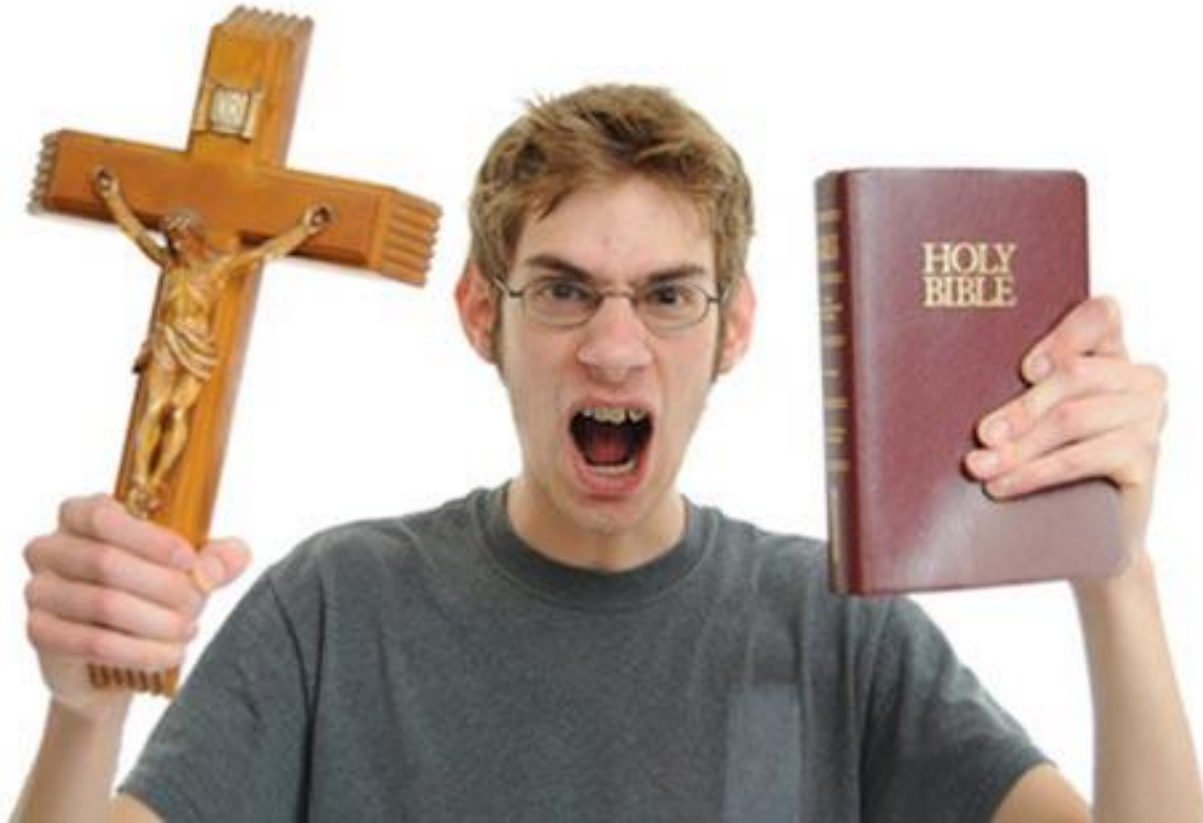


Making the most of your 10 minutes of fame

Dave.Barney@cern.ch



I am not going to evangelize!



Presentation skill \neq soft skill

Exercise 1: You have 10 minutes to prepare a 1-minute presentation on your favourite topic (not necessarily particle physics!)

Send any slides to David.Barney@cern.ch using filename: **1_<Yourname>.<extension>**
(or you can use your own laptop)

I will choose some at random for presentation!



MATE J

2 mins
Drawing faces

Confidence + Motivation

↳ Fearless

Organization

Expertise

Resources

Demonstration → connected with
Audience

Problem + solution

Everyone paid attention

Antoine

2 mins
INFN Code

Gestured → to slides

Historical reference

"useful" information

Drama

Interesting

Visual

Problem + solution

Diana

Quantum

Emotional

Personal

Reuse of materials

Change in tone

"Just Google it"

Body language

Examples

Magdy

Music scales

Demonstration

Eye contact

Short intro of himself

Confidence

Use of resources
in space

Pacing

Kalpanie Abstract painting

Use of materials

Humour

Positive = confidence

Inspirational

Very clear

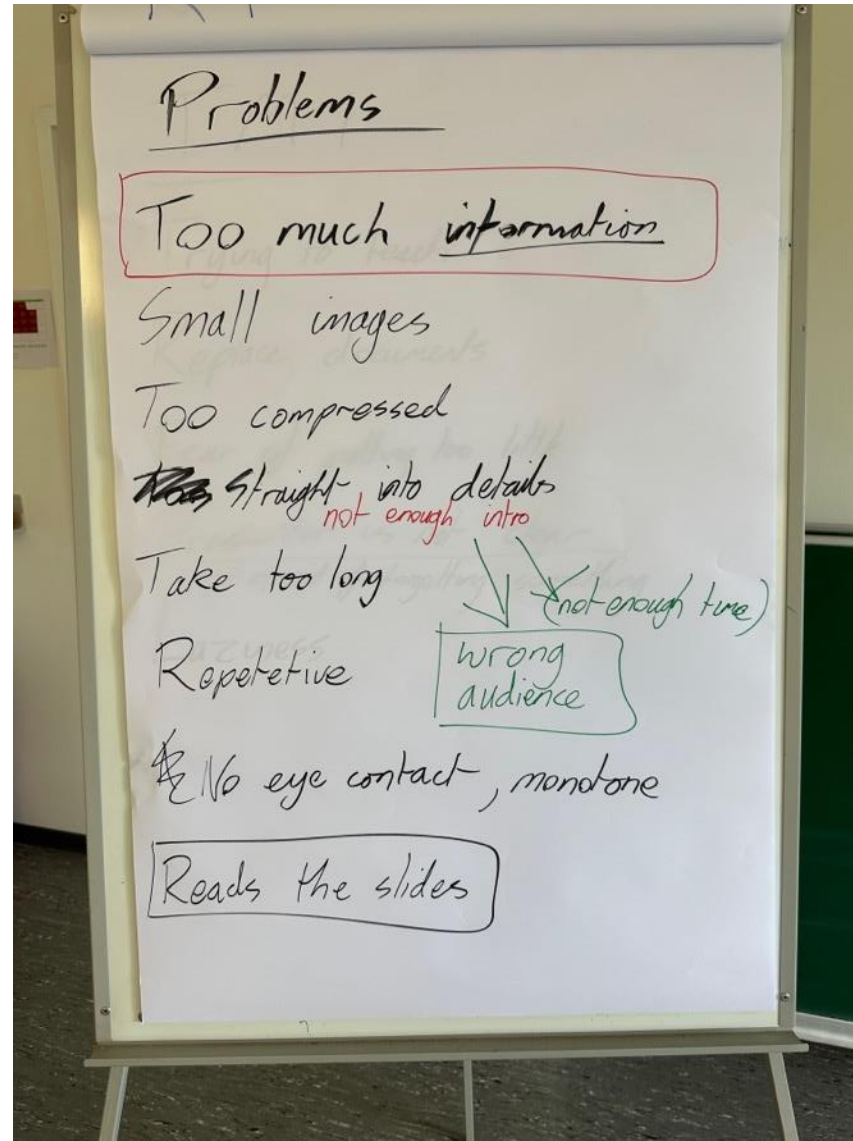
Logical

Reference slides

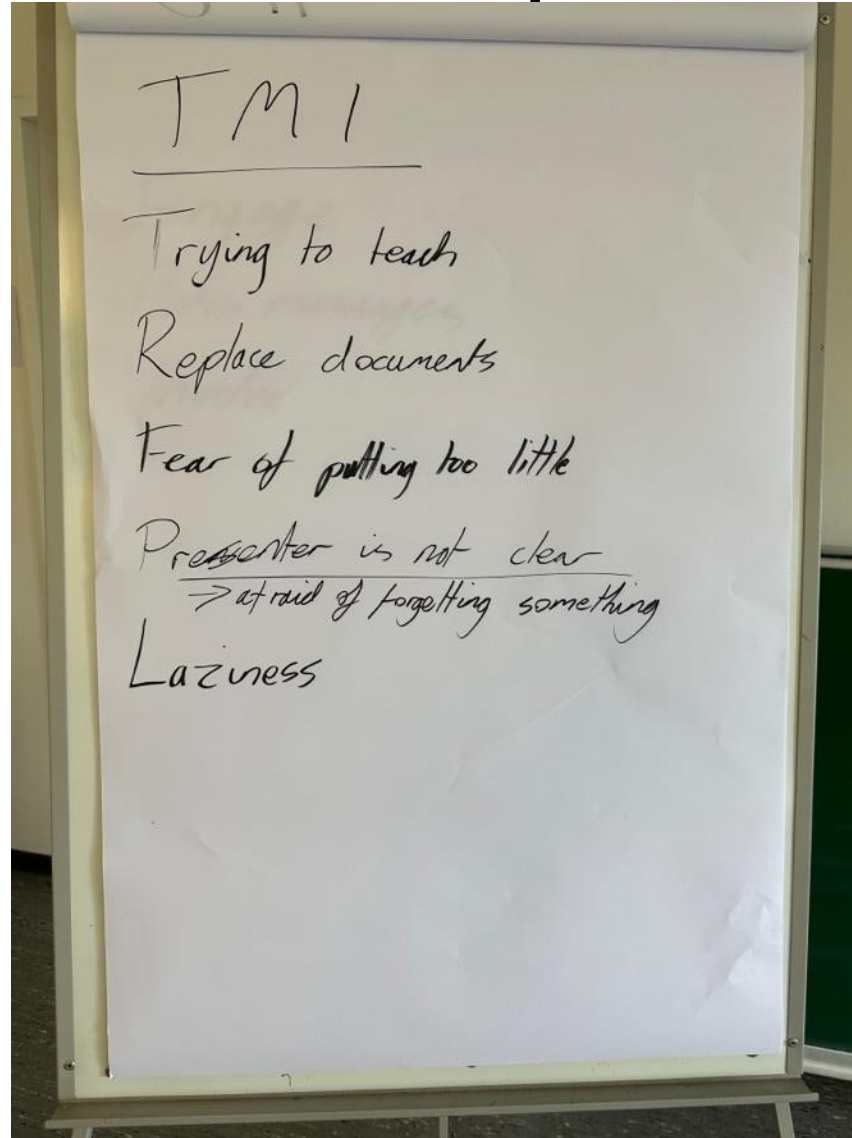
Some common “likes” of all talks:

- Confidence
- Emotion & passion
- Use of body language & change of tone of voice
- Presented a clear problem and clear solution
- Clarity of information & messages

What are the most common problems with presentations?



Why do people put too much information into a presentation?



Your audience is intelligent
But not knowledgeable

You are the only expert in the room!

GUIDELINE #1:

**THE PRESENTATION IS FOR THE AUDIENCE
MAKE SURE YOU KNOW YOUR AUDIENCE!**

What is the purpose of a presentation?

What is the purpose of a presentation?

For the audience to understand
one or more **messages**

And possibly act upon those
messages

message \neq information

Supercars of Wuppertal (1/3)



This is “information”

Koenigsegg Agera in Wuppertal



This is also “information”

The only Koenigsegg Agera
in Wuppertal is the official Eurizon taxi!



This is a “message” that you can act upon!

What is a message?

