WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Jun 15, 2024 – 08:14 AM EDT

PDB ID : 2JJG

Title : Crystal structure of the M. tuberculosis Lysine-epsilon aminotransferase (Rv3290c) complexed to an inhibitor

Authors : Tripathi, S.M.; Ramachandran, R.

Deposited on : 2008-04-04

Resolution : 2.40 Å(reported)

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

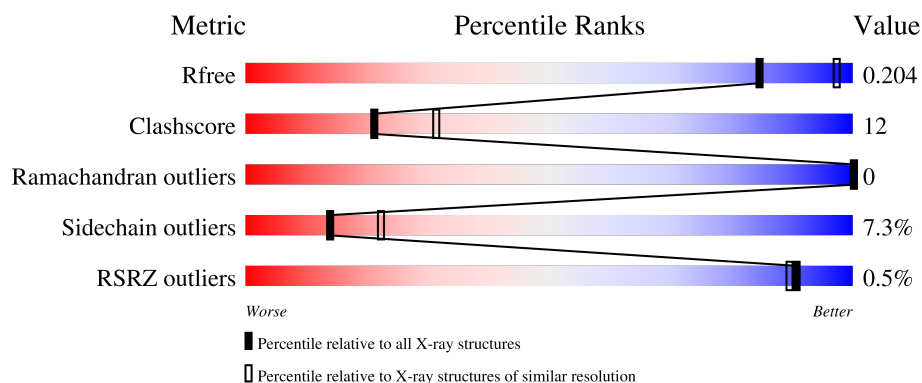|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 2.40 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	Percentile Ranks	Value
Rfree		0.204
Clashscore		12
Ramachandran outliers		0
Sidechain outliers		7.3%
RSRZ outliers		0.5%

Worse   *Better*

▌ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	449	80% 14% . .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	PLP	A	600	-	-	X	-

Continued from previous page...

| Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	L18	A	601[A]	-	-	-	X
3	L18	A	601[B]	-	-	X	X

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 3504 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 L-LYSINE EPSILON AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	435	3354	2123	597	618	16	0	1	0

- Molecule 2 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: $C_8H_{10}NO_6P$).

PLP
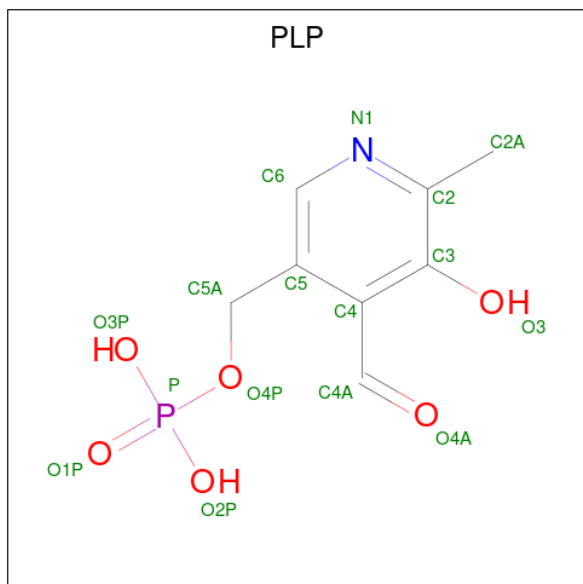
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	15	8	1	5	1	0	0

- Molecule 3 is (2S)-1-methyl-2-[(2S,4R)-2-methyl-4-phenylpentyl]piperidine (three-letter code: L18) (formula: $C_{18}H_{29}N$).

