



# Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 04:06 am BST

PDB ID : 4Y73  
Title : Crystal structure of IRAK4 kinase domain with inhibitor  
Authors : Lesburg, C.A.  
Deposited on : 2015-02-13  
Resolution : 2.14 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

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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 : 2.11  
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

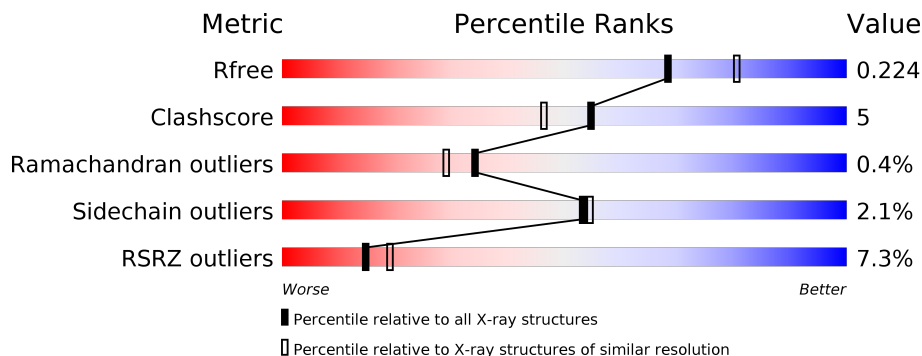
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.14 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	2523 (2.16-2.12)
Clashscore	141614	2653 (2.16-2.12)
Ramachandran outliers	138981	2618 (2.16-2.12)
Sidechain outliers	138945	2617 (2.16-2.12)
RSRZ outliers	127900	2485 (2.16-2.12)

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  $\geq 3$ , 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	302	
1	B	302	
1	C	302	
1	D	302	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9744 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.

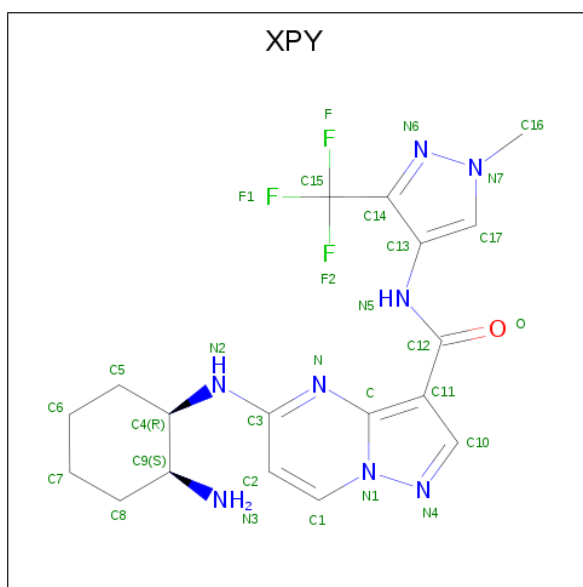
- Molecule 1 is a protein called Interleukin-1 receptor-associated kinase 4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	292	2310	1446	387	458	3	16	0	1	0
1	B	292	2305	1442	386	459	3	15	0	0	0
1	C	293	2310	1445	387	460	3	15	0	0	0
1	D	291	2304	1442	386	458	3	15	0	1	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	159	GLY	-	expression tag	UNP Q9NWZ3
B	159	GLY	-	expression tag	UNP Q9NWZ3
C	159	GLY	-	expression tag	UNP Q9NWZ3
D	159	GLY	-	expression tag	UNP Q9NWZ3

- Molecule 2 is 5-([(1R,2S)-2-aminocyclohexyl]amino)-N-[1-methyl-3-(trifluoromethyl)-1H-pyrazol-4-yl]pyrazolo[1,5-a]pyrimidine-3-carboxamide (three-letter code: XPY) (formula: C<sub>18</sub>H<sub>21</sub>F<sub>3</sub>N<sub>8</sub>O).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	0	0
			30	18	3	8	1		
2	B	1	Total	C	F	N	O	0	0
			30	18	3	8	1		
2	C	1	Total	C	F	N	O	0	0
			30	18	3	8	1		
2	D	1	Total	C	F	N	O	0	0
			30	18	3	8	1		

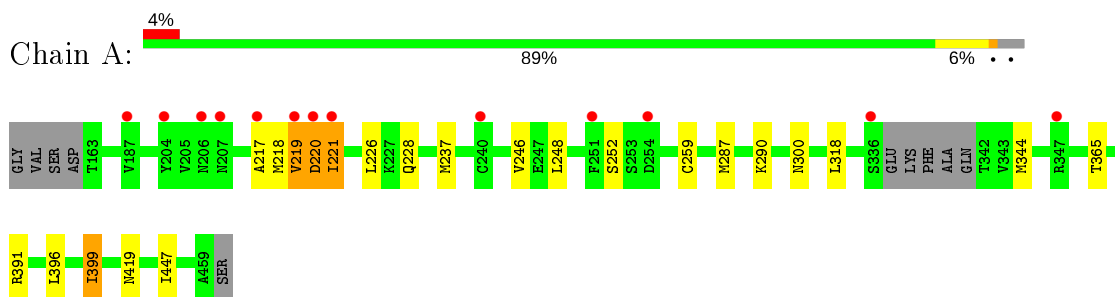
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	98	Total	O	0	0
			98	98		
3	B	86	Total	O	0	0
			86	86		
3	C	105	Total	O	0	0
			105	105		
3	D	106	Total	O	0	0
			106	106		

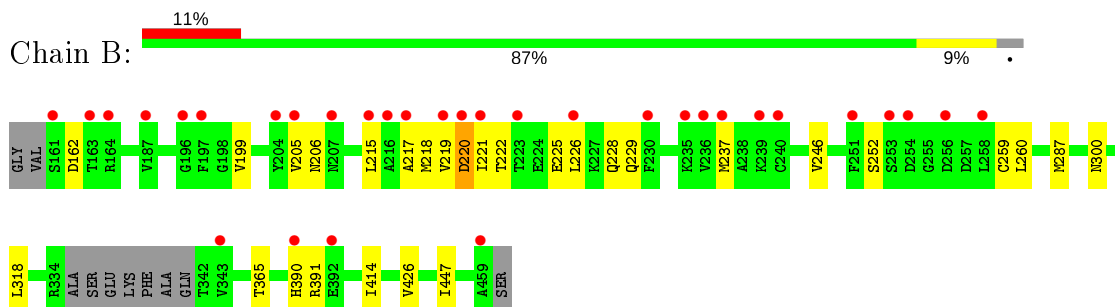
### 3 Residue-property plots [i](#)

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.

