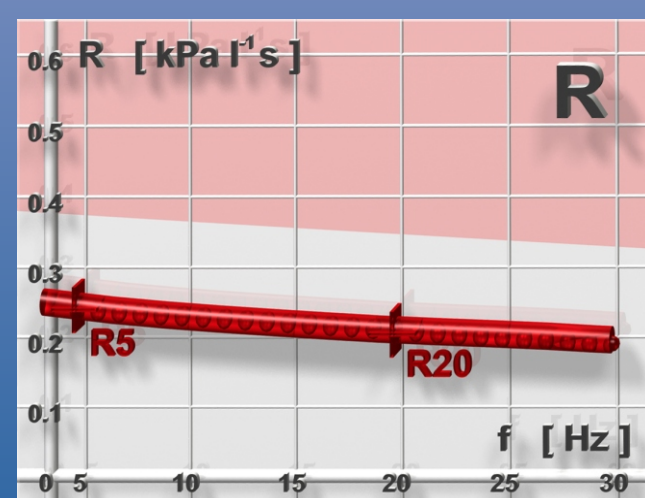
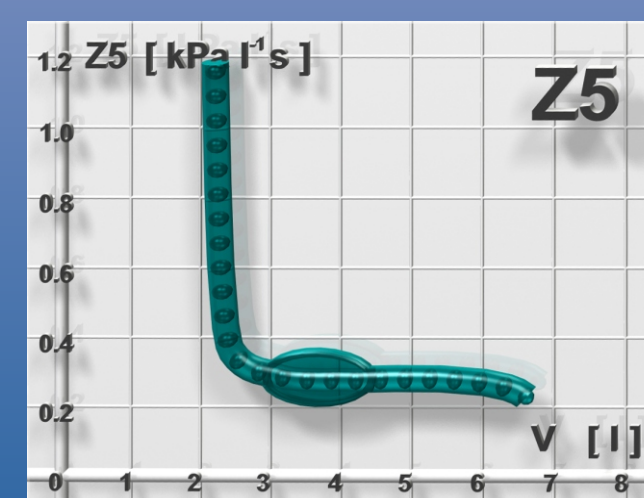
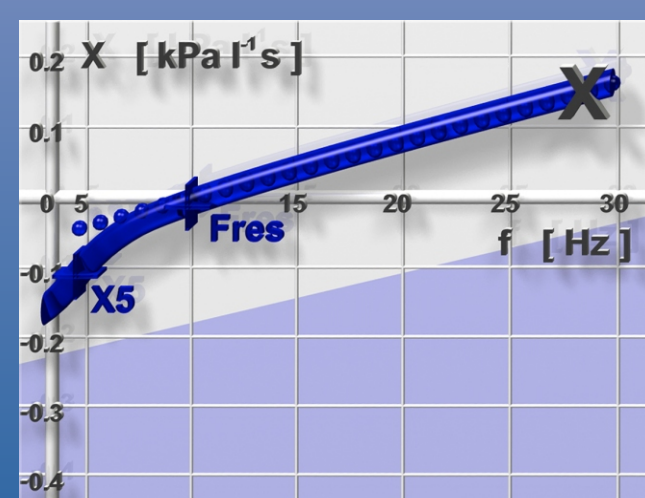


Normal lung function. The flow and volume are within the predicted normal range.



Total Respiratory Resistance  $R_5$  is within the predicted normal range, below the red hatched abnormal level. The Resistance Spectrum  $R(f)$  is independent of frequency. Distal Capacitive Reactance  $X_5$  is within the normal range (higher than the blue coloured area). Resonant Frequency  $F_{res}$  is normal.



Minimal variability of Impedance  $Z_5$  during tidal breathing and normal expiratory reserve volume during the VC-manoeuvre before airway closure (closing volume) are characteristic for a normal lung function.

