

- Professional test modulator for virtually any digital modulation standard
- Unique support for all bands: VHF/UHF and L-Band
- Configurable signal quality and error injection to simulate threshold conditions
- Fully compatible with DekTec API and product line
- Plug&Play for Windows
- Support for Linux



DekTec DTA-2115



How should you test a receiver?

One way would be to pack the receiver in a suitcase, fly straight to the installation location so that you can take the signals you want to receive and plug them directly into the receiver on-site. Most of the time, this isn't a very practical solution and it is most definitely not very efficient.

It would be much better if you could create the signals yourself. And this is exactly what DekTec had in mind when they developed their line of test modulator products. Back in the 12-01/2012 issue of TELE-audiovision we introduced the USB modulator DTU-215 Gold. Now there's a new product: the DTA-2115 PCI Express card.

It unites for the first time the modulation of digital signals in the VHF/UHF range with (and here's the best part) the L-band that is used for satellite signals.

This makes it possible to generate test signals for terrestrial, CATV and satellite receivers with just one PC card.

Sure enough, a continuous frequency range from 32 MHz to 2186 MHz is supported with a maximum bandwidth of 72 MHz.

Since we are dealing here with a „Software Defined Modulator“, nearly every known form of modulation is supported regardless of the frequency. This is unique.

A receiver manufacturer



just needs a TS stream, preferably recorded in the region where the receiver will be used. This can then, with the DekTec modulator at a desired frequency and a desired modulation, be fed into a coax cable that is connected to the input of a receiver. And that's it. The manufacturer can now adjust at leisure the receiver's hardware and software until the signal is correctly demodulated.

And this is exactly how bugs can be found. In one of our TELE-audiovision tests we discovered that the receiver could not correctly process the NIT ta-

ble from TV Cabo. Since the manufacturer had a DekTec modulator, we were able to record the transport stream and send it to them via FTP. This allowed the manufacturer to reproduce the error using the original transport stream and then correct the firmware.

Another perfect application for the DekTec modulator would naturally be at trade shows, where the necessary signals are not available. How are you, for example, supposed to be able to demonstrate a DVB-T2 receiver at the CES in Las Vegas? It's very simple: you record a transport stream in



advance and then modulate it on location with the DekTec Modulator. In this way you can also save on the costs to lease TV signals at a trade show - this alone could quickly let the DekTec Modulator pay for itself.

The DTA-2115 arrived in our test center in a small box. Inside we found the PC card as well as a USB memory stick. The PC card was professionally packed in an anti-static sleeve surrounded by foam padding. The USB stick was loaded with all of DekTec's applications which at first might seem somewhat excessive since most of them were not specific to the DTA-2115 and in some cases required individual licenses.

Yet it does make sense that DekTec supplied a USB stick with so many applications stored on it; the PC can be outfitted with any DekTec hardware without having to rely on an Internet connection. In locations such as production facilities, mobile head-end stations, trade shows, etc., Internet may not always be available.

Installing the PC card was managed without any problems. The PC housing was opened, the card was inserted into an available slot and the mounting screw was

secured without any difficulties. With other cards, it occasionally becomes necessary to shift or slightly manipulate the card so that it can be inserted correctly. This was not the case with the DTA-2115.

The card was properly recognized by Windows 8.1 and was immediately available for use after the drivers were installed without a PC restart. A little tip for you: DekTec software and drivers should always be installed with Administrator rights (right mouse button - „Run as Administrator“) otherwise the installation may not always work.

Of course we had to try the card out right away; we connected a coax cable from the DTA-2115 output to a normal satellite receiver. Using the StreamXpress software, a TS file was selected and the DVB-S2 modulation was chosen. Now we simply entered the desired frequency and then started the creation of the signal.

This was all very easy to do, so much so that we really didn't need any documentation. After a manual scan on the receiver, the test transponder was quickly identified and displayed.

At this point we still had our doubts regarding the

enormous frequency range that the DTA-2115 supports so we connected a DVB-T box and also a DVB-C receiver. In order to test this, we simply switched the modulation mode while running from DVB-S2 to DVB-T or DVB-C while at the same time setting a proper frequency.

It quickly became clear that this PC card won't be removed from our PC anytime soon; it is just far too practical to have many different signals available on just one coax cable.

To test the requirements of receiver manufacturers more closely, we recorded transponder streams from a variety of different providers and modulated them with the DTA-2115. We wanted to find out in particular if encrypted transponder streams could be correctly decrypted after being modulated with the DTA-2115.

We, therefore, recorded a Fransat transport stream (Eutelsat 5 West A at 5.0W - Transponder KB3: DVB - 11554 V SR 29950 FEC 7/8) using a normal DVB-S2 card and then modulated that signal with the DTA-2115 and connected the output signal to an official Fransat receiver with an active SmartCard. The receiver decrypted the

signal without any problems and you could not tell the difference between this signal and the original.

In the same way an NOS transponder (previously known as TV CABO) was recorded using a signal analyzer and then modulated in DVB-C with the DTA-2115. Once again, the official NOS cable receiver had no trouble processing the signal.

For receiver manufacturers this is a blessing; receivers can be developed all the way up to mass production regardless of where the receiver will ultimately be used.

The DTA-2115 is not just a plain test modulator on a PCI-e card, it is an actual laboratory instrument in that it can produce signals in the highest possible quality.

The fact that DekTec developed this PC card also for R&D and test labs, can be seen in the number of available connections. In addition to the standard 75 Ohm „F“ connector from which a -45 dBm signal is provided, there's also a 50 Ohm SMA connector. Here a signal from -50 to 0 dBm (depending on the modulation used) can be provided.

