W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 23, 2021 – 11:15 AM EDT

PDB ID	:	1KNY
Title	:	KANAMYCIN NUCLEOTIDYLTRANSFERASE
Authors	:	Pedersen, L.C.; Benning, M.M.; Holden, H.M.
Deposited on	:	1995-07-07
Resolution	:	2.50 Å(reported)

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

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
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)	:	2.23.2

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 2.50 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
Clashscore		34
Ramachandran outliers		2.2%
Sidechain outliers		15.8%

Worse *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution
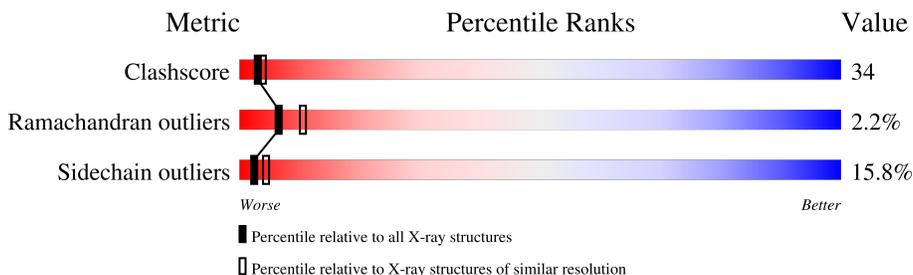
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)

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	253	34% 53% 12% •
1	B	253	32% 53% 12% •

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 4231 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 KANAMYCIN NUCLEOTIDYLTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	253	Total	C	N	O	S	0	0	0
			2029	1294	329	393	13			
1	B	253	Total	C	N	O	S	0	0	0
			2029	1294	329	393	13			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	80	TYR	ASP	engineered mutation	UNP P05057
B	80	TYR	ASP	engineered mutation	UNP P05057

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		
2	B	1	Total	Mg	0	0
			1	1		

- Molecule 3 is DIPHOSPHOMETHYLPHOSPHONIC ACID ADENOSYL ESTER (three-letter code: APC) (formula: $C_{11}H_{18}N_5O_{12}P_3$).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
3	B	1	Total	C	N	O	P	0	0
			31	11	5	12	3		

- Molecule 4 is KANAMYCIN A (three-letter code: KAN) (formula: $C_{18}H_{36}N_4O_{11}$).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			33	18	4	11		
4	B	1	Total	C	N	O	0	0
			33	18	4	11		

