# 6 SCHEDULE AND MILESTONES (1 page)

*Describe the foreseen schedule for the R&D activities. Detail the intermediate steps towards achieving the final goals. Provide an activity matrix for the various institutions, showing tasks and time periods. Indicate milestones and deliverable items planned for CY2015.*

# Liquid Scintillator Tiles

|  |  |  |
| --- | --- | --- |
| Start | Duration | Activity |
| January | 2mo | Study optimization of liquid-scintillator container (activity started in CY14) |
| March | 1mo | Analyze samples irradiated in nuclear reactor (conservatively estimate irradiation to start in November; 2-days per week: 24 days -> few Mrad) |
| April | 2mo | Start construction of simil-megatile (at least 4 cells, to be usable in test beam if necessary) to be installed in CMS cavern during data-taking |
| June | 1mo | Install simil-megatile in CMS cavern and/or CASTOR tables; send graduate student for a month to CERN |
| July | 1mo | Analyze samples irradiated in nuclear reactor (irradiation started in November; 2-days per week: ~50 days -> ~Mrad at low dose-rate) |
| December | 1mo | Measure damage on tiles installed in CMS cavern |
|  |  |  |

# Crystal Fibers

|  |  |  |
| --- | --- | --- |
| Start | Duration | Activity |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Radiation-hard Plastic Scintillators

|  |  |  |
| --- | --- | --- |
| Start | Duration | Activity |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# 7 BUDGET AND BUDGET JUSTIFICATION FOR CY2015 (Fill out separate EXCEL spreadsheet)

*The spreadsheet includes detailed instructions on the budget preparation. Itemize your budget according to materials, travel, and labor. Provide a written justification for each item in the budget. Include each institution’s rates for fringe and indirect costs. Note that project funds can only be directed to support technical personnel (not physicists, postdocs, or graduate students). Funding can be used to support undergraduate lab assistants. Travel funds are expected to be used for the people directly involved in the supported activities. If the proposed activities are also supported by generic R&D or other funding sources please provide a clear breakdown.*

# 9 FACILITIES, EQUIPMENT, AND OTHER RESOURCES (1 page)

Tests will be performed at Fermilab test beam within the T-1041 "CMS Forward Calorimetry Upgrade" collaboration. The electronics readout will range from custom commercial VME systems to QIE systems. The tests will continue in the CERN H2 beamline.\* B.Bilki and Y.Onel Spokesman for T-1041.

Radiation damage studies at CERN PS will take place in IRRAD-2 which is an irradiation zone at the CERN PS east hall, where samples can be exposed to ~1MeV neutrons and reach fluences of 3-10x1011 n/cm2 per hour (1 MeV-eq). The maximum sample size is ~300x300x300 mm3 and ~ 5kg. We will also use IRRAD-6, an irradiation zone at the CERN PS East hall, where samples can be exposed to backscattering of a 24GeV/c proton beam (IRRAD-1) five different points in the area facing the cast iron beam dump are characterized.

We will also use proton beams at the PET cyclotron at the CDH Proton Center, A ProCure Center, in the proximity of the Du Page Hospital.

The University of Maryland offers on-campus facilities for the study of irradiation effects:

1. 200kW TRIGA reactor: six exposure points with different neutron energy spectra, from MeV to thermal neutrons
2. 2-9MeV 1kW and 10MeV 15kW electron LINACs
3. 125kCi Co-60 gamma-ray source

In addition, the University of Maryland opened the new Physics Center in January 2014. The new building has a special dark room designed for work with photodetectors, which was used to precisely measure the effects of radiation on the absorption and emission spectra of liquid scintillators and wave-length-shifting fibers. We are also collaborating with Prof. Kadir Aslan, Morgan State University, who offered the possibility of using state-of-the-art equipment for the measurement of light-emission spectra and structural properties of irradiated samples.

# References

|  |  |
| --- | --- |
| [1] | P. d. Barbaro, "Recent results of RadDam effects nin HE and HF from 22/fb 2012 CMS data," 4 June 2013. [Online]. Available: http://indico.cern.ch/event/252240/contribution/1/material/slides/0.pdf. |
| [2] | A. Belloni, "HE Rebuild," 9 June 2014. [Online]. Available: https://indico.cern.ch/event/315045/session/24/contribution/55/material/slides/0.pdf. |