



wwPDB X-ray Structure Validation Summary Report ⓘ

May 29, 2020 – 07:20 am BST

PDB ID : 1G1L
Title : THE STRUCTURAL BASIS OF THE CATALYTIC MECHANISM AND REGULATION OF GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (RMLA). TDP-GLUCOSE COMPLEX.
Authors : Blankenfeldt, W.; Asuncion, M.; Lam, J.S.; Naimsmith, J.H.
Deposited on : 2000-10-12
Resolution : 1.77 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 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 : 2.11
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) : 2.11

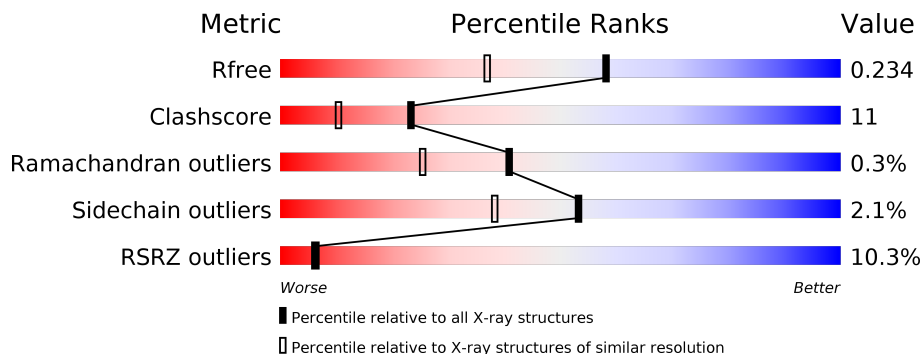
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.77 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	9185 (1.80-1.76)
Clashscore	141614	10184 (1.80-1.76)
Ramachandran outliers	138981	10051 (1.80-1.76)
Sidechain outliers	138945	10050 (1.80-1.76)
RSRZ outliers	127900	9032 (1.80-1.76)

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 on 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	293	<div style="display: flex; align-items: center;"> <div style="width: 8%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 73%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 19%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> </div> <p style="margin-left: 20px;">81% 18% .</p>
1	B	293	<div style="display: flex; align-items: center;"> <div style="width: 6%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 77%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 16%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> </div> <p style="margin-left: 20px;">83% 16% .</p>
1	C	293	<div style="display: flex; align-items: center;"> <div style="width: 12%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 69%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 18%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> </div> <p style="margin-left: 20px;">81% 18% .</p>
1	D	293	<div style="display: flex; align-items: center;"> <div style="width: 14%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 62%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 21%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> </div> <p style="margin-left: 20px;">76% 21% .</p>
1	E	293	<div style="display: flex; align-items: center;"> <div style="width: 13%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 65%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 20%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> </div> <p style="margin-left: 20px;">78% 20% .</p>
1	F	293	<div style="display: flex; align-items: center;"> <div style="width: 11%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 70%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 19%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> </div> <p style="margin-left: 20px;">81% 19%</p>

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Mol	Chain	Length	Quality of chain
1	G	293	
1	H	293	

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
2	SO4	A	3802	-	-	X	-
2	SO4	A	3818	-	-	X	-
2	SO4	B	3701	-	-	X	-
2	SO4	E	3810	-	-	X	-
2	SO4	G	3702	-	-	X	-
2	SO4	H	3703	-	-	X	-
4	CIT	A	3801	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 22376 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 GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	292	Total 2361	C 1508	N 398	O 449	S 6	0	9	0
1	B	293	Total 2333	C 1489	N 395	O 442	S 7	0	5	0
1	C	292	Total 2335	C 1492	N 392	O 445	S 6	0	6	0
1	D	292	Total 2330	C 1487	N 397	O 440	S 6	0	5	0
1	E	292	Total 2320	C 1481	N 391	O 442	S 6	0	5	0
1	F	293	Total 2362	C 1508	N 395	O 452	S 7	0	9	0
1	G	292	Total 2334	C 1491	N 393	O 444	S 6	0	6	0
1	H	292	Total 2313	C 1477	N 390	O 440	S 6	0	4	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



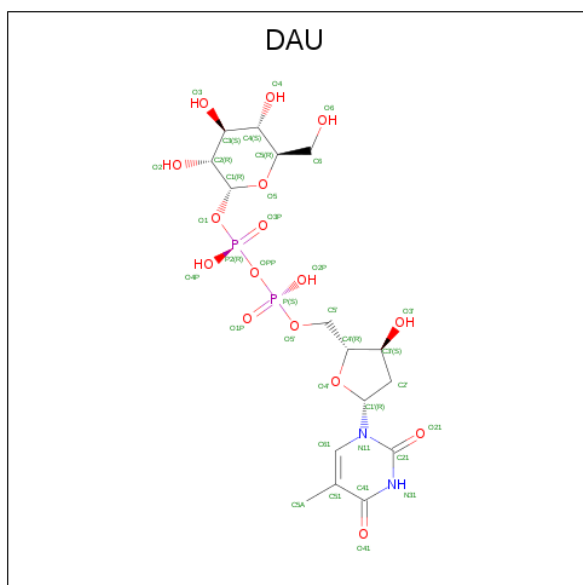
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		
2	E	1	Total	O	S	0	0
			5	4	1		
2	E	1	Total	O	S	0	0
			5	4	1		
2	E	1	Total	O	S	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	E	1	Total	O	S	0	0
			5	4	1		
2	F	1	Total	O	S	0	0
			5	4	1		
2	G	1	Total	O	S	0	0
			5	4	1		
2	G	1	Total	O	S	0	0
			5	4	1		
2	G	1	Total	O	S	0	0
			5	4	1		
2	H	1	Total	O	S	0	0
			5	4	1		
2	H	1	Total	O	S	0	0
			5	4	1		
2	H	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is 2'DEOXY-THYMIDINE-5'-DIPHOSPHO-ALPHA-D-GLUCOSE (three-letter code: DAU) (formula: C₁₆H₂₆N₂O₁₆P₂).



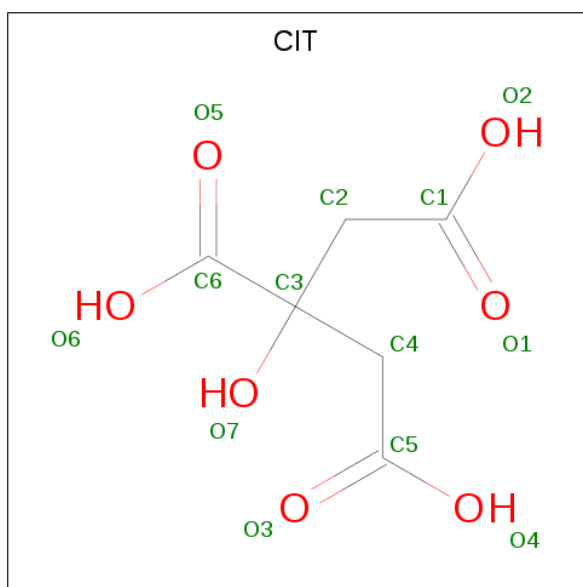
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
3	A	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	A	1	Total	C	N	O	P	0	0
			36	16	2	16	2		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	B	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	B	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	C	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	C	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	D	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	D	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	E	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	E	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	F	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	F	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	G	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	G	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	H	1	Total	C	N	O	P	0	0
			36	16	2	16	2		
3	H	1	Total	C	N	O	P	0	0
			36	16	2	16	2		

- Molecule 4 is CITRIC ACID (three-letter code: CIT) (formula: C₆H₈O₇).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 13 6 7	0	0
4	A	1	Total C O 13 6 7	0	0

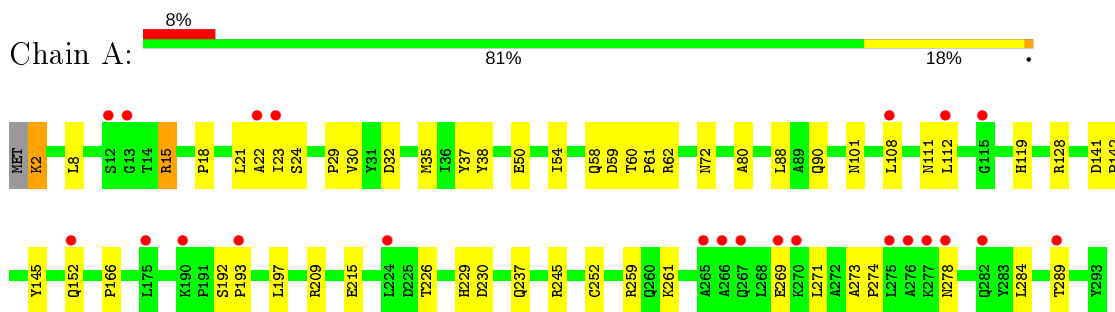
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	406	Total O 406 406	0	0
5	B	414	Total O 414 414	1	0
5	C	358	Total O 358 358	0	0
5	D	309	Total O 309 309	0	0
5	E	324	Total O 324 324	0	0
5	F	325	Total O 325 325	0	0
5	G	420	Total O 420 420	0	0
5	H	415	Total O 415 415	1	0

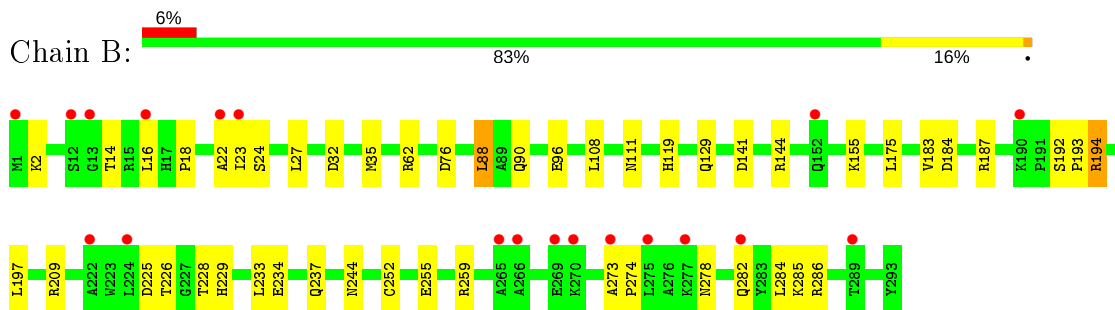
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

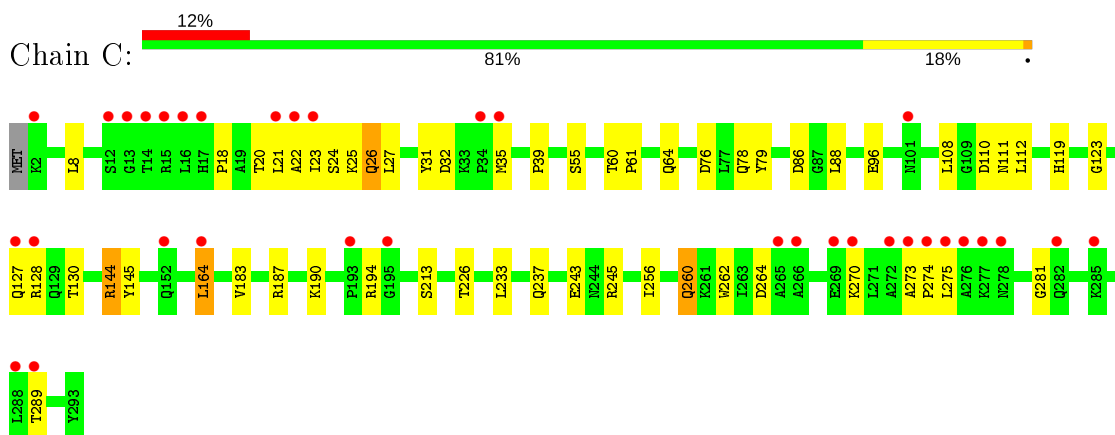
- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE



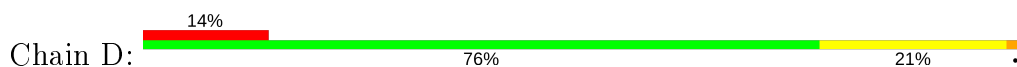
- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE

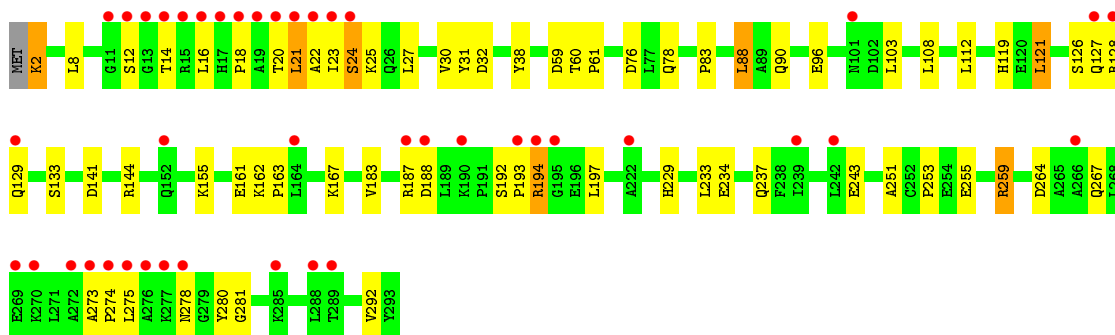


- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE

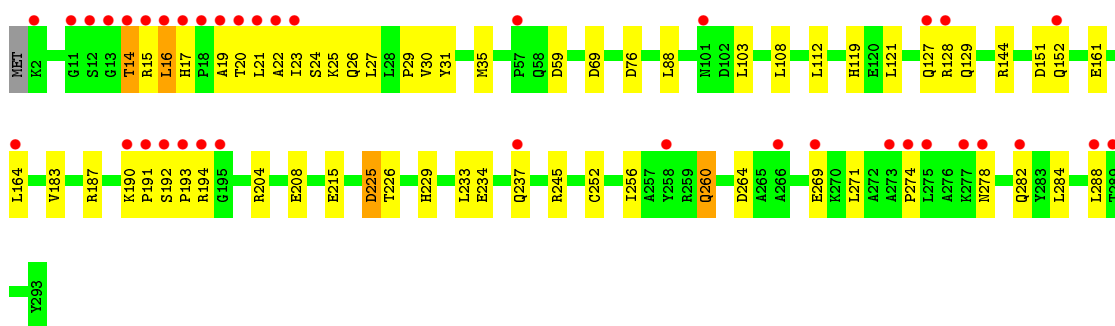
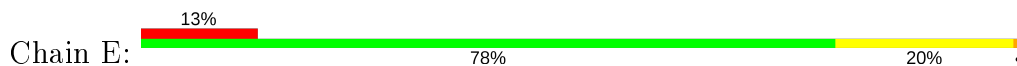


- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE

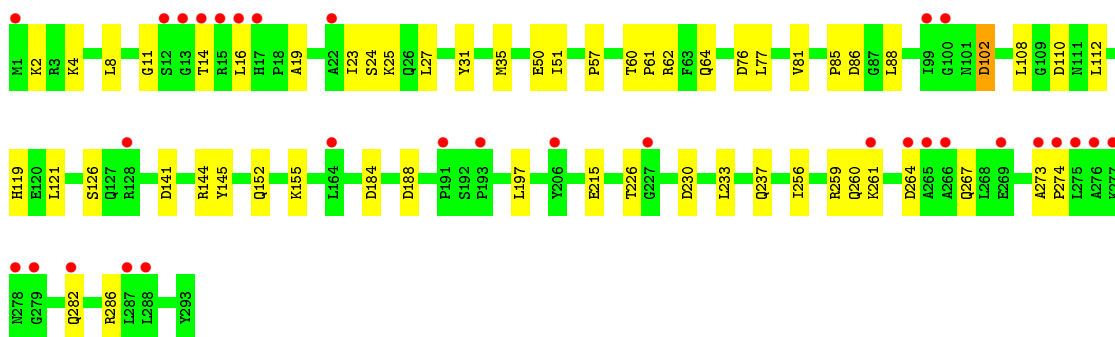
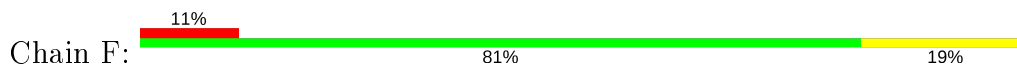




