

FTK

*Fast TracKer for hadron collider
experiments*

324318, FP7-PEOPLE-2012-IAPP

Deliverable D8.2:

CAEN Training Event – July 29th 2013

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Insert here a short description on the contents of this document.

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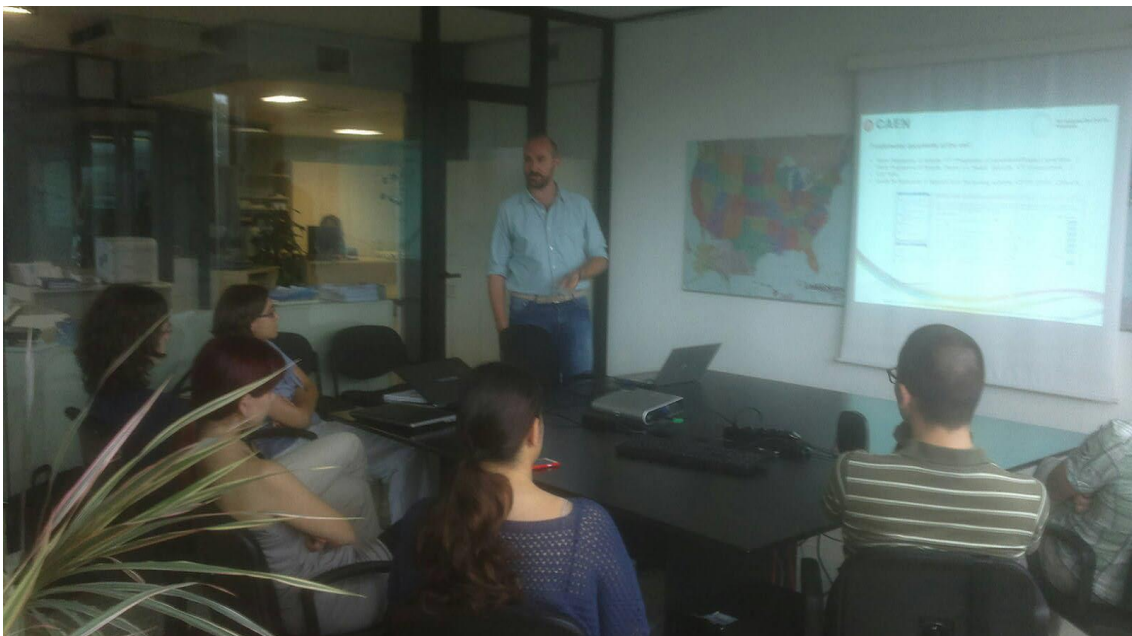


Figure 1: A photo during the CAEN training event



1 Agenda of the event

- *14.30 – 14.45:*
Stefano Petrucci – Marketing Manager and Chief of Innovative Project Division at CAEN

Opening of the Training Event and introduction to the talks

Chair of the session: Stefano Petrucci

- *14.45 – 16.45*
Alessandro Iovene – Project Manager at CAEN
EU Collaborative Projects: How to build up a successful project proposal for the European Framework Programme

- *16.45 – 17.00*
Coffee Break

- *17.00 – 17.45*
Marco Locatelli – Field Application Scientist at CAEN
Workshop on CAEN Silicon Photomultipliers Educational Kit

- *17.45 – 18.30*
Claudio Raffo – Chief of R&D Division at CAEN
The CAEN experience at CERN for the development of custom electronics for the LHC experiments

- *18.30 – 18.40:*
Stefano Petrucci – Marketing Manager and Chief of Innovative Project Division at CAEN
Closing of the session and of the Training Event



2 EU Collaborative Projects: How to build up a successful project proposal for the European Framework Programme



Electronic Instrumentation

Alessandro Iovene
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How to build-up an FP7 COOPERATIVE PROJECT

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A typical FP7 project lifecycle PROPOSAL WRITING



<http://ec.europa.eu/research/participants/portal/page/home>

List of FP7 Calls

- Open
- Closed
- Forthcoming

List of FP7 Programmes

Call Identifier	Call Title	Publication Date	Deadline
FP7-KBBE-2013-FEEDTRIALS	FEEDTRIALS KBBE 2013	2013-06-28	2013-10-01

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Fundamental documents of the call:

- Work Programme of Specific FP7 Programme (Cooperation/People/Capacities/...)
- Work Programme of Specific Theme (i.e. Health, Security, ICT, Environment,...)
- Call Fiche
- Guide for Applicants (it depends from the funding scheme: CP-FP, CP-IP, CSA-CA,...)

Information Package Key documents required for the preparation of your proposal

In order to receive a complete Information Package for this call (call text, work programme, guide for proposers, etc.), you will need to choose which files you would like to download from the list below. Single file selection is downloaded uncompressed, while for multiple selections, you need a utility capable of opening the ".zip" format

