

# Radiation Monitoring

**\* Sensors Make the Invisible  
Visible \***

Joe Jesson

[jjesson@xacttechnology.com](mailto:jjesson@xacttechnology.com)

M: +12036133344

**J. Jesson**

**March 10,2012**

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# Radiation Monitoring

## Why Monitor Radiation?

### **\*\* Fukushima Nuclear Disaster \*\***

“By socializing radiation data via Pachube, users are also gaining the ability to answer questions like:

- *Is my data consistent with others close by?*
- *How has my particular region been affected in relation to other parts of the country?*
- *How are radiation levels changing with the weather?*
- *Is my data consistent with official reports at home and abroad?”*

<http://blog.pachube.com/search/label/radiation>

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# No More Secrets

## Open Data Pioneer Unlocks Radiation Datasets:

**“Pachube Pioneer: Marian Steinbach**

**Resides: Cologne, Germany**

**Occupation: User Experience Designer**

**Web: <http://www.sendung.de/>**

**Pachube Feeds: <http://pachube.com/users/marian>**

**Data: Gamma radiation**

The death knell has rung for the Dark Ages of Data where we all had to beg to get a glimpse into BigGov's secret vaults of knowledge. [People have the right to access data gathered from public space](#), and they are now exercising that right.

In the aftermath of the Fukushima nuclear disaster, people from all over the world came together to aid support efforts in the form of a [crowdsourcing movement around real-time radiation data](#). While citizens in Japan continue even now to contribute public data streams to Pachube to fill in significant gaps in the official reports, others, like Marian Steinbach, have worked hard to put pressure on governments to make available the data they do have. “

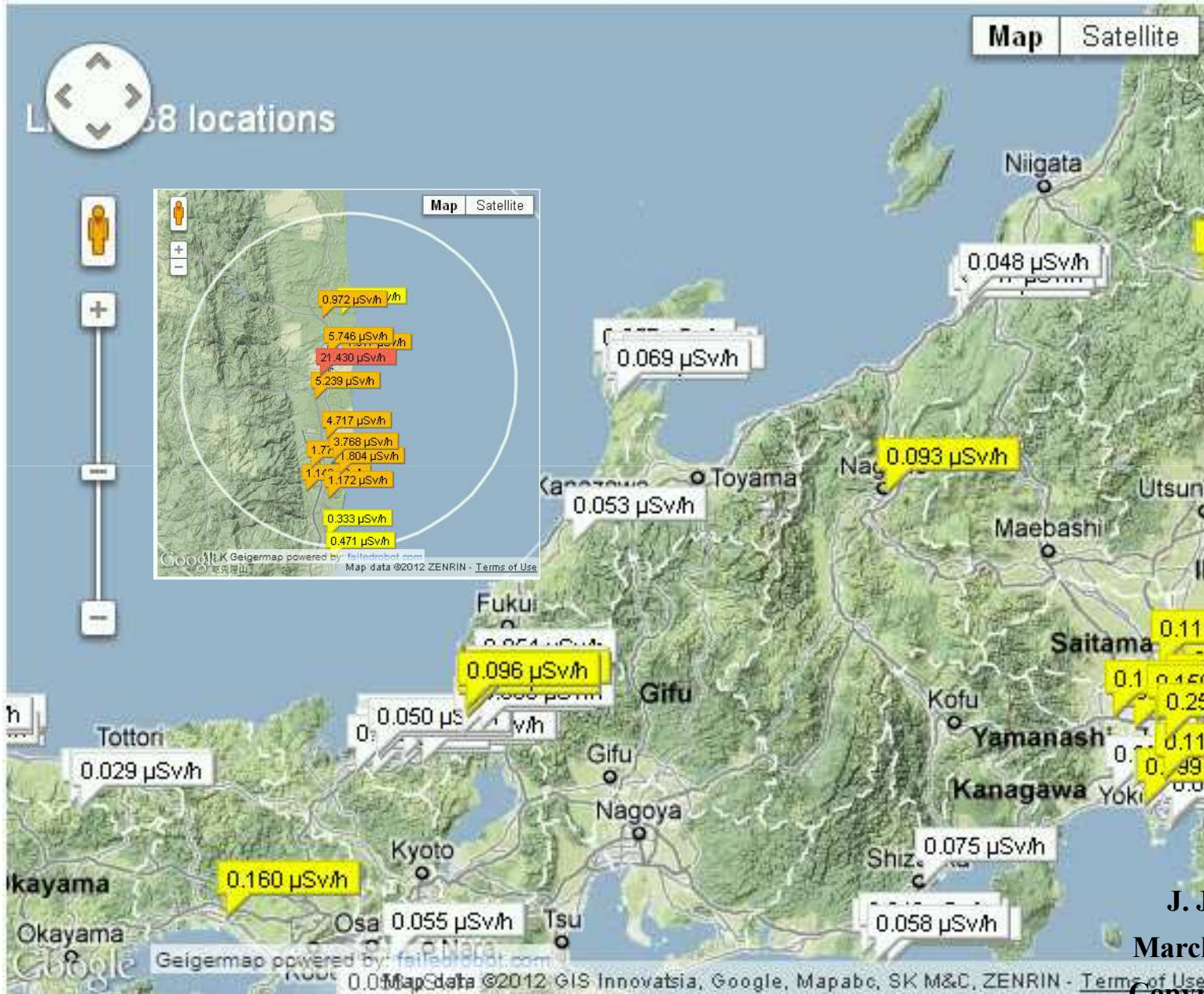
<http://blog.pachube.com/search/label/radiation>

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# Japan's Radiation Levels via Pachube



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# Pachube Radiation Feeds

## Immediate & Open Ports

- CSV output
- JSON
- EEMML



**input - register a feed**

In order to connect a device, building, environment or sensor (either physical or virtual) as an INPUT feed, it must be able to serve for "automatic" feeds or post/out for "manual" feeds) data in **EEMML** or **CSV** format. For more info, see the [quickstart](#), the [tutorial video](#) and the [API documentation](#).

