FRont End Electronics, Data Acquisition and Control

FREEDAC

To pool resources for a common strategy towards the next generation Electronics Systems for the Nuclear Physics Community

dapnia

cea

saclay

Ljubijana May 2008

Emanuel Pollacco CEA Saclay

History: FREEDAC

N.B.
JRA vs non-JRA

Call for LoI at GSI/FAIR
MANDATE
GSI² & GANIL

Call for LoI at GANIL/SPIRAL2
LEGNARO

Call for LoI for FP7
Deposition of LoI
Huelva & KVI

Got to know who is doing what.
Got to know each other.

dapnia
cea
saclay

Mandate

Scope: The idea of a SGFD has been developed during common meetings of people working on front-end electronics and data acquisition within **SPIRAL2, NUSTAR/FAIR and LEGNARO**. The synergistic approach offers some significant benefits:

- It overcomes problems caused by the limited capacities and scarce expertise in the field of ASIC development and manufacturing for **nuclear physics** applications.
- It provides the strongly overlapping user communities with **common user interfaces and data structures for DAQ systems and controls.**
- It makes the most **effective use of the limit scientific and engineering manpower** dedicated to **DAQ and controls tasks.**

Multi Lab?

Nuclear

Key

Key

With this letter, we approach the boards of the above listed collaborations and facilities to formally establish a FREEDAC and to provide the FREEDAC with the mandate to recommend areas of R&D to the various working groups on instrumentation. The FREEDAC will seek to **establish** the necessary **organization** for the implementation of this **common R&D**. In addition, FREEDAC will seek and recommend common technological solutions in the areas of front-end electronics and data acquisition. **To allow for a functional group, the members are expected to perform studies and development.**

Have we?

Have to do something.
Not just talk!

Study : Similar Instr. Requirements
➔ Similar System Architecture/Specs

- TPC
  Very High Dyn. Range, Shape, Time
  - ACTAR -
  - R3B TPC -

- Position Sensitive Particle Telescopes (DSSD) - Particle Spectroscopy
  High Dyn Range, Time,
  - EXL -
  - GASPARD
  - AGATA -
  - R3B -
  - HYDE -
  - FAZIA -

SPIRAL2 | NuStar | Legnaro

- Spectrometers Focal Plane
  Gas or Si Det. – Q, T & Shape
  - VAMOS (GANIL)/S3
    - DRIFT/Se-D
    - BRAGG
  - SPEG (GANIL)
    - DRIFT
  - BIG-BYTE (KVI)
    - DRIFT
  - Beam Tracking
  - PRISMA
    - PPAC

- CALORIMETER (CsI/LaBr + ADP/PM)
  Very High Dyn. Range, Time
  - EXL -
  - GASPARD/PARIS -
  - R3B -
  - FAZIA -
  - Neutron Detection - **Shape**

CORE GROUP - FREEDAC

- **Patricia Roussel Chomaz,** (SPIRAL2 – ACTAR, VAMOS2, NFS)
  - GANIL, France ..... **- task 1 leader**
- **Andres Gadea** (AGATA – Auxiliary)
  - Legnaro, INFN, Italy
- **Ian Lazarus,** (NUSTAR -HiSec/DeSpec, EXL, R3B)
  - STFC Daresbury and Rutherford Labs, England ..... **- task 2 leader**
- **Ismael Martel** (NUSTAR – HYDE)
  - University of Huelva, Spain
- **Emanuel Pollacco,** (SPIRAL2 –S3 & GASPAR; NUSTAR, – R3B/TPC, HiSpec) ..... **JRA leader**
  - CEA Saclay, France (Frédéric DRUILLOLE) ..... **3 leader**
- **Haik Simon** (NUSTAR – R3B, EXL, [illegible]) **ASIC R&D**
  - GSI, Darmstadt, Germany
- **Heinrich Johannes Wörtche** (NUSTAR – [illegible]) **sk [illegible] r**
  - KVI, Univ. of Groninge[illegible] ..... **DAC & Contol**

- **Industrial Partner[illegible]**

Workshops

System R&D

A core group with invested interest for instrumental application

History:
FREEDAC

Networking

- Survey
  - Who is doing what …
  - Who can do what …
  - Needs of the community …
- Discussion Forums
  - Technology-Physics
- Explore technologies outside Nuclear Physics
- Define & Design tools for:-
  - User friendly …
  - User defined interfaces …
- Study & Define System that can be built within.
- Standards Setting
  - Security
  - Reliability
  - User-friendly

Principle ACTIVITIES for FREEDAC

TASKS

- **MAPPING**
- **JRA**
  - Systems St
  - **ASIC developme**
  - R&D ASIC/ADC Interface
  - Data Acquisition
  - Time-Stamping
  - **Control & Optimization**

MAPPING

Assemble the Euro. Nucl. Phys. Community towards :

- **A study of available resources.**
- **Study of the next generation FEE+DAQ.**
  - **Develop Euro strategy.**
- **Information diffusing, educ. (Master, PhD), …**
  - **Future of the field**

JRA

To design & build a demonstrator that will employ the capacities of the community to work collectively – Resources & Needs exercise.