## Normal Lung Function

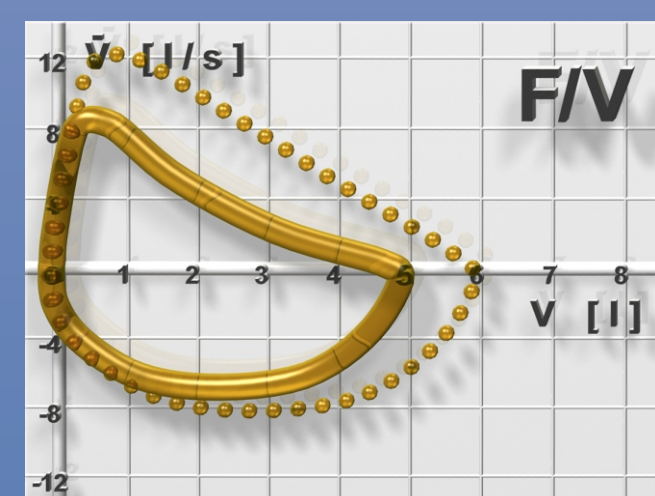


# Impulse Oscillometry

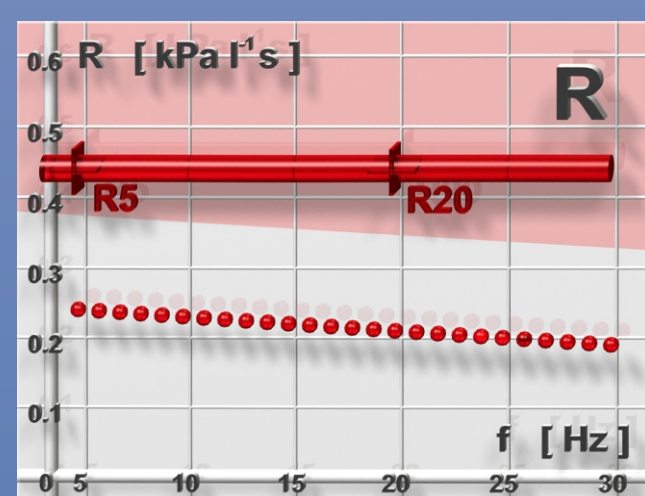
## Typical Curves in Health and Disease

### Parameter Definition

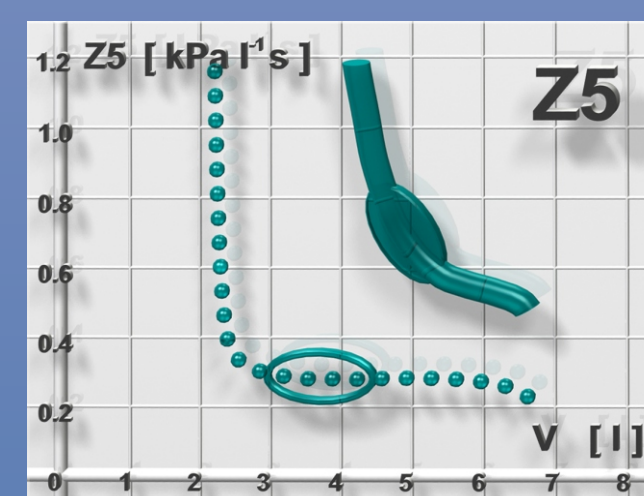
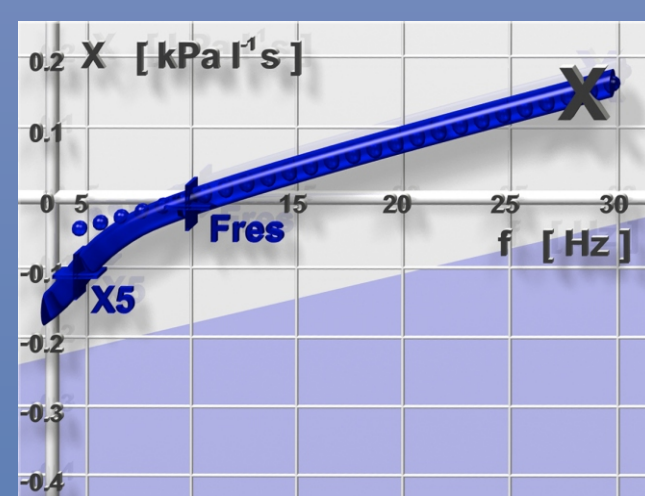
- $Z_5$  = Amplitude of Respiratory Impedance
- $R_5$  = Total Respiratory Resistance
- $R_{20}$  = Proximal Respiratory Resistance
- $X_5$  = Distal Capacitive Reactance
- $F_{res}$  = Resonant Frequency



The expiratory portion of the curve is clearly concave.

