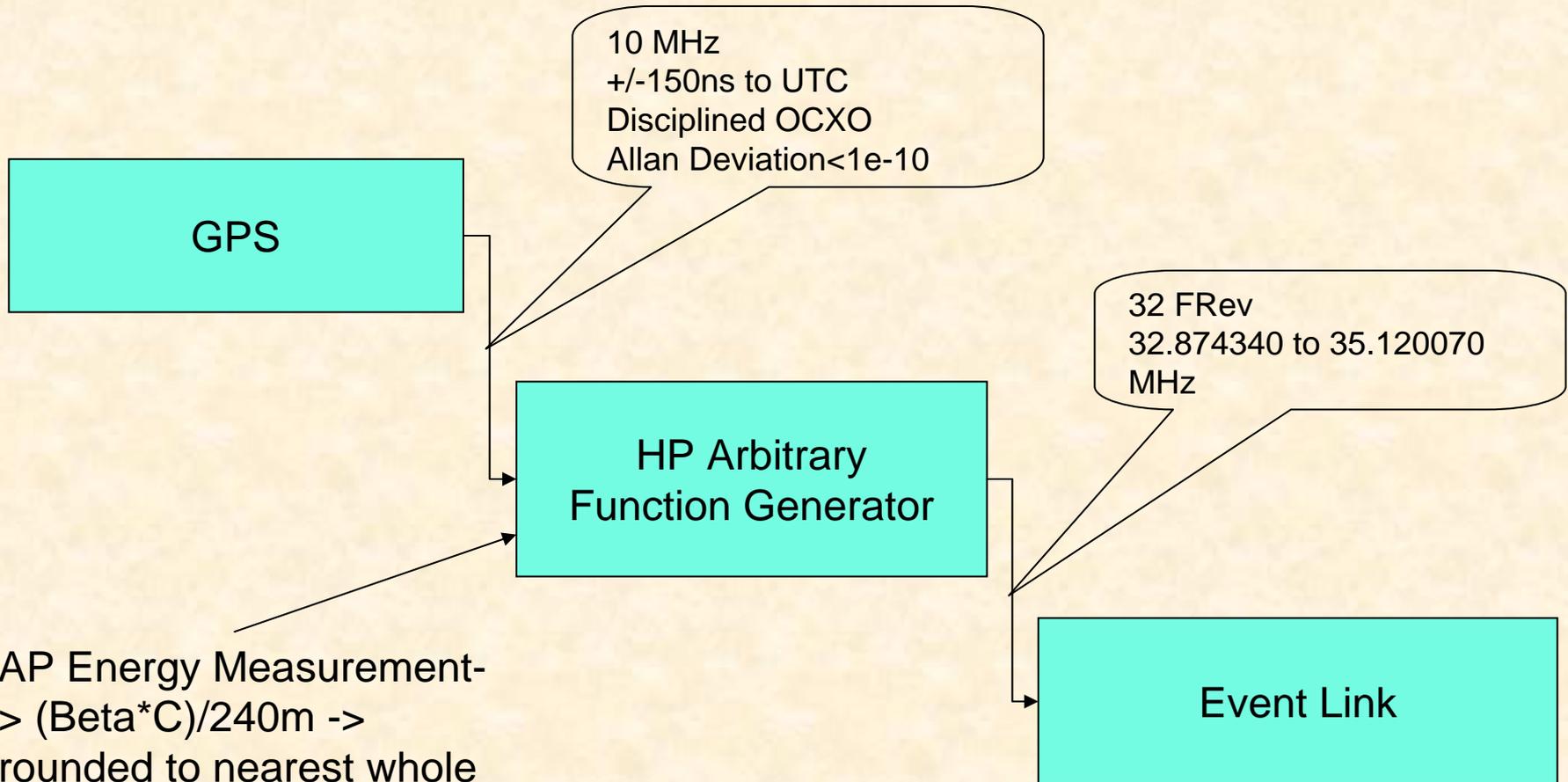


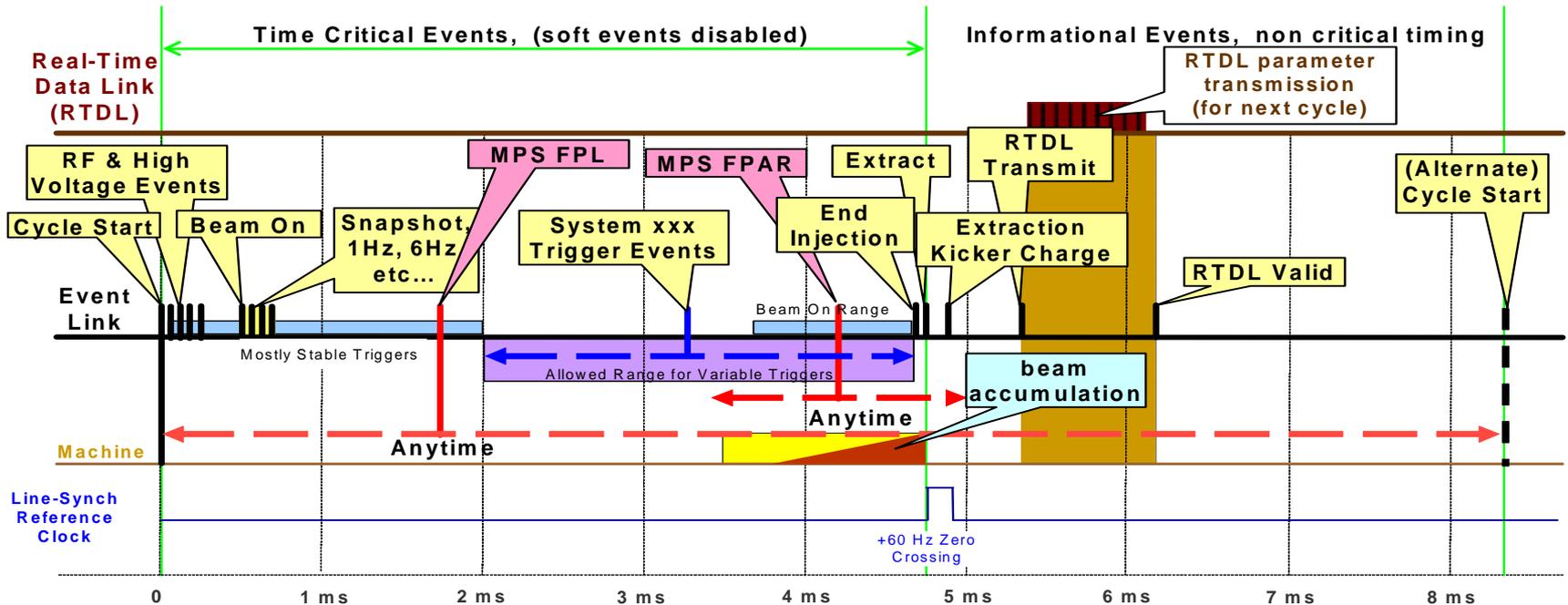
# Frequency standard used by timing system