NOT a Universal System

TASKS and LABS

JRA06

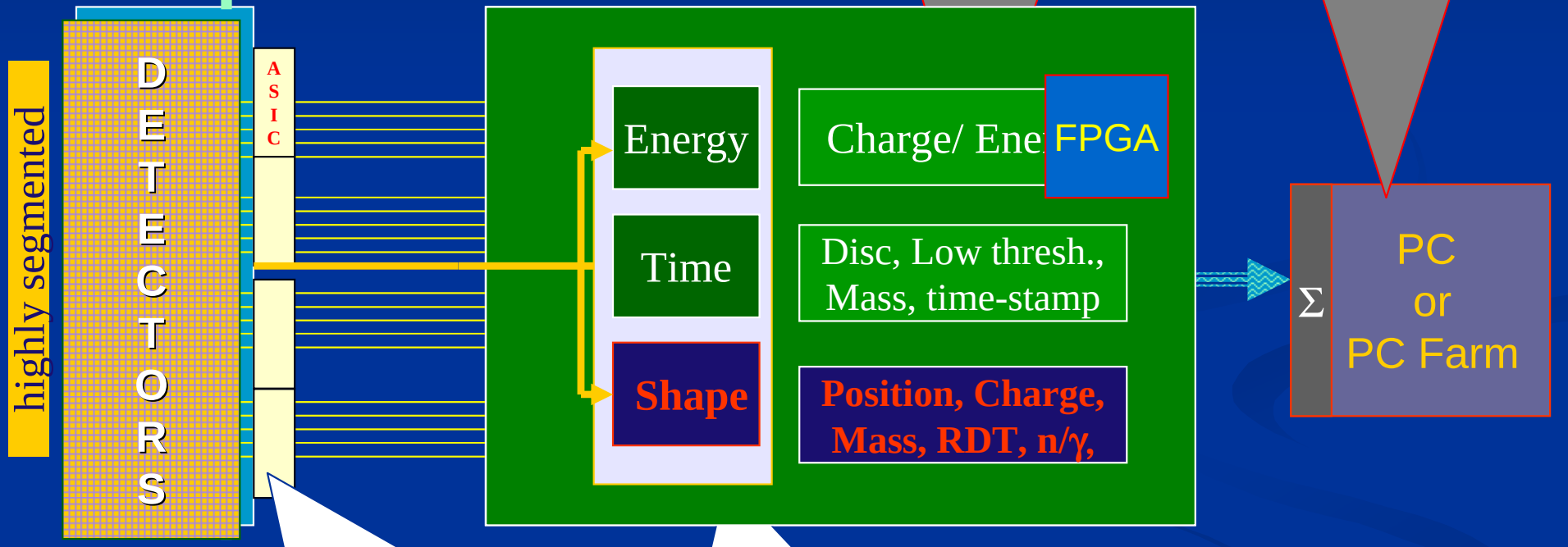
MEASURE

306k€

STFC(UK)-CEA -Huelva-KVI-
GANIL: *Task 2*
System Structure & Development

120k€

KVI, JSI, GSI, INFN, GANIL Huelva: *Task 4*
Data Treatment, Data Acquisition, Control



INFN *Task 3, low power,*
Very high gain, multi function

407k€

CEA, **INFN** *Task 3, Multi function, modular design*

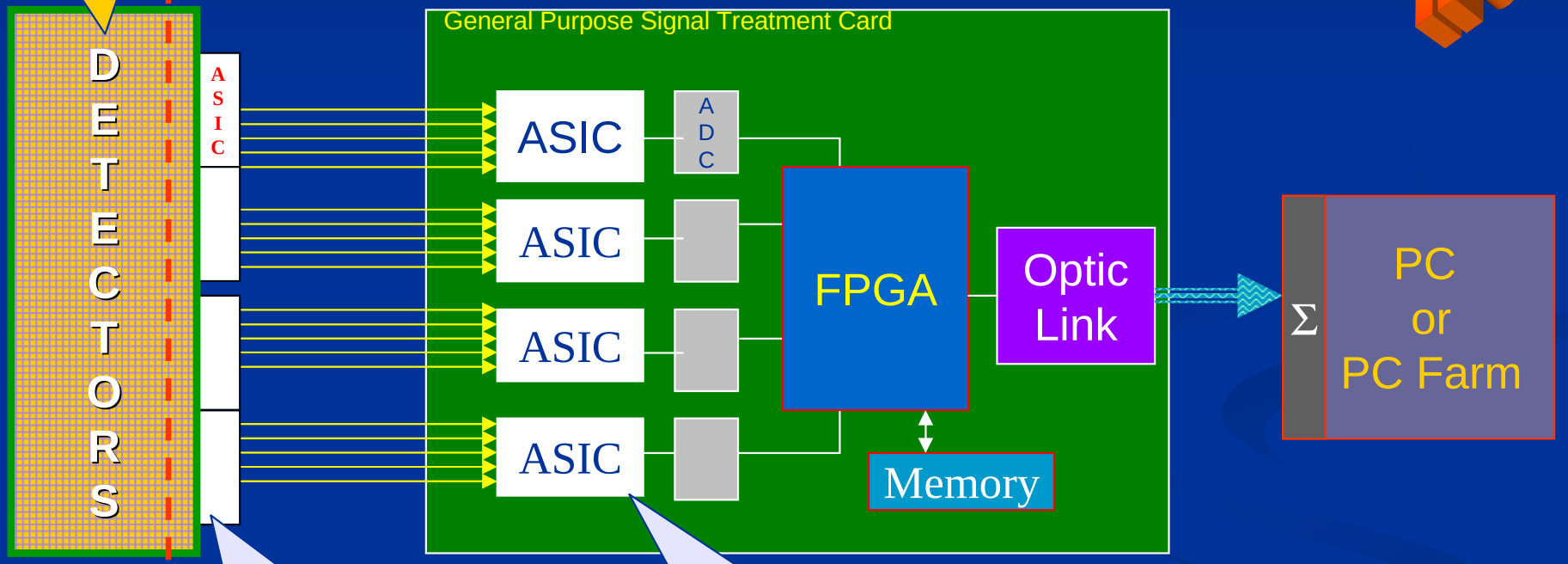
GANIL & Huelva
Workshops

98k€

HIGH SEGMENTATION
TPC
Si based devices
PM and Avalance PD

System Functional Structure
User-Centered Design
Modular, Portable
Scalable
Adaptive intelligent system control
Future Proofing

