TG-10 status report

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on behalf of the TG-10

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GERDA Collaboration Meeting,
Ringberg Castle, 12.02. – 14.02.2007

Overview

- Completed projects
- Ongoing projects
- Future projects
- Majorana / GERDA Joint Monte Carlo Workshop
- Your input is needed

Recently completed projects

- Placement of PMTs for the muon veto — Tübingen
- Validation of MaGe with test stand data (gammas) — Munich
- Studies of the angular correlation between gammas in Co-60 — Munich
- Installation of MaGe in Heidelberg — Heidelberg

Ongoing projects

• (GERDA) MaGe update	all
• Validation of MaGe with test stand data (neutrons)	Washington/Munich
• MaGe reference paper	all
• Easy geometry implementation	LNGS
• Muon veto efficiency	Tübingen
• Calculation of radioactivity limits for Phase I	Moscow
• MaGe documentation	Washington/Munich
• Bench mark processes	Washington/Munich

Ongoing projects: MaGe Update

- **Geometry:**
  - Infrastructure → Beams, clean room, lock, ...
  - Water tank → final geometry needed
  - Cryostat → final geometry needed
  - Detectors → Phase I detector geometries needed (database?)
    → Define reference arrays (Phase I and II)

  → Drawings accessible to TG 10?

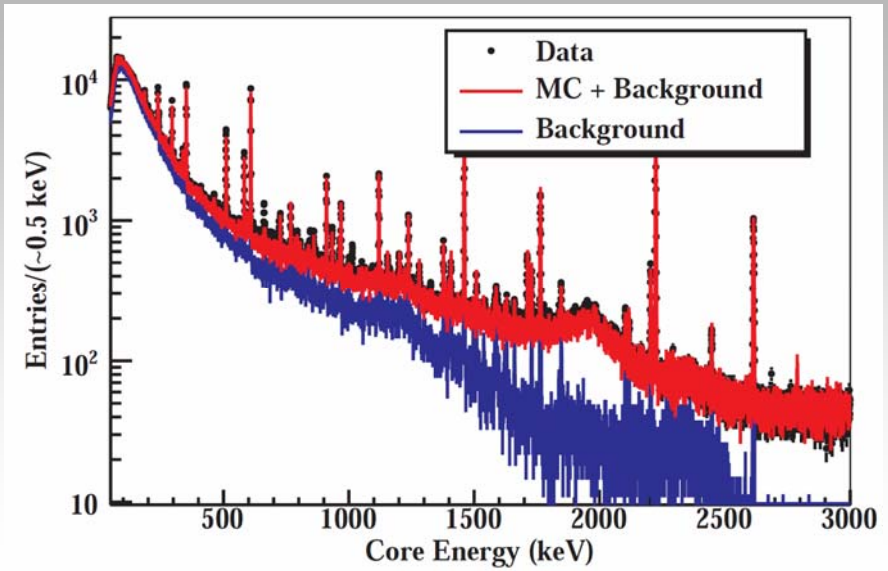
  → Materials (and thus activities) fixed yet?