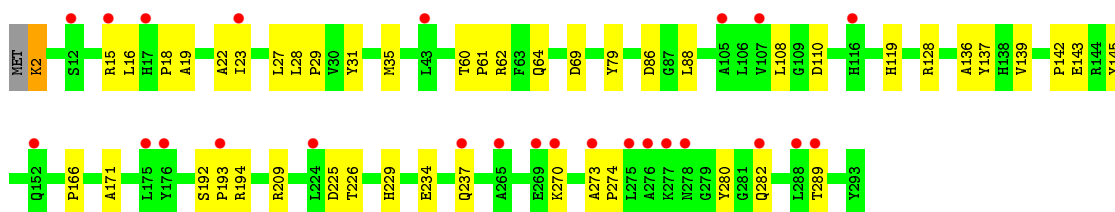
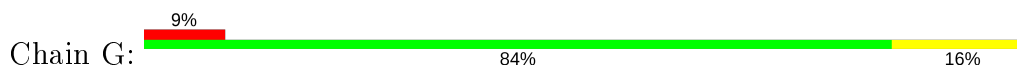
- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE



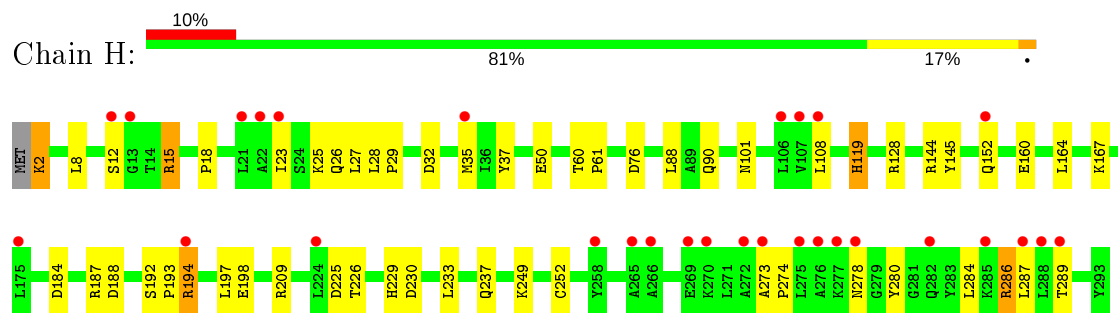
- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE



- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE



- Molecule 1: GLUCOSE-1-PHOSPHATE THYMIDYLTRANSFERASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	71.58Å 73.41Å 134.29Å 89.94° 80.61° 80.93°	Depositor
Resolution (Å)	40.64 – 1.77 40.64 – 1.77	Depositor EDS
% Data completeness (in resolution range)	93.3 (40.64-1.77) 93.9 (40.64-1.77)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.31 (at 1.77Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.156 , 0.215 0.181 , 0.234	Depositor DCC
R_{free} test set	12192 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	15.4	Xtrriage
Anisotropy	0.122	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 67.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	22376	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.96% of the height of the origin peak. No significant pseudotranslation is detected.*

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: DAU, SO4, CIT

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	1.08	3/2413 (0.1%)	1.05	5/3274 (0.2%)
1	B	1.07	0/2383	1.06	9/3231 (0.3%)
1	C	1.02	1/2386 (0.0%)	1.00	3/3237 (0.1%)
1	D	1.03	1/2380 (0.0%)	1.11	13/3227 (0.4%)
1	E	0.96	0/2370	0.98	5/3215 (0.2%)
1	F	1.05	0/2413	1.05	9/3273 (0.3%)
1	G	1.10	3/2385 (0.1%)	1.05	7/3236 (0.2%)
1	H	1.07	2/2363 (0.1%)	1.05	8/3206 (0.2%)
All	All	1.05	10/19093 (0.1%)	1.04	59/25899 (0.2%)

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	H	37	TYR	CD1-CE1	6.24	1.48	1.39
1	C	55	SER	CB-OG	5.62	1.49	1.42
1	A	37	TYR	CD1-CE1	5.60	1.47	1.39
1	A	215	GLU	CD-OE1	5.36	1.31	1.25
1	A	128	ARG	CB-CG	-5.34	1.38	1.52

The worst 5 of 59 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	H	194	ARG	NE-CZ-NH2	-12.19	114.20	120.30
1	D	259[A]	ARG	NE-CZ-NH1	11.50	126.05	120.30
1	D	259[B]	ARG	NE-CZ-NH1	11.50	126.05	120.30
1	G	209	ARG	NE-CZ-NH2	-10.86	114.87	120.30
1	D	259[A]	ARG	NE-CZ-NH2	-10.77	114.92	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2361	0	2330	65	0
1	B	2333	0	2320	46	0
1	C	2335	0	2309	61	0
1	D	2330	0	2316	72	0
1	E	2320	0	2300	77	0
1	F	2362	0	2335	45	1
1	G	2334	0	2309	42	0
1	H	2313	0	2294	53	0
2	A	25	0	0	4	0
2	B	10	0	0	2	0
2	C	10	0	0	1	0
2	D	10	0	0	0	0
2	E	20	0	0	3	0
2	F	5	0	0	0	0
2	G	15	0	0	4	0
2	H	20	0	0	3	0
3	A	72	0	48	3	0
3	B	72	0	48	2	0
3	C	72	0	48	3	0
3	D	72	0	48	1	0
3	E	72	0	48	3	0
3	F	72	0	48	4	0
3	G	72	0	48	0	0
3	H	72	0	48	2	0
4	A	26	0	10	12	0
5	A	406	0	0	22	1
5	B	414	0	0	18	1
5	C	358	0	0	20	0
5	D	309	0	0	16	2
5	E	324	0	0	26	1
5	F	325	0	0	11	0
5	G	420	0	0	13	1
5	H	415	0	0	9	1
All	All	22376	0	18907	431	4

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 11.

The worst 5 of 431 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)
4:A:3801:CIT:H22	5:A:4214:HOH:O	1.33	1.26
1:A:119[B]:HIS:ND1	5:A:4023:HOH:O	1.65	1.24
1:C:237[B]:GLN:NE2	1:D:237[B]:GLN:OE1	1.70	1.23
1:C:27:LEU:HD12	5:C:4073:HOH:O	1.51	1.10
1:A:101[B]:ASN:OD1	5:A:4055:HOH:O	1.69	1.09

All (4) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:D:3941:HOH:O	5:H:4205:HOH:O[1_565]	2.12	0.08
5:D:4087:HOH:O	5:E:4106:HOH:O[1_655]	2.14	0.06
5:A:4001:HOH:O	5:B:4113:HOH:O[1_565]	2.19	0.01
1:F:64:GLN:OE1	5:G:4216:HOH:O[1_455]	2.19	0.01

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	299/293 (102%)	295 (99%)	4 (1%)	0	100	100
1	B	296/293 (101%)	292 (99%)	4 (1%)	0	100	100
1	C	296/293 (101%)	293 (99%)	2 (1%)	1 (0%)	41	25
1	D	295/293 (101%)	289 (98%)	5 (2%)	1 (0%)	41	25
1	E	295/293 (101%)	290 (98%)	3 (1%)	2 (1%)	22	9
1	F	300/293 (102%)	296 (99%)	3 (1%)	1 (0%)	41	25
1	G	296/293 (101%)	293 (99%)	2 (1%)	1 (0%)	41	25
1	H	294/293 (100%)	291 (99%)	3 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	2371/2344 (101%)	2339 (99%)	26 (1%)	6 (0%)	41	25

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	31	TYR
1	D	31	TYR
1	E	14	THR
1	E	31	TYR
1	F	31	TYR

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	248/240 (103%)	244 (98%)	4 (2%)	62	51
1	B	245/240 (102%)	240 (98%)	5 (2%)	55	40
1	C	245/240 (102%)	240 (98%)	5 (2%)	55	40
1	D	244/240 (102%)	238 (98%)	6 (2%)	47	31
1	E	244/240 (102%)	238 (98%)	6 (2%)	47	31
1	F	249/240 (104%)	243 (98%)	6 (2%)	49	33
1	G	245/240 (102%)	242 (99%)	3 (1%)	71	62
1	H	243/240 (101%)	237 (98%)	6 (2%)	47	31
All	All	1963/1920 (102%)	1922 (98%)	41 (2%)	53	38

5 of 41 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	24	SER
1	E	16	LEU
1	H	119	HIS
1	D	119	HIS
1	E	14	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 23 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	282	GLN
1	F	65	GLN
1	H	229	HIS
1	F	17	HIS
1	F	152	GLN

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

41 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	DAU	G	3515	-	32,38,38	1.06	3 (9%)	43,58,58	1.20	4 (9%)
2	SO4	G	3813	-	4,4,4	0.22	0	6,6,6	0.59	0
2	SO4	A	3818	-	4,4,4	0.20	0	6,6,6	0.42	0
3	DAU	E	3509	-	32,38,38	1.08	2 (6%)	43,58,58	1.55	4 (9%)
3	DAU	B	3503	-	32,38,38	0.89	1 (3%)	43,58,58	1.59	4 (9%)
2	SO4	H	3816	-	4,4,4	0.15	0	6,6,6	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	SO4	D	3807	-	4,4,4	0.17	0	6,6,6	0.41	0
4	CIT	A	3800	-	3,12,12	0.86	0	3,17,17	1.33	0
2	SO4	G	3812	-	4,4,4	0.31	0	6,6,6	0.53	0
2	SO4	A	3803	-	4,4,4	0.33	0	6,6,6	0.53	0
2	SO4	E	3808	-	4,4,4	0.31	0	6,6,6	0.29	0
3	DAU	H	3512	-	32,38,38	1.11	4 (12%)	43,58,58	1.92	10 (23%)
2	SO4	E	3810	-	4,4,4	0.35	0	6,6,6	0.84	0
2	SO4	A	3802	-	4,4,4	0.20	0	6,6,6	0.33	0
3	DAU	C	3504	-	32,38,38	1.14	3 (9%)	43,58,58	2.15	13 (30%)
3	DAU	B	3502	-	32,38,38	1.02	3 (9%)	43,58,58	1.69	7 (16%)
2	SO4	E	3820	-	4,4,4	0.29	0	6,6,6	0.71	0
2	SO4	B	3804	-	4,4,4	0.16	0	6,6,6	0.54	0
2	SO4	E	3809	-	4,4,4	0.16	0	6,6,6	0.20	0
2	SO4	F	3811	-	4,4,4	0.17	0	6,6,6	0.37	0
3	DAU	G	3514	-	32,38,38	1.08	3 (9%)	43,58,58	1.69	7 (16%)
2	SO4	H	3703	-	4,4,4	0.14	0	6,6,6	0.26	0
2	SO4	H	3815	-	4,4,4	0.35	0	6,6,6	0.35	0
2	SO4	C	3806	-	4,4,4	0.19	0	6,6,6	0.39	0
2	SO4	A	3817	-	4,4,4	0.34	0	6,6,6	0.39	0
3	DAU	D	3506	-	32,38,38	1.19	4 (12%)	43,58,58	2.29	9 (20%)
2	SO4	A	3700	-	4,4,4	0.11	0	6,6,6	0.29	0
4	CIT	A	3801	-	3,12,12	1.29	0	3,17,17	0.97	0
3	DAU	C	3505	-	32,38,38	1.28	3 (9%)	43,58,58	1.88	4 (9%)
2	SO4	G	3702	-	4,4,4	0.19	0	6,6,6	0.38	0
3	DAU	H	3513	-	32,38,38	1.09	3 (9%)	43,58,58	1.51	4 (9%)
2	SO4	D	3819	-	4,4,4	0.45	0	6,6,6	0.38	0
3	DAU	D	3507	-	32,38,38	1.00	3 (9%)	43,58,58	1.53	4 (9%)
2	SO4	B	3701	-	4,4,4	0.14	0	6,6,6	0.46	0
3	DAU	F	3510	-	32,38,38	1.22	2 (6%)	43,58,58	2.23	10 (23%)
3	DAU	A	3500	-	32,38,38	1.14	3 (9%)	43,58,58	2.05	11 (25%)
2	SO4	H	3814	1	4,4,4	0.25	0	6,6,6	0.44	0
2	SO4	C	3805	-	4,4,4	0.31	0	6,6,6	0.58	0
3	DAU	F	3511	-	32,38,38	1.05	2 (6%)	43,58,58	1.59	6 (13%)
3	DAU	A	3501	-	32,38,38	1.02	2 (6%)	43,58,58	1.30	5 (11%)
3	DAU	E	3508	-	32,38,38	1.07	3 (9%)	43,58,58	2.02	10 (23%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	DAU	G	3515	-	-	5/20/55/55	0/3/3/3
3	DAU	H	3512	-	-	1/20/55/55	0/3/3/3
3	DAU	H	3513	-	-	6/20/55/55	0/3/3/3
3	DAU	D	3507	-	-	5/20/55/55	0/3/3/3
3	DAU	E	3509	-	-	7/20/55/55	0/3/3/3
3	DAU	B	3503	-	-	3/20/55/55	0/3/3/3
3	DAU	G	3514	-	-	0/20/55/55	0/3/3/3
3	DAU	F	3510	-	-	1/20/55/55	0/3/3/3
3	DAU	A	3500	-	-	2/20/55/55	0/3/3/3
3	DAU	D	3506	-	-	0/20/55/55	0/3/3/3
3	DAU	C	3504	-	-	1/20/55/55	0/3/3/3
3	DAU	B	3502	-	-	1/20/55/55	0/3/3/3
4	CIT	A	3800	-	-	4/6/16/16	-
3	DAU	F	3511	-	-	6/20/55/55	0/3/3/3
3	DAU	A	3501	-	-	6/20/55/55	0/3/3/3
3	DAU	E	3508	-	-	1/20/55/55	0/3/3/3
3	DAU	C	3505	-	-	6/20/55/55	0/3/3/3
4	CIT	A	3801	-	-	3/6/16/16	-

The worst 5 of 44 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	3505	DAU	O41-C41	4.16	1.35	1.24
3	F	3510	DAU	P2-O3P	3.40	1.62	1.50
3	G	3514	DAU	P2-O3P	3.32	1.62	1.50
3	D	3506	DAU	O41-C41	3.16	1.32	1.24
3	E	3509	DAU	O41-C41	3.16	1.32	1.24

The worst 5 of 112 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	3505	DAU	C41-N31-C21	10.11	123.68	115.14
3	D	3506	DAU	C41-N31-C21	9.55	123.21	115.14
3	F	3510	DAU	O5-C1-O1	-8.44	100.33	111.36
3	D	3507	DAU	C41-N31-C21	7.03	121.08	115.14
3	F	3511	DAU	C41-N31-C21	6.93	120.99	115.14

There are no chirality outliers.

