A1426 CARDARELLI
Matched Charge Preamplifier
Data Sheet

A1426 CARDARELLI[1] is a fast and low noise charge preamplifier with AC coupled input. It is composed by two amplification stages implementing BJT NPN silicon technology. The amplifier **A1426** has been designed to be used with fast detectors as e.g. diamond detectors, thin silicon detectors with 100 ps time resolution and high counting rate RPC.

The main feature of the A 1426 amplifier is that the **input impedance can be matched to a 50 Ω transmission line, thus allowing to put the preamplifier far from the detector at a distance up to 100 m, without deteriorating its response in terms of equivalent noise**. In particular, A1426 has an input impedance very close to 50 Ω in the in the frequency range of interest. It shows a discrete matching in the range 6 MHz - 600 MHz, and a RL > 13 dB in the range 6 MHz - 320 MHz.

Another important feature of A 1426 is the **fast shaping of the signal, down to 12 ns**, that allows working at a rate of **few MHz** without incurring in signal pile-up.

A1426 is suited for detectors installed in hostile environments with high radiation flux and high temperature, when is not possible to connect the front-end electronics in proximity of the sensor (e.g. nuclear reactors or high intensity, high ionizing particle beams). The amplifier, in fact, **can be connected to the detector by means of a long cable without a significant degradation of its performance**. Dedicated 50 Ω triaxial cables of different lengths (up to 30 meters) are available on request.

A1426 embeds an high voltage input and decoupling stage for detector bias rated up to 1 kV.

[1] *Based on the fast preamplifier developed by R. Cardarelli, INFN Roma2*

- **Fast, non-inverting preamplifier, positive output**
- **Up to 5 mV/fC sensitivity**
- **ENC of 0.3 fC (2000 e)**
- **Input impedance can be matched to a 50 Ω transmission line**
- **Amplifier can be very far from the detector (up to 100 m)**
- **Output range 0 to 1 V**
- **Output impedance of 50 Ω**
- **Up to 1 kV (positive or negative) detector bias voltage**

Specification

Polarity
Input pulse polarity: positive only
*Optional **A1430** wide band pulse polarity inverter*
Output polarity: positive

Sensitivity
Up to 5 mV/fC according to the input charge

Output voltage range
0 ÷ 1 V (open circuit)
0 ÷ 500 mV (50 Ω termination)

Input pulse width
100 ps to 8 ns

Noise
ENC of 0.3 fC (2000 e)
measured with no input signal

Packaging
Shielded Box
Dimensions (WxHxD):
69 x 24 x 104 mm^3 (without connectors)
69 x 24 x 134 mm^3 (including connectors)
Weight: 220 g

Inputs

IN(*)
Detector input (AC coupled)
Input impedance: 50 Ω (100 kHz to 1GHz),
SMA 142-0711-811 Johnson connector

HV
HV BIAS input / Detector bias voltage
Range: 0 ÷ 1 kV
SMA 142-0711-811 Johnson connector

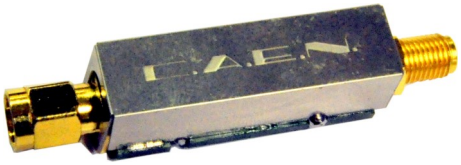
12 V
Power supply input connector
Power supply voltage: + 12 V DC
2.0 mm Center Pin Diameter
DC Power Jack Locking Type
KLDX-0202-A-LT KYCON connector

(*)Safety and Operation requirements
Care must be taken in the use of A1426 with high voltage detectors. Please remember to:
- *Turn down gradually bias voltage prior to connect or disconnect preamp input*
- *Avoid fast changes in bias voltage*
- *Avoid Detector breakdown or discharge*

Outputs

OUT
Amplifier Out
Dynamics: 0 ÷ 1 V (open circuit)
Output impedance: 50 Ω
SMA 142-0711-811 Johnson connector

Power Requirements
+12 V 30 mA (typical)
The module is powered by an external AC-DC stabilized power supply provided with the amplifier and included in the delivered kit.
Note:
The power jack is a 2mm type, Recommended to be used with KYCON locking plug: KLDX-PA-0202-A-LT
A suitable cable is the RS 656-3816 type (or similar).



A1430 - wide band pulse polarity inverter

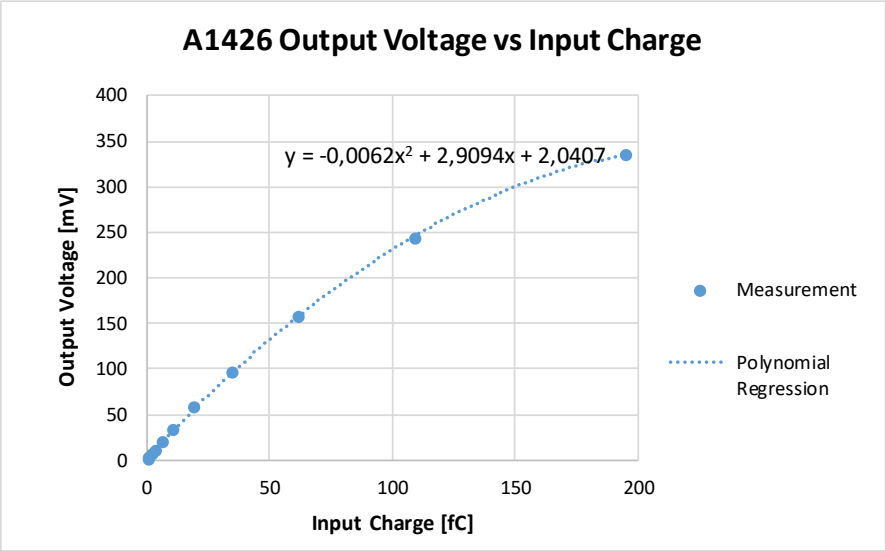


Fig. 2 A1426 Output Voltage (50 Ω termination)