Note: all information is optional except where marked \*.

**Feed type \***  automatic  manual

**Feed title \***

**Description**

**Website**

**Contact email**   
Optional - this email address will be publicly available on the site, so that non-members can contact you. Please don't use any email address you wish to keep private.

**Location name**

**Elevation (m)**

**Exposure**  indoor  outdoor

**Disposition**  fixed  mobile

**Domain**  physical  virtual

**Datastreams**

ID (required)	Tags	Units	Symbol	Type	
1	temperature sensor			--	<input type="button" value="add"/> <input type="button" value="remove"/>
0	light sensor			--	<input type="button" value="add"/> <input type="button" value="remove"/>

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# Radiation Monitoring

- **What is the personal threat due to Radiation?**

ALL radioactive emissions are dangerous to living things because they knock electrons out of Atoms, or IONIZE living Tissue. Damage or Mutate Tissue.

- **Depending upon the Type of Radiation and Dose:**

Three types of Radiation – Alpha, Beta, Gamma – and dangerous if ingested or inhaled. Alpha travels short distances and many geiger-muller sensors only sense Beta and Gamma since a Mica window drives up cost.

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*No-Wa-Ta-Ra-Di-Um-Wa-Ta*

**NOWATA RADIUM  
SANITARIUM COMPANY**

FROM NATURE'S OWN LABORATORY  
1500 FT. IN THE EARTH

PREPARED BY NATURE FROM  
THE ELEMENTS OF  
PURE WATER, THE ESSENCE AND THE EXERCISE OF ALL THINGS  
THE CAUSE AS WELL AS THE CURE OF ALL DISEASES  
THE WATER IS THE BEST DRUG AND HER PRODUCT THE  
BEST MEDICINE.

**NOWATA RADIUM SPLITZ**

MADE FROM  
NOWATA  
RADIUM THERMAL  
WATER  
U.S.A.

*We  
Enrich the  
World with  
- Radium Water*

**Radium Cures.     Nature's Remedy.**  
**Baths are Good Medicine.**  
**Baths Bring Beauty.**  
**Visit the Well that makes you Well.**  
**Health is here for You.**

Whatever your Ill., write us.  
 Testimonials of Cases cured will be sent you.

**Try a gal. 50c, by express**  
**f. o. b., Howaia, H. T.**

**Ask for "Radium Splitz" at all**  
**Fountains.**

It relieves the over indulgence in drink; purities the stomach,  
 gives appetite, assists nature.

**Sanitarium at Howata, H. T.**

## Radium Water

Advertising Brochure, c. 1905

**The Good News** – Less than 5% of all advertised Radium “Remedies” had Radium in it!

Since Radium is invisible, unscrupulous companies did not feel compelled to add expensive Radium to their remedy . Only in the later 1920s did they correlate the health horrors – bone cancer and cell destruction from within – with ingesting radium.

