

IIMeC

Intrinsic Internal Metrology while Controlling

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Intrinsic Internal Metrology while Controlling

- * A new (under patent) method and related electronic circuit that transforms a simple actuator in a device with a double feature, actuator plus sensor, thus enabling the advantages offered by closed loop control techniques also for those applications in which true sensors are not present.*
- * Since the patent process is not yet concluded, I will tell you only what the discovery can do, and not how it works.*

Benefits and advantages

- * *For all the systems in which a true sensor is not present (e.g. constraints due to space, heating or costs), you can gain advantages on dynamic and on static performances, using the sensor feature offered by IIMeC to control and drive the system in closed loop.*
- * *For the systems in which a true sensor is already adopted, using IIMeC method you can gain advantages in space, heating and reliability (what is not present has not a failure...)*

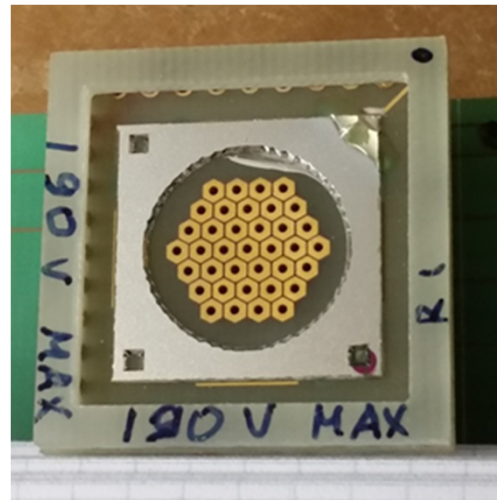
Demos test

We setted up a laboratory demonstration of the concept.

- 1. Goal: compare the measurement made by the interferometer with the signal from IIMeC.*
- 2. Goal : compare the measurement made by a mechanical probe with the signal from IIMeC.*
- 3. Low cost: 50 Euros total expenses for 3 demos.*

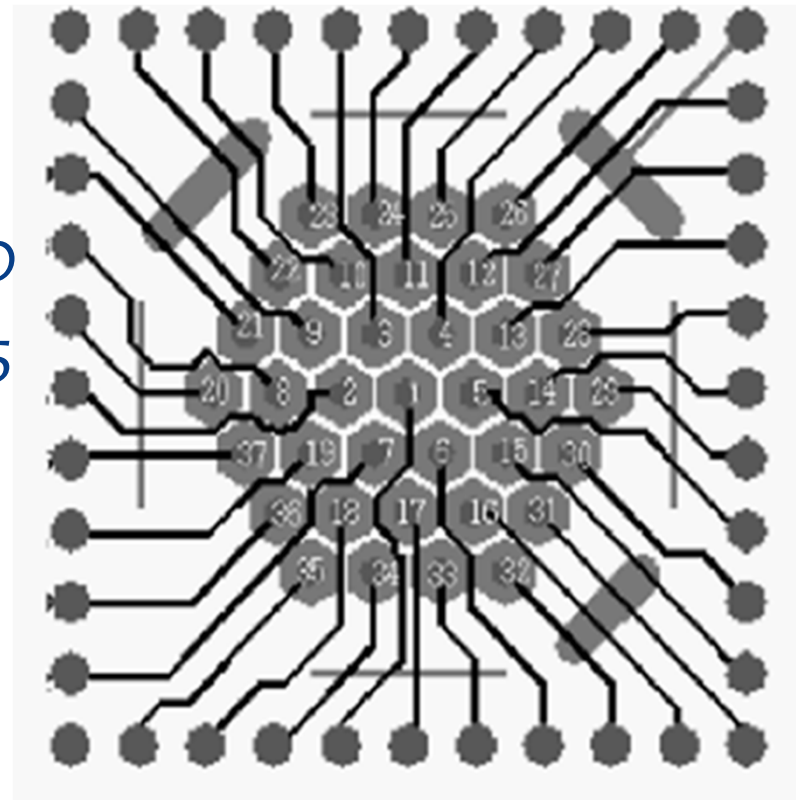
First demonstration: Membrane electrostatic DM.

- * Precision displacement Measurement while driving an electrostatic actuator (OKO Mirror).

