WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 22, 2021 – 04:07 pm GMT

PDB ID	:	6Z3S
Title	:	Crystal structure of delta466-491 cystathionine beta-synthase from Toxoplasma gondii with O-Acetylserine
Authors	:	Fernandez-Rodriguez, C.; Oyenarte, I.; Conter, C.; Gonzalez-Recio, I.; Quintana, I.; Martinez-Chantar, M.; Astegno, A.; Martinez-Cruz, L.A.
Deposited on	:	2020-05-21
Resolution	:	3.05 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see references ⓘ) were used in the production of this report:

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4 (270009), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.23.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0267
CCP4	:	7.1.010 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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 3.05 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.
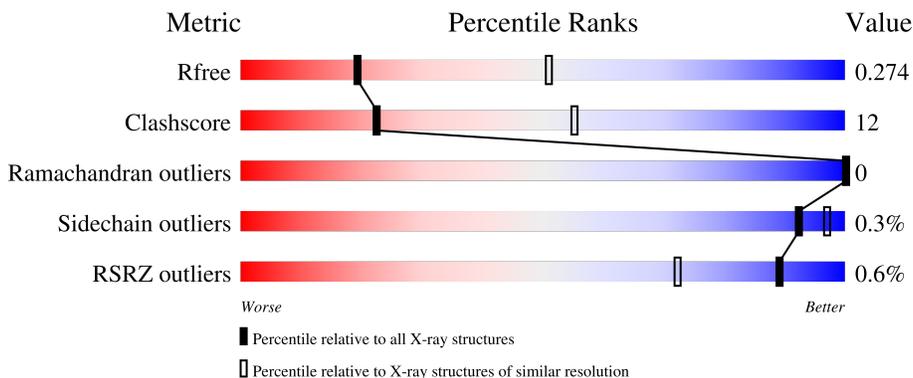
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2752 (3.08-3.00)
Clashscore	141614	3096 (3.08-3.00)
Ramachandran outliers	138981	2986 (3.08-3.00)
Sidechain outliers	138945	2988 (3.08-3.00)
RSRZ outliers	127900	2636 (3.08-3.00)

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	490	73% 24% .
1	B	490	.% 71% 23% 6%
1	D	490	72% 24% .

2   Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 10623 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 Cystathionine beta-synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	D	468	Total	C	N	O	S	0	0	0
			3521	2211	618	667	25			
1	A	475	Total	C	N	O	S	0	0	0
			3565	2235	626	679	25			
1	B	462	Total	C	N	O	S	0	0	0
			3474	2182	610	658	24			

There are 72 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	?	-	SER	deletion	UNP A0A125YSJ9
D	?	-	THR	deletion	UNP A0A125YSJ9
D	?	-	LYS	deletion	UNP A0A125YSJ9
D	?	-	LYS	deletion	UNP A0A125YSJ9
D	?	-	GLN	deletion	UNP A0A125YSJ9
D	?	-	ALA	deletion	UNP A0A125YSJ9
D	?	-	GLY	deletion	UNP A0A125YSJ9
D	?	-	MET	deletion	UNP A0A125YSJ9
D	?	-	GLY	deletion	UNP A0A125YSJ9
D	?	-	GLU	deletion	UNP A0A125YSJ9
D	?	-	HIS	deletion	UNP A0A125YSJ9
D	?	-	GLU	deletion	UNP A0A125YSJ9
D	?	-	ARG	deletion	UNP A0A125YSJ9
D	?	-	ALA	deletion	UNP A0A125YSJ9
D	?	-	LYS	deletion	UNP A0A125YSJ9
D	?	-	ILE	deletion	UNP A0A125YSJ9
D	?	-	SER	deletion	UNP A0A125YSJ9
D	?	-	LEU	deletion	UNP A0A125YSJ9
D	?	-	ARG	deletion	UNP A0A125YSJ9
D	?	-	LYS	deletion	UNP A0A125YSJ9
D	?	-	ALA	deletion	UNP A0A125YSJ9
D	?	-	GLY	deletion	UNP A0A125YSJ9
D	?	-	ASN	deletion	UNP A0A125YSJ9

