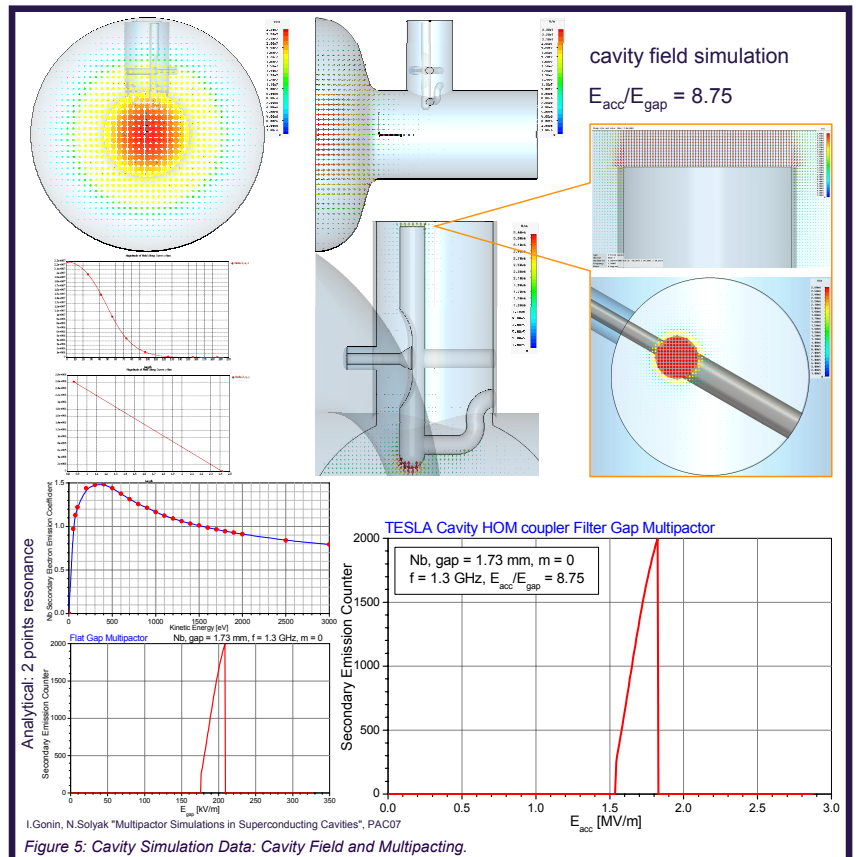
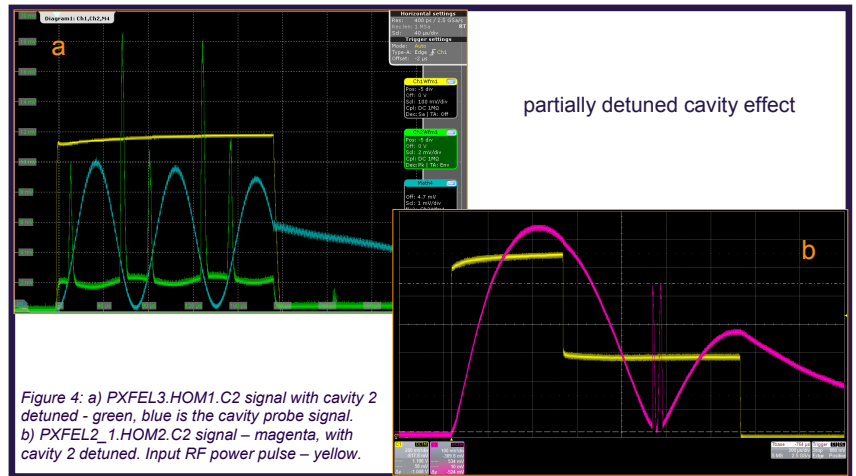
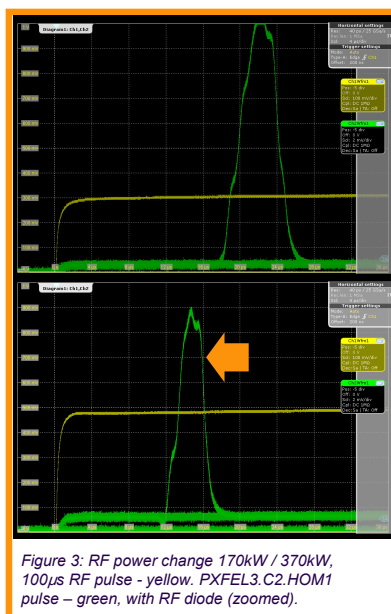
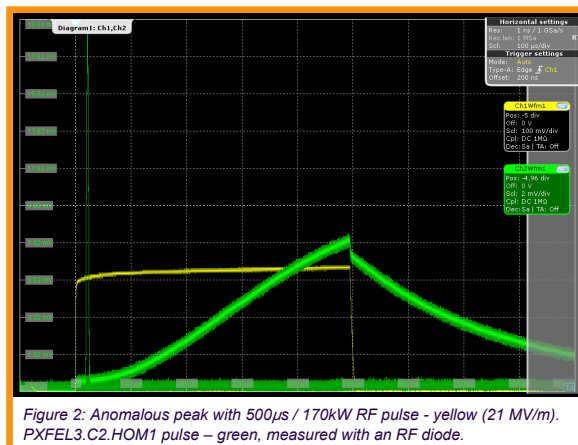
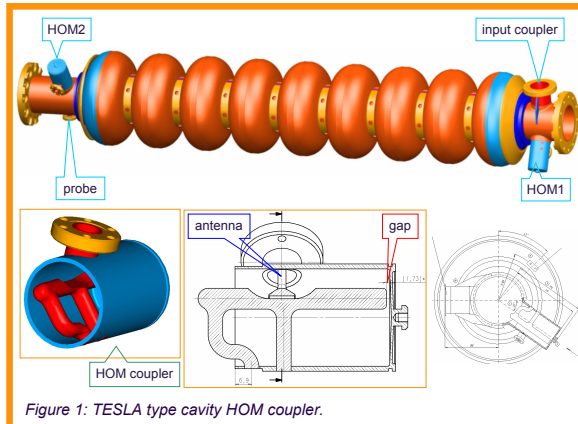


