Consequences of 30 years of operation on the of RF cooling circuits at GANIL

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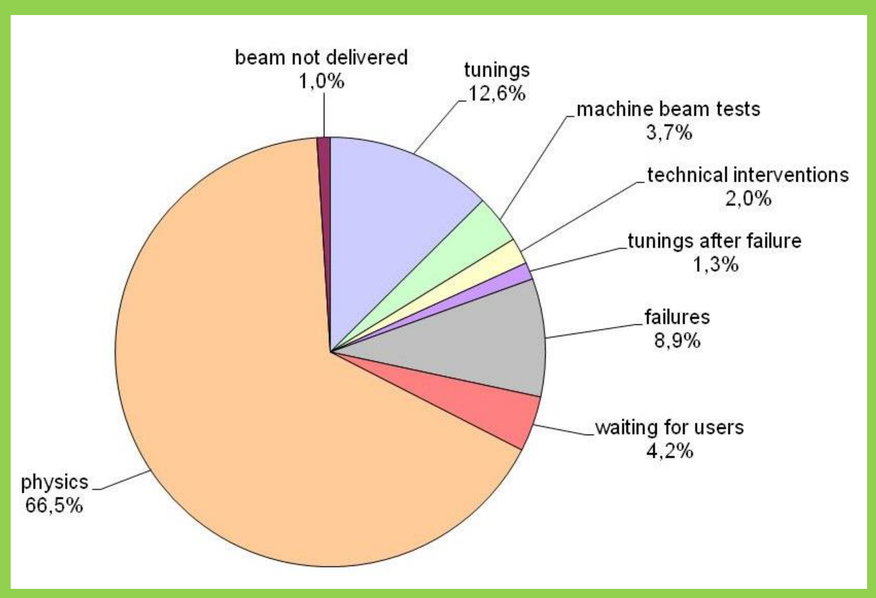
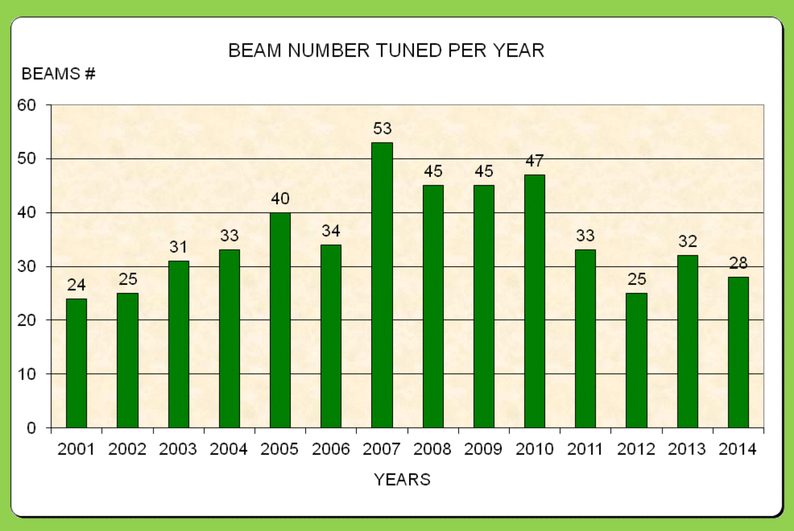
ABSTRACT : The GANIL facility (Caen, France) is dedicated to the acceleration of heavy ion beams for nuclear physics, atomic physics, radiobiology and material irradiation since 1983. With an average beam-time of 3500 h over more than 30 years, the GANIL encounter water leak problems mainly on the RF cooling circuits. The impact on the beam-time available for the physics is becoming visible because of the heavy intervention required. Therefore, a preliminary study in 2011, several causes were identified that may induce corrosion and erosion of our circuits. In 2015, a second report stated that some improvements may enhance the lifetime of the circuit. An exhaustive check of the parameters of the water compared to the literature showed that some improvement can be launched for a reduced. Nevertheless, the erosion seems to be the main reasons for our water leaks and the poster will present the status of our reflexions and the curative or preventives actions foreseen.

