



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 11, 2023 – 01:57 PM EDT

PDB ID : 4MDT  
Title : Structure of LpxC bound to the reaction product UDP-(3-O-(R-3-hydroxymyristoyl))-glucosamine  
Authors : Clayton, G.M.; Klein, D.J.; Rickert, K.W.; Patel, S.B.; Kornienko, M.; Zugay-Murphy, J.; Reid, J.C.; Tummala, S.; Sharma, S.; Singh, S.B.; Miesel, L.; Lumb, K.J.; Soisson, S.M.  
Deposited on : 2013-08-23  
Resolution : 2.59 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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The following versions of software and data (see [references](#) ①) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.35.1  
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) : 2.35.1

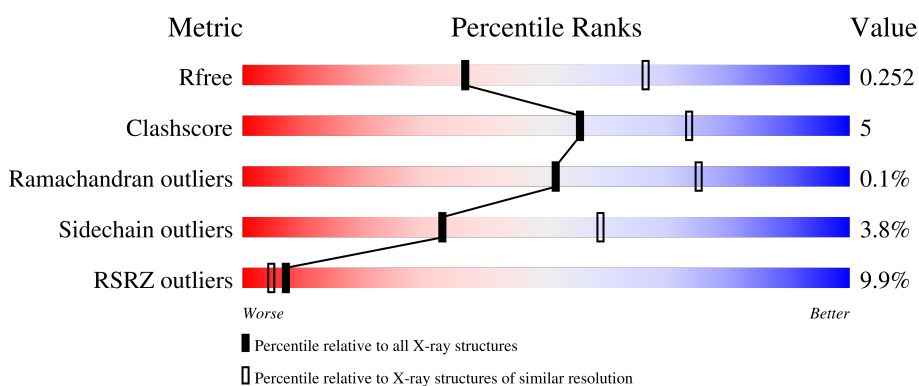
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.59 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  $\geq 3$ , 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	305	 16% 87% 11%
1	B	305	 1% 83% 14%
1	C	305	 16% 82% 16%
1	D	305	 20% 80% 15%

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:

<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
4	PO4	D	403	-	-	X	-

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 9746 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 UDP-3-O-[3-hydroxymyristoyl] N-acetylglucosamine deacetylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	300	2356	1497	408	438	13	0	0	0
1	B	300	2356	1497	408	438	13	0	0	0
1	C	299	2350	1494	407	436	13	0	0	0
1	D	293	2299	1457	399	431	12	0	0	0

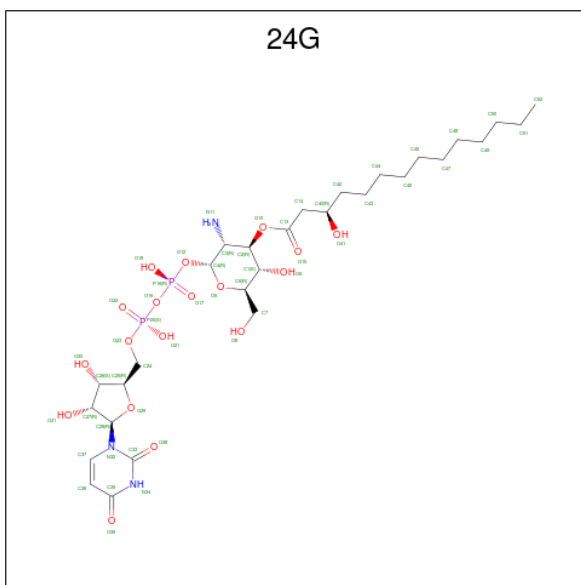
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	125	SER	CYS	engineered mutation	UNP K0BGQ2
B	125	SER	CYS	engineered mutation	UNP K0BGQ2
C	125	SER	CYS	engineered mutation	UNP K0BGQ2
D	125	SER	CYS	engineered mutation	UNP K0BGQ2

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

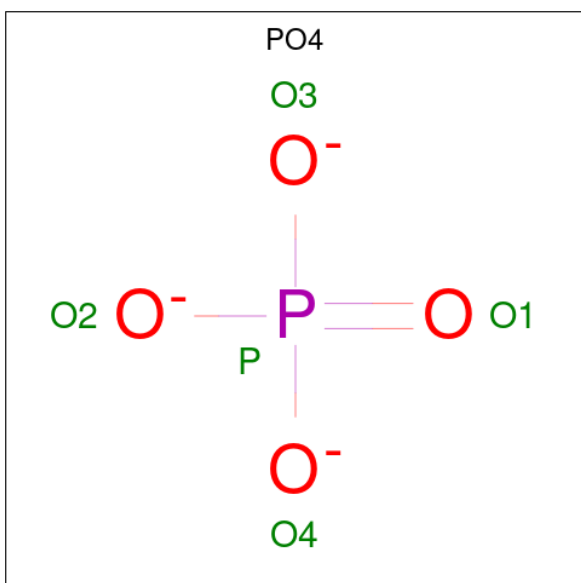
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total 1	Zn 1	0	0
2	B	1	Total 1	Zn 1	0	0
2	C	1	Total 1	Zn 1	0	0
2	D	1	Total 1	Zn 1	0	0

- Molecule 3 is uridine-5'-diphosphate-3-O-(R-3-hydroxymyristoyl)-glucosamine (three-letter code: 24G) (formula: C<sub>29</sub>H<sub>51</sub>N<sub>3</sub>O<sub>18</sub>P<sub>2</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	Total	C	N	O	P	0	0
			52	29	3	18	2		
3	B	1	Total	C	N	O	P	0	0
			52	29	3	18	2		
3	C	1	Total	C	N	O	P	0	0
			52	29	3	18	2		
3	D	1	Total	C	N	O	P	0	0
			52	29	3	18	2		

- Molecule 4 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



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

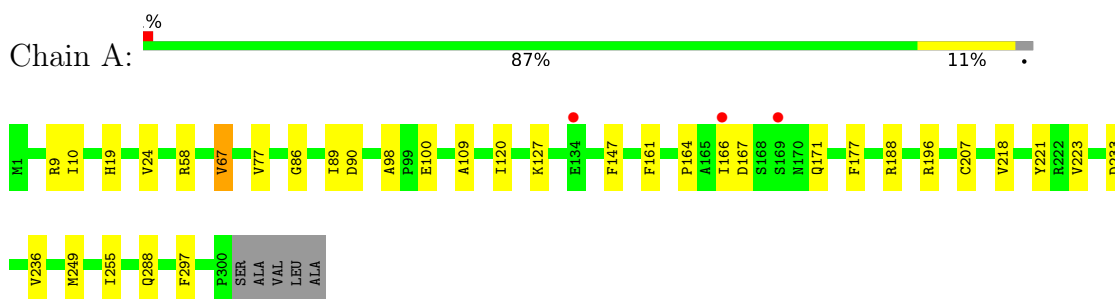
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	61	Total	O	0	0
			61	61		
5	B	55	Total	O	0	0
			55	55		
5	C	17	Total	O	0	0
			17	17		
5	D	20	Total	O	0	0
			20	20		

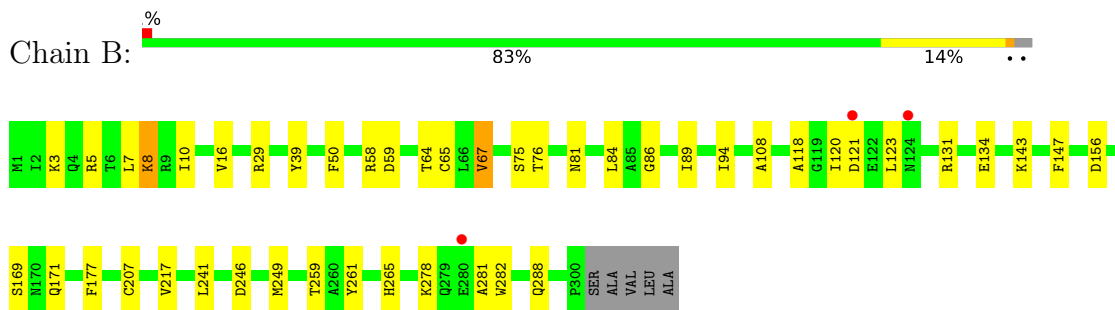
### 3 Residue-property plots [i](#)

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.

