WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Jun 11, 2024 – 05:58 PM EDT

PDB ID	:	1IYE
Title	:	CRYSTAL STRUCTURE OF ESCHELICHIA COLI BRANCHED-CHAIN AMINO ACID AMINOTRANSFERASE
Authors	:	Hirotsu, K.; Goto, M.
Deposited on	:	2002-08-07
Resolution	:	1.82 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 (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	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
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)	:	2.36.2

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 1.82 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.
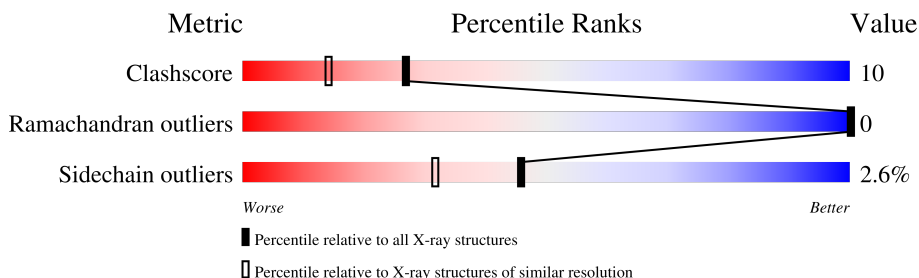
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	8401 (1.84-1.80)
Ramachandran outliers	138981	8290 (1.84-1.80)
Sidechain outliers	138945	8290 (1.84-1.80)

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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	309	78% 19% ··
1	B	309	79% 17% ··
1	C	309	80% 17% ··

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	PGU	A	513	X	X	-	-
2	PGU	B	913	X	X	-	-

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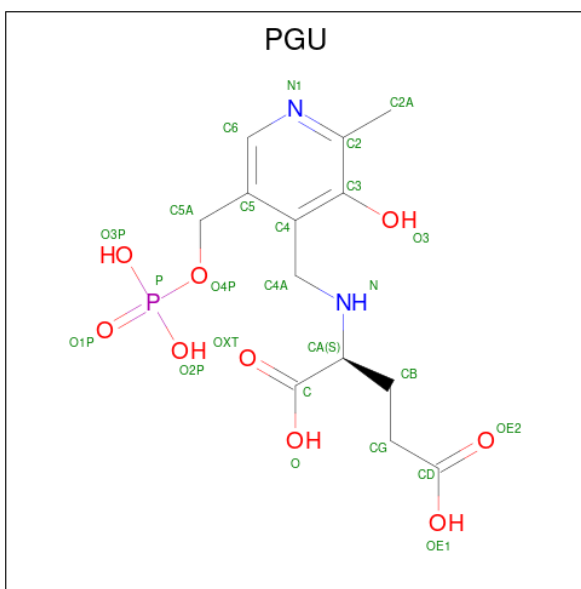| Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	PGU	C	1413	X	X	-	-

2   Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 7661 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 BRANCHED-CHAIN AMINO ACID AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	304	Total	C	N	O	S	0	0	0
			2362	1499	410	443	10			
1	B	304	Total	C	N	O	S	0	0	0
			2362	1499	410	443	10			
1	C	304	Total	C	N	O	S	0	0	0
			2362	1499	410	443	10			

- Molecule 2 is N-({3-hydroxy-2-methyl-5-[(phosphonooxy)methyl]pyridin-4-yl}methyl)-L-glutamic acid (three-letter code: PGU) (formula: $C_{13}H_{19}N_2O_9P$).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			25	13	2	9	1		
2	B	1	Total	C	N	O	P	0	0
			25	13	2	9	1		
2	C	1	Total	C	N	O	P	0	0
			25	13	2	9	1		

• Molecule 3 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	150	Total 150	O 150	0	0
3	B	144	Total 144	O 144	0	0
3	C	206	Total 206	O 206	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. 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. 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.
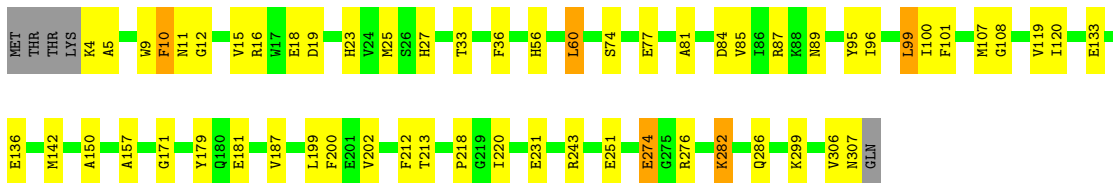
Note EDS was not executed.

