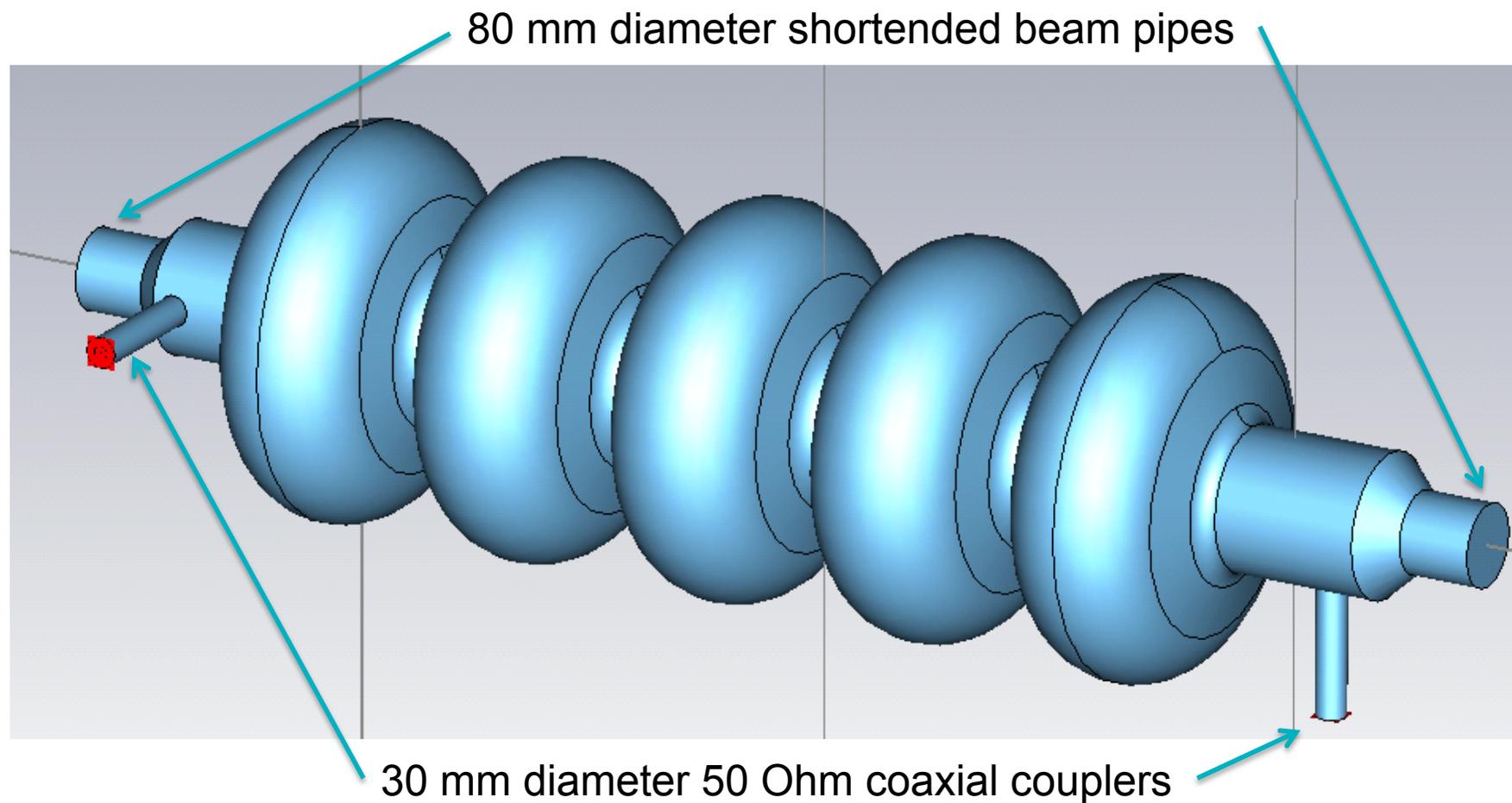


## Damping Considerations for Coax-type Couplers

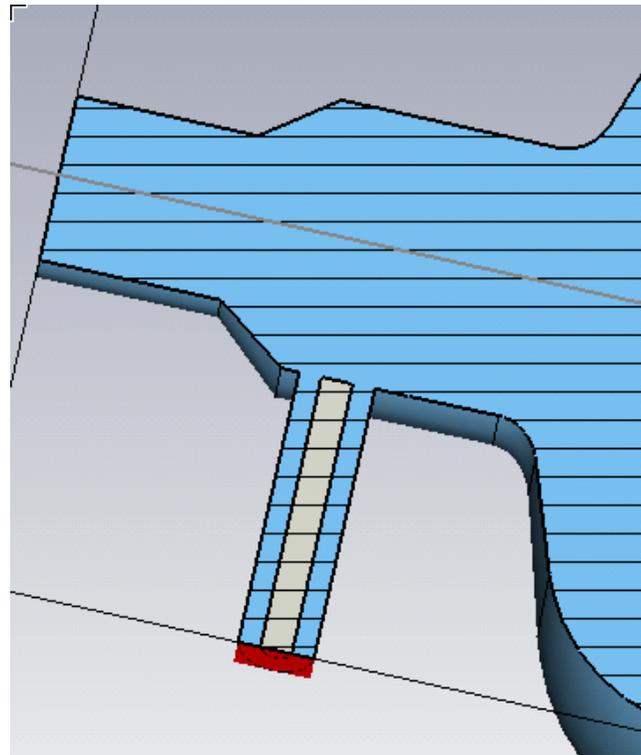
- **H.-W. Glock**
- **Universität Rostock - Institut für Allgemeine Elektrotechnik**
- **CERN-SPL Video Meeting, 3.5.2010**