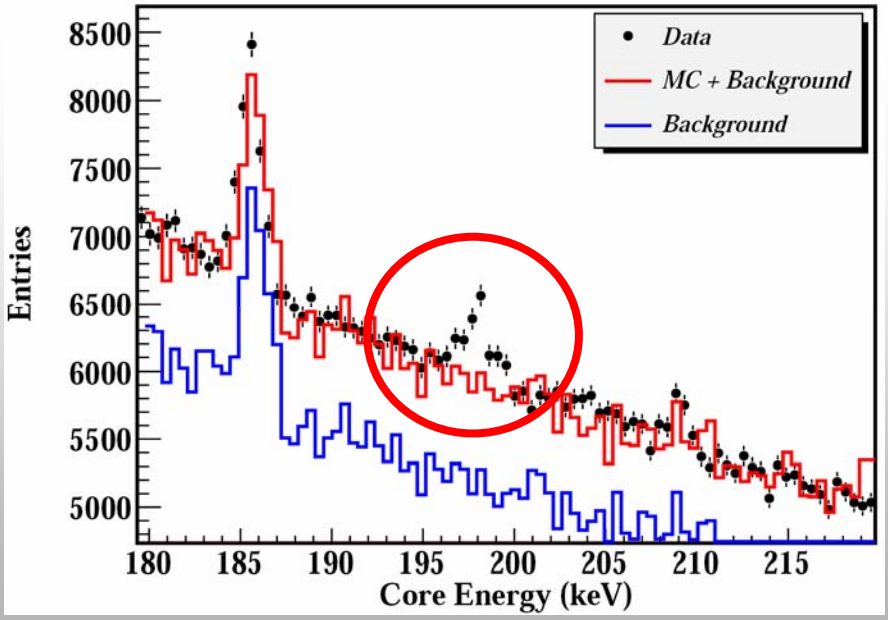
- **Physics lists, technical details**

- **Documentation:**
  - MaGe user‘s and developer‘s guide

Ongoing projects: Validation with test stand data (neutrons)

- Data taken with an 18-fold segmented detector and an AmBe source
- Identification of lines is ongoing
- MC plus background describes most of the features in the spectrum
- Some lines are not described in GEANT4 (meta-stable states)
- Work with neutron data also performed by Majorana





Ongoing projects: MaGe reference publication

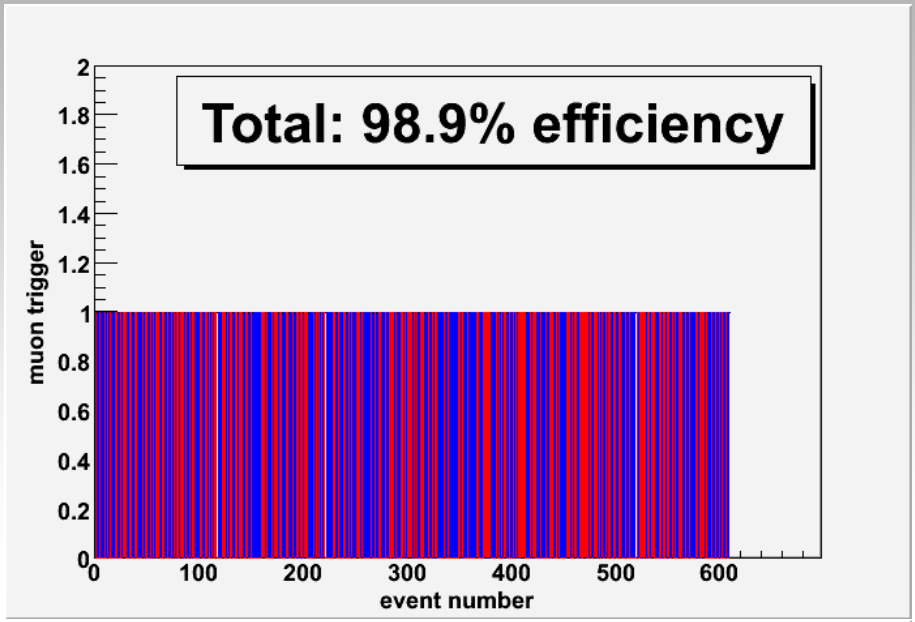
- **Aim:** MaGe reference
- Together with Majorana MC group
- GERDA participation: Tübingen, LNGS, Munich
- **Topics:**
    - Scope (double-beta decay and related)
    - Structure of MaGe (flexibility)
    - Physics validation
- Journal: IEEE

