

# Proton Source MicroBooNE

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# Recent Activity

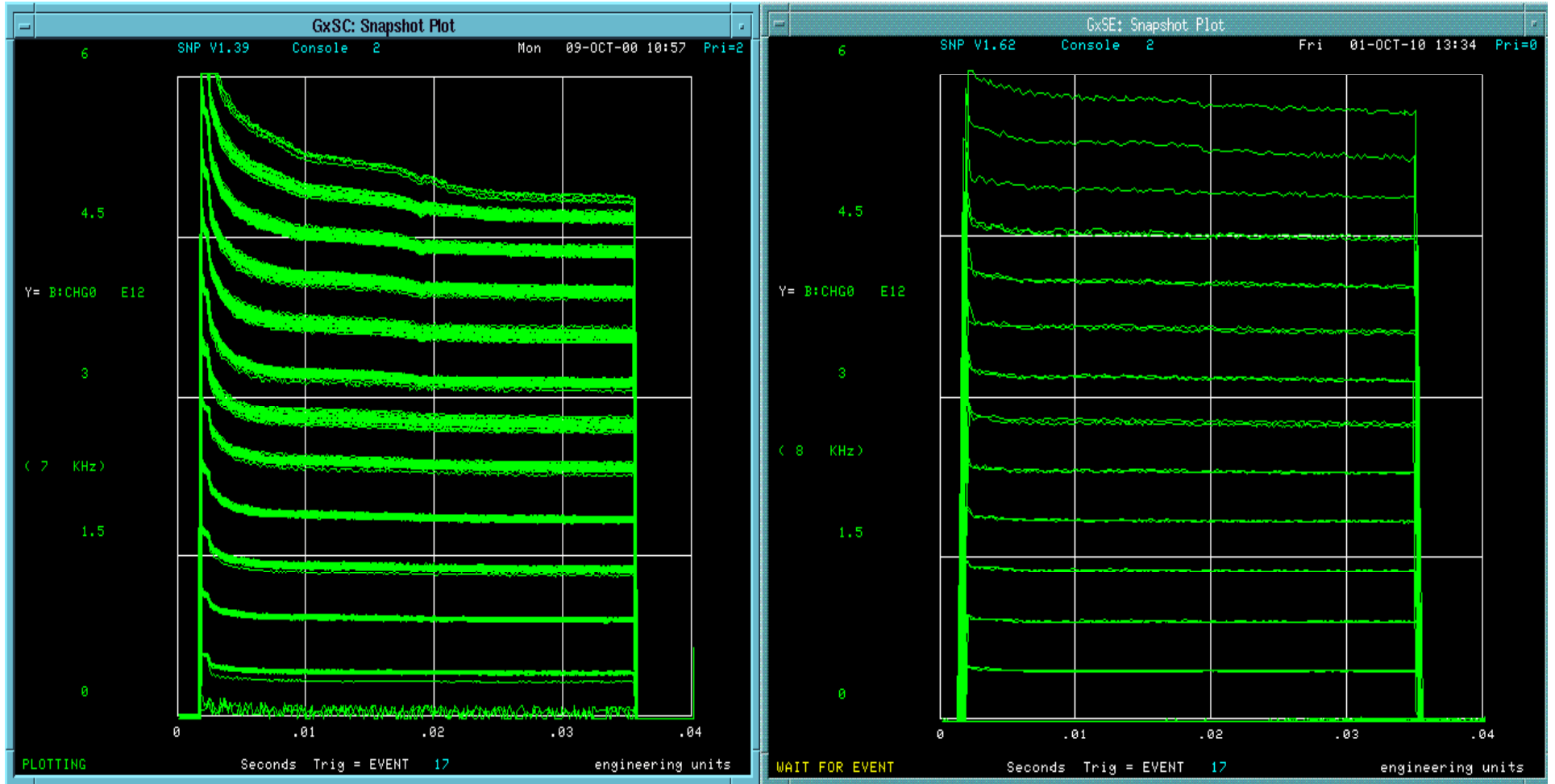
- There has been a lot of talk about future plans for Proton Source and how it fits the plans for the High Intensity Frontier and/or Collider (RUN III..RUN IIB.)
- The budget, manpower and proton numbers required to meet goals are being discussed –
- Several recent talks and papers on the Proton Source regarding future operations can be found in the Public Document Database.
  - Task Force Report
  - Proton Source Task Force Talk - APT\_Seminar
  - Directorate's Meeting – Task Force Report
  - Proton Source Improvement Workshop

