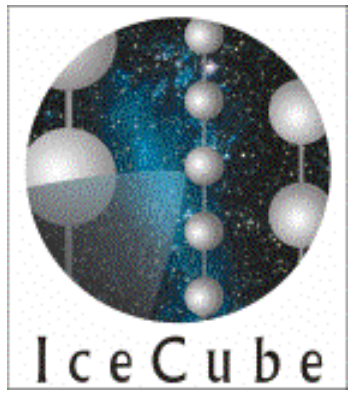
PMT HV Base Prototypes Evaluation



Instrumentation Workshop
LBNL
July 23-24, 2003

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SSEC

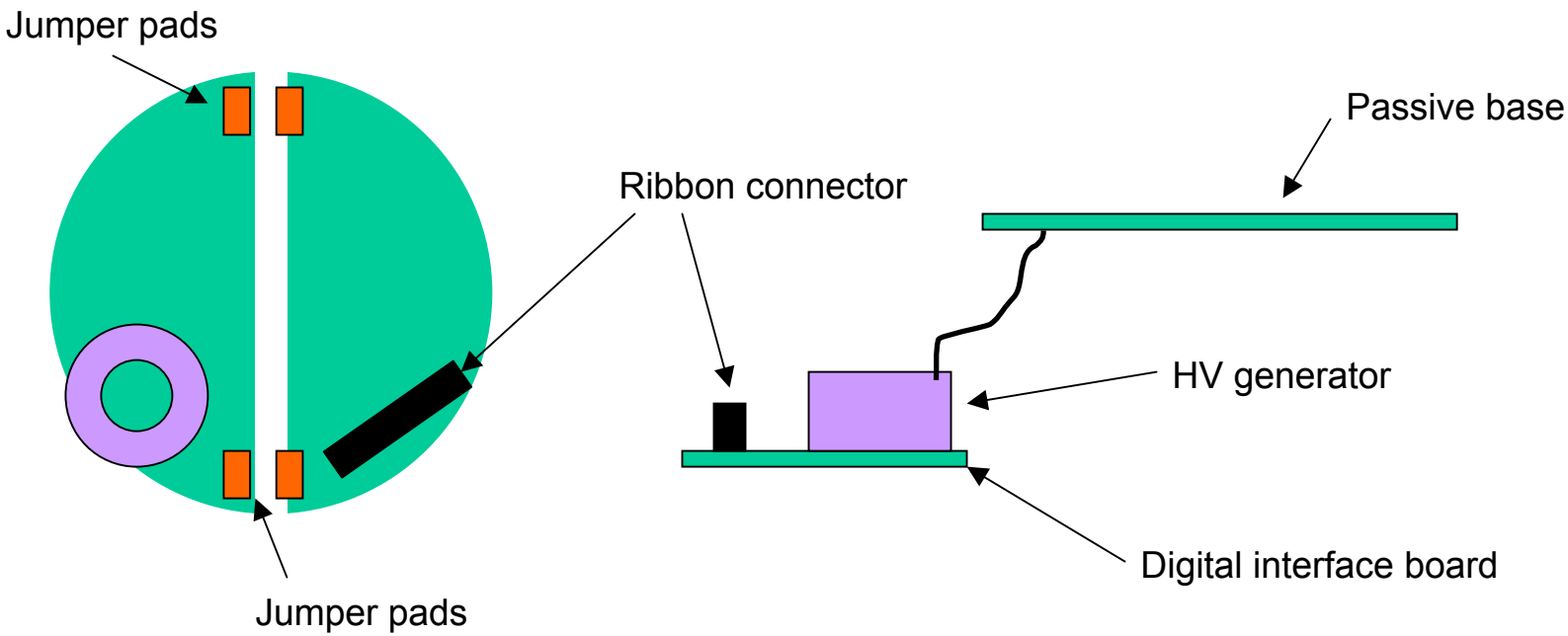
Three prototypes

"Old Iseg"—Aug. 2002 prototypes

"New Iseg"—Split ground implemented.

