



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 01:59 PM UTC

PDB ID : 5VYT / pdb_00005vyt
Title : Crystal structure of the WbkC N-formyltransferase (F142A variant) from *Brucella melitensis*
Authors : Riegert, A.S.; Chantigian, D.P.; Thoden, J.B.; Holden, H.M.
Deposited on : 2017-05-26
Resolution : 2.20 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

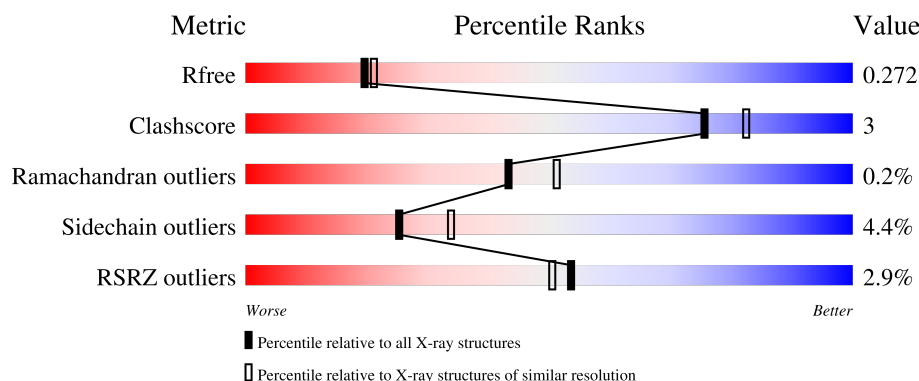
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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}	180053	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	261	 3% 87% 8% 5%
1	B	261	 2% 89% 7% . .
1	C	261	 2% 86% 11% . .
1	D	261	 4% 85% 9% . .

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8458 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 Gdp-mannose 4,6-dehydratase / gdp-4-amino-4,6-dideoxy-d-mannose formyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	248	Total	C	N	O	S	0	1	0
			1971	1265	341	356	9			
1	B	252	Total	C	N	O	S	0	0	0
			1991	1276	343	362	10			
1	C	256	Total	C	N	O	S	0	0	0
			2019	1293	350	366	10			
1	D	250	Total	C	N	O	S	0	0	0
			1977	1270	340	357	10			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP F8WJP6
A	0	HIS	-	expression tag	UNP F8WJP6
A	78	ALA	ASP	engineered mutation	UNP F8WJP6
A	142	ALA	PHE	engineered mutation	UNP F8WJP6
B	-1	GLY	-	expression tag	UNP F8WJP6
B	0	HIS	-	expression tag	UNP F8WJP6
B	78	ALA	ASP	engineered mutation	UNP F8WJP6
B	142	ALA	PHE	engineered mutation	UNP F8WJP6
C	-1	GLY	-	expression tag	UNP F8WJP6
C	0	HIS	-	expression tag	UNP F8WJP6
C	78	ALA	ASP	engineered mutation	UNP F8WJP6
C	142	ALA	PHE	engineered mutation	UNP F8WJP6
D	-1	GLY	-	expression tag	UNP F8WJP6
D	0	HIS	-	expression tag	UNP F8WJP6
D	78	ALA	ASP	engineered mutation	UNP F8WJP6
D	142	ALA	PHE	engineered mutation	UNP F8WJP6

- Molecule 2 is N-{{[4-({[(6R)-2-amino-5-formyl-4-oxo-1,4,5,6,7,8-hexahydropteridin-6-yl]methyl}amino)phenyl]carbonyl}-L-glutamic acid (CCD ID: FON) (formula: C₂₀H₂₃N₇O₇).



Mol	Chain	Residues	Atoms				ZeroOcc	AltCon
2	A	1	Total 22	C 14	N 6	O 2	0	0
2	B	1	Total 22	C 14	N 6	O 2	0	0
2	C	1	Total 22	C 14	N 6	O 2	0	0
2	D	1	Total 26	C 16	N 7	O 3	0	0

- Molecule 3 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			24	10	5	8	1		
3	B	1	Total	C	N	O	P	0	0
			24	10	5	8	1		
3	C	1	Total	C	N	O	P	0	0
			24	10	5	8	1		
3	D	1	Total	C	N	O	P	0	0
			28	10	5	11	2		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	2	Total	Cl	0	0
			2	2		

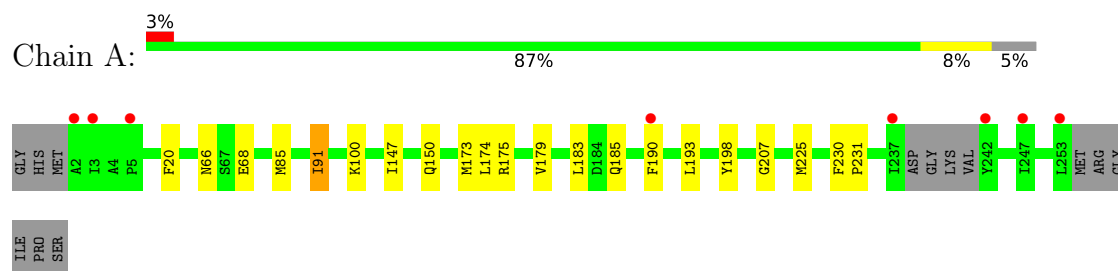
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	75	Total	O	0	0
			75	75		
5	B	54	Total	O	0	0
			54	54		
5	C	86	Total	O	0	0
			86	86		
5	D	91	Total	O	0	0
			91	91		

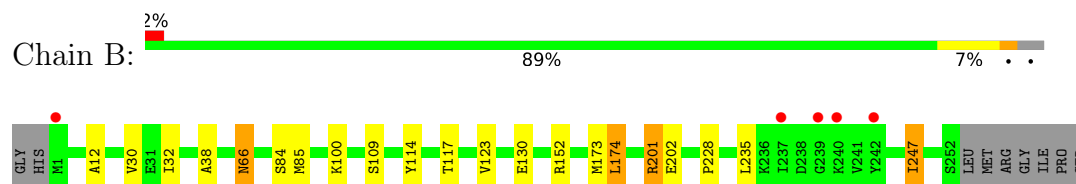
3 Residue-property plots [i](#)

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.

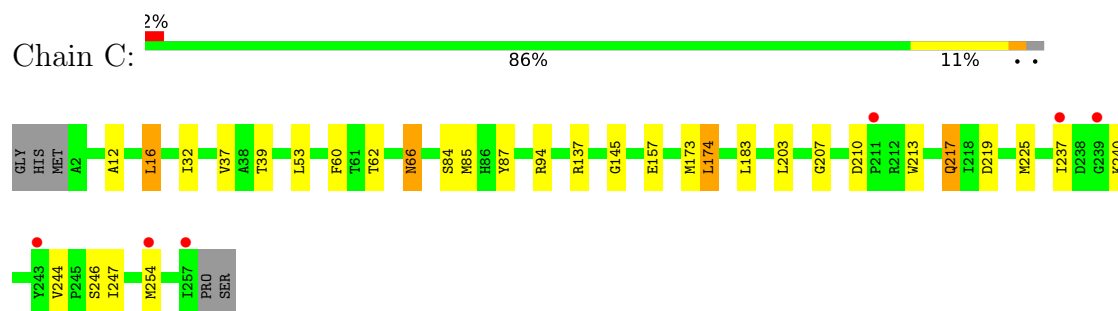
- Molecule 1: Gdp-mannose 4,6-dehydratase / gdp-4-amino-4,6-dideoxy-d-mannose formyltransferase



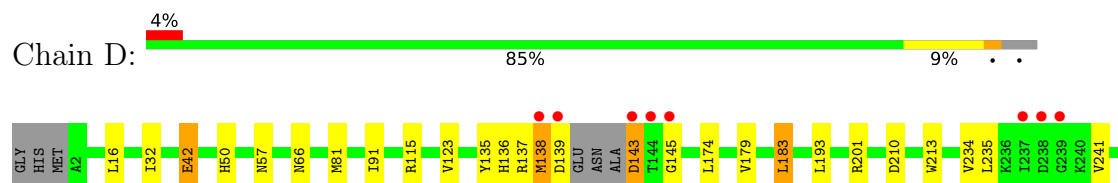
- Molecule 1: Gdp-mannose 4,6-dehydratase / gdp-4-amino-4,6-dideoxy-d-mannose formyltransferase



- Molecule 1: Gdp-mannose 4,6-dehydratase / gdp-4-amino-4,6-dideoxy-d-mannose formyltransferase



- Molecule 1: Gdp-mannose 4,6-dehydratase / gdp-4-amino-4,6-dideoxy-d-mannose formyltransferase



L253	ARG
Y254	GLY
	ILE
	PRO
	SER

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.31Å 68.02Å 236.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.20 50.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	96.6 (50.00-2.20) 96.7 (50.00-2.20)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.42 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.8.0124	Depositor
R, R_{free}	0.202 , 0.268 0.209 , 0.272	Depositor DCC
R_{free} test set	2687 reflections (4.78%)	wwPDB-VP
Wilson B-factor (Å ²)	23.4	Xtriage
Anisotropy	0.047	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 38.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.027 for k,h,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	8458	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.01% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CL, FON, GDP

