Titanium Satellite

# Titanium Satellite C1W-PLL

- *Cost effective C-band LNBF for satellite enthusiasts*
- *Uses PLL technology, which normally could only be found in professional LNBFs*
- *Wideband support for satellite enthusiasts outside the USA*
- *High gain and the ability to lock onto low symbol rates lets the enthusiast receive many of the more difficult-to-receive channels*

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# Receive C band like the professionals

TELE-audiovision recently introduced the Titanium Satellite ASC1, an excellent positioner for big satellite dishes. But Titanium Satellite, a newly established powerhouse for high quality products for the satellite enthusiast, has also developed a brand new PLL-powered LNBF, dedicated to C-Band satellite enthusiasts as well as professionals.

The abbreviation PLL stands for Phase Locked Loop, an electronic way to provide extremely solid signal locks, even if you're dealing with weak signals, low symbol rates or high FEC digital carriers. PLL based LNBs are also immune to annoying drifts.

The first PLL Ku band LNBFs appeared on the market in 2011. Titanium Satellite reacted quickly and developed the first PLL LNBFs for the C-Band and brought its model C1PLL to the North American market in November of 2013. Today Titanium Satellite sells a wideband version covering 3.4GHz all the way up to 4.2GHz. There are two versions of the C-Band PLL LNBF: the C1W-PLL is for single cable applications while the C2W-PLL is a twin LNBF with two cable outputs. And as recently as May of 2014, Titanium Satellite introduced their low cost "lite" versions that are made using the same PCB and components but with a basic body and scalar ring; it is rated to provide a stability of 100 kHz or better compared to the 50 kHz of the regular model.

We decided to test the single cable version C1W-PLL LNBF since this is the most commonly used LNBF for the majority of those C-Band enthusiasts who have motorized dishes. Titanium Satellite has taken extra care and ships the C1W-PLL LNBF securely in a high quality package instead of the usual white box. Inside the package we found the LNBF surrounded by an extra layer of protective cardboard, the scalar ring designed for prime focus dishes and a set of screws to hold the scalar ring in place.

Because we were going to test the C1W-PLL on an offset dish, we were also supplied with the matching Titanium Satellite CS1 conical feedhorn scalar ring. This is sold separately and comes in a high quality package, as well. Actually, we were amazed at the sheer quality of this product considering its rather friendly price range.

The C1W-PLL looks similar to other economic LNBFs but it comes with an attached heat sink to help keep its internal electronics cool. What a clever idea!

In order to test how good the C1W-PLL really is we once again paid a visit to that well known satellite enthusiast 'Feedsat'. We had already tested the Titanium Satellite ASC1 positioner at his location in southern France (you can find out more about it in our test report: www.TELE-audiovision.com/eng/TELE-audiovision-1409/eng/titanium.pdf). This time we wanted to evaluate the LNBF on his 1.8-meter AS-1800 offset dish. This antenna was perfect for our test because it is a very popular C-Band dish with satellite enthusiasts throughout Europe. Also, the antenna was already equipped with a multi-feed rail. This allowed us to perform the test where the LNBF is not in the ideal central focus position, but at an angular offset of about 6 degrees.

■ Our test dish, an offset dish with 1.8m diameter. The center is occupied by a Ku band LNB with our reference LNBF on the right side and the new Titanium Satellite C1W-PLL LNBF on the left side.



