**Concrete structures vulnerability study test bench**

There is plenty of critical infrastructure worldwide, like power plants, hydroelectric dams, bridges, ect.

During their construction years ago and now concrete and reinforced concrete structures are used.

Year after year these structures are affected by various factors like earthquakes, floods, precipitations, solar activity, change of temperatures of environment, load of transport vehicles, etc.

Besides, there is inevitable process of change of physical properties of various brands of cement, steel and other materials with time.

It is almost impossible to evaluate by just visual inspection by engineers how reliable the concrete structure is and where inside this structure weak point emerged.

Timely diagnostics of such weak points become one of the critical tasks with global construction companies.

To help in resolving this problem special laboratory equipment was designed, that allows distant scanning of construction objects with microwaves and evaluation of reflected signals.

The idea is simple at first glance – each material has it’s own specific and unique electromagnetic properties and signatures. Correct diagnostics of shifts in these parameters allows to evaluate their strength conditions and predict possible degradations.

At the same time, correct analysis of the received data, selection of microwave flow modes and development of mathematical algorithms require serious studies and competence from designers and manufacturers of test benches like ARRH111-01M-01.

Application of such test benches in construction industries allows:

- to avoid mistakes during erection of concrete structures of critical infrastructure;

- to estimate their assigned technical life based not only on calculations, but also on physical experiments,

- to save manpower and cost of routine inspection of concrete structures within their service life.

Concrete structures vulnerability study test bench ARRH111-01M-01 has been tested and has proven the following basic operation parameters:

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| **Sl.****No.** | **Parameters** | **Specifications** |
| 1 | Frequency | 1 to 2.8 GHz |
| 2 | RF Output power(min) | 500MWatt at TE11 mode |
| 3 | RF Pulse width | 80-90 ns |
| 4 | Pulse Repetition Frequency(PRF) | 1 to 15Hz |
| 5 | Operating voltage | Up to 500 kV |
| 6 | Operating current | Minimum 60 kA |
| 7 | Coupling to power supply system | Coaxial arrangement |
| 8 | Operating vacuum | 10-5 to 10-6 Torr |

It has been proven that concrete structures vulnerability study test bench ARRH111-01M-01 could be effectively used for distant non-destructive monitoring / study of complex structures like hydro power plants with the view to:

* find hidden defects and create RF image of defective zone;
* find inside cracks and destruction of metal armature after natural calamities like earthquakes and floods;
* develop simulation model of future degradation of concrete structures after finding hidden defects and damages.

Equipment satisfies to relevant EU / USA standards and requirements for construction equipment and does not require any specific treatment during operation.