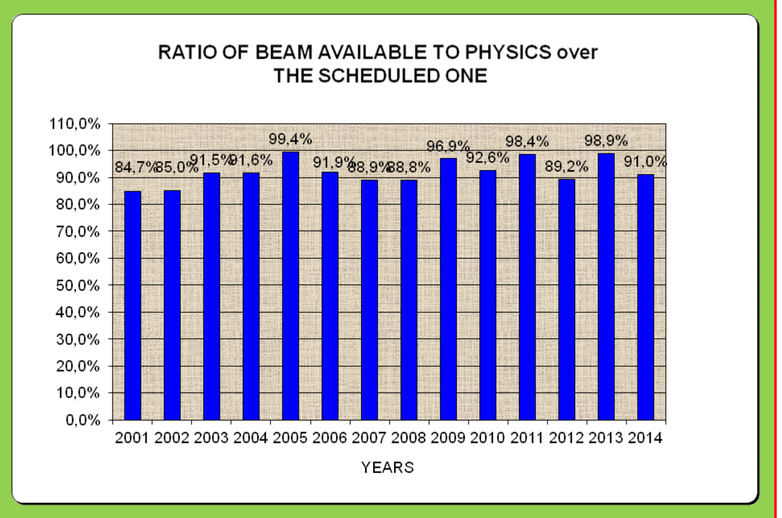
RUNNING STATISTICS 2001-2014

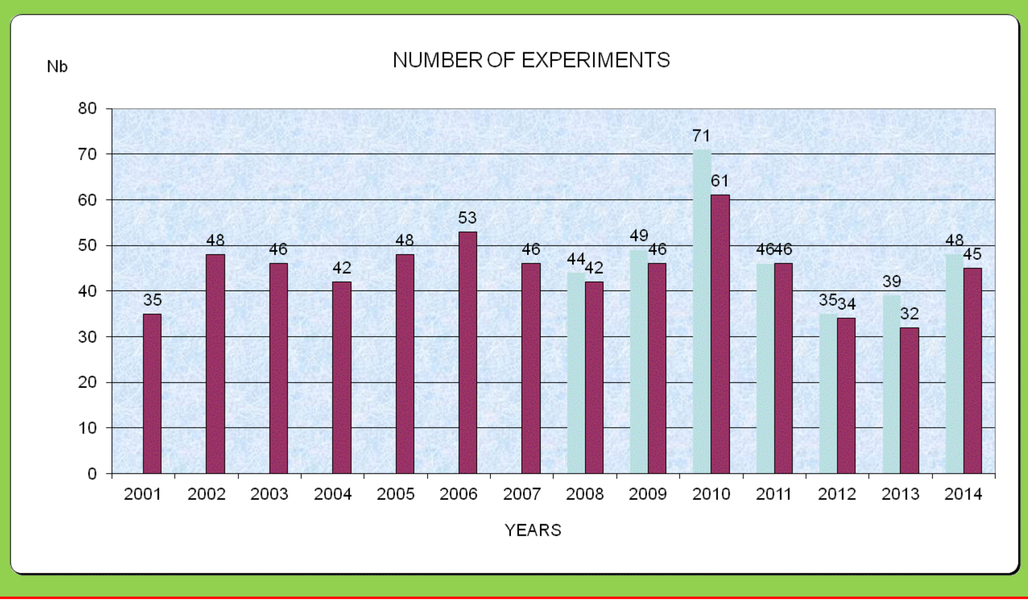
GANIL per year: 32 weeks within 4 runs ; 4900h of operating time. Leading to 7200 h of beam time for users (multi-beam effect)

SPIRAL1 since 2001: 8500h of exotic beams. More than 30 exotic beams produced





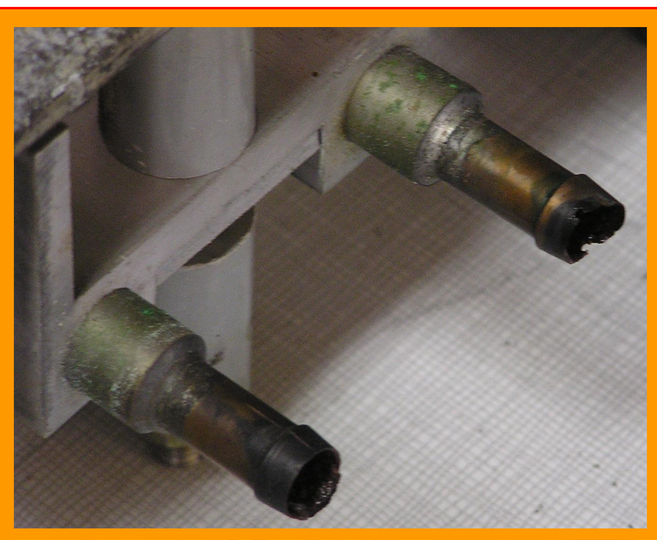




Availability rate = 1 – failure rate
over 14 years: 88.6 %

Availability in 2011 : 89.2 %

Scheduled physics time in 2014 : 91.4%



First conclusions and good practices :

1. The circuits must be closed and water free from any gas dissolves (Oxygen, CO2,…). What implies:
   - ❖ Fill water tank under nitrogen
   - ❖ The circuit must be equipped with a degasser
   - ❖ No connection of equipment for tests (in the case of the GANIL, example of the BUMM, the bench of SPIRAL1, the change of pipes,…)
   - ❖ The circuits must be watertight to avoid gas entrance
   - ❖ Neutralization of any biological activity by U.V at the time of the filling
2. Go towards a pH above 7 and limitation of its reduction being ensured keeping a high resistivity
   - ❖ Installation of new mixed beds equipped with electromagnetic water gates controlled by a regulation on the basis of measurement of the water conductivity in order to maintain a water with pH> 7. A strongly resistive and slightly alkaline water forces to respect item 1.
3. Measure the proportion of sulphates and chlorides.
4. To decrease in an important way the rate of flow: Power supplies and RF circuits. Possible locally.
5. Maintaining the temperature of the fluids as low as possible
6. Stagnation of water during the stops machine has to be investigated