PHYS 1444 – Section 501
Lecture #1

Wednesday, Jan. 18, 2006

Dr. Jaehoon Yu

- Who am I?
- How is this class organized?
- What is Physics?
- What do we want from this class?
- Brief history of physics
- Some basics …
- Chapter 21
  - Static Electricity and Charge Conservation
  - Charges in Atom
  - Insulators and Conductors
  - Induced Charge

Today's homework is homework #1, due 7pm, next Thursday!!

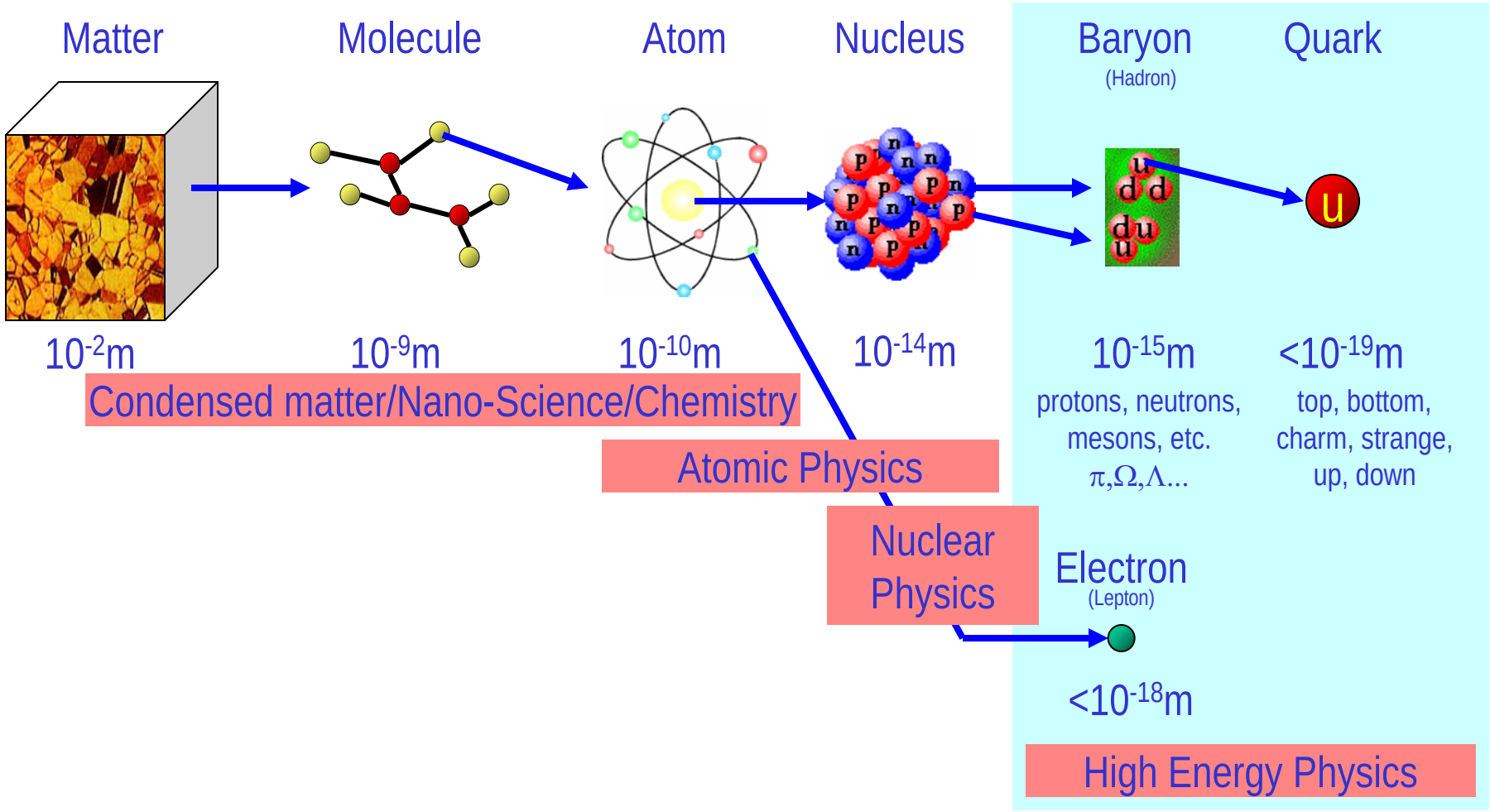
Announcements

- Plea to you: Please turn off your cell-phones, pagers and computers in the class
- Reading assignment #1: Read and follow through all sections in appendix A by Monday, Jan. 23
  - A-1 through A-7
- There will be a quiz on this and Ch. 21 on Monday, Jan. 30.

