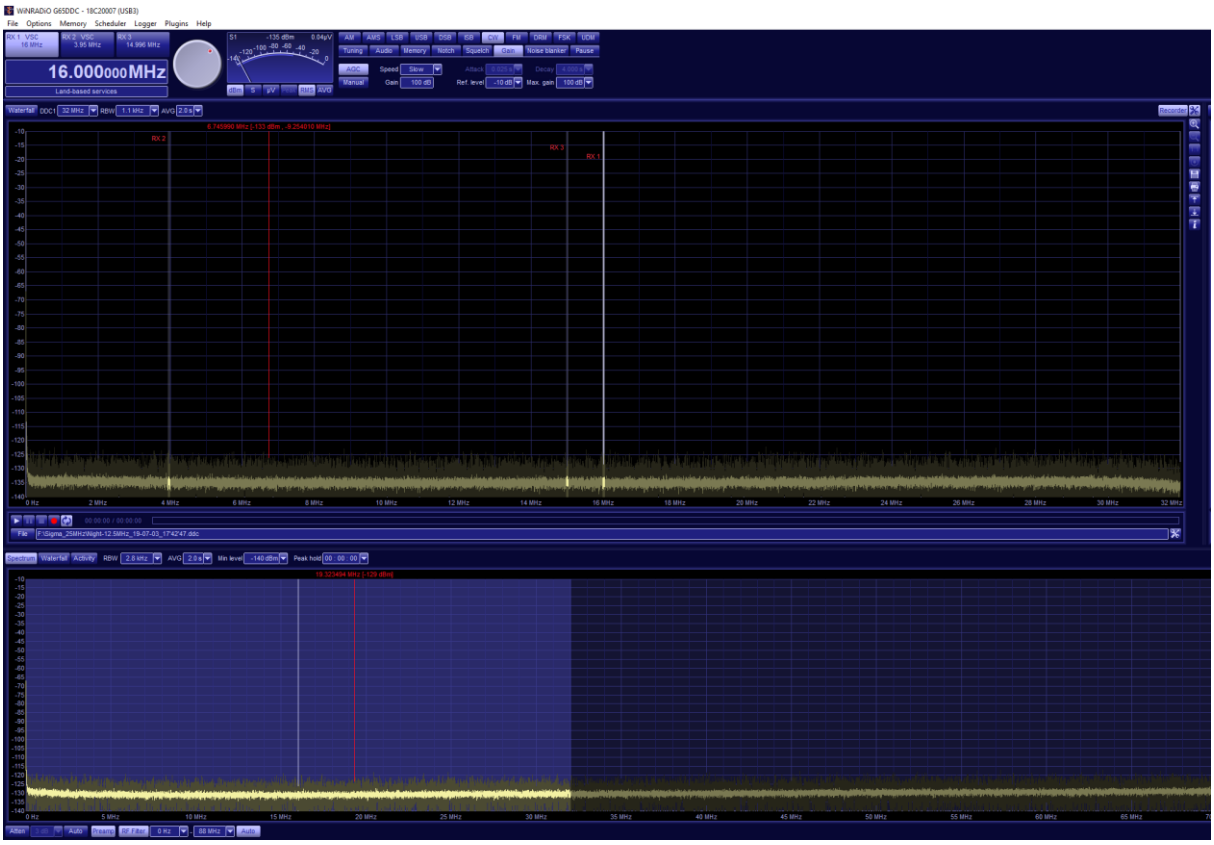
Airspy HF+ Discovery & Spurious Signals – Much Ado about Nothing

There has been a discussion about spurious radiations from the new Airspy HF+ Discovery. From a practitioner's view, the very few spurious signals of low level have no adverse effects. The discussion in the format of a Shakespearean drama is: *Much Ado about Nothing.*

Rumour has also some odd behaviour of *different* receiver of Airspys HF+. To visualize any spurious signals, I connected an