• Molecule 5 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	28	Total O 28 28		0	0
5	B	15	Total O 15 15		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: KANAMYCIN NUCLEOTIDYLTRANSFERASE
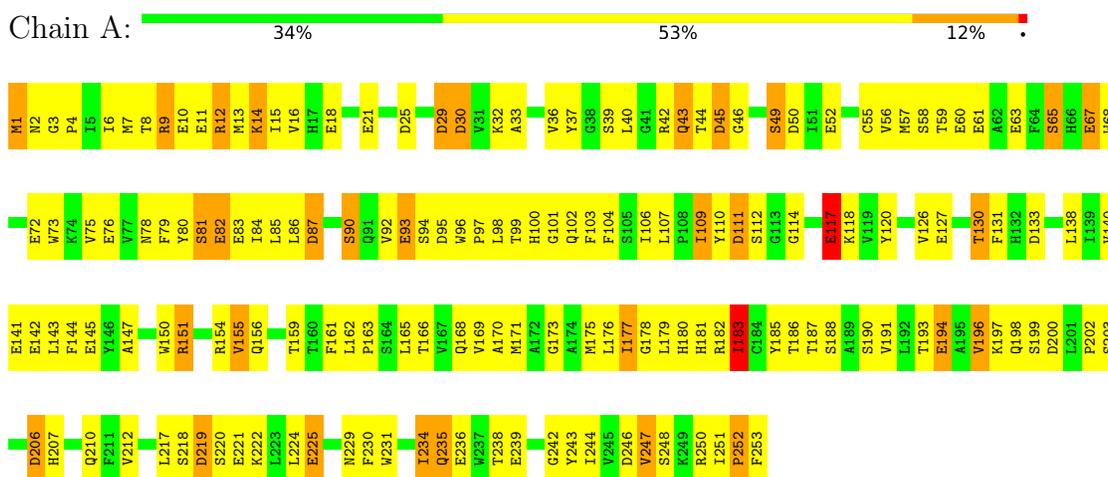
• Molecule 1: KANAMYCIN NUCLEOTIDYLTRANSFERASE
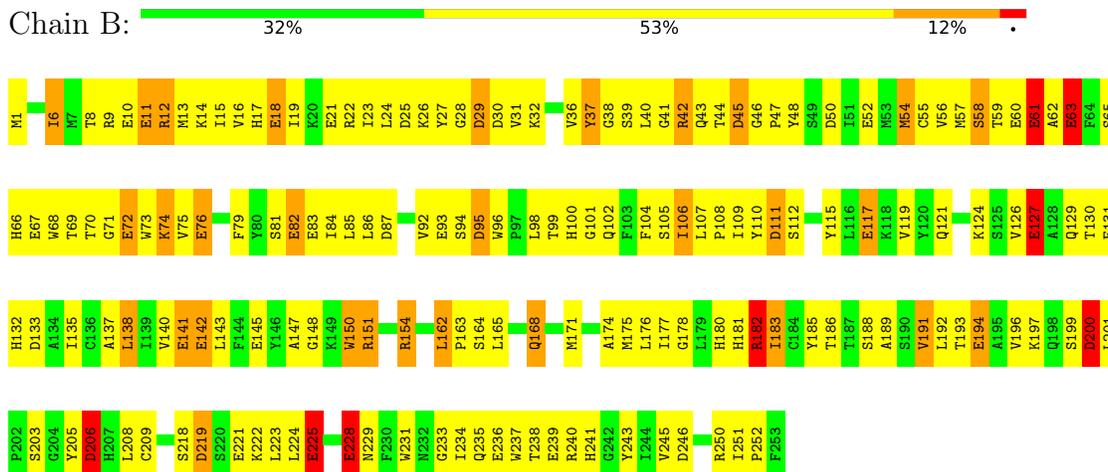
4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	57.30Å 102.20Å 108.80Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) (30.00-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT	Depositor
R, R_{free}	0.168 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4231	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: MG, APC, KAN

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	1.11	21/2078 (1.0%)	1.35	20/2815 (0.7%)
1	B	1.08	23/2078 (1.1%)	1.40	23/2815 (0.8%)
All	All	1.10	44/4156 (1.1%)	1.37	43/5630 (0.8%)

The worst 5 of 44 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	145	GLU	CD-OE2	8.87	1.35	1.25
1	A	142	GLU	CD-OE1	8.59	1.35	1.25
1	A	60	GLU	CD-OE2	7.19	1.33	1.25
1	A	83	GLU	CD-OE1	7.00	1.33	1.25
1	A	221	GLU	CD-OE1	6.78	1.33	1.25

The worst 5 of 43 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	12	ARG	NE-CZ-NH2	-8.63	115.98	120.30
1	B	200	ASP	CB-CG-OD1	-8.38	110.75	118.30
1	B	50	ASP	CB-CG-OD2	-8.12	110.99	118.30
1	B	87	ASP	CB-CG-OD2	-7.85	111.23	118.30
1	B	29	ASP	CB-CG-OD2	-7.83	111.26	118.30

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	2029	0	1957	138	19
1	B	2029	0	1957	165	19
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	31	0	12	4	0
3	B	31	0	14	4	0
4	A	33	0	36	3	0
4	B	33	0	36	1	0
5	A	28	0	0	3	0
5	B	15	0	0	3	0
All	All	4231	0	4012	281	19

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 34.