Who am I?

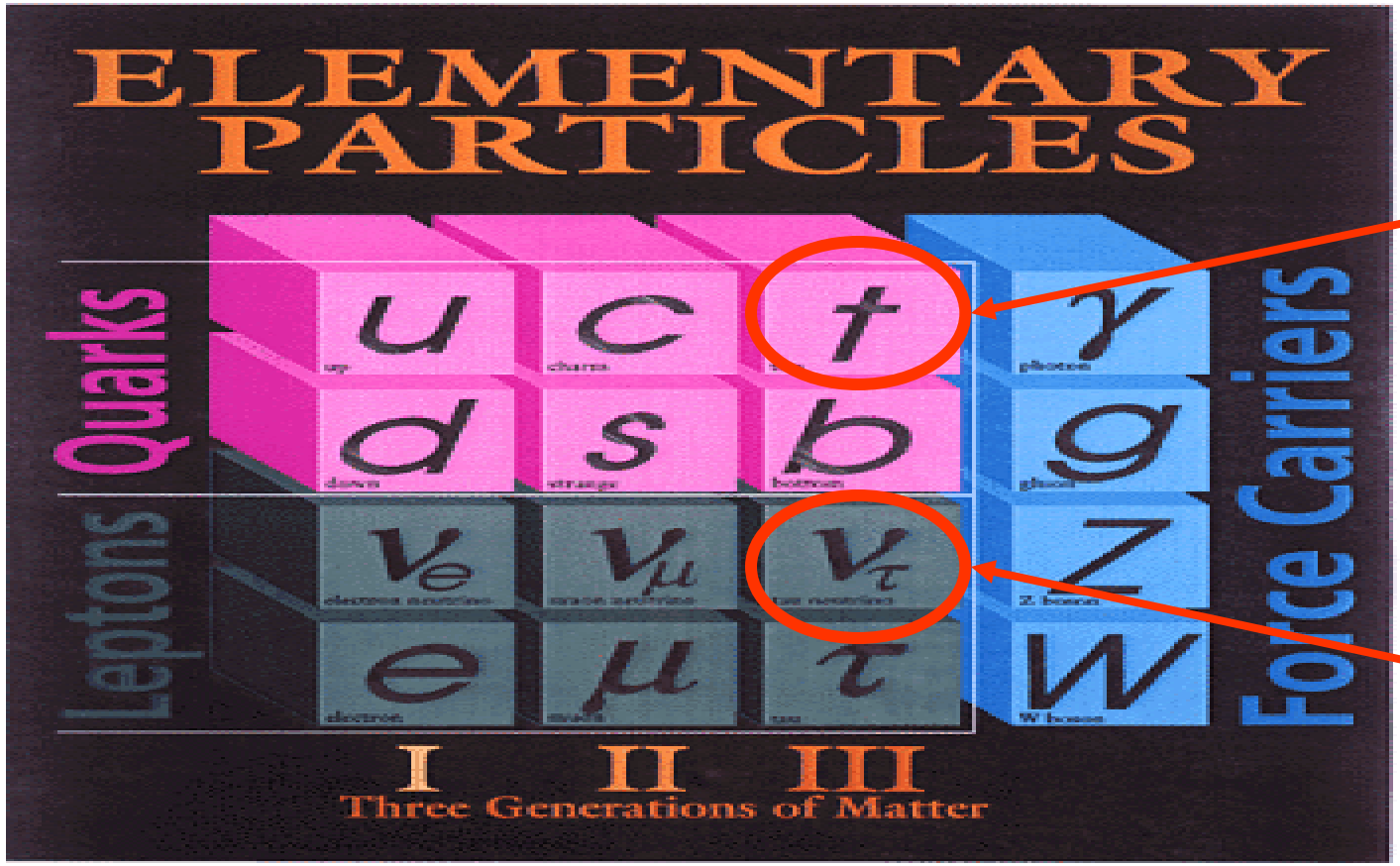
- Name: Dr. Jaehoon Yu (You can call me Dr. Yu)
- Office: Rm 342, Chemistry and Physics Building
- Extension: x22814, E-mail: *jaehoonyu@uta.edu*
- My profession:High Energy Physics (HEP)
  - Collide particles (protons on anti-protons or electrons on anti-electrons, positrons) at the energies equivalent to 10,000 Trillion degrees
  - To understand
    - Fundamental constituents of matter
    - Forces between the constituents (gravitational, electro-magnetic, weak and strong forces)
    - Origin of Mass
    - Creation of Universe (**Big Bang** Theory)
  - A pure scientific research activity
    - Direct use of the fundamental laws we find may take longer than we want but
    - Indirect product of research contribute to every day lives; eg. WWW
  - Why do we do with this?
    - Make our everyday lives better

