Full wwPDB X-ray Structure Validation Report ⓘ

Oct 28, 2025 – 02:08 PM EDT

PDB ID	:	9O42 / pdb_00009o42
Title	:	Crystal structure of the L411A mutant of pregnane X receptor ligand binding domain in complex with SJPYT-328
Authors	:	Huber, A.D.; Garcia-Maldonado, E.; Miller, D.J.; Chen, T.
Deposited on	:	2025-04-08
Resolution	:	2.51 Å(reported)

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

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

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

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

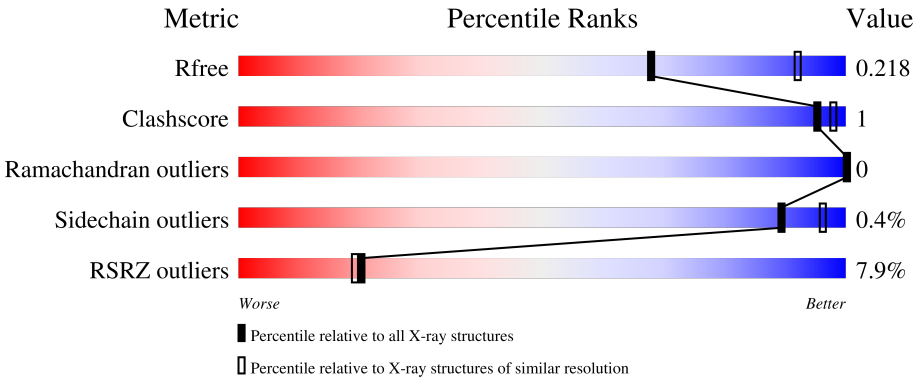
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.51 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}	164625	5504 (2.50-2.50)
Clashscore	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (2.50-2.50)

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	355	4% 79% · 18%
1	B	355	9% 79% · 19%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 4724 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 Pregnane X receptor ligand binding domain tethered to steroid receptor coactivator-1 peptide.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	292	Total	C	N	O	S	0	1	0
			2329	1498	399	413	19			
1	B	287	Total	C	N	O	S	0	1	0
			2241	1438	384	400	19			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	119	MET	-	initiating methionine	UNP O75469
A	120	LYS	-	expression tag	UNP O75469
A	121	LYS	-	expression tag	UNP O75469
A	122	GLY	-	expression tag	UNP O75469
A	123	HIS	-	expression tag	UNP O75469
A	124	HIS	-	expression tag	UNP O75469
A	125	HIS	-	expression tag	UNP O75469
A	126	HIS	-	expression tag	UNP O75469
A	127	HIS	-	expression tag	UNP O75469
A	128	HIS	-	expression tag	UNP O75469
A	129	GLY	-	expression tag	UNP O75469
A	411	ALA	LEU	engineered mutation	UNP O75469
A	432C	SER	-	linker	UNP O75469
A	432D	GLY	-	linker	UNP O75469
A	432E	GLY	-	linker	UNP O75469
A	432F	SER	-	linker	UNP O75469
A	432G	GLY	-	linker	UNP O75469
A	432H	GLY	-	linker	UNP O75469
A	432I	SER	-	linker	UNP O75469
A	432J	SER	-	linker	UNP O75469
A	432K	HIS	-	linker	UNP O75469
A	432L	SER	-	linker	UNP O75469
B	119	MET	-	initiating methionine	UNP O75469
B	120	LYS	-	expression tag	UNP O75469