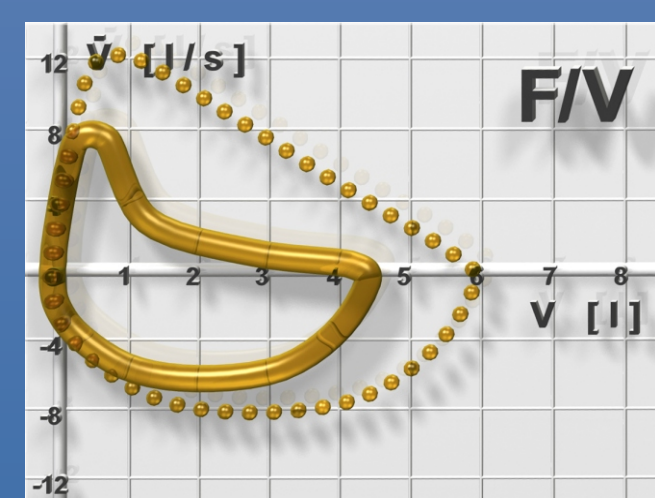
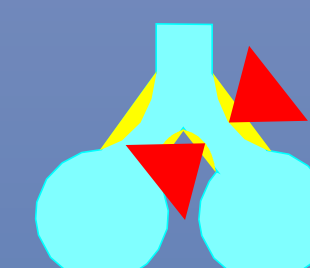


The Total Respiratory Resistance  $R_5$  is high and within the abnormal range. The Resistance Spectrum  $R(f)$  is independent of frequency, i.e. Proximal Respiratory Resistance  $R_{20}$  is similar to Total Respiratory Resistance  $R_5$ . Distal Capacitive Reactance  $X_5$  is completely within the normal range, as is Resonant Frequency  $F_{res}$ .

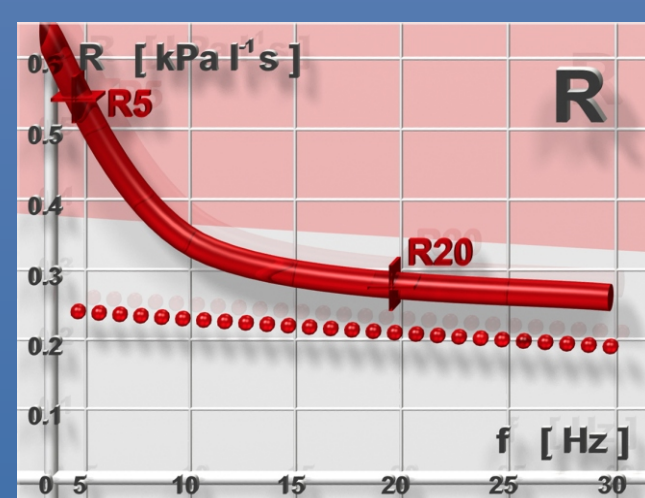


There is a large variability and an increased mean value of Impedance  $Z_5$  during tidal breathing. The expiratory reserve volume of the VC-manoeuvre may be limited or normal.

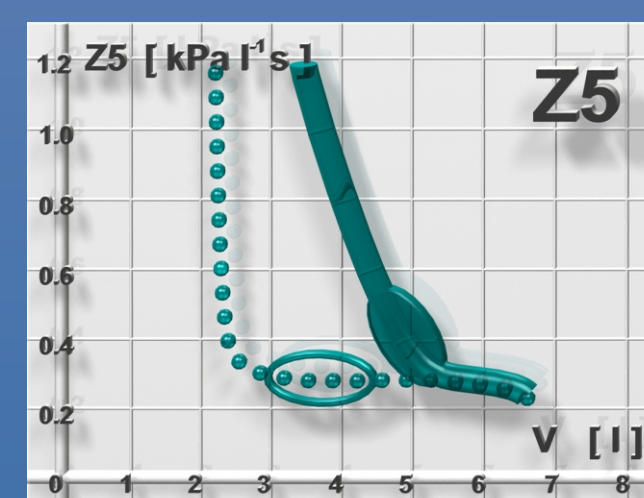
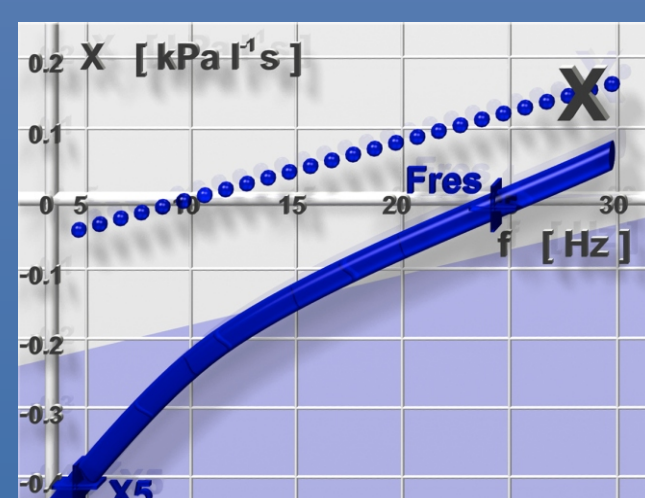
## Proximal Obstruction (central)