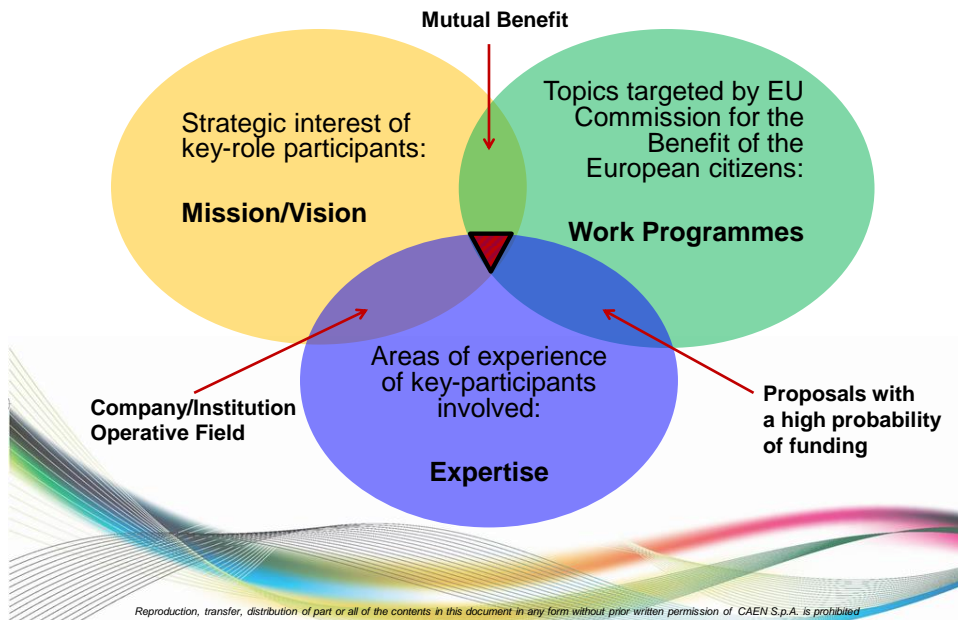
Click to download file Select language

Cooperation Work Programme 2013 - General Introduction	English
Call Fiche	English
Work Programme 2013 - Information and Communication Technologies	English
Guide for applicants (Collaborative projects, Large-scale integrating projects - IP)	English
Cooperation Work Programme 2013 - General Annexes	English
Guide for applicants (Coordination and Support Action, Coordinating - CSA-CA)	English
FP7 Factsheets	English
Guide for applicants (Coordination and Support Action, Supporting - CSA-SA)	English
Guide for applicants (Combination of Collaborative project and Coordination and support action - CP-CSA)	English

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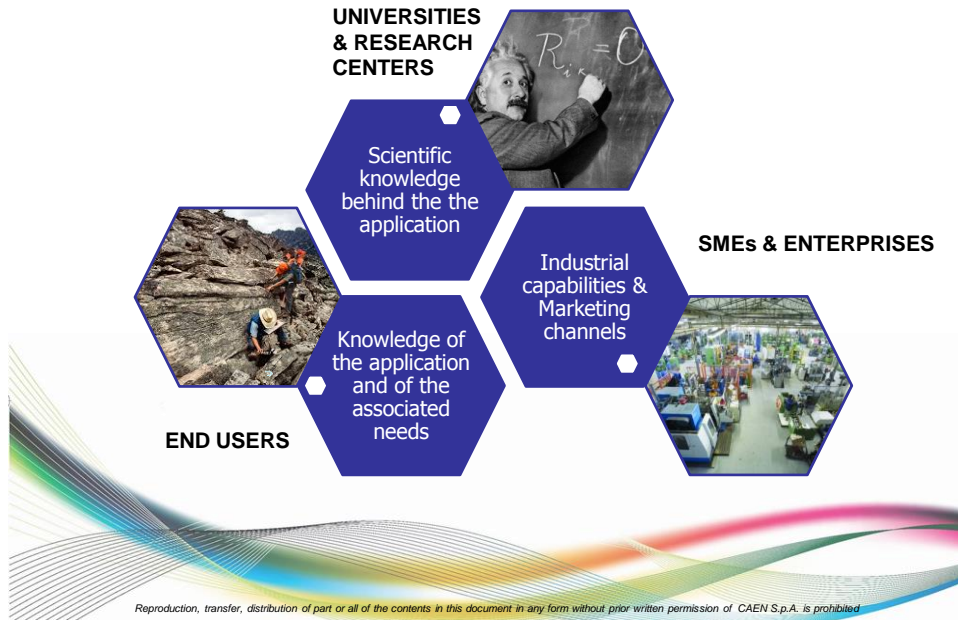


Select the call which fits as best as possible the law: «What I would like (and I'm able!) to do – What is needed by EU



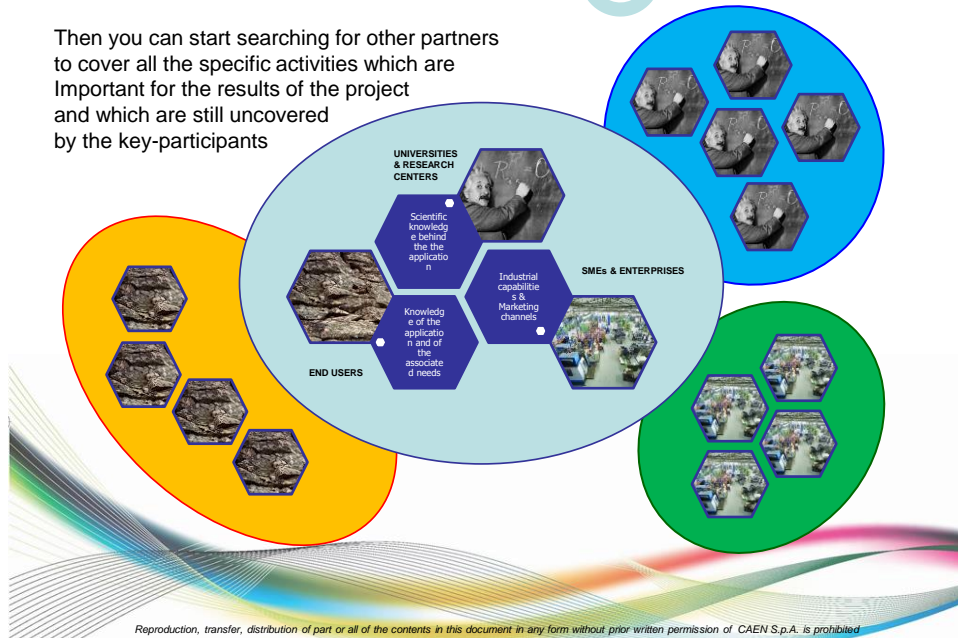


Build up the party with the key-role participants



Search for specific partners to cover the tasks which cannot be covered by the party

