WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

May 24, 2020 – 04:07 am BST

PDB ID	:	6H8T
Title	:	Crystal structure of Papain modify by achiral Ru(II)complex
Authors	:	Cherrier, M.V.; Amara, P.; Talbi, B.; Salmin, M.; Fontecilla-Camps, J.C.
Deposited on	:	2018-08-03
Resolution	:	2.10 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 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:
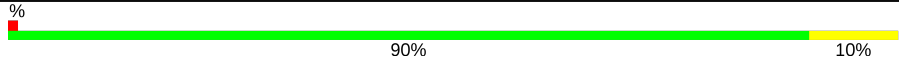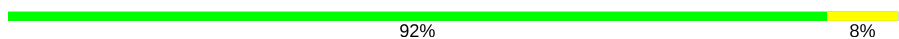*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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.
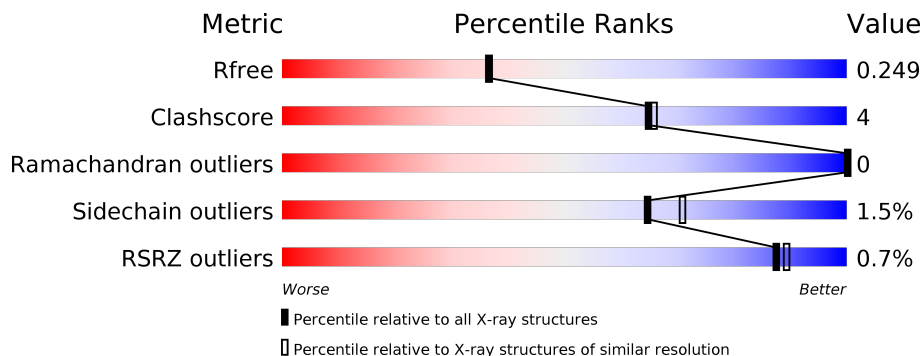
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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 <=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	214	90% 10%
1	J	214	92% 8%

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	ACT	J	309	-	-	X	-

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 3796 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 Papain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	212	Total 1702	C 1083	N 296	O 316	S 7	0	6	0
1	J	212	Total 1671	C 1062	N 291	O 309	S 9	0	4	0

- Molecule 2 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).
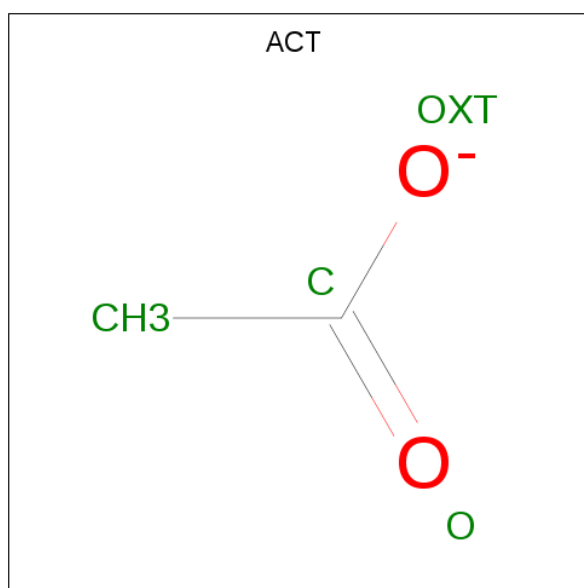
ACT

OXT

O^-

C

CH3—

O

O

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 4	C 2	O 2	0	0
2	A	1	Total 4	C 2	O 2	0	0
2	A	1	Total 4	C 2	O 2	0	0
2	J	1	Total 4	C 2	O 2	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	J	1	Total 4	C 2	O 2	0	0
2	J	1	Total 4	C 2	O 2	0	0
2	J	1	Total 4	C 2	O 2	0	0
2	J	1	Total 4	C 2	O 2	0	0
2	J	1	Total 4	C 2	O 2	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Cl 1	0	0

