

## Measurements of Category I Special Nuclear Material at Nevada National Security Site

#### John Mattingly

Associate Professor, Nuclear Engineering
North Carolina State University



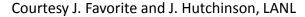
#### Subcritical measurements at DAF

- LANL will support measurements of subcritical assemblies of SNM at the NNSS Device Assembly Facility (DAF)
- Both CVT and CNEC will be able to conduct 1 week each of measurements each year
- This year's schedule:
  - June 29 July 2, 2015
  - July 6 July 9, 2015
- We will have greater flexibility to select dates in 2016



#### Available materials

- The LANL inventory at DAF includes plutonium, uranium, and neptunium ranging from grams to tens of kilograms
- BeRP ball: 4.5 kg weapons-grade plutonium metal
- Rocky Flats shells:
  - 1/8 inch thick HEU metal hemishells
  - Can be assembled into spherical shells of various masses; 10-20 kg configurations are typical
- Fissionable material may be reflected by a variety of materials (polyethylene, tungsten, etc.)
- Many combinations are possible with the current LANL inventory











# Fissionable and Reflector Materials Allowed in Construction of Multiplying Assembly

Fissionable Material	Mass Limit
Pu in metal/compounds/dry residues	≤3,000 g
<sup>233</sup> U in metal/compounds/dry residues	≤3,000 g
Pu in oxide	≤4,400 g
<sup>233</sup> U in oxide	≤ 4,400 g
<sup>235</sup> U in hydride	≤3,000 g
<sup>235</sup> U in metal/compounds (excluding hydride)/dry residues	≤ 10,000 g
<sup>237</sup> Np Sphere	~6 kg Np
BeRP Ball	~4.5 kg Pu
Rocky Flats Shells (1-24)	~13.7 kg HEU
One Thor Core Piece	~2-4 kg Pu

Reflector Material	Туре	Thickness Restriction
Copper		Total thickness of these
Nickel		reflectors shall not exceed 1 inch
Stainless Steel 304		
Tungsten	A	
Natural Uranium		
Depleted Uranium		
Cadmium		
Carbon Steel	В	The total combined
Iron		thickness of Type A and B
Lead		reflectors shall not exceed 1 inch if Type A reflectors
Lucite		are present.
Polyethylene		If no Type A reflectors are
Borated Polyethylene		used, an unlimited
Manganese		thickness of Type B
Boroflex		reflectors may be used.
Aluminum		Unlimited thickness of
Thorium		these materials in any combination may be used.
Mock HE1	С	
Mock HE2		
Mock HE3		



UNCLASSIFIED

The World's Greatest Science Protecting America







### Operational constraints

- DAF operates Monday Thursday
- Escorting requirements will limit the number of visiting students/faculty to 9 people
- If any of the participants are foreign nationals, we need to provide LANL their names by January 1, 2015
- We have more time to select US citizen participants
- If we use pre-approved subcritical assemblies (there are a \*lot\* of them),
   we have until Spring to specify which assemblies we want
- We have to provide LANL with information describing all the instruments we plan to use and our experiment plans by January 1, 2015



