Contribution ID: **260** Type: **Poster presentation (105min)**

Low pressure range sensor compatible with the LHC environment

Purpose:
The purpose of this work was to test and to adapt a low pressure (0-60 mbar) inductive sensor (Niche Sensor, Nanterre, France) for application in heavy duty radiation environments like that of the Large Hadron Collider (LHC).

Material and Methods:
The selected pressure sensor is based on a commercial device with remote conditioning electronics. To improve the senor performance: (1) the supplied cables are replaced with double shielded twisted pairs (to avoid cross-talking problem), (2) radiation resistant electronics is employed where necessary and, finally, (3) the adapted sensors were re-calibrated. Tests and calibrations were done for different types of cables (different length and capacitance per meter) and in different temperatures using a climatic chamber with controlled temperature (0-50℃). A dedicated test bench was built to perform these measurements and a LabView based software was developed for automatized control of all instruments.

Results and conclusion:
Tests have shown that calibration depends on cable capacitance, ambient temperature, position of the sensor and it requires selecting proper frequency of the excitation signal. Two methods of calibration were tested: (1) based on full temperature cycle and (2) based on single calibration curve with temperature correction factor. The accuracy of these methods is respectively 0.15mbar and 0.4 mbar. Both methods can be adopted in future usage of the sensors as both of them meet requirements of 0.5mbar of measurement uncertainty. The full integration of the sensors in LHC system is scheduled for 2014.

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Track Classification: C-16: Instrumentation and process control