

Introduction

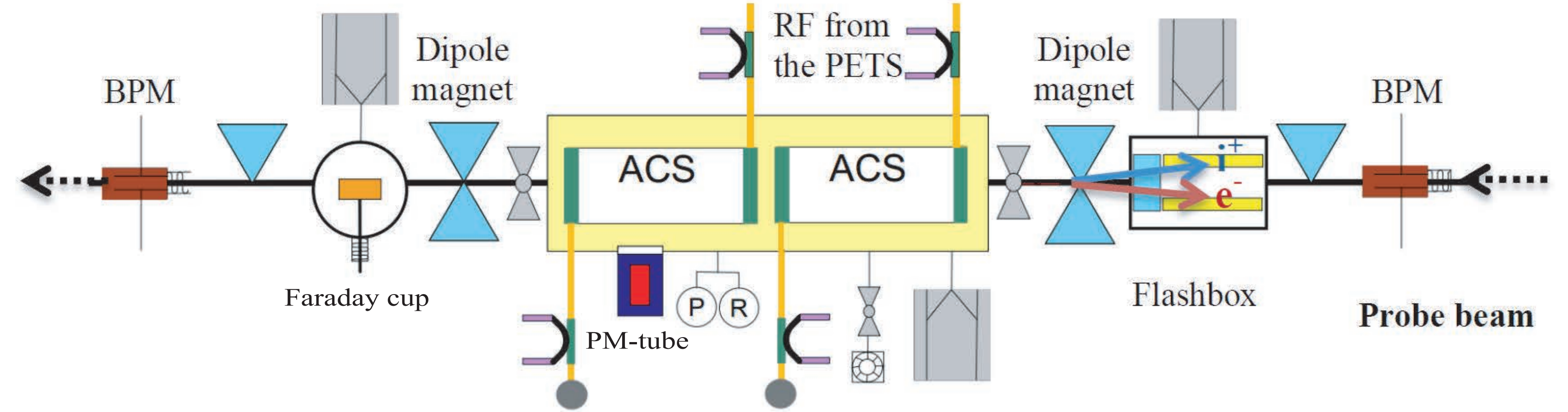
What limits CLIC accelerating structures to sustainably perform at 100 MV/m and above? [1]

What happens in structures when accidental RF breakdowns occur?

Two-beam Test Stand (TBTS) offers an opportunity to study breakdowns in conditions, which are close to the CLIC one.

The Flashbox detector will measure properties of emitted electrons and ions during RF breakdowns.

