



# wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 4, 2023 – 02:41 PM EST

PDB ID : 8F99  
Title : Compound 10 bound to procaspase-6  
Authors : Fan, P.; Zhao, Y.; Renslo, A.R.; Arkin, M.R.  
Deposited on : 2022-11-23  
Resolution : 2.86 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](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 ⓘ](#)) 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 : 2.36  
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) : 2.36

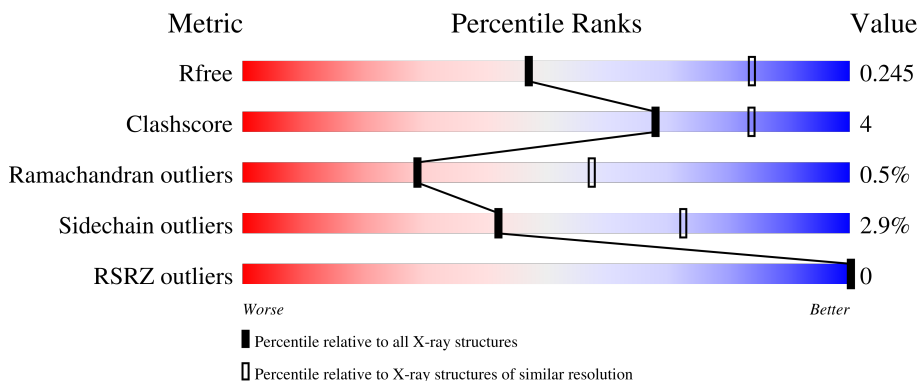
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.86 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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	299	75% 9% 16%
1	B	299	73% 9% 18%
1	C	299	72% 9% 18%
1	D	299	72% 10% • 18%

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 8143 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 Procaspase-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	251	2024	1292	350	368	14	0	0	0
1	B	245	1967	1254	342	357	14	0	0	0
1	C	245	1967	1254	342	357	14	0	0	0
1	D	245	1967	1254	342	357	14	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

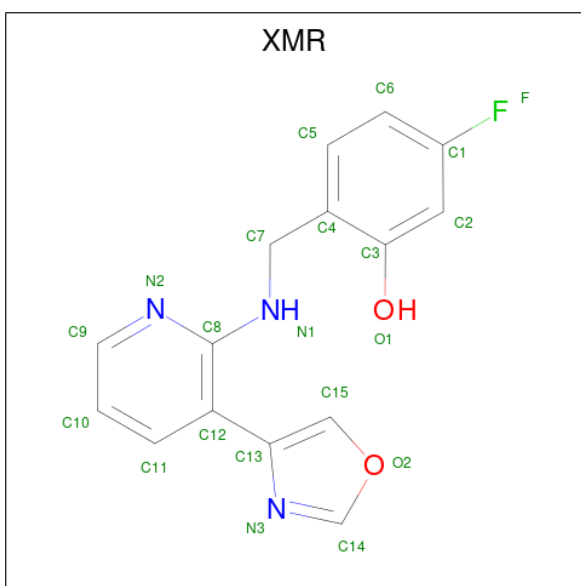
Chain	Residue	Modelled	Actual	Comment	Reference
A	163	ALA	CYS	conflict	UNP P55212
A	294	GLU	-	expression tag	UNP P55212
A	295	ASN	-	expression tag	UNP P55212
A	296	LEU	-	expression tag	UNP P55212
A	297	TYR	-	expression tag	UNP P55212
A	298	PHE	-	expression tag	UNP P55212
A	299	GLN	-	expression tag	UNP P55212
B	163	ALA	CYS	conflict	UNP P55212
B	294	GLU	-	expression tag	UNP P55212
B	295	ASN	-	expression tag	UNP P55212
B	296	LEU	-	expression tag	UNP P55212
B	297	TYR	-	expression tag	UNP P55212
B	298	PHE	-	expression tag	UNP P55212
B	299	GLN	-	expression tag	UNP P55212
C	163	ALA	CYS	conflict	UNP P55212
C	294	GLU	-	expression tag	UNP P55212
C	295	ASN	-	expression tag	UNP P55212
C	296	LEU	-	expression tag	UNP P55212
C	297	TYR	-	expression tag	UNP P55212
C	298	PHE	-	expression tag	UNP P55212
C	299	GLN	-	expression tag	UNP P55212

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Chain	Residue	Modelled	Actual	Comment	Reference
D	163	ALA	CYS	conflict	UNP P55212
D	294	GLU	-	expression tag	UNP P55212
D	295	ASN	-	expression tag	UNP P55212
D	296	LEU	-	expression tag	UNP P55212
D	297	TYR	-	expression tag	UNP P55212
D	298	PHE	-	expression tag	UNP P55212
D	299	GLN	-	expression tag	UNP P55212