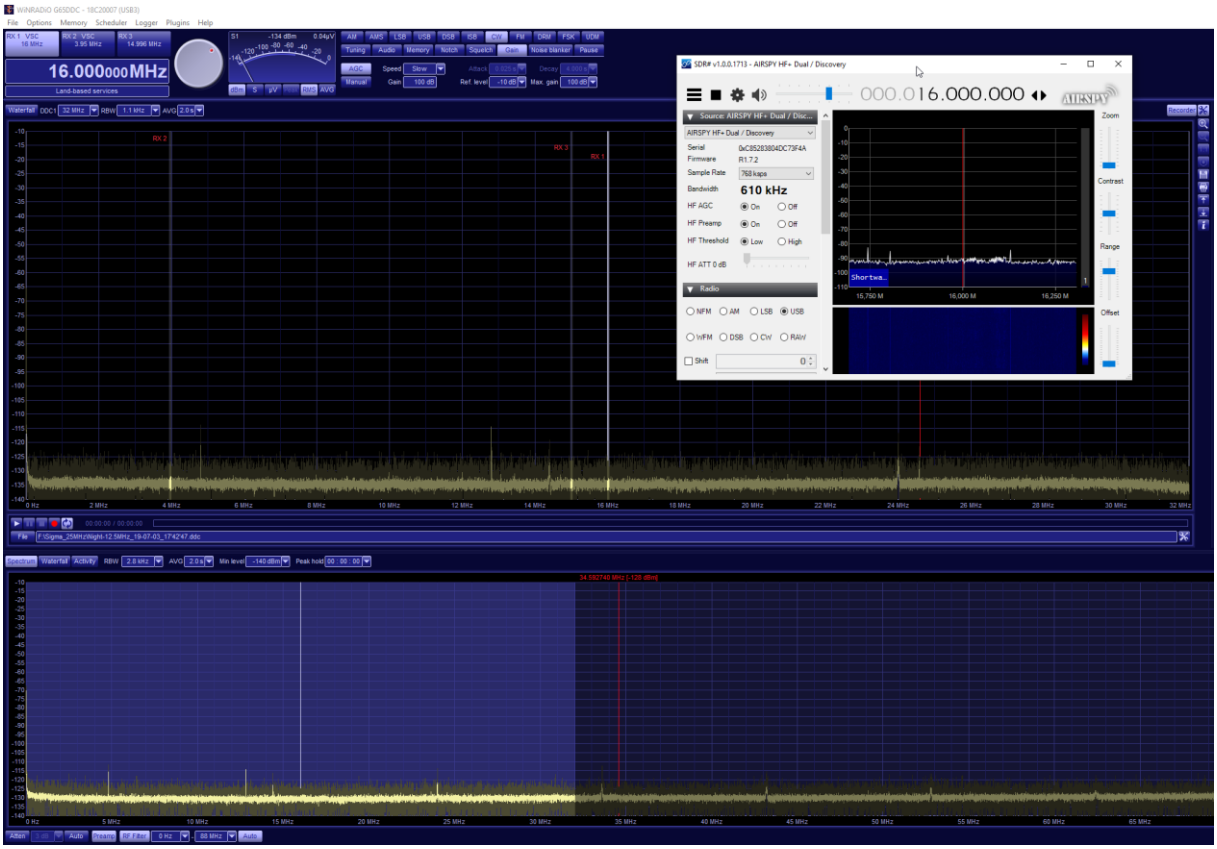
- Airspy HF+ [2017/18],
- Airspy HF+ Preselector [June 2018] and
- the Airspy HF+ Discovery [June 2019]

to a Winradio W65DDC receiver (yeah, this world-class professional SDR also makes an excellent spectrum analyser!) via a plug adapter. Then the Airspys were run with their SDR# software, whereas the Winradio Sigma was used with the Winradio software.
Here are the results, with some comments:

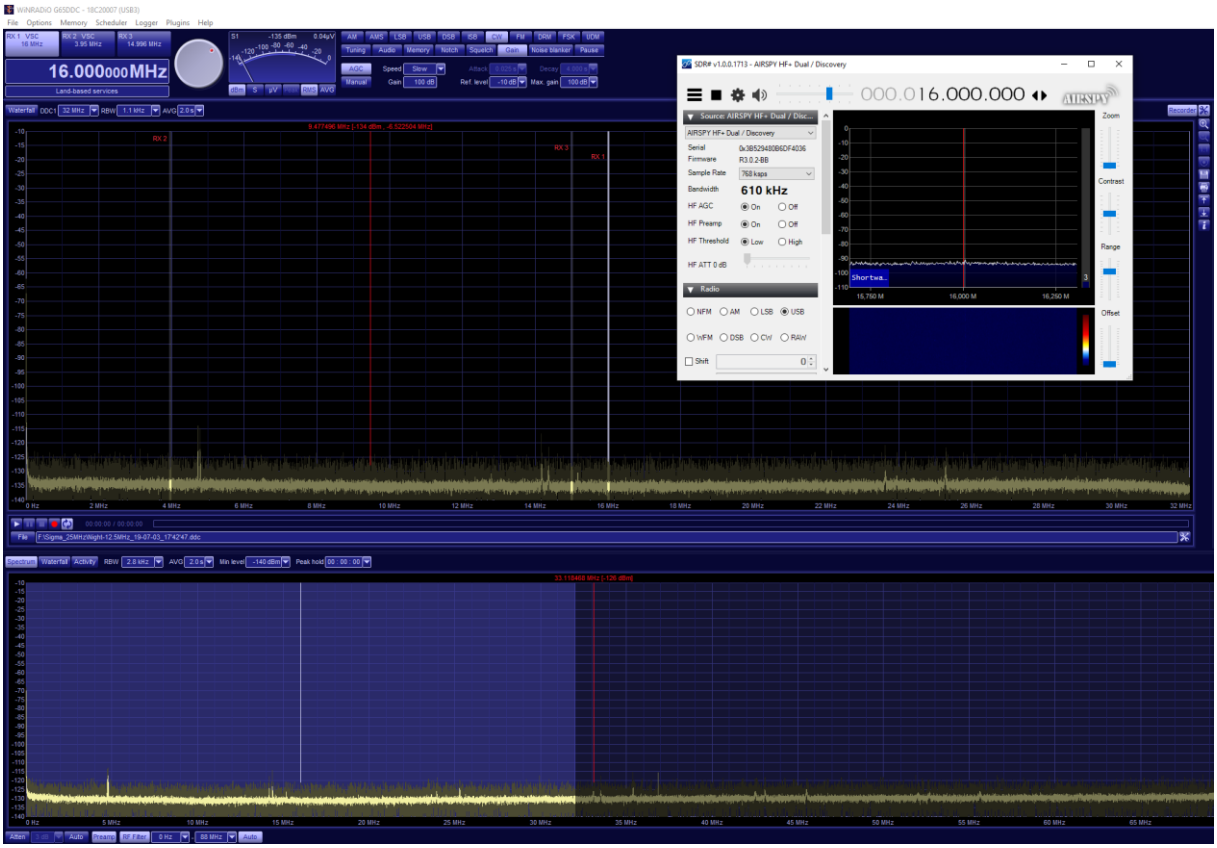


To lay some solid ground, this is the Sigma's view with just a **dummy load** connected to its antenna socket. Centre frequency 16 MHz, half of DDC1 bandwidth of 32 MHz – the big spectrum on top. Resolution 1.1 kHz, resulting in an averaged noise floor of about -165 dBm/Hz. Should be enough to dig quite deep. The spectrum at the bottom shows the range up to nearly 70 MHz at 2.8kHz resolution – so the noise floor rose by about 4 dB.

Here, I connected the **Airspy HF+** to the input of Winradio's Sigma. You indeed see a very few spurious signals, all well below -140 dBm/Hz.
[The pop-up "Stop" just means: "Click here to stop the software, as it is running now …"]



With the **Airspy HF+ Preselector** connected, the number of spurious signal is very much reduced, as is their maximum level.



This picture still further improves with the **Airspy HF+ Discovery** connected: all visible seven spurious signals are measured to well below -150 dBm/Hz.