With professional TV equipment it is typical to use an external 10 MHz signal for

perfect synchronization. The DTA-2115 also shines brightly here; there are two 50-Ohm BNC connectors available to provide 10 MHz/1pps input signals. This could be important, for example, when testing SFN networks where different antennas transmit synchronously on the same frequency. This makes the DTA-2115 also interesting for use in broadcasting applications; it supports a frequency range of 32 MHz to 2186 MHz and the symbolrate can be set from 0.088MBd to 85MBd. It has a maximum bandwidth of 72 MHz.

The DTA-2115 is available in two different versions; the hardware in both versions is the same, just the included licenses are different.

The DTA-2115-SP supports the following modulations: ADTB-T, ATSC, DVB-C, DVB-H, DVB-S, DVB-S2, DVB-T, QAM-B and QAM-C.

How to capture a Transport Stream

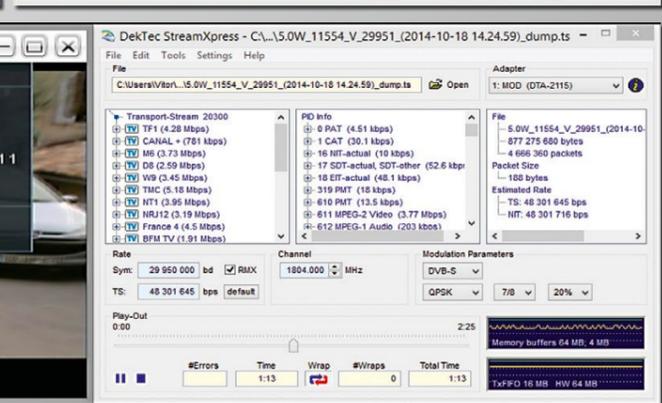
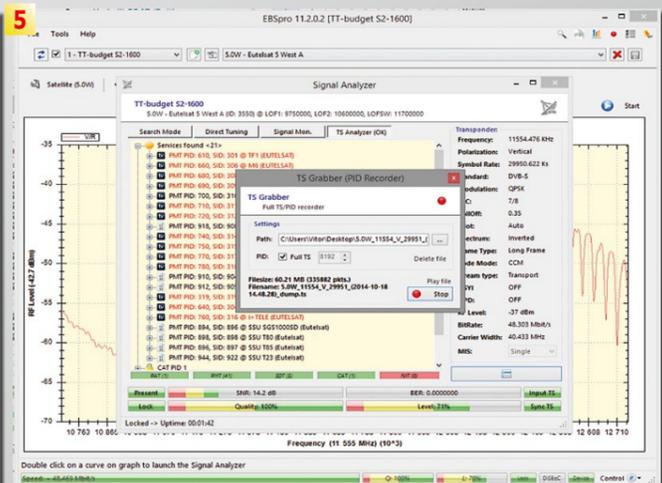
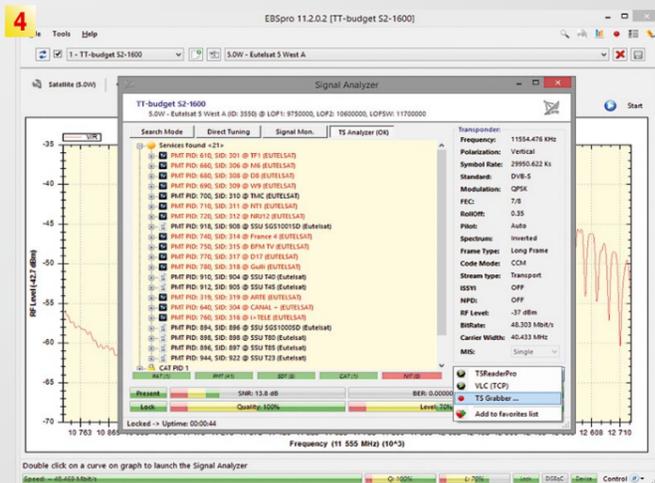
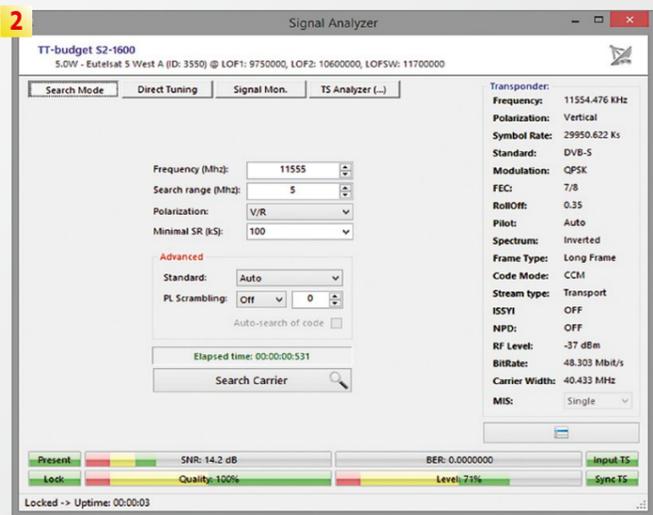
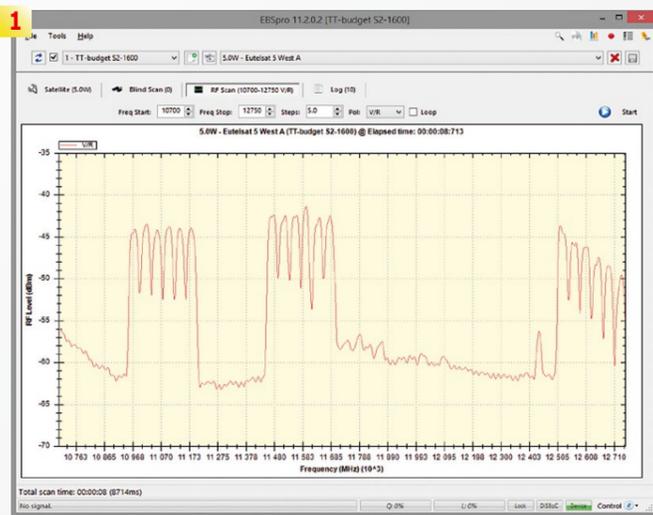
1. One way to obtain a transport stream is to simply record one. This is what most users want to do anyway, because such a transport stream is required to test or demonstrate a receiver with authentic data. To grab a transport stream I used the EBSpro software, which is popular amongst DX enthusiasts. The first step consists in tuning to the desired satellite and polarisation and do a spectrum scan.
2. Next just double click on the preferred transponder. The Signal Analyser will try to automatically tune into the signal and upon success it will show all reception parameters.
3. EBSpro even features an integrated TS Analyser, which shows all services available in the transport stream of the current locked transponder.
4. Further options include the visualization of the stream with VLC or TSReaderPro, which are certainly familiar tools within our readers. Also, you can just use the TS Grabber option. This simply writes the transport stream to a file: exactly what we need. In this case I am recording a transport stream