- Molecule 2 is 5-fluoro-2-({[(3M)-3-(1,3-oxazol-4-yl)pyridin-2-yl]amino}methyl)phenol (three-letter code: XMR) (formula: C<sub>15</sub>H<sub>12</sub>FN<sub>3</sub>O<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	F	N			O
2	A	1	Total	C	F	N	O	0	1
			42	30	2	6	4		
2	C	1	Total	C	F	N	O	0	1
			42	30	2	6	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	33	Total	O	0	0
			33	33		
3	B	27	Total	O	0	0
			27	27		
3	C	38	Total	O	0	0
			38	38		

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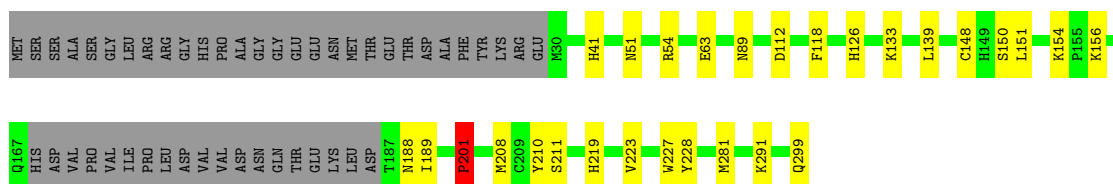
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
3	D	36	Total	O	0	0
			36	36		

### 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 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.

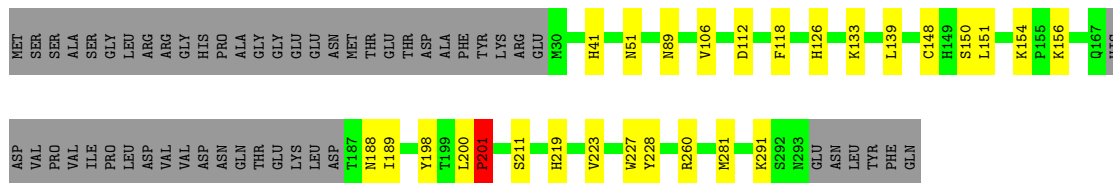
- Molecule 1: Procaspase-6

Chain A: 



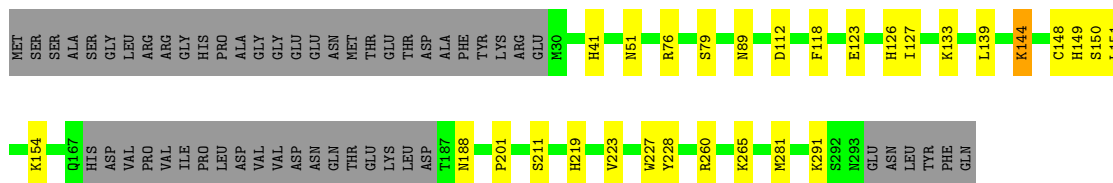
- Molecule 1: Procaspase-6

Chain B: 



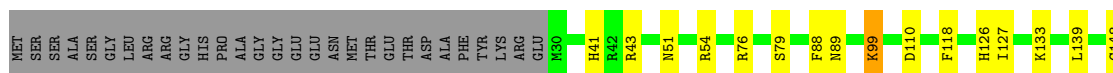
- Molecule 1: Procaspase-6

Chain C: 



- Molecule 1: Procaspase-6

Chain D: 



H149	S150	L151	K154	M166	Q167	HIS	ASP	VAL	PRO	PRO	VAL	ILE	PRO	LEU	ASP	VAL	VAL	ASP	ASN	GLN	THR	GLU	LYS	LEU	ASP	I187	M188	I189	P201	S211	H219	V223	W227	Y228	M261	K291	S292	N293	GLU	ASN	LEU	TYR	PHE	GLN
------	------	------	------	------	------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------	------	------	------	-----	-----	-----	-----	-----	-----

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	101.48Å 101.48Å 321.54Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.90 – 2.86 45.86 – 2.86	Depositor EDS
% Data completeness (in resolution range)	100.0 (45.90-2.86) 100.0 (45.86-2.86)	Depositor EDS
$R_{merge}$	0.26	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.15 (at 2.86Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, $R_{free}$	0.200 , 0.246 0.202 , 0.245	Depositor DCC
$R_{free}$ test set	2209 reflections (5.13%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	54.7	Xtrriage
Anisotropy	0.689	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 25.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	0.470 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	8143	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	68.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.90% 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: XMR

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	0.65	0/2071	0.81	0/2789
1	B	0.64	0/2012	0.81	0/2709
1	C	0.65	0/2012	0.82	0/2709
1	D	0.65	0/2012	0.82	0/2709
All	All	0.65	0/8107	0.82	0/10916

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	2024	0	1985	15	0
1	B	1967	0	1936	16	0
1	C	1967	0	1936	16	0
1	D	1967	0	1936	13	0
2	A	42	0	0	0	0
2	C	42	0	0	0	0
3	A	33	0	0	0	0
3	B	27	0	0	1	0
3	C	38	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	36	0	0	1	0
All	All	8143	0	7793	60	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.

