



# Switchyard TLM Calibration Study Plan

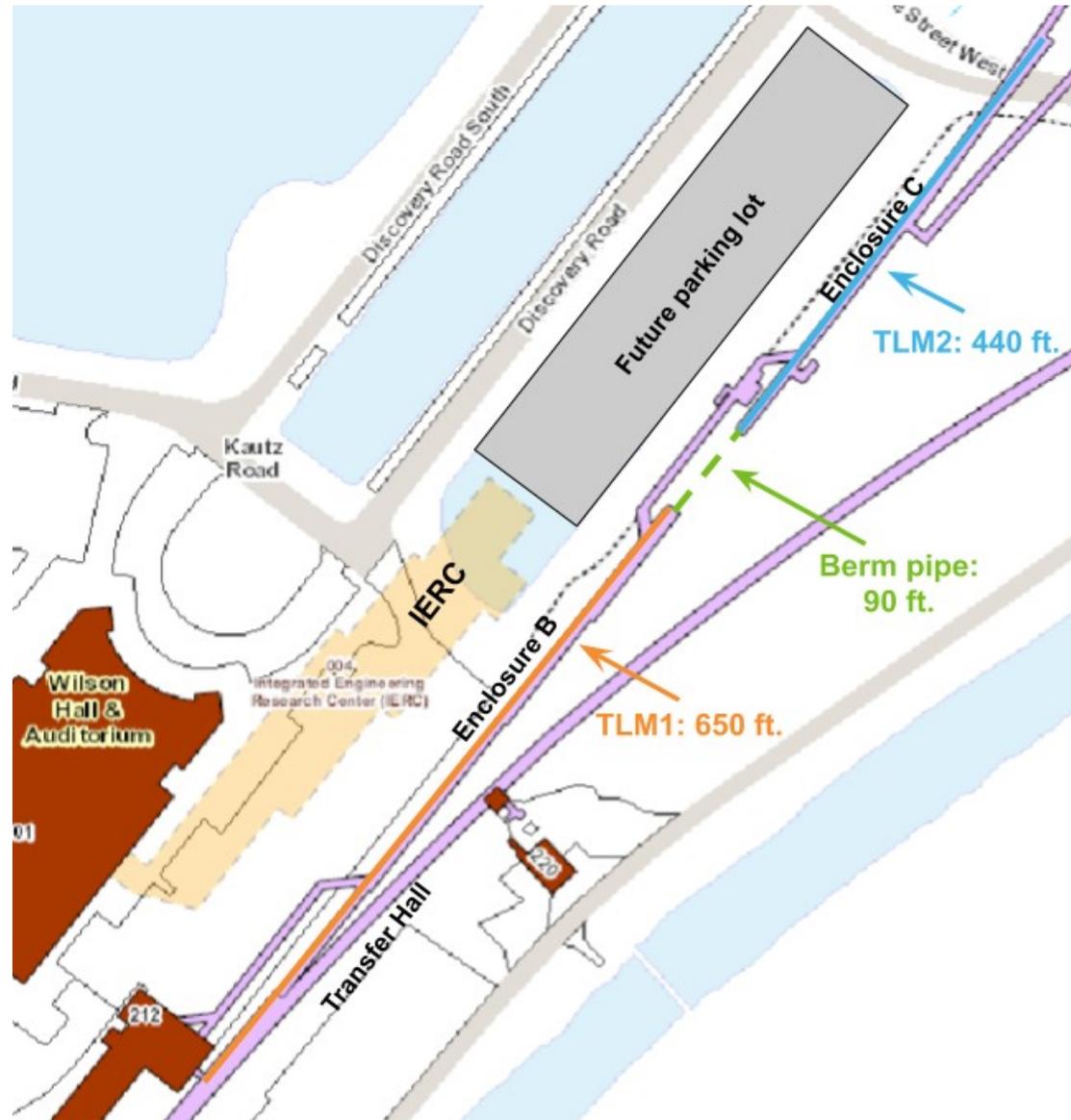