- Molecule 4 is chloro[N,N-di(pyridin-2-yl-kappaN)pentane-1,5-diamine]ruthenium (three-letter code: YXZ) (formula: $C_{15}H_{20}ClN_4Ru$).
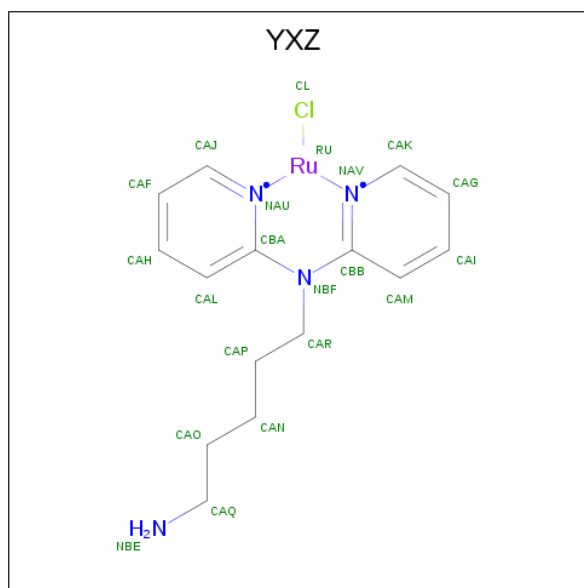
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total 21	C 15	Cl 1	N 4	Ru 1	0	0

- Molecule 5 is chloro(1-{5-[di(pyridin-2-yl-kappaN)amino]pentyl}pyrrolidine-2,5-dione)ruthenium (three-letter code: YXX) (formula: $C_{19}H_{22}ClN_4O_2Ru$).
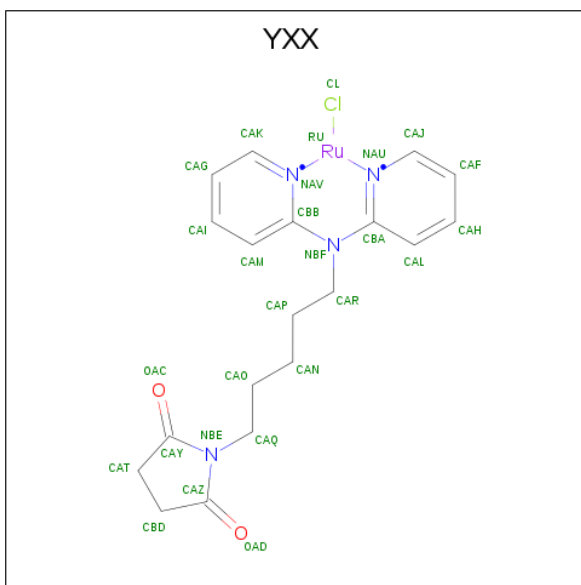
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	Cl	N	O	Ru		
5	J	1	27	19	1	4	2	1	0	0

• Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O_4S).
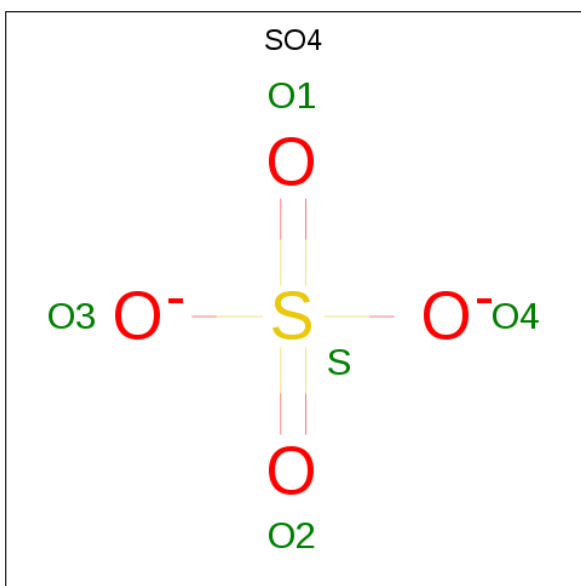
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
6	J	1	5	4	1	0	0

• Molecule 7 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	J	1	Total 1	Na 1	0	0

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	164	Total 167	O 167	0	4
8	J	163	Total 165	O 165	0	3

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: Papain

Chain A:

