

Oleg Sotnikov

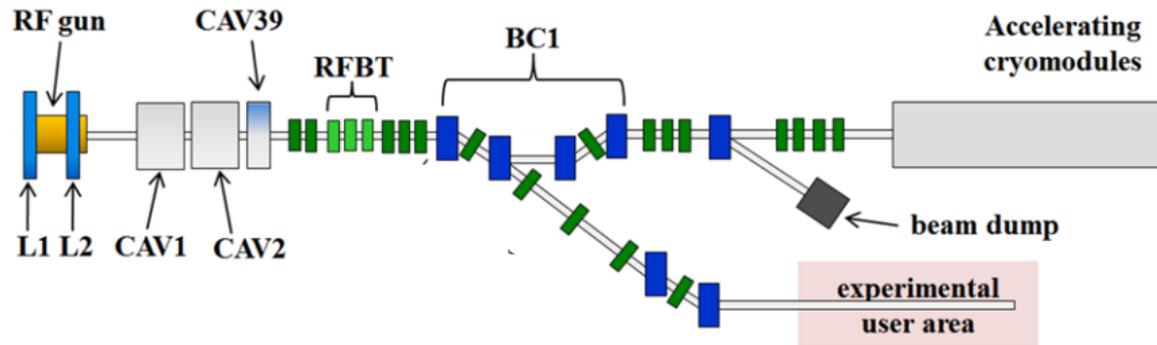
Novosibirsk State University

1 master course

Commissioning photo-injector gun on ASTA

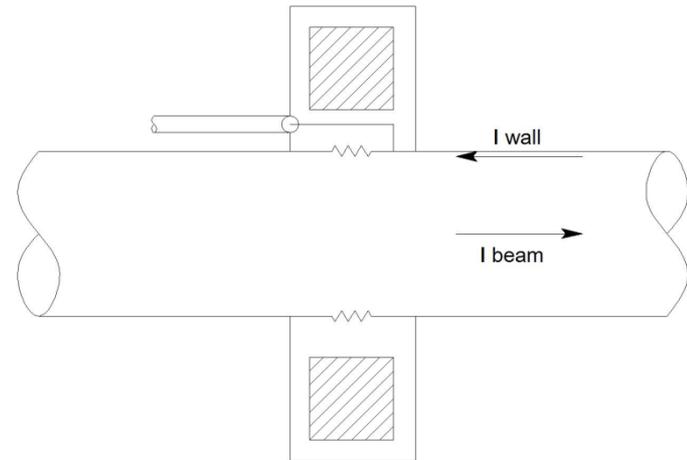
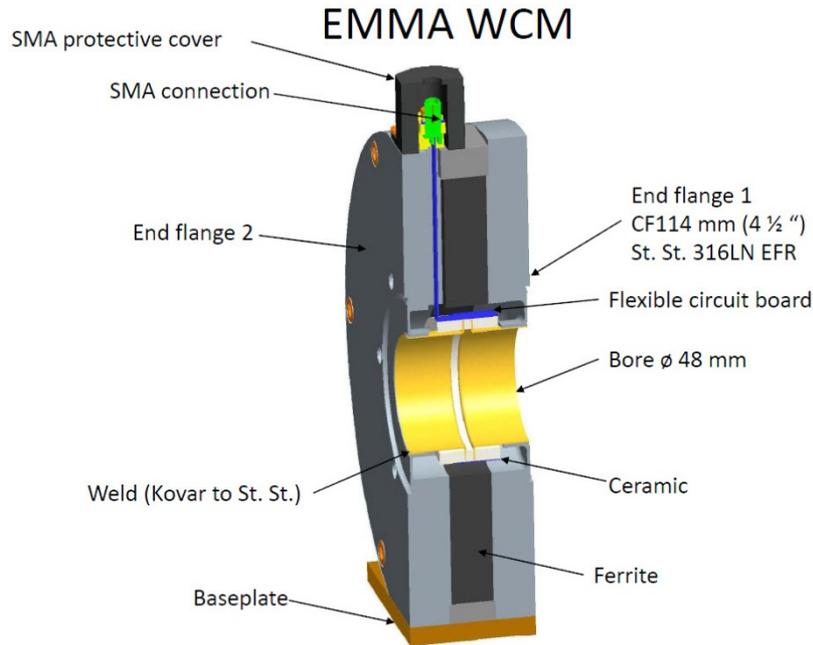
PARTI supervisor E. Harms

