Select BIO for Perry Wilson
(from Greg Loew)

- **Perry Baker Wilson,1927-2013**
- 1958 PhD thesis “Microwave Electron Velocity Spectrograph,” under Prof. Edward Ginzton in the Microwave Laboratory/Stanford.
- 1959-1964 Stanford University, Research Associate, High Energy Physics Laboratory (HEPL)
- 1964 -1966 Associate Director for Operations at HEPL
- 1966-1968 Senior Research Associate
- 1968-1969 Visiting Scientist at CERN
- 1969 SLAC as a Senior Research Associate.
- SLAC first assignment: explore the possibility of converting the three-kilometer-long copper linear accelerator to a higher duty-cycle, higher-gradient superconducting niobium machine (now LCLS-II !!)

INVESTIGATION OF THE Q OF A SUPERCONDUCTING MICROWAVE CAVITY

- P B WILSON, *High-Energy Physics Laboratory, W W Hansen Laboratories o] Physics, Stanford University*
- Wilson is Sole author
  - acknowledges, Fairbanks and Pierce
- NUCLEAR INSTRUMENTS AND METHODS 20 (1963)
- Note BCS :1957, Mattis and Bardeen :1958
- surface conductivity for lead and tin superconductors as a function of temperature, frequency, rf field strength.
- Motivation: possible application of superconductivity to particle accelerators, superconducting linacs and rf separators.

Cavity

- Copper TE_{011} cavity, 2856 MHz, 14 cm in diameter and 14 cm long, with a surface deposit of the superconductor. G =780 Ohm.
- Indium gaskets at the joints.
- TE_{011} mode picked because there is no current flow across the junctions between the cylindrical cavity side wall and the end plates.
- The Q therefore does not depend on the quality of the contact at these junctions.
- A re-entrant trap in one end plate perturbs the frequency of the unwanted, degenerate TM111 mode.
- Gives a block diagram of the microwave circuitry involved for measurements.

Pioneering Results

- The *Q* for tin and lead cavities measured at 1.8 ° K, highest reached 2×10^8 for lead and 5×10^7 for tin.

=>R_s for lead $3.6\times10^{-6}\ \Omega$, R_s for Sn $15.6\times10^{-6}\ \Omega$

- Surface resistance fitting was done with a Pippard two fluid like model:

$$R_s = A(\omega) R_n \frac{t^4(1-t^2)}{(1-t^4)^2} + R_0$$

- *Q* was constant with power up to about 3 W, reaching peak magnetic fields of about 40 G for tin and about 70 G for lead.