The worst 5 of 60 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:112:ASP:OD2	1:C:291:LYS:HE2	1.87	0.75
1:B:112:ASP:OD2	1:B:291:LYS:HE2	1.86	0.75
1:A:112:ASP:OD2	1:A:291:LYS:HE2	1.87	0.74
1:B:201:PRO:HB2	1:B:281:MET:SD	2.33	0.68
1:A:201:PRO:HB2	1:A:281:MET:SD	2.35	0.66

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	247/299 (83%)	235 (95%)	11 (4%)	1 (0%)	34	62
1	B	241/299 (81%)	230 (95%)	10 (4%)	1 (0%)	34	62
1	C	241/299 (81%)	228 (95%)	11 (5%)	2 (1%)	19	46
1	D	241/299 (81%)	231 (96%)	9 (4%)	1 (0%)	34	62
All	All	970/1196 (81%)	924 (95%)	41 (4%)	5 (0%)	29	57

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	144	LYS

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Mol	Chain	Res	Type
1	D	201	PRO
1	B	201	PRO
1	C	201	PRO
1	A	201	PRO

### 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	219/260 (84%)	215 (98%)	4 (2%)	59	82
1	B	213/260 (82%)	209 (98%)	4 (2%)	57	81
1	C	213/260 (82%)	205 (96%)	8 (4%)	33	64
1	D	213/260 (82%)	204 (96%)	9 (4%)	30	60
All	All	858/1040 (82%)	833 (97%)	25 (3%)	42	72

5 of 25 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	265	LYS
1	D	76	ARG
1	D	291	LYS
1	D	54	ARG
1	D	79	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 21 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	224	ASN
1	D	89	ASN
1	D	230	GLN
1	D	101	HIS
1	D	41	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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

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	XMR	A	301[A]	-	19,23,23	1.37	1 (5%)	24,31,31	1.29	3 (12%)
2	XMR	C	301[B]	-	19,23,23	1.39	1 (5%)	24,31,31	1.71	6 (25%)
2	XMR	C	301[A]	-	19,23,23	1.45	1 (5%)	24,31,31	1.49	4 (16%)
2	XMR	A	301[B]	-	19,23,23	1.41	1 (5%)	24,31,31	1.45	5 (20%)

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	XMR	A	301[A]	-	-	0/8/9/9	0/3/3/3
2	XMR	C	301[B]	-	-	0/8/9/9	0/3/3/3
2	XMR	C	301[A]	-	-	0/8/9/9	0/3/3/3
2	XMR	A	301[B]	-	-	0/8/9/9	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301[A]	XMR	C8-N1	5.32	1.42	1.34
2	C	301[B]	XMR	C8-N1	5.29	1.42	1.34
2	A	301[A]	XMR	C8-N1	5.00	1.42	1.34
2	A	301[B]	XMR	C8-N1	4.96	1.42	1.34

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	301[B]	XMR	C12-C8-N1	-4.10	119.87	121.84
2	C	301[B]	XMR	C11-C12-C8	3.71	120.22	117.46
2	C	301[A]	XMR	C11-C12-C8	3.45	120.03	117.46
2	C	301[B]	XMR	C7-N1-C8	2.88	126.92	123.14
2	C	301[A]	XMR	C12-C8-N2	-2.86	118.01	121.90