- Molecule 1: Papain

Chain J:
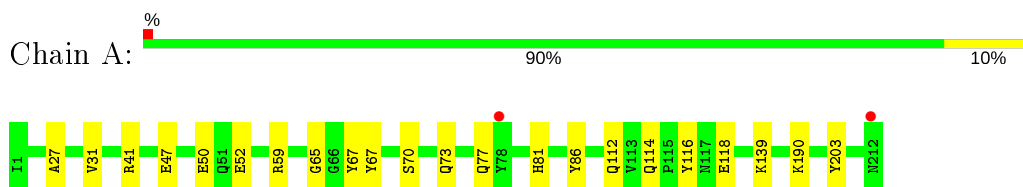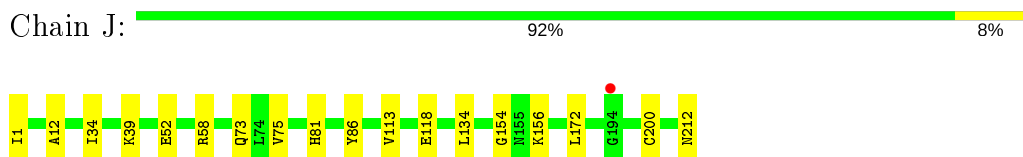
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	61.03Å　　74.85Å　　86.25Å 90.00°　　90.00°　　90.00°	Depositor
Resolution (Å)	37.42　–　2.10 37.42　–　2.10	Depositor EDS
% Data completeness (in resolution range)	99.8 (37.42-2.10) 99.9 (37.42-2.10)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	5.12 (at 2.10Å)	Xtriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, R_{free}	0.192　,　0.249 0.192　,　0.249	Depositor DCC
R_{free} test set	1184 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å²)	16.9	Xtriage
Anisotropy	0.869	Xtriage
Bulk solvent k_{sol}(e/Å³), B_{sol}(Å²)	0.35 , 69.2	EDS
L-test for twinning [2]	$<|L|> = 0.50$, $<L^2> = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	3796	wwPDB-VP
Average B, all atoms (Å²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 40.62 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.6621e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

---

[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: YXZ, YXX, CL, NA, SO4, TXY, ACT, OMX

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	0.50	1/1730 (0.1%)	0.61	0/2344
1	J	0.48	1/1727 (0.1%)	0.62	0/2344
All	All	0.49	2/3457 (0.1%)	0.61	0/4688

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	J	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	47	GLU	CD-OE1	-5.42	1.19	1.25
1	J	118	GLU	CD-OE2	-5.06	1.20	1.25

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	J	58	ARG	Sidechain

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	1702	0	1641	15	0
1	J	1671	0	1616	10	0
2	A	12	0	9	0	0
2	J	24	0	18	2	0
3	A	1	0	0	1	0
4	A	21	0	20	1	0
5	J	27	0	21	2	0
6	J	5	0	0	0	0
7	J	1	0	0	0	0
8	A	167	0	0	3	0
8	J	165	0	0	5	0
All	All	3796	0	3325	26	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 (26) 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:A:114[B]:GLN:OE1	8:A:401[B]:HOH:O	2.10	0.69
1:J:1:ILE:N	8:J:401:HOH:O	2.22	0.67
1:J:73:GLN:NE2	8:J:402:HOH:O	2.24	0.66
1:A:112:GLN:NE2	8:A:402:HOH:O	2.21	0.61
1:A:116:TYR:HB2	5:J:301:YXX:H6	1.83	0.59
1:A:31[B]:VAL:HG21	1:A:50:GLU:HG3	1.85	0.58
1:A:73:GLN:O	1:A:77:GLN:HG3	2.07	0.54
1:A:190:LYS:NZ	3:A:302:CL:CL	2.64	0.54
1:J:212:ASN:ND2	8:J:403:HOH:O	2.25	0.53
1:J:154:GLY:O	1:J:200[B]:CYS:HA	2.09	0.52
1:J:52:GLU:OE2	1:J:81:HIS:ND1	2.36	0.50
1:A:59:ARG:NH2	8:J:407:HOH:O	2.39	0.49
1:A:67[A]:TYR:HB2	1:A:70:SER:OG	2.13	0.48
1:A:116:TYR:HB2	5:J:301:YXX:CAI	2.45	0.47
1:J:172:LEU:HD11	2:J:309:ACT:H1	1.97	0.46
1:A:41[A]:ARG:NH2	8:A:407:HOH:O	2.45	0.46
1:A:65:GLY:HA3	4:A:305:YXZ:H14	1.98	0.44
1:A:31[A]:VAL:HG21	1:A:50:GLU:HG3	1.99	0.43
1:J:154:GLY:O	1:J:200[A]:CYS:HA	2.18	0.43
1:J:34[B]:ILE:HD12	1:J:75:VAL:HG11	2.01	0.42