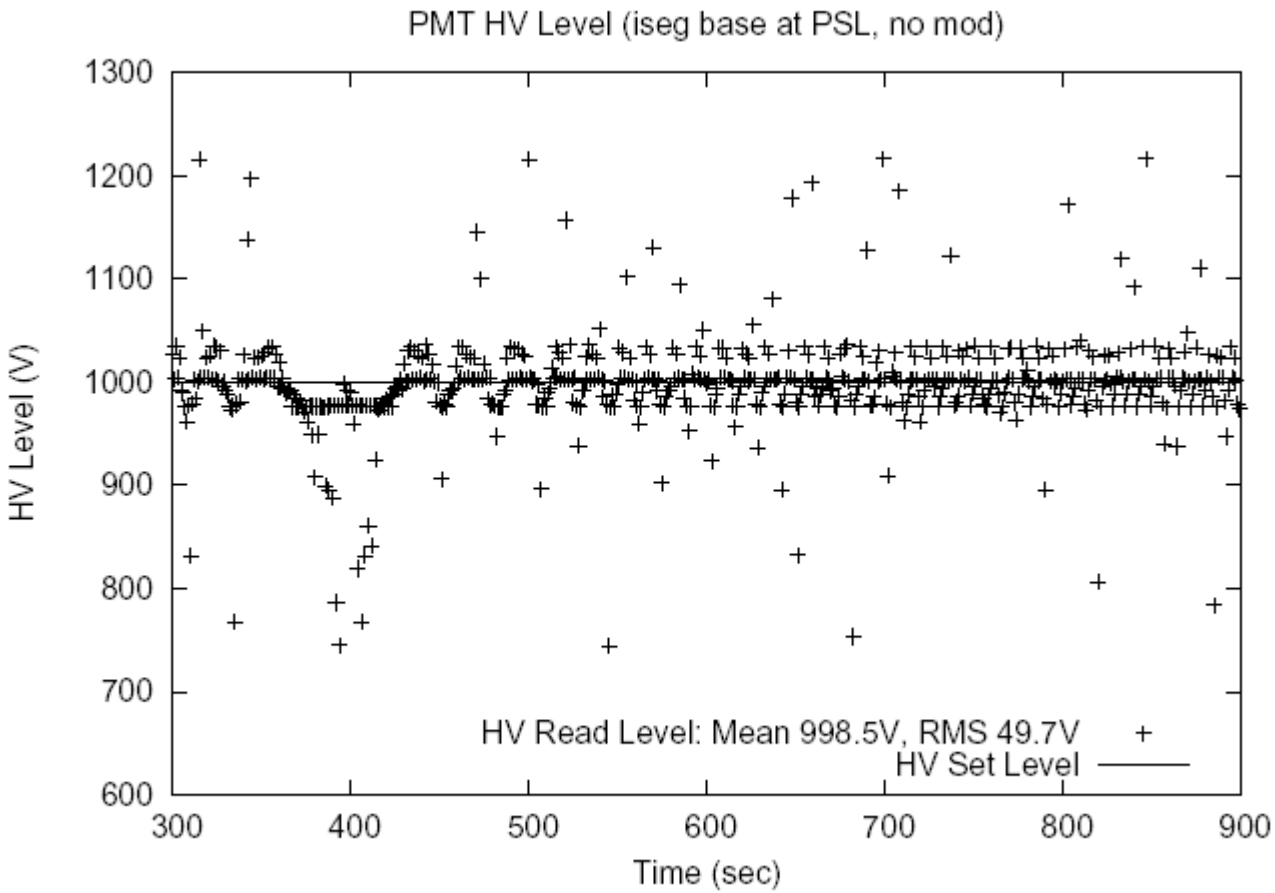
"EMCO"—Passive base approach consisting of three components:
Passive base, HV generator, & digital interface.

All designs present the same interface to DOMMB.