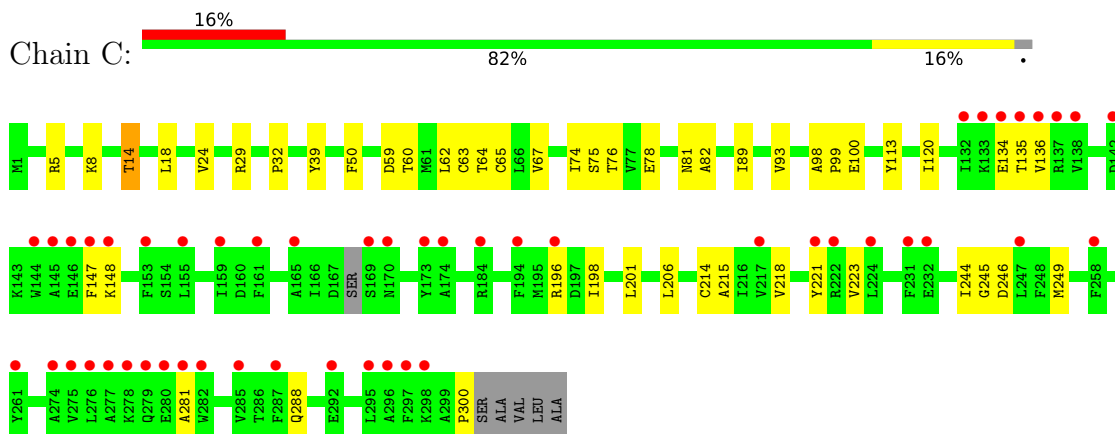
- Molecule 1: UDP-3-O-[3-hydroxymyristoyl] N-acetylglucosamine deacetylase



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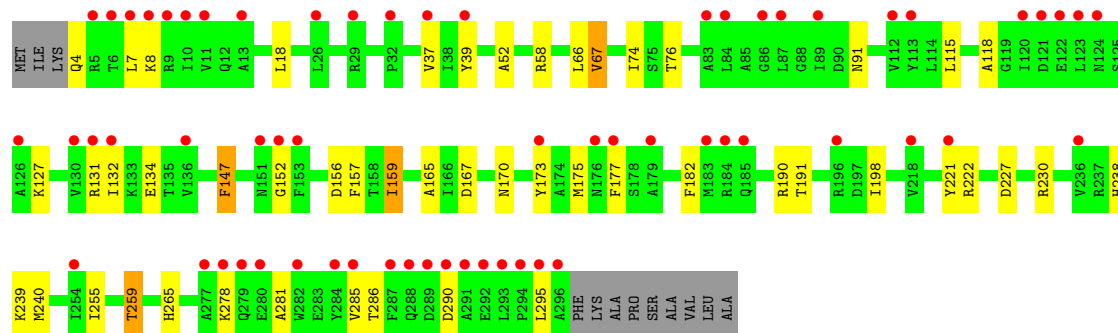
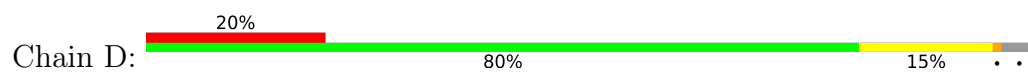


- Molecule 1: UDP-3-O-[3-hydroxymyristoyl] N-acetylglucosamine deacetylase



- Molecule 1: UDP-3-O-[3-hydroxymyristoyl] N-acetylglucosamine deacetylase





## 4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	168.97Å 103.52Å 103.97Å 90.00° 103.96° 90.00°	Depositor
Resolution (Å)	50.45 – 2.59 50.45 – 2.59	Depositor EDS
% Data completeness (in resolution range)	95.7 (50.45-2.59) 95.9 (50.45-2.59)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.02 (at 2.58Å)	Xtrriage
Refinement program	BUSTER-TNT BUSTER 2.9.7, BUSTER 2.9.7	Depositor
R, $R_{free}$	0.197 , 0.240 0.205 , 0.252	Depositor DCC
$R_{free}$ test set	2646 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	54.7	Xtrriage
Anisotropy	0.290	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 65.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	9746	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	64.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.89% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: 24G, ZN, PO4

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	0.53	0/2404	0.79	0/3255
1	B	0.52	0/2404	0.79	0/3255
1	C	0.48	0/2397	0.75	0/3244
1	D	0.48	0/2345	0.76	0/3177
All	All	0.50	0/9550	0.77	0/12931

