RF power requirements, coupling calculation, and LLRF

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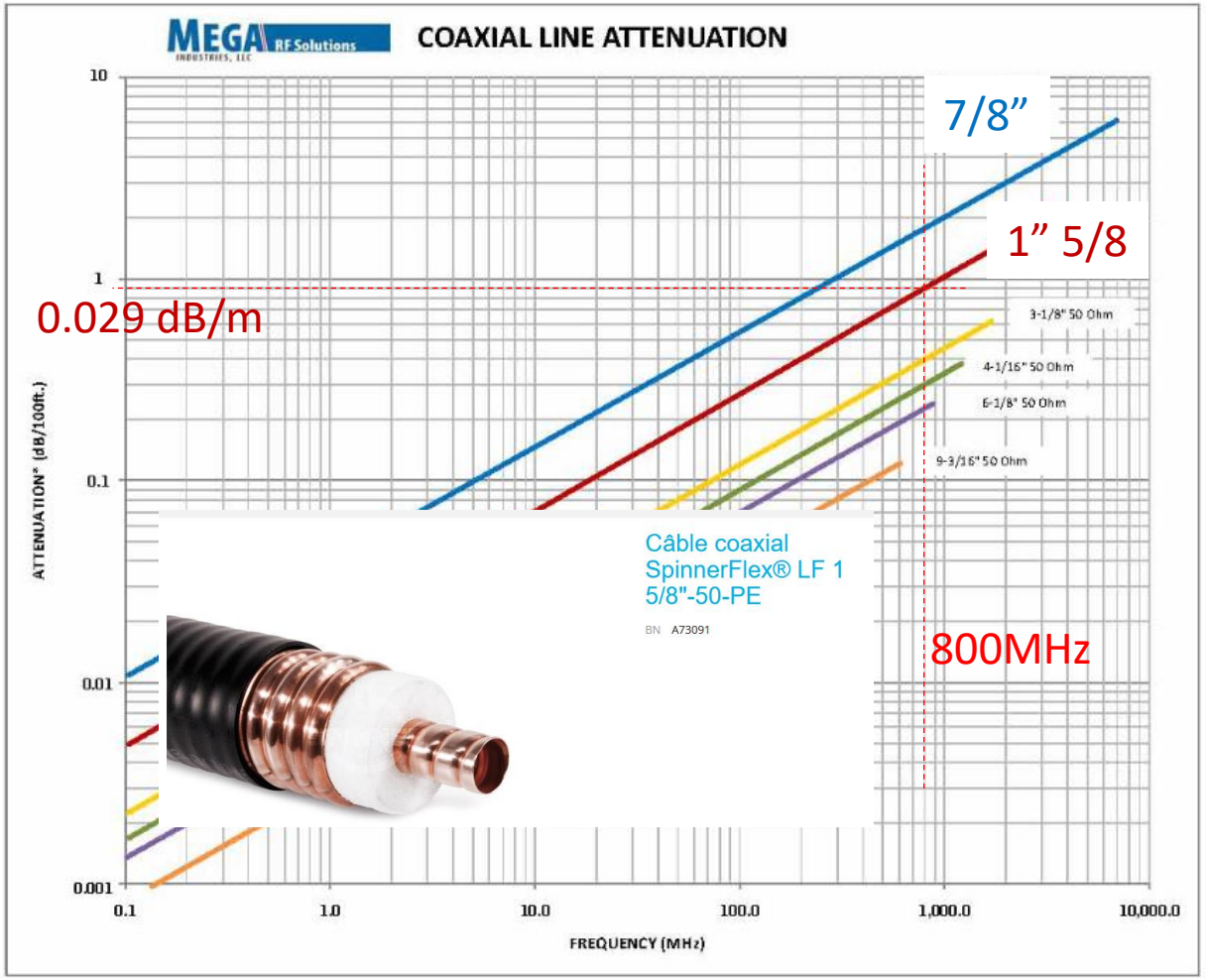
Parameters	Buncher
Frequency [MHz]	801.58
Beta	0.8048
Q0	2.21E4
r/Q [Ω]	166.57
Qext	2.21E4
QL[Required]	1.1àE4
Bandwidth [Hz]	72667
Filling time [µs]	2.53
Eacc [MV/m]	0.608
Lacc [m]	0.126
Nb of cavities	1

