PATRAM 2010 - LONDON

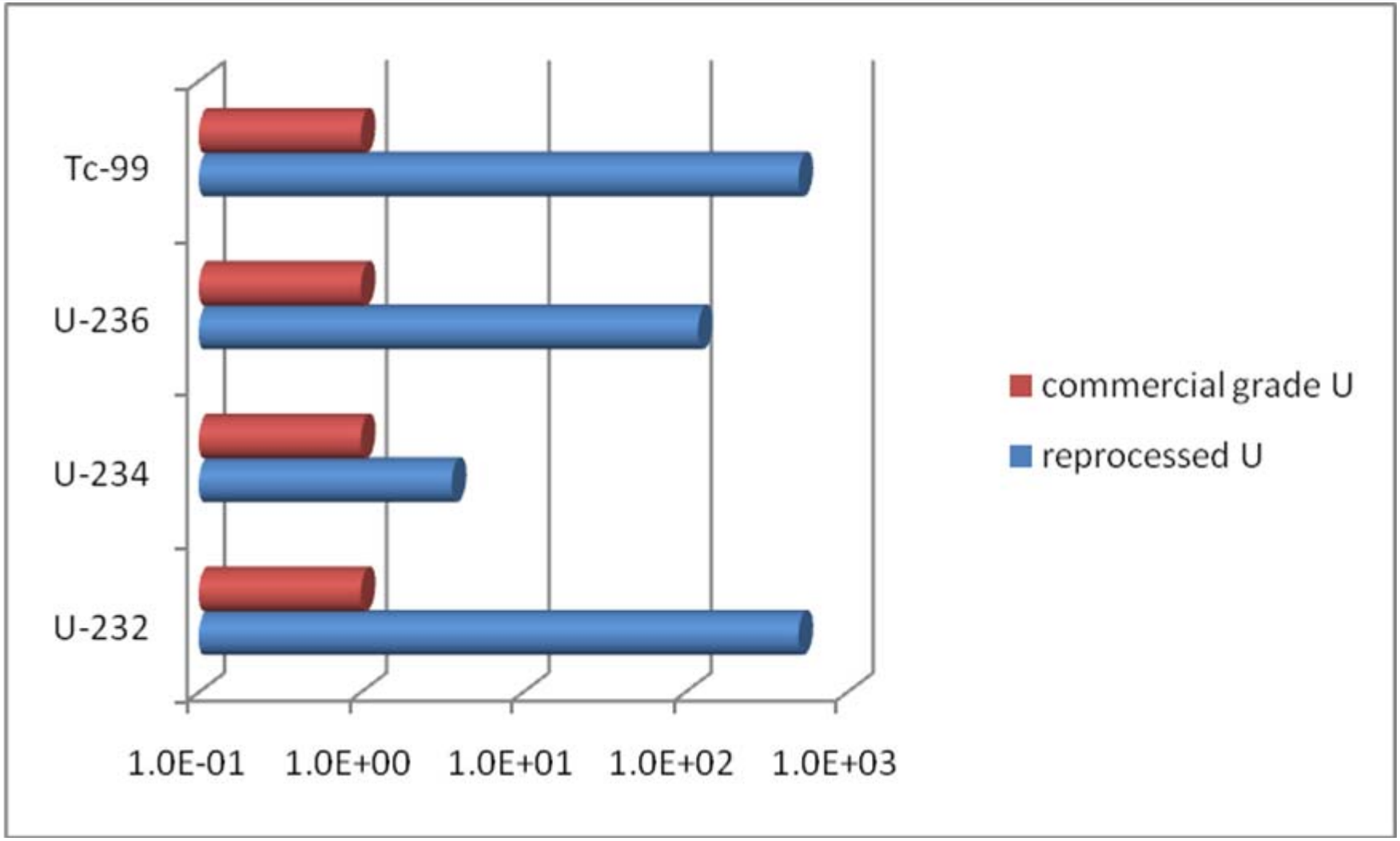
# Transportation of Enriched Reprocessed Uranium

