Full wwPDB X-ray Structure Validation Report (i)

Oct 5, 2023 – 12:41 AM EDT

PDB ID	:	6VGS
Title	:	Alpha-ketoisovalerate decarboxylase (KivD) from Lactococcus lactis, thermostable mutant
Authors	:	Chan, S.; Korman, T.P.; Sawaya, M.R.; Bowie, J.U.
Deposited on	:	2020-01-08
Resolution	:	1.80 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 (1)) were used in the production of this report:

MolProbity	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	FAILED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 1.80 Å.

There are no overall percentile quality scores available for this entry.

MolProbity and EDS failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 17973 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 Alpha-keto acid decarboxylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	AAA	539	4170	2668	685	805	12	0	3	0
1	BBB	543	4177	2675	682	808	12	0	0	0
1	CCC	540	4165	2665	680	808	12	0	3	0
1	DDD	542	4170	2674	683	801	12	0	1	0

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AAA	-19	MET	-	initiating methionine	UNP A0A0B8QZ66
AAA	-18	GLY	-	expression tag	UNP A0A0B8QZ66
AAA	-17	SER	-	expression tag	UNP A0A0B8QZ66
AAA	-16	SER	-	expression tag	UNP A0A0B8QZ66
AAA	-15	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	-14	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	-13	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	-12	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	-11	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	-10	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	-9	SER	-	expression tag	UNP A0A0B8QZ66
AAA	-8	SER	-	expression tag	UNP A0A0B8QZ66
AAA	-7	GLY	-	expression tag	UNP A0A0B8QZ66
AAA	-6	LEU	-	expression tag	UNP A0A0B8QZ66
AAA	-5	VAL	-	expression tag	UNP A0A0B8QZ66
AAA	-4	PRO	-	expression tag	UNP A0A0B8QZ66
AAA	-3	ARG	-	expression tag	UNP A0A0B8QZ66
AAA	-2	GLY	-	expression tag	UNP A0A0B8QZ66
AAA	-1	SER	-	expression tag	UNP A0A0B8QZ66
AAA	0	HIS	-	expression tag	UNP A0A0B8QZ66
AAA	34	HIS	GLN	engineered mutation	UNP A0A0B8QZ66

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Chain	Residue	Modelled	Actual	Comment	Reference
AAA	290	VAL	ALA	engineered mutation	UNP A0A0B8QZ66
AAA	386	PRO	SER	engineered mutation	UNP A0A0B8QZ66
BBB	-19	MET	-	initiating methionine	UNP A0A0B8QZ66
BBB	-18	GLY	-	expression tag	UNP A0A0B8QZ66
BBB	-17	SER	-	expression tag	UNP A0A0B8QZ66
BBB	-16	SER	-	expression tag	UNP A0A0B8QZ66
BBB	-15	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	-14	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	-13	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	-12	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	-11	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	-10	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	-9	SER	-	expression tag	UNP A0A0B8QZ66
BBB	-8	SER	-	expression tag	UNP A0A0B8QZ66
BBB	-7	GLY	-	expression tag	UNP A0A0B8QZ66
BBB	-6	LEU	-	expression tag	UNP A0A0B8QZ66
BBB	-5	VAL	-	expression tag	UNP A0A0B8QZ66
BBB	-4	PRO	-	expression tag	UNP A0A0B8QZ66
BBB	-3	ARG	-	expression tag	UNP A0A0B8QZ66
BBB	-2	GLY	-	expression tag	UNP A0A0B8QZ66
BBB	-1	SER	-	expression tag	UNP A0A0B8QZ66
BBB	0	HIS	-	expression tag	UNP A0A0B8QZ66
BBB	34	HIS	GLN	engineered mutation	UNP A0A0B8QZ66
BBB	290	VAL	ALA	engineered mutation	UNP A0A0B8QZ66
BBB	386	PRO	SER	engineered mutation	UNP A0A0B8QZ66
CCC	-19	MET	-	initiating methionine	UNP A0A0B8QZ66
CCC	-18	GLY	-	expression tag	UNP A0A0B8QZ66
CCC	-17	SER	-	expression tag	UNP A0A0B8QZ66
CCC	-16	SER	-	expression tag	UNP A0A0B8QZ66
CCC	-15	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	-14	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	-13	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	-12	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	-11	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	-10	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	-9	SER	-	expression tag	UNP A0A0B8QZ66
CCC	-8	SER	-	expression tag	UNP A0A0B8QZ66
CCC	-7	GLY	-	expression tag	UNP A0A0B8QZ66
CCC	-6	LEU	-	expression tag	UNP A0A0B8QZ66
CCC	-5	VAL	-	expression tag	UNP A0A0B8QZ66
CCC	-4	PRO	-	expression tag	UNP A0A0B8QZ66
CCC	-3	ARG	-	expression tag	UNP A0A0B8QZ66

