New Japan Radio Co.,Ltd.

Technical Information

Rev.1

【V9 Technology】
Advanced Spectrum Control

With the ever-growing demand to reduce the unwanted emissions level, the International Telecommunication Union has issued a design recommendation described on ITU-R SM.1541-5 Annex 8 restricting spurious emission caused by radar. The design objective requires for the radar designer to meet the spectrum regulation mask. To help radar manufacturers meet this regulation NewJRC has developed Advanced Spectrum Controlled (ASC) magnetrons. These magnetrons utilize NewJRC's patented V9 technology, which results in a dramatic improvement in the reduction of unwanted emission levels. ASC magnetrons have already being used by several radar manufacturers in the world, and have gotten approval on 40 dB/decade ITU-R SM.1541-5 Annex 8 design objective mask. These are available for X band radars (2kW, 4kW, 10kW, 12kW, and 25 kW types) and S band radars (30kW and 60 kW types).

ITU-R SM.1541;

OoB domain emission limits for primary radars

Formulas for the B_{-40} 40 dB bandwidth

K is 7.6 for lower-power radars and radars operating in the radionavigation service in the 2900-3100 MHz and 9200-9500 MHz bands

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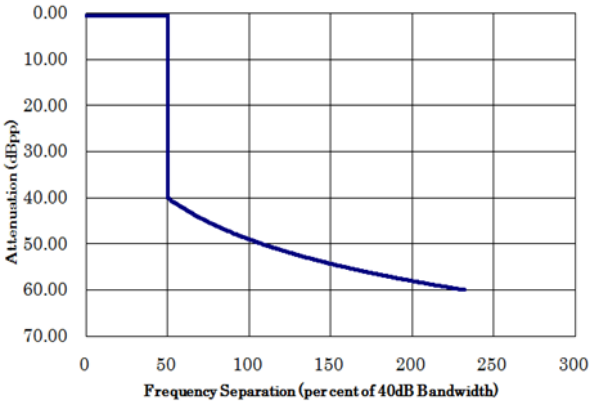
$$B_{-x} = \frac{K}{\sqrt{\varepsilon \cdot \varepsilon_p}} \text{ or } \frac{64}{\varepsilon}$$

OoB mask

The roll-off for all waveforms listed in section 3 of ITU-R SM-1541, other than those listed in section 4.2is **30 dB/decade**, as shown in Fig. 1.



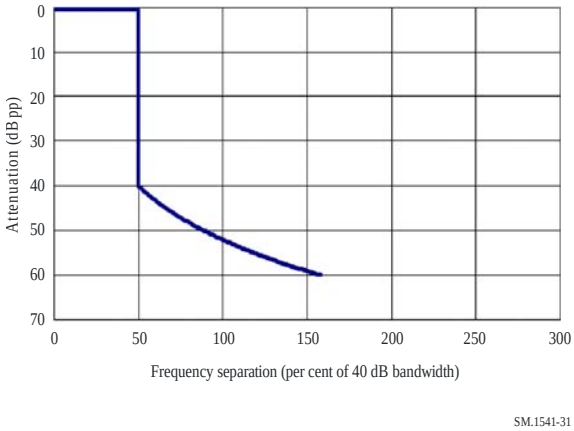


Fig.1 30dB/decade OoB mask **Fig.2 40 dB/decade OoB mask**

Design objective

The mask in Fig.2 is the ITU design objective of radar systems.

The mask rolls off at **40 dB/decade** from the B_{-40} dB bandwidth to the spurious level specified in RR Appendix 3. All radar should be designed to meet the requirement of the design objective mask.

【V9 Technology】 **Advantage**

- ✓ 1. Narrower B-40 bandwidth
- ✓ 2. Better symmetry of spectrum
- ✓ 3. Shorter rise time [8nsec-17nsec]
- ✓ 4. Lower π -1 mode emission

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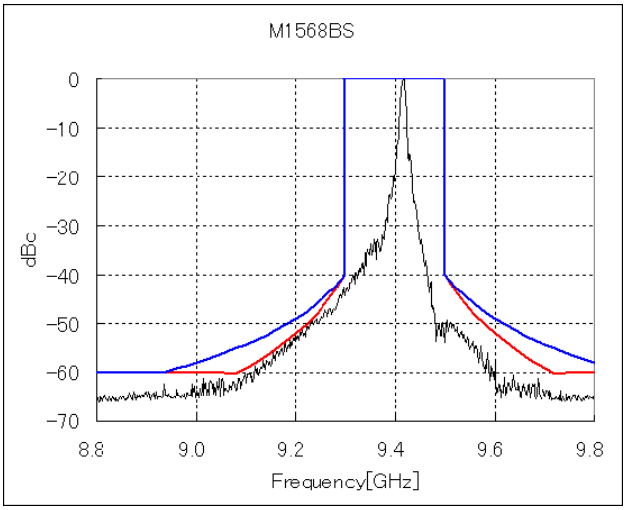
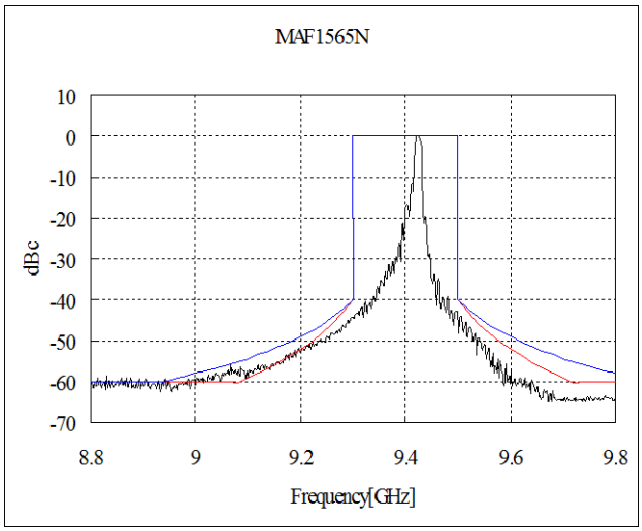
Actual result of 【V♀ Technology】 magnetrons' spectrum

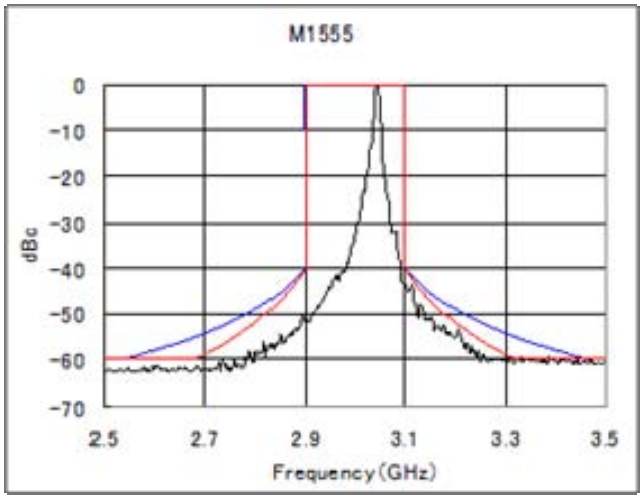


Blue mask is 30 dB/decade
Red mask is 40 dB/decade

X band 25 kW magnetron
(M1568BS)



X band 4 to 12 kW magnetron
(MAF1565N 10 kW)



S band 30 kW magnetron
(M1555)

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