Structure of Matter



The Standard Model

- Assumes the following fundamental structure:



Discovered in 1995

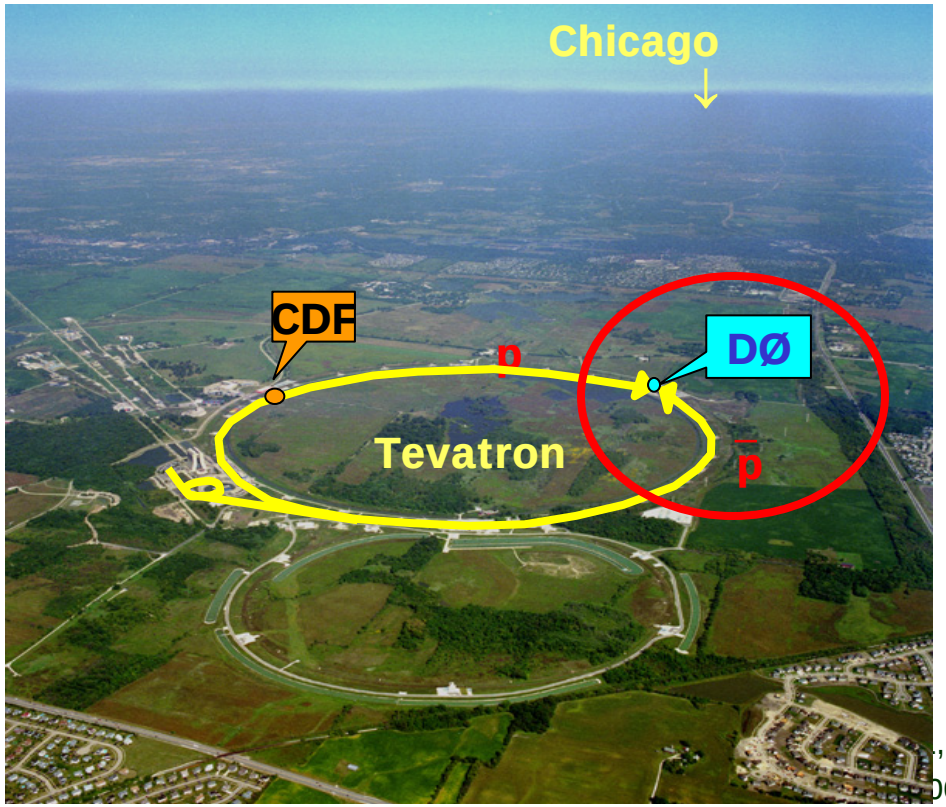
Directly observed in 2000

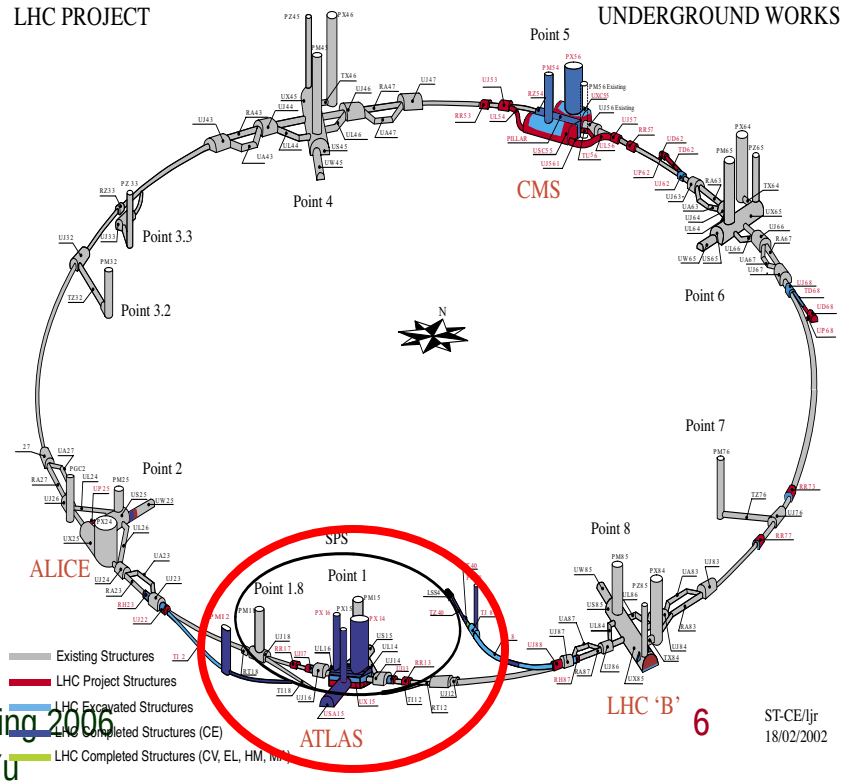
Fermilab Tevatron and LHC at CERN

- Present world's Highest Energy proton-anti-proton collider
  - E_{cm}=1.96 TeV (=6.3x10^{-7}J/p➔ 13M Joules on 10^{-4}m^2)