Abstract

During the XFEL prototype module tests on the module test stand at DESY RF power measurement anomaly on the high order mode (HOM) couplers on the cavity operating frequency was detected and investigated. HOM coupler multipacting, predicted by the analytical simulations, was found to be the source of the anomalous signal peak. TESLA type SRF cavity HOM coupler multipacting simulations and observations are presented, compared and discussed.



Summary

- Probable source of an anomalous signal in HOM couplers is the multipacting in the HOM coupler. After 18 μ s at 170 kW cavity reaches 1.1 MV/m (same for 12 μ s and 370 kW). The multipactor discharge detunes the notch filter. Effect was found in several cavities in PXFEL1,2,3 modules.
- This effect depends both on the RF input power amplitude and field in the cavity. There is no effect with long pulses but lower RF power, with a short pulse (as short as 50 μ s) effect can be seen with higher RF power – even with much lower cavity field. But if the signal is observed during the cavity detuning field dependence can be also seen. Partially detuned cavity with time oscillating field has multiple peaks, corresponding to the field periods.
- The anomalous peak amplitude is rather small compared to the cavity probe signal, its amplitude exceeds the one of the normal HOM coupler signal (the notch filters are very good tuned). From the other side this anomalous peak effect is amplified and multiplied in peaks number during the cavity detuning.
- The multipacting discharge is not affecting the feedthrough / HOM coupler antenna area – DC measurement with 10 V bias (and without it) with RF low pass filter shows no signal. If the multipacting is the source of the effect under investigation, it must be present at the HOM coupler rejection filter gap and be localized there, as simulation predicts