
MultiGeiger

Release V1.14.0

May 16, 2020

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What is MultiGeiger?

The MultiGeiger is a radioactivity measurement device.

1.1 Main features

multiple use cases supported

- fixed location stations (data transfer via network)
- mobile operations (using the OLED display and speaker)
- (more are planned)

multiple 400V Geiger-Mueller tubes supported

- big, sensitive tubes, like the Si21g or Si22g (for measurement stations)
- smaller, less sensitive tubes, like the SBM21 (good for finding hot spots)

Hardware

- low parts count, simple to assemble
- inexpensive, but still good parts
- using ESP32, a modern and fast 32bit micro controller
- with WiFi (WPA2) or with WiFi + LoRA
- with OLED display

Firmware

- implemented in C
- using the popular arduino API
- over-the-air firmware updates

Network and Community

- this is an Ecocurious citizen science project
- web-based geo map for publishing measurements
- web-based archive of historic radiation data

Free and Open

- GPL v3 licensed
- open development and issue tracking on GitHub

There is a lot more information in our [documentation](#), which is also available as [offline documentation](#).

Note: some stuff is only available in German language or in document formats which can not be directly included in the above mentioned docs - see the docs/ directory.

1.1.1 Changelog

V1.14.0 2020-05-16

New features:

- implement status line on OLED display (see docs), #257
- also support BME680 sensor for temperature, humidity, pressure
- display time up to 60s / 60m / 24h / 99d, then roll over
- speaker/LED: timer-driven sequencer, hw PWM sound, #35
- TLS support
 - add clock module, use NTP to set the clock
 - use persistent per-server HTTPClient instances
 - use connection: keep-alive for web requests
 - add https capability (can be used for sending data)
 - note: transmission to sensors.community and madavi is still using http!

Fixes:

- fixed GM pulse debouncing, #248
- pulse counting: deal with microseconds uint32 overflow, #273
- check WiFi status before trying to transmit
- fix race condition, #286

Other changes:

- dip switches: only read once at boot time, #207
- new font (u8x8 uses 8px width anyway)
- slow down main loop
- toilet -> custom server, add comments about toilet usage, #214
- refactor/simplify pulse counting ISR, bookkeeping in main loop, #220
- refactor big main loop into smaller functions with local bookkeeping.
- misc. other code cleanups

- loraWan: removed unused/not needed code, #212, #234
- removed meeting notes, #294
- docs:
 - README improvements (board name, flash size, partition scheme, passwords, LoRa)
 - update development/release docs (create/test binaries, IDE settings, ...)

V1.13.0 2020-04-14

- auto-detect hardware (STICK vs. WIFI) by hardware pin
- use config web page for more values (userdefines.h has the defaults), #140
- try both addresses of BME280
- LoRa payload changes, e.g. to fulfill ‘TTN Fair Access Policy’
- send additional data to servers
- send to MADAVI in one single request both geiger and thp data
- new logging with DEFAULT_LOG_LEVEL configuration
- integrated travis-ci:
 - for compile checks (platformio, wifi and stick build)
 - for style checks (using the “astyle” CPP checker)
- source: modularization, cleanups, less globals, ... (quite huge internal changes, please help testing!)
- building:
 - platformio-based build: suppress lmic_project_config.h usage
 - arduino-ide-based build: you still need to edit that file
- use bump2version tool for project version bumps, #169
- docs:
 - added upgrade hints for 1.13 in README on github
 - <https://multigeiger.readthedocs.io/> == the beginning of new (sphinx / reST-markup based) online docs, #163
 - add a basic, short README in English (also for online docs)
 - include infos about project name, #121
 - moved changelog.md to docs/source/changes.rst
 - updated/fixed development docs, #46
 - update docs about new 5V power supply / cabling, #122
 - description of LoRa Payload updated
 - other docs improvements / fixes

V1.12.0 2020-01-18

- simple OTA (Over-The-Air) updates via web browser based upload, #120
- use less charge pulses in loop() for timing, more in setup() for initial charging, #134
- output error msg on Serial if HV charging fails
- tag log output with “GEIGER: “, #85
- add TUBE_UNKNOWN 0 to have a specific value for experimenting
- adapted platformio.ini to pull all dependencies
- send CR and LF on serial
- changed default tube from sbm-20 to si22g
- semantic versioning, version numbers now like x.y.z
- changed building of revString and lora_version
- docs updated / improved
- explain SBM-19/SBM-20 conversion factor
- removed IotWebconf bundled&patched code, used as a lib now.