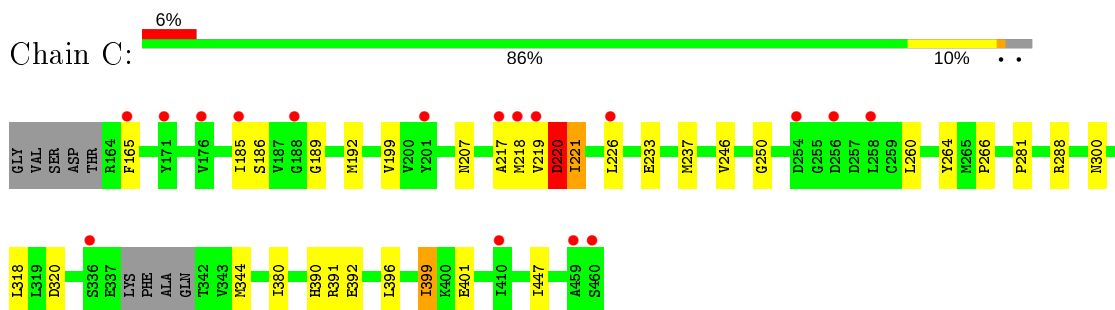
- Molecule 1: Interleukin-1 receptor-associated kinase 4



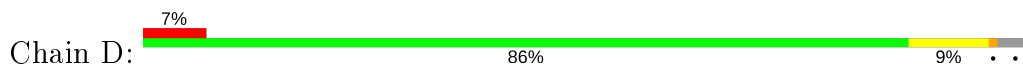
- Molecule 1: Interleukin-1 receptor-associated kinase 4

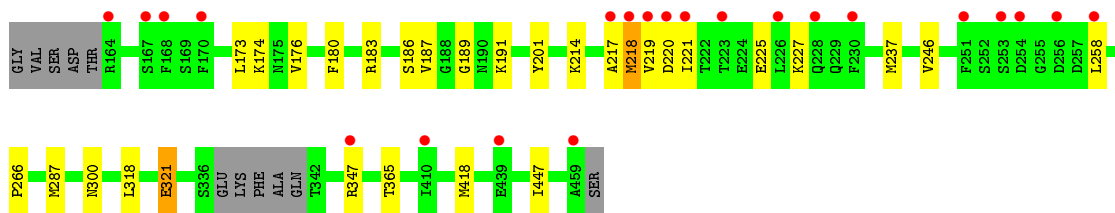


- Molecule 1: Interleukin-1 receptor-associated kinase 4



- Molecule 1: Interleukin-1 receptor-associated kinase 4





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	142.86Å 138.75Å 88.02Å 90.00° 124.59° 90.00°	Depositor
Resolution (Å)	74.24 – 2.14 74.23 – 2.14	Depositor EDS
% Data completeness (in resolution range)	99.2 (74.24-2.14) 99.4 (74.23-2.14)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.10 (at 2.14Å)	Xtrriage
Refinement program	BUSTER 2.11.4	Depositor
R, $R_{free}$	0.195 , 0.217 0.201 , 0.224	Depositor DCC
$R_{free}$ test set	3869 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	38.7	Xtrriage
Anisotropy	0.504	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 52.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	9744	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	55.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 17.93% 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: TPO, XPY, SEP

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	0.49	0/2315	0.66	1/3120 (0.0%)
1	B	0.50	0/2310	0.66	1/3114 (0.0%)
1	C	0.49	0/2315	0.67	0/3120
1	D	0.50	0/2309	0.67	0/3112
All	All	0.49	0/9249	0.66	2/12466 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	220	ASP	C-N-CA	5.12	134.51	121.70
1	A	220	ASP	C-N-CA	5.04	134.30	121.70

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	2310	0	2274	19	0
1	B	2305	0	2265	29	0
1	C	2310	0	2270	28	0
1	D	2304	0	2264	30	0
2	A	30	0	21	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	30	0	21	0	0
2	C	30	0	21	0	0
2	D	30	0	21	0	0
3	A	98	0	0	1	0
3	B	86	0	0	1	0
3	C	105	0	0	0	0
3	D	106	0	0	0	0
All	All	9744	0	9157	97	0