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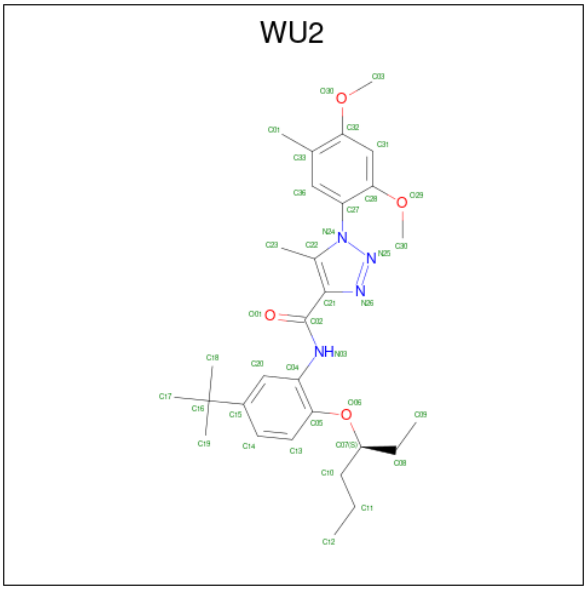
Chain	Residue	Modelled	Actual	Comment	Reference
B	121	LYS	-	expression tag	UNP O75469
B	122	GLY	-	expression tag	UNP O75469
B	123	HIS	-	expression tag	UNP O75469
B	124	HIS	-	expression tag	UNP O75469
B	125	HIS	-	expression tag	UNP O75469
B	126	HIS	-	expression tag	UNP O75469
B	127	HIS	-	expression tag	UNP O75469
B	128	HIS	-	expression tag	UNP O75469
B	129	GLY	-	expression tag	UNP O75469
B	411	ALA	LEU	engineered mutation	UNP O75469
B	431D	SER	-	linker	UNP O75469
B	431E	GLY	-	linker	UNP O75469
B	431F	GLY	-	linker	UNP O75469
B	431G	SER	-	linker	UNP O75469
B	431H	GLY	-	linker	UNP O75469
B	431I	GLY	-	linker	UNP O75469
B	431J	SER	-	linker	UNP O75469
B	431K	SER	-	linker	UNP O75469
B	431L	HIS	-	linker	UNP O75469
B	431M	SER	-	linker	UNP O75469

- Molecule 2 is (1P)-N-(5-tert-butyl-2-{[(3S)-hexan-3-yl]oxy}phenyl)-1-(2,4-dimethoxy-5-methylphenyl)-5-methyl-1H-1,2,3-triazole-4-carboxamide (CCD ID: WU2) (formula: $C_{29}H_{40}N_4O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			37	29	4	4		
2	B	1	Total	C	N	O	0	0
			37	29	4	4		

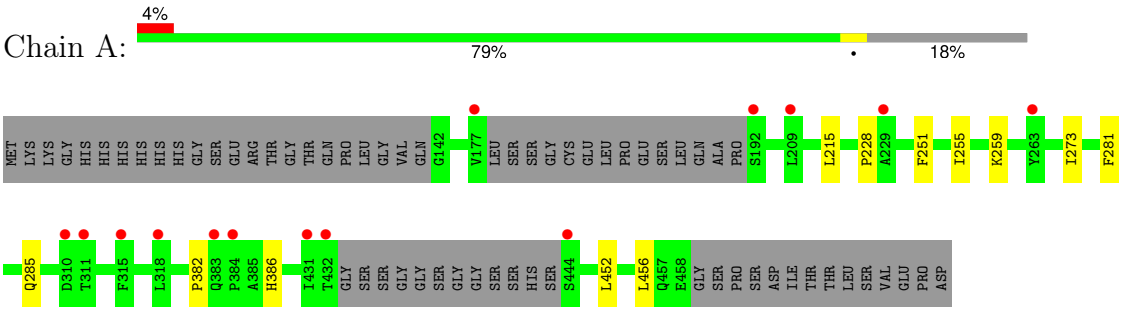
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	47	Total	O	0	0
			47	47		
3	B	33	Total	O	0	0
			33	33		