## SPL - HOM $Q_{\text{load}}$ : Full Setup Computation: Coax-Coax-Transmission

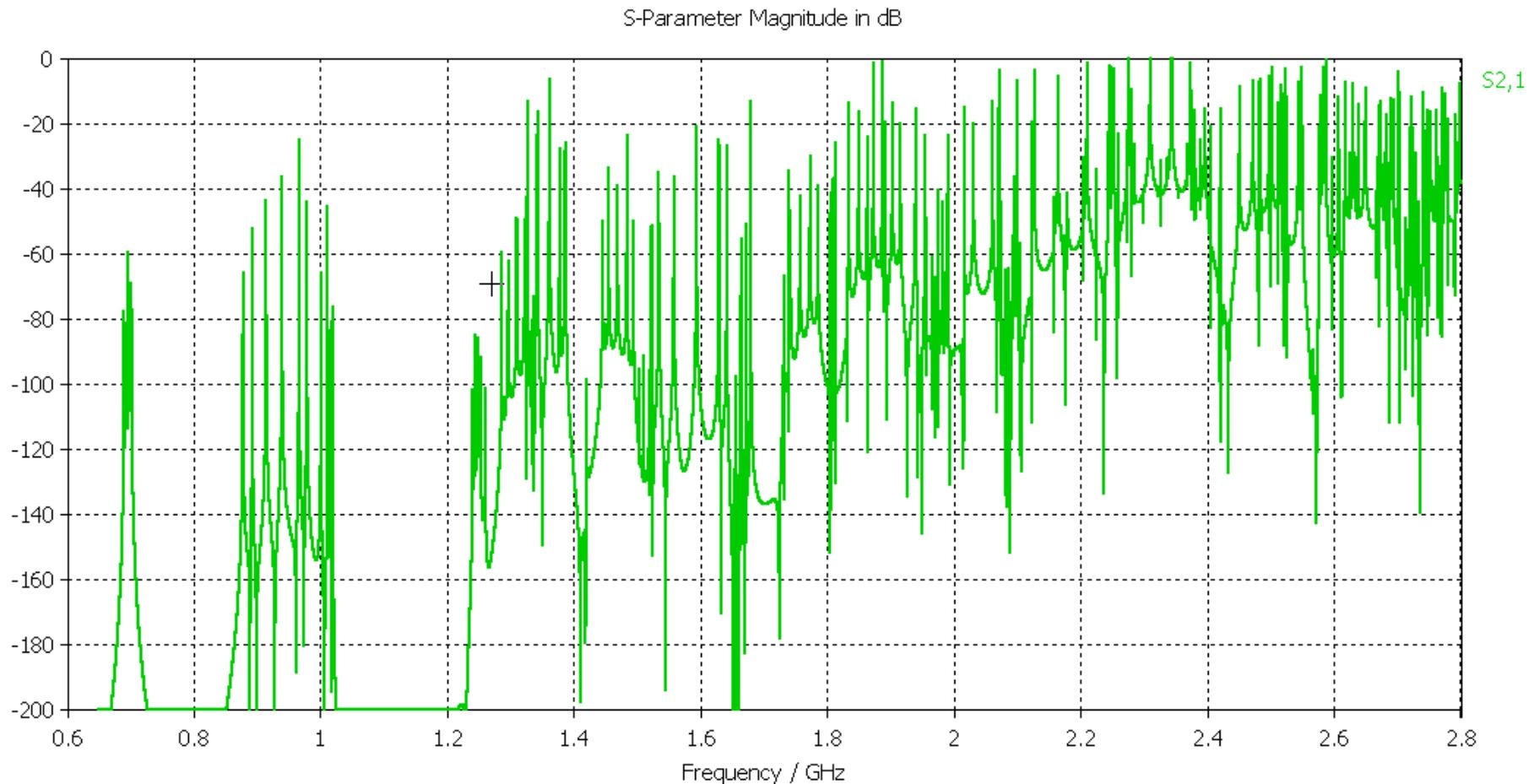


## Coax with antenna tip depth = 0:

- to avoid extreme Q-values
- scaling in second step using coupler section's S-parameters

