

LHC Interactive Tunnel

A User Manual

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1 Project Description

How can we shorten the distance between complex scientific knowledge and wide public understanding? Concepts like “the influence of Higgs Field on matter” and “particle acceleration and collision” can lead to explanations which are quite often hard to understand and even harder to retain. By immersing the public in a fully interactive gaming experience, the LHC Interactive Tunnel manages to bridge the gap between science education, interactive media and information visualization, creating an entertaining and memorable tool for learning.

When entering the tunnel, the users are presented with two very high-definition projection surfaces – front and floor, as well as an audio system. Their body movements are captured by a set of two Kinect sensors. From here on the possibilities are endless. Firstly, a generic video player allows you to display pre-rendered content. In addition we have developed two new applications.

In *Higgnite*, visitors can interact with a visualization of themselves immersed in two different universes – one in the presence of the Higgs Field and another without. Visitors become acquainted with the basic concept of the Higgs Field and what its effect is in particles with and without mass.

Proton Football invites visitors to play football with protons. This application allows us to explain how particles are accelerated and what happens when two protons collide. The harder you kick, the more energy in the collision and the more particles are produced.

2 Apparatus

- (a) 82 inches (or larger) Samsung Q60 4K Smart QLED.
- (b) 2 Kinect cameras (Microsoft) for Xbox.
- (c) 2 Epson short-throw projectors - Full HD - Epson EB685Wi.
- (d) 2 Gaming Grade PCs : e.g. MasterBox K501L, i7 processor; NVidia GTX1070TI), min. 16 GB DDR4 RAM, SSD 256 GB min.
- (e) Sound system: Logitech Z623 or equivalent.
- (f) Router: Tp-link AC1900 wireless; Archer C9 or equivalent.
- (g) Tablet: Android system.
- (h) Two keyboards Logitech K400 Plus TV.
- (i) Local construction: truss support, video projector support.
- (j) Network and video cables and adapters.

3 The Experimental Setup

3.1 Hardware Installation

3.1.1 Hardware Setup

- Here is the labelled diagram of the accessories:



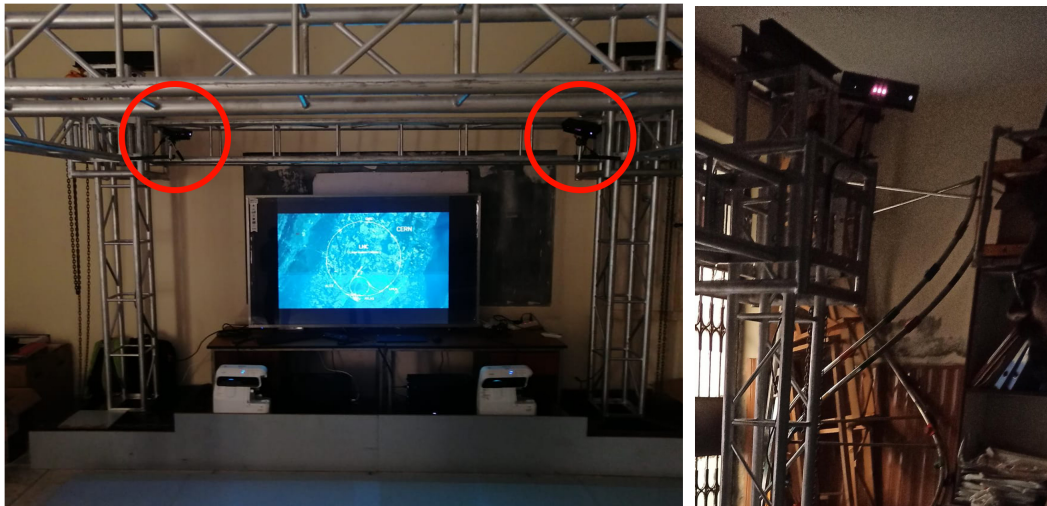
- After all parts of the truss gets unloaded, place the four vertical truss in the four dollies. Next, align the horizontal columns with the dolly such that two 6 feet horizontal columns are on the sides of the structure whereas the other two 10 feet horizontal columns are on the front and back. Align the ends with dolly and screw them up.