New Iseg--Isolated Ground

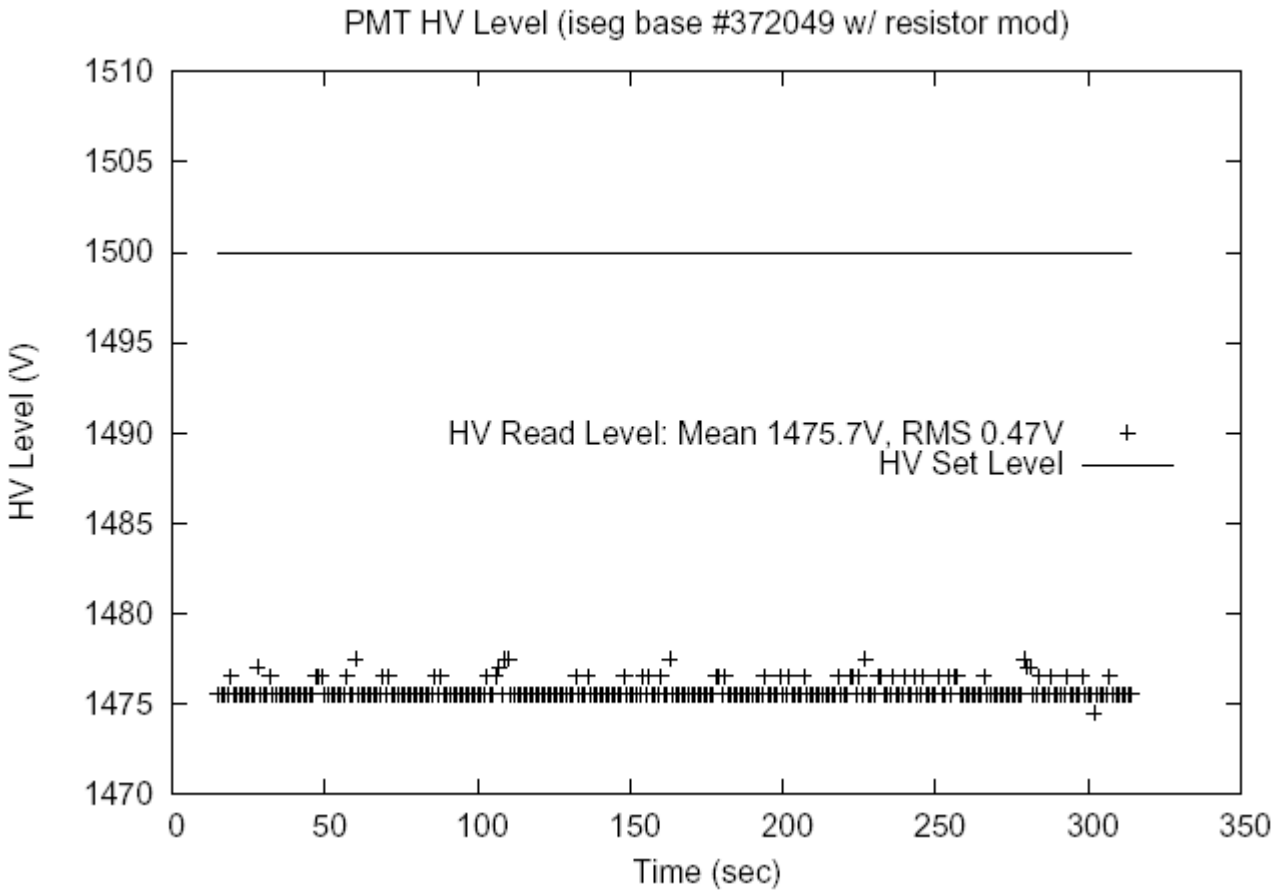
Output voltage is unstable with no ground-connecting jumper



Data by John Kelly
(hv_2000_iseg_psl.pdf)

