

FIGURES

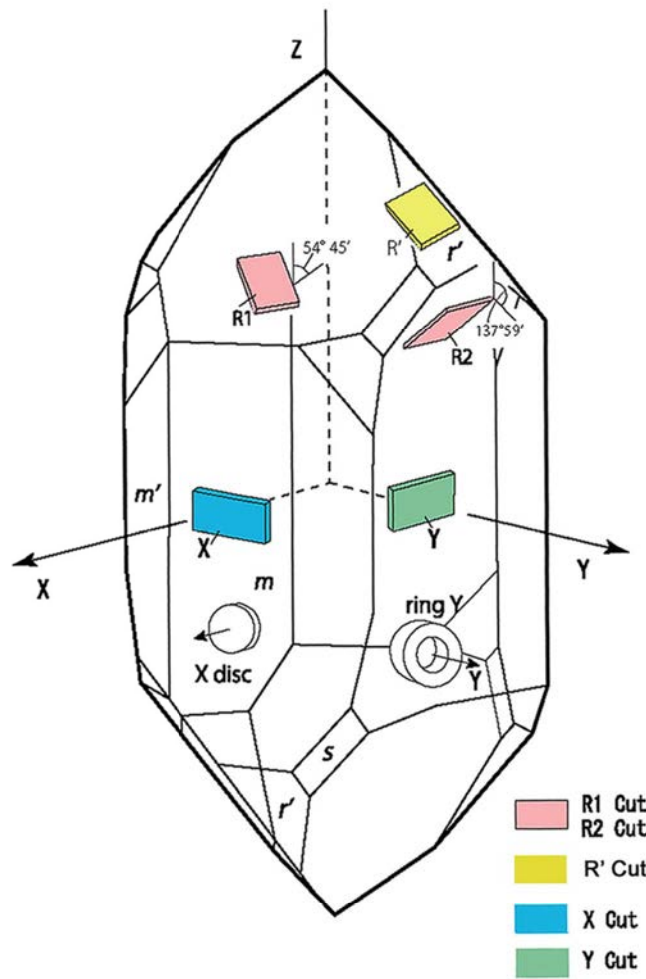


Fig. 1 Various cuts in quartz crystal

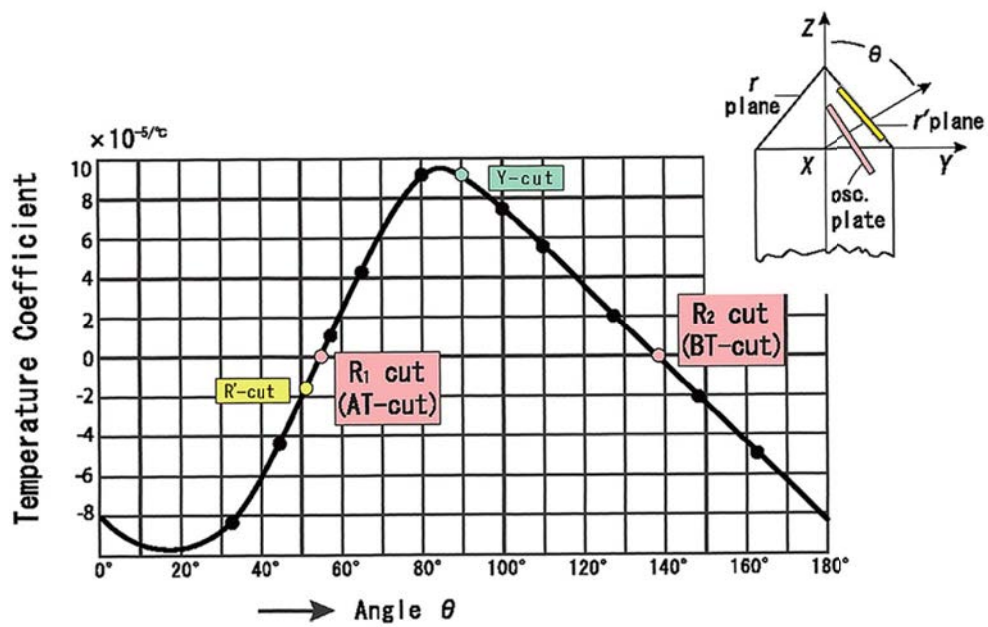


Fig. 2 Temperature coefficient versus cutting angle θ of plate



Fig. 3 Crystal plate holder apparatus used by Koga in his early research (1930)