- Hang the pulleys with the vertical columns (*8 feet*) and tie the chains with the square structure. With the help of four team members, pull the truss to its height.



- Mount the kinect sensors on the truss.



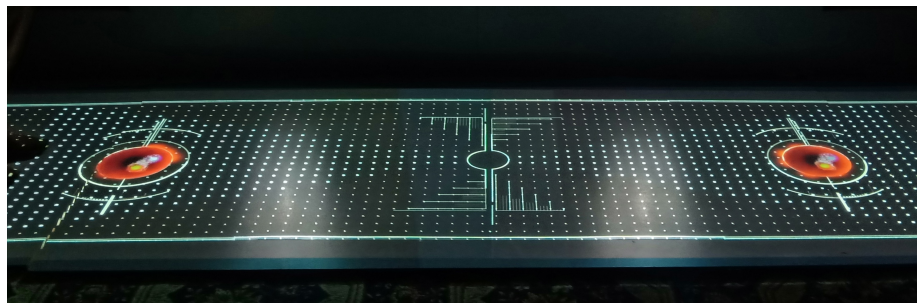
- Tighten the screws of the short-throw projectors mounts and attach the projectors on it. Roughly align the projectors or we can do the alignment part when aligning the displays.



- Place the LCD on the table and setup is ready to get software installation.

3.2 Working with PCs

- Connect PC-1 to LCD and both short-throw projectors to PC-2 via HDMI cables.
- One kinect sensor is fixed on the left side of the truss via a movable support and connected to the PC-1 while the other kinect sensor is fixed on the right side of the truss via the same support and connected to the PC-2. The height of the kinects from the ground cannot exceed above 4m because that is the range of the kinects to detect the motion.
- Combine two projected screens as one on the track via NVIDIA Surround function for both PCs and set their screen resolutions to its maximum value.
- Rectangular lines of both the projectors must overlap to some level. In order to do that, projectors must be at the same height and the distance between them depends such 'that the projections of both the projectors would overlap. We can use the projector's **Quick-Corner** setting to correct the shape and size of an image that is unevenly rectangular on all sides.

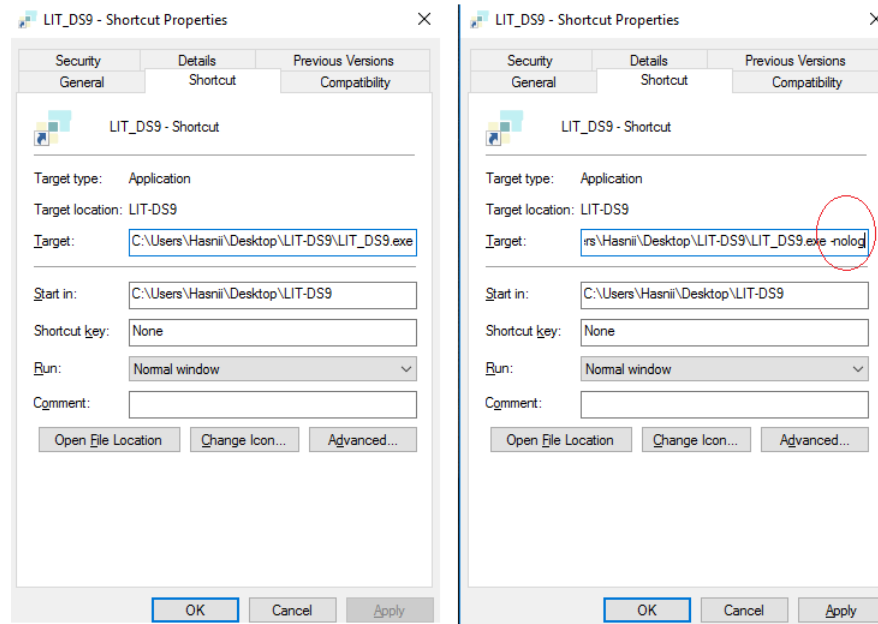


- Label both PCs as PC-1 and PC-2.