It is not the “what”

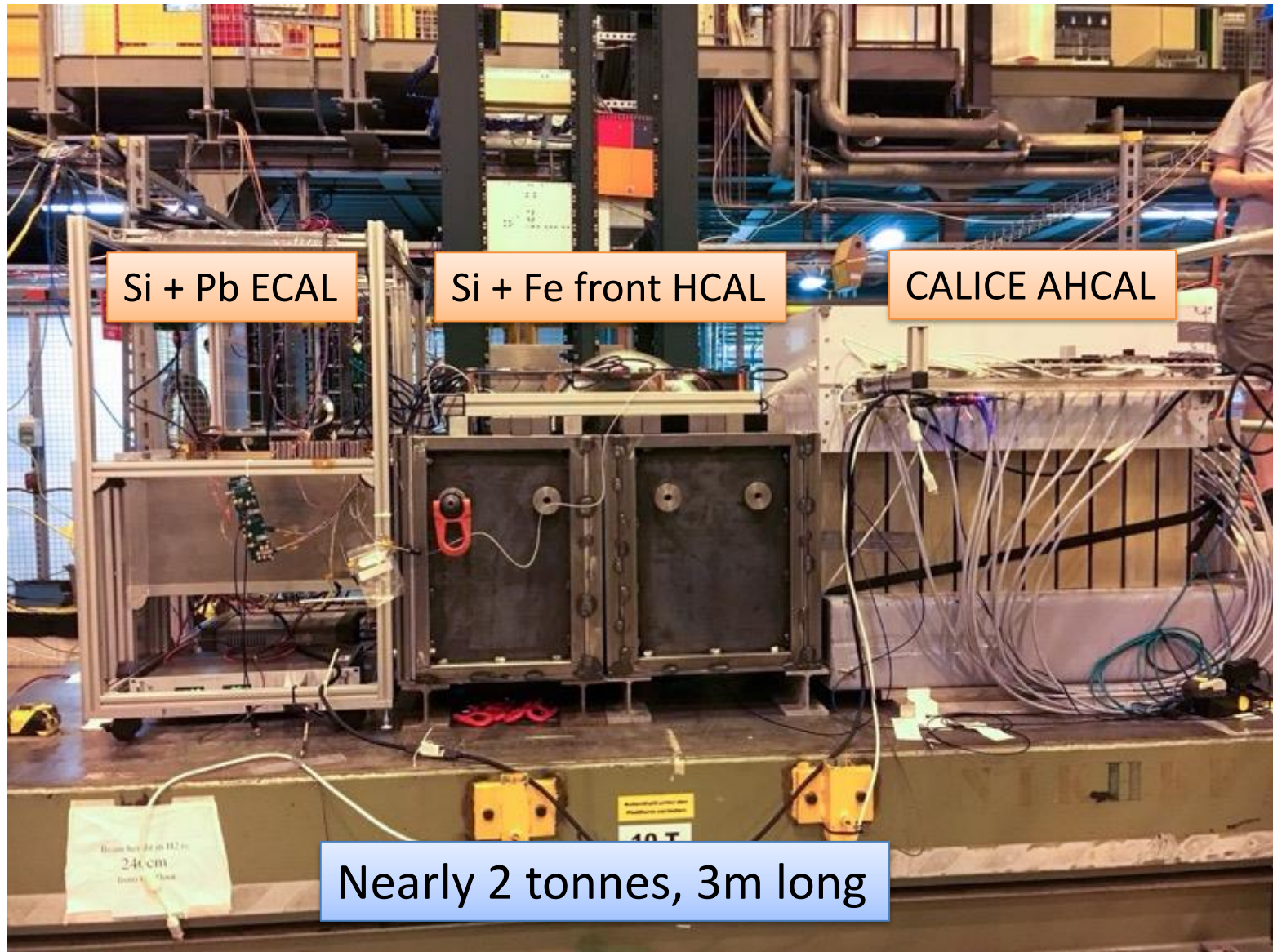
It is the “*so what?*”

Including the “so what?” explicitly on your slides is a basic redundancy

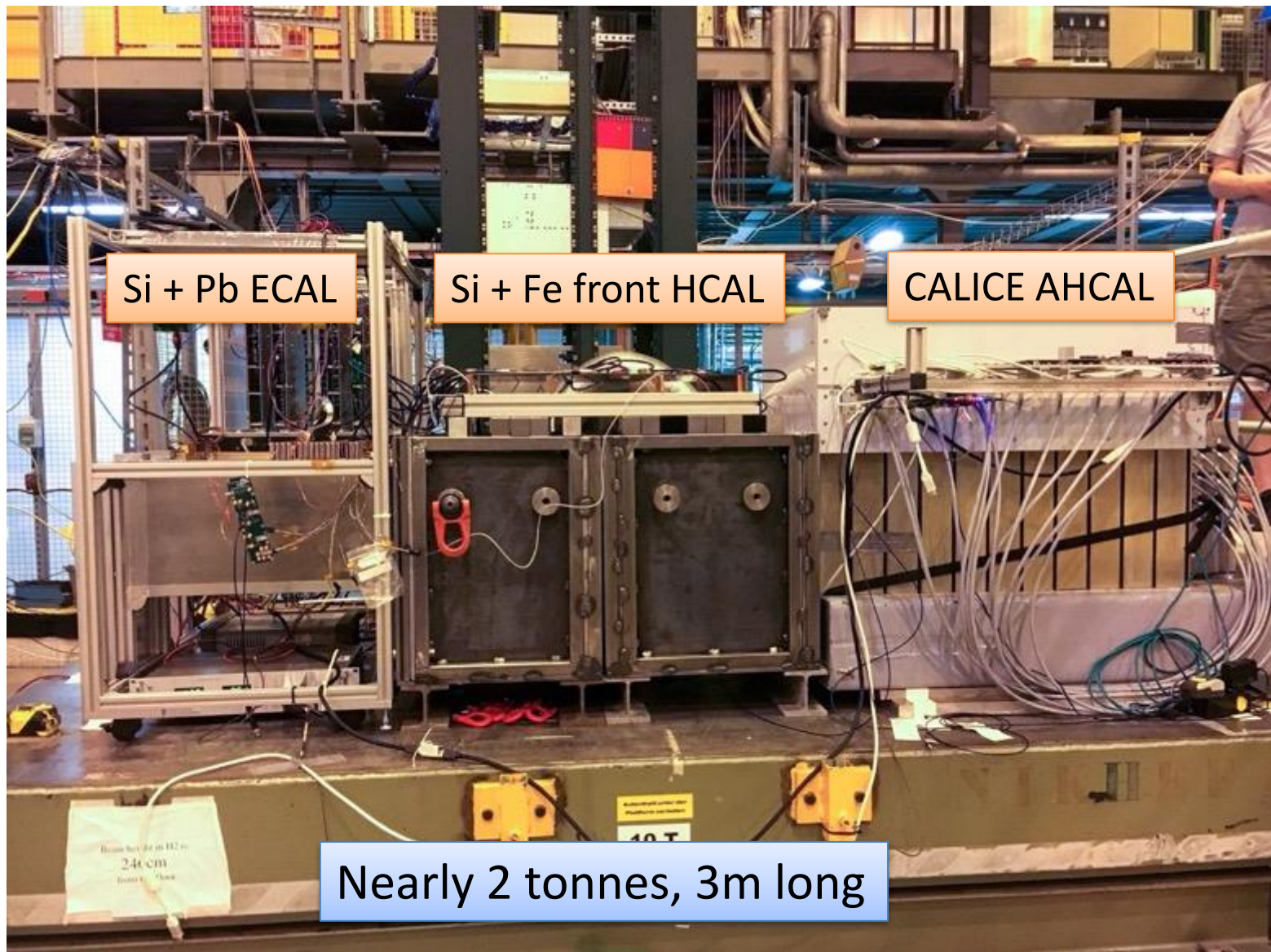
Even if the “so what?” is the only text on your slide, an offline reader will be able to understand the important points of the presentation

The “title” part of your slide is perfect for putting the “so what?”

HGCAL Beamtest 2017



Full prototype HGCAL is at the limit of what can be placed on the CERN SPS H2 moving table



Omitting the “so what?” or not being clear can have serious consequences...

For a pretty extreme view, take a look at:

https://www.inf.ed.ac.uk/teaching/courses/pi/2016_2017/phil/tufte-powerpoint.pdf

And a nice response:

<http://web.mit.edu/5.95/readings/doumont-responds-to-tufte.pdf>

Review of Test Data Indicates Conservatism for Tiles Penetration

- The existing SOFI on tile test data used to create Crater was reviewed along with STS-107 Southwest Research data
 - Crater overpredicted penetration of tile coating significantly
 - Initial penetration to described by normal velocity
 - Varies with volume/mass of projectile(e.g. 200ft/sec for 3cu. In)
 - Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating
 - Test results do show that it is possible at sufficient mass and velocity
 - Conversely, once tile is penetrated SOFI can cause significant damage
 - Minor variations in total energy (above penetration level) can cause significant tile damage
 - Flight condition is significantly outside of test database
 - Volume of ramp is 1920cu in vs 3 cu in for test

Exercise 2: Decoding NASA

Look at your handouts. Work in pairs! You have 5 minutes to determine the three most important conclusions from this slide

Some context & glossary:

This concerns a **US Space Shuttle**

- **Tiles** = the special foam tiles covering the Space Shuttle
- **Crater** = simulation program
- **SOFI** = spray-on foam insulation, used on the separate fuel tanks of the space shuttle
- **ramp** = piece of debris
- **cu in** = cubic inch

1) The “Crater” simulation is not a realistic representation of what happened

2) A penetration of the tile cannot be ruled out

3) If this happened, the consequences could be catastrophic



Anecdotes can be even more
memorable than messages

1975

A Phenomenological Profile of the Higgs Boson

- First attempt at systematic survey

A PHENOMENOLOGICAL PROFILE OF THE HIGGS BOSON

John ELLIS, Mary K. GAILLARD * and D.V. NANOPOULOS **
CERN, Geneva

Received 7 November 1975

A discussion is given of the production, decay and observability of the scalar Higgs boson H expected in gauge theories of the weak and electromagnetic interactions such as the Weinberg-Salam model. After reviewing previous experimental limits on the mass of

We should perhaps finish with an apology and a caution. We apologize to experimentalists for having no idea what is the mass of the Higgs boson, unlike the case with charm [3,4] and for not being sure of its couplings to other particles, except that they are probably all very small. For these reasons, **we do not want to encourage** big experimental searches for the Higgs boson, but we do feel that people performing experiments vulnerable to the Higgs boson should know how it may turn up.