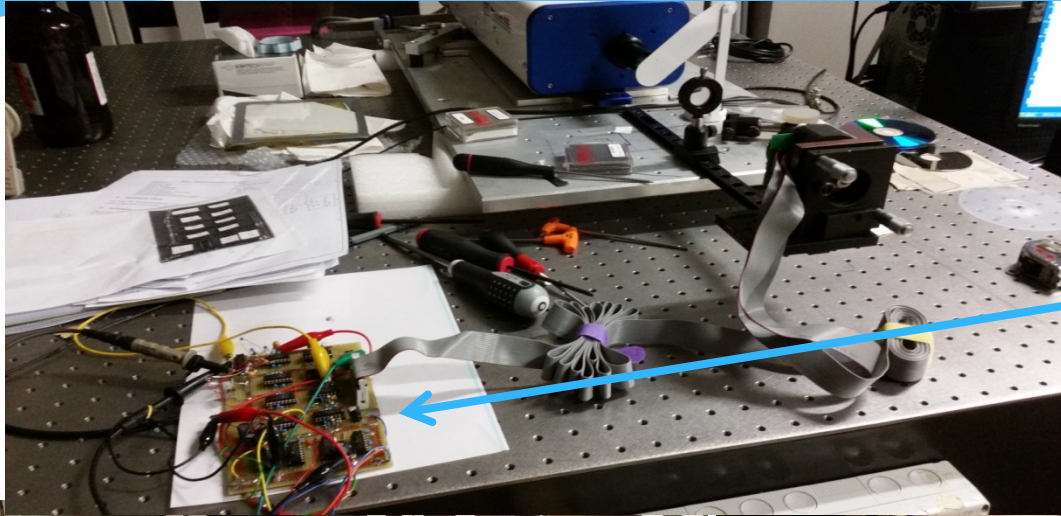


Test setup

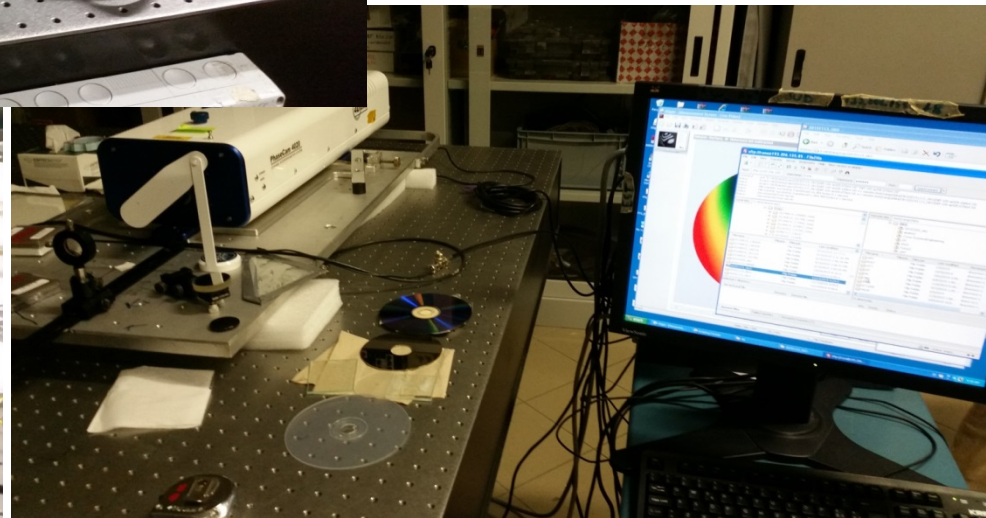
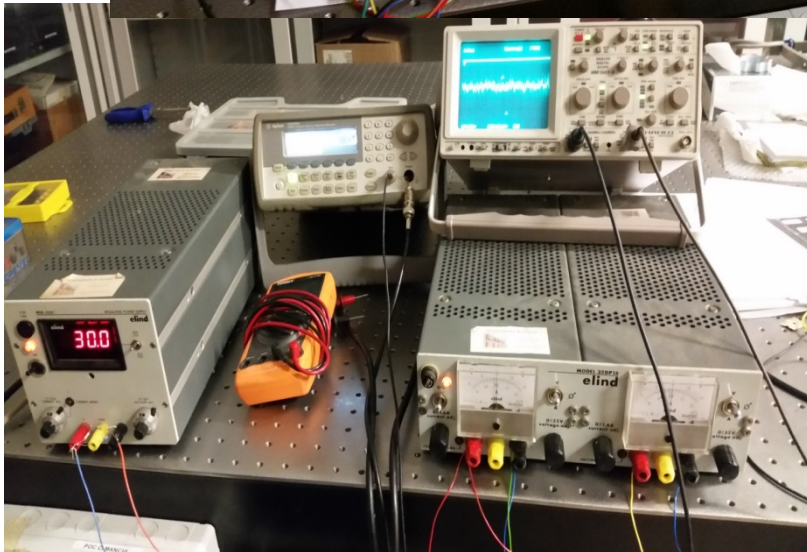
- * *External actuators n.c.*
- * *3,4,5,9,11,13,16,18 connctted*
- * *The others connected to GND*
- * *Measurement on Act. 4 and 5*



