**SLED Phase measurement / control**

**Description:** system mixes signals down to ~400MHz. An arbitrary phase adjust is added to one leg to match desired phase difference between channels. A +/-45 degree phase shift is applied to the other leg on alternate pulses. The signals are combined, and a diode is used to measure the power. The diode is read with a GADC with the gate time set to the desired matching time (probably the 2nd fill of the SLED).

**Mixers:** Pulsar (973) 779-6262 ML-07-SC ($155), Ordered 4.
SMA connectors, 10dBm LO, 5MHz - 4GHz IF, 6.5-9.5dB loss, 4dBm 1dB comp. ($155)

**I/Q Modulator:** Pulsar (973) 779-6262 MO-08-412 ($180), ordered 4
+/-20mA control. 10dBm Max input. 300-550MHz.

**Pulse Generator:** Various Options, probably have something. If not, use SRS DS345 30MHz function generator ($1600)

**I/Q control through DAC:**
Use outputs from VMIC 4100, or Control System DAC. Note, outputs are only 5mA. Need to buffer to 20mA. 20mA constant current can be from +15V supply and resistor.

**Amplifiers:** Mini Circuits (718) 934 4500 ZFL1000LN ($90) 2 ordered.
20dB gain. 0.1-1000MHz NF = 2.9dB. 1dB comp = 3dBm. Power +15V@60mA

**Attenuators:** Any, set to match levels to ~1dB.

**Splitter / combiner:** Mini Circuits (718) 934 4500 ZFSC-2-2-S ($56.95) 2 ordered.

**Adjustable Attenuator:** Mini Circuits (718) 934 4500 ZFAS-2000 ($64.95) 2 ordered
100-2000MHz, 0-20mA control (from buffered DAC).
Attenuator adjust set to match delivered klystron power.

**Detector:** Need 400MHz RF response (most should work)

**DAC buffers:** Need to build from National CLC114 quad buffer chips. Use 100 OHm output impedance, +/- 5V supplies. Need total of 4 channels (1 chip).
Use diagram on page 8 of Data Sheet. Rin = 2k OHms, Rout = 100OHms

**DAC channels:**
1, 2: Phase Control +/-2V range.
   If possible, make panel where ch1 = 2 * sin(w), ch2 = 2 * cos(w). w entered from panel.
3: Amplitude control. Need to put in polynomial to match the inverse of the main klystron attenuator.
SLED Phase Control (temporary solution)

- Forward Reflected
- Attenuate to ~0dBm Max
- R
- L
- Merrimac (existing)
- 400MHz pulse
- Gunn Diode (existing).
- 11.824MHz
- Note, drive is 20mA.
- add series resistor if needed.

I/Q Mod

- Phase Control
- I = 20mA
- +/- 20mA
- max -20dBm in
- Match layout of two input channels (cable lengths, etc).

- 20dB
- +15V

Match Levels

- 30Hz Trigger
- TS=A

Pulse Gen

100usec

Pulser output -20ma / 20ma

- Optional, use pulse generator ~14V, ~150mA.

+ ~14 V adjust

Gunn Diode

S

Detector

GADC

Attn

Power level adjust (optional)

Buffered DAC

Long Cable

Fast or Slow feedback to Joerger Motor

TS=A state

TS=B state