WORLDWIDE PDB

PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Sep 9, 2023 – 02:15 PM EDT

PDB ID	:	4HFR
Title	:	Human 11beta-Hydroxysteroid Dehydrogenase Type 1 in complex with an orally bioavailable acidic inhibitor AZD4017.
Authors	:	Ogg, D.J.; Gerhardt, S.; Hargreaves, D.
Deposited on	:	2012-10-05
Resolution	:	2.73 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 (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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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 2.73 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.
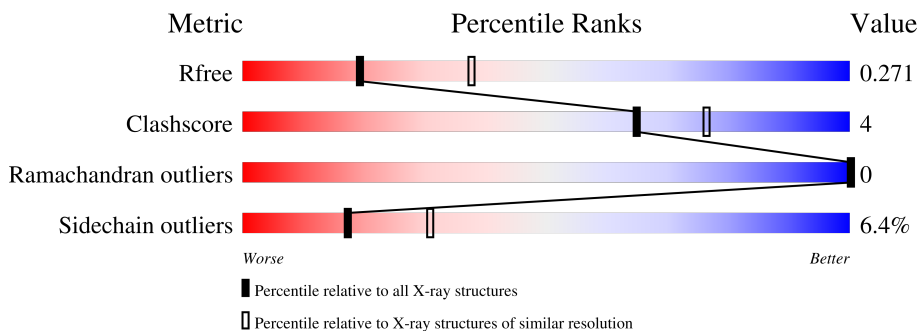
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1271 (2.76-2.72)
Clashscore	141614	1322 (2.76-2.72)
Ramachandran outliers	138981	1297 (2.76-2.72)
Sidechain outliers	138945	1298 (2.76-2.72)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%

Mol	Chain	Length	Quality of chain
1	A	272	80% · · · 12% · 6%
1	B	272	82% · · · 10% · 7%

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 4053 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 Corticosteroid 11-beta-dehydrogenase isozyme 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	255	Total	C	N	O	S	0	0	0
			1956	1246	332	364	14			
1	B	253	Total	C	N	O	S	0	0	0
			1939	1234	330	361	14			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	21	GLY	-	expression tag	UNP P28845
A	22	GLY	-	expression tag	UNP P28845
A	23	GLY	-	expression tag	UNP P28845
A	179	LEU	MET	engineered mutation	UNP P28845
A	262	ARG	LEU	engineered mutation	UNP P28845
A	272	SER	CYS	engineered mutation	UNP P28845
A	278	GLU	PHE	engineered mutation	UNP P28845
A	286	TRP	MET	engineered mutation	UNP P28845
B	21	GLY	-	expression tag	UNP P28845
B	22	GLY	-	expression tag	UNP P28845
B	23	GLY	-	expression tag	UNP P28845
B	179	LEU	MET	engineered mutation	UNP P28845
B	262	ARG	LEU	engineered mutation	UNP P28845
B	272	SER	CYS	engineered mutation	UNP P28845
B	278	GLU	PHE	engineered mutation	UNP P28845
B	286	TRP	MET	engineered mutation	UNP P28845

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is {(3S)-1-[5-(cyclohexylcarbamoyl)-6-(propylsulfanyl)pyridin-2-yl]piperidin-3-yl}acetic acid (three-letter code: 14M) (formula: $C_{22}H_{33}N_3O_3S$).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			29	22	3	3	1		

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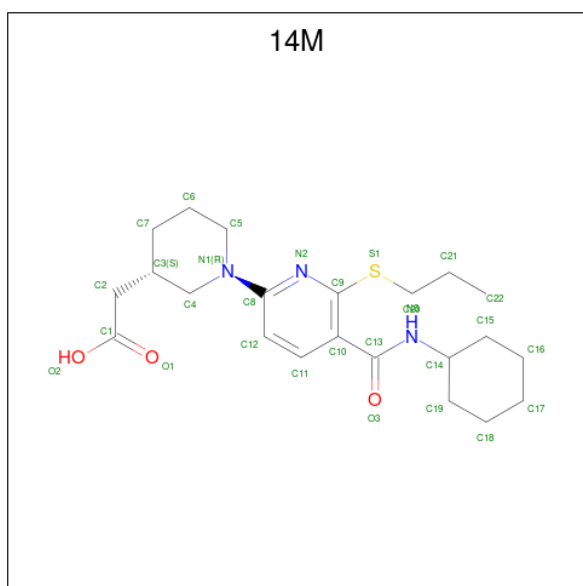
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	B	1	Total 29	C 22	N 3	O 3	S 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total 2	O 2	0	0
4	B	2	Total 2	O 2	0	0

3 Residue-property plots ⓘ

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. 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. 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: Corticosteroid 11-beta-dehydrogenase isozyme 1

Chain A:
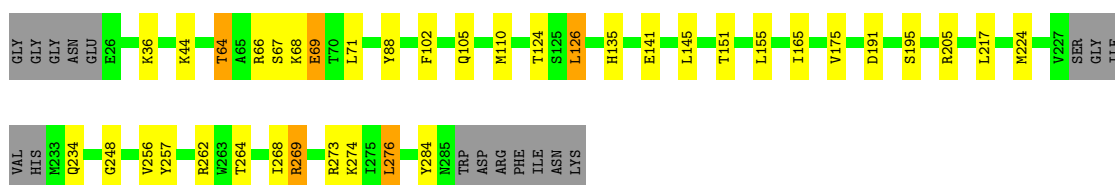
• Molecule 1: Corticosteroid 11-beta-dehydrogenase isozyme 1