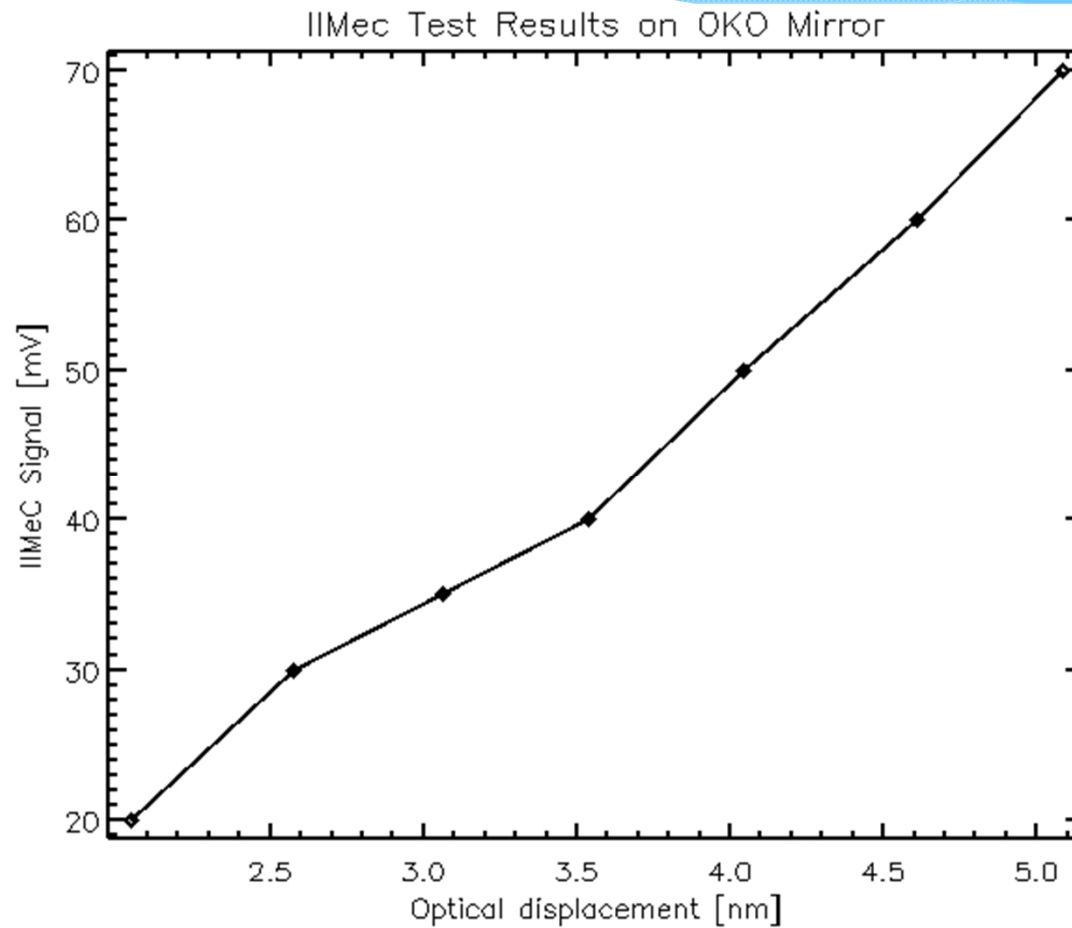
Test setup



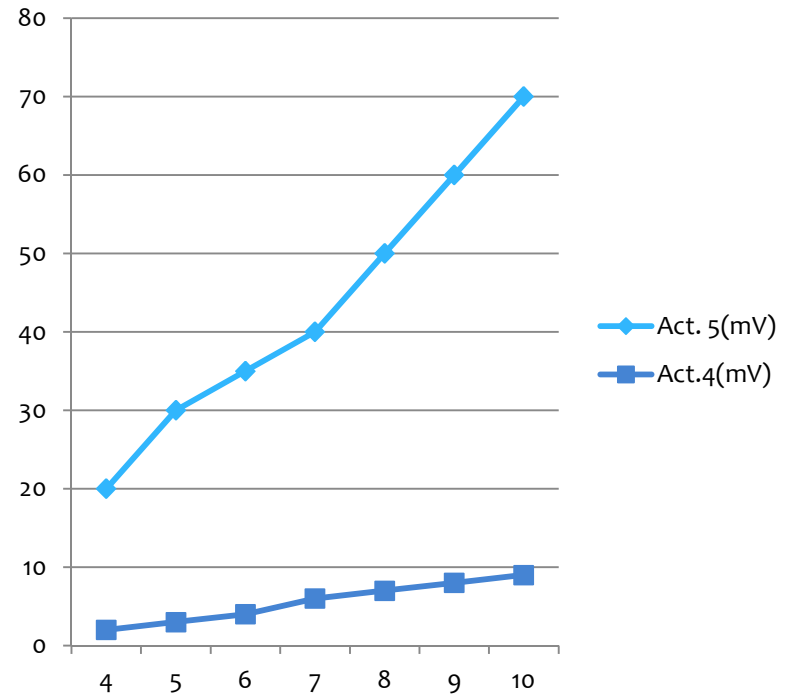
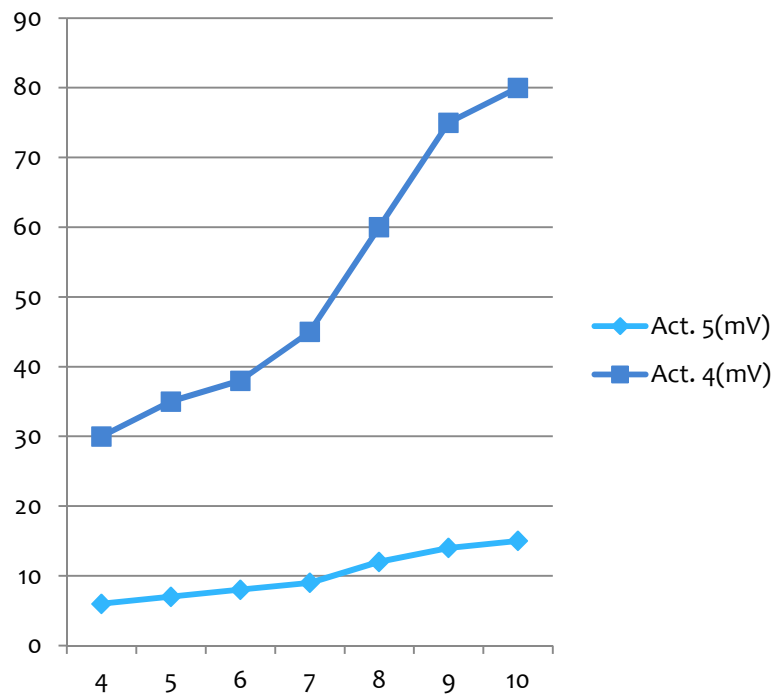
