

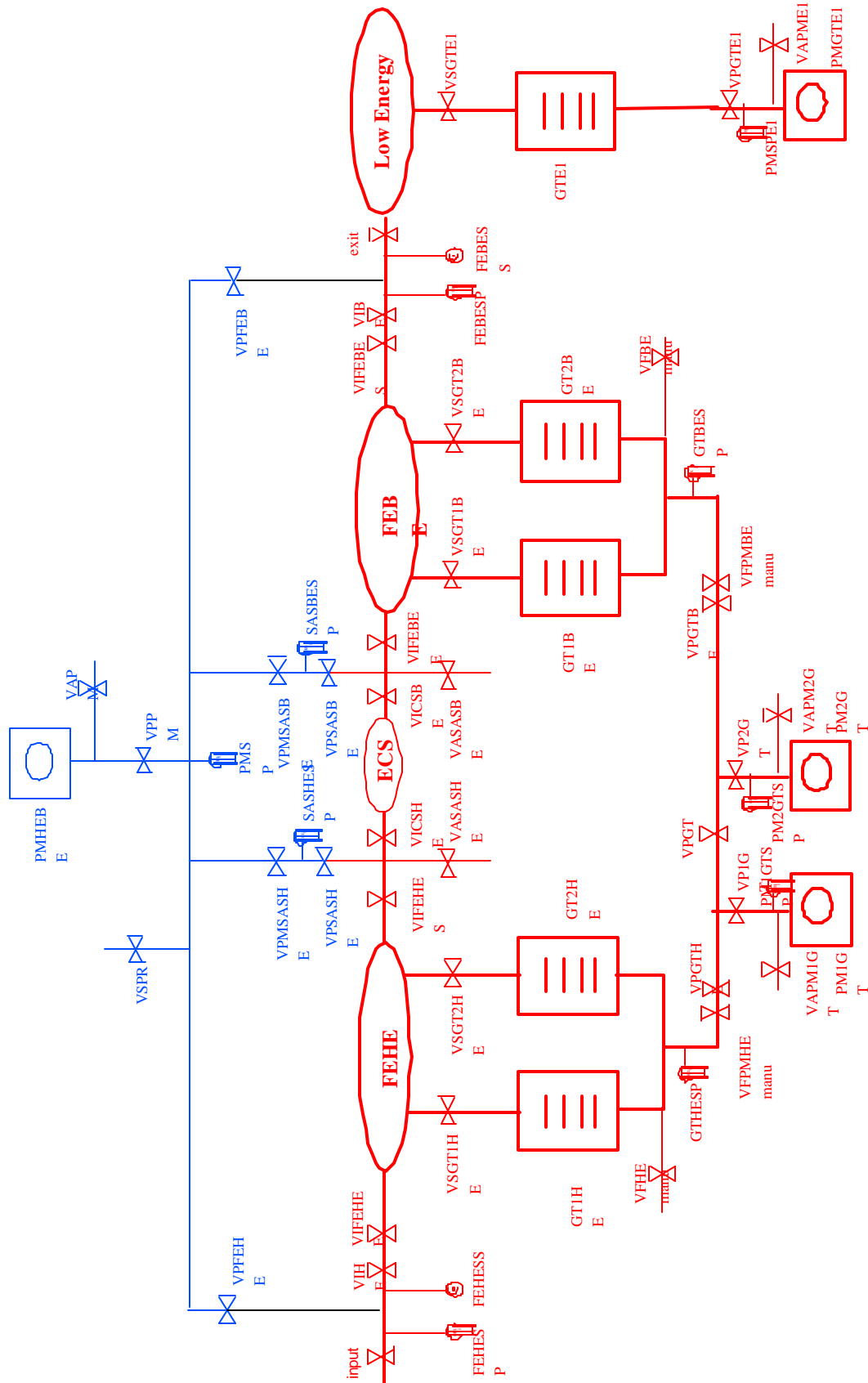
## Gas storage system of SPIRAL/GANIL

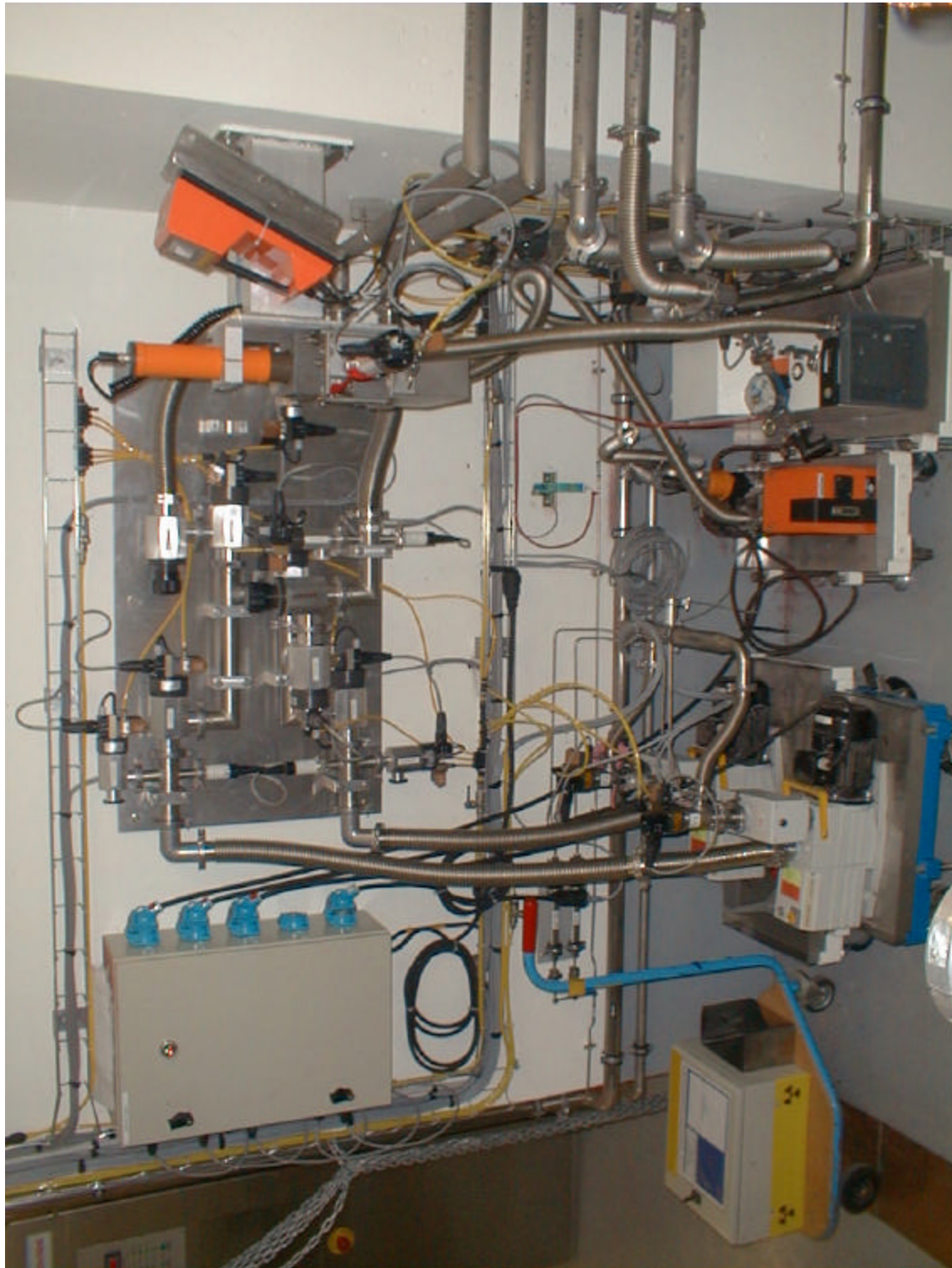
