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

Aug 16, 2023 – 05:29 PM EDT

| | | |
|---|---|---|
| PDB ID | : | 1ZM2 |
| Title | : | Structure of ADP-ribosylated eEF2 in complex with catalytic fragment of ETA |
| Authors | : | Joergensen, R.; Merrill, A.R.; Yates, S.P.; Marquez, V.E.; Schwan, A.L.; Boesen, T.; Andersen, G.R. |
| Deposited on | : | 2005-05-10 |
| Resolution | : | 3.07 Å(reported) |

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

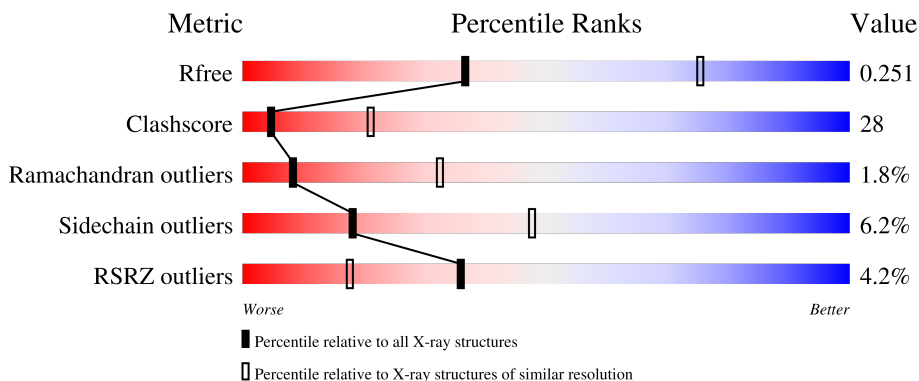| | | |
|---|---|---|
| MolProbity | : | 4.02b-467 |
| Mogul | : | 1.8.5 (274361), CSD as541be (2020) |
| Xtriage (Phenix) | : | 1.13 |
| EDS | : | 2.35 |
| buster-report | : | 1.1.7 (2018) |
| Percentile statistics | : | 20191225.v01 (using entries in the PDB archive December 25th 2019) |
| Refmac | : | 5.8.0158 |
| CCP4 | : | 7.0.044 (Gargrove) |
| Ideal geometry (proteins) | : | Engh & Huber (2001) |
| Ideal geometry (DNA, RNA) | : | Parkinson et al. (1996) |
| Validation Pipeline (wwPDB-VP) | : | 2.35 |

# 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 3.07 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 |
|--------|------------------|-------|
| Rfree | | 0.251 |
| Clashscore | | 28 |
| Ramachandran outliers | | 1.8% |
| Sidechain outliers | | 6.2% |
| RSRZ outliers | | 4.2% |

*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)) |
|--------|--------------------------|----------------------------------------------------|
| $R_{free}$ | 130704 | 1447 (3.10-3.06) |
| Clashscore | 141614 | 1546 (3.10-3.06) |
| Ramachandran outliers | 138981 | 1487 (3.10-3.06) |
| Sidechain outliers | 138945 | 1486 (3.10-3.06) |
| RSRZ outliers | 127900 | 1416 (3.10-3.06) |

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% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 1 | A | 842 | 53%  42%  · · |
| 1 | C | 842 | 3% / 47%  47%  · · |
| 1 | E | 842 | 13% / 46%  48%  · · |
| 2 | B | 207 | 62%  32%  5% |
| 2 | D | 207 | 59%  35%  5% |

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| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 2 | F | 207 | 53%      41%    6% |

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 |
|-----|------|-------|-----|-----------|----------|---------|------------------|
| 1 | DDE | E | 699 | - | - | X | - |
| 3 | APR | E | 843 | X | - | - | - |

# 2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 24024 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 Elongation factor 2.

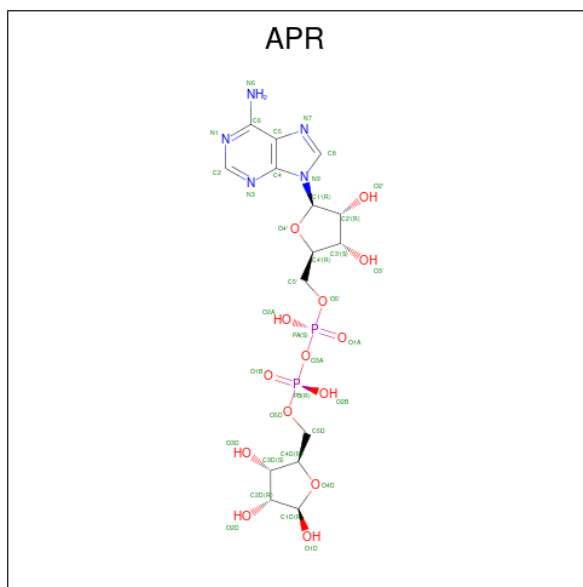| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|------|------|------|---------|---------|-------|
| 1 | A | 823 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 6405 | 4075 | 1093 | 1207 | 30 | | | |
| 1 | C | 823 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 6405 | 4075 | 1093 | 1207 | 30 | | | |
| 1 | E | 823 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 6415 | 4082 | 1095 | 1208 | 30 | | | |