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	0.86	1/2021 (0.0%)	1.01	3/2739 (0.1%)
1	B	0.86	0/2039	1.00	2/2764 (0.1%)
1	C	0.93	0/2067	1.01	2/2801 (0.1%)
1	D	0.89	0/2024	1.00	1/2742 (0.0%)
All	All	0.89	1/8151 (0.0%)	1.01	8/11046 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	91	ILE	N-CA	-5.36	1.41	1.46

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	230	PHE	CA-C-N	-8.02	113.88	119.66
1	A	230	PHE	C-N-CA	-8.02	113.88	119.66
1	B	30	VAL	N-CA-C	-5.99	100.98	108.89
1	D	253	LEU	N-CA-C	-5.72	98.61	110.80
1	B	228	PRO	CA-C-O	-5.39	117.02	120.90
1	C	32	ILE	CB-CA-C	-5.29	105.11	111.88
1	A	231	PRO	O-C-N	5.22	123.60	121.15
1	C	87	TYR	N-CA-C	-5.11	103.29	110.50

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	1971	0	1957	11	0
1	B	1991	0	1975	10	0
1	C	2019	0	2001	18	0
1	D	1977	0	1965	13	0
2	A	22	0	15	1	0
2	B	22	0	15	0	0
2	C	22	0	15	0	0
2	D	26	0	16	1	0
3	A	24	0	12	0	0
3	B	24	0	12	0	0
3	C	24	0	12	1	0
3	D	28	0	12	0	0
4	C	2	0	0	0	0
5	A	75	0	0	0	0
5	B	54	0	0	1	0
5	C	86	0	0	2	0
5	D	91	0	0	0	0
All	All	8458	0	8007	48	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 3.

All (48) 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:C:85:MET:HE1	1:C:173:MET:HE1	1.62	0.80
1:A:85:MET:HE1	1:A:173:MET:HE1	1.70	0.74
1:B:85:MET:HE1	1:B:173:MET:HE1	1.69	0.73
1:C:219:ASP:OD2	1:C:247:ILE:HG21	1.92	0.69
1:D:138:MET:O	1:D:139:ASP:HB2	1.98	0.64
1:D:137:ARG:O	1:D:145:GLY:HA3	1.99	0.61
1:D:136:HIS:CE1	1:D:143:ASP:HA	2.35	0.61
1:D:115:ARG:NH2	1:D:143:ASP:O	2.33	0.61
1:D:234:VAL:HG13	1:D:241:VAL:HG13	1.82	0.60
1:A:175:ARG:O	1:A:179:VAL:HG23	2.01	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:174:LEU:HD22	1:B:174:LEU:HA	1.85	0.59
1:C:207:GLY:HA2	1:C:225:MET:HE2	1.88	0.56
1:C:37:VAL:HG21	1:C:53:LEU:HD21	1.88	0.56
1:C:85:MET:CE	1:C:173:MET:HE1	2.34	0.54
1:C:246:SER:HB2	5:C:471:HOH:O	2.07	0.53
1:D:135:TYR:CG	1:D:179:VAL:HG21	2.45	0.52
1:C:203:LEU:HD21	1:C:225:MET:HE1	1.91	0.51
1:A:91:ILE:H	2:A:301:FON:HN1	1.58	0.51
1:D:210:ASP:HB3	1:D:213:TRP:CE2	2.46	0.51
1:C:213:TRP:HB3	1:C:217:GLN:HB3	1.95	0.49
1:C:37:VAL:O	1:C:60:PHE:HA	2.13	0.48
1:B:109:SER:HB2	1:B:114:TYR:HB2	1.95	0.47
1:C:16:LEU:HD13	1:D:16:LEU:HD11	1.96	0.47
1:B:66:ASN:HD22	1:B:66:ASN:C	2.22	0.47
3:C:302:GDP:O2A	5:C:401:HOH:O	2.20	0.46
1:A:198:TYR:CD1	1:A:198:TYR:C	2.93	0.46
1:B:12:ALA:HA	1:B:38:ALA:O	2.14	0.46
1:A:85:MET:CE	1:A:173:MET:HE1	2.43	0.44
1:A:147:ILE:HG21	1:A:150:GLN:HG3	2.00	0.44
1:C:174:LEU:HD22	1:D:174:LEU:HA	1.99	0.43
1:B:66:ASN:C	1:B:66:ASN:ND2	2.75	0.43
1:C:66:ASN:C	1:C:66:ASN:HD22	2.26	0.43
1:D:135:TYR:CD2	1:D:179:VAL:HG21	2.53	0.43
1:A:20:PHE:CE1	1:A:173:MET:HB3	2.53	0.43
1:C:137:ARG:O	1:C:145:GLY:HA3	2.19	0.43
1:C:207:GLY:CA	1:C:225:MET:HE2	2.49	0.42
1:A:207:GLY:HA2	1:A:225:MET:HE2	2.01	0.42
1:C:12:ALA:O	1:C:84:SER:HA	2.19	0.42
1:A:174:LEU:HA	1:B:174:LEU:HD22	2.02	0.42
1:D:81:MET:HB2	1:D:183:LEU:HD13	2.01	0.42
1:C:210:ASP:HB3	1:C:213:TRP:CE2	2.55	0.41
1:C:39:THR:O	1:C:62:THR:HA	2.19	0.41
1:B:12:ALA:O	1:B:84:SER:HA	2.21	0.41
1:A:68:GLU:OE2	1:C:94:ARG:NH2	2.54	0.41
1:D:42:GLU:HG2	1:D:50:HIS:CG	2.55	0.41
1:B:32:ILE:HG21	5:B:425:HOH:O	2.20	0.41
1:D:91:ILE:H	2:D:301:FON:HN1	1.67	0.41
1:B:117:THR:OG1	1:B:201:ARG:HA	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	245/261 (94%)	236 (96%)	9 (4%)	0	100	100
1	B	250/261 (96%)	242 (97%)	7 (3%)	1 (0%)	30	34
1	C	254/261 (97%)	242 (95%)	11 (4%)	1 (0%)	30	34
1	D	246/261 (94%)	239 (97%)	7 (3%)	0	100	100
All	All	995/1044 (95%)	959 (96%)	34 (3%)	2 (0%)	43	51

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	254	MET
1	B	247	ILE

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	208/217 (96%)	202 (97%)	6 (3%)	37	51
1	B	210/217 (97%)	200 (95%)	10 (5%)	23	30
1	C	212/217 (98%)	203 (96%)	9 (4%)	26	36
1	D	209/217 (96%)	197 (94%)	12 (6%)	18	23
All	All	839/868 (97%)	802 (96%)	37 (4%)	25	34

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	66	ASN
1	A	100	LYS
1	A	183	LEU
1	A	185	GLN
1	A	190	PHE
1	A	193	LEU
1	B	66	ASN
1	B	100	LYS
1	B	123	VAL
1	B	130	GLU
1	B	152	ARG
1	B	174	LEU
1	B	201	ARG
1	B	202	GLU
1	B	235	LEU
1	B	247	ILE
1	C	16	LEU
1	C	66	ASN
1	C	157	GLU
1	C	174	LEU
1	C	183	LEU
1	C	217	GLN
1	C	237	ILE
1	C	240	LYS
1	C	244	VAL
1	D	32	ILE
1	D	42	GLU
1	D	57	ASN
1	D	66	ASN
1	D	123	VAL
1	D	138	MET
1	D	143	ASP
1	D	183	LEU
1	D	193	LEU
1	D	201	ARG
1	D	235	LEU
1	D	253	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	66	ASN
1	B	66	ASN

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Mol	Chain	Res	Type
1	B	126	ASN
1	C	57	ASN
1	C	66	ASN
1	C	118	ASN
1	C	217	GLN
1	D	59	GLN
1	D	66	ASN
1	D	136	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 2 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
2	FON	C	301	-	22,24,36	1.93	5 (22%)	17,33,50	1.75	5 (29%)
2	FON	A	301	-	22,24,36	2.05	6 (27%)	17,33,50	1.58	3 (17%)
3	GDP	A	302	-	26,26,30	1.32	4 (15%)	39,40,47	1.99	10 (25%)
2	FON	B	301	-	22,24,36	2.02	7 (31%)	17,33,50	1.77	4 (23%)
3	GDP	C	302	-	26,26,30	1.24	3 (11%)	39,40,47	1.92	7 (17%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	GDP	D	302	-	29,30,30	1.17	4 (13%)	45,47,47	1.79	7 (15%)
3	GDP	B	302	-	26,26,30	1.21	2 (7%)	39,40,47	2.03	10 (25%)
2	FON	D	301	-	26,28,36	1.91	6 (23%)	23,39,50	1.27	2 (8%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	FON	C	301	-	-	0/7/20/37	0/3/3/3
2	FON	A	301	-	-	0/7/20/37	0/3/3/3
3	GDP	A	302	-	-	2/10/26/32	0/3/3/3
2	FON	B	301	-	-	1/7/20/37	0/3/3/3
3	GDP	C	302	-	-	1/10/26/32	0/3/3/3
3	GDP	D	302	-	-	4/16/32/32	0/3/3/3
3	GDP	B	302	-	-	0/10/26/32	0/3/3/3
2	FON	D	301	-	-	4/13/26/37	0/3/3/3