Cost 20 Euro



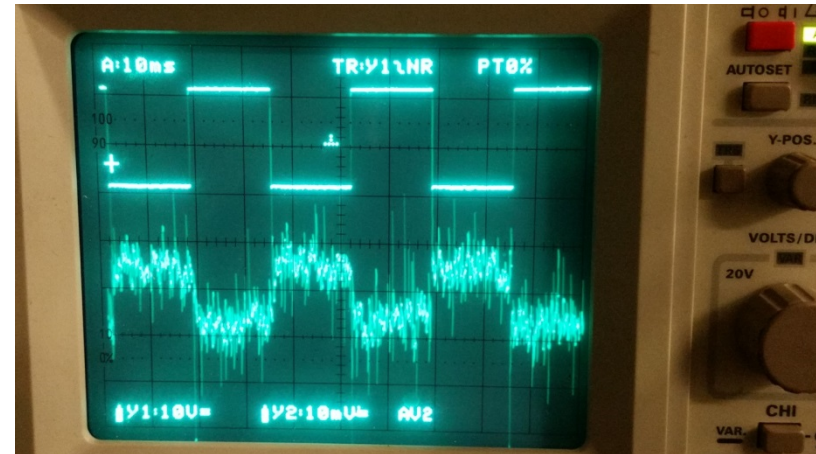
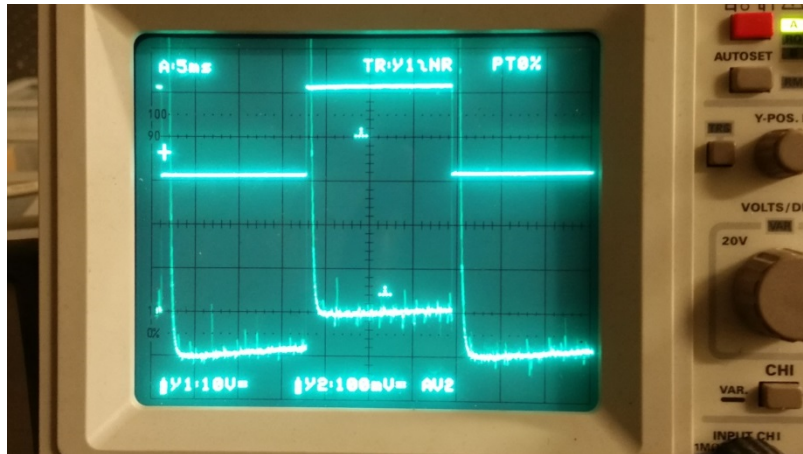
Test results: signal vs displacement



