MM noise specs:

Need to measure & verify

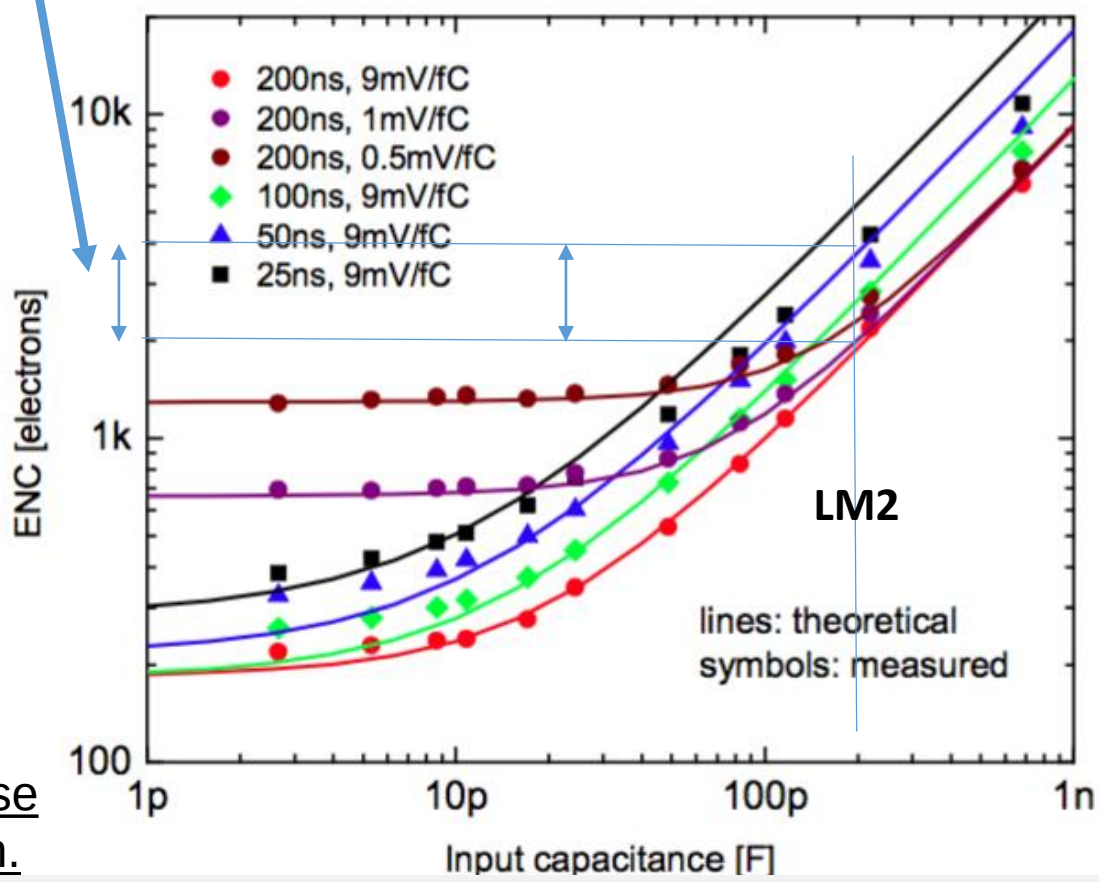
- Typical MM capacitance *C*=100 pF/m per strip; total ion driftTime=200 ns
- vmm measured/theoretical noise levels for input *C*=200 pF is 4000 e^- --> 2/3 fC; assume vmm gain=9 mV/fC and peakingTime=50 ns
- Typical numbers of ENC noise: 1/3 fC -- 2/3 fC for peakingTimes = 200 -- 50 ns

- 2/3 fC at vmm gain 9 mV/fC corresponds to 6 mV noise

- If we need to detect single primary e^- : for chamber *G* = $2x10^4$

PeakingTime [ns]	signal [*e*]	signal [mV]	signal [fC]
50	5000	7.2	0.8
100	10000	14.4	1.5
200	20000	28.8	3.2

vmm ENC noise vs input capacitance (GdG)



Idealy:

* we need to keep the ENC noise of mmfe8 on detector at the level ~2/3 fC ~ 4000 e^- or 6 mV

* Use peakingTime=200 ns for high charge efficiency and lower noise levels for a certain input capacitance but you give up time resolution.

** Do we realy need to insist being sensitive on1e^- per strip? No!* @ 30° <#*e*/*strip*->~8.3 see George's talk using ful MC analysis

Where we stand: (are we converging to the theoretical noise levels?)

Summary of the noise problem of various mmfe8 boards on various detectors:

1. Using mmfe8-vmm2 on SM1 module-0, small TZ chamber and on Harvard octuplet the noise levels are **150-200 mV** (at 9 mV/fC) p2p. Different numbers of noise levels (between cern and Harvard) are consistent considering they have been measured using different detectors with different Aluminum frames (have been presented in an MM & Elx meetings). Also, using the mini-2 on T chamber the theoretical noise levels have been achieved (see George's talk).

2. Using mmfe8-vmm2-feast on LM2 module-0 the noise levels are **60 mV** p2p (have been presented in MM & Elx meetings).

3. Using mmfe8-vmm3-feast on TZ chamber (~30 pF) the noise levels are <**30 mV** p2p (see George's talk and Ken's talk for the AZ measurements).

All the above measurements were conducted with one (on TZ chambers) or two boards (on module-0's);
The above studies have concluded that the noise is propagated by the dcdc converters to the vmm inputs and is not dominated by the input detector capacitance; we need to conduct the measurements with the total number of boards on a module-0 quadruplet to check the linearity of the noise.

4. Using mmfe8-vmm2_remove_DC/DC on Harvard octuplet the noise levels are **5-10 mV** p2p (see Ann's & Alex's talk). In addition, the noise levels remain the same even in the case of reading out 8 boards installed on the octuplet when using one DC/DC converter 0.5 m away from the octuplet. Keep in mind that placing the DCDC converters off mmfe8 boards creates a problem in the "services department", since we need to resolve cooling and location issues. Some of us believe that we need to keep lowering the noise levels by adjustments on the board with the feast in place (steps 1-3). If the new version of mmfe8 with GdG suggestions drops the noise levels by a factor of 2-3 we will reach the theoretical noise levels and then we will start seeing the effect of the input detector capacitance on the noise levels.