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:J:309:ACT:H2	8:J:484:HOH:O	2.20	0.41
1:A:52:GLU:OE2	1:A:81:HIS:ND1	2.39	0.41
1:A:27:ALA:O	1:A:31[B]:VAL:HG22	2.20	0.41
1:J:134:LEU:HB2	1:J:200[B]:CYS:SG	2.61	0.41
1:A:118:GLU:HB2	1:A:203:TYR:CE1	2.56	0.40
1:J:12:ALA:HA	1:J:39:LYS:HG2	2.02	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	212/214 (99%)	208 (98%)	4 (2%)	0	100	100
1	J	214/214 (100%)	210 (98%)	4 (2%)	0	100	100
All	All	426/428 (100%)	418 (98%)	8 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	174/170 (102%)	172 (99%)	2 (1%)	73	79
1	J	174/170 (102%)	171 (98%)	3 (2%)	60	67

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	348/340 (102%)	343 (99%)	5 (1%)	65 73

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	86	TYR
1	A	139	LYS
1	J	86	TYR
1	J	113	VAL
1	J	156	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3   RNA (i)

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues 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	#$|Z| > 2$
1	OMX	A	61[B]	1	11,13,14	1.10	1 (9%)	15,17,19	1.13	1 (6%)
1	TXY	A	67[B]	1	9,13,14	1.89	3 (33%)	4,17,19	1.56	1 (25%)

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
1	OMX	A	61[B]	1	-	1/9/10/12	0/1/1/1
1	TXY	A	67[B]	1	-	0/5/19/21	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	61[B]	OMX	OC-CB	-3.08	1.36	1.42
1	A	67[B]	TXY	CE1-CZ	3.05	1.38	1.34
1	A	67[B]	TXY	CE1-CD1	2.90	1.49	1.41
1	A	67[B]	TXY	OE2-CE2	-2.15	1.38	1.42

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	67[B]	TXY	CE1-CD1-CG	-2.73	116.89	120.64
1	A	61[B]	OMX	CE1-CD1-CG	-2.53	118.65	121.20

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	61[B]	OMX	N-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no carbohydrates in this entry.

5.6 Ligand geometry (i)

Of 14 ligands modelled in this entry, 2 are monoatomic - leaving 12 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
5	YXX	J	301	1	25,30,30	3.87	11 (44%)	30,42,42	8.55	24 (80%)
2	ACT	J	306	-	1,3,3	5.47	1 (100%)	0,3,3	0.00	-
6	SO4	J	302	-	4,4,4	0.20	0	6,6,6	0.19	0
2	ACT	A	301	-	1,3,3	5.68	1 (100%)	0,3,3	0.00	-
2	ACT	J	307	-	1,3,3	7.42	1 (100%)	0,3,3	0.00	-
2	ACT	J	303	-	1,3,3	6.41	1 (100%)	0,3,3	0.00	-
2	ACT	J	308	-	1,3,3	6.66	1 (100%)	0,3,3	0.00	-
4	YXZ	A	305	-	18,23,23	4.36	9 (50%)	19,31,31	4.35	12 (63%)
2	ACT	J	304	7	1,3,3	8.51	1 (100%)	0,3,3	0.00	-
2	ACT	J	309	-	1,3,3	5.22	1 (100%)	0,3,3	0.00	-
2	ACT	A	303	-	1,3,3	5.12	1 (100%)	0,3,3	0.00	-
2	ACT	A	304	-	1,3,3	6.29	1 (100%)	0,3,3	0.00	-

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	YXZ	A	305	-	-	3/6/44/44	0/2/3/3
5	YXX	J	301	1	-	3/8/59/59	0/3/4/4

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	305	YXZ	CAM-CBB	-12.29	1.41	1.52
5	J	301	YXX	CAM-CBB	-12.26	1.41	1.52
2	J	304	ACT	CH3-C	8.51	1.59	1.48
2	J	307	ACT	CH3-C	7.42	1.58	1.48
4	A	305	YXZ	CAJ-NAU	-6.87	1.37	1.49
4	A	305	YXZ	CAL-CBA	-6.68	1.46	1.52
2	J	308	ACT	CH3-C	6.66	1.57	1.48
5	J	301	YXX	CAJ-NAU	-6.57	1.37	1.49
5	J	301	YXX	CAK-NAV	-6.44	1.37	1.49
5	J	301	YXX	CAL-CBA	-6.43	1.46	1.52
2	J	303	ACT	CH3-C	6.41	1.56	1.48
2	A	304	ACT	CH3-C	6.29	1.56	1.48
4	A	305	YXZ	CAK-NAV	-6.10	1.38	1.49
2	A	301	ACT	CH3-C	5.68	1.56	1.48