GUIDELINE #2:

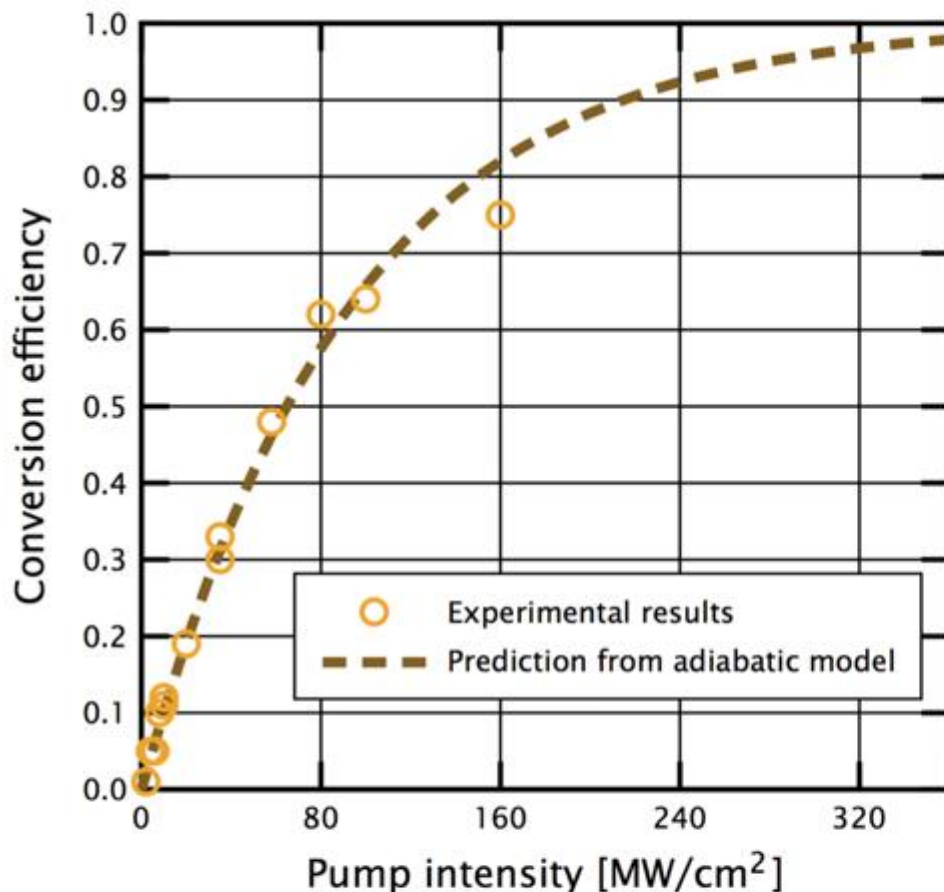
**FOCUS ON YOUR MAIN MESSAGES (AND ANECDOTES WHEN APPROPRIATE)
AND DON'T LET POWERPOINT CONTROL
HOW YOUR MESSAGES APPEAR**

Plots

The following is taken from the excellent “Traditions, templates, and group leaders” by Jean-Luc Doumont

<http://www.treesmapsandtheorems.com/barriers>

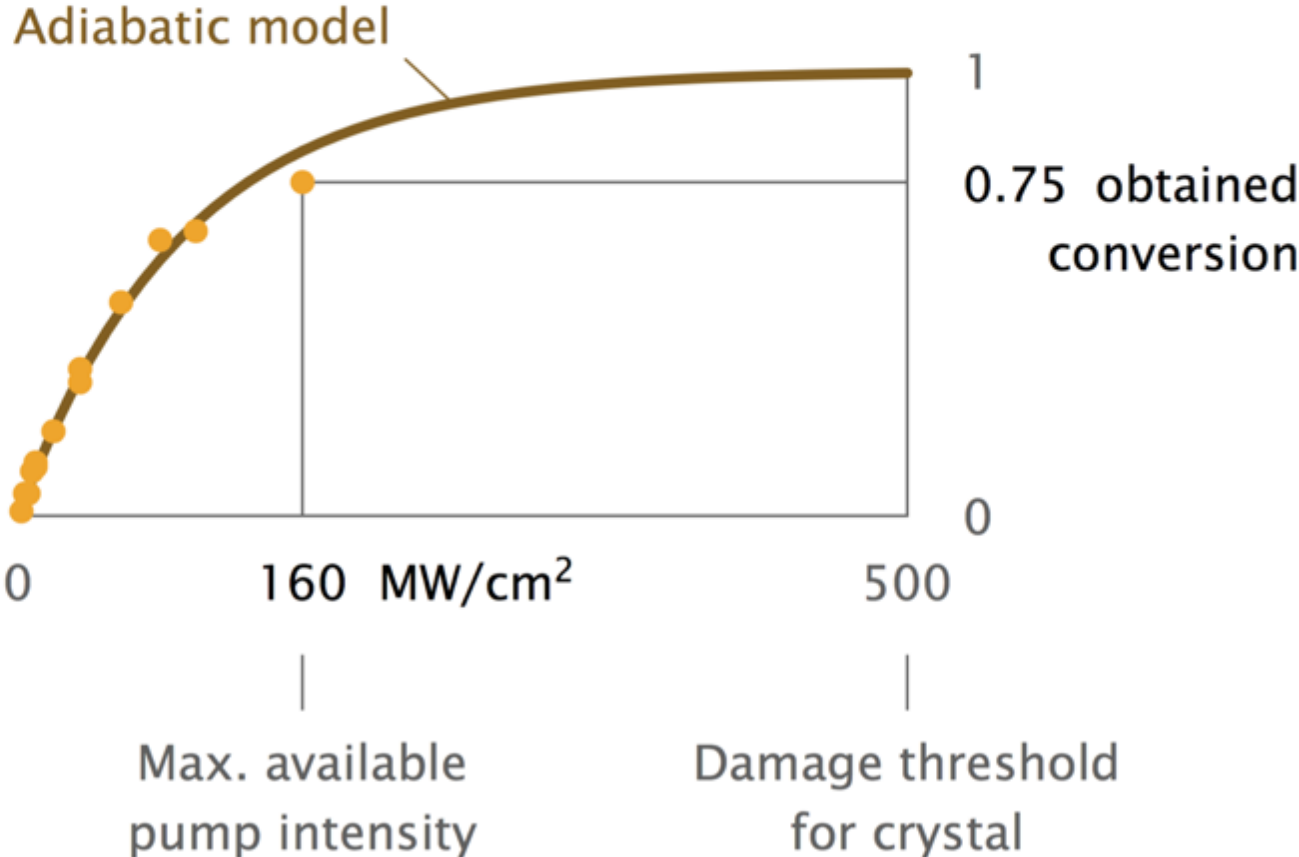
Efficiency of adiabatic frequency conversion



- Maximum pump intensity available experimentally: 160 MW/cm²
- $\lambda_1 = 1530$ nm; $\lambda_2 = 1064$ nm (Q-switched Nd:YLF)
- The maximum demonstrated conversion efficiency was 75 percent
- Periodically poled crystal can get damaged from 500 MW/cm² of pump intensity



The conversion approaches 100%
for high enough pump intensity





Global Reconstruction - Full Simulation

Reconstruction and Detector Performance: Photons

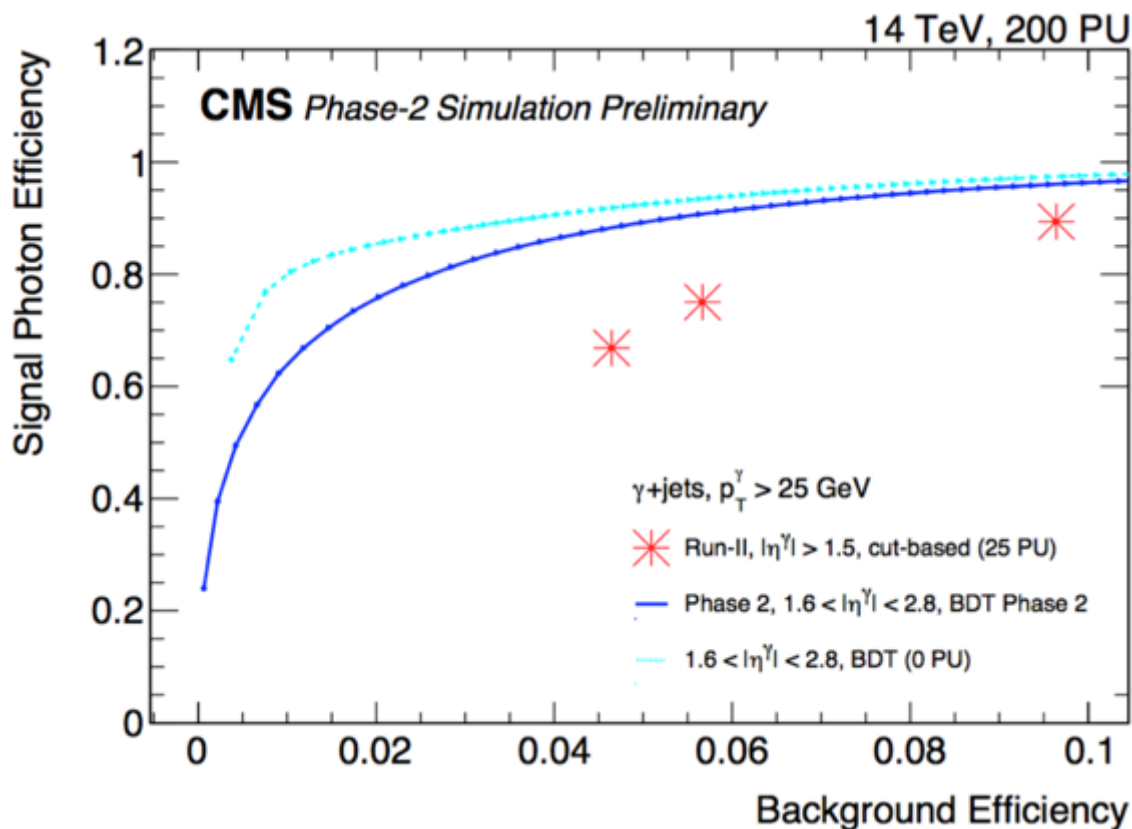


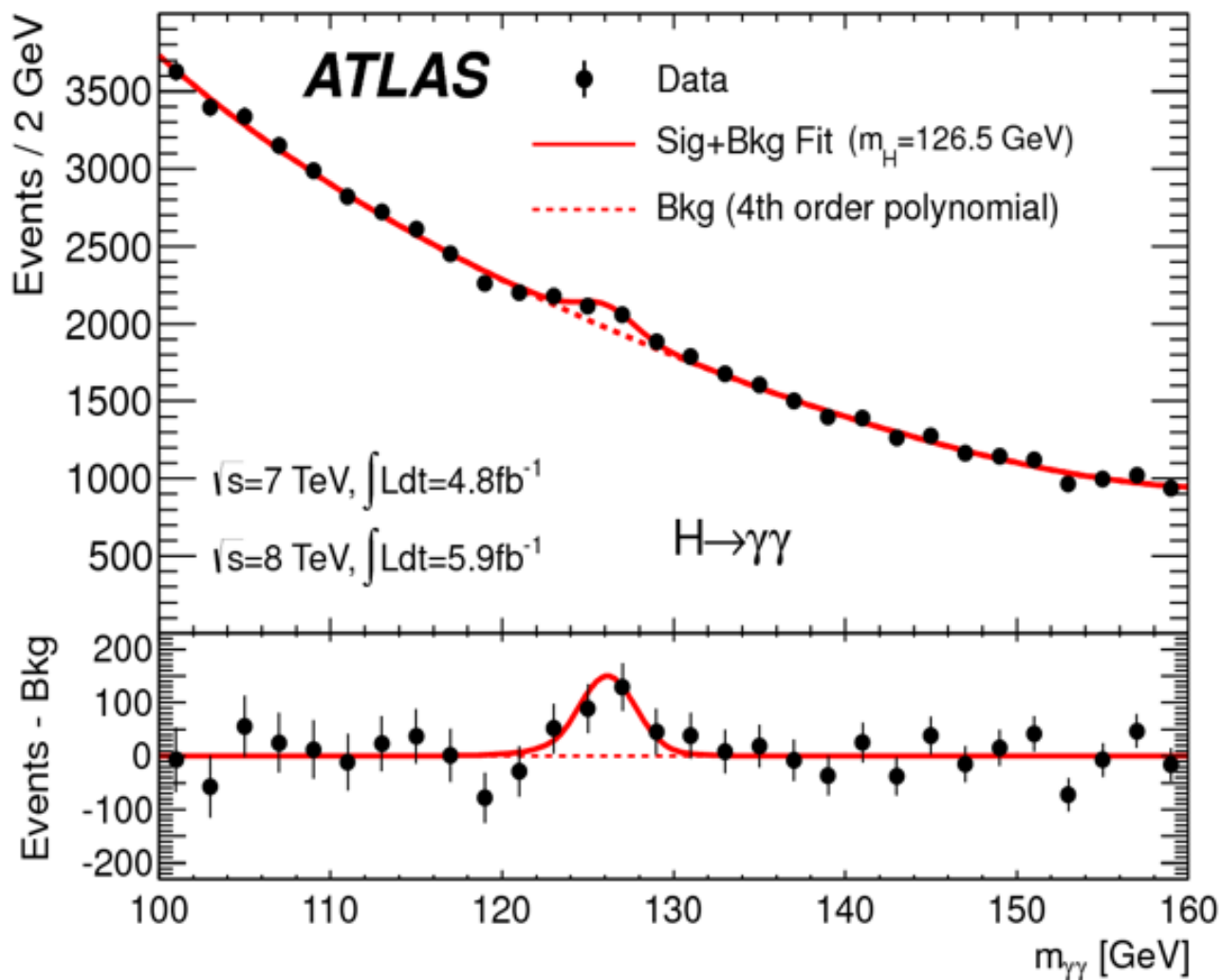
Figure 11.6: Photon efficiency versus photon-misidentification probability in simulated γ + jets events for the BDT training. Signal photons are matched within $\Delta R(\eta, \phi) < 0.1$ to isolated photons generated within the kinematic phase space $p_T^\gamma > 25$ GeV and $1.6 < |\eta_\gamma| < 2.8$. Misidentified photons are defined as reconstructed photons found in the same kinematic phase space but not matched to an isolated generated photon. The performance of a Run 2 cut-based ID is also presented, evaluated on a similar sample of γ + jets produced using the Run 2 conditions (average pileup of 25 pp collisions at $\sqrt{s} = 13$ TeV).