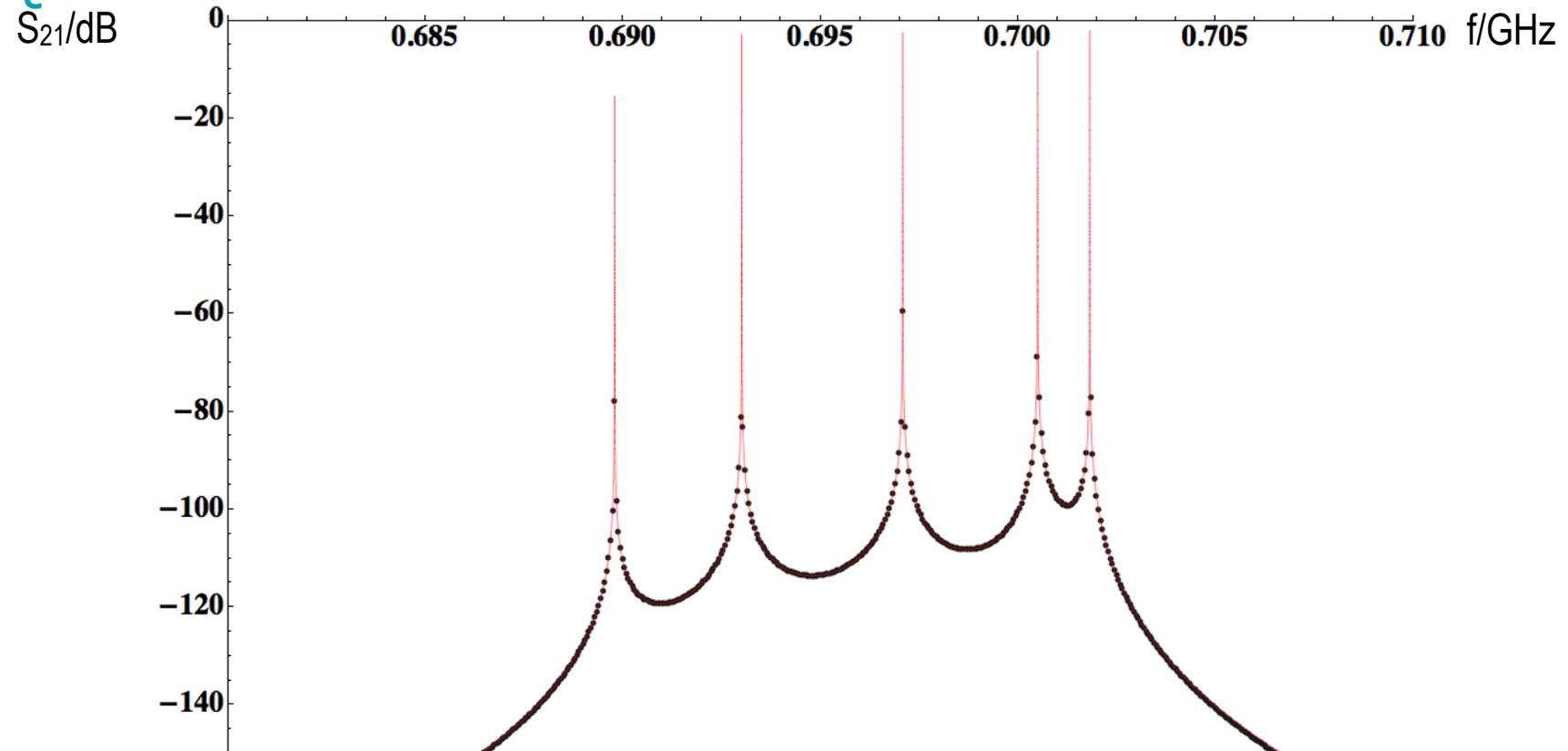


## Entire transmission spectrum 0.65 – 2.80 GHz: - more than 400 resonances with wide Q-range



## Using Pole-fitting