# wwPDB X-ray Structure Validation Summary Report (i)

Dec 3, 2023 – 06:15 am GMT

|  |  |  |
|---|---|---|
| PDB ID | : | 1E6Y |
| Title | : | Methyl-coenzyme M reductase from Methanosarcina barkeri |
| Authors | : | Grabarse, W.; Ermler, U. |
| Deposited on | : | 2000-08-23 |
| Resolution | : | 1.60 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.

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

|  |  |  |
|---|---|---|
| MolProbity | : | 4.02b-467 |
| Mogul | : | 1.8.4, 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) | : | 2.36 |

PERCENTILES INFOmissingINFO

# 1 Entry composition ⓘ

There are 8 unique types of molecules in this entry. The entry contains 21340 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 METHYL-COENZYME M REDUCTASE SUBUNIT ALPHA.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|---|---|---|---|---------|---------|-------|
| 1 | A | 568 | Total 4346 | C 2735 | N 737 | O 846 | S 28 | 0 | 4 | 0 |
| 1 | D | 568 | Total 4348 | C 2738 | N 740 | O 842 | S 28 | 0 | 3 | 0 |

- Molecule 2 is a protein called METHYL-COENZYME M REDUCTASE I BETA SUBUNIT.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|---|---|---|---|---------|---------|-------|
| 2 | B | 432 | Total 3176 | C 1987 | N 549 | O 621 | S 19 | 0 | 4 | 0 |
| 2 | E | 433 | Total 3178 | C 1990 | N 550 | O 620 | S 18 | 0 | 1 | 0 |

- Molecule 3 is a protein called METHYL-COENZYME M REDUCTASE SUBUNIT GAMMA.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|---|---|---|---|---------|---------|-------|
| 3 | C | 247 | Total 1947 | C 1202 | N 359 | O 375 | S 11 | 0 | 0 | 0 |
| 3 | F | 247 | Total 1950 | C 1205 | N 359 | O 375 | S 11 | 0 | 1 | 0 |

- Molecule 4 is FACTOR 430 (three-letter code: F43) (formula: $C_{42}H_{51}N_6NiO_{13}$).
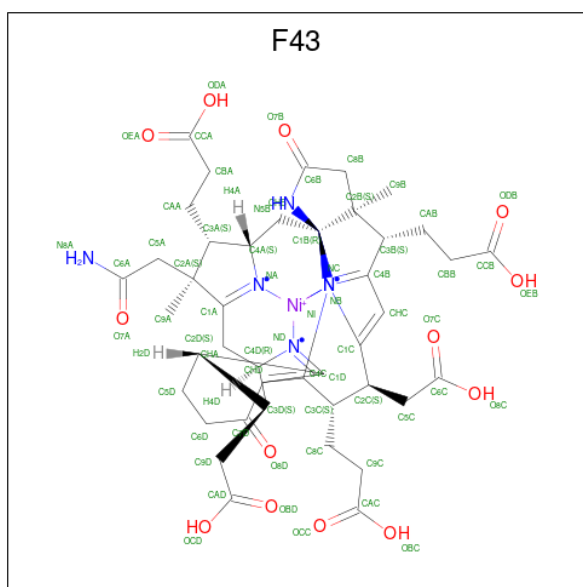
| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|---------|
| 4 | A | 1 | Total | C | N | Ni | O | 0 | 0 |
| | | | 62 | 42 | 6 | 1 | 13 | | |
| 4 | D | 1 | Total | C | N | Ni | O | 0 | 0 |
| | | | 62 | 42 | 6 | 1 | 13 | | |

• Molecule 5 is Coenzyme B (three-letter code: TP7) (formula: $C_{11}H_{22}NO_7PS$).
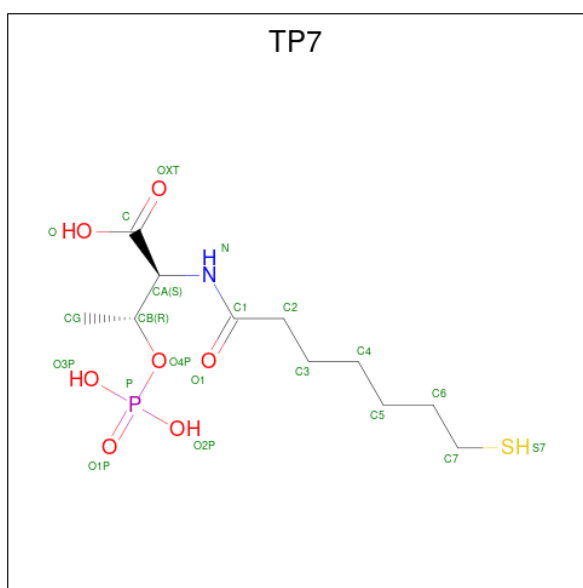


| Mol | Chain | Residues | Atoms | | | | | | ZeroOcc | AltConf |
|-----|-------|----------|-------|-----|-----|-----|-----|-----|---------|---------|
| 5 | A | 1 | Total | C | N | O | P | S | 0 | 0 |
| | | | 21 | 11 | 1 | 7 | 1 | 1 | | |
| 5 | D | 1 | Total | C | N | O | P | S | 0 | 0 |
| | | | 21 | 11 | 1 | 7 | 1 | 1 | | |