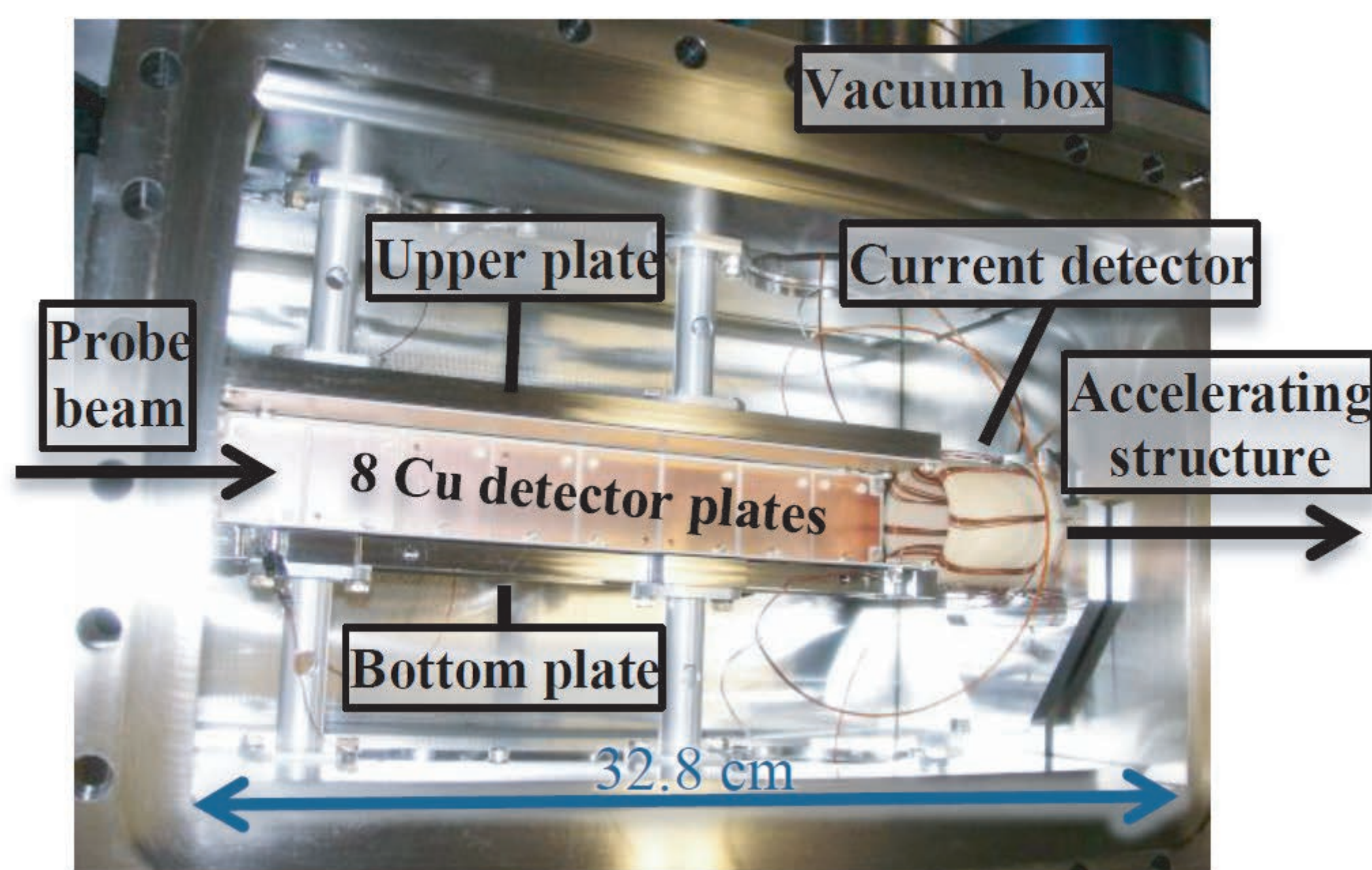
Probe beam line layout



The Flashbox experiment has been set up in the TBTS area [2]:

- * two beam acceleration and deceleration studies;
- * >200 MW power extraction in PETS;
- * up to 150 MV/m accelerating gradient;
- * advanced RF breakdown diagnostics: RF-power, Faraday cup, BPMs, PM-tubes.

