/10/22/22	0/2/2/2
4	DU	K	203	2	-	0/10/22/22	0/2/2/2
3	DCM	L	202	-	-	3/10/22/22	0/2/2/2
3	DCM	D	202	-	-	0/10/22/22	0/2/2/2
3	DCM	E	202	-	-	2/10/22/22	0/2/2/2
4	DU	F	203	2	-	4/10/22/22	0/2/2/2
4	DU	I	203	-	-	4/10/22/22	0/2/2/2
3	DCM	G	202	-	-	0/10/22/22	0/2/2/2
4	DU	H	203	-	-	0/10/22/22	0/2/2/2
3	DCM	C	202	-	-	2/10/22/22	0/2/2/2
3	DCM	B	202	-	-	0/10/22/22	0/2/2/2
4	DU	D	203	2	-	1/10/22/22	0/2/2/2
3	DCM	K	202	-	-	4/10/22/22	0/2/2/2
3	DCM	A	202	-	-	0/10/22/22	0/2/2/2

The worst 5 of 156 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	203	DU	P-O5'	-9.81	1.28	1.60
4	G	203	DU	P-O5'	-7.34	1.36	1.60
4	B	203	DU	P-O5'	-7.01	1.37	1.60
4	J	203	DU	P-O5'	-6.68	1.38	1.60
4	K	203	DU	O4'-C4'	-5.88	1.31	1.45

The worst 5 of 147 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	203	DU	O4'-C1'-N1	-6.22	96.74	107.86
4	H	203	DU	C4-N3-C2	-6.06	118.58	126.58
4	K	203	DU	N3-C2-N1	5.32	121.95	114.89
4	J	203	DU	O4'-C1'-N1	-5.29	98.41	107.86
4	B	203	DU	C5-C4-N3	5.15	122.55	114.84

There are no chirality outliers.

5 of 56 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	202	DCM	C5'-O5'-P-O3P
3	H	202	DCM	C3'-C4'-C5'-O5'
3	H	202	DCM	O4'-C4'-C5'-O5'
3	I	202	DCM	C5'-O5'-P-O1P
3	I	202	DCM	C5'-O5'-P-O2P

There are no ring outliers.

14 monomers are involved in 40 short contacts:

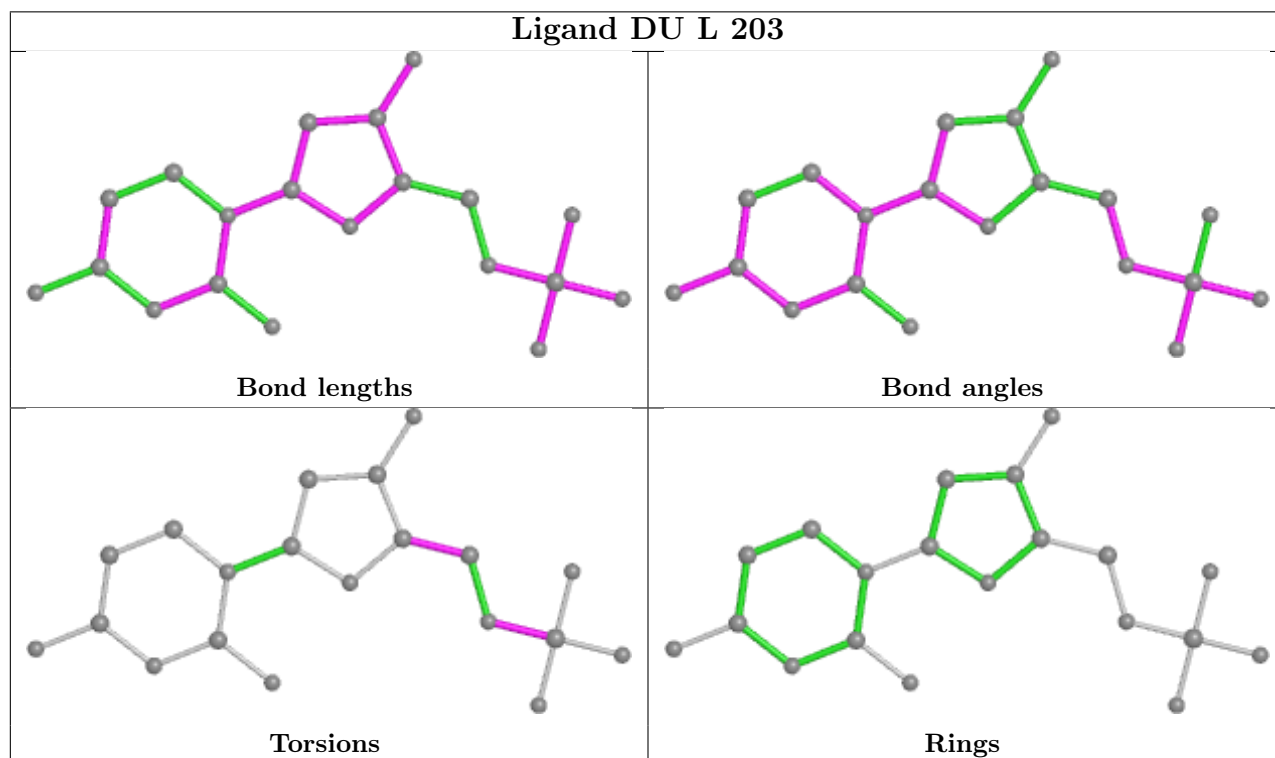
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	L	203	DU	3	0
4	A	203	DU	4	0
3	F	202	DCM	1	0
4	E	203	DU	2	0
4	J	203	DU	5	0
4	C	203	DU	7	0
4	B	203	DU	1	0
4	G	203	DU	3	0
3	D	202	DCM	1	0
3	E	202	DCM	1	0
4	F	203	DU	7	0

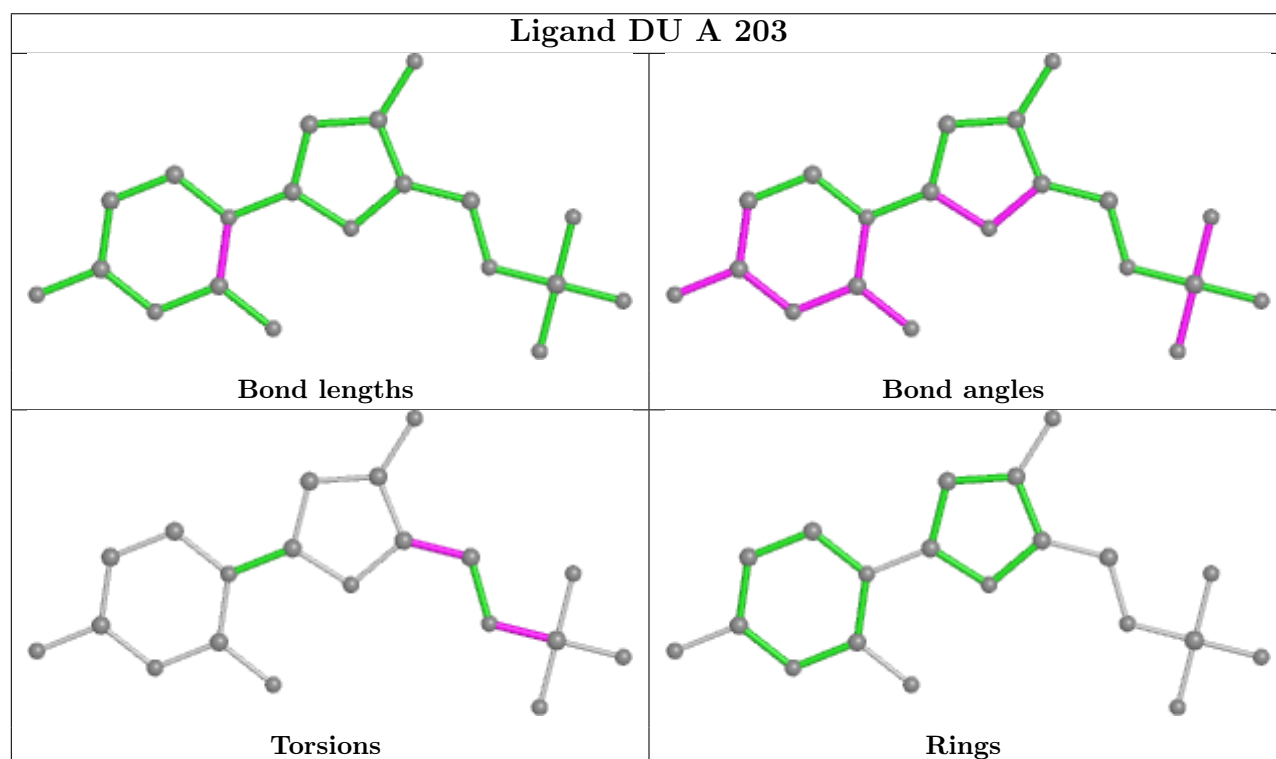
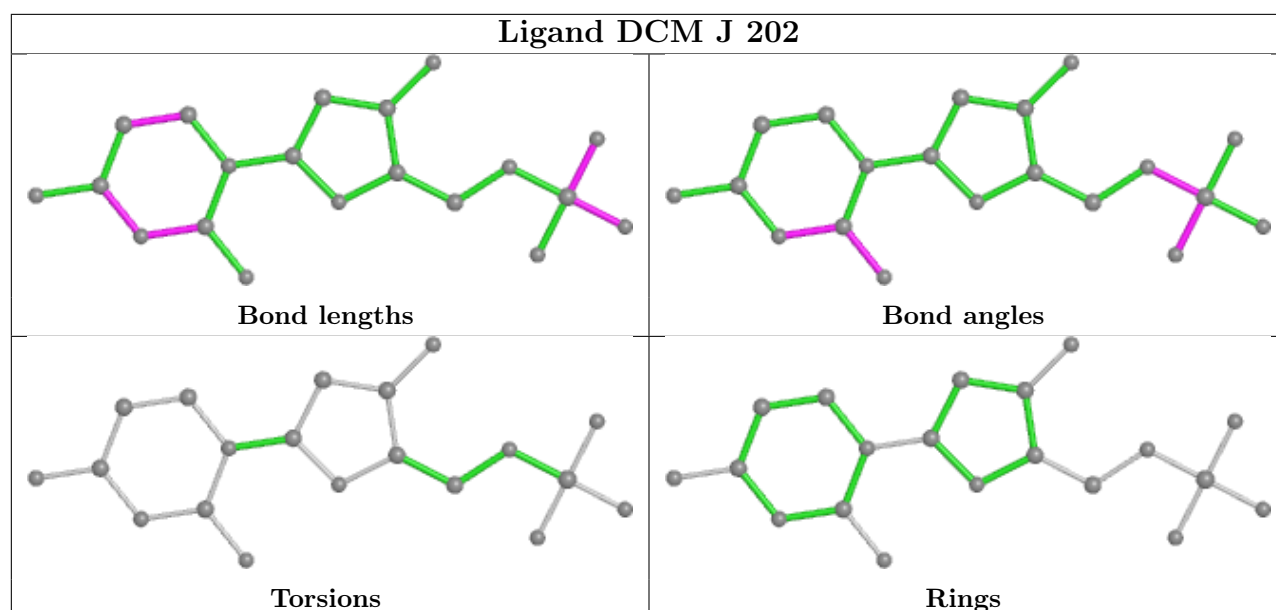
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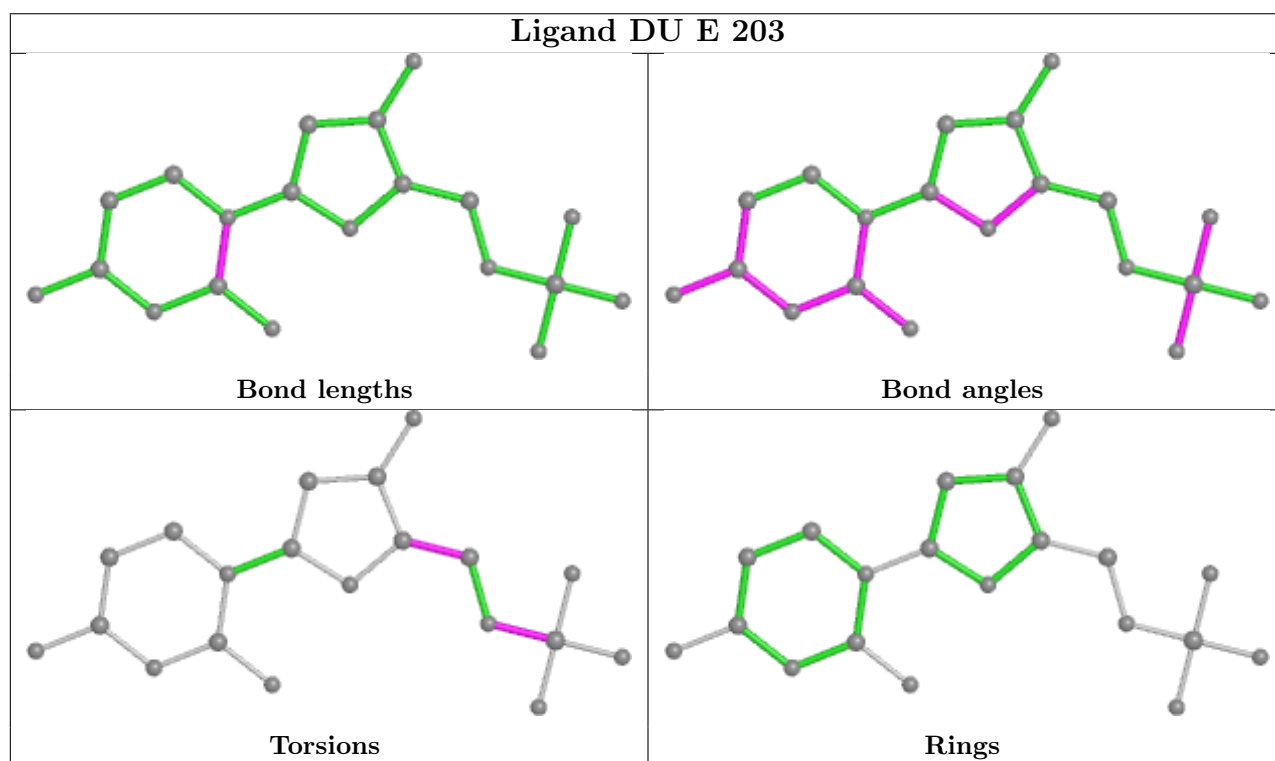
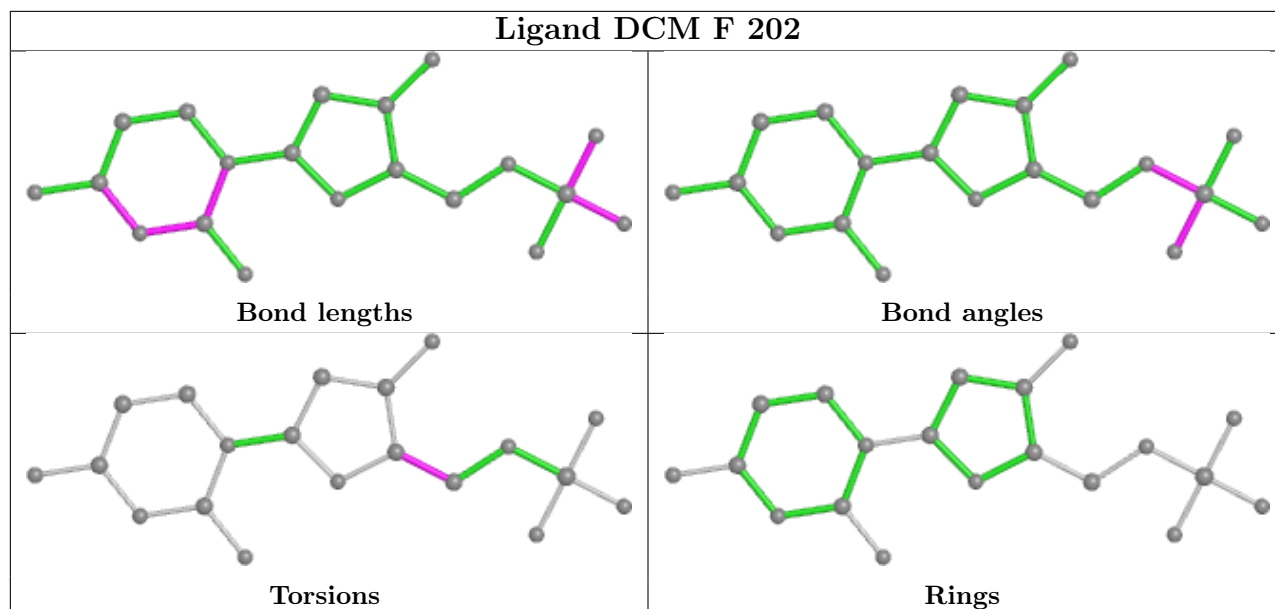
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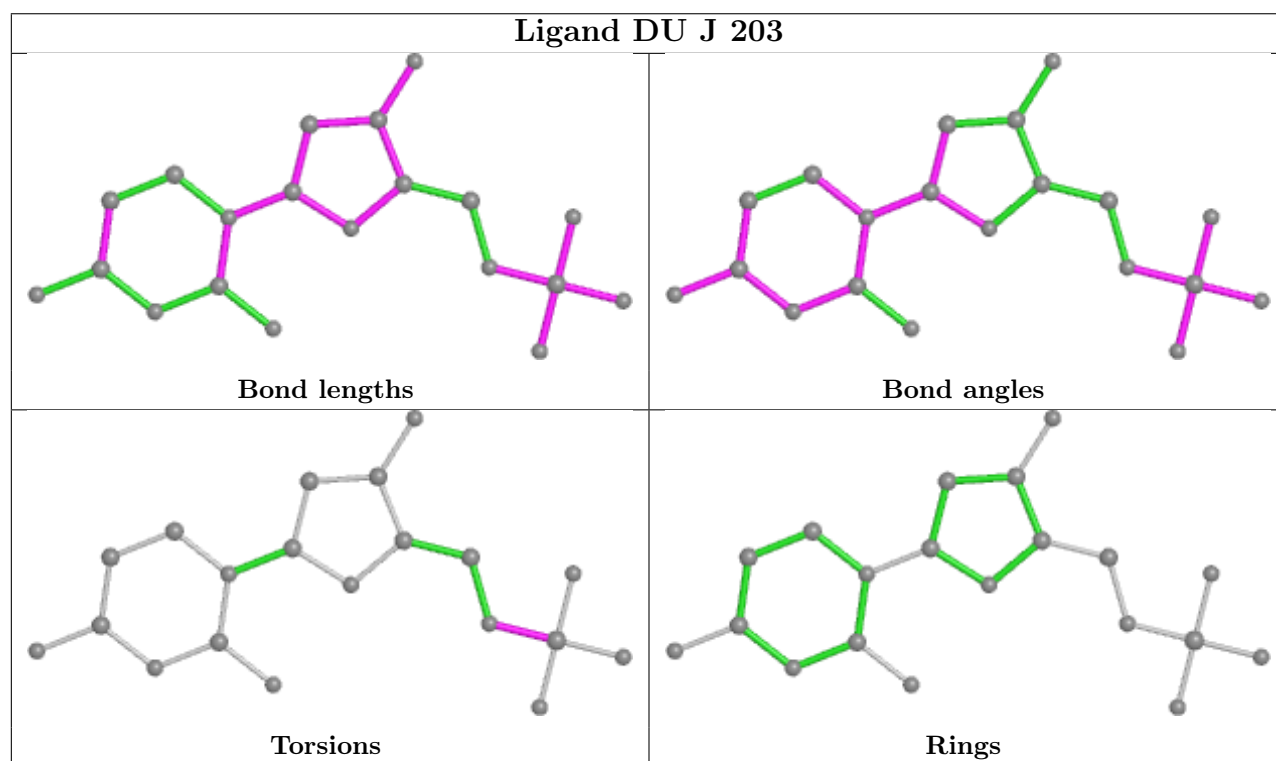
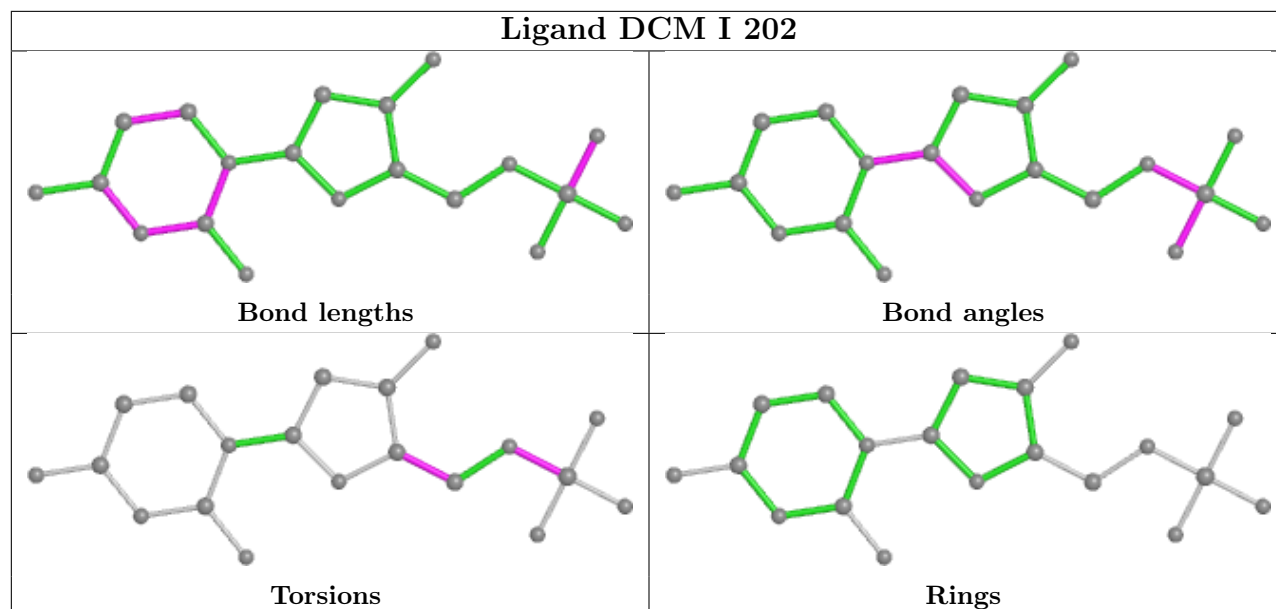
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	I	203	DU	3	0
3	C	202	DCM	1	0
4	D	203	DU	1	0