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Chain	Residue	Modelled	Actual	Comment	Reference
D	?	-	SER	deletion	UNP A0A125YSJ9
A	?	-	SER	deletion	UNP A0A125YSJ9
A	?	-	THR	deletion	UNP A0A125YSJ9
A	?	-	LYS	deletion	UNP A0A125YSJ9
A	?	-	LYS	deletion	UNP A0A125YSJ9
A	?	-	GLN	deletion	UNP A0A125YSJ9
A	?	-	ALA	deletion	UNP A0A125YSJ9
A	?	-	GLY	deletion	UNP A0A125YSJ9
A	?	-	MET	deletion	UNP A0A125YSJ9
A	?	-	GLY	deletion	UNP A0A125YSJ9
A	?	-	GLU	deletion	UNP A0A125YSJ9
A	?	-	HIS	deletion	UNP A0A125YSJ9
A	?	-	GLU	deletion	UNP A0A125YSJ9
A	?	-	ARG	deletion	UNP A0A125YSJ9
A	?	-	ALA	deletion	UNP A0A125YSJ9
A	?	-	LYS	deletion	UNP A0A125YSJ9
A	?	-	ILE	deletion	UNP A0A125YSJ9
A	?	-	SER	deletion	UNP A0A125YSJ9
A	?	-	LEU	deletion	UNP A0A125YSJ9
A	?	-	ARG	deletion	UNP A0A125YSJ9
A	?	-	LYS	deletion	UNP A0A125YSJ9
A	?	-	ALA	deletion	UNP A0A125YSJ9
A	?	-	GLY	deletion	UNP A0A125YSJ9
A	?	-	ASN	deletion	UNP A0A125YSJ9
A	?	-	SER	deletion	UNP A0A125YSJ9
B	?	-	SER	deletion	UNP A0A125YSJ9
B	?	-	THR	deletion	UNP A0A125YSJ9
B	?	-	LYS	deletion	UNP A0A125YSJ9
B	?	-	LYS	deletion	UNP A0A125YSJ9
B	?	-	GLN	deletion	UNP A0A125YSJ9
B	?	-	ALA	deletion	UNP A0A125YSJ9
B	?	-	GLY	deletion	UNP A0A125YSJ9
B	?	-	MET	deletion	UNP A0A125YSJ9
B	?	-	GLY	deletion	UNP A0A125YSJ9
B	?	-	GLU	deletion	UNP A0A125YSJ9
B	?	-	HIS	deletion	UNP A0A125YSJ9
B	?	-	GLU	deletion	UNP A0A125YSJ9
B	?	-	ARG	deletion	UNP A0A125YSJ9
B	?	-	ALA	deletion	UNP A0A125YSJ9
B	?	-	LYS	deletion	UNP A0A125YSJ9
B	?	-	ILE	deletion	UNP A0A125YSJ9
B	?	-	SER	deletion	UNP A0A125YSJ9

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	LEU	deletion	UNP A0A125YSJ9
B	?	-	ARG	deletion	UNP A0A125YSJ9
B	?	-	LYS	deletion	UNP A0A125YSJ9
B	?	-	ALA	deletion	UNP A0A125YSJ9
B	?	-	GLY	deletion	UNP A0A125YSJ9
B	?	-	ASN	deletion	UNP A0A125YSJ9
B	?	-	SER	deletion	UNP A0A125YSJ9

- Molecule 2 is 2-[({3-HYDROXY-2-METHYL-5-[(PHOSPHONOOXY)METHYL]PYRIDIN-4-YL}METHYL)AMINO]ACRYLIC ACID (three-letter code: P1T) (formula: $C_{11}H_{15}N_2O_7P$) (labeled as "Ligand of Interest" by depositor).
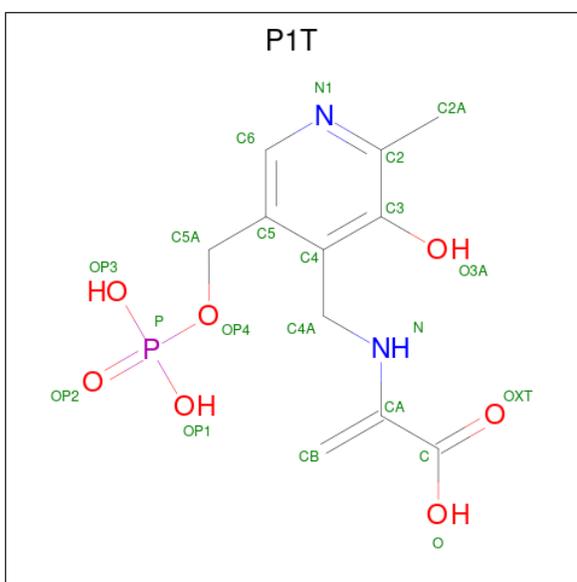
| Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	D	1	Total	C	N	O	P	0	0
			21	11	2	7	1		
2	A	1	Total	C	N	O	P	0	0
			21	11	2	7	1		
2	B	1	Total	C	N	O	P	0	0
			21	11	2	7	1		

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.