Chain B:

4 Data and refinement statistics ⓘ

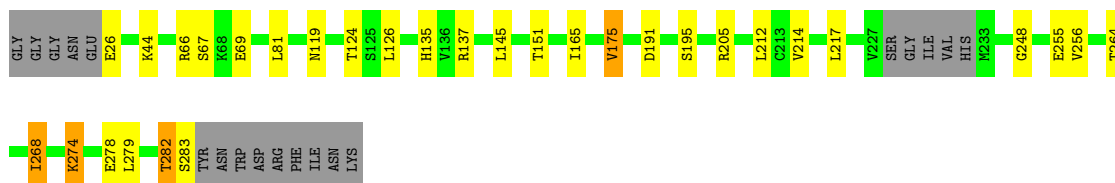| Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	108.19Å 108.19Å 135.29Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	21.32 – 2.73 21.23 – 2.73	Depositor EDS
% Data completeness (in resolution range)	96.8 (21.32-2.73) 96.9 (21.23-2.73)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.04 (at 2.75Å)	Xtriage
Refinement program	BUSTER 2.11.2	Depositor
R, R_{free}	0.199 , 0.227 0.251 , 0.271	Depositor DCC
R_{free} test set	1226 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å^2)	83.2	Xtriage
Anisotropy	0.354	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 82.8	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.023 for -h,-k,l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	4053	wwPDB-VP
Average B, all atoms (Å^2)	100.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.84% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NAP, 14M

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	0.52	0/1987	0.74	0/2681
1	B	0.51	0/1969	0.71	0/2656
All	All	0.52	0/3956	0.72	0/5337

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 ⓘ

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	1956	0	2001	18	0
1	B	1939	0	1990	17	0
2	A	48	0	25	1	0
2	B	48	0	25	3	0
3	A	29	0	32	2	0
3	B	29	0	32	1	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
All	All	4053	0	4105	33	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 4.

All (33) 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:282:THR:HA	1:B:283:SER:C	2.04	0.76
1:B:66:ARG:HB2	2:B:301:NAP:O3X	2.06	0.56
1:B:274:LYS:O	1:B:278:GLU:HG3	2.06	0.56
3:A:302:14M:S1	3:A:302:14M:N3	2.82	0.52
1:B:214:VAL:HG11	1:B:268:ILE:HD13	1.92	0.52
1:A:68:LYS:HG3	1:A:88:TYR:HE2	1.75	0.52
1:A:257:TYR:HE2	1:A:269:ARG:HG3	1.75	0.51
1:A:273:ARG:HG3	1:B:175:VAL:HG22	1.93	0.51
1:A:64:THR:HG21	1:A:102:PHE:CZ	2.45	0.51
1:A:191:ASP:O	1:A:195:SER:HB2	2.12	0.50
1:A:64:THR:CG2	1:A:102:PHE:CZ	2.95	0.49
1:A:257:TYR:CE2	1:A:269:ARG:HG3	2.48	0.48
1:A:126:LEU:HD11	3:A:302:14M:H17	1.96	0.48
1:B:126:LEU:HD21	3:B:302:14M:H17	1.95	0.48
1:A:141:GLU:CD	1:B:137:ARG:HH22	2.16	0.48
1:B:248:GLY:HA3	1:B:256:VAL:HG21	1.98	0.46
1:B:119:ASN:ND2	2:B:301:NAP:H4D	2.31	0.45
1:A:248:GLY:HA3	1:A:256:VAL:HG21	1.98	0.45
1:A:151:THR:HG23	1:A:165:ILE:HD13	1.99	0.45
1:A:124:THR:HG22	1:A:135:HIS:CE1	2.52	0.44
1:B:279:LEU:HD23	1:B:279:LEU:HA	1.86	0.44
1:A:276:LEU:HD11	1:B:264:THR:HG23	2.00	0.44
1:A:69:GLU:H	1:A:69:GLU:HG2	1.57	0.43
1:B:151:THR:HG23	1:B:165:ILE:HD13	2.00	0.43
1:B:67:SER:OG	2:B:301:NAP:O2X	2.30	0.43
1:B:191:ASP:O	1:B:195:SER:HB2	2.19	0.43
1:B:124:THR:HG22	1:B:135:HIS:CE1	2.54	0.42
1:A:67:SER:O	1:A:71:LEU:HG	2.20	0.42
1:A:66:ARG:HB2	2:A:301:NAP:O1X	2.20	0.42
1:B:212:LEU:O	1:B:255:GLU:HA	2.21	0.41
1:B:217:LEU:HD12	1:B:217:LEU:HA	1.85	0.41
1:A:36:LYS:HG2	1:A:110:MET:HB3	2.04	0.40
1:A:264:THR:O	1:A:268:ILE:HG13	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	251/272 (92%)	243 (97%)	8 (3%)	0	100	100
1	B	249/272 (92%)	240 (96%)	9 (4%)	0	100	100
All	All	500/544 (92%)	483 (97%)	17 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	212/226 (94%)	195 (92%)	17 (8%)	12	22
1	B	211/226 (93%)	201 (95%)	10 (5%)	26	45
All	All	423/452 (94%)	396 (94%)	27 (6%)	17	31