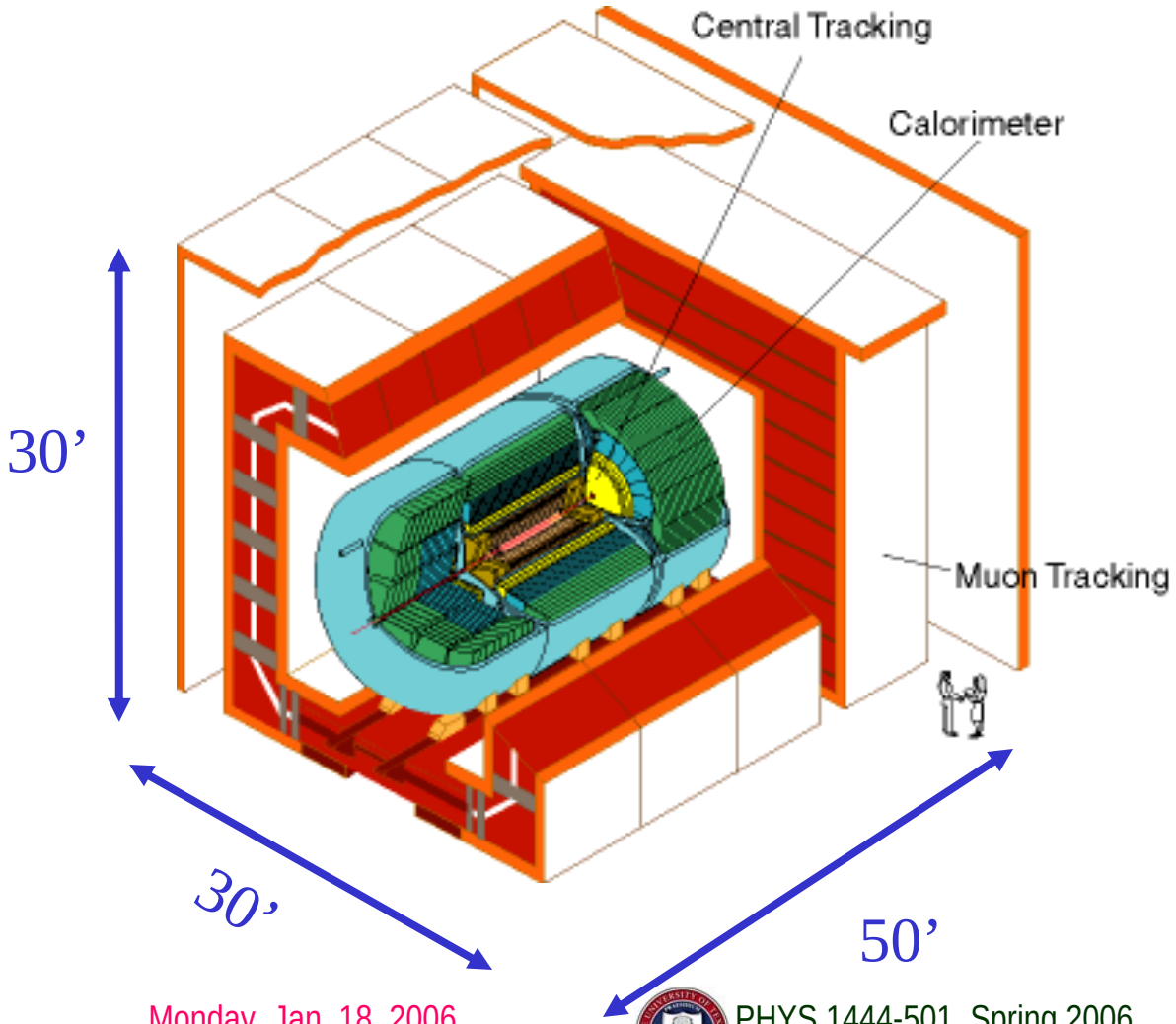
  ⇒ Equivalent to the kinetic energy of a 20t truck at a speed 80 mi/hr
- World's Highest Energy proton-proton collider in 2 years
  - E_{cm}=14 TeV (=44x10^{-7}J/p➔ 1000M Joules on 10^{-4}m^2)