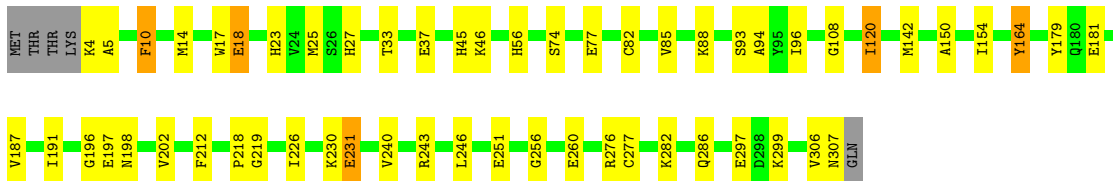- Molecule 1: BRANCHED-CHAIN AMINO ACID AMINOTRANSFERASE

Chain A:
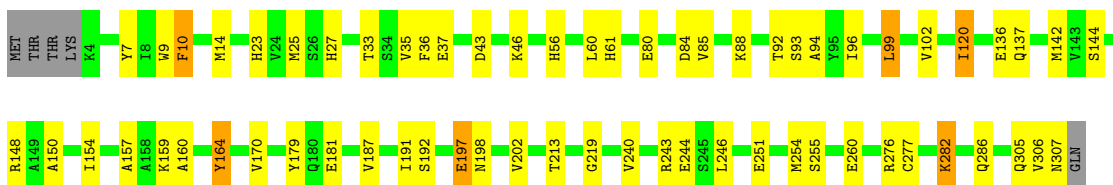
- Molecule 1: BRANCHED-CHAIN AMINO ACID AMINOTRANSFERASE

Chain B:

- Molecule 1: BRANCHED-CHAIN AMINO ACID AMINOTRANSFERASE

Chain C:

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	154.60Å 98.86Å 138.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.82	Depositor
% Data completeness (in resolution range)	(Not available) (10.00-1.82)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.209 , 0.239	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	7661	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

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: PGU

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	0.37	1/2418 (0.0%)	0.63	0/3279
1	B	0.37	1/2418 (0.0%)	0.63	0/3279
1	C	0.37	1/2418 (0.0%)	0.62	0/3279
All	All	0.37	3/7254 (0.0%)	0.63	0/9837

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	C	0	1
All	All	0	2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	181	GLU	CD-OE2	7.32	1.33	1.25
1	C	181	GLU	CD-OE2	6.91	1.33	1.25
1	A	181	GLU	CD-OE2	6.84	1.33	1.25

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	164	TYR	Sidechain
1	C	164	TYR	Sidechain

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	2362	0	2302	53	0
1	B	2362	0	2302	50	0
1	C	2362	0	2302	44	0
2	A	25	0	14	2	0
2	B	25	0	13	0	0
2	C	25	0	14	0	0
3	A	150	0	0	0	0
3	B	144	0	0	1	0
3	C	206	0	0	3	1
All	All	7661	0	6947	144	1

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 10.

The worst 5 of 144 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:46:LYS:HB3	1:A:305:GLN:HE21	1.33	0.94
1:B:16:ARG:HE	1:B:18:GLU:HB2	1.31	0.92
1:B:274:GLU:H	1:B:274:GLU:CD	1.85	0.80
1:B:16:ARG:NE	1:B:18:GLU:HB2	1.97	0.78
1:A:9:TRP:HB2	1:A:85:VAL:CG1	2.15	0.77

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:1578:HOH:O	3:C:1578:HOH:O[4_555]	1.93	0.27

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	302/309 (98%)	295 (98%)	7 (2%)	0	100	100
1	B	302/309 (98%)	292 (97%)	10 (3%)	0	100	100
1	C	302/309 (98%)	296 (98%)	6 (2%)	0	100	100
All	All	906/927 (98%)	883 (98%)	23 (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	246/251 (98%)	238 (97%)	8 (3%)	38	23
1	B	246/251 (98%)	240 (98%)	6 (2%)	49	35
1	C	246/251 (98%)	241 (98%)	5 (2%)	55	43
All	All	738/753 (98%)	719 (97%)	19 (3%)	46	32

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	10	PHE
1	C	231	GLU
1	C	243	ARG
1	C	120	ILE
1	B	10	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	286	GLN
1	C	23	HIS
1	B	307	ASN
1	C	27	HIS
1	A	286	GLN

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.

