

Development of DC/DC converter in VHF band

Thursday, 29 September 2011 16:00 (2h 30m)

We will present some new ideas on the design of different parts of DC/DC converter which operates on Very High Frequency. I show different topologies, and its power efficiency influence, which is being achieved during design stage of 2 years project called Brahms. There are recent interesting results, but not final solution yet. The presentation is focused to the perspective of power conversion in hundred Megahertz operational range. The reason to move up operating frequency of DC/DC converter over the bandwidth of detector front-end is to reduce interference.

Summary 500 words

The DC/DC converter operated on high frequency is not a new idea for decades. The term of High Frequency means different at passing decades. VHF range is real goal in present technology. Real advantage of the design which push-up the operational frequency, is miniaturization of transformers, capacitors and other passive components in power train. Especially EMC / EMI filters are significantly smaller for VHF range than at common sub-MHz converters. We can reduce large sized bulk aluminium capacitors to multi ceramic capacitors. Design is reflecting the needs of recent radiation tolerance. All the benefits are not for free as we know. It namely pays off by losing efficiency and generally moving to VHF transmitter techniques.

There are two principal topologies of the convertor being tested in our laboratory. One is push-pull based converter and the other is based on single ended class E system with resonant tank. All topologies have a bottle-neck on the rectification with competent efficiency. We are testing an active synchro-rectifier.

We use transformers with toroidal shape. At present with low mu powder core and non-magnetic ("air") core wound inductors and transformers. There is also developed and tested toroidal inductors on PCB.

We have performed several irradiation tests on set of classic and modern components. The results significantly get a narrow choice of the components.

Running radiation tolerant VHF DC/DC converter is the target of this design, but it seems long way to go and it is real challenge. I hope to may share some ideas gotten on this way of thrilling design work.

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