Franz Hilbert
Nuclear Cargo + Service GmbH

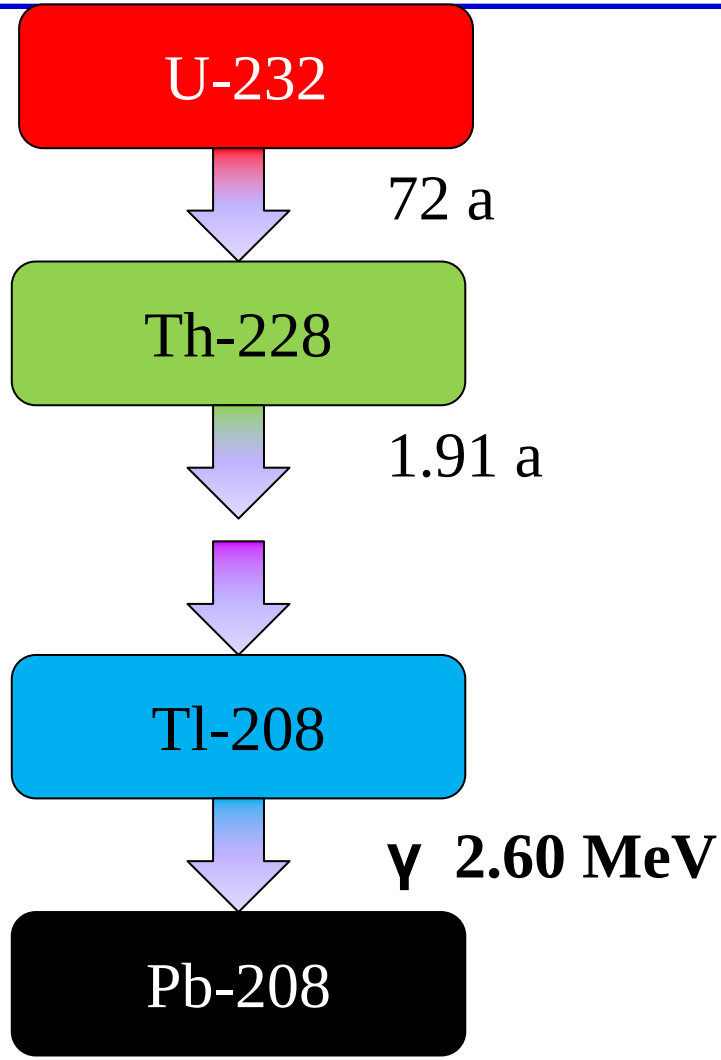
## Content of the Presentation

- Enriched commercial grade vs. reprocessed $UF_6$
- Radioactivity of enriched reprocessed $UF_6$
- Gamma radiation source term of enriched reprocessed $UF_6$
- Typical dose rates
- Current PSP designs for enriched reprocessed $UF_6$
- Conclusion