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

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

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:221:ILE:HG21	1:B:226:LEU:HD11	1.34	1.08
1:D:217:ALA:HA	1:D:218:MET:HB3	1.33	1.06
1:B:222:THR:HB	1:B:225:GLU:HG3	1.44	0.95
1:B:217:ALA:HA	1:B:218:MET:CB	1.95	0.95
1:C:217:ALA:HA	1:C:218:MET:HB2	1.49	0.95
1:A:217:ALA:HA	1:A:218:MET:CB	1.98	0.93
1:C:220:ASP:HB3	1:C:221:ILE:HA	1.50	0.93
1:D:266:PRO:HG2	1:D:321[A]:GLU:HG3	1.55	0.89
1:B:221:ILE:HG21	1:B:226:LEU:CD1	2.02	0.89
1:B:221:ILE:CG2	1:B:226:LEU:CD1	2.56	0.83
1:B:217:ALA:HA	1:B:218:MET:HB3	1.61	0.82
1:D:180:PHE:CD2	1:D:214:LYS:HD2	2.15	0.80
1:A:217:ALA:HA	1:A:218:MET:HB3	1.63	0.80
1:B:221:ILE:CG2	1:B:226:LEU:HD11	2.12	0.80
1:B:217:ALA:HA	1:B:218:MET:HB2	1.75	0.69
1:B:390:HIS:O	1:C:391:ARG:HA	1.94	0.67
1:D:217:ALA:HA	1:D:218:MET:CB	2.15	0.66
1:B:287:MET:HG3	3:B:1116:HOH:O	1.96	0.65
1:D:237:MET:HE1	1:D:246:VAL:HG23	1.78	0.65
1:A:217:ALA:HA	1:A:218:MET:HB2	1.76	0.65
1:C:220:ASP:HB2	1:C:221:ILE:HG13	1.79	0.65
1:B:391:ARG:HA	1:C:390:HIS:O	1.98	0.64
1:D:287:MET:HA	1:D:287:MET:HE3	1.78	0.63
1:A:217:ALA:HB3	1:A:221:ILE:CG2	2.28	0.62
1:D:174:LYS:HG2	1:D:180:PHE:HE1	1.63	0.62
1:B:217:ALA:HB3	1:B:221:ILE:HG21	1.82	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:220:ASP:HB2	1:A:221:ILE:HG13	1.81	0.61
1:D:217:ALA:HB3	1:D:221:ILE:HG21	1.81	0.60
1:C:217:ALA:HA	1:C:218:MET:CB	2.30	0.60
1:B:246:VAL:HG11	1:B:318:LEU:HD12	1.84	0.60
1:B:217:ALA:HB3	1:B:221:ILE:CG2	2.33	0.59
1:A:217:ALA:HB3	1:A:221:ILE:HG21	1.84	0.58
1:C:233:GLU:HG2	1:C:260:LEU:HD13	1.85	0.58
1:C:217:ALA:HB3	1:C:221:ILE:HG21	1.85	0.58
1:C:220:ASP:CB	1:C:221:ILE:HA	2.30	0.57
1:B:221:ILE:HG23	1:B:226:LEU:CD1	2.35	0.56
1:B:220:ASP:HB2	1:B:221:ILE:HG13	1.88	0.56
1:C:281:PRO:HD3	1:D:321[B]:GLU:HG2	1.88	0.56
1:B:220:ASP:HB2	1:B:221:ILE:HA	1.89	0.55
1:D:220:ASP:OD2	1:D:225:GLU:OE2	2.24	0.55
1:A:419:ASN:HB2	1:D:186:SER:CB	2.36	0.55
1:C:207:ASN:HA	1:D:187:VAL:HG23	1.90	0.54
1:C:220:ASP:HB3	1:C:221:ILE:CA	2.32	0.53
1:C:396:LEU:HD12	1:C:399:ILE:HD13	1.91	0.52
1:D:246:VAL:HG11	1:D:318:LEU:HD12	1.92	0.52
1:A:396:LEU:HD12	1:A:399:ILE:HD13	1.92	0.52
1:A:220:ASP:HB2	1:A:221:ILE:HA	1.92	0.51
1:D:173:LEU:HA	1:D:176:VAL:HG22	1.92	0.51
1:C:237:MET:HE2	1:C:246:VAL:HG23	1.93	0.51
1:B:221:ILE:CG2	1:B:226:LEU:HD13	2.40	0.51
1:A:419:ASN:HB2	1:D:186:SER:HB3	1.92	0.50
1:D:217:ALA:HB3	1:D:221:ILE:CG2	2.41	0.49
1:B:221:ILE:HG23	1:B:226:LEU:HD13	1.94	0.48
1:D:174:LYS:HG2	1:D:180:PHE:CE1	2.46	0.48
1:B:225:GLU:O	1:B:228:GLN:HB3	2.14	0.48
1:C:217:ALA:HB3	1:C:221:ILE:CG2	2.43	0.48
1:A:246:VAL:HG11	1:A:318:LEU:HD12	1.96	0.48
1:D:183:ARG:HB2	1:D:189:GLY:HA3	1.95	0.48
1:A:237:MET:HG2	1:A:248:LEU:CB	2.44	0.47
1:A:391:ARG:HD3	3:A:1162:HOH:O	2.14	0.47
1:C:220:ASP:CB	1:C:221:ILE:HG13	2.44	0.47
1:D:227:LYS:HG2	1:D:258:LEU:HD11	1.97	0.47
1:B:237:MET:HE2	1:B:246:VAL:HG23	1.96	0.46
1:D:217:ALA:CA	1:D:218:MET:HB3	2.24	0.46
1:B:237:MET:CE	1:B:246:VAL:HG23	2.45	0.46
1:B:215:LEU:HD11	1:B:260:LEU:HD12	1.97	0.46
1:D:237:MET:CE	1:D:246:VAL:HG23	2.47	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:300:ASN:HA	1:B:447:ILE:HG21	1.99	0.44
1:D:183:ARG:HB3	1:D:187:VAL:CG1	2.48	0.44
1:A:300:ASN:HA	1:A:447:ILE:HG21	1.99	0.44
1:B:390:HIS:HB3	1:C:392:GLU:H	1.83	0.44
1:C:185:ILE:HD13	1:C:189:GLY:O	2.17	0.43
1:D:287:MET:HA	1:D:287:MET:CE	2.46	0.43
1:A:237:MET:HG2	1:A:248:LEU:HB2	2.00	0.43
1:D:217:ALA:HB1	1:D:219:VAL:H	1.83	0.43
1:C:192:MET:SD	1:C:264:TYR:HE1	2.41	0.42
1:A:287[B]:MET:CE	1:A:290:LYS:HD3	2.49	0.42
1:C:281:PRO:CD	1:D:321[B]:GLU:HG2	2.49	0.42
1:C:300:ASN:HA	1:C:447:ILE:HG21	2.01	0.42
1:B:217:ALA:CA	1:B:218:MET:CB	2.82	0.42
1:B:414:ILE:HG12	1:B:426:VAL:HG11	2.01	0.42
1:C:246:VAL:HG11	1:C:318:LEU:HD12	2.02	0.42
1:A:252:SER:HB3	1:A:259:CYS:HB2	2.02	0.42
1:D:191:LYS:HA	1:D:201:TYR:HD1	1.85	0.42
1:A:287[B]:MET:HE1	1:A:290:LYS:HD3	2.01	0.42
1:C:165:PHE:HB3	1:C:250:GLY:HA2	2.02	0.42
1:B:252:SER:HB3	1:B:259:CYS:HB2	2.00	0.41
1:C:221:ILE:HG21	1:C:226:LEU:HD13	2.02	0.41
1:C:281:PRO:HD3	1:D:321[B]:GLU:CG	2.49	0.41
1:D:300:ASN:HA	1:D:447:ILE:HG21	2.01	0.41
1:B:205:VAL:HG23	1:B:206:ASN:H	1.86	0.41
1:C:237:MET:CE	1:C:246:VAL:HG23	2.51	0.41
1:C:266:PRO:HD2	1:C:320:ASP:HA	2.04	0.41
1:D:217:ALA:CA	1:D:218:MET:CB	2.94	0.40
1:C:288:ARG:HB3	1:C:380:ILE:HG23	2.03	0.40
1:D:321[A]:GLU:H	1:D:321[A]:GLU:CD	2.25	0.40
1:A:221:ILE:HG21	1:A:226:LEU:HD13	2.03	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	287/302 (95%)	277 (96%)	9 (3%)	1 (0%)	41	36
1	B	286/302 (95%)	272 (95%)	13 (4%)	1 (0%)	41	36
1	C	287/302 (95%)	275 (96%)	10 (4%)	2 (1%)	22	14
1	D	286/302 (95%)	272 (95%)	13 (4%)	1 (0%)	41	36
All	All	1146/1208 (95%)	1096 (96%)	45 (4%)	5 (0%)	34	29

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	219	VAL
1	B	219	VAL
1	C	219	VAL
1	C	220	ASP
1	D	218	MET

### 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	252/259 (97%)	246 (98%)	6 (2%)	49	49
1	B	252/259 (97%)	248 (98%)	4 (2%)	62	65
1	C	252/259 (97%)	245 (97%)	7 (3%)	43	42
1	D	251/259 (97%)	246 (98%)	5 (2%)	55	57
All	All	1007/1036 (97%)	985 (98%)	22 (2%)	53	53

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	219	VAL
1	A	221	ILE
1	A	228	GLN