The shape of the curve is similar to that of proximal obstruction, but is normally more exaggerated. When airway collapse is a feature, the expiratory portion of the curve shows a very pronounced concave appearance.

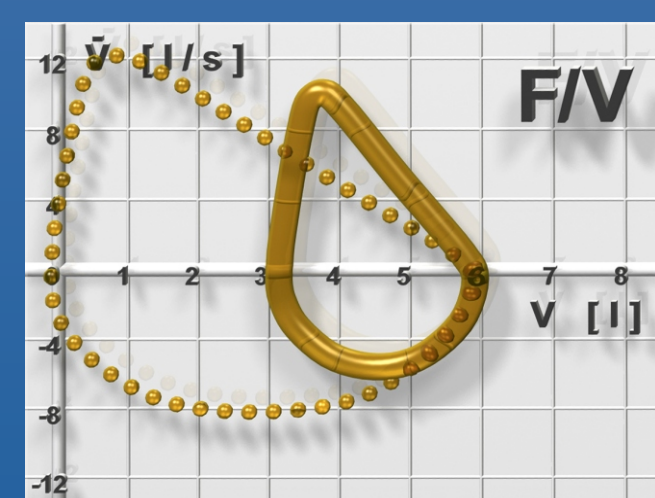
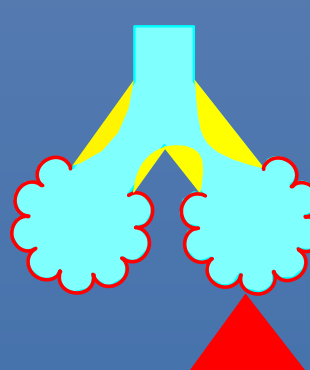


Total Respiratory Resistance  $R_5$  is within the red coloured abnormal range. The Resistance Spectrum  $R(f)$  is frequency dependent, becoming less at higher frequencies. Proximal Respiratory Resistance  $R_{20}$  is considerably lower than  $R_5$ . Distal Capacitive Reactance  $X_5$  is reduced into the abnormal range and Resonant Frequency  $F_{res}$  is shifted to the right, i.e. towards higher frequencies.

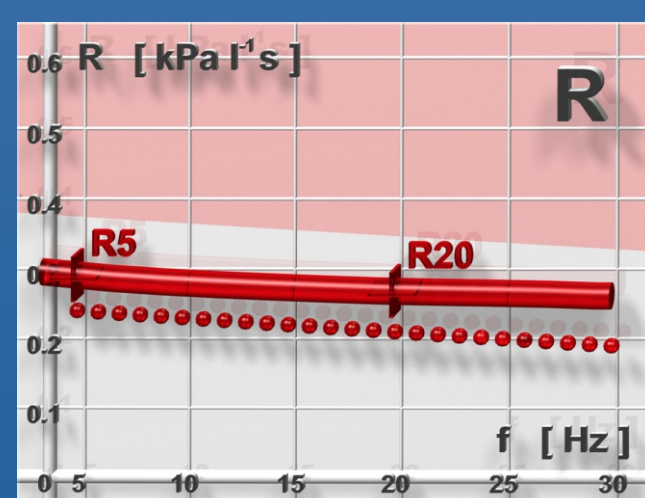


There is a large variability of Impedance  $Z_5$  during tidal breathing, however its mean value may be close to normal. There is considerable reduction in the expiratory reserve during the VC-manoeuvre.