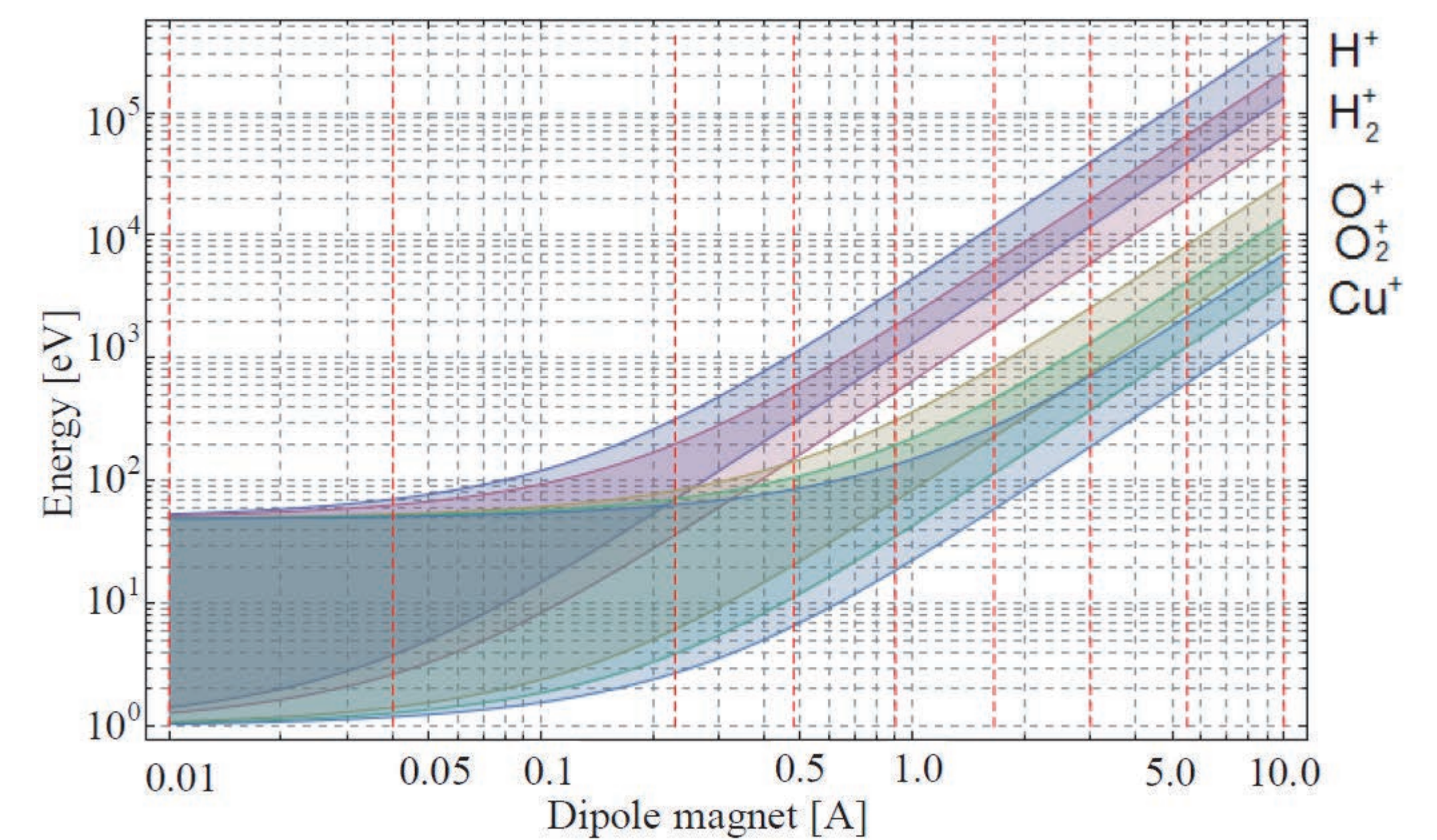
Flashbox detector



Flashbox detects charged particles emitted during RF breakdowns:

- * 8 Cu (for e-) or Ag plates (for ions) that act as charge collectors;
- * low crosstalk between plates (-40 dB);
- * connected to a fast digitizer (bandwidth few 100 MHz);
- * suppression of secondary particles with bias voltage;
- * suitable for the operation when the probe beam is on.