All (37) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	FON	CP1-N5	-5.90	1.25	1.36
2	B	301	FON	CP1-N5	-5.86	1.25	1.36
2	A	301	FON	CP1-N5	-5.54	1.26	1.36
2	D	301	FON	CP1-N5	-5.26	1.26	1.36
2	D	301	FON	C8A-N1	-4.12	1.30	1.37
3	A	302	GDP	PA-O1A	3.61	1.61	1.50
2	A	301	FON	C4A-N5	3.54	1.43	1.38
3	B	302	GDP	C5-C4	3.48	1.48	1.38
3	D	302	GDP	C5-C4	3.33	1.47	1.38
2	B	301	FON	C8A-N8	3.20	1.35	1.32
2	A	301	FON	C8A-N8	3.14	1.35	1.32
3	A	302	GDP	C5-C4	3.07	1.47	1.38
2	D	301	FON	C4A-C8A	3.04	1.47	1.37
2	C	301	FON	C4A-C8A	2.99	1.47	1.37
3	C	302	GDP	C5-C4	2.84	1.46	1.38
2	D	301	FON	C8A-N8	2.82	1.35	1.32
2	D	301	FON	C4A-N5	2.78	1.42	1.38
2	A	301	FON	C4A-C8A	2.75	1.46	1.37
3	C	302	GDP	C5-N7	-2.73	1.33	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	FON	C8A-N1	-2.67	1.32	1.37
2	C	301	FON	C8A-N1	-2.60	1.33	1.37
3	D	302	GDP	C5-N7	-2.51	1.34	1.39
2	B	301	FON	C4A-C8A	2.49	1.45	1.37
3	C	302	GDP	C4-N9	-2.42	1.31	1.38
2	B	301	FON	C8A-N1	-2.33	1.33	1.37
2	B	301	FON	C7-C6	2.32	1.54	1.52
3	A	302	GDP	C5-N7	-2.15	1.34	1.39
3	D	302	GDP	C4-N9	-2.13	1.32	1.38
2	A	301	FON	C12-C13	2.11	1.42	1.38
2	C	301	FON	C4A-N5	2.11	1.41	1.38
3	D	302	GDP	C6-N1	-2.11	1.34	1.38
3	A	302	GDP	C4-N9	-2.11	1.32	1.38
2	C	301	FON	C15-C14	2.09	1.42	1.39
2	B	301	FON	C16-C15	2.08	1.42	1.38
3	B	302	GDP	C5-N7	-2.08	1.34	1.39
2	D	301	FON	C7-C6	2.07	1.54	1.52
2	B	301	FON	C12-C13	2.05	1.42	1.38

All (48) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	302	GDP	C5-C4-N3	-5.63	119.42	128.39
3	C	302	GDP	C5-C4-N3	-5.48	119.68	128.39
3	C	302	GDP	C2-N3-C4	5.29	121.42	112.30
3	B	302	GDP	C5-C4-N3	-5.19	120.13	128.39
3	A	302	GDP	C5-C4-N3	-5.10	120.28	128.39
3	A	302	GDP	C2-N3-C4	4.98	120.88	112.30
3	D	302	GDP	C2-N3-C4	4.76	120.50	112.30
3	D	302	GDP	N9-C4-N3	4.70	135.36	125.95
3	C	302	GDP	N9-C4-N3	4.58	135.10	125.95
3	B	302	GDP	C2-N3-C4	4.51	120.06	112.30
3	A	302	GDP	N9-C4-N3	4.46	134.88	125.95
3	B	302	GDP	N9-C4-N3	3.91	133.77	125.95
2	C	301	FON	O3-CP1-N5	-3.79	118.26	124.67
3	C	302	GDP	O2A-PA-O1A	3.73	125.35	110.83
2	B	301	FON	N1-C8A-N8	3.50	123.85	117.28
3	A	302	GDP	O2A-PA-O3A	3.48	120.86	107.80
3	D	302	GDP	O3B-PB-O2B	3.44	120.70	107.80
3	A	302	GDP	C6-C5-N7	3.31	136.31	130.29
3	B	302	GDP	C6-C5-N7	3.10	135.93	130.29
2	B	301	FON	C12-C13-C14	3.06	123.26	119.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	302	GDP	O6-C6-C5	-3.03	118.53	126.53
3	B	302	GDP	O2A-PA-O1A	2.99	122.50	110.83
3	B	302	GDP	O6-C6-C5	-2.99	118.64	126.53
3	C	302	GDP	C6-C5-N7	2.97	135.70	130.29
2	B	301	FON	O3-CP1-N5	-2.97	119.66	124.67
2	A	301	FON	C16-C15-C14	2.95	123.12	119.73
3	A	302	GDP	O5'-PA-O1A	-2.93	98.52	106.44
3	D	302	GDP	C6-C5-N7	2.92	135.60	130.29
2	B	301	FON	C15-C14-C13	-2.82	115.29	119.04
3	C	302	GDP	O6-C6-C5	-2.79	119.17	126.53
3	B	302	GDP	O4'-C1'-N9	2.76	114.60	108.36
3	D	302	GDP	O6-C6-C5	-2.69	119.42	126.53
3	B	302	GDP	C5'-C4'-C3'	-2.55	106.05	115.21
2	D	301	FON	C11-C-N	2.51	120.16	117.01
2	C	301	FON	N1-C8A-N8	2.49	121.96	117.28
2	C	301	FON	C15-C14-C13	-2.42	115.83	119.04
2	A	301	FON	C15-C14-C13	-2.37	115.89	119.04
3	D	302	GDP	C5-C6-N1	2.36	119.27	113.25
2	D	301	FON	O3-CP1-N5	-2.33	120.74	124.67
2	A	301	FON	N1-C8A-N8	2.31	121.61	117.28
3	A	302	GDP	C5-C6-N1	2.25	118.97	113.25
3	B	302	GDP	O5'-C5'-C4'	2.15	116.31	108.99
3	B	302	GDP	C5-C6-N1	2.14	118.69	113.25
2	C	301	FON	C16-C15-C14	2.11	122.16	119.73
3	A	302	GDP	C8-N9-C4	2.08	109.92	106.03
3	C	302	GDP	C5-C6-N1	2.07	118.52	113.25
2	C	301	FON	C12-C13-C14	2.06	122.10	119.73
3	A	302	GDP	C6-C5-C4	-2.02	115.79	118.83

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	301	FON	C7-C6-C9-N10
3	D	302	GDP	C5'-O5'-PA-O1A
3	A	302	GDP	O4'-C4'-C5'-O5'
2	D	301	FON	N-C-C11-C12
3	D	302	GDP	PA-O3A-PB-O1B
2	D	301	FON	O-C-C11-C12
2	D	301	FON	N-C-C11-C16
2	D	301	FON	O-C-C11-C16
3	D	302	GDP	PB-O3A-PA-O5'