Advanced Superconducting Test Accelerator (ASTA)



- **Photocathode laser:** illuminates the photocathode by 263 nm wavelength light which is directed by a 45° off-axis mirror downstream of the RF coupler.
- **Electron gun:** 10 mm diameter molybdenum disk coated with Cs₂Te.
- **Beamline elements:** the electron gun is followed by two SRF cryomodules to accelerate beam to 50 MeV.
- **Low energy diagnostics:** BPM's, profile monitors, **resistive wall monitor**, loss monitors.
- **High energy beamlines:** The beam will be initially transported from the cryomodule string to the first high energy spectrometer magnet by a 4-quad matching section, a 4-quad FODO lattice, and an additional 4 quad matching section. This region of beamline is 45 m in length and is intended to house future AARD experiments.

Resistive wall current monitor



A resistive wall current monitor, basically consist of a resistive gap along a conducting pipe. Charged particles traveling inside the vacuum pipe, produces an image current along the inside surface that has equal magnitude but opposite sign. When this image current passes through the resistive gap, a voltage signal is produced.

RWCM

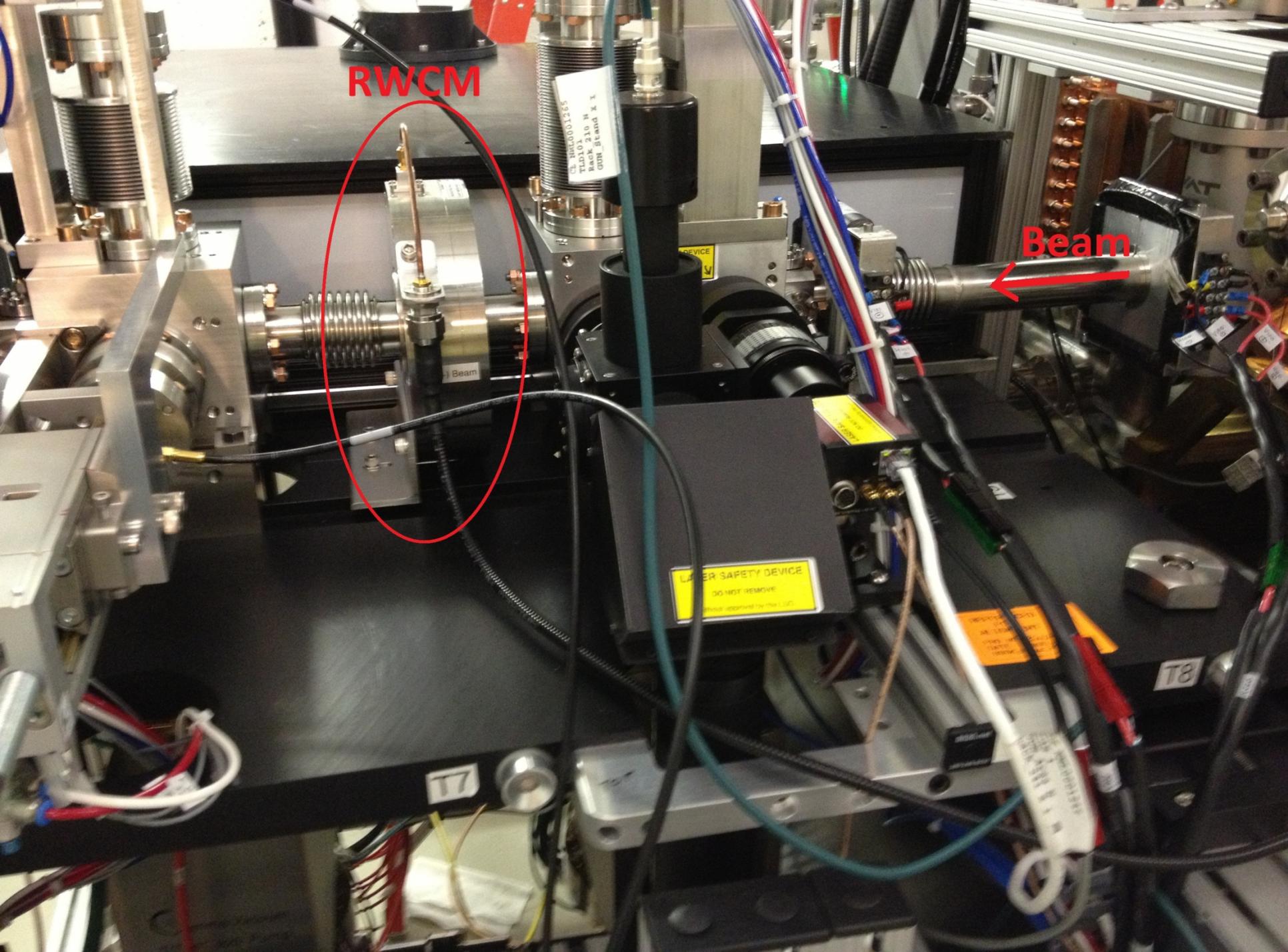
Beam

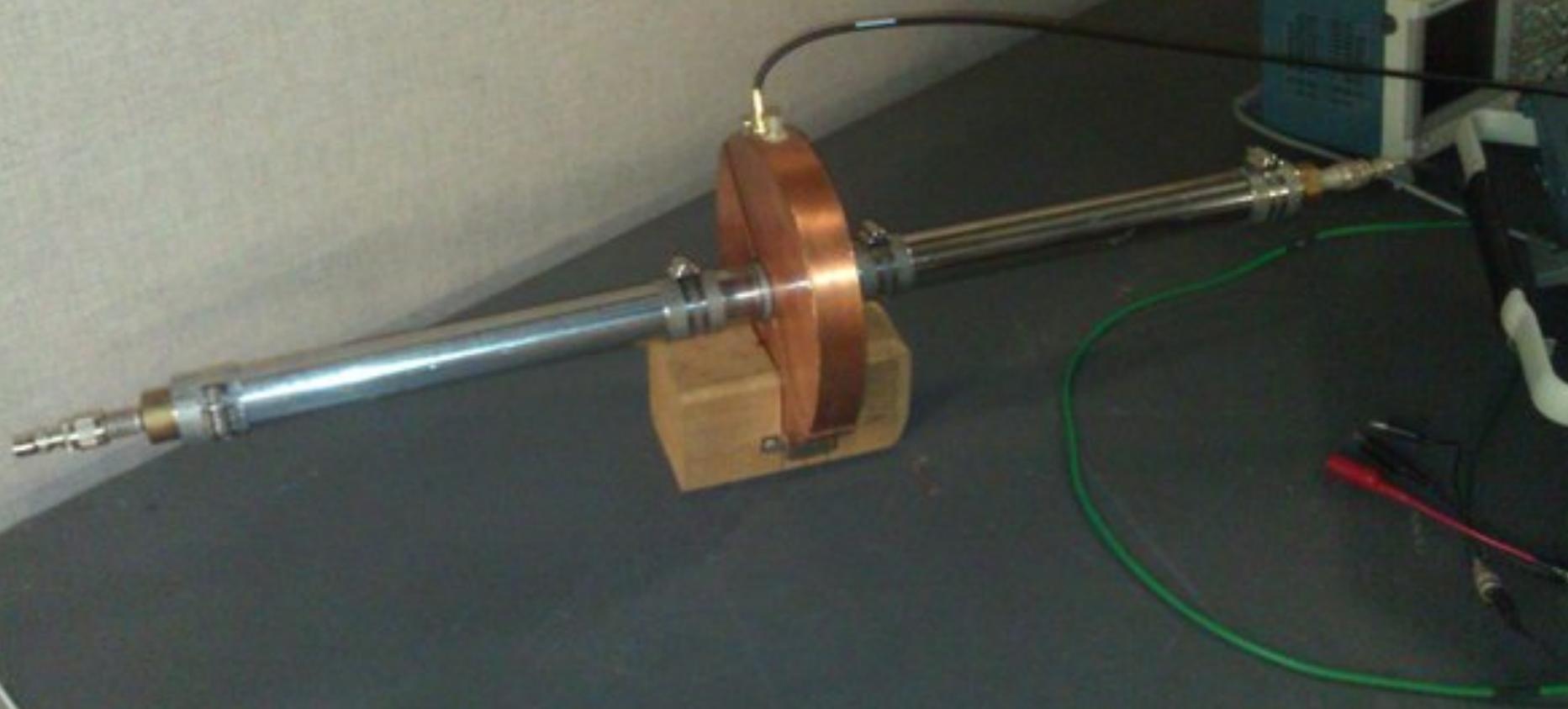
LASER SAFETY DEVICE
DO NOT REMOVE
Device approved by the LDC