  ⇒ Equivalent to the kinetic energy of a 20t truck at a speed 212 mi/hr



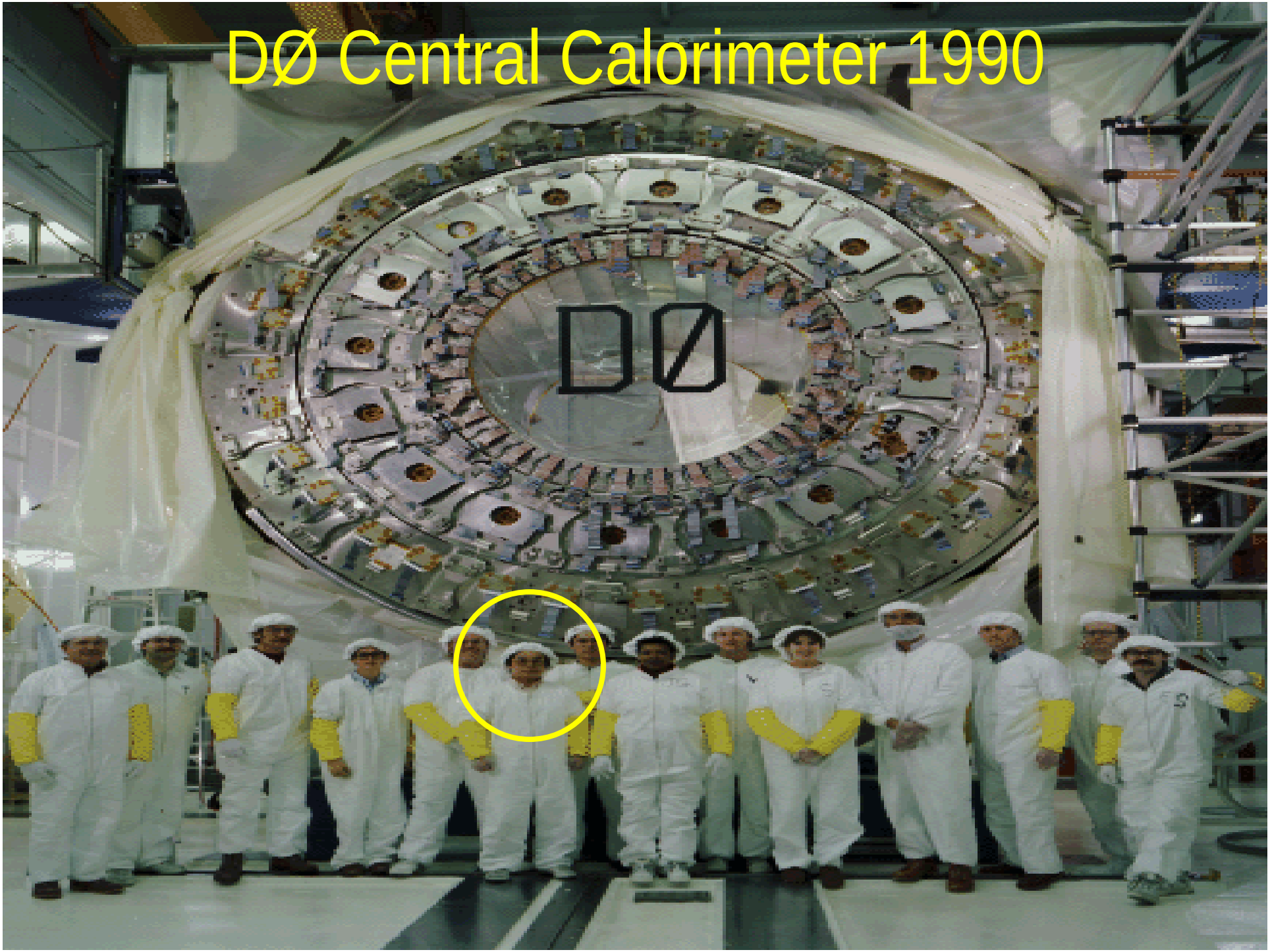


DØ Detector: Run II