### Main constraints

- No rejection out of the plan (no right)
- 3 barriers

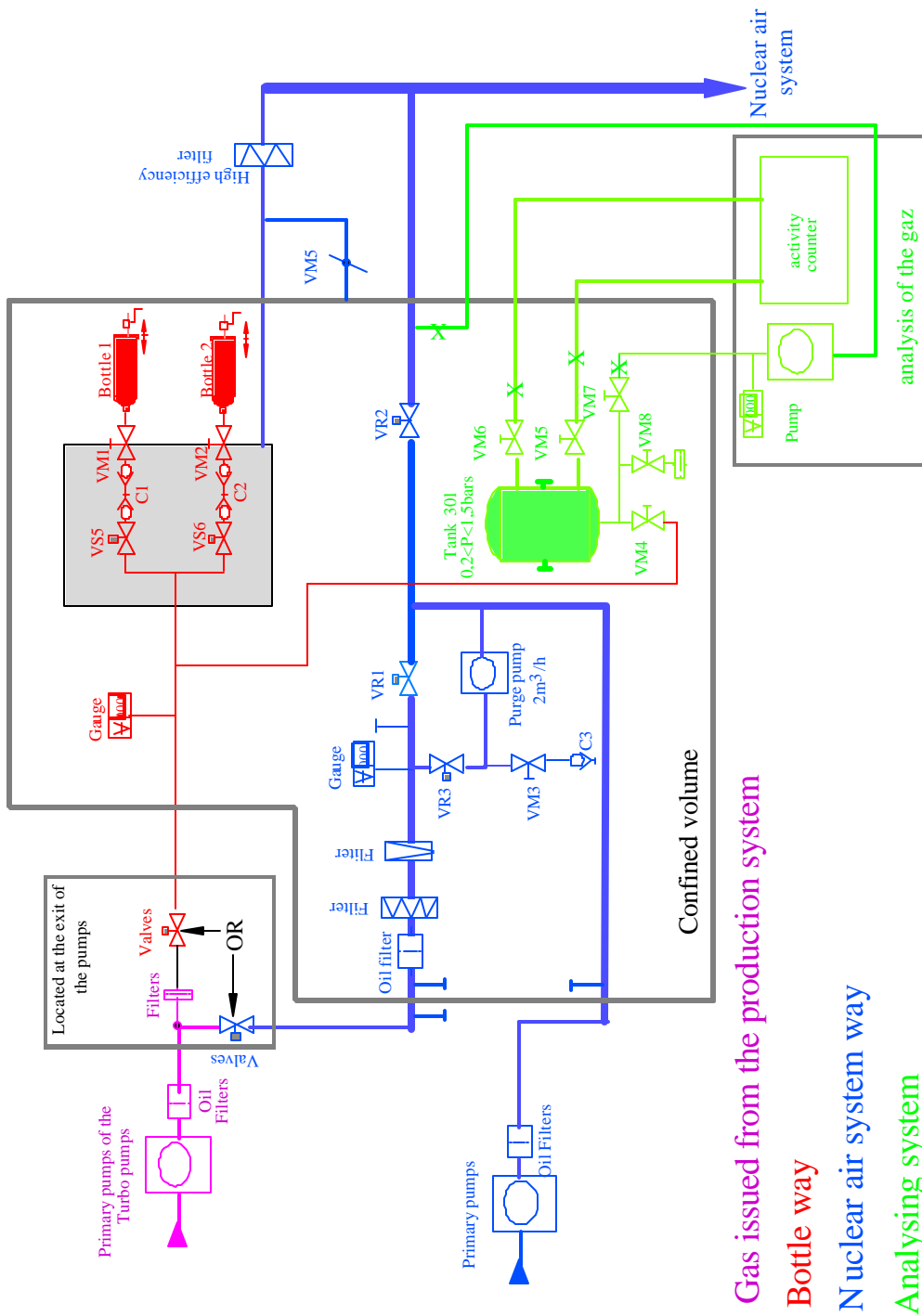
⇒ confinement of the gas during and after the radioactive ion production