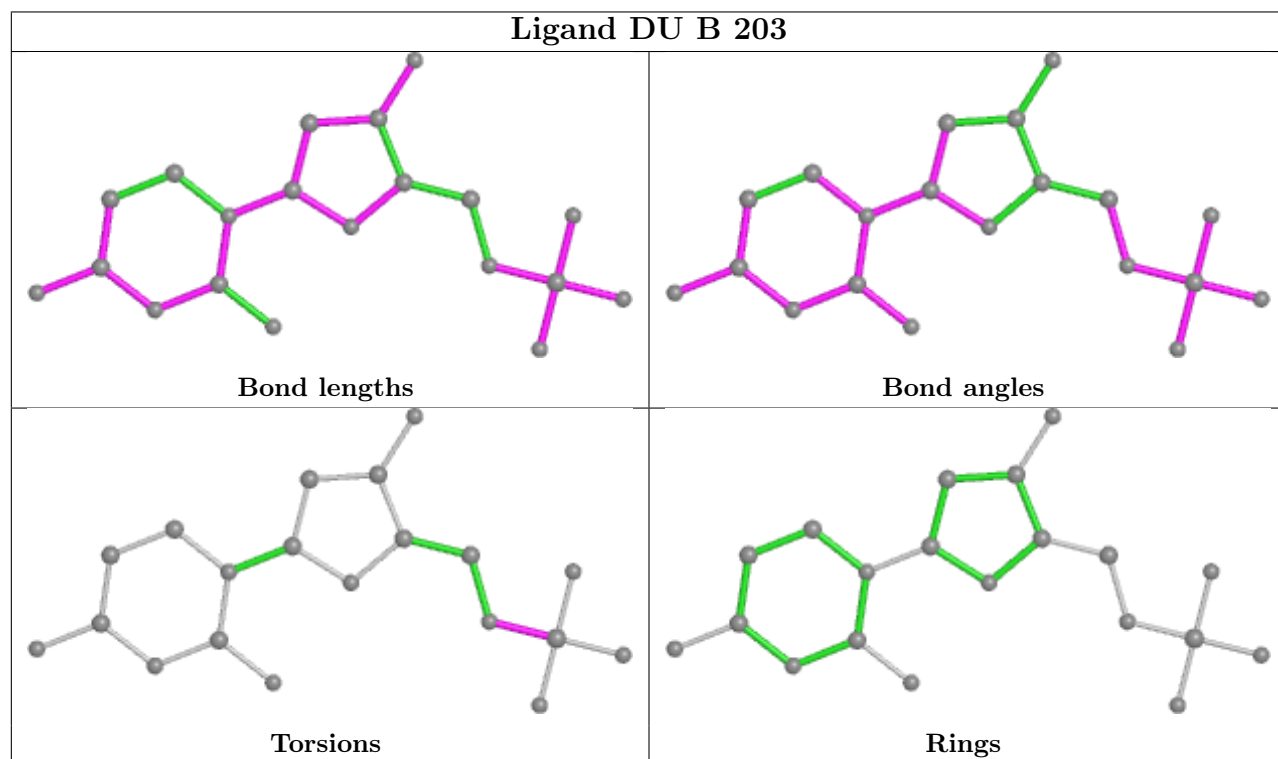
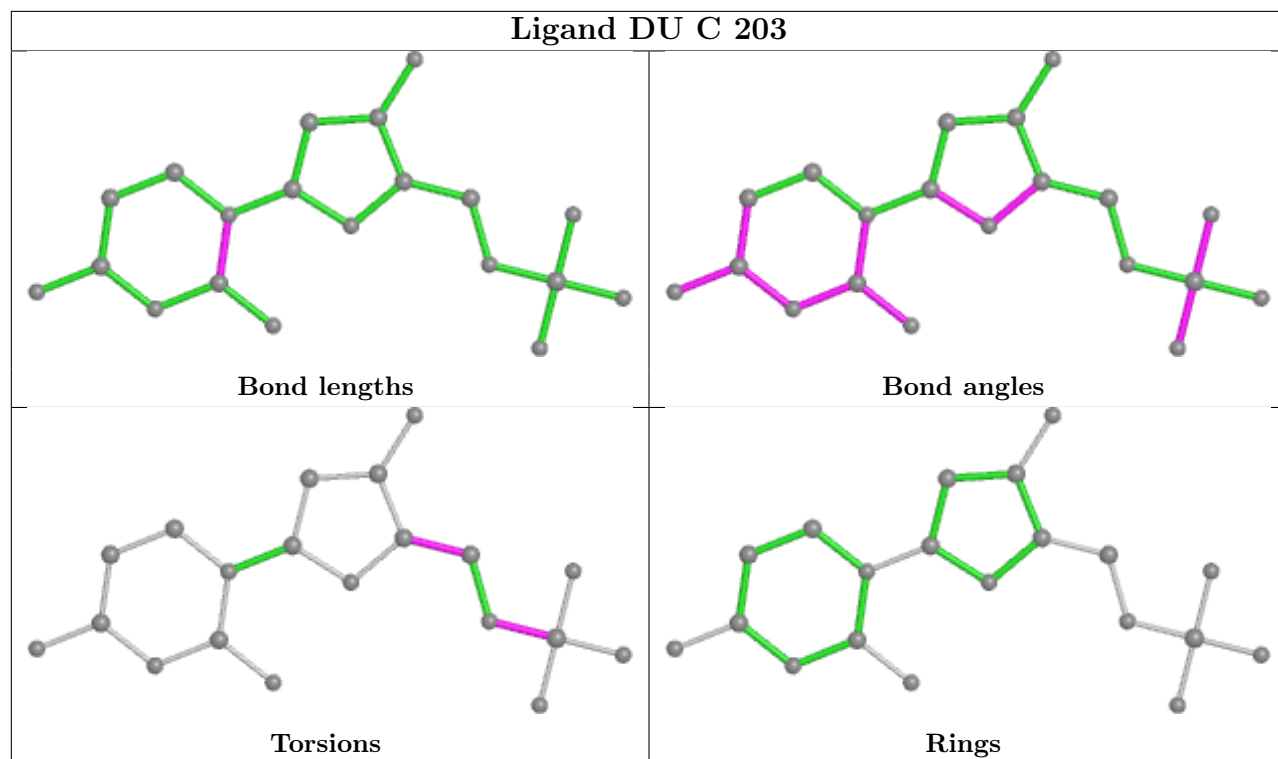
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 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.

