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Design Aspects of Korean Half Impulse Radiating Antenna (KOHIRA)

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***Abstract*—** This paper describes the design, fabrication and testing of KOHIRA which is under development. KOHIRA consists of half of a Paraboloidal reflector of diameter 1.164 m, fed by two coplanar arms, each at 45 degrees from the vertical. KOHIRA is energized by a transient pulse generator PBG 3 offered by Kentech in UK. The input pulse has amplitude of 12 kV, a 10-90% risetime of 100 ps and an exponential decay time of 4.2 ns.

Keywords- Impulse Radiating Antenna, Half IRA, Transient pulse

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I. INTRODUCTION

KOHIRA is schematically shown in Figure 1.

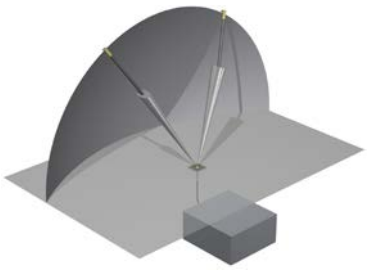

Figure 1. Notional sketch of KOHIRA

Focal length F = 42.3 cm, Diameter D = 116.4 cm
F/D = 0.363 and Depth d = 19.737 cm.
KOHIRA is expected to work over a band of frequencies raging from a low (f_ℓ) to high (f_h) frequencies. The low frequency limit is governed by the reflector size and the high frequency is governed by the rise time of the input pulse and how well the feed is constructed. Considering some risetime degradation between the pulser output and the wavelaunch on to the reflector, KOHIRA is expected to work from about 150 MHz to about 1.75 GHz.

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II EXCITATION VOLTAGE WAVEFORM

The voltage waveform is analytically modeled by

$$V(t) = V_0\left(1+\Gamma\right)e^{-\beta\left(\frac{t-t_s}{t_d}\right)}\left[0.5\,\mathrm{erfc}\left(-\sqrt{\pi}\,\frac{t-t_s}{t_d}\right)u\left(-\left(t-t_s\right)\right)+\left[1-0.5\,\mathrm{erfc}\left(-\sqrt{\pi}\,\frac{t-t_s}{t_d}\right)\right]u\left(t-t_s\right)\right]$$

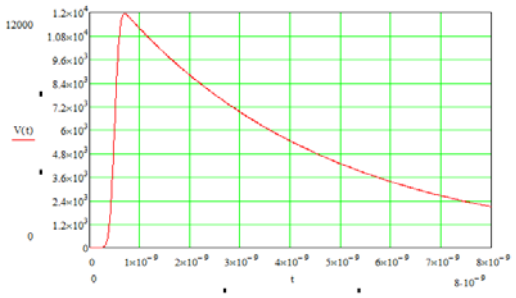

Figure 2. Excitation voltage waveform

With V_0 = 12,000 V, T =0.05, β = 0.048, t_d = 200 ps, t_s = 0.5 ns and is shown plotted in Figure 2. This waveform has a fairly simple Fourier transform. The pulse generator is a 50 Ohm device and the input impedance of the antenna is 100 Ohms and we have inserted an impedance transformer at the feed point.

II RADIATED ELECTRIC FIELDS

The radiated electric fields are estimated and shown plotted in Figure 3.

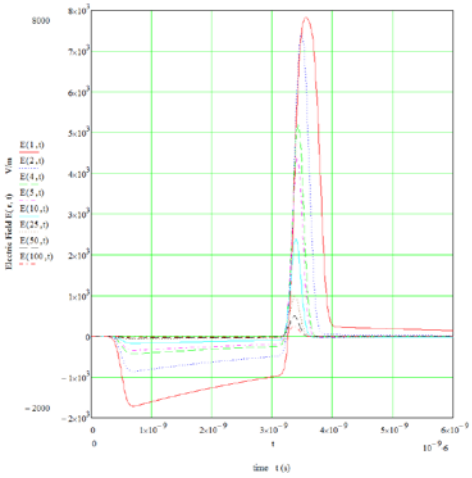

Figure 3. Calculated electric fields at various ranges

We will present detailed design and measurements as it becomes available.

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