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2356	0	2337	20	0
1	B	2356	0	2337	23	0
1	C	2350	0	2331	28	0
1	D	2299	0	2267	29	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
3	A	52	0	49	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	52	0	49	1	0
3	C	52	0	49	3	0
3	D	52	0	49	3	0
4	A	5	0	0	0	0
4	B	5	0	0	0	0
4	C	5	0	0	0	0
4	D	5	0	0	2	0
5	A	61	0	0	0	0
5	B	55	0	0	0	0
5	C	17	0	0	0	0
5	D	20	0	0	0	0
All	All	9746	0	9468	97	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (97) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:39:TYR:HB2	1:B:50:PHE:HB2	1.69	0.75
1:D:134:GLU:HB2	1:D:281:ALA:HA	1.73	0.71
1:C:81:ASN:HD21	1:C:249:MET:CE	2.05	0.69
1:D:4:GLN:HB3	1:D:91:ASN:HD21	1.58	0.69
1:B:64:THR:HG21	1:B:246:ASP:OD1	1.94	0.68
1:A:89:ILE:HD11	1:A:120:ILE:HD12	1.74	0.67
1:B:8:LYS:HG2	1:B:121:ASP:HB2	1.77	0.65
1:A:77:VAL:HG21	1:A:249:MET:HE3	1.77	0.65
1:B:81:ASN:HD21	1:B:249:MET:HE2	1.66	0.61
1:B:58:ARG:HB2	1:B:67:VAL:HG13	1.82	0.61
1:A:24:VAL:HG11	1:A:100:GLU:O	2.01	0.60
1:C:134:GLU:HB2	1:C:281:ALA:HA	1.84	0.60
1:C:81:ASN:HD21	1:C:249:MET:HE3	1.66	0.59
1:A:166:ILE:HG22	1:A:171:GLN:HE21	1.68	0.58
1:B:84:LEU:HD11	1:B:94:ILE:HD11	1.85	0.58
1:C:64:THR:OG1	1:C:246:ASP:OD1	2.18	0.58
1:C:135:THR:HG23	1:C:148:LYS:HG2	1.85	0.57
1:A:58:ARG:HB2	1:A:67:VAL:HG13	1.87	0.57
1:D:191:THR:HA	1:D:238:HIS:CD2	2.39	0.57
1:B:39:TYR:OH	1:B:81:ASN:OD1	2.23	0.57
1:A:10:ILE:CD1	1:D:167:ASP:HB2	2.36	0.56
1:C:39:TYR:HB2	1:C:50:PHE:HB2	1.89	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:156:ASP:O	1:D:259:THR:HA	2.07	0.54
1:C:5:ARG:HH22	1:C:300:PRO:HD3	1.71	0.54
1:B:134:GLU:HB2	1:B:281:ALA:HA	1.89	0.54
1:C:29:ARG:HB2	1:C:93:VAL:HB	1.90	0.53
1:C:81:ASN:HD21	1:C:249:MET:HE2	1.71	0.53
1:C:59:ASP:HB3	1:C:65:CYS:HB3	1.91	0.53
1:D:265:HIS:NE2	4:D:403:PO4:O3	2.35	0.53
1:B:64:THR:HG22	1:B:265:HIS:HB3	1.91	0.53
1:A:10:ILE:HD12	1:D:167:ASP:HB2	1.91	0.53
1:A:218:VAL:HG12	1:A:223:VAL:HA	1.91	0.52
1:D:58:ARG:HB2	1:D:67:VAL:HG13	1.92	0.52
1:C:82:ALA:HA	1:C:244:ILE:HG22	1.91	0.51
1:C:24:VAL:HG11	1:C:100:GLU:O	2.10	0.51
1:B:81:ASN:HD21	1:B:249:MET:CE	2.22	0.51
1:A:164:PRO:HG2	1:A:221:TYR:HA	1.93	0.50
1:C:24:VAL:HG13	1:C:98:ALA:HB3	1.94	0.50
1:D:66:LEU:HB2	1:D:74:ILE:HG23	1.94	0.50
1:B:169:SER:O	1:B:171:GLN:NE2	2.41	0.49
1:C:201:LEU:HB3	1:C:206:LEU:HB2	1.93	0.49
3:D:402:24G:N11	4:D:403:PO4:O4	2.46	0.49
1:C:218:VAL:HG12	1:C:223:VAL:HA	1.94	0.48
1:D:131:ARG:HD3	1:D:285:VAL:HG11	1.95	0.48
1:B:86:GLY:HA2	1:B:177:PHE:HZ	1.78	0.48
1:B:108:ALA:HB2	1:B:241:LEU:HD21	1.96	0.48
1:D:7:LEU:HD21	1:D:115:LEU:HD23	1.96	0.48
1:D:157:PHE:CE2	1:D:159:ILE:HG23	2.49	0.47
1:D:165:ALA:HB2	1:D:222:ARG:HA	1.97	0.47
1:C:198:ILE:HG21	3:C:402:24G:H27	1.97	0.47
1:B:7:LEU:HD22	1:B:118:ALA:HB3	1.97	0.46
1:D:198:ILE:HG21	3:D:402:24G:H27	1.96	0.46
1:A:19:HIS:CE1	1:A:207:CYS:HG	2.33	0.46
1:A:161:PHE:H	1:A:171:GLN:HE22	1.62	0.46
1:B:3:LYS:HB3	1:B:123:LEU:O	2.16	0.46
1:A:109:ALA:HB2	1:A:188:ARG:HG2	1.97	0.46
1:B:89:ILE:HD11	1:B:120:ILE:HD12	1.98	0.46
1:C:62:LEU:HD11	1:C:206:LEU:HD13	1.98	0.45
1:A:86:GLY:HA2	1:A:177:PHE:HZ	1.81	0.45
1:B:278:LYS:HD3	1:B:281:ALA:HB2	1.98	0.45
1:D:152:GLY:H	1:D:255:ILE:HG23	1.81	0.45
1:D:4:GLN:HG3	1:D:127:LYS:HA	1.97	0.44
1:B:59:ASP:HB3	1:B:65:CYS:HB3	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:24:VAL:HG13	1:A:98:ALA:HB3	1.99	0.44
1:D:18:LEU:HD21	3:D:402:24G:H40	2.00	0.44
1:C:78:GLU:O	1:C:245:GLY:HA3	2.18	0.44
1:C:89:ILE:HD11	1:C:120:ILE:HD12	1.99	0.44
1:D:157:PHE:HE2	1:D:159:ILE:HG23	1.83	0.44
1:C:39:TYR:OH	1:C:81:ASN:OD1	2.31	0.43
1:A:24:VAL:HG22	1:A:98:ALA:HB3	1.99	0.43
1:C:18:LEU:HD11	3:C:402:24G:H36	1.99	0.43
1:D:177:PHE:CE1	1:D:182:PHE:HB2	2.53	0.43
1:C:81:ASN:ND2	1:C:249:MET:HE3	2.34	0.42
1:D:132:ILE:HG13	1:D:147:PHE:CD1	2.54	0.42
1:A:77:VAL:CG2	1:A:249:MET:HE3	2.48	0.42
1:B:10:ILE:HG12	1:B:29:ARG:HG2	2.00	0.42
1:A:233:ASP:HB2	1:A:236:VAL:HG12	2.01	0.42
1:B:156:ASP:O	1:B:259:THR:HA	2.19	0.42
1:B:131:ARG:O	1:B:282:TRP:HA	2.20	0.42
1:D:37:VAL:HB	1:D:52:ALA:HB2	2.02	0.42
1:D:278:LYS:HD3	1:D:281:ALA:HB2	2.00	0.42
1:D:39:TYR:HB3	1:D:74:ILE:HD13	2.02	0.42
1:D:173:TYR:O	1:D:240:MET:HE1	2.19	0.42
1:C:14:THR:HG23	1:D:227:ASP:OD1	2.20	0.41
1:D:159:ILE:HG21	1:D:239:LYS:HG3	2.02	0.41
1:B:217:VAL:HG21	3:B:402:24G:H30	2.01	0.41
1:C:74:ILE:HA	1:C:99:PRO:O	2.21	0.41
1:C:215:ALA:HB3	3:C:402:24G:H33	2.03	0.41
1:A:90:ASP:OD1	1:A:127:LYS:HG3	2.19	0.41
1:C:39:TYR:HB3	1:C:74:ILE:HD13	2.03	0.41
1:B:261:TYR:CG	1:C:32:PRO:HG3	2.55	0.41
1:D:190:ARG:HE	1:D:230:ARG:HG3	1.85	0.41
1:A:24:VAL:HG22	1:A:98:ALA:CB	2.50	0.41
1:A:255:ILE:HG12	1:A:297:PHE:CE2	2.56	0.41
1:C:63:CYS:SG	1:C:75:SER:HB2	2.61	0.41
1:D:173:TYR:HB3	1:D:240:MET:HE3	2.02	0.40
1:D:8:LYS:HB2	1:D:118:ALA:O	2.21	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	298/305 (98%)	286 (96%)	12 (4%)	0	100	100
1	B	298/305 (98%)	282 (95%)	16 (5%)	0	100	100
1	C	295/305 (97%)	271 (92%)	24 (8%)	0	100	100
1	D	291/305 (95%)	273 (94%)	17 (6%)	1 (0%)	41	64
All	All	1182/1220 (97%)	1112 (94%)	69 (6%)	1 (0%)	51	75

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	295	LEU

### 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	251/254 (99%)	245 (98%)	6 (2%)	49	74
1	B	251/254 (99%)	241 (96%)	10 (4%)	31	57
1	C	250/254 (98%)	238 (95%)	12 (5%)	25	49
1	D	245/254 (96%)	235 (96%)	10 (4%)	30	56
All	All	997/1016 (98%)	959 (96%)	38 (4%)	33	59

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	ARG
1	A	67	VAL
1	A	147	PHE
1	A	167	ASP
1	A	196	ARG
1	A	288	GLN
1	B	5	ARG
1	B	8	LYS
1	B	16	VAL
1	B	67	VAL
1	B	75	SER
1	B	76	THR
1	B	143	LYS
1	B	147	PHE
1	B	207	CYS
1	B	288	GLN
1	C	8	LYS
1	C	14	THR
1	C	60	THR
1	C	67	VAL
1	C	76	THR
1	C	113	TYR
1	C	136	VAL
1	C	147	PHE
1	C	196	ARG
1	C	214	CYS
1	C	221	TYR
1	C	288	GLN
1	D	67	VAL
1	D	76	THR
1	D	147	PHE
1	D	159	ILE
1	D	170	ASN
1	D	175	MET
1	D	221	TYR
1	D	259	THR
1	D	286	THR
1	D	290	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	81	ASN