algorithm\* to determine loaded

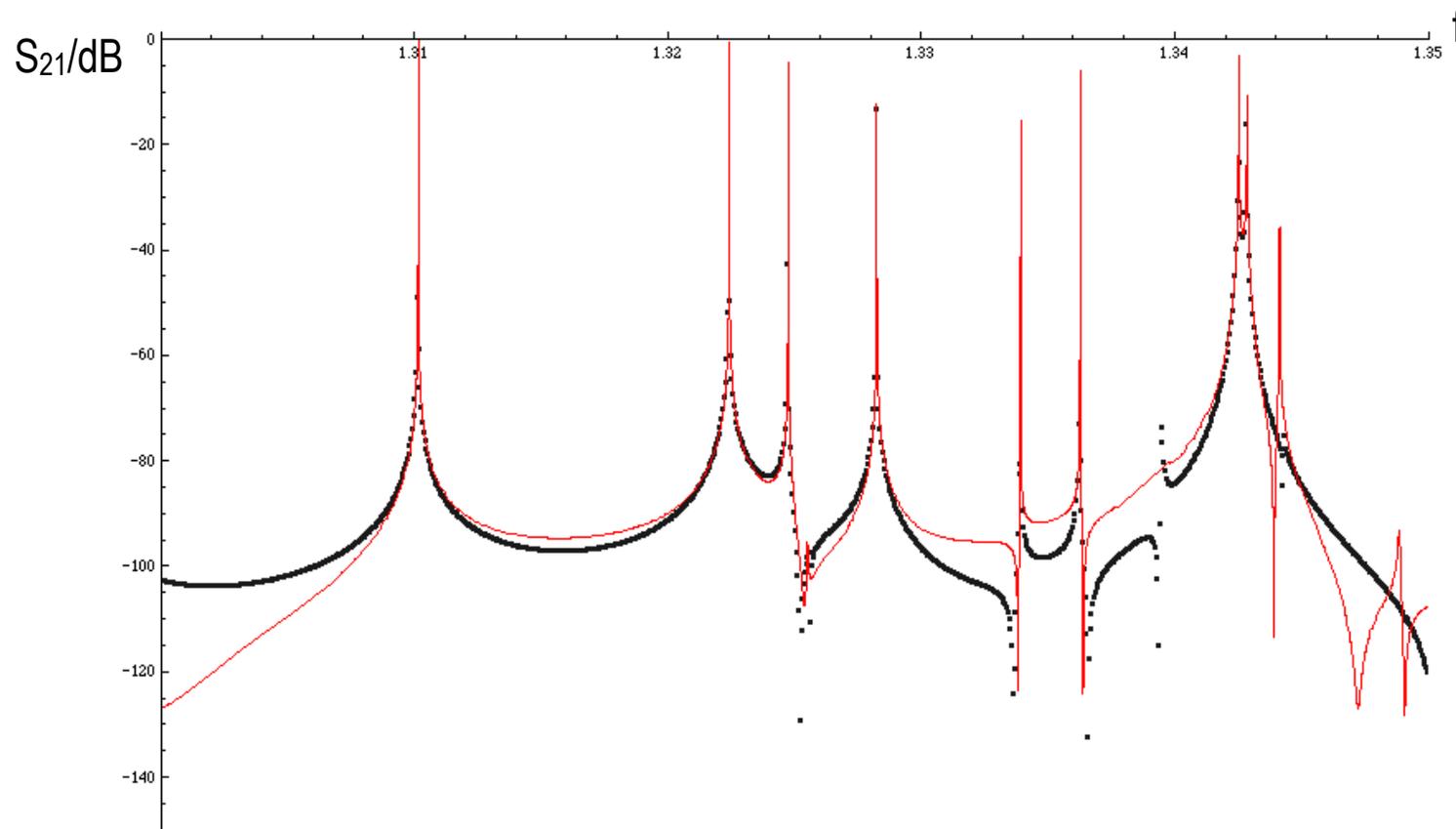
Q's



fundamental mode passband - dots: cstStudio© computation - line: fit result

