Full wwPDB X-ray Structure Validation Report (i)

Oct 2, 2023 – 11:56 PM EDT

PDB ID	:	6UGO
Title	:	Human Carbonic Anhydrase IX-mimic complexed with SB4-205
Authors	:	Murray, A.B.; McKenna, R.; Lomelino, C.L.
Deposited on	:	2019-09-26
Resolution	:	1.46 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 1.46 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.

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
4	CIT	A	305	-	X	-	-

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 4304 atoms, of which 2024 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 Carbonic anhydrase IX-mimic.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	257	4034	1307	1992	351	382	2	0	0	0

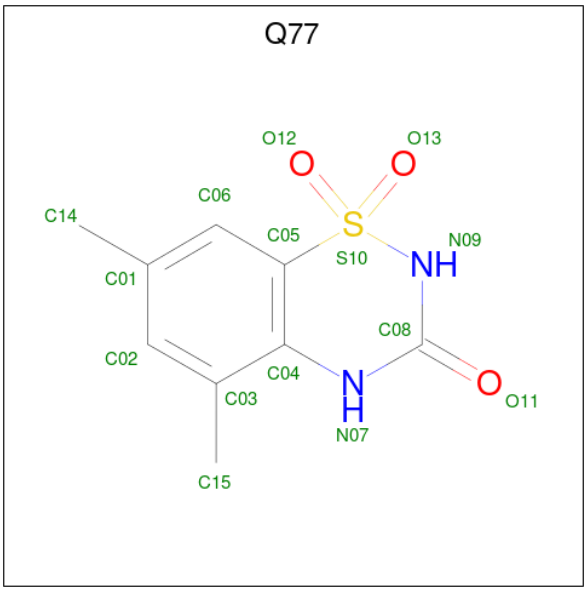
There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	65	SER	ALA	engineered mutation	UNP P00918
A	67	GLN	ASN	engineered mutation	UNP P00918
A	69	THR	GLU	engineered mutation	UNP P00918
A	91	LEU	ILE	engineered mutation	UNP P00918
A	131	VAL	PHE	engineered mutation	UNP P00918
A	170	GLU	LYS	engineered mutation	UNP P00918
A	204	ALA	LEU	engineered mutation	UNP P00918

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

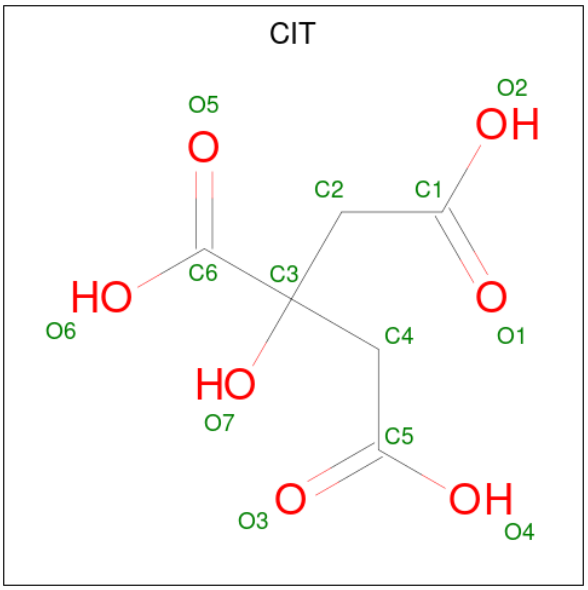
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
2	A	1	1	1	0	0

- Molecule 3 is 5,7-dimethyl-1lambda 6 ,2,4-benzothiadiazine-1,1,3(2H,4H)-trione (three-letter code: Q77) (formula: $C_9H_{10}N_2O_3S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	H	N	O	S		
3	A	1	24	9	9	2	3	1	0	0
			Total	C	H	N	O	S		
3	A	1	24	9	9	2	3	1	0	0
			Total	C	H	N	O	S		
3	A	1	24	9	9	2	3	1	0	0