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Mol	Chain	Res	Type
1	A	171	GLN
1	A	176	ASN
1	B	12	GLN
1	B	176	ASN
1	B	185	GLN
1	C	81	ASN
1	C	176	ASN
1	D	91	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 4 are monoatomic - leaving 8 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	PO4	C	403	2	4,4,4	2.00	1 (25%)	6,6,6	1.52	1 (16%)
3	24G	B	402	-	51,54,54	0.91	3 (5%)	71,76,76	1.06	4 (5%)
4	PO4	A	403	2	4,4,4	2.01	1 (25%)	6,6,6	1.12	0
4	PO4	D	403	2	4,4,4	3.75	1 (25%)	6,6,6	1.66	1 (16%)
3	24G	C	402	-	51,54,54	0.94	3 (5%)	71,76,76	1.17	7 (9%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	24G	D	402	-	51,54,54	0.97	3 (5%)	71,76,76	1.05	5 (7%)
4	PO4	B	403	2	4,4,4	1.71	1 (25%)	6,6,6	0.91	0
3	24G	A	402	-	51,54,54	0.98	3 (5%)	71,76,76	1.38	10 (14%)

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	24G	B	402	-	-	11/41/78/78	0/3/3/3
3	24G	C	402	-	-	11/41/78/78	0/3/3/3
3	24G	D	402	-	-	14/41/78/78	0/3/3/3
3	24G	A	402	-	-	17/41/78/78	0/3/3/3

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	403	PO4	P-O1	7.19	1.67	1.50
4	A	403	PO4	P-O1	3.91	1.60	1.50
3	D	402	24G	P16-O17	3.78	1.64	1.50
3	D	402	24G	P20-O22	3.71	1.64	1.50
3	A	402	24G	P20-O22	3.68	1.64	1.50
3	C	402	24G	P20-O22	3.66	1.63	1.50
3	A	402	24G	P16-O17	3.61	1.63	1.50
3	C	402	24G	P16-O17	3.61	1.63	1.50
3	B	402	24G	P16-O17	3.38	1.62	1.50
3	B	402	24G	P20-O22	3.37	1.62	1.50
4	C	403	PO4	P-O1	3.36	1.58	1.50
4	B	403	PO4	P-O1	2.74	1.57	1.50
3	D	402	24G	C36-C35	2.48	1.49	1.43
3	A	402	24G	C36-C35	2.13	1.48	1.43
3	C	402	24G	C36-C35	2.09	1.48	1.43
3	B	402	24G	C36-C35	2.01	1.48	1.43

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	402	24G	O5-C4-O12	3.70	116.20	111.36
3	C	402	24G	O39-C35-N34	3.56	124.53	119.31

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	402	24G	O39-C35-C36	-3.30	119.36	125.16
3	C	402	24G	O39-C35-C36	-3.11	119.69	125.16
3	A	402	24G	O39-C35-N34	3.06	123.81	119.31
4	C	403	PO4	O4-P-O1	-3.02	99.86	110.89
3	C	402	24G	O5-C4-O12	2.89	115.15	111.36
3	D	402	24G	O39-C35-N34	2.87	123.52	119.31
3	D	402	24G	O29-C28-N32	2.70	114.55	108.36
3	D	402	24G	O5-C4-O12	2.58	114.74	111.36
3	B	402	24G	O39-C35-N34	2.53	123.02	119.31
3	A	402	24G	O10-C2-C1	2.53	113.47	107.70
3	A	402	24G	O18-P16-O12	2.52	116.72	106.78
3	A	402	24G	C37-C36-C35	-2.50	116.10	119.52
3	A	402	24G	C2-O10-C13	-2.50	113.37	117.53
4	D	403	PO4	O4-P-O3	-2.49	99.97	107.97
3	A	402	24G	O21-P20-O23	2.46	119.19	107.75
3	D	402	24G	O39-C35-C36	-2.44	120.88	125.16
3	B	402	24G	C37-C36-C35	-2.37	116.27	119.52
3	A	402	24G	O12-C4-C3	2.33	112.61	108.40
3	B	402	24G	O39-C35-C36	-2.32	121.07	125.16
3	C	402	24G	C37-C36-C35	-2.25	116.44	119.52
3	B	402	24G	C2-C3-N11	-2.23	106.30	110.92
3	C	402	24G	C36-C37-N32	2.11	125.35	121.81
3	A	402	24G	C36-C37-N32	2.09	125.30	121.81
3	D	402	24G	C37-C36-C35	-2.04	116.72	119.52
3	C	402	24G	C26-C27-C28	2.04	105.30	101.43
3	C	402	24G	O18-P16-O12	2.01	114.71	106.78

There are no chirality outliers.

All (53) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	24G	O23-C24-C25-O29
3	A	402	24G	C14-C40-C42-C43
3	A	402	24G	C24-O23-P20-O21
3	A	402	24G	C24-O23-P20-O22
3	A	402	24G	C24-O23-P20-O19
3	B	402	24G	O23-C24-C25-O29
3	C	402	24G	C14-C40-C42-C43
3	C	402	24G	C24-O23-P20-O21
3	C	402	24G	C24-O23-P20-O22
3	D	402	24G	C14-C40-C42-C43
3	D	402	24G	C24-O23-P20-O21

