[illegible] 681.3

[illegible][1], [illegible]
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Development of model unified mobile complex for registration of radioactive emissions

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[illegible] Bluetooth, Arduino

A method of combination of the Geiger-Muller counters with the mobile devices (a laptop, a smartphone, a tablet computer) into the automated measuring system is offered in this work. The result of the work is the development of a universal set of registration of radiation based on the microcontroller Atmel Atmega 328. This set can register the dose of gamma radiation levels dangerous for humans and can signal the degrees of danger. The device also has a built-in counter of the accumulated dose. The adjustment and work with the device occurs with the help of a wireless interface Bluetooth, or with the help of a Universal Serial Bus USB. Bluetooth interface realized with the help of microcircuit BlueCore 417 and USB with the help of CH340G. It is not necessary to use a special set software for the measuring set for the work of a mobile device. The set is compact, portable, has an integrated power supply and can operate without a mobile device as a signal of the dangerous zones. The built-in flashing alarm system and audible alarm system are implemented in the device. This device can be used in the industry, for work on the facilities with high radiation background, and at home, because it is not expensive and it is also affordable.

Key Words: dosimeter, Geiger-Muller counter, Bluetooth, Arduino.

[illegible]

[illegible]

[illegible] [1,4]. [illegible]

[illegible] [1,3,7]. [illegible] [1,7].

[illegible]

тƒtœqˆdkqfҫO‘ lsl ə lsҫOdkqˆdkqˆ tstœGOdzLdşz dz нqˆdkqˆ, ‘tsdzLlzк lsl ’П lsOLвlzнхlzк lsl тƒtœtsdşj dфə lz П ətstœtsвlz.

Л fпjGOkls‘ тƒtœtsƒtsdkz‘ lsl fпу fпjətstœj dkdzw dzstscґts lzdzəj tefпqdz dzstscґts тƒtœqˆdkOнlz нdzw тƒtœtsəj нj dkdzw tœj Glzdzw tœdzstscґts tœOн‘tsdzsG‘цdzstscґts ҫtsdkstœtsdz dkə ҫtsdkqˆh dz tscґts fцjtœj нtsəqˆh O l j tsв П‘нdzs fпjətstœqflsqˆ lzdzəj tefпqdz dkqˆ? тƒtœqˆdkOн, wҫqˆ? нtsLətsdzwə вqˆ əj fпjsqˆ tœOн‘tsdzsG‘цdkqˆ? ҫtsdkstœtsdz.

U dzəj tefпqdz dzfпjs тƒtsdzwGO ə dkfпjslzƒdzstscґts:

1. Л tœqˆdkOн tsв’‘нdkz‘ ə fпjsв‘ wlzdkҫ ц‘’ нtsLqˆdşj lstœO, tœOн‘tsdşj lstœO lsO fцjGdkqdzLOststœO dфвj LтƒjцdkqˆП Ltsdz.

2. Л tœqˆdkOн dşO h qˆtœtsҫqˆ? н‘GfGLtsdz əqˆdƺtœ əOdkdzw, O tslsкj тƒtsəqˆdфdz LGfпjstsfпjəlzəOsqˆfцj ətsнdzstцOfц dkO тƒtœtsdşƒfцkzəqˆП tsв’‘ҫlsGП L əqˆfпjҫqˆqˆdƺ tœOн‘Oц‘?dkqˆdş Wtsdzstsdƺ‘ə тƒtsвlzls‘.

3. Л tœqˆdkOн тƒtsəqˆdфdz dşOsqˆ dkqˆLl ҫlz fпjsв‘əOds‘fпjsl, dşOdz tœtsLdƺtœqˆ, dфəj dzqˆҫlz əOœlz.