new



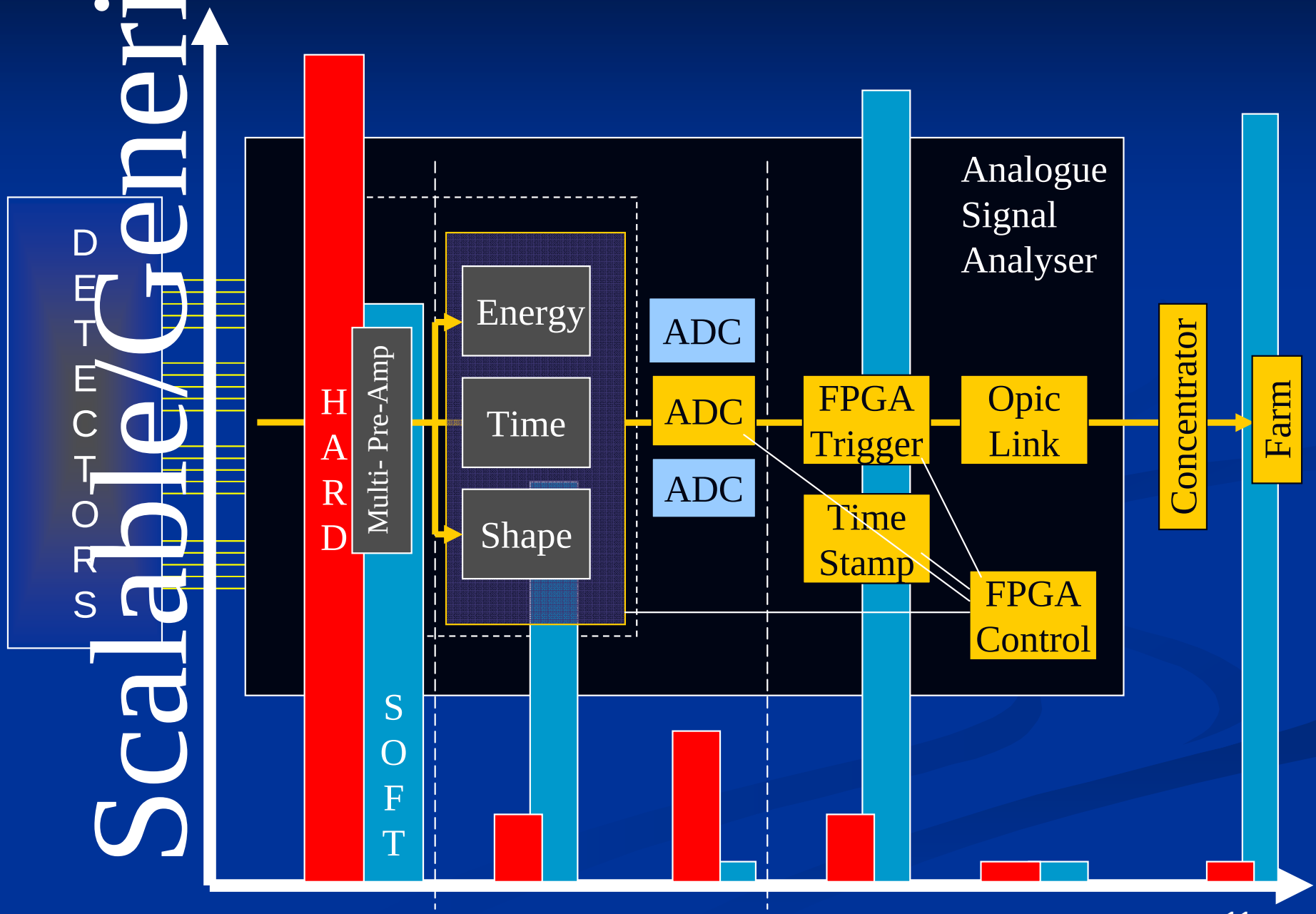
Multi-Function Pre-Amp:
High Gain & Resolution,
Low Power, Low mass,

