

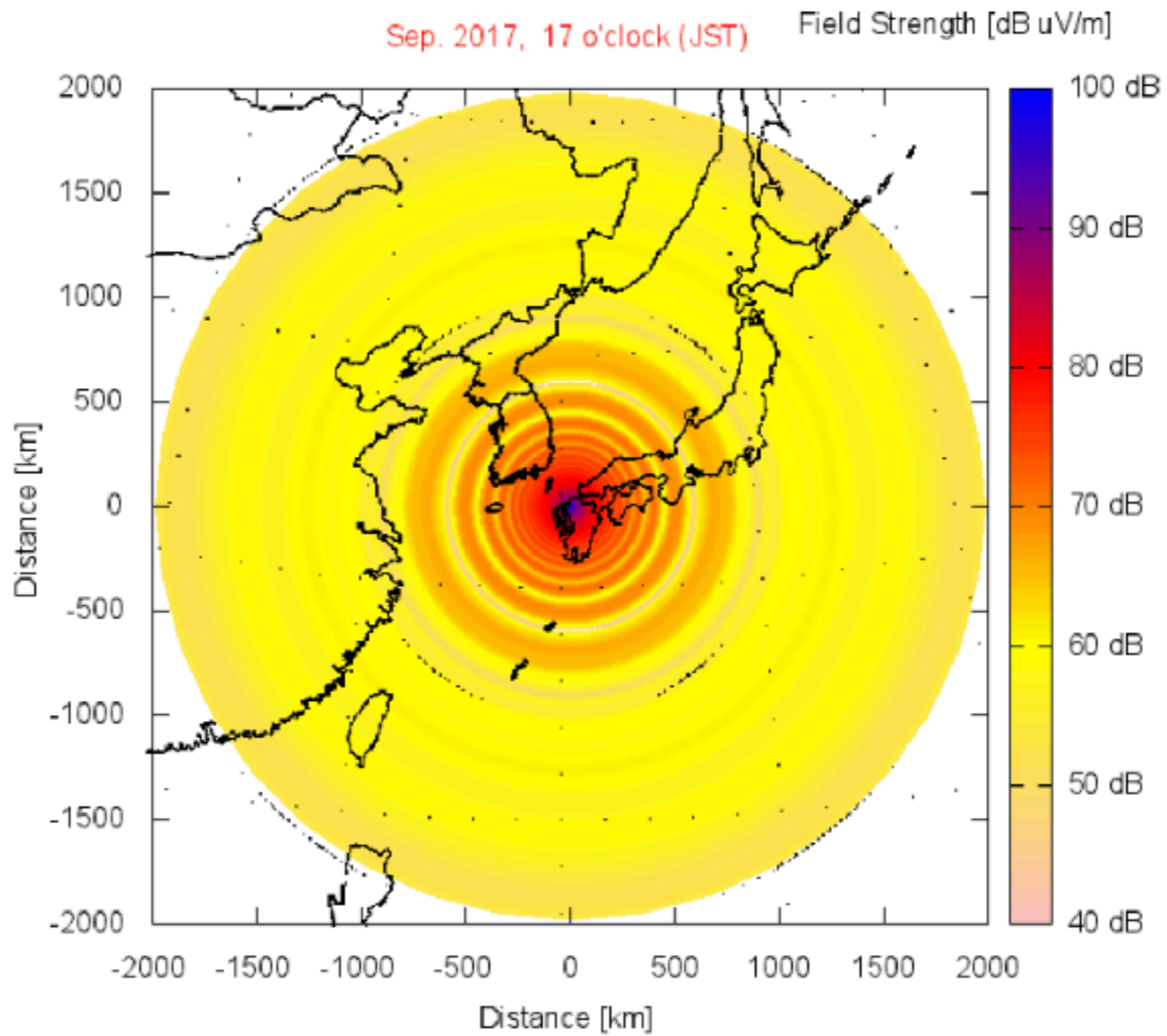
Course Activity

JJY

Introduction

- **What is JJY?**
 - The call sign of a longwave time signal radio station
- **What is the purpose of using JJY?**
 - Used to synchronize consumer radio-controlled clocks throughout Japan with Japan Standard Time(JST)
- **In Japan, the station broadcasts the JJY signal from two sites**
 - The Mount Otakadoya : 40 kHz signal
 - The Mount Hagane : 60 kHz signal
- Official website: <http://jy.nict.go.jp/index-e.html>