Then you can start searching for other partners to cover all the specific activities which are Important for the results of the project and which are still uncovered by the key-participants

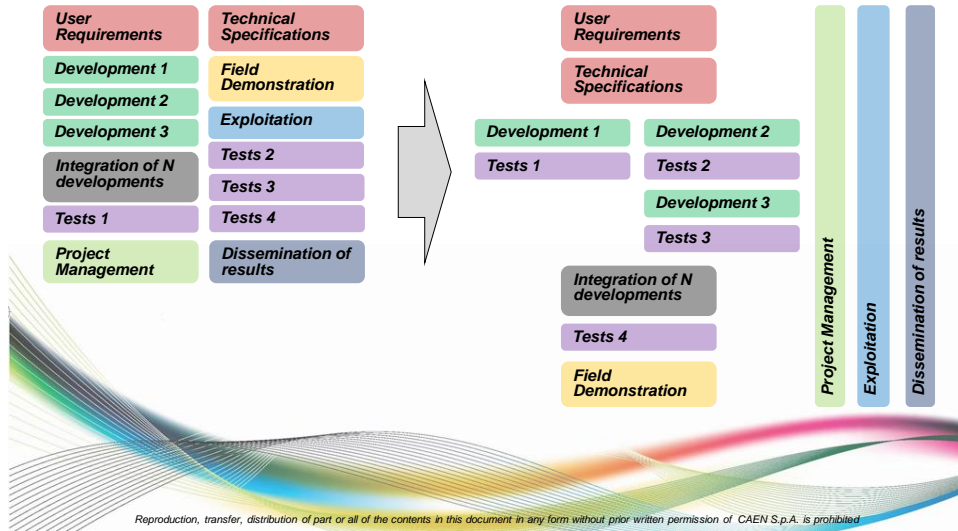




Draft the list of activities, the project structure, the timing, the budget,...

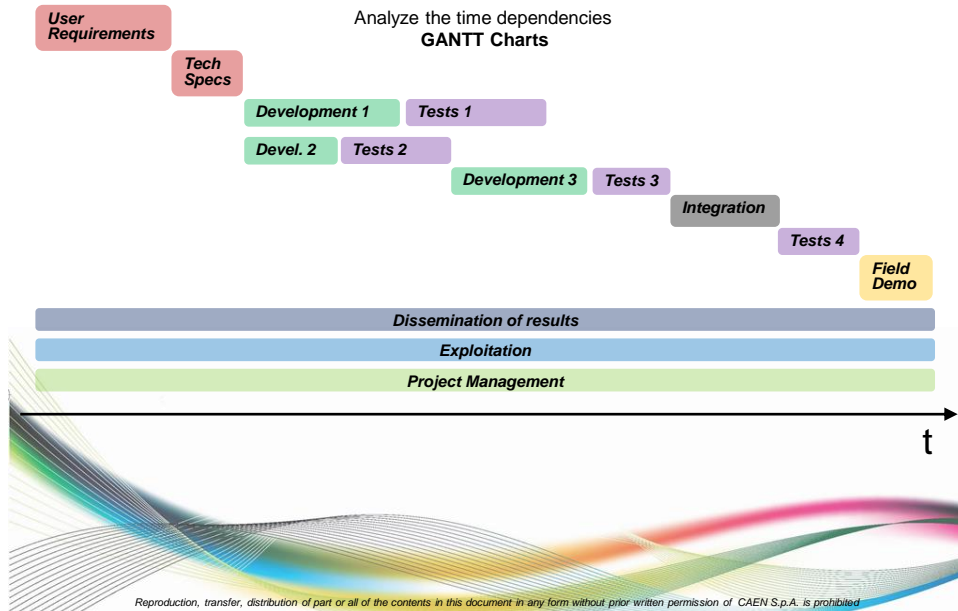
Split the work in a list of activities
Work Breakdown Structure (WBS)

Analyze the relationships
PERT Diagrams



Draft the list of activities, the project structure, the timing, the budget,...

