

Ultra Cold Neutron (UCN) example

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[/examples/extended/exoticphysics/ucn](#)

First import: June 6, 2014

[/source/materials/](#)

G4UCNMaterialPropertiesTable

G4UCNMicroRoughnessHelper

[/source/processes/hadronic/processes](#)

G4UCNAbsorption, G4UCNLoss,

G4UCNMultiScattering,

G4UCNBoundaryProcess

- PrimaryGeneratorAction
 - Neutron with flat energy distribution 1e-9eV to 1e-7eV
 - SetParticlePolarization(GeThreeVector(0,1,0))
 - Isotropic direction from the origin
- DetectorConstruction
 - DefineMaterials uses G4NistManager
 - Hollow niobium tube with end-plate
 - G4UCNMaterialPropertiesTable->AddConstProperty
 - “REFLECTIVITY”, “DIFFUSION”, “FERMIPOT”, “SPINFLIP”
 - “LOSS”, “LOSSCS”, “ABSCS”, “SCATCS”
 - SetMicroRoughnessParameters
 - G4UserLimits(maxStep=1*mm,DBL_MAX,maxTime=100*s)
 - ConstructSDandField
 - G4UniformGravityField, G4RepleteEofM(field,12)
 - G4ClassicalRK4(equation,12)

- PhysicsList
 - RegisterPhysics(G4DecayPhysics, ExUCNExtraPhysics)
 - ExUCNExtraPhysics
 - AddDiscreteProcess(G4StepLimiter, G4UserSpecialCuts)
 - G4Transportation::EnableUseMagneticMoment
 - For neutron:
 - G4UCNLoss, G4UCNAbsorption, G4UCNMultiScattering
 - G4UCNBoundaryProcess (SetMicroRoughness(true)
analogous to G4OpBoundaryProcess

References: F.Aitchison et.al. “The simulation of ultracold neutron experiments using GEANT4”, NIM A 552 (2005) 513-521 and F.Aitchison et.al. “Diffuse reflection of ultracold neutrons from low-roughness surfaces” Eur. Phys. J. A 44, 23-29 (2010)