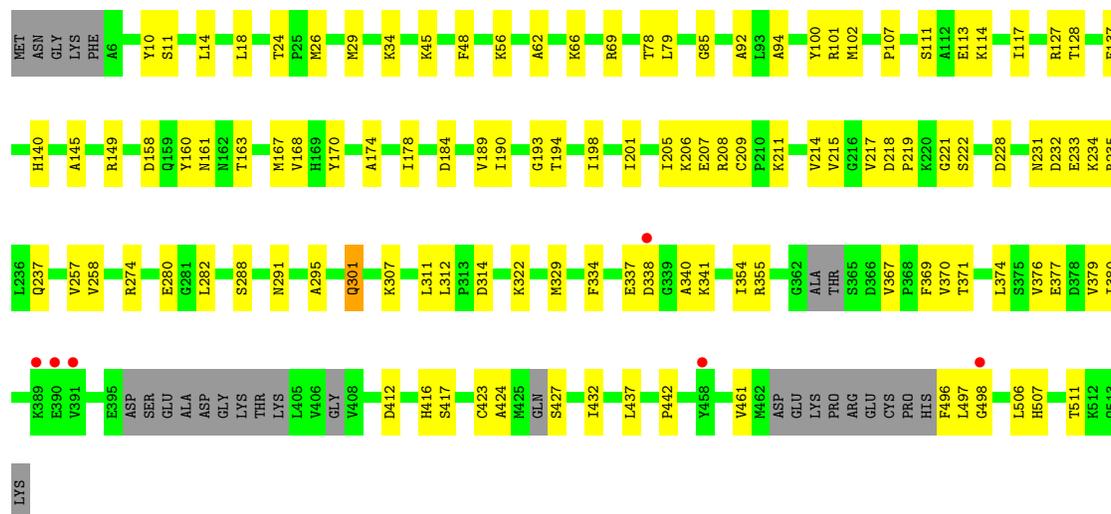• Molecule 1: Cystathionine beta-synthase
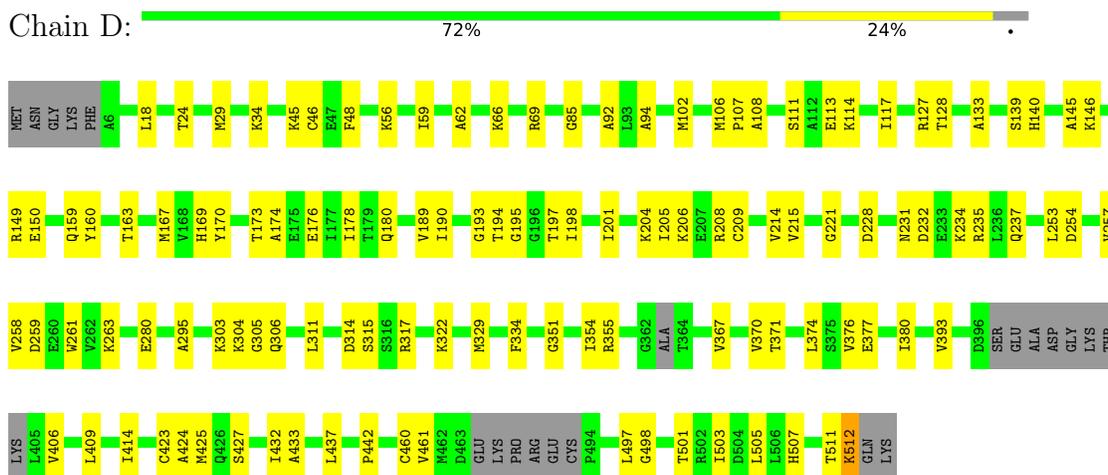
Chain D:

• Molecule 1: Cystathionine beta-synthase

Chain A:

• Molecule 1: Cystathionine beta-synthase

Chain B:
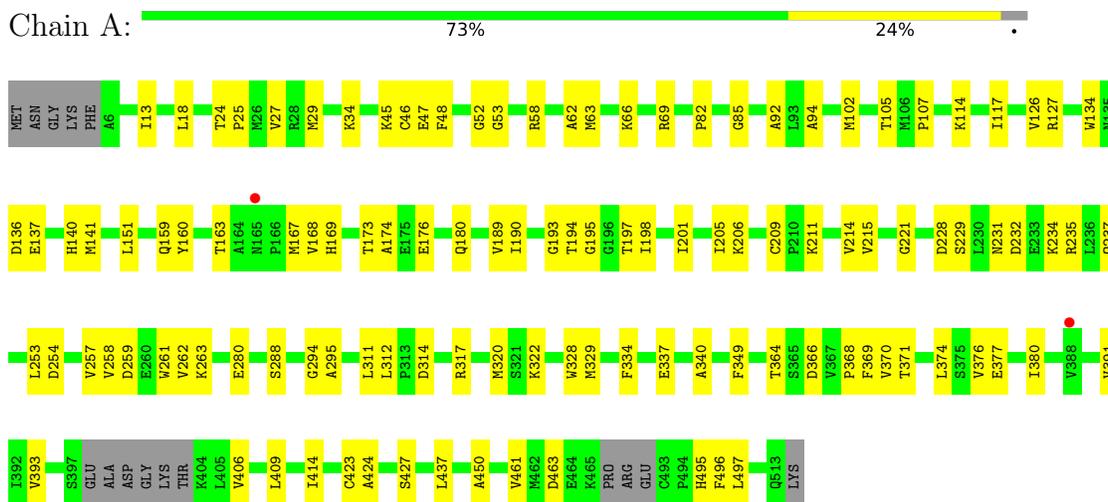
4   Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	82.70Å 82.70Å 422.97Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	70.61 – 3.05 70.62 – 3.05	Depositor EDS
% Data completeness (in resolution range)	79.0 (70.61-3.05) 79.0 (70.62-3.05)	Depositor EDS
R_{merge}	0.72	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.14 (at 3.07Å)	Xtriage
Refinement program	PHENIX 1.14_3260	Depositor
R, R_{free}	0.268 , 0.288 0.268 , 0.274	Depositor DCC
R_{free} test set	1334 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å^2)	73.2	Xtriage
Anisotropy	0.063	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	(Not available) , (Not available)	EDS
L-test for twinning[2]	$< \|L\| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.039 for -h,-k,l	Xtriage
F_o,F_c correlation	0.86	EDS
Total number of atoms	10623	wwPDB-VP
Average B, all atoms (Å^2)	68.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.45% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: P1T