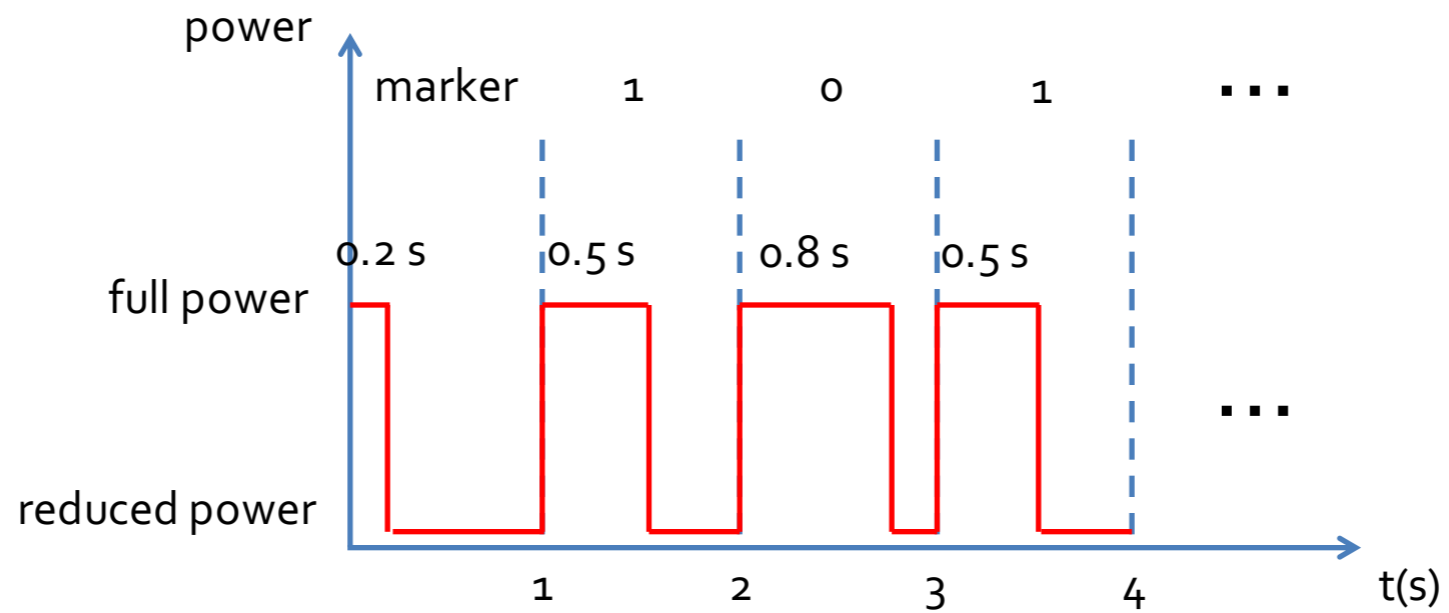
- Service area



Generating JJY signals

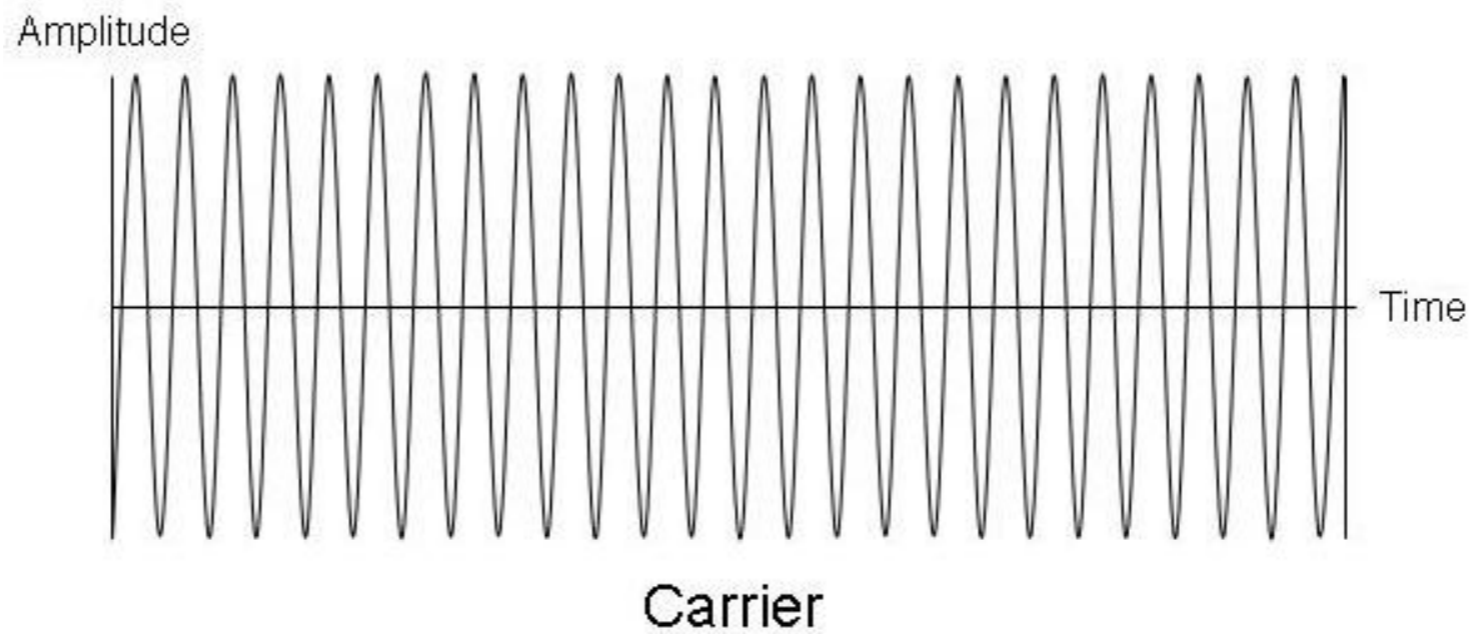
- Duty cycle modulation: 40kHz
- Send one bit per second, a complete time code in one minute
- Encode Japan Standard Time(JST) using binary-coded decimal(BCD) → JJY time code
Ex. 39 (in decimal) → 0011 1001 (BCD)
- <https://en.wikipedia.org/wiki/JJY>

$m(t)$



$$\cos(2\pi f_c t)$$

$$f_c = 40k Hz$$



送出的訊號:

$$s(t) = m(t) * \cos(2\pi f_c t)$$

- JJY time code

Bit	Weight	Meaning	Bit	Weight	Meaning	Bit	Weight	Meaning
:00	M	Start of minute marker bit	:20	0	<i>Unused, always 0.</i>	:40	SU2	Currently unused, always 0. <i>(Future: summer time is in effect.)</i>
:01	40	Minutes	:21	0		:41	80	Year
:02	20		:22	200	:42	40		
:03	10		:23	100	:43	20		
:04	0		:24	0	:44	10		
:05	8		:25	80	:45	8		
:06	4		:26	40	:46	4		
:07	2		:27	20	:47	2		
:08	1		:28	10	:48	1		
:09	P1	Marker bit	:29	P3	Day of year 1=January 1 365=December 31 366=December 31, leap year	:49	P5	Marker bit
:10	0	<i>Unused, always 0.</i>	:30	8		:50	4	Day of week. 0=Sunday, 6=Saturday