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	LYS
1	A	64	THR
1	A	69	GLU
1	A	105	GLN
1	A	126	LEU
1	A	145	LEU
1	A	155	LEU
1	A	175	VAL

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Mol	Chain	Res	Type
1	A	205	ARG
1	A	217	LEU
1	A	224	MET
1	A	234	GLN
1	A	262	ARG
1	A	269	ARG
1	A	274	LYS
1	A	276	LEU
1	A	284	TYR
1	B	26	GLU
1	B	44	LYS
1	B	69	GLU
1	B	81	LEU
1	B	145	LEU
1	B	175	VAL
1	B	205	ARG
1	B	268	ILE
1	B	274	LYS
1	B	282	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	135	HIS
1	B	77	HIS
1	B	119	ASN
1	B	135	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

4 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	#$|Z| > 2$
2	NAP	A	301	-	45,52,52	1.12	1 (2%)	56,80,80	0.99	5 (8%)
2	NAP	B	301	-	45,52,52	1.15	1 (2%)	56,80,80	0.92	3 (5%)
3	14M	A	302	-	31,31,31	0.88	1 (3%)	37,41,41	1.89	10 (27%)
3	14M	B	302	-	31,31,31	0.83	0	37,41,41	1.68	8 (21%)

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	NAP	A	301	-	-	9/31/67/67	0/5/5/5
2	NAP	B	301	-	-	6/31/67/67	0/5/5/5
3	14M	A	302	-	-	4/20/38/38	0/3/3/3
3	14M	B	302	-	-	4/20/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	NAP	C2N-N1N	6.74	1.43	1.35
2	B	301	NAP	C2N-N1N	6.61	1.43	1.35
3	A	302	14M	C8-N1	2.04	1.41	1.37

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	302	14M	C3-C4-N1	-5.81	104.07	112.35
3	A	302	14M	C3-C4-N1	-5.42	104.62	112.35
3	A	302	14M	C7-C3-C4	4.40	113.65	108.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	301	NAP	O2B-P2B-O1X	3.41	122.56	109.39
3	A	302	14M	C11-C10-C9	3.34	120.72	117.29
3	A	302	14M	S1-C9-N2	-3.31	115.19	119.19
2	B	301	NAP	O2X-P2B-O2B	-3.01	92.52	105.99
3	A	302	14M	C5-N1-C4	2.99	121.27	112.55
3	A	302	14M	C10-C13-N3	-2.94	111.36	116.80
3	B	302	14M	C11-C10-C9	2.88	120.24	117.29
2	A	301	NAP	O3X-P2B-O2B	-2.75	93.68	105.99
3	A	302	14M	C10-C9-S1	2.72	123.94	121.11
3	B	302	14M	C7-C3-C4	2.57	111.59	108.68
2	B	301	NAP	O2B-P2B-O1X	2.55	119.22	109.39
3	A	302	14M	O3-C13-N3	2.54	127.12	122.45
3	B	302	14M	C5-N1-C4	2.52	119.89	112.55
3	B	302	14M	O3-C13-N3	2.45	126.96	122.45
2	B	301	NAP	C5A-C6A-N6A	2.40	124.00	120.35
3	B	302	14M	C6-C5-N1	-2.39	106.37	111.05
3	B	302	14M	S1-C9-N2	-2.34	116.37	119.19
2	A	301	NAP	O4D-C1D-C2D	-2.26	103.62	106.93
3	A	302	14M	C19-C14-C15	2.26	114.74	110.82
2	A	301	NAP	C6N-N1N-C2N	-2.23	119.94	121.97
3	B	302	14M	C7-C3-C2	-2.12	109.05	111.52
2	A	301	NAP	C5A-C6A-N6A	2.12	123.58	120.35
3	A	302	14M	C12-C11-C10	-2.07	117.58	120.94

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	NAP	C5D-O5D-PN-O1N
2	A	301	NAP	C5D-O5D-PN-O2N
2	B	301	NAP	C5D-O5D-PN-O2N
2	A	301	NAP	C1B-C2B-O2B-P2B
2	A	301	NAP	C3B-C2B-O2B-P2B
3	A	302	14M	O2-C1-C2-C3
2	A	301	NAP	C2B-O2B-P2B-O2X
2	B	301	NAP	C5D-O5D-PN-O3
3	A	302	14M	C9-C10-C13-O3
3	B	302	14M	O2-C1-C2-C3
3	B	302	14M	C9-C10-C13-O3
3	A	302	14M	C9-C10-C13-N3
3	B	302	14M	C9-C10-C13-N3
3	A	302	14M	O1-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
3	B	302	14M	O1-C1-C2-C3
2	B	301	NAP	O4B-C4B-C5B-O5B
2	A	301	NAP	C5D-O5D-PN-O3
2	B	301	NAP	C2B-O2B-P2B-O3X
2	A	301	NAP	O4B-C4B-C5B-O5B
2	A	301	NAP	PA-O3-PN-O1N
2	A	301	NAP	PA-O3-PN-O2N
2	B	301	NAP	PN-O3-PA-O1A
2	B	301	NAP	C5D-O5D-PN-O1N

