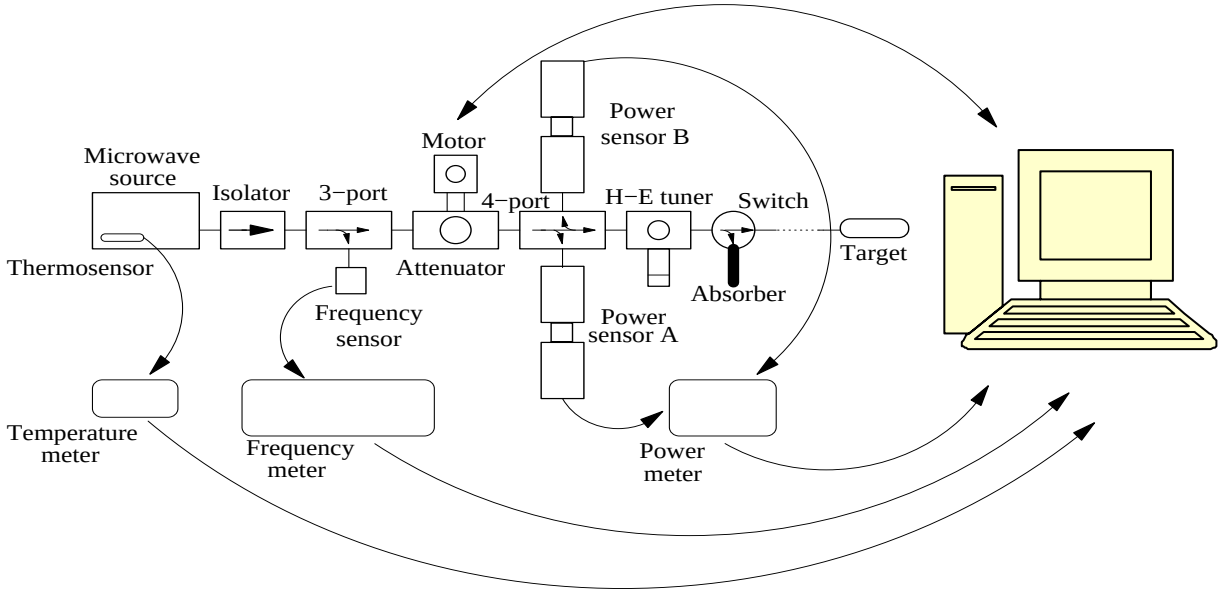
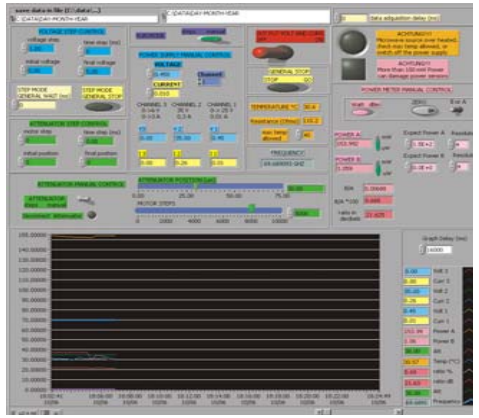
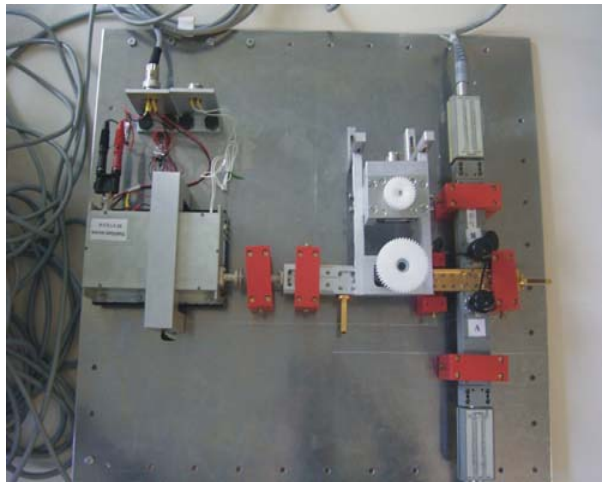
Microwave system



