



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 28, 2021 – 02:12 PM BST

PDB ID : 5AIK  
Title : Human DYRK1A in complex with LDN-211898  
Authors : Elkins, J.M.; Soundararajan, M.; Muniz, J.R.C.; Cuny, G.; Higgins, J.; Edwards, A.; Bountra, C.; Knapp, S.  
Deposited on : 2015-02-15  
Resolution : 2.70 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 : 2.20  
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) : 2.20

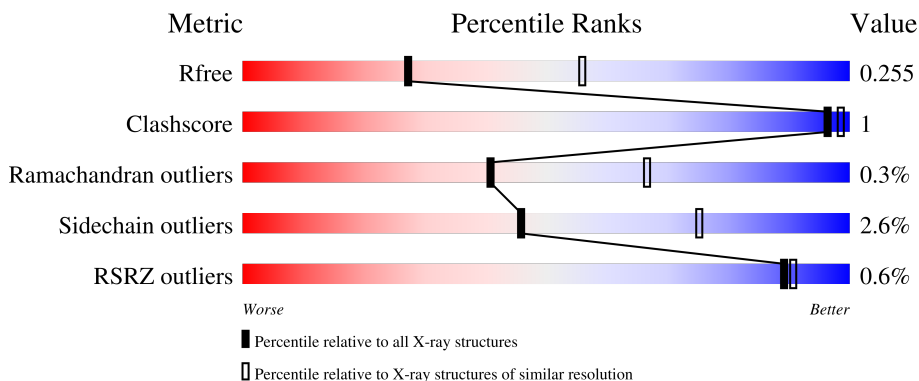
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	382	
1	B	382	
1	C	382	
1	D	382	

## 2 Entry composition i

There are 4 unique types of molecules in this entry. The entry contains 11321 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 DYRK1A DUAL-SPECIFICITY TYROSINE-PHOSPHORYLATION REGULATED KINASE 1A.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	345	2794	1799	473	504	1	17	0	0	0
1	B	343	2770	1786	469	497	1	17	0	0	0
1	C	343	2777	1789	468	502	1	17	0	0	0
1	D	343	2770	1789	464	499	1	17	0	0	0

There are 96 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	104	MET	-	expression tag	UNP Q13627
A	105	HIS	-	expression tag	UNP Q13627
A	106	HIS	-	expression tag	UNP Q13627
A	107	HIS	-	expression tag	UNP Q13627
A	108	HIS	-	expression tag	UNP Q13627
A	109	HIS	-	expression tag	UNP Q13627
A	110	HIS	-	expression tag	UNP Q13627
A	111	SER	-	expression tag	UNP Q13627
A	112	SER	-	expression tag	UNP Q13627
A	113	GLY	-	expression tag	UNP Q13627
A	114	VAL	-	expression tag	UNP Q13627
A	115	ASP	-	expression tag	UNP Q13627
A	116	LEU	-	expression tag	UNP Q13627
A	117	GLY	-	expression tag	UNP Q13627
A	118	THR	-	expression tag	UNP Q13627
A	119	GLU	-	expression tag	UNP Q13627
A	120	ASN	-	expression tag	UNP Q13627
A	121	LEU	-	expression tag	UNP Q13627
A	122	TYR	-	expression tag	UNP Q13627
A	123	PHE	-	expression tag	UNP Q13627

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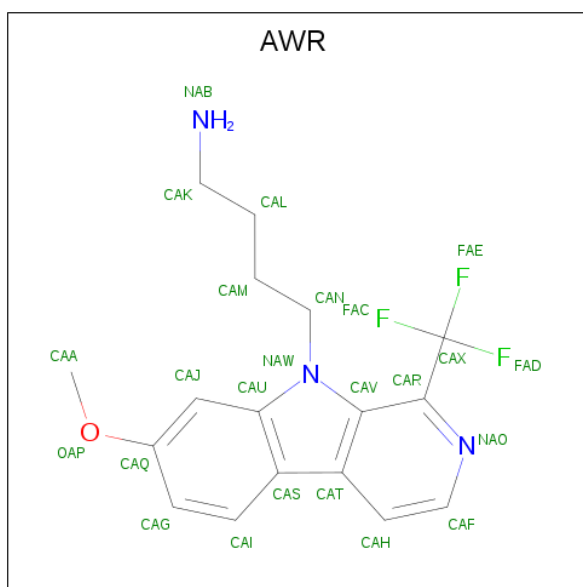
Chain	Residue	Modelled	Actual	Comment	Reference
A	124	GLN	-	expression tag	UNP Q13627
A	125	SER	-	expression tag	UNP Q13627
A	126	MET	-	expression tag	UNP Q13627
A	127	SER	-	expression tag	UNP Q13627
B	104	MET	-	expression tag	UNP Q13627
B	105	HIS	-	expression tag	UNP Q13627
B	106	HIS	-	expression tag	UNP Q13627
B	107	HIS	-	expression tag	UNP Q13627
B	108	HIS	-	expression tag	UNP Q13627
B	109	HIS	-	expression tag	UNP Q13627
B	110	HIS	-	expression tag	UNP Q13627
B	111	SER	-	expression tag	UNP Q13627
B	112	SER	-	expression tag	UNP Q13627
B	113	GLY	-	expression tag	UNP Q13627
B	114	VAL	-	expression tag	UNP Q13627
B	115	ASP	-	expression tag	UNP Q13627
B	116	LEU	-	expression tag	UNP Q13627
B	117	GLY	-	expression tag	UNP Q13627
B	118	THR	-	expression tag	UNP Q13627
B	119	GLU	-	expression tag	UNP Q13627
B	120	ASN	-	expression tag	UNP Q13627
B	121	LEU	-	expression tag	UNP Q13627
B	122	TYR	-	expression tag	UNP Q13627
B	123	PHE	-	expression tag	UNP Q13627
B	124	GLN	-	expression tag	UNP Q13627
B	125	SER	-	expression tag	UNP Q13627
B	126	MET	-	expression tag	UNP Q13627
B	127	SER	-	expression tag	UNP Q13627
C	104	MET	-	expression tag	UNP Q13627
C	105	HIS	-	expression tag	UNP Q13627
C	106	HIS	-	expression tag	UNP Q13627
C	107	HIS	-	expression tag	UNP Q13627
C	108	HIS	-	expression tag	UNP Q13627
C	109	HIS	-	expression tag	UNP Q13627
C	110	HIS	-	expression tag	UNP Q13627
C	111	SER	-	expression tag	UNP Q13627
C	112	SER	-	expression tag	UNP Q13627
C	113	GLY	-	expression tag	UNP Q13627
C	114	VAL	-	expression tag	UNP Q13627
C	115	ASP	-	expression tag	UNP Q13627
C	116	LEU	-	expression tag	UNP Q13627
C	117	GLY	-	expression tag	UNP Q13627