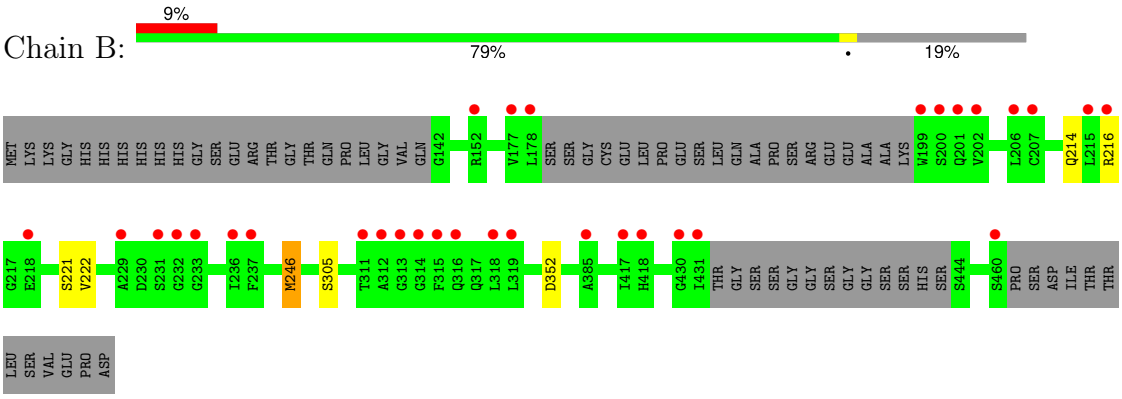
3 Residue-property plots (i)

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: Pregnane X receptor ligand binding domain tethered to steroid receptor coactivator-1 peptide



• Molecule 1: Pregnane X receptor ligand binding domain tethered to steroid receptor coactivator-1 peptide



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	85.44Å 89.91Å 106.29Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.75 – 2.51 45.75 – 2.51	Depositor EDS
% Data completeness (in resolution range)	99.7 (45.75-2.51) 99.9 (45.75-2.51)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	2.09 (at 2.51Å)	Xtriage
Refinement program	PHENIX 1.21.1_5286	Depositor
R, R_{free}	0.199 , 0.219 0.198 , 0.218	Depositor DCC
R_{free} test set	1454 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å^2)	47.2	Xtriage
Anisotropy	0.017	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 54.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.019 for k,h,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	4724	wwPDB-VP
Average B, all atoms (Å^2)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.91% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: WU2

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	0.18	0/2380	0.36	0/3210
1	B	0.19	0/2290	0.38	0/3092
All	All	0.18	0/4670	0.37	0/6302

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

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	2329	0	2296	6	0
1	B	2241	0	2152	5	0
2	A	37	0	0	0	0
2	B	37	0	0	0	0
3	A	47	0	0	0	0
3	B	33	0	0	0	0
All	All	4724	0	4448	10	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 (10) close contacts within the same asymmetric unit are listed below, sorted by their clash

magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:259:LYS:HD3	1:A:456:LEU:HA	1.75	0.66
1:A:382:PRO:HD2	1:A:386:HIS:CE1	2.46	0.51
1:A:251:PHE:CE2	1:A:255:ILE:HD11	2.52	0.45
1:B:214:GLN:HB3	1:B:305:SER:HB2	1.98	0.44
1:A:228:PRO:HD3	1:B:221:SER:HB3	2.01	0.43
1:A:273:ILE:HG23	1:A:452:LEU:HD23	2.01	0.43
1:B:216:ARG:HG2	1:B:222:VAL:HG22	2.01	0.42
1:A:281:PHE:O	1:A:285:GLN:HG2	2.20	0.42
1:B:246:MET:HA	1:B:246:MET:HE3	2.02	0.41
1:B:352:ASP:OD1	1:B:352:ASP:N	2.38	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	287/355 (81%)	280 (98%)	7 (2%)	0	100	100
1	B	282/355 (79%)	275 (98%)	7 (2%)	0	100	100
All	All	569/710 (80%)	555 (98%)	14 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	247/312 (79%)	246 (100%)	1 (0%)	89 96
1	B	230/312 (74%)	229 (100%)	1 (0%)	89 96
All	All	477/624 (76%)	475 (100%)	2 (0%)	89 96

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	215	LEU
1	B	246	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	158	GLN
1	A	289	ASN
1	A	317	GLN
1	A	344	GLN
1	A	358	GLN
1	A	418	HIS
1	B	168	HIS
1	B	289	ASN
1	B	364	GLN
1	B	380	ASN
1	B	457	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)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

2 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	WU2	A	501	-	37,39,39	1.77	7 (18%)	53,56,56	1.15	6 (11%)
2	WU2	B	501	-	37,39,39	1.83	9 (24%)	53,56,56	1.25	7 (13%)

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	WU2	A	501	-	-	3/28/31/31	0/3/3/3
2	WU2	B	501	-	-	3/28/31/31	0/3/3/3