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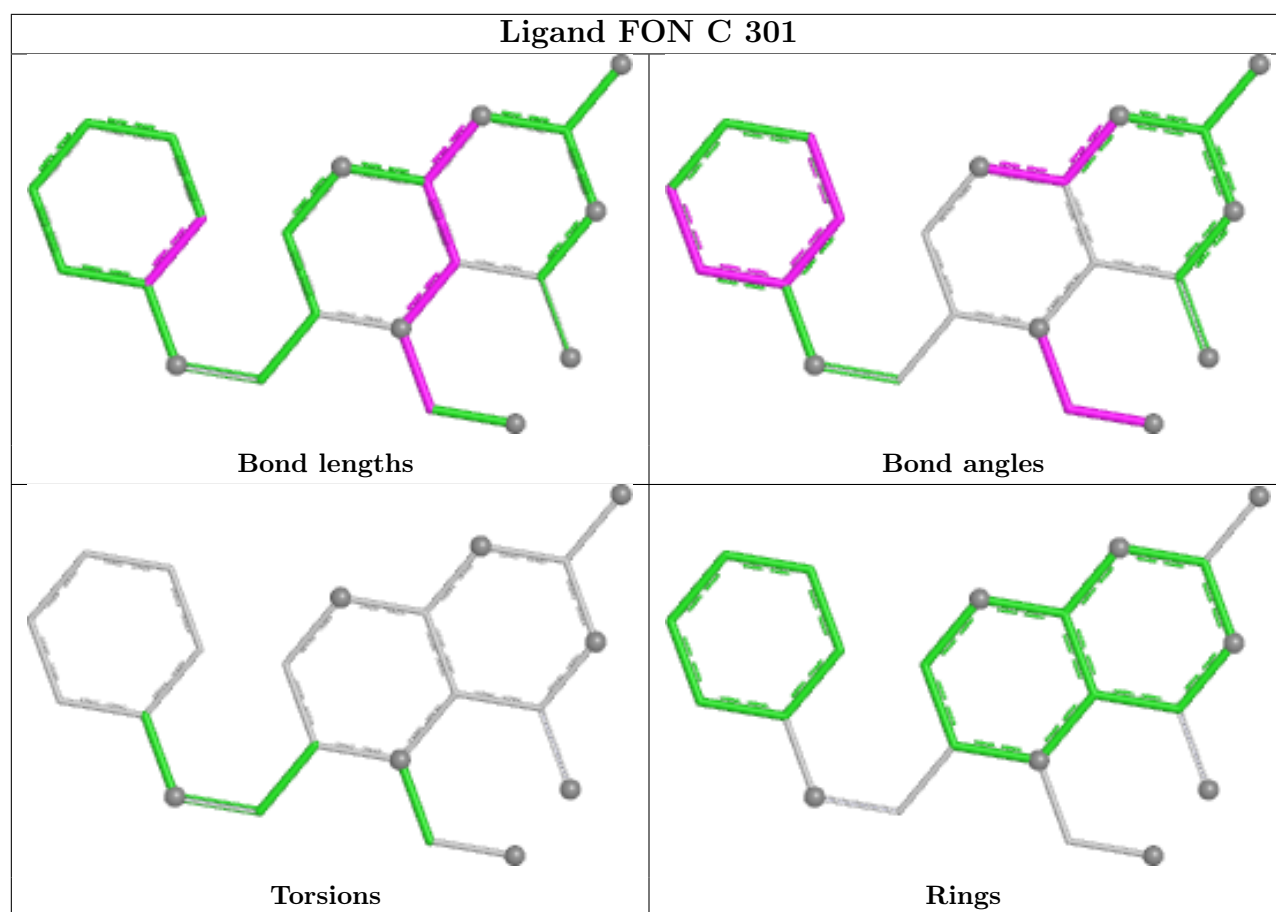
Mol	Chain	Res	Type	Atoms
3	D	302	GDP	PB-O3A-PA-O1A
3	A	302	GDP	C3'-C4'-C5'-O5'
3	C	302	GDP	O4'-C4'-C5'-O5'

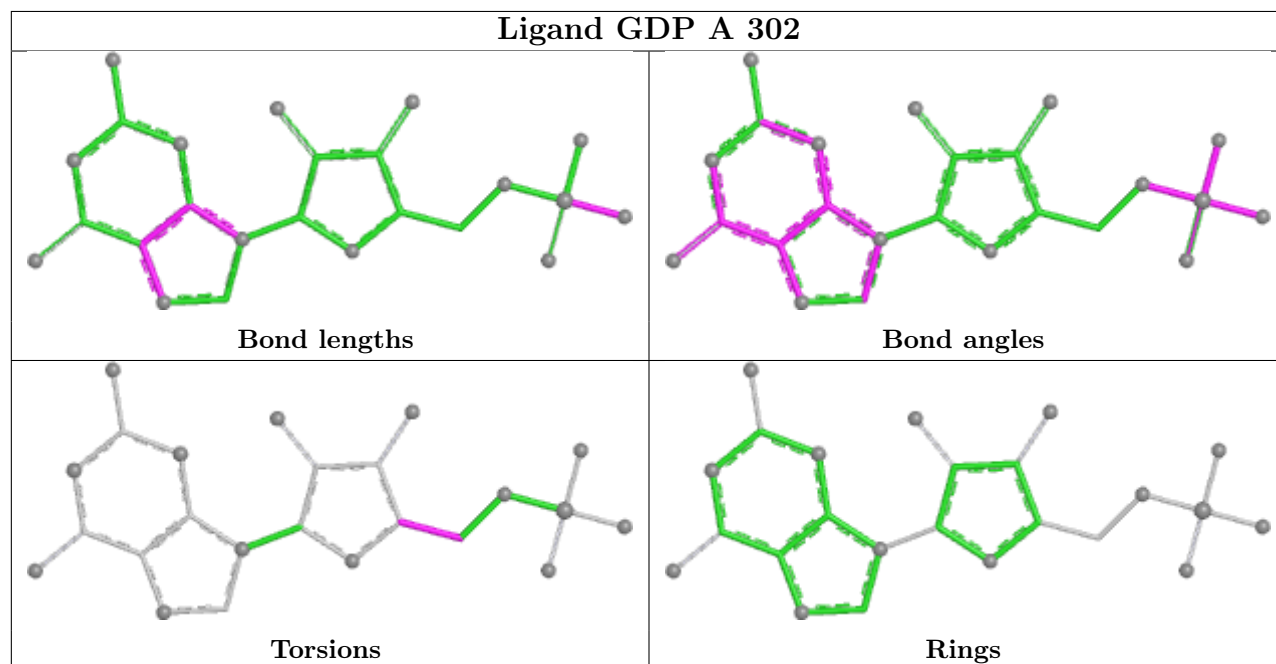
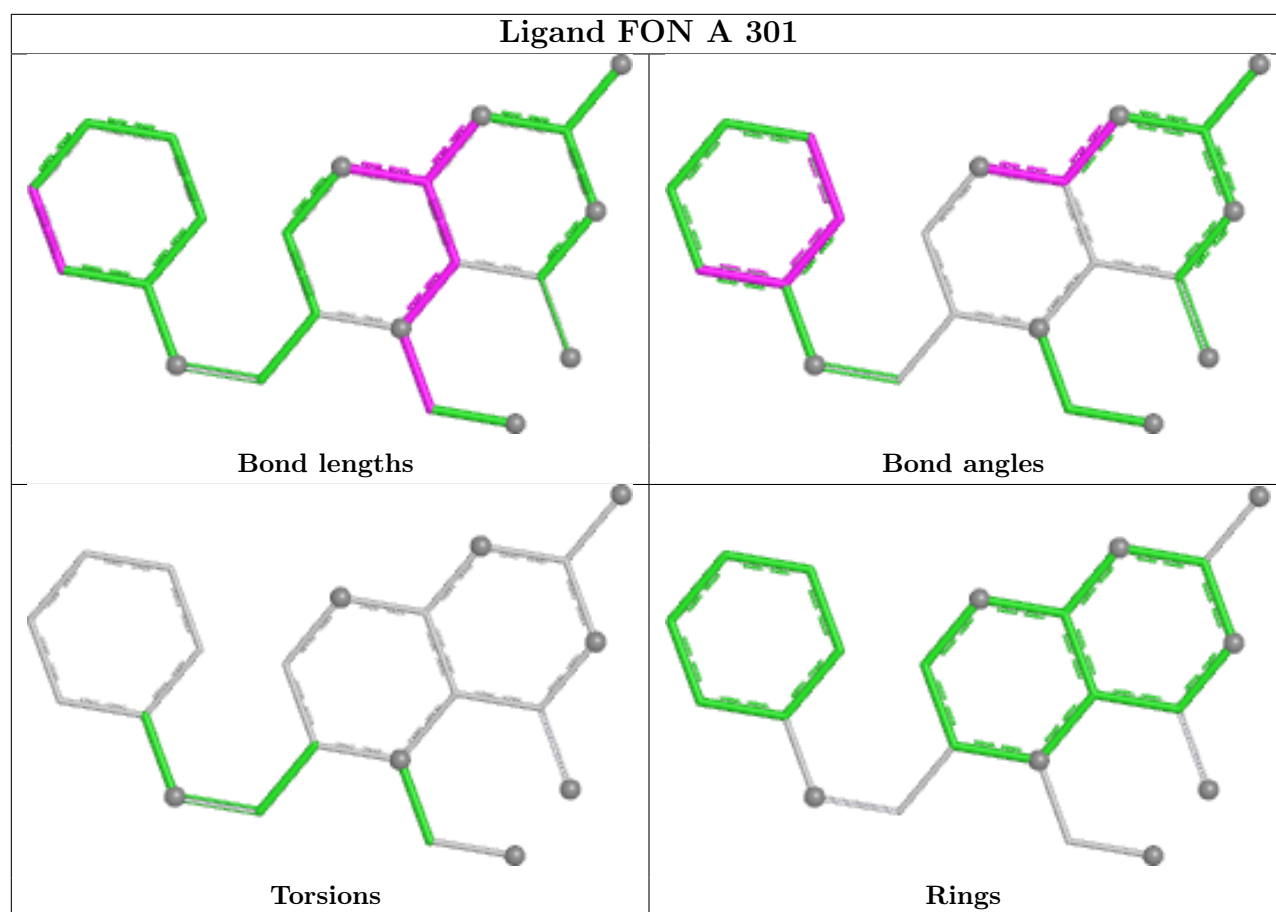
There are no ring outliers.