- Molecule 4 is CITRIC ACID (three-letter code: CIT) (formula: $C_6H_8O_7$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
4	A	1	18	6	5	7	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	179	179	179	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 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	42.15Å 41.36Å 72.05Å 90.00° 103.97° 90.00°	Depositor
Resolution (Å)	30.45 – 1.46	Depositor
% Data completeness (in resolution range)	98.3 (30.45-1.46)	Depositor
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.05 (at 1.46Å)	Xtriage
Refinement program	PHENIX 1.11.1_2575	Depositor
R, R_{free}	0.175 , 0.203	Depositor
Wilson B-factor (Å^2)	15.2	Xtriage
Anisotropy	0.127	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4304	wwPDB-VP
Average B, all atoms (Å^2)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.60% 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 5 ligands modelled in this entry, 1 is 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	$\#\|Z\| > 2$
4	CIT	A	305	-	12,12,12	1.51	3 (25%)	17,17,17	2.85	10 (58%)
3	Q77	A	304	-	16,16,16	5.95	6 (37%)	21,25,25	6.54	12 (57%)
3	Q77	A	302	2	16,16,16	4.56	9 (56%)	21,25,25	4.84	13 (61%)
3	Q77	A	303	-	16,16,16	5.63	9 (56%)	21,25,25	3.59	12 (57%)

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
4	CIT	A	305	-	-	6/16/16/16	-
3	Q77	A	304	-	-	-	0/1/2/2
3	Q77	A	302	2	-	-	0/1/2/2
3	Q77	A	303	-	-	-	0/1/2/2

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	304	Q77	C05-S10	-16.94	1.60	1.75
3	A	303	Q77	C05-S10	-12.39	1.64	1.75
3	A	303	Q77	S10-N09	-11.25	1.51	1.62
3	A	302	Q77	C05-S10	-10.25	1.66	1.75
3	A	303	Q77	C08-N07	9.15	1.53	1.36
3	A	302	Q77	C08-N07	8.79	1.53	1.36
3	A	304	Q77	C08-N07	8.66	1.52	1.36
3	A	304	Q77	S10-N09	-8.32	1.54	1.62
3	A	303	Q77	C04-N07	7.17	1.54	1.39
3	A	304	Q77	C04-N07	7.16	1.54	1.39
3	A	302	Q77	C04-N07	7.13	1.54	1.39
3	A	302	Q77	C08-N09	6.34	1.44	1.36
3	A	304	Q77	C08-N09	6.03	1.44	1.36
3	A	304	Q77	O11-C08	-5.85	1.11	1.23
3	A	303	Q77	O13-S10	-5.50	1.37	1.43
3	A	302	Q77	S10-N09	-5.22	1.57	1.62
3	A	303	Q77	C08-N09	4.31	1.42	1.36
3	A	303	Q77	O12-S10	-4.11	1.38	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	303	Q77	O11-C08	-3.79	1.15	1.23
3	A	302	Q77	O11-C08	-3.04	1.17	1.23
3	A	302	Q77	O13-S10	2.94	1.46	1.43
3	A	303	Q77	C02-C03	-2.90	1.35	1.39
4	A	305	CIT	C4-C3	2.38	1.56	1.53
4	A	305	CIT	O6-C6	-2.20	1.22	1.30
4	A	305	CIT	O5-C6	2.17	1.29	1.22
3	A	302	Q77	O12-S10	2.12	1.45	1.43
3	A	302	Q77	C02-C03	-2.08	1.36	1.39

