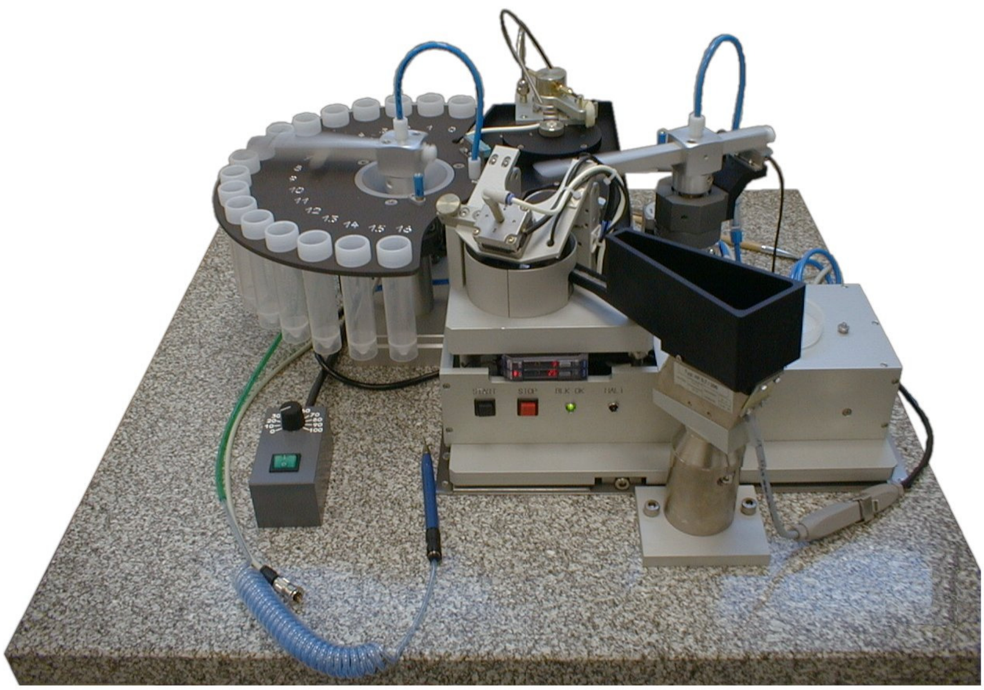
Frequency Sorter

FS-05

Supplementary
information on MESA
blank processing
November 2007



EFG GmbH BERLIN

Supplementary information on MESA blank processing

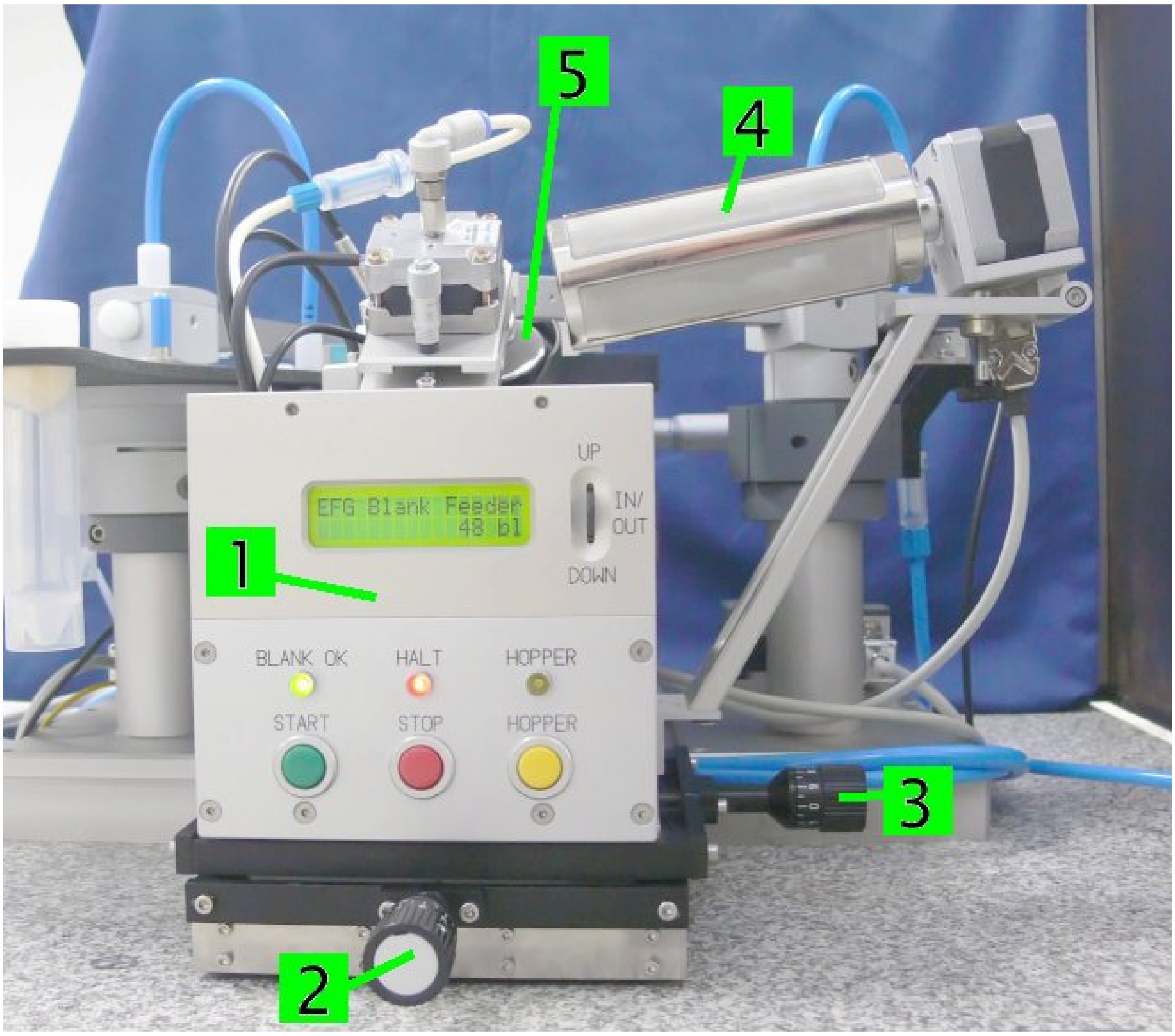
This document is meant to give more detail information on the use of the EFG Frequency Sorter for processing MESA blanks.