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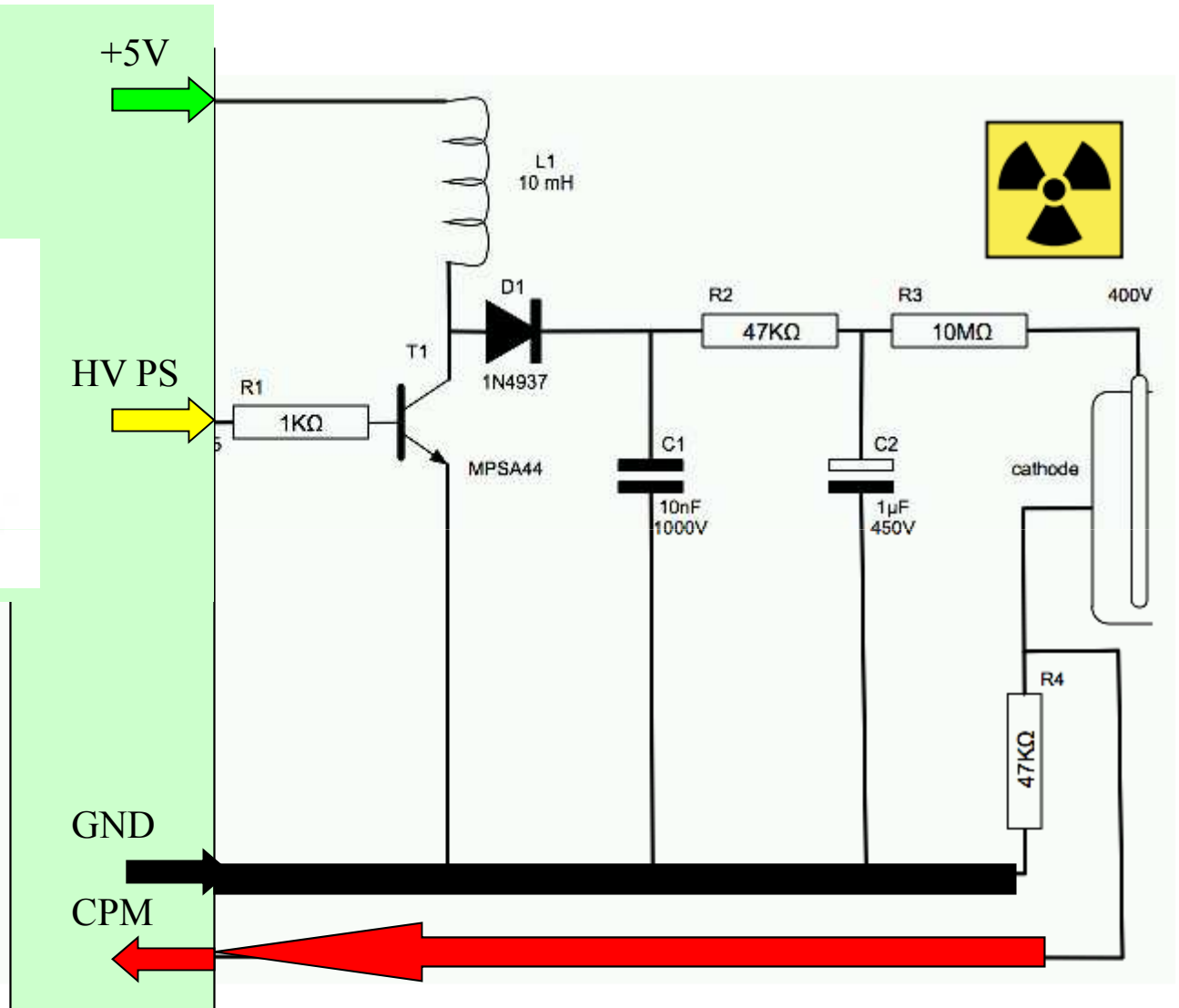
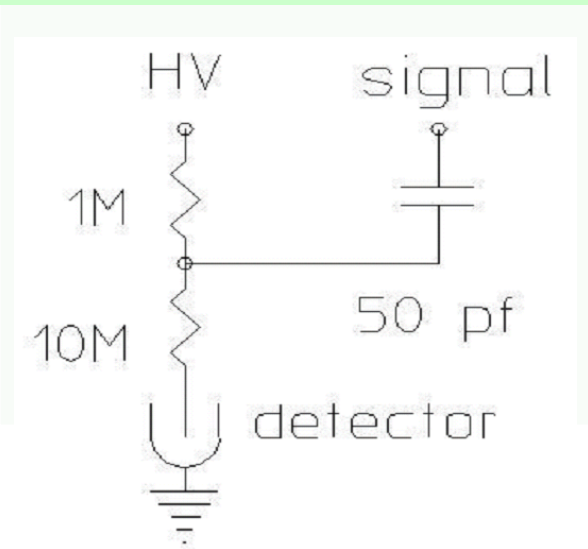
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# Typical Geiger-Muller (GM) Tube Interface

## Arduino

- + Ethernet Shield
- + USB Shield



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# Alpha, Beta, & Gamma GM Sensors

Alpha Particle Detecting Geiger Counter Kit



[http://www.makershed.com/category\\_s/211.htm](http://www.makershed.com/category_s/211.htm)



<http://www.sparkfun.com/products/9848>

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# GM Tube Interface

## 712 End Window-Alpha-Beta-Gamma Detector

### GENERAL SPECIFICATIONS

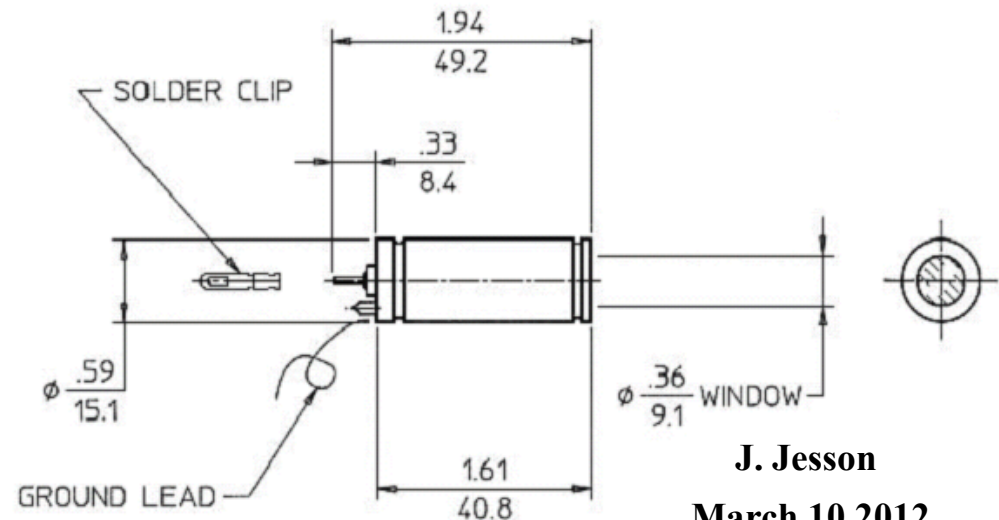
Gas filling	Ne +Halogen
Cathode material	446 Stainless Steel
Maximum length (inch/mm)	1.94/49.2
Effective length (inch/mm)	1.5/38.1
Maximum diameter (inch/mm)	0.59/15.1
Effective diameter (inch/mm)	0.36/9.1
Connector	Pin
Operating temperature range °C	-40 to +75