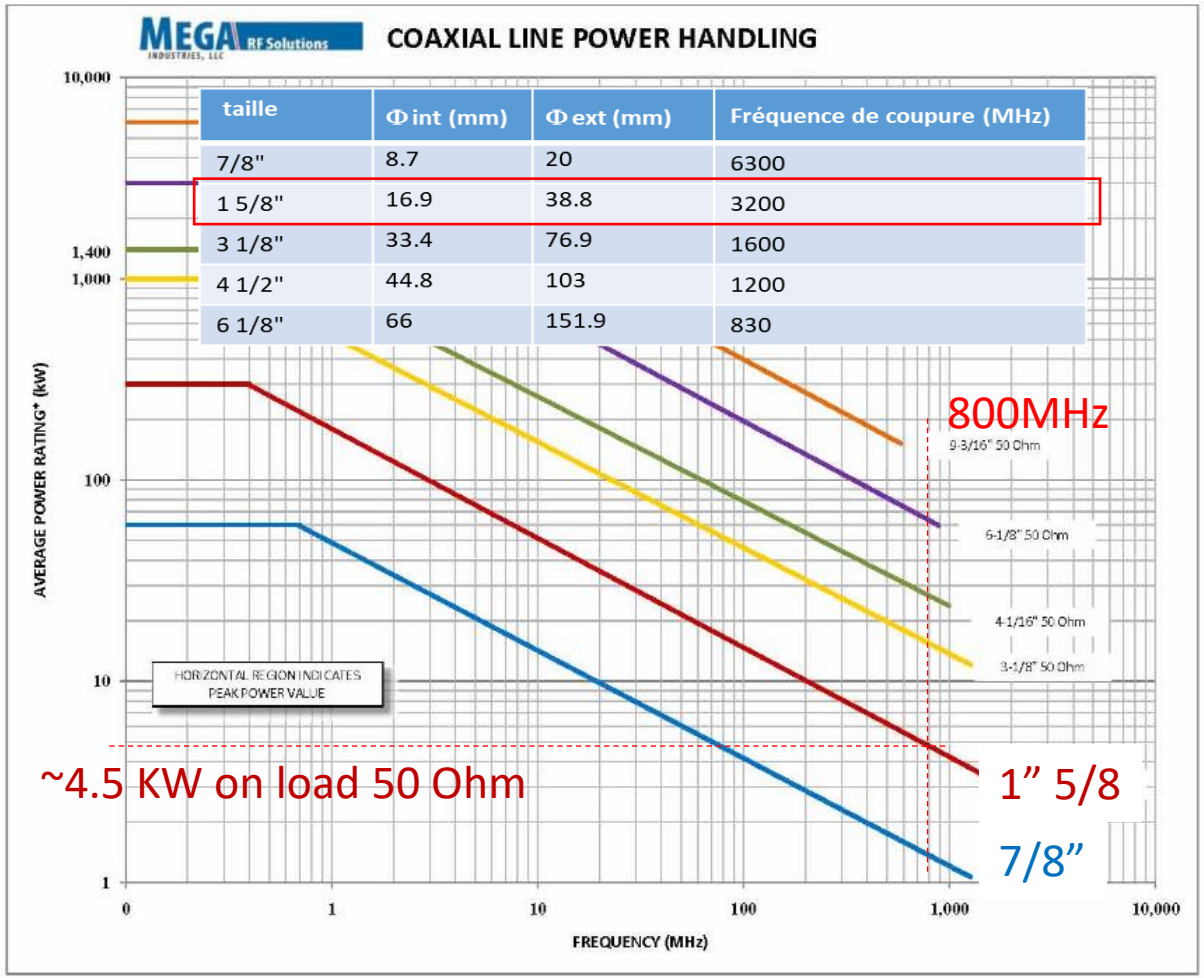
- 4.933kW ↘ **1.6 kW** with new calculation → Use of cables or rigid coaxial line
  → Use of solid state amplifier

- BW ~ **72kHz** & Sensitivity **?KHz/ deg C°**
- RF power line attenuation
- Manufacturing (Q0)

→ Margins

Buncher Design Review : RF power requirements





It should better to try to limit to 4.5kW/2 = 2.25kW in case of reflected power

Global margin : 2.25kW -1.6kW = 650W

Margins due to the Frequency variations

- Steady state : due to T° regulation → sensitivity of the Cavity (50kHz/°C @3GHz **→ @0.8GHz?)**
- Transient state : due to T° increase → of the accelerator field to the nominal value (CPLR & cavity T°)
- Beam loading effect ~17kHz @20mA → RF power + ~25% → **2kW**

Depending of T° regulation performance : water cooling is slow
RF tuning system : fixed plunger

Margins : with Attenuation of rigid coaxial line of 0.029dB → ~20m max (0.58dB) si max value = 2kW for the others margins

- Coupling with waveguide opening and Rf power circuit = Waveguide

→ Fixed Qext, no modification with a standard assembly → variable stub needed

- Electric coupling via an antenna

→ Fixed Qext, no modification possible → variable coupler but it's more complex

→ Cooling needed → complex circuit due to the inner diameter

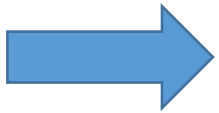
- Magnetic coupling via an loop

→ Fixed coupling but modification possible by orientation modification

→ cooling needed → can be included into the cavity cooling

Goal : the minimum opening for the coupling → Minimum RF power to provide allowing to use RF cable

- Stability in Phase < 1°
- Stability in amplitude < 3%



-Without LLRF system, no possible adjustments of setpoints
-Depending of the water cooling performance
-Use of a RF generator synchronized
- A specific RF power measurements needed

-With LLRF system, possible adjustments of setpoints
-Synchronized too
-RF power measurements integrated into the LLRF

Buncher Design Review : LLRF