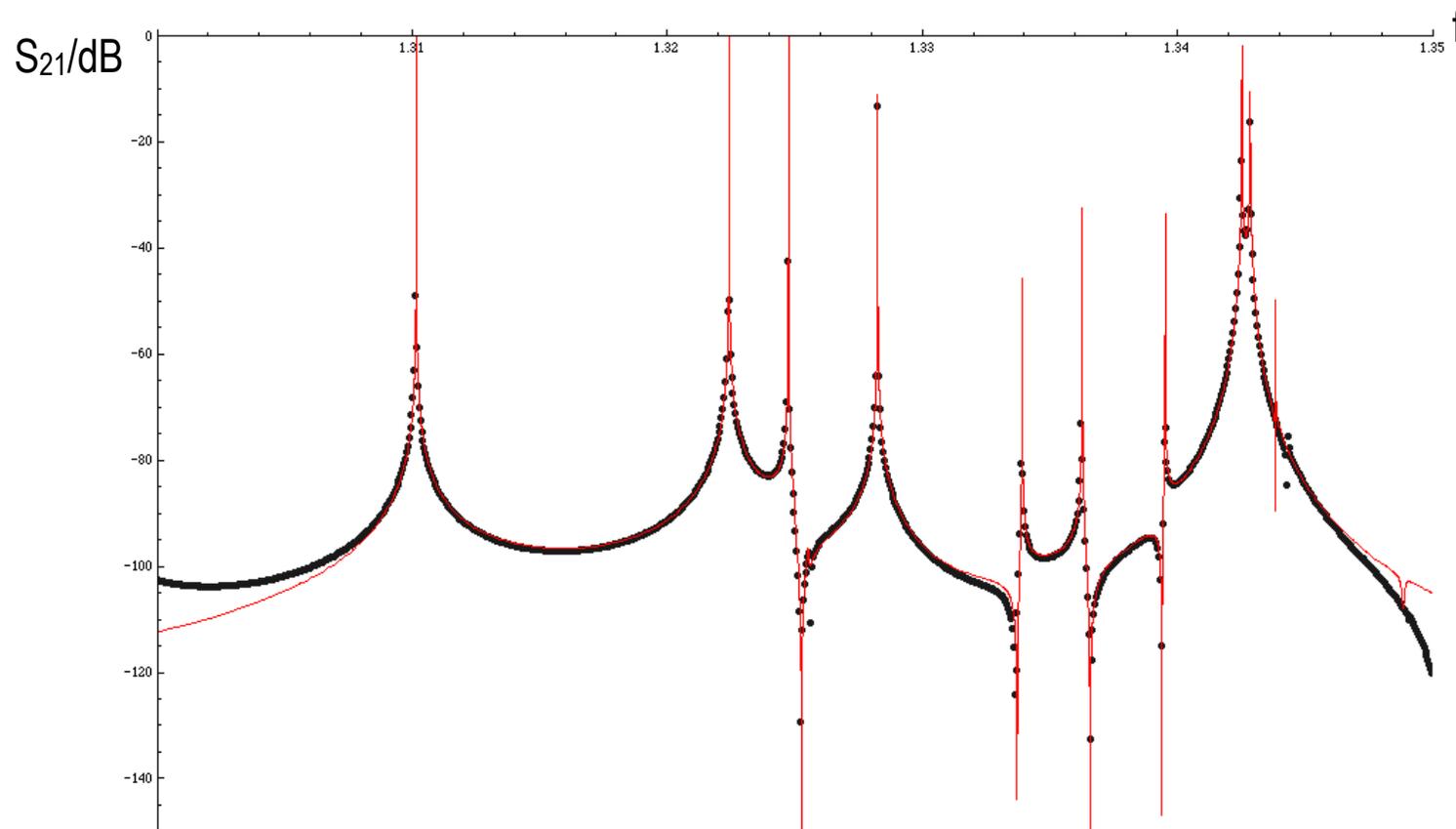
\*: Hecht, Rothemund, Glock, van Rienen: "Computation of RF properties of long and complex structures", Proc. EPAC 2002