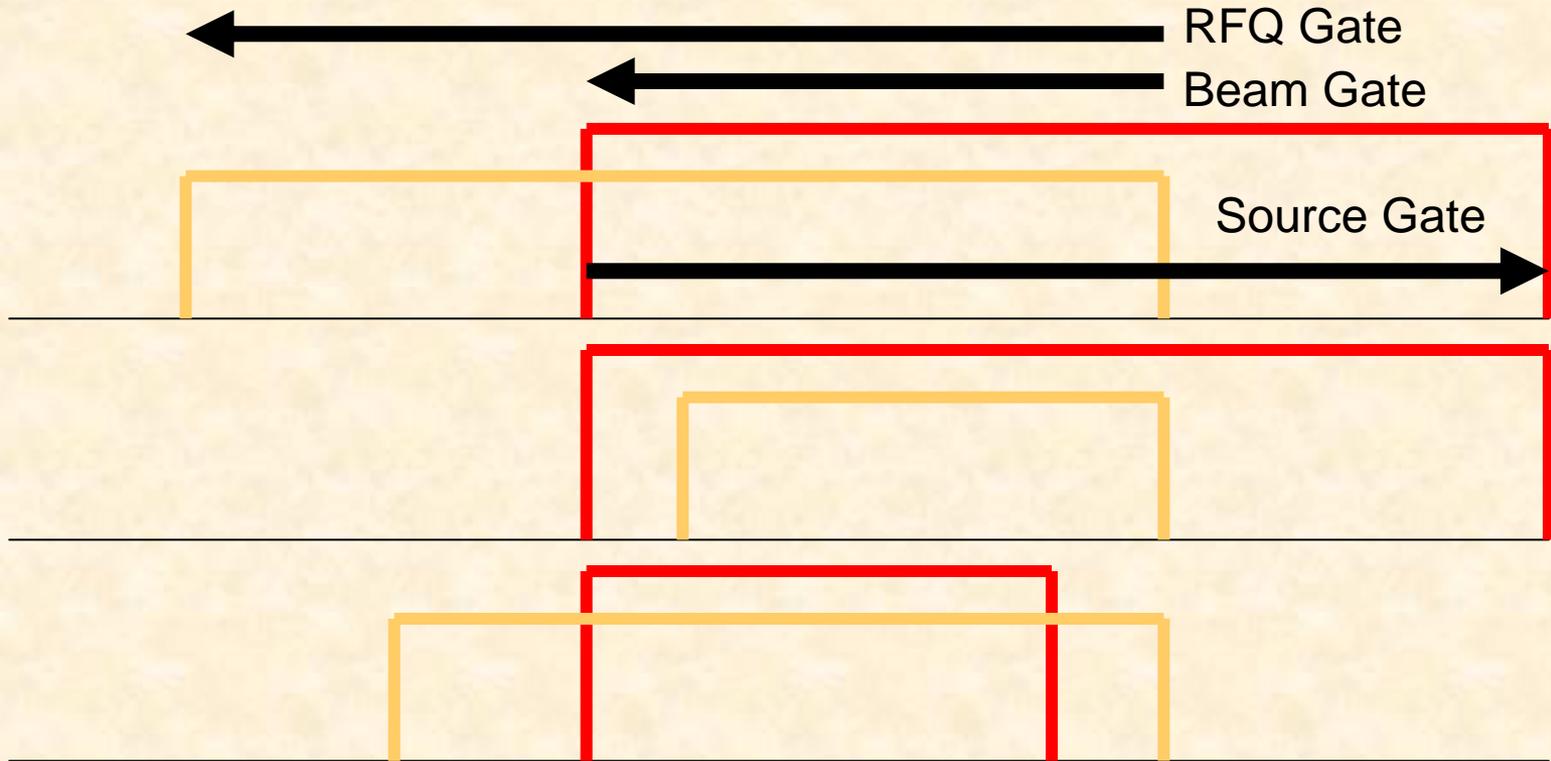
AP Energy Measurement ->  $(\text{Beta} \cdot C) / 240\text{m}$  -> rounded to nearest whole ps, and sent to ARB as 32 FRev.

