Model 7029A
Differential Constant Fraction Discriminator

//// FAST

FEATURES

- **Simultaneously usable as normal Constant Fraction Discriminator and as Differential Constant Fraction Discriminator (two in one)**

- **Dynamic range 700:1 for the BLD part and 300:1 for the SCA part**

- **Walk less than 60ps for 100:1 dynamic range (typ. < 40ps)**

- **DC coupling for high count rate capability**

- **ULD can be disabled - use as integral discriminator**

- **Rate indication by color of LED**

- **Dead time normal or truly updating mode**

- **Easy to setup and use**

DESCRIPTION

The model 7029A is a fully dc coupled discriminator which can be simultaneously used as a normal Constant Fraction Discriminator (BLD part) and as a Differential Constant Fraction Discriminator (SCA part) with upper and lower level settings that allow precise selection of energy ranges from which the timing signal is to be derived.

The unit provides optimum time resolution for many detector types and applications either using the *slow risetime reject mode* (SR) or the *constant fraction mode* of operation. The constant fraction composite signal is formed by the algebraic sum of a direct, attenuated (by a fraction f) signal path and a delayed, unattenuated signal path. The delay time is selectable according to the propagation delay of 50 Ohm BNC cable. Careful selection of fraction and delay provides full compensation of timing distortions due to both amplitude and risetime variations in the input signal.

The front panel walk adjust control and the inspect output permit the user to trim the time walk characteristic of the experimental setup for optimum timing resolution. A front

panel LED indicates count rates by color change.

Several additional options are available on customer request.

SPECIFICATIONS

Inputs
Input: -5mV to about -3.5V linear pulses in the BLD part (ref. common mode range of ultra fast comparators) and -10mV to -2.5V linear pulses in the SCA part, risetime $\geq$ 700ps typ., R_{in} = 50 Ohm, dc coupled, front panel BNC connector, minimum input pulse width $\geq$ 1ns (BLD part)

Delay: 2 BNC connectors for an external delay cable to form the internal constant fraction signal (for specific length see section *Performance*).

Outputs
Inspect: Displays output signal of zero crossing discriminator for use in adjusting the time walk.

BDL neg.: negative current output, providing -32mA into 50 Ohm, risetime approx. 2ns, pulse width $\geq$ 5ns nominal, dc coupled

BLD pos.: positive voltage output providing 1.5V (min.) into 50 Ohm, risetime approx. 4ns, width (in normal deadtime mode) adjustable by front panel trimming potentiometer, the width then determines the internal deadtime

SCA neg.: negative current output, providing -32mA into 50 Ohm, risetime approx. 2ns , pulse width $\geq$ 5ns nominal, dc coupled

SCA pos.: positive voltage output, providing 2V (min.) into 50 Ohm, risetime approx. 4ns, width as BLD pos.

ULD: positive voltage output, providing 1.5V (min.) into 50 Ohm, risetime approx. 4ns, width as BLD pos.

Controls
Threshold: front panel 10 turn locking dial potentiometer to set acceptance level for input pulses (range approx. -5mV to -1.2 V)

LLD: front panel 10 turn locking dial potentiometer to set lower discriminator threshold for input pulses in the SCA part (range approx. -10mV to -2.5V)

ULD: front panel 10 turn locking dial potentiometer to set upper discriminator threshold for input pulses in the SCA part (mode ULD *on*, range approx. -10mV to -2.5 V)

Z/C adjust: (walk adjust) front panel trimming (screwdriver) potentiometer to compensate walk of the internal zero crossing discriminator

CF-SR: front panel two position switch to select the modes of timing

ULD on/off: selects *window* or *integral mode* of operation in the SCA part

DT n/up: selects mode of deadtime operations: in *n* (=

normal) position the deadtime is given by the width of the positive output signals (BLD, SCA or ULD). Width is adjustable from 10 ns to 100 ns by a front panel (screwdriver) potentiometer (*up* = updating)

Indicators
Rate: LED indicates activity of the discriminator. Color of the LED changes by count rate of the BLD part: *green* up to approx. 5kHz, *orange* from approx. 5kHz to approx. 10kHz, *red* above (for statistical input pulses)

PERFORMANCE

Dynamic range: 700:1 for the BLD part (regarding the linearity of the input signals) and 300:1 for the SCA part as specified above

Walk: in CF mode for a 1ns risetime pulse over a 100:1 range (reference -2.5V) approx. $\pm$60ps, typical $\pm$40ps

Count rate: up to approx. 100 MHz, limited by deadtime setting, 50 MHz in SCA-mode

Pulse pair resolution: less than 10ns, or as limited by deadtime

Threshold stability: better than $\pm$0.02%/^{o}C ($\pm$200ppm/^{o}C)

Linearity: $\pm$0.25% integral

Temperature range: 0°C to +50°C

Delay cable typ. lengths: for fast pulses approc. 0.5m to 1m, for pulses from slow detectors (e.g. germanium) 1.5m to 4m (for better determination of the cable length ref. instruction manual). For very fast risetimes the internal cable lengths have to be taken into account (see instructions)

Power Requirements
+ 6V, 150 mA, -6V, 450 mA (standard version)

+ 12V, 150 mA, - 12V, 450 mA[1] (optional)

[1] this power exceeds the normal BIN power allowment of 167mA for a single width NIM module, version for $\pm$12V power supplies available

Physical
Size: single width NIM module (1.35 x 871 inches; 3.43 x 22.13 cm) as per TID - 20893 (rev.)

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