There are 3 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference |
|-------|---------|----------|--------|----------|-----------|
| A | 699 | DDE | HIS | modified residue | UNP P32324 |
| C | 699 | DDE | HIS | modified residue | UNP P32324 |
| E | 699 | DDE | HIS | modified residue | UNP P32324 |

- Molecule 2 is a protein called Exotoxin A.

| Mol | Chain | Residues | Atoms | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---------|---------|-------|
| 2 | B | 207 | Total | C | N | O | 0 | 0 | 0 |
| | | | 1588 | 1001 | 283 | 304 | | | |
| 2 | D | 207 | Total | C | N | O | 0 | 0 | 0 |
| | | | 1588 | 1001 | 283 | 304 | | | |
| 2 | F | 207 | Total | C | N | O | 0 | 0 | 0 |
| | | | 1588 | 1001 | 283 | 304 | | | |

- Molecule 3 is ADENOSINE-5-DIPHOSPHORIBOSE (three-letter code: APR) (formula: $C_{15}H_{23}N_5O_{14}P_2$).

**APR**

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf |
|-----|-------|----------|-------|-----|---|----|---|---------|---------|
| | | | Total | C | N | O | P | | |
| 3 | E | 1 | 35 | 15 | 5 | 13 | 2 | 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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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.
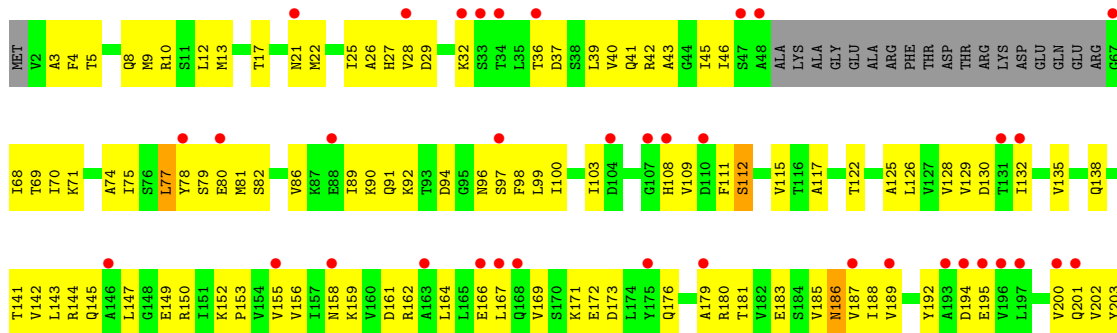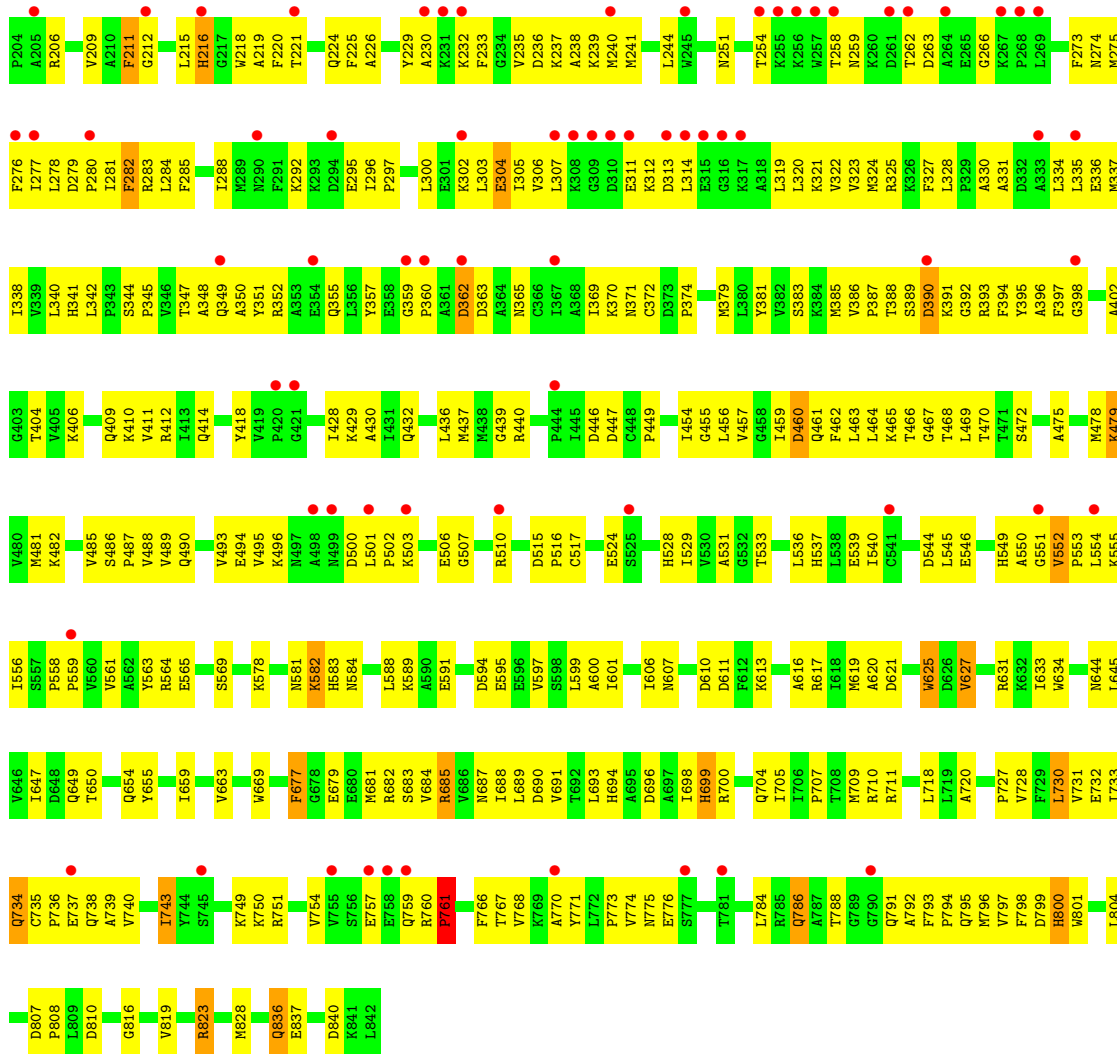
● Molecule 1: Elongation factor 2
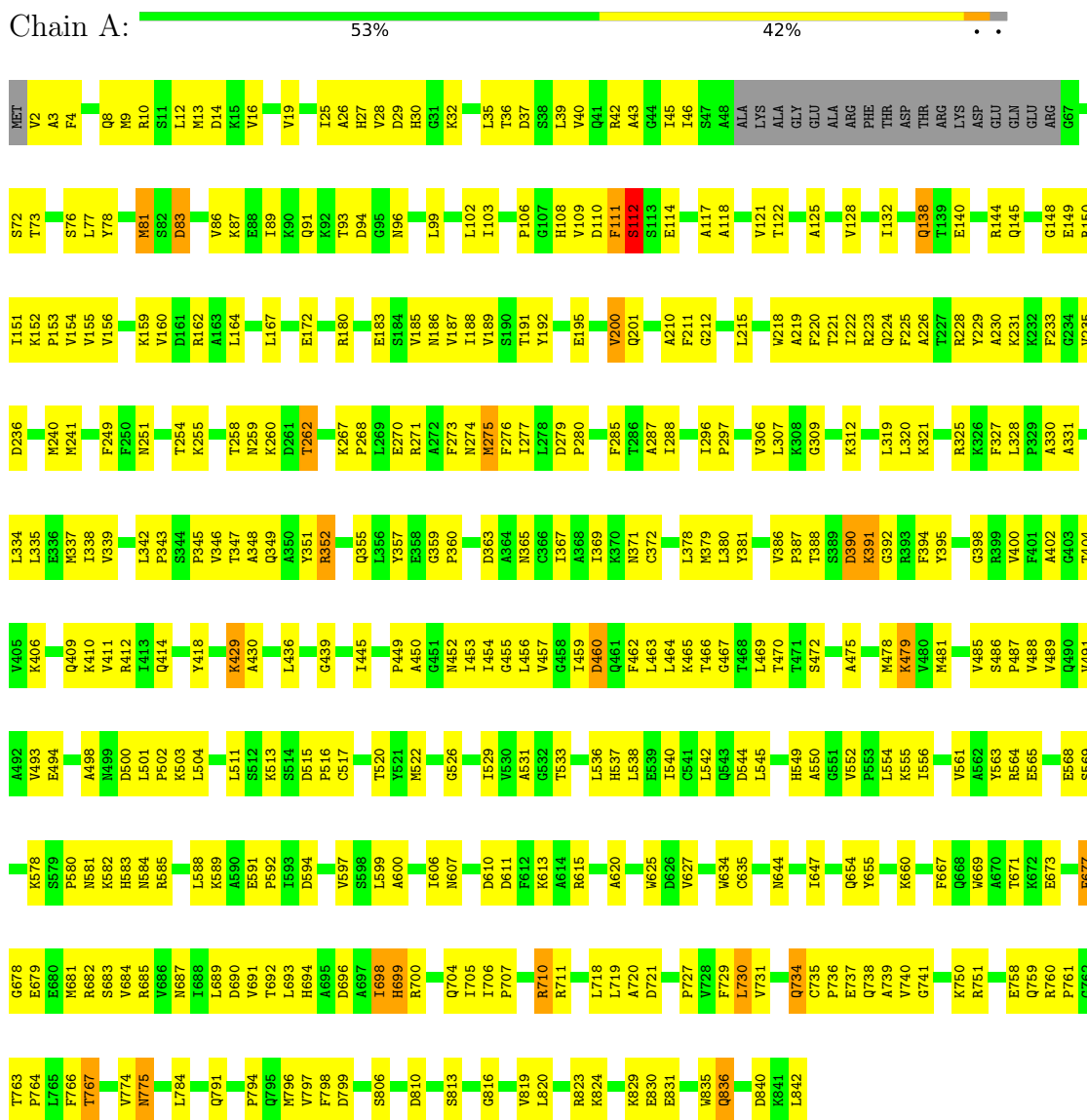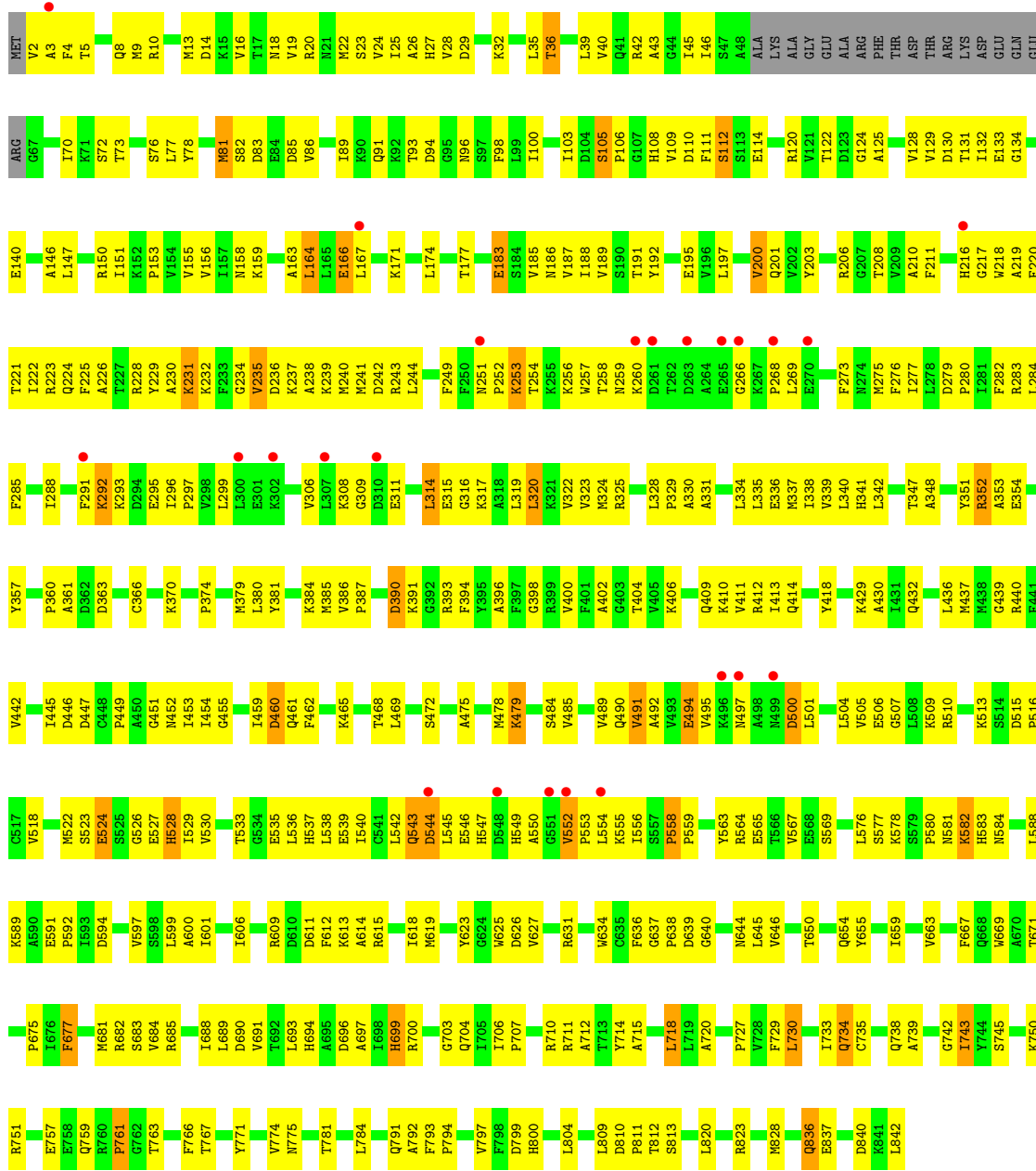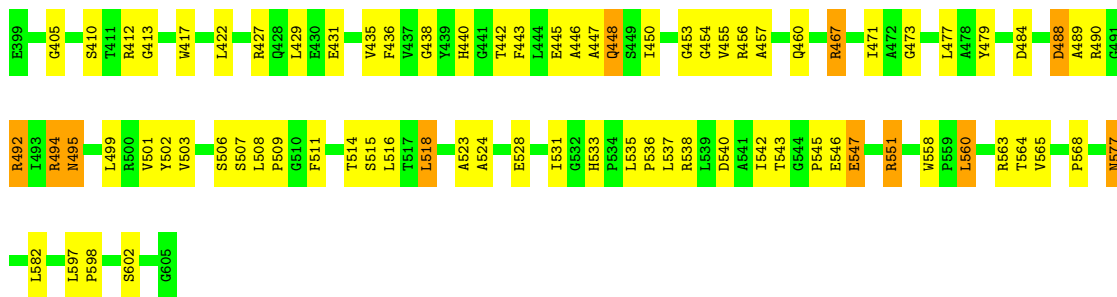