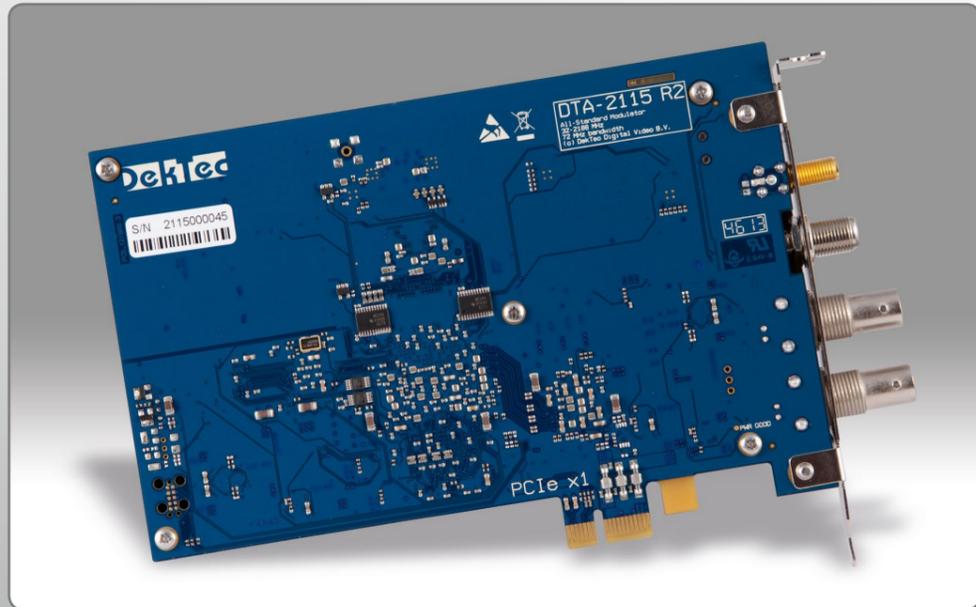
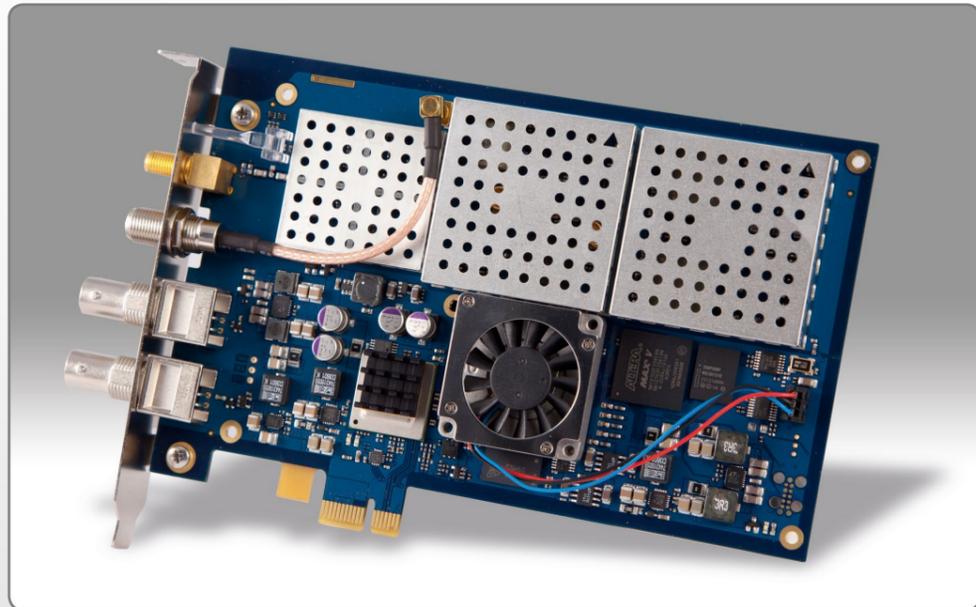
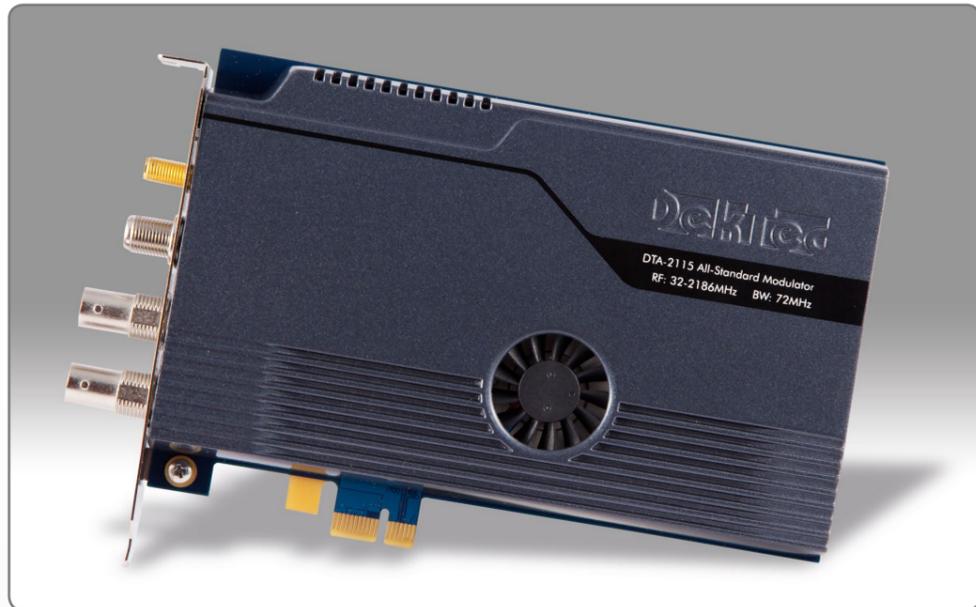
for my test from Eutelsat 5 West A. The transponder is used by Fransat, a French bouquet that transmits with Viaccess encryption.

