

# *Status of Radiological Requirements, Simulations and Screenings*

Juergen Reichenbacher



**DUNE Background Task Force  
Kick-Off Meeting  
Oct 26, 2018**

# Motivation of Radiological Model and Inputs from Screening

**=> Requirements on Radiopurity driven by intrinsic Ar-39 level in LAr (1.01 Bq / kg)**

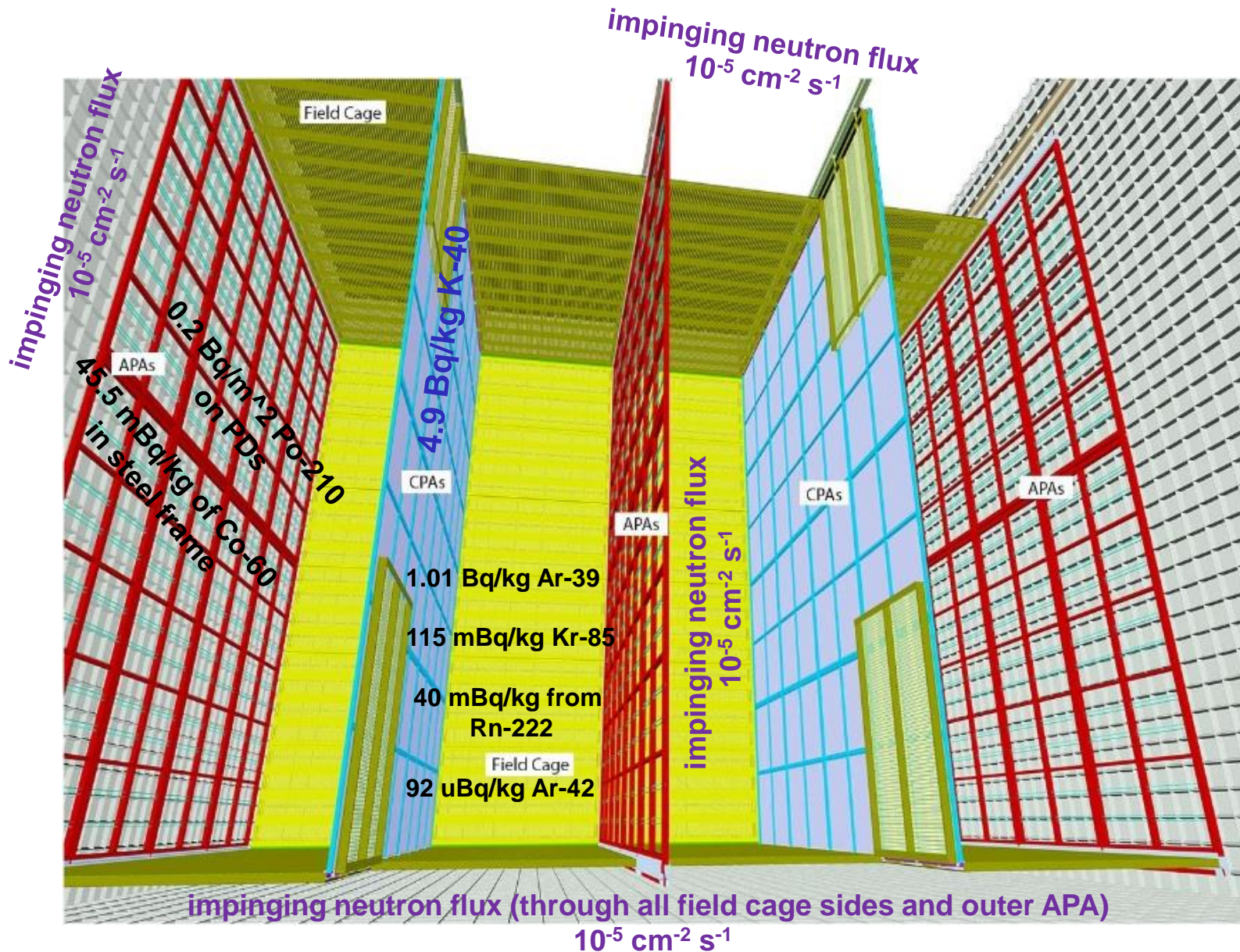
*(would require Manhattan-Project style effort to mitigate for DUNE)*

- Radiological control is crucial for far detector  
(not so critical for ProtoDUNE)

**=> Propose alpha- and gamma-screenings, ICP-MS of radiologically critical detector components for far detector for QC and to be used as inputs for radiological model**

- Full-blown radiological model is condensed into one LArSoft fcl producer file to be provided as input for SNB, DAQ, cosmogenics, atmospheric nus, pdk etc.
- LArSoft simulations with full-blown radiological model (-> Jason Stock *APS 2017*) validated current requirements set on various radiological backgrounds

# Synopsis of Simulated Radiological Backgrounds



# **DUNE Radiopurity (& Purity) Requirements for FD**

ProtoDUNE indicates that electron lifetime in liquid argon (>3.0 ms) and HV are not an issue (*otherwise would result in more stringent bg requirements*)

**-> QA for detector materials is mostly not an issue but QC is!**

## **Action Item:**

**Establish reasonably extensive QC program for FD construction and installation (utilizing existing screeners at various institutions)**

## **Action Item:**

**Validate radiopurity requirements with DAQ studies (-> realistic threshold, triggering, data streaming, etc.)**

# **External Backgrounds for FD**

## **Action Item:**

**Dominant neutron backgrounds from rock, concrete, shockcrete.  
Do we need passive shielding?**

## **Action Item:**

**Establish that external cosmic backgrounds are not an issue  
(fast neutrons from muon capture and DIS in rock and LAr,  
cosmogenic activation in LAr)**