Program of the experiment



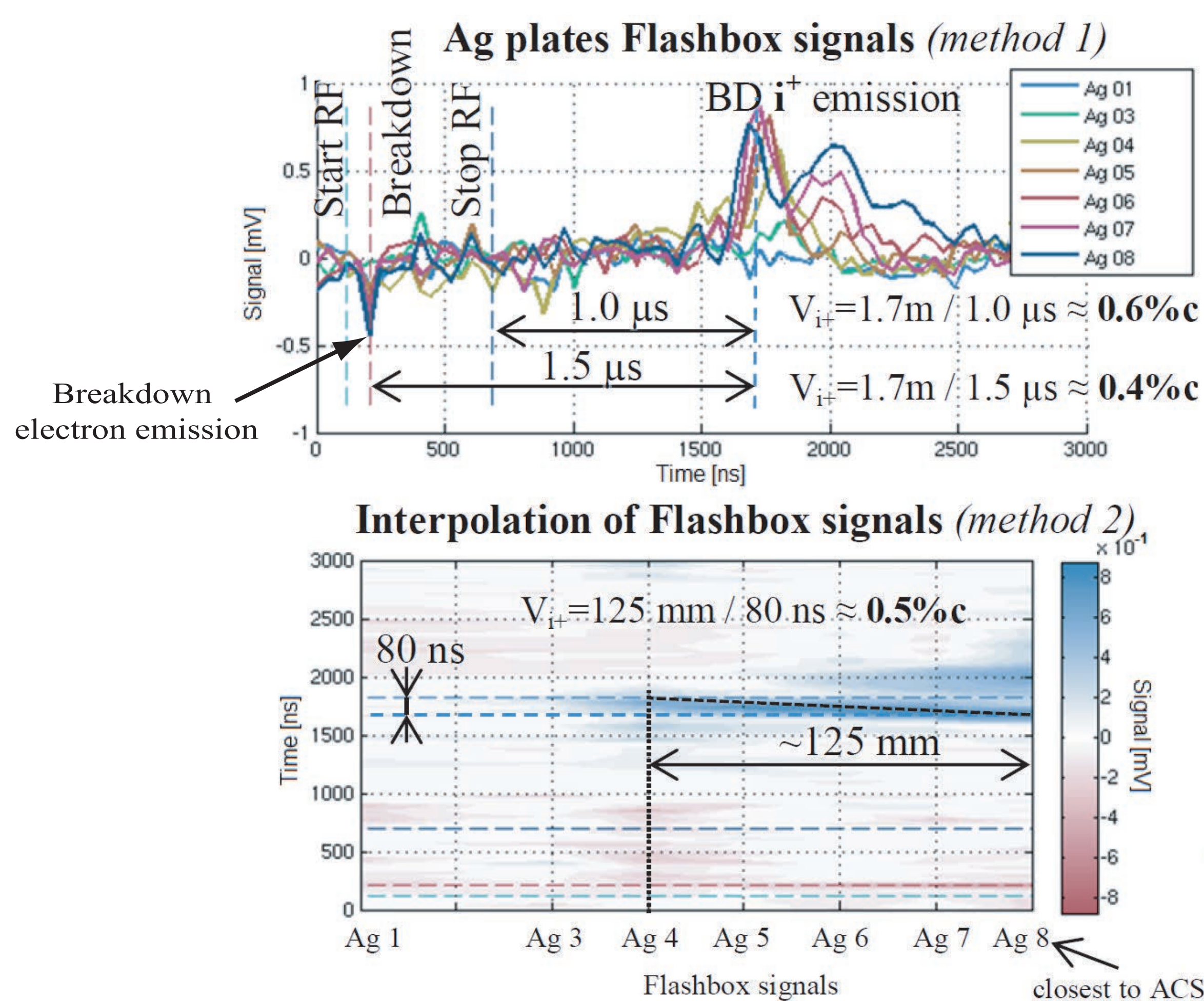
The main aim of the experiment:

- * to find energetic ions;
- * to measure time resolved energy spectra;
- * to measure mass-to-charge ratios;
- * to measure at different initial RF conditions.

The challenge is that:

- * the detectable part of the spectrum is finite
- * the spectrum of breakdowns is not reproducible.

Detected Ions



By now only one type of ions has been detected:

- * the mass-to-charge ratio is between 1.2 u/e and 2.5 u/e;
- * the velocity is between 0.4% and 0.6% of the speed of light;
- * H₂⁺ ions are the main candidates.

Conclusions

- * Flashbox has been developed, installed and commissioned;
- * First spectra of electron emission have been measured in the range between 1 kV and 4MV;
- * The evidence of the H₂⁺ ion emission has been obtained and understood;
- * The program is on-going.

Acknowledgments

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References

- [1] A Multi-TeV linear collider based on CLIC technology: CLIC Conceptual Design Report edited by M. Aicheler et al. 2012.
- [2] W. Farabolini et al., Two Beam Test Stand Experiments in the CTF3 Facility, IPAC11, 2011.
- [3] Walter Wuensch and Sergio Calatroni, private communications, CERN, 2012.
- [4] I. Martini, Master Degree Thesis: Copper for particle accelerators: electron stimulated desorption and study of hydrogen content measurement by laser ablation, Politecnico di Milano, 2011.