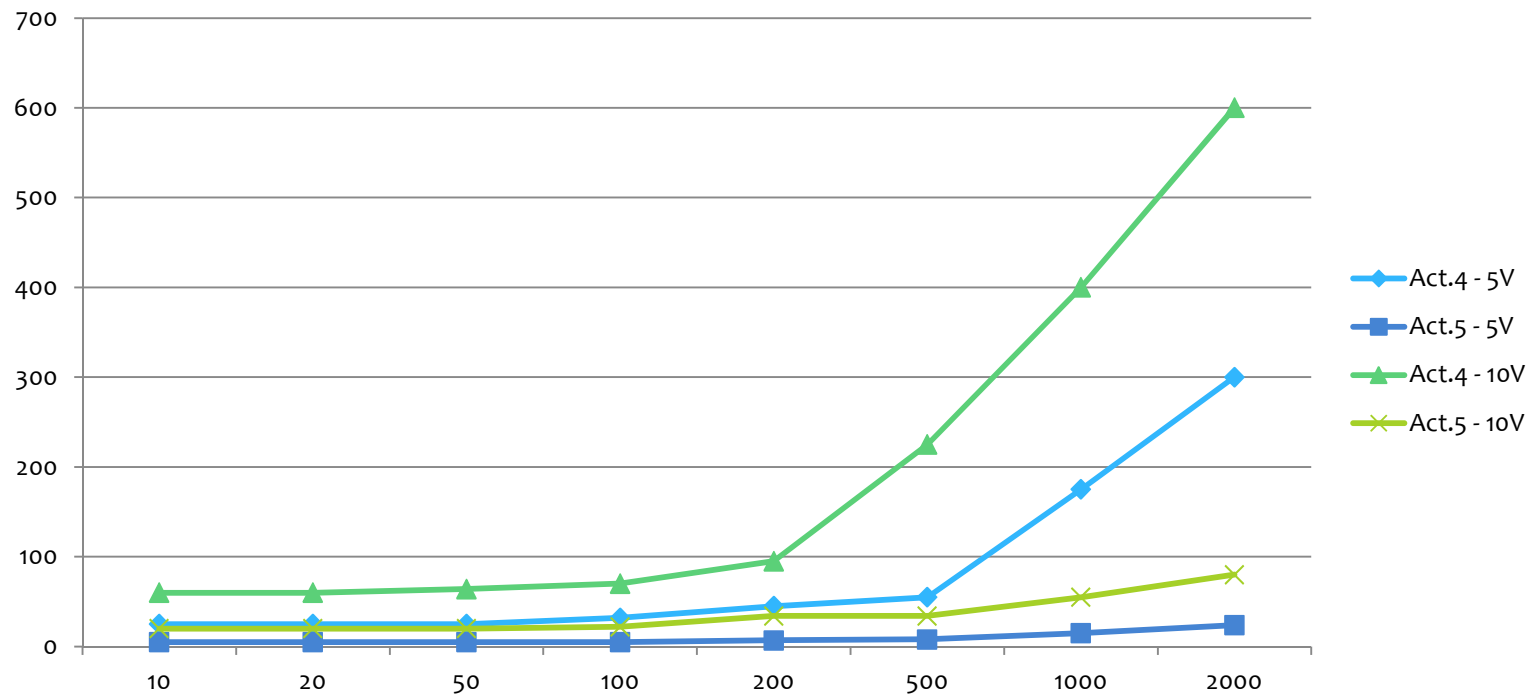
Test results: Act4 vs Act.5



Act.4 vs Act.5



Frequency responses

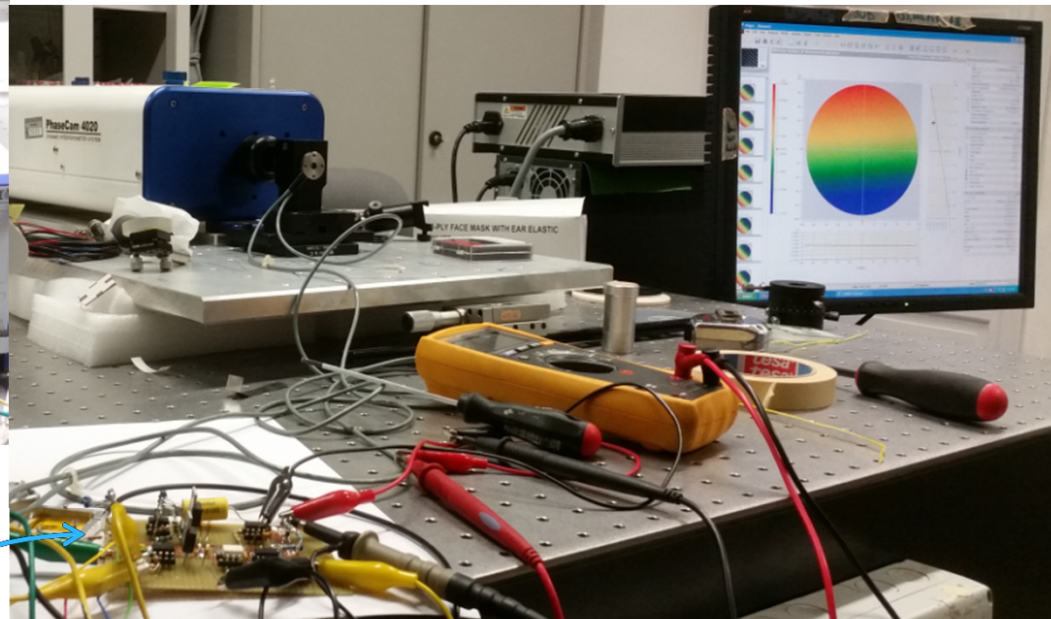