## Remark: Pole-fitting algorithm



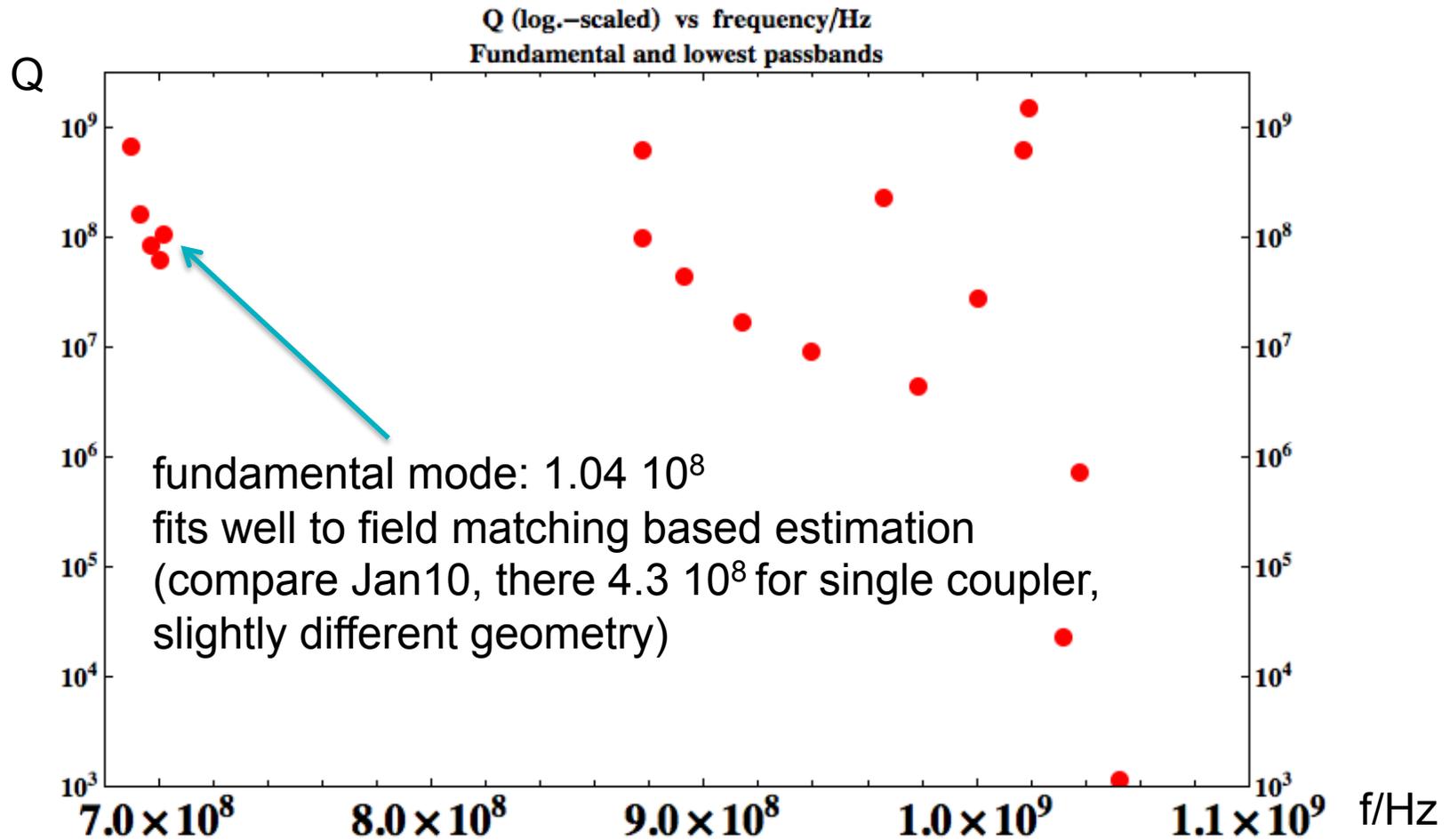
"Old" algorithm (see reference)

