



wwPDB/EMDatabank EM Map/Model Validation Summary Report ⓘ

Apr 13, 2019 – 12:36 PM EDT

PDB ID : 6O7T
EMDB ID: : EMD-0644
Title : Saccharomyces cerevisiae V-ATPase Vph1-VO
Authors : Vasanthakumar, T.; Bueler, S.A.; Wu, D.; Beilsten-Edmands, V.; Robinson, C.V.; Rubinstein, J.L.
Deposited on : 2019-03-08
Resolution : 3.20 Å(reported)

This is a wwPDB/EMDatabank EM Map/Model Validation Summary Report
for a publicly released PDB/EMDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

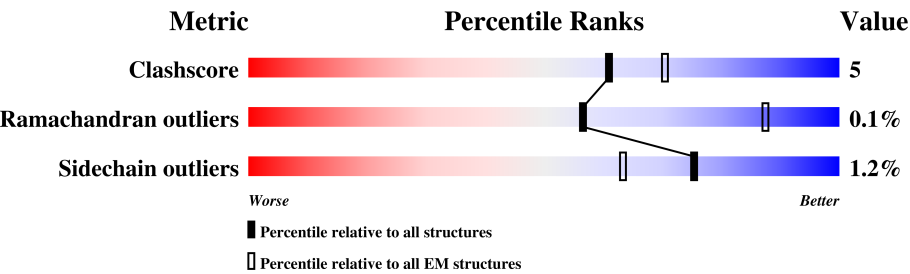
MolProbity : 4.02b-467
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20031633

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.20 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) | EM structures (#Entries) |
|-----------------------|-----------------------------|-----------------------------|
| Clashscore | 136327 | 1886 |
| Ramachandran outliers | 132723 | 1663 |
| Sidechain outliers | 132532 | 1531 |

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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 $\leq 5\%$

| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 1 | a | 862 | 84% 15% |
| 2 | b | 265 | 14% 86% |
| 3 | c | 213 | 91% 8% |
| 4 | d | 345 | 90% 9% |
| 5 | f | 85 | 73% 26% |
| 6 | g | 160 | 95% .. |
| 6 | h | 160 | 99% . |
| 6 | i | 160 | 96% .. |
| 6 | j | 160 | 97% .. |

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| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|--|
| 6 | k | 160 | <div><div></div><div>98%</div><div></div></div> <div>..</div> |
| 6 | l | 160 | <div><div></div><div>95%</div><div></div></div> <div>. .</div> |
| 6 | m | 160 | <div><div></div><div>98%</div><div></div></div> <div>..</div> |
| 6 | n | 160 | <div><div></div><div>98%</div><div></div></div> <div>..</div> |
| 7 | o | 164 | <div><div></div><div>95%</div><div>5%</div></div> <div></div> |
| 8 | e | 73 | <div><div></div><div>88%</div><div>12%</div></div> <div></div> |

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 19730 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 V-type proton ATPase subunit a, vacuolar isoform.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
| 1 | a | 734 | Total | C | N | O | S | 0 | 0 |
| | | | 5358 | 3484 | 888 | 956 | 30 | | |

There are 22 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference |
|-------|---------|----------|--------|----------------|------------|
| a | 841 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 842 | TYR | - | SEE REMARK 999 | UNP P32563 |
| a | 843 | LYS | - | SEE REMARK 999 | UNP P32563 |
| a | 844 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 845 | HIS | - | SEE REMARK 999 | UNP P32563 |
| a | 846 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 847 | GLY | - | SEE REMARK 999 | UNP P32563 |
| a | 848 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 849 | TYR | - | SEE REMARK 999 | UNP P32563 |
| a | 850 | LYS | - | SEE REMARK 999 | UNP P32563 |
| a | 851 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 852 | HIS | - | SEE REMARK 999 | UNP P32563 |
| a | 853 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 854 | ILE | - | SEE REMARK 999 | UNP P32563 |
| a | 855 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 856 | TYR | - | SEE REMARK 999 | UNP P32563 |
| a | 857 | LYS | - | SEE REMARK 999 | UNP P32563 |
| a | 858 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 859 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 860 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 861 | ASP | - | SEE REMARK 999 | UNP P32563 |
| a | 862 | LYS | - | SEE REMARK 999 | UNP P32563 |