5 of 58 torsion outliers are listed below:

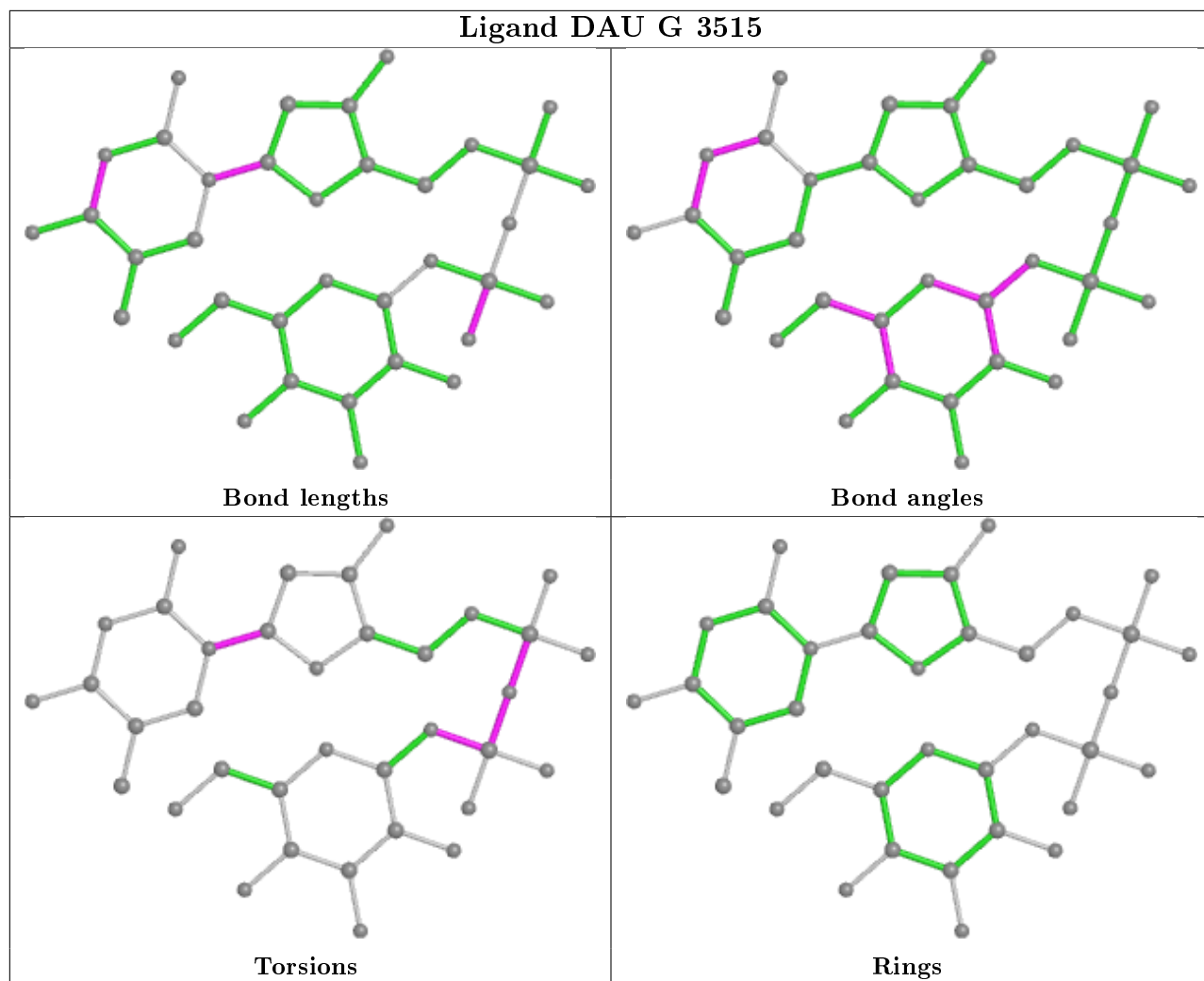
Mol	Chain	Res	Type	Atoms
3	G	3515	DAU	O4'-C1'-N11-C61
3	E	3509	DAU	C1-O1-P2-O4P
4	A	3800	CIT	C1-C2-C3-C4
4	A	3800	CIT	C1-C2-C3-C6
3	D	3507	DAU	C1-O1-P2-O4P

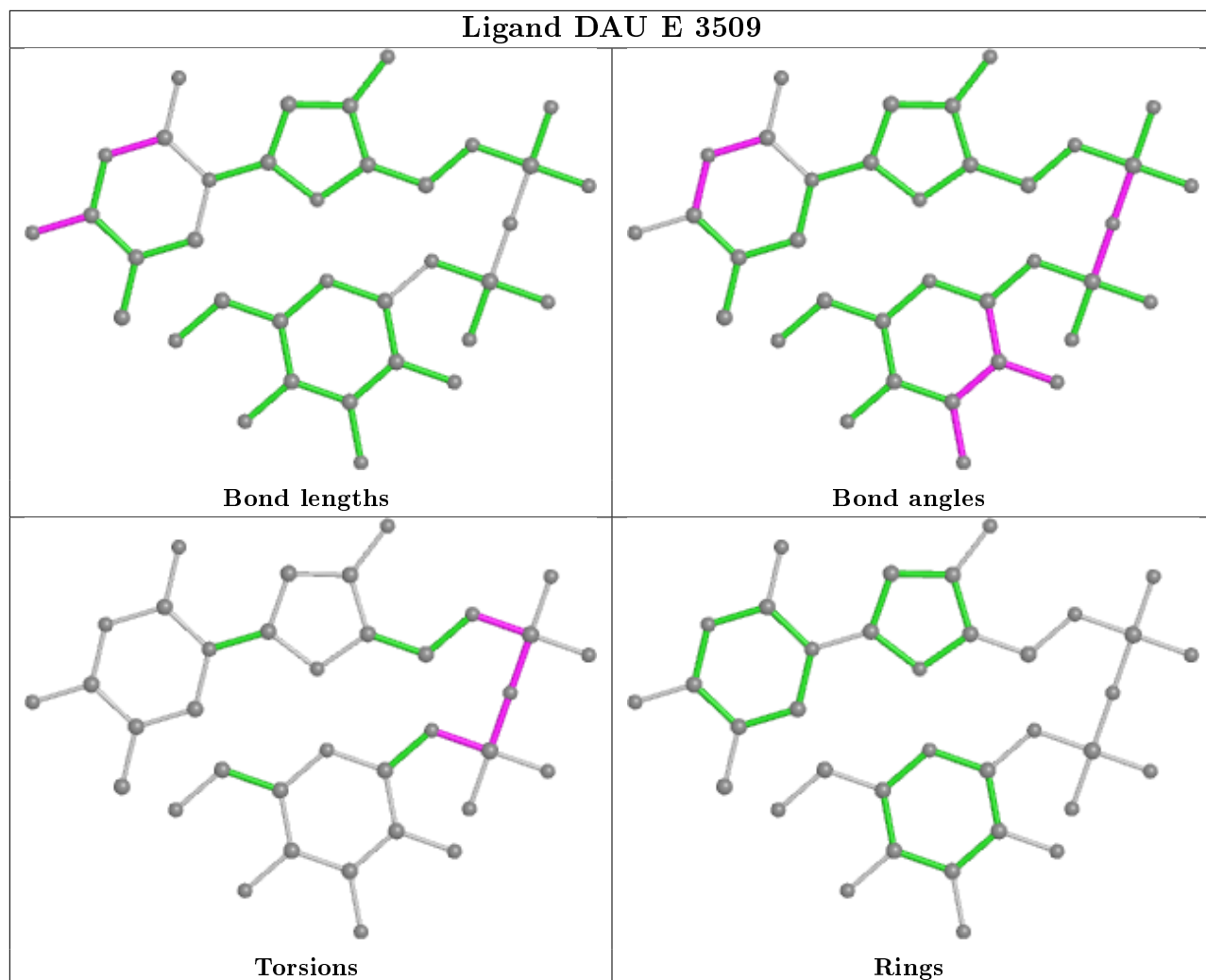
There are no ring outliers.

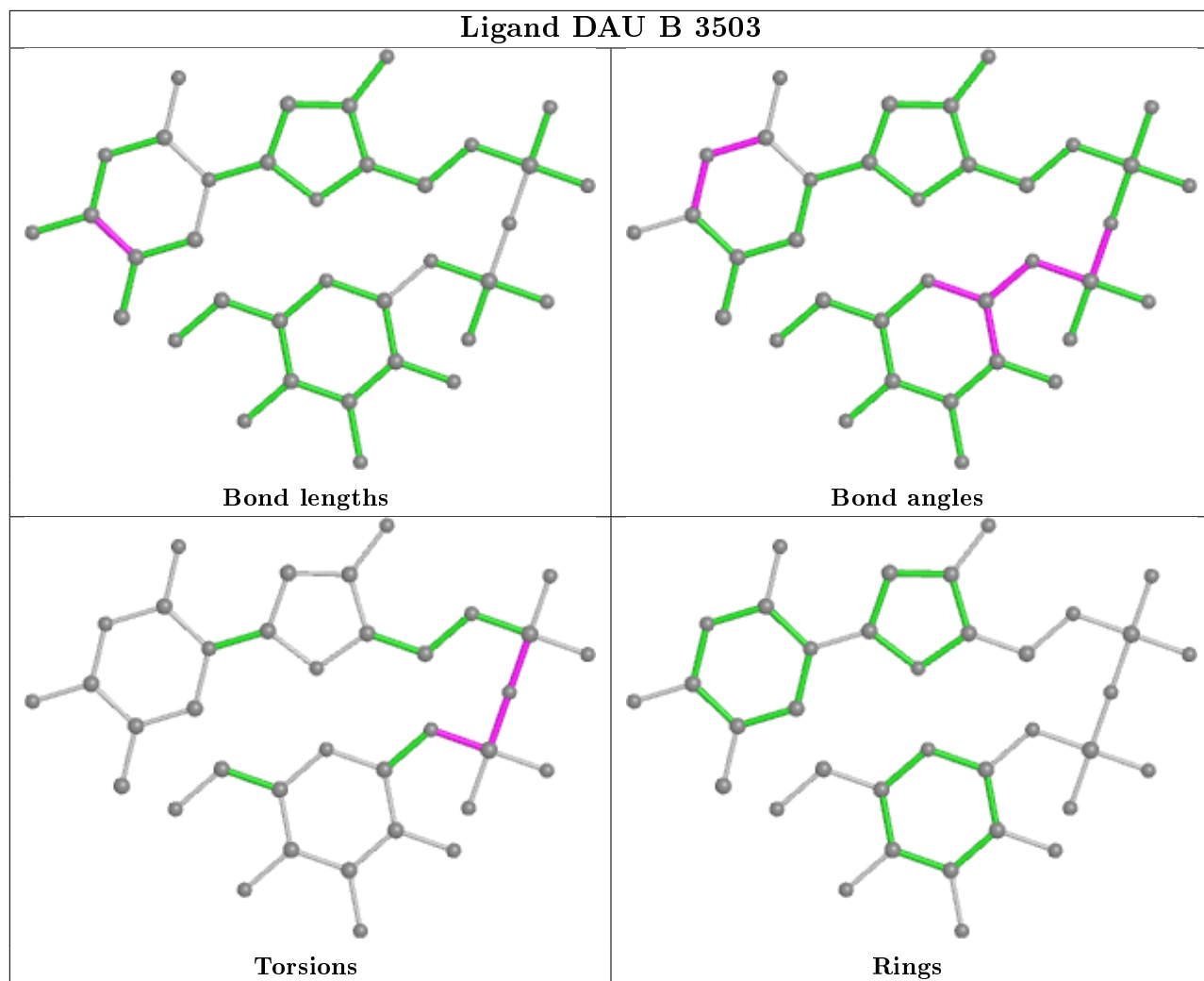
19 monomers are involved in 46 short contacts:

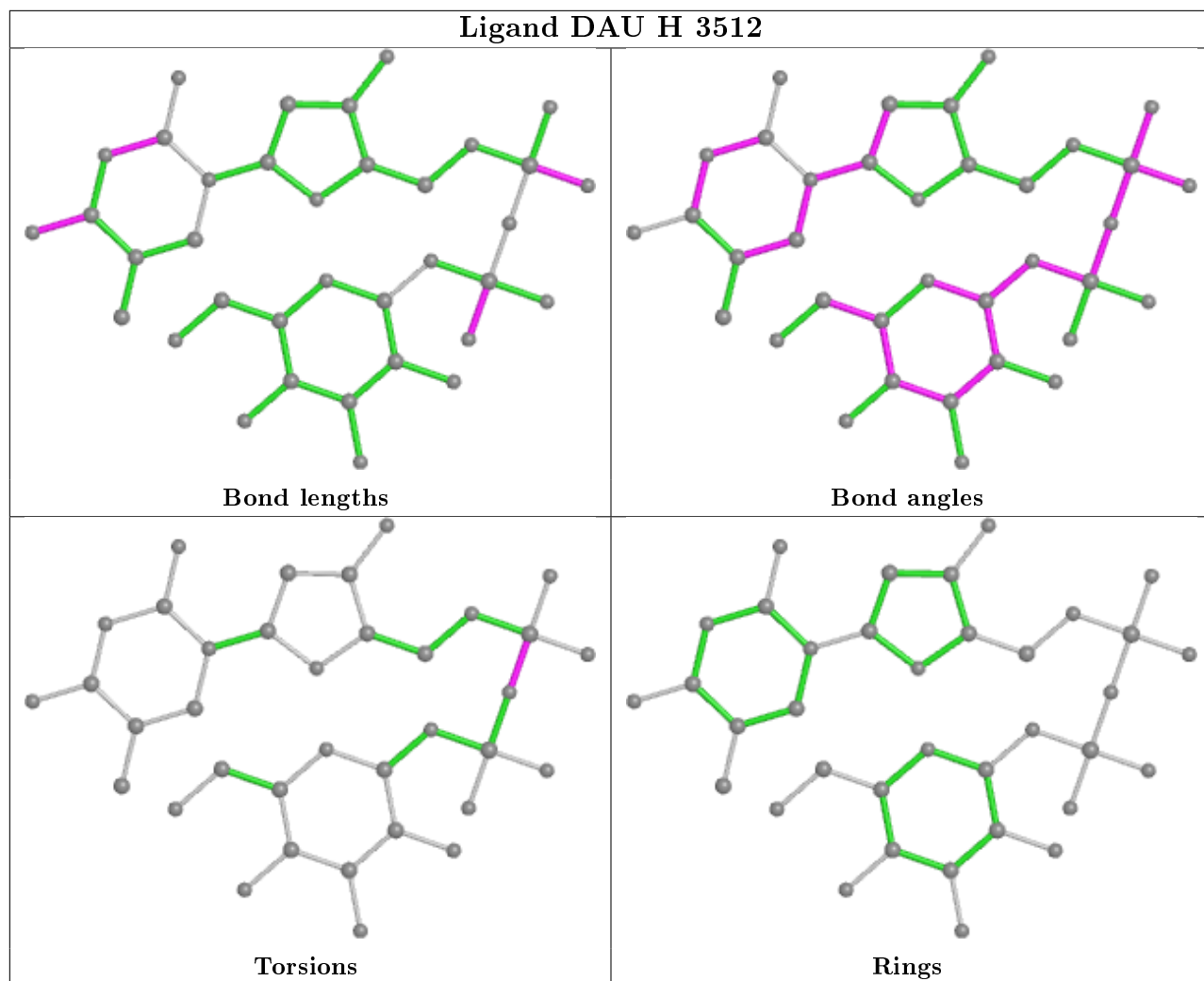
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	3818	SO4	2	0
4	A	3800	CIT	3	0
3	H	3512	DAU	1	0
2	E	3810	SO4	2	0
2	A	3802	SO4	2	0
3	C	3504	DAU	3	0
3	B	3502	DAU	2	0
2	E	3820	SO4	1	0
2	H	3703	SO4	3	0
2	C	3806	SO4	1	0
3	D	3506	DAU	1	0
4	A	3801	CIT	9	0
2	G	3702	SO4	4	0
3	H	3513	DAU	1	0
2	B	3701	SO4	2	0
3	F	3510	DAU	4	0
3	A	3500	DAU	1	0
3	A	3501	DAU	2	0
3	E	3508	DAU	3	0