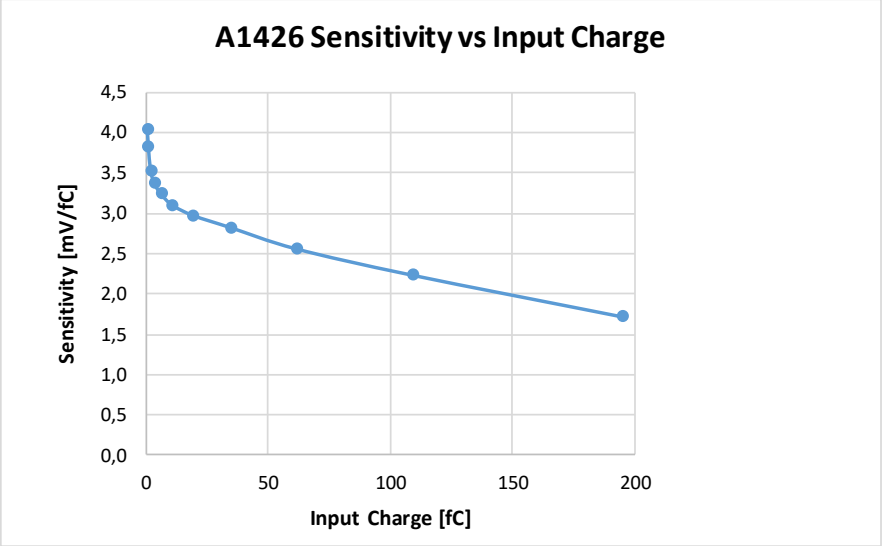


Fig. 1 A1426 Sensitivity (50 Ω termination)

A1426 is non-linear amplifier, **Fig.1 and Fig. 2** shows the quadratic polynomial operating region.

Measurements have been made by using an Agilent 81110A pulse generator, HP high bandwidth attenuators and a charge injector with 1 pF capacitor.

Ordering Option

Ordering code	Description
WA1426XAAAAA	A1426 CARDARELLI - Matched Preamplifier
WA1430XAAAAA	A1430 Wide Band Pulse polarity Inverter for A1426
WA1431XAAAAA	A1431 3 meters 50 Ohm triaxial cable with SMA straight plugs for A1426
WA1432XAAAAA	A1432 10 meters 50 Ohm triaxial cable with SMA straight plugs for A1426
WA1433XAAAAA	A1433 30 meters 50 Ohm triaxial cable with SMA straight plugs for A1426

Reference Documents

- ***Neutron Spectroscopy by Means of Artificial Diamond Detectors Using a Remote Read Out Scheme***
  Article in IEEE Transactions on Nuclear Science 57(6): 3655 - 3660 · January 2010
- ***Thermal and fast neutron dosimetry using artificial single crystal diamond detectors***
  Angeline, M., Pillon, M., Prestopino, G., Marinelli, M., Milani, E., Verona, C., Verona-Rinati, G., Aielli, G., Cardarelli, R., Santonico, R., Bedogni, R., Esposito, A. (2011) Radiation Measurements, 46, pp. 1686-1689
- ***UFSD for CT-PPS Timing Status and Development***
  R. Arcidiacono, R. Bellan, A. Bellora, S. Durando, N. Cartiglia, F. Cenna, M. Ferrero, V. Monaco,R. Mulargia, M.M. Obertino,R. Sacchi, VS, A. Staiano INFN and Università di Torino,Università del Piemonte Orientale 3RD ELBA WORKSHOP ON FORWARD PHYSICS @ LHC ENERGY
- ***Response of diamond detector sandwich to 14 MeV neutrons***
  M. Osipenko, M. Ripani, G. Ricco, B. Caiffi, F. Pompili, M. Pillon, G. Verona-Rinati, R. Cardarelli Oct 20 2015 physics.ins-det nucl-ex arXiv:1510.05415v3
- ***R. Cardarelli, RPC performance vs. front-end electronics***
  Nuclear Instruments and Methods in in Physics Research A, doi: 10.1016/j.nima.2010.09.136

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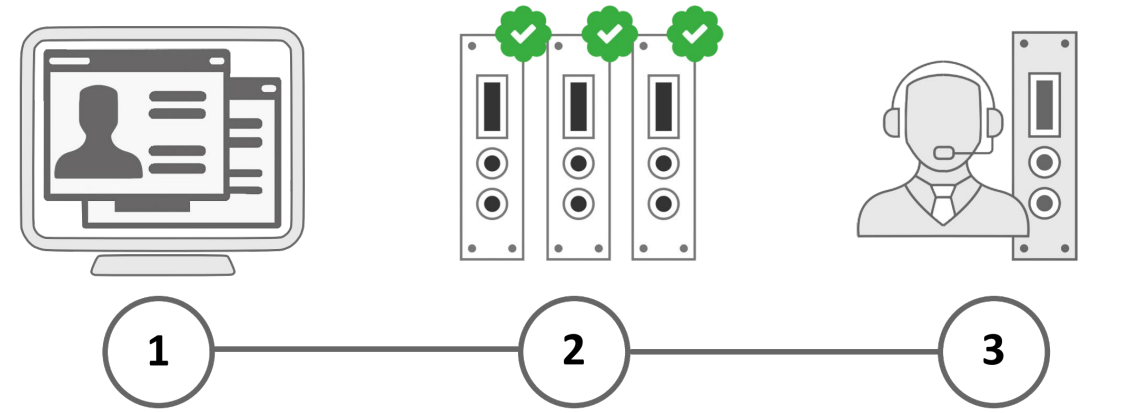

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