Chain A:

● Molecule 1: Elongation factor 2



Chain C:

● Molecule 1: Elongation factor 2

Chain E:

• Molecule 2: Exotoxin A

Chain B:



• Molecule 2: Exotoxin A

Chain D:

A497 L498 L499 R505 S506 S507 L508 P509 T517 A523 A524 V527 E528 R529 L530 I531 G532 H533 R538 L539 D540 A541 I542 T543 E546 E547 E548 R551 L552 E553 T554 W558 P559 L560 A561 E562 R563 T564 V565 V566 I567 P568 S569 A570 R576 N577 L582 E591

L597 S602 Q603 P604 G605
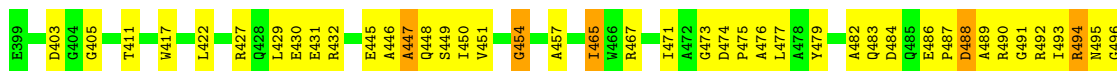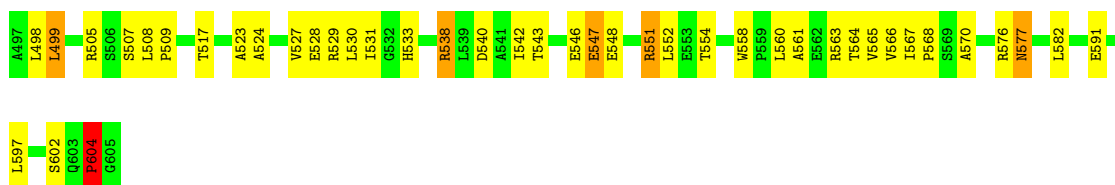
• Molecule 2: Exotoxin A

Chain F:

53%                       41%           6%

E399 F400 G405 S410 T411 R412 W417 E420 R421 L422 L423 H426 R427 Q428 L429 E430 E431 R432 G433 Y434 V435 F436 V437 H440 F443 L444 E445 A446 A447 I450 V451 G454 V455 R456 A457 R458 I465 W466 R467 Y470 I471 A472 G473 A476 Y479 D484

P487 D488 R492 I493 R494 N495 L498 L499 R500 V501 Y502 V503 P504 R505 S506 S507 L508 P509 G510 F511 Y512 R513 T514 T517 L518 A519 A520 P521 A524 E528 R529 L530 I531 G532 H533 P534 L535 P536 L537 R538 L539 D540 A541 I542 T543 E546 E547 E548 L552 I555

W558 P559 L560 A561 E562 R563 T564 V565 V566 I567 P568 I571 N577 L582 D583 P584 I587 K590 I594 L597 P598 P604 G605

# 4 Data and refinement statistics (i)

| Property | Value | Source |
|---|---|---|
| Space group | C 1 2 1 | Depositor |
| Cell constants<br>a, b, c, $\alpha$, $\beta$, $\gamma$ | 330.63Å    67.84Å    191.50Å<br>90.00°    103.30°    90.00° | Depositor |
| Resolution (Å) | 30.00 – 3.07<br>29.63 – 3.07 | Depositor<br>EDS |
| % Data completeness<br>(in resolution range) | (Not available) (30.00-3.07)<br>99.4 (29.63-3.07) | Depositor<br>EDS |
| $R_{merge}$ | (Not available) | Depositor |
| $R_{sym}$ | 0.14 | Depositor |
| $< I/\sigma(I) >$ [1] | 1.65 (at 3.06Å) | Xtriage |
| Refinement program | CNS | Depositor |
| R, $R_{free}$ | 0.231   ,   0.265<br>0.224   ,   0.251 | Depositor<br>DCC |
| $R_{free}$ test set | 1552 reflections (1.99%) | wwPDB-VP |
| Wilson B-factor (Å$^2$) | 52.7 | Xtriage |
| Anisotropy | 0.304 | Xtriage |
| Bulk solvent $k_{sol}$(e/Å$^3$), $B_{sol}$(Å$^2$) | 0.29 , 53.3 | EDS |
| L-test for twinning[2] | $< |L| > = 0.45$, $< L^2 > = 0.27$ | Xtriage |
| Estimated twinning fraction | No twinning to report. | Xtriage |
| $F_o,F_c$ correlation | 0.90 | EDS |
| Total number of atoms | 24024 | wwPDB-VP |
| Average B, all atoms (Å$^2$) | 61.0 | 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 39.80 % 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 3.0079e-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.

## 5 Model quality ⓘ

### 5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: DDE, APR

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 | 0.47 | 0/6517 | 0.68 | 0/8823 |
| 1 | C | 0.43 | 0/6517 | 0.67 | 0/8823 |
| 1 | E | 0.41 | 0/6517 | 0.64 | 0/8823 |
| 2 | B | 0.60 | 0/1627 | 0.86 | 0/2216 |
| 2 | D | 0.58 | 0/1627 | 0.81 | 0/2216 |
| 2 | F | 0.57 | 0/1627 | 0.84 | 1/2216 (0.0%) |
| All | All | 0.47 | 0/24432 | 0.70 | 1/33117 (0.0%) |

There are no bond length outliers.

All (1) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|-----|-------|-----|------|-------|---|-------------|----------|
| 2 | F | 494 | ARG | NE-CZ-NH1 | 6.14 | 123.37 | 120.30 |

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 | 6405 | 0 | 6472 | 342 | 0 |
| 1 | C | 6405 | 0 | 6472 | 377 | 0 |
| 1 | E | 6415 | 0 | 6487 | 422 | 0 |
| 2 | B | 1588 | 0 | 1539 | 66 | 0 |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 2 | D | 1588 | 0 | 1539 | 74 | 0 |
| 2 | F | 1588 | 0 | 1539 | 82 | 0 |
| 3 | E | 35 | 0 | 19 | 6 | 0 |
| All | All | 24024 | 0 | 24067 | 1350 | 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 28.