# Past History - Improvements

- There is a history of continuous efforts to improve the Proton Source reliability and beam performance.
  - Booster Damper Systems Upgrade (late 90's)
  - Linac Energy Regulation and H- Source Regulation
  - New Booster Low Level
  - GMPS power supply replacement and control Upgrade
- MiniBooNE forced the issue (2002)
  - Shielding Improvements
  - Loss Monitoring/Control Effort
  - **Proton Plan (\$\$\$)**
    - New Booster Injection Girder
    - Removal of Long 13 extraction (Beam Dump moved to MI-8 Line)
    - Booster Corrector Upgrade
    - Linac Quad PS upgrade
    - **Many Other Items**
- NuMI added additional pressure....
  - **COGGING !!!**
  - Low Level Upgrade – Quad Damper, Bunch Rotation.....

# Booster Charge Compare – 2000 to 2010

## Higher Throughput – Higher Efficiency



# Recent Work Leading Up To Task Force

- 2008 Department Review of Linac and Booster

What systems needed immediate help – pose reliability issue next 5 years

Consider issues: Spares, Manpower, Reliability, Replacement Options

Two systems stood out :

**Booster Magnets** (No Fully Tested Spare Gradient Magnet)

**Pre-Acc** (Cockcroft-Waltons – downtime and manpower concerns)

- 1) Large downtime due to failure likely in next 5 years
- 2) Retirement of skilled personnel
- 3) Replacement Options Available

Work then started to repair/replace (**Initially used operational task codes – took money from other operational areas**)

- February 2010 – Projections raised concerns and led to discussions with Dr. Holmes –

- “OK, if I can't say 20 I will suggest going out 15 years. The current best case scenario for Project X is construction over FY15-19.” Holmes
- “So let's put together a 15 year plan ...” Holmes

- Roger Dixon

- Proton Source Charge March 3 2010
- Task Force report released August 17 – Can be found in Doc. Database

## **Task Force Strategy and Concern Criteria**

The responsible person(s) for each system were asked to review their respective system and submit a document listing what is required to repair or replace their reviewed system(s) to meet the task charge of reliable operation for 15 years. The documents were collected in a public data storage area to allow for changes and review. (Due to limited time, proposed solutions will not be fully scoped and all estimates are preliminary)

### **The document should include:**

1. System description and issues
2. Replacement/repair suggestions
3. Cost and manpower to meet suggested replacement and or repair of systems
4. A concern level of low, medium or high is then given based upon the below criteria.
  - Replacement available
  - Failure does not result in substantial downtime – several weeks
  - Cost below 200,000 dollars

### **Concern level is assigned as follows:**

**Low**, if all three points of the criteria can be met

**Medium**, if one of the three criteria is not met

**High**, if two of three criteria is not met

Note that even items in the Low concern category can have a significant impact on operational budgets and machine availability..

