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Introduction to the high gradient/high Q session

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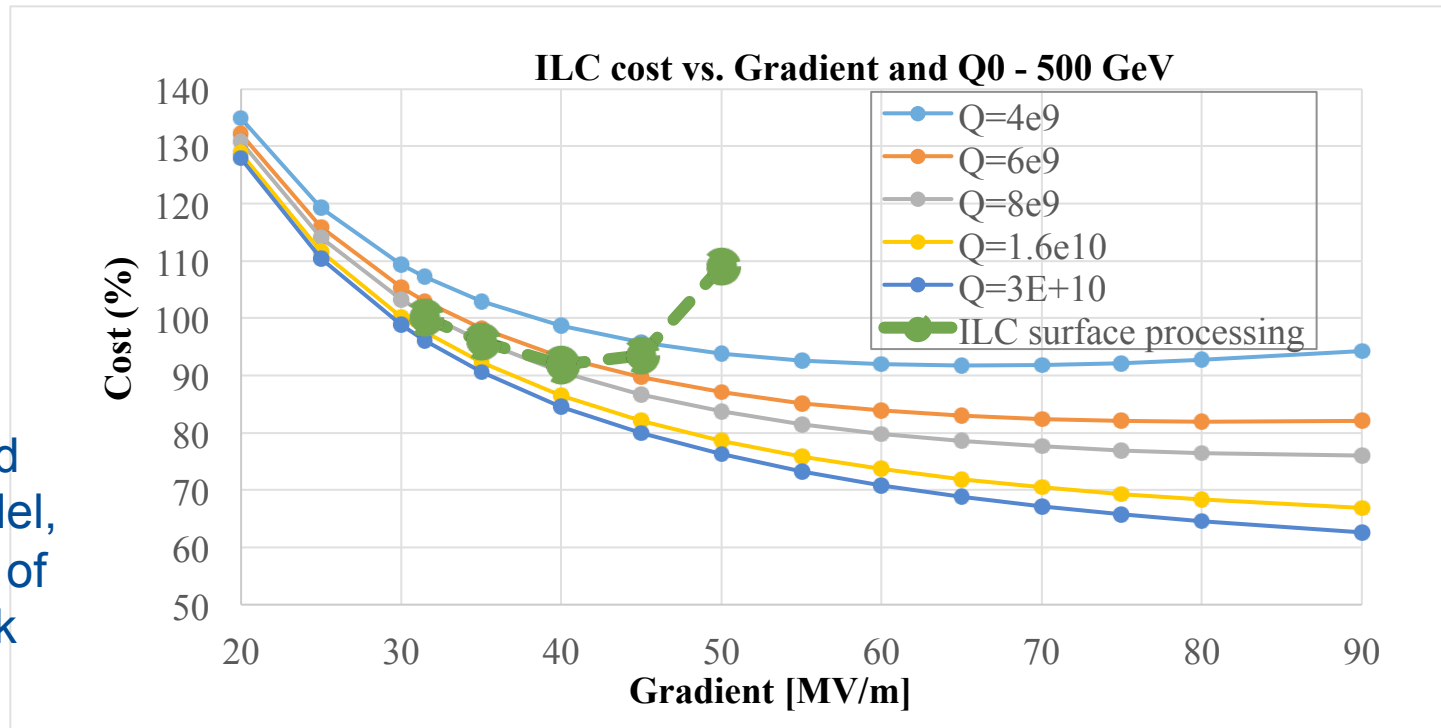
Goal of the session: past, present and future

1. Summarize: what are the achievable gradients and Q at high gradients with state of the art ILC surface processing; where do we stand in terms of field emission
 - Nick Walker, Rongli Geng
2. New results promising of very high gradients and high Q at very high gradients
 - Grassellino/Aderhold
3. New samples studies indicating potential pathway to higher gradients
 - Laxdal
4. Experimental max achievable gradients from Klystron measurements
 - Maniscalco
5. Theoretical predictions/explanations for maximum achievable gradients in SRF cavities
 - Checchin, Kubo

Talks 2, 3 and 5 have the common theme of “thin dirty layer on clean bulk” potentially being key to maximize achievable gradients

Achievable gradients and Q at high gradients: a major cost driver for SRF accelerators

- Even for case of ILC-like machine (low duty factor) Q is extremely important to reduce cost of accelerator
- We need to increase both achievable gradient and Q at high gradients to drive cost down



Simplified cost model, courtesy of N. Solyak

Provocative questions to address in this session

- What is the ultimate limit for achievable gradients in SRF cavities? What can we reach with bulk Nb, what with new materials? 50, 100 MV/m? Could we one day reach $> 100\text{MV/m}$? Is bulk Nb at the end of the road?
- Suppose we can reach systematically in $>90\%$ cavities 45MV/m with $3e10$ from the material/surface processing standpoint. Could we re-baseline ILC to operate at $40\text{-}45\text{ MV/m}$ with $3e10$, or would FE be an obstacle? Why would it be an obstacle? Could we overcome it?
- What can we expect for Q at the highest gradients? Can we dream of $Q > 3e10$ at 50 or 100 MV/m or are there practical or theoretical concerns for achieving that? What is the pathway?
- What research pathways should be more vigorously pursued to abate field emission? In situ processing in cryomodules? Robotic CM assembly?

Let's have a productive session!