### WINDOW SPECIFICATIONS

Areal density (mg/cm <sup>2</sup> )	1.5 - 2.0
Effective diameter (inch/mm)	0.36/9.1
Material	Mica

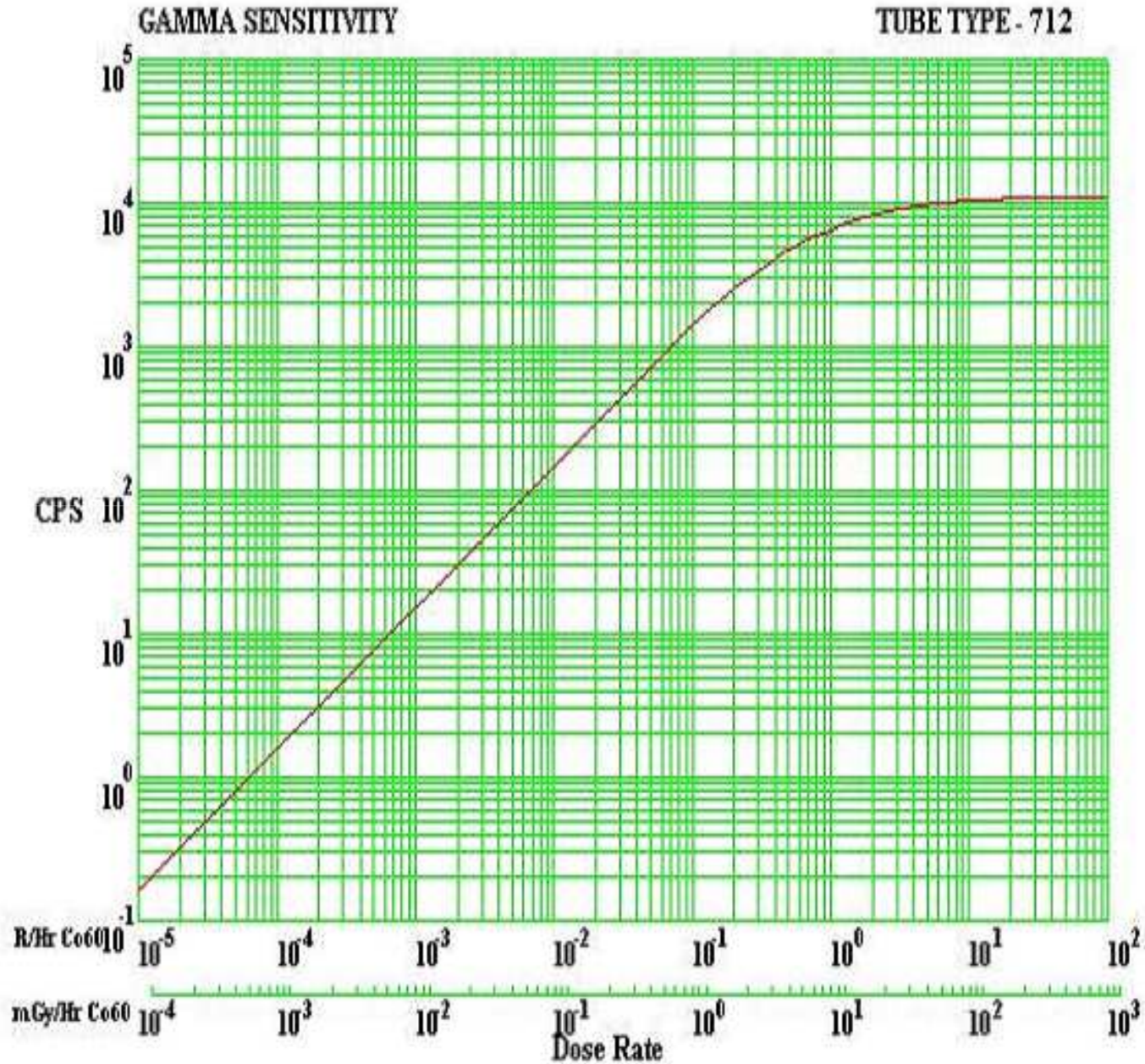
### ELECTRICAL SPECIFICATIONS

Recommended anode resistor (meg ohm)	10
Maximum starting voltage (volts)	325
Recommended operating voltage (volts)	500
Operating voltage range (volts)	450 - 650
Maximum plateau slope (%/100 volts)	6
Minimum dead time (micro sec)	90
Gamma sensitivity Co60 (cps/mr/hr)	18
Tube capacitance (pf)	3
Weight (grams)	8
Maximum background shielded 50mm Pb + 3mm Al (cpm)	10