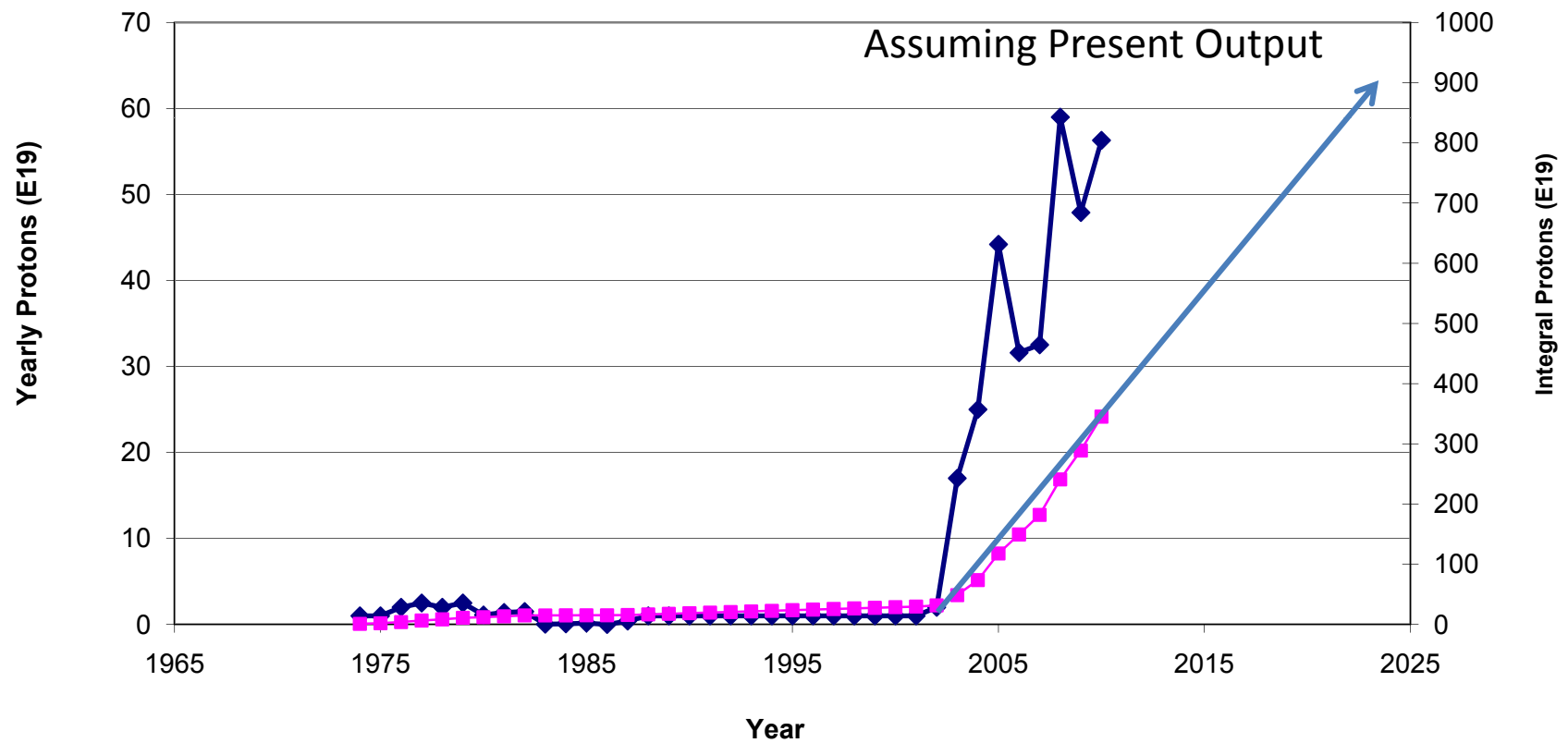
# Systems found to be of **High Concern** and (Possible) Solutions:

(Items in Green = Work Underway → Funding/Manpower Still Required )

- **Cockcroft-Waltons**
  - Replacement Underway - RFQ
- **Low Energy Modulators**
  - Switch to LANL system under development – Testing underway at LANL using Thales Tube
  - Rebuild present Modulators with newer components – In discussion with Continental over rebuild
- **Entire Drift Tube Tanks (Tank 1 - especially) and Drive Systems**
  - Try and copy SNS like system – Big move that needs lots of discussion
- **Linac Momentum Beam Dump**
  - Retro Fit work underway
- **Booster Gradient Magnets (system)**
  - Rebuild/Prepare as many spares as possible (two magnets done)
- **Power Distribution**
  - Buy minimum number of spares – use removed hardware for parts
  - Rework electrical with modern equipment in critical areas
- **Booster Gradient Magnets (system)**
  - Rebuild/Prepare as many spares as possible (two magnets done)
- **Booster High Level Radio Frequency (system)**
  - Solid State work underway – required for running reliably above 10 to 12 Hz
  - New Cavities – Under consideration – Issues with aperture, reliability
- **Anode Supply and 13.8 kV Hardware**
  - Replace with MI style
- **Spare Cavity**
  - Being discussed– needs attention/manpower
- **Bias Supplies**
  - Upgrade hardware for 15 Hz operation
  - Build spare tuners
- **Component Activation/Radiation Issues**
  - Complex issue that needs more attention