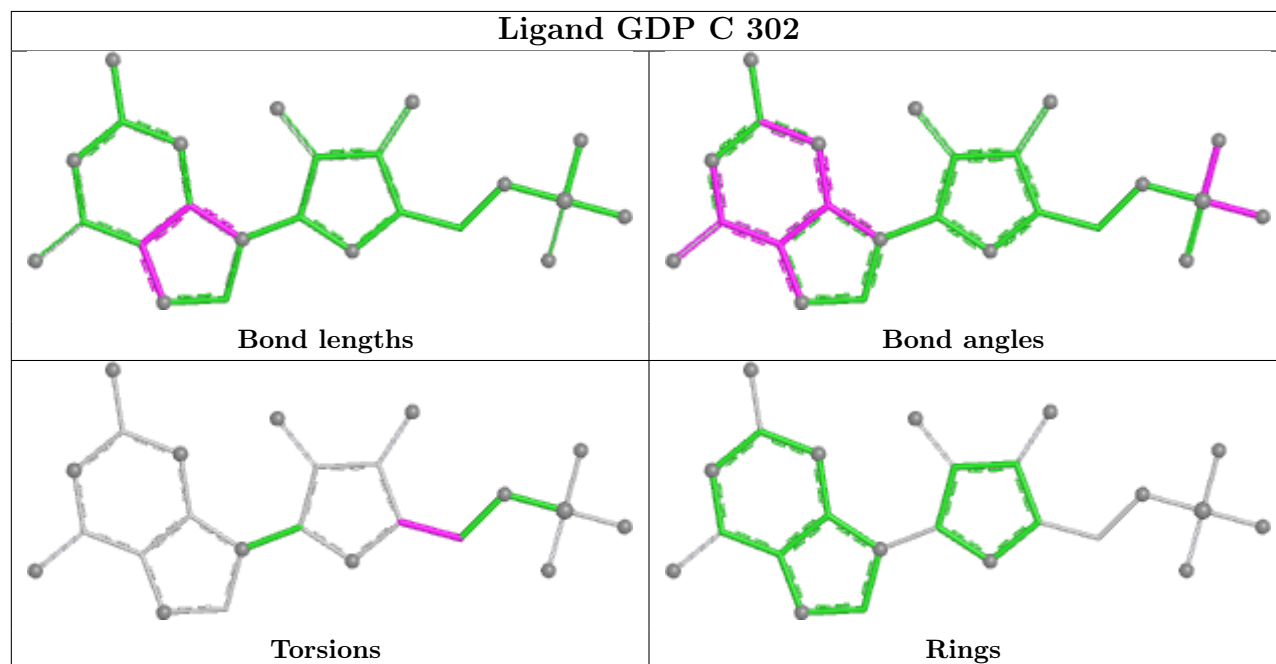
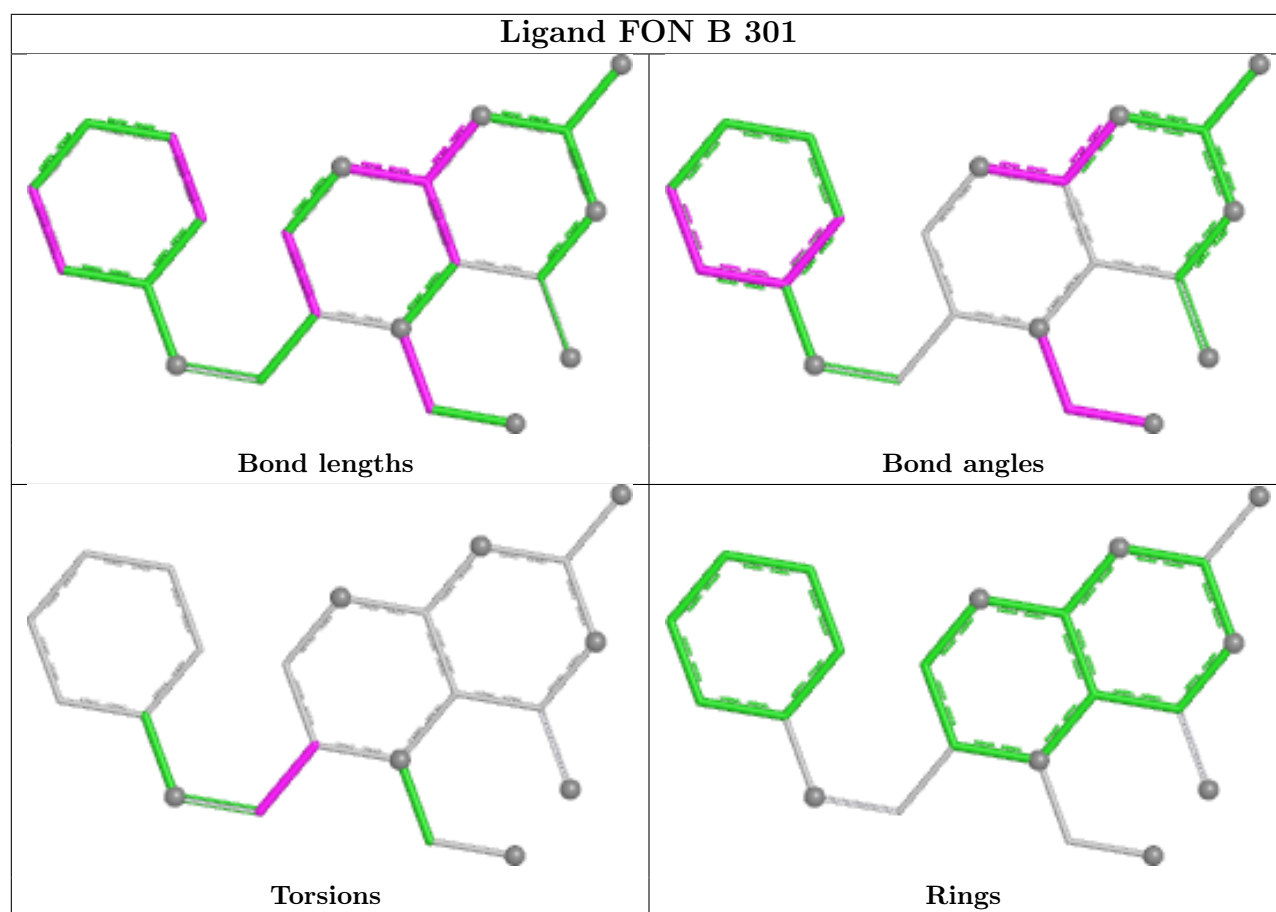
3 monomers are involved in 3 short contacts:

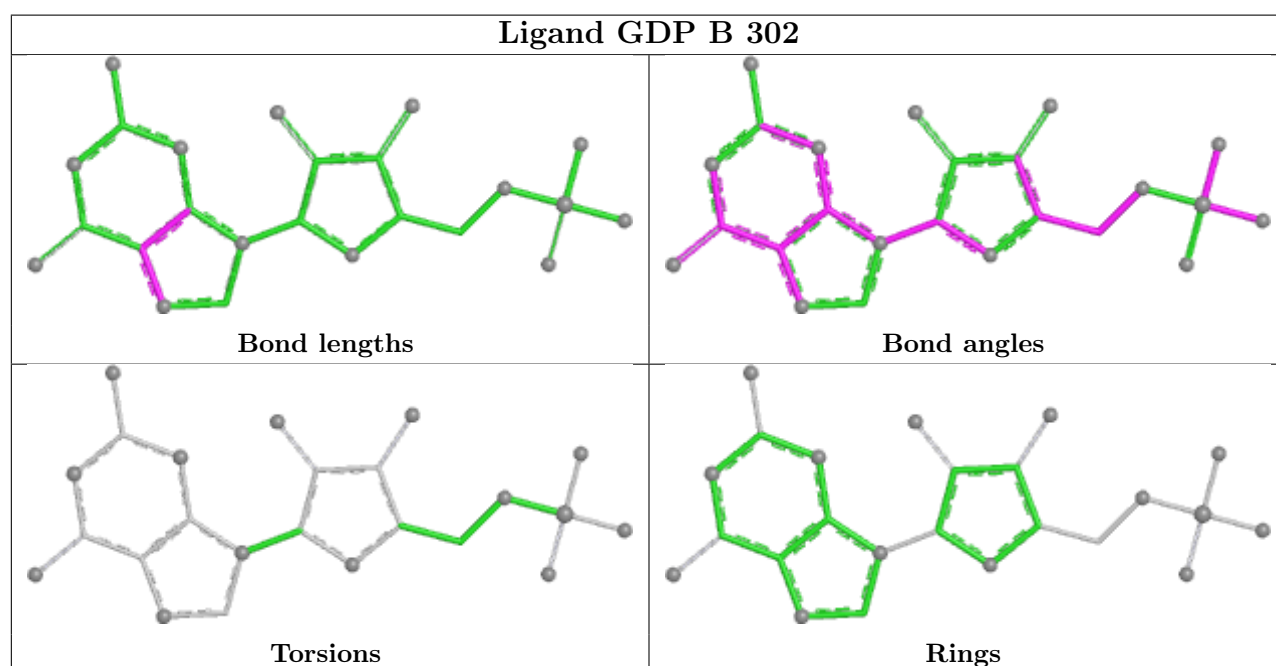
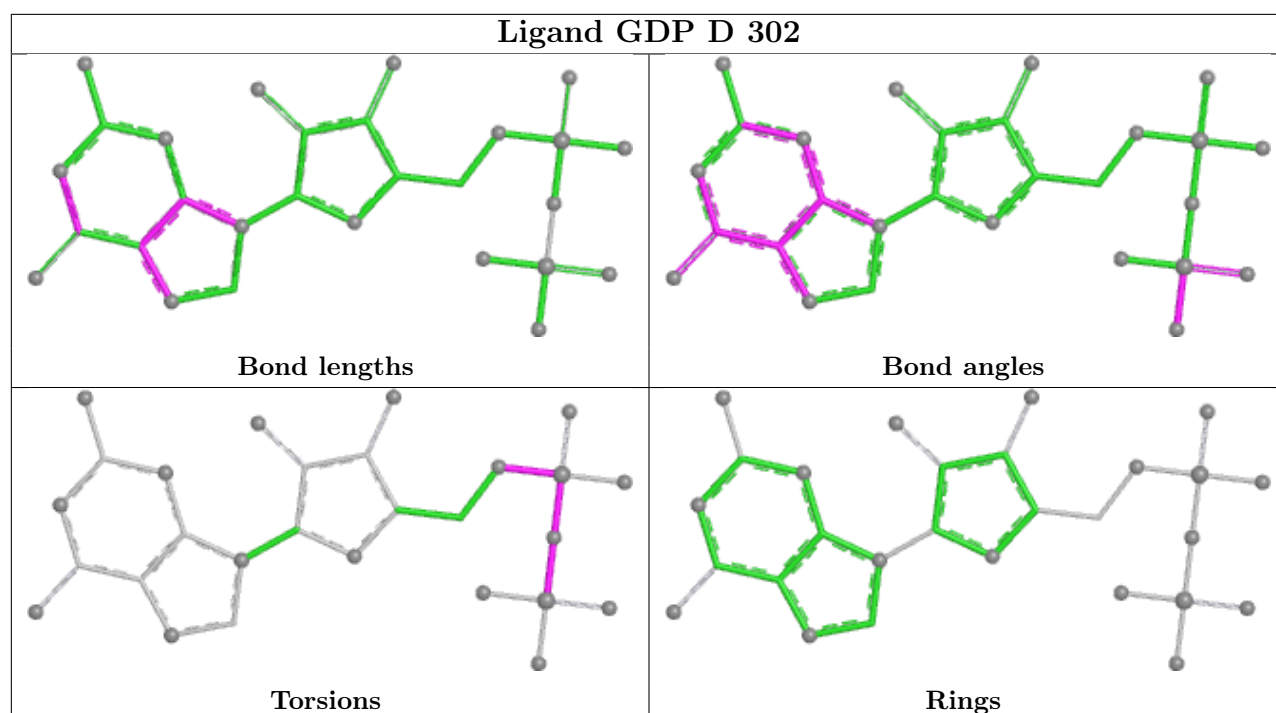
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	FON	1	0
3	C	302	GDP	1	0
2	D	301	FON	1	0

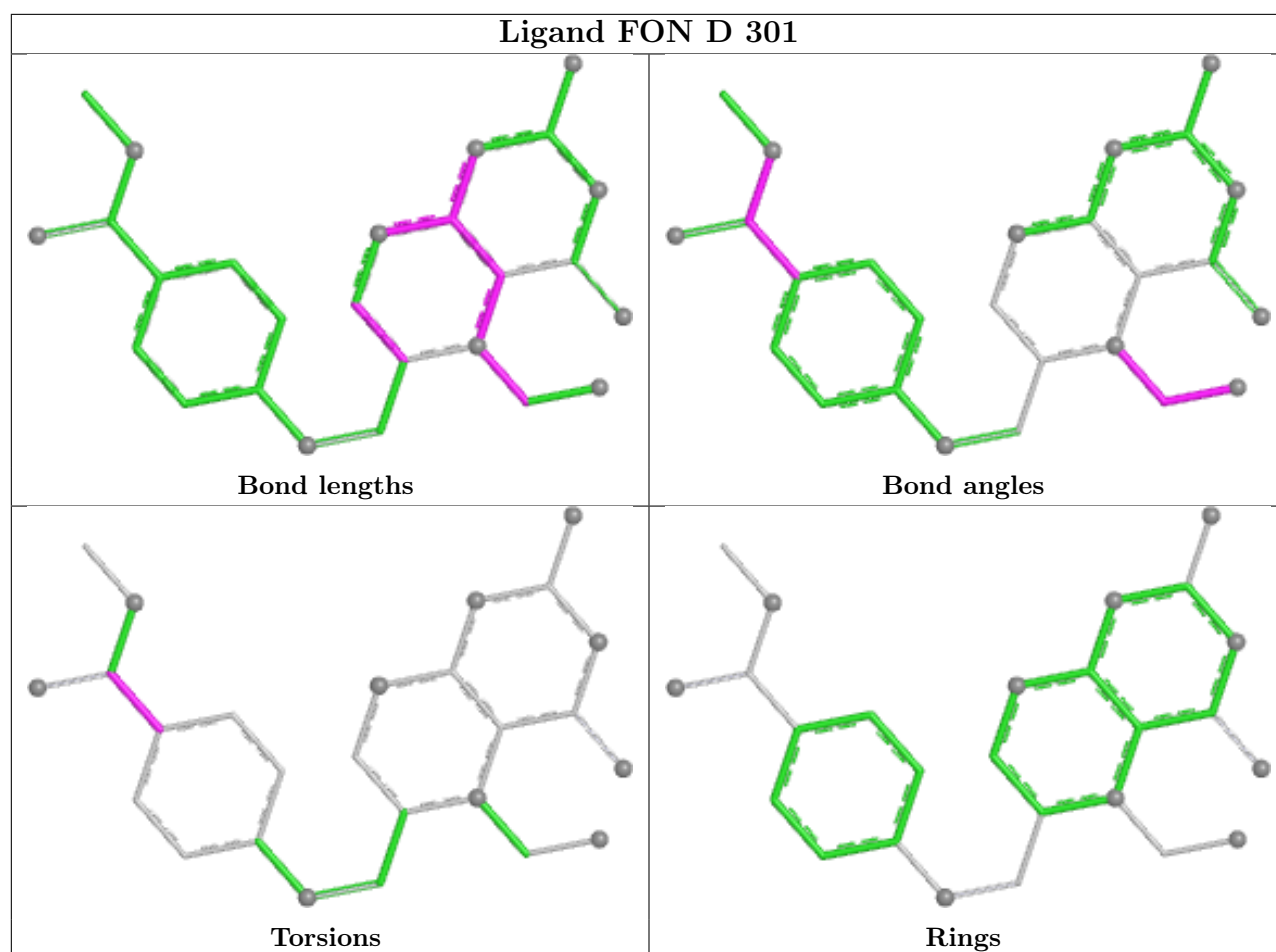
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

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, 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	248/261 (95%)	-0.10	8 (3%)	50	47	11, 27, 56, 71	1 (0%)
1	B	252/261 (96%)	-0.07	5 (1%)	65	62	16, 29, 54, 68	0
1	C	256/261 (98%)	-0.24	6 (2%)	61	58	14, 22, 56, 76	0
1	D	250/261 (95%)	-0.15	10 (4%)	42	39	15, 24, 45, 79	0
All	All	1006/1044 (96%)	-0.14	29 (2%)	53	50	11, 25, 54, 79	1 (0%)

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	139	ASP	6.4
1	A	2	ALA	4.1
1	A	253	LEU	4.0
1	D	144	THR	3.9
1	D	143	ASP	3.8
1	A	237	ILE	3.8
1	B	1	MET	3.8
1	D	253	LEU	3.3
1	B	242	TYR	3.3
1	C	257	ILE	3.0
1	D	254	MET	3.0
1	D	145	GLY	3.0
1	C	211	PRO	2.8
1	A	190	PHE	2.8
1	A	247	ILE	2.6
1	C	237	ILE	2.6
1	B	237	ILE	2.5
1	B	239	GLY	2.5
1	A	242	TYR	2.4
1	D	138	MET	2.4
1	D	238	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	C	239	GLY	2.3
1	C	254	MET	2.3
1	C	243	TYR	2.2
1	D	237	ILE	2.2
1	B	240	LYS	2.1
1	D	239	GLY	2.1
1	A	5	PRO	2.0
1	A	3	ILE	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