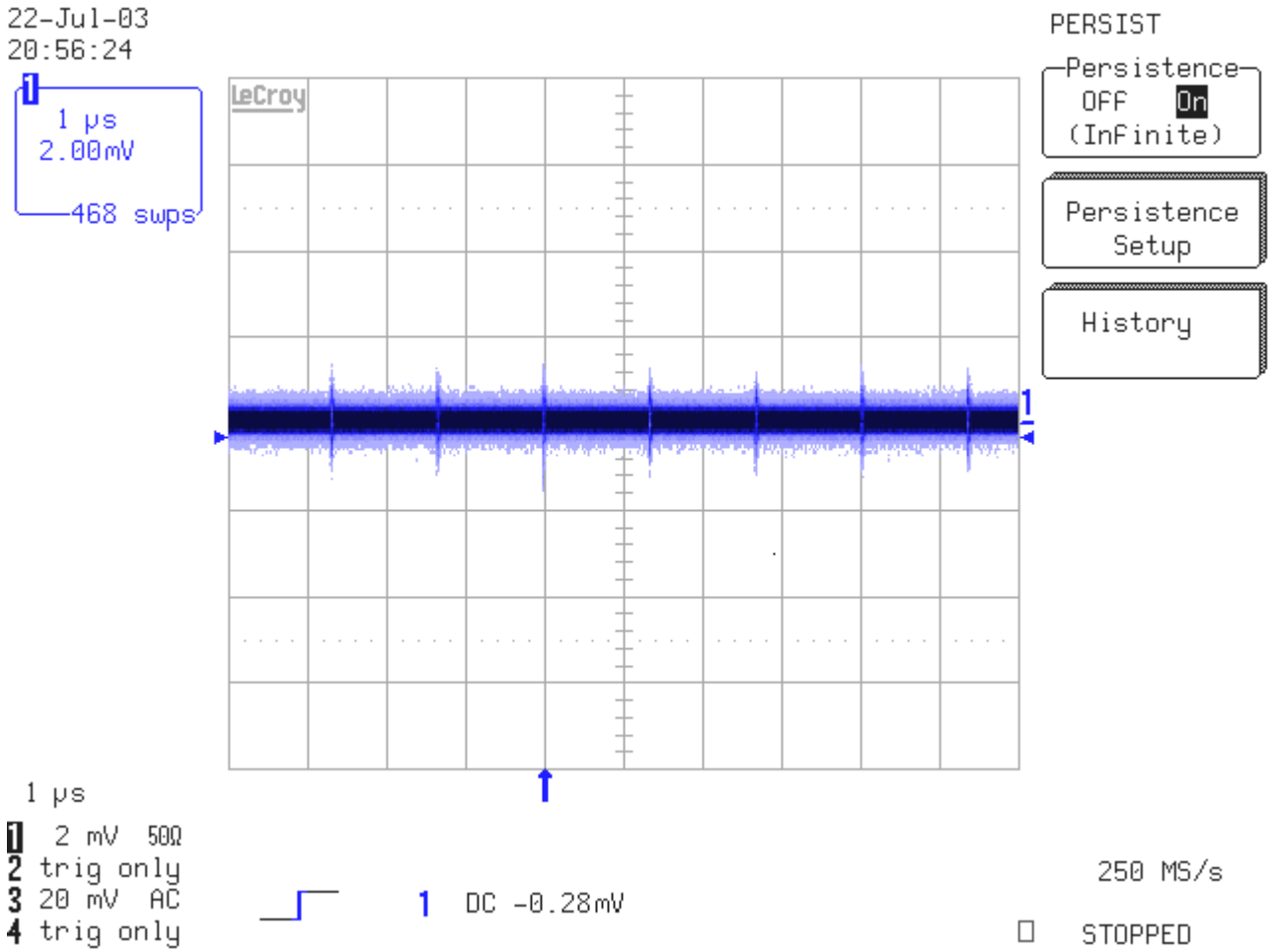
New Iseg with a 1MΩ Jumper

The output voltage is stabilized by installing a jumper.



