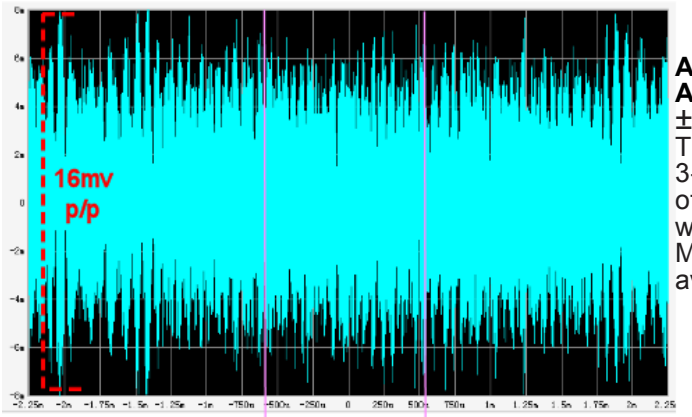
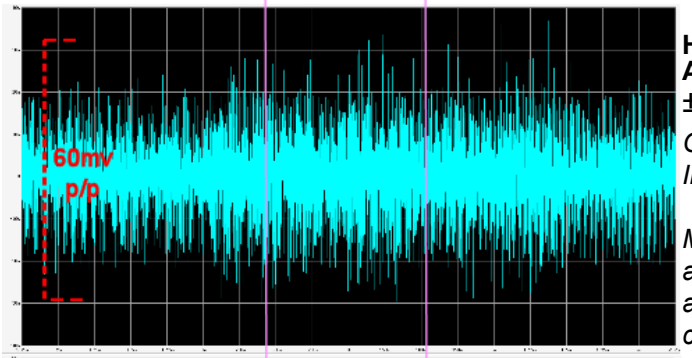
 excerpt from orig doc rev 09/14/2021

Example Operation: NO Sferics- Ambient "Grass"



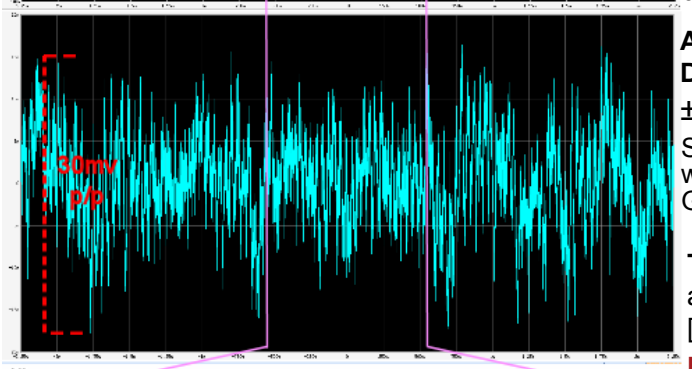
An xLoop Antenna Output ±12-16mV p/p ..yep! The 879K xLoop has 3-4x the avg grass of a 'thingy' ferrite with123K resonance. More energy events available with xLoop



H Preamp Output / Analog chain Input ± 60mV p/p

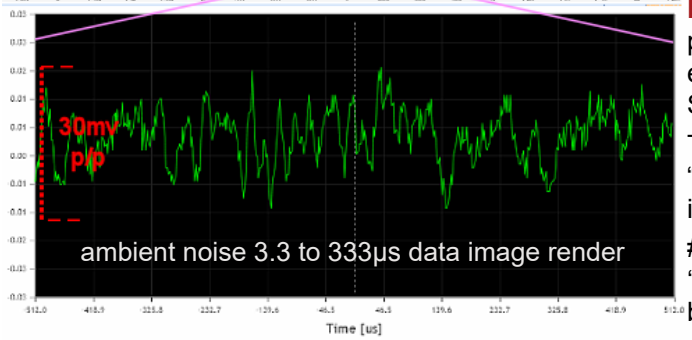
Gain 4X within Initial pre-filter

Many noise events are <3.3µs or >333µs and removed by filter configurations.↓



Analog Chain Out / Digital Proc Input ± 30mV p/p

Summed energy events with times 3.3-333µs ±. Gain is up to 56db



Lightning Energy is not AC. There is no 'repeating' structure that makes a lightning impulse an RF or AC wave-form. Sferic energy weakens rapidly with distance. Research implies 'E and I' components exist 'in-phase', rather than at 180°, and no 90° E & M field plane structures which are believed to invoke RF wave behavior and maintain the self-regeneration of an RF wave on toward infinity, with gradual power weakening.. No Specific points in the impulse energy structure repeat in amplitude, shape, or period to create a sustained pattern..

It isn't DC. A large number of variably charged 'points' decide to 'discharge' randomly, each with variable current, voltage, and discharge period. Variable Voltage and Current AIN'T DC.

In "Normal" air, once started, a current flows until potential between start and end point reaches 'normal air' "Cutoff Voltage" of about 1000V/meter. In an active storm cell environment, these 'end points' dramatically change shape, value and location.

Should effective charges across many group regions exceed the cumulative cut-offs, from initial 'start point' to group's 'terminal end', a 'discharge' cascade erupts. Each segment's unique time and energy variables, with other associated 'group' events will decribe the 'Energy Impulse' Signature.