The worst 5 of 1350 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) |
|--------|--------|--------------------------|-------------------|
| 2:D:546:GLU:HG3 | 2:D:547:GLU:HG3 | 1.29 | 1.14 |
| 2:B:546:GLU:HG3 | 2:B:547:GLU:HG3 | 1.32 | 1.11 |
| 1:C:404:THR:HG22 | 1:C:449:PRO:HA | 1.34 | 1.05 |
| 1:E:68:ILE:HD12 | 1:E:390:ASP:HB2 | 1.37 | 1.03 |
| 1:C:231:LYS:HE3 | 1:C:232:LYS:HG3 | 1.42 | 1.02 |

There are no symmetry-related clashes.

## 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 | 818/842 (97%) | 732 (90%) | 74 (9%) | 12 (2%) | 10 | 37 |
| 1 | C | 818/842 (97%) | 711 (87%) | 87 (11%) | 20 (2%) | 6 | 25 |
| 1 | E | 818/842 (97%) | 707 (86%) | 97 (12%) | 14 (2%) | 9 | 34 |
| 2 | B | 205/207 (99%) | 179 (87%) | 24 (12%) | 2 (1%) | 15 | 47 |
| 2 | D | 205/207 (99%) | 176 (86%) | 24 (12%) | 5 (2%) | 6 | 25 |
| 2 | F | 205/207 (99%) | 175 (85%) | 27 (13%) | 3 (2%) | 10 | 37 |
| All | All | 3069/3147 (98%) | 2680 (87%) | 333 (11%) | 56 (2%) | 8 | 32 |

5 of 56 Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | A | 112 | SER |
| 1 | C | 235 | VAL |
| 1 | C | 460 | ASP |
| 1 | C | 639 | ASP |
| 1 | C | 761 | PRO |

### 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 | 699/714 (98%) | 669 (96%) | 30 (4%) | 29 | 60 |
| 1 | C | 699/714 (98%) | 651 (93%) | 48 (7%) | 15 | 44 |
| 1 | E | 699/714 (98%) | 664 (95%) | 35 (5%) | 24 | 55 |
| 2 | B | 161/162 (99%) | 145 (90%) | 16 (10%) | 8 | 27 |
| 2 | D | 161/162 (99%) | 144 (89%) | 17 (11%) | 6 | 24 |
| 2 | F | 161/162 (99%) | 146 (91%) | 15 (9%) | 9 | 31 |
| All | All | 2580/2628 (98%) | 2419 (94%) | 161 (6%) | 18 | 48 |

5 of 161 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | E | 194 | ASP |
| 1 | E | 823 | ARG |
| 1 | E | 275 | MET |
| 1 | E | 627 | VAL |
| 2 | F | 499 | LEU |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 75 such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | E | 91 | GLN |
| 1 | E | 836 | GLN |

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| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | E | 201 | GLN |
| 1 | E | 644 | ASN |
| 2 | B | 495 | ASN |

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

3 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 | DDE | E | 699 | 1,3 | 14,20,21 | 2.05 | 4 (28%) | 14,28,30 | 2.40 | 4 (28%) |
| 1 | DDE | C | 699 | 1 | 5,10,21 | 1.22 | 1 (20%) | 3,12,30 | 1.25 | 1 (33%) |
| 1 | DDE | A | 699 | 1 | 5,10,21 | 0.80 | 0 | 3,12,30 | 1.26 | 1 (33%) |

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 | DDE | E | 699 | 1,3 | - | 2/20/21/23 | 0/1/1/1 |
| 1 | DDE | C | 699 | 1 | - | 1/5/6/23 | 0/1/1/1 |
| 1 | DDE | A | 699 | 1 | - | 1/5/6/23 | 0/1/1/1 |

All (5) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|---|-------------|----------|
| 1 | E | 699 | DDE | OAG-CBI | 4.98 | 1.33 | 1.23 |
| 1 | E | 699 | DDE | CAT-CE1 | 3.61 | 1.55 | 1.50 |

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| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|---|-------------|----------|
| 1 | E | 699 | DDE | CAC-NCB | 2.89 | 1.59 | 1.50 |
| 1 | C | 699 | DDE | CB-CA | 2.17 | 1.58 | 1.53 |
| 1 | E | 699 | DDE | CBW-CBI | 2.04 | 1.56 | 1.53 |

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

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|-----|-------|-----|------|-------|---|----------------|-------------|
| 1 | E | 699 | DDE | OAG-CBI-CBW | -6.21 | 112.63 | 120.49 |
| 1 | E | 699 | DDE | OAG-CBI-NAD | 4.73 | 131.24 | 123.00 |
| 1 | E | 699 | DDE | CG-ND1-CE1 | 2.18 | 109.51 | 103.05 |
| 1 | E | 699 | DDE | CAT-CE1-ND1 | 2.18 | 128.63 | 122.54 |
| 1 | A | 699 | DDE | CD2-NE2-CE1 | 2.05 | 108.97 | 105.78 |

There are no chirality outliers.

All (4) torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-------|
| 1 | A | 699 | DDE | O-C-CA-CB |
| 1 | C | 699 | DDE | O-C-CA-CB |
| 1 | E | 699 | DDE | CAU-CAT-CE1-ND1 |
| 1 | E | 699 | DDE | CE1-CAT-CAU-CBW |

There are no ring outliers.