Data by John Kelly
(hv_3000_iseg_049.pdf)

Connecting Grounds with a Zero Ω Jumper



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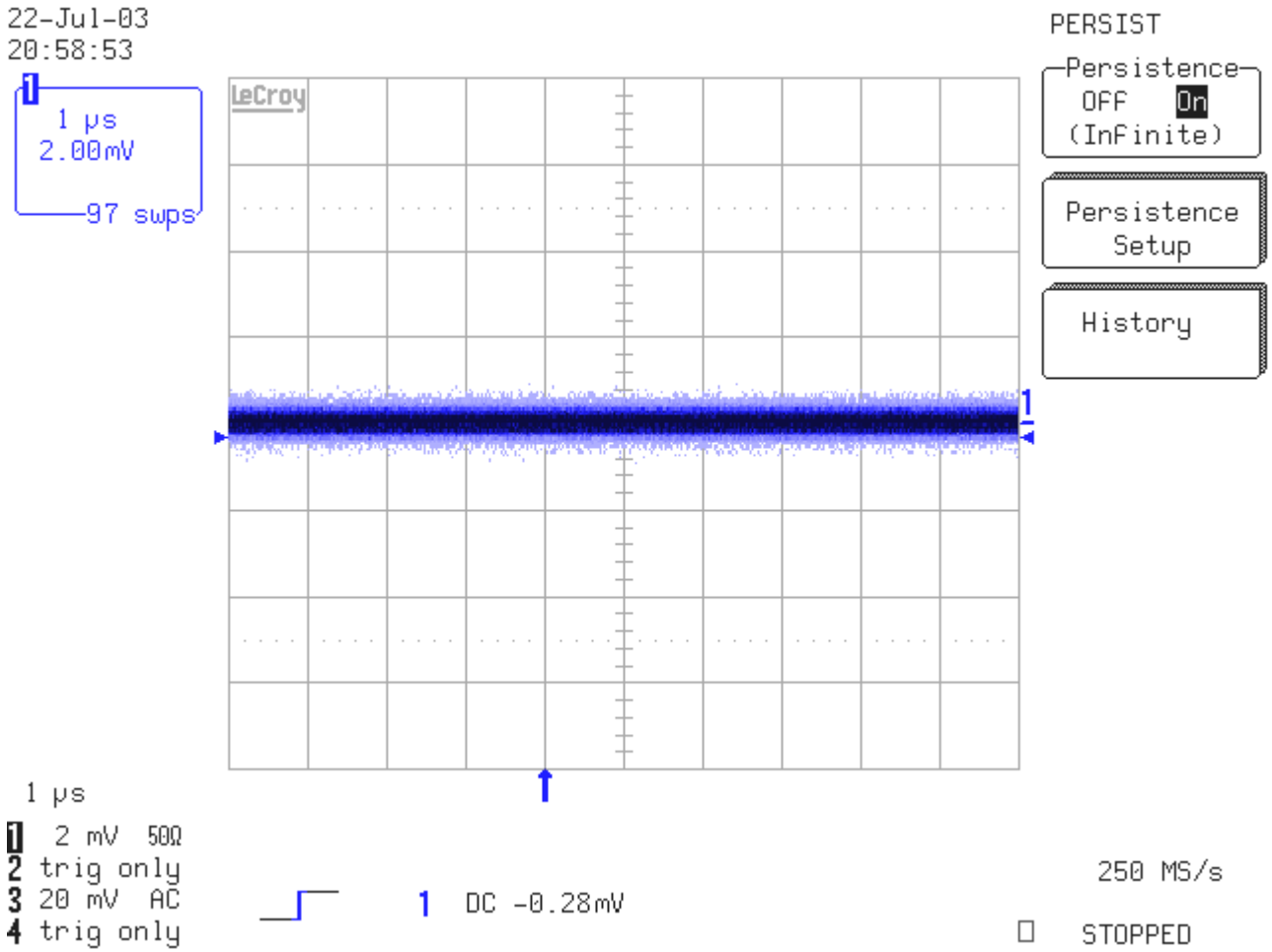
Connecting Grounds with a 1MΩ Resister