new

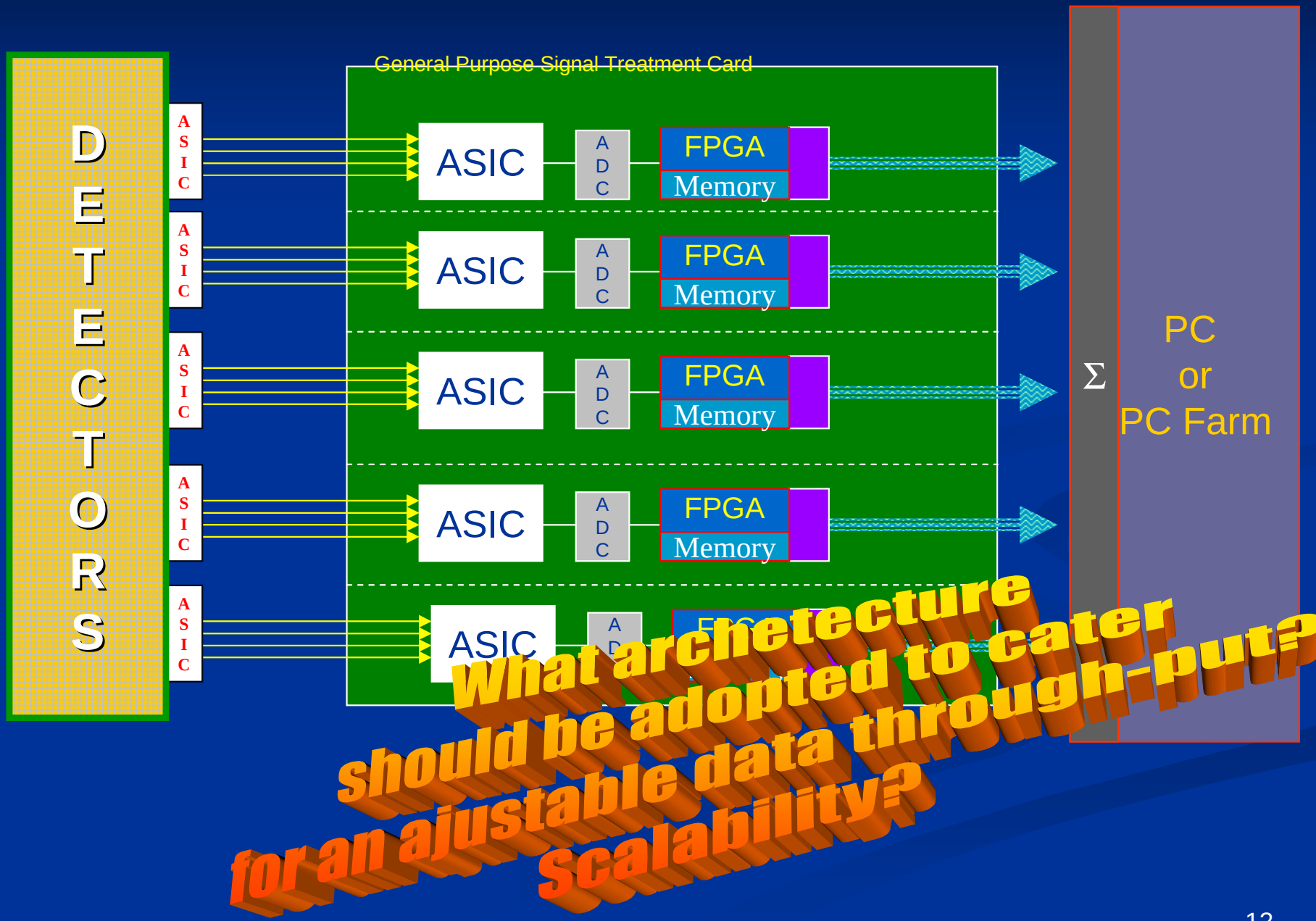
Combined Measure of
Energy, Time & Shape
Selective-Readout
Auto-Trigger, Low Power

new

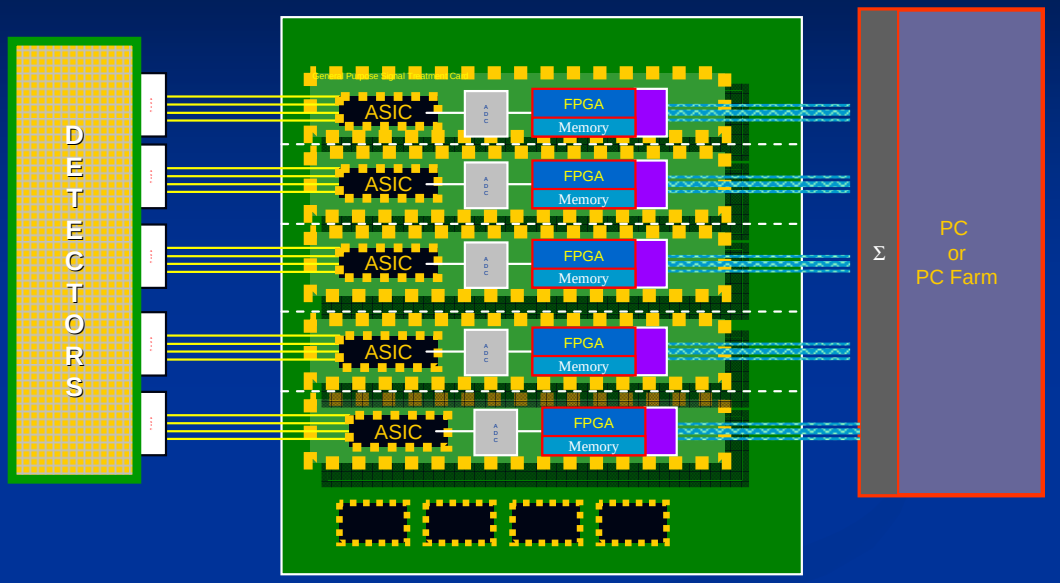
How do we achieve the GENERIC, SCALABLE, PORTABLE … attributes?
Combination- SOFT & HARD