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	0.28	0/3619	0.48	0/4887
1	B	0.29	0/3523	0.50	0/4751
1	D	0.29	0/3574	0.50	0/4822
All	All	0.29	0/10716	0.49	0/14460

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	3565	0	3568	83	0
1	B	3474	0	3488	88	0
1	D	3521	0	3537	82	0
2	A	21	0	12	3	0
2	B	21	0	12	5	0
2	D	21	0	12	6	0
All	All	10623	0	10629	246	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 12.

The worst 5 of 246 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:417:SER:HB2	1:B:423:CYS:SG	1.80	1.20
1:B:417:SER:CB	1:B:423:CYS:SG	2.42	1.07
1:B:301:GLN:HA	1:B:301:GLN:NE2	1.84	0.90
1:B:423:CYS:SG	1:B:432:ILE:HG21	2.12	0.90
1:B:417:SER:OG	1:B:423:CYS:SG	2.33	0.86

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 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	469/490 (96%)	458 (98%)	11 (2%)	0	100	100
1	B	450/490 (92%)	437 (97%)	13 (3%)	0	100	100
1	D	460/490 (94%)	451 (98%)	9 (2%)	0	100	100
All	All	1379/1470 (94%)	1346 (98%)	33 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 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	374/399 (94%)	374 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	364/399 (91%)	362 (100%)	2 (0%)	88	95
1	D	370/399 (93%)	369 (100%)	1 (0%)	92	97
All	All	1108/1197 (93%)	1105 (100%)	3 (0%)	92	97

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	512	LYS
1	B	233	GLU
1	B	301	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	180	GLN
1	D	318	ASN
1	B	301	GLN
1	B	318	ASN

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5   Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6   Ligand geometry ⓘ

3 ligands are modelled in this entry.

There are no bond length outliers.

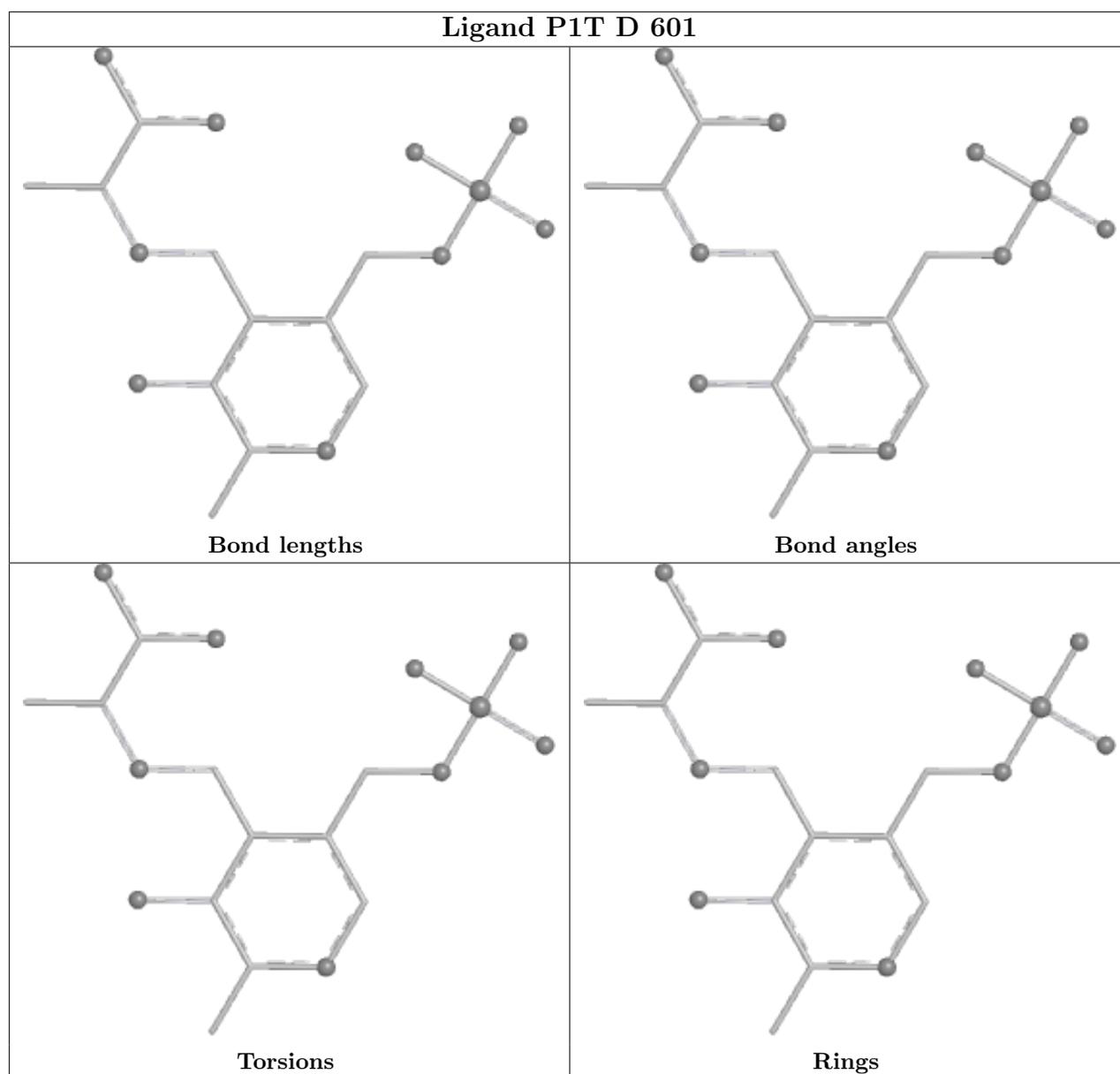There are no bond angle outliers.