Blank Feeder

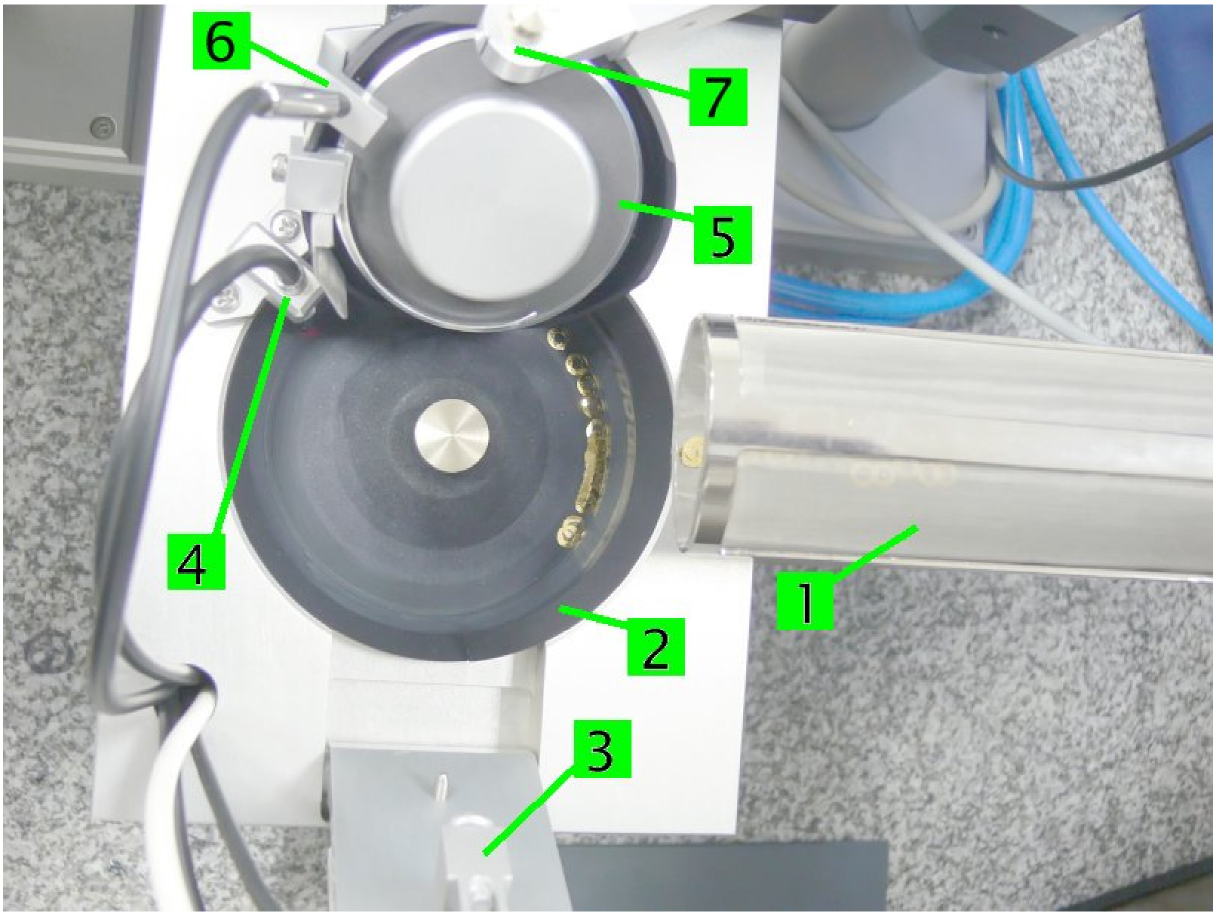
The new blank feeder consists of three main parts:

- The feeder control unit
- The feeder reservoir
- The blank handling system

The feeder control unit has a front panel with buttons and indicators [1]. It is mounted on an xy-table with adjustment screws [2] and [3]. The blank reservoir is a very fine mesh metal cylinder [4]. The reservoir is sloping. A motor spins the reservoir. Few gentle spins of the reservoir make blanks slide down towards the edge of the reservoir from where they drop into the blank handling system [5].