CE: H060001265
T10114 210 W
RWS
GDH Stand X 1

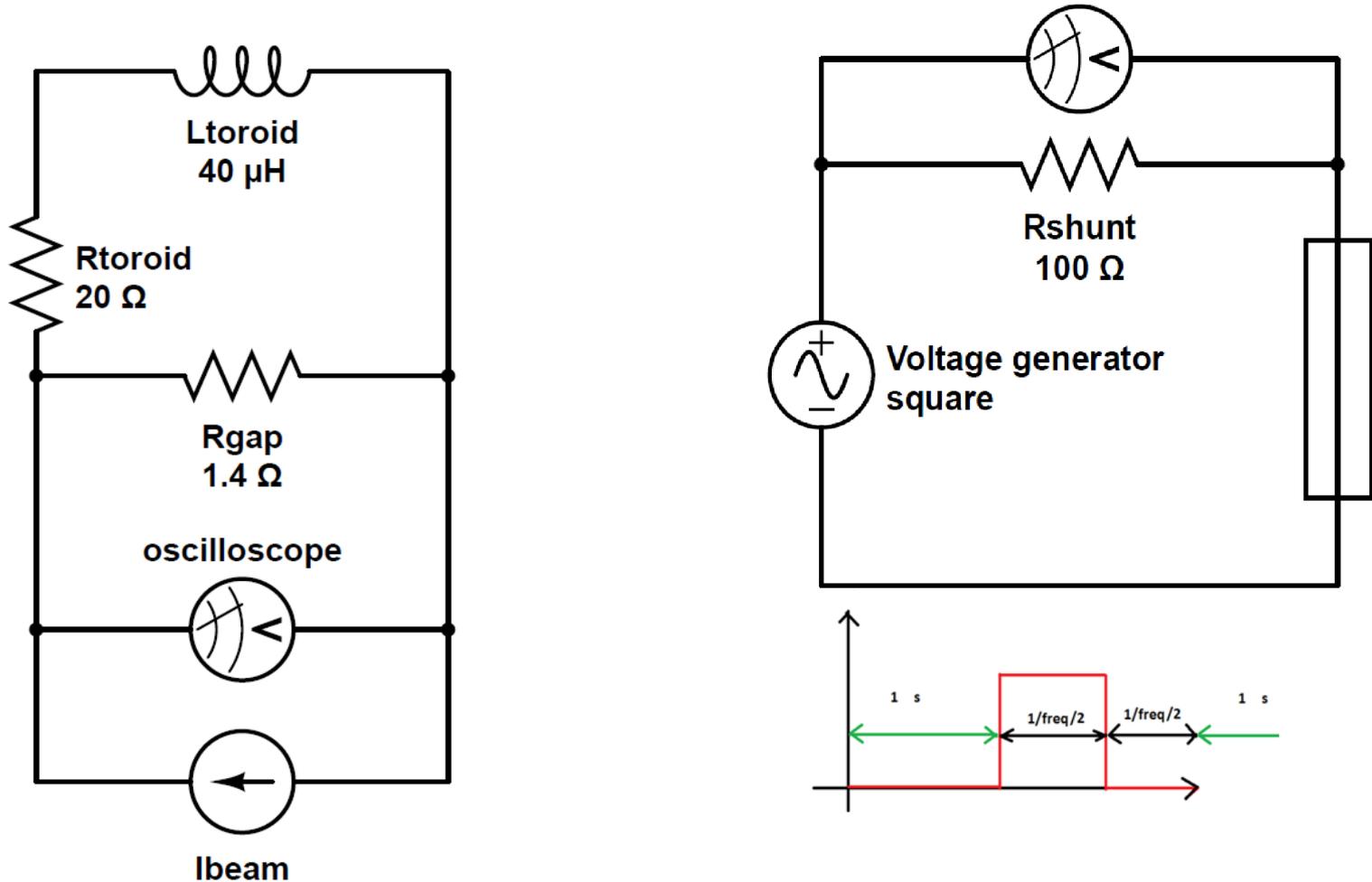
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T8