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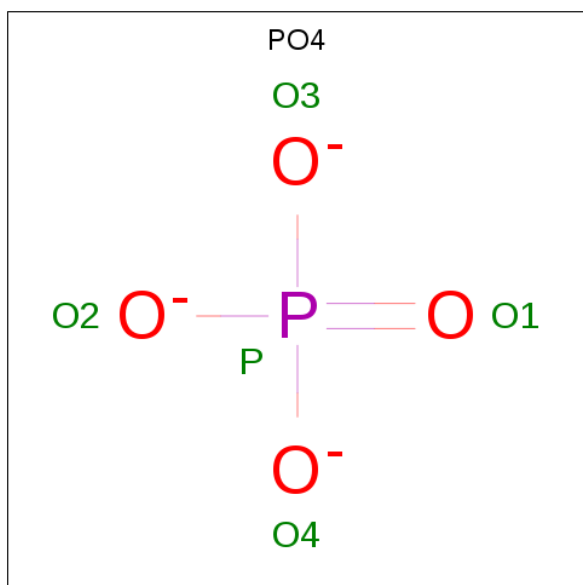
Chain	Residue	Modelled	Actual	Comment	Reference
C	118	THR	-	expression tag	UNP Q13627
C	119	GLU	-	expression tag	UNP Q13627
C	120	ASN	-	expression tag	UNP Q13627
C	121	LEU	-	expression tag	UNP Q13627
C	122	TYR	-	expression tag	UNP Q13627
C	123	PHE	-	expression tag	UNP Q13627
C	124	GLN	-	expression tag	UNP Q13627
C	125	SER	-	expression tag	UNP Q13627
C	126	MET	-	expression tag	UNP Q13627
C	127	SER	-	expression tag	UNP Q13627
D	104	MET	-	expression tag	UNP Q13627
D	105	HIS	-	expression tag	UNP Q13627
D	106	HIS	-	expression tag	UNP Q13627
D	107	HIS	-	expression tag	UNP Q13627
D	108	HIS	-	expression tag	UNP Q13627
D	109	HIS	-	expression tag	UNP Q13627
D	110	HIS	-	expression tag	UNP Q13627
D	111	SER	-	expression tag	UNP Q13627
D	112	SER	-	expression tag	UNP Q13627
D	113	GLY	-	expression tag	UNP Q13627
D	114	VAL	-	expression tag	UNP Q13627
D	115	ASP	-	expression tag	UNP Q13627
D	116	LEU	-	expression tag	UNP Q13627
D	117	GLY	-	expression tag	UNP Q13627
D	118	THR	-	expression tag	UNP Q13627
D	119	GLU	-	expression tag	UNP Q13627
D	120	ASN	-	expression tag	UNP Q13627
D	121	LEU	-	expression tag	UNP Q13627
D	122	TYR	-	expression tag	UNP Q13627
D	123	PHE	-	expression tag	UNP Q13627
D	124	GLN	-	expression tag	UNP Q13627
D	125	SER	-	expression tag	UNP Q13627
D	126	MET	-	expression tag	UNP Q13627
D	127	SER	-	expression tag	UNP Q13627

- Molecule 2 is 4-(7-METHOXY-1-(TRIFLUOROMETHYL)-9H-PYRIDO[3,4-B]INDOL-9-yl)butan-1-amine (three-letter code: AWR) (formula: C<sub>17</sub>H<sub>18</sub>F<sub>3</sub>N<sub>3</sub>O).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	F	N	O		
2	A	1	Total	C	F	N	O	0	0
			24	17	3	3	1		
2	B	1	Total	C	F	N	O	0	0
			24	17	3	3	1		
2	C	1	Total	C	F	N	O	0	0
			24	17	3	3	1		
2	D	1	Total	C	F	N	O	0	0
			24	17	3	3	1		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	C	1	Total	O	P	0	0
			5	4	1		
3	C	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		


- Molecule 4 is water.

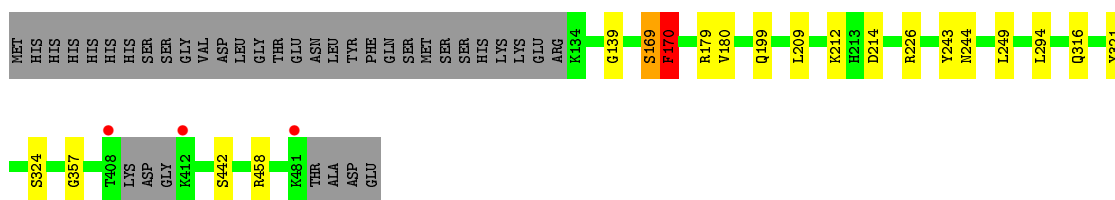
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	20	Total	O	0	0
			20	20		
4	B	23	Total	O	0	0
			23	23		
4	C	13	Total	O	0	0
			13	13		
4	D	8	Total	O	0	0
			8	8		

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


These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

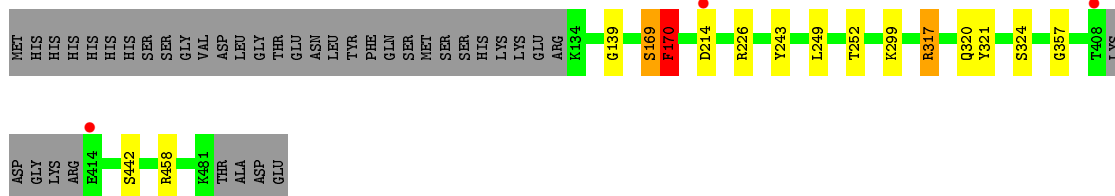
- Molecule 1: DYRK1A DUAL-SPECIFICITY TYROSINE-PHOSPHORYLATION REGULATED KINASE 1A

Chain A: 




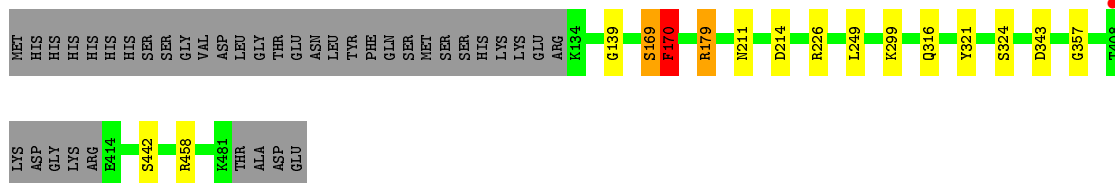
- Molecule 1: DYRK1A DUAL-SPECIFICITY TYROSINE-PHOSPHORYLATION REGULATED KINASE 1A

Chain B: 




- Molecule 1: DYRK1A DUAL-SPECIFICITY TYROSINE-PHOSPHORYLATION REGULATED KINASE 1A

Chain C: 