dapnia
cea
saclay



dapnia
cea
saclay

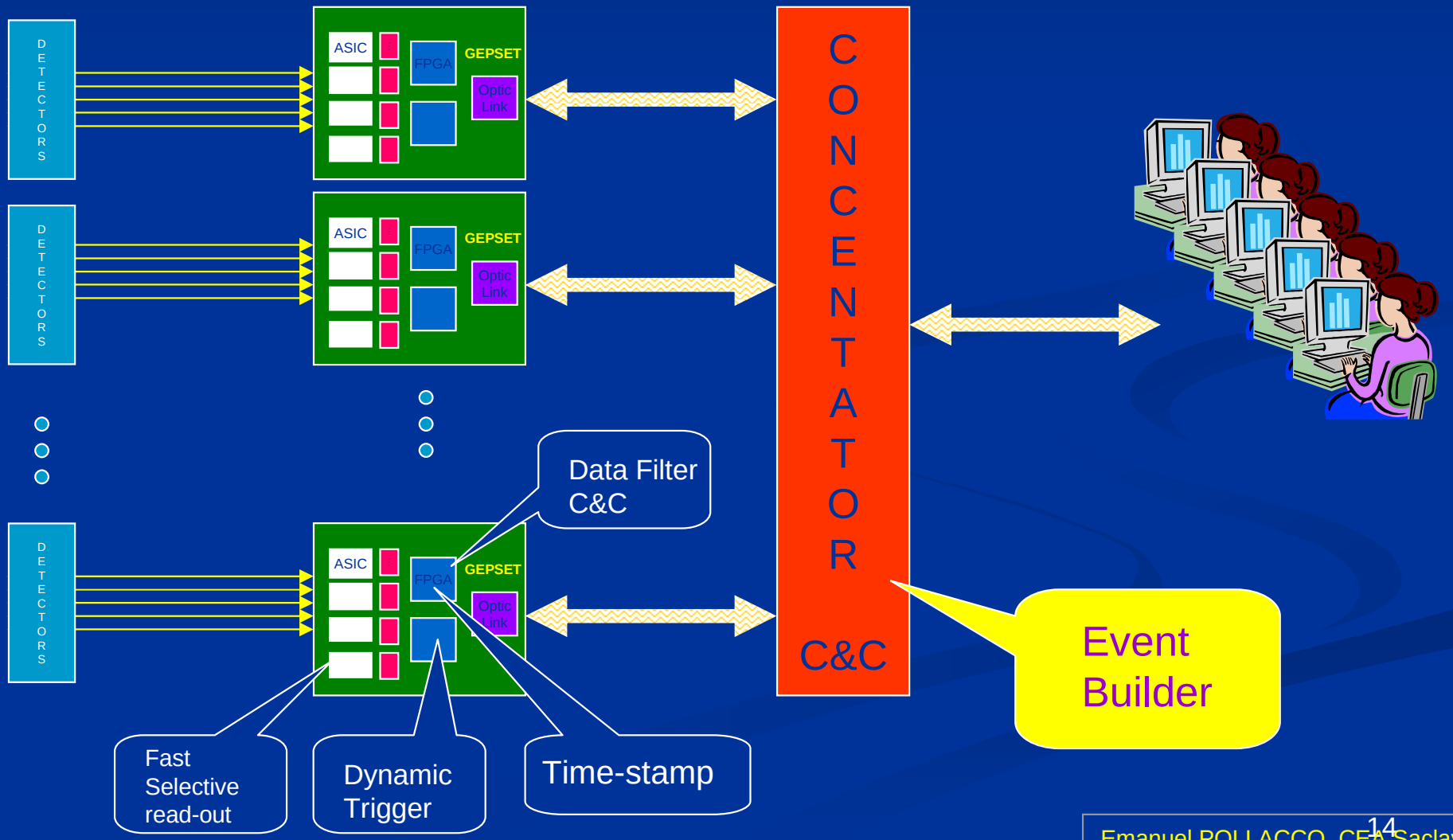


How, where and what **control parameters** are needed to allow for an automatic performance adjustment and lodging?

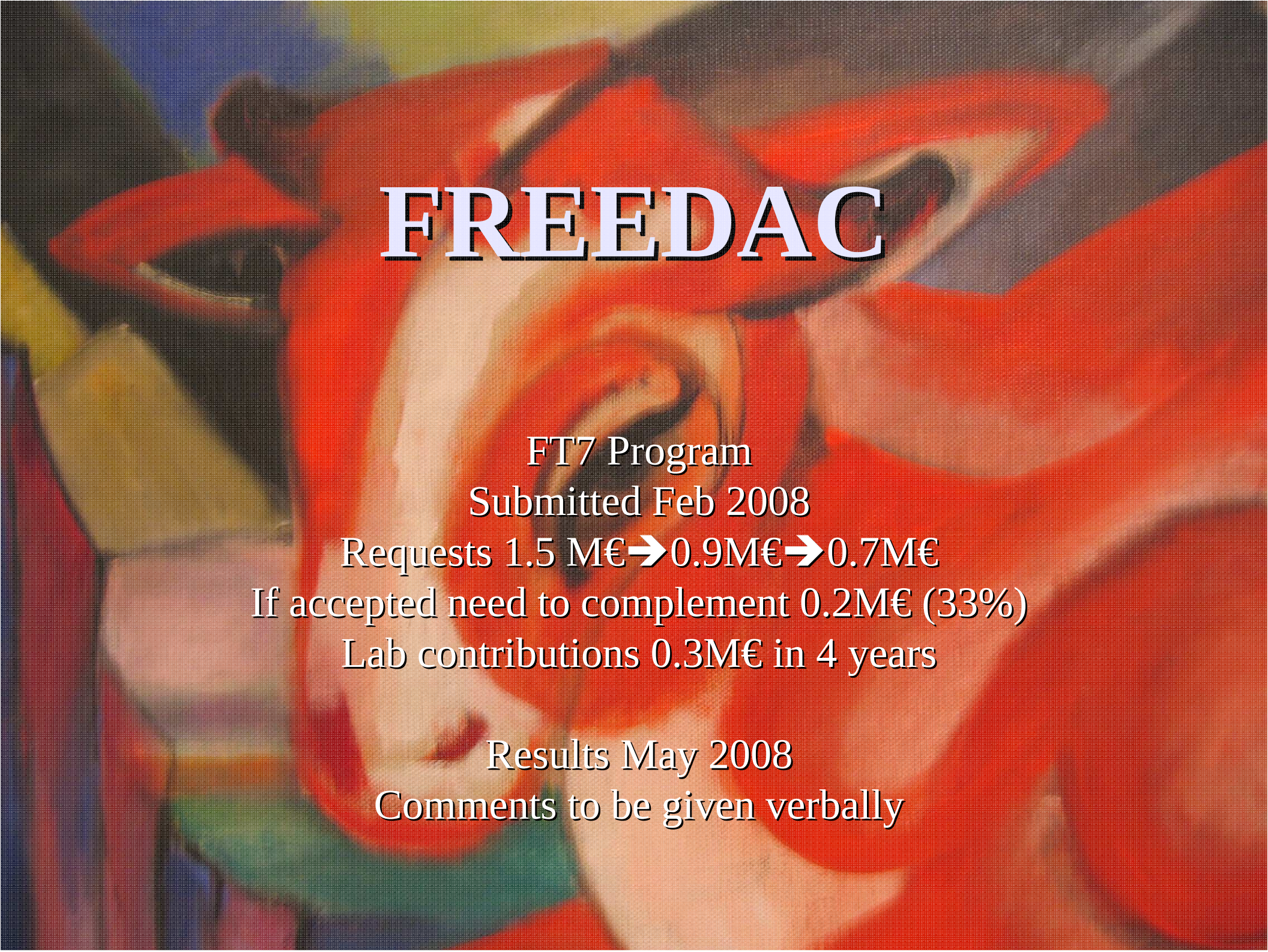
Temperature, pressure, current, tension, S/N, …