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	304	Q77	O12-S10-N09	-18.73	92.99	108.26
3	A	304	Q77	C05-S10-N09	17.42	116.97	102.13
3	A	302	Q77	O13-S10-N09	-12.73	97.88	108.26
3	A	302	Q77	C05-S10-N09	12.17	112.50	102.13
3	A	303	Q77	C05-S10-N09	11.47	111.90	102.13
3	A	304	Q77	O13-S10-N09	10.94	117.17	108.26
3	A	302	Q77	O13-S10-O12	-7.34	110.97	118.46
3	A	303	Q77	O12-S10-N09	-5.85	103.49	108.26
3	A	304	Q77	C04-C05-S10	5.15	123.01	119.04
4	A	305	CIT	C3-C2-C1	4.84	125.53	113.81
3	A	303	Q77	C14-C01-C02	-4.70	113.98	120.94
4	A	305	CIT	C3-C4-C5	4.68	125.14	113.81
3	A	304	Q77	C14-C01-C06	-4.48	114.31	120.94
3	A	302	Q77	O12-S10-N09	4.46	111.89	108.26
3	A	302	Q77	C03-C02-C01	-4.28	117.78	122.17
4	A	305	CIT	O5-C6-C3	4.14	128.12	122.25
3	A	304	Q77	C03-C02-C01	-3.88	118.19	122.17
3	A	304	Q77	O11-C08-N07	-3.80	116.60	122.08
3	A	302	Q77	C14-C01-C02	-3.79	115.33	120.94
3	A	303	Q77	O13-S10-N09	-3.74	105.21	108.26
3	A	302	Q77	C06-C01-C02	3.71	122.52	118.09
3	A	303	Q77	C04-C05-S10	3.61	121.82	119.04
3	A	302	Q77	C04-C05-S10	3.58	121.81	119.04
3	A	304	Q77	N09-C08-N07	3.57	121.52	115.79
4	A	305	CIT	C2-C3-C6	3.38	117.37	110.11
4	A	305	CIT	O7-C3-C2	-3.36	101.54	109.40
4	A	305	CIT	O6-C6-O5	-3.35	113.17	123.82
4	A	305	CIT	O6-C6-C3	3.26	118.71	113.05
3	A	302	Q77	O12-S10-C05	3.13	113.16	109.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	302	Q77	N09-C08-N07	3.04	120.67	115.79
4	A	305	CIT	O2-C1-O1	-2.99	115.86	123.30
4	A	305	CIT	O2-C1-C2	2.97	123.89	114.35
3	A	303	Q77	O13-S10-O12	-2.97	115.44	118.46
3	A	302	Q77	C06-C05-S10	2.94	122.23	119.82
3	A	303	Q77	C14-C01-C06	2.90	125.23	120.94
3	A	304	Q77	C06-C01-C02	2.85	121.49	118.09
3	A	302	Q77	O11-C08-N07	-2.79	118.05	122.08
3	A	304	Q77	O13-S10-O12	-2.69	115.71	118.46
3	A	304	Q77	O12-S10-C05	-2.63	106.04	109.29
3	A	303	Q77	O12-S10-C05	2.55	112.44	109.29
3	A	303	Q77	N09-C08-N07	2.25	119.40	115.79
3	A	303	Q77	O11-C08-N09	-2.25	117.89	121.49
3	A	303	Q77	C06-C01-C02	2.21	120.73	118.09
4	A	305	CIT	C4-C3-C6	2.18	114.79	110.11
3	A	304	Q77	C14-C01-C02	2.18	124.17	120.94
3	A	303	Q77	C06-C05-S10	2.17	121.60	119.82
3	A	302	Q77	C06-C05-C04	-2.13	115.62	119.89

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	305	CIT	O7-C3-C6-O5
4	A	305	CIT	O7-C3-C6-O6
4	A	305	CIT	C4-C3-C6-O5
4	A	305	CIT	C4-C3-C6-O6
4	A	305	CIT	C2-C3-C6-O5
4	A	305	CIT	C2-C3-C6-O6