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# GM Tube Interface

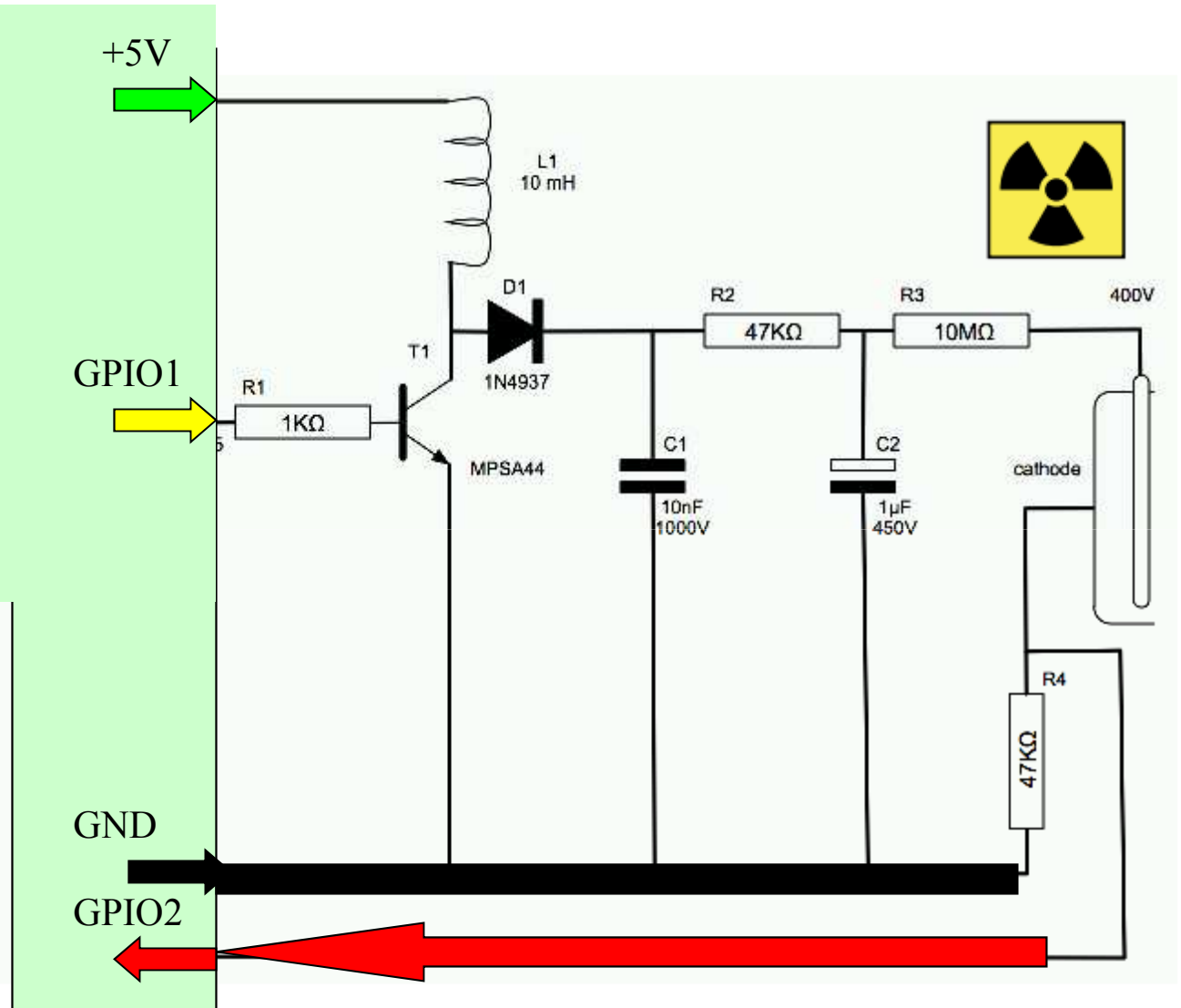
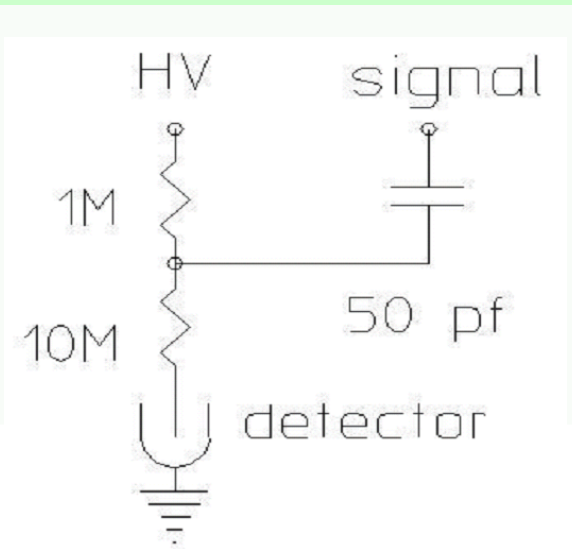


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# Alpha, Beta, & Gamma GM Tube Interface

## GSM Wireless

- + Fully Mobile
- + GSM, GPRS
- + GPS Location
- + Accelerometer



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# XACT Wireless WAN Interface