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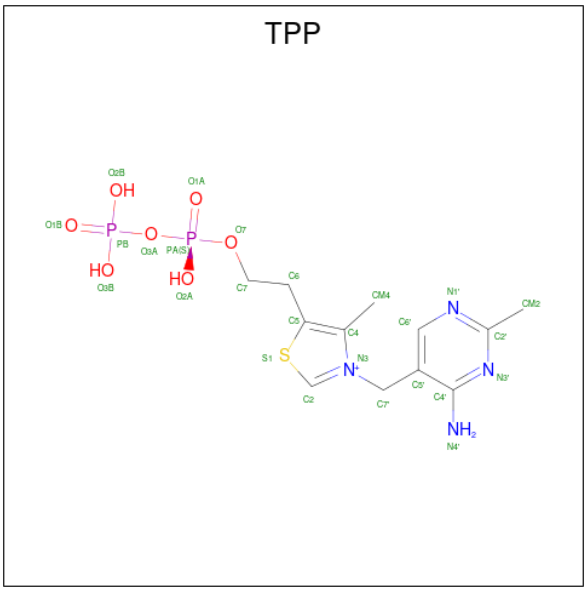
Chain	Residue	Modelled	Actual	Comment	Reference
CCC	-2	GLY	-	expression tag	UNP A0A0B8QZ66
CCC	-1	SER	-	expression tag	UNP A0A0B8QZ66
CCC	0	HIS	-	expression tag	UNP A0A0B8QZ66
CCC	34	HIS	GLN	engineered mutation	UNP A0A0B8QZ66
CCC	290	VAL	ALA	engineered mutation	UNP A0A0B8QZ66
CCC	386	PRO	SER	engineered mutation	UNP A0A0B8QZ66
DDD	-19	MET	-	initiating methionine	UNP A0A0B8QZ66
DDD	-18	GLY	-	expression tag	UNP A0A0B8QZ66
DDD	-17	SER	-	expression tag	UNP A0A0B8QZ66
DDD	-16	SER	-	expression tag	UNP A0A0B8QZ66
DDD	-15	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	-14	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	-13	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	-12	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	-11	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	-10	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	-9	SER	-	expression tag	UNP A0A0B8QZ66
DDD	-8	SER	-	expression tag	UNP A0A0B8QZ66
DDD	-7	GLY	-	expression tag	UNP A0A0B8QZ66
DDD	-6	LEU	-	expression tag	UNP A0A0B8QZ66
DDD	-5	VAL	-	expression tag	UNP A0A0B8QZ66
DDD	-4	PRO	-	expression tag	UNP A0A0B8QZ66
DDD	-3	ARG	-	expression tag	UNP A0A0B8QZ66
DDD	-2	GLY	-	expression tag	UNP A0A0B8QZ66
DDD	-1	SER	-	expression tag	UNP A0A0B8QZ66
DDD	0	HIS	-	expression tag	UNP A0A0B8QZ66
DDD	34	HIS	GLN	engineered mutation	UNP A0A0B8QZ66
DDD	290	VAL	ALA	engineered mutation	UNP A0A0B8QZ66
DDD	386	PRO	SER	engineered mutation	UNP A0A0B8QZ66