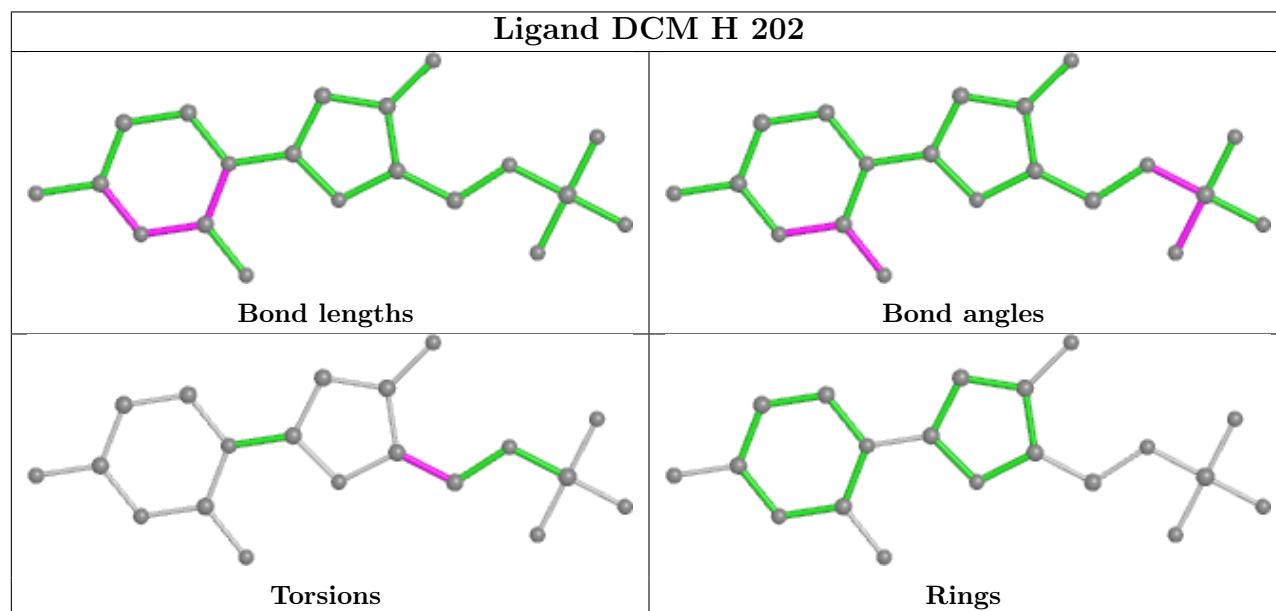
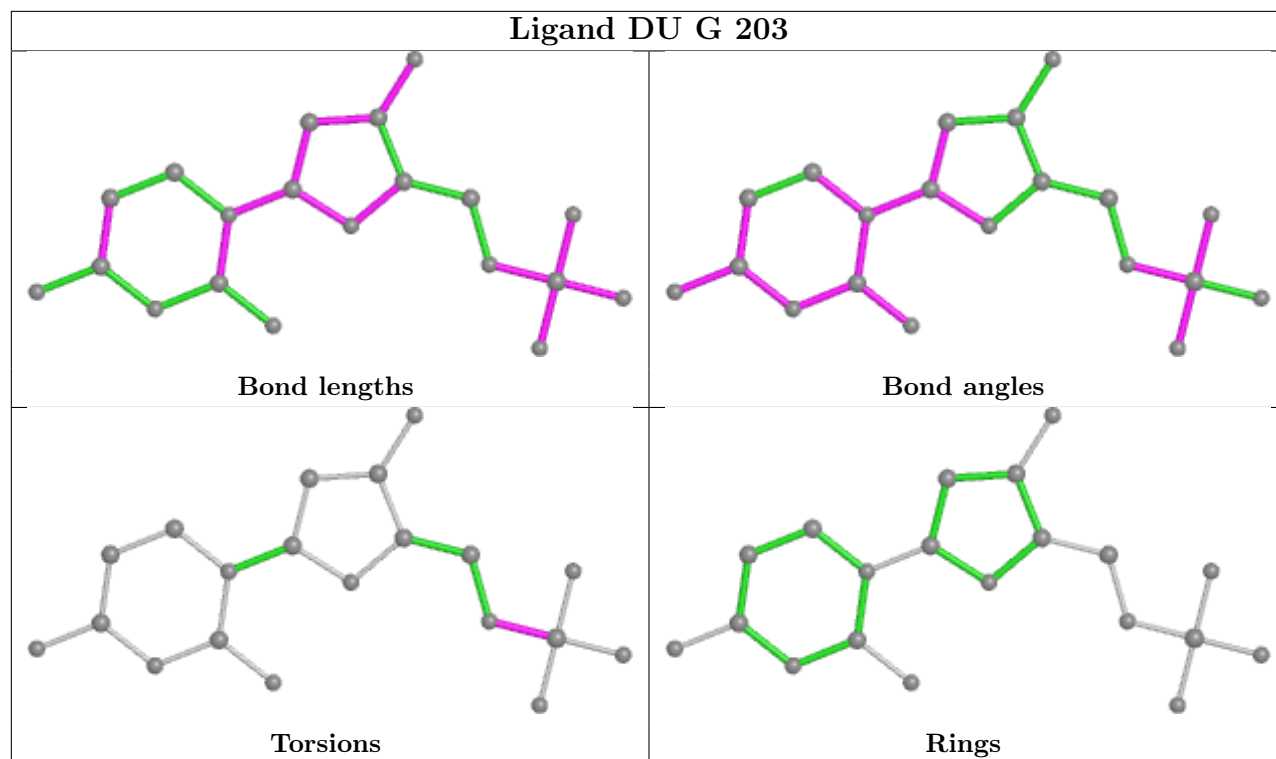


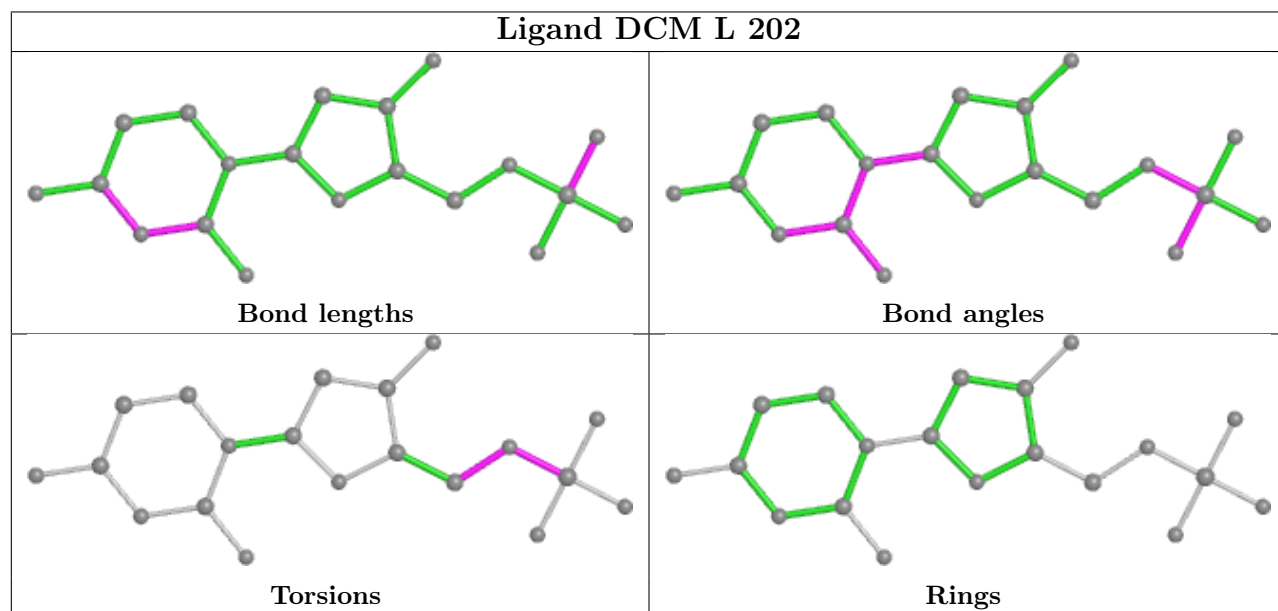
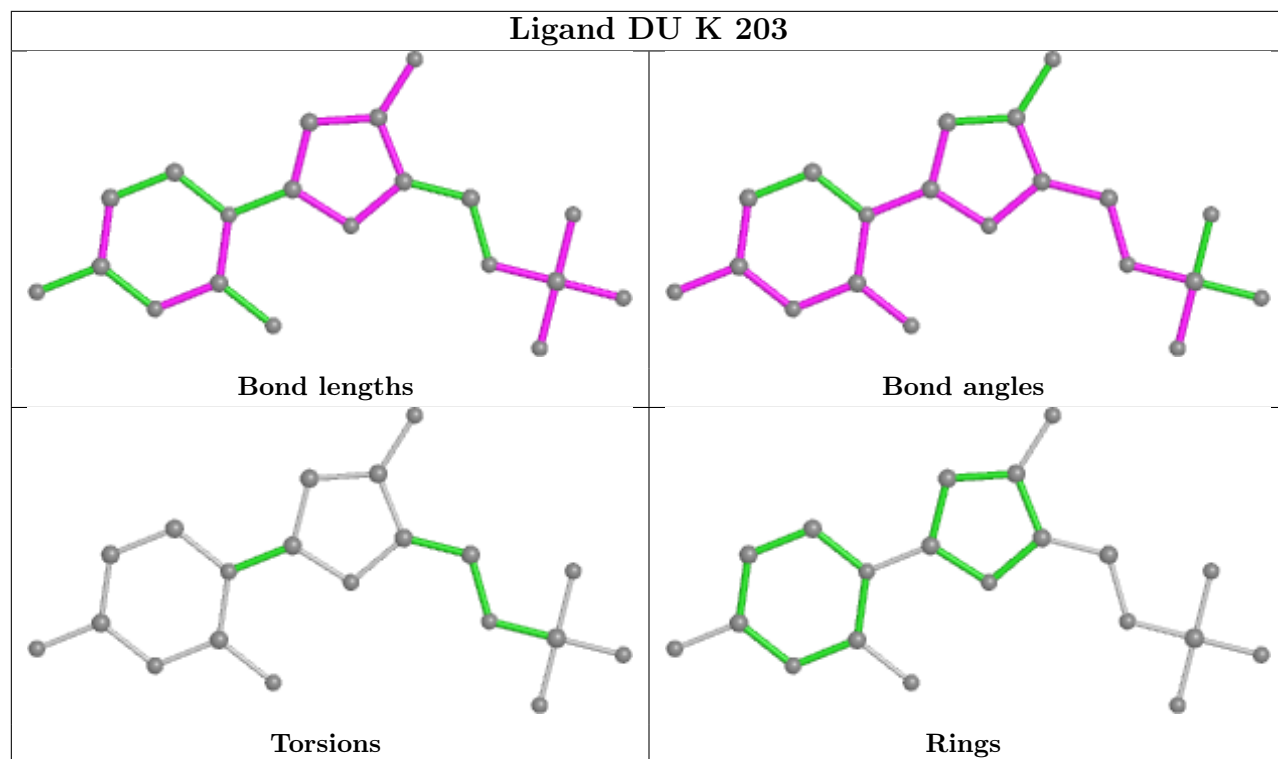