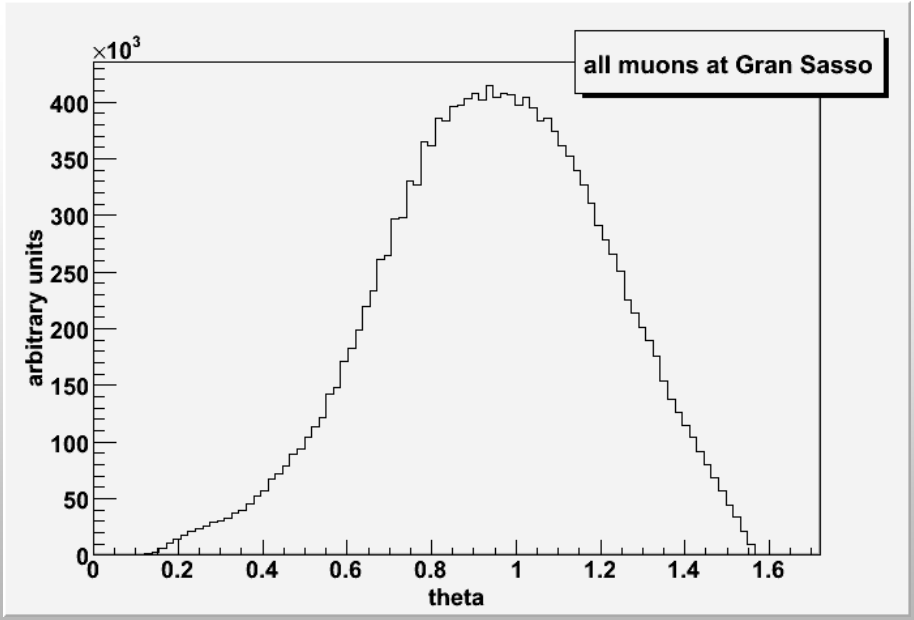
Ongoing projects: Easy geometry implementation

- Triggered by material screening group
- New feature: define materials and (simple) geometries from external file, i.e. no re-compiling necessary.
- New feature: new output scheme for detector efficiency calculation
- Manual and test macros available (CVS)
- Test of GDML (more general database) planned
- Further details in the MaGe Workshop

Ongoing projects: Muon veto efficiency

- Calculation of the muon veto efficiency ongoing
- Efficiency of 98.9% obtained with Cherencov detector and scintillator
- Data base of *dangerous muons* is being build up
- Geometry of scintillator plates to be updated during general MaGe update





Ongoing projects: Calculation of radioactivity limits for Phase I

- Calculation of background from suspension and crystals for Phase I
- Assumptions: 9 Phase I crystals

  liquid Argon

  Anti-coincidence analysis
- Allowed activities A for 10^{-3} counts/(kg·keV·y):

Part	Mass [kg]	A(^{238}U) [μBq/kg]	A(^{228}Th) [μBq/kg]
Crystals	18.0	0.13	0.4
Argon	88605.0	1.8	0.4
Holder	1.1	55.6	10.1
Electronics	0.6	≈8000	≈500

Planned projects

- **Monte Carlo campaign with updated geometry:**
  - Estimate of expected background
  - Signal efficiencies for physics processes (0νββ, 2νββ, ...)

  → Major effort in the next months

  → Create reference background table for GERDA

- **Pulse shape simulation:**
  - Extra software package with interface to MaGe
  - Development together with Majorana MC group

- **Simulation of test stands and auxiliary experiments:**
  - Monte Carlo validation

- **Joint Majorana / GERDA Monte Carlo Workshop on MaGe**
  - Majorana and Gerda participation (about 25 participants)
  - Monte Carlo validation – Data to Monte Carlo comparisons
  - Technical issues (code design and development, organization, release policy, ...) and documentation
  - User‘s input
  - Discussion of development of pulse shape simulation
  - MaGe ↔ GEANT4 ↔ ILIAS connections

Your input is needed

- **If you did work related to Monte Carlo please let TG-10 know.**
  - Communication is improvable, please help
- **We would like to have input from users:**
  - Do you have problems running MaGe, let us know.
  - Are there features which you´d like to see in MaGe, let us know.
  - Are there any changes in the hardware design, let us know.
  - Is there data which does/does not agree with MC, let us know.