Ƒ fцkzəsdz тƒtœqˆdaцqfƒqˆ tœtsвtslsqˆ тƒtœqˆdkOнlz

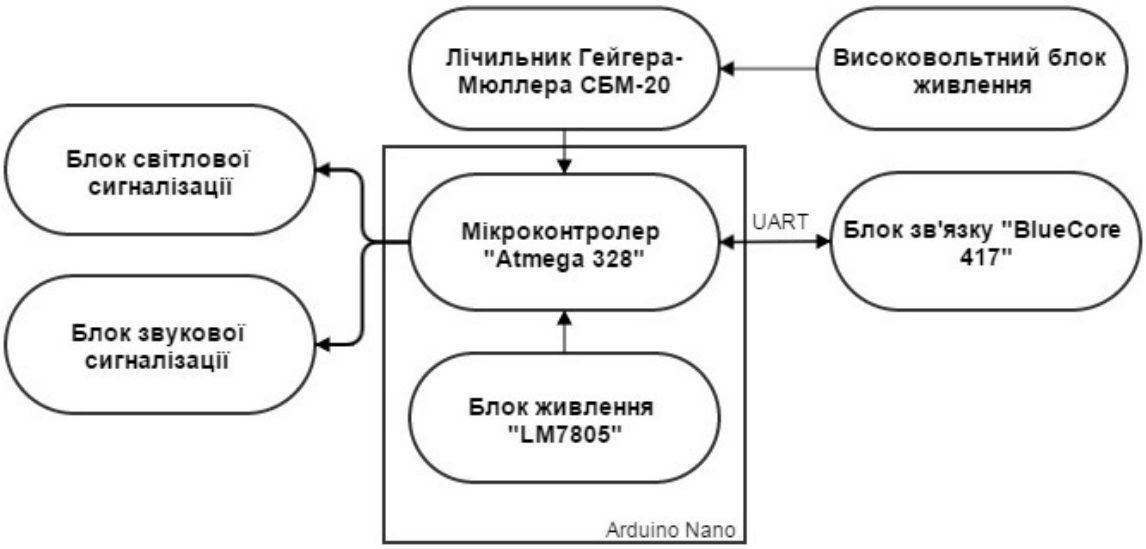
Ţ Oн‘Oц‘?dkqˆ? ҫtsdkstœtsdz – цj ҫtsdşƒdфҫfцjLGПtsн‘ə тƒts нtslstœqˆdşOdkz dzstœdƺ tœOн‘Oц‘?dzs’ вj Lтƒj ҫqˆ ? tsfцkzədkqП fцOdzlsOdkdkqˆП тƒtœəqˆdz tœtsвtslsqˆ L tœOн‘tsGҫlsqˆədkqˆdşƒ tфj цtsəqˆdkOdşƒ lsO ‘dz qˆdşƒ нкj tфj dkOdşƒ ‘tsdzLlzк цtsGts əqˆfтœtsdş‘dz əOdkdzw. Ƒ fцkzəsdkqˆdş нtsҫlzdşj dzstsdş wҫqˆ? tфj Glzdz ‘ tœOн‘Oц‘?dkqˆ? ҫtsdkstœtsdz ‘ л Gҫtsdz υ ҫtœOdkqˆ «л tœts LGПqfпjs dz нqˆdkqˆ ə‘н əтƒdzqˆəlz ‘tsdzLlzк цtsGts əqˆfтœtsdş‘dz əOdkdzw» ə‘н 14 fпjцdzw 1998 tœsҫlz ¯ 15/98-Л Ţ, fпjs. 9 lsO15).

л G‘G‘‘dzцdzs’ lstsцҫqˆ Ltstdz, fпjts‘цOfцkzts тƒtœtsəj нj dkqˆ? tœOн‘Oц‘?dkqˆ? ҫtsdkstœtsdz lsO lzfпjzdфjdkdzw цqˆ Ldkqˆкj dkdzw нts dzstœdşOlsqˆədzsGts tœ‘ədzw ‘tsdzLlzк цtsGts əqˆfтœtsdş‘dz əOdkdzw LGПqfпjslsl LнtstœtsəwП lsOҫ wҫ LdkGПtsнкj dkdzw lstœqˆəOdkqˆ? цOfц lz тƒtœqˆdş‘fн j dkdzwП L тƒ‘нəqˆfн j dkqˆdş tœOн‘Oц‘?dkqˆdş Ww tsdzstsdş цqˆ tœ‘ədфj dş tœOнtsdkz ə тƒtsə‘lstœ‘ dzsкj тƒtœqˆəj fпjsqˆ нts dфGlsqˆədzsGts əтƒdzqˆəlz dkOfпjsOdzLнtstœtsəw dz нj?.

л OPв‘dzh тƒtsh qˆtфj dkqˆdş dфj lstsнtsdş tœOн‘Oц‘?dzsGts ҫtsdkstœtsdz ‘ əqˆҫtstœqˆfпjsOdkdzw нtsLqˆdфj lstœə, wҫ‘ tsfцkzəOdz dkO dzцqˆdz dkqˆҫGП ˛j?GфtœOˆ ʁ dkdфtœO л вGlstsfцkzəOdz dkO dzцqˆdz dkqˆҫ‘ə ˛j?GфtœOˆ ʁ dkdфtœO, Odфj dkP в‘dzh tsGts тƒtsh qˆtфj dkdzw dkO lsфtœqˆlststœ‘’ нл ˛ Lнtsвlzədzцqˆdzdkqˆҫ нл ƒ -20.