The worst 5 of 281 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:154:ARG:HG3	1:B:224:LEU:HD13	1.38	1.04
1:A:252:PRO:HG3	1:B:68:TRP:CE3	2.08	0.89
1:B:194:GLU:HA	1:B:197:LYS:HE3	1.58	0.85
1:A:252:PRO:HG3	1:B:68:TRP:CD2	2.12	0.84
1:B:219:ASP:O	1:B:223:LEU:HG	1.79	0.82

The worst 5 of 19 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)
1:A:112:SER:O	1:B:111:ASP:N[1_455]	1.02	1.18
1:A:114:GLY:N	1:B:109:ILE:O[1_455]	1.47	0.73
1:A:117:GLU:CG	1:B:17:HIS:ND1[1_455]	1.63	0.57
1:A:43:GLN:OE1	1:B:43:GLN:O[1_455]	1.65	0.55
1:A:112:SER:C	1:B:111:ASP:N[1_455]	1.68	0.52

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	251/253 (99%)	227 (90%)	19 (8%)	5 (2%)	7	12
1	B	251/253 (99%)	221 (88%)	24 (10%)	6 (2%)	6	9
All	All	502/506 (99%)	448 (89%)	43 (9%)	11 (2%)	6	10

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	182	ARG
1	A	155	VAL
1	A	198	GLN
1	A	248	SER
1	B	200	ASP

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	222/222 (100%)	188 (85%)	34 (15%)	2	5
1	B	222/222 (100%)	186 (84%)	36 (16%)	2	4
All	All	444/444 (100%)	374 (84%)	70 (16%)	2	4

5 of 70 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	182	ARG

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Mol	Chain	Res	Type
1	B	186	THR
1	B	225	GLU
1	A	183	ILE
1	A	182	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	132	HIS
1	B	156	GLN
1	B	229	ASN
1	B	181	HIS
1	A	229	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 ⓘ

Of 6 ligands modelled in this entry, 2 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	APC	A	556	2	27,33,33	1.45	5 (18%)	31,52,52	1.85	6 (19%)
3	APC	B	557	2	27,33,33	1.21	4 (14%)	31,52,52	1.68	5 (16%)
4	KAN	B	559	-	35,35,35	0.45	0	46,52,52	1.37	6 (13%)
4	KAN	A	558	-	35,35,35	0.41	0	46,52,52	1.20	6 (13%)

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	APC	A	556	2	-	8/15/38/38	0/3/3/3
3	APC	B	557	2	-	6/15/38/38	0/3/3/3
4	KAN	B	559	-	-	3/12/72/72	0/3/3/3
4	KAN	A	558	-	-	3/12/72/72	0/3/3/3

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	556	APC	PB-O2B	-3.24	1.48	1.56
3	A	556	APC	C6-N6	-3.10	1.22	1.34
3	B	557	APC	PA-O2A	-2.71	1.50	1.56
3	A	556	APC	C2-N3	-2.64	1.27	1.32
3	B	557	APC	PB-O2B	-2.59	1.50	1.56

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	556	APC	C2-N1-C6	5.29	127.81	118.75
4	B	559	KAN	O9-C10-C11	4.65	120.28	109.18
3	A	556	APC	C5-C6-N1	-4.59	109.94	120.35
3	A	556	APC	C5-C6-N6	4.32	126.92	120.35
3	B	557	APC	C2-N1-C6	4.29	126.09	118.75

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	556	APC	PB-C3A-PA-O1A
3	A	556	APC	PB-C3A-PA-O2A

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Mol	Chain	Res	Type	Atoms
3	A	556	APC	PB-C3A-PA-O5'
3	A	556	APC	C5'-O5'-PA-O1A
3	B	557	APC	PB-C3A-PA-O1A

There are no ring outliers.

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	556	APC	4	0
3	B	557	APC	4	0
4	B	559	KAN	1	0
4	A	558	KAN	3	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 APC A 556