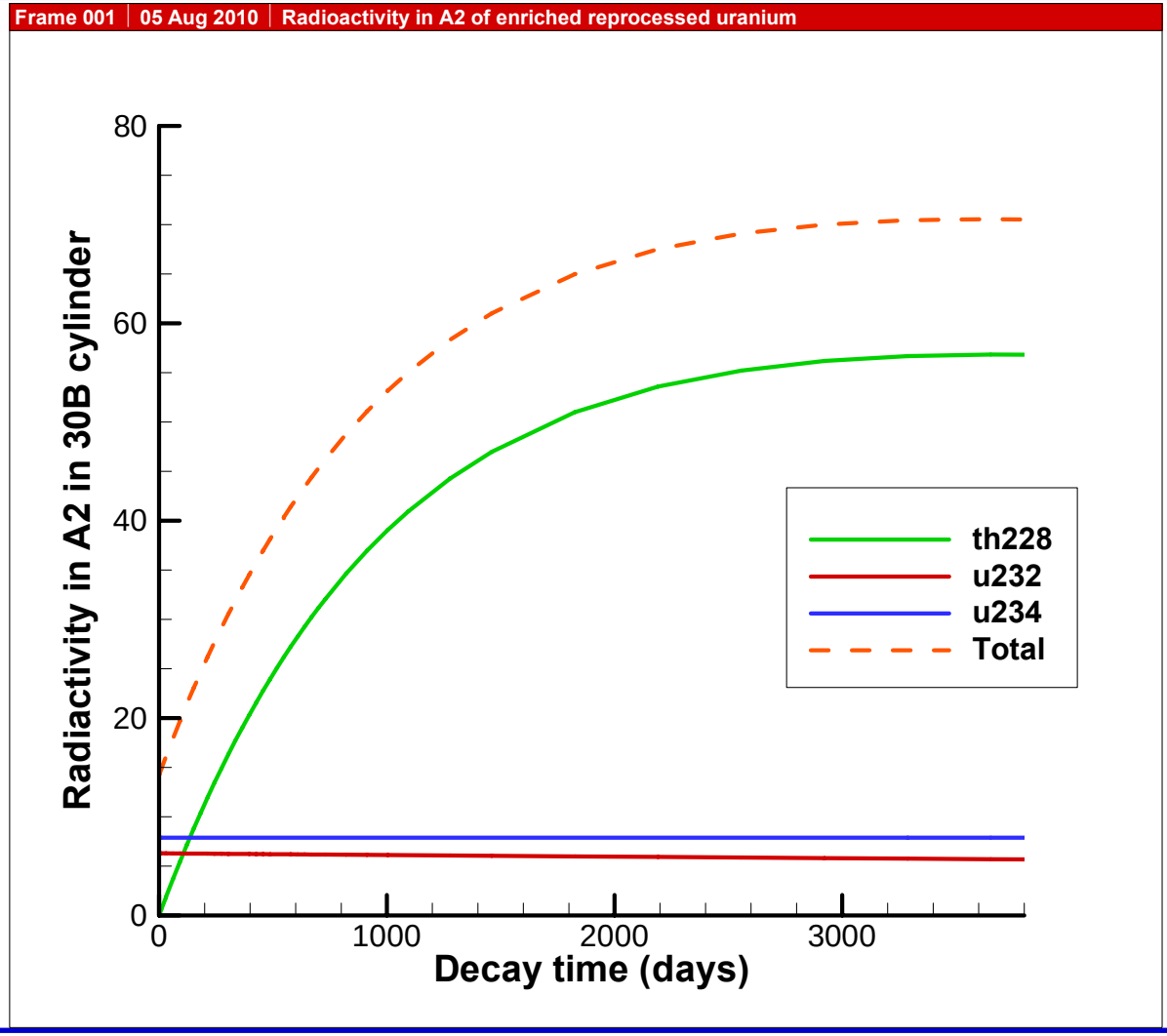
# Enriched commercial grade vs. reprocessed $UF_6$ ASTM C 996



