

# Update on irradiation test plans using UC Davis cyclotron

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# Test schedule and cyclotron parameters

- **Test schedule:** May 14<sup>th</sup>-15<sup>th</sup> (moved up from August); 7-8 hours of beam time per day
- **Beam energy:** Proton beam with kinetic energy of 64 MeV
- **Beam flux and dose:**  $10^7 - 10^{10}$  / cm<sup>2</sup> / s. Beam flux setting can be changed in a few minutes. Total fluence will be measured to 2% level.
- **Beam transverse profile:** For 64MeV beam, the beam spot diameter is 7.6 cm. The beam intensity is uniform (within 4%) out to a diameter of 6 cm (3 cm from beam center); it drops quickly after that. The transverse distribution of the beam has been mapped – see figure 1 in document below.
- **Documentation:** [UC Davis 76 Inch Isochronous Cyclotron](#)

# Test setup

1. What is the typical cable length from the experimenter's work area to a device set up in the beam line? Please describe any facility installed user cables and patch panel connections.

The cable run is 50 feet from the user control room to the radiation effects experimenter's work area. The current cabling includes 30 BNC cables, four DB-25 serial interface cables, two USB cables, two CAT-5 cables, and four Ethernet cables. More cables can be installed as required. Figures 8 and 9 show the experimental cave layout and patch panel access.

2. How are devices mounted in the beam? Describe stands, holders, etc.

Devices are mounted on a remotely user-controlled X, Y, Z optical bench. The surface has standard optical bench threaded holes for mounting clamps. The facility has a large amount of clamp downs, flexible stands, vices, and other mounting hardware. The cyclotron machine shop can also provide real time fabrication of mounting fixtures, if required. Figure 10 shows the radiation effects experimental area.

# Test 1 – Bare SiPMs (forward calorimeter groups)

Beam Flux (cm <sup>-2</sup> s <sup>-1</sup> )	Time (seconds)	Total Fluence (cm <sup>-2</sup> )	Number of SiPMs
10 <sup>7</sup>	10	10 <sup>8</sup>	4 S14160-1315PS (1.3mm, 15um pitch) 4 S14160-3015PS (3mm, 15um pitch)
10 <sup>7</sup>	100	10 <sup>9</sup>	4 S14160-1315PS (1.3mm, 15um pitch) 4 S14160-3015PS (3mm, 15um pitch) 1 S14160-6015 (6mm, 15um pitch)
10 <sup>8</sup>	100	10 <sup>10</sup>	4 S14160-1315PS (1.3mm, 15um pitch) 4 S14160-3015PS (3mm, 15um pitch) 2 S14160-6015 (6mm, 15um pitch)
10 <sup>9</sup>	100	10 <sup>11</sup>	4 S14160-1315PS (1.3mm, 15um pitch) 4 S14160-3015PS (3mm, 15um pitch) 2 S14160-6015 (6mm, 15um pitch)
10 <sup>10</sup>	100	10 <sup>12</sup>	4 S14160-1315PS (1.3mm, 15um pitch) 4 S14160-3015PS (3mm, 15um pitch) 2 S14160-6015 (6mm, 15um pitch)
10 <sup>10</sup>	1000	10 <sup>13</sup>	4 S14160-1315PS (1.3mm, 15um pitch) 4 S14160-3015PS (3mm, 15um pitch) 1 S14160-6015 (6mm, 15um pitch)

# Test 1 – Bare SiPMs (forward calorimeter groups)

- We have a (metal) mount for the SiPMs. This mount has slots where the SiPMs can be placed. This will allow easy removal and installation of the SiPMs.
- SiPMs will be studied pre-irradiation and post-irradiation (e.g. I-V curves). SiPMs do not need to be monitored during irradiation.

## Test 2 – Bare SiPMs (barrel Ecal group)

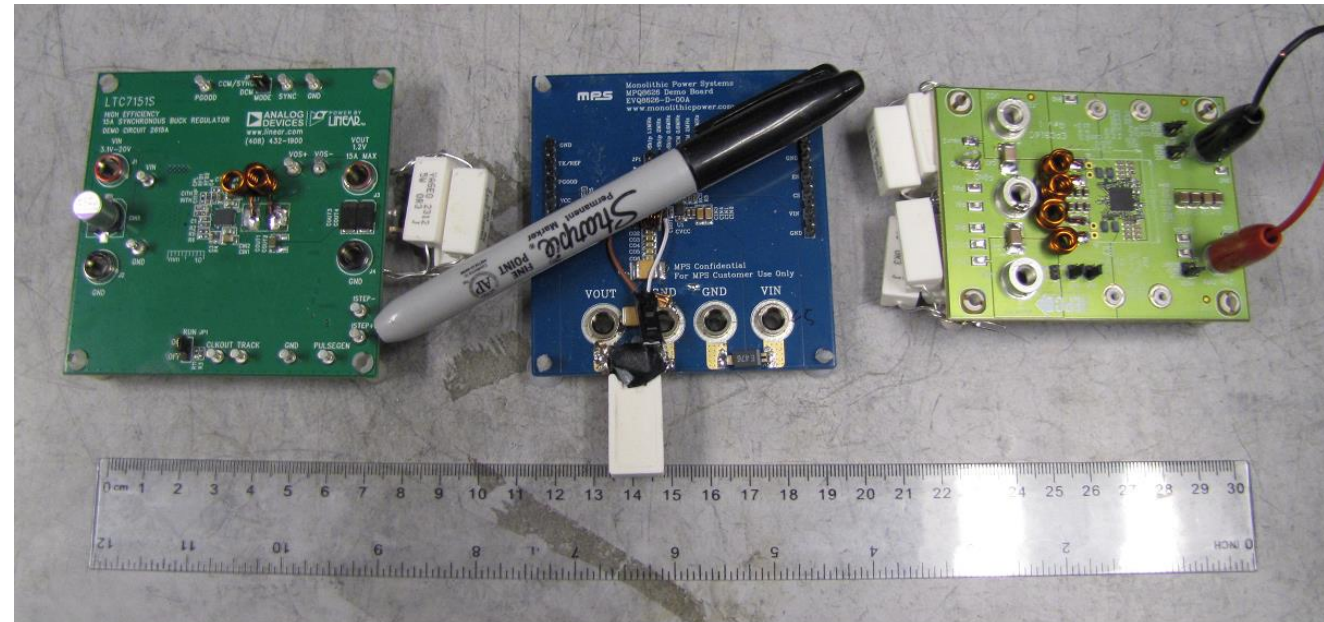
- Study S14160-6050HS and S13360-6050PE models.
- The S14160-6050HS should be at UCR. The S13360-6050PE one will be shipped from Argonne.
- How many SiPMs will we have? What doses do we want?

## Test 3 – SiPMs for electron endcap ECal

- Irradiation of bare SiPMs and SiPMs mounted to adaptor boards.
- How many SiPMs will be sent? What fluences are requested?

## Test 4 – boards from BNL EE group

- 3 DC:DC converter PCB boards.
- Board size: 8x8 cm<sup>2</sup>
- The boards will need to be powered and monitored for voltage output during irradiation.
- Dose requested:  $10^{12}$  / cm<sup>2</sup>. What beam flux should be used for this irradiation?





# Plans for next few days

- Compile a list of individuals who will attend the test and send that information over to the UC Davis Cyclotron administration.
- Complete an inventory of SiPMs located at LBL and UCR.
- Provide shipping info to various groups.
- UCR students will restart the bench tests in the next week.