dapnia
saclay

General Purpose Signal Treatment Card : GEPSET



dapnia
cea
saclay


FREEDAC
FT7 Program
Submitted Feb 2008
Requests 1.5 M€➔0.9M€➔0.7M€
If accepted need to complement 0.2M€ (33%)
Lab contributions 0.3M€ in 4 years
Results May 2008
Comments to be given verbally

Budget

	EU (k€)	T. Budget (k€)	%
GANIL	94	395	24
CEA	305	1,071	29
KVI	53	149	36
GSI	61	230	26
JSI	64	189	34
HUELVA			
SFTC			
INFN	124	200	62
Sum	***701***	***2,234***	***31***

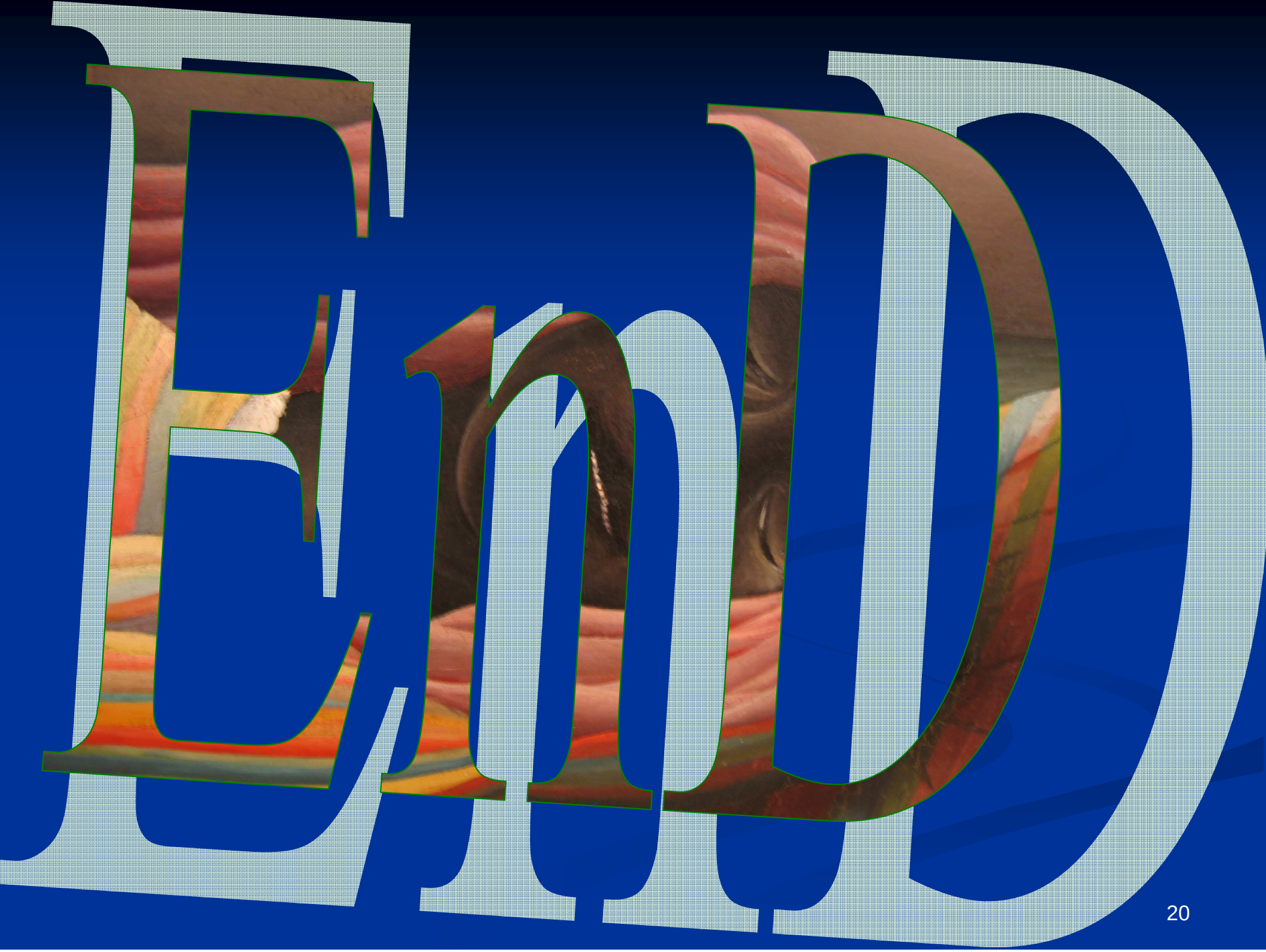
	cea	ganil	gsi	infn	kvi	stfc	huelva	jsi
Perso-month	72	26	15	4.4	57	66	51	12
Post-Doc	120	65	65	65				65
Prototype	160	30		60	35			
Travel	56	25	16	76	36	38	34	20
Travel	127	25	16	40	36			20
Total	407	120	81	165	71			85