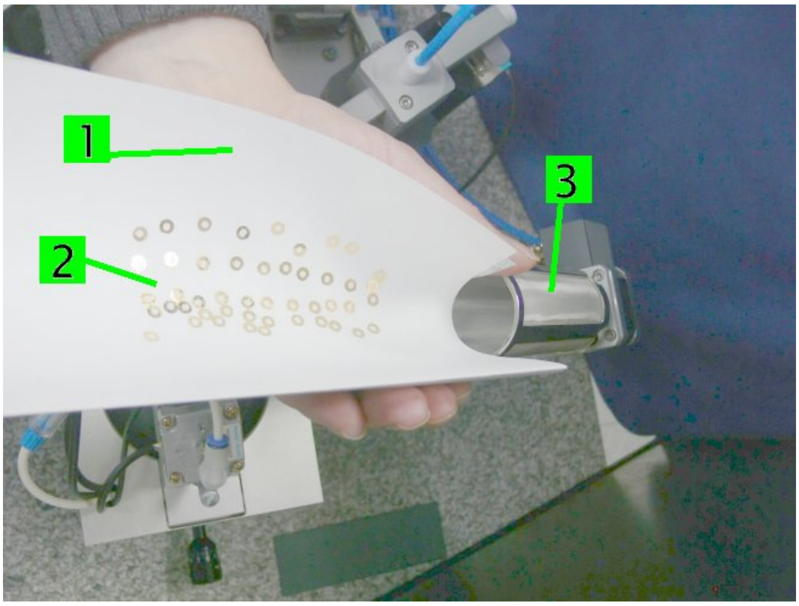


The next photo shows some blanks in the reservoir [1] and more blanks poured into the spinning lower cup [2], where they single out. In the photo, the plate bearing the pickup nozzle is opened and one can only see the nozzle holder [3]. While the lower cup spins, blanks are dectected by an optical sensor [4]. The nozzle picks blanks at the edge and transports them to the upper cone [5]. Again blanks are detected by an optical sensor [6] and are exactly presented at the blank feeding position, which in the photo is hidden behind the feed arm [7].



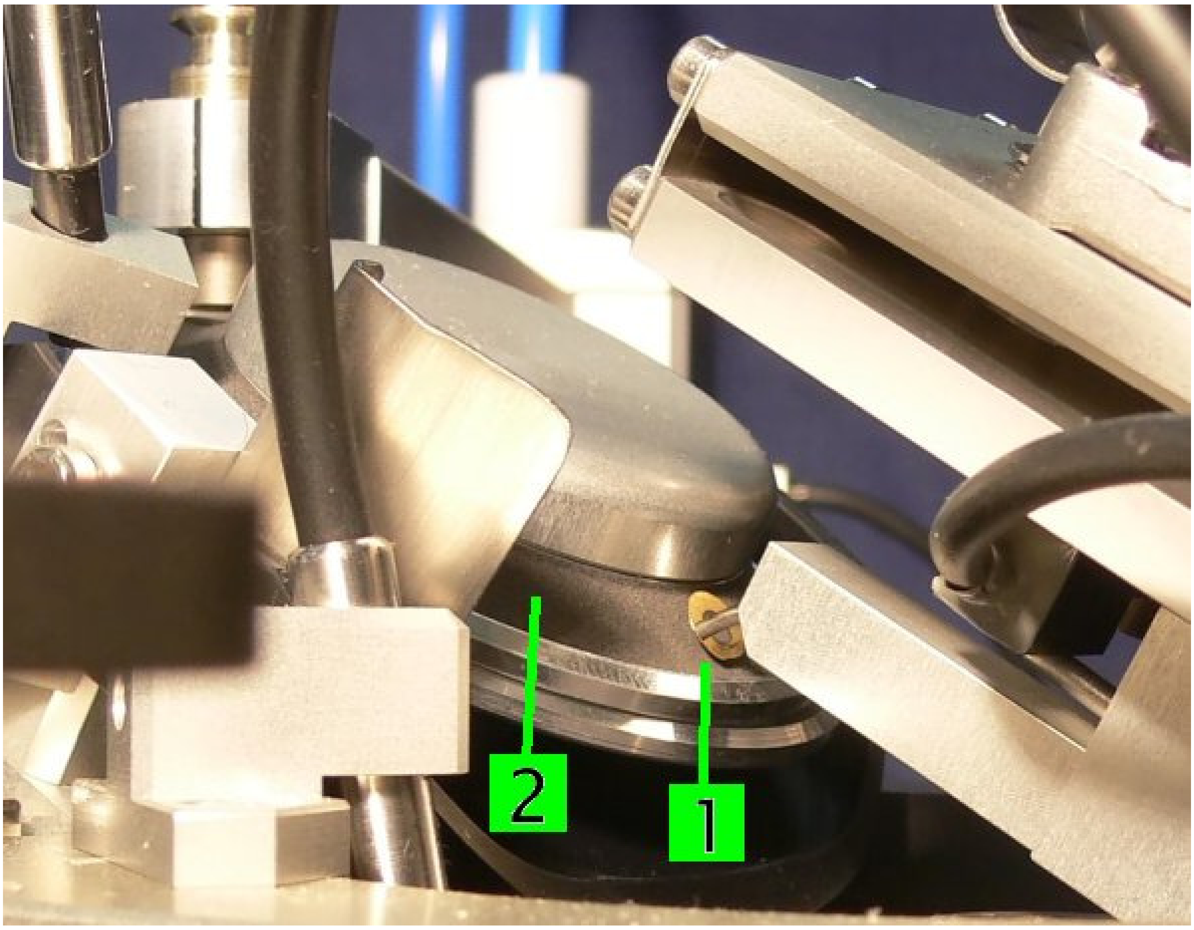
The following points are important for MESA handling:

- MESA blanks can gently be fed into the reservoir using e.g. a flat shovel
- Without touching a blank, the pickup nozzle is positioned over it at the outer edge
- The nozzle gently picks blanks up by suction
- Blanks are unloaded from the upper cone with a thick pickup nozzle exerting minimum suction force