5. Recording is started and terminated manually. I normally record 1 minute, sometimes 5 minutes. If you do recordings shorter than 1 minute, you will find that the contained transport stream gets looped too quickly and you don't have enough time on the receiver to make the required tests. A side note: the StreamXpress software can loop the transport

stream file automatically, but naturally there is an interruption with each loop, as the tuner must wait for new headers. This takes about 3 seconds and can be annoying with too small transport stream files.

6. Once the recording is terminated you can start StreamXpress, select the file you just created and output a transponder. The picture shows the image grabbed from the official Fransat satellite receiver next to the StreamXpress window.





With the DTA-2115-GOLD that we tested, the following modulations are possible: ADTB-T, ATSC, ATSC-M/H, CMMB, DAB(+), DMB-T/H, DVB-C, DVB-C2, DVB-H, DVB-S, DVB-S2, DVB-S2X, DVB-T, DVB-T2, I/Q, ISDB-S, ISDB-T, QAM-B, QAM-C, and T-DMB.

All of the available modulation types can be set to any desired frequency. You can, for example, take a DVB-S2 signal and output it on a standard CATV frequency.

Normally you'd want to be able to receive perfect signals. When it comes to testing a receiver and its error correction, it can be extremely critical to have the ability to influence the signal quality.

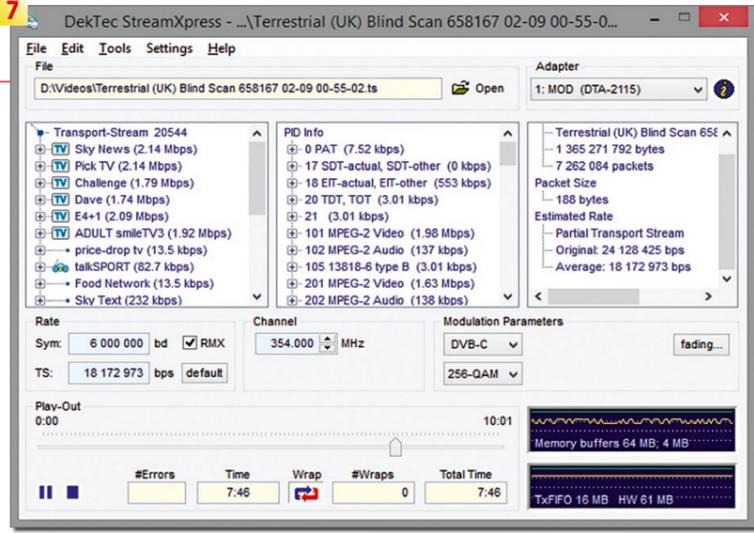
The included StreamXpress software makes it possible to inject errors in the modulated signal. Lost packets, bit errors and byte errors can be generated independent from each other. The errors are created statistically, that is, one error in x packets where x is specified by the user.

In the case of Bit and Byte, errors can be given a maximum value of error bits or bytes per packet so that the error correction algorithm can be tested to its limit.