(Tokyo Institute of Technology Museum)

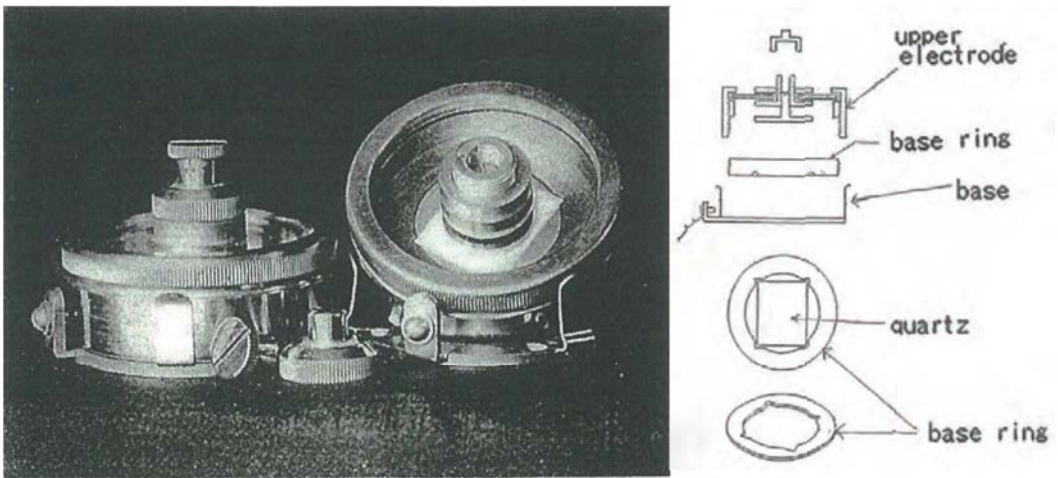
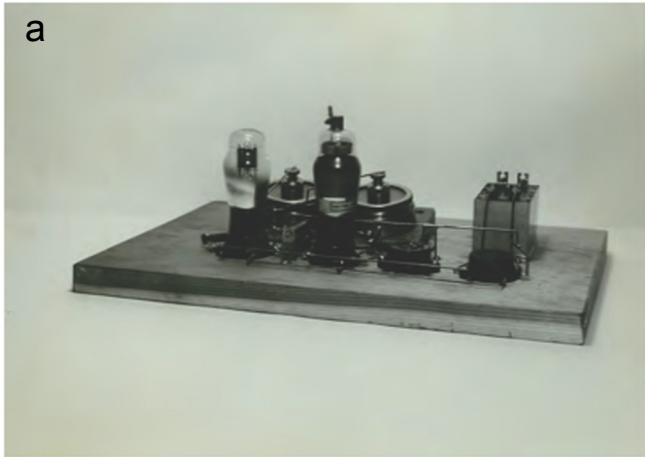


Fig. 4 Koga-type holder used for testing of temperature-insensitive plates

(Tokyo Institute of Technology Museum)



Quartz oscillator



Time indicator
(Tokyo Institute of Technology Museum)

Fig. 5 Components of the first model quartz clock (KQ-1) exhibited at the 1937 Paris International Exposition