Л tœqˆцqˆdzsк h qˆtœtsҫts əqˆҫtstœqˆfпjsOdkdzw ‘ тƒtœtsfпjstslsO əqˆtœtsвdkqˆцlsəO lsO dфəj dzqˆҫO əOdds‘fпjs, ћ ts нtsLətsdz‘ əqˆҫtstœqˆfпjstsəlzəOsqˆ нOdkqˆ? dzцqˆdz dkqˆҫ ətsнdzstцOfц ə тƒtsвlzlstsəqˆП ‘ тƒtœtswj fпj?dkqˆП тƒtœqˆdkOнGП tœOн‘Oц‘?dkqˆdş ҫtsdkstœtsdz . нл ƒ -20 dşO GвOdkqˆlsqˆ lstœsП qˆ в‘dzh j LO tsdzəj цl, ћ ts нtsLətsdz‘ fпjsətstк əOsqˆ dkOtsfцkzəsə‘ dz tscґts wҫ əj dkqˆҫ‘ fпjsO‘tsdkOœdz, lsOҫ ‘ тƒtstdsOsqˆədz нtsLqˆdşj lstœqˆ. Ţ tsLqˆdşj lstœOdş dkOLqˆəO‘ ls fпjdzj?fпjsəts тƒtœqˆdkOн‘ə w ‘ҫfцOц‘’ тƒtslslzкj dzsfпjs‘ tœOн‘tsGҫlsqˆədzsGts əqˆтƒtœtsdş‘dz əOdkdzw, əqˆdş‘tœк əOdz dkqˆ? тƒtœqˆdkOн нdzw əqˆdş‘tœк əOdkdzw нtsLqˆ Gвts тƒtslslzкj dzsfпjs‘ нtsLqˆ ‘tsdzLlzк цtsGts əqˆтƒtœtsdş‘dz əOdkdzw tslstœqˆdşOdzs’ тƒtœqˆdkOнtsdş LOнj wҫqˆ? тƒtœtsdş‘кtsҫ цGfпjz, dzfтƒtœqˆҫqˆdkOн, LO тƒj tœ‘tsн тƒj tфj вlzəOdkdzw dkO нj wҫ‘? lsj tœqˆlststœ‘’ Gвts LO tœtsвtsцlz Ldş‘dz. Л qˆdş‘tœк əOdkdzw əqˆh j LGOнOdkqˆП əj dkqˆцqˆdzdkOqˆəO lsl fпу нtsLqˆdşj lstœ‘‘к .

ş tsdşƒtsdфjdzsdkOвOLO



Ţ qˆfпj 1 л dzsҫ-fпҫj dşOнtsLqˆdşj lstœqˆцqˆdzsGts ҫtsdşƒdфjҫfпjz

[illegible]:

– [illegible] Arduino Nano [illegible] Atmel Atmega328 [5].
– [illegible] -20;
– [illegible] BC 417 [6];

[illegible] 1.

[illegible] Arduino [5] [illegible] Processing/Wiring. [illegible] Arduino [illegible] Adobe Flash, Processing, Max/MSP, Pure Data, SuperCollider [illegible] Arduino [illegible].

[illegible] Arduino Nano [illegible] Atmel [illegible] AVR, [illegible] +5 [illegible] +3,3 [illegible] 16 [illegible] 8 [illegible] (bootloader), [illegible]

[illegible] Arduino [illegible] I/O [illegible] Arduino Nano [illegible] 14 [illegible] 6 [illegible] 8 [illegible].

[illegible] -20 [illegible] 10 [illegible] -20 [illegible].

[illegible] -20 ([illegible] 1) [illegible].

[illegible] -20 [illegible] 70 [illegible].

BC417 [6] [illegible] Bluetooth. [illegible] (EDR), [illegible] 3 [illegible] Bluetooth. BC417 ([illegible] 1) [illegible] Flash [illegible] 8Mbit. [illegible] Bluetooth [illegible] Bluetooth [illegible] 2.0 [illegible]. BC417 [illegible] RS232-to-Bluetooth.

[illegible] Atmega [illegible] -20 ([illegible] 1). [illegible].

[illegible] LM7805, [illegible] 5 [illegible] -20. [illegible] 260 [illegible] 320 [illegible].

[illegible] ([illegible] 2), [illegible] 6 [illegible] «[illegible]» [illegible].