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Mol	Chain	Res	Type
1	A	344	MET
1	A	365	THR
1	A	399	ILE
1	B	162	ASP
1	B	199	VAL
1	B	229	GLN
1	B	365	THR
1	C	186	SER
1	C	199	VAL
1	C	220	ASP
1	C	221	ILE
1	C	344	MET
1	C	399	ILE
1	C	401	GLU
1	D	321[A]	GLU
1	D	321[B]	GLU
1	D	347	ARG
1	D	365	THR
1	D	418	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	232	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

12 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	TPO	C	345	1	8,10,11	1.26	2 (25%)	10,14,16	1.13	0
1	TPO	A	345	1	8,10,11	1.14	0	10,14,16	1.36	1 (10%)
1	SEP	D	346	1	8,9,10	0.94	0	8,12,14	1.10	0
1	SEP	B	346	1	8,9,10	1.07	1 (12%)	8,12,14	1.24	1 (12%)
1	SEP	C	346	1	8,9,10	0.91	0	8,12,14	1.23	1 (12%)
1	SEP	A	346	1	8,9,10	0.68	0	8,12,14	1.52	2 (25%)
1	TPO	B	342	1	8,10,11	1.02	0	10,14,16	1.12	0
1	TPO	B	345	1	8,10,11	0.96	0	10,14,16	1.32	0
1	TPO	D	345	1	8,10,11	1.18	0	10,14,16	1.39	1 (10%)
1	TPO	D	342	1	8,10,11	1.14	1 (12%)	10,14,16	0.98	1 (10%)
1	TPO	A	342	1	8,10,11	1.12	0	10,14,16	1.09	1 (10%)
1	TPO	C	342	1	8,10,11	1.09	1 (12%)	10,14,16	0.96	0

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	TPO	C	345	1	-	3/9/11/13	-
1	TPO	A	345	1	-	4/9/11/13	-
1	SEP	D	346	1	-	0/5/8/10	-
1	SEP	B	346	1	-	0/5/8/10	-
1	SEP	C	346	1	-	0/5/8/10	-
1	SEP	A	346	1	-	0/5/8/10	-
1	TPO	B	342	1	-	1/9/11/13	-
1	TPO	B	345	1	-	3/9/11/13	-
1	TPO	D	345	1	-	3/9/11/13	-
1	TPO	D	342	1	-	0/9/11/13	-
1	TPO	A	342	1	-	1/9/11/13	-
1	TPO	C	342	1	-	1/9/11/13	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	345	TPO	CB-CA	2.23	1.58	1.53
1	C	342	TPO	P-OG1	-2.17	1.55	1.59
1	D	342	TPO	P-OG1	-2.12	1.55	1.59
1	B	346	SEP	P-O1P	2.11	1.57	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	345	TPO	CG2-CB	2.04	1.56	1.51

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	345	TPO	O3P-P-OG1	2.92	119.07	105.99
1	A	346	SEP	P-OG-CB	-2.86	110.41	118.30
1	B	346	SEP	P-OG-CB	-2.29	111.98	118.30
1	C	346	SEP	OG-CB-CA	2.19	110.28	108.14
1	A	345	TPO	P-OG1-CB	-2.12	116.81	123.21
1	A	346	SEP	OG-CB-CA	2.07	110.16	108.14
1	A	342	TPO	P-OG1-CB	-2.07	116.97	123.21
1	D	342	TPO	P-OG1-CB	-2.02	117.10	123.21

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	C	345	TPO	N-CA-CB-OG1
1	C	345	TPO	O-C-CA-CB
1	A	345	TPO	N-CA-CB-OG1
1	A	345	TPO	O-C-CA-CB
1	B	345	TPO	N-CA-CB-OG1
1	B	345	TPO	O-C-CA-CB
1	B	345	TPO	CB-OG1-P-O1P
1	D	345	TPO	N-CA-CB-OG1
1	D	345	TPO	O-C-CA-CB
1	D	345	TPO	CB-OG1-P-O1P
1	A	345	TPO	CB-OG1-P-O3P
1	C	345	TPO	CB-OG1-P-O2P
1	A	345	TPO	CB-OG1-P-O2P
1	B	342	TPO	O-C-CA-CB
1	A	342	TPO	O-C-CA-CB
1	C	342	TPO	O-C-CA-CB

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](#)

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	XPY	C	1000	-	23,33,33	1.65	3 (13%)	25,49,49	1.45	4 (16%)
2	XPY	D	1000	-	23,33,33	1.77	4 (17%)	25,49,49	1.63	6 (24%)
2	XPY	A	1000	-	23,33,33	1.66	4 (17%)	25,49,49	1.57	7 (28%)
2	XPY	B	1000	-	23,33,33	1.73	4 (17%)	25,49,49	1.72	6 (24%)

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	XPY	C	1000	-	-	3/14/29/29	0/4/4/4
2	XPY	D	1000	-	-	3/14/29/29	0/4/4/4
2	XPY	A	1000	-	-	3/14/29/29	0/4/4/4
2	XPY	B	1000	-	-	3/14/29/29	0/4/4/4

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	1000	XPY	C3-N2	5.98	1.50	1.37
2	A	1000	XPY	C3-N2	5.71	1.50	1.37
2	C	1000	XPY	C3-N2	5.49	1.49	1.37
2	B	1000	XPY	C3-N2	5.16	1.48	1.37
2	C	1000	XPY	C4-N2	3.49	1.51	1.45
2	B	1000	XPY	C17-C13	3.48	1.42	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1000	XPY	C4-N2	3.44	1.51	1.45
2	D	1000	XPY	C4-N2	3.35	1.50	1.45
2	B	1000	XPY	C4-N2	3.31	1.50	1.45
2	D	1000	XPY	C17-C13	2.77	1.41	1.38
2	B	1000	XPY	C2-C3	2.62	1.45	1.39
2	C	1000	XPY	C17-C13	2.58	1.41	1.38
2	A	1000	XPY	C17-C13	2.57	1.41	1.38
2	D	1000	XPY	C2-C3	2.49	1.45	1.39
2	A	1000	XPY	C2-C3	2.04	1.44	1.39