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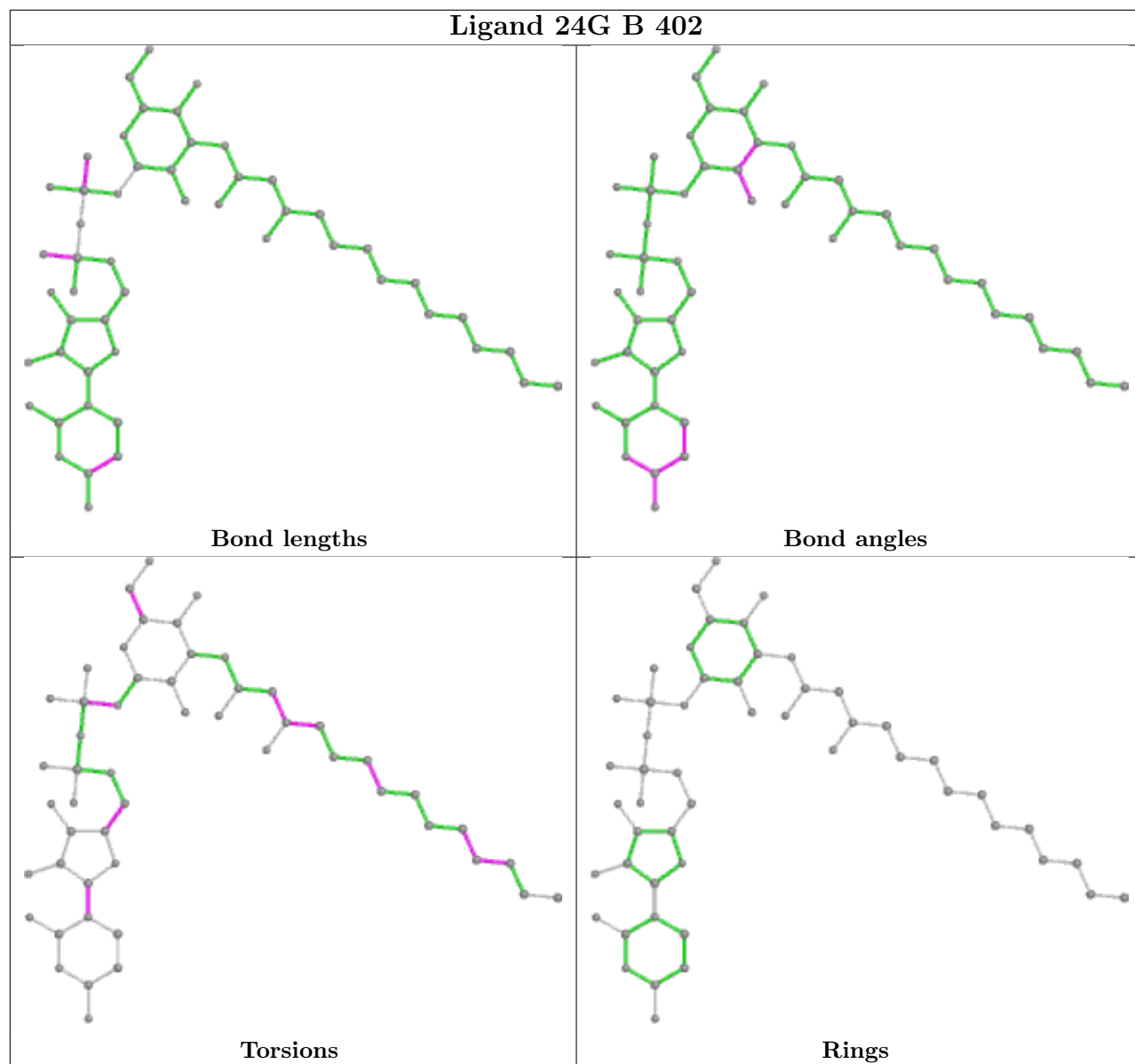
Mol	Chain	Res	Type	Atoms
3	D	402	24G	C24-O23-P20-O22
3	D	402	24G	C24-O23-P20-O19
3	A	402	24G	O23-C24-C25-C26
3	D	402	24G	O23-C24-C25-C26
3	D	402	24G	O23-C24-C25-O29
3	B	402	24G	O23-C24-C25-C26
3	A	402	24G	O41-C40-C42-C43
3	D	402	24G	O41-C40-C42-C43
3	D	402	24G	C45-C46-C47-C48
3	A	402	24G	C48-C49-C50-C51
3	D	402	24G	C48-C49-C50-C51
3	A	402	24G	C47-C48-C49-C50
3	C	402	24G	O41-C40-C42-C43
3	D	402	24G	C47-C48-C49-C50
3	C	402	24G	C48-C49-C50-C51
3	A	402	24G	P16-O19-P20-O22
3	B	402	24G	C14-C40-C42-C43
3	A	402	24G	C49-C50-C51-C52
3	A	402	24G	C43-C44-C45-C46
3	B	402	24G	O5-C6-C7-O8
3	D	402	24G	C4-O12-P16-O19
3	A	402	24G	C4-O12-P16-O19
3	B	402	24G	C48-C49-C50-C51
3	D	402	24G	C49-C50-C51-C52
3	D	402	24G	P16-O19-P20-O21
3	C	402	24G	C49-C50-C51-C52
3	B	402	24G	O41-C40-C42-C43
3	A	402	24G	C44-C45-C46-C47
3	C	402	24G	P16-O19-P20-O22
3	D	402	24G	P16-O19-P20-O22
3	C	402	24G	O23-C24-C25-O29
3	B	402	24G	C43-C44-C45-C46
3	C	402	24G	O23-C24-C25-C26
3	A	402	24G	O10-C13-C14-C40
3	B	402	24G	C13-C14-C40-C42
3	B	402	24G	O29-C28-N32-C37
3	B	402	24G	C47-C48-C49-C50
3	C	402	24G	C24-O23-P20-O19
3	A	402	24G	P16-O19-P20-O21
3	A	402	24G	C45-C46-C47-C48
3	B	402	24G	C4-O12-P16-O19
3	C	402	24G	C47-C48-C49-C50

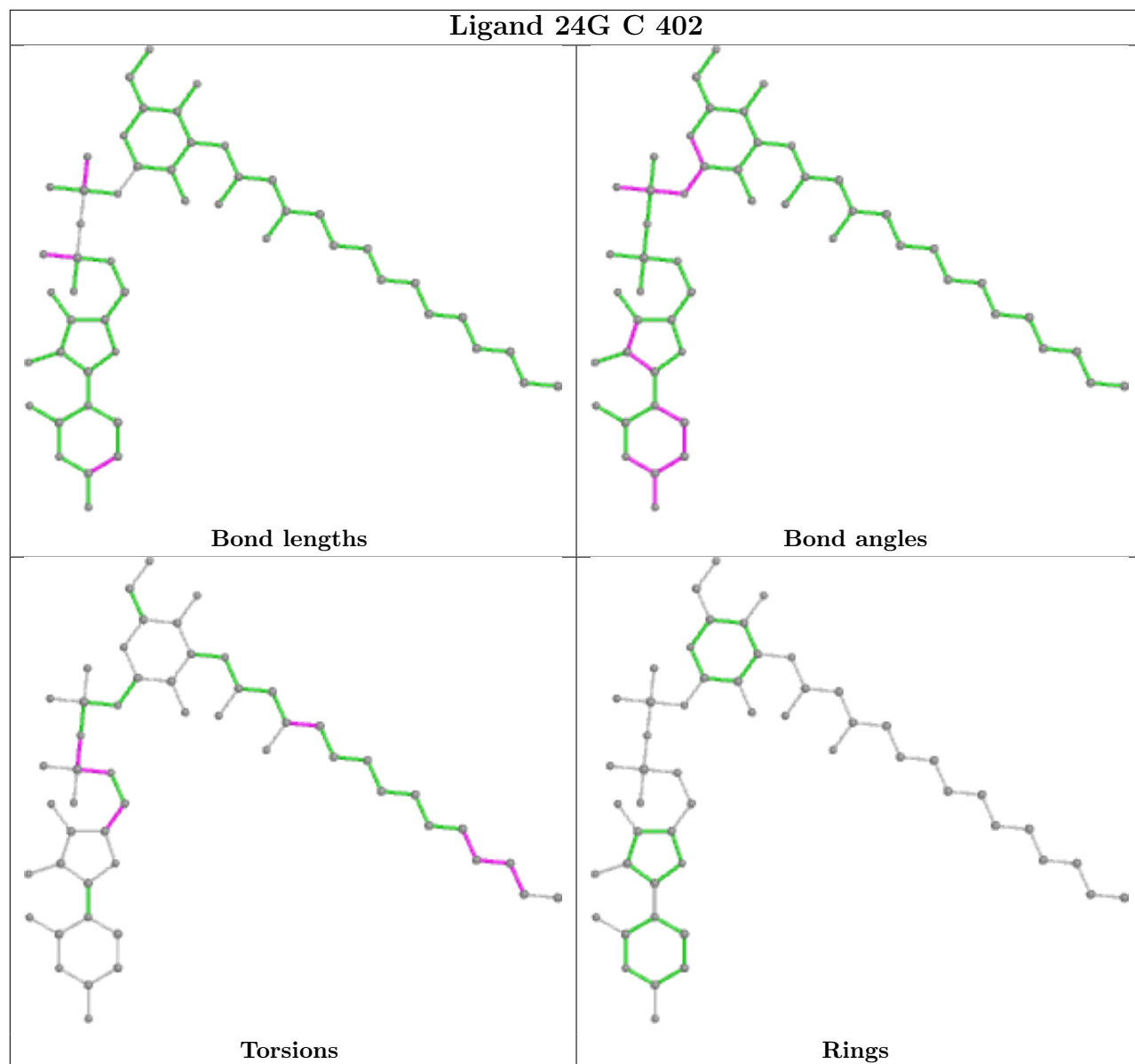
There are no ring outliers.