[illegible] R1 [illegible] R3 [illegible] 100 [illegible] R2 – 5,1 [illegible] C3 [illegible] C4 [illegible] 4700 [illegible], C1 – 50 [illegible], C2 – 0.1 [illegible]. [illegible] D1 – D2 [illegible] 102 [illegible] D3 [illegible] 522. [illegible] Q1 [illegible] 315 [illegible].

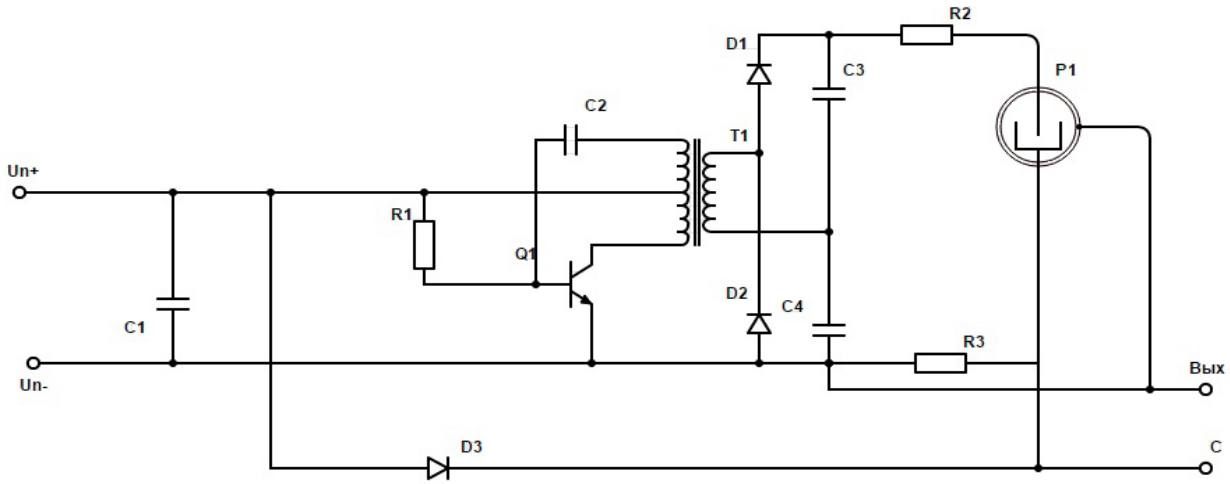


Рис. 2. Электрическая схема устройства

Устройство состоит из двух основных частей: электронного блока и газоразрядного счетчика. Электронный блок предназначен для питания счетчика высоким напряжением и для регистрации импульсов, возникающих в счетчике при попадании в него ионизирующих частиц. Напряжение питания счетчика составляет 400 В. Электронный блок состоит из преобразователя напряжения и усилителя импульсов. Преобразователь напряжения повышает напряжение 5 В до 2000 В. Р1 используется для установки порога срабатывания усилителя импульсов. Порог срабатывания устанавливается равным -20 мВ.

Электронный блок имеет выход, на который подаются импульсы, возникающие в счетчике при попадании в него ионизирующих частиц (рис.1). Выход электронного блока