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
2	AAA	1	1	1	0	0
2	BBB	1	1	1	0	0
2	CCC	1	1	1	0	0
2	DDD	1	1	1	0	0

- Molecule 3 is THIAMINE DIPHOSPHATE (three-letter code: TPP) (formula: $C_{12}H_{19}N_4O_7P_2S$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
3	AAA	1	26	12	4	7	2	1	0	0
3	BBB	1	26	12	4	7	2	1	0	0
3	CCC	1	26	12	4	7	2	1	0	0
3	DDD	1	26	12	4	7	2	1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	AAA	301	302	302	0	2
4	BBB	277	277	277	0	0
4	CCC	300	301	301	0	2
4	DDD	303	303	303	0	0

MolProbity and EDS failed to run properly - this section is therefore empty.

3 Data and refinement statistics (i)

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	128.19Å 128.27Å 147.74Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	96.86 – 1.80	Depositor
% Data completeness (in resolution range)	99.2 (96.86-1.80)	Depositor
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.50 (at 1.80Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.183 , 0.210	Depositor
Wilson B-factor (Å^2)	35.8	Xtriage
Anisotropy	0.025	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.41$, $< L^2 > = 0.24$	Xtriage
Estimated twinning fraction	0.176 for k,h,-l	Xtriage
Total number of atoms	17973	wwPDB-VP
Average B, all atoms (Å^2)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.29% 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.

4 Model quality (i)

4.1 Standard geometry (i)

MolProbity failed to run properly - this section is therefore empty.

4.2 Too-close contacts (i)

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles (i)

4.3.1 Protein backbone (i)

MolProbity failed to run properly - this section is therefore empty.

4.3.2 Protein sidechains (i)

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA (i)

MolProbity failed to run properly - this section is therefore empty.

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

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

4.5 Carbohydrates (i)

There are no monosaccharides in this entry.

4.6 Ligand geometry (i)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	$\#\|Z\| > 2$
3	TPP	BBB	602	2	22,27,27	0.57	0	29,40,40	0.95	1 (3%)
3	TPP	CCC	602	2	22,27,27	0.70	0	29,40,40	0.82	1 (3%)
3	TPP	AAA	602	2	22,27,27	0.66	0	29,40,40	0.93	1 (3%)
3	TPP	DDD	602	2	22,27,27	0.68	0	29,40,40	0.87	0

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	TPP	BBB	602	2	-	5/16/17/17	0/2/2/2
3	TPP	CCC	602	2	-	4/16/17/17	0/2/2/2
3	TPP	AAA	602	2	-	4/16/17/17	0/2/2/2
3	TPP	DDD	602	2	-	4/16/17/17	0/2/2/2

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	BBB	602	TPP	C5-C4-N3	2.57	112.71	107.57
3	CCC	602	TPP	C5-C4-N3	2.28	112.13	107.57
3	AAA	602	TPP	C5-C4-N3	2.27	112.11	107.57

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	AAA	602	TPP	C4-C5-C6-C7
3	AAA	602	TPP	PA-O3A-PB-O3B
3	BBB	602	TPP	C4-C5-C6-C7
3	BBB	602	TPP	PA-O3A-PB-O3B
3	CCC	602	TPP	C4-C5-C6-C7
3	CCC	602	TPP	PA-O3A-PB-O3B
3	DDD	602	TPP	C4-C5-C6-C7
3	DDD	602	TPP	PA-O3A-PB-O1B

