

<https://www.youtube.com/watch?v=-2jN0kOP1os>

Pulse amplifier for signal generator

video transcript

0:00

Good day to everyone
today we look into this add on board for signal generator
for coil testing
it is not complicated
it made of IRF840 transistor, on heatsink
driver TC4420 and additional buffer chip between
signal generator and TC4420

0:30

it is TC4093
we use DC-DC LM2596 for powering this board
I set 15v
and use this power adapter (220 - 18v)

1:00

you can power it from battery if you like
this is schematic
BTW all my circuit can be found on yandex disk (see link in video comments)
Ok, here at this point we will get this nice looking scope trace

1:30

here signal from lab SG comes to two Schmitt triggers
then thru 10ohm goes to driver
then from the driver to MOSFET gate
and it control main power supply
e.g. from battery to inductor
schematic not complicated
now let's see it in operation

2:20

board connected to lab SG
select pulse mode
set frequency
this circuit will work ok upto 2.5MHz
after that set amplitude
6v is a minimum with voltage at which circuit starts working

3:00

if you have 5v output on SG
you will need replace TC4093 with 5v logic
you will need add 7805 for powering it
ok, we set amplitude

3:30

now set duty factor
I will show what it does
switching on PSU
here we see scope trace
see, now I will reduce duty factor
signal get distorted

4:16

so for every coil we will need to set individually
working point of this transistor
so I am increasing back duty factor
in this case on this frequency it starts working at about 71%
after we got clean signal
we start looking into our coil's properties

4:50

what happen? Such coils, at such frequencies
here it's LC resonance frequency

5:02

starts working like a Tesla coil
now both ends not connected
you can see that there is a discharge on the end of coil

5:28

coil work at $\frac{1}{4}$ wave mode
you can see it with neon bulb
in parallel to the coil I have fluorescent lamp
to ignite it let's touch it with a hot end

5:55

see what happen
lamp is very bright when connected
and it also glows after I disconnected coil
what we have to see
it could be not visible on the camera
but there are dim stripes moving on the lamp

6:18

lamp became all in stripes
if coil wound properly stripes will be clearly seen
and by adjusting frequency you should be able
stop the stripes
if you can do this then coil made properly

6:44

if you can't find such frequency
this means that there is something wrong with the coil
standing wave around coil not formed

7:06

you will need do some adjustments e.g. increase or decrease
wire length
you will get it with practice
but main task is to get coil working like a Tesla coil
and see these stripes on the lamp
once more time

7:40

here a scope trace
I already described how to tune it
and here is a power consumption

12.4v 1.34amp

the better coil made less power it will require

8:05

and brighter lamp will be
also lamp will be brighter if we connect
grounding to the coil

8:15

I am connecting ground, you see that brightness increase
without changing power supply
we can check with a second scope probe
what is going on here
I put it here like this

8:40

here we see what is on our coil
at this frequency it is sine
also clearly seen a place where pulse “strike”
a sharp edge on top

9:00

now let's try change frequency
here I decrease frequency
it is interesting that if coil aligned properly to a frequency
it “adsorbs” generator signal
so when you come close to a resonance point
sine is growing and peak from the SG is decreasing

9:38

and vise verse
if peaks from SG growing – you going to a wrong frequency
in both directions
we find maximum amplitude
maximum brightness
but most important – stripes on the lamp

10:20

when you see them they will be running
chaotically
our goal is to make coil such way that we can stop these stripes
I wish everyone successful research
schematic will be available in the link under video