Analyze the time dependencies
GANTT Charts

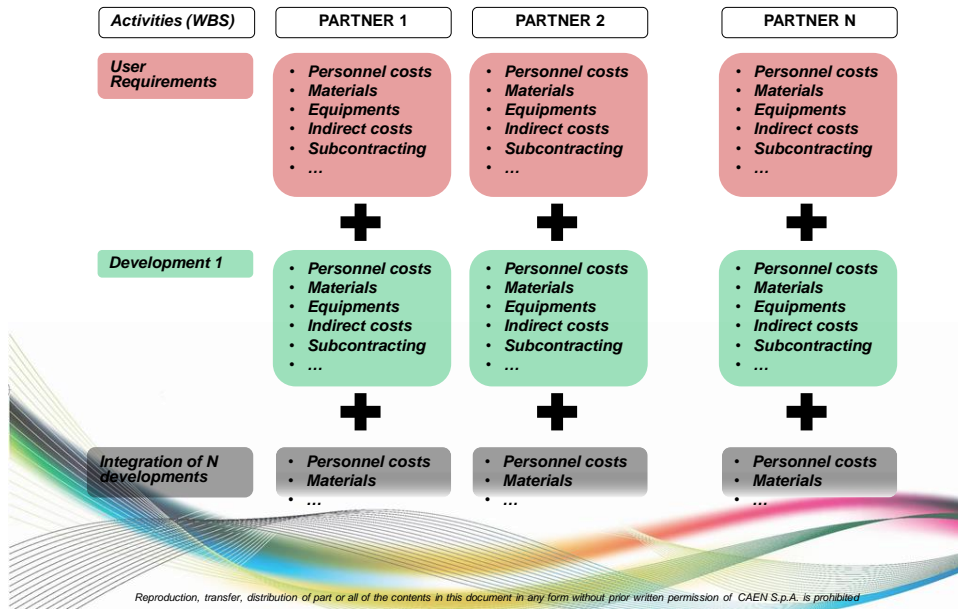




Draft the costs
Budget



Draft the list of activities, the
project structure, the timing, the
budget,...

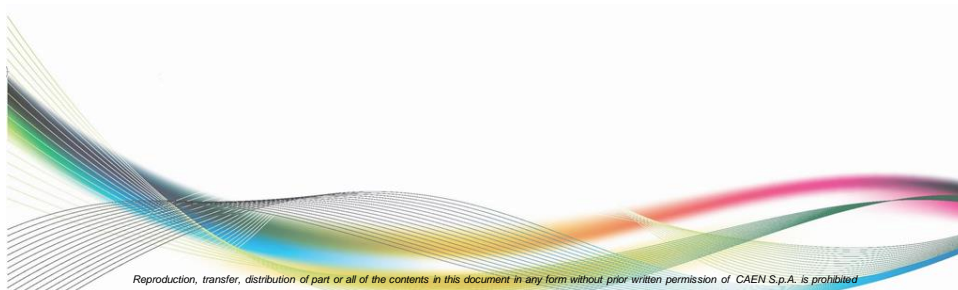


Manage the «bureaucracy» (EPSS,
PIC, LEAR, Financial Checks,...)

During the proposal preparation, the coordinator and the participants have to manage some bureaucracy:

- Registration of each participant in the EU Participant Portal
- Appointment of the LEAR (Legal Entity Appointed Representative)
- Financial checks of the participant
- Tables to be filled in the Proposal submission page (EPSS)
- ...

The good news is that many of this boring things need to be done only for the first time that an entity participates to FP7.



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Write the project proposal
involving all partners

Now it's the time to start drafting the project proposal!

EU provides to the participant a proposal template to be followed; the specific content of the template depends from the FUNDING SCHEME used for the call (CP-IP, CP-FP, CSA-CA, CSA-SA,...).

In the next slides we will refer to CP-FP, which is the typical funding scheme used in «small» collaborative projects.

The proposal is divided into 3 main sections:

- 1) Scientific and/or technical quality, relevant to the topics addressed by the call
- 2) Implementation
- 3) Impact

These 3 sections are one-to-one matching with the 3 evaluation criteria used by the independent reviewers to assign a score to the project.

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Write the project proposal
involving all partners

1) Scientific and/or technical quality, relevant to the topics addressed by the call

- The idea behind the project and the project objectives
- The state-of-the-art in the field and the progress beyond the state of the art that the project aims to achieve
- The scientific/technical detailed description of the proposed technology, explaining in details where are the key innovative features
- The benefits of the proposed technology
- The S/T methodology and the associated work plan:
 - GANTT Chart, showing the time planning
 - Detailed Work Description of each WP (WP Objectives, WP DoW, who do what?, Deliverables of the WP, Milestones of the WP)
 - PERT Diagram
- Risks and contingency planning

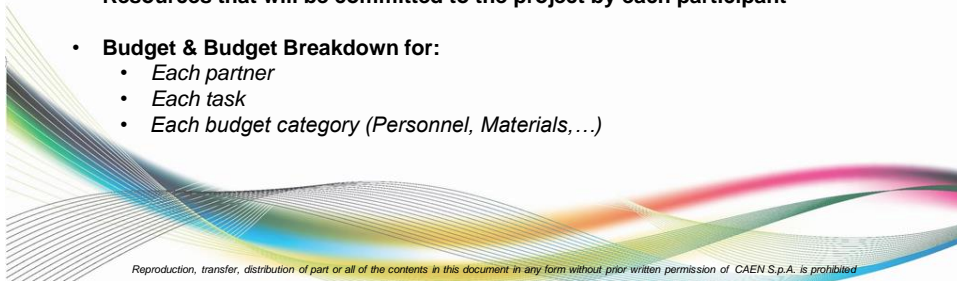
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Write the project proposal
involving all partners

2) Implementation

- **Management structure that will be implemented in the project**
 - *Hierarchical definition of the project boards (i.e. Steering Committee, Scientific Board, Exploitation Board, Advisory Board,...)*
 - *Relationship between boards*
 - *Decision Mechanism*
- **Individual Participants CVs**
- **Consortium as a whole** (the previous expertise matured during other projects/collaboration of the key participants)
- **Resources that will be committed to the project by each participant**
- **Budget & Budget Breakdown for:**
 - *Each partner*
 - *Each task*
 - *Each budget category (Personnel, Materials,...)*