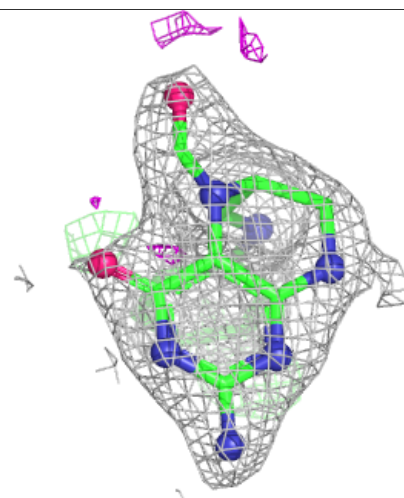
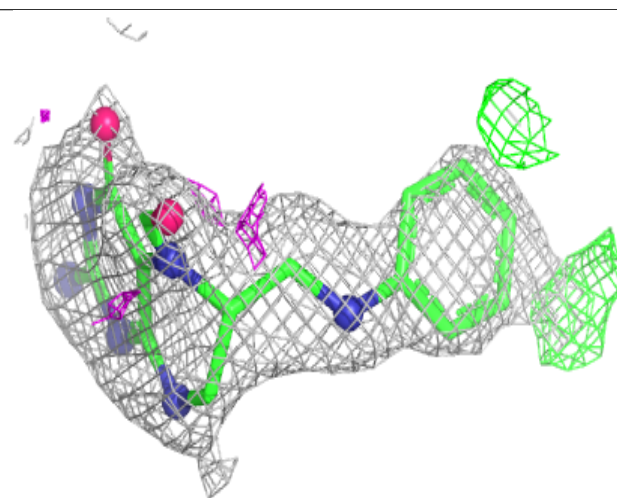
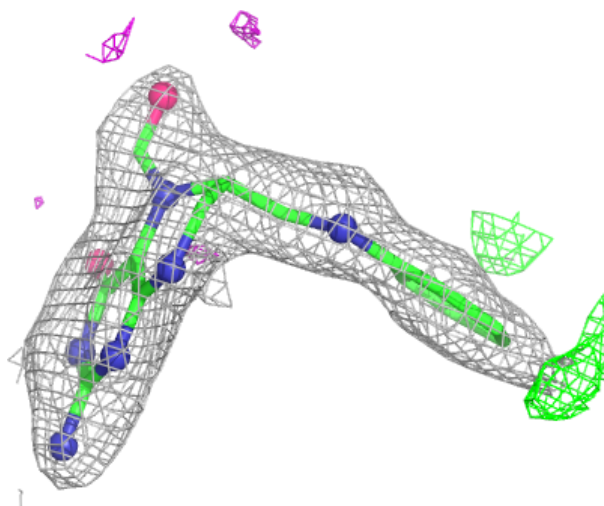
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	FON	B	301	22/34	0.85	0.12	34,38,54,55	0
3	GDP	A	302	24/28	0.85	0.11	39,47,60,65	0
2	FON	D	301	26/34	0.86	0.12	37,43,55,60	0
2	FON	A	301	22/34	0.86	0.12	33,39,54,56	0
3	GDP	B	302	24/28	0.88	0.10	38,49,58,65	0
2	FON	C	301	22/34	0.90	0.11	27,29,56,61	0
3	GDP	C	302	24/28	0.93	0.07	28,33,40,43	0
3	GDP	D	302	28/28	0.93	0.08	27,33,61,65	0
4	CL	C	303	1/1	0.97	0.06	32,32,32,32	0
4	CL	C	304	1/1	0.98	0.12	36,36,36,36	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.

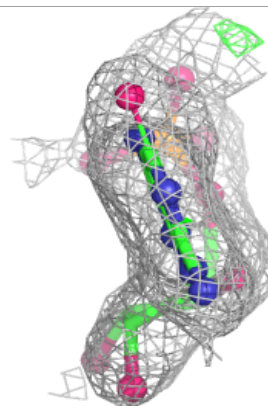
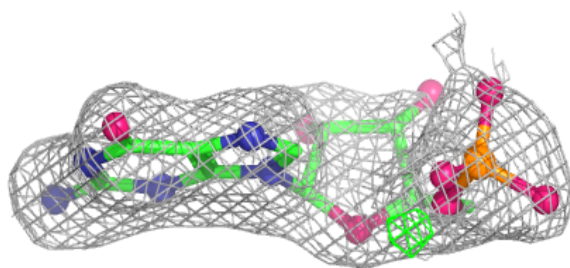
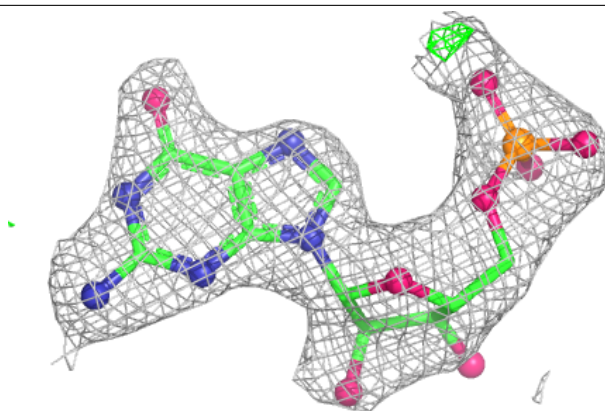
Electron density around FON B 301:

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

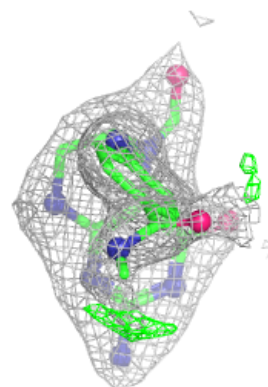
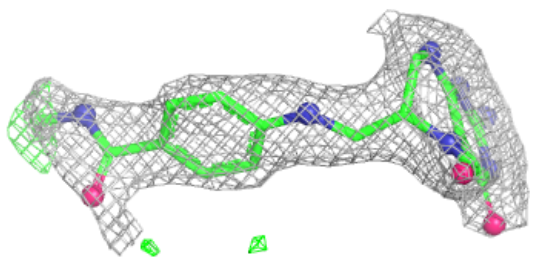
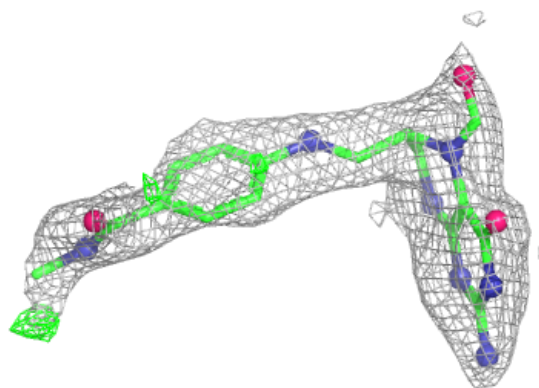


Electron density around GDP A 302:

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

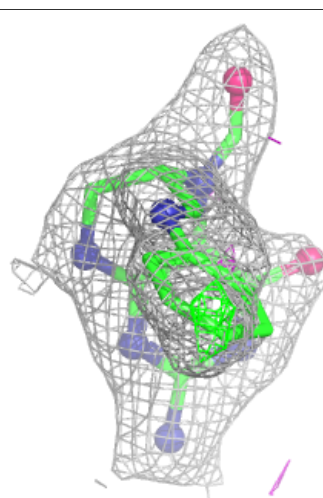
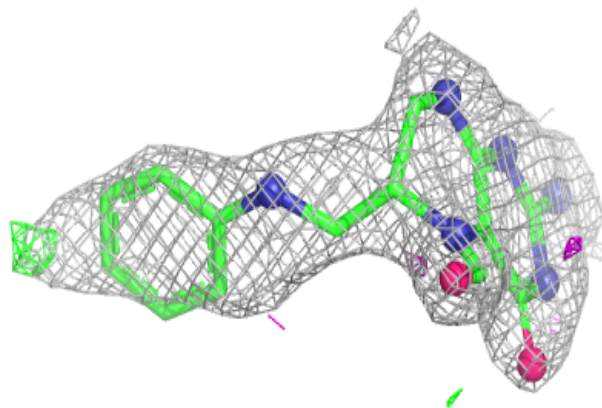
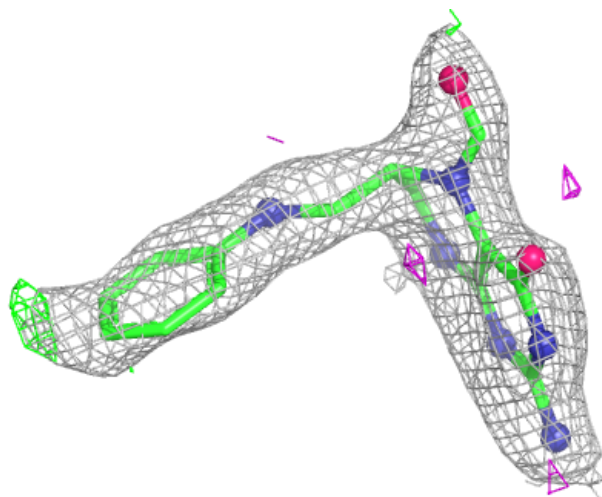
**Electron density around FON D 301:**