Bond lengths   Bond angles

Torsions   Rings

Ligand APC B 557

Bond lengths

Bond angles

Torsions

Rings

Ligand KAN B 559

Bond lengths

Bond angles

Torsions

Rings

Ligand KAN A 558

Bond lengths

Bond angles

Torsions

Rings
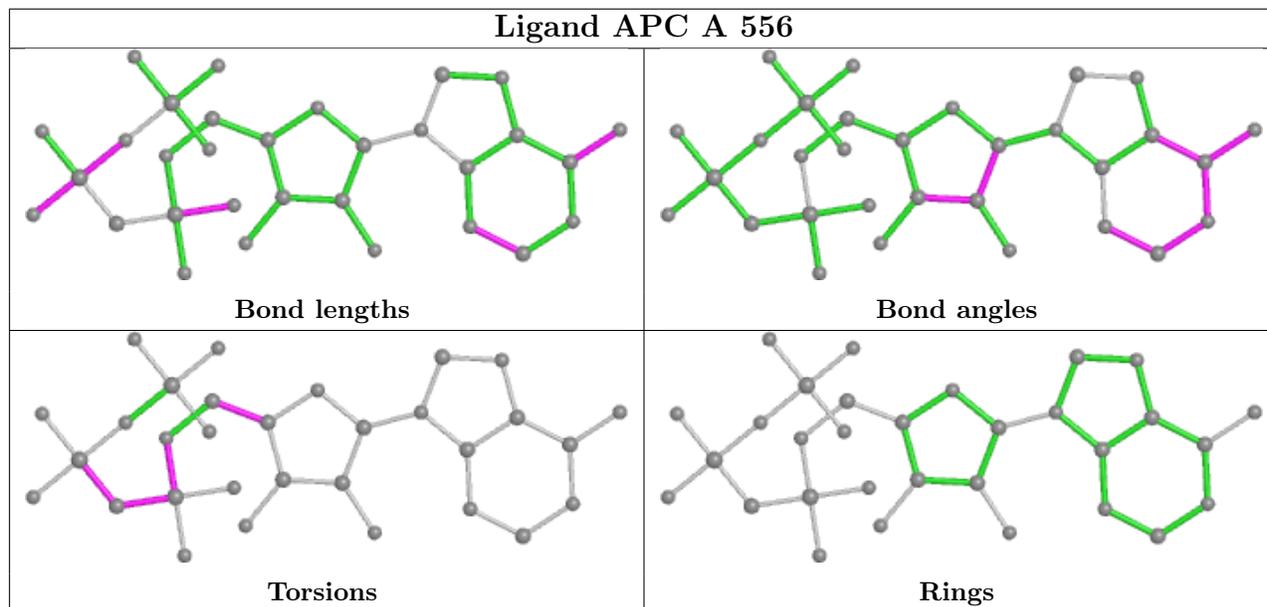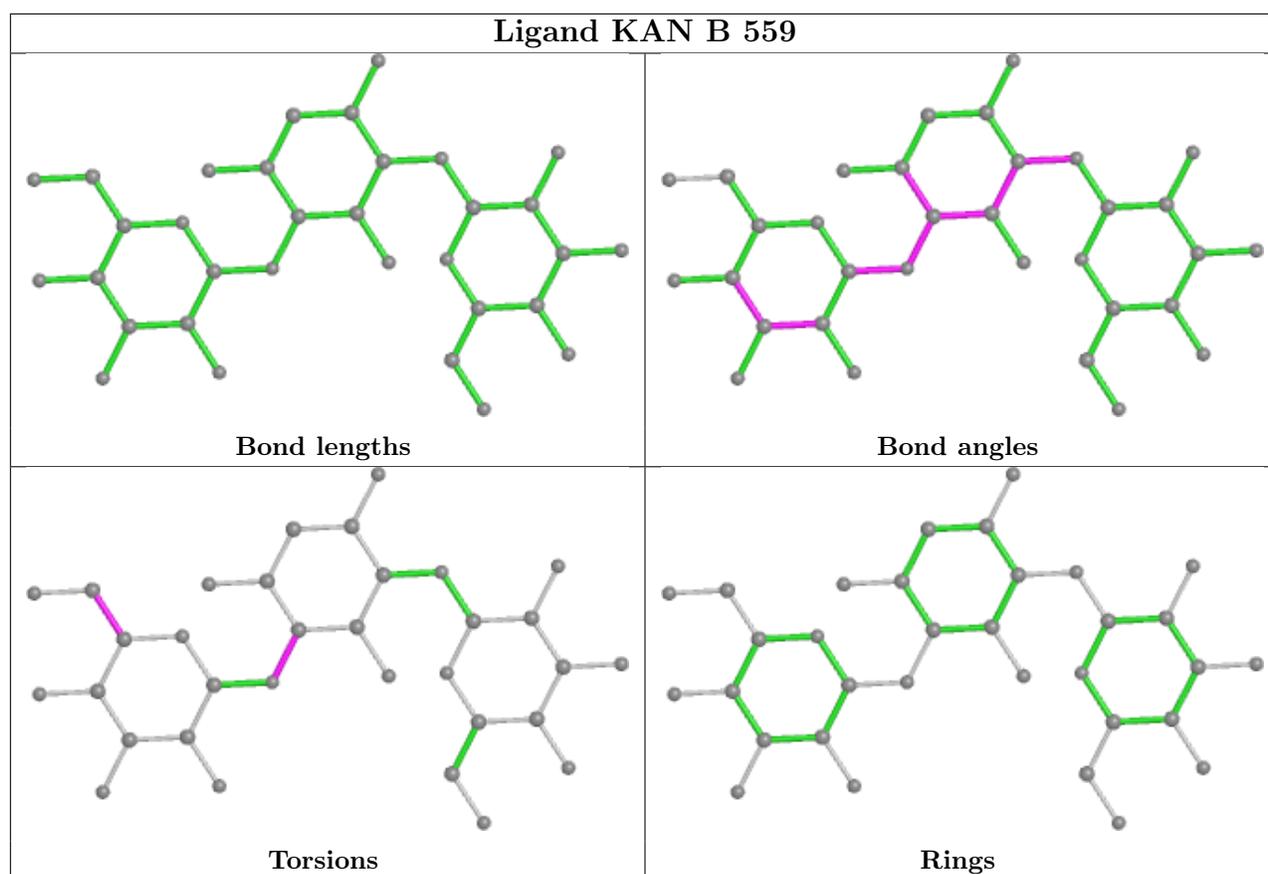