There are no ring outliers.
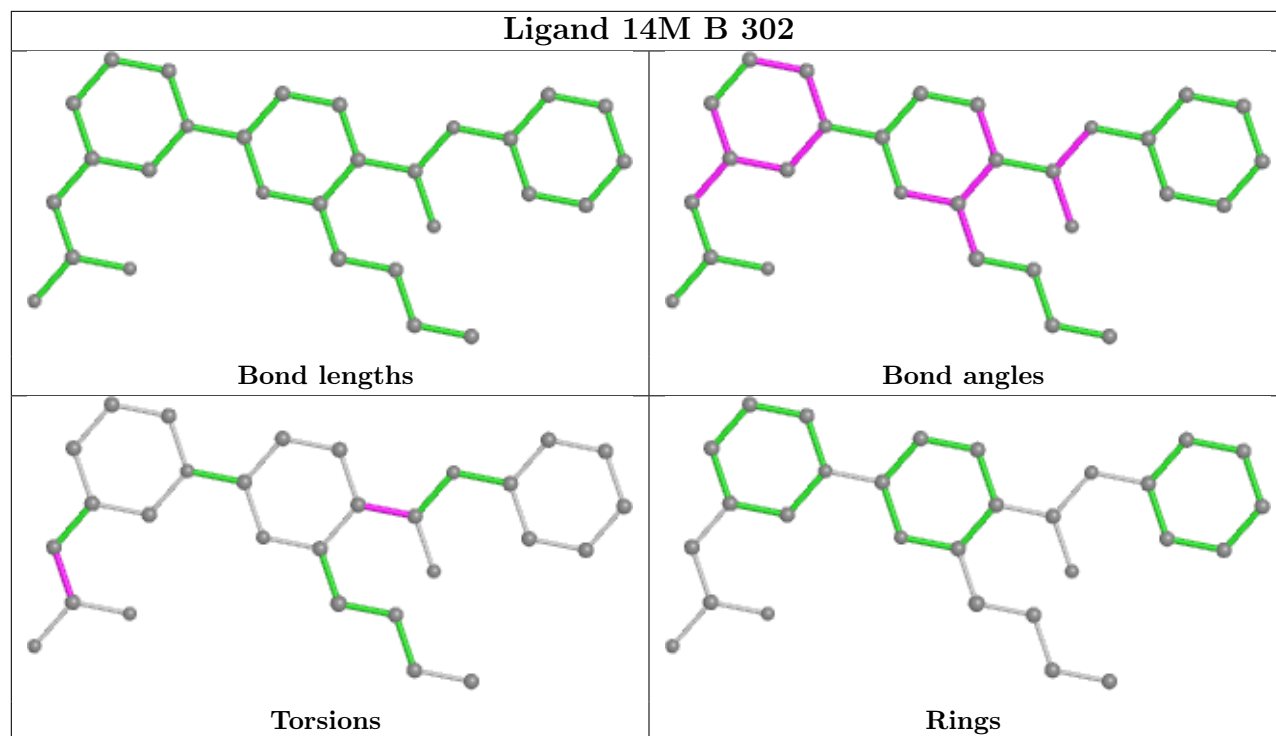
4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	NAP	1	0
2	B	301	NAP	3	0
3	A	302	14M	2	0
3	B	302	14M	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 then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand NAP A 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NAP B 301