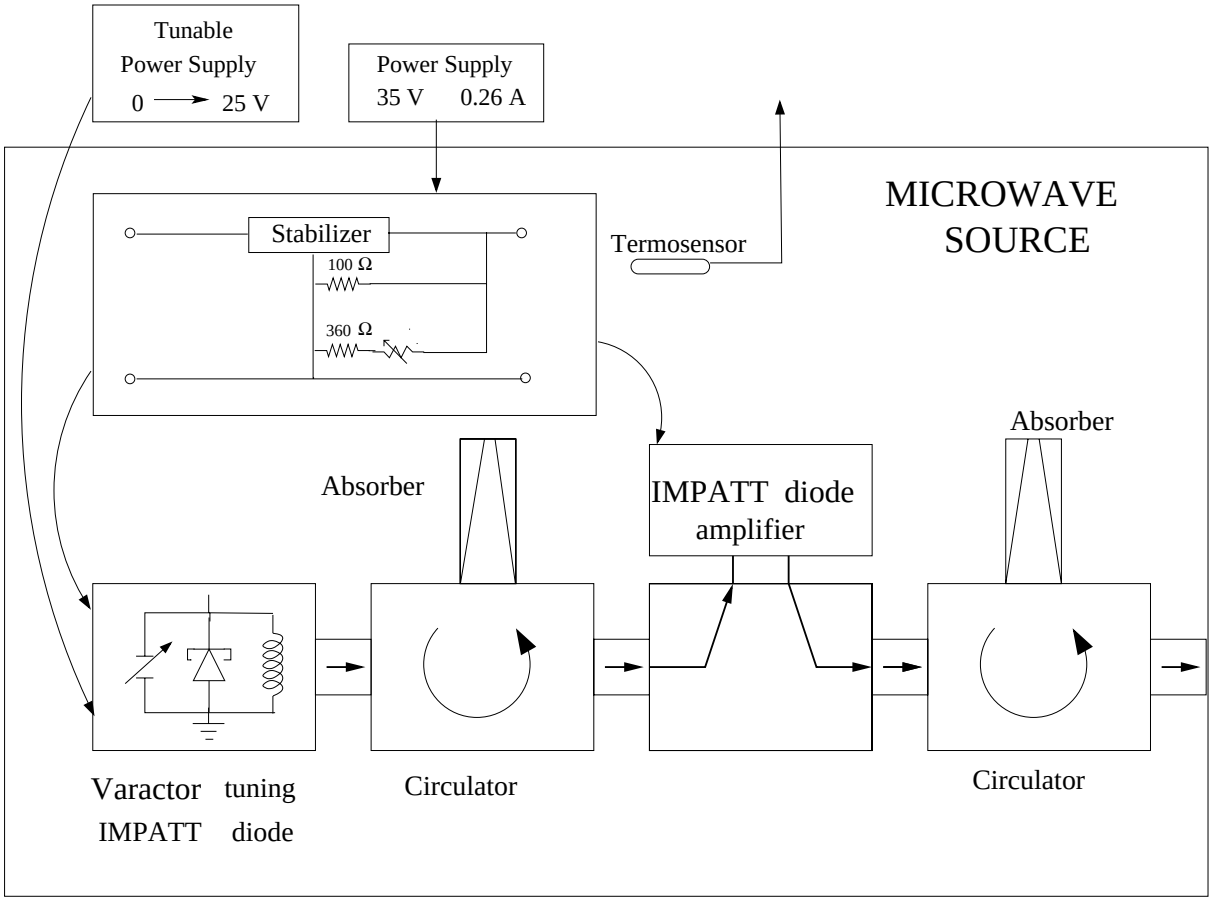


- Varactor tuning IMPATT diode
- Tunable frequency 70GHz +- 200MHz
- Used in the GDH Sum Rule experiment 2003
- LabView control panel

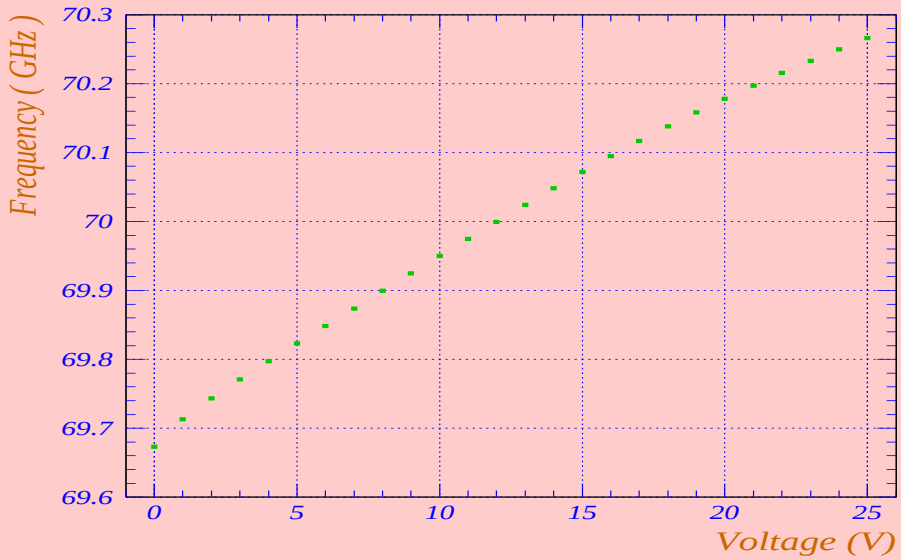


Microwave source

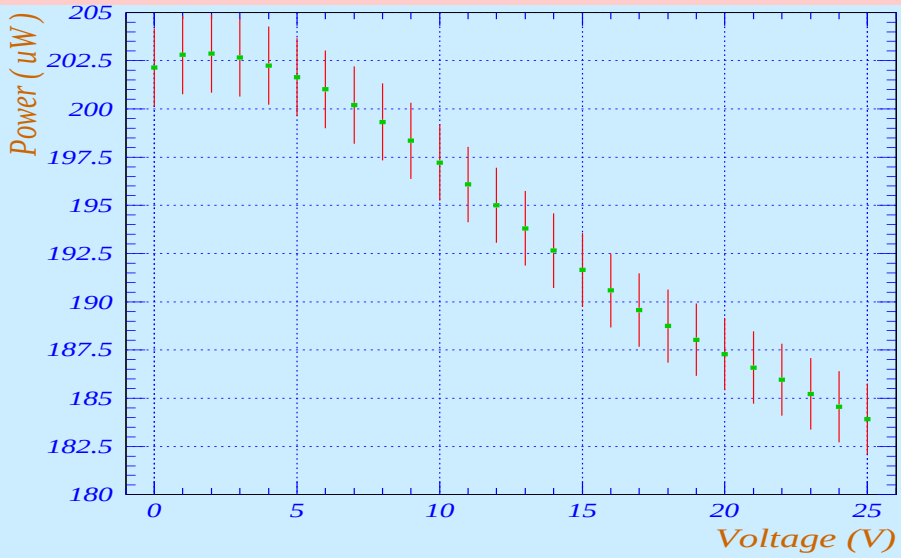
- Varactor tunning IMPATT (IMPAct Time Transition) diode
- Frequency from 69.673 up to 70.266 GHz
- Frequency stability of 0.008%
- Power 200 mW
- Power stability of 2%
- Temperature stability of 0.7%