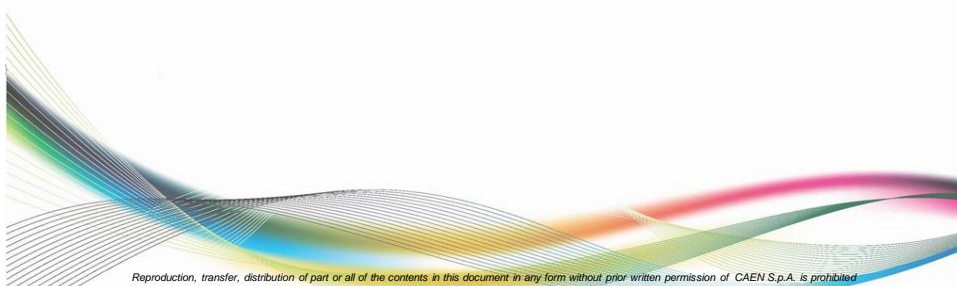
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Write the project proposal
involving all partners

3) Impact

- **Expected impacts of the project matching the expected impacts listed in the work programme**
- **Dissemination / Exploitation of project results**
- **Intellectual Properties management**
 - The background IP
 - The foreground IP
 - The Consortium Agreement



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Write the project proposal
involving all partners

In addition to the 3 main sections, other 2 specific sections have to be addressed:

• **ETHICS**

How the relevant ethic issues of the proposed project (if any) have been addressed?

- Informed Consent (involvement of childrens, patients, healthy volunteers,...)
- Research on Human embryos/foetus
- Privacy
- Research on Animals
- Research involving developing countries (use of local resources/benefit of the local community)
- Dual Use (potential military/terrorist application)

• **SECURITY**

How the relevant security sensitivity issues of the proposed project (if any) have been addressed?

- Security Sensitive Information / Classified documents

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Write the project proposal
involving all partners

The Part B of the proposal now is finished!

Only few notes on Part A (EPSS tables):

- Check carefully the information provided by each partner
- Check carefully that the option for indirect costs chosen by each partner is the same as the basis used for budget
- Fill the budget tables with the total amounts
- Check that eligibility rules are fulfilled
- Upload the Part B

Then...

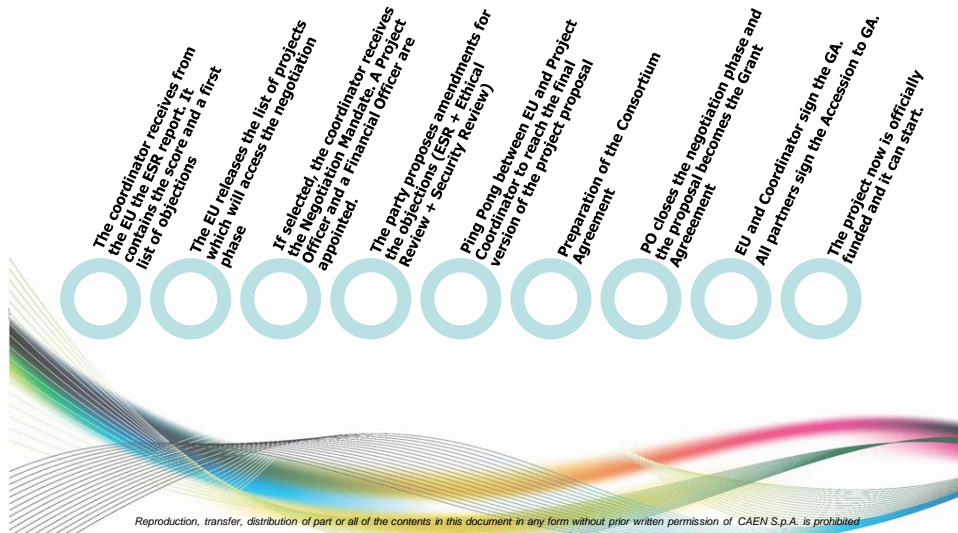


Send the proposal and cross
your fingers

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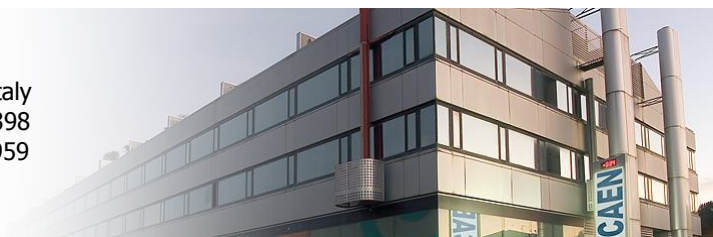