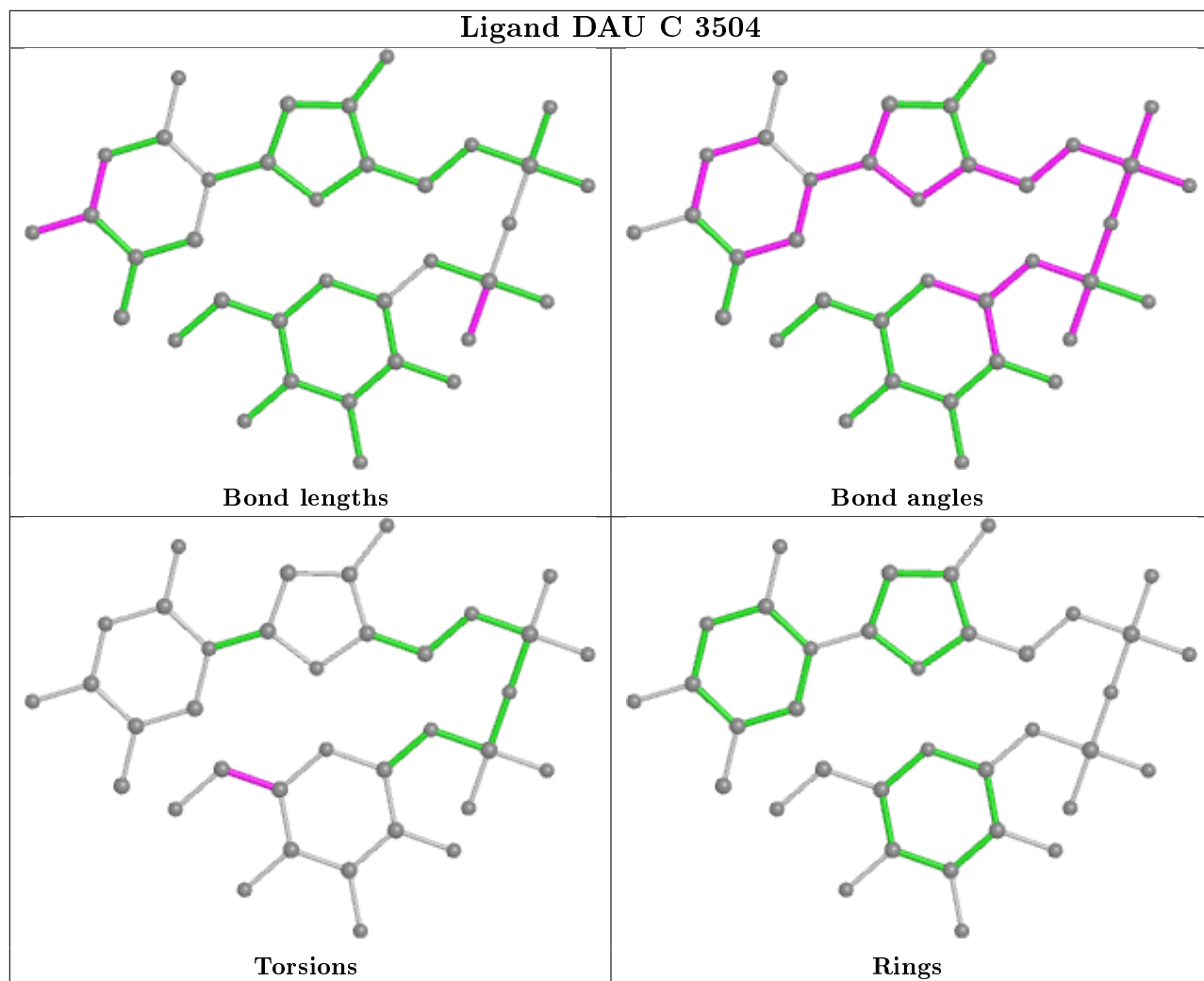
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