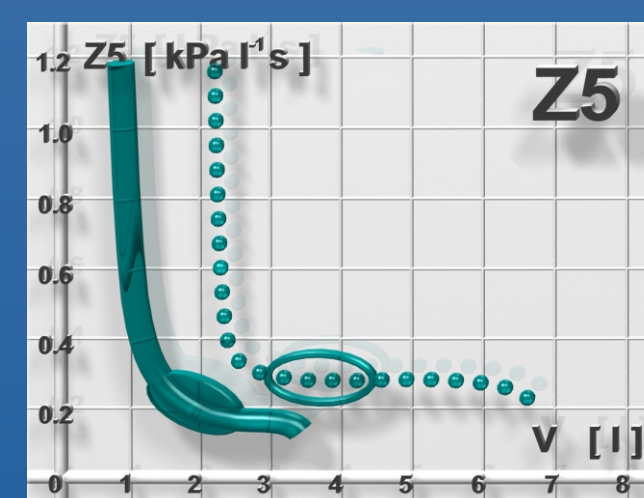
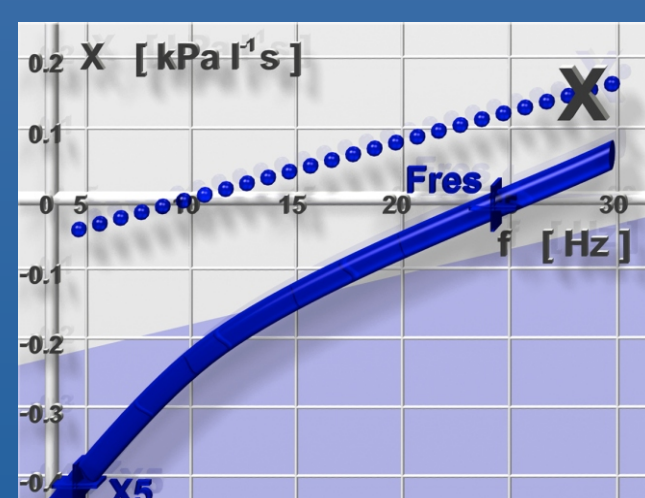
## Distal Obstruction (peripheral)



The curve is of normal shape, however Vital Capacity  $VC$  is considerably reduced.

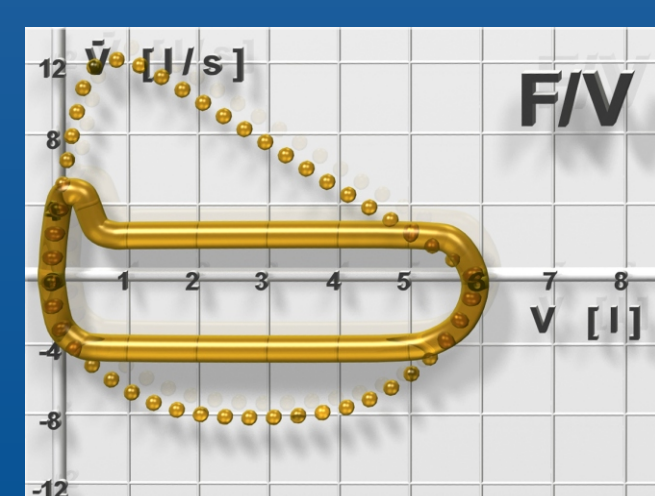
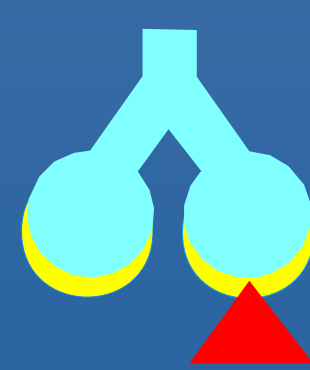


Total Respiratory Resistance  $R_5$  is within the normal range. The Resistance Spectrum  $R(f)$  is independent of frequency. Only in severe impairments, Distal Capacitive Reactance  $X_5$  is reduced and within the abnormal range and Resonant Frequency  $F_{res}$  is shifted to the right to a higher value. The reduced Vital Capacity  $VC$  in the  $Z_5$  impedance graph may be better suited to indicate the presence of pulmonary restriction.