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	PGU	C	1413	-	25,25,25	2.19	8 (32%)	31,35,35	3.86	18 (58%)
2	PGU	B	913	-	25,25,25	2.17	7 (28%)	31,35,35	3.94	18 (58%)
2	PGU	A	513	-	25,25,25	2.10	8 (32%)	31,35,35	3.88	18 (58%)

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	PGU	C	1413	-	1/1/4/5	8/20/20/20	0/1/1/1
2	PGU	B	913	-	1/1/4/5	9/20/20/20	0/1/1/1
2	PGU	A	513	-	1/1/4/5	9/20/20/20	0/1/1/1

The worst 5 of 23 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1413	PGU	C3-C2	6.38	1.47	1.41
2	B	913	PGU	C3-C2	6.12	1.47	1.41
2	A	513	PGU	C3-C2	5.58	1.46	1.41
2	C	1413	PGU	C2-N1	3.43	1.39	1.33
2	B	913	PGU	C5-C4	3.41	1.45	1.40

The worst 5 of 54 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	1413	PGU	C6-C5-C4	11.23	126.56	118.06
2	A	513	PGU	C6-C5-C4	10.90	126.31	118.06
2	B	913	PGU	C6-C5-C4	10.90	126.31	118.06
2	A	513	PGU	C2A-C2-C3	10.50	133.08	120.80
2	B	913	PGU	C2A-C2-C3	10.37	132.93	120.80

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	513	PGU	CA
2	B	913	PGU	CA
2	C	1413	PGU	CA

5 of 26 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	513	PGU	C-CA-N-C4A
2	B	913	PGU	C-CA-N-C4A
2	C	1413	PGU	C-CA-N-C4A
2	A	513	PGU	N-CA-CB-CG
2	B	913	PGU	N-CA-CB-CG

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	513	PGU	2	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 PGU C 1413