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1000	XPY	C10-N4-N1	3.78	106.45	103.70
2	D	1000	XPY	C2-C3-N2	-3.71	114.24	120.89
2	B	1000	XPY	C2-C3-N2	-3.68	114.29	120.89
2	D	1000	XPY	C3-N-C	-3.62	114.30	117.59
2	C	1000	XPY	C10-N4-N1	3.39	106.16	103.70
2	B	1000	XPY	C15-C14-C13	-3.35	126.16	129.30
2	B	1000	XPY	C3-N-C	-3.30	114.59	117.59
2	A	1000	XPY	C2-C3-N2	-3.26	115.03	120.89
2	D	1000	XPY	C10-N4-N1	3.25	106.06	103.70
2	C	1000	XPY	C2-C3-N2	-3.24	115.08	120.89
2	D	1000	XPY	C15-C14-C13	-3.23	126.27	129.30
2	C	1000	XPY	C3-N-C	-3.20	114.68	117.59
2	A	1000	XPY	C3-N-C	-3.13	114.75	117.59
2	A	1000	XPY	C15-C14-C13	-2.95	126.53	129.30
2	B	1000	XPY	C5-C4-N2	-2.86	106.18	111.36
2	C	1000	XPY	C5-C4-N2	-2.83	106.22	111.36
2	A	1000	XPY	C5-C4-N2	-2.74	106.40	111.36
2	A	1000	XPY	C10-N4-N1	2.64	105.61	103.70