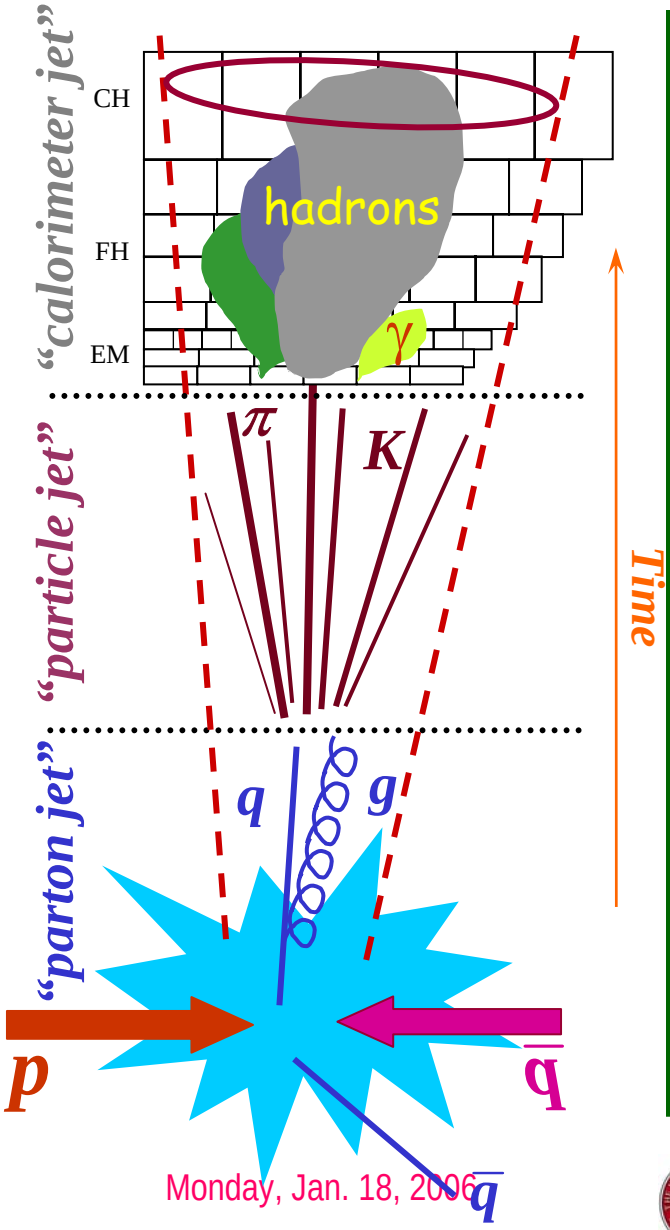


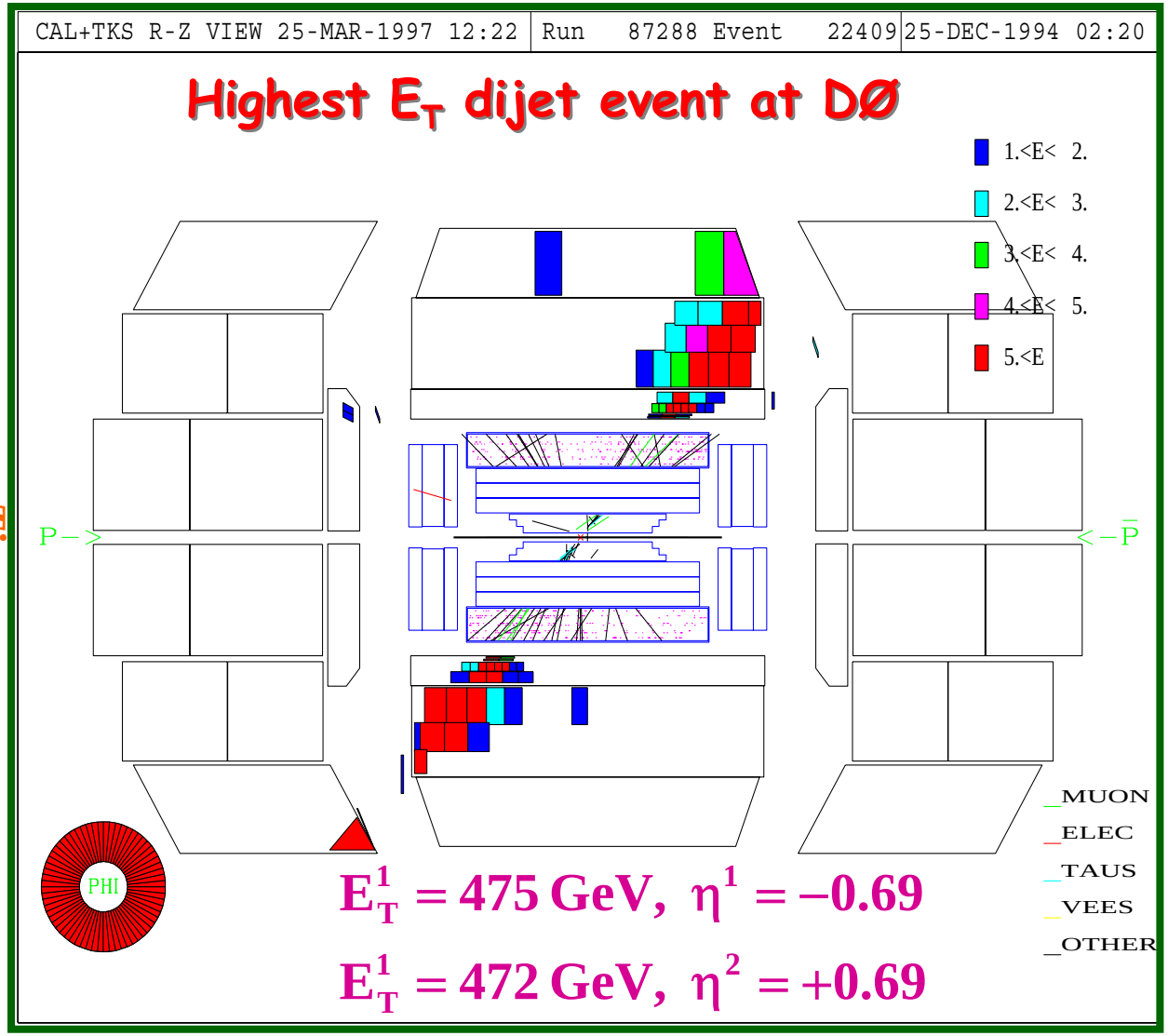
- Weighs 5000 tons
- Can inspect 3,000,000 collisions/second
- Will record 50 collisions/second
- Records ~12.5M Bytes/second
- Will record 2 Peta bytes in the current run.
- Has over a 100 million parts