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	J	306	ACT	CH3-C	5.47	1.55	1.48
2	J	309	ACT	CH3-C	5.22	1.55	1.48
2	A	303	ACT	CH3-C	5.12	1.55	1.48
5	J	301	YXX	CAY-NBE	4.34	1.45	1.38
5	J	301	YXX	CAH-CAL	-4.18	1.42	1.53
4	A	305	YXZ	CAH-CAL	-4.15	1.42	1.53
4	A	305	YXZ	CAF-CAH	-4.07	1.35	1.51
5	J	301	YXX	CAZ-NBE	4.02	1.45	1.38
5	J	301	YXX	CAF-CAH	-3.80	1.36	1.51
5	J	301	YXX	CAI-CAM	-3.33	1.44	1.53
4	A	305	YXZ	CAI-CAM	-3.31	1.44	1.53
5	J	301	YXX	CAK-CAG	-2.91	1.40	1.51
4	A	305	YXZ	CAK-CAG	-2.79	1.41	1.51
5	J	301	YXX	CAG-CAI	-2.30	1.42	1.51
4	A	305	YXZ	CAG-CAI	-2.23	1.42	1.51

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	J	301	YXX	CAY-NBE-CAZ	-37.61	95.75	112.96
5	J	301	YXX	CBD-CAZ-NBE	13.18	120.21	108.00
5	J	301	YXX	CAT-CAY-NBE	10.82	118.03	108.00
5	J	301	YXX	CAL-CBA-NAU	9.01	120.12	110.10
4	A	305	YXZ	CAL-CBA-NAU	8.80	119.89	110.10
5	J	301	YXX	CAM-CBB-NAV	7.93	118.92	110.10
4	A	305	YXZ	CAM-CBB-NAV	7.61	118.56	110.10
5	J	301	YXX	CAG-CAK-NAV	5.74	120.17	111.85
4	A	305	YXZ	CAF-CAJ-NAU	5.68	120.09	111.85
5	J	301	YXX	OAD-CAZ-NBE	-5.49	117.84	123.92
4	A	305	YXZ	CAG-CAK-NAV	5.45	119.75	111.85
5	J	301	YXX	CAJ-CAF-CAH	5.43	120.64	111.44
4	A	305	YXZ	CAH-CAL-CBA	4.99	119.92	110.39
4	A	305	YXZ	CAJ-CAF-CAH	4.99	119.89	111.44
5	J	301	YXX	CAG-CAI-CAM	4.97	121.55	111.42
5	J	301	YXX	CAF-CAJ-NAU	4.97	119.05	111.85
5	J	301	YXX	CAH-CAL-CBA	4.84	119.64	110.39
4	A	305	YXZ	CAG-CAI-CAM	4.66	120.92	111.42
5	J	301	YXX	CAQ-NBE-CAY	4.60	131.41	122.80
5	J	301	YXX	CAT-CBD-CAZ	-4.44	100.42	105.23
4	A	305	YXZ	CAI-CAM-CBB	4.40	118.79	110.39
4	A	305	YXZ	CAL-CBA-NBF	4.23	120.87	113.24
5	J	301	YXX	CAO-CAQ-NBE	4.13	121.94	112.39

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	J	301	YXX	CAM-CBB-NBF	4.11	120.65	113.24
5	J	301	YXX	CAI-CAM-CBB	4.01	118.04	110.39
4	A	305	YXZ	CAM-CBB-NBF	3.99	120.44	113.24
4	A	305	YXZ	CAK-CAG-CAI	3.77	117.83	111.44
5	J	301	YXX	CAL-CBA-NBF	3.71	119.93	113.24
5	J	301	YXX	CAK-CAG-CAI	3.56	117.48	111.44
5	J	301	YXX	OAC-CAY-NBE	-3.47	120.08	123.92
5	J	301	YXX	CAQ-NBE-CAZ	3.47	129.28	122.80
4	A	305	YXZ	CAF-CAH-CAL	3.37	118.28	111.42
5	J	301	YXX	CAF-CAH-CAL	3.36	118.27	111.42
5	J	301	YXX	CAP-CAR-NBF	2.91	120.01	113.10
5	J	301	YXX	OAC-CAY-CAT	-2.03	121.89	127.08
5	J	301	YXX	OAD-CAZ-CBD	-2.01	121.93	127.08

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	J	301	YXX	CAO-CAQ-NBE-CAY
5	J	301	YXX	CAN-CAP-CAR-NBF
5	J	301	YXX	CAP-CAN-CAO-CAQ
4	A	305	YXZ	CAO-CAN-CAP-CAR
4	A	305	YXZ	CAP-CAN-CAO-CAQ
4	A	305	YXZ	CAN-CAO-CAQ-NBE