2	D	1000	XPY	C15-C14-N6	2.51	122.69	119.69
2	A	1000	XPY	C15-C14-N6	2.51	122.69	119.69
2	B	1000	XPY	C15-C14-N6	2.49	122.66	119.69
2	A	1000	XPY	C9-C4-N2	2.03	113.90	110.12
2	D	1000	XPY	C5-C4-N2	-2.01	107.71	111.36

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1000	XPY	N6-C14-C15-F2

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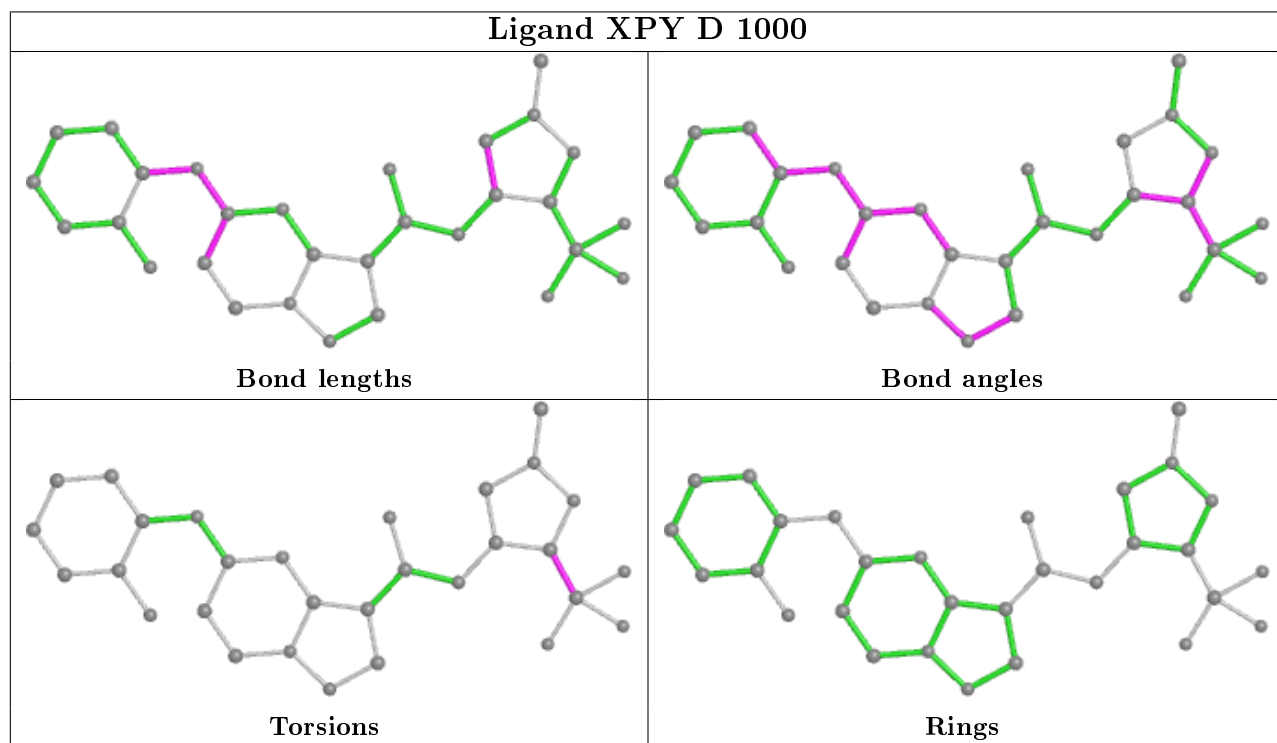
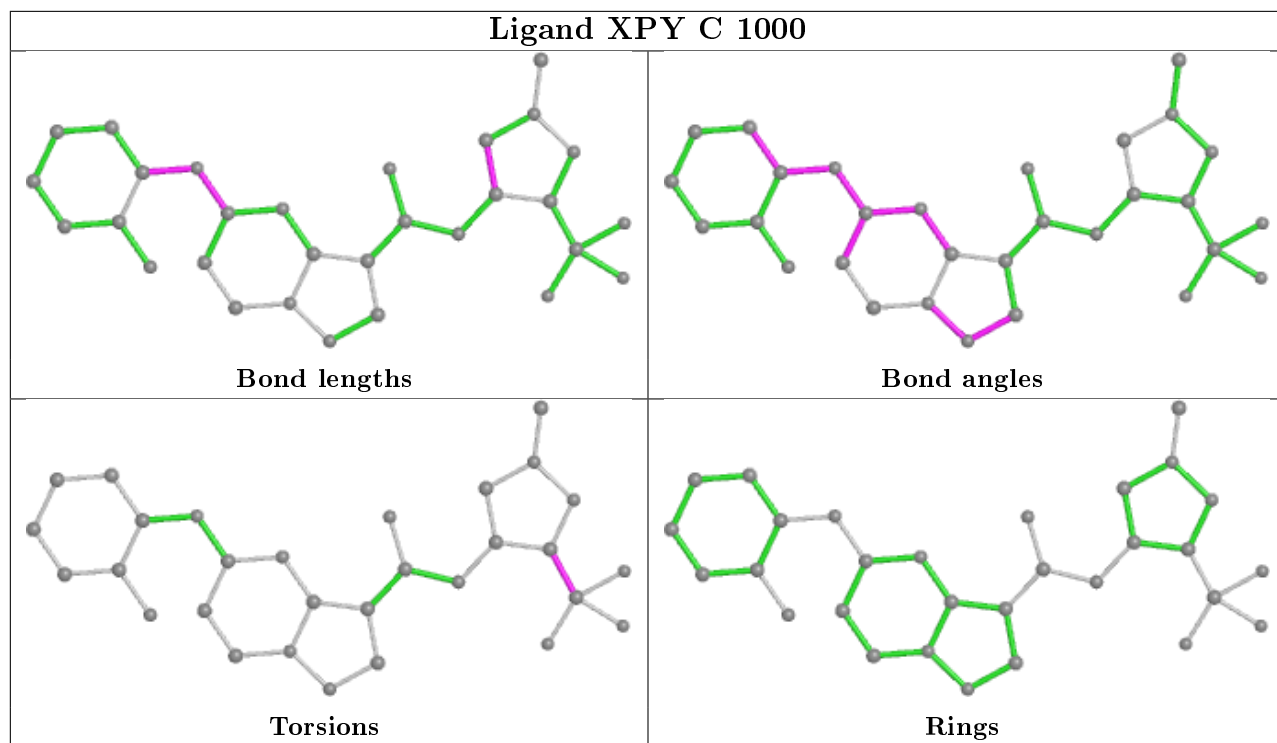
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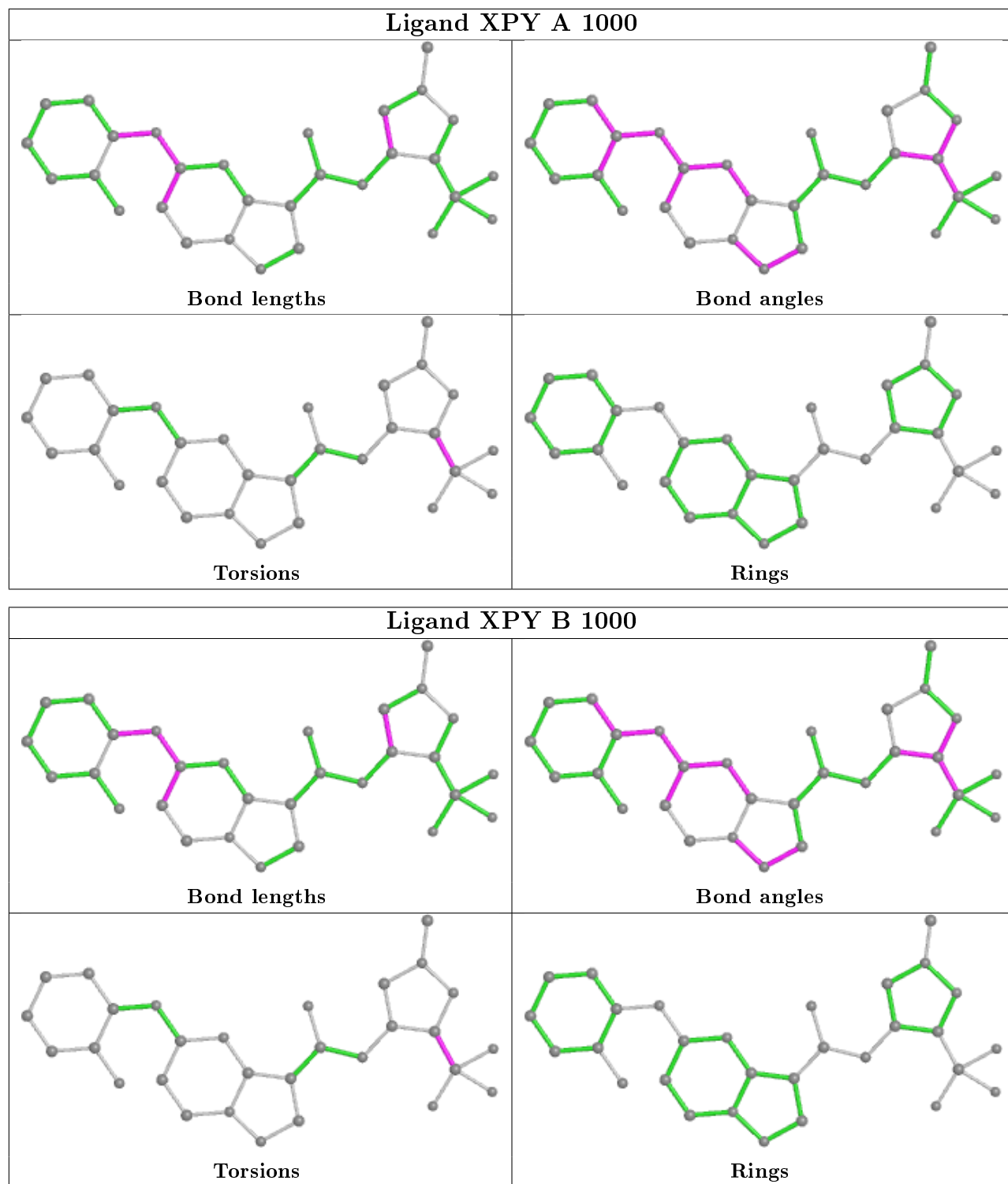
Mol	Chain	Res	Type	Atoms
2	D	1000	XPY	N6-C14-C15-F1
2	A	1000	XPY	N6-C14-C15-F1
2	B	1000	XPY	N6-C14-C15-F2
2	B	1000	XPY	N6-C14-C15-F1
2	C	1000	XPY	N6-C14-C15-F
2	C	1000	XPY	N6-C14-C15-F1
2	D	1000	XPY	N6-C14-C15-F2
2	D	1000	XPY	N6-C14-C15-F
2	A	1000	XPY	N6-C14-C15-F2
2	A	1000	XPY	N6-C14-C15-F
2	B	1000	XPY	N6-C14-C15-F