3 monomers are involved in 13 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|-----|-------|-----|------|---------|--------------|
| 1 | E | 699 | DDE | 11 | 0 |
| 1 | C | 699 | DDE | 1 | 0 |
| 1 | A | 699 | DDE | 1 | 0 |

## 5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

1 ligand is 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 | #$|Z| > 2$ |
| 3 | APR | E | 843 | 1 | 33,38,39 | 1.47 | 6 (18%) | 37,58,60 | 1.76 | 7 (18%) |

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 | APR | E | 843 | 1 | 1/1/9/10 | 3/18/51/54 | 0/4/4/4 |

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

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|------|-------------|----------|
| 3 | E | 843 | APR | C2-N1 | 4.17 | 1.41 | 1.33 |
| 3 | E | 843 | APR | C3'-C4' | 2.91 | 1.60 | 1.53 |
| 3 | E | 843 | APR | O2'-C2' | 2.73 | 1.49 | 1.43 |
| 3 | E | 843 | APR | C4-N3 | 2.28 | 1.38 | 1.35 |
| 3 | E | 843 | APR | O4D-C4D | 2.24 | 1.48 | 1.44 |

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

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-------|------|-------------|----------|
| 3 | E | 843 | APR | O2D-C2D-C3D | -4.95 | 101.89 | 111.27 |
| 3 | E | 843 | APR | PB-O3A-PA | -4.10 | 118.74 | 132.83 |
| 3 | E | 843 | APR | C1D-C2D-C3D | 3.77 | 107.37 | 101.63 |
| 3 | E | 843 | APR | C1D-O4D-C4D | 3.23 | 115.71 | 108.16 |
| 3 | E | 843 | APR | O4D-C1D-C2D | -2.74 | 100.68 | 105.99 |

All (1) chirality outliers are listed below:

| Mol | Chain | Res | Type | Atom |
|-----|-------|-----|------|------|
| 3 | E | 843 | APR | C1D |

All (3) torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-------|
| 3 | E | 843 | APR | C3'-C4'-C5'-O5' |
| 3 | E | 843 | APR | O4'-C4'-C5'-O5' |
| 3 | E | 843 | APR | C5D-O5D-PB-O1B |

There are no ring outliers.

1 monomer is involved in 6 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|-----|-------|-----|------|---------|--------------|
| 3 | E | 843 | APR | 6 | 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 APR E 843**

Bond lengths

Bond angles

Torsions

Rings
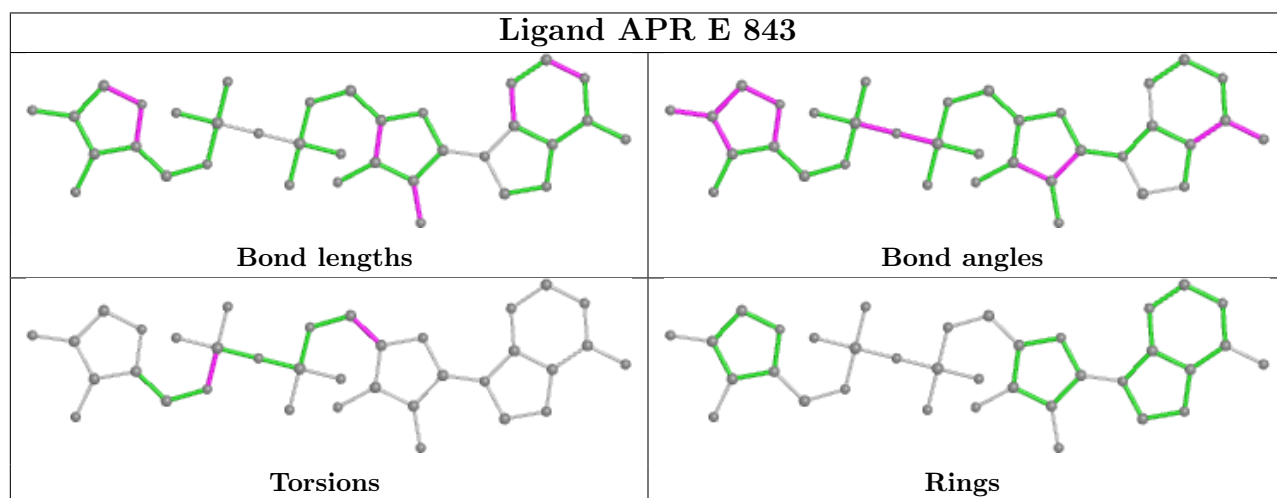
## 5.7 Other polymers ⓘ

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 ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, $95^{th}$ percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

| Mol | Chain | Analysed | <RSRZ> | #RSRZ>2 | | | OWAB(Å²) | Q<0.9 |
|-----|-------|----------|--------|---------|---|---|----------|-------|
| 1 | A | 822/842 (97%) | -0.44 | 0 | 100 | 100 | 5, 48, 81, 101 | 0 |
| 1 | C | 822/842 (97%) | -0.13 | 24 (2%) | 51 | 27 | 11, 64, 123, 135 | 0 |
| 1 | E | 822/842 (97%) | 0.53 | 106 (12%) | 3 | 1 | 7, 106, 129, 147 | 0 |
| 2 | B | 207/207 (100%) | -0.72 | 0 | 100 | 100 | 5, 22, 55, 71 | 0 |
| 2 | D | 207/207 (100%) | -0.65 | 0 | 100 | 100 | 5, 25, 64, 78 | 0 |
| 2 | F | 207/207 (100%) | -0.64 | 0 | 100 | 100 | 7, 27, 64, 79 | 0 |
| All | All | 3087/3147 (98%) | -0.14 | 130 (4%) | 36 | 18 | 5, 54, 123, 147 | 0 |