DØ Central Calorimeter 1990



How does an Event Look in a Collider Detector?





Information & Communication Source

- My web page: http://www-hep.uta.edu/~yu/
  - Contact information & Class Schedule
  - Syllabus
  - Homework
  - Holidays and Exam days
  - Evaluation Policy
  - Class Style & Communication
  - Other information
- Primary communication tool is e-mail: Register for PHYS1444-501-SPRING06 e-mail distribution list as soon possible ➔ Instruction available in Class style & Communication
  - 5 points extra credit if done by Wednesday, Jan. 25
  - 3 points extra credit if done by Monday, Jan. 30
- Office Hours: 6:50 – 7:50pm, Mondays and Wednesdays in SH241-C or by appointments in CPB342
  - My office door is wide open for you!!!

Evaluation Policy

- Term Exams: 45%
  - Total of three non-comprehensive term exams (2/22, 4/5 & 5/6)
  - Best two of the three will be used for the final grade
  - Each will constitute 22.5% of the total
  - Missing an exam is not permissible unless pre-approved
    - No makeup test
    - You will get an F if you miss any of the exams without a prior approval
- Lab score: 20%
- Homework: 25%
- Pop-quizzes: 10%

100%

- Extra credits: 10% of the total
  - Random attendances
  - Strong participation in the class discussions
  - Other many opportunities
- Will be on sliding scale unless everyone does very well

Homeworks

- Solving homework problems is the only way to comprehend class material
- An electronic homework system has been setup for you
  - Details are in the material distributed last week and on the web
  - https://hw.utexas.edu/studentInstructions.html
  - Download homework #1 (1 problem), attempt to solve it, and submit it ➔ You will receive a 100% credit for HW#1
    - This HW is due at 7pm next Thursday, Jan. 26. So you still have some time to take advantage!
  - Roster will close next Wednesday, Feb. 1
- Each homework carries the same weight!!
- Home work will constitute 25% of the total ➔ A good way of keeping your grades high
- Strongly encouraged to collaborate ➔ Does not mean you can copy
- Take advantage of the Physics Clinic: 12 – 6pm, M – F, SH010

Attendances and Class Style

- Attendances:
  - Will be taken randomly at the beginning of each class
  - Will be used for extra credits
- Class style:
  - Lectures will be on electronic media
    - The lecture notes will be posted on the web AFTER each class
  - Will be mixed with traditional methods
  - Active participation through questions and discussions are STRONGLY encouraged ➔ Extra credit….

Why do Physics?

Exp.
- To understand nature through experimental observations and measurements (Research)

Theory
- Establish limited number of fundamental laws, usually with mathematical expressions
- Predict the nature's course

⇒Theory and Experiment work hand-in-hand

⇒Theory works generally under restricted conditions

⇒Discrepancies between experimental measurements and theory are good for improvements

⇒Improves our everyday lives, though some laws can take a while till we see amongst us

What do we want from this class?

- Physics is everywhere around you.
- Understand the fundamental principles that surrounds you in everyday lives…
- Identify what law of physics applies to what phenomena and use them appropriately
- Understand the impact of such physical laws
- Learn how to research and analyze what you observe.
- Learn how to express observations and measurements in mathematical languages.
- Learn how to express your research in systematic manner in writing
- I don't want you to be scared of PHYSICS!!!

Most of importantly, let us have a lot of FUN!!