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

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	289/302 (95%)	0.47	13 (4%) 33 40	31, 52, 91, 108	0
1	B	289/302 (95%)	0.75	32 (11%) 5 6	28, 51, 94, 120	0
1	C	290/302 (96%)	0.52	17 (5%) 22 28	27, 48, 95, 112	0
1	D	288/302 (95%)	0.61	22 (7%) 13 17	28, 50, 95, 121	0
All	All	1156/1208 (95%)	0.59	84 (7%) 15 19	27, 50, 94, 121	0

All (84) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	217	ALA	10.5
1	B	221	ILE	7.1
1	B	220	ASP	6.1
1	A	254	ASP	5.8
1	D	221	ILE	5.8
1	C	256	ASP	5.5
1	D	253	SER	5.5
1	B	163	THR	5.3
1	C	217	ALA	5.0
1	D	217	ALA	4.7
1	B	240	CYS	4.7
1	C	218	MET	4.6
1	D	254	ASP	4.3
1	B	239	LYS	4.2
1	B	216	ALA	4.2
1	B	205	VAL	4.1
1	A	240	CYS	3.9
1	B	226	LEU	3.9
1	A	221	ILE	3.8
1	A	207	ASN	3.8
1	D	220	ASP	3.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	D	164	ARG	3.5
1	D	251	PHE	3.5
1	D	459	ALA	3.4
1	A	219	VAL	3.4
1	C	410	ILE	3.3
1	A	220	ASP	3.3
1	B	237	MET	3.3
1	B	254	ASP	3.2
1	C	460	SER	3.2
1	B	219	VAL	3.2
1	B	204	TYR	3.2
1	D	226	LEU	3.2
1	D	219	VAL	3.1
1	B	207	ASN	3.0
1	A	217	ALA	3.0
1	B	161	SER	2.9
1	C	185	ILE	2.8
1	D	223	THR	2.8
1	B	343	VAL	2.8
1	A	204	TYR	2.7
1	D	167	SER	2.7
1	D	347	ARG	2.7
1	B	230	PHE	2.7
1	A	187	VAL	2.7
1	C	254	ASP	2.7
1	A	206	ASN	2.7
1	A	347	ARG	2.7
1	D	168	PHE	2.7
1	D	258	LEU	2.6
1	B	187	VAL	2.6
1	D	439	GLU	2.6
1	B	251	PHE	2.6
1	B	196	GLY	2.5
1	B	258	LEU	2.5
1	D	218	MET	2.5
1	D	170	PHE	2.5
1	B	215	LEU	2.5
1	D	256	ASP	2.5
1	B	253	SER	2.5
1	C	459	ALA	2.5
1	D	410	ILE	2.4
1	B	459	ALA	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	171	TYR	2.4
1	C	219	VAL	2.4
1	B	236	VAL	2.3
1	B	235	LYS	2.3
1	C	201	TYR	2.3
1	B	256	ASP	2.3
1	B	164	ARG	2.3
1	C	165	PHE	2.3
1	B	390	HIS	2.2
1	A	336	SER	2.2
1	C	258	LEU	2.2
1	D	228	GLN	2.2
1	B	223	THR	2.2
1	C	188	GLY	2.1
1	C	226	LEU	2.1
1	B	197	PHE	2.1
1	B	392	GLU	2.0
1	C	176	VAL	2.0
1	A	251	PHE	2.0
1	D	230	PHE	2.0
1	C	336	SER	2.0

## 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, 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
1	TPO	A	342	11/12	0.70	0.18	95,96,101,101	0
1	TPO	C	342	11/12	0.70	0.20	79,85,94,95	0
1	SEP	B	346	10/11	0.73	0.14	79,83,90,90	0
1	SEP	D	346	10/11	0.75	0.18	73,80,88,89	0
1	TPO	D	342	11/12	0.80	0.14	76,77,84,85	0
1	SEP	A	346	10/11	0.84	0.14	83,87,93,93	0
1	TPO	B	342	11/12	0.89	0.12	88,89,92,92	0
1	SEP	C	346	10/11	0.89	0.11	66,75,84,85	0
1	TPO	B	345	11/12	0.91	0.13	75,77,81,82	0
1	TPO	A	345	11/12	0.91	0.13	80,82,85,86	0
1	TPO	C	345	11/12	0.96	0.11	57,60,63,65	0
1	TPO	D	345	11/12	0.97	0.12	67,69,71,73	0



### 6.3 Carbohydrates

There are no carbohydrates in this entry.

### 6.4 Ligands

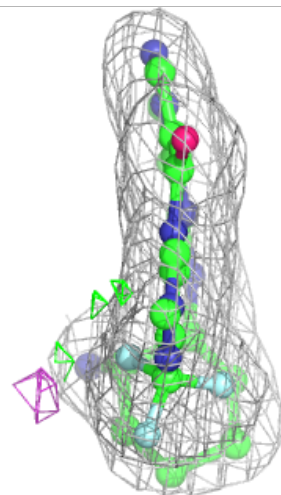
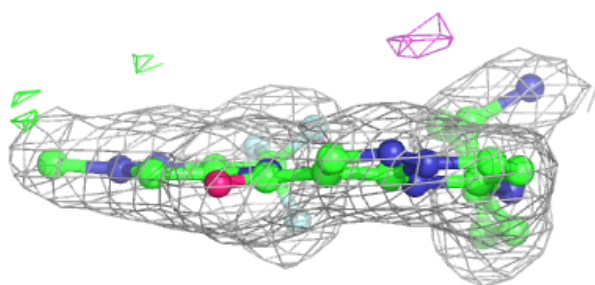
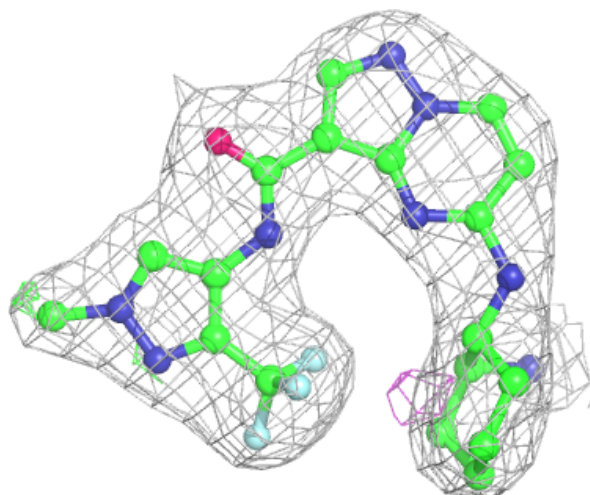
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	XPY	A	1000	30/30	0.95	0.13	29,40,48,50	0
2	XPY	C	1000	30/30	0.97	0.14	27,35,42,42	0
2	XPY	B	1000	30/30	0.97	0.13	25,33,39,42	0
2	XPY	D	1000	30/30	0.98	0.13	26,39,44,49	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.

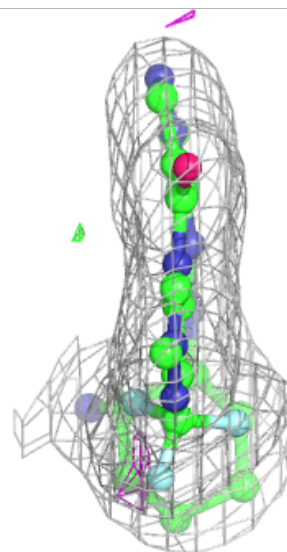
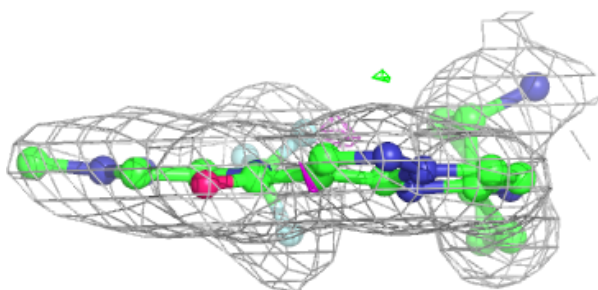
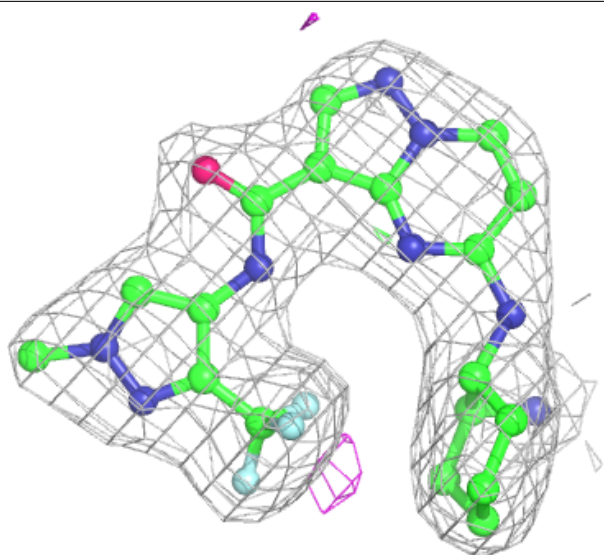
**Electron density around XPY A 1000:**