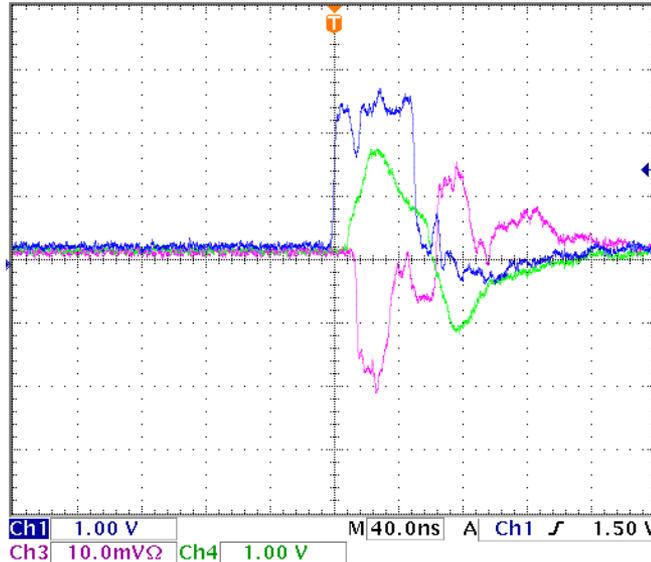
Electric circuit schemes



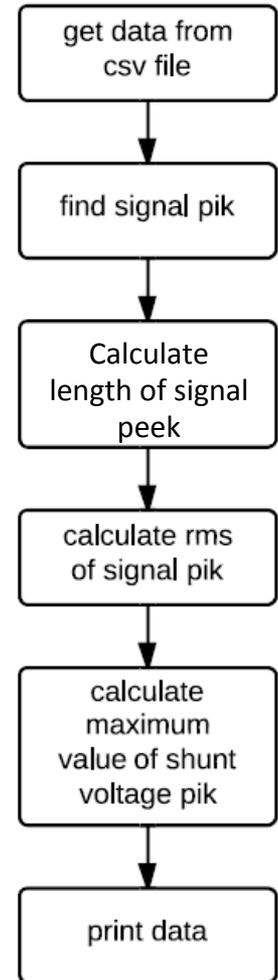
Charged particles traveling inside the vacuum pipe, produces an image current, like current source.