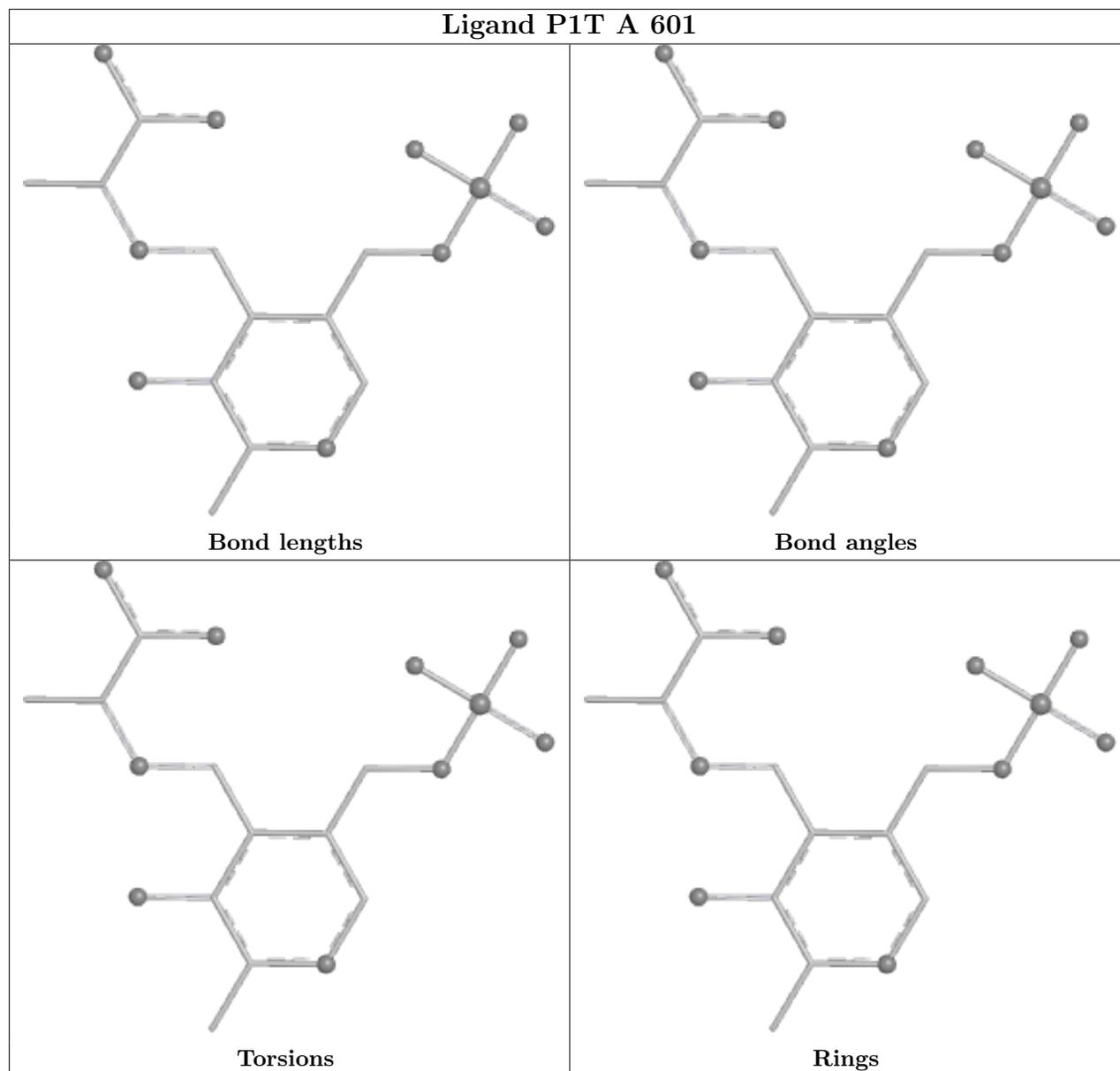There are no chirality outliers.