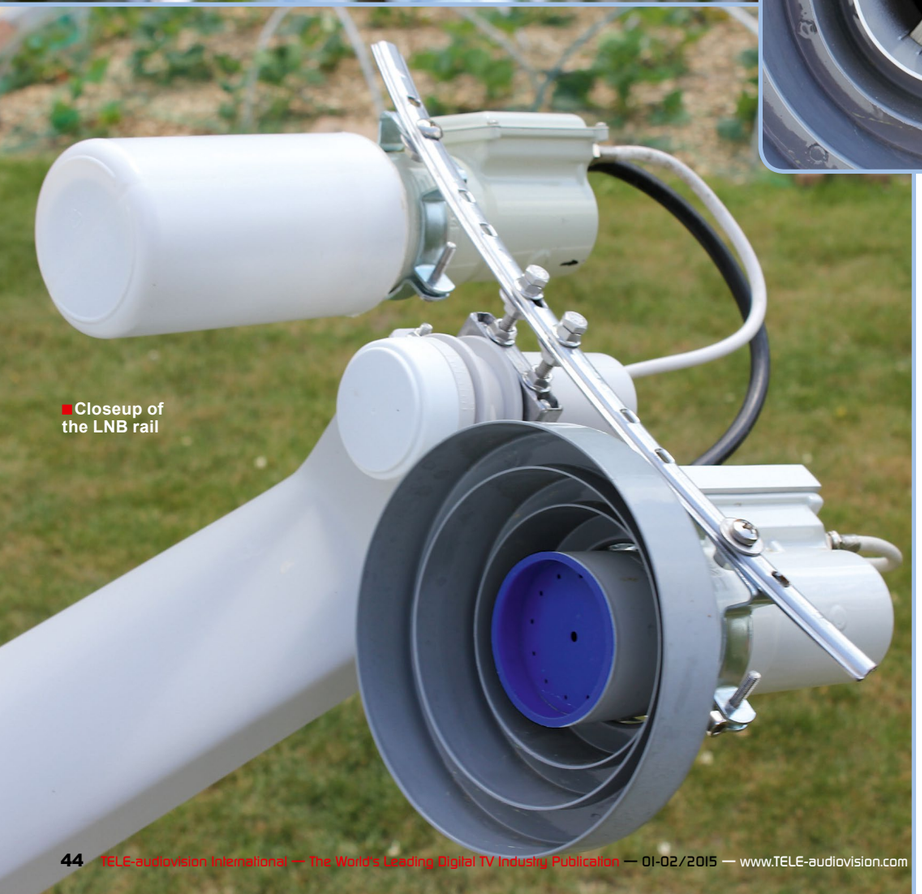
To get a better understanding of the C1W-PLL's performance, we pointed our satellite dish to SES-6 at 40.5W and programmed three C-band transponders in a new satellite channel list created for the Deviser S7000 signal analyzer. We selected three right circular transponders:

- 3803MHz, SR 26.680, FEC 7/8
- 3660MHz, SR 2.960, FEC 3/4


■The Titanium Satellite C1W-PLL LNBF in place



■A look inside the feed reveals the polarization probe



■Closeup of the LNB rail

• 4100 MHz, SR 6.111, FEC 3/4

Initially, as can be seen on the pictures, we attached the C1W-PLL on the opposite side of the multi feed rail, so that we had a Ku-band LNB in the center and both C-band LNBFs on each side. To use either one of the C-Band LNBFs, the antenna had to be rotated about 12 degrees relative to the center position. However, we then decided to swap the LNBFs for the comparison test, because we wanted to make absolutely sure that we were comparing the exact same signal, without the influence of any dish fine tuning.

We then performed the same measurements - picture analysis and spectrum

■Ready for testing: the Deviser S7000 signal analyzer is plugged in and ready to take measurements.

■A/B Test: Reference LNBF Titanium C1W-PLL

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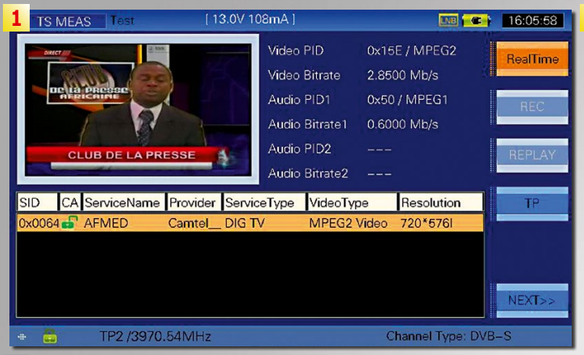
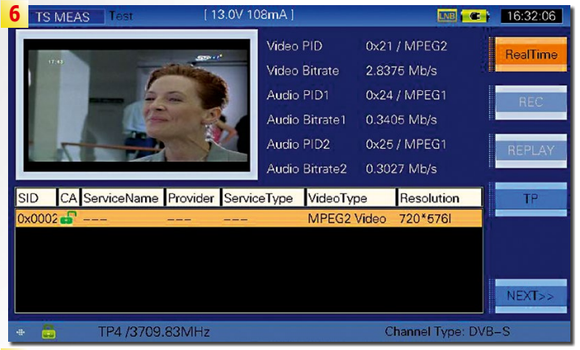
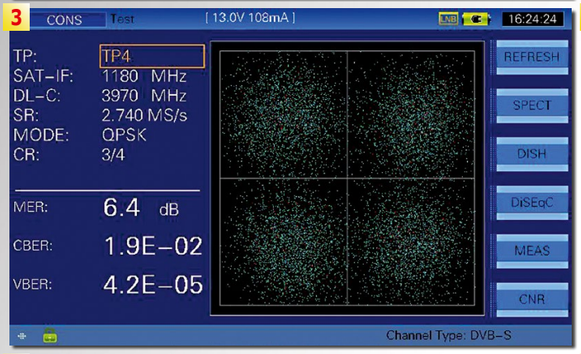
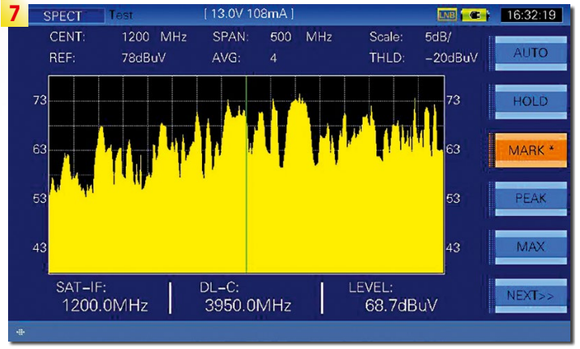