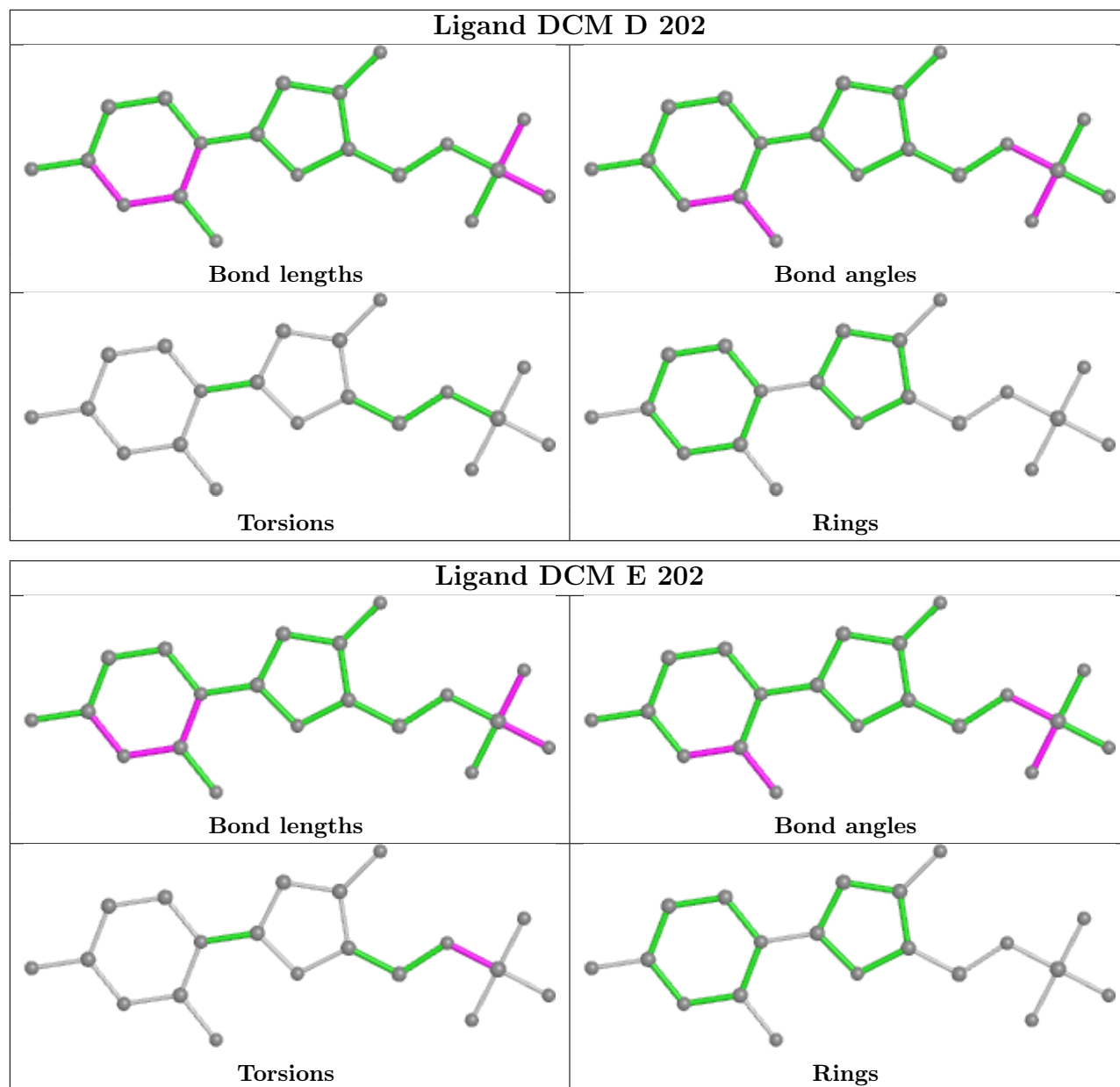


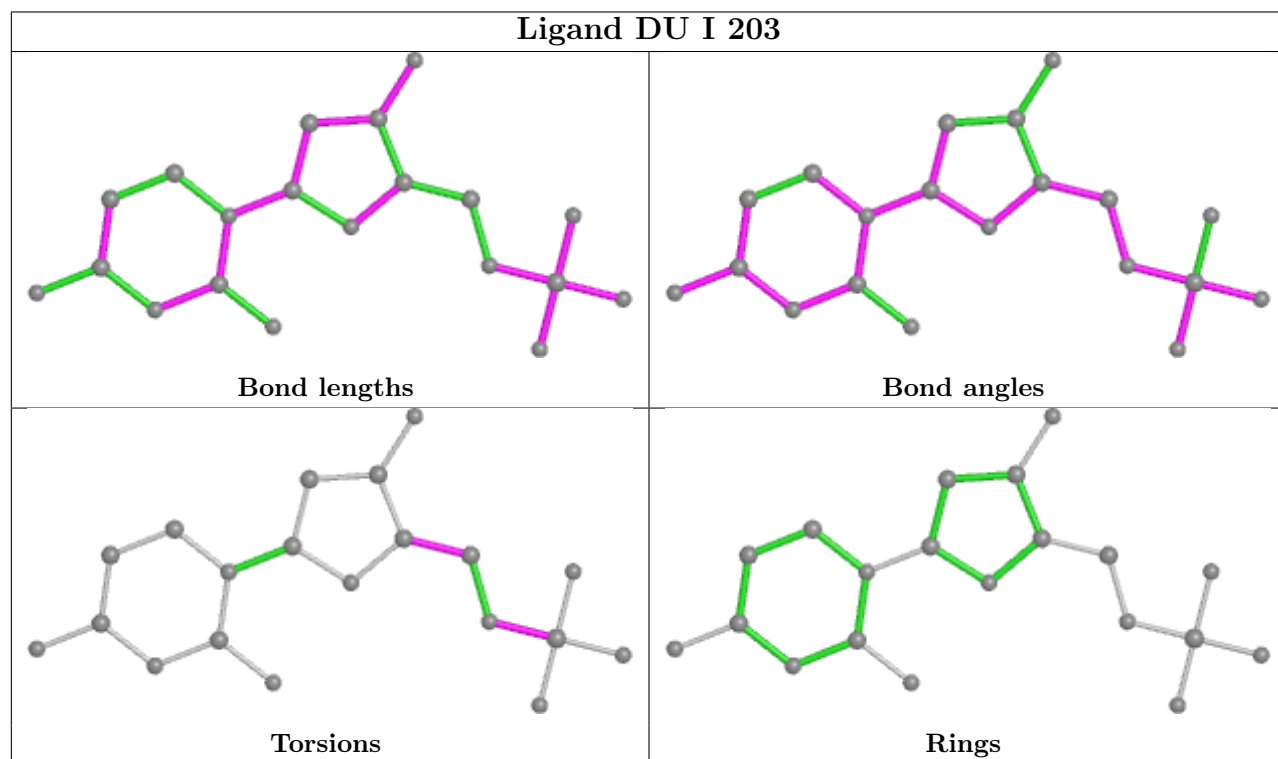
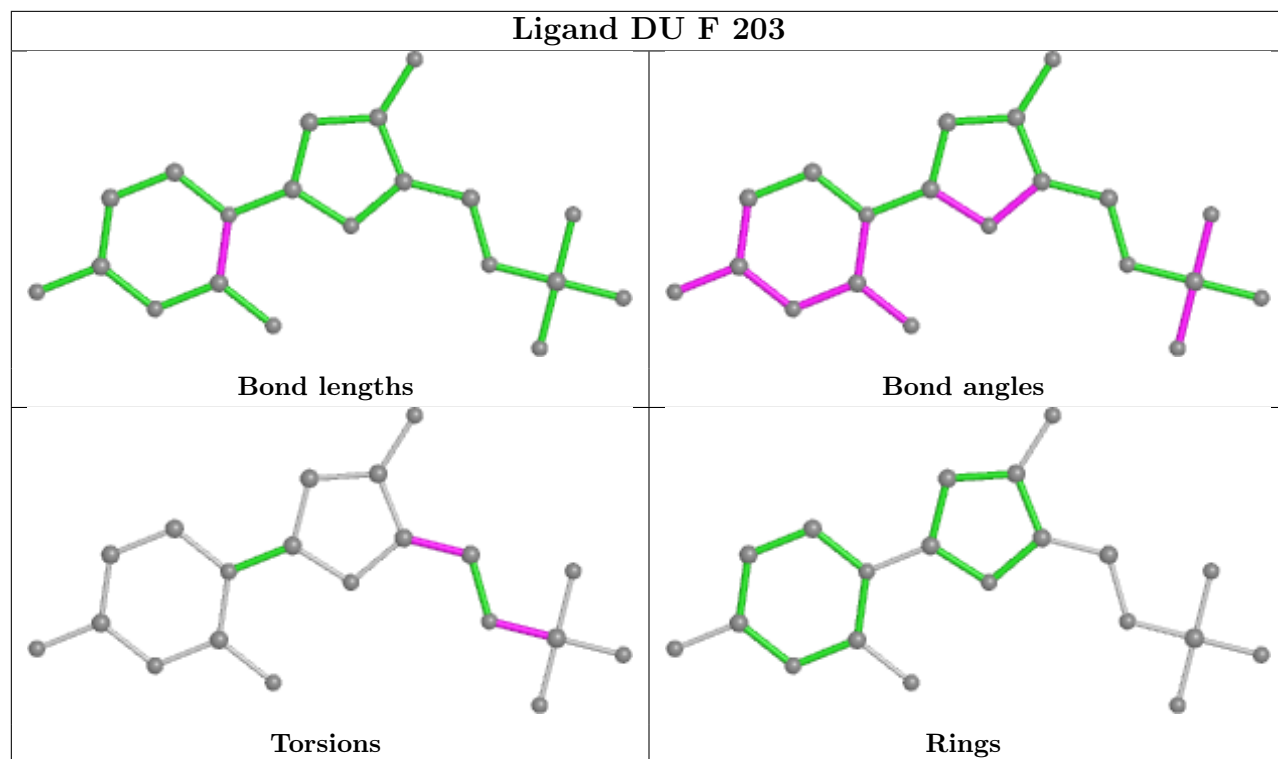


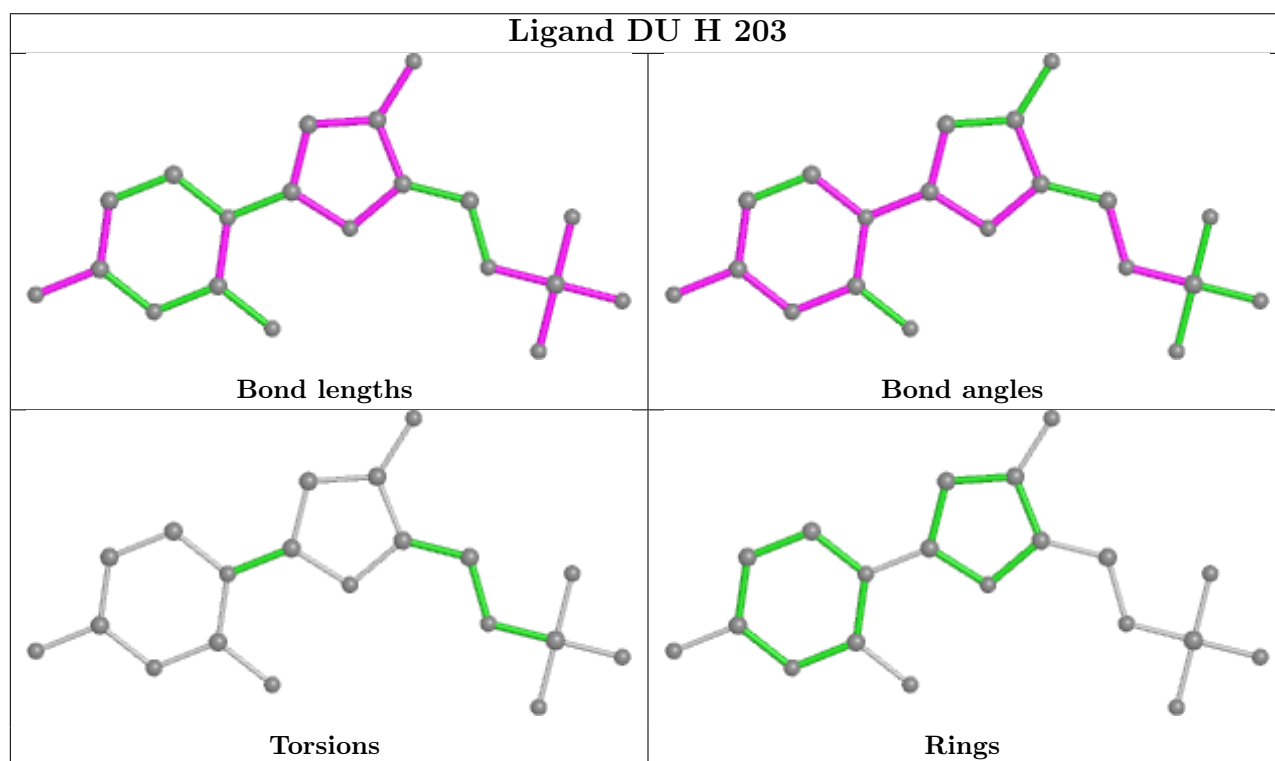
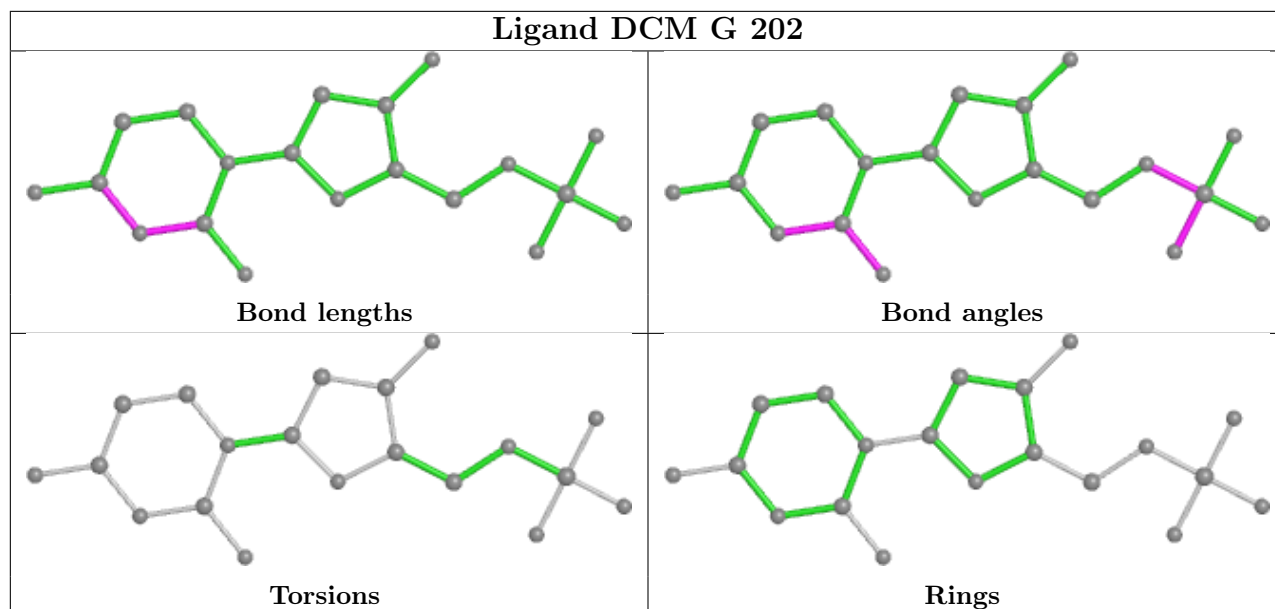


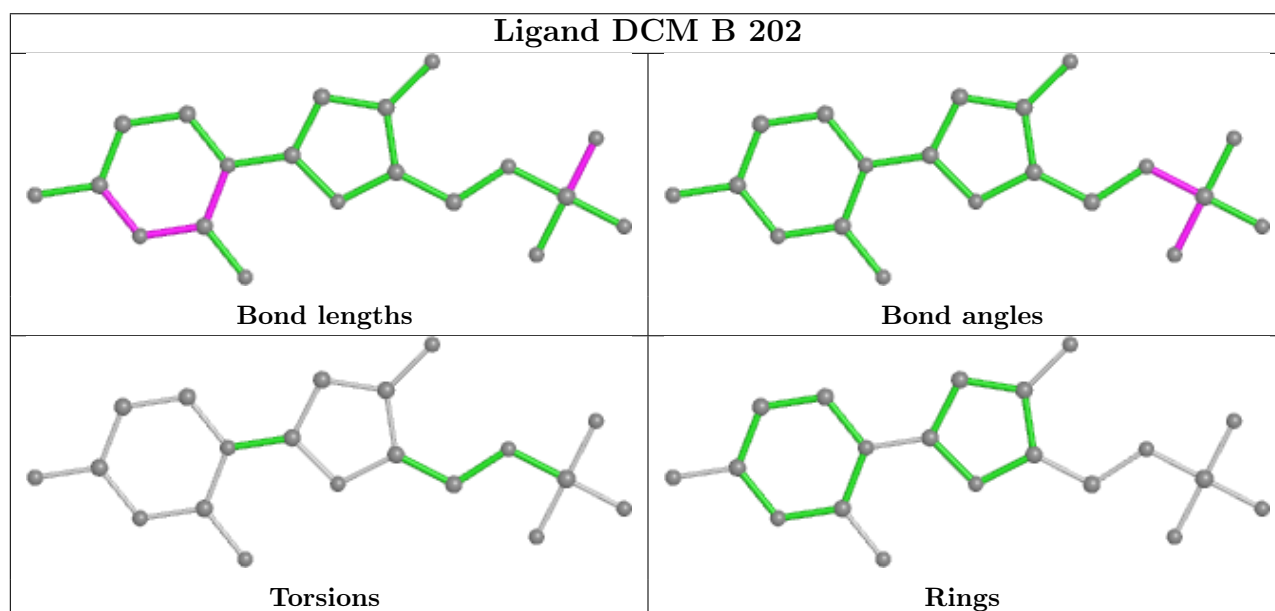
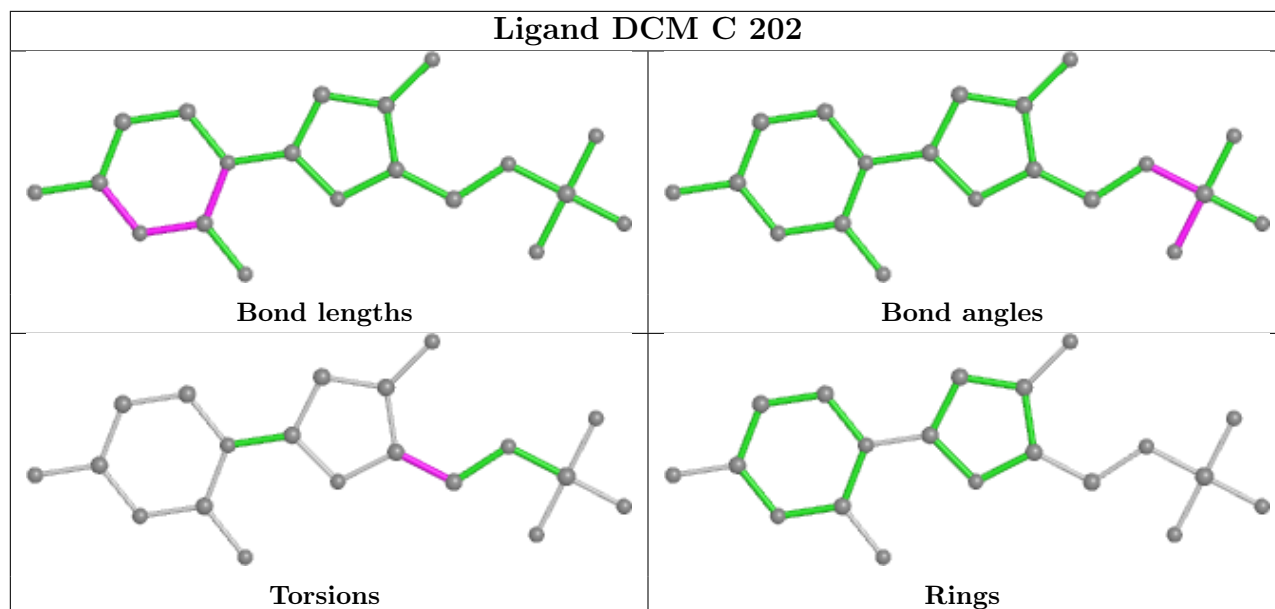