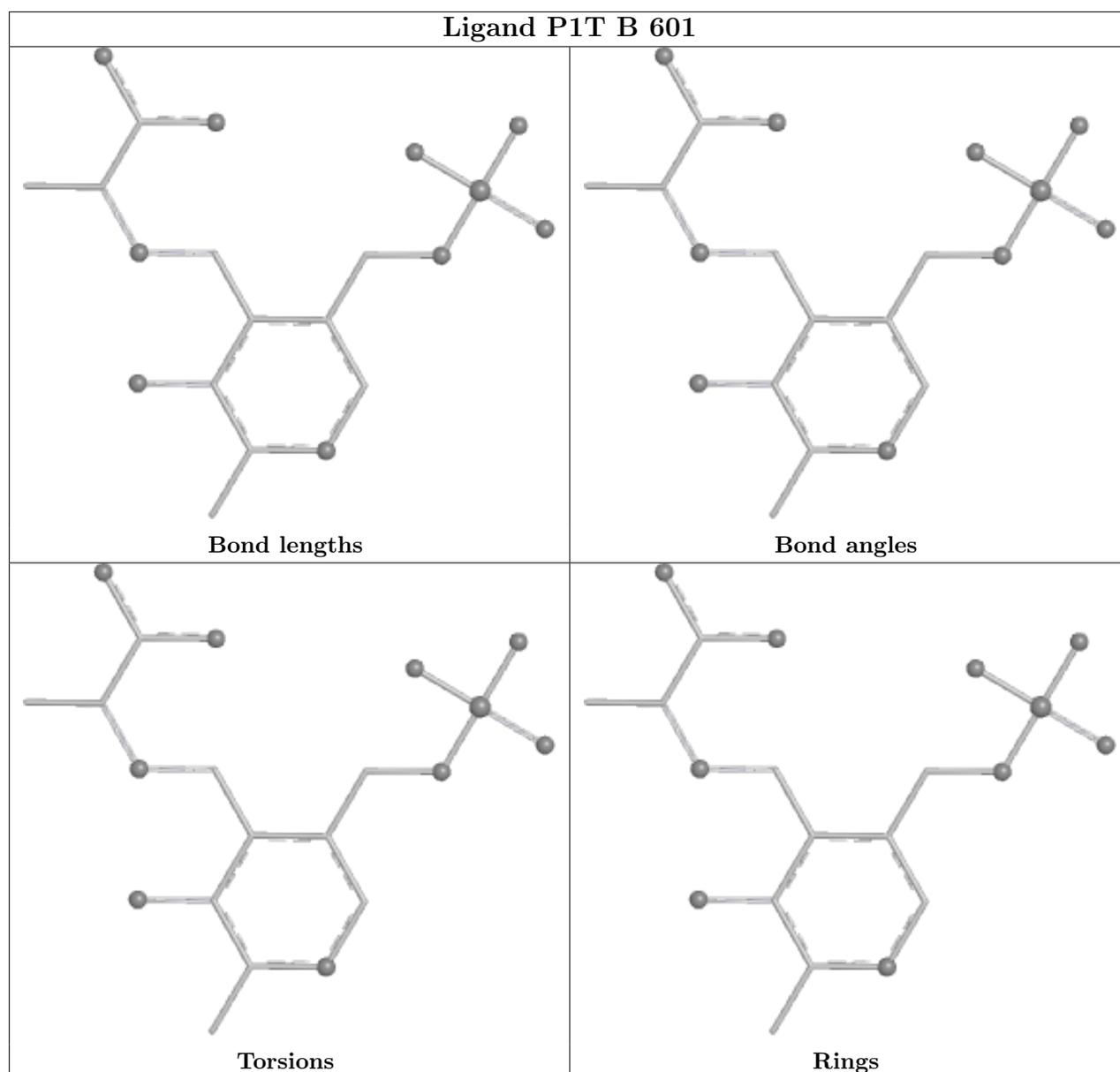There are no torsion outliers.

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 P1T D 601

Bond lengths

Bond angles

Torsions

Rings

Ligand P1T A 601

Bond lengths

Bond angles

Torsions

Rings

Ligand P1T B 601

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, 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	475/490 (96%)	0.12	2 (0%)	92	79	45, 64, 108, 123	0
1	B	462/490 (94%)	0.12	6 (1%)	77	51	44, 65, 116, 128	1 (0%)
1	D	468/490 (95%)	0.01	0	100	100	40, 56, 114, 128	1 (0%)
All	All	1405/1470 (95%)	0.08	8 (0%)	89	72	40, 63, 113, 128	2 (0%)

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	338	ASP	3.1
1	B	498	GLY	2.3
1	A	165	ASN	2.3
1	B	390	GLU	2.2
1	B	389	LYS	2.2

