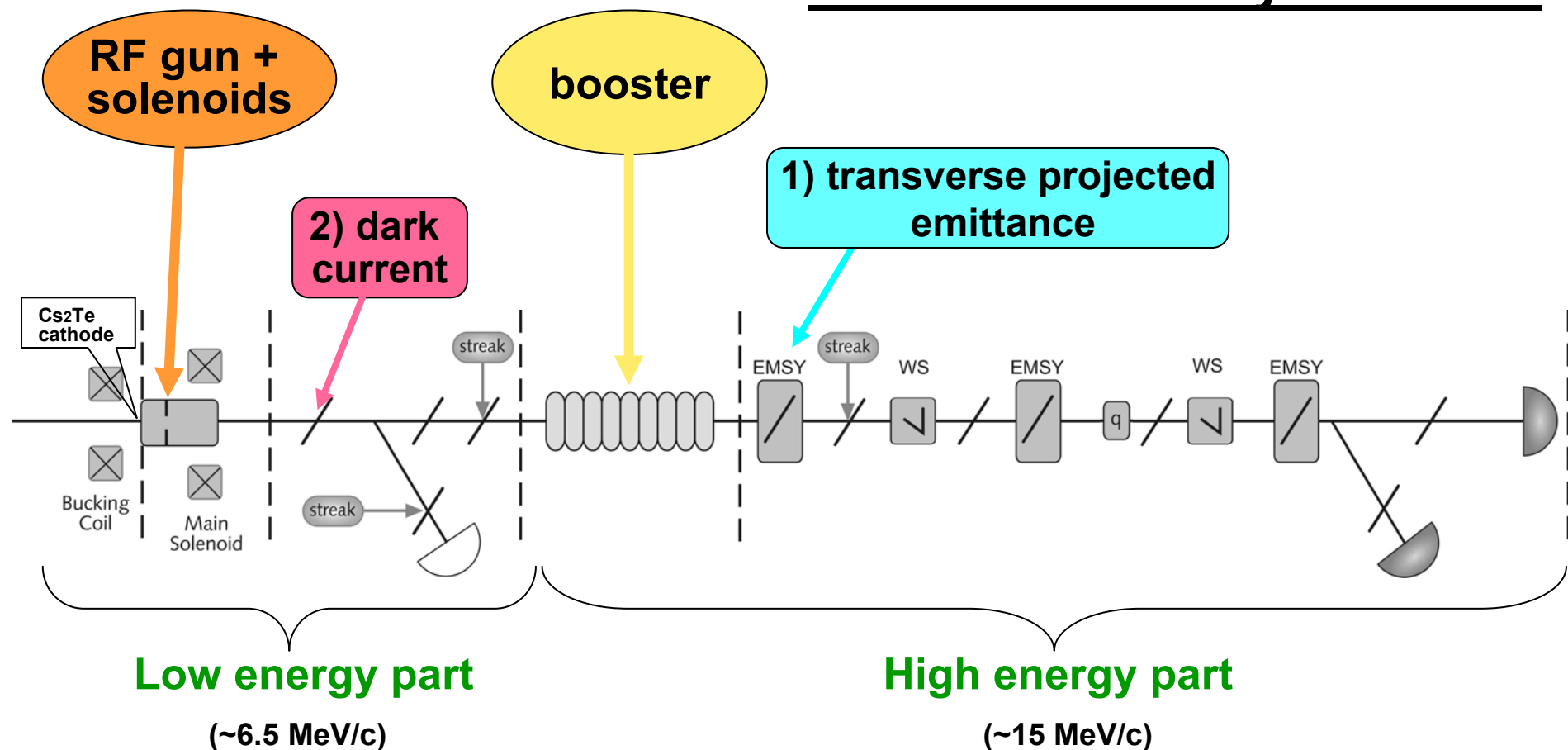
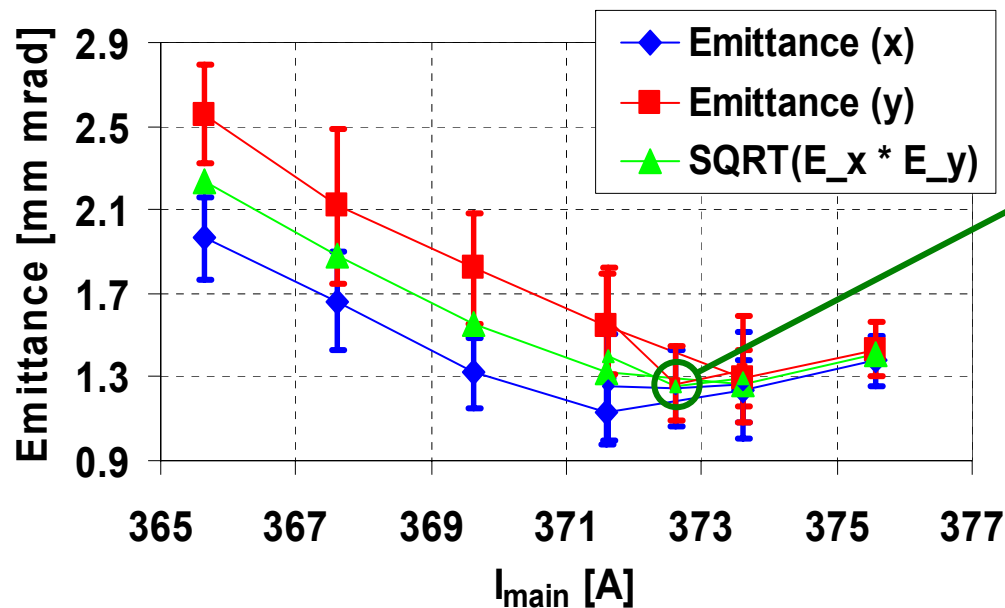


