

## **The spur in HIFI band 1a and impact on observations of H<sub>2</sub>O**

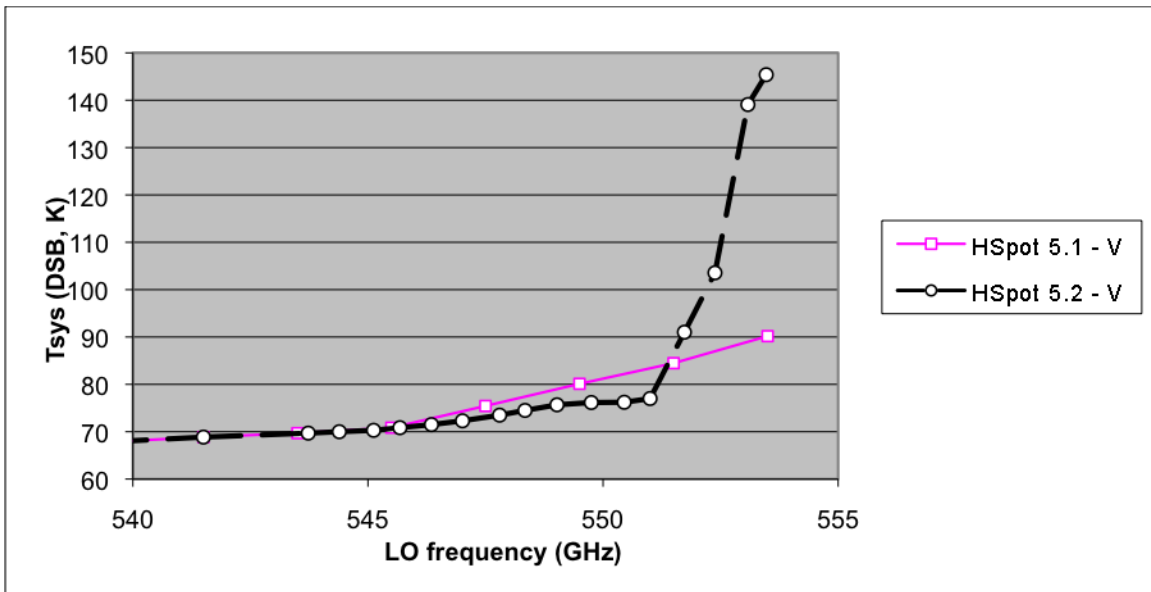
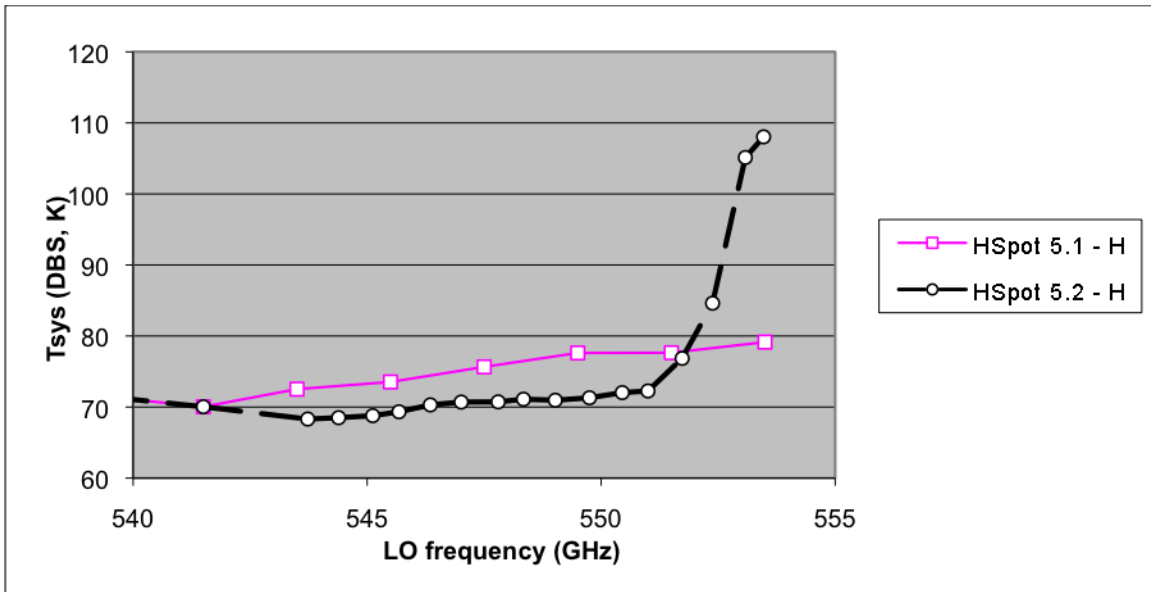
Science data obtained in band 1a up to OD 474 had to avoid LO tunings above 548 GHz except for in two very narrow windows. The proximity of this spur to the 557 GHz water line made such observations difficult and in some cases impossible. Hence users were encouraged to use the lower sideband of band 1b.

After an extensive engineering effort, hardware settings for 1a were adjusted to suppress this spur without causing an appreciable degradation of the system temperature, with the exception of the last ~2 GHz at the upper end of the band.

It should be noted that there is a mild artifact that remains at 542.378 GHz that occasionally impacts data in the first subband. It is very important to note that the new settings have not been tested extensively on AOTs. ***It is imperative that anyone wanting to use band 1a at any LO setting higher than 540 GHz contact the helpdesk to confirm that spurs will not be a problem.***

We also invite users who moved to band 1b in order to observe this line to reconsider using band 1a if it makes sense for their program. When doing this, users should be aware that the noise temperature in band 1a has slightly changed in the upper frequency range, as a consequence of the spur removal (this is illustrated in Fig. 1 below). The sensitivity is better or similar than that in band 1b for LO frequencies up to 551.9 GHz. Above this frequency, the time penalty in using band 1a rather than band 1b will depend on the requested noise level (typically, there is no significant difference down to noise rms of some tens of mK).

It should also be noted that in several OT proposals, the water line was placed at one extreme end of the WBS lower sideband in order to squeeze in another line at the other extreme end of the WBS upper sideband. Due to the double sideband nature of HIFI, the two lines will end up falling on top of each other in the observation. Such a configuration should only be attempted if the user is ***extremely*** confident in the velocity structure of the two lines, and that they can deconvolve them in post-processing. The HIFI ICC very strongly discourages such a practice however.



**Fig 1:** Receiver noise temperatures in band 1a for the H and V polarisations, in HSpot 5.1 (old value) and HSpot 5.2 (new values)