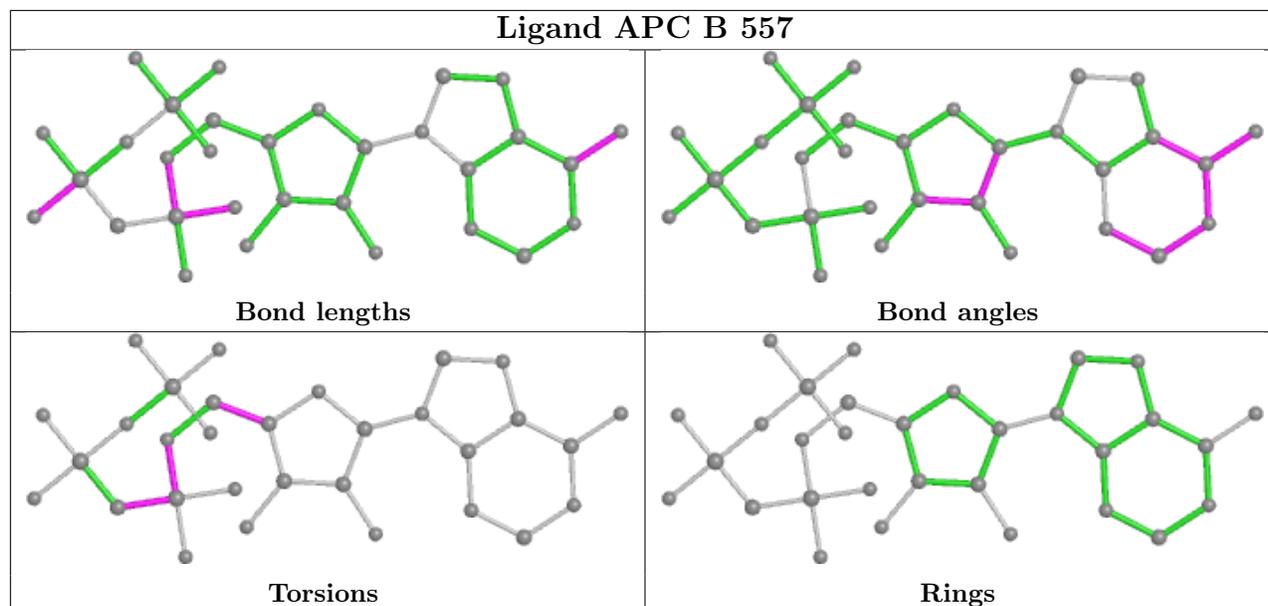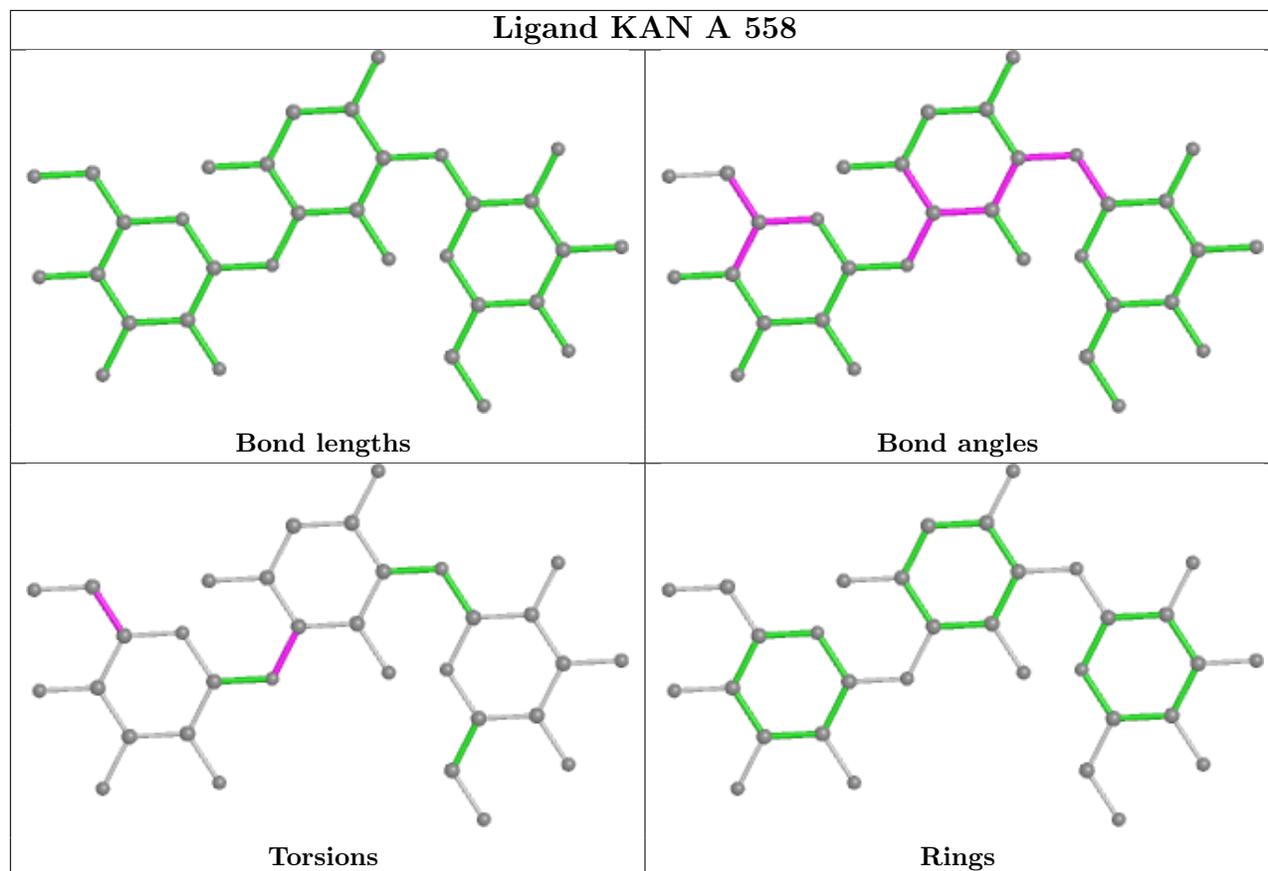
5.7 Other polymers ⓘ

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.