

# Exotic application of FIB : magneto-resistive sensor modification

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## Abstract

We report here on FIB modification of commercial magneto-resistive sensors. It has been verified that ion beam does not affect physical property sensor which allows magnetic field measurements.

## Purpose of the sensor modification

Among commercial magnetic sensors, Giant Magneto-resistive one seems a good compromise between size and magnetic resolution

| Principle  | Optimal magnetic resolution | Optimal spatial resolution | Drawbacks                                    |
|--|-----------------------------|----------------------------|--|
| High variation in sensor material resistance (20-100%) | 1nT                         | 1 $\mu$ m                  | Low spatial resolution for commercial sensor |

Typical GMR microstructure

Permalloy thickness ~ 1nm



Sensor optical image : active area is 25 $\mu$ m wide and 200  $\mu$ m long



25  $\mu$ m

Detail of active area

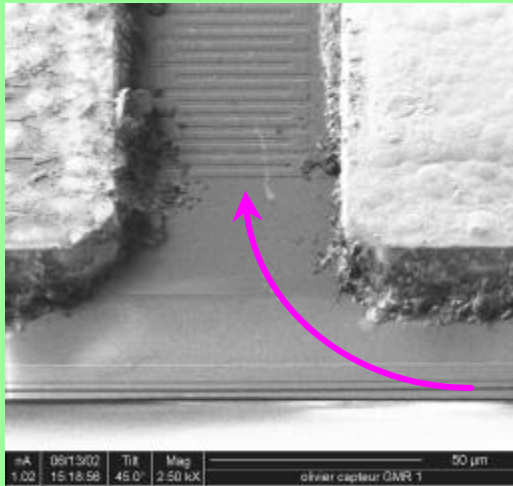


Spatial resolution depends on sensor size



Reduce the sensor size by FIB modification

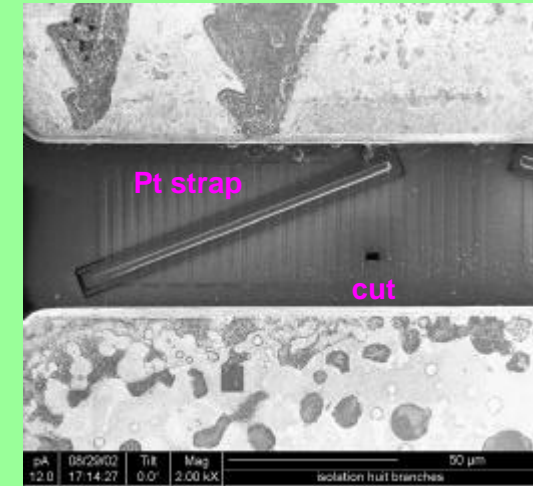
## Sensor FIB modification



FIB image of the GMR coil

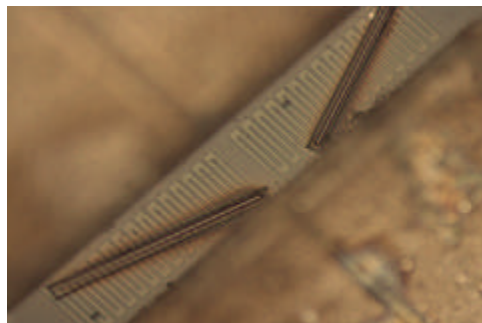
The size of the GMR coil is reduced through :

- cuts
- platinum straps



Both coils have been reduced in size.

Electrical and magnetic measurements have confirmed the preserved GMR property of the sensor



### Conclusion

FIB allows to modify successfully GMR devices. Further experiments are under progress to improve the spatial resolution of GMR magnetic sensors.