INVENTION DISCLOSURE

1. **Invention Title.**

DT Box: DOCSIS TEST BOX

2. **Invention Summary.**
A diagnostic device with multiple applications in CATV environments; can be used to simulate a standard DOCSIS Cable Plant and provides a means for capturing and analyzing specific types of Radio Frequency signals. The tool is particularly adapted to sensing bursty traffic on coaxial networks and providing triggering signals to RF measurement equipment.

3. **Invention Description**.

a. **Describe the invention in detail and/or attach a description, drawing(s) and/or diagram(s), if available. Please include flow charts for descriptions of software processes, and block diagrams for descriptions of hardware systems. Include the description/attachments in electronic form if possible.**

Construction Details:

The attachment (DT Box Schematic.vsd) shows a diagram of the DT Box including components, wiring, inputs and outputs. Electronic components include:
 - Pulse Width Discriminator & Envelope Detector
 - Programmable Attenuator (0-60 dbmv)
 - 6 ft. Cable Plant simulation (Diplex Filter and appropriate Attenuation)
 - RS-232 serial interface
 - Standard 12 volt DC power supply
 - Directional Couplers
 - Wiring

The DT box is encased in tin and is labeled with the following ports: DS in, US out, Signal to Measurement Equipment, Trigger to Triggering Equipment, Device Under Test port..

Sample application 1:

1. Insert the tool inline in a coaxial network between a Cable Modem and a CMTS. Connect a Vector Signal Analyzer, CATV analyzer or Oscilloscope to the Signal-to- Measurement-Equipment port. Attach a Windows PC to the RS-232 connector. Connect the Cable Modem to the Device Under Test port.
2. From a Windows PC console set following signal parameters on the internal programmable Pulse Width Discriminator and Envelope Detection chips:
    a. Triggering mode, levels and delay
    b. Attenuation levels
    c. Pulse windows

d. Noise floor
3. RF signals may now be captured and analyzed on the measurement equipment based on specific triggering criteria programmed into the DT Box in Step 2.

Sample application 2:

1. On a working CATV plant the DT Box can be used to replace the RF link between two CATV devices in order to determine normalized Modulation Error Rates, Bit Error Rates or other indicators, and thereby isolate plant or device faults.

b. **Why was the invention developed? What problem(s) does the invention solve? How is it better?**

The DT box was originally created to expedite DOCSIS Certification Testing and provides the following benefits:
- Eliminates variability in test environment arising from periodic reconstruction of complex test setups requiring a large number of components (e.g. cabling, attenuators, active and passive devices).
- Can be run against a Network Analyzer prior to usage to ensure correct calibration of components and baseline input/output levels.
- Can trigger on bursty traffic types to enable automated capture and analysis by an RF measurement device.
- Incorporates an US Programmable Attenuator for dynamically setting signal ranges.
- Reduces setup time and provides a consistent test environment for a wide range of test applications.

c. **Briefly outline the potential commercial value and customers of the invention.**

CableLabs currently uses the DT Box extensively in DOCSIS Certification testing saving a good deal of setup time and eliminating a number of potential error sources.