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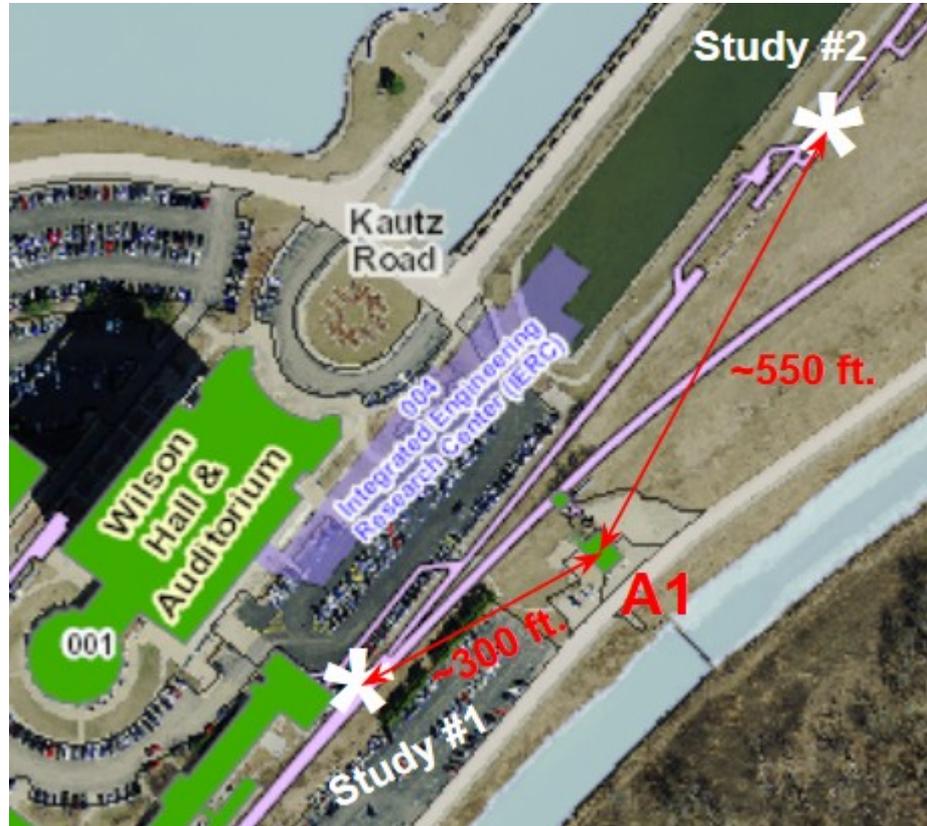
# Motivation