Measured signals

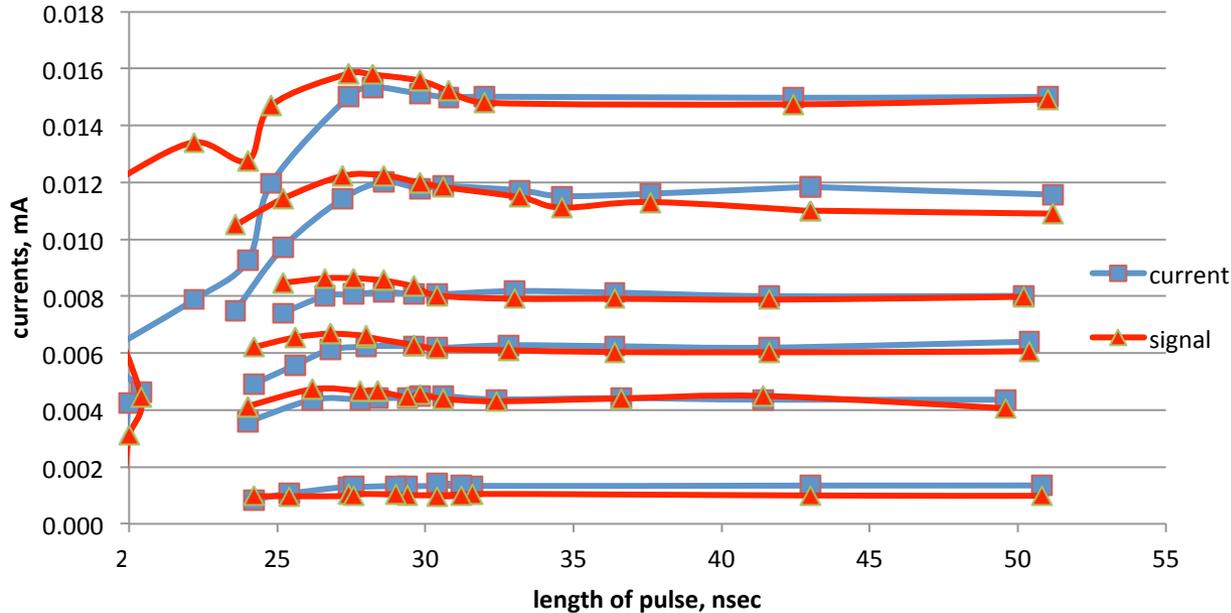
Signal from generator
Voltage on resistive shunt
Signal from RWCM



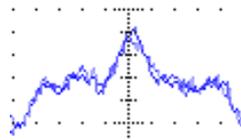
- Measurements were conducted for signals with different signal's frequency, and amplitude
- **Beam's current** was calculated from ohm's law on the shunt



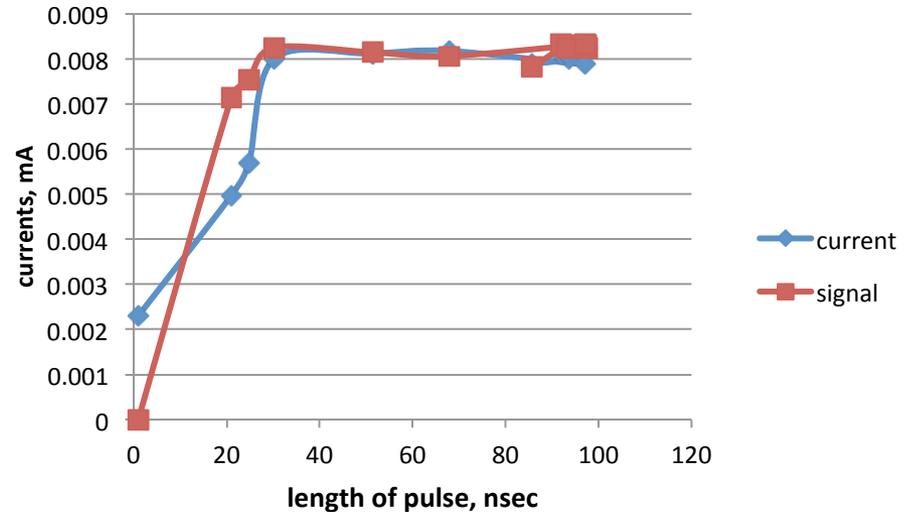
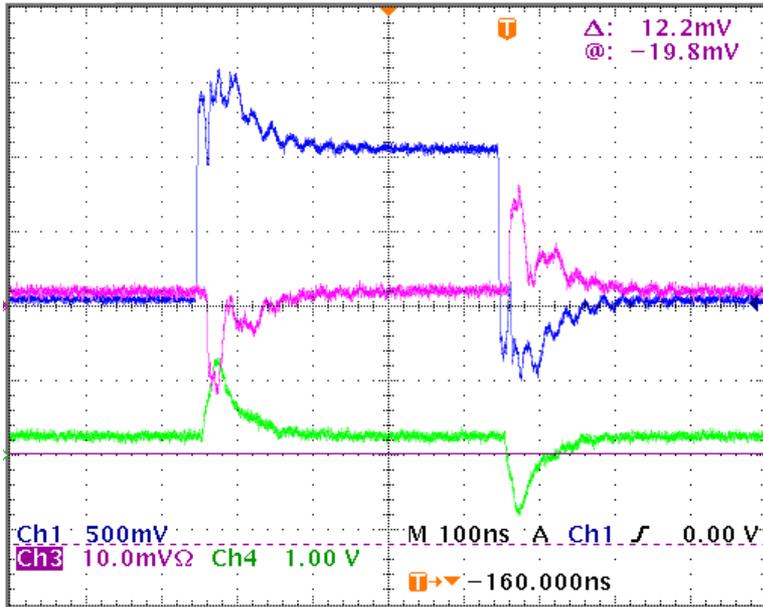
Measured currents vs freq/amplitude