V1.11.1 2019-12-16 rxf

- change luftdaten.info to sensor.community

V1.11.0 2019-12-16 rxf

- defaults in userdefines-example.h changed
- Software version for LoRa now 2 Bytes
- Display start screen for Wireless stick fixed
- changed to semantic versioning

V1.10 2019-12-13

- conversion factor for Si22G tube fixed
- char variables changed to int
- isr routines shielded with portMUX
- debug serial out formatting improved
- sequence of counting and displaying and hv charging improved
- speaker and led tick fixed
- many calls to millis() consolidated

V1.9 2019-11-12

- structure for different counter tubes
- LoRa payload changed again
- hv pulse every second
- calculate and display cpm value every 10 seconds
- fixed div by 0 if there's no tube
- Readme corrected

V1.8 2019-11-04

- indentation/spacing, refactor OLED functions, fix conversion factor
- MEASUREMENT_INTERVAL 150sec
- changed LoRa payload

V1.7 2019-10-21

- PINs rearranged, so we can use new Wifi-Kit-32 and WiFi Stick Light
- Hardware-Layout V1.4 and up
- use switch for speaker tick and display off

V1.61 2019-09-30

- default measuring interval is now 2.5min

V1.6 2019-09-13

- some rearrangement of files
- userdefine.h for user changable #defines
- test with dip-switch (needs pullup resistors!)
- Hardware layout V1.3 and lower - OLD Wifi-Kit-32!

V1.5 2019-09-11

- added BME280 (uses same I2C as display)
- Support for display on Wireless Stick
- For LoRa-Devices added LoRa functionality

V1.4 2019-09-03

- default configuration with measurement interval of 10min

V1.3 2019-09-03

- building of ESP-ID out of MAC address is now identical to 'Feinstaubsensor'

V1.2 2019-09-02

- sending to madavi corrected

V1.1 2019-09-01

- Library IoTWebConfig changed -> function 'setThingName' added
- Move this (IoTWebConfig) library to source path
- building the SSID from the MAC corrected: first 3 Bytes of MAC build SSID
- LoRa autodetection removed

V1.0 2019-08-19 rxf

- added detection of LoRa device
- WiFiManager to enter WLAN data and other configs
- send to luftdaten.info every 2.5 min

V0.3 2019-05-12 jb

- added bug fix for the "Double-Trigger-Problem". This was caused by the rising edge falsely triggering an other pulse recording. The Problem is that there is no Schmitt-Trigger available in the controller.
- simplified serial printing modes
- made seconds in Display as inverse to be able to separate it from minutes
- cleaned up the code
- Fixed overflow bug in Minute-Count+

V0.2 2019-04-26 jb

- added 1 Minute RS232 (USB) logging mode

V0.1 2019-03-25 jb

- first version for ESP32 board

1.1.2 Usage

OLED display

Top line

Left: Time since power-on (not shown on small displays).

Right: Overall average radiation since power-on.

Middle area

Current CPM (counts per minute) displayed using a rather big font.

Bottom line

This is a status display with 8 positions, numbered 0..7:

Rules of thumb:

- . usually means “off” or “unused”.
- if you see some *number* (0 .. 7) within the status display line, something went wrong.