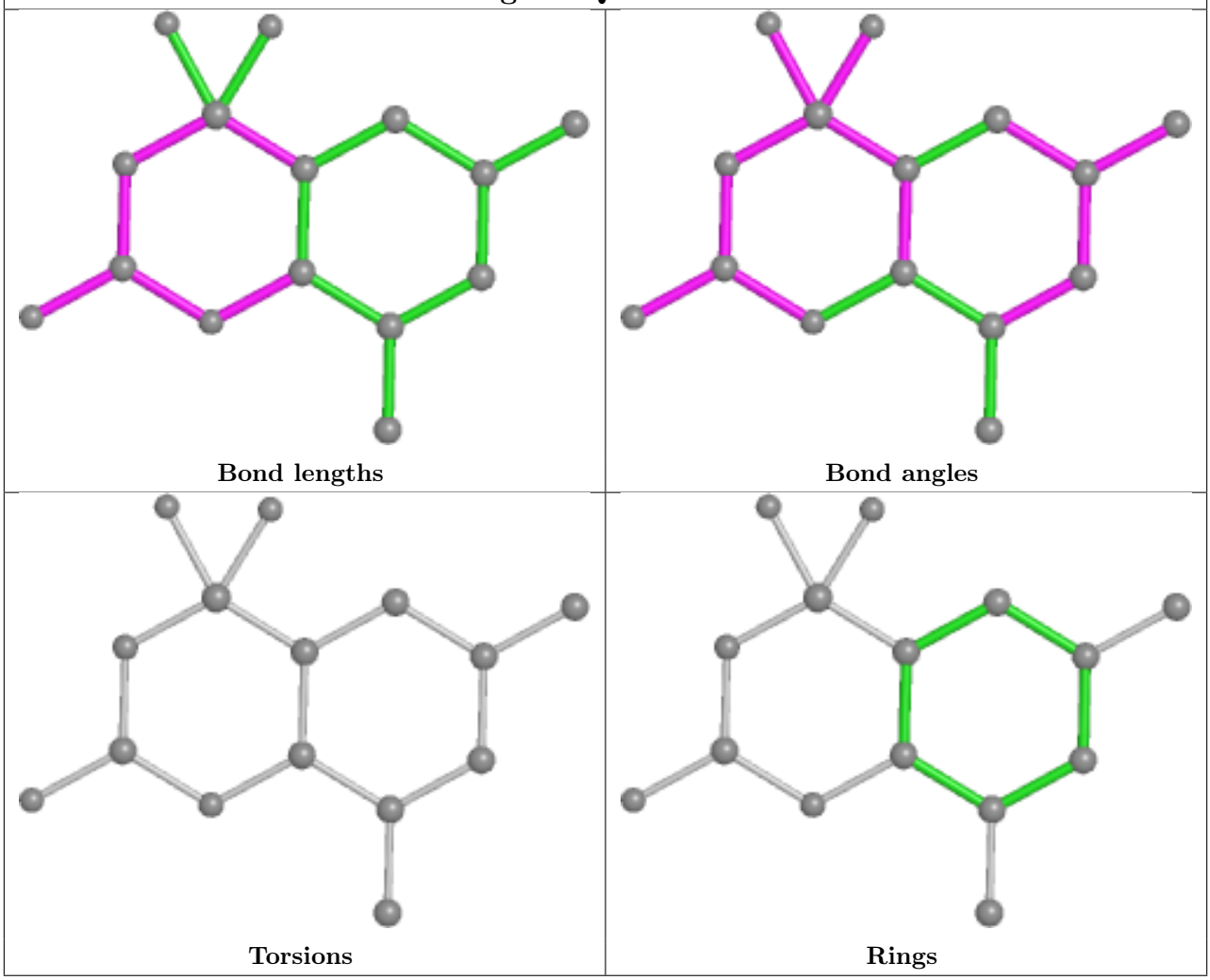
There are no ring outliers.

No monomer is involved in short contacts.