- Molecule 6 is 1-THIOETHANESULFONIC ACID (three-letter code: COM) (formula: $C_2H_6O_3S_2$).
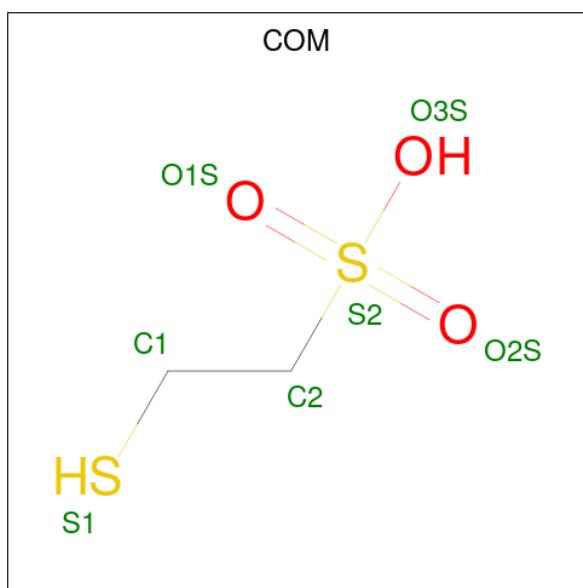


| Mol | Chain | Residues | Atoms | | | | ZeroOcc | AltConf |
|-----|-------|----------|-------|---|---|---|---------|---------|
| 6 | A | 1 | Total | C | O | S | 0 | 0 |
| | | | 7 | 2 | 3 | 2 | | |
| 6 | D | 1 | Total | C | O | S | 0 | 0 |
| | | | 7 | 2 | 3 | 2 | | |

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).
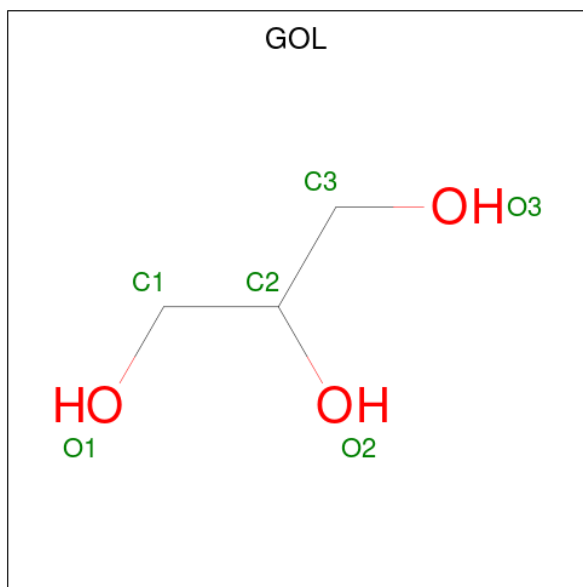


| Mol | Chain | Residues | Atoms | | | ZeroOcc | AltConf |
|-----|-------|----------|-------|---|---|---------|---------|
| 7 | A | 1 | Total | C | O | 0 | 0 |
| | | | 6 | 3 | 3 | | |

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| Mol | Chain | Residues | Atoms | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|
| 7 | A | 1 | Total<br>6 | C<br>3 | O<br>3 | 0 | 0 |
| 7 | D | 1 | Total<br>6 | C<br>3 | O<br>3 | 0 | 0 |

• Molecule 8 is water.

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| 8 | A | 489 | Total<br>489 | O<br>489 | 0 | 0 |
| 8 | B | 340 | Total<br>342 | O<br>342 | 0 | 2 |
| 8 | C | 241 | Total<br>241 | O<br>241 | 0 | 0 |
| 8 | D | 522 | Total<br>522 | O<br>522 | 0 | 0 |
| 8 | E | 339 | Total<br>339 | O<br>339 | 0 | 0 |
| 8 | F | 264 | Total<br>264 | O<br>264 | 0 | 0 |

SEQUENCE-PLOTS INFOmissingINFO

# 2 Data and refinement statistics ⓘ

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

| Property | Value | Source |
|----------|-------|--------|
| Space group | P 21 21 21 | Depositor |
| Cell constants<br>a, b, c, $\alpha$, $\beta$, $\gamma$ | 113.68Å     153.10Å     153.29Å<br>90.00°      90.00°      90.00° | Depositor |
| Resolution (Å) | 30.00   –   1.60 | Depositor |
| % Data completeness<br>(in resolution range) | 89.0 (30.00-1.60) | Depositor |
| $R_{merge}$ | 0.06 | Depositor |
| $R_{sym}$ | (Not available) | Depositor |
| $<I/\sigma(I)>$ [1] | 3.98 (at 1.60Å) | Xtriage |
| Refinement program | CNS 0.3 | Depositor |
| R, $R_{free}$ | 0.160   ,   0.179 | Depositor |
| Wilson B-factor (Å$^2$) | 11.0 | Xtriage |
| Anisotropy | 0.817 | Xtriage |
| L-test for twinning[2] | $<|L|> = 0.48$, $<L^2> = 0.31$ | Xtriage |
| Estimated twinning fraction | 0.011 for -h,l,k | Xtriage |
| Total number of atoms | 21340 | wwPDB-VP |
| Average B, all atoms (Å$^2$) | 14.0 | wwPDB-VP |

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 33.28 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 8.2047e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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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.

