Slovenian contribution to FAIR

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In-kind role in build-up of experiments

- **NEULAND:**
  - up to 3 double planes (bars+PMT)
- **CALIFA:**
  - Iphos construction help
  - external mech. structure help
  - barrel backward angle detectors
- **DEGAS**
  - BGO backcatcher
  - CsI+SiPM shield
- **HISPEC/DESPEC**
  - various particle tracking subsystems

Key question

- Final commitment subject to financing on Slovenian side
- Hope to have more information by this fall

Characterization of PMT compensation

- **Transient gain loss in PMT by over-exposure**
  - Motivation: TOF wall, etc...
  - A first glimpse into approach
- **Adaptation of hardware**
  - Modifications of resistive divider or reduction of bias voltage sometimes undesirable
  - Reduction of beam luminosity - blasphemic
- **Collaboration:**
  - Martina Loknar (MSc thesis @FE), M. Miklavec, M. Vencelj (JSI), D. Savran (GSI/FAIR)

Controlled light source

- Voltage-controlled light source
  (to be used with pulsers and AWGs)
- Bright enough to badly saturate a PMT
- Fast enough to mimic LaBr/CeBr pulse shapes or even organics
- Very linear
  (output light vs input voltage)

Fast enough?

- fastest visible-light LED pulses

A Simple Subnanosecond Light Pulser

Dušan Ponikvar

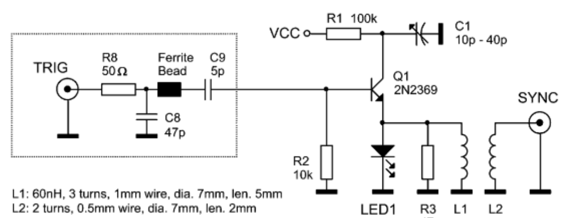
Abstract—**An electronic circuit for generation of short light pulses is presented. The circuit uses low-cost, general-purpose electronic components and is simple in its structure. It is suitable for testing of the instruments and setups for the detection of light and adjusting correct timing and synchronization. The light pulses have a full width at half-maximum (FWHM) ranging from 0.9 to 2 ns for selected blue and red LEDs, and 250 ps for a red laser diode.**

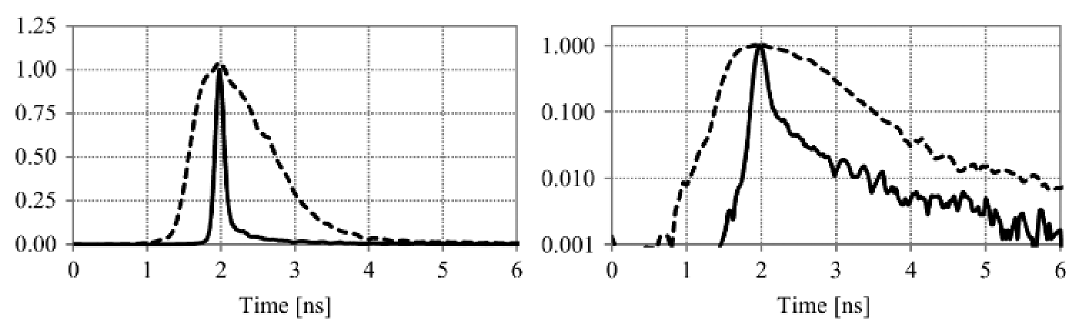
Index Terms—**Electronic circuit, optical pulse generation.**

I. Introduction and Background

A FAST light pulser is a helpful tool for setup, timing calibration, and testing of any fast optical counting system. Since optical systems evolve rapidly and are becoming increasingly faster, the calibration and testing tools must follow, but are still expected to be simple and cheap.