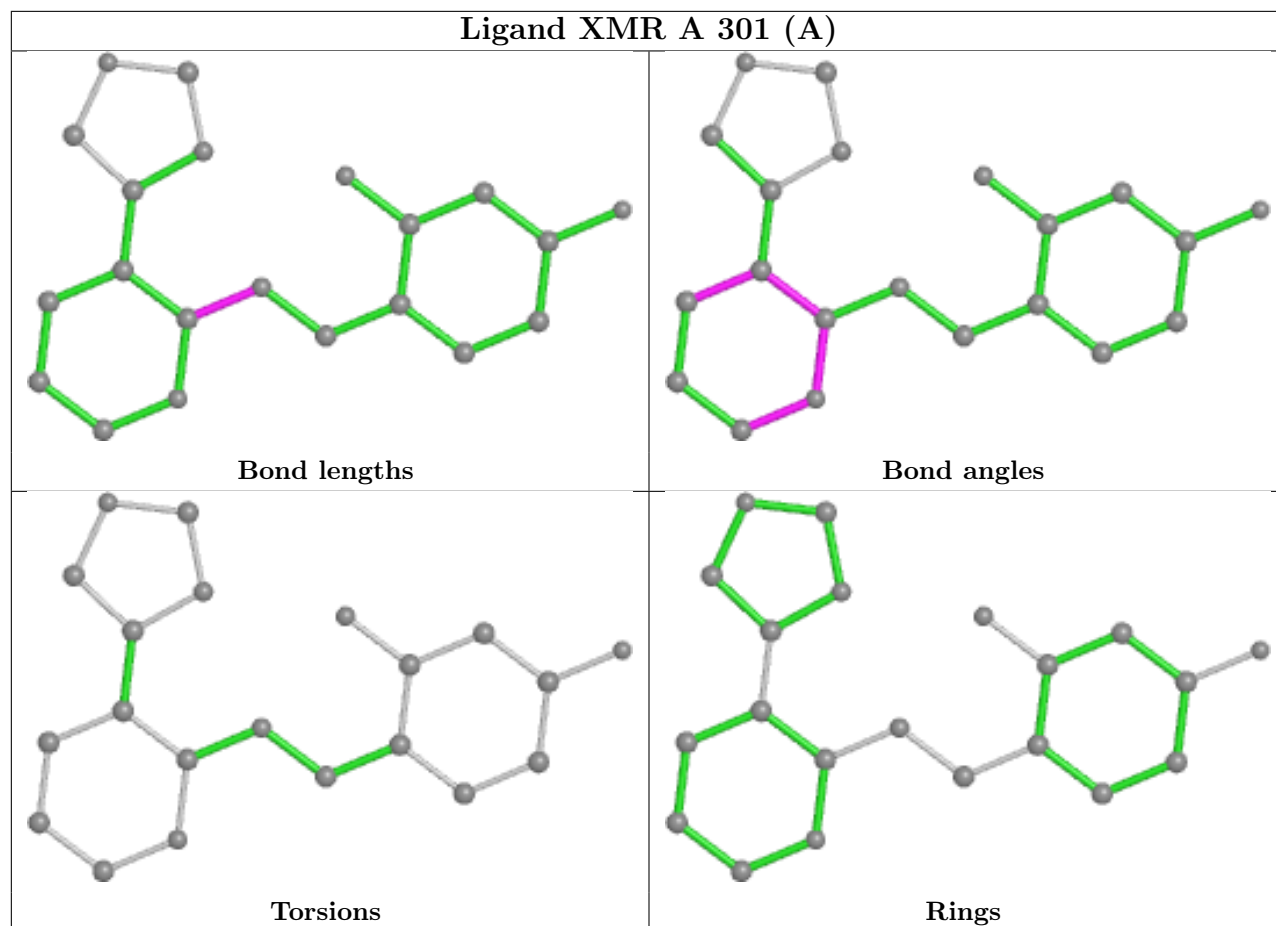
There are no chirality outliers.

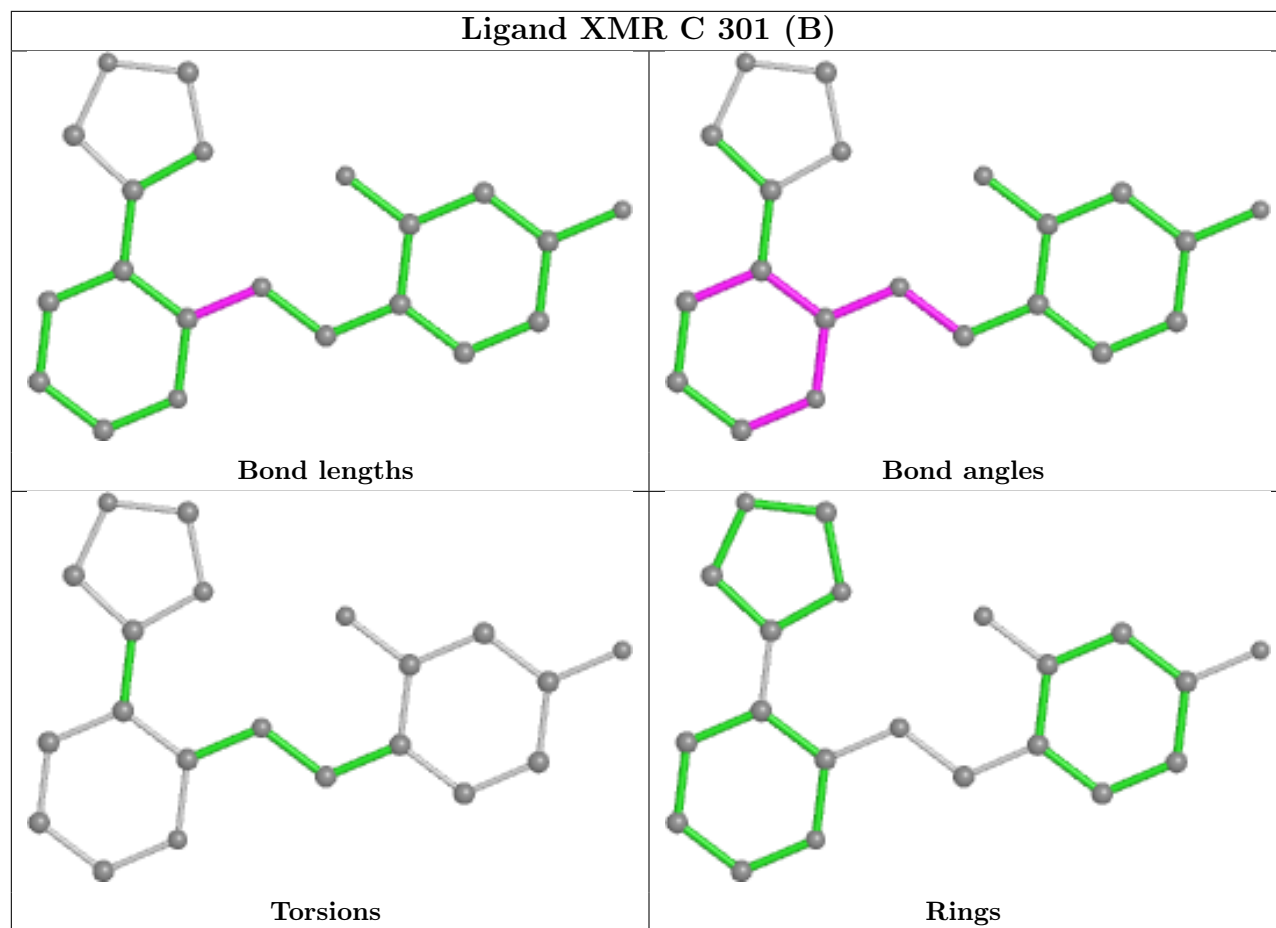
There are no torsion outliers.