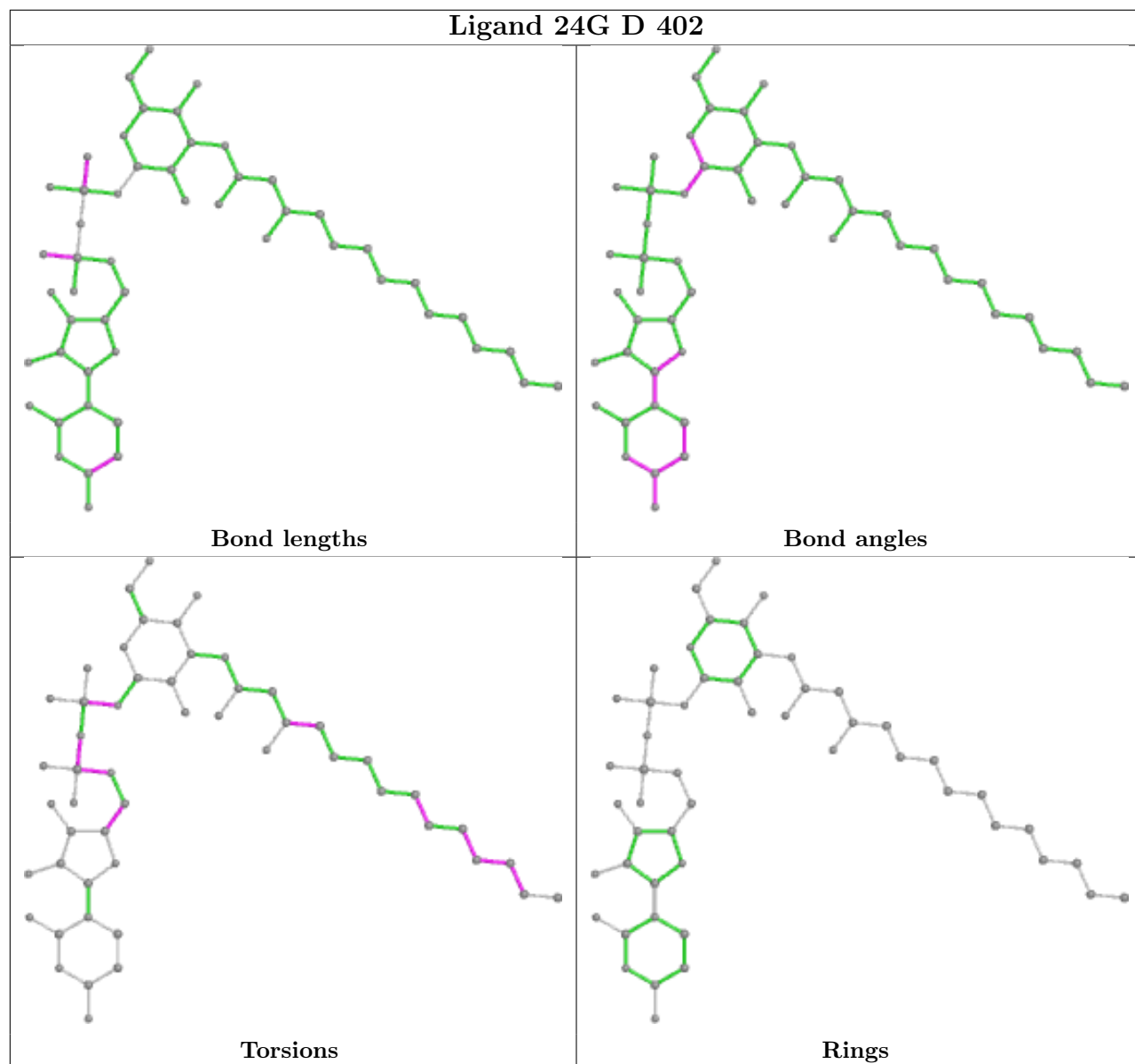
4 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	402	24G	1	0
4	D	403	PO4	2	0
3	C	402	24G	3	0
3	D	402	24G	3	0

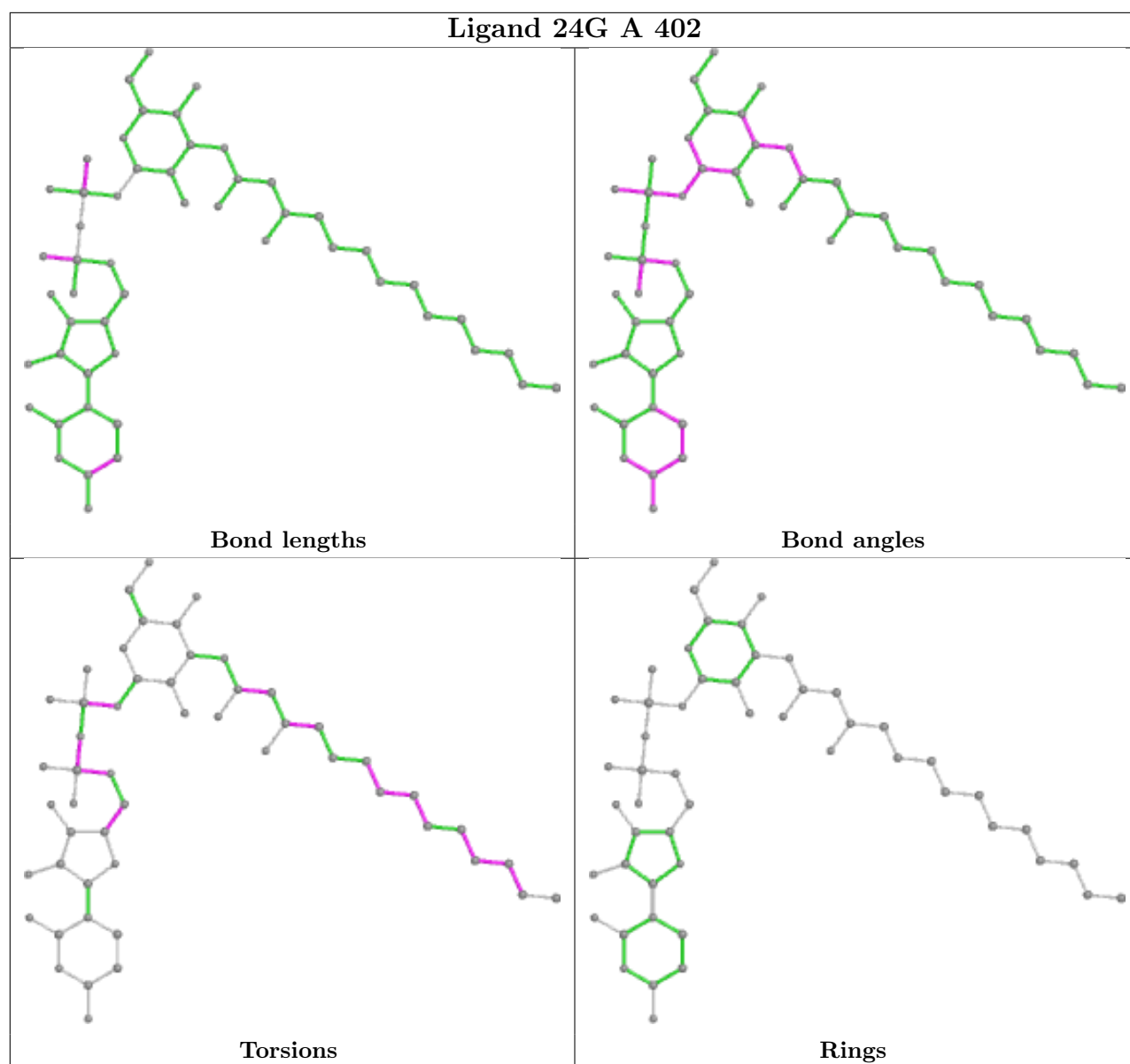
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	300/305 (98%)	0.16	3 (1%) 82 80	32, 46, 69, 90	0
1	B	300/305 (98%)	0.26	3 (1%) 82 80	32, 51, 75, 95	0
1	C	299/305 (98%)	1.01	50 (16%) 1 1	42, 72, 111, 148	0
1	D	293/305 (96%)	1.26	62 (21%) 0 0	44, 74, 117, 156	0
All	All	1192/1220 (97%)	0.67	118 (9%) 7 5	32, 59, 105, 156	0