A popular circuit for generation of short light pulses was pub-





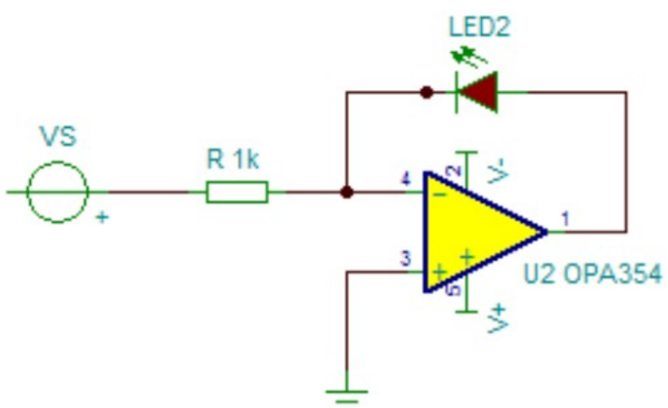
ː light pulses from laser diode TOLD9200 (Toshiba, red, 3 mW, solid line) compared to LED Seoul, LB5209, blue,
ical scales (left: linear; right: logarithmic) are normalized.

Bright enough?

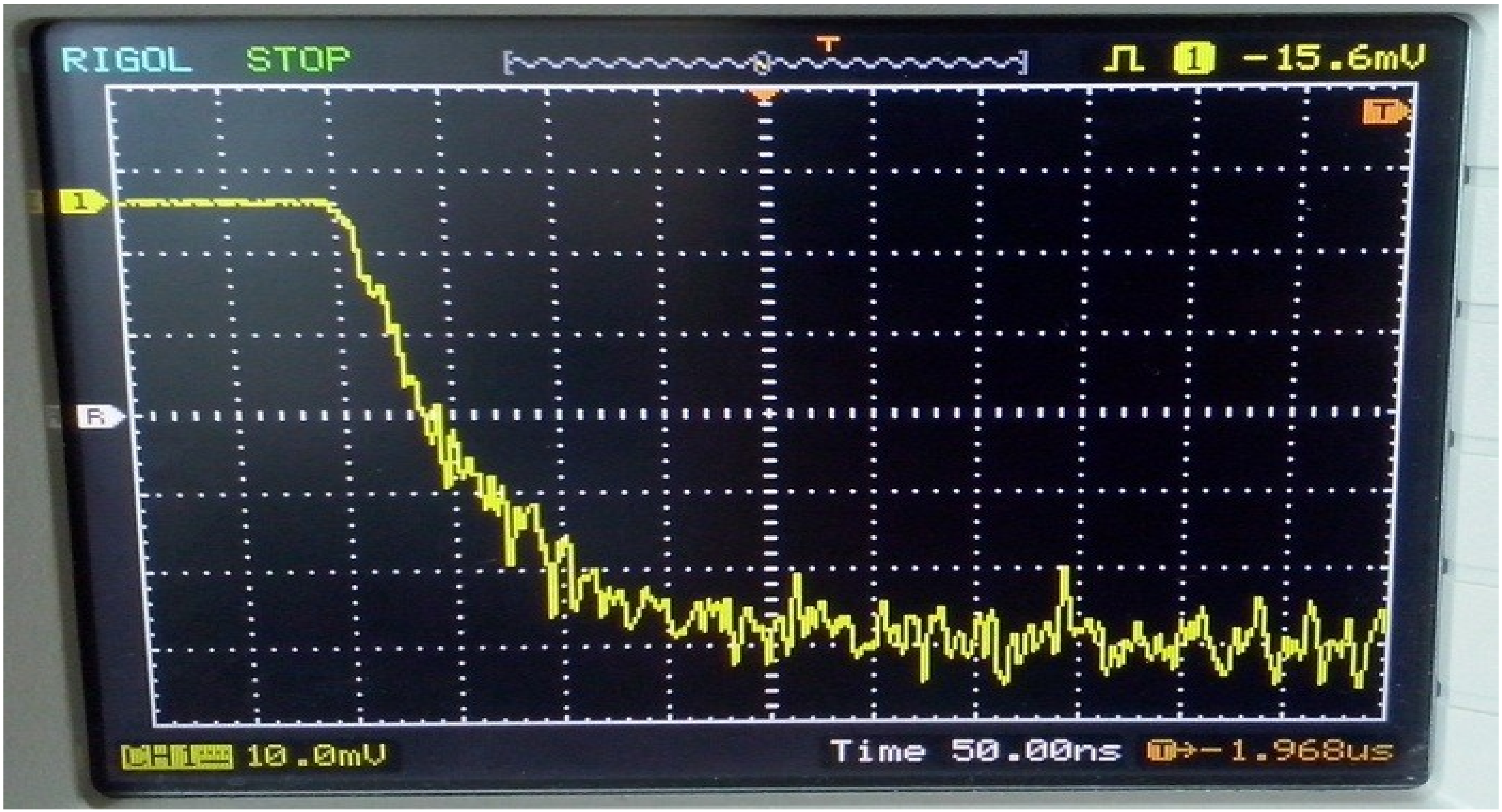
- **Brightest non-destructive 1us pulses from a single LED die**
  - Linda Bitenc, high school science project,
    1st place, regional competition 2017
- **bullet photo, 30cm from LED, 500ns, 1500W, f/2.8, ISO 1600**