- When length of input signal is more than 50 ns the current calculated from RWCM differs from Ohm's current due to noise in the tube.
- When length of input signal is less than 20 ns its shape changes from square to

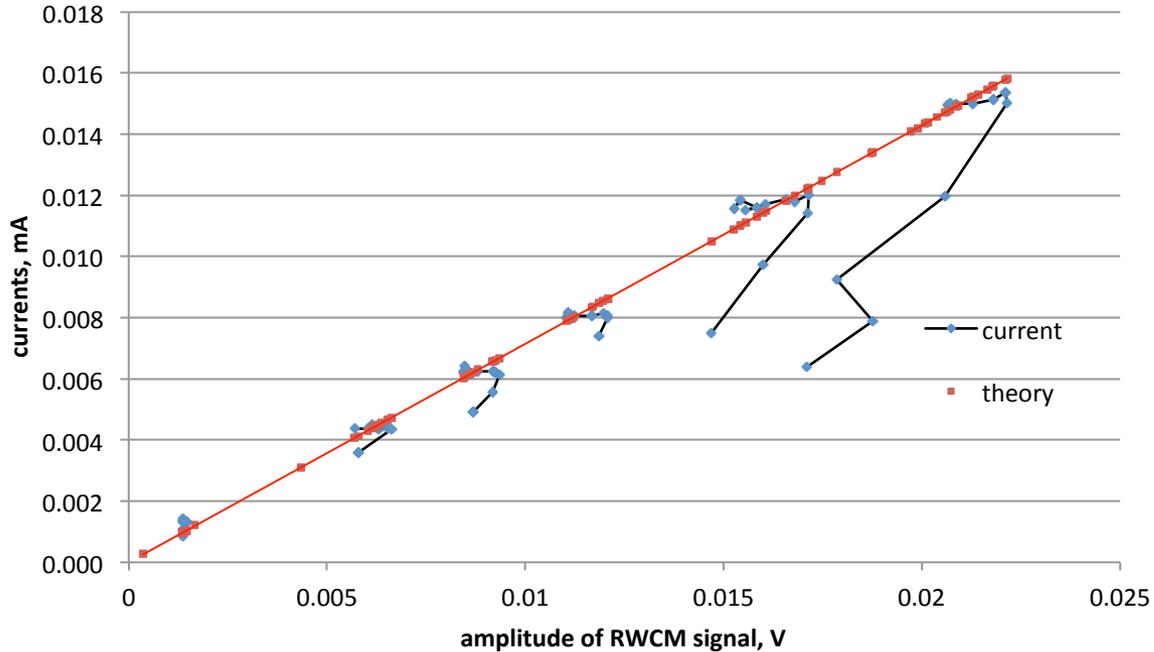


“Long” pulses



Frequency of signal on generator (~1 MHz) doesn't influence on length of signal (~100 nsec)

Measured currents vs freq/amplitude



$$I_{current} (mA) = \frac{U_{shunt} (mV)}{165(\Omega)}$$

$$I_{signal} (mA) = \frac{U_{RWCM} (mV)}{1.4(\Omega)}$$

Different groups of points have different generator's voltage.

Points of signal with length of 30 - 50 nsec lies close to approximation line

Internship goals

- Calibrate resistive wall monitor (with Scientist & Engineer)
- Understand monitor operation
- Prepare a Users Guide
- Participate in SRF Cavity cold operation (as conditions allow)

Thank you for attention!