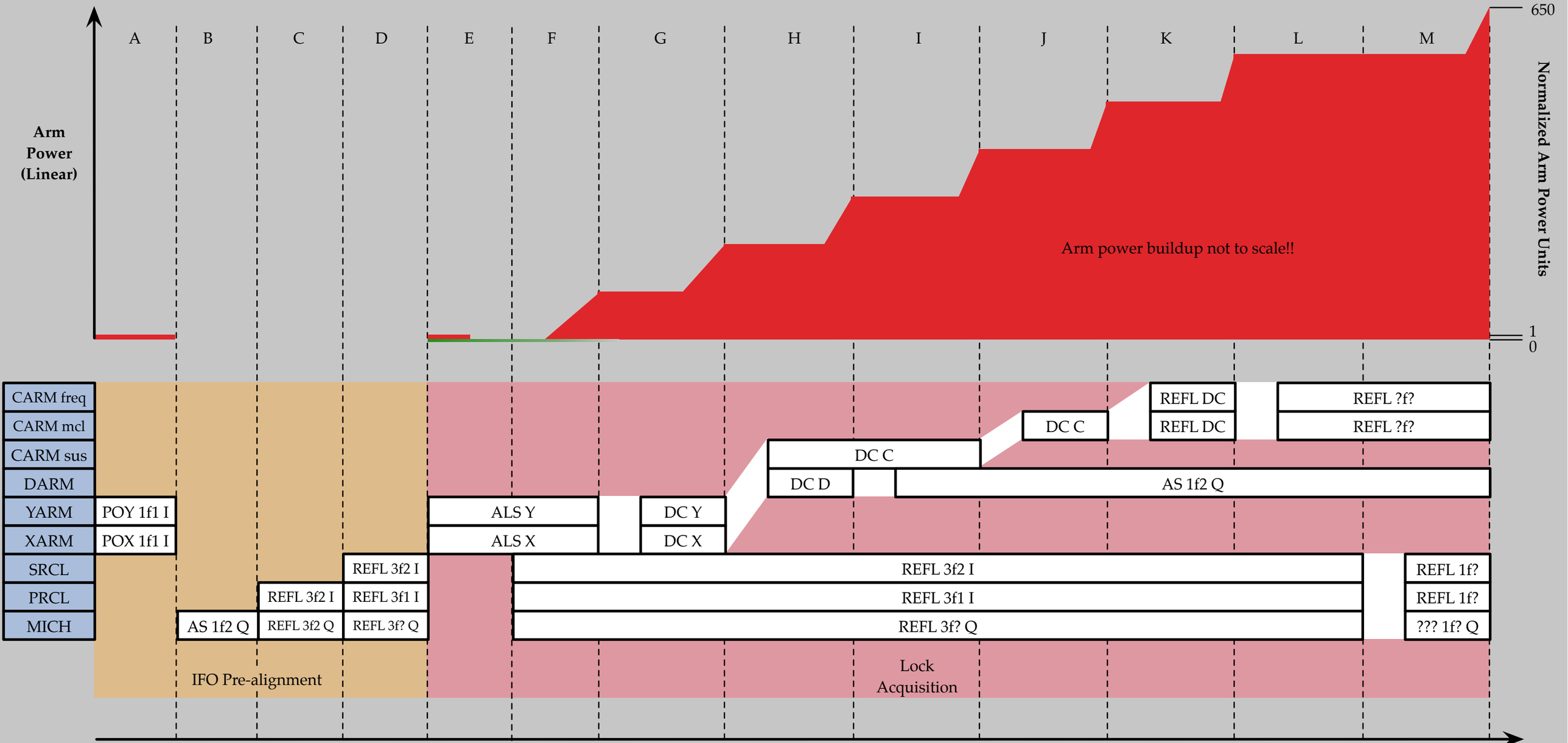
40m Lock Acquisition Protocol as of 7 November 2013

Jenne Driggers



$$DC\ X = \frac{1}{\sqrt{TRX}} - \text{offset} \qquad DC\ D = \frac{TRX - TRY}{TRX + TRY}$$

$$DC\ Y = \frac{1}{\sqrt{TRY}} - \text{offset} \qquad DC\ C = \frac{1}{\sqrt{TRX}} + \frac{1}{\sqrt{TRY}} - \text{offset}$$

See next page for description of steps

ALS (X, Y) = control frequency of beat between green transmission of (X, Y) arm and PSL pickoff

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A. Lock arms (PRM and SRM misaligned). Align arms and input pointing.

B. Misalign ETMs, lock MICH, check alignment.

C. Restore PRM. Lock and align PRMI on sidebands using 3f signals.

D. Restore SRM. Lock and align DRMI on sidebands using 3f signals.

E. Misalign PRM, SRM. Restore ETMs. Lock auxiliary lasers to arms. Lock arms to ALS beatnotes. Find IR resonances. Move both arms just off IR resonance so we have a CARM offset, but not DARM offset. Ensure that no sideband resonances are crossed.

F. Restore PRM, SRM. Lock DRMI using 3f signals. Use ALS to reduce CARM offset (by how much?? Maybe to about one half final arm powers?).

G. Transition control of arms to DC transmission signals. Turn off / shutter aux lasers. Reduce CARM offset (by how much??).

H. Transition control of arms to CARM and DARM signals, calculated from DC transmission signals. Reduce CARM offset (by how much??).

I. Transition control of DARM to AS port PDH signal. Reduce CARM offset (by how much??). Note that DARM needs to be moved to quiet RF PDH signal before CARM offset is too close to zero.

J. Transition actuation of CARM to MC length. (Does the FSS need to be involved at this point?). Reduce CARM offset (by how much??).

K. Transition control of CARM to REFL DC, actuating on FSS and MCL. Reduce CARM offset (by how much??). Is this step actually necessary? Can we just transition CARM from the calculated DC signal to REFL RF signal?

L. Transition CARM to REFL port PDH signal.

M. Transition control of DRMI to 1f PDH signals. Reduce CARM offset to zero. Should this step happen sooner? Perhaps we get better SNR, and better ability to hold lock with 1f signals, so we want to transition to them somewhat earlier?