L18
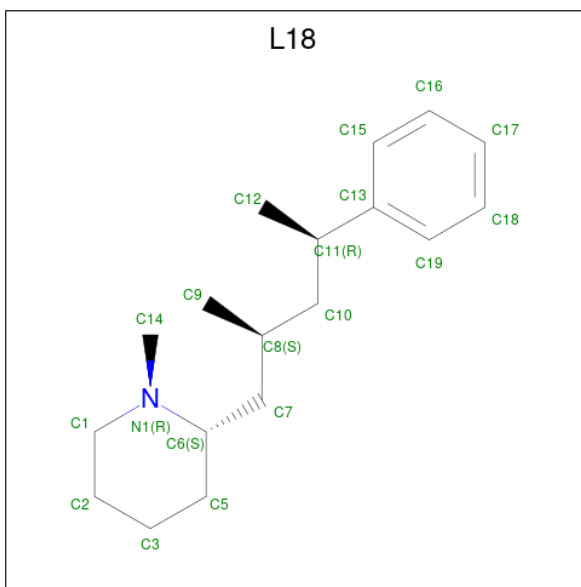
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total 27	C 25	N 2	0	1

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	108	Total 108	O 108	0	0

3 Residue-property plots ⓘ

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

• Molecule 1: L-LYSINE EPSILON AMINOTRANSFERASE

Chain A:
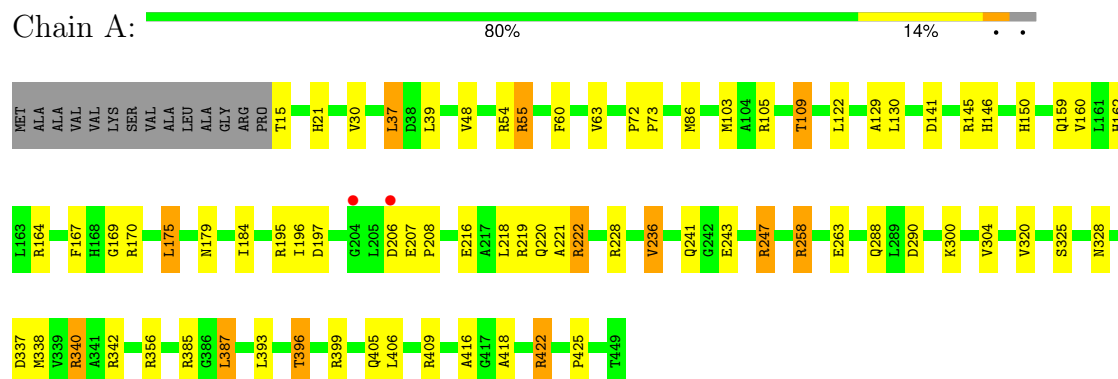
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	103.04Å　　103.04Å　　98.22Å 90.00°　　　90.00°　　　120.00°	Depositor
Resolution (Å)	89.09　–　2.40 19.85　–　2.40	Depositor EDS
% Data completeness (in resolution range)	94.0 (89.09-2.40) 93.6 (19.85-2.40)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.51 (at 2.41Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.160　,　0.205 0.160　,　0.204	Depositor DCC
R_{free} test set	1151 reflections (5.14%)	wwPDB-VP
Wilson B-factor (Å^2)	22.5	Xtriage
Anisotropy	0.094	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 33.7	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.040 for -h,-k,l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	3504	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.51% 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: L18, PLP

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	0.50	0/3434	0.69	2/4671 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	340	ARG	NE-CZ-NH1	6.03	123.31	120.30
1	A	340	ARG	NE-CZ-NH2	-5.87	117.36	120.30

There are no chirality outliers.

There are no planarity outliers.

CLOSE-CONTACTS INFOmissingINFO

5.2 Torsion angles ⓘ

5.2.1 Protein backbone ⓘ

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	434/449 (97%)	417 (96%)	17 (4%)	0	100 100

There are no Ramachandran outliers to report.

WORLDWIDE wwPDB PROTEIN DATA BANK

5.2.2 Protein sidechains ⓘ

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	345/354 (98%)	320 (93%)	25 (7%)	14	23

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	THR
1	A	37	LEU
1	A	54	ARG
1	A	55	ARG
1	A	60	PHE
1	A	86	MET
1	A	109	THR
1	A	122	LEU
1	A	130	LEU
1	A	175	LEU
1	A	206	ASP
1	A	218	LEU
1	A	222	ARG
1	A	236	VAL
1	A	247	ARG
1	A	258	ARG
1	A	290	ASP
1	A	304	VAL
1	A	320	VAL
1	A	325	SER
1	A	342	ARG
1	A	387	LEU
1	A	396	THR
1	A	406	LEU
1	A	422	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	21	HIS
1	A	150	HIS
1	A	159	GLN
1	A	162	HIS
1	A	179	ASN
1	A	220	GLN
1	A	287	GLN
1	A	288	GLN
1	A	360	HIS
1	A	405	GLN

5.2.3 RNA (i)

There are no RNA molecules in this entry.