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	J	301	YXX	2	0
4	A	305	YXZ	1	0
2	J	309	ACT	2	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 YXX J 301

Bond lengths

Bond angles

Torsions

Rings

Ligand YXZ A 305

Bond lengths

Bond angles

Torsions

Rings
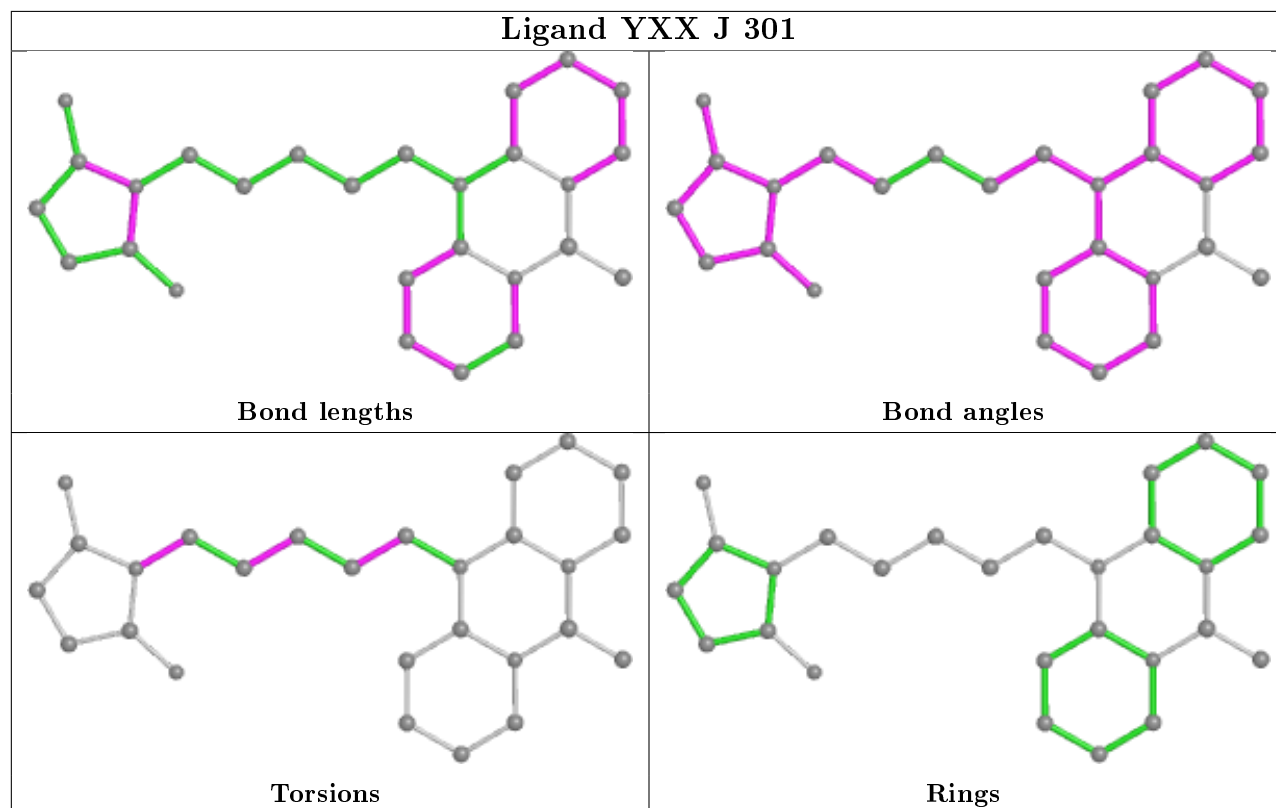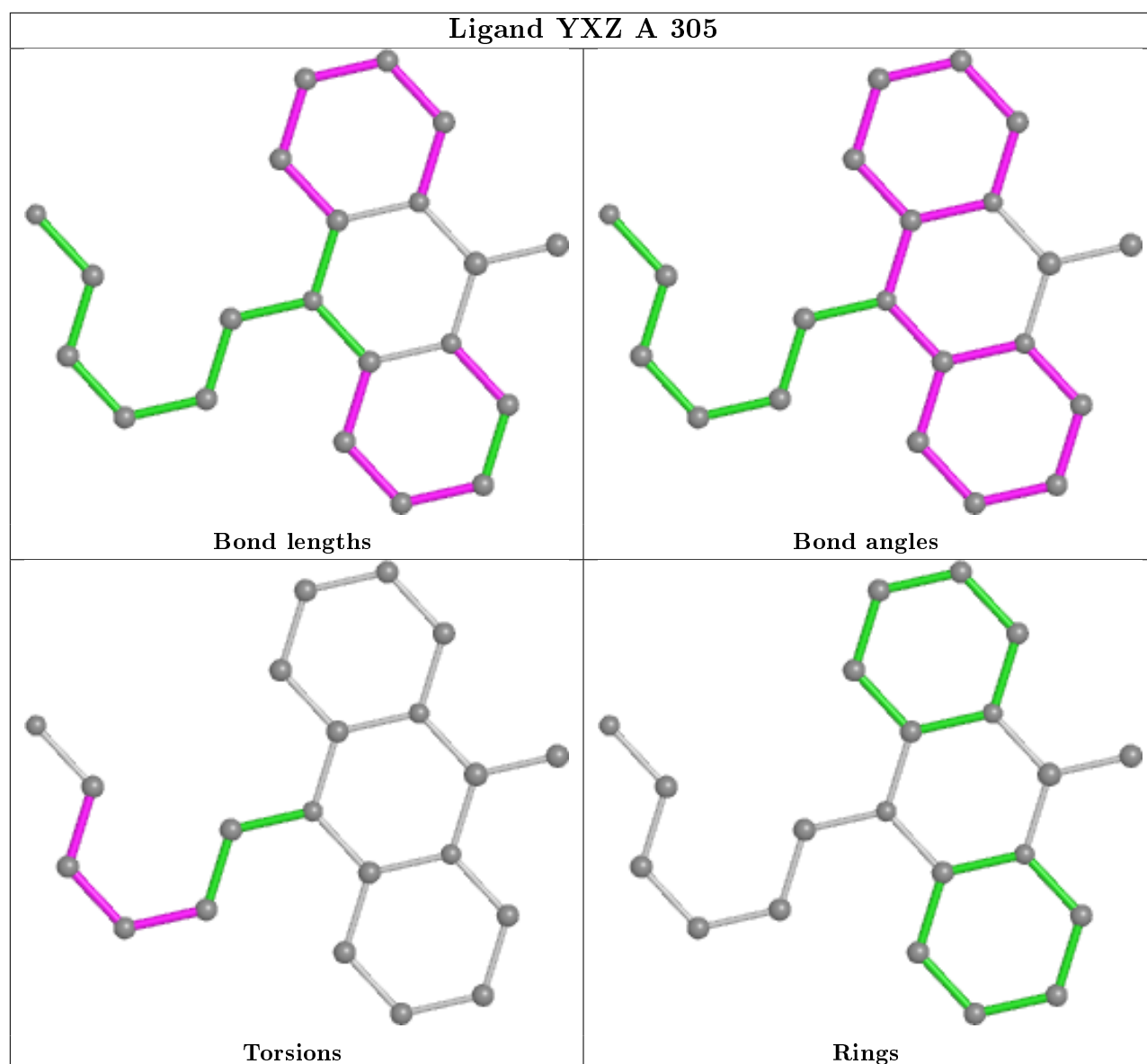
5.7 Other polymers (i)