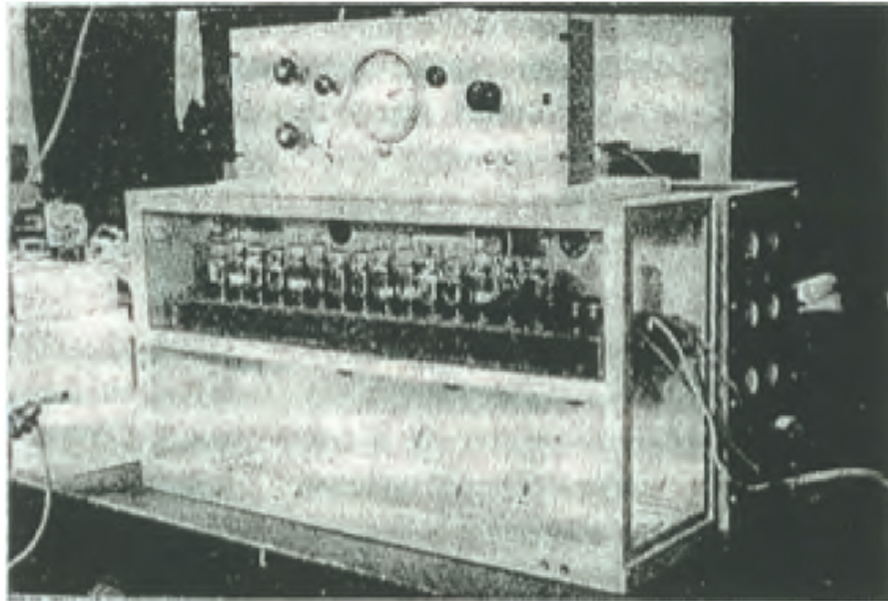


Fig. 6 Total view of the improved KQ-1 model used in cooperation with Tokyo Observatory

(KQ-1 employed the R_1 -cut oscillation plate. 1 MHz oscillation frequency was converted to 10 Hz by 5-stage multivibrator-type frequency demultiplier.)

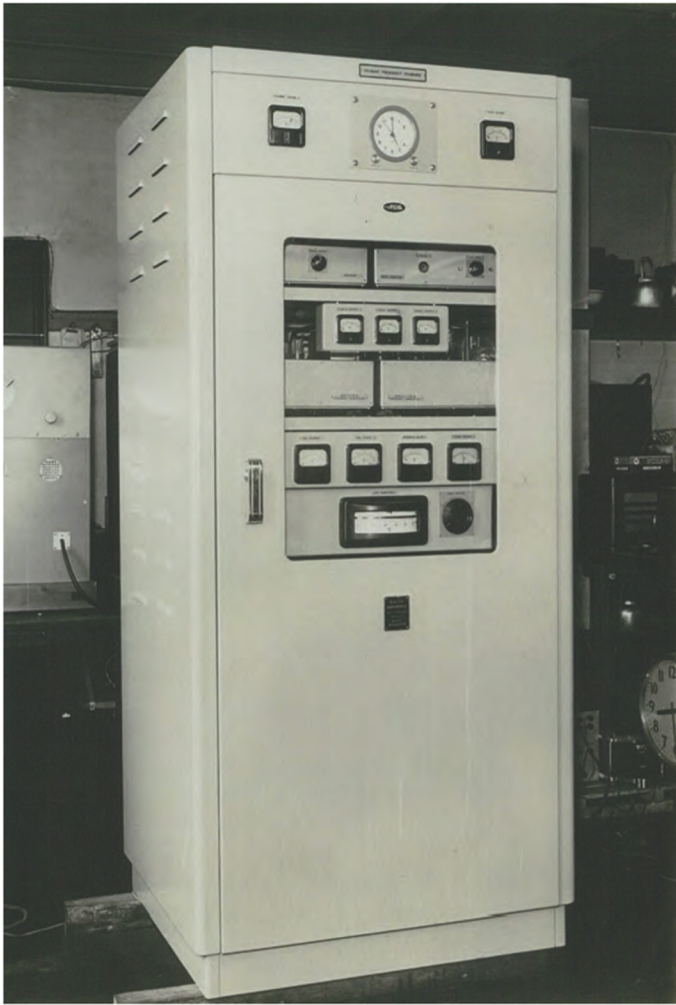


Fig. 7
Koga's final model KQ-6
installed at KDD Co. Ltd.,
providing time and frequency
standards