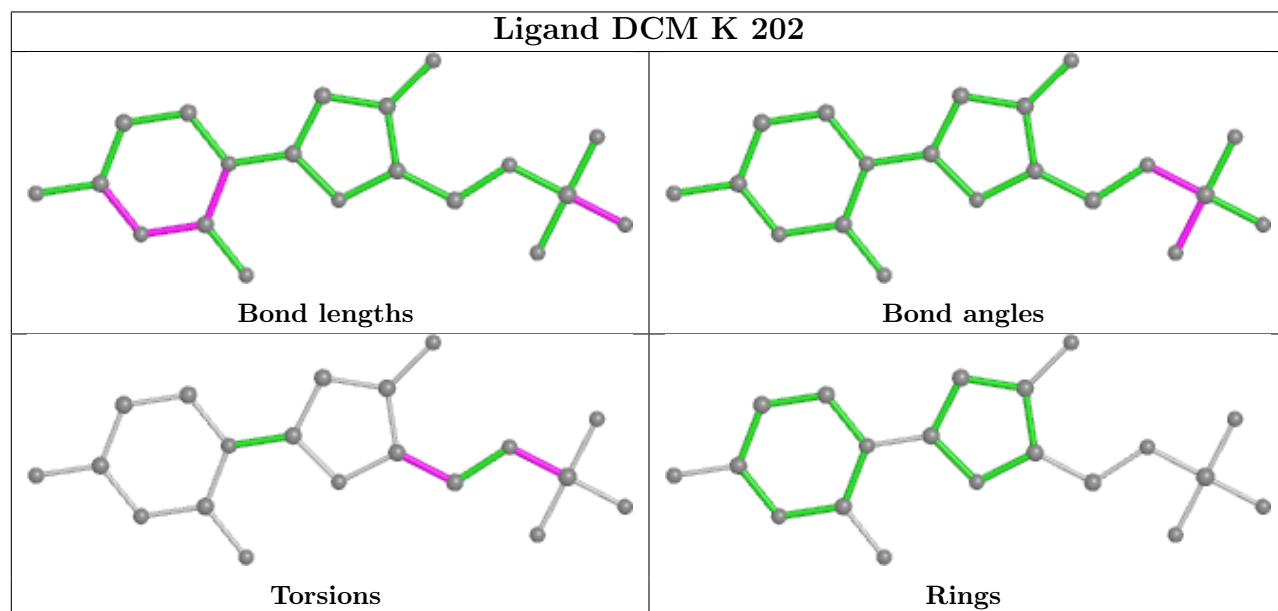
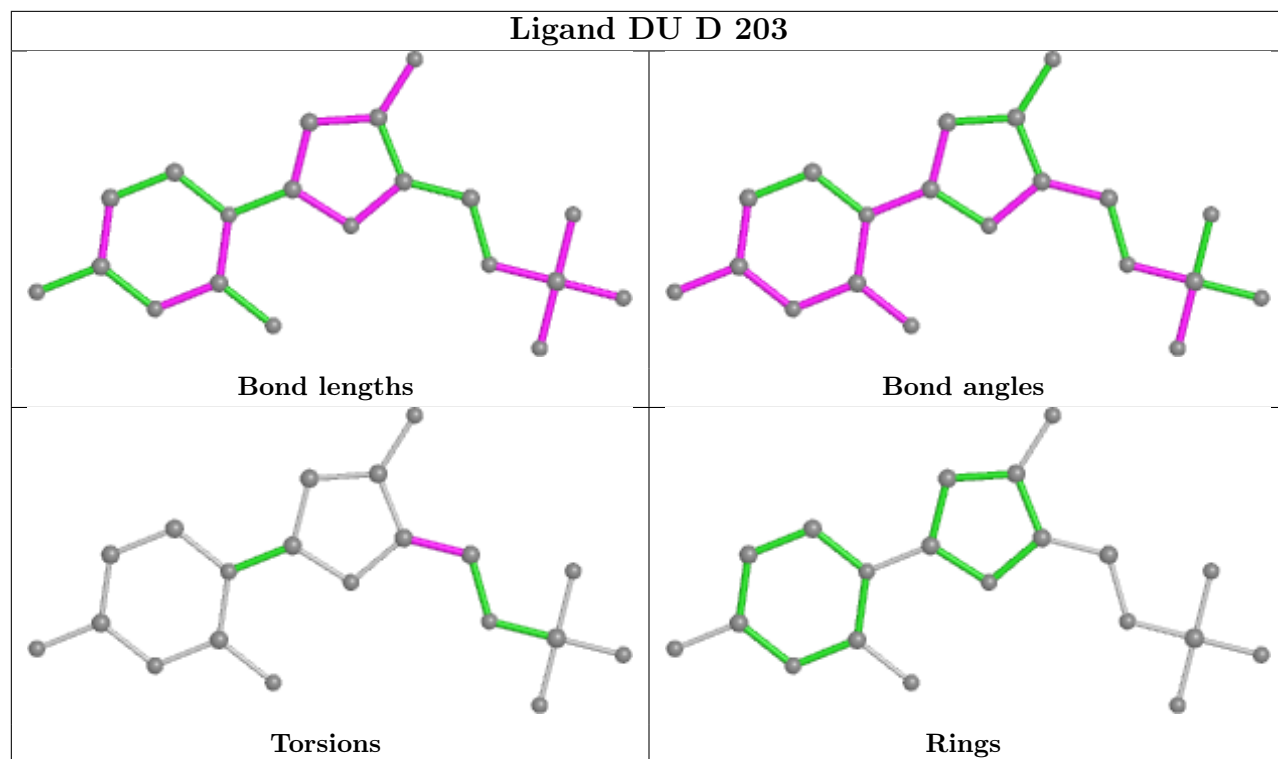


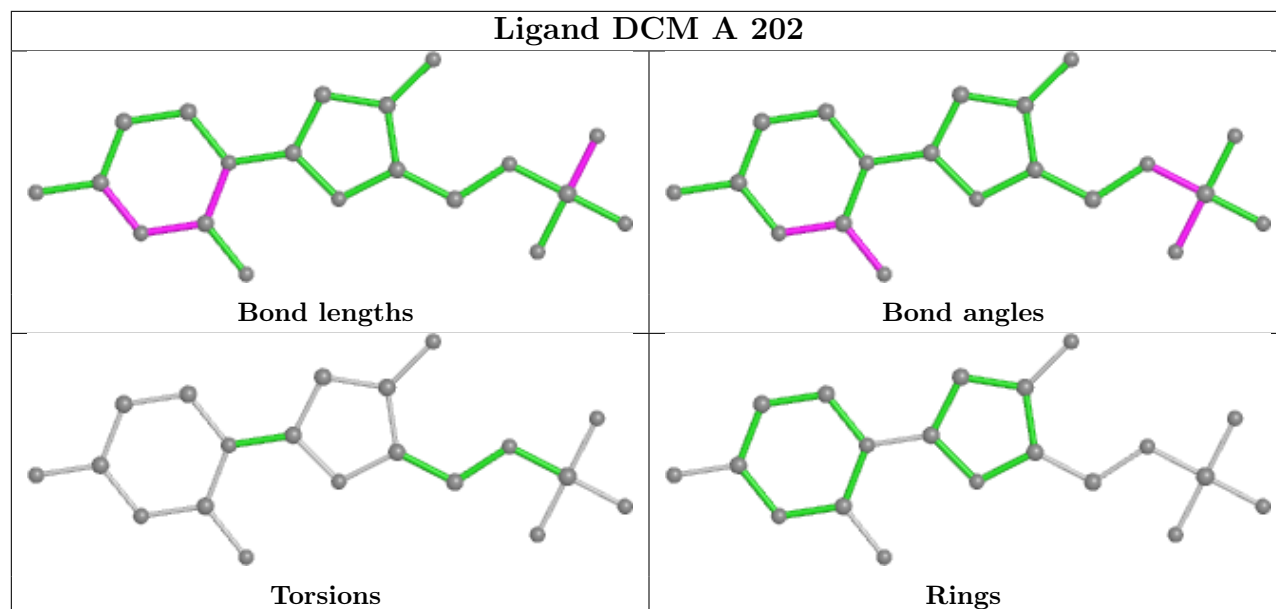












5.7 Other polymers [i](#)

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	136/138 (98%)	-0.13	0 100 100	22, 34, 49, 64	0
1	B	136/138 (98%)	-0.16	0 100 100	19, 30, 44, 59	0
1	C	136/138 (98%)	-0.19	0 100 100	20, 31, 44, 60	0
1	D	136/138 (98%)	-0.21	0 100 100	23, 32, 44, 54	0
1	E	136/138 (98%)	-0.13	0 100 100	23, 32, 45, 64	0
1	F	136/138 (98%)	-0.27	0 100 100	21, 30, 41, 52	0
1	G	136/138 (98%)	-0.15	1 (0%) 87 86	22, 34, 58, 69	0
1	H	135/138 (97%)	-0.02	2 (1%) 73 70	25, 37, 58, 66	0
1	I	135/138 (97%)	0.00	1 (0%) 87 86	26, 41, 60, 67	0
1	J	136/138 (98%)	-0.09	0 100 100	23, 35, 56, 66	0
1	K	136/138 (98%)	-0.03	1 (0%) 87 86	25, 40, 56, 70	0
1	L	135/138 (97%)	0.02	2 (1%) 73 70	26, 40, 60, 69	0
All	All	1629/1656 (98%)	-0.11	7 (0%) 92 91	19, 35, 55, 70	0

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	L	48	GLY	2.2
1	I	59	GLY	2.2
1	L	57	GLU	2.2
1	H	18	GLN	2.1
1	G	22[A]	CYS	2.1

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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

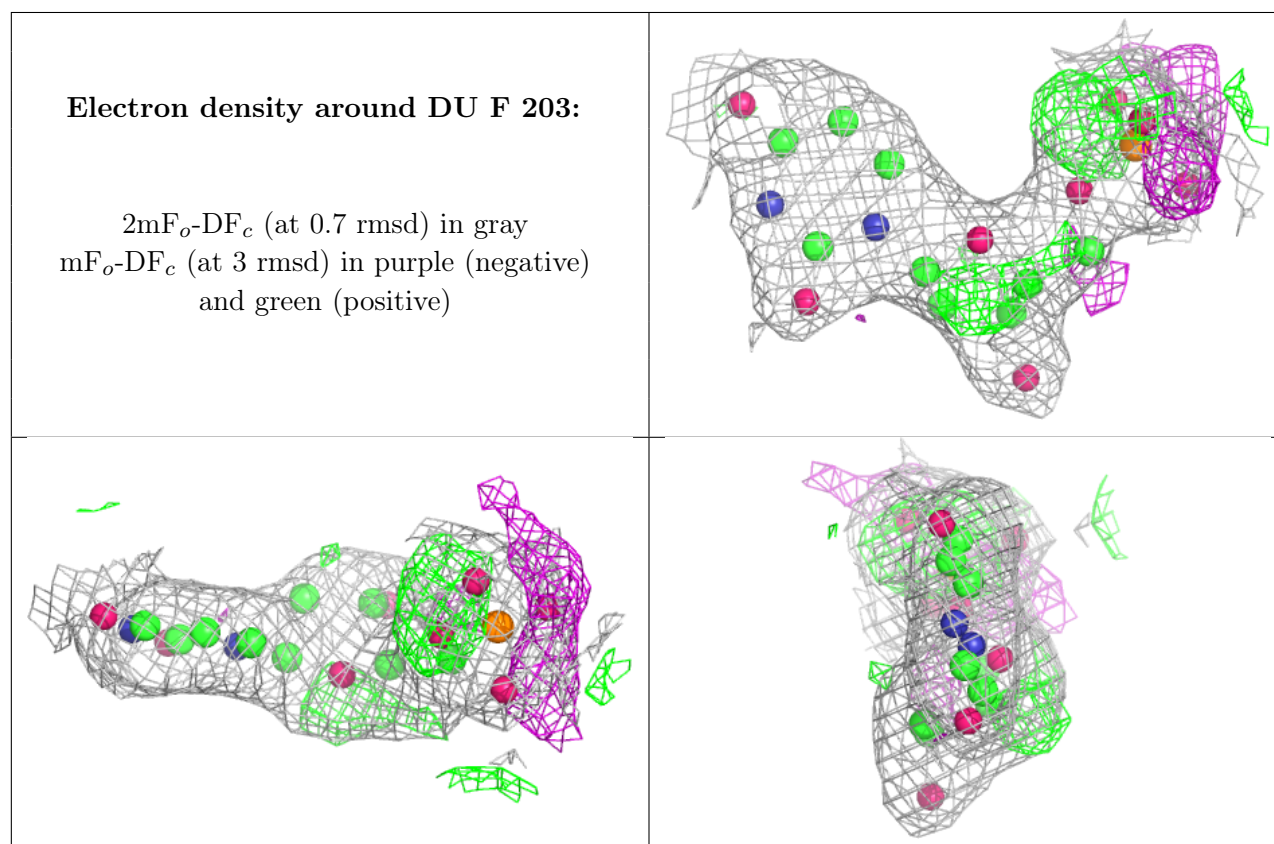
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	ZN	H	201	1/1	0.76	0.16	40,40,40,40	0
4	DU	F	203	20/20	0.88	0.21	31,33,35,35	0
2	ZN	K	201	1/1	0.91	0.12	33,33,33,33	0
3	DCM	H	202	20/20	0.92	0.17	28,40,57,58	0
3	DCM	J	202	20/20	0.92	0.15	28,34,54,54	0
3	DCM	K	202	20/20	0.92	0.18	35,42,55,56	0
4	DU	A	203	20/20	0.92	0.20	31,33,35,35	0
2	ZN	J	201	1/1	0.92	0.12	34,34,34,34	0
3	DCM	G	202	20/20	0.93	0.15	23,31,49,50	0
3	DCM	L	202	20/20	0.93	0.15	29,36,59,60	0
2	ZN	F	201	1/1	0.93	0.14	32,32,32,32	0
4	DU	C	203	20/20	0.93	0.17	31,33,35,35	0
4	DU	D	203	20/20	0.93	0.18	31,33,35,35	0
3	DCM	D	202	20/20	0.93	0.17	24,31,51,51	0
3	DCM	F	202	20/20	0.94	0.15	20,28,50,51	0
3	DCM	I	202	20/20	0.94	0.13	33,40,56,57	0
4	DU	E	203	20/20	0.94	0.16	31,33,35,35	0
3	DCM	E	202	20/20	0.94	0.18	23,30,53,55	0
4	DU	L	203	20/20	0.94	0.17	31,33,35,35	0
2	ZN	D	201	1/1	0.95	0.12	35,35,35,35	0
3	DCM	A	202	20/20	0.95	0.15	26,30,50,51	0
4	DU	I	203	20/20	0.95	0.15	31,33,35,35	0
4	DU	K	203	20/20	0.95	0.15	31,33,35,35	0
3	DCM	B	202	20/20	0.95	0.14	25,30,51,52	0
4	DU	G	203	20/20	0.96	0.14	31,33,35,35	0
4	DU	H	203	20/20	0.96	0.11	31,33,35,35	0
3	DCM	C	202	20/20	0.96	0.15	31,34,52,53	0
4	DU	J	203	20/20	0.96	0.11	31,33,35,35	0
2	ZN	B	201	1/1	0.96	0.09	31,31,31,31	0
2	ZN	L	201	1/1	0.96	0.10	42,42,42,42	0
2	ZN	A	201	1/1	0.97	0.10	34,34,34,34	0
4	DU	B	203	20/20	0.97	0.11	31,33,35,35	0

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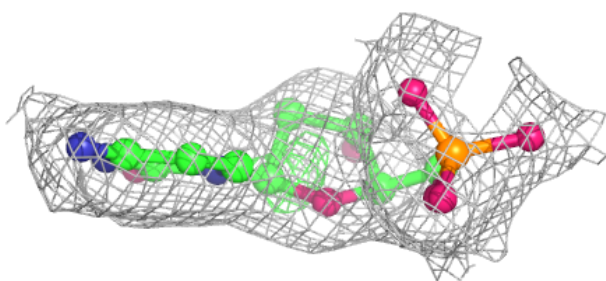
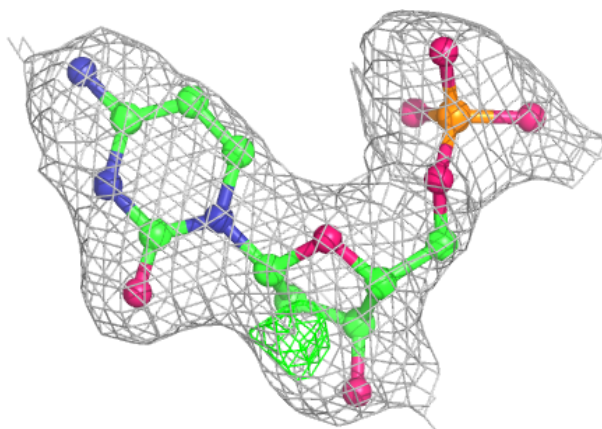
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	ZN	G	201	1/1	0.97	0.10	38,38,38,38	0
2	ZN	E	201	1/1	0.97	0.10	29,29,29,29	0
2	ZN	I	201	1/1	0.98	0.10	39,39,39,39	0
2	ZN	C	201	1/1	0.99	0.11	29,29,29,29	0

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.