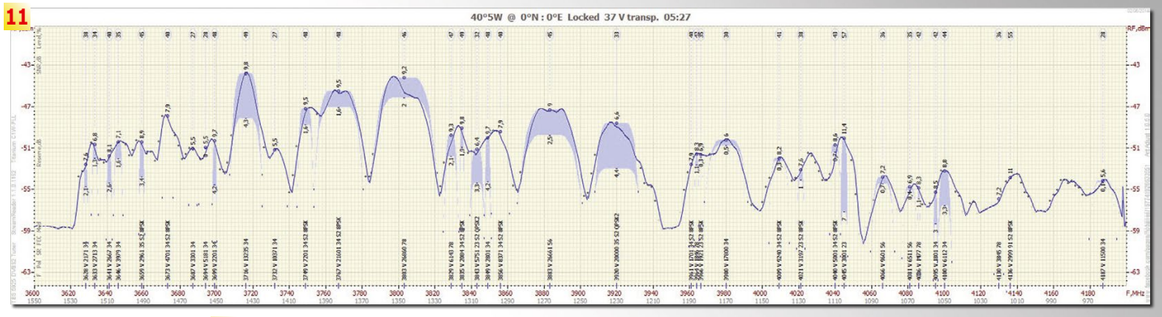

capture - twice, once for the reference LNBF and again for the C1W-PLL LNBF, both at the same position on the multi-feed rail and without any further movement of the dish.

The result was pretty amazing: we obtained a gain of up to 6.2 dBµV! We do have to point out, though, that our reference LNBF only had a noise figure of 17oK while the C1W-PLL has a lower noise figure of just 15oK. But of course, it is not easy to find a reference LNBF with a noise figure that low; this just highlights what

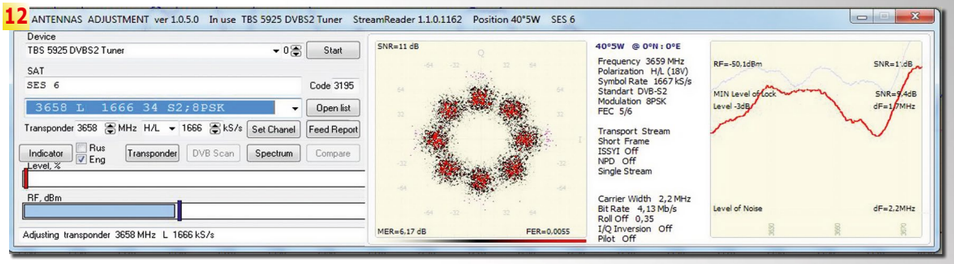
## A little bit of fun, testing the C1W-PLL LNBF in real life and receiving some rare channels in Europe

**1, 2, 3, 4. Rascom-QAF1R at 2.9E**
**5, 6, 7. Arabsat-5C at 20.0E with a very low symbol rate**
**8, 9, 10. Eutelsat 10A at 10.0E in the C-band**