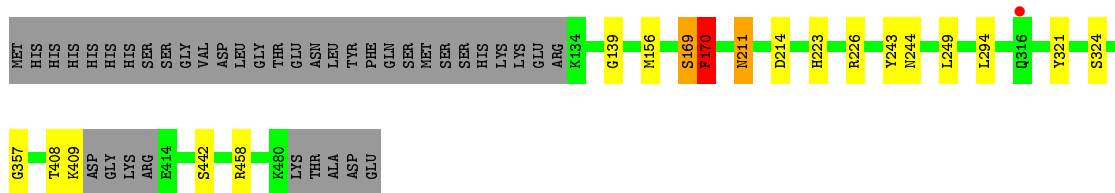


- Molecule 1: DYRK1A DUAL-SPECIFICITY TYROSINE-PHOSPHORYLATION REGULATED KINASE 1A

Chain D: 







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	89.95Å 90.89Å 232.47Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	116.23 – 2.70 35.76 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.4 (116.23-2.70) 98.4 (35.76-2.70)	Depositor EDS
$R_{merge}$	0.18	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.30 (at 2.68Å)	Xtrriage
Refinement program	REFMAC 5.8.0103	Depositor
R, $R_{free}$	0.227 , 0.252 0.230 , 0.255	Depositor DCC
$R_{free}$ test set	2665 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	38.3	Xtrriage
Anisotropy	0.245	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 0.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.42$ , $\langle L^2 \rangle = 0.25$	Xtrriage
Estimated twinning fraction	0.068 for k,h,-l	Xtrriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	11321	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.94% 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: AWR, PTR, PO4

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	0.59	0/2842	0.76	3/3838 (0.1%)
1	B	0.54	0/2818	0.76	4/3808 (0.1%)
1	C	0.55	0/2825	0.76	5/3816 (0.1%)
1	D	0.52	0/2818	0.74	5/3806 (0.1%)
All	All	0.55	0/11303	0.76	17/15268 (0.1%)

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	A	0	2
1	B	0	2
1	C	0	2
1	D	0	2
All	All	0	8

There are no bond length outliers.

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	179	ARG	NE-CZ-NH1	6.80	123.70	120.30
1	A	458	ARG	NE-CZ-NH1	6.42	123.51	120.30
1	B	317	ARG	NE-CZ-NH1	6.26	123.43	120.30
1	D	458	ARG	NE-CZ-NH1	6.08	123.34	120.30
1	B	169	SER	C-N-CA	5.89	136.44	121.70
1	A	169	SER	C-N-CA	5.73	136.02	121.70
1	C	169	SER	C-N-CA	5.68	135.90	121.70
1	D	169	SER	C-N-CA	5.63	135.77	121.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	170	PHE	CB-CA-C	5.50	121.40	110.40
1	B	170	PHE	CB-CA-C	5.45	121.29	110.40
1	D	170	PHE	CB-CA-C	5.44	121.28	110.40
1	B	458	ARG	NE-CZ-NH1	5.28	122.94	120.30
1	C	170	PHE	CB-CA-C	5.28	120.95	110.40
1	C	458	ARG	NE-CZ-NH1	5.28	122.94	120.30
1	C	343	ASP	CB-CG-OD1	5.16	122.94	118.30
1	D	156	MET	CG-SD-CE	5.12	108.39	100.20
1	D	169	SER	CA-C-N	5.04	128.28	117.20

There are no chirality outliers.

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	139	GLY	Peptide
1	A	169	SER	Peptide
1	B	139	GLY	Peptide
1	B	169	SER	Peptide
1	C	139	GLY	Peptide
1	C	169	SER	Peptide
1	D	139	GLY	Peptide
1	D	169	SER	Peptide

## 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	2794	0	2752	6	0
1	B	2770	0	2717	5	0
1	C	2777	0	2735	3	0
1	D	2770	0	2728	8	0
2	A	24	0	18	1	0
2	B	24	0	18	0	0
2	C	24	0	18	0	0
2	D	24	0	18	3	0
3	A	10	0	0	0	0
3	B	15	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	10	0	0	0	0
3	D	15	0	0	0	0
4	A	20	0	0	0	0
4	B	23	0	0	0	0
4	C	13	0	0	0	0
4	D	8	0	0	0	0
All	All	11321	0	11004	23	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 1.

All (23) 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:D:408:THR:HB	1:D:409:LYS:HA	1.57	0.86
2:D:900:AWR:FAD	2:D:900:AWR:HAN2	1.74	0.78
1:A:180:VAL:HG11	1:B:252:THR:HG22	1.69	0.72
1:A:180:VAL:CG1	1:B:252:THR:HG22	2.26	0.66
1:D:408:THR:HB	1:D:409:LYS:CA	2.31	0.57
1:D:408:THR:CB	1:D:409:LYS:HA	2.33	0.54
1:C:170:PHE:C	1:C:170:PHE:CD1	2.80	0.53
1:B:170:PHE:C	1:B:170:PHE:CD1	2.82	0.52
1:B:317:ARG:HD3	1:B:320:GLN:HG3	1.94	0.50
1:D:170:PHE:C	1:D:170:PHE:CD1	2.84	0.50
1:A:209:LEU:HD12	1:A:212:LYS:HE3	1.93	0.49
1:A:170:PHE:CD1	1:A:170:PHE:C	2.86	0.49
2:D:900:AWR:HAN2	2:D:900:AWR:CAX	2.41	0.49
1:B:249:LEU:HD22	1:B:357:GLY:HA2	1.96	0.48
1:D:211:ASN:HD21	1:D:223:HIS:CE1	2.33	0.46
1:D:249:LEU:HD22	1:D:357:GLY:HA2	1.97	0.46
1:C:249:LEU:HD22	1:C:357:GLY:HA2	1.97	0.45
1:A:249:LEU:HD22	1:A:357:GLY:HA2	1.97	0.45
1:D:294:LEU:HD23	2:D:900:AWR:HAA3	2.00	0.44
1:C:211:ASN:HD22	1:C:211:ASN:HA	1.68	0.41
1:A:244:ASN:HA	1:A:294:LEU:HA	2.03	0.41
2:A:900:AWR:HAN2	2:A:900:AWR:FAD	2.11	0.41
1:D:244:ASN:HA	1:D:294:LEU:HA	2.03	0.41

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	340/382 (89%)	327 (96%)	12 (4%)	1 (0%)	41	66
1	B	338/382 (88%)	326 (96%)	11 (3%)	1 (0%)	41	66
1	C	338/382 (88%)	326 (96%)	11 (3%)	1 (0%)	41	66
1	D	338/382 (88%)	325 (96%)	12 (4%)	1 (0%)	41	66
All	All	1354/1528 (89%)	1304 (96%)	46 (3%)	4 (0%)	41	66

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	170	PHE
1	B	170	PHE
1	C	170	PHE
1	D	170	PHE

### 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	296/339 (87%)	287 (97%)	9 (3%)	41	70
1	B	290/339 (86%)	283 (98%)	7 (2%)	49	77
1	C	295/339 (87%)	287 (97%)	8 (3%)	44	74
1	D	292/339 (86%)	285 (98%)	7 (2%)	49	77
All	All	1173/1356 (86%)	1142 (97%)	31 (3%)	46	75

