Full wwPDB X-ray Structure Validation Report (i)

Aug 6, 2023 – 07:49 AM EDT

PDB ID	:	1L1H
Title	:	Crystal Structure of the Quadruplex DNA-Drug Complex
Authors	:	Haider, S.M.; Parkinson, G.N.; Neidle, S.
Deposited on	:	2002-02-16
Resolution	:	1.75 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

The following versions of software and data (see references (i)) were used in the production of this report:

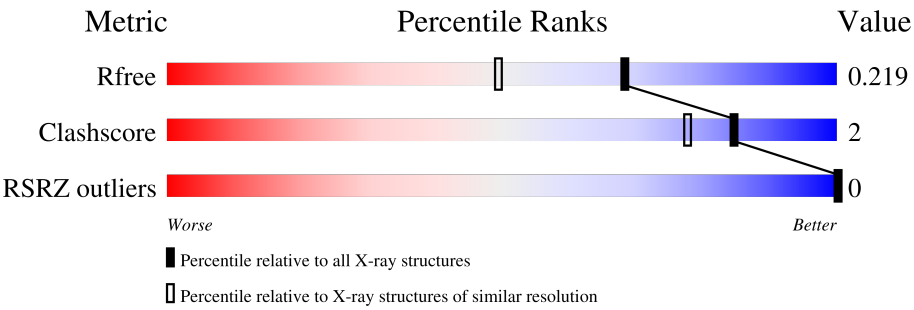
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.75 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	2340 (1.76-1.76)
Clashscore	141614	2466 (1.76-1.76)
RSRZ outliers	127900	2298 (1.76-1.76)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% 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	12	50% 50%
1	B	12	33% 67%

2 Entry composition (i)

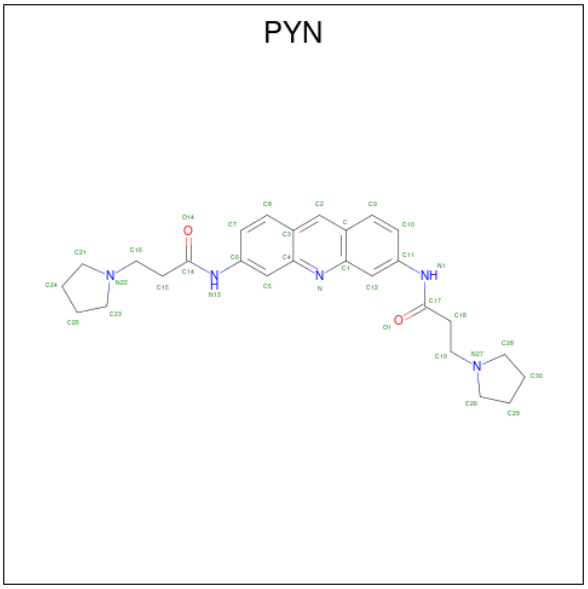
There are 4 unique types of molecules in this entry. The entry contains 690 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 DNA chain called 5'-D(*GP*GP*GP*GP*TP*TP*TP*TP*GP*GP*GP*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	A	12	253	120	48	74	11	0	0	0
1	B	12	253	120	48	74	11	0	0	0

- Molecule 2 is 3-PYRROLIDIN-1-YL-N-[6-(3-PYRROLIDIN-1-YL-PROPIONYLAMINO)-ACRIDIN-3-YL]-PROPIONAMIDE (three-letter code: PYN) (formula: $C_{27}H_{33}N_5O_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	34	27	5	2	0	0

- Molecule 3 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	K		
3	A	3	3	3	0	0
			Total	K		
3	B	1	1	1	0	0

- Molecule 4 is water.

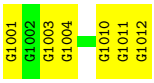
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	79	79	79	0	0
			Total	O		
4	B	67	67	67	0	0

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.

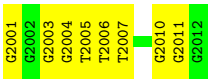
- Molecule 1: 5'-D(*GP*GP*GP*GP*TP*TP*TP*TP*GP*GP*GP*G)-3'

Chain A:



- Molecule 1: 5'-D(*GP*GP*GP*GP*TP*TP*TP*TP*GP*GP*GP*G)-3'

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	55.45Å 42.74Å 26.93Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.75 19.94 – 1.75	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-1.75) 93.6 (19.94-1.75)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	10.48 (at 1.74Å)	Xtriage
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.139 , 0.219 0.159 , 0.219	Depositor DCC
R_{free} test set	660 reflections (10.12%)	wwPDB-VP
Wilson B-factor (Å^2)	12.3	Xtriage
Anisotropy	0.335	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 56.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	690	wwPDB-VP
Average B, all atoms (Å^2)	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 16.07% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

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

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: K, PYN

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	0.76	0/284	1.97	11/440 (2.5%)
1	B	0.85	0/284	2.04	12/440 (2.7%)
All	All	0.81	0/568	2.00	23/880 (2.6%)