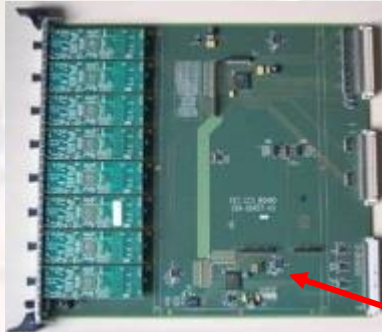
GUIDELINE 3:

**DON'T MAKE THE AUDIENCE WORK
TOO HARD TO UNDERSTAND
PLOTS/FIGURES**

AND DARE TO BE (A LITTLE!) DIFFERENT

We are all familiar with the concept of signal-to-background (or s-to-noise)





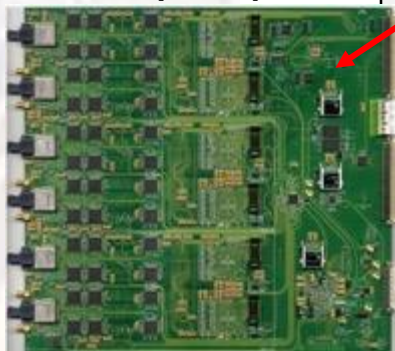
Clock & Control System Card (CCS)

Trigger Concentrator Cards (TCCs) receive FE card trigger primitives

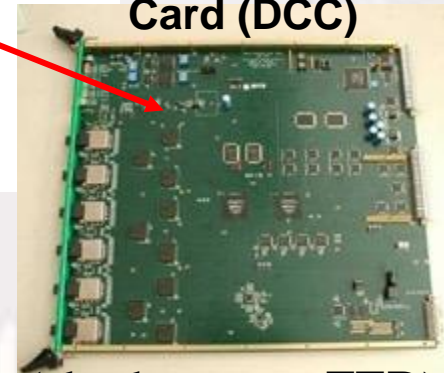
TCCs send trigger tower energy sums to Regional Calorimeter Trigger (RCT) at 40 MHz

Data Concentrator Card (DCC) reads FE data and TCC information upon L1 accept; performs data reduction and transfers to DAQ

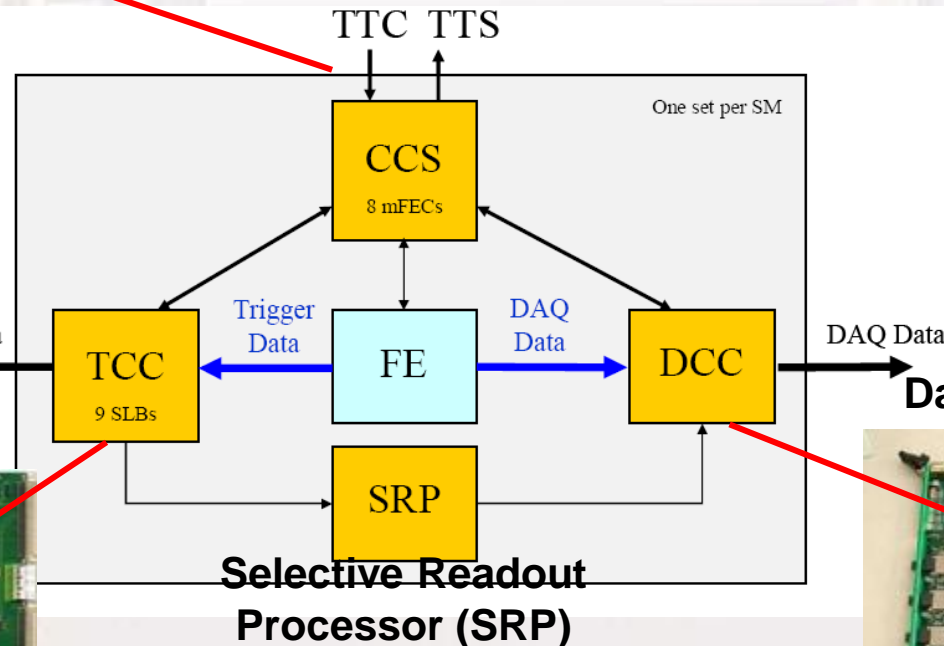
Trigger Concentrator Card (TCC)



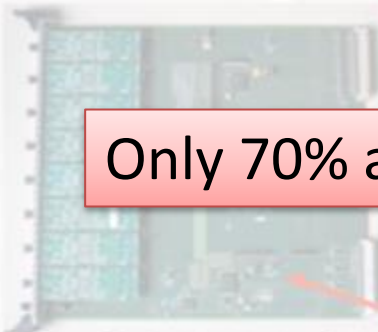
Data Concentrator Card (DCC)



(also known as **FED**)



TTC: Trigger and Timing Card
 TTS: Trigger Throttling System
 mFEC: mezzanine Front End Controller card
 (connects to FE card via token ring)
 SLB: Synchronization and Link Board
 mezzanine



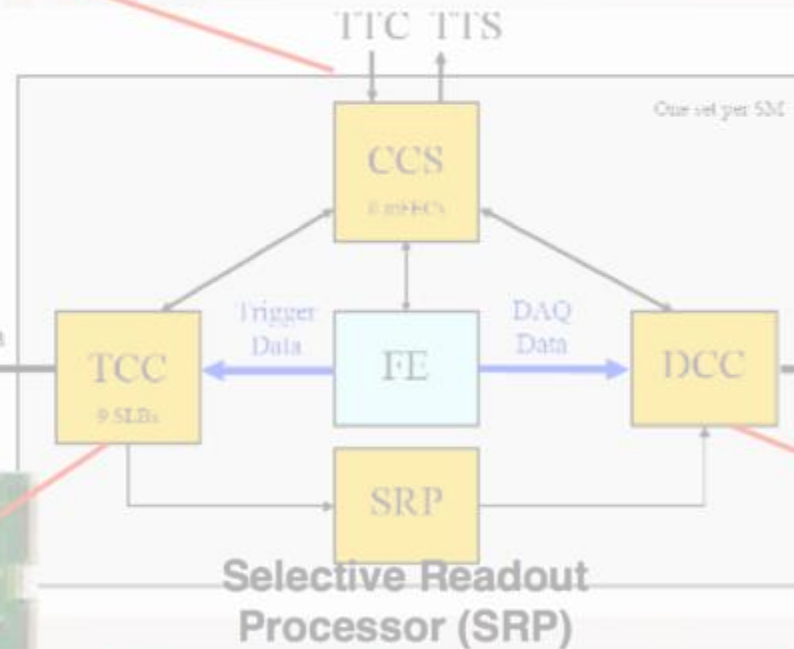
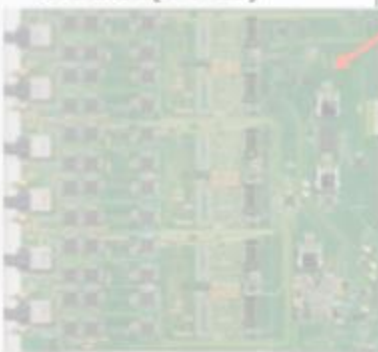
Clock & Control System Card (CCS)

Trigger Concentrator Cards (TCCs) receive FE card trigger primitives
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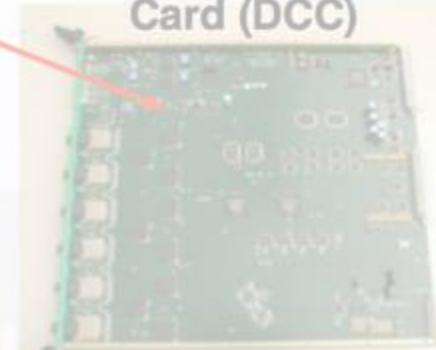
Only 70% area can be used for something useful!

Data Concentrator Card (DCC) reads FE data and TCC information upon L1 accept; performs data reduction and transfers to DAQ

Trigger Concentrator Card (TCC)



Data Concentrator Card (DCC)

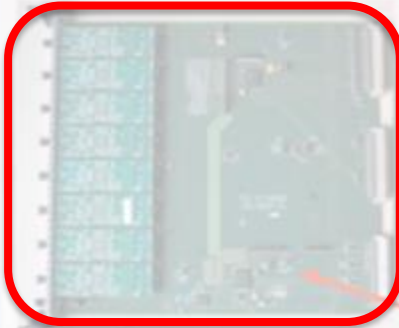


(also known as **FED**)

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SLB: Synchronization and Link Board mezzanine

- Basics
- Technology
- Data Acquisition
- Construction
- Issues
- Performance
- Long-term
- Organization

ECAL Electronics Chain

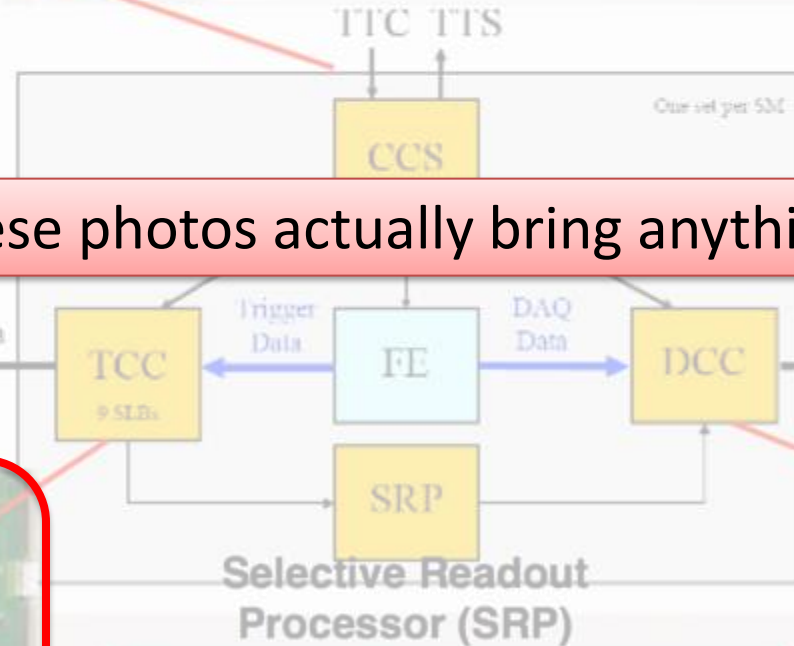


Clock & Control System Card (CCS)

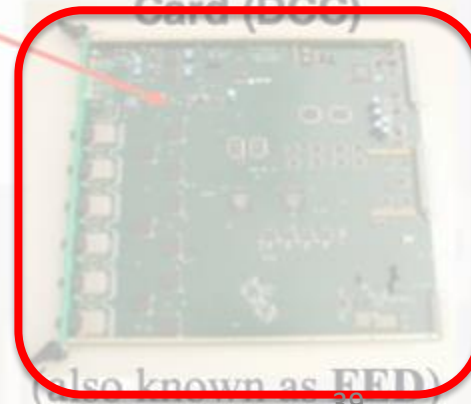
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Do these photos actually bring anything useful?