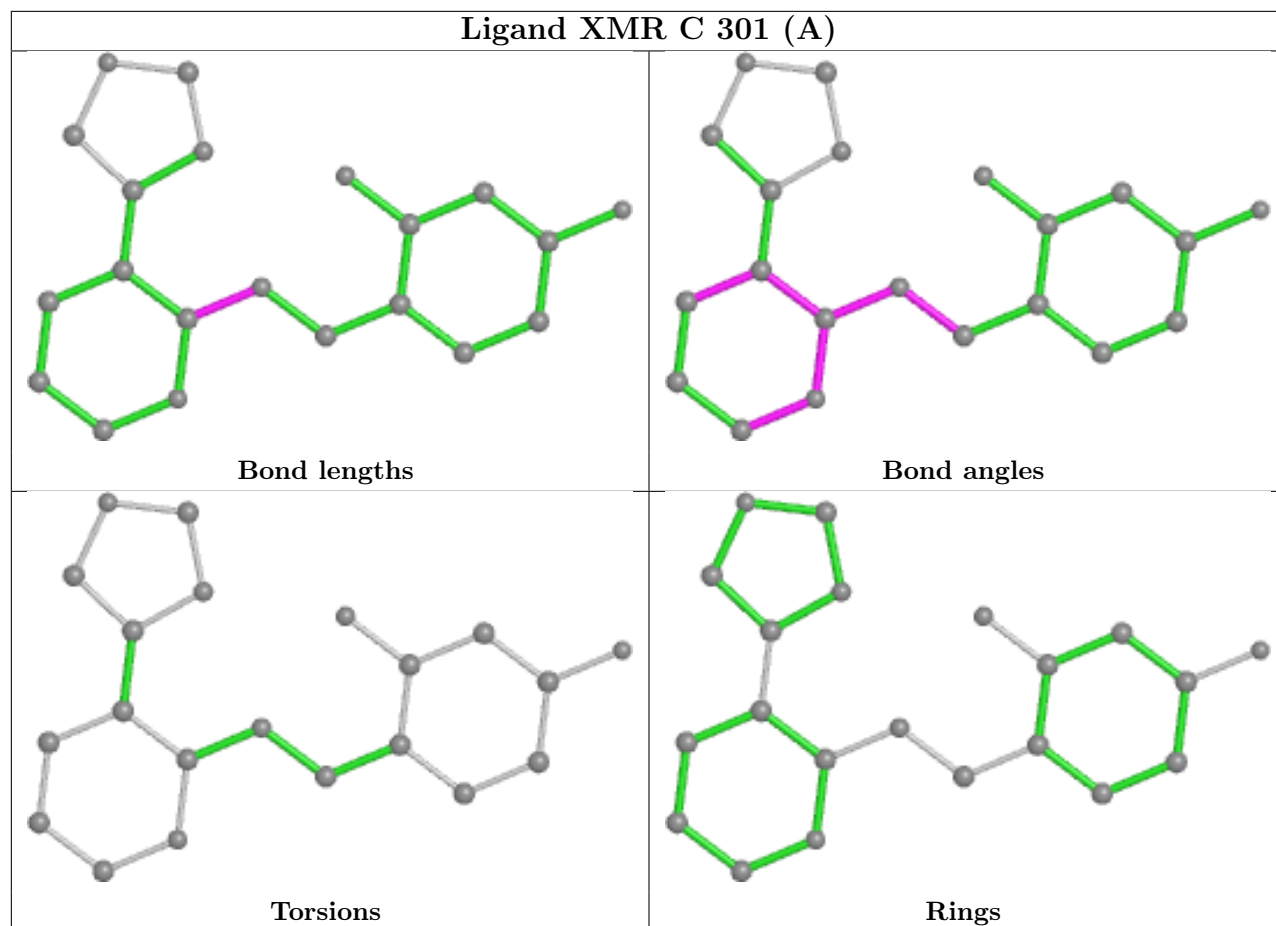
There are no ring outliers.