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	170	PHE
1	A	179	ARG
1	A	199	GLN
1	A	214	ASP
1	A	226	ARG
1	A	243	TYR
1	A	316	GLN
1	A	324	SER
1	A	442	SER
1	B	170	PHE
1	B	214	ASP
1	B	226	ARG
1	B	243	TYR
1	B	299	LYS
1	B	324	SER
1	B	442	SER
1	C	170	PHE
1	C	179	ARG
1	C	214	ASP
1	C	226	ARG
1	C	299	LYS
1	C	316	GLN
1	C	324	SER
1	C	442	SER
1	D	170	PHE
1	D	211	ASN
1	D	214	ASP
1	D	226	ARG
1	D	243	TYR
1	D	324	SER
1	D	442	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	198	ASN
1	A	199	GLN
1	A	201	GLN
1	A	316	GLN
1	B	198	ASN
1	B	201	GLN

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Mol	Chain	Res	Type
1	C	198	ASN
1	C	201	GLN
1	C	211	ASN
1	C	313	GLN
1	D	198	ASN
1	D	201	GLN
1	D	211	ASN
1	D	223	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](#)

4 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	PTR	A	321	1	15,16,17	0.87	0	19,22,24	1.20	2 (10%)
1	PTR	D	321	1	15,16,17	0.76	0	19,22,24	0.93	1 (5%)
1	PTR	C	321	1	15,16,17	0.93	0	19,22,24	1.10	2 (10%)
1	PTR	B	321	1	15,16,17	0.92	0	19,22,24	0.96	1 (5%)

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	PTR	A	321	1	-	0/10/11/13	0/1/1/1
1	PTR	D	321	1	-	0/10/11/13	0/1/1/1
1	PTR	C	321	1	-	0/10/11/13	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	PTR	B	321	1	-	0/10/11/13	0/1/1/1

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	321	PTR	OH-P-O1P	-3.01	97.96	109.31
1	C	321	PTR	OH-P-O1P	-2.87	98.47	109.31
1	B	321	PTR	OH-P-O1P	-2.33	100.52	109.31
1	A	321	PTR	O2P-P-O1P	2.24	119.43	110.68
1	C	321	PTR	O2P-P-O1P	2.21	119.31	110.68
1	D	321	PTR	OH-P-O1P	-2.13	101.26	109.31

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

14 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	$\# Z  > 2$
3	PO4	B	1483	-	4,4,4	0.95	0	6,6,6	0.51	0
3	PO4	B	1484	-	4,4,4	0.83	0	6,6,6	0.53	0
3	PO4	A	1483	-	4,4,4	0.80	0	6,6,6	0.56	0
3	PO4	A	1484	-	4,4,4	0.90	0	6,6,6	0.73	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	PO4	B	1485	-	4,4,4	0.79	0	6,6,6	0.93	0
3	PO4	D	1484	-	4,4,4	0.91	0	6,6,6	0.39	0
2	AWR	B	900	-	24,26,26	0.73	0	28,38,38	1.14	2 (7%)
2	AWR	D	900	-	24,26,26	0.89	3 (12%)	28,38,38	1.24	2 (7%)
3	PO4	D	1482	-	4,4,4	0.91	0	6,6,6	0.43	0
3	PO4	C	1484	-	4,4,4	0.86	0	6,6,6	0.60	0
3	PO4	D	1483	-	4,4,4	0.92	0	6,6,6	0.48	0
3	PO4	C	1483	-	4,4,4	0.87	0	6,6,6	0.50	0
2	AWR	A	900	-	24,26,26	0.78	0	28,38,38	1.56	2 (7%)
2	AWR	C	900	-	24,26,26	0.78	1 (4%)	28,38,38	1.70	2 (7%)

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	AWR	A	900	-	-	2/13/13/13	0/3/3/3
2	AWR	D	900	-	-	8/13/13/13	0/3/3/3
2	AWR	B	900	-	-	3/13/13/13	0/3/3/3
2	AWR	C	900	-	-	2/13/13/13	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	900	AWR	CAH-CAF	2.30	1.39	1.36
2	C	900	AWR	CAJ-CAQ	2.06	1.40	1.37
2	D	900	AWR	CAR-CAV	2.04	1.46	1.43
2	D	900	AWR	CAJ-CAQ	2.04	1.40	1.37

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	900	AWR	CAX-CAR-CAV	7.97	126.19	119.38
2	A	900	AWR	CAX-CAR-CAV	7.08	125.44	119.38
2	D	900	AWR	CAX-CAR-CAV	4.77	123.46	119.38
2	B	900	AWR	CAX-CAR-CAV	3.95	122.75	119.38
2	D	900	AWR	CAF-CAH-CAT	-2.58	117.54	119.77
2	C	900	AWR	CAF-CAH-CAT	-2.57	117.55	119.77
2	B	900	AWR	CAF-CAH-CAT	-2.57	117.56	119.77

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Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
2	A	900	AWR	CAF-CAH-CAT	-2.56	117.56	119.77

There are no chirality outliers.

All (15) torsion outliers are listed below:

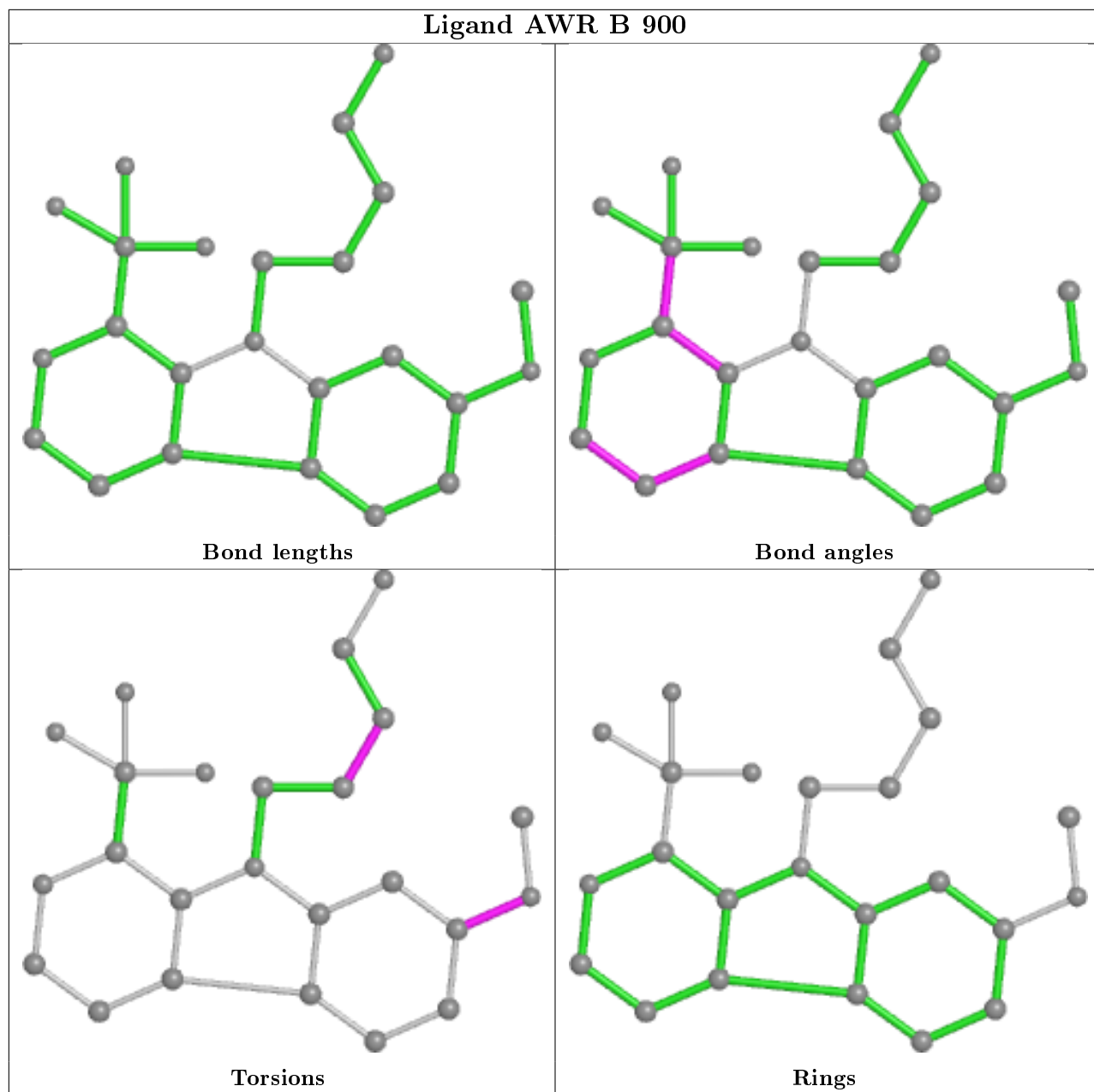
Mol	Chain	Res	Type	Atoms
2	D	900	AWR	CAM-CAN-NAW-CAV
2	D	900	AWR	CAM-CAN-NAW-CAU
2	B	900	AWR	CAG-CAQ-OAP-CAA
2	B	900	AWR	CAJ-CAQ-OAP-CAA
2	D	900	AWR	CAV-CAR-CAX-FAE
2	A	900	AWR	CAL-CAM-CAN-NAW
2	D	900	AWR	CAL-CAM-CAN-NAW
2	B	900	AWR	CAK-CAL-CAM-CAN
2	D	900	AWR	CAV-CAR-CAX-FAC
2	D	900	AWR	CAV-CAR-CAX-FAD
2	D	900	AWR	CAG-CAQ-OAP-CAA
2	D	900	AWR	CAJ-CAQ-OAP-CAA
2	A	900	AWR	CAK-CAL-CAM-CAN
2	C	900	AWR	CAK-CAL-CAM-CAN
2	C	900	AWR	NAB-CAK-CAL-CAM

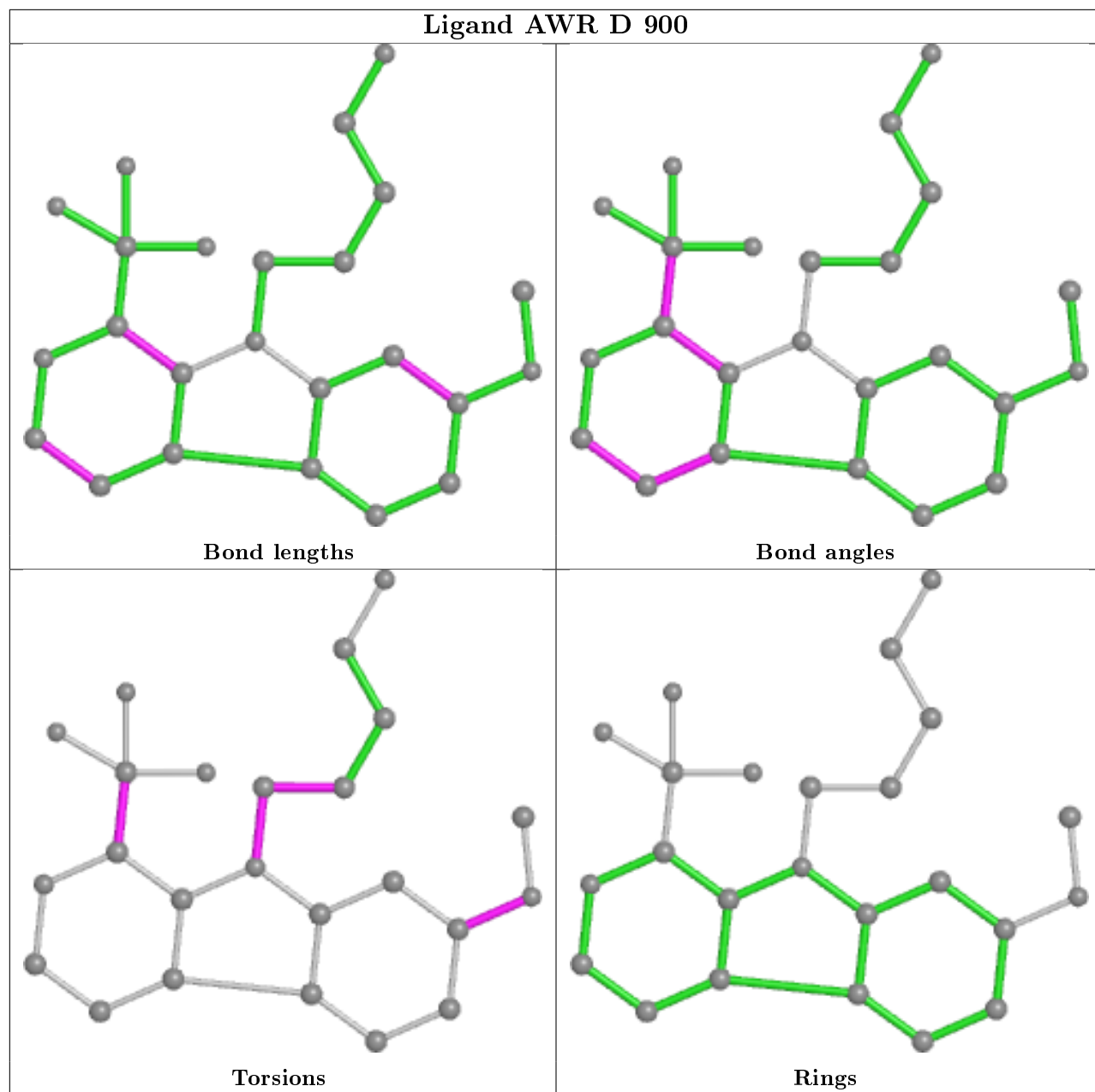
There are no ring outliers.