Trigger Concentrator Card (TCC)



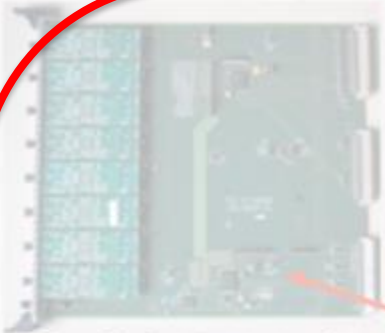
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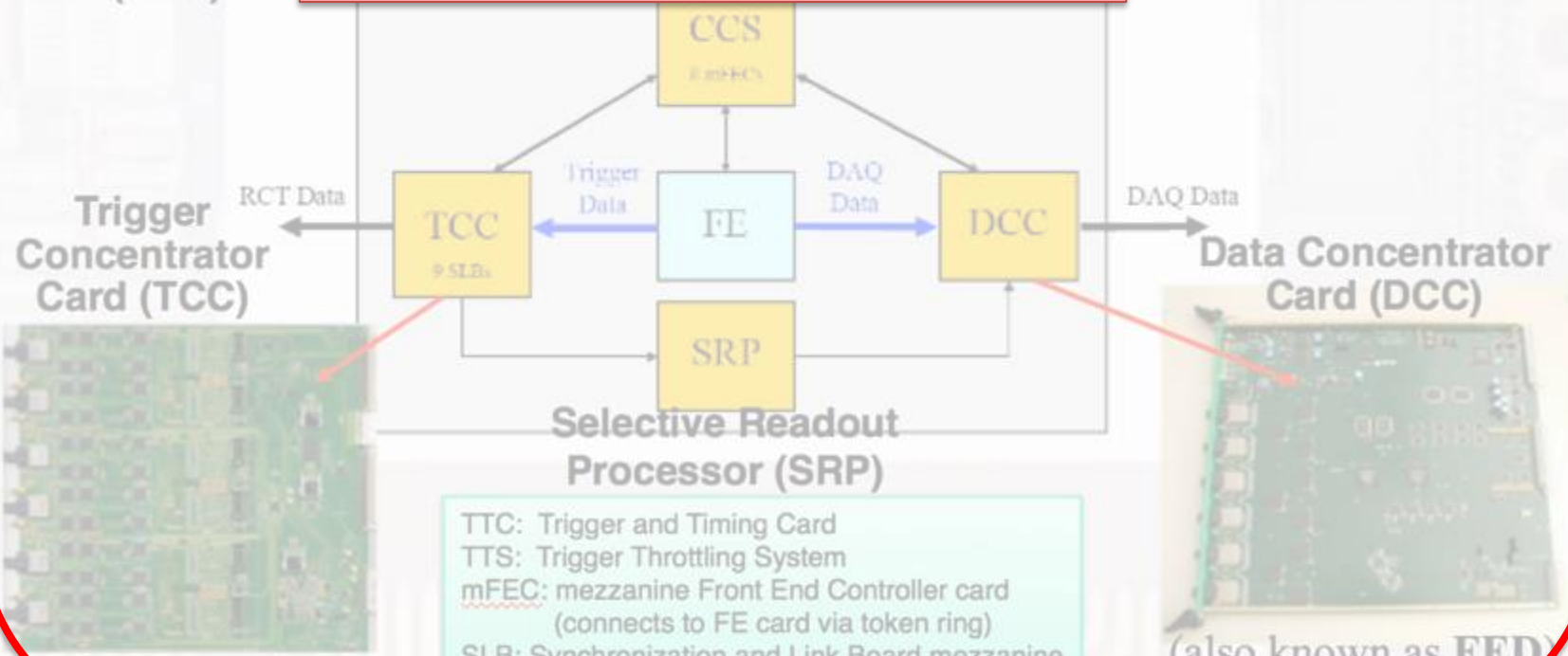
ECAL Electronics Chain



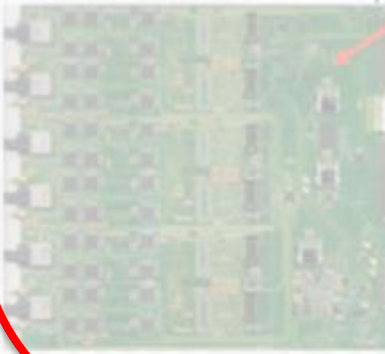
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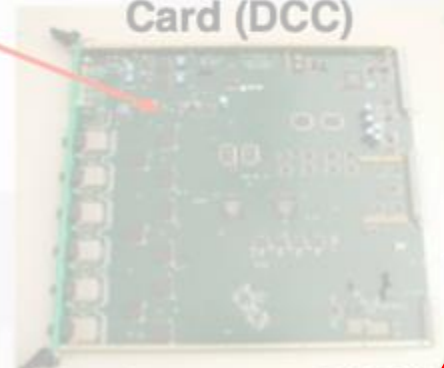
Background image is distracting



Trigger Concentrator Card (TCC)



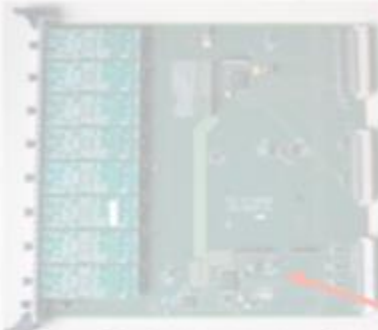
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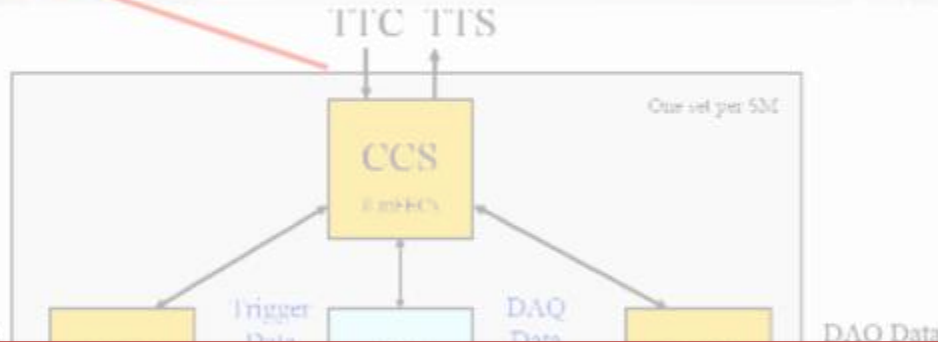
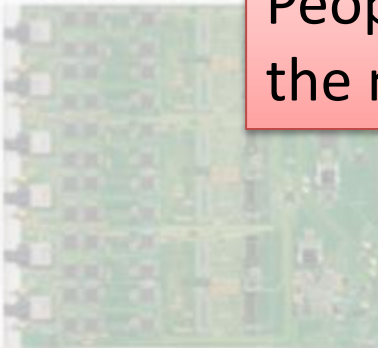
ECAL Electronics Chain



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Trigger Concentrator Card (TCC)



Concentrator Card (DCC)



(also known as **FED**)

So many abbreviations - need a glossary!
 People will read this and perhaps miss the main message!

Processor (SRP)

TTC: Trigger and Timing Card
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ECAL Electronics Chain

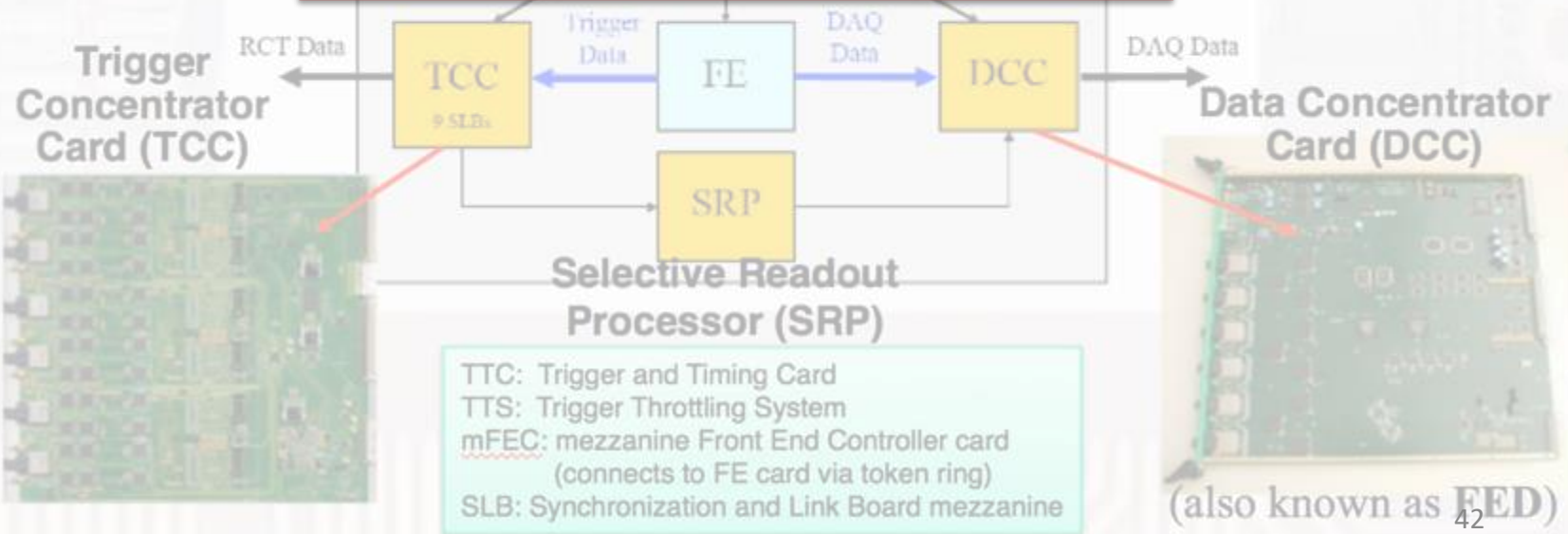


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- Basics
- Technology
- Data Acquisition
- Construction
- Issues
- Performance
- Long-term
- Organization

Where should the audience look?
 What is important?
 Where is the message?