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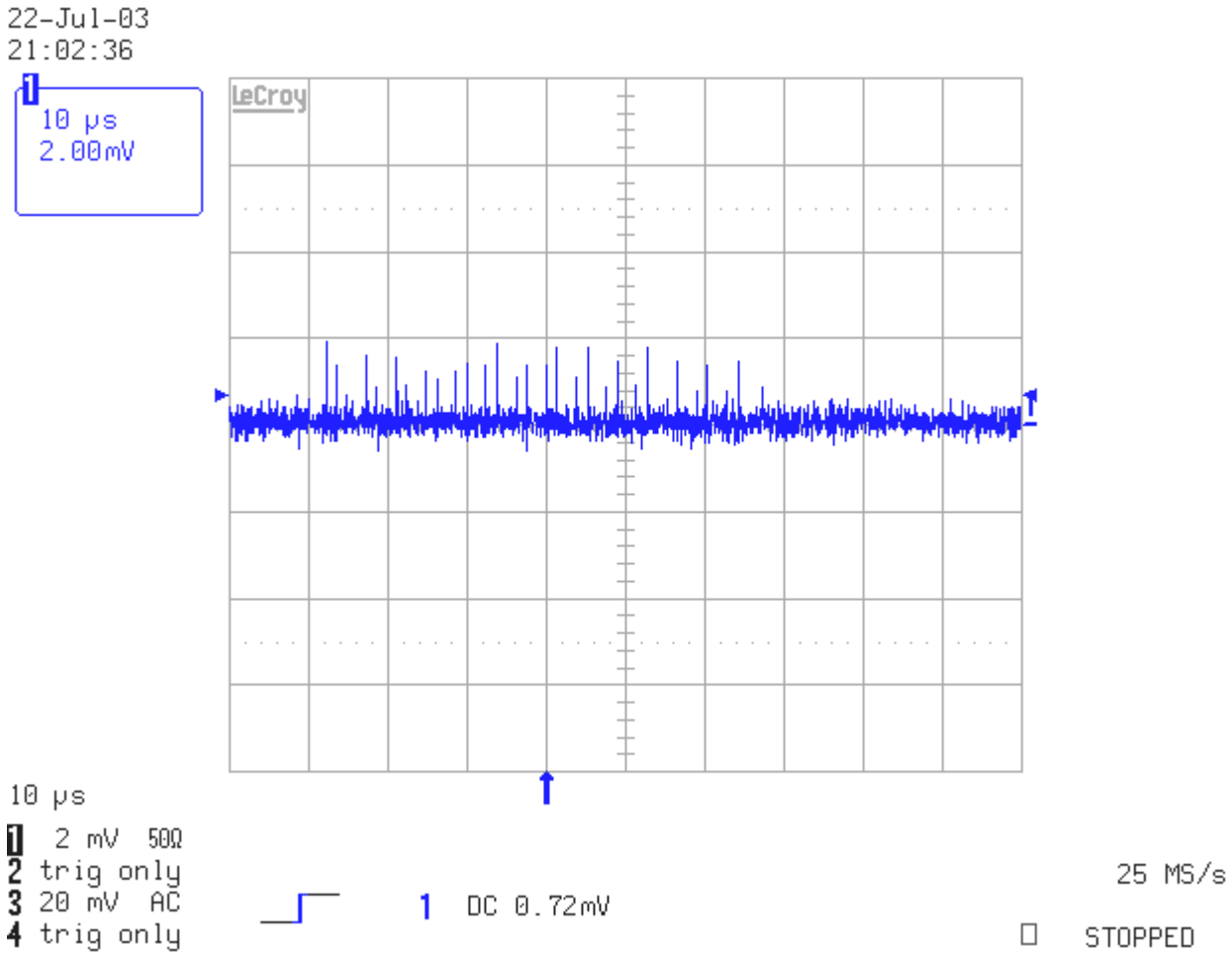
Noise Introduced by Digital Communication

This example shows noise from reading the ADC on a new Iseg base with a 1MΩ jumper.