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(Å²)	Q<0.9
1	A	210/214 (98%)	-0.15	2 (0%)	82	85	11, 18, 31, 67	0
1	J	214/214 (100%)	-0.16	1 (0%)	91	92	11, 18, 29, 52	0
All	All	424/428 (99%)	-0.15	3 (0%)	87	89	11, 18, 31, 67	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	J	194	GLY	4.1
1	A	212	ASN	3.7
1	A	78	TYR	2.2

## 6.2 Non-standard residues in protein, DNA, RNA chains (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(Å²)	Q<0.9
1	TXY	A	67[B]	13/14	0.88	0.17	11,12,16,16	13
1	OMX	A	61[B]	13/14	0.94	0.12	13,17,22,23	13

6.3 Carbohydrates (i)

There are no carbohydrates in this entry.

6.4 Ligands (i)

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

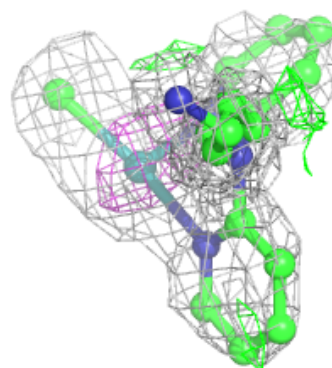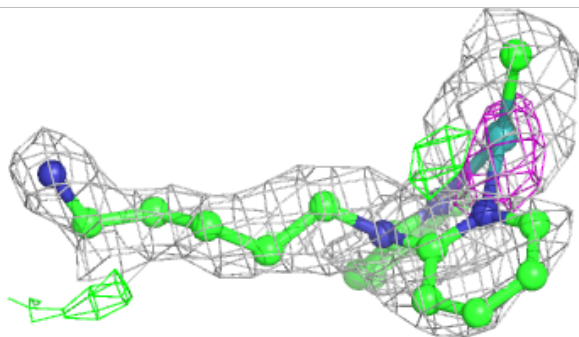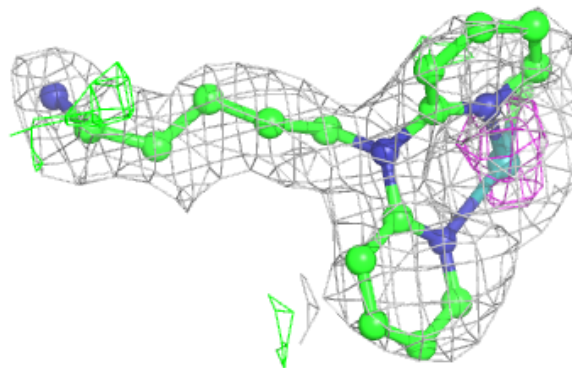| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	ACT	J	304	4/4	0.78	0.15	34,38,39,43	0
2	ACT	J	308	4/4	0.79	0.18	37,39,40,40	0
2	ACT	J	303	4/4	0.82	0.18	28,34,37,38	0
2	ACT	A	304	4/4	0.82	0.25	50,54,55,60	0
7	NA	J	305	1/1	0.86	0.15	63,63,63,63	0
2	ACT	J	306	4/4	0.87	0.14	28,37,39,46	0
2	ACT	J	307	4/4	0.89	0.16	18,27,27,31	0
2	ACT	J	309	4/4	0.90	0.23	33,39,40,47	0
2	ACT	A	303	4/4	0.91	0.17	38,41,42,49	0
2	ACT	A	301	4/4	0.92	0.13	26,27,30,32	0
5	YXX	J	301	27/27	0.95	0.16	26,37,46,56	2
4	YXZ	A	305	21/21	0.95	0.14	17,38,50,51	2
6	SO4	J	302	5/5	0.97	0.09	22,29,33,39	0
3	CL	A	302	1/1	0.98	0.11	24,24,24,24	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 YXX J 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
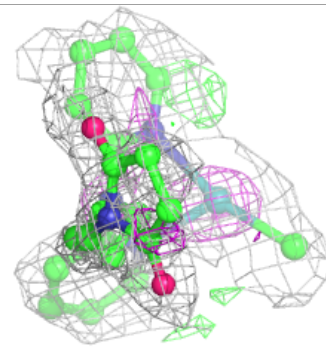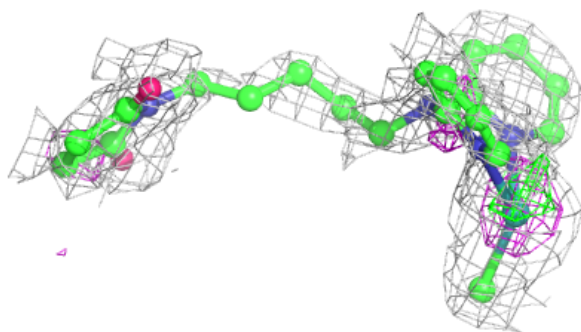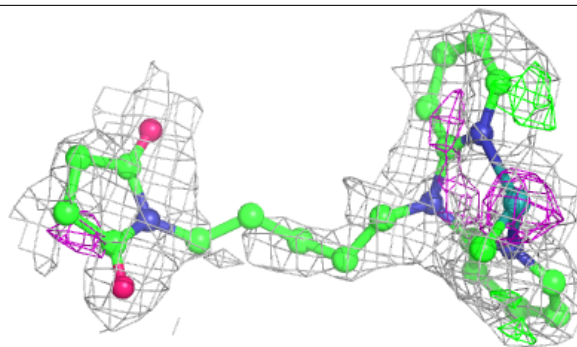
Electron density around YXZ A 305:

$2mF_o$-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.