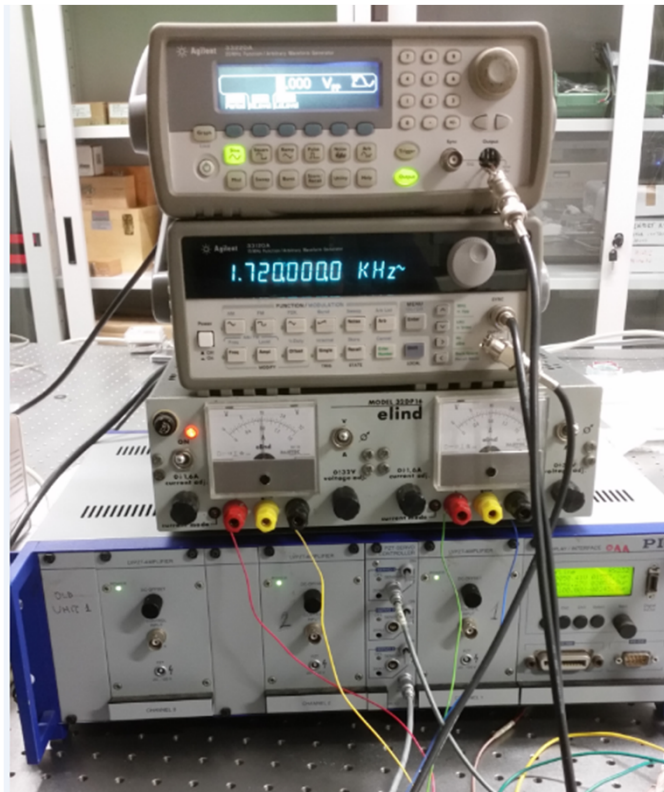


Second demonstration: Tip-Tilt Piezo mirror

- * Precision displacement measurement while driving a Piezo actuator (Physik Instrumente)

