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Aether Theory and Observations  
Involving Ultra Low Frequency Waves  
Experimental Apparatus Construction Notes:

Ultra Low Frequency Wave Monitor:

The detector circuit may be built on a prototyping board. Construction is not critical but keep leads short and use .1 microfarad caps across power at IC's.

You may want to build all three front end variations (Capacitor, E-Field and Aether-Magnetic), for one or both channels, in the same box and use a selector switch to switch from one front end variation to another.

The aether-magnetic detector's transformer was purchased from Radio Shack. PN# 273-1512B. Be sure to connect the transformer's electrostatic shield (shell) to circuit ground. Other large transformers or frame type inductors should work ok too.

The IC's are available from Digi-Key.

Most of the small parts (resistors, caps, etc.) can be found at Radio Shack, Jameco Electronics, Mouser, Digi-Key and many other places.

The Velleman VM-110 USB interface and dual channel A to D converter, is available from Appogee Kits and some other places. You can save a little money by building the kit version of the VM-110 which is called K8055. The aprox. 2 inch wire jumper that is on the parts side of the VM-110 which is located near the time base crystal, is the 5 volts positive power bus from the PC via the USB connection. This can be used to power the detector circuit.

Note: Be sure to set the VM-110 board to USB address 0. (see instructions that come with the VM-110 / K8055). To do this leave the two plastic jumpers (SK5 and SK6) on the VM-110 board both in place to set the USB board address to 0.

Remove the two plastic jumpers (SK2 and SK3) on the VM-110 board that are described in the Velleman instruction manual, which connect a 5 volt + line as a reference voltage. This is described on page 6 of the manual as items 3/4. Turn the two pots on the VM-110 board (RV1 and RV2) fully clockwise.

The 2N6725 NPN darlington, is not always easy to find, but another high gain NPN darlington with similar specs should work ok.

## The Ultra Low Frequency Wave Monitor Software:

The program "ULFINSTL.EXE" is a self-installer that when clicked on, will install the Ultra Low Frequency Wave Monitor program on your PC. It will run on Win 2000, Win XP, Win ME and Vista. It uses about 5 megs of hard disk space. After installation, it will be found in your startup menu programs as "ULF Wave Monitor". Channel one (blue trace) is connected to the VM-110 circuit board A2 / D2 inputs. Channel two (yellow trace) is connected to the VM-110 A1 / D1 inputs.

On all personal computer systems, be sure to connect the USB cable from the interface to the PC, before running the software or the program will not "see" the interface. On some personal computers, you will need to connect the USB cable from the interface to the PC, even before powering up the computer system or the system may not be aware of the interface.

On the program screen top-left, are the signal strength meter bars. These are roughly 0 to 500 microvolts average.

Each channel has its own gain control (0 to 30) and position control (vertical trace position). A gain of 6 for the E-Field detector and the Aether-Magnetic detector, and a gain of about 16 for the Capacitor detector, were the setting used in the author's experiments.

The recorder controls on the top-right are as follows:

The Normal / Continuous switch: In the Normal position, the recorder / display will run until it is manually stopped or until it has acquired 72,000 samples. (this is 2 hours at 100mS / sample). In the Continuous position, the recorder / display will run continuously and will automatically clear itself and start over, after the 72,000 sample have been reached.

The RUN button starts and stops the recorder/display.

The counter at the bottom of this section counts running time. The button to the right of the counter is the reset button for the counter.

Right-click on the chart screen to display an option menu. This menu will allow you to change settings, zoom, print, save recording to hard disk, or load a recording from hard disk. You may also left-click on the chart's right bottom corner-tip to toggle a control panel for these and other features.

You may change the recorder sample rate down to a slow 2 seconds per sample. This will give you at a somewhat low resolution, 40 hours of recording.

To uninstall the program, go to your Windows settings/ control panel and to "Add/Remove Programs" and select the program by name. This will remove the program from your computer. On some Windows systems, Win 2000 for example, After uninstalling with Windows, there will still remain a folder called "ULF614", with some files This folder may then be deleted manually.

### Basic Circuit Operation:

IC 1-4 is an inverting amplifier in the classic current to voltage configuration. Input from the chosen front end circuit is amplified by at least 1000. IC 1-3 is a simple non-inverting buffer. IC1-2 is a non-inverting amp with a fixed gain of 7. IC1-1 is a polarity sensing comparitor that sends a polarity signal out to the VM-110 interface digital input, via the transistor Q1. IC2-1 is a diode drop compensator which compensates for the voltage drop through D1 and D2. IC2-2 is an inverting amplifier that inverts the wave negative half-cycles into positive. The reason that this inversion of negative voltages and polarity signal, are needed, is that the VM-110 is a unipolar A to D converter and can only accept 0 to +5 volts, so the negative levels are inverted into positive, the positive and negative levels are added together, this varying 0 to 4 or 5 volts positive level signal is fed to the A to D converter's analog input and the polarity signal line is fed to the converter's digital input. The software then decodes the signals from these two lines back into fullwave signal information.