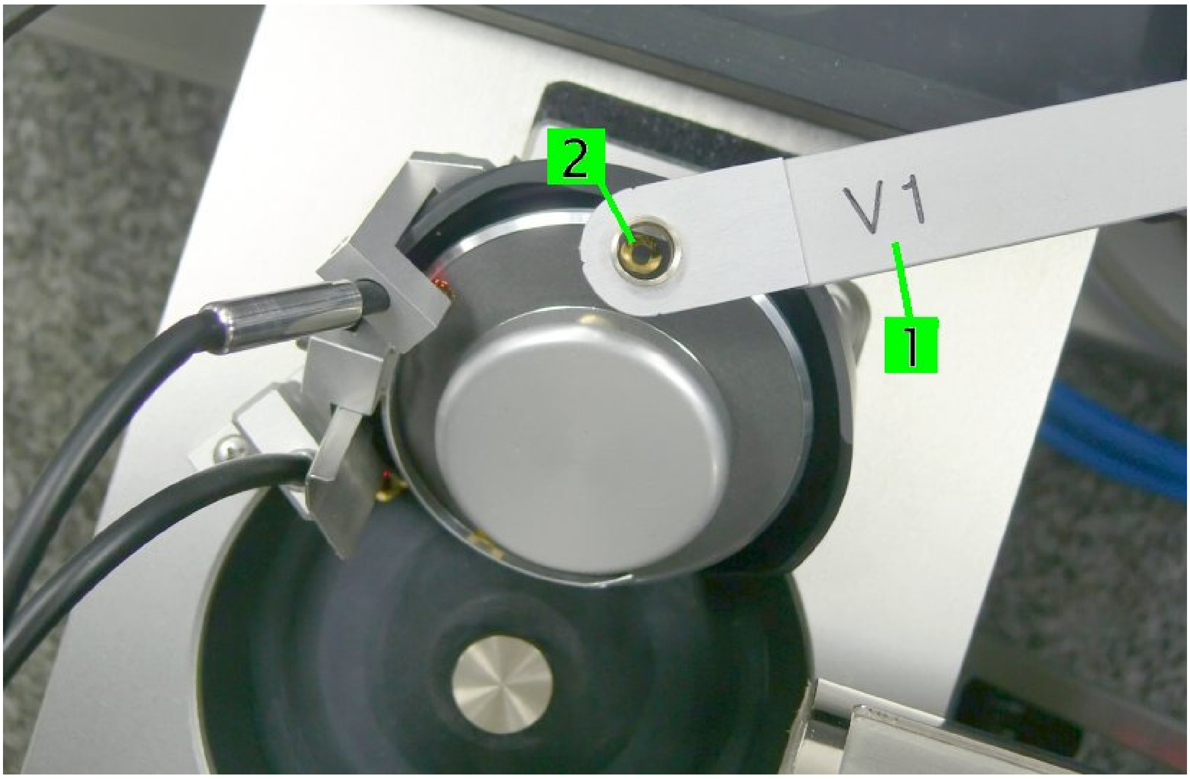


A piece of slightly bend paper [1] was used as a shovel for filling the blanks [2] into the reservoir [3].

A blank is picked up at the outer edge by the nozzle [1]. It is then dropped onto the upper cone [2].



The exchangeable pickup nozzle has been removed from the feed arm [1]. Through the hole one can seen taht a blank [2] has been provided at the feed position.



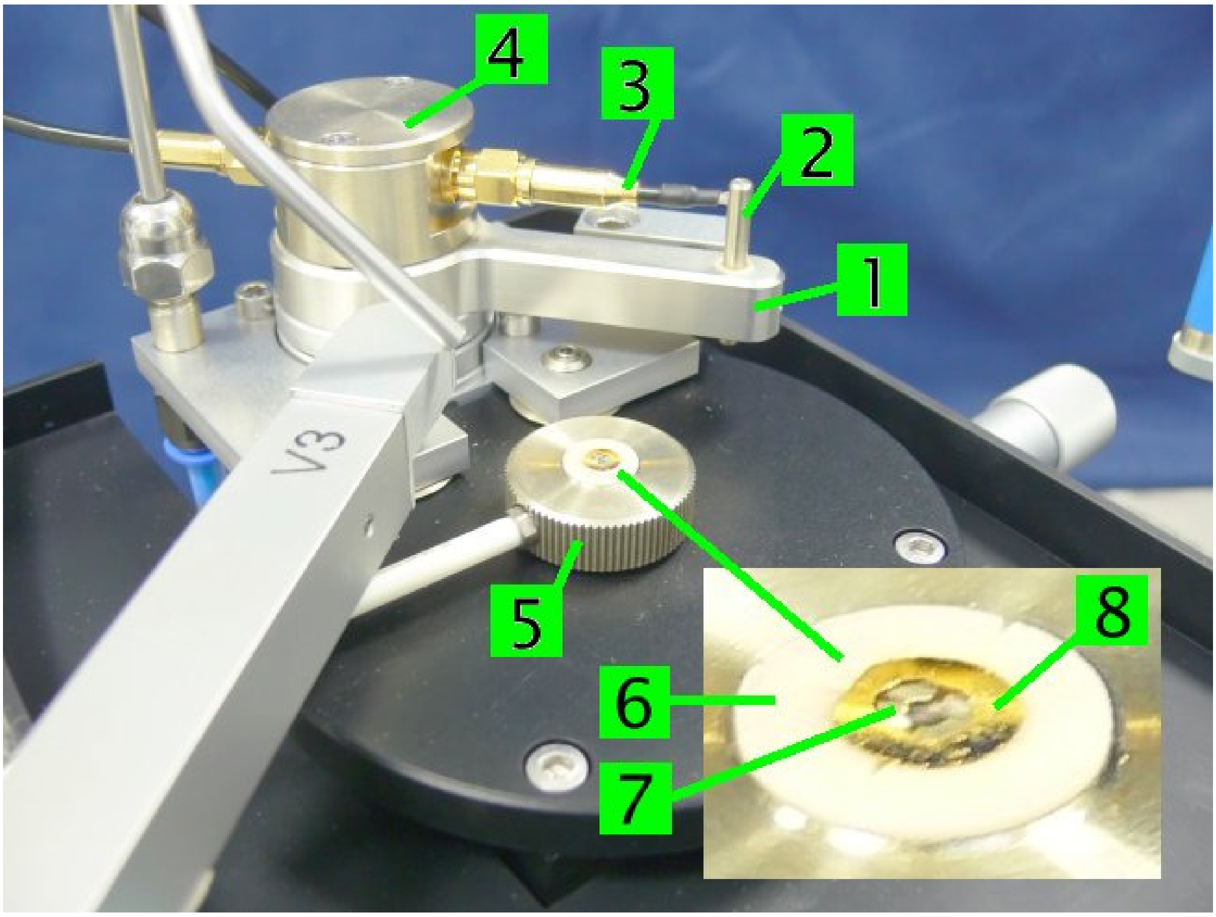
Small-tip and wide-tip exchangeable suction nozzles can be seen in the next photos. The central bore [1] for vacuum suction has about same diameter for both types of nozzle. However, the wide-tip nozzle has three large channels [2] where the vacuum is by-passed. The acting force is therefore spread over a large area, which is favourable for treatment of MESA blanks.