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	WU2	O06-C05	4.27	1.44	1.37
2	A	501	WU2	O06-C05	4.20	1.44	1.37
2	B	501	WU2	C21-C02	4.10	1.56	1.50
2	A	501	WU2	C21-C02	3.86	1.56	1.50
2	A	501	WU2	C02-N03	3.83	1.46	1.35
2	B	501	WU2	O29-C28	3.76	1.43	1.37
2	B	501	WU2	C02-N03	3.72	1.46	1.35
2	A	501	WU2	O29-C28	3.62	1.43	1.37
2	B	501	WU2	O30-C32	3.48	1.42	1.37
2	B	501	WU2	C04-N03	3.33	1.48	1.41
2	A	501	WU2	O30-C32	3.31	1.42	1.37
2	A	501	WU2	C04-N03	3.25	1.48	1.41
2	A	501	WU2	C01-C33	2.69	1.56	1.51
2	B	501	WU2	C01-C33	2.56	1.55	1.51
2	B	501	WU2	C13-C14	2.03	1.42	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	WU2	N26-N25	2.01	1.38	1.34

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	501	WU2	O30-C32-C33	3.41	120.98	115.09
2	A	501	WU2	O30-C32-C33	3.03	120.33	115.09
2	B	501	WU2	O30-C32-C31	-2.99	118.93	124.08
2	A	501	WU2	O30-C32-C31	-2.88	119.11	124.08
2	A	501	WU2	C03-O30-C32	-2.82	113.37	117.51
2	B	501	WU2	C23-C22-C21	-2.67	126.35	129.67
2	B	501	WU2	C20-C04-C05	2.55	121.94	118.95
2	A	501	WU2	C20-C04-C05	2.46	121.83	118.95
2	B	501	WU2	C03-O30-C32	-2.39	114.00	117.51
2	B	501	WU2	C27-N24-N25	2.33	123.69	119.95
2	B	501	WU2	O01-C02-C21	2.22	124.29	120.75
2	A	501	WU2	C30-O29-C28	-2.15	114.36	117.51
2	A	501	WU2	C23-C22-C21	-2.10	127.06	129.67

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	WU2	C08-C07-C10-C11
2	B	501	WU2	O06-C07-C08-C09
2	A	501	WU2	O06-C07-C10-C11
2	B	501	WU2	C10-C07-C08-C09
2	A	501	WU2	O01-C02-C21-C22
2	B	501	WU2	O01-C02-C21-C22