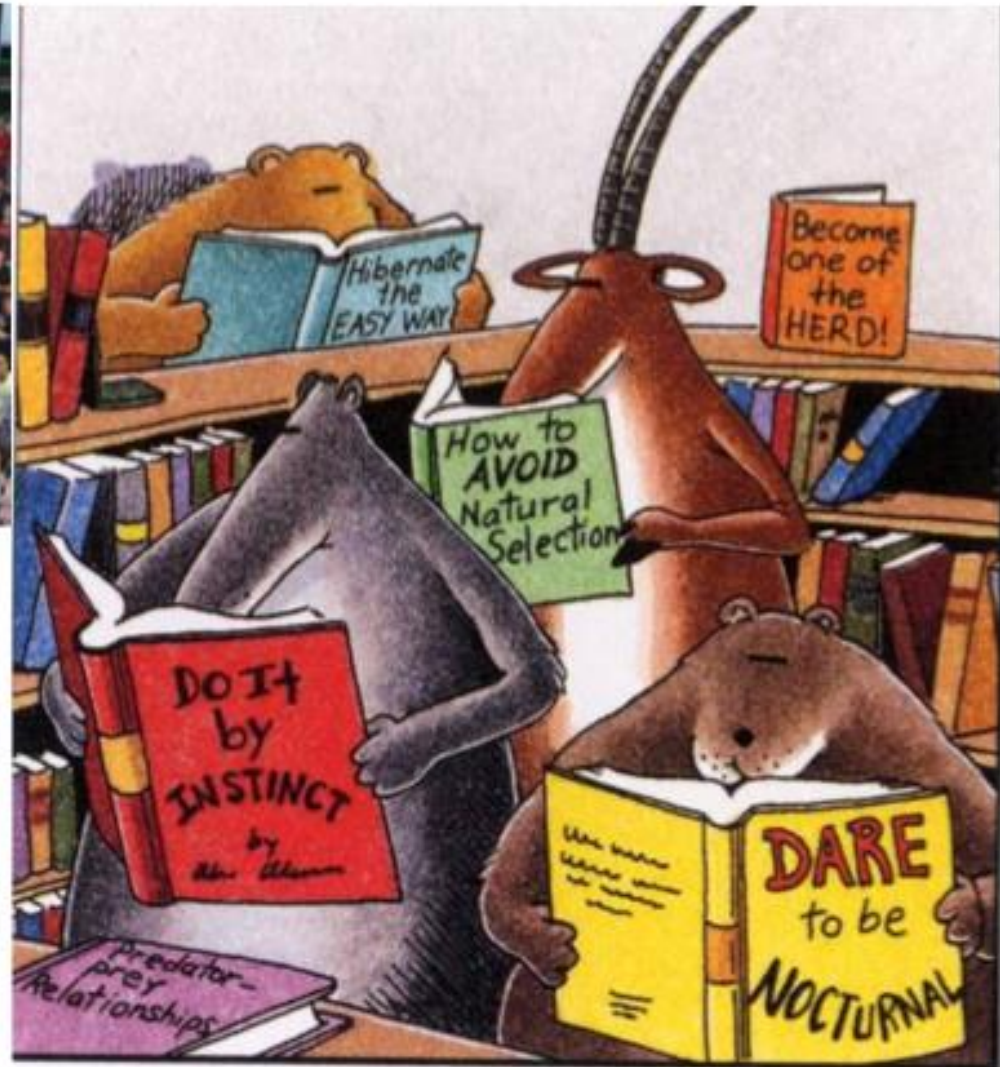


TTC: Trigger and Timing Card
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Images and cartoons:

Can be great, but be careful not to decrease your S/N and lose your main message(s)!

If I have a novel idea, how do I navigate?



In the animal self-help section

- Numerous discussions, several levels many stages,
- Long process: "how can it be known to the outside world, that the idea was mine" particularly to pertinent committees
- Options and metrics to get individual recognition.
- Motivations to seek more new ideas and/or help career promotion?

Challenge #6

What we do at CERN: Smash things together, see what happens!



Before the particle accelerator

**Bullet lists have their uses, but
don't overdo it!**

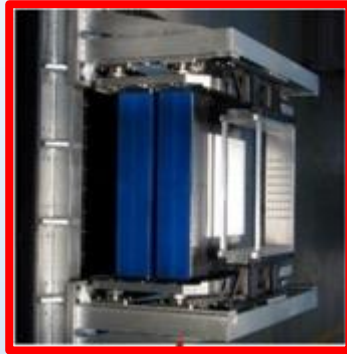
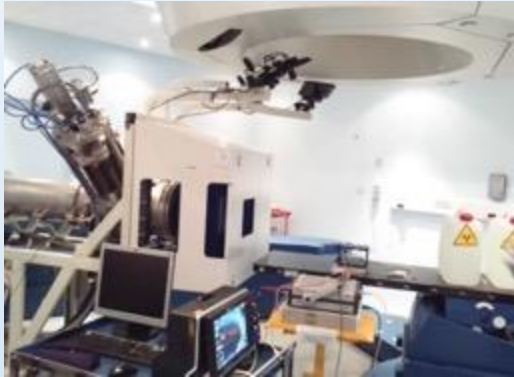
Good examples:

Pros vs cons

Checklists

Beam monitoring in charged-particle therapy

Parallel-plate ionization chambers



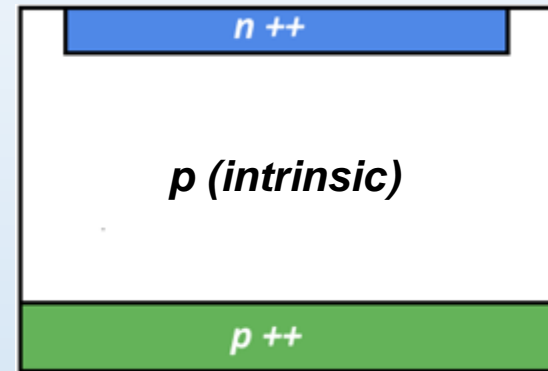
PROS:

- Robust, stable, radiation resistance

CONS;

- Slow response time
- Limited sensitivity
- Measurement of number of particles from the produced charge depends on energy
- Daily QA and calibration measurements.

Silicon detectors



PROS:

- Good sensitivity (single particle detection)
- Small signal duration (direct count of number of particles)
- Fine segmentation -> beam profile
- Time resolution (measurement of beam energy with time-of-flight techniques)

CONS:

- Pile-up effects at high frequencies
- Radiation resistance.

Practical Aspects in irradiation-test organization

- Ensure that **facility is compliant with your requirements** (energy, flux, etc.)
- Ensure that your **system is compliant with facility requirements** (dimension, operation, safety, etc.)
- Respect instructions of the facility about **positioning and alignment of your samples**. Get this checked by facility staff before going, if possible
 - spare devices can be useful if re-test needed
- Dosimetry usually (but not always) done by facility staff. When this is available, it is likely to be accurate typically $\pm 10\%$
 - **dosimetry may be complex**
 - possibly **bring your own reference dosimeter**. This is even more important when the experimental team is not present during irradiation
- Inform the facility about the need of maintaining equipment **for post-irradiation measurements** (annealing tests, etc.)
- **Personnel Dosimetry**: always required when working with ionizing radiation

Federico Ravotti, "Dosimetry Techniques and Radiation Test Facilities for Total Ionizing Dose Testing", Short course RADECS2017

GUIDELINE 4:

MAXIMIZE YOUR S/N RATIO!

Content ordering

Most presentations follow a standard format:

- title
- overview of talk
- what we did
- what we found
- what this means
- what do we do next

This is the exciting stuff!



Higgs-discovery talk

https://indico.cern.ch/event/197461/contributions/1478916/attachments/290953/406672/ATLAS_Higgs-CERN-seminar-2012.pptx

But compare to a newspaper...

Trump back-pedals on Russian meddling remarks after outcry

Republicans and Democrats attack president's comments in press conference with Putin

● **Opinion: Republicans followed Trump off a cliff of treachery**



▲ Trump backflips on Russia interference - video

Donald Trump sought to partially reverse course on Tuesday in the face of furious, bipartisan criticism of his public undermining of US intelligence agencies during a press conference with **Vladimir Putin** in Helsinki.

The US president sought to bring closure after more than 24 hours of bitter recrimination by saying he had simply misspoke when he said in Finland that he saw no reason to believe **Russia** had interfered in the 2016 US election.

- Headline – get attention!
- Image – get attention!
- Give the main message(s)
- details
- links to more information

So how **could** the Higgs discovery
have been announced?

And what about posters?

Even more important to grab the attention as you do not have a captive audience!

A poster is essentially an abstract for a paper: summarize main points and show reader where to get more information

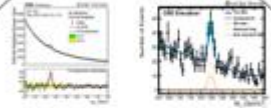
The CMS ECAL Upgrade for Precision Crystal Calorimetry at the HL-LHC



SCINT2017
Chamonix - France

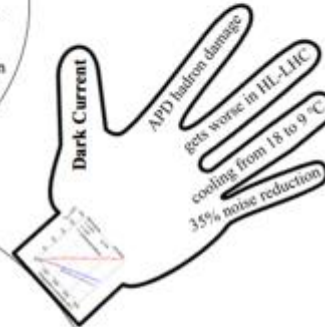


Arash Jofrehei
on behalf of CMS Collaboration
arash.jofrehei@cern.ch



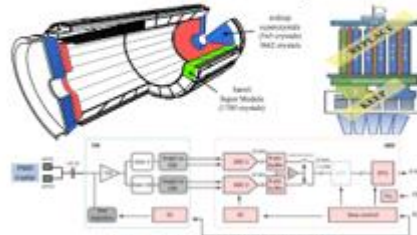
Physics Motivation

Mass resolution with $\sim 1\%$ precision crucial for discovery of Higgs boson.
Analyzing di-Higgs production will shed light on vacuum stability of universe.
+ many other beyond standard model studies



ECAL Legacy

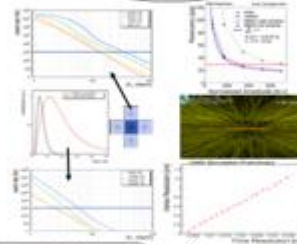
5x5 arrays of crystals
APDs in barrel
Vacuum Photo Triodes in end caps
5 identical Very Front End readouts
one Front-End (FE) card for transmission
separate readout per channel, triggered by overall sum
40 MHz sampling ADC with 3 gains



Barrel Electronics Upgrade

faster optical links (4 fibers needed) – No buffer
single crystal trigger primitive
160 MHz sampling with two gains
mitigate dark current, out-of-time pile up, spikes
precision timing is possible

For further details, please refer to TDR-17-002 which will come out soon.



Spike Rejection

energy deposit in the APD bulk
EM-shower-like but faster
currently rejected by topological cuts
single crystal triggering + pulse shape discrimination will be added

Precision Timing

higher sampling rate
measuring time-of-flight from vertices
precise vertex discrimination
precise angle between di-photons
enhancing mass resolution

"Do you know that J/ψ is used to study the QGP?"
 "What do you mean? What about the relationship QGP?"
 "Yeah, but hadron production is not fully understood though."
 "QGP is considered the best model we have now, but it does not describe well the fragmentation, for example."
 "So how would you get a better understanding then?"
 "You can look at J/ψ in jets!"
 "How does this help? What can you measure exactly?"
 "By measuring $R = \frac{P_{T, J/\psi} / P_{T, jet}}{P_{T, J/\psi} / P_{T, jet}}$ you can study the J/ψ Fragmentation Function. You can also check how often J/ψ end up in jets."
 "Actually the CMS Heavy Ion Group has some interesting results in pp collisions!"
 "Oh! Great! You are heavy on!"
 "They are going to measure J/ψ in jets in Pb-Pb collisions to see the effect of the QGP on J/ψ jets. Watch the J/ψ expression of high- p_T is not just considered to be a leading but also higher energy hadron."