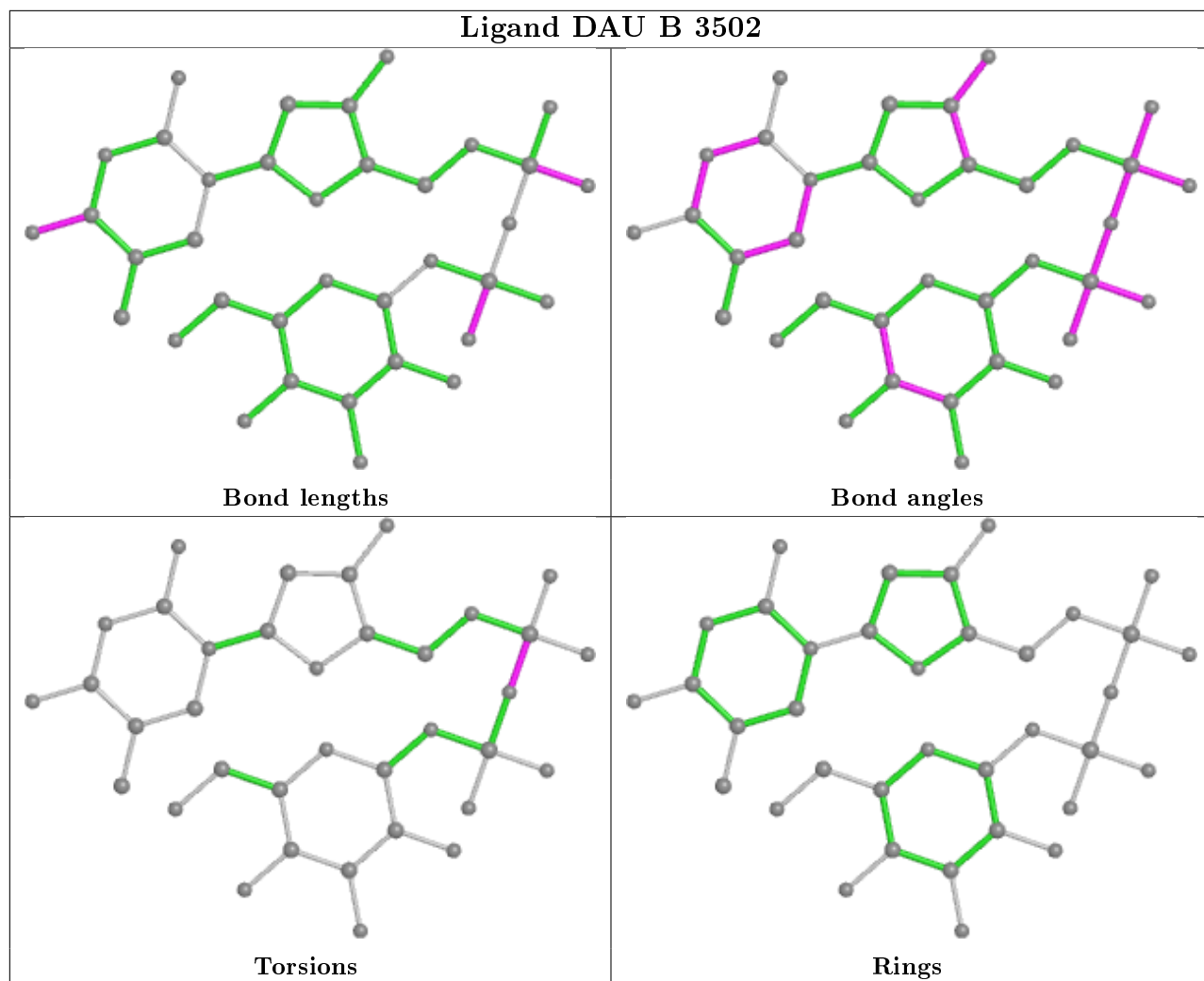


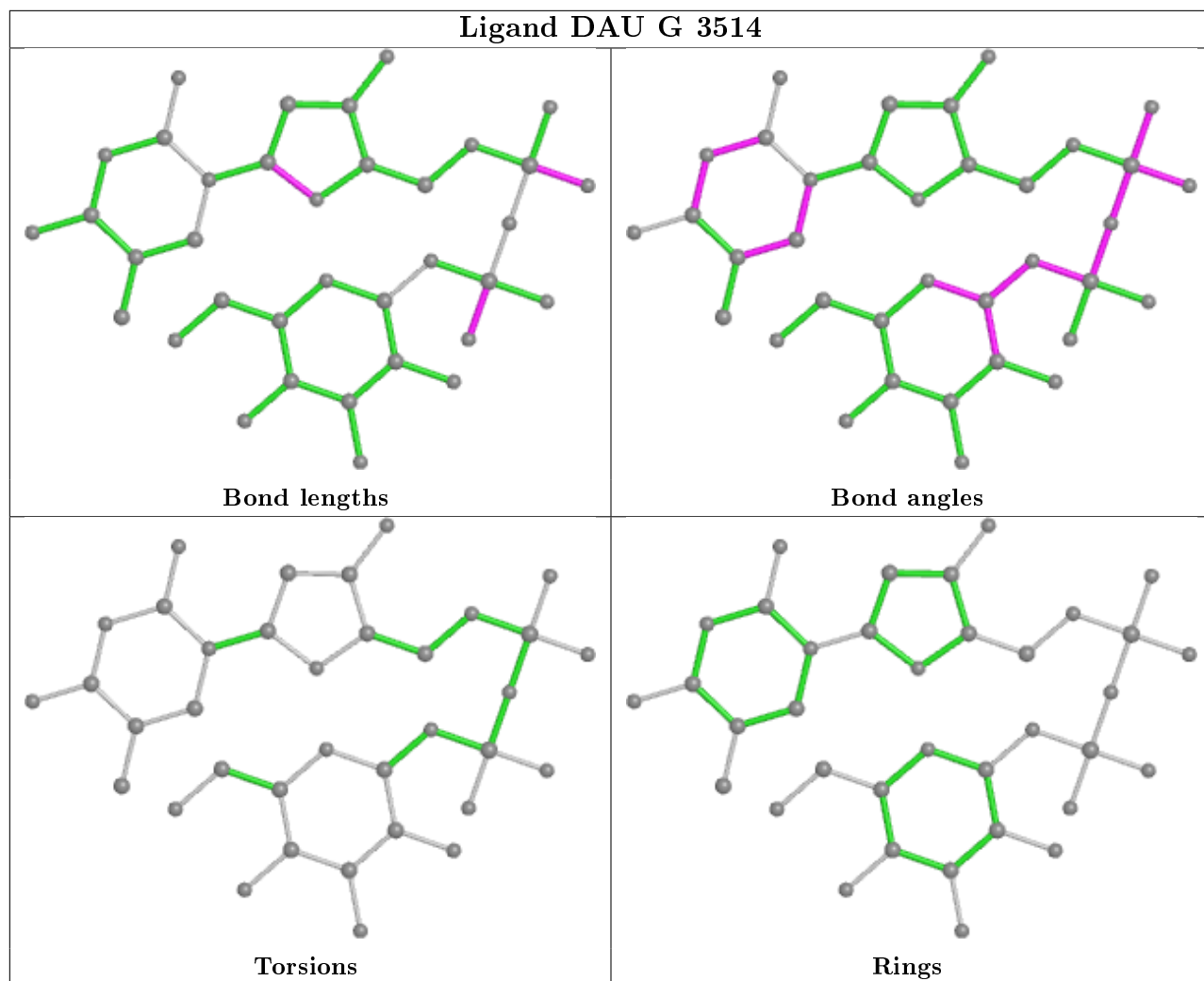


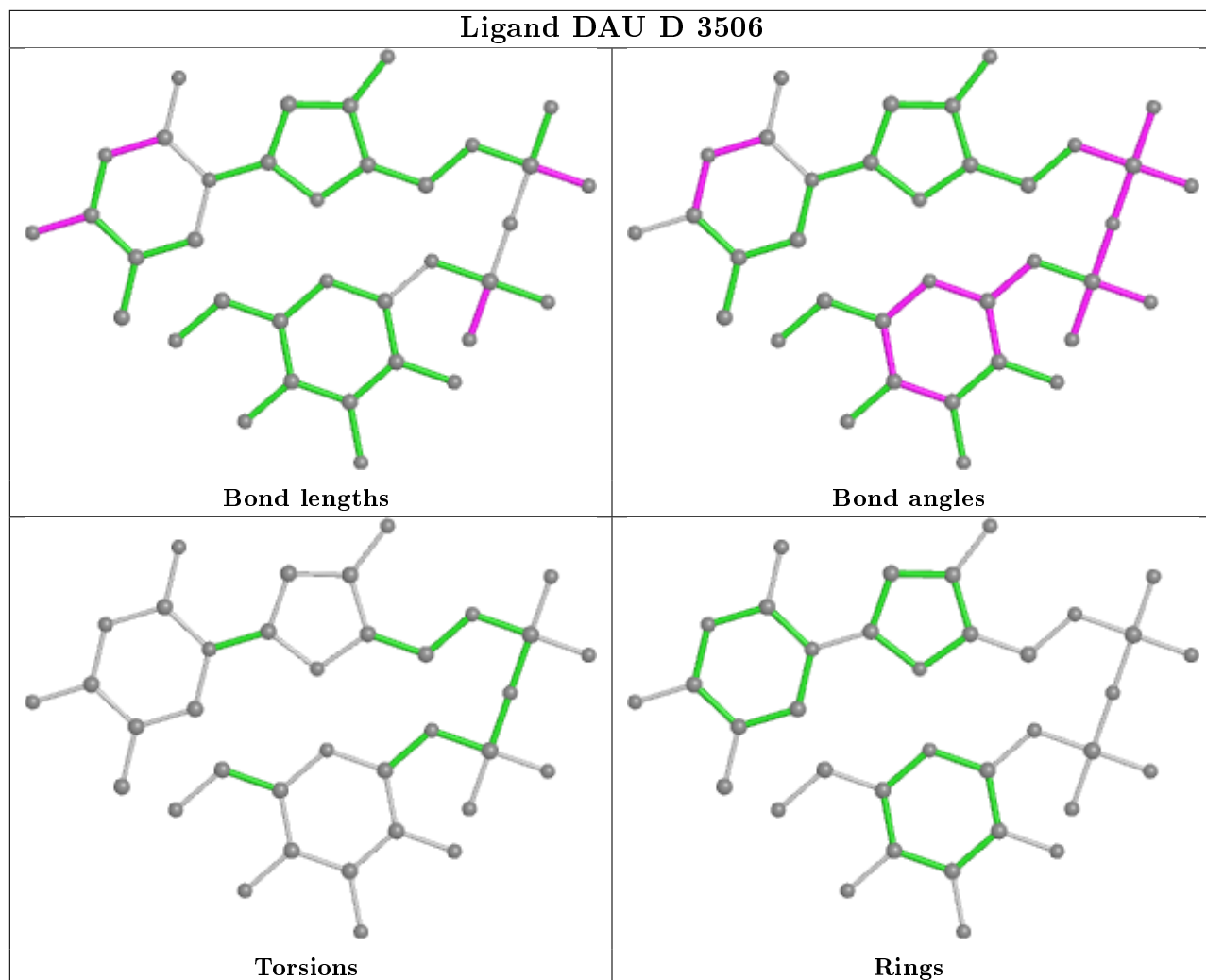


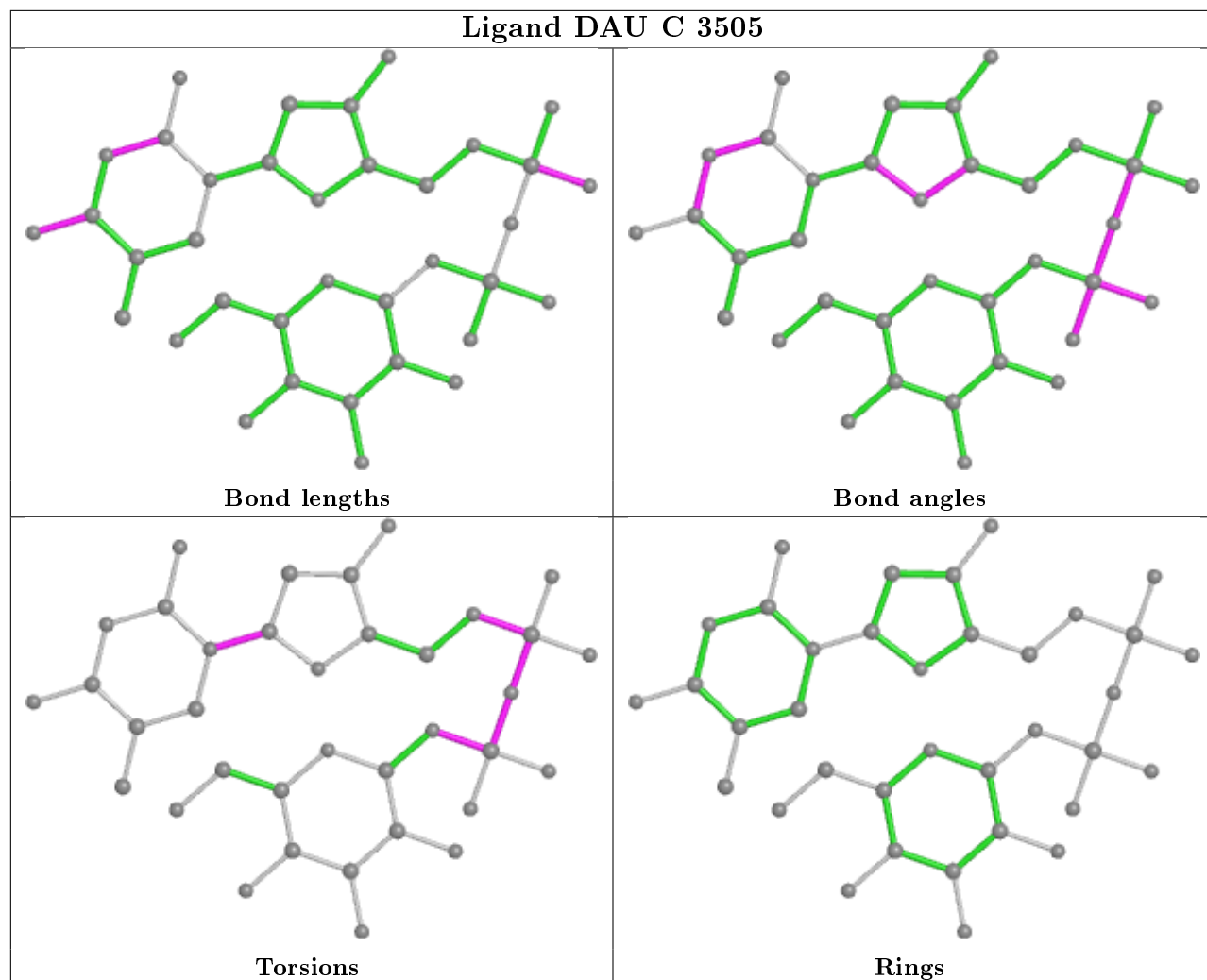


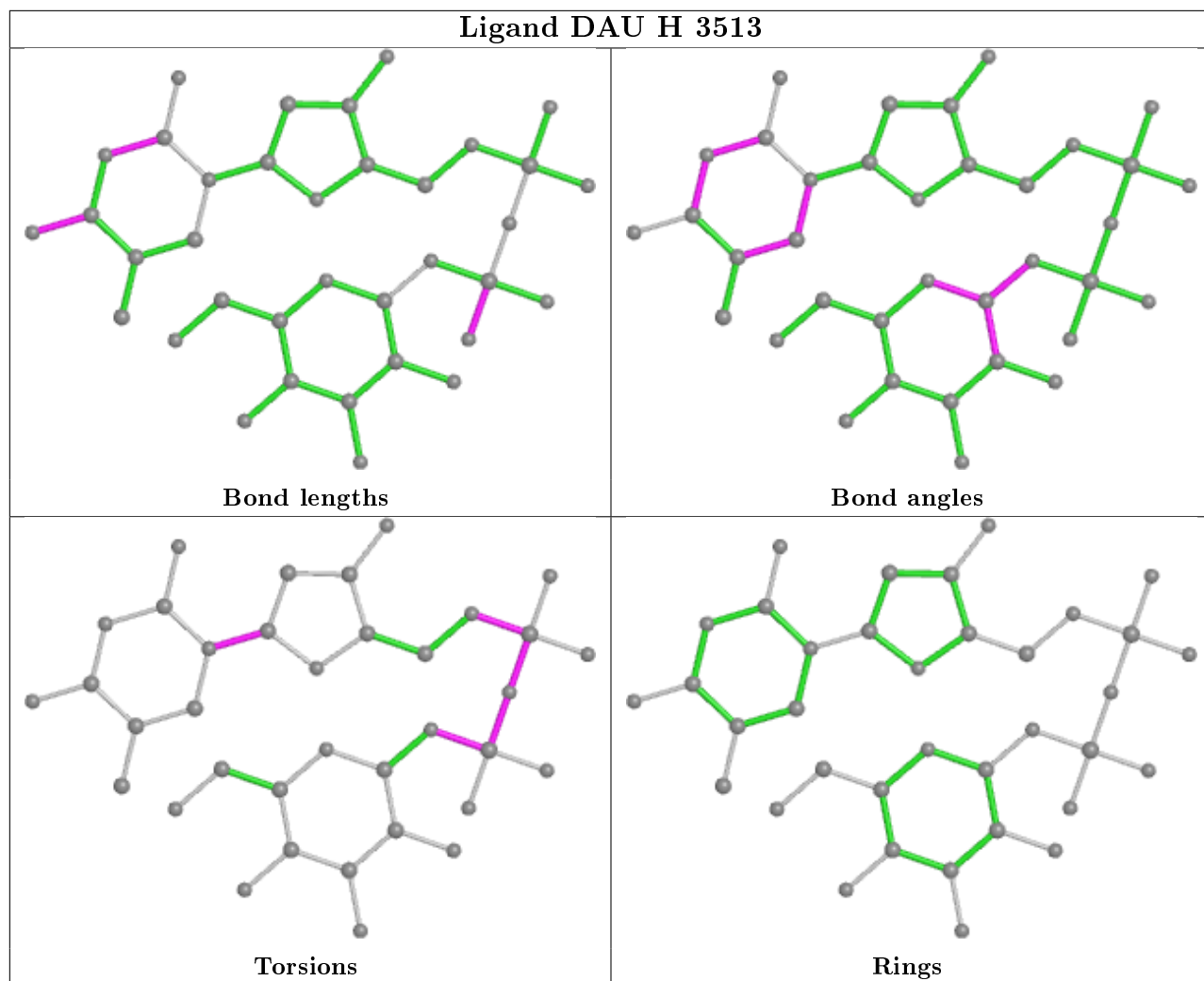


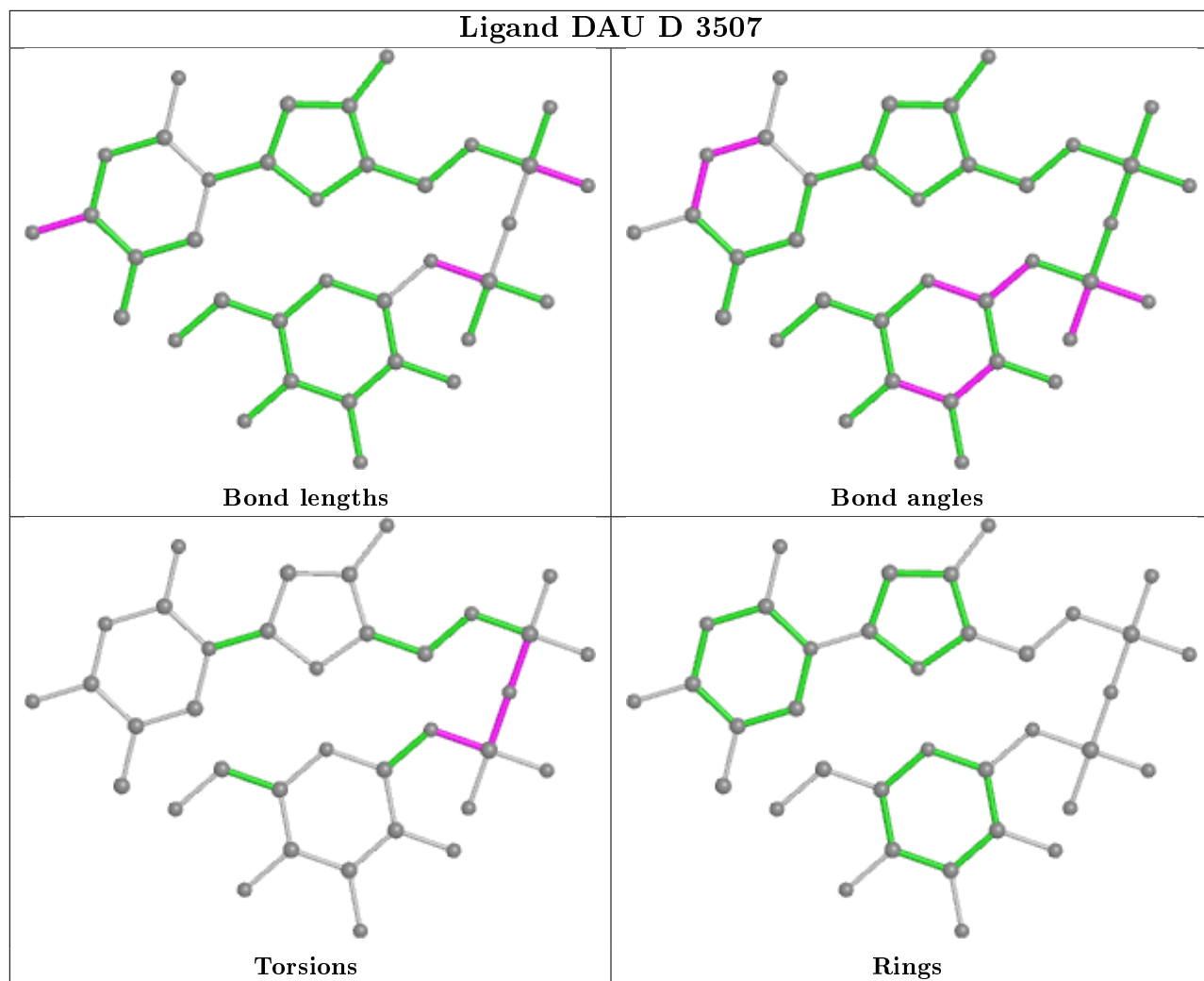


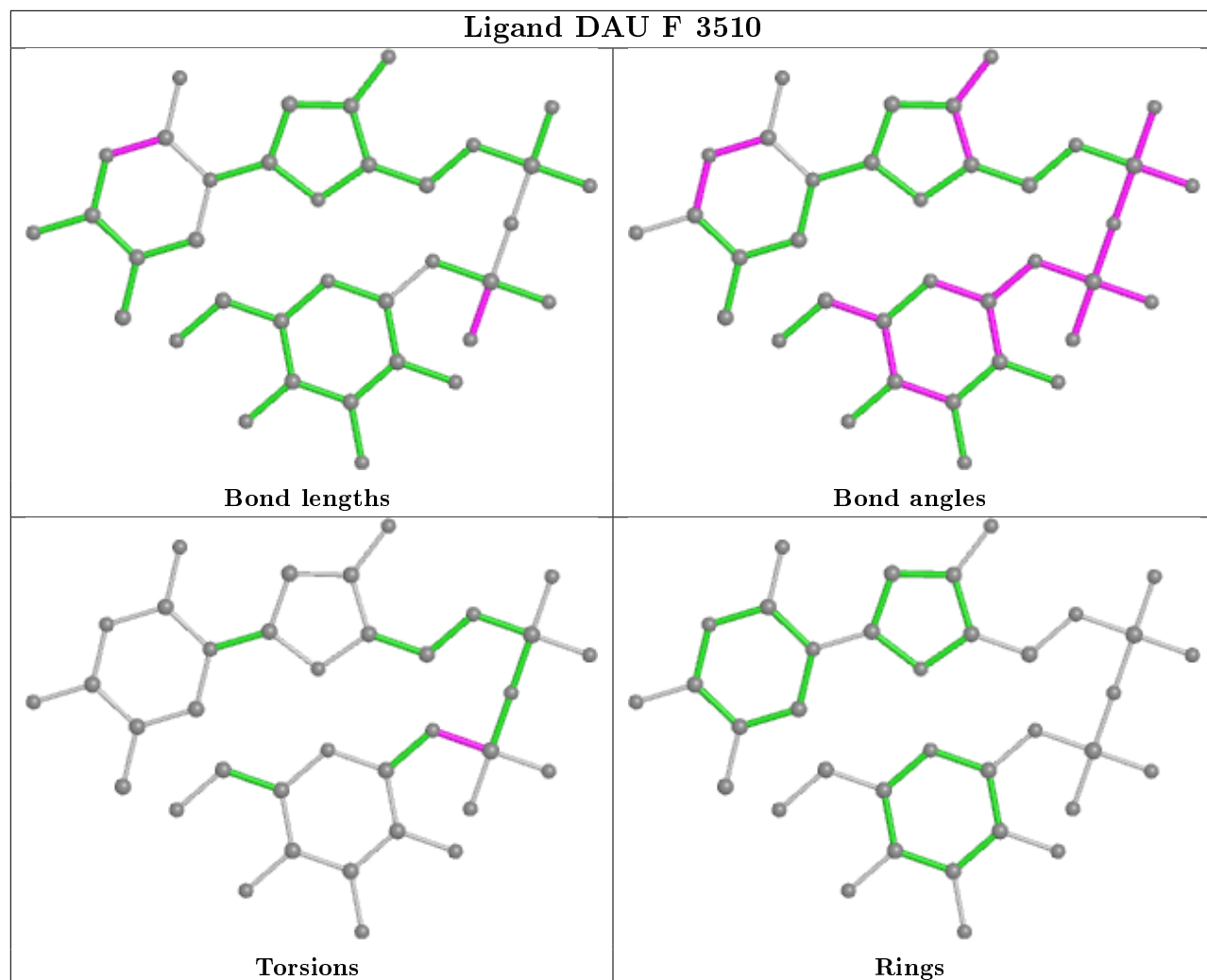


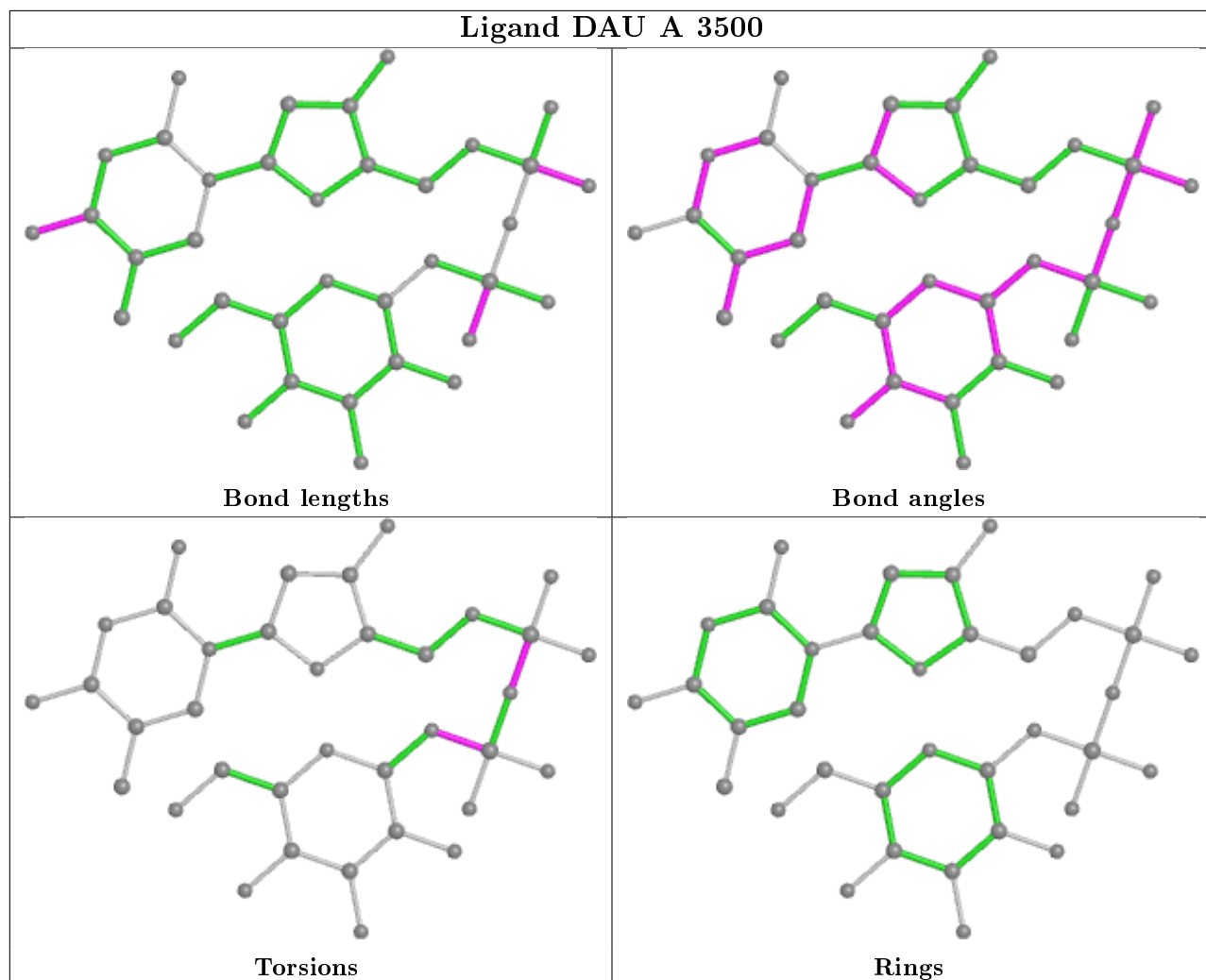


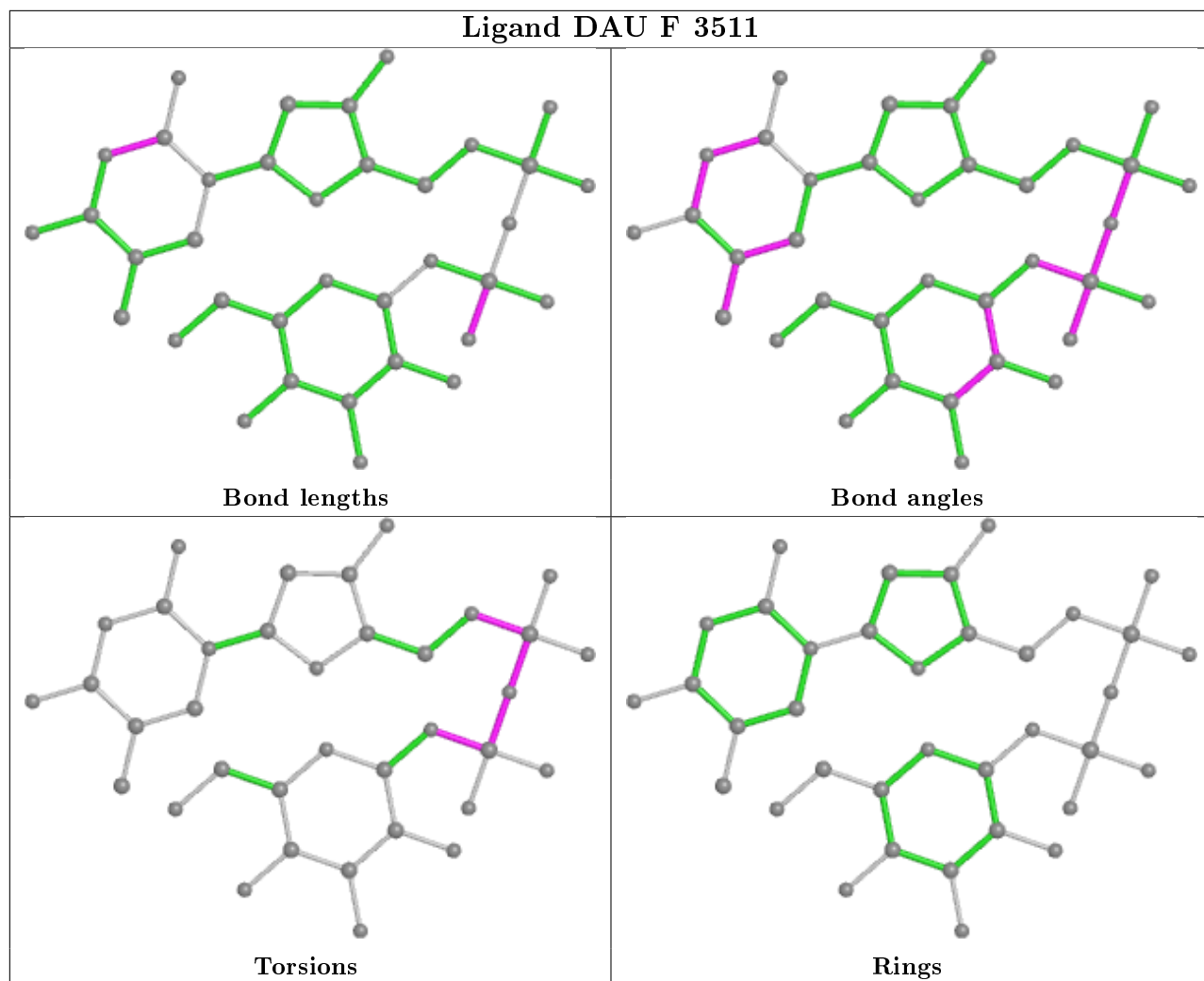


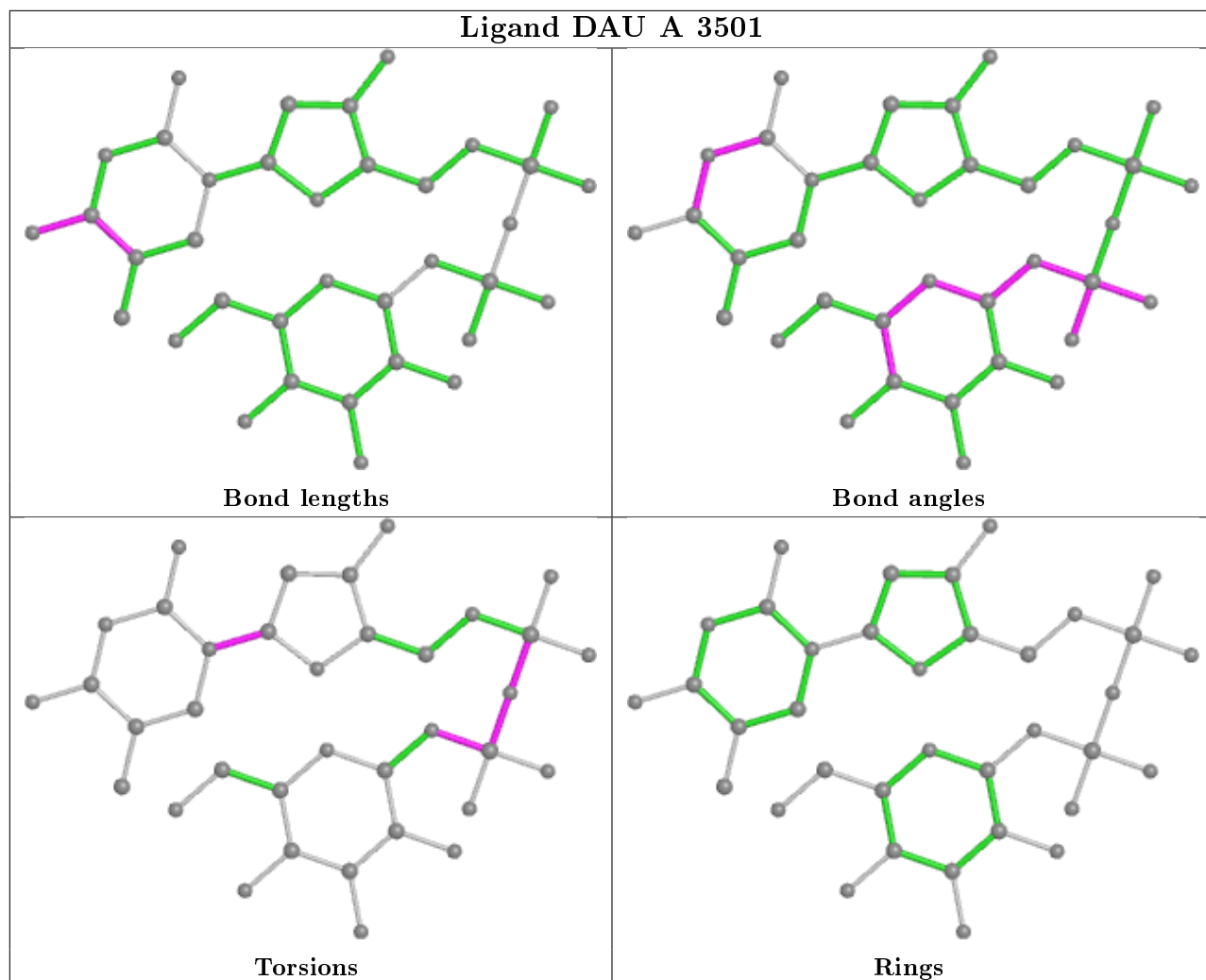


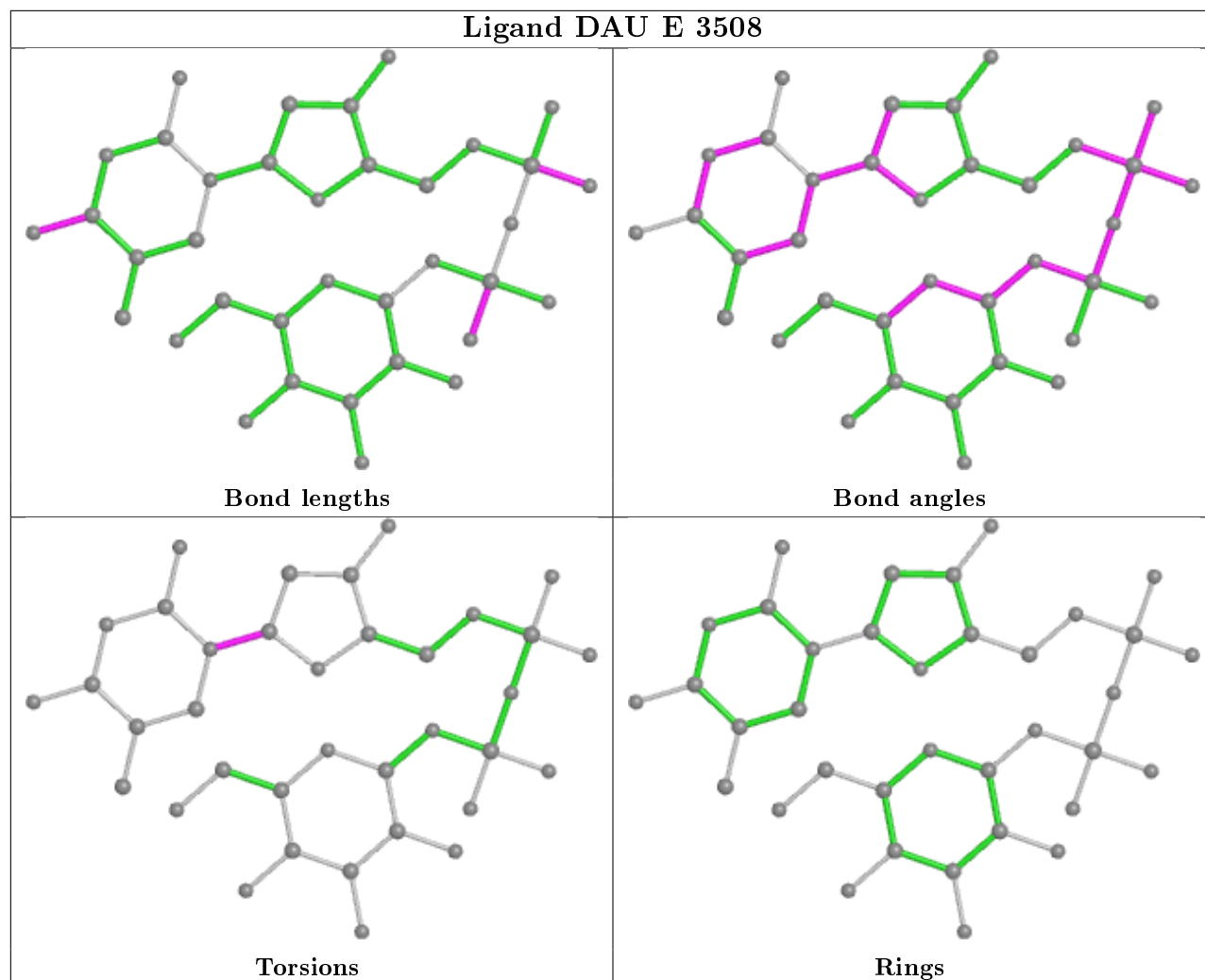












5.7 Other polymers [i](#)

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	292/293 (99%)	0.46	23 (7%) 12 12	4, 10, 20, 30	0
1	B	293/293 (100%)	0.40	19 (6%) 18 18	4, 9, 21, 34	0
1	C	292/293 (99%)	0.60	34 (11%) 4 4	6, 10, 32, 47	0
1	D	292/293 (99%)	0.79	42 (14%) 2 2	5, 11, 36, 49	0
1	E	292/293 (99%)	0.80	38 (13%) 3 3	6, 12, 36, 56	0
1	F	293/293 (100%)	0.58	31 (10%) 6 6	4, 10, 29, 48	0
1	G	292/293 (99%)	0.53	25 (8%) 10 10	4, 9, 20, 66	0
1	H	292/293 (99%)	0.58	29 (9%) 7 7	5, 10, 21, 28	0
All	All	2338/2344 (99%)	0.59	241 (10%) 6 6	4, 10, 26, 66	0

The worst 5 of 241 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	23	ILE	11.7
1	D	23	ILE	10.7
1	D	22	ALA	9.8
1	E	15	ARG	7.9
1	F	14	THR	7.4

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 carbohydrates in this entry.