Positions:

- 0: WiFi
 - A: AccessPoint active
 - w: WiFi client trying to connect
 - W: WiFi client connected
 - 0: some error happened
- 1: sensors.community transmission
 - .: off (not configured / enabled)
 - ?: init (enabled, before 1st transmission)
 - S: sending
 - s: idle (shown after successful sending)
 - 1: sending failed (shown after trying to send)
- 2: madavi transmission
 - .: off (not configured / enabled)
 - ?: init (enabled, before 1st transmission)
 - M: sending
 - m: idle (shown after successful sending)
 - 2: sending failed (shown after trying to send)
- 3: TTN (“The Things Network”)
 - .: off (not configured, not enabled, no LoRa hardware)

- ? : init (enabled, before 1st transmission)
- T : sending
- t : idle (shown after successful sending)
- 3 : sending failed (shown after trying to send)
- 4: reserved for BT
- 5: unused
- 6: unused
- 7: High-Voltage Capacitor charging
 - H: OK
 - 7: failure to charge HV capacitor

1.1.3 Frequently Asked Questions

SECTION1

Question1?

Answer1

Question2?

Answer2

1.1.4 Resources

This is a collection of additional resources that are somehow related to MultiGeiger.

TODO: add links.

1.1.5 Development

This chapter will get you started with MultiGeiger development.

MultiGeiger is written in C using Arduino-ESP32.

Contributions

... are welcome!

Some guidance for contributors:

- discuss about changes on github issue tracker
- make your PRs against the `master` branch
- do clean changesets:
 - focus on some topic, resist changing anything else.

- do not do style changes mixed with functional changes.
- run the automatic code formatter before committing
- try to avoid refactorings mixed with functional changes.
- if you need to fix something after commit/push:
 - * if there are ongoing reviews: do a fixup commit you can merge into the bad commit later.
 - * if there are no ongoing reviews or you did not push the bad commit yet: edit the commit to include your fix or merge the fixup commit before pushing.
- have a nice, clear, typo-free commit comment
- if you fixed an issue, refer to it in your commit comment
- make a pull request on github and check on the PR page what `travis-ci` tells about the code in your PR
- wait for review by other developers

Building a development environment

TODO

Automatic Code Formatter

We use `astyle` for automated code formatting / formatting checks.

Run it like this:

```
astyle --options=.astylerc 'multigeiger/\*'
```

Documentation

Building the docs with Sphinx

The documentation (in reStructuredText format, `.rst`) is in `docs/source/`, `index.rst` is the starting point there.

To build the docs, you need to have `Sphinx` installed and run:

```
cd docs/
make html
```

Then point a web browser at `docs/build/html/index.html`.

The website is updated automatically by ReadTheDocs through GitHub web hooks on the main repository.

Flashing devices / creating binaries

Arduino IDE:

- do a git checkout of the wanted release, e.g. `git checkout V1.13.0`
- use the default `userdefines.h` (available as `userdefines-example.h`)
- IDE settings:
 - Device: Heltec WiFi Stick (always use this, even if you have a WiFi Kit 32)

- Flash size: 4MB (32Mb)
- Partition scheme: minimal SPIFFS (large APPS with OTA) - this fits onto 4MB devices.
- Arduino IDE -> Sketch -> Upload
This is to test whether the compiled code actually works after USB-flashing to your device.
- Arduino IDE -> Sketch -> Export compiled binary
This creates a .bin file for OTA updating. Test whether OTA updating using that file works.

Creating a new release

Checklist:

- make sure all issues for this milestone are closed or moved to the next milestone
- check if there are any pending fixes for severe issues
- check whether some CA certificate (see `ca_certs.h`) will expire soon and whether we already can add their next valid cert.
- find and fix any low hanging fruit left on the issue tracker
- close release milestone on Github
- update `docs/source/changes.rst`, based on `git log $PREVIOUS_RELEASE..`
- `bump2version --new-version 1.23.0 release` - this will:
 - update versions everywhere
 - auto-create a git tag
 - auto-create a git commit
- review the automatically generated changeset
- create a github release for this tag:
 - create a binary (see above) and attach to the github release
 - add a link to the relevant `changes.rst` section to the github release

1.1.6 Authors

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