Electrical engineers develop LED 'Magic Wands'

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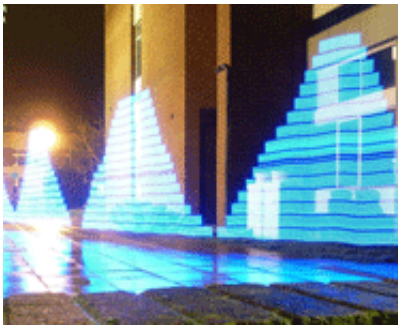

The hologram image was created using the wand and a camera on long exposure (around 30 seconds). Since the LED lights are so bright they burn an image into the picture. As you walk with the wand you build up a glowing light graph of the signal. The person holding the wand tends to disappear and blend into the background. Credit: Chris Hill and Jim Milner.

Engineers from the University of Bristol have developed illuminating ‘magic wands’ that work by picking up radio signals from mobile devices. The wands, to be showcased on BBC’s Bang Goes the Theory [16 April], visualise how radio waves bounce around a city.

Researchers from the University’s Department of Electrical and Electronic Engineering have been working with the BBC to see if they could find a way of showing how radio signals travel to and from your mobile phone.

The Bristol team, led by Professor Andrew Nix, Dr Naim Dahnoun and Mr Denys Berkovskyy, made three LED Wands that work by allowing radio frequency signal levels from Wi-Fi, cellular or FM radio to be sent to the Wand using Bluetooth. This information is then visualised using a microcontroller which illuminates a two-metre strip of LED lights.

Dr. Naim Dahnoun said: “Here's the cool bit, if you put a camera on a long exposure and then walk around with the wand you get to see a bright graph of the radio signals in your local environment.”

Alex and Jack from the BBC team holding the LED wands

Using the University’s Communication Systems & Network Group’s radio modelling technology - ProPhecy, which has the ability to consider every 3D building, tree and hill over an area of more than 140 square kilometres, the team were able to predict how bright the LED Wand would glow at a number of points in central London.

The work for the ‘wireless edition’ of the BBC programme continues its investigation into how life surrounded by wireless signals affects us by

exploring how microwave ovens interfere with Wi-Fi signals in the home.

Presenter, Jem Stansfield, shows how power levels leaking from a microwave oven can distort a Wi-Fi signal by attempting to stream a high-definition video in Professor Nix's kitchen. The video is seen grinding to a halt as Jem uses the microwave to heat a cup of tea.

Andrew Nix, Professor of Wireless Communication Systems, explains: "Both systems operate on exactly the same radio frequency, although the microwave is around 4,000 times more powerful. There's no need to worry since the power leaking from the microwave oven is around a billion times lower than the level inside."

"To begin with we're sending around 20Mbps to the laptop, which is more than enough to support the 8Mbps video stream. However, when the microwave oven comes on the data rate drops to just 4-5Mbps. Even though this is enough to surf the net and stream standard definition video, it's simply not enough for high-definition video. To reliably send this kind of content you'll need to move further from the microwave and/or closer to the Wi-Fi router. Another option is to use one of the latest 5GHz WiFi routers, since these higher frequencies are immune to the leakage from microwave ovens."

The team's work will be broadcast on the "wireless" edition of Bang Goes the Theory, the popular science programme for families and young people, at 7.30 pm on Monday 16 April and can be viewed again on BBC iPlayer.

Bristol's CSN group are well-known for their cutting-edge research in radiowave propagation and WiFi/cellular systems. The LED Wands now have a starring role in the Bang Goes the Theory live science spectaculars. The first was held in Edinburgh on 13-15 April, and the

shows roll into Sheffield and Poole over the following months. The team would also like to thank Motorola Mobility who donated three of their latest mobile phones to work with the wands.

Provided by University of Bristol