## GSM Wireless

- + Fully Mobile
- + GSM, GPRS
- + GPS Location

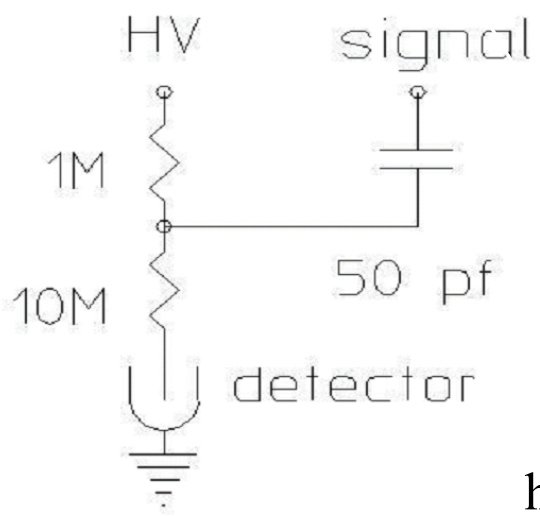
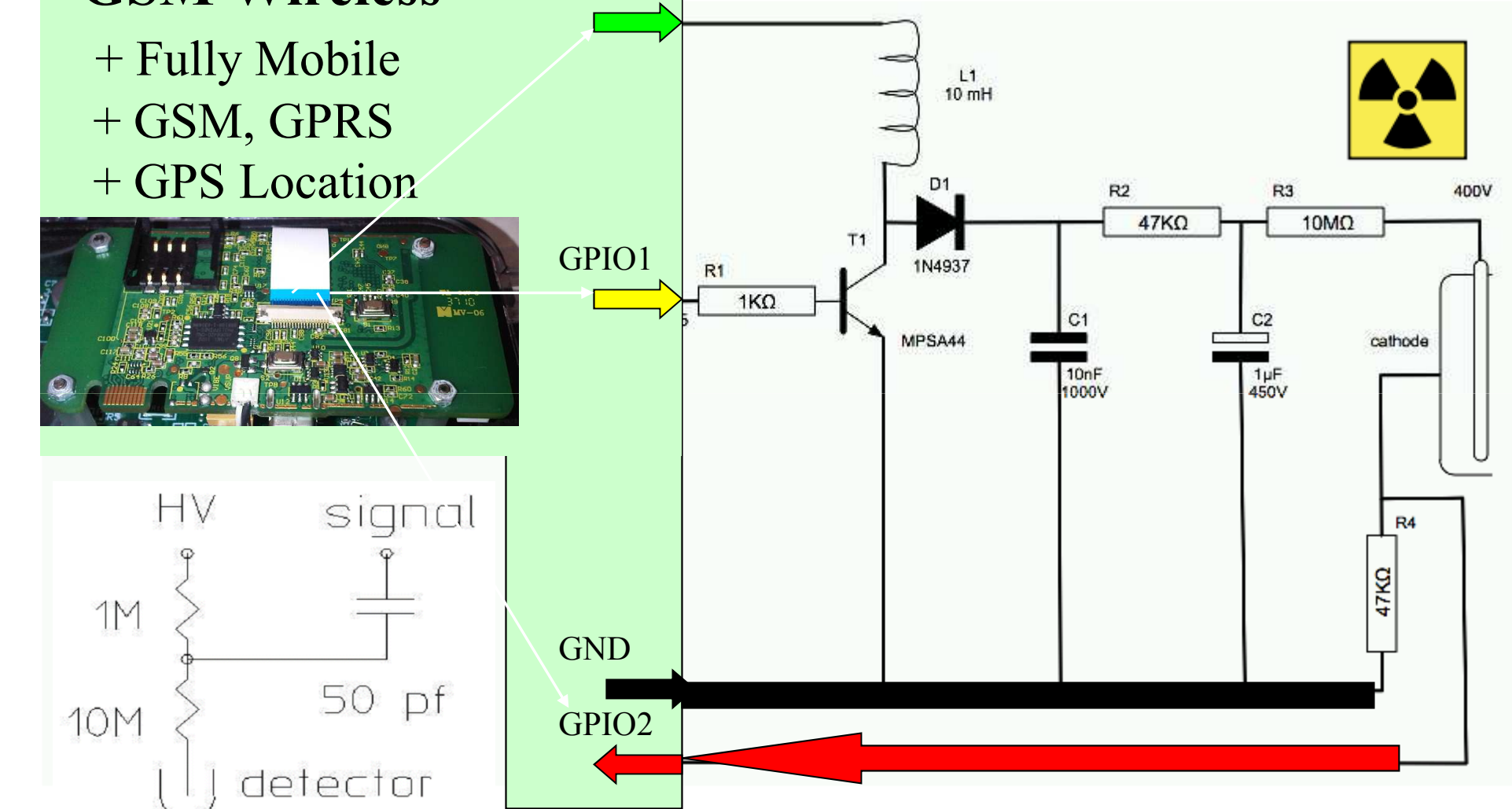


+3.3V

GPIO1

GND

GPIO2

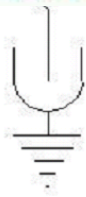


<http://www.xacttrax.com/openm2m.html>

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# XACT Wireless WAN Interface