5.3 Non-standard residues in protein, DNA, RNA chains (i)

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

5.4 Carbohydrates (i)

There are no monosaccharides in this entry.

5.5 Ligand geometry (i)

3 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	L18	A	601[B]	-	20,20,20	1.47	3 (15%)	24,26,26	1.41	4 (16%)
2	PLP	A	600	1	15,15,16	1.26	2 (13%)	21,22,23	1.42	2 (9%)
3	L18	A	601[A]	-	20,20,20	1.59	3 (15%)	24,26,26	2.27	9 (37%)

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
3	L18	A	601[B]	-	-	6/12/23/23	1/2/2/2
2	PLP	A	600	1	-	0/6/6/8	0/1/1/1
3	L18	A	601[A]	-	-	6/12/23/23	0/2/2/2

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	601[A]	L18	C1-N1	4.17	1.54	1.47
3	A	601[A]	L18	C6-N1	3.90	1.55	1.47
3	A	601[B]	L18	C6-N1	3.53	1.54	1.47
3	A	601[B]	L18	C1-N1	3.51	1.53	1.47
2	A	600	PLP	C2-N1	3.42	1.39	1.33
3	A	601[B]	L18	C14-N1	3.35	1.53	1.46
3	A	601[A]	L18	C14-N1	2.70	1.52	1.46
2	A	600	PLP	C6-N1	2.23	1.38	1.34

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	601[A]	L18	C2-C1-N1	5.88	120.55	111.36
2	A	600	PLP	C4A-C4-C5	-4.31	116.50	120.94
3	A	601[A]	L18	C1-N1-C6	3.37	118.82	112.68
3	A	601[A]	L18	C3-C2-C1	3.32	117.35	111.19
3	A	601[A]	L18	C9-C8-C7	3.07	120.21	110.84
3	A	601[A]	L18	C7-C6-C5	3.03	118.19	112.94
3	A	601[B]	L18	C9-C8-C7	-2.67	102.68	110.84
3	A	601[A]	L18	C16-C15-C13	2.62	123.78	120.65
3	A	601[B]	L18	C16-C15-C13	2.62	123.78	120.65
3	A	601[A]	L18	C3-C5-C6	2.55	115.65	110.81
3	A	601[A]	L18	C12-C11-C13	-2.41	103.71	112.33
3	A	601[B]	L18	C12-C11-C13	-2.41	103.71	112.33
3	A	601[B]	L18	C7-C8-C10	-2.36	101.58	111.08
3	A	601[A]	L18	C14-N1-C1	-2.21	106.97	110.61
2	A	600	PLP	C5-C6-N1	-2.09	120.43	123.83

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	601[A]	L18	C11-C10-C8-C9
3	A	601[B]	L18	C11-C10-C8-C9
3	A	601[B]	L18	C6-C7-C8-C9
3	A	601[B]	L18	C11-C10-C8-C7
3	A	601[B]	L18	C6-C7-C8-C10
3	A	601[A]	L18	C8-C10-C11-C13
3	A	601[B]	L18	C8-C10-C11-C13
3	A	601[A]	L18	C8-C10-C11-C12
3	A	601[B]	L18	C8-C10-C11-C12
3	A	601[A]	L18	C11-C10-C8-C7
3	A	601[A]	L18	C5-C6-C7-C8
3	A	601[A]	L18	C6-C7-C8-C10

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	601[B]	L18	C1-C2-C3-C5-C6-N1

3 monomers are involved in 23 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	601[B]	L18	9	1
2	A	600	PLP	7	0
3	A	601[A]	L18	6	1

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 L18 A 601 (B)