1.

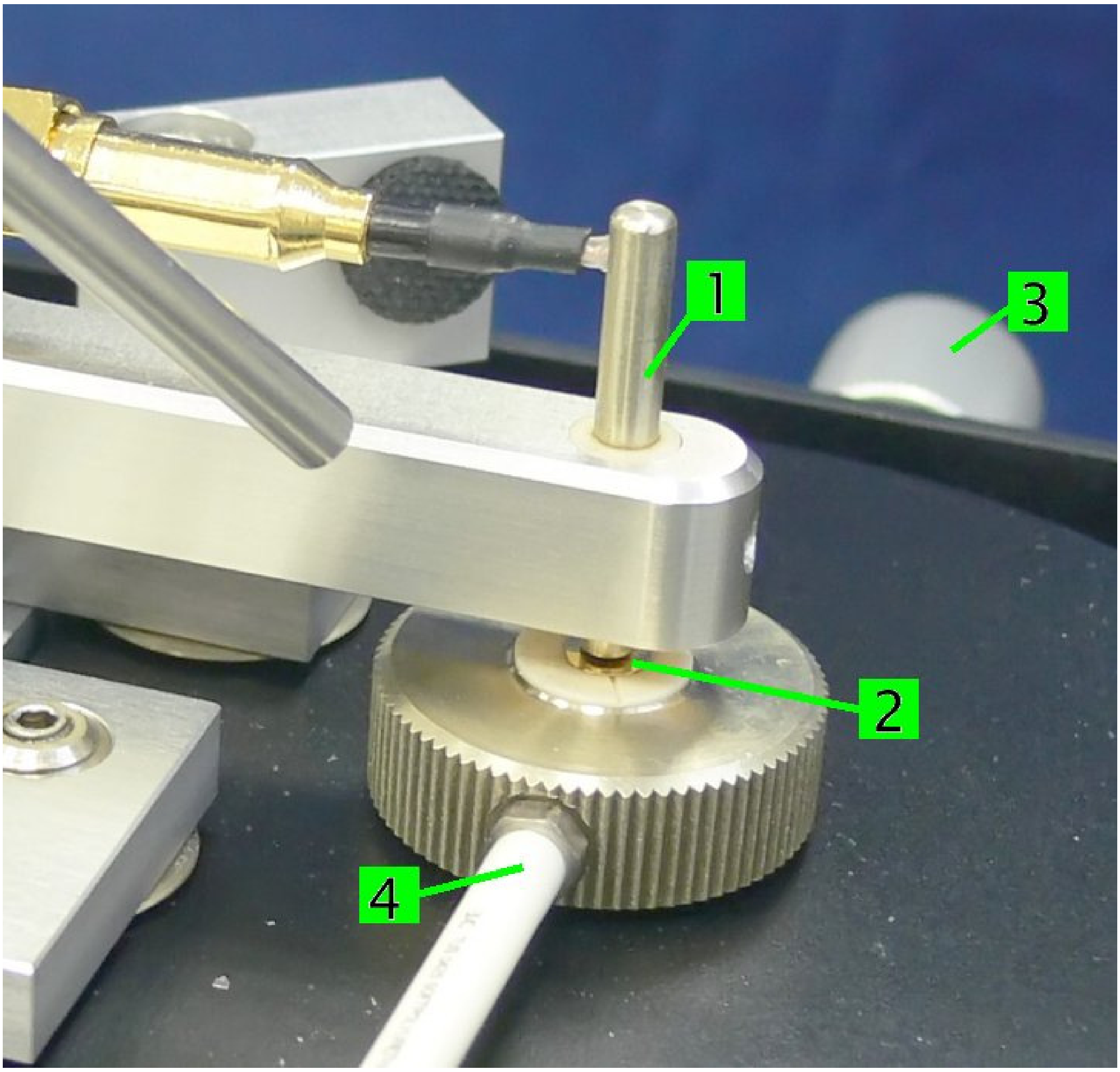
2.

