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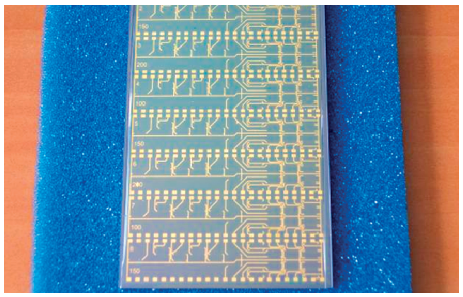
Applications in Space

R&D Strategy and Space

LioniX invests in a number of strategic areas, both in technology and in applications/markets. Space is being considered as a technology and application driver which perfectly fits LioniX' core competences Integrated Optics for Telecom and Microfluidics / Lab-on-a-Chip, which enable extreme miniaturization and replacement of existing space technologies. LioniX role in the (inter)national space society is growing rapidly. Moreover, LioniX is actively building consortia with complementary organizations in order to strengthen its role and to facilitate spin-off to commercial products.

Integrated Optics for Telecom Satellites

Planar light waveguides (on 'photonic chips') have the same functionality as classical optical fibers. Based on a standard microelectronics (CMOS) process, LioniX' technology enables large-scale integration (LSI) of functions in the optical domain, analogous to electronic chips. LioniX technology is exploited in Optical Switching and Beam Forming Networks. Prototypes of True-Time-Delay (TTD) for



Photonic LSI chip module with eight 1x8 TTDs

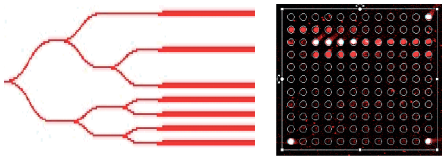
Phased Array Antennas, as well as optical filters, phase shifters and combiners are being developed. The applications are ranging from low volume, high-end applications in satellites up to mass volume applications in fiber-to-the-home as spin-off.

ExoMars rover (artist concept courtesy of ESA)

Lab-on-a-Chip for Space Research

A key factor for the successful breakthrough of Lab-on-a-Chip technology in products such as medical and food diagnostics will be the ability to combine all the required functions in a miniaturized, automated system. This is being exploited in the Life Marker Chip instrument (LMC), being one of the key instruments to detect signs of past and/or present life, i.e.'biosignature' molecules on Mars. It is, however, a Lab-on-a-Chip based platform for many other applications as well.
The ExoMars mission is currently planned for launch in 2013 and to land its rover in 2015. Its Pasteur payload will be capable to acquire samples of Martian subsurface soil at a depth of 2 meter, as biomolecules do not survive the harsh environment on Mars. The development of the instrument is ongoing with English, German, US and Dutch partners. The LMC instrument consists of two parts which are the fluorescence based micro array for the biomolecule detection and the sample processing unit which should convert 'macrovolume' soil samples into micro samples for the detection system.

LioniX is responsible for both the microfluidics based system (including EC, pH and flow sensors) and the miniaturized array reaction chamber with planar waveguides for evanescent field excitation of the fluorescent dyes in the antibody spots.



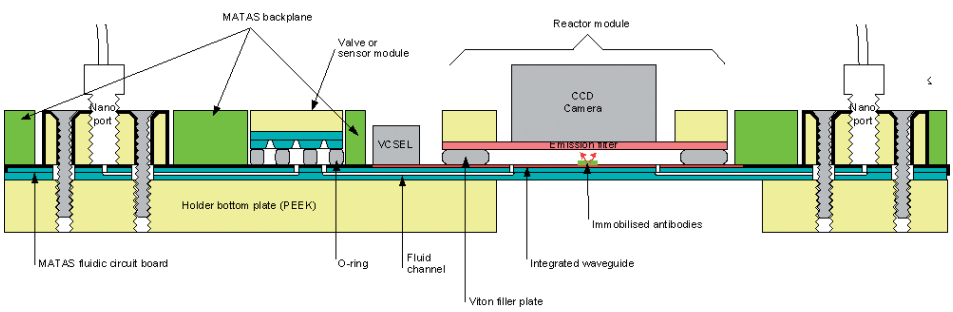
Waveguide design (left) in substrate for micro array (right)

Our expertise

- integrated optics based switching and beam forming for telecommunication satellites
- miniaturized (bio) analysis and sensor systems for space research

References

Projects in this area are being executed for space organizations such as ESA and the Netherlands Aerospace Agency (NIVR) in co-operation with Dutch space organizations Dutch Space, NLR, ASTRON and TNO Space. Moreover, LioniX works with innovative SME companies such as Satellite Services, Culgi and Bioclear, and research groups (a.o. Leiden University) with complementary competences.



Microfluidcs based system (artist concept)