Ligand L18 A 601 (A)
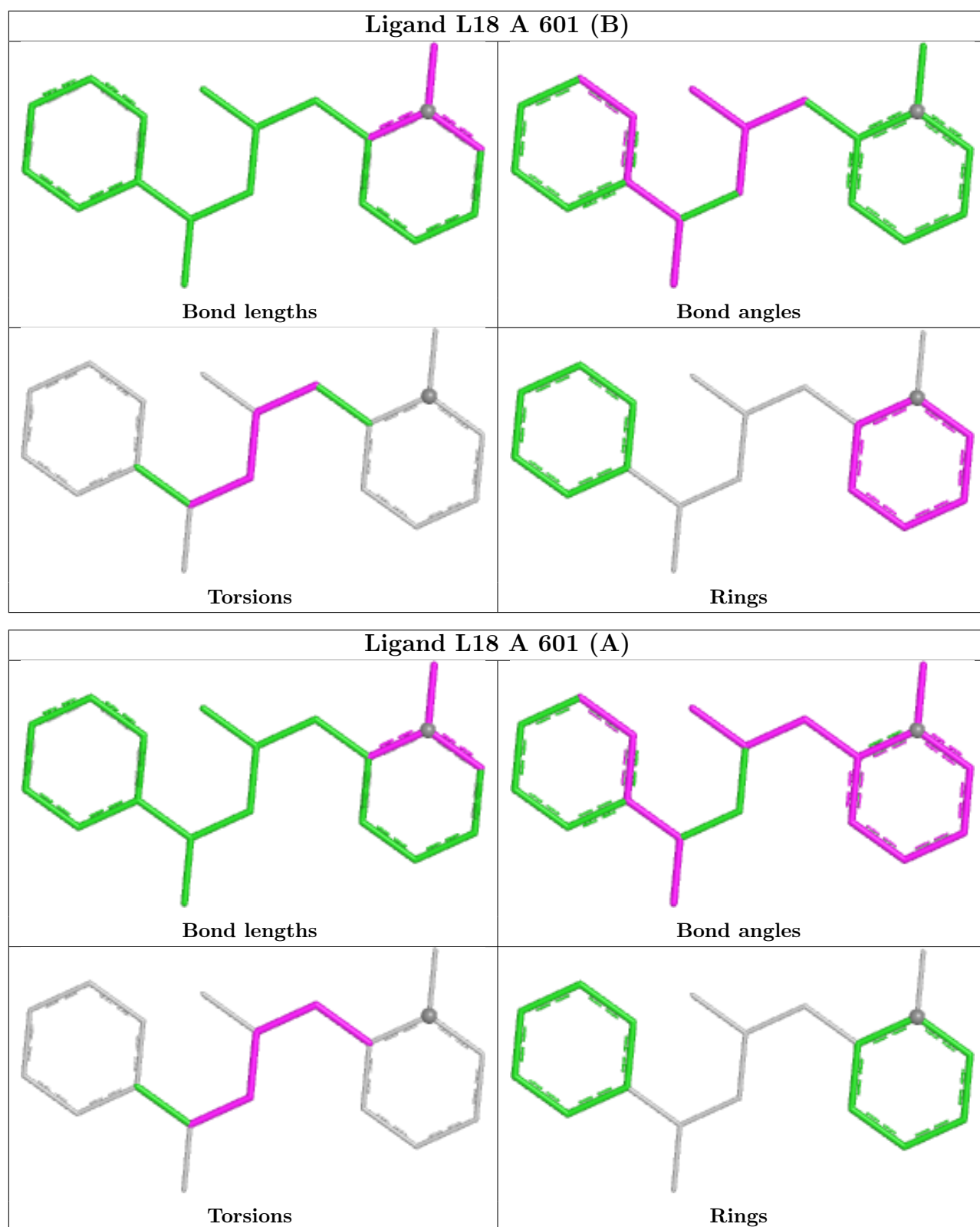
5.6 Other polymers ⓘ

There are no such residues in this entry.