## 3 Model quality ⓘ

### 3.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: COM, AGM, F43, TP7, MHS, GOL, OCS, GL3, SMC

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 | 0.31 | 0/4423 | 0.68 | 9/5988 (0.2%) |
| 1 | D | 0.64 | 6/4418 (0.1%) | 1.95 | 26/5979 (0.4%) |
| 2 | B | 0.29 | 0/3244 | 0.61 | 8/4390 (0.2%) |
| 2 | E | 0.30 | 0/3231 | 0.65 | 8/4372 (0.2%) |
| 3 | C | 0.31 | 0/1976 | 0.85 | 17/2666 (0.6%) |
| 3 | F | 0.32 | 0/1983 | 1.85 | 15/2676 (0.6%) |
| All | All | 0.41 | 6/19275 (0.0%) | 1.24 | 83/26071 (0.3%) |

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 | 2 |
| 1 | D | 0 | 2 |
| 2 | B | 0 | 2 |
| 2 | E | 0 | 3 |
| 3 | C | 0 | 1 |
| 3 | F | 0 | 1 |
| All | All | 0 | 11 |

The worst 5 of 6 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|---------|------|--------|-------|-------------|----------|
| 1 | D | 4551[A] | ARG | CZ-NH2 | 22.62 | 1.62 | 1.33 |
| 1 | D | 4551[B] | ARG | CZ-NH2 | 22.62 | 1.62 | 1.33 |
| 1 | D | 4551[A] | ARG | NE-CZ | 10.05 | 1.46 | 1.33 |
| 1 | D | 4551[B] | ARG | NE-CZ | 10.05 | 1.46 | 1.33 |
| 1 | D | 4551[A] | ARG | CG-CD | -8.02 | 1.31 | 1.51 |

The worst 5 of 83 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|-----|-------|-----|------|-------|---|----------------|-------------|
| 1 | D | 4551[A] | ARG | NH1-CZ-NH2 | -85.30 | 25.57 | 119.40 |
| 1 | D | 4551[B] | ARG | NH1-CZ-NH2 | -85.30 | 25.57 | 119.40 |
| 3 | F | 6040[A] | VAL | CG1-CB-CG2 | -59.08 | 16.37 | 110.90 |
| 3 | F | 6040[B] | VAL | CG1-CB-CG2 | -59.08 | 16.37 | 110.90 |
| 1 | D | 4551[A] | ARG | NE-CZ-NH2 | -44.85 | 97.87 | 120.30 |

There are no chirality outliers.

5 of 11 planarity outliers are listed below:

| Mol | Chain | Res | Type | Group |
|-----|-------|-----|------|-------|
| 1 | A | 1396[A] | GLU | Sidechain |
| 1 | A | 1396[B] | GLU | Sidechain |
| 2 | B | 2331 | TYR | Sidechain |
| 2 | B | 2347 | TYR | Sidechain |
| 3 | C | 3093 | TYR | Sidechain |

## 3.2 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 | 4346 | 0 | 4191 | 39 | 0 |
| 1 | D | 4348 | 0 | 4205 | 50 | 0 |
| 2 | B | 3176 | 0 | 3161 | 17 | 0 |
| 2 | E | 3178 | 0 | 3170 | 22 | 0 |
| 3 | C | 1947 | 0 | 1888 | 9 | 0 |
| 3 | F | 1950 | 0 | 1894 | 13 | 0 |
| 4 | A | 62 | 0 | 43 | 6 | 0 |
| 4 | D | 62 | 0 | 43 | 5 | 0 |
| 5 | A | 21 | 0 | 19 | 2 | 0 |
| 5 | D | 21 | 0 | 19 | 1 | 0 |
| 6 | A | 7 | 0 | 5 | 1 | 0 |
| 6 | D | 7 | 0 | 5 | 0 | 0 |
| 7 | A | 12 | 0 | 16 | 0 | 0 |
| 7 | D | 6 | 0 | 8 | 0 | 0 |
| 8 | A | 489 | 0 | 0 | 5 | 0 |
| 8 | B | 342 | 0 | 0 | 1 | 0 |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 8 | C | 241 | 0 | 0 | 1 | 0 |
| 8 | D | 522 | 0 | 0 | 4 | 0 |
| 8 | E | 339 | 0 | 0 | 4 | 0 |
| 8 | F | 264 | 0 | 0 | 2 | 0 |
| All | All | 21340 | 0 | 18667 | 131 | 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 3.

The worst 5 of 131 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:D:4551[B]:ARG:NH2 | 1:D:4551[B]:ARG:CZ | 1.69 | 1.56 |
| 1:D:4551[B]:ARG:CD | 1:D:4551[B]:ARG:CG | 1.76 | 1.55 |
| 1:D:4551[B]:ARG:CG | 1:D:4551[B]:ARG:NE | 1.87 | 1.38 |
| 1:D:4551[B]:ARG:CD | 1:D:4551[B]:ARG:CB | 2.38 | 1.01 |
| 1:D:4551[B]:ARG:HE | 1:D:4551[B]:ARG:HG2 | 1.24 | 1.01 |

There are no symmetry-related clashes.