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



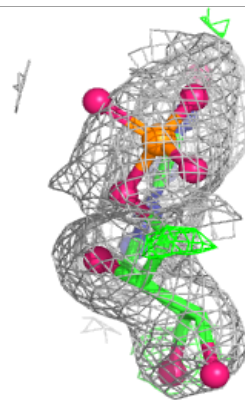
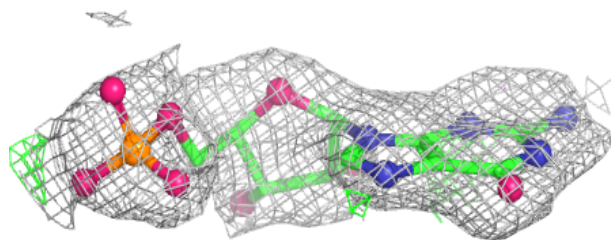
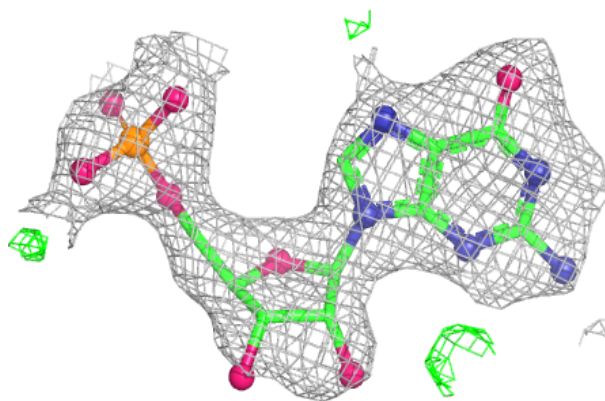
Electron density around FON A 301:

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and green (positive)



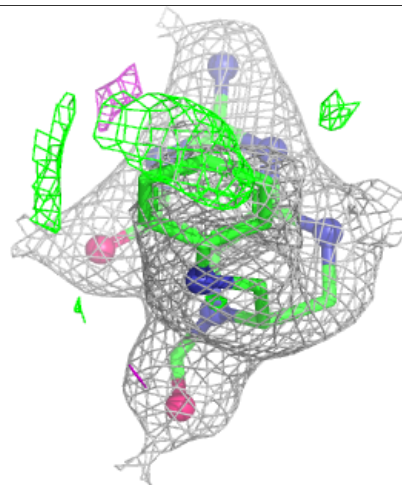
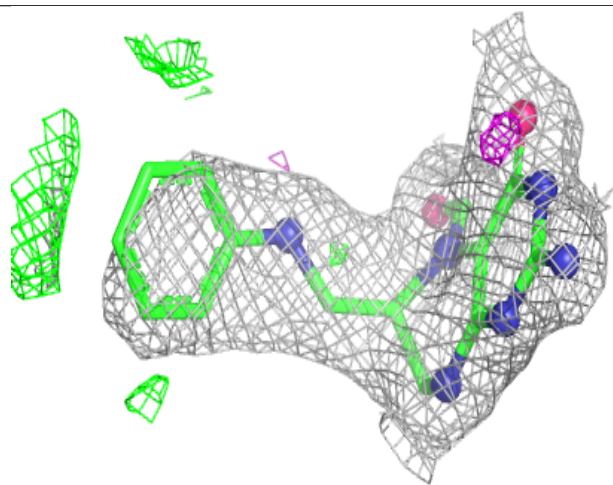
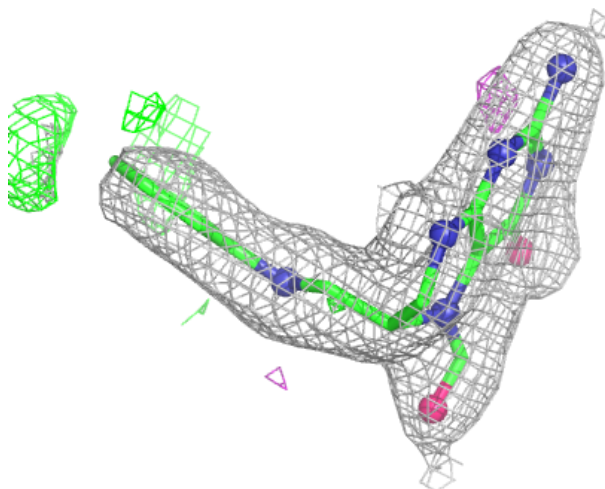
Electron density around GDP B 302:

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



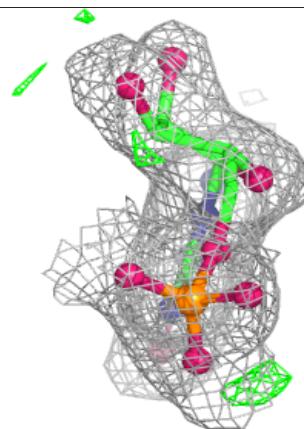
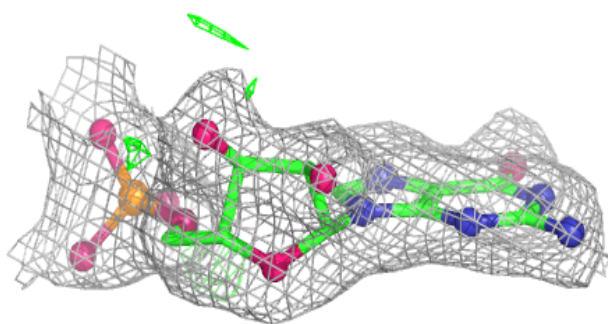
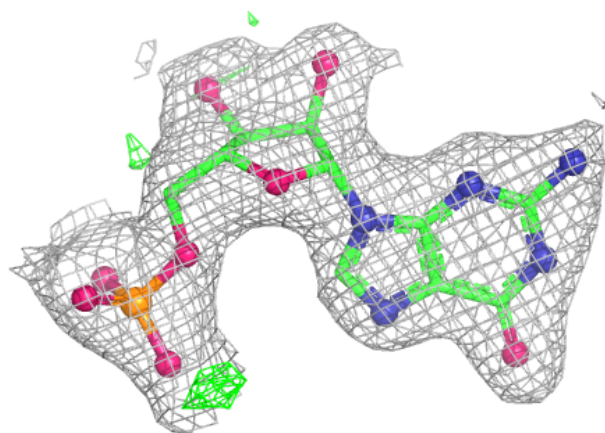
Electron density around FON C 301:

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and green (positive)



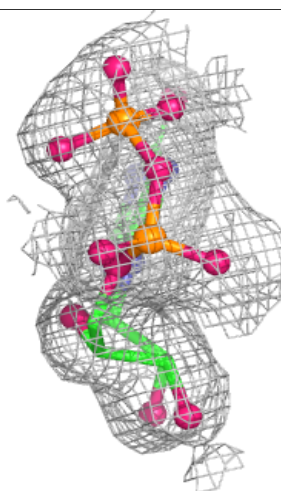
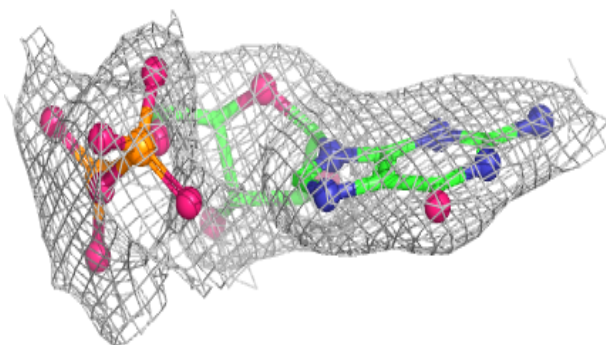
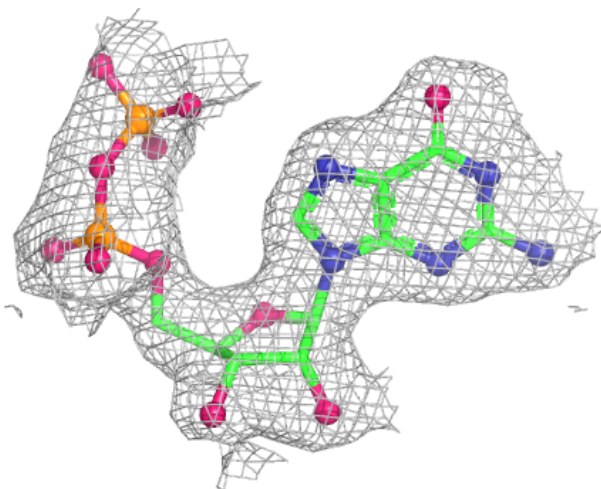
Electron density around GDP C 302:

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



Electron density around GDP D 302:

$2mF_o-DF_c$ (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.