Calibration

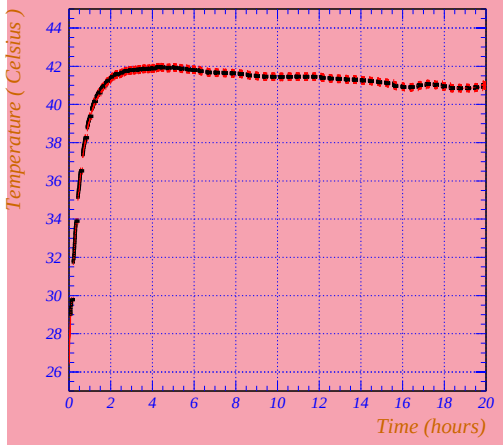


Frequency :
from 69.673 GHz
up to 70.266 GHz

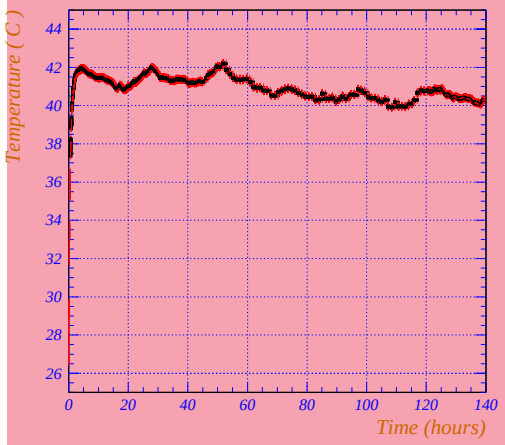


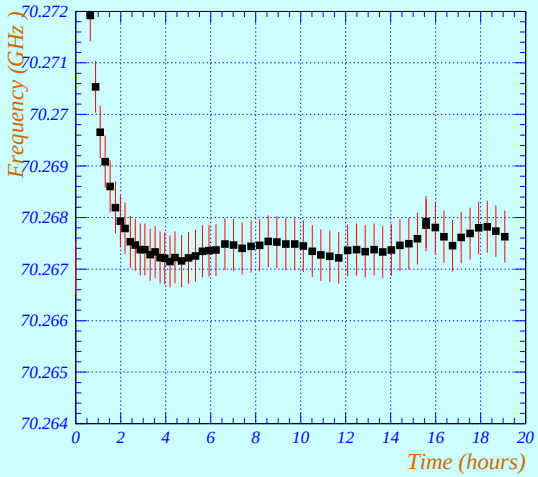
Power:
About 200 mW.