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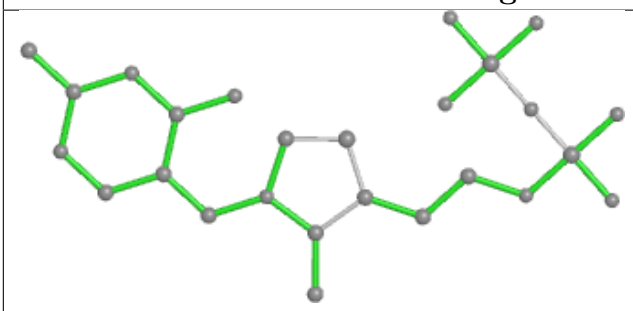
Mol	Chain	Res	Type	Atoms
3	BBB	602	TPP	PB-O3A-PA-O2A
3	AAA	602	TPP	C4'-C5'-C7'-N3
3	BBB	602	TPP	PA-O3A-PB-O1B
3	AAA	602	TPP	PA-O3A-PB-O2B
3	BBB	602	TPP	PA-O3A-PB-O2B
3	CCC	602	TPP	PA-O3A-PB-O2B
3	DDD	602	TPP	PA-O3A-PB-O2B
3	DDD	602	TPP	PA-O3A-PB-O3B
3	CCC	602	TPP	PA-O3A-PB-O1B

There are no ring outliers.

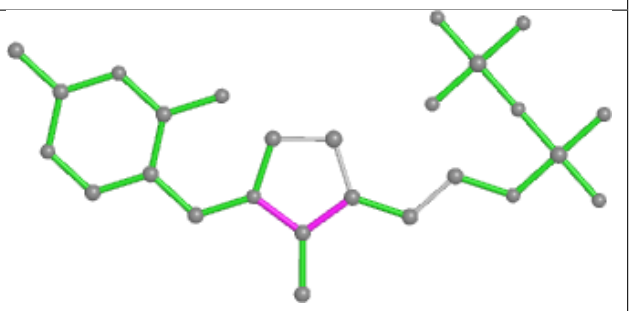
No monomer is involved in short contacts.

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.

