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Design of a local oscillator for the 2.45GHz/4MW LHCD system on EAST

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The paper describes the design process and experimental validation of a local oscillator for the lower hybrid current system(LHCD) on EAST. The local oscillator is designed to provide original RF energy for the whole LHCD system, which plays an important role. The local oscillator must be of high spectral purity and stability. Only phase noise is better than -90dBc/10KHz can satisfy the requirements of the LHCD system. The local oscillator consists of the phase locking loop(PLL), the PIN switch, the regulable attenuation, the amplifier, the coupler and the power divider. Among these components, PLL determines the phase noise to a large extent. Usually the design of PLL is used with PLL chips integrated VCO. That makes the design simpler, but the phase noise is not better than that with PLL chips disintegrated VCO. Measures such as using fourth-order passive filter circuit and reducing the power supply ripple are adopted to optimize phase noise in addition. The test shows that the phase noise of the local oscillator is -94dBc/10KHz. The local oscillator must have the function that rapidly shut off in case an accident. The PIN switch plays the rule and it can shut off the oscillator in 1us. Due to requirements of the LHCD system, the local oscillator has three output ports, two ports must more than 30dBm, and another one must more than 20dBm. Before the production of the amplifier, coupler and the power divider circuit, the design must begin with theoretical calculation and regulated models built in the software ADS. In order to improve the stimulation accuracy, joint stimulation combined with the actual circuit is adopted in ADS. Test shows that the output power meet the requirements. Stimulations and experimental results fit well and the local oscillator has worked in LHCD system for months. That successfully indicate the reliability of the local oscillator.

Eligible for student paper award?

No

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