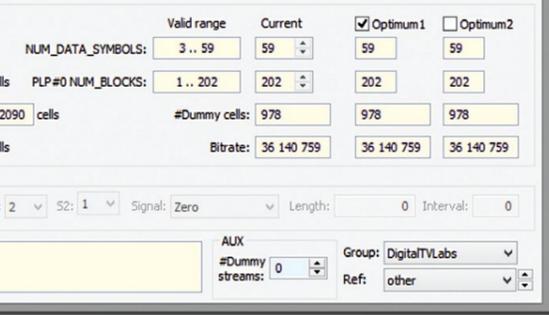
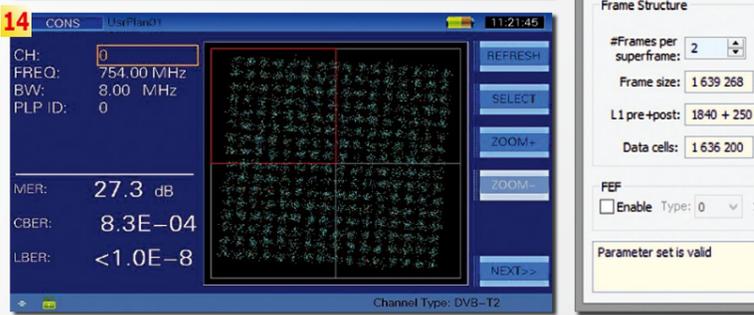
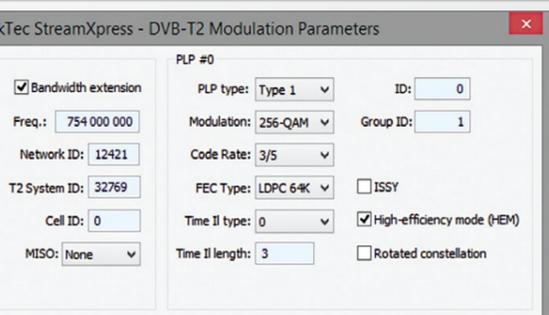
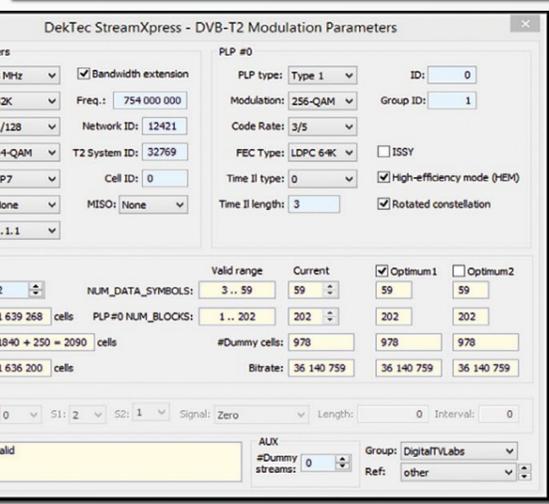
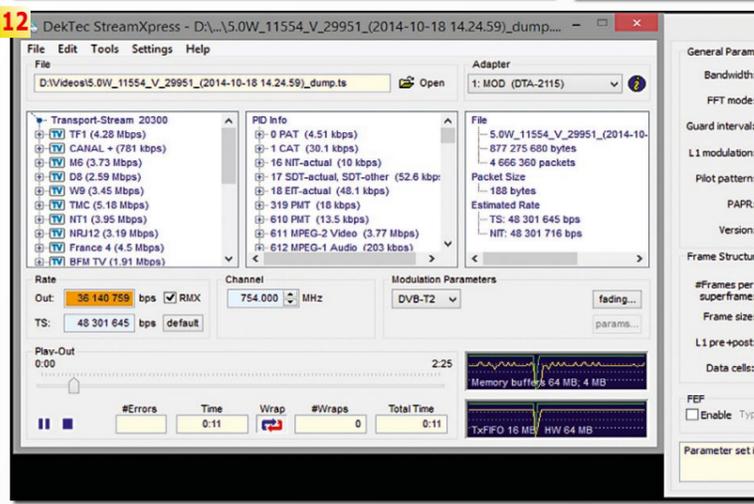
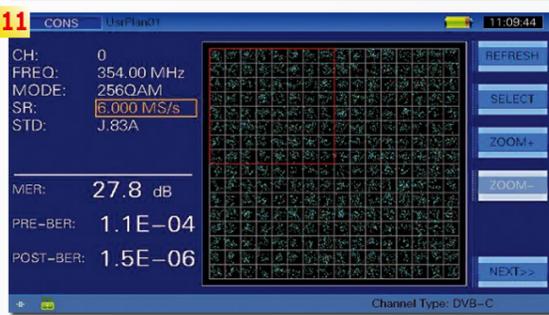
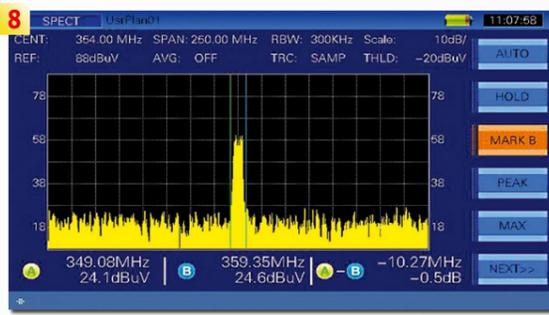
Naturally, the signal level at the 50-ohm output is adjustable between -63 dBm and -3 dBm in 0.5 dBm steps. Additionally, the signal-to-noise ratio function can be turned on. It can be set between 0.0 dB and 30.0 dB.

In the 05-06/2014 issue of TELE-audiovision we reported on the DekTec API and showed how easy it is to develop your own uses for DekTec hardware in order to create individual test systems.