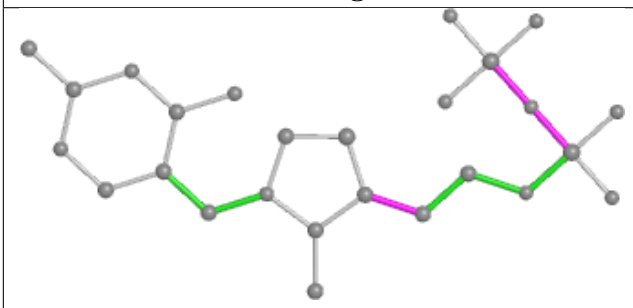
Ligand TPP BBB 602



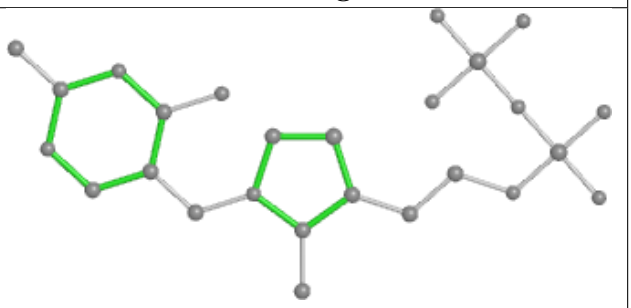
Bond lengths



Bond angles

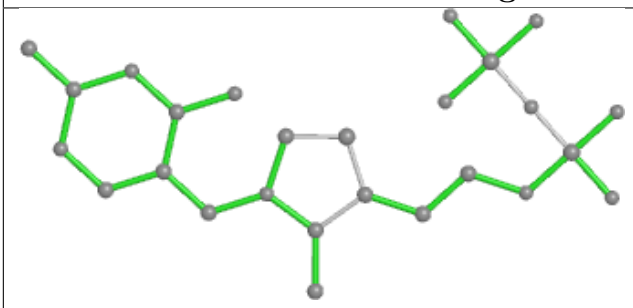


Torsions

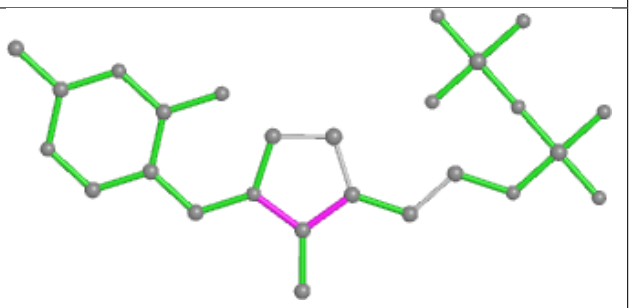


Rings

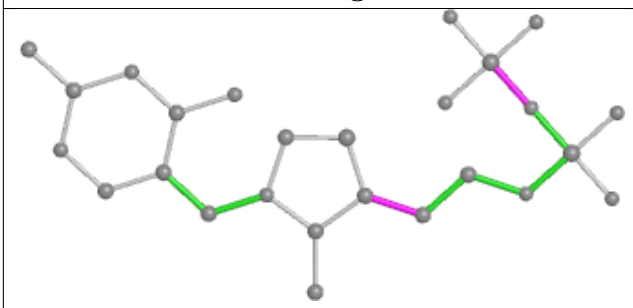
Ligand TPP CCC 602



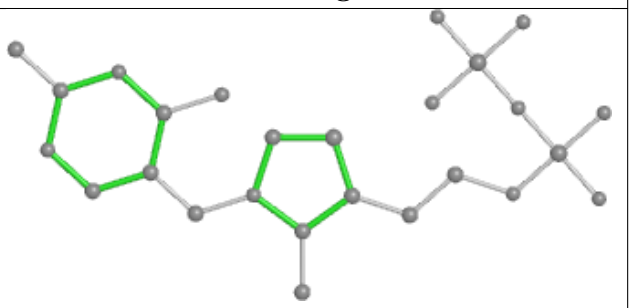
Bond lengths



Bond angles

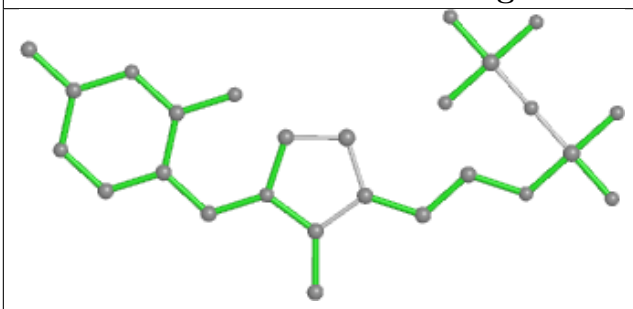


Torsions

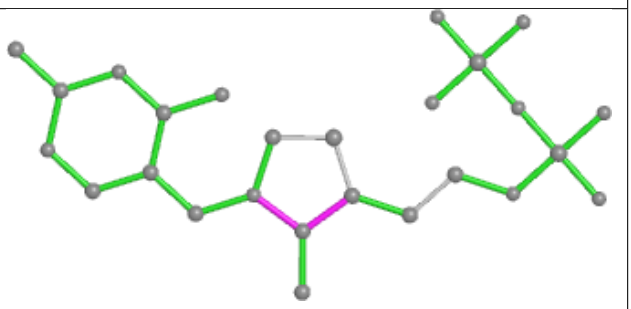


Rings

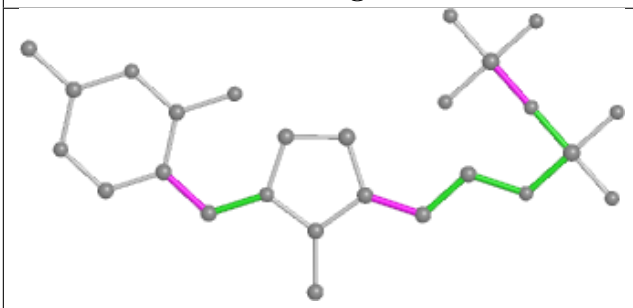
Ligand TPP AAA 602



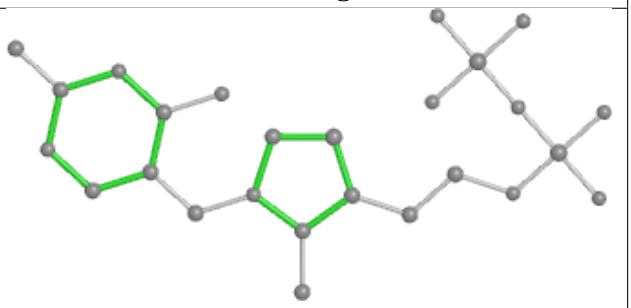
Bond lengths



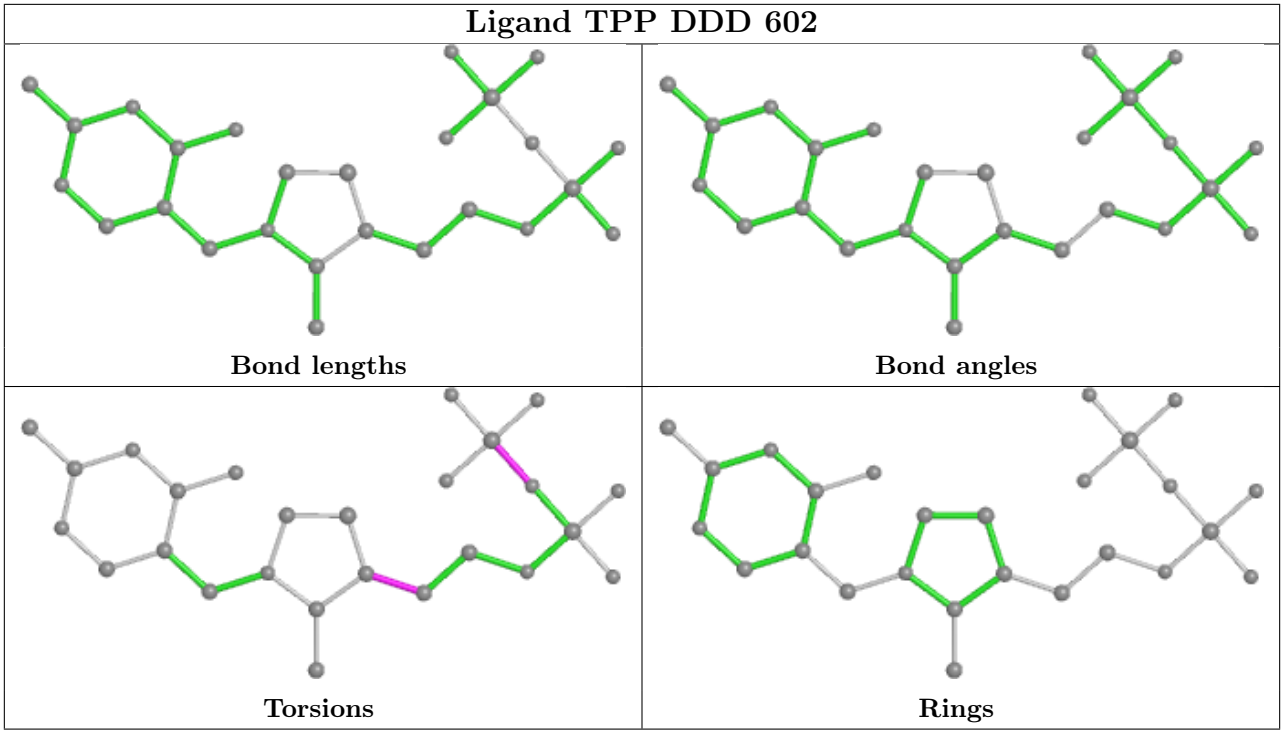
Bond angles



Torsions



Rings



4.7 Other polymers (i)

There are no such residues in this entry.

4.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

5 Fit of model and data (i)

5.1 Protein, DNA and RNA chains (i)

EDS failed to run properly - this section is therefore empty.

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

EDS failed to run properly - this section is therefore empty.

5.3 Carbohydrates (i)

EDS failed to run properly - this section is therefore empty.

5.4 Ligands (i)

EDS failed to run properly - this section is therefore empty.

5.5 Other polymers (i)

EDS failed to run properly - this section is therefore empty.