Measurement System

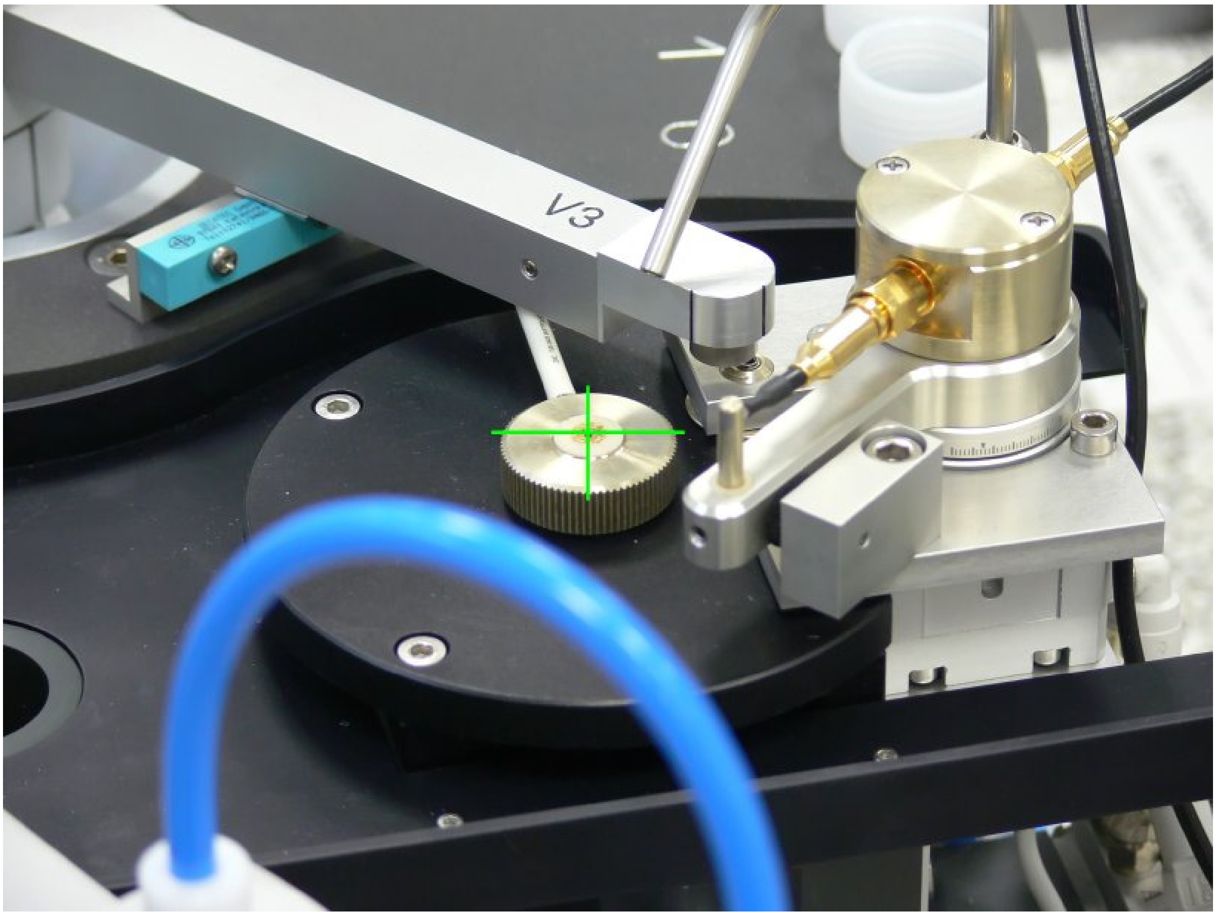
The next photo gives an overview over the components of the measurement system. The measurement arm [1] holds the measuring electrode [2]. The adaptor [3] connects the measurement electrode to the shielded pi-filter housing [4]. The lower electrode [5] has a ceramics insert [6] and the counter electrode is in the middle [7]. The sample blank [8] rests on the ceramics insert. It is a MESA blank with a transparent inner membrane so that the counter electrode [7] can be seen through it.