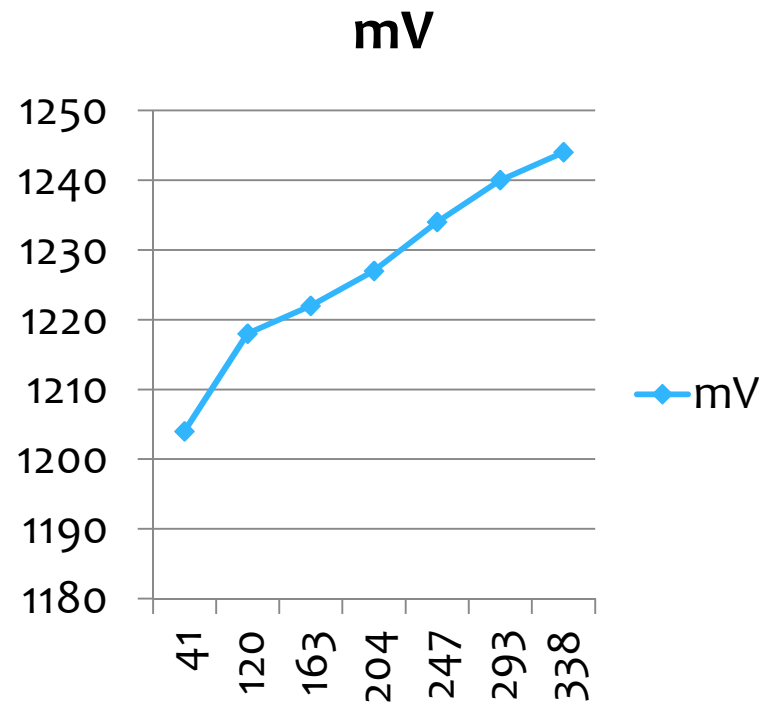
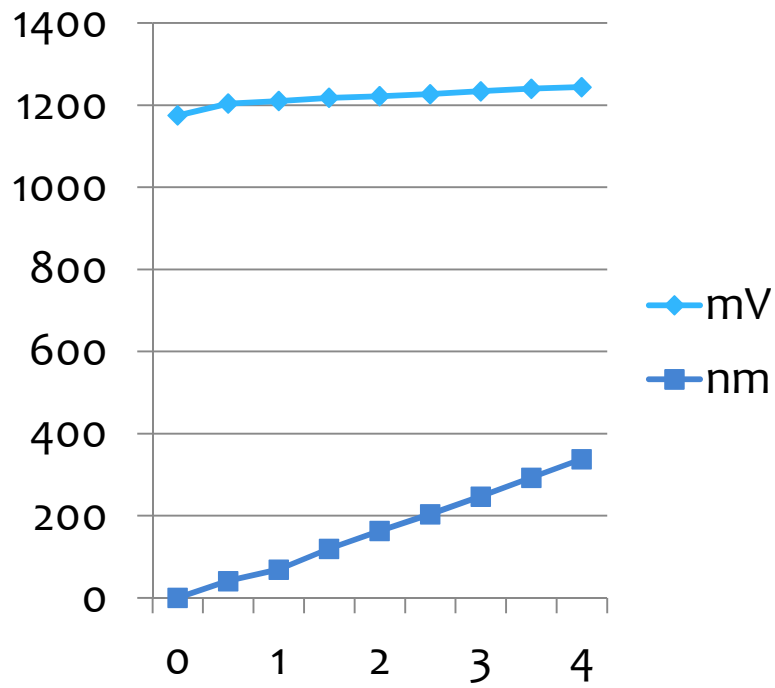


