

TRIGGER: decision box unit that should have the capability to selectively recognize within hundreds of nanoseconds, the signals of a “good event” by analyzing a set of many signals arriving from thousands of channels at a very high rate. The Trigger system (or “decision box unit”) must have the capability of executing a particle identification algorithm (or First-Level Trigger algorithm or pattern recognition algorithm on pixels of images) on data acquired at a very high rate that will be impossible to store. If all data from HEP experiments would be saved, it would fill up every hard drive on the planet in about one day. The Trigger system has the task of selecting in real-time the highest quality collision events (“good events”) out of many. For example, at LHC it has the task of selecting 100 event/sec out of over 1 million event/second (or about 52 trillion event/day) generated by the machine. (By analogy, it is like trying to identify a small detail that we call “good event” by analyzing the pixels with a pattern recognition in each frame from your movie camera while you are watching it. The difference is that your movie camera runs at 24 frame per second while a HEP experiment runs at 40 million frames per second). Furthermore, because in nature these “good events” occur randomly, the “decision box” must be capable of capturing and processing two (or more) sets of thousands of signals separated anywhere between a few to hundreds of nanoseconds. The more efficient the decision box is in capturing and measuring very accurately the characteristics of the possible “good events”, the less radiation is needed and the more chances there are to recognize abnormal metabolisms.

Acronyms

ACS:	American Cancer Society
ALICE:	A Large Ion Collider experiment at CERN LHC
APD:	Avalanche Photodiode
ATLAS:	One of the four HEP experiments at CERN LHC
ASIC:	Application Specific Integrated Circuit
BGO:	Bismuth Germanate crystal
BNL:	Brookhaven National Laboratory
CDC:	Centers for Disease Control and Prevention
CDF:	Collider Detector at Fermilab
CERN:	European Center for Particle Physics
CMS:	Compact Muon Solenoid experiment at CERN LHC
CT:	Computed Tomography
DESY:	Research Laboratory for Particle Physics – Germany
DOI:	Depth of Interaction
EMFCSC:	Ettore Majorana Foundation Center for Scientific Culture
FDA:	Food and Drugs Administration
FDG:	Fluorodeoxyglucose
FERMILab:	Fermi National Accelerator Laboratory
FPGA:	Field Programmable Gate Array
FOV:	Field of View
GEM:	Gammas Electrons and Muons Collaboration at SSC
HEP:	High Energy Physics
ICSC:	International Center for Scientific Culture – World Laboratory
IEEE:	Institute of Electrical and Electronics Engineers
KeV:	Kilo electron volt
LIF:	Light-Induced Fluorescence spectroscopy
LHC:	Large Hadron Collider at CERN
LHCb:	Large Hadron Collider Beauty experiment at CERN LHC
LOR:	Line of Response
LSO:	Lutetium Oxyorthosilicate crystal
MIC:	Medical Imaging Conference
MRI:	Magnetic Resonance Imaging
NCI:	National Cancer Institute
NRE:	Non Recurrent Engineering
NSS:	Nuclear Science Symposium
PAP Smear:	Papanicolaou test (checks for changes in the cells of cervix)
PET:	Positron Emission Tomography. (From Greek: Tomography = cuts, or slices of images of the body)
PMT:	Photomultiplier (Transducers converting light into electrical signal)
PSA:	Prostate Specific Antigen
SDC:	Solenoidal Detector Collaboration at SSC
SPECT:	Single Photon Emission Computed Tomography
SSC:	Superconducting Super Collider - Texas
TIR:	Thermal Infrared;
VME:	Computer bus and cards standard
WFS:	World Federation of Scientists