No monomer is involved in short contacts.

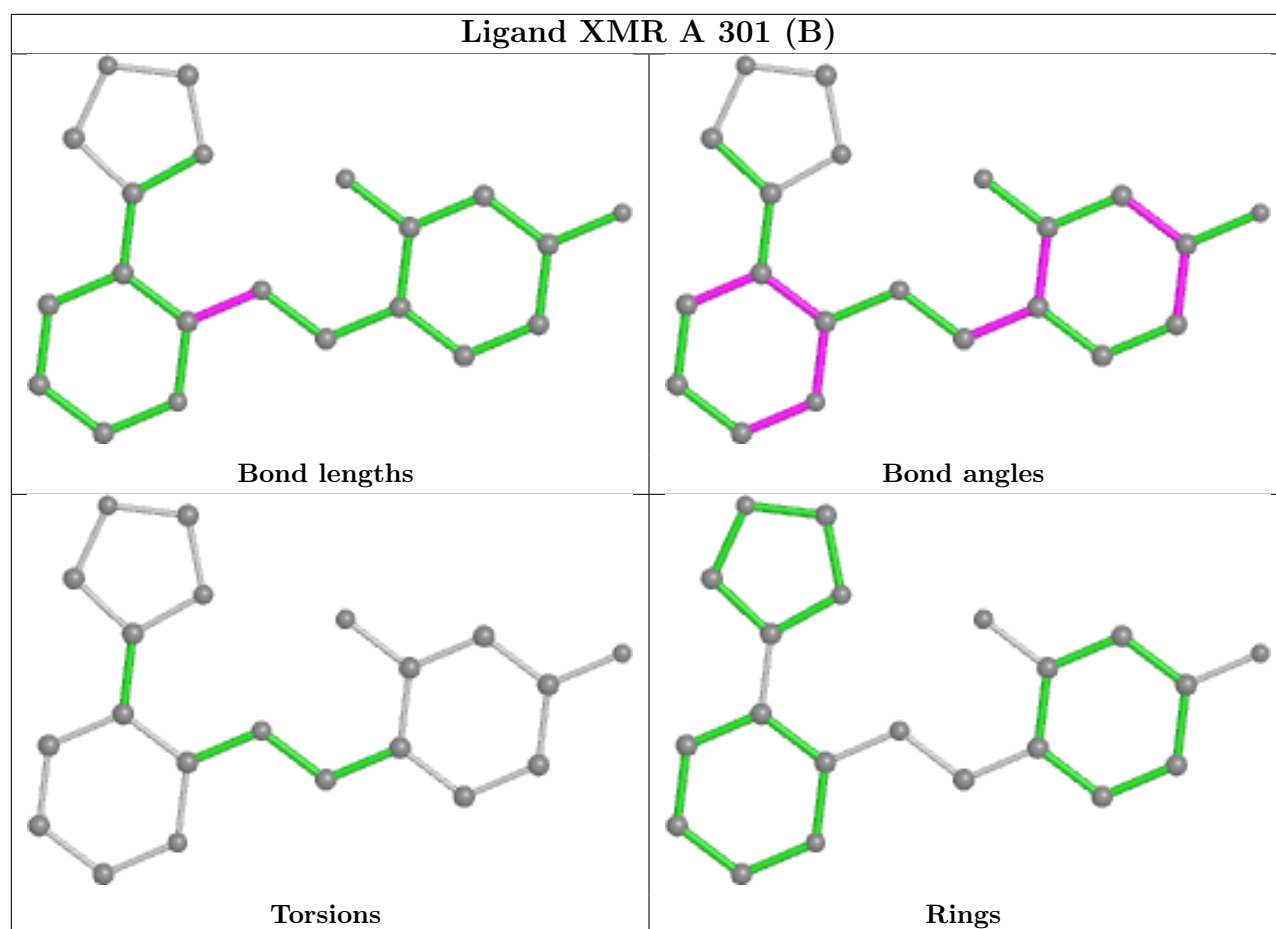
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.











## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	251/299 (83%)	-0.17	0 100 100	47, 65, 113, 142	0
1	B	245/299 (81%)	-0.17	0 100 100	46, 64, 103, 135	0
1	C	245/299 (81%)	-0.15	0 100 100	44, 63, 106, 144	0
1	D	245/299 (81%)	-0.14	0 100 100	48, 62, 100, 143	0
All	All	986/1196 (82%)	-0.16	0 100 100	44, 63, 106, 144	0

There are no RSRZ outliers to report.

### 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](#)

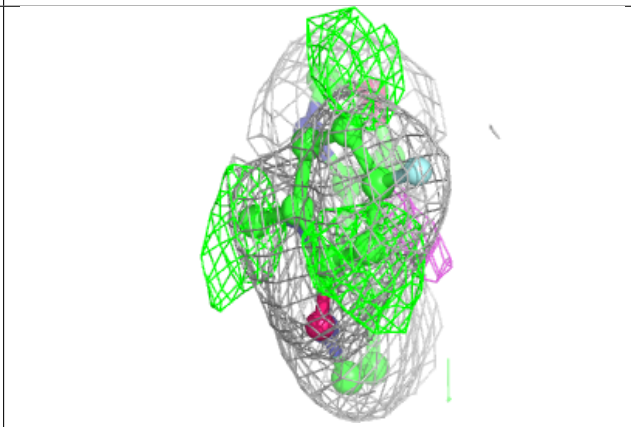
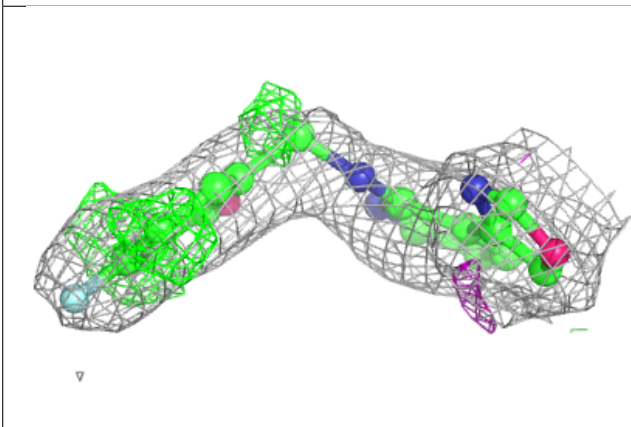
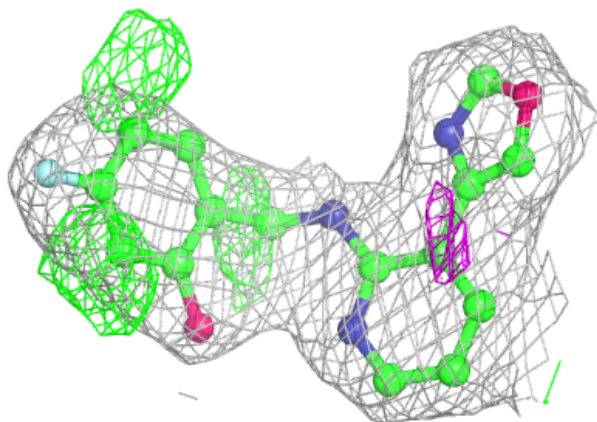
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 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
2	XMR	C	301[A]	21/21	0.88	0.27	28,48,64,65	21
2	XMR	C	301[B]	21/21	0.88	0.27	28,45,60,60	21
2	XMR	A	301[A]	21/21	0.90	0.27	36,64,84,90	21
2	XMR	A	301[B]	21/21	0.90	0.27	37,61,84,90	21

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.

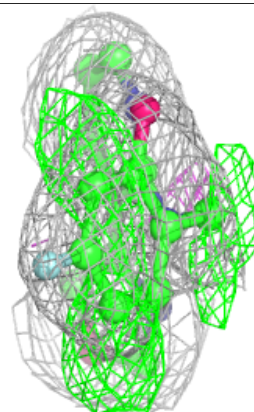
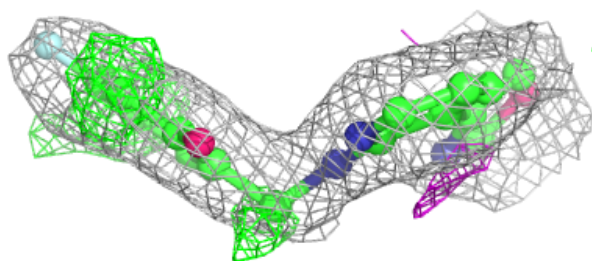
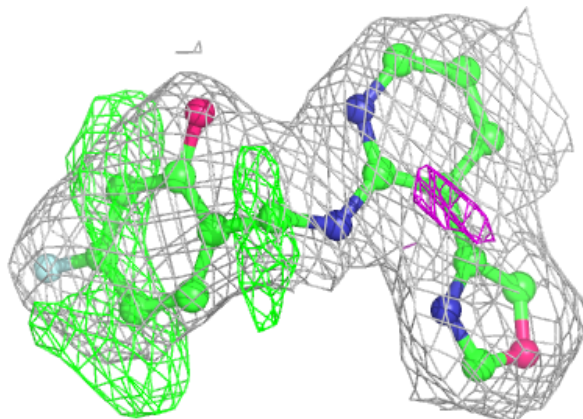
**Electron density around XMR C 301 (A):**

