Arrayás, Fontelos, and Trueba Reply:

In [1] the dispersion relation for transversal perturbation of a planar negative front is obtained analytically. We estimate the spacing between the streamers in terms of the gas pressure p (in bars), the physical external electric field $\mathcal{E}$, and the diffusion coefficient D_e. For small $D_e/\mathcal{E}$ it reads

$$\lambda_{\max} \propto \left(\frac{D_e}{p\mathcal{E}}\right)^{1/3}. \quad (1)$$

The preceding Comment [2] claims that (i) the first order perturbation of the electron density n_e cannot be removed, (ii) the expression for the dispersion relation in [1] in the limit $k \ll 1$ is inconsistent both with [3] for $D_e = 0$ and with [6] for $D_e \geq 0$, and (iii) $\lambda_{\max} \sim D_e^{1/4}$. Our reply follows:

(i) In [5], we have included the first order perturbation to n_e [see formula (4.12)] and shown that it is negligible. This follows from the fact that the perturbation φ satisfies the partial differential equation given in [1]. Details are a bit involved and could not be included in [1] due to space limitations.

(ii) In [6] they do not obtain for the dispersion relation the $1/2$ prefactor in the limit $k \ll 1$ because they erroneously assume that the perturbed planar ionization front is equipotential. Quoting [6]: "The potential is constant behind the front and the electric field is constant ahead the front; therefore for the potential ϕ, the Dirichlet condition $\phi = 0$ is imposed at $z = 0 \ldots$." This is done for any k and not only for $k \ll 1$. The front cannot be taken as equipotential *ad hoc* and indeed it is not. Even taking a constant potential at a distance L behind the front amounts to assuming that the front is equipotential in the limit $\lambda \gg L$ (i.e., $k \ll 2\pi/L$) and affects the results for other values of k since the potential there is a constant plus a periodic perturbation. Note that this situation is different from models of Laplacian growth where equipotentiality at the moving interface is assumed and a k dispersion relation is obtained.

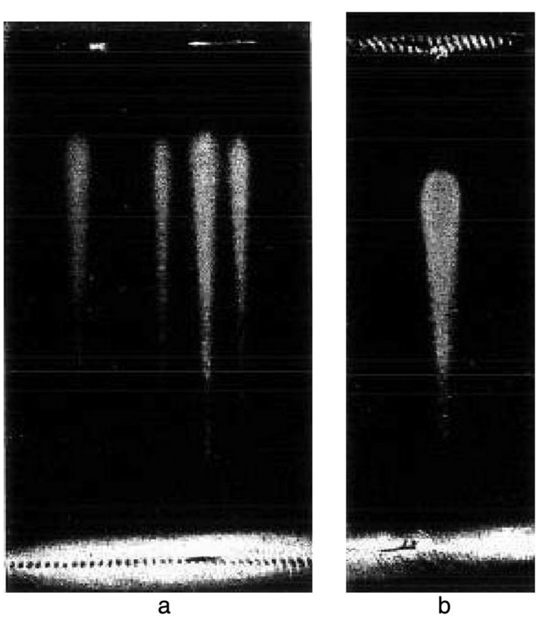

FIG. 1. Raether's experiments [4] (courtesy of the editors).

TABLE I. Data taken from Raether's work [4].

Gas	Pressure (Torr)	$\mathcal{E}/p$ (Volt/cm · Torr)	Avalanche Size Width/Length
N_2	280	38	6.8×10^{-2}
	143	39	8.5×10^{-2}
Ar	528	12	12.3×10^{-2}
	290	16	13.6×10^{-2}

TABLE II. β exponent of $\lambda_{\max} \sim D_e^{\beta}$.

Gas	Ebert *et al.*	Arrayás *et al.*	Experimental
N_2	0.25	0.33	0.34
Ar	0.25	0.33	0.32

(iii) Their prediction for the β exponent of $\lambda_{\max} \sim D_e^{\beta}$ is affected by the wrong hypothesis of an equipotential front. The expression (1) shows the possibility of validating our work through experiments of planar electric discharges in nonattaching gases as Raether did [4]. In Fig. 1 we see a typical streamer avalanche with planar geometry. Table I presents the data for N_2 and Ar under the conditions where our theory applies. The width/length of the streamer avalanche is roughly proportional to $\lambda_{\max}$, and we can find the exponent β of $\lambda_{\max} \sim D_e^{\beta}$ from the experimental data (Table II).

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