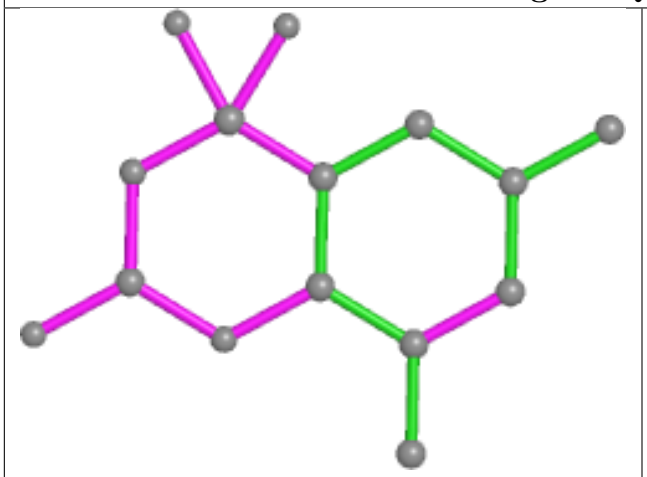
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

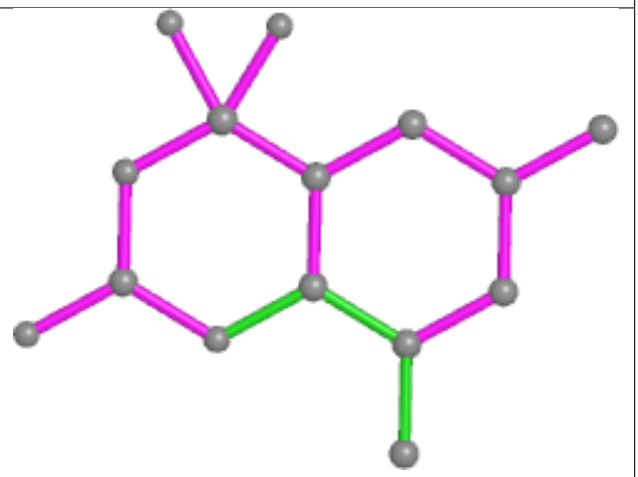
Ligand Q77 A 304



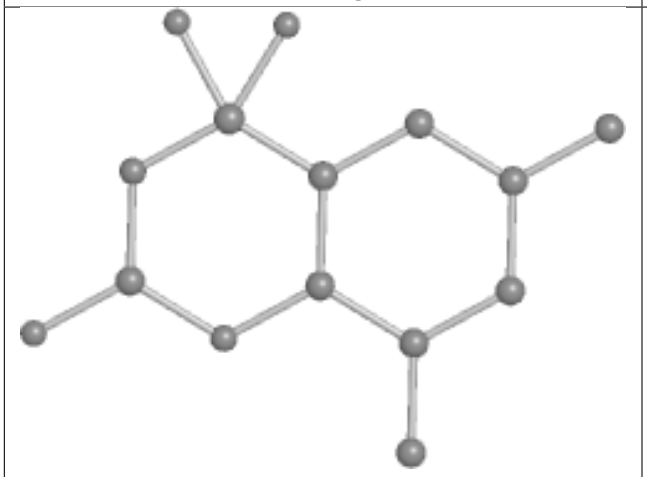
Ligand Q77 A 302