IC3 is a switched capacitor DC to DC converter which takes a 5 volt positive input from the PC power bus and produces 5 volts negative, to provide the negative power rail for the op amps.

Interpreting levels on the chart: The chart recorder was given an arbitrary 0 to 10 scale both plus and minus. Actual values being read depend on gain settings and the sensor and value being detected. This instrument was designed more for research into the ULF wave structure and commonalities of the three types of waves detected, than a precision level measurement device.

The ULF-E field level is roughly:

Chart Scale / (Gain Setting X 7) = Millivolts at the point of detection.

The Magnetic level is roughly:

Chart Scale / (Gain Setting X 2) = Milligauss at point of detection.

The Scalar level can only be measured as the voltage within the detection capacitor =  
Chart Scale / (Gain Setting X 7) = Millivolts.

The values above are for the extracted or demodulated ULF wave levels.

The small "signal level" bars on the top left of the screen are the pre-extraction levels

and are roughly 0 to 500 microvolts.

### Aether-Magnetic Detector Apparatus and Software:

The detector circuit may be built on a prototyping board. Construction is not critical but keep leads short and use .1 microfarad caps across power at IC's.

A simple selector switch may be used to select a gain of 7 or 70 by switching the gain determining resistor

The aether-magnetic detector's transformer was purchased from Radio Shack. PN# 273-1512B. Be sure to connect the transformer's electrostatic shield (shell) to circuit ground. Other large transformers or frame type inductors should work ok too.

The IC's are available from Digi-Key.

Most of the small parts (resistors, caps, etc.) can be found at Radio Shack, Jameco Electronics, Mouser, Digi-Key and many other places.

The Velleman VM-110 USB interface and dual channel A to D converter, is available from Appogee Kits and some other places. You can save a little money by building the kit version of the VM-110 which is called K8055. The aprox. 2 inch wire jumper that is on the parts side of the VM-110 which is located near the time base crystal, is the 5 volts positive power bus from the PC via the USB connection. This can be used to power the detector circuit.

Remove the two plastic jumpers (SK2 and SK3) on the VM-110 board that are described in the Velleman instruction manual, that connect a 5 volt + line as a reference voltage. This is described on page 6 of the manual as items 3/4. Turn the two pots on the VM-110 board (RV1 and RV2) fully clockwise.

Be sure to set the VM-110 board to USB address 0. (see instructions that come with the VM-110 / K8055). To do this leave the two plastic jumpers (SK5 and SK6) on the VM-110 board both in place to set the USB board address to 0.

Use the analog input A2 on the VM-110 board as that is the one that the Aether-Magnetic Detector software accesses.

### The Aether-Magnetic Detector Software:

The program "AMDINSTL.EXE" is a self-installer that when clicked on, will install the Aether-Magnetic Detector program on your PC. It will run on Win 2000, Win XP, Win

ME and Vista. It uses about 5 megs of hard disk space. After installation, it will be found in your startup menu programs as "Aether Magnetic Detector".

On all personal computer systems, be sure to connect the USB cable from the interface to the PC, before running the software or the program will not "see" the interface. On some personal computers, you will need to connect the USB cable from the interface to the PC, even before powering up the computer system or the system may not be aware of the interface.

The program screen is very simple. It features a virtual analog meter and a virtual oscilloscope display.

On the bottom-right of the scope is a button switch which will change the meter scale from 0.1 mG full scale to 1.0 mG full scale, to accommodate the manual gain setting on the detector. This virtual switch does not change gain within the program, but only makes the meter scale correctly marked for the actual gain that is used.

The virtual oscope has a small control panel that may be opened by clicking on the top-right of the scope at the arrow. This software-modular virtual scope is actually a dual trace scope, but both inputs are tied together internal to this program. The time bases may be changed but best results are usually to leave the settings as is. The scope sensitivity is set to 200mV /Div. Experiment with this if you like but return to the original settings before exiting the program, so it will open with the correct settings next time it is run.

Under the meter is the Zero Adjust slider. In the full-right position the meter will read the absolute average ultra low frequency milligauss. Sliding the slider to the left will allow you to set a baseline by zeroing out some or all of the ambient detected activity. The Zero slider does the same thing for the oscilloscope too.

To uninstall the program, go to your Windows settings/ control panel and to "Add/Remove Programs" and select the program by name. This will remove the program from your computer. On some Windows systems, Win 2000 for example, after uninstalling with Windows, there will still remain a folder called "AMD619", with some files This folder may then be deleted manually.

#### Basic Circuit Operation:

IC 1-4 is an inverting amplifier in the classic current to voltage configuration. Input from the Aether-Magnetic detector circuit is amplified by at least 1000. IC 1-3 is a simple non-inverting buffer. IC1-2 is a non-inverting amp with a gain of either 7 or 70, depending on the value chosen for R5. The output of IC1-2 is rectified through D1 and integrated by the network of R14 and C7. This output is then fed to the VM-110 A to D converter's analog input A2.

IC3 is a switched capacitor DC to DC converter which takes a 5 volt positive input from the PC power bus and produces 5 volts negative, to provide the negative power rail for the op amps.