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



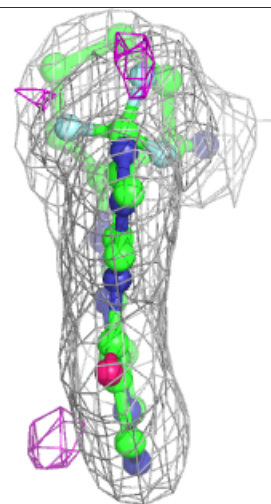
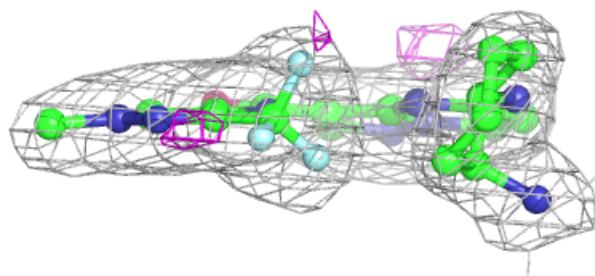
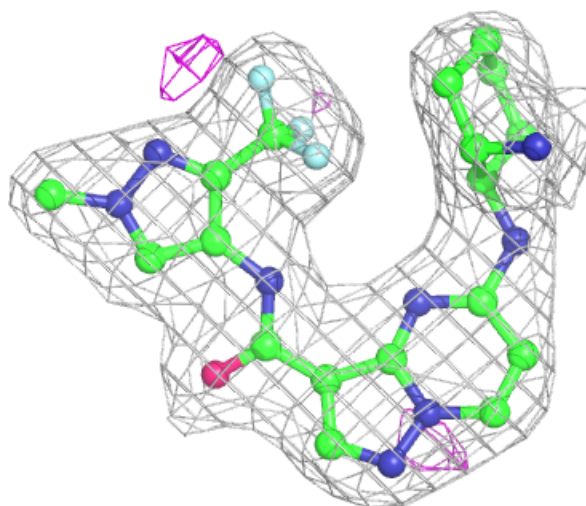
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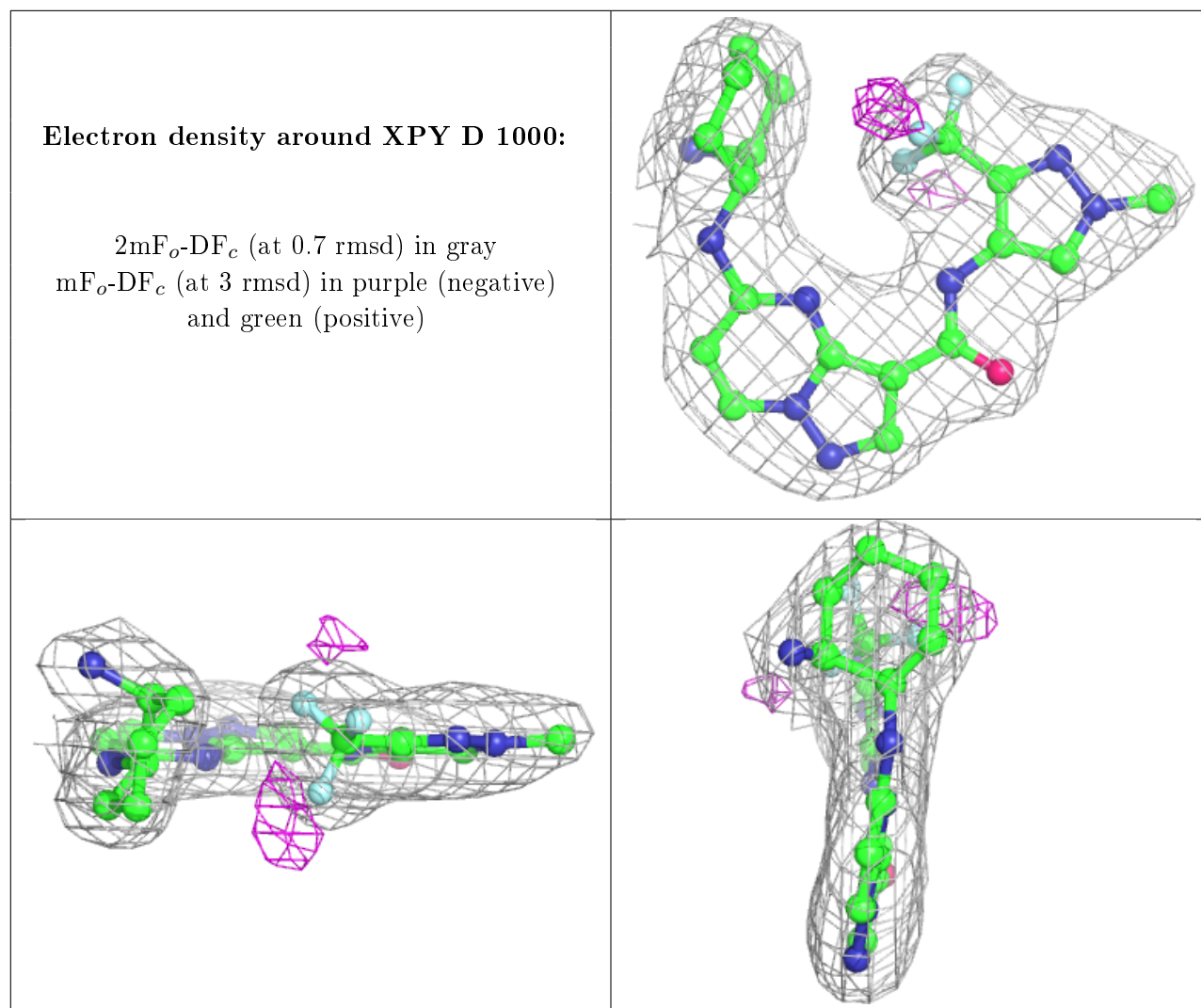
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around XPY B 1000:**

$2mF_o-DF_c$  (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.