Android app for LMBR chronographs

The app receives velocities from the chronograph over Bluetooth Low Energy (BLE), shows the result, statistics, a chart and a table, and saves series to TXT files.

Buttons

The result of every operation appears in the message bar (bottom right); errors are shown in red.

Button	Location	Function
ON / OFF	header, right	ON – connects to the BLE chronograph. OFF – disconnects (also stops automatic reconnecting).
SAVE AS	button panel	Saves the measurement series to a TXT file (default name CH_YYYYMMDD_HHMMSS.txt), one velocity per line, in the current units.
LOAD	button panel	Loads a TXT file. Measurement file – values are appended to the current series. Configuration file (CHRONO_CONFIG:1) – loads the CONFIG settings.
CLEAR	button panel	Deletes all measurements of the current series (without confirmation – use SAVE AS first if you need the series).
START	TEST block	Adds a test measurement: a random velocity within MIN–MAX (step 0.1).
+ / −	block headers	Expands / collapses a block (TEST, STATISTICS, CHART, MEASUREMENTS, CONFIG).
MAX	bottom, left	Enlarges the measurement field to full screen (proportionally). Tap again or press the Android Back button to return to the normal view.

Button	Location	Function
V / E	CHART block	Chart of velocity (V) or energy (E).
− ← R → +	CHART block	− / + – decreases / increases the number of shots shown (NR zoom), ← / → – moves the range, R – automatic range.
SCROLL	CHART block	On – the chart shows the last 25 shots and scrolls with new ones. Off – the whole series is compressed into the chart.
LOCK CONFIG / SAVE CONFIG	CONFIG block	See the CONFIG section.

Tapping or dragging a finger across the chart places a marker on the selected shot; the measurement field then shows that shot.

BLE operation

The chronograph connects through a BLE module. The connection is controlled from the header: BLE field, status dot, ON / OFF button.

BLE field – what you can enter:

- the device name (letters, digits, - _ . space) – the app searches for a device with this name,
- a MAC address, e.g. A4:C1:38:00:11:22 or A4C138001122 – direct connection, no search,
- nothing – the app scans for about 3.5 s and picks the device with the strongest signal.

After a successful connection the app remembers the name and MAC; the next connection with that name goes straight to the MAC. The field cannot be edited while connected.

BLE LED indicator

Colour	State
grey	disconnected
blue, pulsing	connecting or automatic reconnecting
green	connected, data reception on
red	error (description in the message bar)

BLE AUTO (CONFIG) – connects when the app starts and after the connection drops; retries after 1.5 s, 3 s, 6 s, then every 10 s. OFF stops reconnecting until the next ON.

Android permissions – on the first ON the system asks for access: Android 12+ “Nearby devices”, Android 6–11 “Location” (location must also be switched on). If Bluetooth is off, the app asks you to turn it on.

Connection example:

1. Switch on the chronograph and Bluetooth on the phone.
2. In the BLE field enter `NAME` (or `A4:C1:38:00:11:22`, or leave it empty if there are no other modules nearby).
3. Press ON and, the first time, allow access to nearby devices.
4. The dot pulses blue, the message bar shows: “BTLE scanning for NAME…”, then “BTLE found … Connecting…”.
5. The dot turns green, the button changes to OFF, message “BTLE ready: NAME · FFE1 notifications.”
6. Take a shot: the velocity appears in the measurement field and the bar shows “BTLE RX: 823.4 m/s · Shot 1”.
7. To connect automatically at every start, switch on BLE AUTO in CONFIG; to save the device to a file, use SAVE CONFIG.

Common problems: “No BLE device found” – chronograph off or out of range; “BLE device not found: …” – the name differs from the one entered (try an empty field or the MAC); “Bluetooth permission was denied” – grant the permission in the app settings.

Function blocks

Screen, from top to bottom:

Block	Description
Header	LMBR, BLE field, status dot, ON / OFF – connection control (see BLE operation).
Button panel	SAVE AS, LOAD, CLEAR – save, load and delete a series.
TEST	Visible when TEST is on in CONFIG. MIN and MAX set the range, START adds a random measurement – for checking the app without a chronograph.
Measurement field	Large velocity of the last (or chart-selected) shot, with the shot number and energy below. Text that is too long is scaled down; scientific notation only above 99999.9. A shot outside the ALARM VdV band – velocity and “Shot N” in red.
STATISTICS	Statistics of the whole series (table below). Values in the current units, 1 decimal place.

Block	Description
CHART	Chart of V or E versus shot number (NR), with zoom, panning and a marker. Shots with an alarm – red points; VdV band limits – dashed lines.
MEASUREMENTS	Table of all shots: NR, V, E, PF. Velocities with an alarm in red.
CONFIG	Settings (see the CONFIG section).
Bottom bar	MAX on the left, messages on the right (errors in red).

STATISTICS – symbols

Symbol	Meaning
VMAX / VMIN	highest / lowest velocity
VAVG	average velocity
dV	spread: VMAX − VMIN
SV	standard deviation of velocity (sample, n−1)
EAVG	average energy
PAVG	Power Factor for VAVG (integer part)
NR	number of shots

Formulas: $E = m \cdot V^2 / 2$ (m in kg, V in m/s, result in J; in IMPERIAL in ft·lb). PF = mass [gr] · V [ft/s] / 1000, integer part. The projectile mass is set in CONFIG (WEIGHT).

CONFIG

Settings are saved in the app automatically after every change; SAVE CONFIG additionally creates a portable TXT file.

Option	Function
LOCK CONFIG	Locks all CONFIG options and loading a configuration file with LOAD.
SAVE CONFIG	Saves the configuration to the file CF_YYYYMMDD_HHMMSS.txt (including the BLE device name and MAC).
Name / Description	Free description of the series or setup (e.g. gun, ammunition).
WEIGHT	Projectile mass in g or gr (depending on UNITS

Option	Function
	and MIX) – needed for energy and PF.
ALARM VdV	Band of acceptable velocities in the format V d width, e.g. 800d20 = normal range 790–810 (limits included). A shot outside the band is marked in red. Empty field = OFF. Values in the current units.
Fit Screen	ON – the whole interface is scaled to fit the screen without scrolling.
BLE Auto	ON – automatic connection at start and reconnecting after the connection drops.
Test	ON – shows the TEST block (START, MIN, MAX).
Mix	Swaps the mass unit: METRIC + Mix = mass in gr, IMPERIAL + Mix = mass in g. Other units unchanged.
Style	Colour scheme 1–4: 1 dark green, 2 dark graphite, 3 light blue, 4 light sepia.
Units	METRIC (m/s, J, g) or IMPERIAL (ft/s, ft·lb, gr). Changing it converts all displayed values.

Configuration file – a text file; it is loaded with the LOAD button. A missing or empty entry does not change the current setting (exception: an empty ALARM_VDV_MPS switches the alarm off). Values in the file are always in m/s and grams.

```
CHRONO_CONFIG:1

NAME=Air rifle 5.5 / JSB 1.03 g
WEIGHT_G=1.03
ALARM_VDV_MPS=280d10
FIT_SCREEN=0
BLE_AUTO=1
BLE_NAME=CHRONO
BLE_MAC=A4:C1:38:00:11:22
TEST=0
MIX=0
STYLE=1
UNITS=METRIC
```

BLE on LOAD: accepted are the MAC alone, the name alone, or the name with the MAC (`BLE_NAME=` / `BLE_MAC=` or a single line, e.g. `BLE=CHRONO A4:C1:38:00:11:22`). While BLE is connected, the device is not changed.