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PITZ schematic layout '06/'07





→ for ~60 MV/m we obtained

$$\epsilon_{x,n} = 1.25 \pm 0.19 \text{ mm mrad}$$

$$\epsilon_{y,n} = 1.27 \pm 0.18 \text{ mm mrad} \quad @1\text{nC}$$

for 100 % RMS emittance !

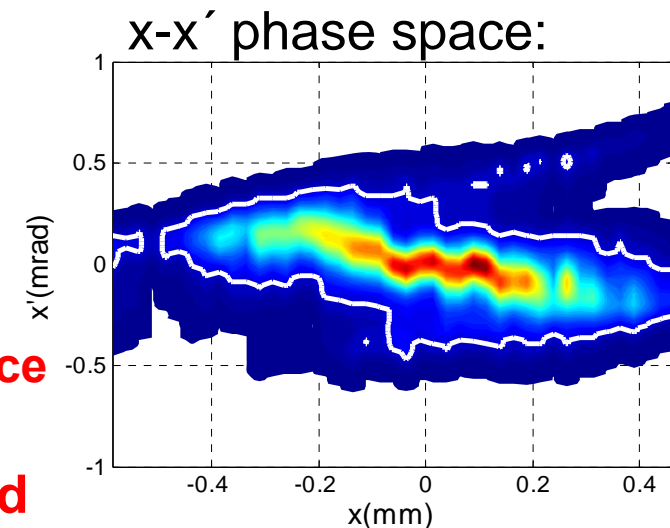
→ in good agreement with prediction from ASTRA

Cathode: # 90.1
Gun gradient: ~60 MV/m
Gun phase: $\phi^{\text{gun}} = \phi^{\text{gun}}_{\text{ref}}$
Momentum from gun: ~6.44 MeV/c