Test setup

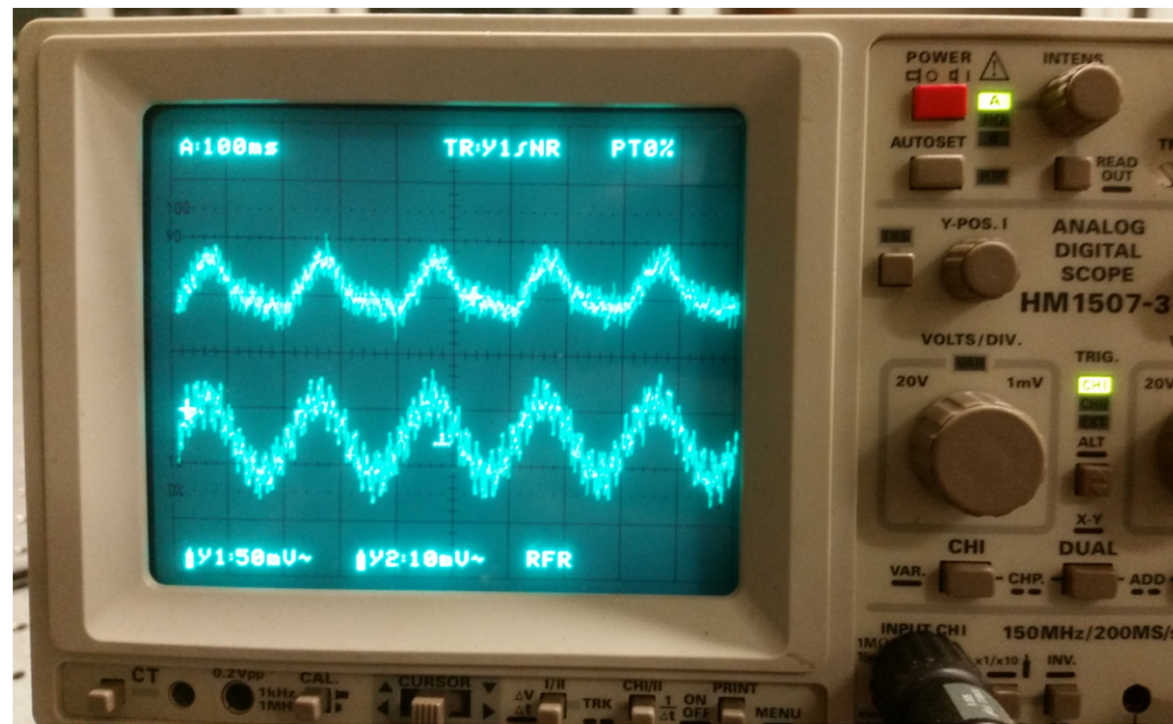


Cost: 30
Euro

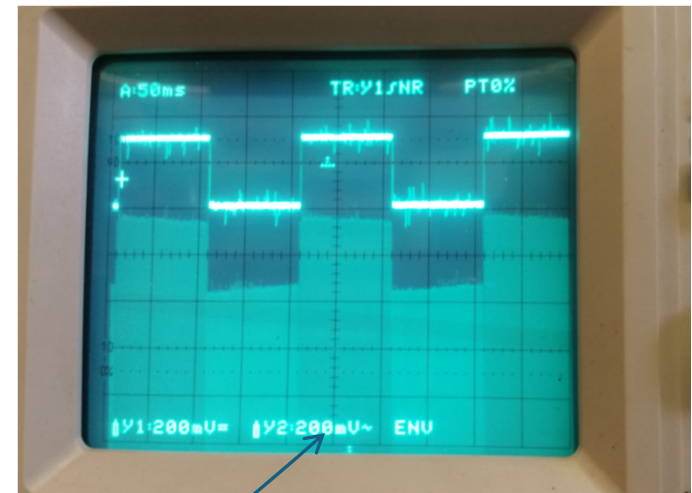
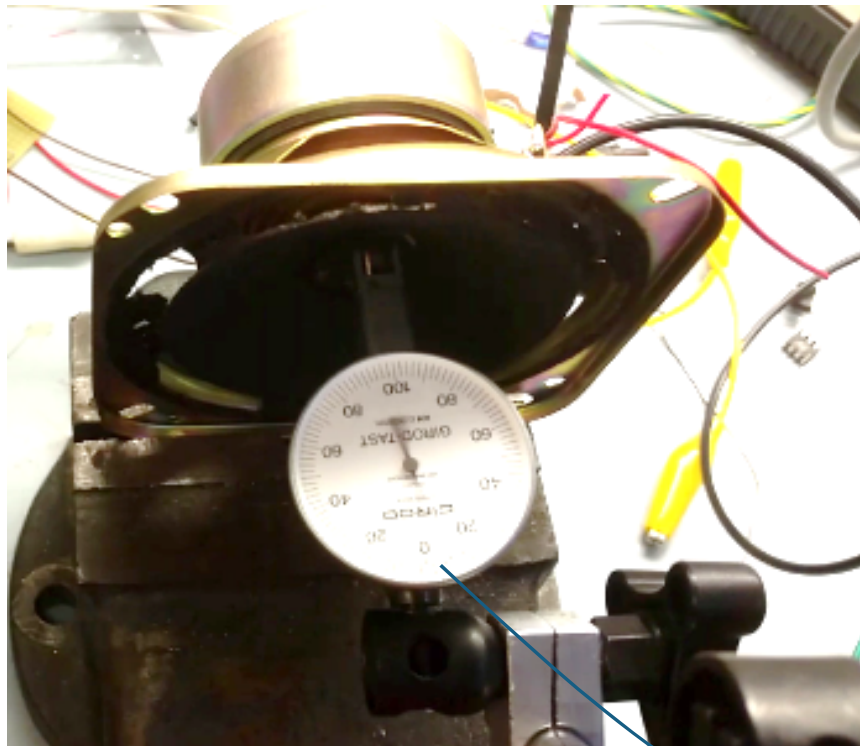
Test results



Test results, at a glance



Third demonstration: voice coil actuator



Thanks to Luca Cresci

Test setup and results



Conclusions

- * *The feature «sensor» does not come from the actuator for free, a certain amount of electronics is necessary.*
- * *The invention is not limited to the position measurement, it can suit to measure also other parameters, depending by the actuator.*
- * *To realize the «sensor» feature, certain conditions should be met. Implementation is not always possible.*
- * *The performances as a «sensor» of an actuator mostly depend on actuator's parameters.*