The worst 5 of 130 RSRZ outliers are listed below:

| Mol | Chain | Res | Type | RSRZ |
|-----|-------|-----|------|------|
| 1 | E | 269 | LEU | 5.5 |
| 1 | E | 197 | LEU | 5.2 |
| 1 | E | 167 | LEU | 5.2 |
| 1 | C | 499 | ASN | 5.0 |
| 1 | E | 166 | GLU | 4.9 |

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, $95^{th}$ percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

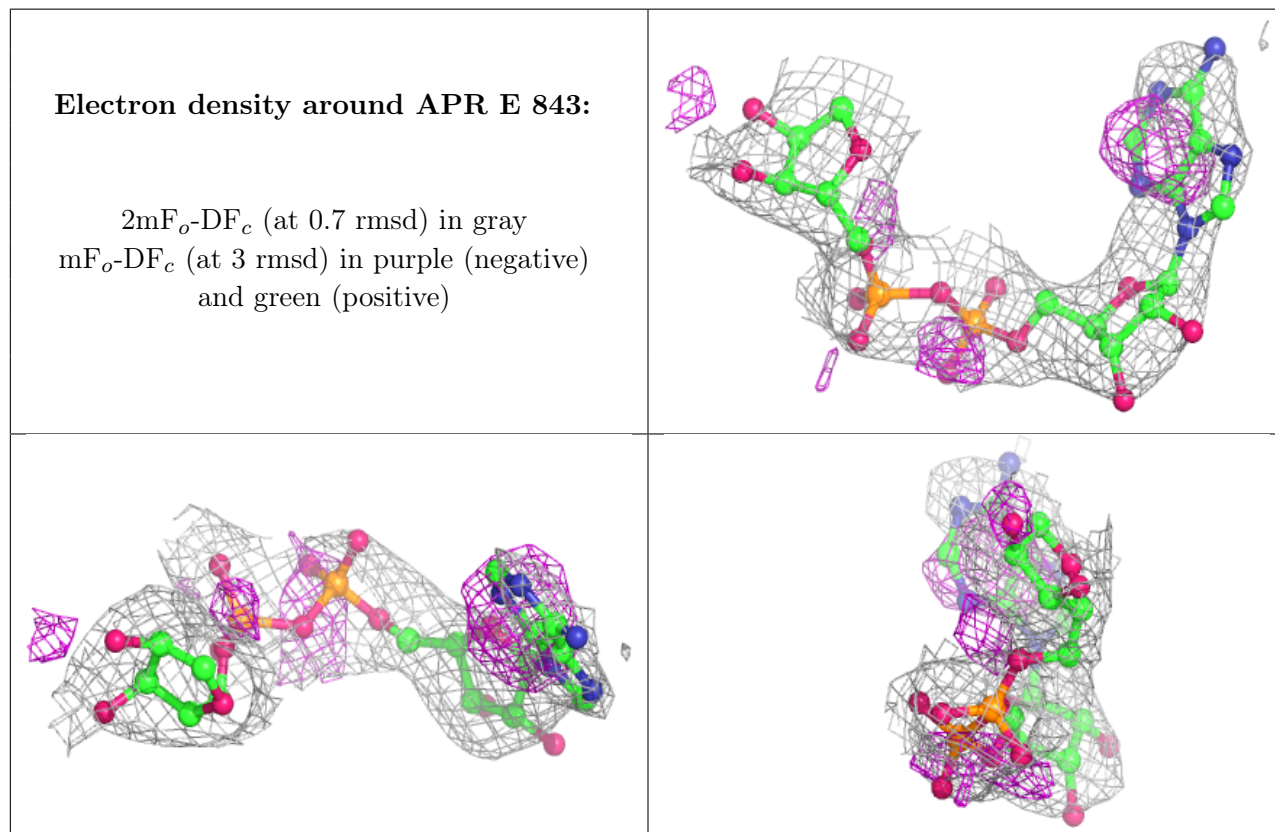| Mol | Type | Chain | Res | Atoms | RSCC | RSR | B-factors(Å²) | Q<0.9 |
|-----|------|-------|-----|-------|------|-----|---------------|-------|
| 1 | DDE | C | 699 | 10/21 | 0.84 | 0.21 | 44,52,55,56 | 0 |
| 1 | DDE | A | 699 | 10/21 | 0.89 | 0.12 | 37,41,46,47 | 0 |
| 1 | DDE | E | 699 | 20/21 | 0.92 | 0.29 | 48,68,80,81 | 0 |

## 6.3   Carbohydrates   (i)

There are no monosaccharides in this entry.

## 6.4   Ligands   (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, $95^{th}$ percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

| Mol | Type | Chain | Res | Atoms | RSCC | RSR | B-factors($\text{Å}^2$) | Q<0.9 |
|-----|------|-------|-----|-------|------|-----|-------------------------|-------|
| 3 | APR | E | 843 | 35/36 | 0.85 | 0.33 | 64,71,85,86 | 0 |

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



Electron density around APR E 843:

$2\text{mF}_o\text{-DF}_c$ (at 0.7 rmsd) in gray
$\text{mF}_o\text{-DF}_c$ (at 3 rmsd) in purple (negative) and green (positive)

## 6.5   Other polymers   (i)

There are no such residues in this entry.