The LTCC system will be part of the forward CLAS12 detector and will be used to for pions/kaons discrimination. The LTCC consists of 6 sectors of lightweight mirrors, light collecting cones, 5'' PMTs and magnetic shields. The sectors are filled with C₄F₁₀ gas, providing pion/kaon discrimination from 3.5 to 9 GeV/c. Each sector contains:

- 108 lightweight mirrors
- 36 Winston Cones
- 36 5'' PMT
- 36 Magnetic Shields

The LTCC is required to have excellent efficiency over the forward angular acceptance available to CLAS12.

### LTCC - TECHNICAL PARAMETERS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DESIGN VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirrors</td>
<td></td>
</tr>
<tr>
<td>Support Structure</td>
<td>3 Kevlar layers sandwiched with vinyl foam</td>
</tr>
<tr>
<td>Elliptical</td>
<td>Length = 6’’ to 55’’, Width = 8’’ to 11’’</td>
</tr>
<tr>
<td>Hyperbolic</td>
<td>Length = 12’’ to 30’’, Width = 8’’ to 9.25’’</td>
</tr>
<tr>
<td>Mirror Coating</td>
<td>Al/MgF₂</td>
</tr>
<tr>
<td>Reflectivity</td>
<td>90% from 250 to 650 nm</td>
</tr>
<tr>
<td>C₄F₁₀ Gas</td>
<td></td>
</tr>
<tr>
<td>Refraction Index</td>
<td>1.00134</td>
</tr>
<tr>
<td>Transparency</td>
<td>100% above 220 nm</td>
</tr>
<tr>
<td>Density</td>
<td>9.94 kg/m³</td>
</tr>
<tr>
<td>Window Material</td>
<td>Tedlar/Mylar/Tedlar composite</td>
</tr>
<tr>
<td>PMTs</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>Photonis XP 4500B</td>
</tr>
<tr>
<td>18</td>
<td>Electron Tubes 9823QKB</td>
</tr>
<tr>
<td>18</td>
<td>Photonis XP 4508</td>
</tr>
<tr>
<td>Magnetic Shields</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Eagle AAA: 80% Ni, 4.20% Mo, and 15% Fe</td>
</tr>
<tr>
<td>Field Attenuation Factor</td>
<td>85 Axial, 390 Transverse</td>
</tr>
<tr>
<td>PID:</td>
<td></td>
</tr>
<tr>
<td>π/K Separation</td>
<td>3.5 to 9 GeV/c</td>
</tr>
</tbody>
</table>
• **Construction Strategy and Project Leadership:**
  
  – LTCC system Group Leader: Maurizio Ungaro
  – Construction strategy, all at JLab:
    o Strip all sectors of PMTs, Mirrors, WC, and shielding.
    o Remodel the LTCC Box according to CLAS12 design.
    o Refurbish mirrors, PMTs, Box.
    o Re-mount PMTs, Mirrors, WC, and shielding.
    o Align mirrors for max charged pion efficiency.

• **Significant Dates:**
  
  – March 2013: Work started
  – May 2013: All sectors stripped
  – Feb 2014: All Cylindrical Mirrors coated
  – March 2014: All sectors cut
  – Nov 2014: Mirror coating completed
  – Nov 2014: PMT coating completed
  – Jan 2015: First completed box assembled
  – June 2015: LTCC installation on Forward Carriage

• **Project Status:**
  
  – Mirrors:
    o Mirror coating completed
  
  – PMTs:
    o P-terphenyl coating completed
  
  – LTCC Box:
    o Back-walls received
    o Noses installed
    o Mounting hardware on one sector in the clean room

*Last Updated: February 6, 2015*