## 3.3 Torsion angles ⓘ

### 3.3.1 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 | 566/569 (100%) | 546 (96%) | 19 (3%) | 1 (0%) | 47 | 26 |
| 1 | D | 565/569 (99%) | 546 (97%) | 18 (3%) | 1 (0%) | 47 | 26 |
| 2 | B | 434/433 (100%) | 428 (99%) | 6 (1%) | 0 | 100 | 100 |
| 2 | E | 432/433 (100%) | 426 (99%) | 6 (1%) | 0 | 100 | 100 |
| 3 | C | 244/247 (99%) | 239 (98%) | 5 (2%) | 0 | 100 | 100 |
| 3 | F | 245/247 (99%) | 237 (97%) | 8 (3%) | 0 | 100 | 100 |

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| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles | |
|-----|-------|----------|----------|---------|----------|-----|-----|
| All | All | 2486/2498 (100%) | 2422 (97%) | 62 (2%) | 2 (0%) | 51 | 29 |

All (2) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | A | 1525 | VAL |
| 1 | D | 4525 | VAL |

### 3.3.2 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 | 446/443 (101%) | 436 (98%) | 10 (2%) | 52 | 27 |
| 1 | D | 445/443 (100%) | 436 (98%) | 9 (2%) | 55 | 31 |
| 2 | B | 335/332 (101%) | 333 (99%) | 2 (1%) | 86 | 77 |
| 2 | E | 333/332 (100%) | 331 (99%) | 2 (1%) | 86 | 77 |
| 3 | C | 201/201 (100%) | 197 (98%) | 4 (2%) | 55 | 31 |
| 3 | F | 202/201 (100%) | 198 (98%) | 4 (2%) | 55 | 31 |
| All | All | 1962/1952 (100%) | 1931 (98%) | 31 (2%) | 65 | 41 |

5 of 31 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 3 | C | 3178 | LEU |
| 3 | F | 6176 | ARG |
| 1 | D | 4131 | GLU |
| 3 | F | 6195 | ASP |
| 1 | D | 4551[B] | ARG |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|------|------|
| 3 | C | 3239 | GLN |
| 1 | D | 4019 | GLN |
| 3 | F | 6133 | GLN |
| 2 | E | 5402 | GLN |
| 2 | B | 2241 | GLN |

### 3.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 3.4 Non-standard residues in protein, DNA, RNA chains ⓘ

10 non-standard protein/DNA/RNA residues 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 | #$|Z| > 2$ |
| 1 | MHS | D | 4271 | 1 | 7,11,12 | 1.81 | 1 (14%) | 6,14,16 | 1.29 | 1 (16%) |
| 3 | OCS | F | 6065 | 3 | 7,8,9 | 1.24 | 2 (28%) | 6,11,13 | 1.68 | 3 (50%) |
| 3 | OCS | C | 3065 | 3 | 7,8,9 | 1.34 | 2 (28%) | 6,11,13 | 1.70 | 2 (33%) |
| 1 | MHS | A | 1271 | 1 | 7,11,12 | 1.82 | 1 (14%) | 6,14,16 | 1.35 | 1 (16%) |
| 1 | SMC | A | 1472 | 1 | 5,6,7 | 0.61 | 0 | 2,6,8 | 0.53 | 0 |
| 1 | AGM | A | 1285 | 1 | 10,11,12 | 0.49 | 0 | 6,13,15 | 0.33 | 0 |
| 1 | AGM | D | 4285 | 1 | 10,11,12 | 0.46 | 0 | 6,13,15 | 0.25 | 0 |
| 1 | SMC | D | 4472 | 1 | 5,6,7 | 0.60 | 0 | 2,6,8 | 0.52 | 0 |
| 1 | GL3 | A | 1465 | 1 | 2,3,4 | 3.52 | 1 (50%) | 1,2,4 | 0.12 | 0 |
| 1 | GL3 | D | 4465 | 1 | 2,3,4 | 3.47 | 1 (50%) | 1,2,4 | 0.03 | 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 |
|-----|------|-------|-----|------|---------|----------|-------|
| 1 | MHS | D | 4271 | 1 | - | 0/5/6/8 | 0/1/1/1 |

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| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|-----|------|-------|-----|------|---------|----------|-------|
| 3 | OCS | F | 6065 | 3 | - | 0/4/7/9 | - |
| 3 | OCS | C | 3065 | 3 | - | 0/4/7/9 | - |
| 1 | MHS | A | 1271 | 1 | - | 0/5/6/8 | 0/1/1/1 |
| 1 | SMC | A | 1472 | 1 | - | 1/3/5/7 | - |
| 1 | AGM | A | 1285 | 1 | - | 0/10/11/13 | - |
| 1 | AGM | D | 4285 | 1 | - | 0/10/11/13 | - |
| 1 | SMC | D | 4472 | 1 | - | 1/3/5/7 | - |
| 1 | GL3 | A | 1465 | 1 | - | 1/1/1/2 | - |
| 1 | GL3 | D | 4465 | 1 | - | 1/1/1/2 | - |