6.4 Ligands

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

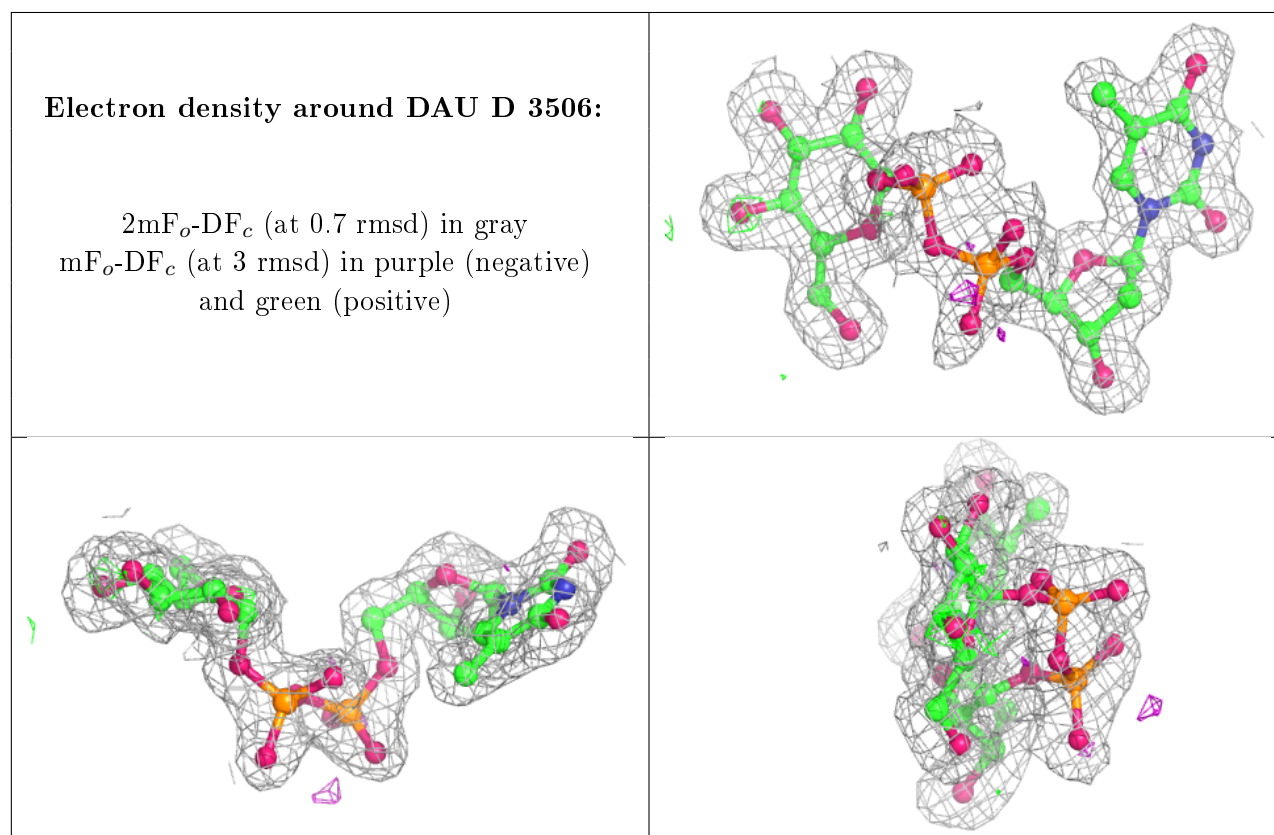
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	CIT	A	3800	13/13	0.63	0.23	47,51,55,57	0
4	CIT	A	3801	13/13	0.63	0.28	55,57,60,61	0
2	SO4	A	3818	5/5	0.82	0.36	46,49,50,52	0
2	SO4	E	3820	5/5	0.87	0.20	48,48,49,51	0
2	SO4	D	3819	5/5	0.87	0.17	44,44,45,49	0
2	SO4	H	3814	5/5	0.88	0.24	57,58,58,58	0
2	SO4	A	3700	5/5	0.89	0.22	55,55,56,59	0
2	SO4	B	3701	5/5	0.89	0.18	53,54,55,57	0
2	SO4	A	3817	5/5	0.89	0.34	38,44,46,47	0
2	SO4	B	3804	5/5	0.90	0.23	45,45,50,52	0
2	SO4	E	3809	5/5	0.90	0.21	46,50,51,53	0
3	DAU	D	3506	36/36	0.92	0.10	12,19,31,32	0
2	SO4	C	3806	5/5	0.92	0.25	42,46,49,49	0
3	DAU	F	3510	36/36	0.92	0.12	12,18,28,34	0
3	DAU	A	3500	36/36	0.92	0.12	10,17,29,30	0
2	SO4	H	3816	5/5	0.92	0.19	39,43,45,46	0
3	DAU	E	3508	36/36	0.92	0.11	11,24,34,36	0
3	DAU	G	3514	36/36	0.93	0.12	9,15,27,30	0
3	DAU	C	3504	36/36	0.93	0.10	11,17,30,31	0
3	DAU	H	3512	36/36	0.93	0.12	10,18,28,31	0
2	SO4	A	3802	5/5	0.94	0.31	62,63,64,65	0
2	SO4	G	3813	5/5	0.94	0.27	38,38,43,45	0
2	SO4	F	3811	5/5	0.94	0.20	43,44,47,49	0
3	DAU	B	3502	36/36	0.94	0.12	8,16,28,30	0
2	SO4	D	3807	5/5	0.94	0.21	45,47,47,47	0
2	SO4	E	3810	5/5	0.95	0.15	35,38,41,44	0
2	SO4	E	3808	5/5	0.96	0.16	47,50,54,54	0
3	DAU	C	3505	36/36	0.96	0.12	10,14,20,22	0
2	SO4	G	3702	5/5	0.96	0.28	39,40,41,44	0
3	DAU	H	3513	36/36	0.96	0.11	10,13,17,17	0
3	DAU	D	3507	36/36	0.96	0.12	9,15,18,19	0
2	SO4	H	3703	5/5	0.96	0.21	49,49,50,52	0
3	DAU	B	3503	36/36	0.96	0.12	10,12,17,18	0
3	DAU	E	3509	36/36	0.96	0.12	11,15,21,22	0
2	SO4	G	3812	5/5	0.96	0.12	41,42,43,48	0
3	DAU	F	3511	36/36	0.96	0.11	10,15,22,23	0
2	SO4	A	3803	5/5	0.96	0.11	37,38,39,44	0

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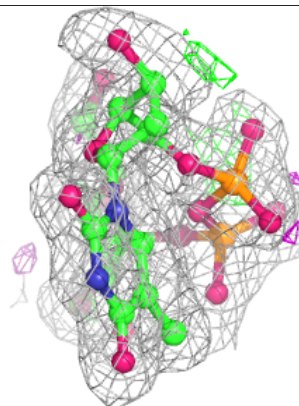
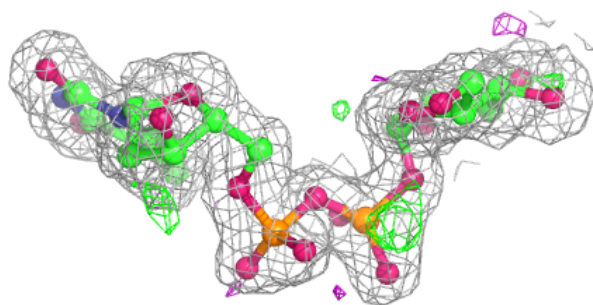
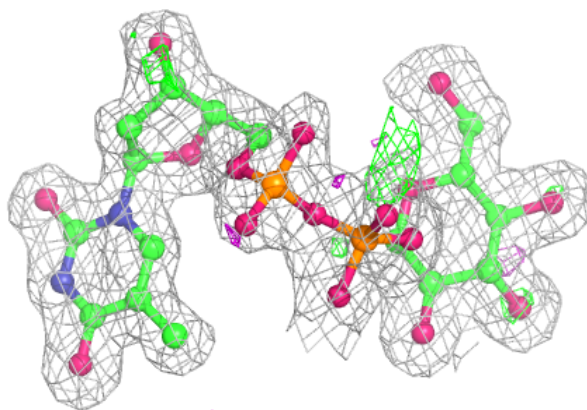
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	SO4	H	3815	5/5	0.97	0.10	38,38,40,43	0
3	DAU	A	3501	36/36	0.97	0.12	8,11,15,16	0
3	DAU	G	3515	36/36	0.97	0.11	8,12,16,16	0
2	SO4	C	3805	5/5	0.98	0.10	38,41,45,46	0

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.

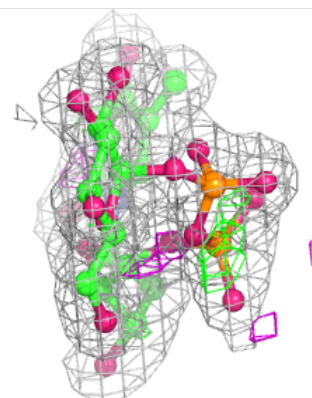
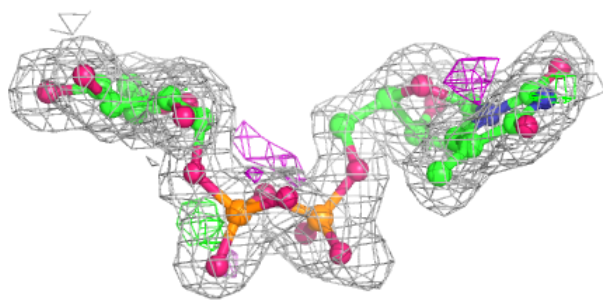
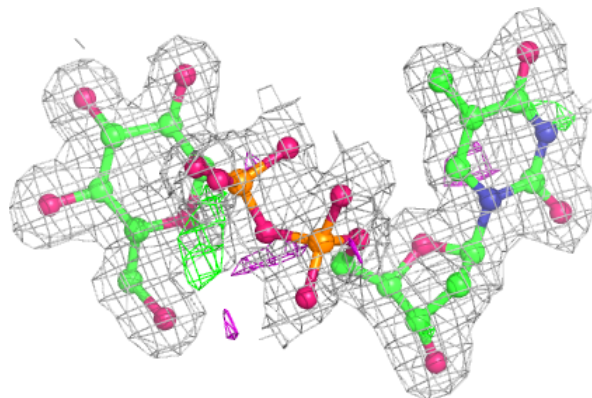


Electron density around DAU F 3510:

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

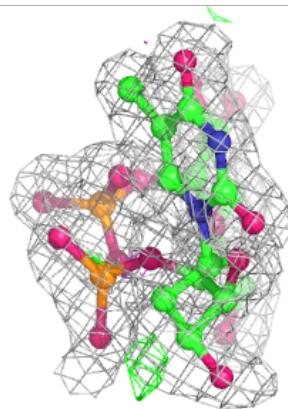
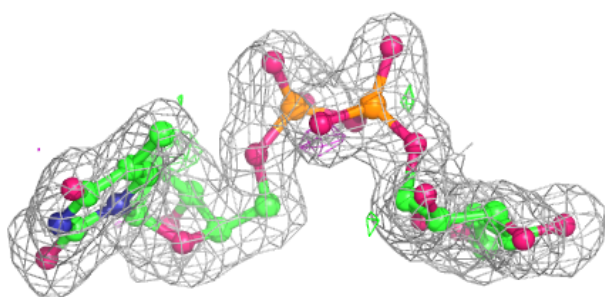
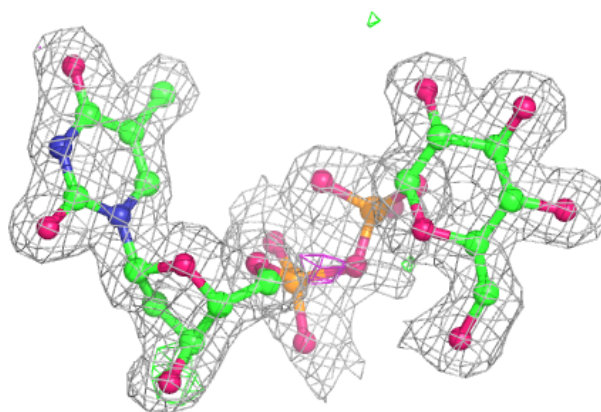
**Electron density around DAU A 3500:**

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



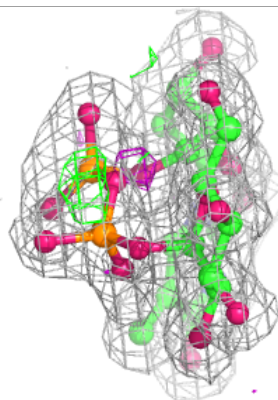
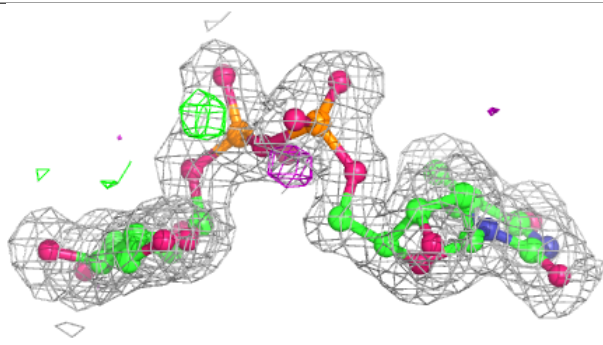
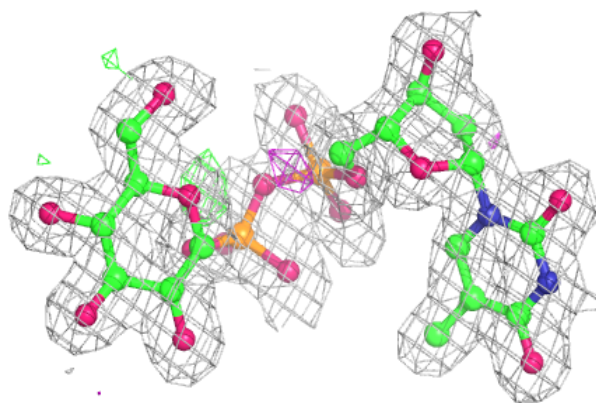
Electron density around DAU E 3508:

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

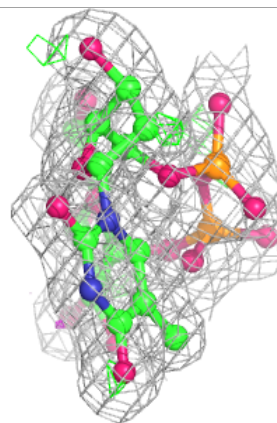
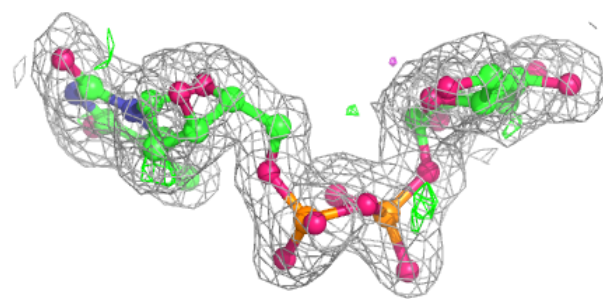
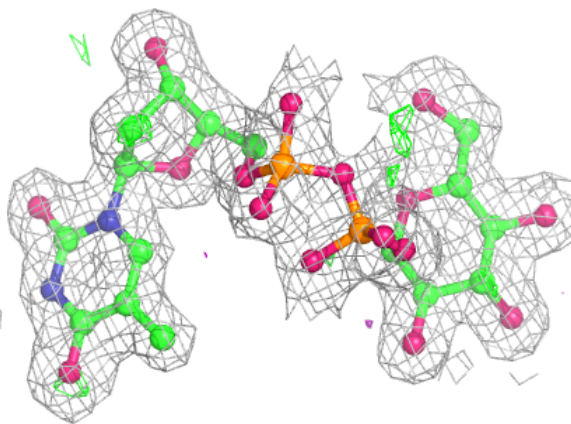


Electron density around DAU G 3514:

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

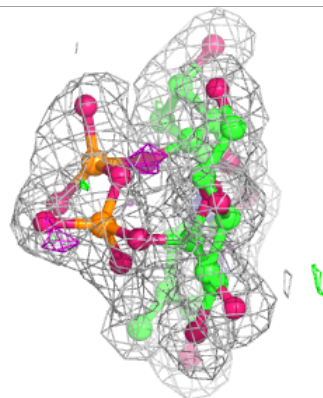
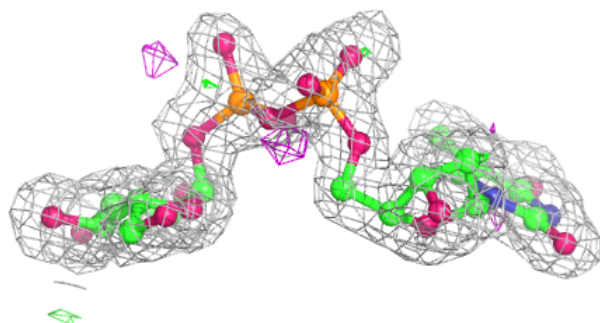
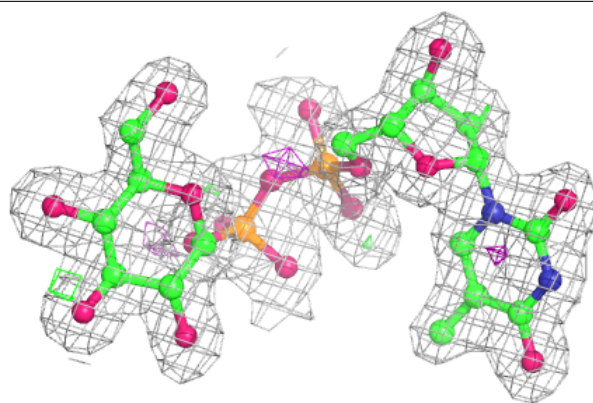
**Electron density around DAU C 3504:**