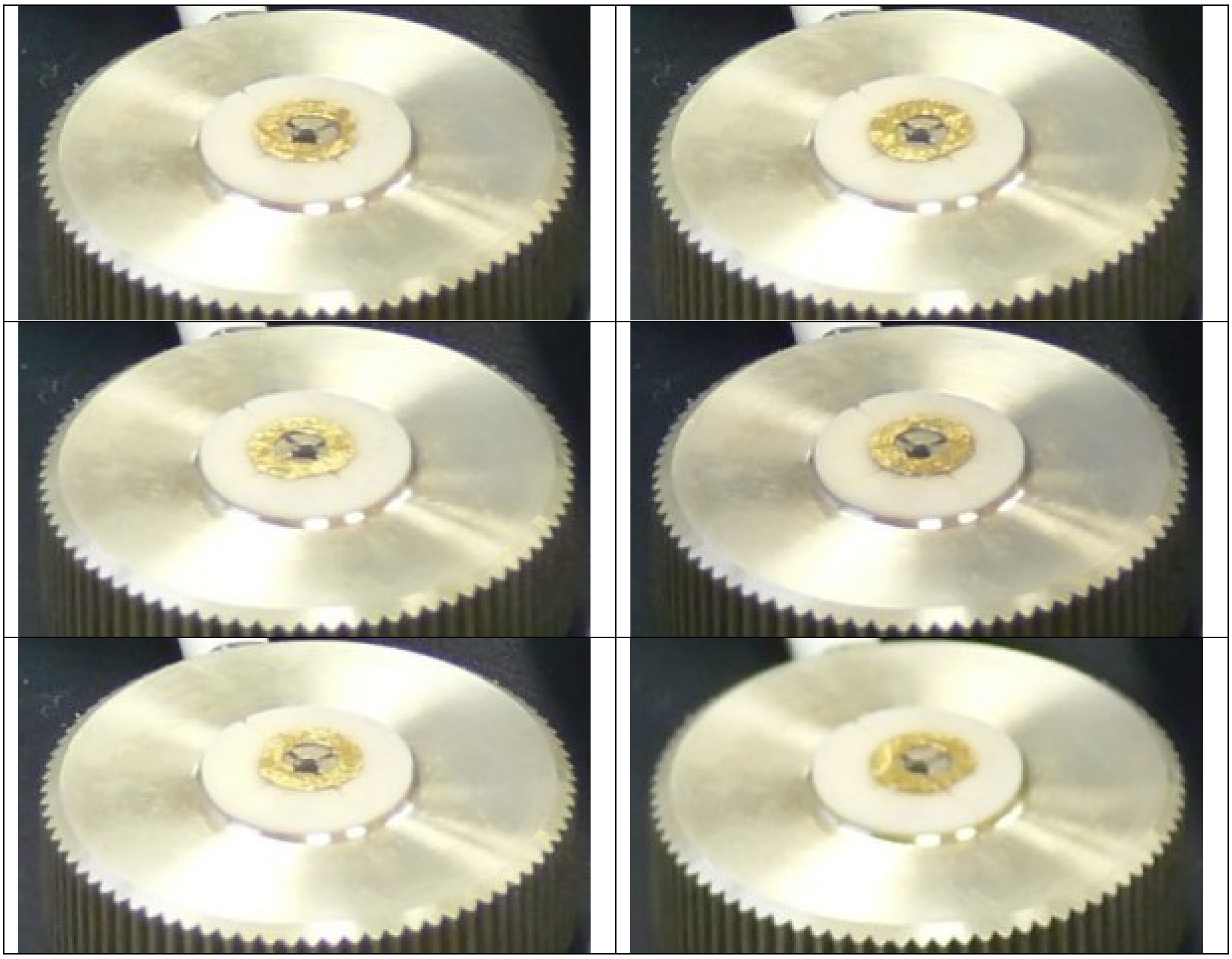
The next photo is a close up of the measurement system with closed measurement arm. The upper electrode [1] is positioned exactly over the lower electrode only leaving a small air gap [2]. The air gap height can be adjusted with a micrometer screw [3]. The blank is kept down to the lower electrode by vacuum suction [4].



In the next photo is marked where blanks are deposited for measurement. However, each handling has a limited precision. Also blanks may have a flat side like the ones used in this demonstration. Therefore the position where blanks are placed will deviate within certain limits.



The next series of photos were taken during repeated blank handlings. The magnified center part of the above image is shown. While deviations in blank positioning can clearly be recognized, each blank is positioned with most of the MESA membrane area over the lower electrode. This means that all these blanks will give valid measurements as was proven at least for this kind of MESA.