"You mean like jet quenching?"
 "Maybe! let's take a look together at their results."

"Once upon a run, J/ψ of p_T larger than 3 (6.5) GeV, in forward (mid-) rapidity, were clustered in jets of $25 < p_T < 35$ GeV."
 "Prompt and nonprompt J/ψ are separated with 2D fit of the invariant mass and the pseudo-proper decay length."
 "You mean the displacement of the jet vertex from the primary collision, right?"
 "Exactly!"
 "The migration across a jet p_T bins, due to the jet p_T resolution, is corrected with 2D unfolding."
 "The transition from true to measured is expressed in terms of a response matrix constructed from MC simulations using PYTHIA 8."

Nonprompt Mid-rapidity **Nonprompt Forward rapidity** **Prompt Mid-rapidity** **Prompt Forward rapidity**

And here are the z distributions they got.

Nonprompt data and MC have similar trends. Due to the decay kinematics, the parent b hadrons have a quite different z distribution.

Wait a sec!!!
Prompt data and MC are very different!

That's not all!!!
 The results for the fraction of J/ψ that are in jets showed a difference both for prompt and nonprompt J/ψ . This fraction is less than 7% in all cases but it is bigger in data than MC.

J/ψ -in-jet fraction (%)

J/ψ -in-jet fraction data/MC

This is really interesting! Is our current understanding of J/ψ in jets not enough?
 Yeah, we need further studies in pp.
 It would also be interesting to see how J/ψ -jets fragment in Pb-Pb.
 Wait a minute!
 What?
 Do you feel like someone is watching u@77?
 Mmm, not.

[1] CMS, "Measurement of the prompt J/ψ and $\psi(2S)$ production in pp collisions at $\sqrt{s} = 7$ TeV", *PLA 707* (2015) 361
 [2] CMS, "Study of J/ψ production in jets", *PLA 106* (2015) 101008
 [3] CMS, "Production of prompt and nonprompt J/ψ in jets in pp collisions at $\sqrt{s} = 5.02$ TeV", *CMS-PAS-2016-08-002*
 [4] M. Spalardi, "On sensitivity of jet quenching and charmness suppression", *PLA 707* (2015) 31



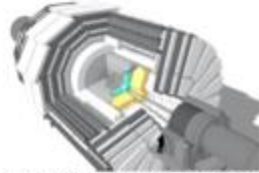
The Silicon Sensors for the High Granularity Calorimeter of CMS



Peter Paulitsch on behalf of the CMS collaboration

Background

The High Luminosity LHC (HL-LHC) will have a factor 5 higher instantaneous luminosity compared to the end of LHC operation, resulting in a proportionally higher event rate and a factor 20 increase of integrated luminosity (3000 fb⁻¹). Therefore, unprecedented levels of radiation and particle shower densities will affect experiments such as CMS. To address these challenges, the CMS collaboration will replace the existing endcap calorimeters with a new High Granularity Calorimeter (HGCal) during the Phase-II Upgrade, around 2024-2026, which will include more than 600m² of silicon sensors to allow efficient mitigation of pileup and facilitate particle-flow calorimetry.

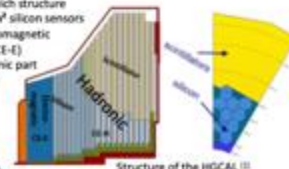


Location of the HGCal at the CMS experiment [1]

Sensor design

- 8" wafers, two cell densities (LD/HD)
- Thicknesses 120, 200, 300µm to cope with different levels of radiation
- 8" process is a new experience in HEP, important differences from well-known 6": oxide charges, oxygen concentration in bulk, and fragile thin metal backside of 8"
- Hexagonal shape: A hexagon is the largest tileable, regular shape on a circular wafer
- Sensing elements are hexagonal, n-in-p, DC-coupled diodes
- Additional smaller, circular calibration diodes with lower capacitance to maintain MIP sensitivity after 3000 fb⁻¹
- Two guard rings (biased-floating)

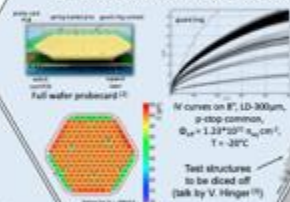
- Sandwich structure
- >600m² silicon sensors
- Electromagnetic part (CE-E)
- Hadronic part (CE-H)



Structure of the HGCal [1]

Sensor testing

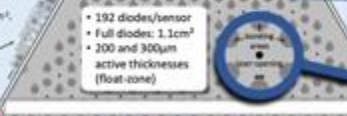
- Laser-TCT for charge collection efficiency
- Sensors DC-coupled, no common biasing
- Single, consecutive diode measurements do not represent NVC situation on module
- Full wafer probecard with spring-loaded pins



Partial sensor type "Three"

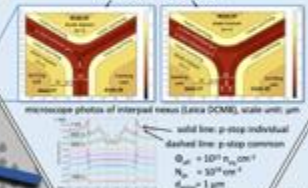
Low-Density (LD) sensor

- 192 diodes/sensor
- Full diodes: 1.1cm²
- 200 and 300µm active thicknesses (float-zone)



Interpad structure

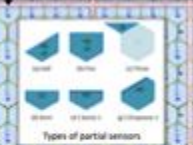
- Metal overhang to move peaks in E fields into oxide
- p+ implants (p-stops) to increase interpad resistance
- Two p-stop geometries under investigation: common and individual



Partial sensor type "Three"

Partial sensors

- Endcap is circular → partial sensors provide better coverage of inner- and outermost regions, as well as the boundaries between silicon and scintillator parts
- Common design from which different versions can be diced
- Dicing streets and full periphery in the middle (!) of sensor



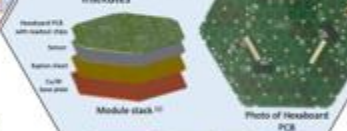
High-Density (HD) sensor

- 432 diodes/sensor
- Full diodes: 0.5cm²
- 120µm active thickness (epitaxial)



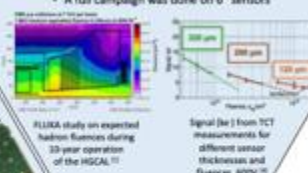
Outlook

- > 600m² sensors will be produced and tested by Hamamatsu Photonics, CMS collaboration will test 2-5%
- 30,000 modules will be assembled by CMS institutes



Radiation hardness

- Total ionizing Dose up to 2 MGy
- Fluence Φ dominated by neutrons (90%)
- Three sensor types for different Φ regions
 - 120µm (HD): 1x10¹³ n_{eq}/cm²
 - 200µm (LD): 2.5x10¹² n_{eq}/cm²
 - 300µm (LD): 5x10¹¹ n_{eq}/cm²
- A full campaign was done on 6" sensors



About the author

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peter.paulitsch@cern.ch
Tel.: +43 (1) 5447328 - 41



References

- [1] CMS Collaboration, The Phase-2 Upgrade of the CMS Endcap Calorimeter, Technical Design Report, 2017
- [2] E. Brondolin et al., ARRR: An open source, modular and probe-card based system with integrated switching matrix for characterization of large area silicon pad sensors, Nucl. Instrum. Methods A 864 (2017) pages 168-173
- [3] V. Hinger, Process quality control strategy for the Phase II upgrade of the CMS tracker and endcap calorimeters, HEPSC, 2020
- [4] M. Valentin, The CMS high granularity calorimeter for the high luminosity LHC, Nucl. Instrum. Methods A 836 (2016), page 103

High Granularity Calorimeter NIM Replacement



kathryn_aggie

Following

6 posts 50k followers 100 following

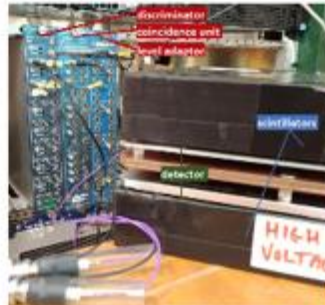
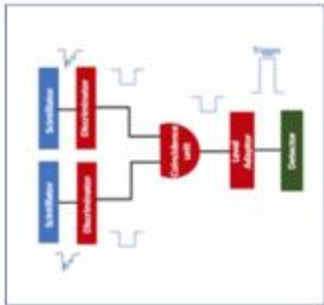
Kathryn Coldham & Agustina Quesada

Queen Mary University of London & Johns Hopkins University

kathryn.coldham@cern.ch & agustina.quesada@cern.ch

Supervisor: Dr. Dave Barney

Acknowledgements: Thanks to Dave Barney & Paul M. Rubinovl



45,120 likes

kathryn_aggie Nuclear Instrumentation Modules (#NIM) are electronics modules used for triggering in data acquisition. An example of their usage is to create a trigger when a particle is incident on scintillators. If an input signal in the scintillators is above a certain threshold voltage, a NIM called a #discriminator converts the signal into a square wave output, removing any unnecessary information. The #coincidence unit NIM then triggers when input signals from multiple scintillators are simultaneous, indicating that the signals are not likely to be noise. Finally the #level adaptor formats the signal to send a trigger to a detector, for example a calorimeter.

42,102 likes

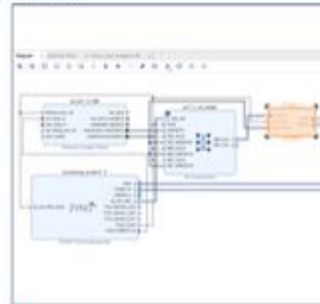
kathryn_aggie An image of the NIM setup is shown above. There are several #disadvantages associated with NIMs. The NIM system is quite bulky and not convenient for transportation. Also, the module parameters must be manually adjusted; there is no computer system to remotely take care of this. During precious beam test time, the beam must be stopped to adjust module parameters. Beam time is expensive and only a certain amount is allocated per project. Therefore, it would be convenient to replace the NIM system with something smaller and more transportable that can alter parameters easily and remotely. In addition, this new system could be easily reproduced in laboratories around the world.



39,656 likes

kathryn_aggie A #NIM+ can replace NIMs, as was proposed at Fermilab by Lorenzo Uplegger. The NIM+ contains a ZedBoard and a custom discriminator. With approximate dimensions of 13 cm by 23 cm, it is much smaller than the existing NIMs so will be easier to transport. In addition, parameters can be adjusted using a computer system, making the use of the NIM+ much more efficient.

kathryn_aggie Biery, K et al. The Fermilab Test Beam Facility Data Acquisition System Based on otdaop.



32,009 likes

kathryn_aggie #Vivado is being used to program the Zynq APSoC, so the NIM+ can replace the NIM system. The FPGA-based PL provides the flexibility to create the necessary #peripherals for the project. Shown in the image is a #block #diagram with an added peripheral (highlighted in orange).

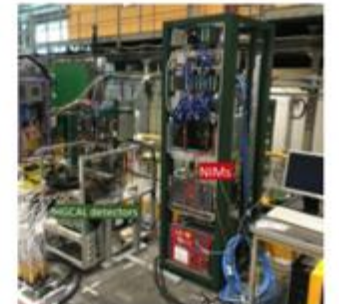
kathryn_aggie Xilinx (2018). Vivado Design Suite Tutorial.



