Introduction:
LIBS technique is well adapted for in-situ analysis. We have developed a specific probe dedicated to remote characterization for preparation of decommissioning of nuclear facilities.

LIBS principle:
The LIBS technology consists in the spectroscopic analysis of the plasma emission produced by a laser focused on the surface to be characterized.

Material characterization:
- Chemical element detection
- Concentration measurement
- Materials identification

LIBS advantages:
- All chemical elements can be detected
- Can be applied to solid, liquid or gas
- No sample preparation
- Real time measurement
- Remote or stand-off

Needs for decommissioning:
- Inventory
- Control of contamination
- In-situ waste identification for sorting
- With the constraints:
  - Irradiation or contamination
  - Many measurements to do
  - Difficulties to take out the samples

LIBS probe characteristics:
- Safe area
- Contaminated area
- Laser
- Spectrometer
- Optical fiber
- > 10 m
- Size: 10cm x 10cm
- Weight: < 1Kg

Schematic view of remote measurement with the compact probe

Sampling characteristics:
- Depth: ~ 1 µm / laser shot
- Analyzed Area: ~ (200 µm)²
- Ablated mass: ~1 ng / laser shot

Discrimination of different metals with chemometrics method:
Each material has its own spectral signature

Building of a database using mathematical method

Results for different applications:
- Discrimination of materials
- Control of contamination / Inventory

Surface analysis of contaminated walls (at CEA Cadarache):

Control of contamination / Inventory:
- This probe is able to detect surface contamination
- Furthermore, the chemical composition, can be obtained in order to prepare decommissioning (inventory)

Conclusion:
- We have developed a LIBS system with the capability to perform remote characterization of materials into nuclear facilities.
- This system can be used for waste sorting, inventory or control of contamination

Perspective:
Our demonstrator is ready to be tested in other in-situ conditions in nuclear facilities

Tuesday 16th • Thursday 18th February 2016
Lyon Convention Centre • France