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cTI Works With 1212-Studio, Inc. For Custom U2-360 Degree Tour LED/Microphone

Tommy Voeten, President and Founder of NYC-based [1212-Studio, Inc.](#), used City Theatrical's [SHoW DMX®](#) to control the now-famous LED microphone he built for U2's 360 Degree Tour, and here's how he made it happen:

For Tommy, the project started with Frederic Opsomer, previously of Innovative Designs, a division of Barco, and his need for a solution for a custom design for an LED fixture to illuminate the tensile fabric roof covering the massive stage. After the successful design and manufacturing of what became the RGBW LED fixture U2BE (pronounced you-tube), Tommy was then asked to design and implement an LED solution for Bono's on-stage suspended steel microphone, in order that the mic would light up in colors and have a separate white source to light up Bono's face while singing. In addition, the mic could be tossed around, and even swung from around the stage. The ring around the microphone would be illuminated with battery-powered LEDs to make the mic come to life.

The design/construction parameters of the microphone required that: 1) it needed to be able to sustain the full body weight of the performer (Bono) and 2) it needed to be battery-operated and the color and brightness needed to be wirelessly controlled.

Tommy started with the outline of the physical SHoW DMX OEM receiver and a battery pack sized for the anticipated load. He put all of the information into a 3D CAD model for strength, thermal analysis and generated drawings for construction risers. Initially, it comprised 8 LED circuits and operated in either 5 DMX slot or 26 DMX slot modes. For the white LEDs, Tommy selected a neutral 4000° Kelvin model that would work well with the variety of different light sources and would register well on the cameras.

Tommy's next step was to use the 3D model to 3D-print a physical model using [direct digital manufacturing \(DDM\)](#) to establish that the concept would work. The modeling and manufacturing process he used in his work is called [FDM or Fused Deposition Modeling](#). If not for 1212-Studio's Stratasys 3D Printer, which had to accommodate the complex shapes of the design, the project would not have been possible using traditional manufacturing processes.

Several iterations were made of the ring part. Some of the LEDs were direct-view and some were indirect-view. The thicknesses and shapes of the materials and internal devices involved determined the overall shape of the models.

Tommy went from the modeling phase to start the analysis process. He then completed a thermal analysis of the LEDs as well as a material analysis and a light study. Key elements in his design were the different diffusers he designed and made, not just for the light, but to distribute the performer's weight around the LEDs. Using epoxy would have been perhaps an easier solution, but it would have forced the weight through the LEDs, leaving them broken.

The overall LED and wireless mic payload was 50 to 60 watts. The batteries would need to be sized for three songs. The mic rig was turned on and flown out in the pre-show setup so the "stand-by" mode battery consumption needed to be minimal. The whole device needed to be waterproof, as well. There was an early version used on the U.S. leg of the tour in 2009 and the current version for 2010 and 2011 has the battery pack streamlined and lowered to provide a lower center of gravity for a clean pendulum swing.

U2's 360 Degree Tour already had four universes of SHoW DMX equipment operating a variety of lighting fixtures. The system had been put together in the [PRG](#) Birmingham shop, making it easy to add another transmitter and receiver to the system. The tour staff had an in-depth knowledge of the product, knew its performance and had spares on hand, if needed. The SHoW DMX OEM card was small and easy to fit into the mic rig.



Bono on stage with the custom LED/mic fixture utilizing SHoW DMX



Close up of the steering wheel design of the custom plastic molding



Tommy Voeten, founder and President of 1212-Studio, Inc. on stage with his custom