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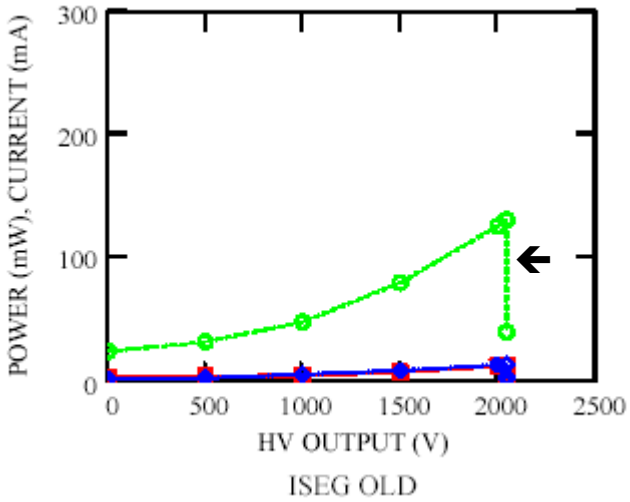
Noise Comparison

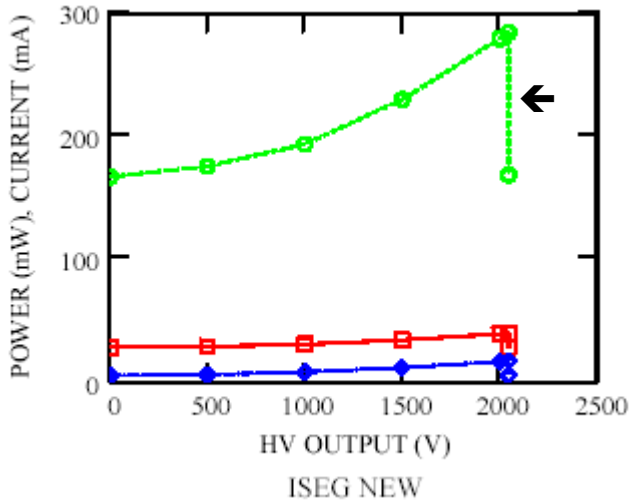
All the bases have similar random noise levels observed at the secondary side of the signal coupling transformer.

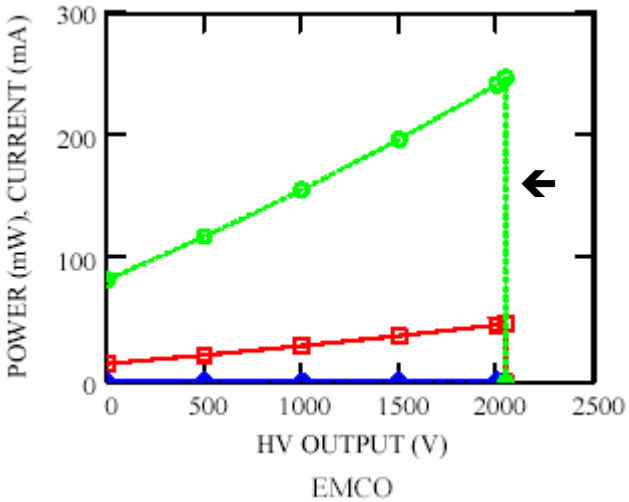
		ISEG OLD	ISEG NEW	EMCO
NOISE AT OUTPUT*	mVpp	1.22 ± 0.13	1.26 ± 0.13	1.12 ± 0.21
	μVrms	214 ± 18	208 ± 18	215 ± 31

*At 50Ω oscilloscope input using a 50Ω cable. 100 nsec window (400 pts.)
The scope background is 1mVpp, 190μVrms over 100 nsec.

Power Dissipation







POWER

CURRENT (+5V)

CURRENT (-5V)