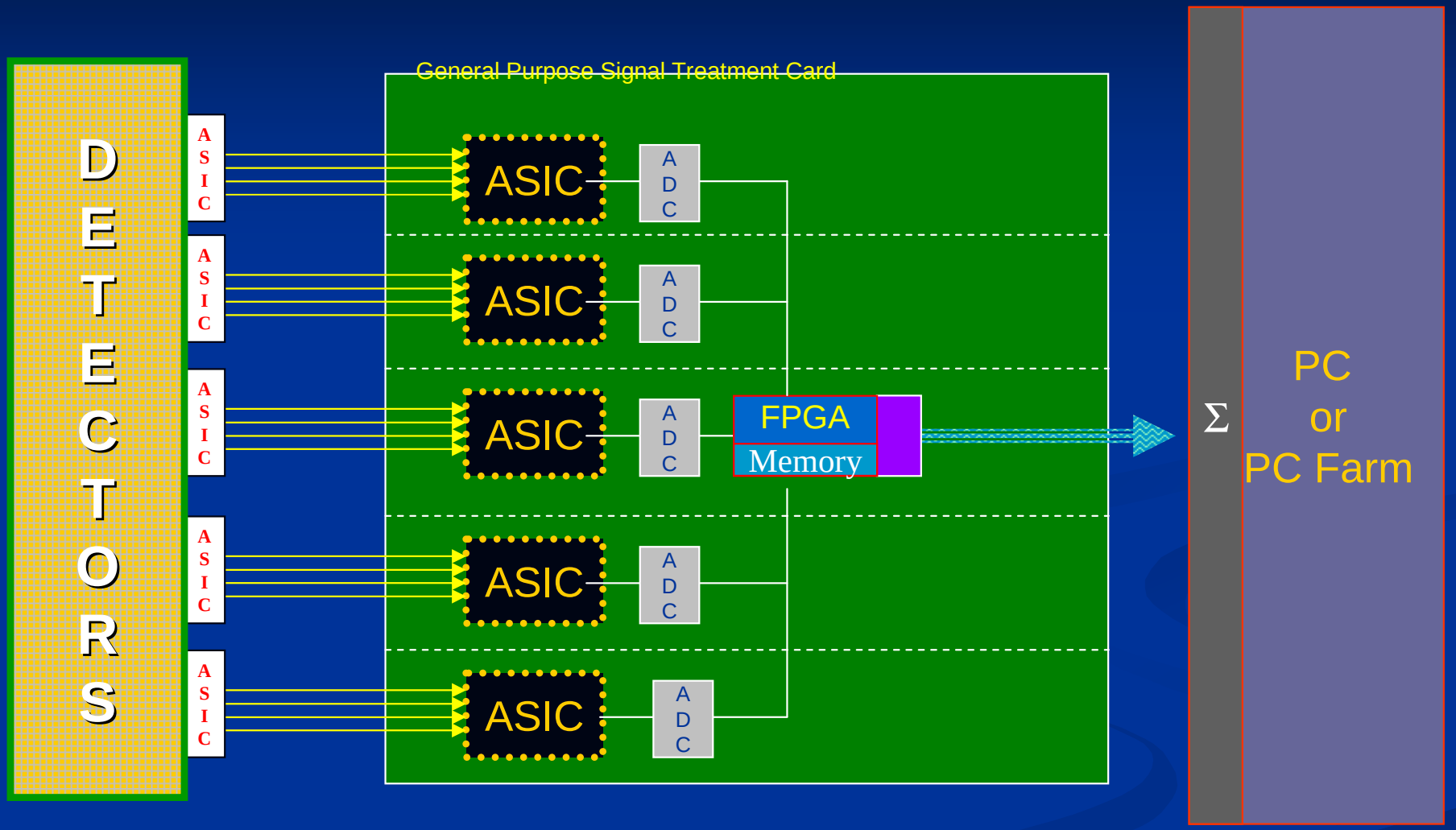
task 1	cea	ganil	gsi	infn	kvi	stfc	Huelva	JSI	Total	EU
Man-months	5	6	3	11	4	4	6	6	45	
travel	12	14	7	26	9.6	10	14	14.4	108	
	12	***14***	***7***	***26***	***10***	***10***	***14***	***14***	***108***	***81***
task2	**cea**	**ganil**	**gsi**	**infn**	**kvi**	**stfc**	**Huelva**	**JSI**	**Total**	**EU**
Man-months	24	14	9	79	6	48	45			
Post-Doc		65	65	0					130	
travel	12	6	4	32	6	21	17		99	
prototyping	60	30			35				125	
	72	***101***	***69.2***	***32***	***41***	***21***	***17***		***354***	***265***
task3	**cea**	**ganil**	**gsi**	**infn**	**kvi**	**stfc**	**Huelva**	**JSI**	**Total**	**EU**
Man-months	48			72		18				
Post-Doc	120			65					185	
travel	32			18		7			57	
prototyping	100			60					160	
	252			***143***		***7***			***402***	***301***
task4	**cea**	**ganil**	**gsi**	**infn**	**kvi**	**stfc**	**Huelva**	**JSI**	**Total**	**EU**
Man-months		12	6		51		6	12		
Post-Doc								65	65	
travel		5	5		20		2	5	38	
prototyping					0				0	
		5	***5***		***20***		***2***	***70***	***103***	***77***