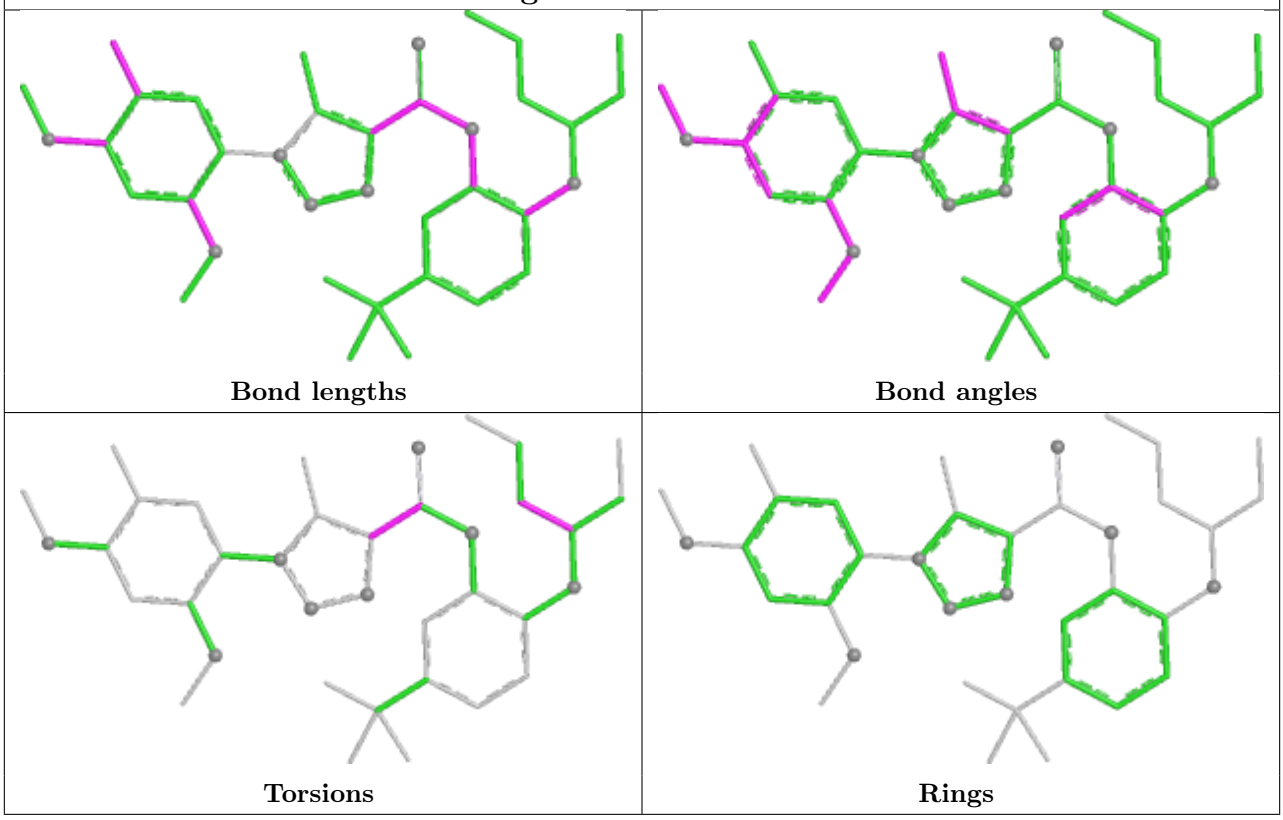
There are no ring outliers.

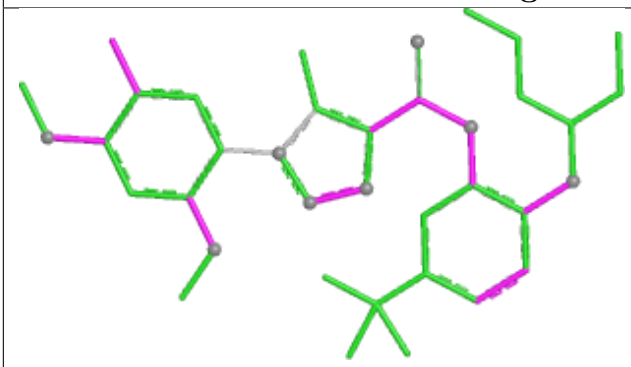
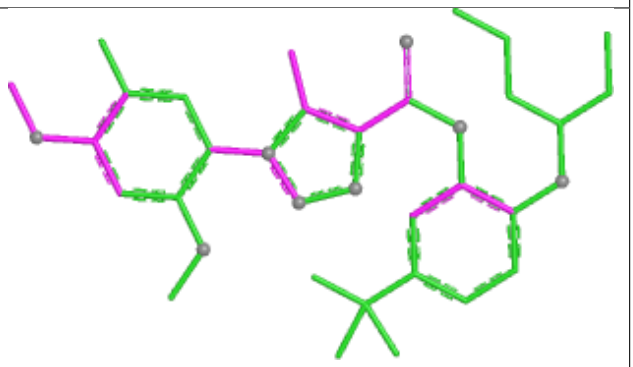
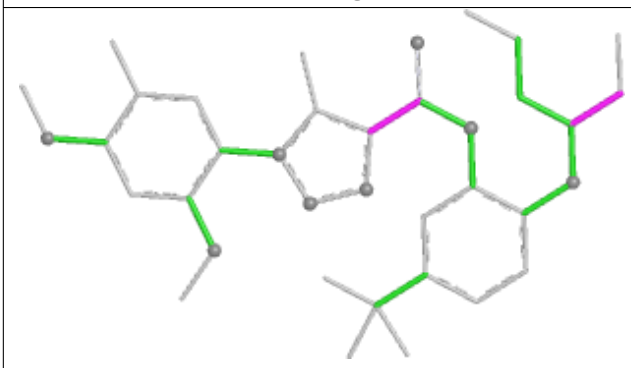
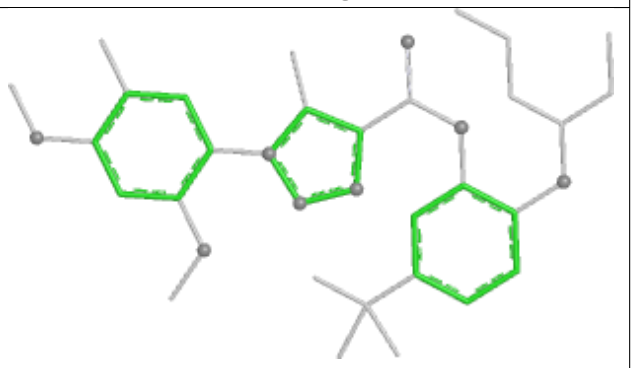
No monomer is involved in short contacts.

