nuSTORM: Facility

- **100 kW Target Station**
  - Assume 60 GeV proton
  - Fermilab PIP era
  - Ta target (Heavy metal)
  - Optimization on-going
  - Horn (NuMI) collection
  - Li lens has also been explored

- **Collection/transport channel**
  - Stochastic injection of $\pi$

- **Decay ring (3.8 GeV/c)**
  - Large aperture FODO
  - Instrumentation
    - BCTs, mag-Spec in arc, polarimeter

\[ \mu^+ \rightarrow e^+ \bar{\nu}_\mu \nu_e \]
\[ \mu^- \rightarrow e^- \nu_\mu \bar{\nu}_e \]
$E_\nu$ spectra ($\mu^+\text{ stored}$)

Event rates/100T at ND hall 50m from straight with $\mu^+\text{ stored}$

<table>
<thead>
<tr>
<th>Channel</th>
<th>$N_{\text{evts}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{\nu}_\mu$ NC</td>
<td>844,793</td>
</tr>
<tr>
<td>$\nu_e$ NC</td>
<td>1,387,698</td>
</tr>
<tr>
<td>$\bar{\nu}_\mu$ CC</td>
<td>2,145,632</td>
</tr>
<tr>
<td>$\nu_e$ CC</td>
<td>3,960,421</td>
</tr>
</tbody>
</table>

$v_e$ - bar

$v_\mu$ - bar
nuSTORM: Conclusions

The Physics case:

- Initial simulation work indicates that a L/E ≈ 1 oscillation experiment using a muon storage ring can confirm/exclude at 10σ (CPT invariant channel) the LSND/MiniBooNE result.

- $\nu_\mu$ and ($\nu_e$) disappearance experiments delivering at the <1% level look to be doable.
  - Systematics need careful analysis.
  - Detailed simulation work on these channels has not yet started.

- $\nu$ physics studies with near detector(s) offer a unique opportunity & can be extended to cover 0.2 < GeV < $E_\nu$ < 4 GeV.

- Could be "transformational" w/r to $\nu$ interaction physics.