- Two new TLM (“Total Loss Monitor”) radiation detectors in the enclosure tunnels cover the IERC building and parking lot construction areas
- Purpose is to limit beam loss accident to single pulse by interlocking into the safety system; TLMs give continuous linear coverage
- Berm pipe between Enc. B and C cannot be covered by TLM because of shielding between beam and utility tunnel (can’t install TLM in berm pipe)

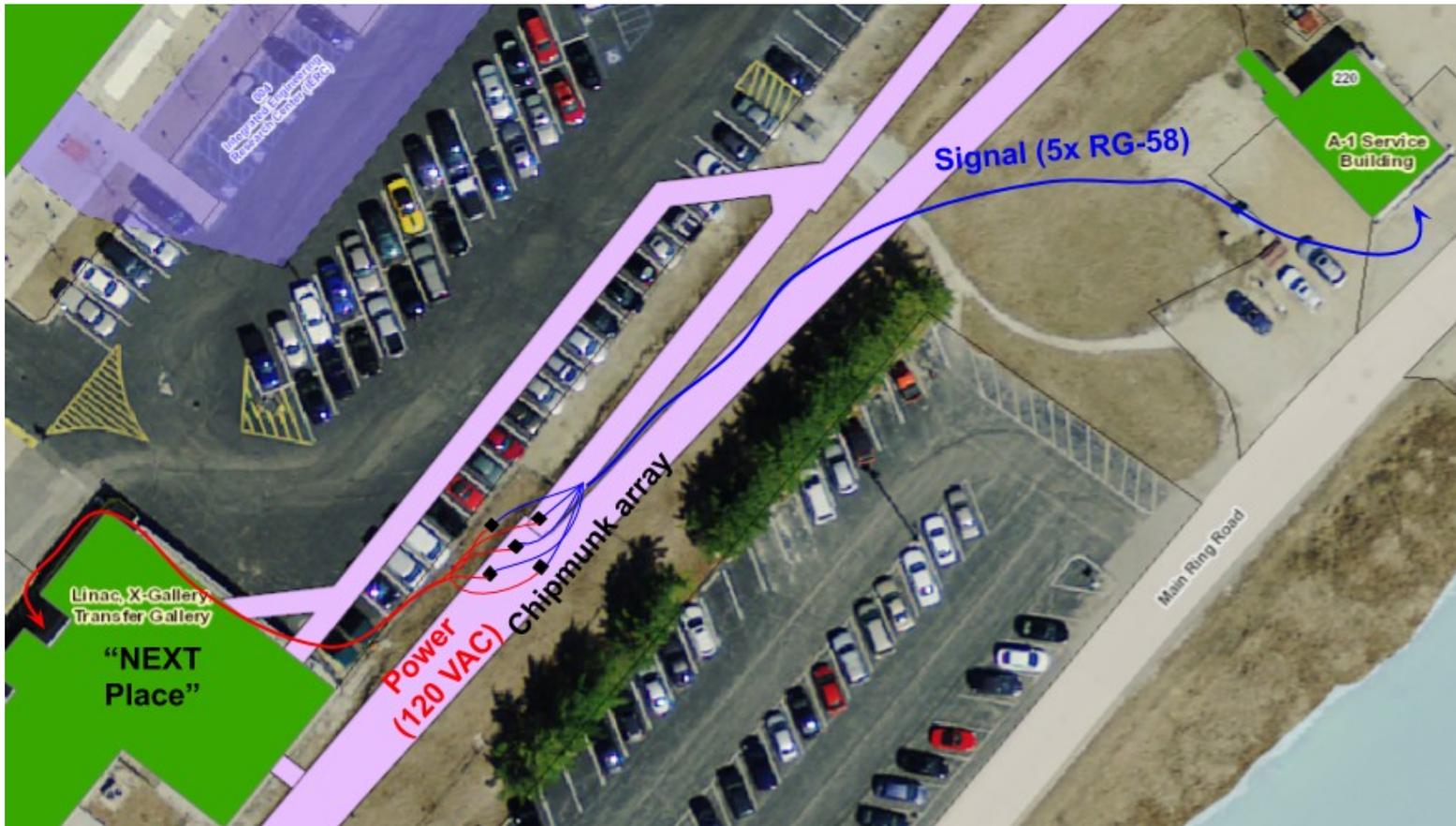


# Calibration Study Overview

- We need to correlate TLM signal (in tunnel) with maximum dose on the surface of the berm
- Pick weakest point in shielding for each TLM where there is a magnet to steer beam into
- Construct chipmunk array on surface above loss point
- Run beam into magnet and collect TLM and maximum chipmunk surface dose readings