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

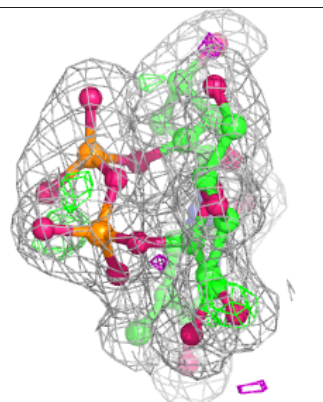
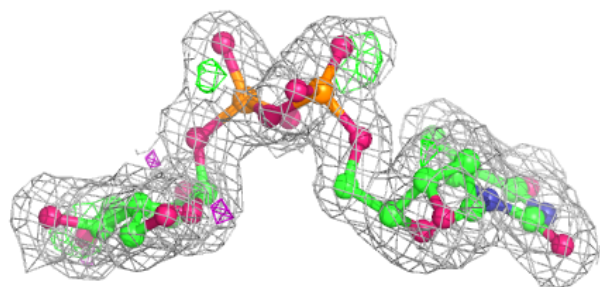
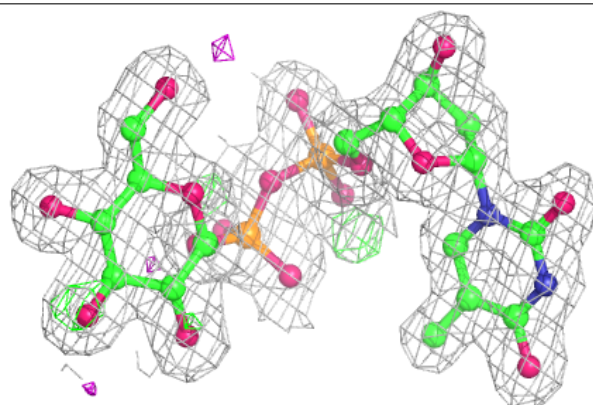


Electron density around DAU H 3512:

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

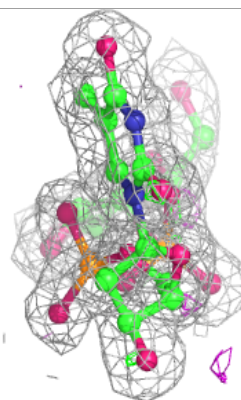
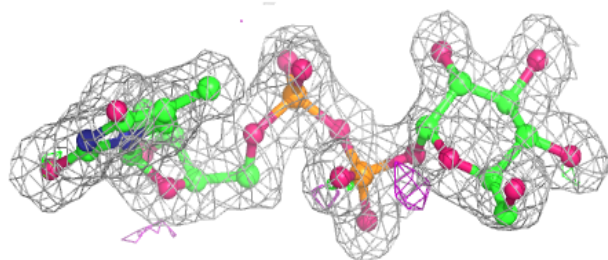
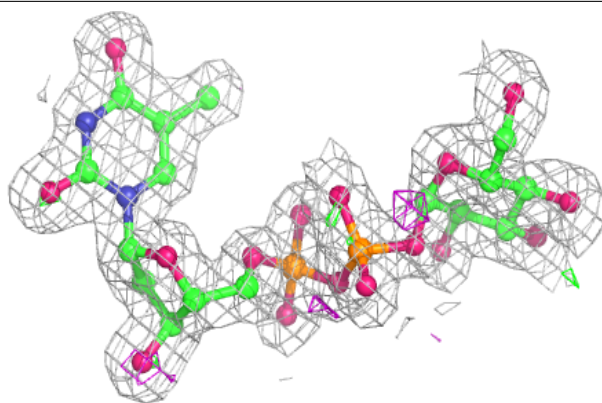
**Electron density around DAU B 3502:**

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

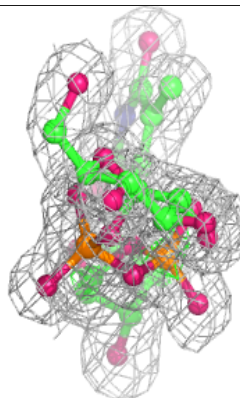
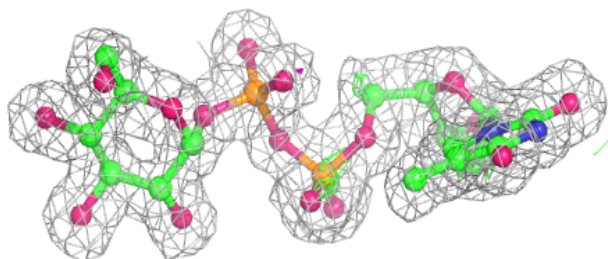
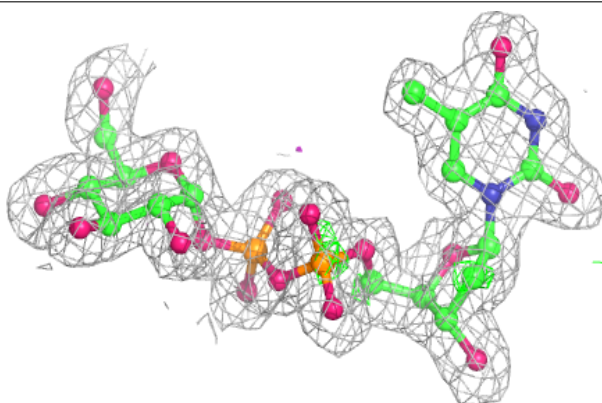


Electron density around DAU C 3505:

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

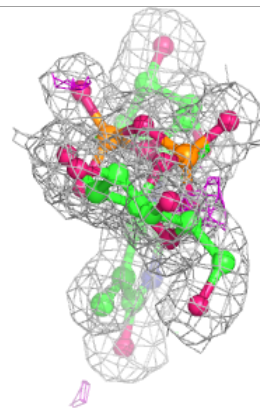
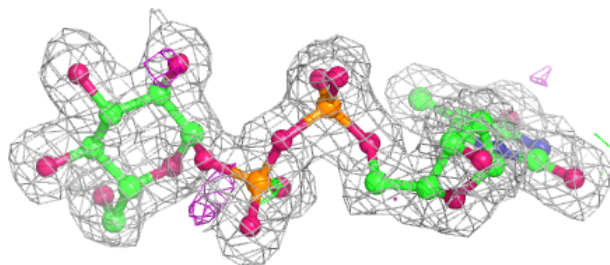
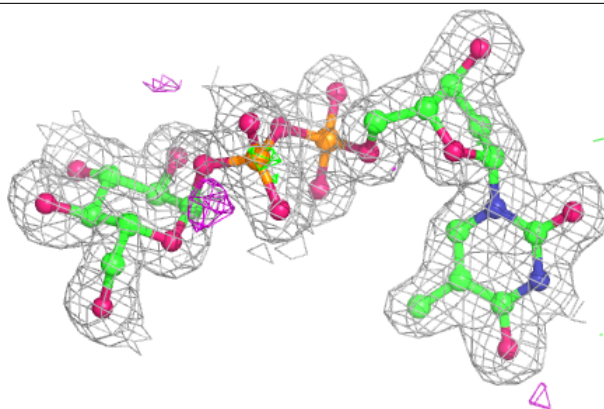
**Electron density around DAU H 3513:**

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

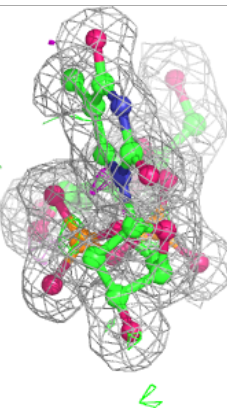
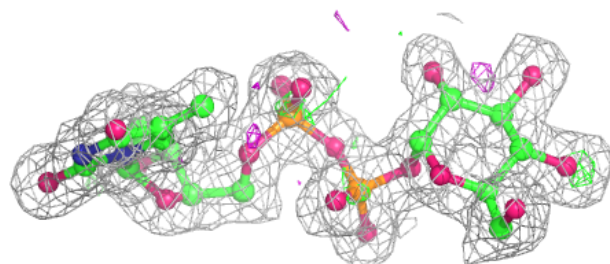
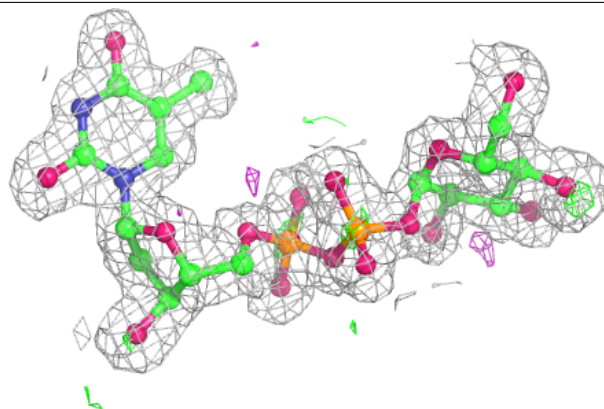


Electron density around DAU D 3507:

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

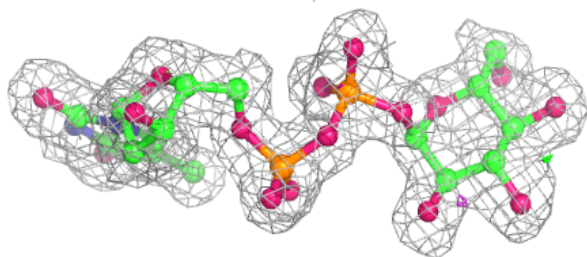
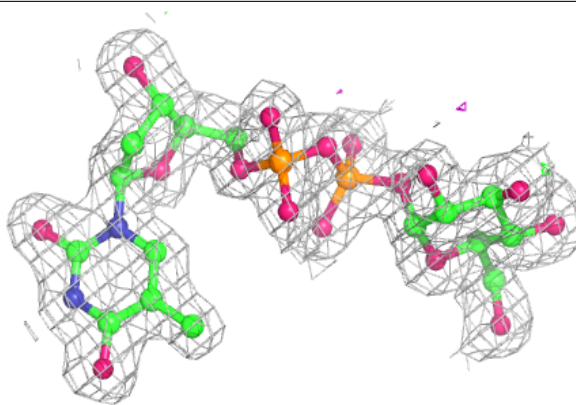
**Electron density around DAU B 3503:**

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

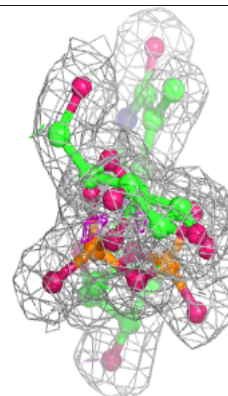
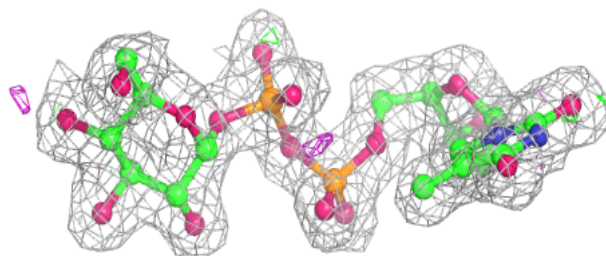
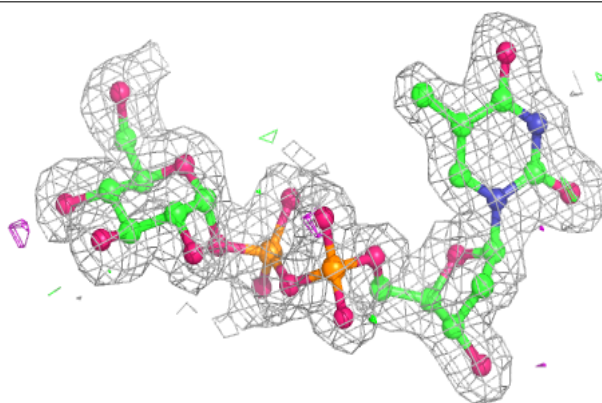


Electron density around DAU E 3509:

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

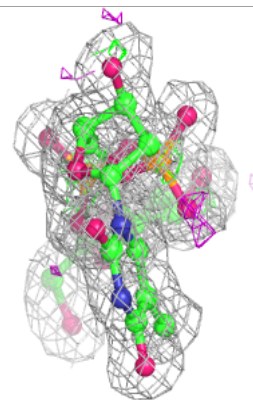
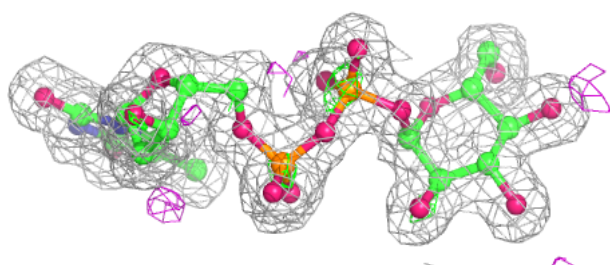
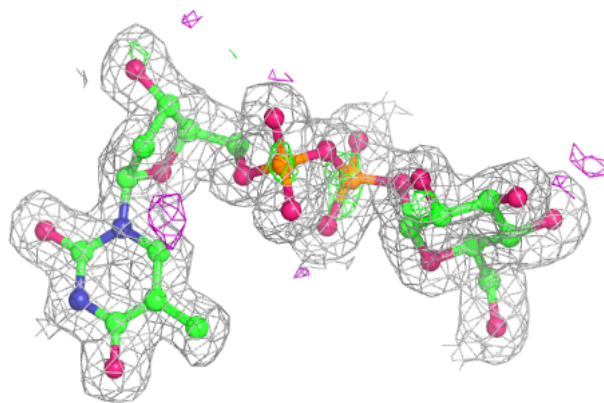
**Electron density around DAU F 3511:**

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

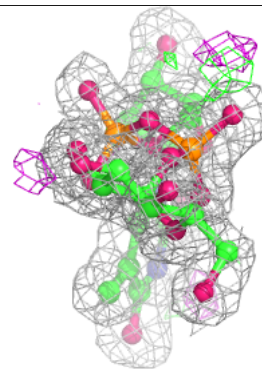
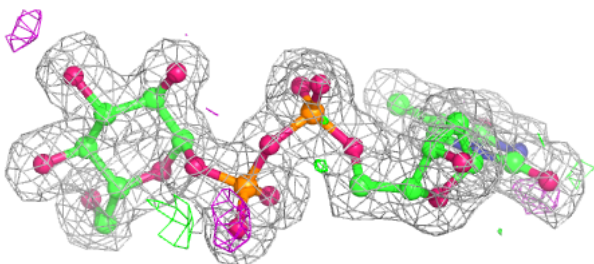
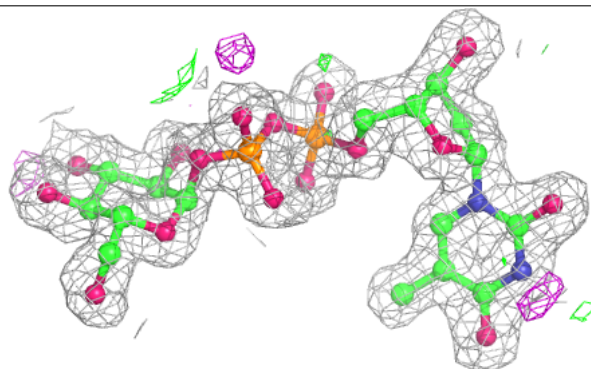


Electron density around DAU A 3501:

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

**Electron density around DAU G 3515:**

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



6.5 Other polymers

There are no such residues in this entry.