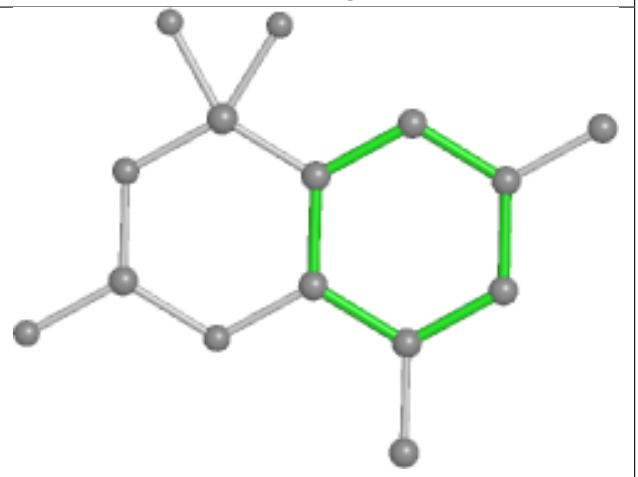
Bond lengths



Bond angles

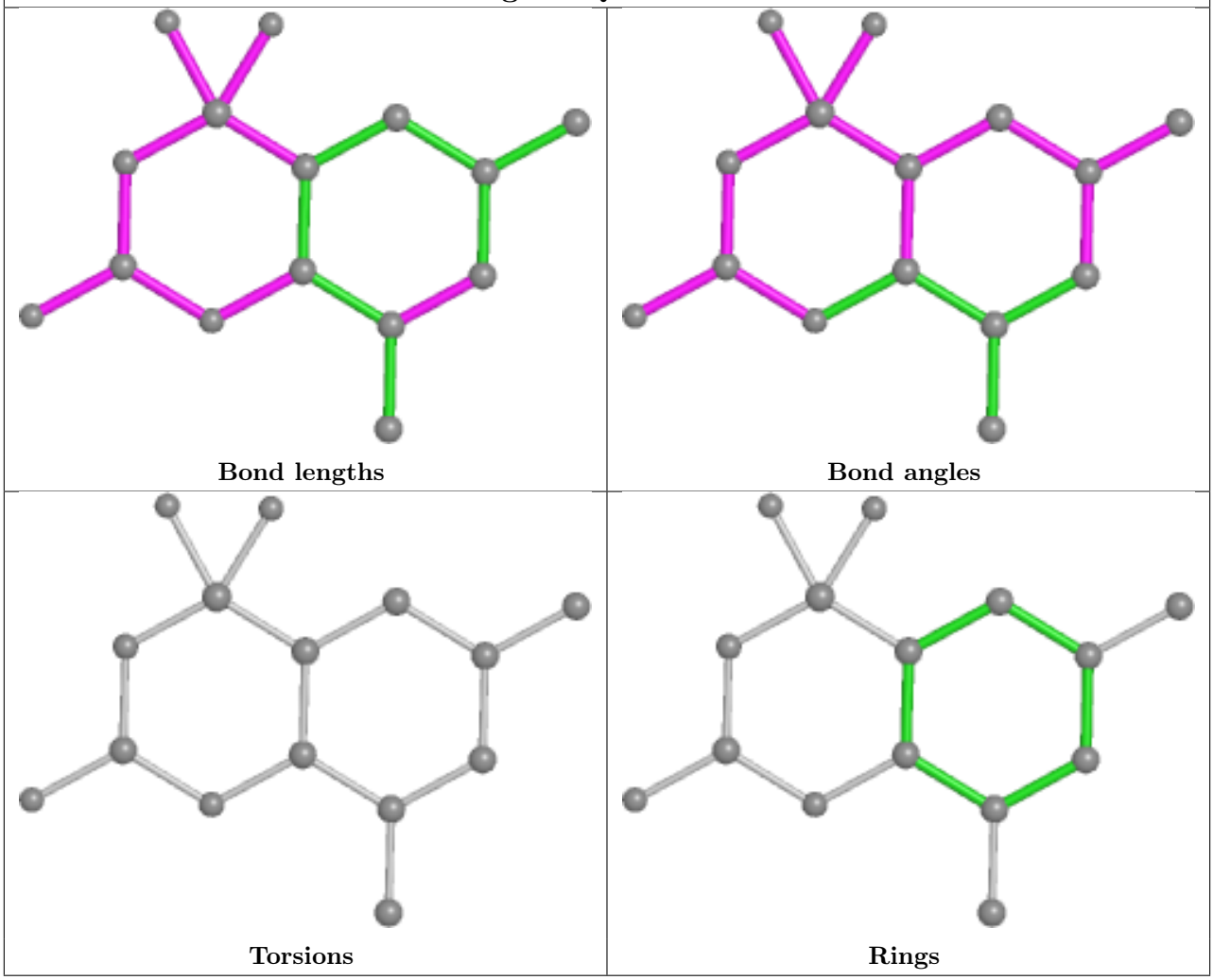


Torsions



Rings

Ligand Q77 A 303



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.