Not locked to Linac RF or MO

# Timing System Timeline



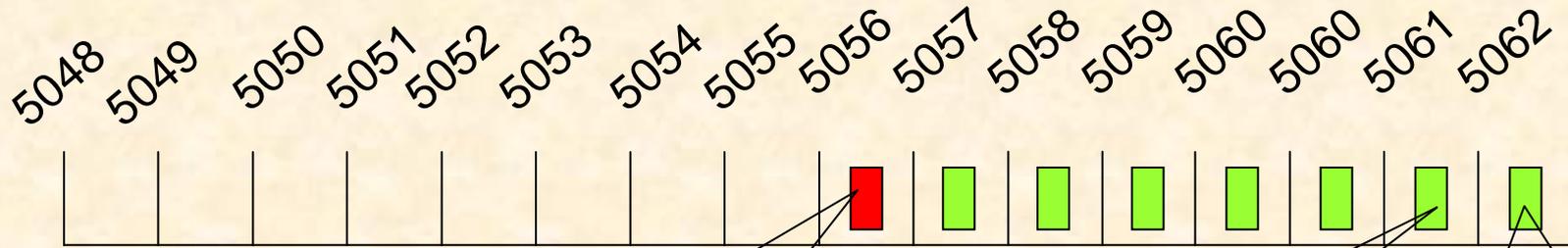
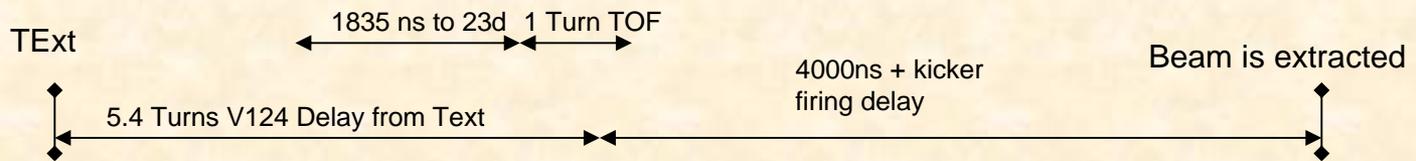
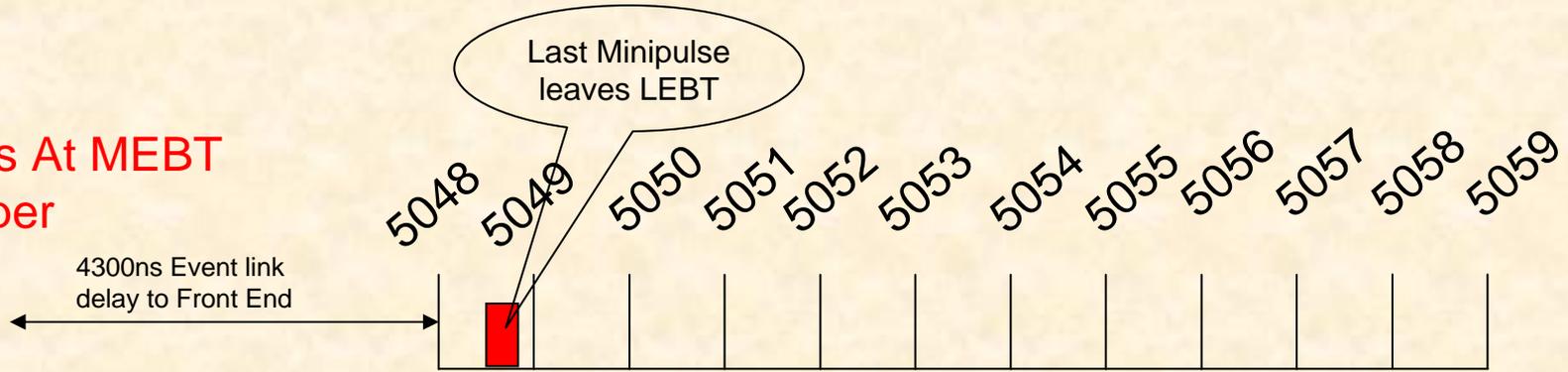
# Possible Source/RFQ timing relationships.



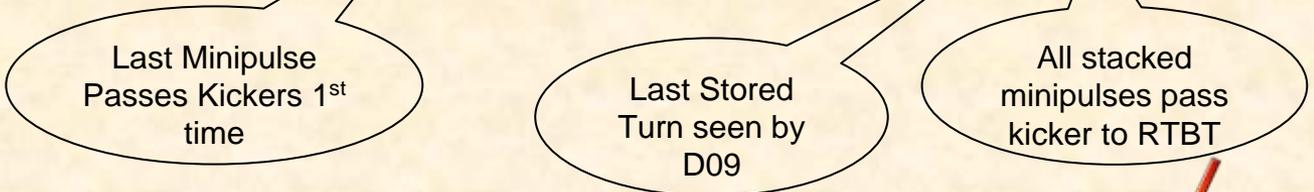
RFQ Source

# Extraction Kicker Timing

Events At MEBT Chopper



Events In RSB at timing master



# Time In, end of linac to target:

$$A/FRev + B/240m = C/FRev + D$$

- **A=1838 ns. (TOF thru linac) + measurement cable delays.**
- **B=Distance from end of linac**
- **C=cable delay of event link**
- **D=event to beam delay from timing system in turns.**
- **Usually only C needs to be unknown.**