36,396 likes

kathryn_aggie The #ZedBoard is a #computer with a Zynq All-Programmable System on a Chip (#APSoC). This incorporates a Processing System (#PS) that uses an ARM processor and Programmable Logic (#PL) that is #FPGA based. This enables it to handle two types of processing: the PL is useful for deterministic, high-speed processing while the PS can run software and an operating system.

kathryn_aggie Crockett, L et al. (2014). The Zynq Book. Scotland: Strathclyde Academic Media.

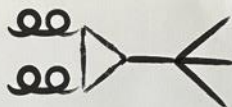


29,794 likes

kathryn_aggie As an example, this NIM+ replacement can be used in High Granularity Calorimeter (#HGAL) testing. The photograph shows the NIMs as part of the test set-up. HGAL will replace the CMS detector endcaps, to survive the tough radiation environment and high pileup of the High-Luminosity LHC.

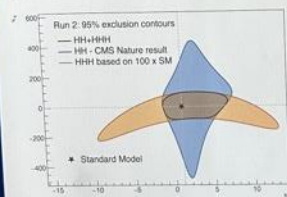
kathryn_aggie CMS Collaboration (2018). The Phase-2 Upgrade of the CMS endcap calorimeter Technical Design Report. CERN.

Probing the Higgs potential: Search for HHH production



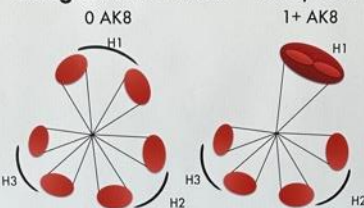
"You should never do what other people do. You have to do something unique because it allows you to make your own mistakes and to modify things – to change your mind 25 times before coming to the right solution." - Carlo Rubia - 2019

Motivation: HH + HHH



Full determination of Higgs potential:
• Only possible through HH + HHH

Categorisation: HHH → 6 b-quarks

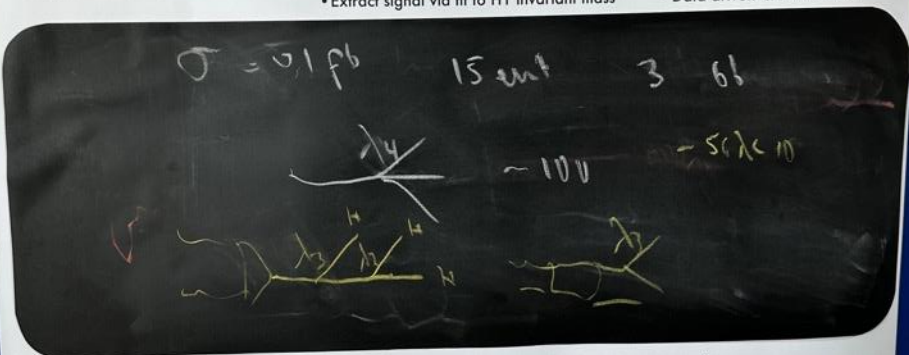


Target both resolved and boosted topologies:
• Remove background exploiting H2 and H3
• Extract signal via fit to H1 invariant mass

Strategy: the "Rubia" bin

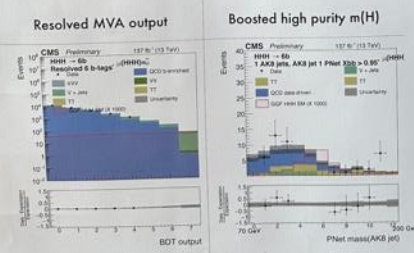


Achieve highest sensitivity
• Target high signal / background
• Data driven QCD estimate



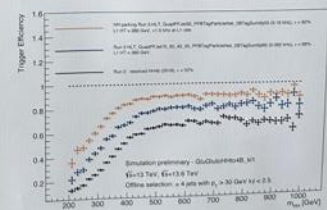
The "blackboard" part is real – stuck on to the poster. Presenter can interact with people whilst describing the poster!

Preliminary results: Run 2 data set



Run 2	Resolved only	Boosted only
Positif b-only expected	562x SM	277 x SM

Towards Run 3: HH parking



HHH → 6 b only the first step
• BR(HHH → 6b) ~ 20% → small fraction of HHH decays
• BR(HHH → 4b2tau) ~ 10%
• BR(HHH → 4bWW) ~ 20%
• HH parking: record 80% to 90+% of HH and HHH events!
→ Run 3 will be the run of the Higgs self-coupling!

GUIDELINE 5:

DON'T BE AFRAID TO BE DIFFERENT

How to finish a talk?

Thank you for your attention!



Thank you !

Questions ?



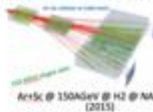
part of ATLAS detector waiting for beam in H8 (2004)



LHCb telescopes being tested in H8 (2015)



CAUICE calorimeter @ H2 (2015)



ATLAS @ 1300GeV @ H2 @ NA63 run (2015)

Thanks for attention!

THANK YOU!

irradiation-facilities.web.cern.ch
Contact: Irradiation.Facilities@cern.ch



Thank you for your attention!



The end ! Thank you. Questions ?



Thank
you
for your attention!



UNIVERSITÀ DI PISA
24-27 January 2017 15

Thank you

Thank you for your attention

The authors gratefully acknowledge the financial support from the projects
"AIDA-2020-TA", "MSMT INGO II, z. LC1902", "MSMT z. L0306 (BCPTM-APU)",
"MSMT z. LM201606", "IGA no. P4/2016/002"

Thanks

Thank you for your patience ...

... unlikely many many issues not covered:

signal formation and digitization

readout

buses

hw configuration

hw control

sw configuration

sw control

monitoring

...

24 January 2017

67

How to finish a talk?

Could include in a summary an overall “so what”?

Guideline #1:

the presentation is for the audience

Guideline #2:

focus on your main messages

spend 70% of your time in planning; 30% in using ppt

Guideline 3:

**don't make the audience work too hard to understand
plots/figures**

Guideline #4:

**maximize your s/n ratio (& don't be afraid to use more
slides!)**

Guideline #5:

Don't be afraid to be different

Exercise 3: Working in pairs, you have 15 minutes to modify and simplify a presentation **you have made** in the last six months, to max. 5 slides (3 minutes)

Send any slides to David.Barney@cern.ch
using filename:

3_<Yourname>.<extension>

*I will choose some at random for
presentation!*

Guideline #1:

the presentation is for the audience

Guideline #2:

focus on your main messages

spend 70% of your time in planning; 30% in using ppt etc.

Guideline 3:

**don't make the audience work too hard to understand
plots/figures**

Guideline #4:

**maximize your s/n ratio & don't be afraid to use more
slides!**

Guideline #5:

don't be afraid to be different

THANK YOU FOR STAYING AWAKE!

1-MINUTE PRESENTATIONS

Luca Ghislotti

The basics of a Hi-Fi system

- Integrated



- Pre + Amp
 - Preamplifier



- Power amplifier



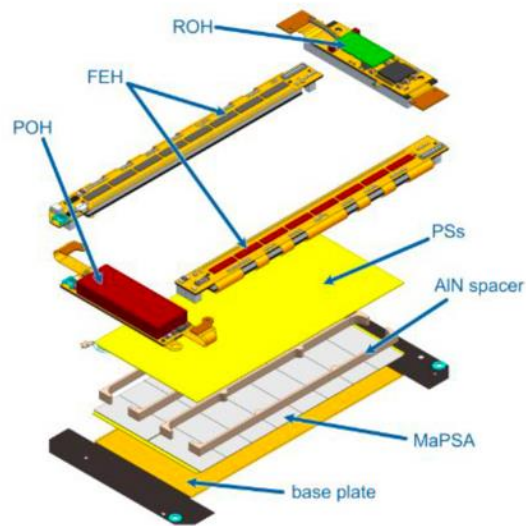
Daniil Rastorguev

(Semi-)automated assembly of PS modules

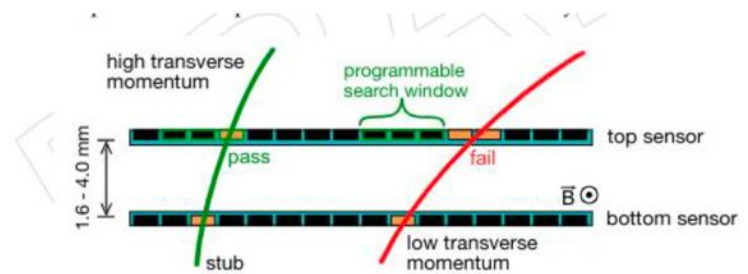
aka robotic arm moving silicon pieces
by Daniil from DESY

Daniil Rastorguev

How this works and why is it important



PS module schematic



p_t discrimination concept

Sukyong Kim



Sukyong Kim



Sukyong Kim



Sukyong Kim



Antoine Venturini

The Room Number @ INFN Pisa

Antoine Venturini

Elena Sidoretti



HOW TO PROPERLY COOK PASTA

an Italian guide for not so Italian people

Elena Sidoretti

THE PROPER WAY

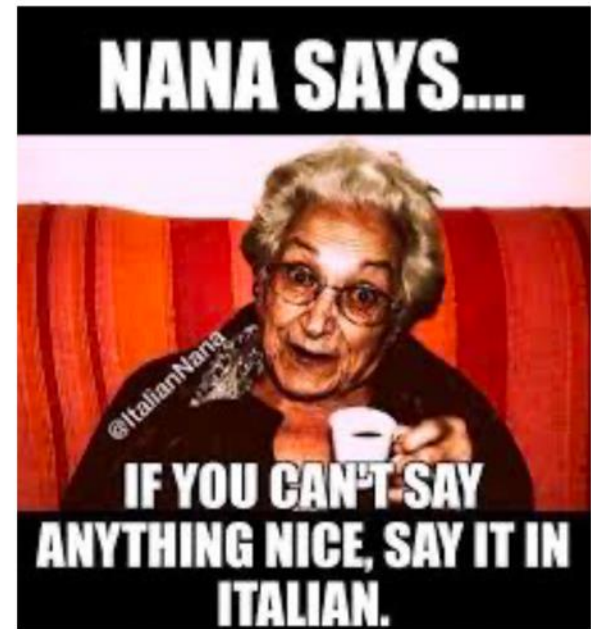
- Just follow the recipe
- Don't do what you think could work



Elena Sidoretti

THE EASY WAY

- Ask an Italian person to cook it for you



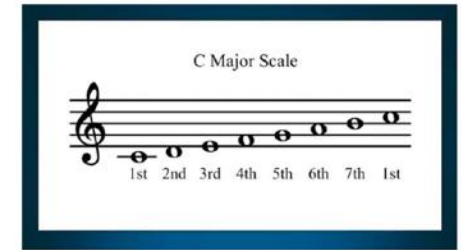
Magdy Louka

Music Scales

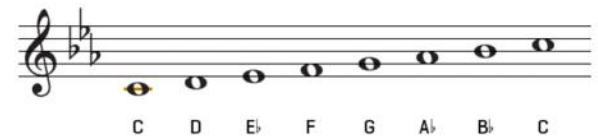
There are a several types of musical scales
Every region has traditional local music

Some are very widely common

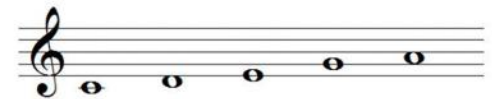
- Major scale
- Minor scale
- Pentatonic scale



C minor scale (treble clef)



Pentatonic scales



Matej, Diana and Kalpanie