- Molecule 2 is a protein called V0 assembly protein 1.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|---|---------|-------|
| 2 | b | 38 | Total | C | N | O | S | 0 | 0 |
| | | | 279 | 190 | 41 | 46 | 2 | | |

- Molecule 3 is a protein called V-type proton ATPase subunit c''.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 3 | c | 195 | Total | C | N | O | S | 0 | 0 |
| | | | 1414 | 938 | 220 | 249 | 7 | | |

- Molecule 4 is a protein called V-type proton ATPase subunit d.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---|---------|-------|
| 4 | d | 314 | Total | C | N | O | S | 0 | 0 |
| | | | 2181 | 1388 | 367 | 418 | 8 | | |

- Molecule 5 is a protein called Putative protein YPR170W-B.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|---|---------|-------|
| 5 | f | 63 | Total | C | N | O | S | 0 | 0 |
| | | | 467 | 308 | 73 | 83 | 3 | | |

- Molecule 6 is a protein called V-type proton ATPase subunit c.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 6 | g | 155 | Total | C | N | O | S | 0 | 0 |
| | | | 1080 | 709 | 174 | 190 | 7 | | |
| 6 | h | 159 | Total | C | N | O | S | 0 | 0 |
| | | | 1085 | 716 | 173 | 191 | 5 | | |
| 6 | i | 158 | Total | C | N | O | S | 0 | 0 |
| | | | 1071 | 705 | 171 | 188 | 7 | | |
| 6 | j | 158 | Total | C | N | O | S | 0 | 0 |
| | | | 1035 | 672 | 168 | 190 | 5 | | |
| 6 | k | 158 | Total | C | N | O | S | 0 | 0 |
| | | | 1049 | 685 | 168 | 191 | 5 | | |
| 6 | l | 156 | Total | C | N | O | S | 0 | 0 |
| | | | 1025 | 665 | 169 | 187 | 4 | | |
| 6 | m | 158 | Total | C | N | O | S | 0 | 0 |
| | | | 1050 | 690 | 167 | 188 | 5 | | |
| 6 | n | 158 | Total | C | N | O | S | 0 | 0 |
| | | | 1034 | 678 | 166 | 185 | 5 | | |

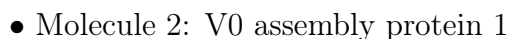
- Molecule 7 is a protein called V-type proton ATPase subunit c'.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|
| 7 | o | 156 | Total | C | N | O | S | 0 | 0 |
| | | | 1096 | 725 | 171 | 189 | 11 | | |

- Molecule 8 is a protein called V-type proton ATPase subunit e.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|---|---------|-------|
| 8 | e | 64 | Total | C | N | O | S | 0 | 0 |
| | | | 506 | 340 | 82 | 79 | 5 | | |

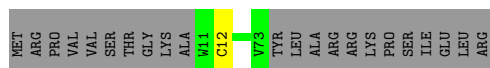
- Molecule 1: V-type proton ATPase subunit a, vacuolar isoform





- Molecule 5: Putative protein YPR170W-B

Chain f: 73% 26%



- Molecule 6: V-type proton ATPase subunit c

Chain g: 95%



- Molecule 6: V-type proton ATPase subunit c

Chain h: 99%



- Molecule 6: V-type proton ATPase subunit c

Chain i: 96%



- Molecule 6: V-type proton ATPase subunit c

Chain j: 97%



- Molecule 6: V-type proton ATPase subunit c

Chain k: 98%



- Molecule 6: V-type proton ATPase subunit c

Chain l: 95%



- Molecule 6: V-type proton ATPase subunit c

Chain m:  98% ..



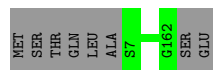
- Molecule 6: V-type proton ATPase subunit c

Chain n:  98% ..




