Automatic Tuning of SMART, KOSMA's 490/810 GHz Array Receiver

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We describe the control system of SMART, KOSMA's 490/810 GHz array receiver. All major electronic functions of the instrument such as mixer bias, magnetic field, PLL, and IF processing can be controlled either by computer or manually. The computer also monitors important status information.

Based on the hardware control system a procedure to automatically tune the array receiver has been developed. The automatic tuning is necessary to increase the duty cycle of the receiver and to avoid mistakes from manual operation of the complex tuning procedure.

To tune the 16 SIS receiver channels, many parameters have to be optimized. Especially the magnetic field, which is applied to the junctions to suppress excess mixer noise caused by the Josephson effect, is very important and can not be set from look-up tables. An algorithm was developed to measure the relation between the strength of the Josephson effect and the applied magnetic field for each junction. Based on these data, the algorithm automatically finds and sets the optimum field strength and mixer bias.

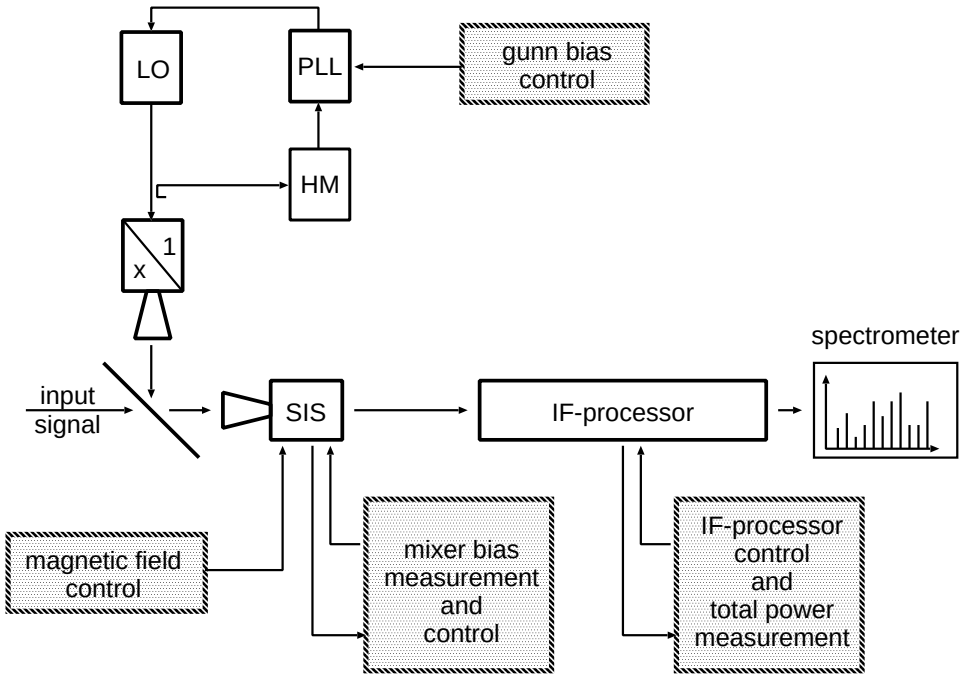

Figure 1: Schematic drawing of the receiver electronics. Dashed outlined boxes are computer controlled.

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