A typical FP7 project lifecycle NEGOTIATION PHASE



Electronic Instrumentation

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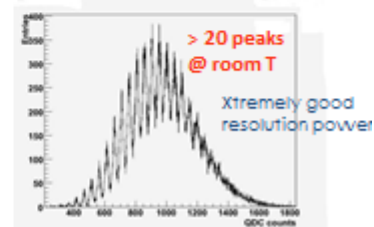
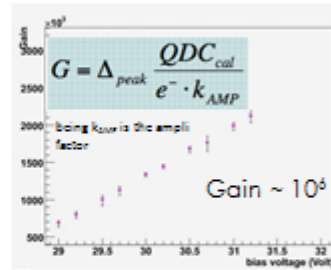
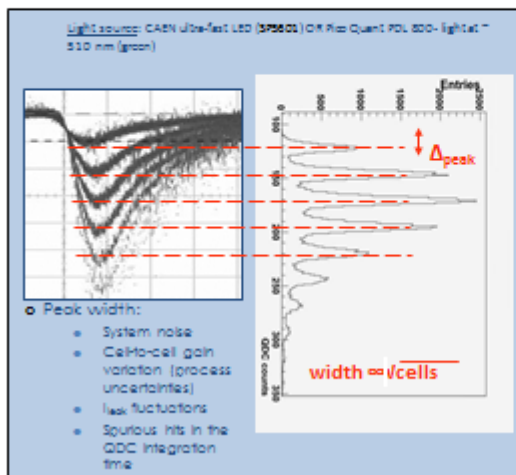


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3 Workshop on CAEN Silicon Photomultipliers Educational Kit

Photon Spectrum & Gain



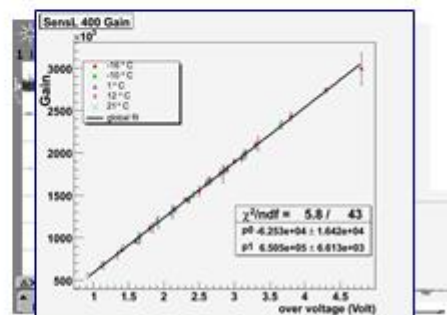
The General Purpose Amplifier

[data and figures refer to the final product]



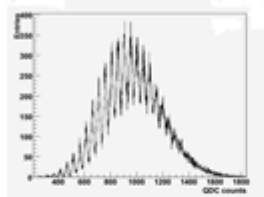
- 2 channel mother & daughter architecture
- every channel features a 2 stage amplification [500 MHz bandwidth, tunable gain up to ~ 50 db]
- active feedback control on V_{bias} for Gain stabilization (0.1 $^{\circ}C$)

A 3 plot qualification:





The FAST LED, an essential tool for sensor testing

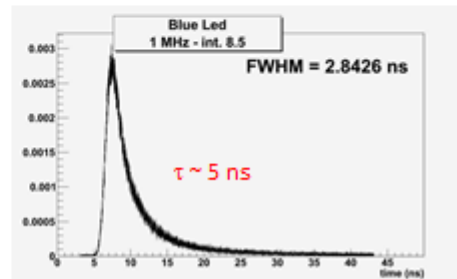


... and for your advertisement multi-photon peak spectrum (something like the LHC Media Event)

Reference LED:

- ❖ $\lambda_{peak} = 420 \text{ nm}$
- ❖ peak current 120 mA
- ❖ luminous intensity = 9500 mcd @20mA
- ❖ 30° half-view angle

Single Photon Timing spectrum

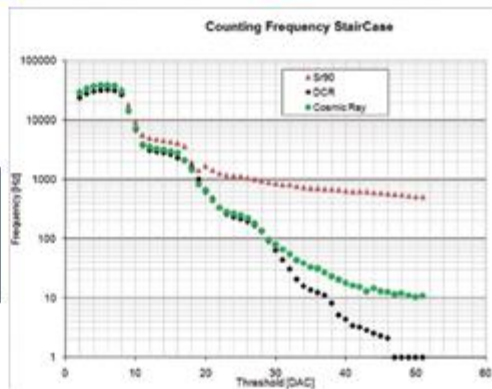
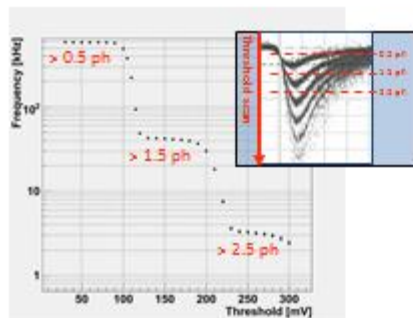


The Cosmic (ray) Tile



- ❖ 100 x 100 x 10 mm³ plastic scintillator tile
- ❖ w/ fiber => 2 channels in coincidence