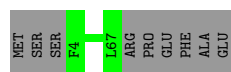
- Molecule 7: V-type proton ATPase subunit c'

Chain o:  95% 5%



- Molecule 8: V-type proton ATPase subunit e

Chain e:  88% 12%



4 Experimental information

| Property | Value | Source |
|--------------------------------------|---|-----------|
| Reconstruction method | SINGLE PARTICLE | Depositor |
| Imposed symmetry | POINT, Not provided | Depositor |
| Number of particles used | 296105 | Depositor |
| Resolution determination method | FSC 0.143 CUT-OFF | Depositor |
| CTF correction method | PHASE FLIPPING AND AMPLITUDE CORRECTION | Depositor |
| Microscope | FEI TITAN KRIOS | Depositor |
| Voltage (kV) | 300 | Depositor |
| Electron dose ($e^-/\text{\AA}^2$) | 42.7 | Depositor |
| Minimum defocus (nm) | Not provided | Depositor |
| Maximum defocus (nm) | Not provided | Depositor |
| Magnification | Not provided | Depositor |
| Image detector | FEI FALCON III (4k x 4k) | Depositor |

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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 | $\# Z > 2$ | RMSZ | $\# Z > 2$ |
| 1 | a | 0.42 | 0/5480 | 0.67 | 3/7477 (0.0%) |
| 2 | b | 0.42 | 0/283 | 0.67 | 0/388 |
| 3 | c | 0.49 | 0/1442 | 0.67 | 0/1965 |
| 4 | d | 0.34 | 0/2220 | 0.59 | 2/3041 (0.1%) |
| 5 | f | 0.35 | 0/481 | 0.58 | 0/661 |
| 6 | g | 0.49 | 0/1096 | 0.80 | 3/1491 (0.2%) |
| 6 | h | 0.49 | 0/1101 | 0.74 | 0/1502 |
| 6 | i | 0.46 | 0/1086 | 0.71 | 1/1481 (0.1%) |
| 6 | j | 0.46 | 0/1048 | 0.78 | 3/1431 (0.2%) |
| 6 | k | 0.44 | 0/1063 | 0.68 | 0/1453 |
| 6 | l | 0.44 | 0/1039 | 0.78 | 2/1420 (0.1%) |
| 6 | m | 0.44 | 0/1065 | 0.68 | 0/1456 |
| 6 | n | 0.47 | 1/1048 (0.1%) | 0.72 | 1/1433 (0.1%) |
| 7 | o | 0.47 | 0/1117 | 0.69 | 0/1519 |
| 8 | e | 0.43 | 0/521 | 0.55 | 0/714 |
| All | All | 0.44 | 1/20090 (0.0%) | 0.69 | 15/27432 (0.1%) |

All (1) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|--------|-------|-------------|----------|
| 6 | n | 97 | VAL | CB-CG2 | -6.65 | 1.38 | 1.52 |

The worst 5 of 15 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|-----|------|------------|-------|-------------|----------|
| 1 | a | 800 | LEU | CB-CG-CD2 | -7.94 | 97.50 | 111.00 |
| 6 | n | 97 | VAL | CG1-CB-CG2 | -7.14 | 99.47 | 110.90 |
| 6 | j | 139 | LEU | CA-CB-CG | 6.57 | 130.41 | 115.30 |
| 6 | g | 99 | LEU | CA-CB-CG | 6.04 | 129.18 | 115.30 |
| 6 | j | 133 | LEU | CA-CB-CG | 6.00 | 129.10 | 115.30 |

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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 | 5358 | 0 | 4883 | 0 | 0 |
| 2 | b | 279 | 0 | 289 | 0 | 0 |
| 3 | c | 1414 | 0 | 1442 | 0 | 0 |
| 4 | d | 2181 | 0 | 1802 | 0 | 0 |
| 5 | f | 467 | 0 | 431 | 0 | 0 |
| 6 | g | 1080 | 0 | 1124 | 0 | 0 |
| 6 | h | 1085 | 0 | 1082 | 0 | 0 |
| 6 | i | 1071 | 0 | 1076 | 0 | 0 |
| 6 | j | 1035 | 0 | 978 | 0 | 0 |
| 6 | k | 1049 | 0 | 1015 | 0 | 0 |
| 6 | l | 1025 | 0 | 970 | 0 | 0 |
| 6 | m | 1050 | 0 | 1021 | 0 | 0 |
| 6 | n | 1034 | 0 | 994 | 0 | 0 |
| 7 | o | 1096 | 0 | 1115 | 0 | 0 |
| 8 | e | 506 | 0 | 514 | 0 | 0 |
| All | All | 19730 | 0 | 18736 | 0 | 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 5.

There are no clashes within the asymmetric unit.

