To: SRT Group
From: A.E.E. Rogers
Subject: Reducing emissions from the SRT

The SRT, with the digital receiver, which was introduced in 2000, uses a high side local oscillator with an I.F. frequency of 800 kHz. While the local oscillator leakage is relatively weak compared with unwanted emissions from many other electronic devices like PCs. However, the L.O. leakage can result in Radio Interference (RFI) with other sensitive systems operating in close proximity to the SRT. The current level of emission can be as high as -70 dBi. This level can be reduced by more than 30 dB by ensuring a better electrical seal of the receiver box cover. In addition the radiated power can be reduced to below -120 dBi by adding copper tape to further improve the leakage from the box and replacing the preamp with a new preamp with greater reverse isolation whose circuit is shown in Figure 1.

The new preamp has the following characteristics:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>30 dB</td>
</tr>
<tr>
<td>Reverse isolation</td>
<td>65 dB</td>
</tr>
<tr>
<td>Noise temperature</td>
<td>70 K</td>
</tr>
<tr>
<td>3 dB bandpass</td>
<td>1385-1440 MHz</td>
</tr>
<tr>
<td>L.O. leakage measured on input port while connected to SRT digital receiver</td>
<td>-120 dBm</td>
</tr>
</tbody>
</table>

If the VSRT control computer is not in a shielded room some shielding of the PC may be required. Any L.O. leakage which travels down the coax cable and get emitted out of the ground controller can be eliminated by adding a low pass filter (mini circuits BLP-600+ is a good choice) to the coax output of the ground controller. If the coax is a single shield RG-6 put the filter on the output of the receiver, otherwise use double shielded coax to reduce the leakage out of the cable.

To summarize:
To reduce L.O. emissions to a very low level
1] Seal the receiver box with copper tape
2] Use a high reverse isolation preamp
3] Shield the control PC and add low pass filter to coax if needed.
4] Use double or quad shielded RG-6

For assistance in reducing the RFI from the SRT at radio astronomy facilities please contact arogers@haystack.mit.edu.
<table>
<thead>
<tr>
<th>value</th>
<th>qty.</th>
<th>ref.des.</th>
<th>manufacturer</th>
<th>part</th>
<th>vendor</th>
<th>vendor part</th>
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<td>10 pf</td>
<td>1</td>
<td>c1</td>
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<td>ECJ-1V1H100D</td>
<td>Digikey</td>
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<td>0.01 uf</td>
<td>9</td>
<td>c2 c3 c4 c5</td>
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Parts for high isolation preamp  

aer 11 June 09