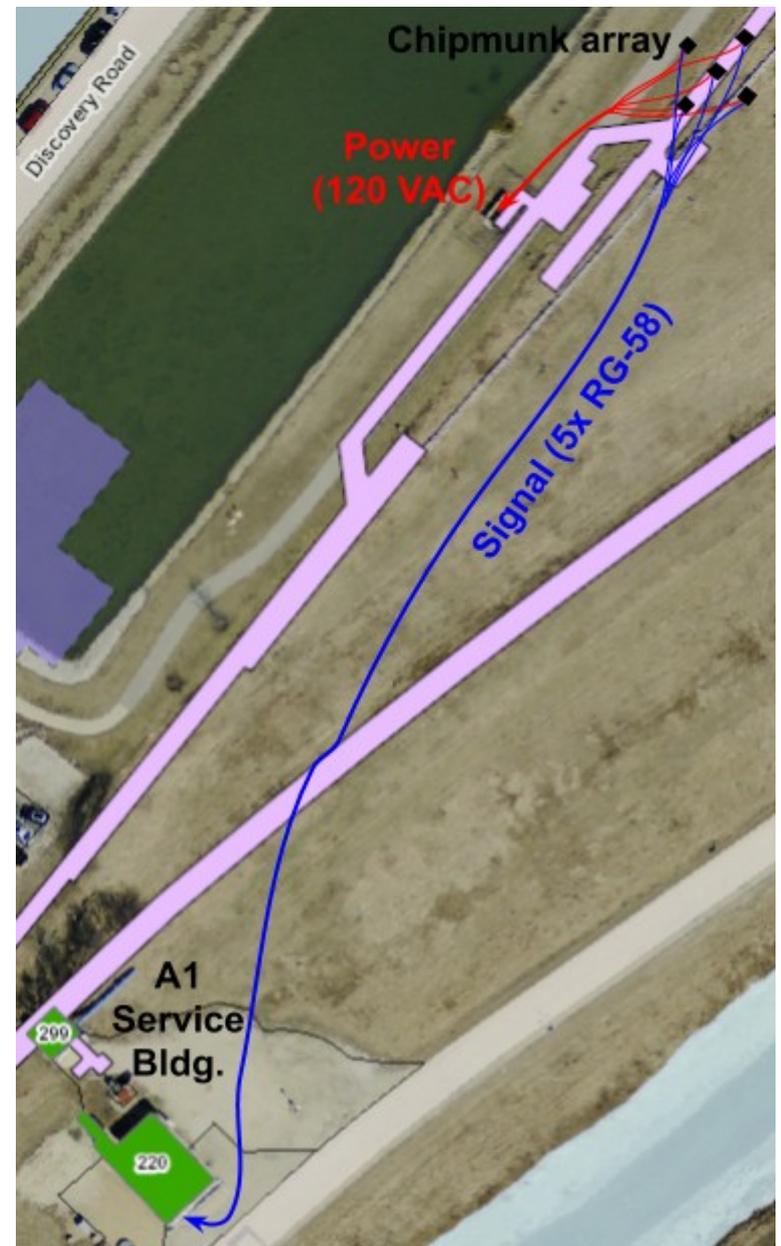
# TLM1 Study Location



- Location #1: array of five chipmunks placed on new cross-road.
- 5x RG-58 cables run along berm to A1 service building (~300 ft.)
- 120 VAC chipmunk power run from “NEXT Place”

# TLM2 Study Location

- Location #2: same chipmunks moved north of Enclosure B emergency exit, arranged in same pattern
- Same RG-58 signal cables run to A1 service building (~550 ft.)
- 120 VAC chipmunk run from Enclosure C tunnel via the emergency exit



# Study Timeline

- Location #1
  - Setup chipmunks and cables (1 day)
  - Take background data (~24 hours)
  - Run beam and take dose data
    - Time depends on consistency of data. Estimate 2-3 work days of *steady* beam. This is a rough estimate, and beam tuning may take time (one pulse per minute is slow!)
- Location #2
  - Move chipmunks and cables to Location #2 (1 day)
  - Take background data (~24 hours)
  - Run beam and take dose data
    - Estimate 2-3 work days of *steady* beam. Same caveats as above.
- Cleanup
  - Remove chipmunks and cables (1 day)

# Area Restrictions

- During beam loss study, area around chipmunk array must be unoccupied due to increased radiation
- To be coordinated with ES&H Radiation Safety (postings, roping-off, administrative control, communication)
- Cables and chipmunks must be protected from construction activities while they are in place, even if beam is not yet running
- Chipmunks to be placed in plastic bags to protect from weather. Cables to be run along ground. Can flag with bright colors to help with visibility.

# Unknowns

- Beam time estimates are very rough, as we don't know how long it will take to achieve statistics we need for 99.7% certainty
- Also need time to first establish clean beam, then steer it reliably and completely into intended loss point (order of hours, not days)
- Accelerator reliability is a key unknown factor: Switchyard gets beam once per minute, and any accelerator hiccups slow down data taking
- Calibration will be computed in real time during the study, so we'll know once we have enough data. See image to the right for analysis of simulated data.