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	2001	DG	O4'-C1'-N9	8.81	114.17	108.00
1	A	1004	DG	O4'-C1'-N9	-8.51	102.04	108.00
1	A	1010	DG	P-O3'-C3'	8.37	129.74	119.70
1	B	2007	DT	P-O3'-C3'	7.34	128.51	119.70
1	A	1003	DG	C6-N1-C2	-7.29	120.73	125.10
1	B	2003	DG	O4'-C1'-N9	-6.93	103.15	108.00
1	B	2010	DG	P-O3'-C3'	6.77	127.82	119.70
1	A	1001	DG	C2-N3-C4	6.21	115.01	111.90
1	B	2007	DT	C6-N1-C2	6.19	124.39	121.30
1	A	1003	DG	N3-C4-C5	-6.15	125.52	128.60
1	B	2005	DT	O4'-C4'-C3'	-6.12	102.05	104.50
1	A	1012	DG	C2-N3-C4	5.95	114.88	111.90
1	A	1011	DG	C6-N1-C2	-5.70	121.68	125.10
1	B	2004	DG	N3-C2-N2	-5.61	115.97	119.90
1	A	1001	DG	C5-C6-O6	-5.52	125.29	128.60
1	A	1011	DG	O4'-C1'-N9	-5.45	104.19	108.00
1	B	2004	DG	P-O3'-C3'	5.39	126.16	119.70
1	B	2003	DG	C5-C6-O6	-5.36	125.38	128.60
1	A	1003	DG	N1-C2-N3	5.26	127.05	123.90
1	B	2006	DT	C2-N3-C4	-5.25	124.05	127.20
1	B	2006	DT	C5-C6-N1	-5.25	120.55	123.70
1	A	1011	DG	N3-C2-N2	-5.17	116.28	119.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	2005	DT	C1'-O4'-C4'	-5.14	104.96	110.10

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	253	0	138	0	0
1	B	253	0	138	1	0
2	A	34	0	33	1	0
3	A	3	0	0	0	0
3	B	1	0	0	0	0
4	A	79	0	0	0	0
4	B	67	0	0	0	0
All	All	690	0	309	2	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 2.

All (2) 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)
2:A:8001:PYN:O14	2:A:8001:PYN:H51	2.14	0.48
1:B:2011:DG:N3	1:B:2011:DG:H5'	2.35	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

There are no protein molecules in this entry.

5.3.2 Protein sidechains (i)

There are no protein molecules in this entry.

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)

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	PYN	A	8001	-	38,38,38	2.15	9 (23%)	52,52,52	1.26	3 (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
2	PYN	A	8001	-	-	7/18/32/32	0/5/5/5

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	8001	PYN	C28-N27	5.62	1.58	1.47
2	A	8001	PYN	C23-N22	5.41	1.57	1.47
2	A	8001	PYN	C26-N27	5.12	1.57	1.47
2	A	8001	PYN	C21-N22	3.93	1.55	1.47
2	A	8001	PYN	C-C1	3.70	1.47	1.42
2	A	8001	PYN	C3-C4	3.18	1.47	1.42
2	A	8001	PYN	C7-C6	3.10	1.44	1.39
2	A	8001	PYN	C10-C11	2.86	1.44	1.39
2	A	8001	PYN	C30-C28	2.61	1.60	1.51

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	8001	PYN	C30-C28-N27	-6.14	96.76	103.92
2	A	8001	PYN	C3-C2-C	-2.18	118.77	121.92
2	A	8001	PYN	C16-N22-C21	2.11	119.14	113.29

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	8001	PYN	C15-C16-N22-C21
2	A	8001	PYN	C15-C16-N22-C23
2	A	8001	PYN	C18-C19-N27-C28
2	A	8001	PYN	C18-C17-N1-C11
2	A	8001	PYN	O1-C17-N1-C11
2	A	8001	PYN	C14-C15-C16-N22
2	A	8001	PYN	C18-C19-N27-C26

There are no ring outliers.

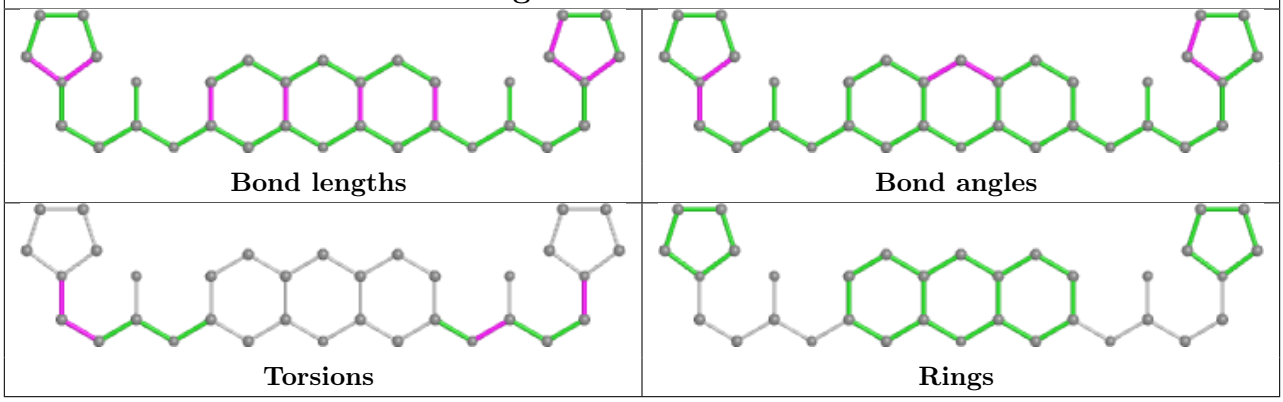
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	8001	PYN	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring

in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand PYN A 8001



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data (i)