The worst 5 of 8 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|---|-------------|----------|
| 1 | A | 1465 | GL3 | C-S | -4.97 | 1.63 | 1.80 |
| 1 | D | 4465 | GL3 | C-S | -4.91 | 1.63 | 1.80 |
| 1 | D | 4271 | MHS | CM-ND1 | 4.57 | 1.58 | 1.47 |
| 1 | A | 1271 | MHS | CM-ND1 | 4.49 | 1.57 | 1.47 |
| 3 | C | 3065 | OCS | OD1-SG | 2.29 | 1.51 | 1.45 |

The worst 5 of 7 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|-----|-------|-----|------|-------|---|----------------|-------------|
| 3 | C | 3065 | OCS | OD3-SG-CB | 2.55 | 109.97 | 106.94 |
| 3 | F | 6065 | OCS | OD2-SG-CB | 2.43 | 109.61 | 105.74 |
| 3 | C | 3065 | OCS | OD2-SG-CB | 2.20 | 109.25 | 105.74 |
| 1 | D | 4271 | MHS | NE2-CE1-ND1 | -2.10 | 109.14 | 112.26 |
| 1 | A | 1271 | MHS | NE2-CE1-ND1 | -2.10 | 109.14 | 112.26 |

There are no chirality outliers.

All (4) torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-------|
| 1 | A | 1472 | SMC | CA-CB-SG-CS |
| 1 | D | 4472 | SMC | CA-CB-SG-CS |
| 1 | A | 1465 | GL3 | S-C-CA-N |
| 1 | D | 4465 | GL3 | S-C-CA-N |

There are no ring outliers.

6 monomers are involved in 6 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|-----|-------|------|------|---------|--------------|
| 1 | D | 4271 | MHS | 1 | 0 |
| 1 | A | 1271 | MHS | 1 | 0 |
| 1 | A | 1472 | SMC | 1 | 0 |
| 1 | D | 4472 | SMC | 1 | 0 |
| 1 | A | 1465 | GL3 | 1 | 0 |
| 1 | D | 4465 | GL3 | 1 | 0 |

## 3.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

## 3.6 Ligand geometry ⓘ

9 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 | #$|Z| > 2$ |
| 5 | TP7 | D | 5571 | - | 19,20,20 | 2.05 | 4 (21%) | 24,26,26 | 1.23 | 2 (8%) |
| 4 | F43 | A | 2570 | 6,1 | 61,71,71 | 3.85 | 20 (32%) | 64,118,118 | 2.11 | 15 (23%) |
| 6 | COM | D | 5572 | 4 | 6,6,6 | 1.56 | 1 (16%) | 7,8,8 | 1.39 | 1 (14%) |
| 7 | GOL | A | 2573 | - | 5,5,5 | 1.02 | 0 | 5,5,5 | 0.49 | 0 |
| 7 | GOL | A | 2574 | - | 5,5,5 | 0.89 | 0 | 5,5,5 | 0.48 | 0 |
| 5 | TP7 | A | 2571 | - | 19,20,20 | 2.03 | 5 (26%) | 24,26,26 | 1.23 | 2 (8%) |
| 6 | COM | A | 2572 | 4 | 6,6,6 | 1.66 | 2 (33%) | 7,8,8 | 1.35 | 1 (14%) |
| 7 | GOL | D | 5573 | - | 5,5,5 | 1.05 | 0 | 5,5,5 | 0.55 | 0 |
| 4 | F43 | D | 5570 | 6,1 | 61,71,71 | 3.87 | 21 (34%) | 64,118,118 | 2.10 | 16 (25%) |

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 |
|-----|------|-------|-----|------|---------|----------|-------|
| 5 | TP7 | D | 5571 | - | - | 2/24/24/24 | - |
| 4 | F43 | A | 2570 | 6,1 | - | 10/28/185/185 | - |
| 6 | COM | D | 5572 | 4 | - | 2/4/4/4 | - |
| 7 | GOL | A | 2573 | - | - | 1/4/4/4 | - |
| 7 | GOL | A | 2574 | - | - | 0/4/4/4 | - |
| 5 | TP7 | A | 2571 | - | - | 2/24/24/24 | - |
| 6 | COM | A | 2572 | 4 | - | 0/4/4/4 | - |
| 7 | GOL | D | 5573 | - | - | 0/4/4/4 | - |
| 4 | F43 | D | 5570 | 6,1 | - | 10/28/185/185 | - |

The worst 5 of 53 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|---|-------------|----------|
| 4 | D | 5570 | F43 | CHB-C1B | -18.14 | 1.41 | 1.53 |
| 4 | A | 2570 | F43 | CHB-C1B | -17.79 | 1.41 | 1.53 |
| 4 | D | 5570 | F43 | NI-NA | 12.09 | 2.15 | 1.89 |
| 4 | A | 2570 | F43 | NI-NA | 12.02 | 2.15 | 1.89 |
| 4 | D | 5570 | F43 | CHD-C1D | 10.48 | 1.57 | 1.43 |

The worst 5 of 37 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-------|---|-------------|----------|
| 4 | A | 2570 | F43 | C4D-ND-C1D | -5.83 | 100.85 | 108.51 |
| 4 | D | 5570 | F43 | C4D-ND-C1D | -5.71 | 101.00 | 108.51 |
| 4 | A | 2570 | F43 | CAB-C3B-C2B | -5.62 | 107.20 | 119.09 |
| 4 | D | 5570 | F43 | CAB-C3B-C2B | -5.60 | 107.24 | 119.09 |
| 4 | A | 2570 | F43 | C3B-C4B-CHC | -5.60 | 111.24 | 123.32 |