## Remark: Pole-fitting algorithm

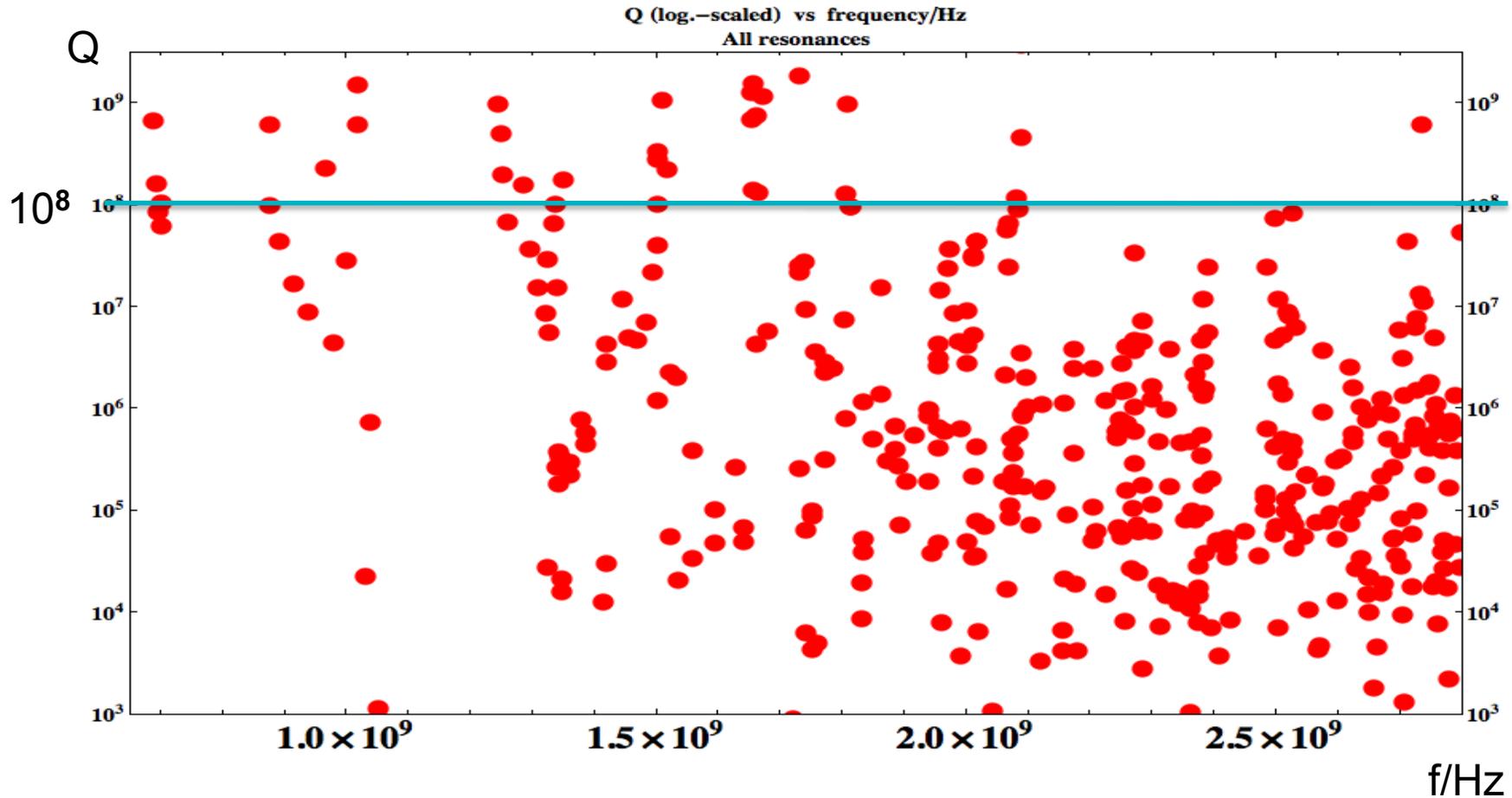


**Improved algorithm** - corrects for higher order contributions, but still not working in any case

## Q-value of lowest modes for 0 mm antenna depth:

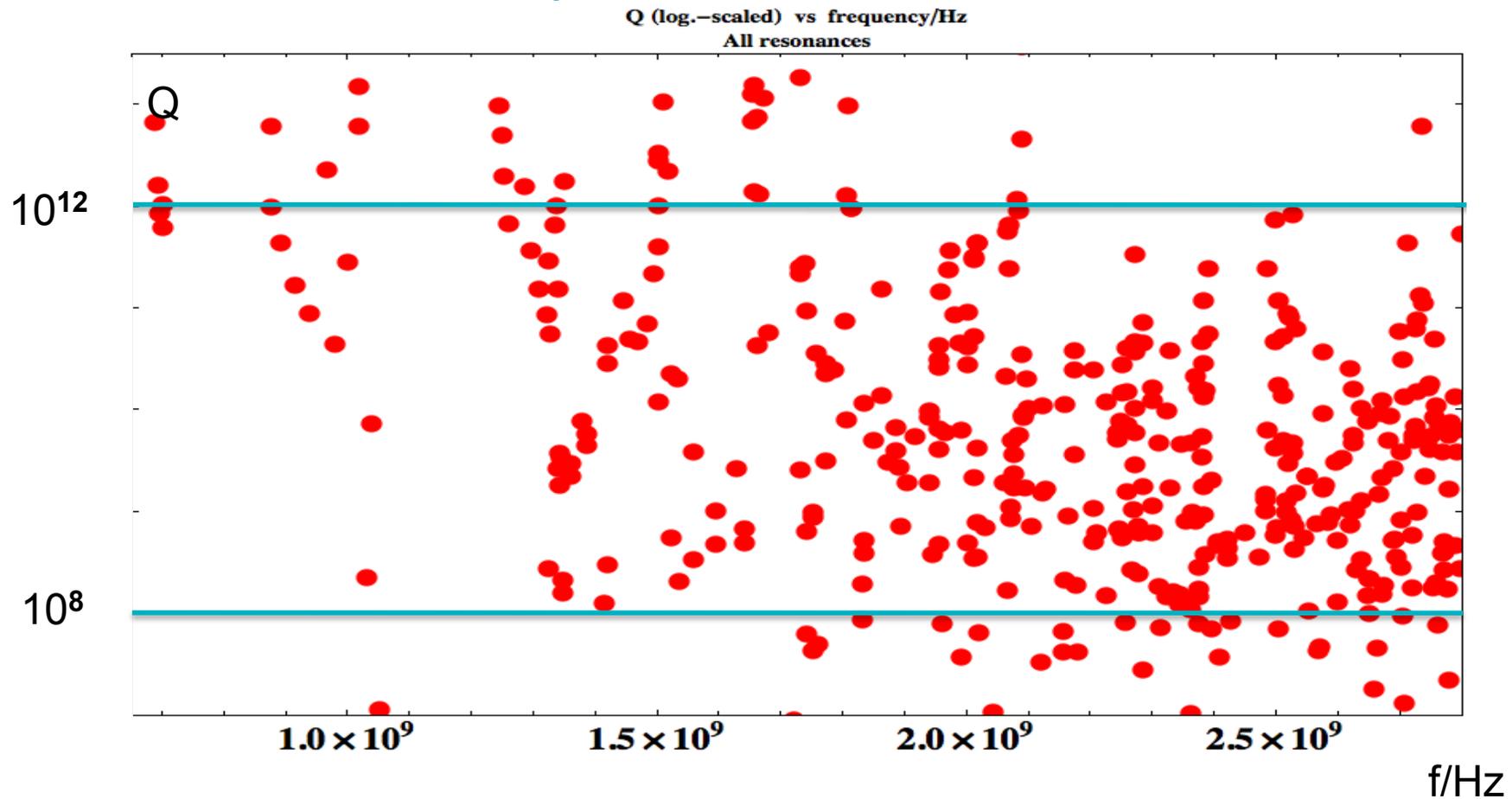


## Q-value spectrum for 0 mm antenna depth:



by far to heavy loading of fundamental mode => ...

## Scaled and approximated Q-value spectrum for 40 mm antenna depth:



## Even though there are some approximations and uncertainties ...

- i.e.:
- pole fitting sometimes fails => some Qs wrong
  - scaling with respect to fundamental mode ignores frequency dependence (but far from cut-off of pick-up)
  - Qs will be slightly reduced by increasing pick-up diameter 30 mm => 36 mm
  - no power coupler considered

## ... the main message remains:

Pick-ups without fundamental mode filters will not be able both to preserve fundamental mode Q and damp all HOMs sufficiently.

Confirmed by Wolfgang Weingarten's 2D computations using beam pipe dampers.

## "Baseline" parameters for HOM-couplers

(summary of email communication, comp. Wolfgang's talk)

- one HOM coupler each cavity side
- 36 mm diameter on both sides (only one design)
- power coupler side: opposite direction to power coupler (simplicity of cavity production), i.e. vertically upwards
- tuner side: upwards  $60^\circ$  from vertical
- longitudinal same distance to cavity and directly opposite to power coupler

### Some of the open questions for design:

Which radial space ("length" of the coupler) is available?

Is a screw flange compatible to the other components?