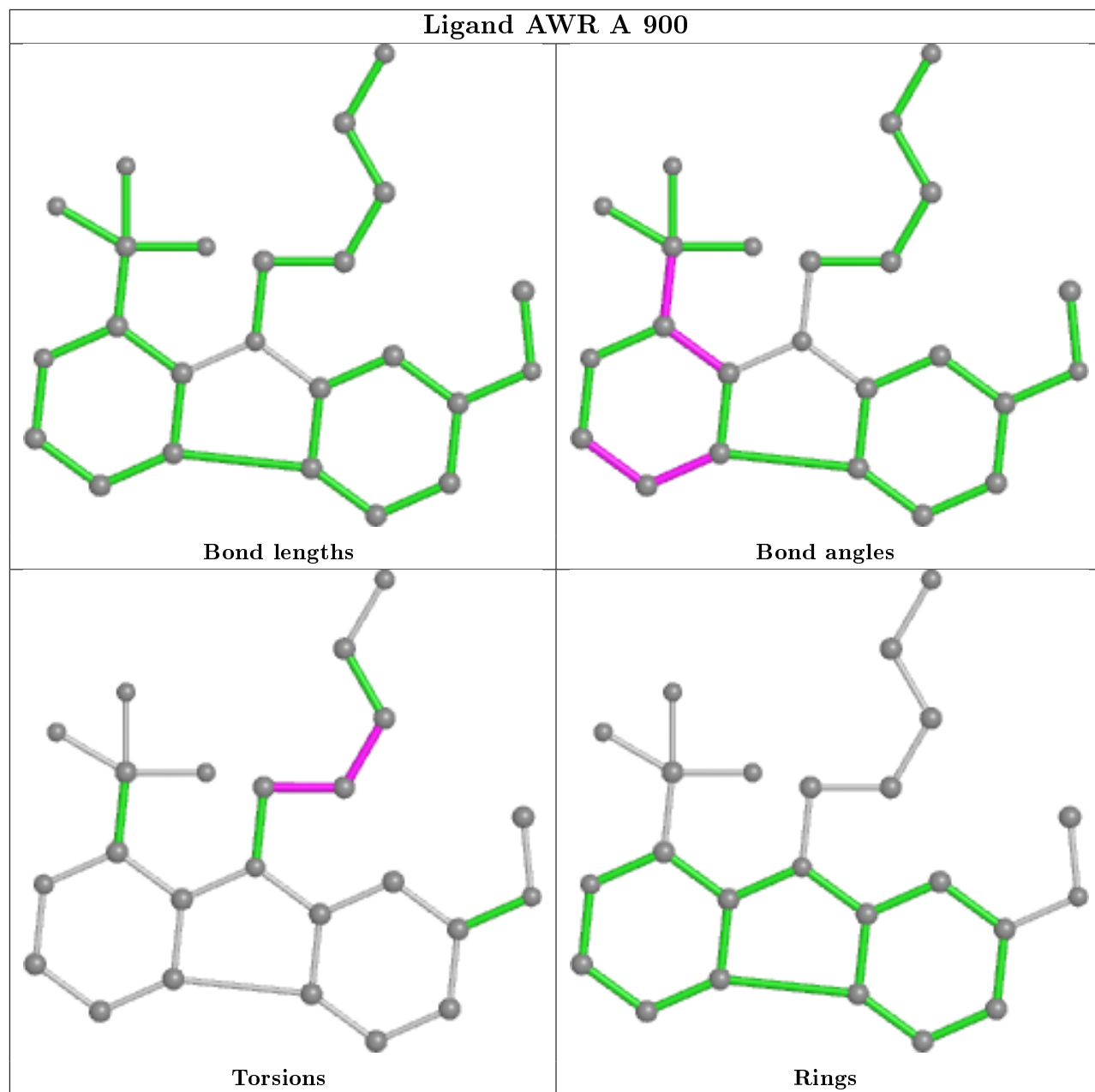
2 monomers are involved in 4 short contacts:

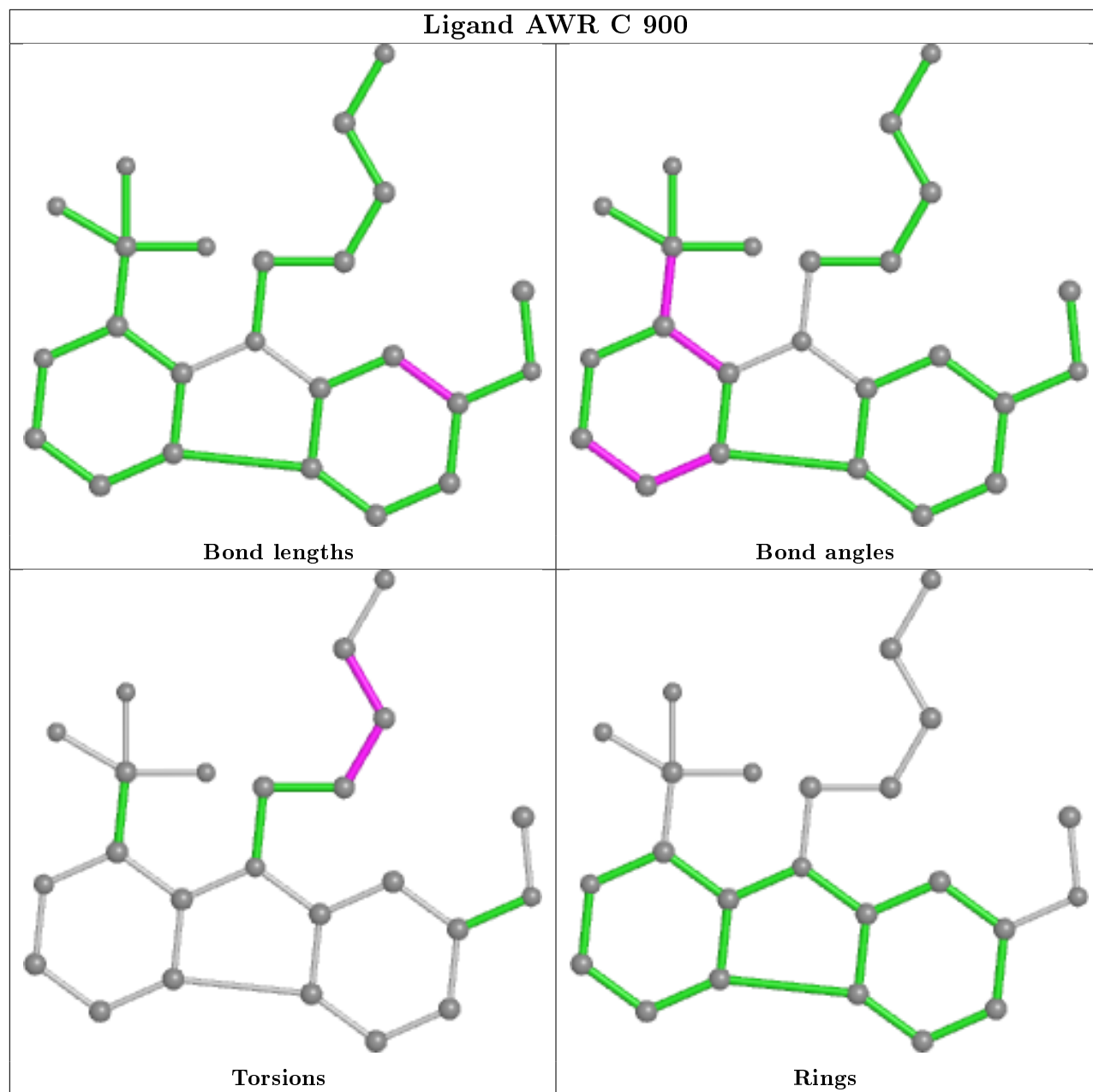
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	900	AWR	3	0
2	A	900	AWR	1	0