Bond lengths

Bond angles

Torsions

Rings

Ligand 14M A 302

Bond lengths

Bond angles

Torsions

Rings

Ligand 14M B 302

Bond lengths

Bond angles

Torsions

Rings
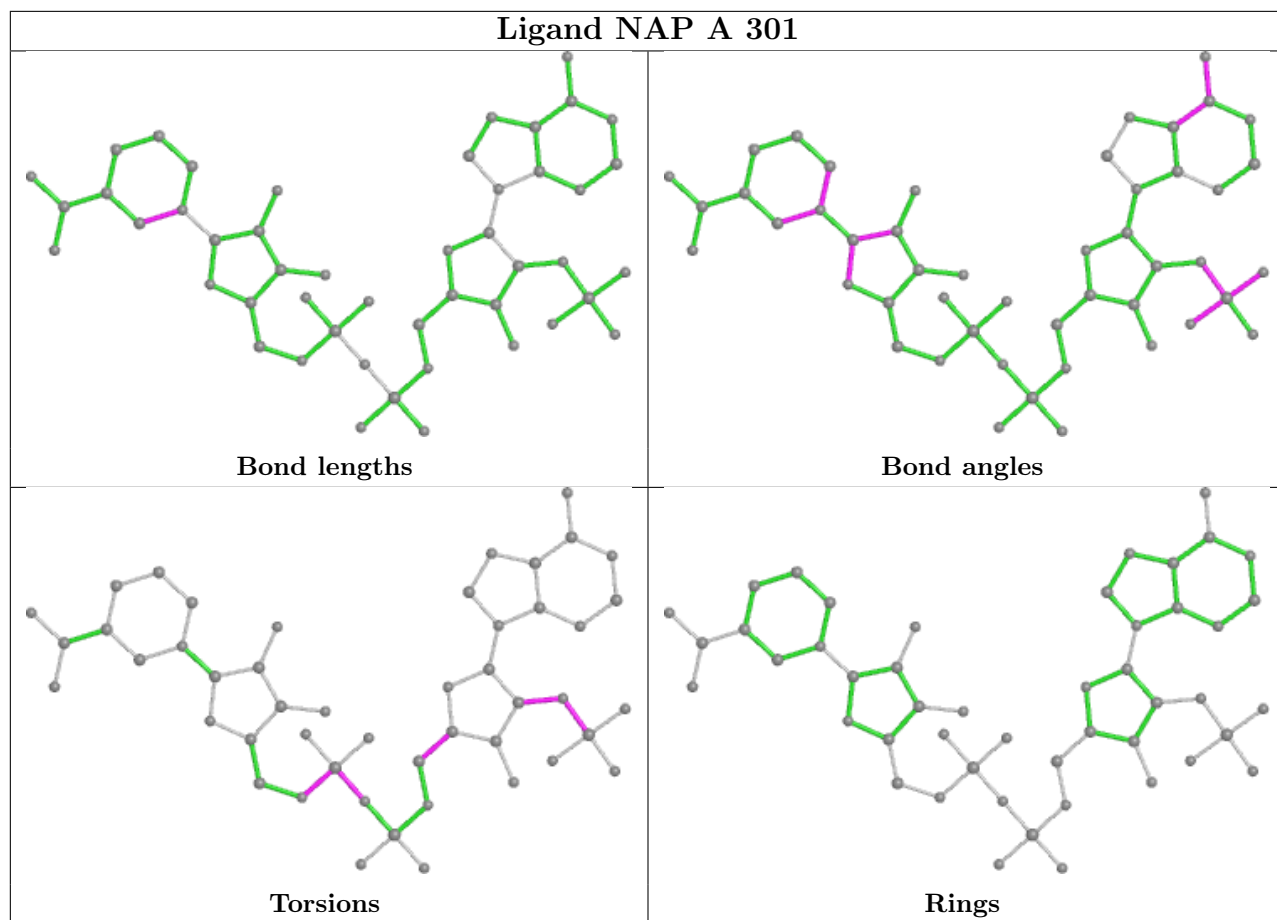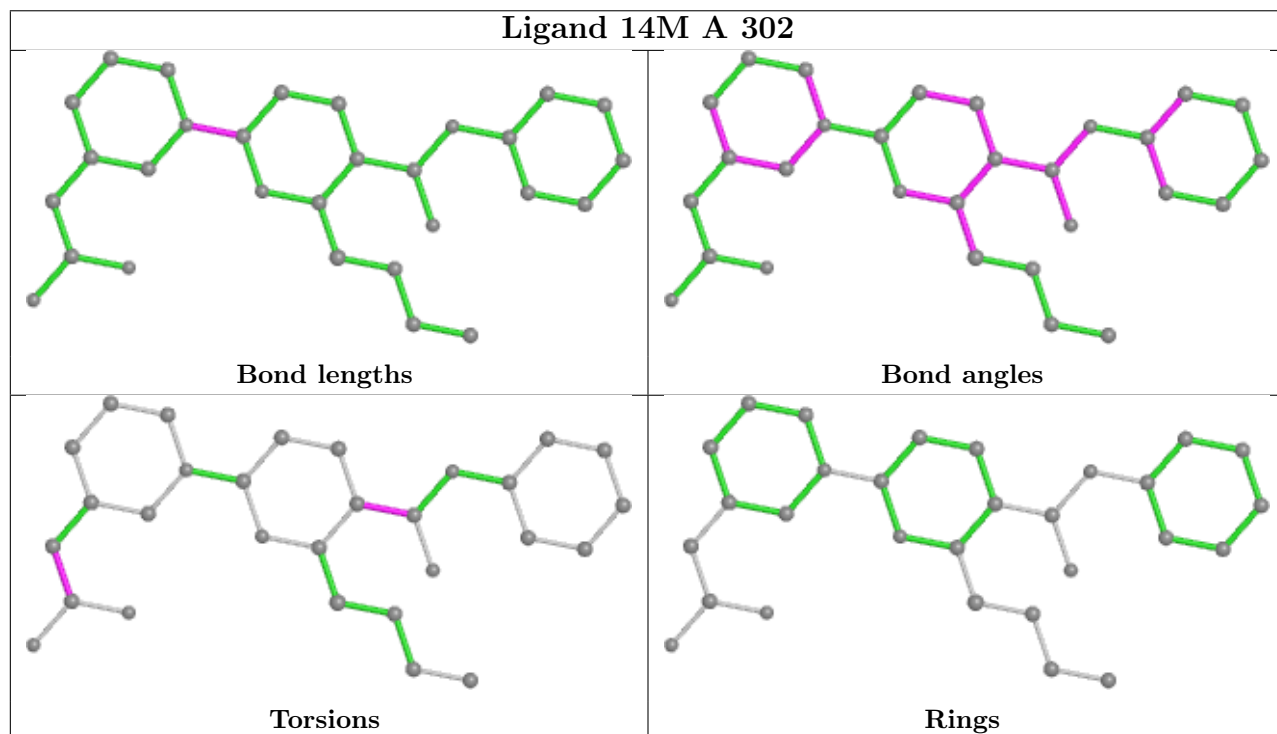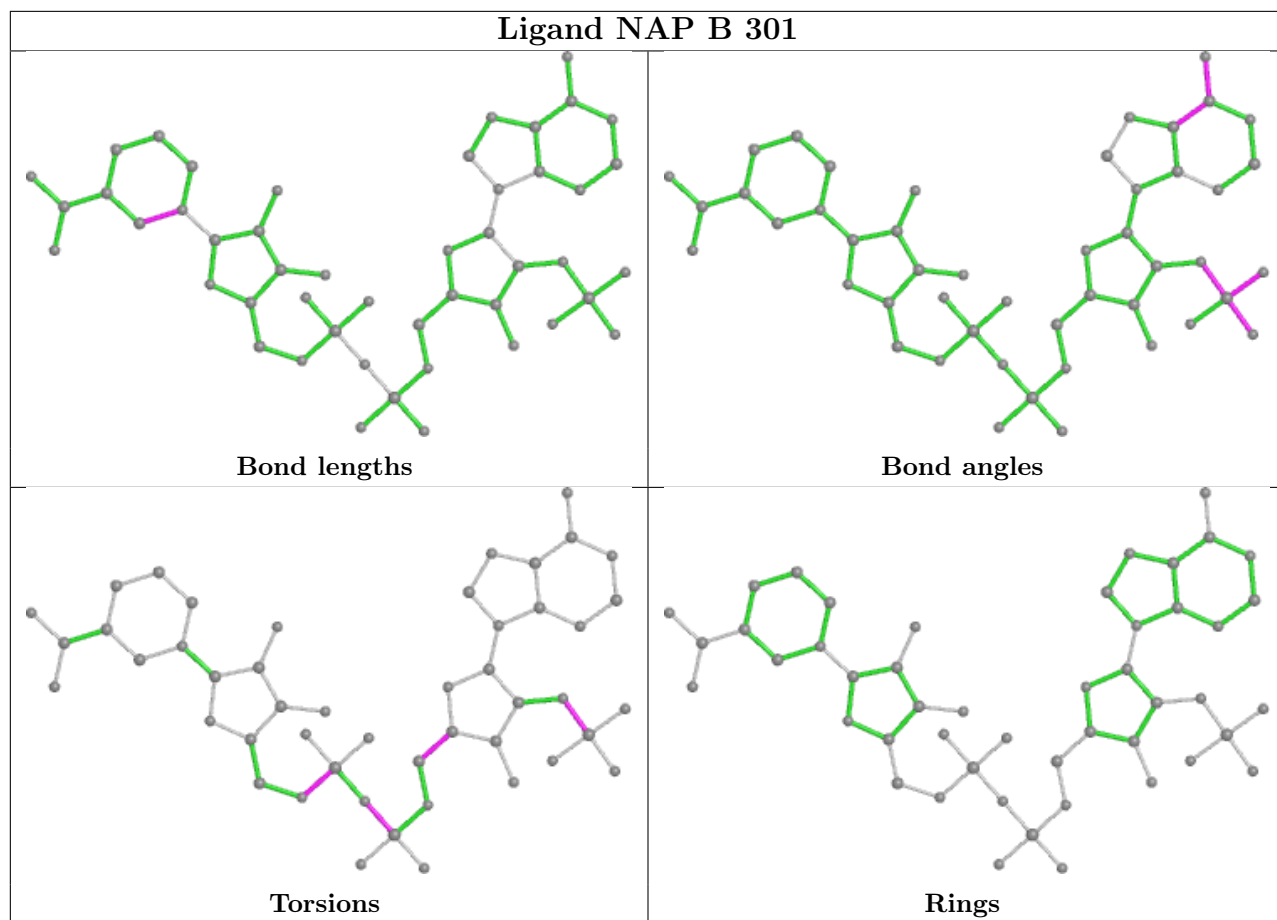
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