Pumping of the production system of SPIRAL





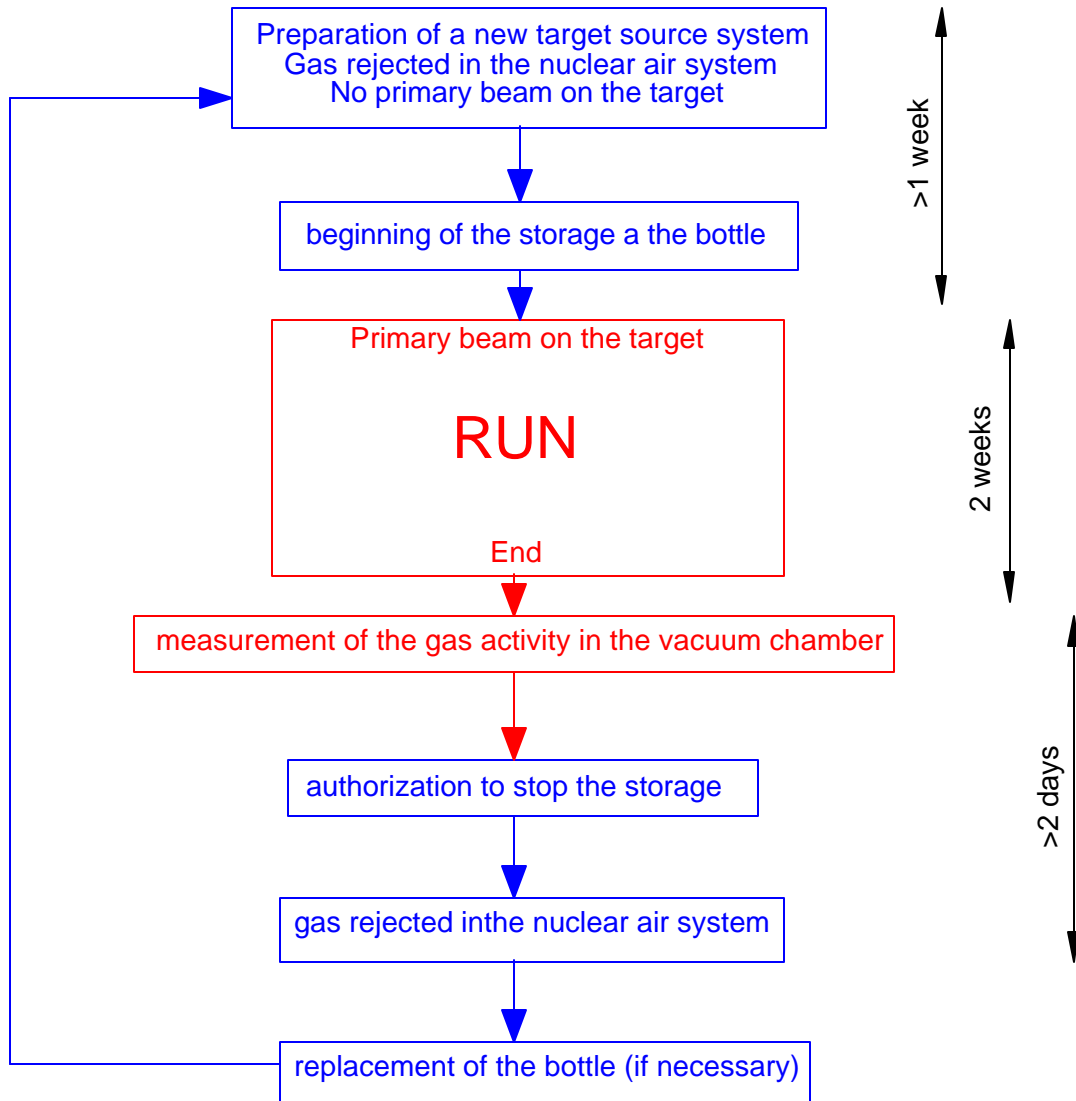
Storage of the radioactive gas coming from the target source system of SPIRAL











## Main safety principles respected to avoid gas and aerosol dissemination

### Passive

- He leak measure below 10<sup>-6</sup>mbar.l/s
- Maximum of connections welded
- Maximum of material made from stainless steel
- Hierarchic pressure dependant on the contamination level

### Active

- bottle pressure monitored, below the atmospheric pressure
- if  $P_{\text{bottle}} > 750 \text{ mbar}$  => alarm, or switch on the second bottle
- if  $P > 950 \text{ mbar}$  or if nuclear ventilation stops or if 2/3 of the primary pumps fails => stop all the production system



## Conclusion

### Advantages of this system

- low volumes of waste
- contamination well confined
- simplicity and reliability
- low storage pressure
- no authorization to throw the gas out

### Gas storage system well suited to

- low activities (the bottles must be handily removed)
- low gas flow (the bottle volume is limited to 20l)

**Last problem: how to retreat the gas?**

## Intensity on the carbon targets and gas flow

| Date     | Irradiation time (h) | Beam                   | Number of part.      | Mean Power (W) | Max. Power (W) |
|----------|----------------------|------------------------|----------------------|----------------|----------------|
| Sept. 01 | 180                  | $^{20}\text{Ne}^{10+}$ | $4,66 \cdot 10^{17}$ | 218            | 342            |
| Nov. 00  | >180                 | $^{13}\text{C}^{6+}$   | $3,75 \cdot 10^{18}$ | 756            | 1460           |
| Apr. 02  | 8                    | $^{13}\text{C}^{6+}$   | $6,8 \cdot 10^{16}$  | 294            | 780            |
| Apr. 02  | 40                   | $^{13}\text{C}^{6+}$   | $3,7 \cdot 10^{17}$  | 480            | 780            |
| June 02  | 264                  | $^{78}\text{Kr}^{33+}$ | $4,7 \cdot 10^{17}$  | 423            | 630            |
| July 02  | 250                  | $^{13}\text{C}^{6+}$   | $3,8 \cdot 10^{18}$  | 657            | 1380           |
| Sept. 02 | 180                  | $^{13}\text{C}^{6+}$   | $3,2 \cdot 10^{18}$  | 777            | 1137           |

For 76 hours of irradiation with  $^{20}\text{Ne}$  (95MeV/A),  $\langle P_{\text{beam}} \rangle = 275\text{W}$   
+ 1400W of heating,

Mean gas flow =  $1,8 \cdot 10^{-3}$  mbar.l/s

For 15 days, 2,33 bar.l

=> One bottle should be useable during 9 runs