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









## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 6 Fit of model and data [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	344/382 (90%)	-0.50	3 (0%) 84 85	17, 32, 54, 82	0
1	B	342/382 (89%)	-0.48	3 (0%) 84 85	22, 35, 64, 93	0
1	C	342/382 (89%)	-0.39	1 (0%) 94 95	18, 41, 71, 86	0
1	D	342/382 (89%)	-0.30	1 (0%) 94 95	25, 49, 82, 109	0
All	All	1370/1528 (89%)	-0.42	8 (0%) 89 91	17, 39, 71, 109	0

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	408	THR	3.9
1	B	214	ASP	2.5
1	A	412	LYS	2.4
1	A	408	THR	2.4
1	D	316	GLN	2.2
1	B	414	GLU	2.1
1	C	408	THR	2.1
1	A	481	LYS	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	PTR	D	321	16/17	0.96	0.14	46,48,50,53	0
1	PTR	C	321	16/17	0.97	0.14	34,36,37,38	0
1	PTR	A	321	16/17	0.98	0.11	21,23,24,25	0
1	PTR	B	321	16/17	0.99	0.11	31,35,36,36	0



### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

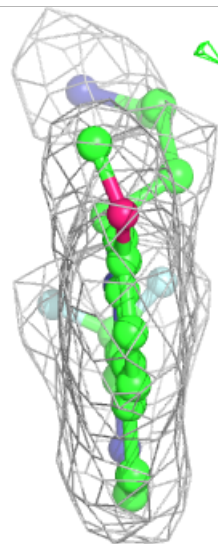
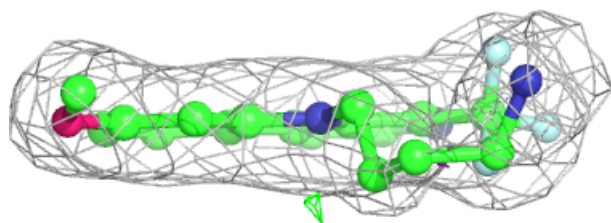
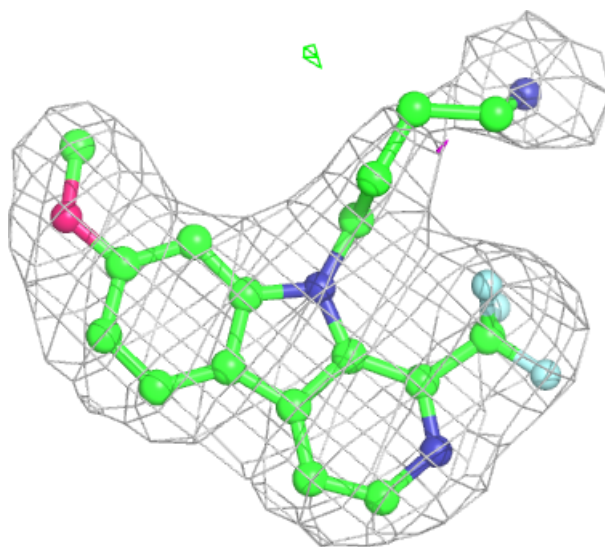
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	PO4	D	1482	5/5	0.89	0.22	65,66,69,69	0
2	AWR	C	900	24/24	0.95	0.16	26,27,38,39	0
2	AWR	D	900	24/24	0.95	0.20	36,40,56,57	0
2	AWR	B	900	24/24	0.95	0.18	35,37,51,56	0
3	PO4	A	1483	5/5	0.96	0.09	66,68,71,72	0
3	PO4	B	1483	5/5	0.96	0.10	53,55,55,55	0
3	PO4	B	1484	5/5	0.96	0.15	50,51,53,56	0
3	PO4	B	1485	5/5	0.96	0.14	41,44,44,47	0
2	AWR	A	900	24/24	0.96	0.14	32,36,52,60	0
3	PO4	C	1484	5/5	0.97	0.16	58,59,62,64	0
3	PO4	D	1483	5/5	0.97	0.10	59,60,61,62	0
3	PO4	D	1484	5/5	0.97	0.10	62,62,64,66	0
3	PO4	C	1483	5/5	0.98	0.06	58,59,63,63	0
3	PO4	A	1484	5/5	0.99	0.08	34,36,37,37	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.

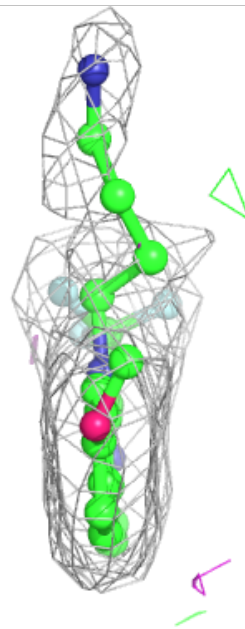
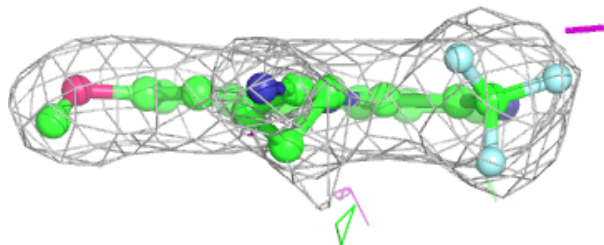
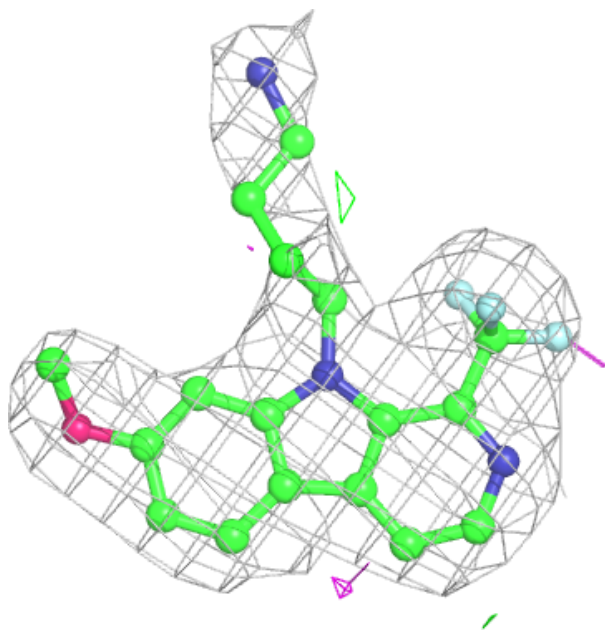
**Electron density around AWR C 900:**