If, for example, receivers need to undergo a quality test at the end of the manu-



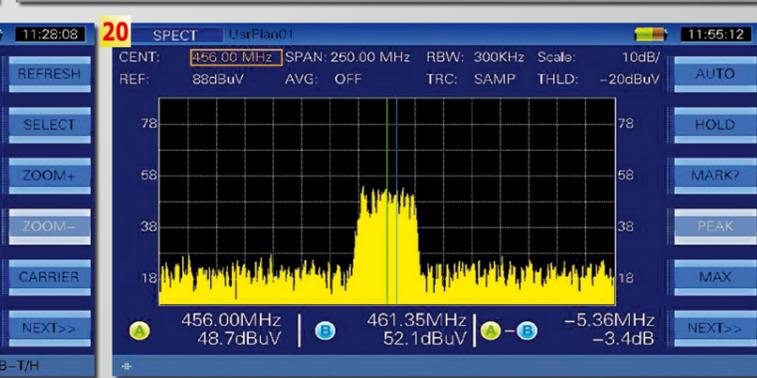
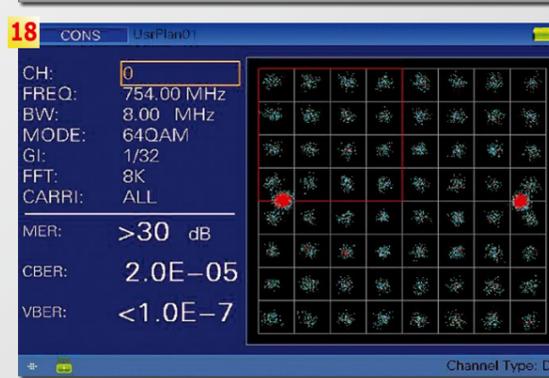
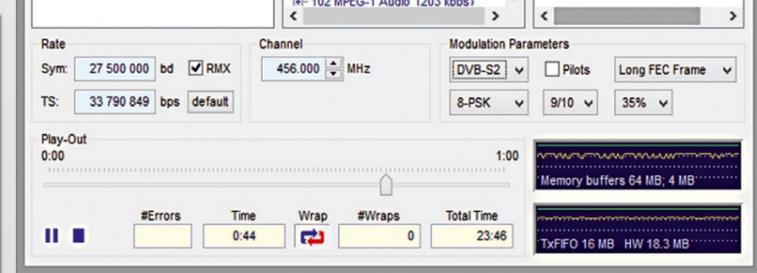
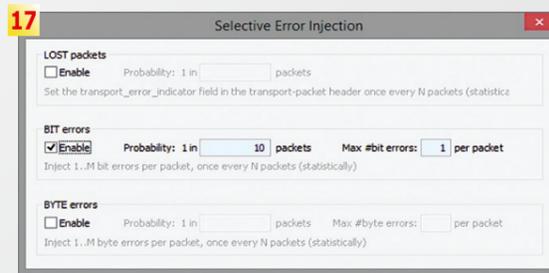
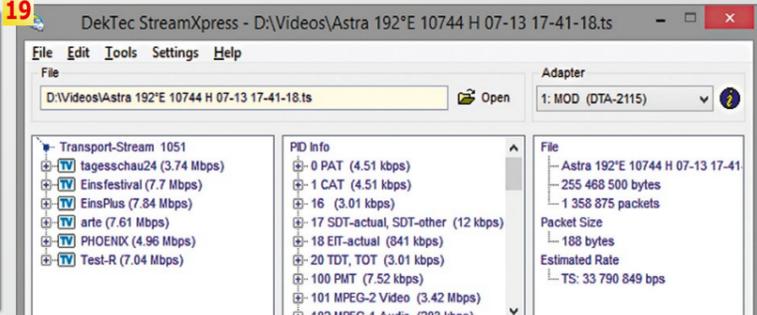
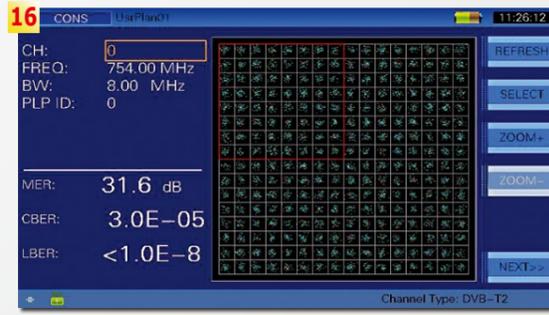
Results with the Deviser Signal Analyzer



7. First test: modulating a DVB-C transponder with 256-QAM at 354 MHz.
 8. The transponder generated by the DTA-2115 is clearly visible in the spectrum.
 9. The field meter shows the corresponding constellation diagram, the signal is locked with no problem. This is nice to test a receiver or to analyse the content, however, the signal is unrealistically good.
 10. DekTec allows to control the SNR of the signal. Introducing a random background noise will produce a more realistic constellation and gives the tuner some work.
 11. The field meter can still lock onto the signal, but now the bit error correction has some work to do.
 12. Second test: modulating a DVB-T2

transponder with 256-QAM and rotated constellation. StreamXpress offers a whole window with access to practically all parameters for DVB-T2. Thankfully DekTec included useful default settings.
 13. The field meter could lock to the signal without any problem. The result is a perfect tilted constellation diagram.
 14. This constellation diagram looks more realistic... I activated the SNR functionality on the StreamXpress software. Notice the slightly lower MER.
 15. DVB-T2 does not necessarily use a rotated constellation. On the advanced DVB-T2 settings panel you can turn this off.
 16. Here we see the resulting DVB-T2 constellation diagram without rotation.
 17. To test error handling, the

StreamXpress software allows to introduce errors. This can come in very handy, when error correction algorithms need to be tested.
 18. Another test: generating a DVB-H transponder. I do not receive such signal in my location, so it is good to be able to rely on the DTA-2115 to obtain such a signal, when DVB-H receivers have to be tested.
 19. Any modulation can be generated. To test this, I modulated a DVB-S2 8-PSK signal at the unusual frequency of 456 MHz.
 20. The field meter shows the generated transponder on the spectrum. I don't have a suitable receiver to demodulate this transponder, but this shows how R&D departments could explore new frequency and modulation combinations.