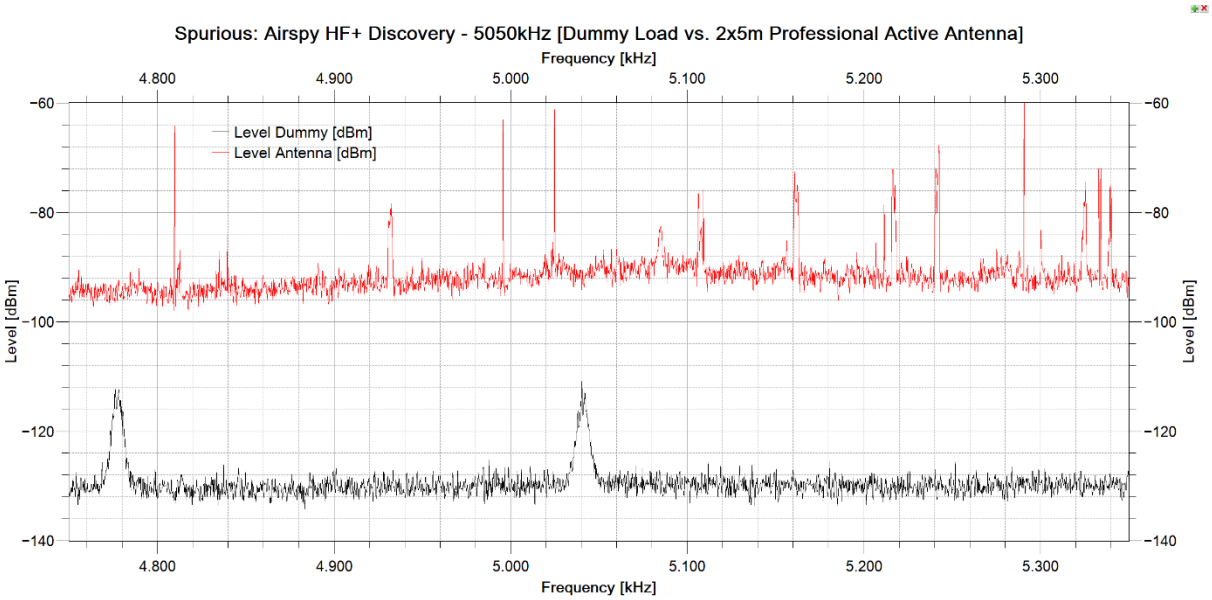
The first result is clear:

- Airspy has improved also the spurious signals from model to model, landing at a stunning reduction with their matchbox-like Discovery.
- The spurious signals were significantly reduced in both numbers and level.
- Together with sensitivity and dynamic range, the performance of these SDRs is exceptionally good. If you see their price tag, they are a real bargain.
- Overall: they deliver professional performance in every important aspect at an incredible low price.

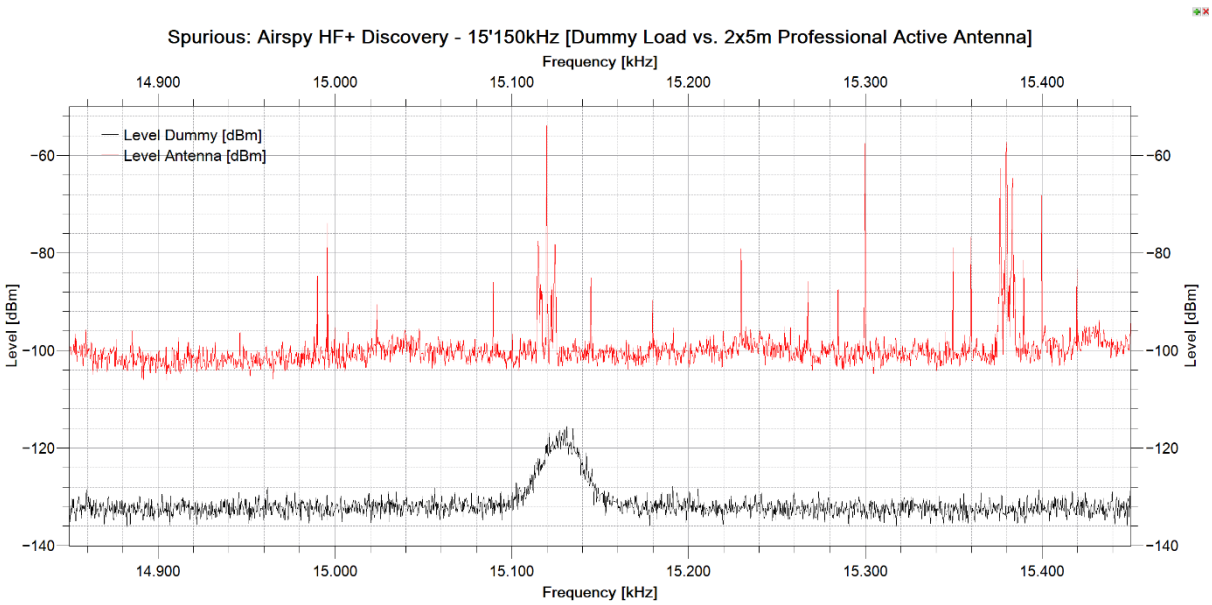
So far for measuring the spurious signals on the antenna socket of the Airspys. Now let's go on the road. How important are these seven low spurious signals in practice? Contrary to my experience, it was said that the spurious *wouldn't hide* in the noise.