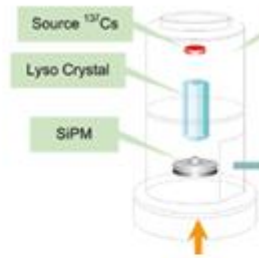
Count rate in coincidence =>



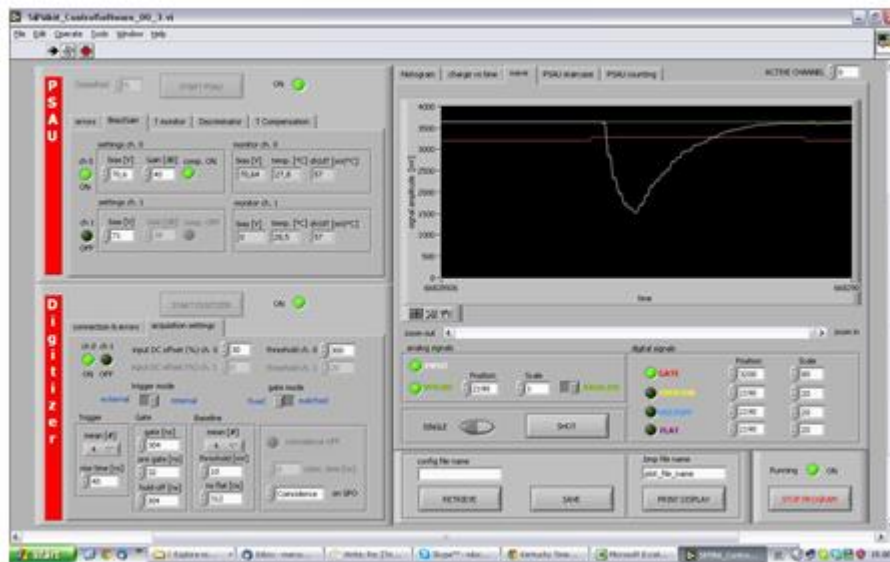
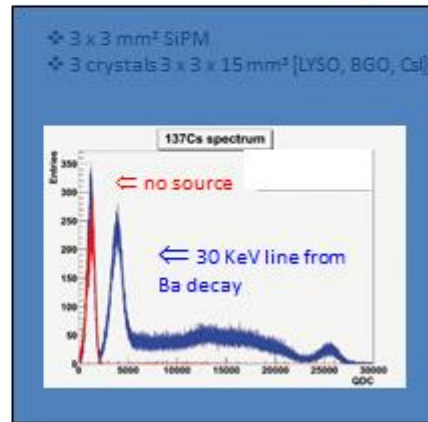
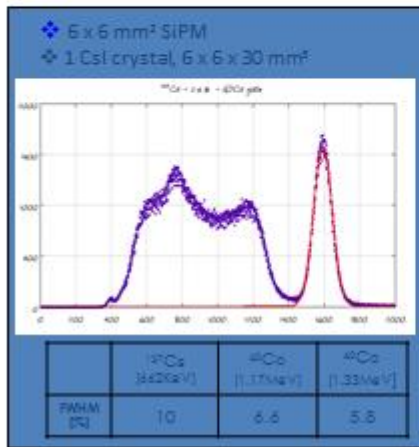
← Single channel Dark Count Rate



The Gamma Ray Spectrometer



Two basic configurations, oriented to EduApplications:





4 The CAEN experience at CERN for the development of custom electronics for the LHC experiments

www.caen.it



CAEN
Tools for Discovery

The CAEN experience at CERN for the development of custom electronics for the LHC experiments



FTK CAEN Meeting
Viareggio, July 29th 2013



CAEN
Tools for Discovery



LHC e CAEN

- LHC accounted for CAEN a real revolution, which has challenged the company in every department
- In CAEN LHC has had a strong impact in the specific areas of design and production, and in the more general business organization
- The ISO 9001 certification obtained by the company as early as 1998 was a good starting point
- It can be said that the LHC was a perfect test for verifying and improving internal procedures, as well as to increase the know-how

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Where we are

Solingen, DE

Headquarters

Branches

San Francisco

New York

Orlando

Viareggio

Isola d'

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CAEN Network's Companies

CAEN SpA

CAENqS
build security • awareness

CAENels
Center For Science

CAENRFID
THE ART OF IDENTIFICATION
RFID

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CAEN briefly

- **CAEN SpA** has been founded in 1979
- Headquarter **Viareggio (LU)**
- Test facilities in Elba island, sales offices in USA (New York, S. Francisco, dal 2005) and Germany (Solingen, dal 2006)
- *Core business*: Power Supplies and Read out Electronics for Experimental Physic (World leader)
- Other group companies: RFID (2006), CAEN EIs (2009), CAEN QS (2012)

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Products



- CAEN catalog includes more than 250 entries



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LHC and CAEN: a decades of Research & Development

- The involvement of CAEN in LHC was in the **design, manufacture and supply of HV and LV power supplies** to many sub detectors of the 4 Experiments
- The phase of research & development began in the second half of the 90s and ended around 2003 to 2004
- The challenges faced and overcome:
 - The "hostile environment"
 - The harmonization of the different user requirements to be implemented in a consistent line of products
 - Special requests of some users (Alice TOF; Atlas Trigger; CMS DT, ECAL e Tracker)

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The "hostile environment"

- The specifications written in the various tender required that the power supplies worked in the so-called "hostile environment", i.e. in the presence of radiation and magnetic field, but making use of electronic components "off the shelf" (reduction of costs of wiring PS-Detector, but without having to use *space grade* versions)
- These special requirements have meant that we could not use the standard catalog products, but we have been forced to design new electronic, based on knowledge coming from literature
- The validation of the solutions was carried out by performing joint testing with users at facilities such as the center of the ENEA Casaccia, or accelerators of the University of Louvain-La-Neuve and Uppsala

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The need of a new product line

- By analyzing the requirements of various sub detectors, and crossing them with the demands of "hostile environment", it emerged that it was not possible to propose an ad hoc solution to everyone, but that it was necessary to define a new line of power supplies with the following characteristics:
 - Be able to work in "hostile environment"
 - Modularity
 - Be able to manage HV and LV modules
 - Hardware and software integration with the standard in the field of CAEN power supply for detector: the system SY1527
- It was therefore proposed the EASY system (**E**mbded **A**ssembly **S**ystem), which was born in early 2000 as the culmination of a period of research and development which took a decade

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The EASY System 1 / 2

- The official presentation has been done at CERN in May 2003
- It took a couple of years before we were able to give the first samples to final users so to let them the opportunity to make a qualification
- In the meantime we have carried out the "hostile environment" tests