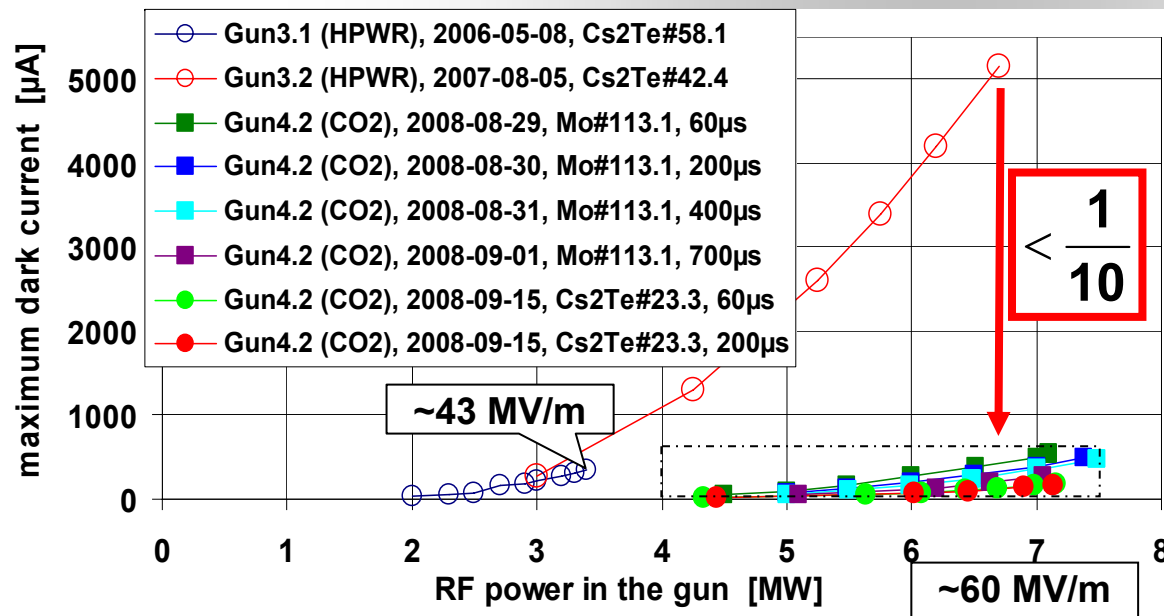
Booster phase: $\phi^{\text{booster}} = \phi^{\text{booster}}_{\text{ref}}$
Total beam momentum: 14.5 MeV/c

With a 10 % charge cut in the tails of the **phase space distribution** (~ remove non-lasing electrons)

→ normalized projected emittance = **~0.9 mm mrad**



→ **first demonstration of beam quality required for European XFEL**

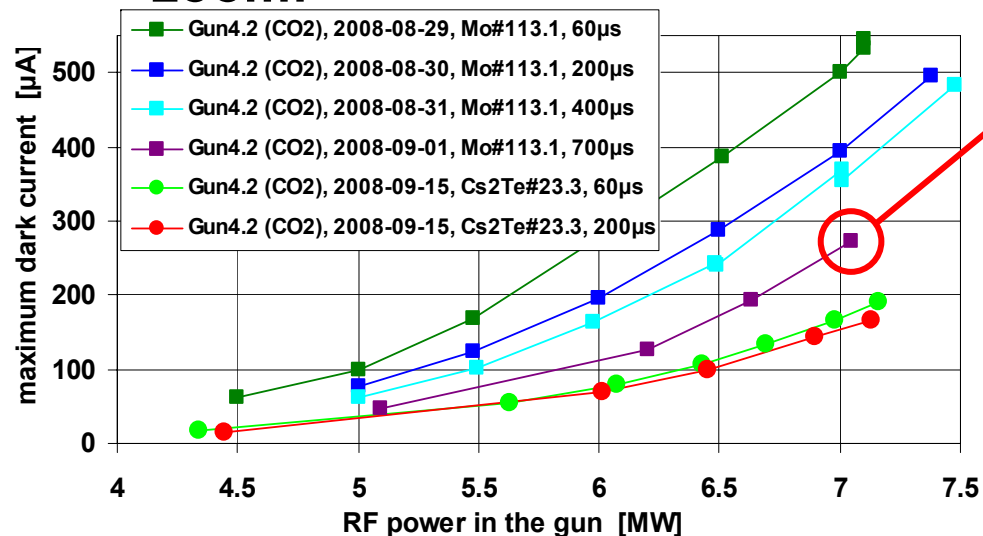


Surface cleaning techniques:

- HPWR: high-pressure water rinsing
- CO2: dry-ice cleaning, for details

• Major reduction of dark current by CO2 snow cleaning

zoom:



• operation with 50 kW average RF power demonstrated !

→ allows high brightness, high average current operation:
1–5 mA in 700 µs,
7–35 µA long term average

	Rep. rate	Pulse train length	Individual pulse	Aver.current [mA]	
				in train	long term
achieved at PITZ 	10Hz	200us, 1MHz (700us, 1MHz)	FWHM=18..19ps, rt≤2ps , 1nC FWHM=18..19ps, rt≤2ps , 1nC	1 1	0.002 (0.007)
XFEL: to be achieved in 3 Years	10Hz	650us, 5MHz	FWHM=20ps, rt≤2ps	5	0.0325
possible in principle	10Hz	1300us, 5MHz	(?)FWHM=20ps, rt≤2ps(?), 1nC	5	0.065
	50Hz	1300us, 1300MHz	No pulse shaping, 77pC	100	6.5