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

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 | 728/862 (84%) | 688 (94%) | 39 (5%) | 1 (0%) | 53 | 87 |
| 2 | b | 36/265 (14%) | 36 (100%) | 0 | 0 | 100 | 100 |
| 3 | c | 193/213 (91%) | 187 (97%) | 6 (3%) | 0 | 100 | 100 |
| 4 | d | 306/345 (89%) | 293 (96%) | 13 (4%) | 0 | 100 | 100 |
| 5 | f | 61/85 (72%) | 58 (95%) | 3 (5%) | 0 | 100 | 100 |
| 6 | g | 153/160 (96%) | 148 (97%) | 5 (3%) | 0 | 100 | 100 |
| 6 | h | 157/160 (98%) | 155 (99%) | 2 (1%) | 0 | 100 | 100 |
| 6 | i | 156/160 (98%) | 151 (97%) | 5 (3%) | 0 | 100 | 100 |
| 6 | j | 156/160 (98%) | 147 (94%) | 9 (6%) | 0 | 100 | 100 |
| 6 | k | 156/160 (98%) | 153 (98%) | 3 (2%) | 0 | 100 | 100 |
| 6 | l | 154/160 (96%) | 148 (96%) | 4 (3%) | 2 (1%) | 13 | 52 |
| 6 | m | 156/160 (98%) | 152 (97%) | 4 (3%) | 0 | 100 | 100 |
| 6 | n | 156/160 (98%) | 147 (94%) | 9 (6%) | 0 | 100 | 100 |
| 7 | o | 154/164 (94%) | 148 (96%) | 6 (4%) | 0 | 100 | 100 |
| 8 | e | 62/73 (85%) | 61 (98%) | 1 (2%) | 0 | 100 | 100 |
| All | All | 2784/3287 (85%) | 2672 (96%) | 109 (4%) | 3 (0%) | 56 | 87 |

All (3) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 6 | l | 154 | ALA |
| 6 | l | 119 | SER |
| 1 | a | 483 | PHE |

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 PDB entries followed by that with respect to all EM entries.

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 | 486/749 (65%) | 477 (98%) | 9 (2%) | 60 | 84 |
| 2 | b | 29/244 (12%) | 29 (100%) | 0 | 100 | 100 |
| 3 | c | 141/168 (84%) | 139 (99%) | 2 (1%) | 69 | 88 |

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| Mol | Chain | Analysed | Rotameric | Outliers | Percentiles | |
|-----|-------|-----------------|------------|----------|-------------|-----|
| 4 | d | 175/309 (57%) | 172 (98%) | 3 (2%) | 63 | 86 |
| 5 | f | 48/72 (67%) | 47 (98%) | 1 (2%) | 56 | 83 |
| 6 | g | 106/119 (89%) | 106 (100%) | 0 | 100 | 100 |
| 6 | h | 98/119 (82%) | 98 (100%) | 0 | 100 | 100 |
| 6 | i | 98/119 (82%) | 95 (97%) | 3 (3%) | 43 | 75 |
| 6 | j | 86/119 (72%) | 86 (100%) | 0 | 100 | 100 |
| 6 | k | 91/119 (76%) | 89 (98%) | 2 (2%) | 55 | 82 |
| 6 | l | 85/119 (71%) | 85 (100%) | 0 | 100 | 100 |
| 6 | m | 91/119 (76%) | 90 (99%) | 1 (1%) | 76 | 90 |
| 6 | n | 86/119 (72%) | 85 (99%) | 1 (1%) | 74 | 90 |
| 7 | o | 108/125 (86%) | 108 (100%) | 0 | 100 | 100 |
| 8 | e | 54/65 (83%) | 54 (100%) | 0 | 100 | 100 |
| All | All | 1782/2684 (66%) | 1760 (99%) | 22 (1%) | 75 | 90 |

5 of 22 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 3 | c | 61 | ASN |
| 4 | d | 27 | ASN |
| 6 | m | 151 | ASN |
| 3 | c | 132 | ASN |
| 4 | d | 21 | ARG |

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 4 | d | 106 | ASN |
| 5 | f | 35 | HIS |
| 7 | o | 159 | ASN |
| 4 | d | 222 | ASN |
| 6 | g | 90 | GLN |

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.