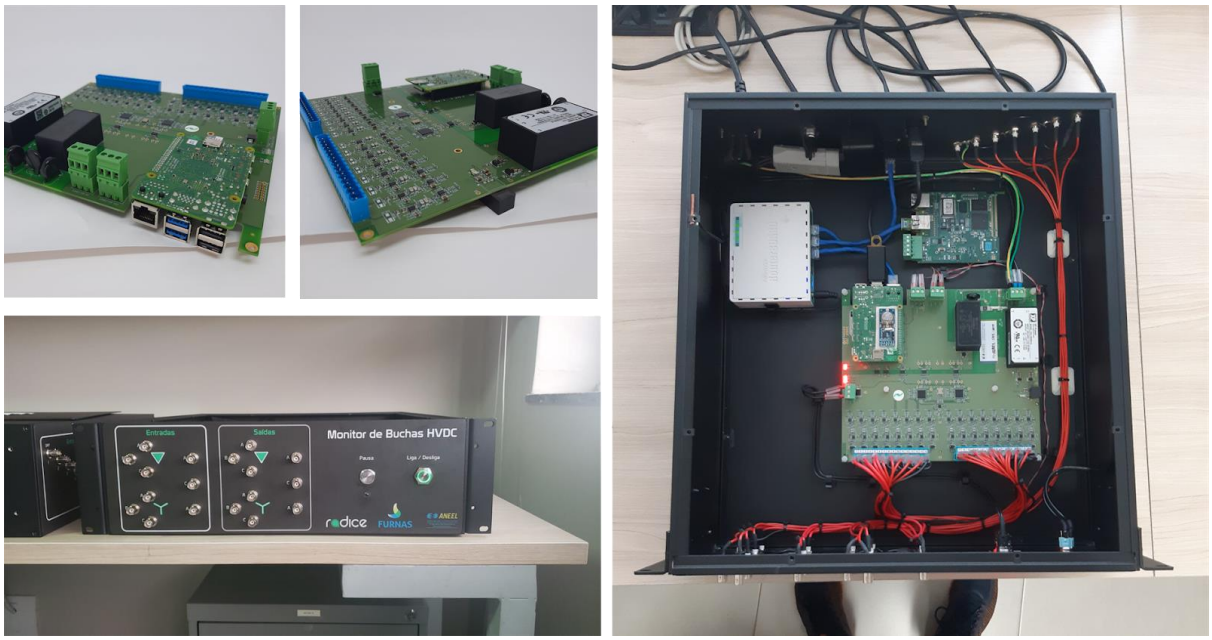
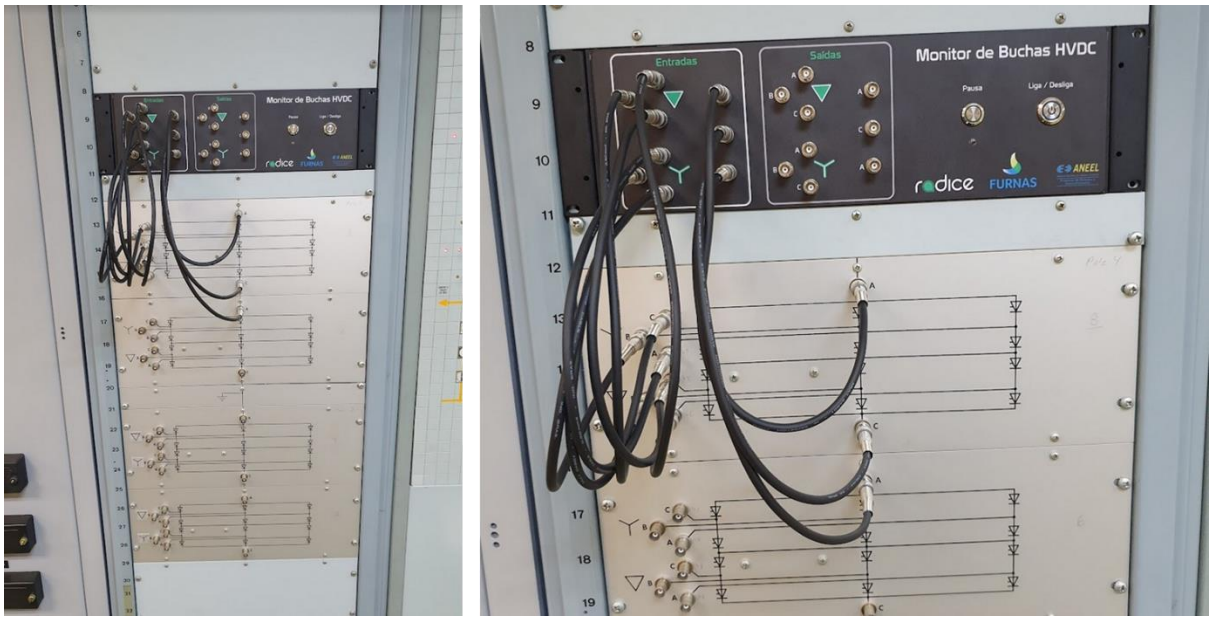
Q19: The base of all the simulations are the measured values provided by different types of instrument transformers or sensors. To prevent misinterpretation or wrong results, data validation on the side close to the sensor is becoming crucial. How to perform such a data validation provided by sensors?

Paper 10133 presents the results of R&D project Aneel PD-00394-1708/2017, "Online Monitoring of High Voltage Wall Bushings in Direct Current (HVDC)", including the development of an On-line Monitor for HVDC Wall Bushings and a diagnostic methodology using two AI techniques.



The prototype was installed at Furnas' Ibiúna Substation, which supports the transmission of energy generated in Itaipu Hydroelectric station. Ibiúna Substation is part of the first HVDC transmission system in Brazil, still one of the largest in the world. This system operates at ± 600 kV and is responsible for matching the nominal frequency of the generating units on the Paraguayan side (50Hz) of Itaipu with the frequency of the Brazilian electrical system (60Hz) as well as the power transmission for 900 km.



In the developed sensor, the issue of data validation was something highly taken into account. Several data validation routines were created along the process, from acquisition to diagnostic generation steps:

- At a first level, the state of the alerts generated by the analog-to-digital converter during data conversion is validated.
- Then, during the acquisition step, some data characteristics are validated, such as the package acquisition time and the number of samples in the package.
- A third validation is performed during the data writing process. It checks whether the sampled data contains values and whether these values are within limits that are consistent with reality.
- A survey of what percentage of the packet contains data with error and if this percentage is greater than a previously stipulated value (1% in this case) the reading process is repeated and the data is discarded.
- Finally, the bushing diagnostic generated is cross validate by two different AI techniques, one supervised and one unsupervised learning.

Additionally, during development stage the data acquisition hardware and firmware and the diagnostic algorithms are being validated by running the prototype in a real operating environment and future comparison of its results against off-line tests to be performed on the wall bushings.