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The EASY System 2 / 2

- The EASY system is thus the end product of a long period of research, and we can say that CAEN was the only company willing to invest heavily in this particular area
- The EASY system has proved successful, and has been adopted in a large extent, especially in Atlas and CMS
- The ability to manage LV modules also allowed the company to expand its offerings beyond traditional HV power supplies
- An accurate analysis of the requests of the users has given rise to a rather limited set of modules, avoiding an unnecessary proliferation of different modules but very similar to each other
- About LV, was particularly interesting the 12 channels of 45W of power, absent in the catalog of the main competitors, which led to the award of a major tender

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Special requests of some users

- The EASY system has been successfully proposed to the majority of users who have appreciated the advantages of standardized product, so sharing the same types of modules with other users and having a single control system
- But some sub detectors (CMS DT, ECAL, Tracker and Alice TOF) had so special requirements to bring to an *ad hoc* solution
- CAEN finally was awarded these important contracts by offering custom solutions, obtained by creating specific power supplies that meet the specific demands of these sub detectors
- However, we have maintained the standardization of control interfaces, so as to insert these "special" modules also within the standard control of the experiments

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The production phase

- The LHC production was added to the standard CAEN production (Catalog products) and saw the company involved for a period of 5 years: **2004-2008**
- Can be identified two distinct phases
- The first phase: **2004-2006** have boost production of 30% roughly and has been bear without shock
- The second phase: **2007-2008** has "de facto" doubled the standard production level in CAEN

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The 2007-2008 phase of the production (Blood and tears)

- The maximum productive effort and organization was therefore required for the phase 2007-2008, in which we were obliged to concentrate in 2 years what the structure was able to produce in 4
- We came to that knowledge in the autumn of 2006, when it emerged that all the delays that had accumulated up to that point would not be absorbed by a further *shift* in the start of the LHC, scheduled for September 2007
- In other words, we were required to produce in less than a year what the company was able to do, in theory, during 4 years!!
- The meeting at CERN with all the experiments responsible in October-November 2006 touched moments of drama: CAEN had become a critical point in the schedule of the LHC ...

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The 2007-2008 phase of the production (Countermeasures)

- The company reacted at its best, especially in autumn 2006:
 - Were identified and qualified new suppliers for the assembly of electronic components
 - It was selected and hired additional staff to the phases of integration, testing and packing of all the material
 - Were rented premises to manage the testing and storage of electronic components

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The 2007-2008 phase of the production (CAEN proposal to Experiments)

- We made a delivery plan realistic and feasible, and with this plan we went to CERN for an official meeting with the experiments in December 2006
- The plan exposed in an Excel spreadsheet production capacity of CAEN on a monthly basis, module by module
- The plan was that by 2007 it would have been delivered enough material to feed all the detectors, even if not 100%, so that if the start of the LHC was confirmed in the autumn of 2007, everyone would be able to take data
- Deliveries would have been concluded anyhow in 2008

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The 2007-2008 phase of the production (The agreement on the schedule)

- To implement the plan it was mandatory that the experiments:
 - Approve the *schedule*
 - Agree between them, staying with CAEN production capability, who will receive what, on a monthly base
- Before Christmas 2006 we received the green light
- A round table has been implemented where the Experiments electronic coordinators, CAEN and the CERN Pool responsible would meet
- Each month, on each delivery to CERN of CAEN modules, there will be a meeting, so to verify step by step the respect of the agreed share between detectors

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The 2007-2008 phase of the production (contingencies and chances) 1/2

- The 2007-2008 phase took place as planned and agreed. Deliveries of PS ended in June
- To date in the history of CAEN it is without doubt the most intense period, both for the effort made by all the experts, both for the pressure which the company was submitted by the user community
- In spring 2007, the development of the accelerator LHC suffered a setback, and in fact the start of the beams was delayed one year, from September 2007 to September 2008

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The 2007-2008 phase of the production (contingencies and chances) 2/2

- In Autumn 2007, CERN, on behalf of the experiments, organized an audit of the processes of design and production of CAEN to make sure that the deliveries of the material would continue on a regular basis, and that the phase of integration and testing of the power supplies was matching the criteria of quality required
- Has been a 2 days very intense where CAEN divisions were subject to "X rays"
- The visit ended with the full recognition by the CERN experts of the validity of the CAEN activities, even and especially in light of the complexity of the processes involved (somebody spoke of "logistic nightmare")

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The last chapter of the story

- The LHC "adventure" for CAEN has finally ended (for now?!?) with the assignment to the company's of the CMS Crystal Award in March 2009

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CAEN & LHC Experiments



1998 – 2008

SYNERGY for SUCCESS

CAEN has received the **"CMS Crystal Award of the year 2009"** for the development and production of the power system for the CMS Tracker.

- Detector subdivided into 1994 Power groups
- HV (0=600V) for silicon strip detector
- LV (1.25V - 2.5V) for FE electronics
- $I_{tot} > 15$ kA
- 139 crates / 29 racks / 1200 Power Supply Units



LHC & CAEN: some numbers

- During the LHC production phase:
 - 6.500 electronic modules build of:
 - 190.000 PCBs
 - 24.000.000 components
 - 71.000.000 soldering points

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Conclusions

- LHC accounted for CAEN a real revolution, which has challenged the company in every department
- It can be said that there was a CAEN "before LHC" and there is now one "after the LHC"
- The company is out of this adventure strengthened and with a greater awareness of its capabilities
- We are ready to face new technological challenge

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Grazie a tutti ! 😊

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