Other entities that could benefit from the DT Box include Equipment Manufacturer Development groups, MSO operations, evaluation and deployment groups, and third party Diagnostic Equipment vendors.
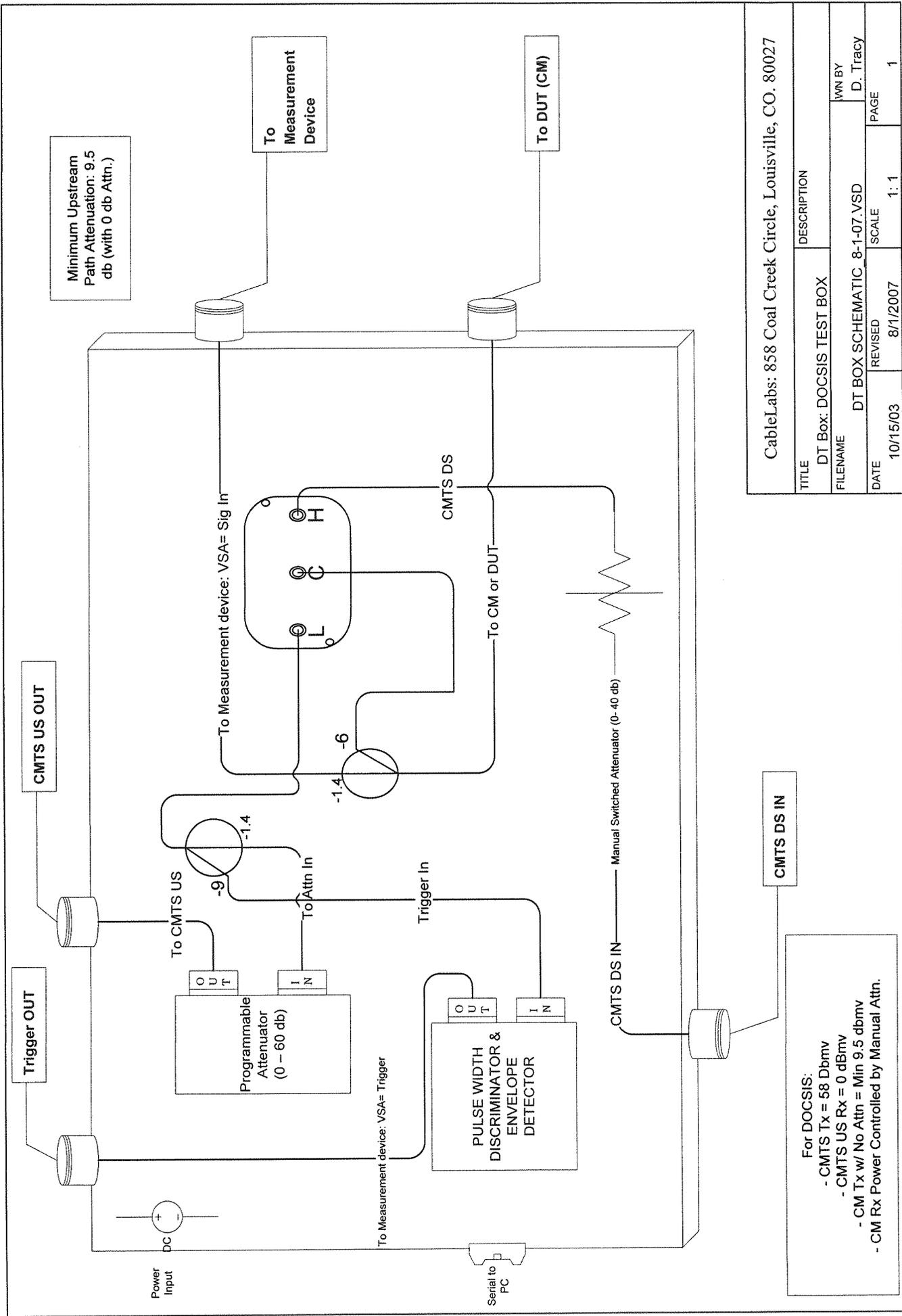
The DT Box could be made available for a fee, for free, or via a licensing agreement. DT Boxes could be loaned or released with CableLabs TEPs, to vendors preparing for Certification, as a value added service to the industry.

4. **How is your invention different from existing products, processes, systems?**
Please list the closest publication(s), product(s), method(s), patent(s), etc. to your invention. For each item, how is your invention different?

We are unaware of other tools similar to the DT Box.

The DT Box can be used to replicate any "6-foot plant" environment and so could be used in many standard CATV applications beyond DOCSIS Certification. Current methods for setting DOCSIS event Triggers involve time-consuming, manual setup of multiple components. The DT Box serial interface enables scripted control of active components from a standard PC workstation. The active components in the DT Box provide suitable dynamic range to enable interaction with any current technology in the cable industry.

DT BOX: DOCSIS Test Box

Minimum Upstream Path Attenuation: 9.5 db (with 0 db Attn.)

To Measurement Device

To DUT (CM)

CMTS US OUT

Trigger OUT

To Measurement device: VSA= Sig In

CMTS DS

H

C

L

To CM or DUT

-6

-1.4

-1.4

-9

To CMTS US

To Attn In

Trigger In

Manual Switched Attenuator (0- 40 db)

CMTS DS IN

OUT

IN

Programmable Attenuator (0 – 60 db)

To Measurement device: VSA= Trigger

OUT

IN

PULSE WIDTH DISCRIMINATOR & ENVELOPE DETECTOR

CMTS DS IN

CMTS DS IN

DC

Power Input

Serial to PC

For DOCSIS:
- CMTS Tx = 58 Dbmv
- CMTS US Rx = 0 dBmv
- CM Tx w/ No Attn = Min 9.5 dbmv
- CM Rx Power Controlled by Manual Attn.

CableLabs: 858 Coal Creek Circle, Louisville, CO. 80027	

TITLE	DESCRIPTION	
DT Box: DOCSIS TEST BOX		WN BY
FILENAME		D. Tracy
DT BOX SCHEMATIC_8-1-07.VSD		PAGE
DATE	REVISED	SCALE
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