TECHNICAL BULLETIN # 111

Speech Detector and Energy Detector

PIKA TECHNOLOGIES INC.

PIKA Technologies Inc., 20 Cope Drive, Kanata, Ontario, Canada, K2M 2V8 Ph: +1 (613) 591-1555 Fax: +1 (613) 591-9295

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Software Version: **MonteCarlo 5.5 or greater**

Product(s): **All Pika cards that have DSP processors**

Purpose: **How to use the speech detector and energy detector**

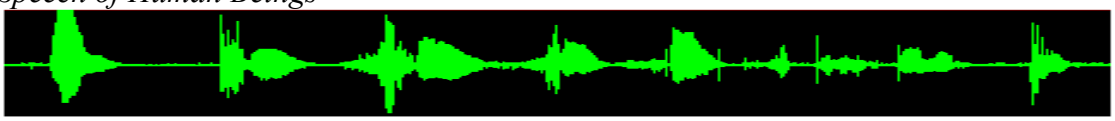
What is a Speech Detector and what is an Energy Detector?

The Speech Detector is a DSP function that is used to detect if there is speech on the line. The Energy Detector is a DSP function that is used to detect if there is any voice (including speech, tone, etc.) on the line.

How can we differentiate between the types of tones on the line?

There are many types of voice tones on the line. Let's just take three characteristic types as examples to see how to differentiate them in the voice application.

Speech of Human Beings



Music

Tone

From the images above, we can clearly see the difference between these three types of sounds. Sometimes music has similar characteristics to tones, while sometimes it is quite similar to speech.

What do the Speech Detector and Energy Detector do?

The speech detector only reports the SPEECH ON/OFF events when there is speech on the line. It looks for a 200 ms **varying** signal to report a SPEECH ON event. When one is detected, PIKA MonteCarlo generates the PK_EVENT_SPEECH_ON event. When the signal stops, the PK_EVENT_SPEECH_OFF event is generated. This is why MonteCarlo doesn't report any SPEECH events for tones.

When the speech detector detects a continuous **non-varying** signal over 200ms, if there was a previously generated PK_EVENT_SPEECH_ON event, it reports a PK_EVENT_SPEECH_OFF event. This explains why when there is music present, the application will occasionally receive the PK_EVENT_SPEECH_OFF event.

The energy detector reports a PK_EVENT_ATD_ENERGY_ON event when the maximum energy threshold is crossed and a PK_EVENT_ATD_ENERGY_OFF event when the minimum energy threshold is crossed.

So, if the application only needs to get the trigger event when there is speech, you would only enable the speech detector in the application. If the application needs to get the trigger event whenever there is any voice on the line (including tones), then you would enable the energy detector in the application. The energy detector and the speech detector can be enabled simultaneously for the same DSP channel.

How can the Speech Detector and Energy Detector be used in an application?

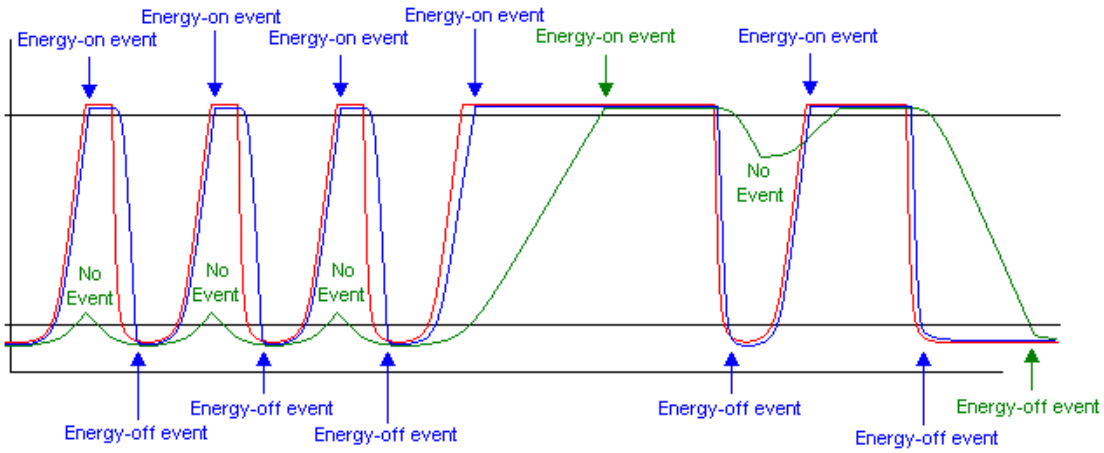
To use the Speech Detector:

- In MCSetup, make sure that speech detection is enabled for the DSP ports.
- In the application, create a DSP port resource by passing the DSP device handle and DSP port resource mask to the ***PK_DSP_SeizePort*** function. Set the ***PK_SPEECH_DETECTION*** bit of the DSP port resource mask.
- Call ***PK_VP_EnableSpeechDetection*** to enable the Speech detector. Change the default value of the speech detection threshold by calling ***PK_VP_SetSpeechDetectionThreshold***.

To use the Energy Detector:

- In MCSetup, make sure that tone detection is enabled for the DSP ports.
- In the application, create a DSP port resource by passing the DSP device handle and DSP port resource mask to the ***PK_DSP_SeizePort*** function. Set the ***PK_TONE_DETECTION*** bit of the DSP port resource mask.
- Call ***PK_VP_SetMaxEnergyThreshold*** and ***PK_VP_SetMinEnergyThreshold*** to set the maximum energy threshold and the minimum energy threshold (*Note: there are no default values set for the energy meter, so these two functions must be called prior to enabling the energy meter.*)
- Call ***PK_VP_EnableToneDetection*** to enable tone detection. This function must be called, otherwise the energy detector will not work.
- Call ***PK_VP_EnableEnergyMeter*** to enable the energy detector.

- Call ***PK_VP_SetEnergyRates*** to change the values of the attack and decay rates for *Moving Average Energy* calculations. Note that it is not necessary to change the default values set by the driver.
- The following diagram shows how the attack and decay rates affect the generation of PK_EVENT_ATD_ENERGY_ON and PK_EVENT_ATD_ENERGY_OFF events.



- **Signal**
- **Energy meter - slow attack rate, slow decay rate**
- **Energy meter - fast attack rate, fast decay rate**