Microwave results

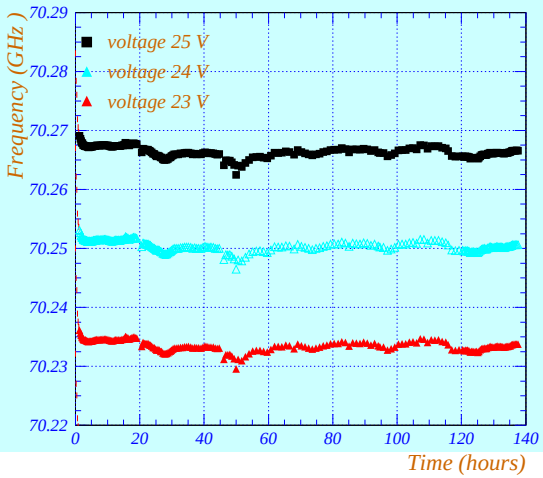


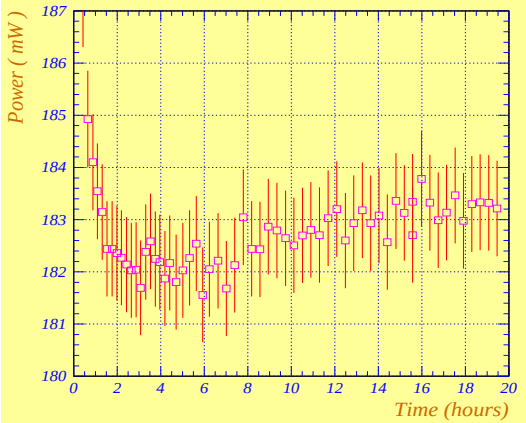
Temperature



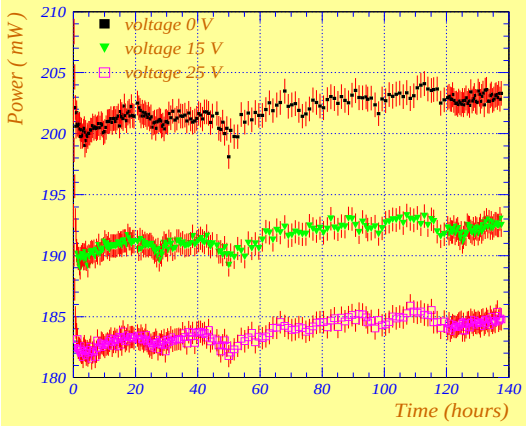


Frequency

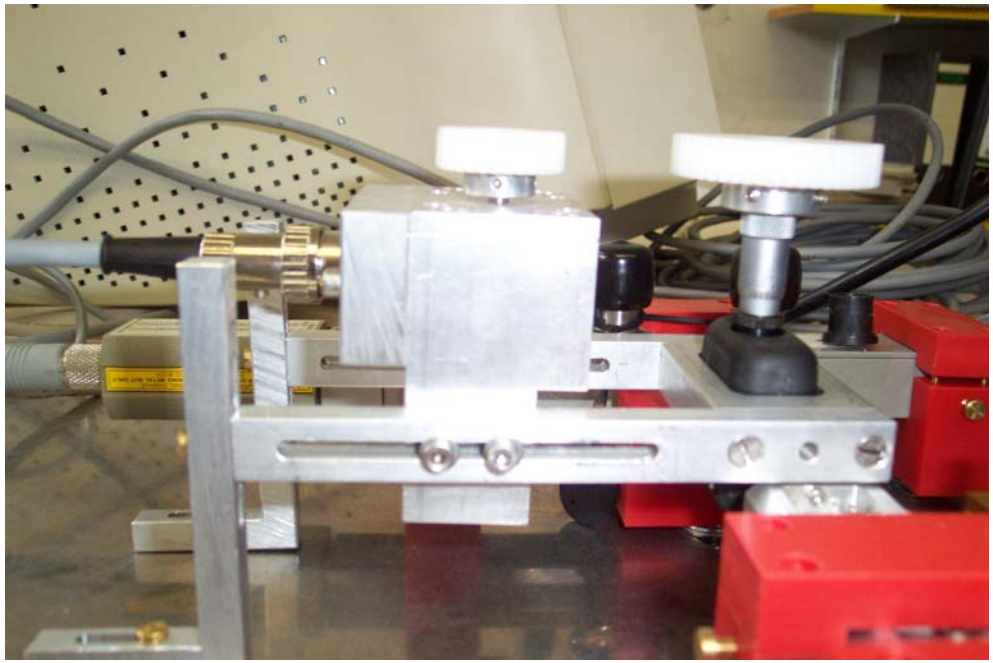




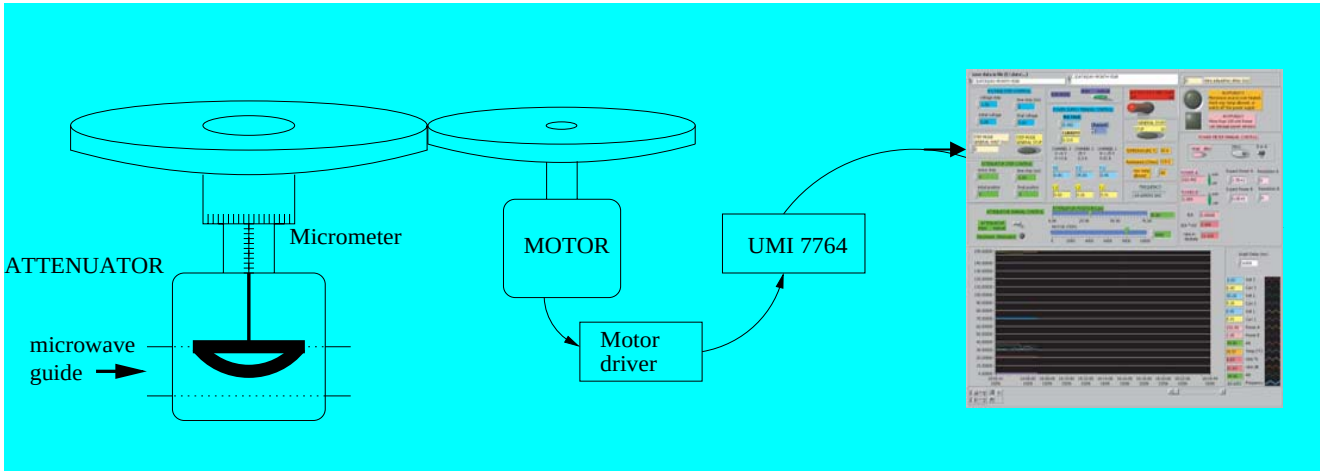
Power



MOTOR ATENUATOR

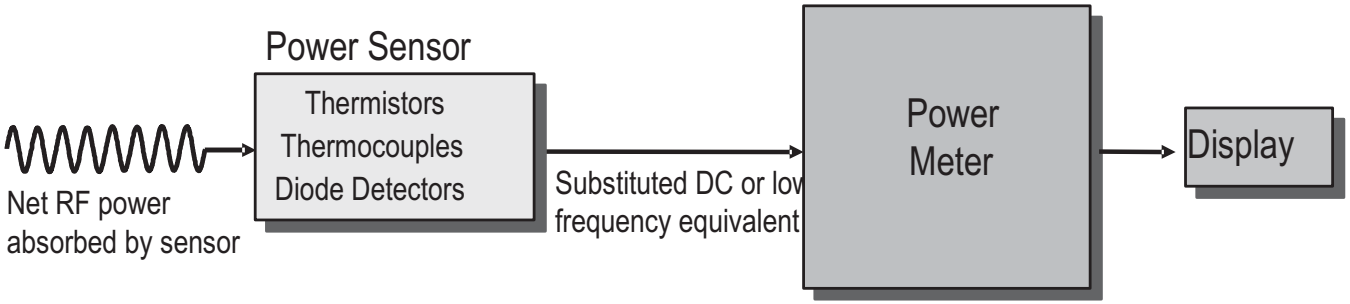


- Step Motor from Lin Engineering 0.9 degrees.
- MB15 micro step driver.
- UMI-7764 motion interface.
- Labview application.

