[0239] Therefore, the invention provides a hydrodynamic resistance matched fluid flow path, wherein the flow path comprises the following components:

[0240] (a) a first resistance region;

[0241] (b) a connecting region proximal to said first resistance region; and

[0242] (c) a matching resistance region proximal to said connecting region and distal to said first resistance region, wherein the hydrodynamic resistance of said matching resistance region is substantially equivalent to the hydrodynamic resistance of said first resistance region and is substantially greater than the hydrodynamic resistance of the connecting region.

[0243] The flow path may further comprise d) an inlet region proximal to said first resistance region and distal to said connecting region and/or e) a outlet region proximal to said matching resistance region and distal to said connecting region. The flow path may be comprised within a fluidic network (which may be within an assay cartridge) which comprises a metering component for introducing a metered fluid slug volume into said fluid flow path.

[0244] The invention also provides a method for moving fluid in a fluidic network comprising:

[0245] (a) introducing a fluid slug into a hydrodynamic resistance matched fluid flow path within said fluidic network, wherein the flow path comprises the following components:

[0246] (i) a first resistance region;

[0247] (ii) a connecting region proximal to said first resistance region; and

[0248] (iii) a matching resistance region proximal to said connecting region and distal to said first resistance region, and

[0249] (b) using air pressure to move said fluid slug through said flow path.

[0250] In this method, the flow path is configured such that i) the hydrodynamic resistance of said matching resistance region is substantially equivalent to the hydrodynamic resistance of said first resistance region and is substantially greater than the hydrodynamic resistance of the connection region and ii) the volume of the slug is greater than the volume of the first resistance region and less than the combined volume of the first resistance region, connecting region and matching resistance region. The method may further comprise metering said fluid slug, prior to introducing said fluid slug into said flow path. Furthermore, the flow path may further comprise (c) an inlet region proximal to said first resistance region and distal to said connecting region and/or (d) a outlet region proximal to said matching resistance region and distal to said connection region.

[0251] In some embodiments of the resistance matched flow path and the methods for using same, the metered volume is approximately equal to the sum of the volumes of the first resistance region and the connecting regions. For example, the sum of the volumes of the first resistance region and the connecting region is about 75-125%, about 85-115%, or about 95-105% of the metered volume. In other embodiments, the sum of the volumes of the first resistance region and the connecting region is about 85-100% or about 95-100% of the metered volume. In other embodiments, the sum of the volume of the first resistance region and the connecting region may be about 100% of the metered volume. Alternatively, the sum of the volume of the first resistance region and the connecting region may be about 100-125%, e.g., about 100-115%, or about 100-105% of the metered volume.

[0252] The resistance matched fluid path may be used with low volume fluid slugs in a microfluidic network. Such fluid slug volumes may be, e.g., less than 200 uL, less than 50 uL or less than 10 uL. In one embodiment, a fluid slug of between 20 uL and 50 uL is passed through the resistance matched fluid path. Depending on the specific application and any design constraints on the fluidic network, the volume of the first resistance region relative to the volume of the fluid slug (or alternatively, relative to the combined volume of the first resistance and connecting regions) may vary over a wide range. Suitable ranges include 10-90%, 20-80% and 30-70%.

[0253] One example of a hydrodynamic resistance matched fluid flow path of the present invention is represented schematically by FIG. **40**. The fluid flow path comprises an inlet region (**4010**), a first resistance region (**4020**), a connecting region (**4030**), a matching resistance region (**4040**) and an outlet region (**4050**), as described above. In this specific example, the first resistance region comprises a fan region (**4022**) to provide a smooth fluidic transition to the first resistance region from the lower resistance inlet region. The remainder of first resistance region **4020** is a high aspect ratio flow cell which may be configured as a detection chamber. Matched resistance region **4040** is designed to roughly match first resistance region **4020** in volume and hydrodynamic resistance.

[0254] One of ordinary skill in the art will be able to select geometries for the first and matching resistance regions that provide substantially equal hydrodynamic resistances (e.g., resistances that are within a factor of 2, within a factor of 1.4 or within a factor of 1.1). The geometries of the two regions may be, but are not required to be the same and cross-sectional areas may be, but are not required to be constant throughout the length of the regions. Hydrodynamic resistance (also sometimes referred to as hydraulic resistance) of a fluid flow path is proportional to the applied pressure drop (ΔP) (generally measured in units of Pascals) divided by the flow rate (Q) (generally measured in units of microliters/second). This can be summarized in the formula: $R_h = \Delta P/Q$, wherein R_h is the hydrodynamic resistance. Equations and software for calculating hydrodynamic resistance are available, e.g., *Viscous Fluid Flow, 2d Ed.*, Frank M. White, McGraw-Hill (1991), which is incorporated herein by reference in its entirety. Equations for calculating the resistance of two simple channel geometries are provide below (an exact formula for rectangular cross-sections is provided on p. 120 of the *Viscous Fluid* Flow reference).

[0255] channel of circular cross-section (total length L, radius R):

$$R_h = \frac{8\,\mu L}{\pi R^4}$$

[0256] rectangular cross-section (width w and height h, where h<w)

$$R_h \approx \frac{12\,\mu L}{wh^3(1-0.630\ \mathrm{h/w})}.$$