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



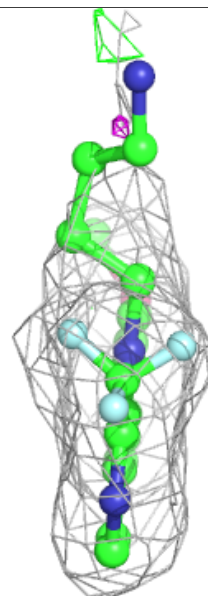
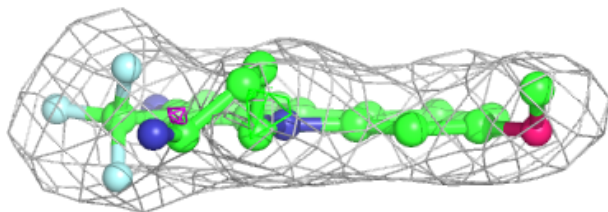
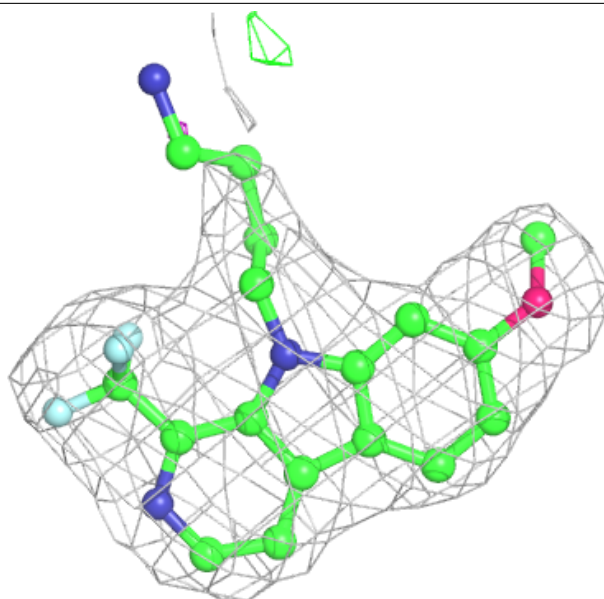
**Electron density around AWR D 900:**

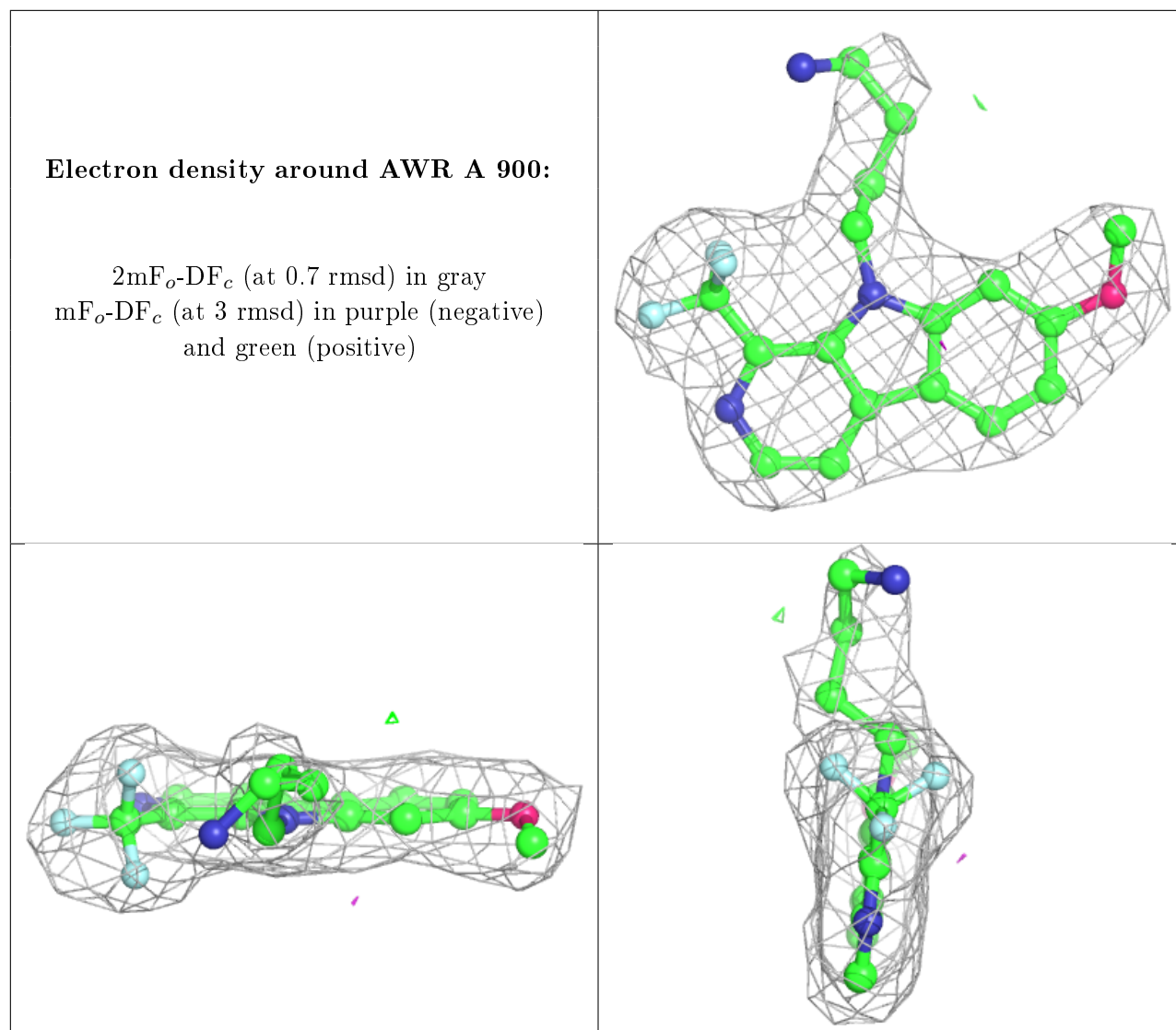
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around AWR B 900:**

$2mF_o-DF_c$  (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.