What is this poster about?
- Careful analyses of the Far-IR continuum emission from dust, and of the Gamma-Ray emission from cosmic ray interactions with gas over the past several years, have revealed extensive clouds of "dark gas" in the Galaxy near the sun. This dark gas is essentially invisible in 21-cm HI and 3-mm CO emission. Although its composition and mass are uncertain, it is likely to be mostly H$_2$, and there may be quite a lot of it.
- The spatial distribution of this dark gas has much in common with the ubiquitous faint OH emission found recently in a "blind" mini-survey of a small 4.5° X 4.5° region in the direction of the Outer Galaxy with the 25m Onsala radio telescope (Allen et al. 2012, 2013) at 0.5° FWHM.
- Here we report on a first pilot survey using the GBT to study the spatial structure of this new and important component of the ISM in a small region of the Galaxy at OH with a vastly improved spatial resolution, comparable to that of the best available CO survey of molecular gas.

Masers at 105.0, +2.5?
- Some unusual OH features appear at this survey position which do not correspond with HI peaks and are not seen in neighboring survey positions. This is a very unusual behavior for survey profiles. The figure shows all 3 OH lines recorded in our survey. The profile features may identify an OH/IR star.

What have we found so far?
- We find OH emission at nearly every pointing. Several OH features appear in any given velocity profile and are almost always accompanied by peaks in the HI. CO emission may be present corresponding with specific isolated OH velocity features in a profile, but often there is no CO detected in the CfA Survey at the position.
- Features tracing Galactic Structure in OH are easily identified in the velocity profiles including Gould's Belt, the Local Arm, and the Perseus Arm.
- These OH studies reveal a component of molecular gas in the Galaxy that is significantly more widespread than that seen in CO, and is not so confined to the canonical "star-forming regions".
- Calculating N(OH) from the profile integrals requires knowledge of the OH excitation temperature, which is about 7 – 10K but is not well known. The column densities of H$_2$ which are expected to accompany the OH can then be directly computed using the ratio of observed UV absorption lines. A substantial increase (by a factor > 2) in the total molecular gas content of the Galaxy is indicated.

A few outstanding questions:
- The present survey is on an 0.5° grid, but we do not yet see to have resolved the spatial structure of the profiles.
- How far in the Outer Galaxy does the OH extend?
- Do star-forming regions look very different in OH compared to quiescent regions?
- What is the best value for excitation temperature to use when calculating column densities?