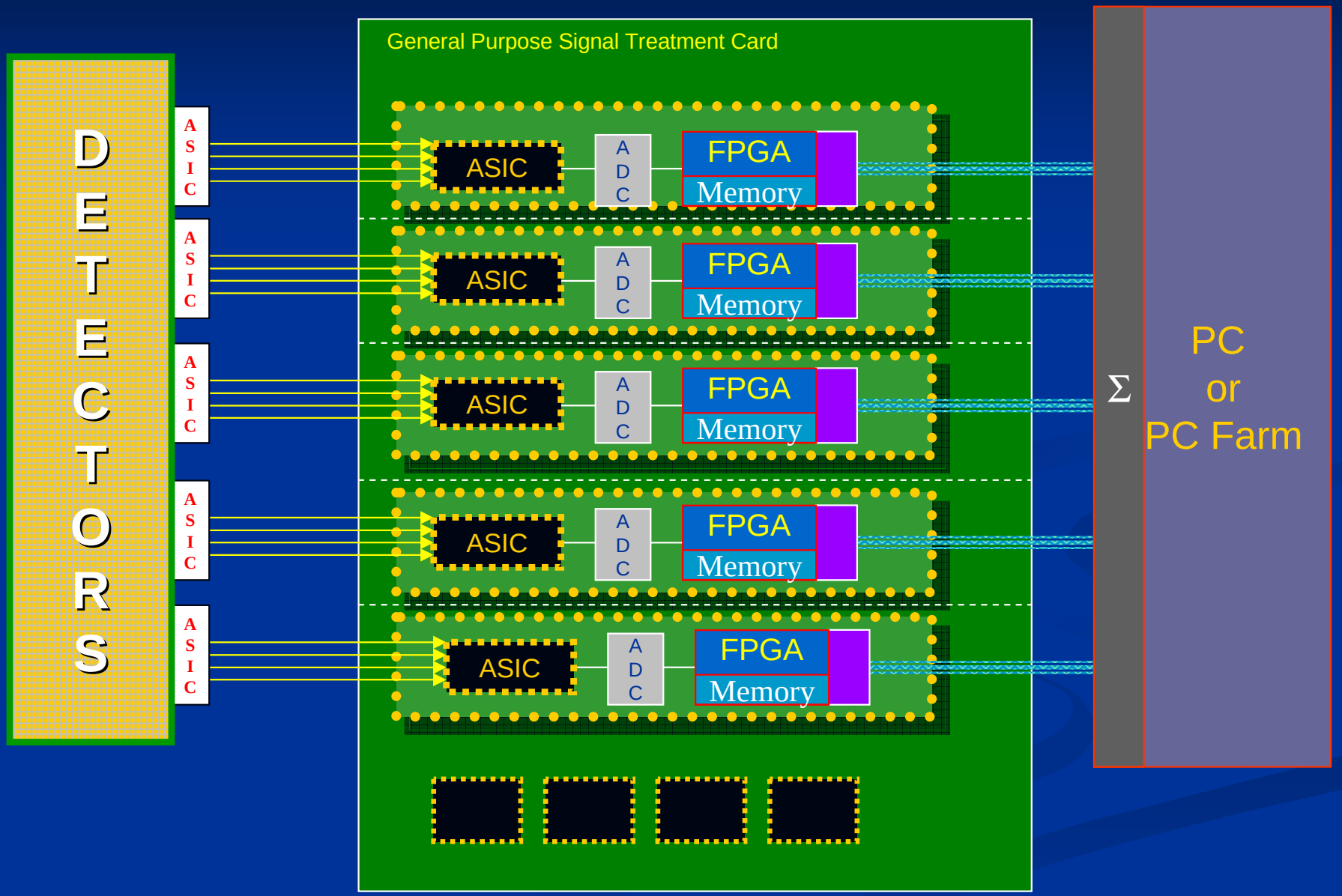
Total	***336***	***120***	***81***	***201***	***71***	***38***	***34***	***85***	***966***	***735***

FREEDAC Future

- Are we still interested in FREEDAC if we do not have a EU support?
- What function(s) will we give FREEDAC?
  - Exchange
  - Conception & Building
- How will we fund the FREEDAC program?
- What organizational structural changes do we require?
- Setting Standards
- Are we enterprising enough?
  - Versus the project
  - Versus industry or institutions (for example)


End


DETECTORS
ASIC
ASIC
ASIC
ASIC
ASIC
General Purpose Signal Treatment Card
ASIC
ASIC
ASIC
ASIC
ADC
ADC
ADC
ADC
ADC
FPGA
Memory
Σ
PC
or
PC Farm


DETECTORS
ASIC
ASIC
ASIC
ASIC
ASIC
General Purpose Signal Treatment Card
ASIC
ADC
FPGA
Memory
ASIC
ADC
FPGA
Memory
ASIC
ADC
FPGA
Memory
ASIC
ADC
FPGA
Memory
ASIC
ADC
FPGA
Memory
Σ
PC
or
PC Farm