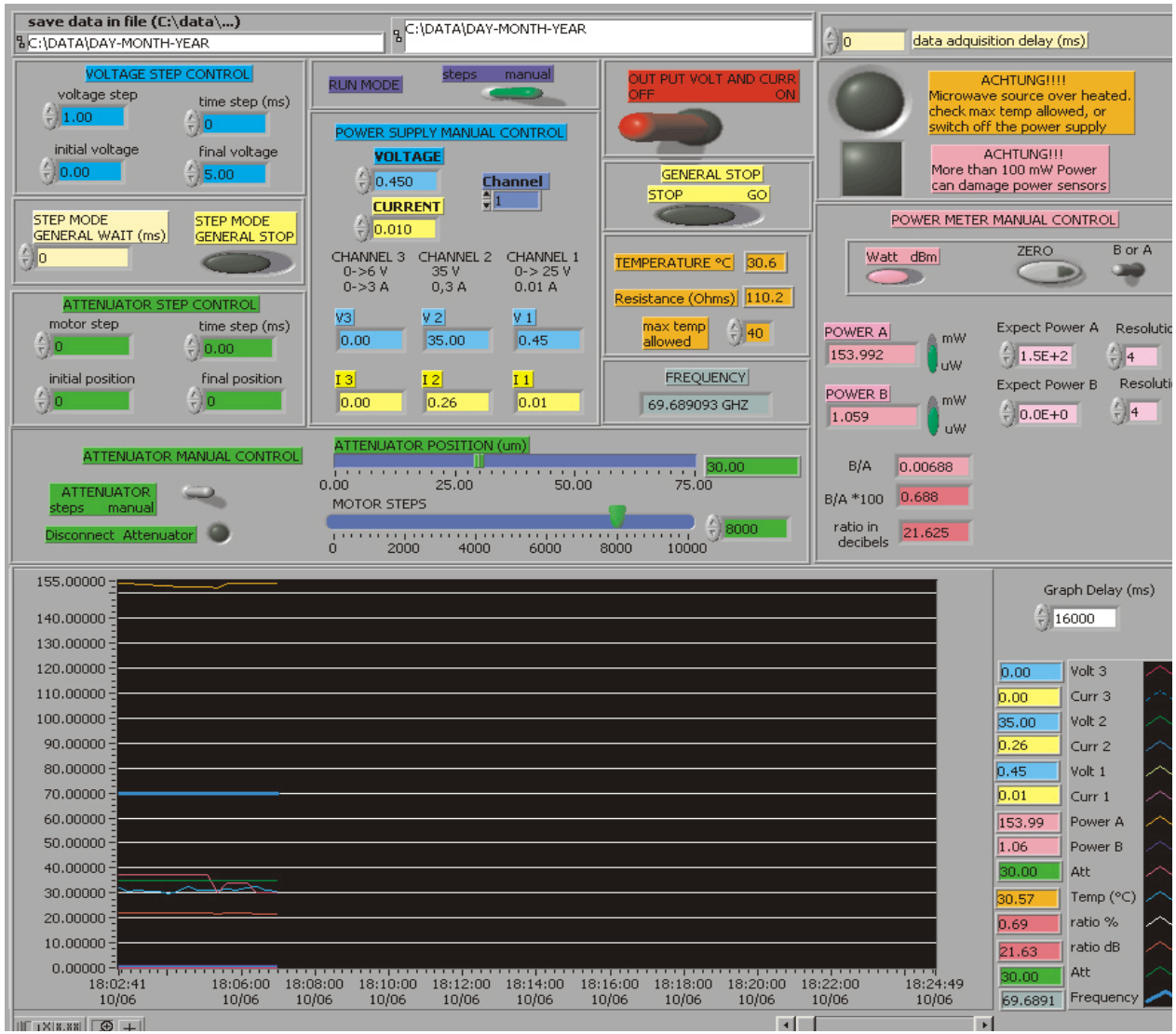


Power Meter

- E4419B EPM Series Power Meter from Agilent Technologies
- Two sensors V8486A



LabView program



Ideas for COMPASS MW control system

- Power Supply of EIO. 6000V.
- Tuning motor EIO. 12V motor.

  Motor -> Driver -> LabView
- Power controlling motor.

  Motor -> Driver -> LabView
- Frequency counter.

  Read GPIB connection via LabView
- Power meter.

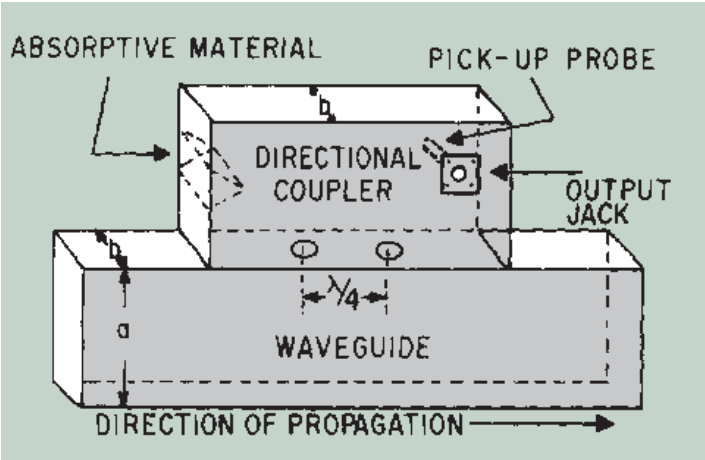
  Read AI Simatic/National Instruments Modules
- Attenuator.