There are no chirality outliers.
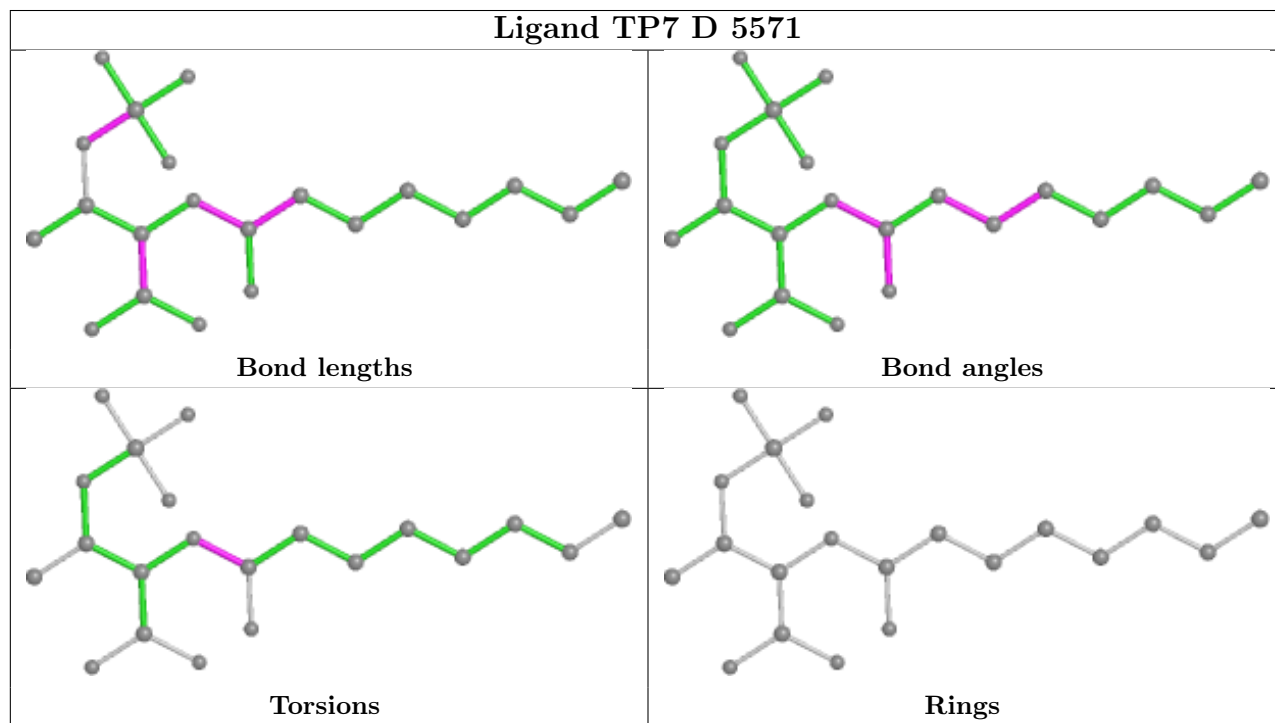
5 of 27 torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-------|
| 4 | A | 2570 | F43 | C3A-CAA-CBA-CCA |
| 4 | D | 5570 | F43 | C3A-CAA-CBA-CCA |
| 5 | D | 5571 | TP7 | O1-C1-N-CA |
| 5 | A | 2571 | TP7 | O1-C1-N-CA |
| 5 | D | 5571 | TP7 | C2-C1-N-CA |

There are no ring outliers.