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



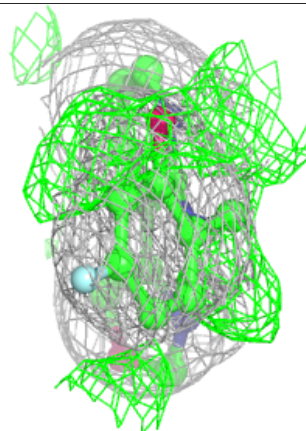
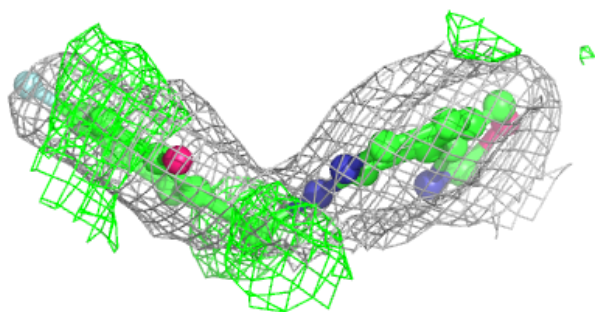
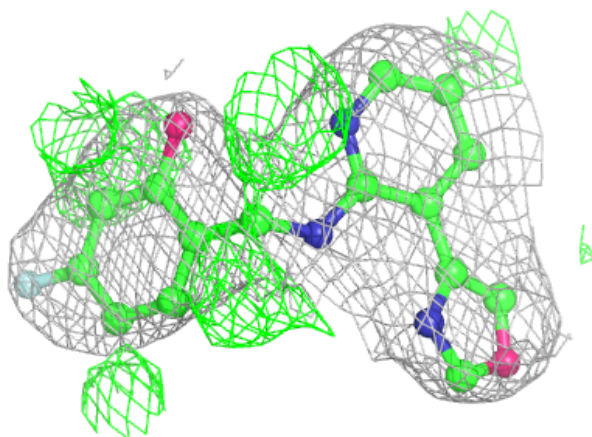
**Electron density around XMR C 301 (B):**

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



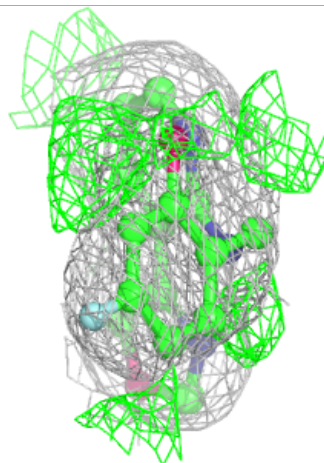
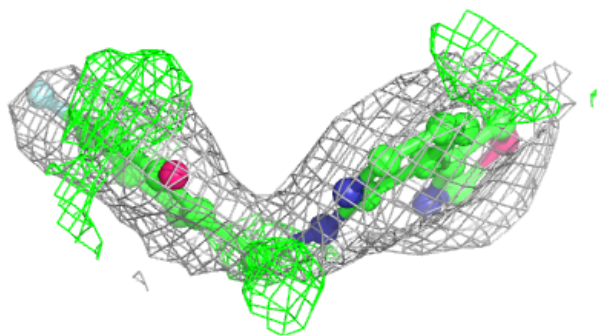
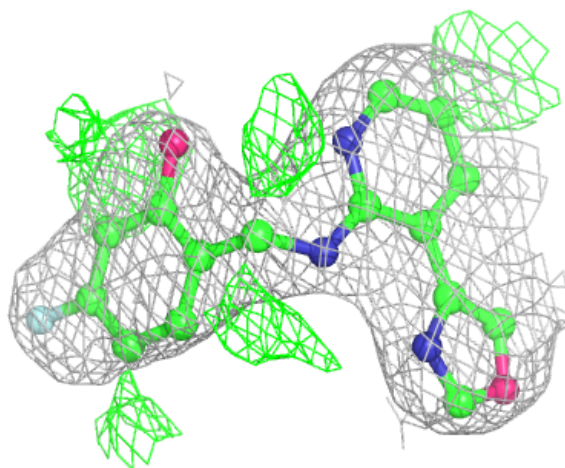
**Electron density around XMR A 301 (A):**

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



**Electron density around XMR A 301 (B):**

$2mF_o-DF_c$  (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.