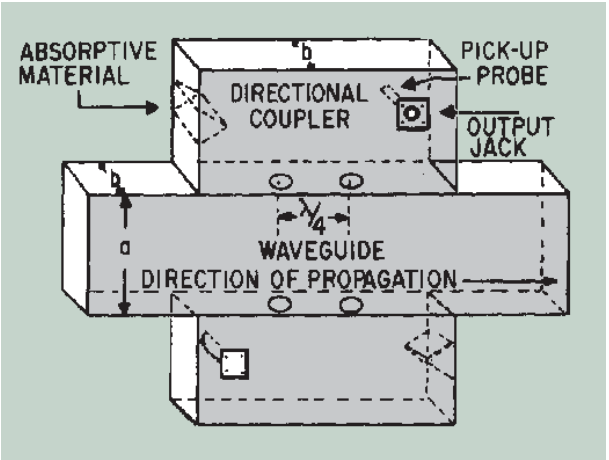
  Motor -> Driver -> LabView

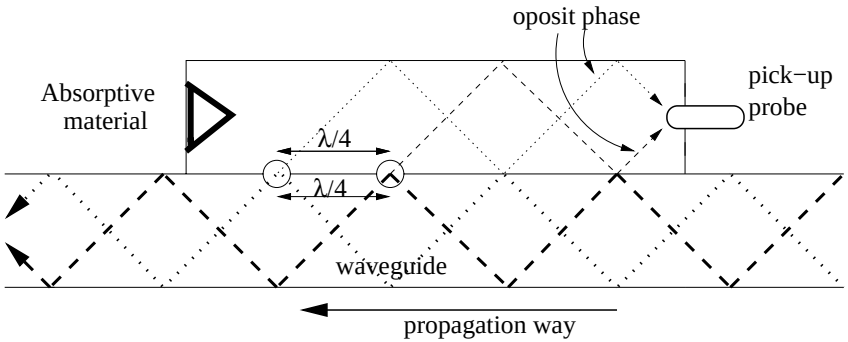
Questions

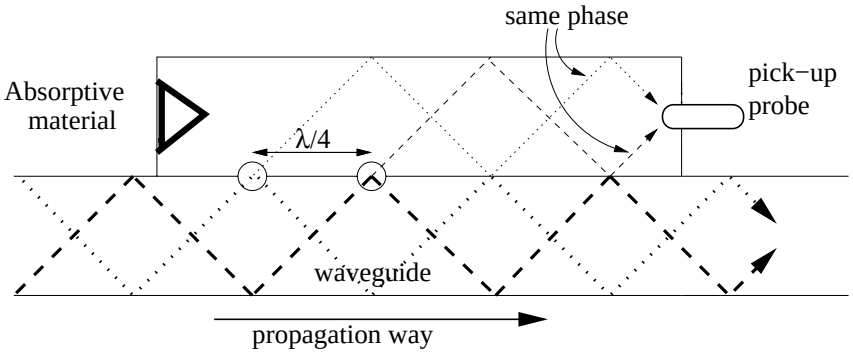
- How to control 6000 V Power Supply with LabView or Simatic?
- How to control EIO tuning motor, and PCA motor?
- Stability of to EIO source?
- Can we put the MW system close to the Cryostat in order to save MW power? Is it needed?
- How many mWatts are needed to polarized the target?
- Can we use Varactor Tuning IMPATT Diode as MW source?
- Measurement of the incoming and reflecting power.