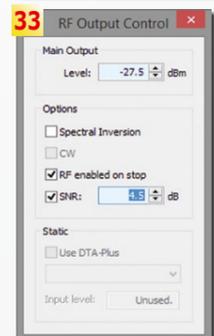
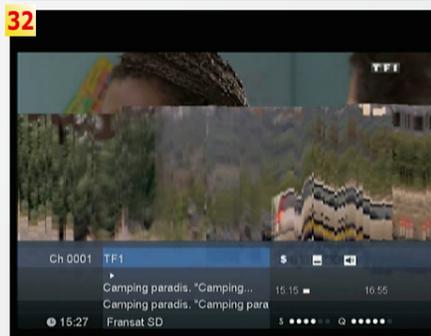
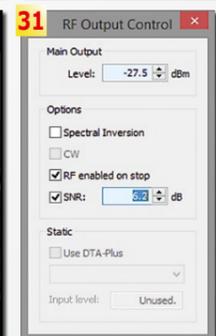
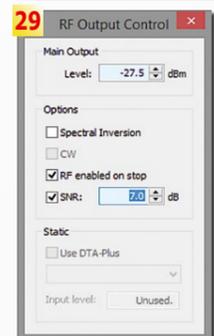
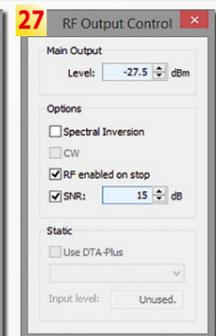
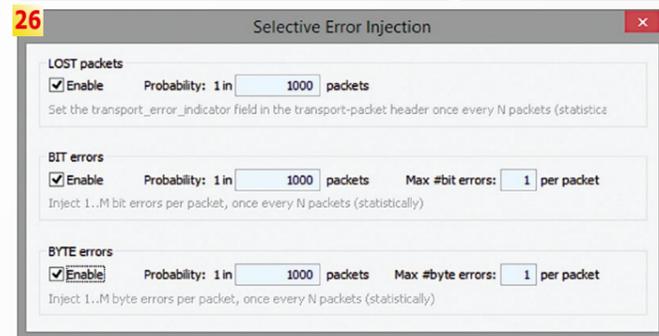
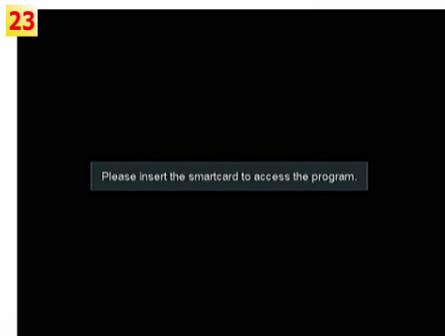
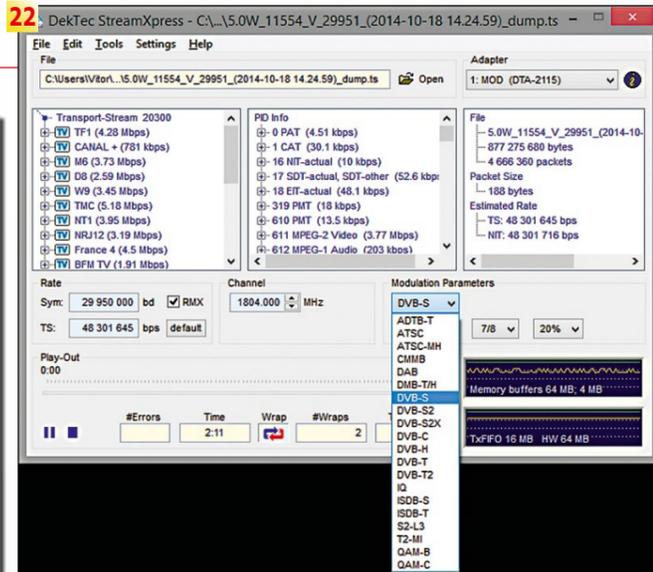
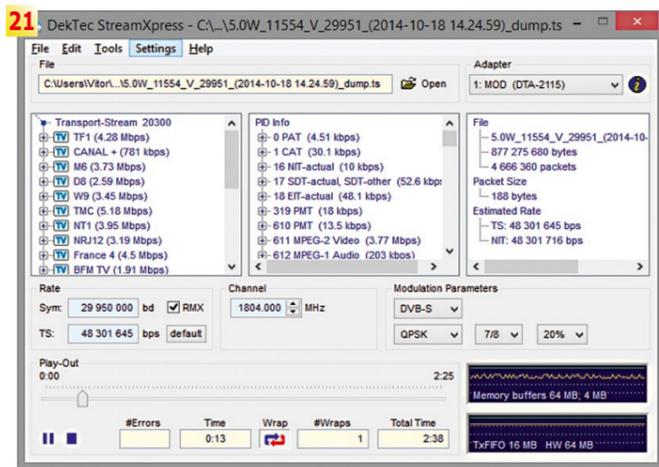


facturing process, special software could be developed that at the touch of a button could play back one transponder stream after another at different frequencies. The technician would not need to do anything special in the StreamXpress software and there would not be any mistakes that would have come from entering wrong frequency information. Even though we're not

professional programmers here in the test lab, we were easily able to create test software like this in a short amount of time. This shows how the well-thought out DekTec concept offers unlimited possibilities. Thanks to the open and documented API, the new DTA-2115 can also, as expected, be integrated into user-defined applications. Whether it's in R&D de-

partments, in service centers or at trade shows, if you've worked with a DekTec modulator once, you'll never want to do without it again. With the DTA-2115, we're talking about an unbelievable product that can work with any modulation and in every standard frequency band. The card works as expected. Working with the StreamXpress software is

logical and uncomplicated. Naturally, complex modulations such as DVB-T2 come with an array of parameters yet the presettings are reasonable and if you need to test a signal like this, you would already know which parameters would need to be tweaked. We love the new DTA-2115 and highly recommend its use in stationary workstations.