Bond lengths

Bond angles

Torsions

Rings

Ligand PGU B 913

Bond lengths

Bond angles

Torsions

Rings

Ligand PGU A 513

Bond lengths

Bond angles

Torsions

Rings
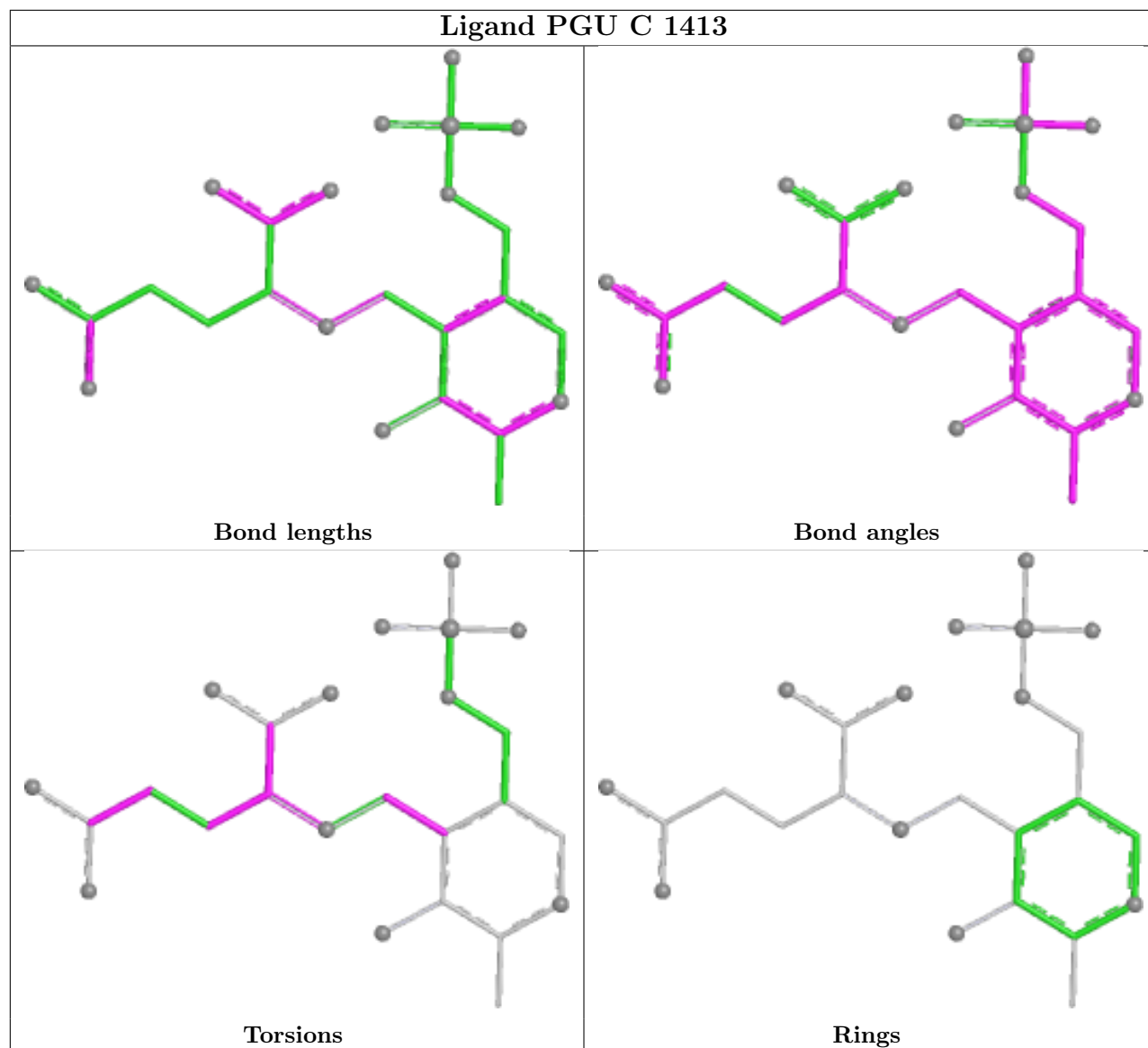