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 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 WU2 A 501



Ligand WU2 B 501	
 Bond lengths	 Bond angles
 Torsions	 Rings

5.7 Other polymers

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

6.1 Protein, DNA and RNA chains

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^{th} 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	292/355 (82%)	0.19	14 (4%)	36	34	18, 51, 88, 107	1 (0%)
1	B	287/355 (80%)	0.35	32 (11%)	12	11	18, 54, 97, 127	1 (0%)
All	All	579/710 (81%)	0.27	46 (7%)	20	19	18, 52, 92, 127	2 (0%)

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	199	TRP	5.4
1	B	177	VAL	4.3
1	A	177	VAL	4.2
1	B	312	ALA	4.0
1	B	178	LEU	3.8
1	A	383	GLN	3.8
1	B	202	VAL	3.7
1	A	432	THR	3.6
1	B	236	ILE	3.6
1	A	209	LEU	3.5
1	B	319	LEU	3.3
1	B	233	GLY	3.2
1	A	311	THR	3.1
1	B	417	ILE	3.0
1	A	192	SER	2.9
1	B	231	SER	2.9
1	A	384	PRO	2.9
1	A	310	ASP	2.9
1	A	315	PHE	2.9
1	A	444	SER	2.9
1	B	385	ALA	2.9
1	B	237	PHE	2.8
1	B	460	SER	2.8
1	B	201	GLN	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	318	LEU	2.7
1	B	229	ALA	2.7
1	B	431	ILE	2.7
1	B	152	ARG	2.5
1	B	311	THR	2.4
1	B	318	LEU	2.4
1	B	216	ARG	2.4
1	B	206	LEU	2.4
1	B	232	GLY	2.4
1	B	200	SER	2.3
1	B	215	LEU	2.2
1	A	229	ALA	2.1
1	B	430	GLY	2.1
1	B	207	CYS	2.1
1	B	316	GLN	2.1
1	B	313	GLY	2.1
1	B	314	GLY	2.1
1	B	418	HIS	2.1
1	A	263	TYR	2.0
1	B	315	PHE	2.0
1	B	218	GLU	2.0
1	A	431	ILE	2.0

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 oligosaccharides 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^{th} 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	WU2	A	501	37/37	0.92	0.13	42,53,66,68	0

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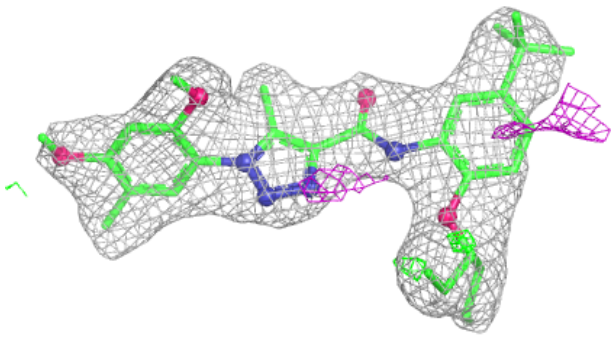
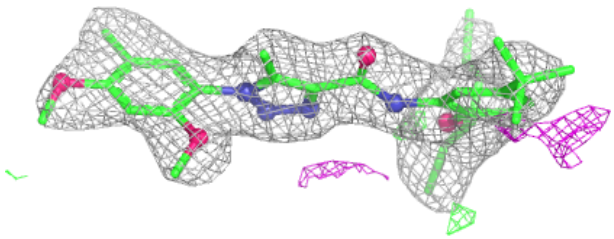
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	WU2	B	501	37/37	0.93	0.11	43,52,63,67	0