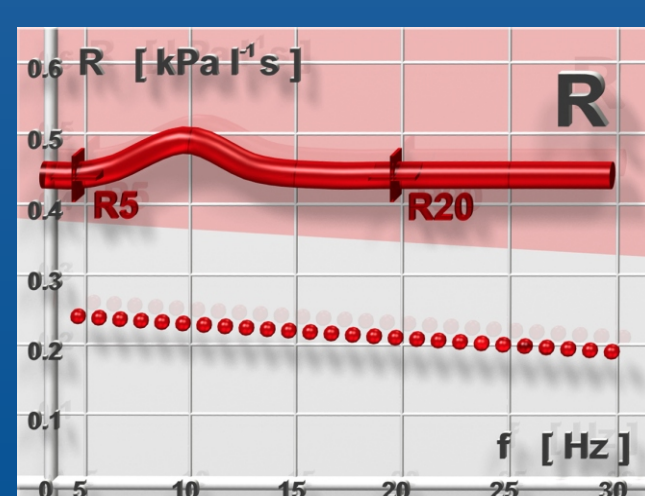


There is little variability of Impedance  $Z_5$  during tidal breathing. Vital Capacity  $VC$  is considerably reduced.

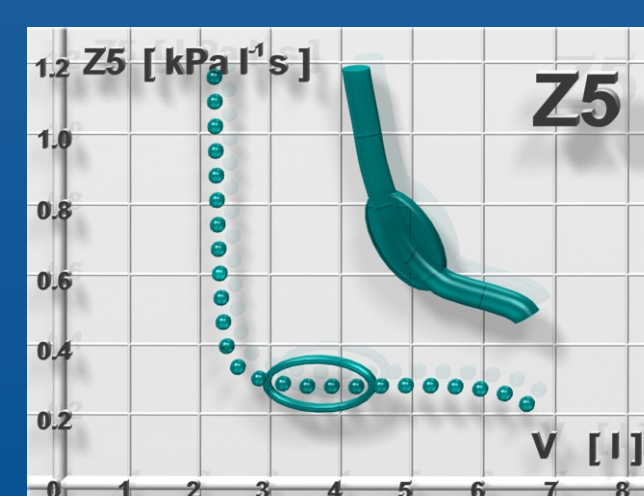
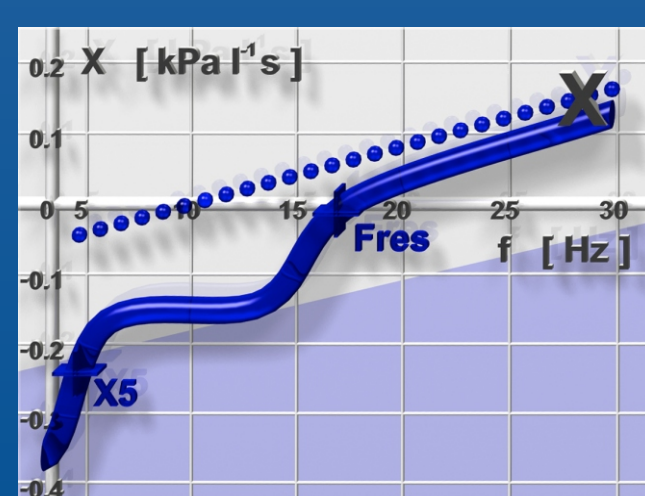
## Pulmonary Restriction



The curve shows a typical plateau in both the inspiratory and expiratory parts of the Flow Volume Curve.



The Total Respiratory Resistance  $R_5$  and the Proximal Respiratory Resistance  $R_{20}$  are both high and within the abnormal range. The Resistance Spectrum  $R(f)$  is independent of frequency, rarely a peak can be observed on the Resistance Spectrum. The Reactance Spectrum  $X(f)$  may be within the normal or the abnormal range, however, Extra Thoracic Airway Obstruction produces a typical plateau in the normally continuous reactance curve. The plateau is normal for children below 4 years of age.



There is a high variability of Impedance  $Z_5$  during tidal breathing with an increased mean value.

## Stenosis (Extra Thoracic Airway Obstruction)