- Install “Kinect SDK V2.0” software on both PCs for the kinect’s working.
- Give PC-1 a fixed IP address and set it as a *server* while make PC-2 a *client* via router settings.

3.2.1 LHC Software Installation

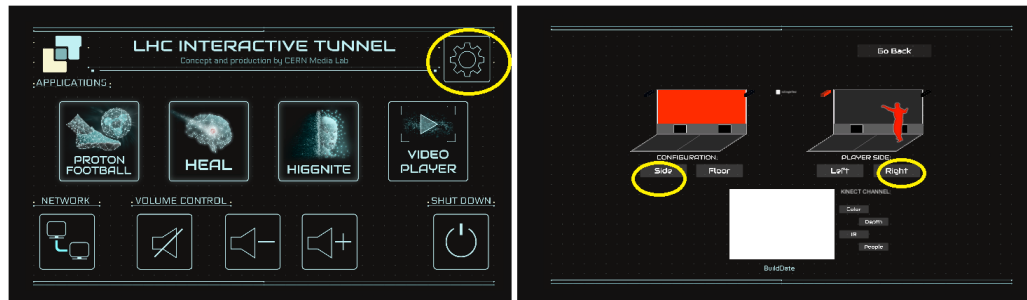
- Download the LHC interactive tunnel software named as “LIT-DS9.zip” from the url: http://mlsoft.web.cern.ch/LIT_Builds/
- Once it’s downloaded then copy the setup named as “LIT-DS9” and paste it as a shortcut on the desktop on both PCs.
- Right-click on that shortcut and go to its properties. Write *-nolog* in the ‘Target’ address bar as shown below figure. Without this, hard drives would store data in bigger volumes and in an hour will get clogged.



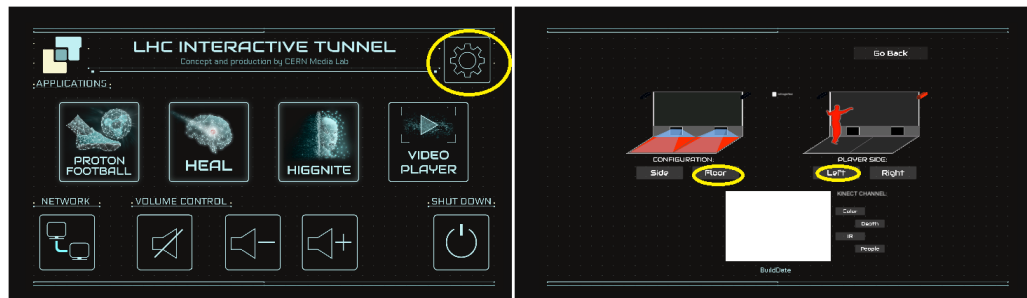
When it is done we would do the software settings for PC-1 and PC-2 by running the setup.

3.2.2 LHC Software Settings

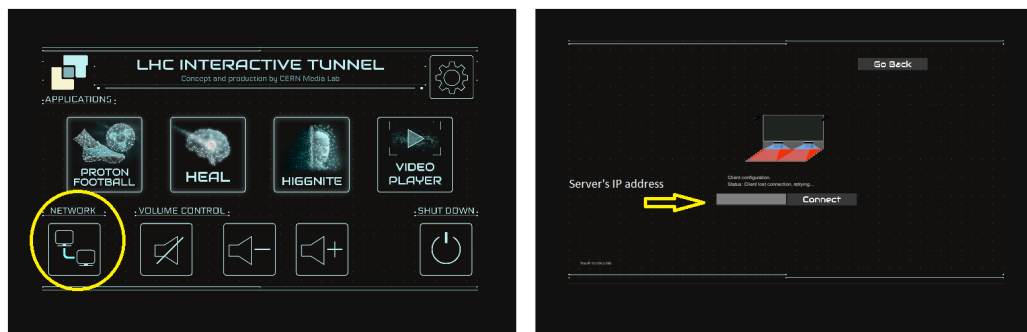
- PC-1 setting:



- PC-2 setting:



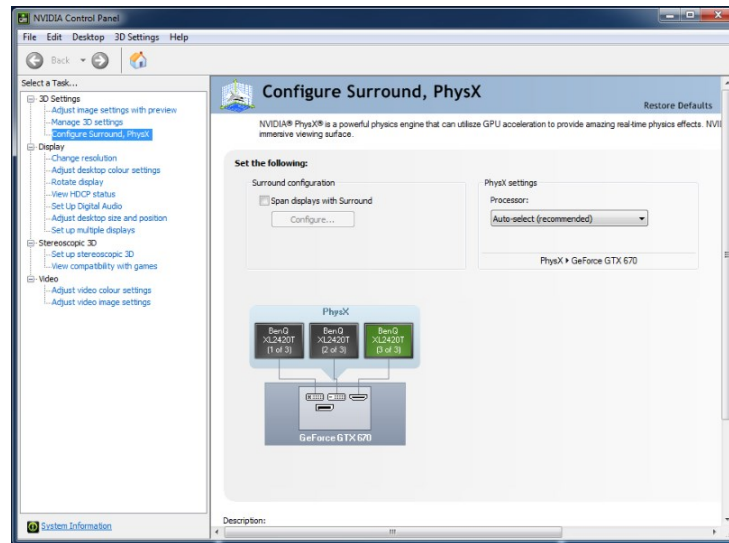
Now go to “Network” and write the server’s IP address and then click on connect as shown below:



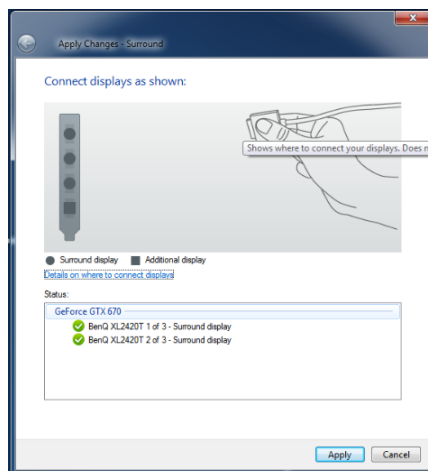
3.2.3 NVIDIA Surround Setting

To combine two projected screens as one on the track. Following steps for both PCs:

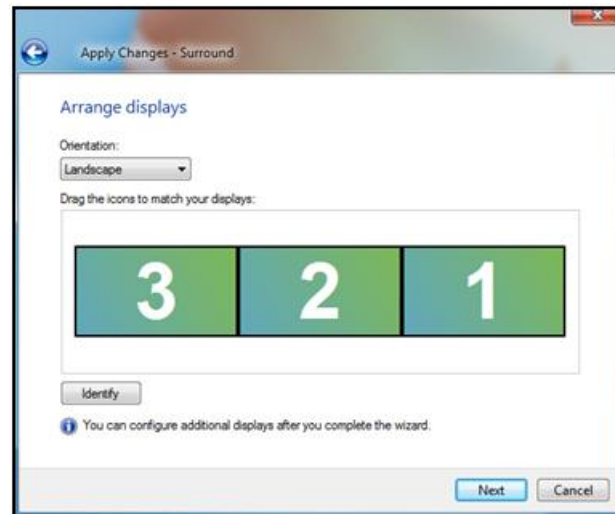
- Open the NVIDIA Control Panel through the Windows Control Panel or by right-clicking on the desktop.
- From the NVIDIA Control Panel navigation tree pane, under **3D Settings**, select **Configure SLI, PhysX, Surround** to open the associated page.
- Select **Span displays with Surround**, and then click the Configure button to launch the wizard.