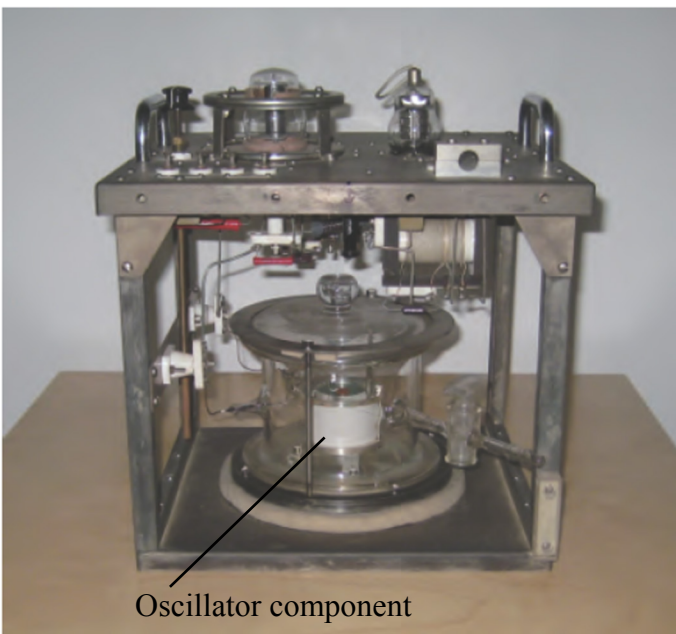


Fig. 8
Oscillator component of KQ-6
(Tokyo Institute of Technology
Museum)



Plug-in types widely used in conventional transmitters



Enclosed-type tubes made at Koga's Lab



Recent mini-size oscillation elements

Fig. 9 Various types of quartz oscillation elements

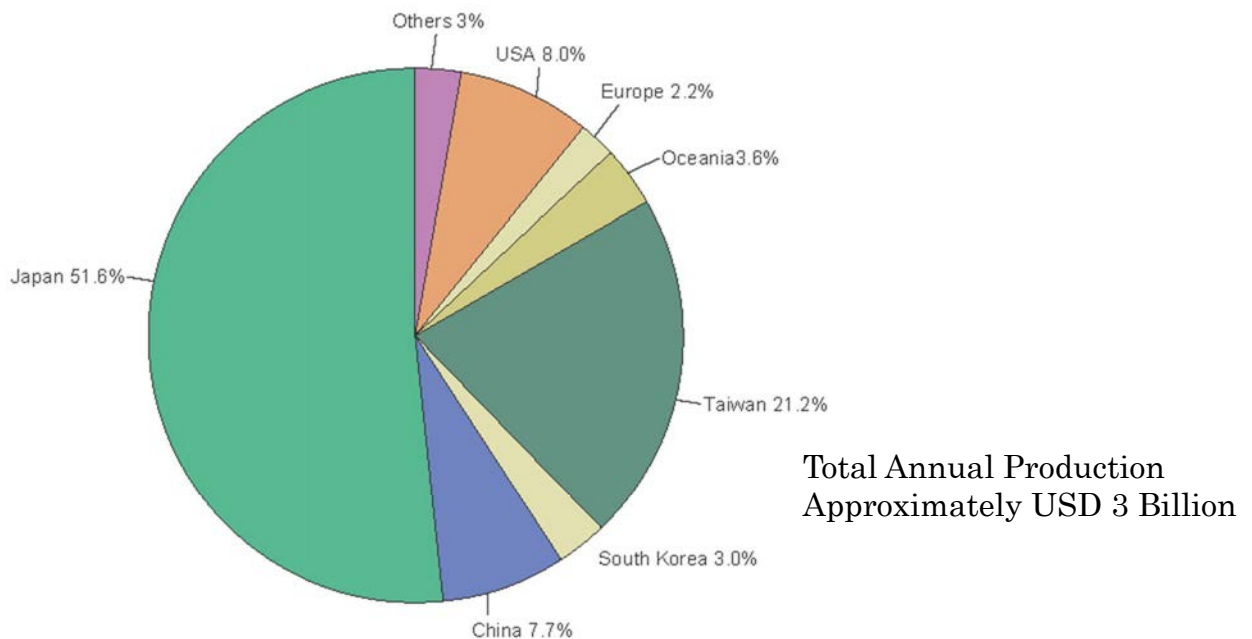


Fig. 10 Global quartz-based products (2013)
(From a report by the Quartz Crystal Industry Association of Japan)