$$A=C \text{ and } B=D!$$

# Extracted Beam Timing

Instruments and RTBT diagnostics must add this number (TURNS) to basic timing delay.

**Extraction Kicker Timing**

v124

Extracting 50 turns after Textract.

Extraction Kicker Timing Delay from extract event to trigger. **50.500 Turns**

Extraction Kicker Firing Mode

Single Shot

Continuous

Rep-Rate: 30 Hz

MPS Latched Fault Reset **Reset**

Set-Rep Rate on Timing Master

**EXIT**

Use lowest loss setting nearest 0.4 Turns to get proper timing to RTBT and target!

This is the gate delay from turn 5050.

# Line Sync

**If the slew rate is inside +/- 1:**

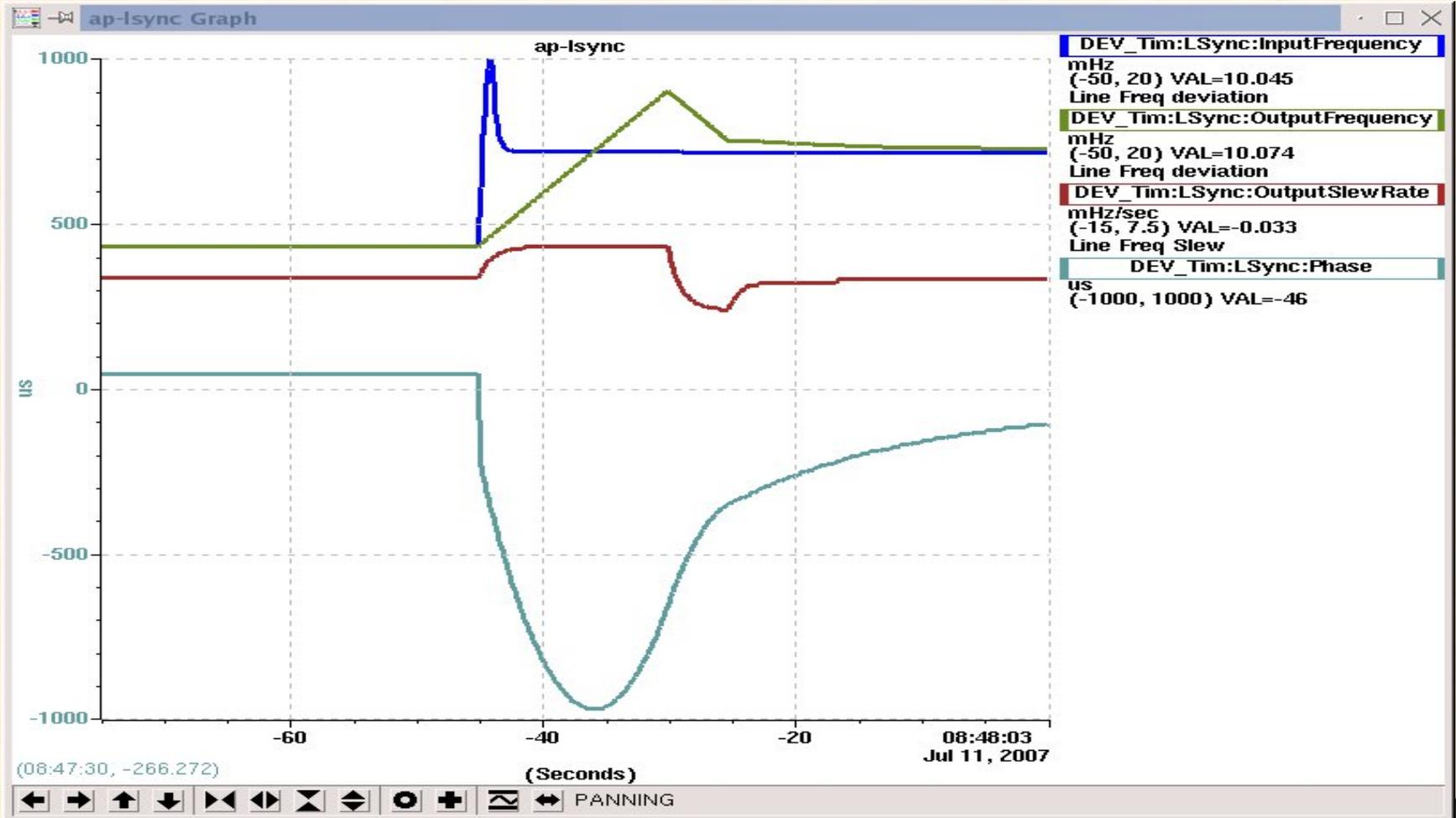
$$\text{F-Out} = \text{filtered(F-In)} + \text{Phase} * \text{Reset Gain}$$