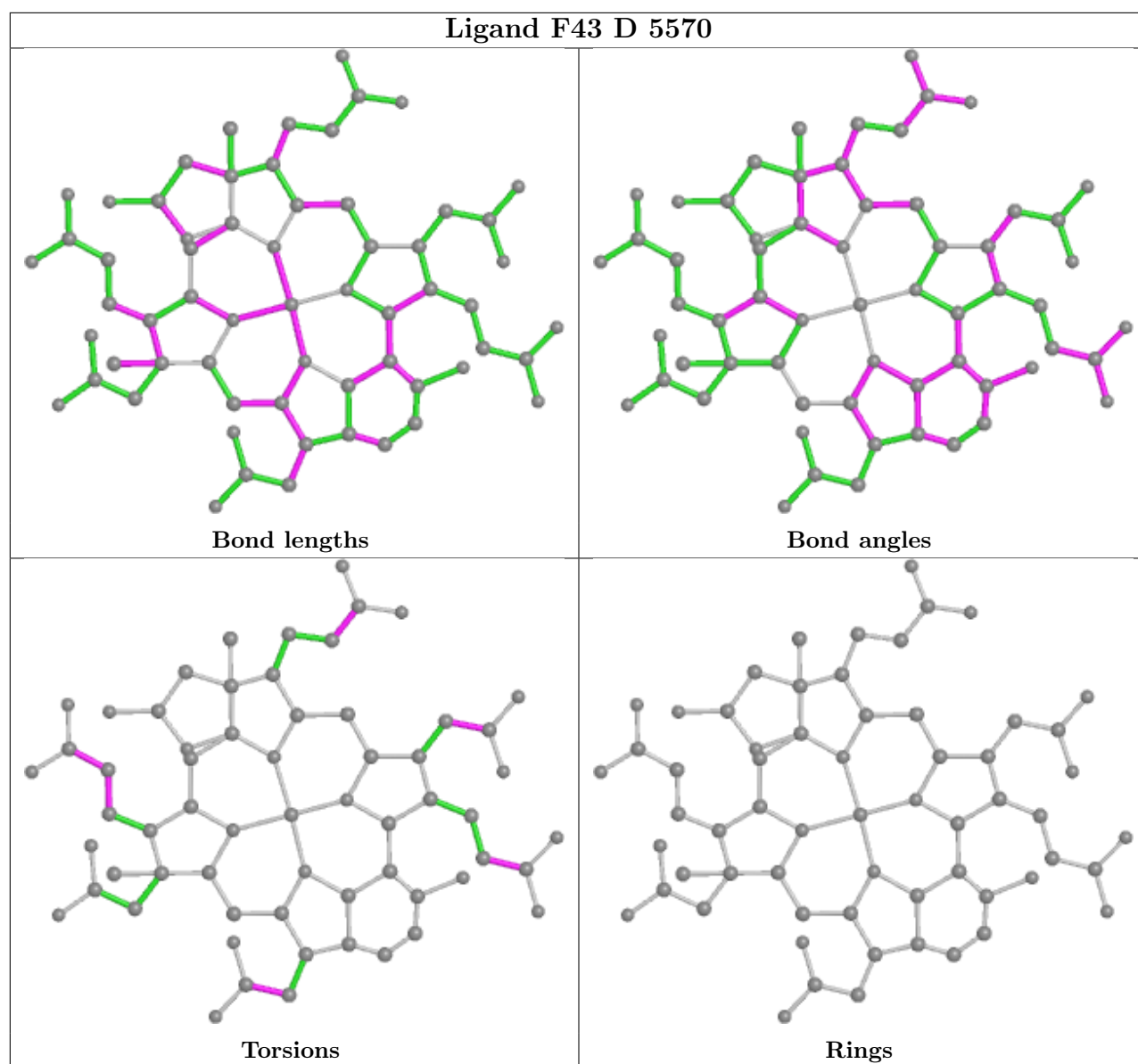5 monomers are involved in 15 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|-----|-------|-----|------|---------|--------------|
| 5 | D | 5571 | TP7 | 1 | 0 |
| 4 | A | 2570 | F43 | 6 | 0 |
| 5 | A | 2571 | TP7 | 2 | 0 |
| 6 | A | 2572 | COM | 1 | 0 |
| 4 | D | 5570 | F43 | 5 | 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 TP7 D 5571**