The energy data moves to the digital realm. We can only look at the analog information 'periodically' in the ADCs. (***Sampling)***. [For BT it's a glimpse every 2µs. (500KHz/Sec sample rate]

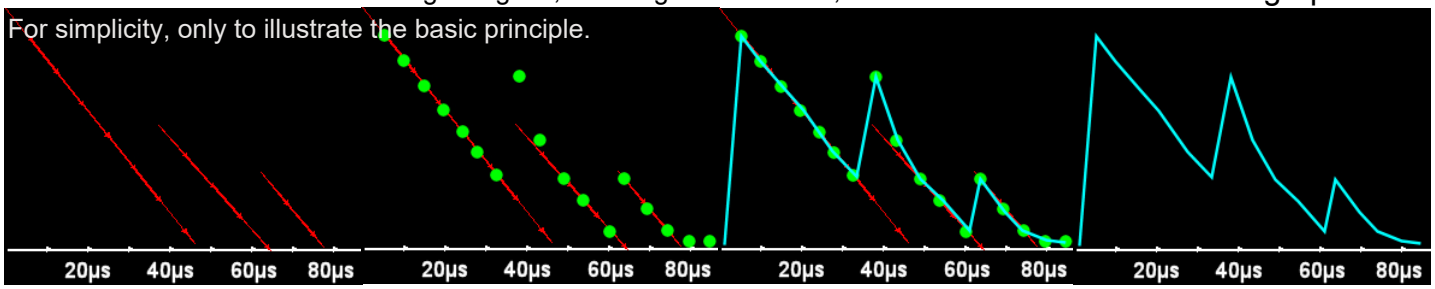
Example: Three quick energy events occur: let's say the end points don't move, voltage decreases linearly a thousand volts every µsec and a proportionate current flows with R dynamic. Scenario below is drastically under-explained and simplifed.

The First event takes 45 µsec. Therefore, it "*wants to be*" a "frequency" of 22KHz, ***if it can repeat every 45 µsec***. It can't... it's a one-time unique event.

#2 begins before the first completed, and ended in 27 µsec.- a 'time period' of 37KHz. Unique and doesn't repeat. This 27µsec burst overlaps and sums with the first's "same time point values".

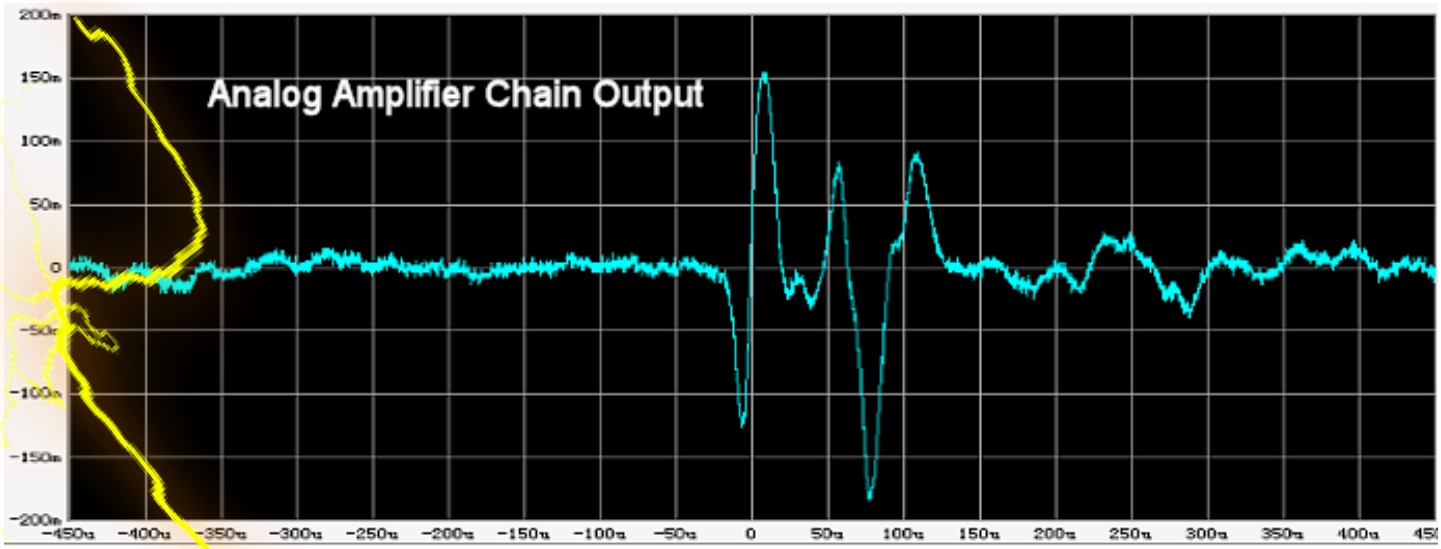
A **third unique burst** of 15 usec, suggests 67KHz.

Now we create a digital "Impulse Energy / Time" 'image' and a data-set from the three pulses above. *(For simplicity we pretend the end points don't change charge states or location, fluctuating charged zones don't affect the 1000V/m cutoff, an aircraft doesn't fly through...etc.)* On the server, **FFT will make algorithmic guesses from the data-set**, and create a mythical "Frequency spectrum". - **Here**, (for simplicity) we sample *(look at)* the 'energy' content (power) every 5 µsec, and "connect the dots". This is NOT a Lightning RF, or a 'signal' waveform, it is an IMPULSE ENERGY / TIME graph!



IMPULSE ENERGY / TIME

Lightning impulses don't Hertz.



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