All (118) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	293	LEU	13.5
1	D	123	LEU	7.3
1	D	296	ALA	7.2
1	C	281	ALA	6.3
1	D	152	GLY	6.2
1	C	144	TRP	6.1
1	D	287	PHE	6.1
1	D	291	ALA	6.0
1	D	289	ASP	5.9
1	C	280	GLU	5.7
1	D	87	LEU	5.5
1	C	278	LYS	5.4
1	C	134	GLU	5.3
1	D	288	GLN	5.3
1	C	221	TYR	5.3
1	C	296	ALA	5.2
1	D	177	PHE	5.1
1	D	120	ILE	5.0
1	C	287	PHE	4.8
1	D	278	LYS	4.8
1	C	222	ARG	4.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	D	285	VAL	4.7
1	D	10	ILE	4.7
1	D	130	VAL	4.5
1	D	290	ASP	4.5
1	D	196	ARG	4.5
1	C	169	SER	4.5
1	C	138	VAL	4.1
1	C	136	VAL	4.1
1	D	124	ASN	4.1
1	D	294	PRO	4.0
1	D	6	THR	4.0
1	C	161	PHE	4.0
1	C	135	THR	4.0
1	C	276	LEU	3.9
1	D	9	ARG	3.9
1	C	170	ASN	3.8
1	C	261	TYR	3.8
1	C	137	ARG	3.8
1	C	297	PHE	3.7
1	D	151	ASN	3.7
1	D	284	TYR	3.6
1	D	254	ILE	3.6
1	C	133	LYS	3.6
1	D	279	GLN	3.6
1	C	285	VAL	3.5
1	C	159	ILE	3.5
1	C	277	ALA	3.4
1	D	176	ASN	3.4
1	C	292	GLU	3.4
1	C	217	VAL	3.3
1	C	173	TYR	3.3
1	C	298	LYS	3.2
1	C	232	GLU	3.2
1	D	292	GLU	3.2
1	D	39	TYR	3.2
1	D	8	LYS	3.2
1	D	7	LEU	3.2
1	D	126	ALA	3.1
1	D	122	GLU	3.1
1	D	5	ARG	3.1
1	D	89	ILE	3.0
1	B	124	ASN	3.0

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	C	184	ARG	3.0
1	D	32	PRO	3.0
1	D	113	TYR	3.0
1	C	295	LEU	3.0
1	D	280	GLU	3.0
1	C	279	GLN	3.0
1	D	277	ALA	2.9
1	C	155	LEU	2.9
1	D	83	ALA	2.9
1	D	131	ARG	2.9
1	D	295	LEU	2.8
1	C	153	PHE	2.8
1	D	184	ARG	2.8
1	C	194	PHE	2.8
1	A	169	SER	2.7
1	C	147	PHE	2.7
1	D	132	ILE	2.7
1	A	166	ILE	2.7
1	D	179	ALA	2.6
1	C	231	PHE	2.6
1	D	153	PHE	2.6
1	D	185	GLN	2.6
1	C	145	ALA	2.6
1	C	258	PHE	2.5
1	D	29	ARG	2.5
1	B	280	GLU	2.5
1	C	275	VAL	2.5
1	D	37	VAL	2.4
1	D	221	TYR	2.4
1	C	132	ILE	2.4
1	D	13	ALA	2.4
1	D	218	VAL	2.4
1	C	146	GLU	2.4
1	C	148	LYS	2.4
1	C	274	ALA	2.4
1	C	224	LEU	2.4
1	D	136	VAL	2.3
1	C	165	ALA	2.3
1	C	247	LEU	2.3
1	C	282	TRP	2.3
1	D	282	TRP	2.2
1	C	196	ARG	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	86	GLY	2.2
1	C	142	ASP	2.2
1	C	174	ALA	2.2
1	B	121	ASP	2.2
1	D	84	LEU	2.2
1	D	11	VAL	2.2
1	A	134	GLU	2.2
1	D	112	VAL	2.1
1	D	121	ASP	2.1
1	D	26	LEU	2.1
1	D	173	TYR	2.0
1	D	183	MET	2.0
1	D	236	VAL	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> 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.

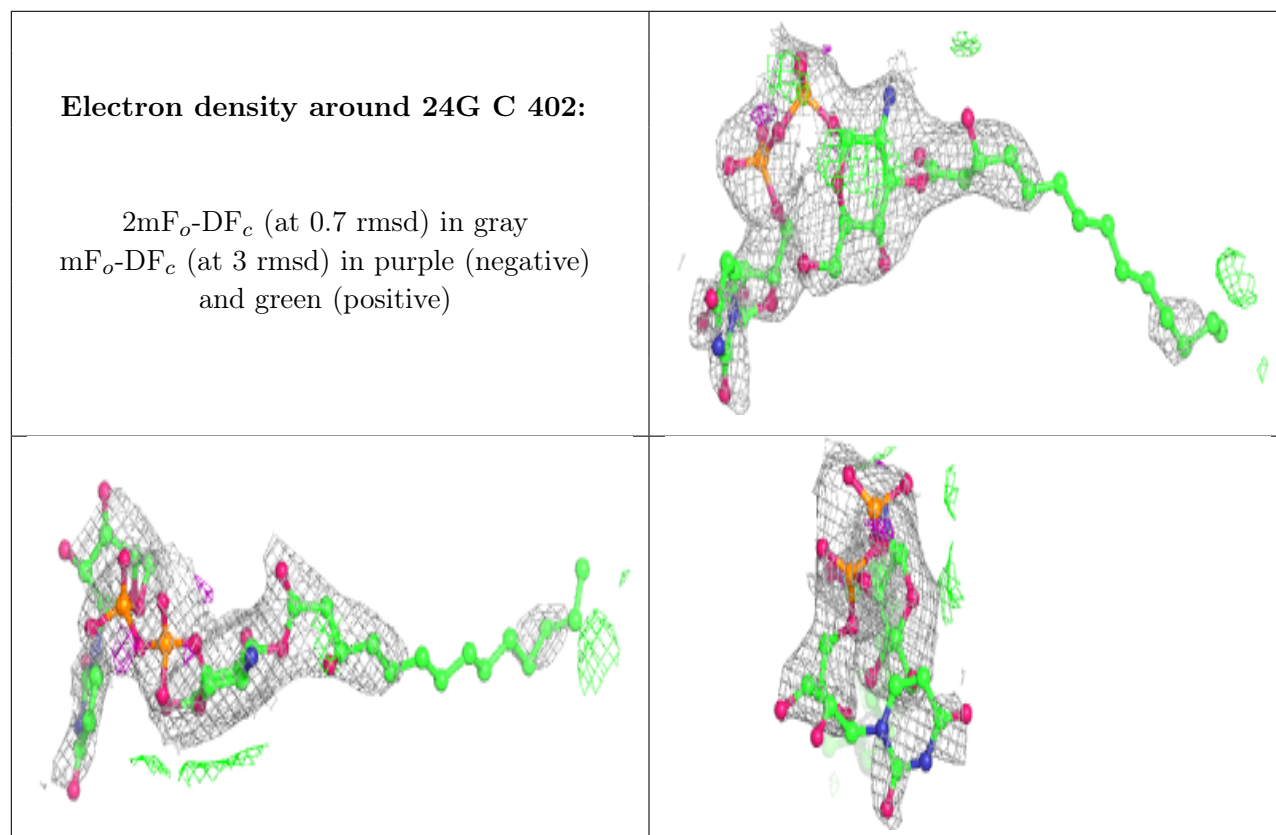
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	24G	C	402	52/52	0.81	0.32	97,105,132,132	0
3	24G	A	402	52/52	0.91	0.26	59,70,88,89	0
3	24G	D	402	52/52	0.92	0.22	55,83,90,92	0
3	24G	B	402	52/52	0.97	0.18	38,48,60,63	0
4	PO4	D	403	5/5	0.97	0.16	42,48,52,57	0
4	PO4	C	403	5/5	0.98	0.14	62,67,68,70	0
2	ZN	D	401	1/1	0.98	0.14	55,55,55,55	0
4	PO4	B	403	5/5	0.99	0.16	43,46,50,50	0
2	ZN	C	401	1/1	0.99	0.16	63,63,63,63	0
4	PO4	A	403	5/5	0.99	0.16	43,47,50,53	0