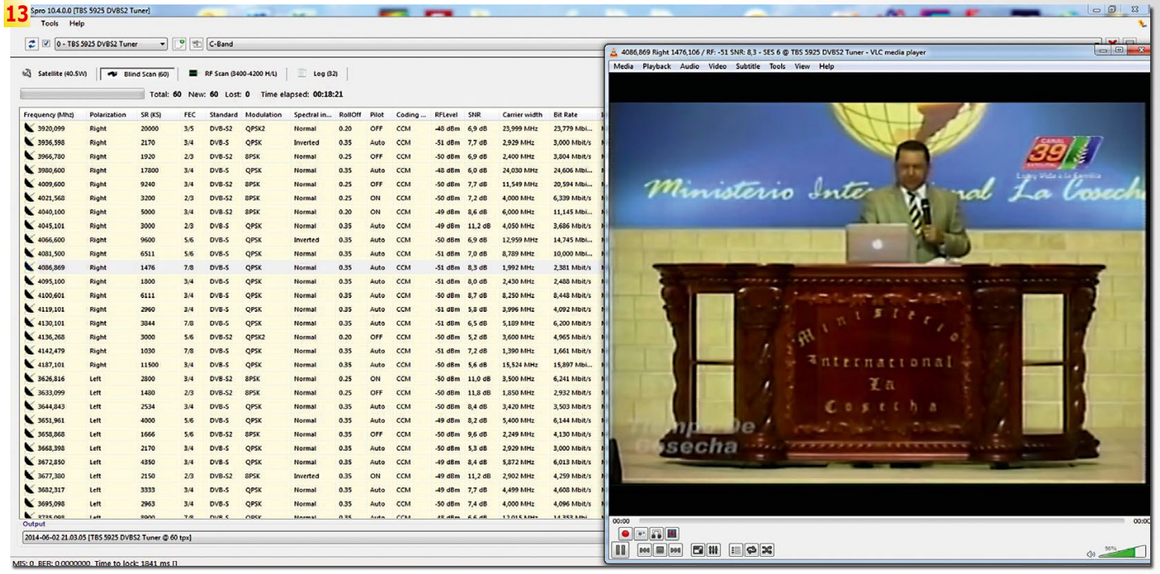

**A little more fun: feedhunting like a professional satellite enthusiast**




**11. Feedhunting on SES6 (40.5W). First we used the SatSpectr software to do a spectrum-based blind scan of all active transponders.**

**12. We used the SatSpectr in combination with a TBS 5925 tuner and could determine the reception parameters for an interesting transponder: 3658 L SR 1666 FEC 5/6. Notice the very low Symbol Rate. The C1W-PLL is performing great with this DVB-S2 modulated signal.**

**13. Further tests were performed, this time with the EBSpro software (which uses the Streamreader DLL, too). One particular transponder at 4086 MHz caught our attention: for a C-Band transponder it features an unusually high FEC of 7/8 in combination with a rather low symbol rate of 1476. The C1W-PLL had no problem locking onto this transponder as can be seen in the demodulated picture.**




a remarkable feature of the C1W-PLL this is.

Because the C1W-PLL LNBF was quickly able to demonstrate how good it is, we spent the rest of the afternoon entertaining ourselves hunting for exotic transponders. The pictures show a selection of three such transponders that were captured in Feedsat's garden in the French countryside. The brand new Titanium Satellite C1W-PLL wideband LNBF is hands down the best bargain any C-Band enthusiast can find for his money - and, of course, any professional as well. When it comes to the price/quality ratio, we were totally surprised by this unique PLL LNBF and its reception results. Granted, a hardcore enthusiast might still prefer to use a professional C-band LNB with skew control, but for most C-Band users, this LNBF will provide exceptional reception results at a fraction of the cost.

Add to this a relatively low power consumption of just 108 mA, a heat sink for enhanced stability and an unusually low noise figure.

For our test in Europe we used the wideband range model (3.4GHz to 4.2GHz). Titanium Satellite also offers a model for the US market with the regular band of 3.7GHz to 4.2GHz. So be sure you know which band you can receive at your location.

## EXPERT OPINION


**+**
- **Great gain**
- **Great Noise Figure**
- **PLL Technology**

**−**
- **None**

## What is PLL?

**PLL stands for Phase-Locked Loop and represents a method to generate an output signal that is in phase with the input signal.**

*When a digital satellite signal is received by the antenna, the LNB is used to convert the input signal, in the case of the wideband C-band from 3.4 GHz to 4.2 GHz, to the IF range of 950 MHz to 1750 MHz, which is what is needed by the satellite receiver's tuner.*

*Because the signal represents a continuous flow of binary data, it is crucial to keep the signal synchronized, so that no piece of information is lost due to fluctuations in the timing. If there is such a delay, bits of information may be missed or interpreted twice, producing errors. The higher the information density, the more critical it becomes to have a correct phase of the signal. This is especially true for DVB-S2 signals with high FEC rates. With an FEC of 7/8, seven out of every 8 bits represent data, while just one bit is used for error correction. In order to get good reception, it is crucial to have a very stable output signal from the LNB.*

*To maintain the output signal in phase with the input signal, most LNBs rely on an oscillator. For C-band LNBFs, the oscillator frequency would typically be 5.15 GHz. There is a small deviation of this theoretical frequency, due to imperfections in the crystal, temperature fluctuations, etc. This is why regular C-band LNBs struggle with signals that have low symbol rates or high FEC values.*

*To get greater stability, high-end LNBs for professional use often use an additional external 10 MHz reference signal, combined with a PLL oscillator.*

*The PLL oscillator basically uses the input phase to synchronize the internal oscillator, thus compensating for the oscillator's deviations. The result is a perfectly timed output signal, which is in phase with the input signal.*

*This requires a rather complex circuit and hence the usually higher cost of PLL LNBs; though not so with Titanium's PLL series of LNBFs.*