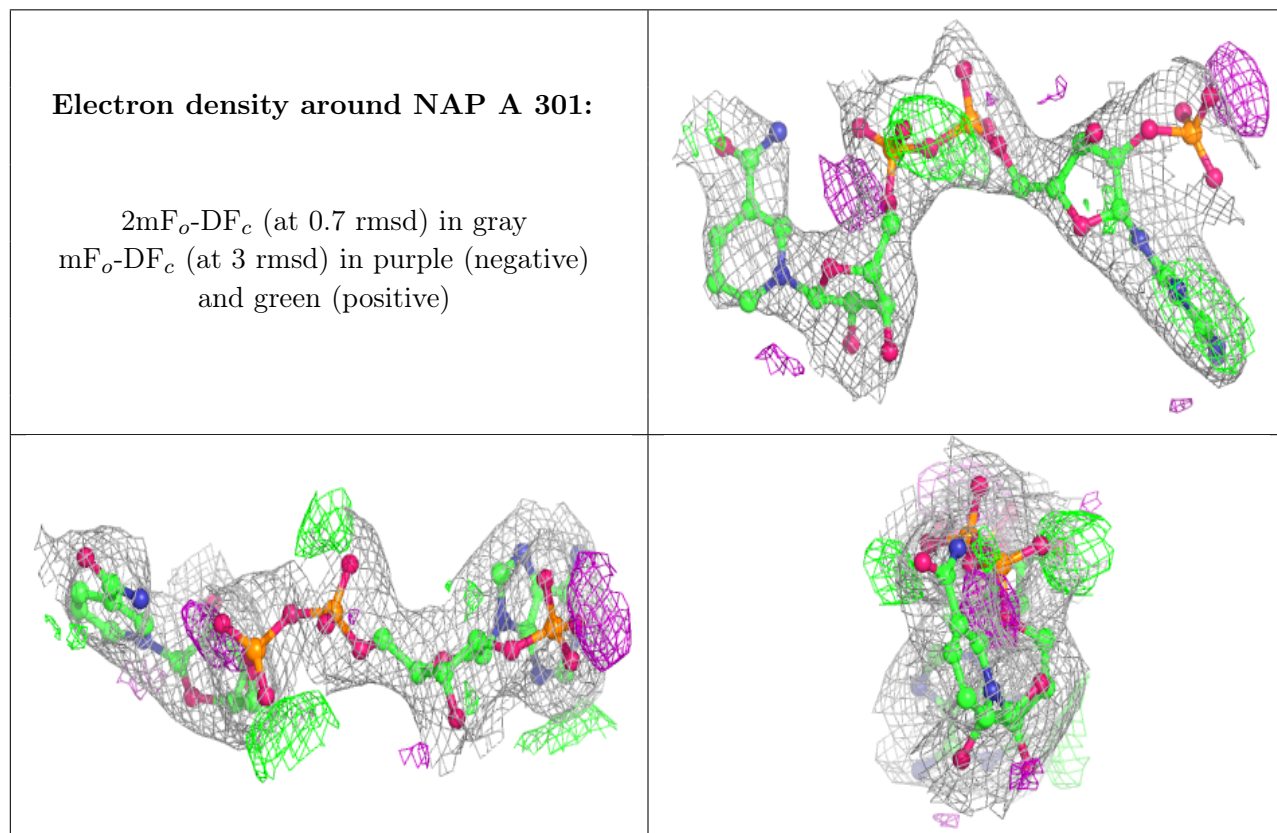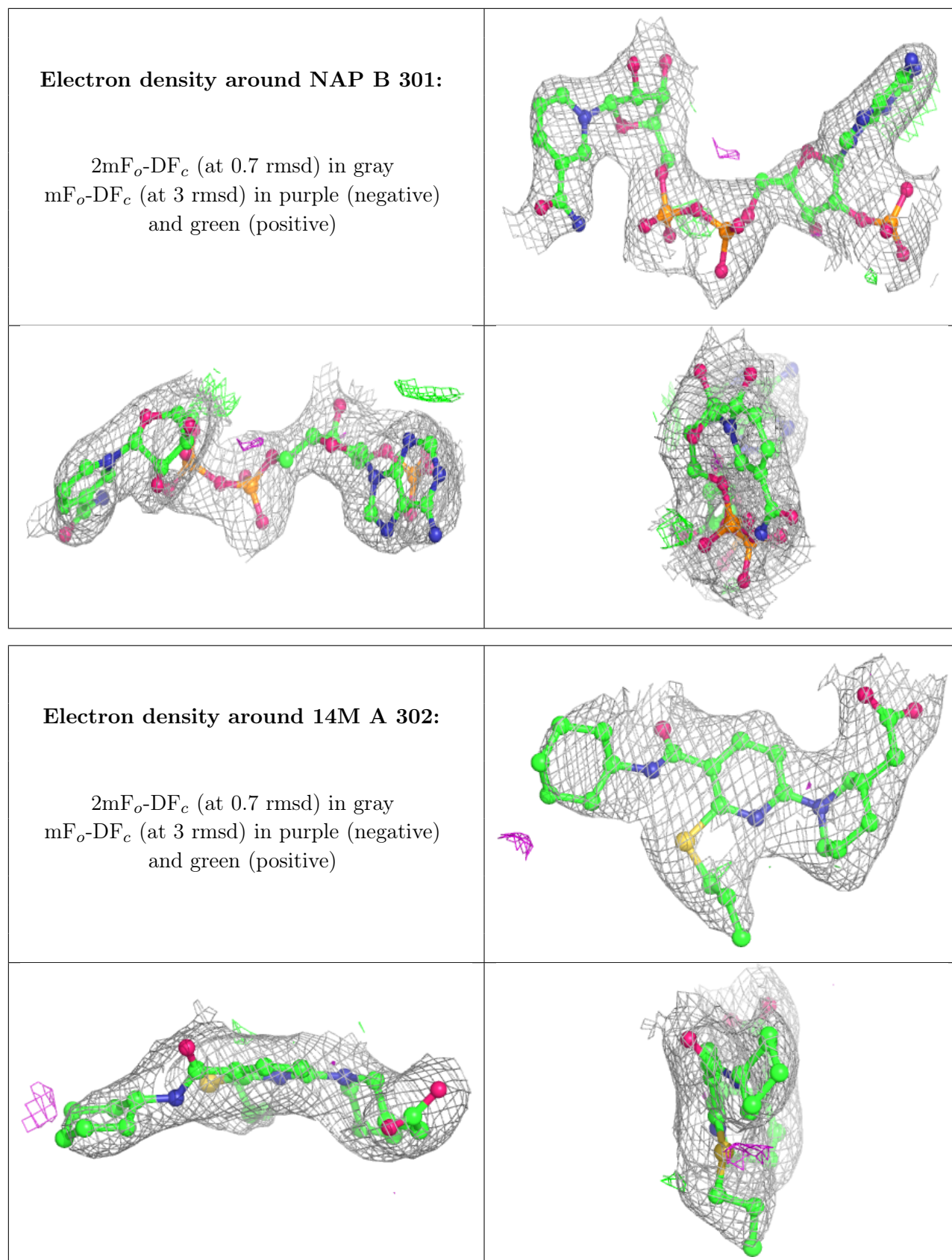## 6.3 Carbohydrates ⓘ

