WHITE PAPER

DIGITAL TERRESTRIAL TELEVISION (DTT) SIGNAL MONITORING PLATFORM

DIGITAL TERRESTRIAL TELEVISION (DTT) SIGNAL

In 2012 Europe had the second highest rate of DTT signal penetration with a value of 77% and the countries with the highest penetration of DTT signal were Finland with 100%, Spain with 99%, Croatia with 95%, and UK and France with 94%.

DTT is transmitted on radio frequencies similarly to prior analogue television, with one difference, which is the use of multiplex transmitters with digital modelation to allow reception of multiple channels on a single RF channel.

To ensure an ideal distribution of this resource, over 156 countries signed an ITU (International Telecommunication Union) agreement in the year of 2006, to switch from analogue to digital TV and all signatories (all countries of Europe, Africa, Middle East and the Islamic Republic of Iran) made a commitment – switch off analogue transmission by the end of 2015.

Many countries are making great progresses towards the implementation of Digital Terrestrial Television (DTT), and for a good number of reasons. The change from analogue to digital is intended to offer better reception quality, better image, the ability to high-definition TV, the most efficient use of the spectrum, among other features.

The main issue is that in several European countries where DTT signal has already been implemented, it is perceived that the transition is not fault free and the best way to smooth migration is to keep it monitored.

The communications regulators main purposes is to ensure that everyone has access to quality television service, and the migration results in a better service. The only safe way to do it is through monitorisation.

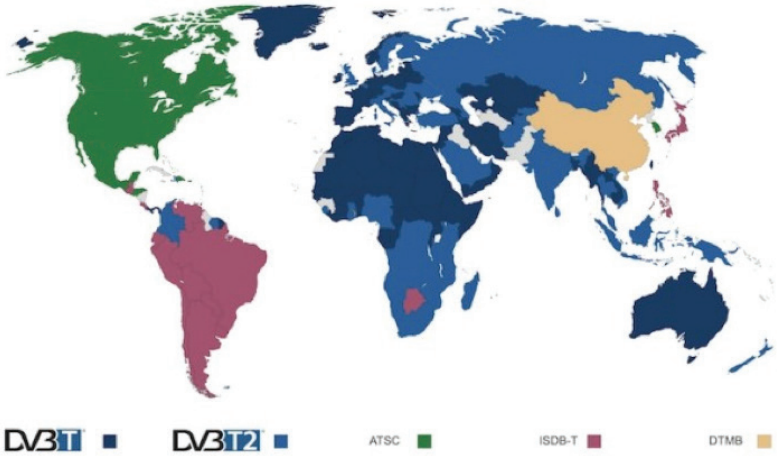


Figure 1: Blue indicates countries that have adopted or deployed DVB-T and DVB-T2.
Source: DVB Project (https://www.dvb.org/news/worldwide)

INTRODUCTION

Digital Terrestrial Television (DTT) Overview

Television has been known as a dominant political and cultural strength in our modern life. At first we had the analogue technology - in black and white - that has been used to deliver "experiences" through the broadcast spectrum and more recently, we had that in colour. But the analogue television transmissions will soon be one thing from the past when outdated by digital technology for good.

One of the best things that digital technology makes is an efficient use of the broadcasting spectrum offering to the end-user a greater choice of content and channels, higher and better TV definition (image), better reception and sound, and more.

The transition from analogue to digital as the one occurred in Portugal is disruptive and induces a strong social impact on the population, requiring a large proximity tracking and a permanent monitorisation of the quality of signal transmitted by DTT. This transition is also described as a transition from a world with spectral inefficiency and one-way services, to a world of on-demand programming, robustness, higher level of flexibility, spectral efficiency, and abundant channels.

DTT can be known as an implementation of digital technology which provides a greater number of channels and better quality of image and sound, using aerial broadcasts to a conventional antenna instead of satellite or cable connection.

BUSINESS CHALLENGE

If DTT is to contribute towards the migration from analogue to digital, the question arises as to how can we ensure that it is successful? Why does the transition to the Digital Terrestrial Television has failures? Why does the reception of signals from different transmitters causes interference and leads to loss of quality viewing? How can this be changed for the end-users satisfaction?

Failures of DTT reception are notorious. After the switch-off of the analogue signal, the main reason that leads DTT end-users to complain is the "coverage and reception service", being image breaking the main problem among end-users houses.

There are several possible causes for bad reception: a single receiving antenna may be receiving the same frequency twice with delay between the received signals (resulting from self interference due to bad planning or propagation ducts), something wrong with the users reception system (antenna, cables, decoder, GSM/LTE interference), or the DTT emission failure.

It is necessary to have a platform with the ability to measure the quality of DTT signal in residential environments. Such monitoring platform provides the answers to those and other related issues.