6.1 Protein, DNA and RNA chains (i)

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	12/12 (100%)	-0.23	0	100	100	12, 14, 16, 19	0
1	B	12/12 (100%)	-0.30	0	100	100	11, 13, 14, 15	0
All	All	24/24 (100%)	-0.27	0	100	100	11, 13, 15, 19	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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

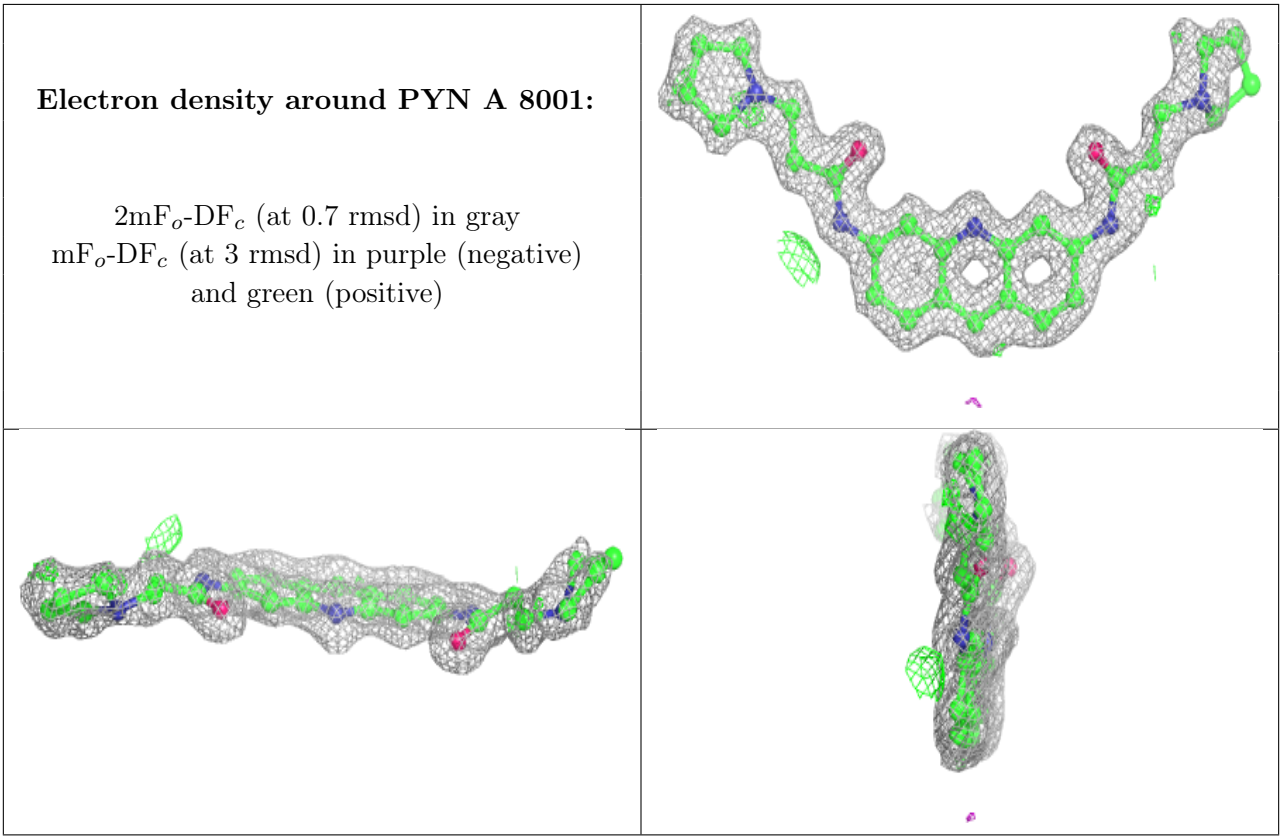
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	PYN	A	8001	34/34	0.88	0.14	6,16,30,36	0
3	K	A	6016	1/1	0.99	0.08	10,10,10,10	0
3	K	A	6015	1/1	1.00	0.08	11,11,11,11	0
3	K	A	6014	1/1	1.00	0.04	10,10,10,10	0
3	K	B	6013	1/1	1.00	0.04	12,12,12,12	0

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 PYN A 8001:

$2mF_o$-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.