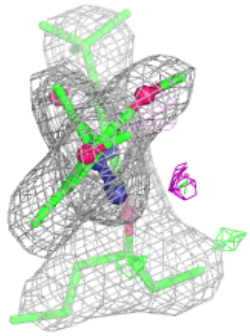
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around WU2 A 501:

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

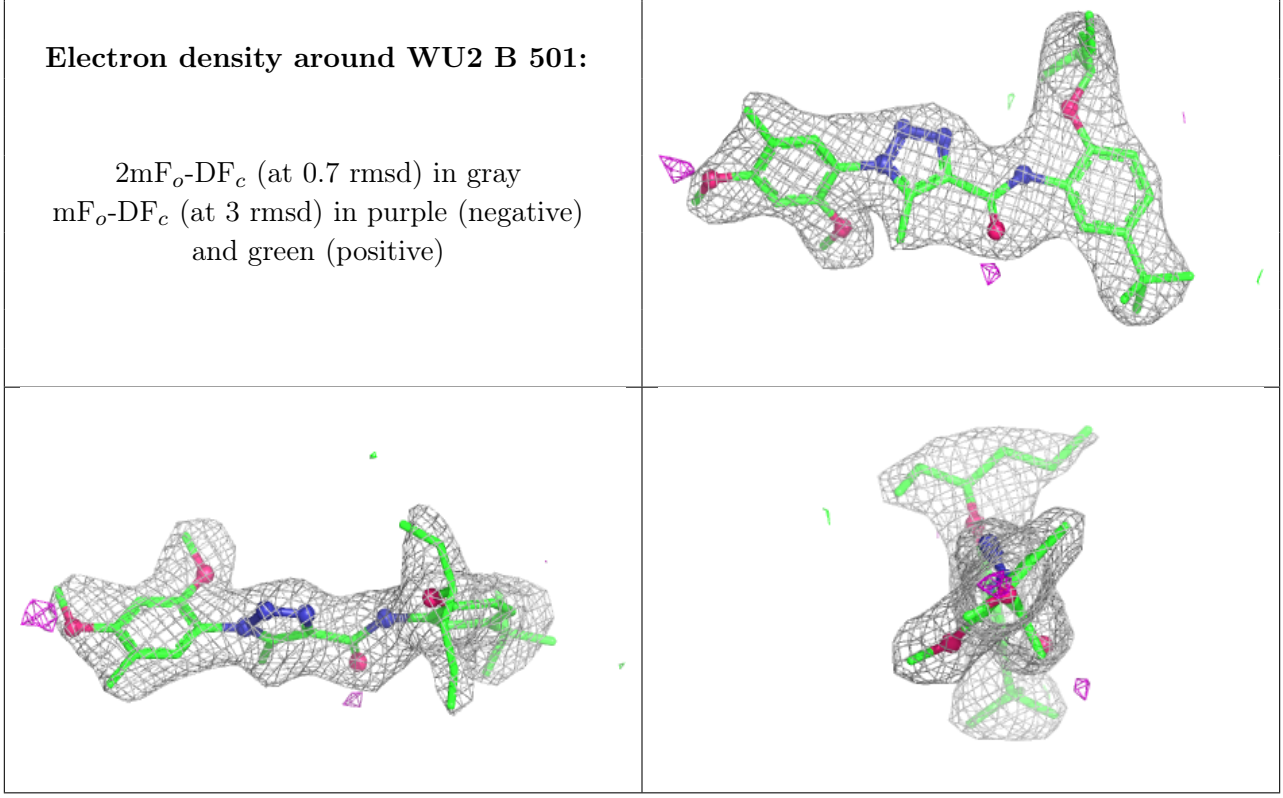






Electron density around WU2 B 501:

$2mF_o$-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.