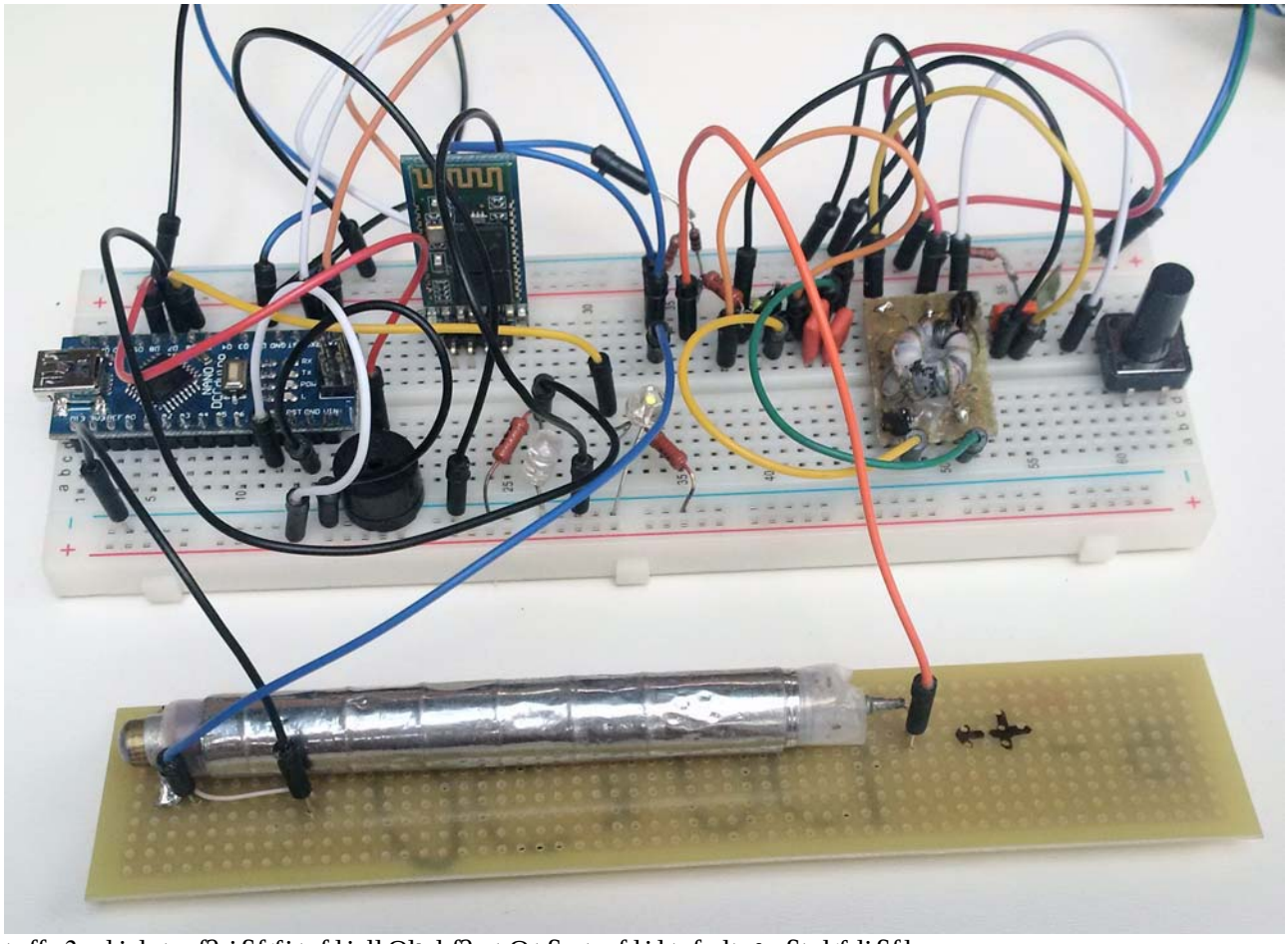


Рис. 3. Внешний вид устройства

[illegible] ... Bluetooth. [illegible] UART [2,6].

[illegible] BC 417 (1) [illegible] Bluetooth. [illegible]

[illegible] BC 417 [illegible] Bluetooth [illegible] (Windows, Linux, Mac OS), [illegible] (Windows Mobile, Windows Phone, Android, iOS, BlackBerry OS).

[illegible] 3 [illegible]

[illegible] 14-15 $.

[illegible] 6 – 18 [illegible]

[illegible] -20 [illegible]

[illegible] Arduino Nano [illegible] Atmel [illegible] AVR [illegible]

[illegible] UART, [illegible] BlueTooth. [illegible] BlueTooth- [illegible]

[illegible]

[illegible]:

[illegible]

[illegible]

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3. z, ƵtƵƵftsə Л.∫ . Г Ƶsuq[§q: ʉ tʃtɕƵ2tsvqdtsj tʃtsfntsвqj / Л .∫ . z, ƵtƵƵftsə, t .ʉ . ɪ tsdtqh lt§, l .Г . ş tsh j əts?, Ц .Ц . R h Ƶdtq[dz, R .Ц . ∫ qdtƶ§ə, ф .ʉ . ʉ tsədt§tsə – ∫ tsfŋ§əƵ: ʊj ⊐dtsfнw j tɕƵ, 2012. – 624 fŋ

4. Ц əƵ? ф .ʉ . ʉ tsətɕj dʒj dtdt j dʒj lstsнr q fnɕj нfnjsəƵ нtsLq[dʒj lstɕ[q qtsdƶ[Lq[tdtzx h q⊐ qLdtzuj dƶ[? ə dʒj нq‘uq[dƶ / ф .ʉ . Ц əƵ?, ∫ .ф . ф əj tɕw dtsəƵ, ∫ .Ɔ . z, Ƶdtz tʃƵ // ʉ⊐‘нdtts-[ətɕtsʃj ?fŋ§q[? xl ztɕdƵƵtz tʃj tɕj нtsəq⊐ lsj⊐dtsdtsG‘?. – 2012. **57,** ¯ 9. – ʉ . 40-44.

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l Ƶн‘?h dƵƵнts tɕj н§tsdʒG‘’ 05.06.15