:11	0		:31	4	:51	2		
:12	20	Hours	:32	2	:52	1		
:13	10		:33	1	:53	LS1	Leap second at end of current UTC month.	
:14	0		:34	0	:54	LS2	Leap second type: 1=added, 0=deleted.	
:15	8		:35	0	:55	0	<i>Unused, always 0.</i>	
:16	4		:36	PA1	Even parity of hours bits (:12–:18).	:56		0
:17	2		:37	PA2	Even parity of minutes bits (:01–:08).	:57		0
:18	1		:38	SU1	Currently unused, always 0. <i>(Future: change to/from summer time within 6 days.)</i>	:58		0
:19	P2	Marker bit	:39	P4	Marker bit	:59	P0	Marker bit.

Course activity

- Simulate JJY signals using audio signals
- The clock can be synchronized to the time sent by the JJY simulator



- **Note1:**
make sure that the selected transmitting station is correct
“JPN” displayed on the top right corner of the clock
receiving JJY signal
- **Note2:**
PC can not create audio signals at frequency higher than 20 kHz
Using 13.3kHz square signals to get 40kHz signals
Sample code for square wave: <https://goo.gl/s5Fz29>
- **Note3:**
Use “audiowrite” in Matlab to generate .wav file
Sampling rate = 44100 or 48000