3 Port Coupler



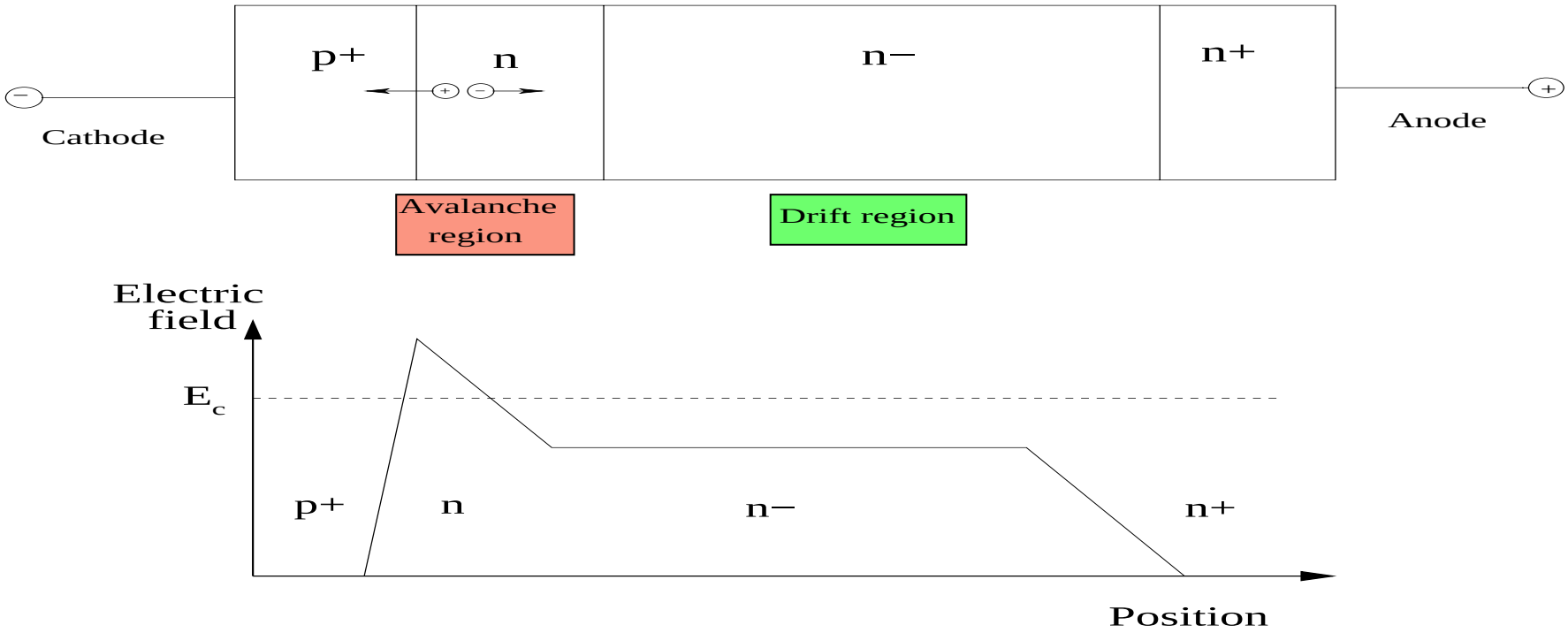






IMPATT diode

Converts DC power to RF power by introducing a 180 Degree phase delay between the voltage and the current



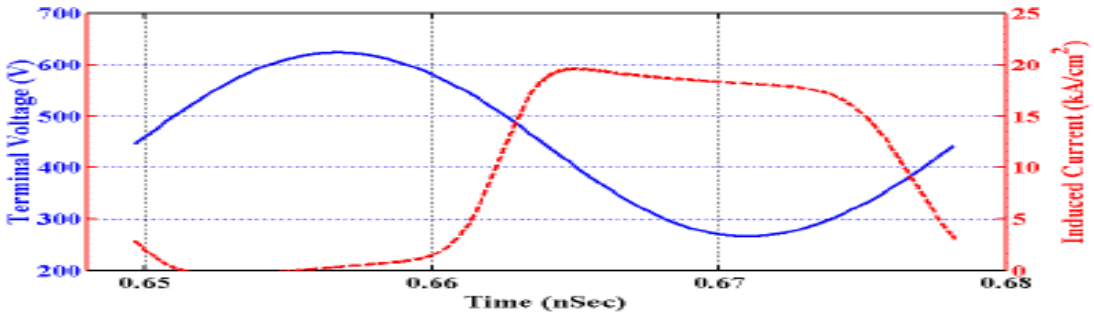
•External potential creates a peak and produces electron-holes pair. Avalanche region

• Electrons move to Anode with constant velocity. Drift region

• Induce mirror charges in anode.

IMPATT diode

- Current Increases as voltage decreases ⇨ opposit phase.



- Diode embedded in resonant cavity produce microwave.
- Frequency depending on drift velocity and lengh of the drift:

$$\upsilon = \frac{V_d}{2L}$$

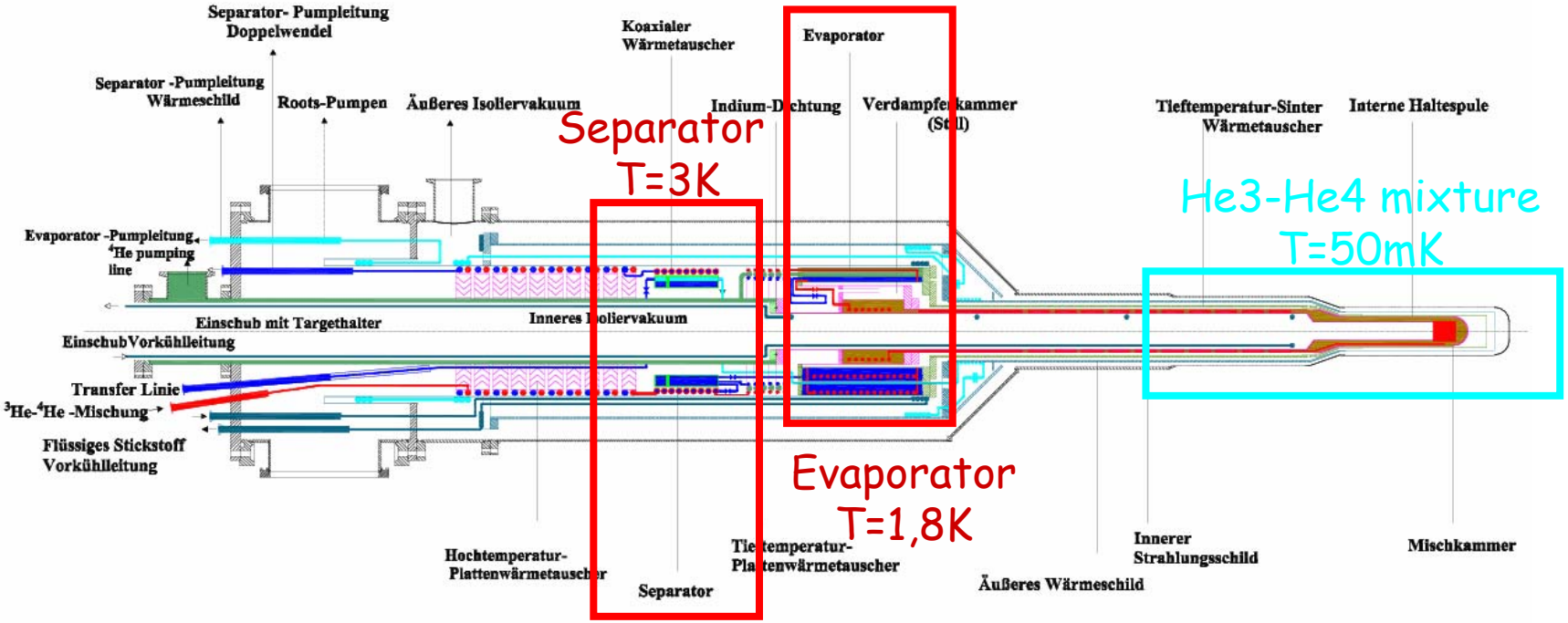
- Power:

$$P_n = \frac{E_c^2 V_d^2}{4\pi X_c \upsilon^2}$$

Rectance X_c

Critical field for avalanche breakdown E_c

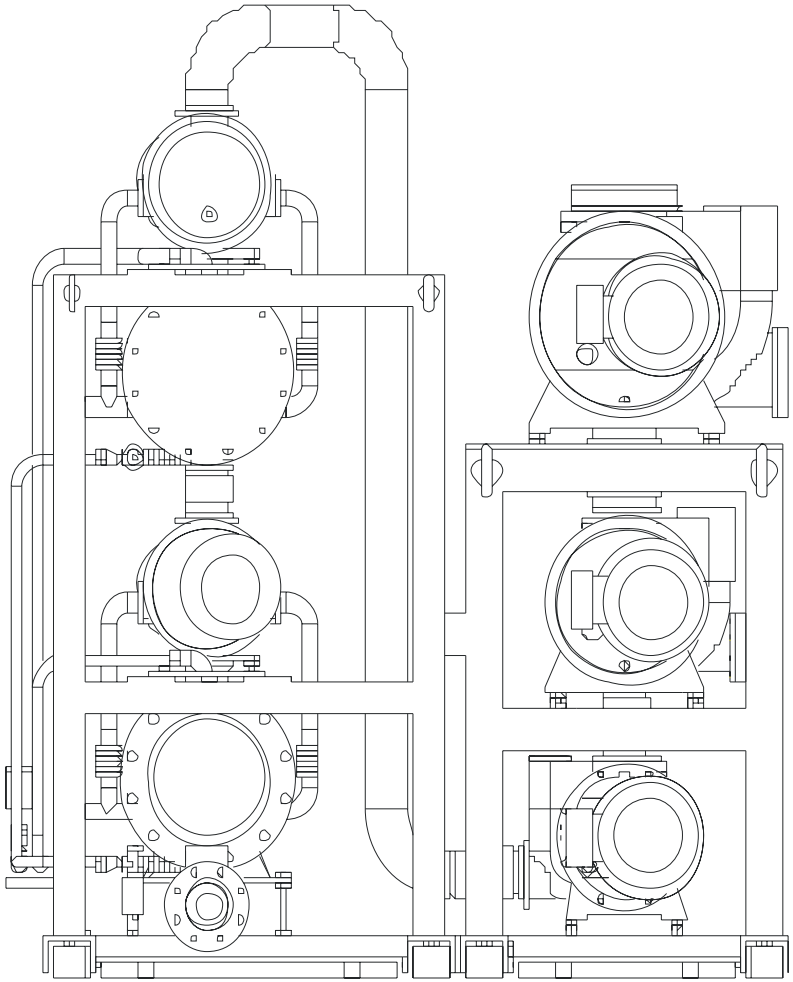
Cryostat

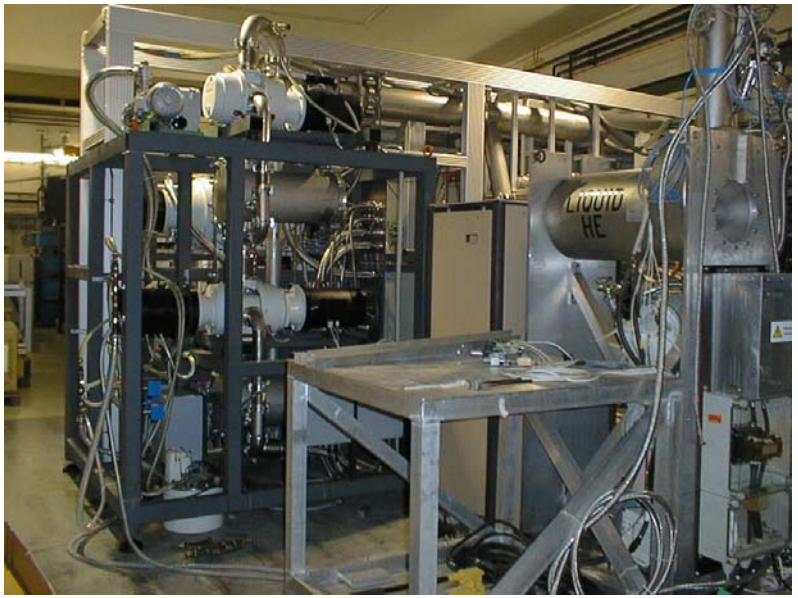


- Horizontal Cryostat
- Temperatures of 50 mK
- Cooling power of 100 mW
- Superconducting holding coil integrated

- Separator and Evaporator precooling stages
- Target insert along the beam axis
- Fits in the geometry of the Crystal Ball detector

Pumping system





-Serie of 5 Roots pumps:
4000 m^3/h, 2000 m^3/h,
1000 m^3/h, 500 m^3/h
and 250 m^3/h
- Very low leak rate