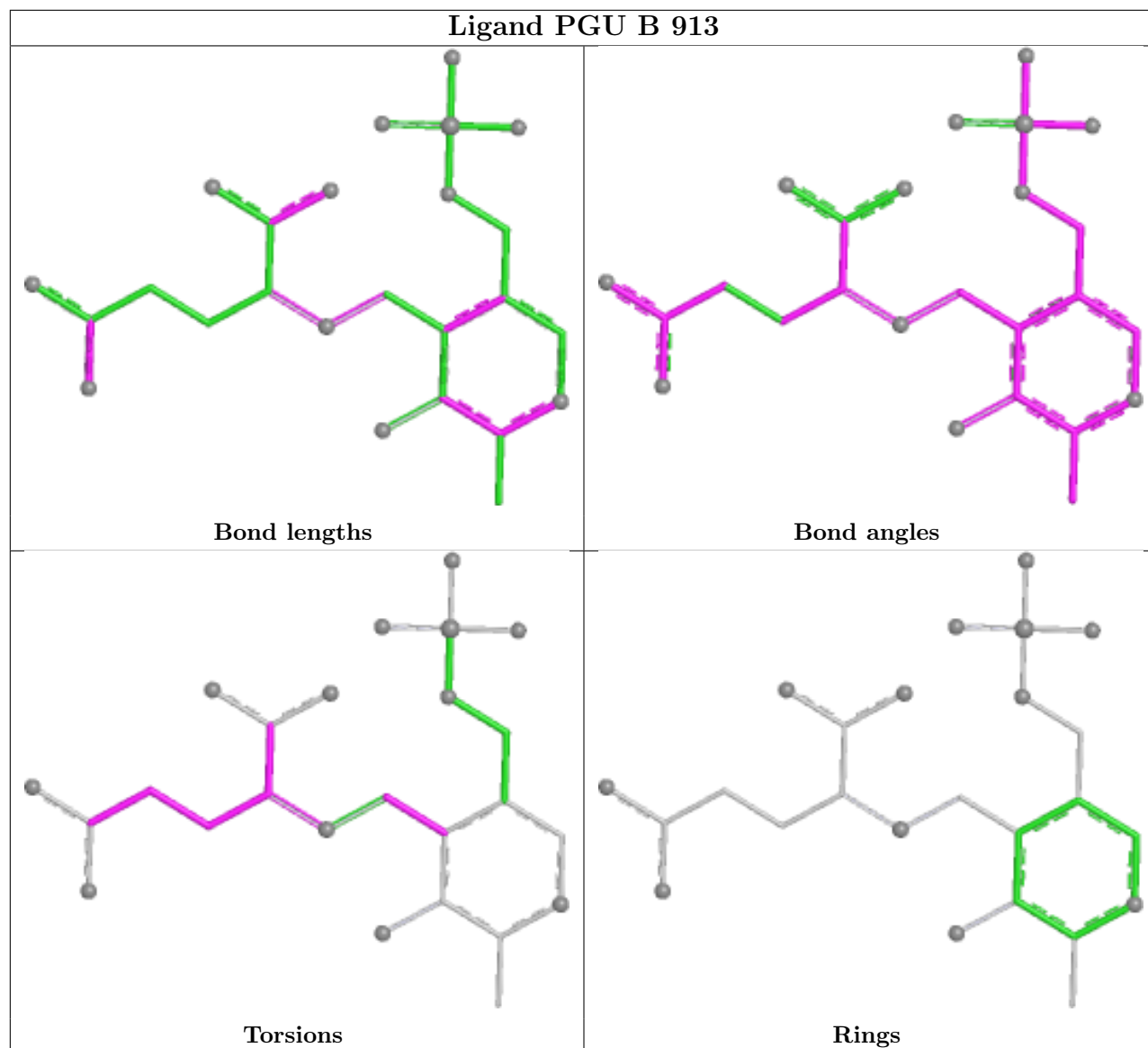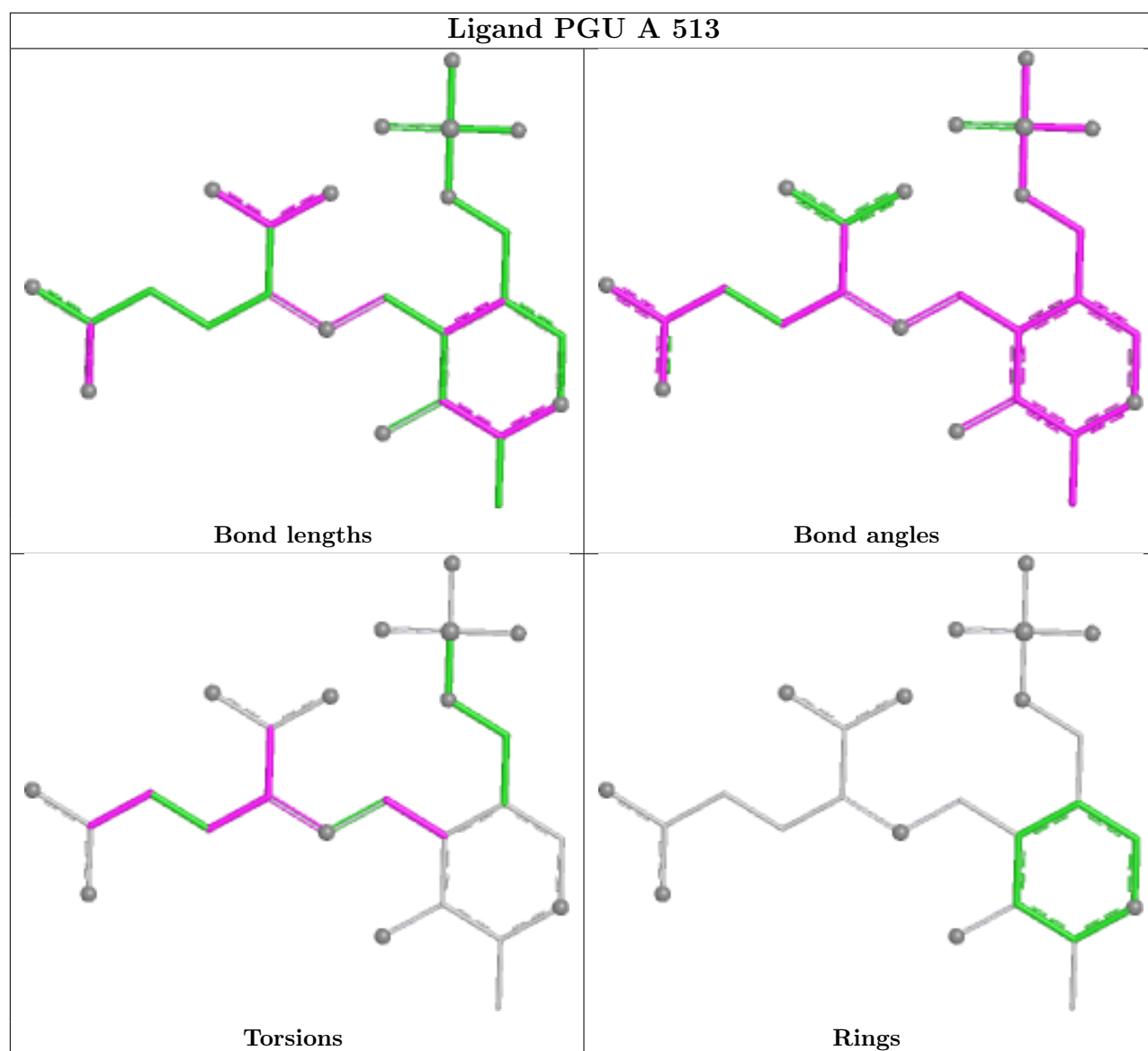
5.7 Other polymers ⓘ

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 ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.