Bond lengths

Bond angles

Torsions

Rings

## Ligand F43 A 2570


Bond lengths


Bond angles


Torsions


Rings

## Ligand TP7 A 2571


Bond lengths


Bond angles


Torsions


Rings

**Ligand F43 D 5570**



Bond lengths

Bond angles

Torsions

Rings
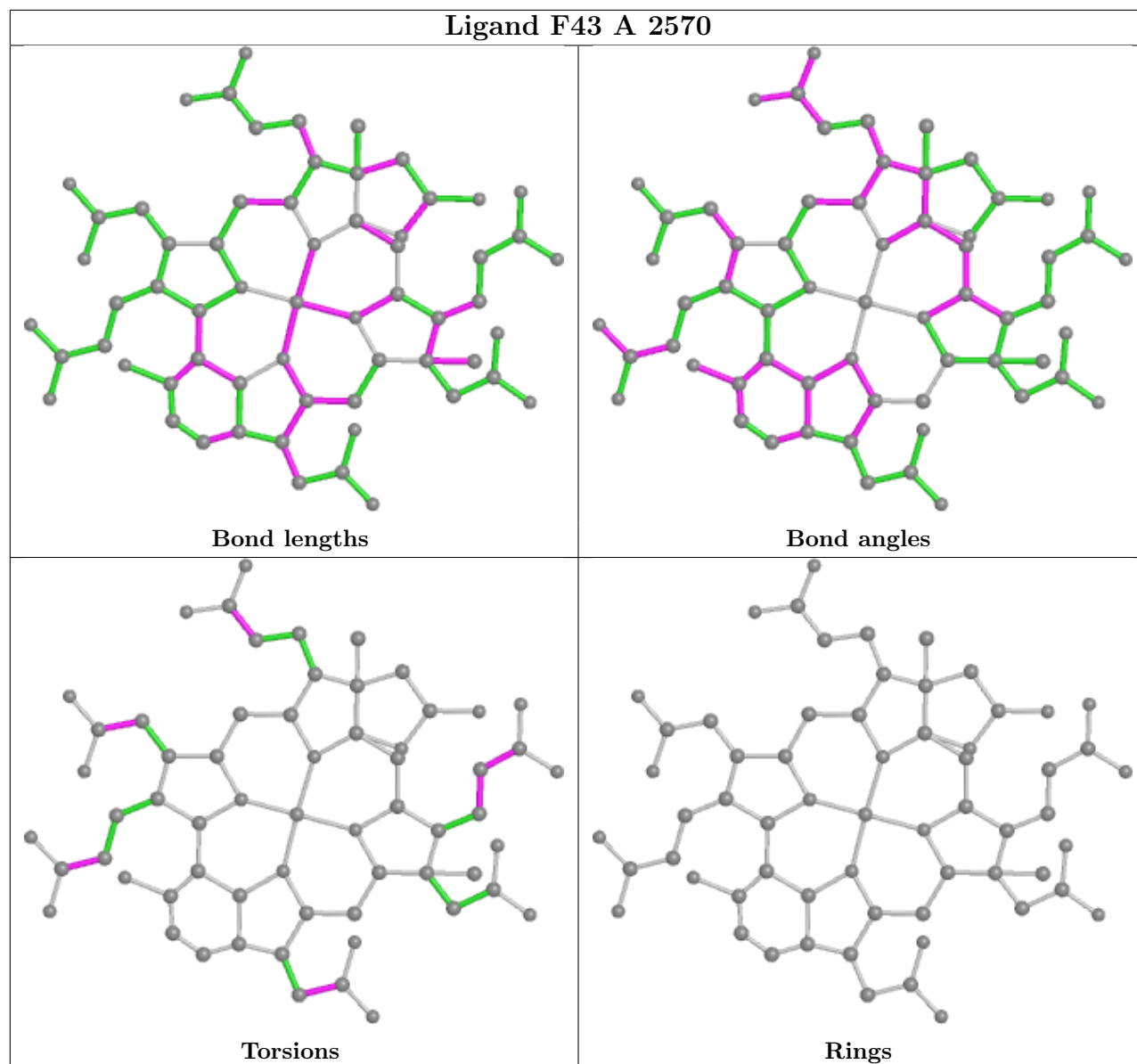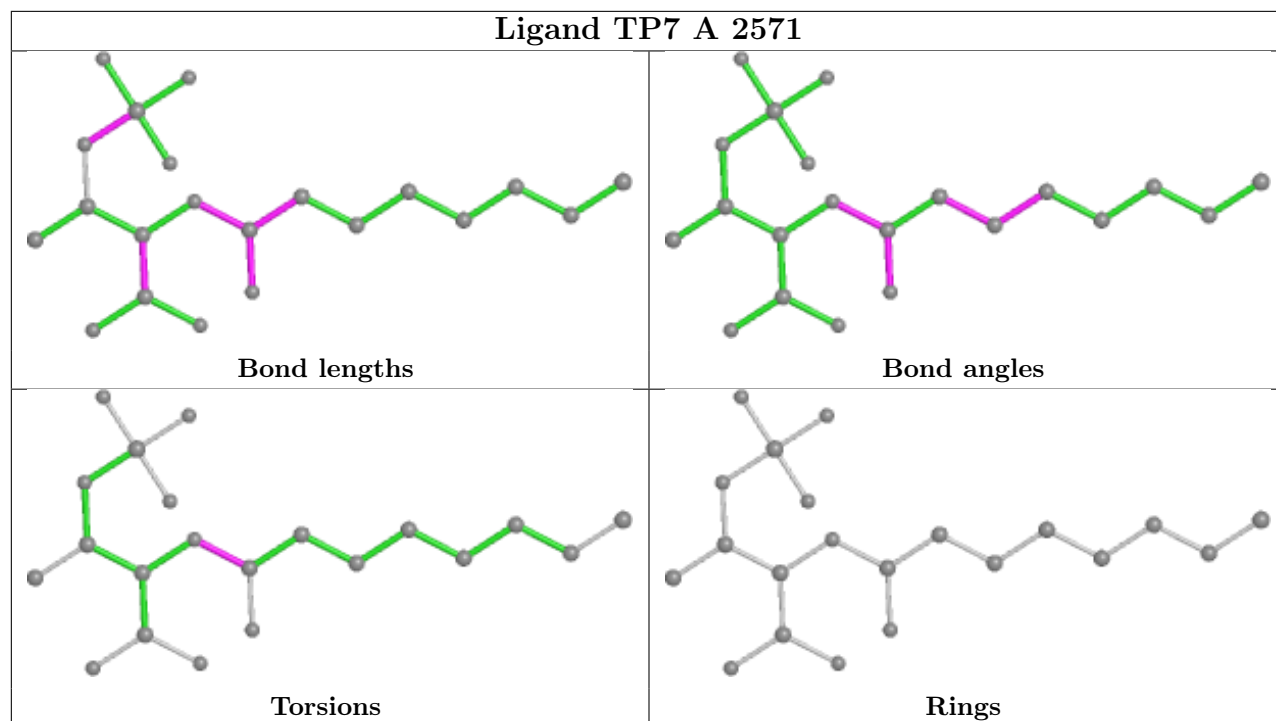
## 3.7 Other polymers ⓘ

There are no such residues in this entry.

## 3.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

# 4 Fit of model and data ⓘ

## 4.1 Protein, DNA and RNA chains ⓘ

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

## 4.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 4.3 Carbohydrates ⓘ

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

## 4.4 Ligands ⓘ

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

## 4.5 Other polymers ⓘ

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