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Custom designed Dummy Loads for HV Pulsed Power Modulator Testing

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As a manufacturer for industrial, medical and scientific pulsed power applications we are frequently confronted with testing new, custom designed power modulators, i.e. pulse generators. In their purposed applications these modulators are often intended to be used on extremely expensive RF tubes like Klystrons. Therefore, it became necessary for us as well as for our customers to develop corresponding dummy loads to avoid testing modulators on these expensive devices directly.

In order to test the modulators in accordance with the actual operating parameters ($U_{\text{peak}} < 150\text{kV}$; $I_{\text{peak}} < 150\text{A}$; $\text{PAV} < 160\text{kW}$), the dummy loads need to fulfill the same requirements as the intended Klystrons. Although the Klystron's perveance is not linear and furthermore depends on the applied voltage, it is sufficient to use resistive loads as a dummy. However, such a replacement load requires an appropriate high voltage, cooling and safety design. Our basic idea was to create a modular dummy solution which can be matched easily to certain load specifications. Each module was designed as a 40kW average power, water cooled high voltage resistive load, based on commonly used standard power resistors. Depending on the specific application up to four modules can be connected in parallel or series. For protection against high voltage the full dummy was put into a surrounding grounded cage which also contains a manifold for deionized water distribution.

At first those kind of high power dummy loads were used for factory and site acceptance tests. By time those dummies also became attractive for our customers to drive long term tests on new modulator principles or to test new purchased modulators on site.

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