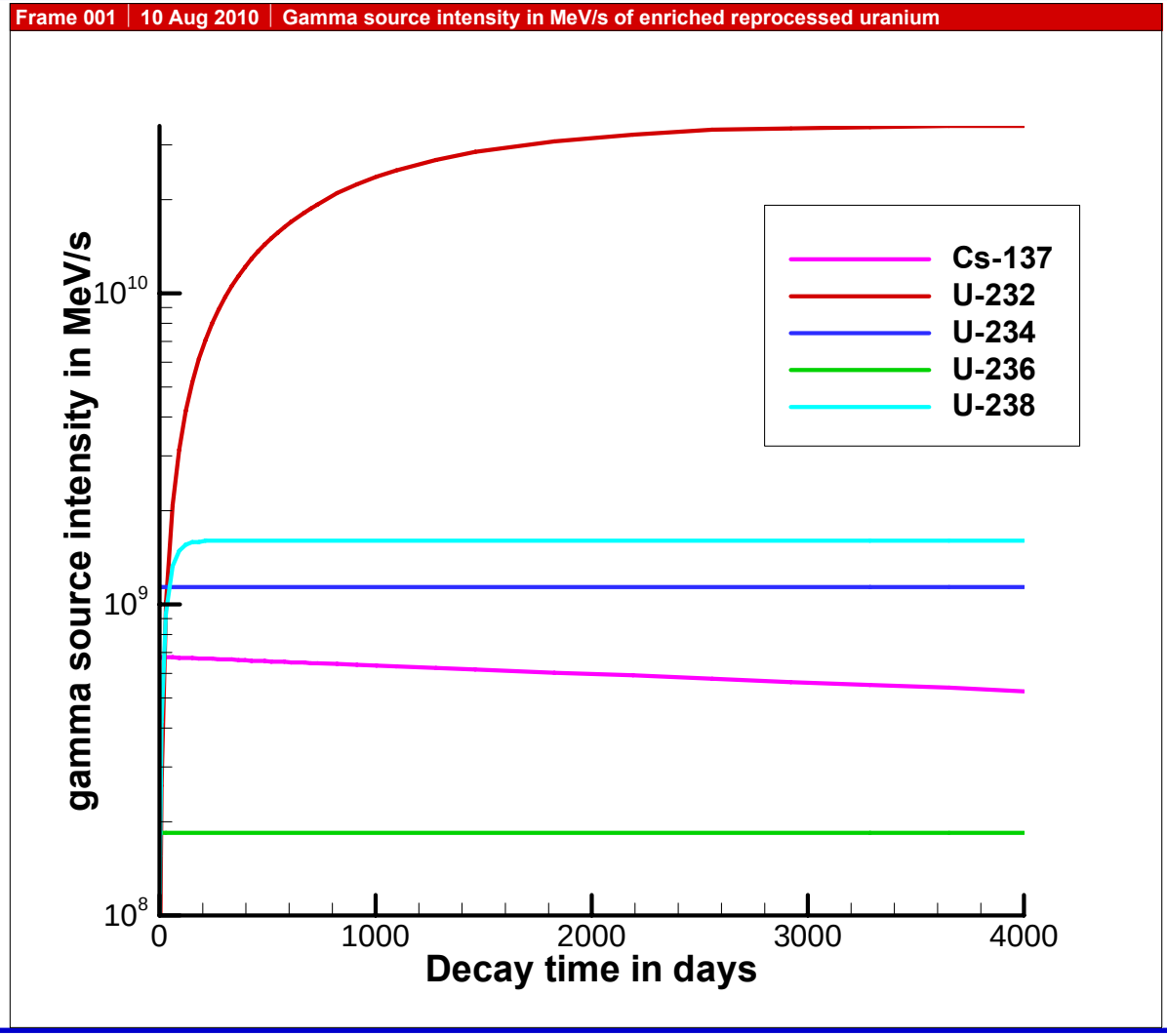
# Decay Chain of U-232



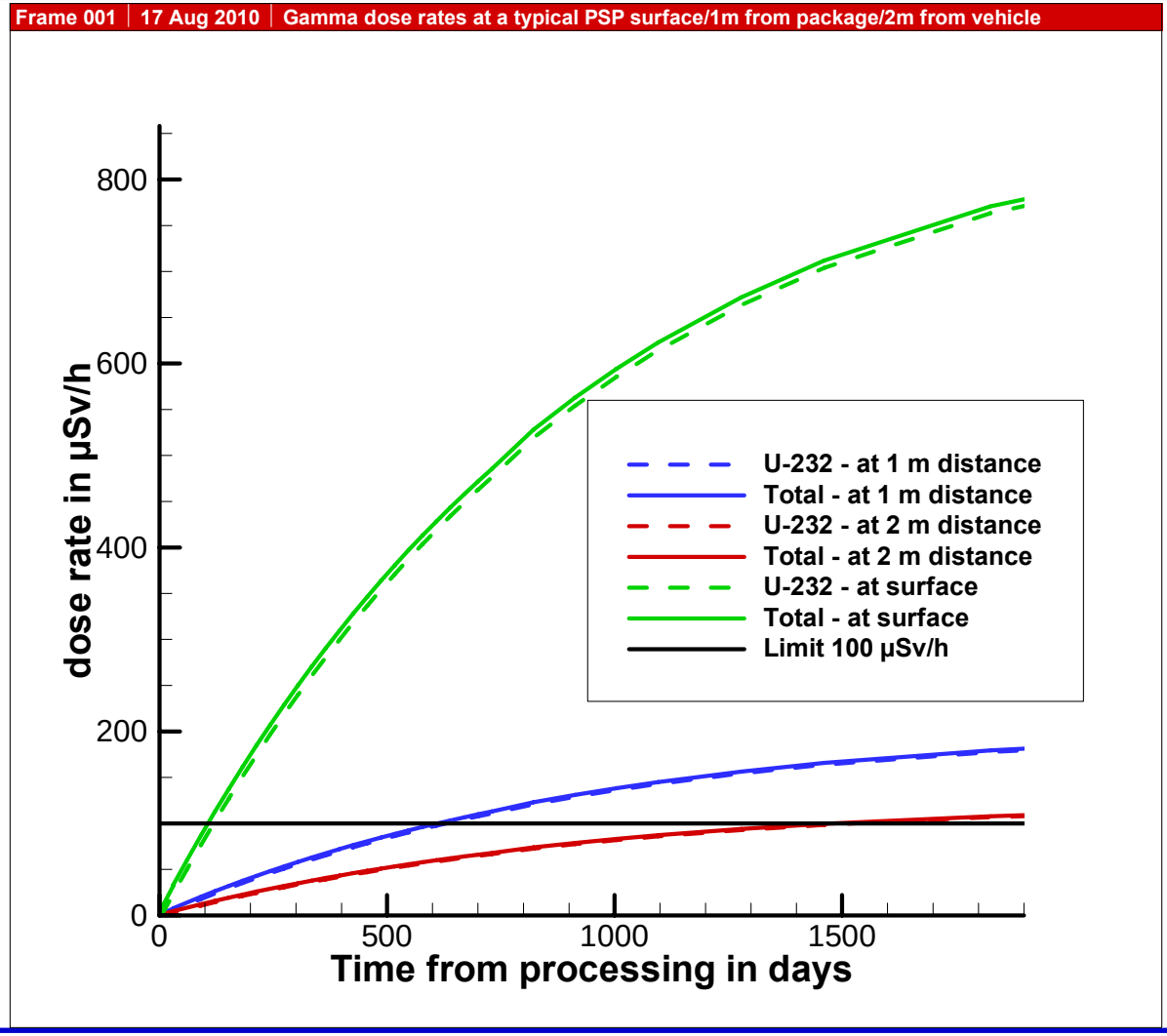
# Radioactivity of enriched reprocessed $UF_6$



# Gamma Radiation of Enriched Reprocessed $UF_6$



# Dose rates at a typical PSP



## Current designs

- Design A (type IF)
  - content close to ASTM C 996 specification
  - only 20% of U-232 limit of ASTM
  - limits on the decay products of U
  - no special requirements for heels
- Design B (type IF, B(U)F)
  - content based on LSA-II requirements
  - no restriction on U-232
  - but restriction on U-233
  - heels are regulated as separate content

## Current designs

- Design C (type B(U)F)
  - content partially based on ASTM C 996 specification
  - no limit for U-232 nor for U-234
  - total activity allowed 1E5 $A_2$
  - not special requirements for heels
- New design of DAHER/NCS (type IF, B(U)F)
  - content based ASTM C 996 specification
  - total activity restricted to 227 $A_2$
  - restriction on U-232 (as a function of time)
  - heels are regulated as separate content

## Conclusions

The transport of enriched reprocessed $UF_6$ is a

- Challenge for designers
  - properties of U-232
  - increase of radioactivity with time
  - increase of dose rates with time
  - possibly high dose rates for heels cylinders

All taken into account by the new DAHER/NCS design DN30

## Conclusions

The transport of enriched reprocessed $UF_6$ is a

- Challenge for Competent authorities
  - no harmonized approach
  - U-232 concentration not specified in some approvals
  - differences in consideration of heels
  - partial revalidation or validations as “special arrangement”

Enveloppe design of DN30 expected to facilitate validation