"←" disableHV

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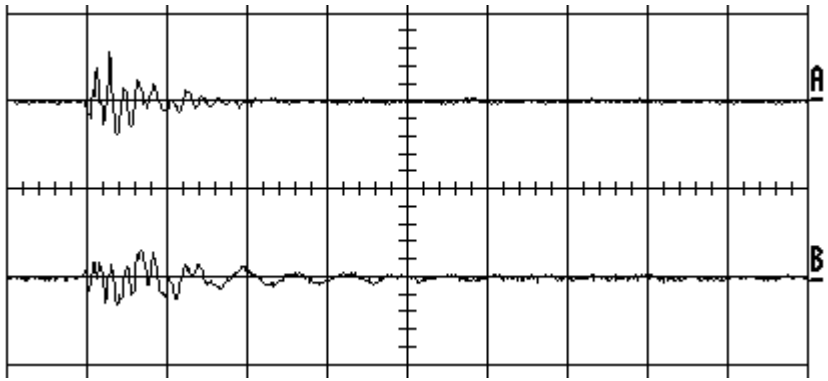
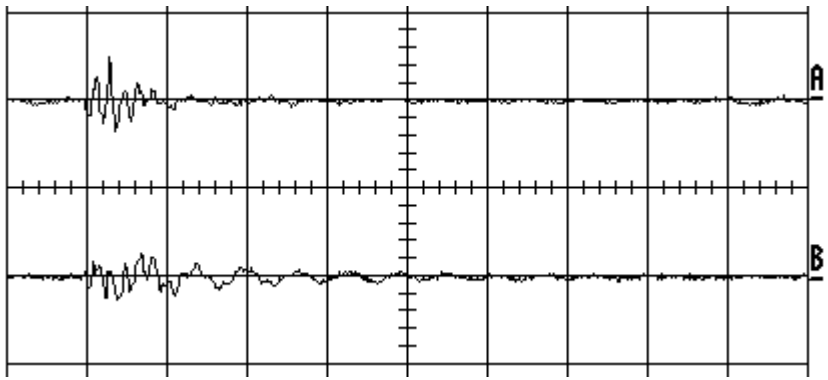
Transient Power



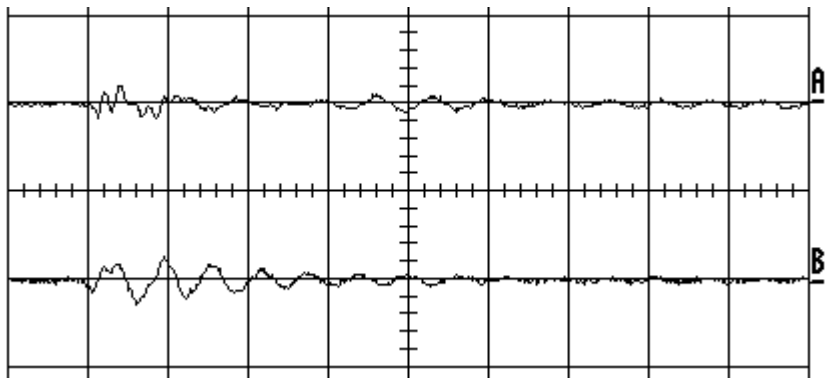
ISEG OLD

Enable after setting DAC to 4095.
Measure across 1Ω.
Trigger on “enableHV”



?

ISEG NEW



0.5V, 50nsec

EMCO

Overall Comparison of the Three Prototypes

		ISEG OLD	ISEG NEW	EMCO
NOISE AT OUTPUT*	mVpp	1.22 ± 0.13	1.26 ± 0.13	1.12 ± 0.21
	μVrms	214 ± 18	208 ± 18	215 ± 31
1ST DYNODE VOLTAGE		FIXED (600V)		SCALE WITH OUTPUT
POWER AT MAX OUTPUT (mW)		130	280	250
COST (US$)		~150	~260	~600

*At 50Ω oscilloscope input using a 50Ω cable. 100 nsec window (400 pts.)
The scope background is 1mVpp, 190μVrms over 100 nsec.

Conclusion

Old Iseg or New Iseg?

- New Iseg with isolated grounds performs badly
- New Iseg with directly connected grounds performs badly
- New Iseg with 1MΩ jumper performs very similarly to Old Iseg
- Old Iseg is cheaper than New Iseg
- Old Iseg consumes less power then New Iseg

➔Old Iseg

Iseg or EMCO?

- Both have similar noise levels
- Vdy1 is fixed in Iseg approach
- Iseg is cheaper than EMCO

➔Iseg