Radivoje Popovic

Category: Lifetime achievement

Sector: **Magnetic Sensors**

Company: Senis AG, Zug, Switzerland, and EPFL, Lausanne, Switzerland

Patent numbers: EP1540748, EP3211381, EP2153241, EP1668378, EP1395844, EP1182461

Invention: Integrated multi-axis magnetic sensors

Swiss - Serbian scientist Radivoje Popovic has dedicated his career to the development of novel magnetic, current, and optical sensors. He is named as inventor in 41 granted European patents. His inventions enabled the realization of integrated multi-axis magnetic sensors that are widely used in automotive industry, in mobile phones and in scientific research. Furthermore, he founded five start-up

companies and lead therein the early development and commercialization of innovative products based on these inventions.

Magnetic sensors are widely used in scientific research, in quality control in industry, in navigation, and as key components of position sensors. Most of the modern magnetic field sensors are based on the Hall effect. Until 1980s, the only known form of the Hall sensor was a Hall plate, similar to that invented 100 years before. A Hall plate is a single-axis magnetic sensor: it responds to a magnetic field perpendicular to the surface of the chip. To measure all three components of magnetic field, one had to use three orthogonally-placed Hall plates. Such three-axis magnetic sensors cannot be fabricated by IC technology, and were too expensive for many applications.

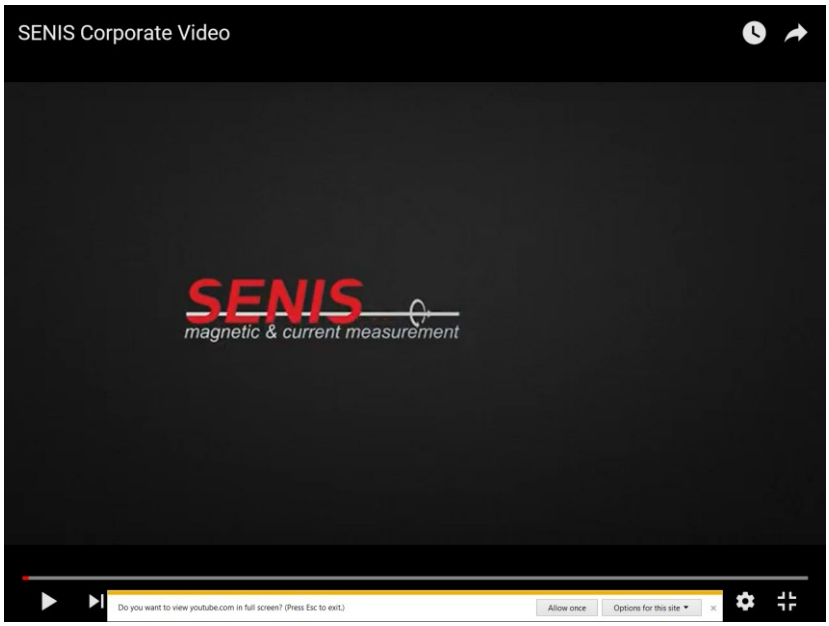
By his inventions, Radivoje Popovic provoked a major paradigm shift in the technology and applications of magnetic sensors.

In 1983, Popovic invented the first integrable vertical Hall device, which is sensitive to magnetic field parallel with the chip surface. Later, a combination of two vertical Hall devices allowed for the development of integrated two-axis magnetic sensors used as rotation position sensors. The integration of a conventional Hall plate and two vertical Hall devices enabled for the first time the realization of a three-axis magnetic sensor in form of an integrated circuit. Integrated three-axis Hall magnetic sensors are mostly applied as position sensors and as probes of high accuracy teslameters.

In 2000, Popovic invented still another concept that enabled the realization of integrated multi-axis magnetic sensors. This concept is known as IMC-Hall or Triaxis technology. The term IMC-Hall denotes a combination of Integrated Magneto-Concentrators and Hall plates. An IMC is a ferromagnetic structure at the surface of an IC incorporating Hall plates. The IMC renders the Hall plates sensitive to magnetic field parallel with the chip surface and increases their sensitivity. The first IMC-Hall magnetic sensors were developed and commercialized by Sentron AG, a start-ups founded by Popovic. The IMC-Hall magnetic sensors are now used in numerous products to improve their usefulness, energy efficiency, and safety. In 2010, 95% of electronic compasses, built in mobile telephones, were based on the IMC-Hall technology. Belgian company Melexis NV, which acquired Sentron AG in 2004 and so adopted the IMC-Hall technology, announced in 2019 that they had shipped, mostly to automotive industry, their 1 billionth position sensor based on this technology.

Dr. Radivoje Popovic was born and educated in Serbia. He worked first in industry in Serbia, and later in industry and academia in Switzerland. He is professor emeritus of EPFL and CTO of SENIS AG.

SENIS products - an overview: https://www.youtube.com/watch?v=Uegc84S1HEk



SENIS Corporate Video: https://www.youtube.com/watch?v=s1N6tzY8sDM

Radivoje Popovic, Prof. Emeritus EPFL
Adress: Hertizentrum 11, 6300 Zug, Switzerland
Tel: +41 79 306 50 47
e-mail: radivoje.popovic@epfl.ch