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 ⓘ

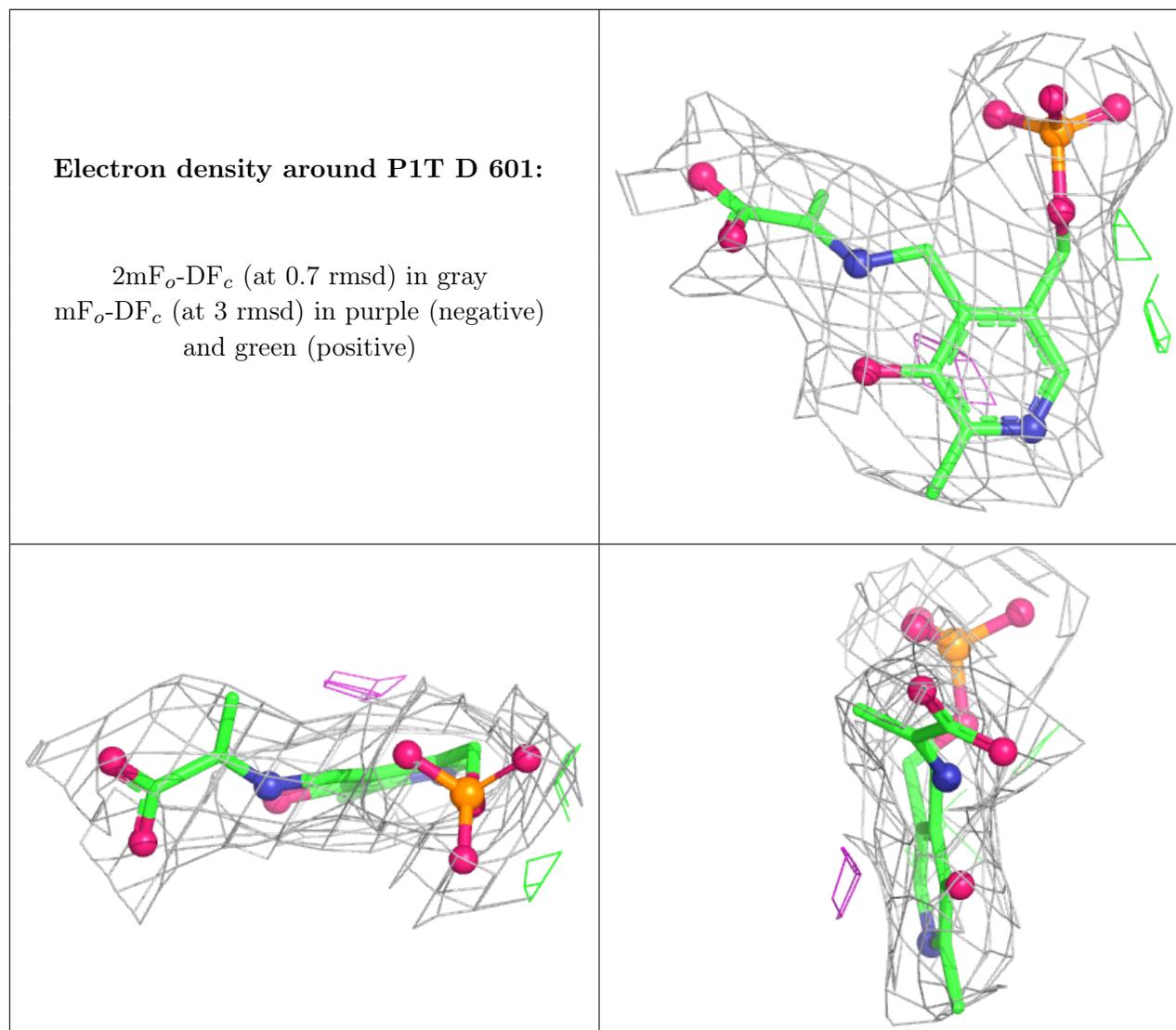There are no monosaccharides in this entry.