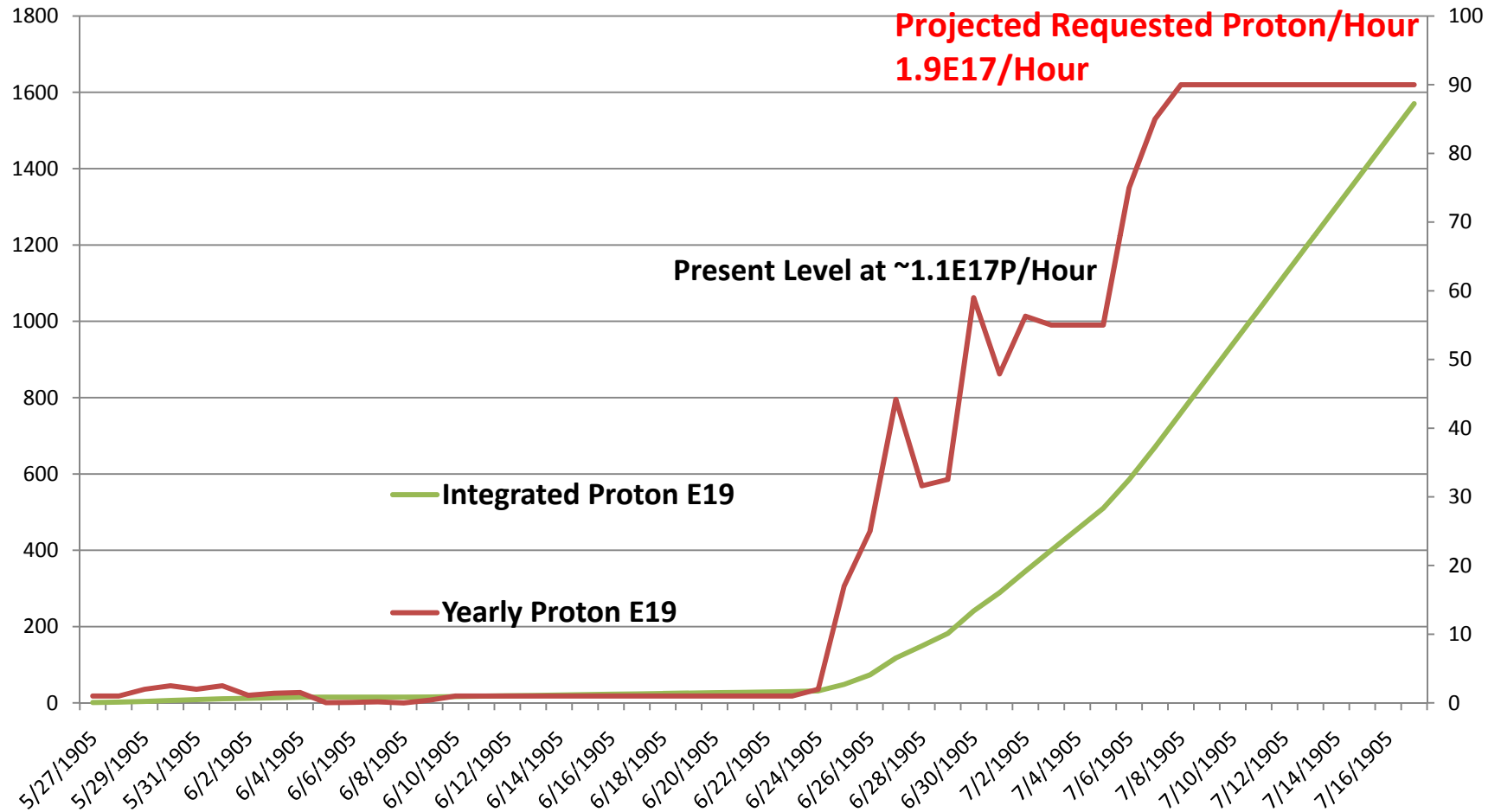
# Total Integrated Beam Now and Expected

Proton Source Yearly and Integrated Output (E19)