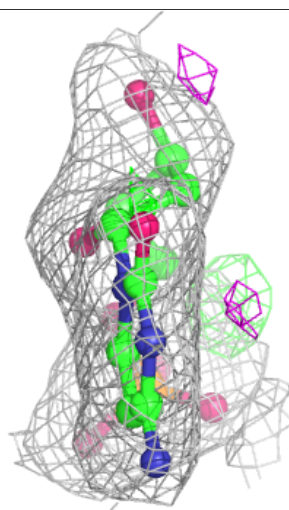
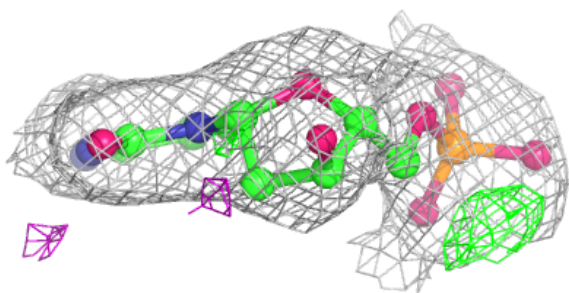
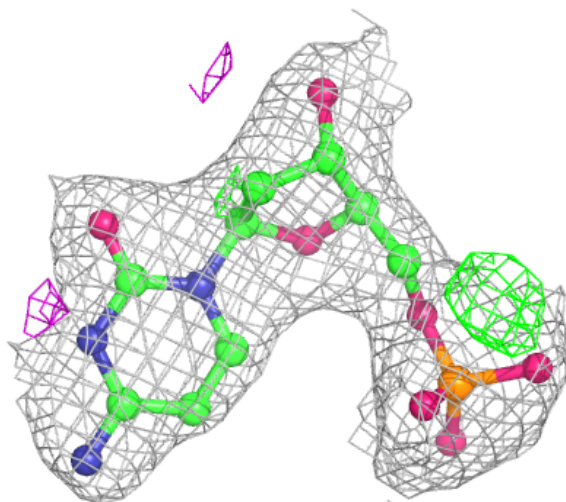
Electron density around DCM H 202:

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



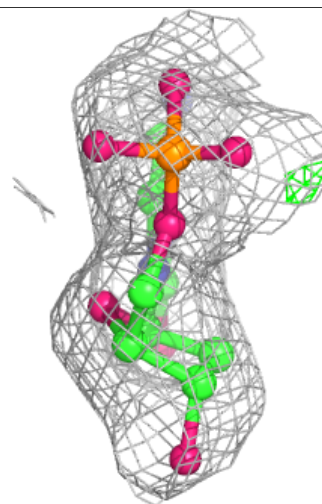
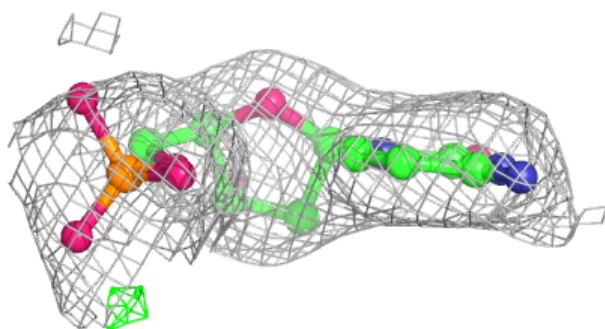
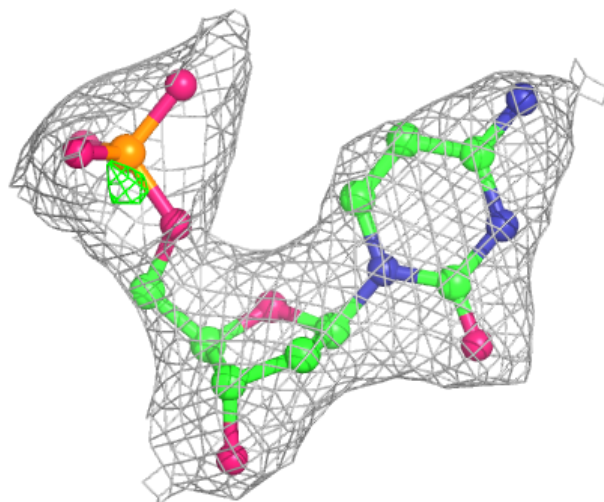
Electron density around DCM J 202:

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



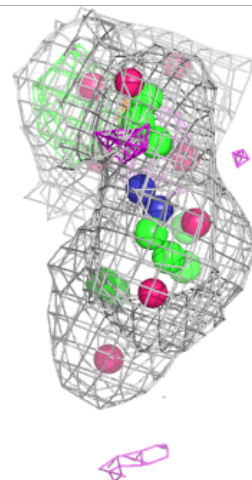
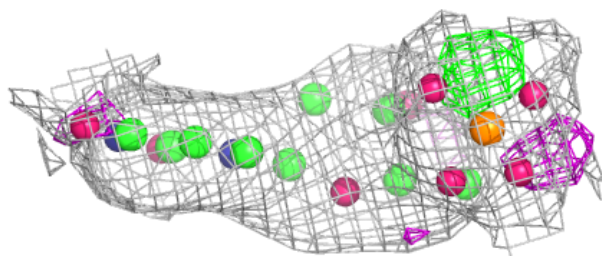
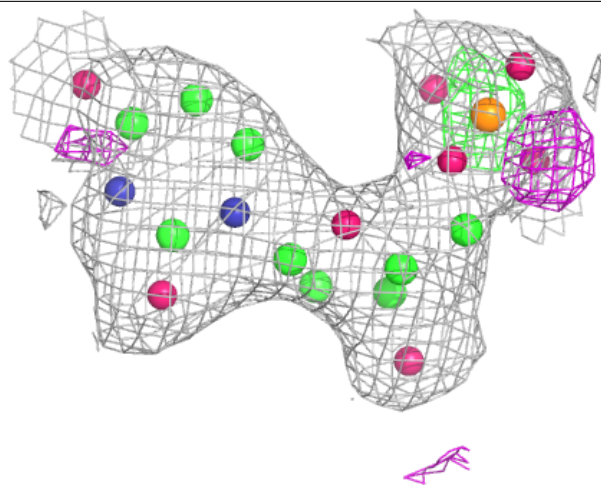
Electron density around DCM K 202:

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



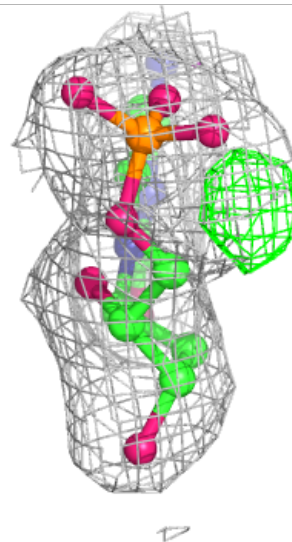
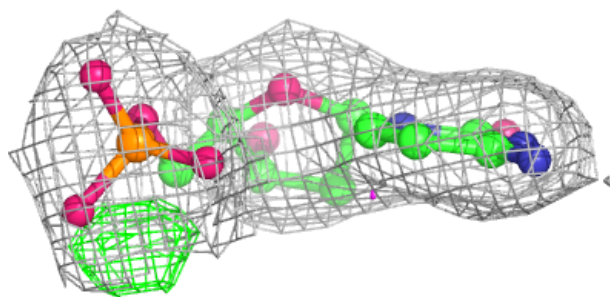
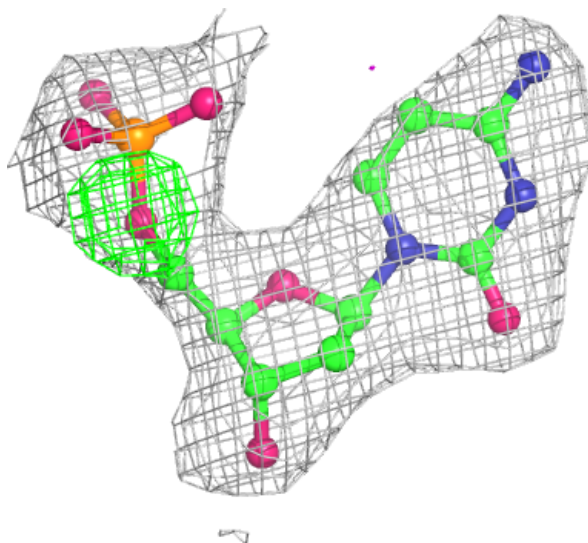
Electron density around DU A 203:

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



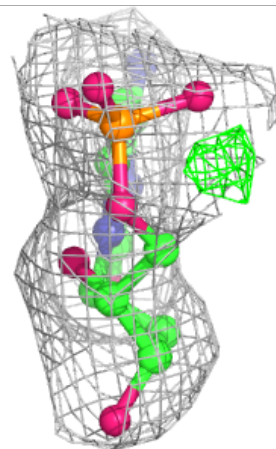
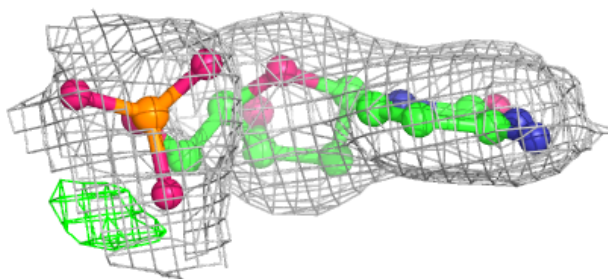
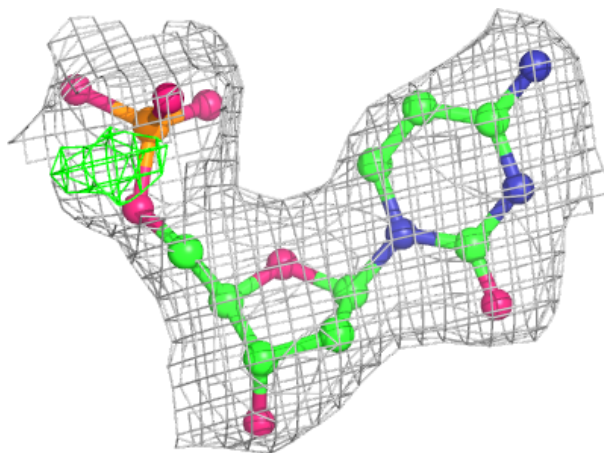
Electron density around DCM G 202:

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



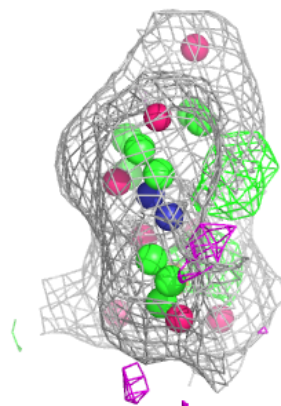
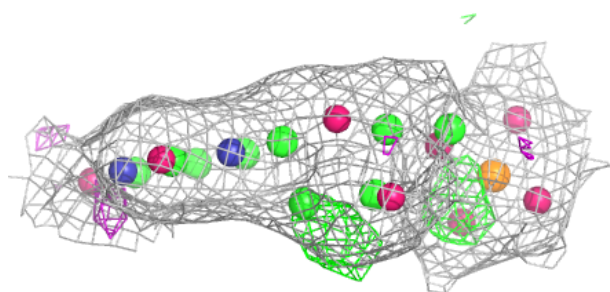
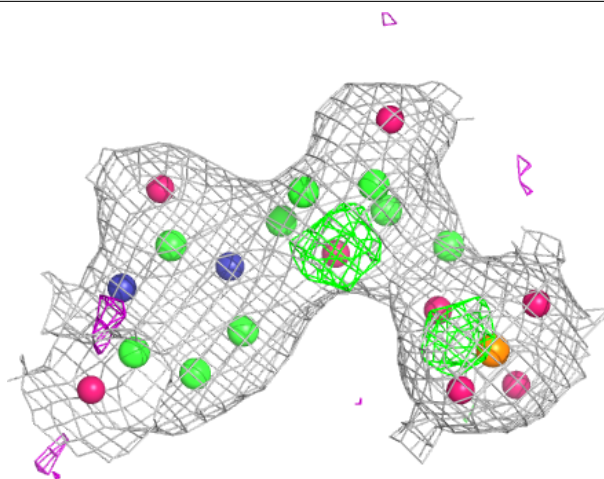
Electron density around DCM L 202:

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



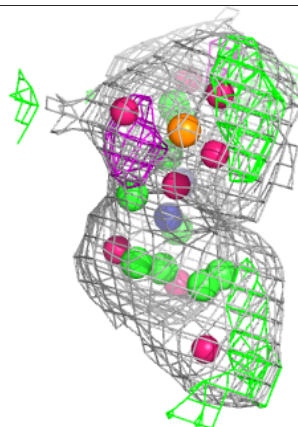
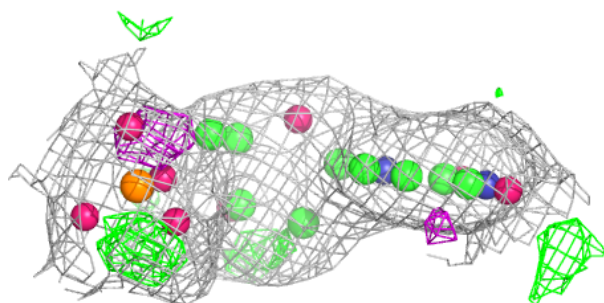
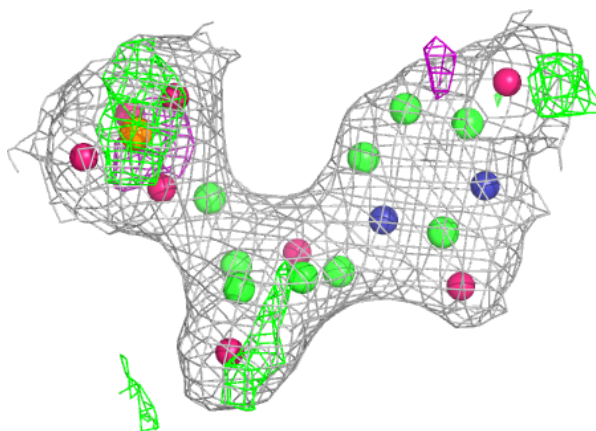
Electron density around DU C 203:

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



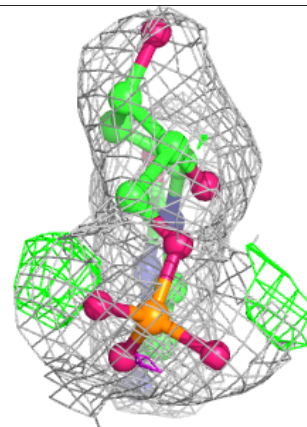
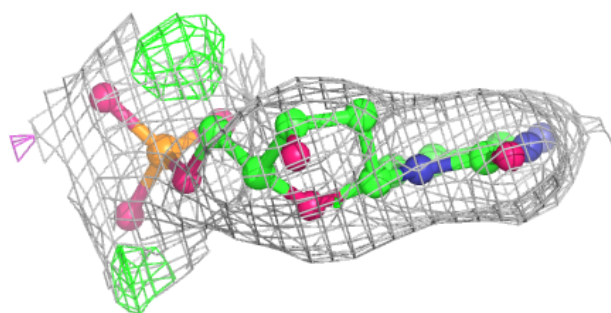
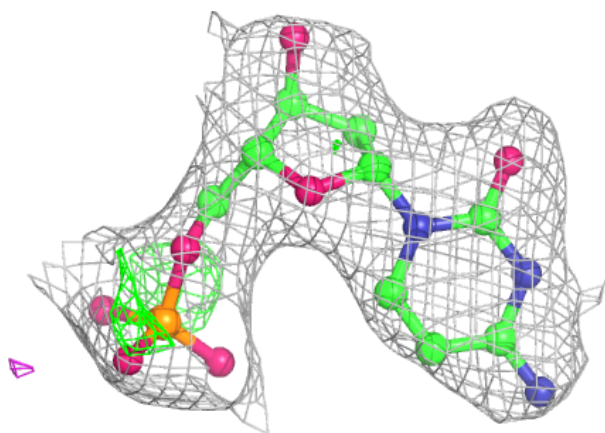
Electron density around DU D 203:

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



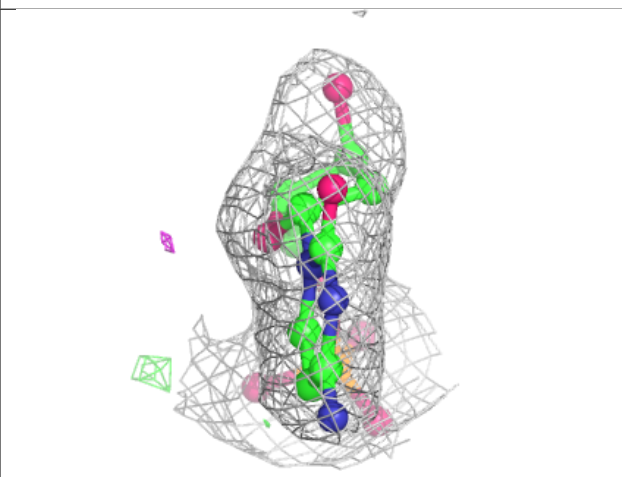
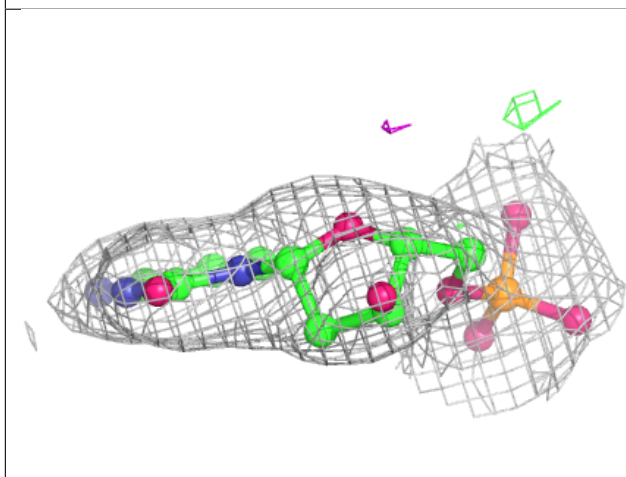
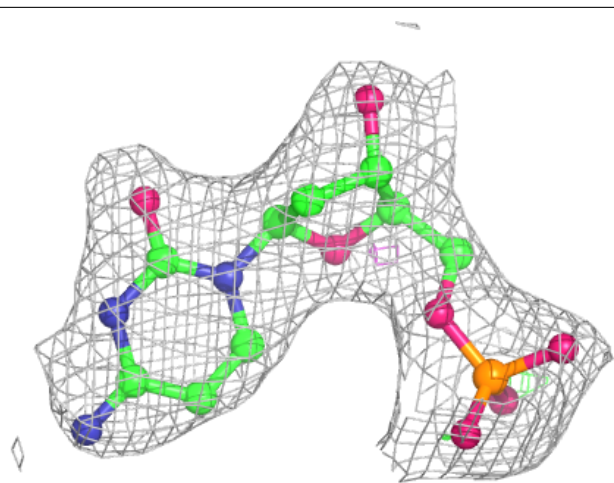
Electron density around DCM D 202:

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



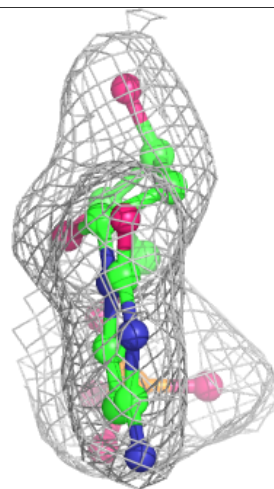
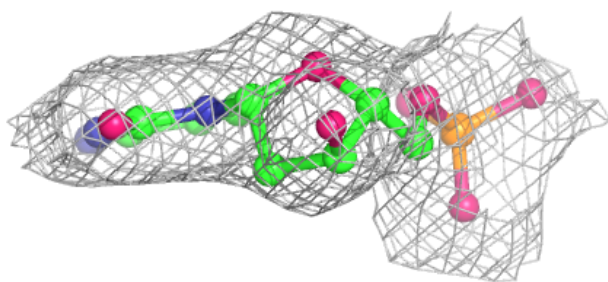
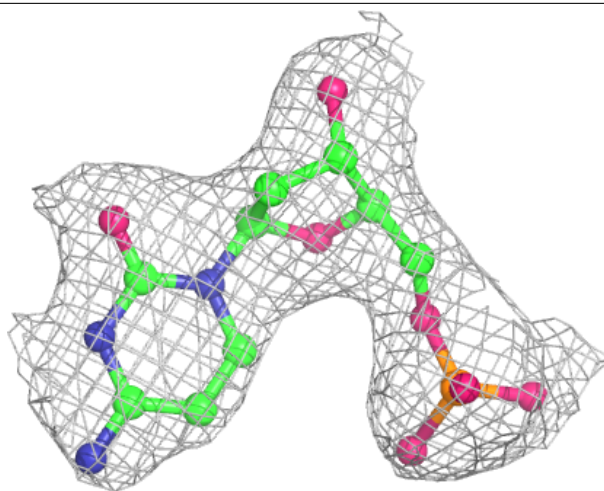
Electron density around DCM F 202:

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



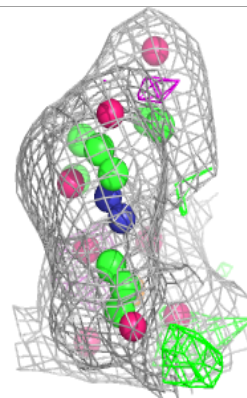
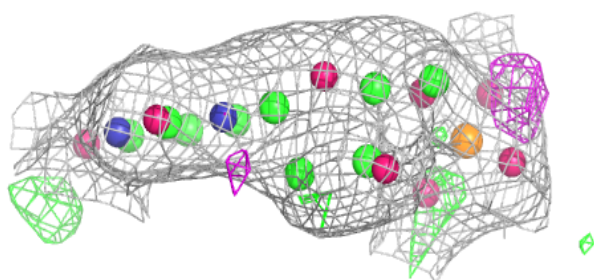
Electron density around DCM I 202:

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and green (positive)



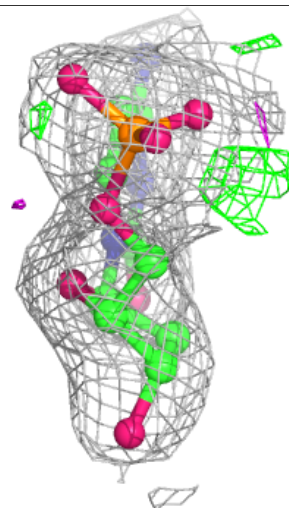
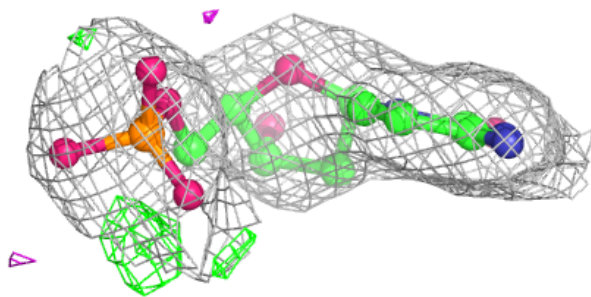
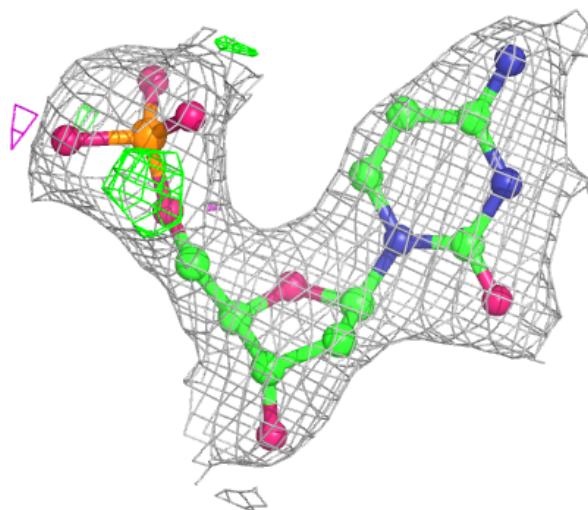
Electron density around DU E 203:

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and green (positive)



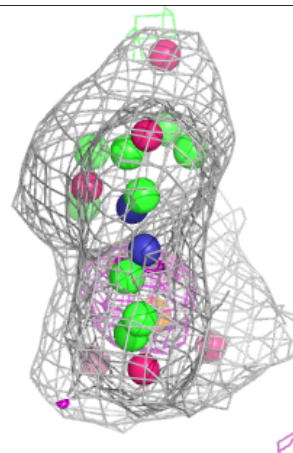
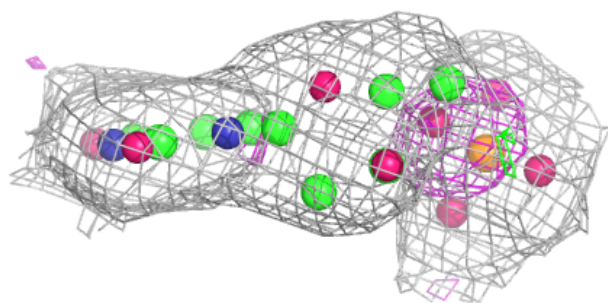
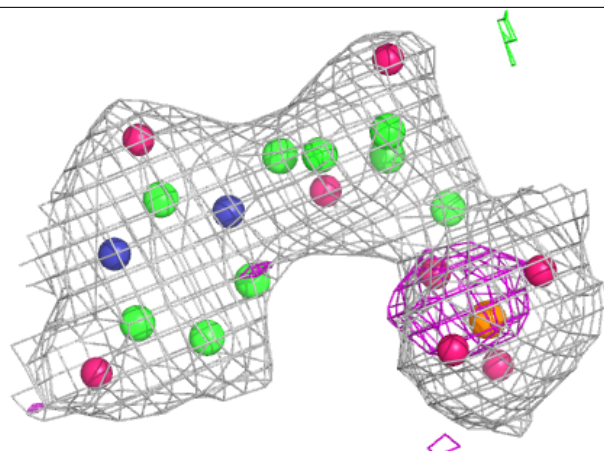
Electron density around DCM E 202:

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



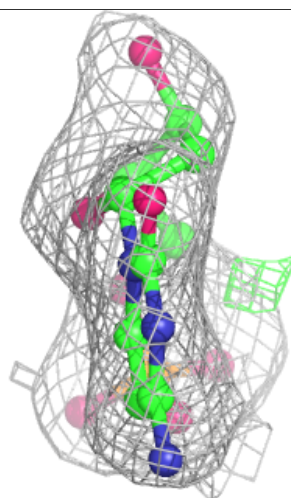
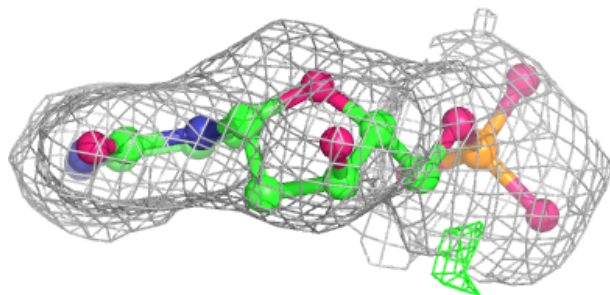
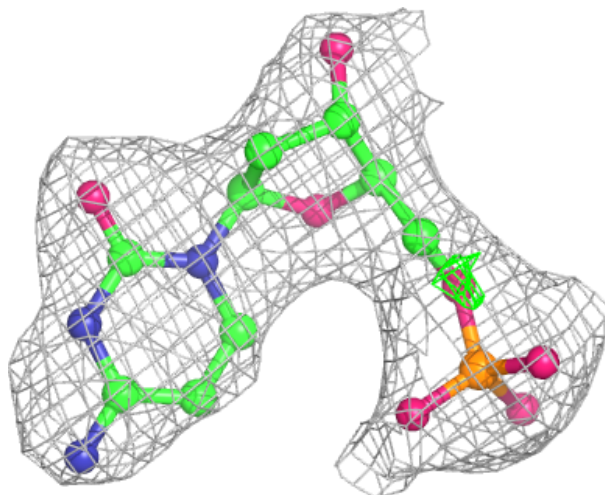
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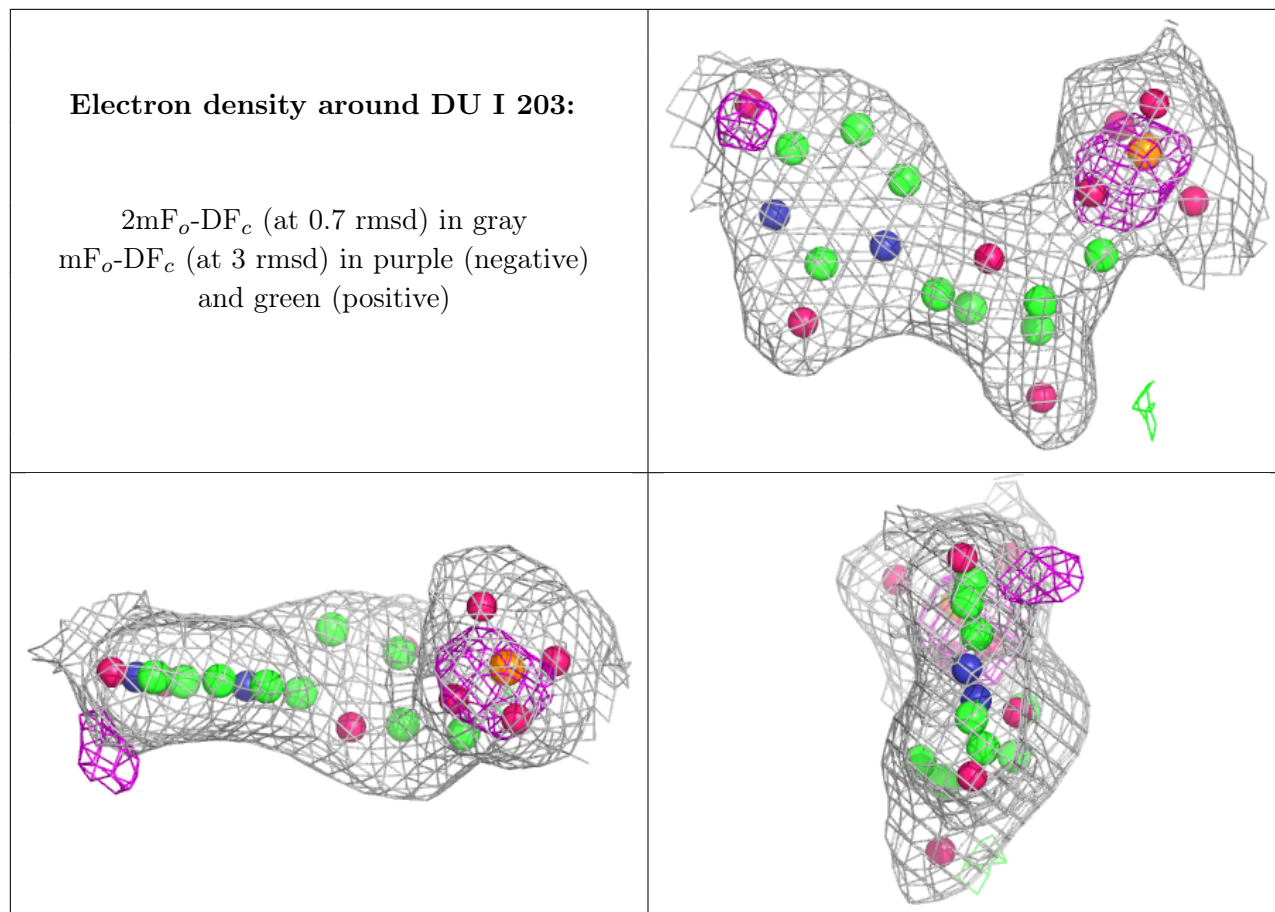
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around DCM A 202:

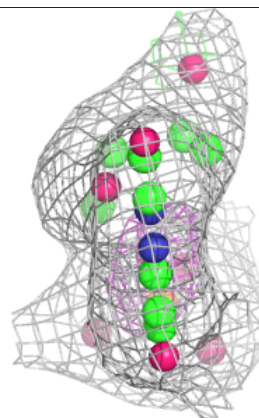
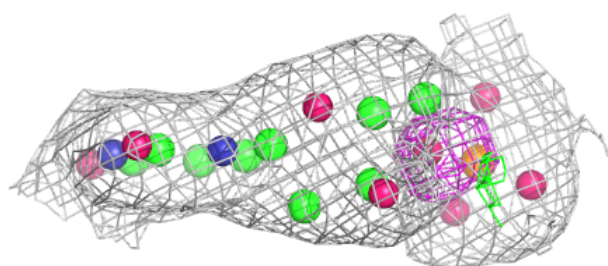
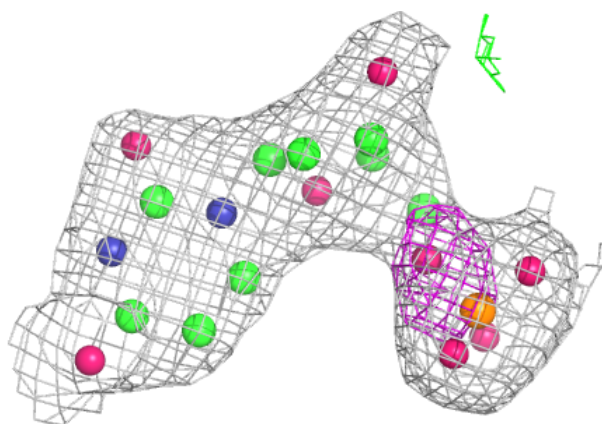
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





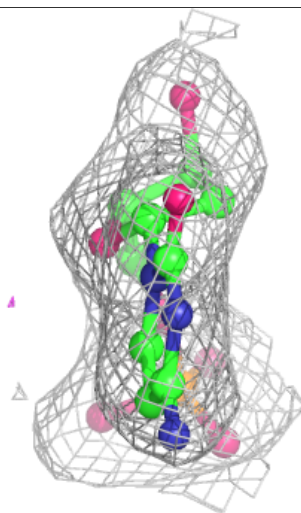
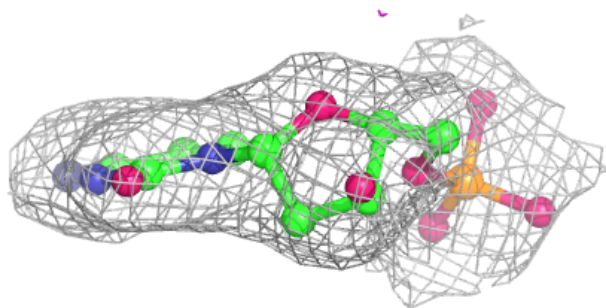
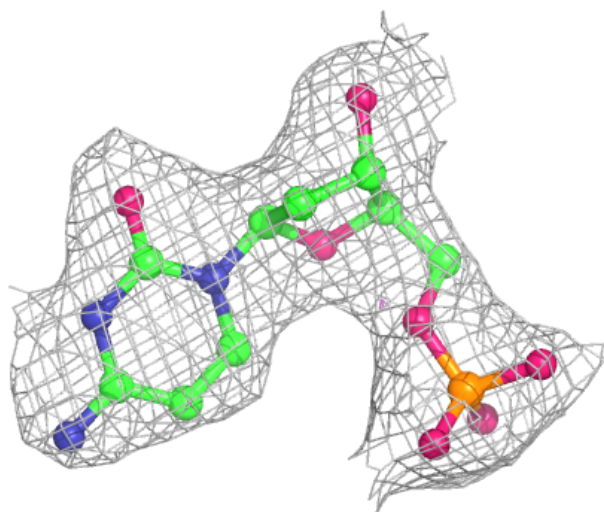
Electron density around DU K 203:

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and green (positive)



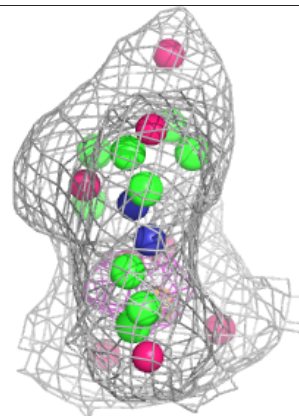
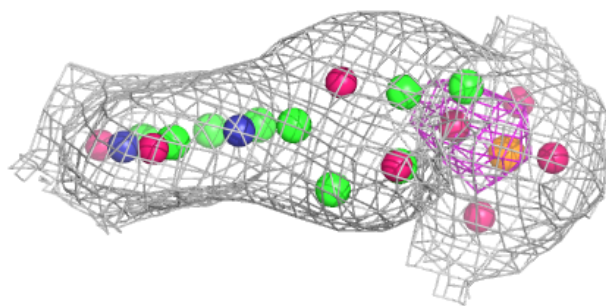
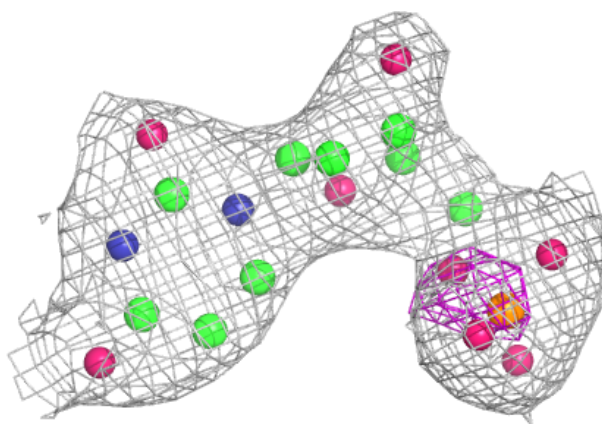
Electron density around DCM B 202:

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and green (positive)



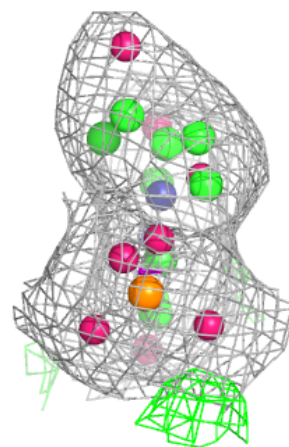
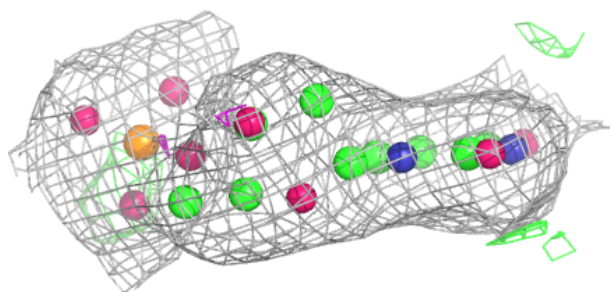
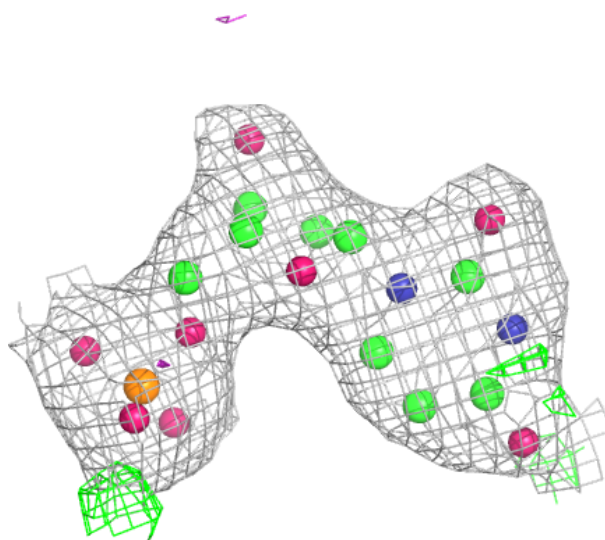
Electron density around DU G 203:

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



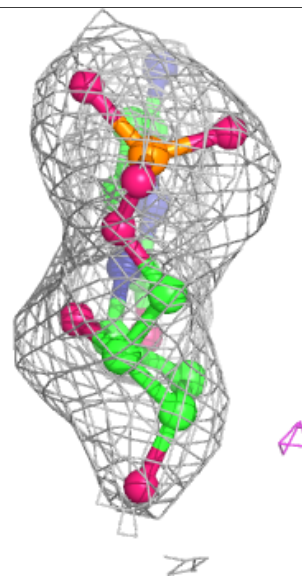
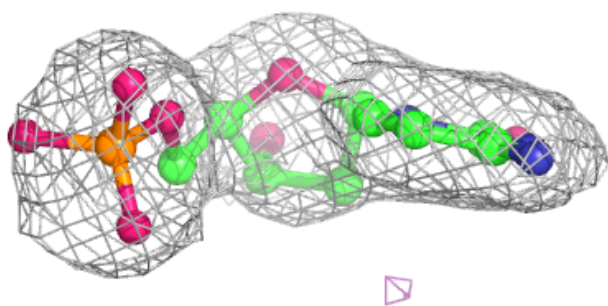
Electron density around DU H 203:

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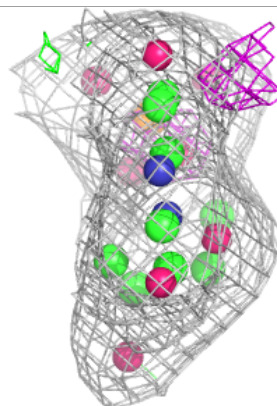
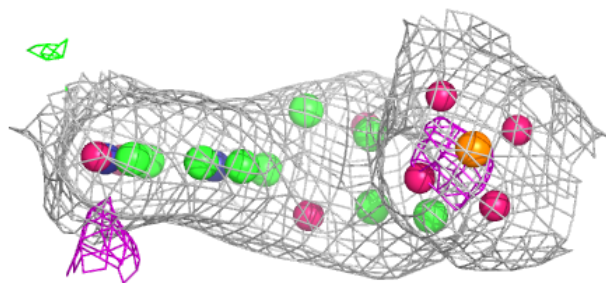
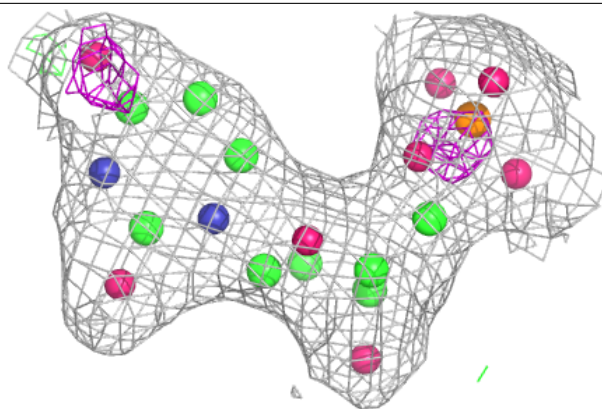
Electron density around DCM C 202:

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and green (positive)

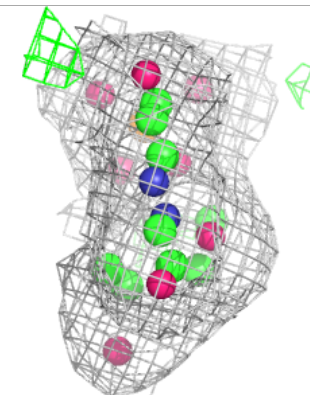
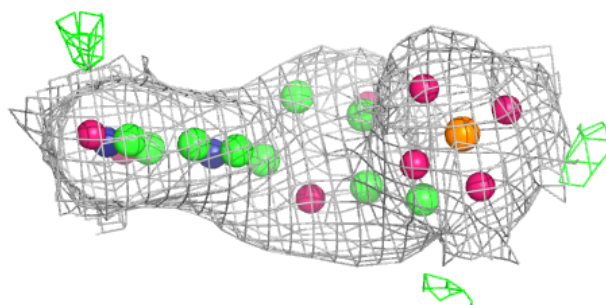
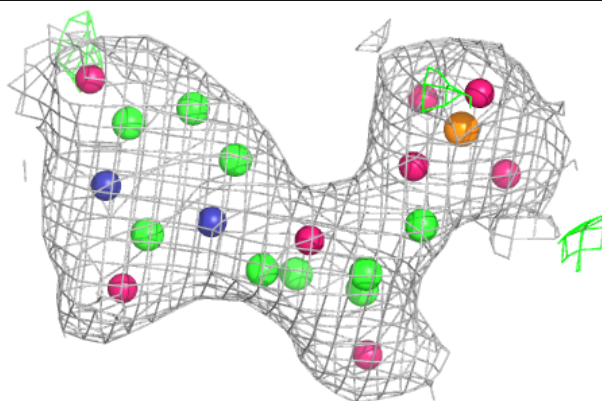


Electron density around DU J 203:

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

**Electron density around DU B 203:**

$2mF_o-DF_c$ (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.