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TO : The Files - Contract RD-103, T.O. 9

DATE: 31 December 1958

FROM : [Redacted]

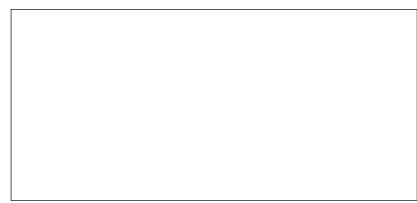
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SUBJECT: (Trip Report - Linear Exciter For AS-4/AS-4A, *CONT RD-103*)

1. A visit was made by [Redacted] on 8 and 9 December to monitor progress on Contract RD-103, T.O. 9, the AS-4/AS-4A linear exciter.

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2. Attached is a chart showing various Collins' linear Power Amplifiers and linear Exciters. The recommended 45 kilowatt, 205 J-1 Power Amplifier can be procured in 8 months for \$48,500; the 310 F-1 Exciter in 9 months for \$17,850.



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Attachment As Above

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Page 1 of 6TECHNICAL DISCUSSIONItems 1 - 3: **LINEAR EXCITER FOR THE AS-4 AND AS-4A**Introduction

The AS-4 and AS-4A have heretofore been intended for operation exclusively with the [redacted] 231-D-20 transmitter. The 231-D-20 is a frequency quadrupler and nonlinear amplifier. It is driven by the AS-4 and AS-4A with rectangular r.f. pulses at one-quarter the desired output frequency. Waveshaping for splatter prevention is accomplished in the high-level plate modulator. The modulator also serves to double the peak plate voltage to the r.f. power amplifier, thus increasing its pulse power output from 3 to 12 kilowatts.

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It is now desired to operate AS-4 and AS-4A transmitting terminals into the Collins 205-J1 linear amplifier. The advantages to be gained are that 45 kv output can be achieved (6 db improvement) and the frequency range is increased from 4-26 megacycles with the 231-D-20, to 2-30 with the 205-J1. In addition, it uses servo tuning as contrasted with autotunes; thus the 205-J1 servo system accommodates an unlimited number of frequency assignments, as contrasted to 10 preset frequencies for the 231-D-20. The 205-J1 is also more suitable for general purpose use, being a linear amplifier.

The 205-J1 amplifier is normally used with the 310F series of exciters. These exciters include a frequency synthesizer which determines the output frequency of the transmitter. The synthesizer also provides the rough tuning information required by the 205-J1 amplifier. Use of the 310F as a single-sideband exciter with the 205-J1 linear amplifier also permits narrow-band (2.2kc) operation with the AS-4A, feeding the 310F from the audio frequency output of the Transmit Data Terminal for use on "easy" high-frequency circuits where multipath is not a serious problem.

Signal input to the 310F may be at audio, for generation of upper and/or lower single-sideband output; or it may be relatively broadband in the 300 kc region for translation (or heterodyning) to the frequency set by the synthesizer.

Approach

It is apparent that the proposed AS-4 and AS-4A exciter should be designed for output at 300 kc. Quantized Frequency Modulation, or QFM, will be generated at this frequency, and the pulses will be waveshaped in the proposed

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exciter for minimum bandwidth. Cosine-squared waveshapes will be approximated for rapid convergence of the pulses' frequency spectra. Then the 310F exciter will translate this QFM signal to the desired output frequency for amplification to the 45 kw level in the 205-J1 amplifier.

This approach avoids the most difficult and expensive functions performed by the present AS-4 and AS-4A exciters: 1) no variable-frequency r.f. circuits are encountered since operation is fixed at 300 kc; and 2) precisely controlled oscillators are not required in the AS-4 and AS-4A, because the 310F synthesizer determines the output frequency. These two simplifications will result in very simple electrical and mechanical design compared to existing AS-4 and AS-4A exciters for the 231-D-20 transmitter.

The proposed exciter should be considered an addition to the AS-4 and AS-4A, rather than as a replacement for the present variable-frequency one. Thus with the proposed exciter installed in addition to the existing one, the user may operate into either a 310F and 205-J1, or into the 231-D-20 transmitter.

Program

[redacted] will design, develop and fabricate one (1) linear exciter to permit use of the AS-4 and AS-4A with the 310F and 205-J1 equipments. This exciter will operate at 800 or 960 pulses per second (for the AS-4 and AS-4A respectively) at the throw of a switch. QFM will be generated at 300 kc. The pulses will be shaped for minimum crosstalk and splatter. This exciter will be built upon one standard chassis for mounting in the blank panel space available in either an AS-4 or an AS-4A.

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Contractor will study control circuits of the 205-J1 and 310F, and design the new exciter for compatibility with their control requirements.

Vertical cable-duct panels, both signal and power, and drawer slide hardware will be provided in kit form for easy field installation into any existing AS-4 Transmit Terminal. Wiring details will also be provided for AS-4A installation, but its cable ducts will not be fabricated in view of the intended use of the first exciter with an AS-4.

It is not expected that the 205-J1 or 310F equipments will be available for local operation with the proposed exciter. Therefore, this proposal excludes testing with the 205-J1 and 310F by Contractor's personnel. ✓

Drawings

Schematic diagrams of the exciter and layouts of cable duct wiring will be provided. Manufacturing drawings will not be prepared. Engineering sketches, to the extent required for fabrication of the equipment, will be submitted.

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205J-1

45 KW PEP
SERVO TUNED
2 TO 30 Mc

8 mos. \$48,500

204C-1

10 KW PEP
MANUALLY TUNED
4 TO 25 Mc
TUNING INDICATORS

204F-1

2.5 KW PEP
Two PRESET CHANNELS
2 TO 25 Mc.

KWT-6

500 W PEP
MANUALLY TUNED
2 TO 30 Mc
INCLUDES RECEIVER
AND EXCITER

EXCITERS310F-1

AUTOMATICALLY TUNED
2 TO 29.999 Mc
1 Kc STEPS
CAN BE REMOTELY CONTROLLED
300 Kc IF
9 mos. \$17,850

310U-1

SINGLE CHANNEL - UP
TO EIGHT CHANNELS WITH
ADDITIONAL EQUIPMENT
2 TO 30 Mc.
MANUALLY CONTROLLED
AND TUNED
300 Kc IF

310F-6

2 TO 30 Mc
INCLUDES RECEIVER
1 Kc STEPS
MANUALLY CONTROLLED
AND TUNED
300 Kc IF