- The Display status dialog checks the connectors on the cards to determine if the displays are connected properly. If the displays need to be moved, do it at this time. The interface will automatically detect the change and show it on this screen.
- Once all two displays are connected properly, press the Apply button to continue the setup procedure.



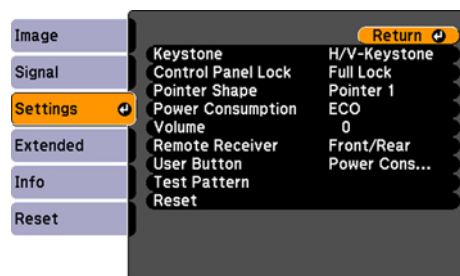
- In the Arrange displays dialog, select the Orientation of the displays (either Landscape or Portrait).
- Click the Identify button to determine the number order of the displays. You will see numbers appear on all two displays when the Identify button is pressed. This is the numbered arrangement you need to make your desktop work correctly.
- Arrange the Surround display order to match your displays by dragging the icons to match the numbers on displays. After the icons are arranged to match the numbers on the displays, click the Next button.



3.3 Projectors' Alignment

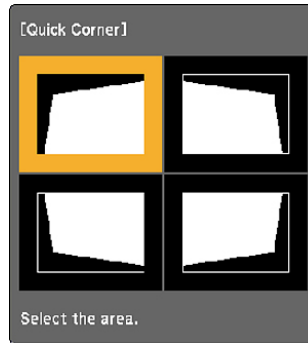
Through Quick-corner function (projector's setting), we can adjust the projection of the projectors by following below steps:

- Turn on the projector and display an image.
- Press the Menu button.
- Select the Settings menu and press Enter.



- Select the Keystone setting and press Enter.

- Select the Quick Corner setting and press Enter. Then press Enter again. You see the Quick Corner adjustment screen:



- Use the arrow buttons on the projector or the remote control to select the corner of the image you want to adjust. Then press Enter.
- Press the arrow buttons to adjust the image shape as necessary.
- When you are finished, press Esc.

3.4 Tablet Functionality

Install the LHC android app setup named as “LIT_Remote_2.apk” on the tablet/phone which can be downloaded from the url: http://mlsoft.web.cern.ch/LIT_Remote/. After the installation, open the application and put the server’s IP in the Network.

3.5 Troubleshooting Tips

1. What to do if the resolution of the floor is smaller?

Try pressing the ALT key from the keyboard instantly while double-clicking the software icon on the floor. A dialogue box will appear from where you can set the 4K resolution.

2. Due to electric failure, if the router resets, how to reconfigure and establish the networking between devices?

1. Here are the things you need to do before going into the networking:
 - Check the name of the router displaying on the WiFi network using the phone. If it is not “Lit”, this means that router settings/configuration has been reset and we need to configure it again to make the things work.
 - Turn the router upside down and find the default username and password for the WiFi and using that, connect to the network using mobile.

- Check the default IP written under the router (something like 192.168.0...) and type it in the URL bar in the mobile browser.
 - A dialog box will appear in the browser asking for the username and password. Put the admin username and password written under the router to get the settings.
 - Change the name of the network from the settings to ‘Lit” and you’re done with this task.
2. Open the ***File Explorer*** in PC-1 and right-click on ***Networks***.
 3. Go to ***Properties*** and double-click on ***Ethernet***.
 4. Double-click on the forth option in the list (*IPv4....*)
 5. Check if both of the options are on ***Automatically obtain IP/DNS?***
 6. Check the IP Address from the router’s setting page which PC-1 has automatically set.
 7. Now follow steps 2,3 and 4 for PC-2 and write the IP Address you got from the router’s setting page in the fields.
 8. Open the LIT Mobile App, go to Networks, enter the same IP Address and click connect.
 9. Everything will be connected.

After all the work, we are good to go.