To test this, I used Simon's SDRC V3 software with the Discovery, because it delivers the levels as numerical results to give an even better visualization. The Discovery was tuned to the centre of three spurious signals – first with dummy load connected, then with an antenna. The latter is a pre-production professional vertical dipole of 2 x 5m length of very low noise, an IP3 of >40 dBm, and delivering a gain of 9 dB.

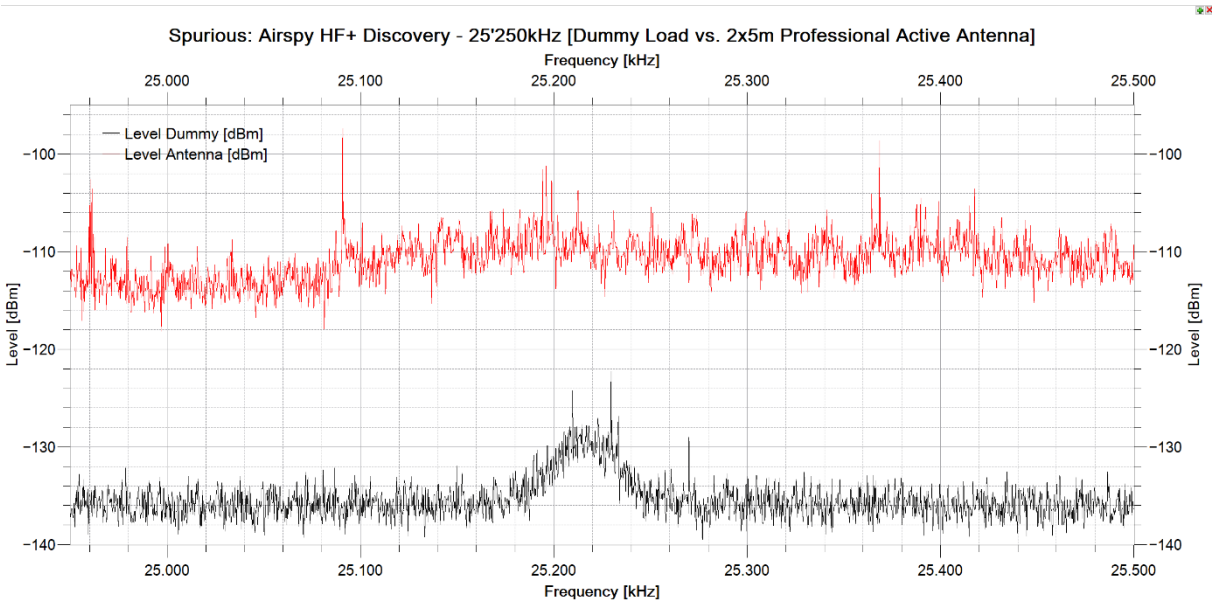
The results of these *carefully and unbiased chosen* ***worst-case examples*** are presented on the following pages.



With the spurious *peaks* at -128 dBm, they perfectly disappear in the atmospheric noise at -96 dBm, minimum. You see the signal of e.g. 4996kHz RWM and Radio Habana, 5025kHz, plus many utility stations, out in the clear. Date/Time: August 28, 2019, 06:05 UTC.



With the spurious *peak* at -116 dBm, it perfectly disappears in the atmospheric noise at -104 dBm, minimum. You see a couple of broadcasters, with Radio China International booming in on 15’120 kHz, all out in the clear. Date/Time: August 28, 2019, 06:07 UTC.