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.
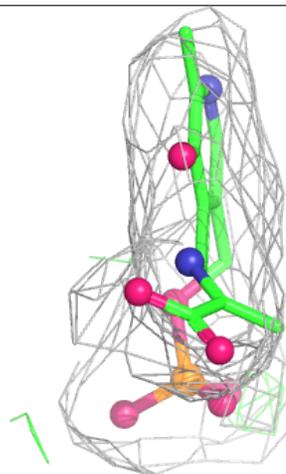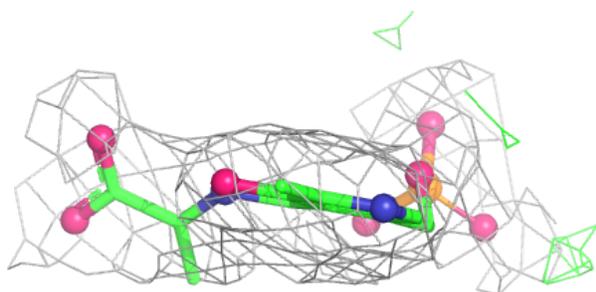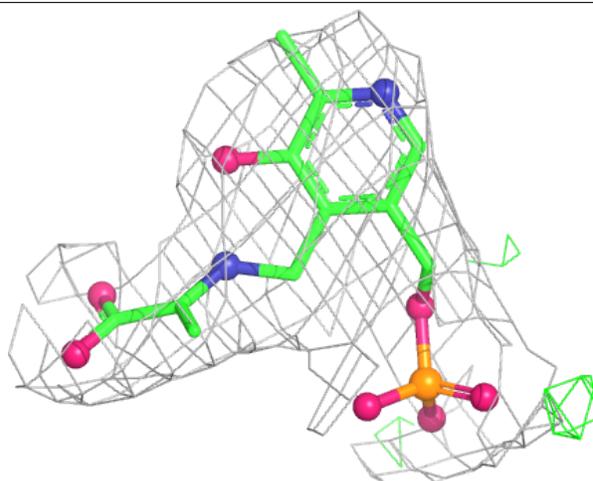
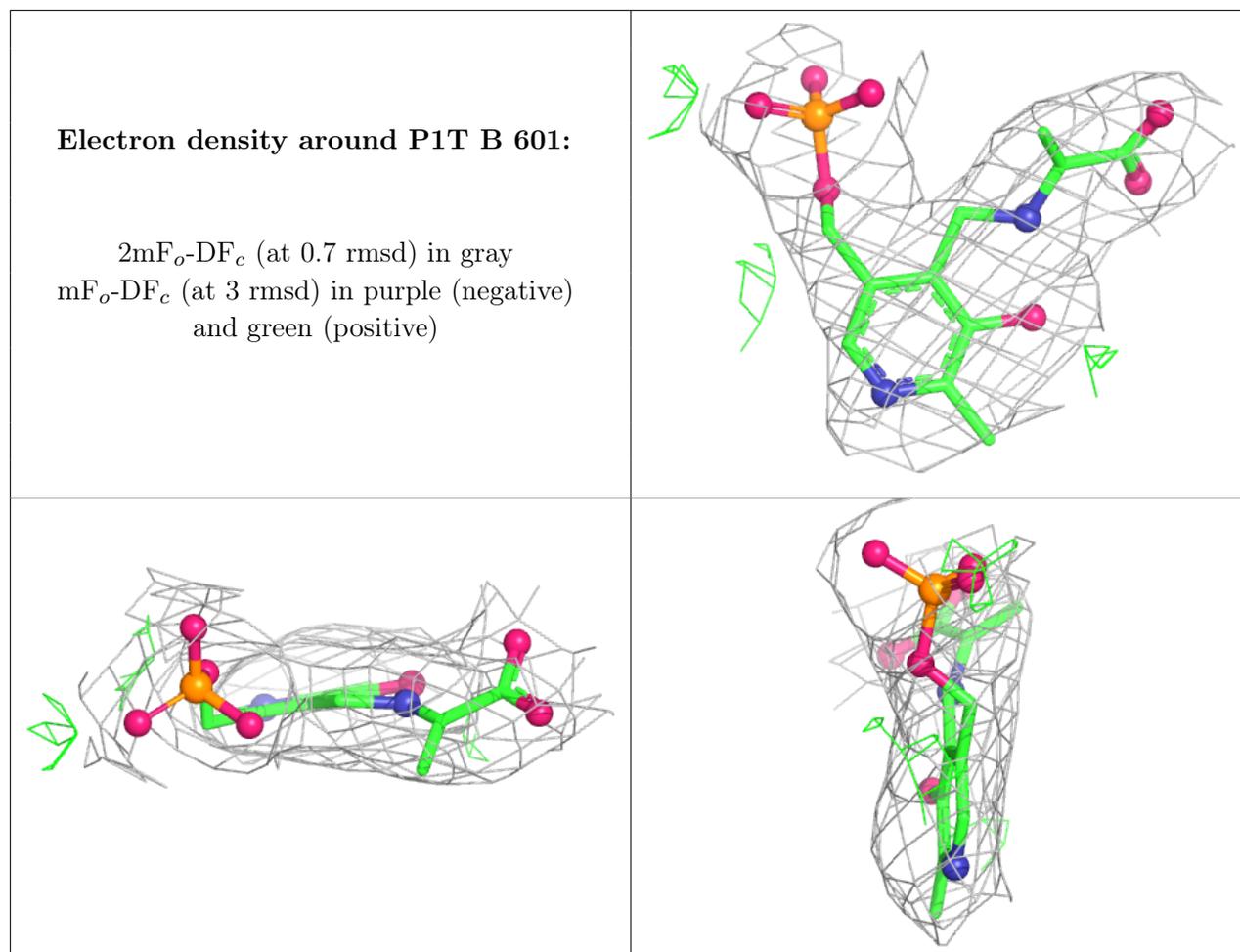| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	P1T	D	601	21/21	0.95	0.18	41,42,43,44	0
2	P1T	A	601	21/21	0.95	0.17	48,50,55,57	0
2	P1T	B	601	21/21	0.95	0.18	49,53,59,60	0

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 P1T D 601:

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

Electron density around P1T A 601:

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 P1T B 601:

$2mF_o$-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.