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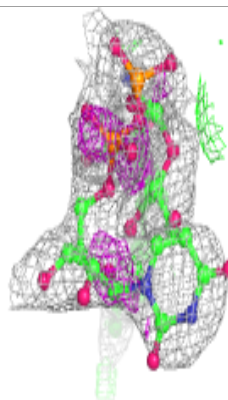
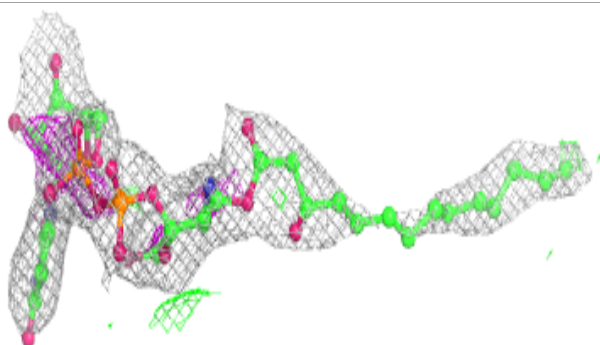
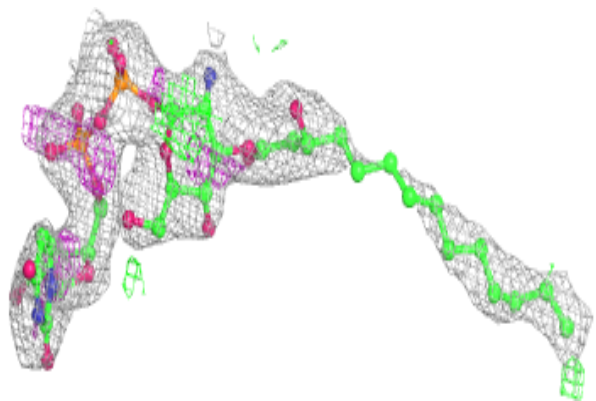
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	ZN	A	401	1/1	1.00	0.17	39,39,39,39	0
2	ZN	B	401	1/1	1.00	0.16	40,40,40,40	0

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.

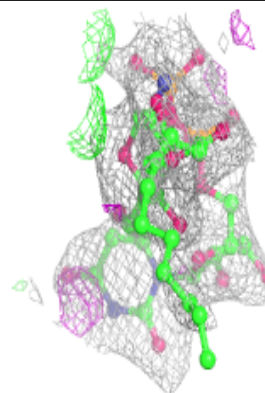
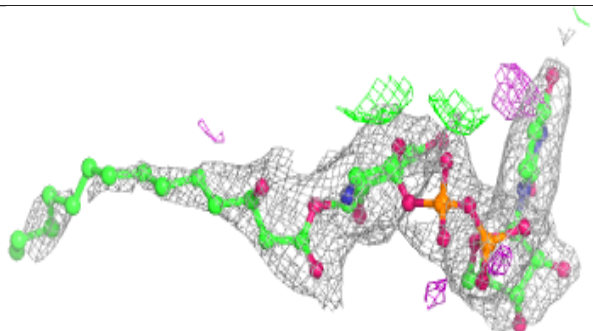
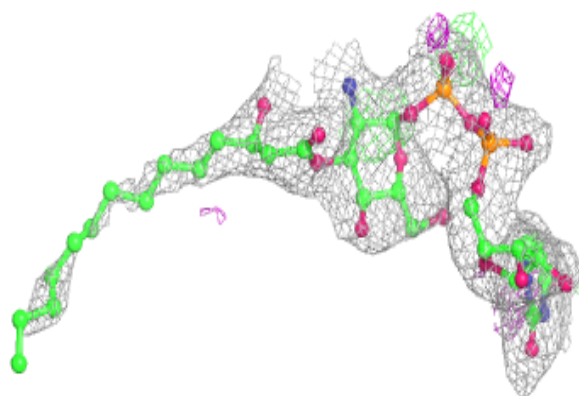


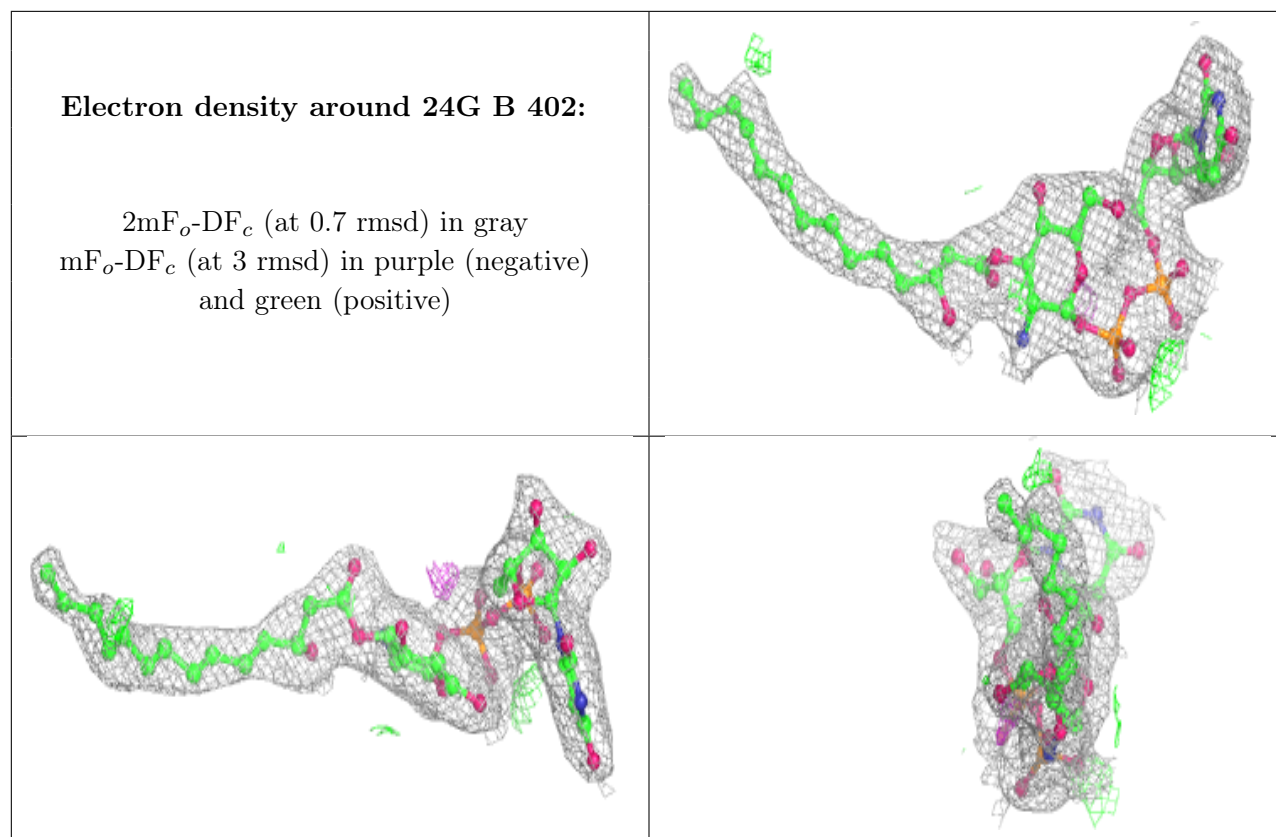
**Electron density around 24G A 402:**

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

**Electron density around 24G D 402:**

$2mF_o-DF_c$  (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.