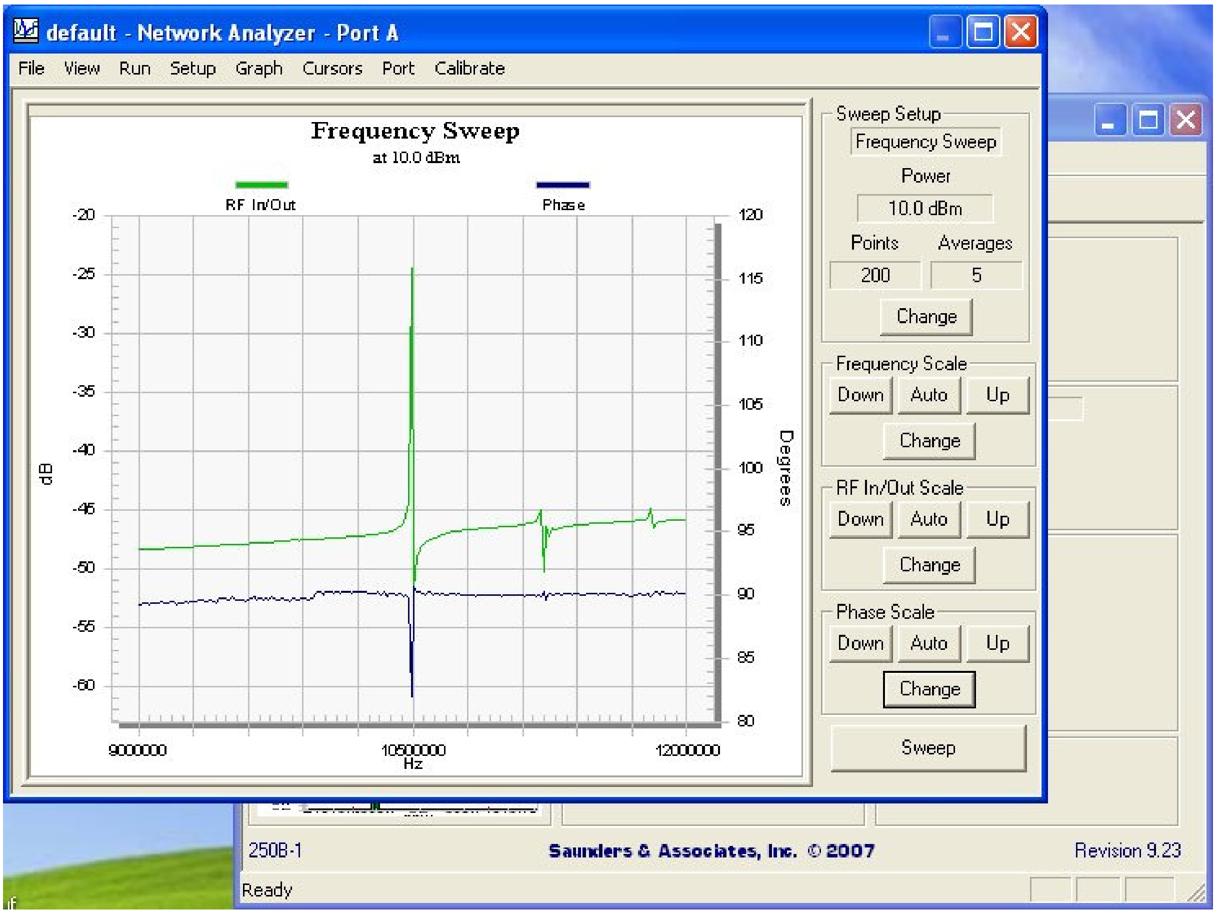


The Saunders Measurement System

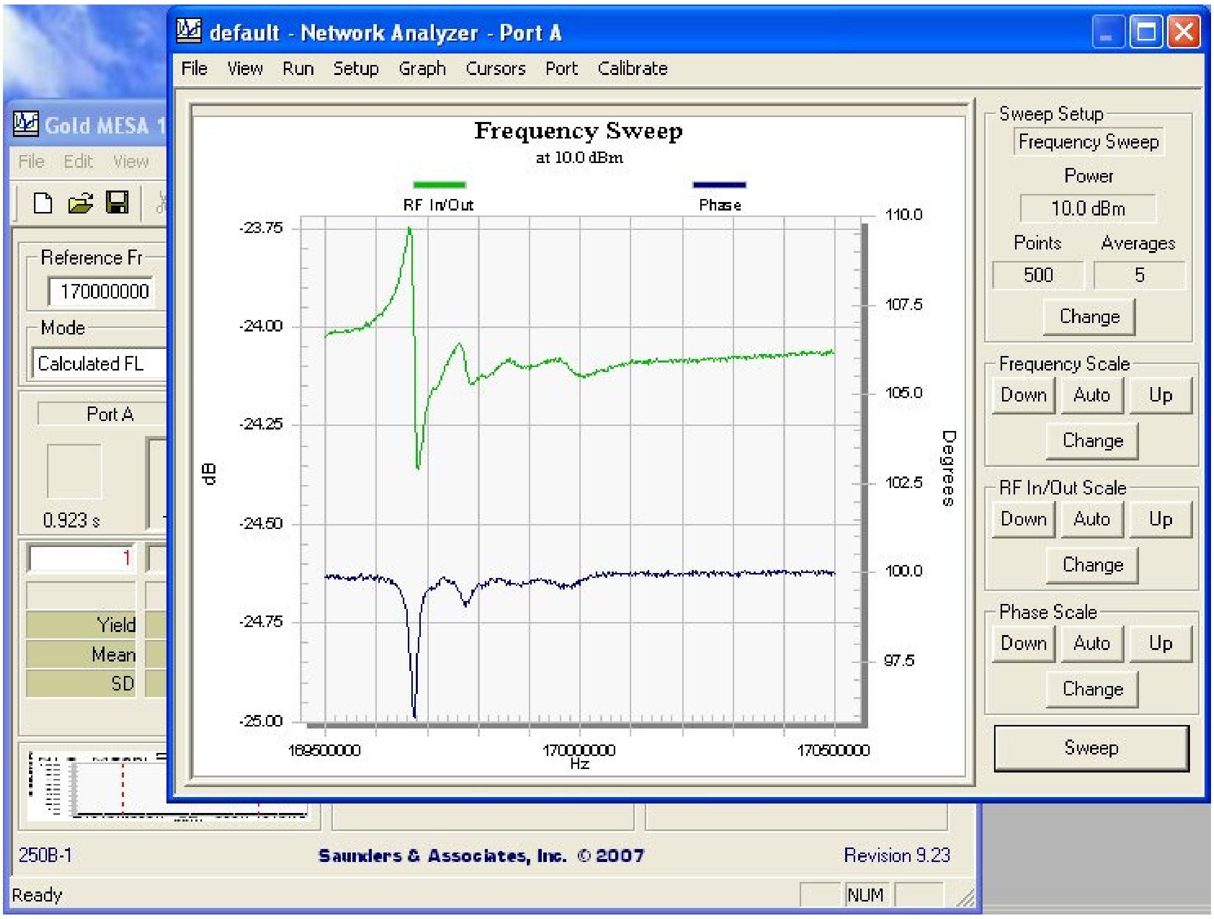
The Saunders measurement system includes the hardware as well as the control and evaluation software. The high-end extension card are called series „250C“ cards and are certified for frequencies up to 500 MHz.

Measurement schemes are defined and saved in so-called QCC-files. Saunders ship their cards with standard measurement schemes that can easily be applied for normal quartz blanks. The standard schemes were used without problems in several tests for blanks with frequencies around 20 MHz.

The next image shows the network response of a 10.5 MHz blank which we use as a standard for comparison. The green curve is the RF In/Out response and gives a 20-30 dB signal. Also the phase response is sharp and clearly visable.



While the standard schemes work out-of-the-box for normal blanks, MESA blanks will definitely require modified schemes. At EFG we could demonstrate that the measurement system gives proper network data for 170 MHz MESA blanks. However, the absolute value of the signal response at the resonance frequency is much smaller (here about 0.5 dB) than that shown above.



While the signal is clear, the standard measurement scheme expects large signals and will probably classify the blank as „dead“.

Therefore we must stress the following points for high-frequency MESA blanks:

1. Measurements of MESA blanks are technically possible.
2. The signal response is small but unambiguously established.
3. The Saunders standard measurement schemes will most probably not work.
4. EFG cannot offer support for establishing measurement schemes.
5. EFG does provide two strategies for implementing customized measurements:
    a. External LabVIEW 8 VIs
    b. External ActiveX DLL or DLL-server