SOLUTION BENEFITS

DTT Signal Monitoring Platform

rprobe supports the latest digital TV broadcast standards: DVB-T, DVB-T2/Lite and DVB-C. It can collect several DVB-T signal parameters such as, signal level (RSSI), modulation error rate (MER), signal-to-noise ratio (SNR), among other important DVB parameters, showing these ones in real-time or in a statistical way, allowing representation, identification and characterisation.

This product ensures that the companies responsible for deploying DTT networks will provide a service that fulfils the broadcast's signal requirements.

The innovative modular solution is based on a high level of engineering expertise, as well as on User Interface (UI) designing, making it effective and user friendly. It also allows the monitoring of other frequency ranges and whose interface can be customised according to the customer´s needs.

The product has two main components: the measuring unit (**rnode**) and the centralised monitoring platform (rcenter).

rnode

The easiest way to measure the DVB-T/T2 signal quality parameters and transmit them to the rprobe center (**rcenter**) via its 3G interface.

- DTT standards: DVB-T, DVB-T2/Lite, DVB-C;
- Real-time data capture of most DVB signal parameters;
- Rejection filter for GSM/UMTS/LTE signals.
- Storage memory to save collected data up to 7 days;
- Thresholds on all metrics to trigger different alarms;
- Transport stream sample record;
- Local and remote management;
- SNMP.

ADVANTAGES AND DISADVANTAGES

One of the many advantages is the mechanisms that DTT provides for making network coverage robust and cost-effective. However, in order to make the most of digital potential, network operators and regulators need to take a fresh look at network design and implementation.

The most noticeable advantages of DTT for the end-user are good images and high quality audio through digital reception, better reception, access to new, free and pay TV channels, and more. For the broadcasters the most noticeable advantages are the opportunity to launch new channels, make better use of content library, generation of additional revenues, and more. For Government authorities the advantages are the possibility to cost-effectively implement social programs and give access to additional frequencies that may be used for essential services.

The time spent by the responsible companies to explain the main advantages to the end-users was necessary because consumers were unaware of the value of DTT. All the successful implementations of DTT have required a strong market communication campaign, showing to the end-user the benefits and also the technical issues (coverage, etc.) and the switch-off dates.

rcenter

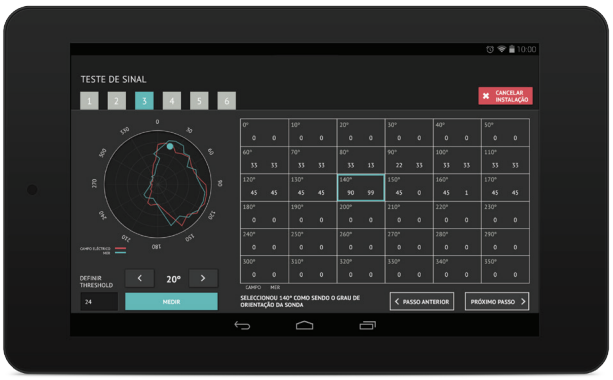
A cloud based centralised system that gathers measurements from **rnodes** and provides an extensive set of statistics, graphs and reports. It is a powerful database which allows the end-user to select a time frame where he can consult in detail each measure.

- DVB-T Real Time Measurements (SNR, MER, cBER, vBER, pBER, C/N);
- Measurement statistics (Histogram; Probability Distribution Function; Complementary Cumulative Distribution Function; Standard Deviation, Average, maximum, minimum and median);
- Probes Map Location;
- Configuration (Probe Parameters; Alert Thresholds; Probe Groups);
- Event-based sytem for dealing with Alerts and Errors;
- User and Profile Management;
- Auditing;
- High Availability and Redundancy.

A complex event processing (CEP) engine is provided by the solution allowing the end user to fully study the measures retrieved from each **rnode**. This engine allows, among other things, to detect variation patterns on one or more variables for a given period of time.

rinstaller

rinstaller is a full installation wizard that guides the installer and collects data results in an automatic report for each rnode installation process, thus being a priceless tool for large scale implementations.



One of the crucial steps to get the **rprobe** system up and running, measuring all the DVB-T2 parameters in a precise way, is installing the antenna according to the ITU-R SM-1875 recommendation. **rinstaller** is an APP the helps the installer learning the direction where the signal level and MER are being received at its finest. To do so, the installer as to rotate the antenna in intervals of 10º until completing 360º, after this, the **rinstaller** will notify the installer with the best azimuth that it has encountered.

By using this solution, communications regulators and network operators will have the necessary tools to measure the quality of signal in all regions selected to run tests. This solution is the most effective way to gather and analyse network coverage parameters, take action in the network to improve it them and ensure that everyone is being provided with premium quality DTT.

The monitoring platform provides 1 second measurements resolution. **rprobe** is a unic temporal statistical analysis/measurement tool in the market.