**Else**

$$\text{F Out} = \text{F Out} + \text{slew.}$$

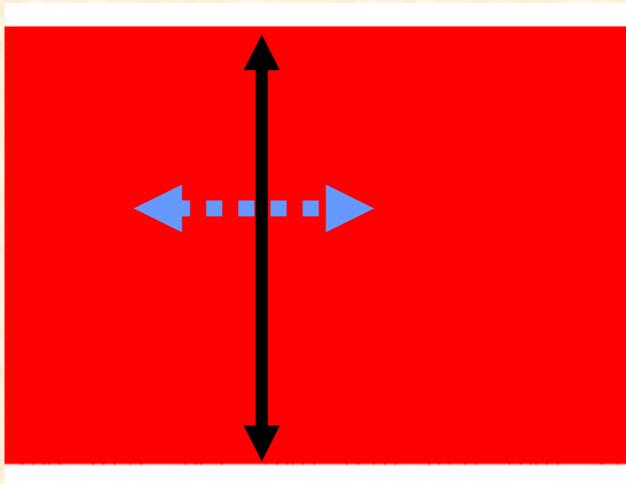
- **The Reset Gain is -8mHz/mSecond.**
- **A 50us dead band is used in the phase loop to provide damping.**
- **TVA's sensitivity to load is about 1 mHz/30MW.**

# Line Sync Response to 10mHz Step

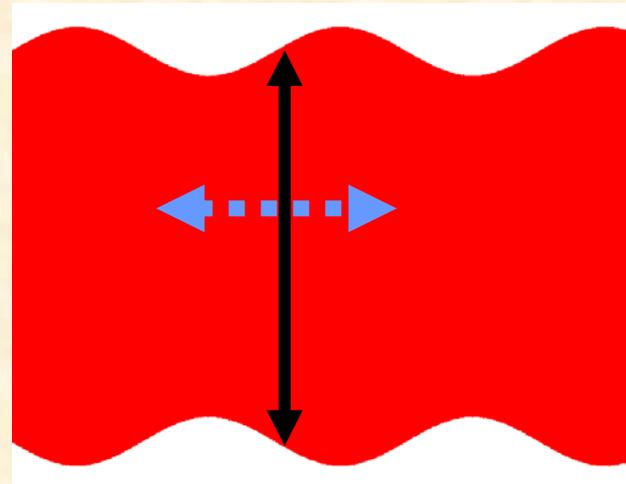


# How Line Phase Affects Reference Line Signal

- **60\*N Hz Sidebands=Modulation**  
(AM or FM Both bad)
- **Line Phase affects timing of reference sample.**
- **Line Phase is essentially random.**



No Sidebands



5% AM modulation