# Requested Protons



# Now What

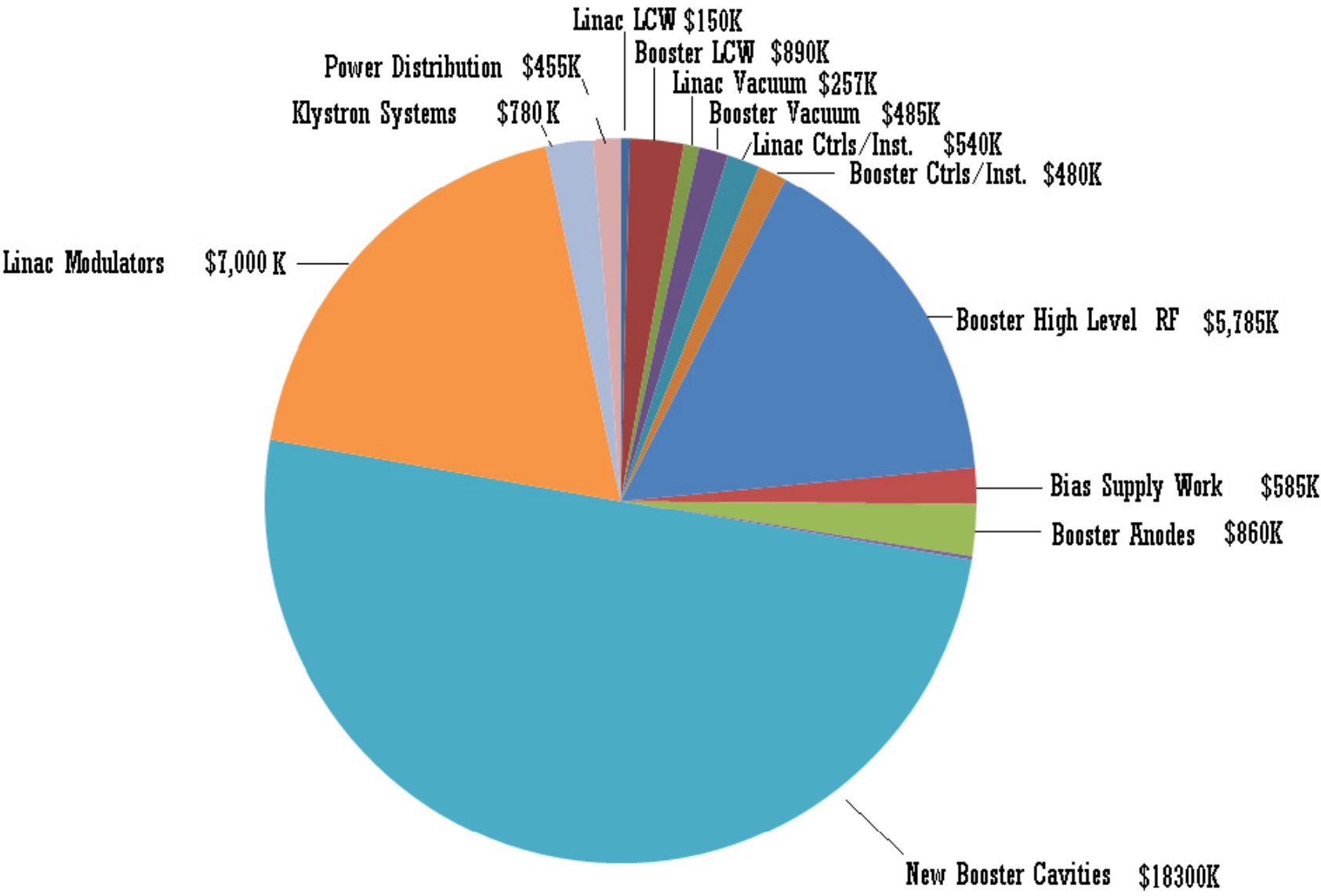
- Task Force Report
  - Showed What Was Needed to Just Continue Running
    - Money
    - Time
    - Labor
- Proton Improvement Plan
  - Look at Task Force
  - Make Recommendations (Again)
  - Look at options for increasing throughput
  - Submit to management new shiny plan

# What is going on now (Partial List)

## (Don't wait for a sunny day )

- Looking into fast short kickers (**Proto Being Built**)
  - Reduce size of Notch
  - Maybe no notch?
    - Lower losses
  - Maybe no cogging?
    - Lower Losses
- Pre-Acc upgrade (**Coming Soon –WILL HAPPEN IN 2012**)
  - Smaller Beam!!
    - Lower Losses
    - Less Downtime
- Correctors – Still Implementing (**Gains still to be made**)
- **RF**
  - **Solid State – MUST HAVE TO RUN 15 HZ - Lacking Funding/Manpower**
  - **Repair/Refurbish Cavities, Bias Supplies and Anode Supplies**
  - **Spare Station**
  - **Request to Run Booster RF at 10Hz (Beam) for 2 months (Again)**

# Task Force Estimated Cost \$37,000 K (M&S)



# Recent Radiation Survey

Booster Radiation for Oct 27 2010

