RF Crosstalk

Commissioning workshop, October 28, 2014
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RF Sources

- □ All Oscillators are locked to GPS
 - Probably some rogues ones around...
 - Interface to timing distribution system
 - Diagnostics available through epics (locked, frequency readback, control voltage, etc)
 - ➤ Phase can still drift a little since we lock at 1 pps (BW < 0.1 Hz)</p>
 - > RF distribution at similar levels (10 dBm to 13 dBm)
 - Baluns are used for DC decoupling
- □ Fixed frequency fiber AOM at 79.2 MHz
 - Compensate for IMC VCO frequency shift

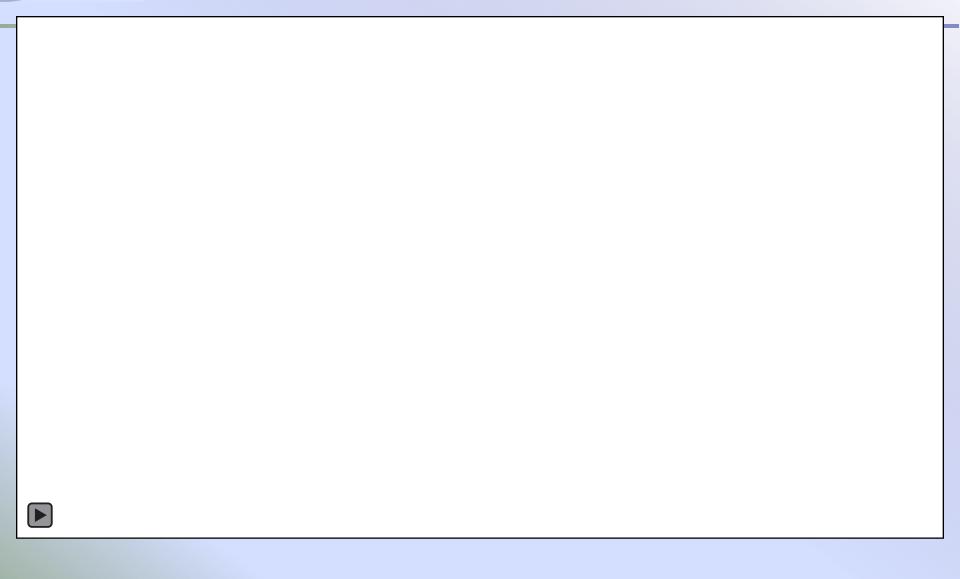
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Voltage Controlled Oscillators

- □ Probably the main cause of RF crosstalk
 - ➤ All of them operate near 79 MHz
 - All frequencies are read back through timing system
 - Single frequency difference divider: IMC, EX PLL, EY PLL
 - > Double frequency difference divider: COMM PLL, DIFF PLL
- Most dangerous path:
 - Anyone of them into IMC VCO
 - Will show up in common mode path and couple to AS port
- Solutions:
 - Exact frequencies (requires tidal feedback)
 - > Park or turn off ALS units after lock is achieved
 - Move doubler for ALS fiber AOM (ECR in prep)
 - Order of magnitude improvement





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Exact Frequencies

Location	Freq. (MHz)	Deviation	Comment
Main Laser	0	$2\Delta f_{main}$	set by main laser VCO
Reference Cavity	316.8	fixed	frequency reference
Fiber	0	fixed	shifted back
X-arm laser	-78.92	Δf_x	down-shifted
Y-arm laser	78.92	Δf_y	up-shifted
Differential beat note	157.84	$\Delta f_y - \Delta f_x$	controlled to zero
Common beat note	-78.92	$2\Delta f_{main} - \Delta f_x$	offset from resonance

- □ All frequency measured ±1 Hz
- □ Ambiguous: 1 IR resonance for 2 GR resonances
- Depends somewhat on green alignment

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