Q&D prototype

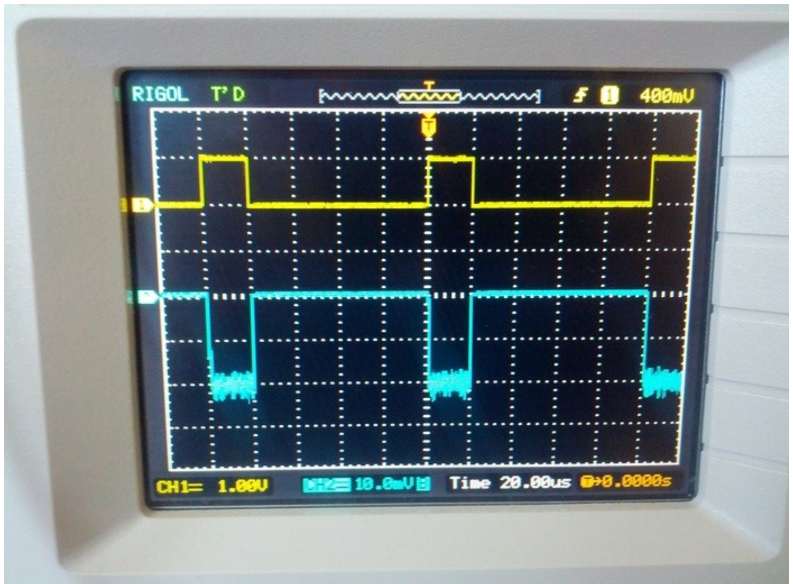
- **Transconductance stage with a LED** **(M. Loknar, MSc)**
  - naive principal scheme:

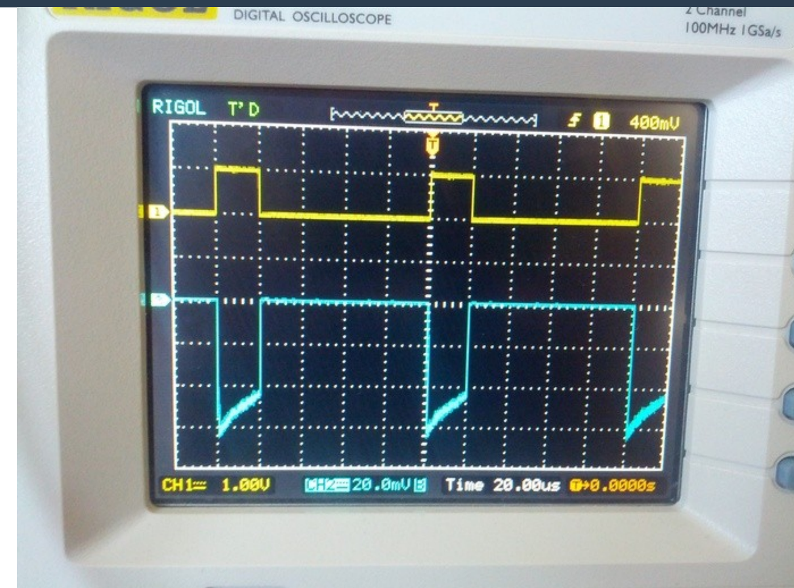


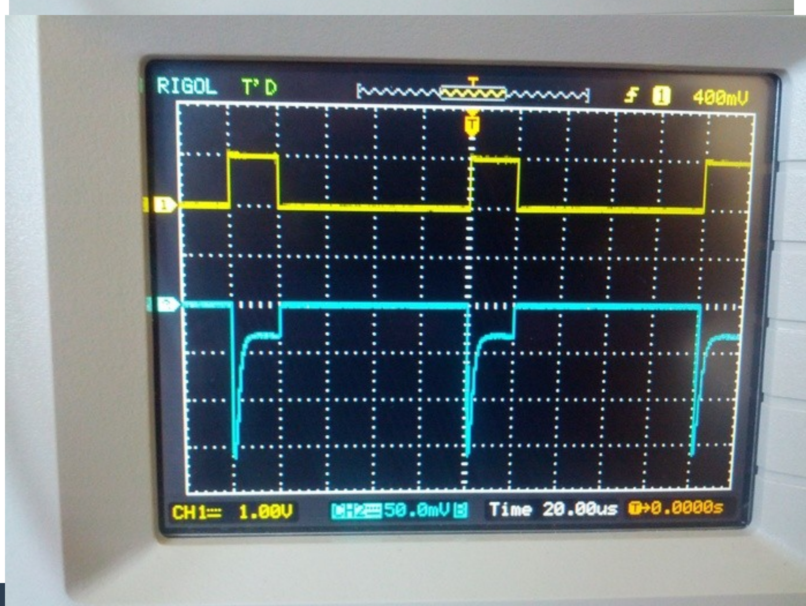
Fast enough again?

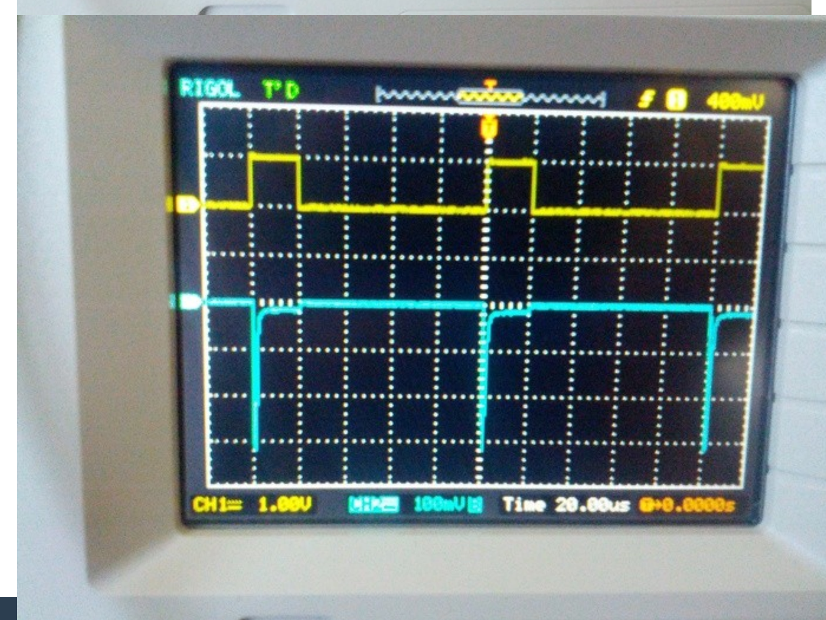


Bright enough meanwhile?









Compensation scheme

- **time-stamped list mode**
  - naive (direct measurement):

    $t_1,a_1;\ t_2,a_2;\ t_3,a_3;\ t_4,a_4 \ldots ;\ t_i,a_i;\ \ldots$
  - compensated (inline or posterior):

    $t_1,a_1;\ t_2,a_2';\ t_2,a_3';\ t_2,a_4';\ \ldots ;\ t_2,a_i';\ \ldots$
- **dependence of gain loss on pulse history**
  - model-based supervised learning
  - autonomous, correlation based

Thank you.