**GSM Wireless**  
 + GSM, GPRS  
 + GPS Location  
 + Accelerometer



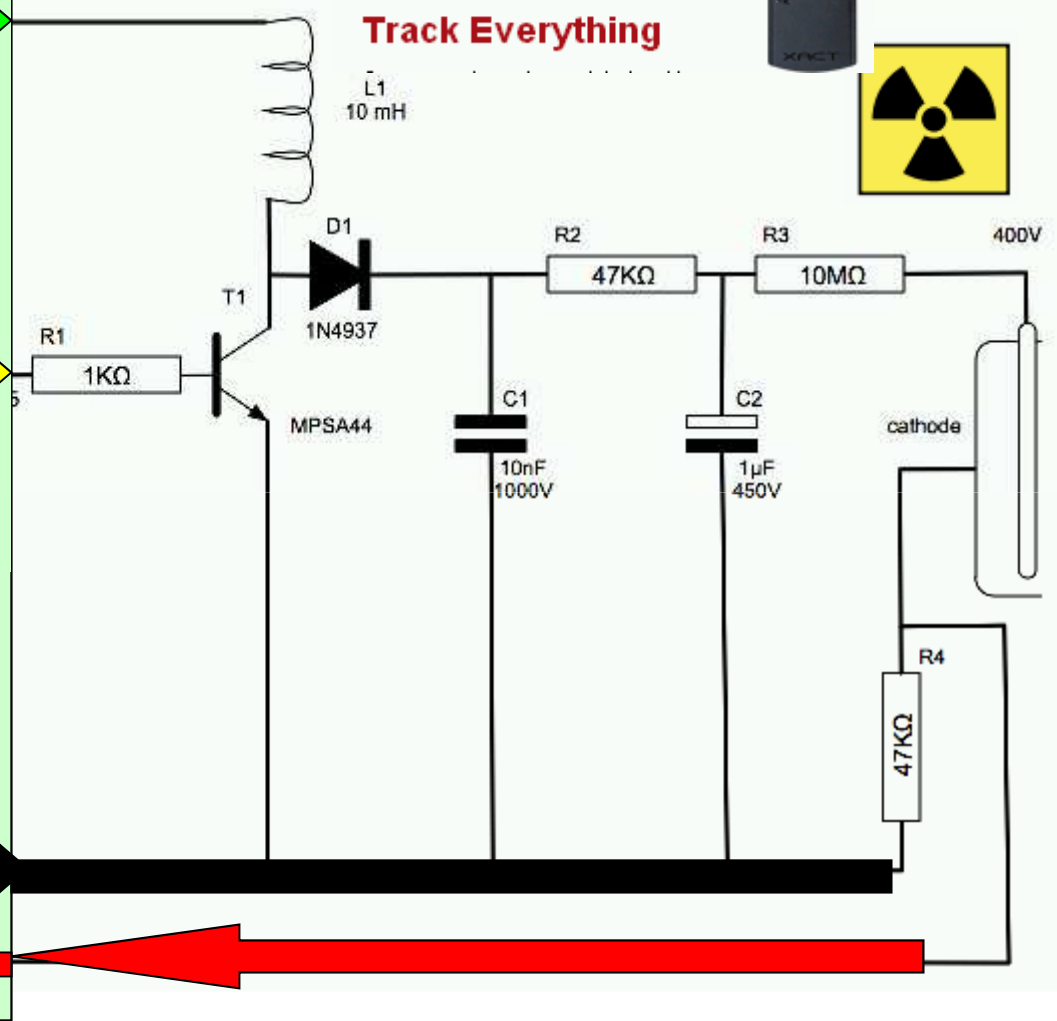
detector

+3.3V

GPIO1

GND

GPIO2



<http://www.xacttrax.com/openm2m.html>

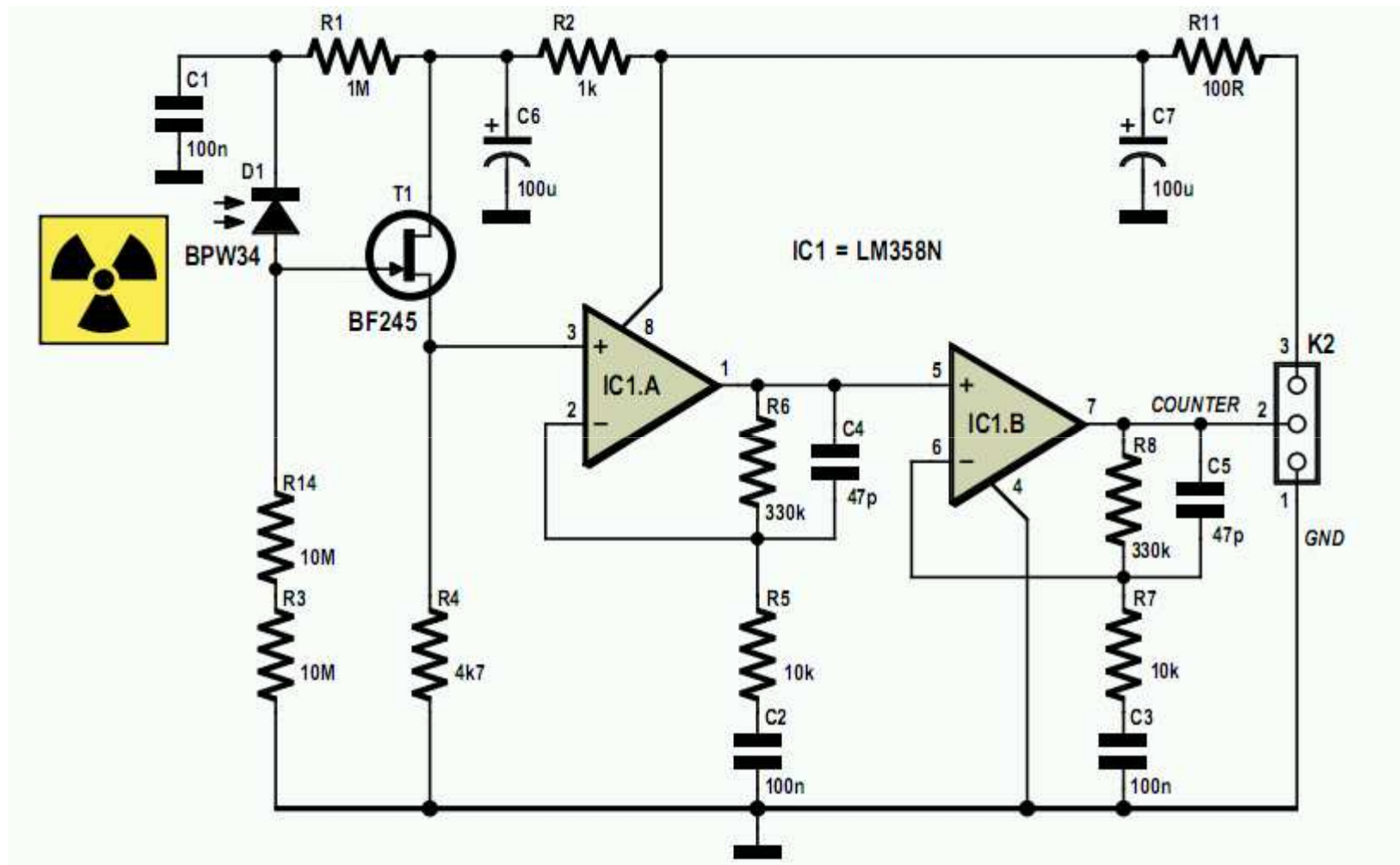
<http://www.xacttrax.com/>

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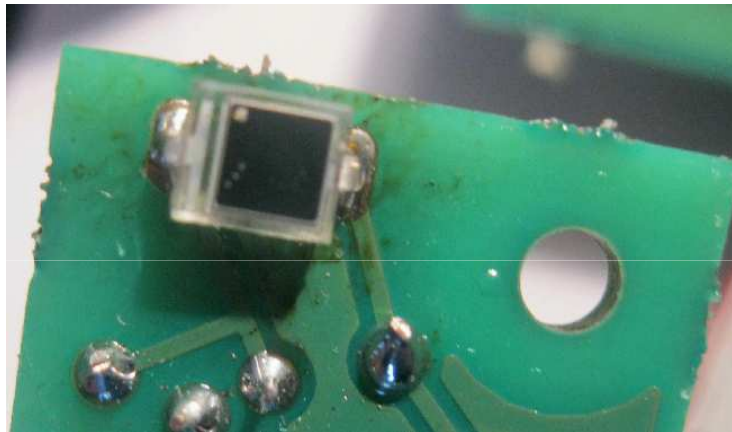
# Experimental Si Photodiode Radiation Interface



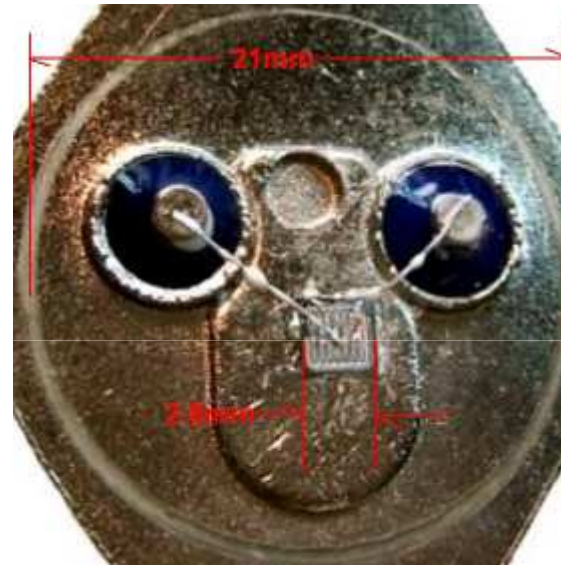
<http://www.elektor.com/magazines/2011/june/measure-gamma-rays-with-a-photodiode.1810862.lynkx>

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# Experimental Low-Cost Si Radiation Interface



BPW34 Photodiode



2N3055 Opened Transistor

<http://www.elektor.com/magazines/2011/june/measure-gamma-rays-with-a-photodiode.1810862.lynkx>

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# References

<sup>1</sup> Simon Monk, ***Arduino + Android Projects for the Evil Genius: Control Arduino with Your Smartphone or Tablet***, TAB books (part of McGraw Hill), 2012

<sup>2</sup> Jeffrey T. Richelson, ***Defusing Armagedon, Inside NEST, America's Secret Nuclear Bomb Squad***, W. W. Norton & Company, 2009

<sup>3</sup> <http://blog.pachube.com/search/label/radiation>

<sup>4</sup> [http://www.makershed.com/category\\_s/211.htm](http://www.makershed.com/category_s/211.htm)  
<http://www.sparkfun.com/products/9848>

<sup>5</sup> <http://www.elektor.com/magazines/2011/june/measure-gamma-rays-with-a-photodiode.1810862.lynkx>

<sup>6</sup> <http://www.xacttrax.com/openm2m.html>

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