P. Wilson pioneering measurement 1963,
H_{max} 70 Gauss (power limit) Q = 2.2x10^8

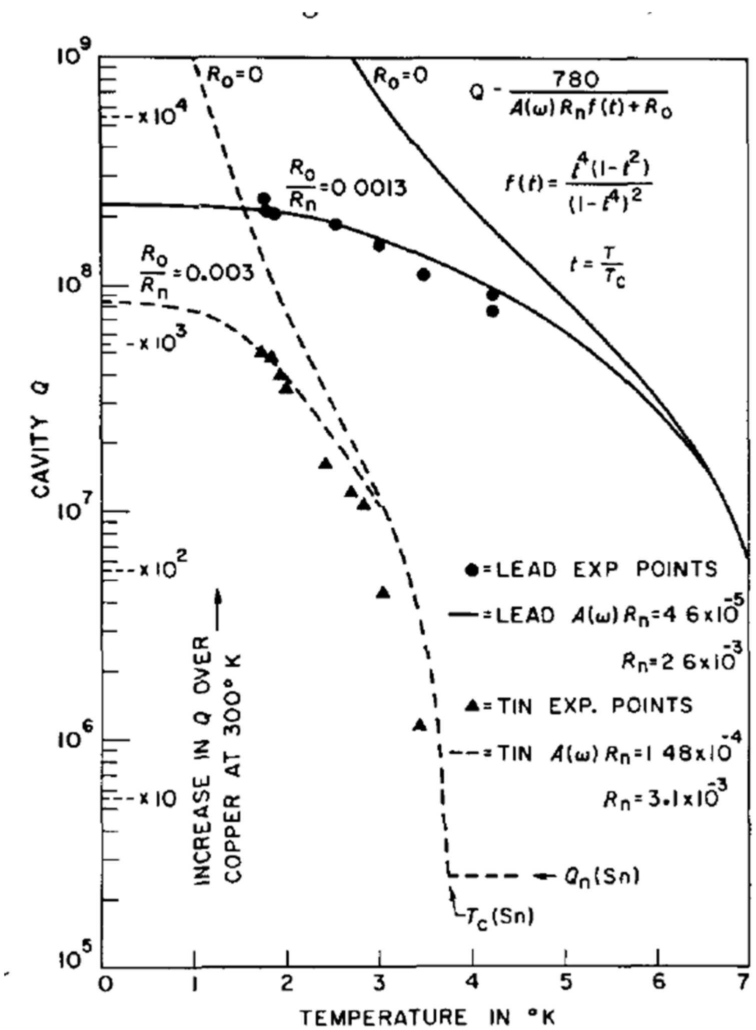

Fig 3 Cavity Q as a function of temperature

Rapid progress in field: 10 years later, CERN
Q: Hrf max near 800 Gauss, Max Q at low H = 8.3 x10^9

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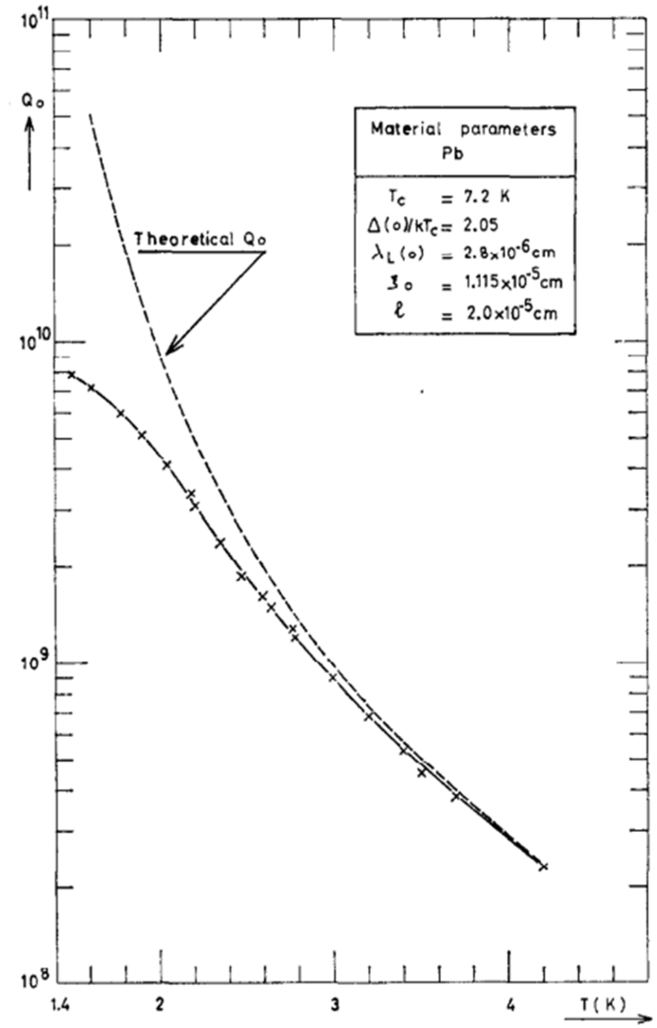

Fig. 5. The Q_0 variation at 2.85 GHz as a function of temperature for a Pb-plated TE_{011} cavity. (×) = measured values; dashed curve = Q_0 (theory); full curve = Q_0 (theory) —Q_0 (residual).

Wilson’s role in this pioneering SRF research was historically crucial for the entire accelerator community.