N = total # tests, N_0 = # that are Null.

Say $R(u)$ is total w/ p-val $\le u$, & $r(u)$ is #Null w/ $p \le u$.

A cut-off equivalent to BH is

$$u^* = \max\left\{ u : u \le q \frac{R(u)}{N} \right\}$$

and then $\frac{1}{R(u^*)} \le q/N u^*$.

$\Rightarrow$ FDP is $\frac{r(u^*)}{R(u^*)} \le q \frac{r(u^*)}{N u^*}$ w/ Expectation $q \frac{N_0}{N}$

(since $\mathbb{E}\left[\frac{r(u)}{u}\right] = N_0$ for unif. & indep. Null prob.)