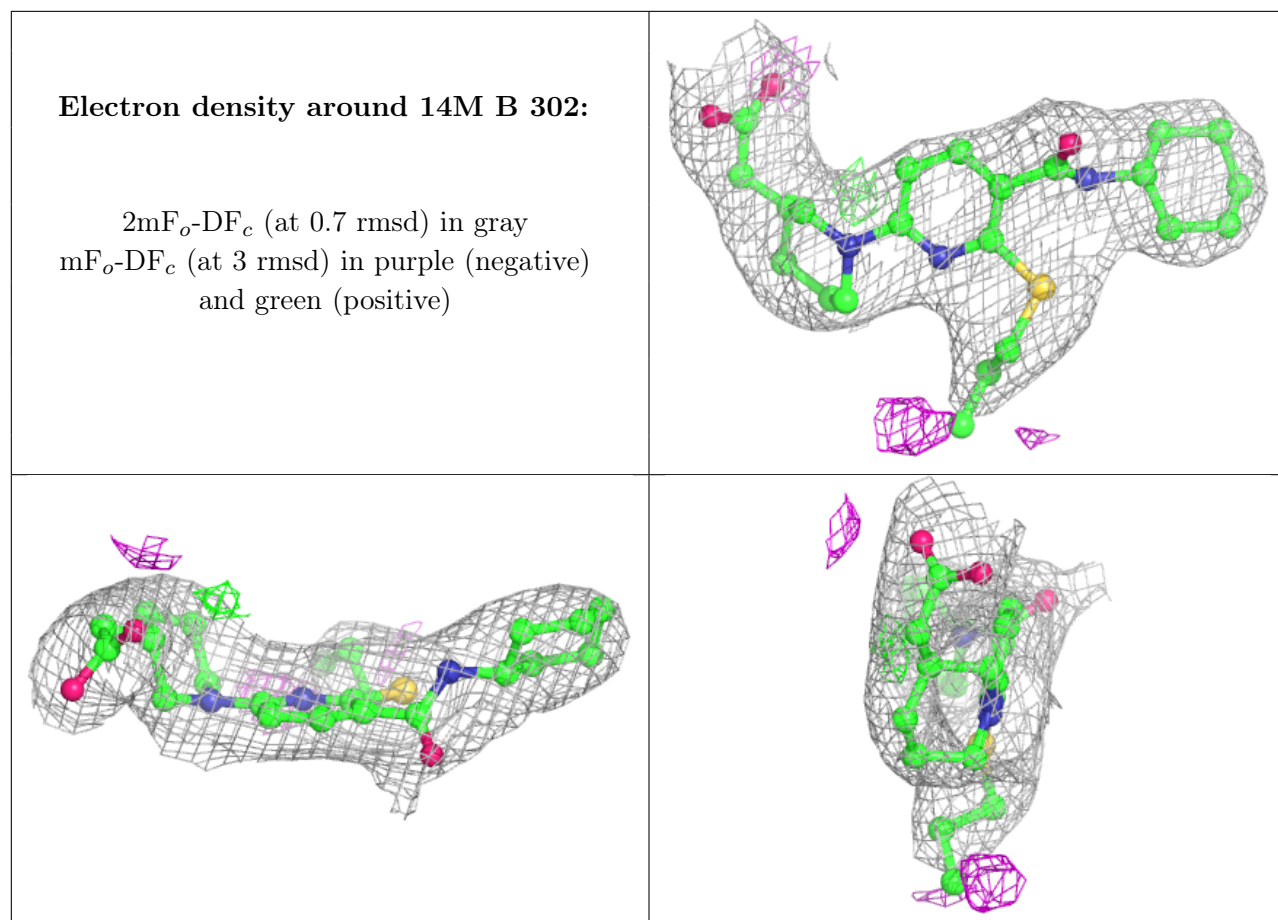Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

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 NAP A 301:

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

Electron density around NAP B 301:

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

Electron density around 14M 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 14M 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)

6.5 Other polymers ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.