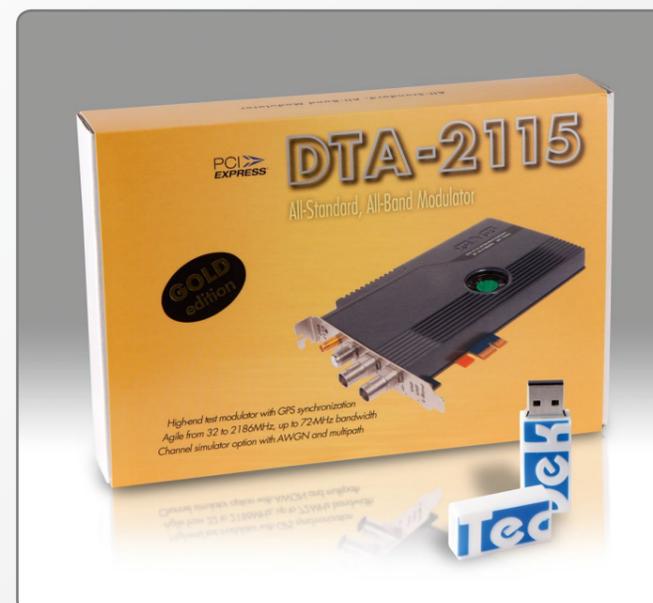


Fransat SAT Receiver

21. I want to test the official Fransat satellite receiver. It comes with an official Viaccess card and is configured to be used with Eutelsat 5 West A. What could I do, if I don't have the possibility to receive this satellite, but still need to test the receiver? Easy: get a file containing the transport stream and start StreamXpress.

22. Select the transport stream file, which in my case has been suitably named by ESBpro, the software used to capture the transport stream. Configure StreamXpress accordingly: DVB-S modulation, at 1804 MHz (11554 MHz – 9750 MHz (LO) = 1084 MHz) with SR 29950. Hit the play button and you are set.

23. On the receiver, the signal is received and because I have not inserted the smartcard, yet, the respective message pops up.



24. After inserting the smartcard, the picture is demodulated: the receiver thinks that it is receiving the genuine live satellite feed. Instead, I am looping the same captured transport stream over and over.

25. The reception parameters are confirmed.

26. It's time to test how sensitive the tuner is and how well it can handle weak receptions. I start by injecting a few errors.

27. Also, I specify an SNR value of 15 dB.

28. This causes the receiver to produce a few glitches when the image content changes quickly and a higher bitrate is

required.

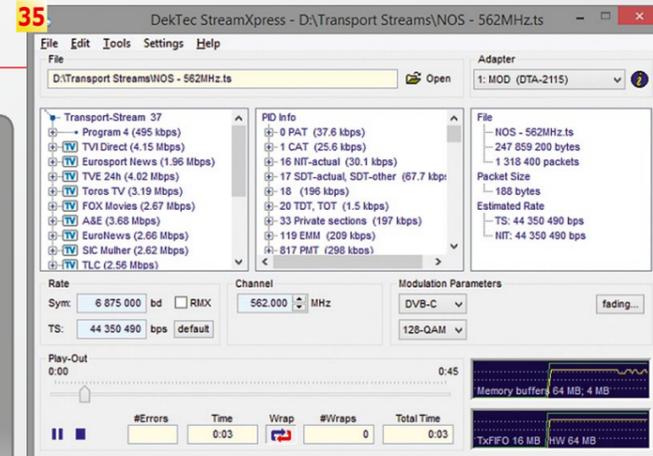
29. What happens if I lower the SNR value to 7 dB?

30. The tuner will struggle with the reception and produces a lot of artefacts, which could not be corrected by the bit error correction algorithm.

31. Setting the SNR even lower to just 6.2 dB.

32. Almost no picture now – just artefacts.

33. With an SNR of 4.5 dB... 34. ...the receiver gives up! No signal is shown. This shows how easy it is to evaluate the tuner's sensitivity and error correction algorithms on a test bench, without the need of a real live signal.



NOS CATV Receiver

35. Setting up StreamXpress to test an official NOS CATV receiver. This is a fully locked down receiver, which does allow little end user configuration – one cannot even select transponders frequencies to be scanned. To test the receiver I had to capture a given transponder, verify which channels it contained and then setup StreamXpress to use the exact same frequency

36. As expected I got immediately a picture.

37. Because I am looping the same transport stream file, I can change the signal quality of the signal produced by the DTA-2115 and watch the performance of the receiver, by comparing the same scenes over and over.

38. In the advanced settings, the receiver reveals the reception parameters, which naturally match the ones I setup on StreamXpress.

EXPERT OPINION

DekTec DTA-2115
Professional Test Modulator

RECOMMENDED PRODUCT BY

TELE-audiovision
THE WORLD'S LEADING DIGITAL TV INDUSTRY PUBLICATION

Vitor Martins Augusto
Test Center
Portugal

VIP CARD

- + Supports practically all modulations over the whole frequency spectrum from 32MHz to 2186MHz
- Easy installation and operation
- Very robust – no crashes, hangs or faults over the entire test period
- Allows development of custom applications with provided API
- Runs under Windows, compatible with Linux
- None.