5.7 Polymer linkage issues (i)

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, 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(Å²)	Q<0.9
1	A	435/449 (96%)	-0.80	2 (0%)	91	89	10, 20, 34, 51	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	204	GLY	3.2
1	A	206	ASP	2.5

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

There are no monosaccharides 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, 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(Å²)	Q<0.9
3	L18	A	601[A]	19/19	0.68	0.53	56,58,66,66	8
3	L18	A	601[B]	19/19	0.68	0.53	56,57,59,59	8
2	PLP	A	600	15/16	0.98	0.07	14,16,19,20	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.
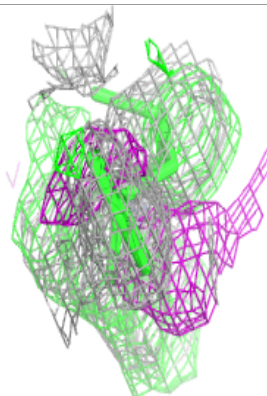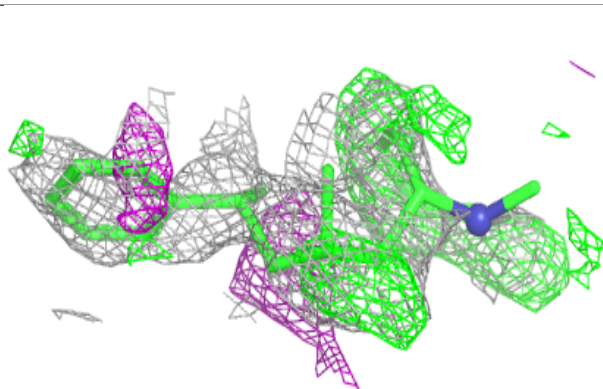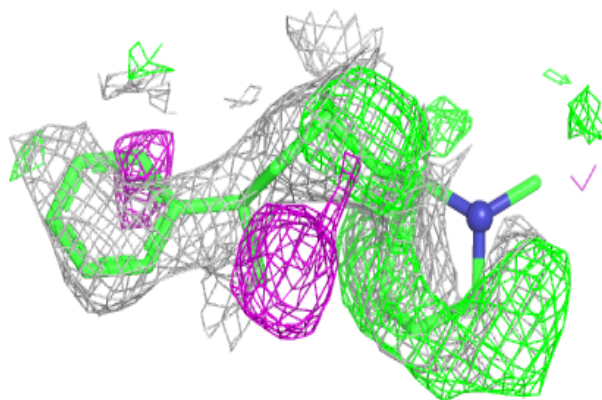
Electron density around L18 A 601 (A):

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
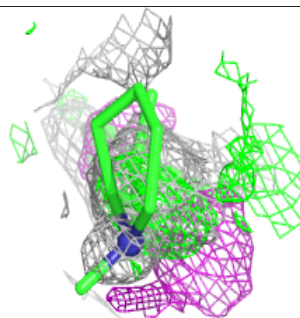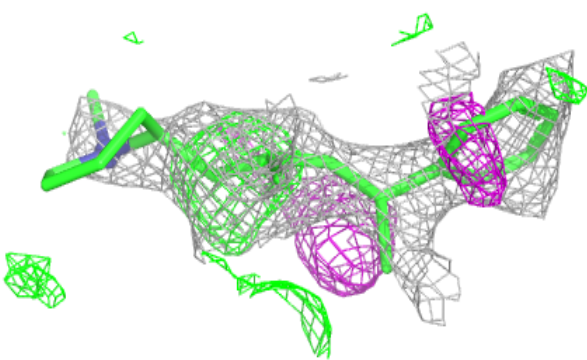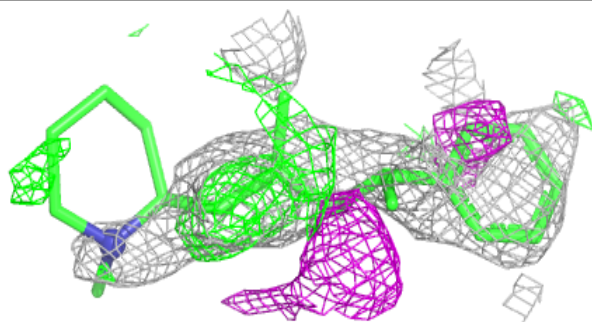
Electron density around L18 A 601 (B):

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

6.5 Other polymers ⓘ

There are no such residues in this entry.