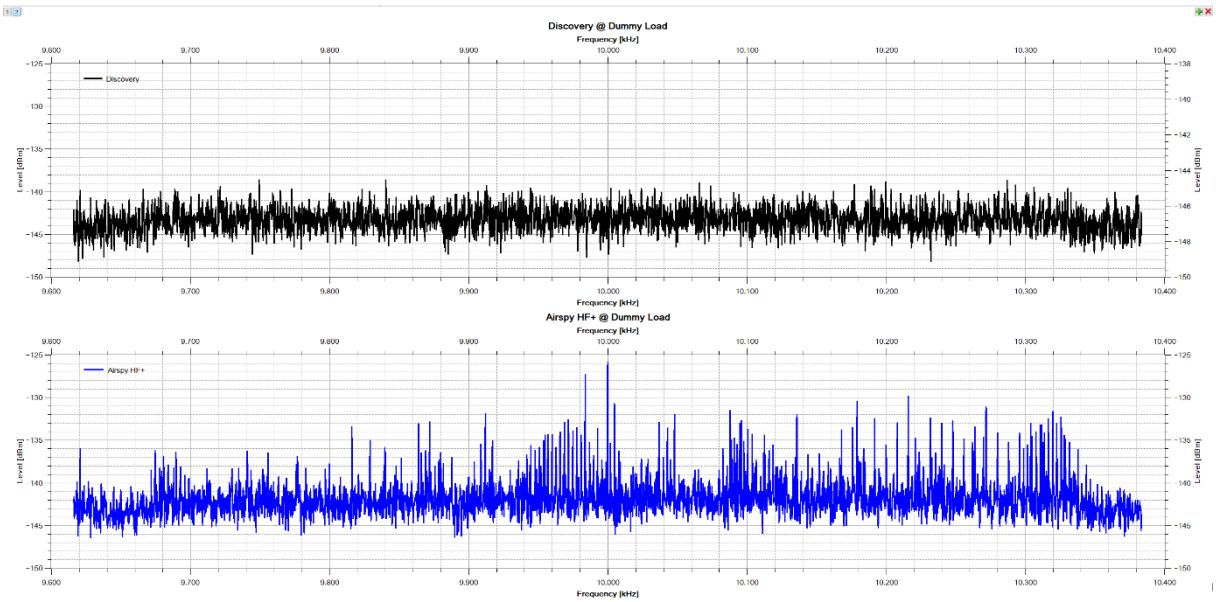


Here you see the usual spurious "hill" with a peak at -128dBm plus a very few distinctive peaks reaching up to -122dBm. With an antenna connected, the mean noise level rises from around -138dBm to -114dBm in the lower frequency part to -112dBm [due to some local PV noise] in the upper part. Date/Time: August 28, 2019, 06:09 UTC.
Even at this worst case there is much room for the faintest signal to produce a decent SNR.

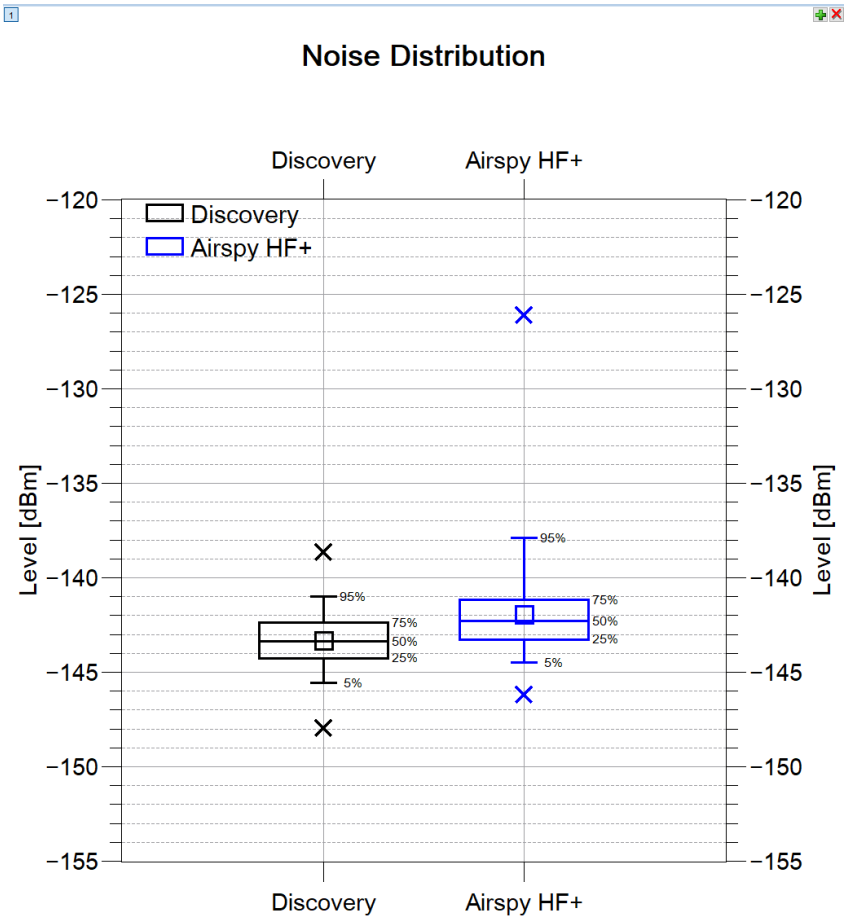
To wrap it up:

- Yes, there are a very few and low-level spurious signals at all Airspy's receivers – as they are found [much] worse at some competing SDRs.
- By development, even this has been significantly improved from model to model with the new Discovery leading the gang.
- All spurious signals disappear with an antenna connected.
- There has been found no case where, in practice, any spurious signal even remotely touched or even limited reception of the most miniscule signals.
  To complain about "spurious signals" simply is "Much Ado about Nothing" in an Ivory Tower, far away from any practical application.

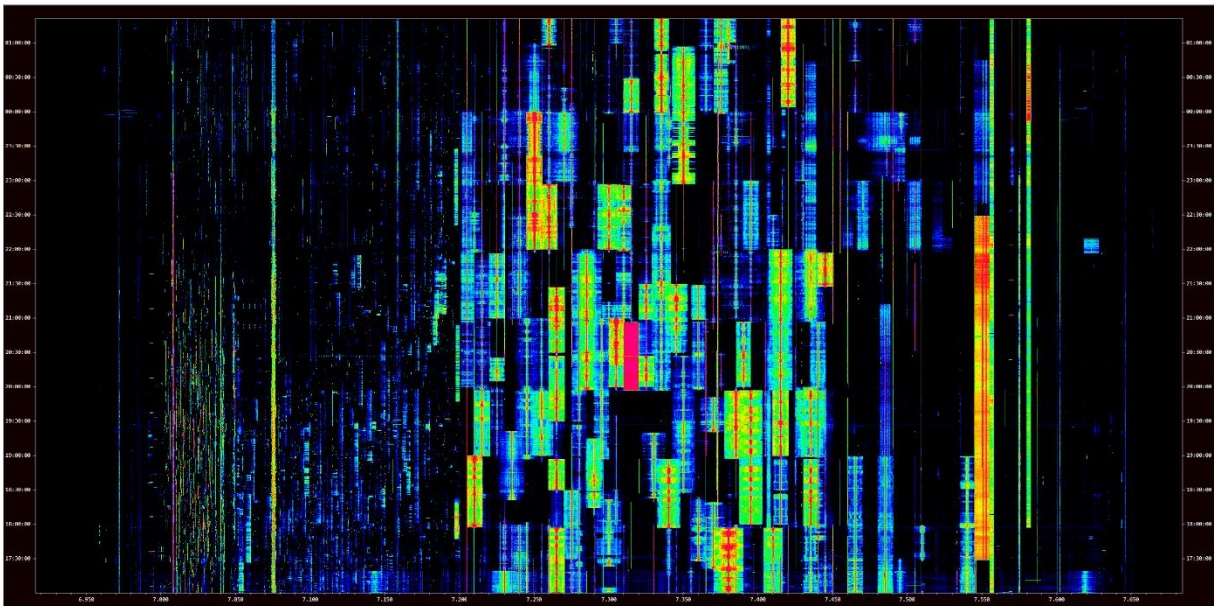
Because DXing is not only chasing spurious signals from one receiver with another, please also see the following two pages.



Here you see the Airspy HF+ [at bottom] compared to the new Discovery @10MHz, both at a dummy load. Please observes the dBm scale – we are fishing in the deepest sea!



The Noise Distribution of the above spectrum gives a more realistic picture of what one will hear when “tuning over the band”.



This spectrogram is centred around 7300kHz and runs from 17:30 UTC to 01:30 UTC in mid-August 2019. The Discovery was driven by the mentioned active dipole antenna.
It convincingly shows the perfect co-existence of weak amateur radio signals in their 40mb, left untouched by the massive broadcast activity in the 41mb.